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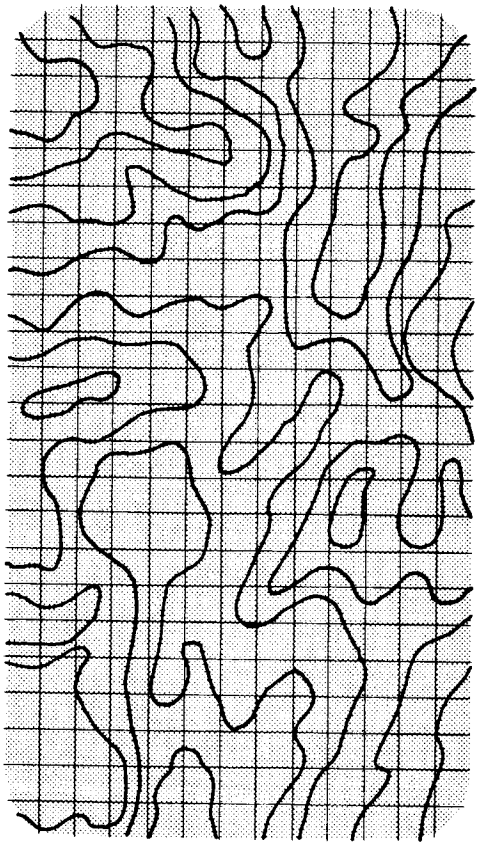

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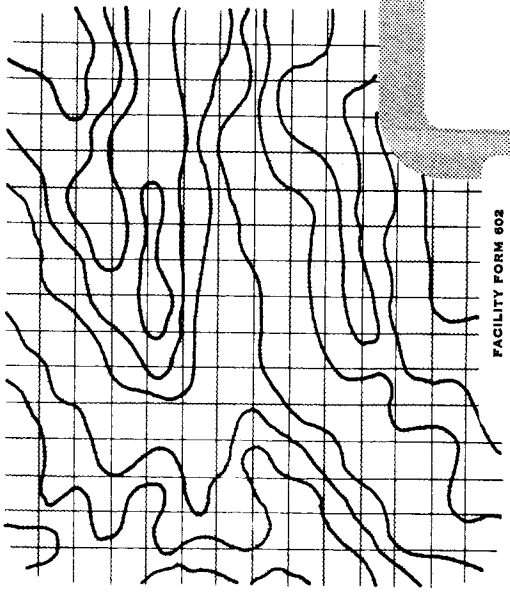
SATURN ANTENNA SYSTEMS SA-5

(A SUPPLEMENT TO "CHECKOUT PROCEDURES FOR SA-5 RF SYSTEMS PUBLICATIONS")



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FACILITY FORM 602

VOLUME 1

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SATURN ANTENNA SYSTEMS, SA-5

VOLUME

June 18, 1963

Compiled and prepared for publication by Chrysler Corporation, Huntsville Division, under a special Task Order issued under Contract Number NAS8-4016.

The data contained in this publication were submitted by the Antenna Unit, RF Systems Development Section, and prepared for publication in accordance with the style and format previously determined best suited for the special requirements of field application by the Technical Data Unit, Planning and Engineering Section, Instrumentation Development Branch.

Coordinated by: Thomas B. Hickman

Approvals:

for

A. L. Bratcher, Chief
Technical Data Unit

J. W. Harper

J. W. Harper, Chief
Antenna Development Unit

SA-5

SATURN ANTENNA SYSTEMS

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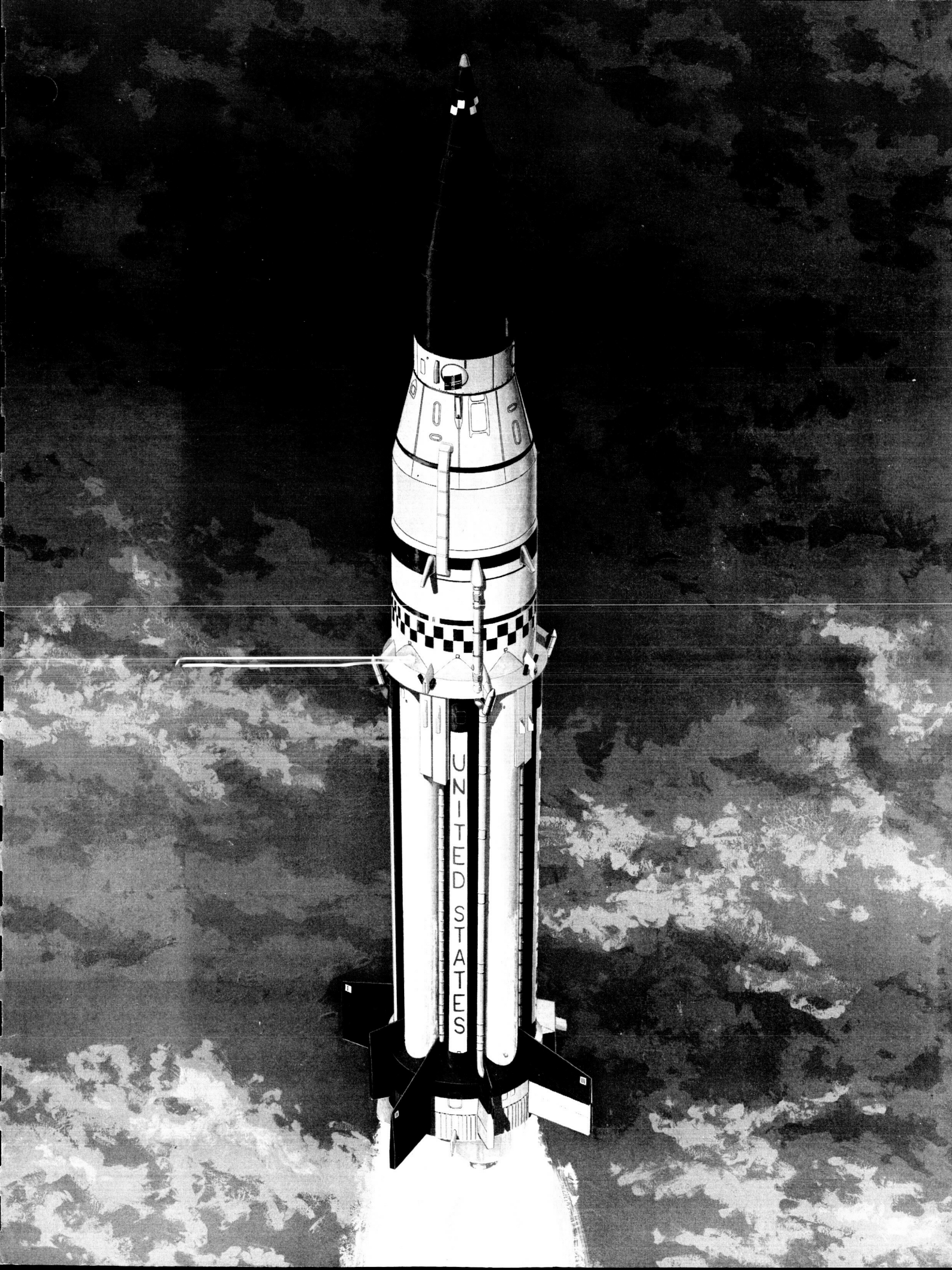
VHF TELEMETRY ANTENNA SYSTEM

MINITRACT-VOT ANTENNA SYSTEM


UNITED STATES

SA-5

SATURN ANTENNA SYSTEMS

INTRODUCTION

Saturn vehicle SA-5 is composed of four major assemblies: S-I stage, S-IV stage, instrument unit, and payload.

S-I Stage - The first stage, S-I, is basically a cluster of nine propellant containers attached at the forward end to a spider beam and at the aft end to a thrust structure. Eight H-1 engines are attached to the rear of the thrust structure. Metal panels are located on the upper portion of the propellant tanks to accommodate the installation of the Command, Television, and four of the six VHF Telemetry antennas. These panels are 24 inches wide and 150 inches long, and have been installed in pairs at each fin position. The two panels of a pair are connected by flexible straps to permit free movement of the propellant tanks while maintaining electrical continuity between panels.

S-IV Stage - The S-IV stage is a cylindrical configuration 220 inches in diameter. Six RL10-A3 engines power the stage. Antennas for the S-IV stage are developed and documented by Douglas Aircraft Company, Inc.

SA-5

SATURN ANTENNA SYSTEMS

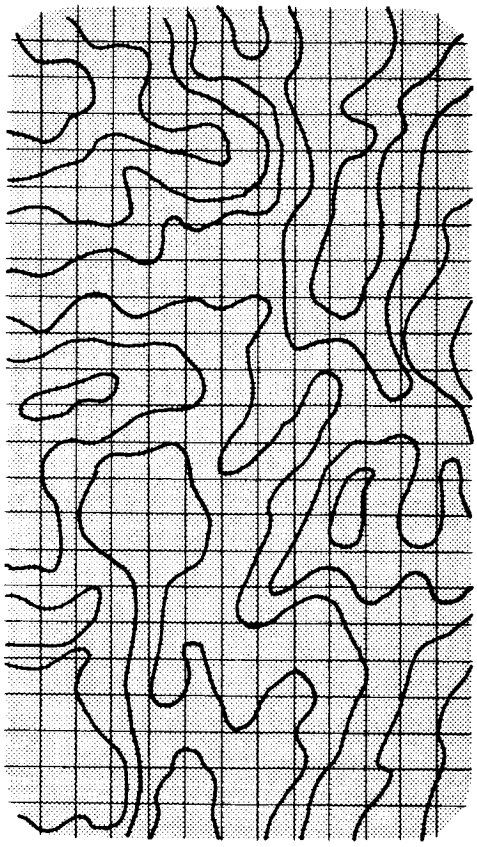
INTRODUCTION
(Cont.)

Instrument Unit - The instrument unit consists of four 40-inch-diameter tubes which extend radially from a vertical 70-inch diameter center tube. The C-Band Radar, Azusa, Udop Transmitting and Receiving, Altimeter, Mistram, and two of the six VHF Telemetry antennas are located on the instrument unit.

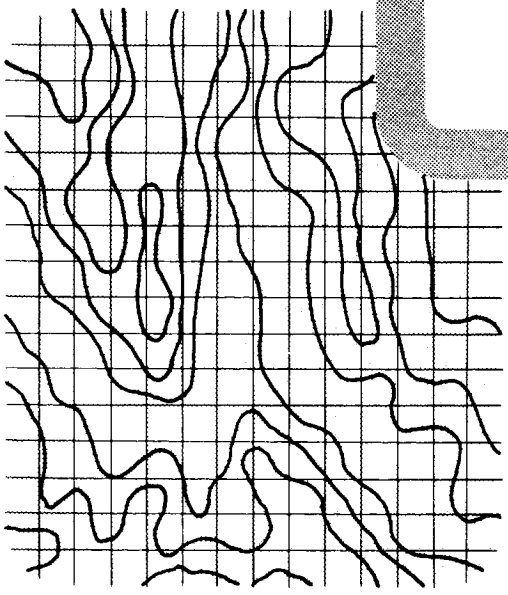
Payload Assembly - The payload consists basically of a modified Jupiter nose cone and aft unit with an adapter section which mates to the instrument unit. The Minitrack-VOT antennas are located on the payload.

Predicted look angles are provided in the back of each volume of this publication. These are on transparent sheets that may be removed and placed over a contour plot to determine the field strength (in db) versus time of any antenna during the flight trajectory.

Direction of the ground stations from the vehicle is shown as a function of time.



VHF TELEMETRY ANTENNA SYSTEM SA-5



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SA-5 VHF TELEMETRY ANTENNA SYSTEM

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SA-5 VHF TELEMETRY ANTENNA SYSTEM

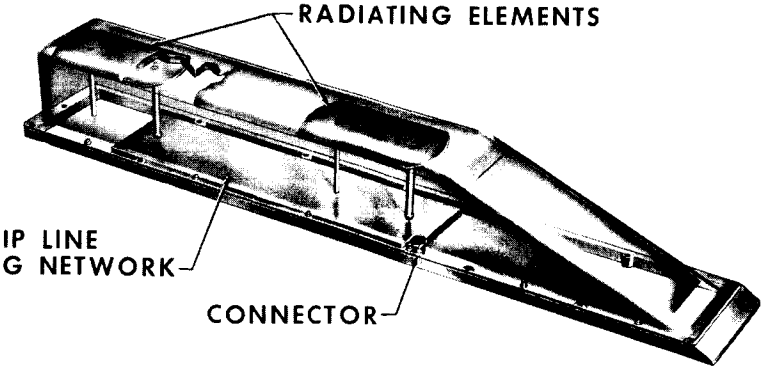
DESCRIPTION

The VHF telemetry antenna system consists of six, Model 213, two-element array antennas. These are divided into three sets of two antennas each. One set of antennas is located on the instrument unit and two sets on the booster. The set on the instrument unit is fed by four telemetry transmitters, which are multiplexed through a Rantec Model MT-433 multiplexer providing 20 db isolation between adjacent frequency transmitters with approximately 1 db insertion loss. Each set on the booster is fed with three transmitters, through a Rantec Model MT-333 multiplexer which provides 20 db isolation between adjacent frequencies with approximately 1 db insertion loss. The two antennas of a set are connected to the multiplexer output through a strip line power divider which provides equal power division and 50 ohm input impedance. The antennas of a set are fed in phase through equal lengths of RG-214/U coaxial cable.

SA-5 VHF TELEMETRY ANTENNA SYSTEM

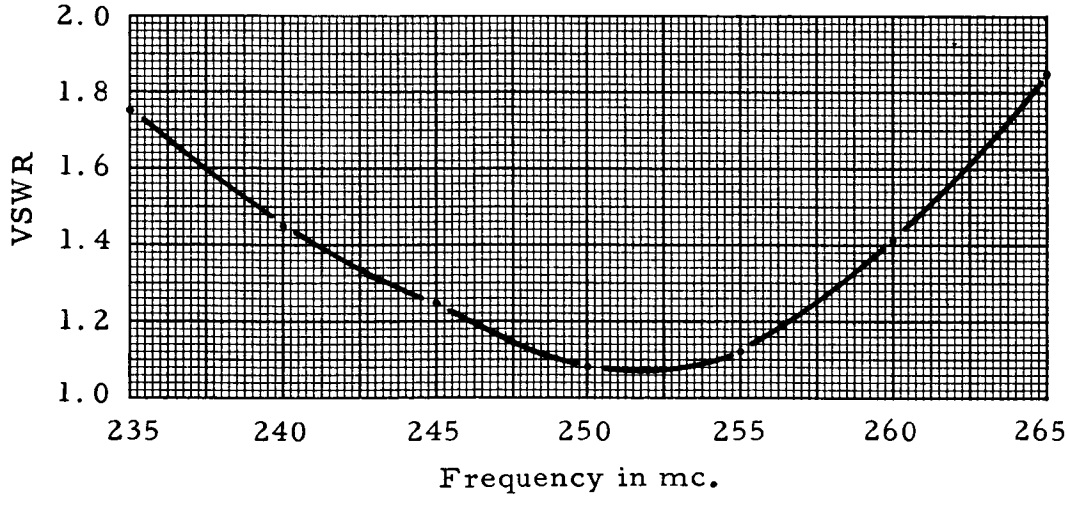
SPECIFICATIONS

MODEL 213

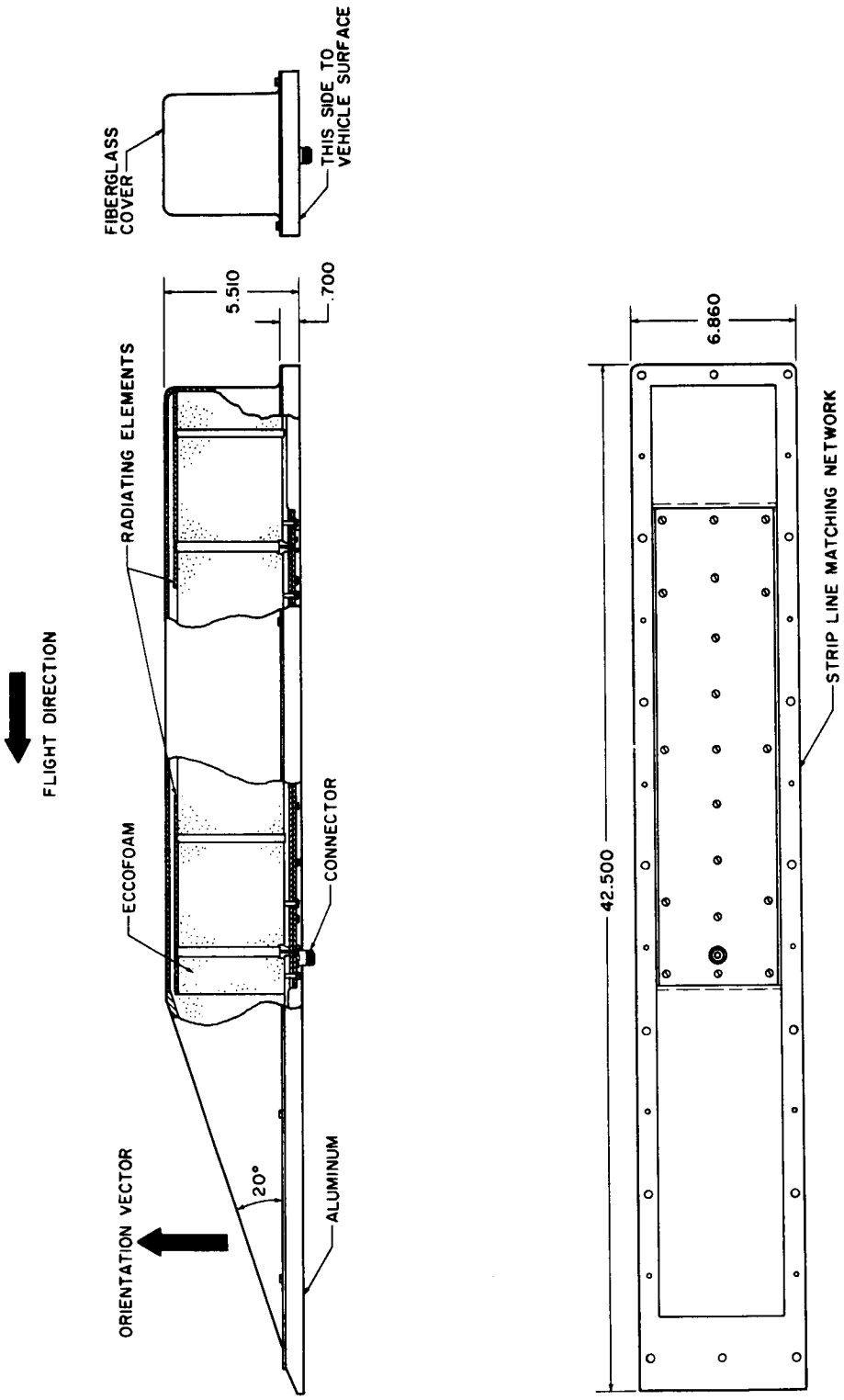


-Location-
Station 1488.396 (Instrument Unit)
Fin II Fin IV
Station 909.929 (S-I Stage)
5.75° II→I 5.75° II→III
5.75° IV→III 5.75° IV→I

Drawing number - 50M10342
Type - two element array
Frequency range - 240 to 260 mc.
Bandwidth - 20 mc. for 1.5:1 VSWR
Number required - 6
Polarization - linear
Gain - 3 db.
Connector type - N
Weight - 19 lbs.
Dimensions - 44 by 6.8 by 5.5 inches

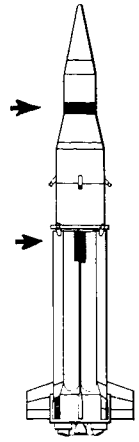


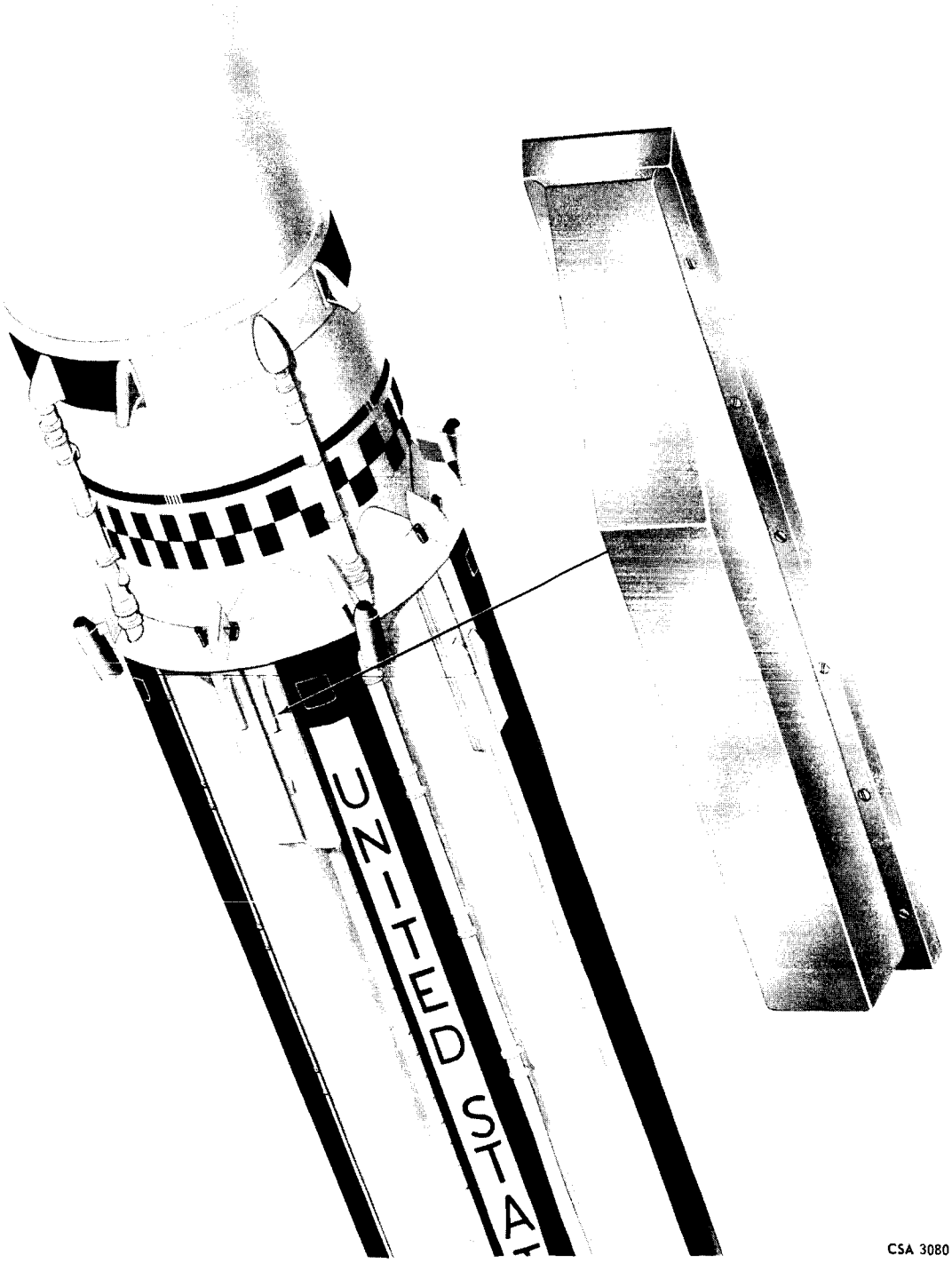
SA-5 VHF TELEMETRY ANTENNA SYSTEM



DIMENSIONAL SKETCH

SA-5 VHF TELEMETRY ANTENNA SYSTEM





CSA 3080

LOCATIONAL VIEW

SA-5 VHF TELEMETRY ANTENNA SYSTEM

RADIATION PATTERNS

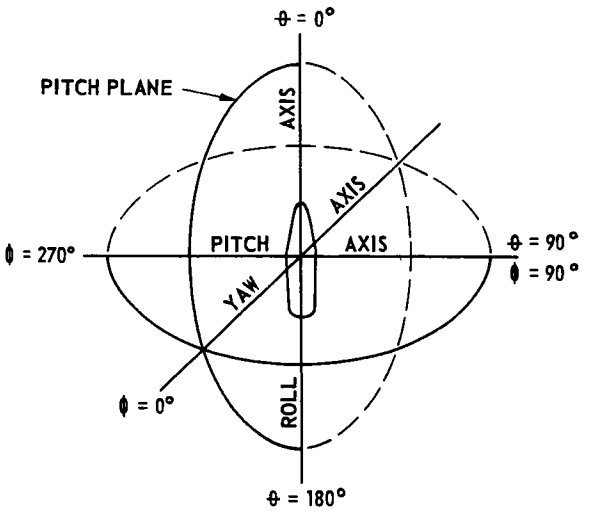
VHF TELEMETRY ANTENNA SYSTEM

ANTENNA MODEL 213

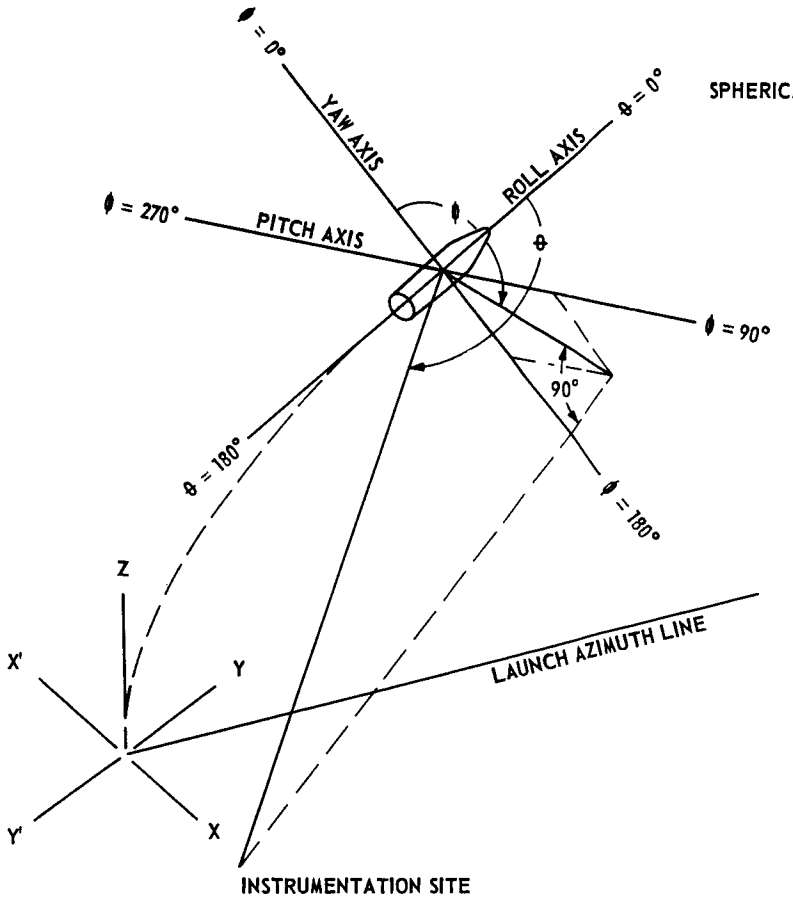
The measurement of antenna radiation is recorded on rectangular and polar patterns. Equipment capable of simultaneous recordings is used to display the rectangular patterns in db, and the polar patterns in voltage.

Rectangular and polar patterns are cut by placing the vehicle in the horizontal position with the antenna located at $\phi = 0°$. Patterns are then plotted through 360° of θ in 10° increments of ϕ (great circle cuts). The 10° increments are made through 180° by rotating the vehicle counter-clockwise, when viewed looking into the tail.

SA-5 VHF TELEMETRY ANTENNA SYSTEM



SPHERICAL COORDINATE SYSTEM



TRAJECTORY GEOMETRY

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I

ANTENNA PATTERN

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			3. DATE 17 April 1963
			4. REPLACES PAGE(S) ___ ___ ___ ___ ___ DATED
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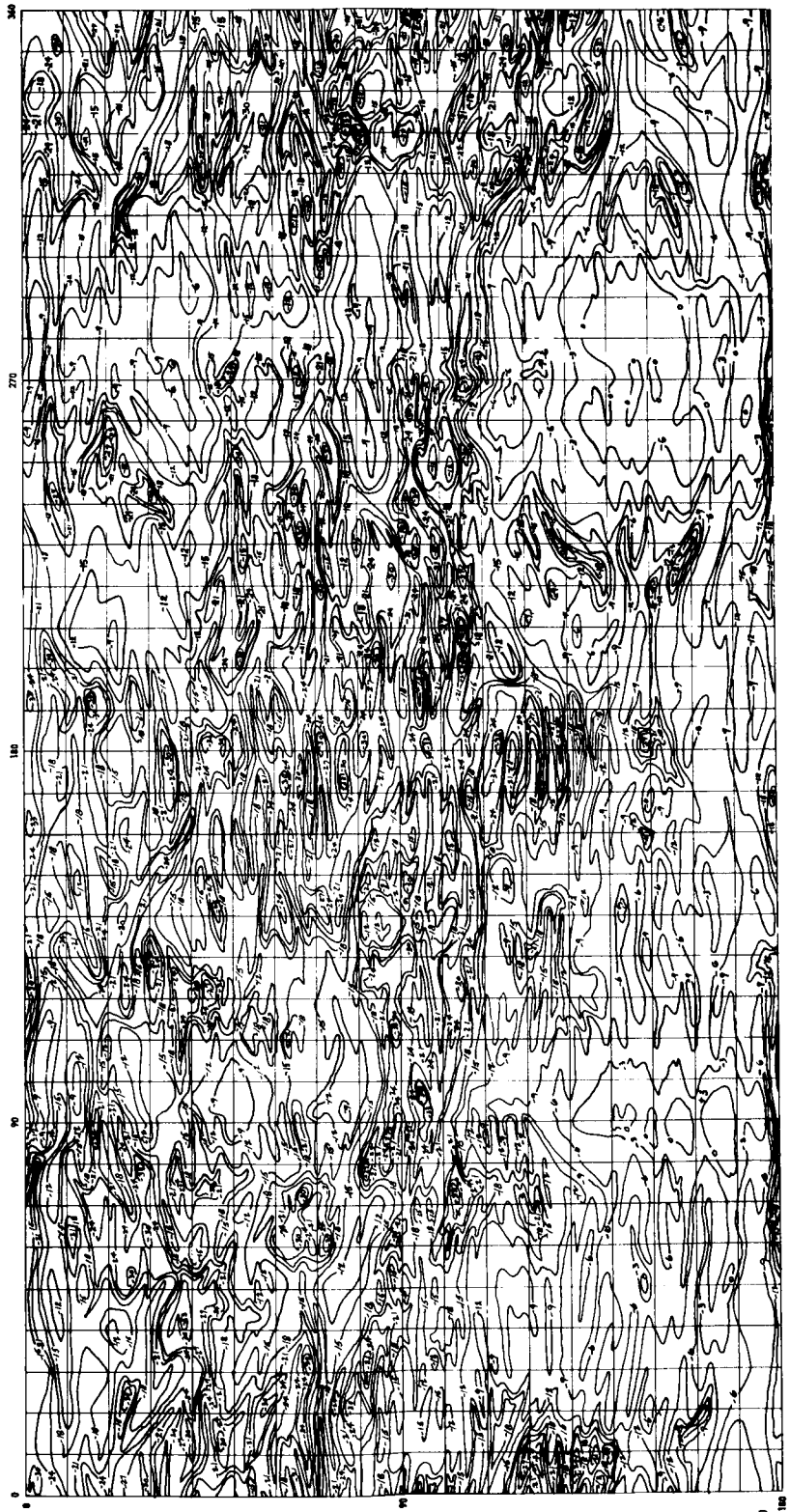
10. TEST CODE:	11. PRD PAGE NO.:	12. INSTRUMENTATION SYSTEM: VHF TELEMETRY SYSTEM I, Horizontal Polarization	14. - 18. (SEE REVERSE SIDE OF FORM)
13. ANTENNA PATTERN PLOT			



1. SECURITY CLASSIFICATION

9. REVISION NO.

AFMTC FORM 50E AUG 59 REPLACES AFMTC FORM 50E, JUN 59 WHICH IS OBSOLETE

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I

ANTENNA PATTERN

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3. DATE: 17 April 1963			
4. REPLACES PAGE(S) ___ ___ ___ ___ DATED			
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10. TEST CODE:	11. PRD PAGE NO.:	12. INSTRUMENTATION SYSTEM: VHF TELEMETRY SYSTEM I, Vertical Polarization	14. IB. (SEE REVERSE SIDE OF FORM)
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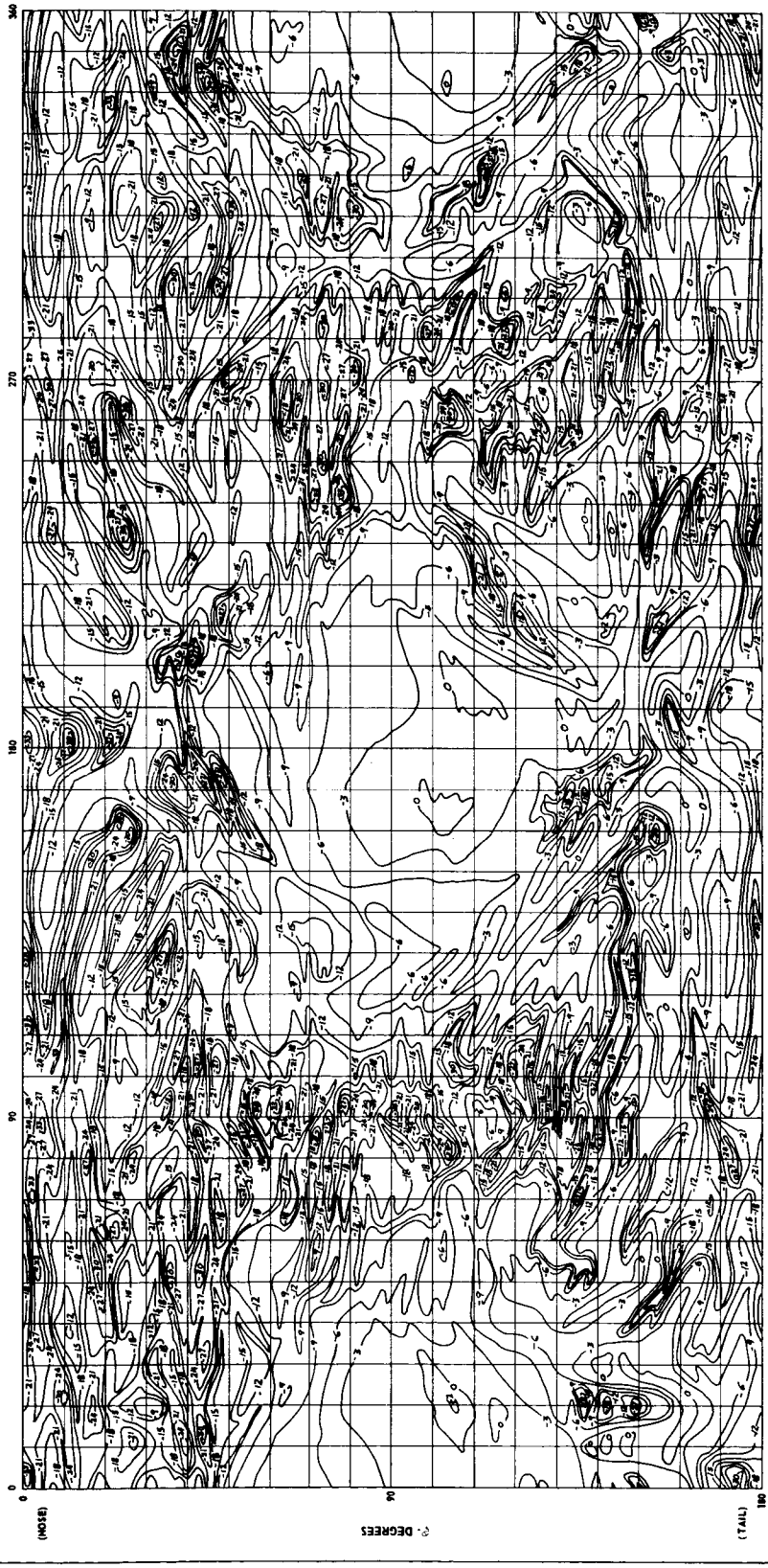

φ, DEGREES

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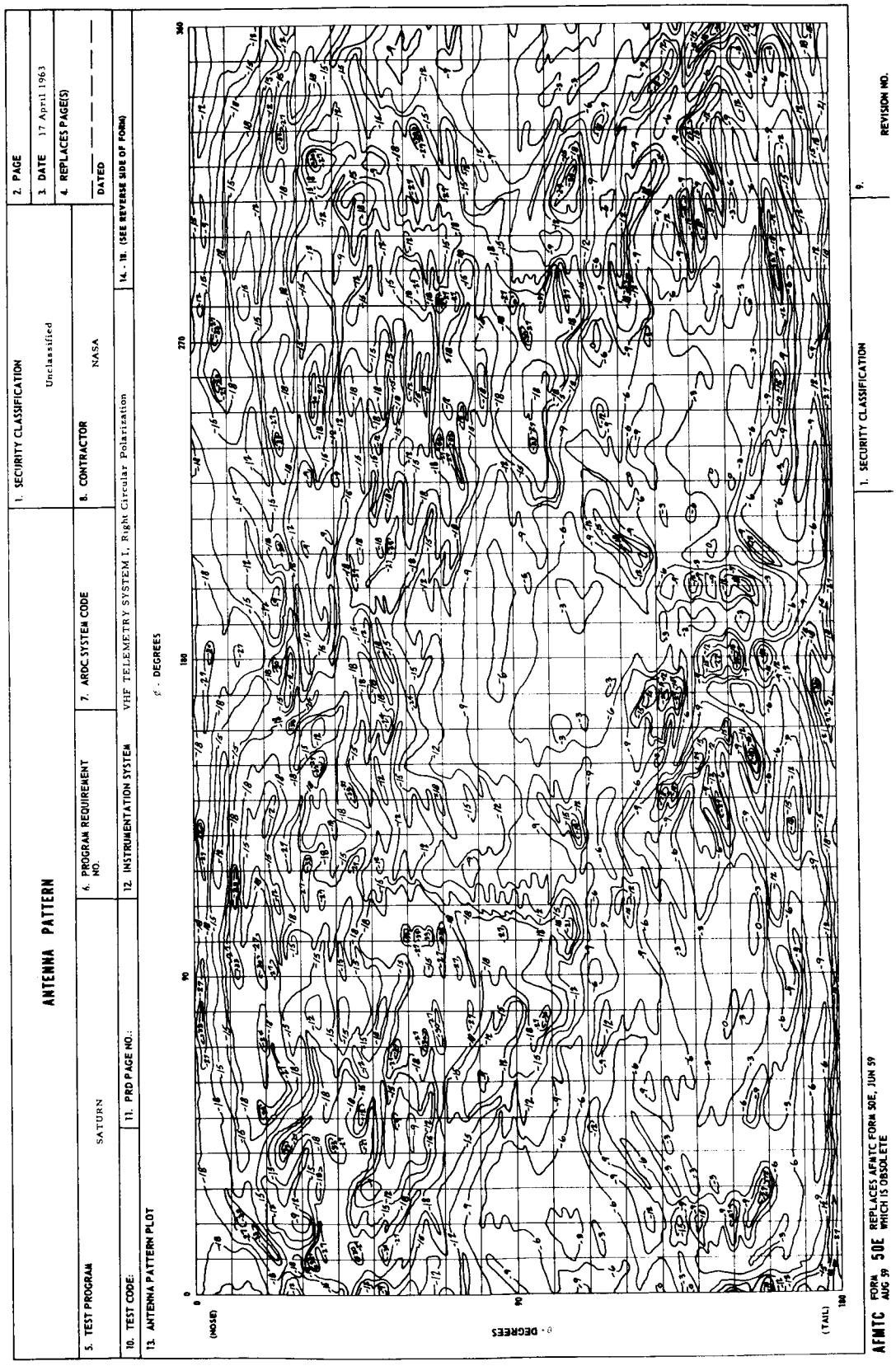
SYSTEM I



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SYSTEM I

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			DATED
10. TEST CODE:	11. PRD PAGE NO.:	12. INSTRUMENTATION SYSTEM: VHF TELEMETRY SYSTEM I, Left Circular Polarization	14. - 18. (SEE REVERSE SIDE OF FORM)
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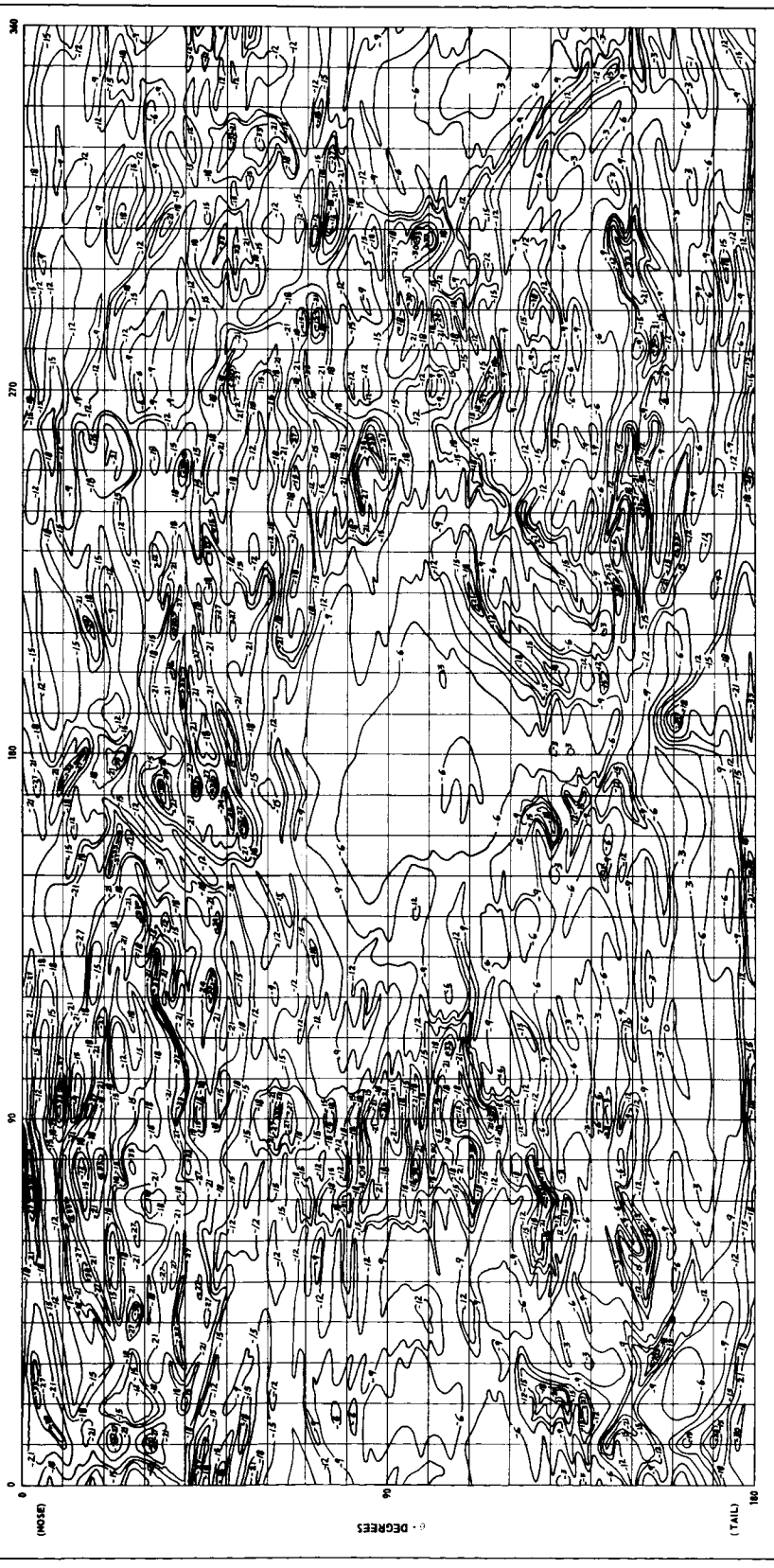

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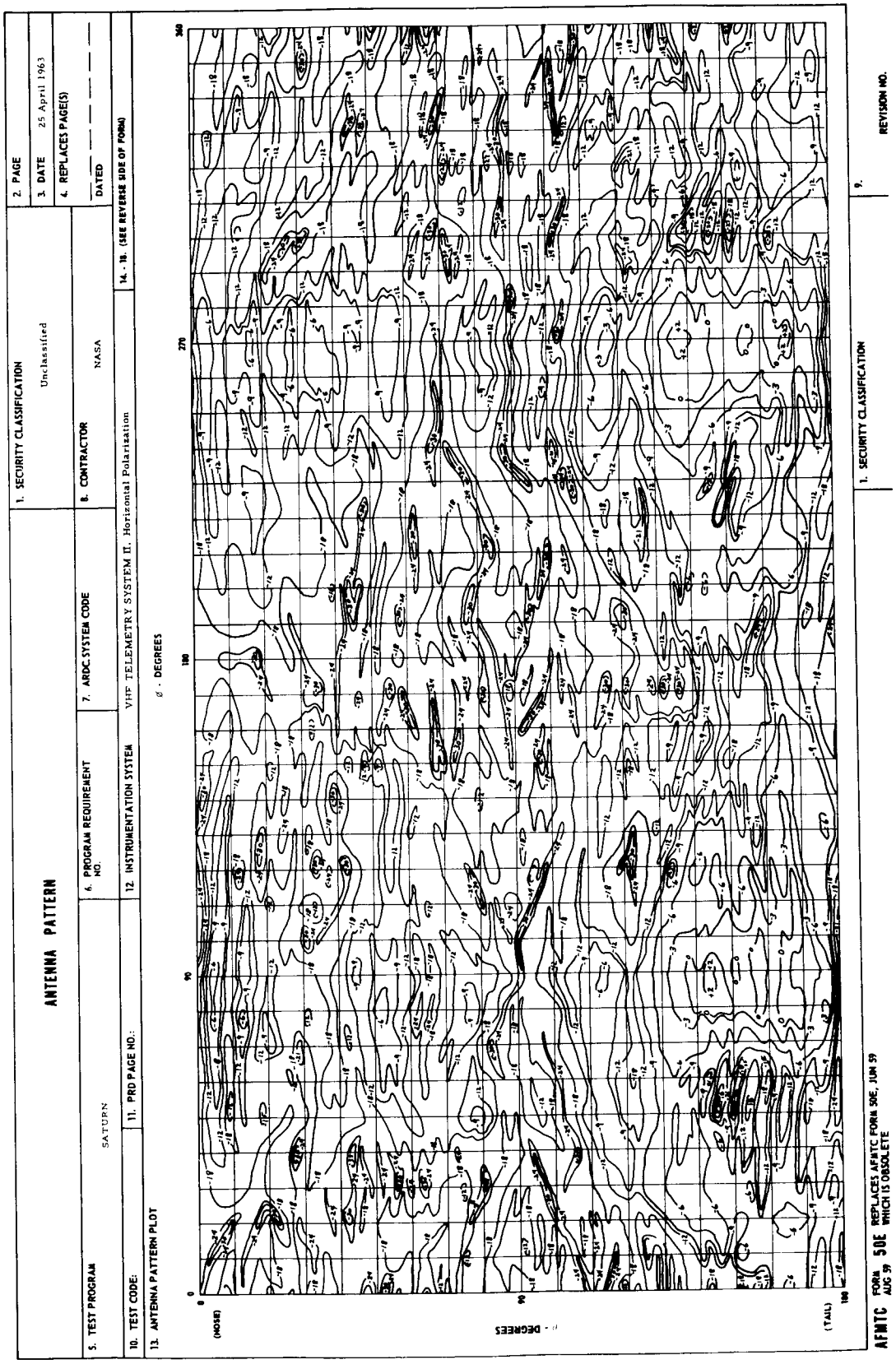
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



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SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II

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10. TEST CODE:	11. PRD PAGE NO.:	12. INSTRUMENTATION SYSTEM: VHF TELEMETRY SYSTEM II. Vertical Polarization	14. - 18. (SEE REVERSE SIDE OF FORM)
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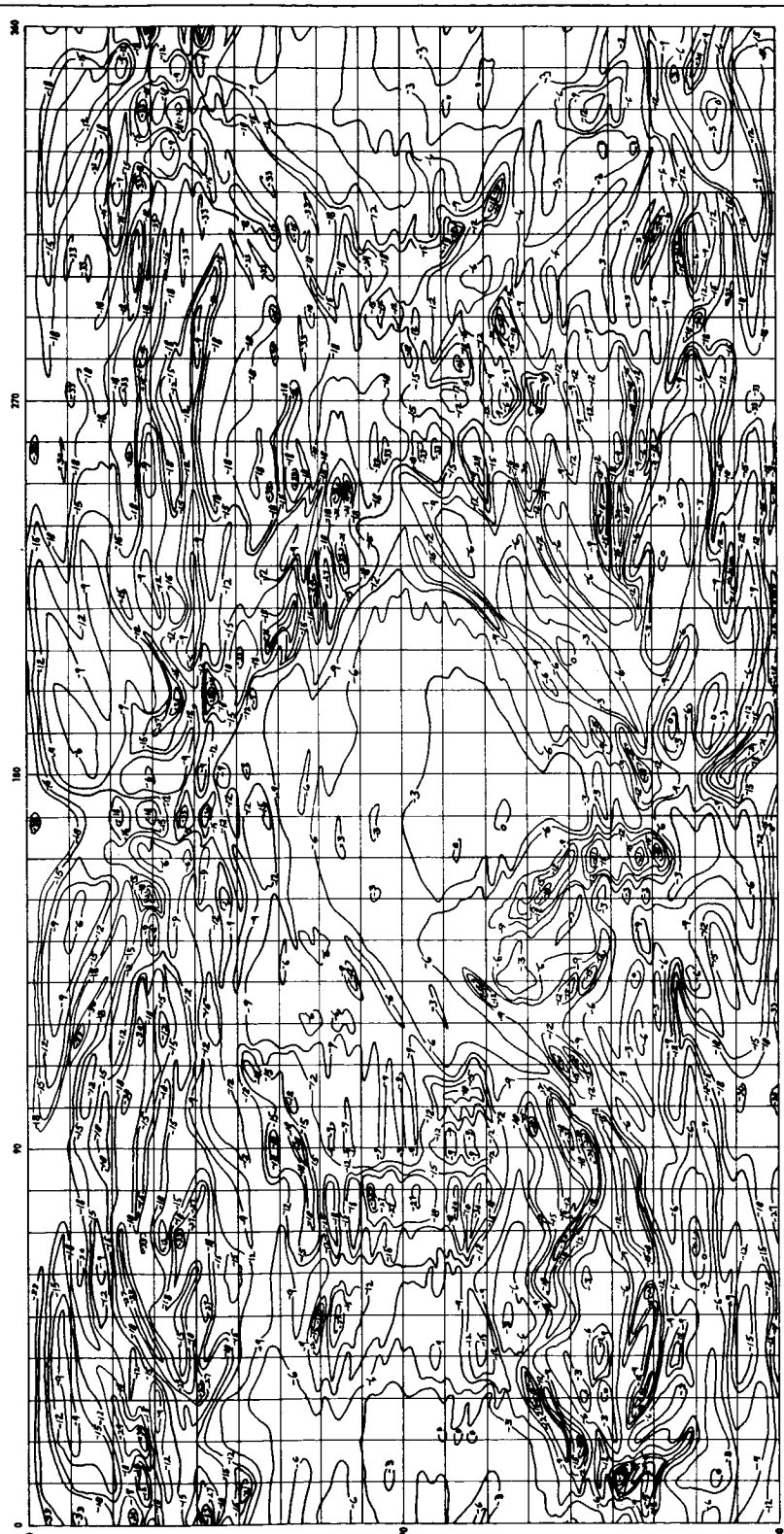

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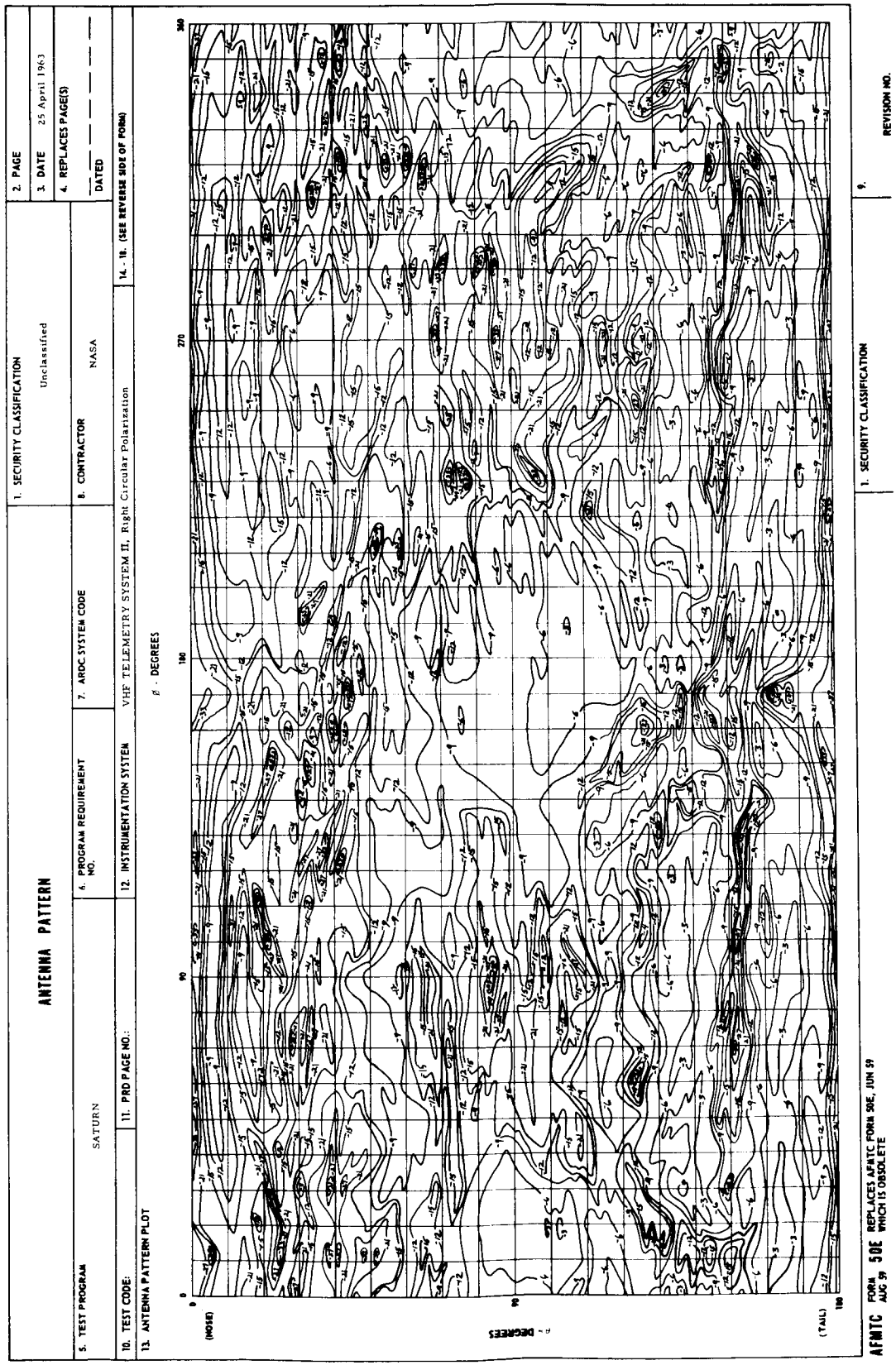
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



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SYSTEM II

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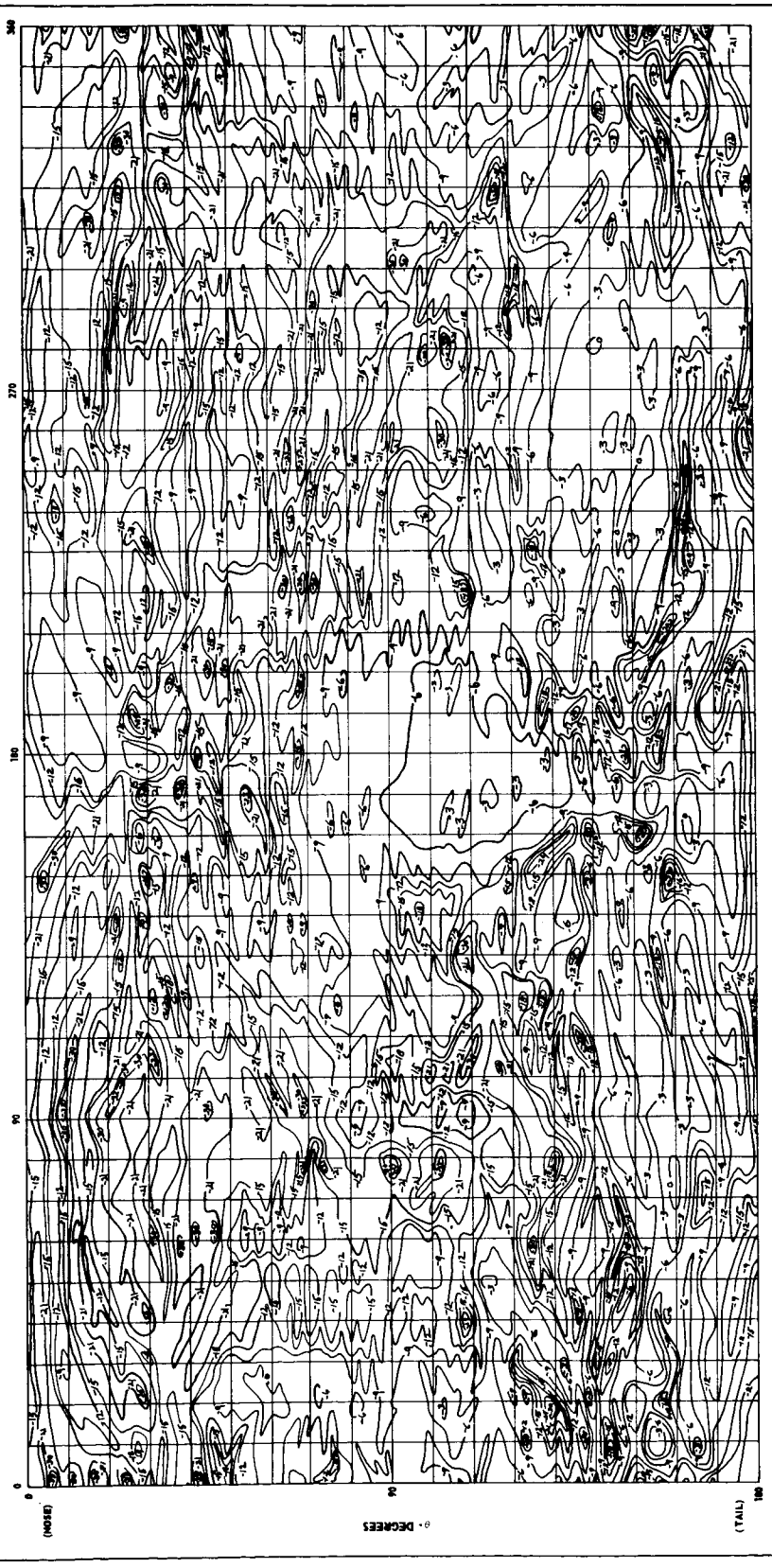

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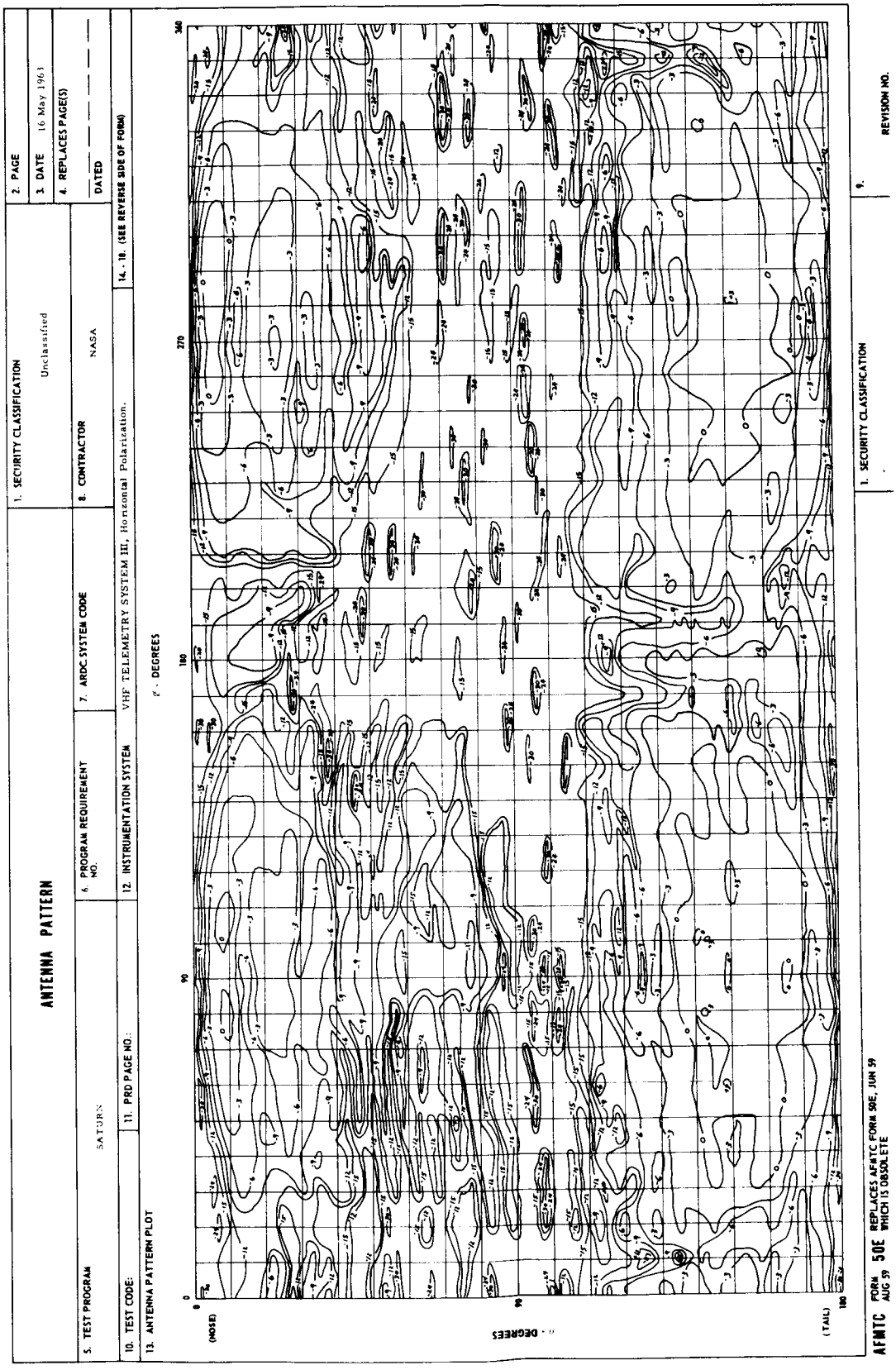
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



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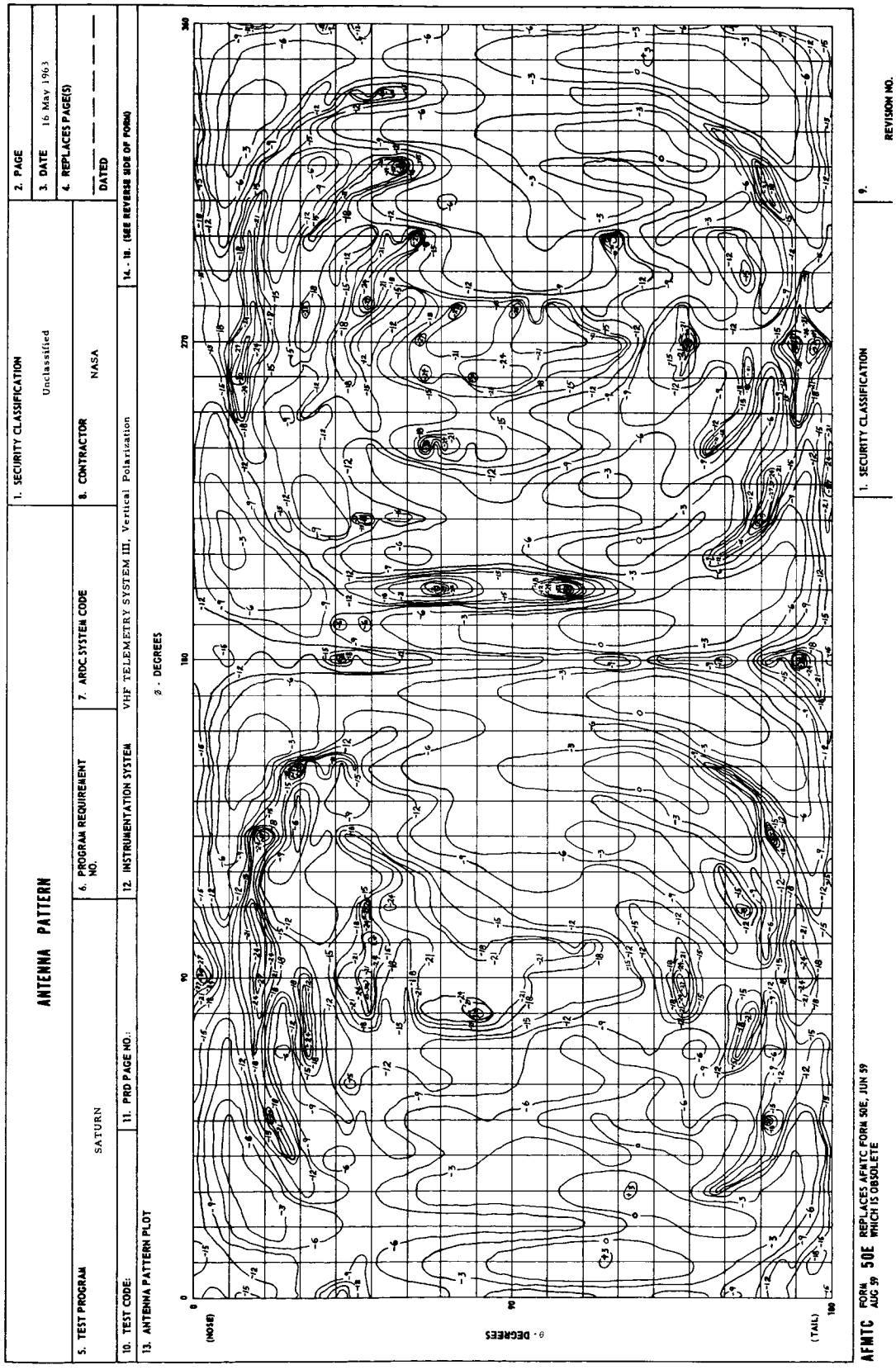
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



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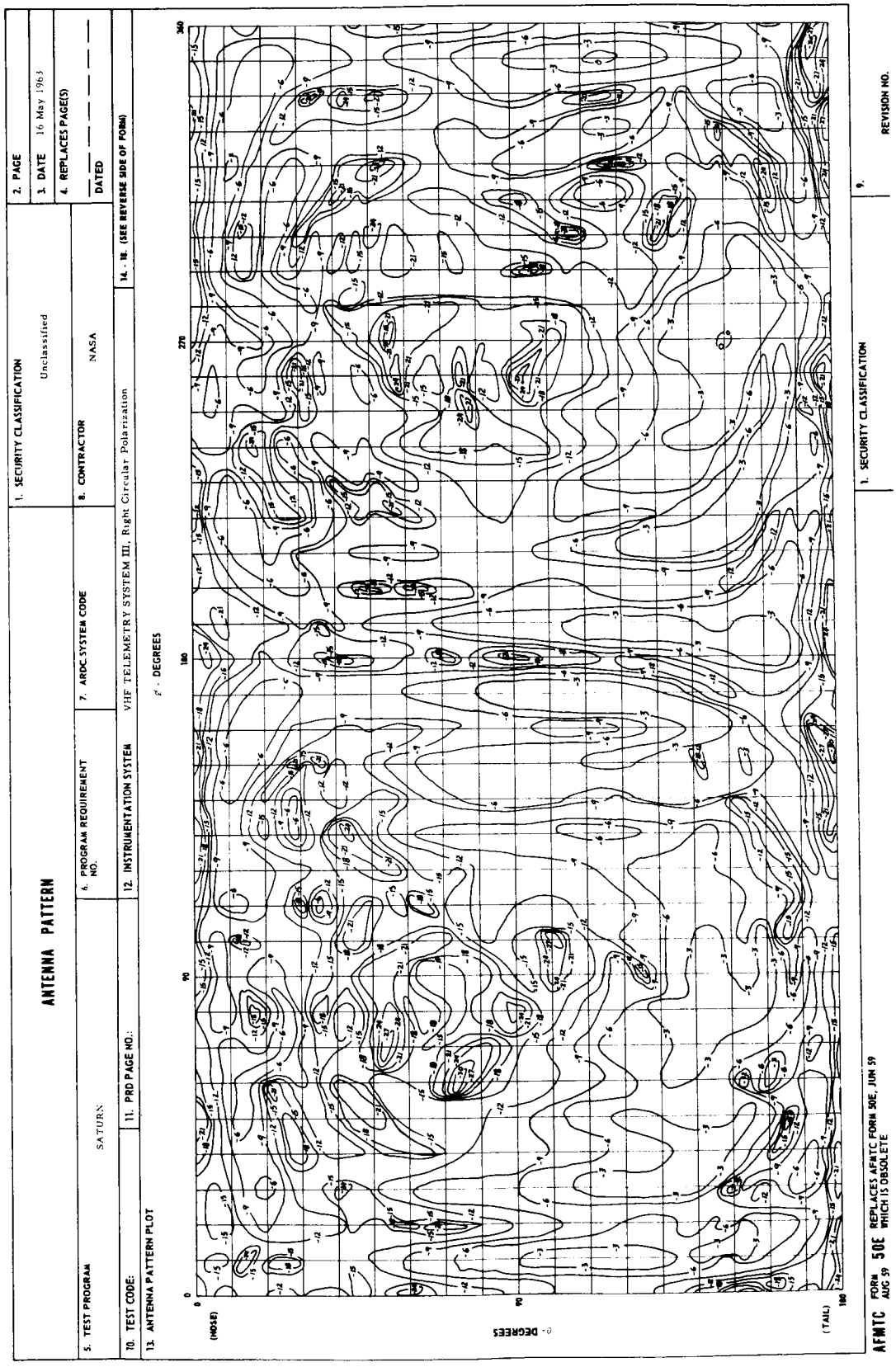
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



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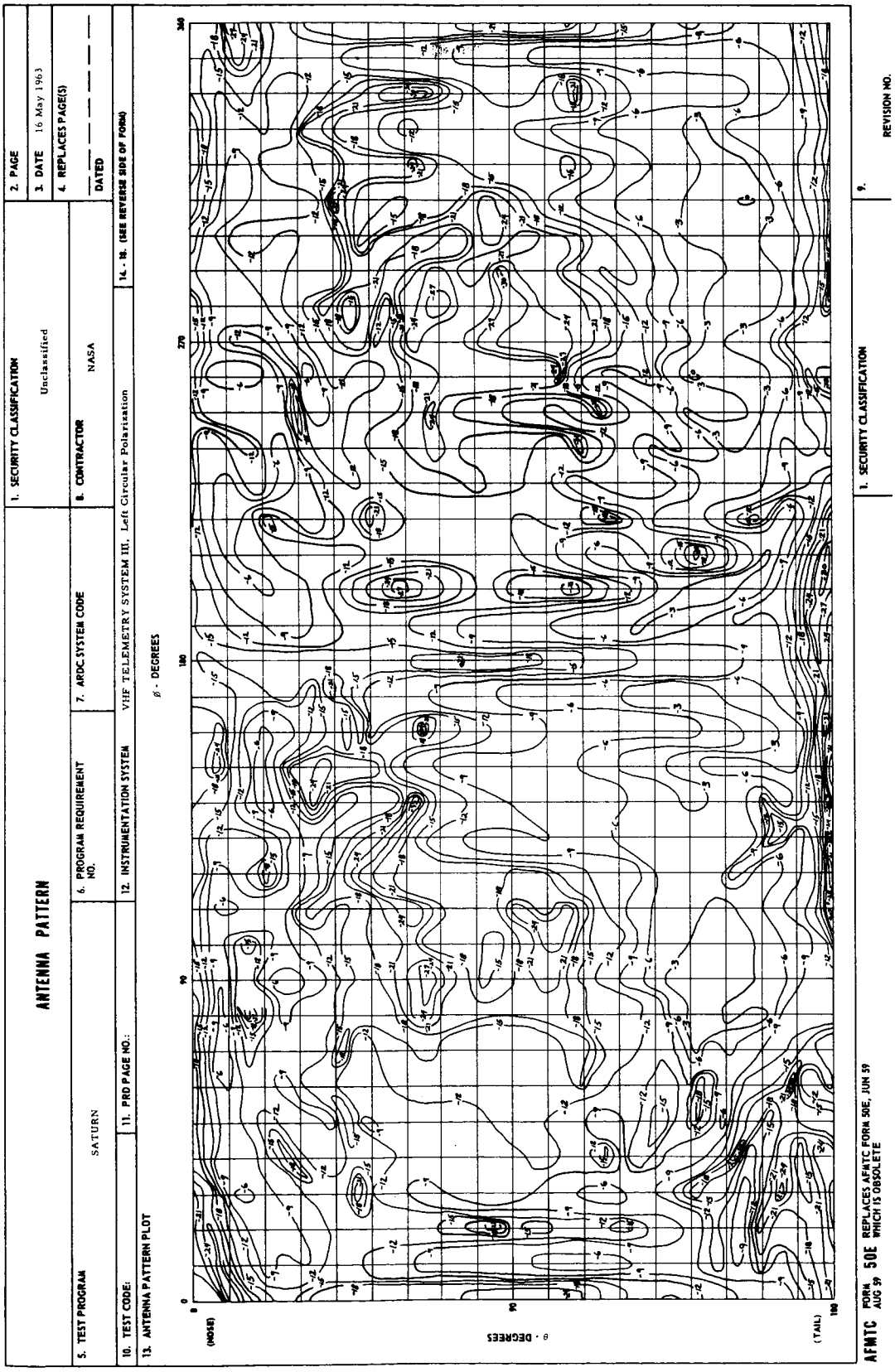
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



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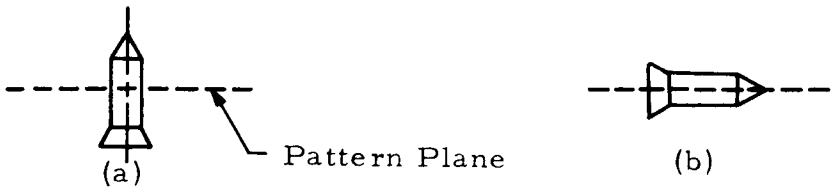
SA-5 VHF TELEMETRY ANTENNA SYSTEM

DESCRIPTION OF PATTERN AND POLARIZATION SYMBOLS AND GAIN DETERMINATION

PATTERN PLANE

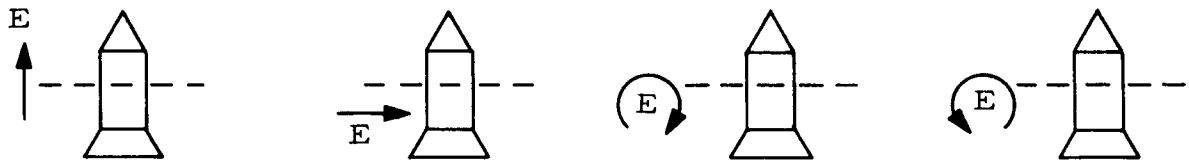
The plane of the pattern is indicated by a broken line passing horizontally through a sketch of the model. This line represents the pattern plane as seen from a point in that plane. The model is then shown in its proper orientation to the line representing the pattern plane.



In the above sketch, the pattern plane is perpendicular to the vehicle axis in (a) and contains the axis in (b). In both cases it is perpendicular to the plane of the sketch.

POLARIZATION

The polarization component shown by the recorded pattern is indicated by a vector which, for linear polarization, is either parallel or perpendicular to the pattern plane. For circular polarization a circular arrow symbol is used.



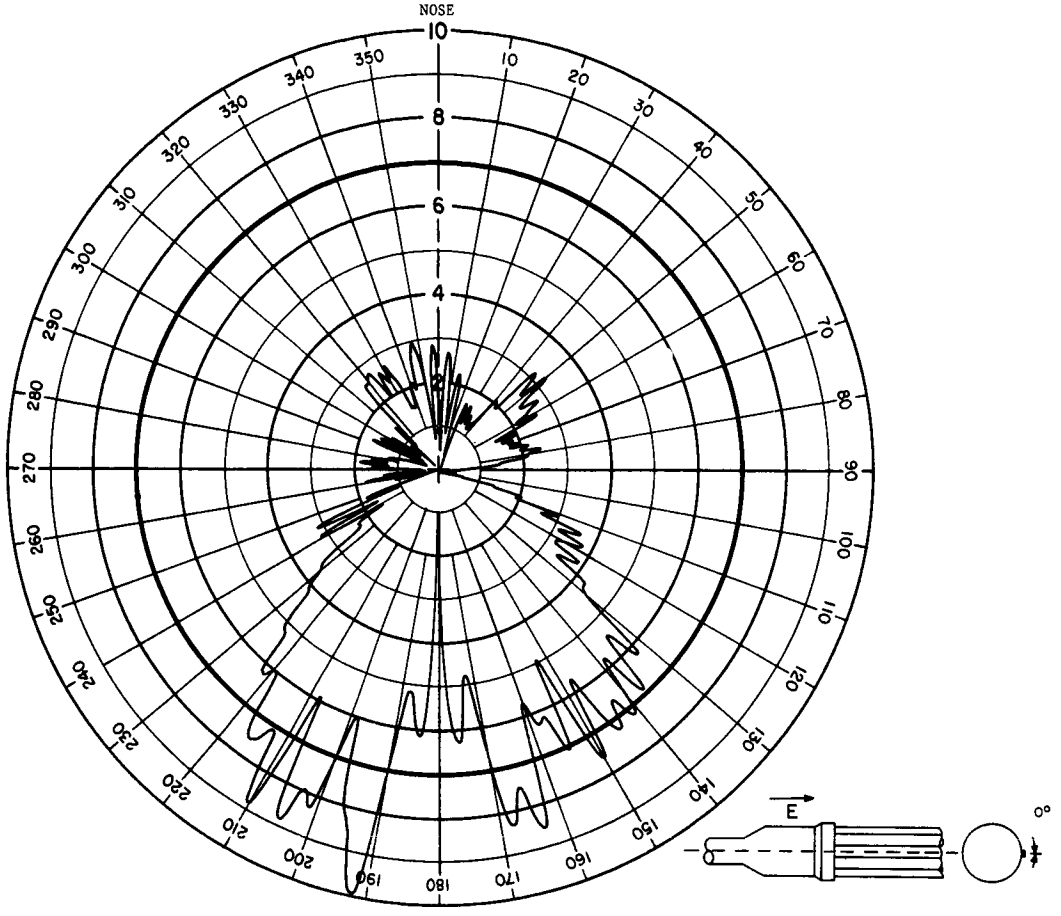
Polarization vector normal to pattern plane | Polarization vector parallel to pattern plane | Right circular polarization | Left circular polarization

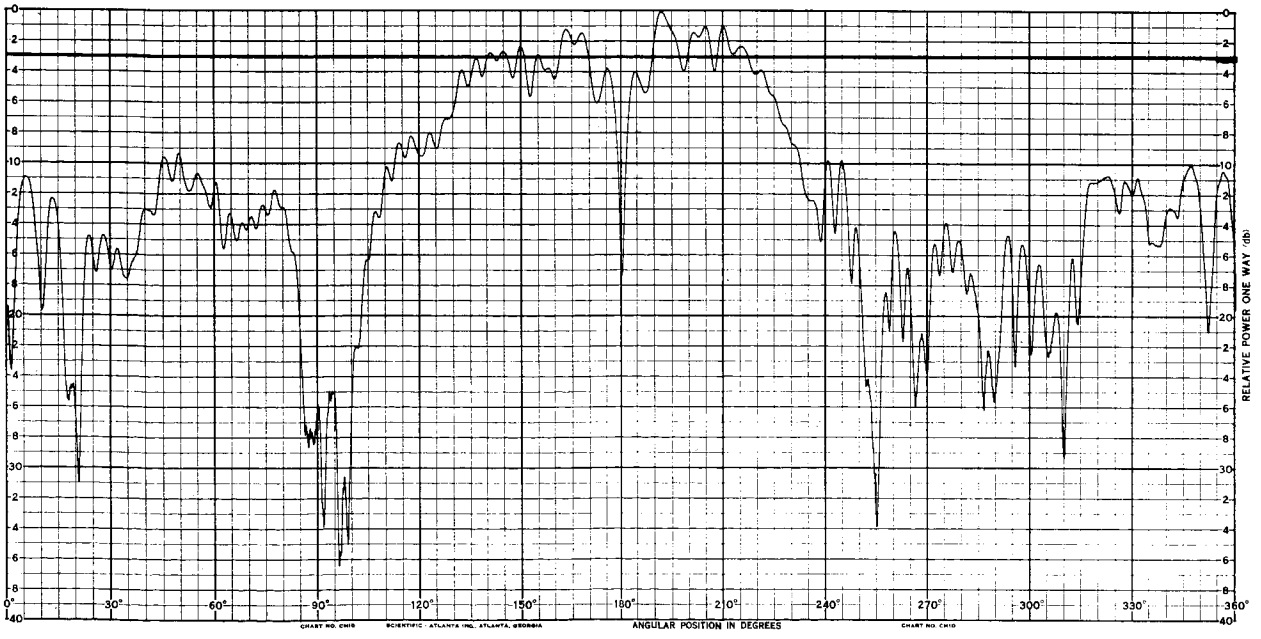
GAIN

The heavy constant level line on each pattern represents the signal level obtained with the same power input to an isotropic radiator. The gain of the antenna is determined by the amount it deviates from this level. The contour plots are also referenced to this isotropic level.

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I





ANTENNA RADIATION PATTERN NO. 203-1

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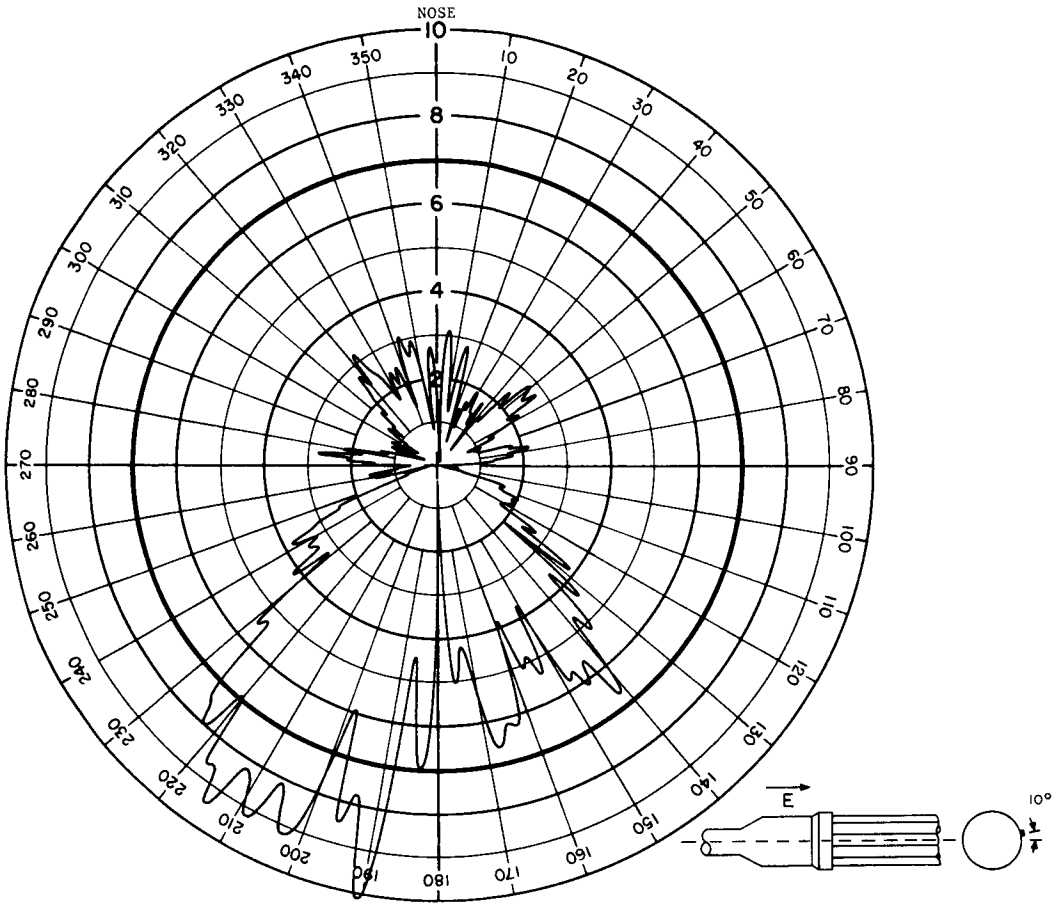
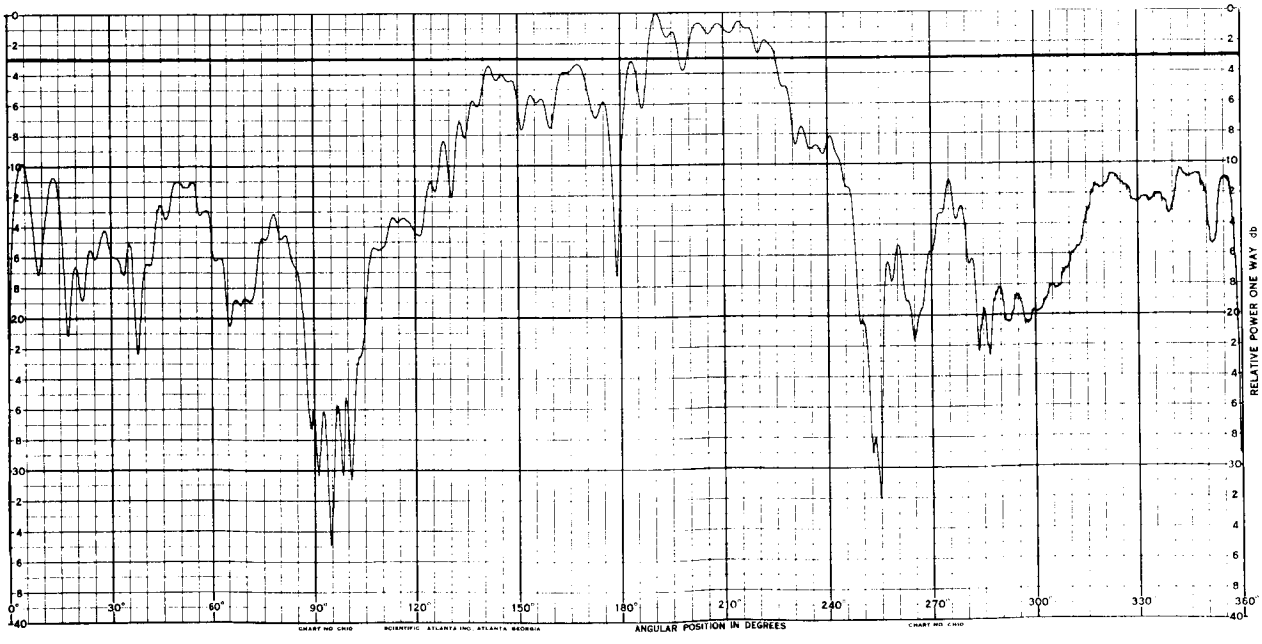
SYSTEM I





ANTENNA RADIATION PATTERN NO. 203-2

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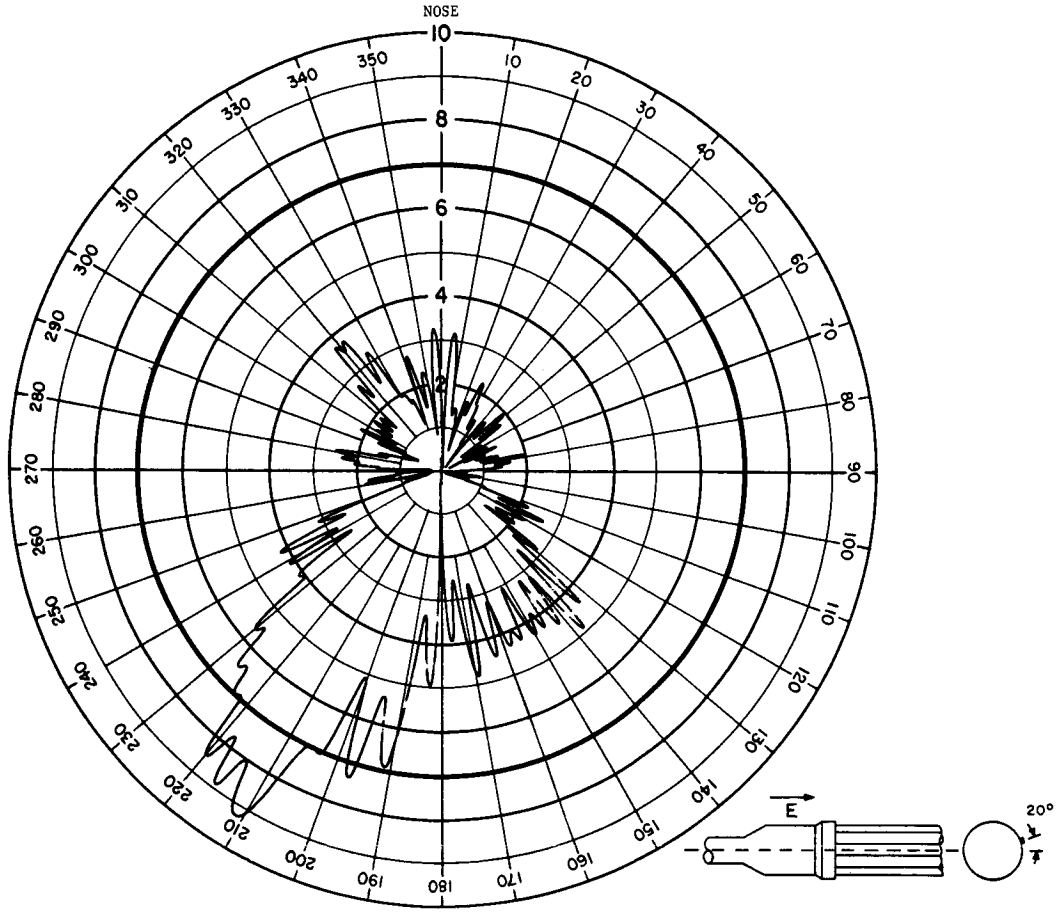
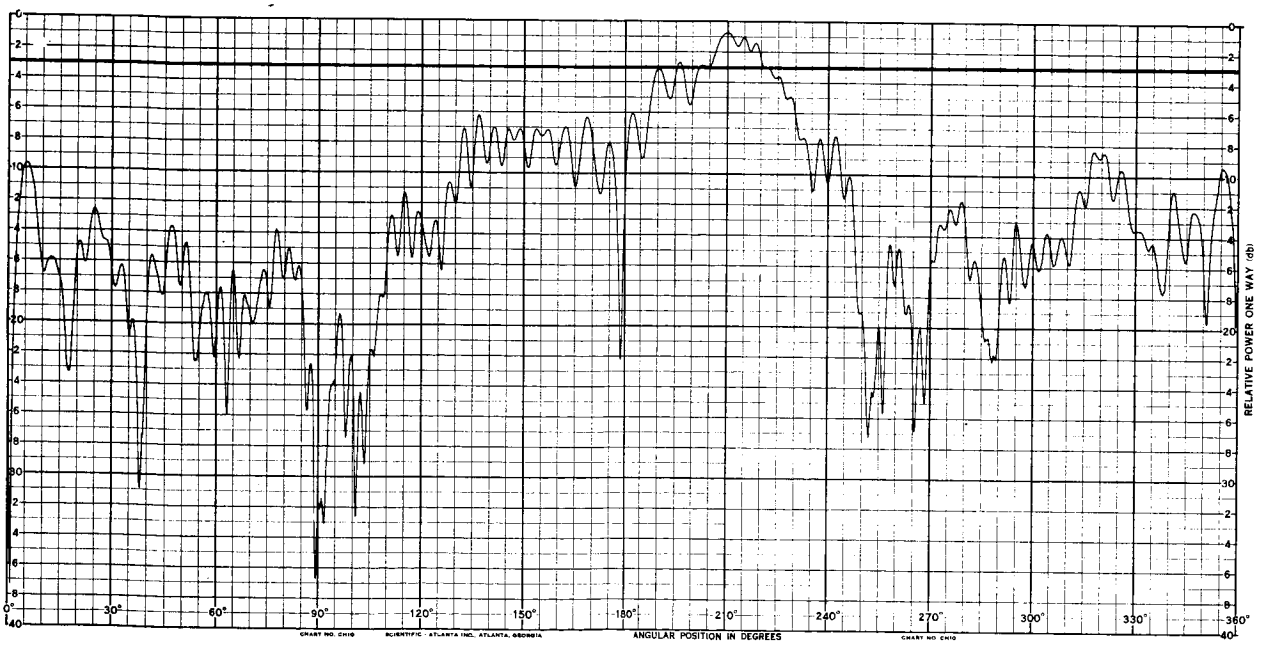
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I





ANTENNA RADIATION PATTERN NO. 203-3

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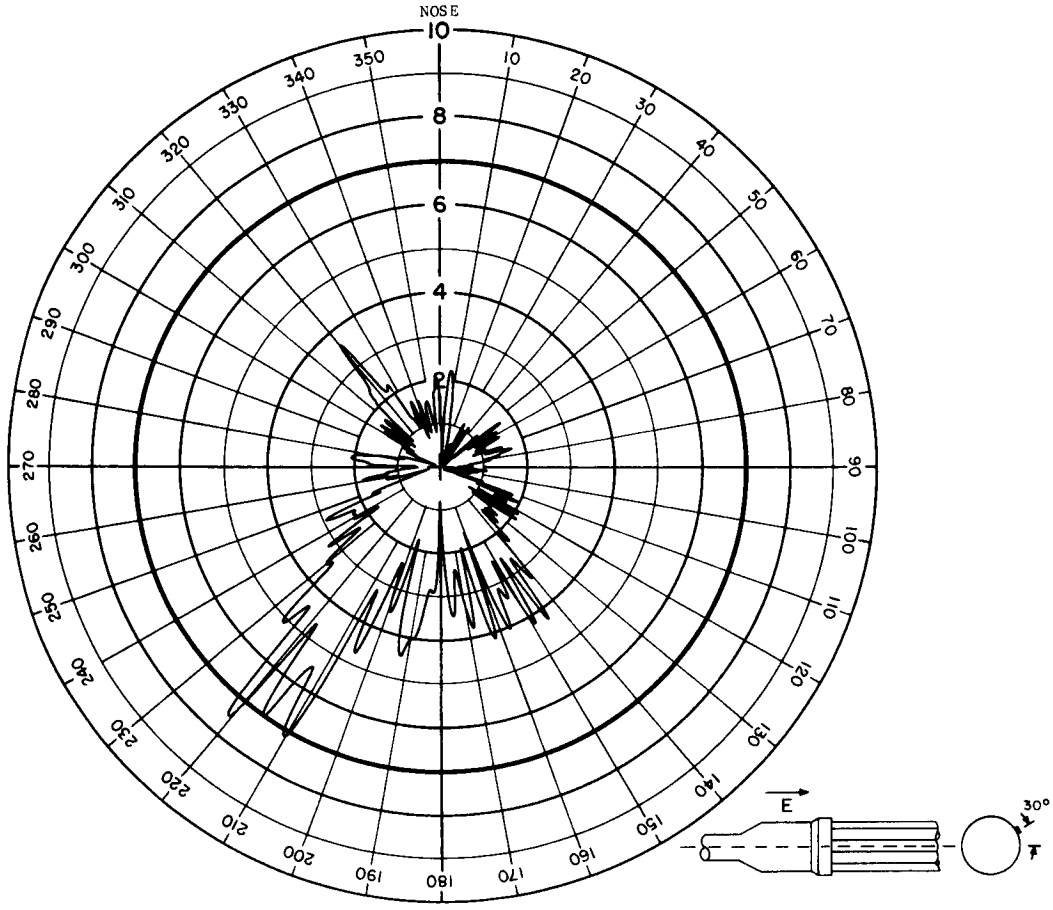
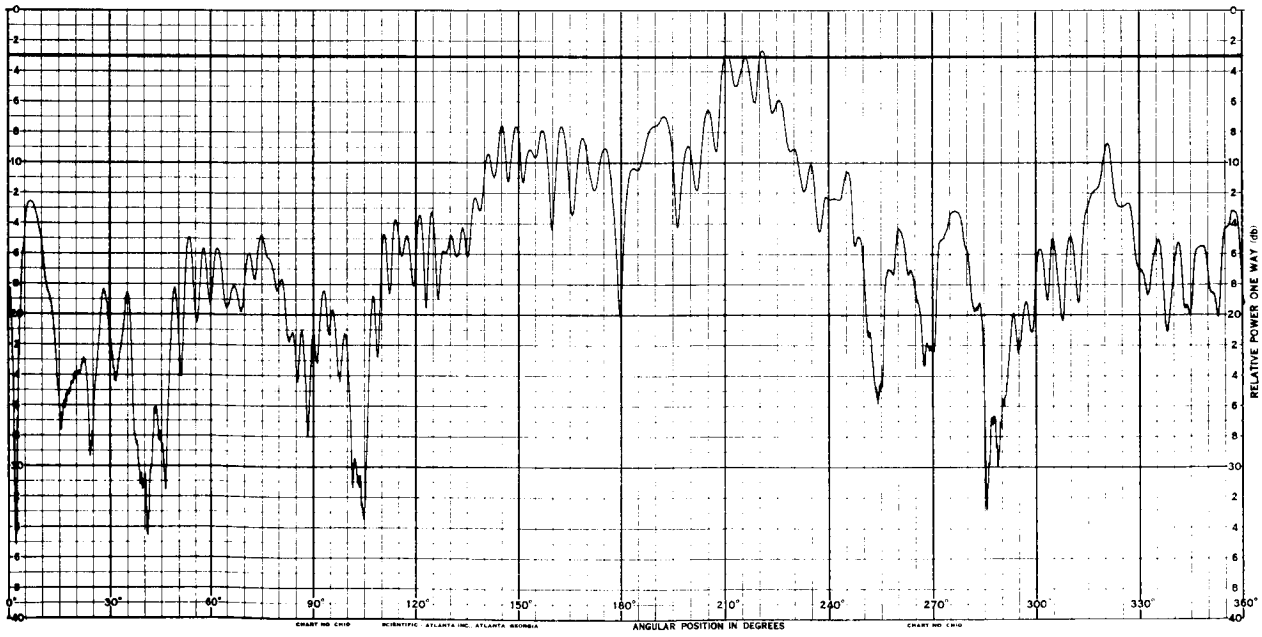
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



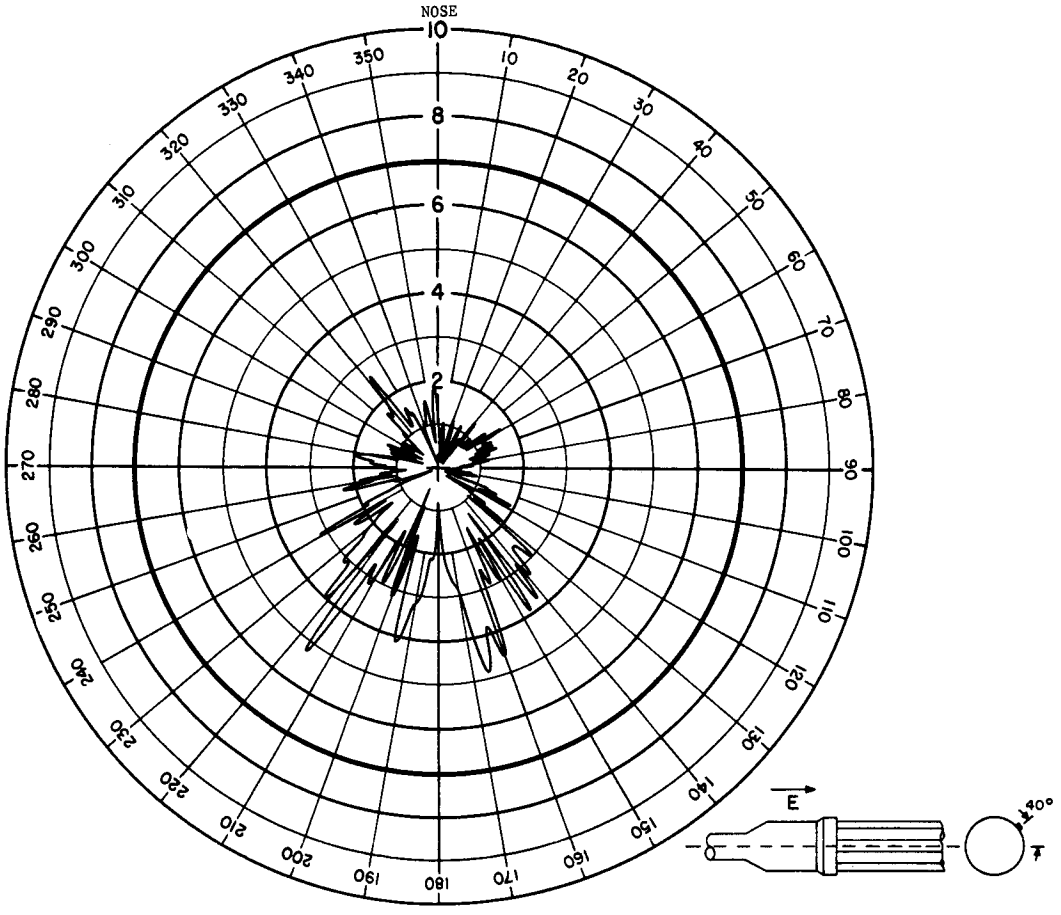


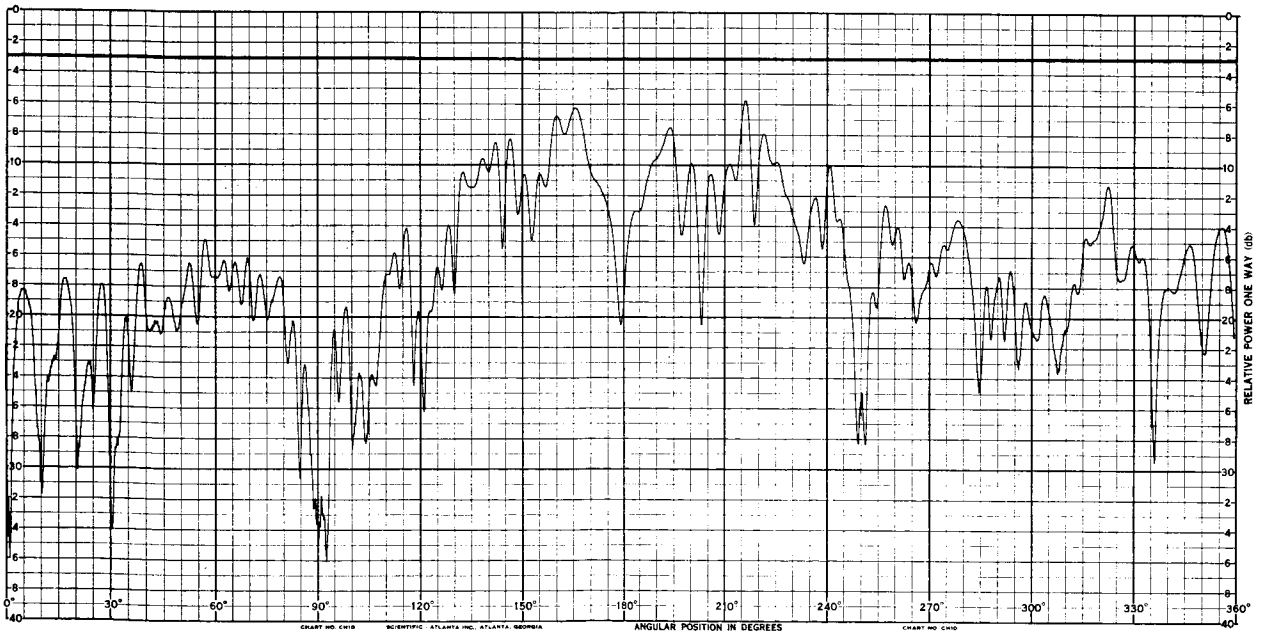
ANTENNA RADIATION PATTERN NO. 203-4

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



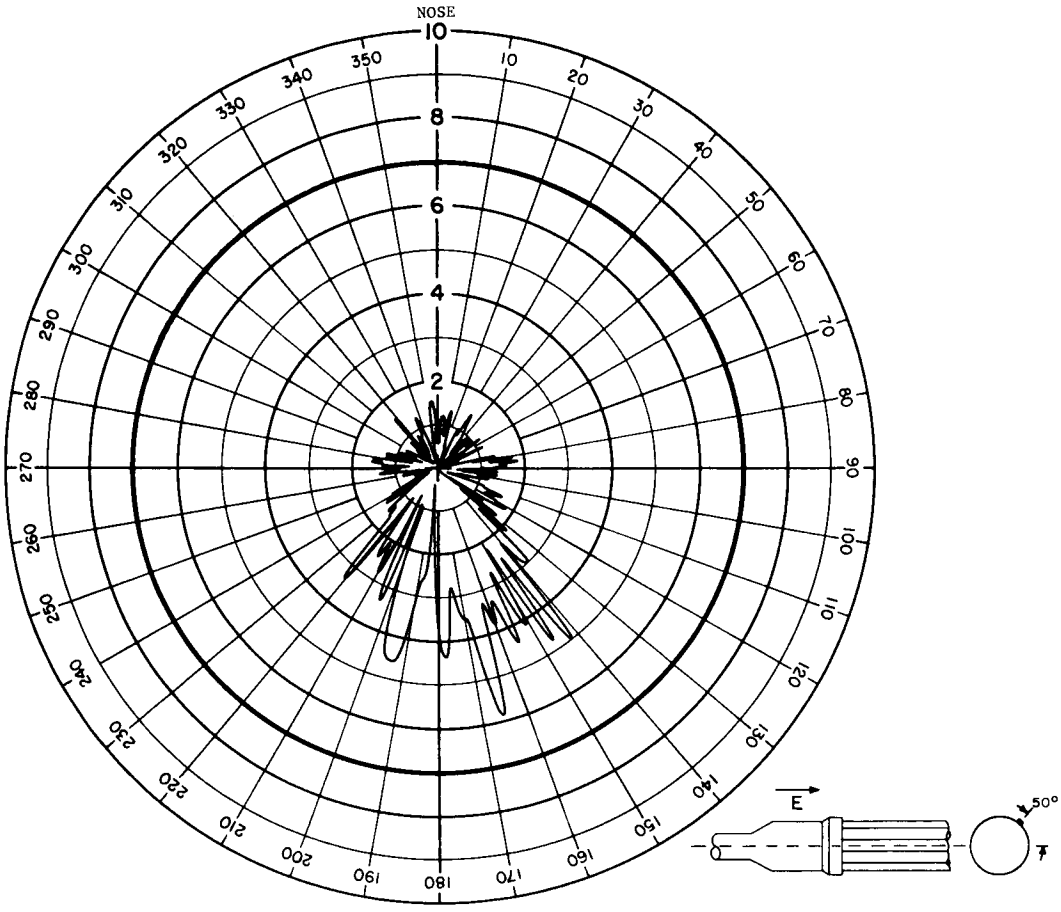


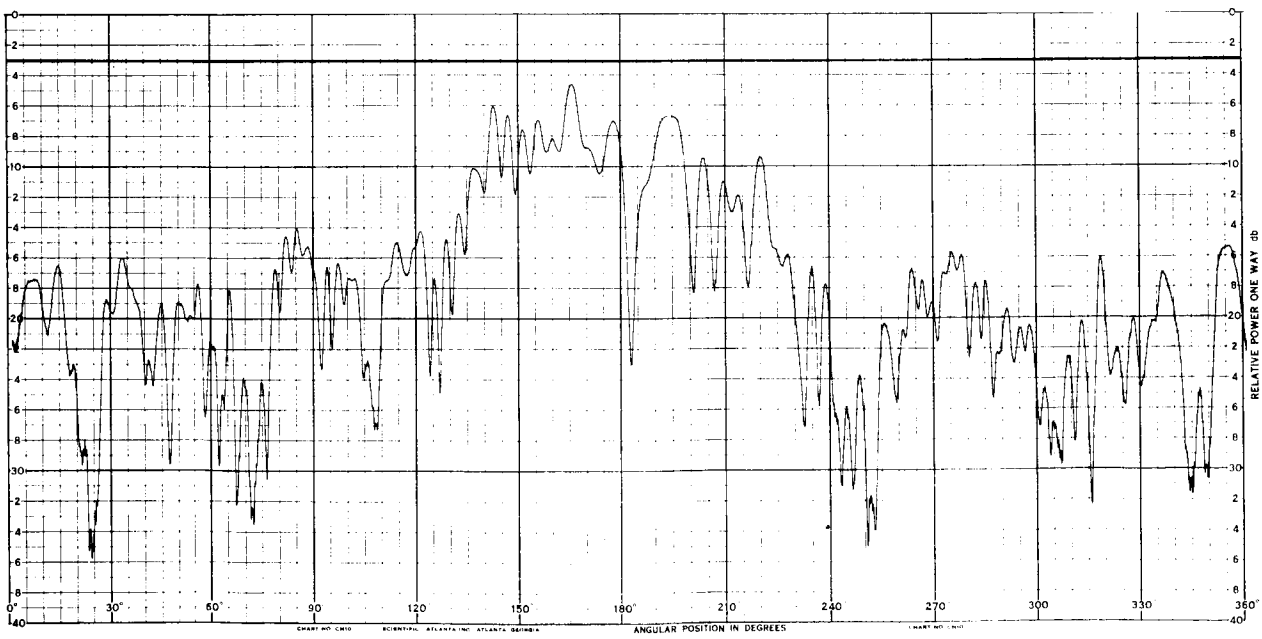
ANTENNA RADIATION PATTERN NO. 203-5

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



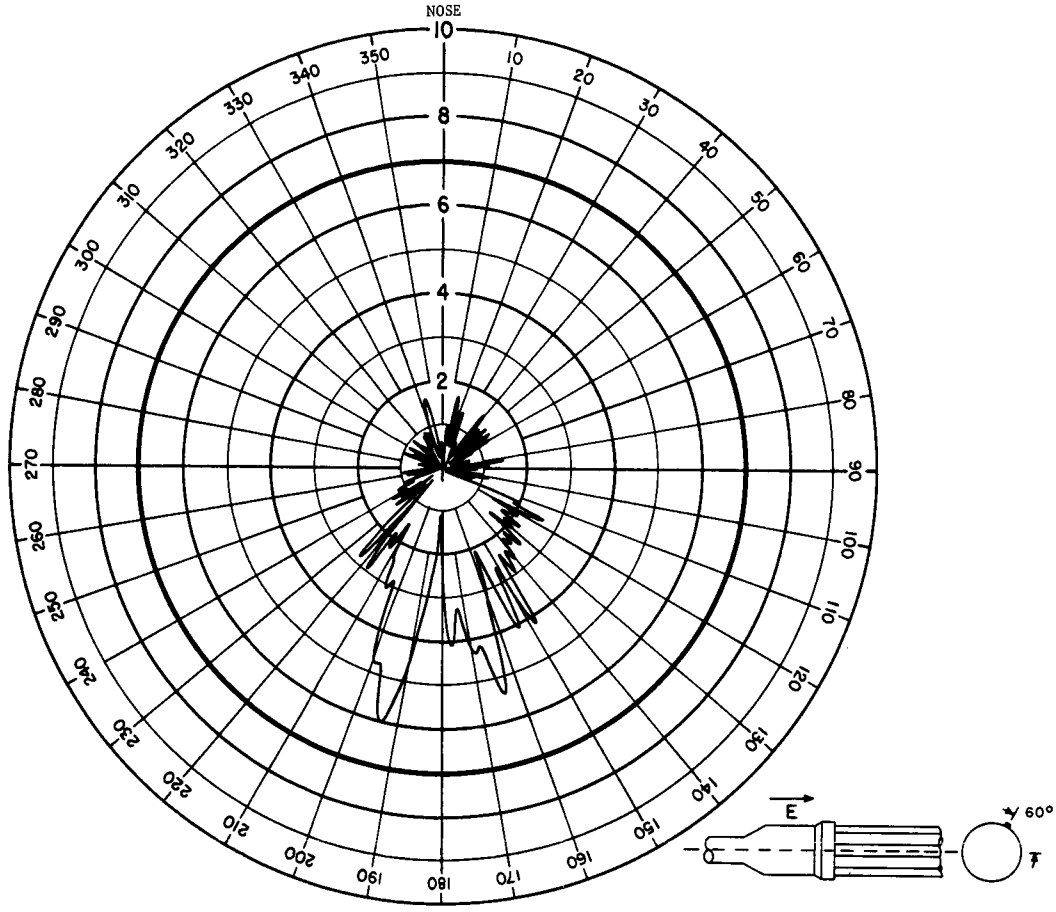


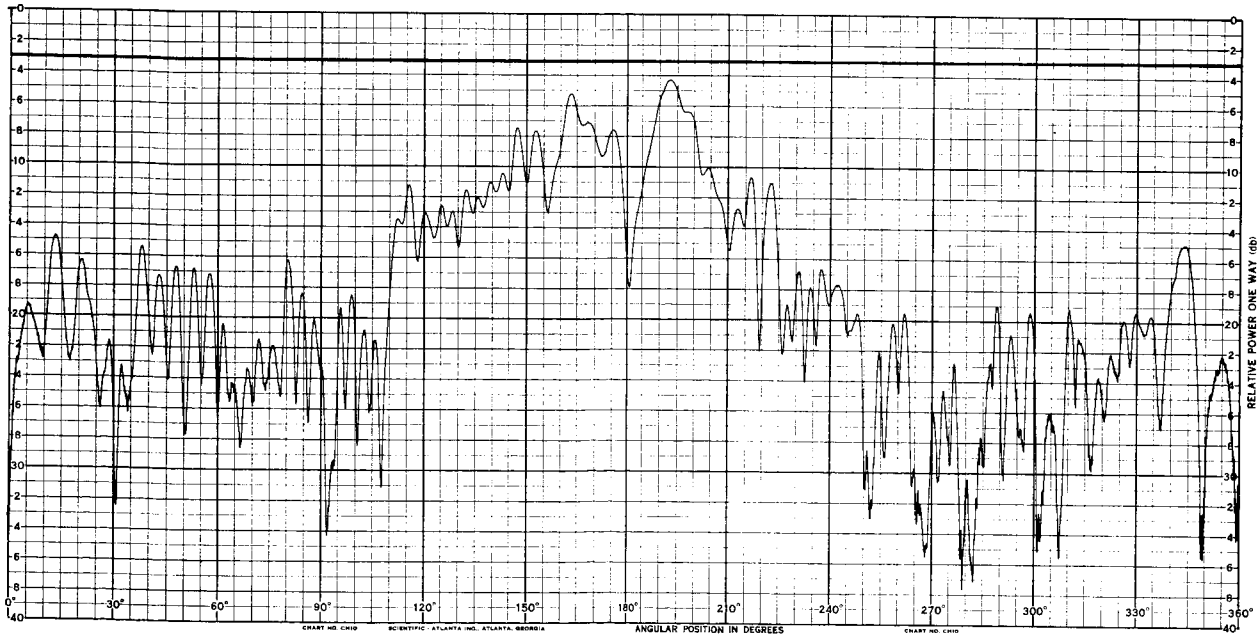
ANTENNA RADIATION PATTERN NO. 203-6

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I

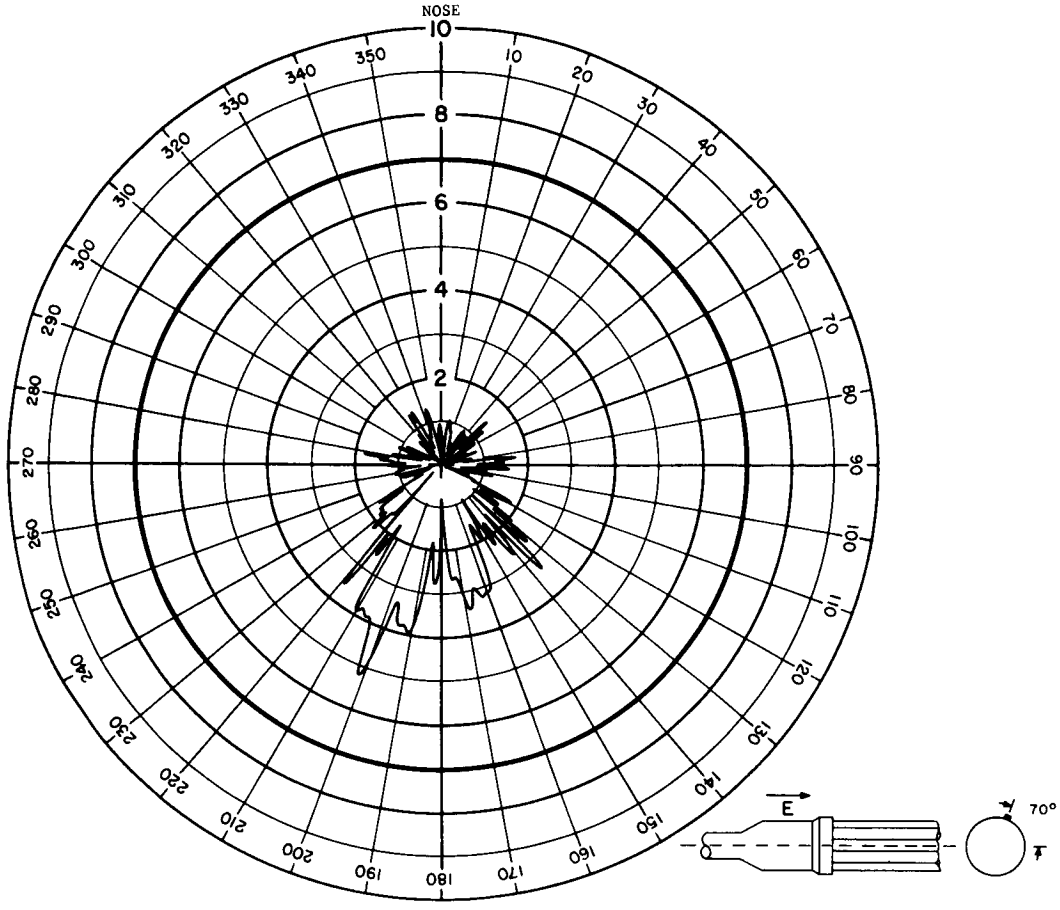


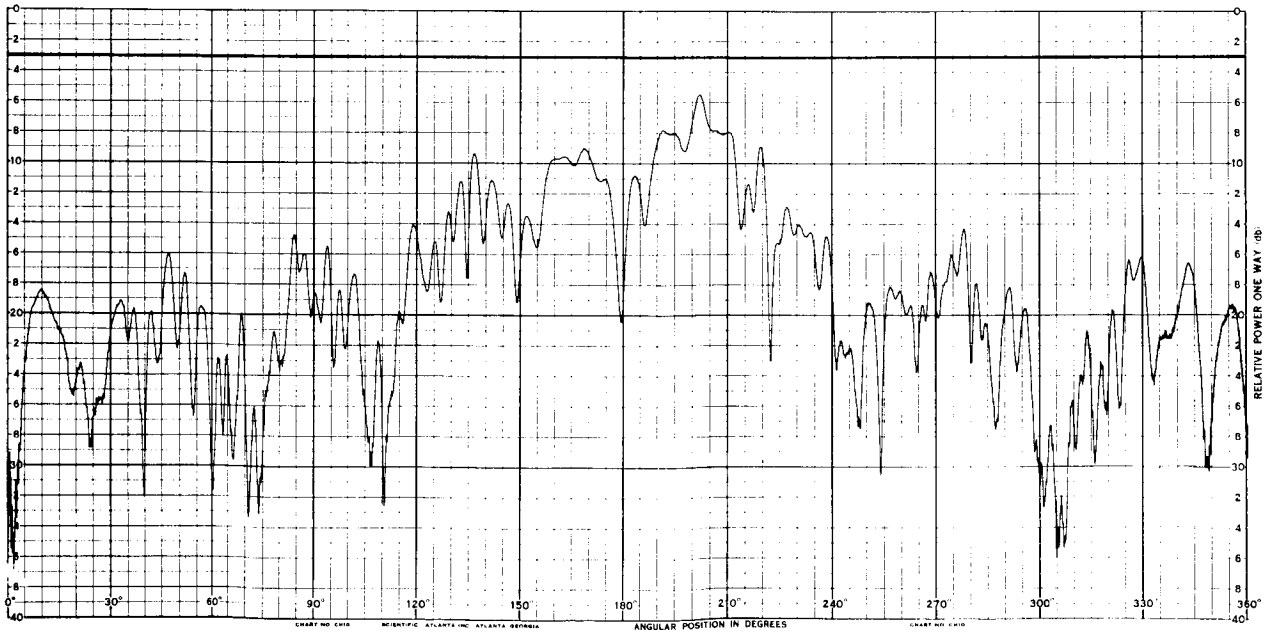


ANTENNA RADIATION PATTERN NO 203-7

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



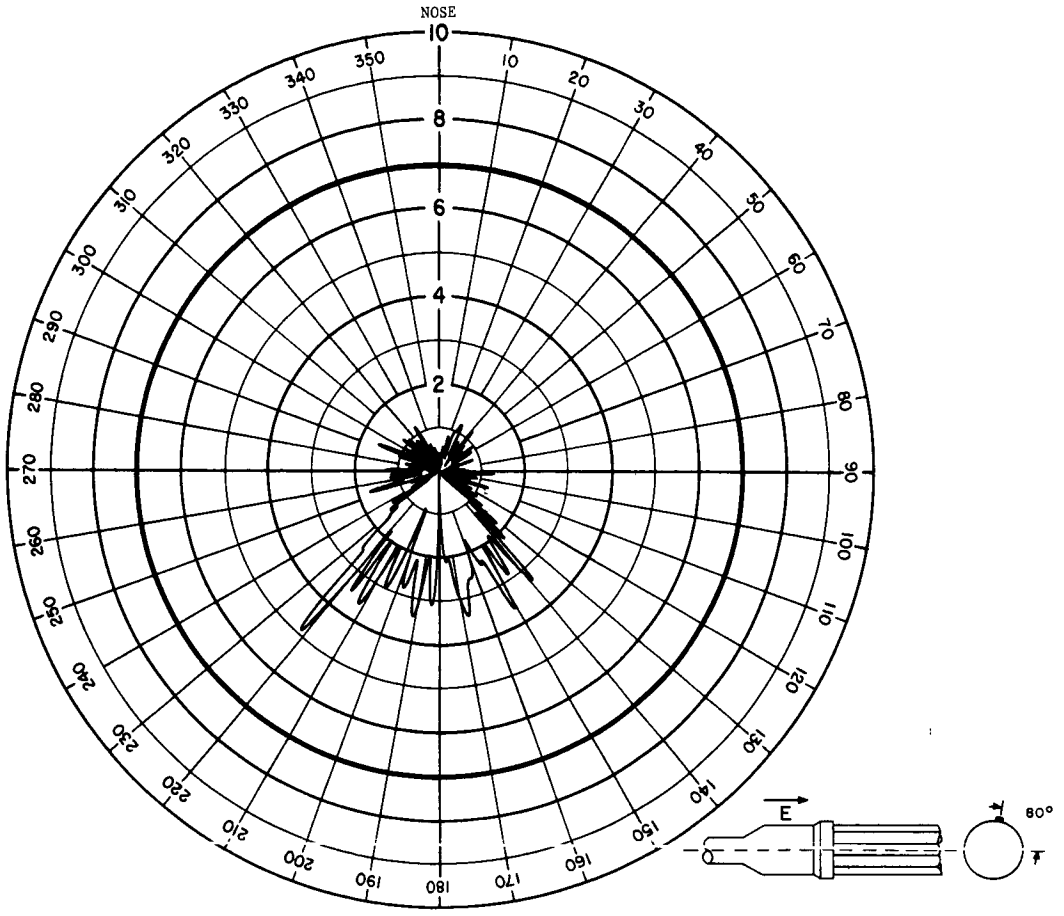


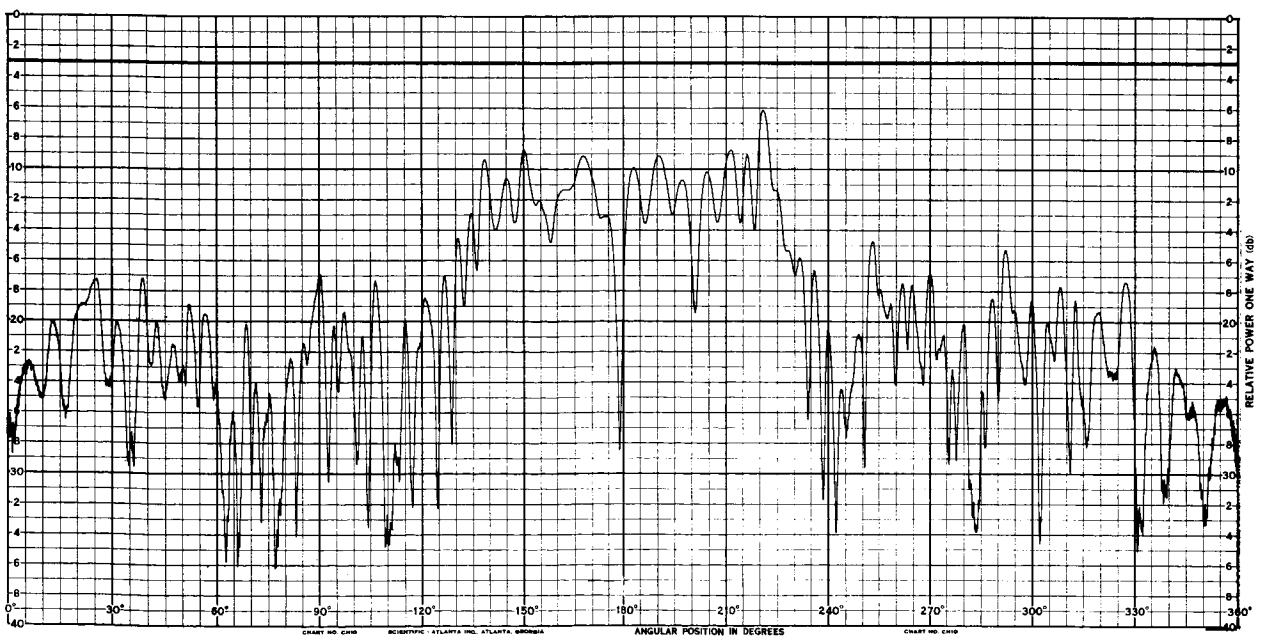
ANTENNA RADIATION PATTERN NO. 203-8

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



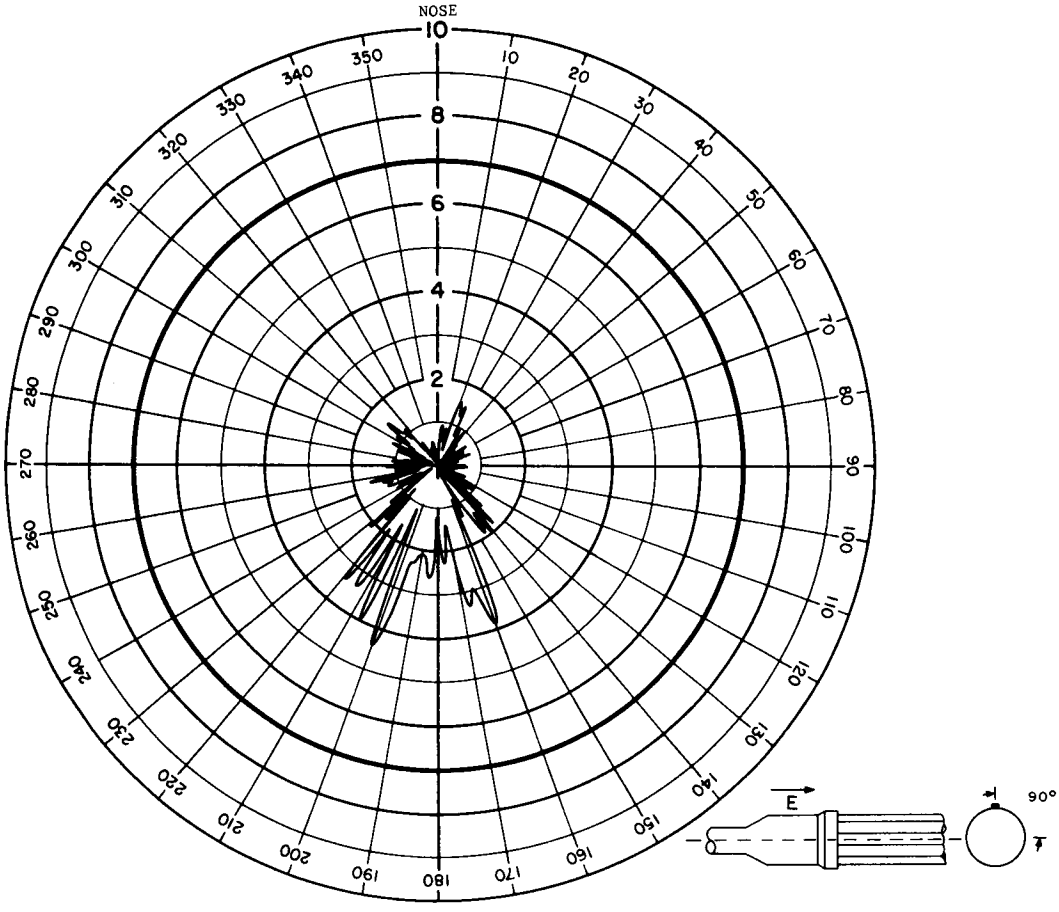


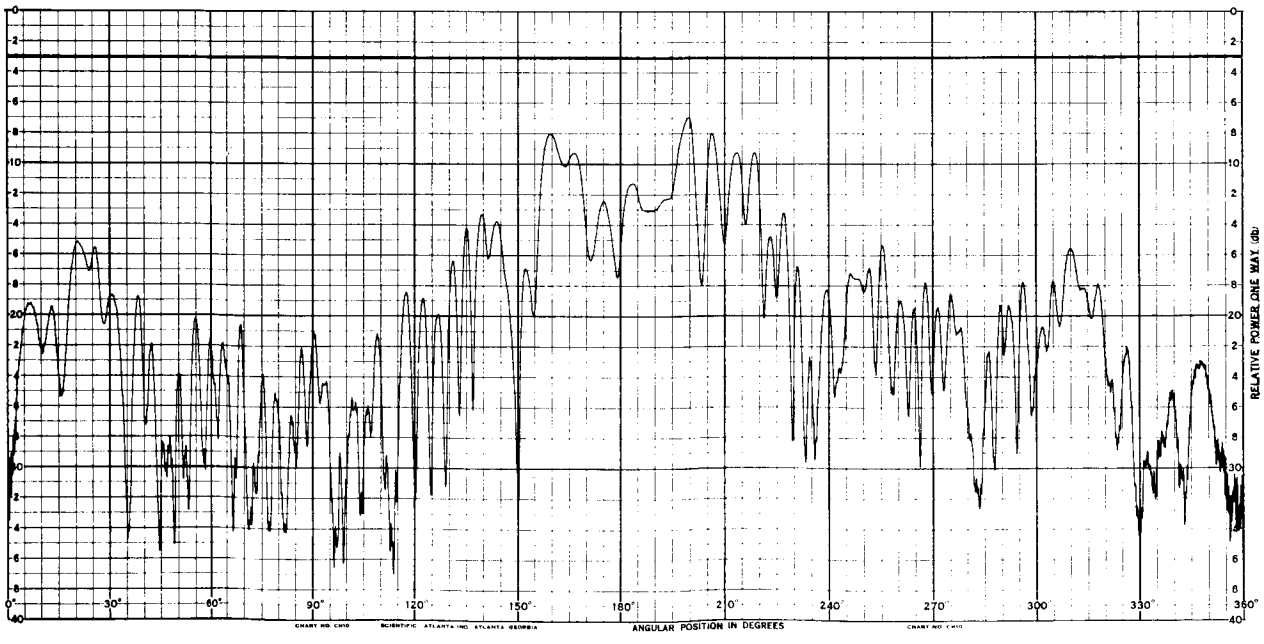
ANTENNA RADIATION PATTERN NO. 203-9

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



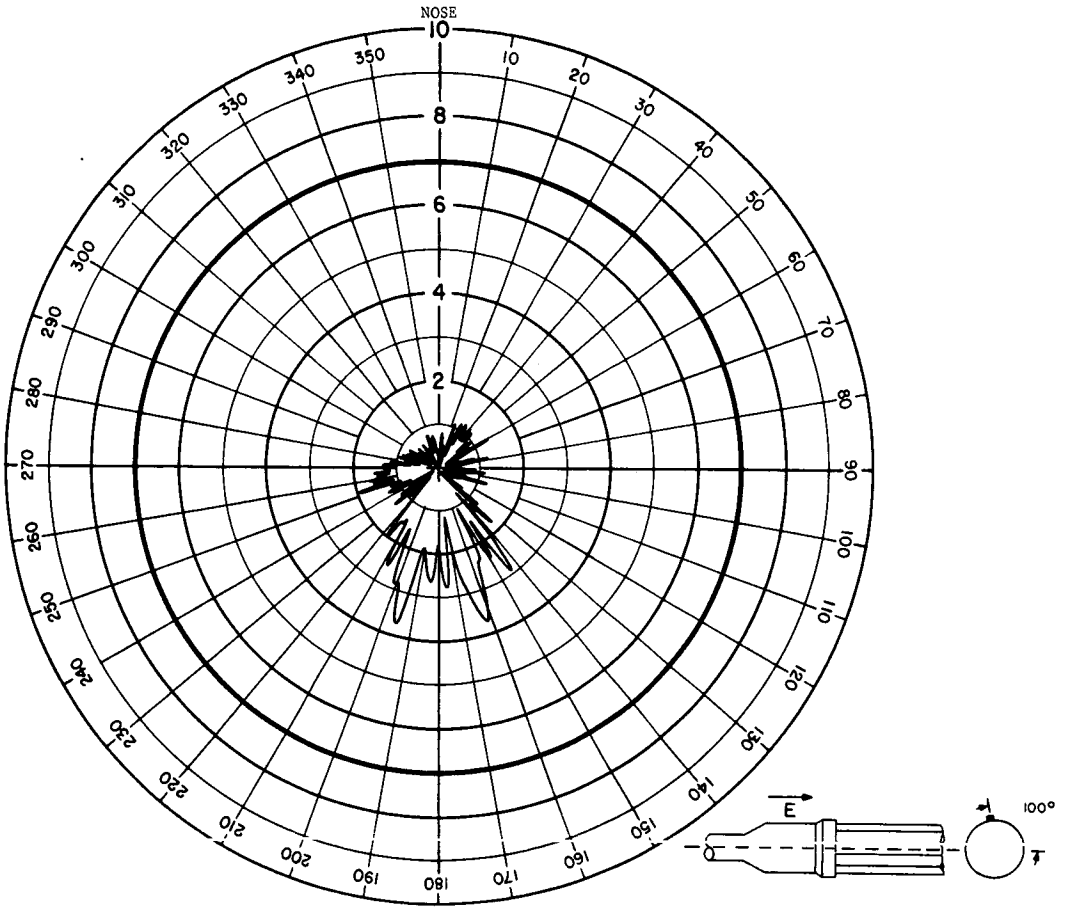


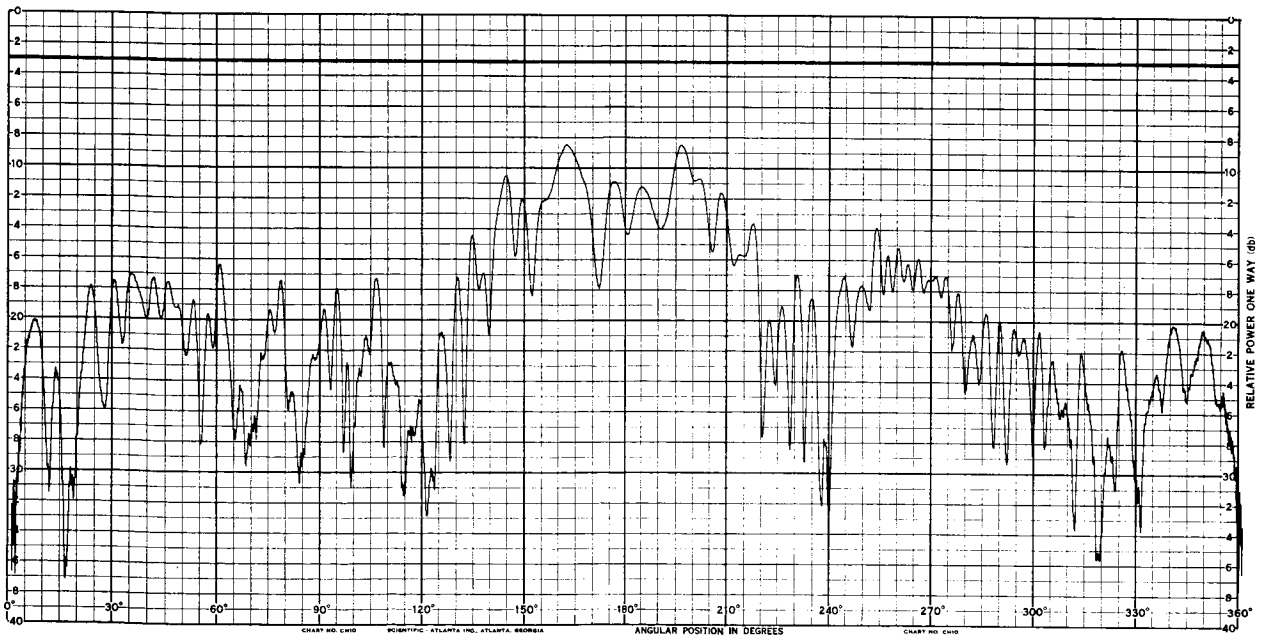
ANTENNA RADIATION PATTERN NO. 203-10

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



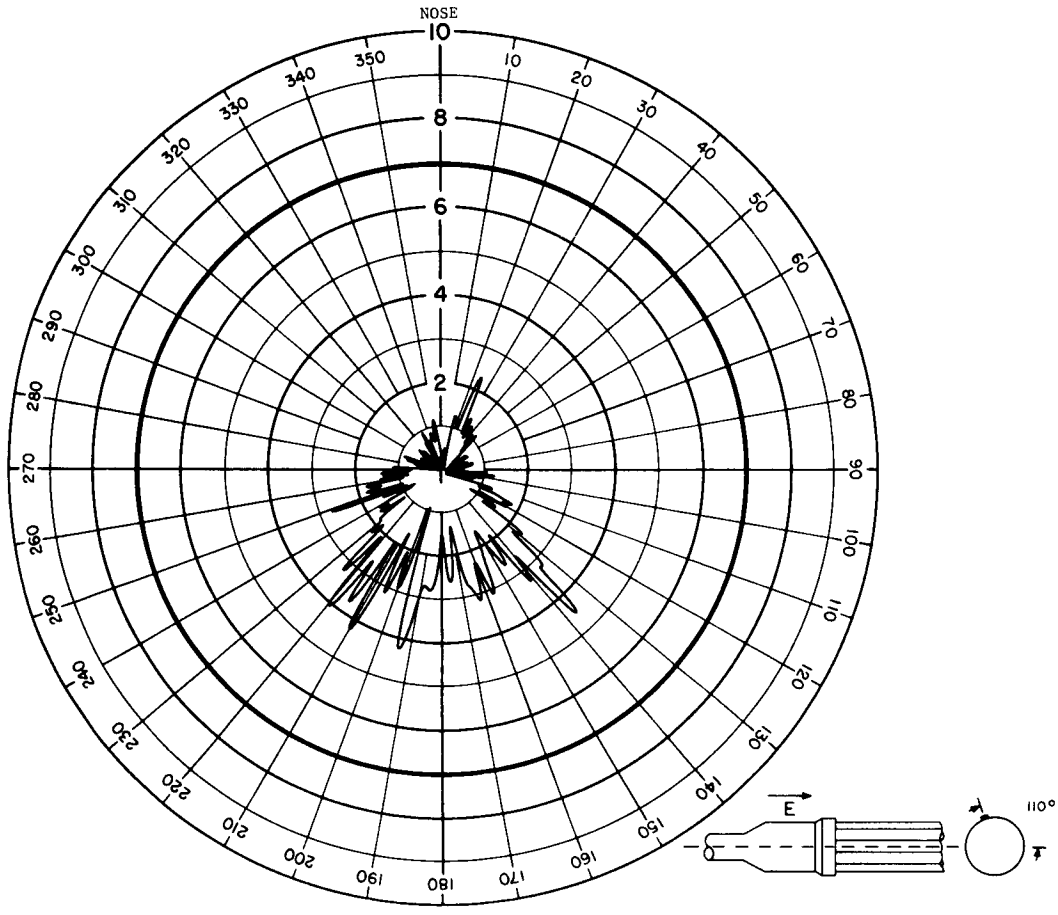


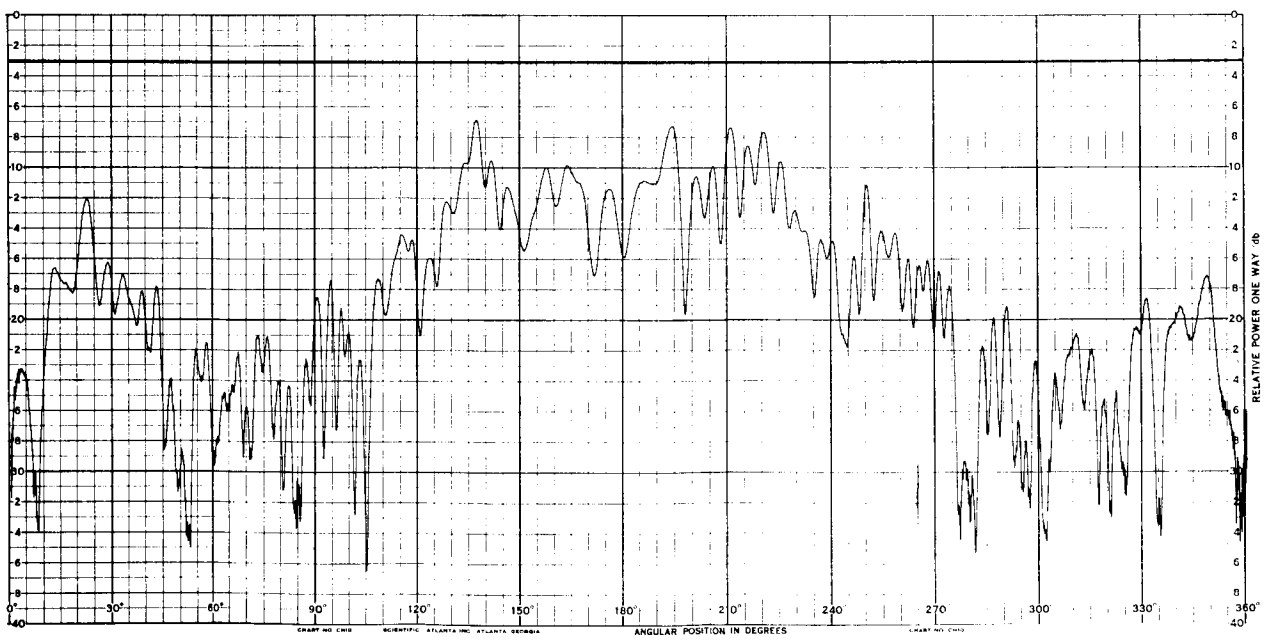
ANTENNA RADIATION PATTERN NO. 203-11

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



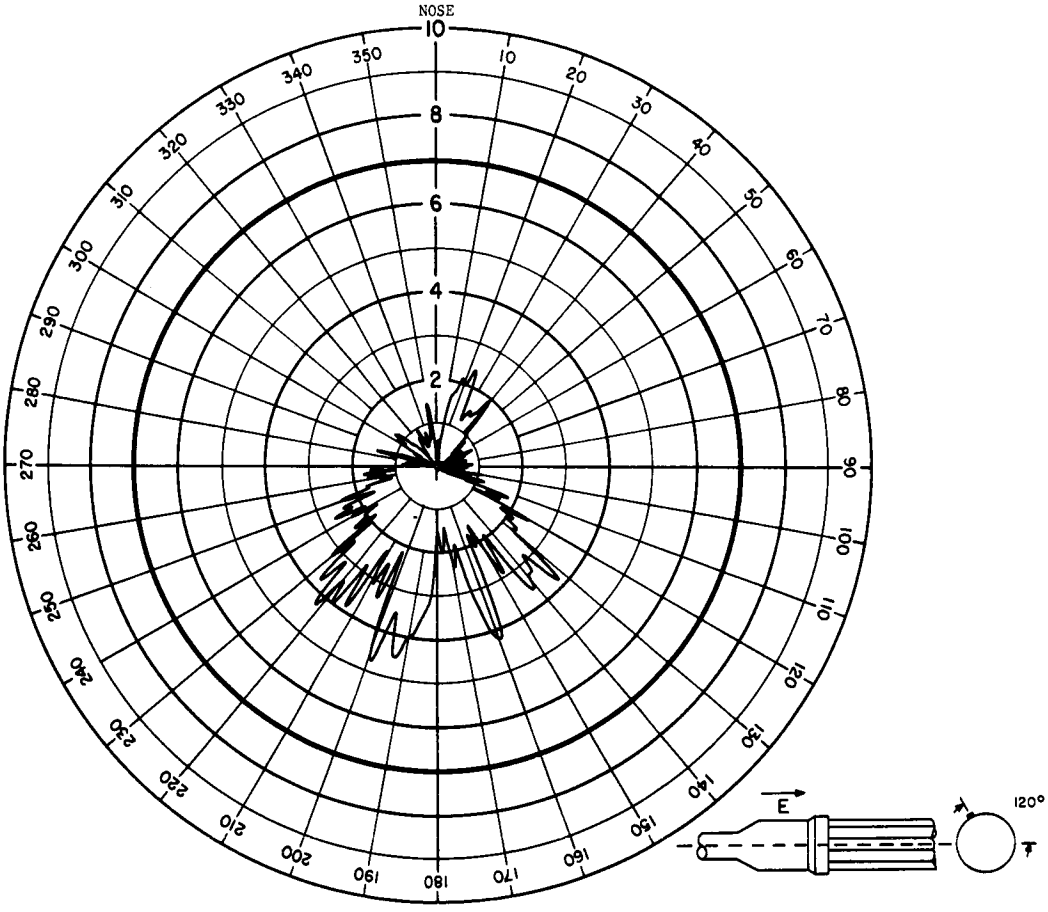


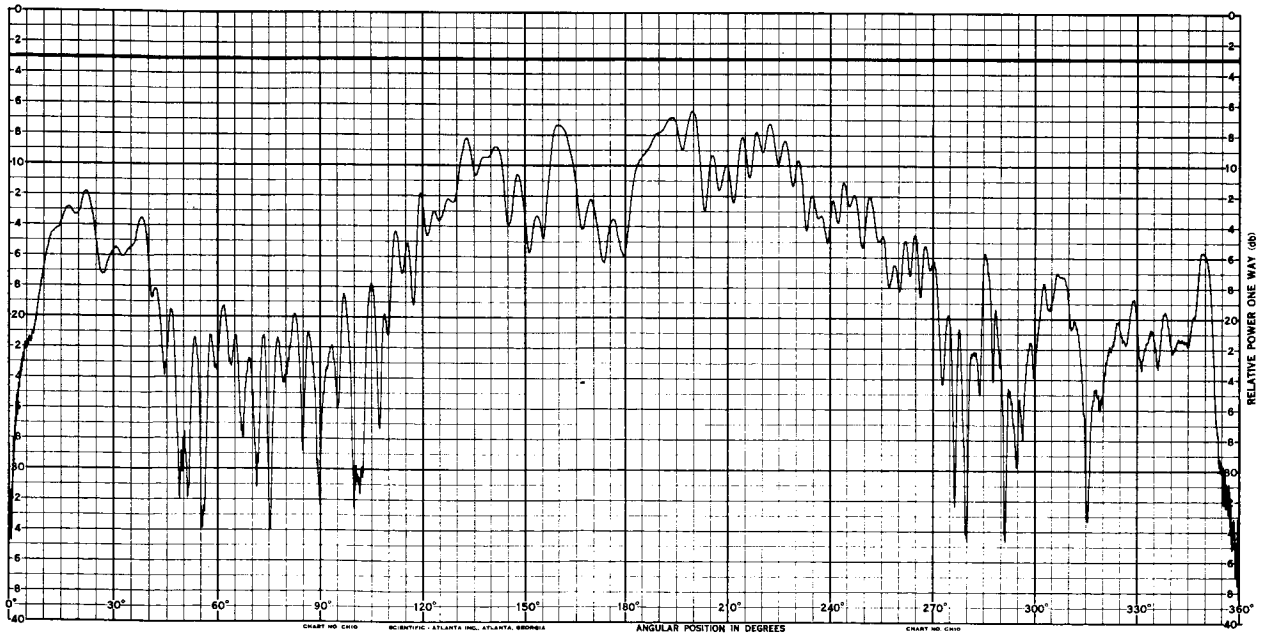
ANTENNA RADIATION PATTERN NO. 203-12

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



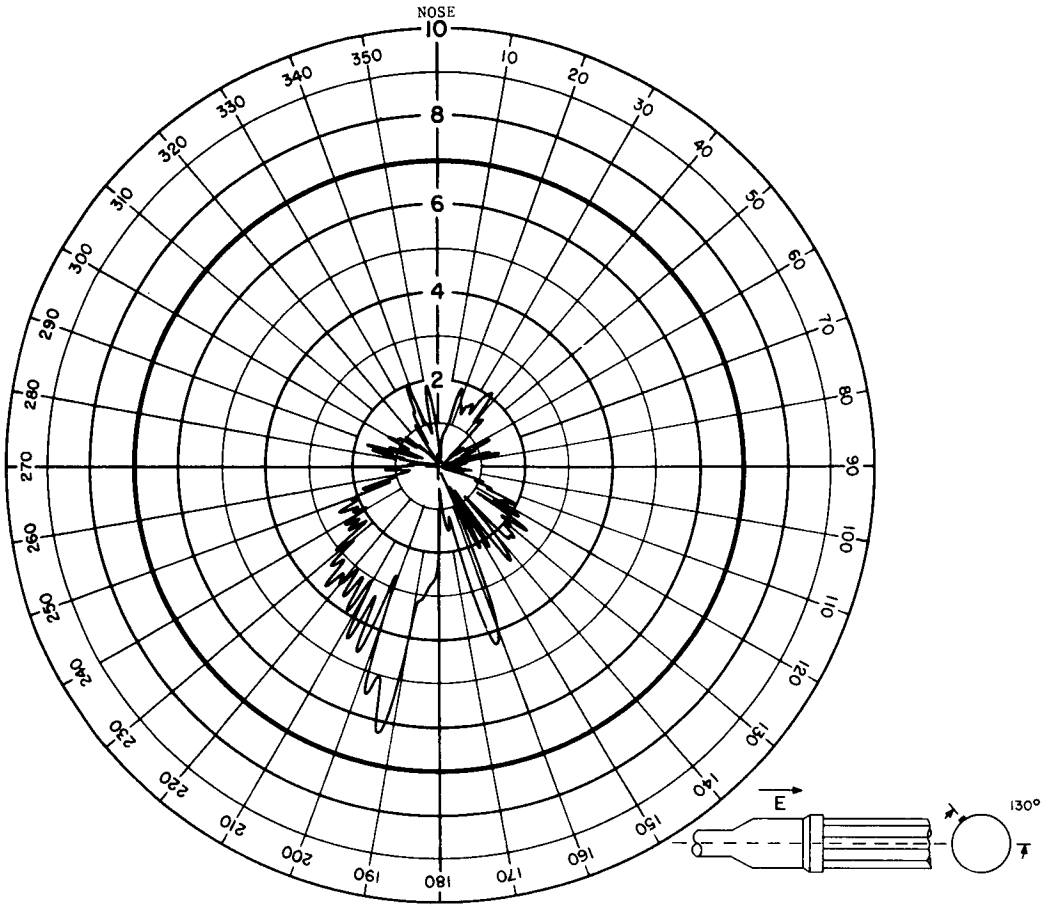


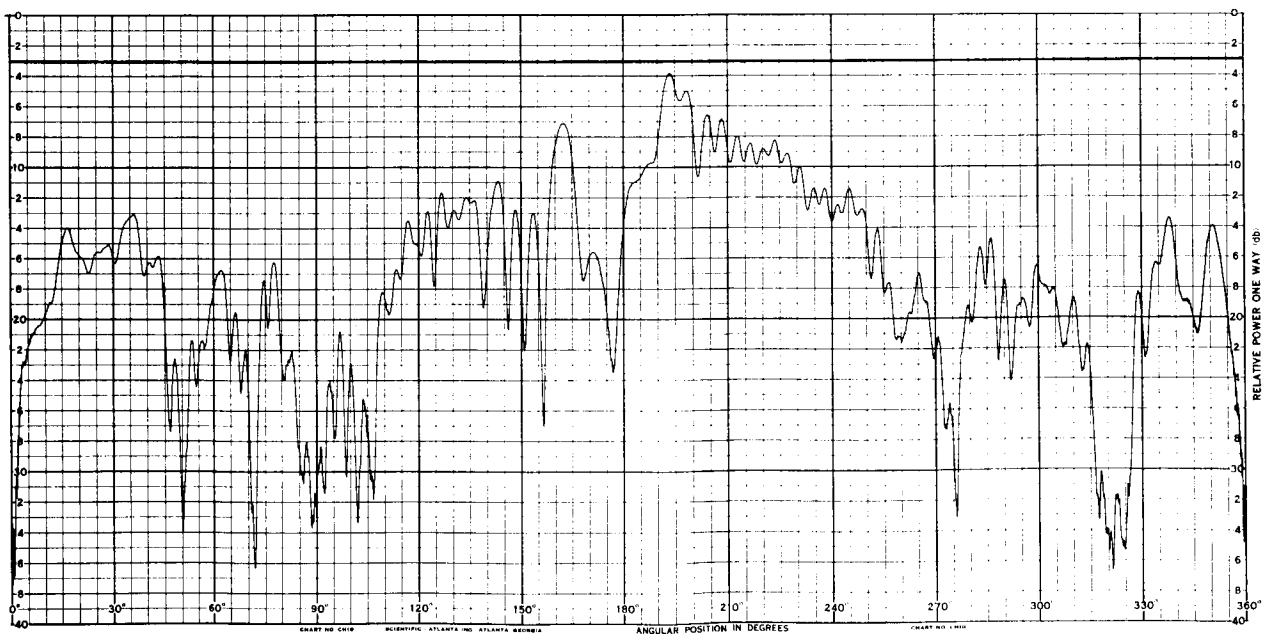
ANTENNA RADIATION PATTERN NO. 203-13

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



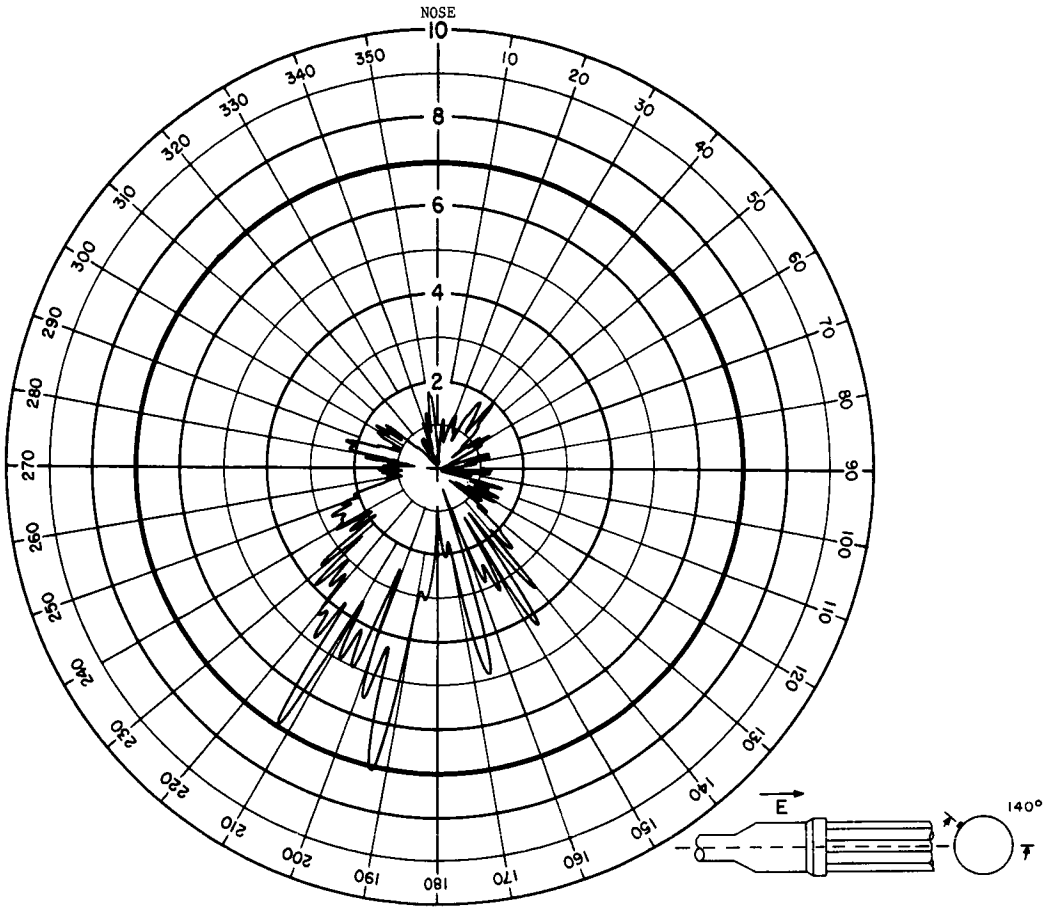


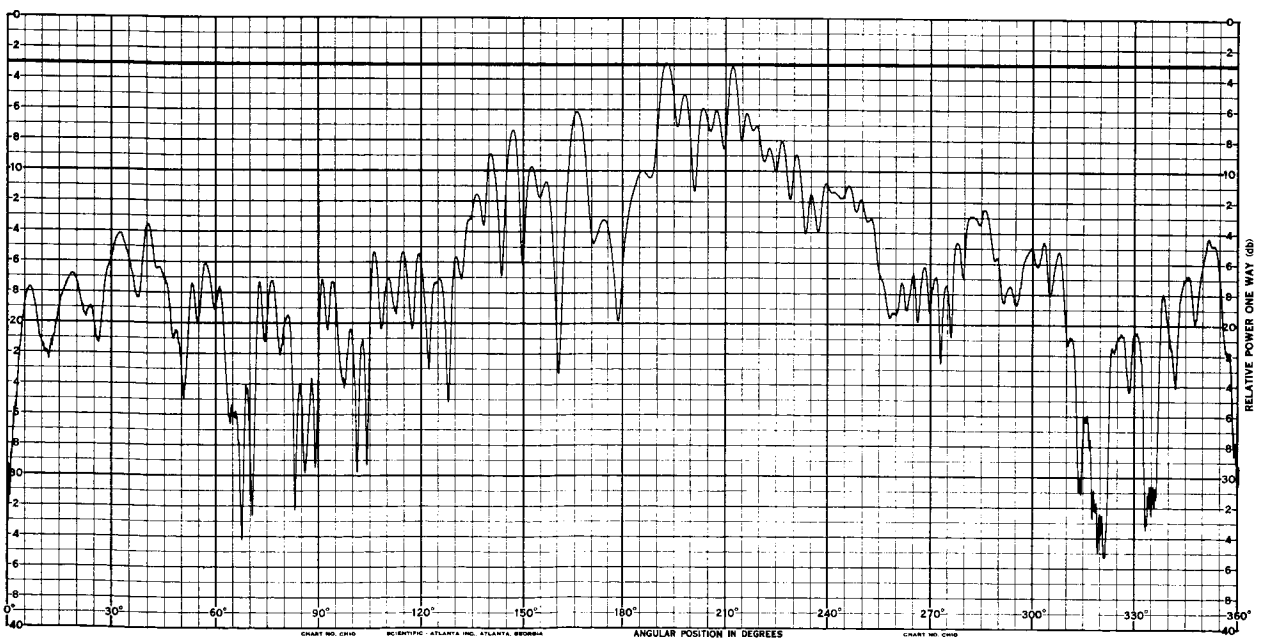
ANTENNA RADIATION PATTERN NO. 203-14

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I

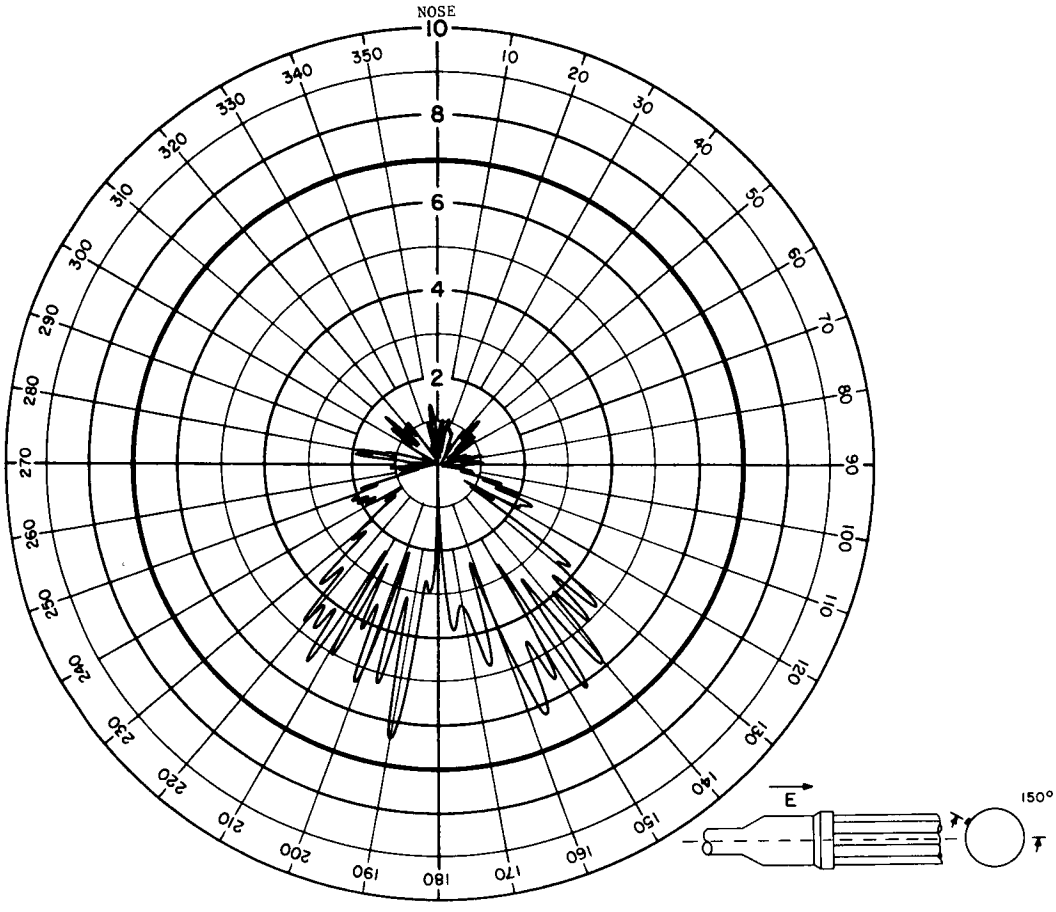


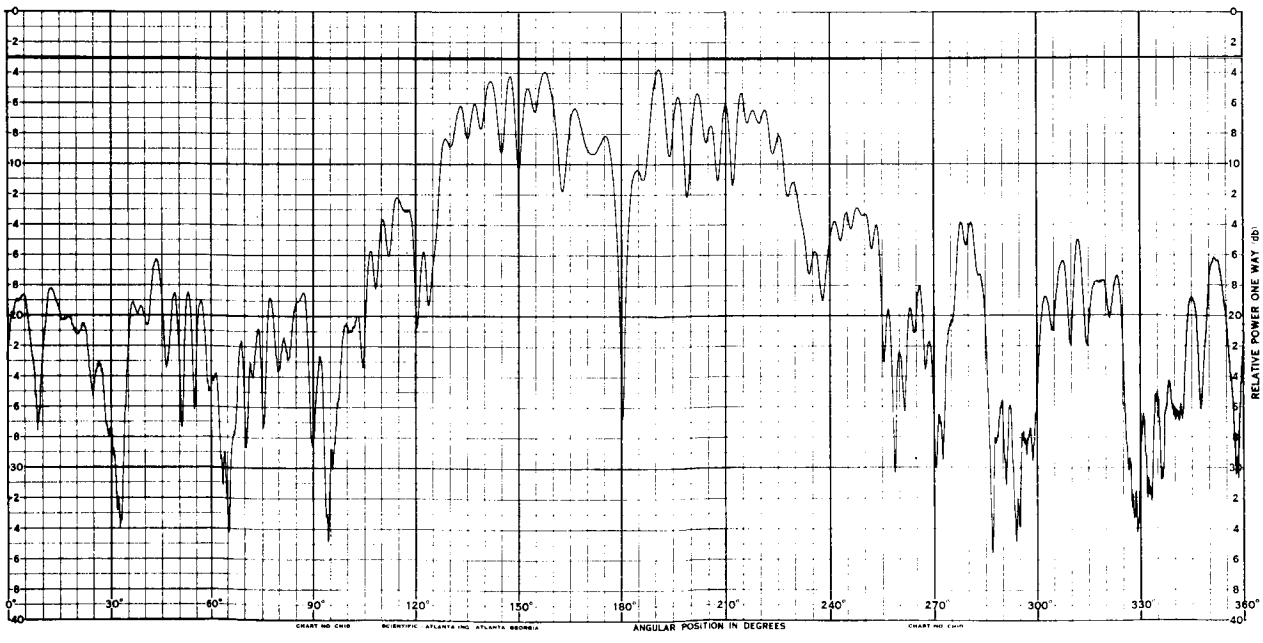


ANTENNA RADIATION PATTERN NO. 203-15

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



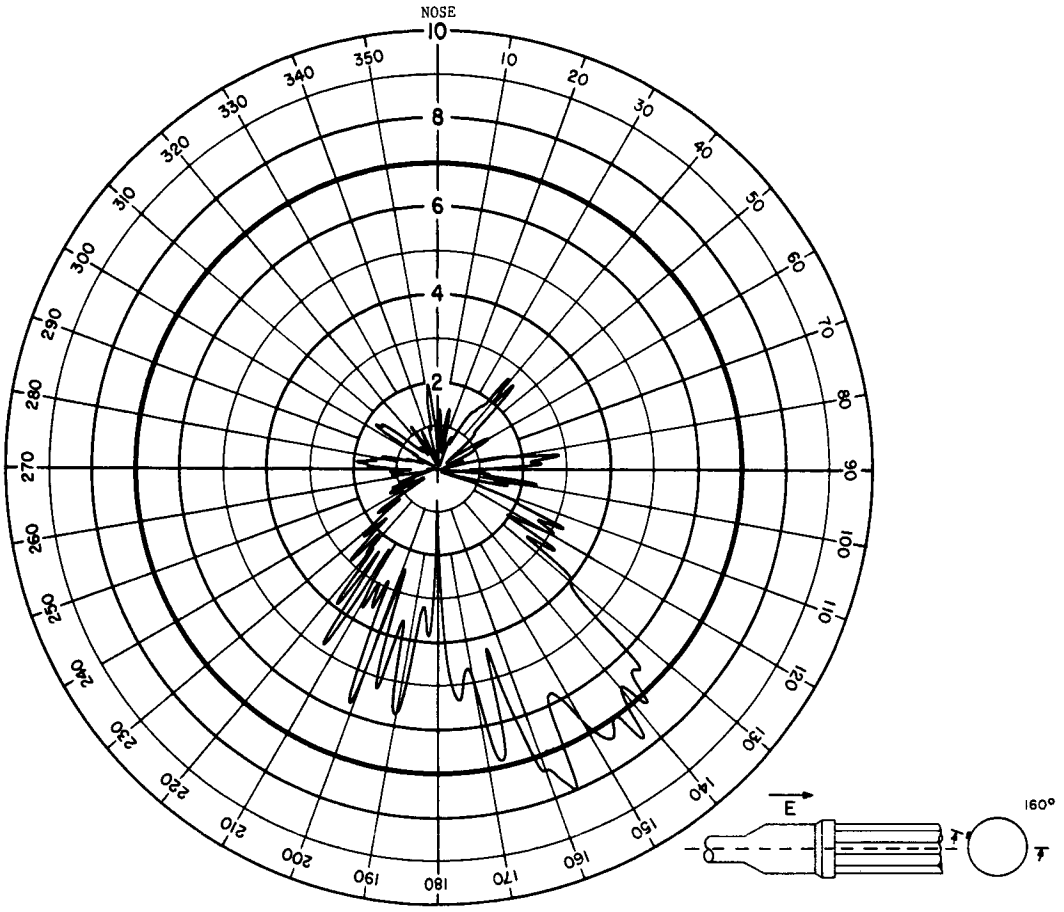


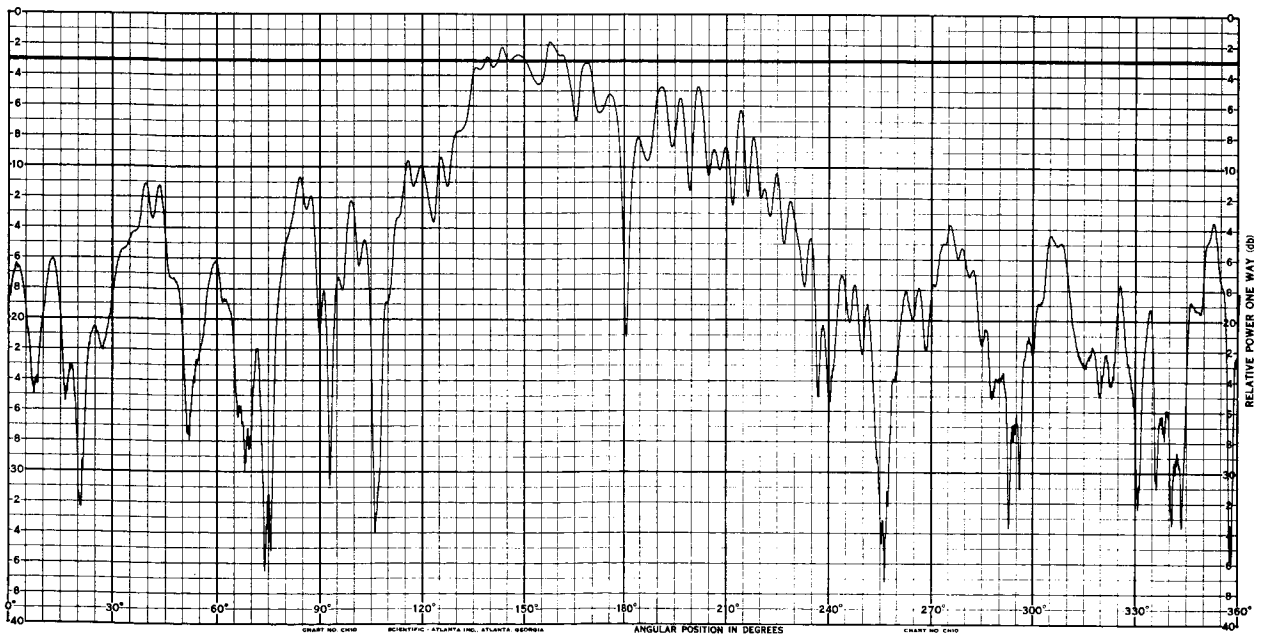
ANTENNA RADIATION PATTERN NO. 203-16

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I

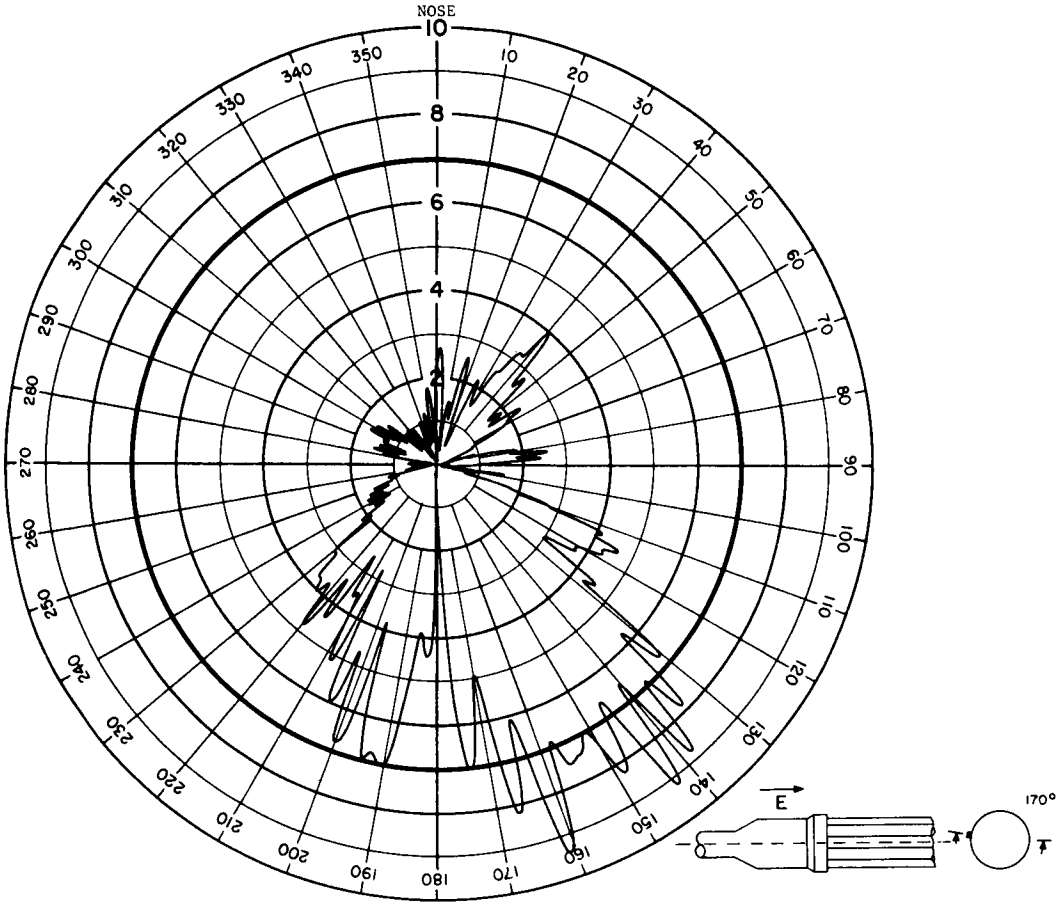


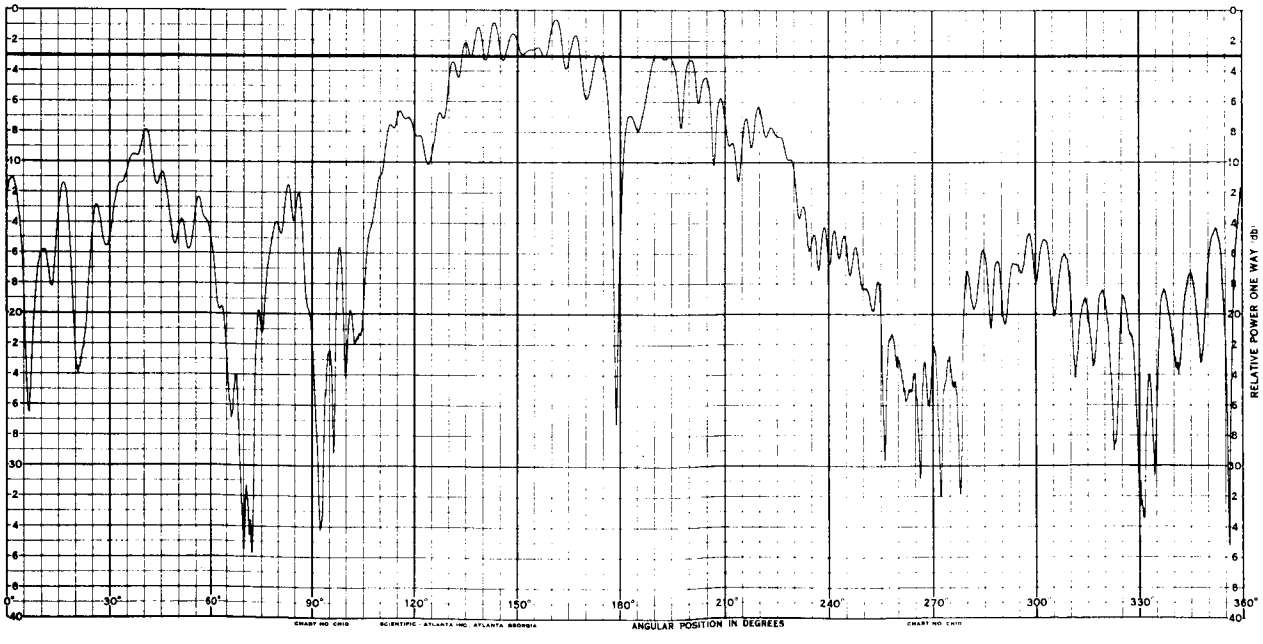


ANTENNA RADIATION PATTERN NO. 203-17

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



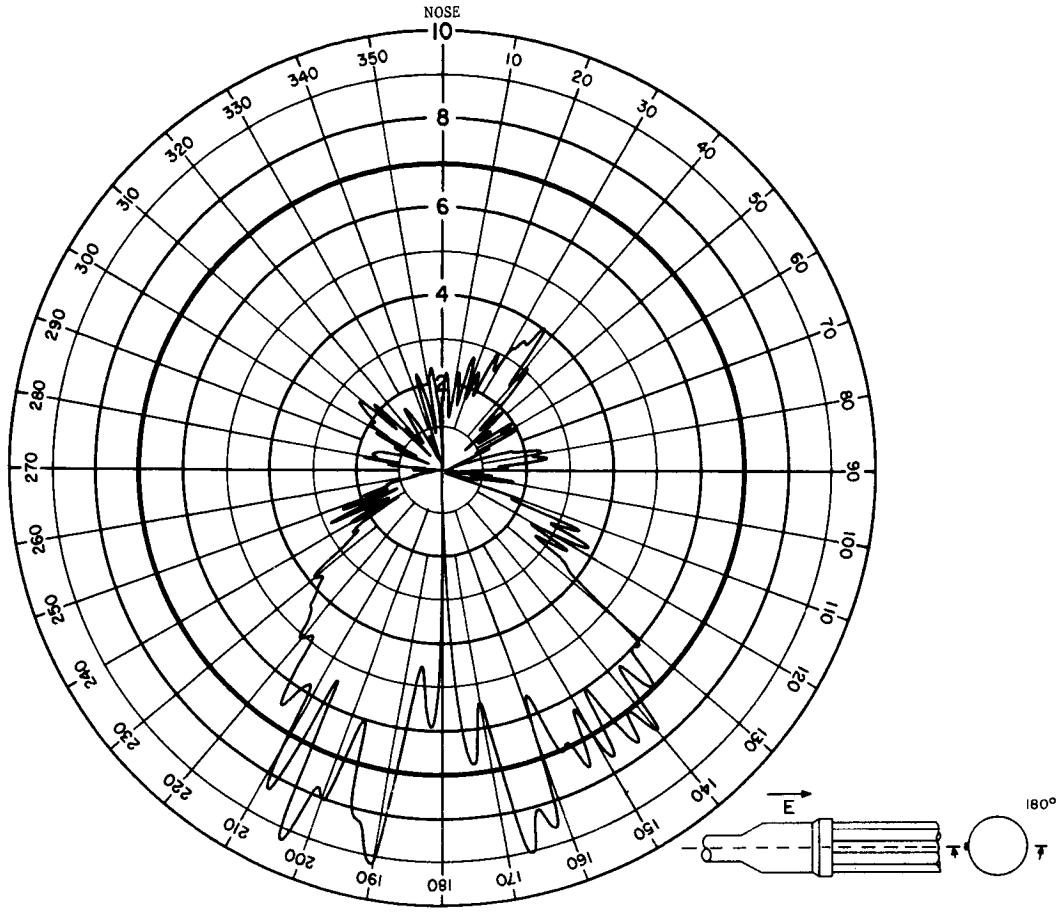


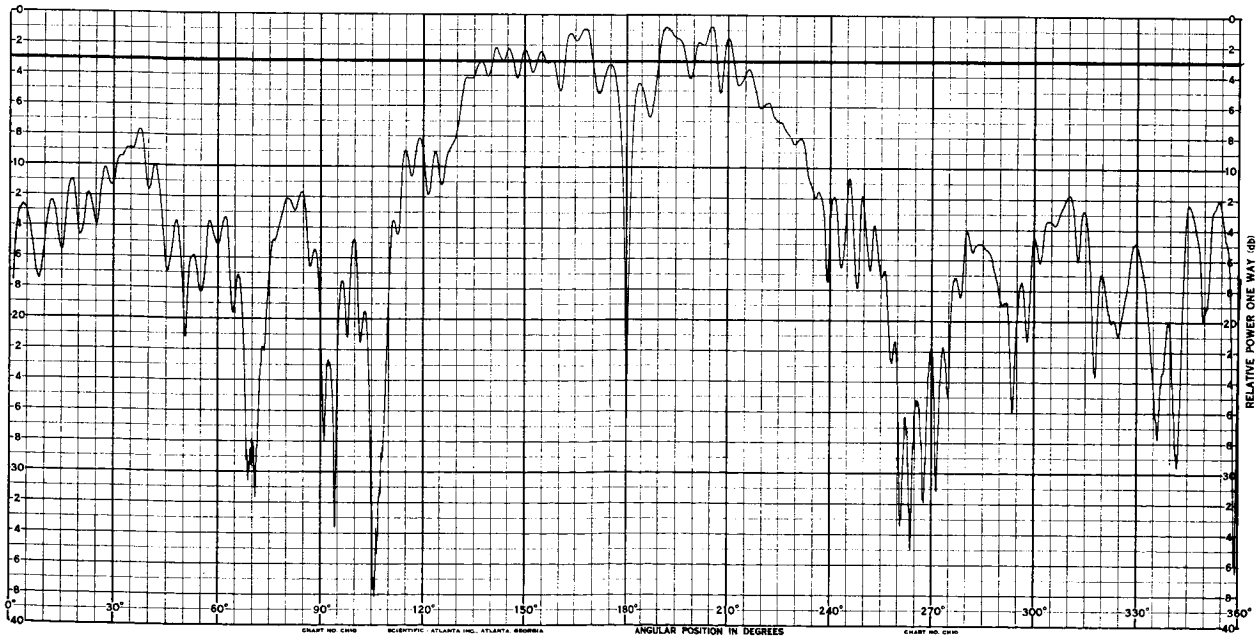
ANTENNA RADIATION PATTERN NO. 203-18

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



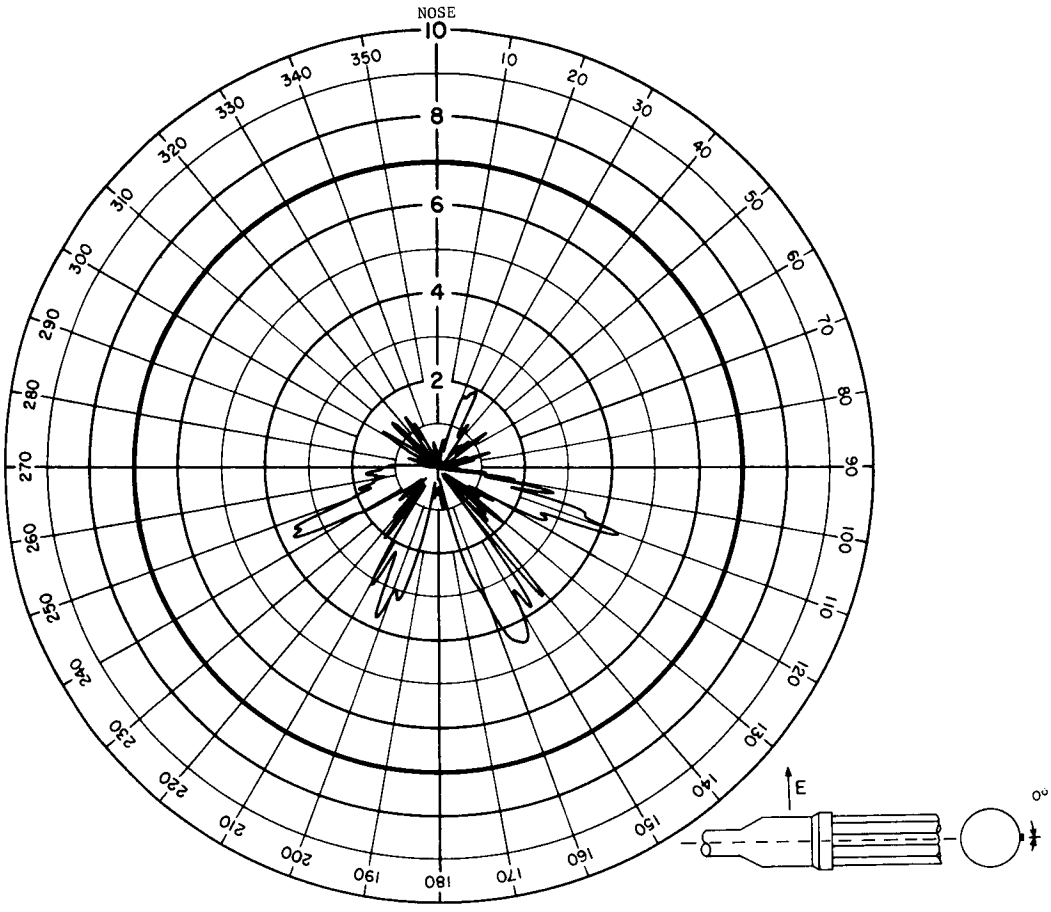


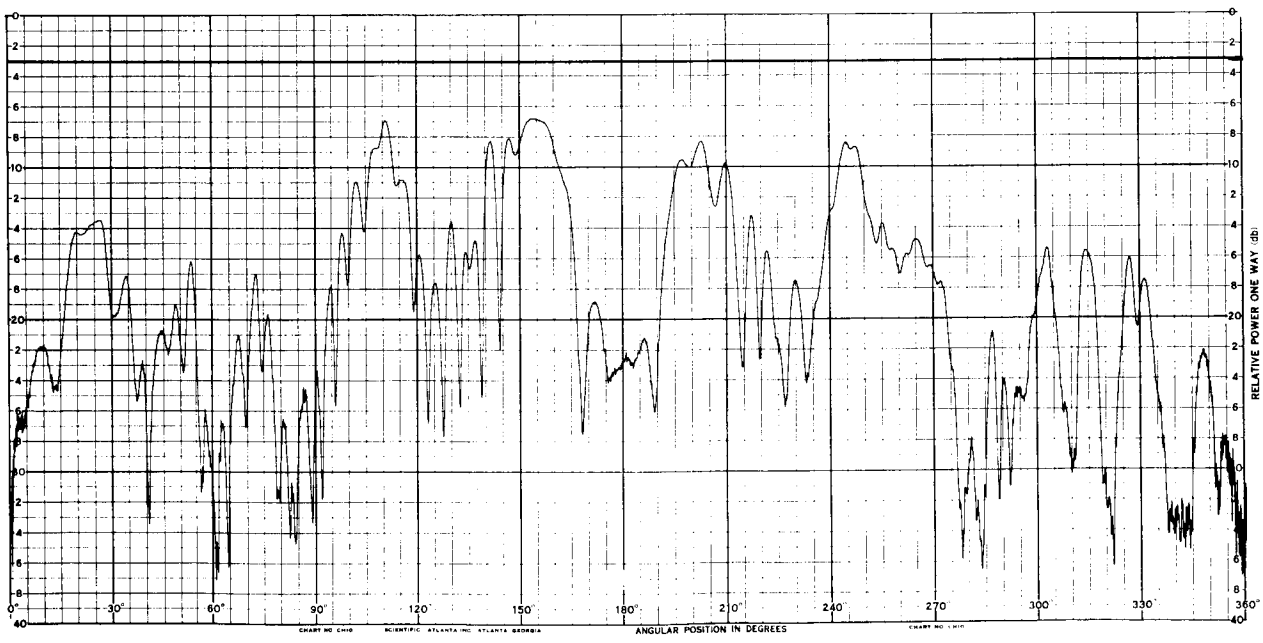
ANTENNA RADIATION PATTERN NO. 203-19

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



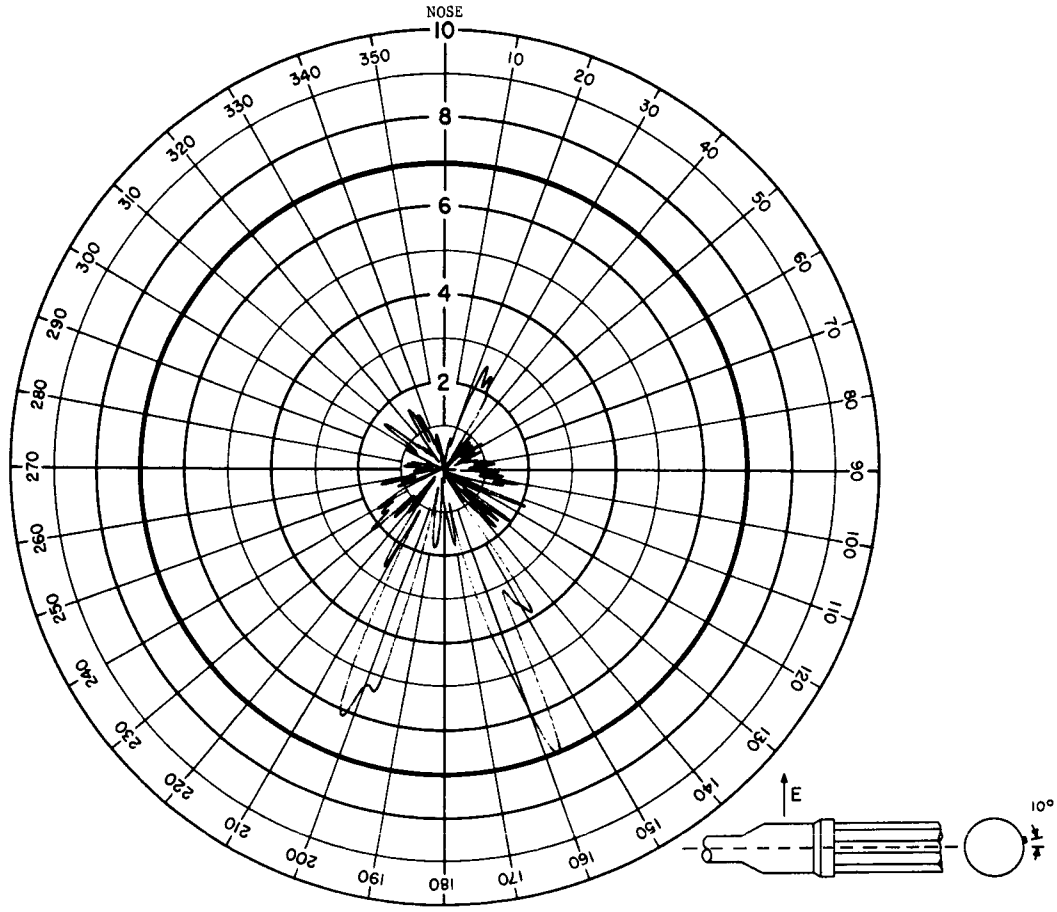


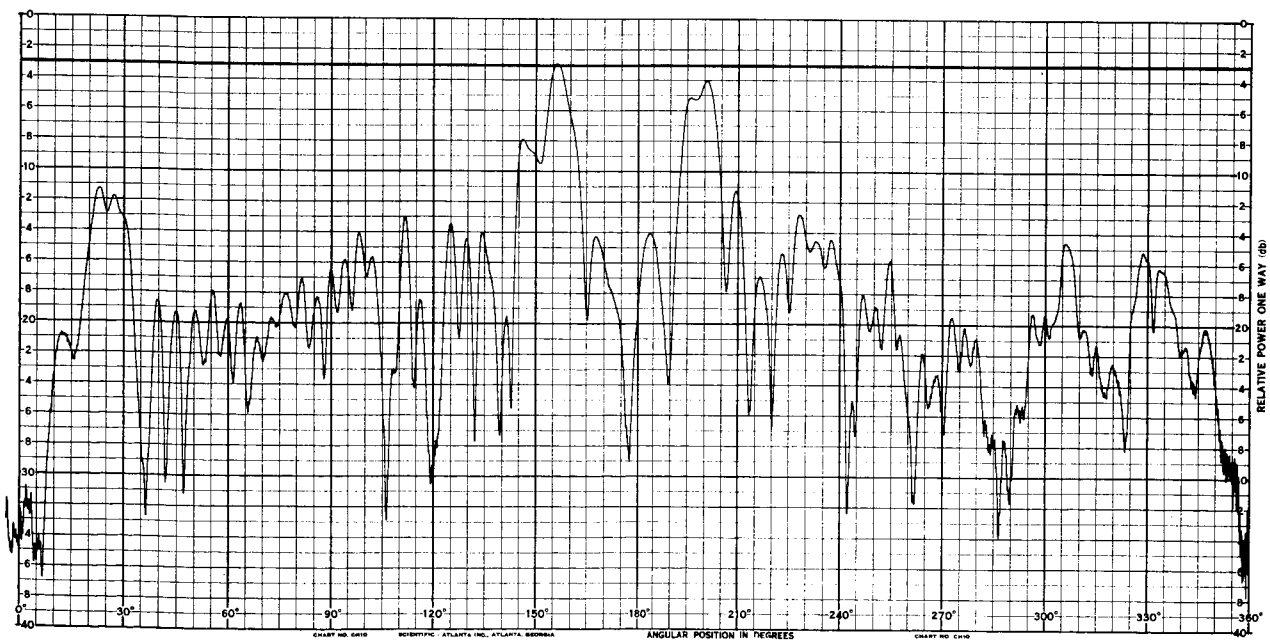
ANTENNA RADIATION PATTERN NO. 203-20

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



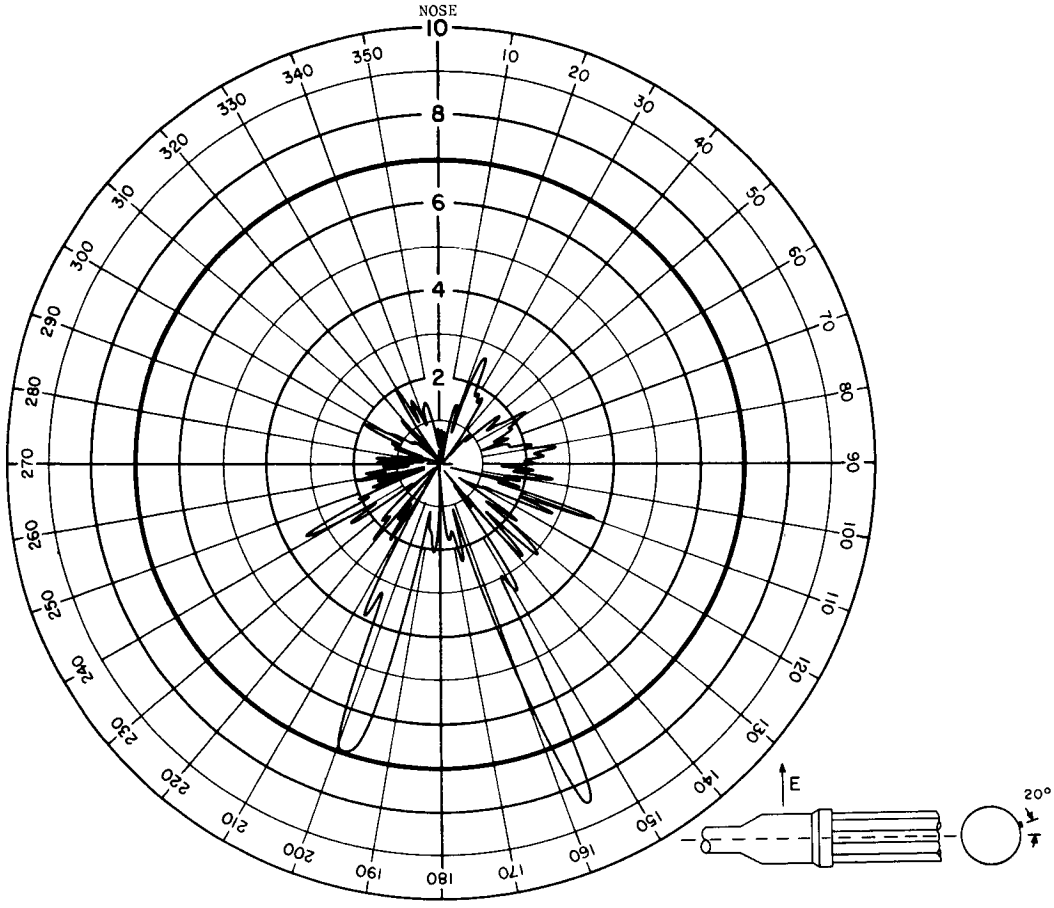


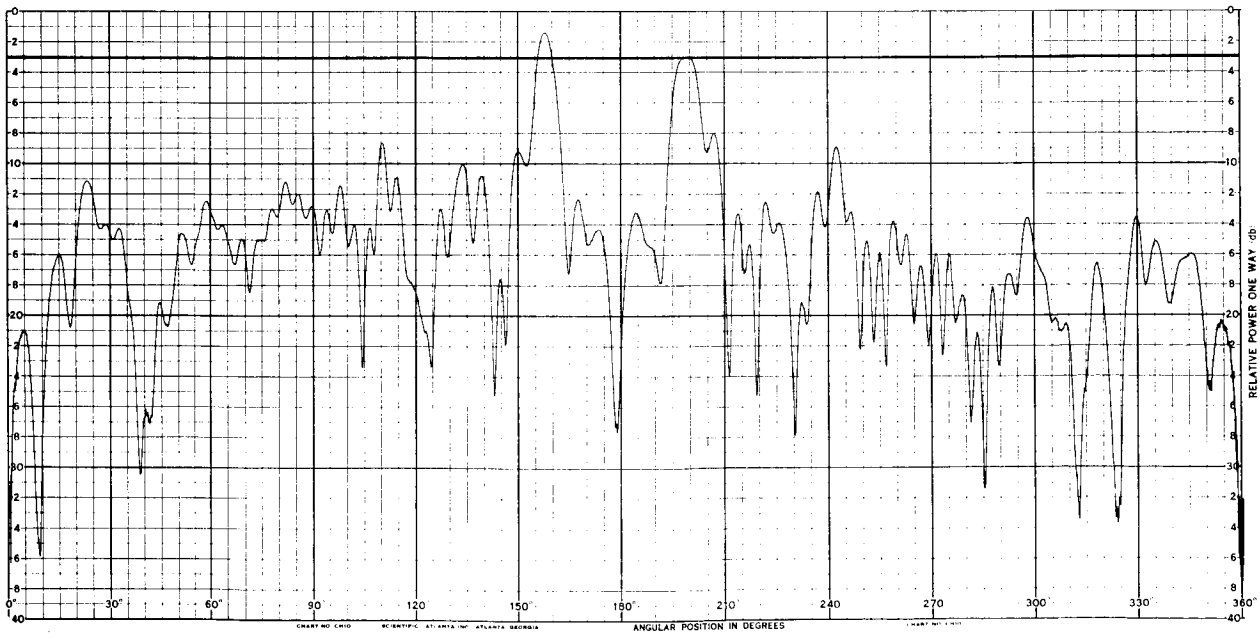
ANTENNA RADIATION PATTERN NO. 203-21

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



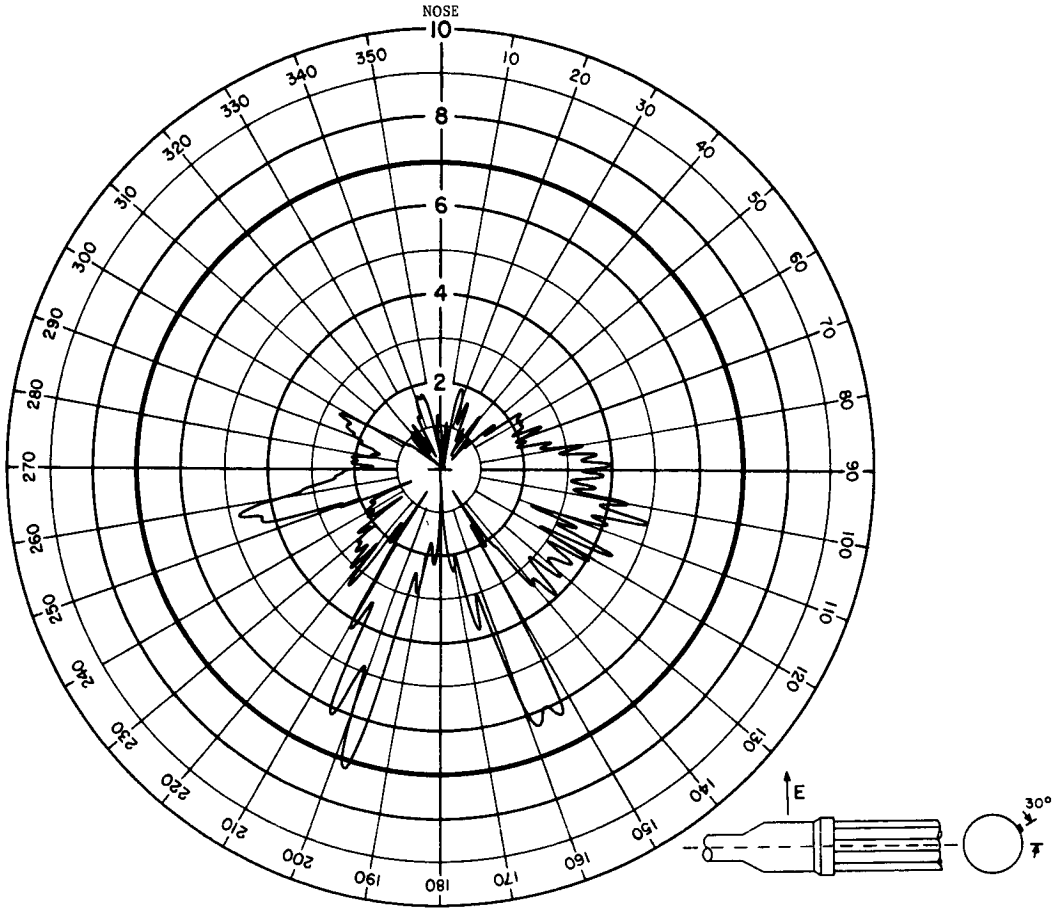


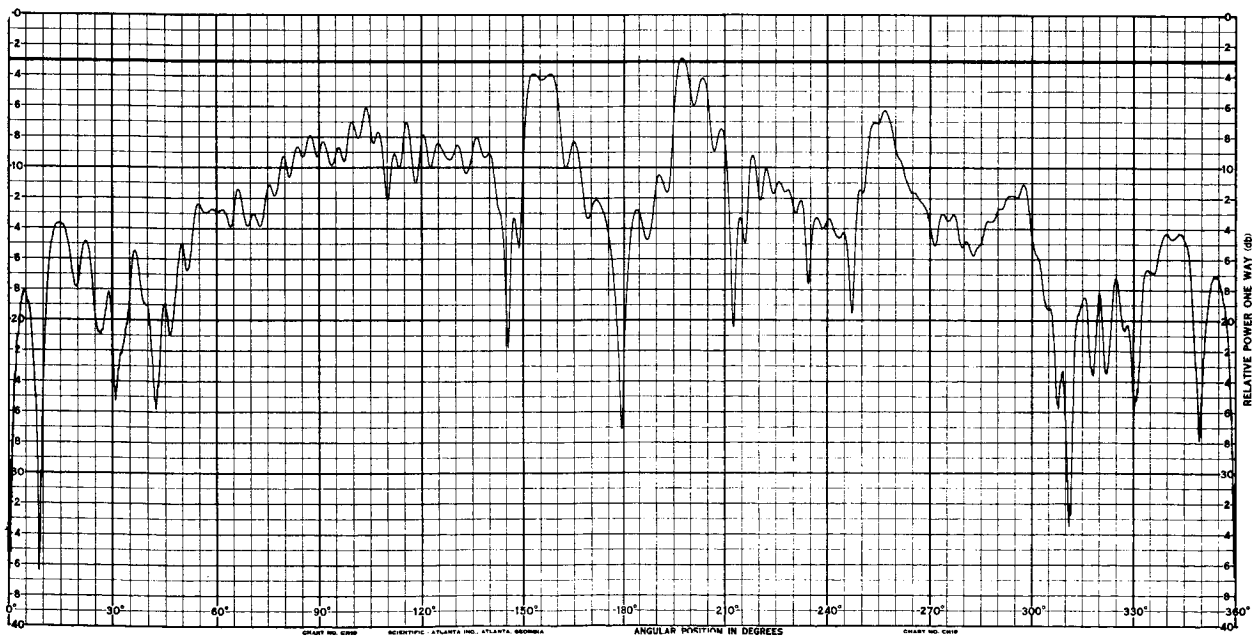
ANTENNA RADIATION PATTERN NO. 203-22

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



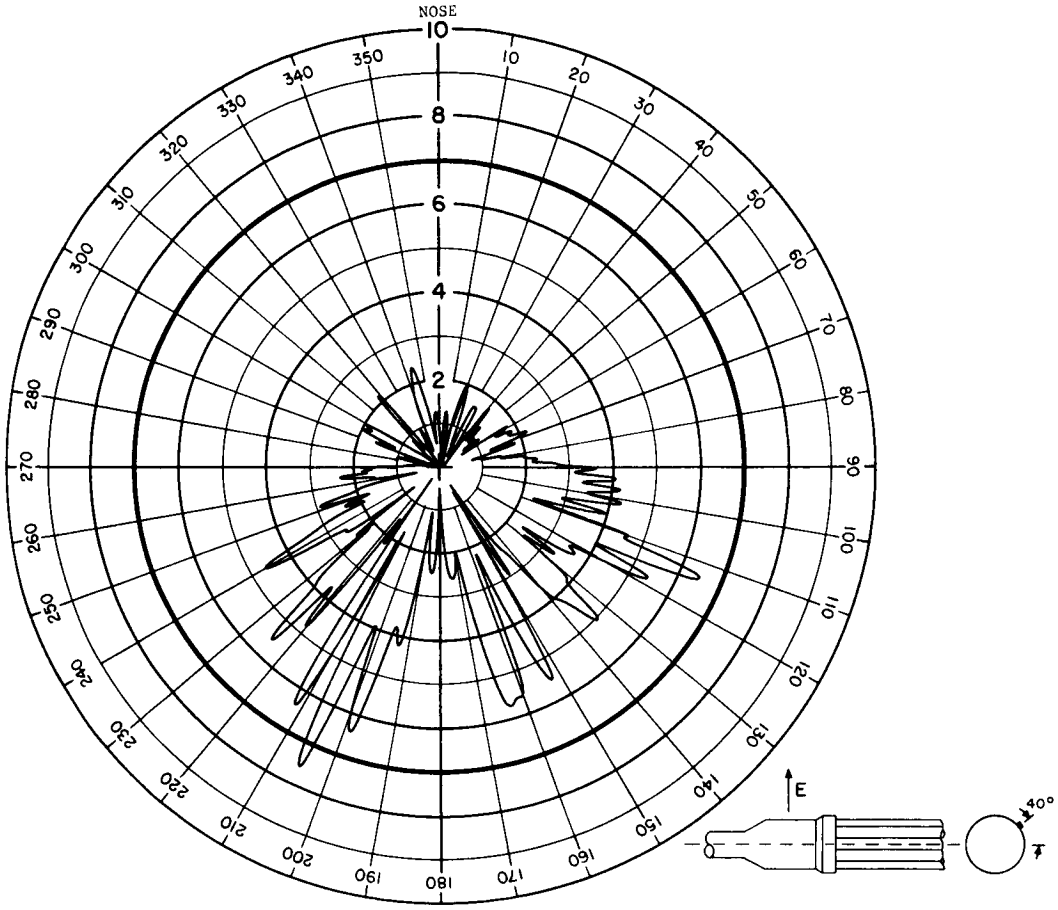


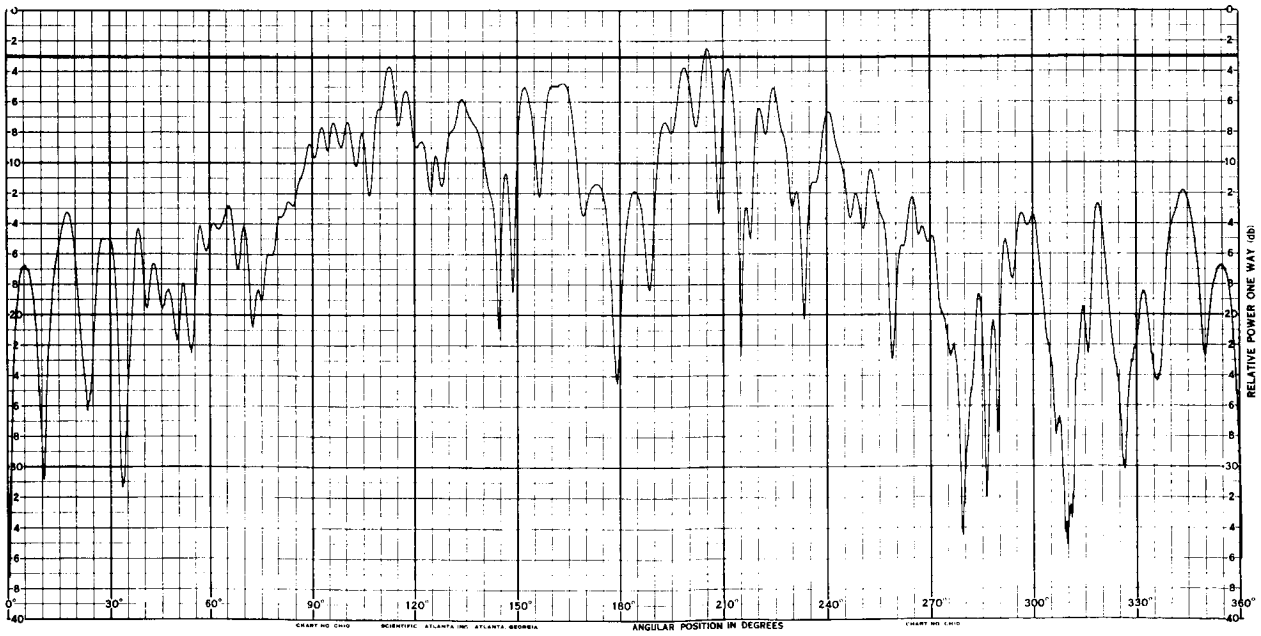
ANTENNA RADIATION PATTERN NO. 203-23

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



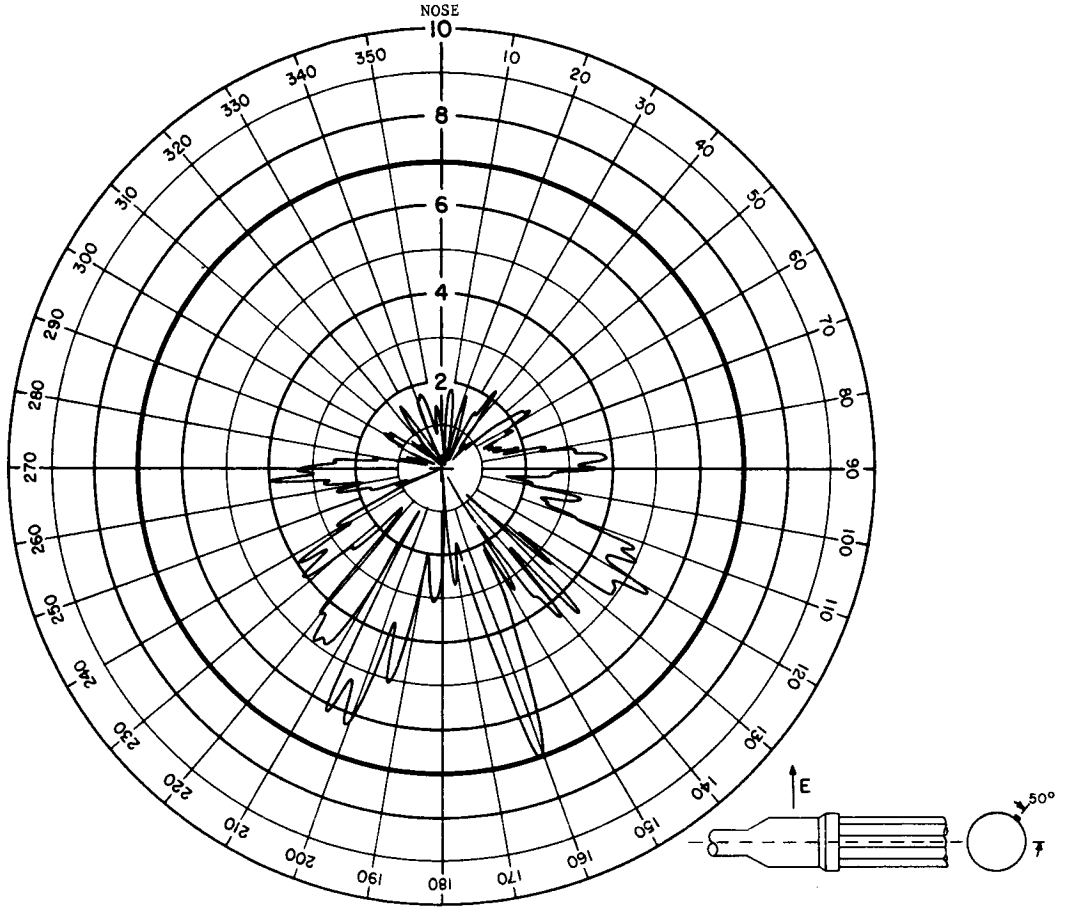


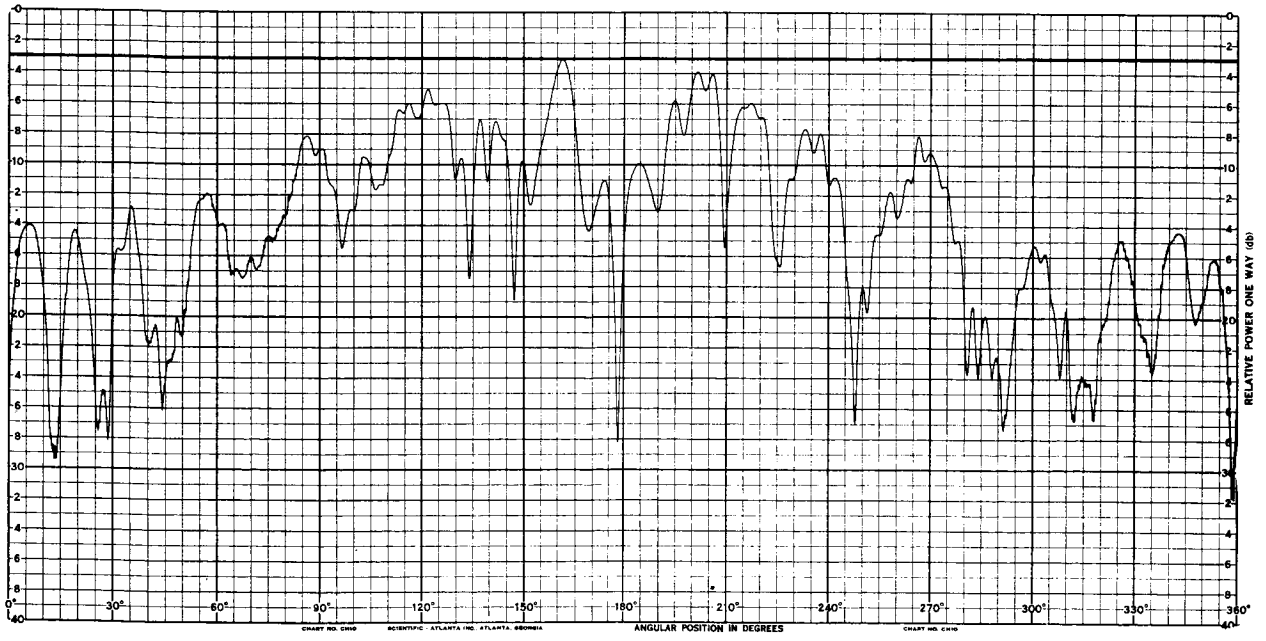
ANTENNA RADIATION PATTERN NO. 203-24

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



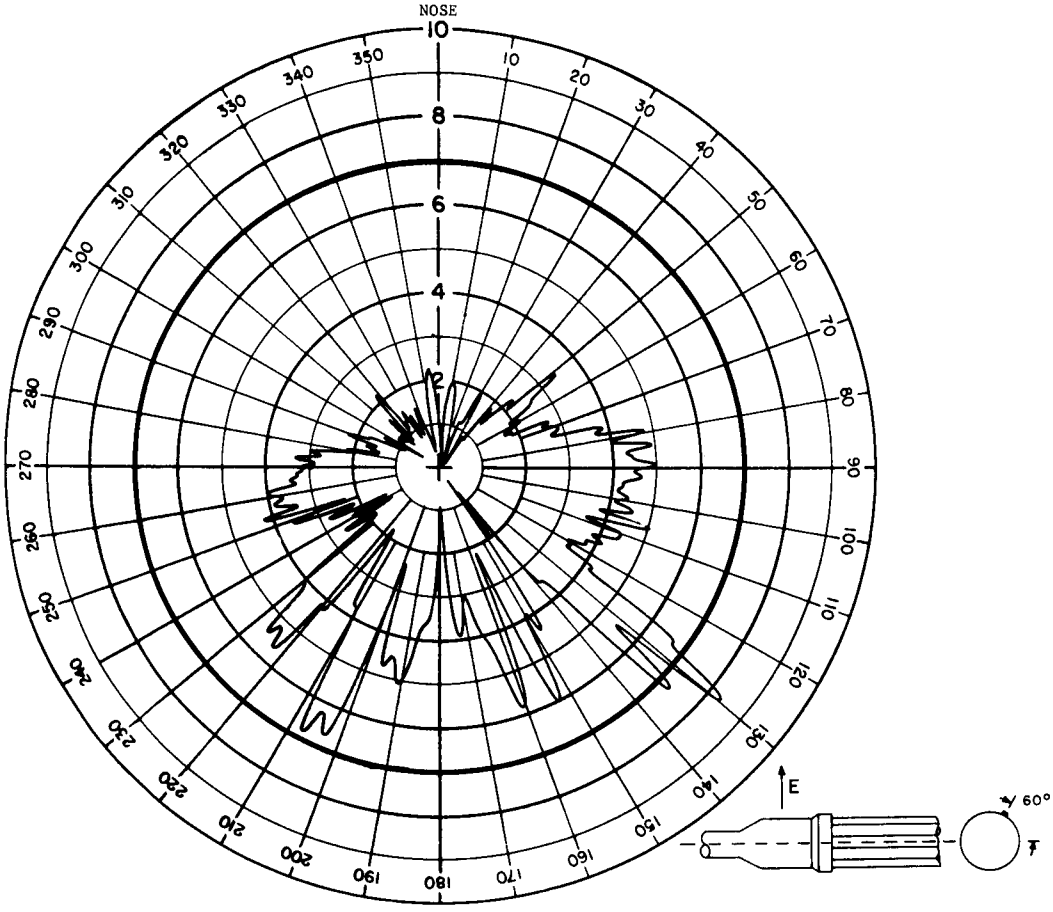


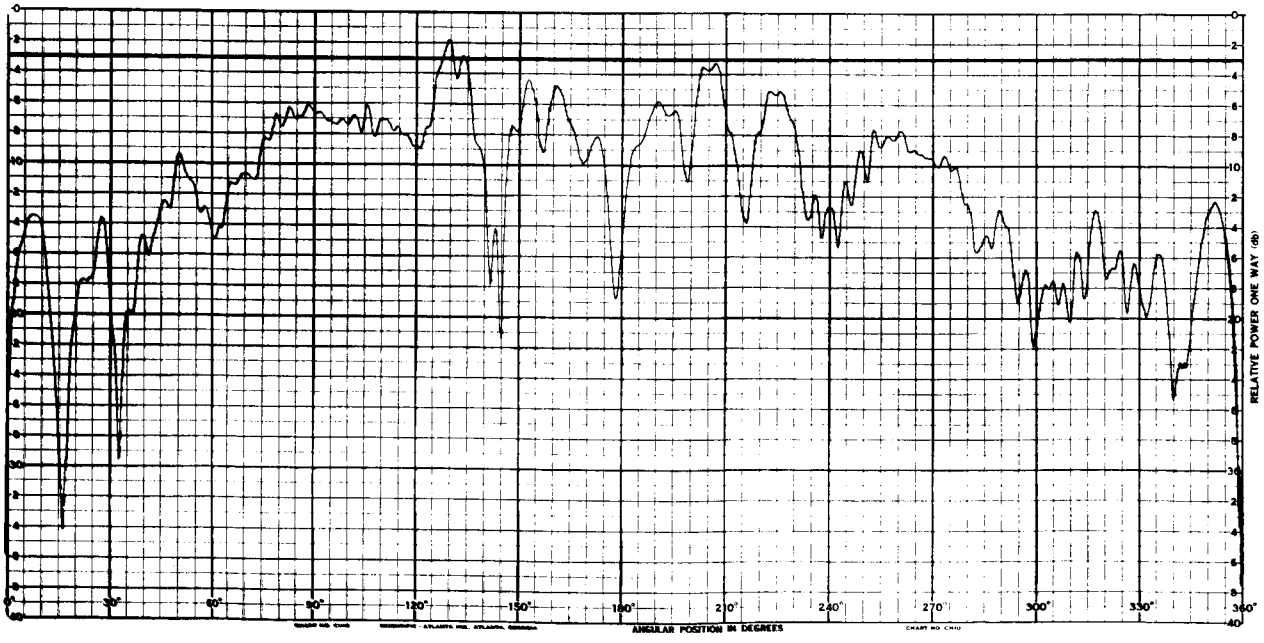
ANTENNA RADIATION PATTERN NO. 203-25

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



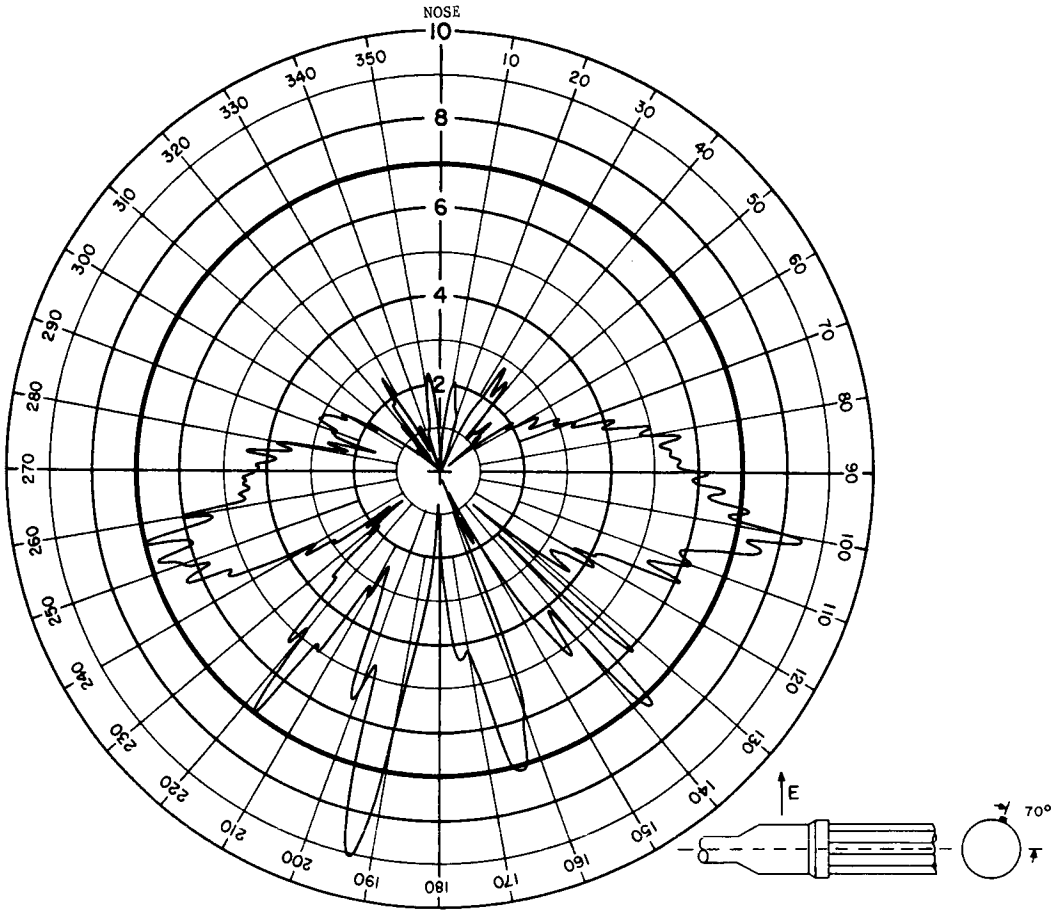


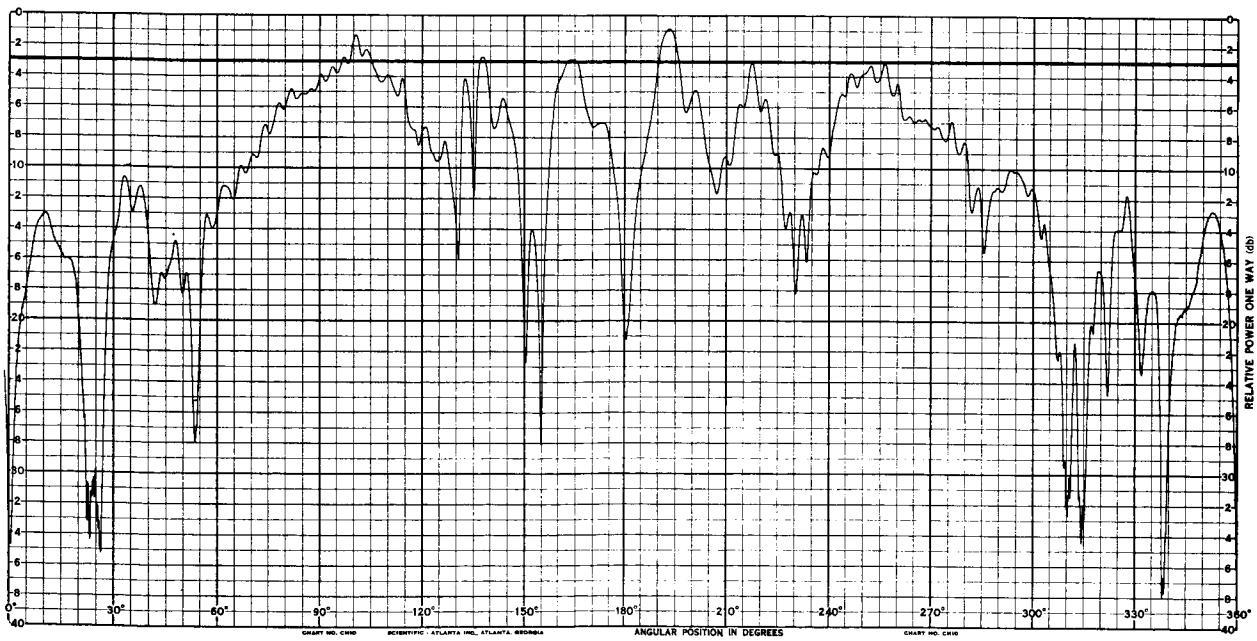
ANTENNA RADIATION PATTERN NO. 203-26

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



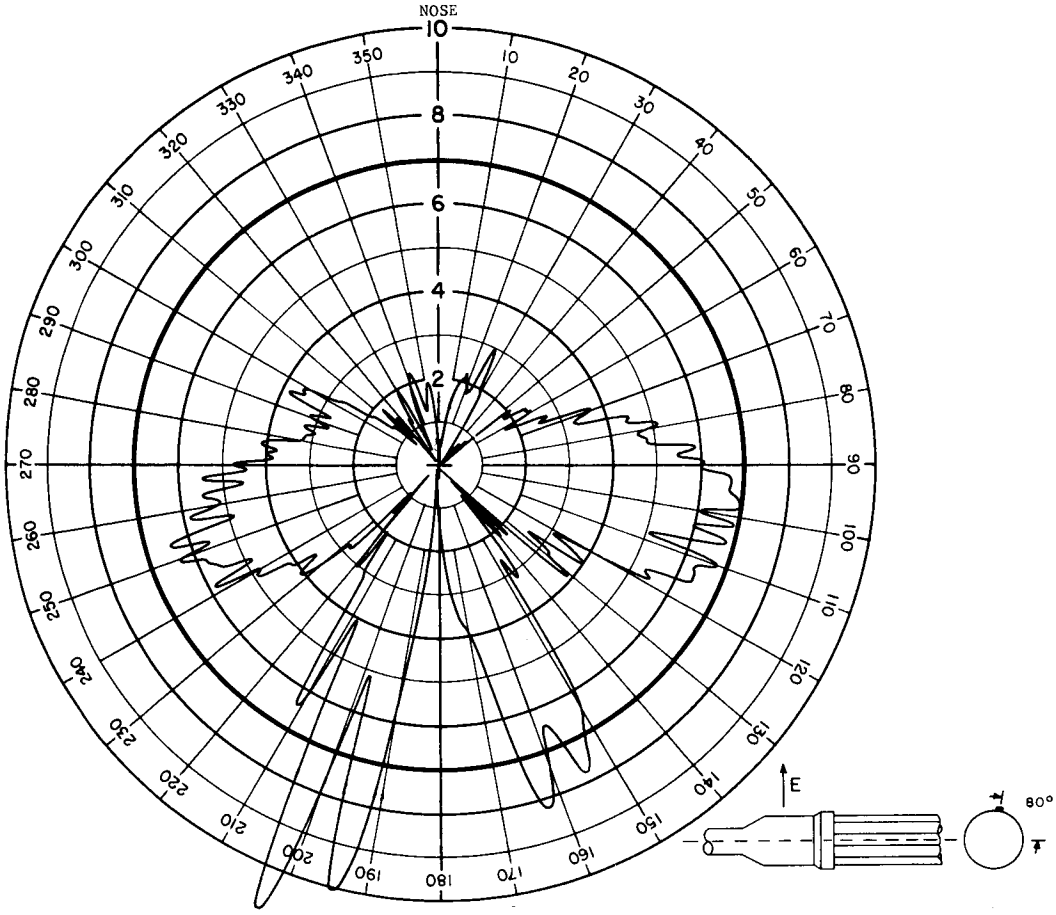


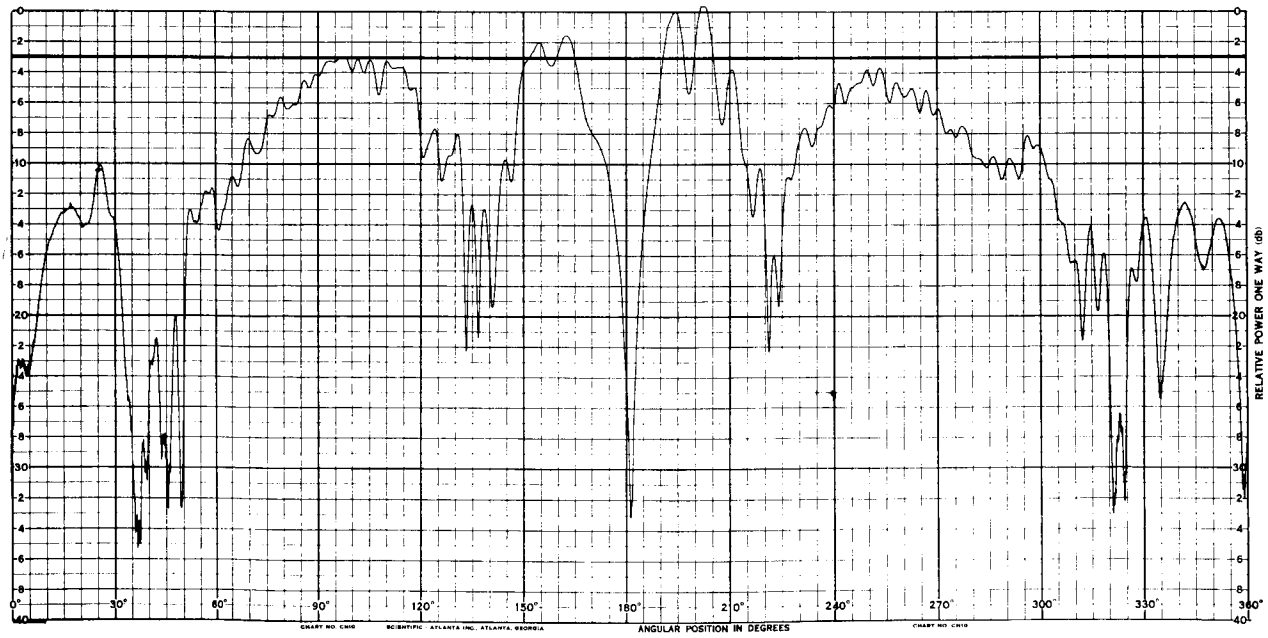
ANTENNA RADIATION PATTERN NO. 203-27

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



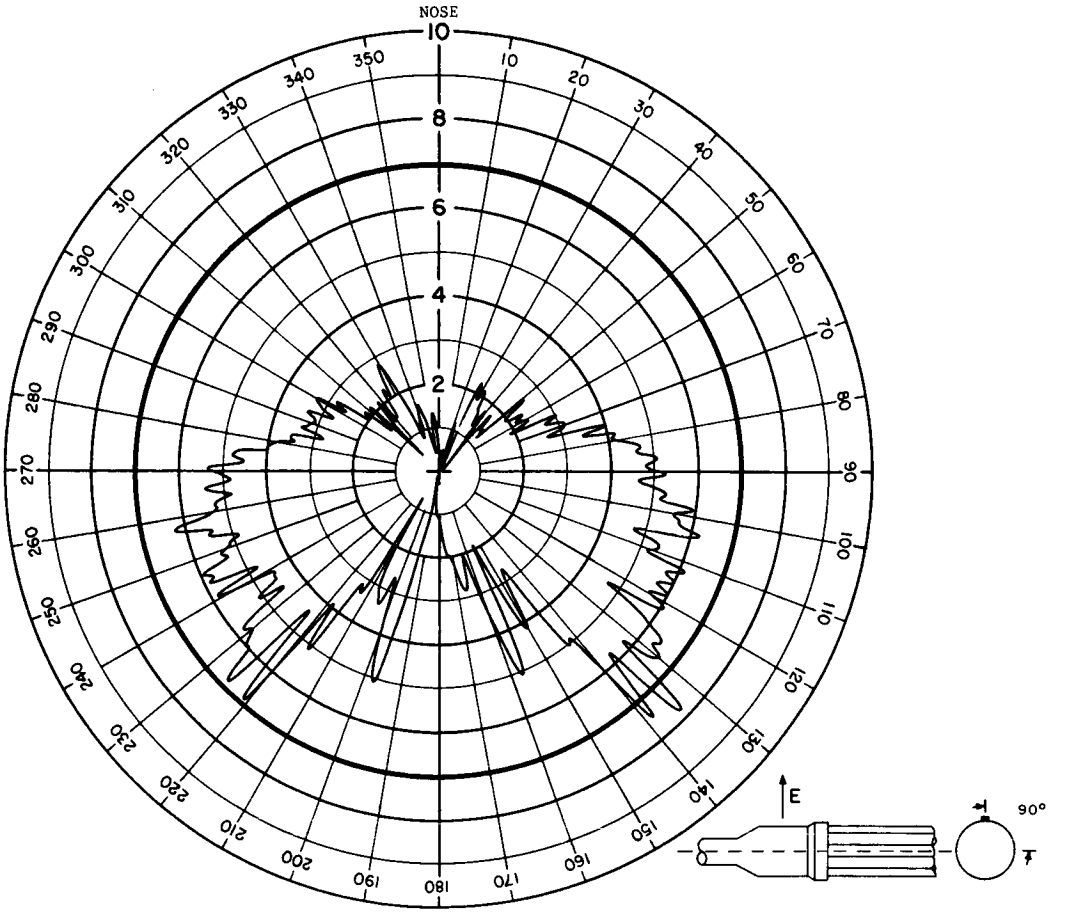


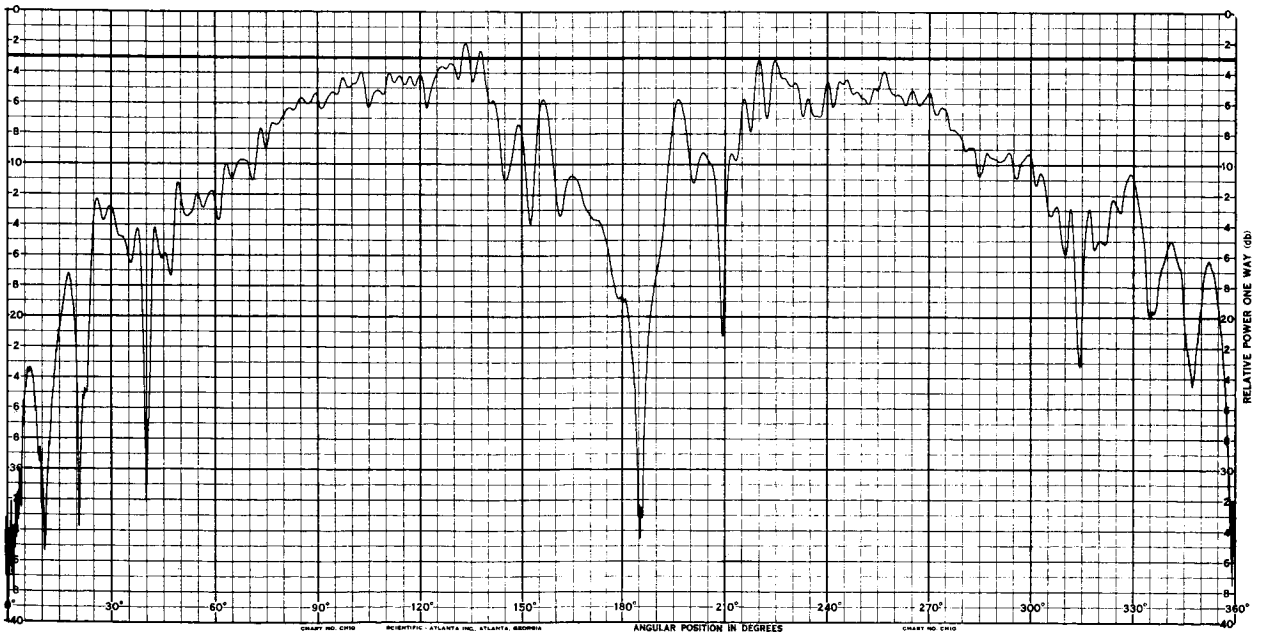
ANTENNA RADIATION PATTERN NO. 203-28

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



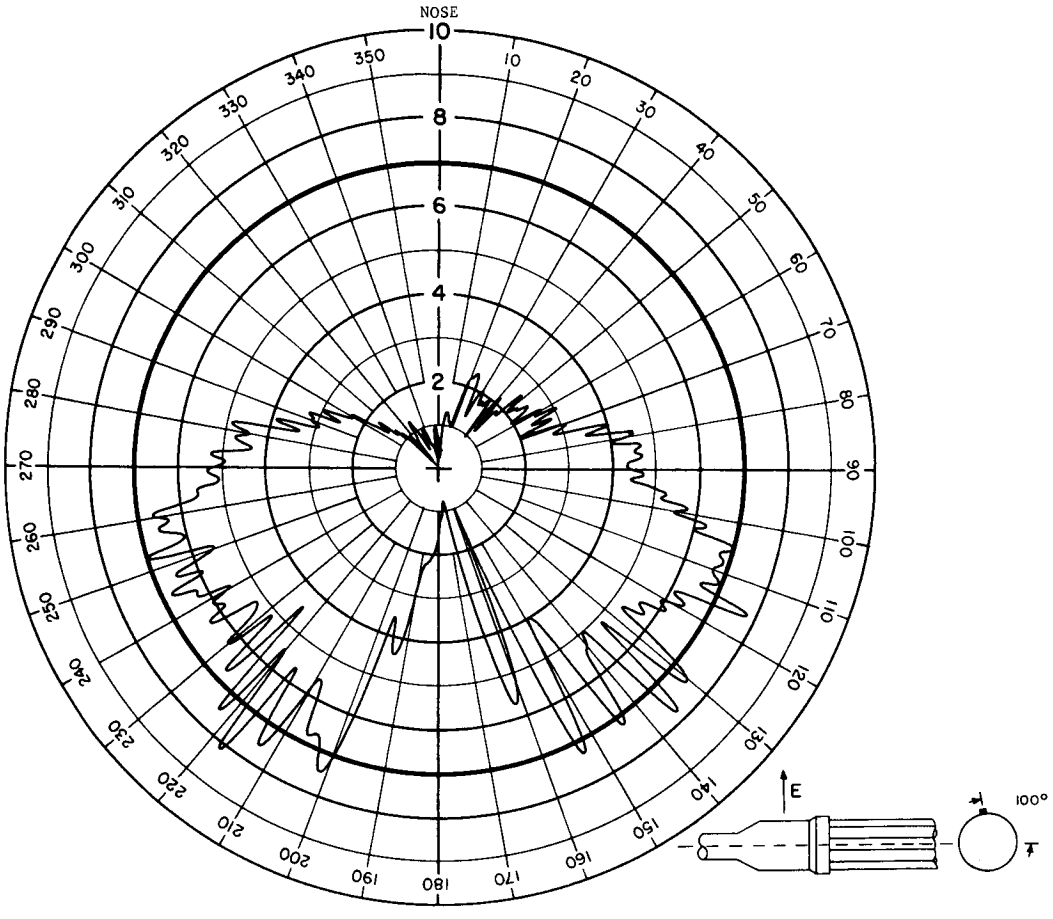


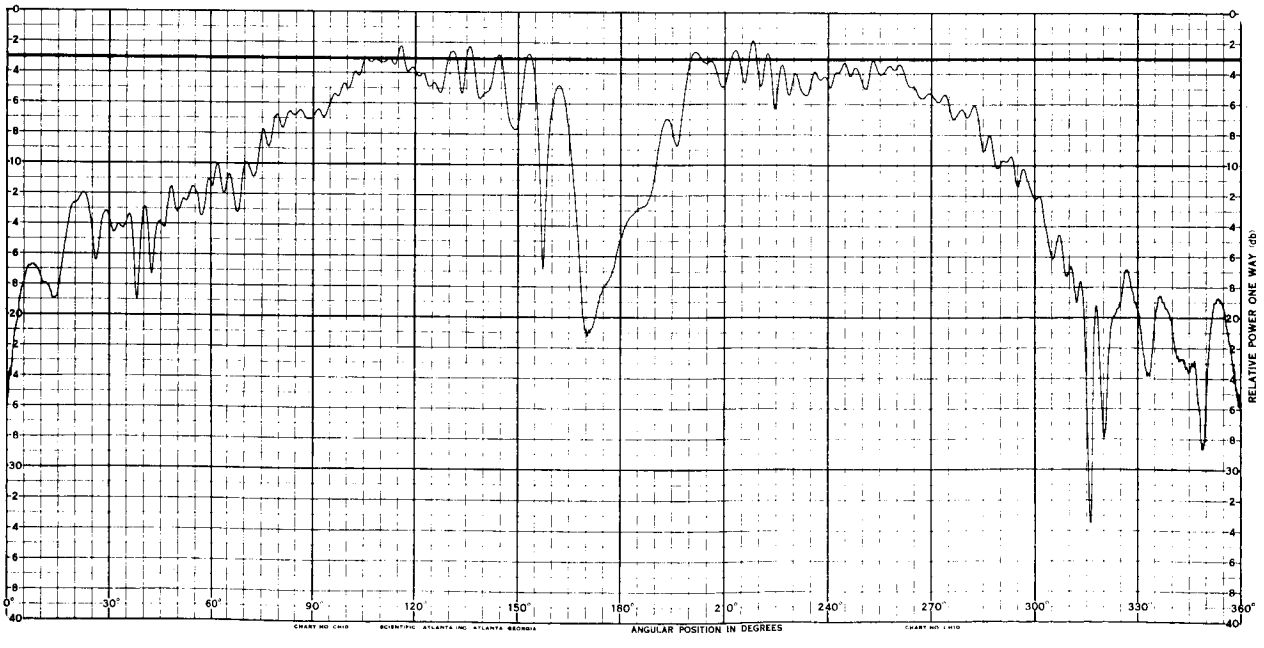
ANTENNA RADIATION PATTERN NO. 203-29

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



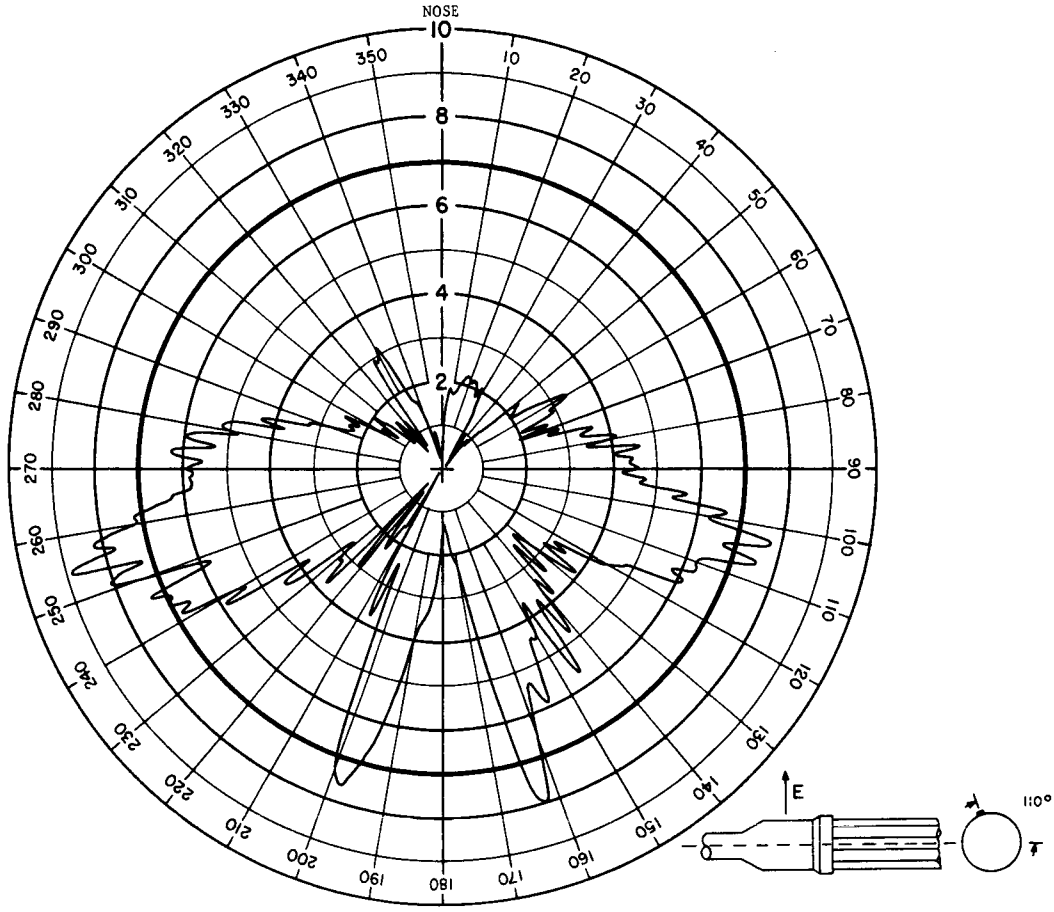


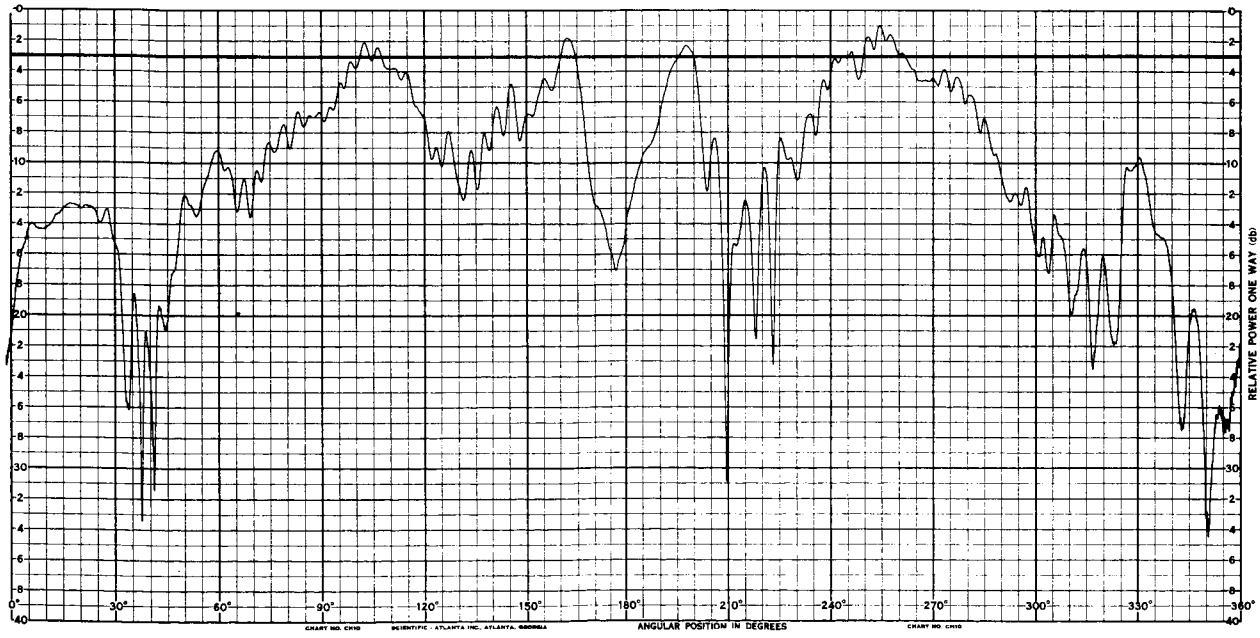
ANTENNA RADIATION PATTERN NO. 203-30

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



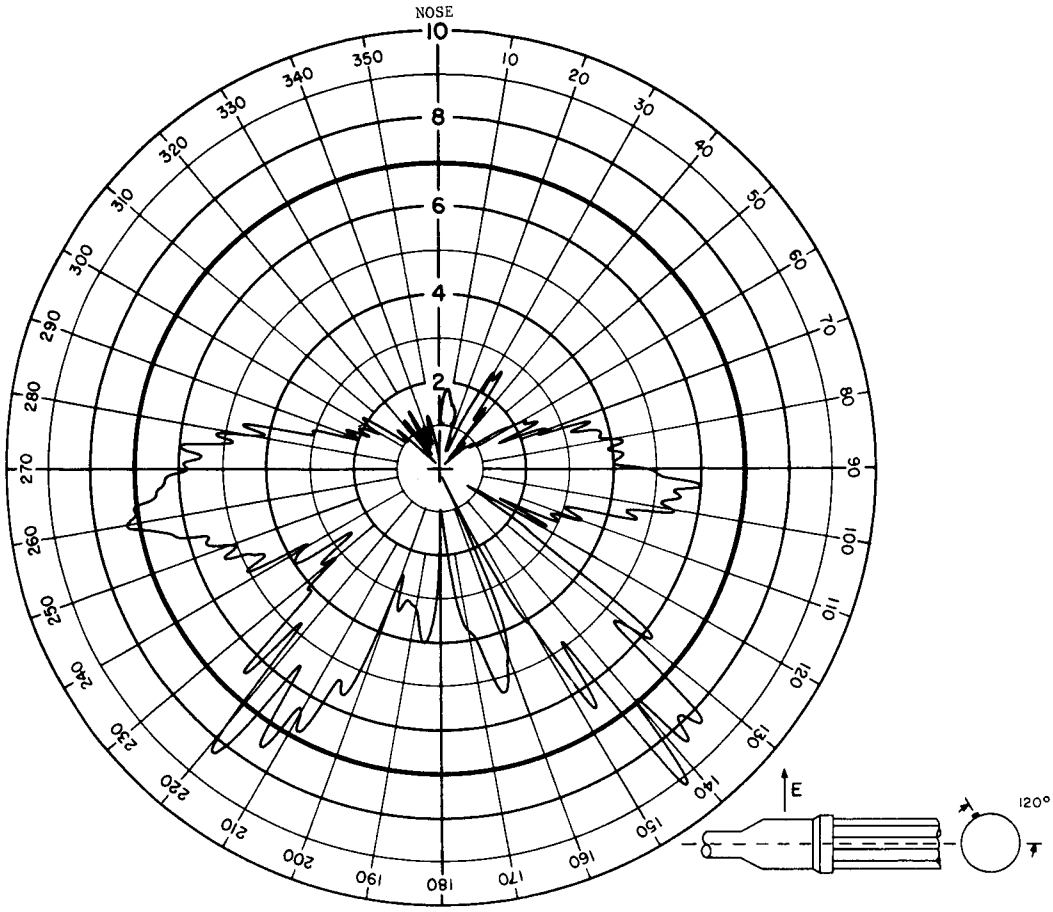


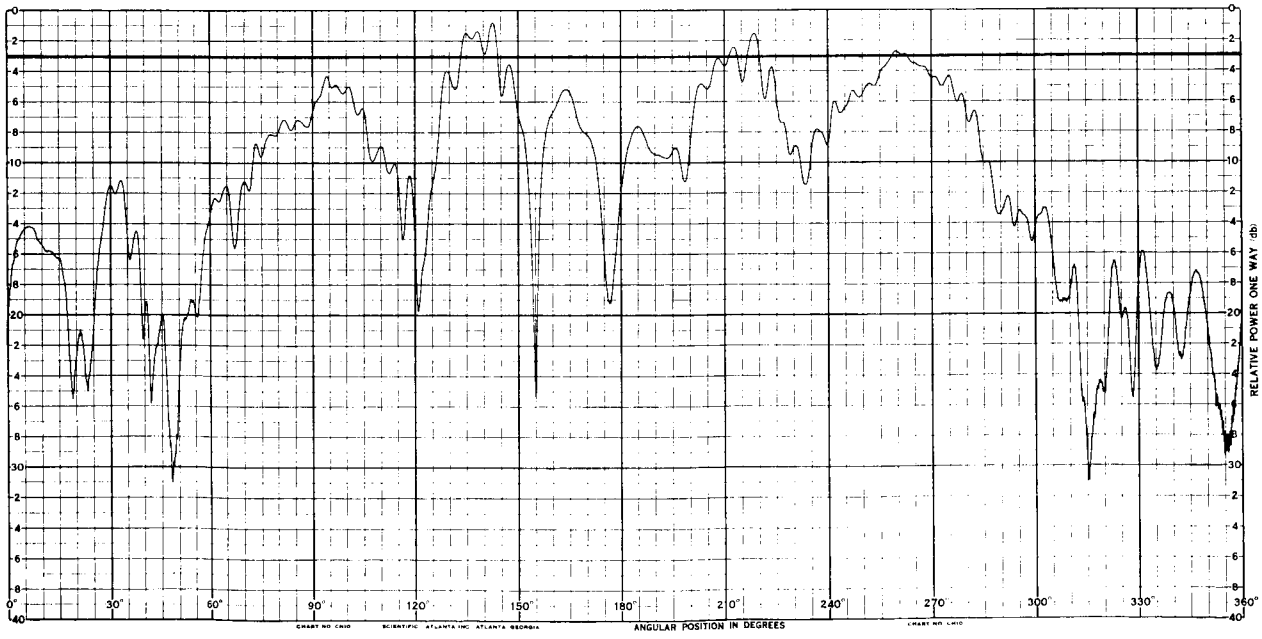
ANTENNA RADIATION PATTERN NO. 203-31

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



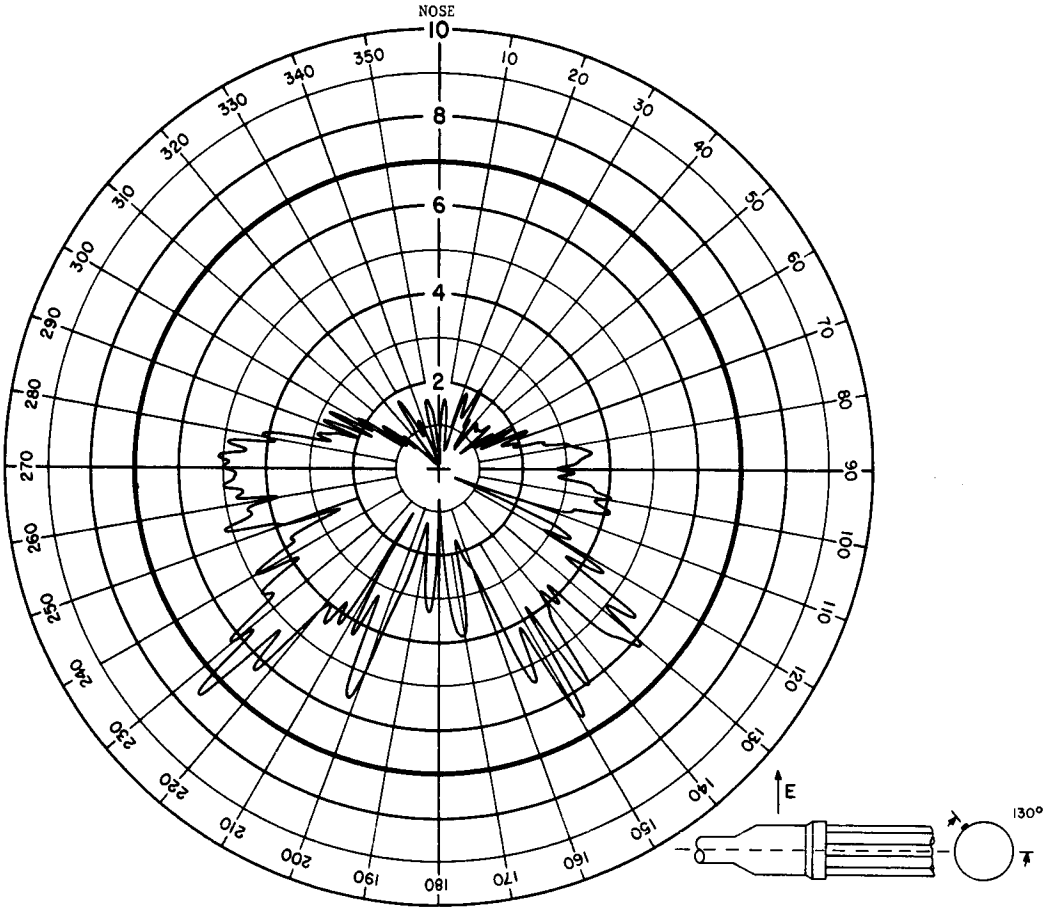


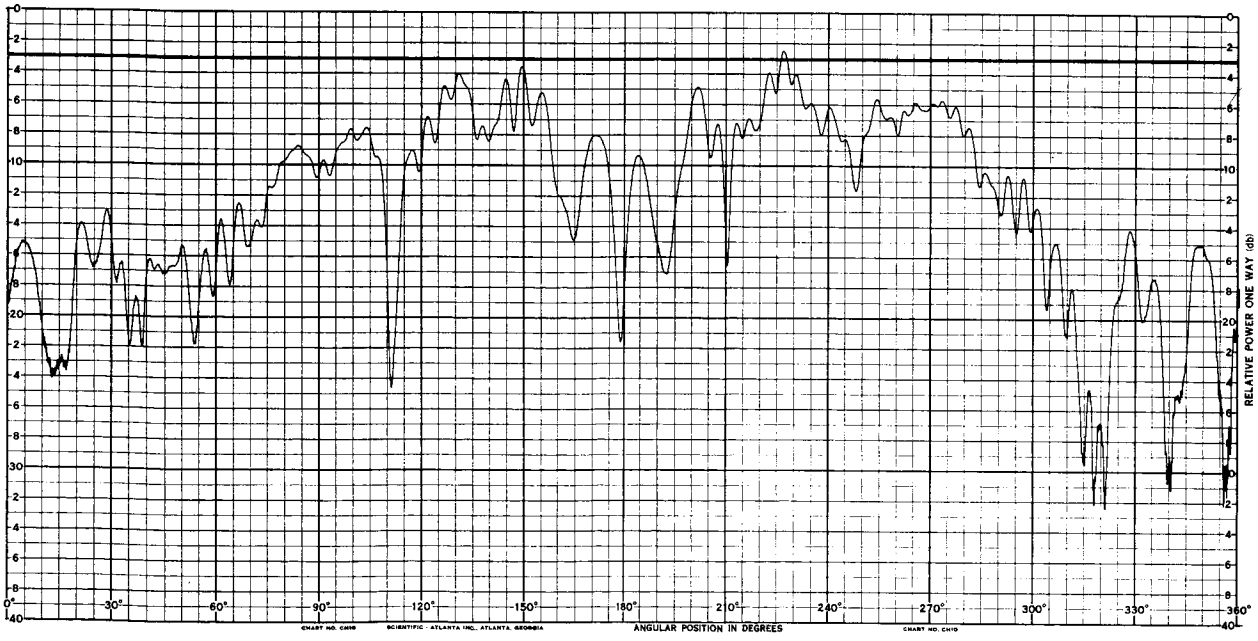
ANTENNA RADIATION PATTERN NO. 203-32

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



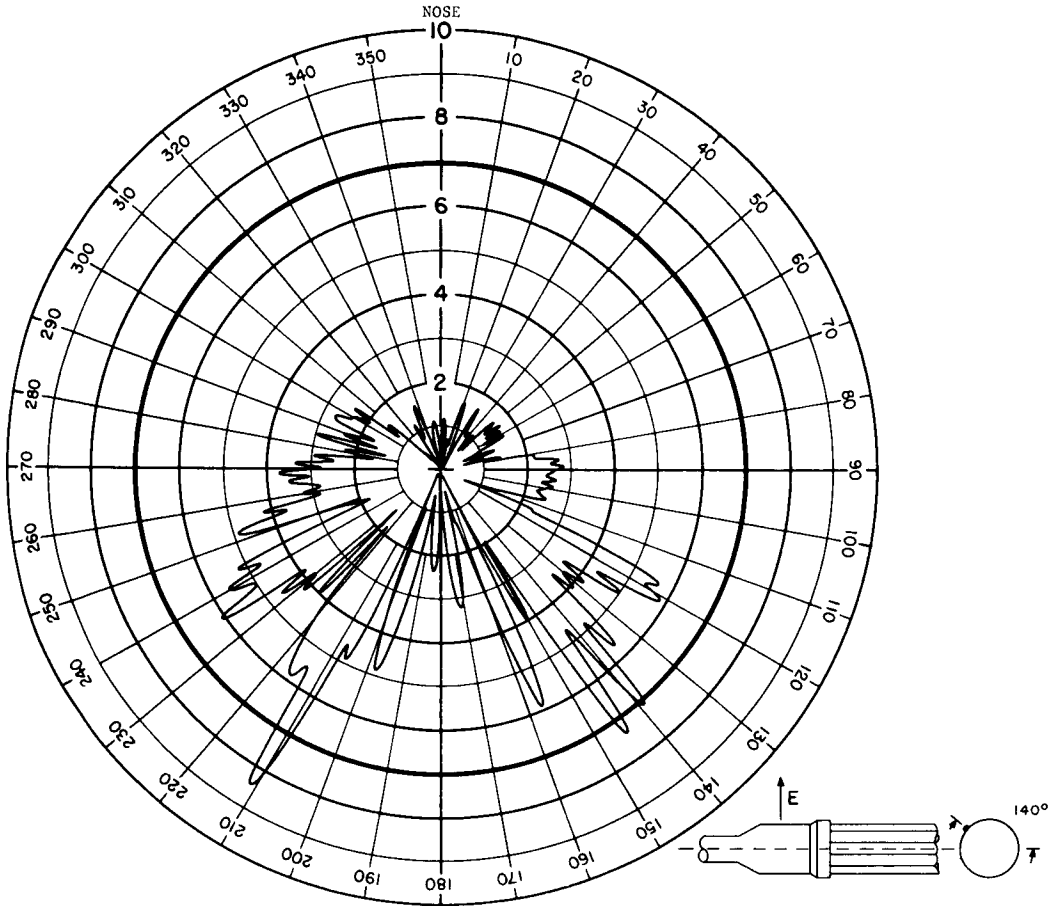


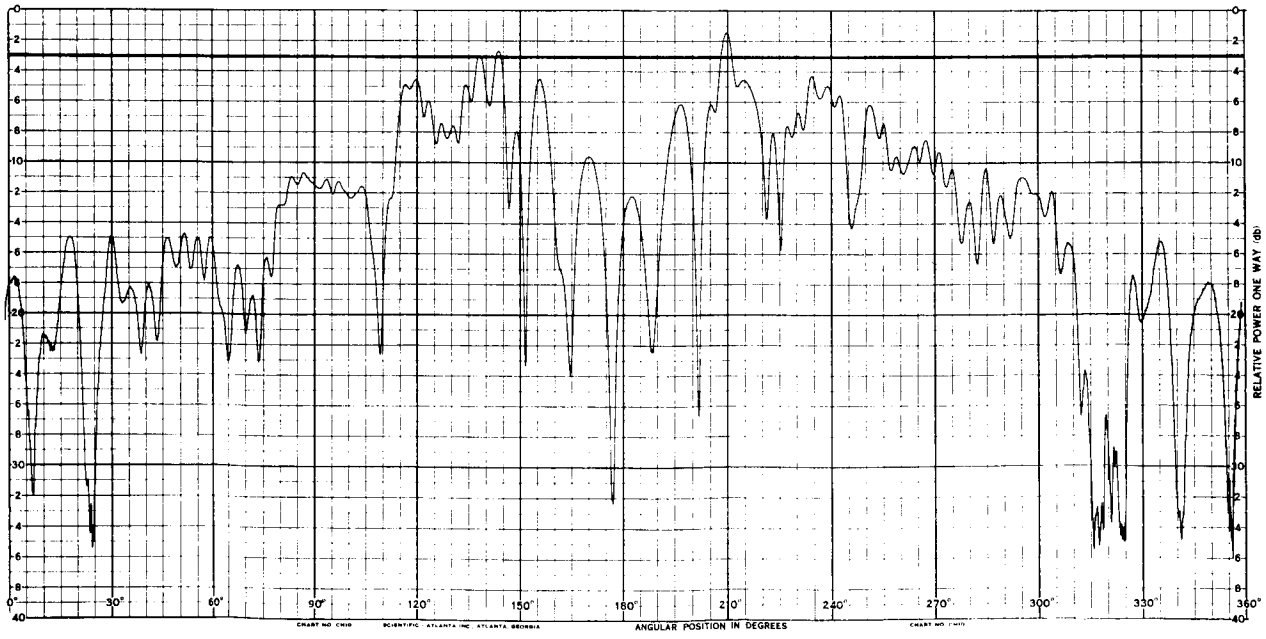
ANTENNA RADIATION PATTERN NO. 203-33

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



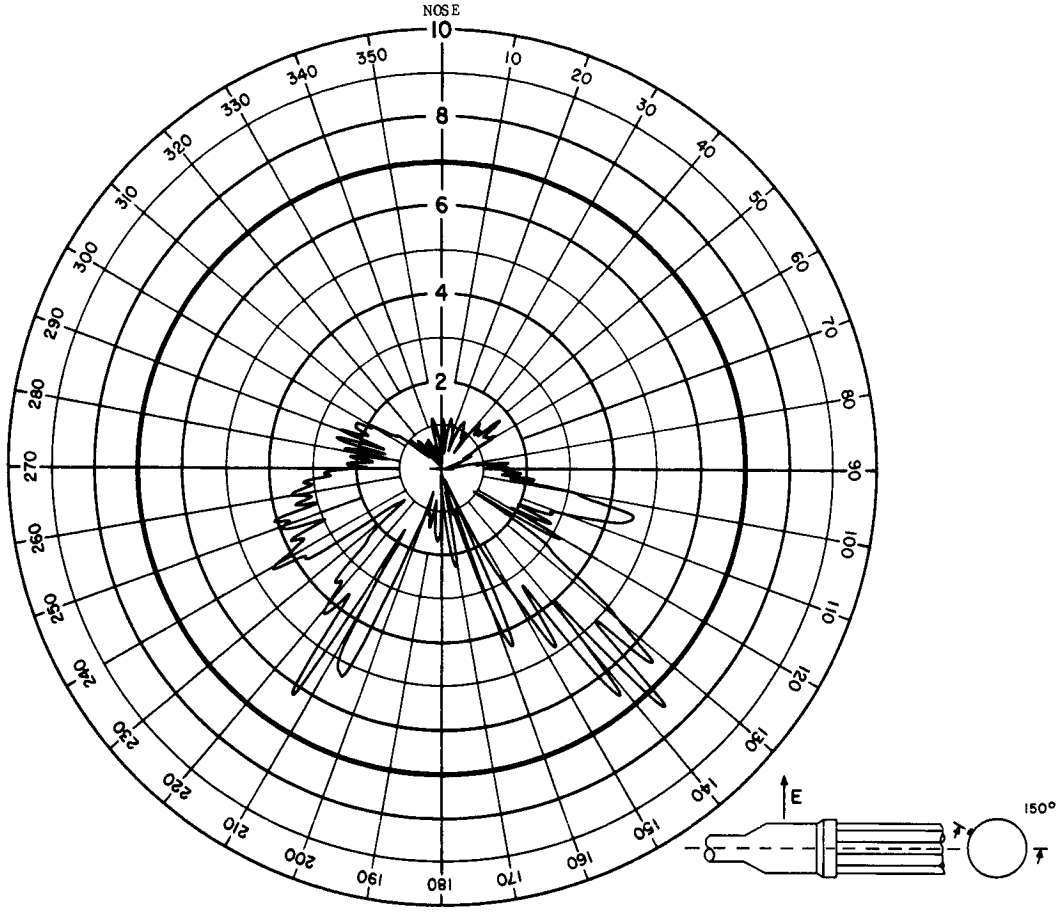


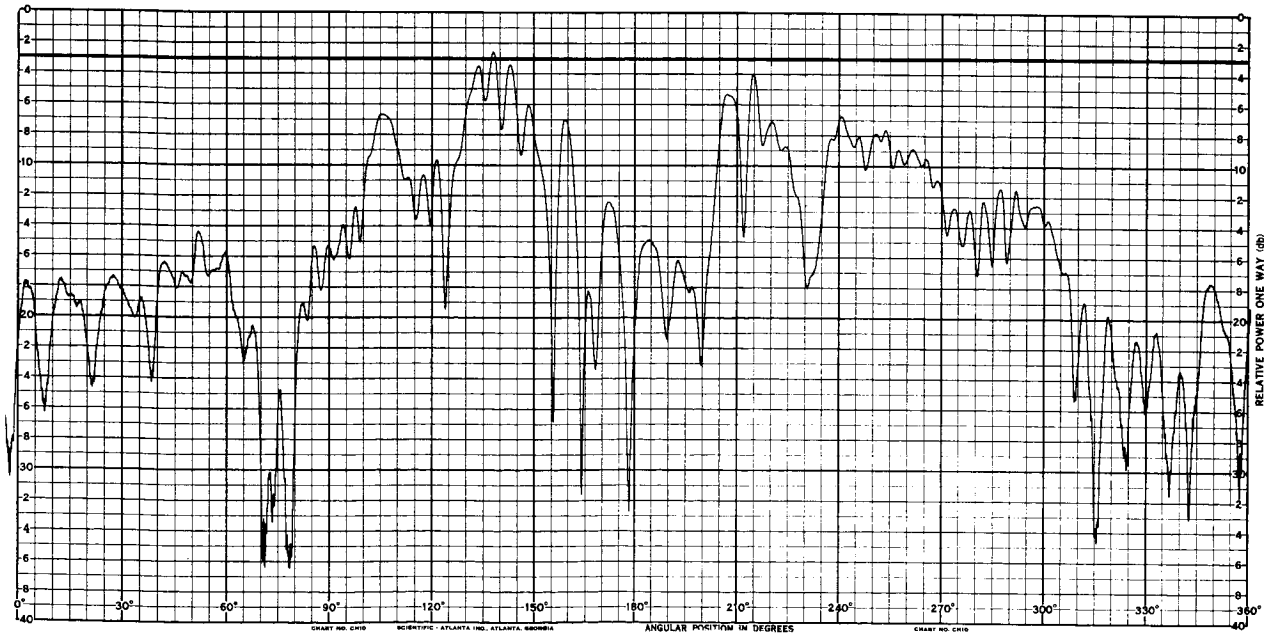
ANTENNA RADIATION PATTERN NO. 203-34

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



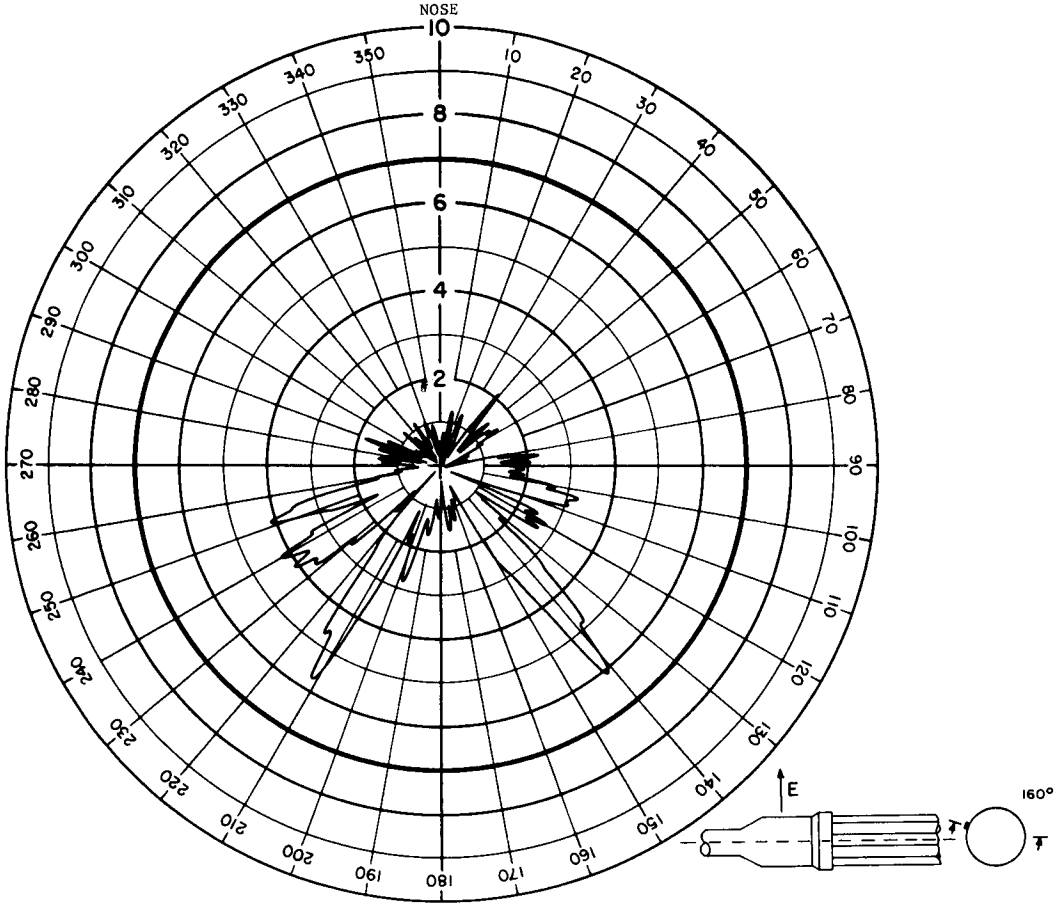


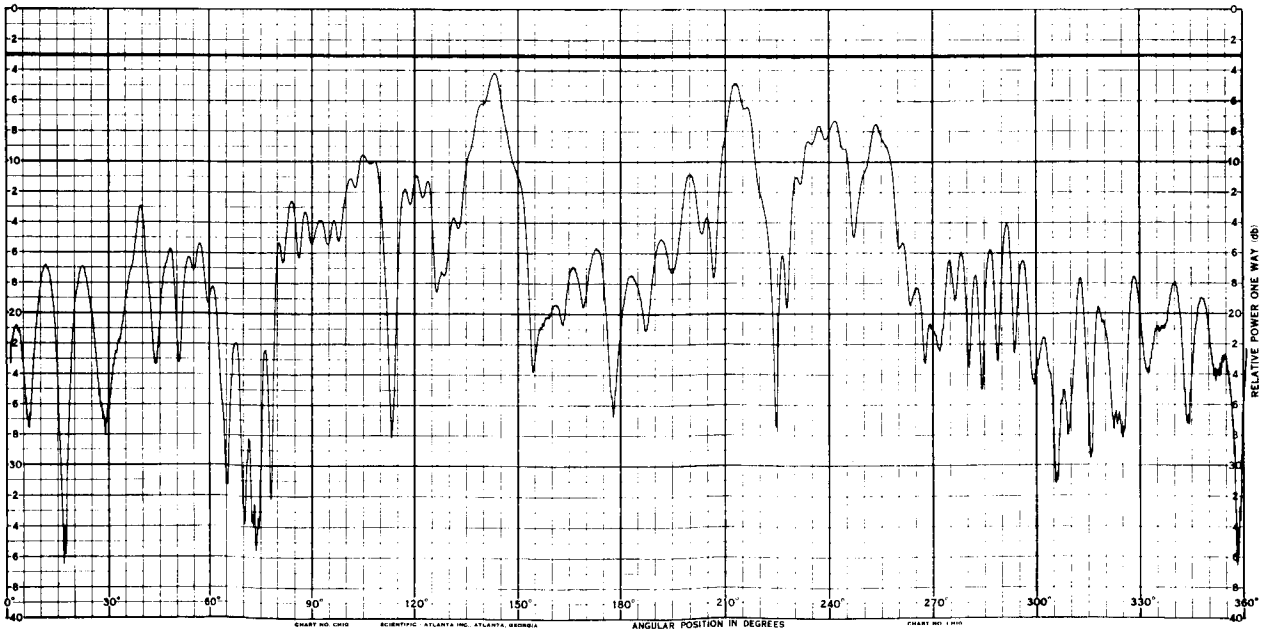
ANTENNA RADIATION PATTERN NO. 203-35

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



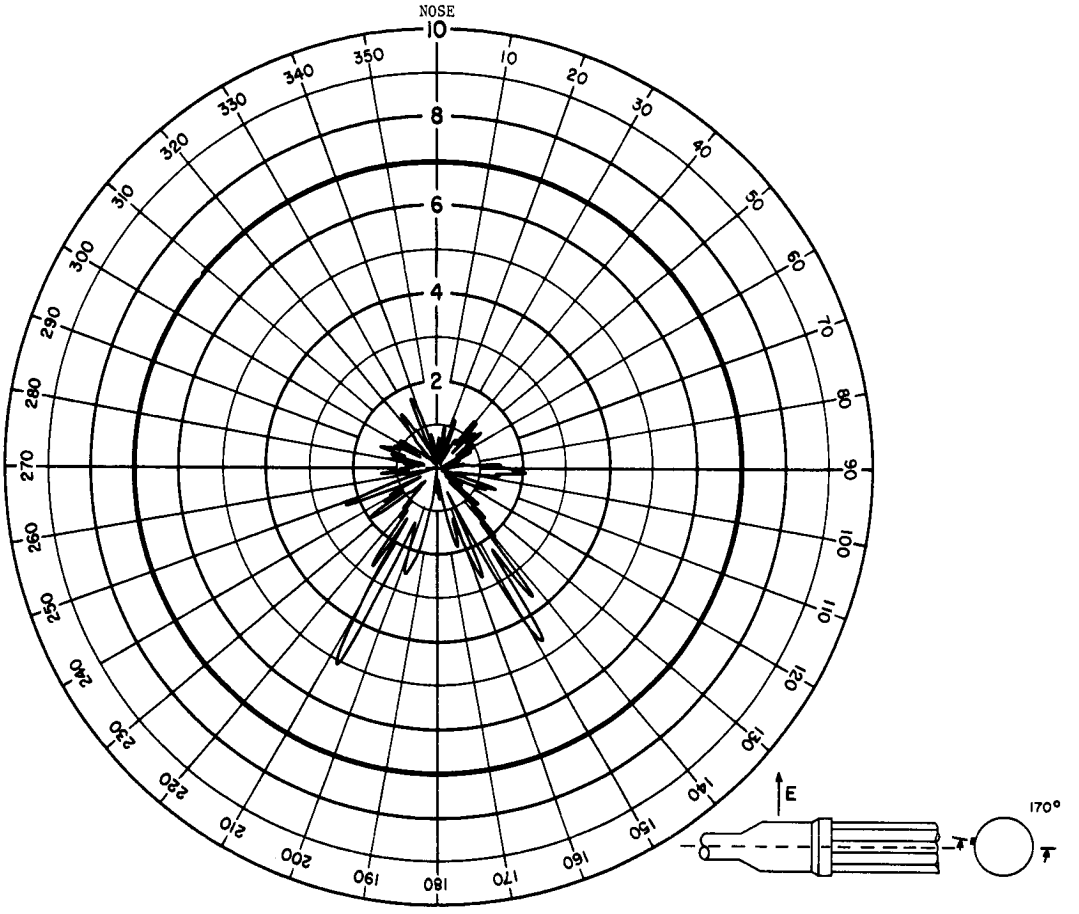


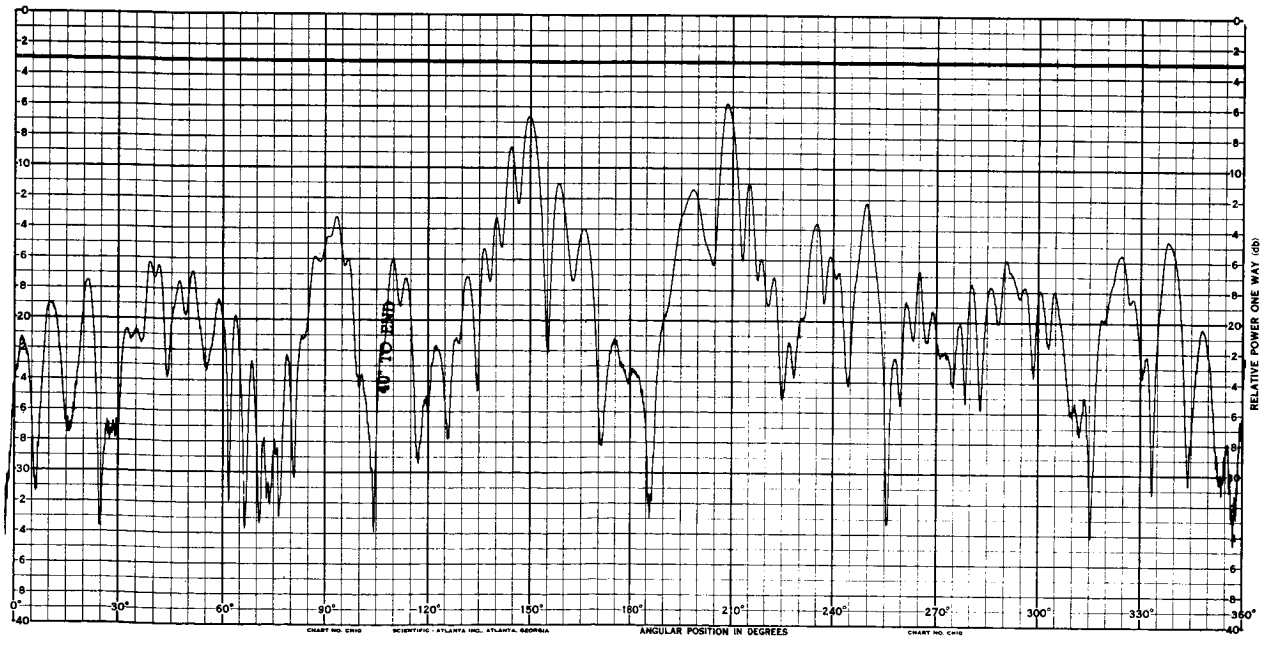
ANTENNA RADIATION PATTERN NO. 203-36

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



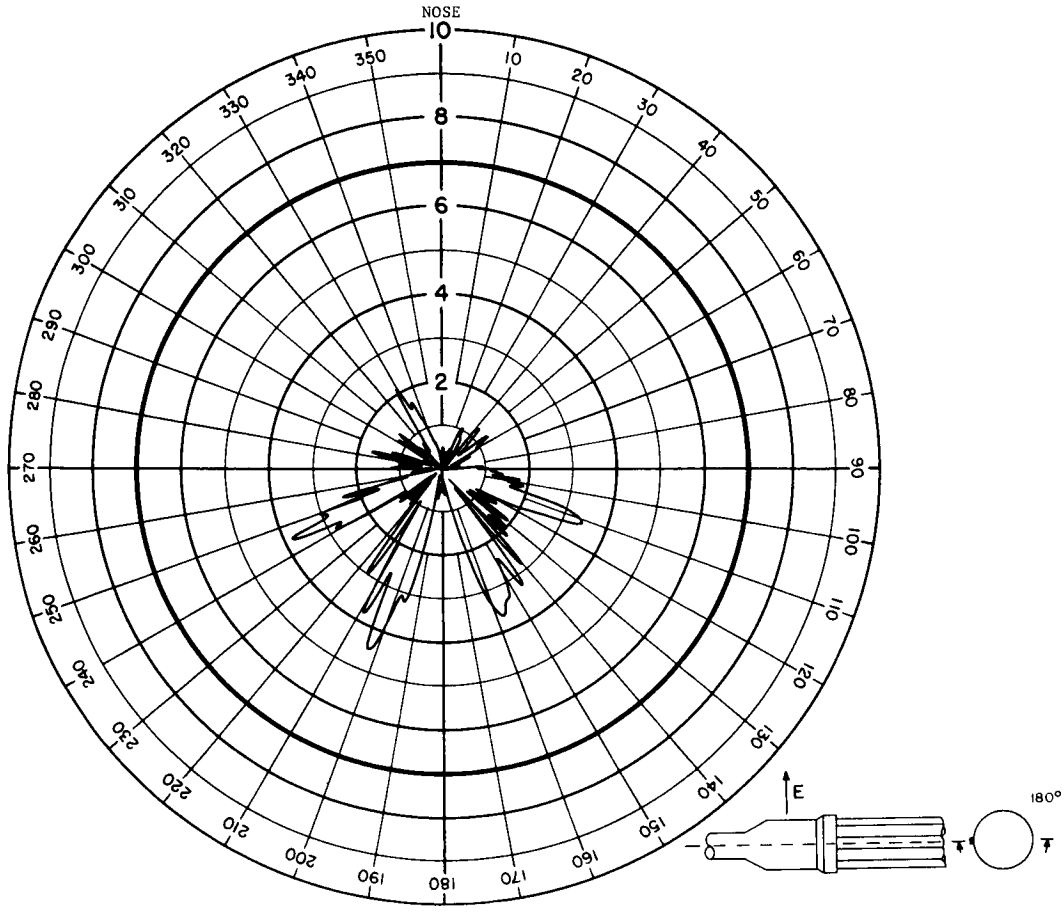


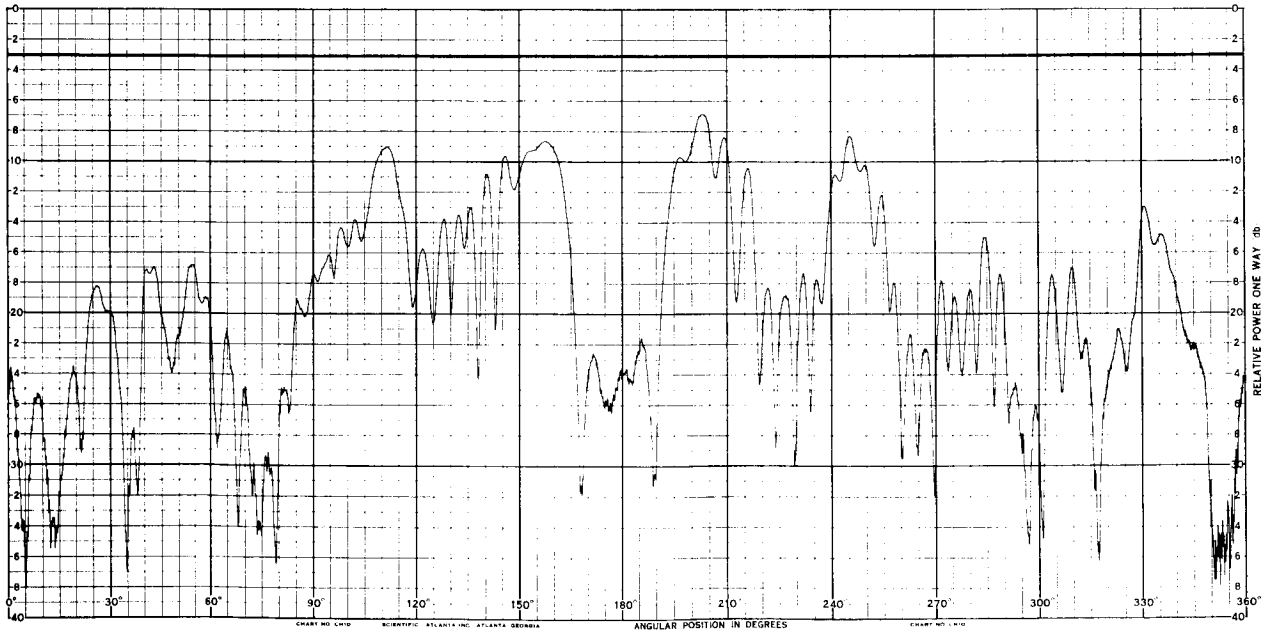
ANTENNA RADIATION PATTERN NO. 203-37

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



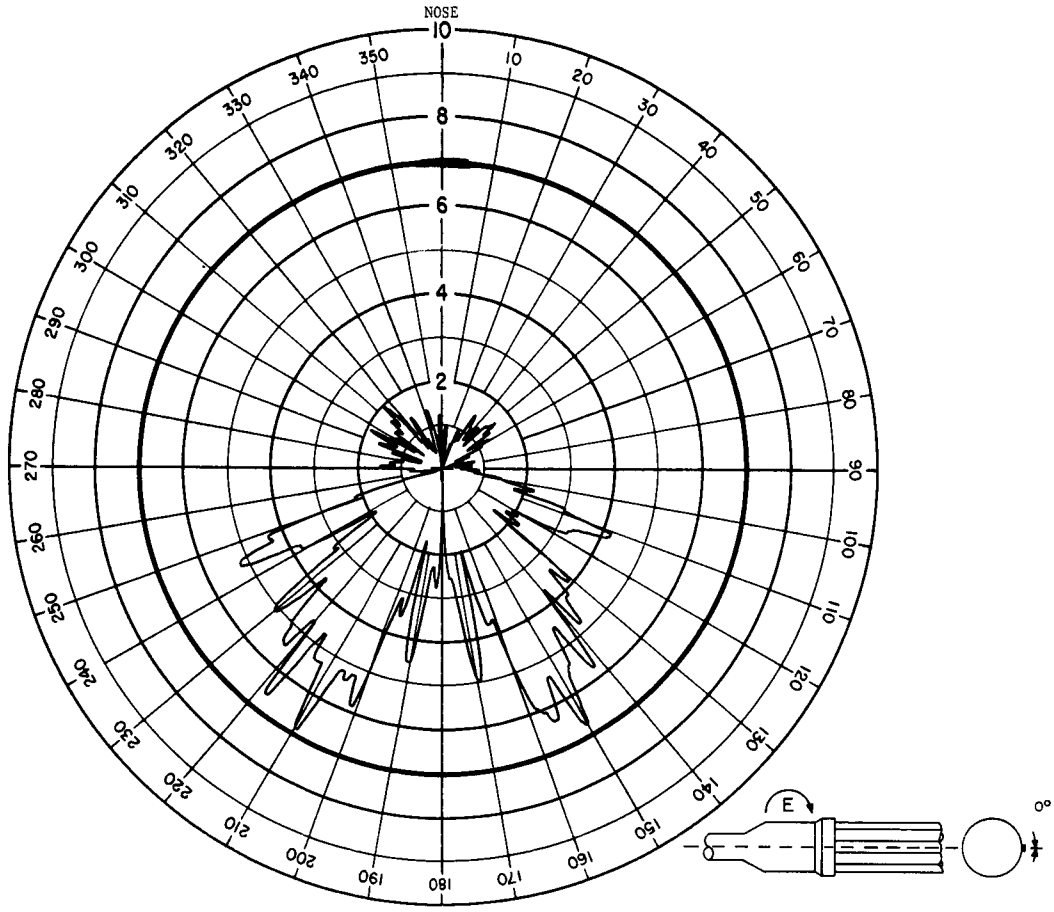


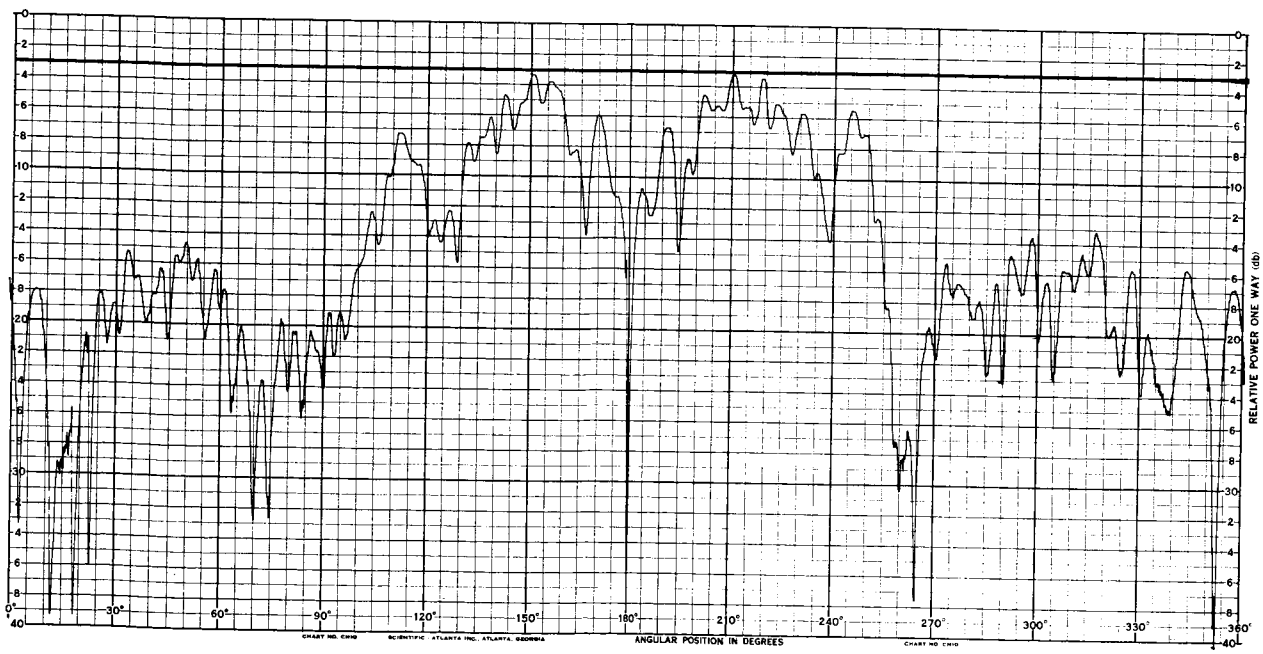
ANTENNA RADIATION PATTERN NO. 203-38

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



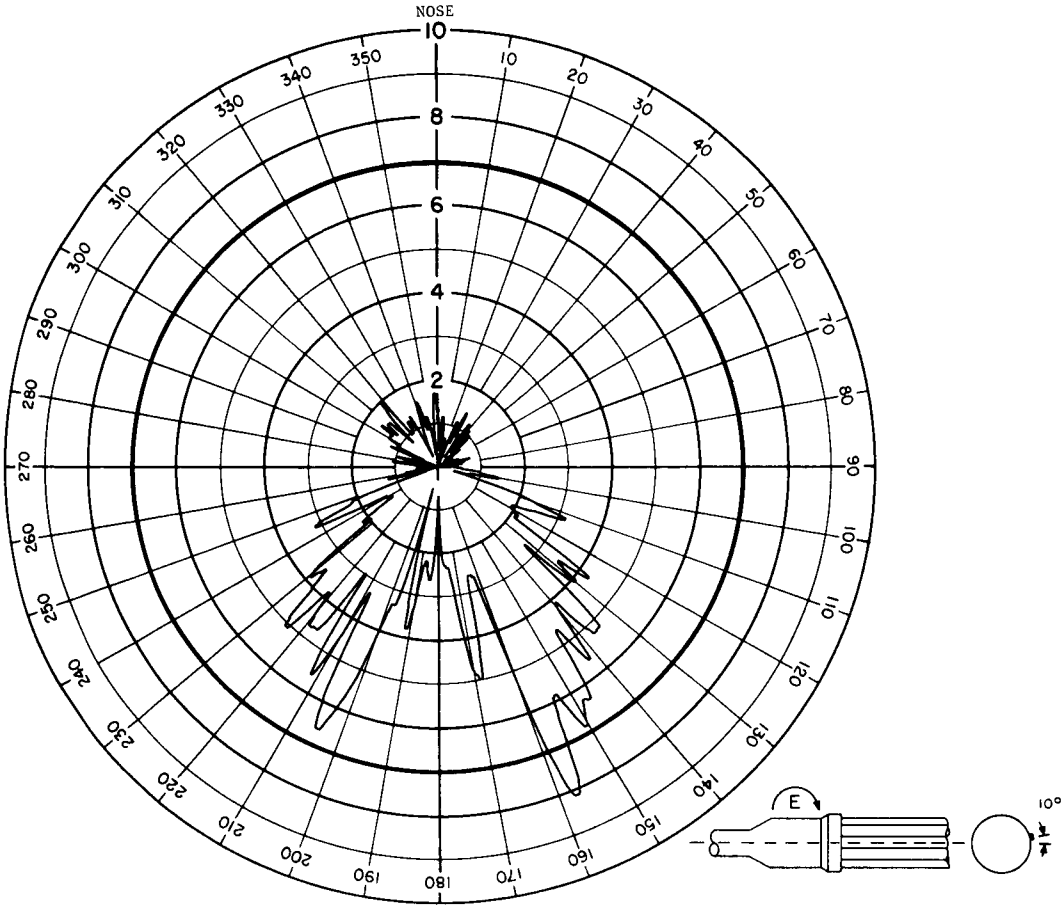


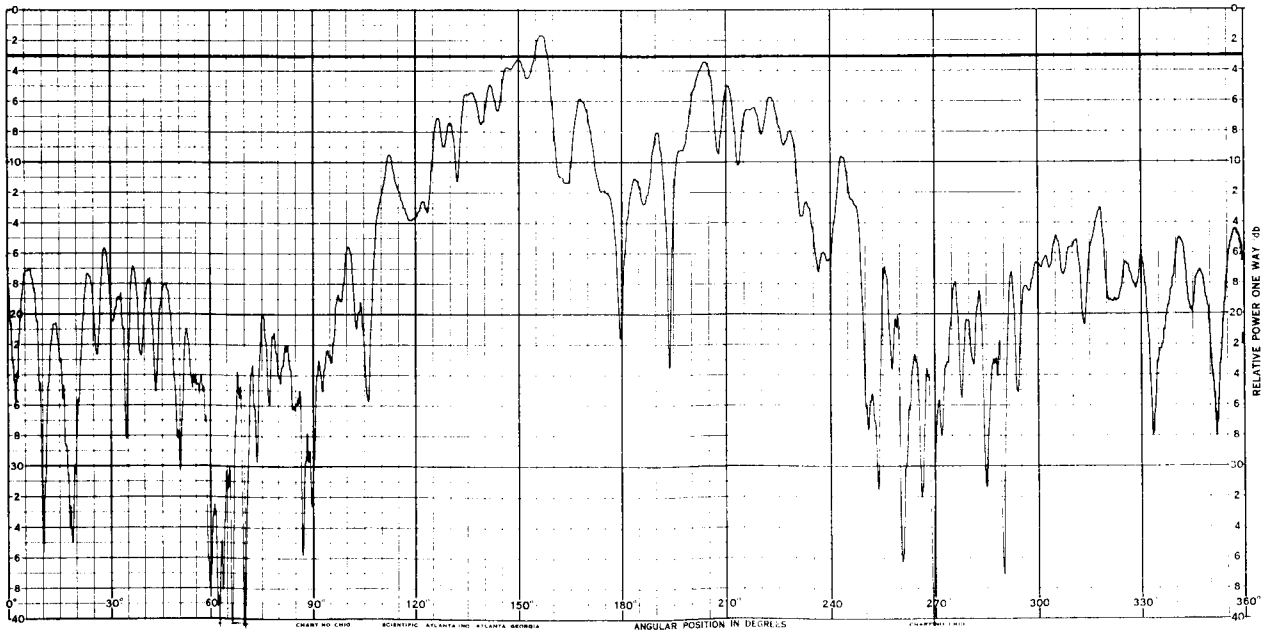
ANTENNA RADIATION PATTERN NO. 203-39

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



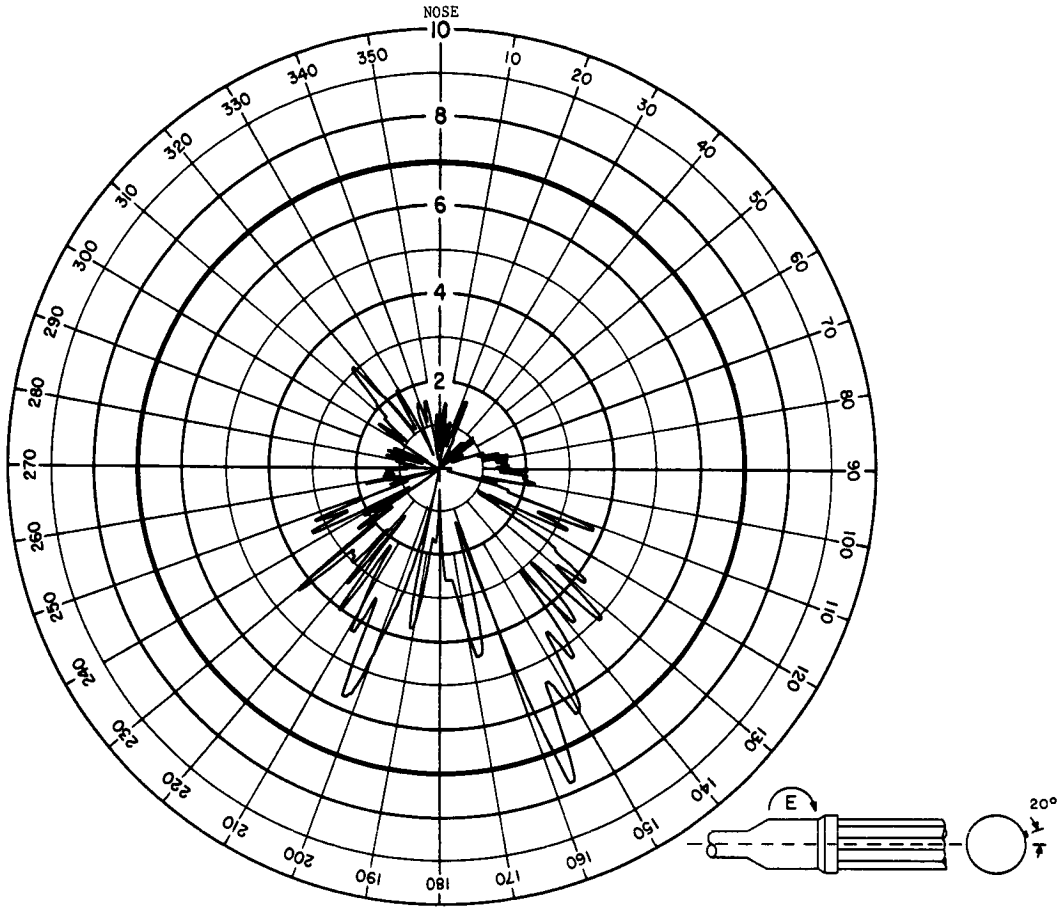


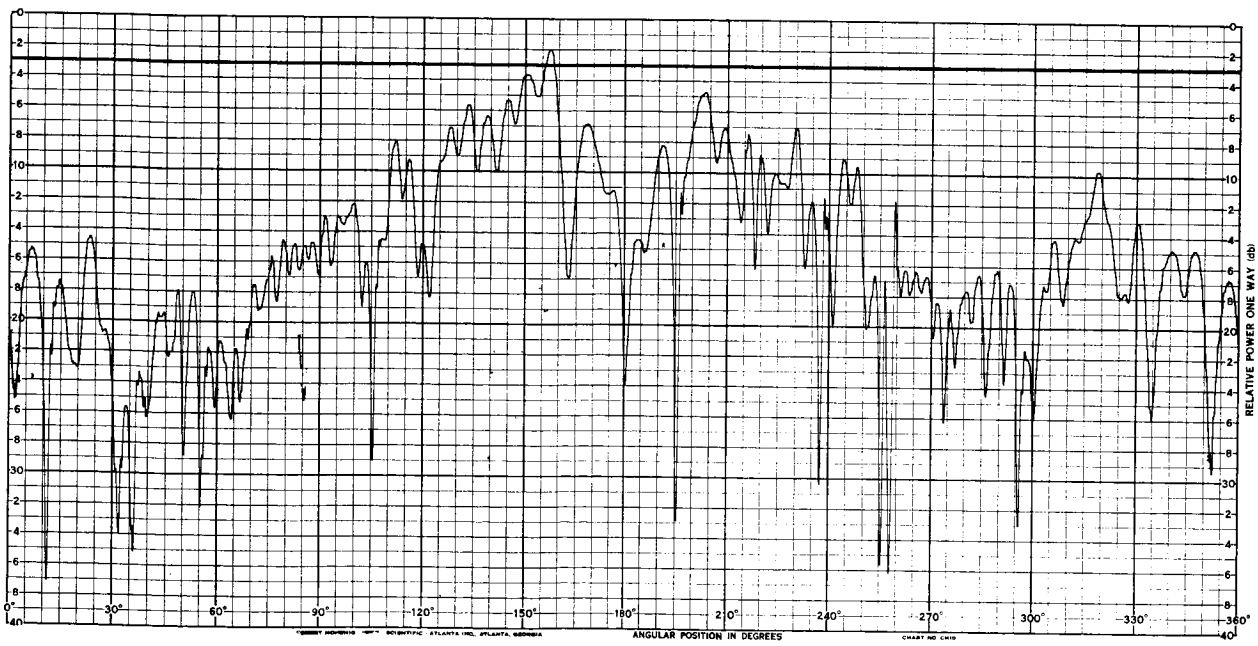
ANTENNA RADIATION PATTERN NO. 203-40

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



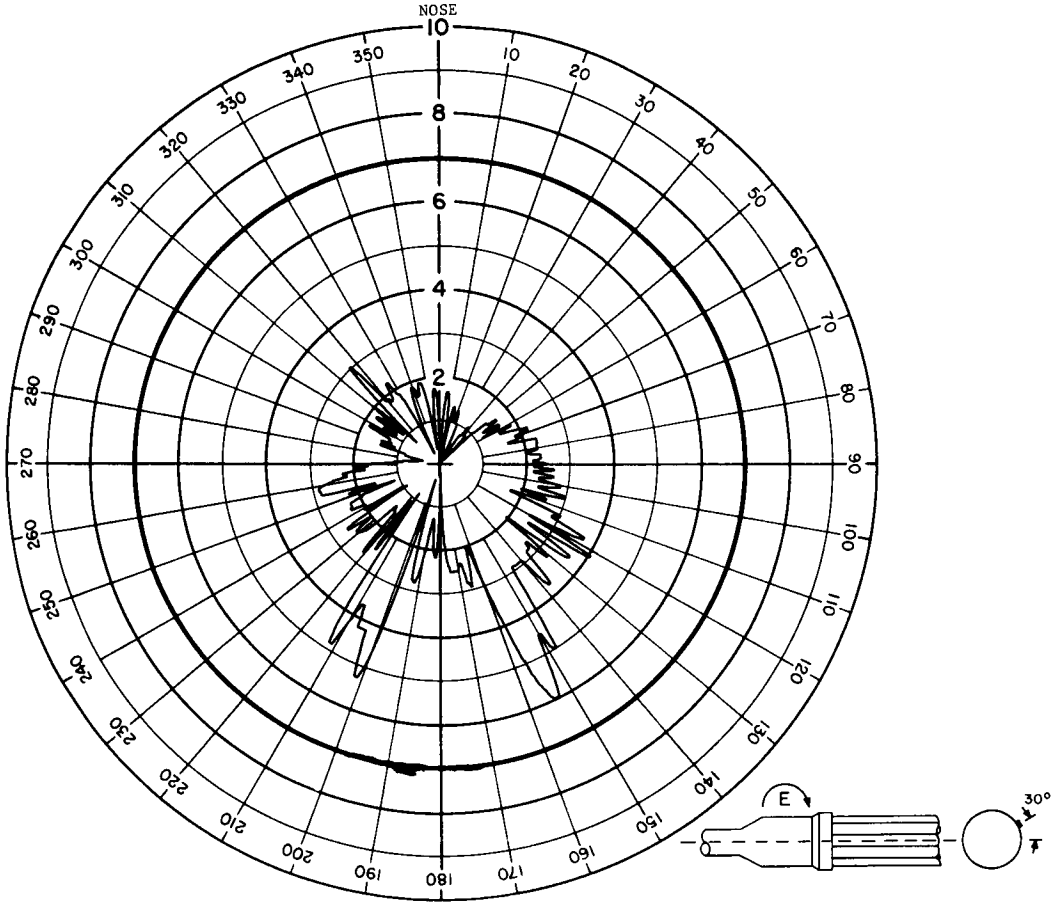


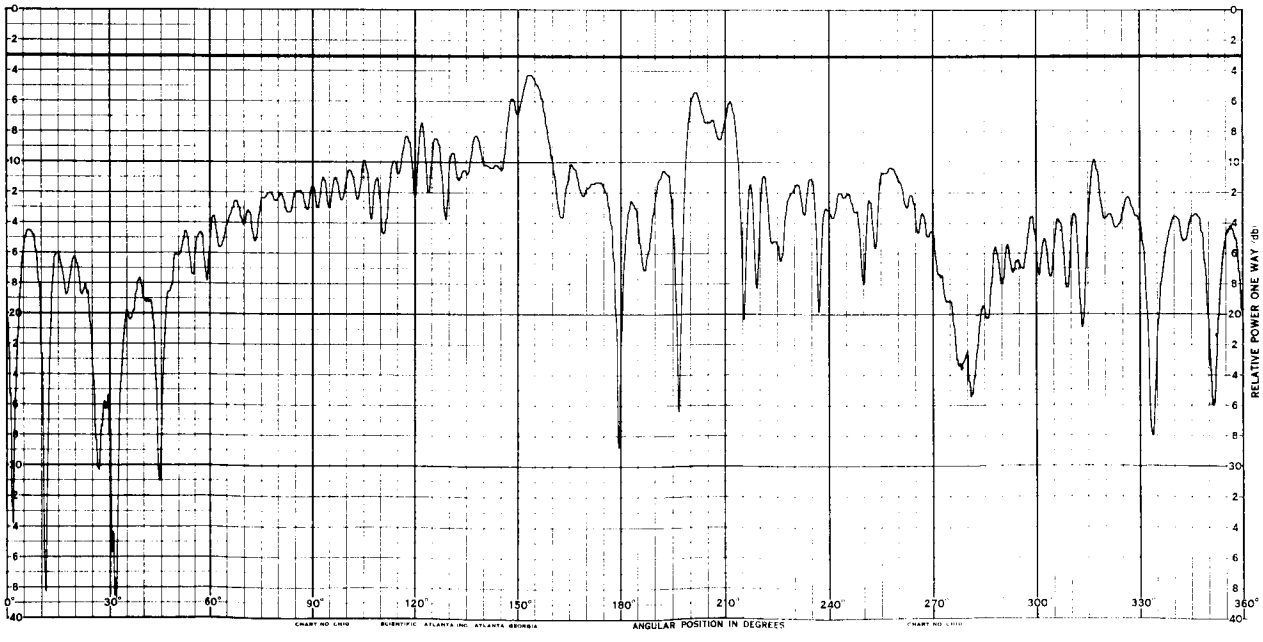
ANTENNA RADIATION PATTERN NO. 203-41

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



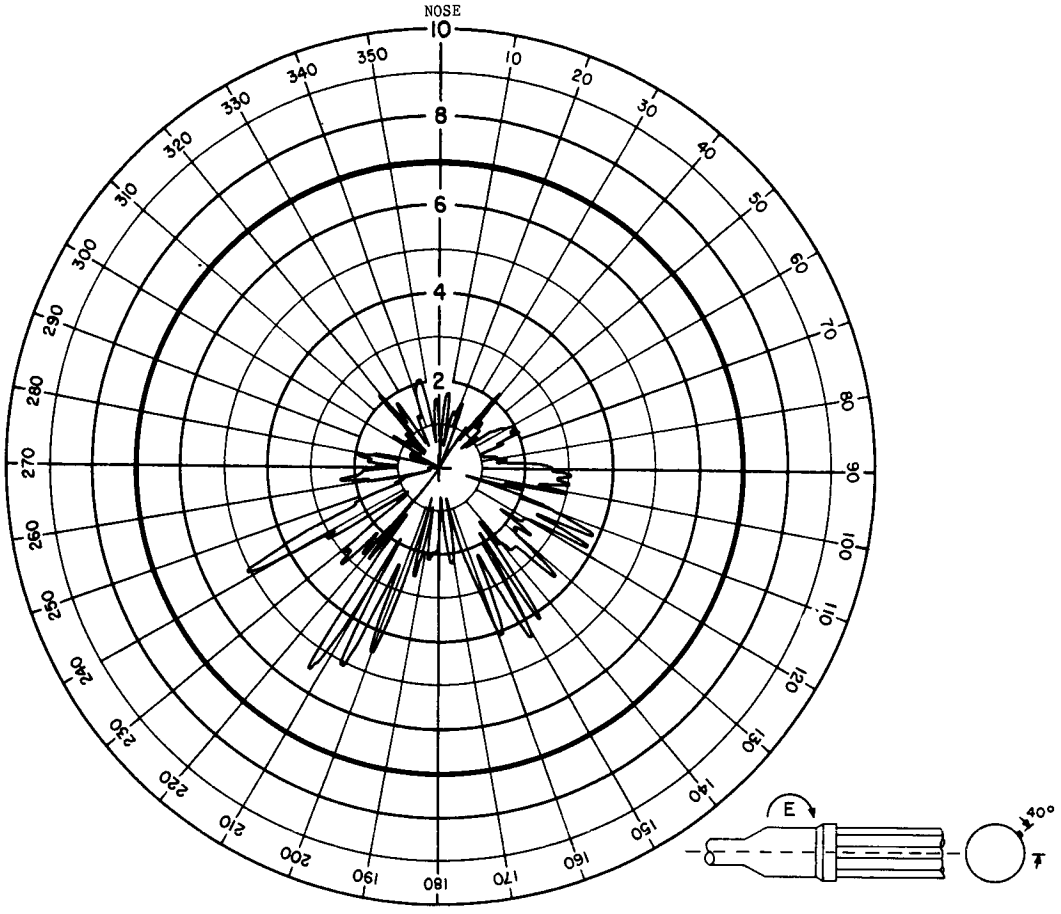


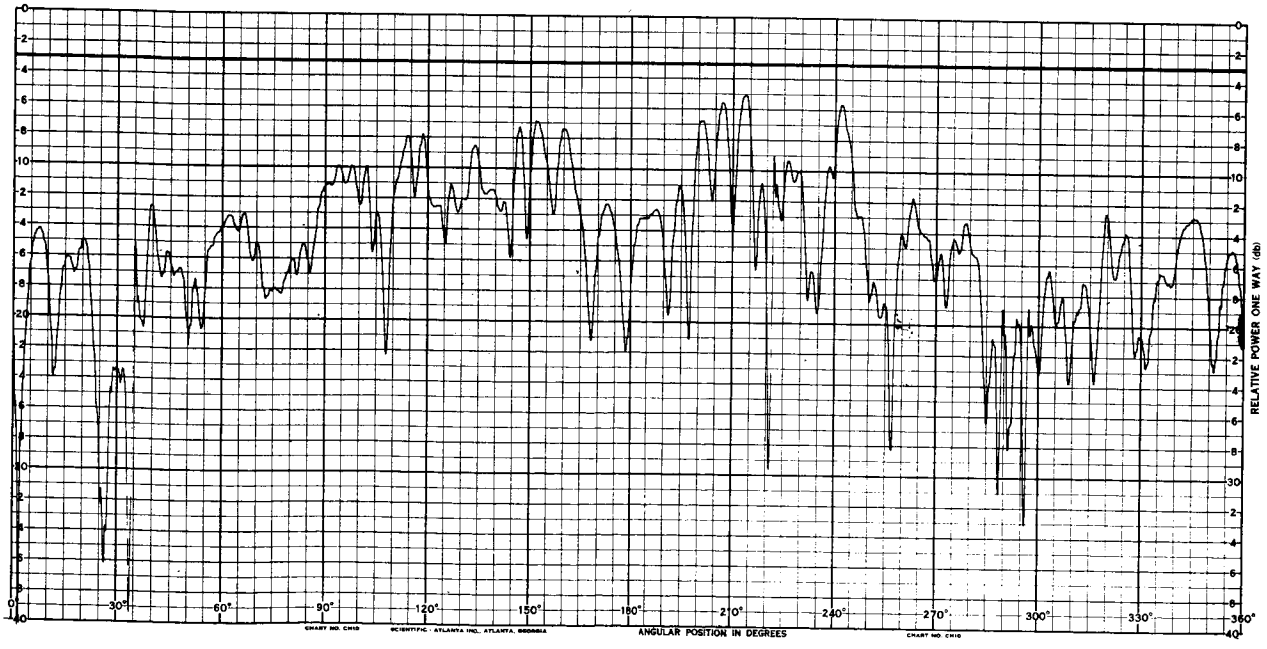
ANTENNA RADIATION PATTERN NO. 203-42

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



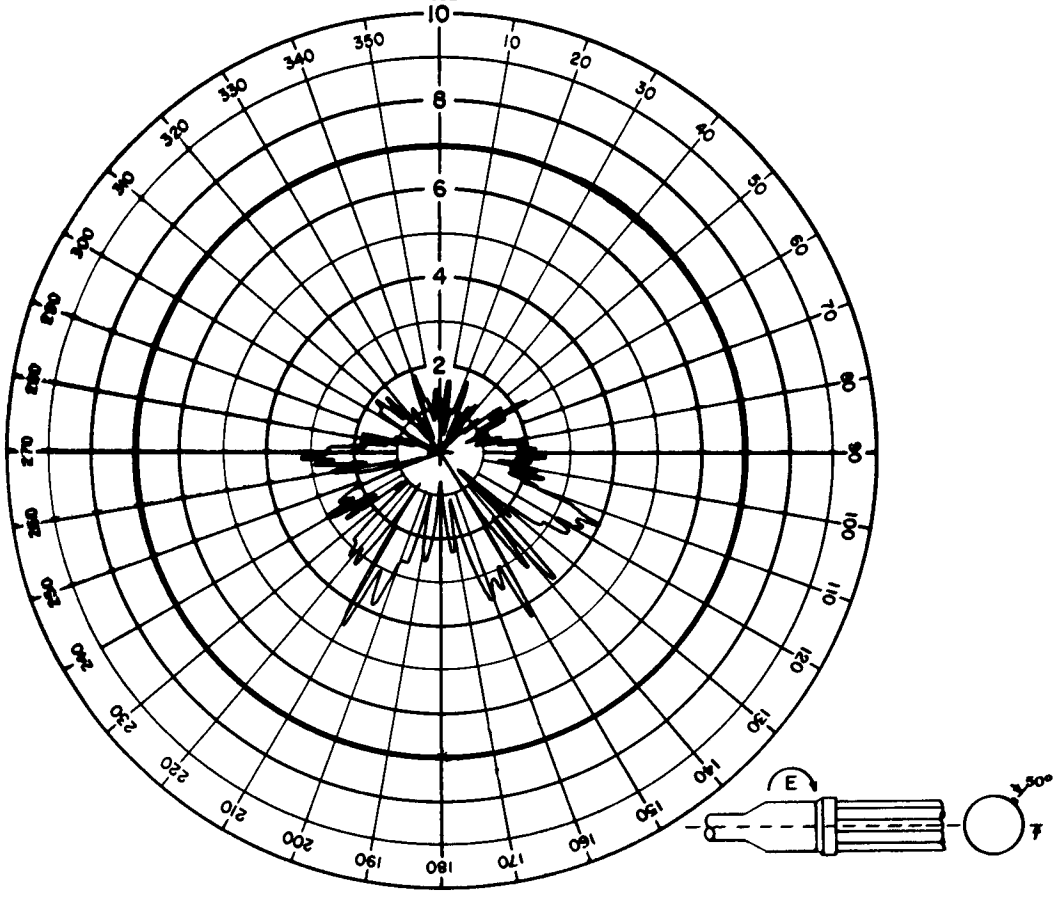


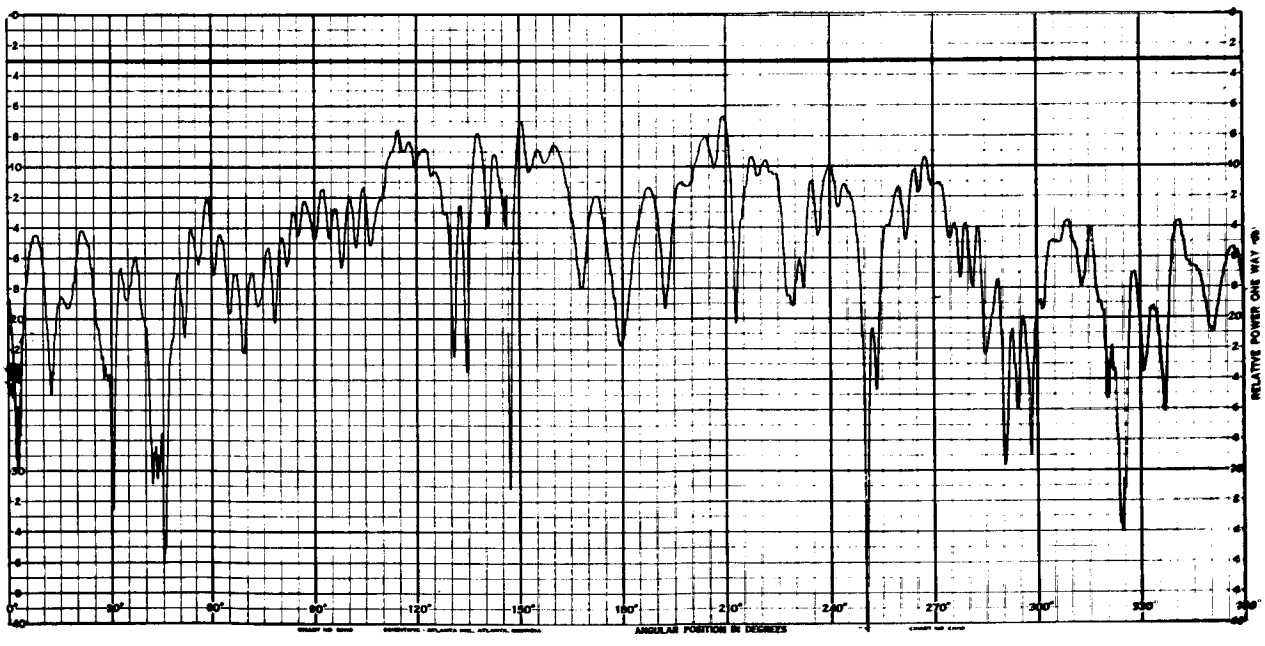
ANTENNA RADIATION PATTERN NO. 203-43

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



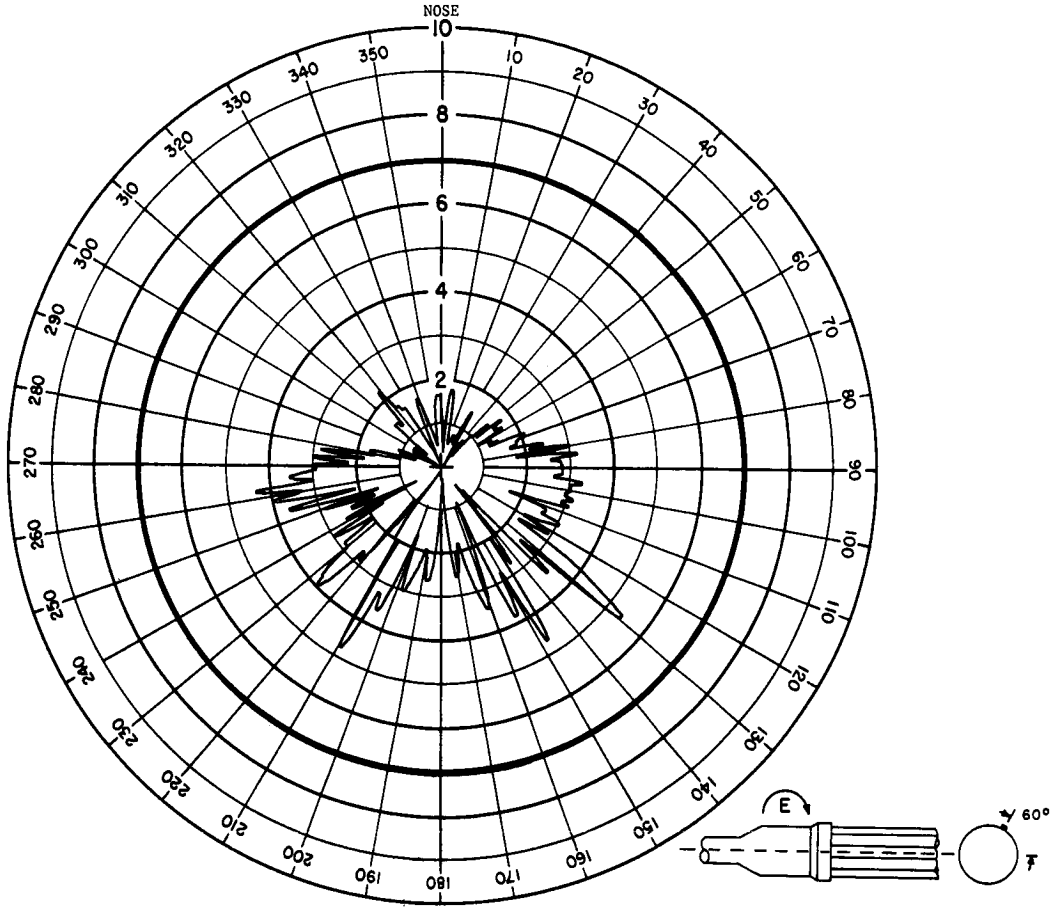


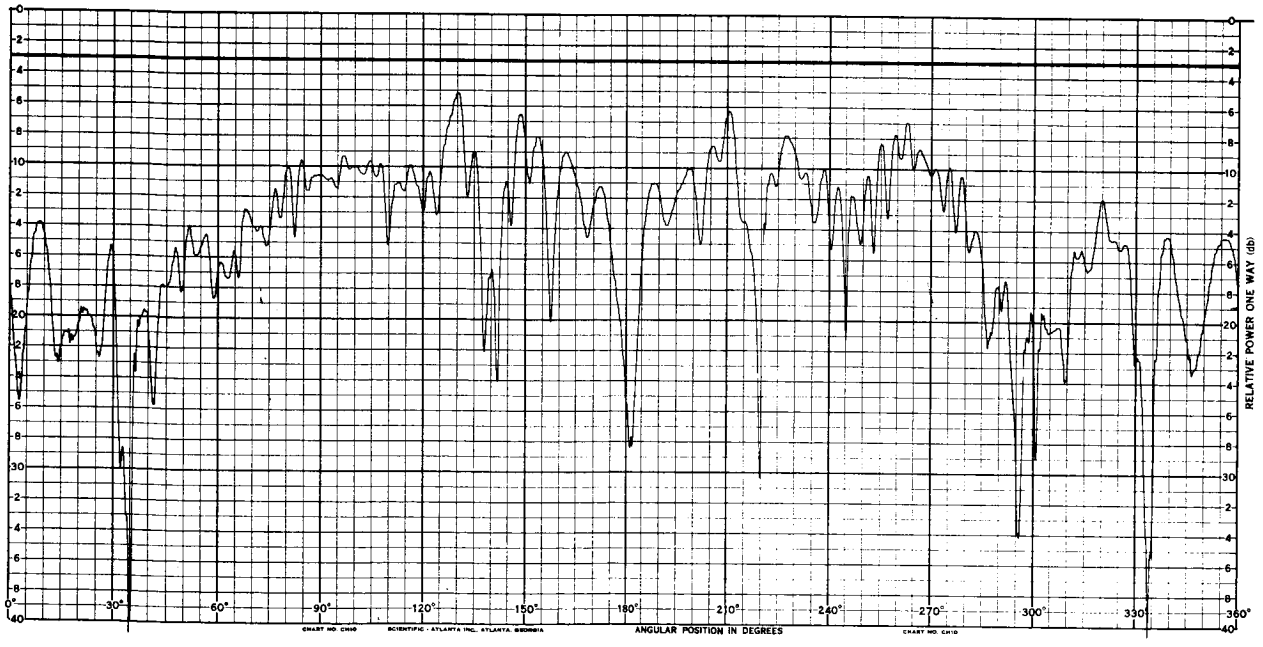
ANTENNA RADIATION PATTERN NO. 203-44

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



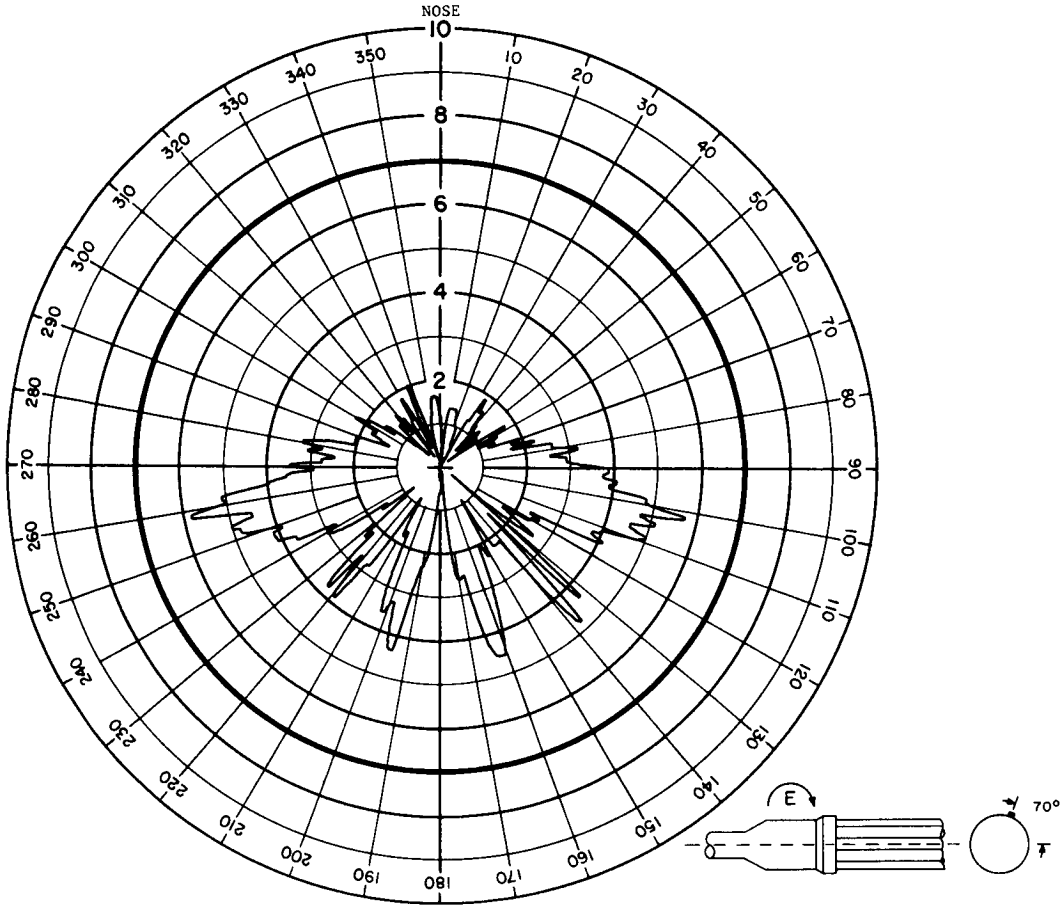


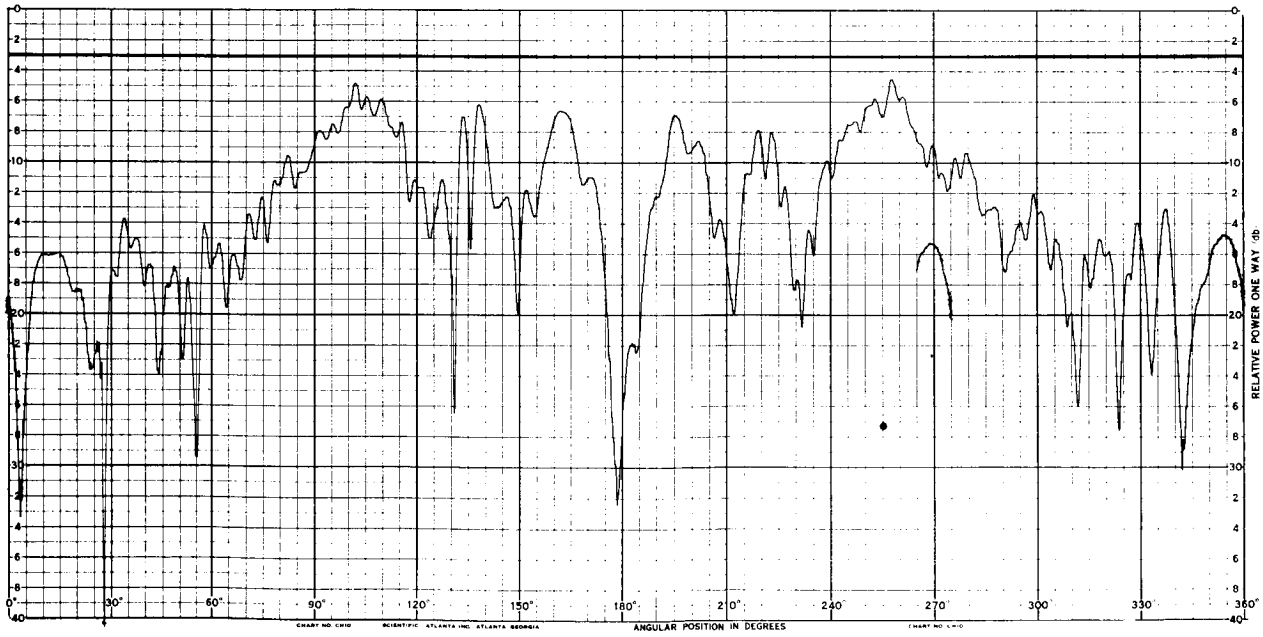
ANTENNA RADIATION PATTERN NO. 203-45

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



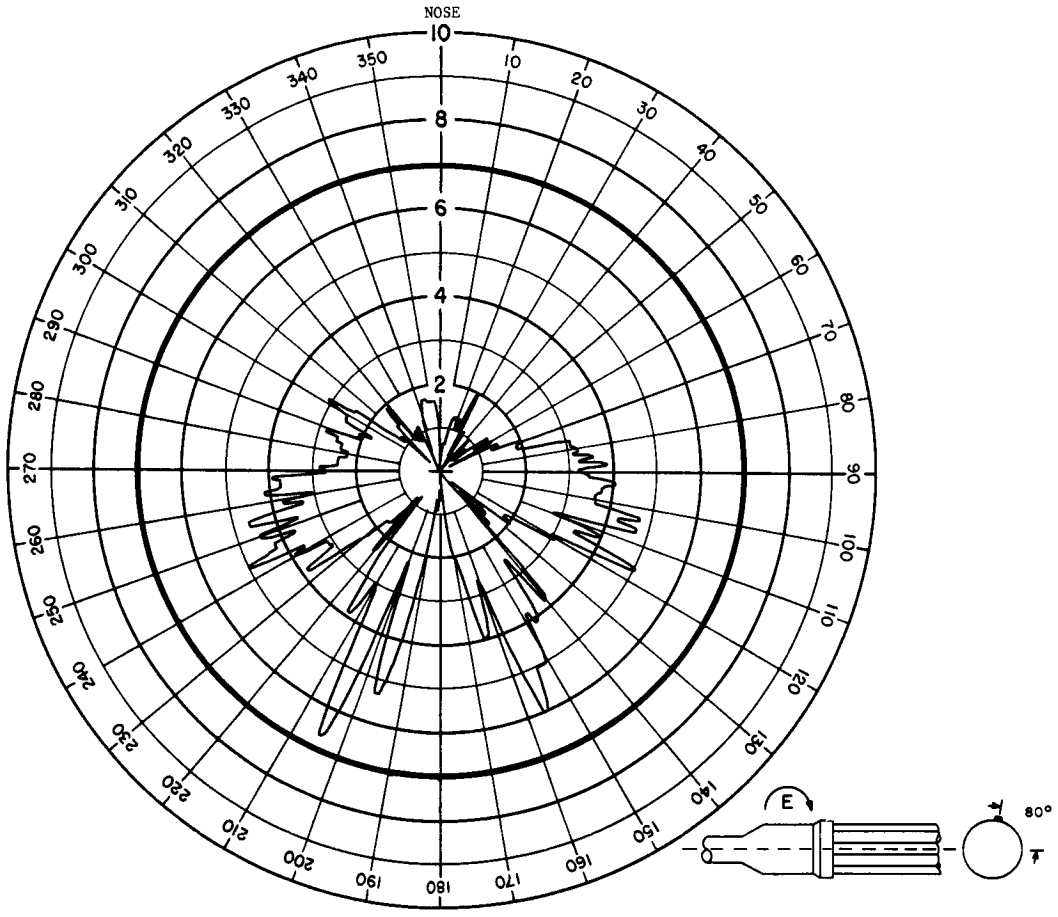


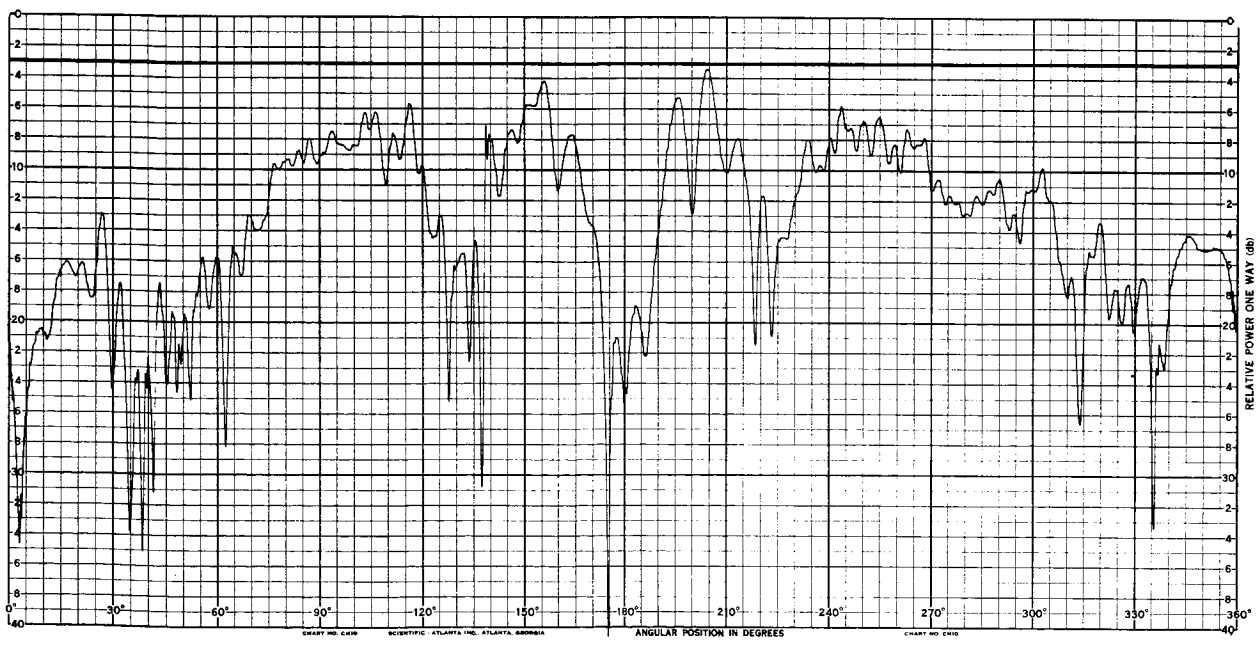
ANTENNA RADIATION PATTERN NO. 203-46

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



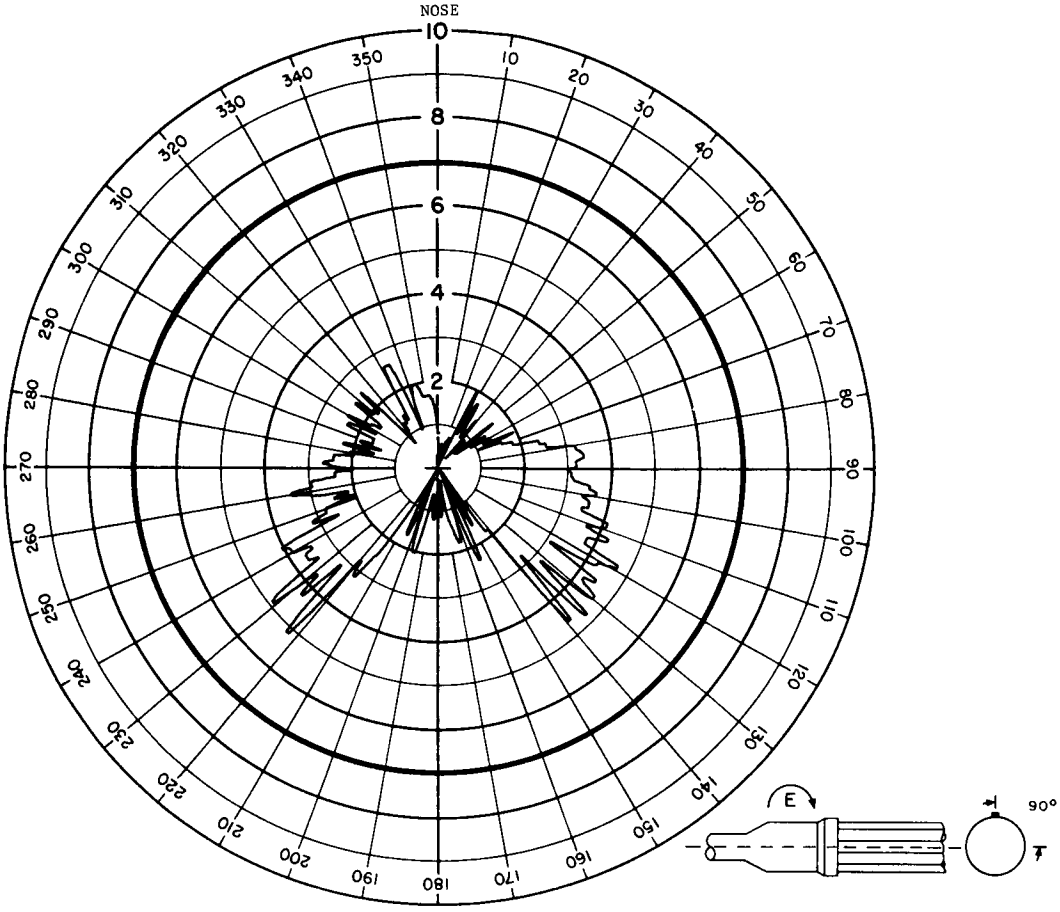


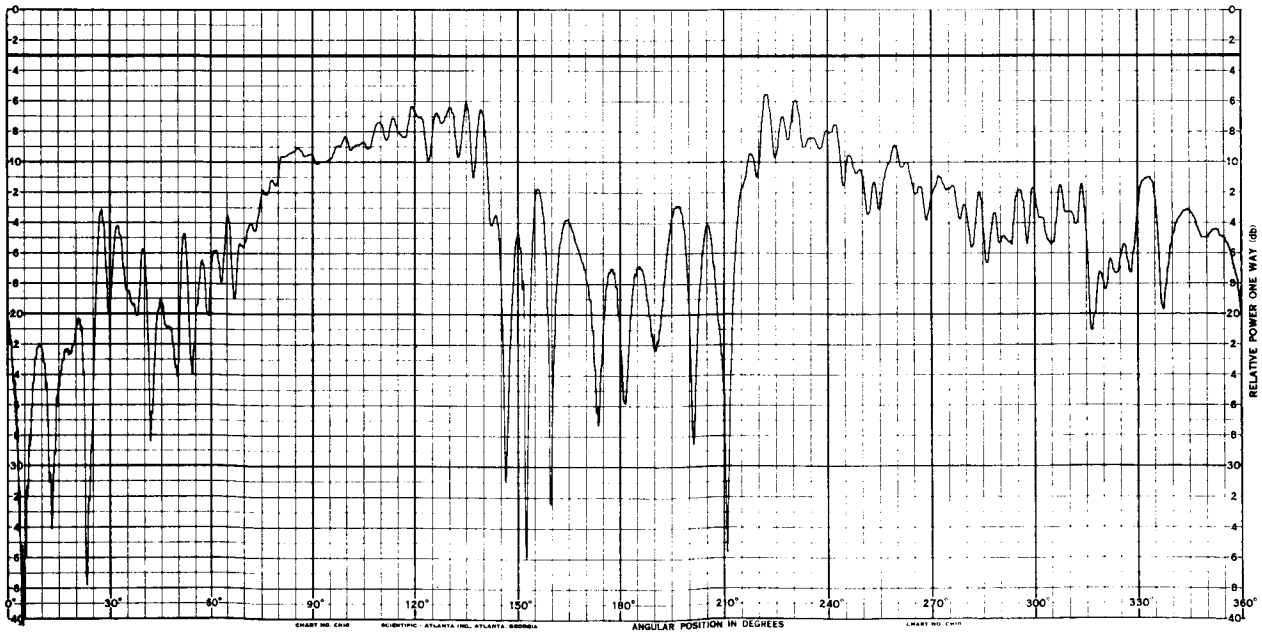
ANTENNA RADIATION PATTERN NO. 203-47

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



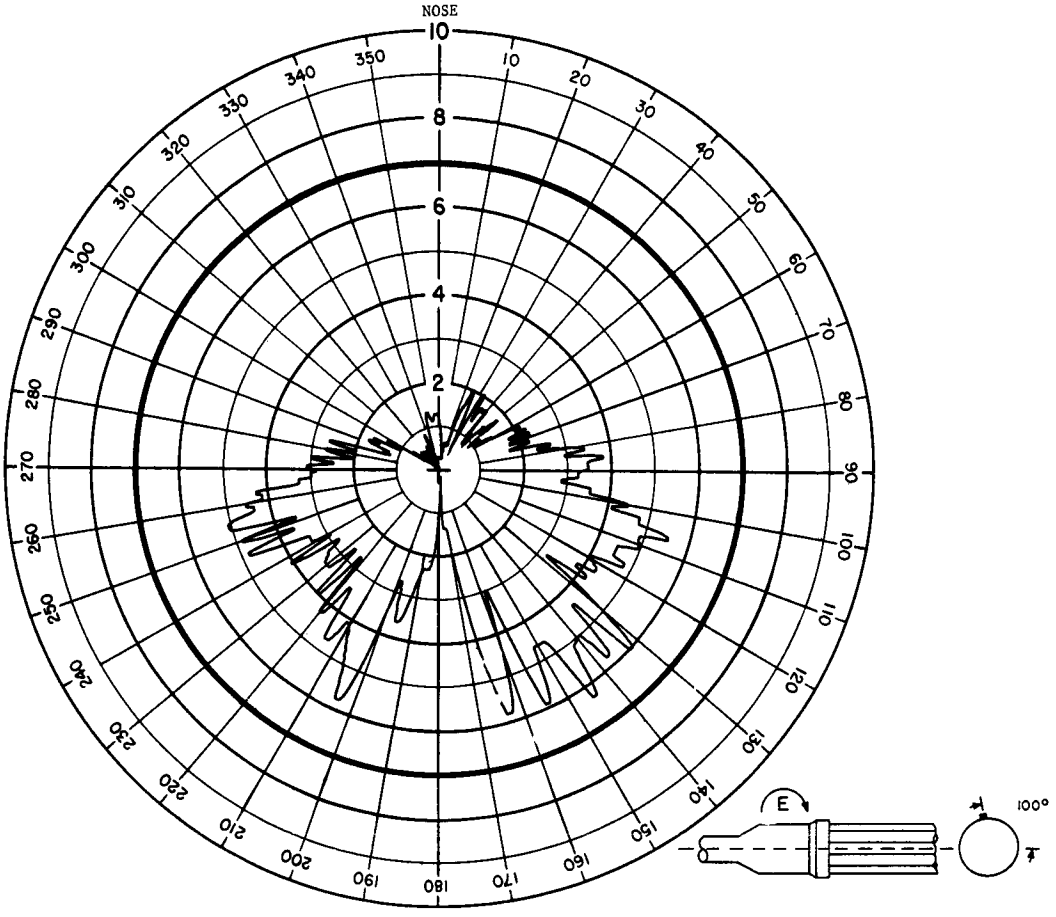


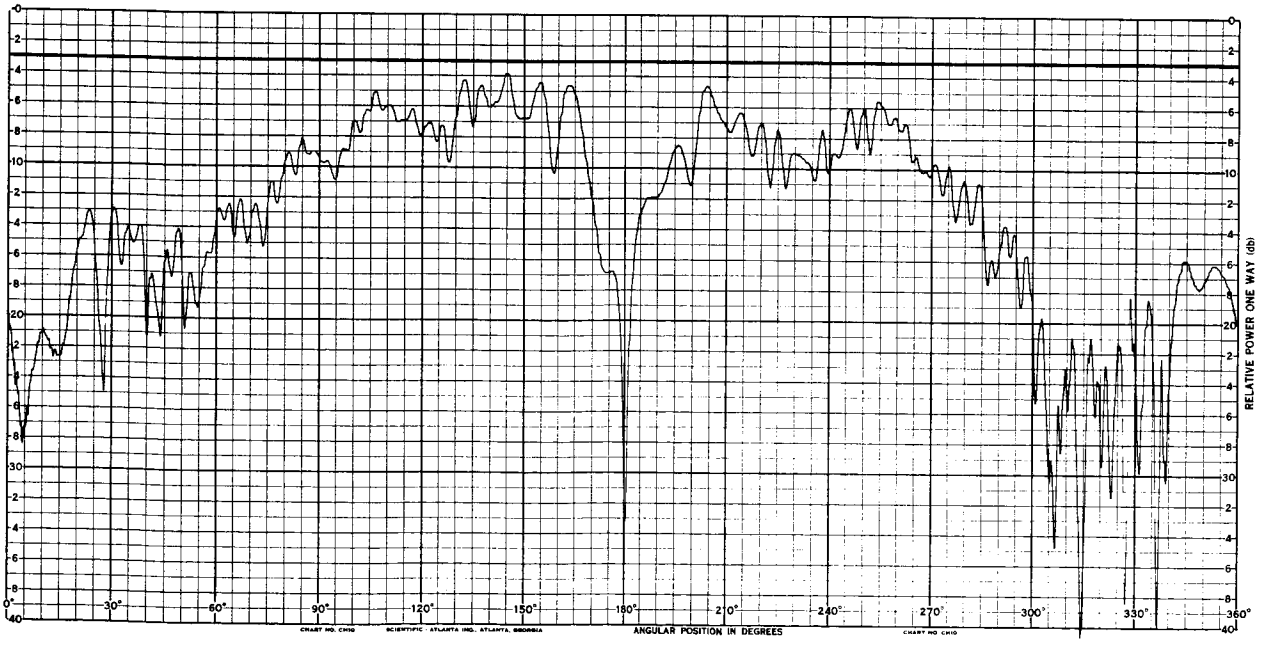
ANTENNA RADIATION PATTERN NO. 203-48

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



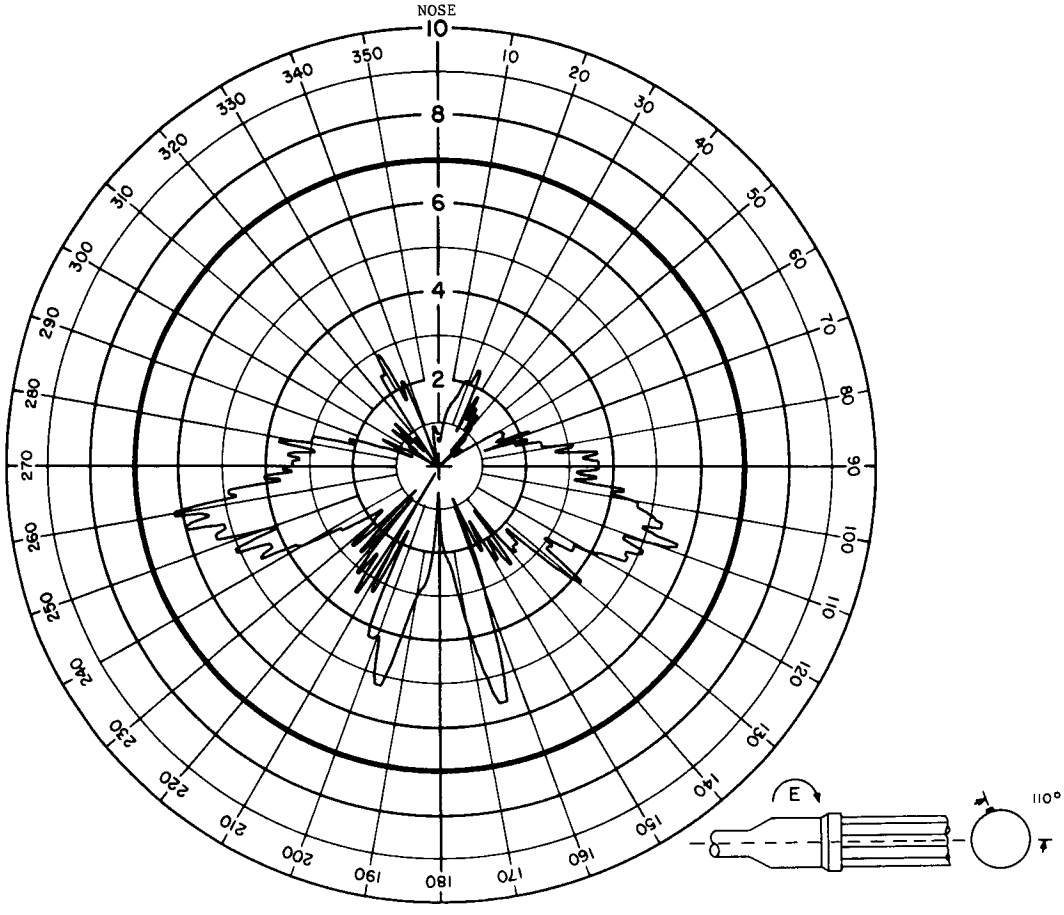


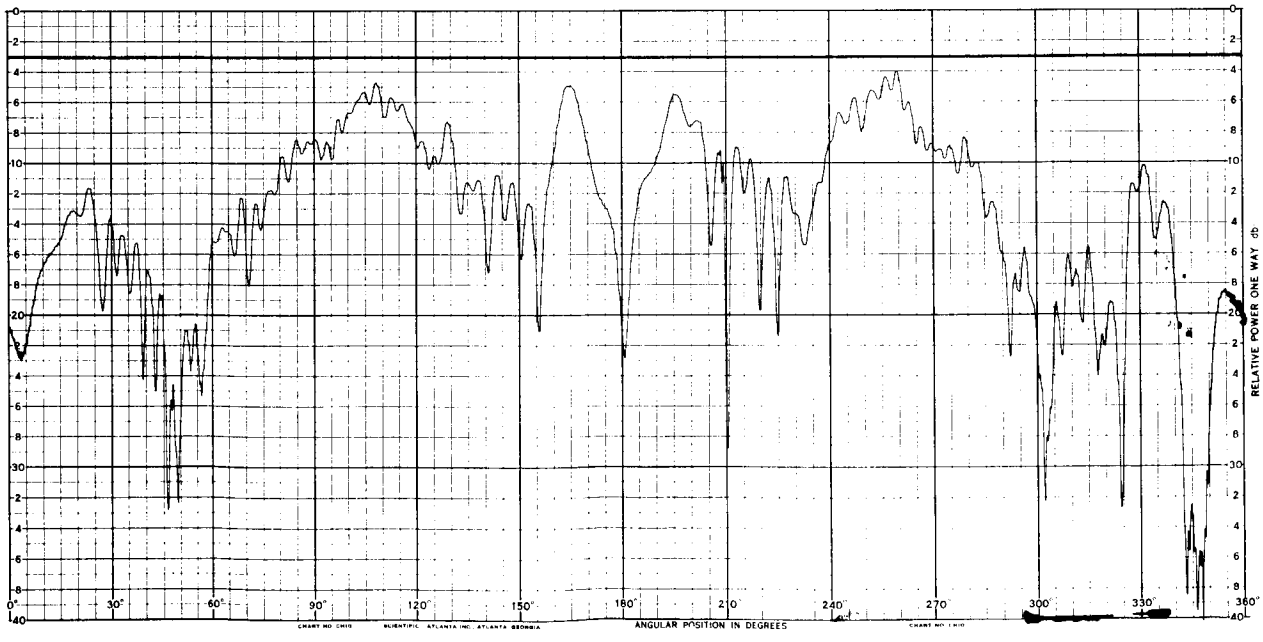
ANTENNA RADIATION PATTERN NO. 203-49

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



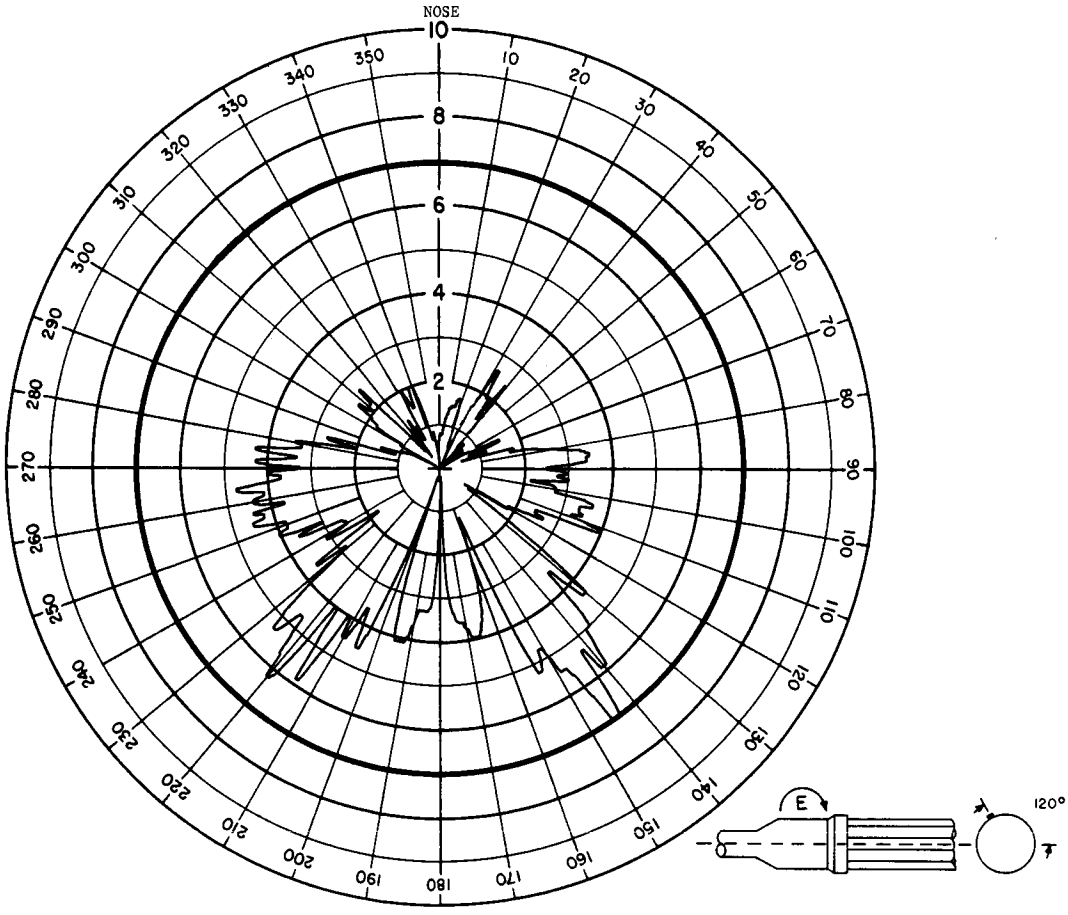


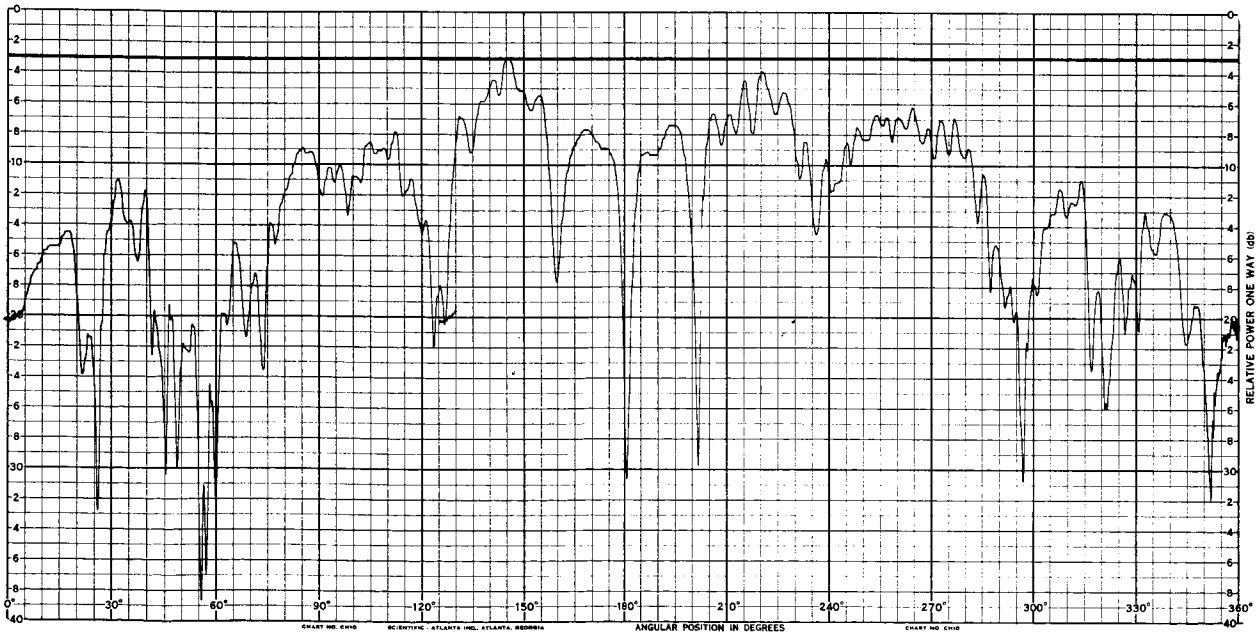
ANTENNA RADIATION PATTERN NO. 203-50

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



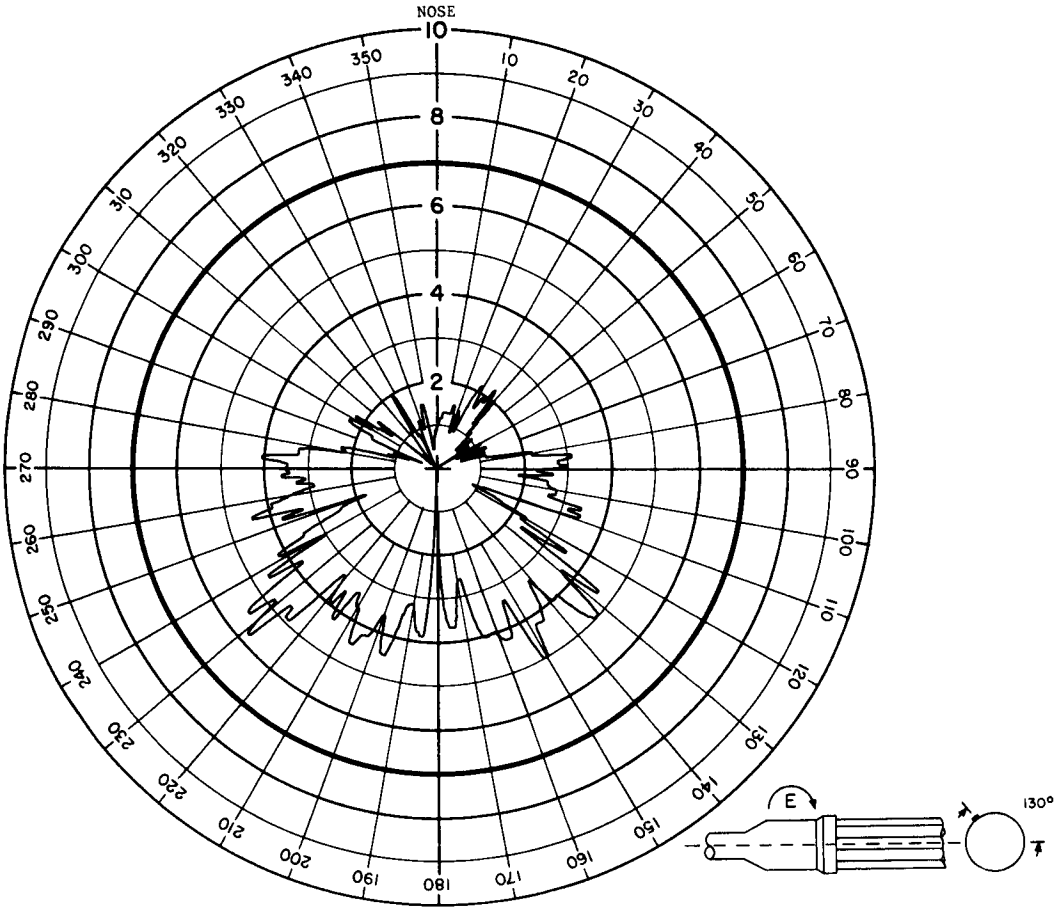


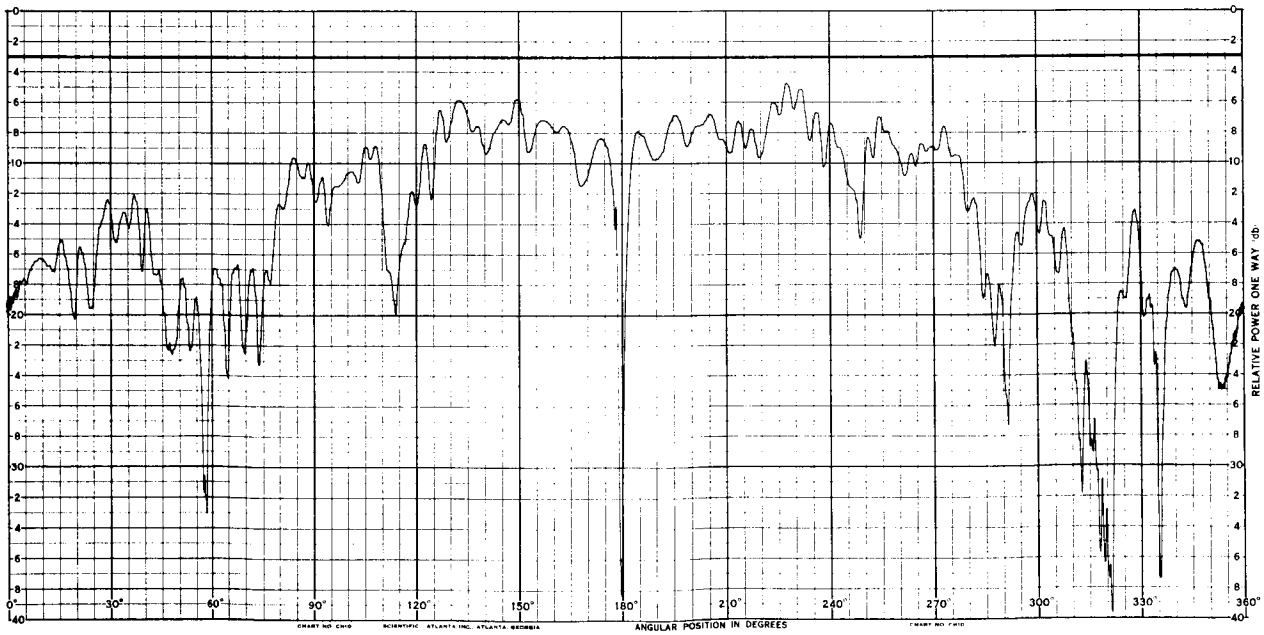
ANTENNA RADIATION PATTERN NO. 203-51

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



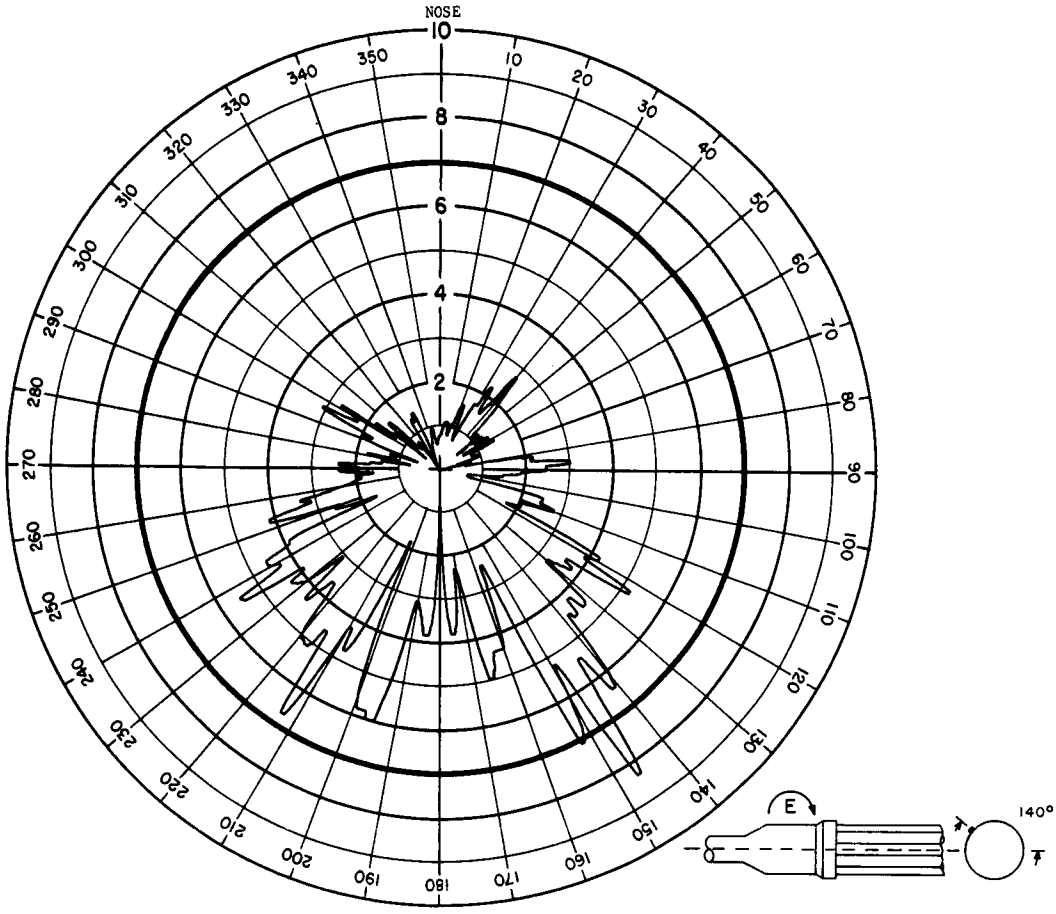


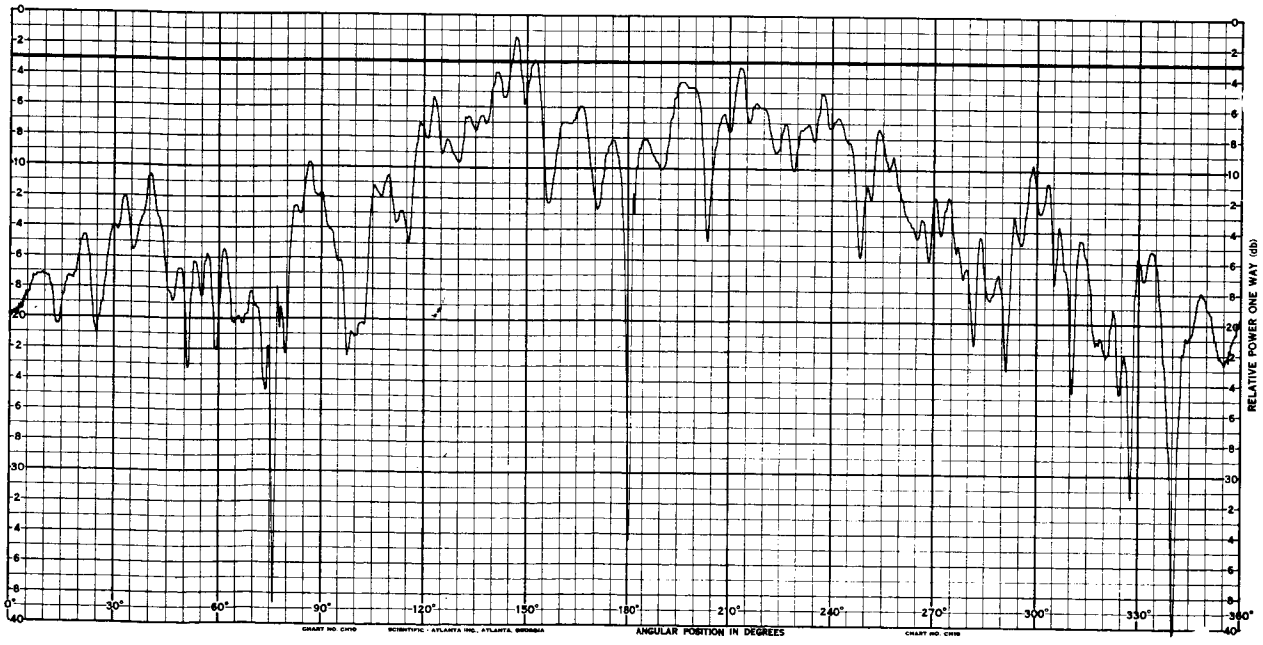
ANTENNA RADIATION PATTERN NO. 203-52

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



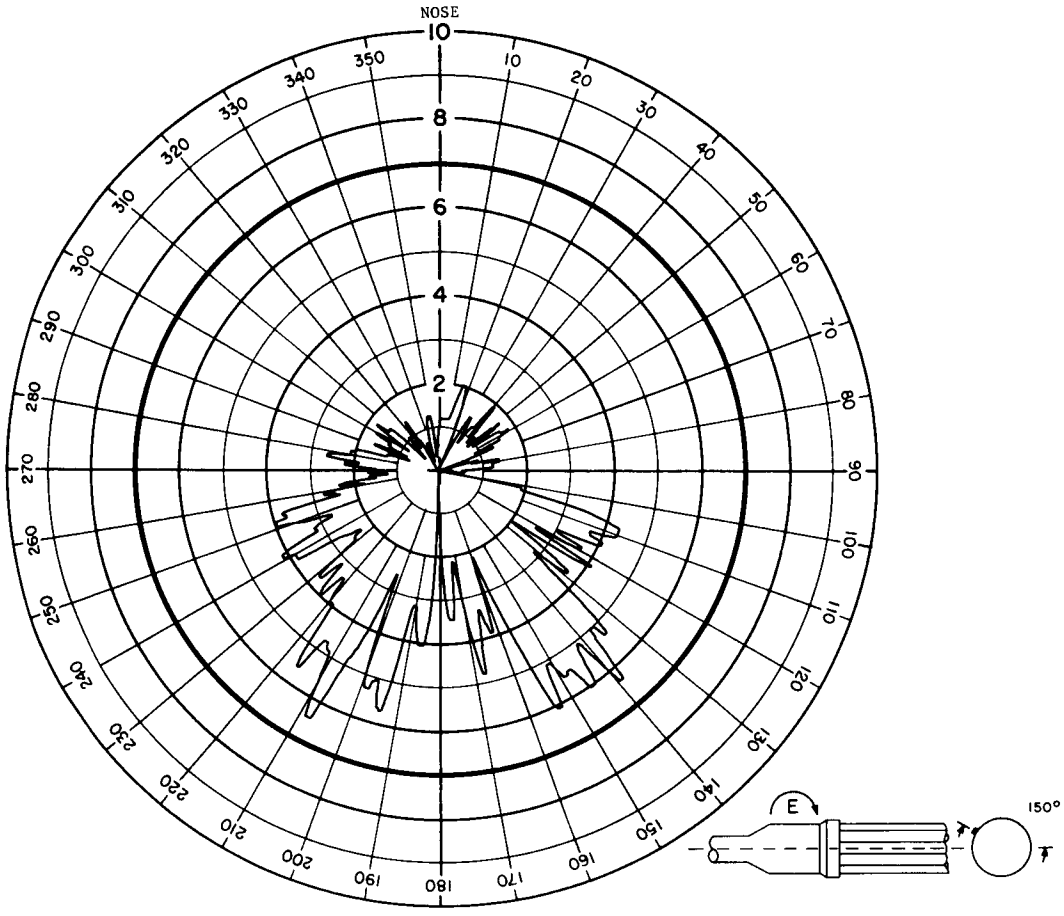


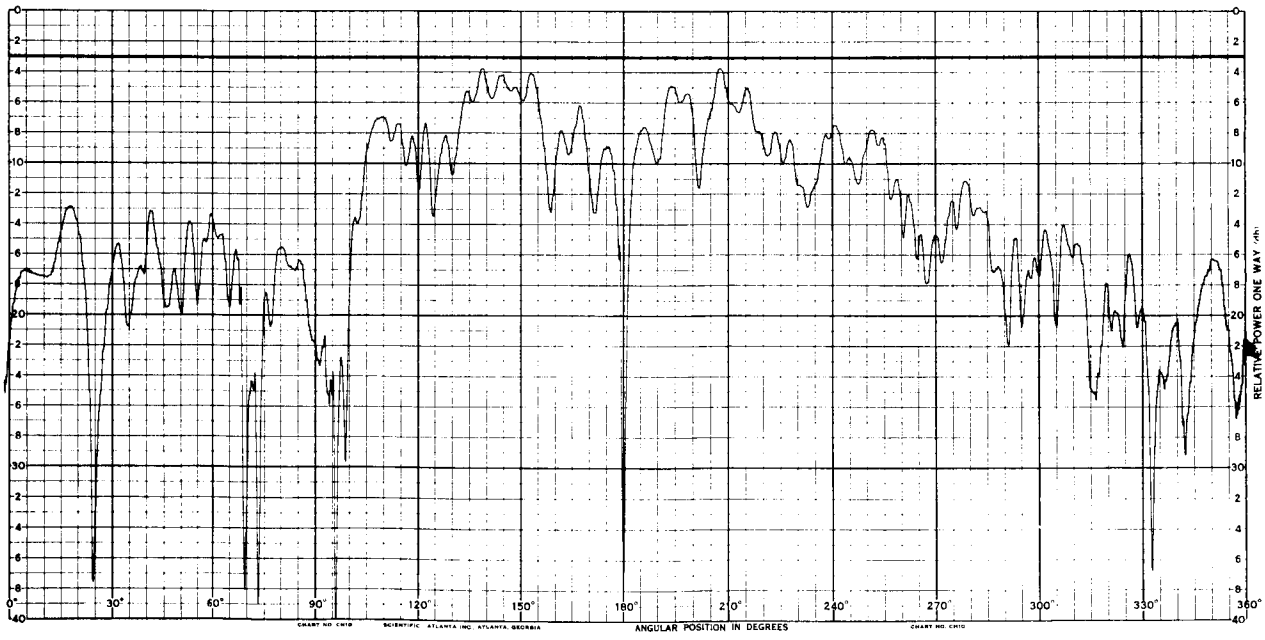
ANTENNA RADIATION PATTERN NO. 203-53

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



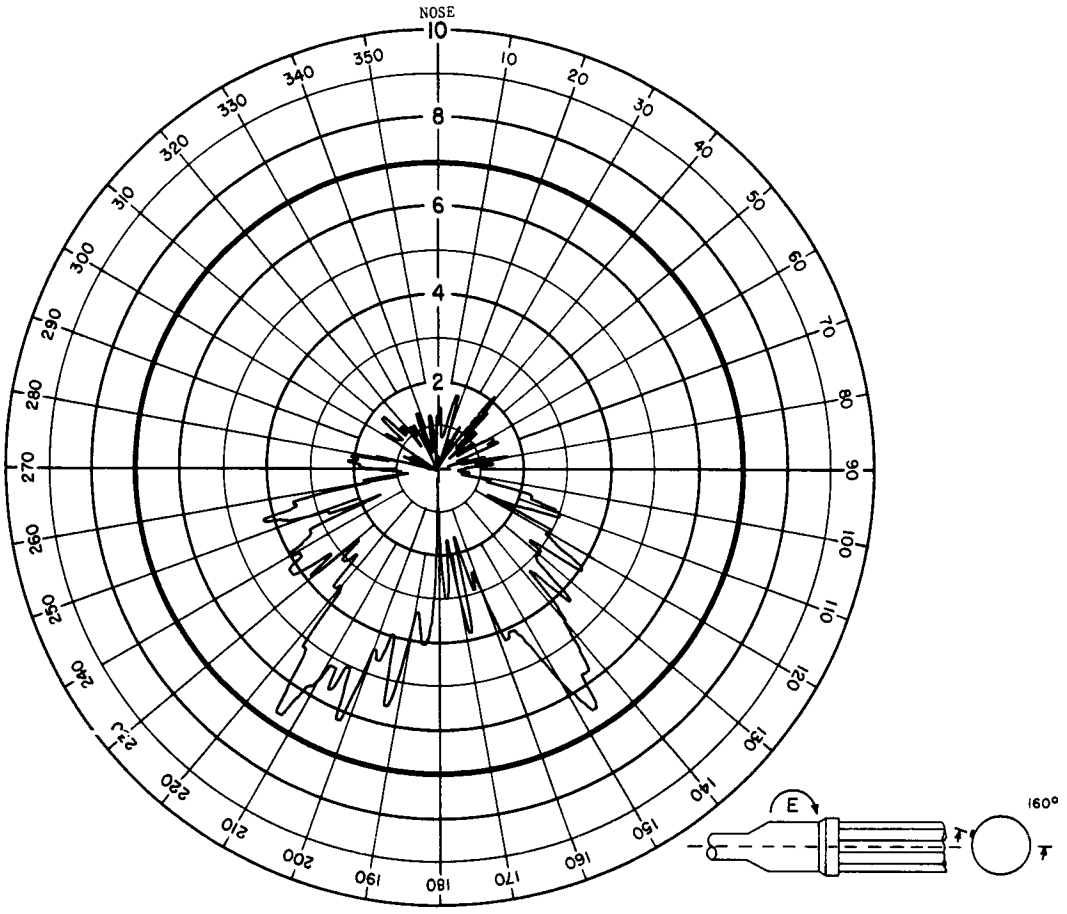


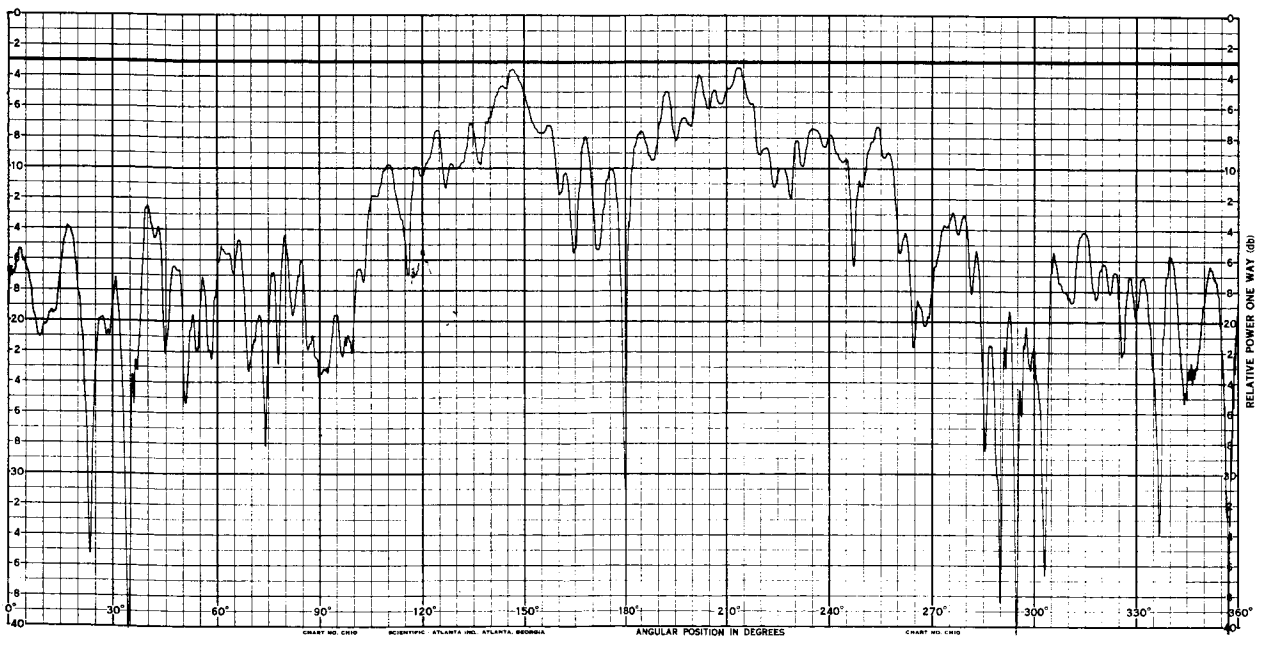
ANTENNA RADIATION PATTERN NO. 203-54

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



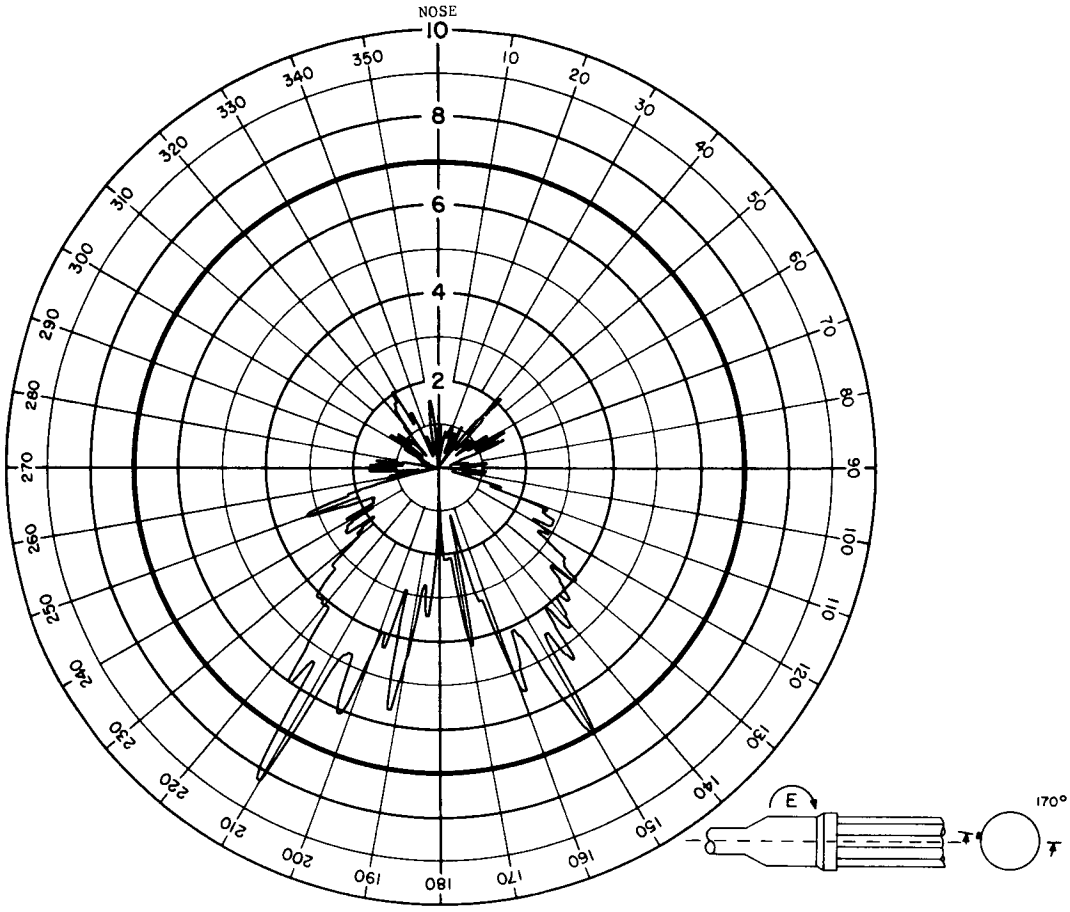


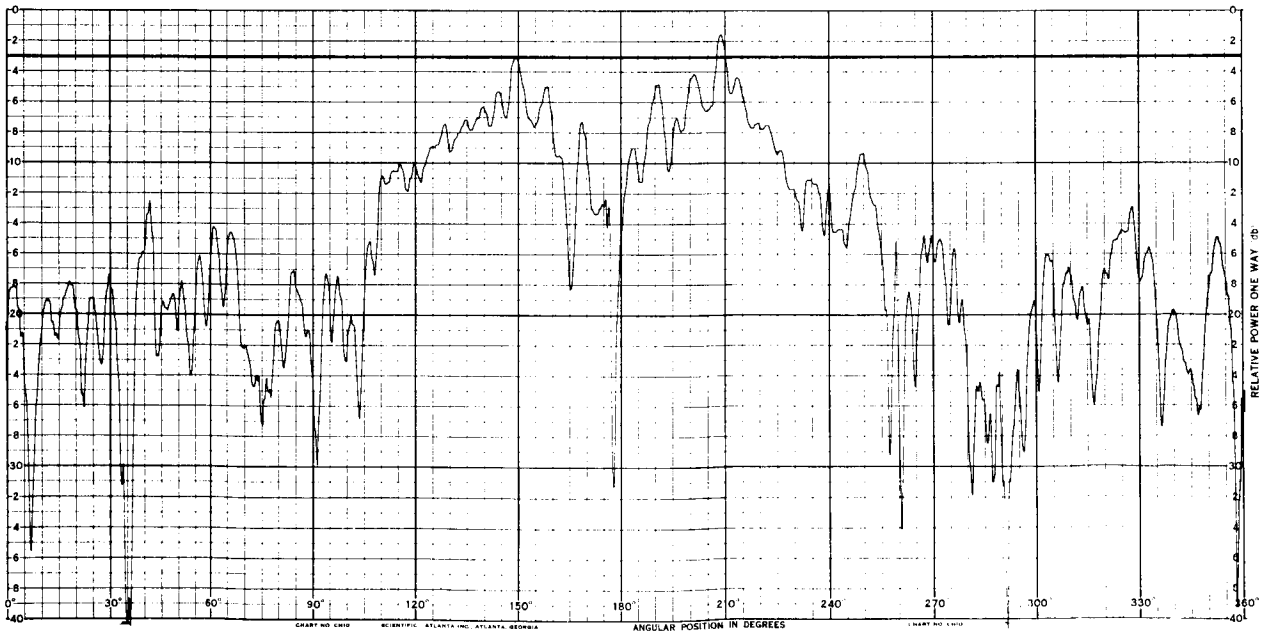
ANTENNA RADIATION PATTERN NO. 203-55

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



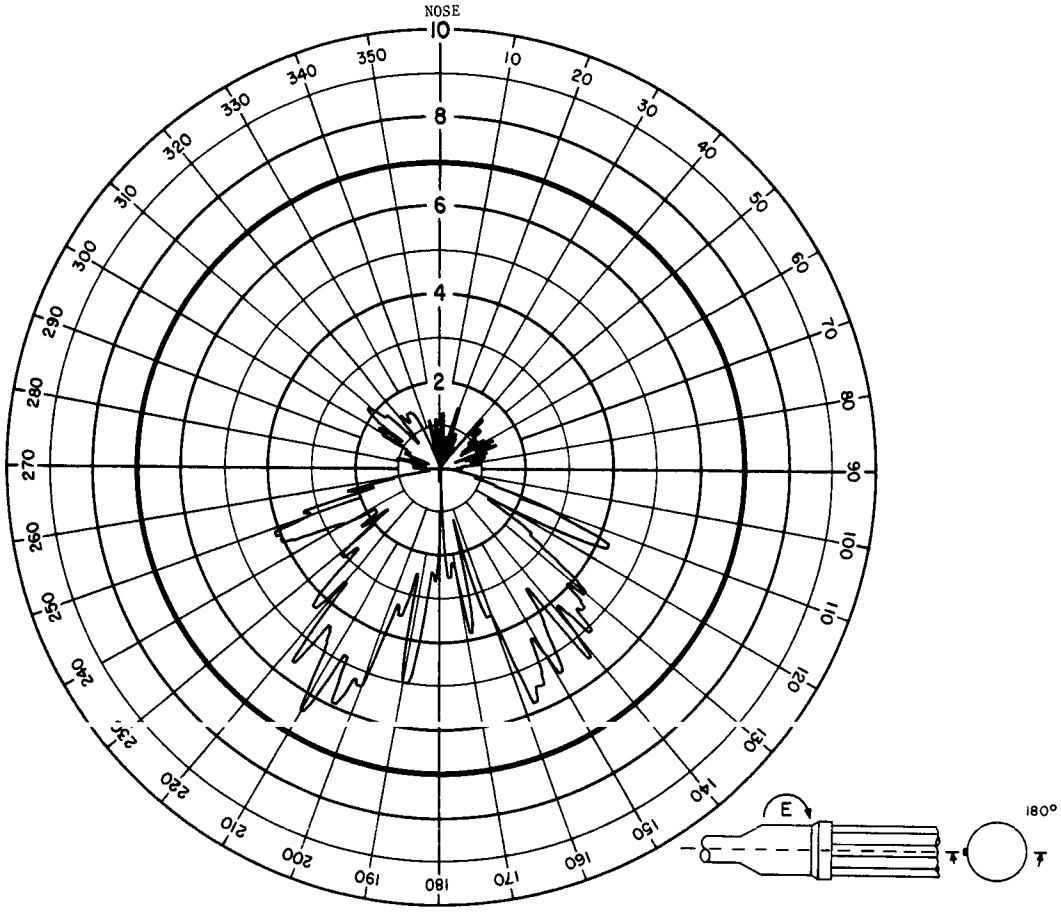


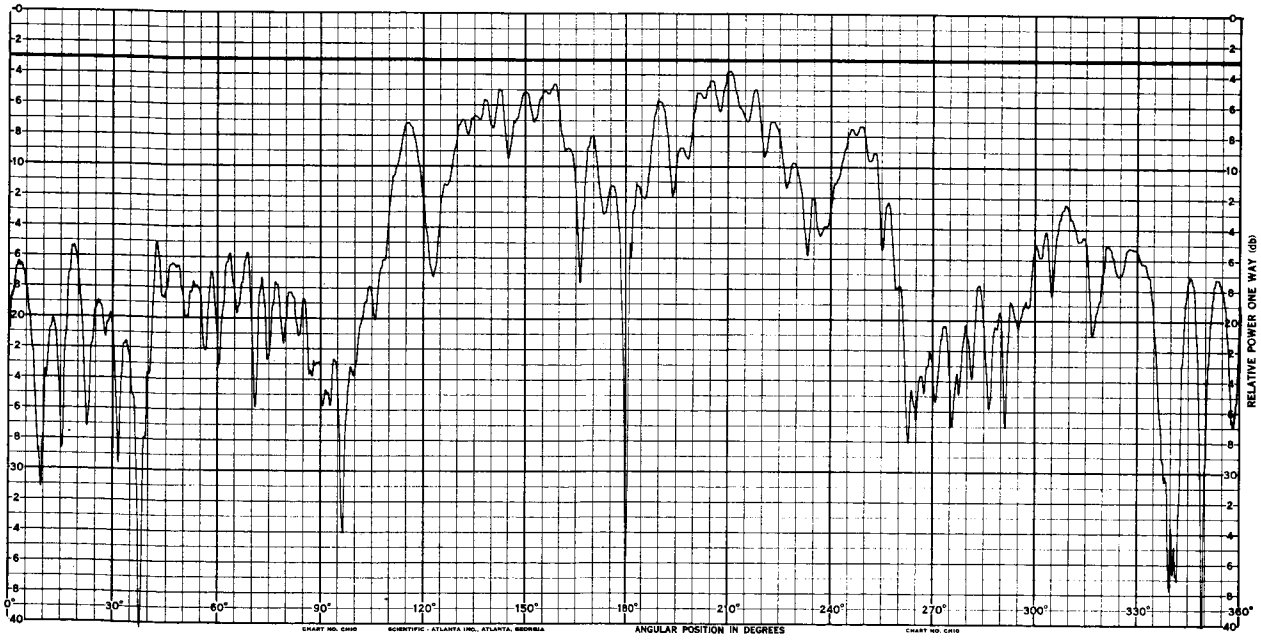
ANTENNA RADIATION PATTERN NO. 203-56

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



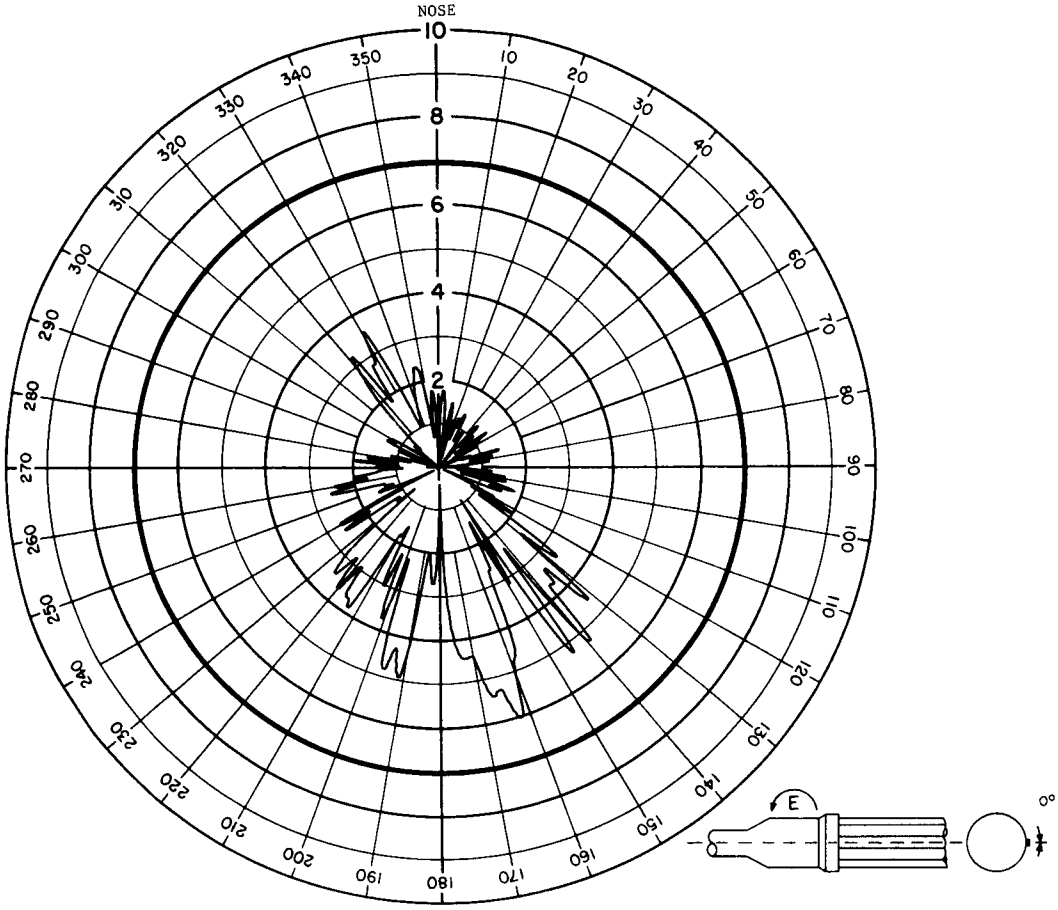


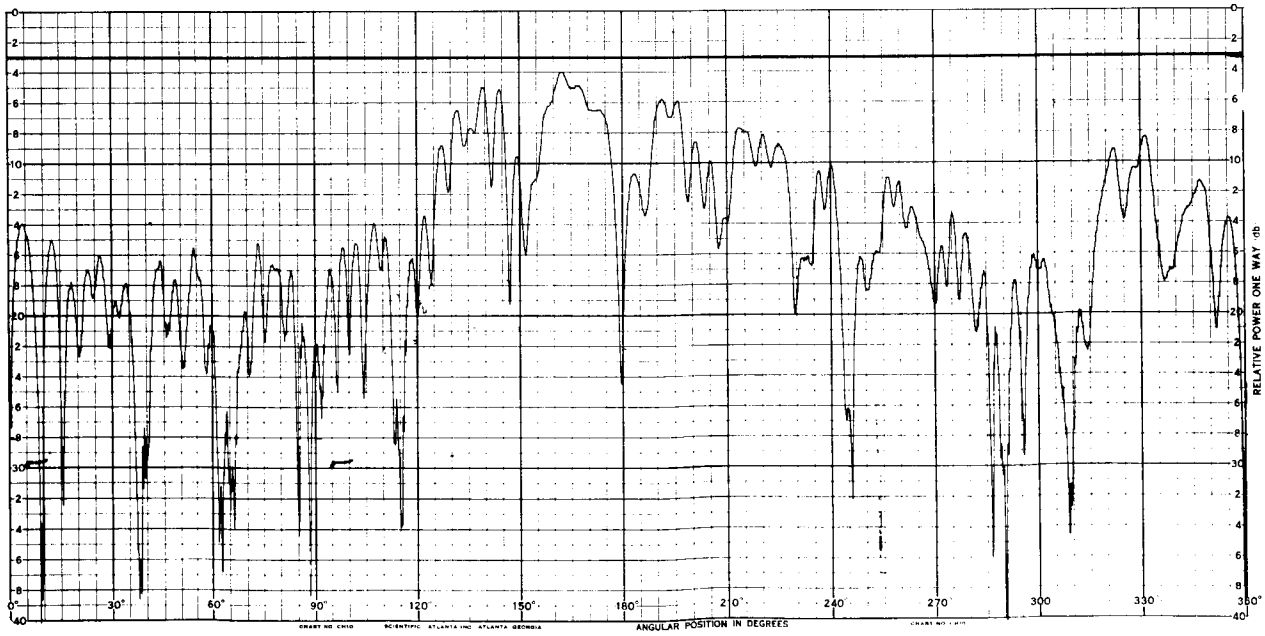
ANTENNA RADIATION PATTERN NO. 203-57

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



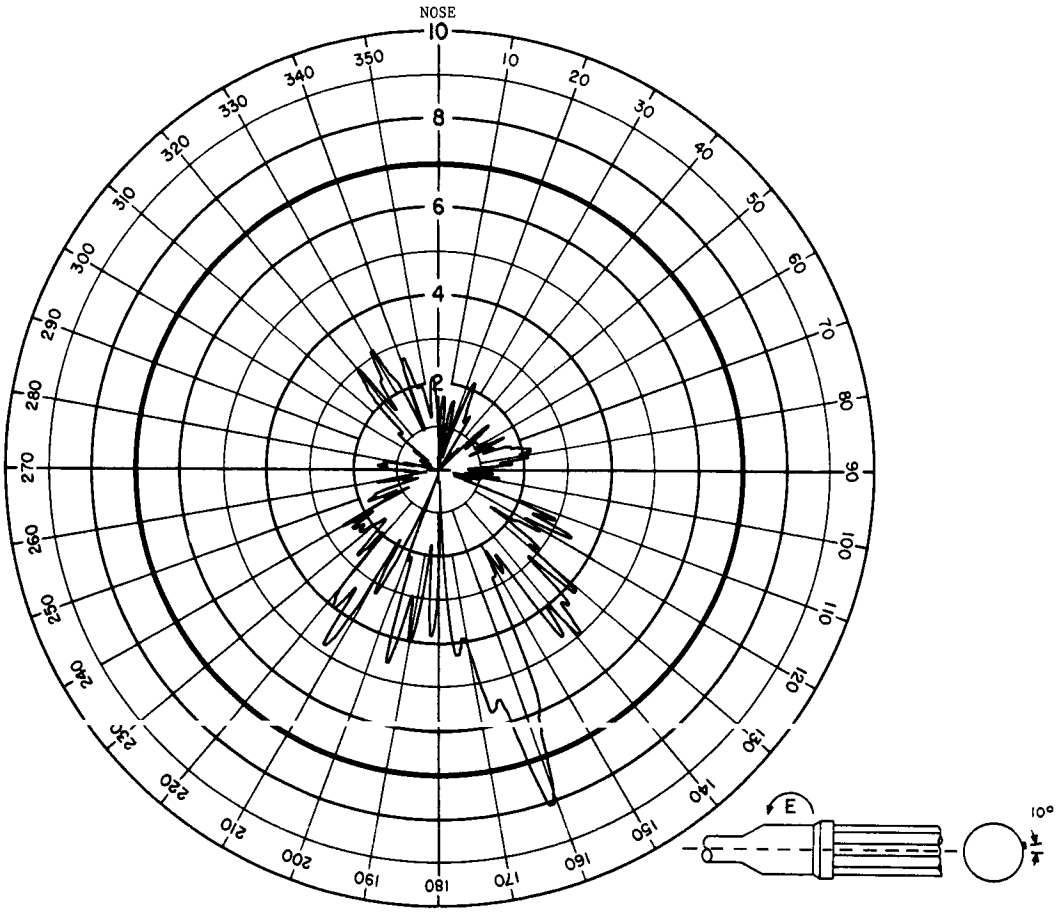


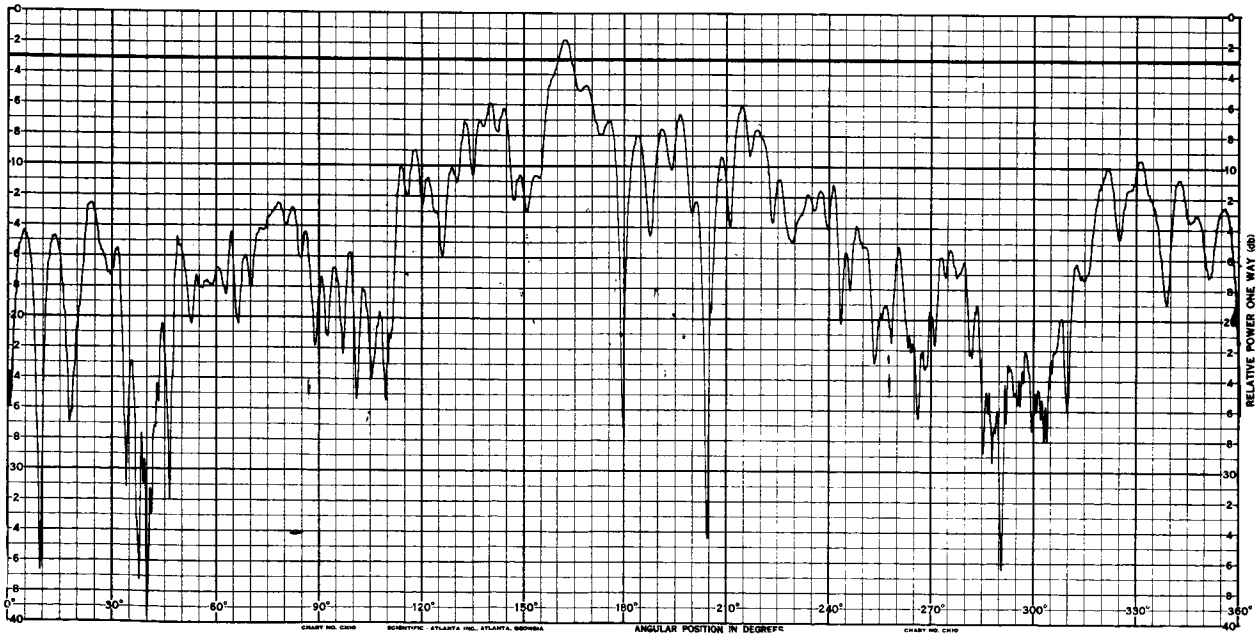
ANTENNA RADIATION PATTERN NO. 203-58

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



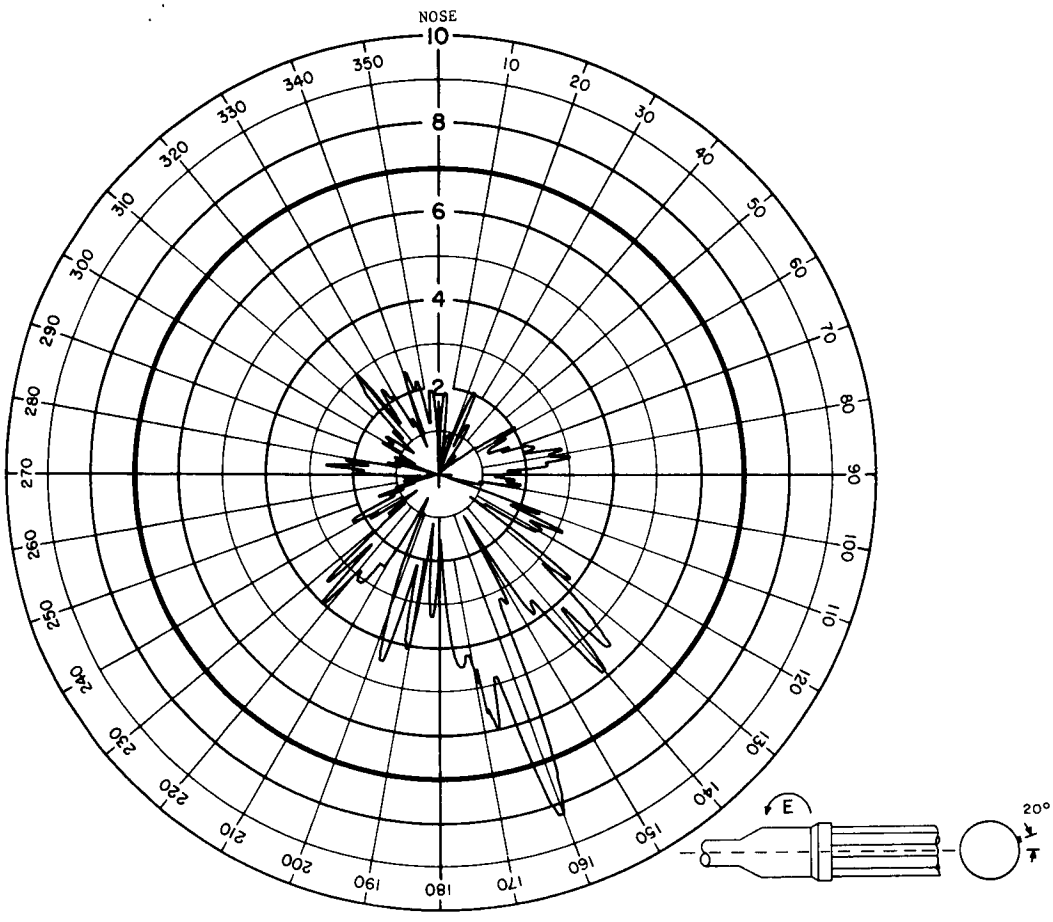


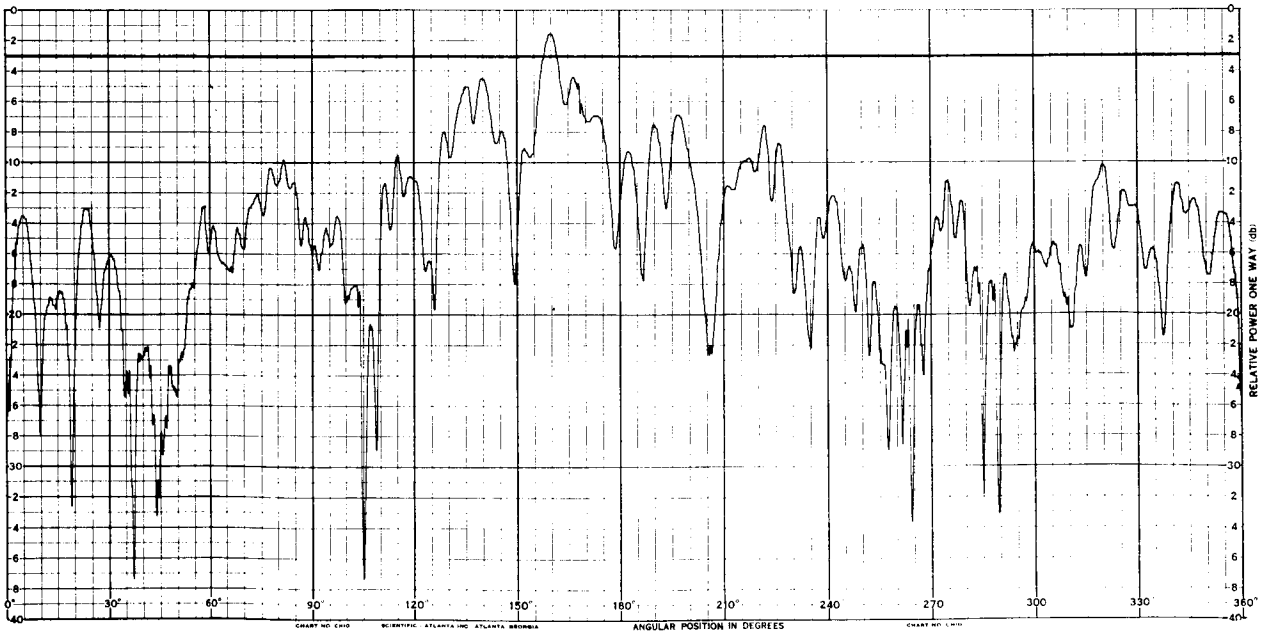
ANTENNA RADIATION PATTERN NO. 203-59

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



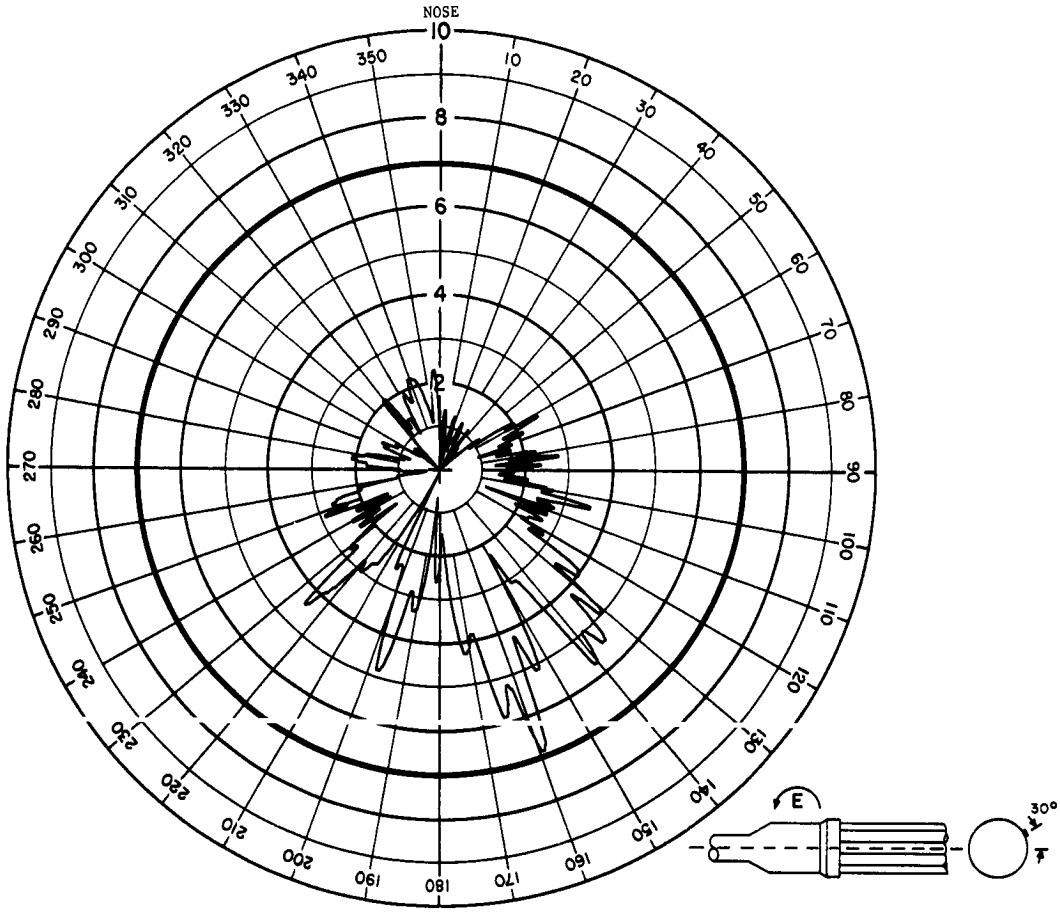


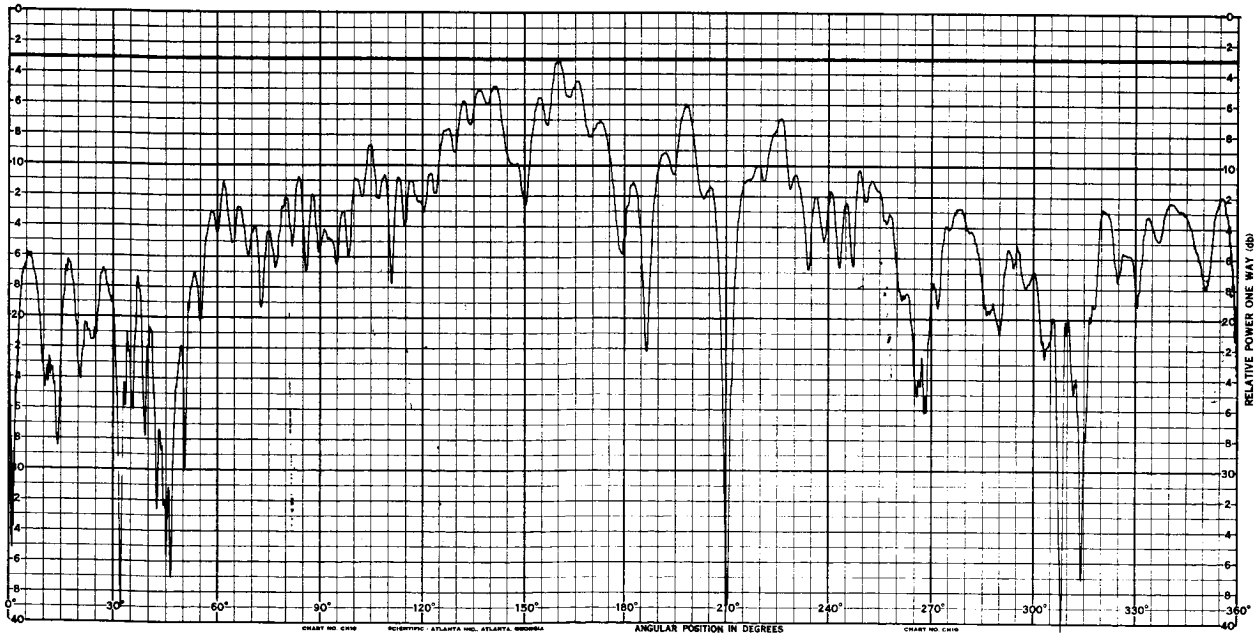
ANTENNA RADIATION PATTERN NO. 203-60

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



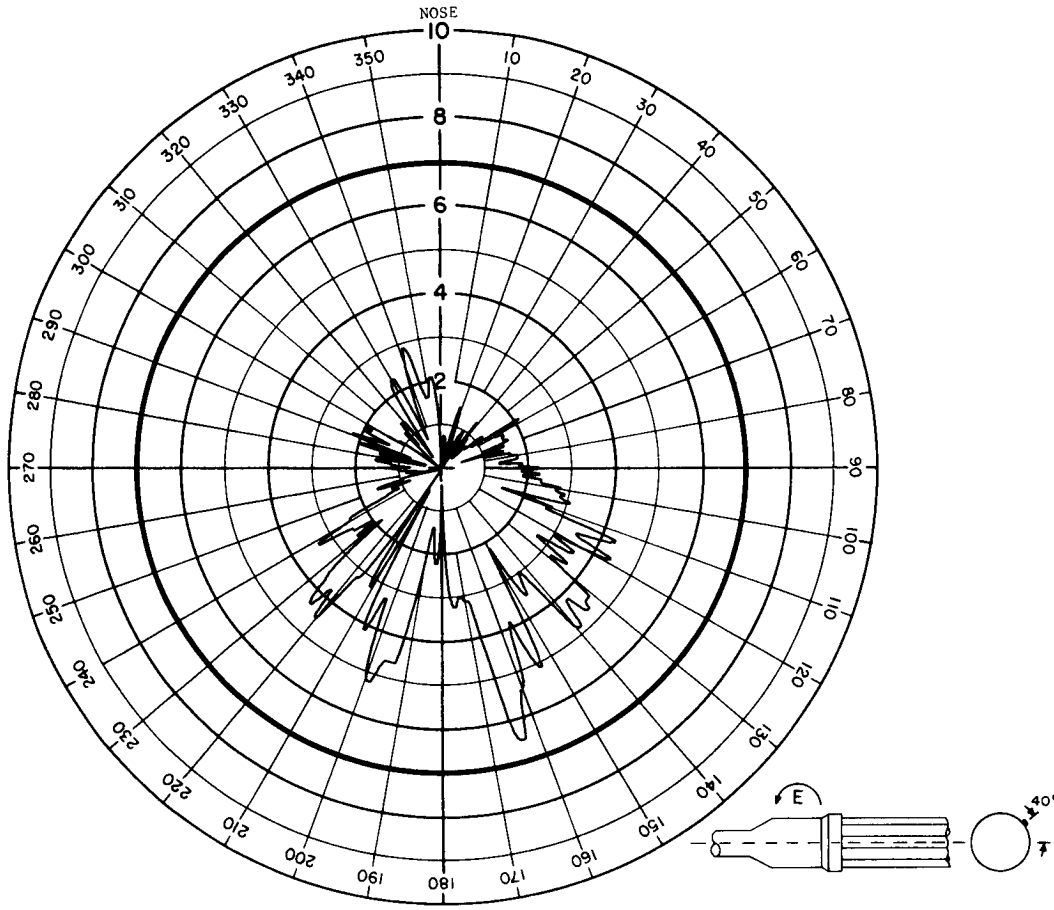


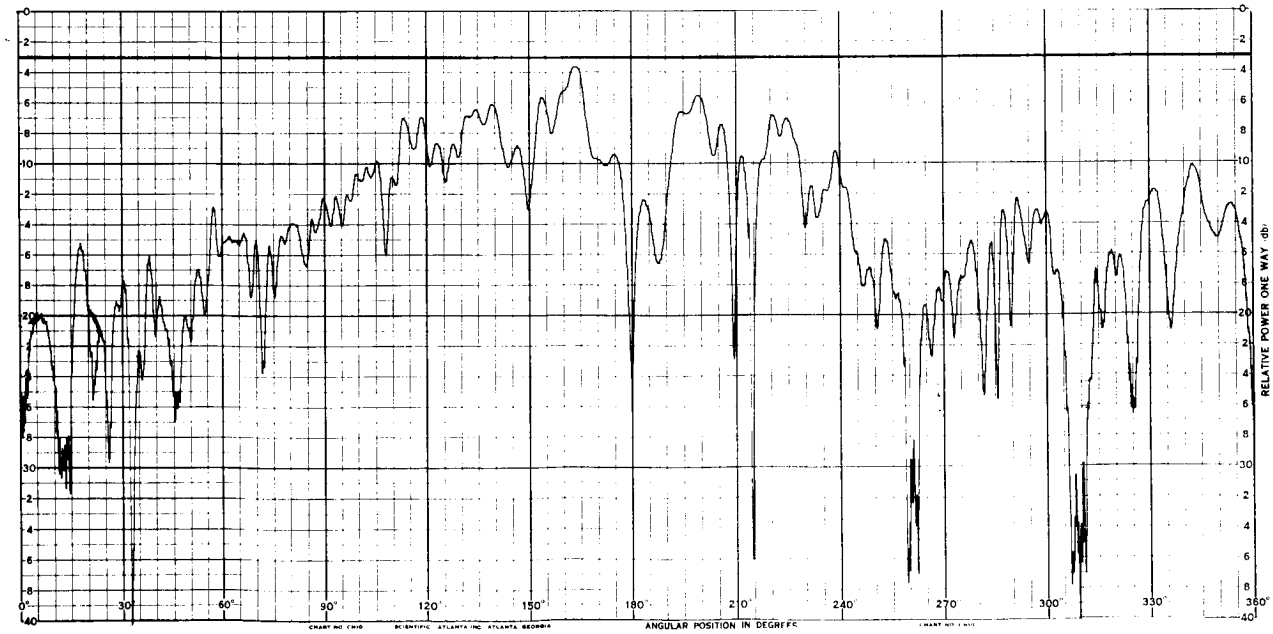
ANTENNA RADIATION PATTERN NO. 203-61

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



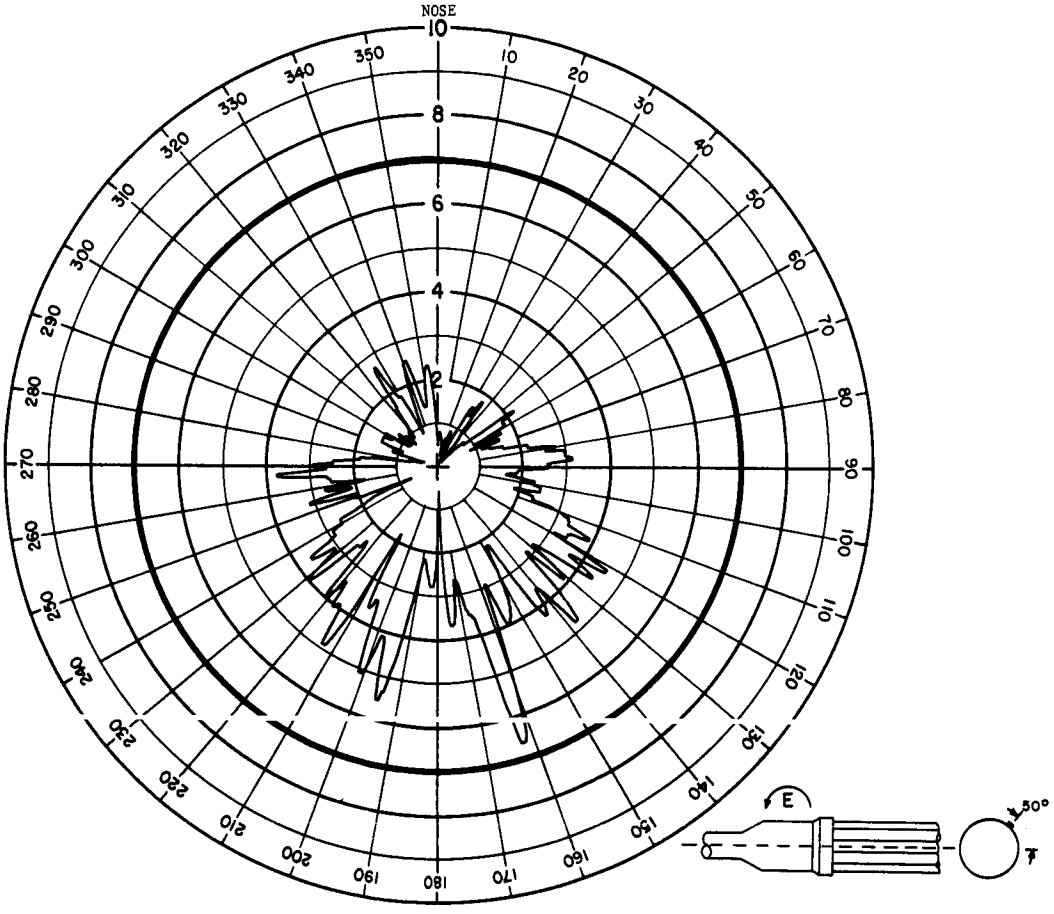


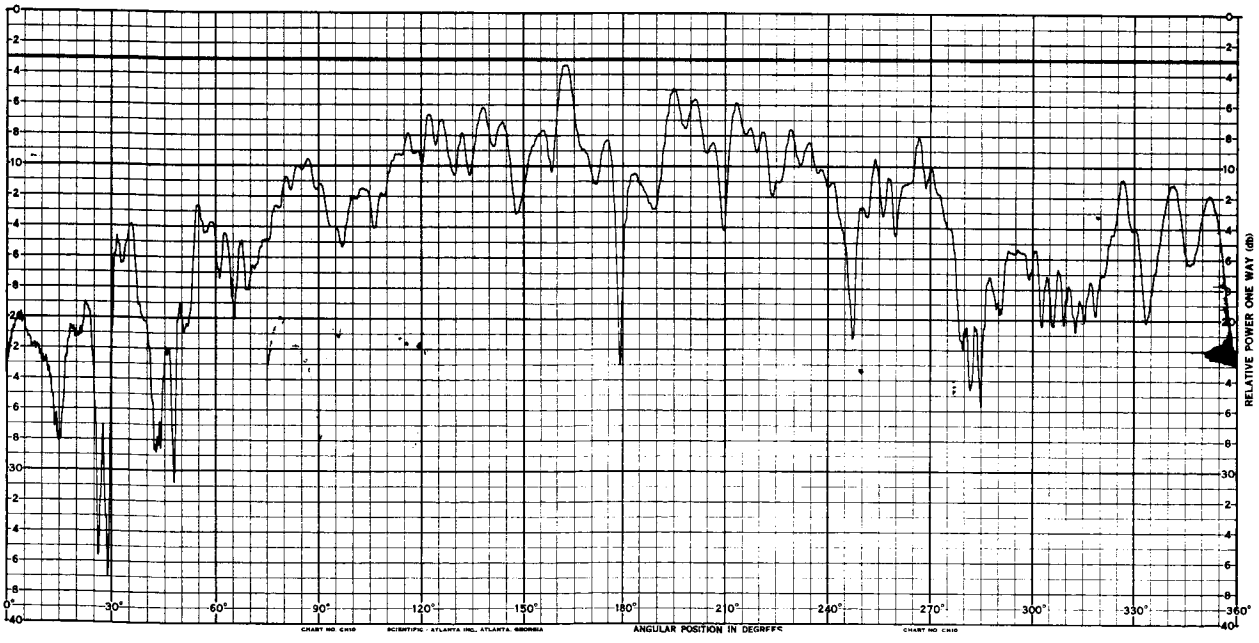
ANTENNA RADIATION PATTERN NO. 203-62

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



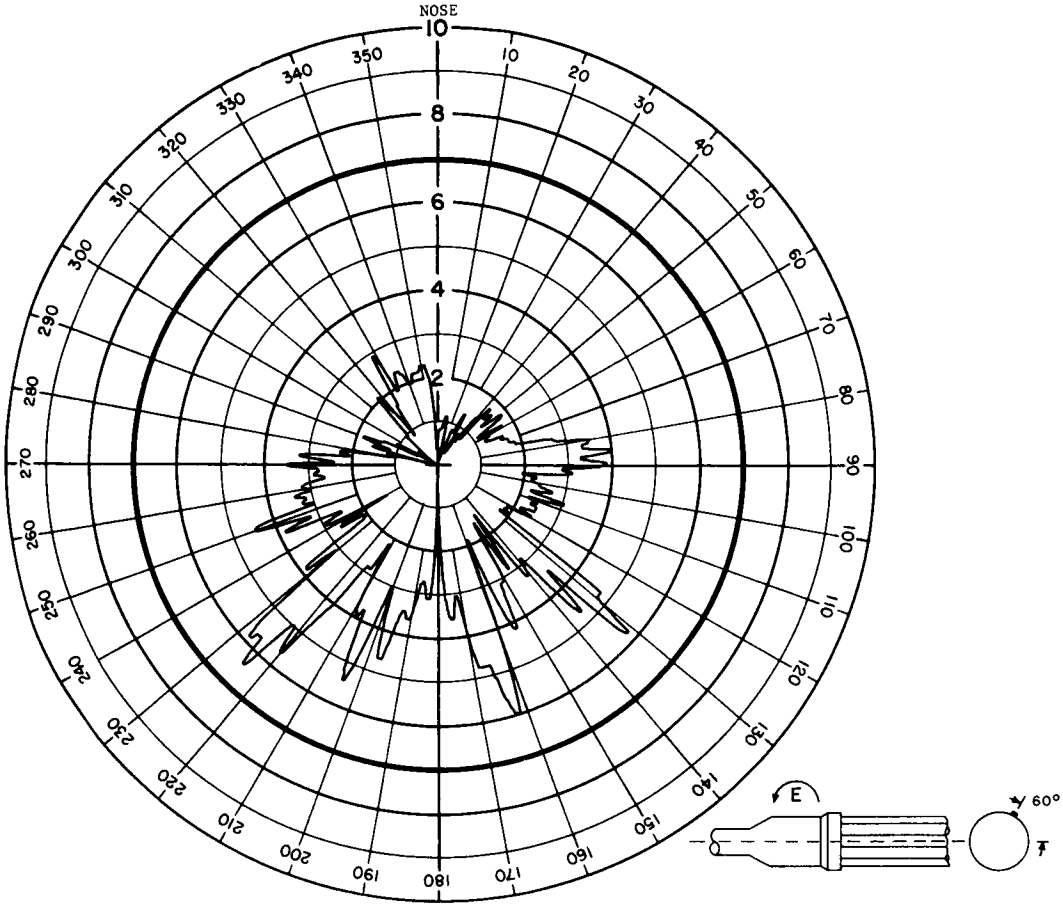


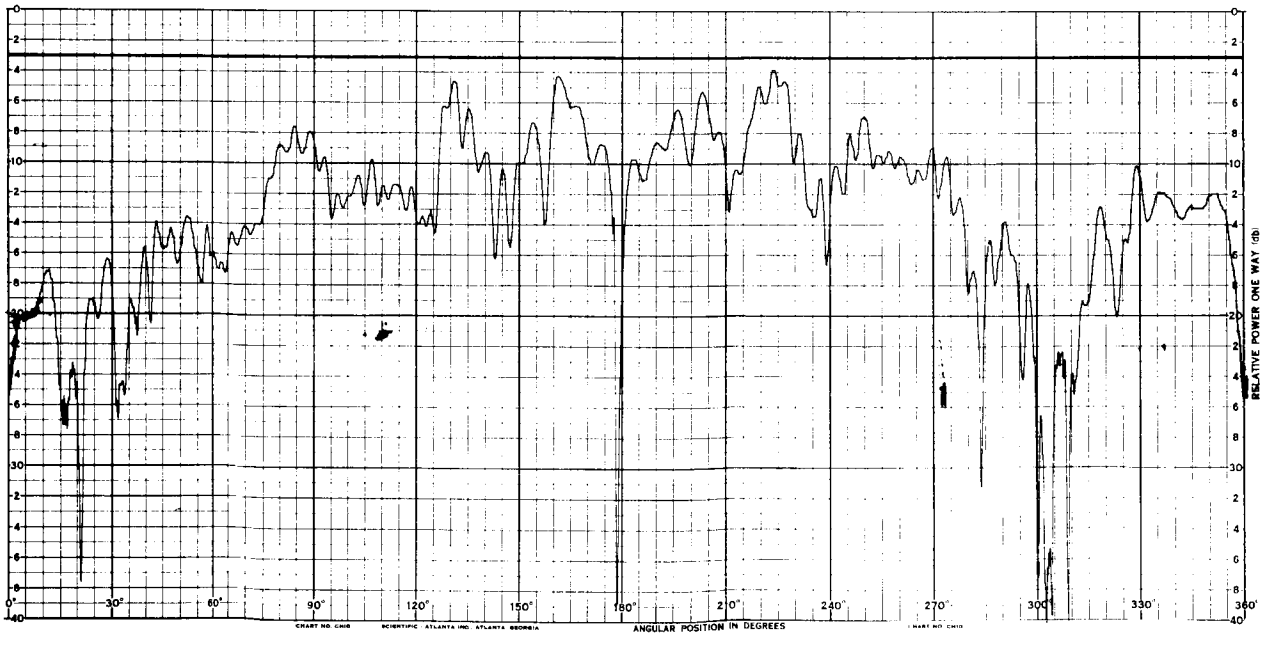
ANTENNA RADIATION PATTERN NO. 203-63

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



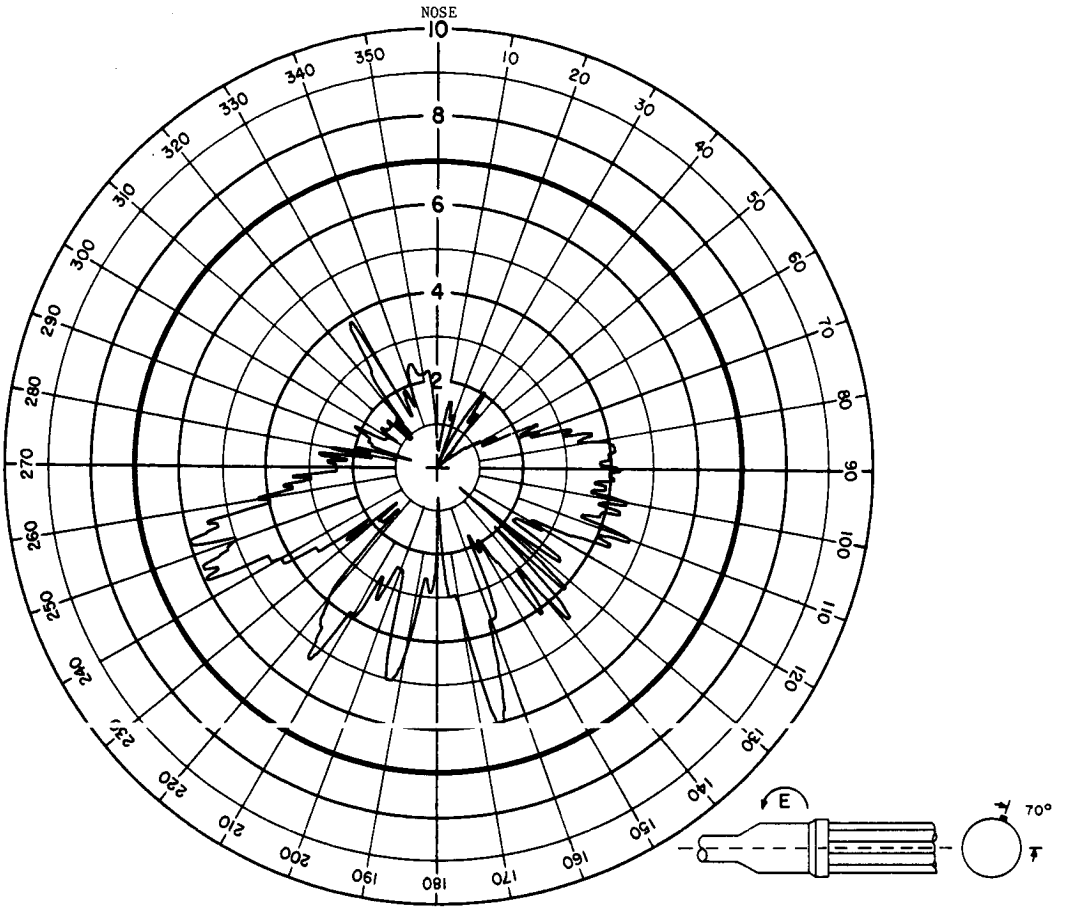


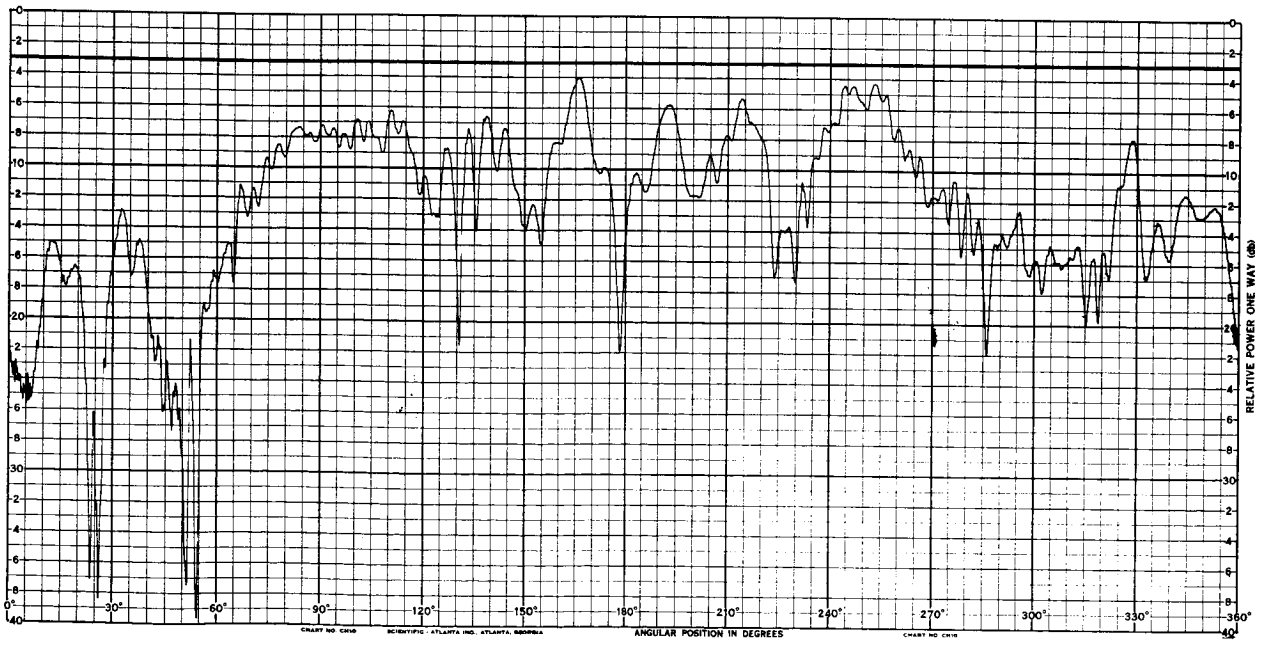
ANTENNA RADIATION PATTERN NO. 203-64

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



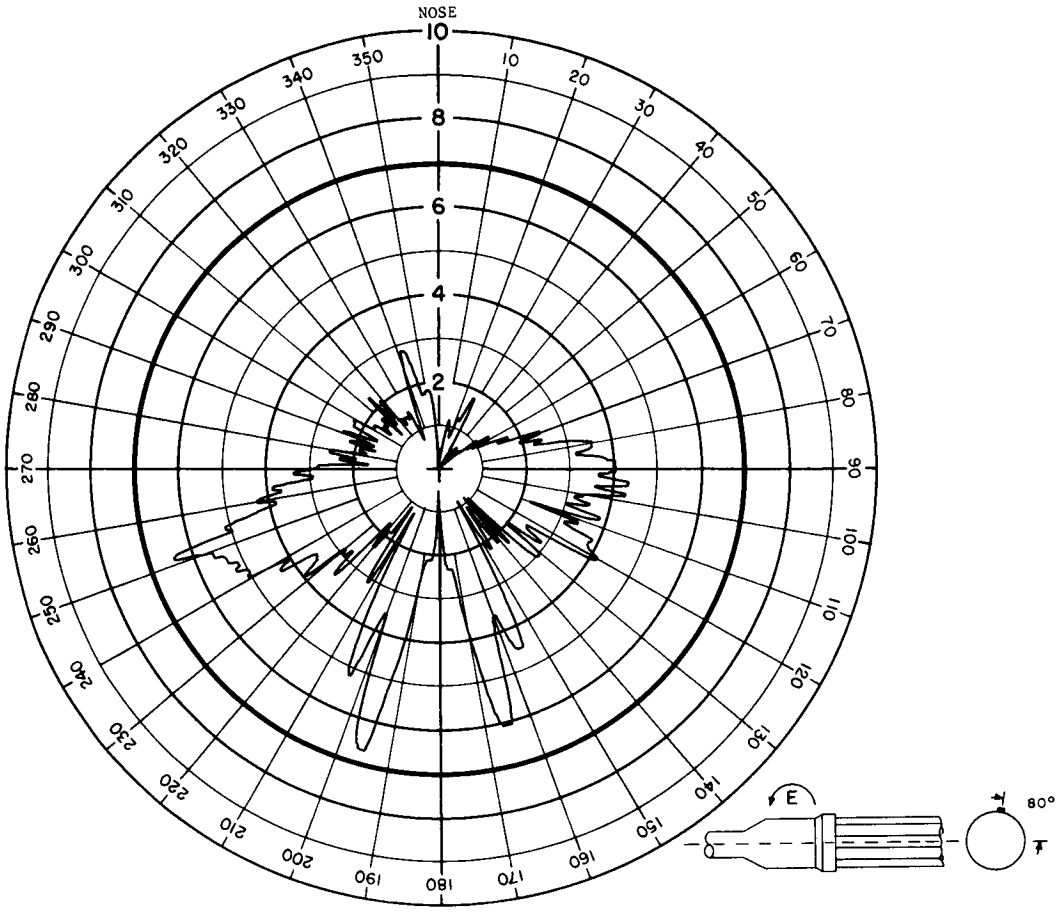


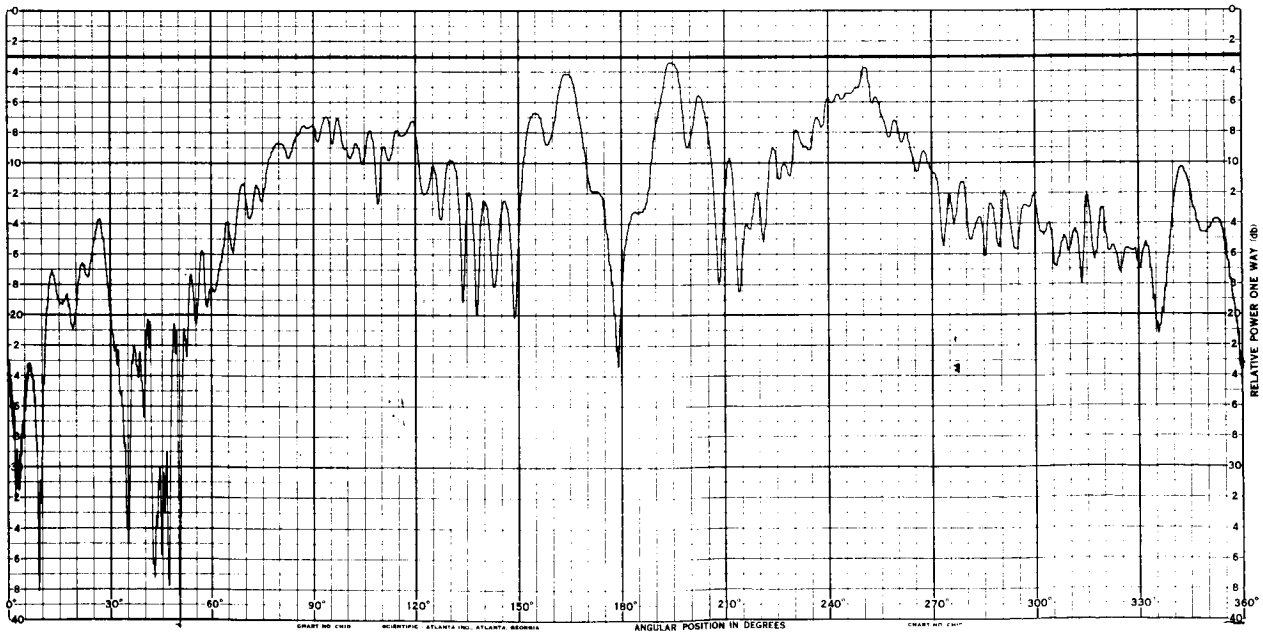
ANTENNA RADIATION PATTERN NO. 203-65

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



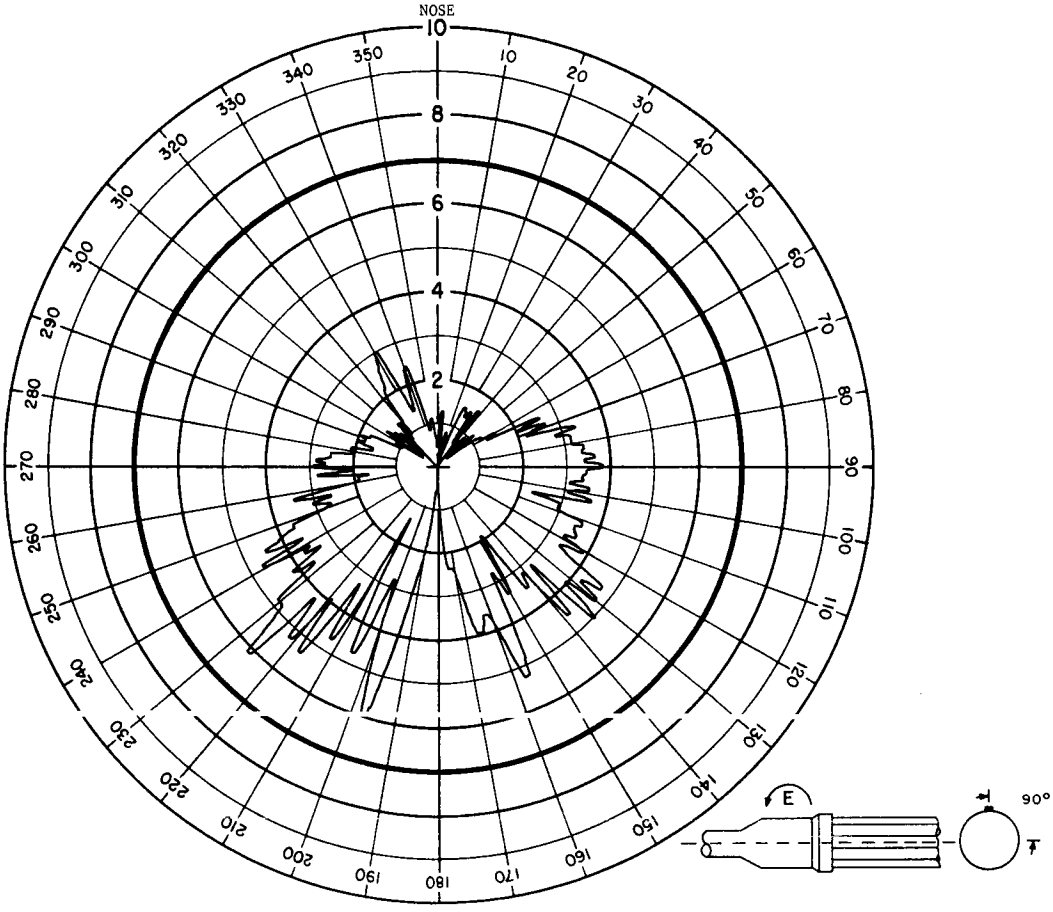


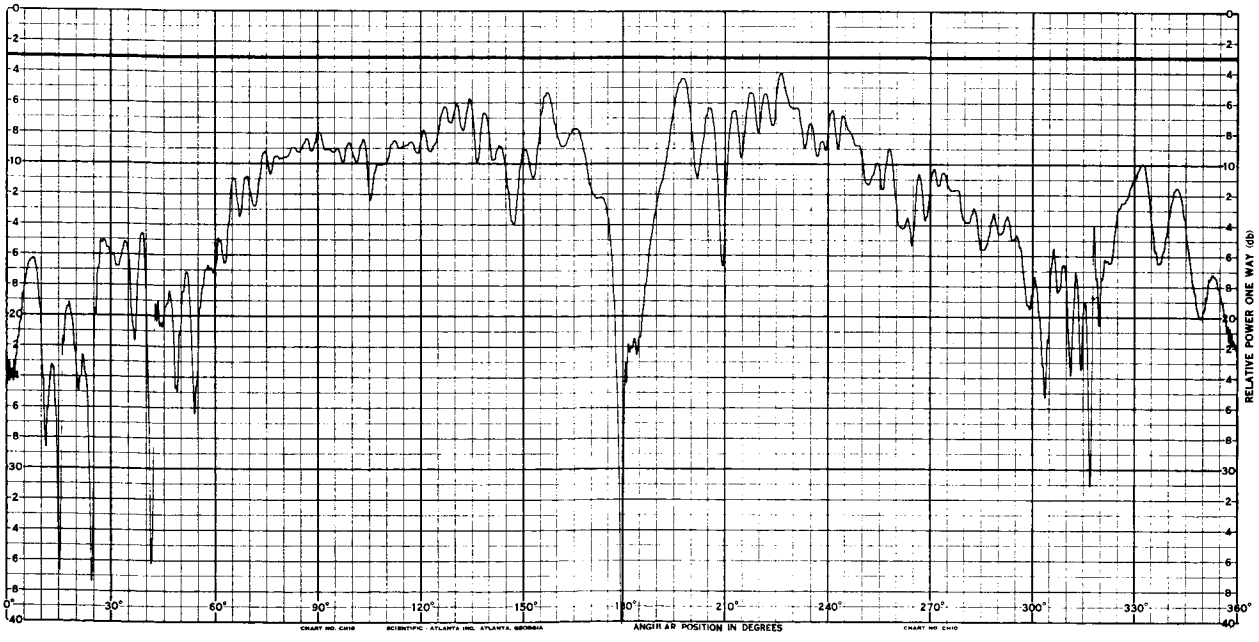
ANTENNA RADIATION PATTERN NO. 203-66

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



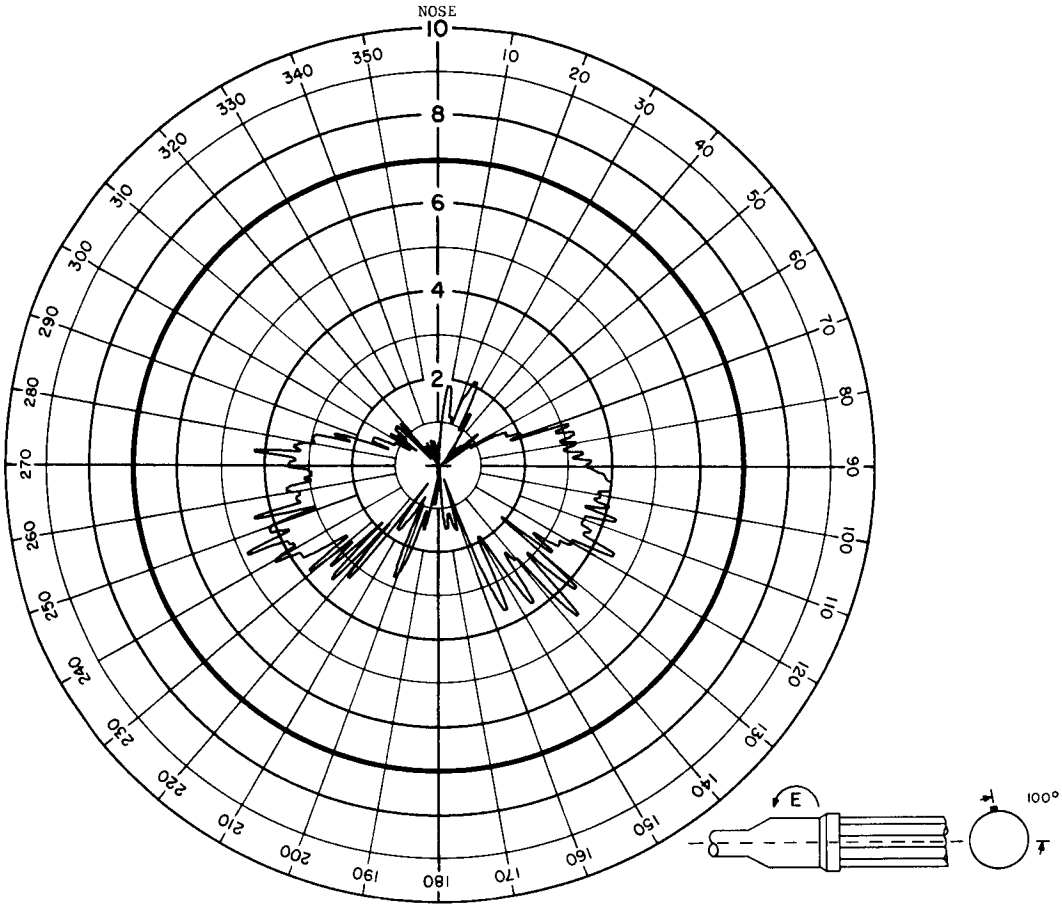


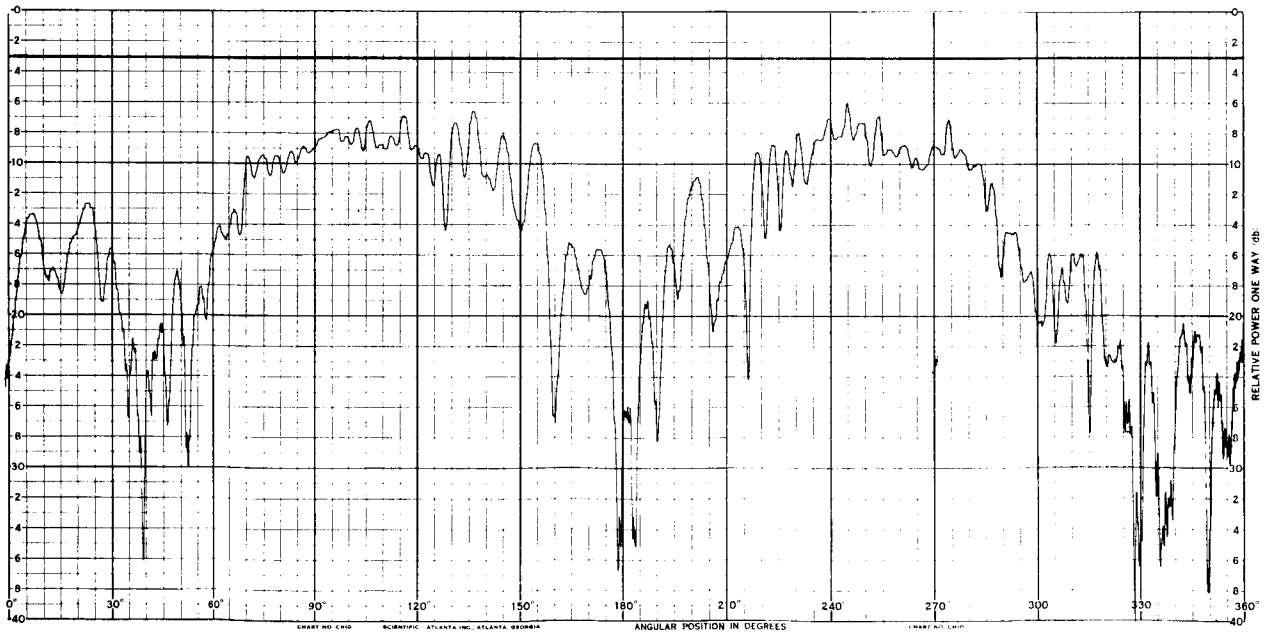
ANTENNA RADIATION PATTERN NO. 203-67

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



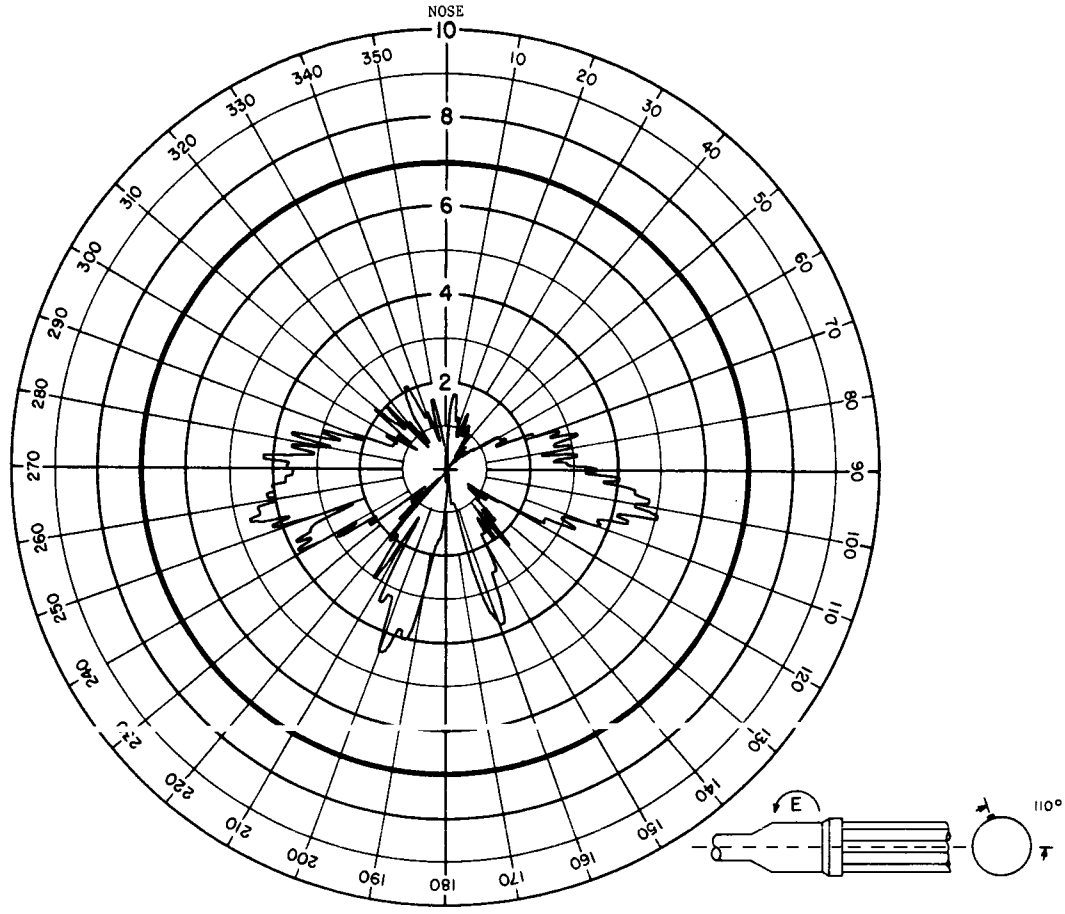


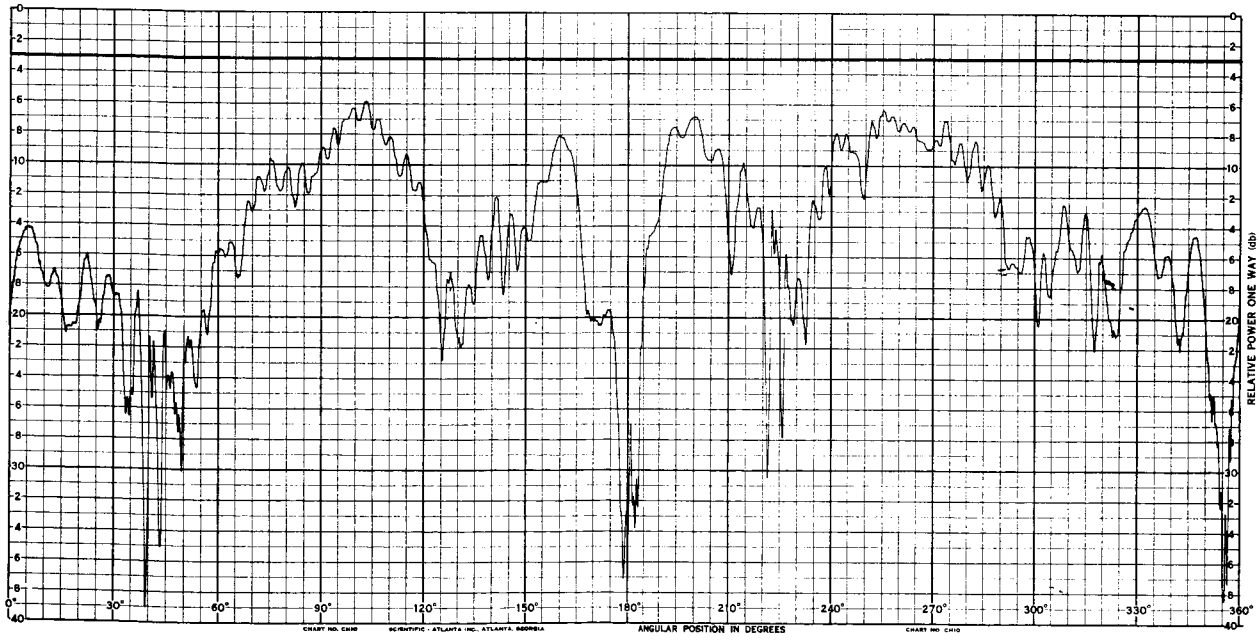
ANTENNA RADIATION PATTERN NO. 203-68

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



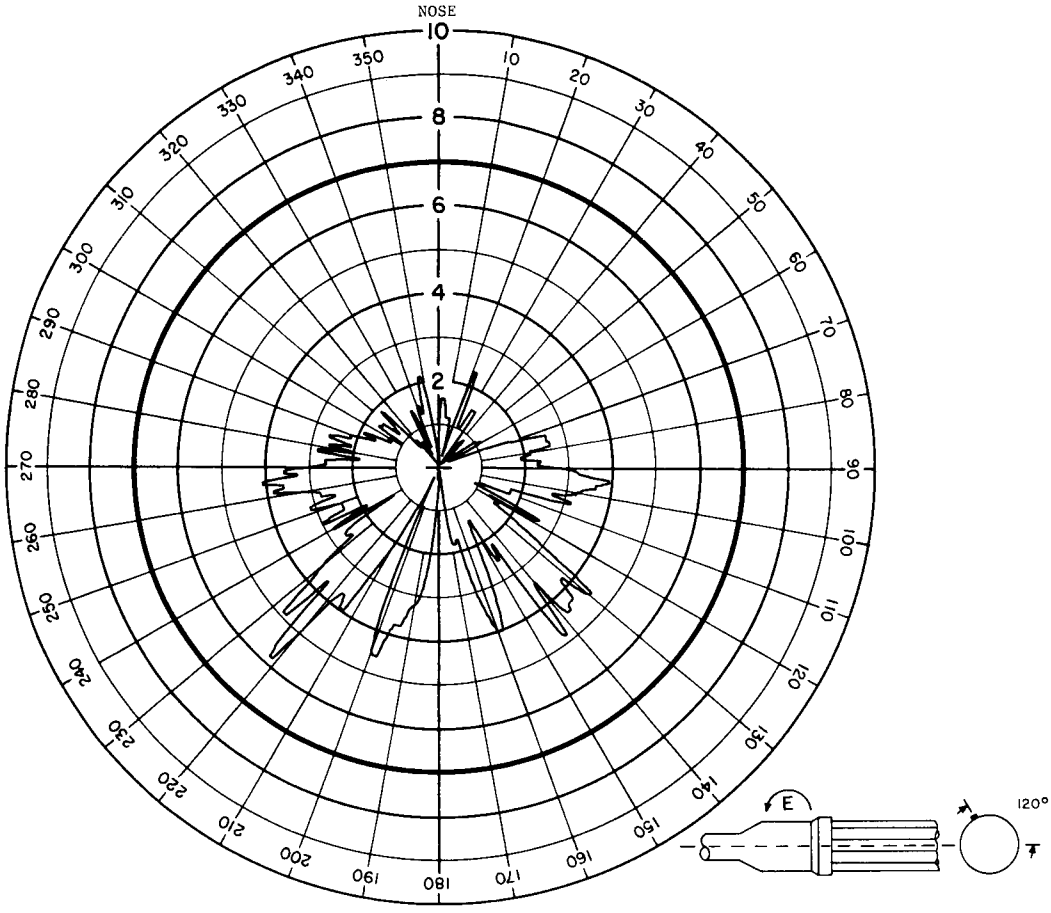


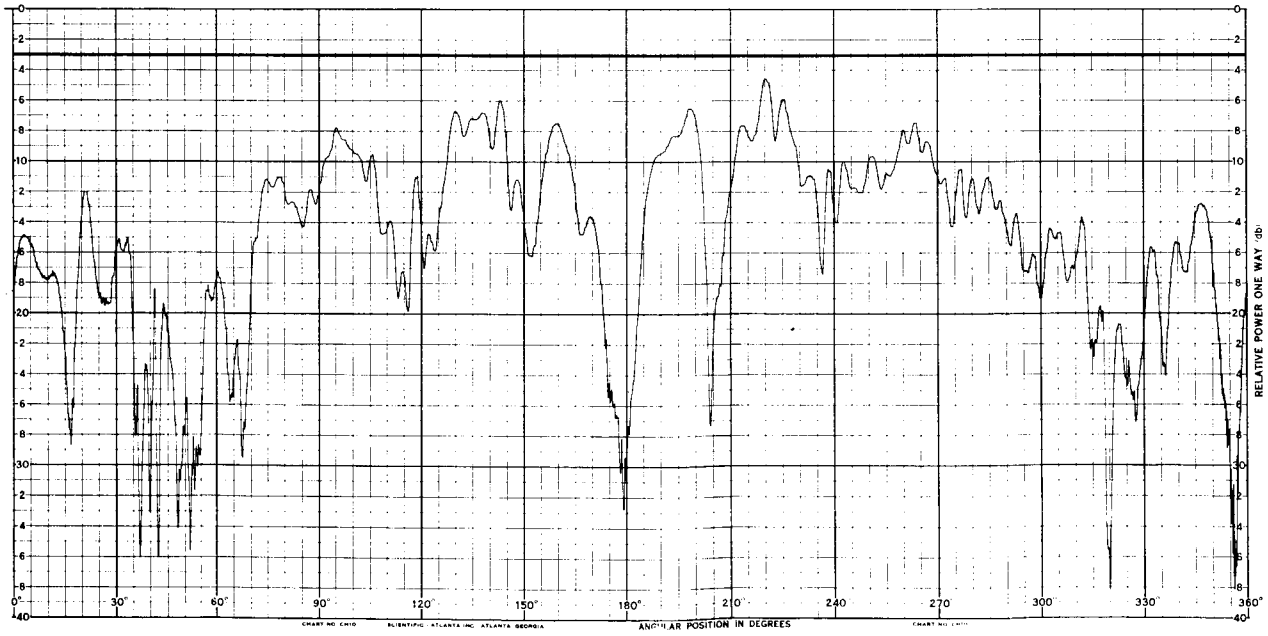
ANTENNA RADIATION PATTERN NO. 203-69

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



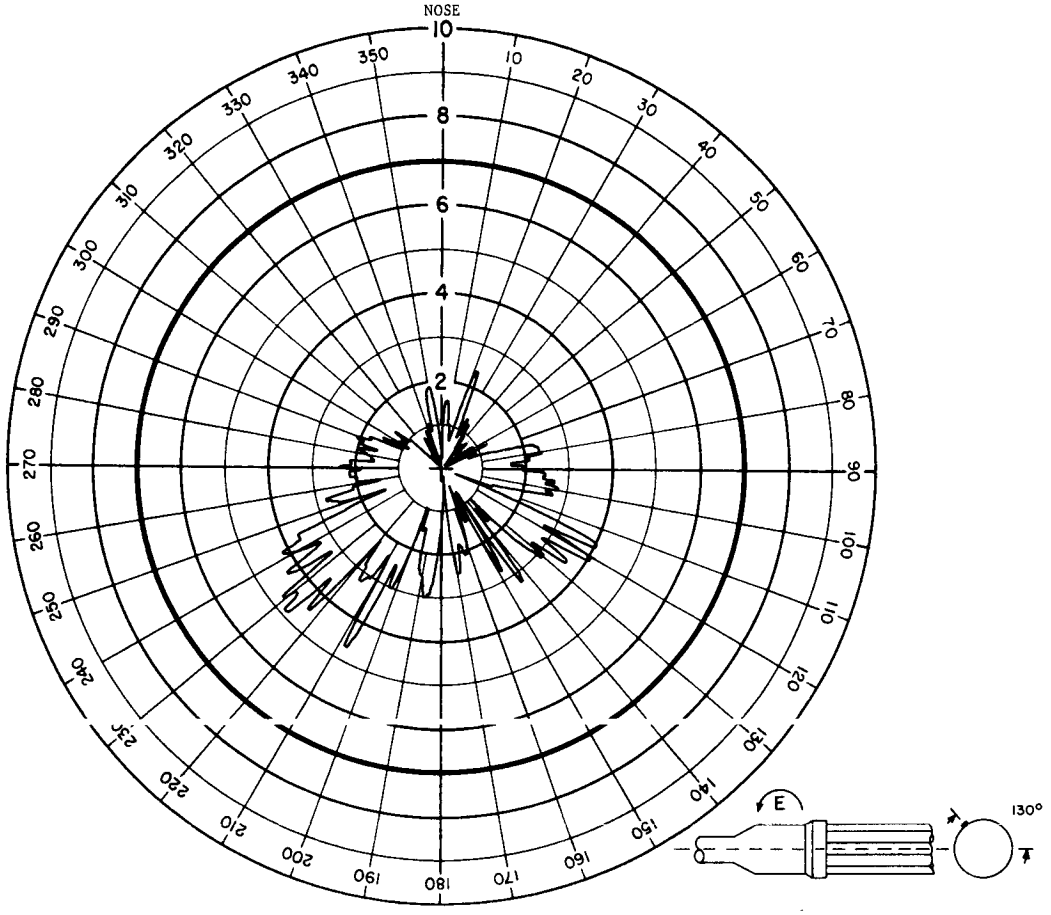


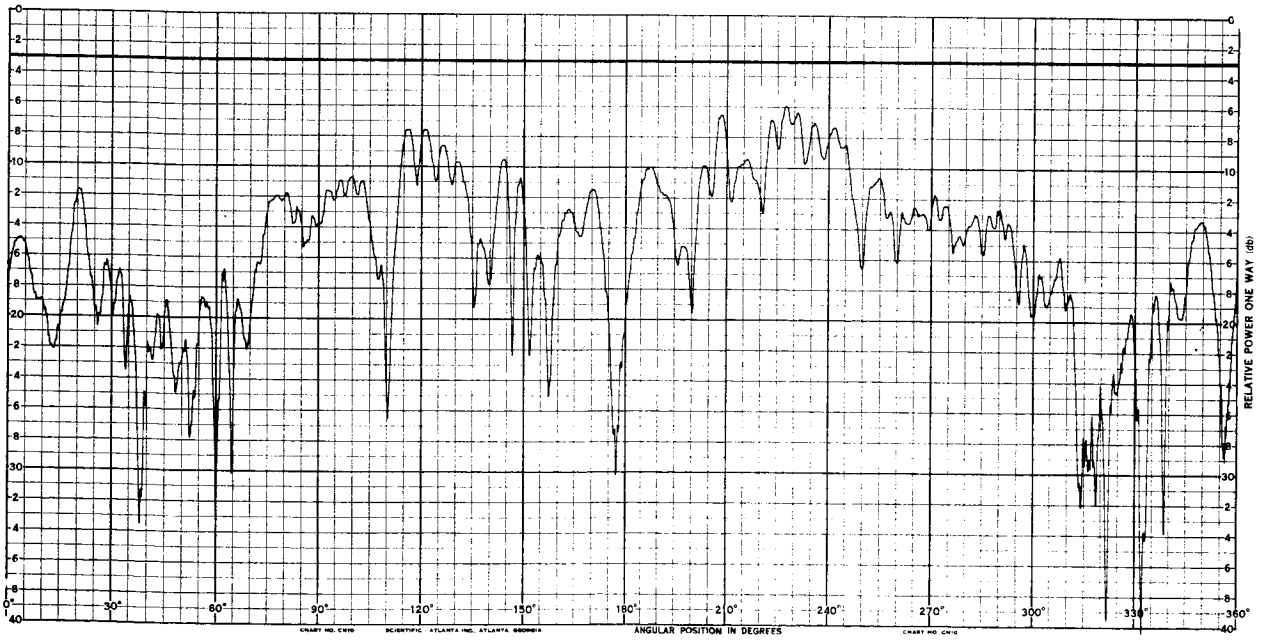
ANTENNA RADIATION PATTERN NO. 203-70

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



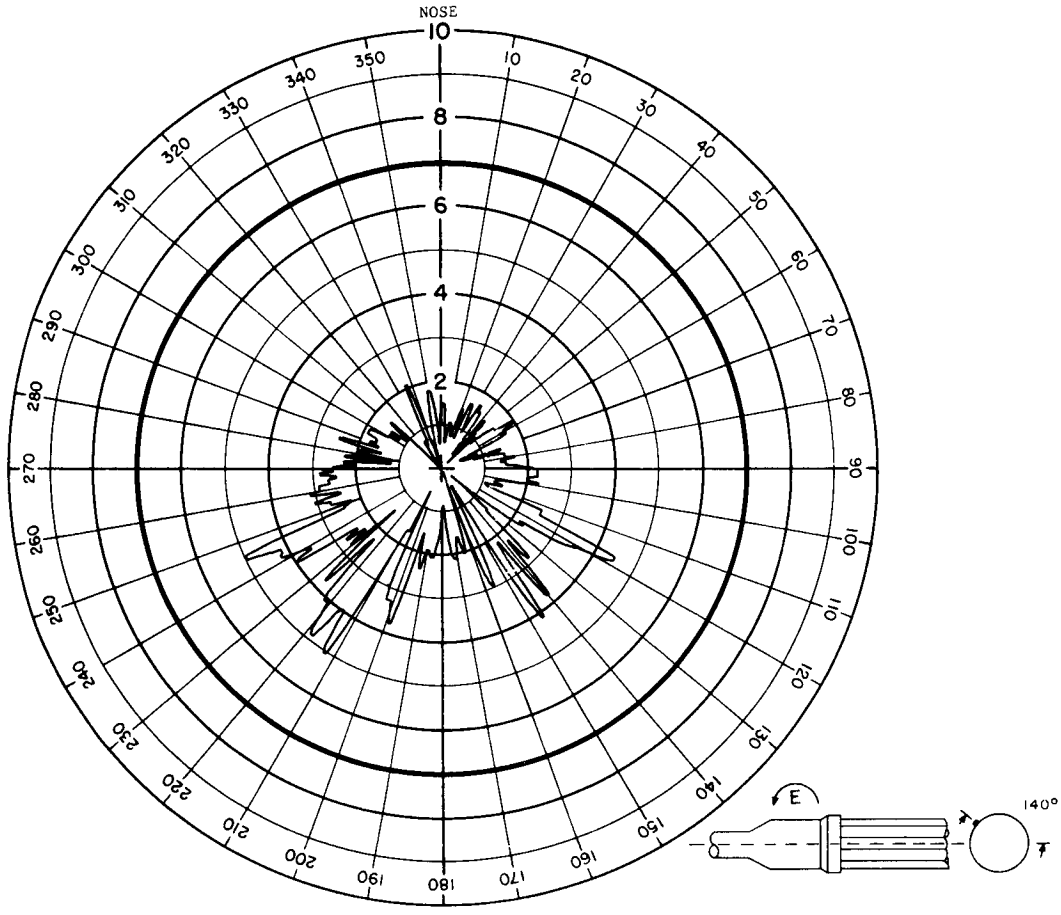


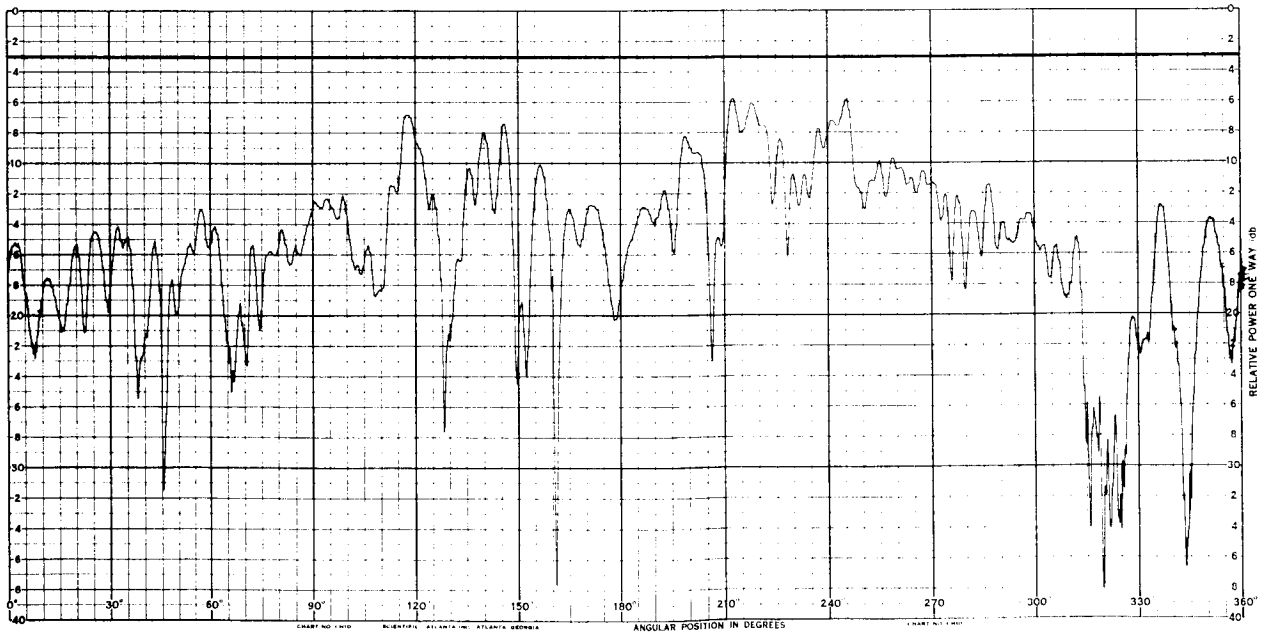
ANTENNA RADIATION PATTERN NO. 203-71

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



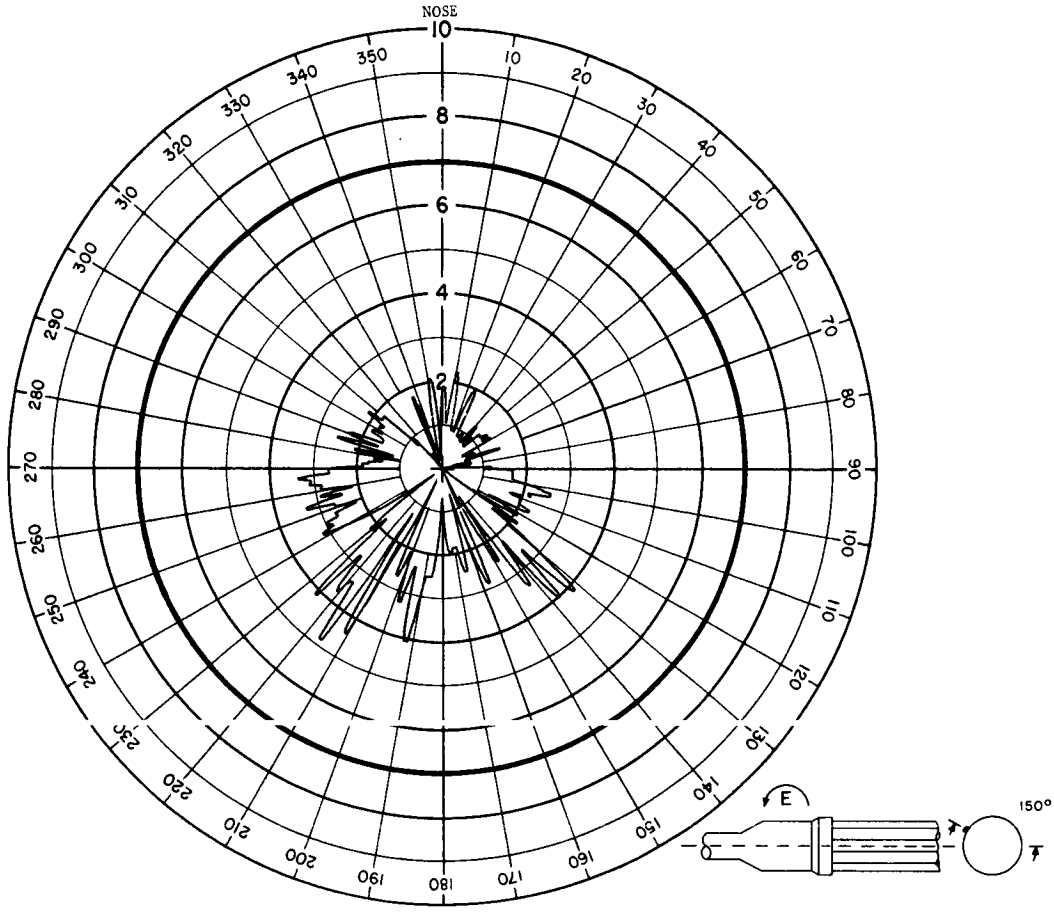


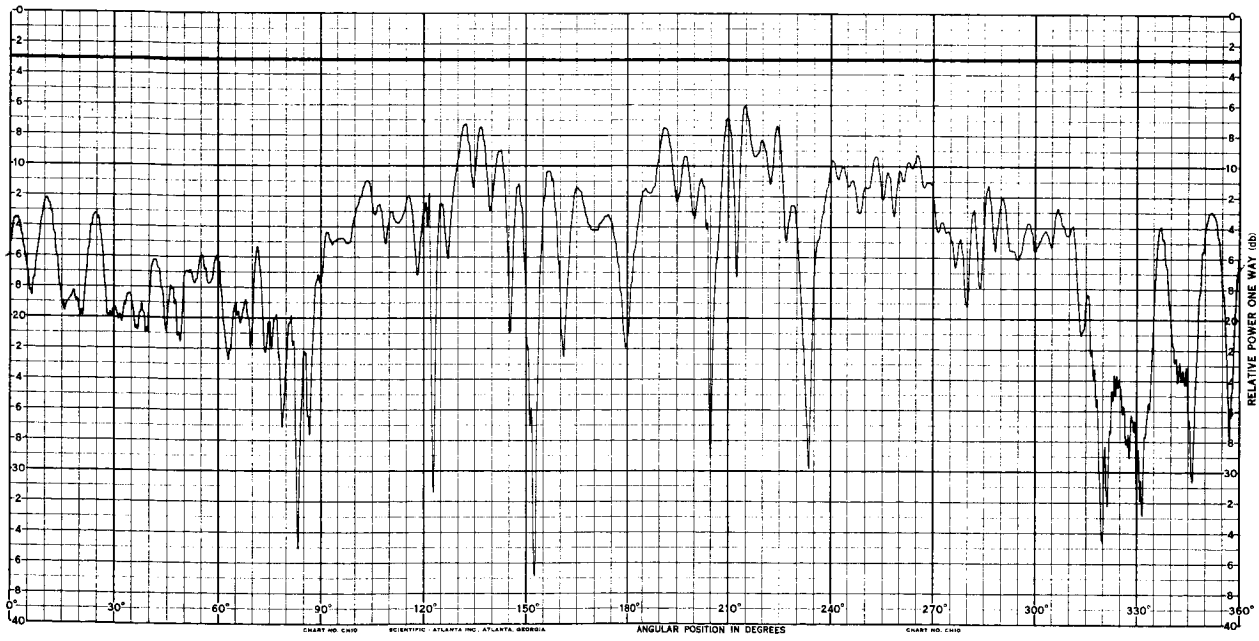
ANTENNA RADIATION PATTERN NO. 203-72

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



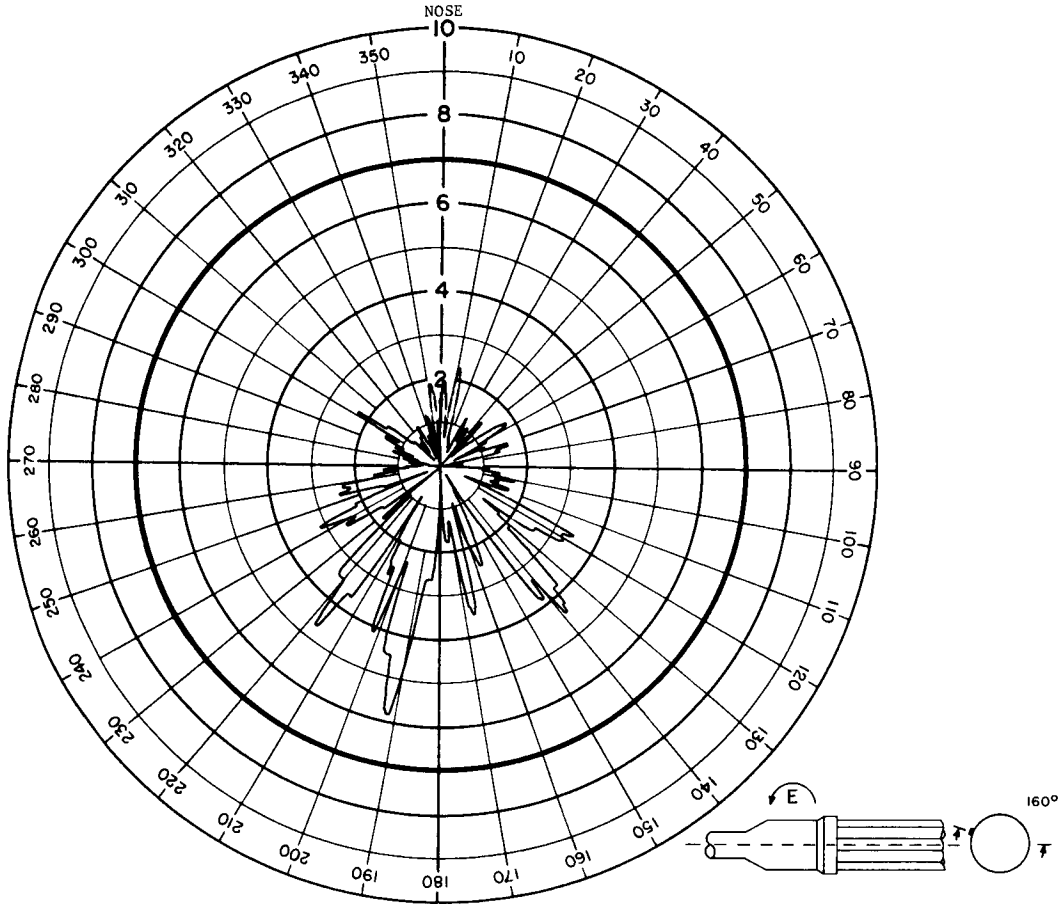


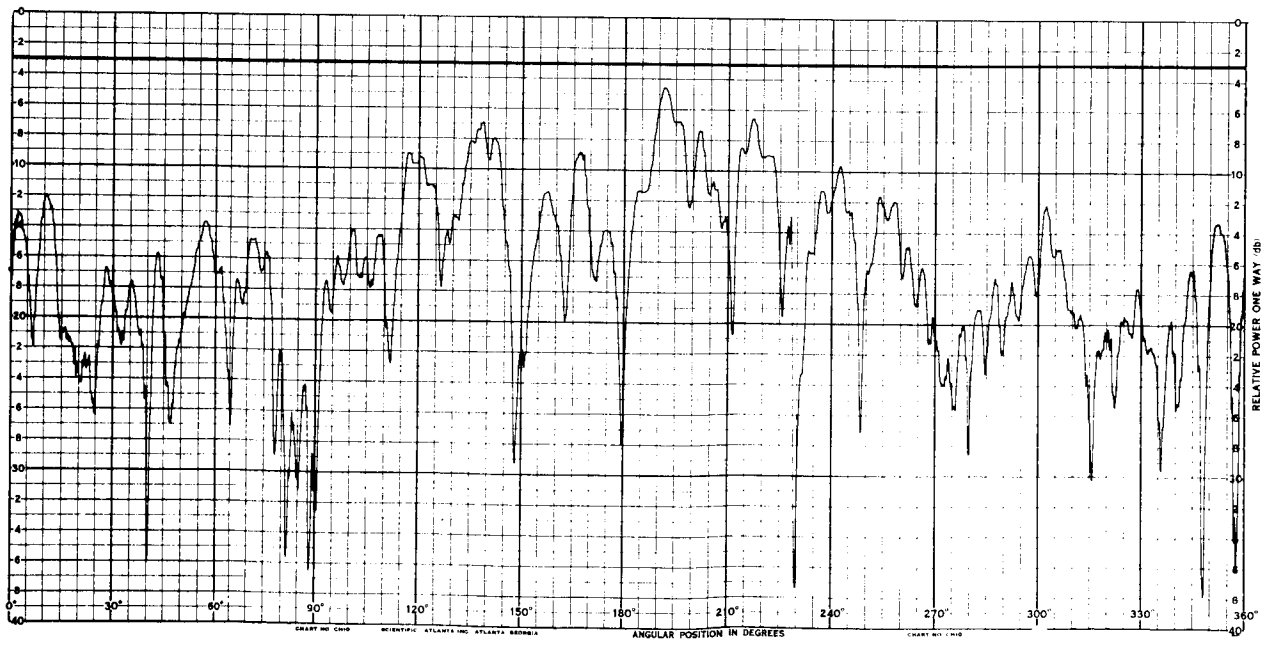
ANTENNA RADIATION PATTERN NO. 203-73

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



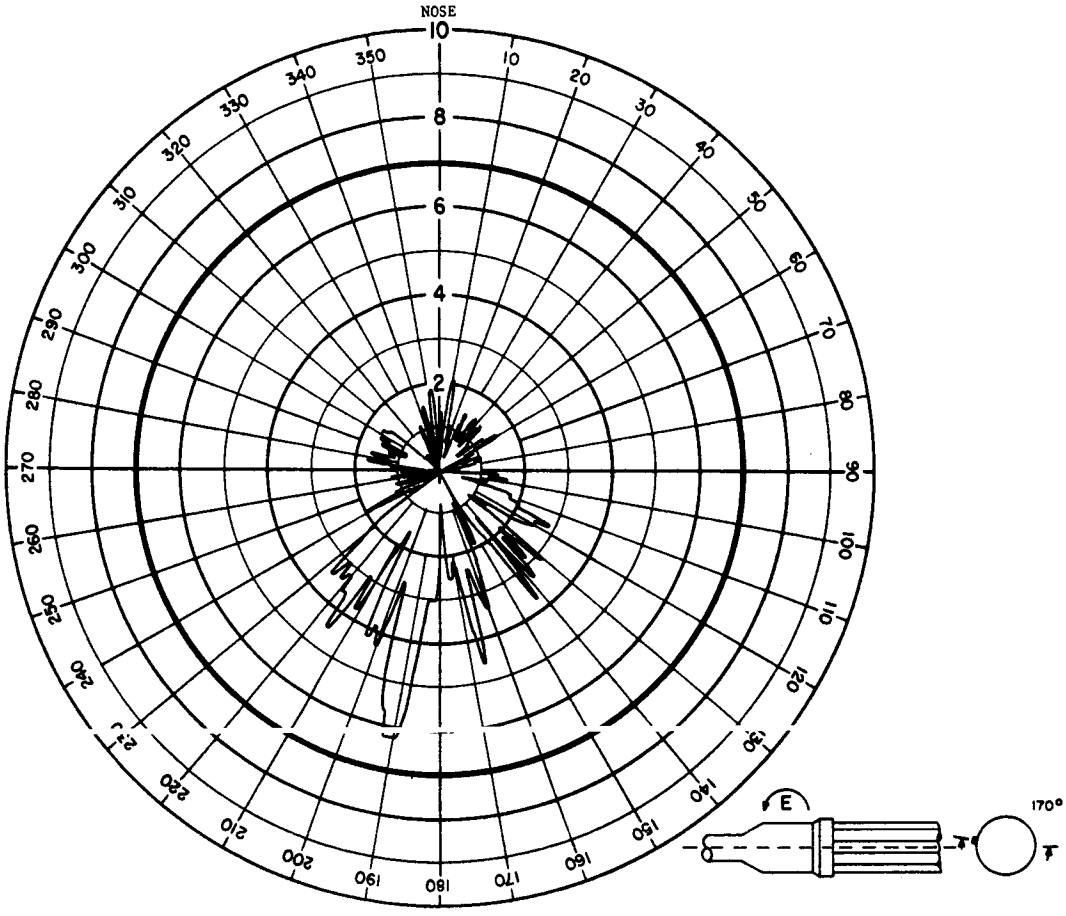


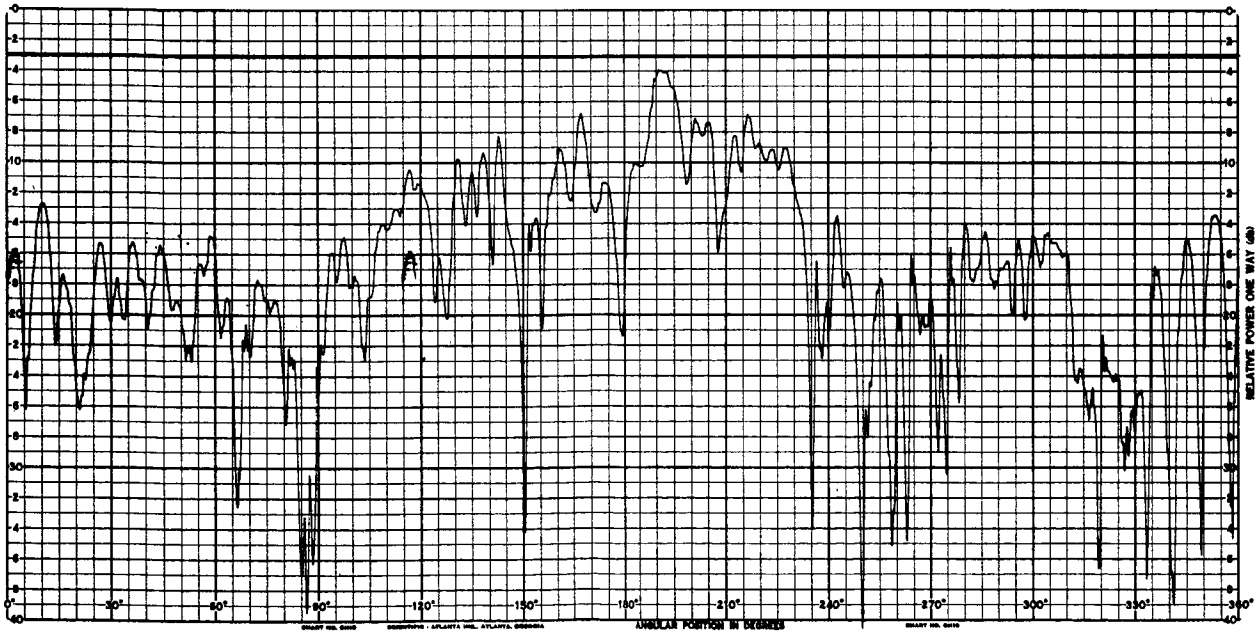
ANTENNA RADIATION PATTERN NO. 203-74

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



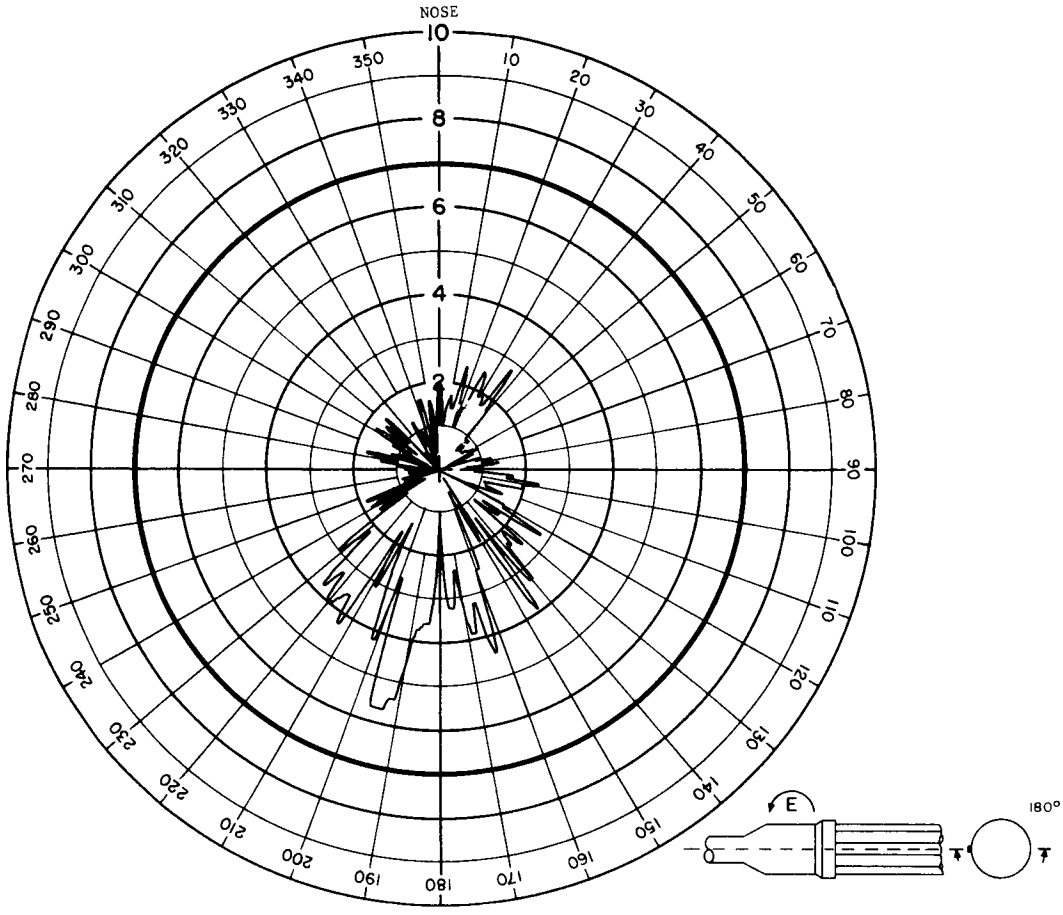


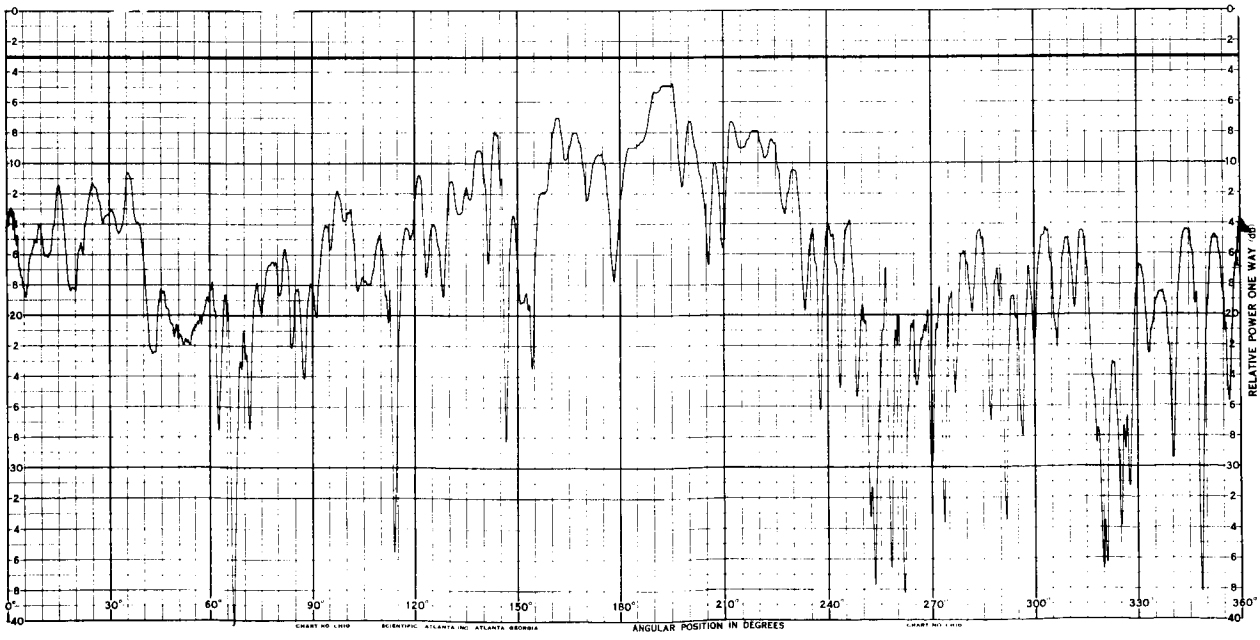
ANTENNA RADIATION PATTERN NO. 203-75

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM I



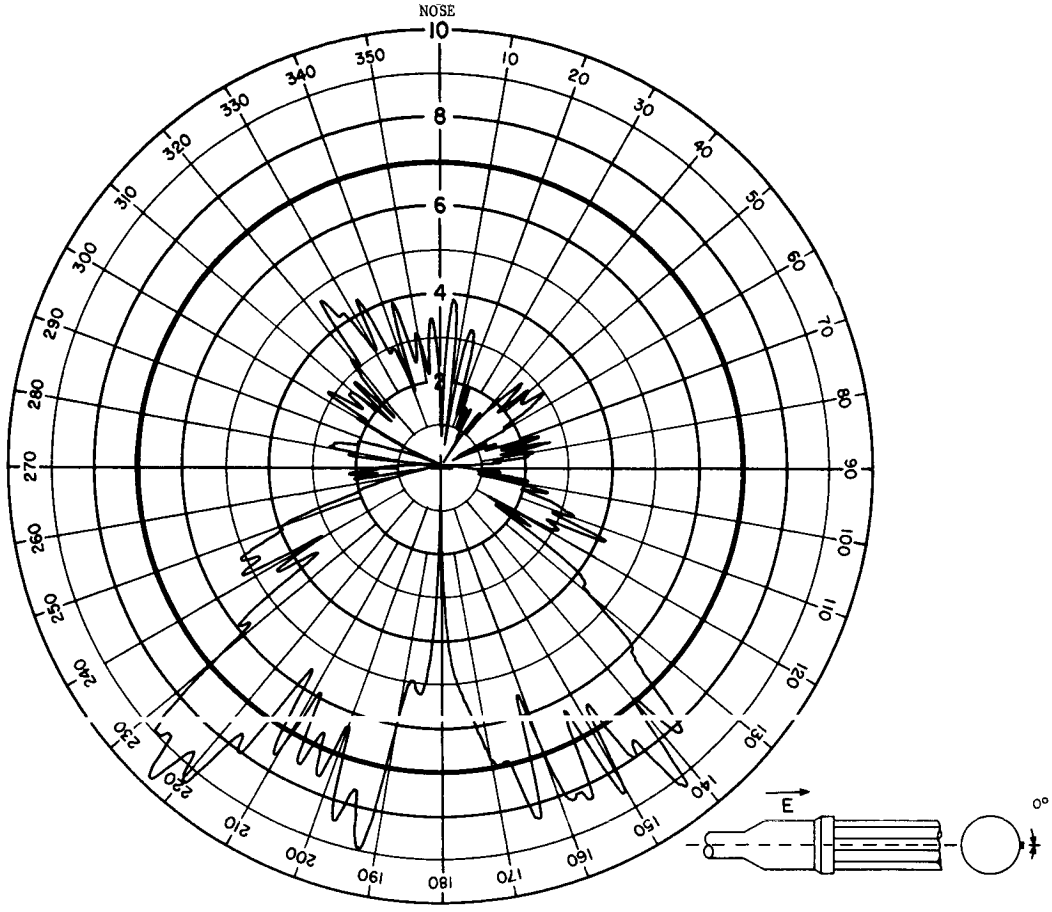


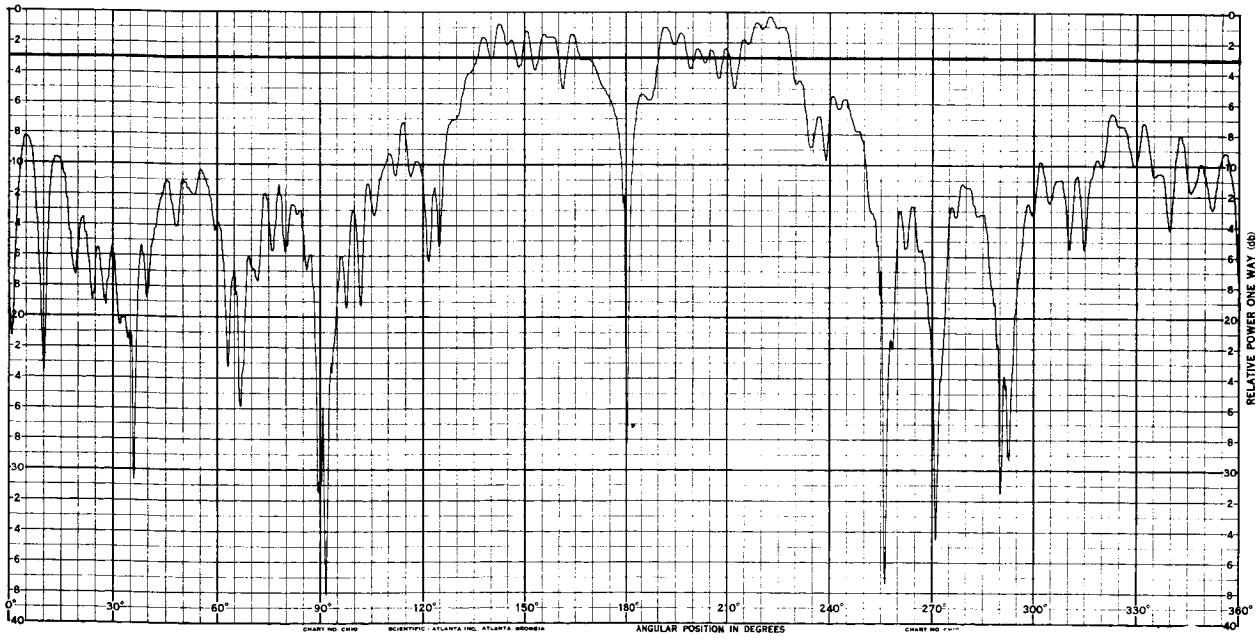
ANTENNA RADIATION PATTERN NO. 203-76

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



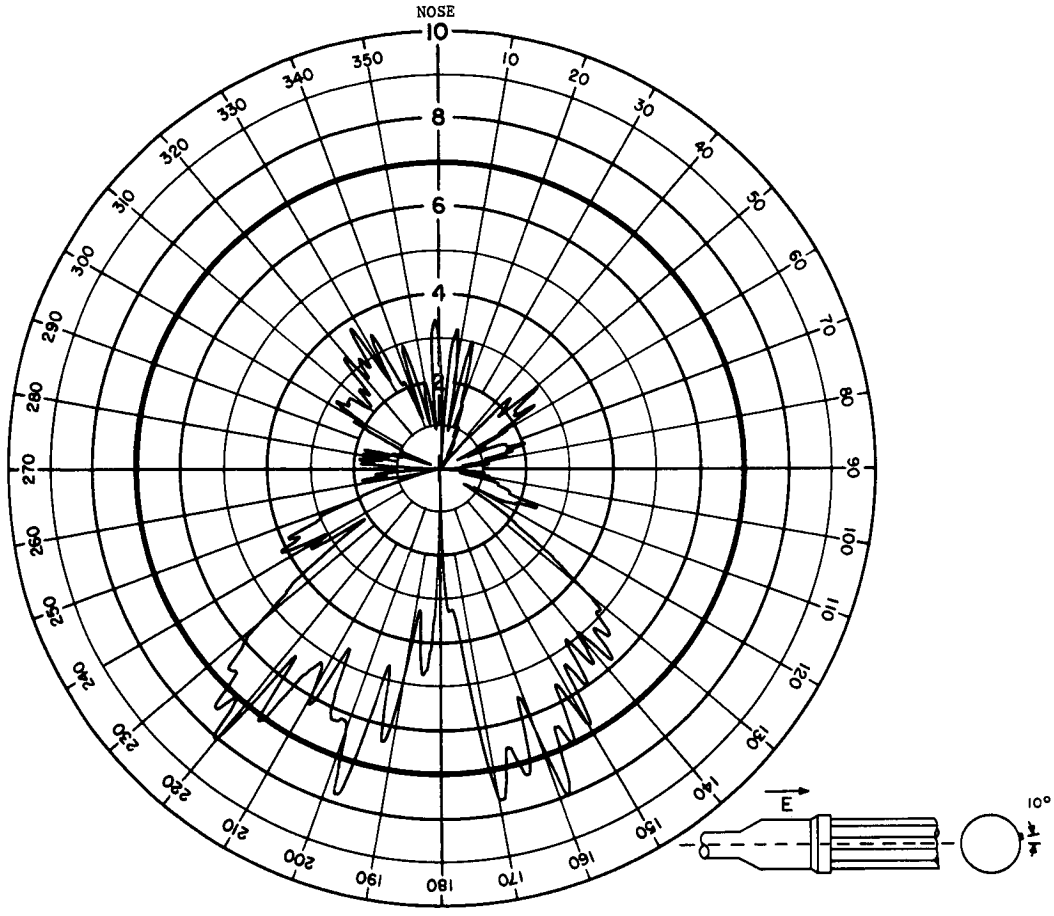


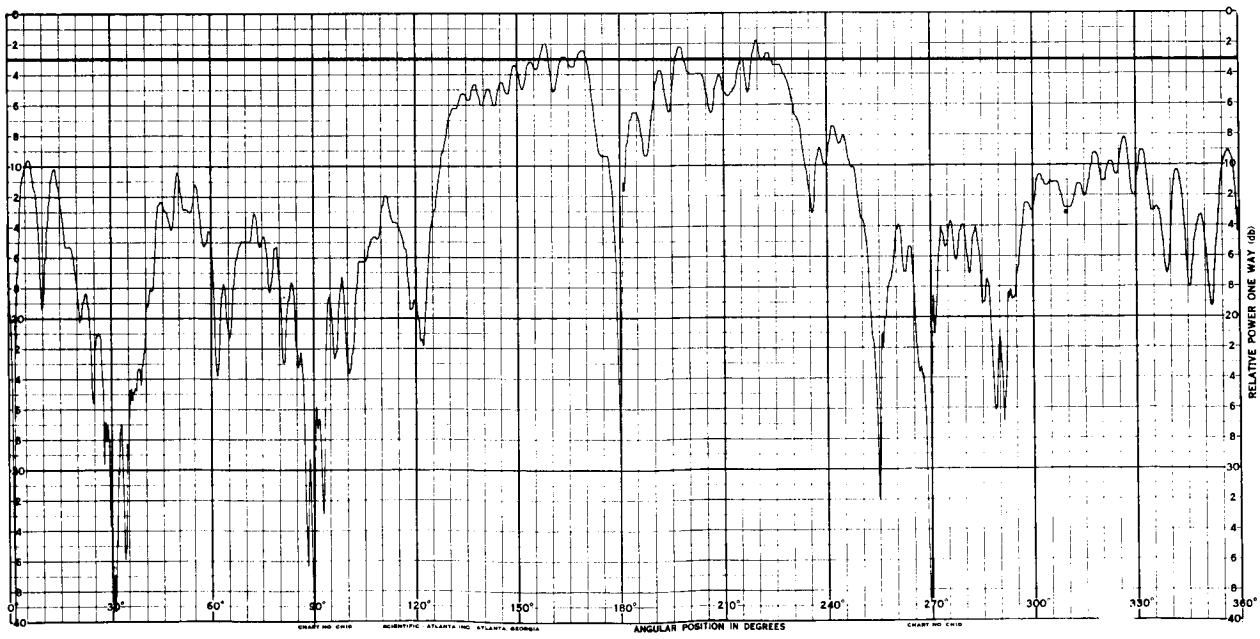
ANTENNA RADIATION PATTERN NO. 204-1

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II

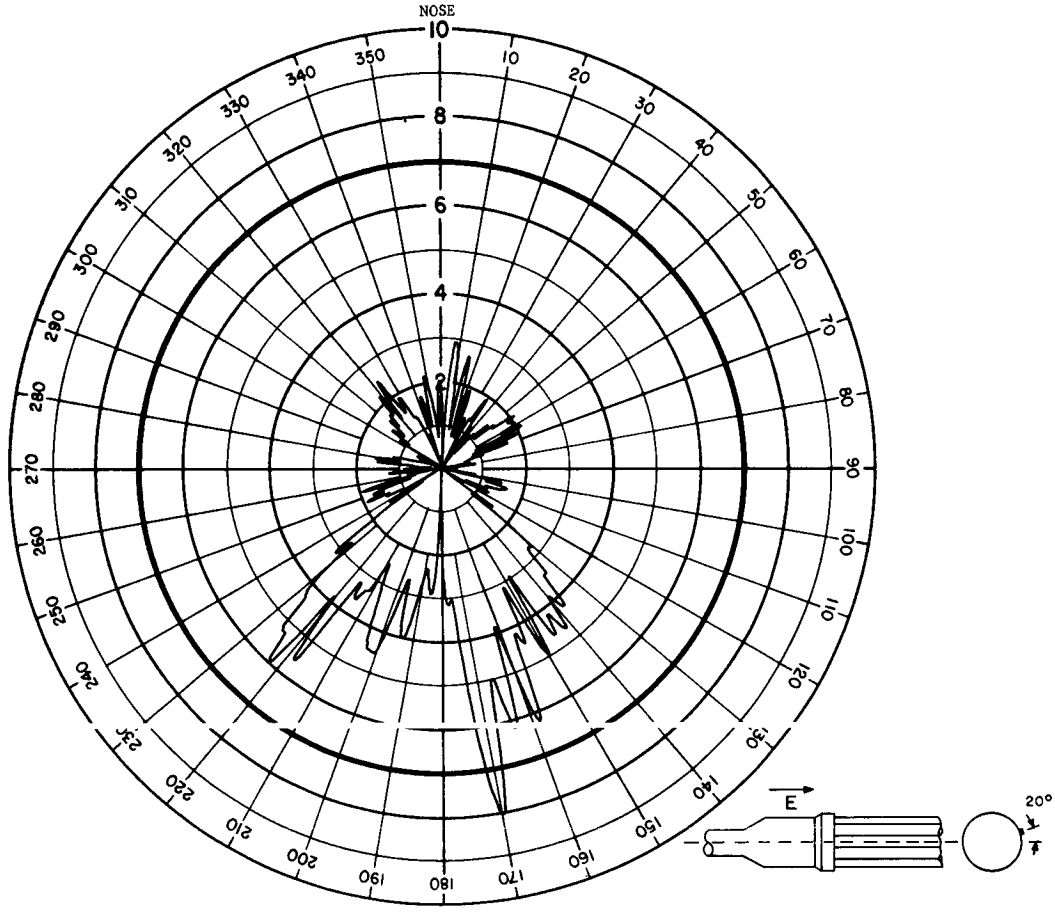


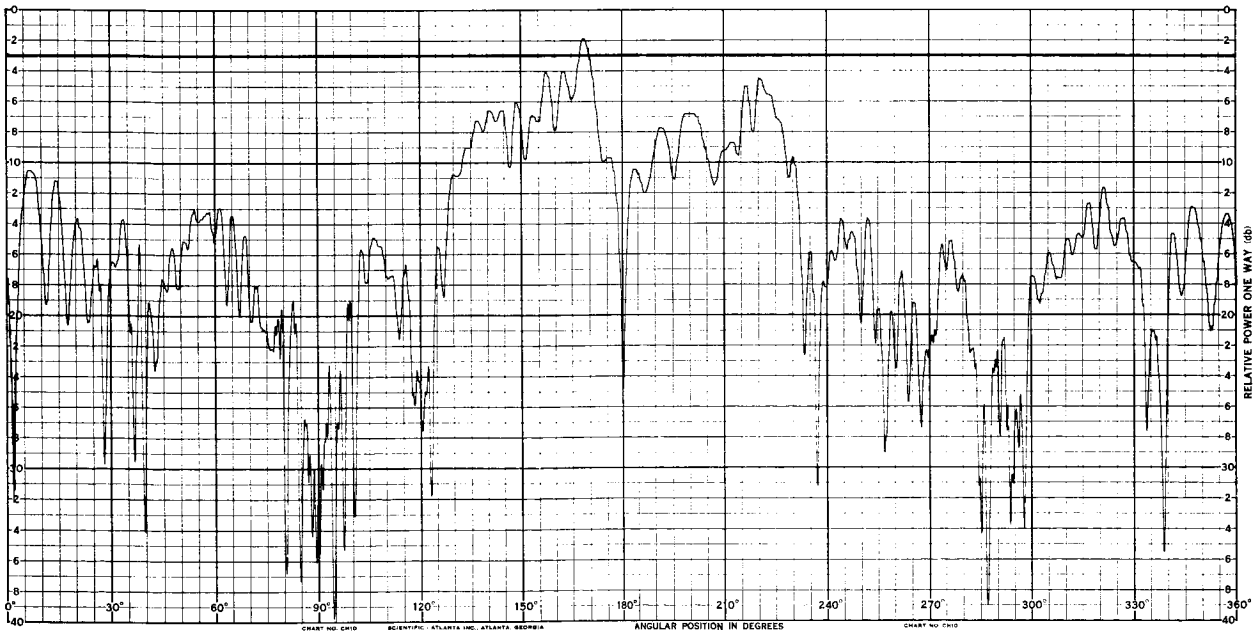


ANTENNA RADIATION PATTERN NO. 204-2

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



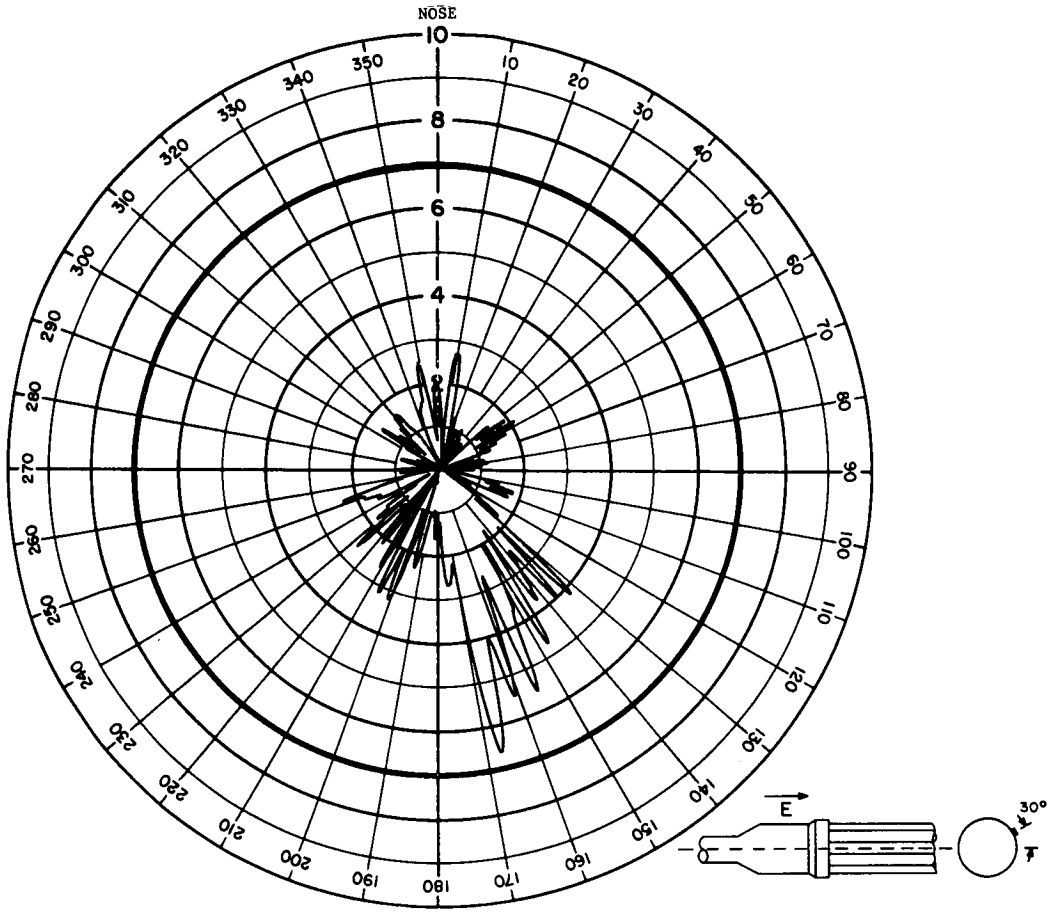


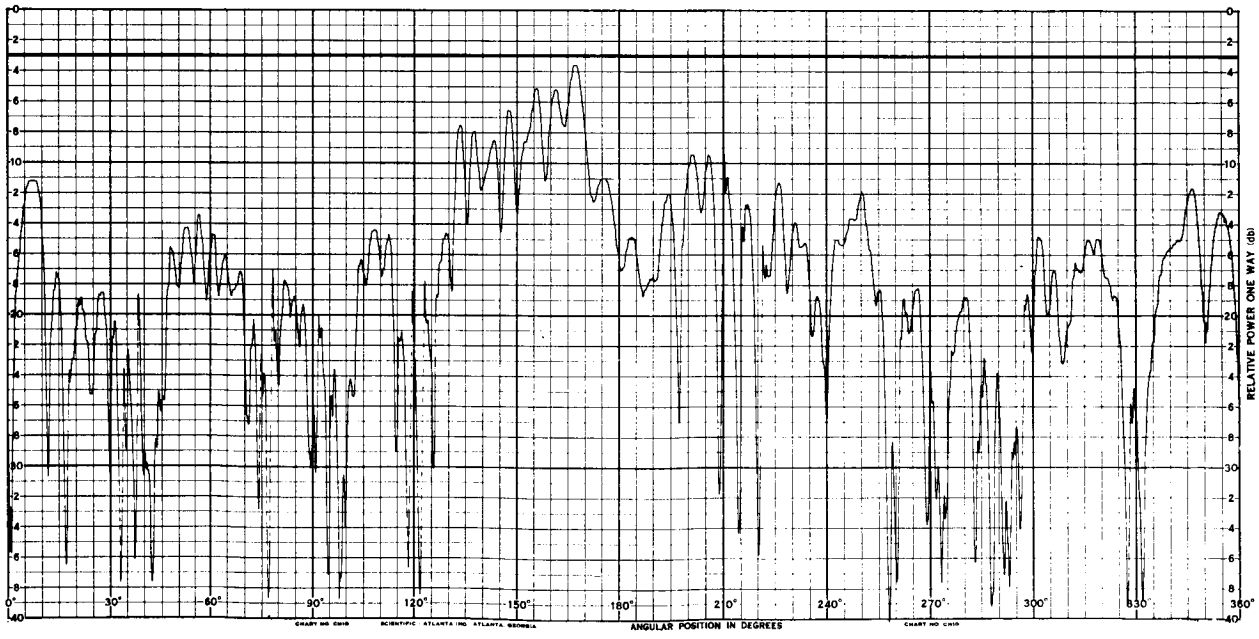
ANTENNA RADIATION PATTERN NO. 204-3

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



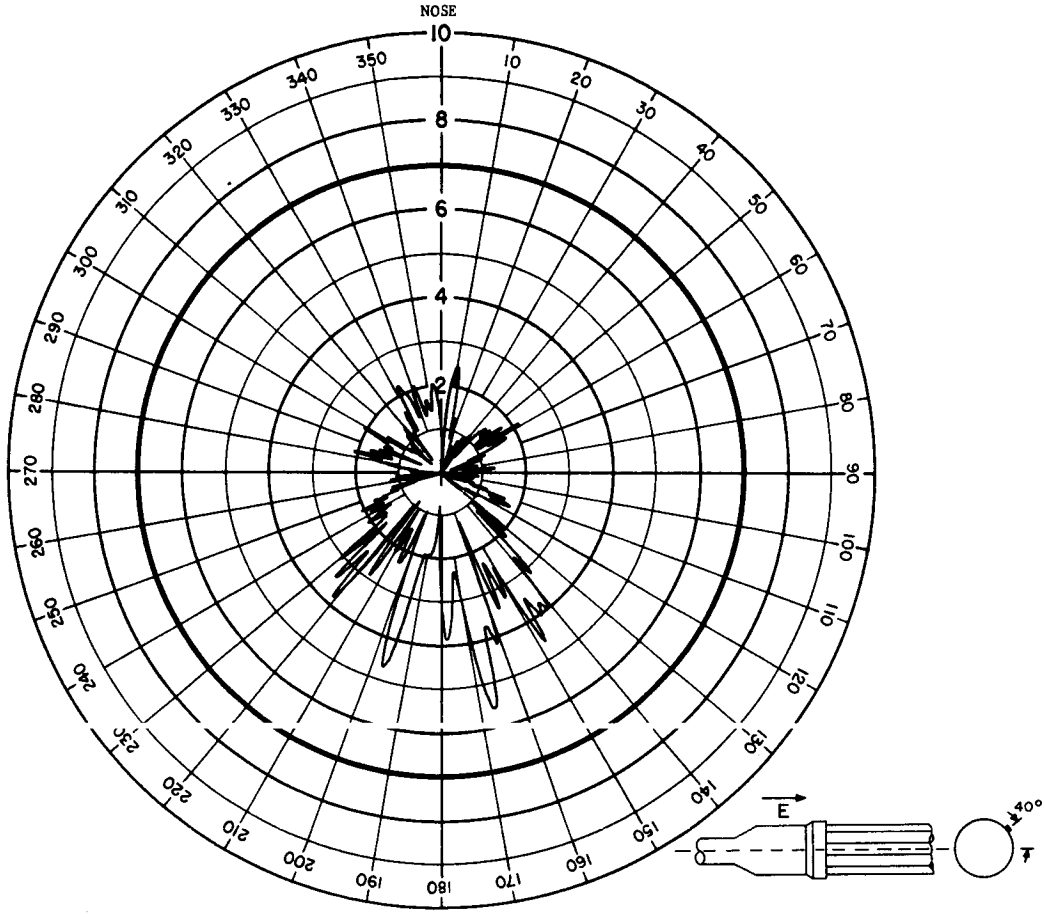


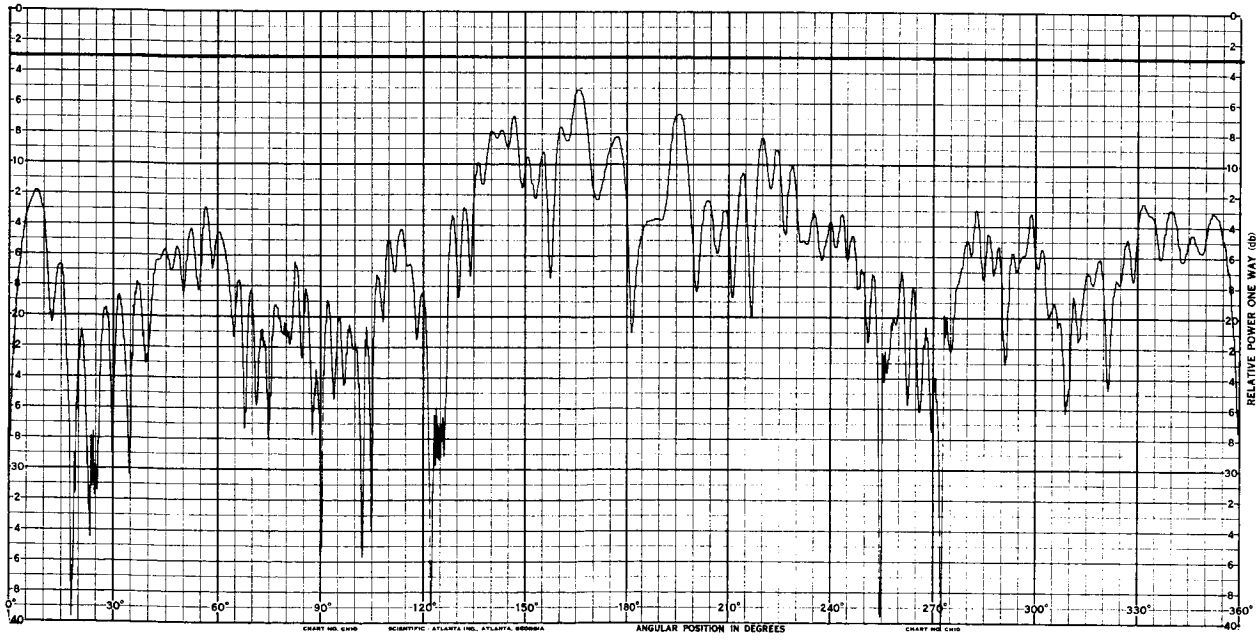
ANTENNA RADIATION PATTERN NO. 204-4

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



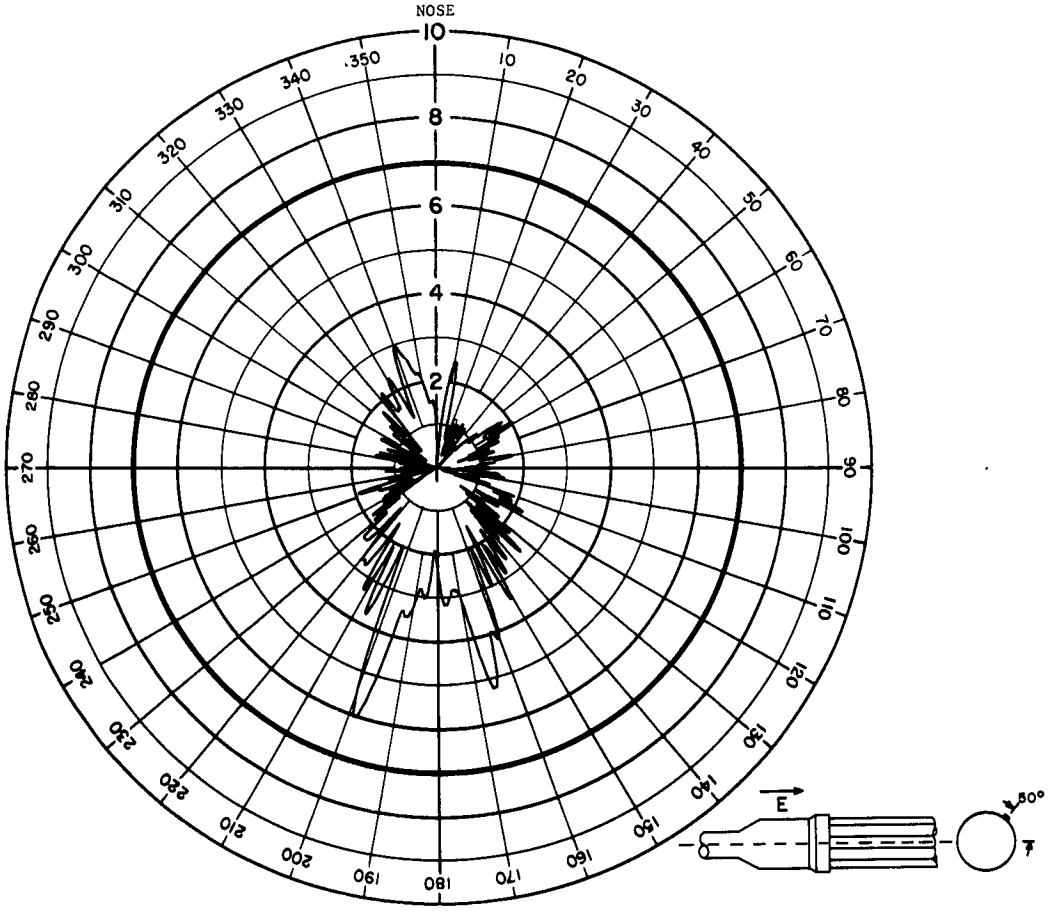


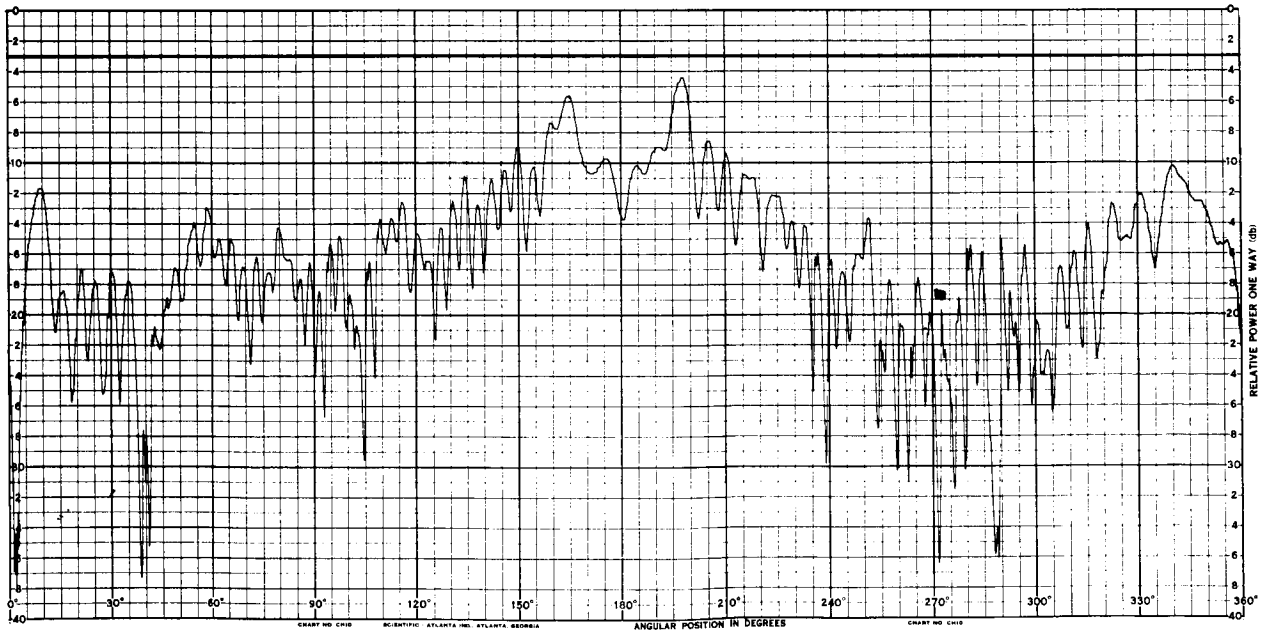
ANTENNA RADIATION PATTERN NO. 204-5

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



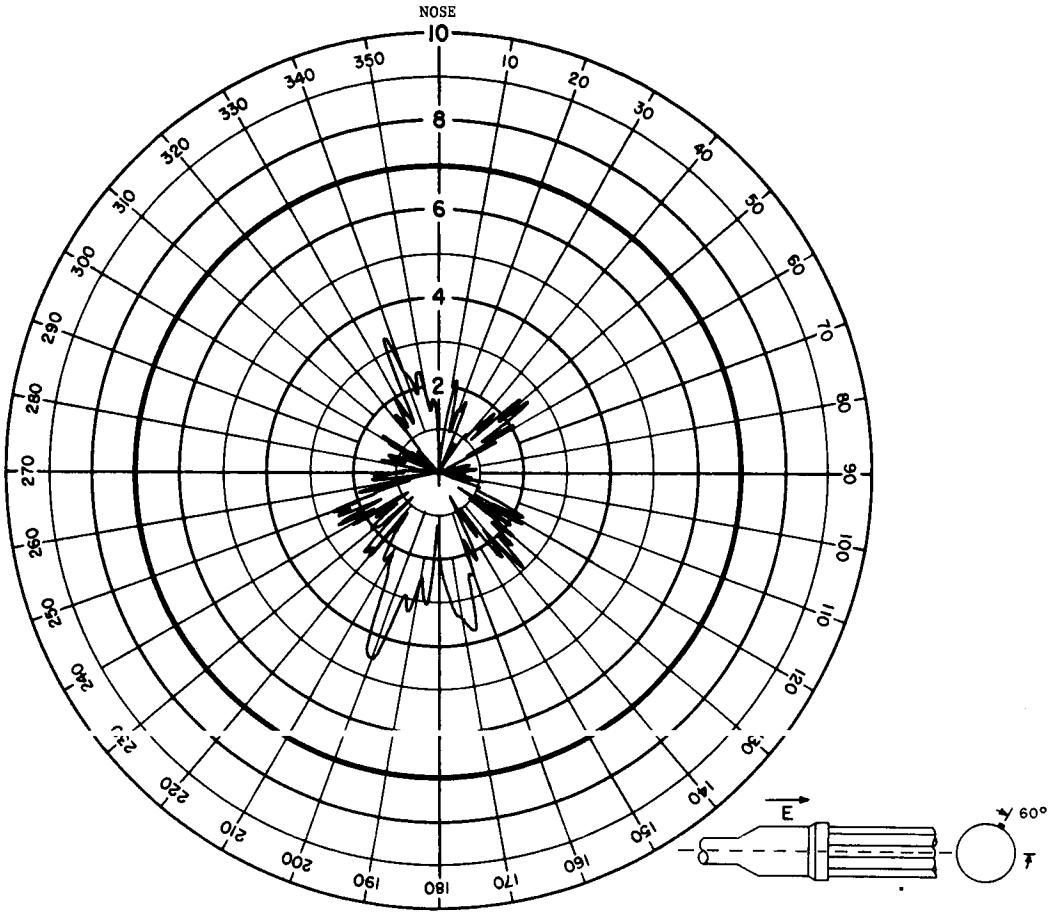


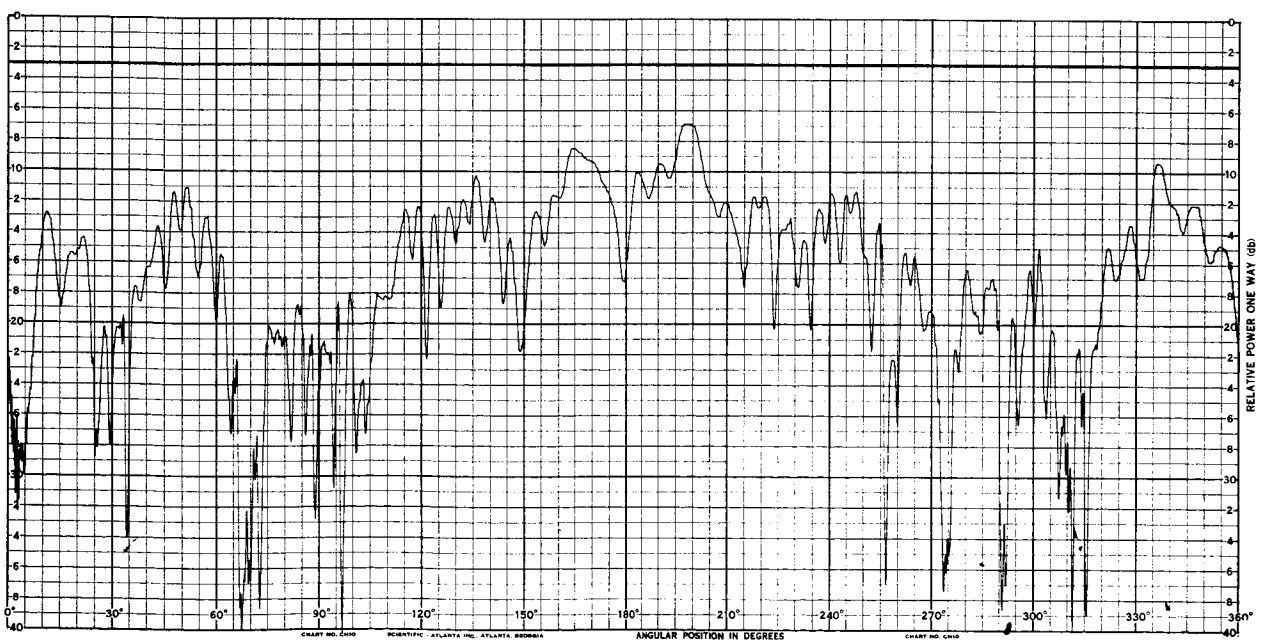
ANTENNA RADIATION PATTERN NO. 204-6

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



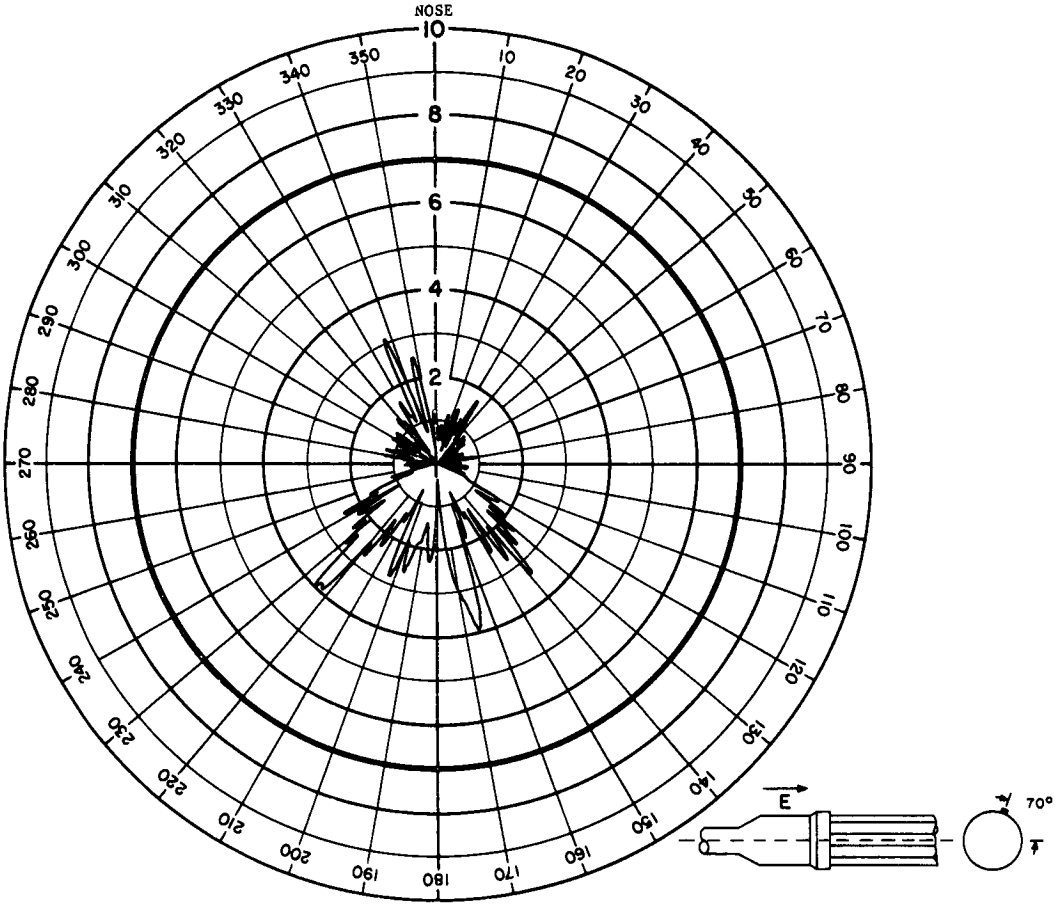


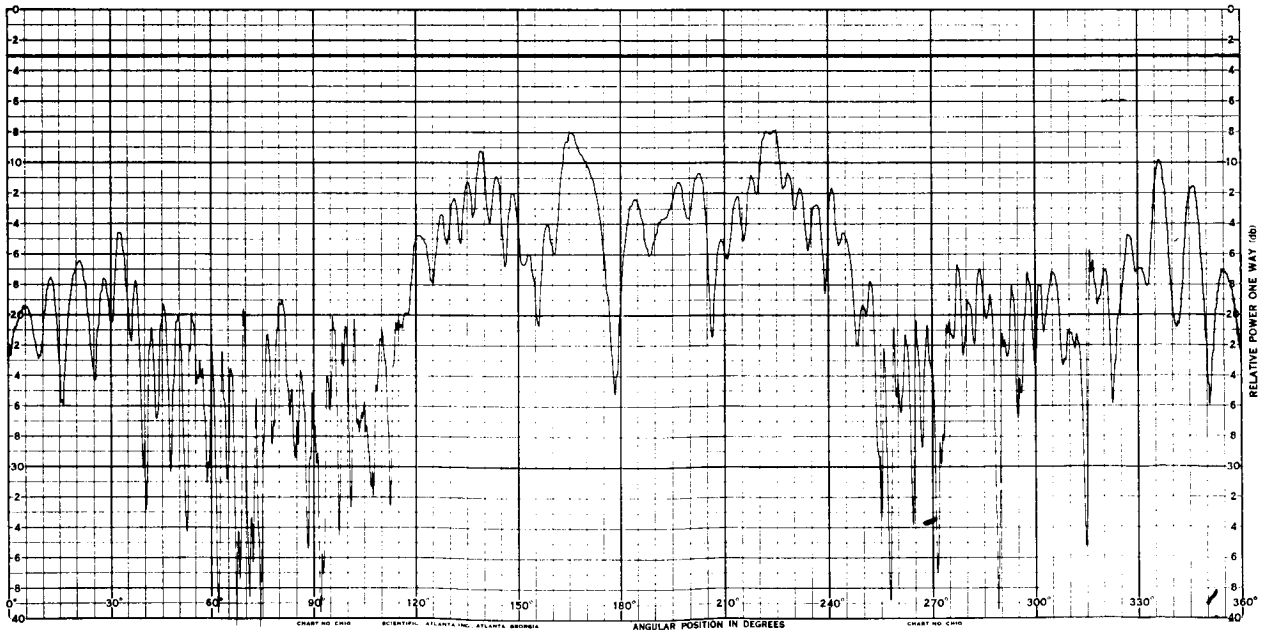
ANTENNA RADIATION PATTERN NO. 204-7

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



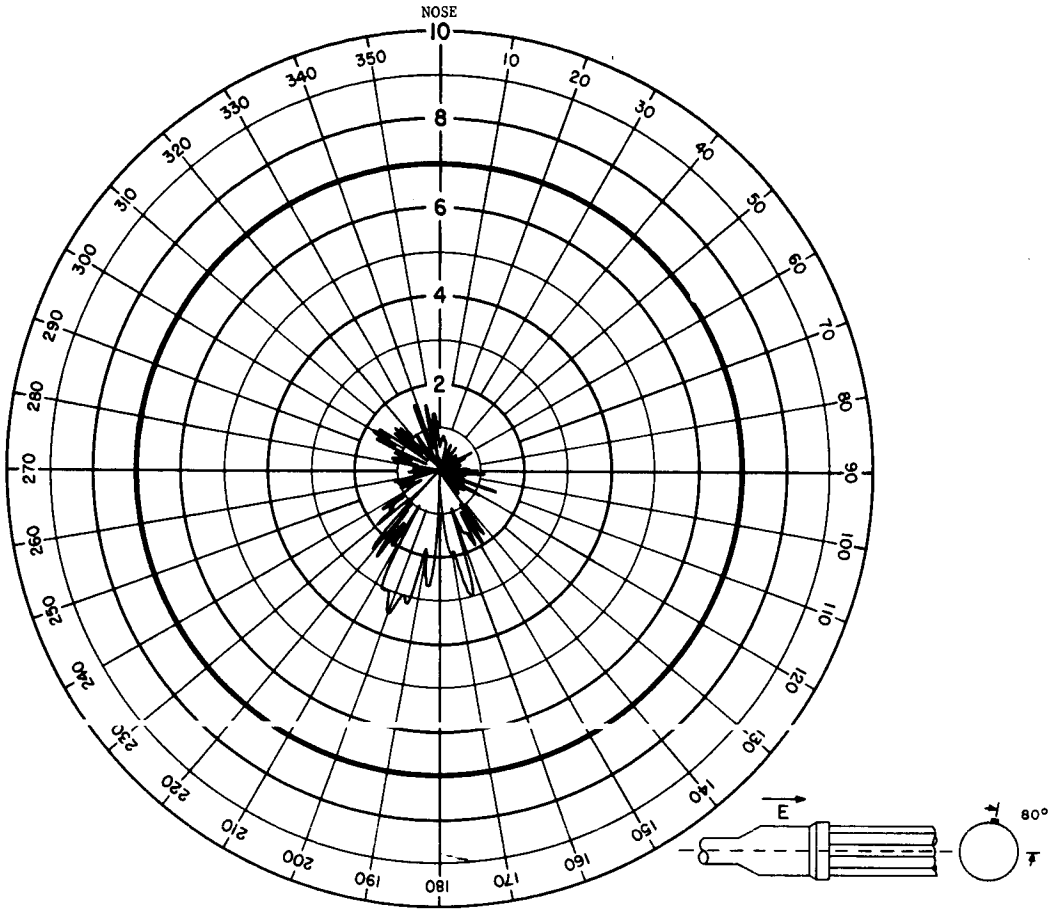


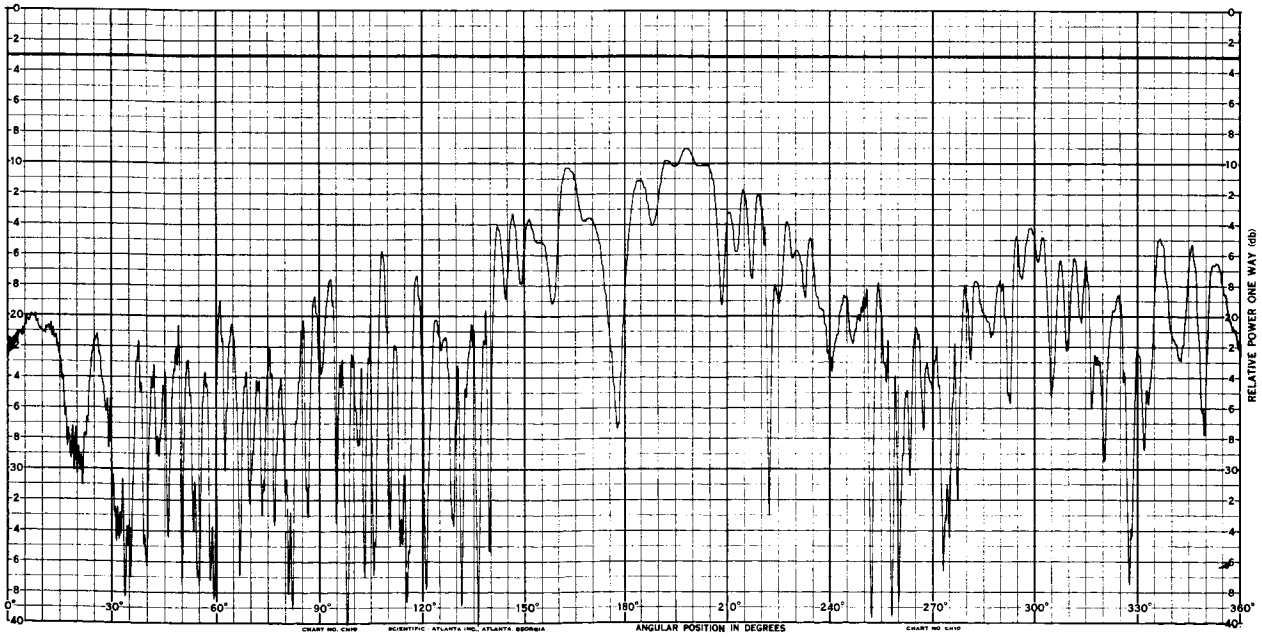
ANTENNA RADIATION PATTERN NO. 204-8

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



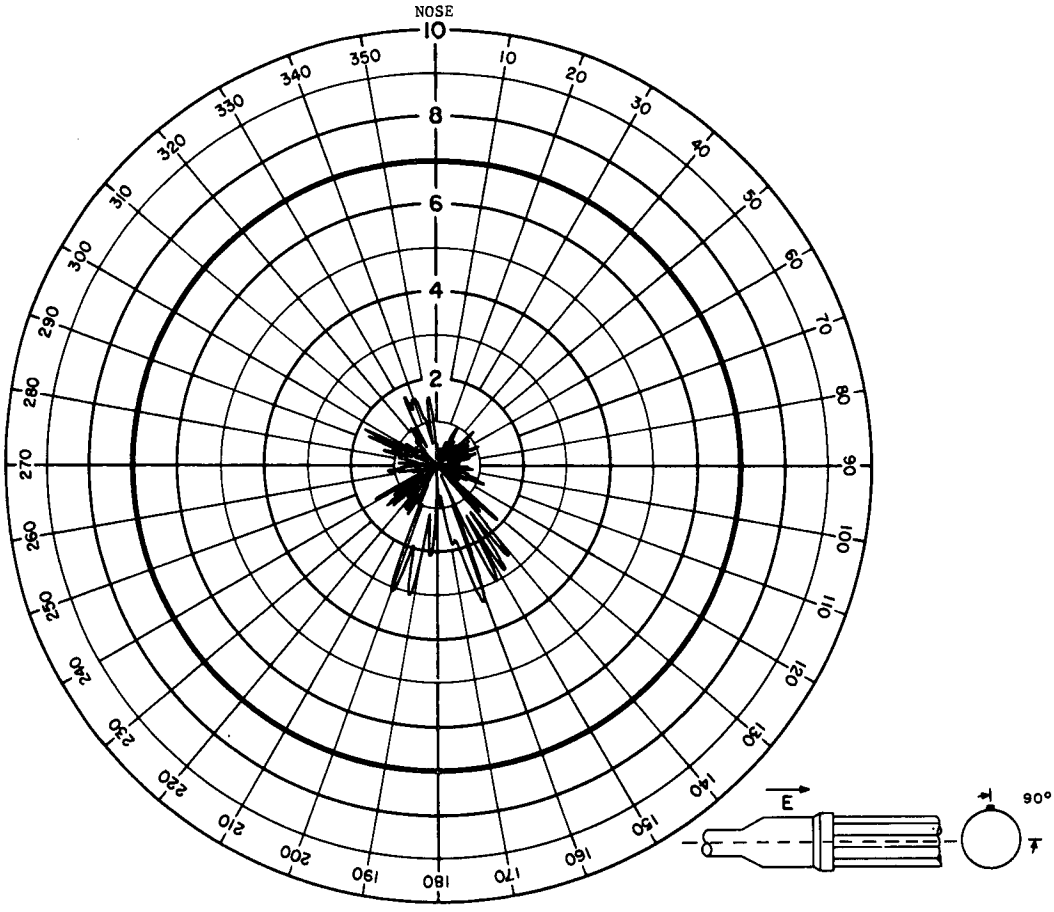


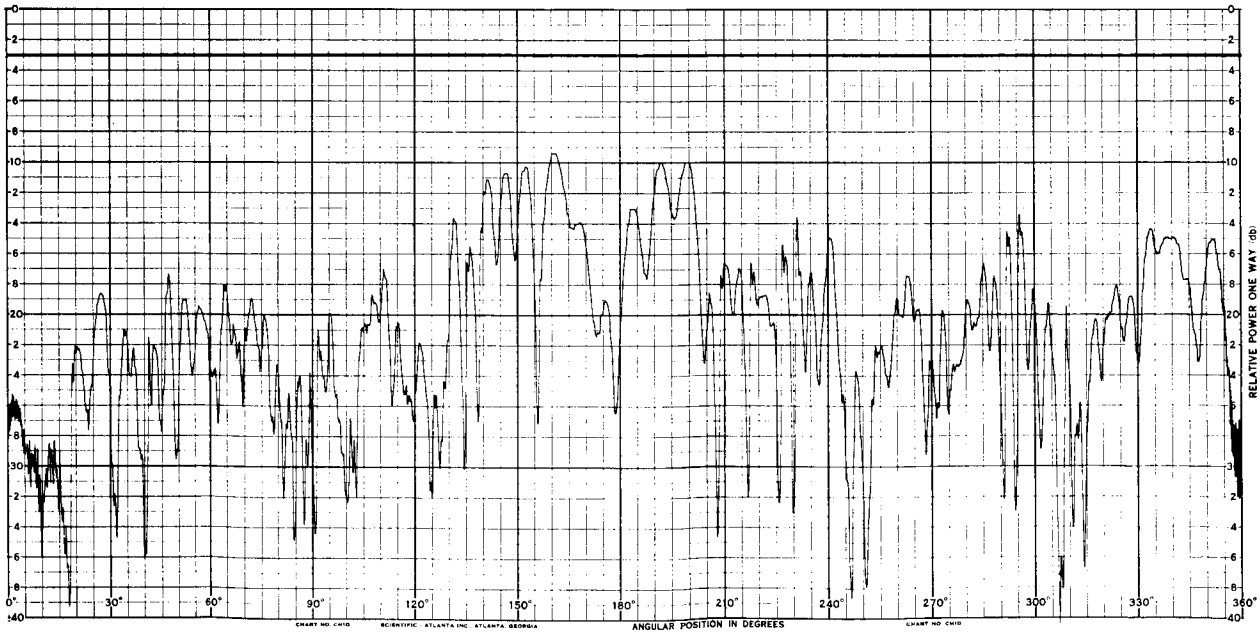
ANTENNA RADIATION PATTERN NO. 204-9

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



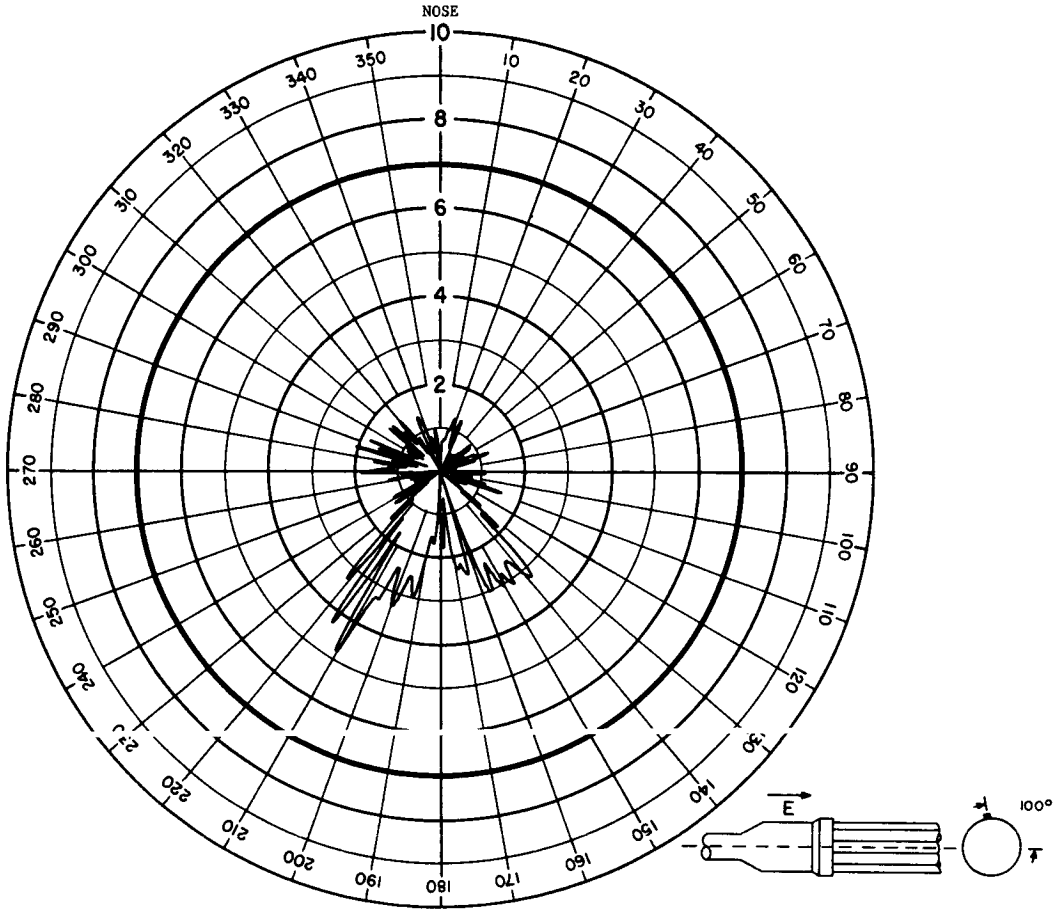


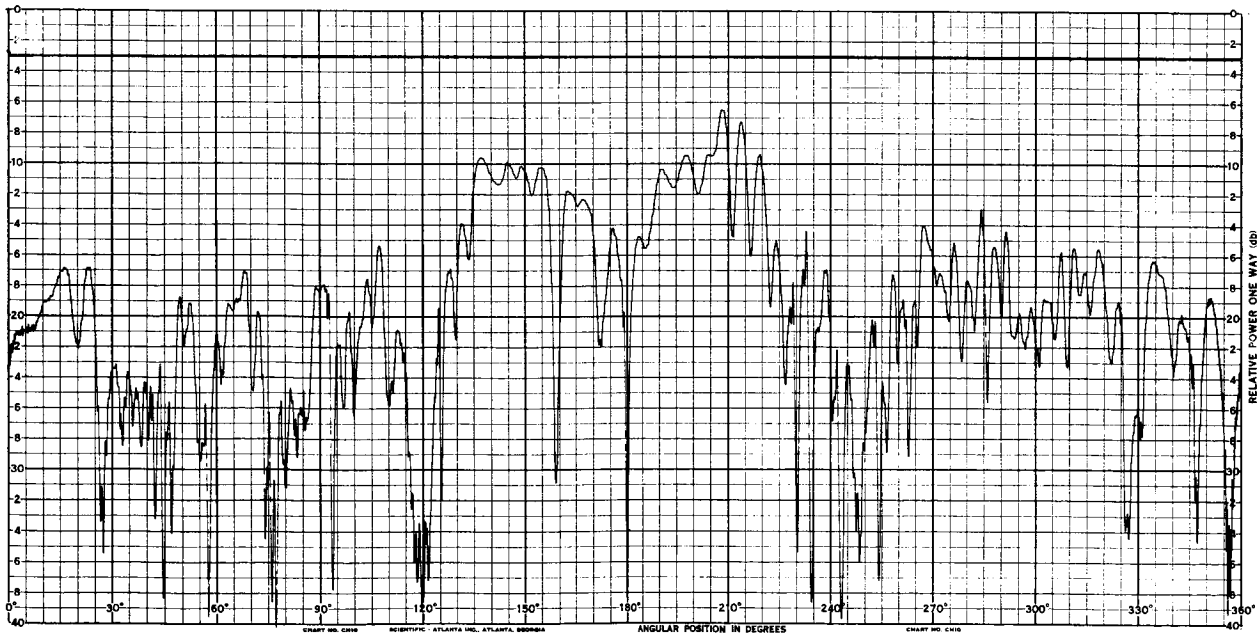
ANTENNA RADIATION PATTERN NO. 204-10

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



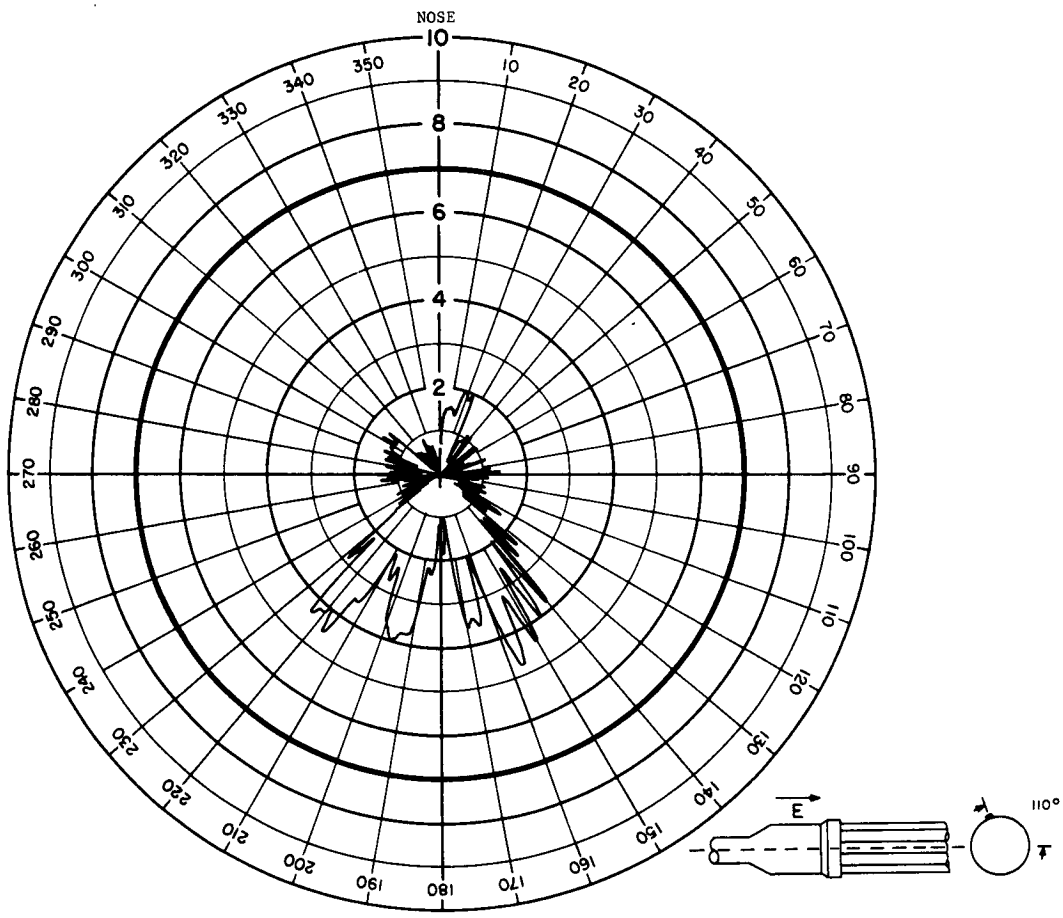


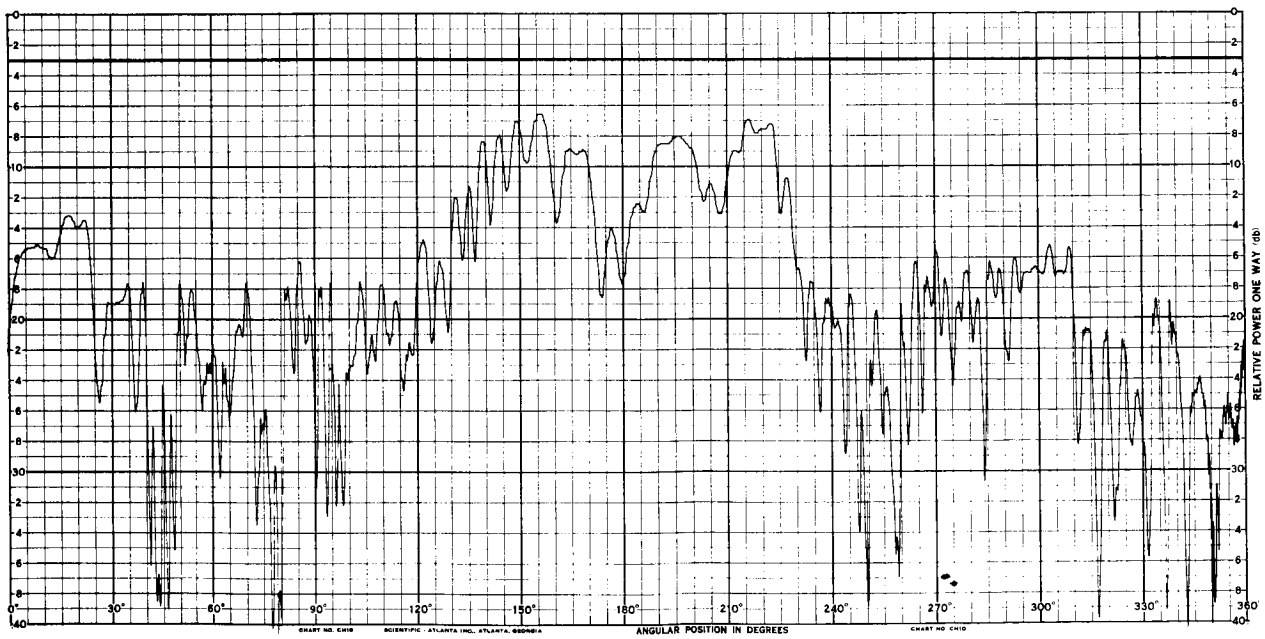
ANTENNA RADIATION PATTERN NO. 204-II

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



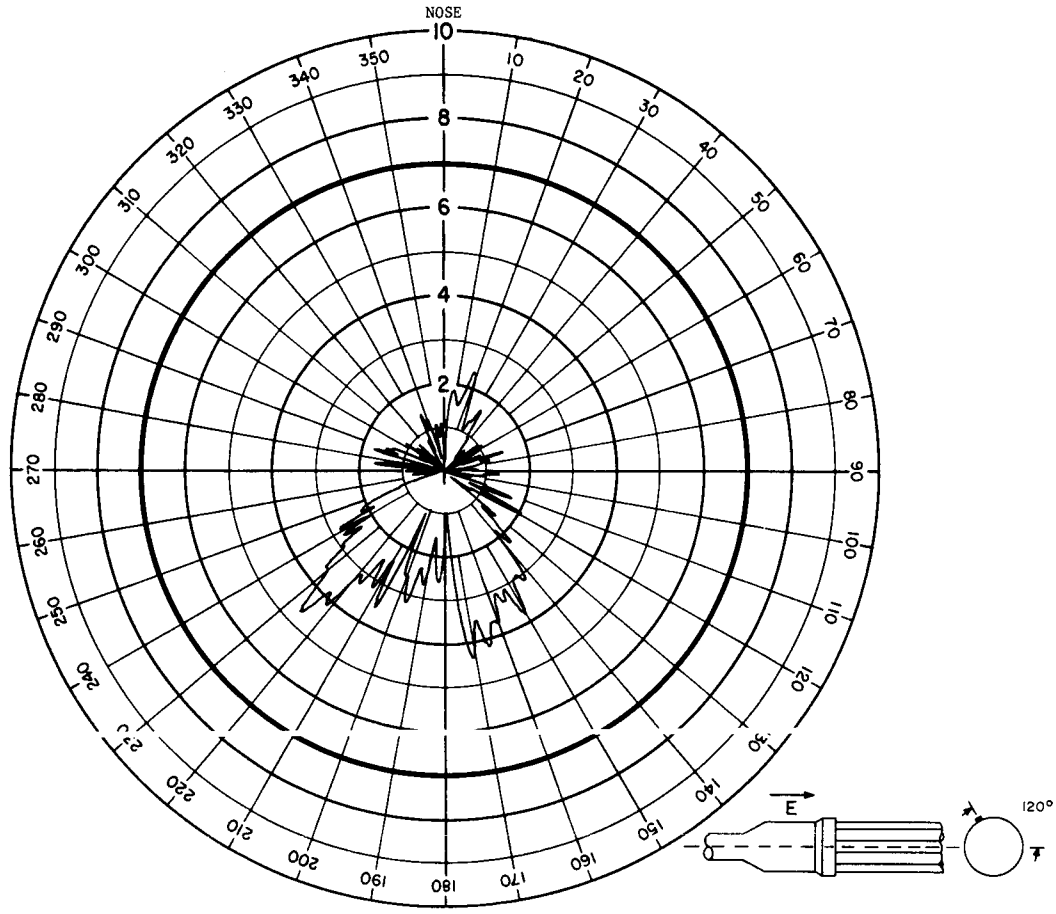


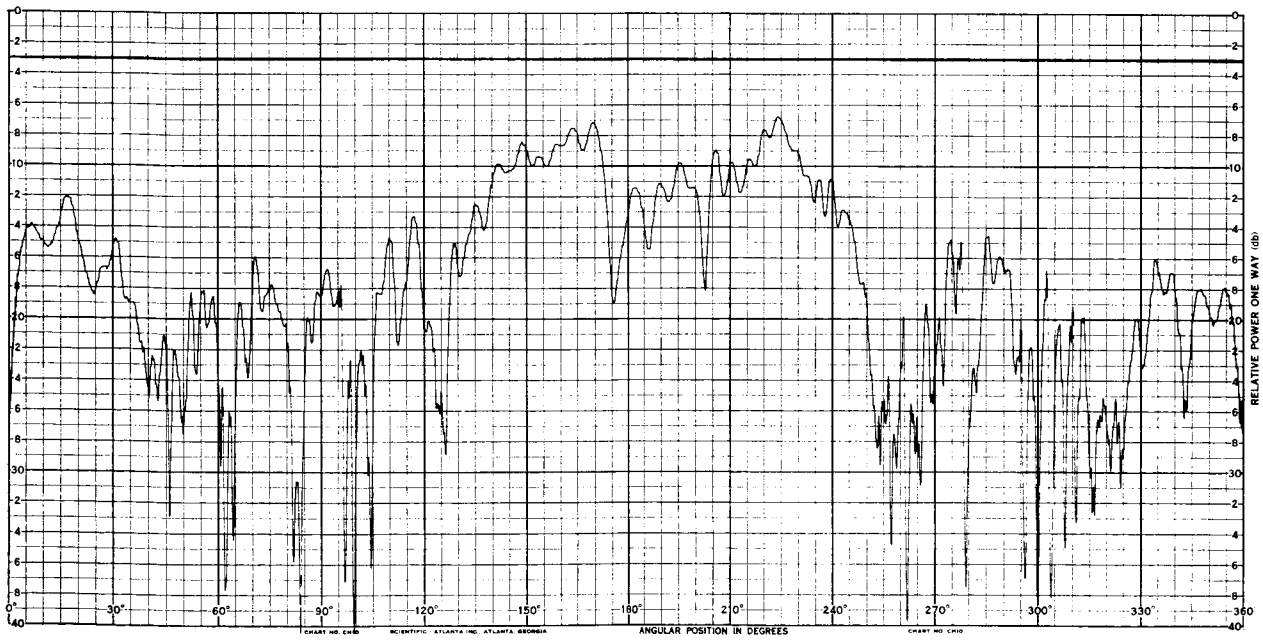
ANTENNA RADIATION PATTERN NO. 204-12

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



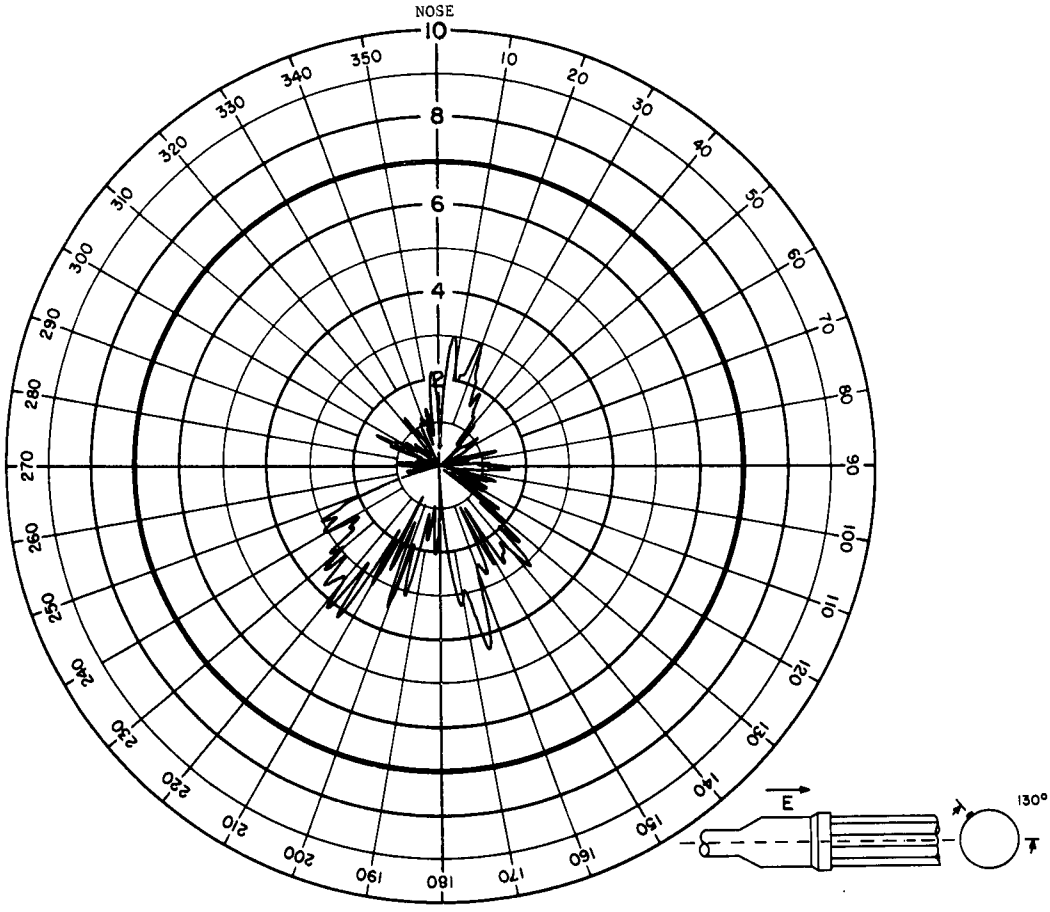


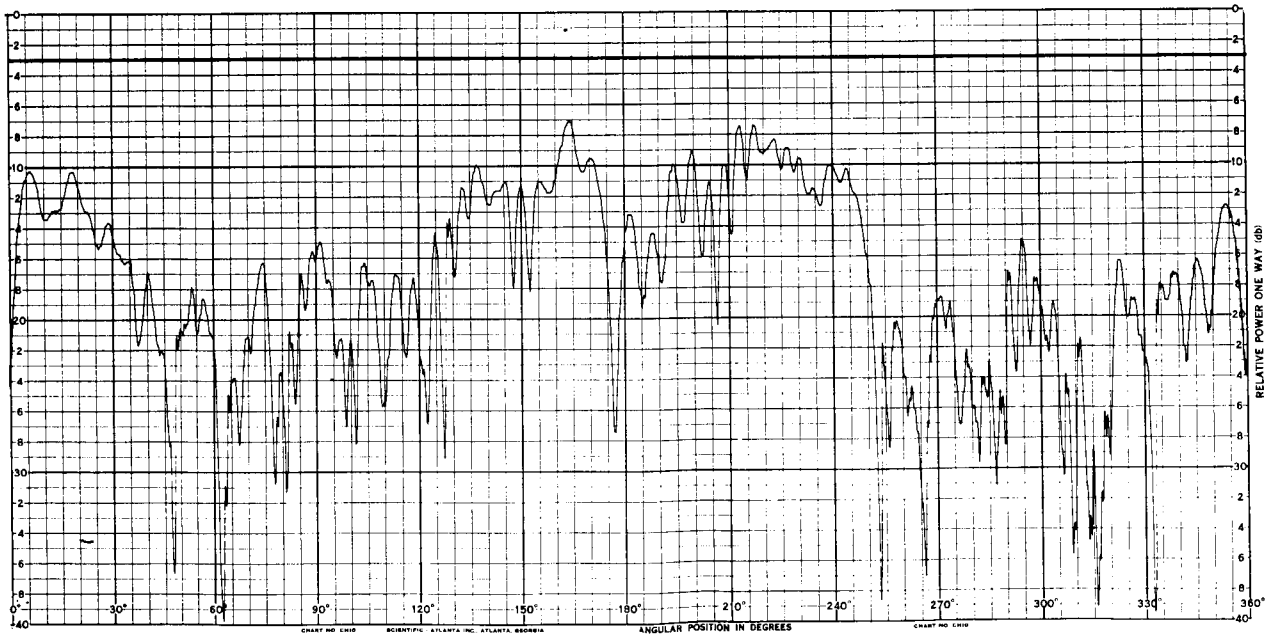
ANTENNA RADIATION PATTERN NO. 204-13

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



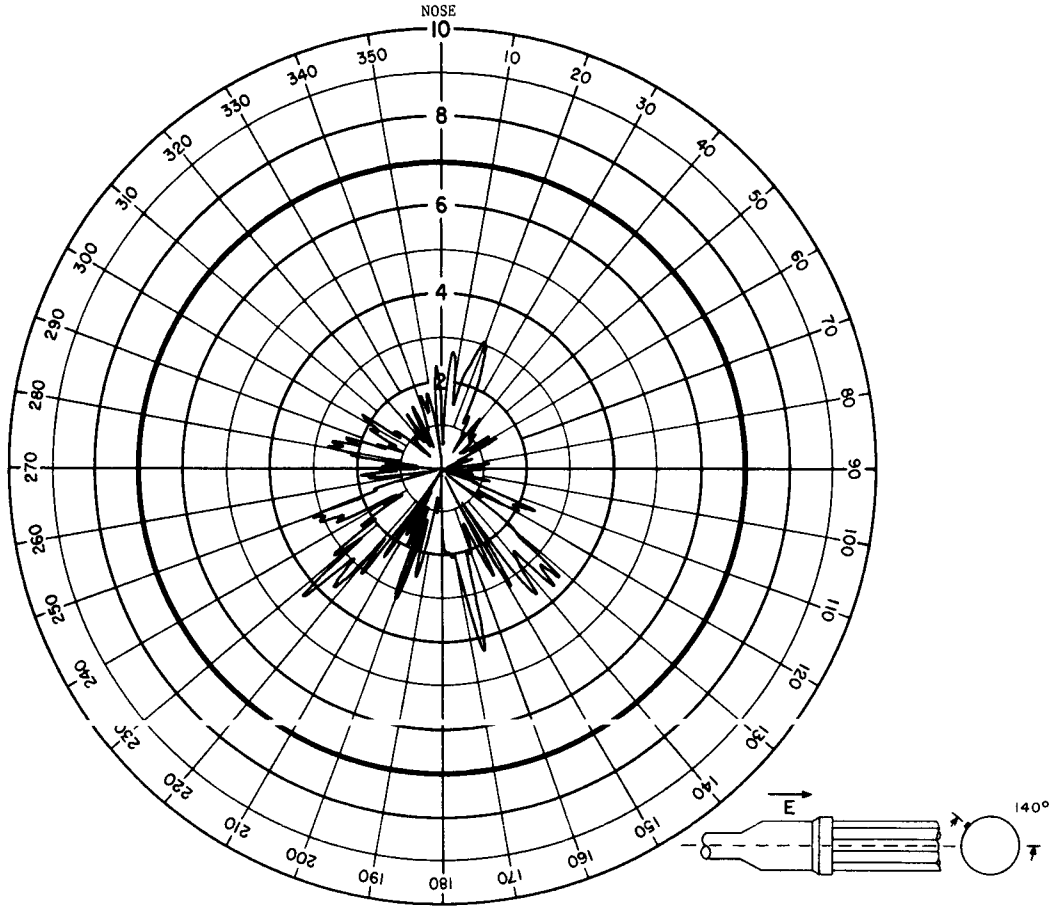


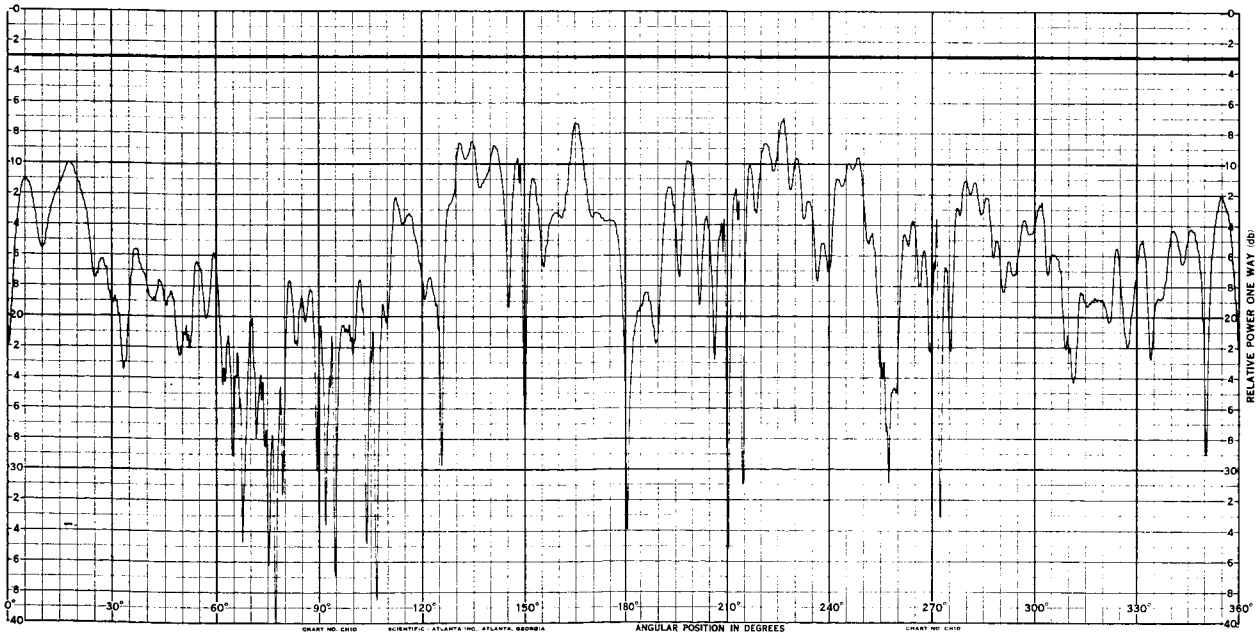
ANTENNA RADIATION PATTERN NO. 204-14

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



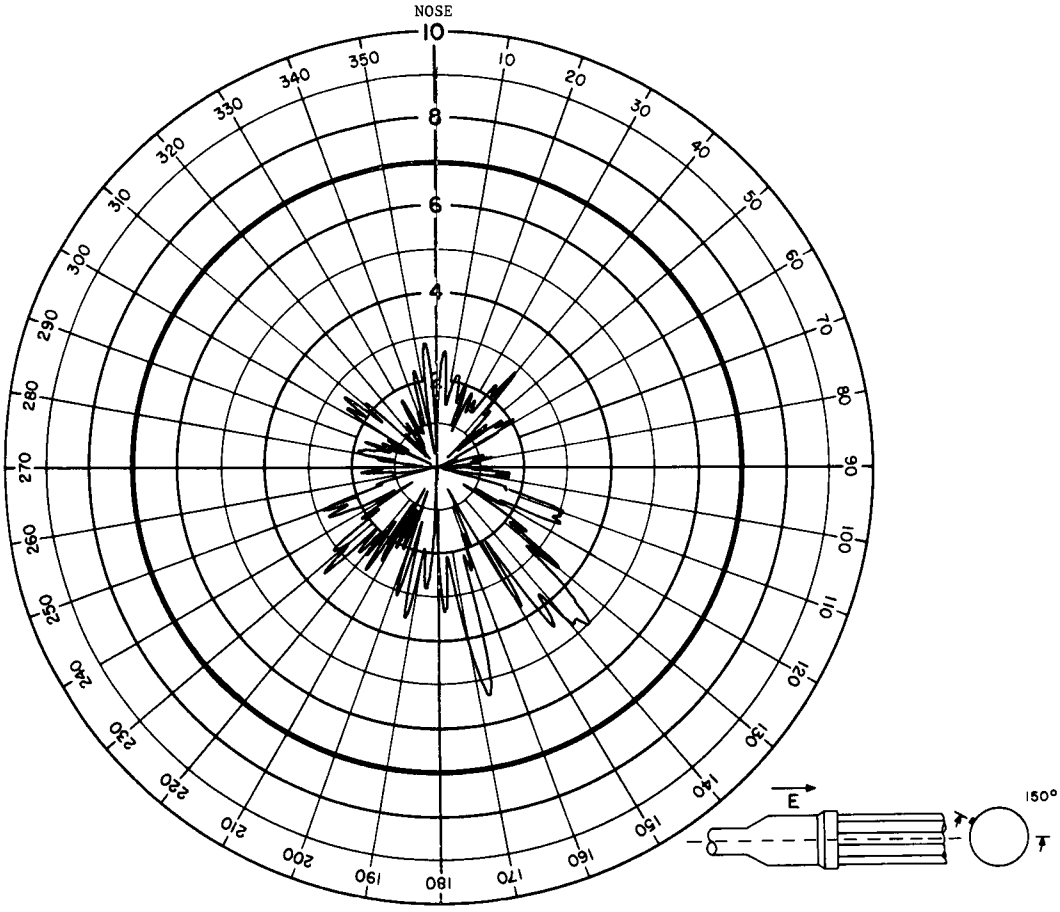


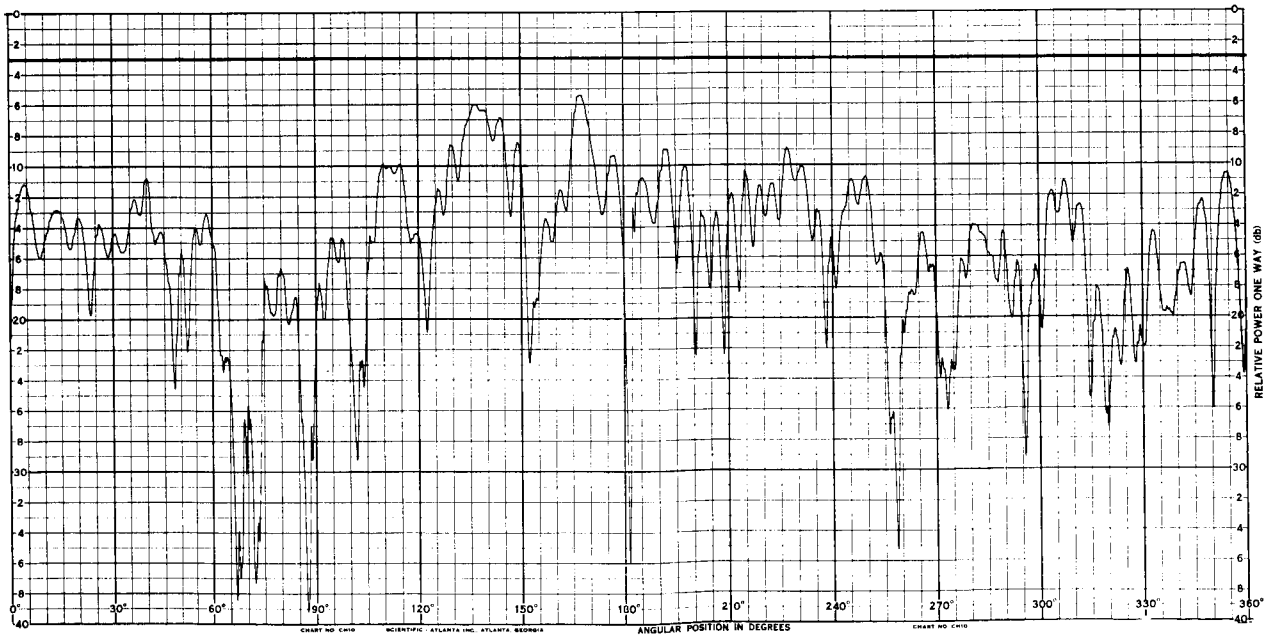
ANTENNA RADIATION PATTERN NO. 204-15

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



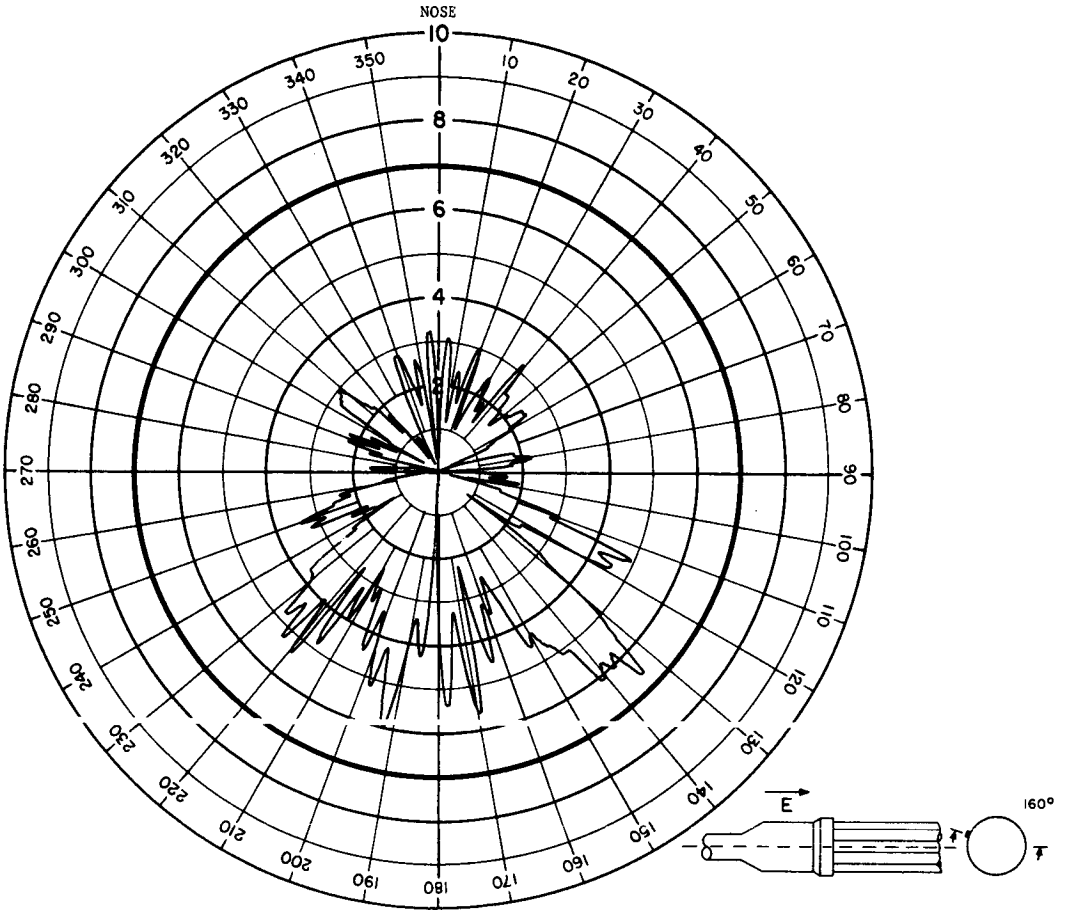


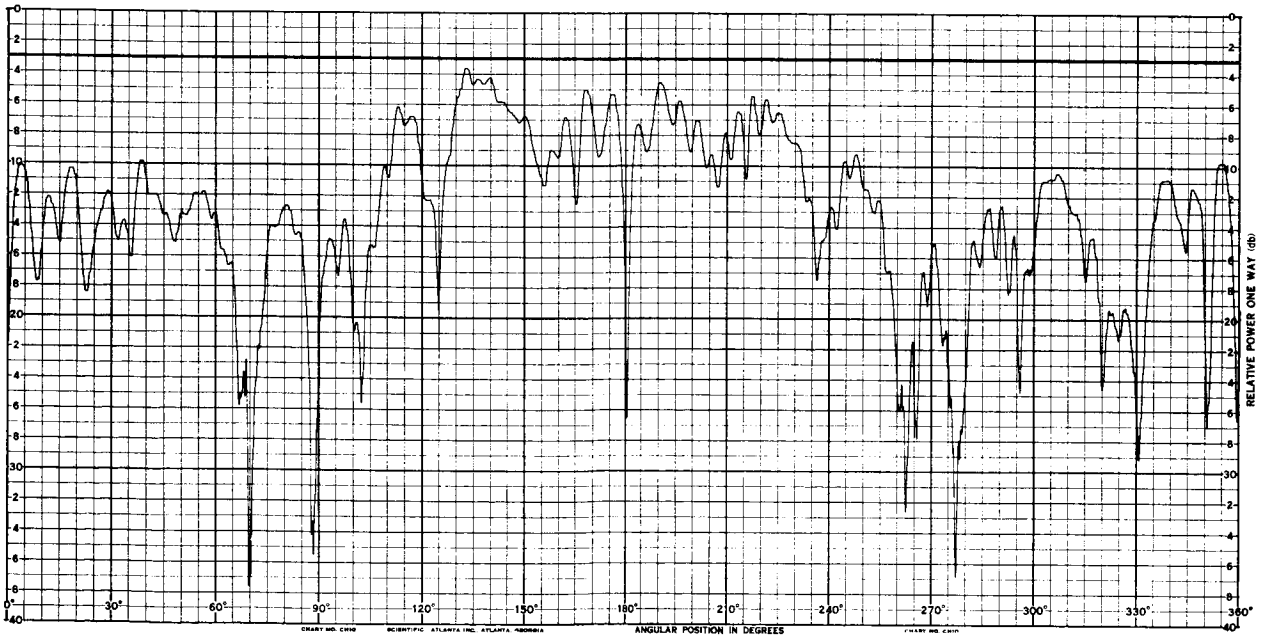
ANTENNA RADIATION PATTERN NO. 204-16

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



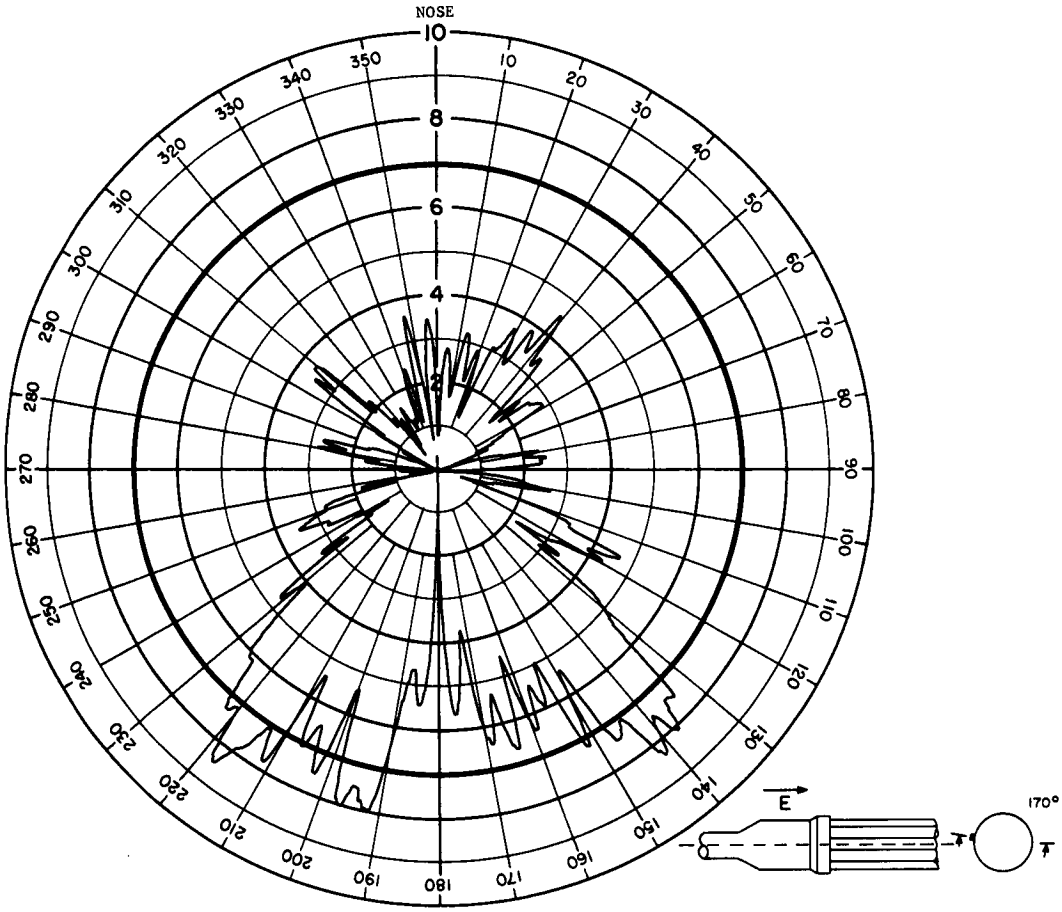


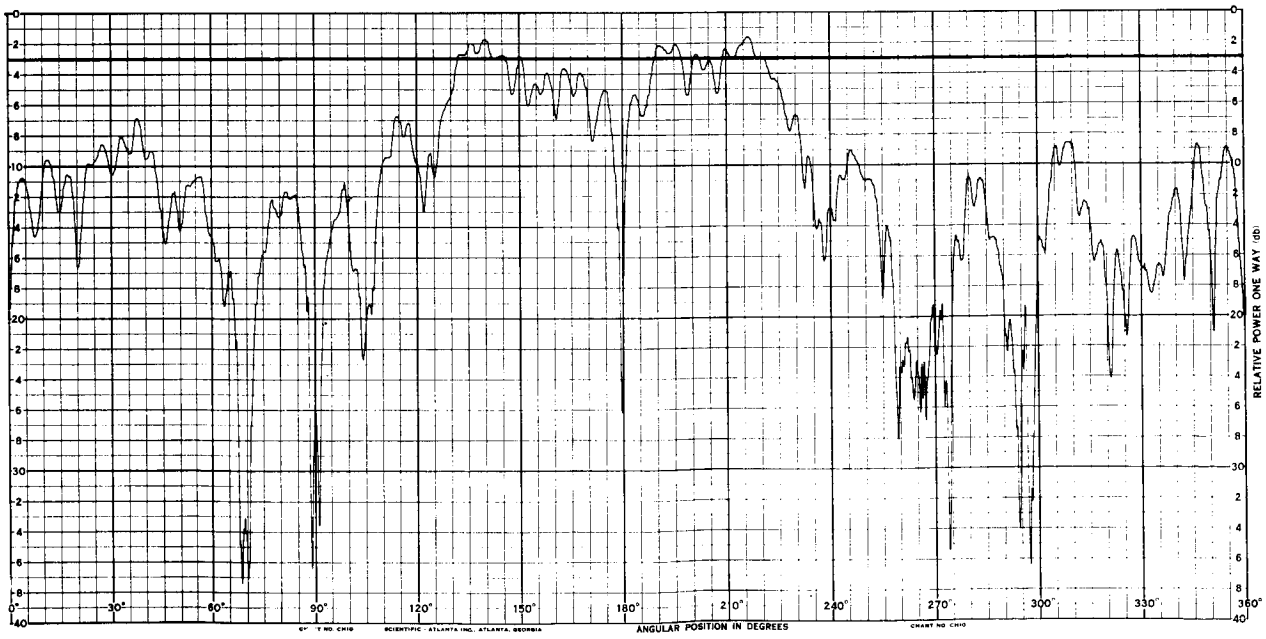
ANTENNA RADIATION PATTERN NO. 204-17

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



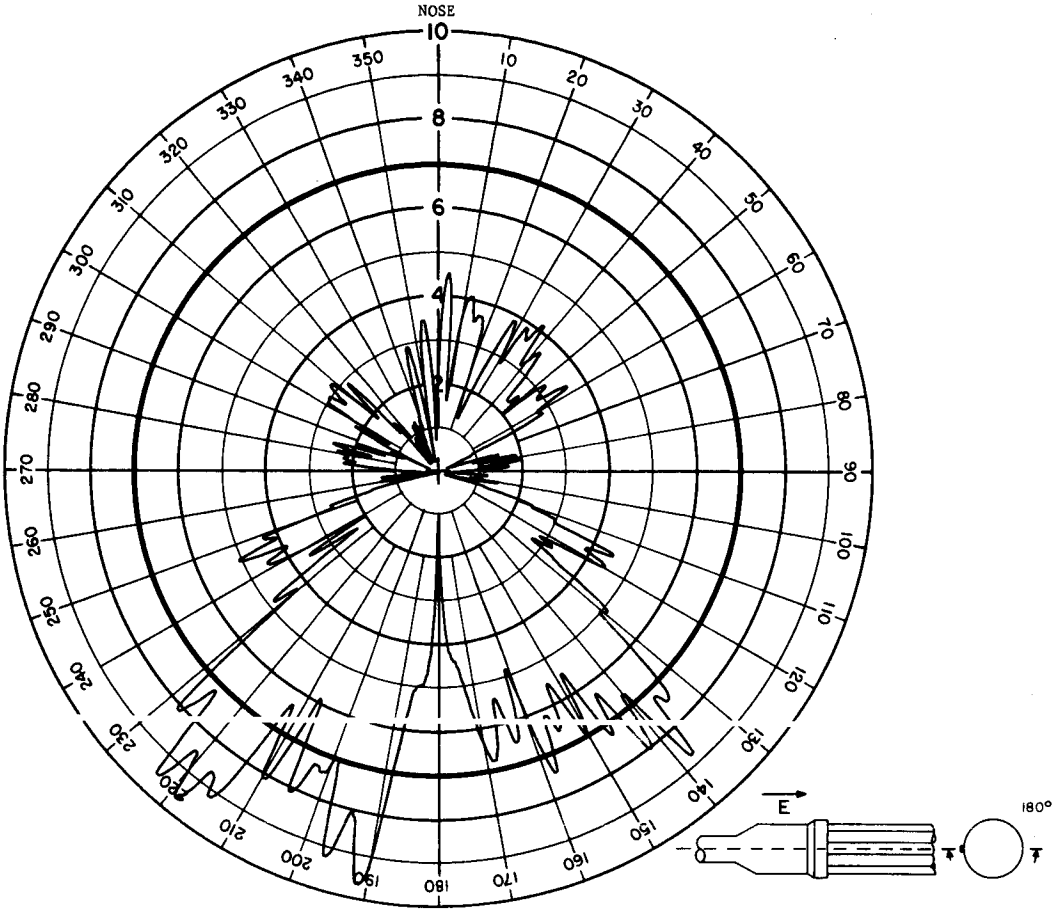


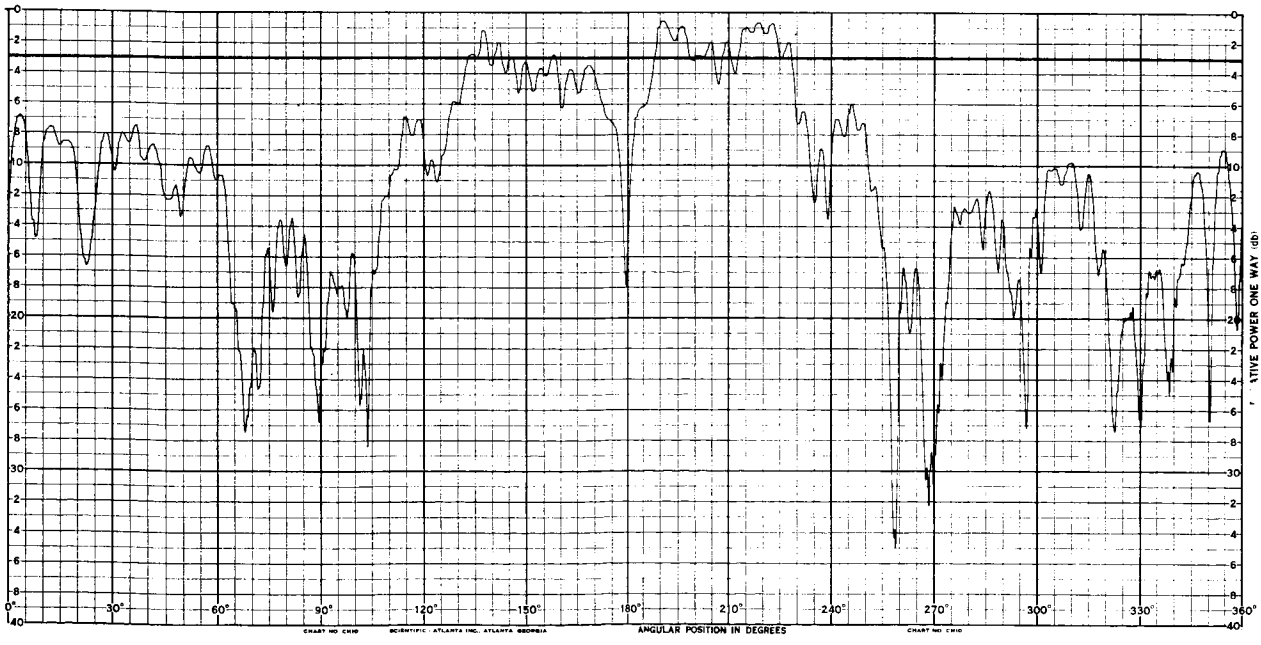
ANTENNA RADIATION PATTERN NO. 204-18

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



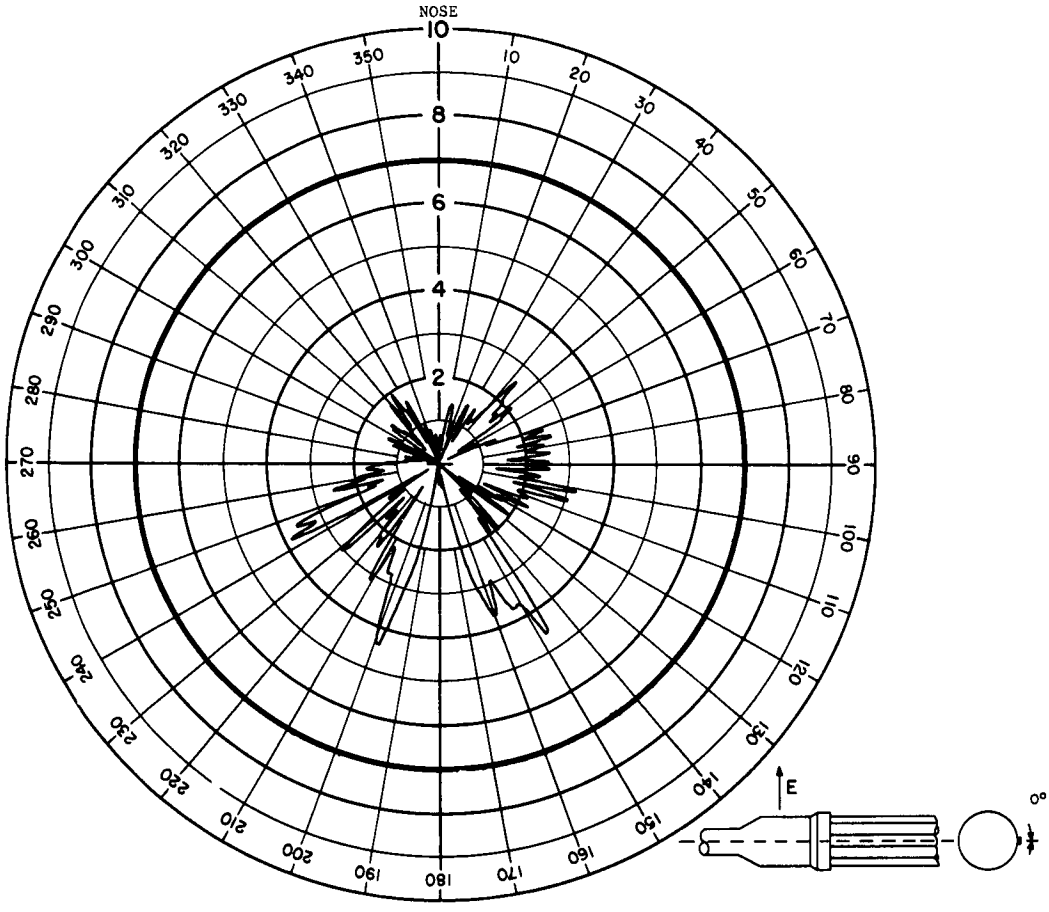


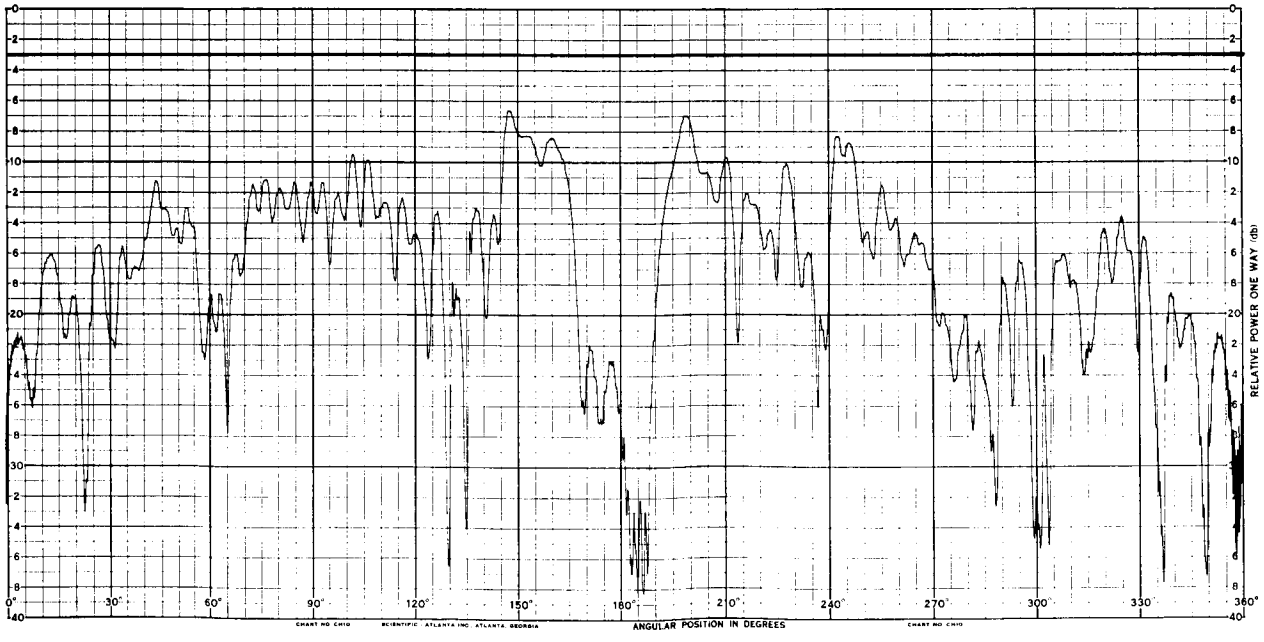
ANTENNA RADIATION PATTERN NO. 204-19

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



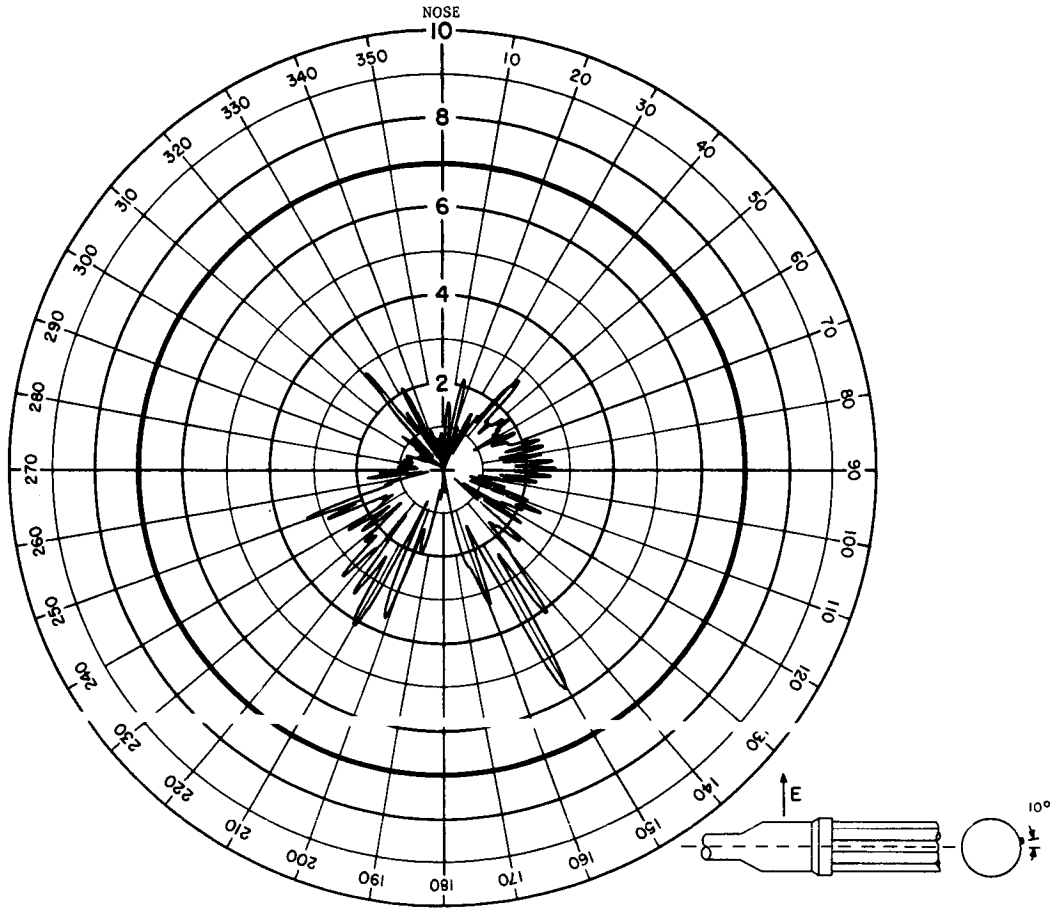


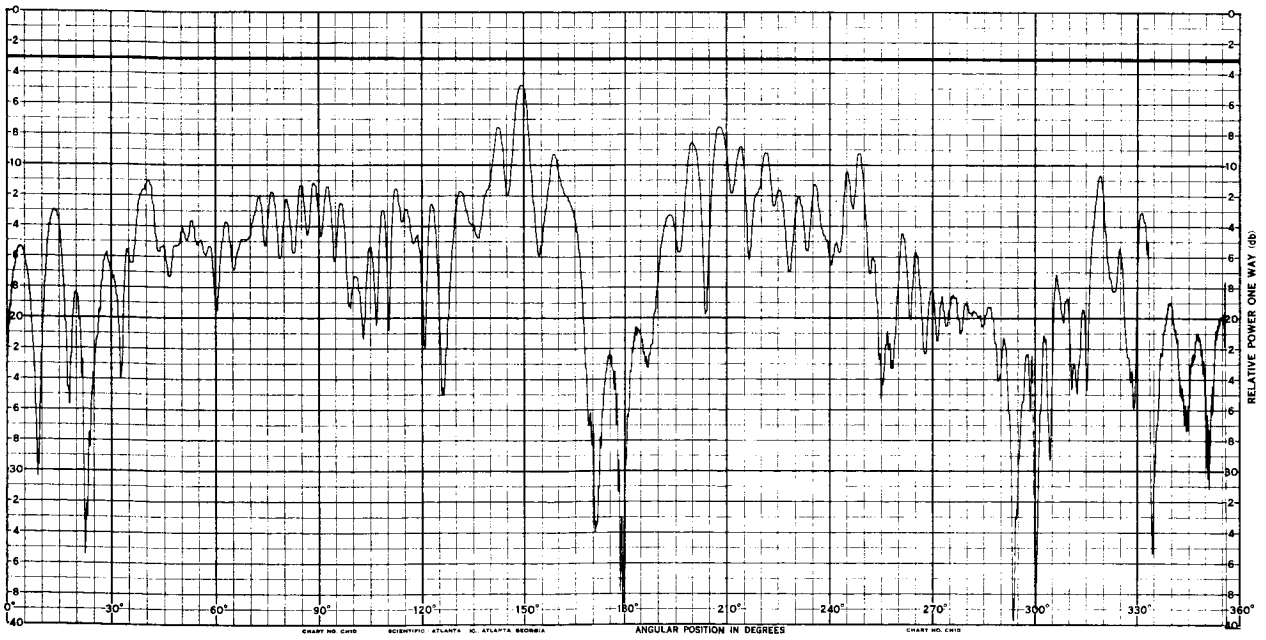
ANTENNA RADIATION PATTERN NO. 204-20

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



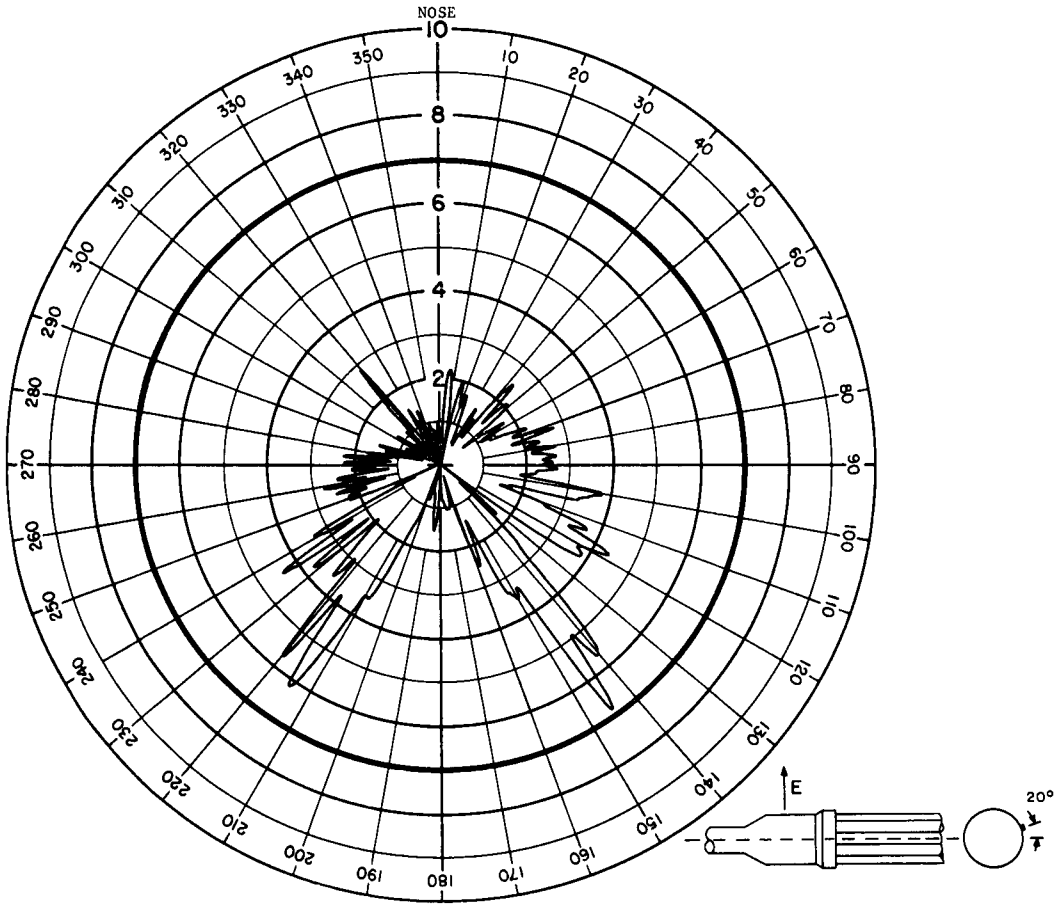


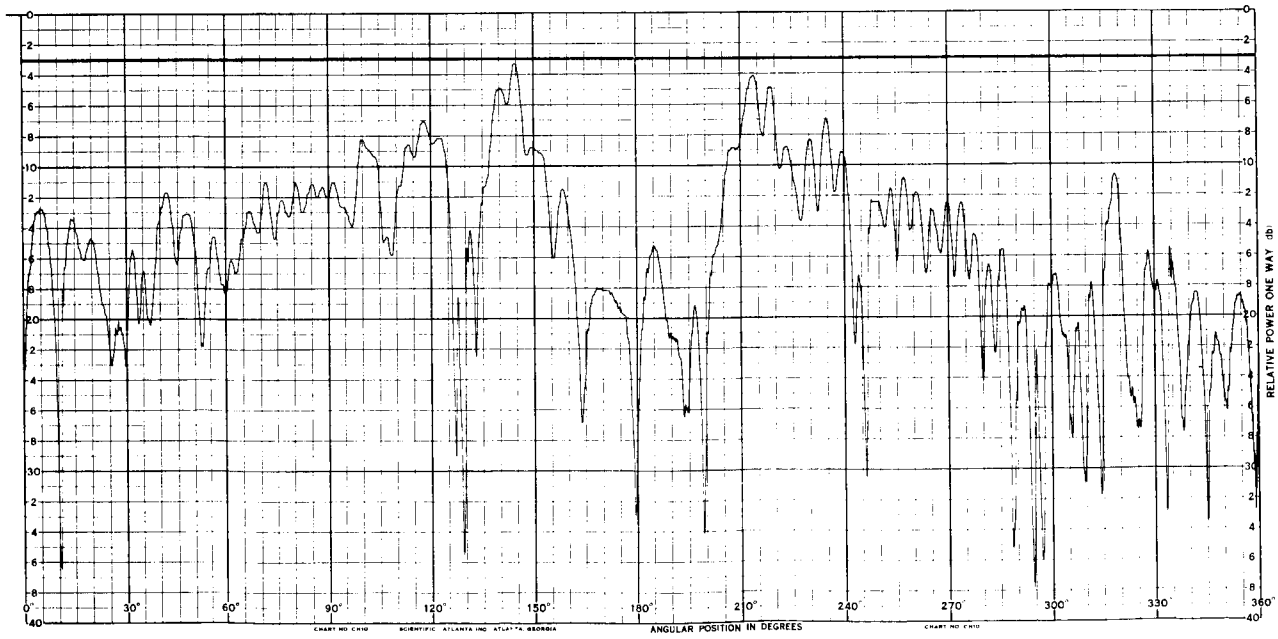
ANTENNA RADIATION PATTERN NO. 204-21

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



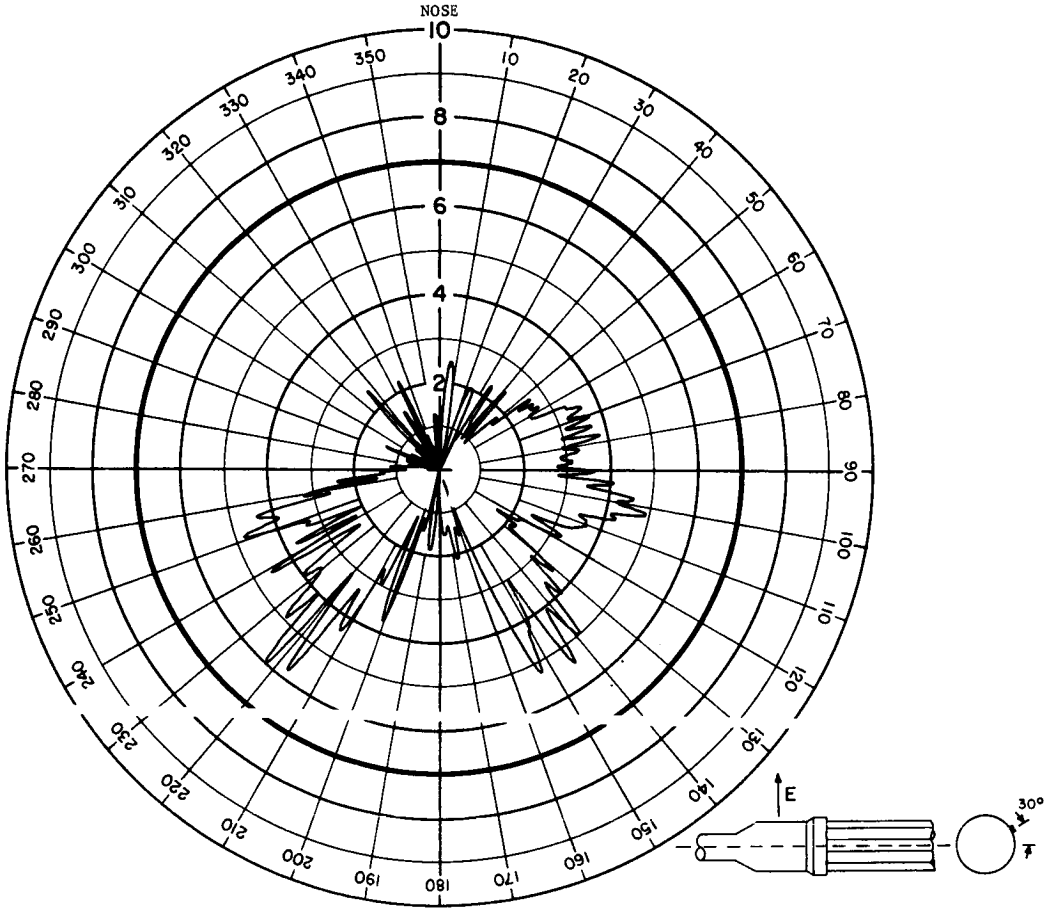


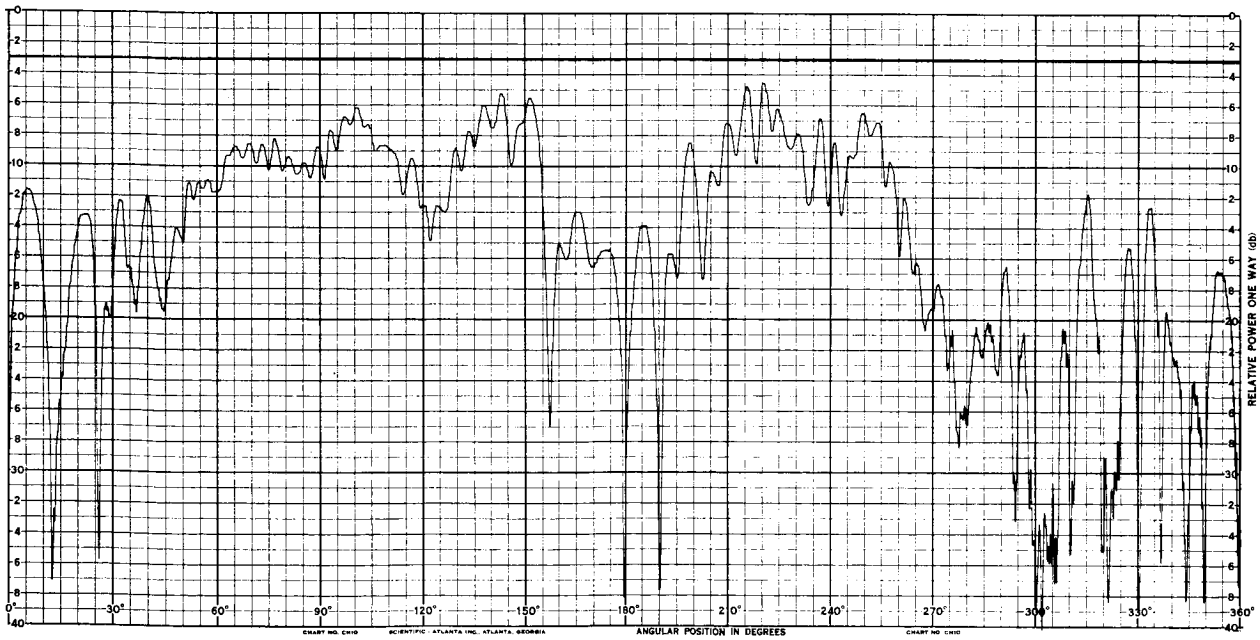
ANTENNA RADIATION PATTERN NO. 204-22

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



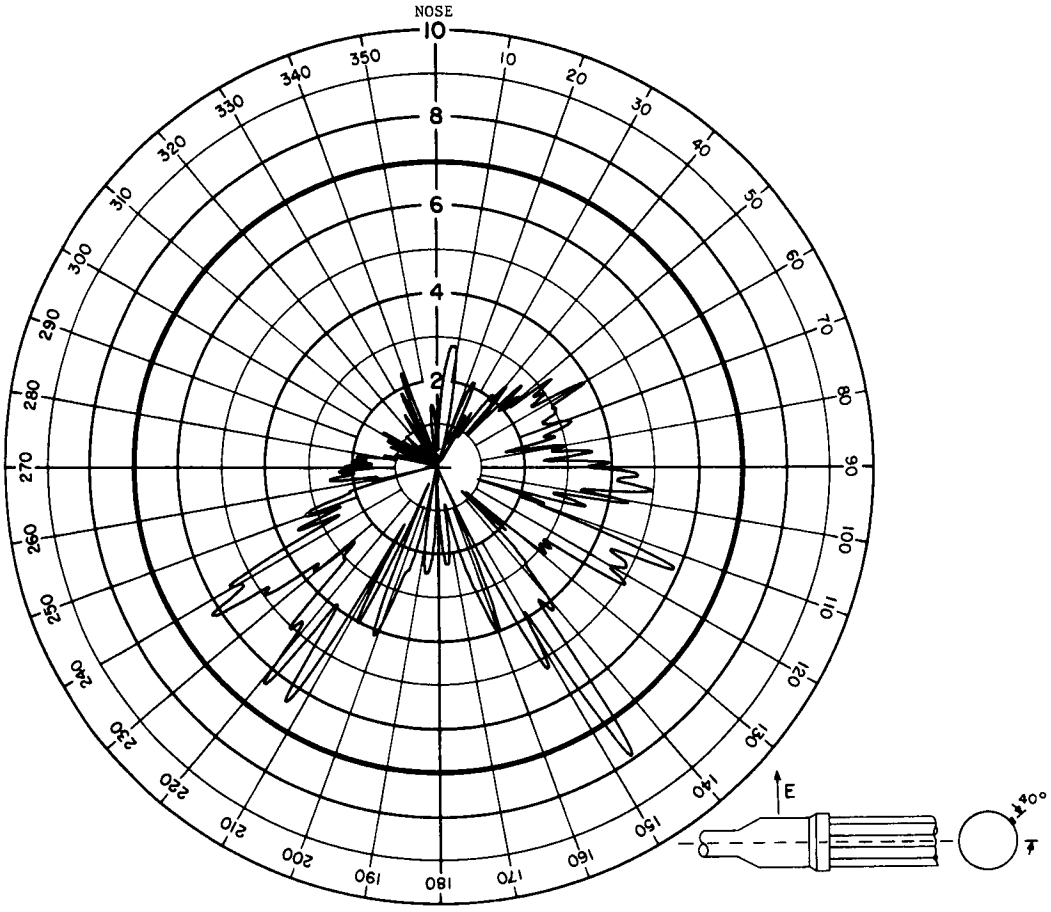


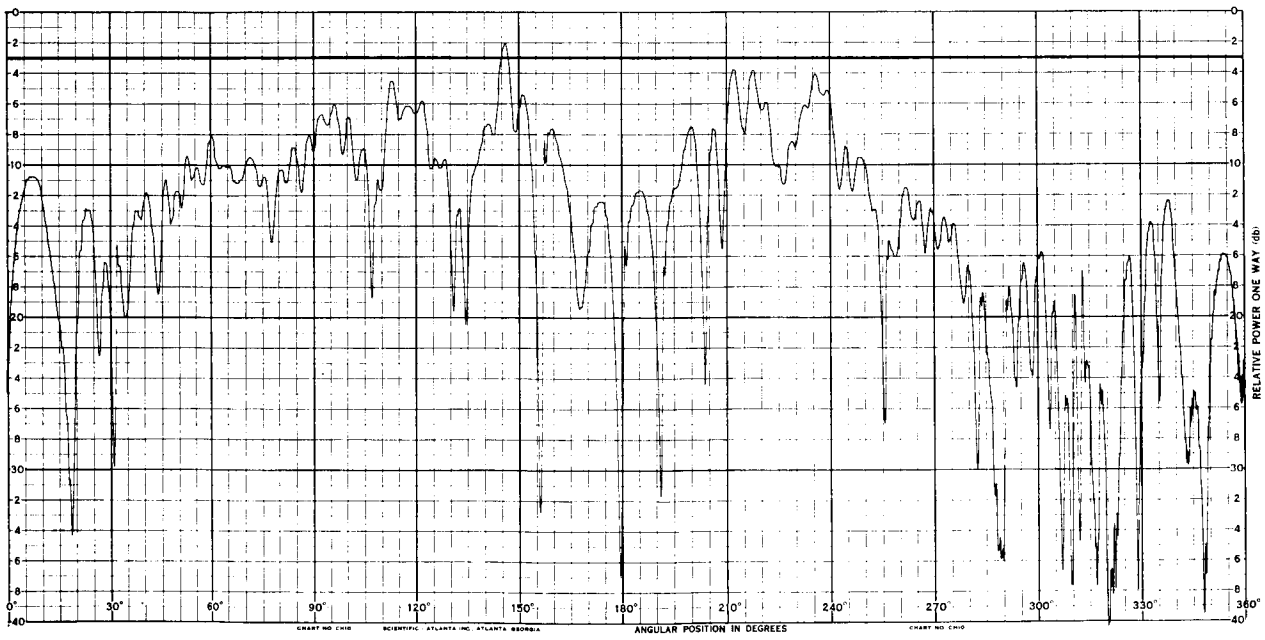
ANTENNA RADIATION PATTERN NO. 204-23

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



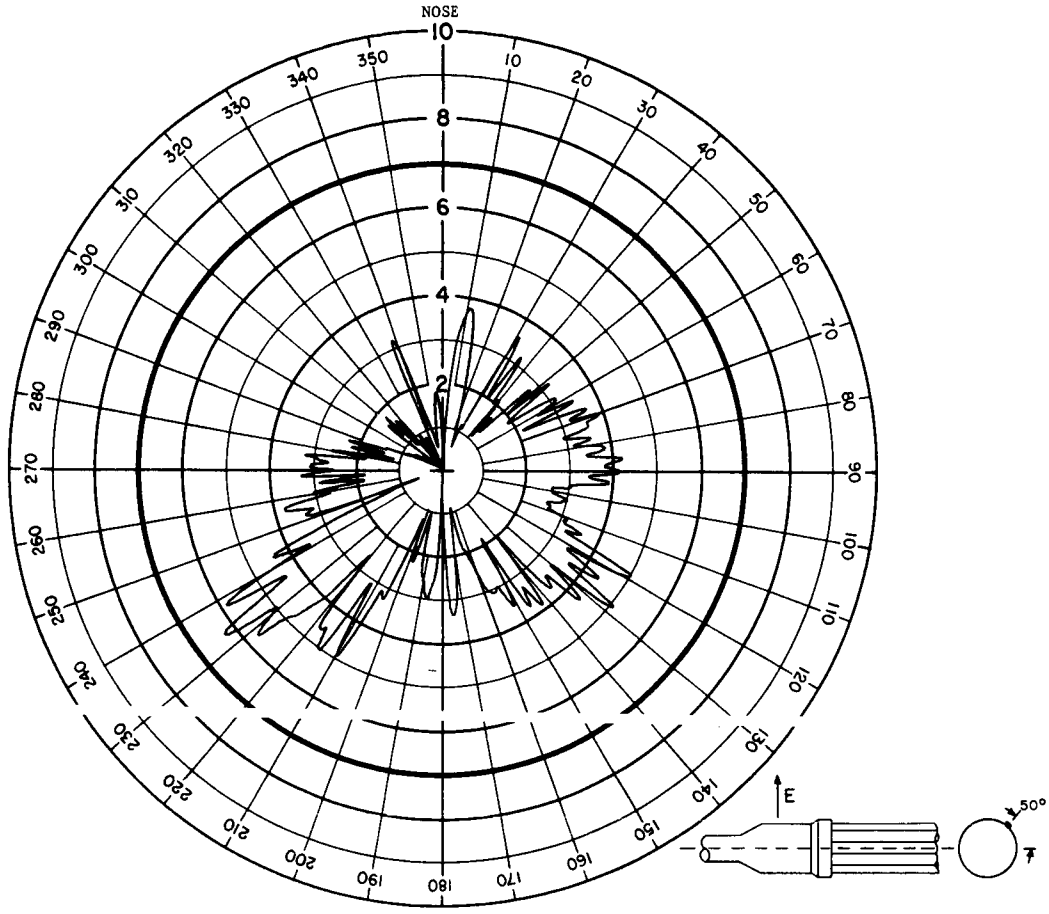


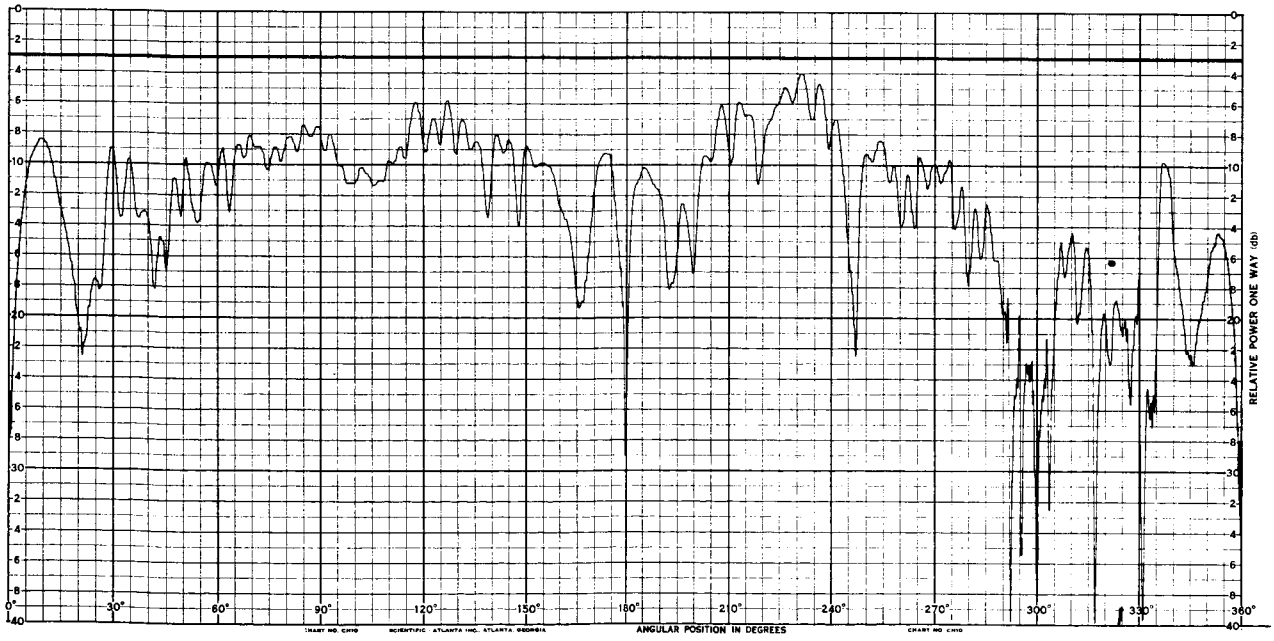
ANTENNA RADIATION PATTERN NO. 204-24

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



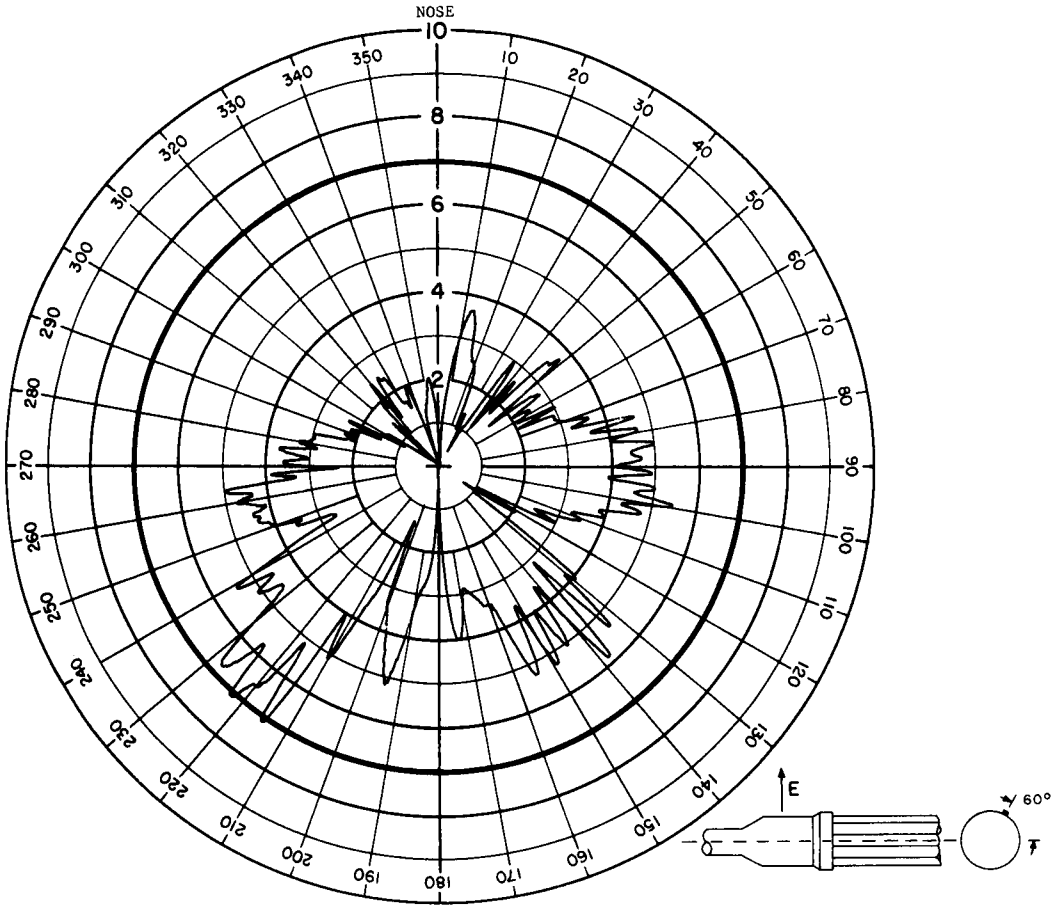


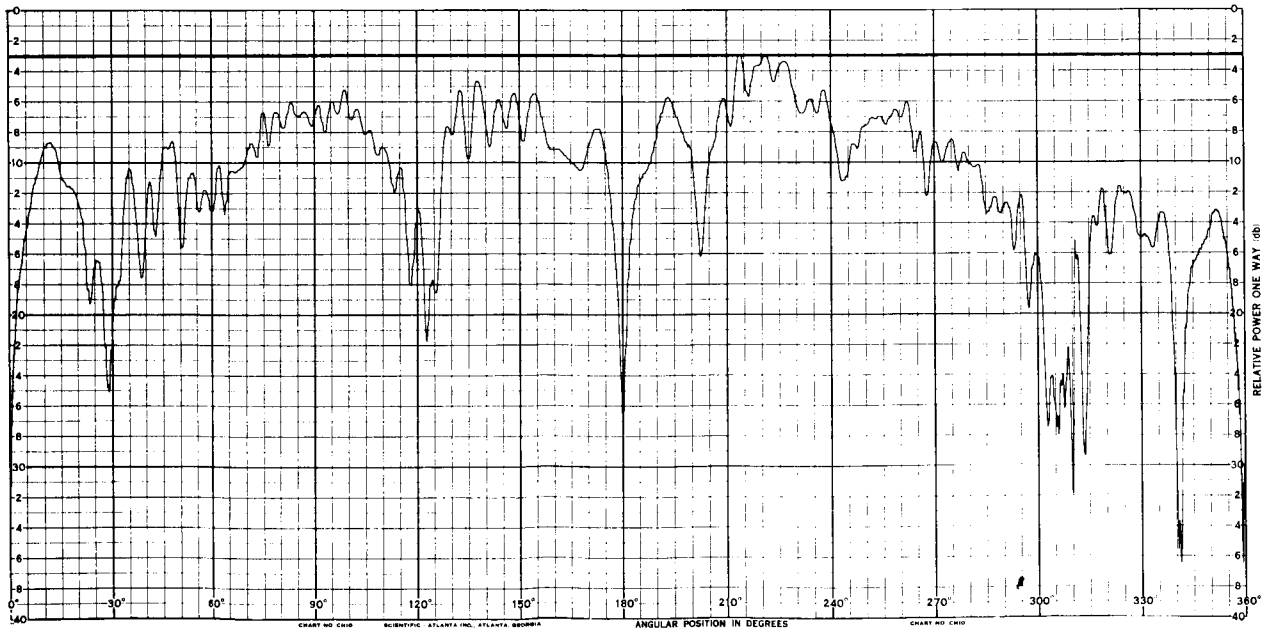
ANTENNA RADIATION PATTERN NO. 204-25

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



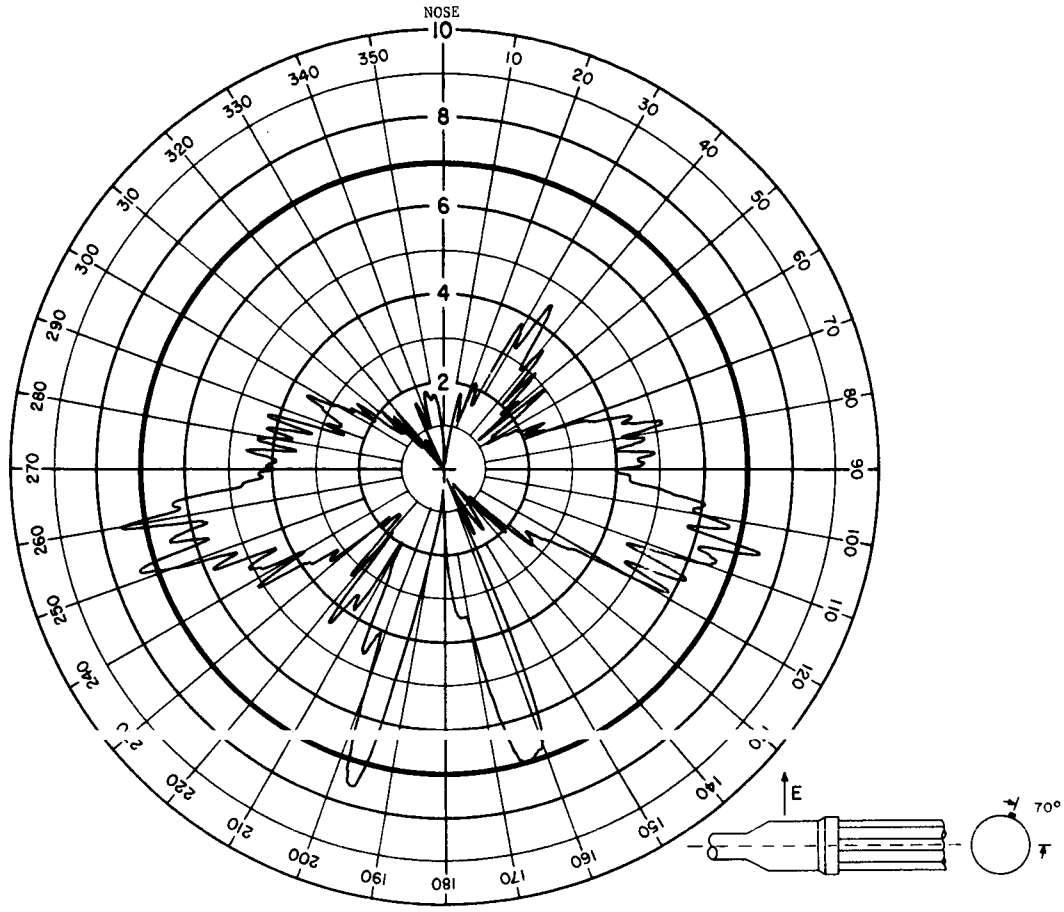


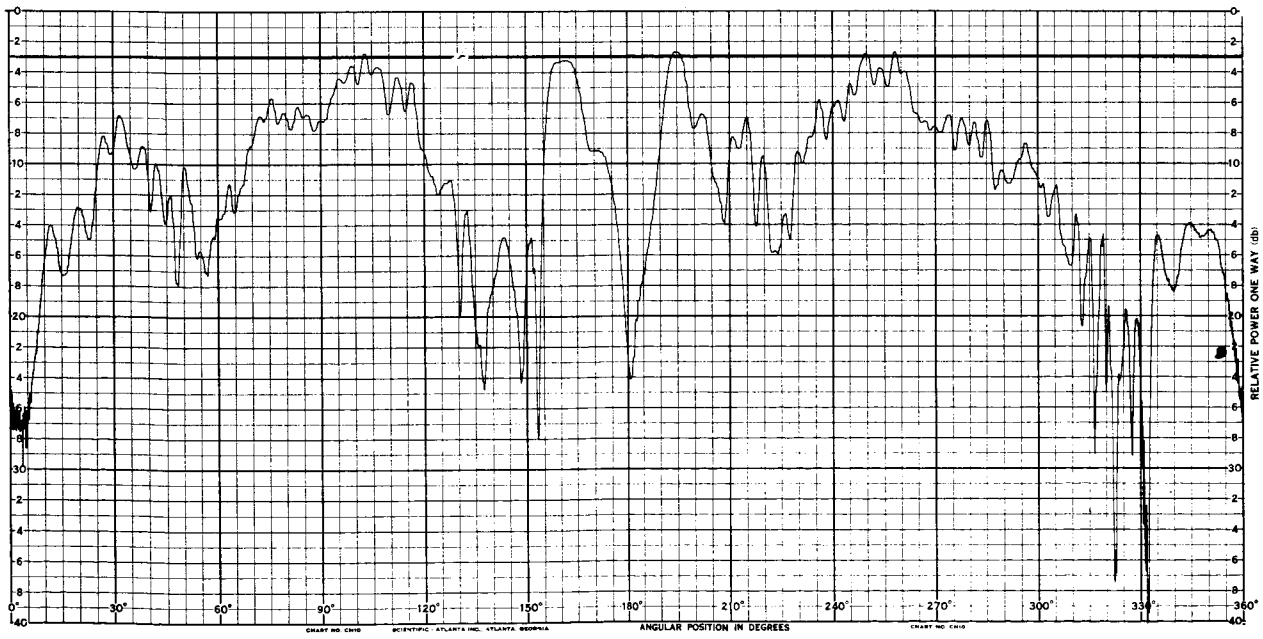
ANTENNA RADIATION PATTERN NO. 204-26

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



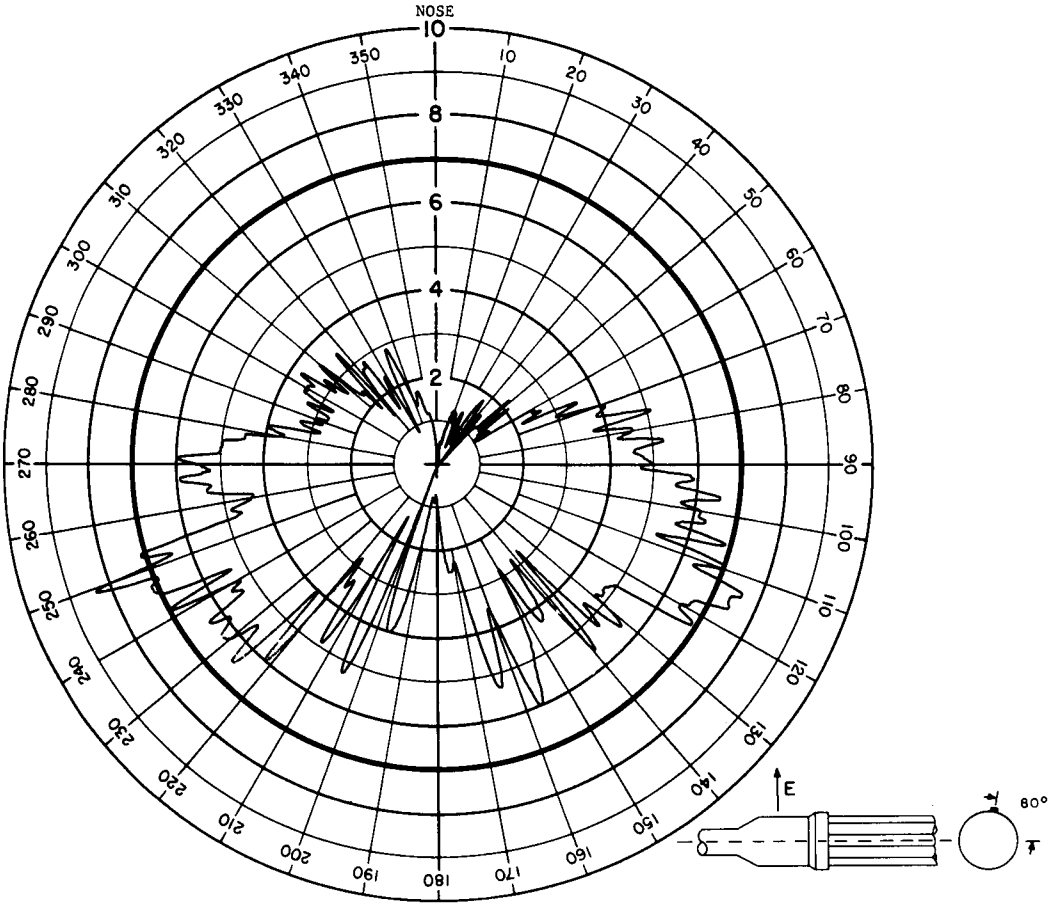


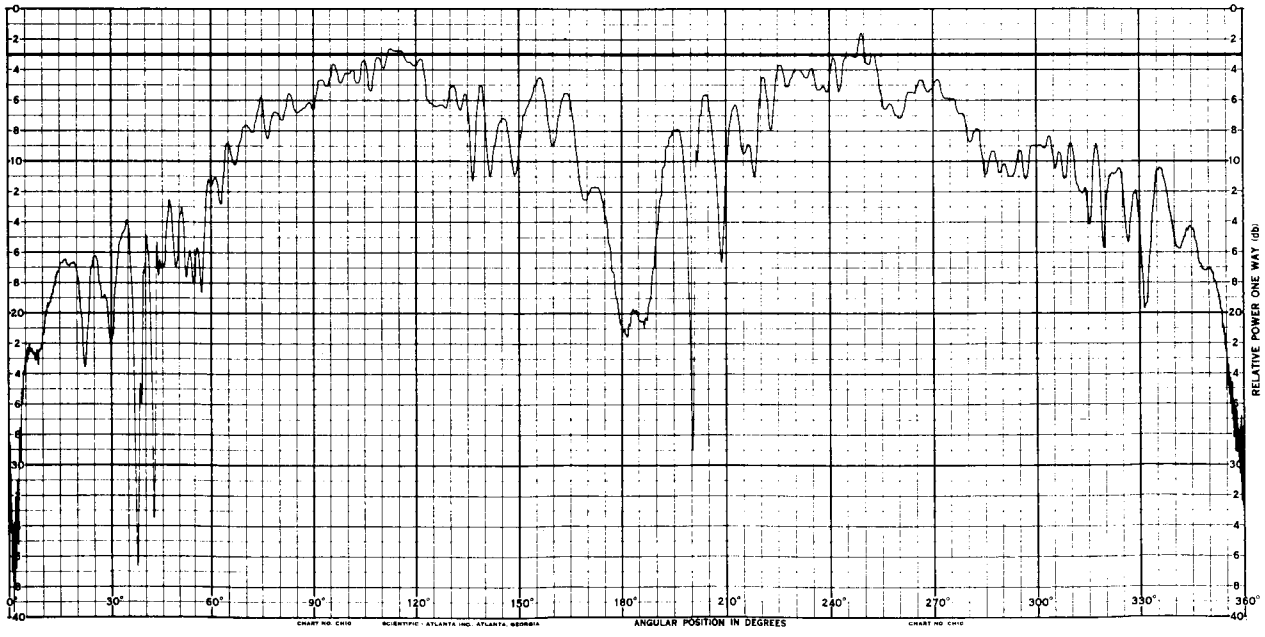
ANTENNA RADIATION PATTERN NO. 204-27

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



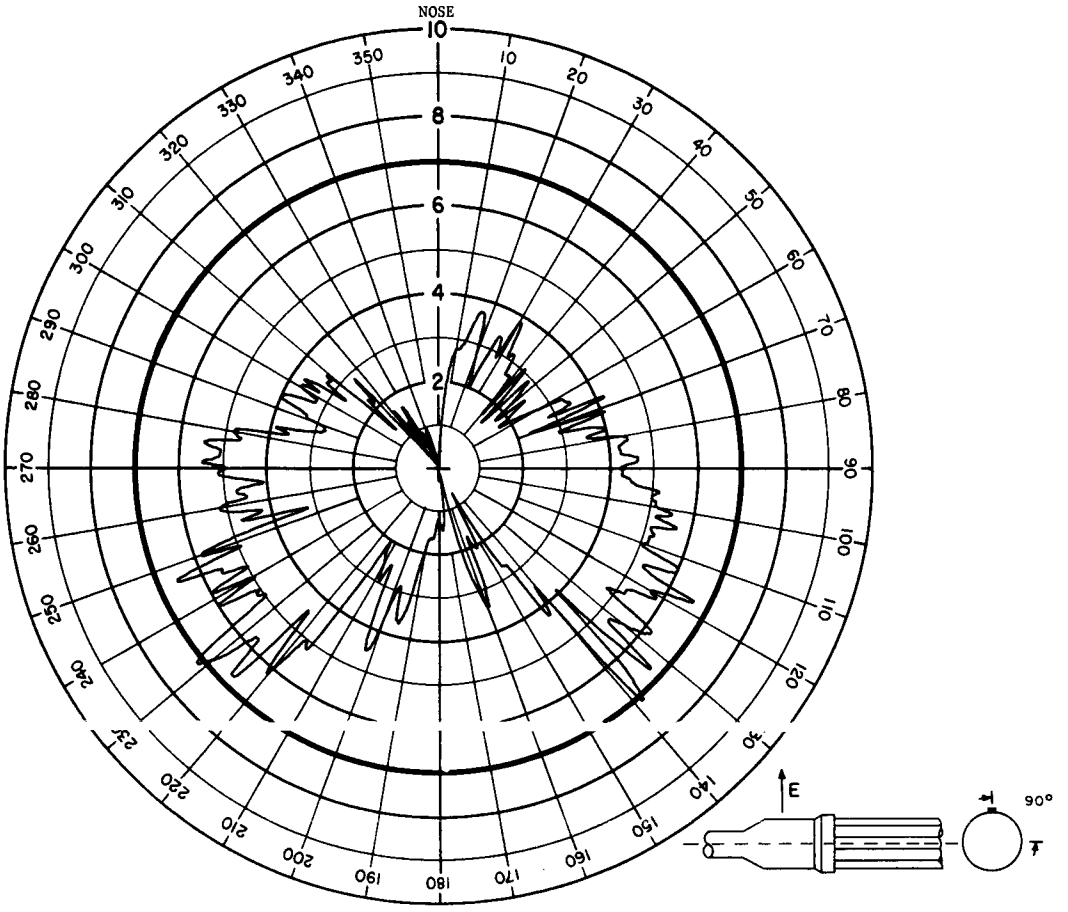


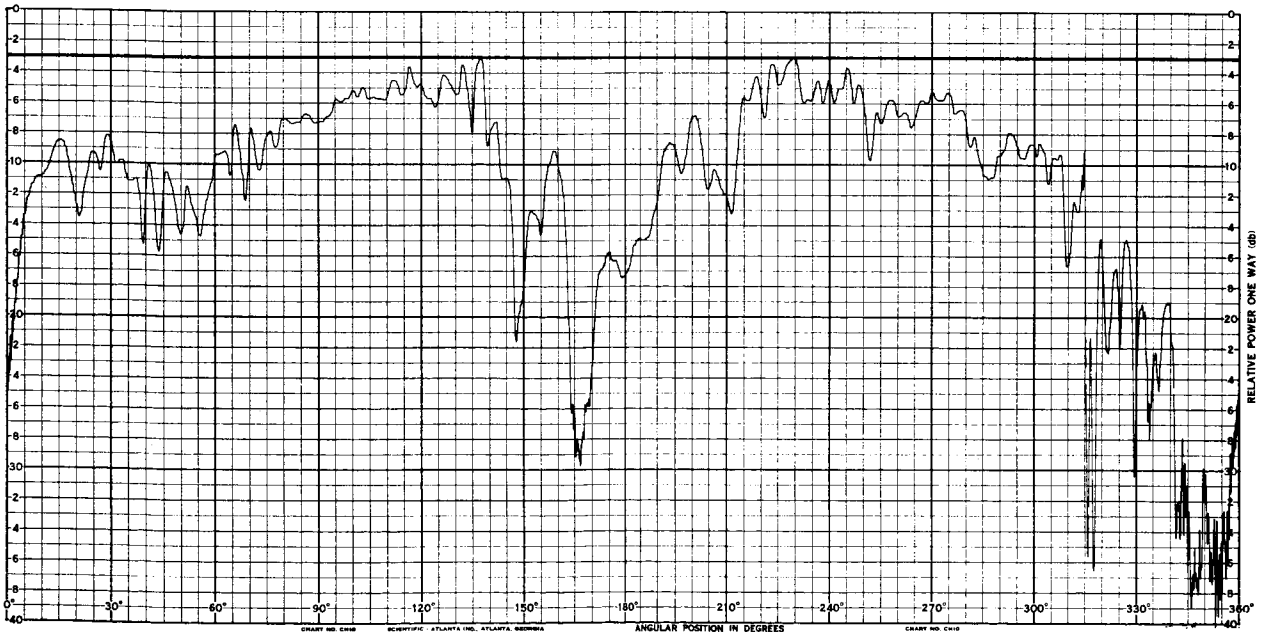
ANTENNA RADIATION PATTERN NO. 204-28

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



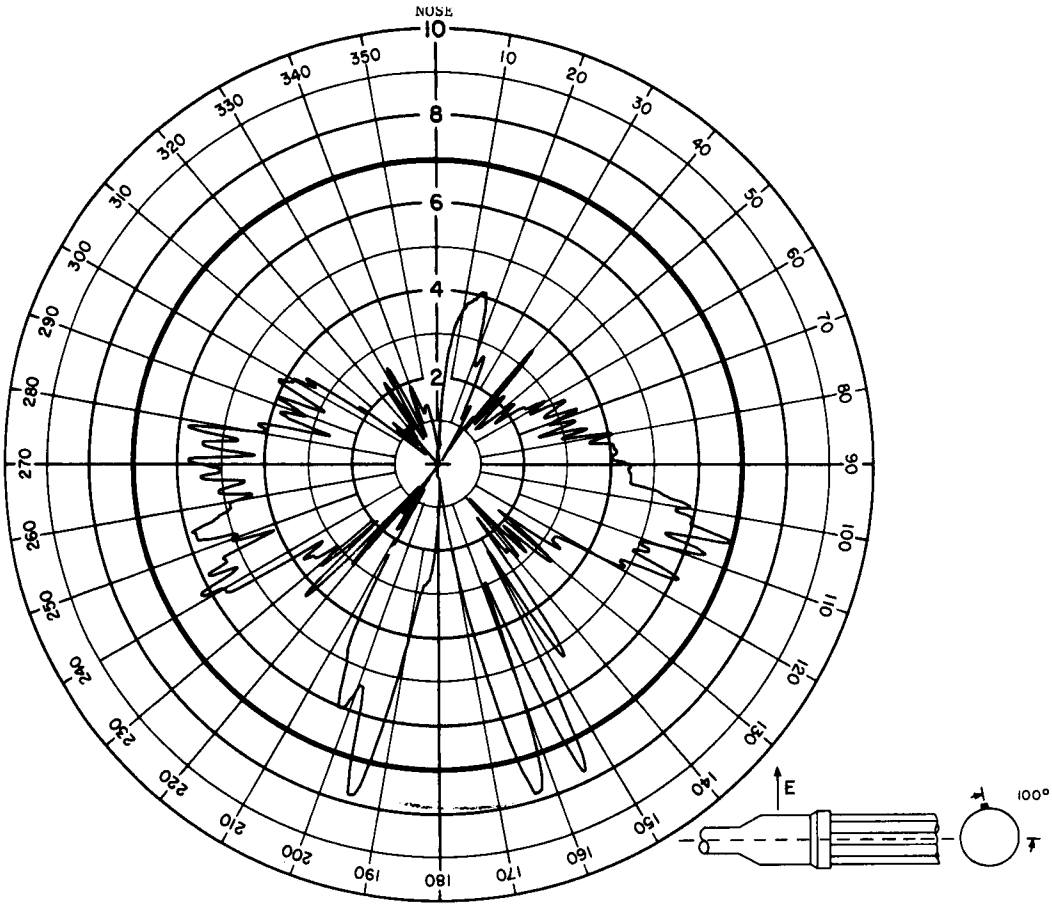


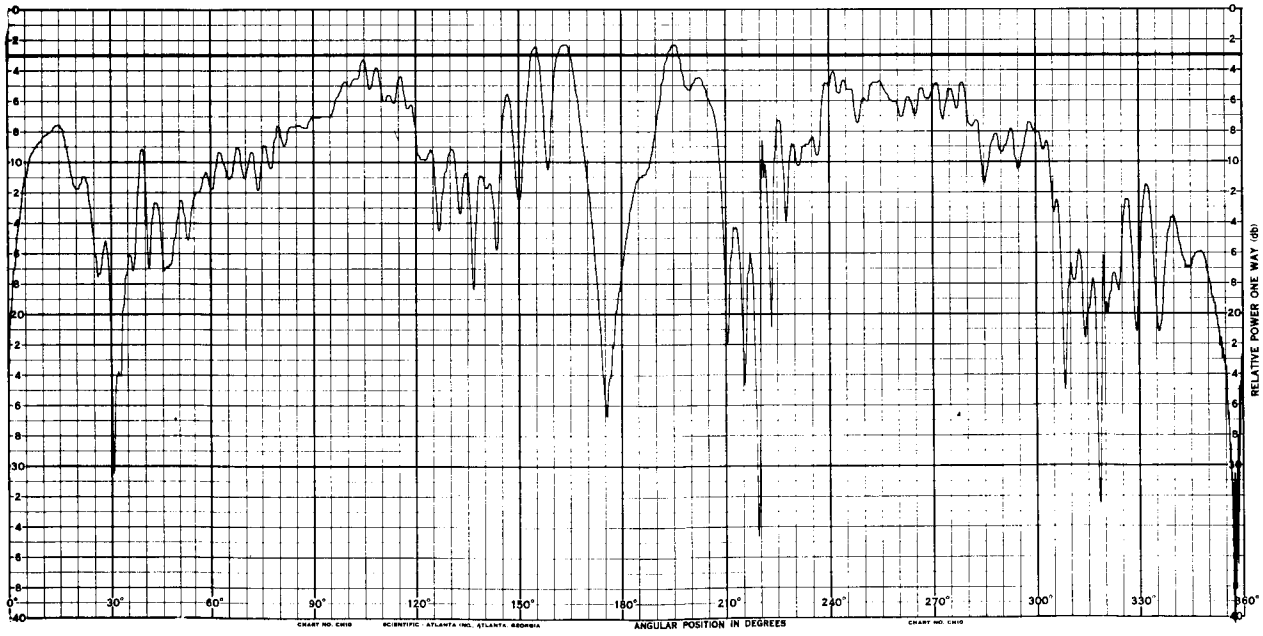
ANTENNA RADIATION PATTERN NO. 204-29

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



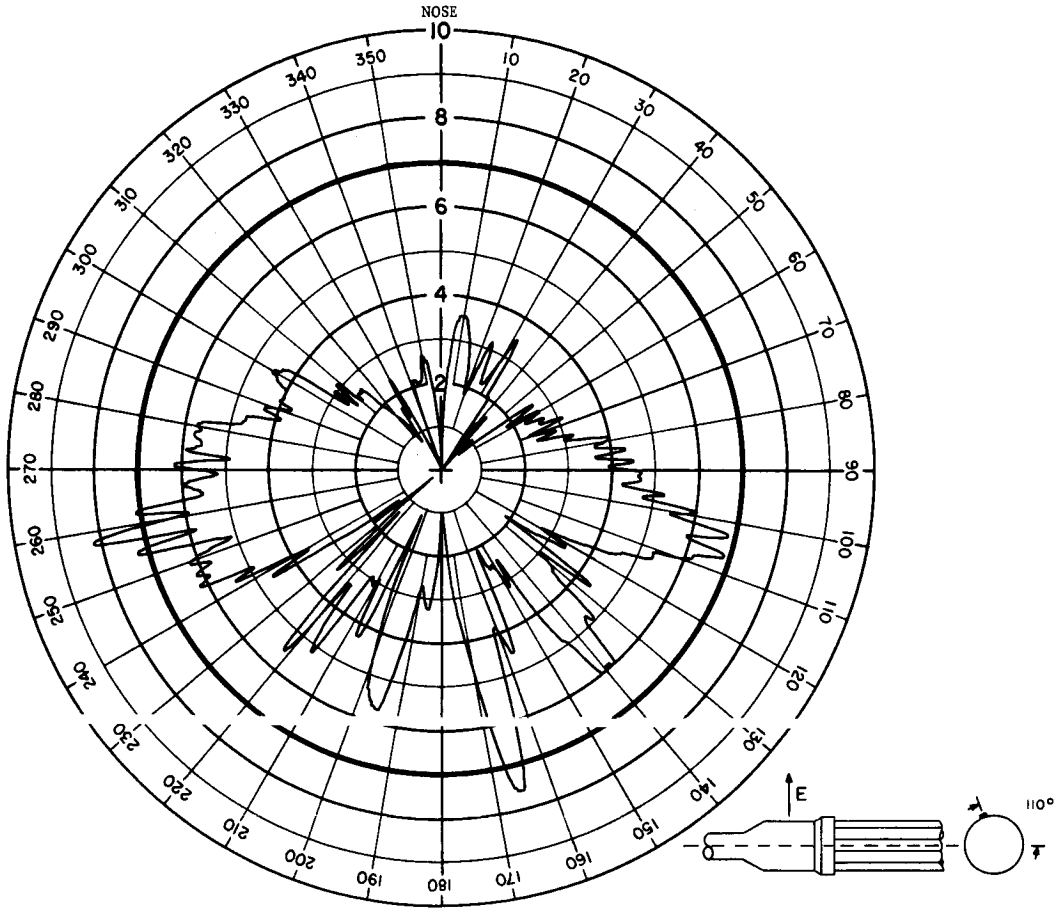


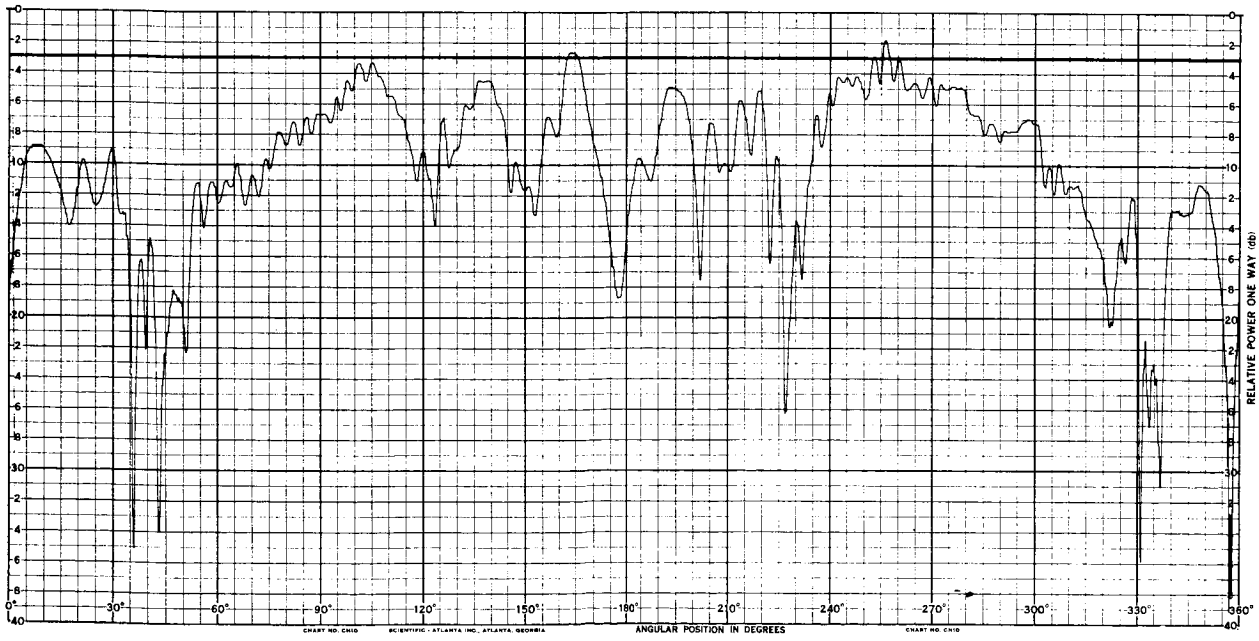
ANTENNA RADIATION PATTERN NO. 204-30

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



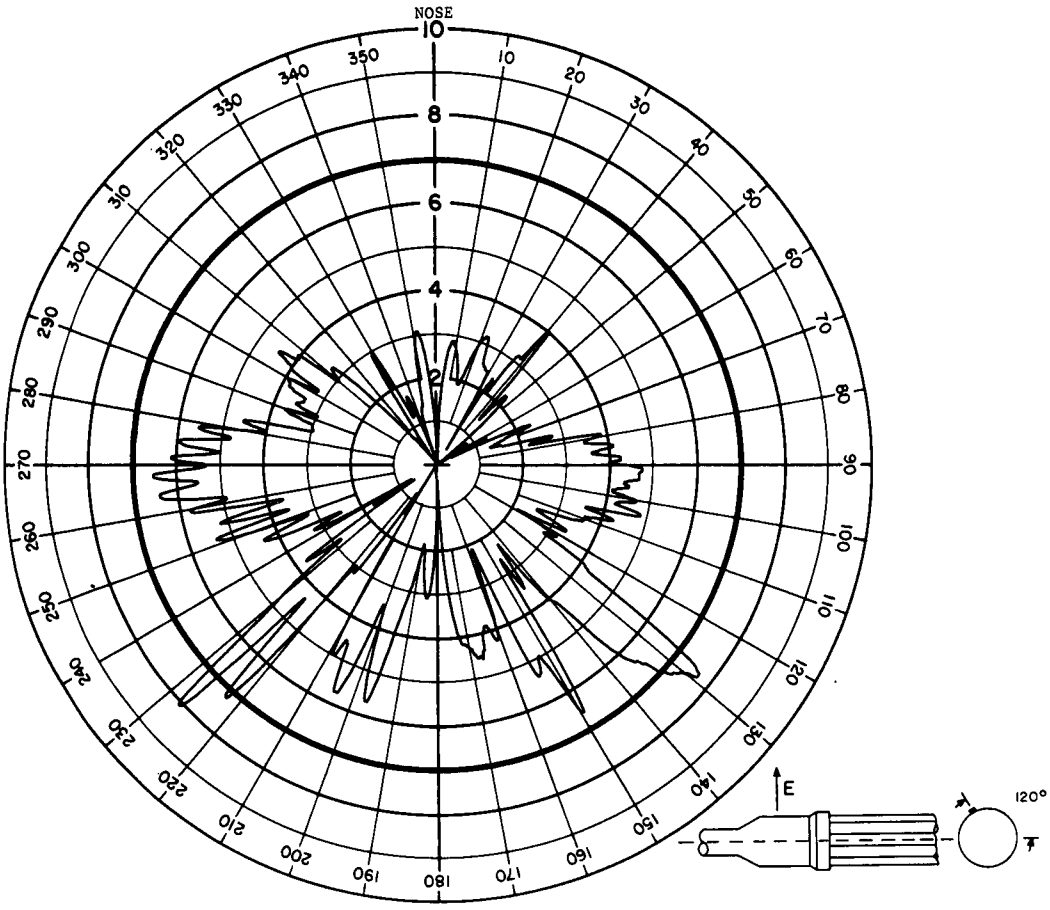


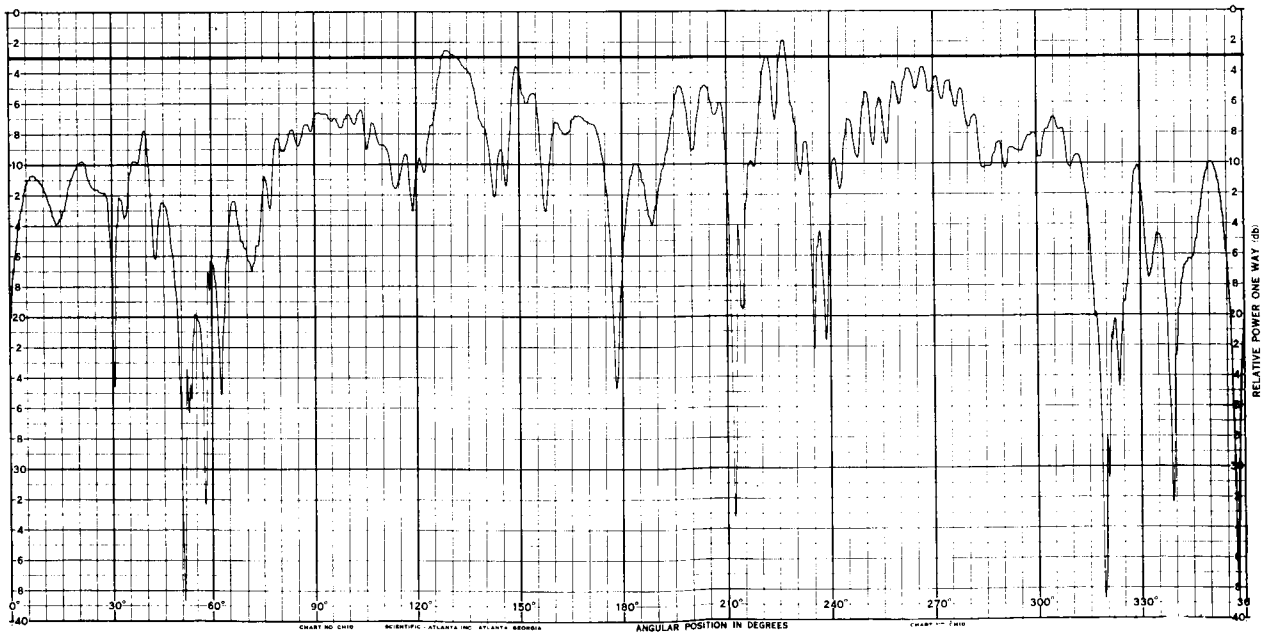
ANTENNA RADIATION PATTERN NO. 204-31

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



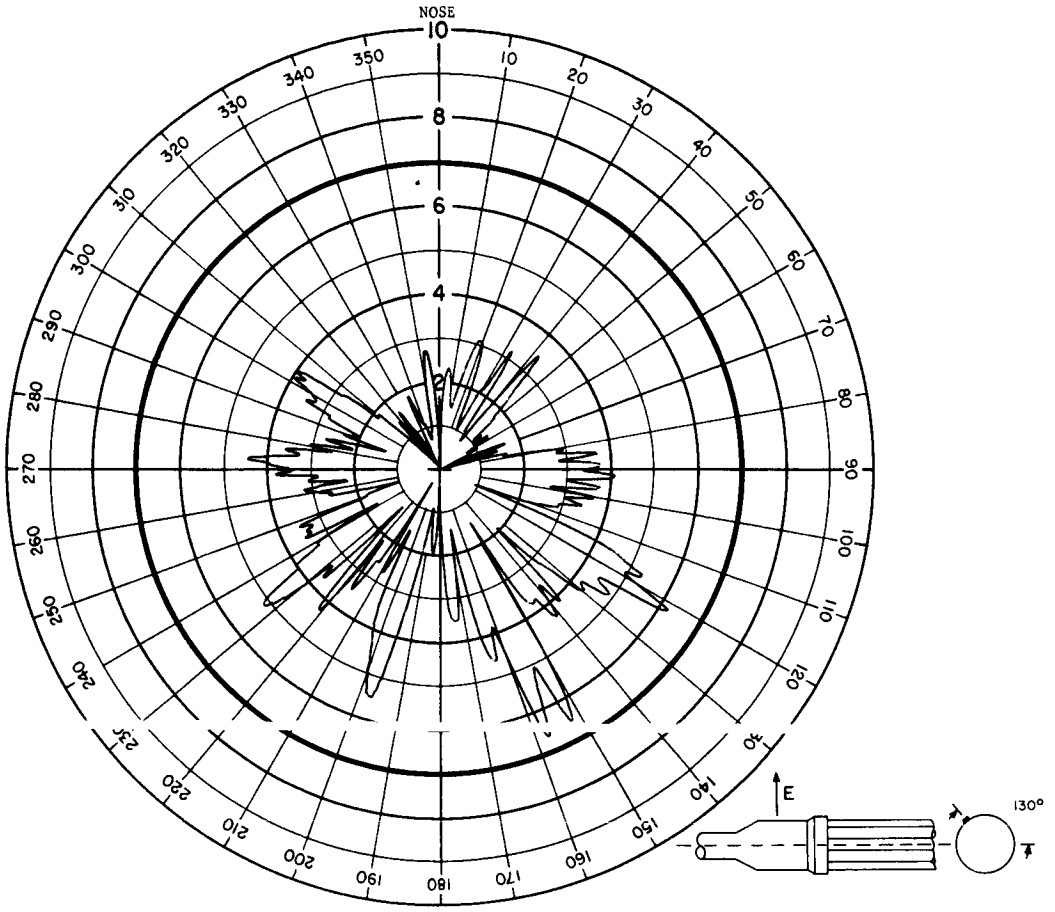


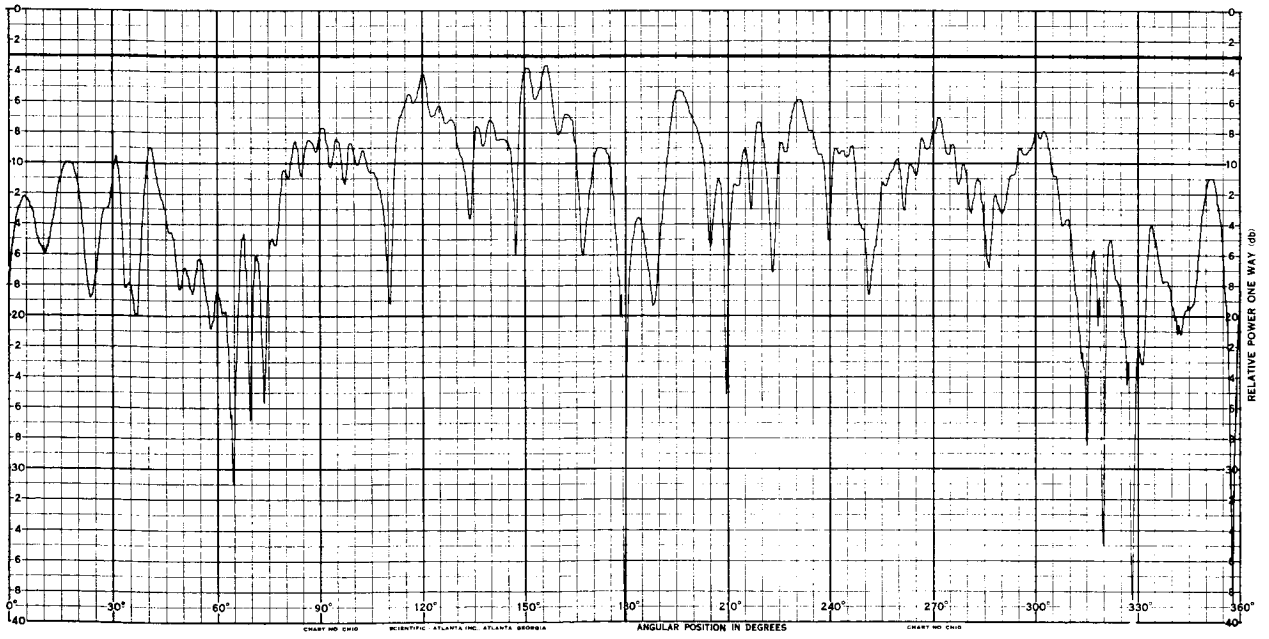
ANTENNA RADIATION PATTERN NO. 204-32

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



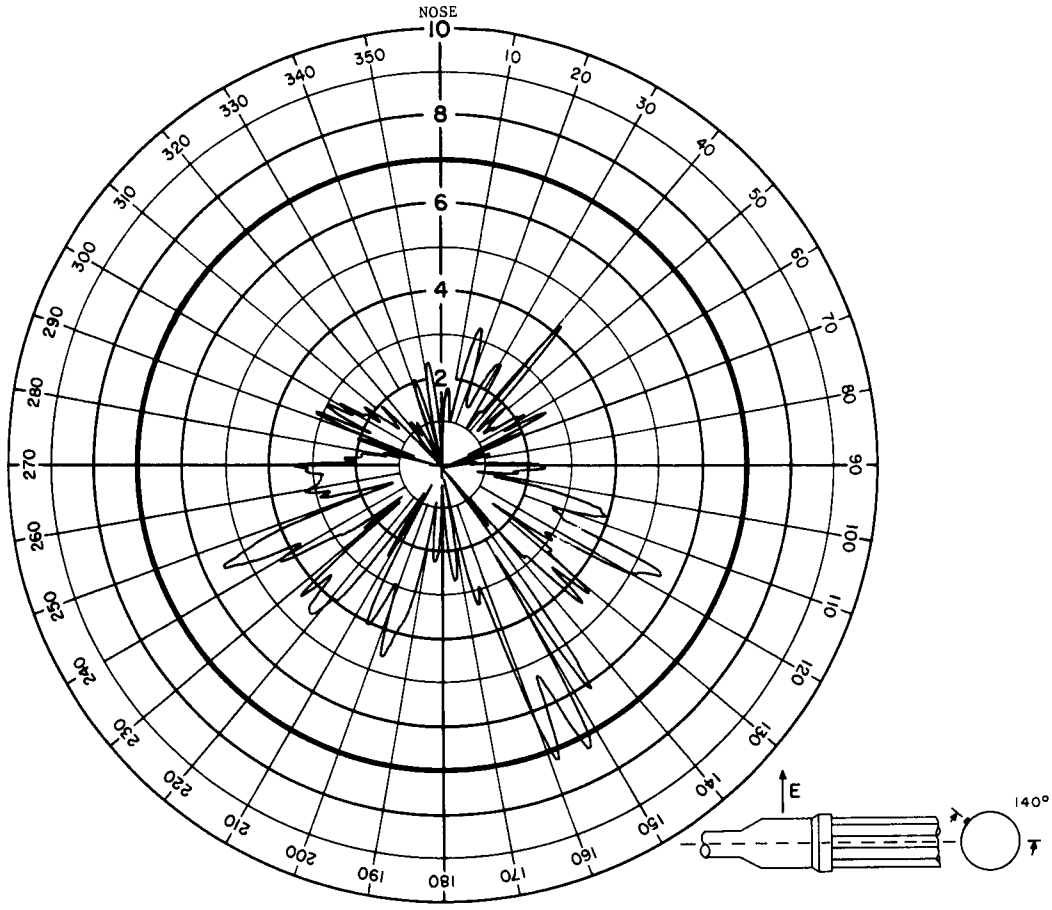


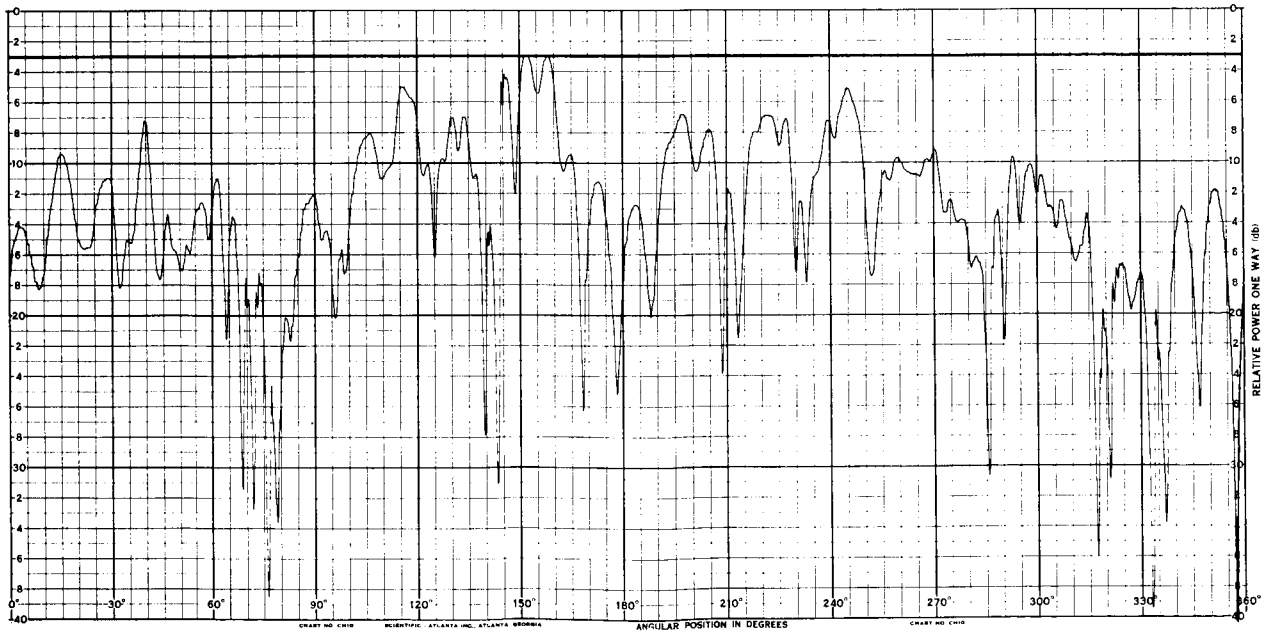
ANTENNA RADIATION PATTERN NO. 204-33

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



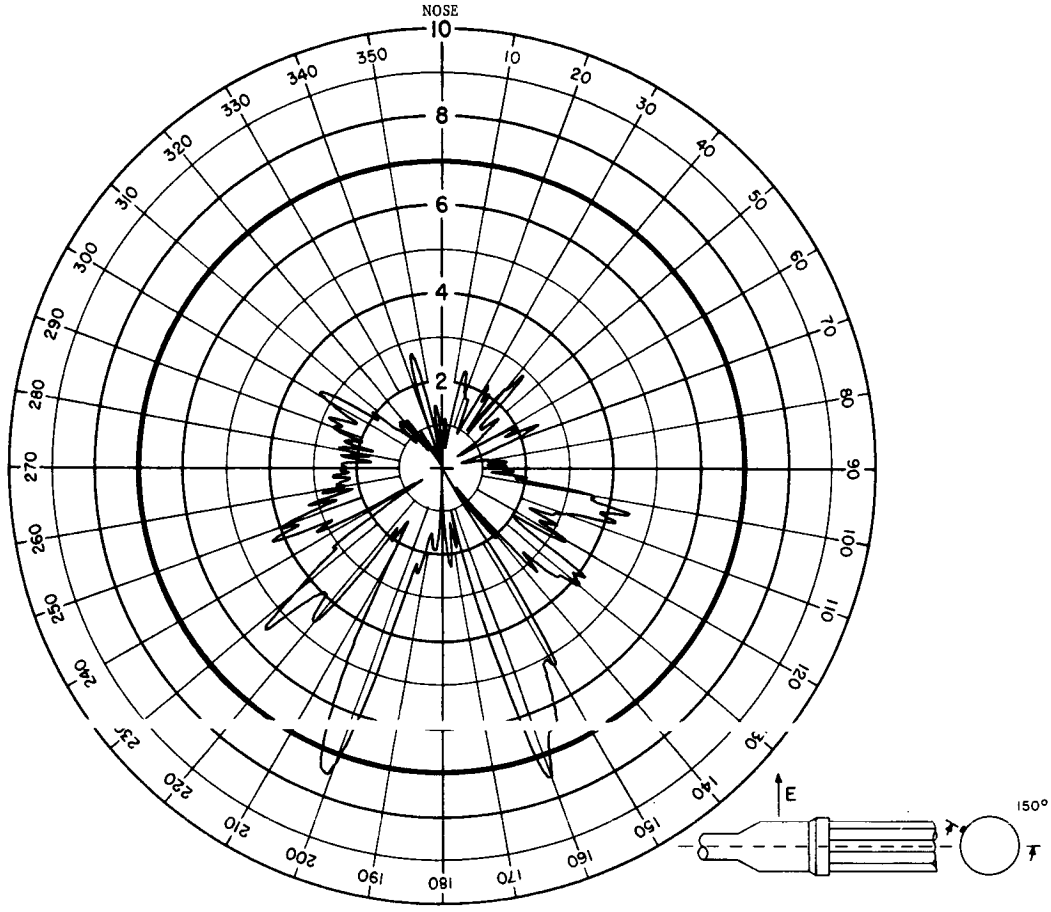


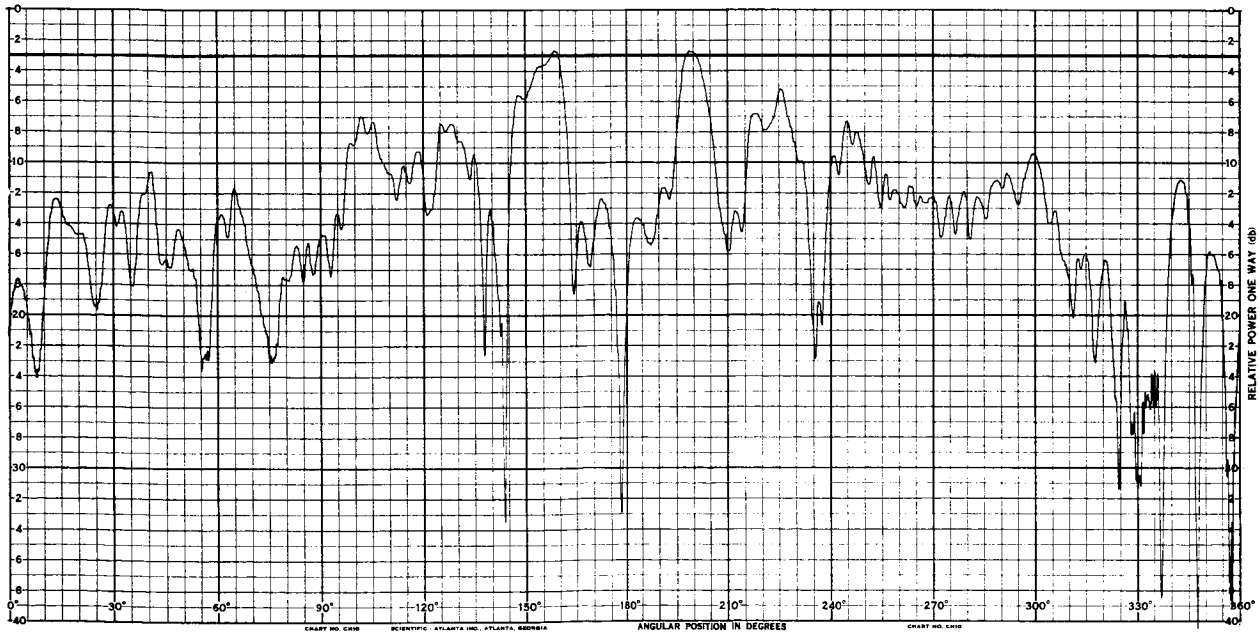
ANTENNA RADIATION PATTERN NO. 204-34

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



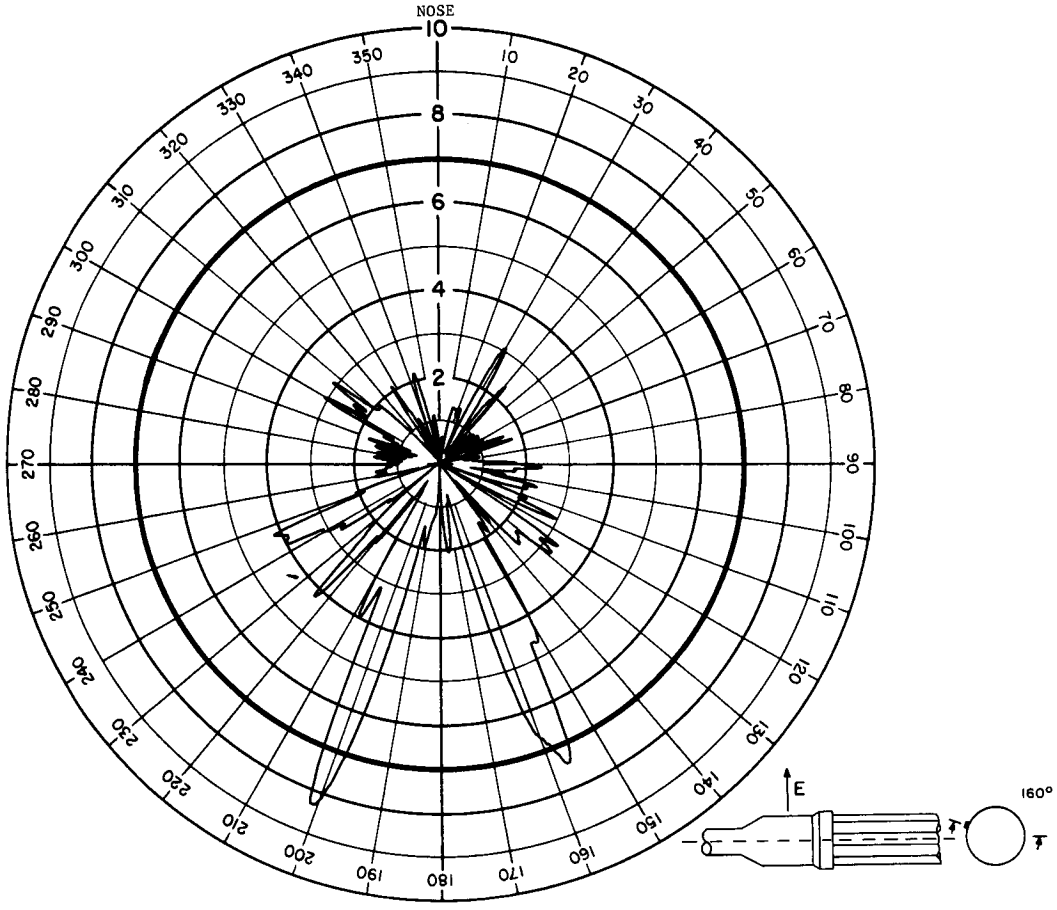


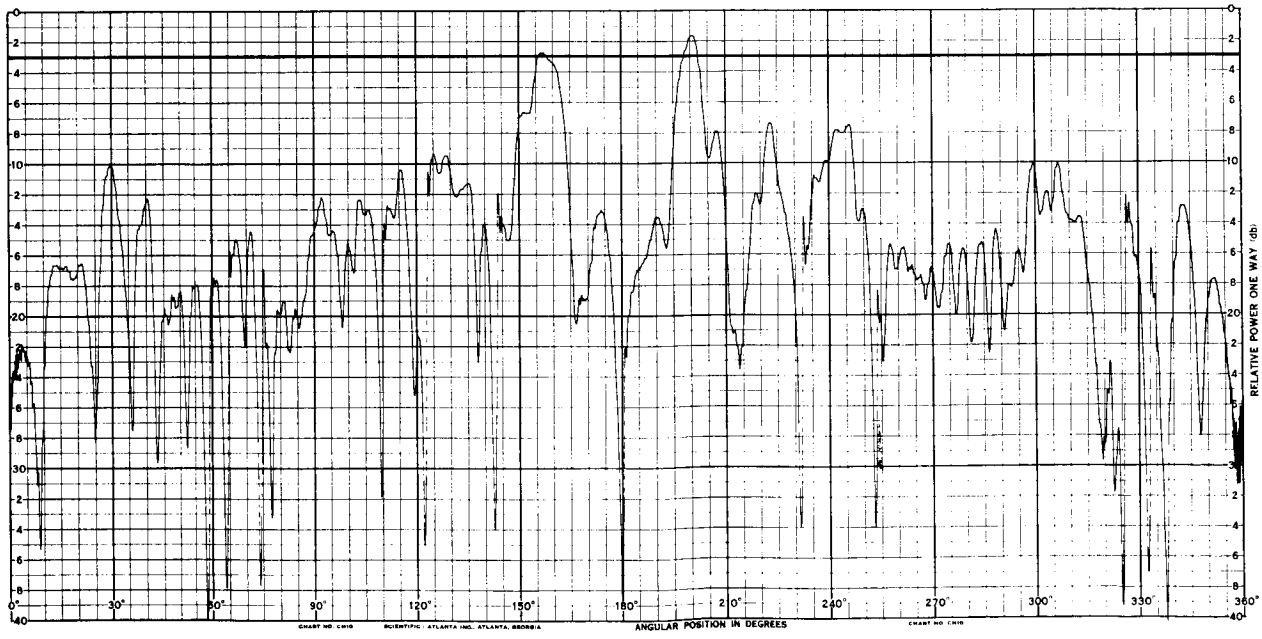
ANTENNA RADIATION PATTERN NO. 204-35

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



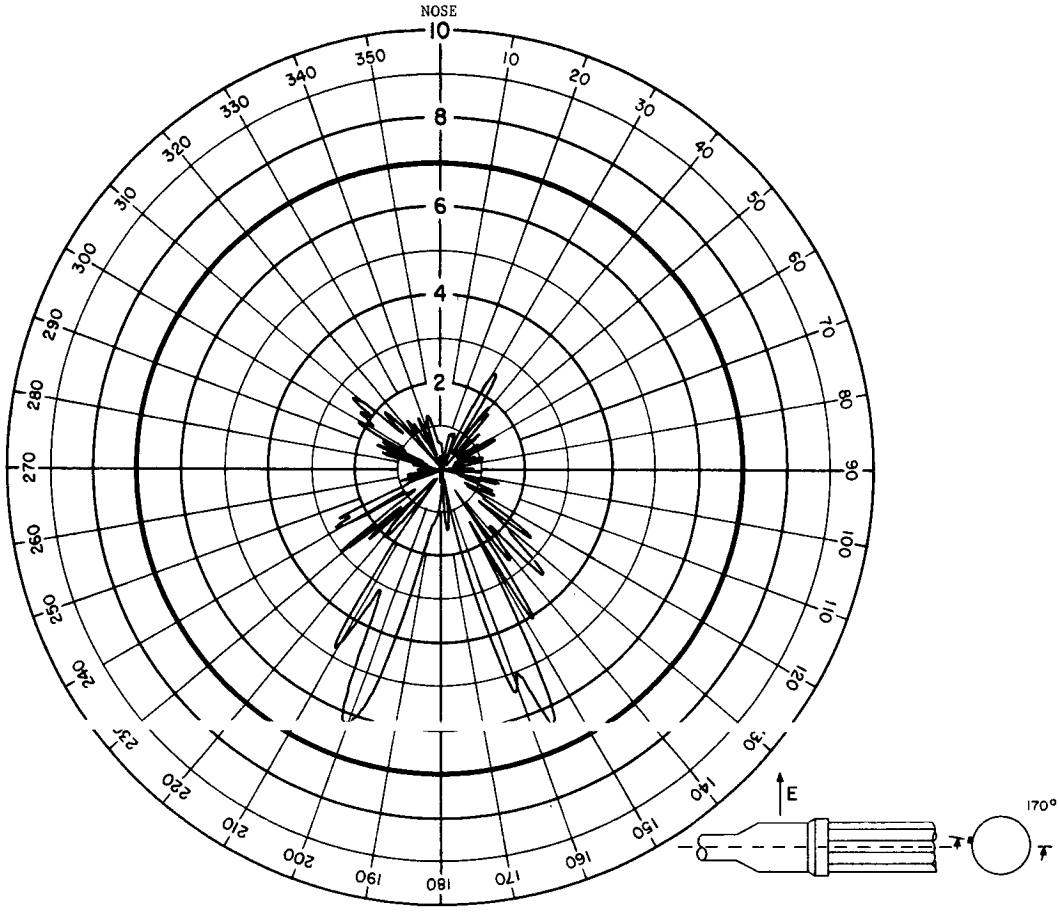


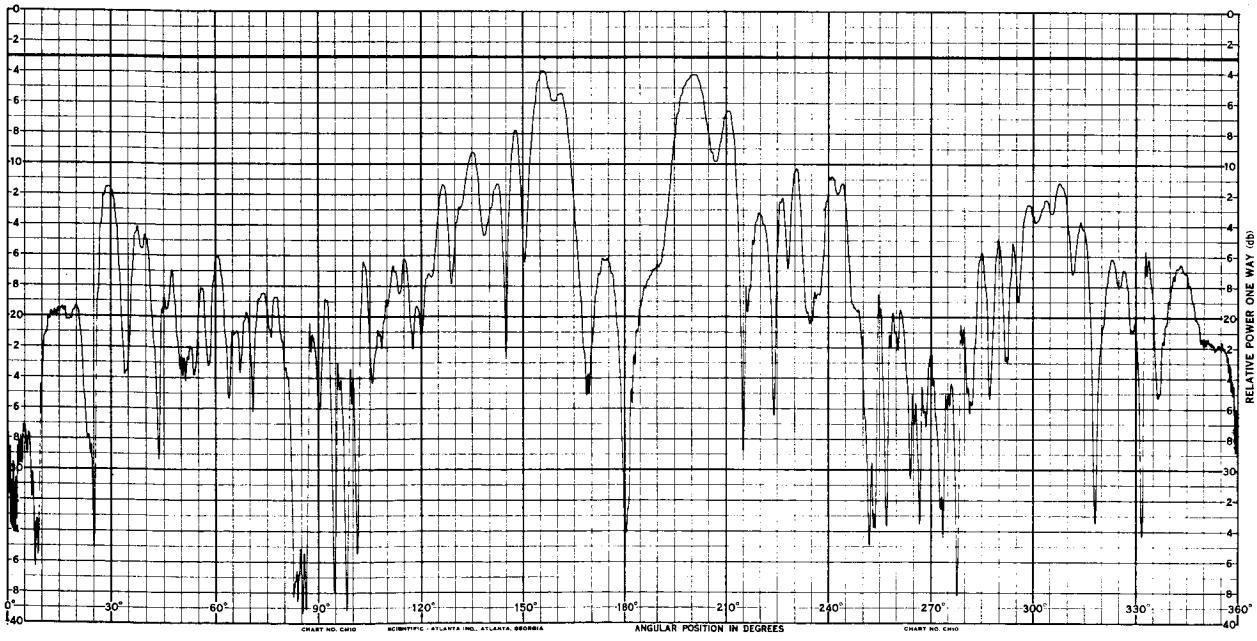
ANTENNA RADIATION PATTERN NO. 204-36

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



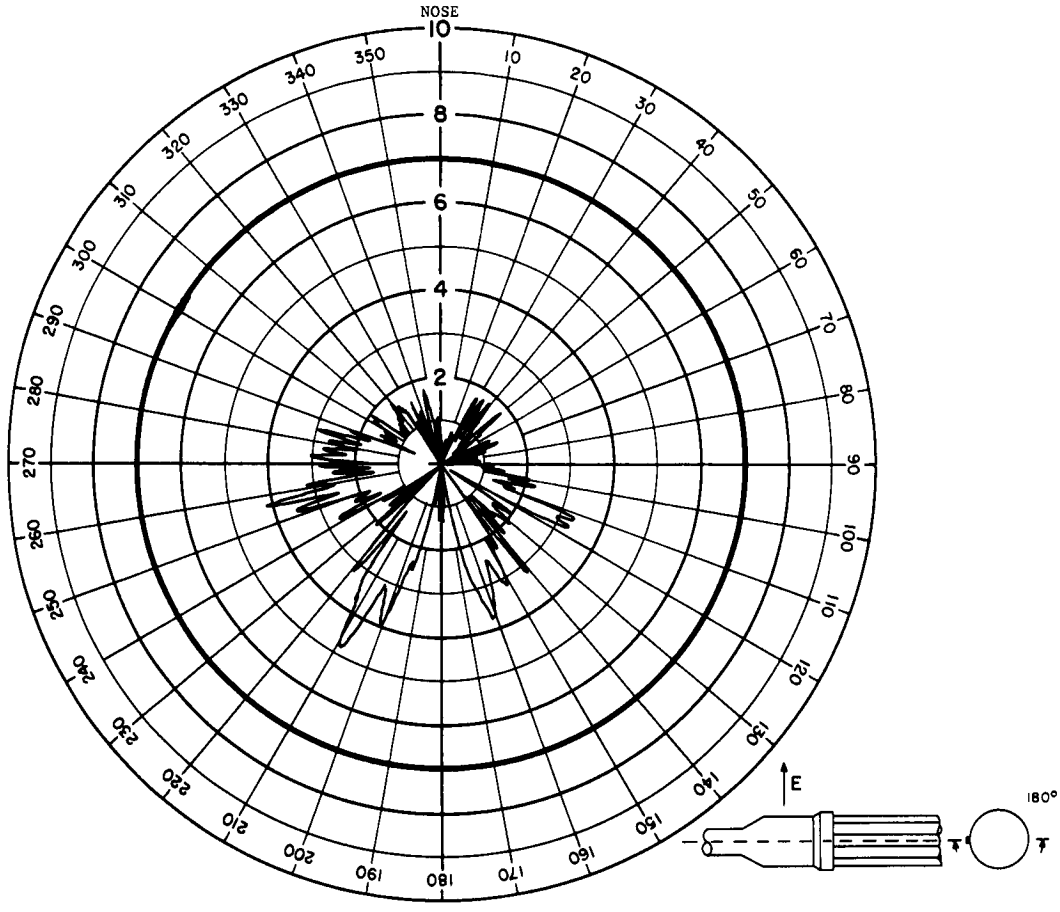


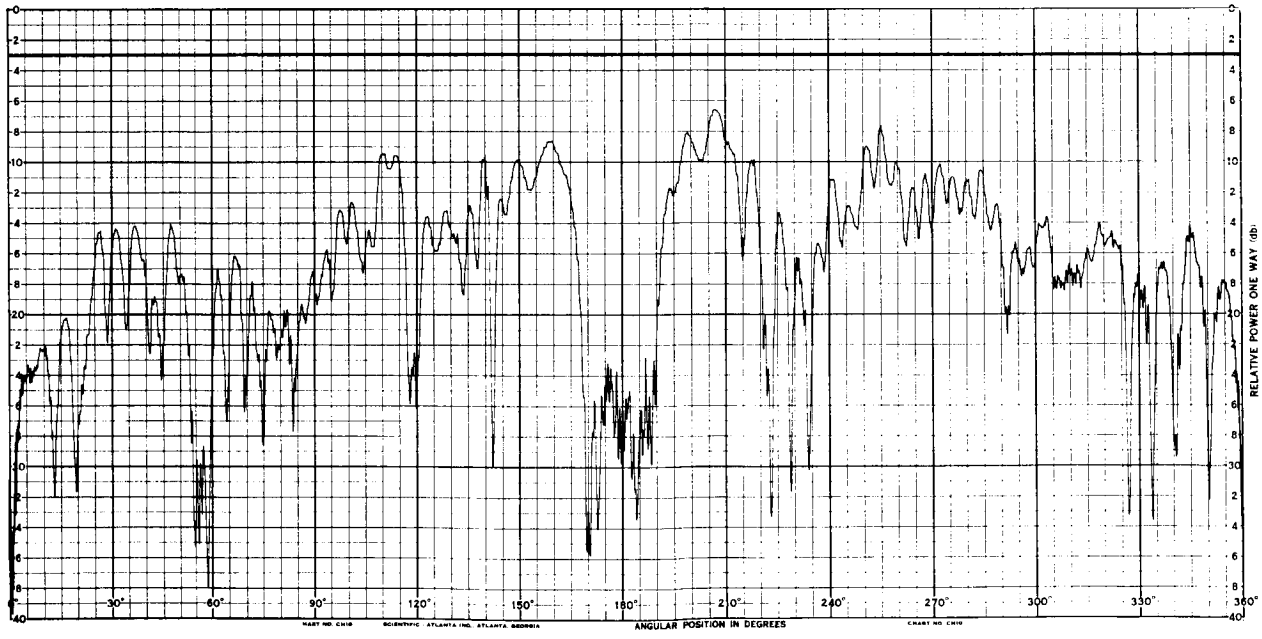
ANTENNA RADIATION PATTERN NO. 204-37

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



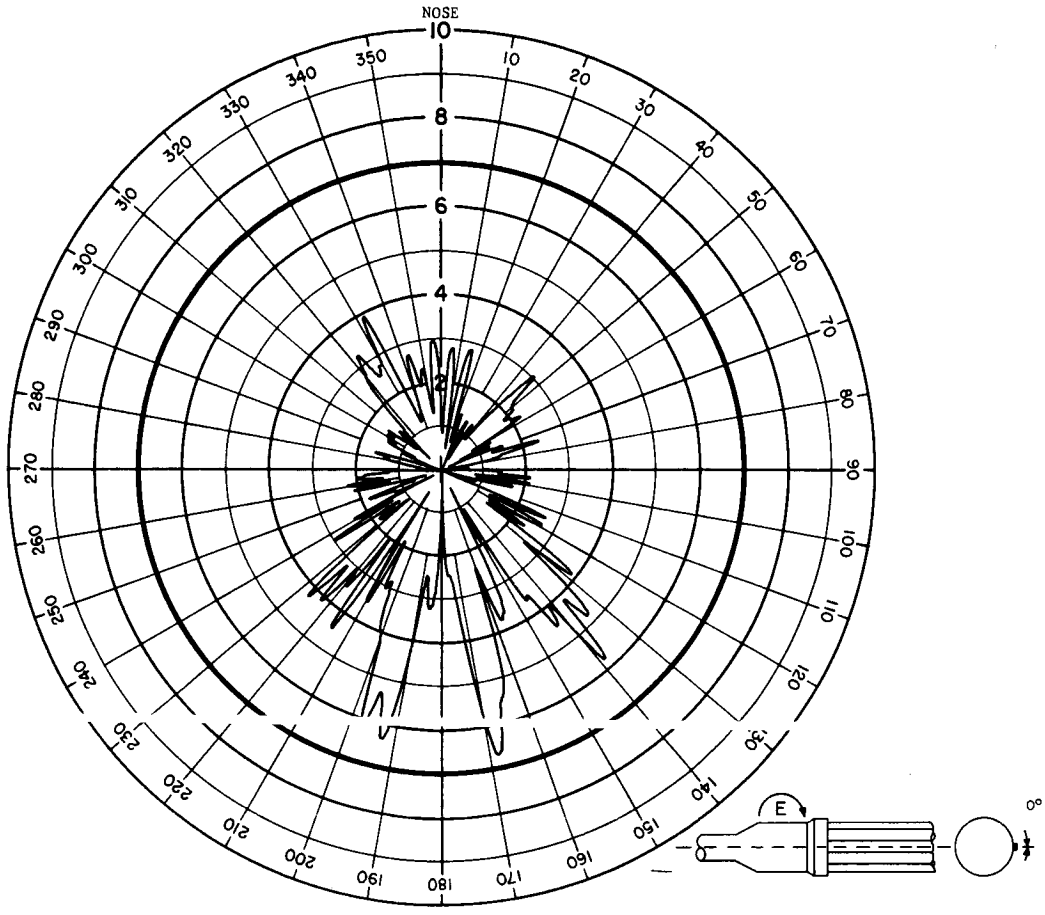


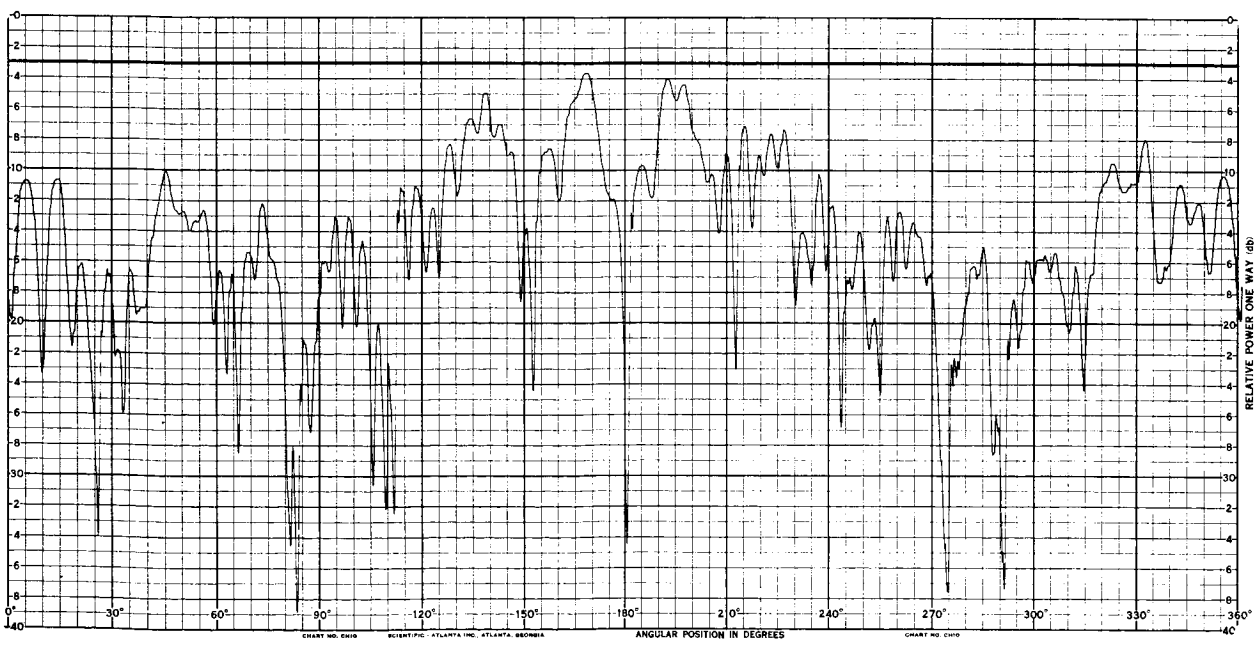
ANTENNA RADIATION PATTERN NO. 204-38

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



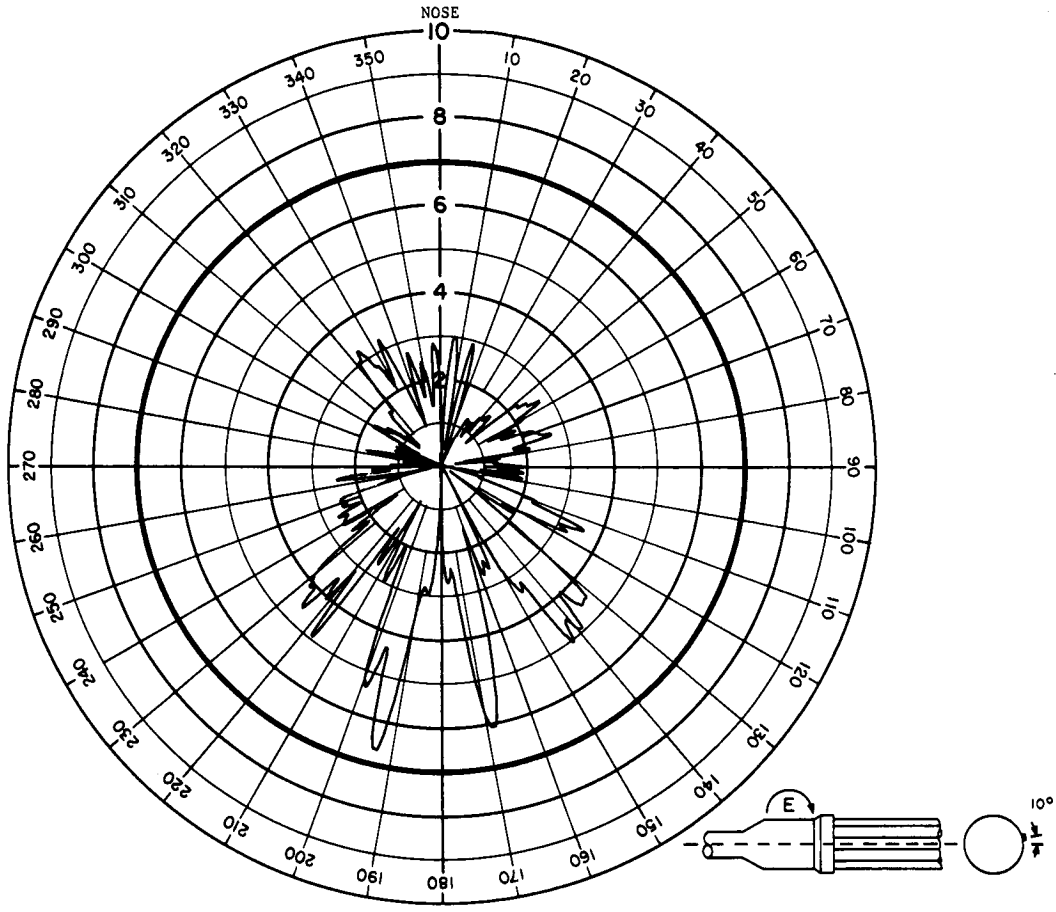


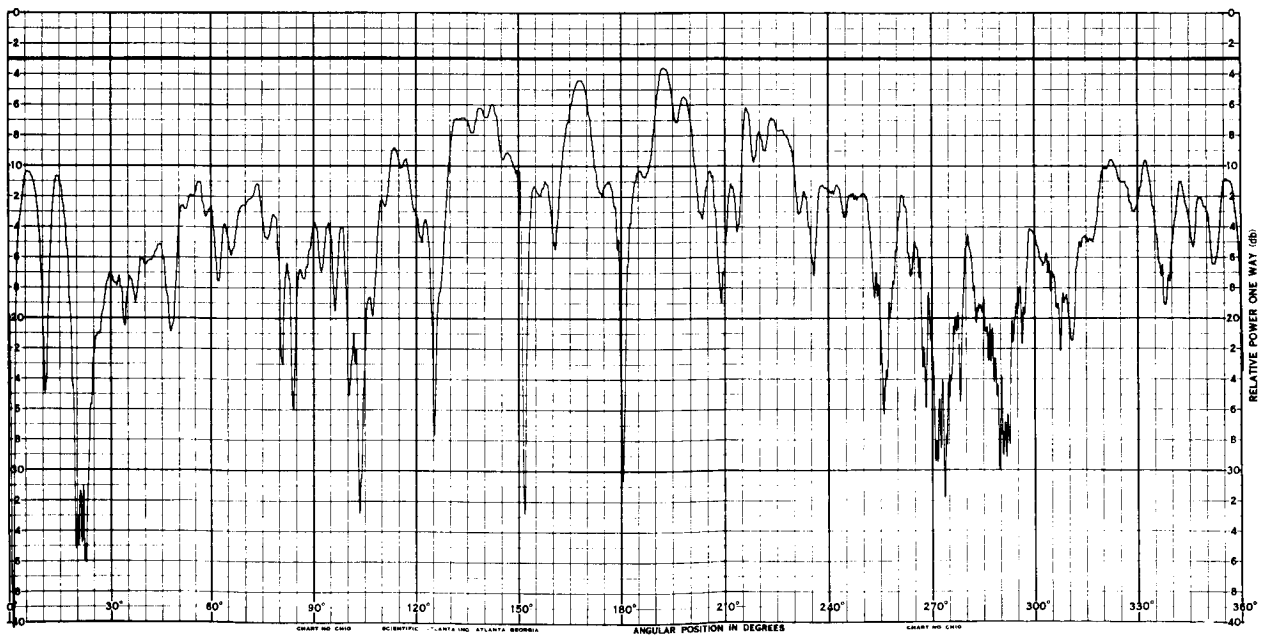
ANTENNA RADIATION PATTERN NO. 204-39

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



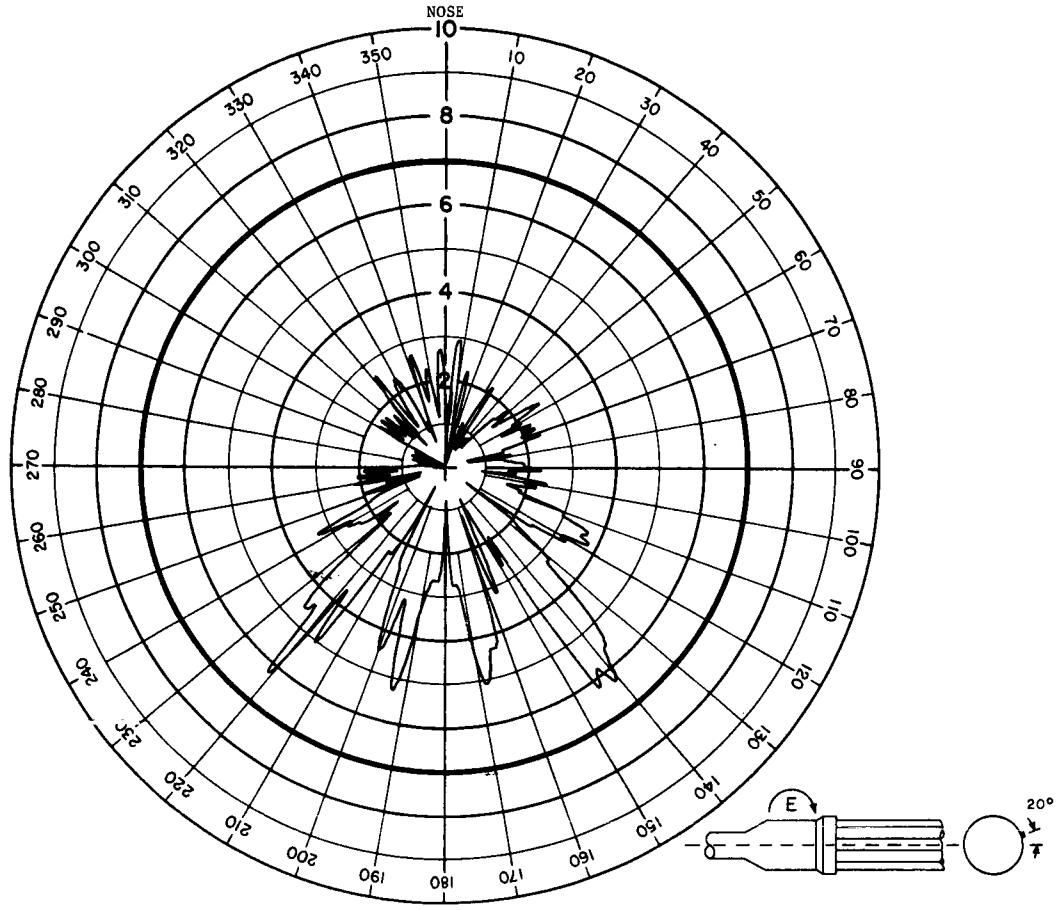


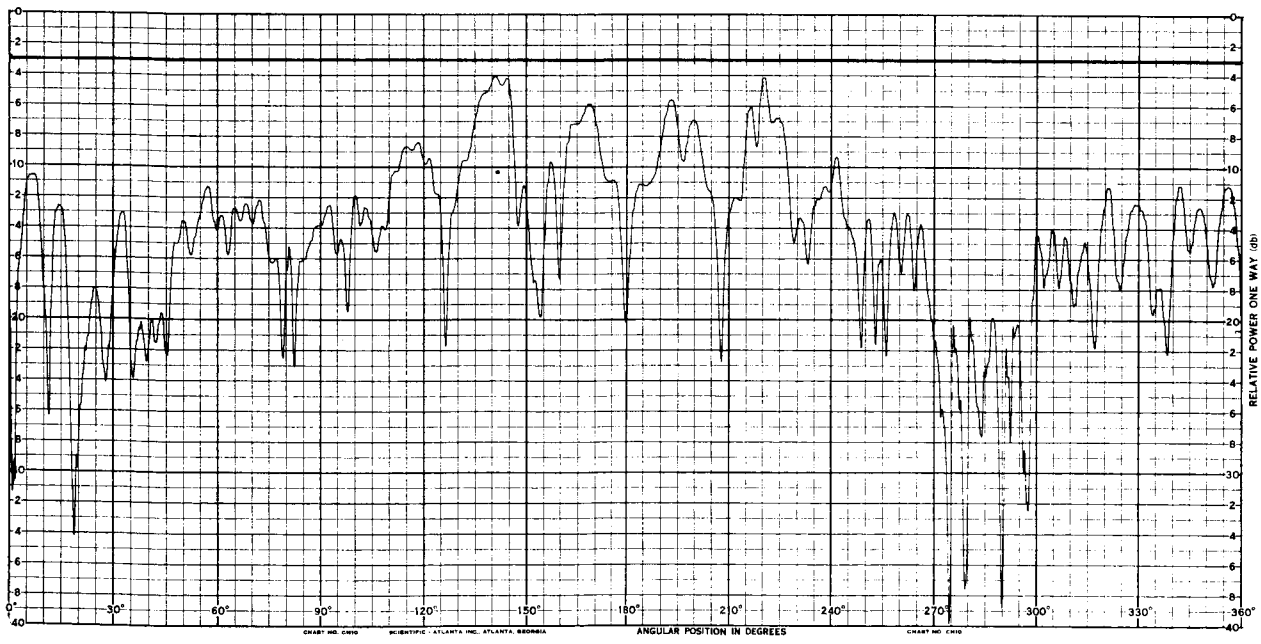
ANTENNA RADIATION PATTERN NO. 204-40

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



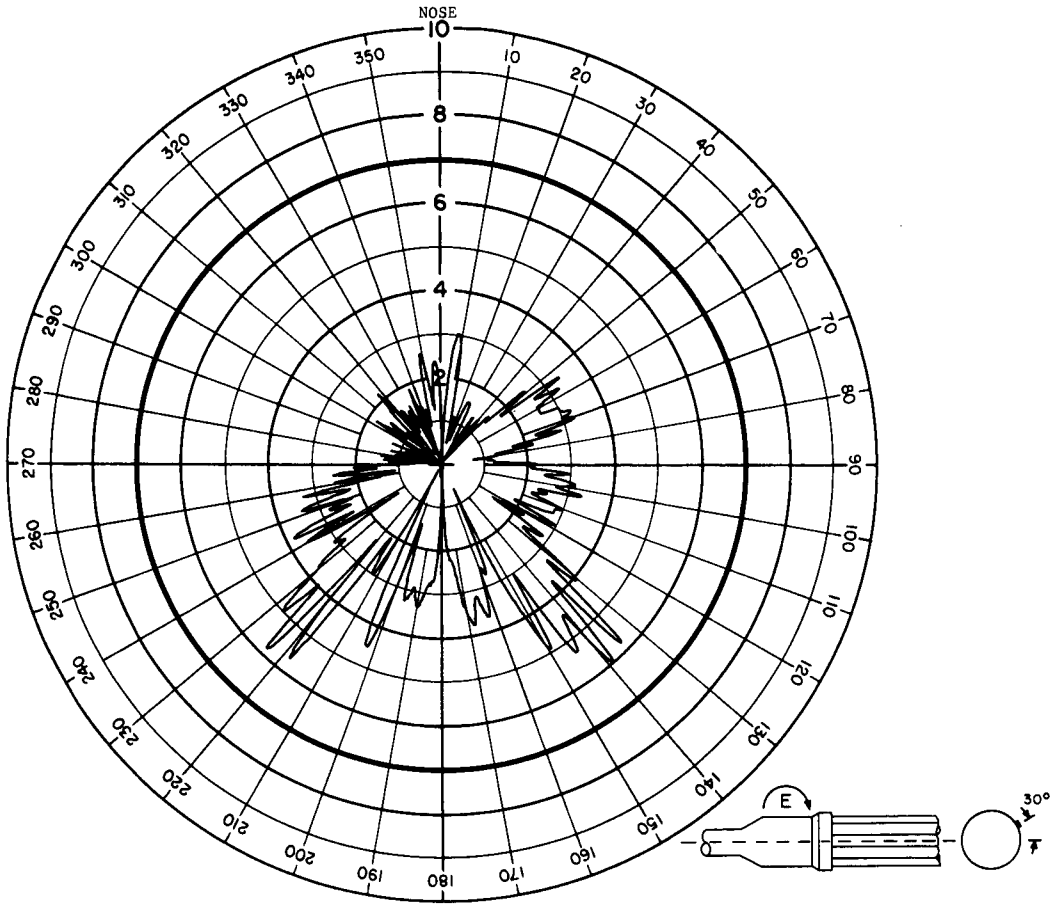


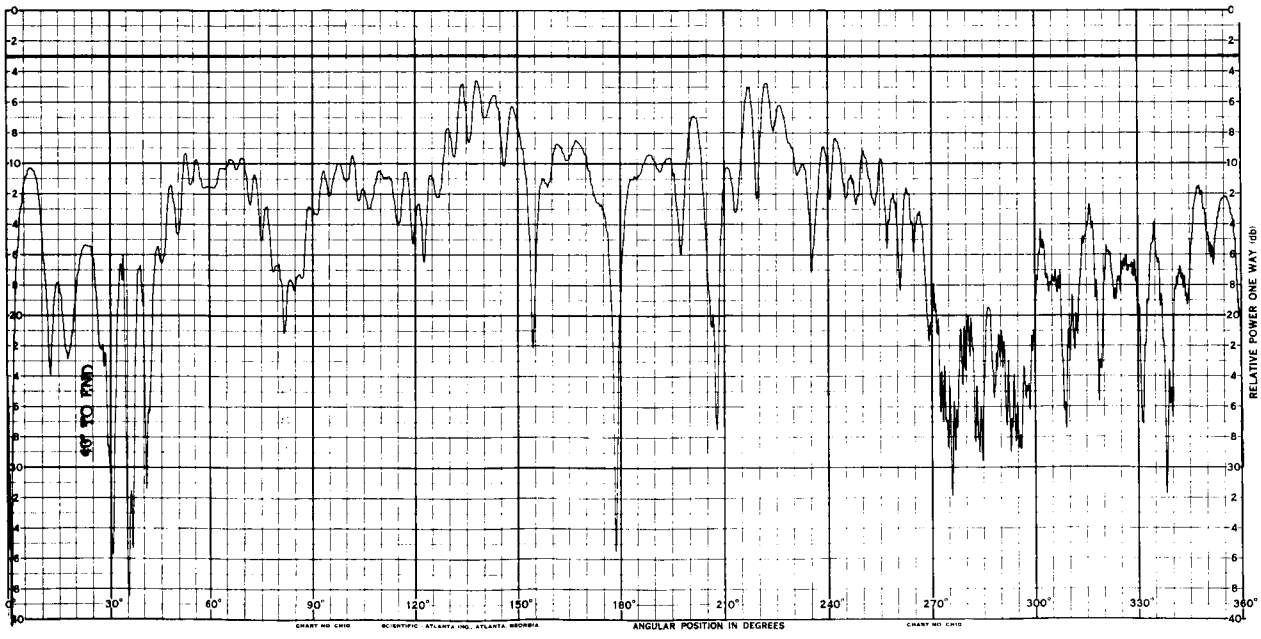
ANTENNA RADIATION PATTERN NO. 204-41

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



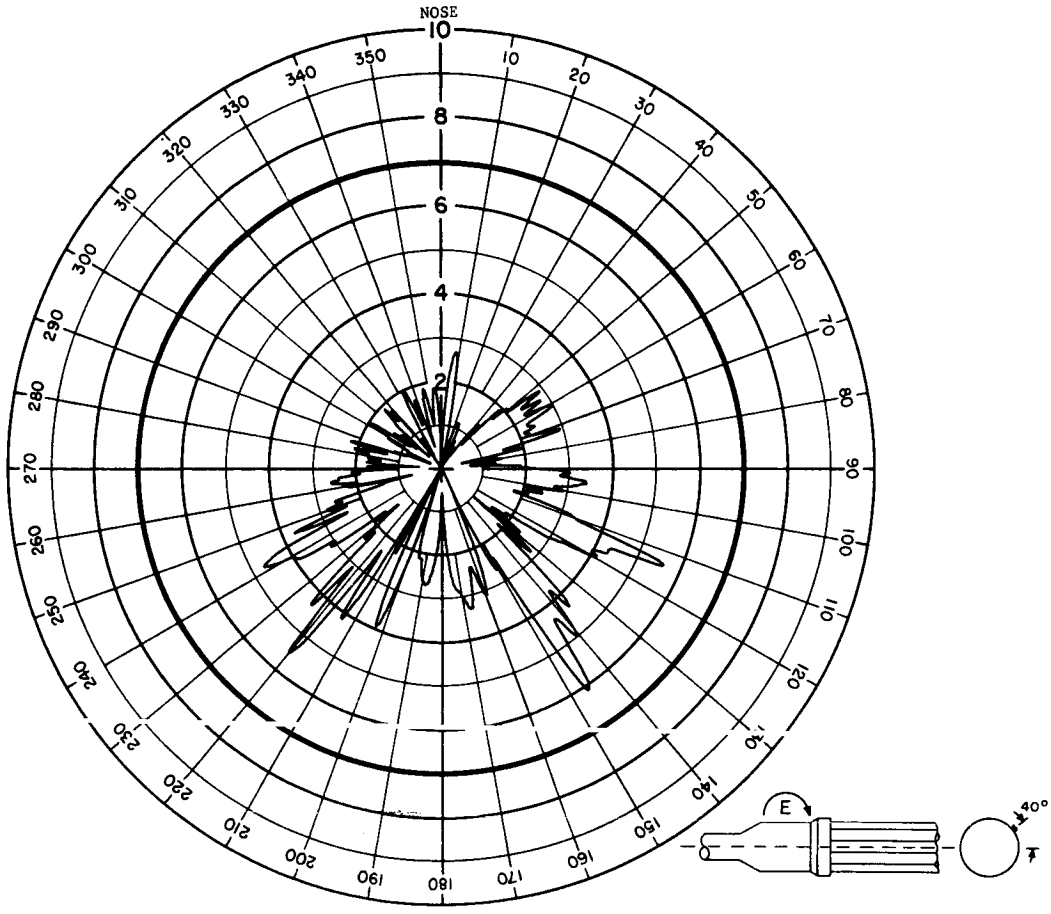


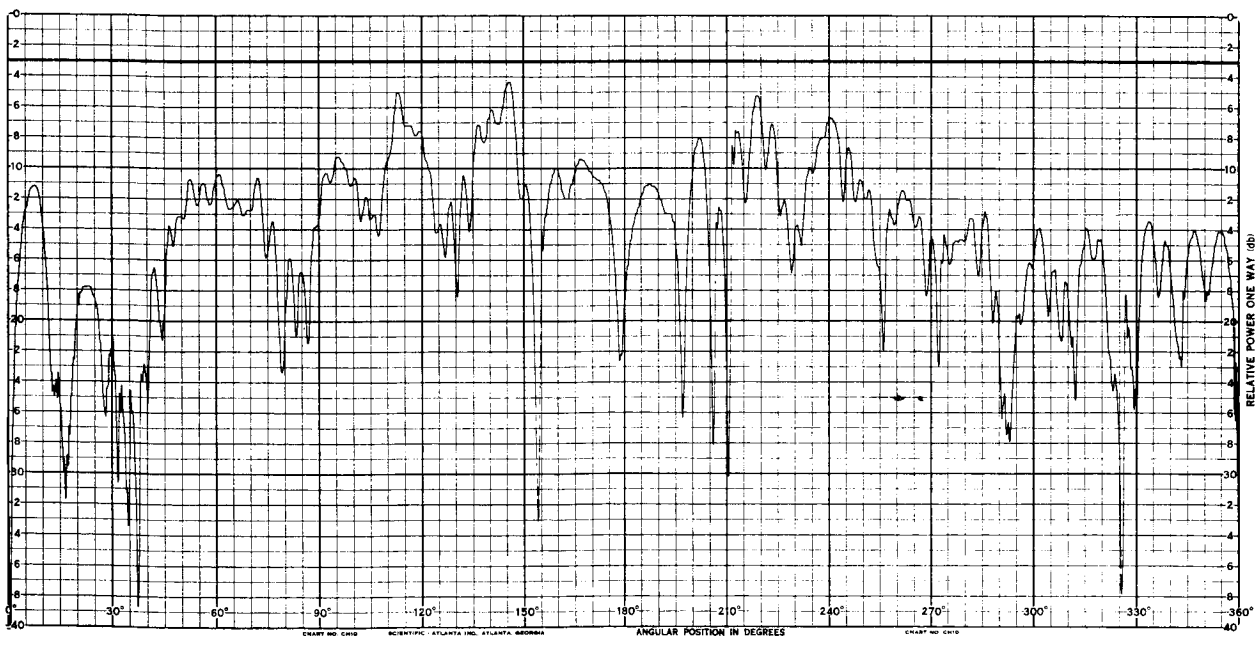
ANTENNA RADIATION PATTERN NO. 204-42

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



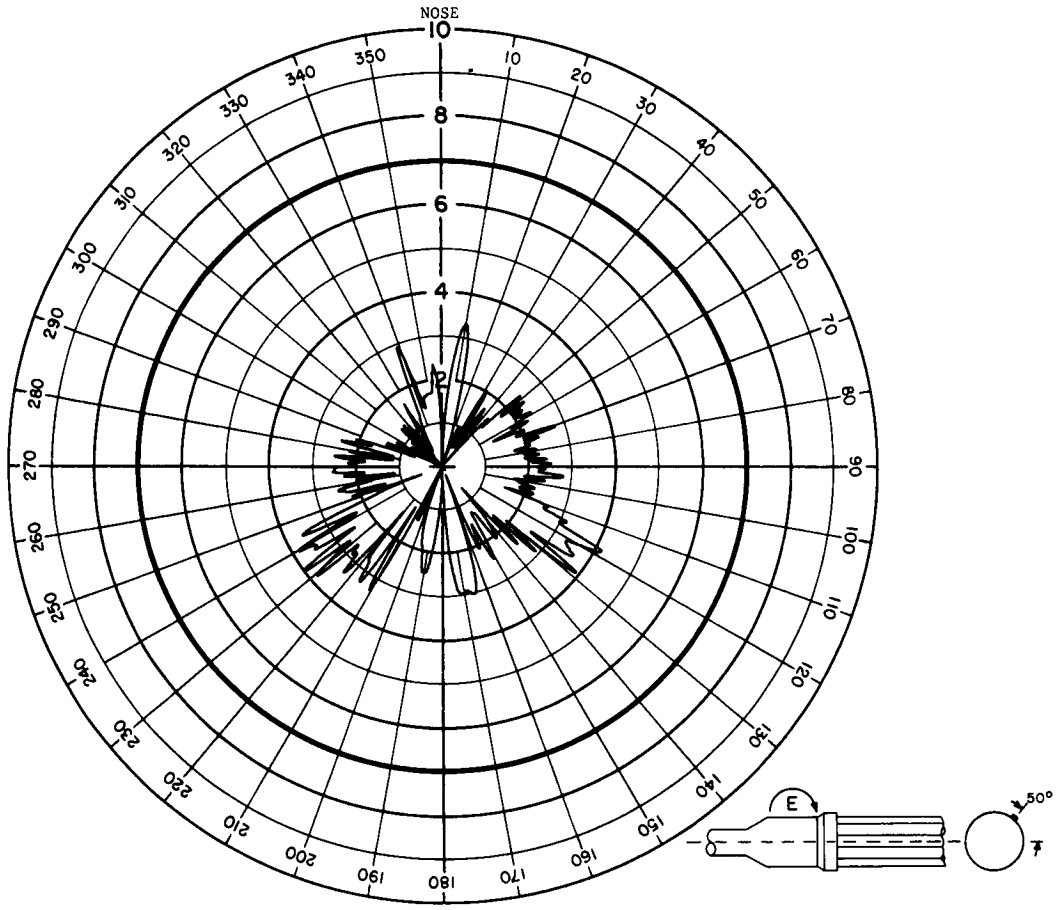


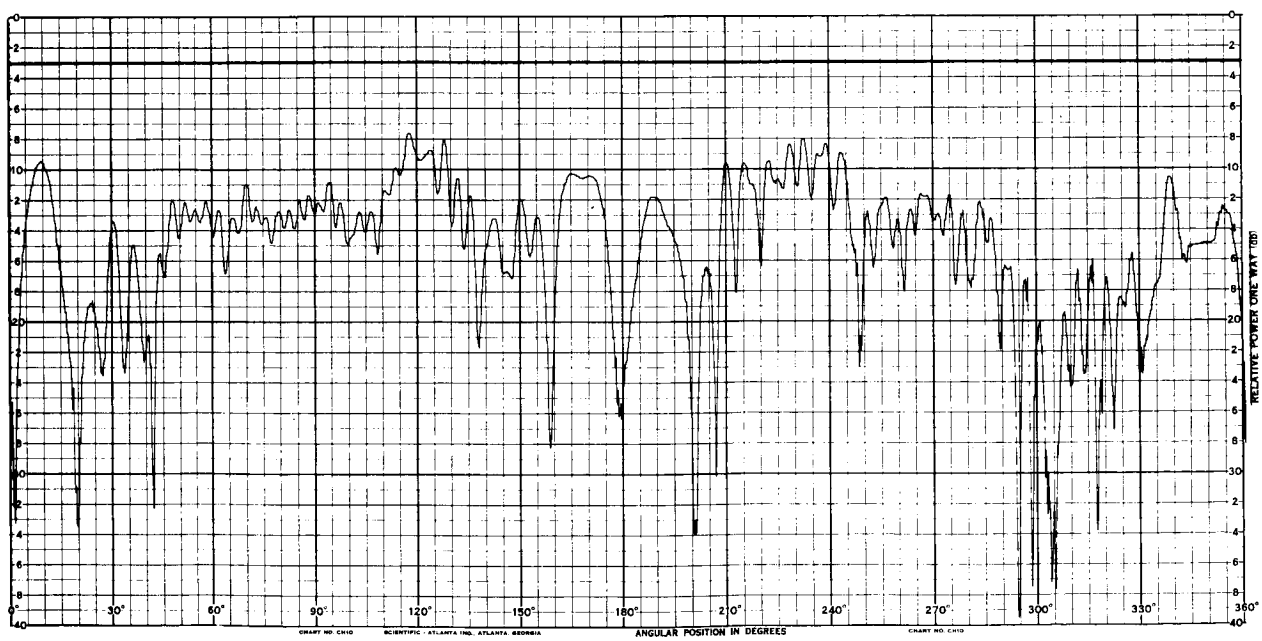
ANTENNA RADIATION PATTERN NO. 204-43

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



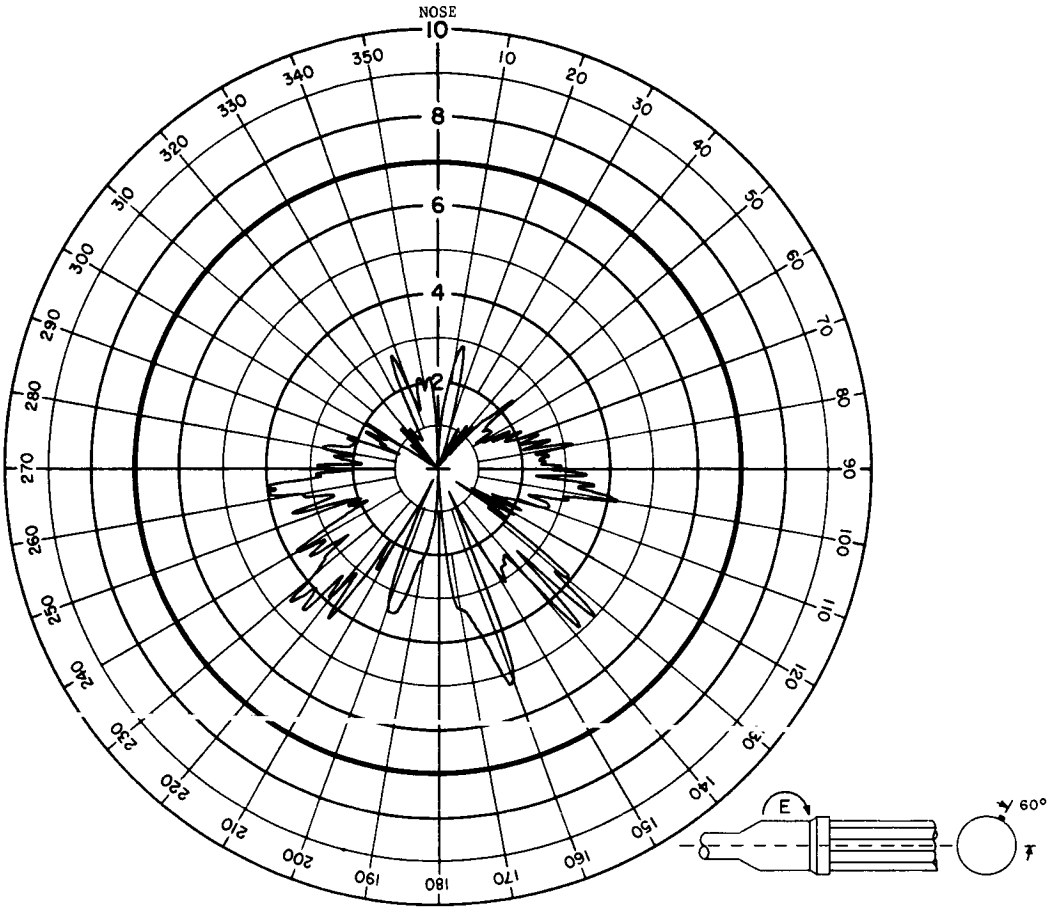


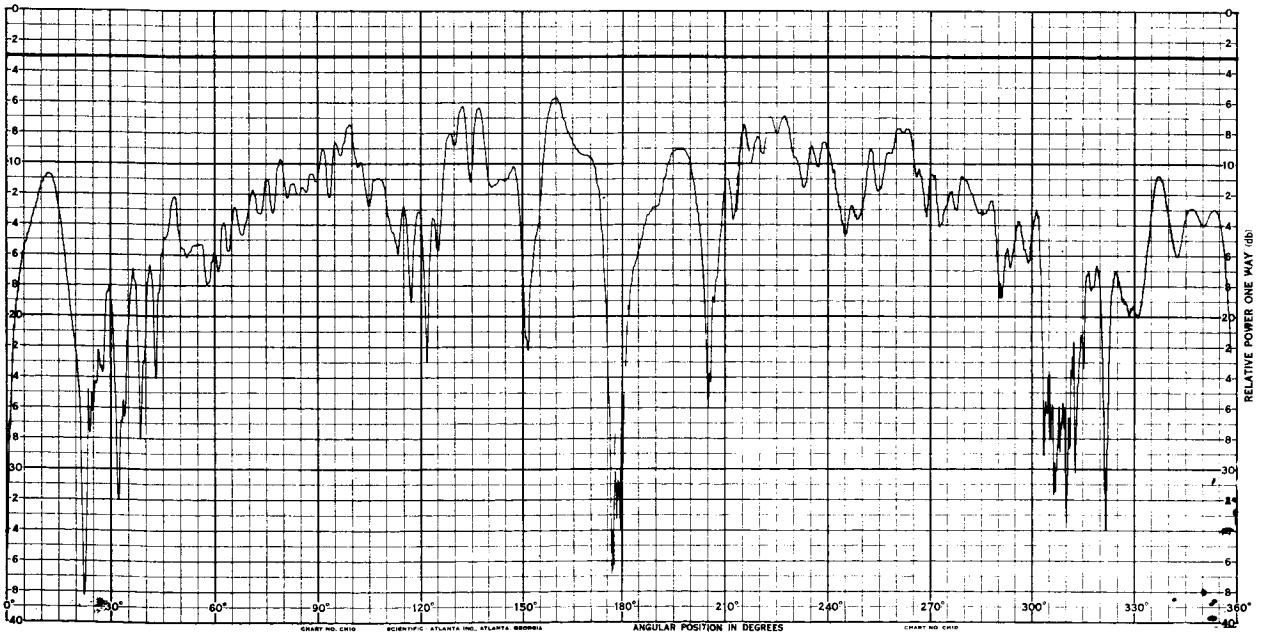
ANTENNA RADIATION PATTERN NO. 204-44

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



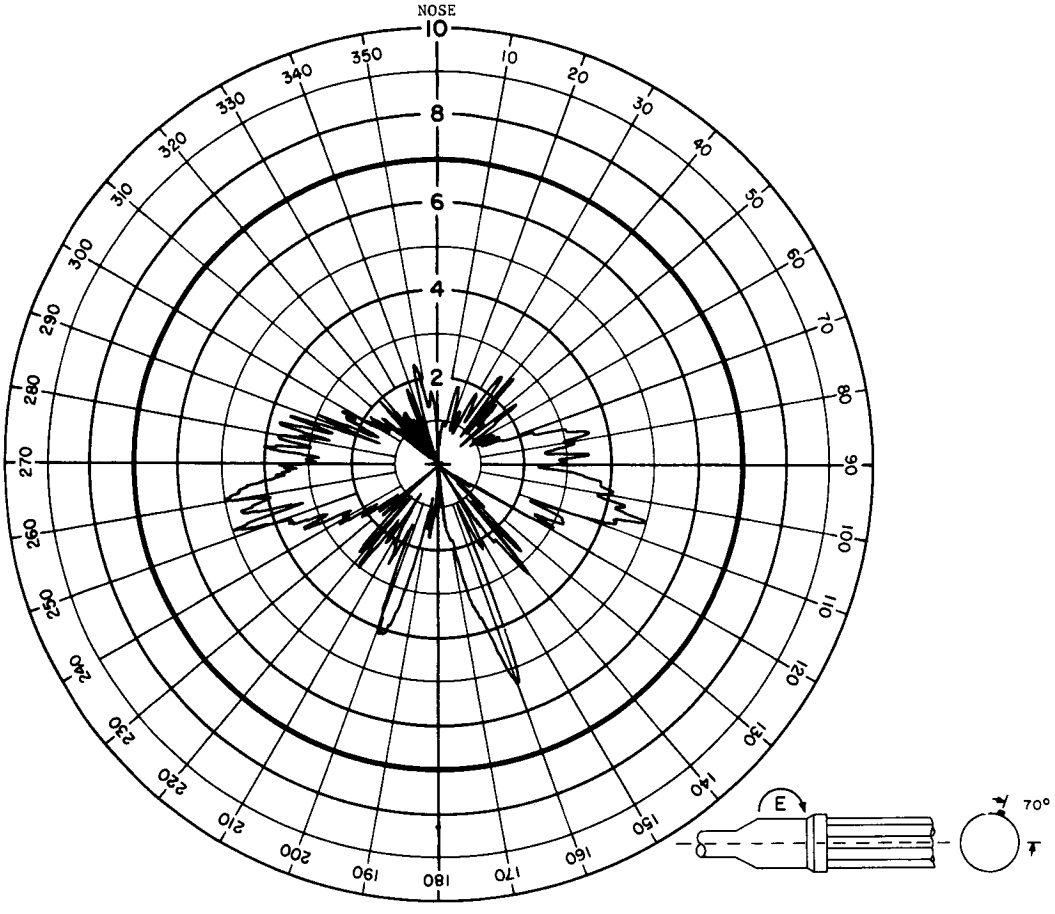


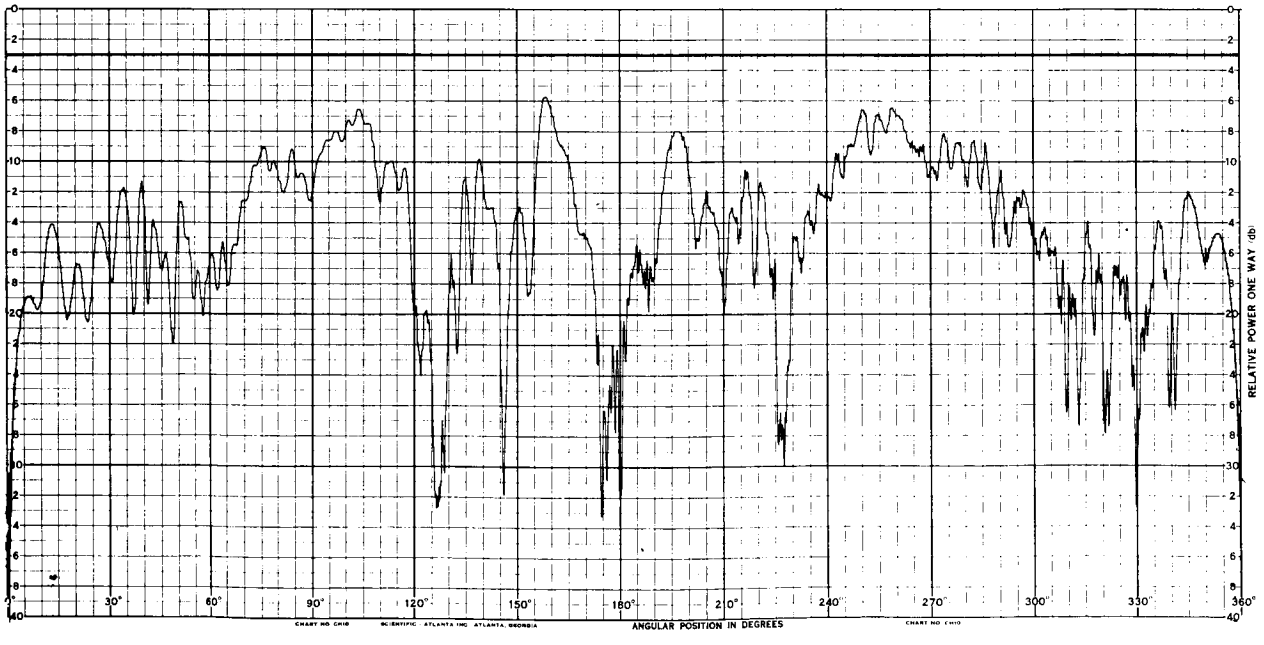
ANTENNA RADIATION PATTERN NO. 204-45

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



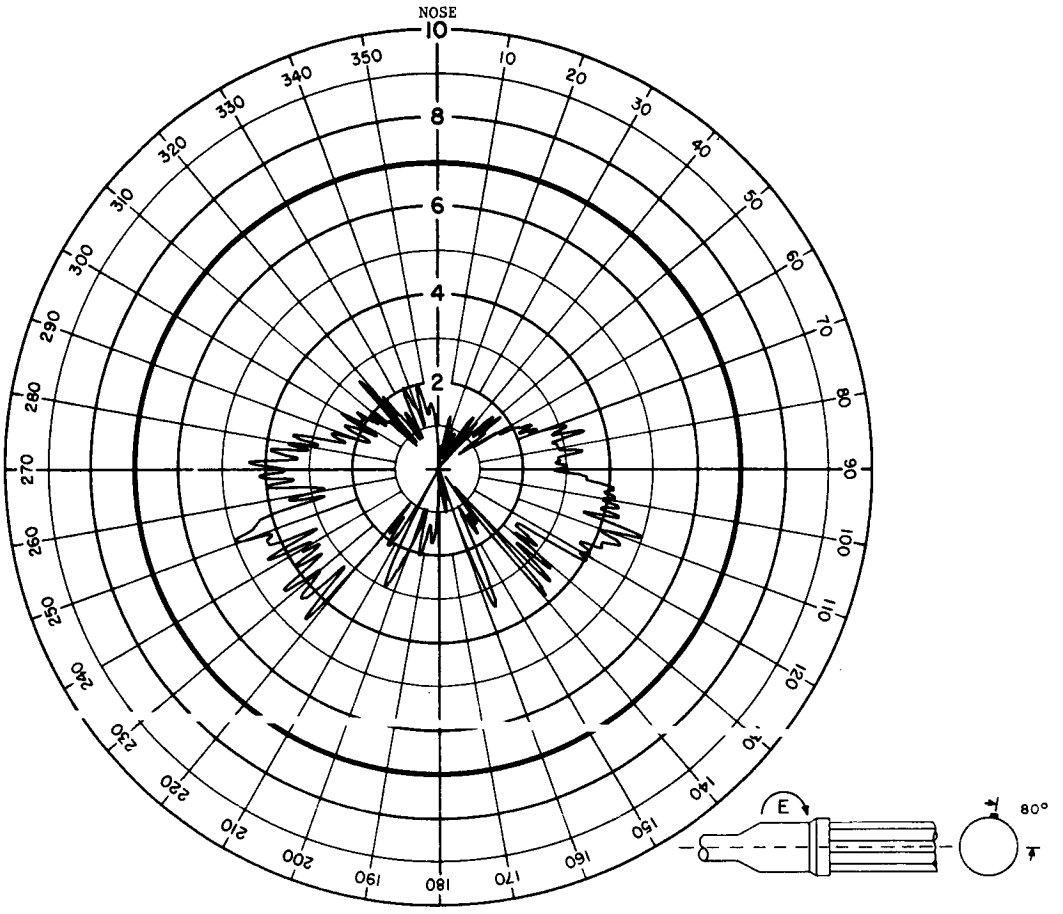


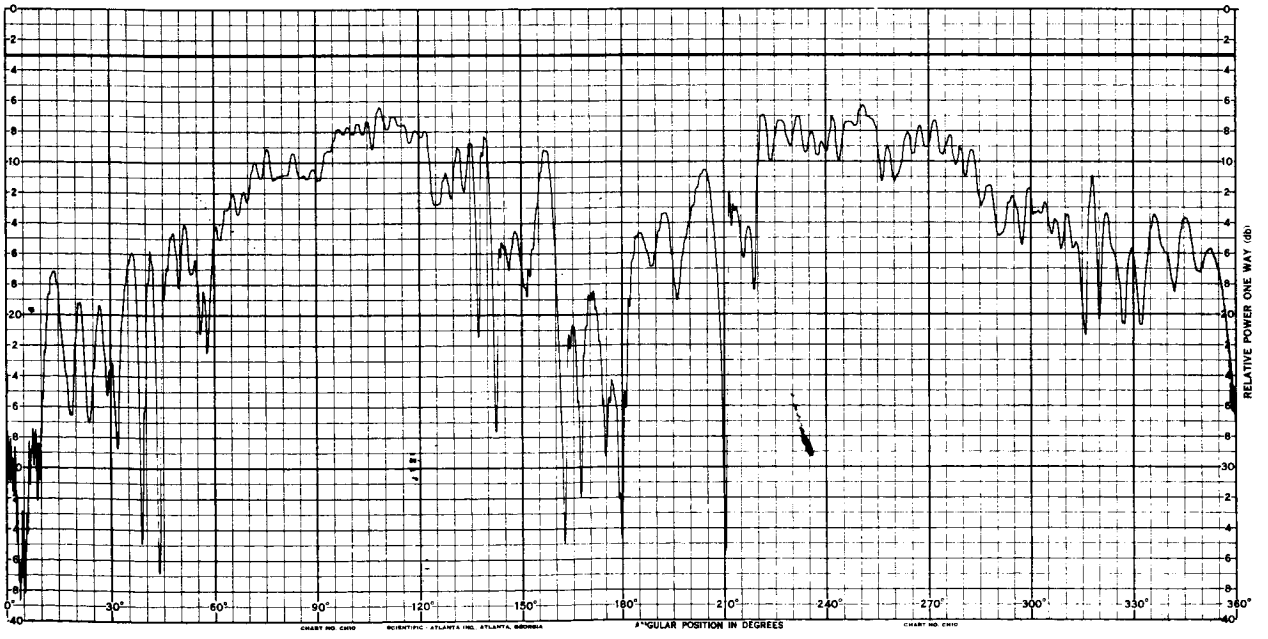
ANTENNA RADIATION PATTERN NO. 204-46

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



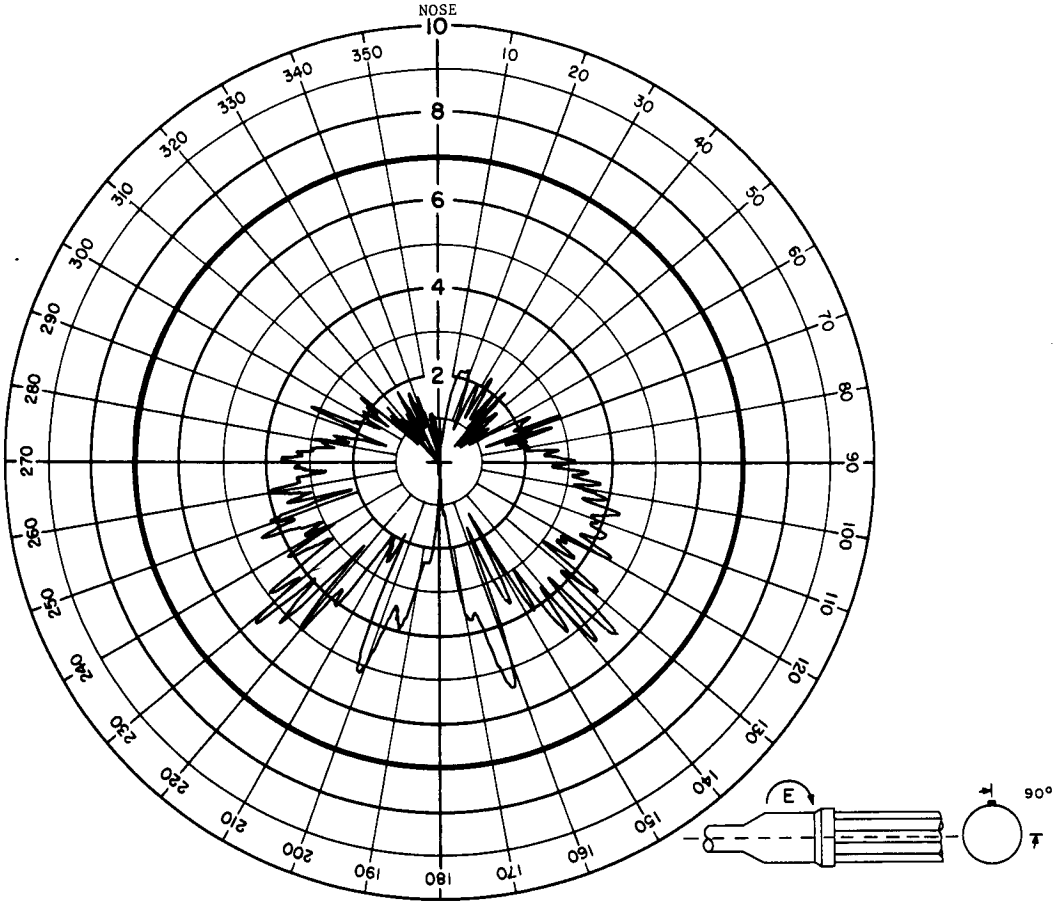


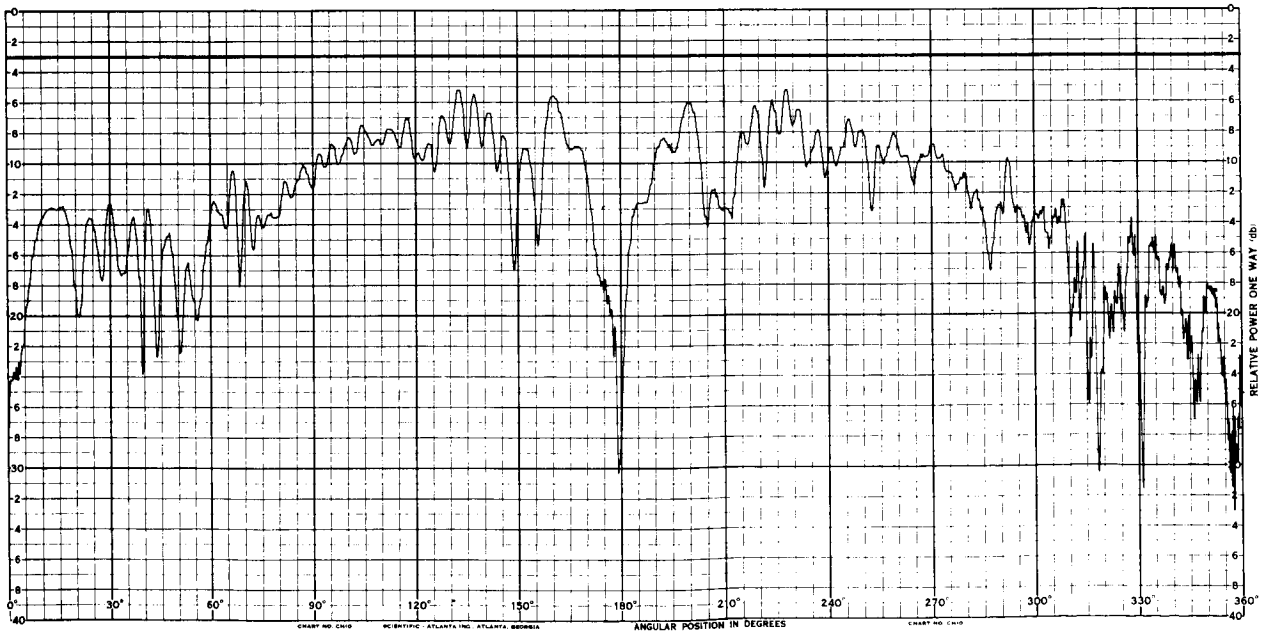
ANTENNA RADIATION PATTERN NO. 204-47

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



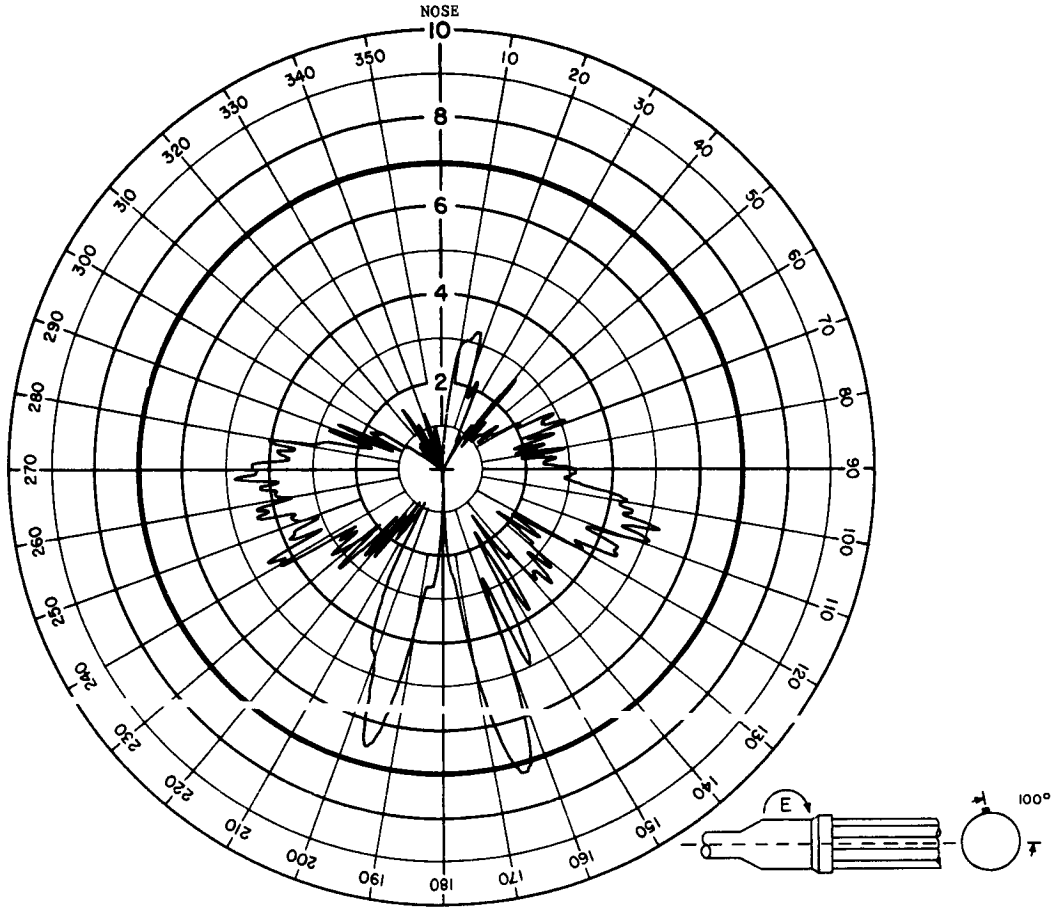


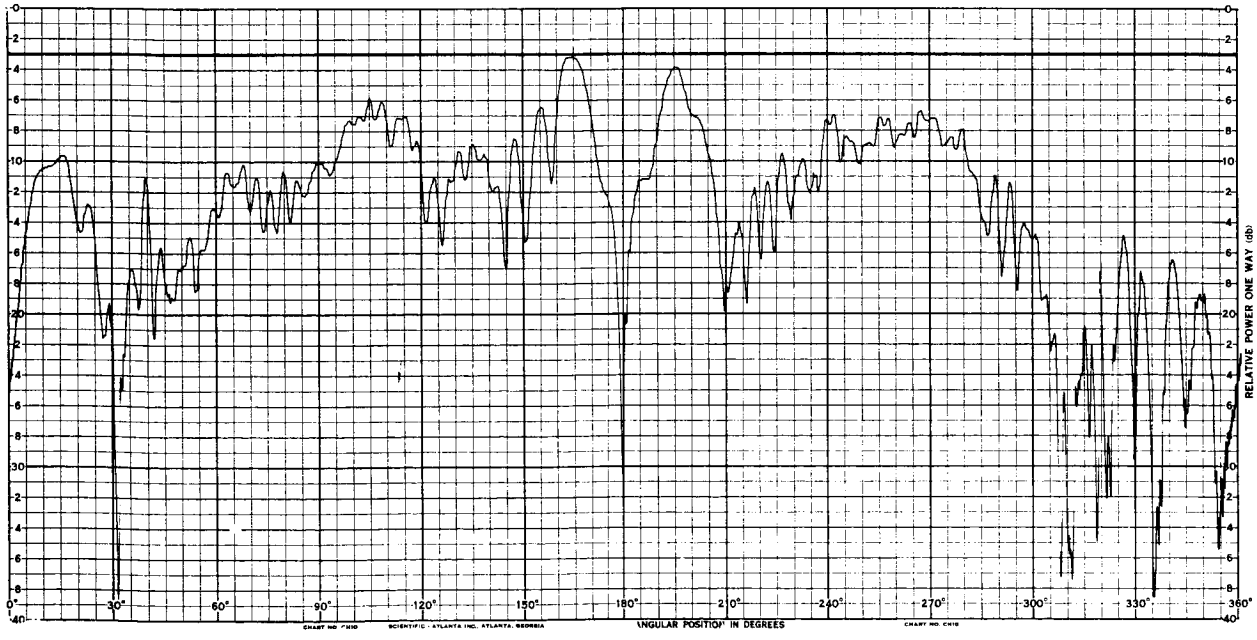
ANTENNA RADIATION PATTERN NO. 204-48

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



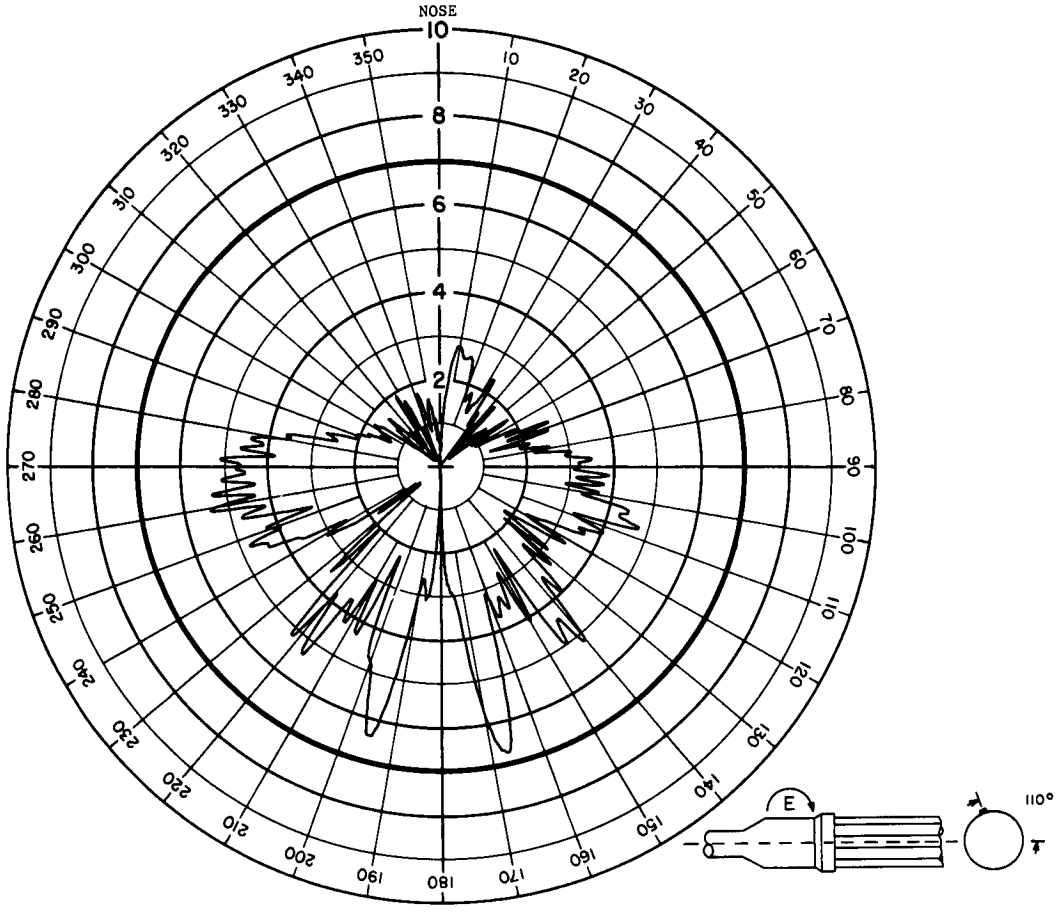


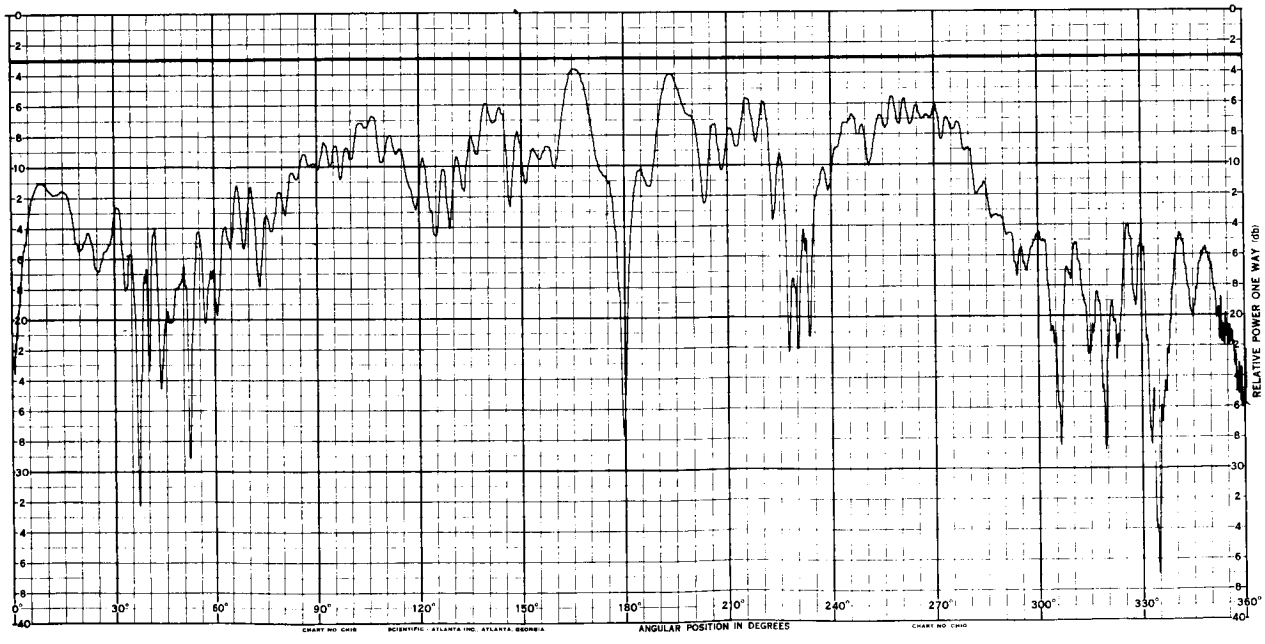
ANTENNA RADIATION PATTERN NO. 204-49

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



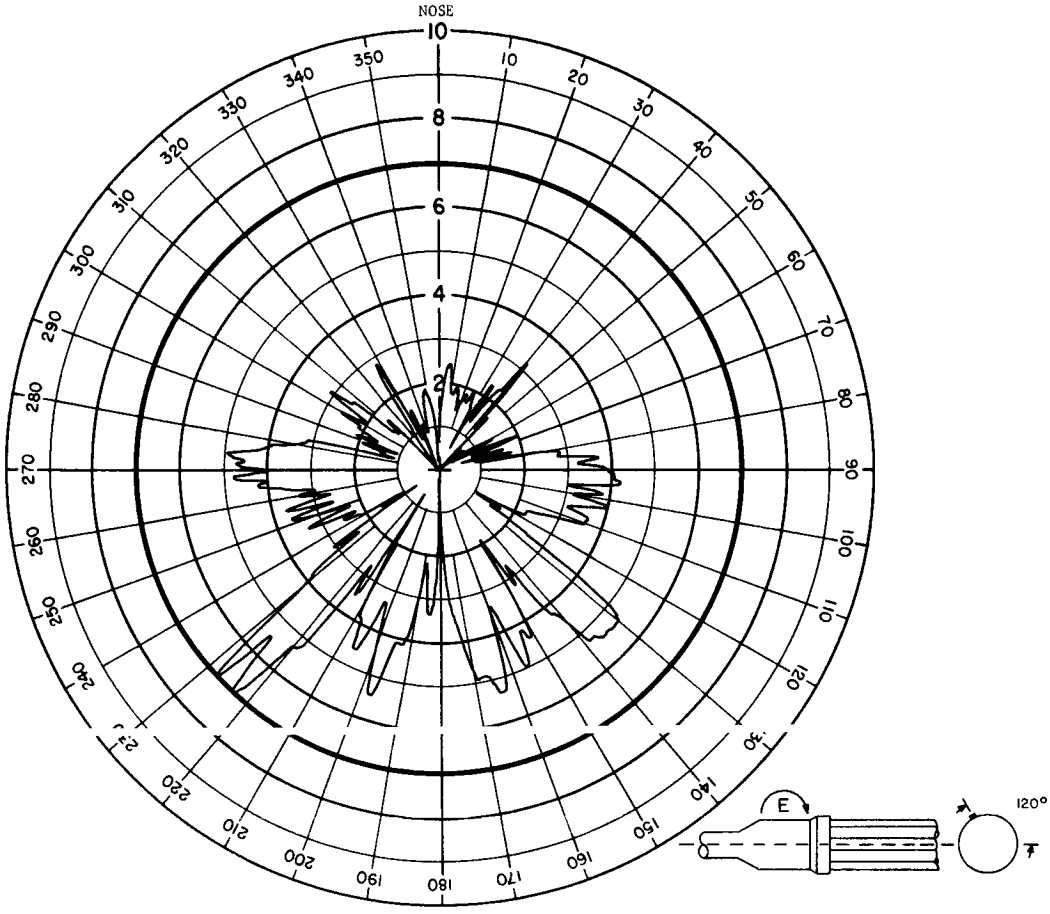


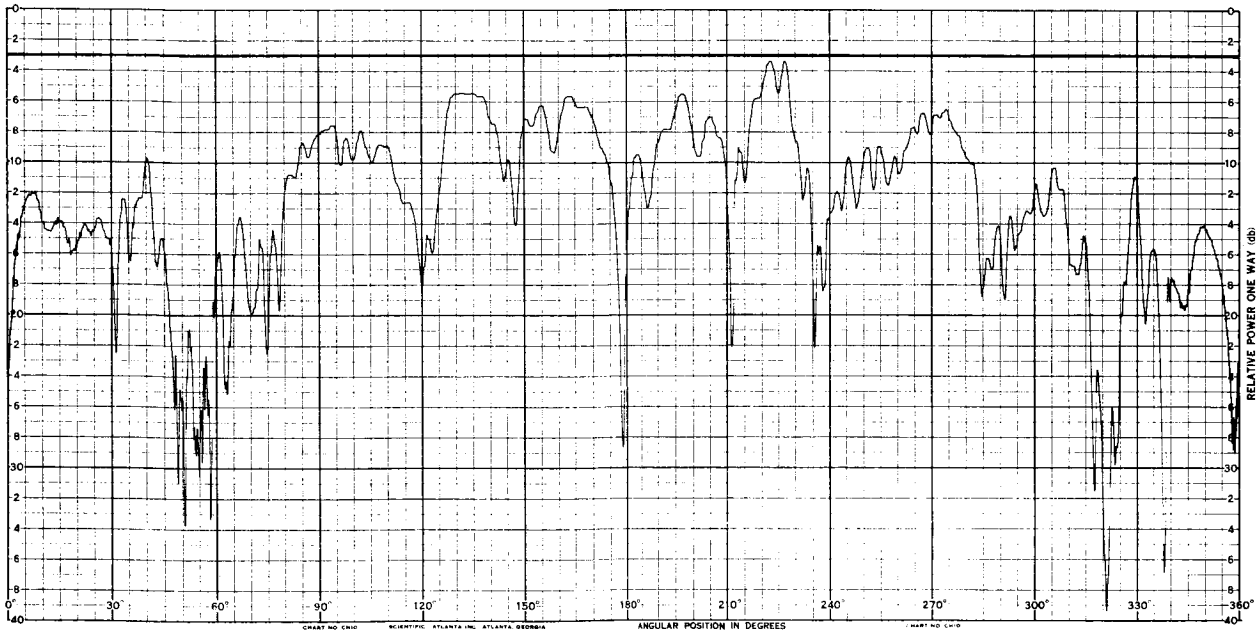
ANTENNA RADIATION PATTERN NO. 204-50

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



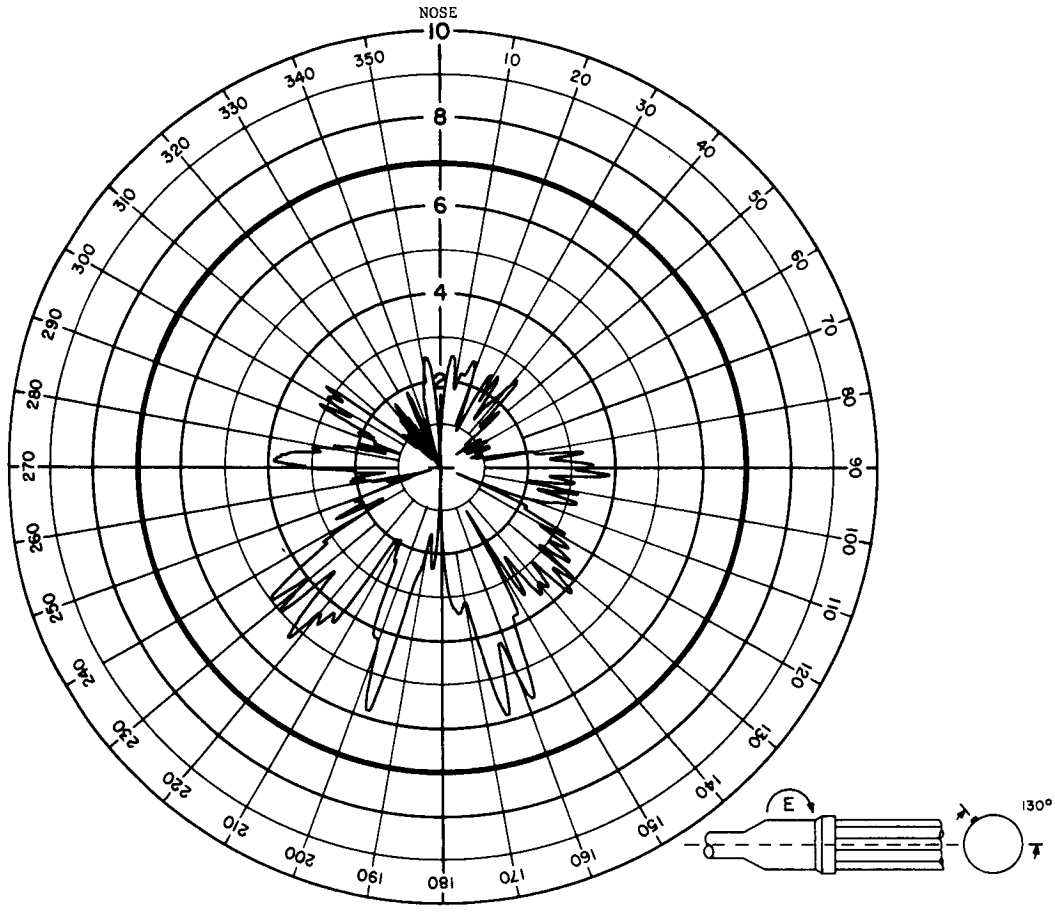


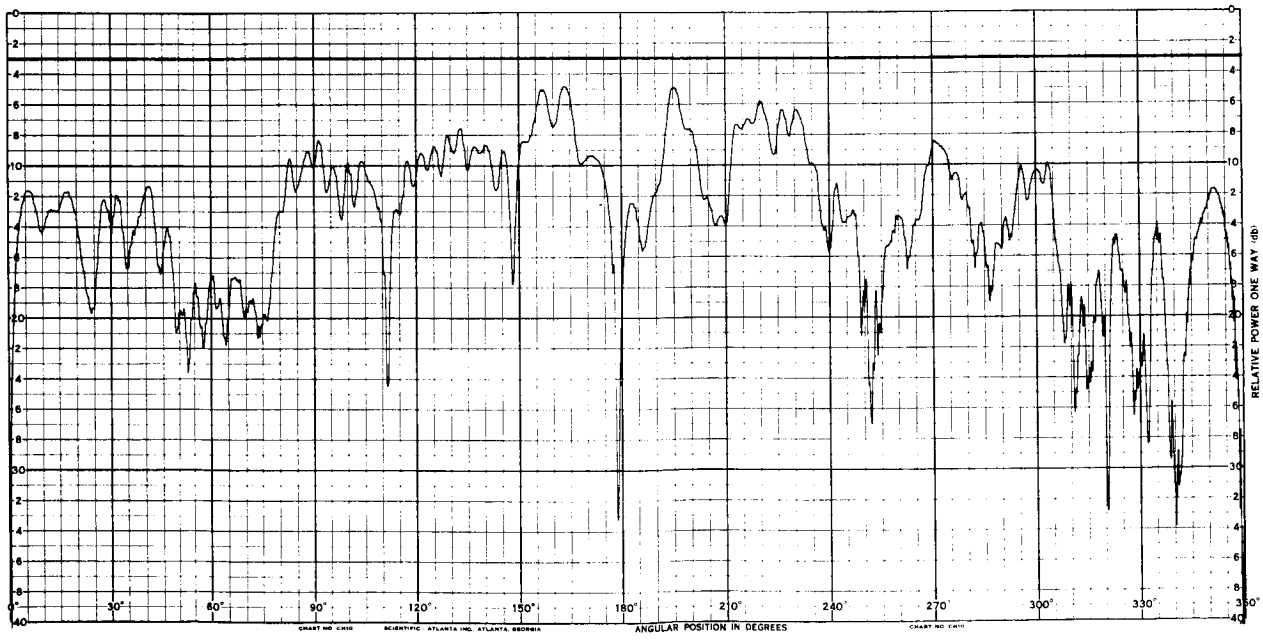
ANTENNA RADIATION PATTERN NO. 204-51

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



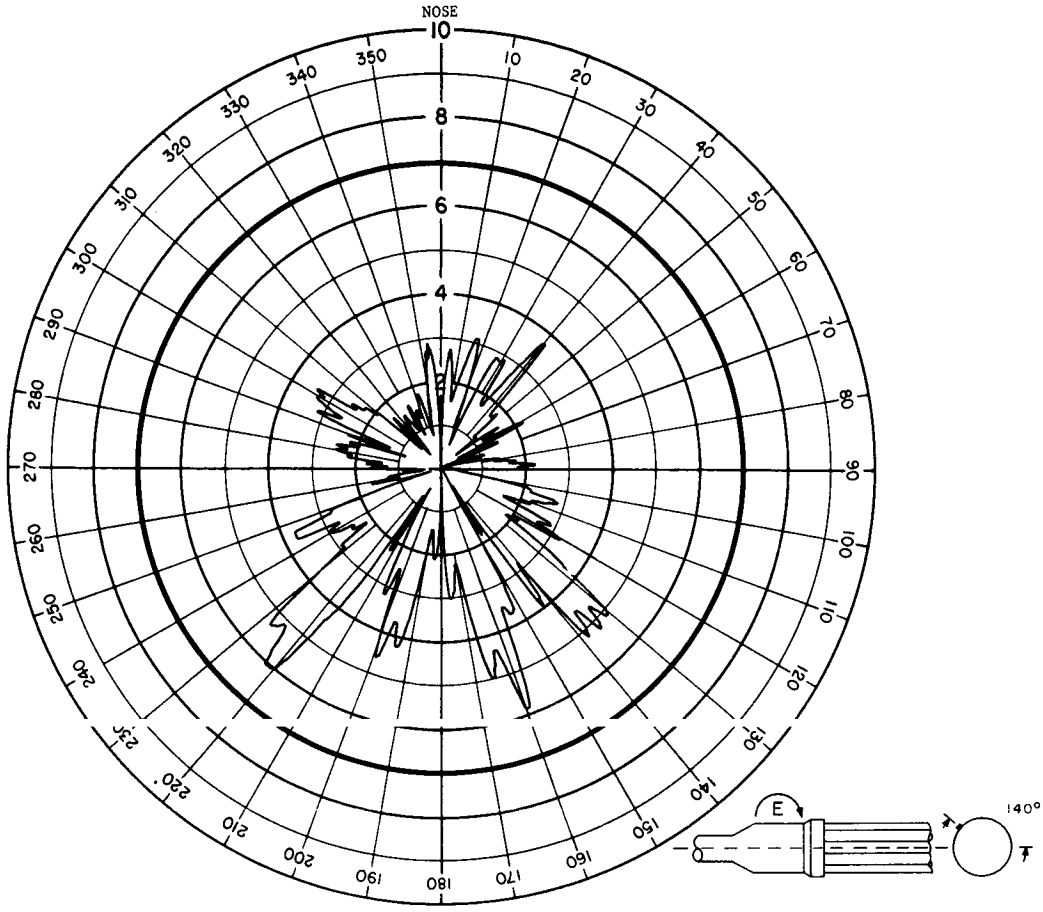


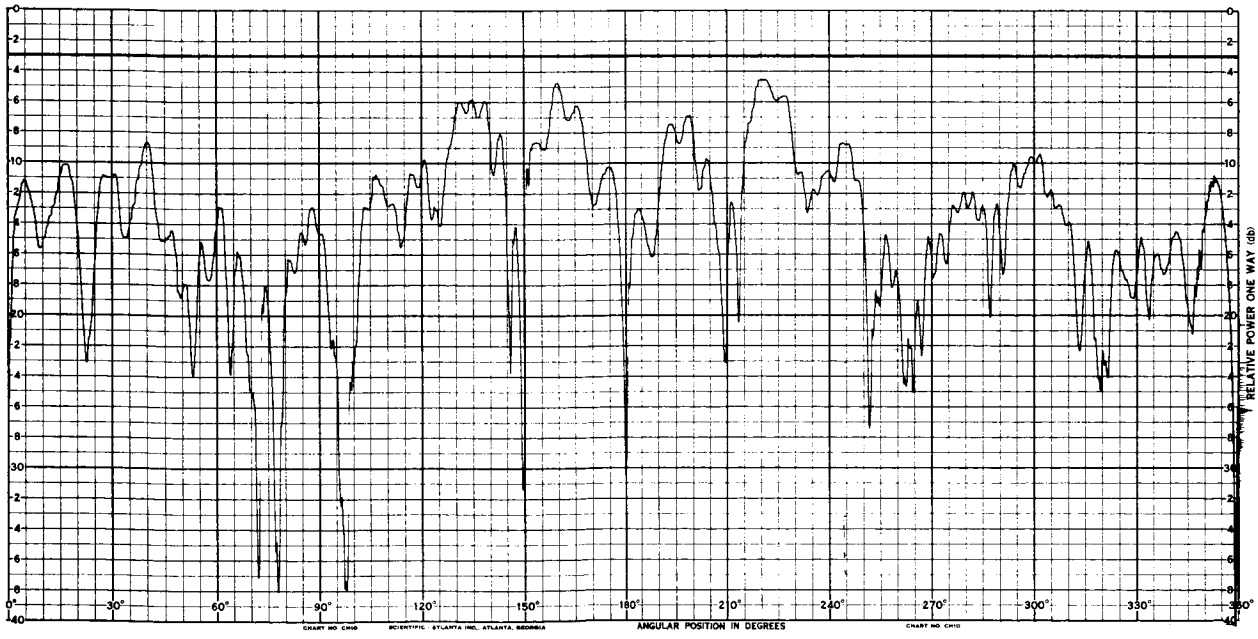
ANTENNA RADIATION PATTERN NO. 204-52

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



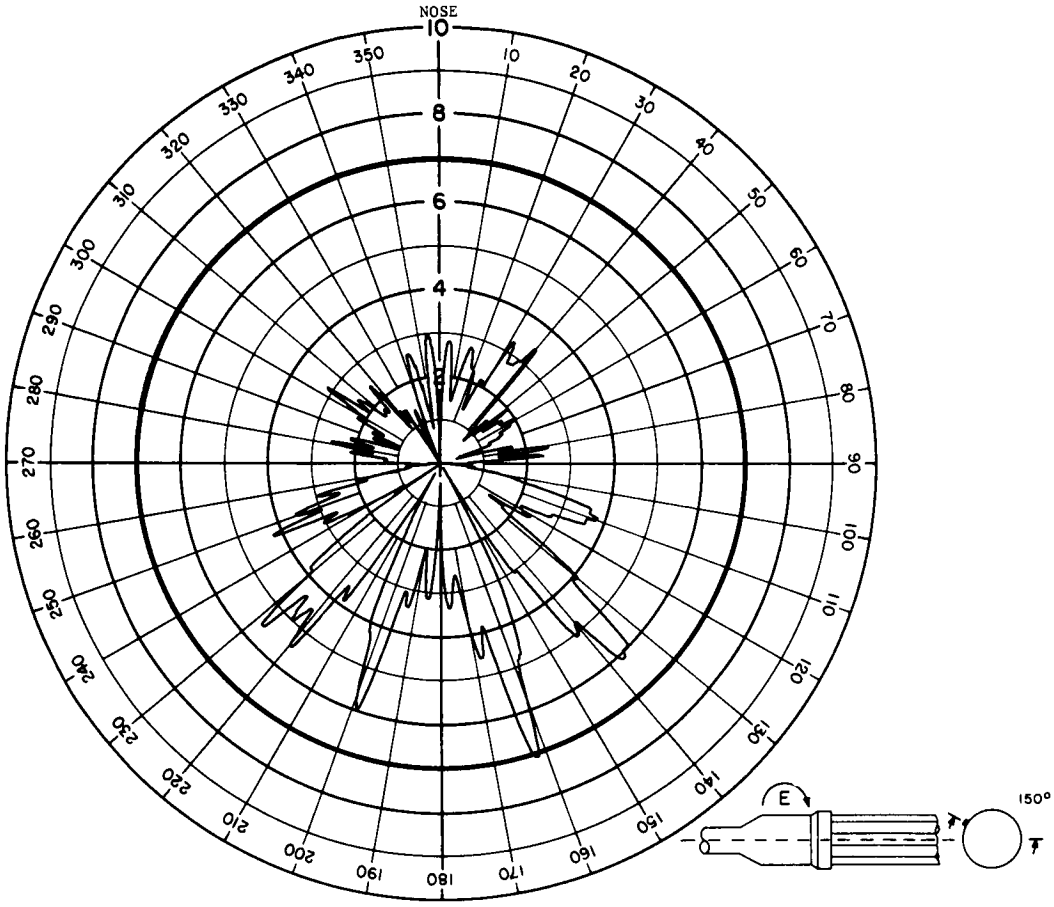


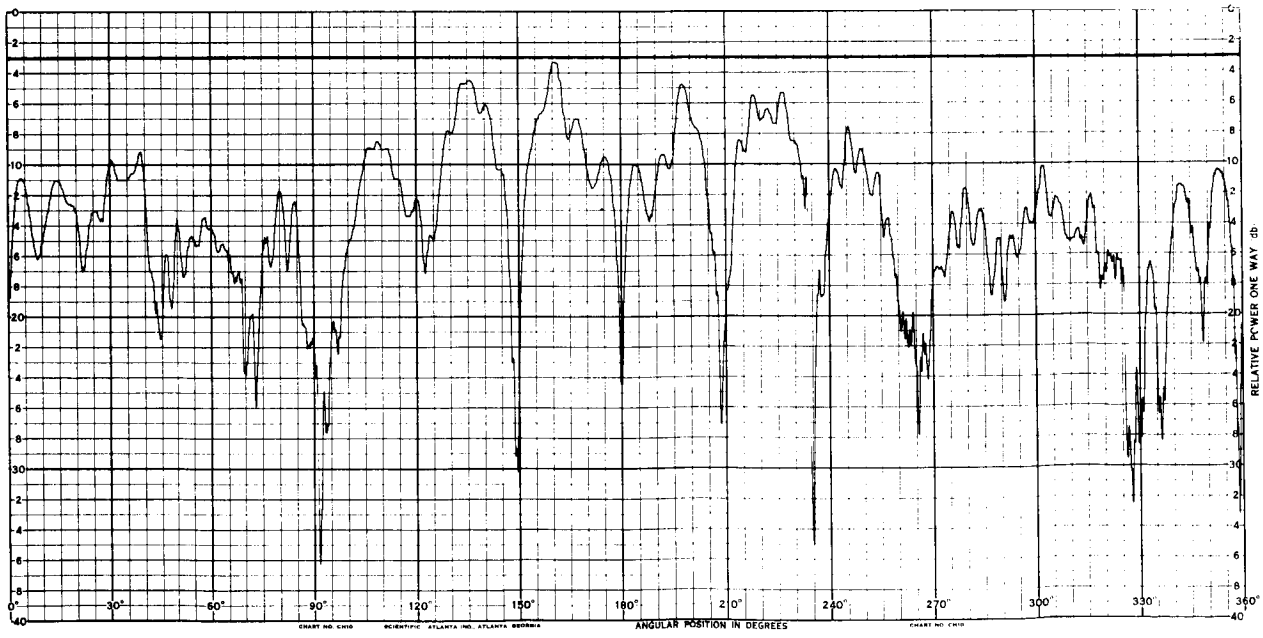
ANTENNA RADIATION PATTERN NO. 204-53

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



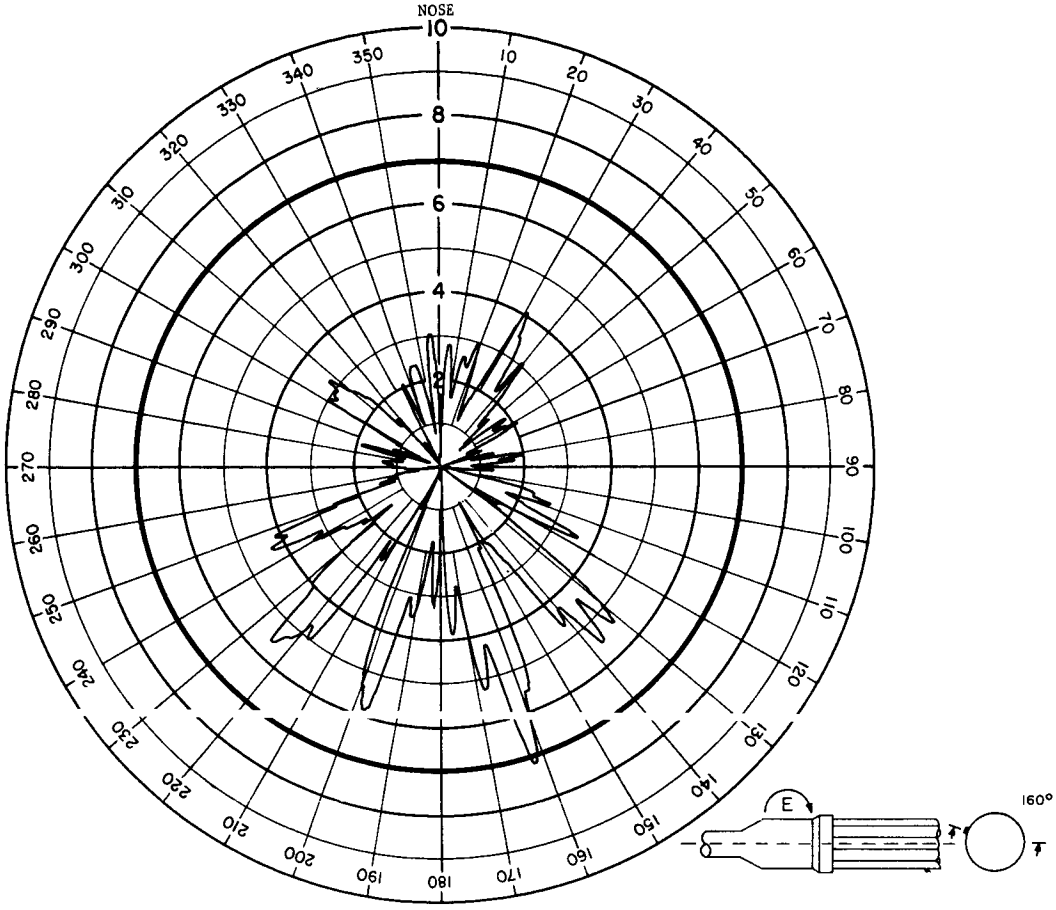


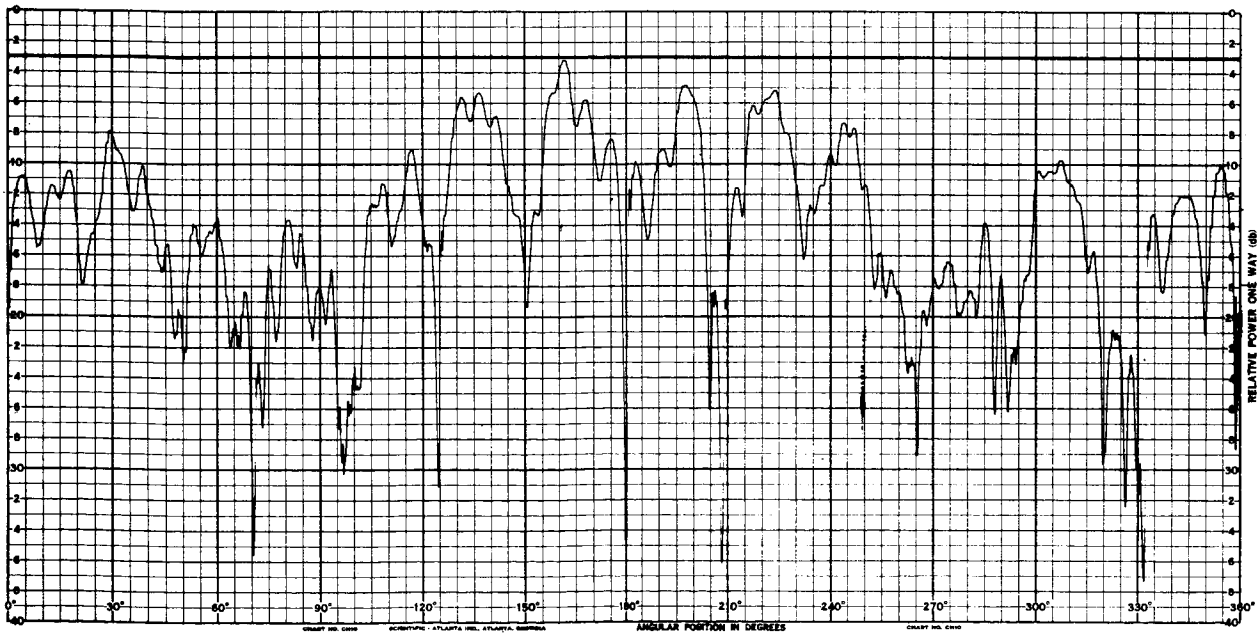
ANTENNA RADIATION PATTERN NO. 204-54

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



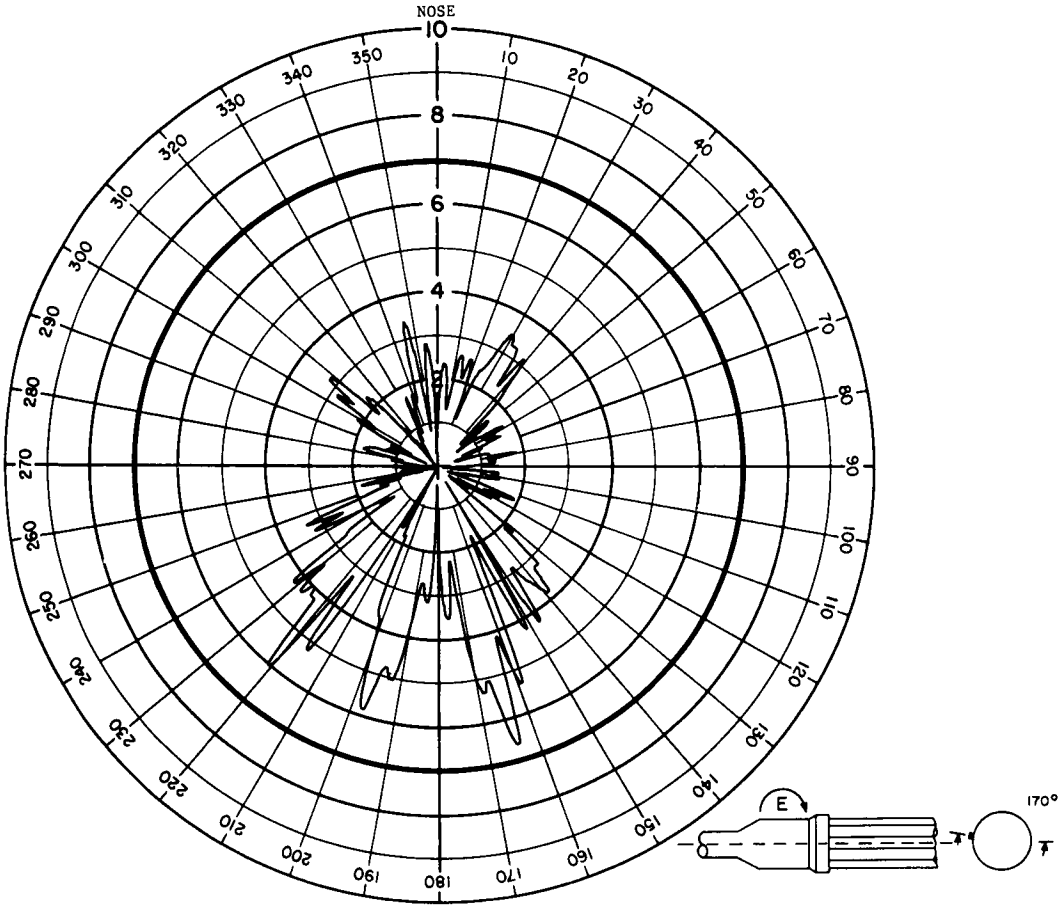


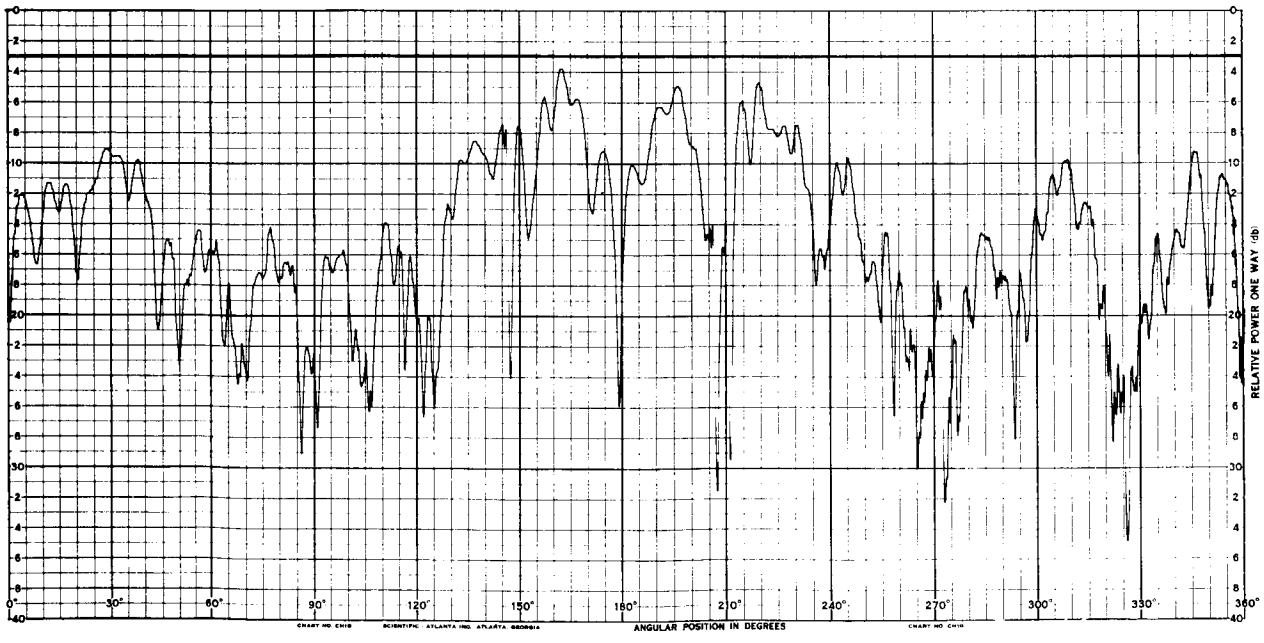
ANTENNA RADIATION PATTERN NO. 204-55

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



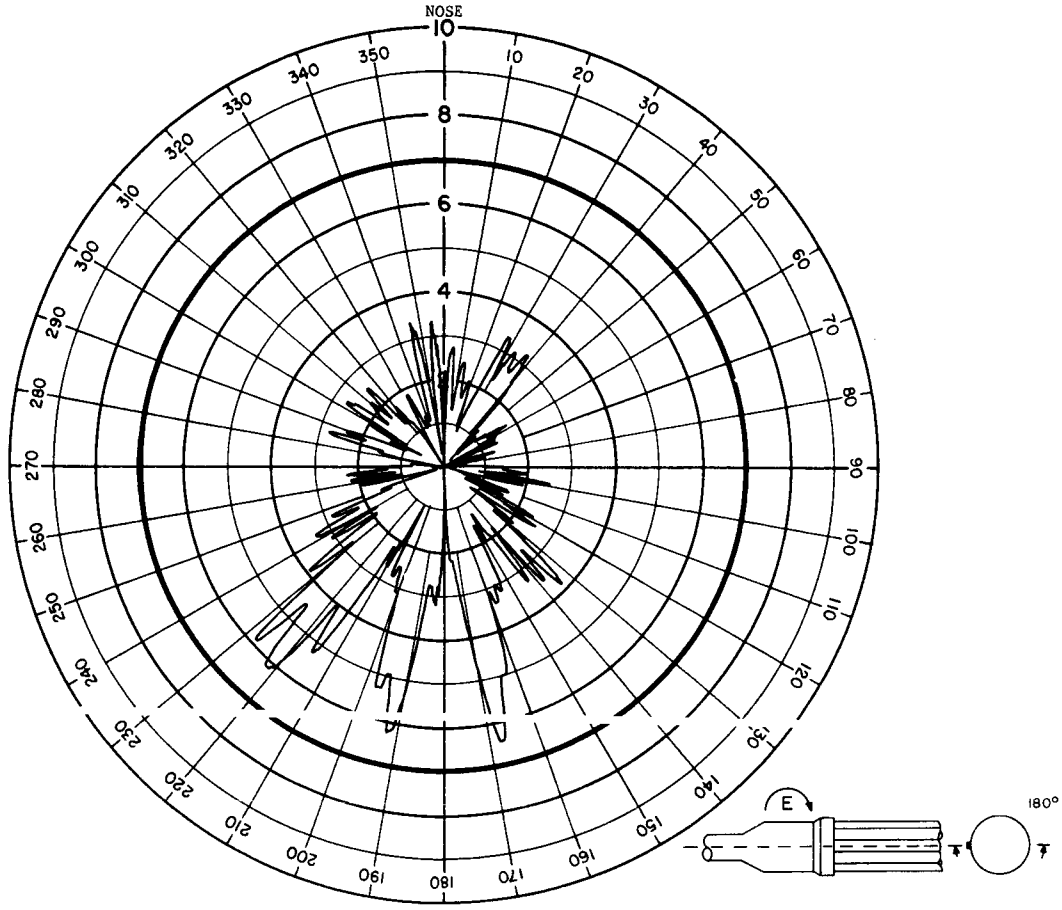


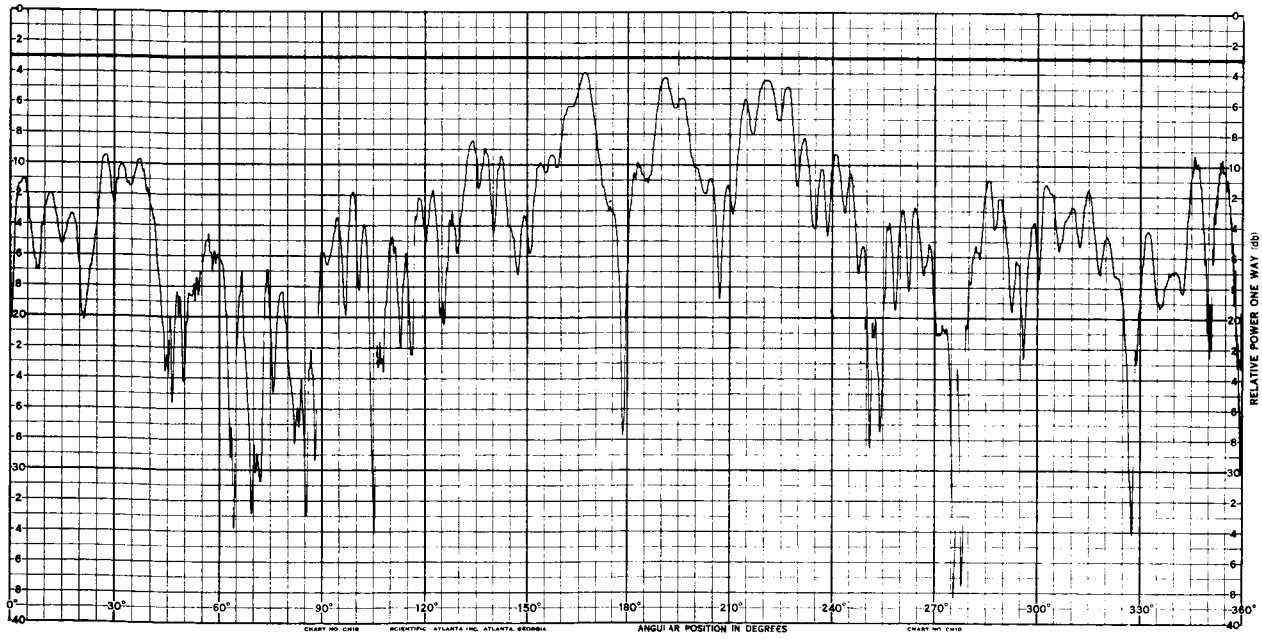
ANTENNA RADIATION PATTERN NO. 204-56

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



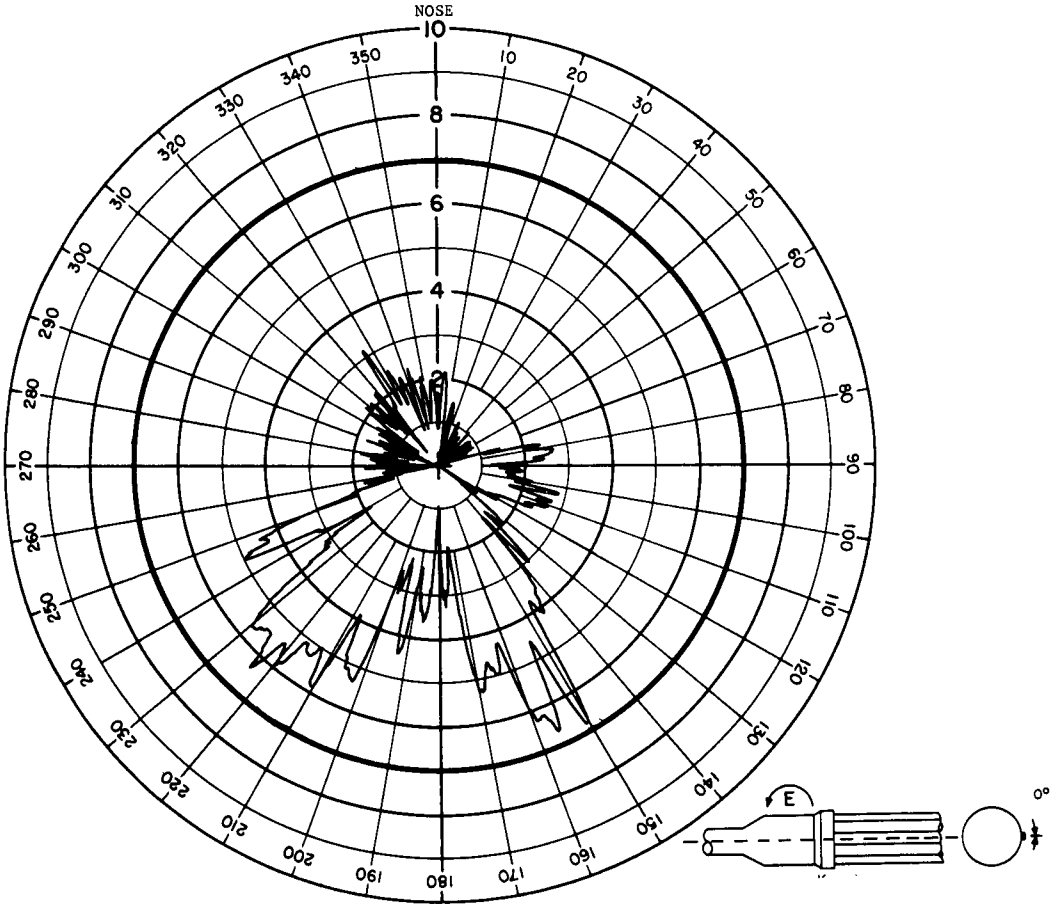


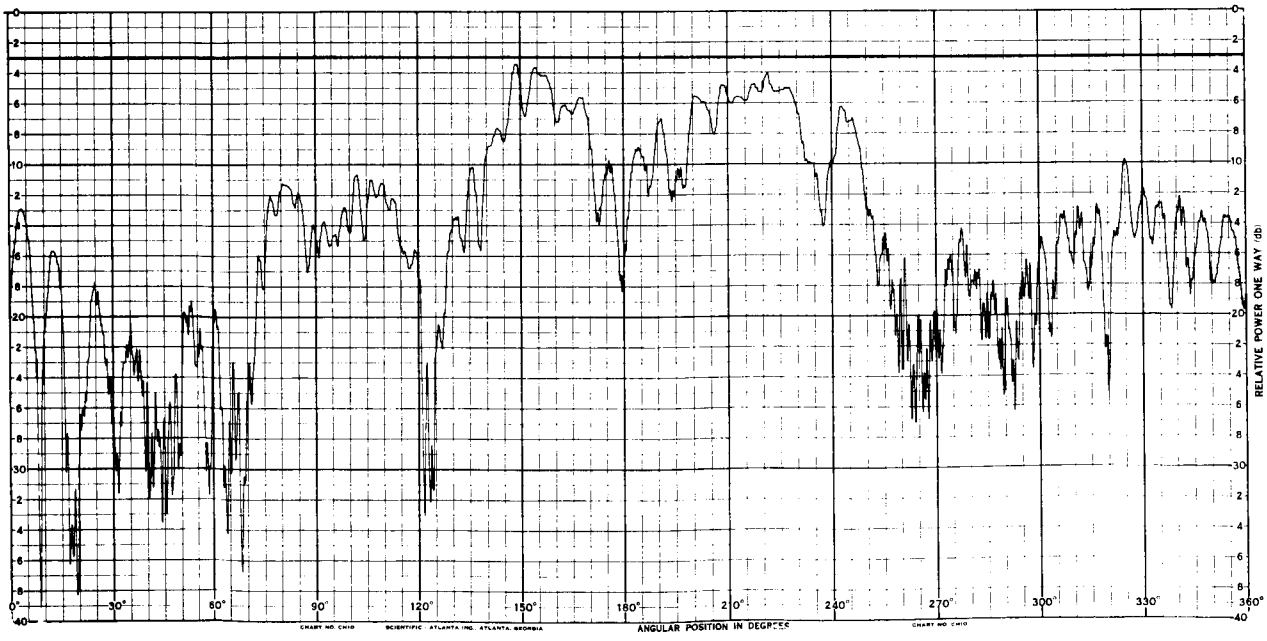
ANTENNA RADIATION PATTERN NO. 204-57

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



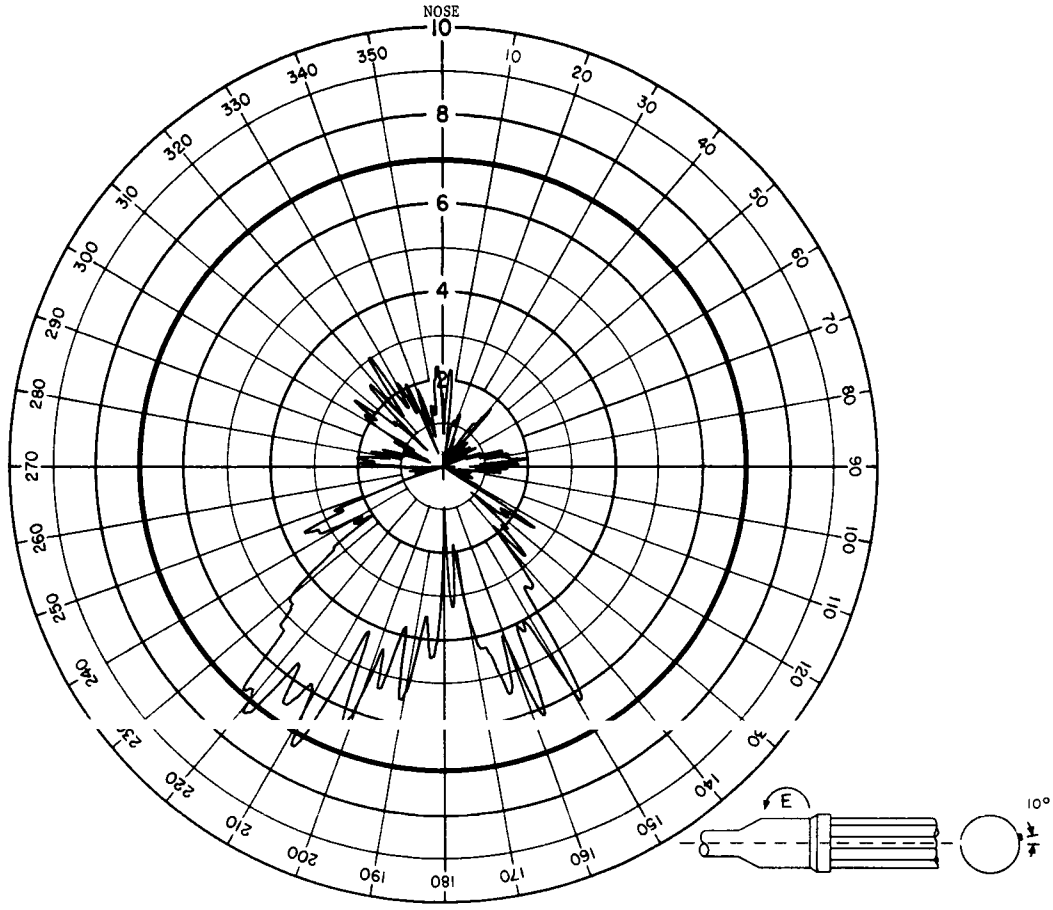


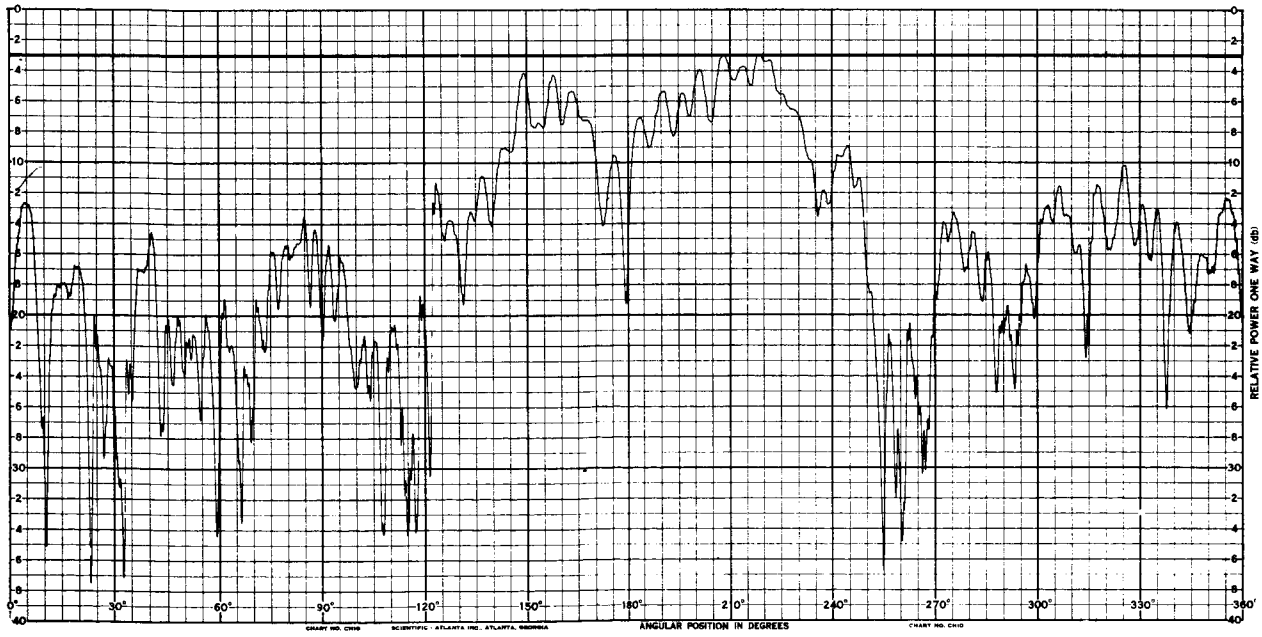
ANTENNA RADIATION PATTERN NO. 204-58

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



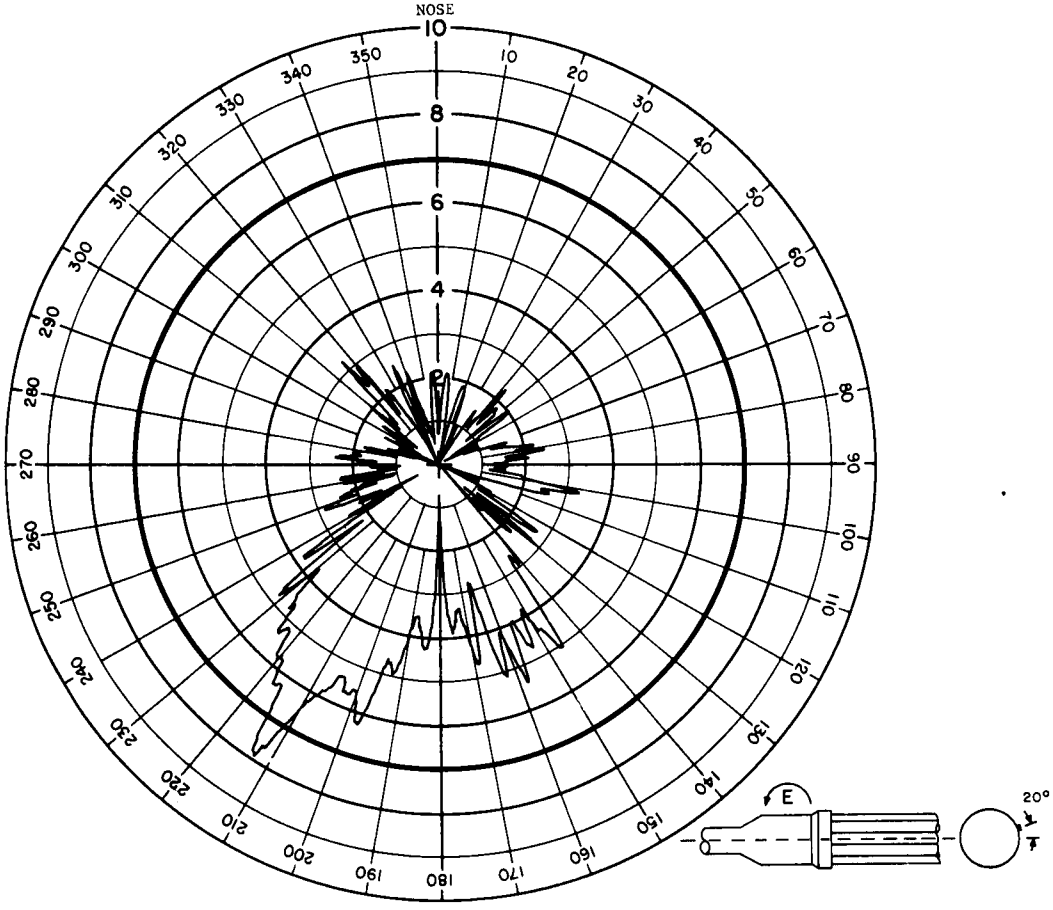


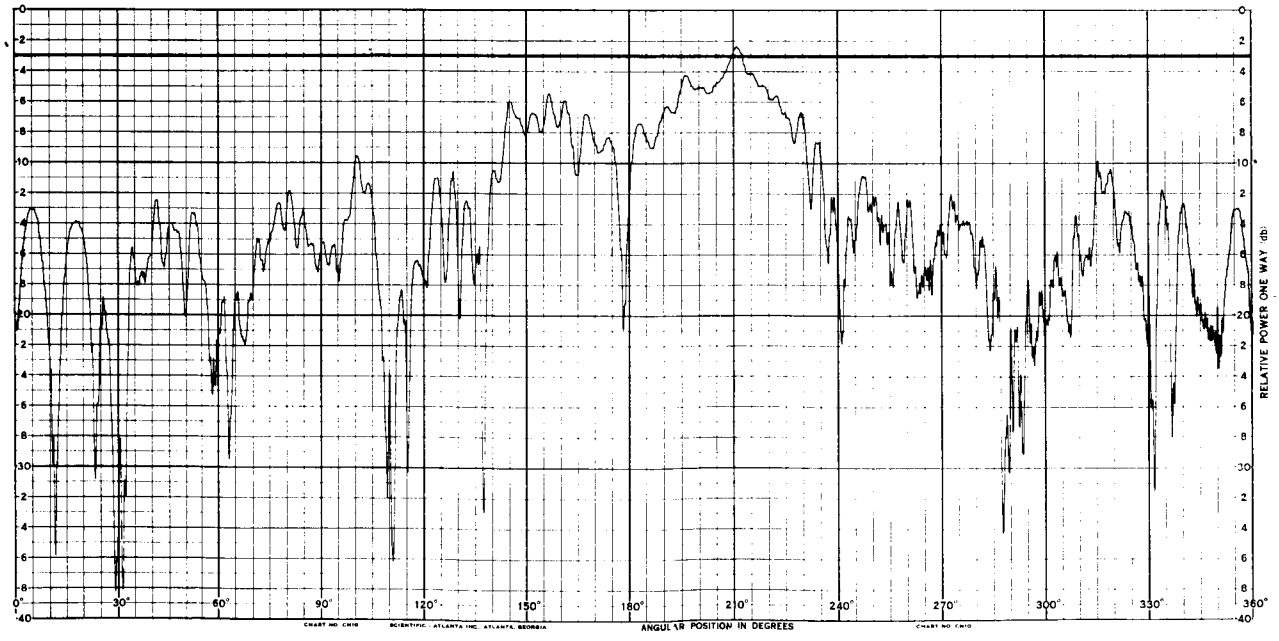
ANTENNA RADIATION PATTERN NO. 204-59

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



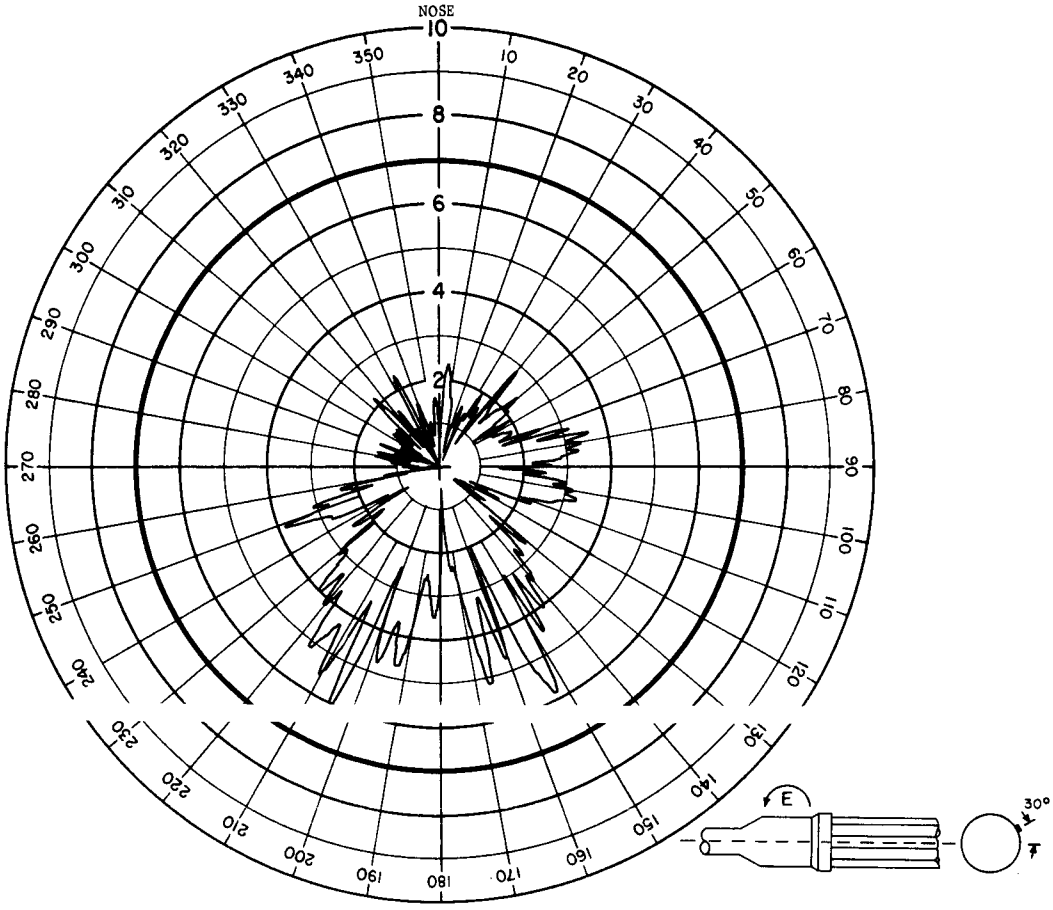


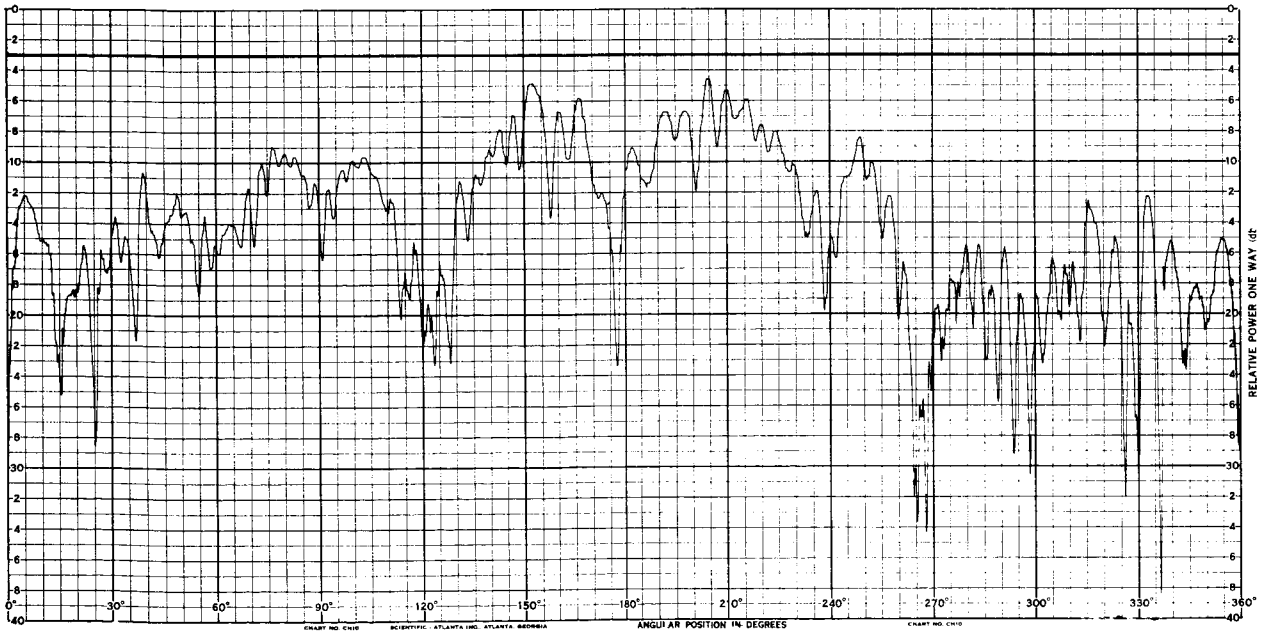
ANTENNA RADIATION PATTERN NO. 204-60

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



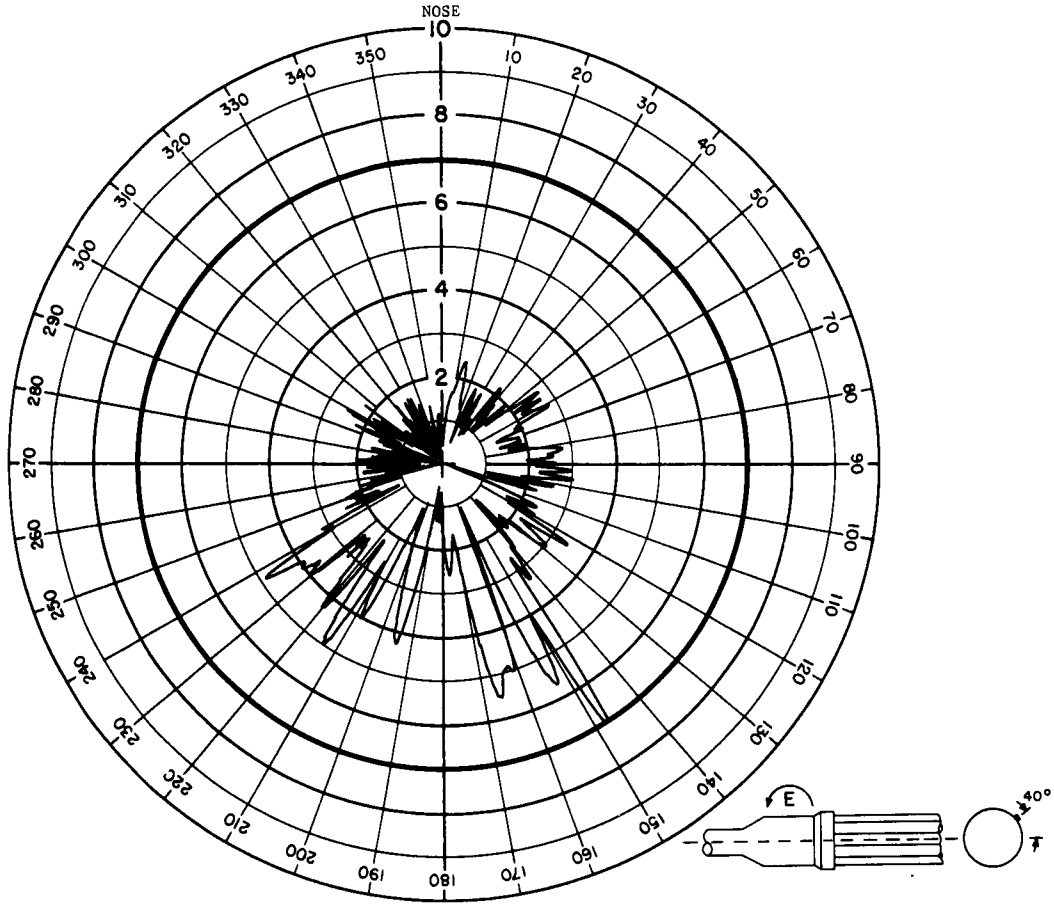


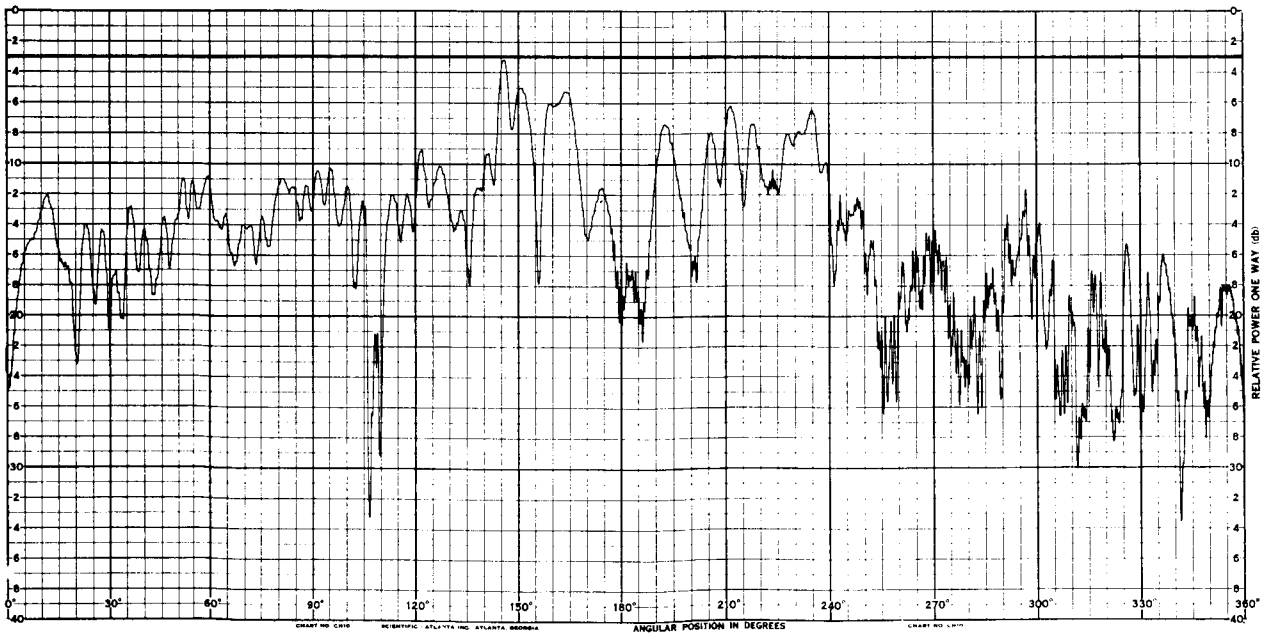
ANTENNA RADIATION PATTERN NO. 204-61

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



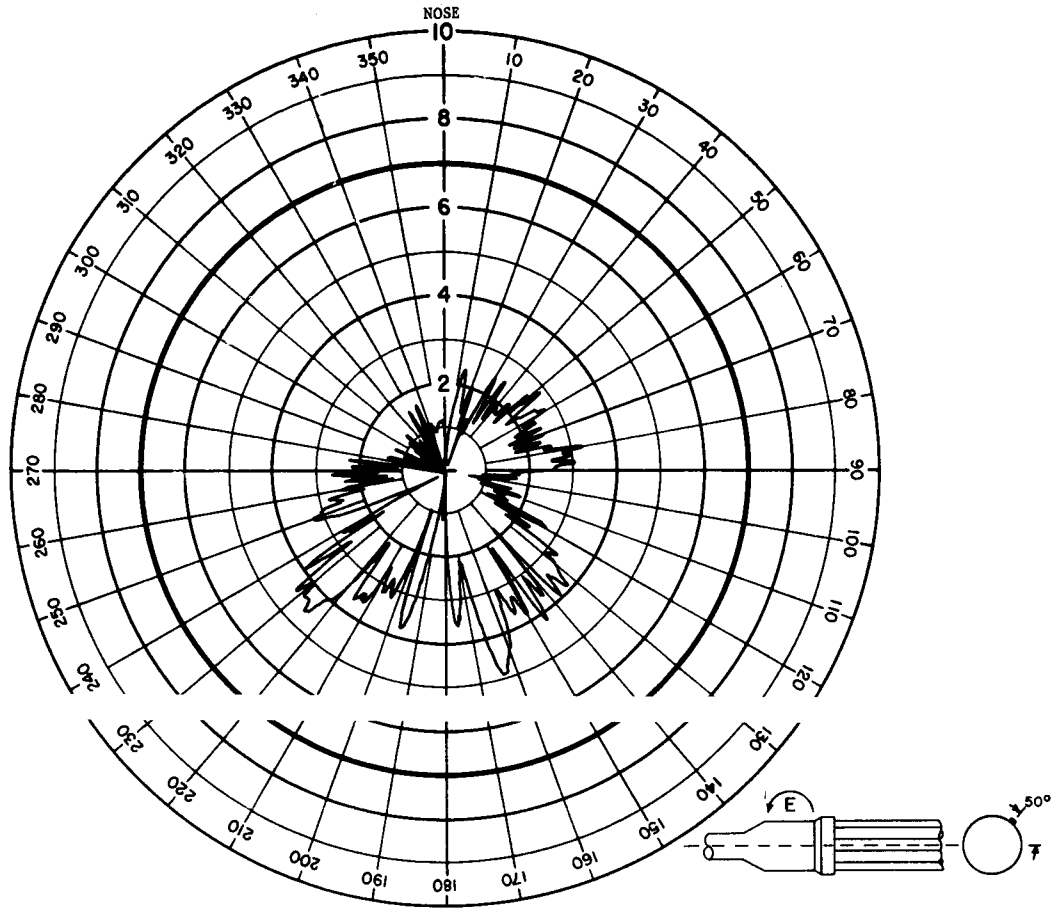


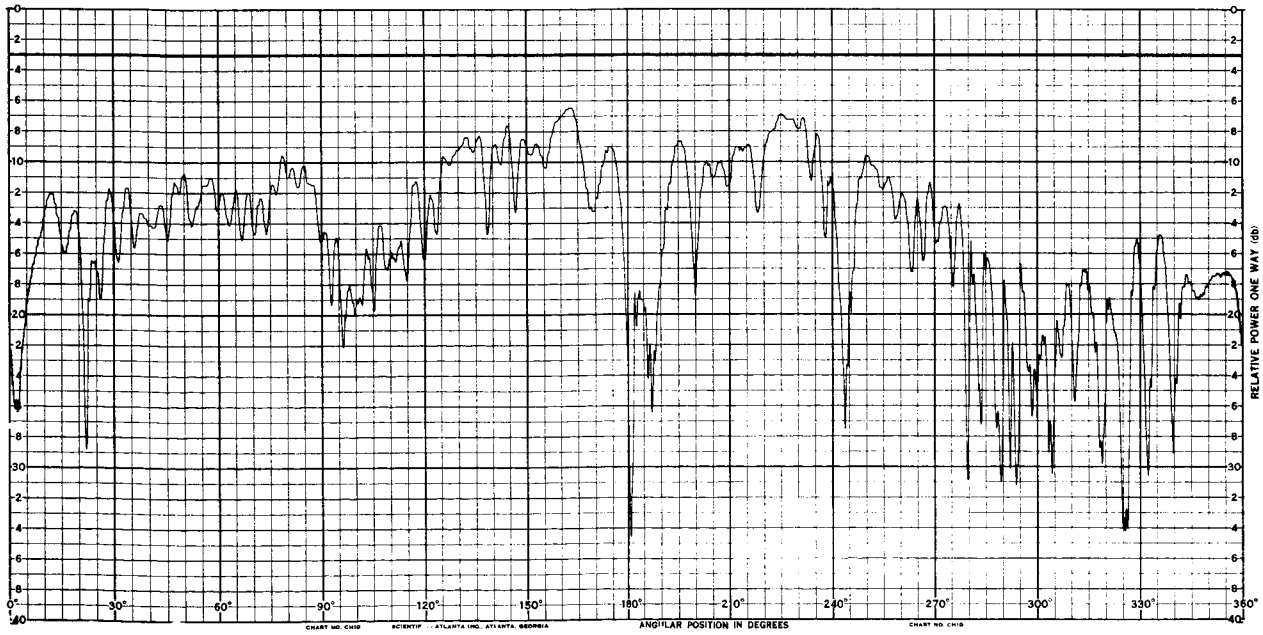
ANTENNA RADIATION PATTERN NO. 204-62

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



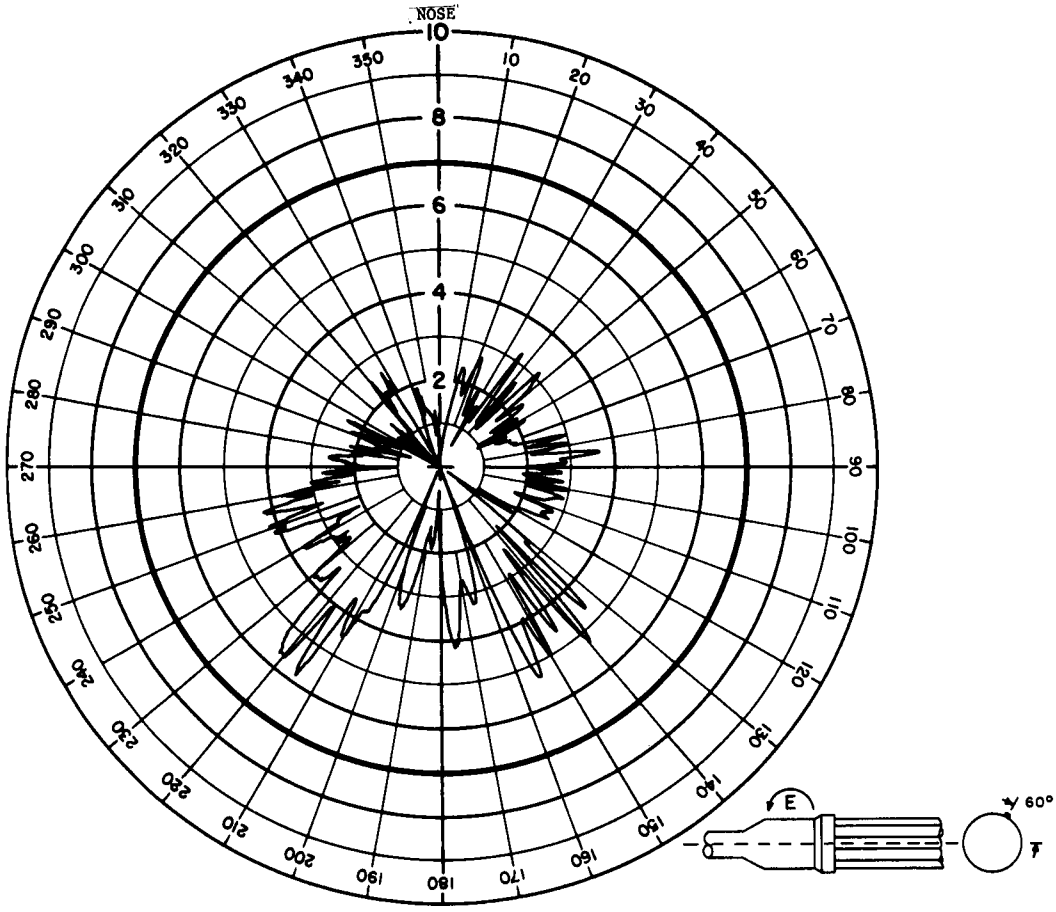


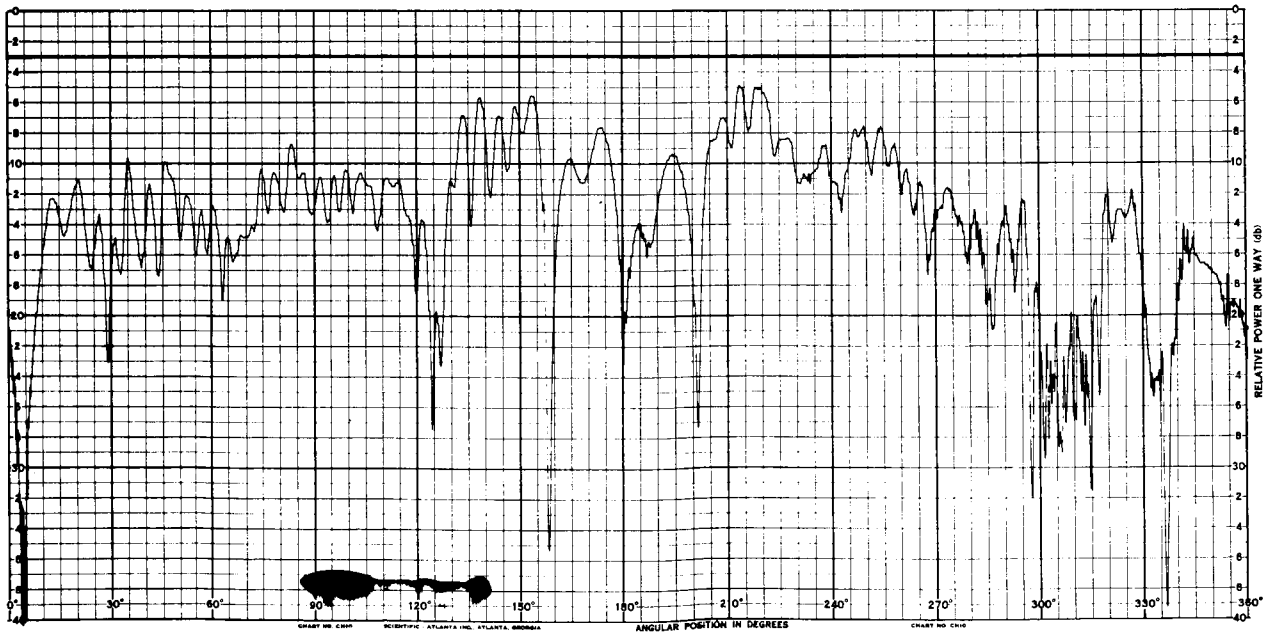
ANTENNA RADIATION PATTERN NO. 204-63

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



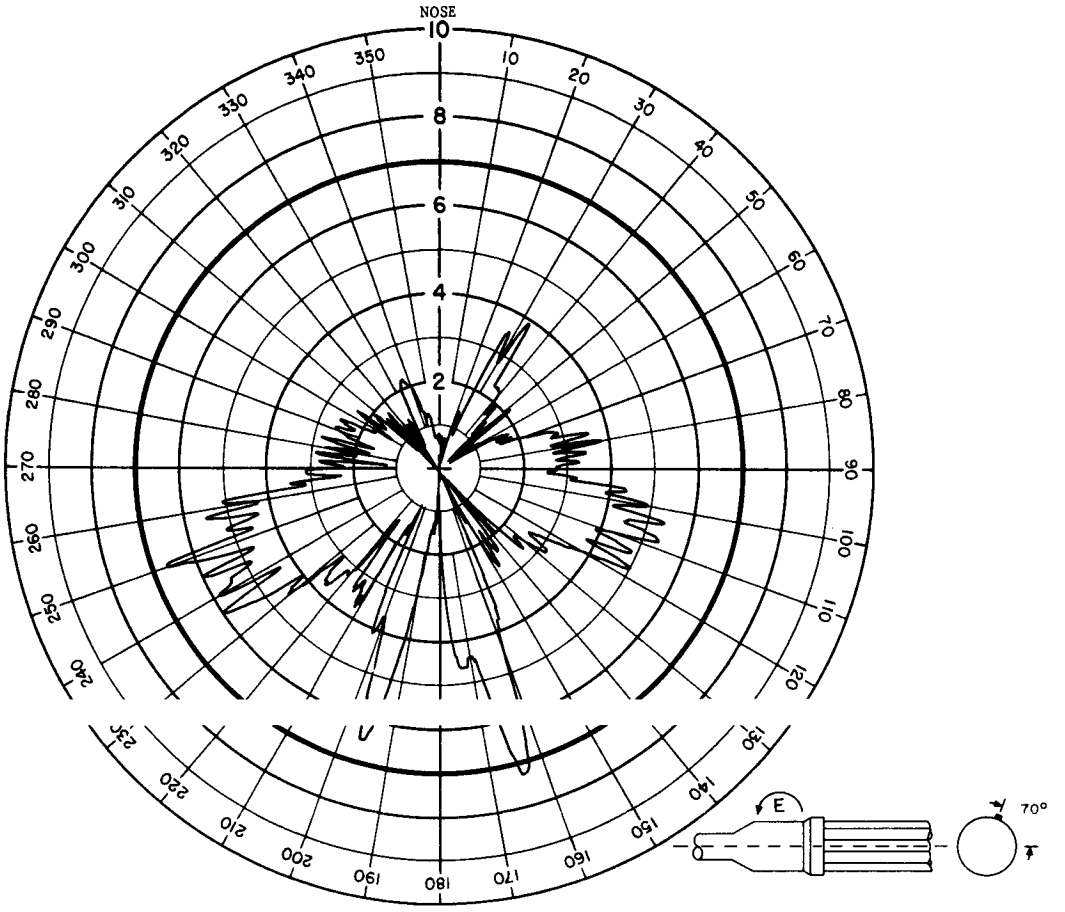


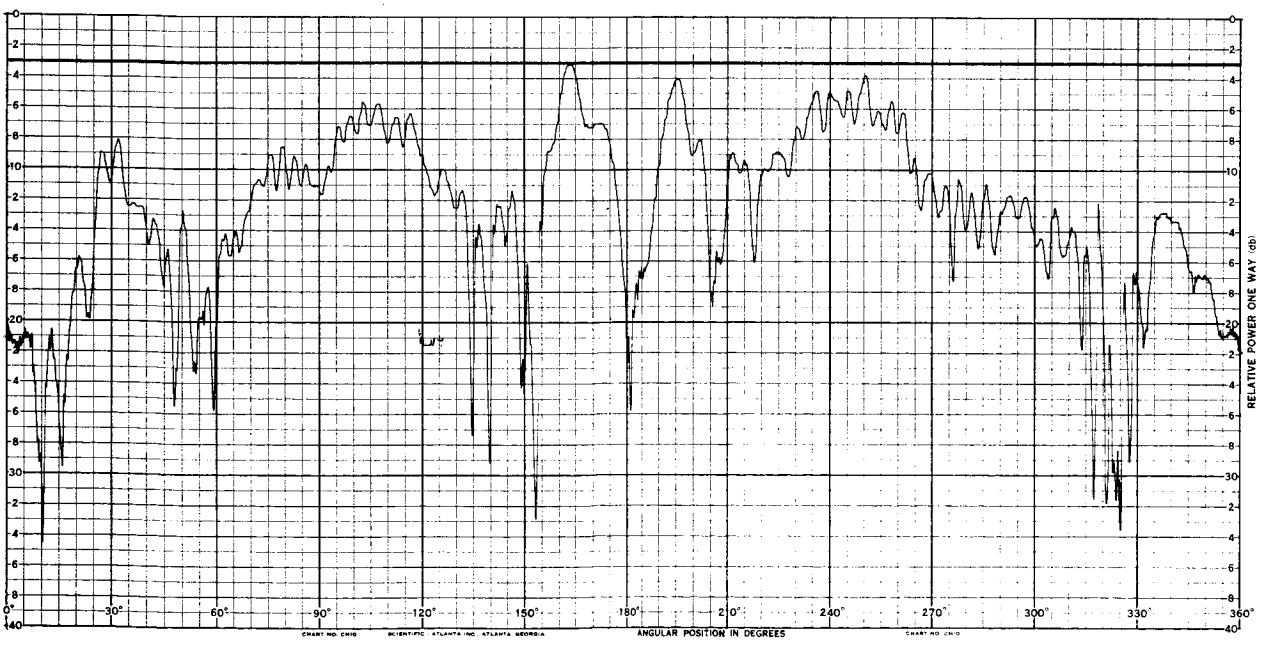
ANTENNA RADIATION PATTERN NO. 204-64

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



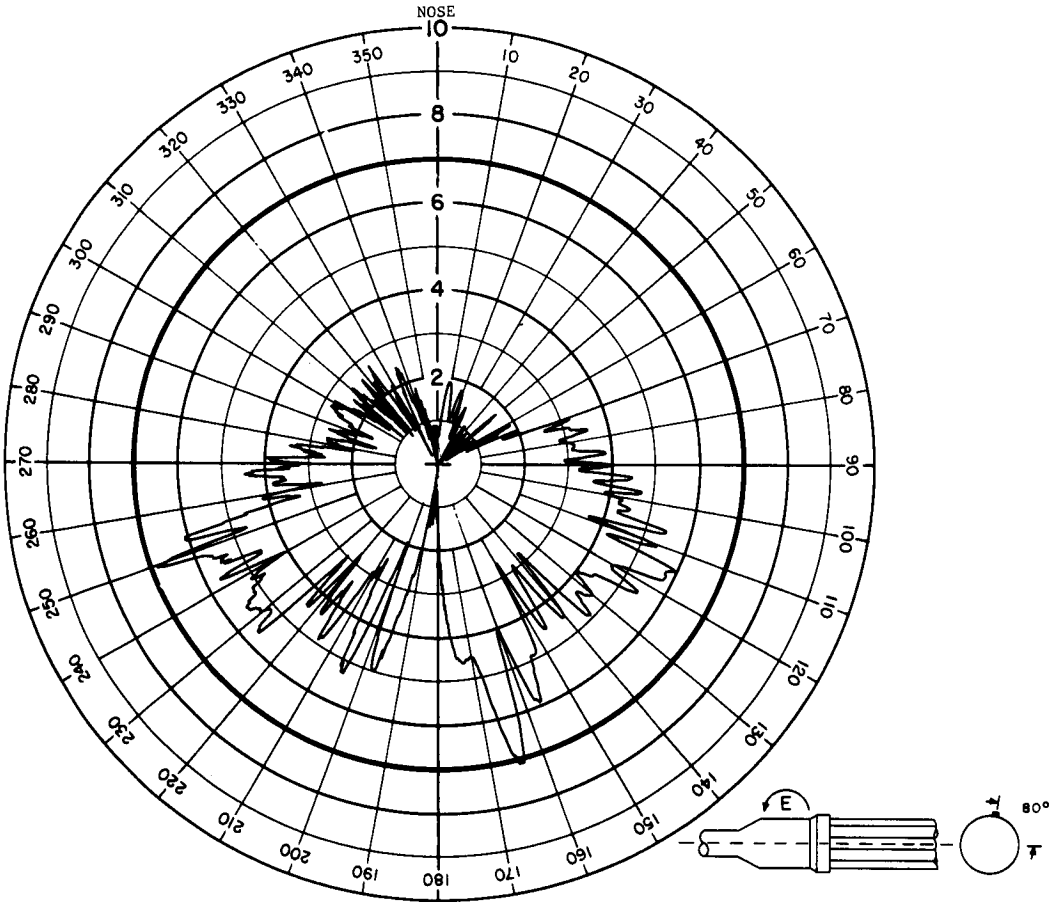


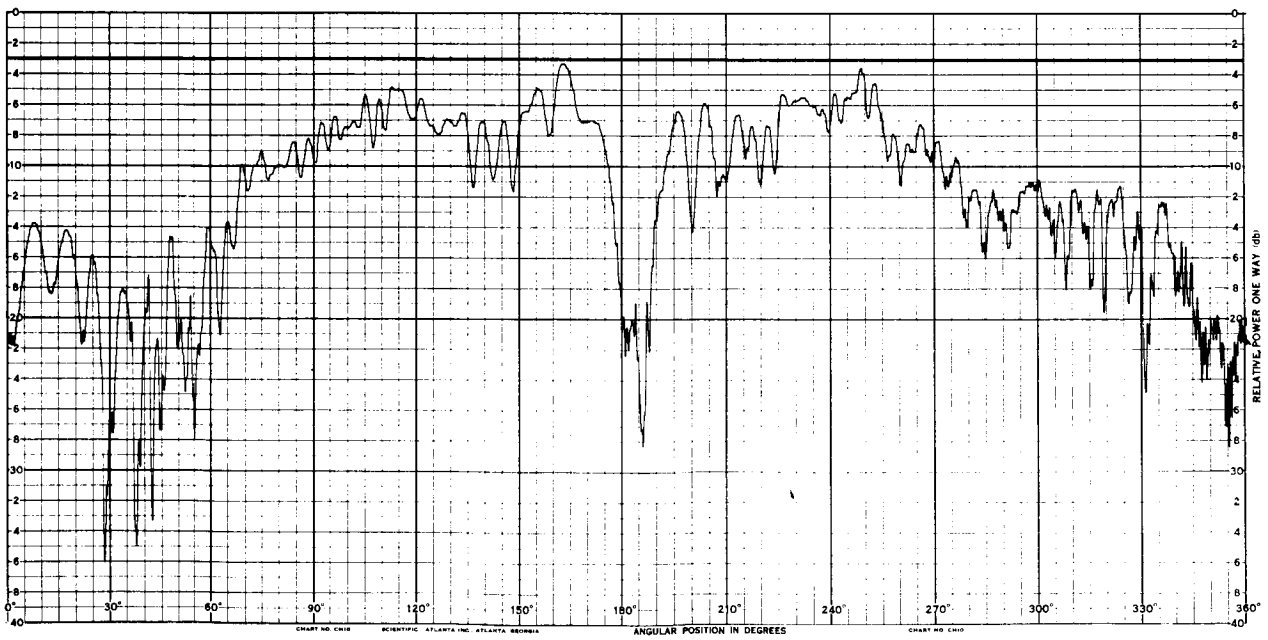
ANTENNA RADIATION PATTERN NO. 204-65

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



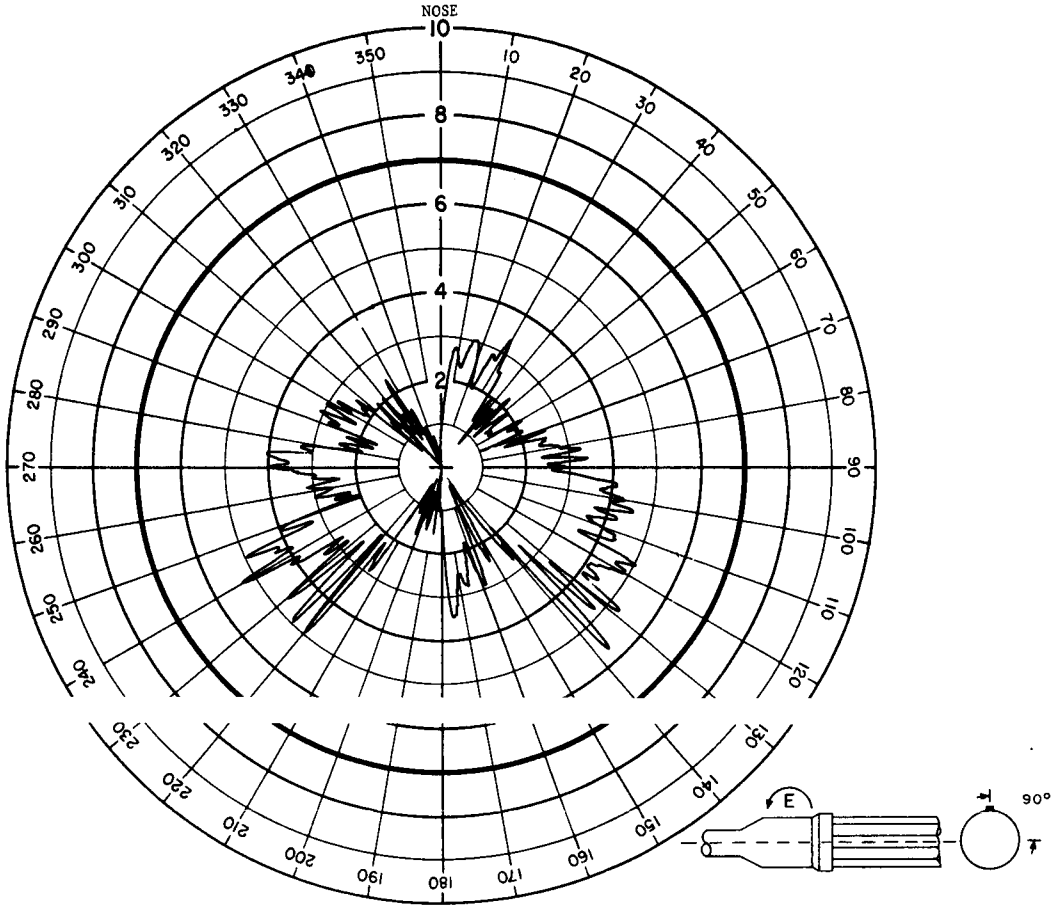


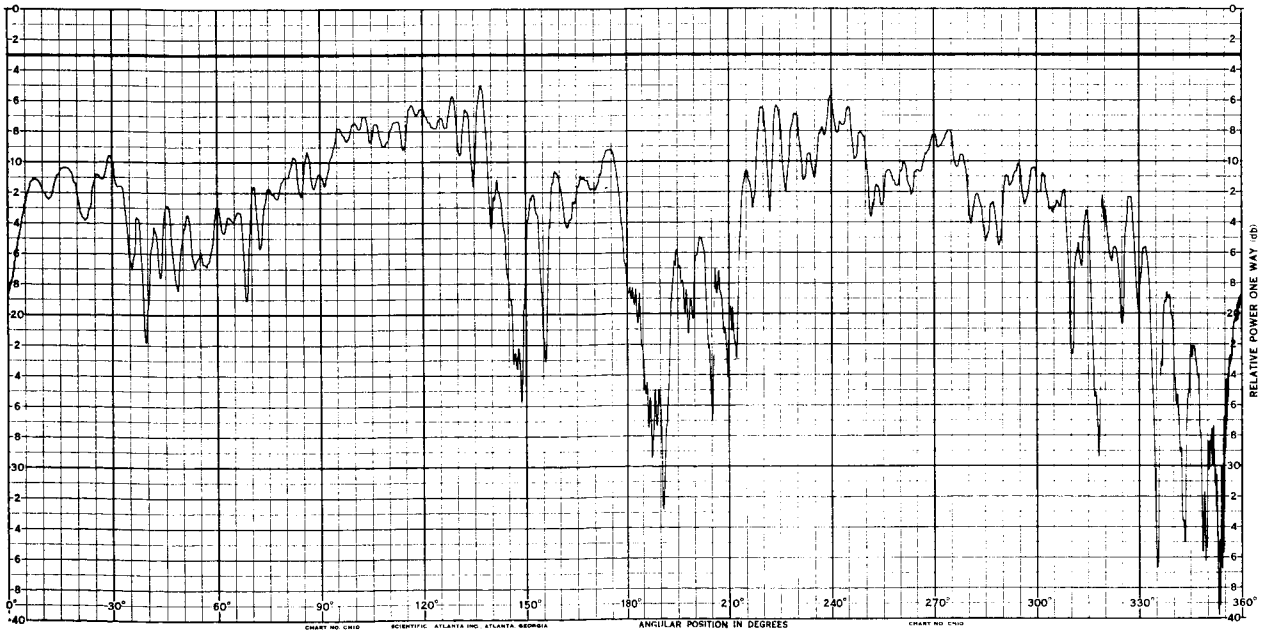
ANTENNA RADIATION PATTERN NO. 204-66

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



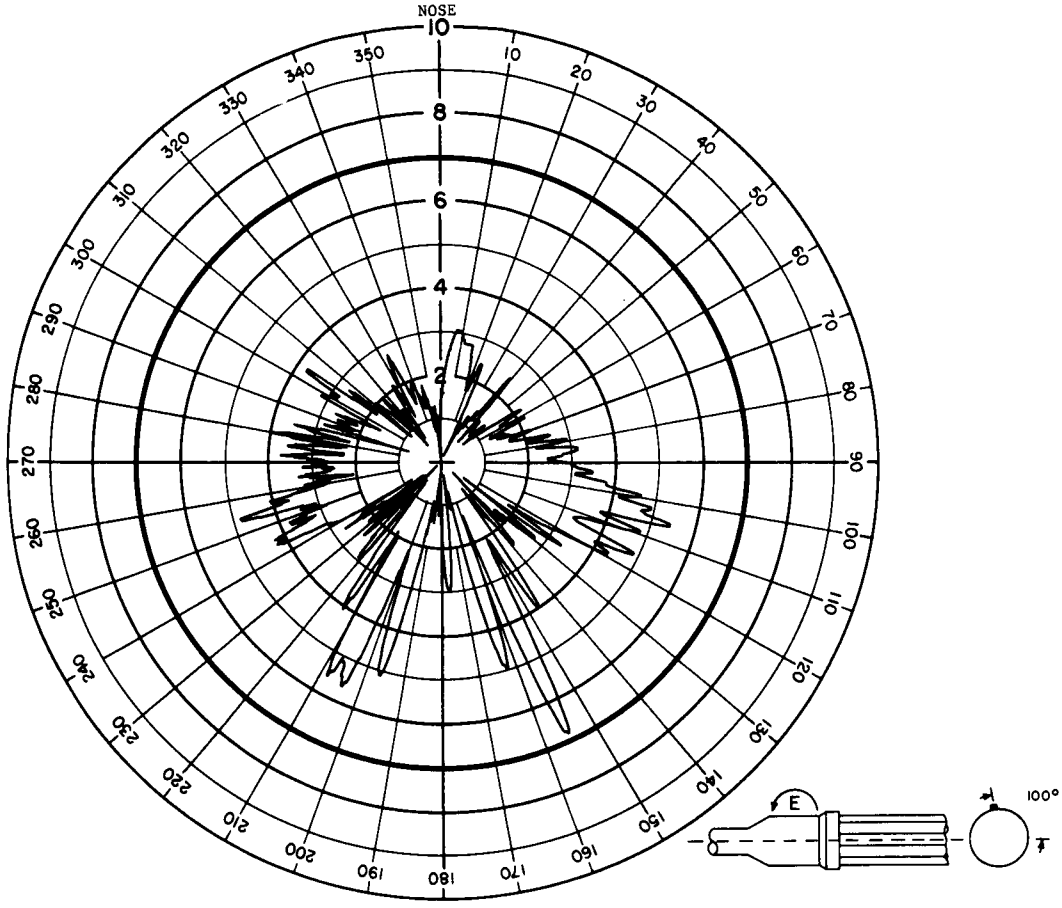


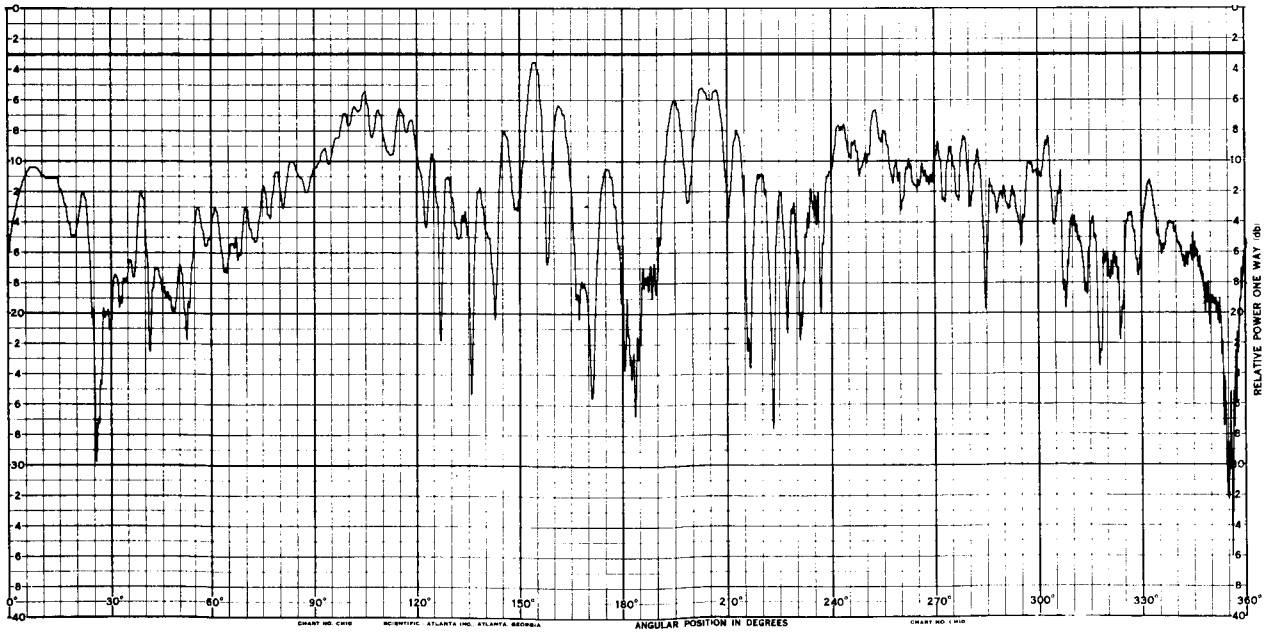
ANTENNA RADIATION PATTERN NO. 204-67

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



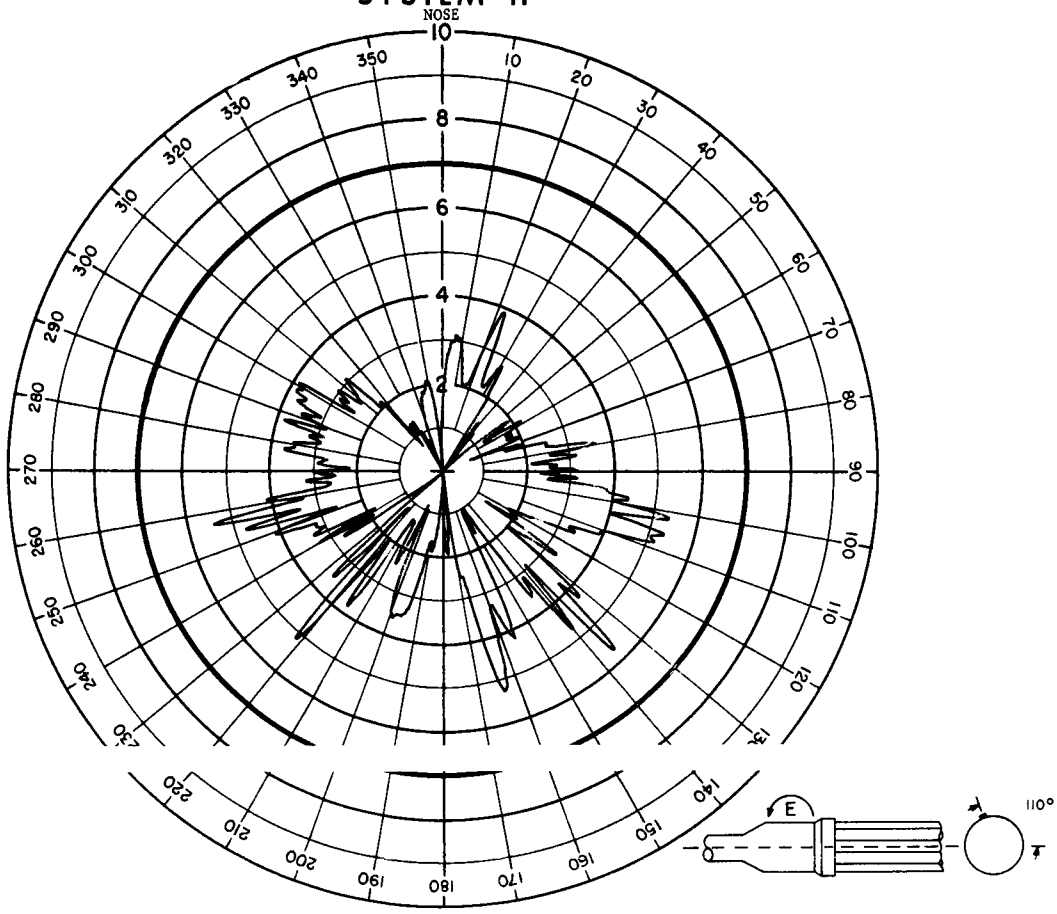


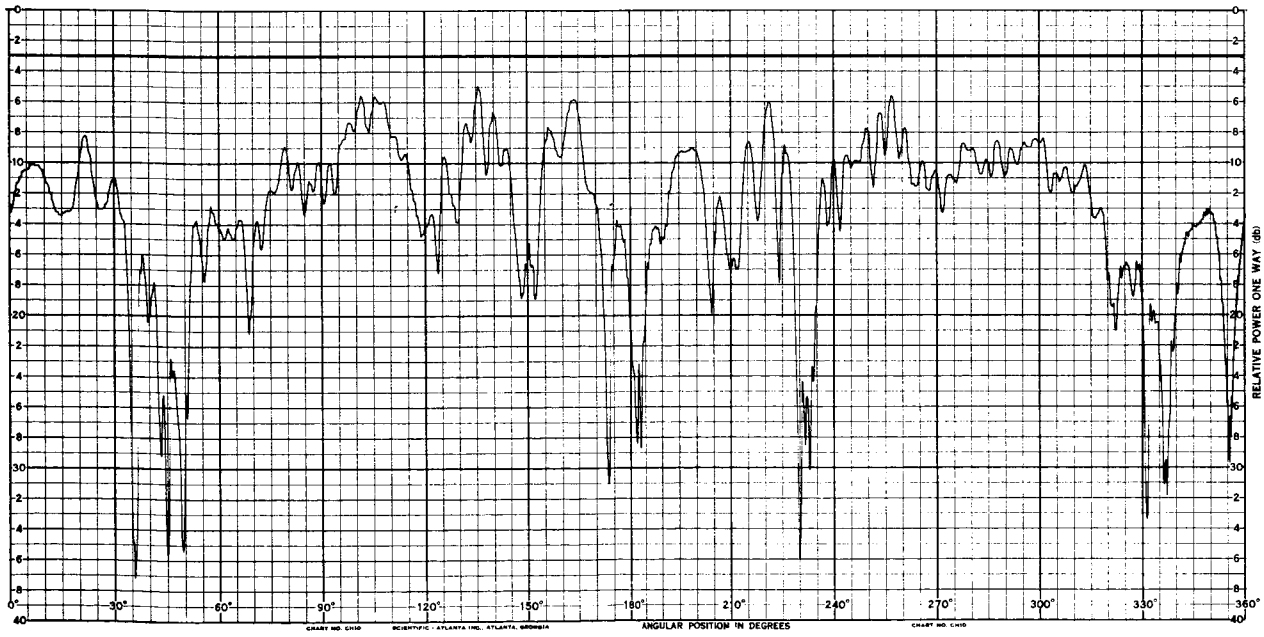
ANTENNA RADIATION PATTERN NO. 204-68

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II

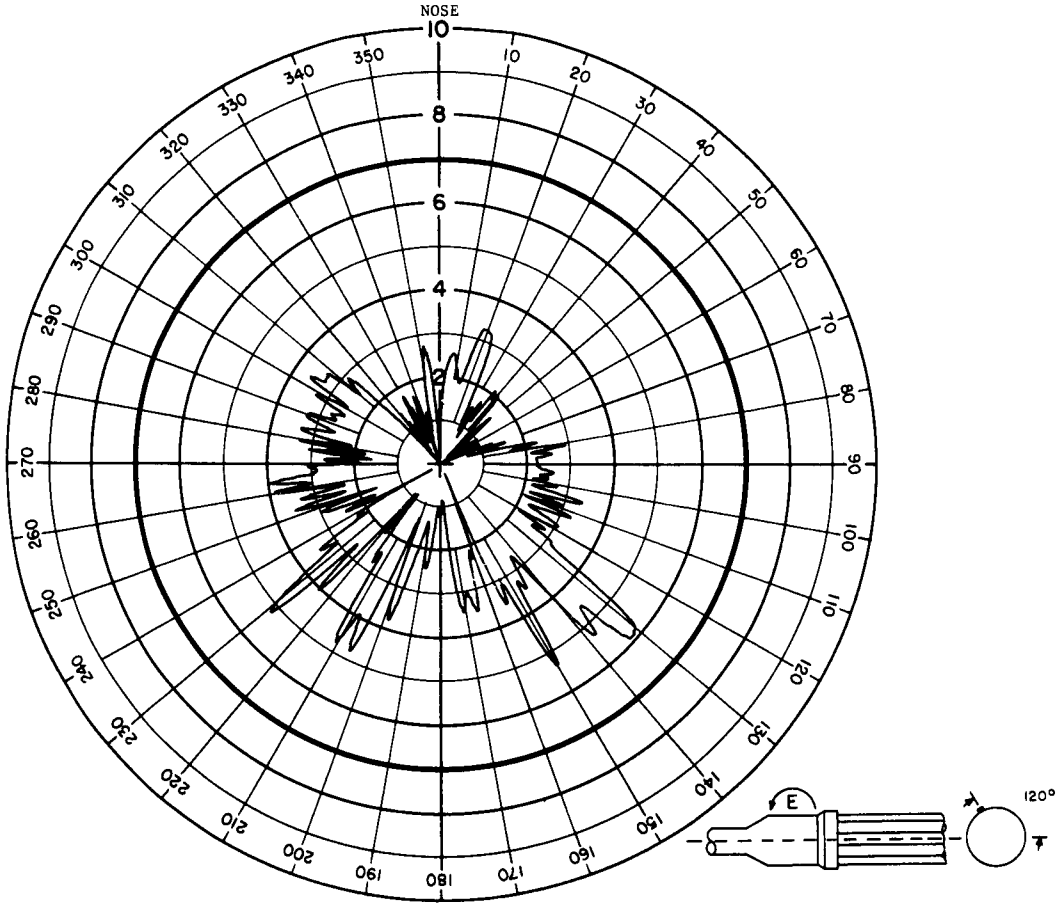


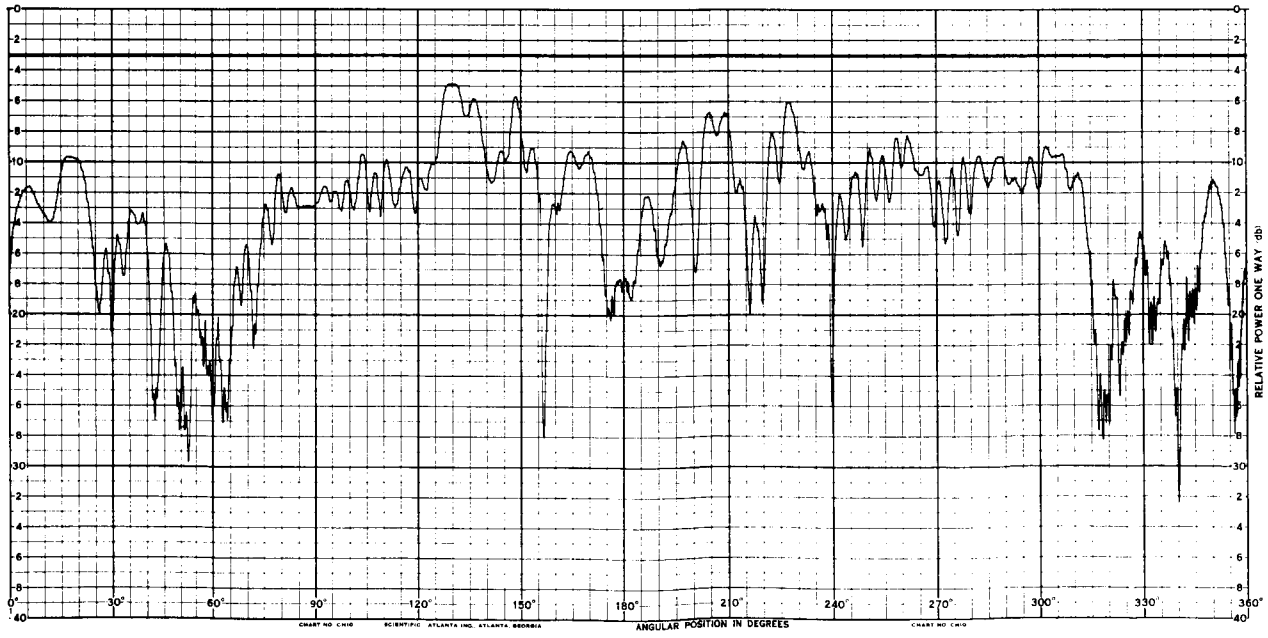


ANTENNA RADIATION PATTERN NO. 204-69

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



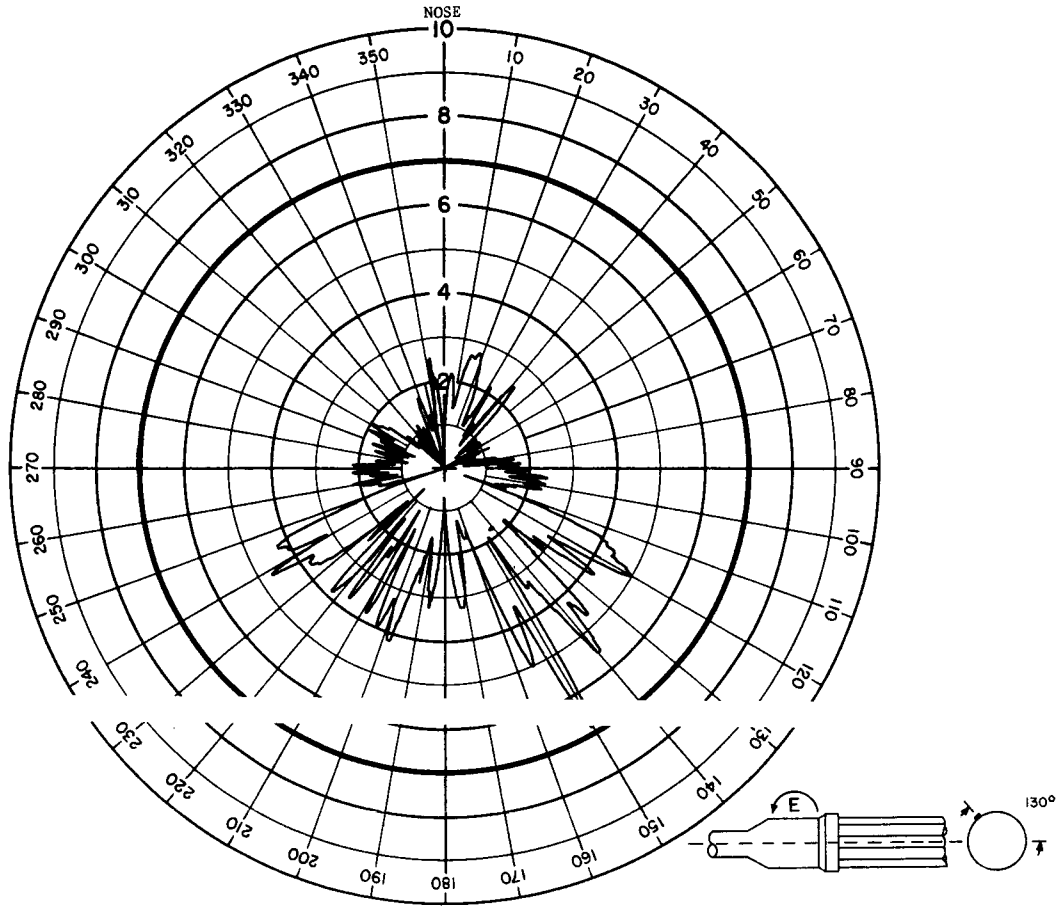


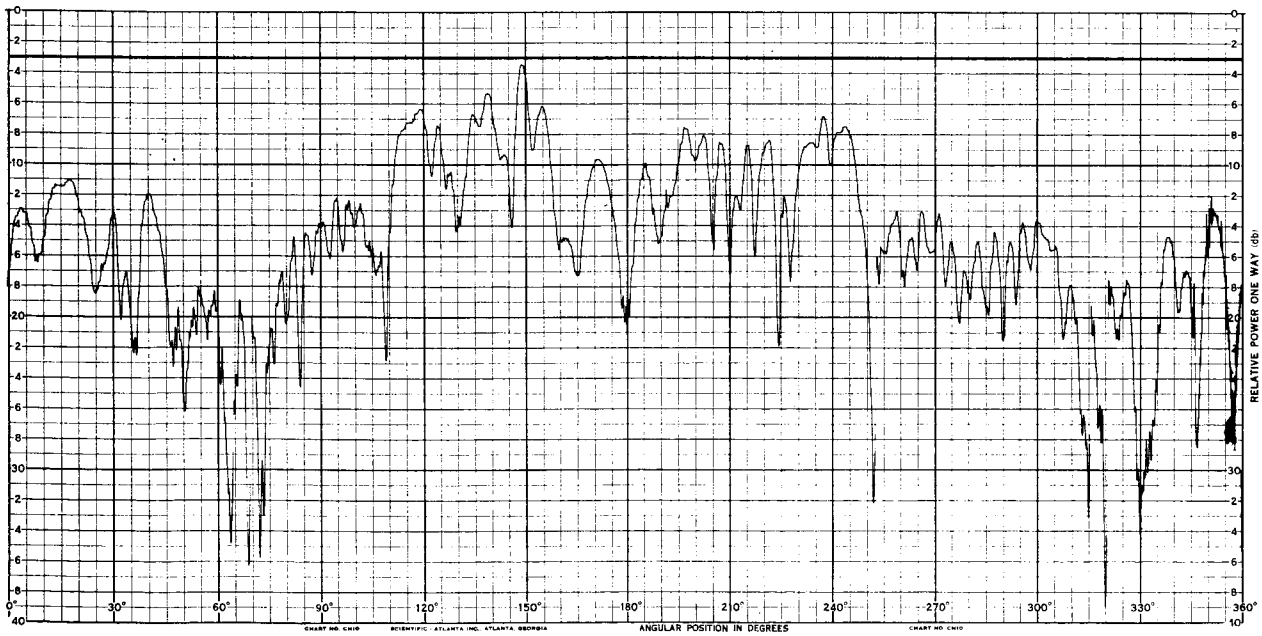
ANTENNA RADIATION PATTERN NO. 204-70

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



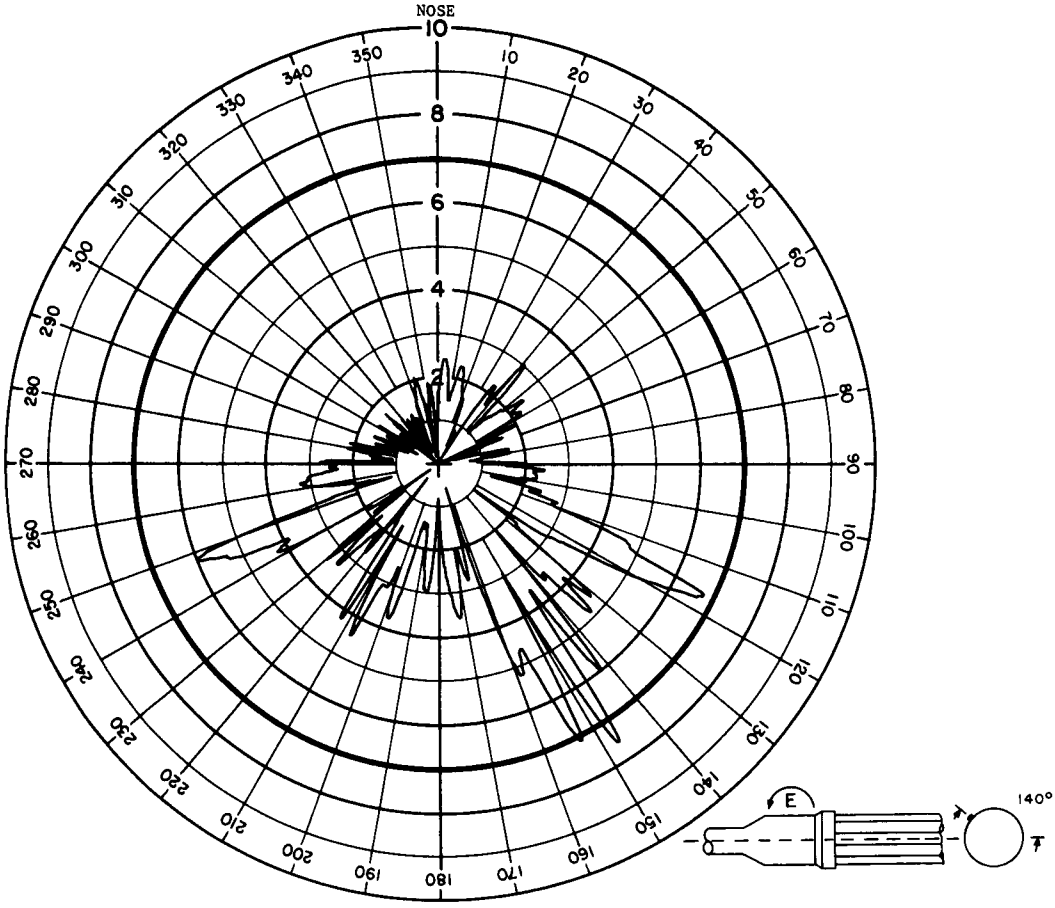


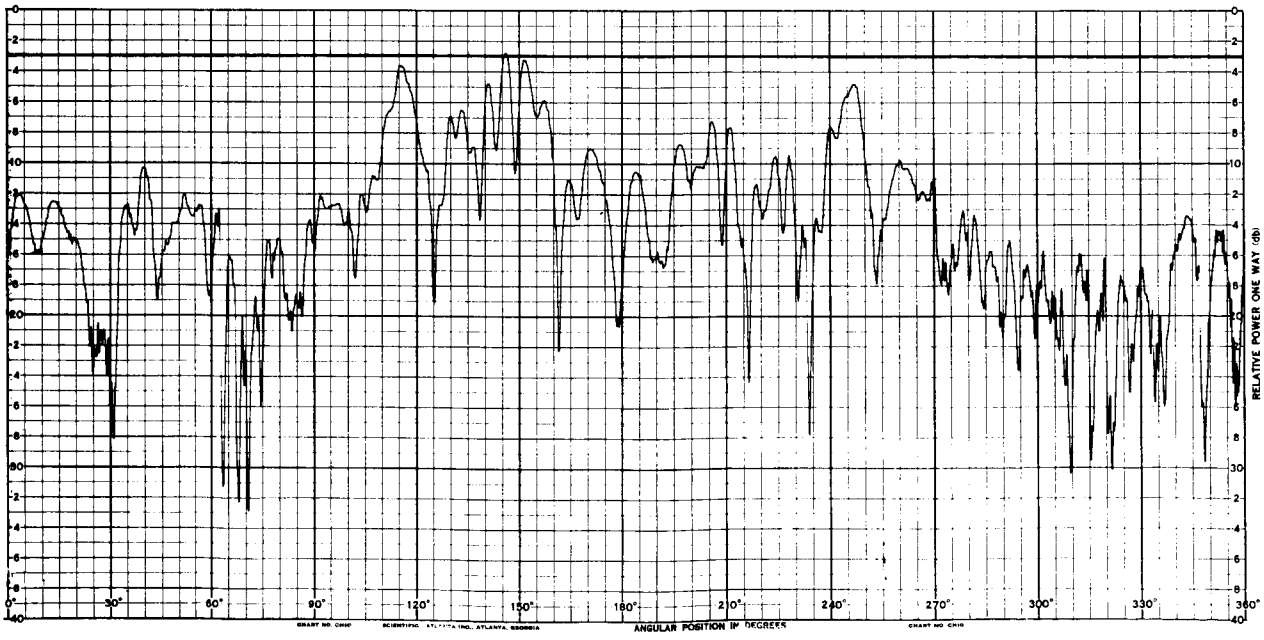
ANTENNA RADIATION PATTERN NO. 204-71

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



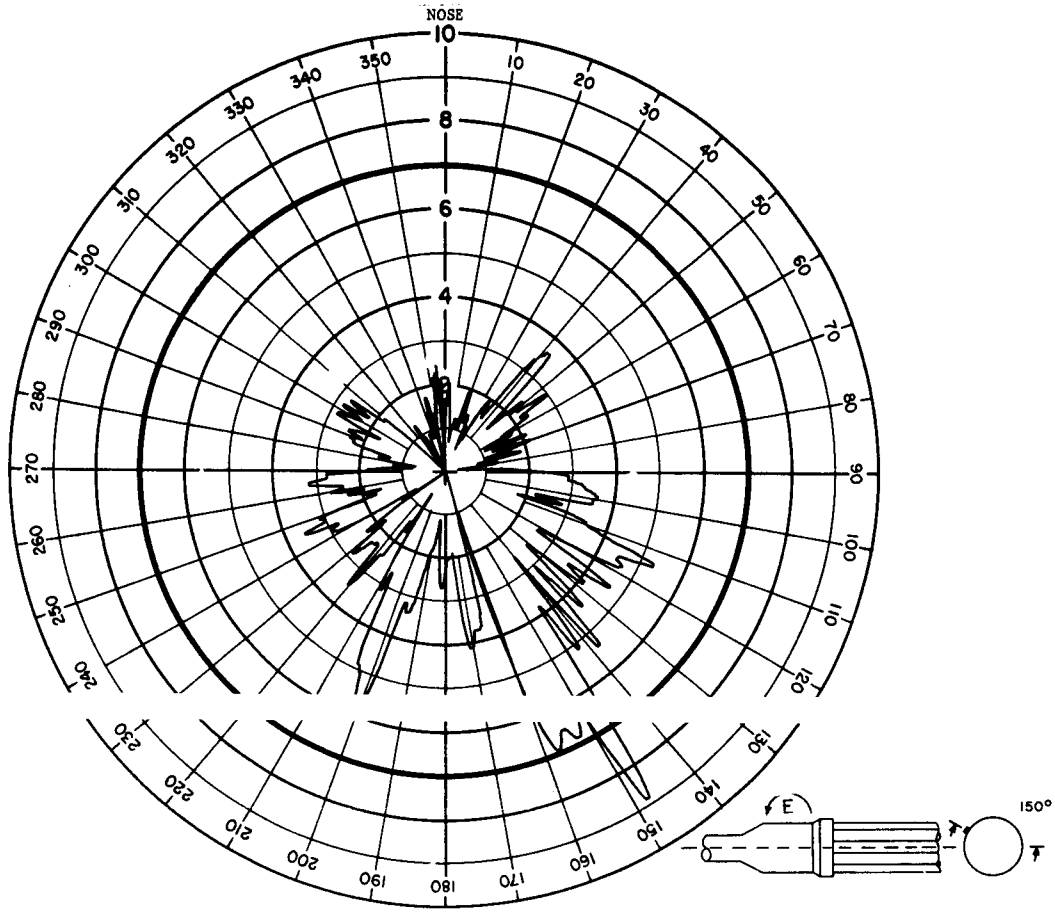


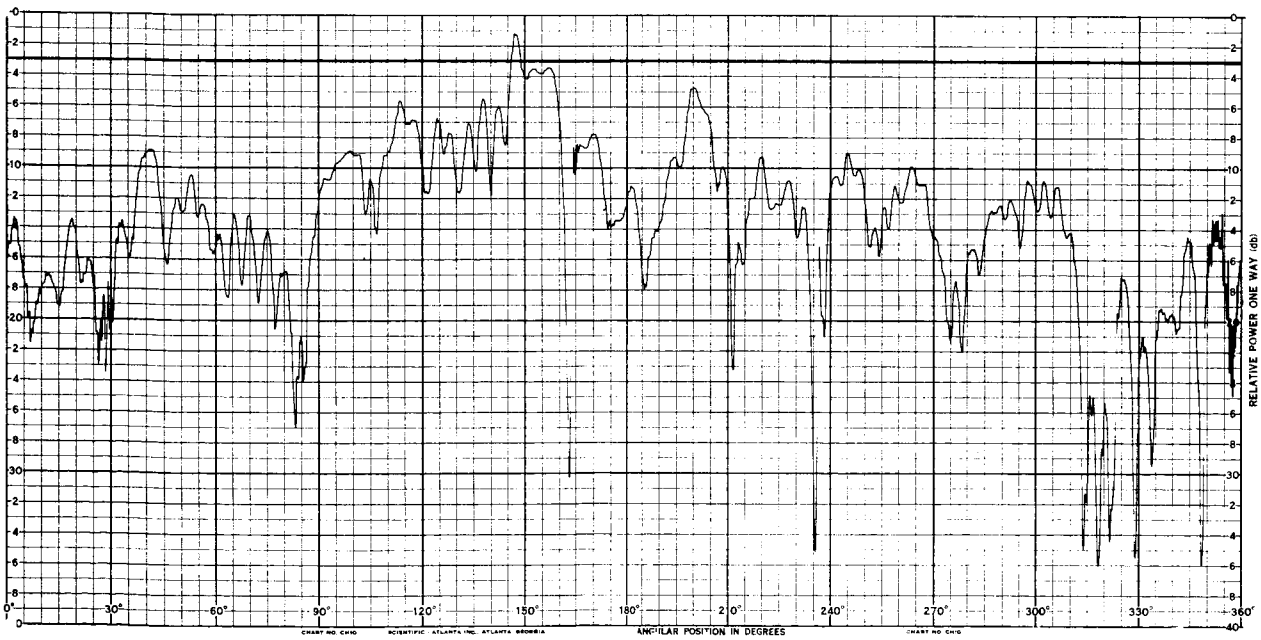
ANTENNA RADIATION PATTERN NO. 204-72

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



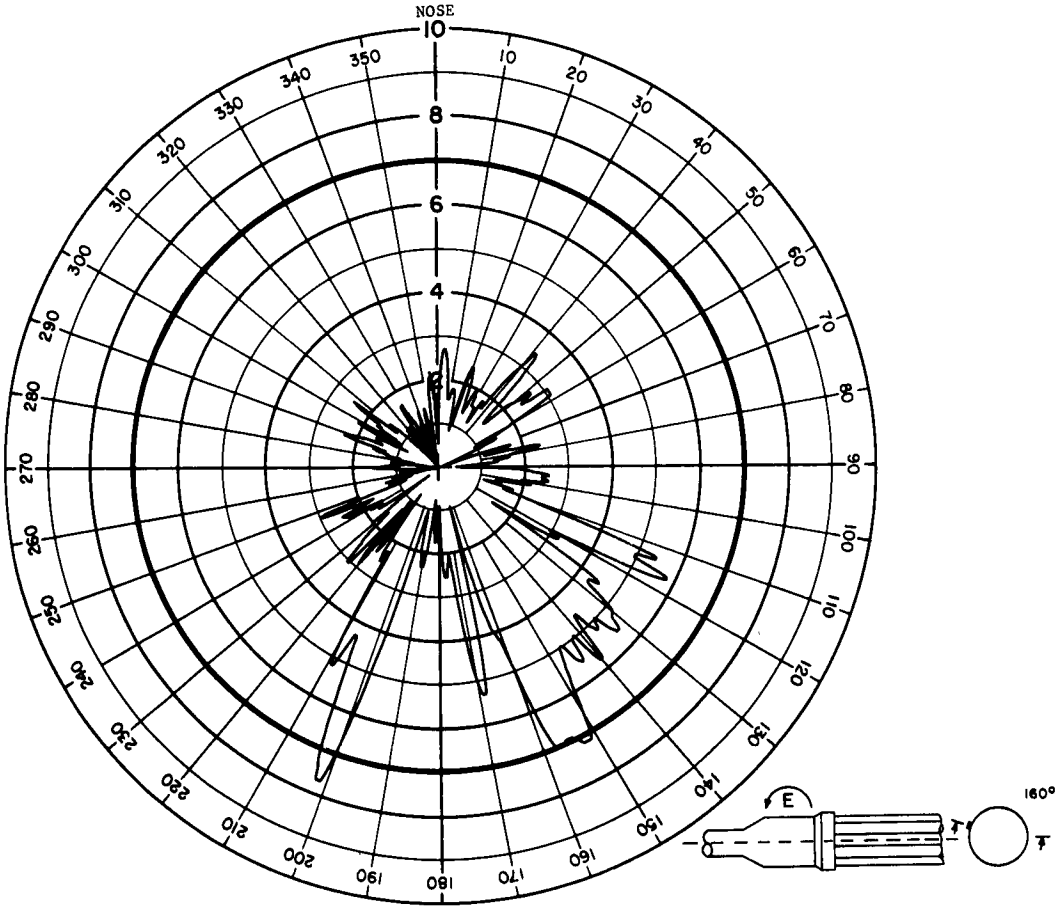


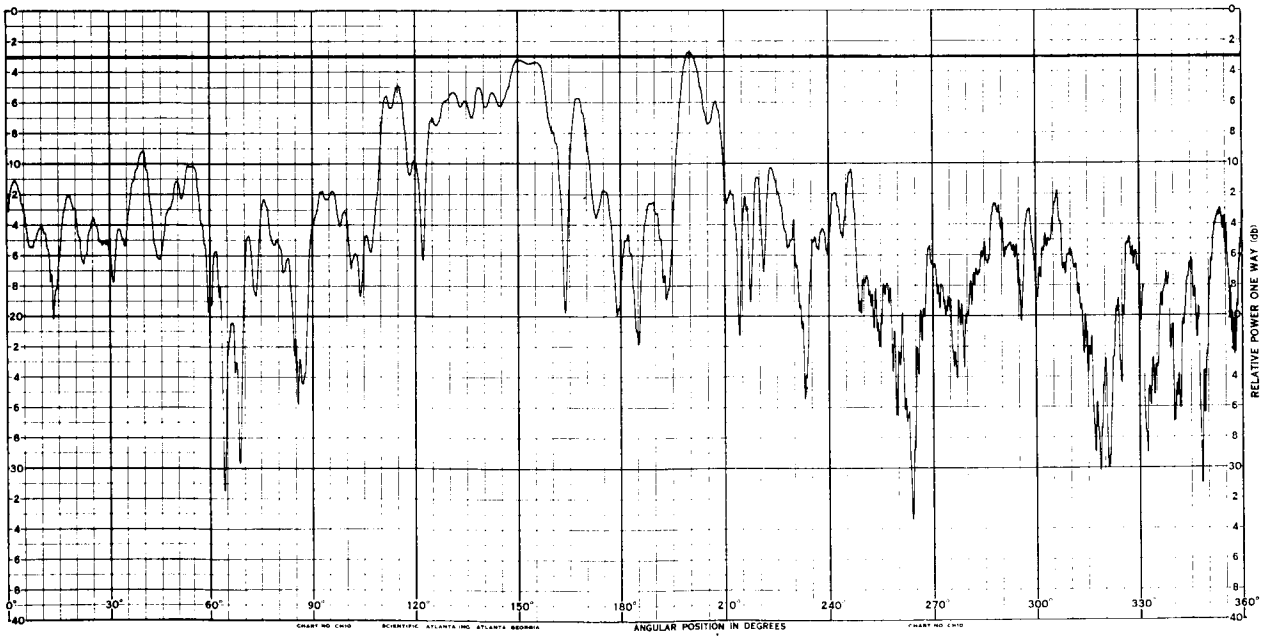
ANTENNA RADIATION PATTERN NO. 204-73

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



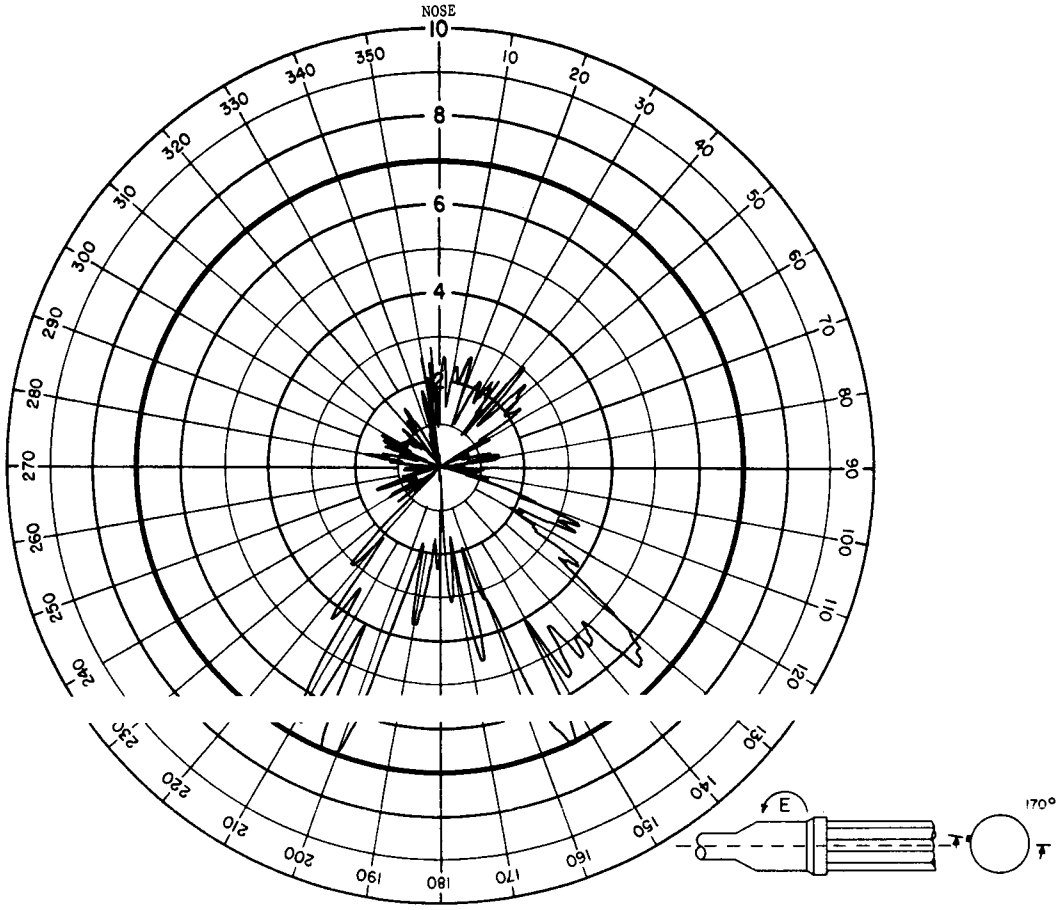


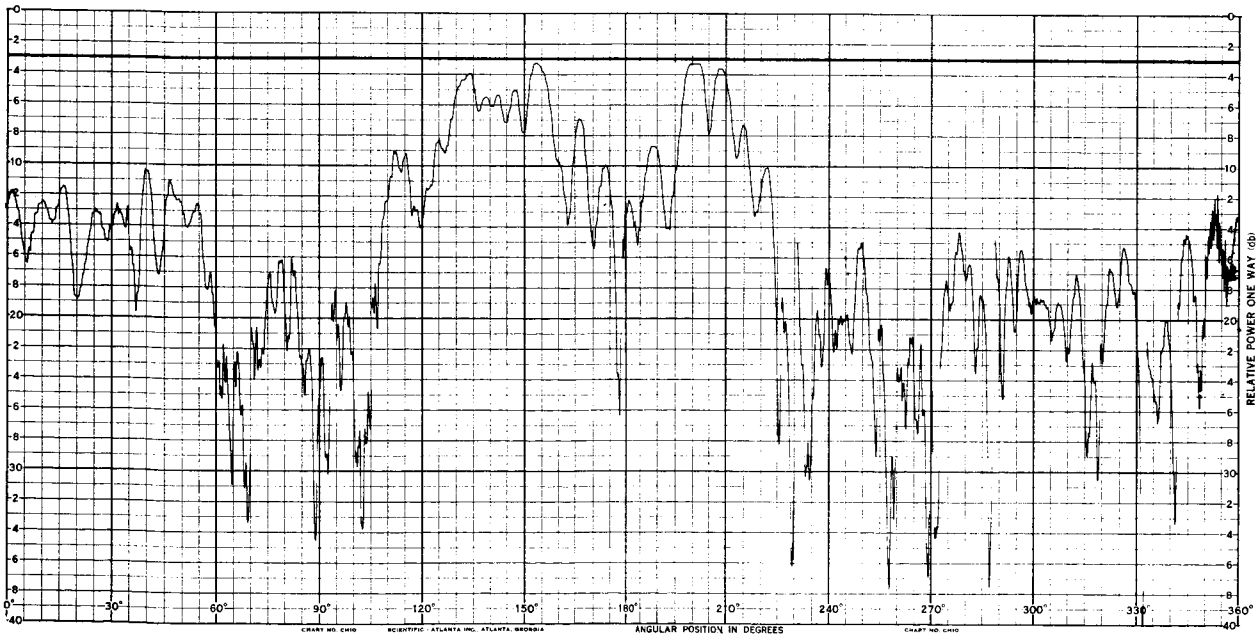
ANTENNA RADIATION PATTERN NO. 204-74

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



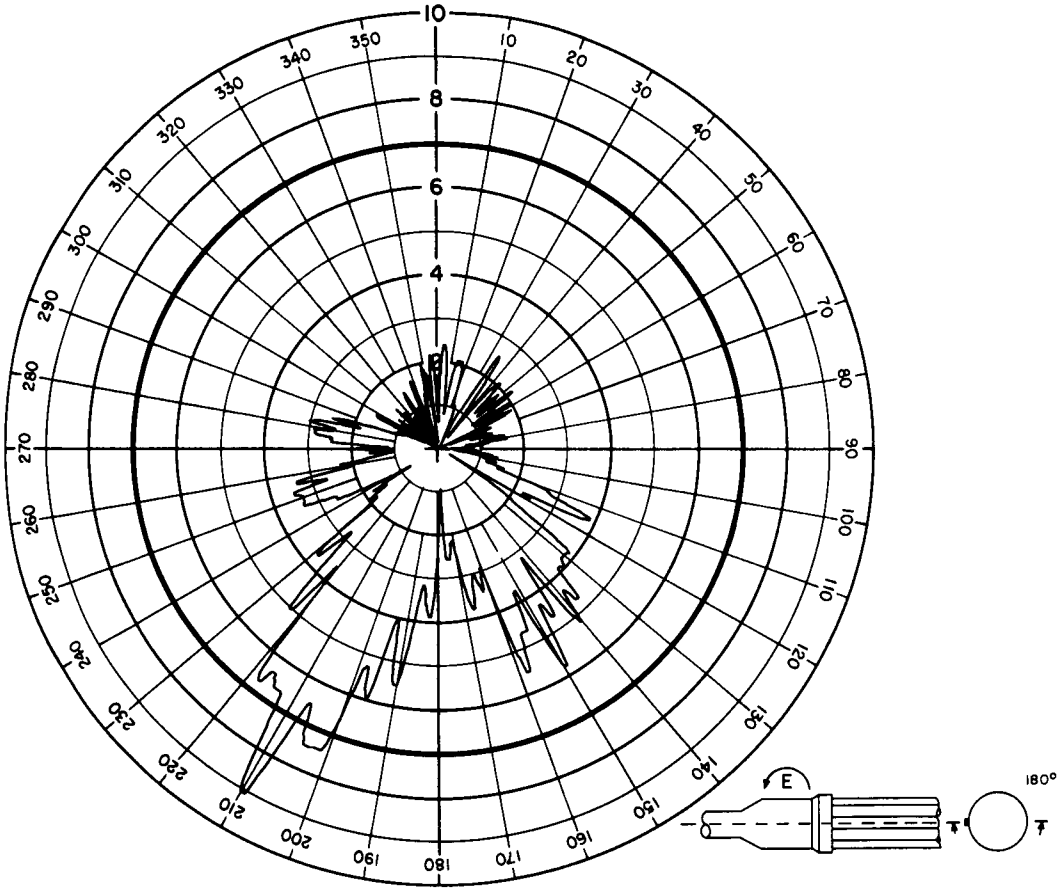


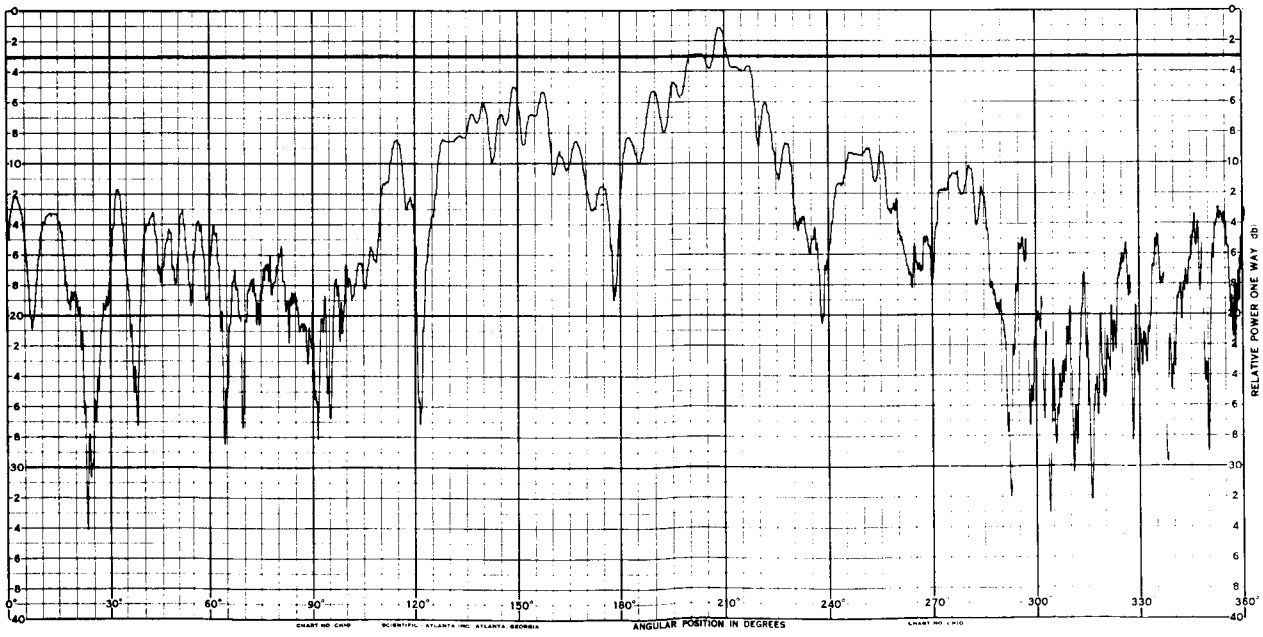
ANTENNA RADIATION PATTERN NO. 204-75

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM II



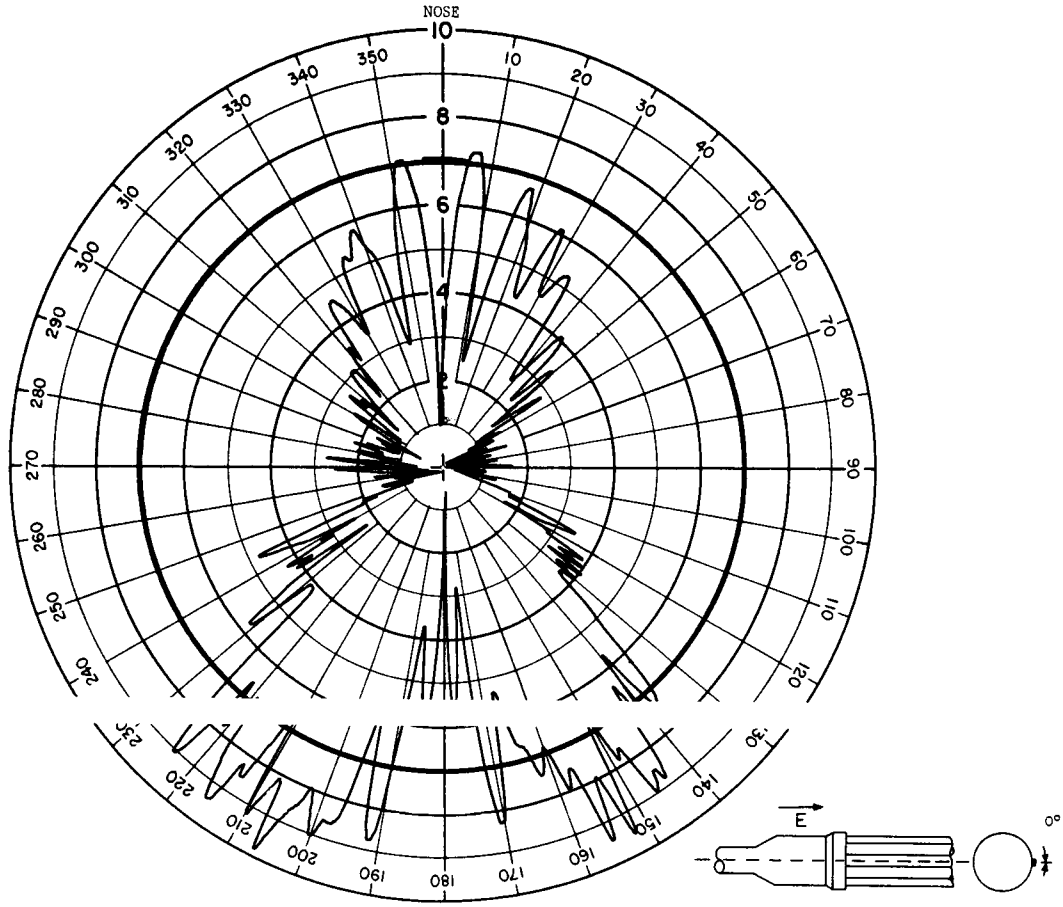


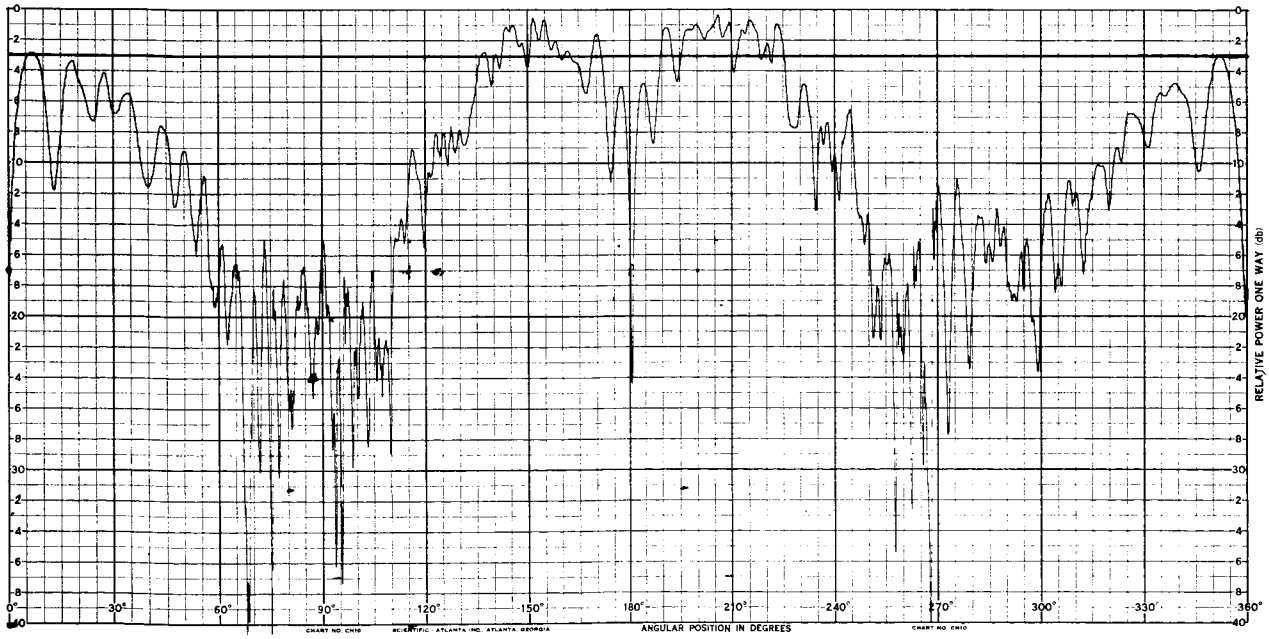
ANTENNA RADIATION PATTERN NO. 204-76

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



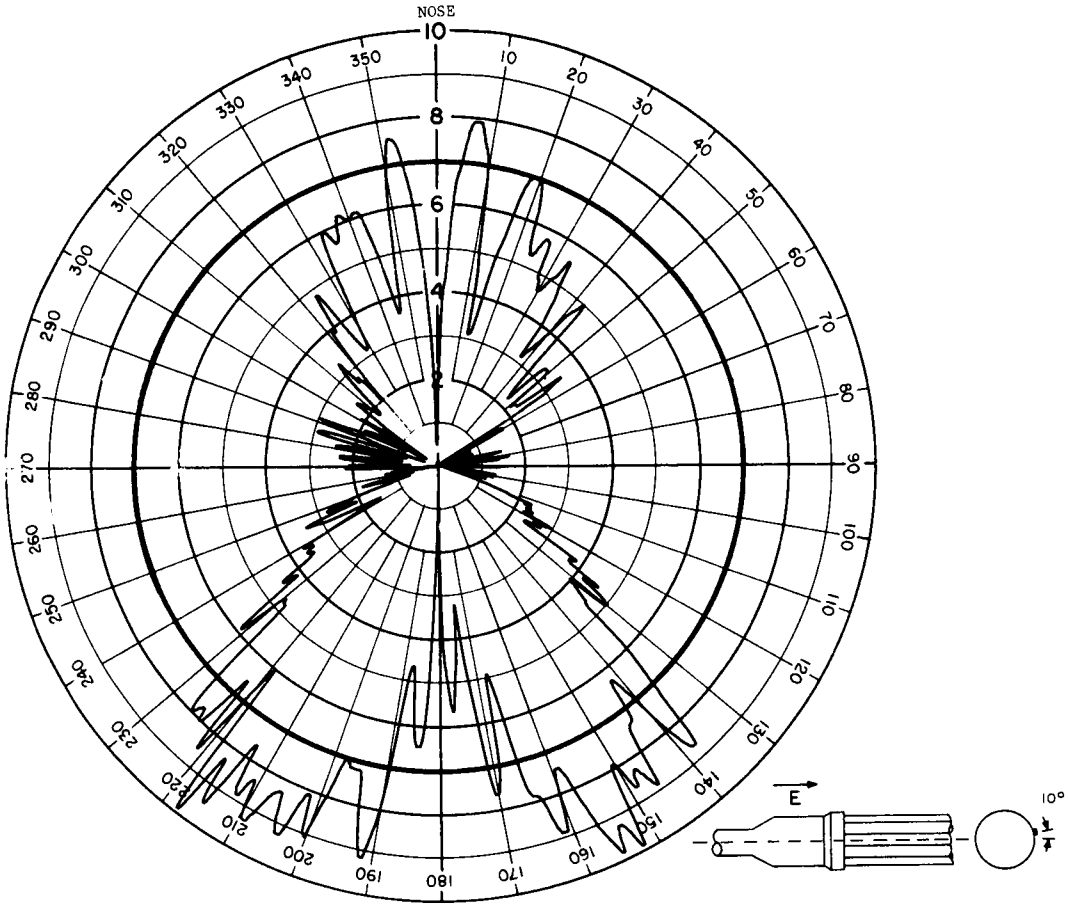


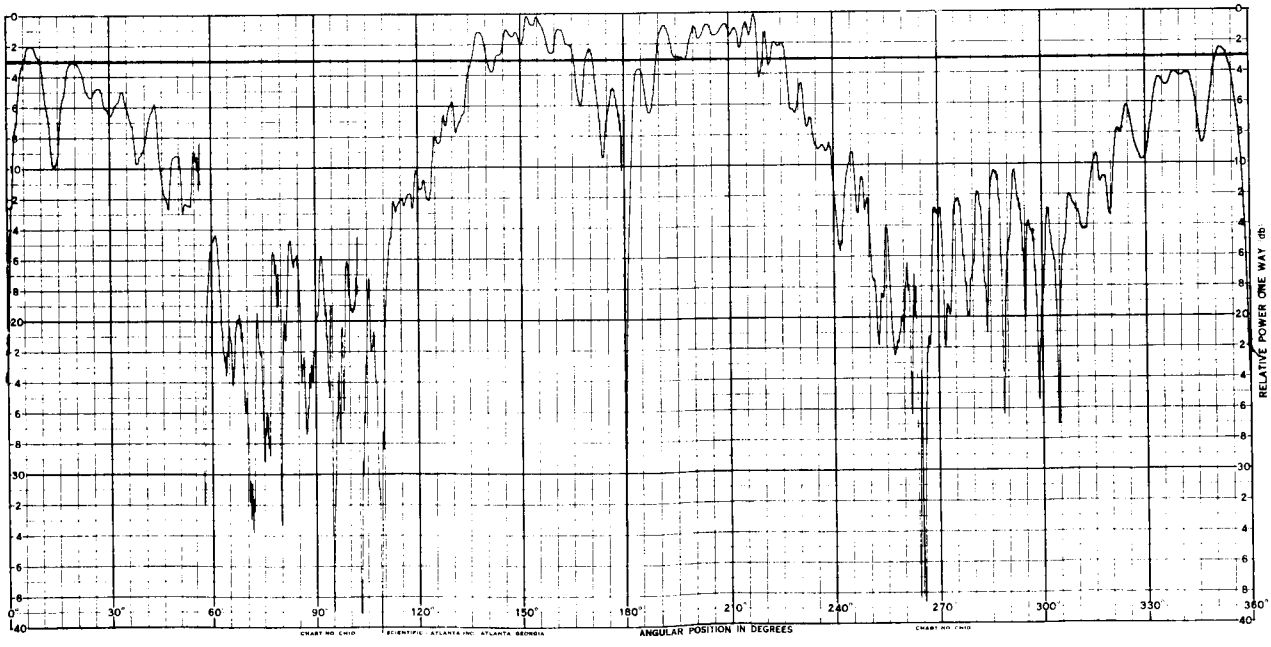
ANTENNA RADIATION PATTERN NO. 208-1

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



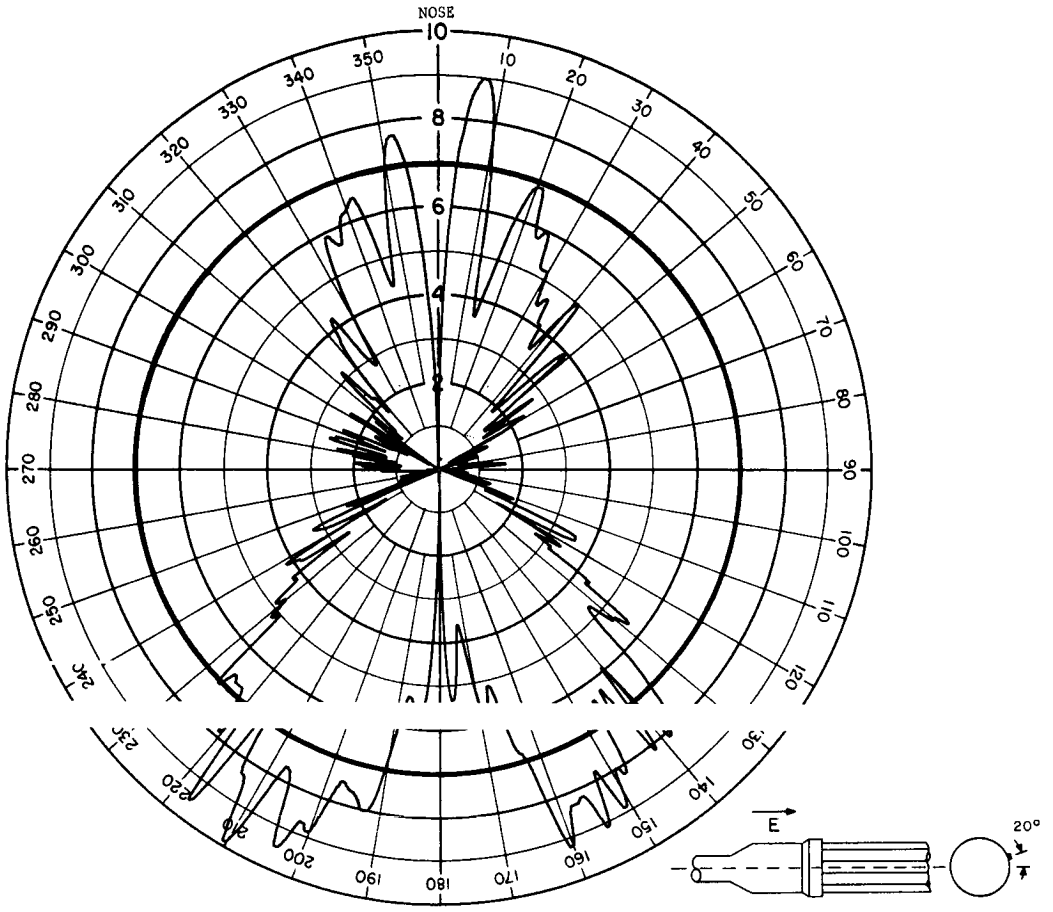


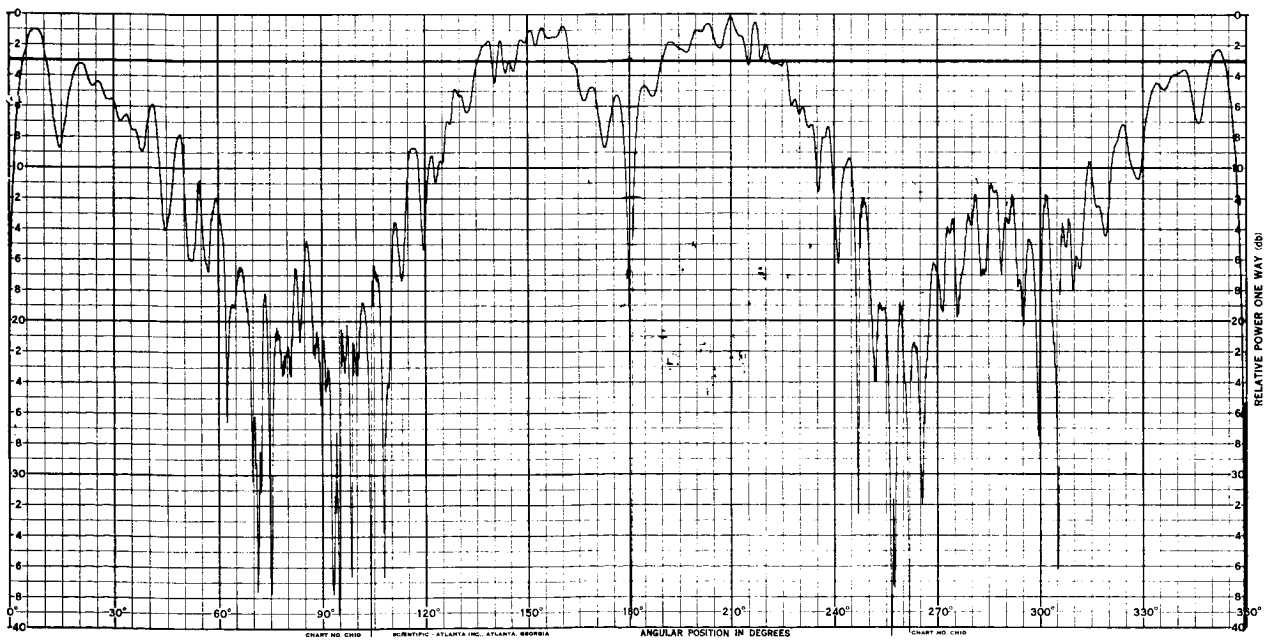
ANTENNA RADIATION PATTERN NO. 208-2

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



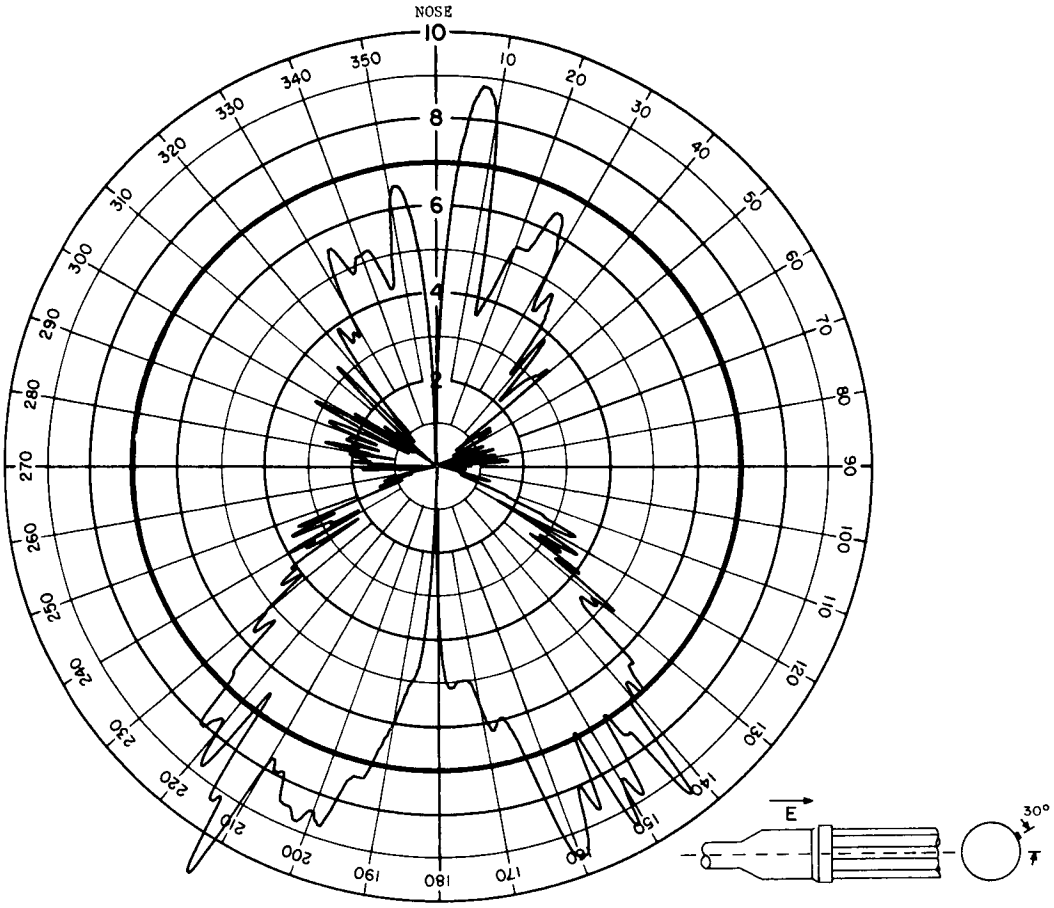


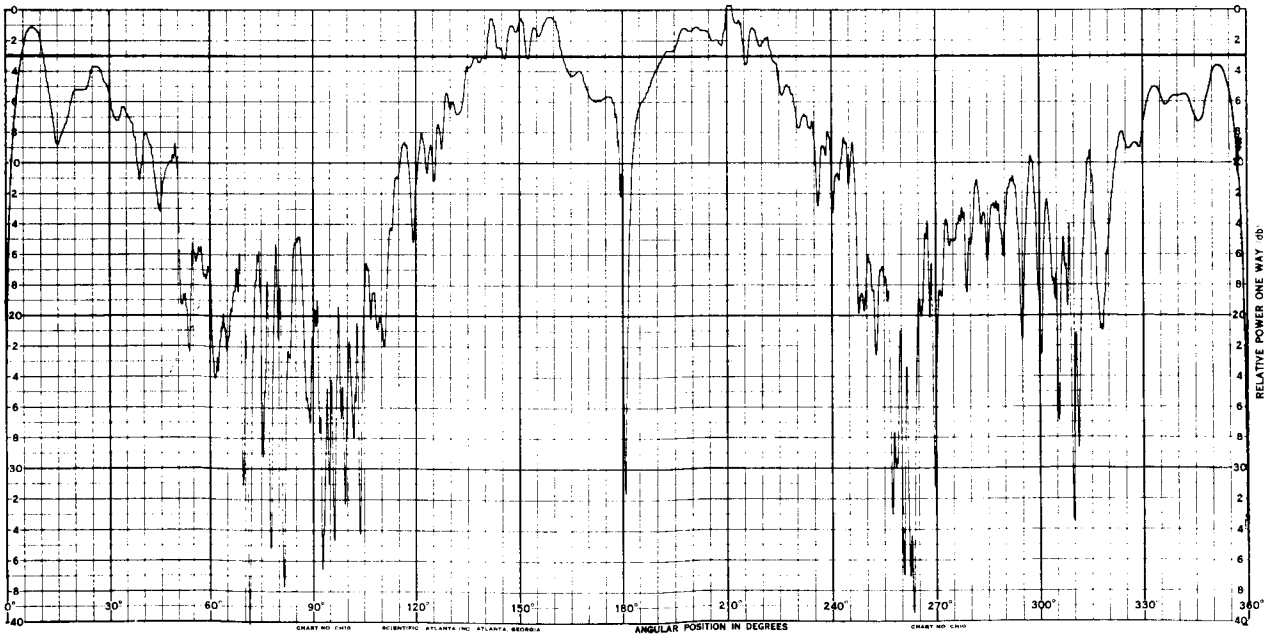
ANTENNA RADIATION PATTERN NO. 208-3

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



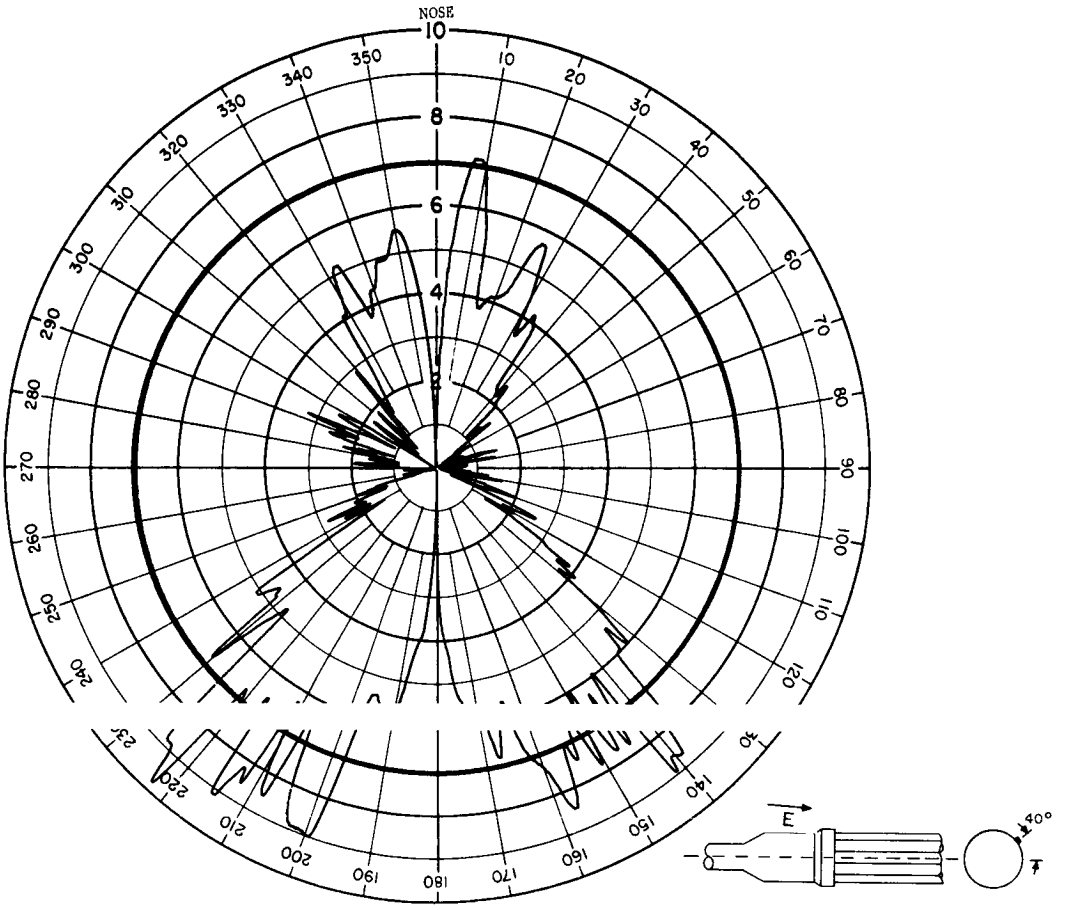


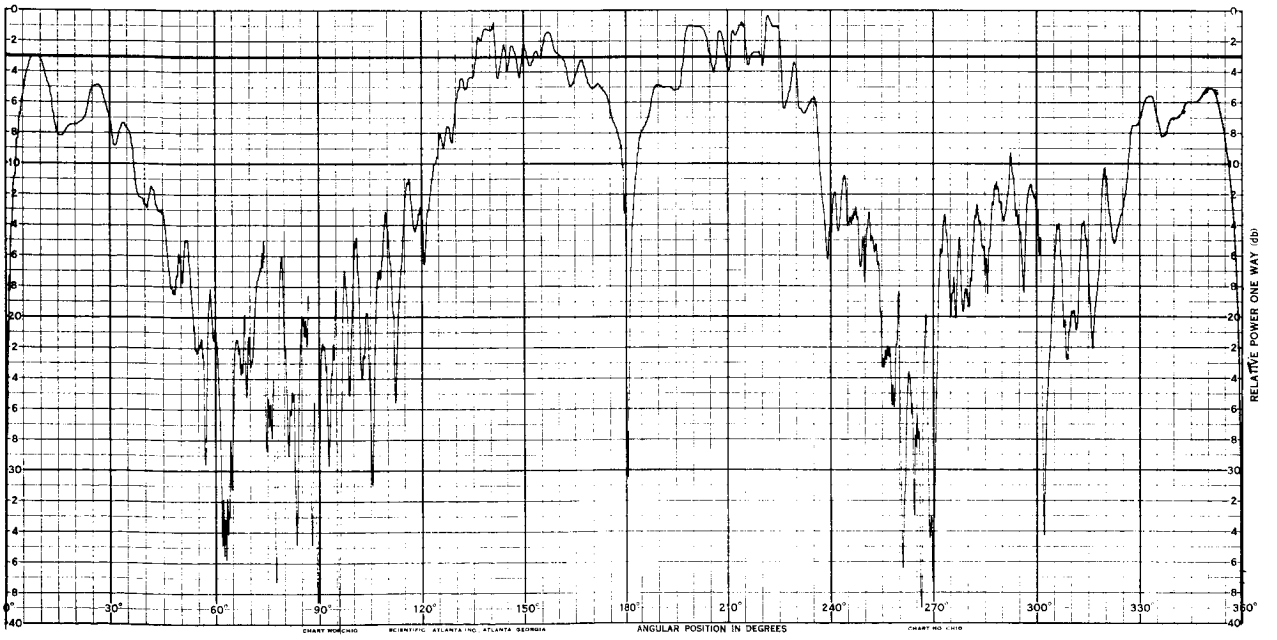
ANTENNA RADIATION PATTERN NO. 208-4

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



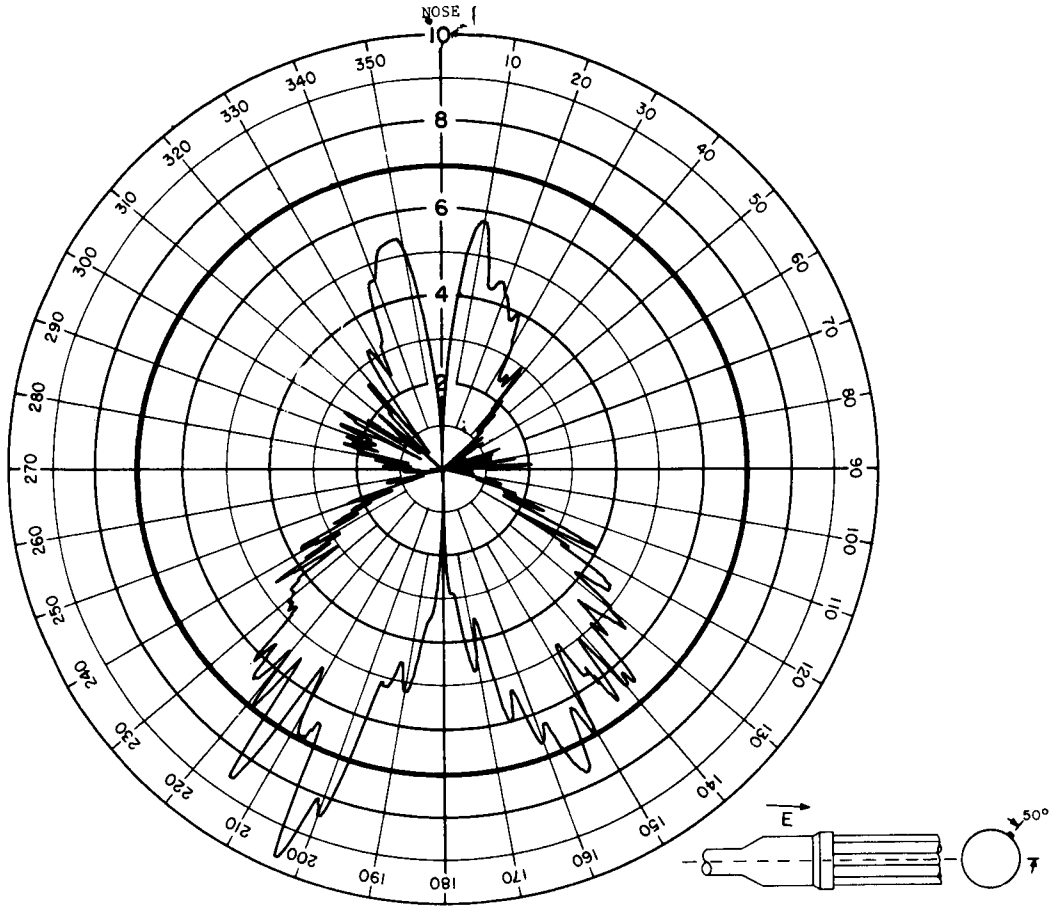


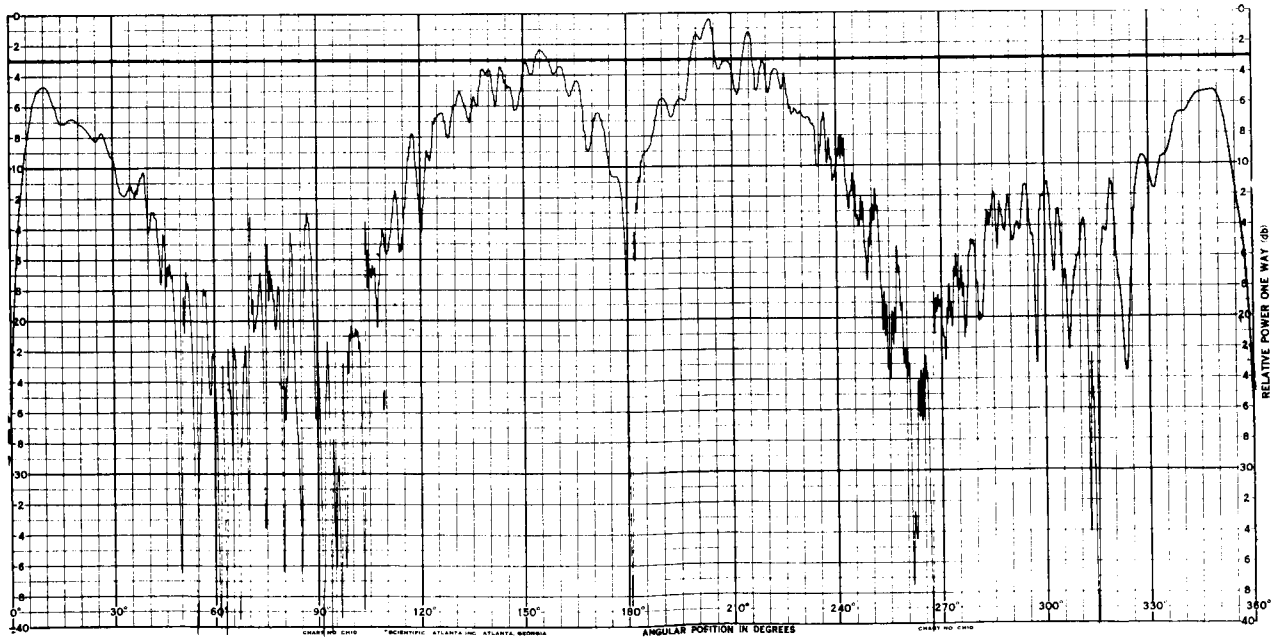
ANTENNA RADIATION PATTERN NO. 208-5

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



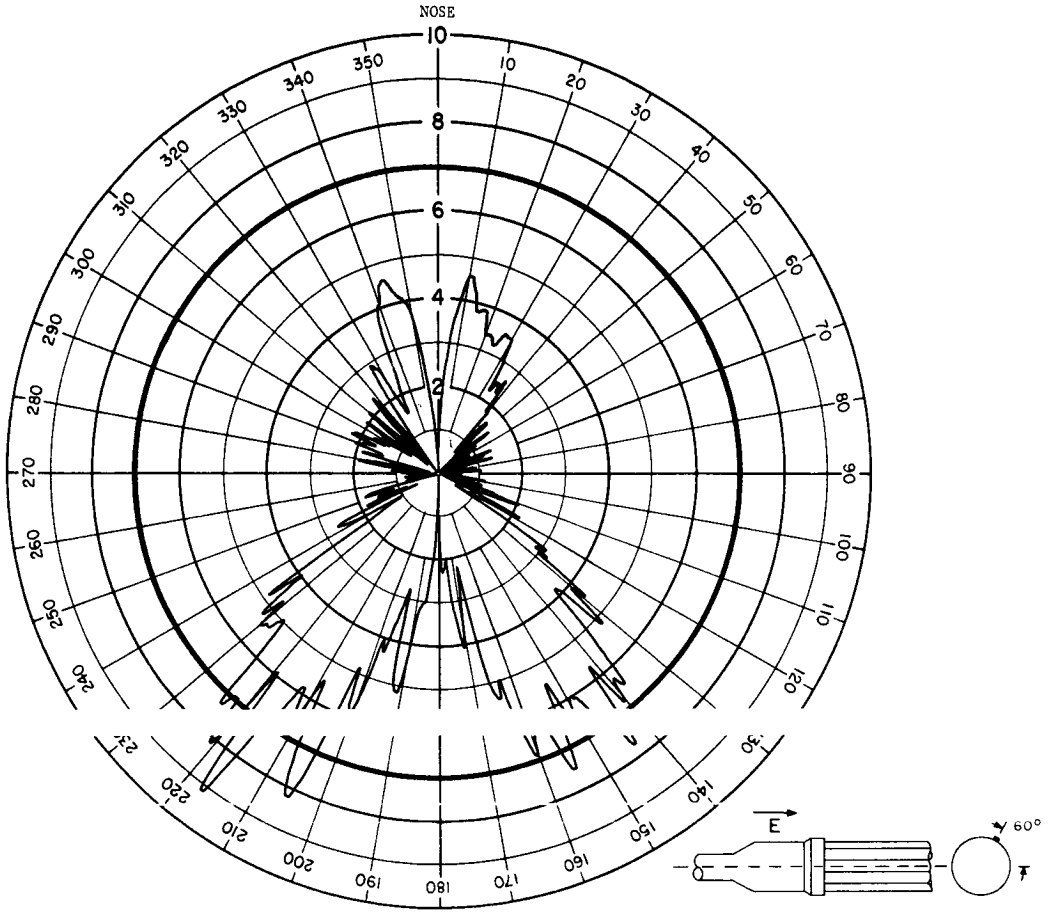


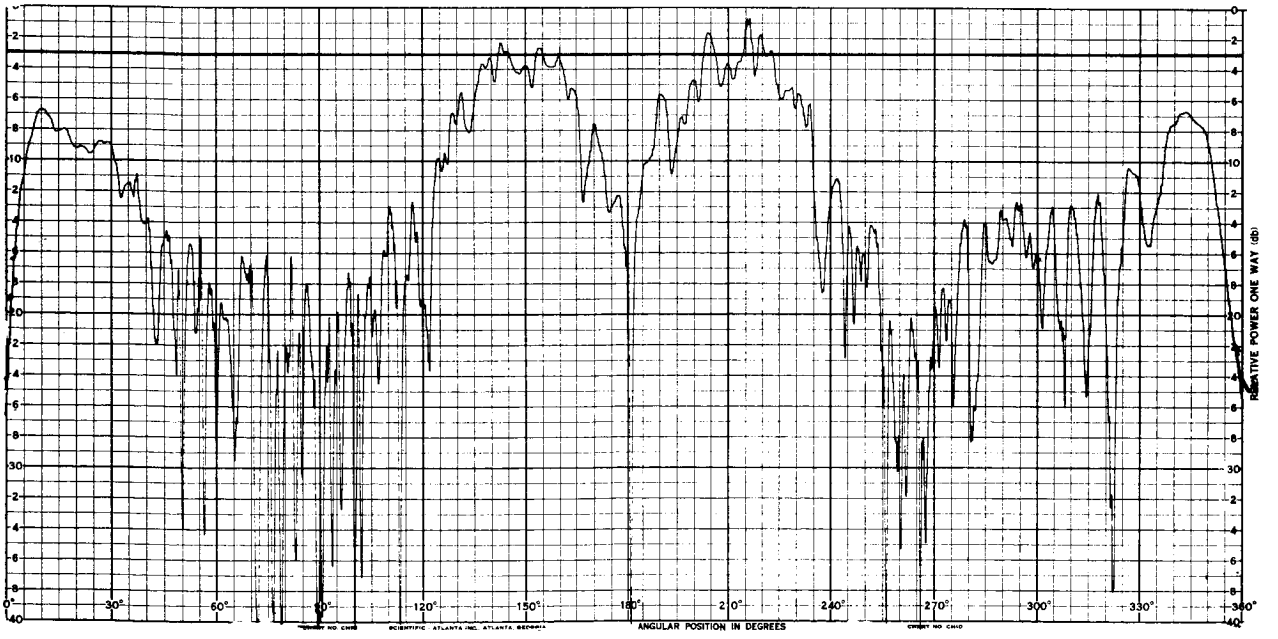
ANTENNA RADIATION PATTERN NO. 208-6

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



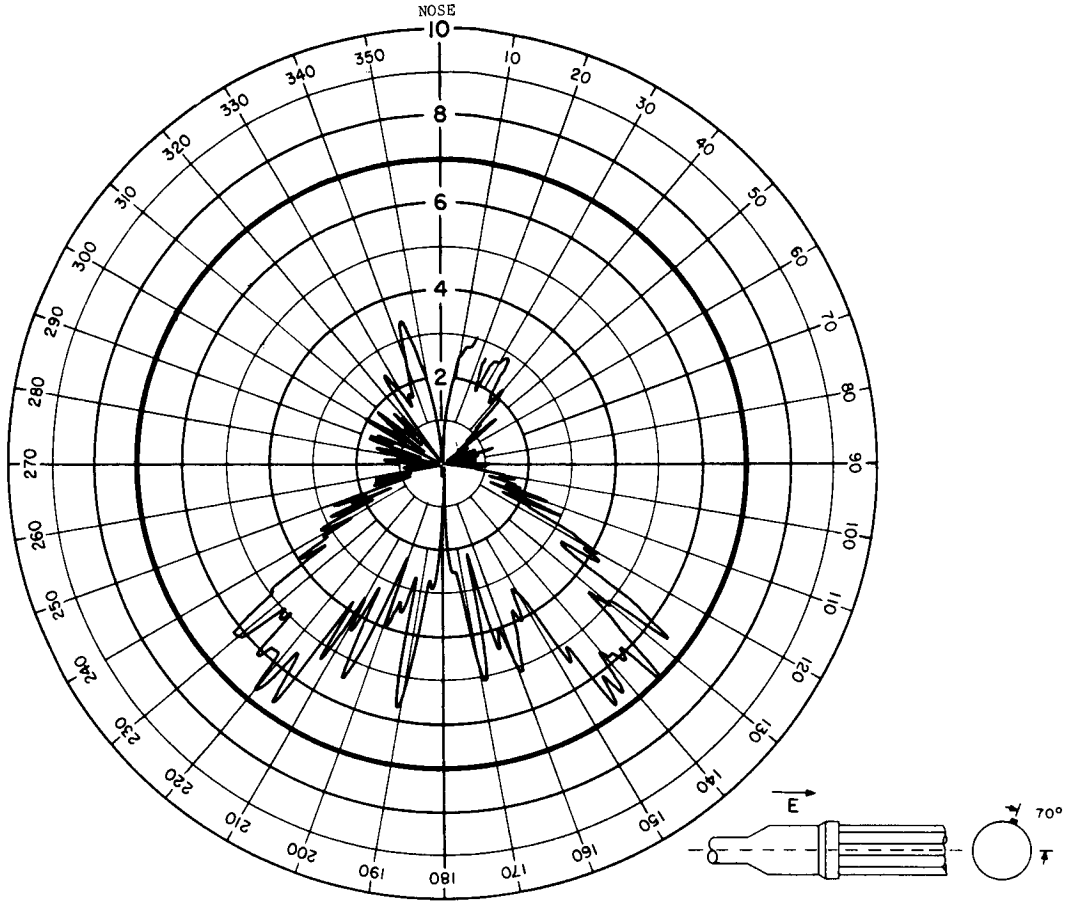


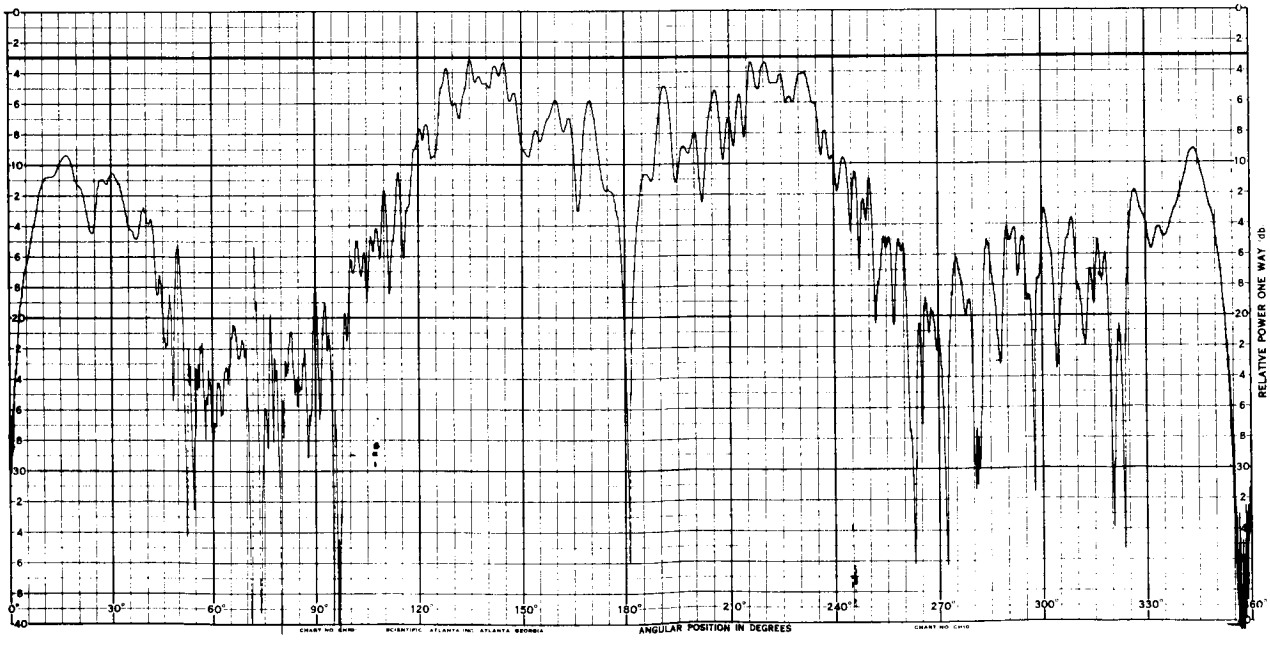
ANTENNA RADIATION PATTERN NO. 208-7

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



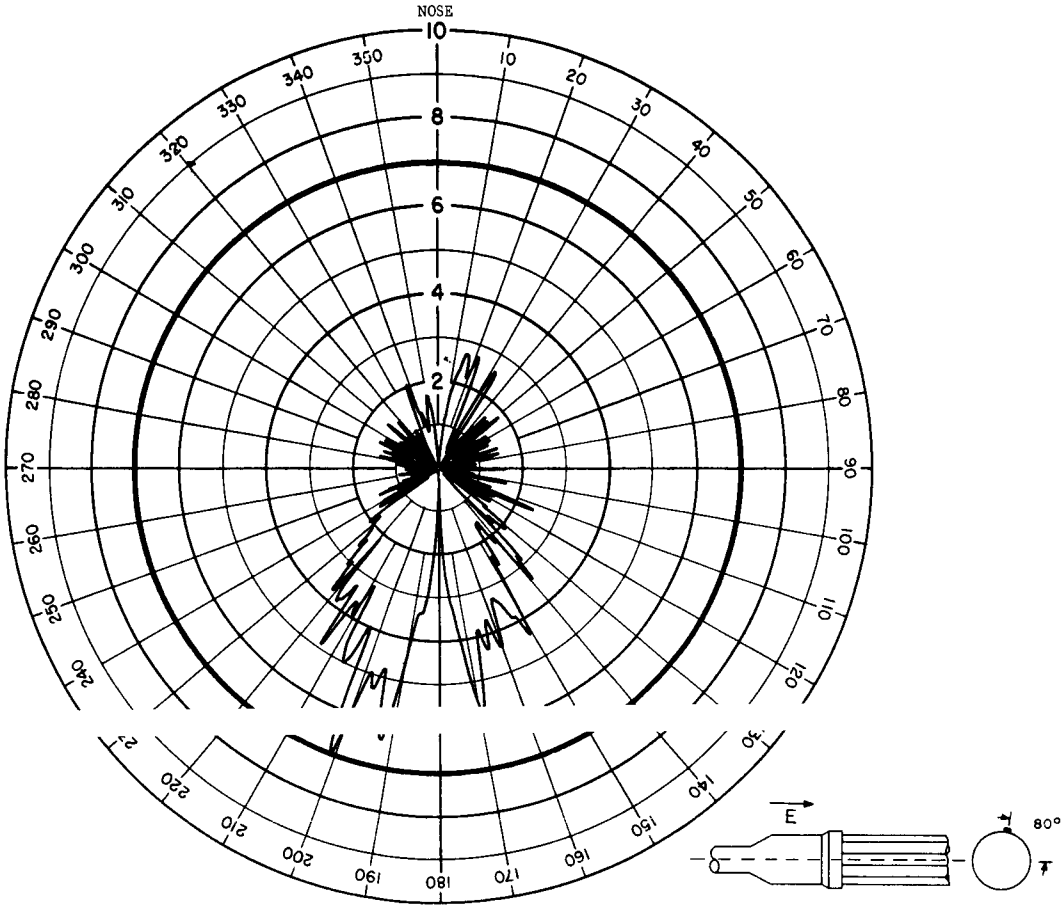


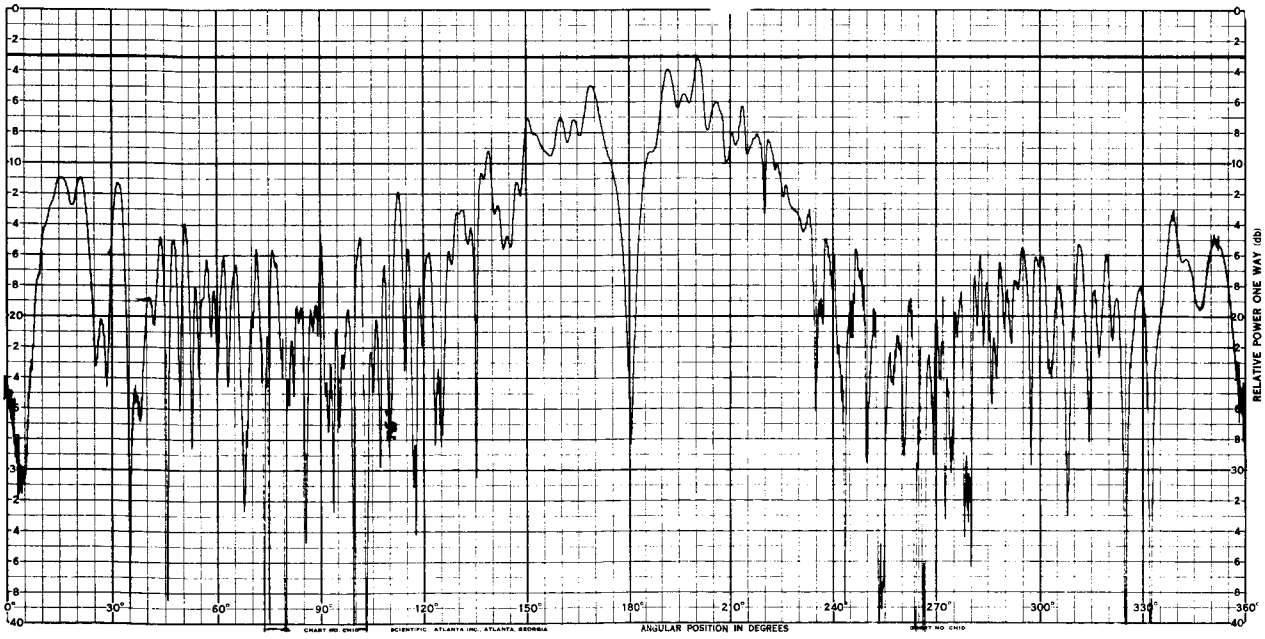
ANTENNA RADIATION PATTERN NO. 208-8

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



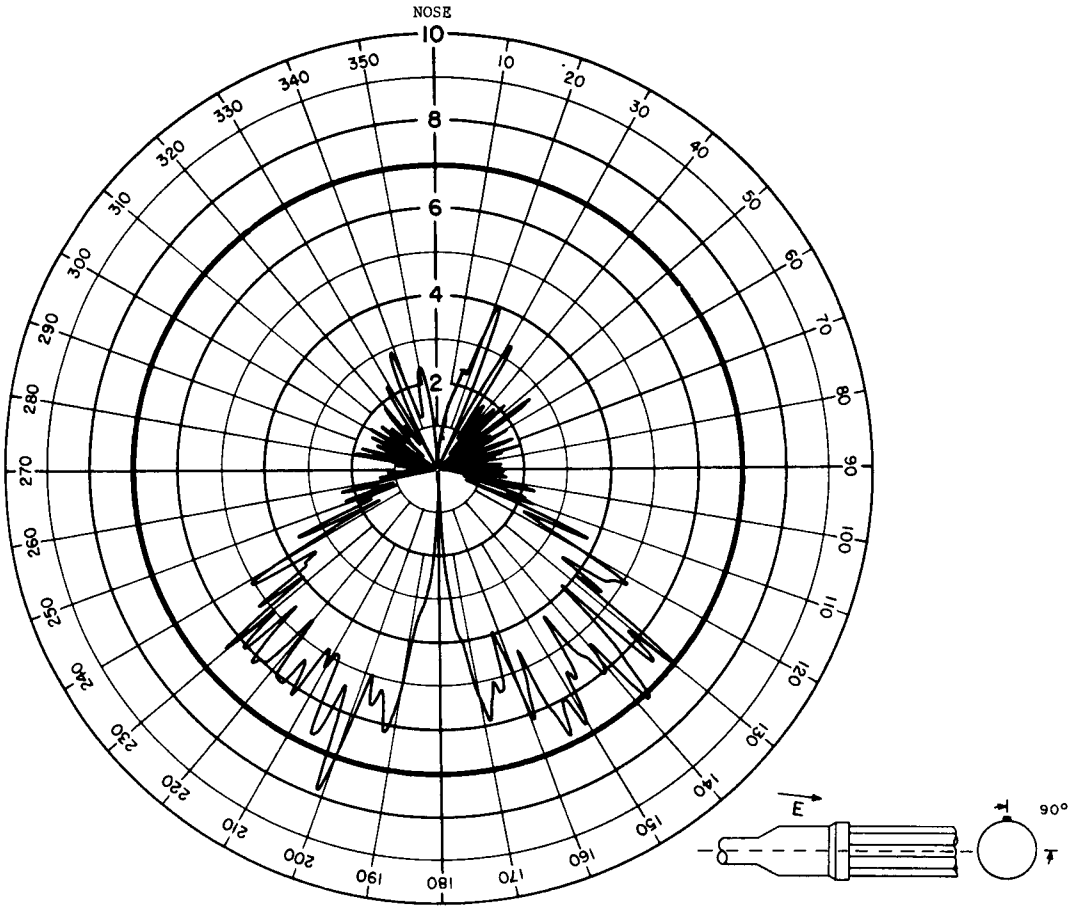


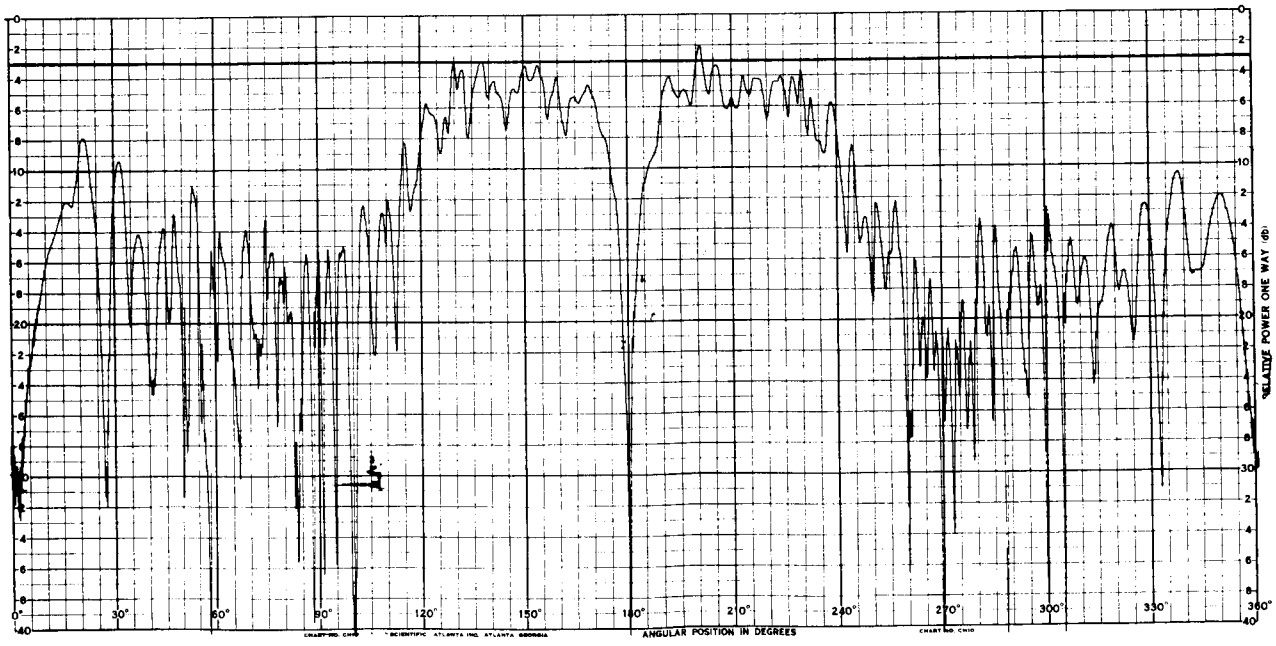
ANTENNA RADIATION PATTERN NO. 208-9

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



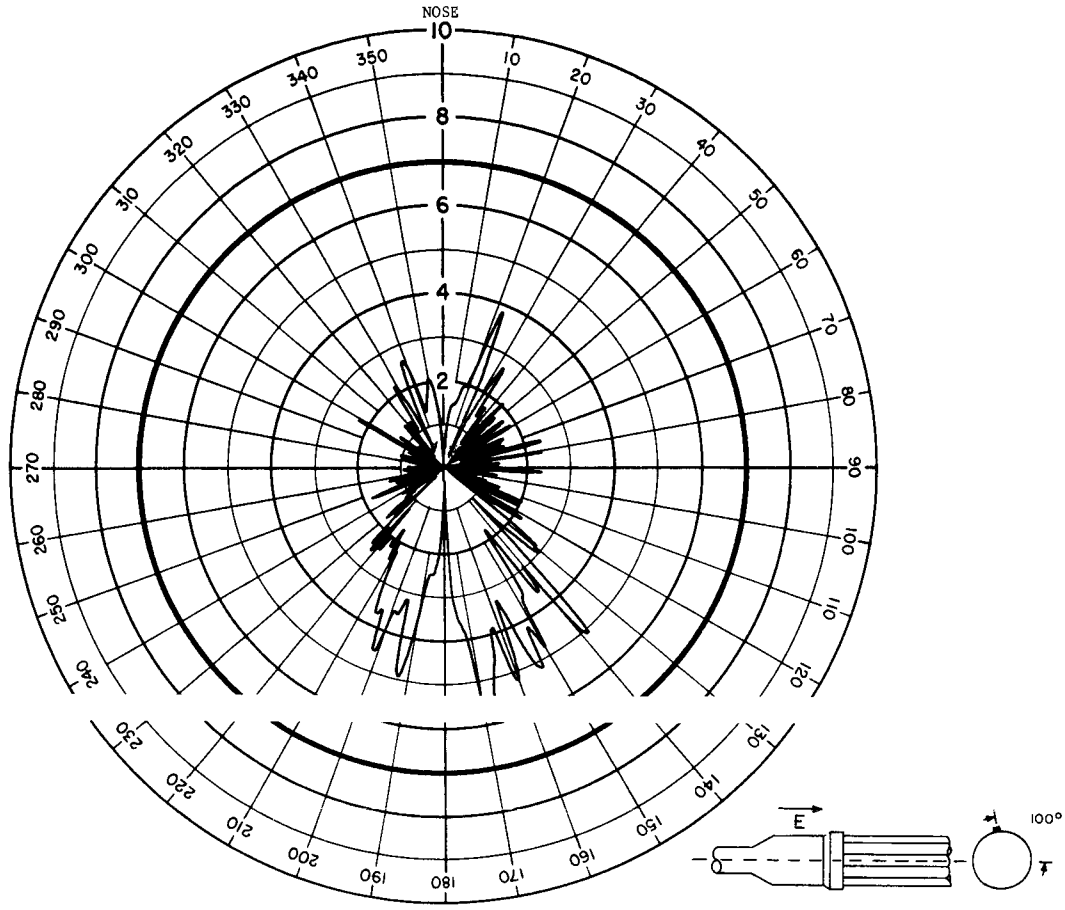


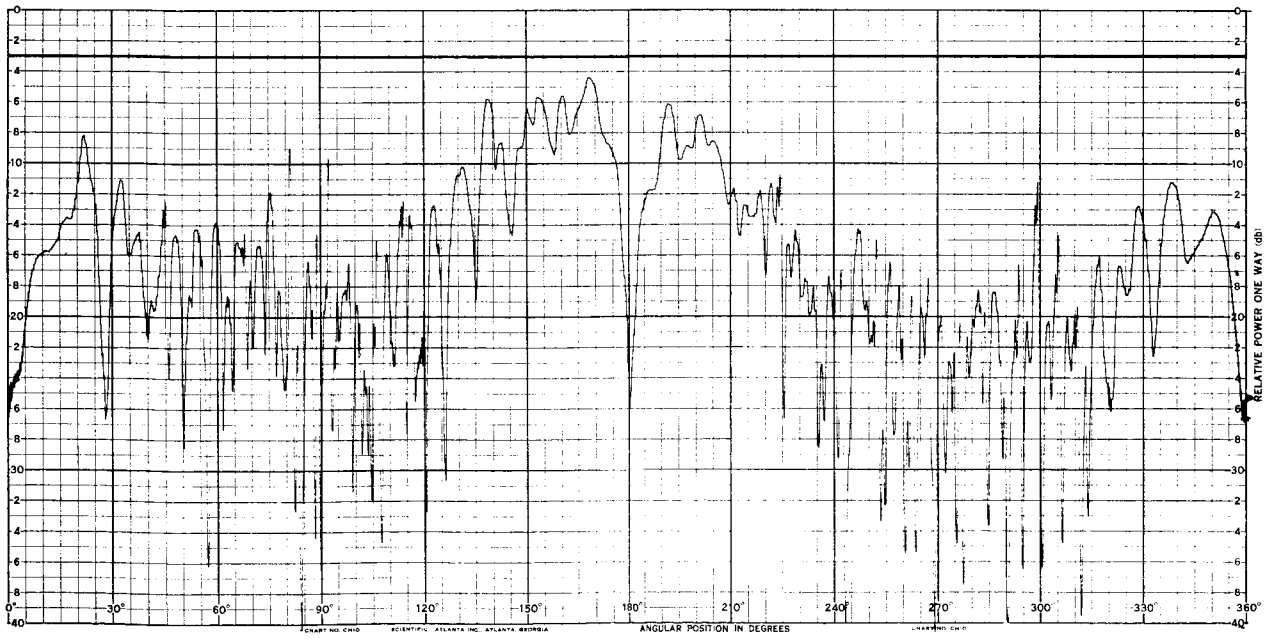
ANTENNA RADIATION PATTERN NO. 208-10

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



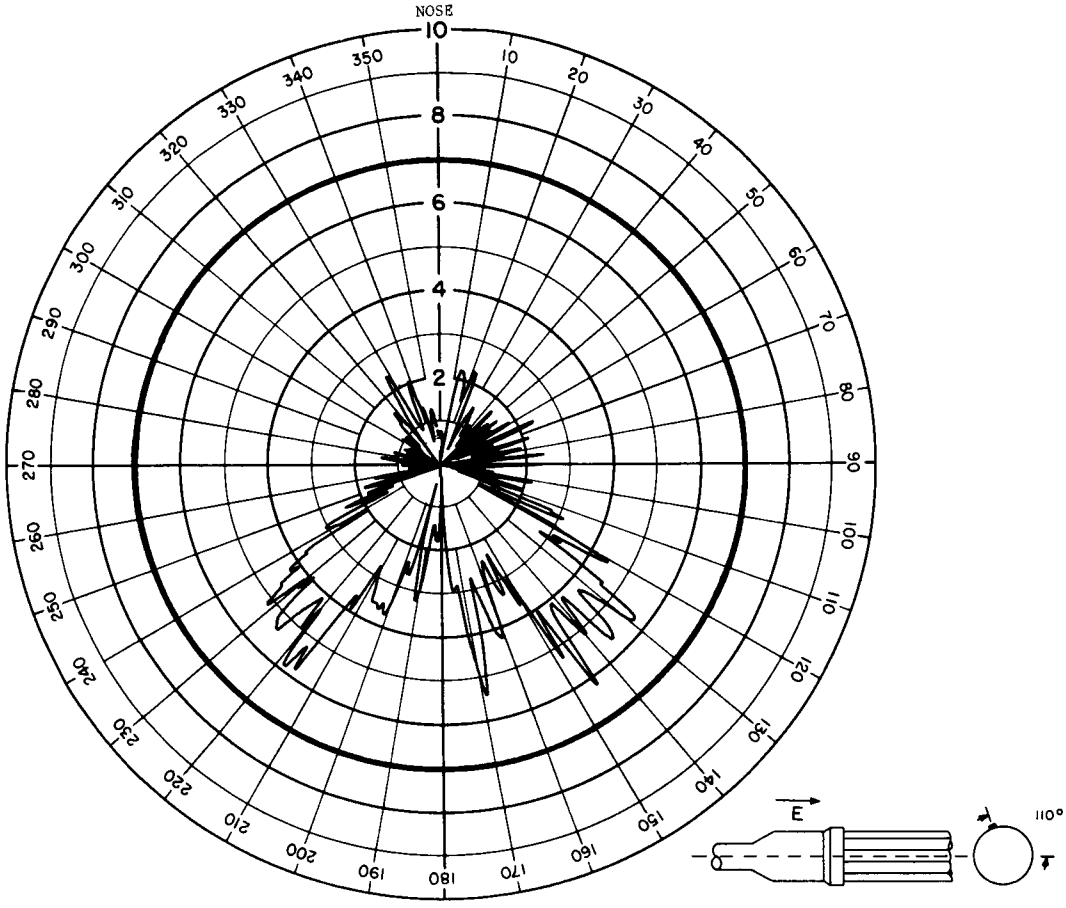


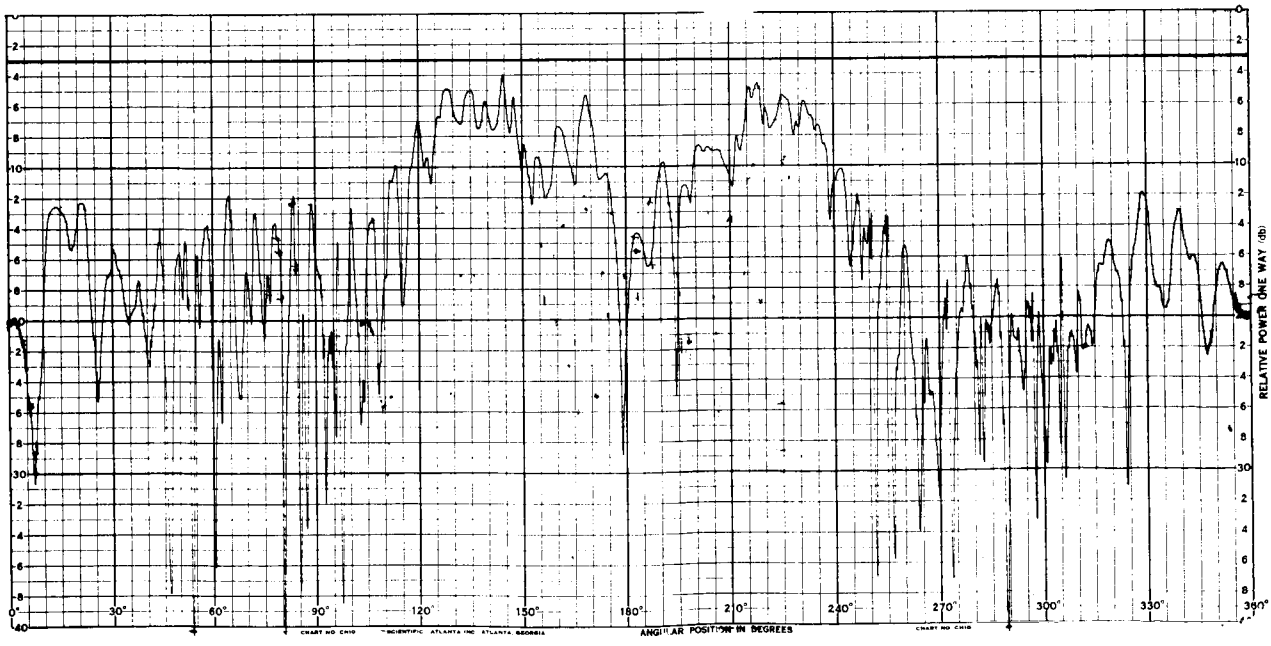
ANTENNA RADIATION PATTERN NO. 208-11

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



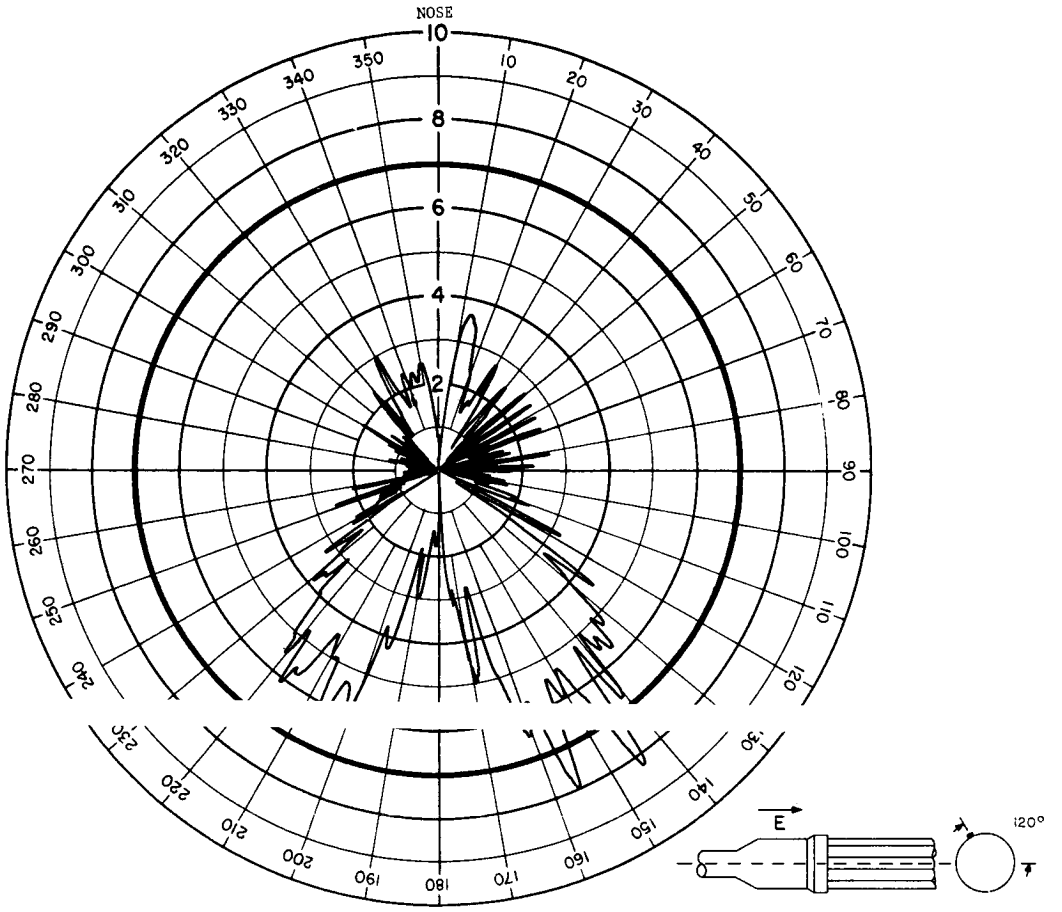


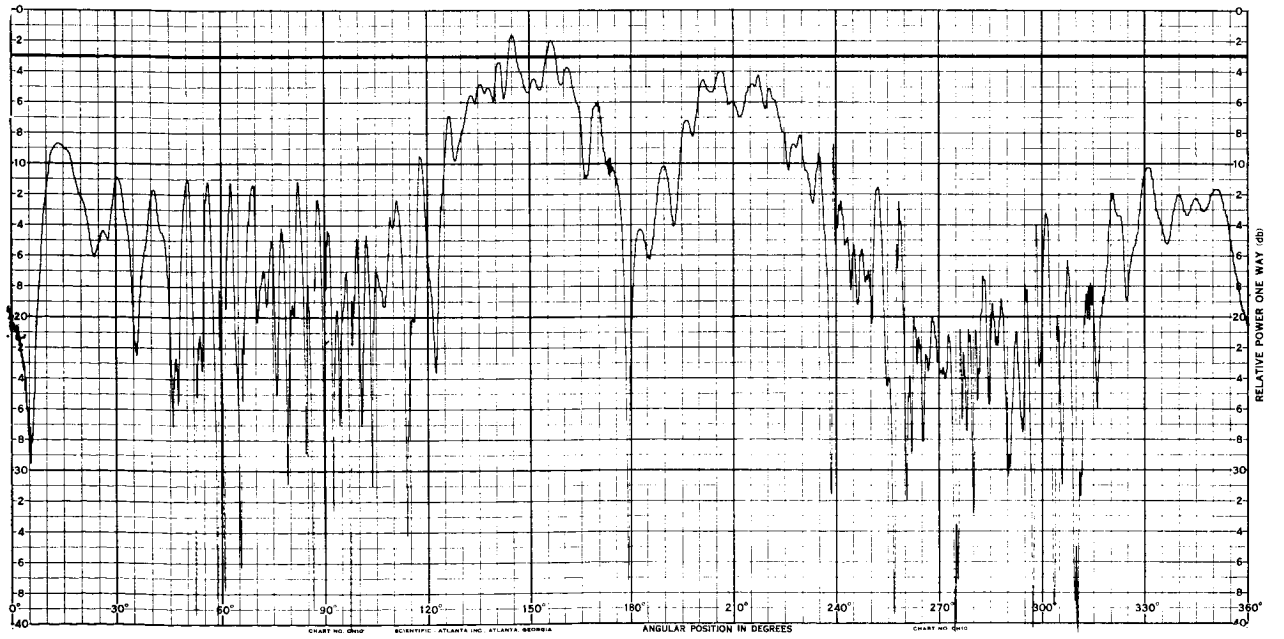
ANTENNA RADIATION PATTERN NO. 208-12

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III





ANTENNA RADIATION PATTERN NO. 208-13

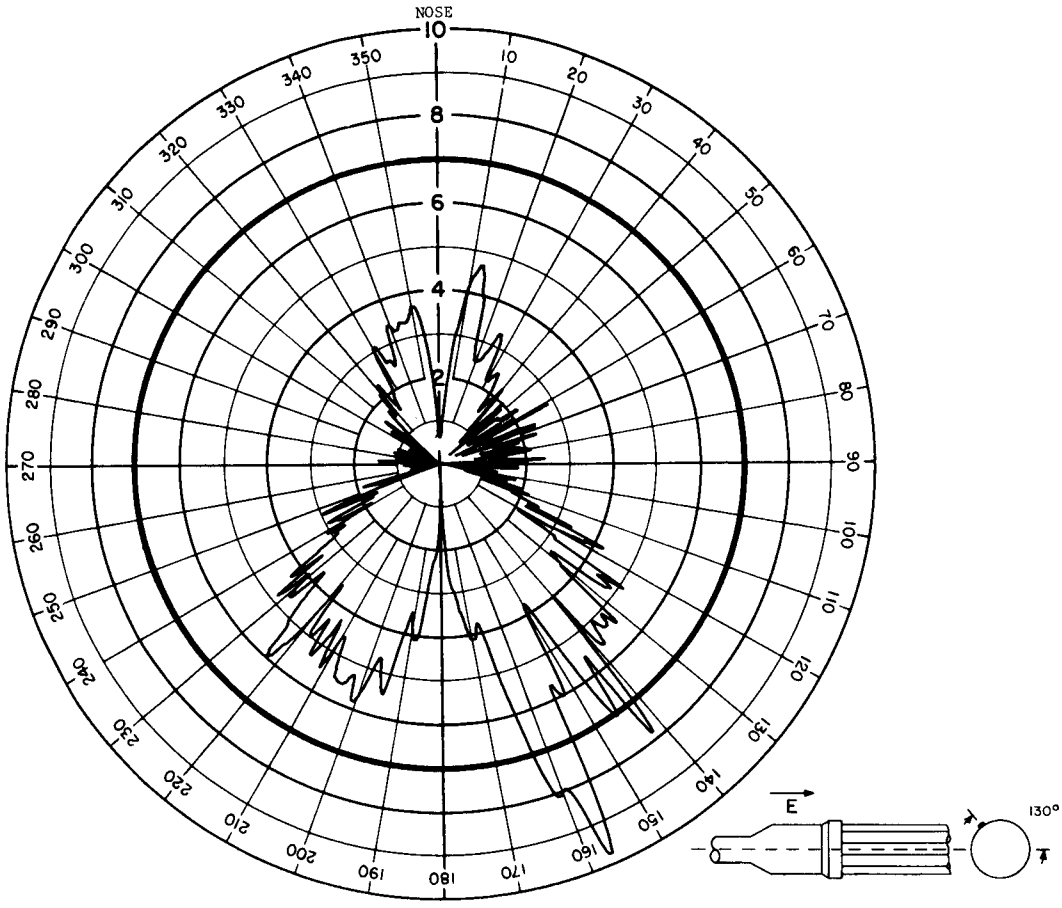
GEORGE C. MARSHALL SPACE FLIGHT CENTER

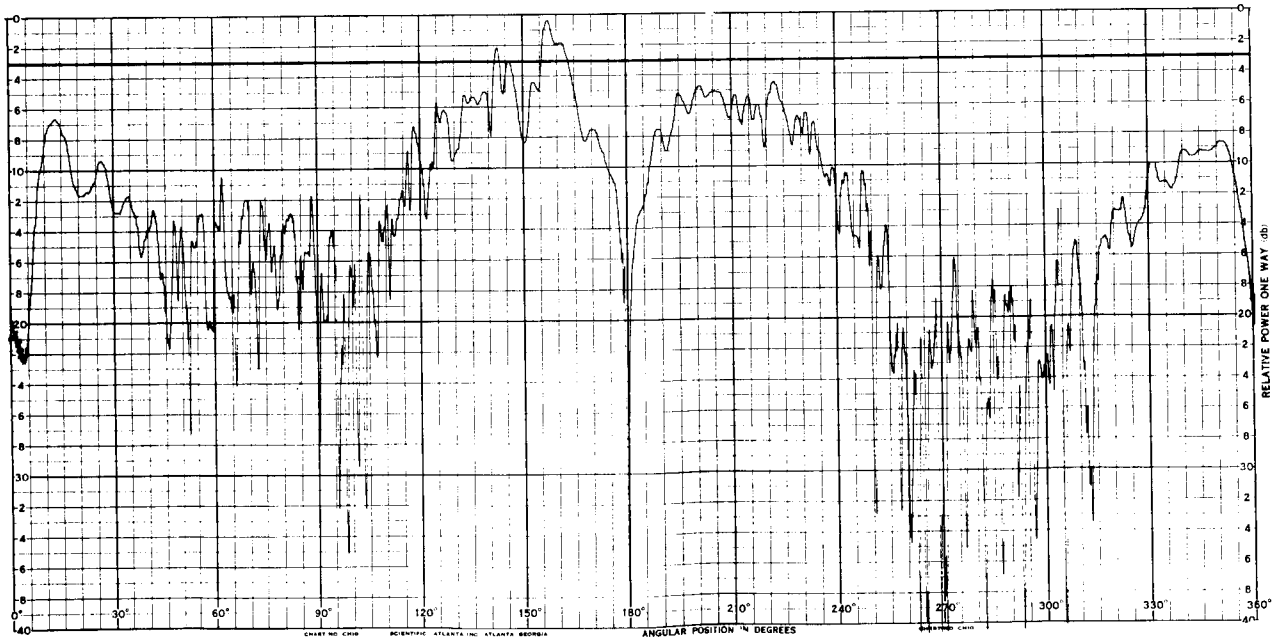
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION

TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



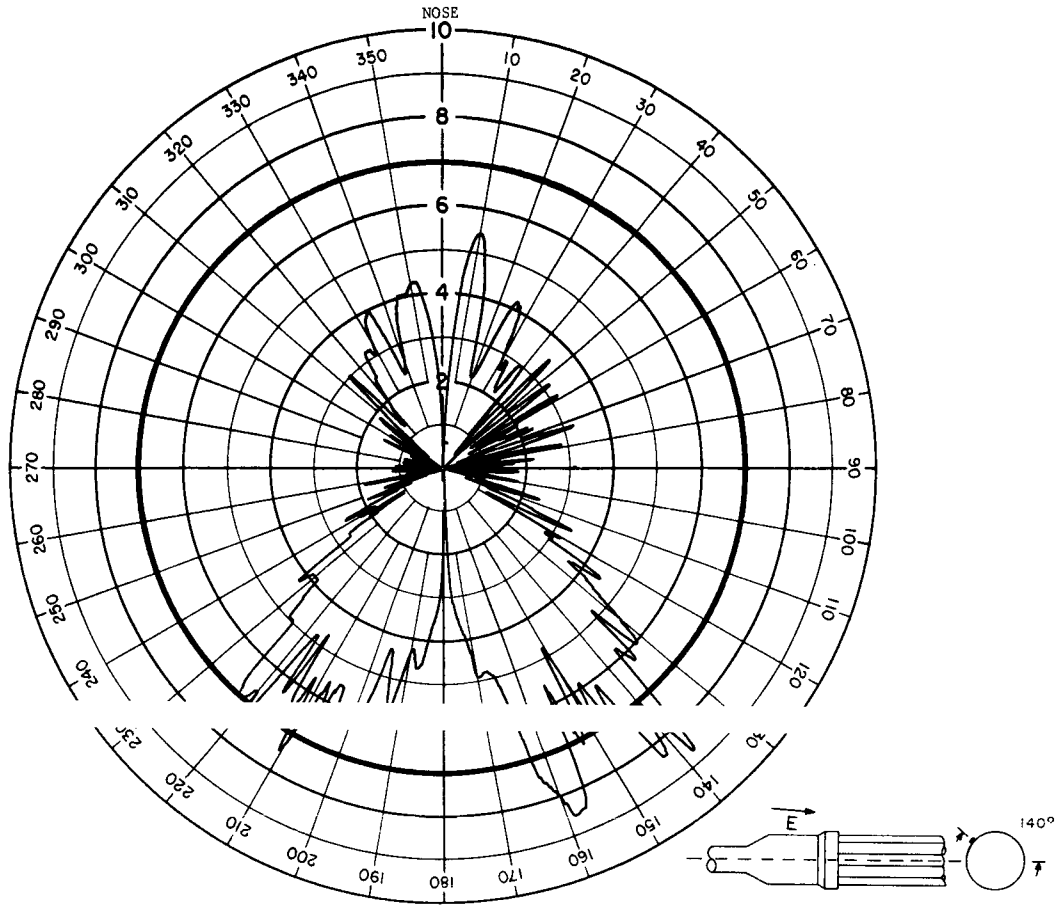


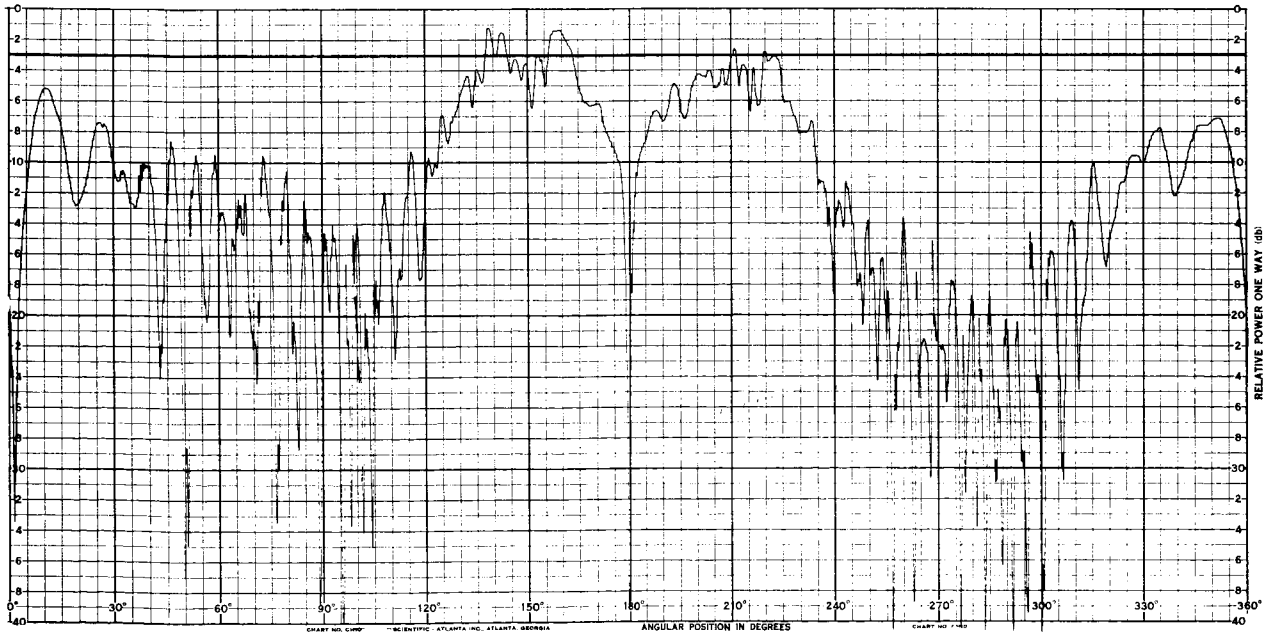
ANTENNA RADIATION PATTERN NO. 208-14

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



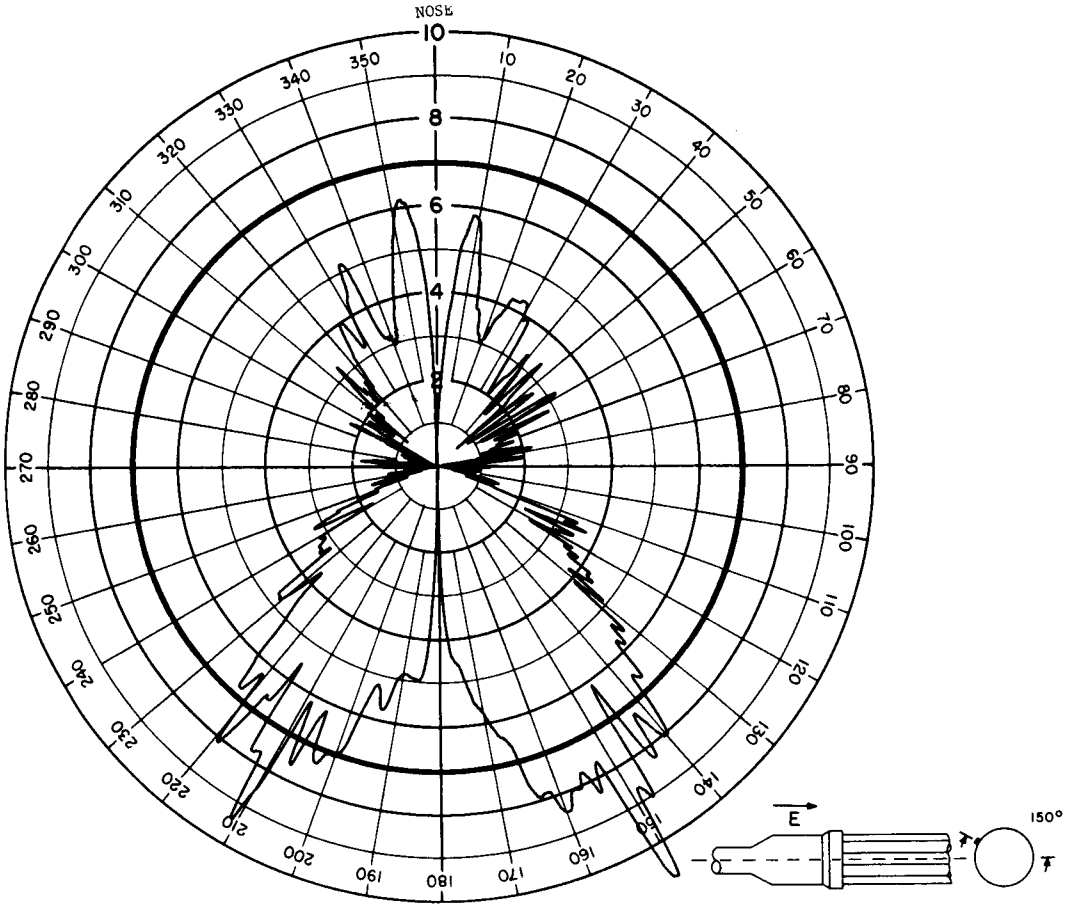


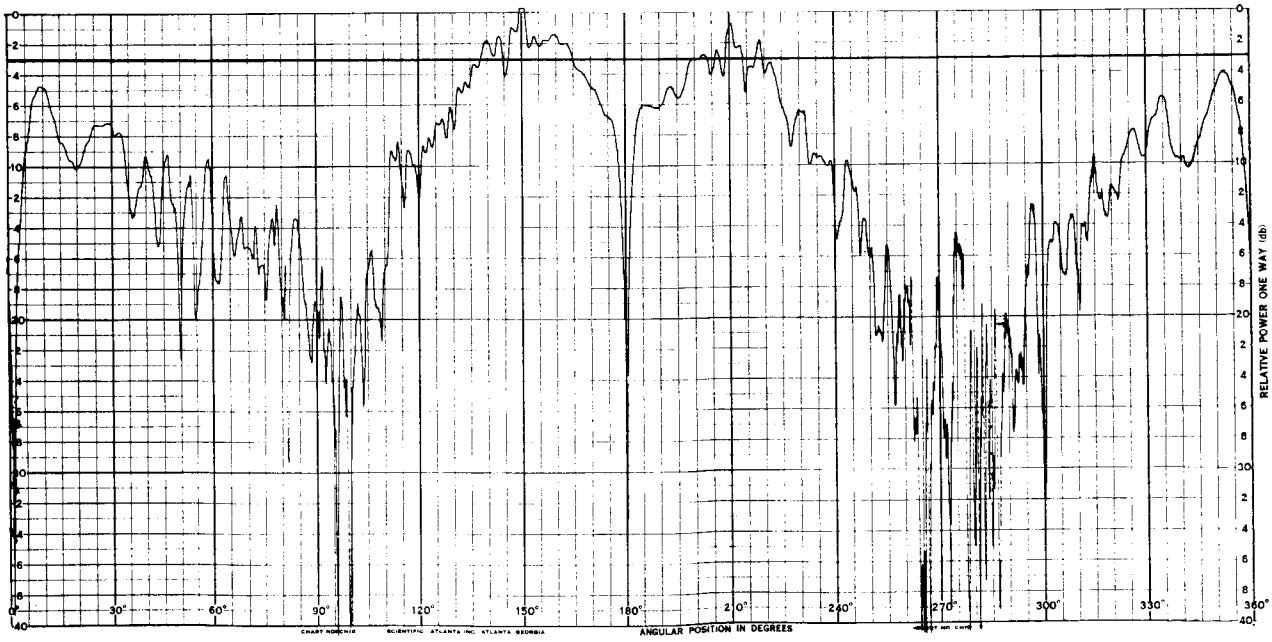
ANTENNA RADIATION PATTERN NO. 208-15

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



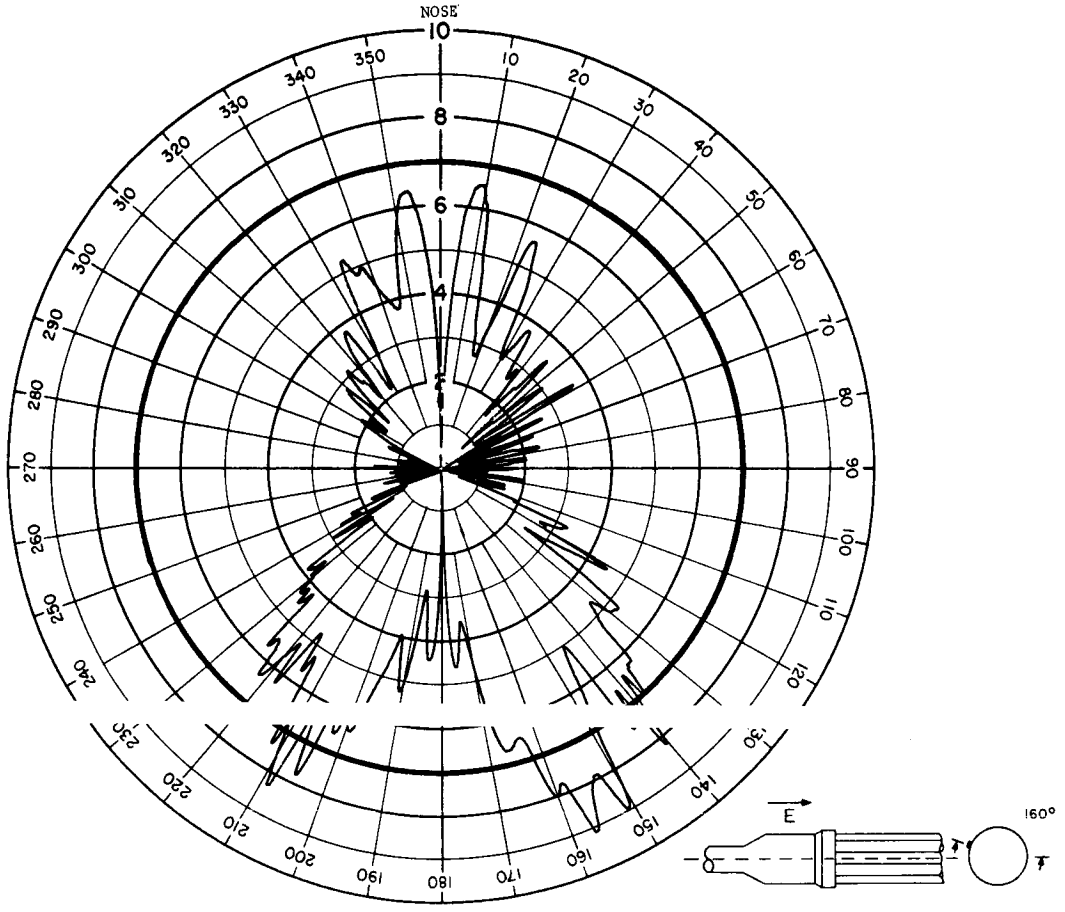


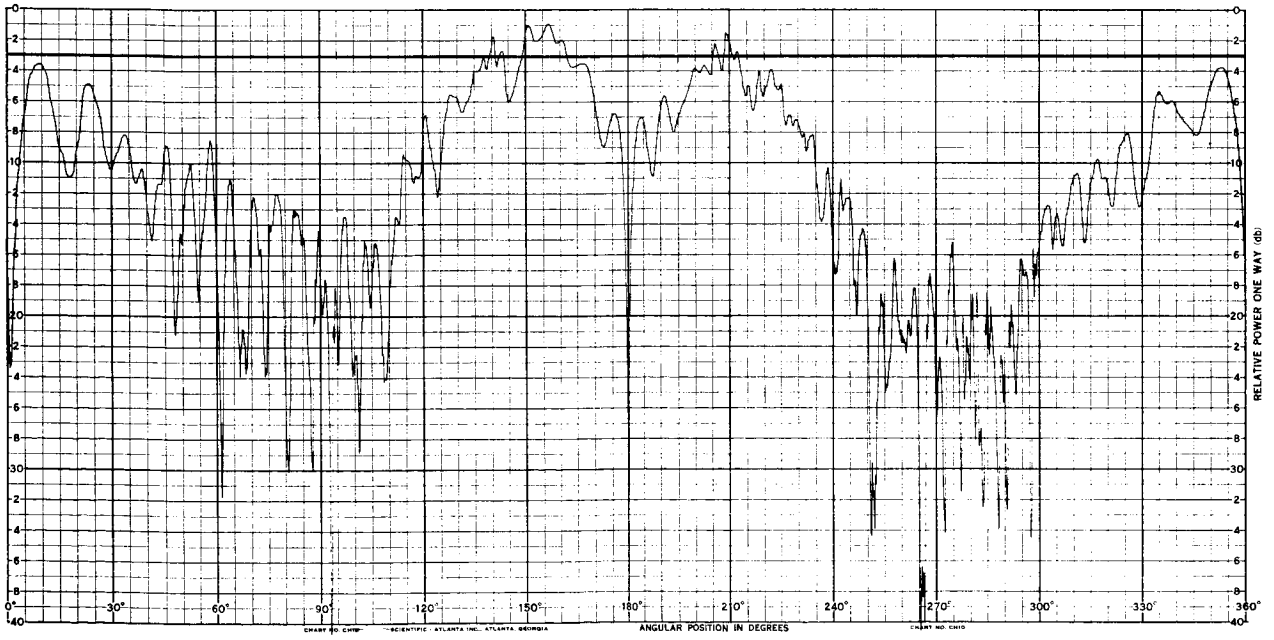
ANTENNA RADIATION PATTERN NO. 208-16

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



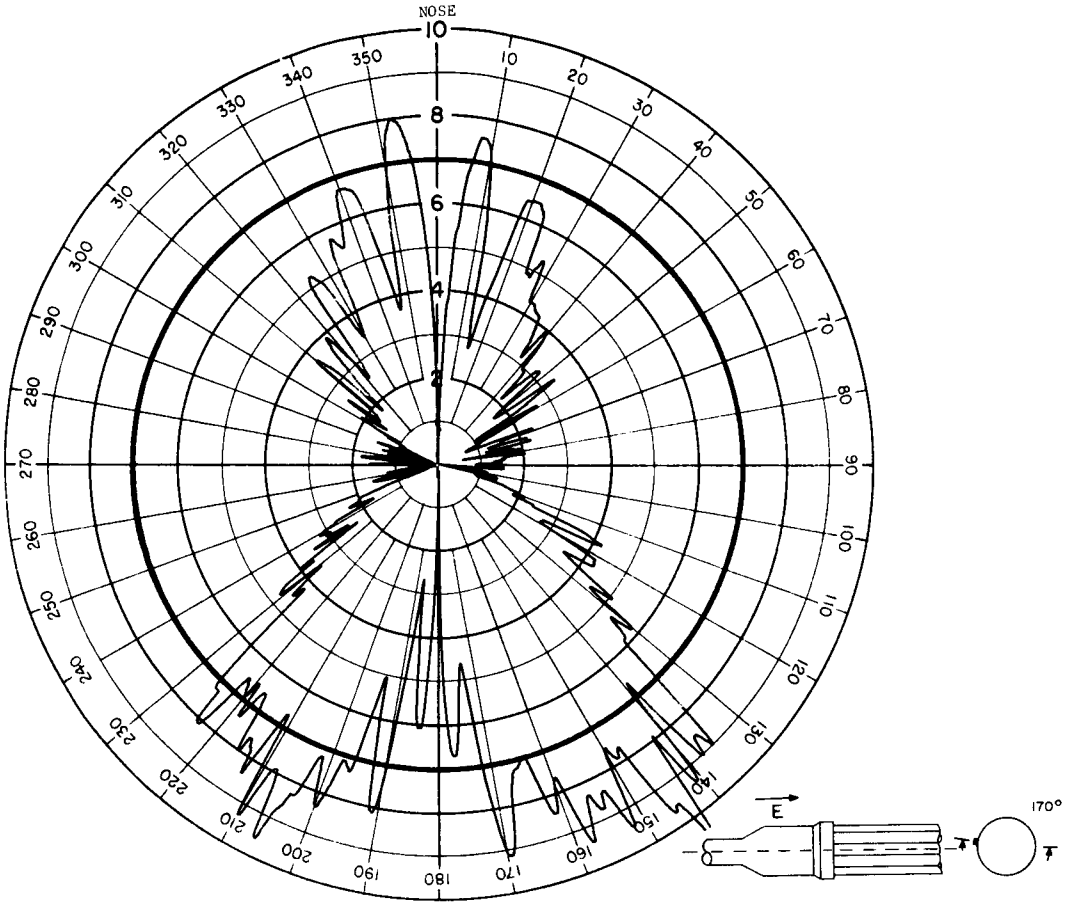


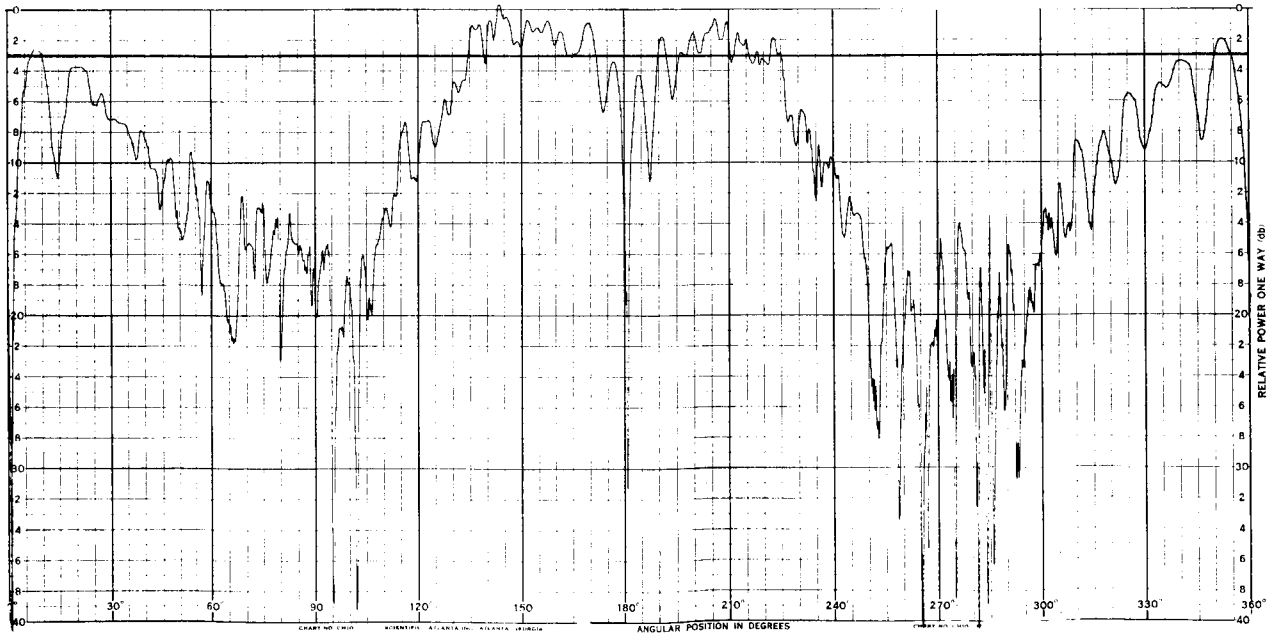
ANTENNA RADIATION PATTERN NO. 208-17

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



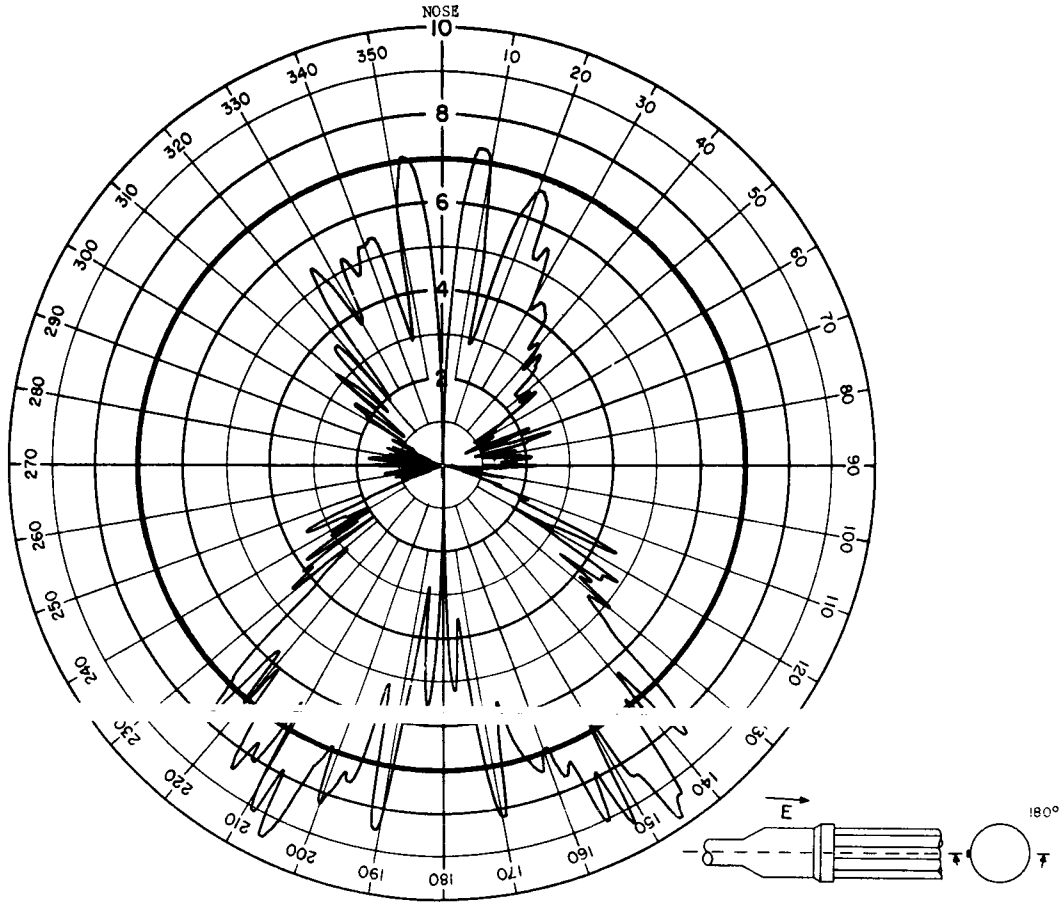


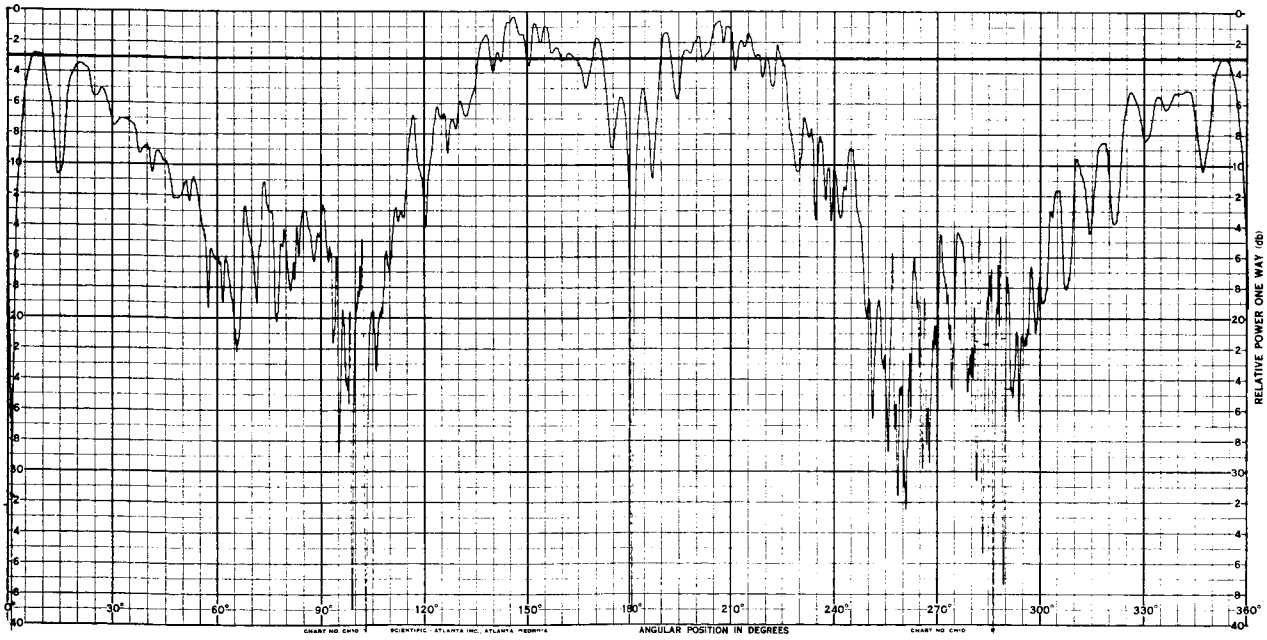
ANTENNA RADIATION PATTERN NO. 208-18

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



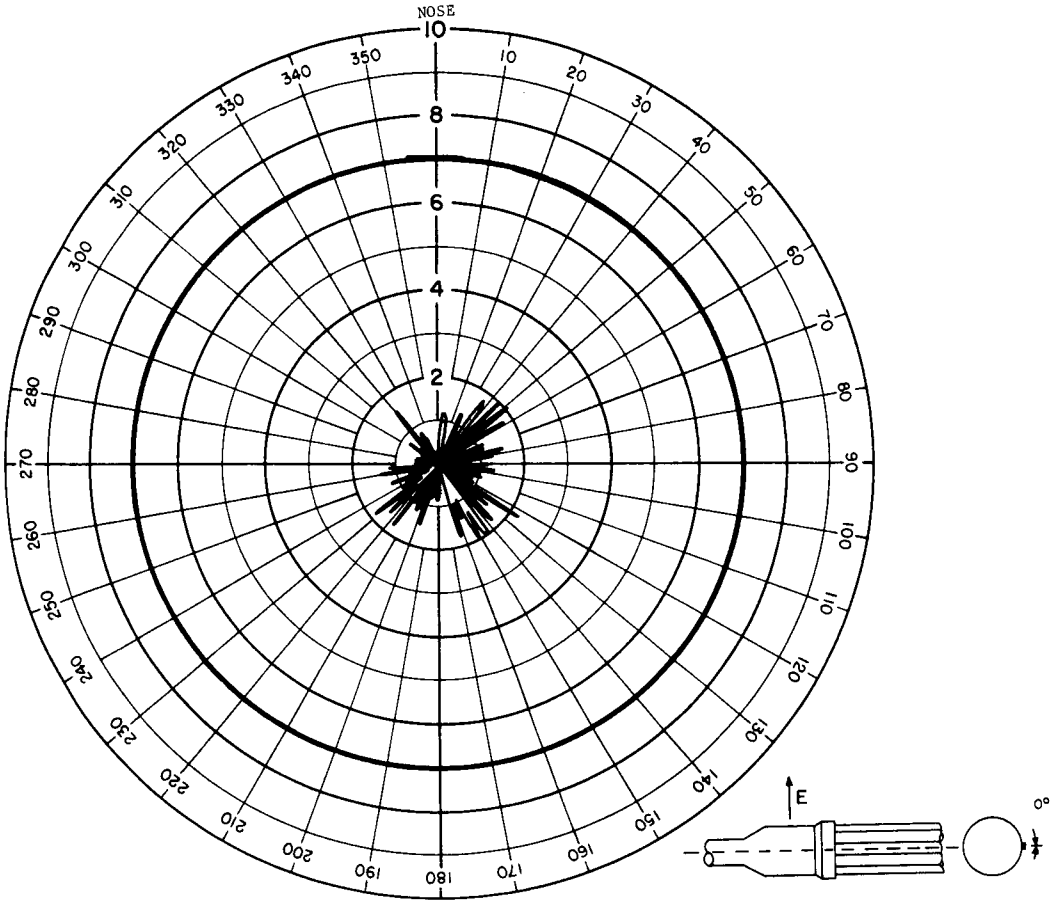


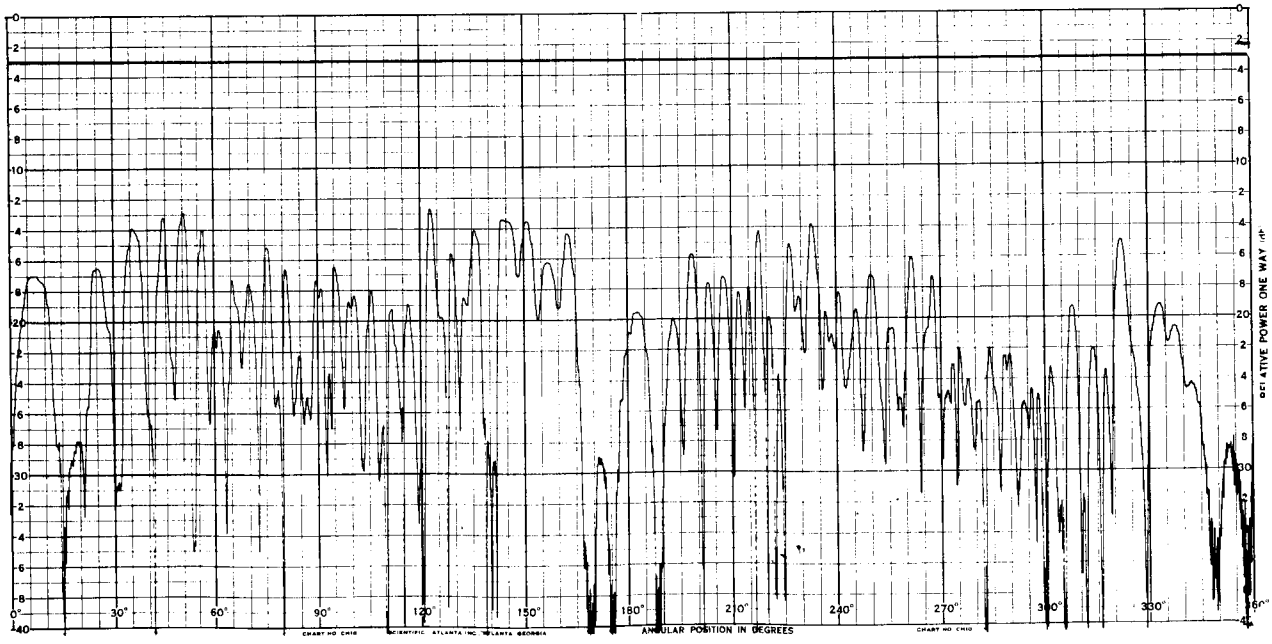
ANTENNA RADIATION PATTERN NO. 208-19

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



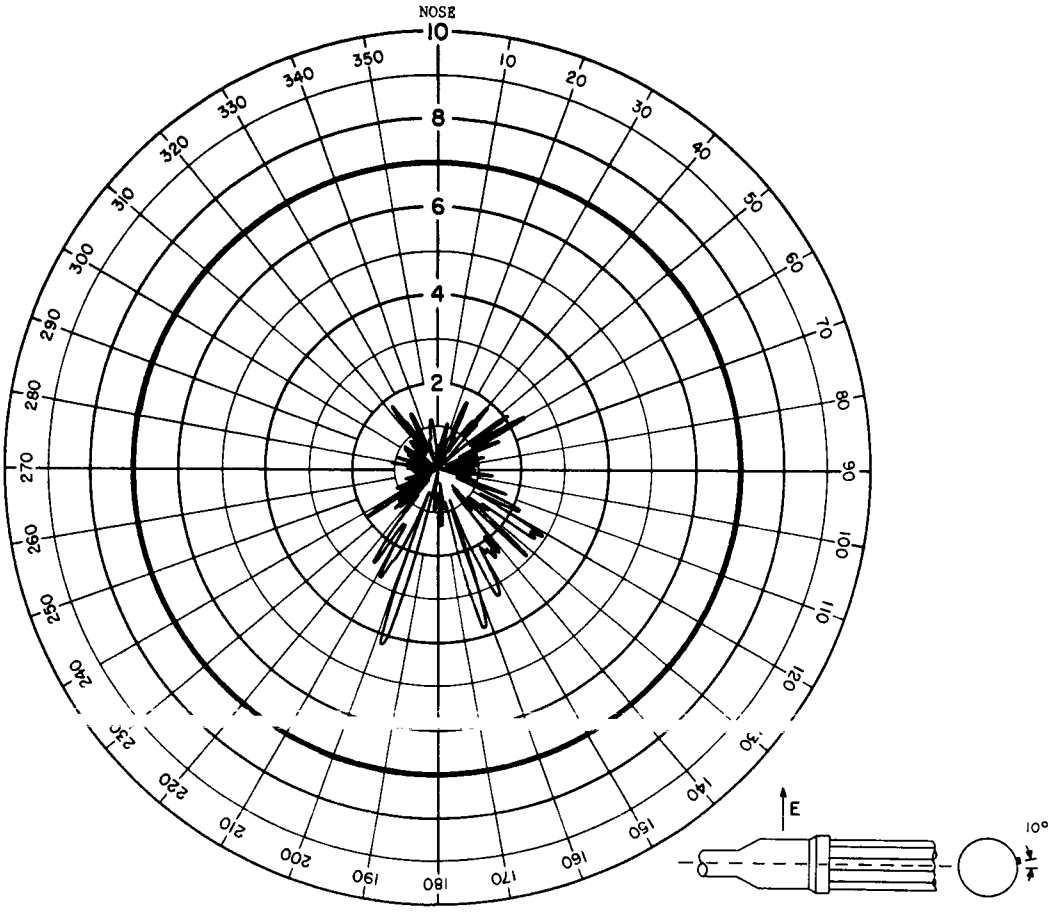


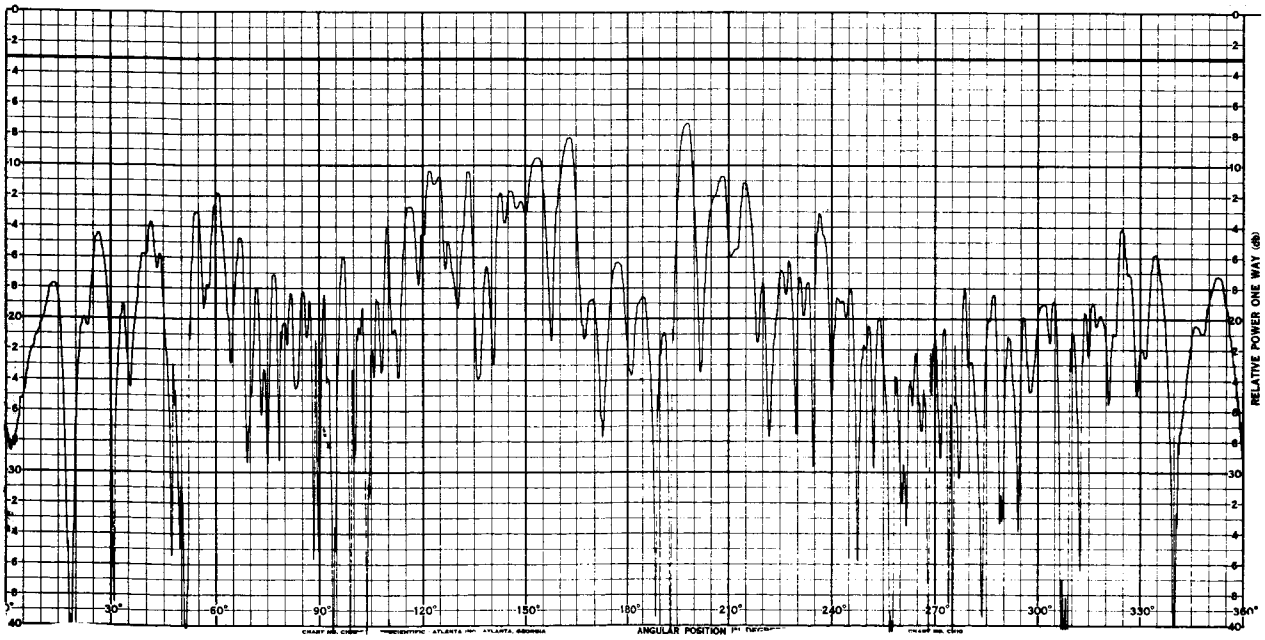
ANTENNA RADIATION PATTERN NO. 208-20

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



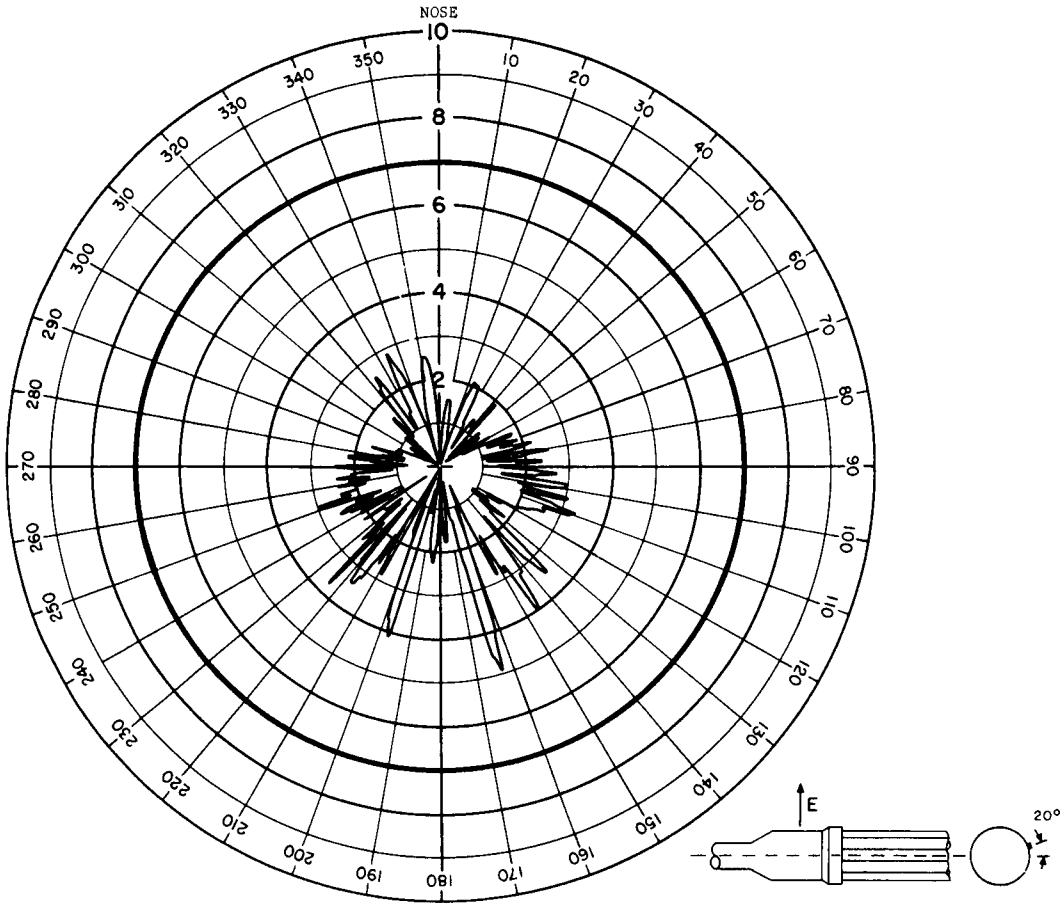


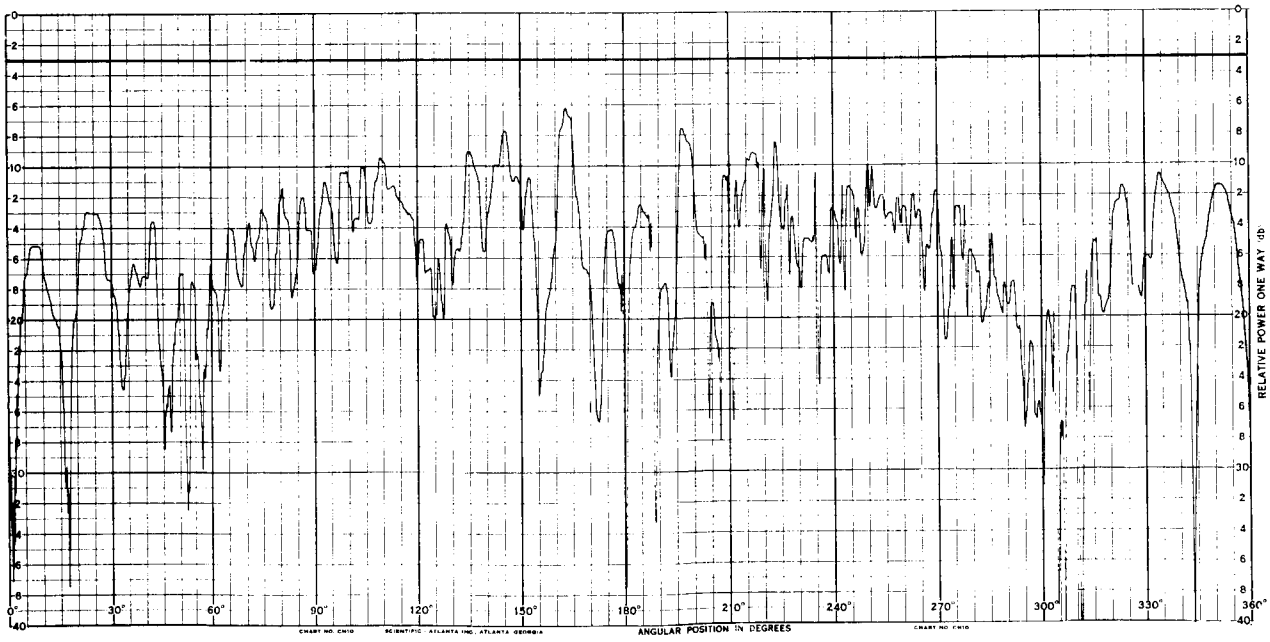
ANTENNA RADIATION PATTERN NO. 208-21

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



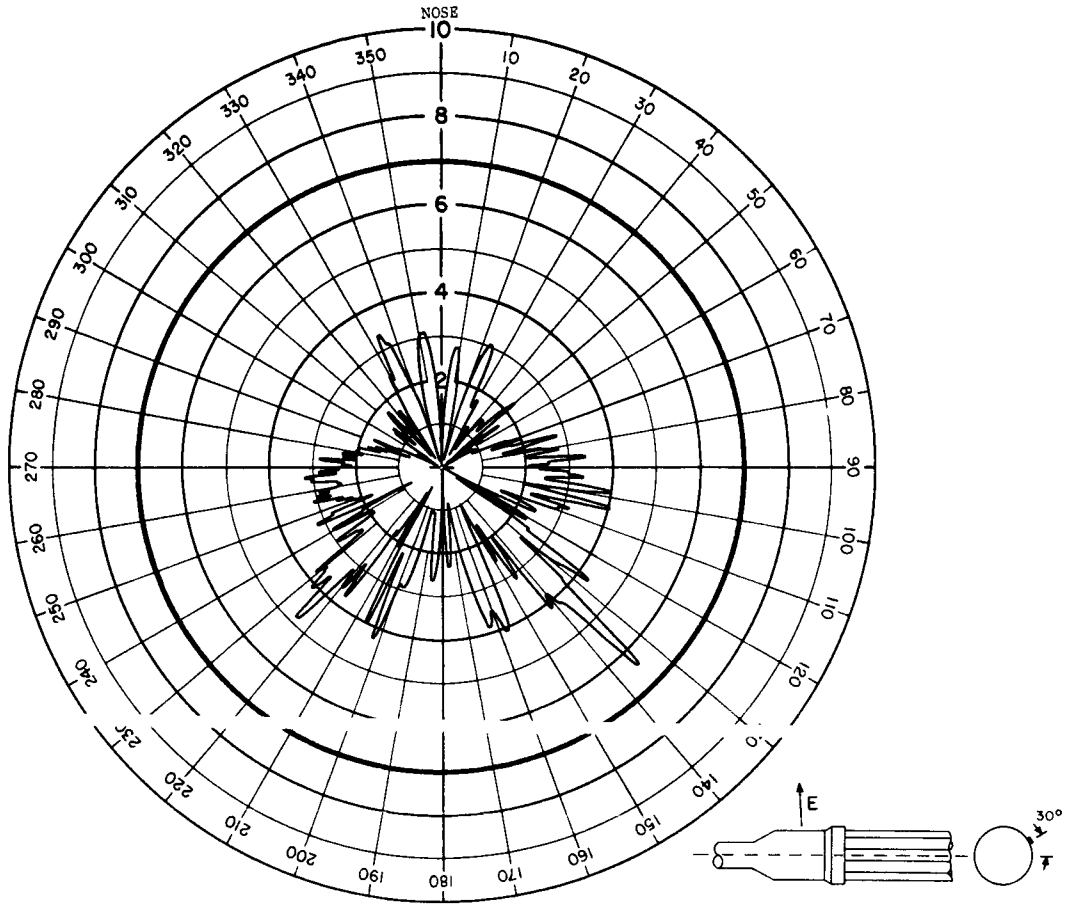


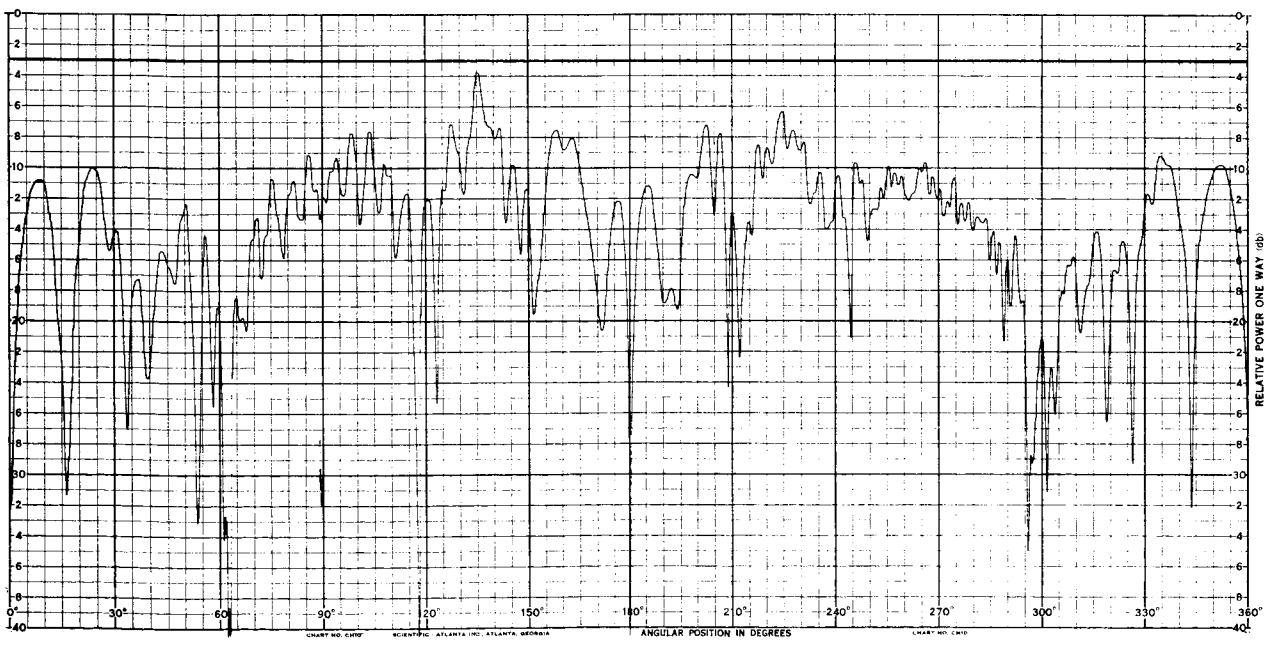
ANTENNA RADIATION PATTERN NO. 208-22

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



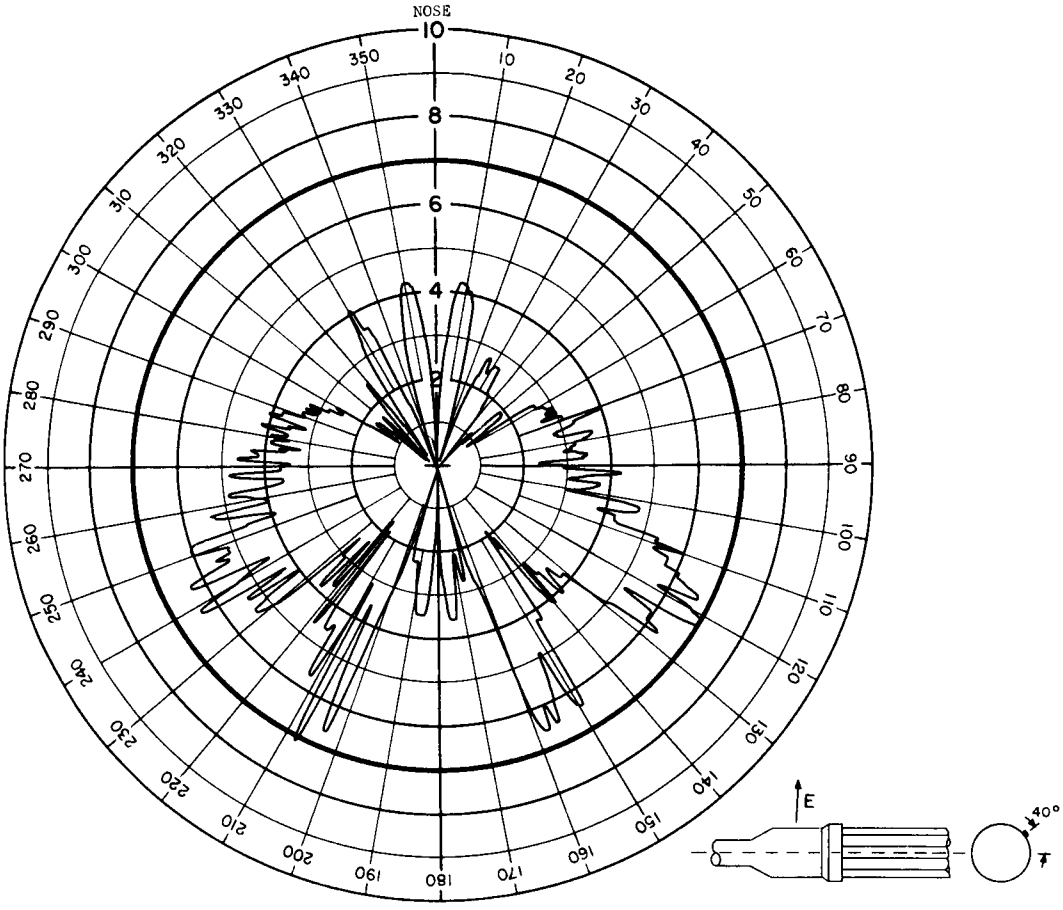


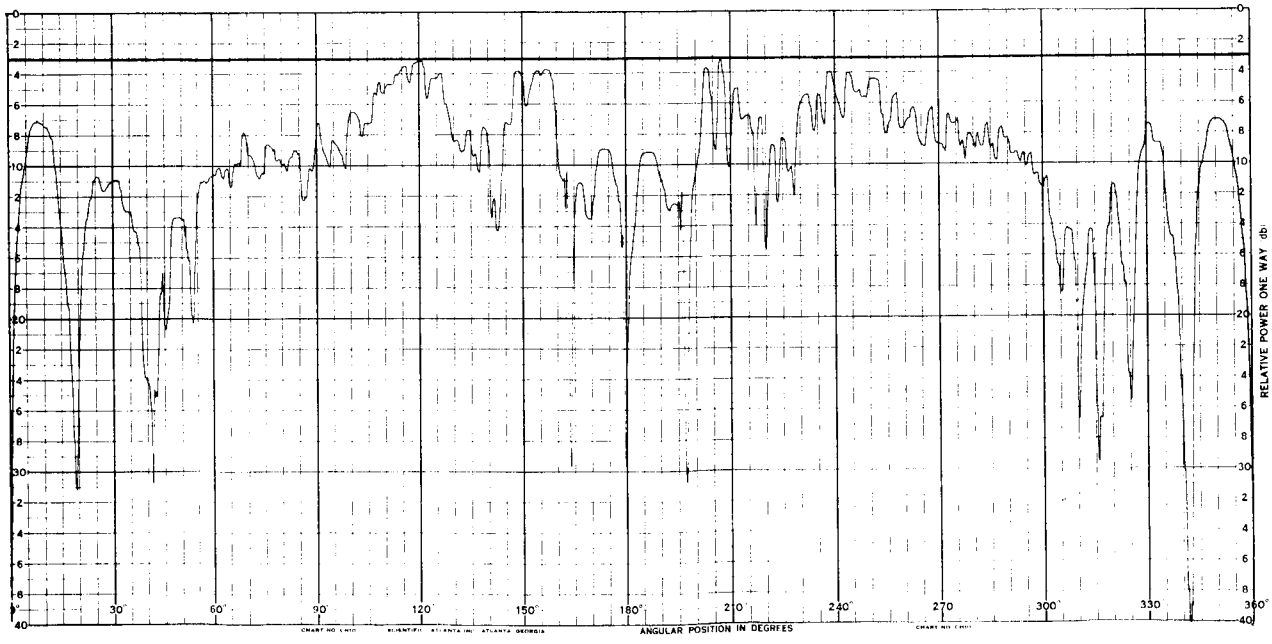
ANTENNA RADIATION PATTERN NO. 208-23

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



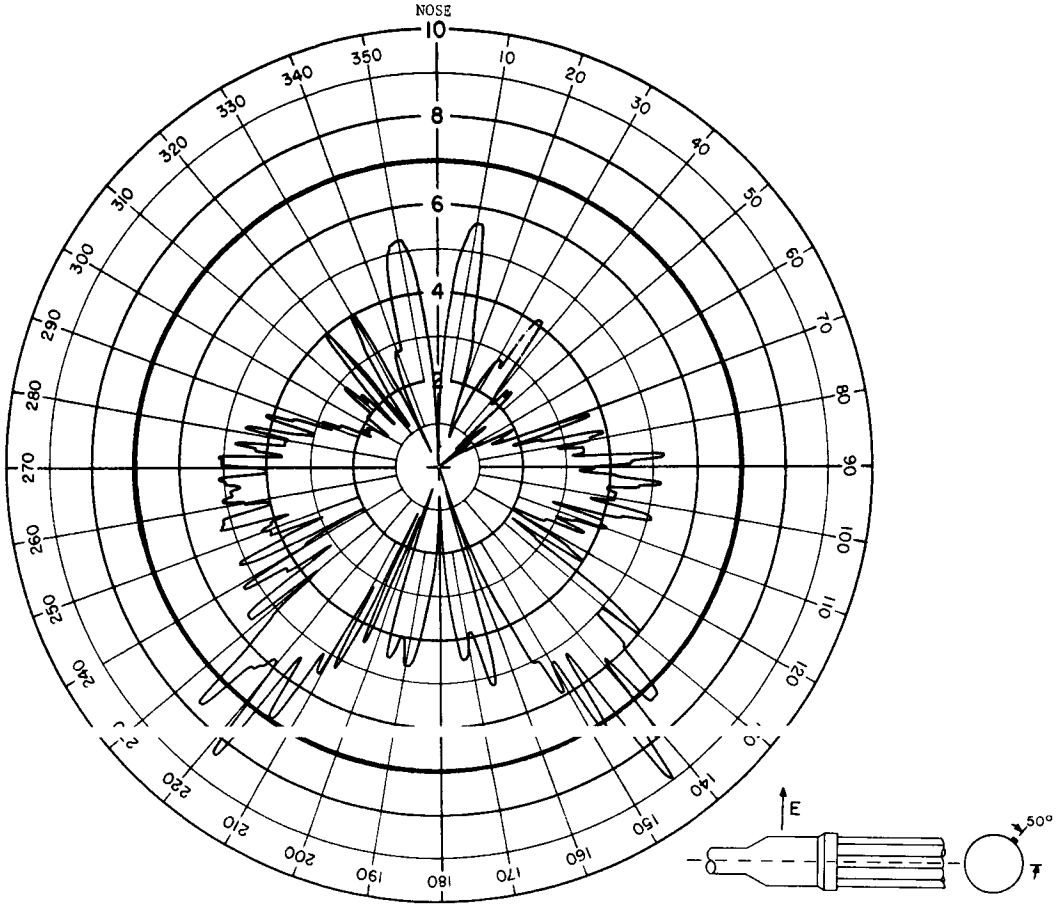


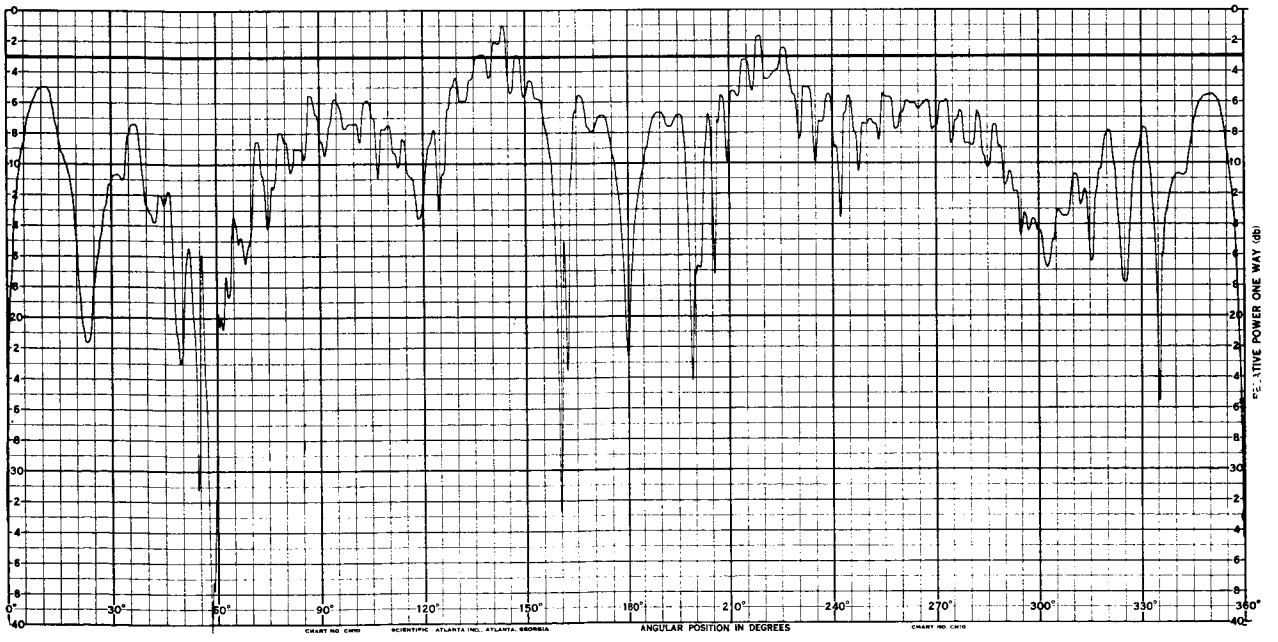
ANTENNA RADIATION PATTERN NO. 208-24

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



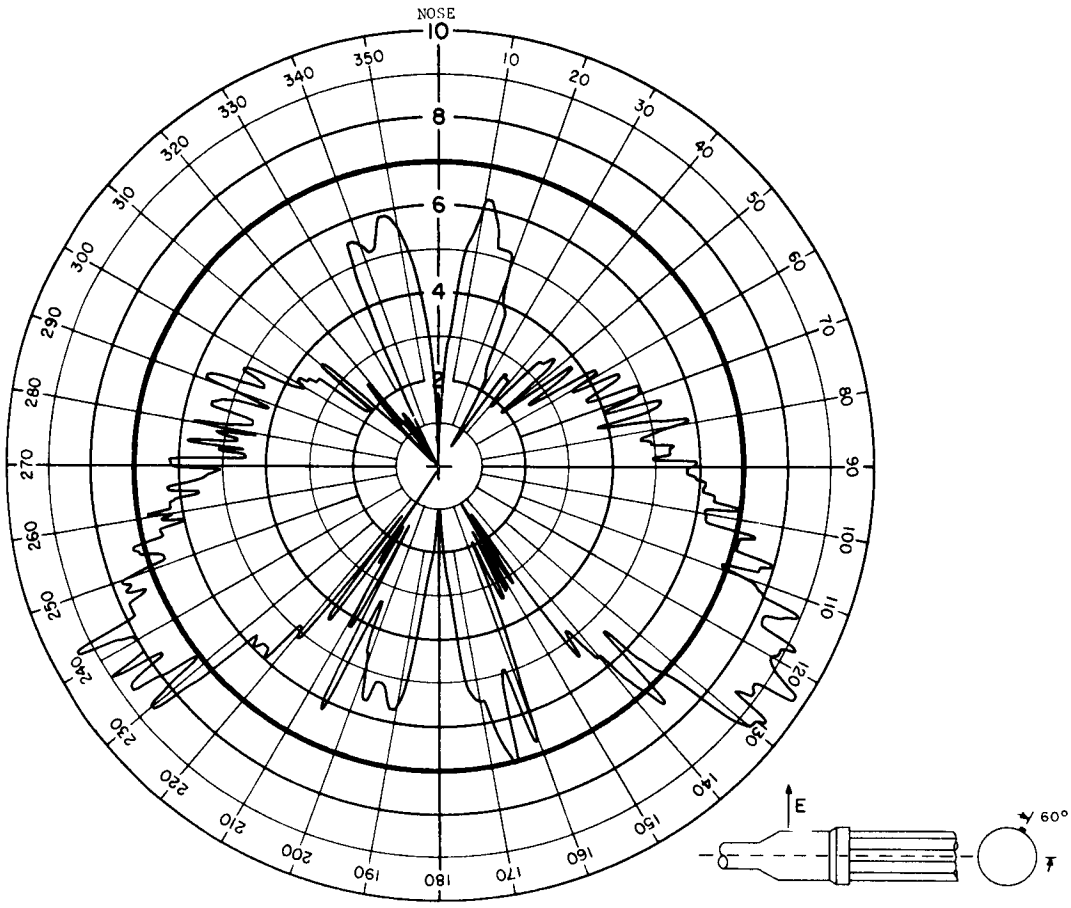


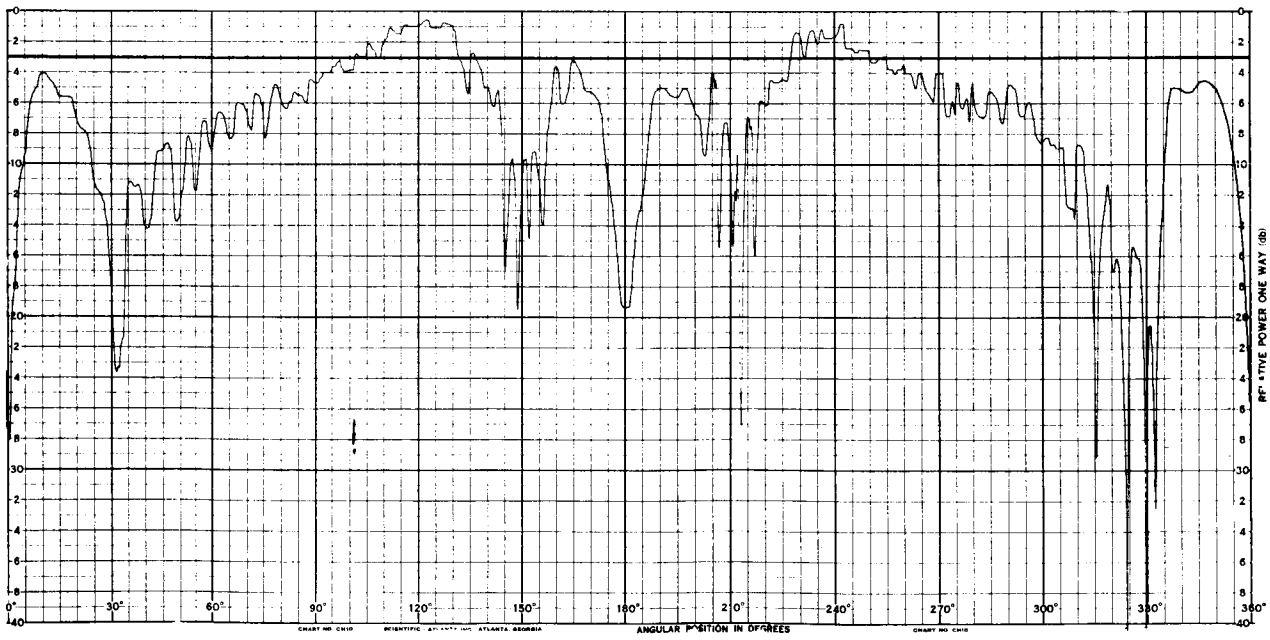
ANTENNA RADIATION PATTERN NO. 208-25

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



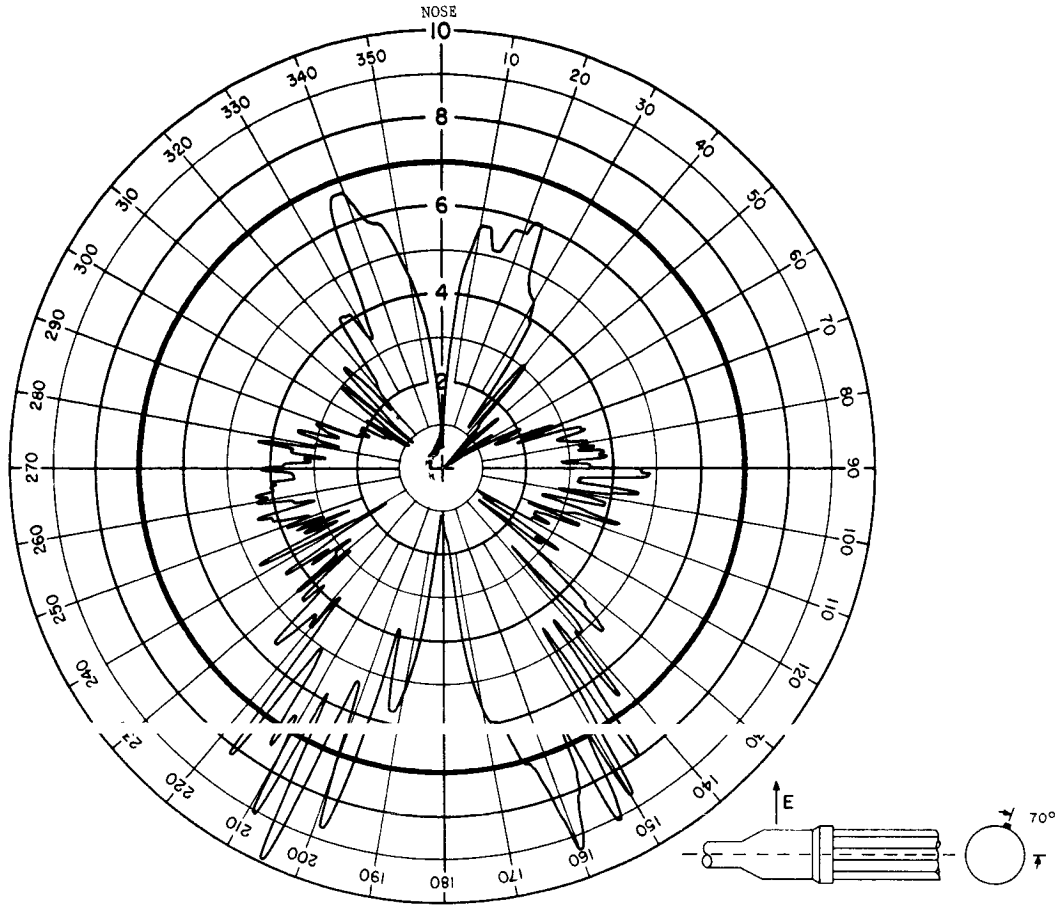


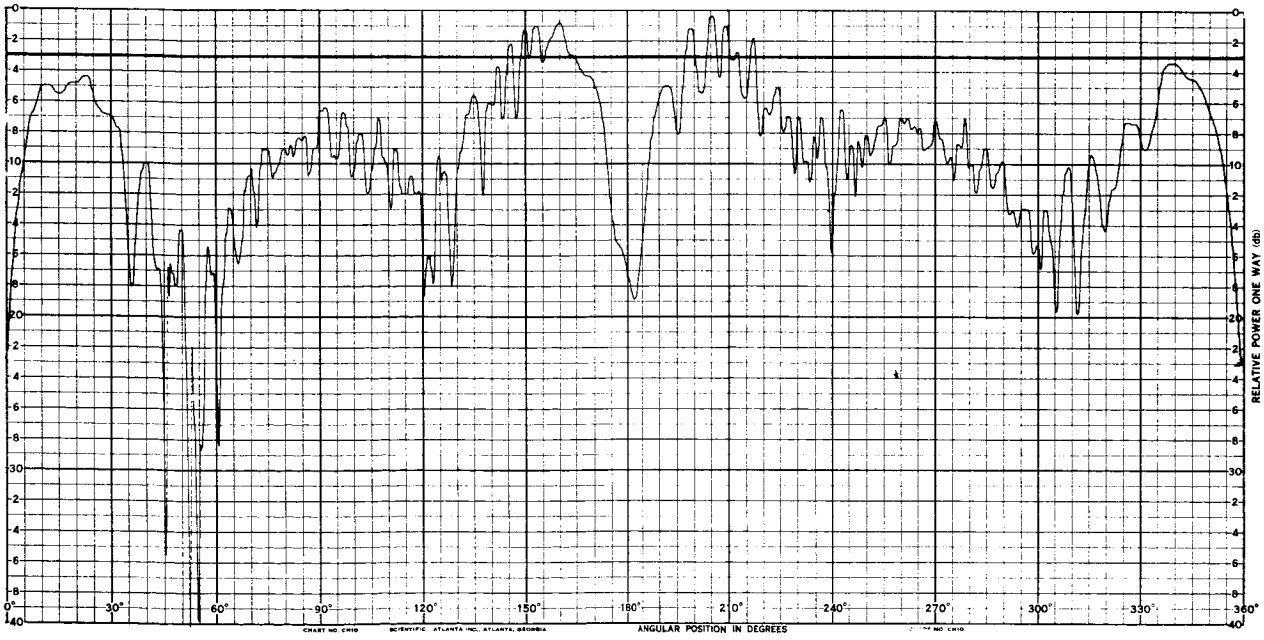
ANTENNA RADIATION PATTERN NO. 208-26

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



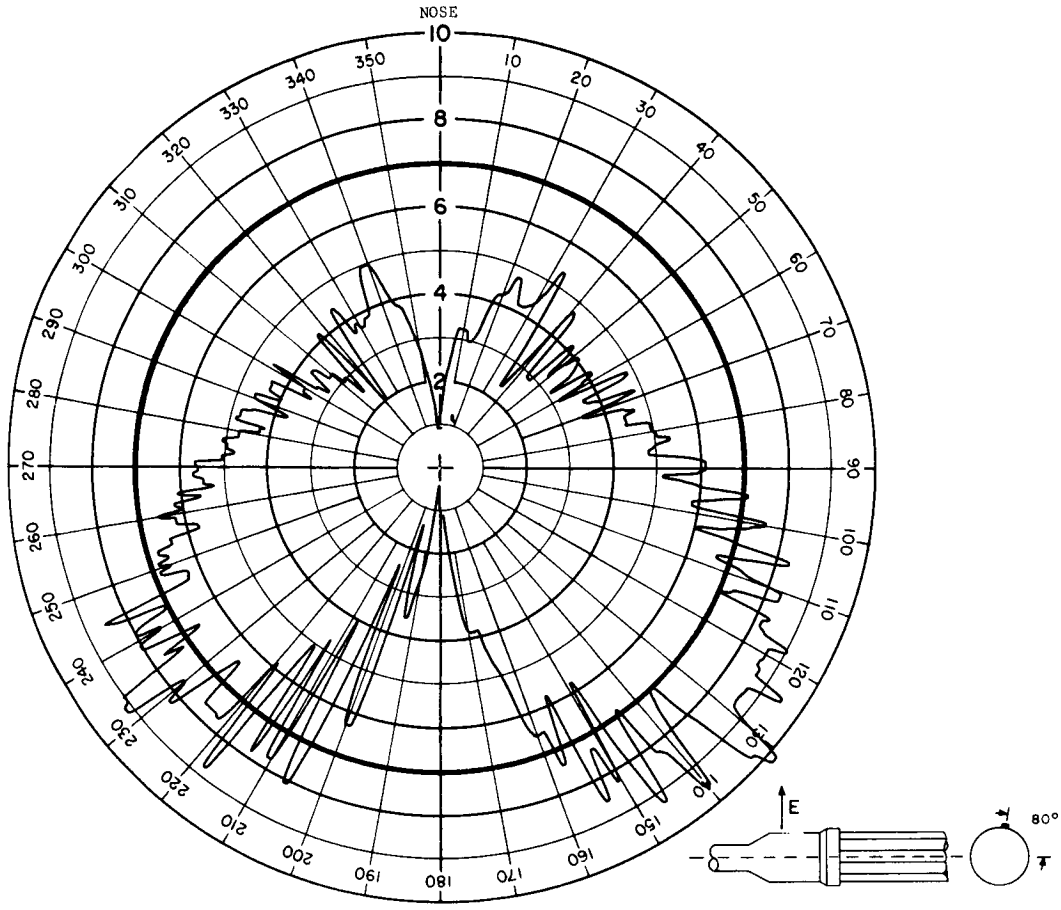


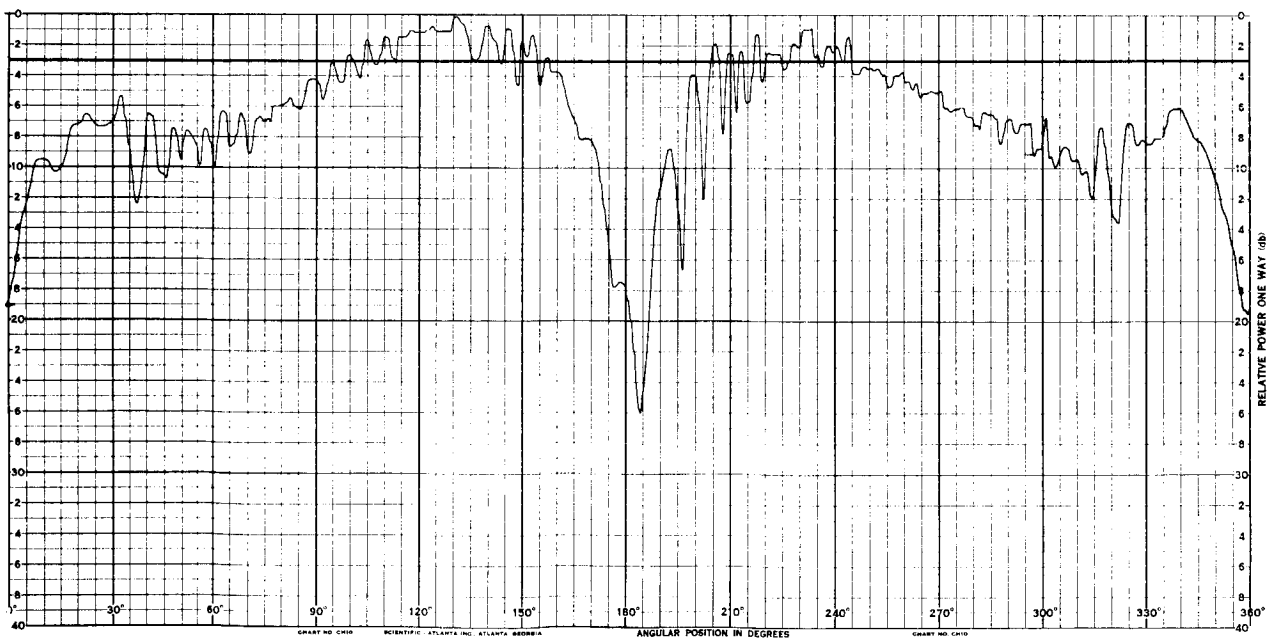
ANTENNA RADIATION PATTERN NO. 208-27

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



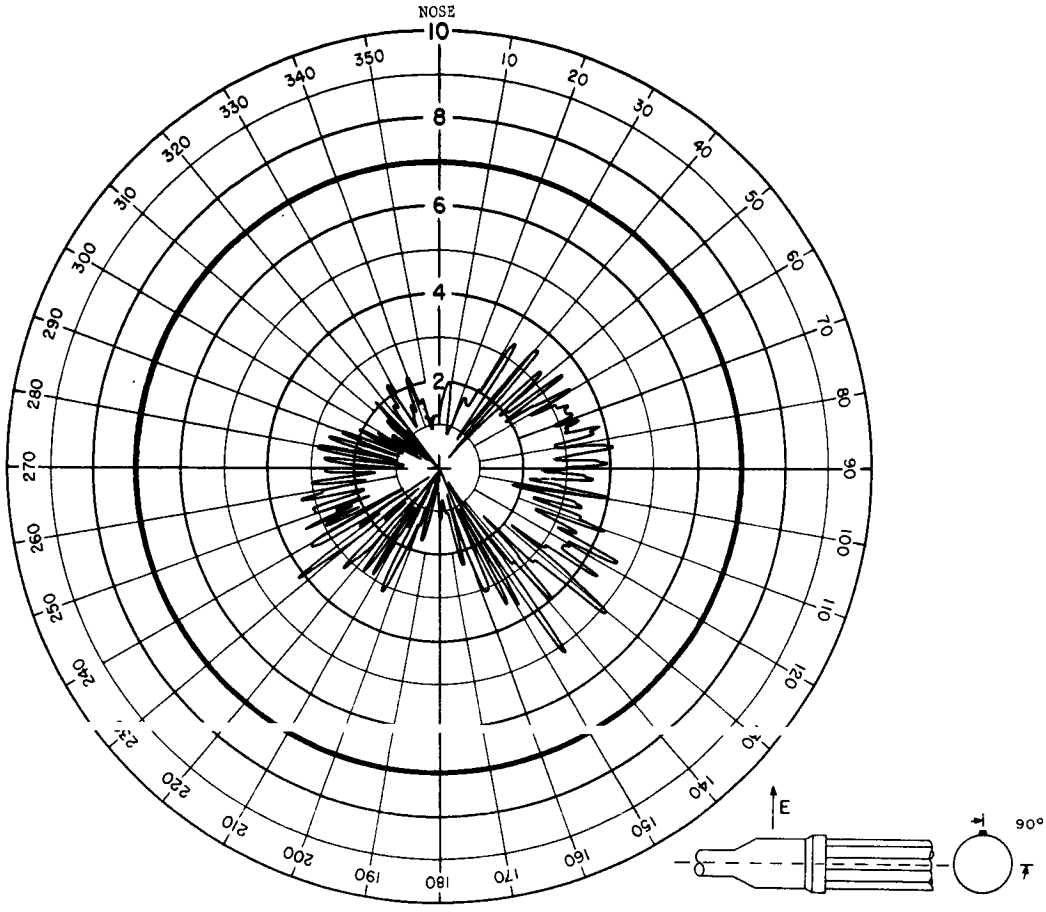


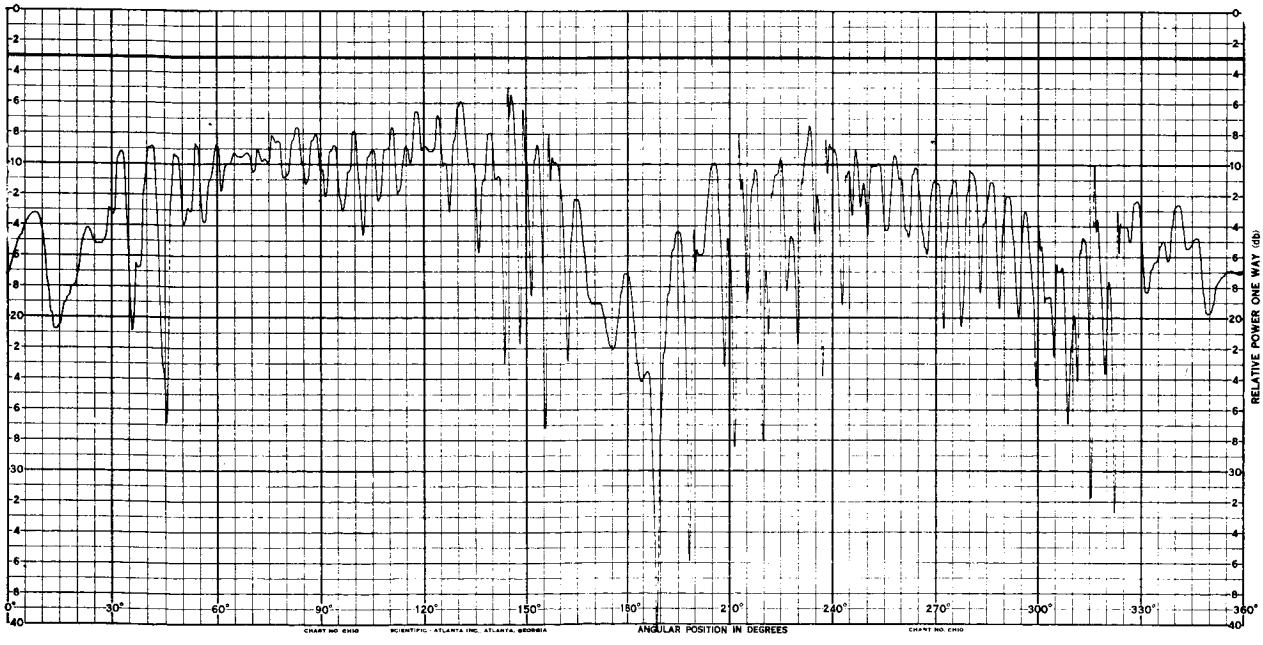
ANTENNA RADIATION PATTERN NO. 208-28

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



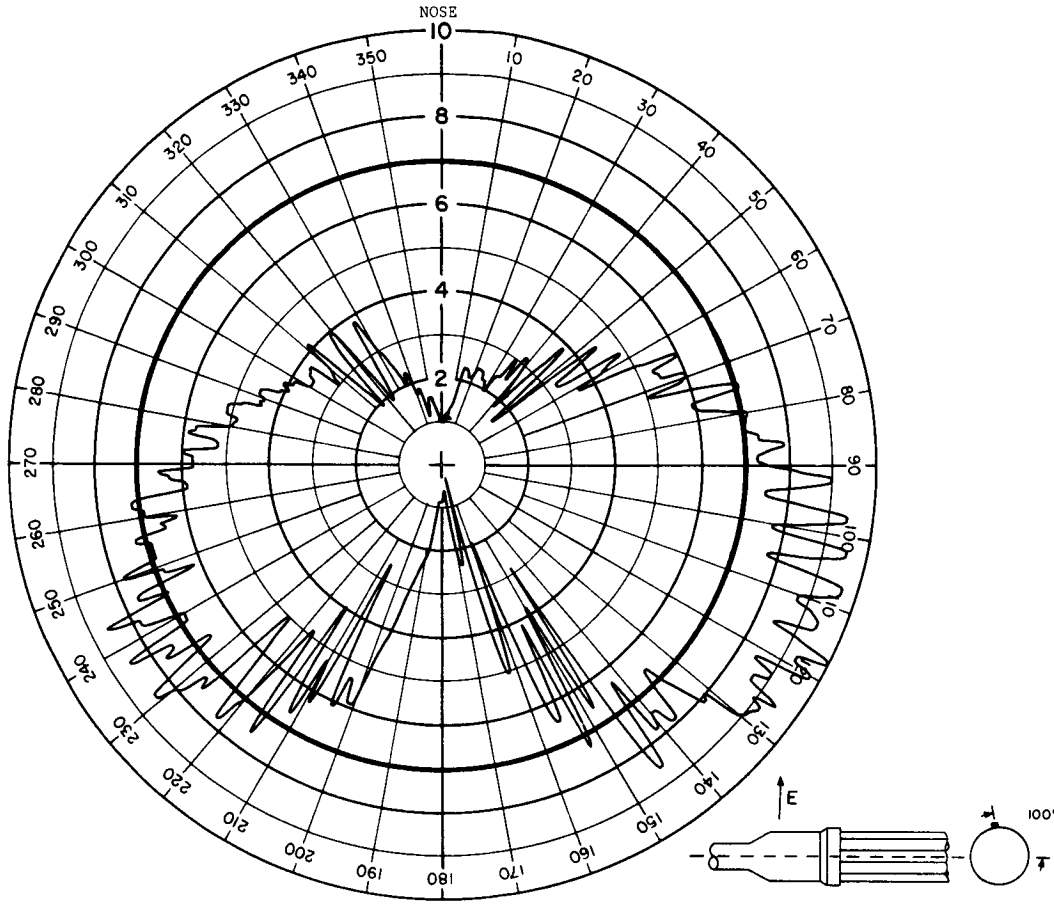


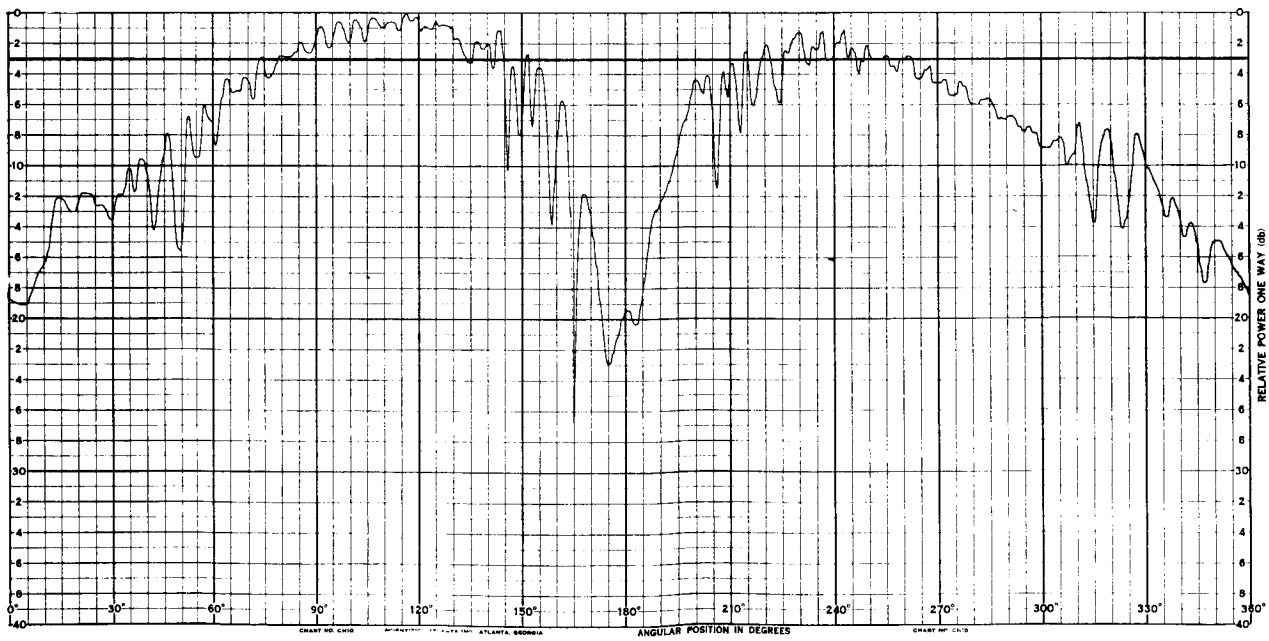
ANTENNA RADIATION PATTERN NO. 208-29

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



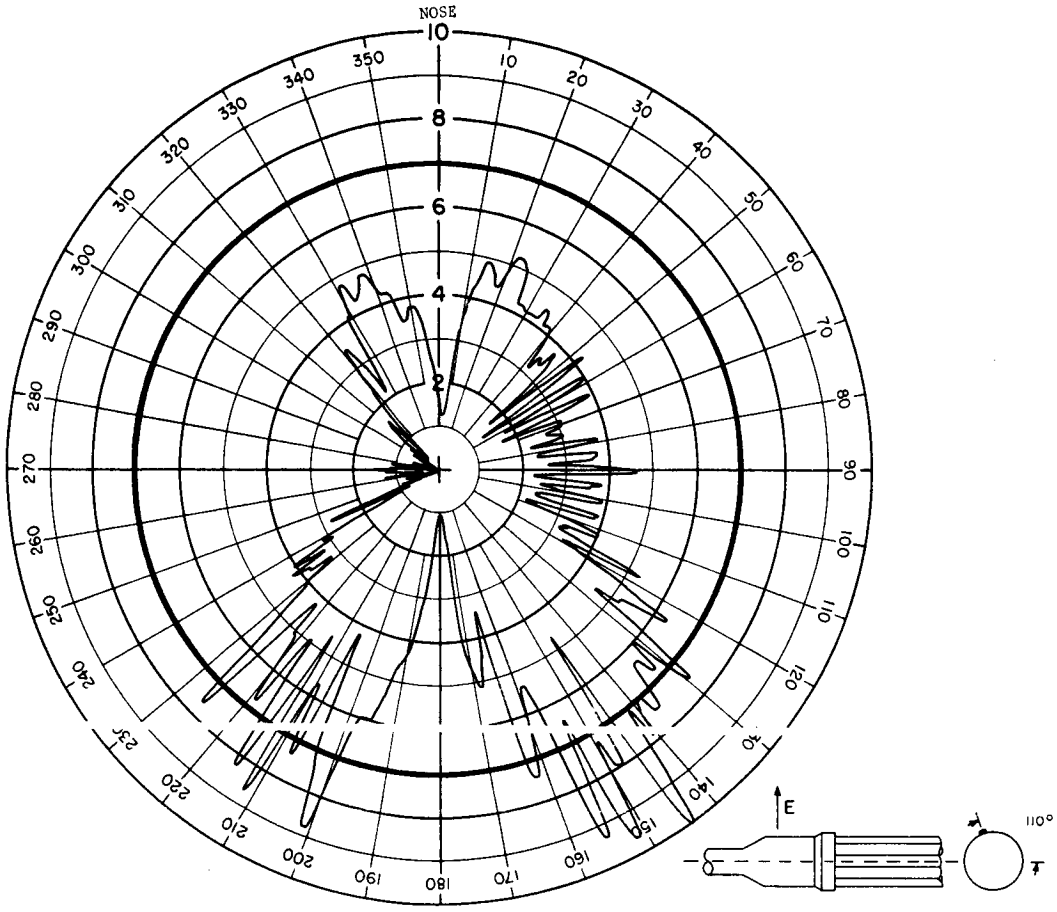


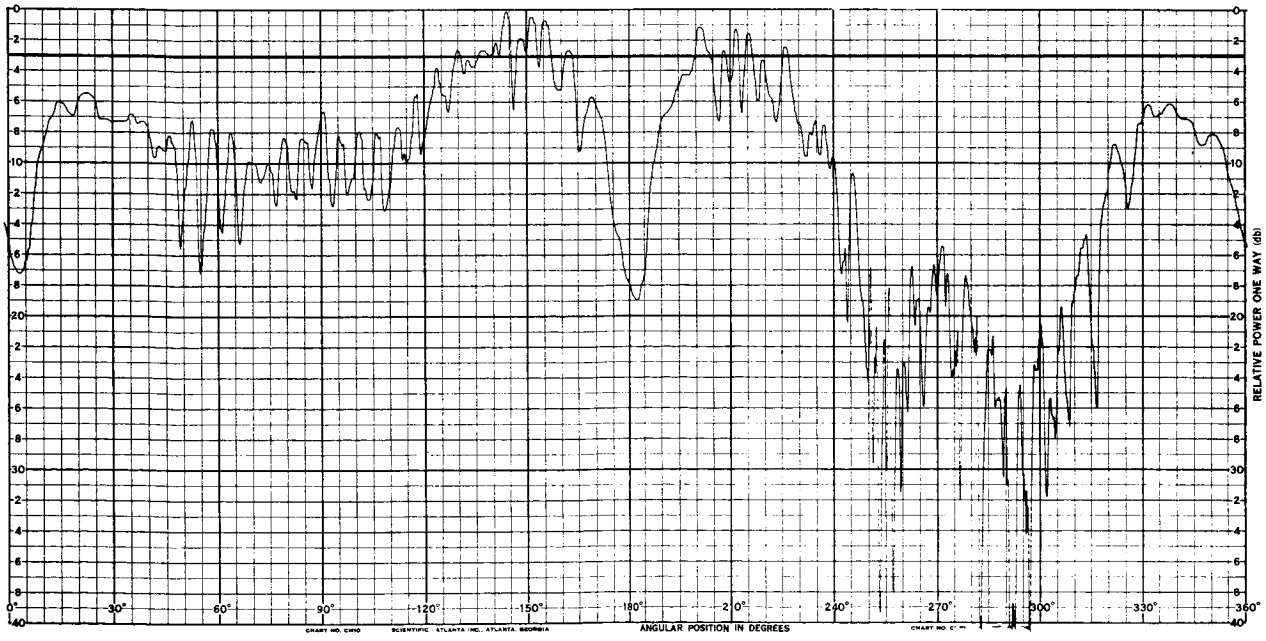
ANTENNA RADIATION PATTERN NO. 208-30

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



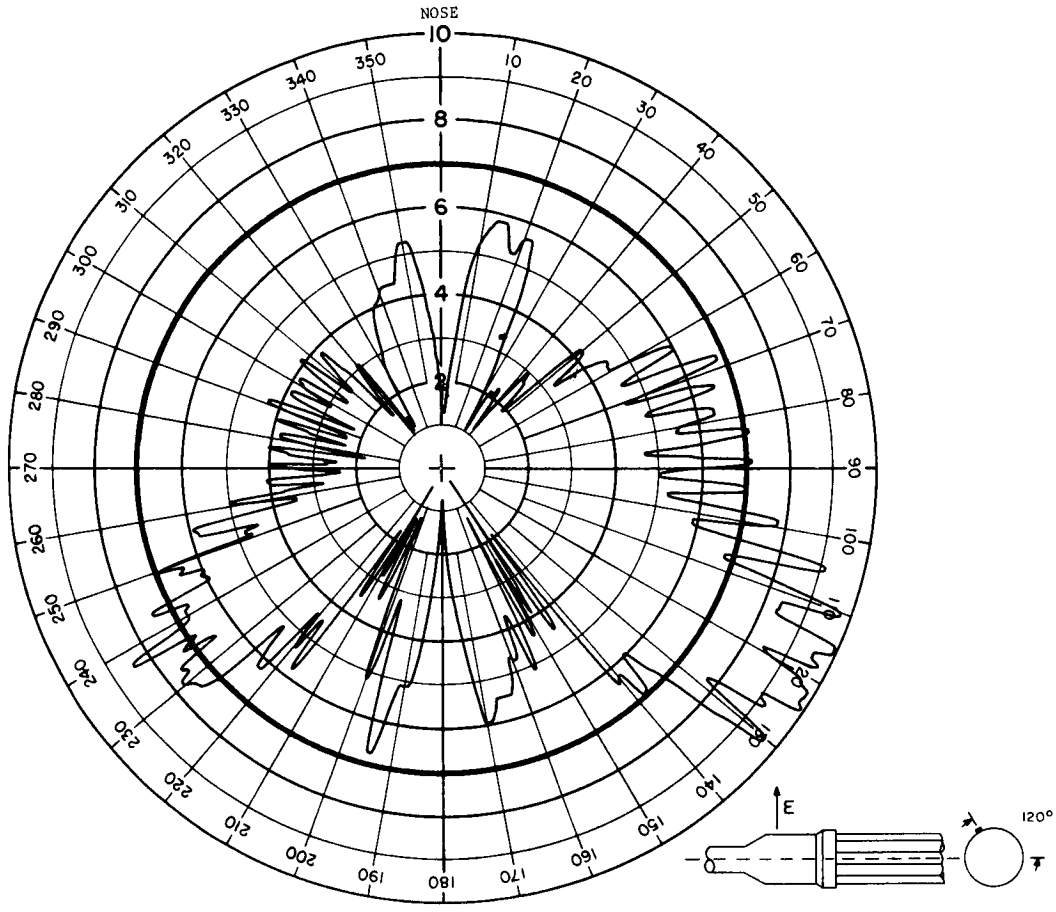


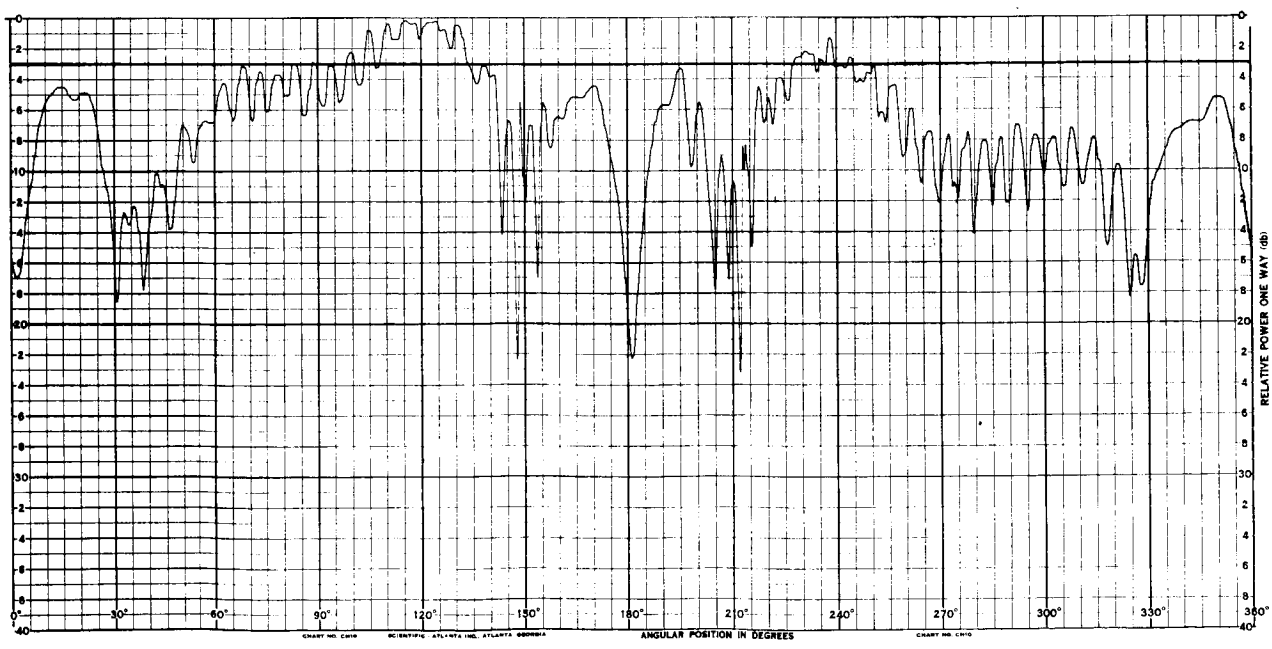
ANTENNA RADIATION PATTERN NO. 208-31

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



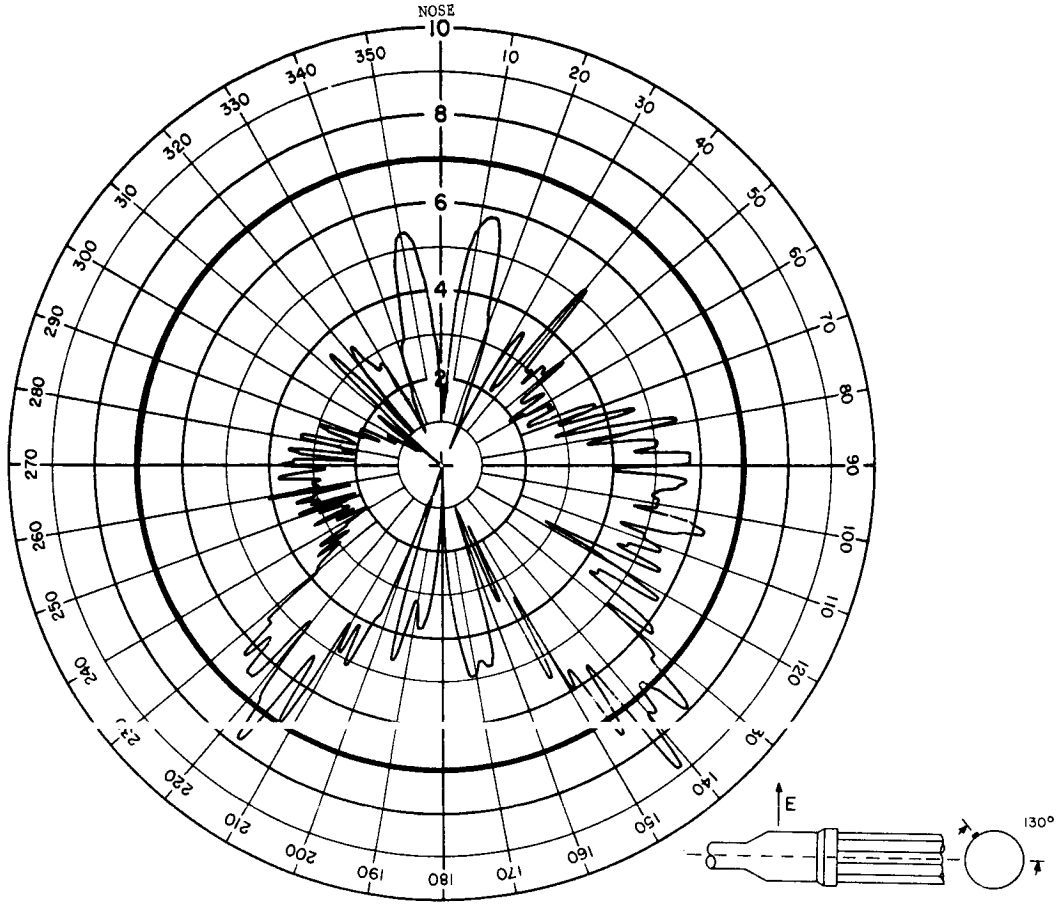


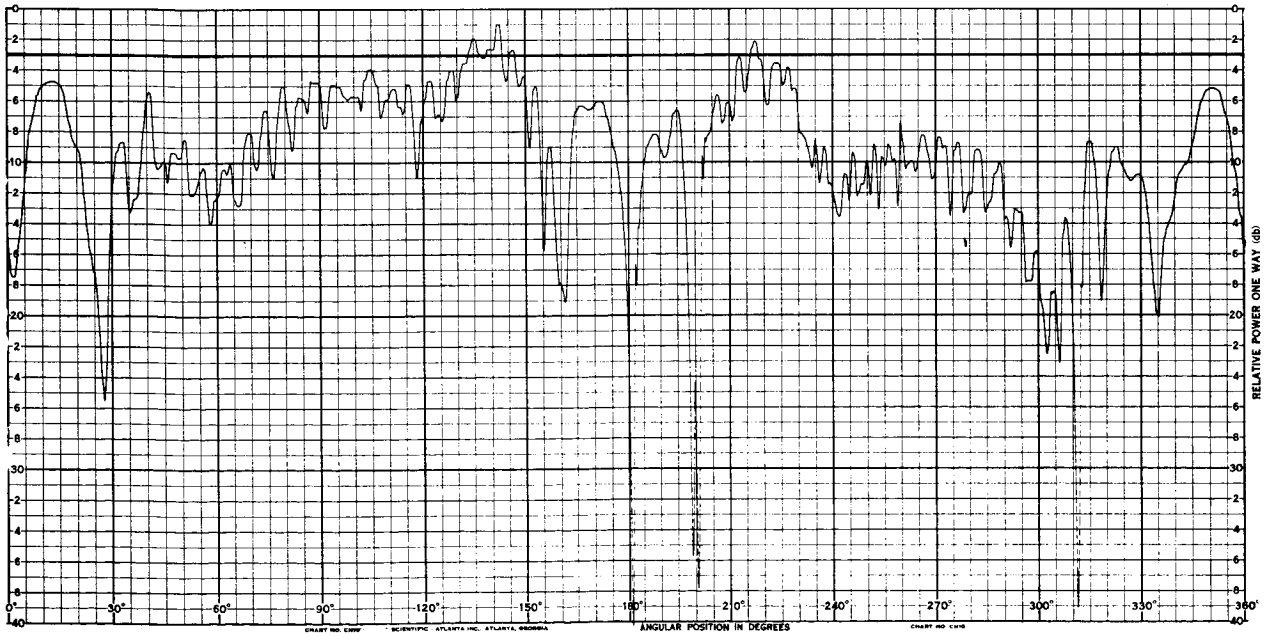
ANTENNA RADIATION PATTERN NO. 208-32

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



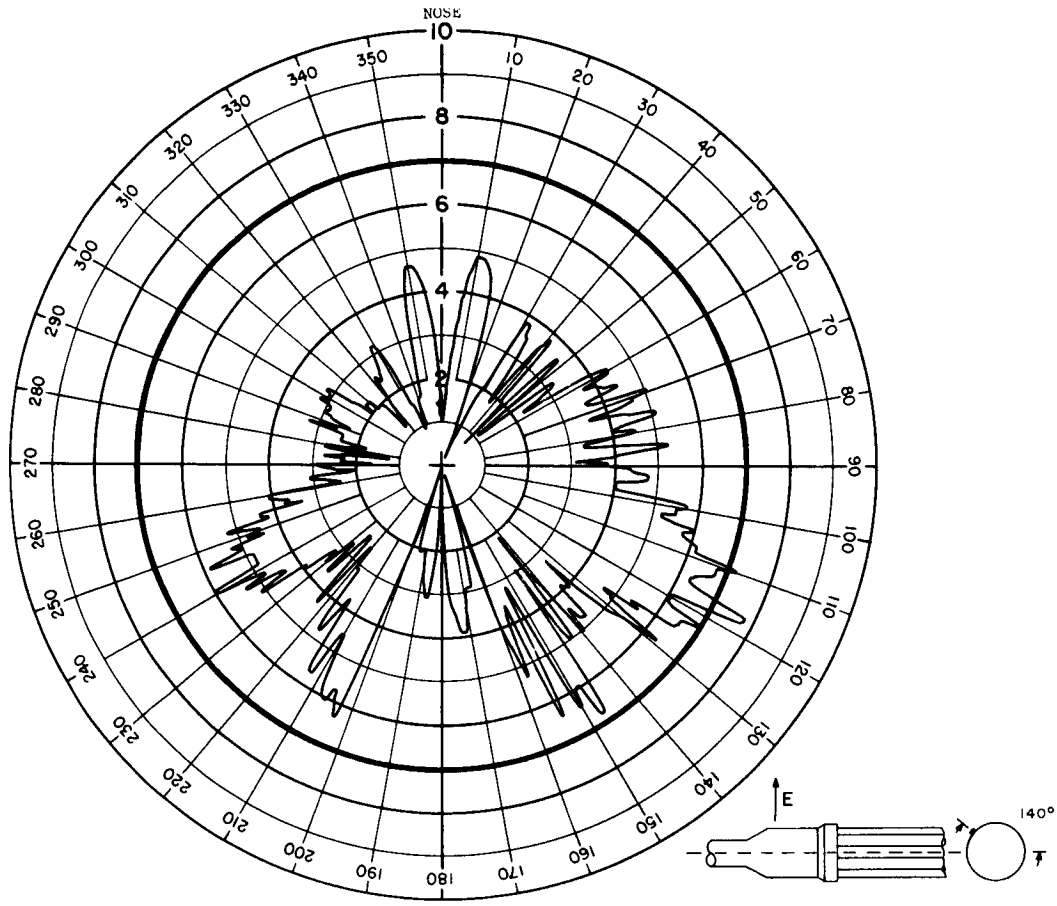


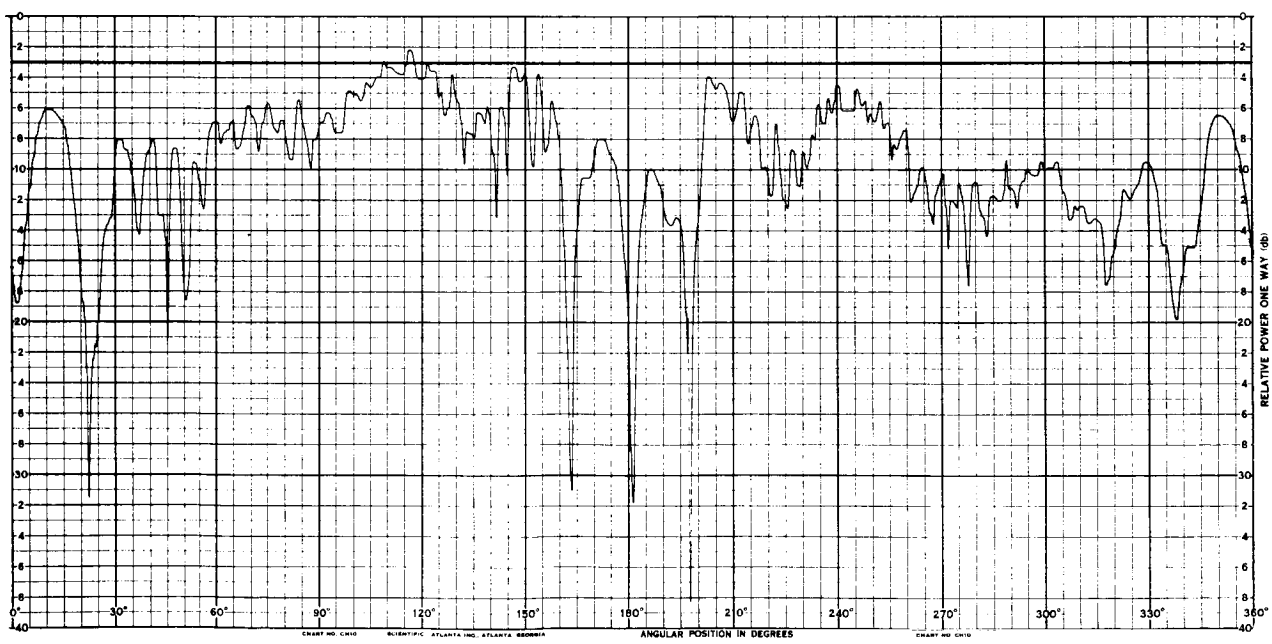
ANTENNA RADIATION PATTERN NO. 208-33

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



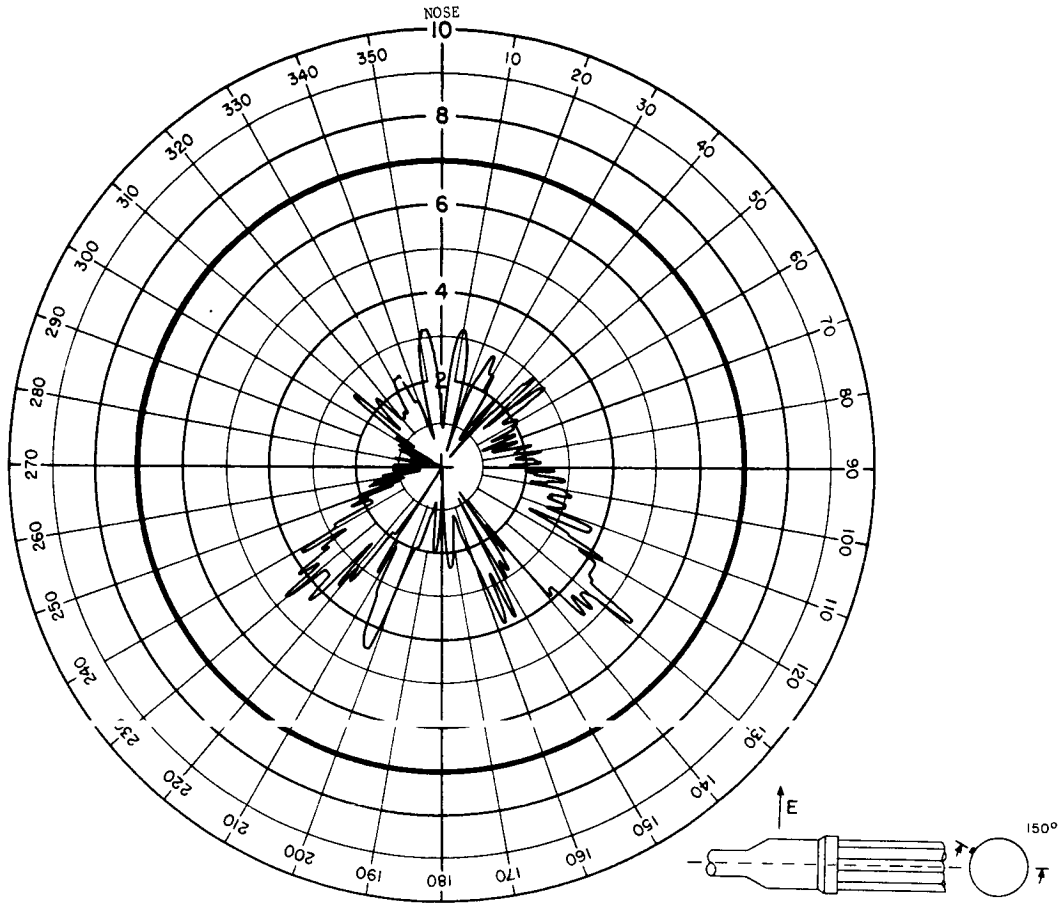


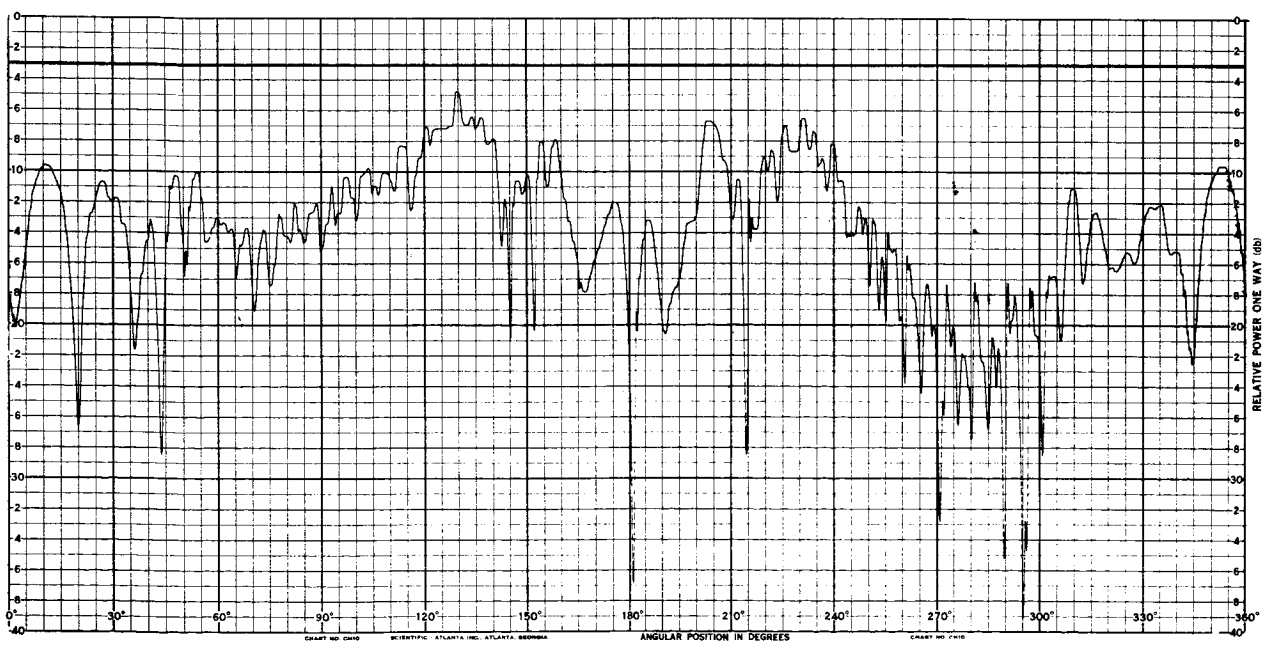
ANTENNA RADIATION PATTERN NO. 208-34

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



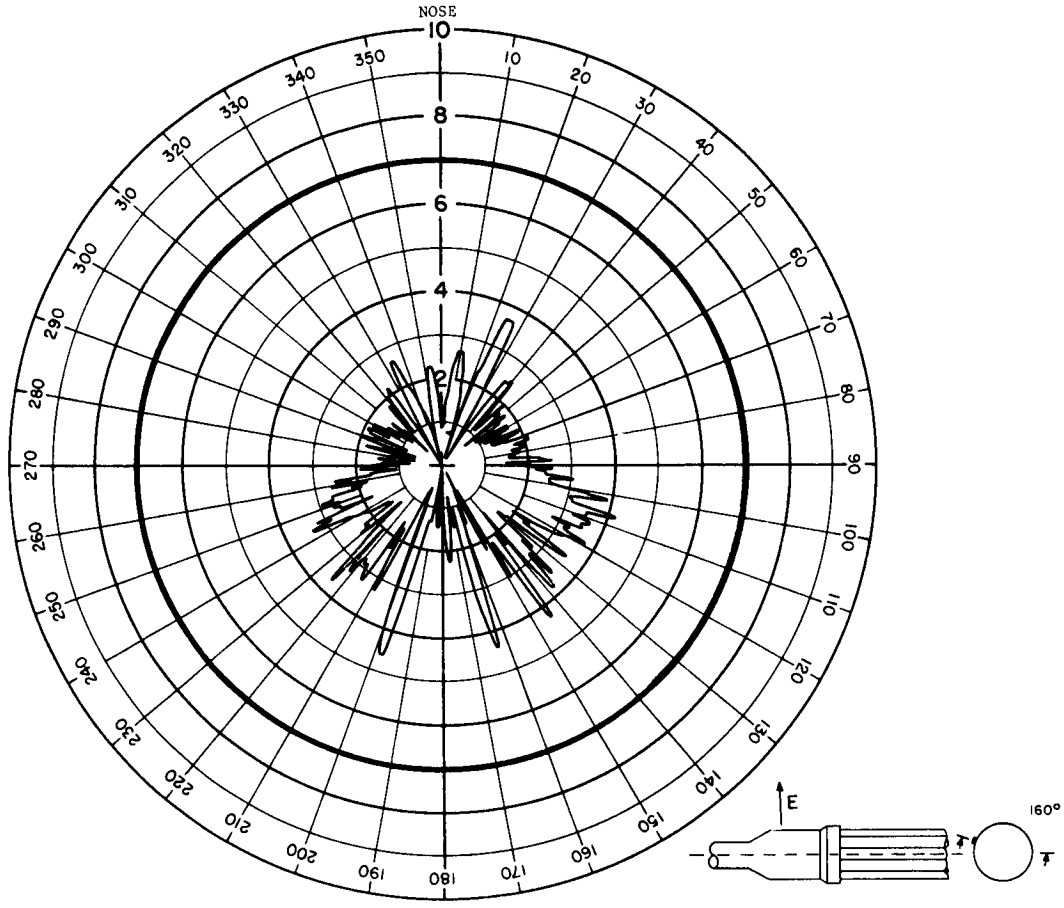


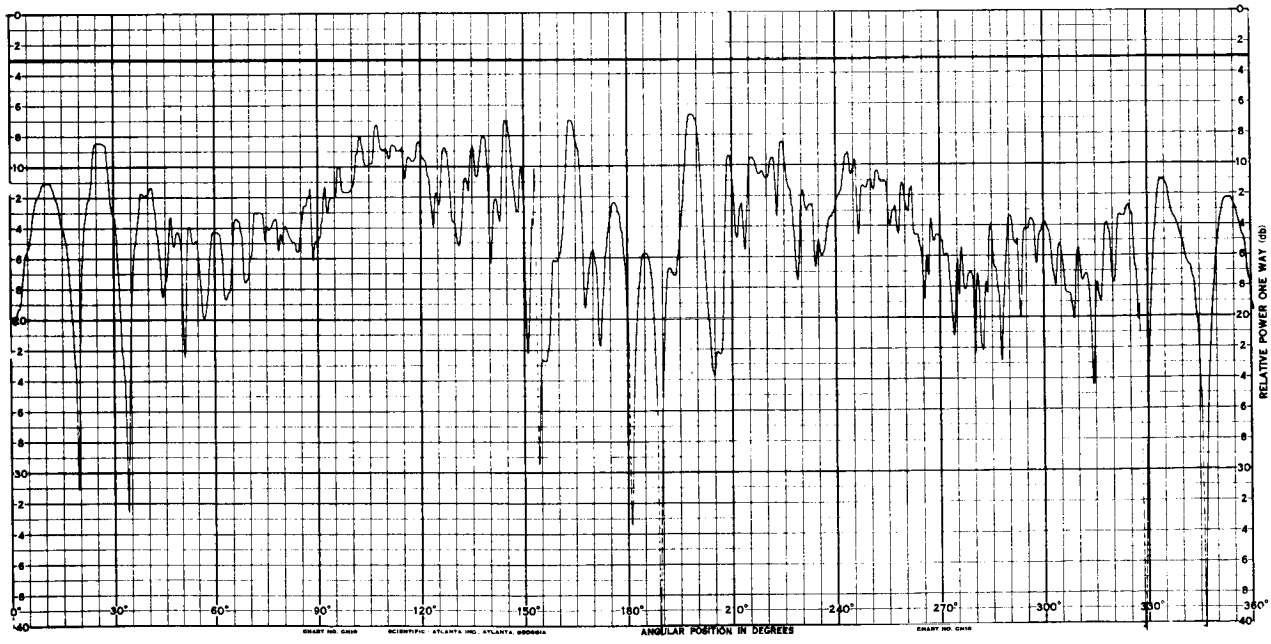
ANTENNA RADIATION PATTERN NO. 208-35

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



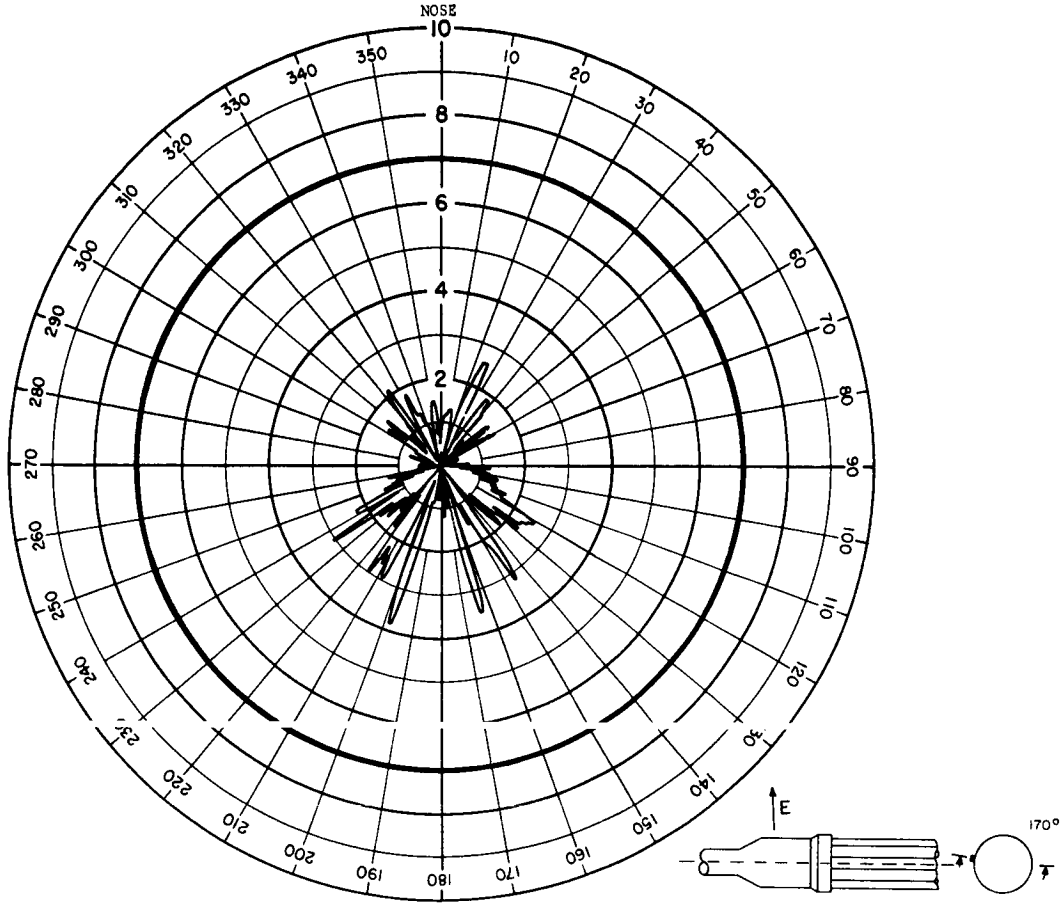


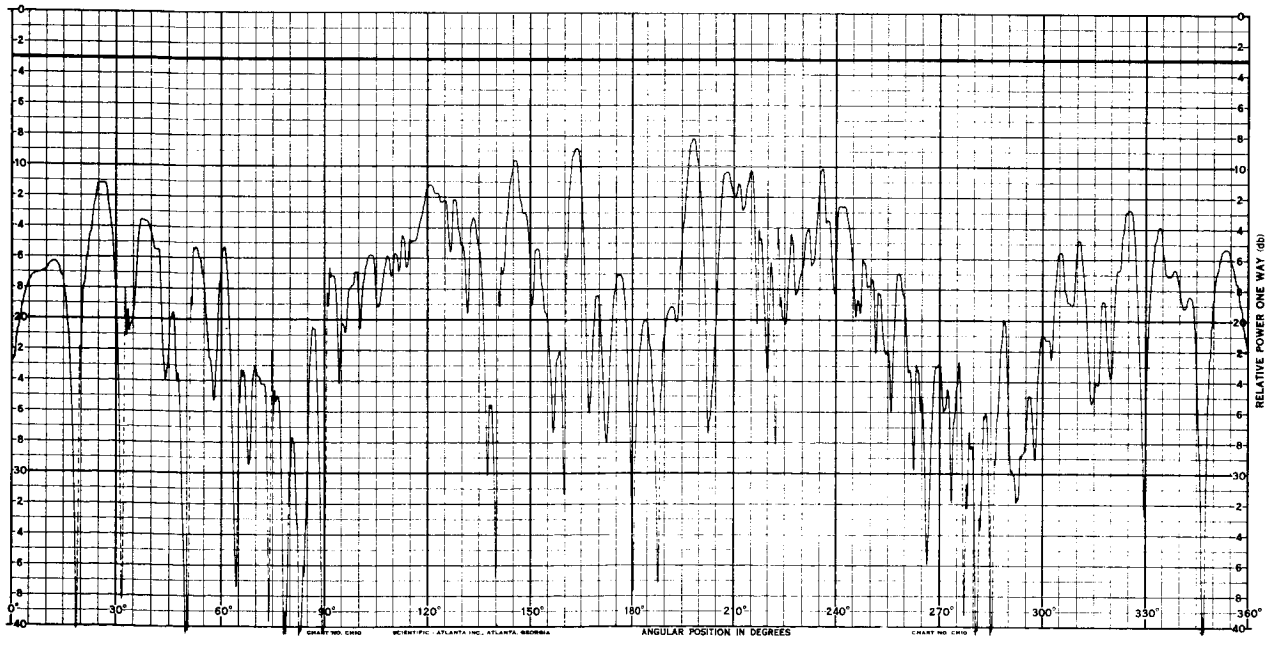
ANTENNA RADIATION PATTERN NO. 208-36

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



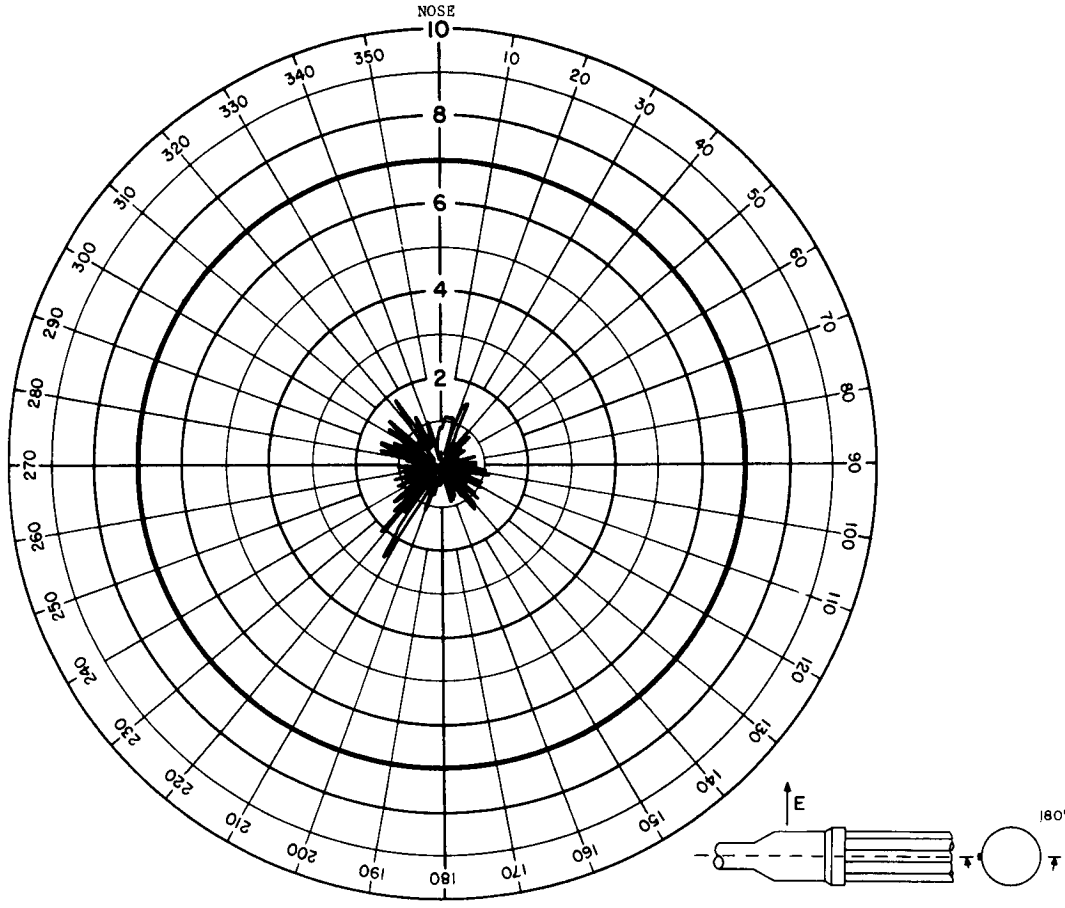


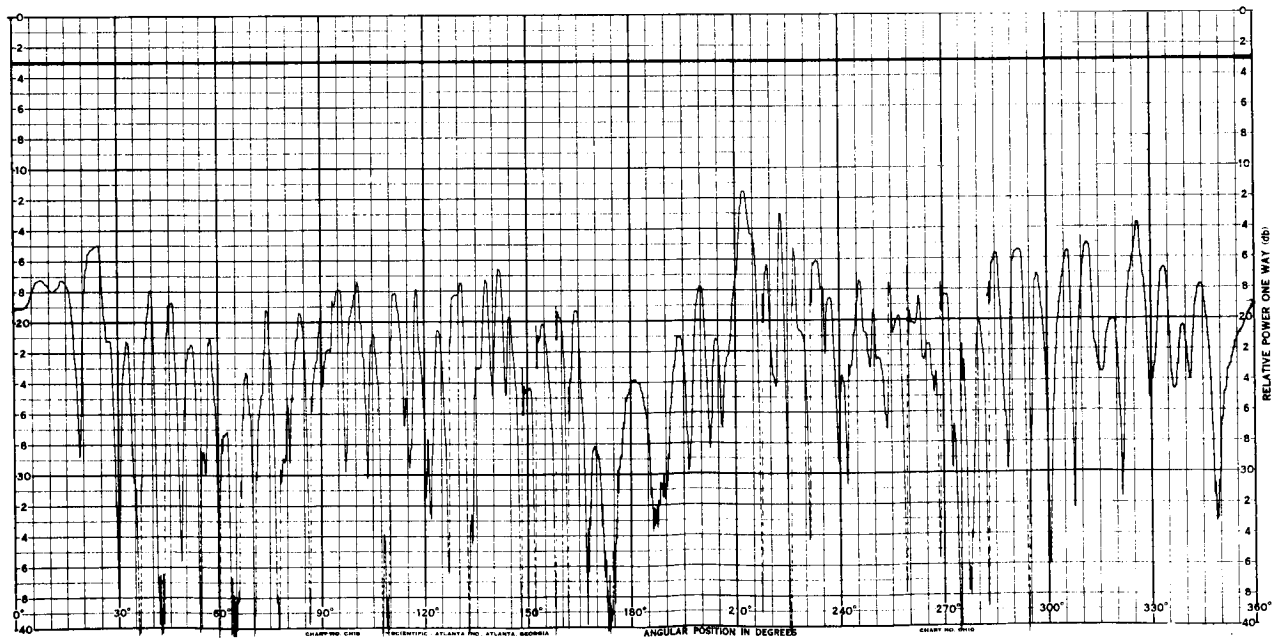
ANTENNA RADIATION PATTERN NO. 208-37

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



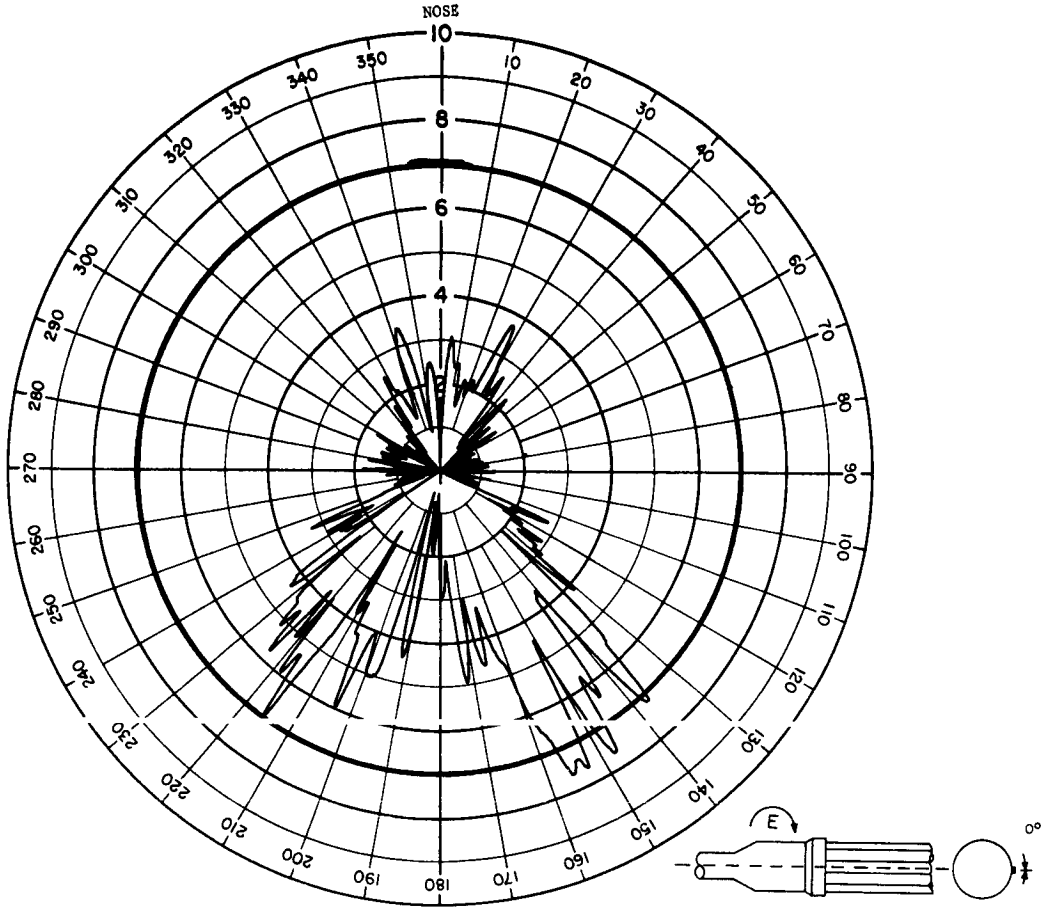


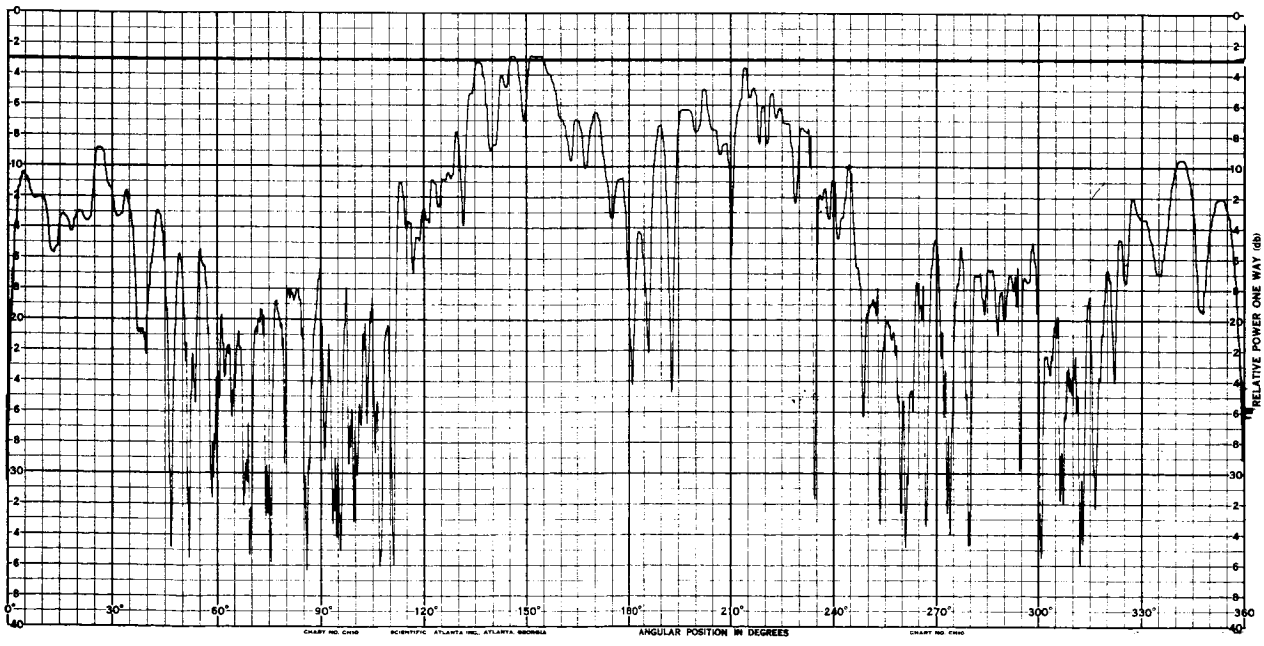
ANTENNA RADIATION PATTERN NO. 208-38

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



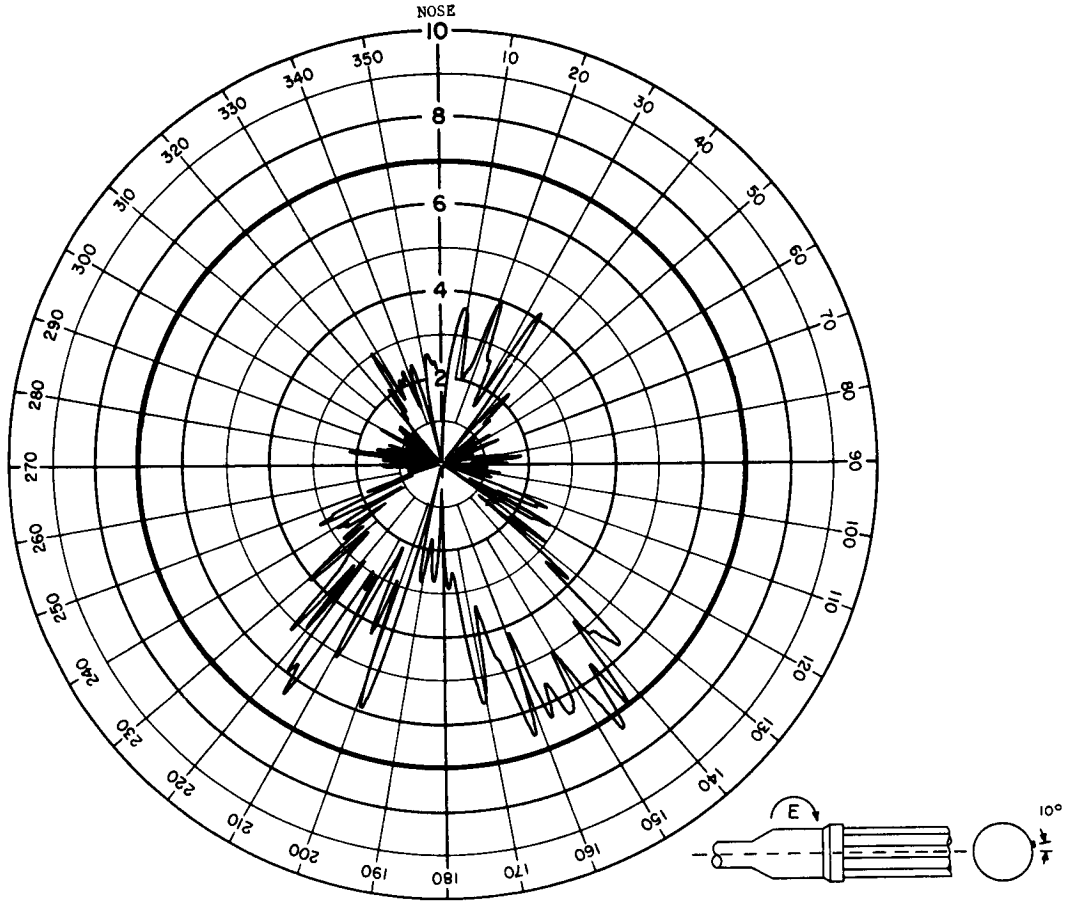


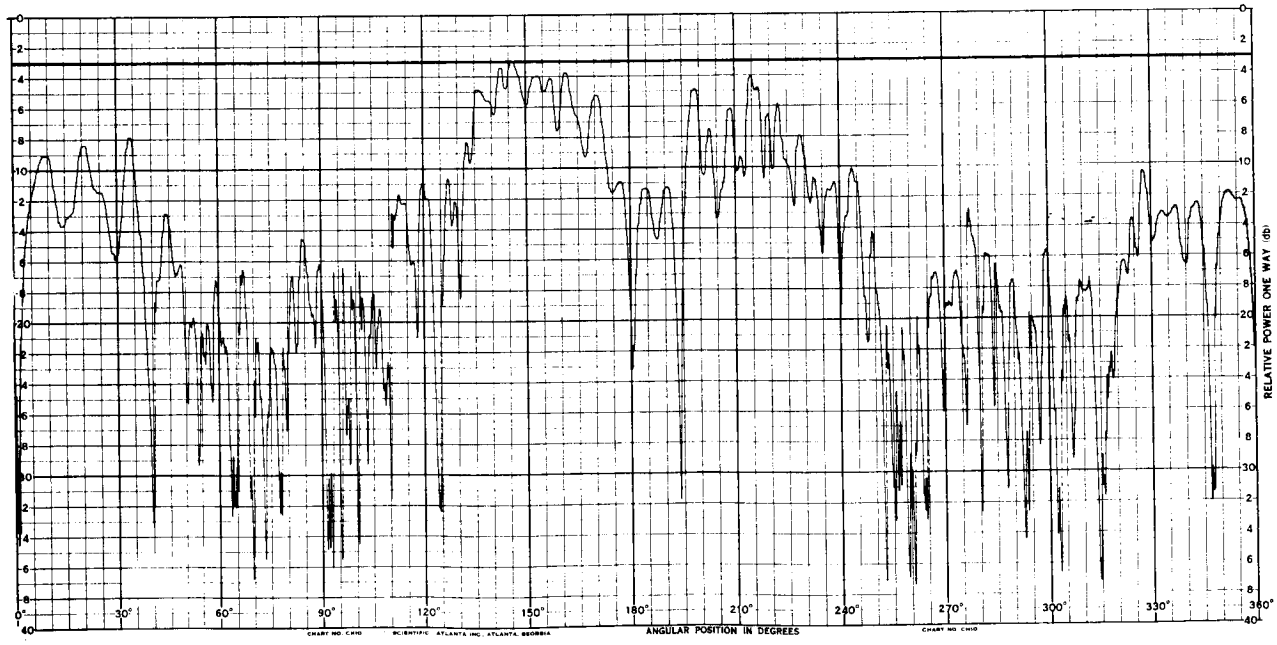
ANTENNA RADIATION PATTERN NO. 208-39

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



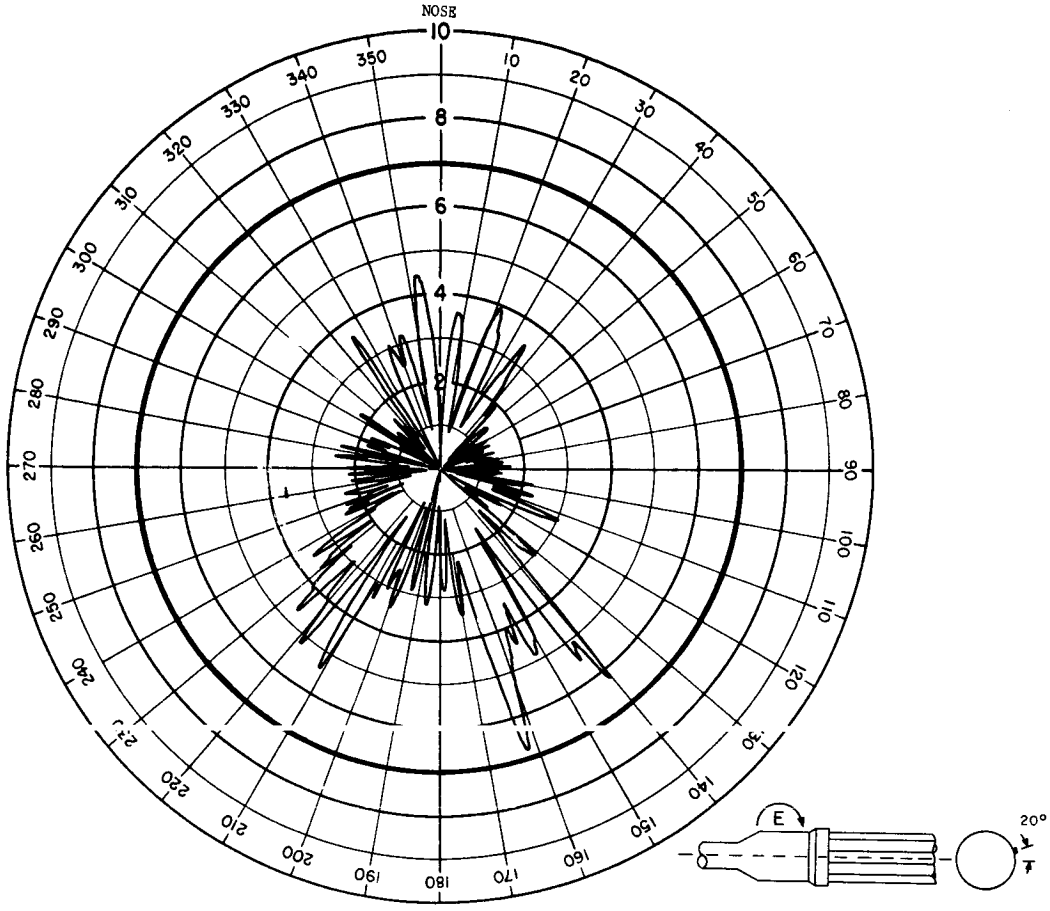


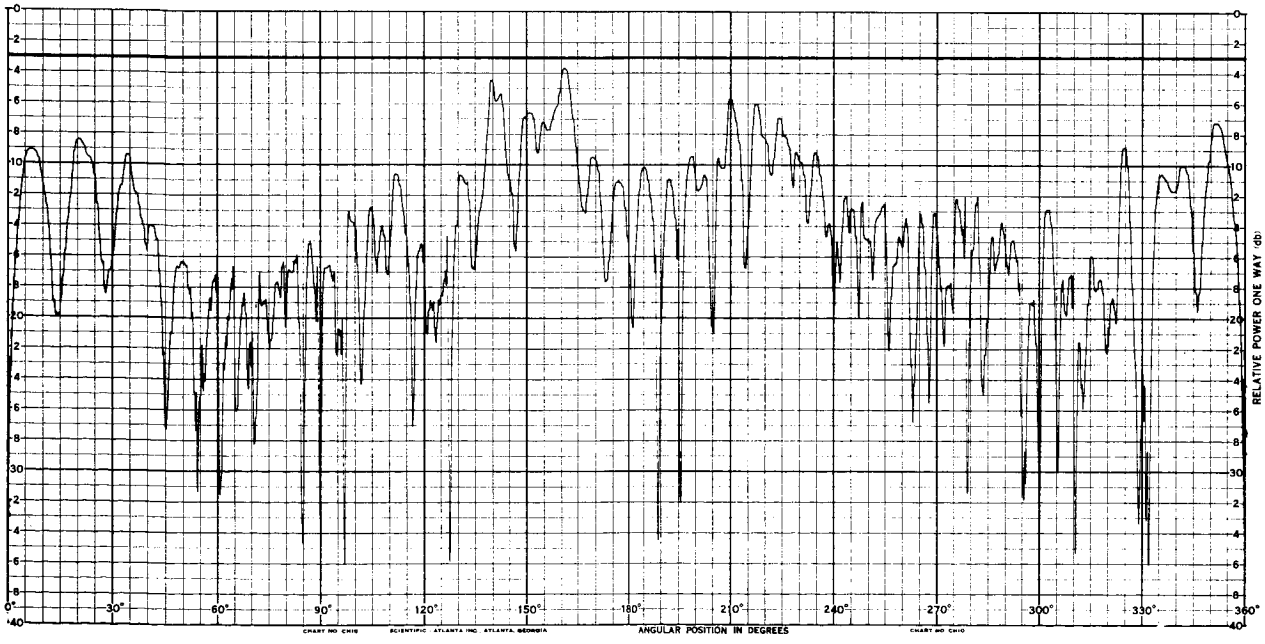
ANTENNA RADIATION PATTERN NO. 208-40

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



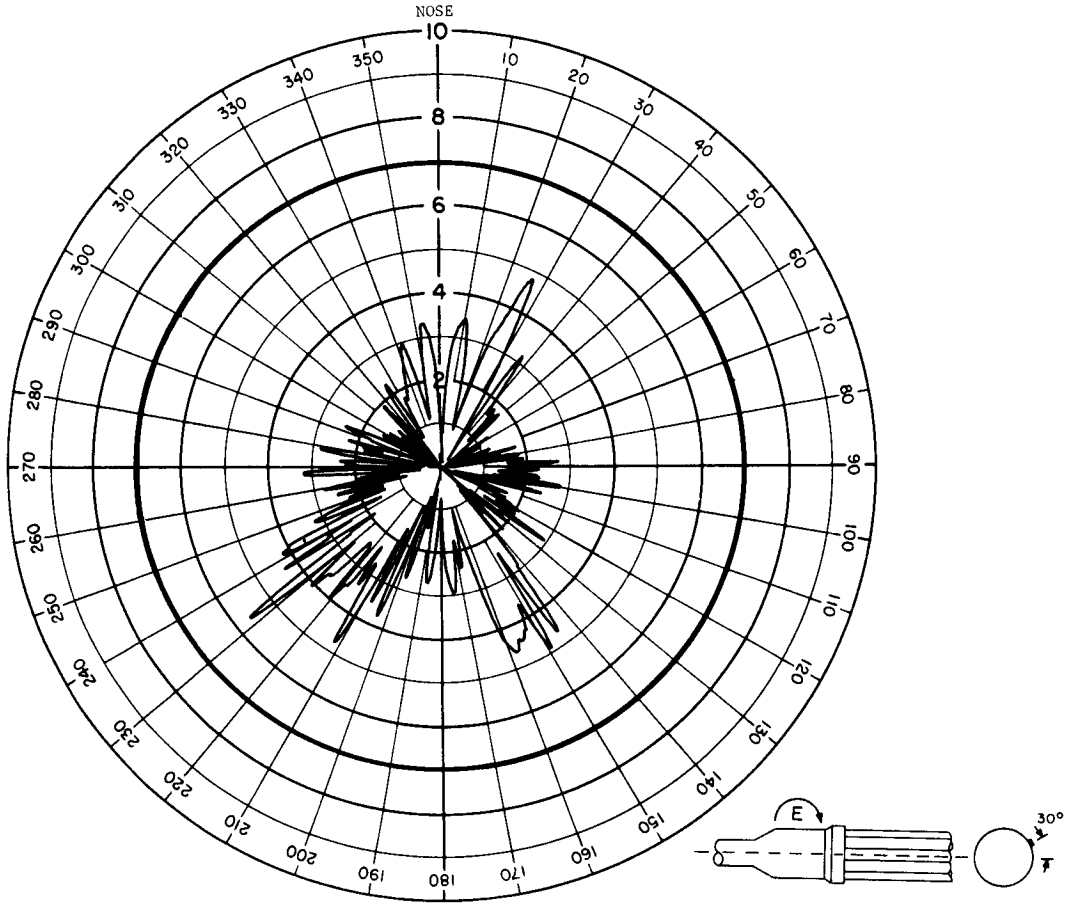


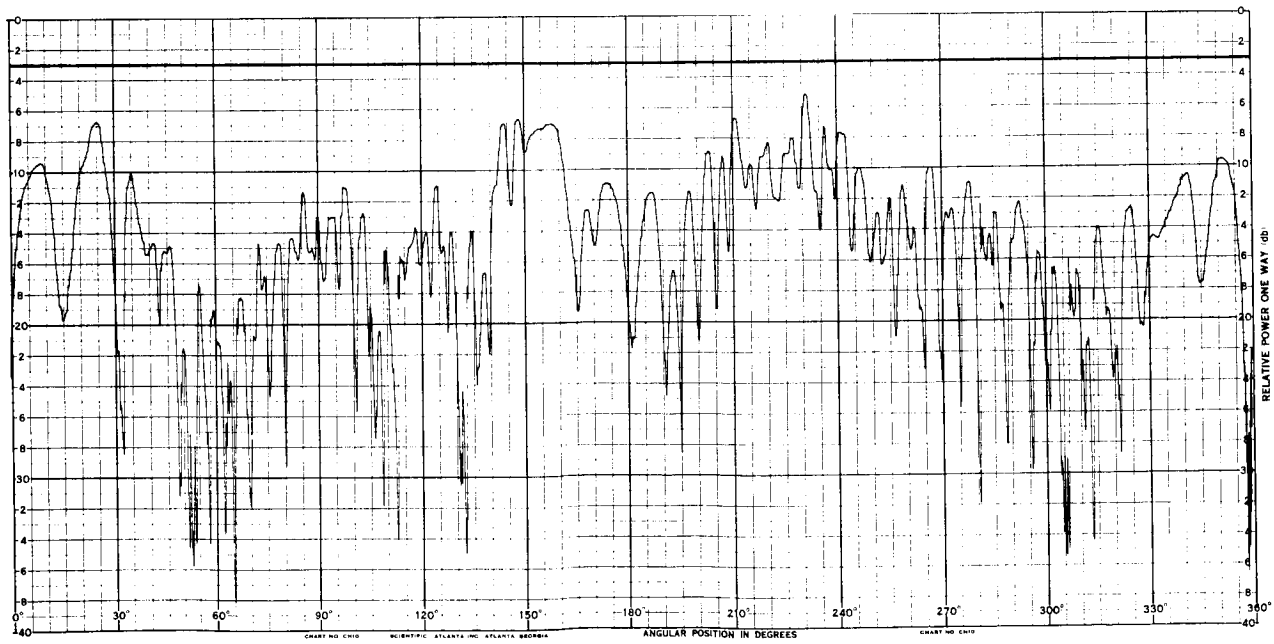
ANTENNA RADIATION PATTERN NO. 208-41

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



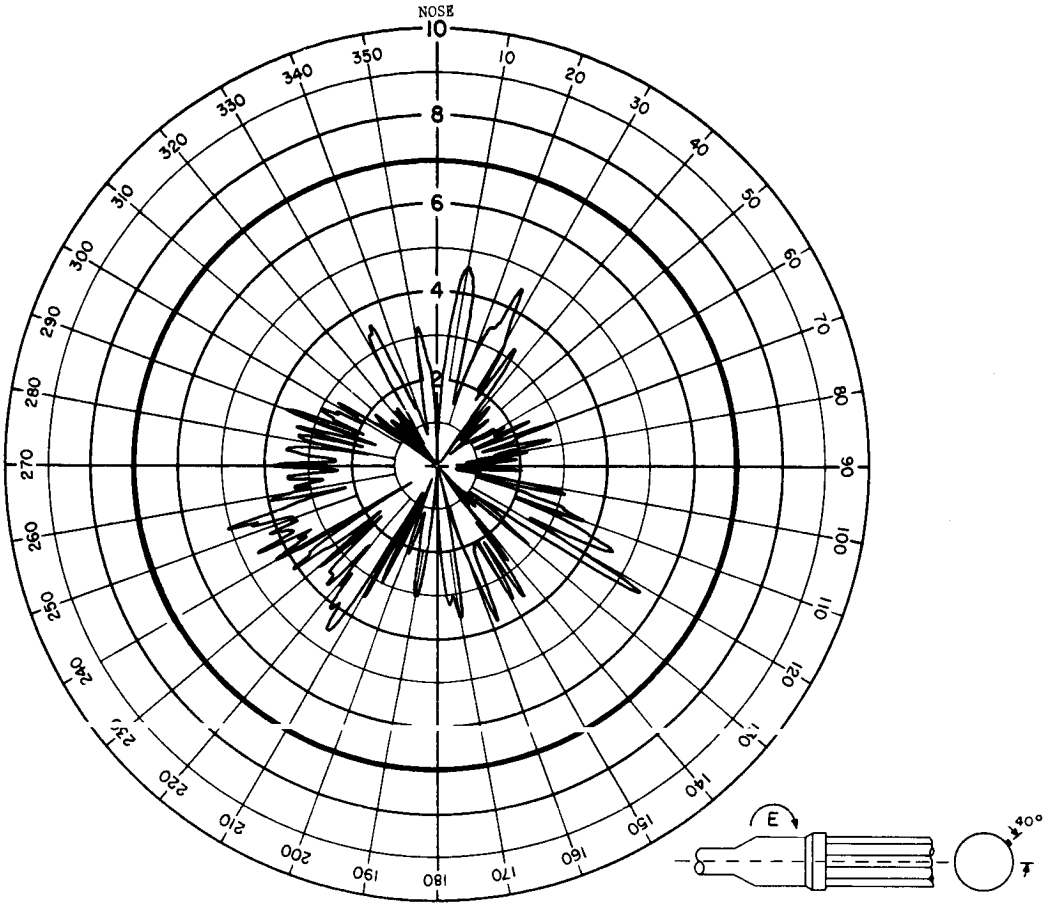


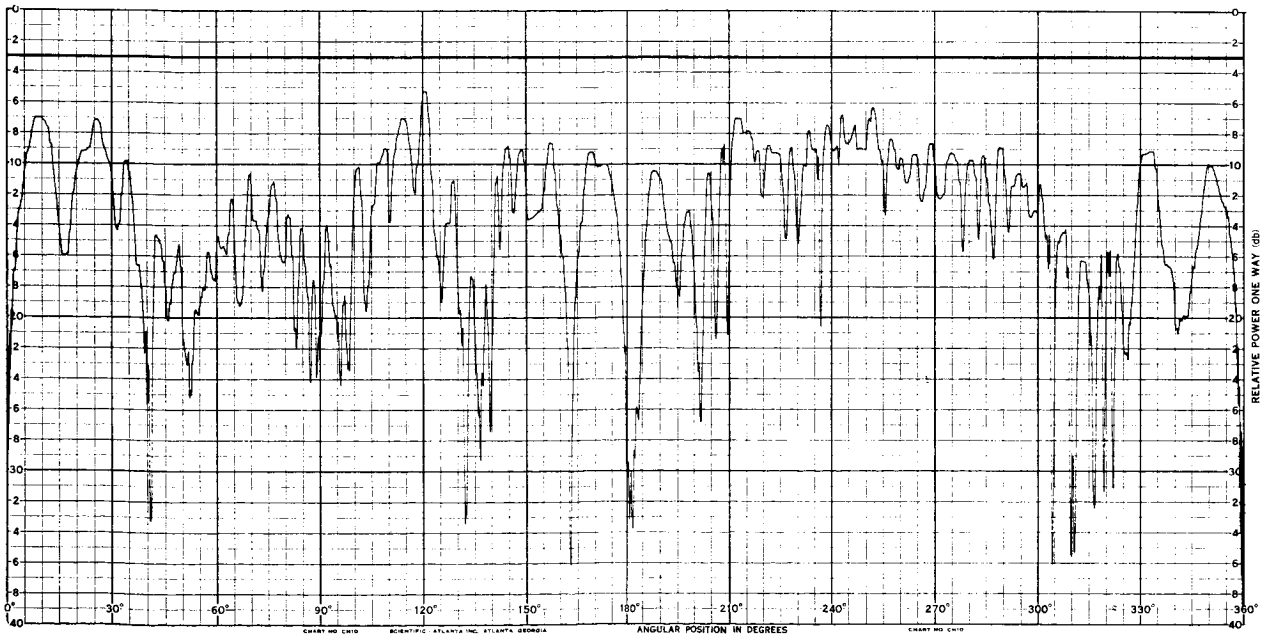
ANTENNA RADIATION PATTERN NO. 208-42

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



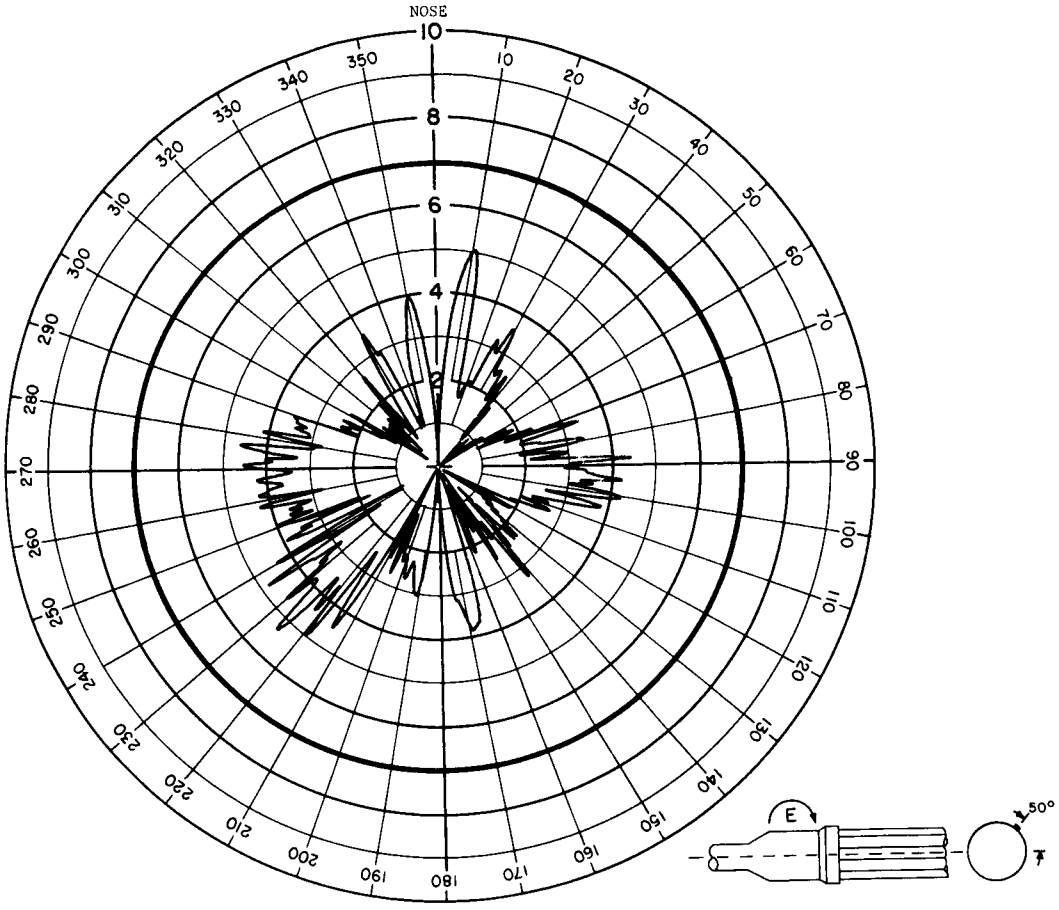


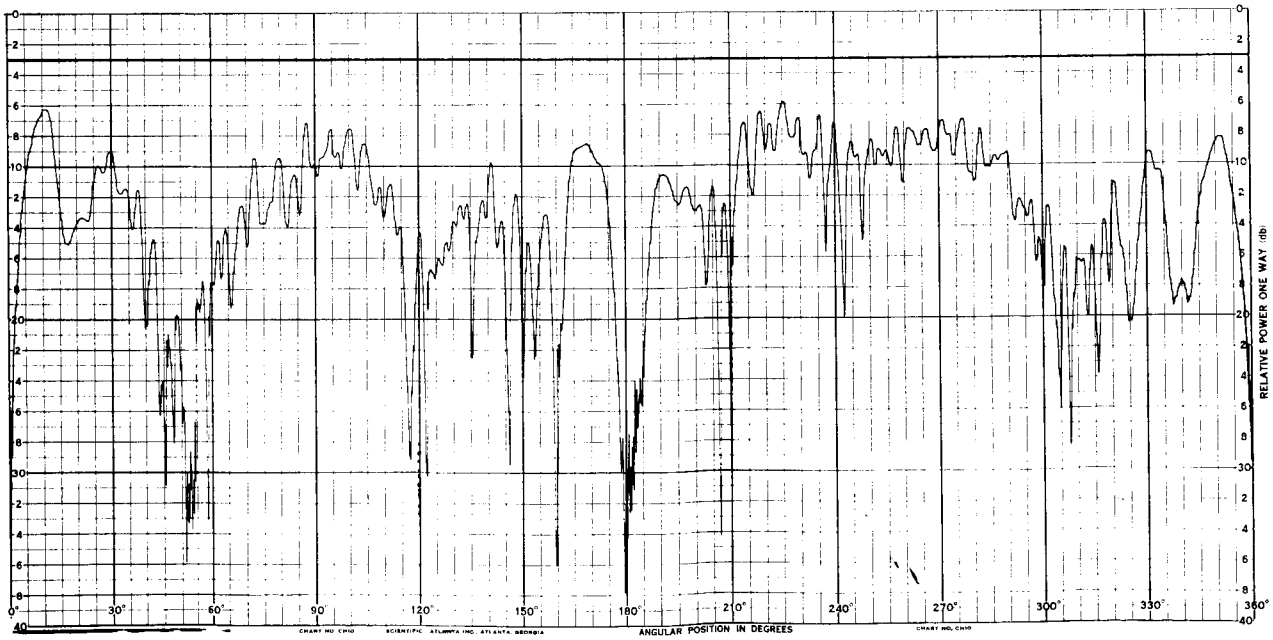
ANTENNA RADIATION PATTERN NO. 208-43

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



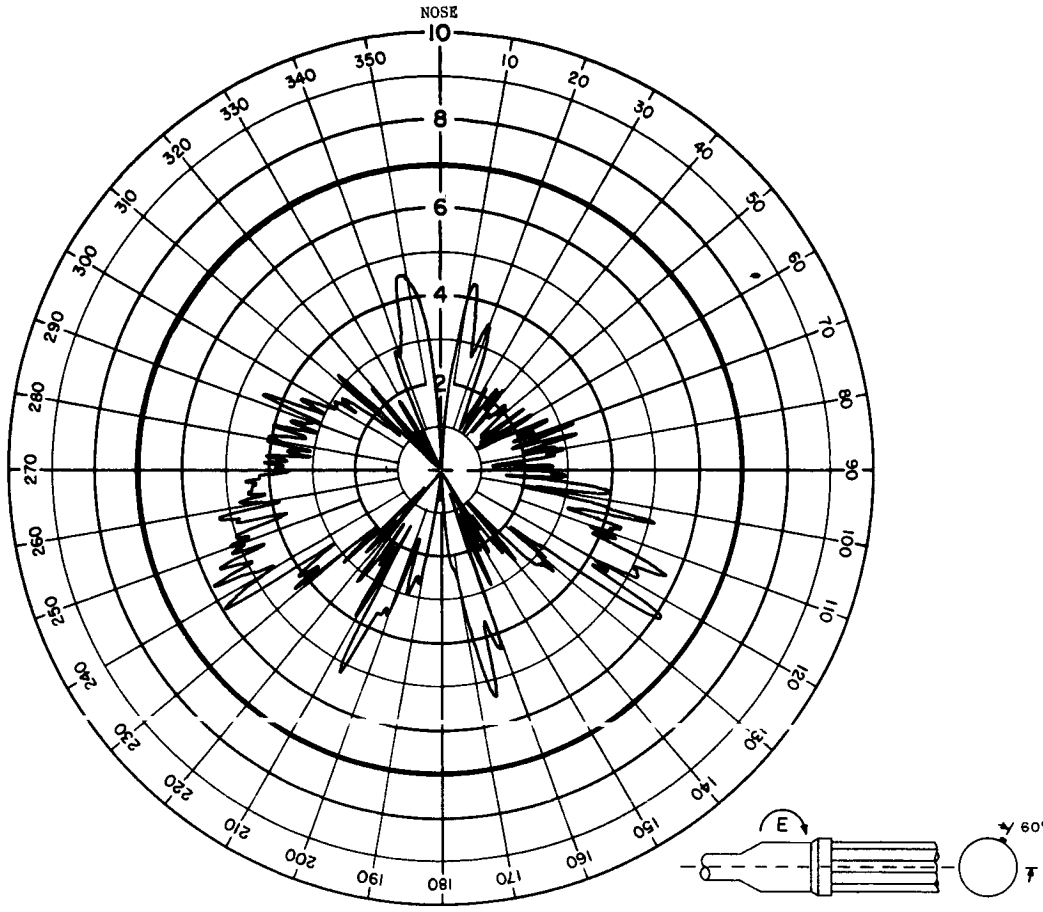


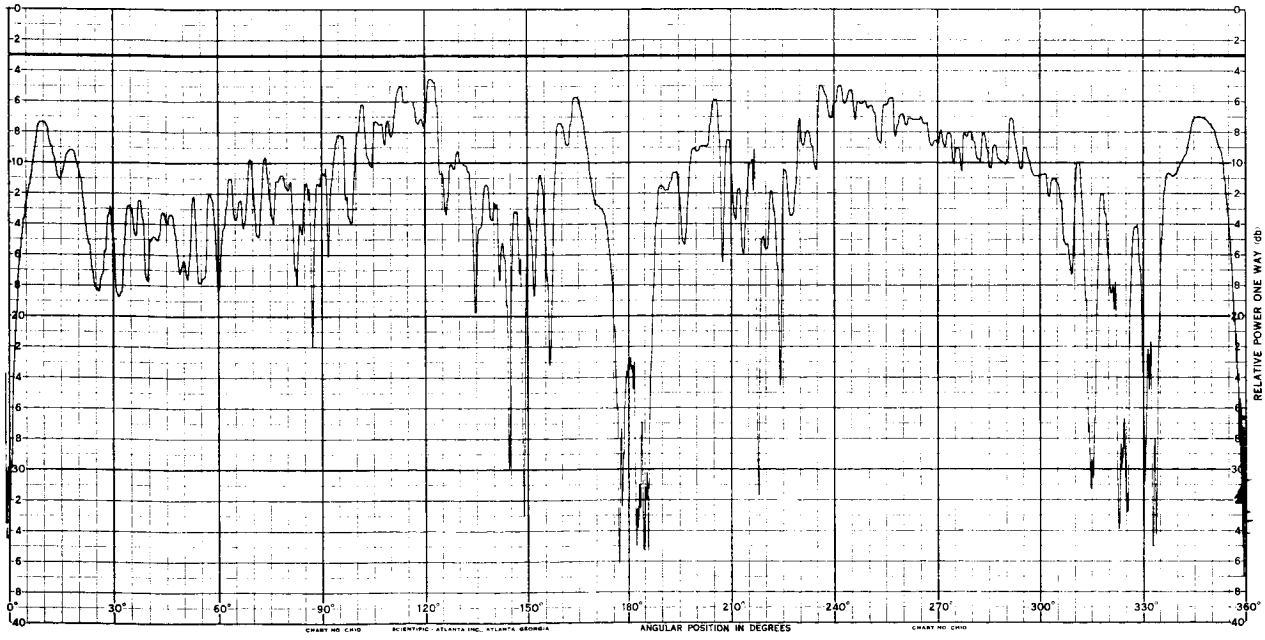
ANTENNA RADIATION PATTERN NO. 208-44

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



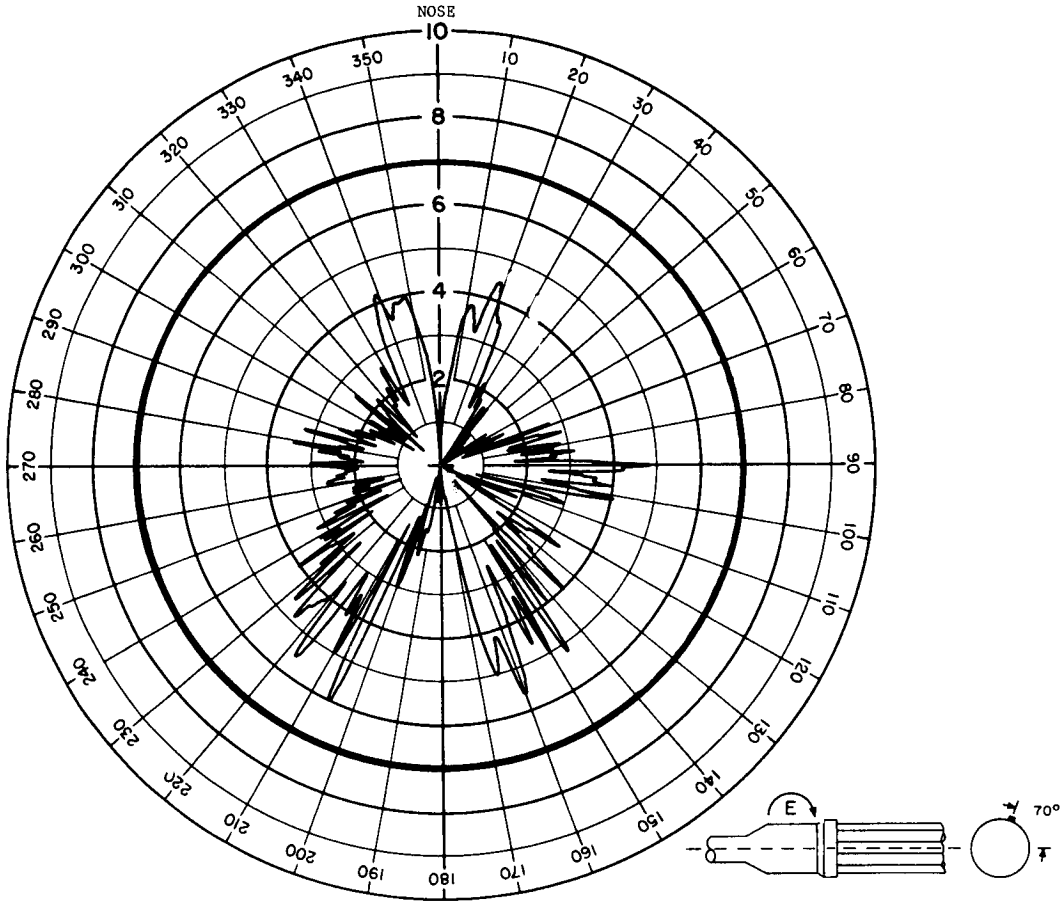


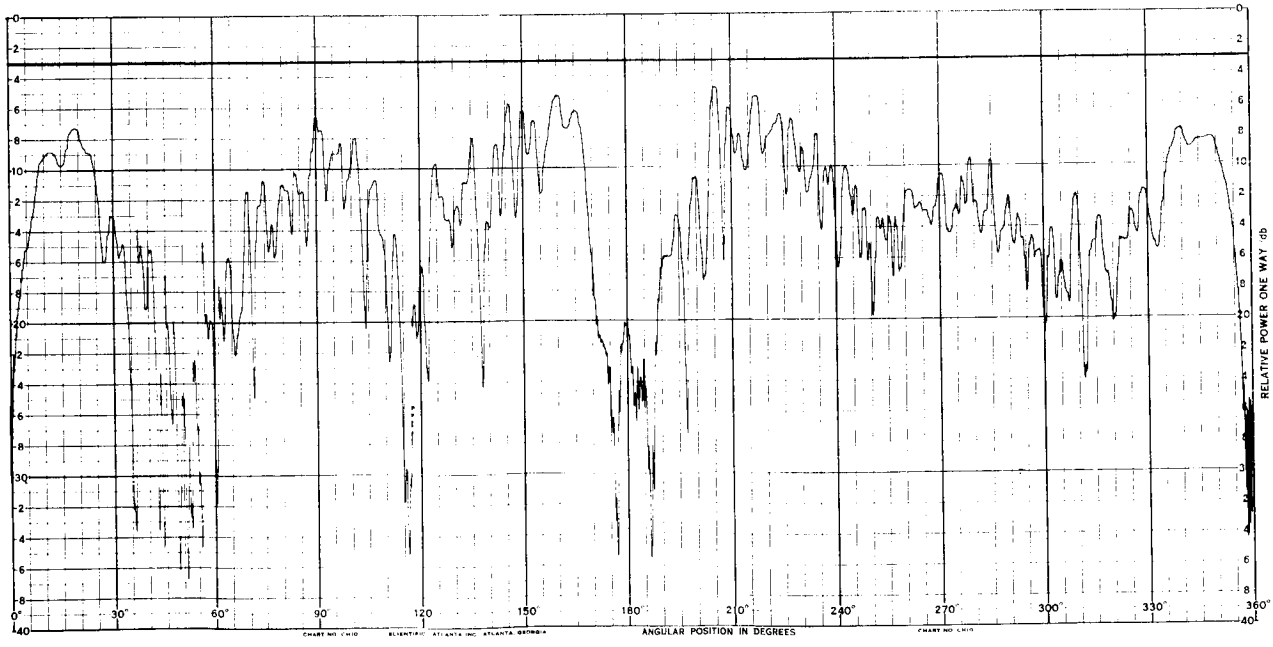
ANTENNA RADIATION PATTERN NO. 208-45

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



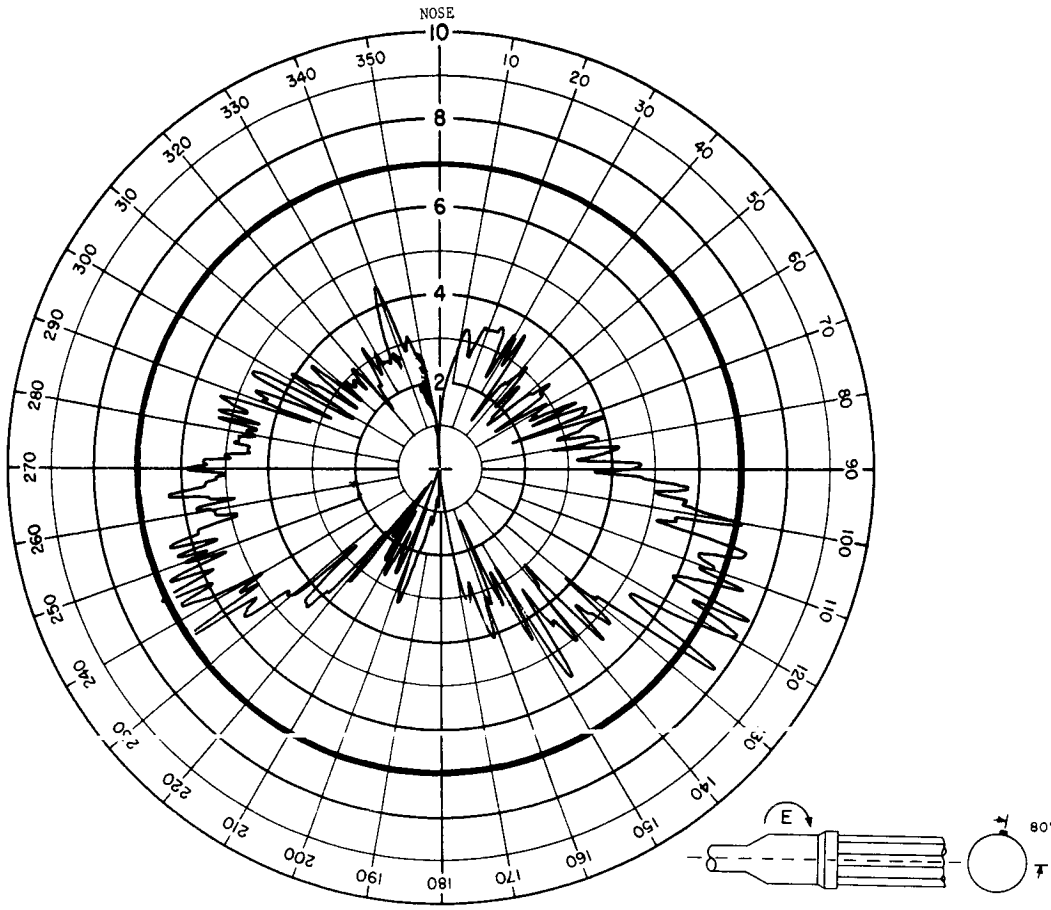


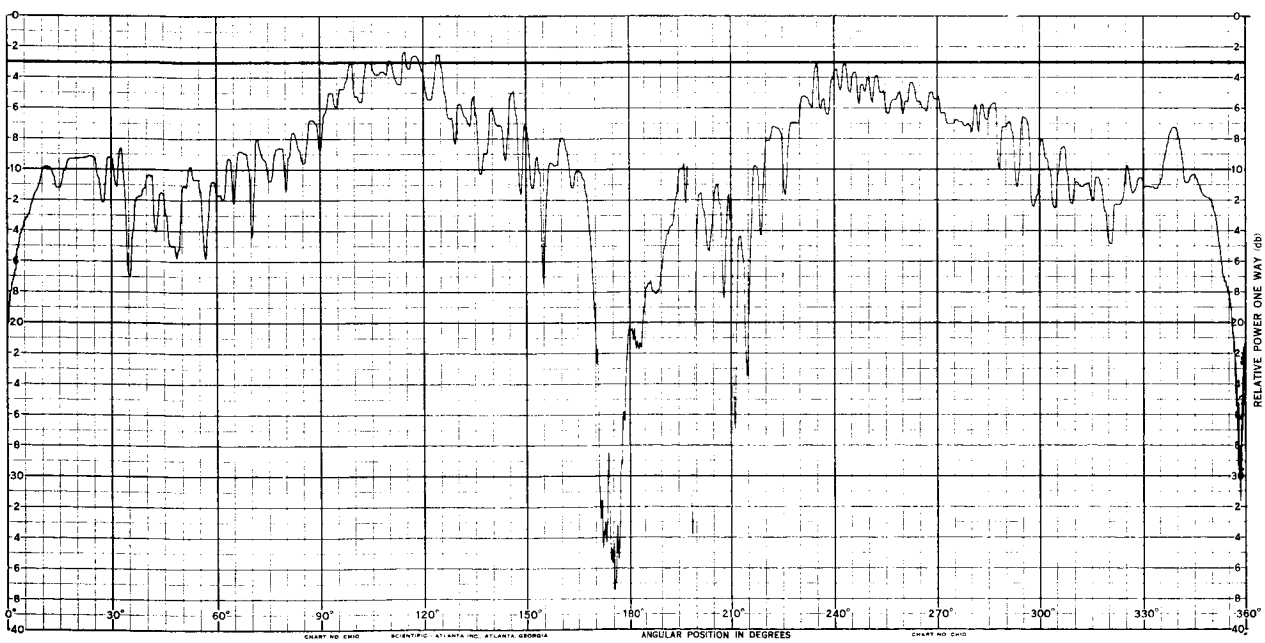
ANTENNA RADIATION PATTERN NO. 208-46

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



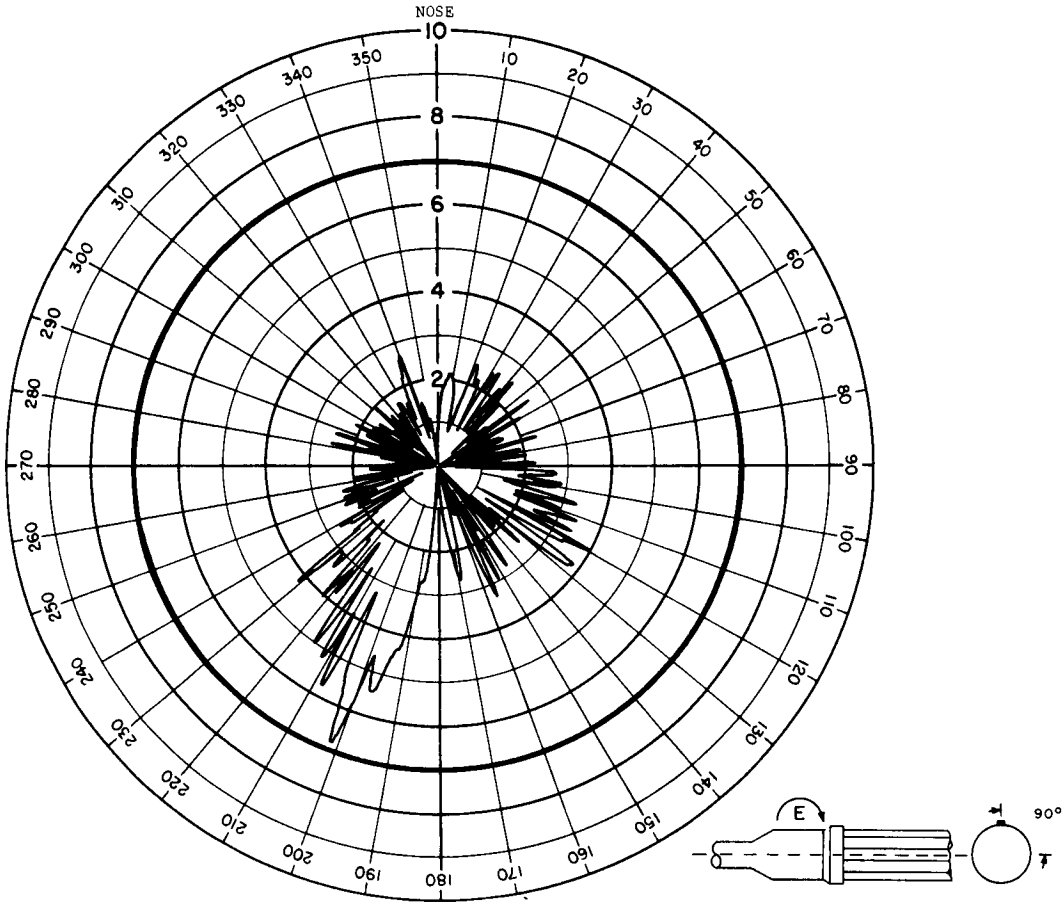


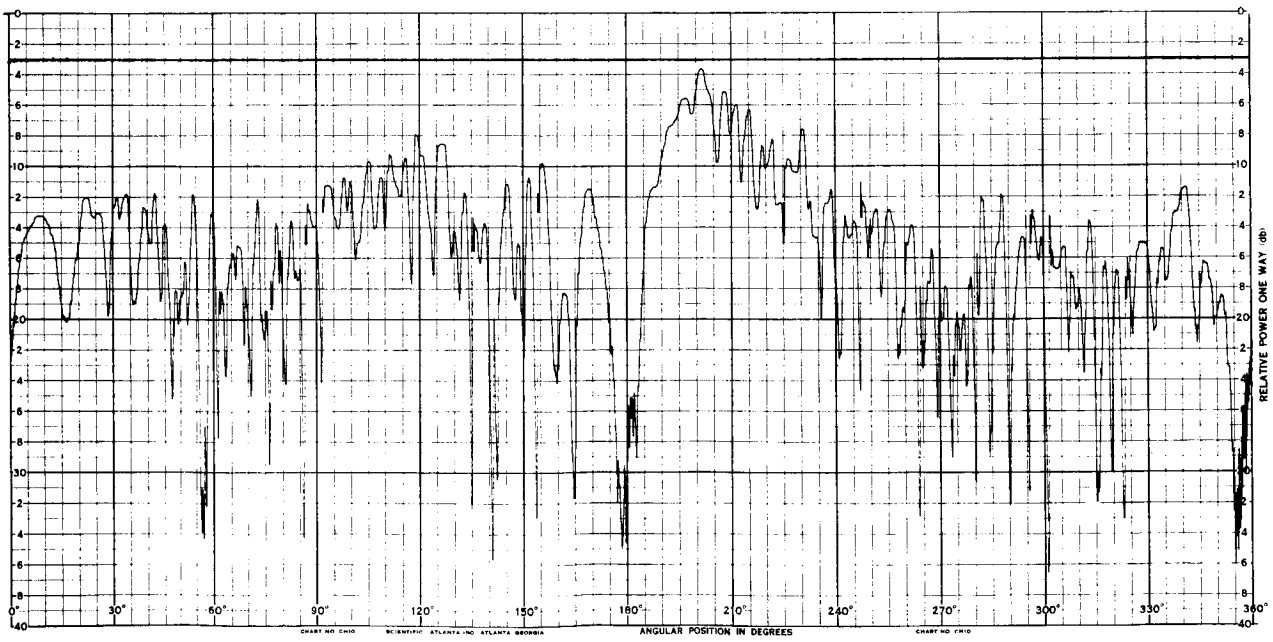
ANTENNA RADIATION PATTERN NO. 208-47

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



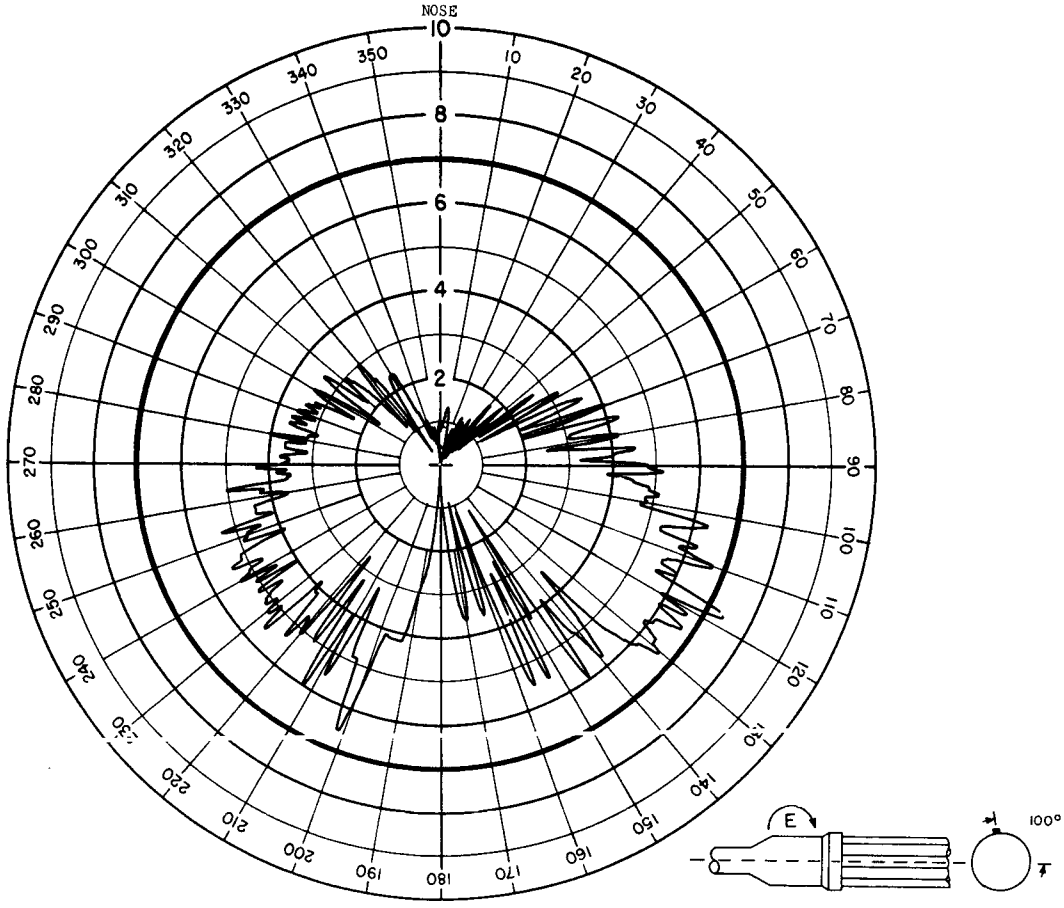


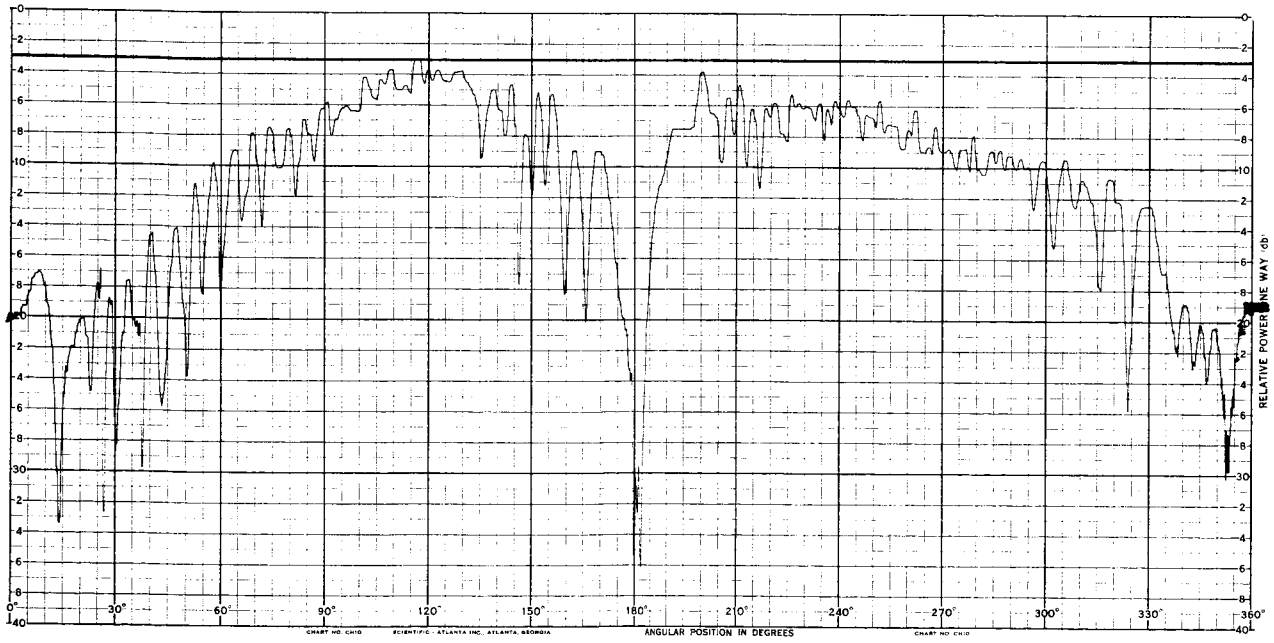
ANTENNA RADIATION PATTERN NO. 208-48

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



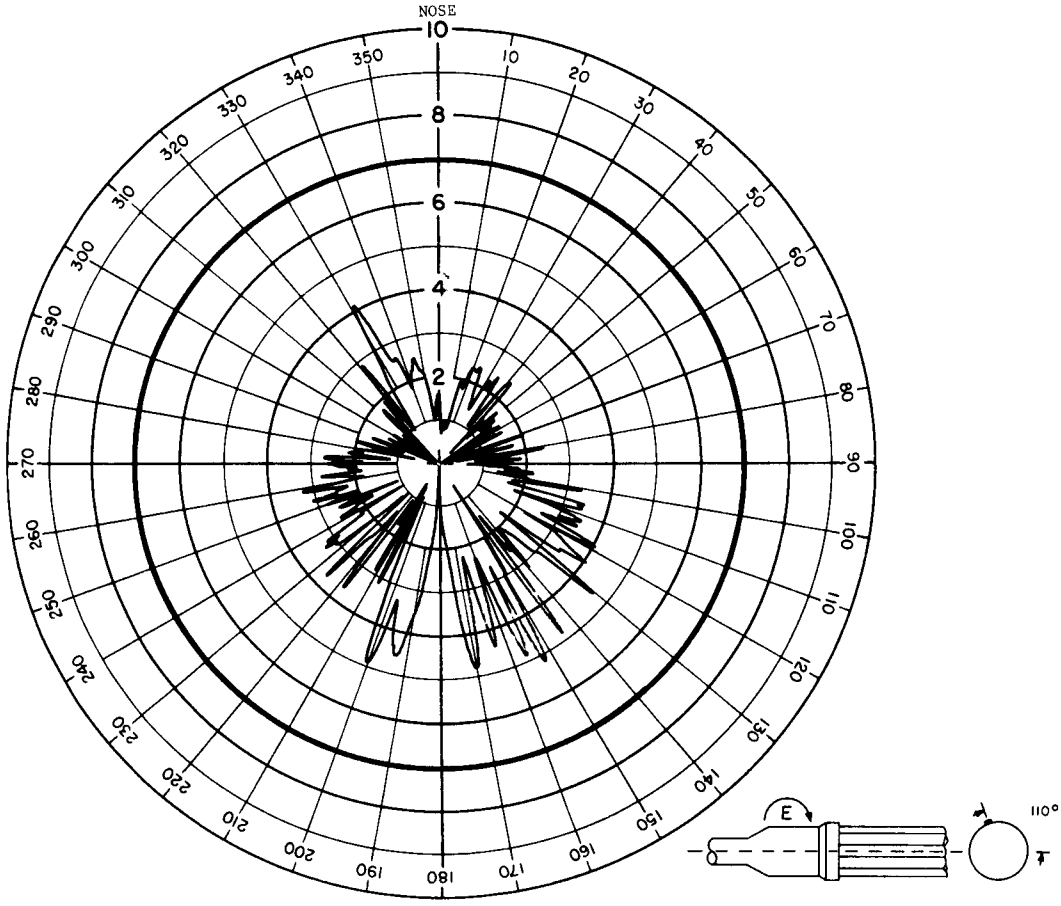


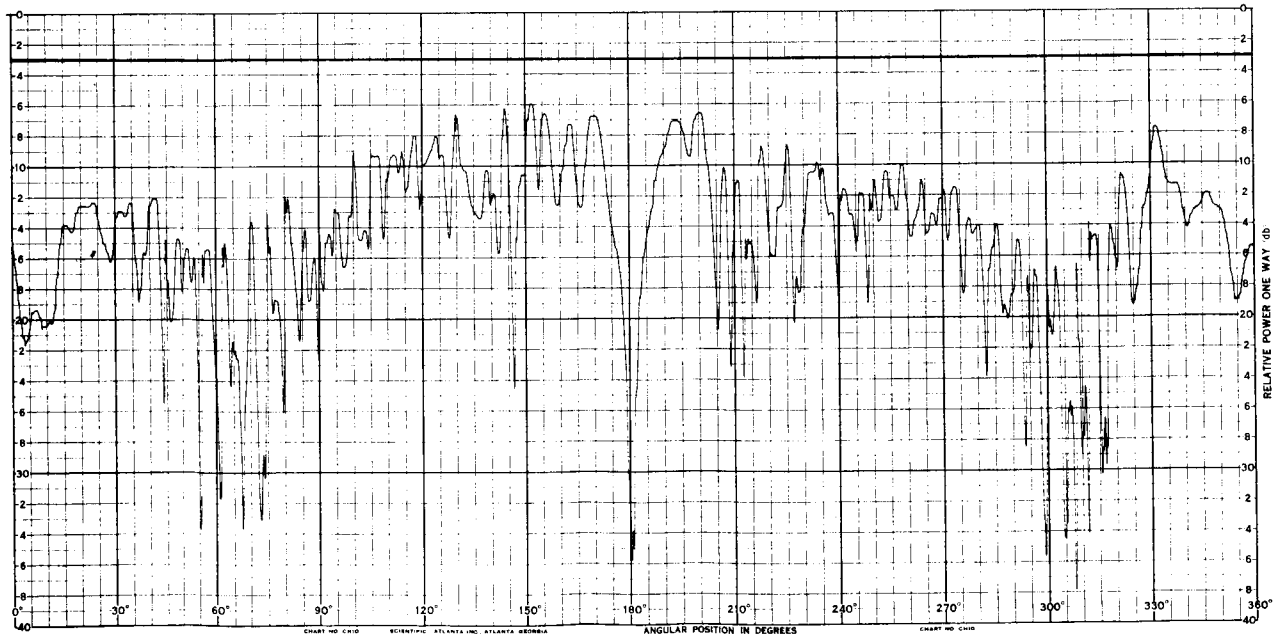
ANTENNA RADIATION PATTERN NO. 208-49

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



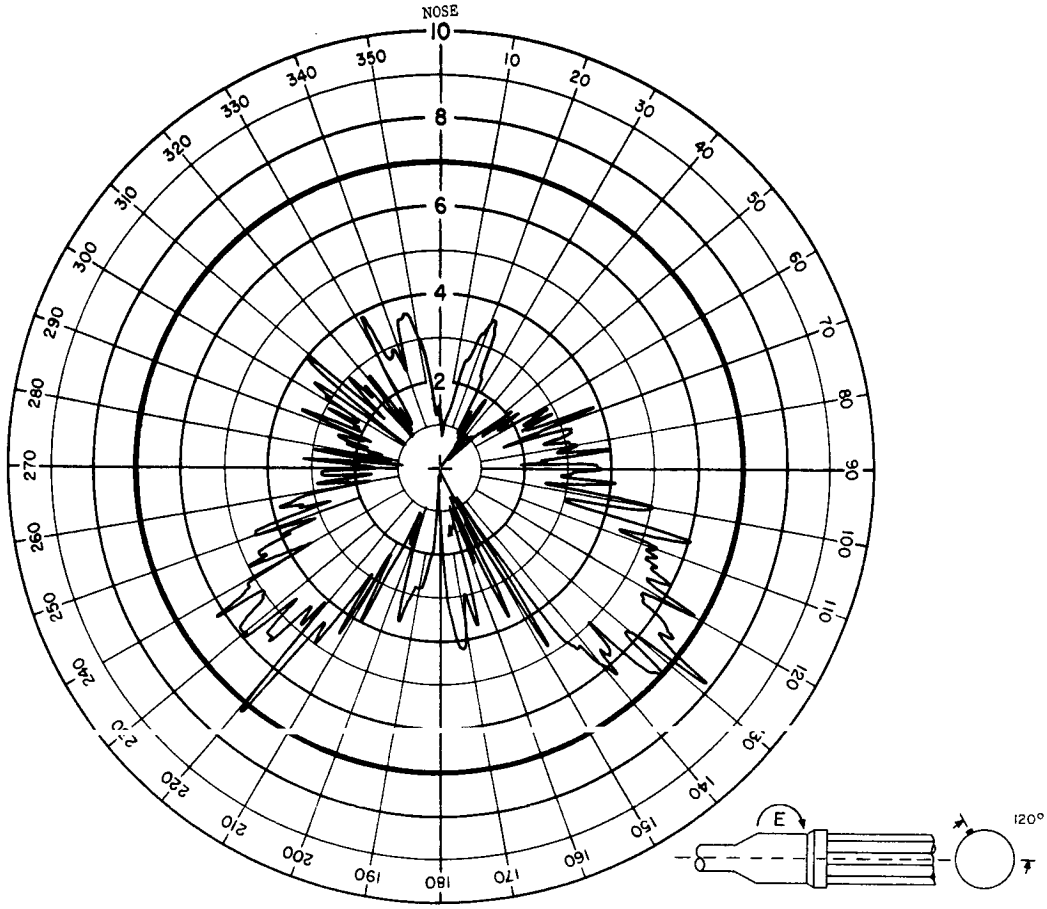


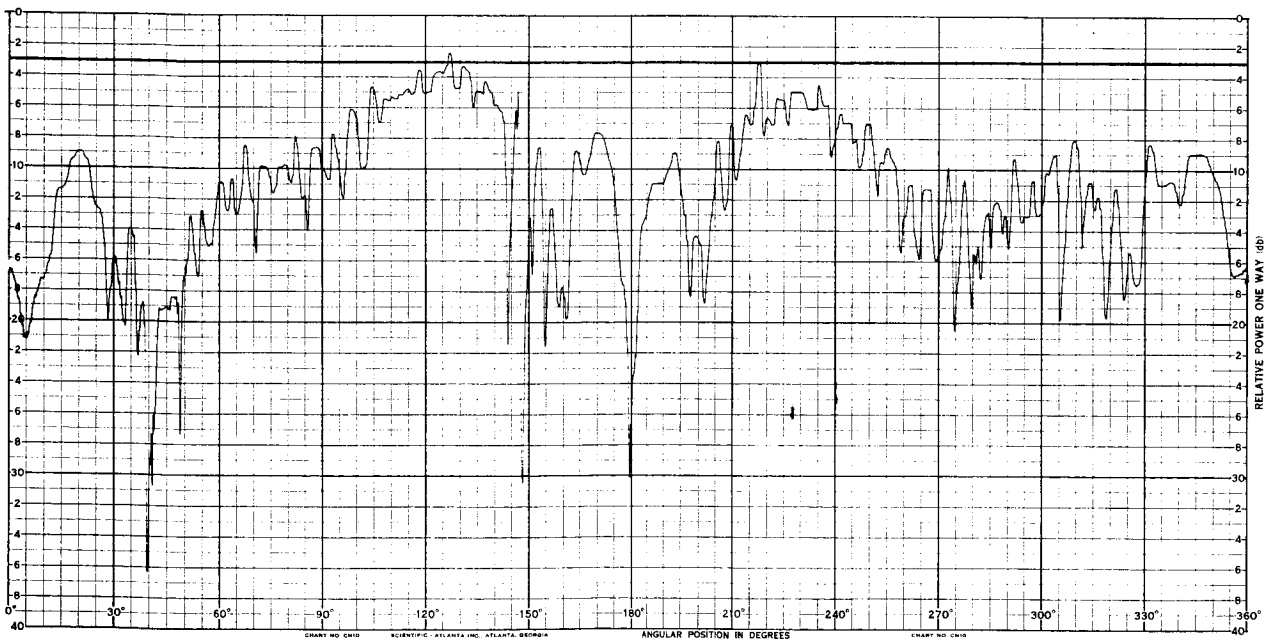
ANTENNA RADIATION PATTERN NO. 208-50

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



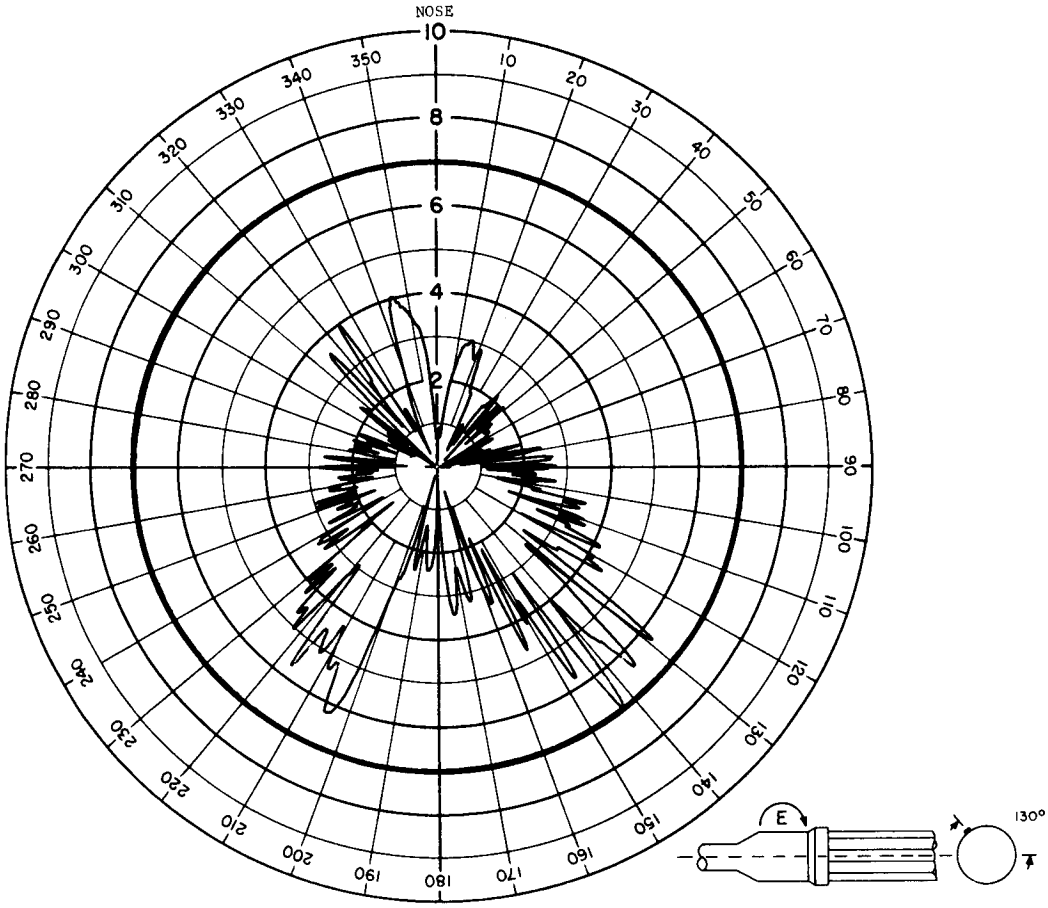


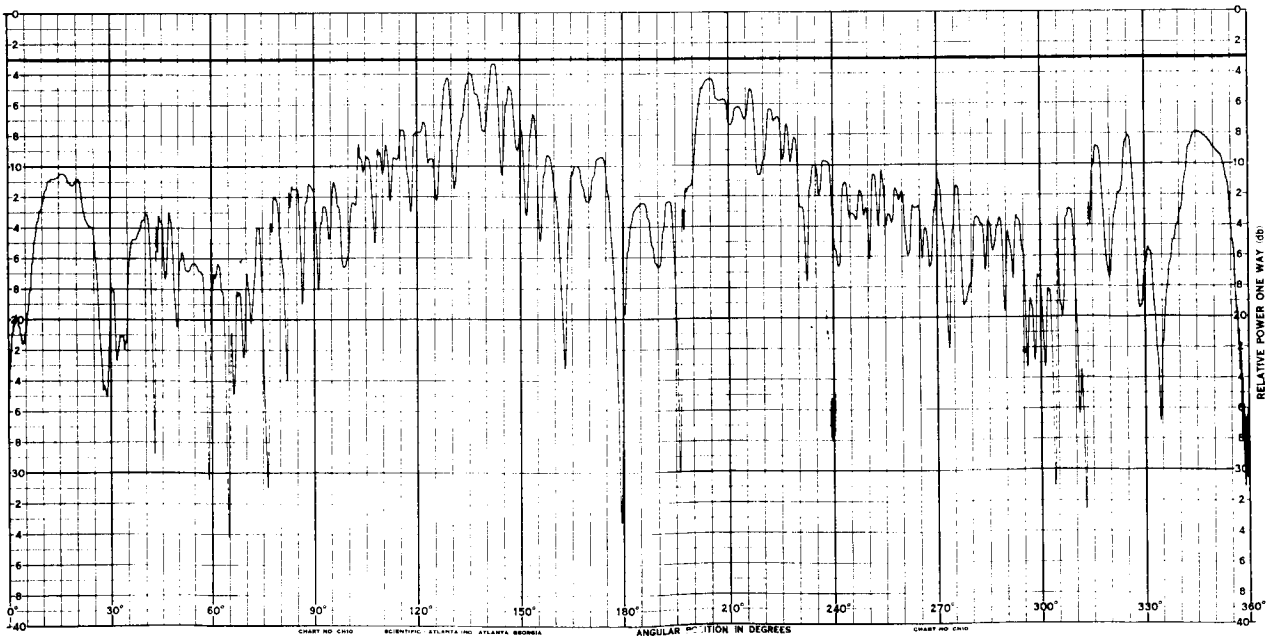
ANTENNA RADIATION PATTERN NO. 208-51

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



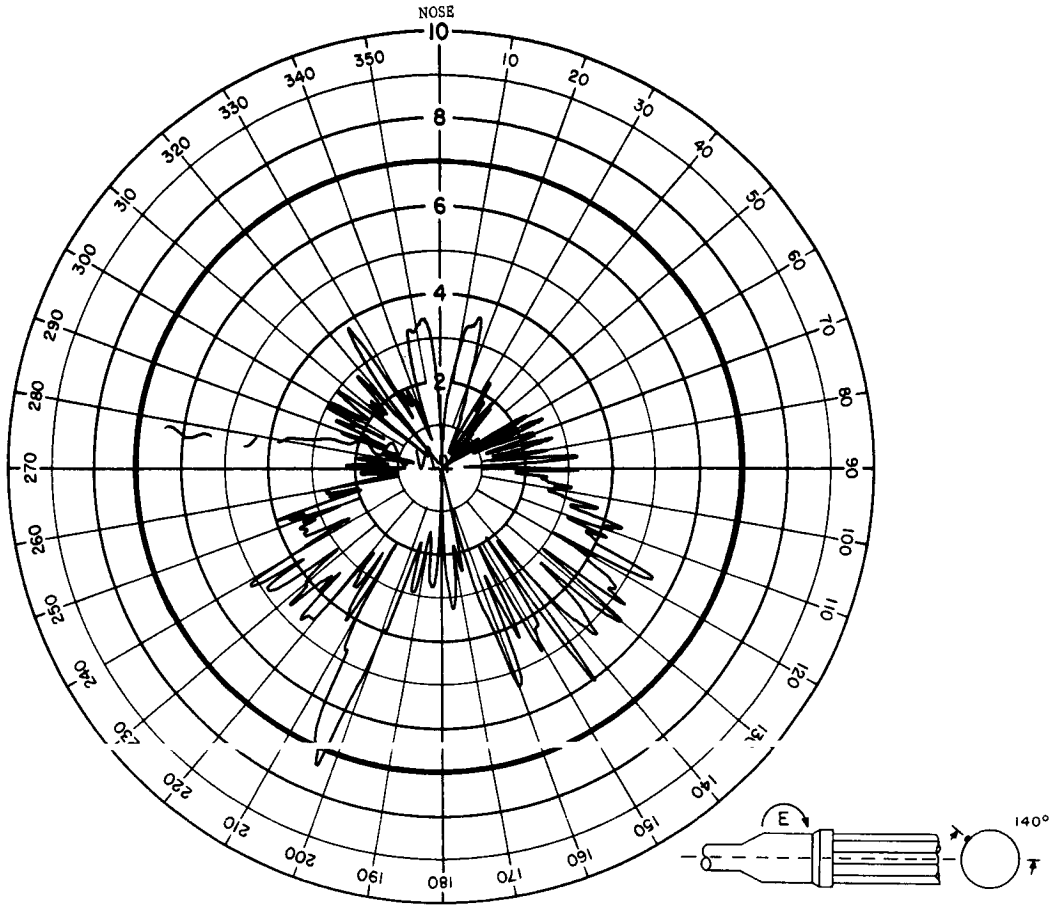


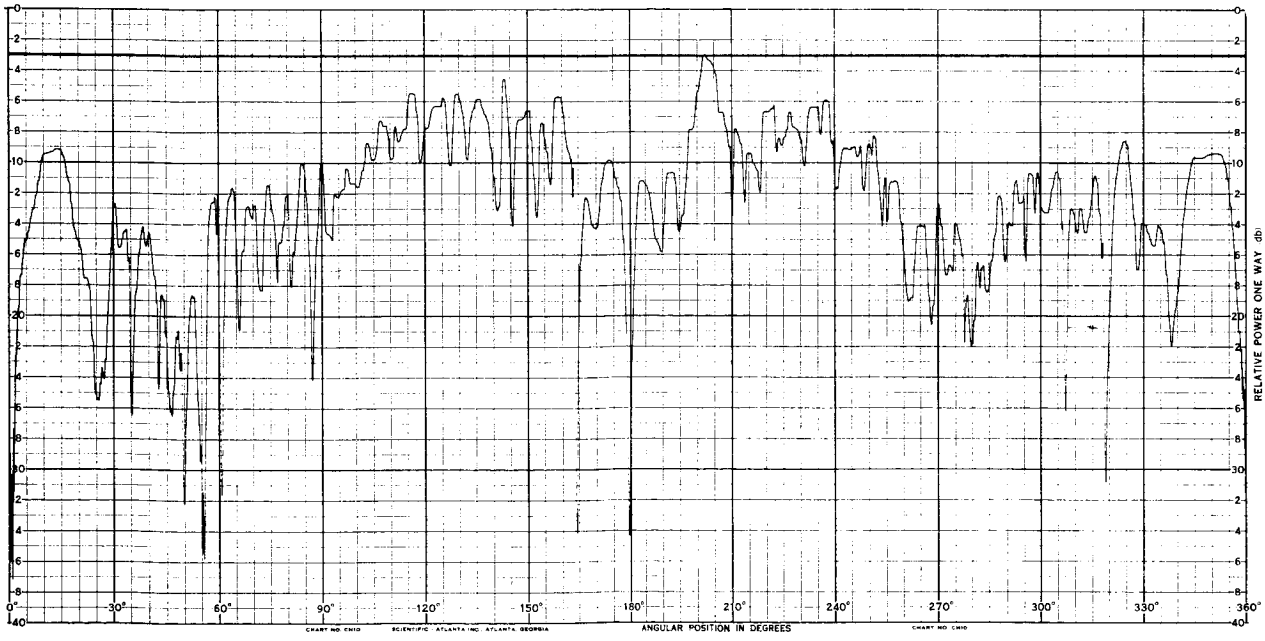
ANTENNA RADIATION PATTERN NO. 208-52

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



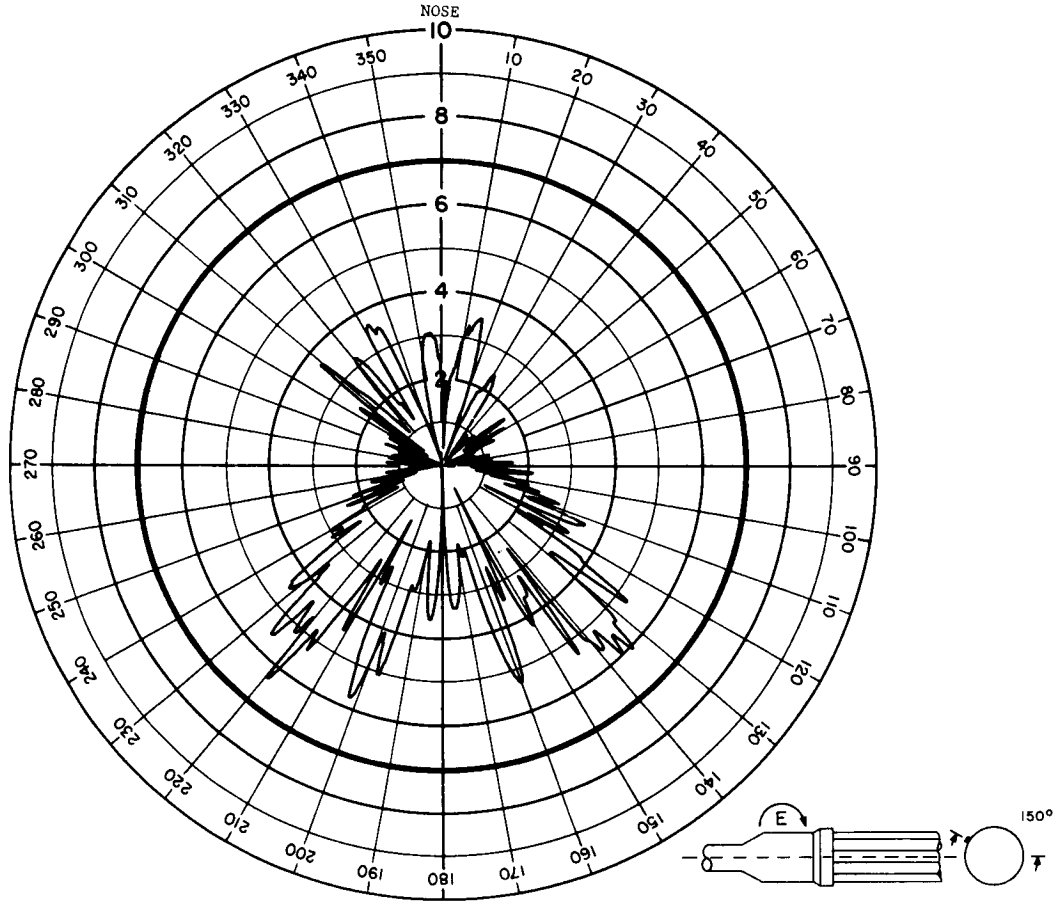


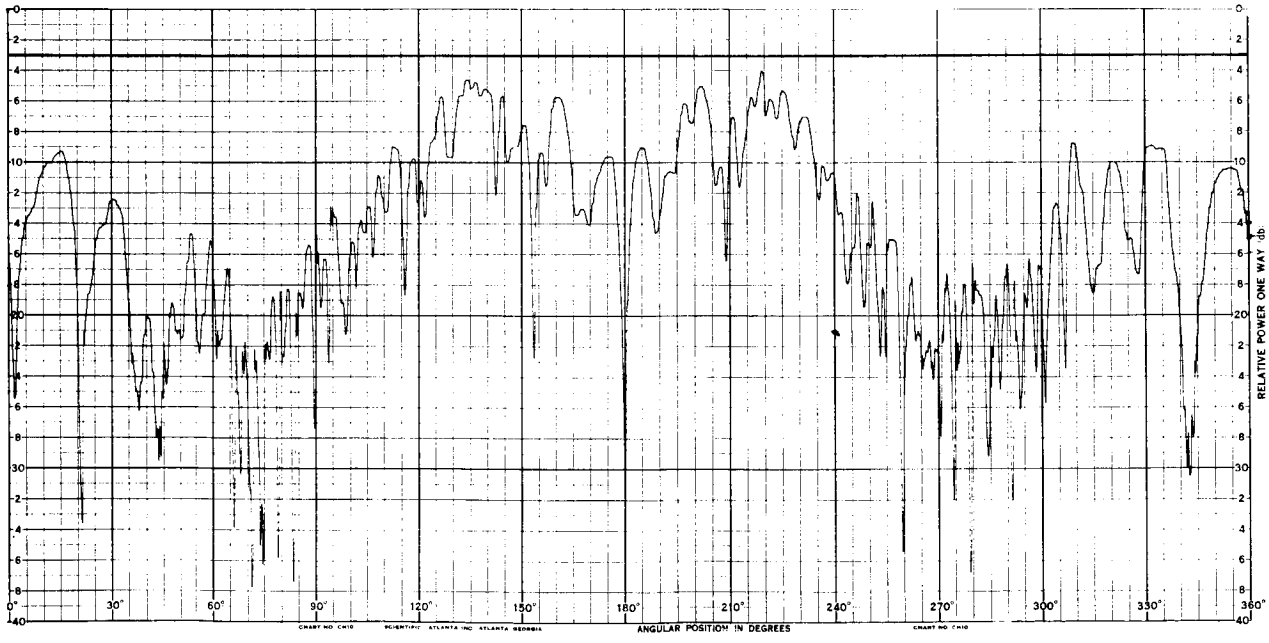
ANTENNA RADIATION PATTERN NO. 208-53

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



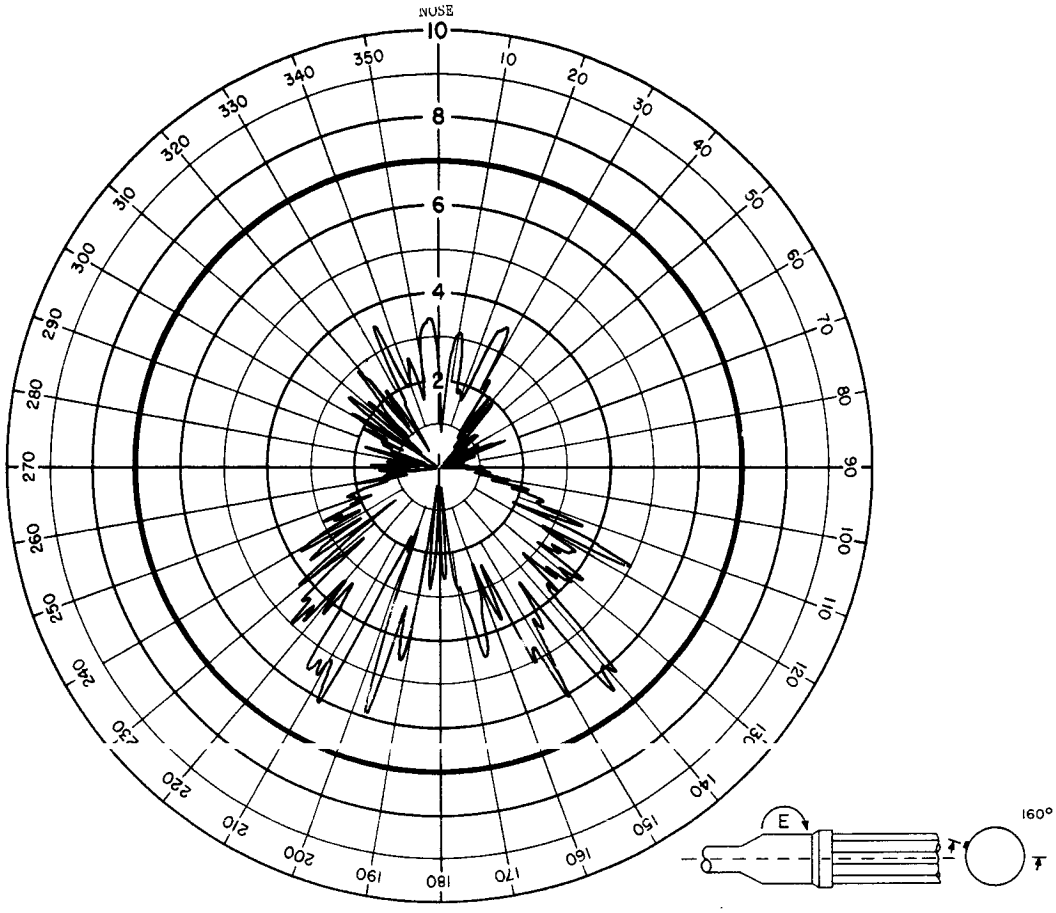


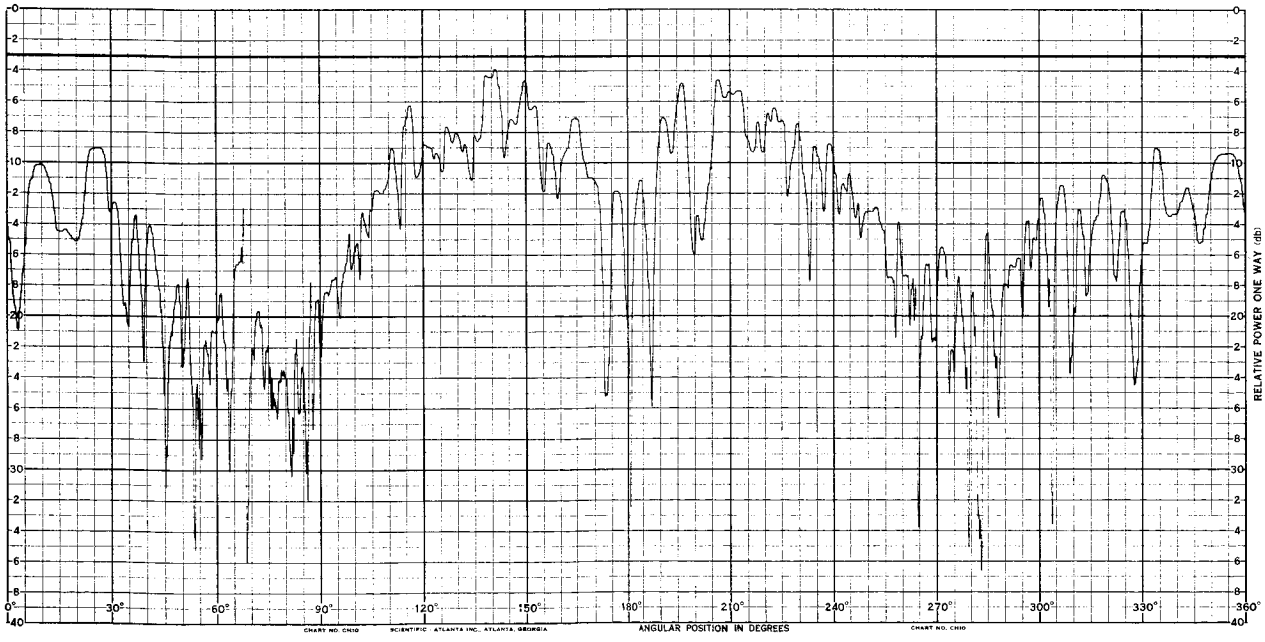
ANTENNA RADIATION PATTERN NO. 208-54

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



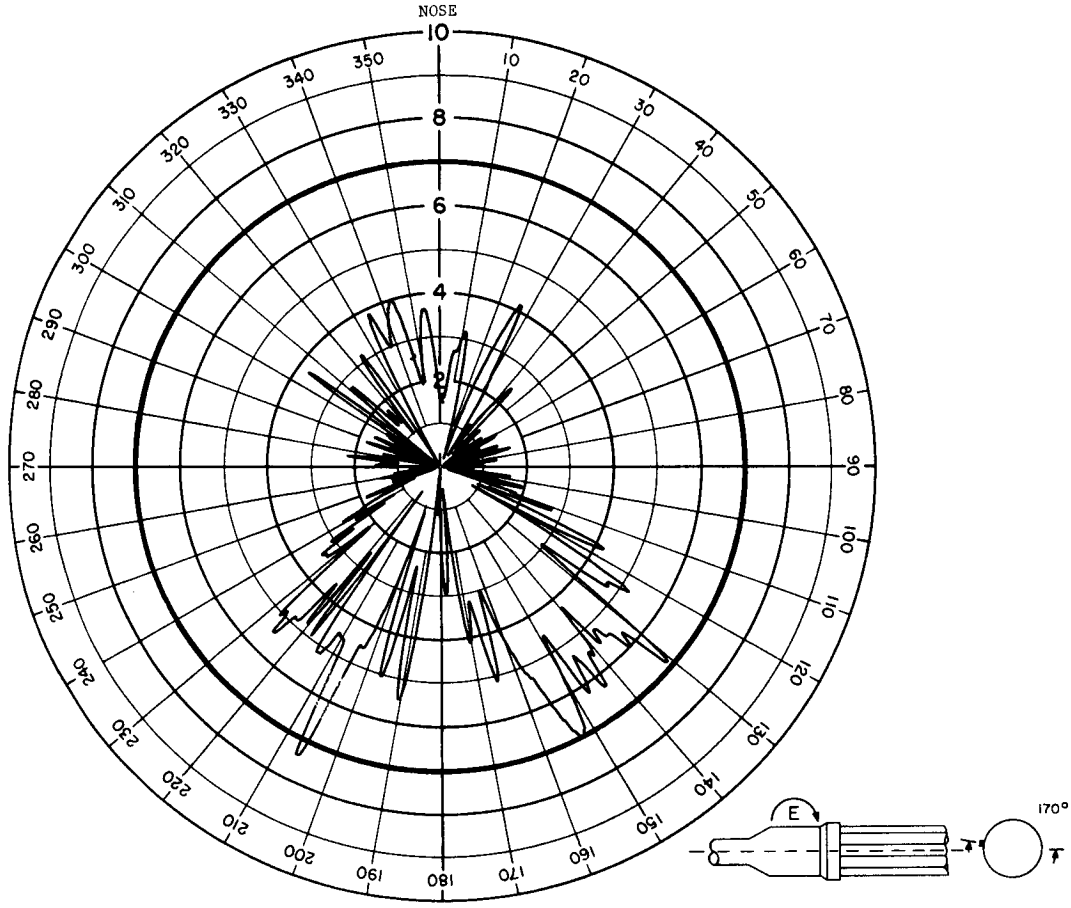


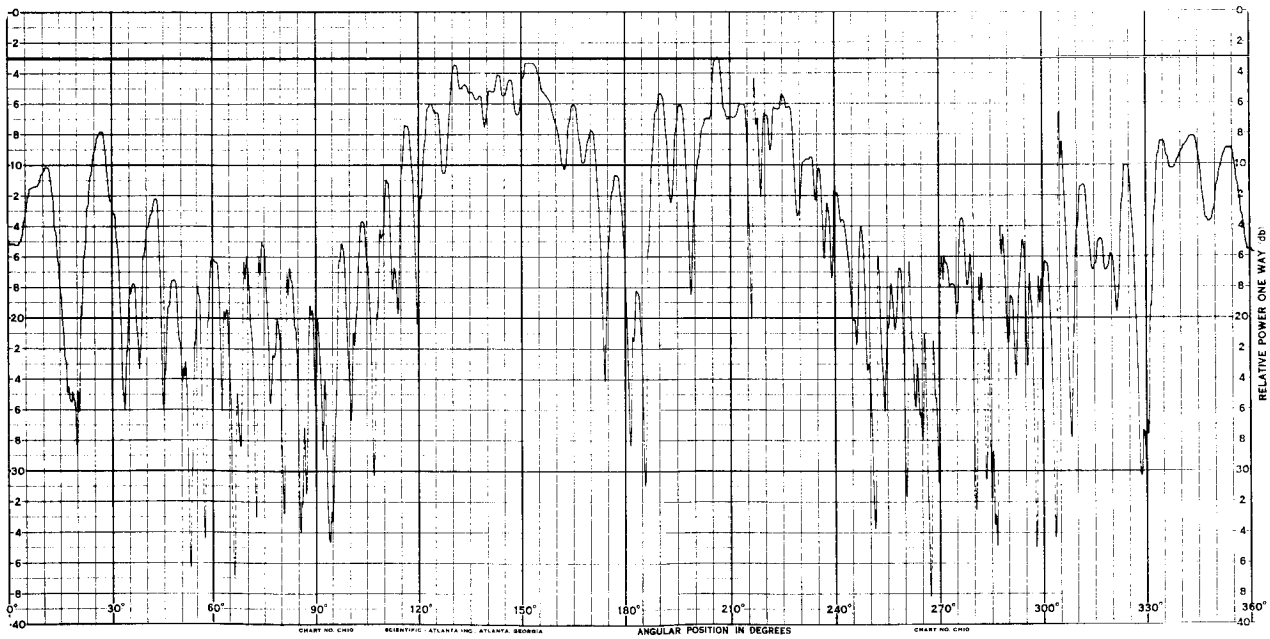
ANTENNA RADIATION PATTERN NO. 208-55

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



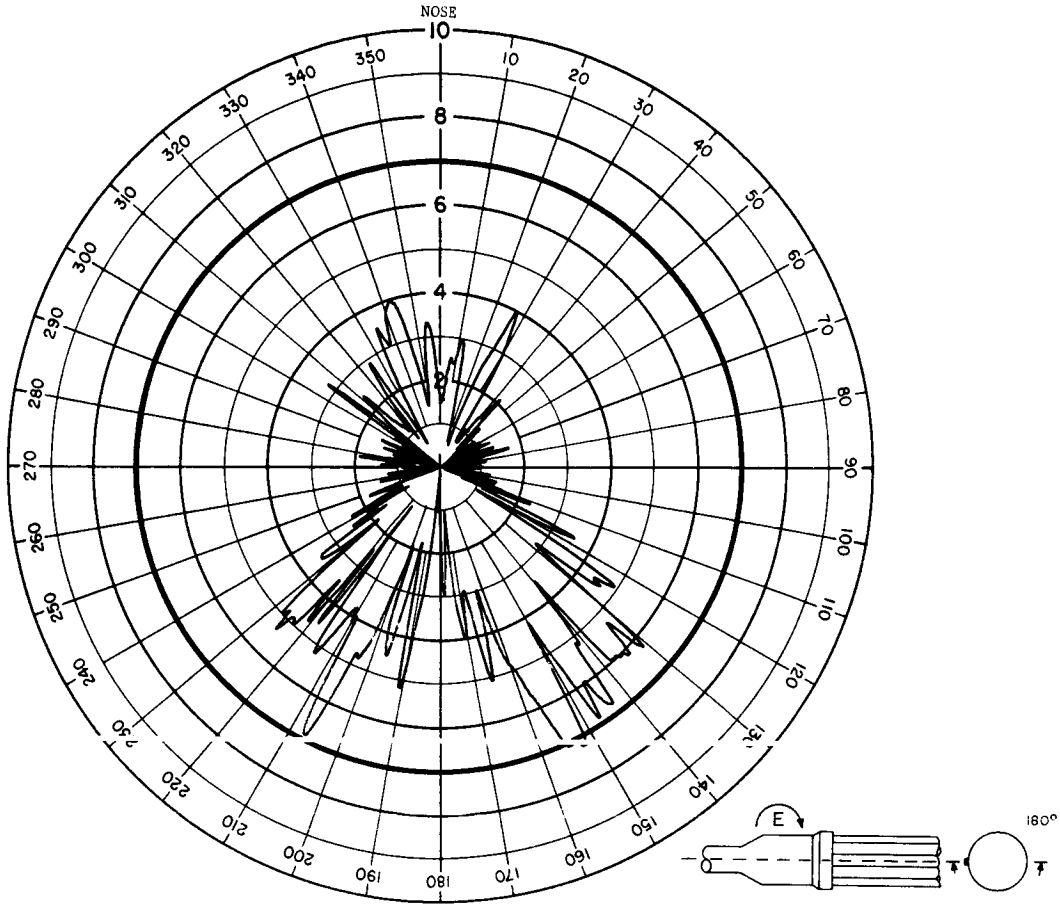


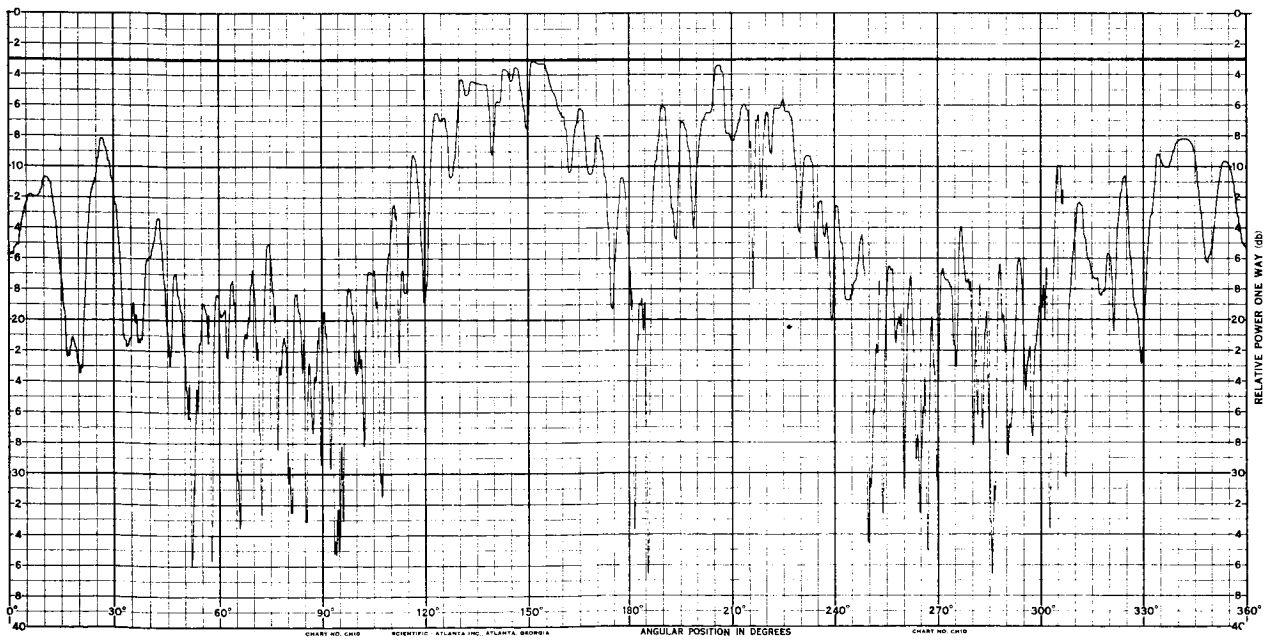
ANTENNA RADIATION PATTERN NO. 208-56

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



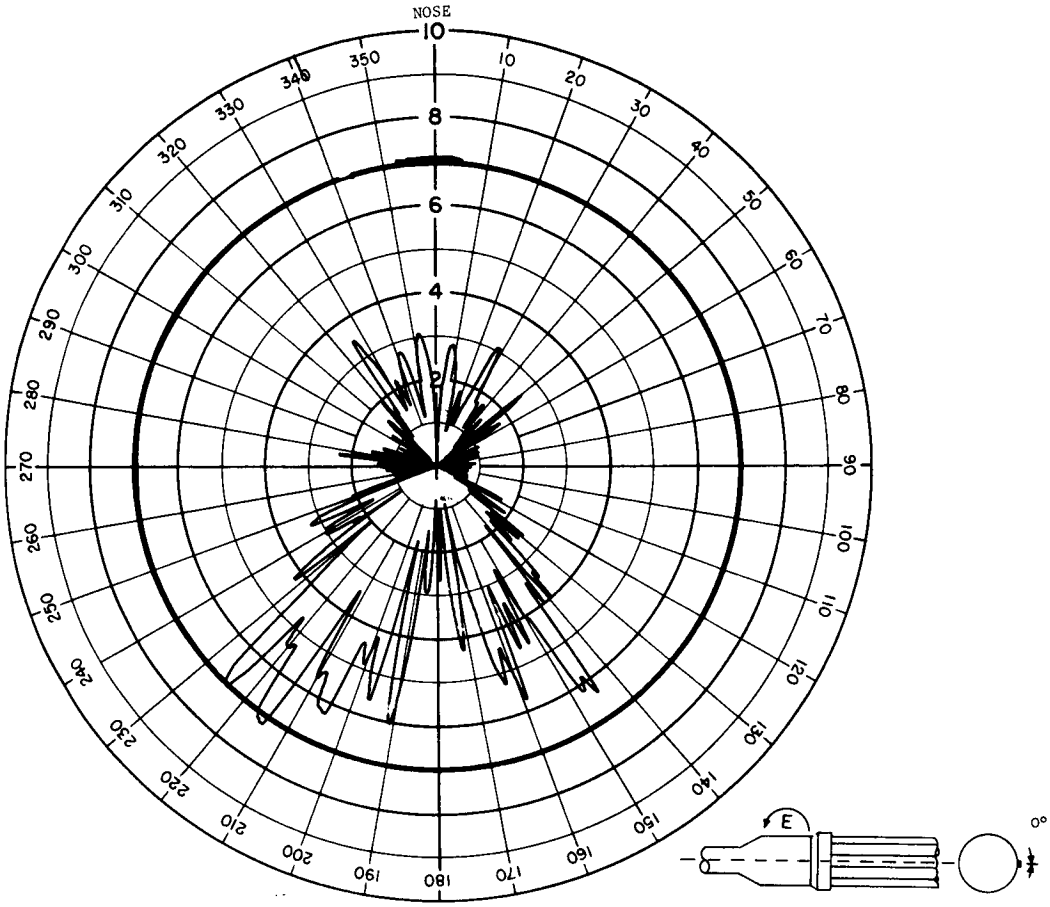


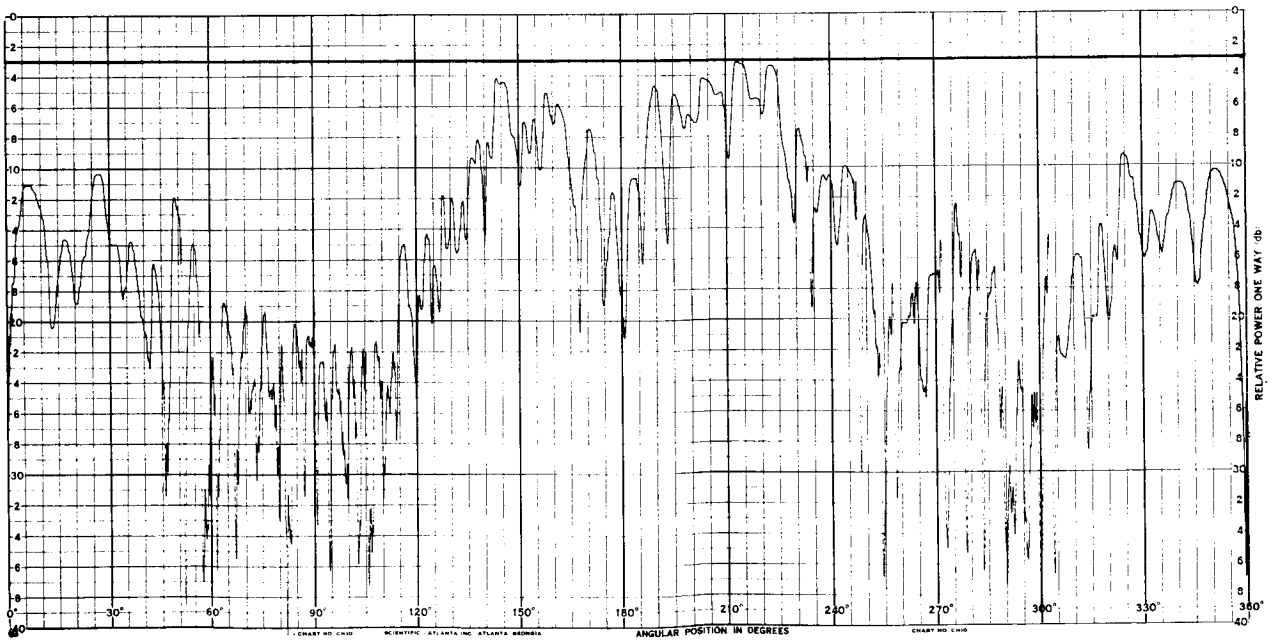
ANTENNA RADIATION PATTERN NO. 208-57

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



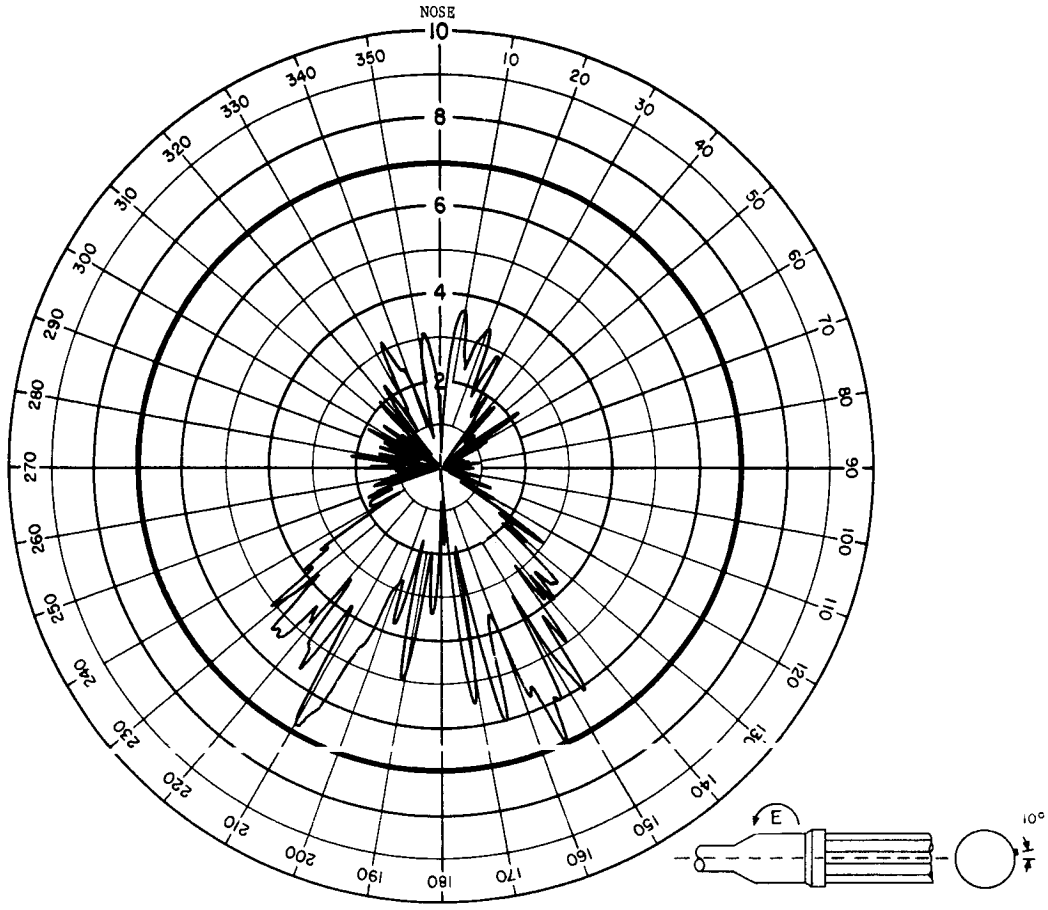


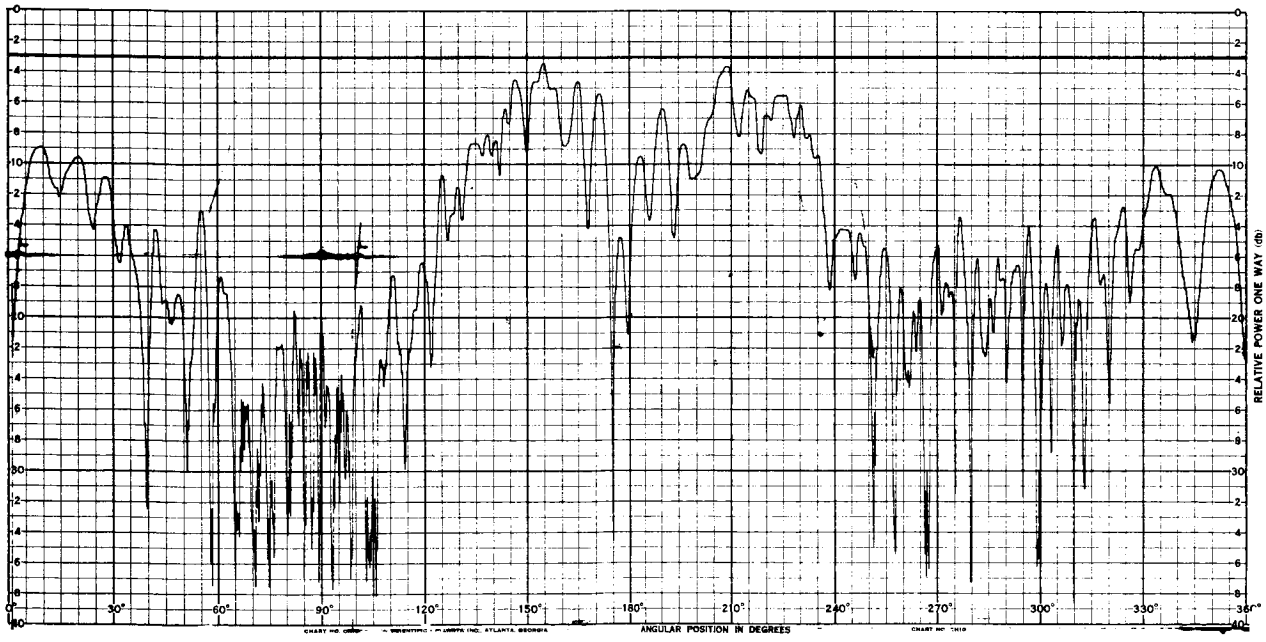
ANTENNA RADIATION PATTERN NO. 208-58

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



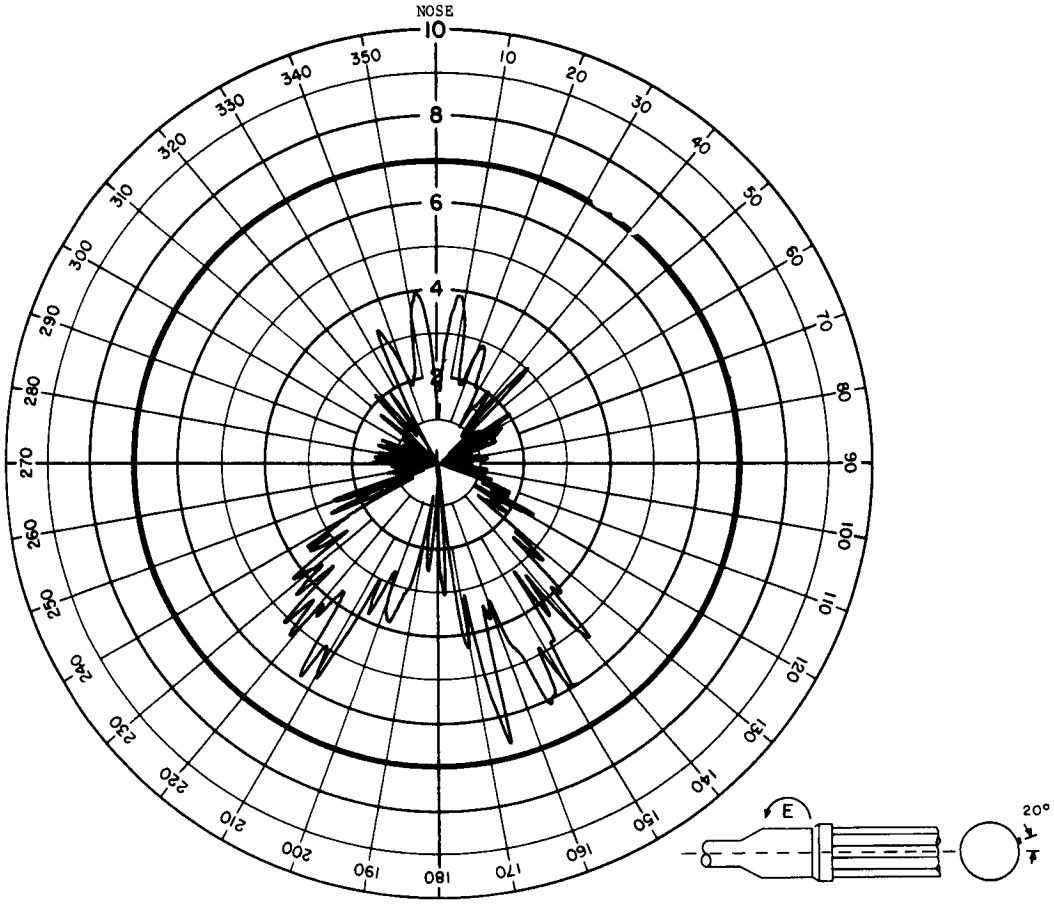


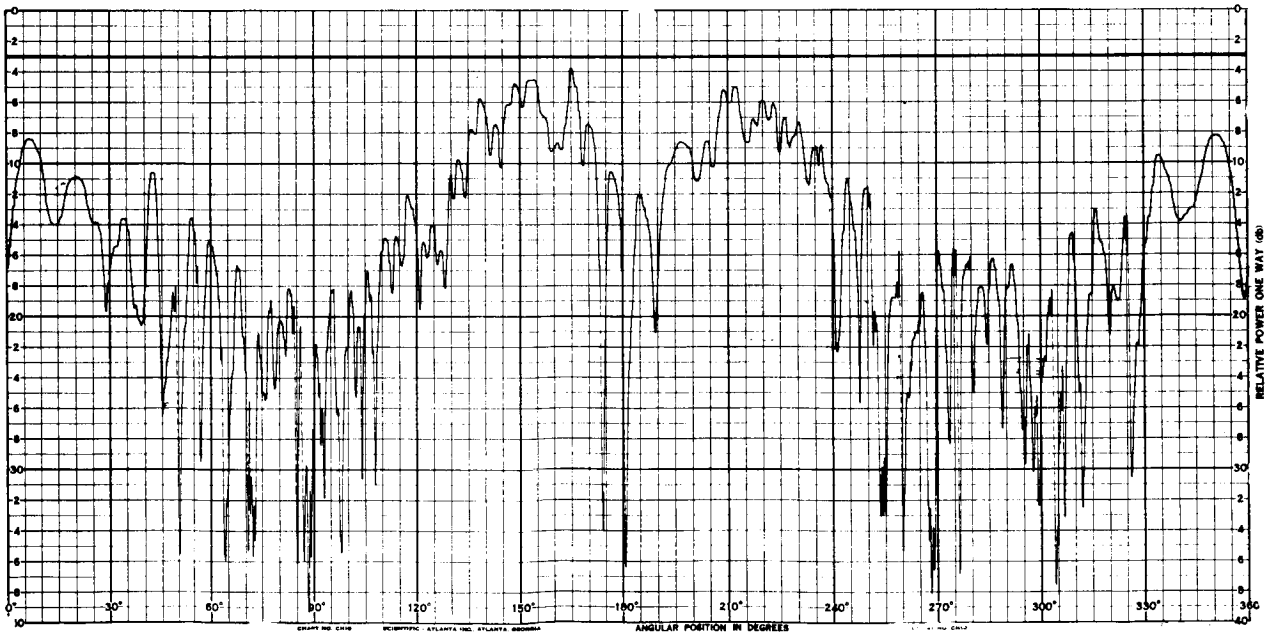
ANTENNA RADIATION PATTERN NO. 208-59

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



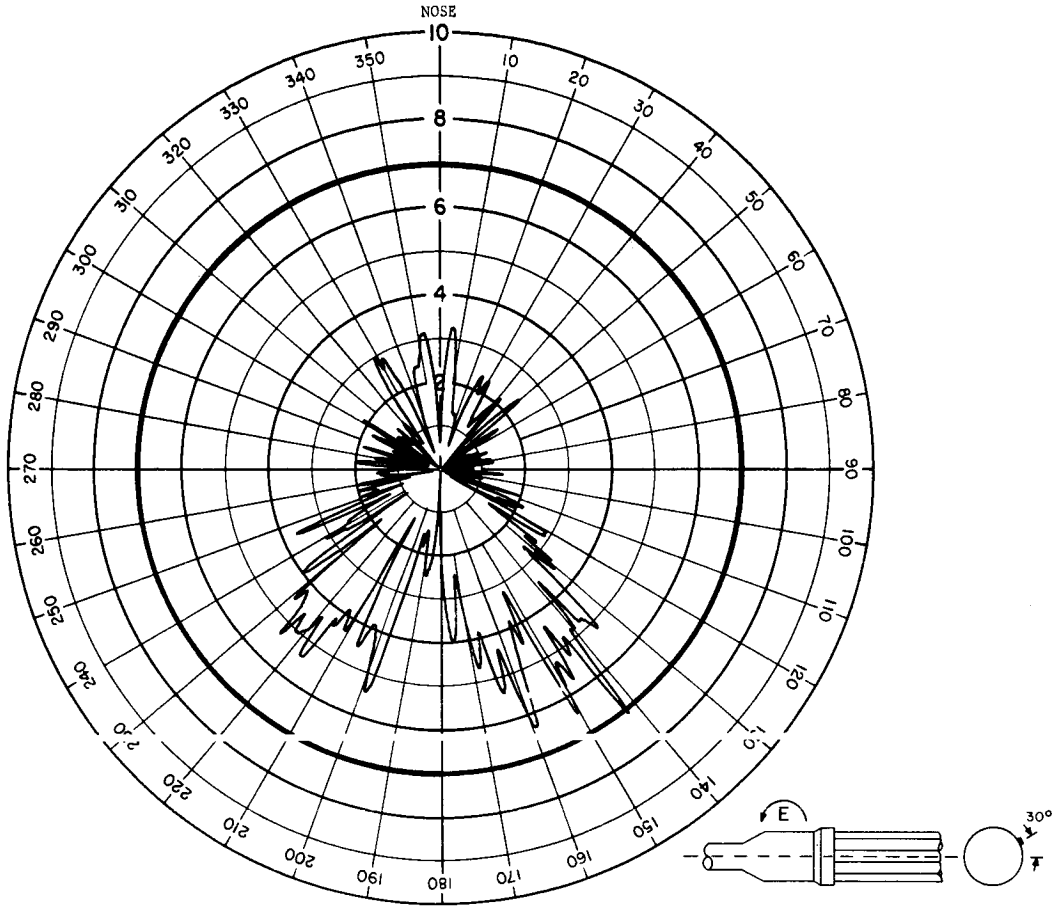


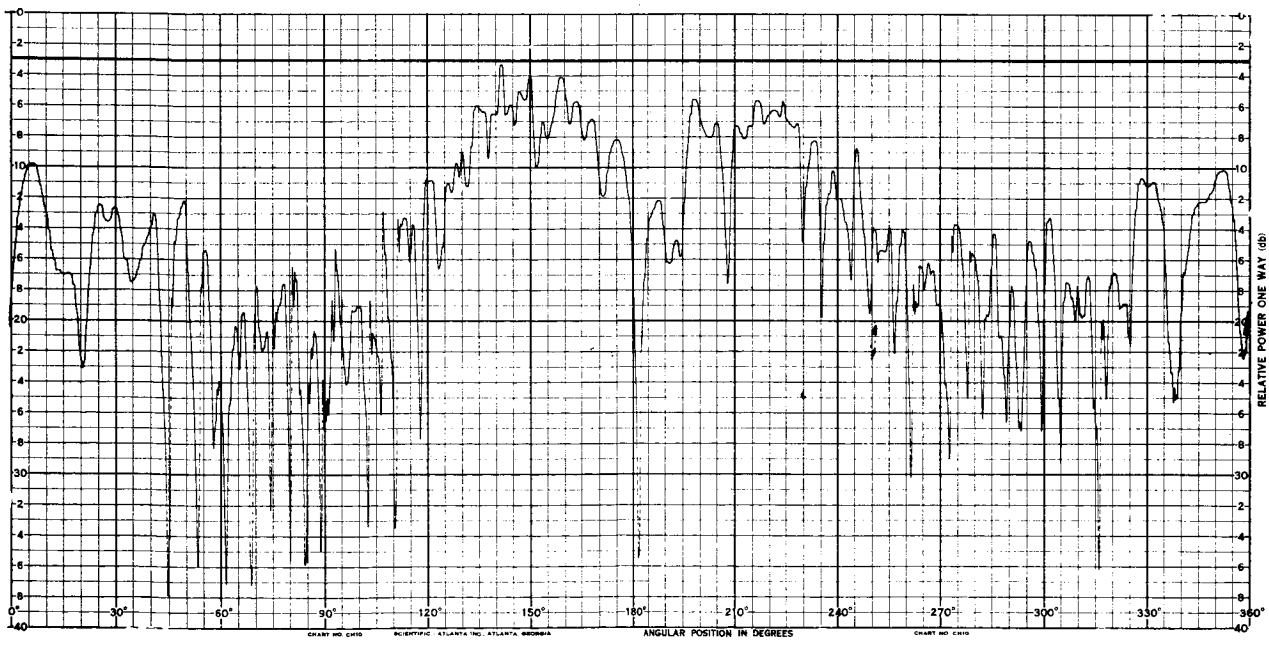
ANTENNA RADIATION PATTERN NO. 208-60

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



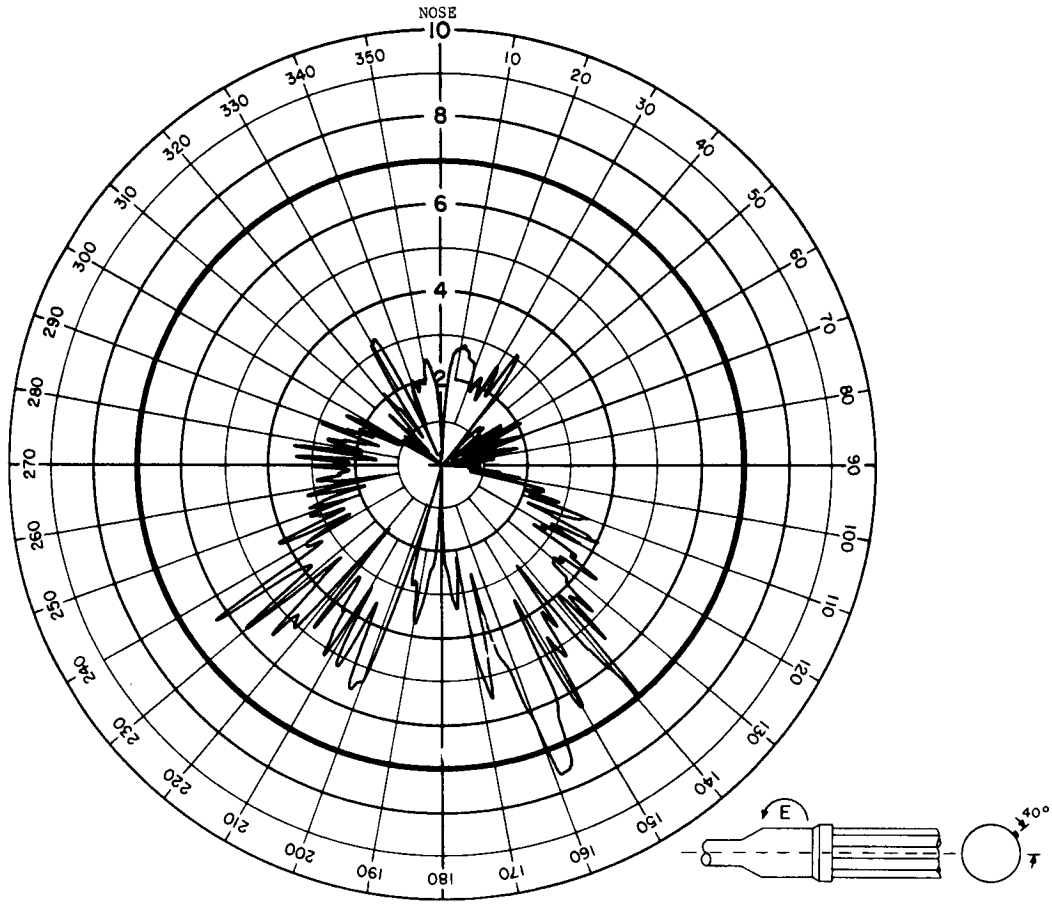


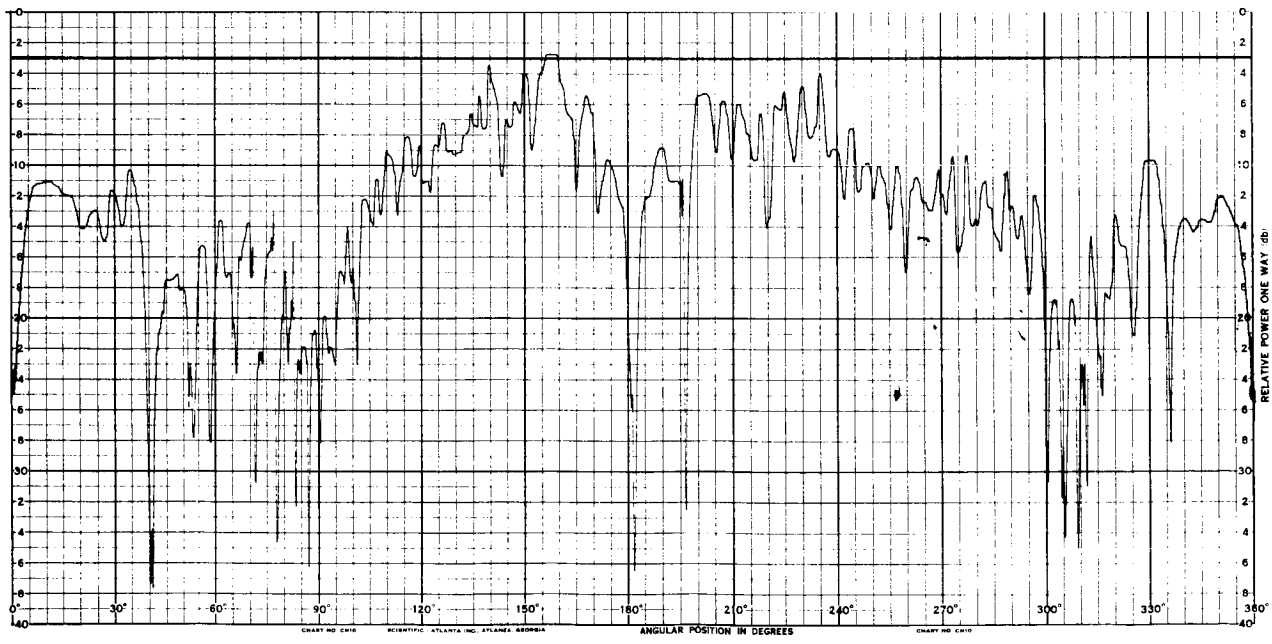
ANTENNA RADIATION PATTERN NO. 208-61

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III



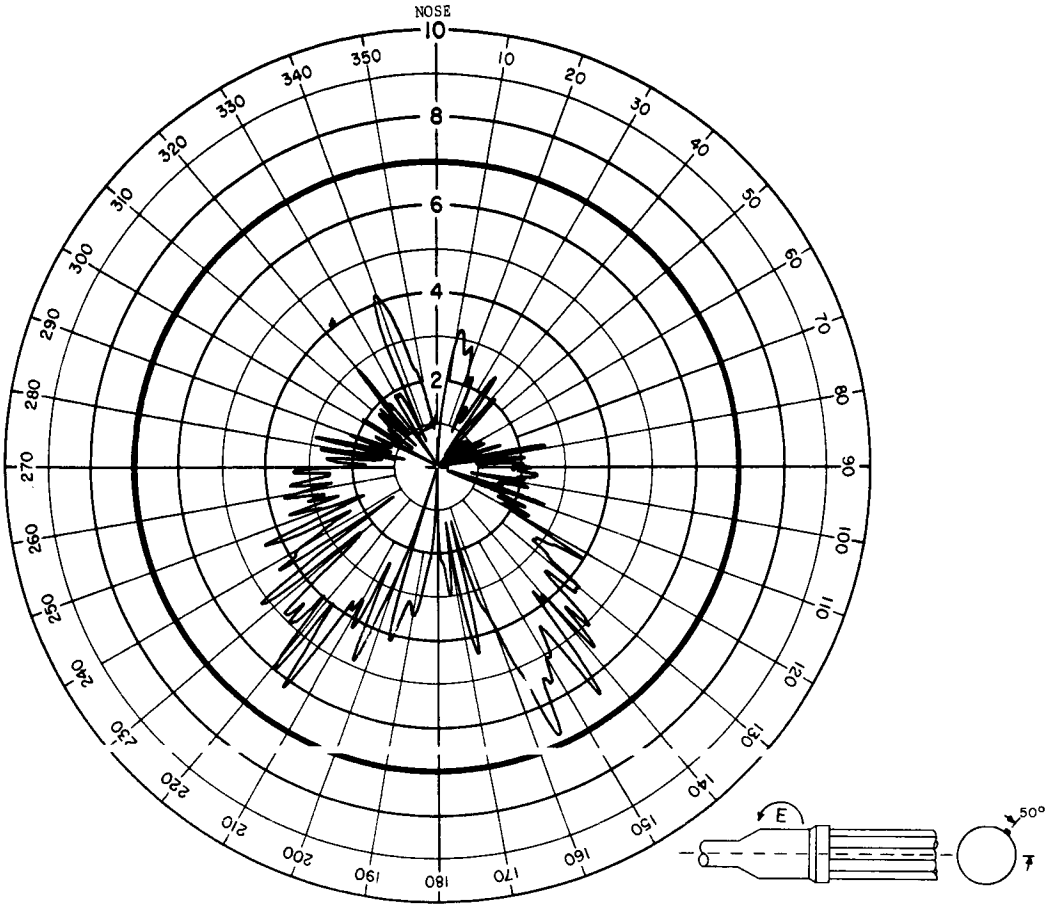


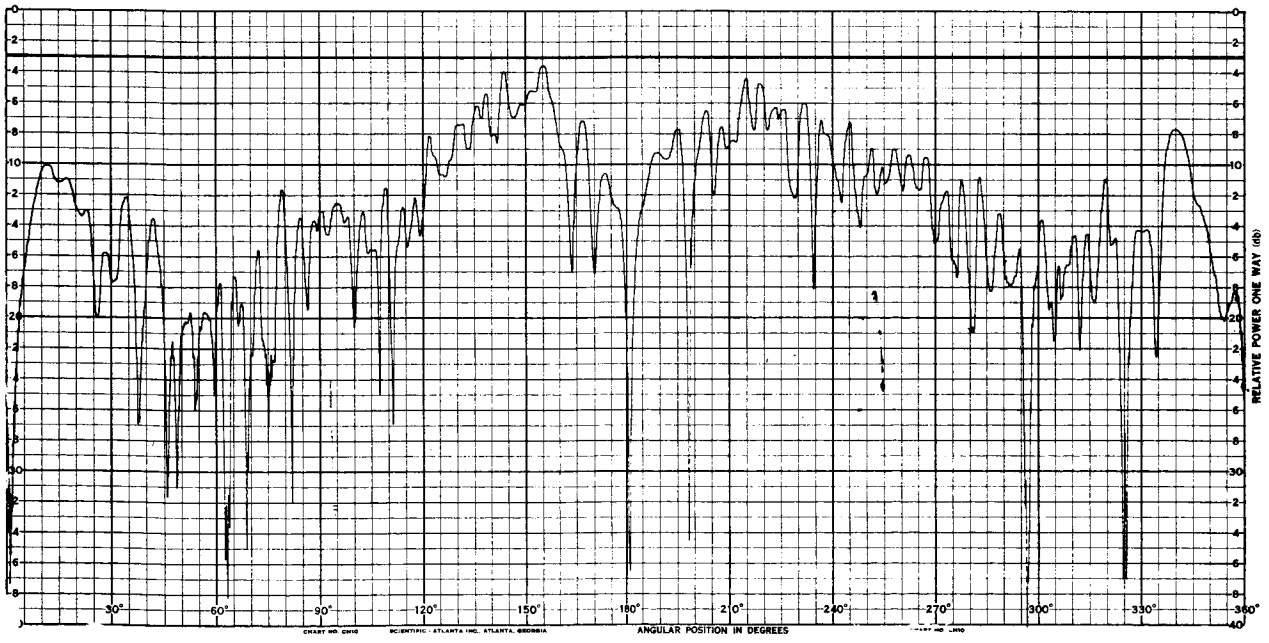
ANTENNA RADIATION PATTERN NO. 208-62

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III





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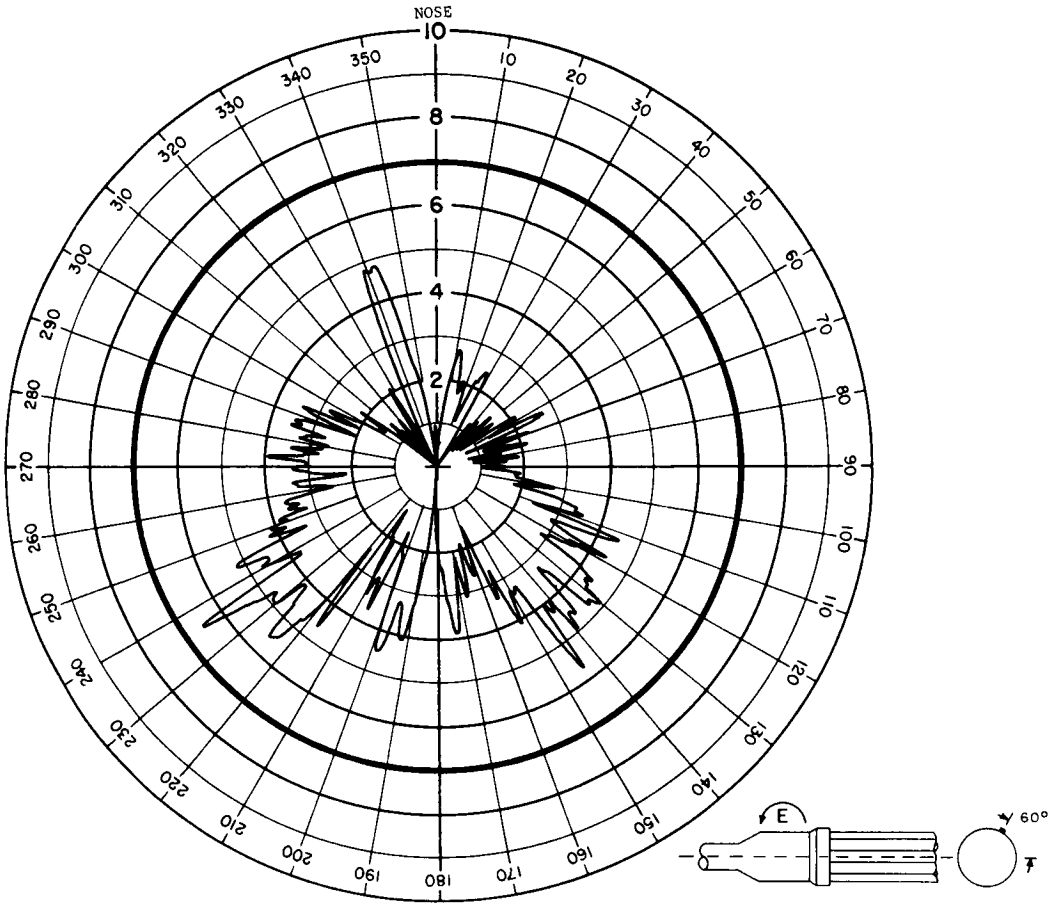
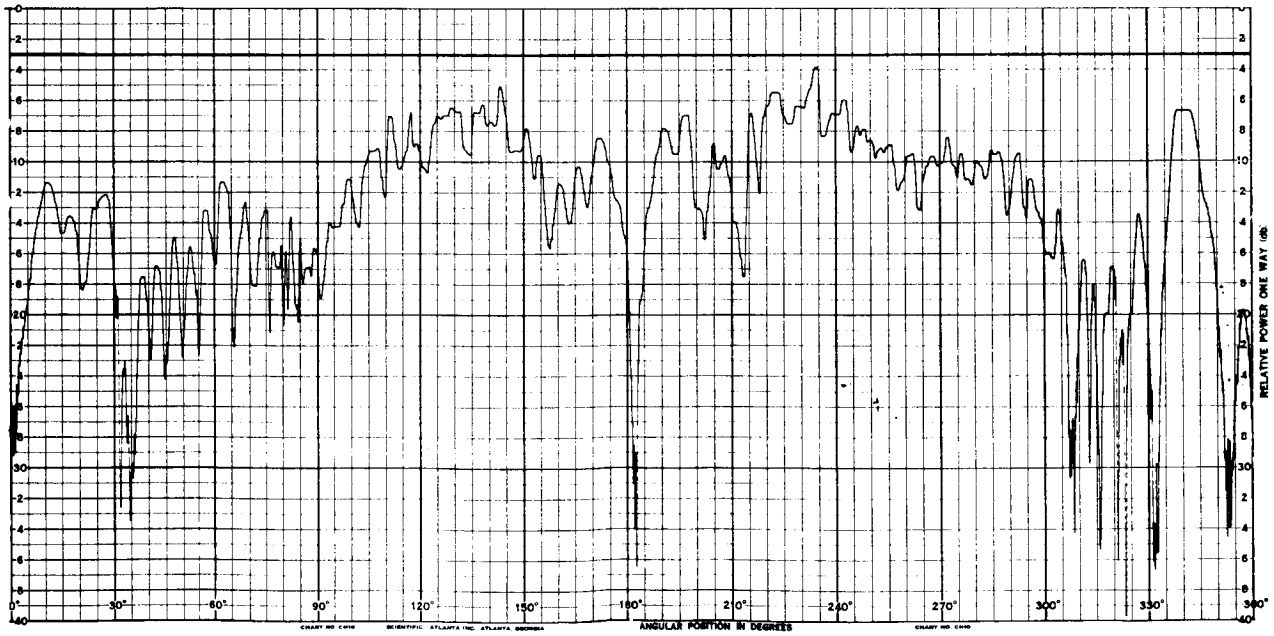
SYSTEM III





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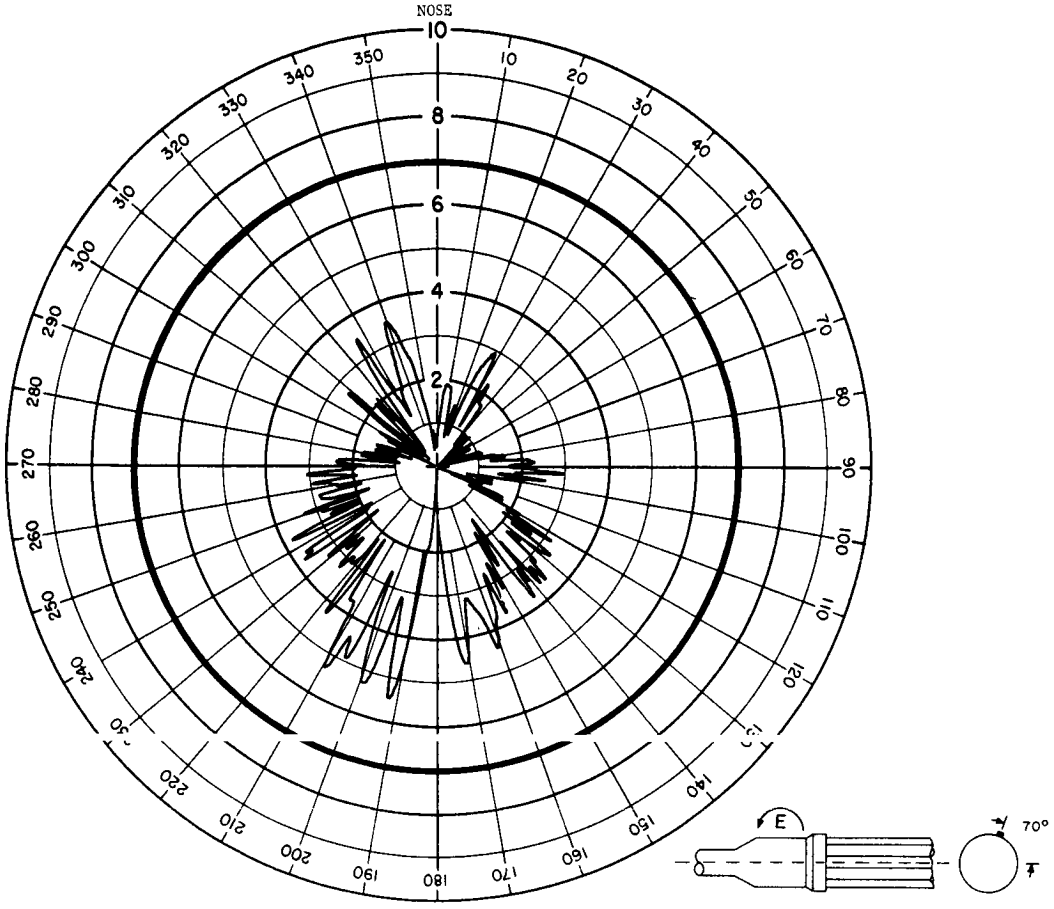

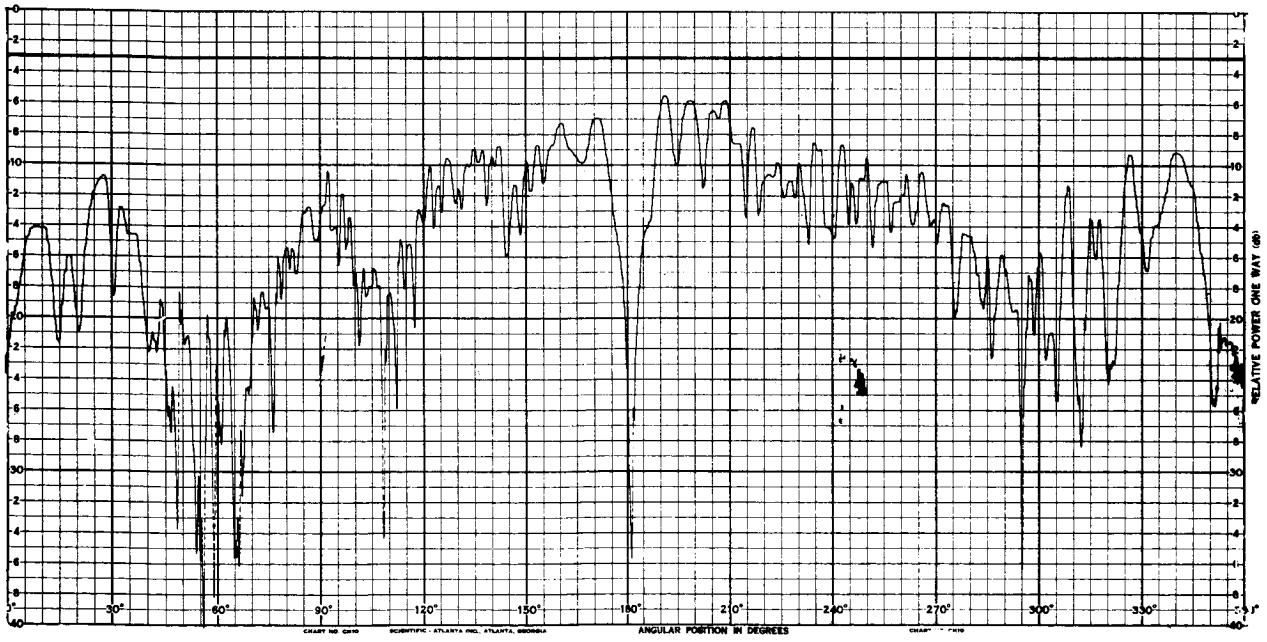

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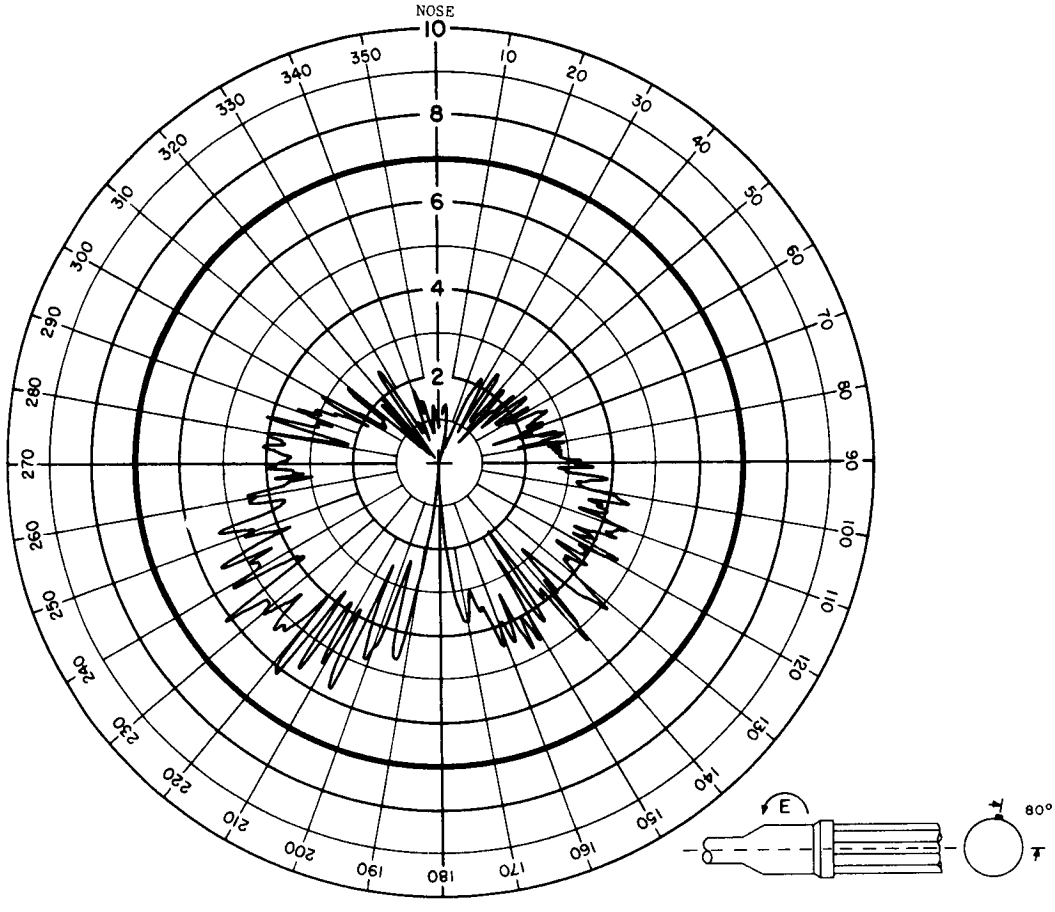
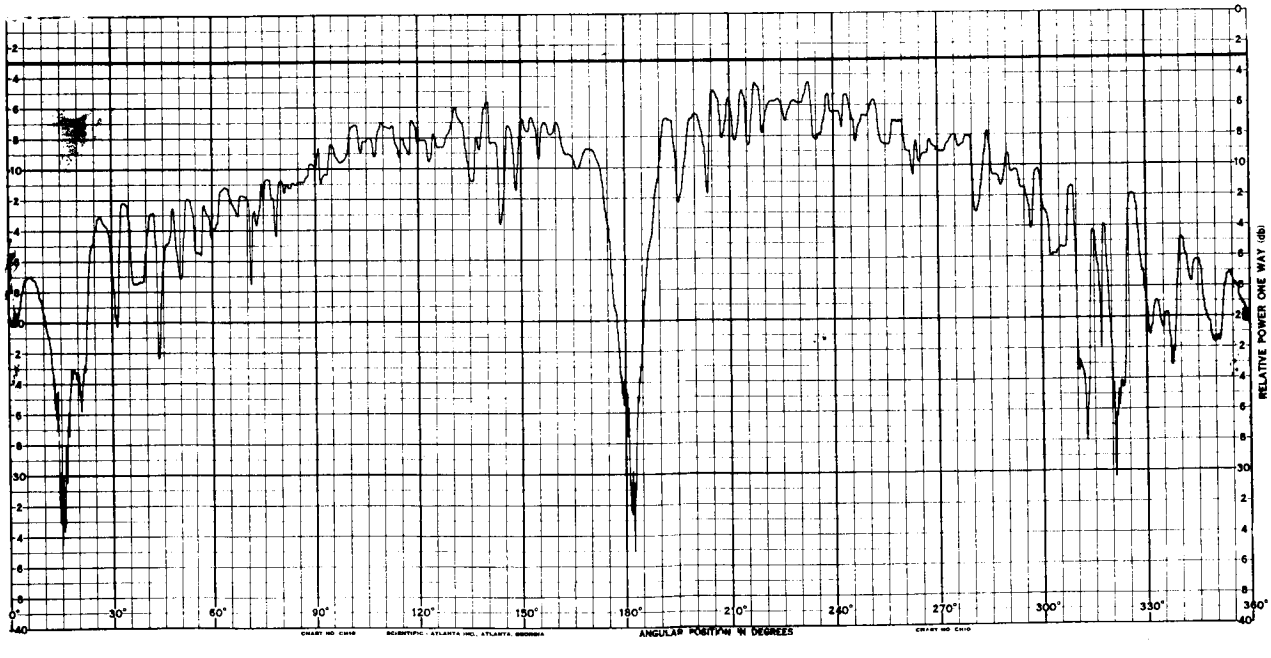
SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III





ANTENNA RADIATION PATTERN NO. 208-66

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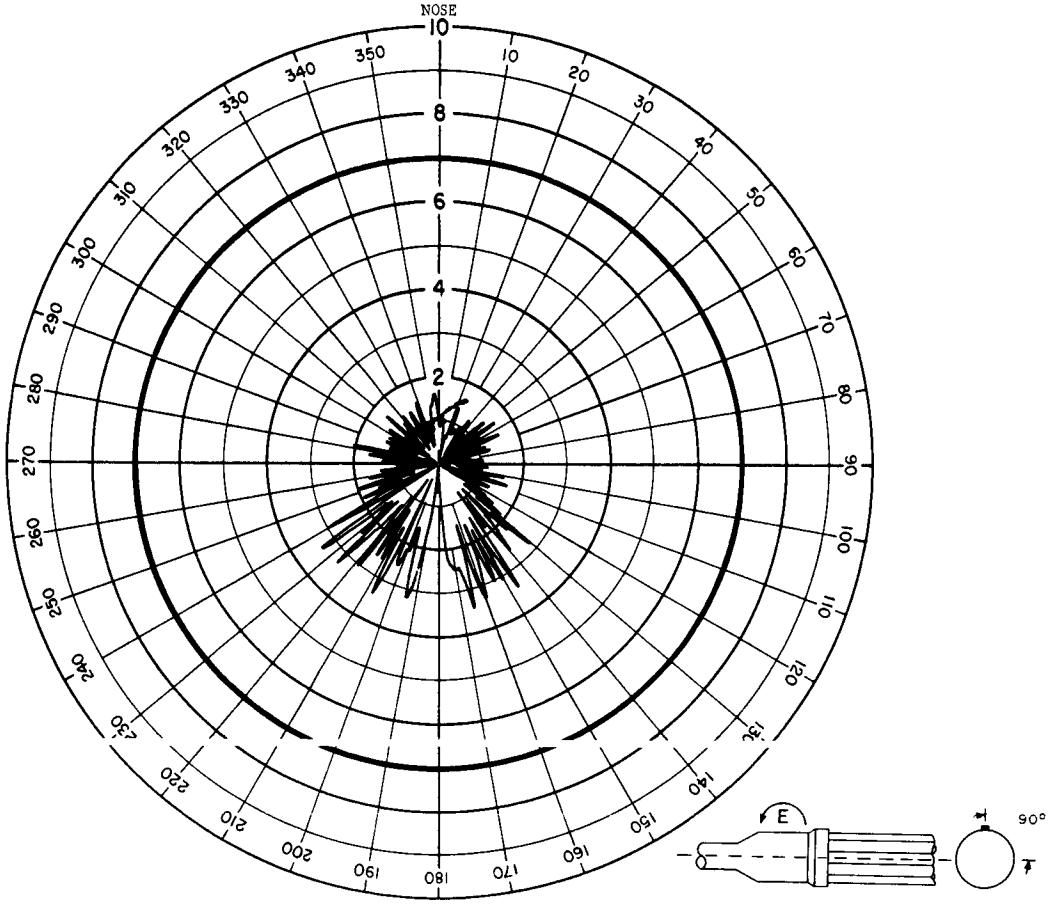
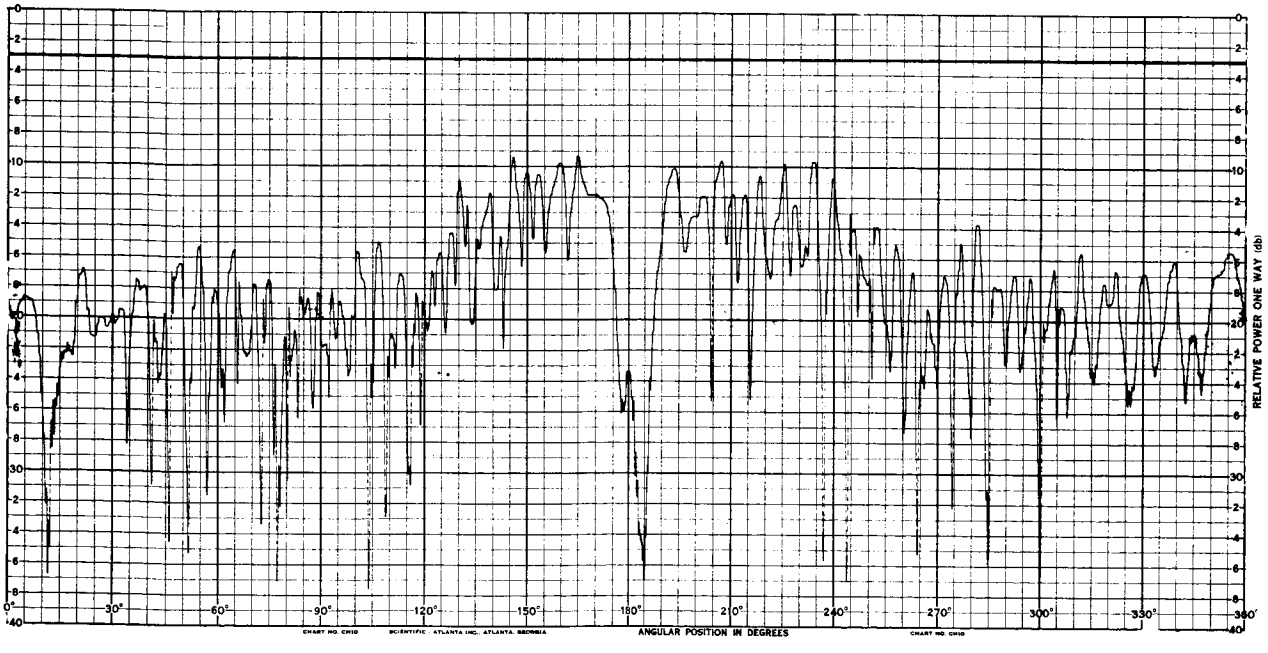
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III





ANTENNA RADIATION PATTERN NO. 208-67

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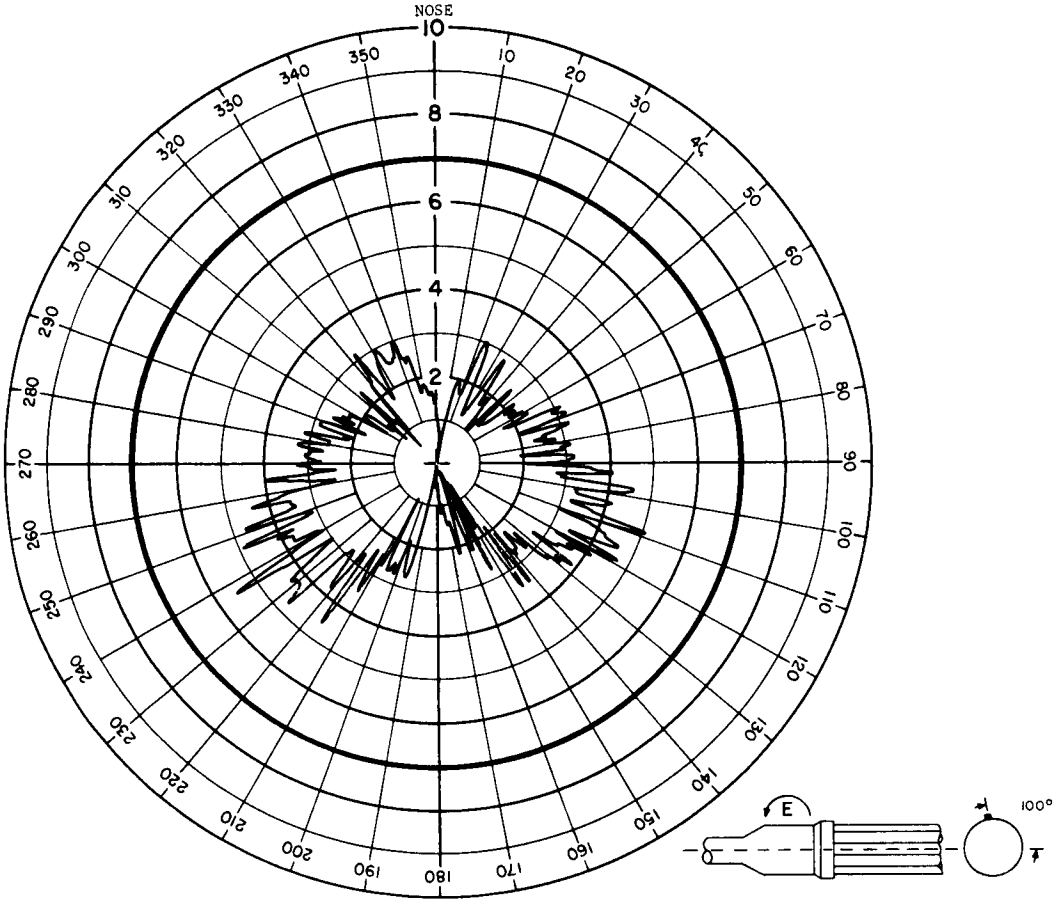
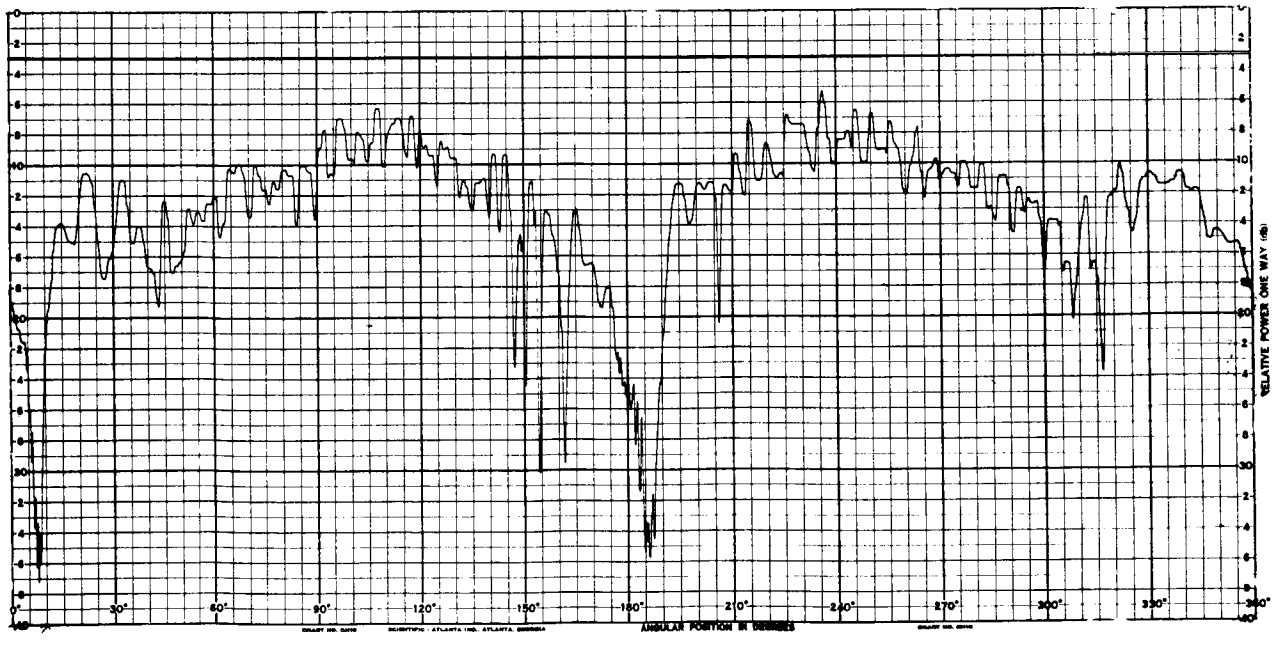
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III





ANTENNA RADIATION PATTERN NO. 208-68

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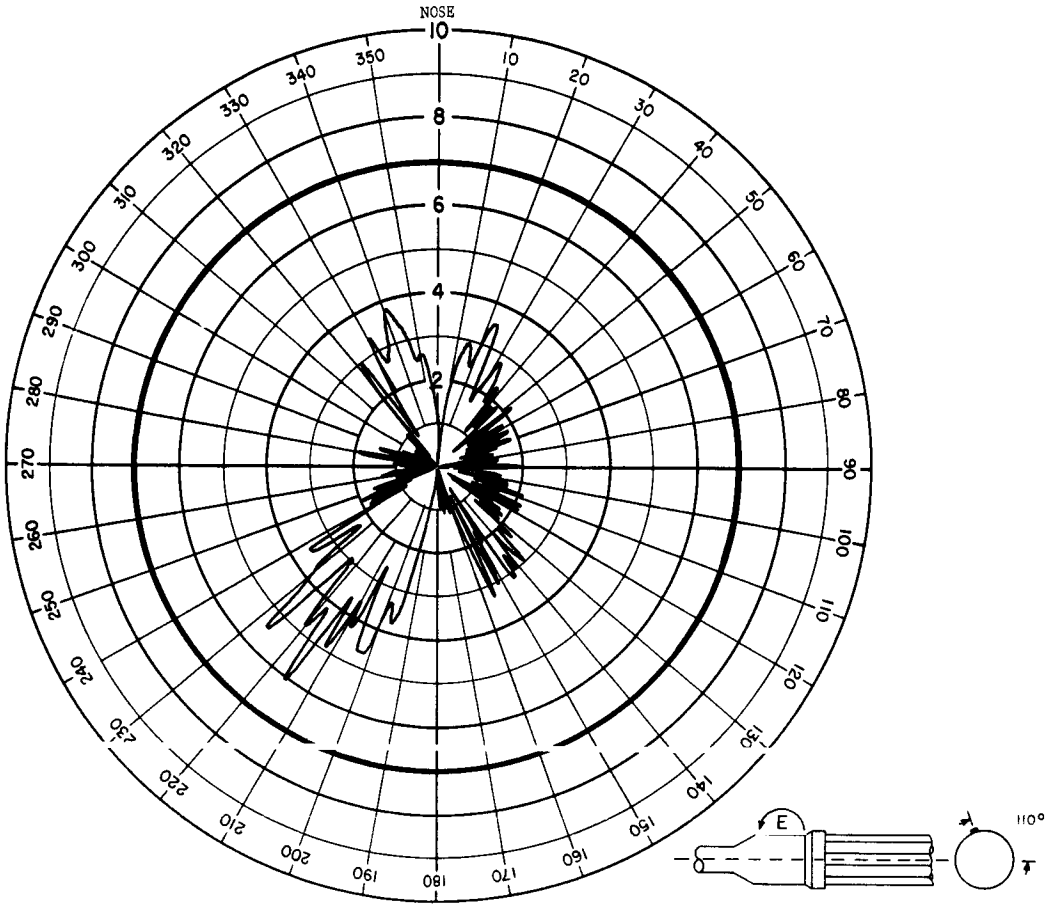
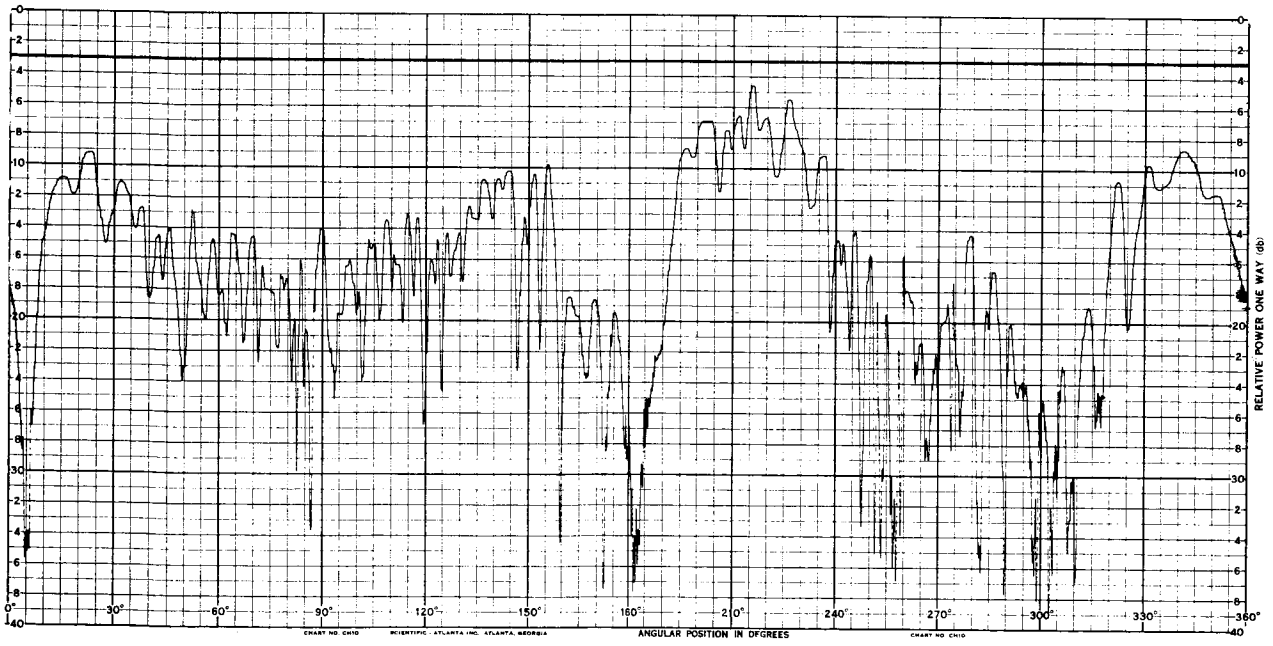
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III





ANTENNA RADIATION PATTERN NO. 208-69

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TECHNICAL DATA UNIT

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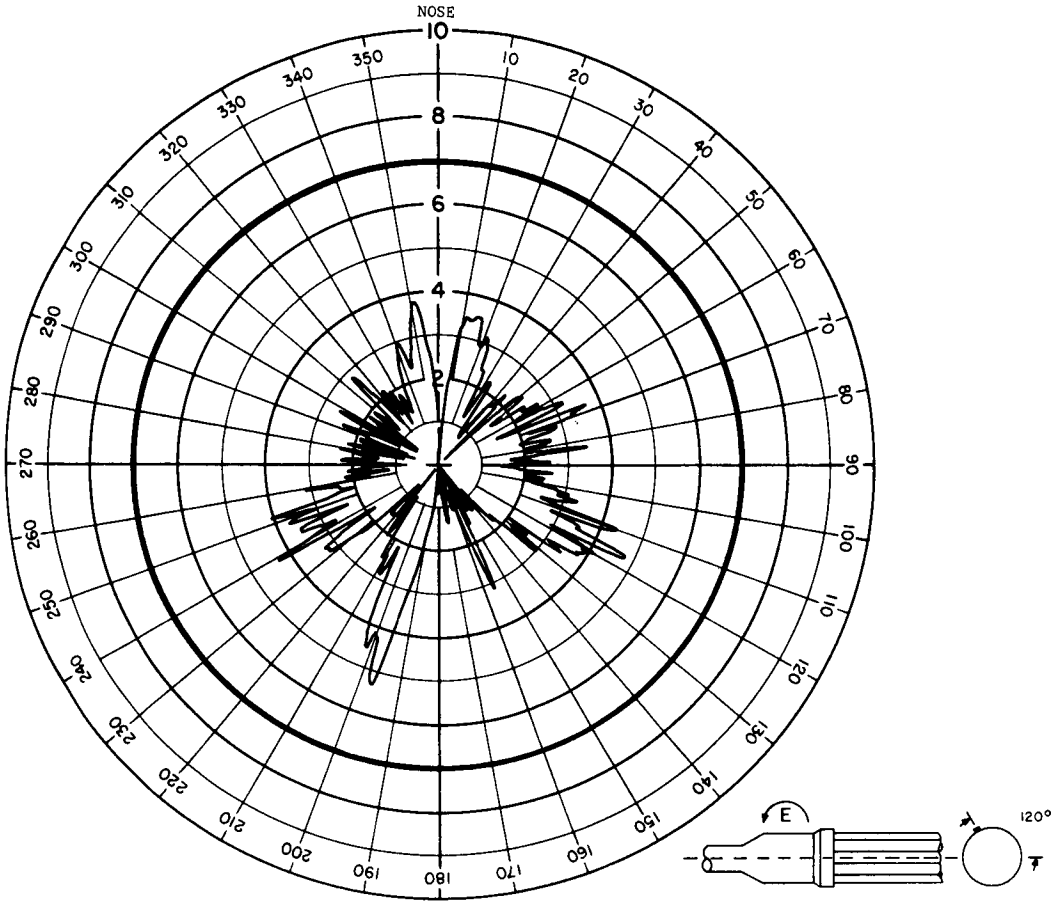
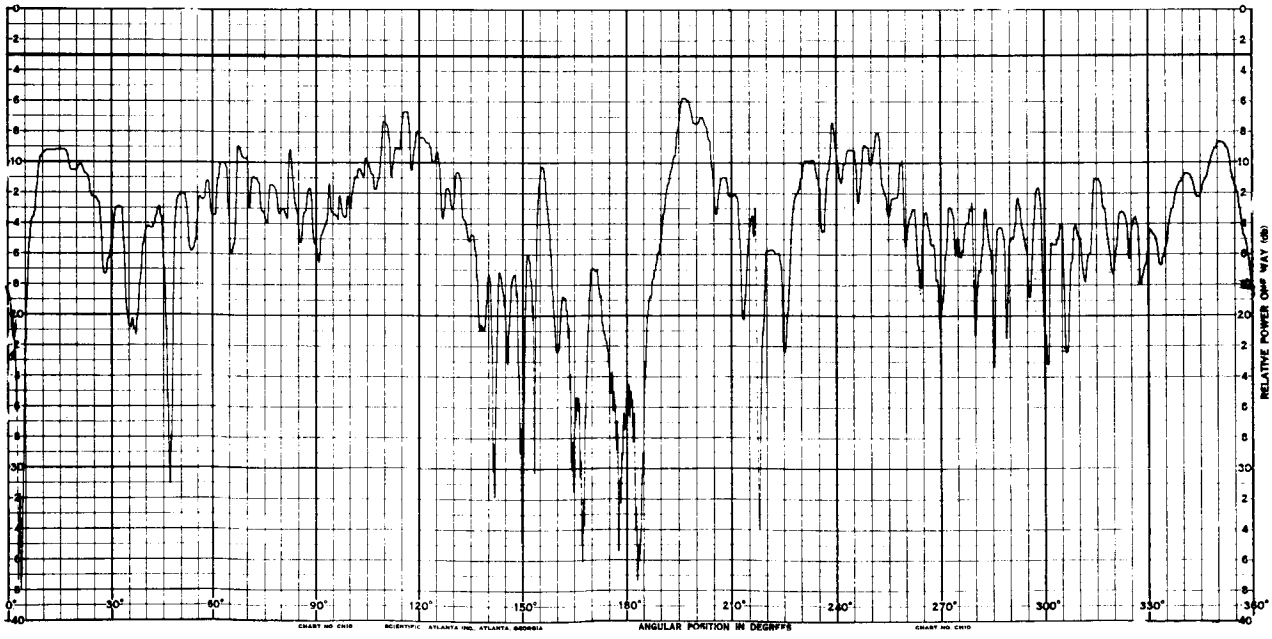
SYSTEM III





ANTENNA RADIATION PATTERN NO. 208-70

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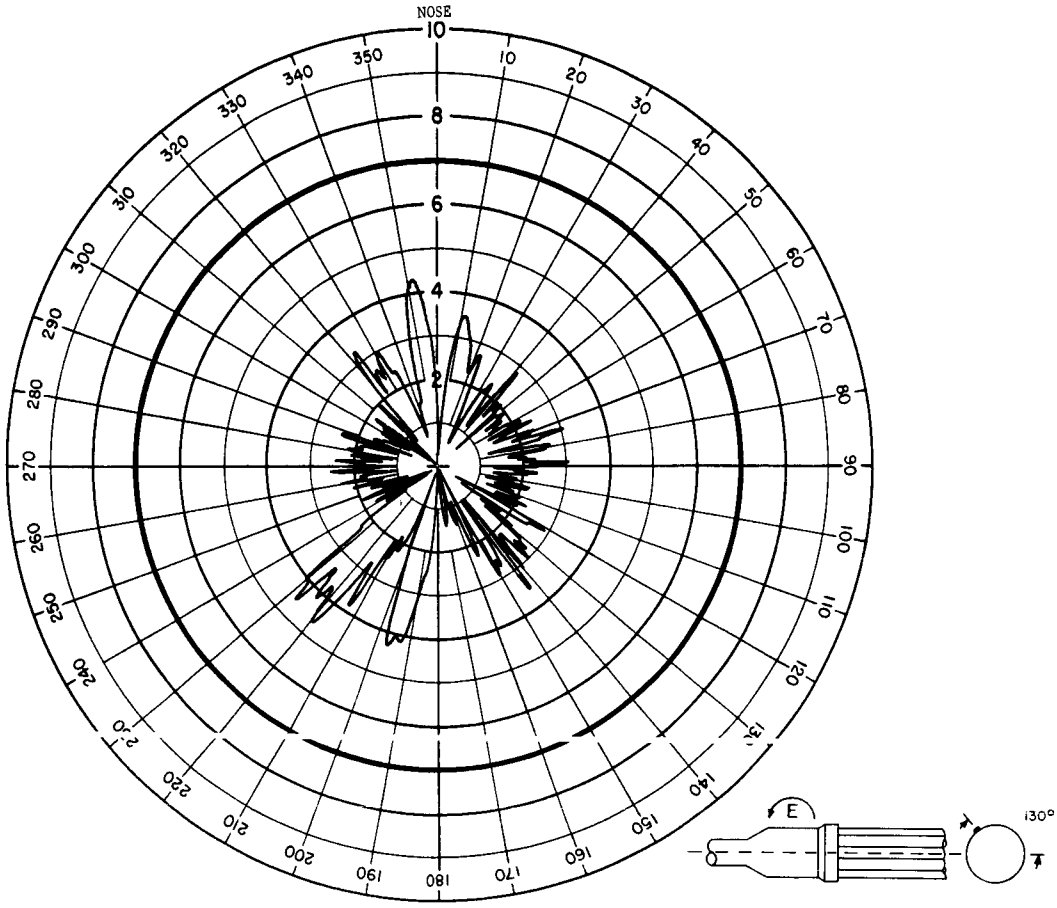
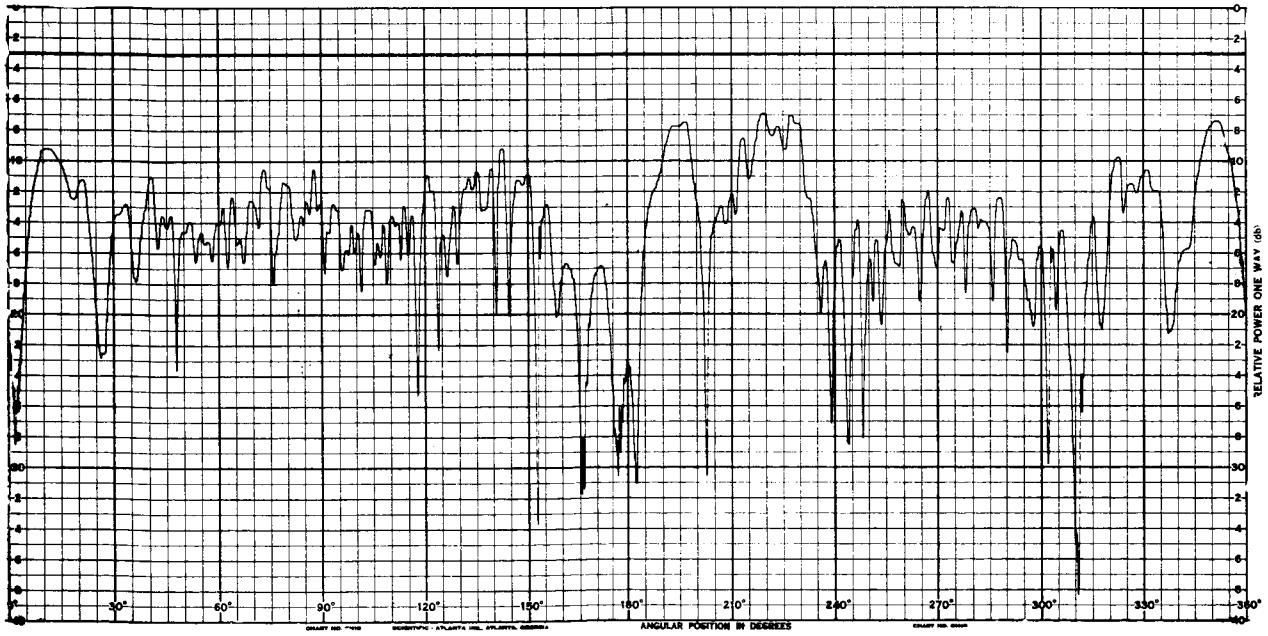
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

SYSTEM III





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TECHNICAL DATA UNIT

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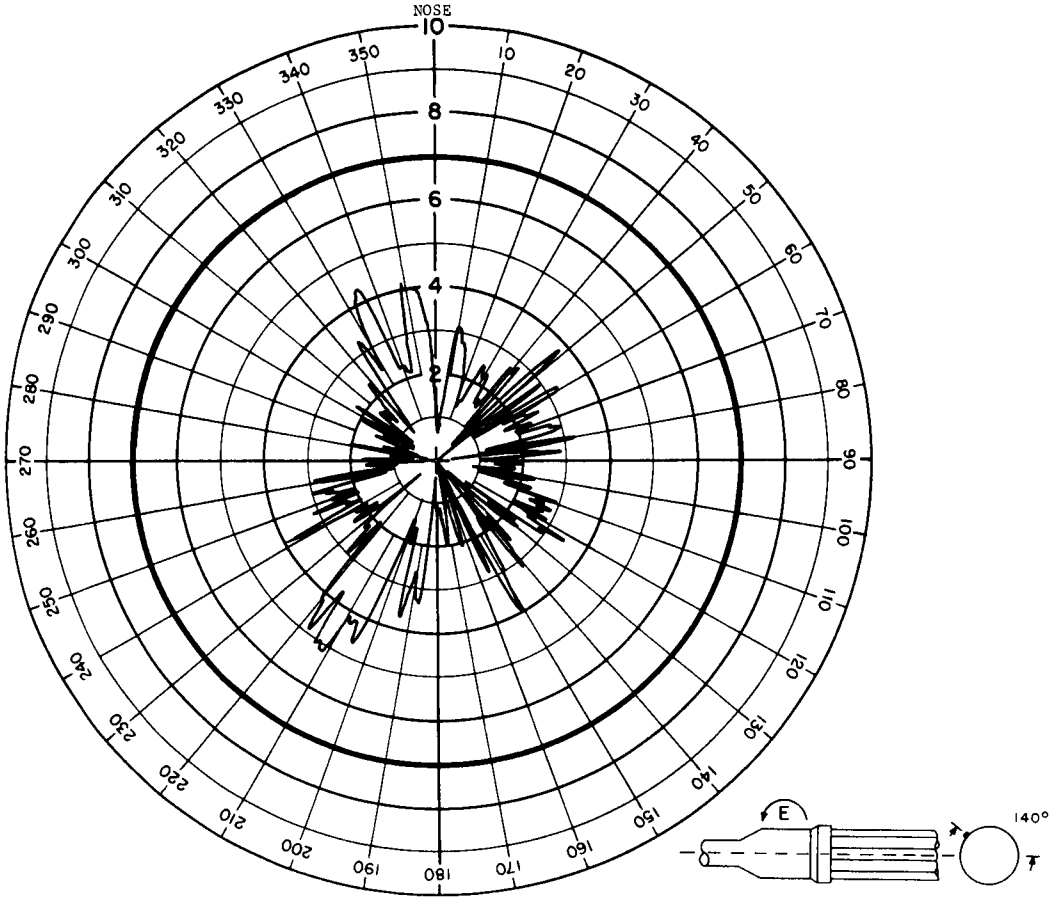
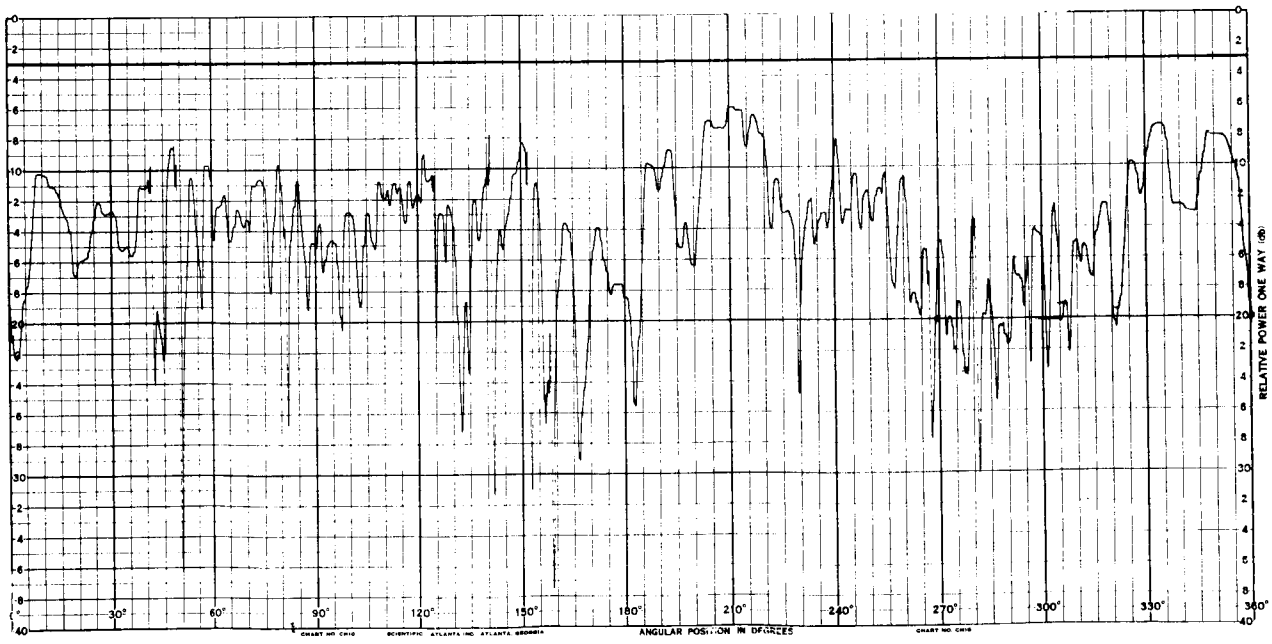
SYSTEM III





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TECHNICAL DATA UNIT

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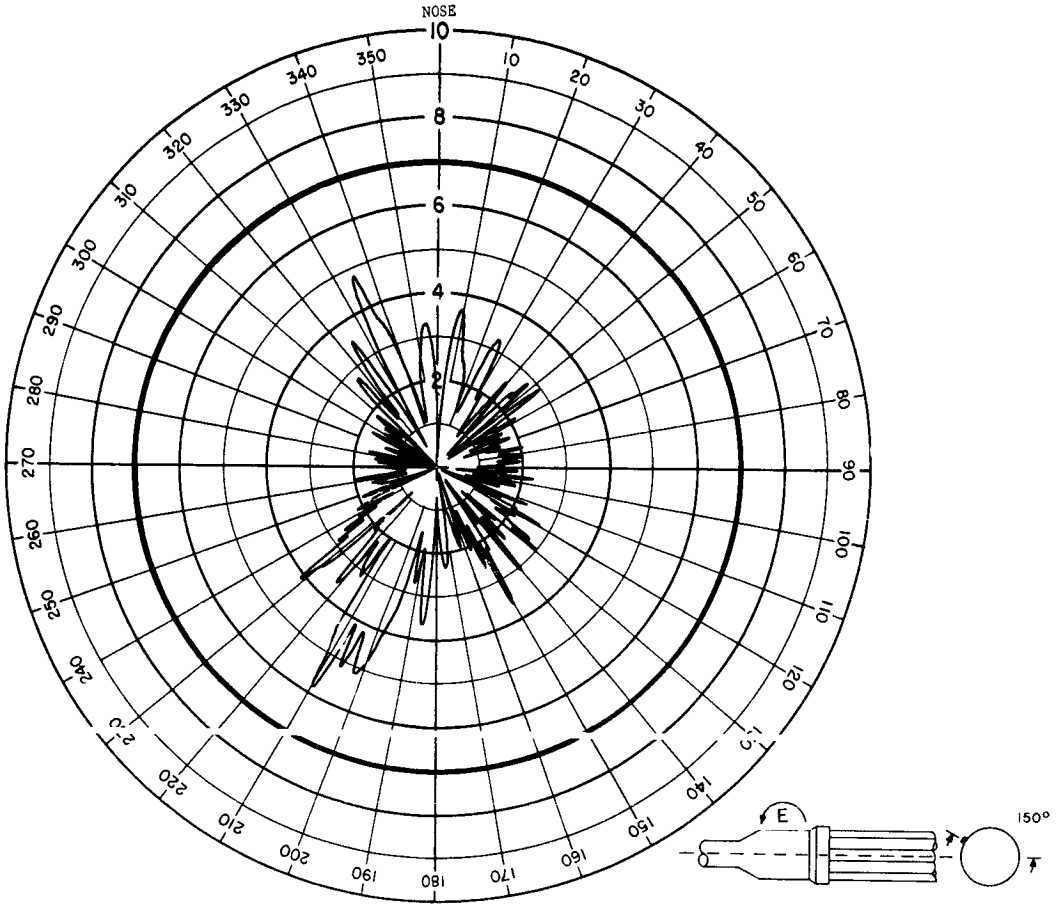
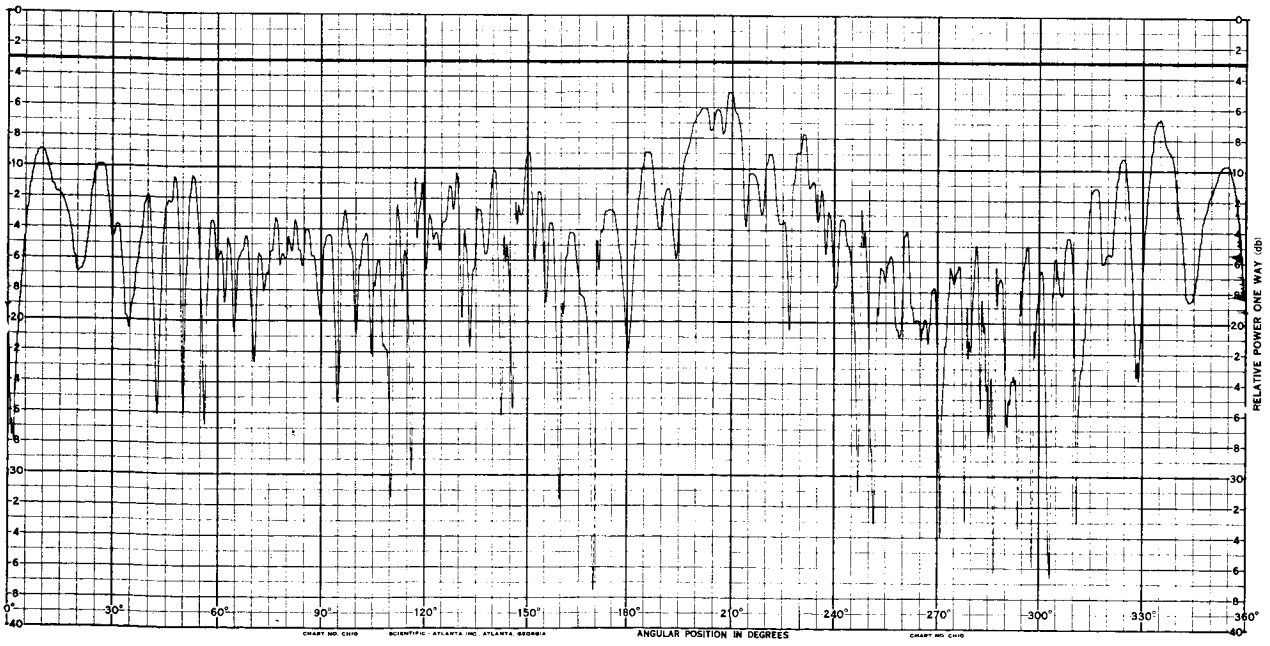
SYSTEM III





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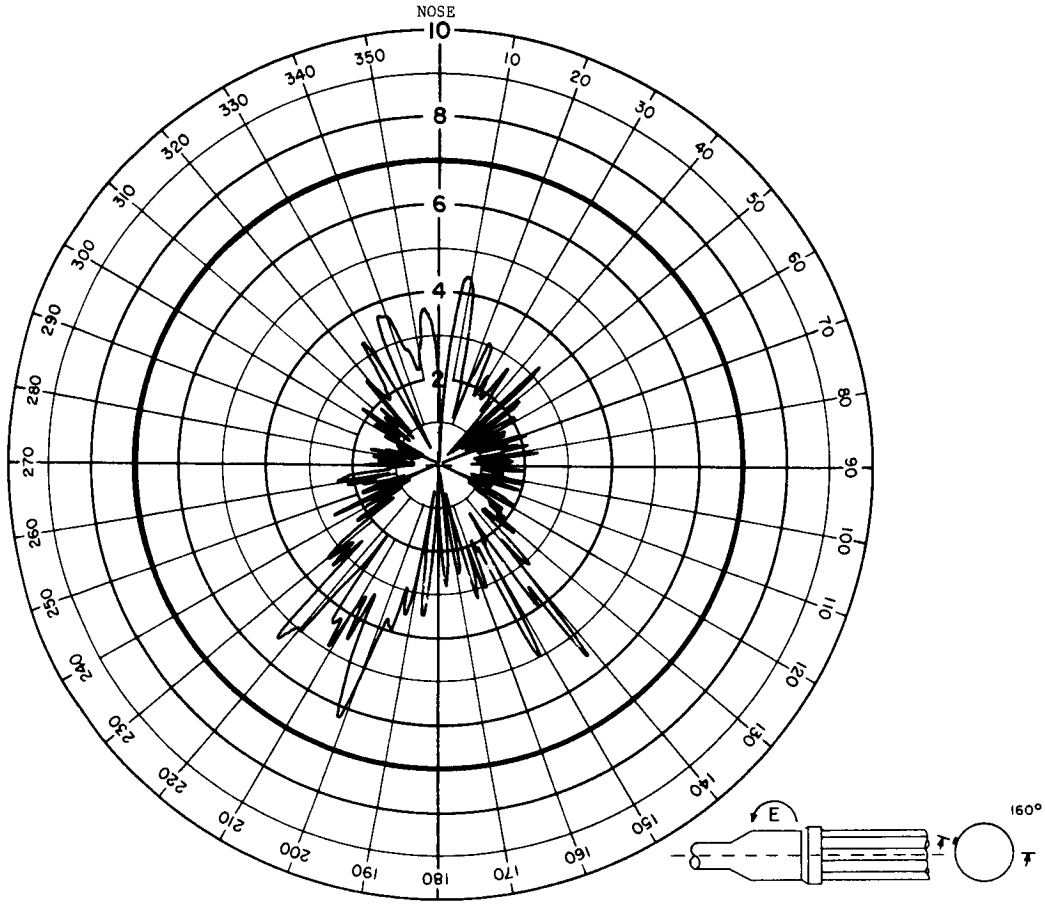
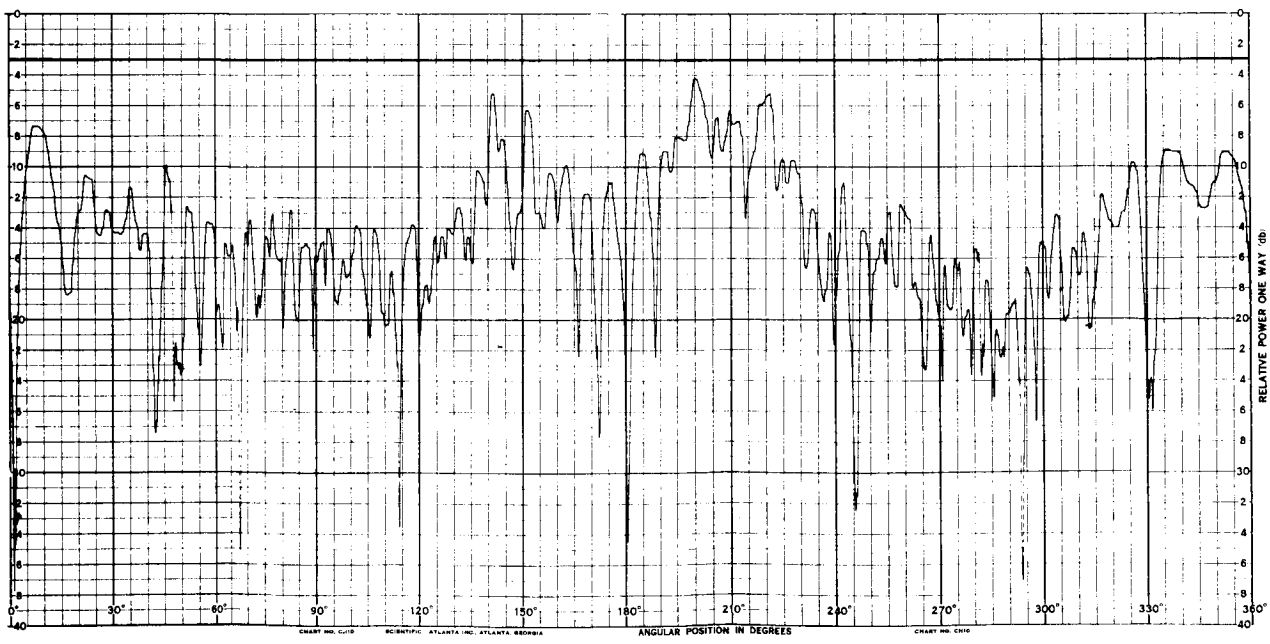
SYSTEM III





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ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

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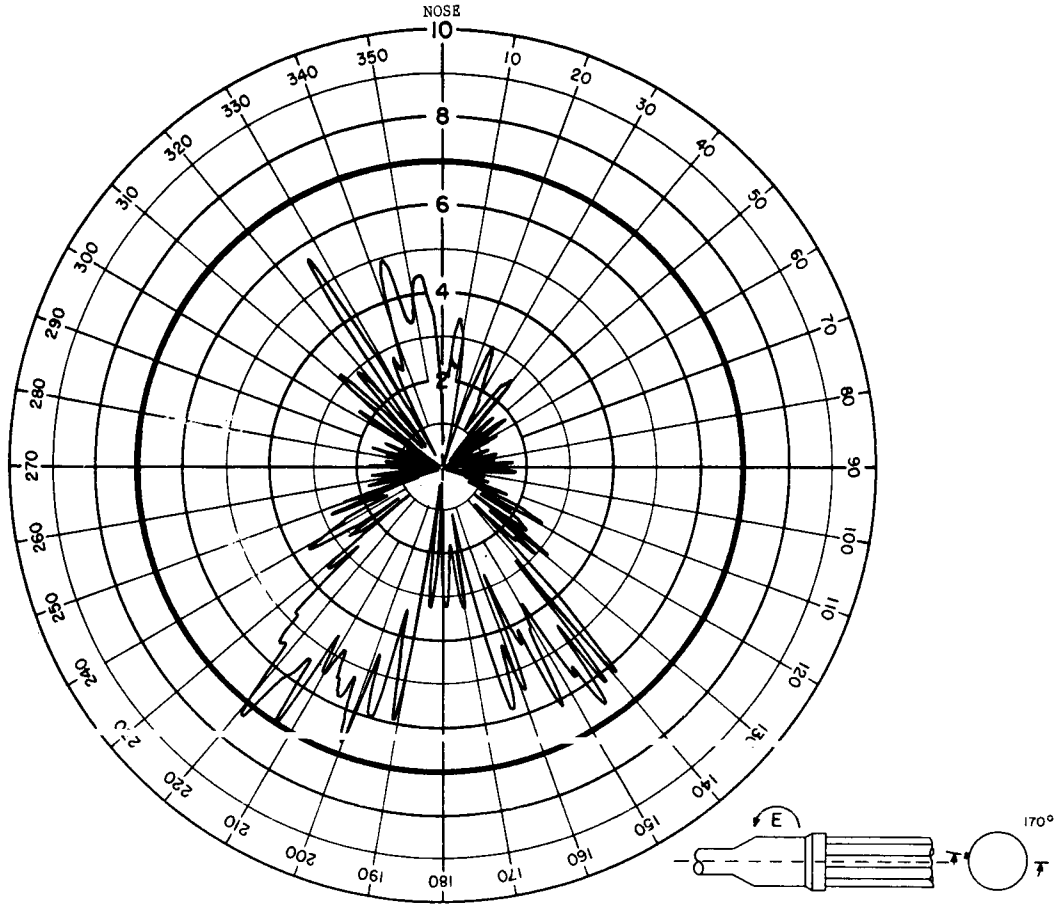
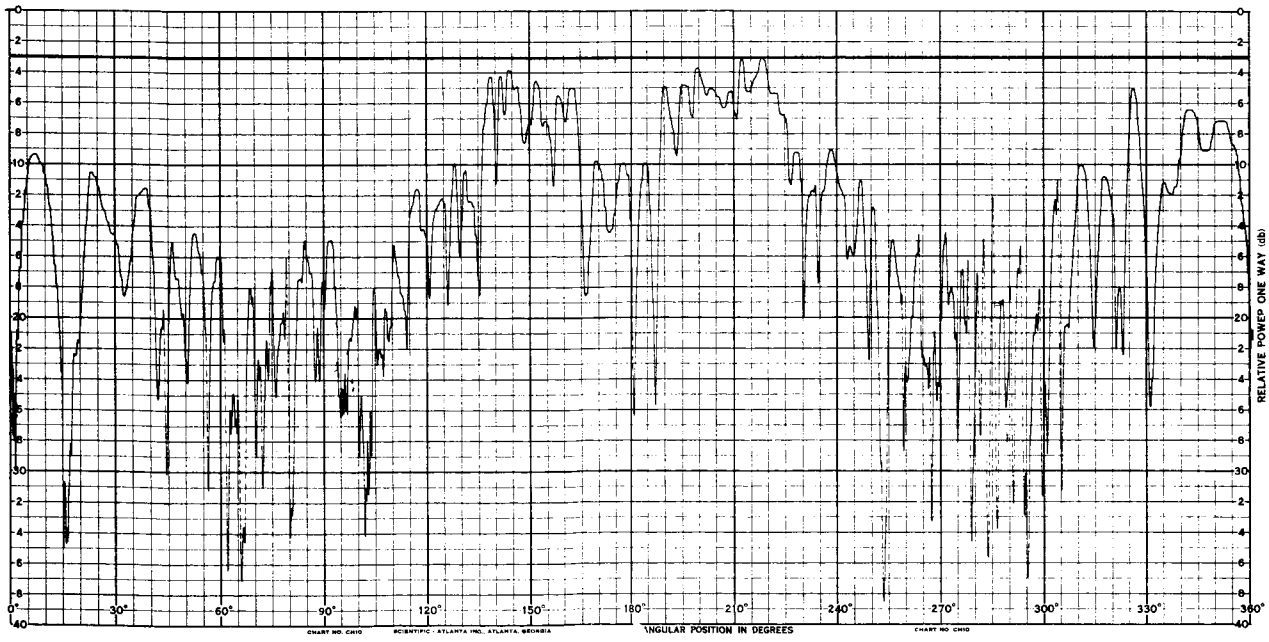
SYSTEM III





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ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

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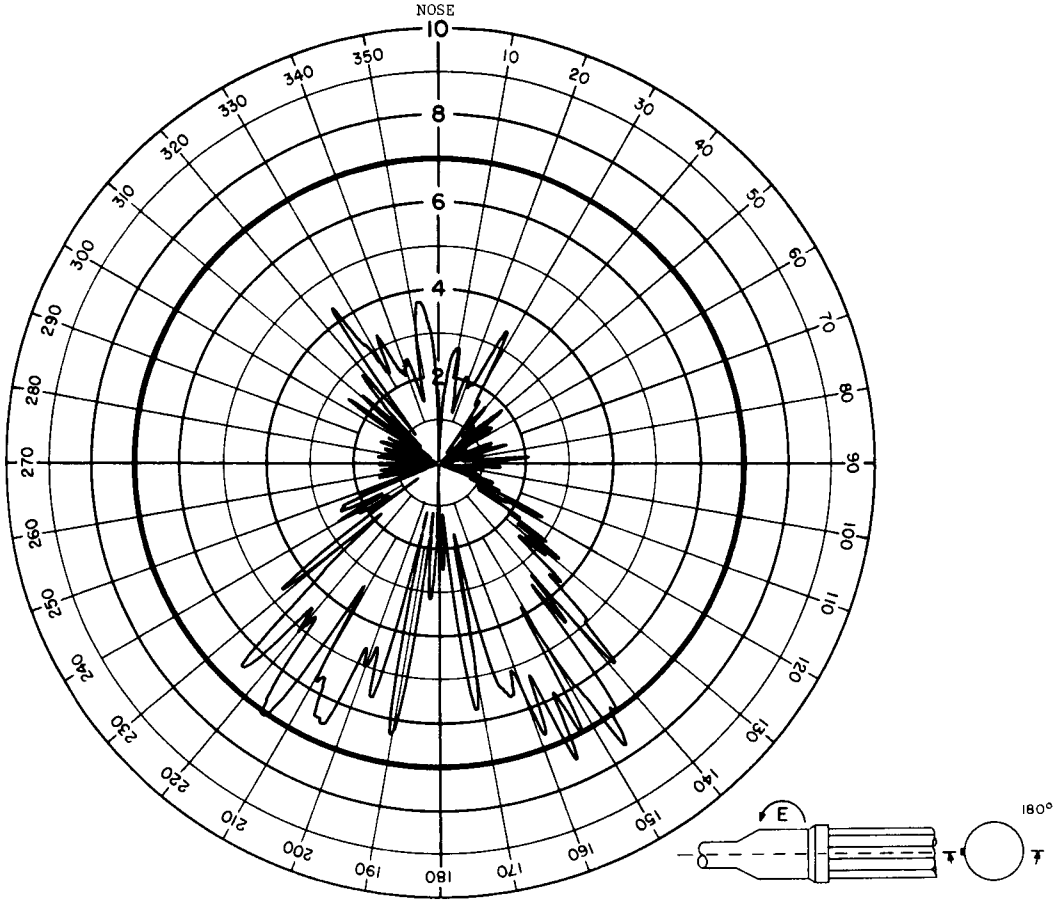
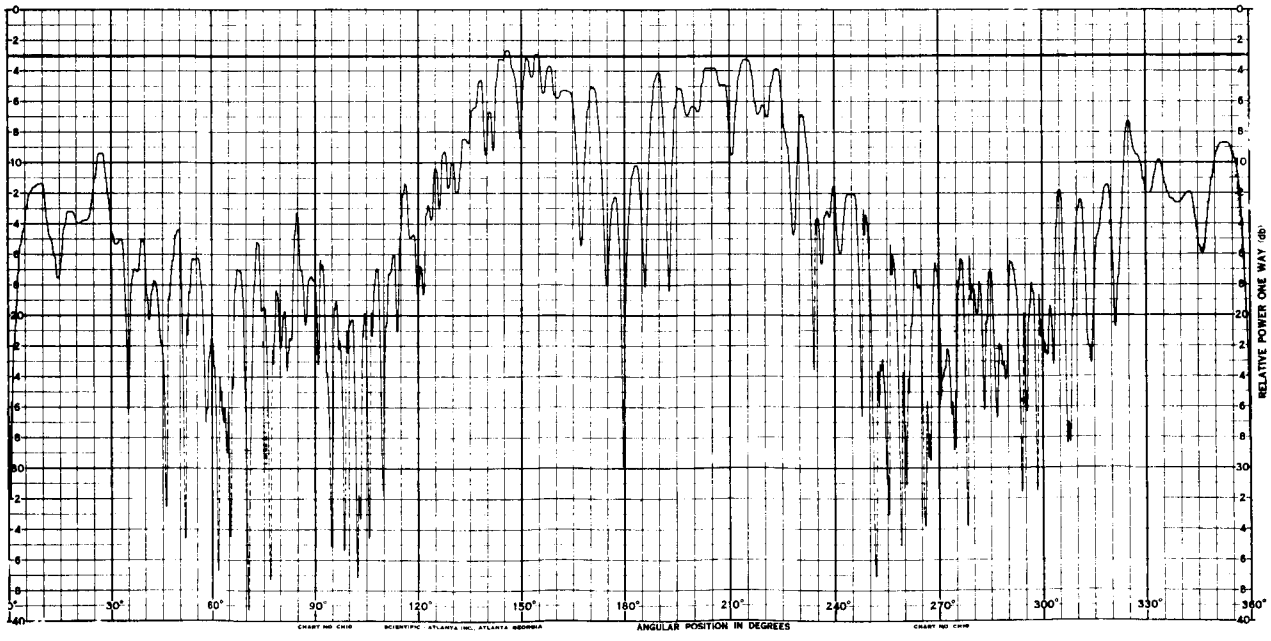
SYSTEM III





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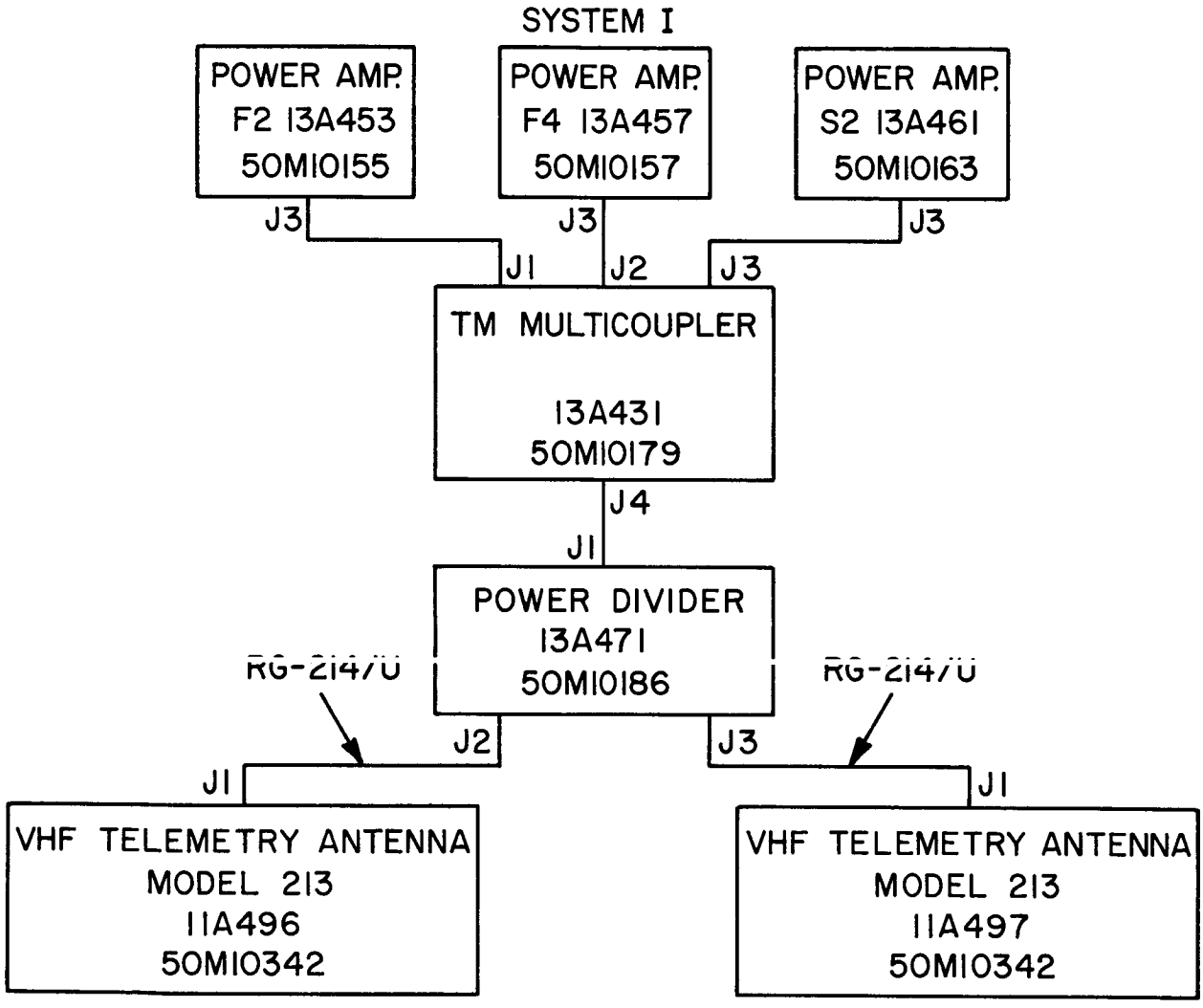
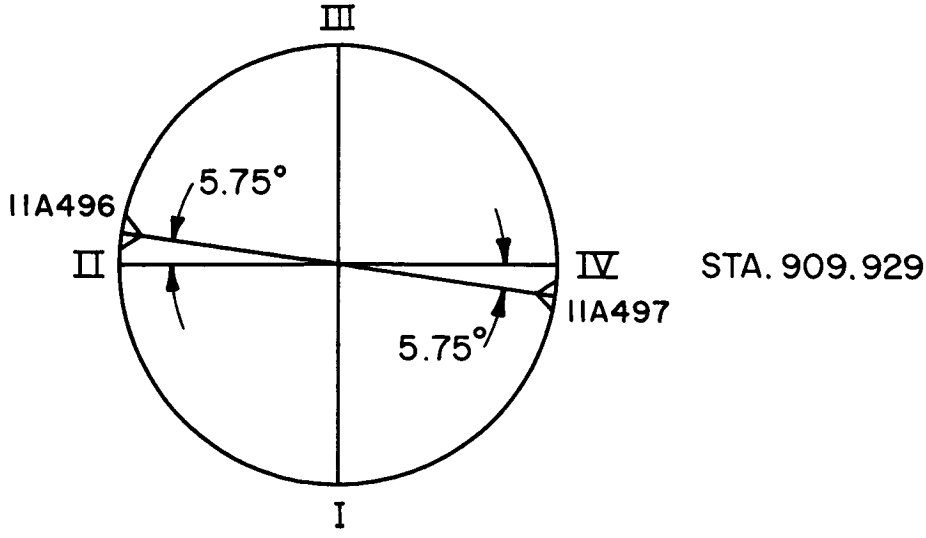
TECHNICAL DATA UNIT

SA-5 VHF TELEMETRY ANTENNA SYSTEM

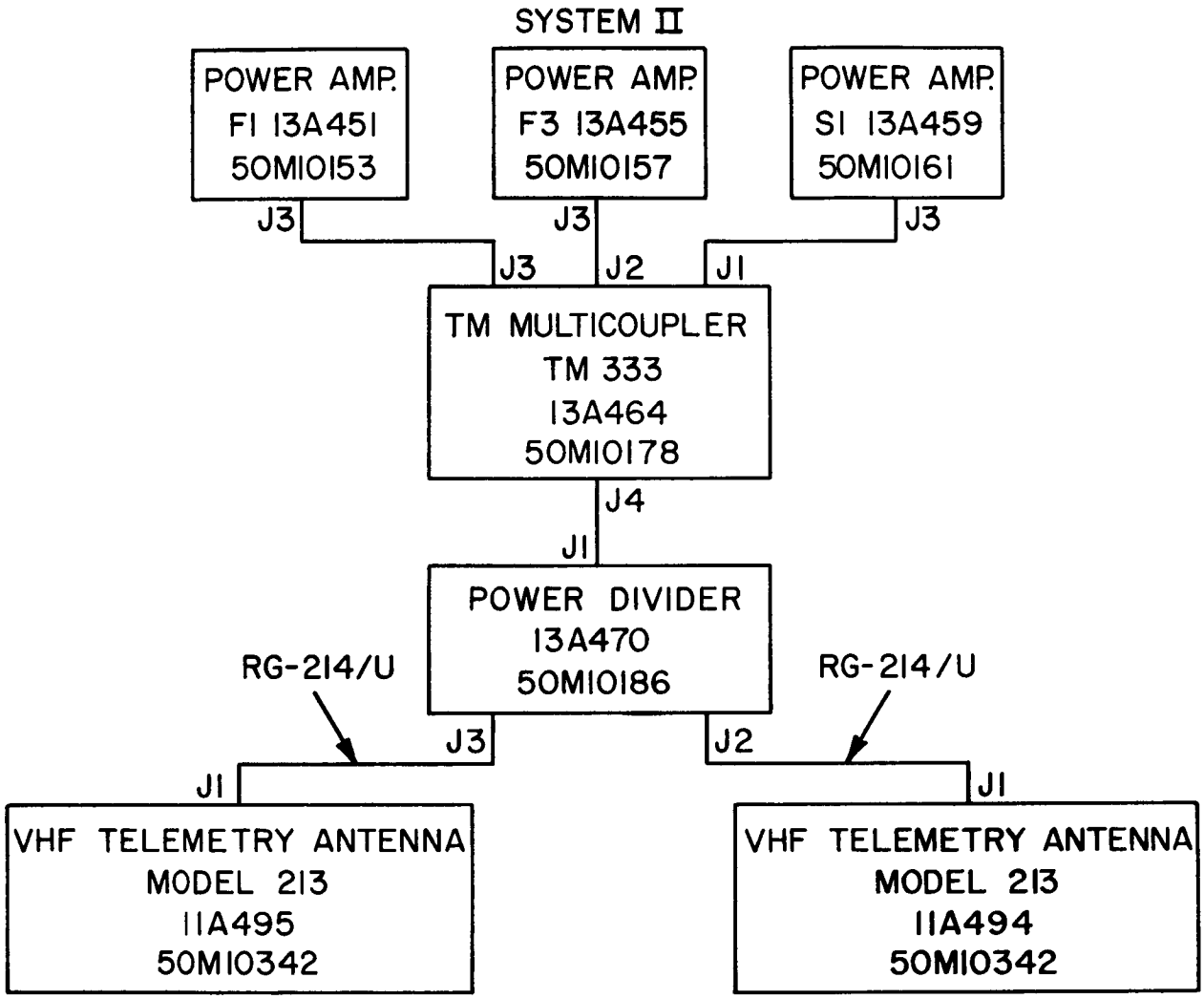
BLOCK DIAGRAM

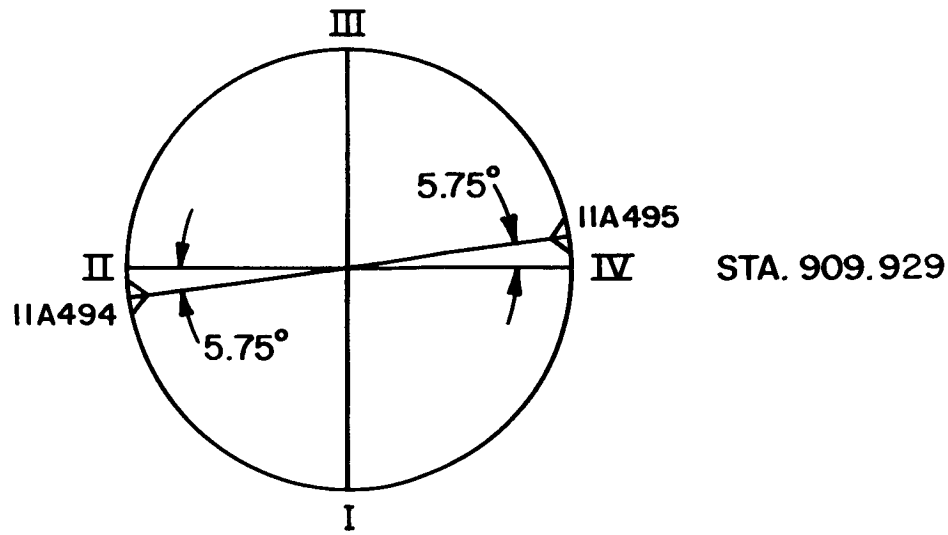




SA-5 VHF TELEMETRY ANTENNA SYSTEM

BLOCK DIAGRAM





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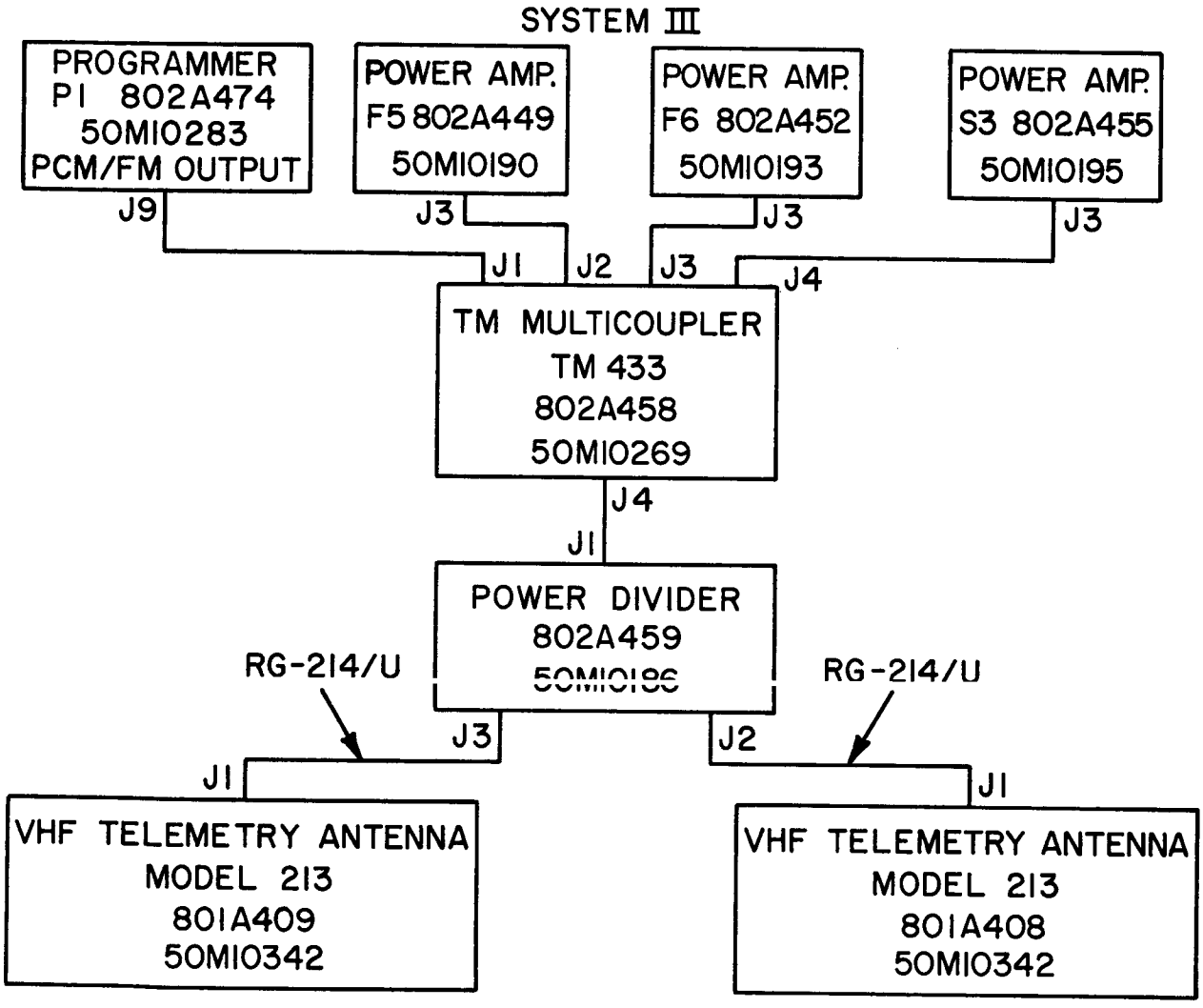

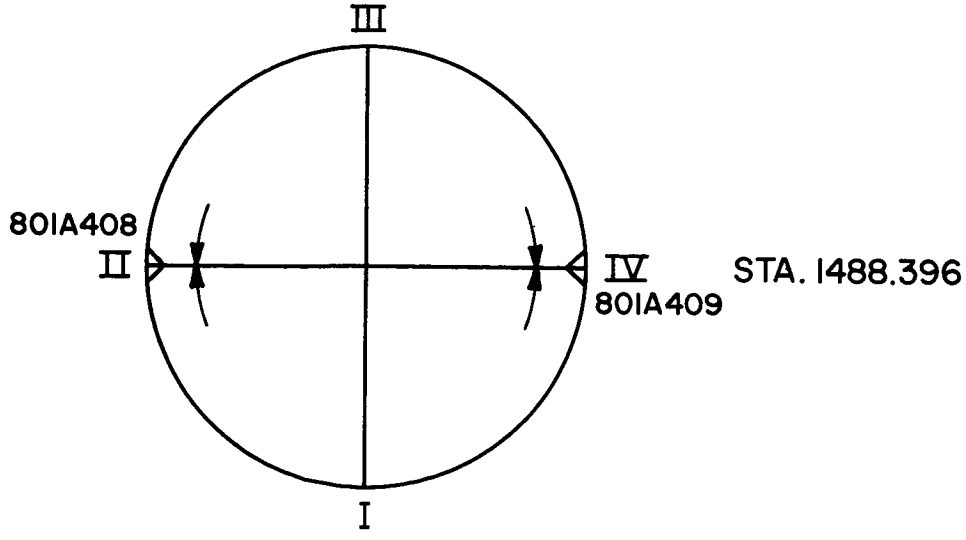

SA-5 VHF TELEMETRY ANTENNA SYSTEM

CHECKOUT PROCEDURE

I. RECOMMENDED TEST EQUIPMENT

The following test equipment (or equivalent) is recommended for final checkout of the VHF Telemetry Antenna System:

Name	Mfr. & Model No.
Signal Generator	HP-608
VHF Bridge	HP-803A
Shielded Receiver	HP-417A
Microwave Power Meter	HP-430C
Thermistor Mount	HP-477
50-Ohm Resistive Load (2 required)	--
Ohmmeter	--
High-Resistance Ohmmeter	--

II. FINAL CHECKOUT STEPS

CAUTION

The area immediately adjacent to the vehicle skin on which the antenna undergoing tests is mounted shall be reasonably free of reflecting objects. Flat plane metallic objects with a surface dimension of 1/4 wavelength or longer, or cables or other conductors in close proximity to the antenna installation are particularly objectionable. These objects must be removed during the tests to a distance not less than three wavelengths in the direction seen by the antenna. One wavelength will be sufficient if the offending object can be taped flush to the skin of the vehicle.

Where neither of the above steps is practical, it will be necessary to experiment with the conditions to determine the seriousness of the reflections.

If an obstruction or reflecting object is believed to be causing unreliable measurements of antenna parameters, an rf absorbing material should be placed in an intervening location and the measurement repeated. Different values measured before and after placing the absorbing material before the obstruction will indicate unsatisfactory measurements and is cause for rejecting all preceding measurements. If obstructions cannot be removed or their effects eliminated by the use of absorbing materials, the results of the antenna tests cannot be considered valid.

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A. Power Dividers

Connect the equipment as shown in figure 1. Terminate the power dividers into two 50-ohm loads and measure Z/θ at the input. Convert Z/θ to VSWR. The VSWR should not exceed 1.3:1 over the operating frequency range.

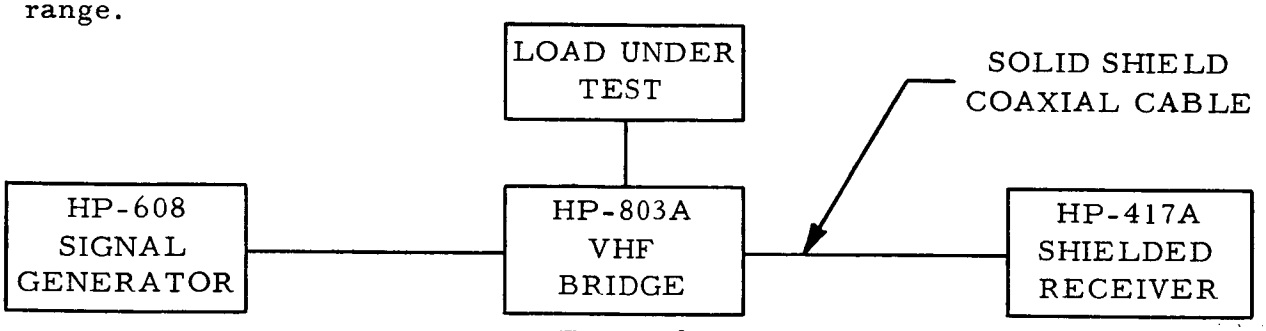

Figure 1.

B. Multicoupler

1. Impedance - Connect the equipment as shown in figure 1. The signal generator must be set precisely to each operating frequency for this test. Terminate the multicoupler output into a 50-ohm load and measure Z/θ at each input on the appropriate frequency. The measured VSWR shall not exceed 1.16:1.

2. Insertion Loss - Connect the equipment as shown in figure 2. Transmit a known level of rf energy through each input of the multicoupler and measure the resulting output power. A comparison of the input and output power levels will reveal a normally small difference (1.5 db or less), which is the insertion loss.

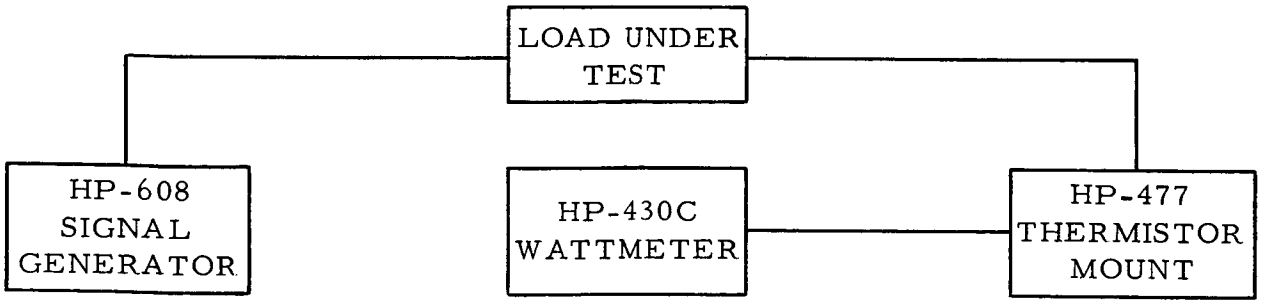

Figure 2.

C. Cables

1. Continuity - Check the continuity of the conductors of each cable, from conductor to conductor, with an ohmmeter.

2. Resistance - Check the resistance between conductors with a high-resistance ohmmeter for short circuits and leakage.

3. VSWR - Terminate one end of the cable into a 50-ohm load and measure the VSWR at the other end. The measured VSWR shall not exceed 1.3:1.

4. Attenuation - Perform attenuation tests at the frequencies at which the cable is to be used by transmitting rf energy, from the signal generator, through the cable. Measure the output power with the power meter and thermistor mount. Determine the insertion loss by comparing the input power with the output power. The measured attenuation shall not exceed the manufacturer's attenuation rating for the cable by more than 1 db for the total length of the cable between the antenna and any cable junction.

5. Electrical Length - The electrical length of the cable must be adjusted to within $\pm 5^{\circ}$ or ± 0.014 wavelength for all systems requiring antenna phasing. The electrical length of the cable may be determined as follows:

a. Terminate one end of the cable into a short and measure the impedance at the other end, using the equipment shown in figure 1. The electrical length shall be within ± 0.014 wavelength or $\pm 5^{\circ}$ difference between any two cables. This test shall be made at, or near the center of, the range of frequencies of the telemeters used on the mission to which the cables are assigned.

b. Repeat the above test at 40 mc to eliminate the possibility of a 180° phase ambiguity which could occur in the previous test.

D. Antennas

Impedance Match

a. Check each antenna, at the antenna input connector, for satisfactory impedance match at each telemetry frequency used, through a length of coaxial cable with an attenuation not to exceed 1 db at the frequency of measurement. For these measurements, the signal generator must be calibrated with its crystal calibrator for each frequency of operation. The measured VSWR shall not exceed 1.55:1.

b. Measure the impedance of each antenna through its individual feed cable at a frequency as close as possible to the center of the operating band. The measured VSWR shall not exceed 1.7:1.

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c. Measure the impedance of the antenna system at the power divider input at a frequency as close as possible to the center of the operating band. The measured VSWR shall not exceed 1.7:1.

d. Measure the impedance of the telemetry antenna system at the multicoupler input for each channel. For these measurements, the signal generator must be calibrated with its crystal calibrator for each channel frequency. The measured VSWR shall not exceed 1.7:1.

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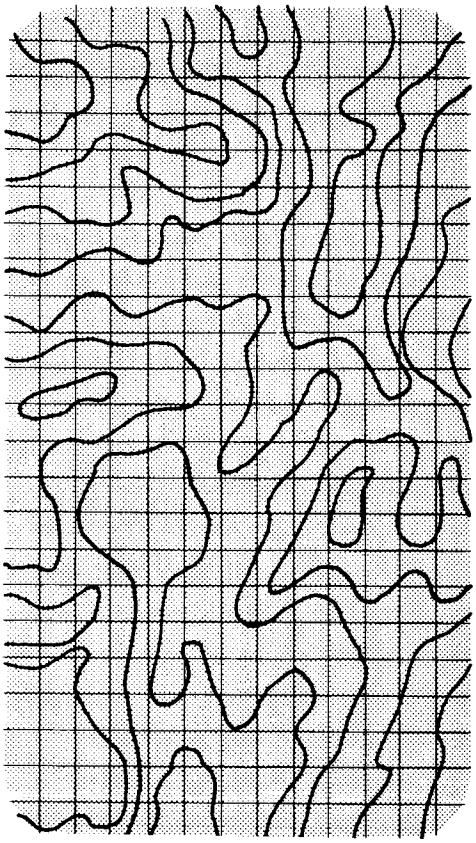
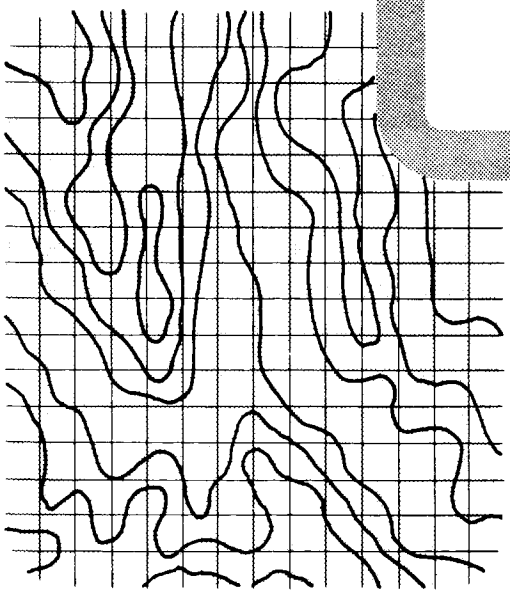
VHF TELEMETRY ANTENNA SYSTEM

NOTES



MINITRACT-VOT ANTENNA SYSTEM SA-5



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SA-5 MINITRACK-VOT ANTENNA SYSTEM

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SA-5 MINITRACK-VOT ANTENNA SYSTEM

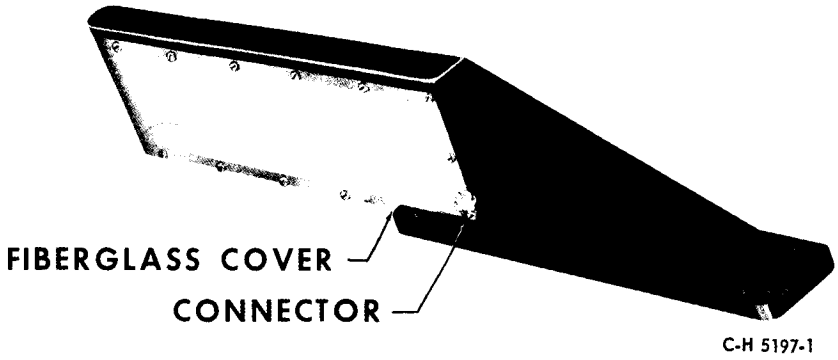
DESCRIPTION

The Minitrack-VOT antenna system consists of two, Model 214, shunt-fed stub antennas. Two transmitters, minitrack and VOT, are coupled to the antennas by a Model 215 hybrid ring. The hybrid ring provides equal power input to each antenna from each transmitter and at least 40 db isolation between the transmitters. The hybrid ring couples in-phase power to the antennas from the minitrack transmitter and couples 180° out-of-phase power to the antennas from the VOT transmitter. This system produces two separate radiation patterns, and are distinguished herein by the subtitles "VOT" and "MINITRACK." Interconnecting cables consist of equal lengths of RG-225/U coaxial cable with captivated UG-1185/U connectors. Insertion loss of the hybrid ring and interconnecting cables is less than 1 db.

SA-5

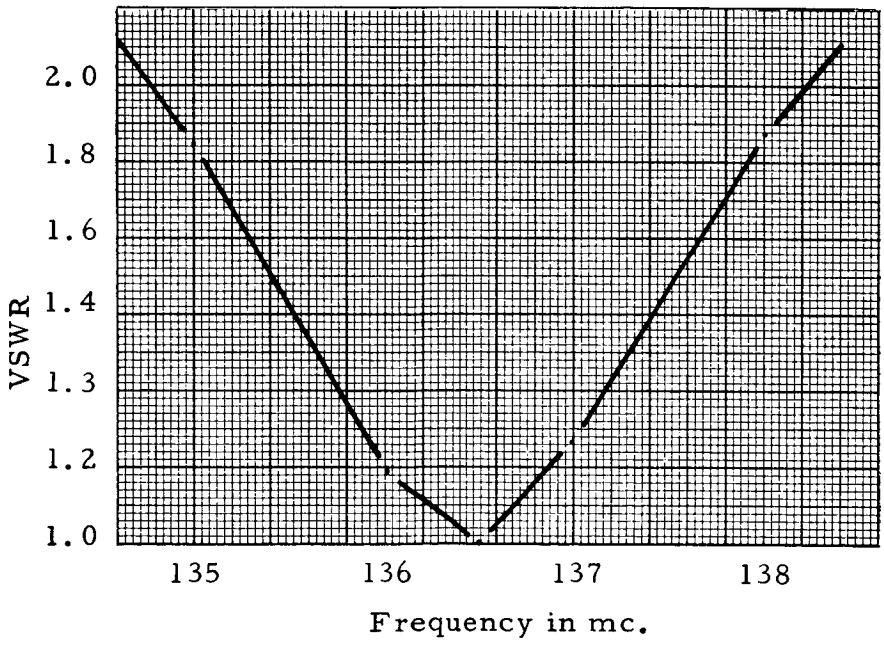
MINITRACK-VOT ANTENNA SYSTEM

SPECIFICATIONS
MODEL 214

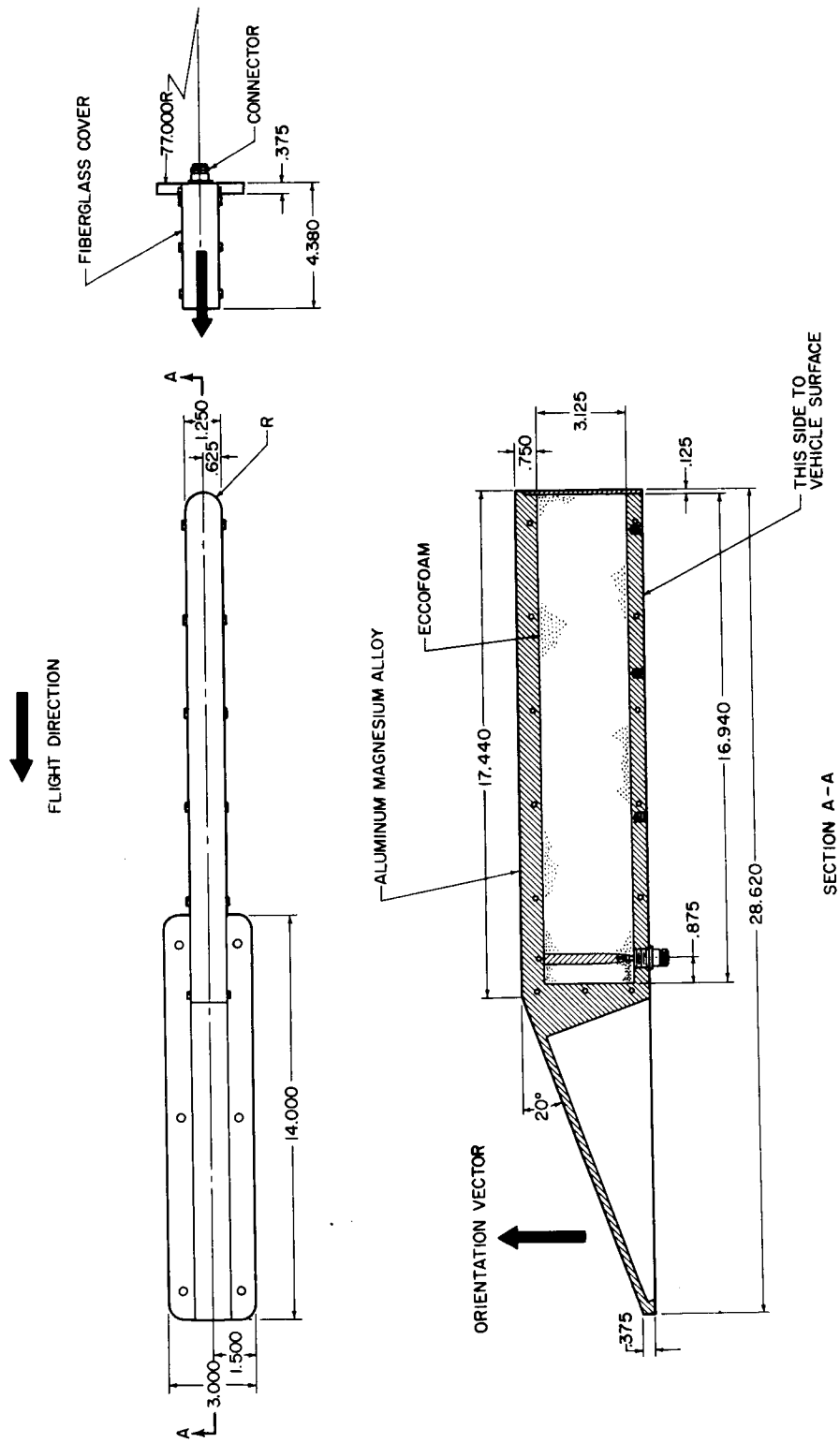


-Location-
Station 1546.590
Fin I and III

Drawing number - 50M10451
Type - Shunt-fed stub
Frequency range - 135.5 to 137.5 mc.
Bandwidth - $\geq$ 2 mc. for 1.6:1 VSWR
Number required - 2
Polarization - linear
Gain - 6 db.
Connector type - N
Weight - 4.63 lbs.
Dimensions - 28-5/8 by 4-3/8 by 3 inches

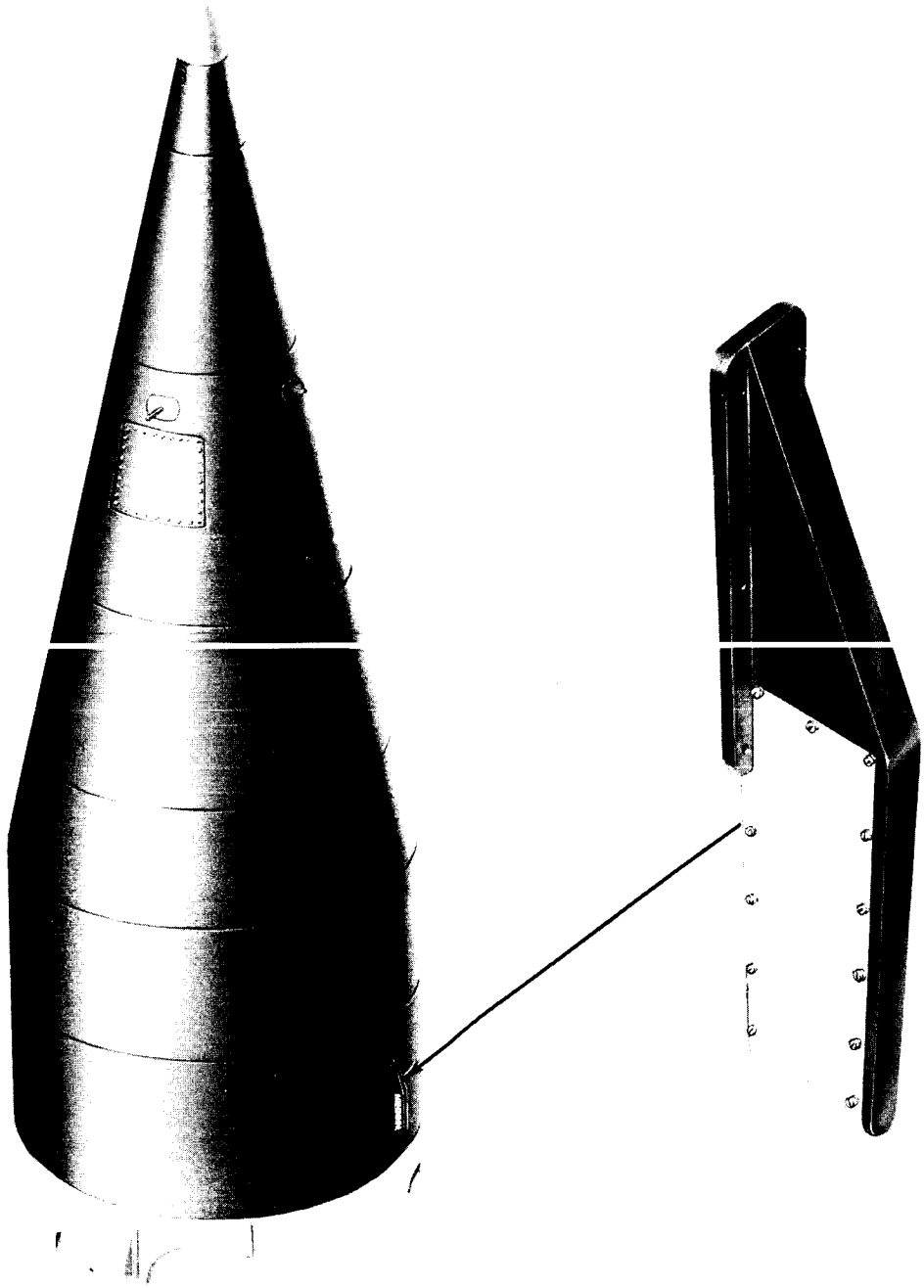


SA-5 MINITRACK-VOT ANTENNA SYSTEM



DIMENSIONAL SKETCH

SA-5 MINITRACK-VOT ANTENNA SYSTEM



LOCATIONAL VIEW

SA-5 MINITRACK-VOT ANTENNA SYSTEM

RADIATION PATTERNS

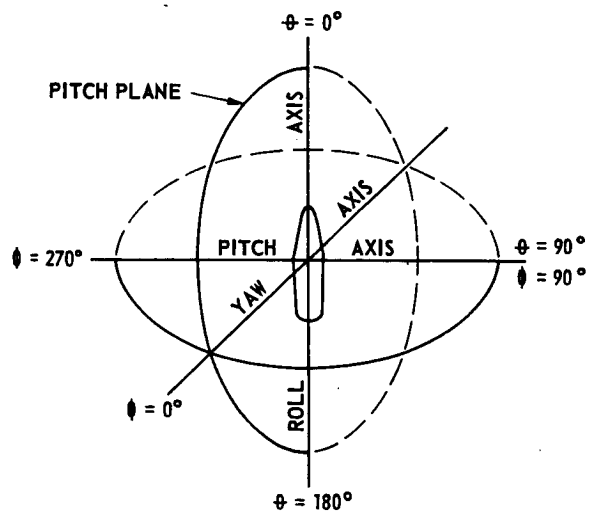
MINITRACK-VOT ANTENNA SYSTEM

ANTENNA MODEL 214

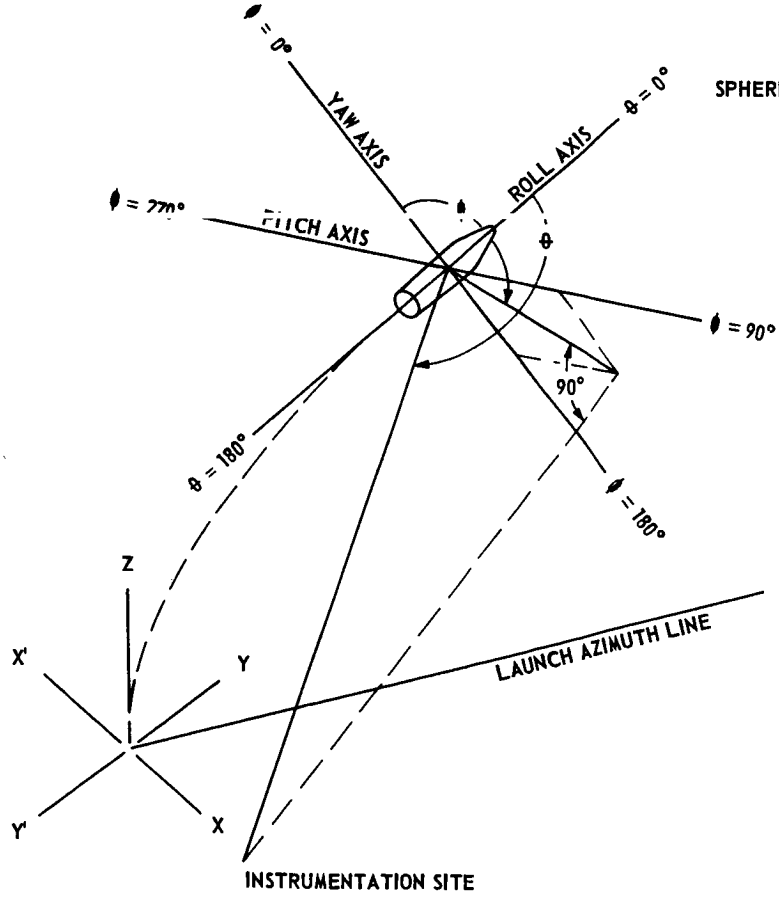
The measurement of antenna radiation is recorded on rectangular and polar patterns. Equipment capable of simultaneous recordings is used to display the rectangular patterns in db, and the polar patterns in voltage.

Rectangular and polar patterns are cut by placing the vehicle in the horizontal position with the antenna located at $\phi = 0°$. Patterns are then plotted through 360° of θ in 10° increments of ϕ (great circle cuts). The 10° increments are made through 180° by rotating the vehicle counter-clockwise, when viewed looking into the tail.

SA-5 MINITRACK-VOT ANTENNA SYSTEM



SPHERICAL COORDINATE SYSTEM



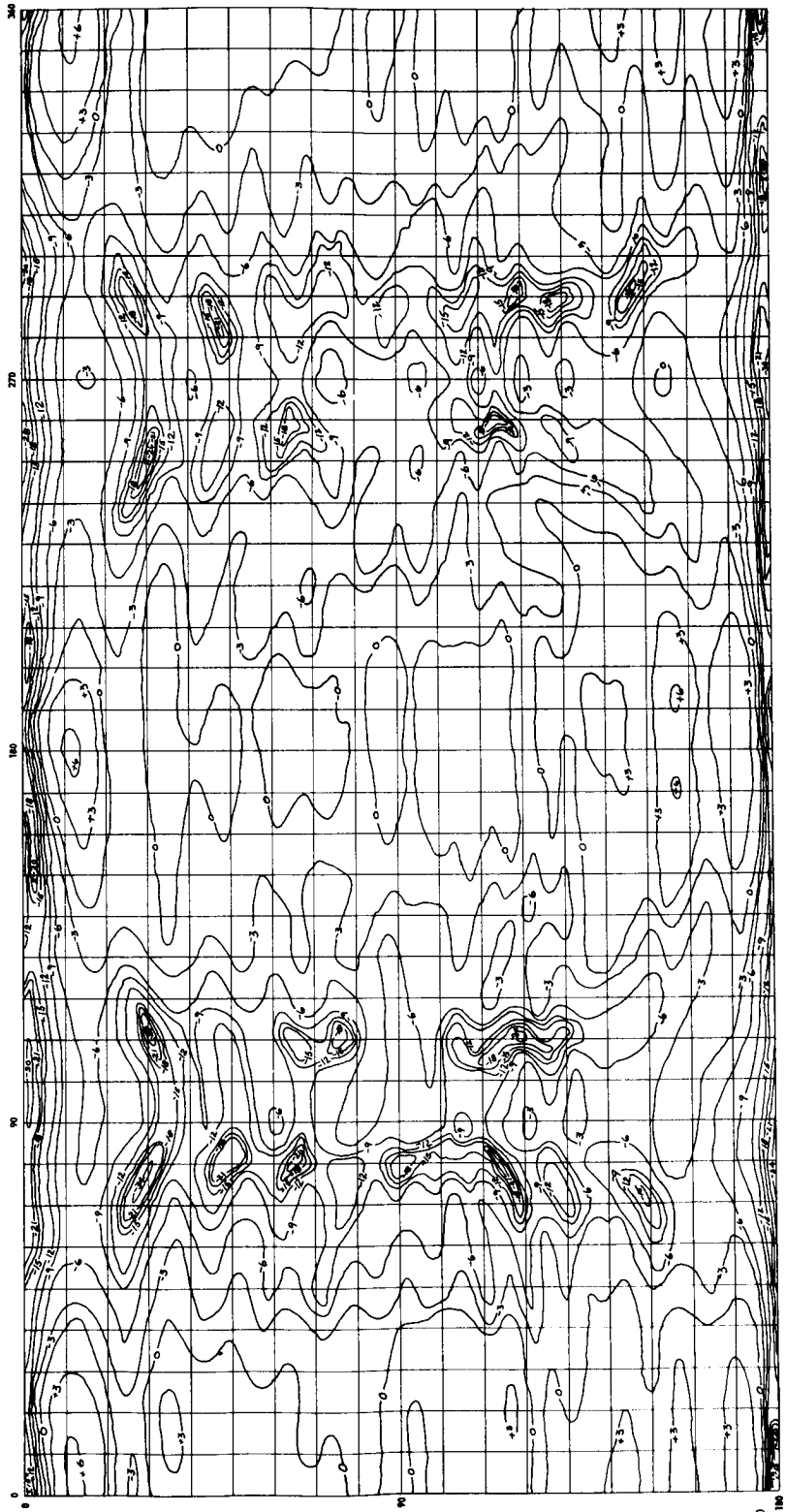
TRAJECTORY GEOMETRY

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK

ANTENNA PATTERN

1. SECURITY CLASSIFICATION: Unclassified			2. PAGE
			3. DATE 5 April 1963
			4. REPLACES PAGE(S) ____ ____ ____ ____ DATED
5. TEST PROGRAM: SATURN	6. PROGRAM REQUIREMENT NO.	7. ARDC SYSTEM CODE	8. CONTRACTOR: NASA
10. TEST CODE:	11. PRD PAGE NO.:	12. INSTRUMENTATION SYSTEM: MINITRACK ANTENNA, Horizontal Polarization	14. - 18. (SEE REVERSE SIDE OF FORM)
13. ANTENNA PATTERN PLOT			



1. SECURITY CLASSIFICATION

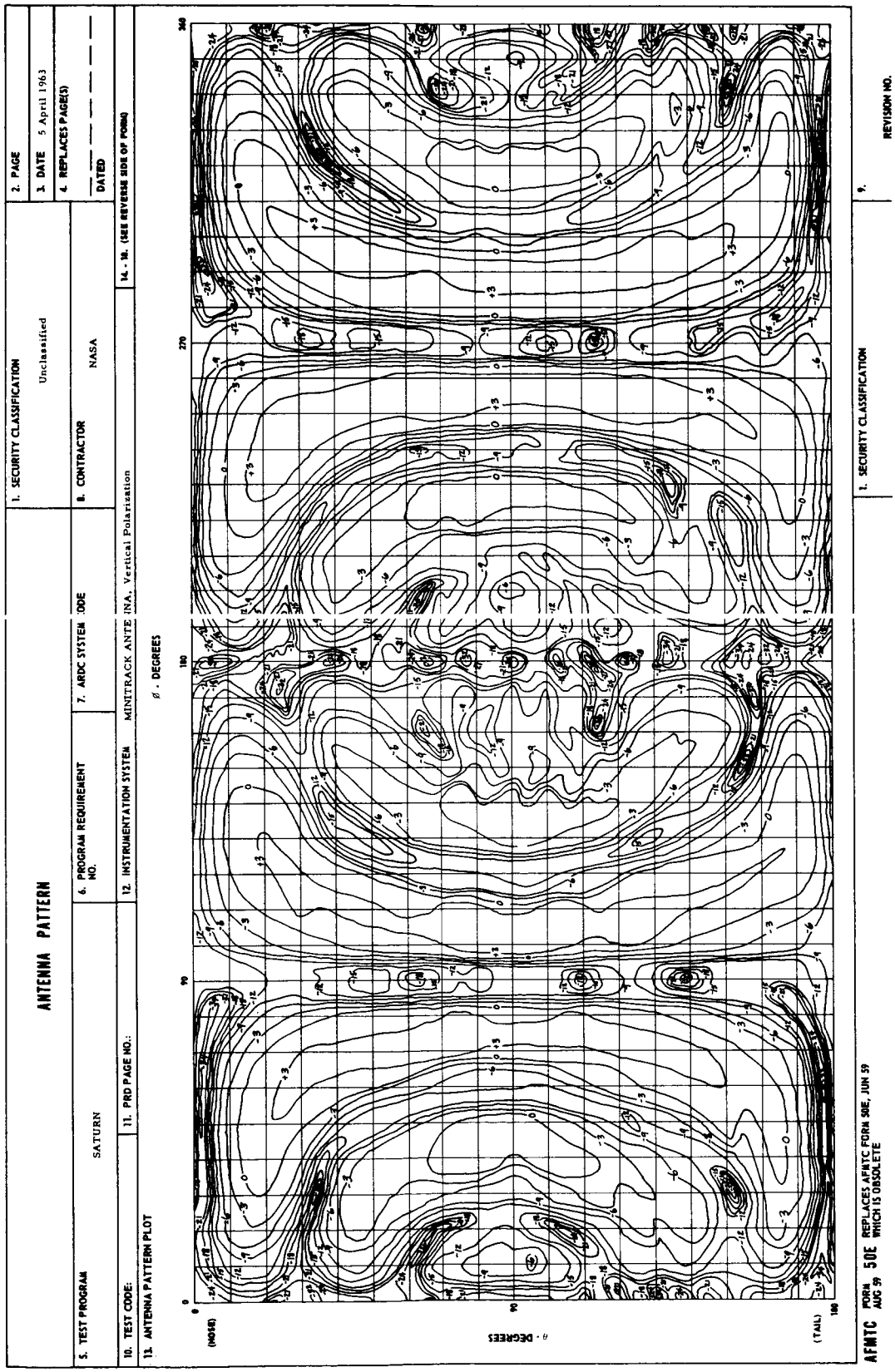
9. REVISION NO.

AFMTC FORM 50E AUG 59 REPLACES AFMTC FORM 50E, JUN 59 WHICH IS OBSOLETE

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK

ANTENNA PATTERN

1. SECURITY CLASSIFICATION: Unclassified			2. PAGE
			3. DATE 5 April 1963
			4. REPLACES PAGE(S)
			DATED
5. TEST PROGRAM: SATURN	6. PROGRAM REQUIREMENT NO.	7. ARDC SYSTEM CODE	8. CONTRACTOR: NASA
10. TEST CODE:	11. PRD PAGE NO.:	12. INSTRUMENTATION SYSTEM: MINITRACK ANTENNA, Right Circular Polarization	14. - 18. (SEE REVERSE SIDE OF FORM)
13. ANTENNA PATTERN PLOT			

1. SECURITY CLASSIFICATION

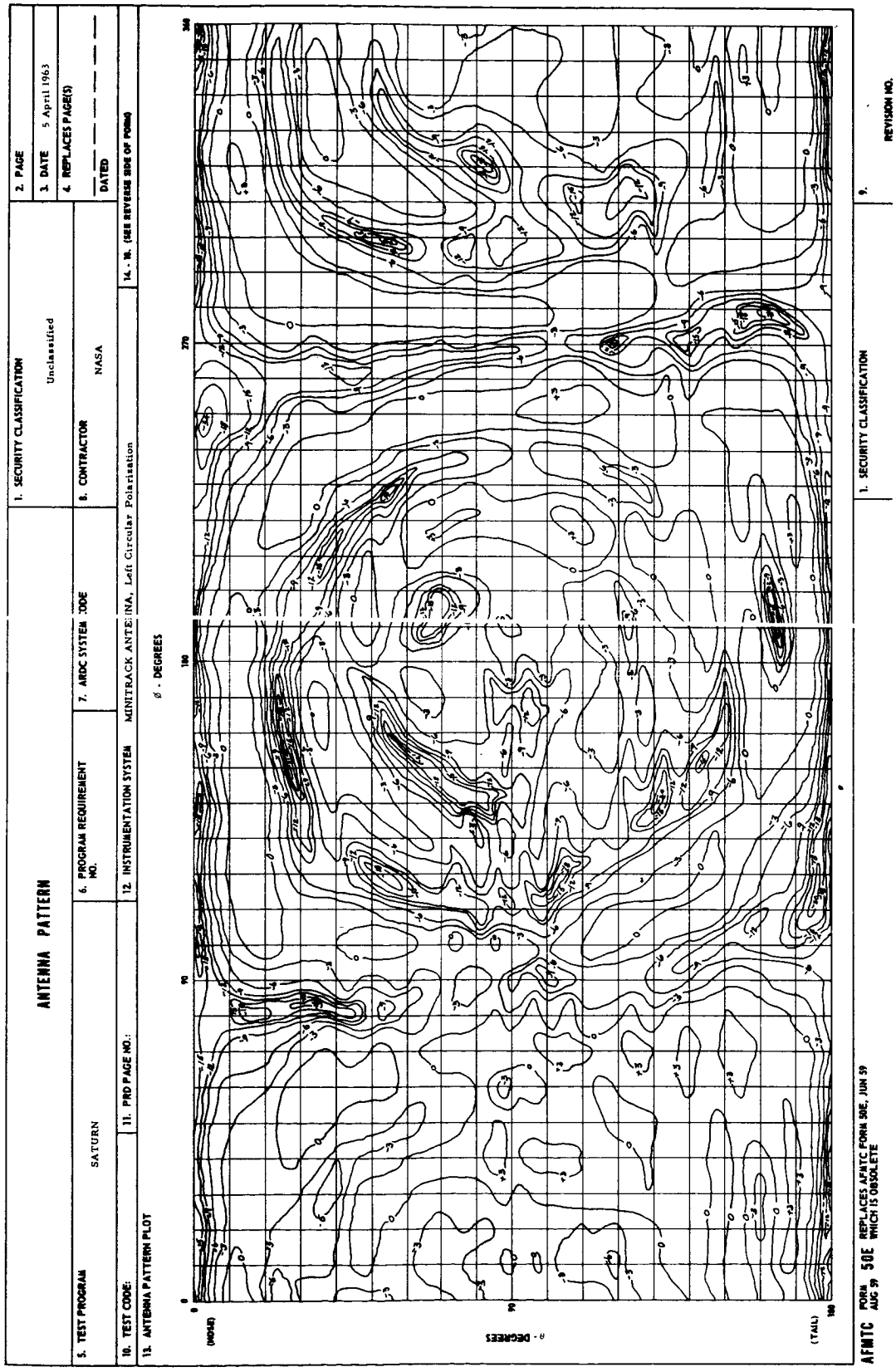
9. REVISION NO.

AFMTC FORM 50E AUG 59 REPLACES AFMTC FORM 50E, JUN 59 WHICH IS OBSOLETE

SA-5

MINITRACK-VOT ANTENNA SYSTEM

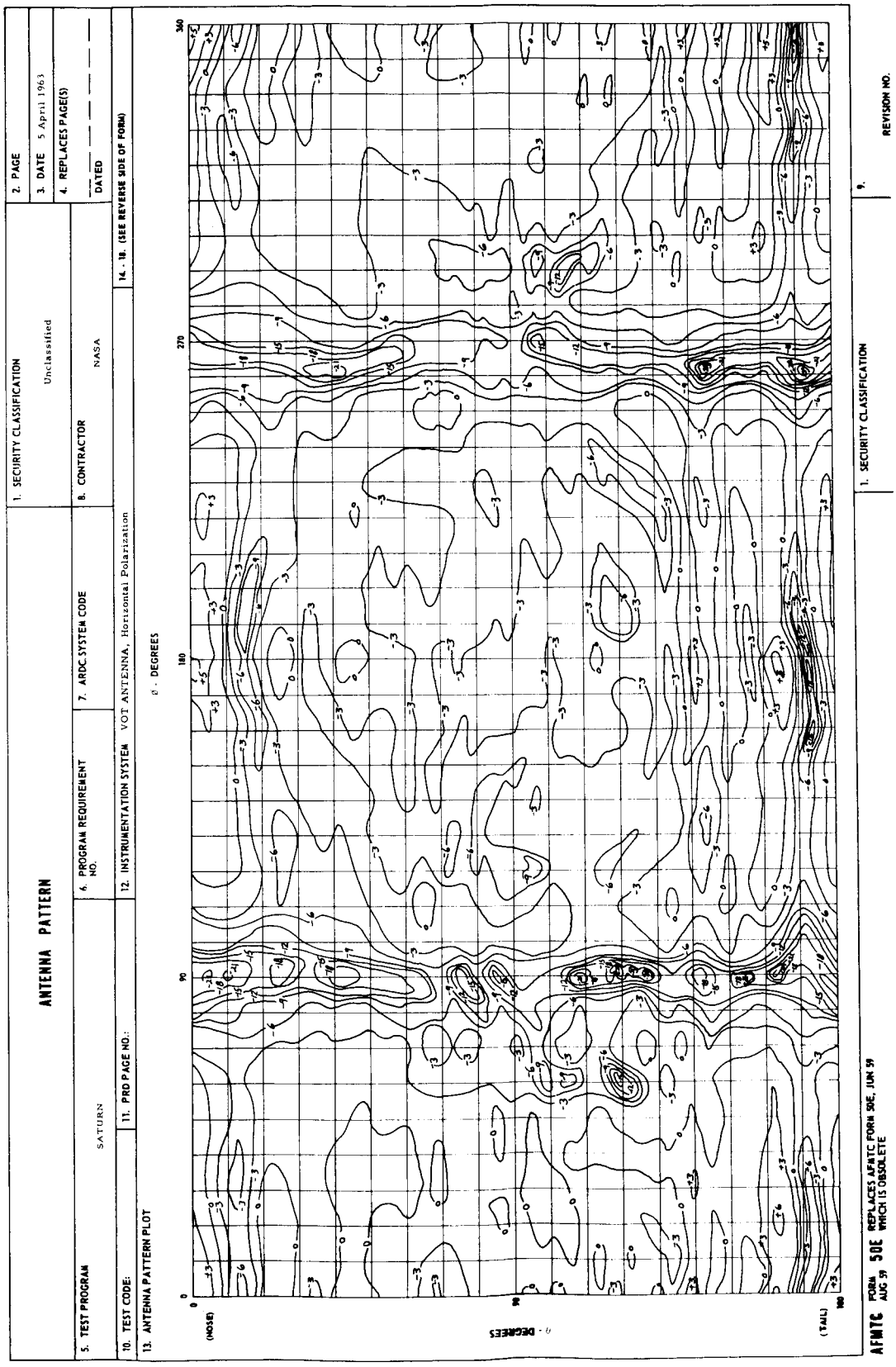
MINITRACK



GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT

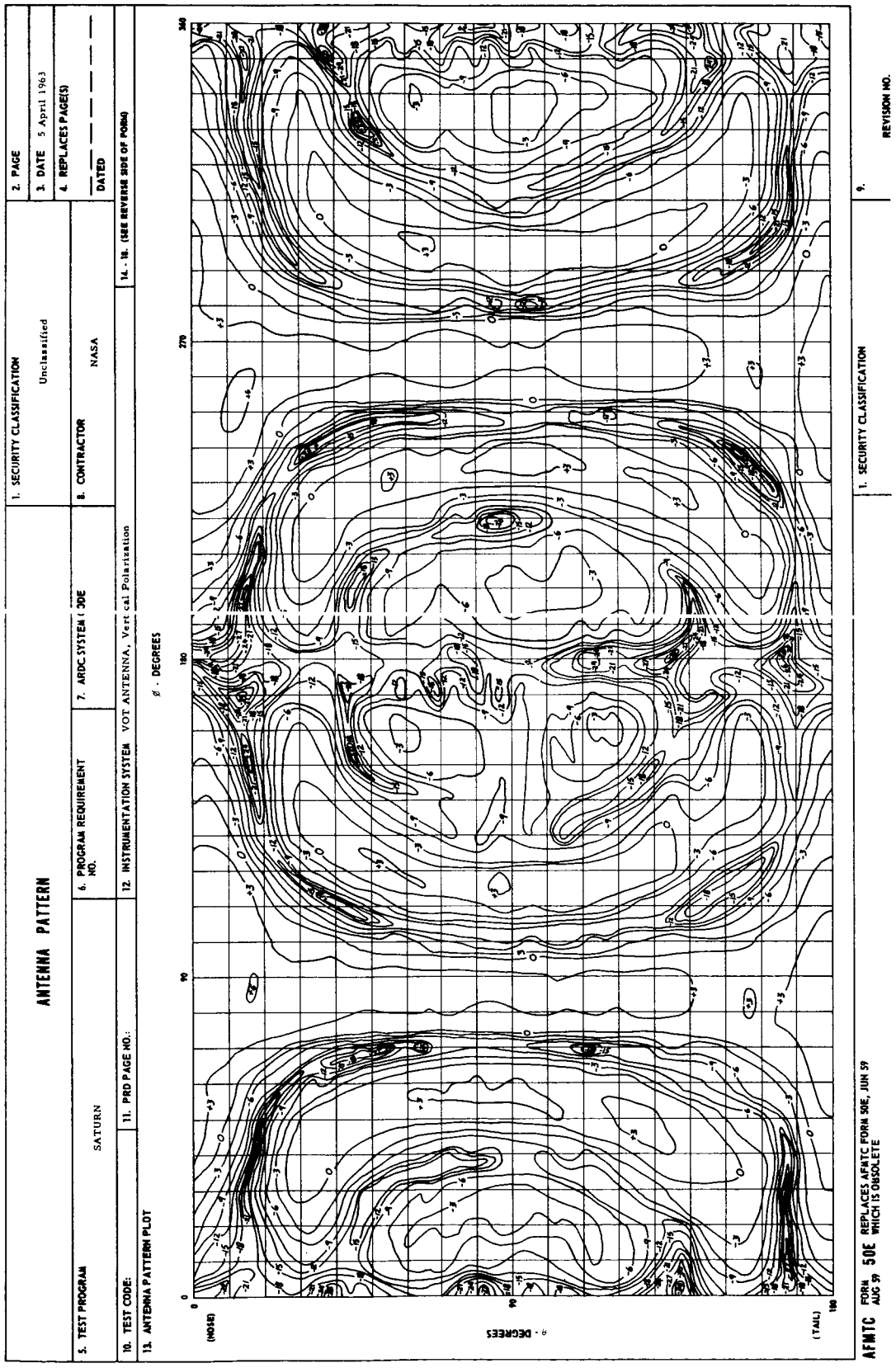


GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



GEORGE C. MARSHALL SPACE FLIGHT CENTER
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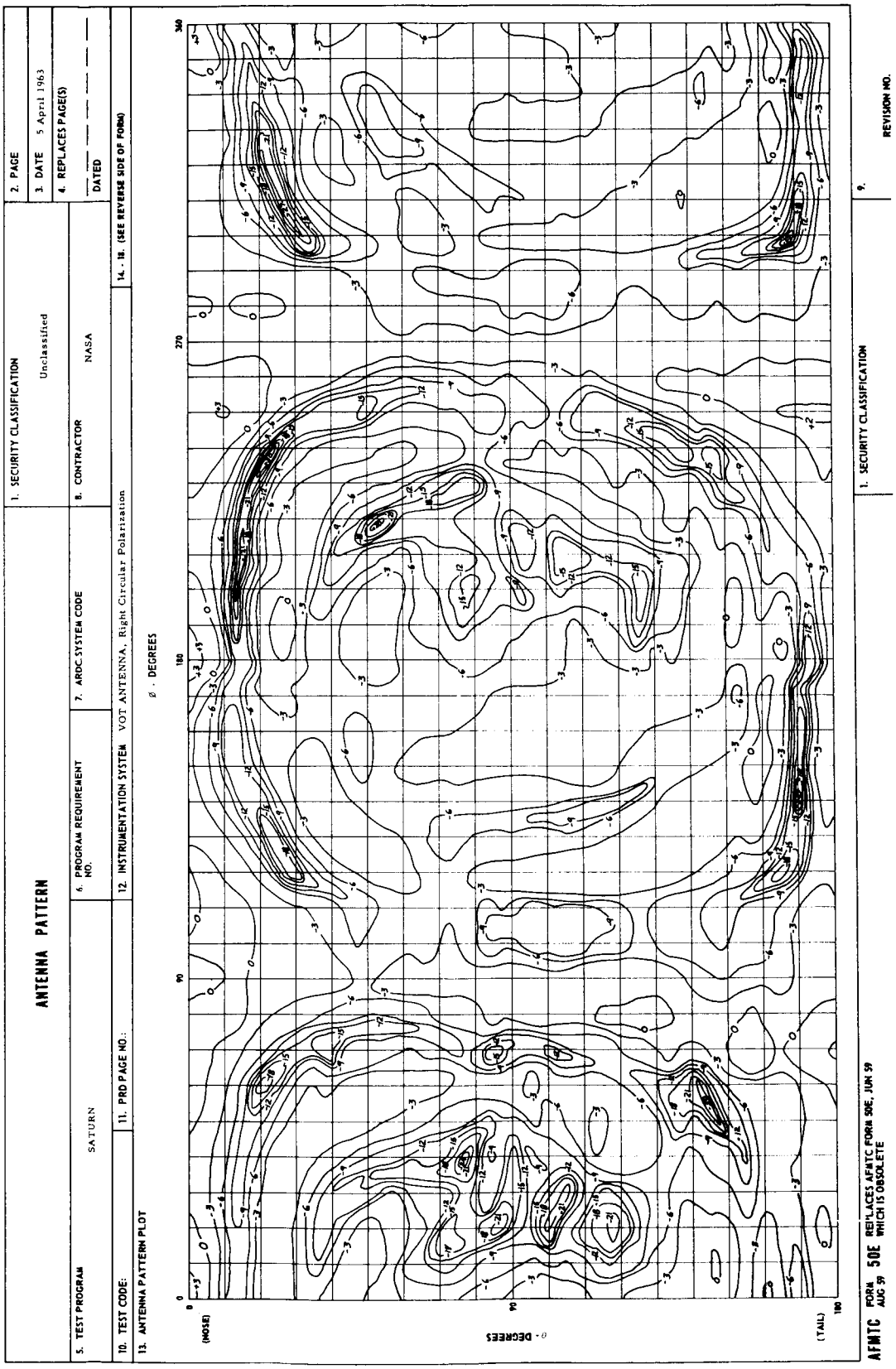
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



GEORGE C. MARSHALL SPACE FLIGHT CENTER
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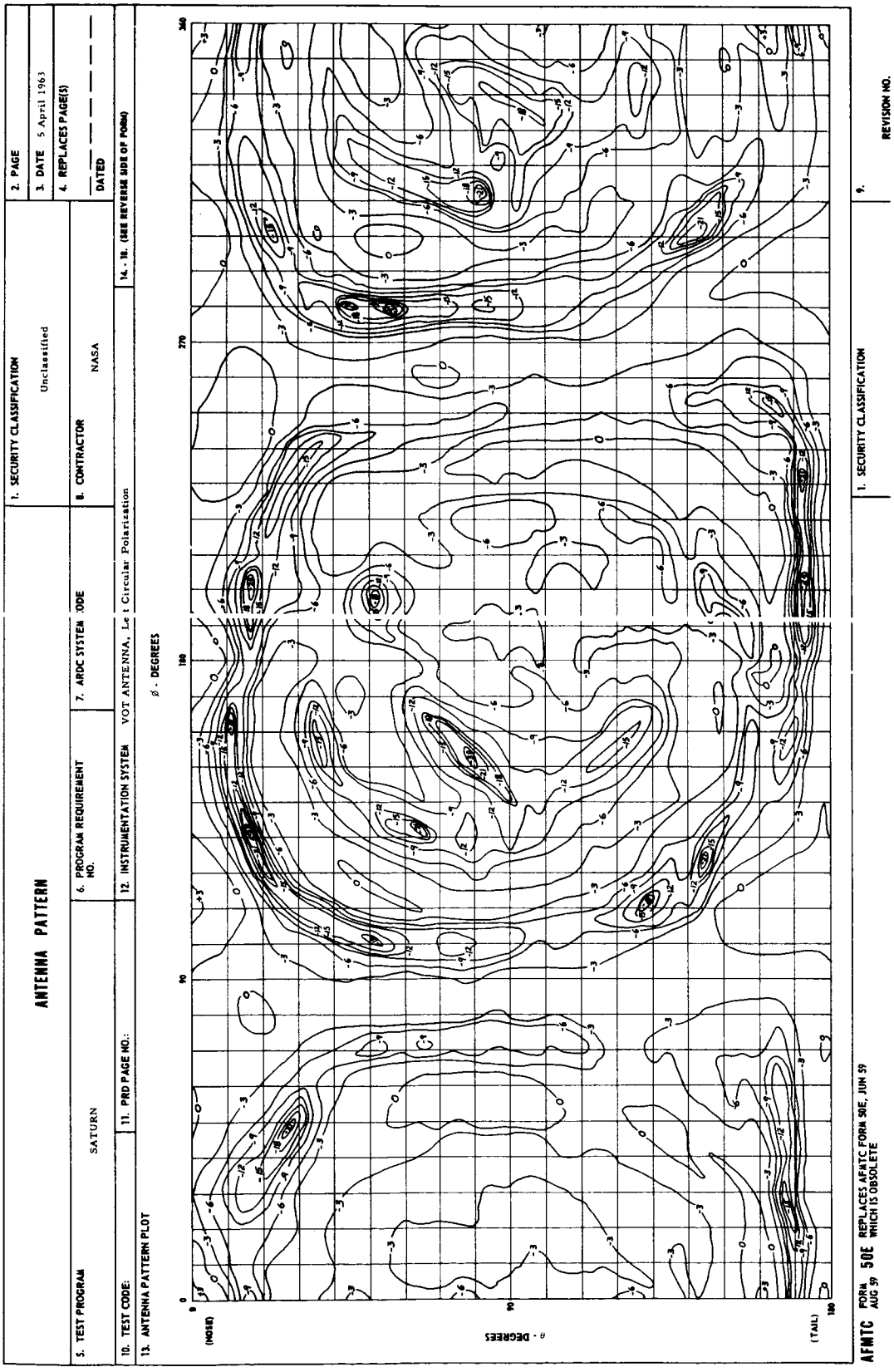
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



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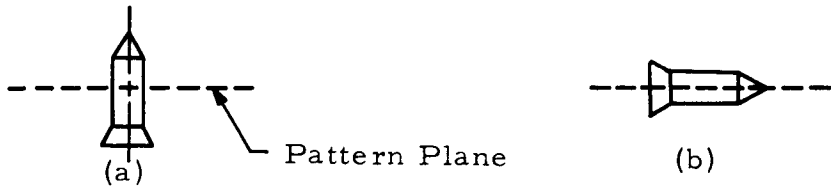
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

DESCRIPTION OF PATTERN AND POLARIZATION SYMBOLS AND GAIN DETERMINATION

PATTERN PLANE

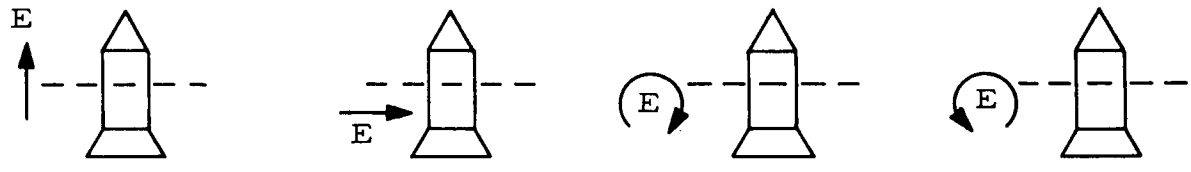
The plane of the pattern is indicated by a broken line passing horizontally through a sketch of the model. This line represents the pattern plane as seen from a point in that plane. The model is then shown in its proper orientation to the line representing the pattern plane.



In the above sketch, the pattern plane is perpendicular to the vehicle axis in (a) and contains the axis in (b). In both cases it is perpendicular to the plane of the sketch.

POLARIZATION

The polarization component shown by the recorded pattern is indicated by a vector which, for linear polarization, is either parallel or perpendicular to the pattern plane. For circular polarization a circular arrow symbol is used.



Polarization vector normal to pattern plane | Polarization vector parallel to pattern plane | Right circular polarization | Left circular polarization

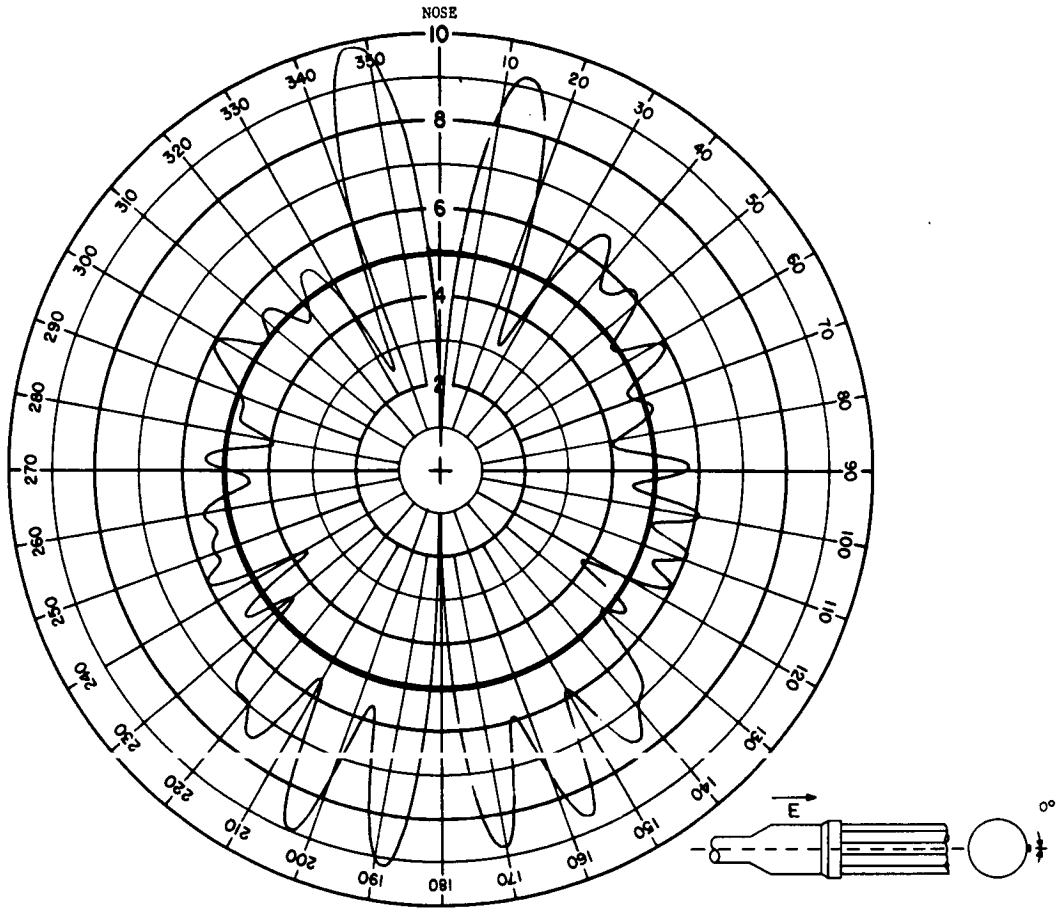
GAIN

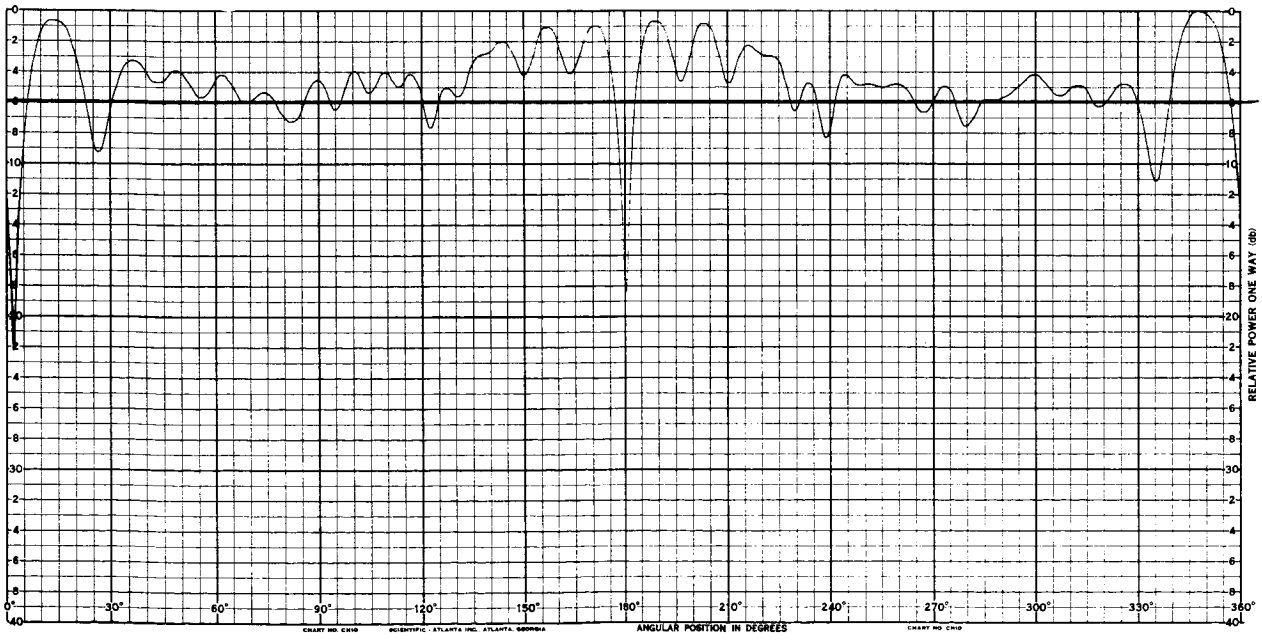
The heavy constant level line on each pattern represents the signal level obtained with the same power input to an isotropic radiator. The gain of the antenna is determined by the amount it deviates from this level. The contour plots are also referenced to this isotropic level.

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



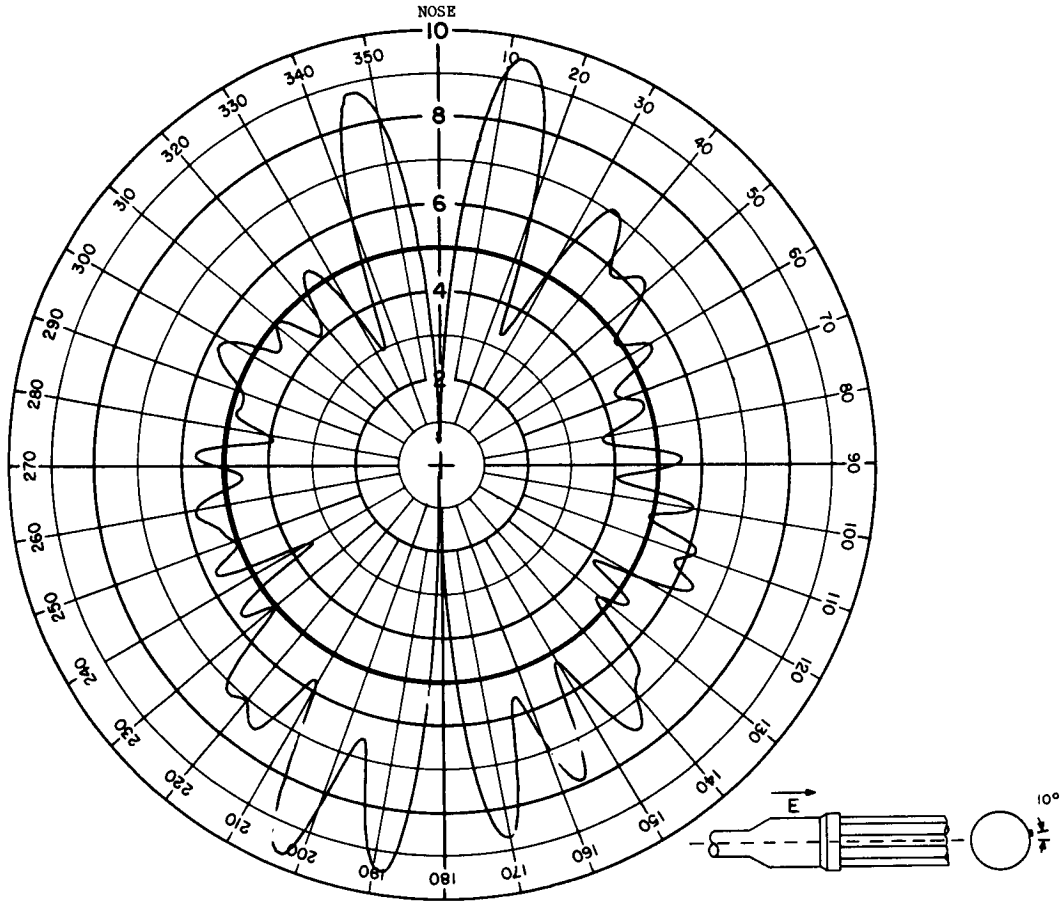


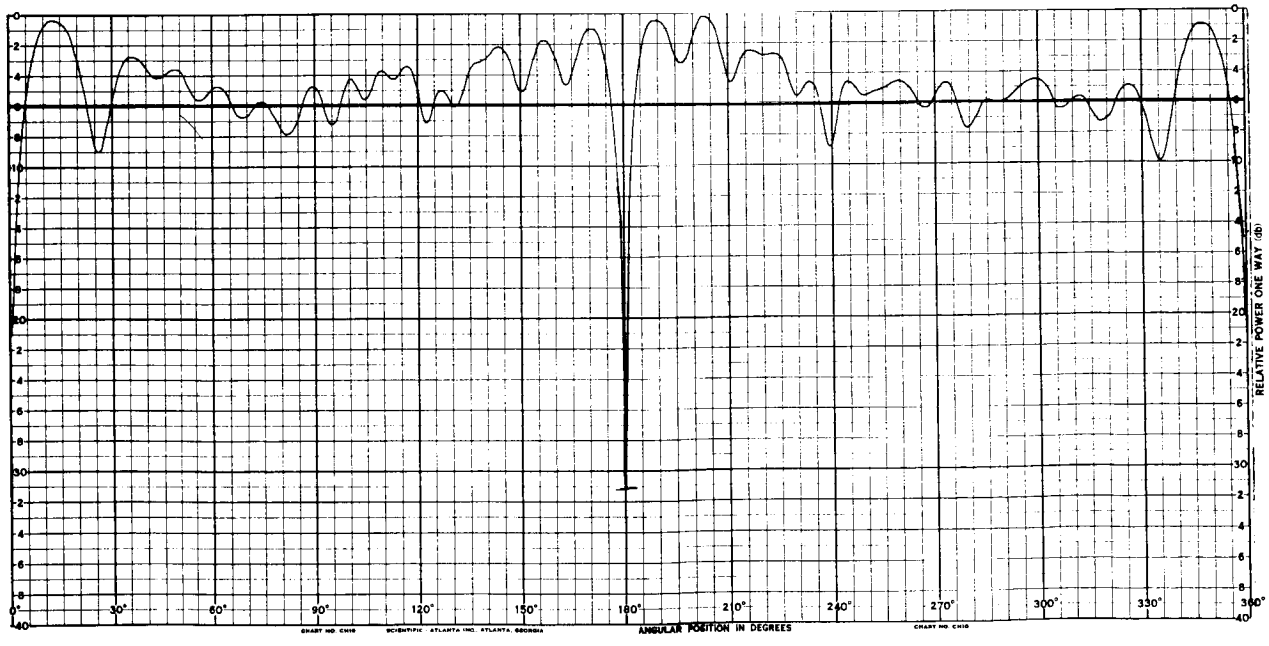
ANTENNA RADIATION PATTERN NO. 200-1

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





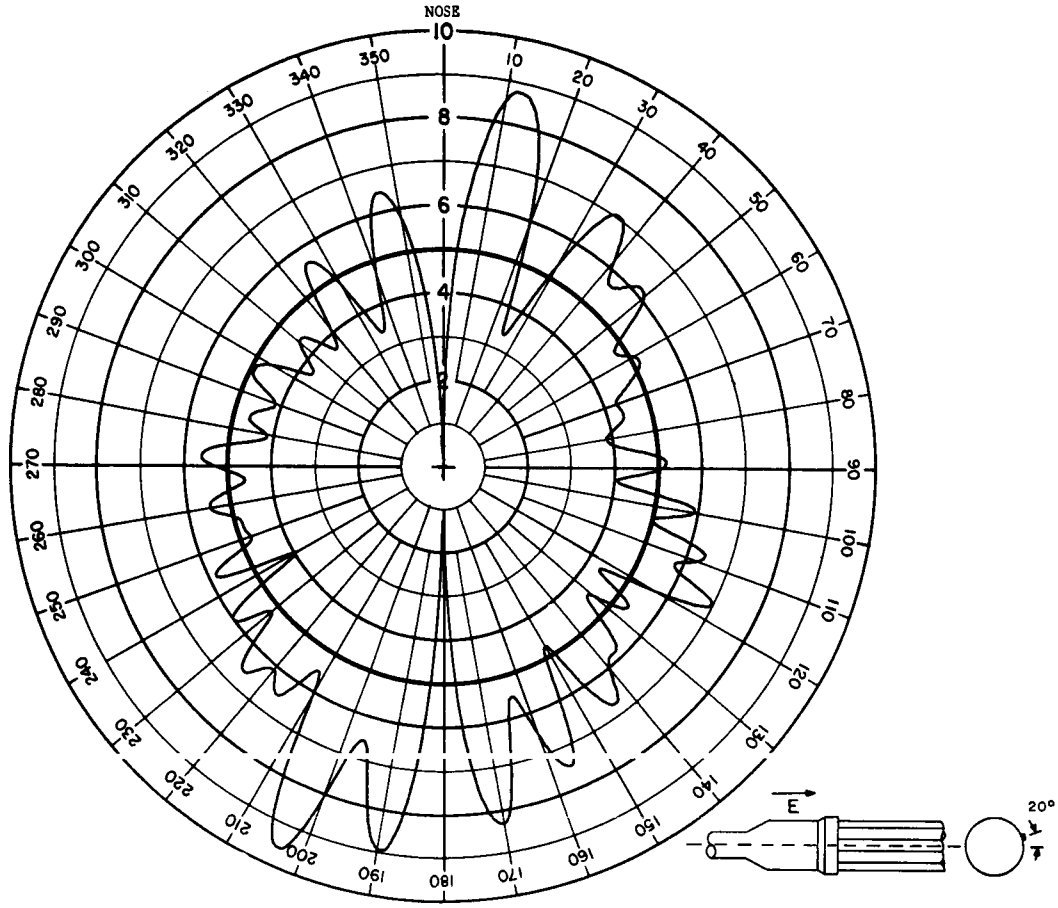
ANTENNA RADIATION PATTERN NO. 200-2

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK

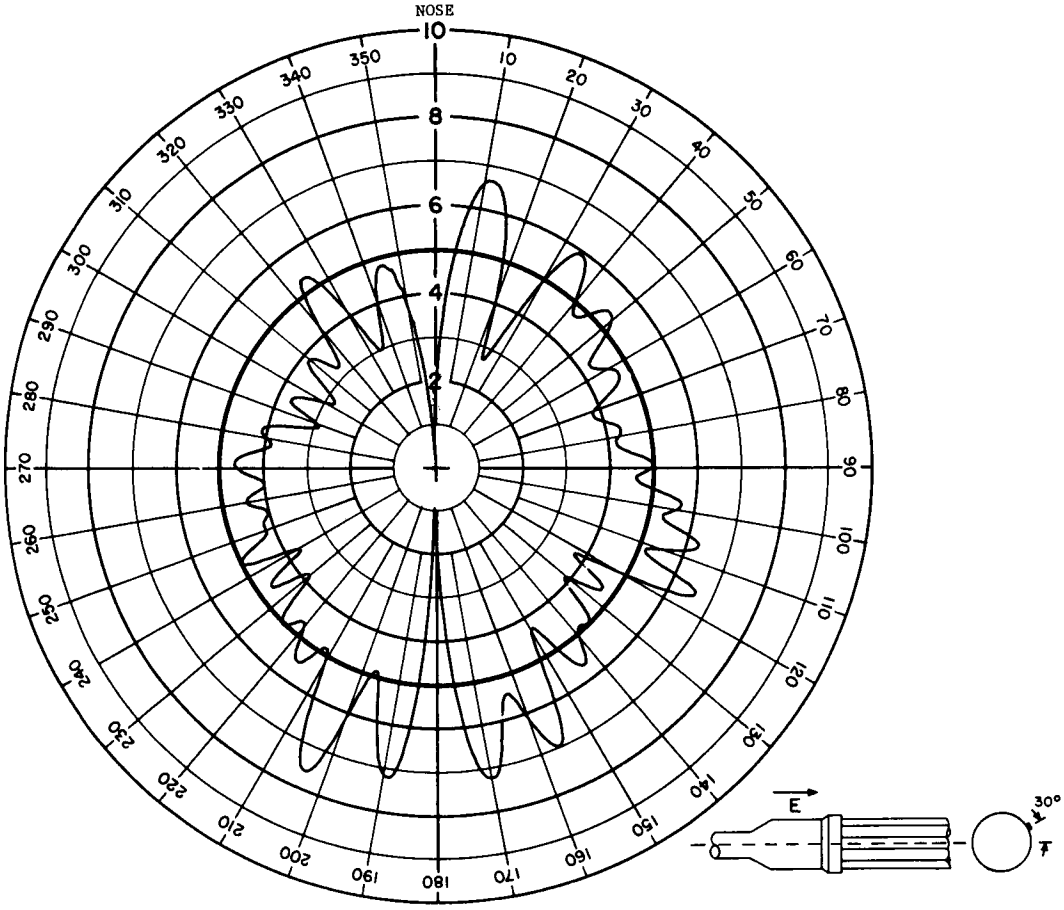


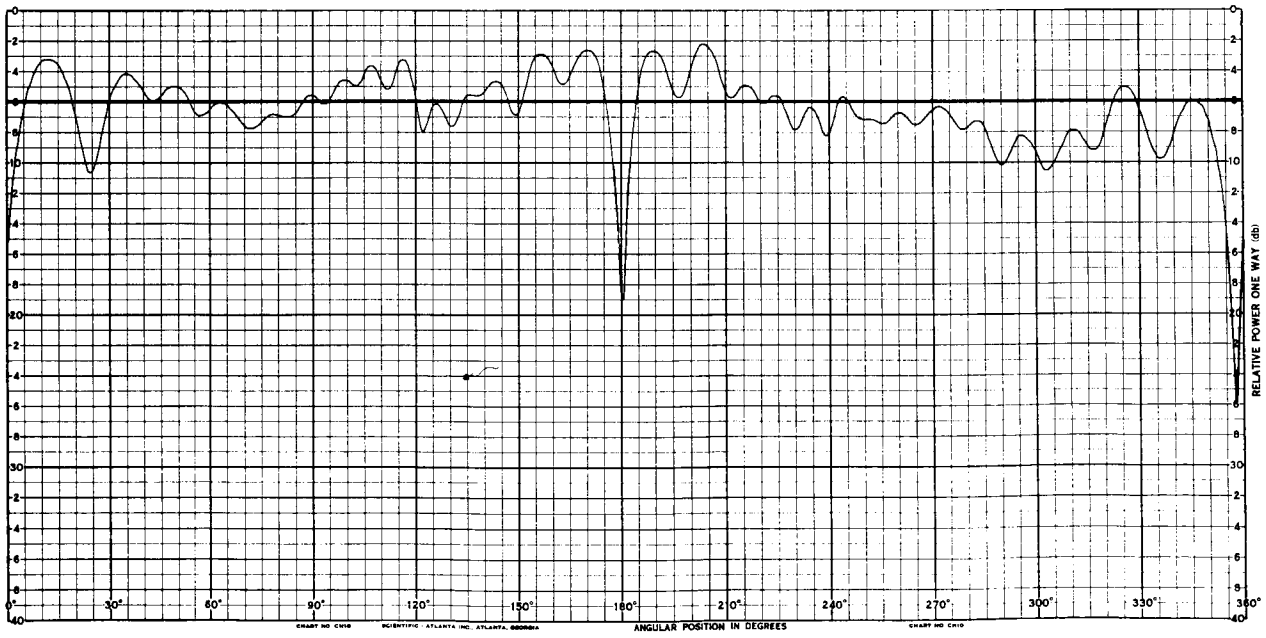
ANTENNA RADIATION PATTERN NO. 200-3

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



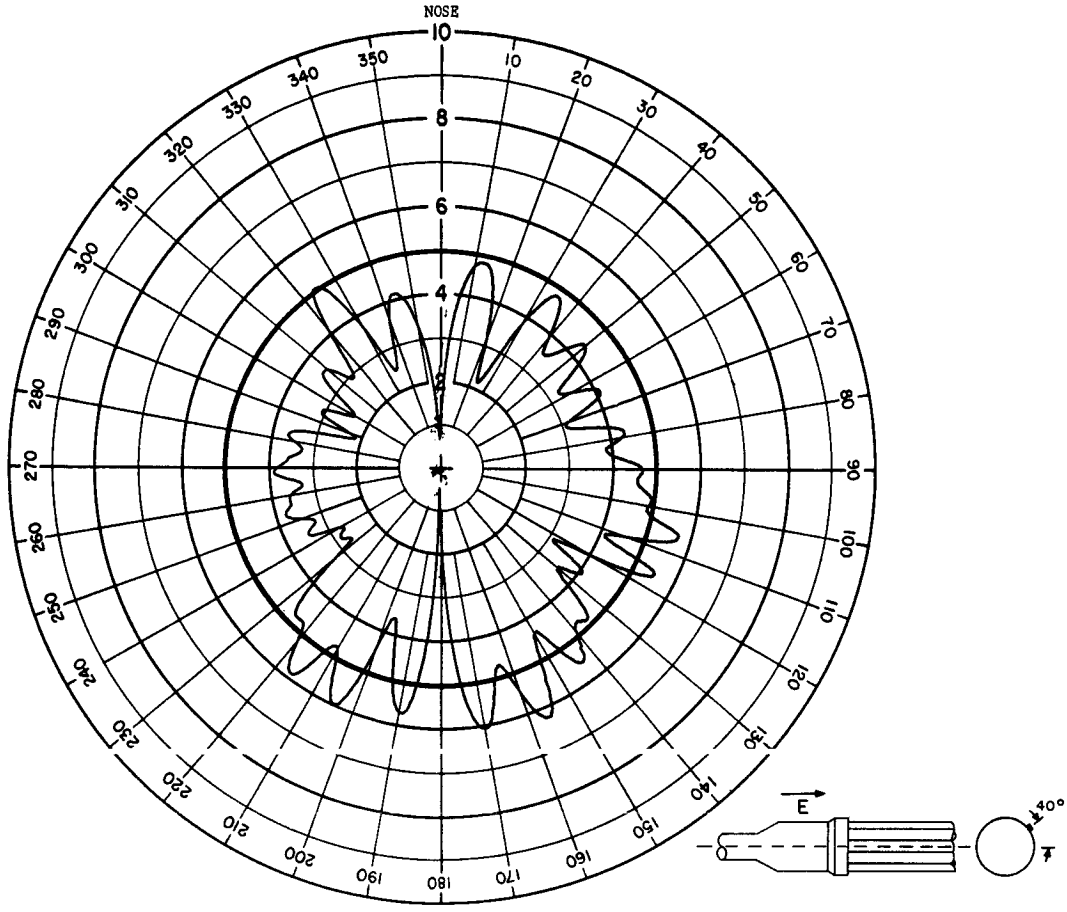


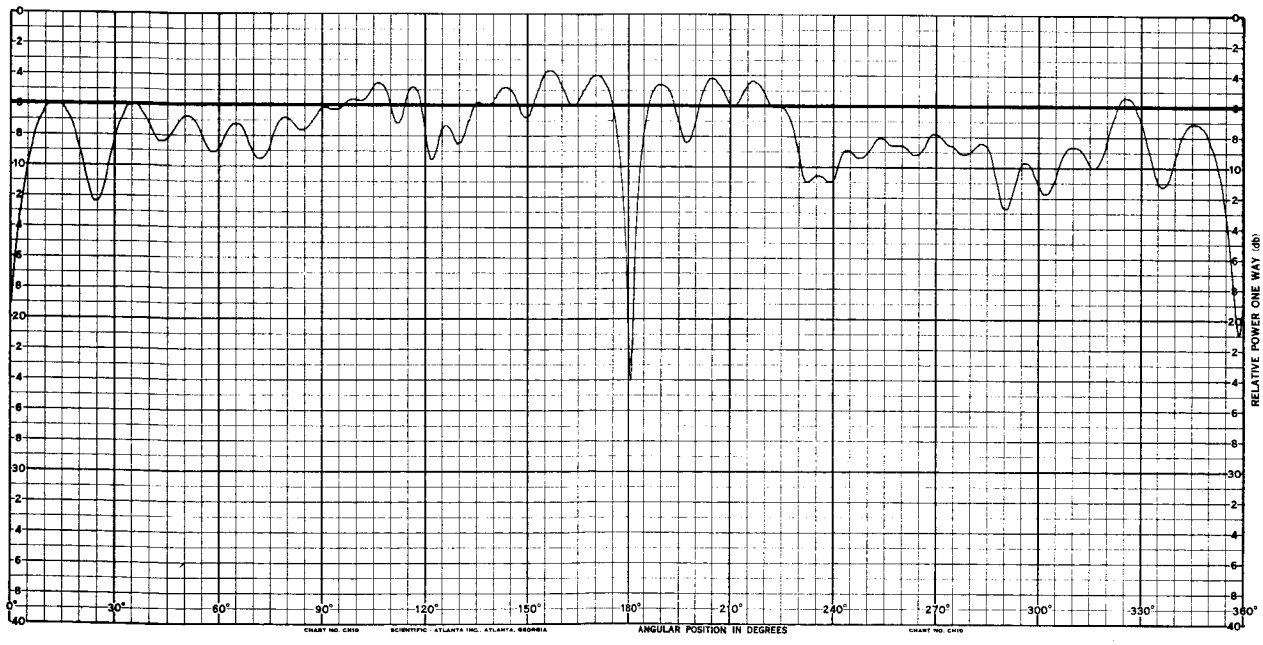
ANTENNA RADIATION PATTERN NO. 200-4

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK

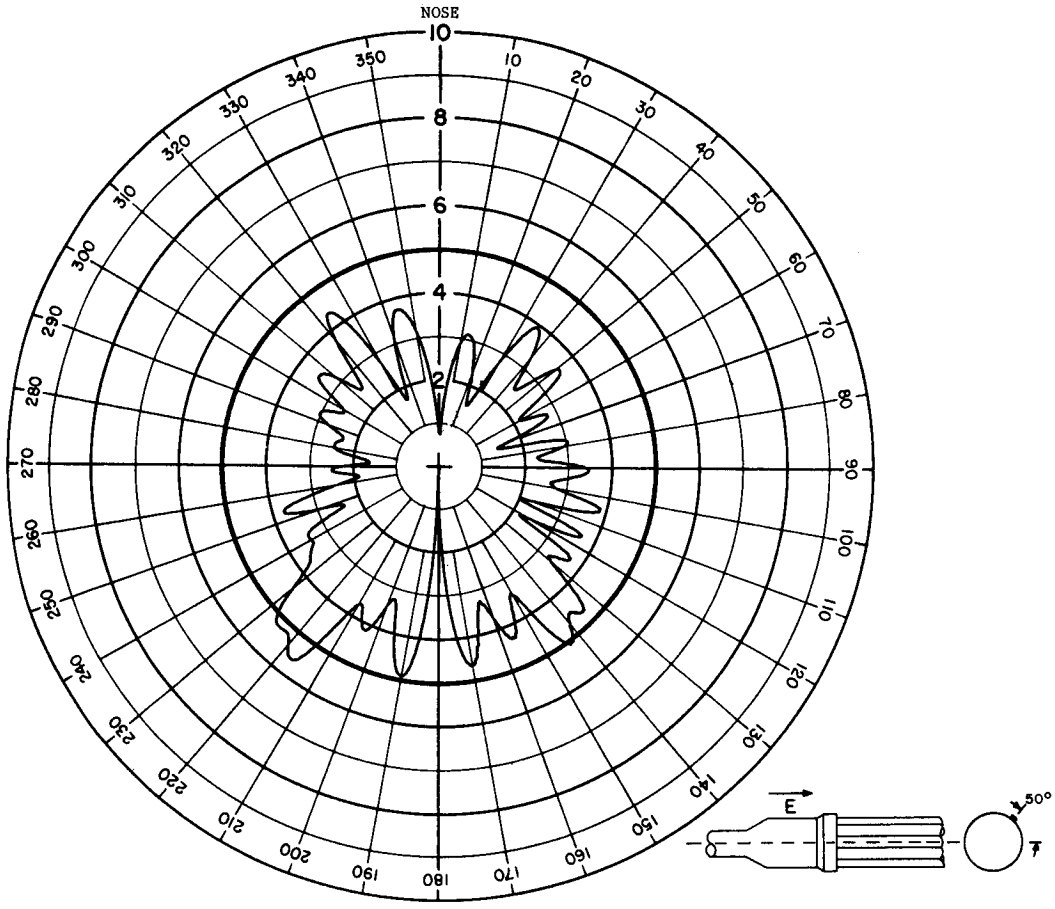


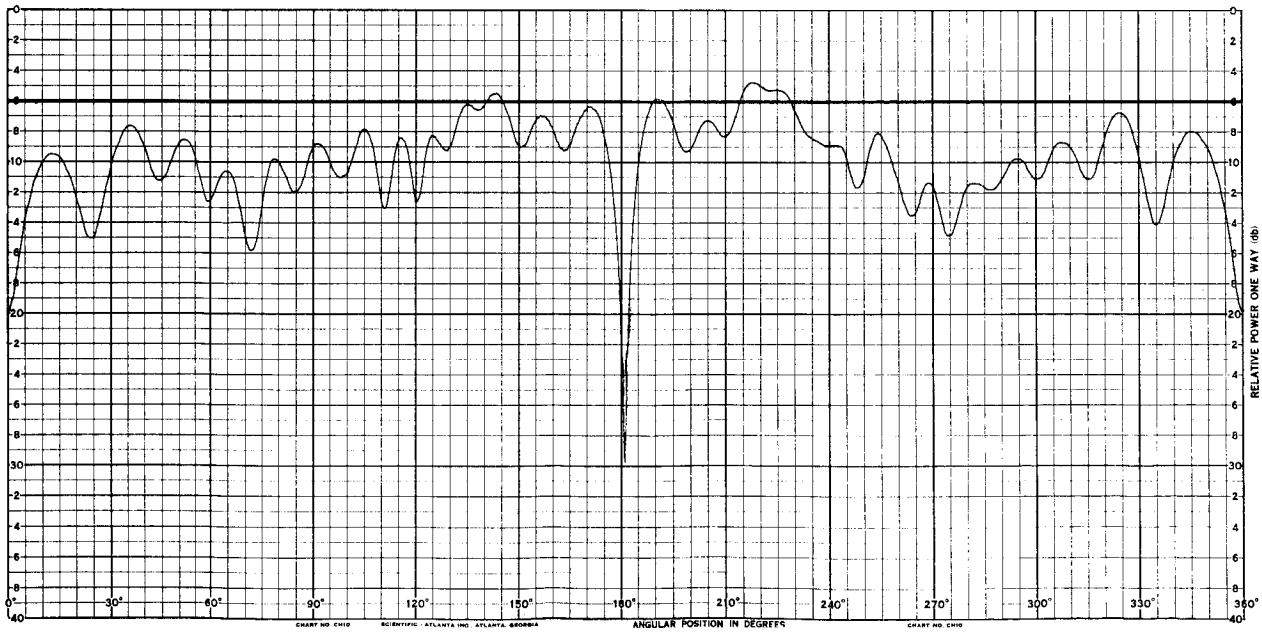


ANTENNA RADIATION PATTERN NO. 200-5

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





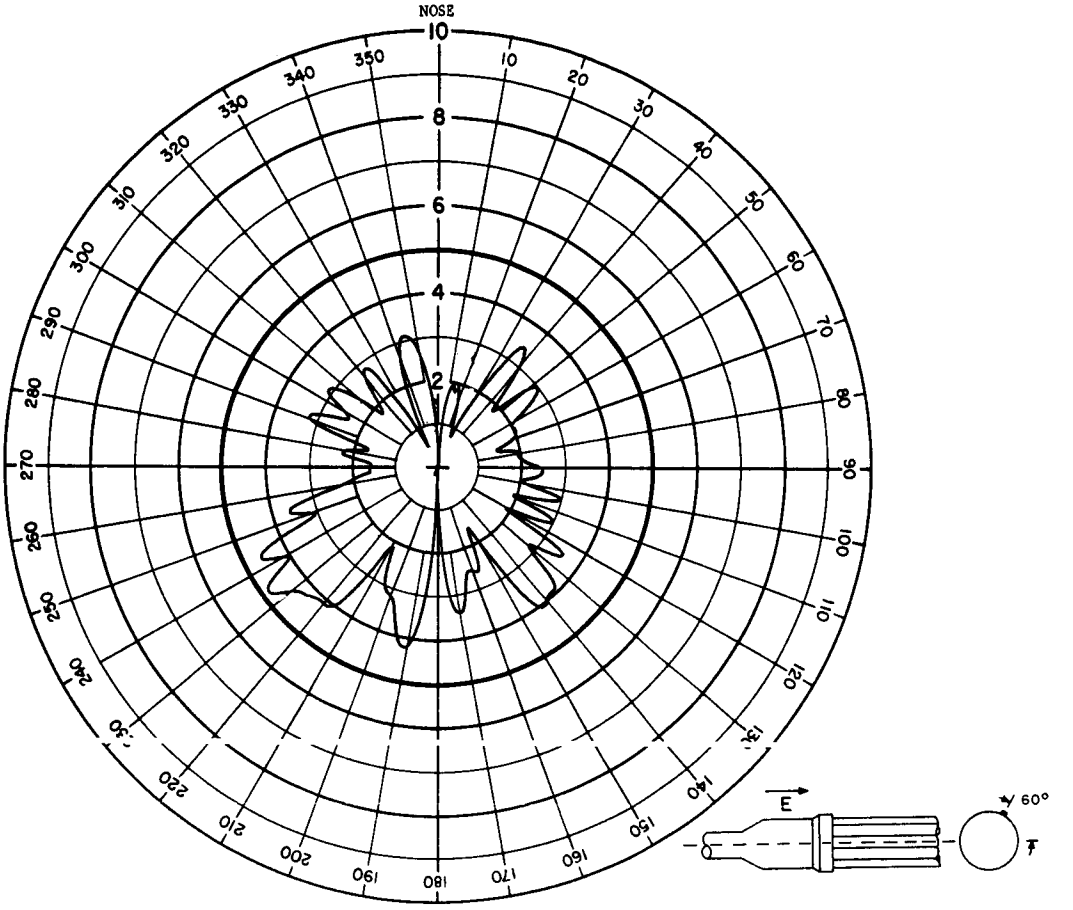
ANTENNA RADIATION PATTERN NO. 200-6

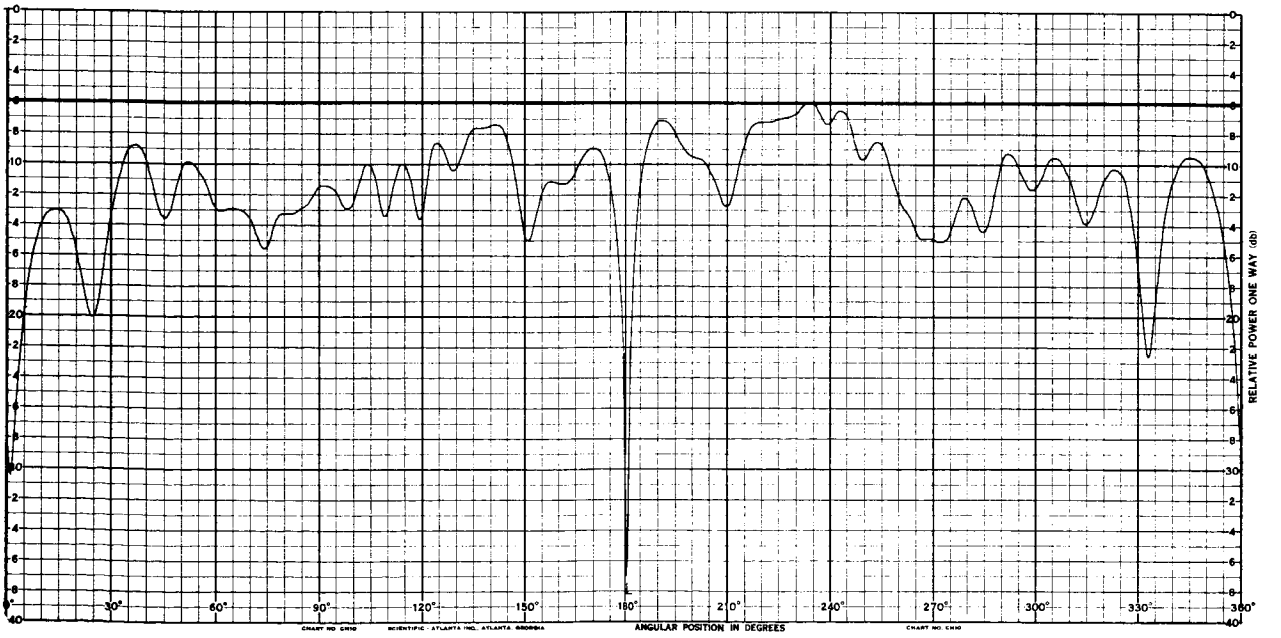
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



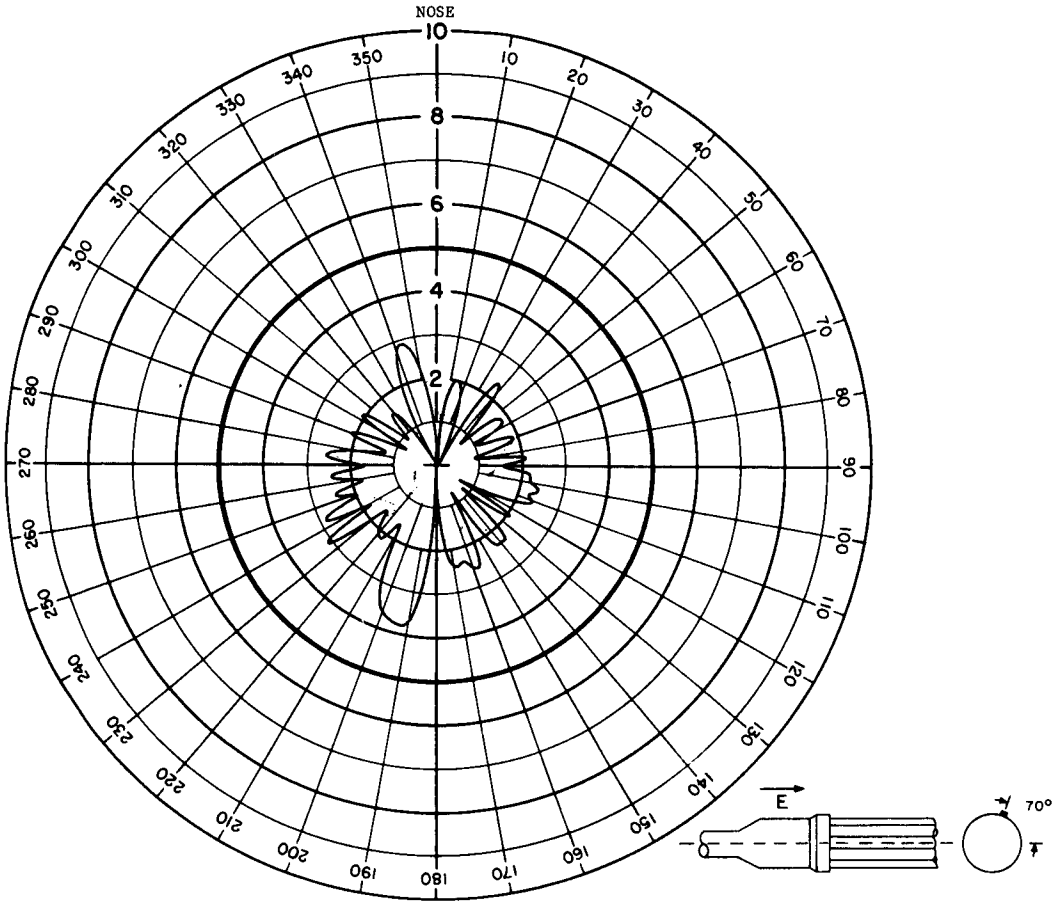


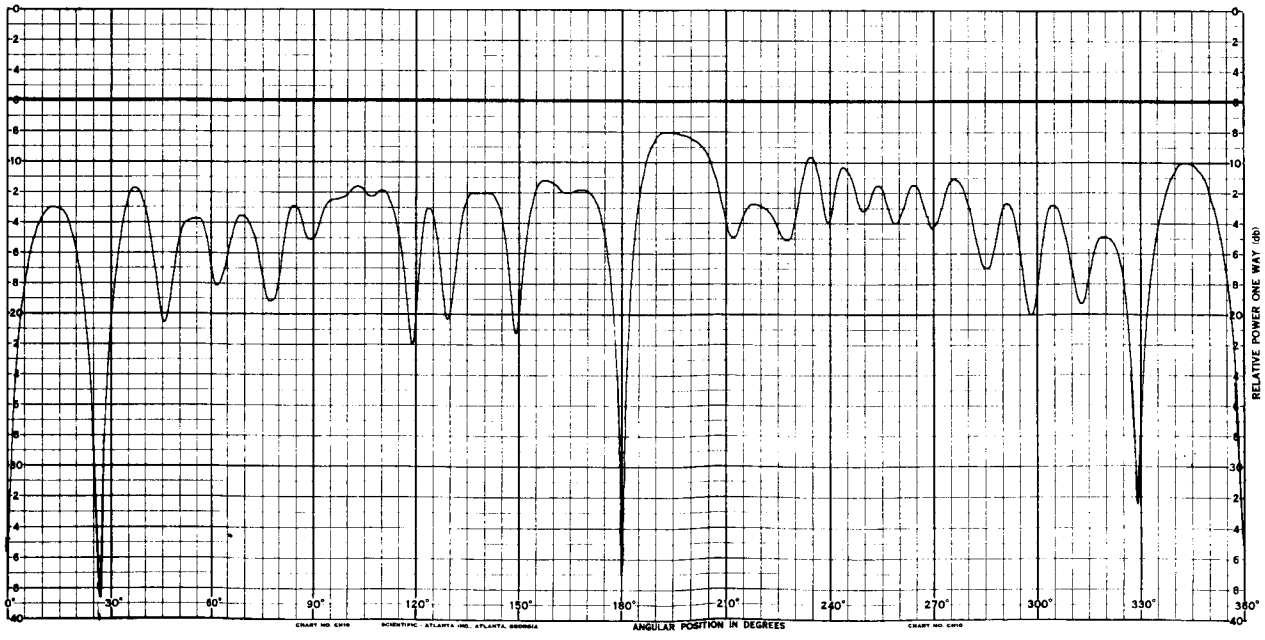
ANTENNA RADIATION PATTERN NO. 200-7

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





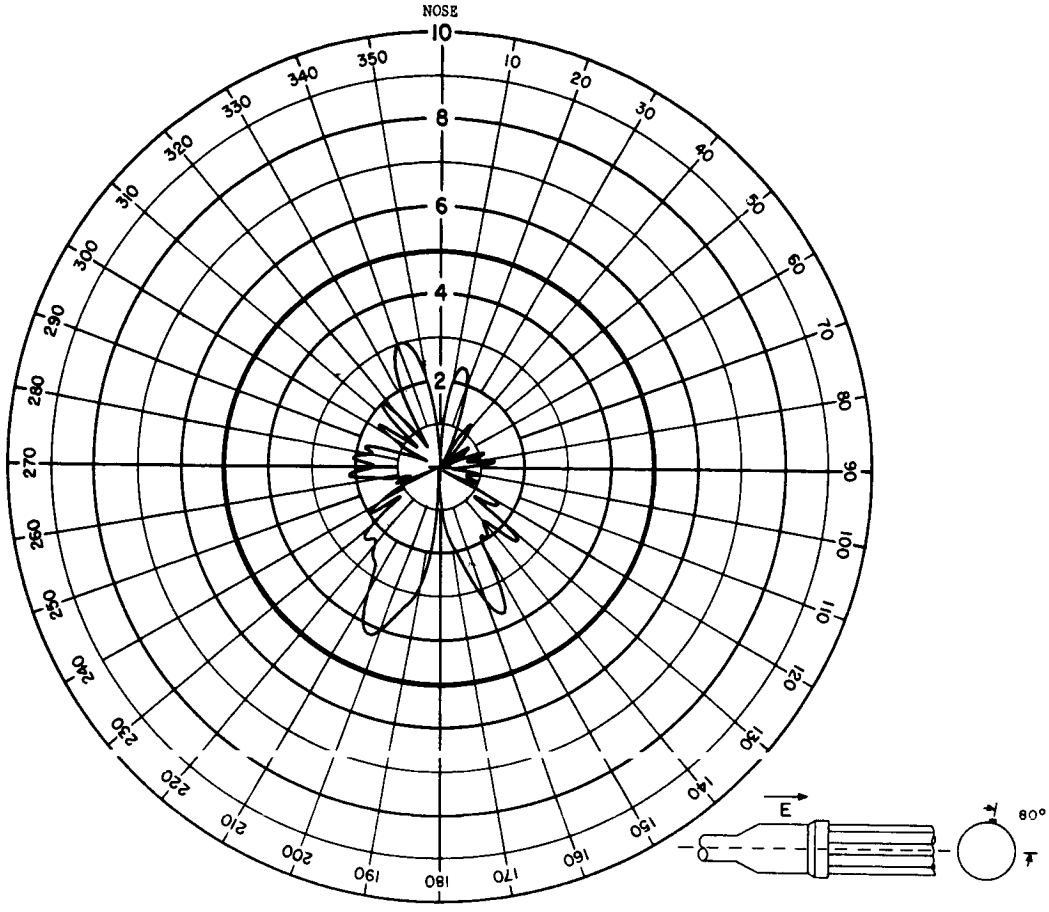
ANTENNA RADIATION PATTERN NO. 200-8

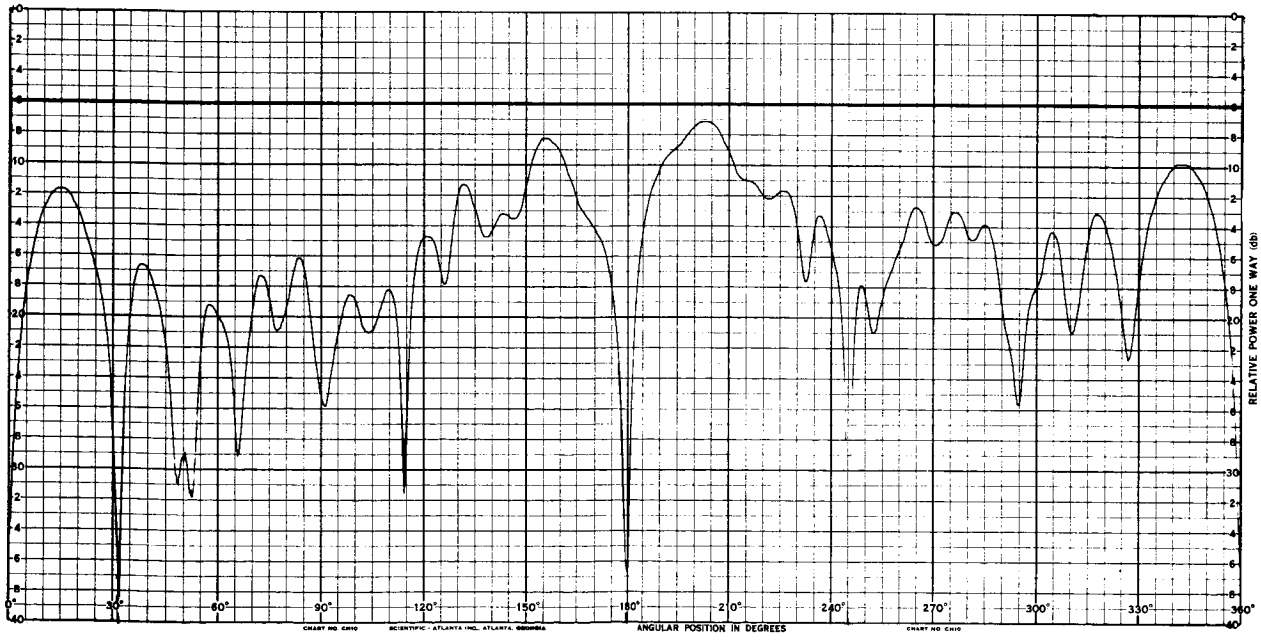
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





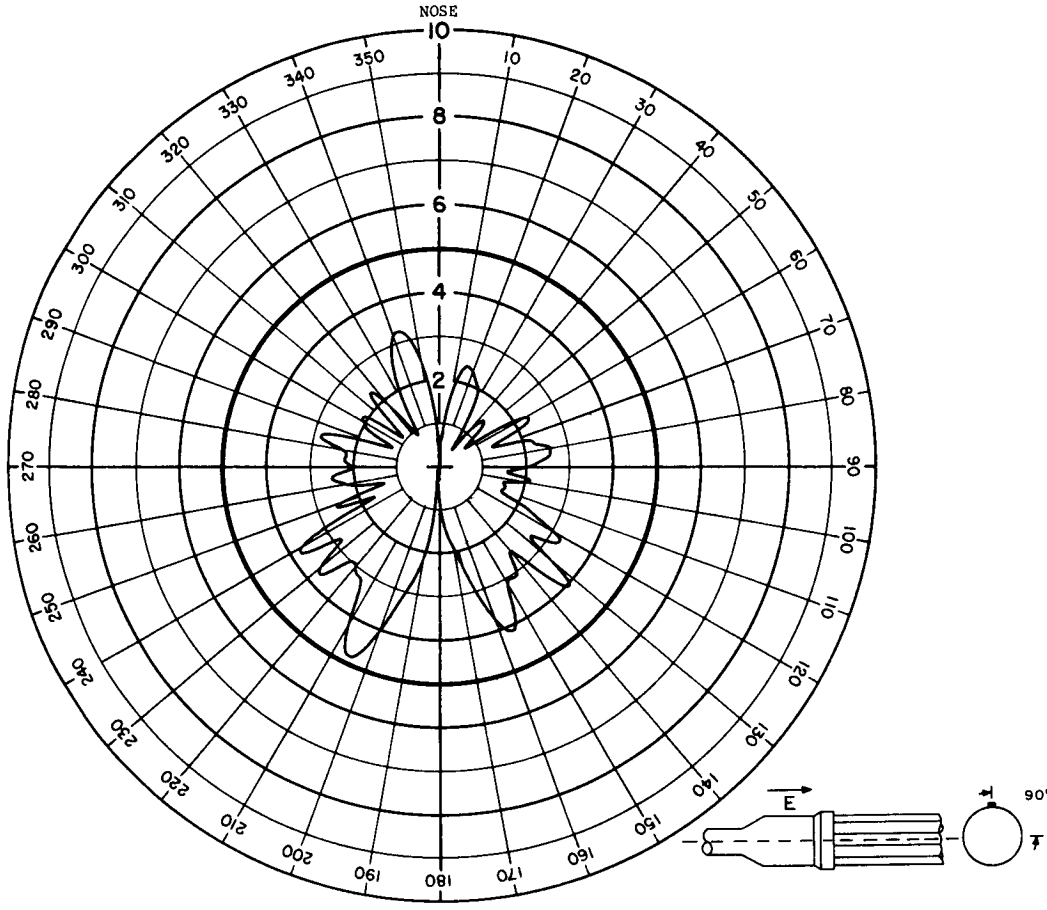
ANTENNA RADIATION PATTERN NO. 200-9

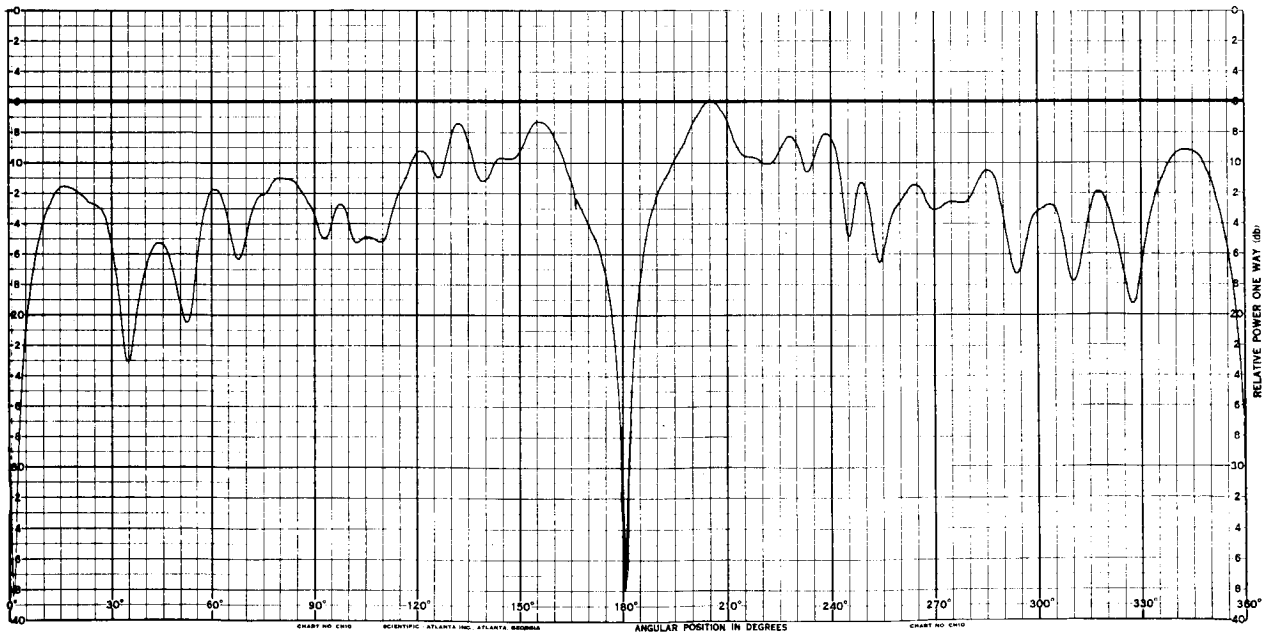
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



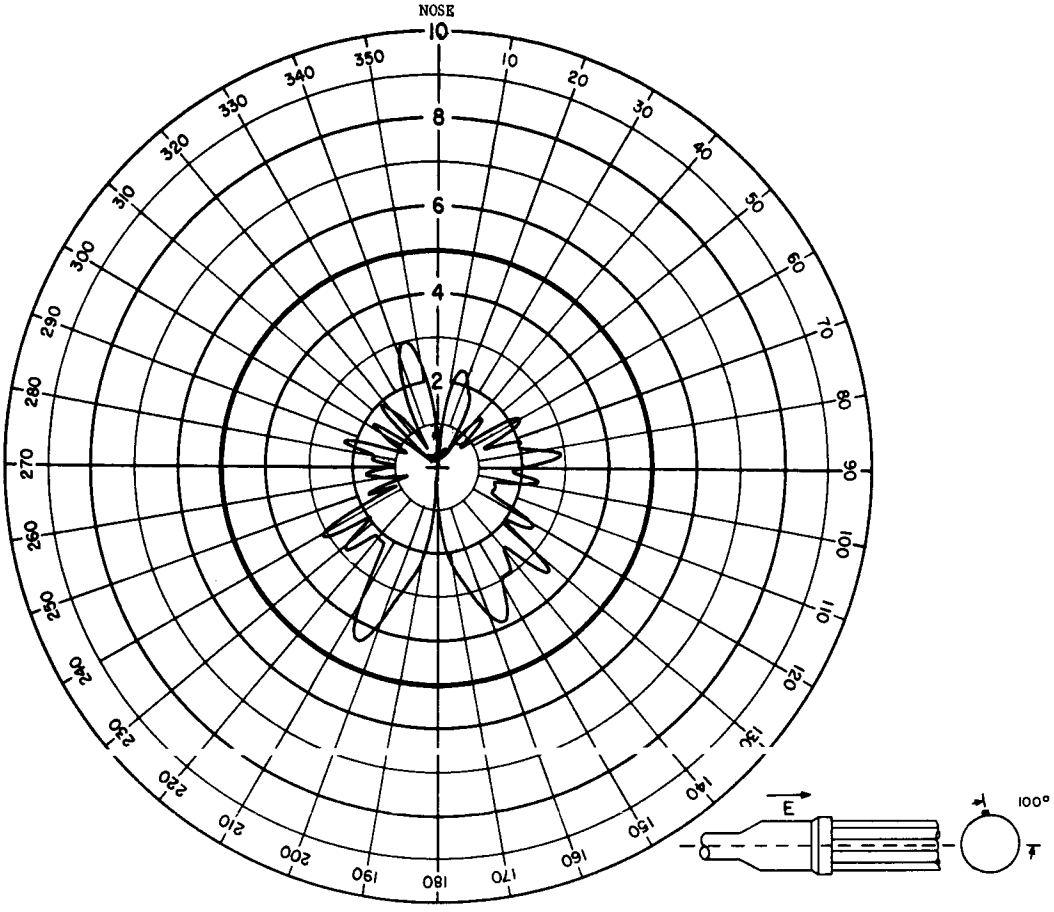


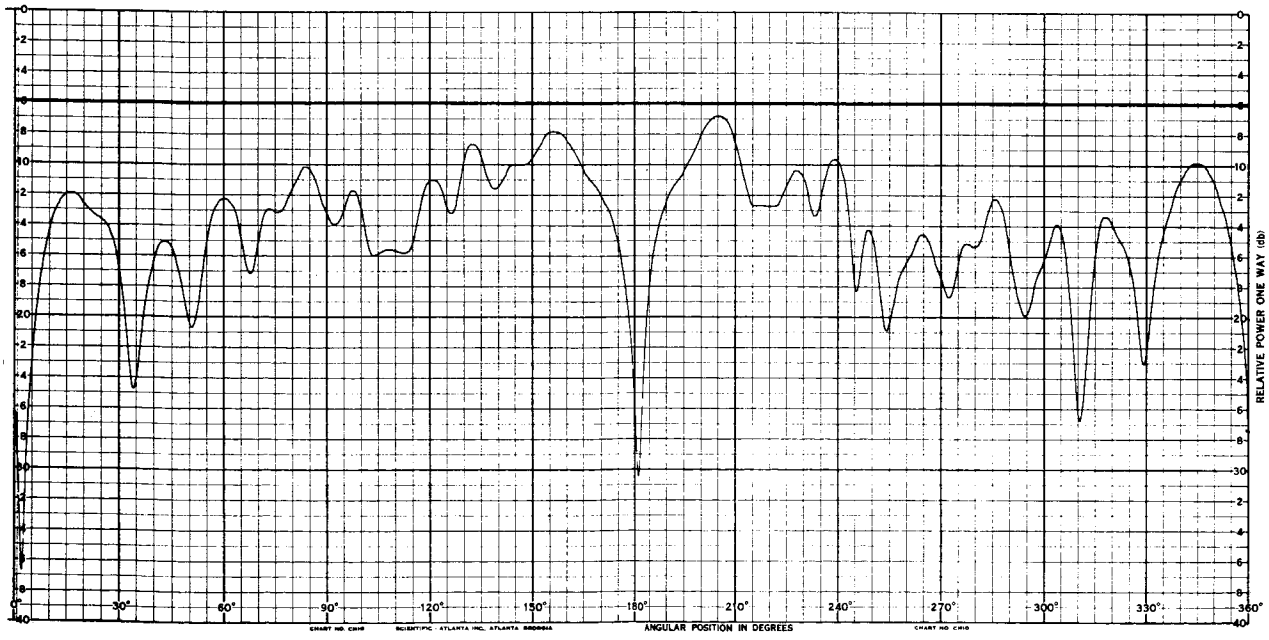
ANTENNA RADIATION PATTERN NO. 200-10

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



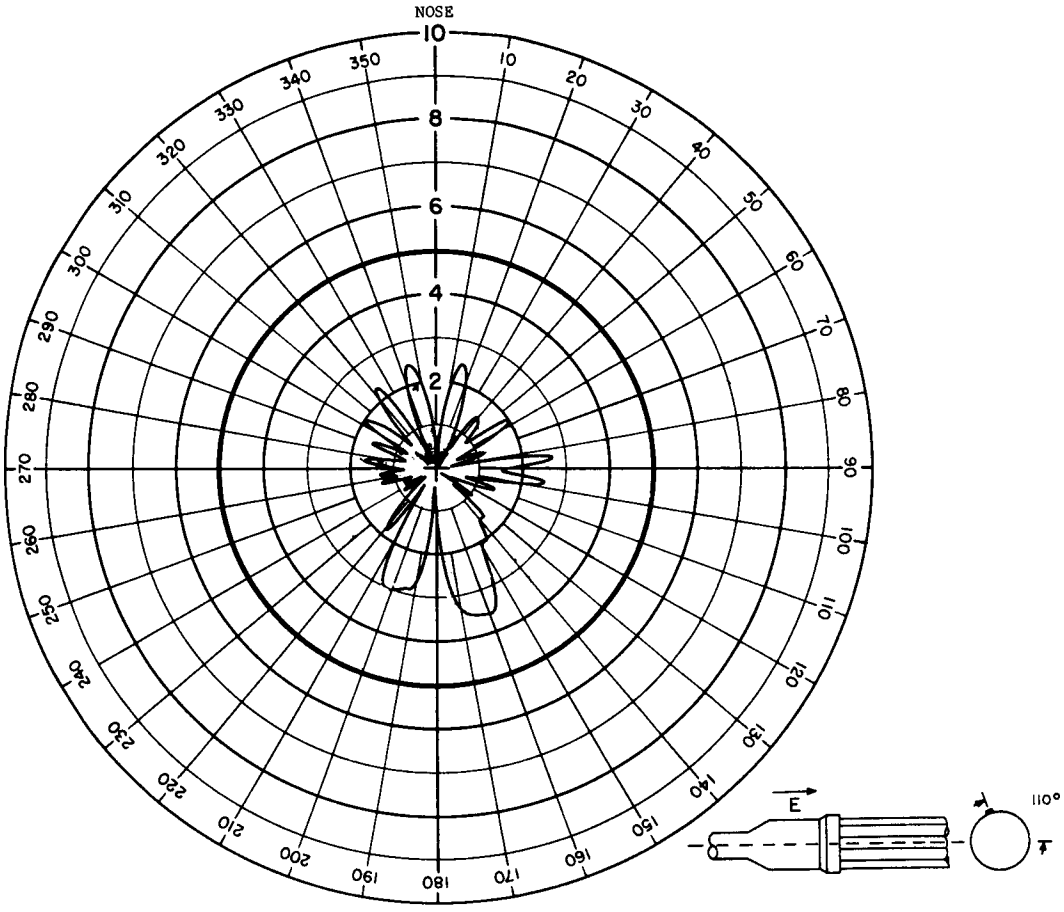


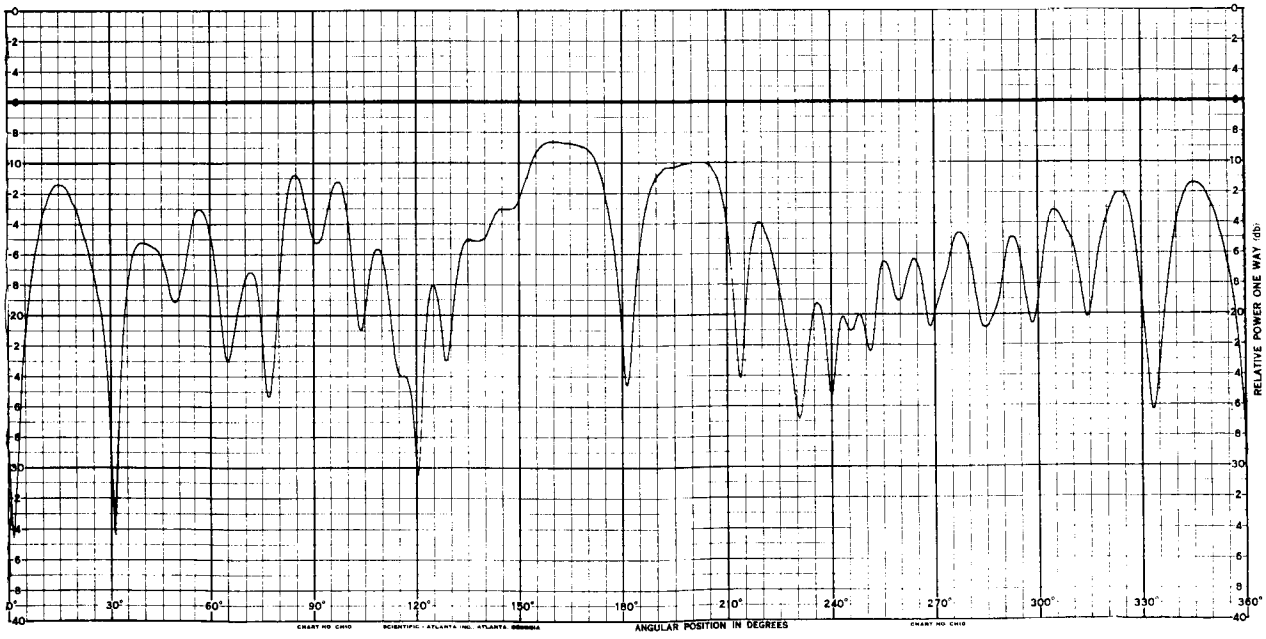
ANTENNA RADIATION PATTERN NO. 200-11

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





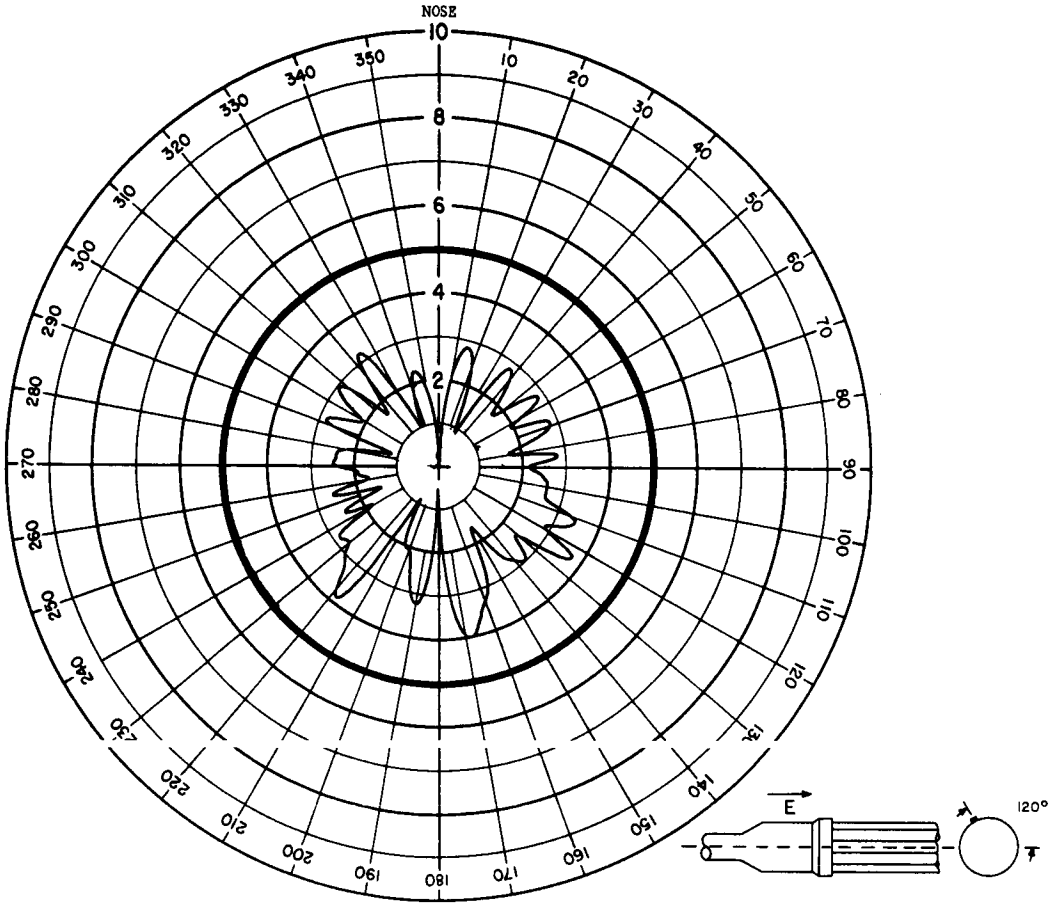
ANTENNA RADIATION PATTERN NO. 200-12

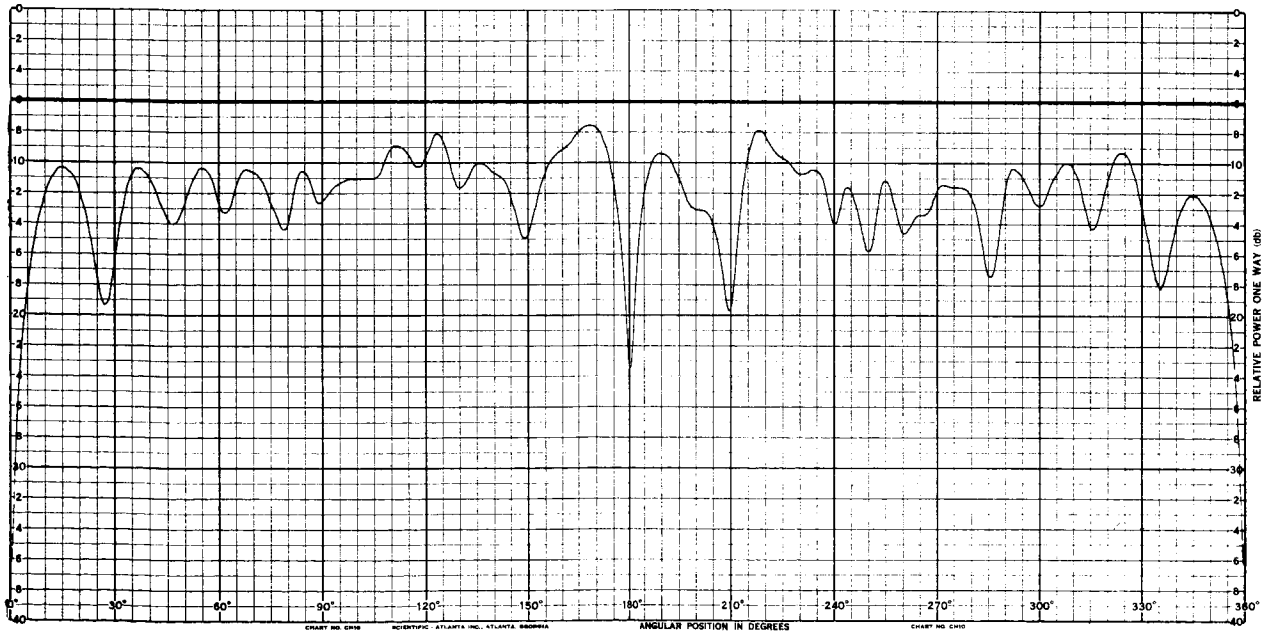
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





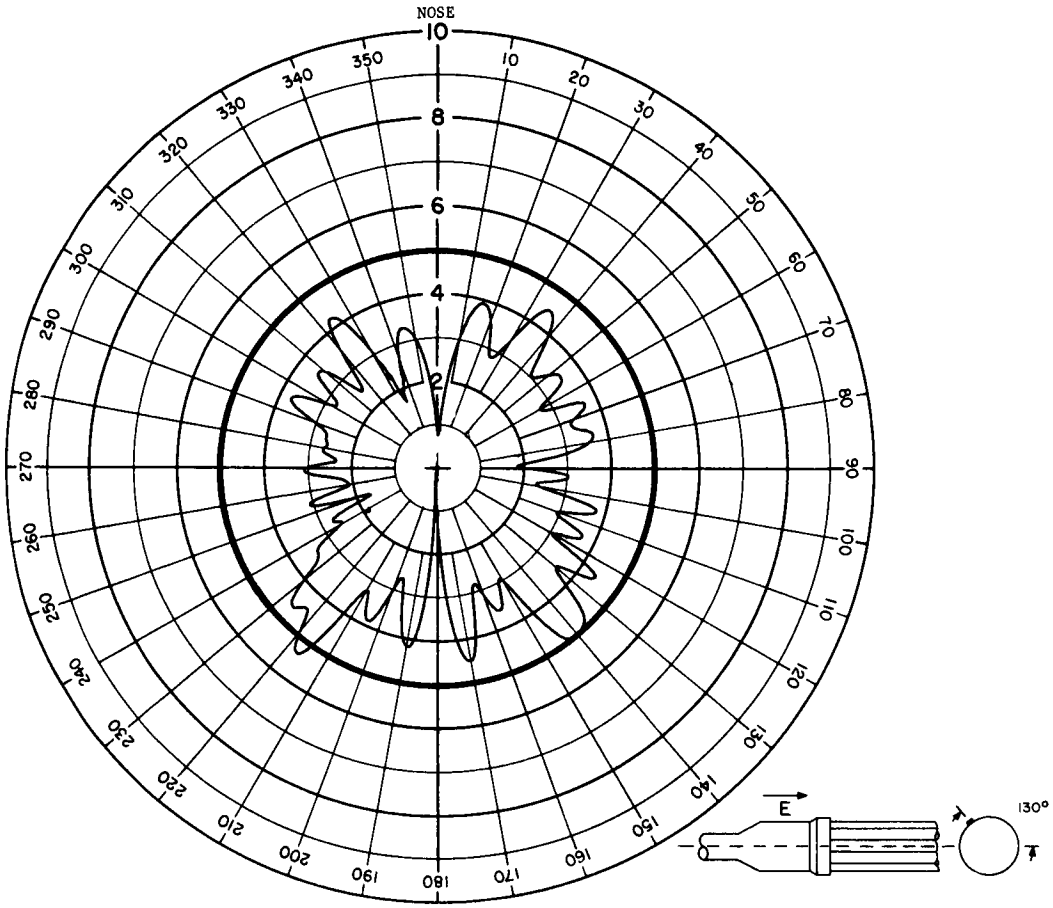
ANTENNA RADIATION PATTERN NO. 200-13

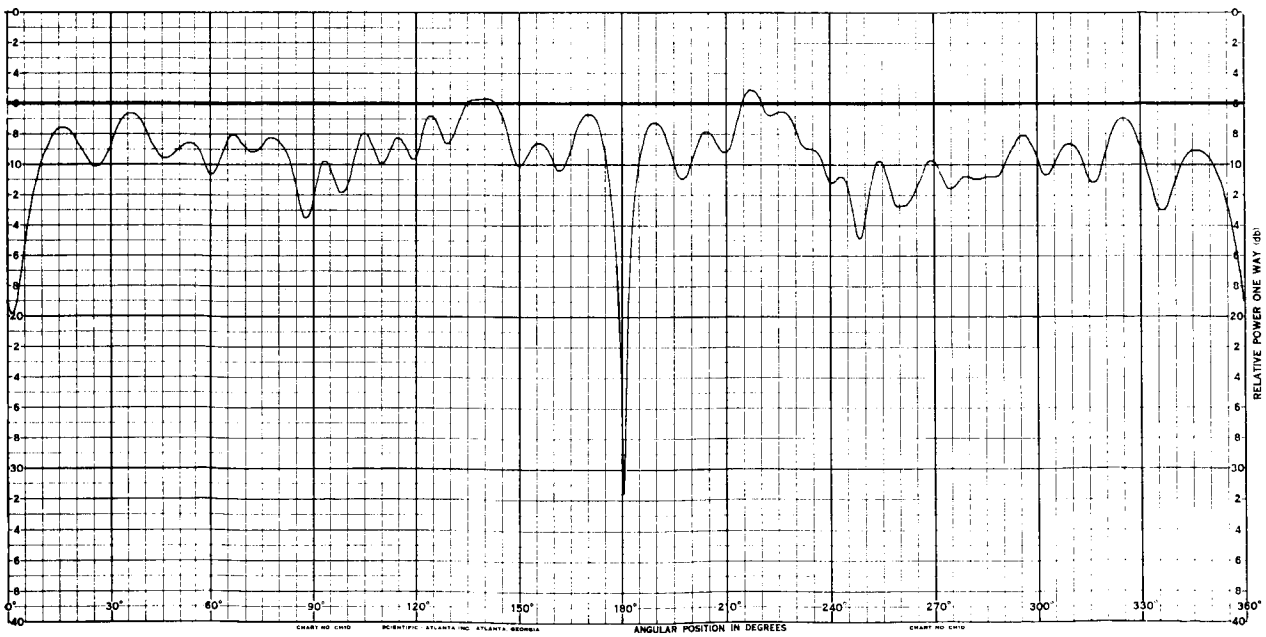
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





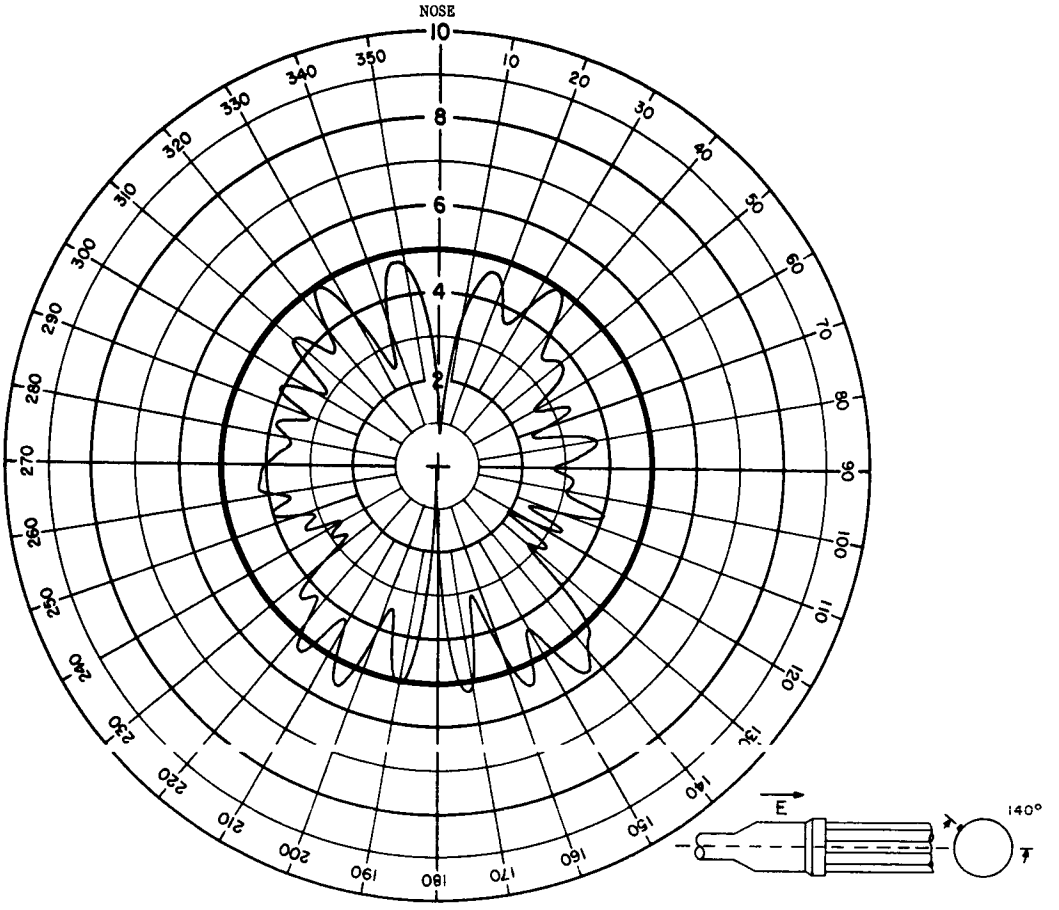
ANTENNA RADIATION PATTERN NO. 200-14

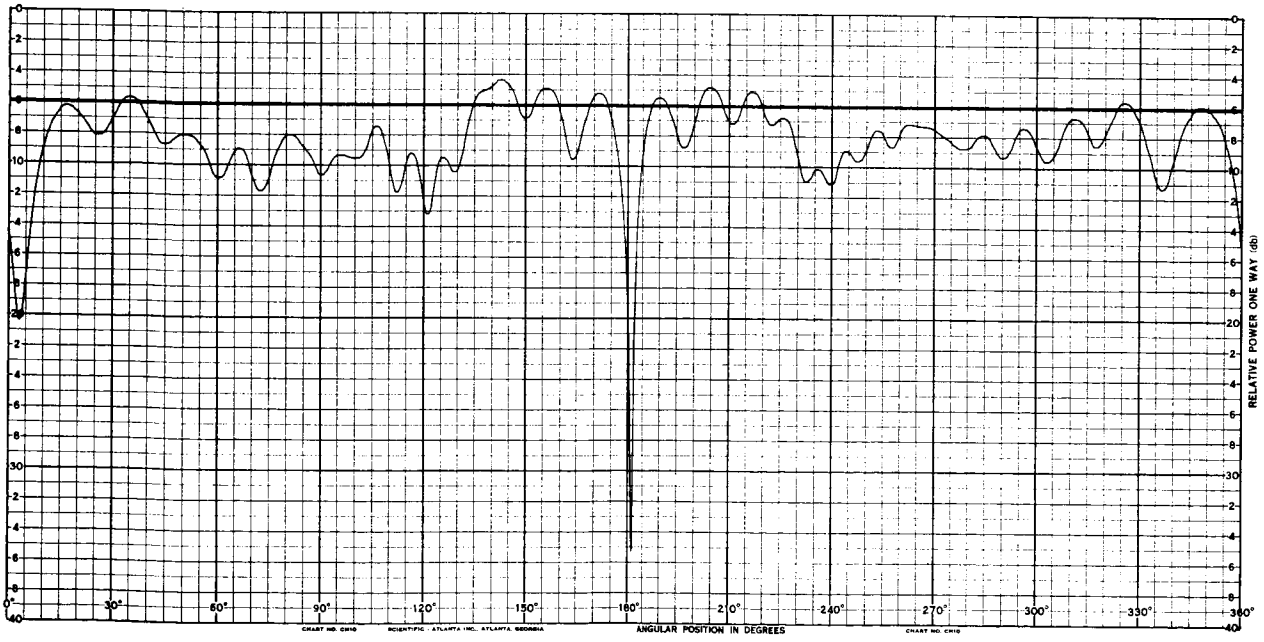
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





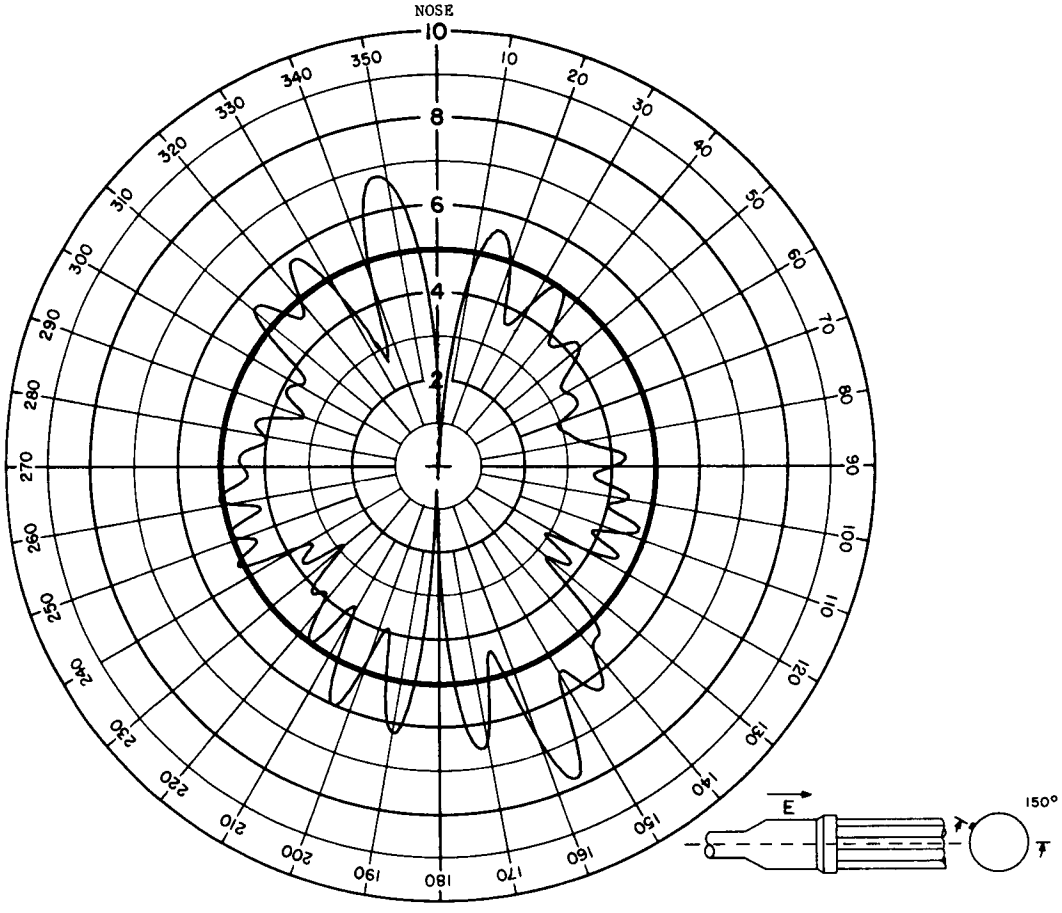
ANTENNA RADIATION PATTERN NO. 200-15

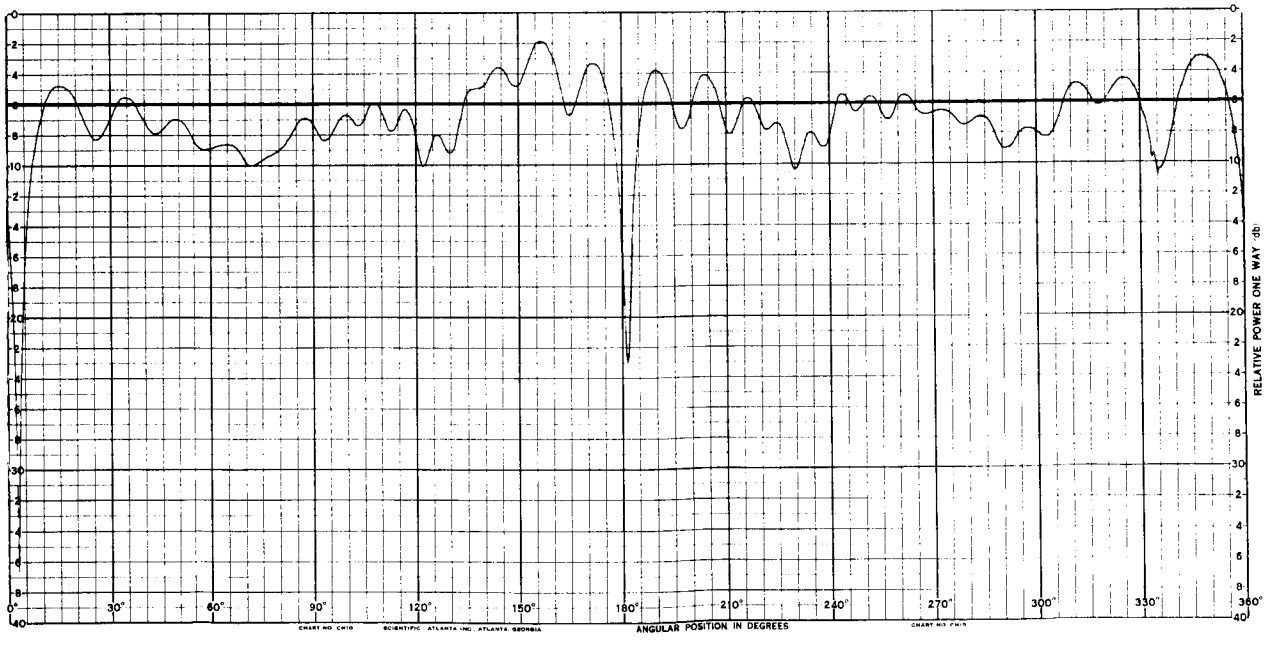
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





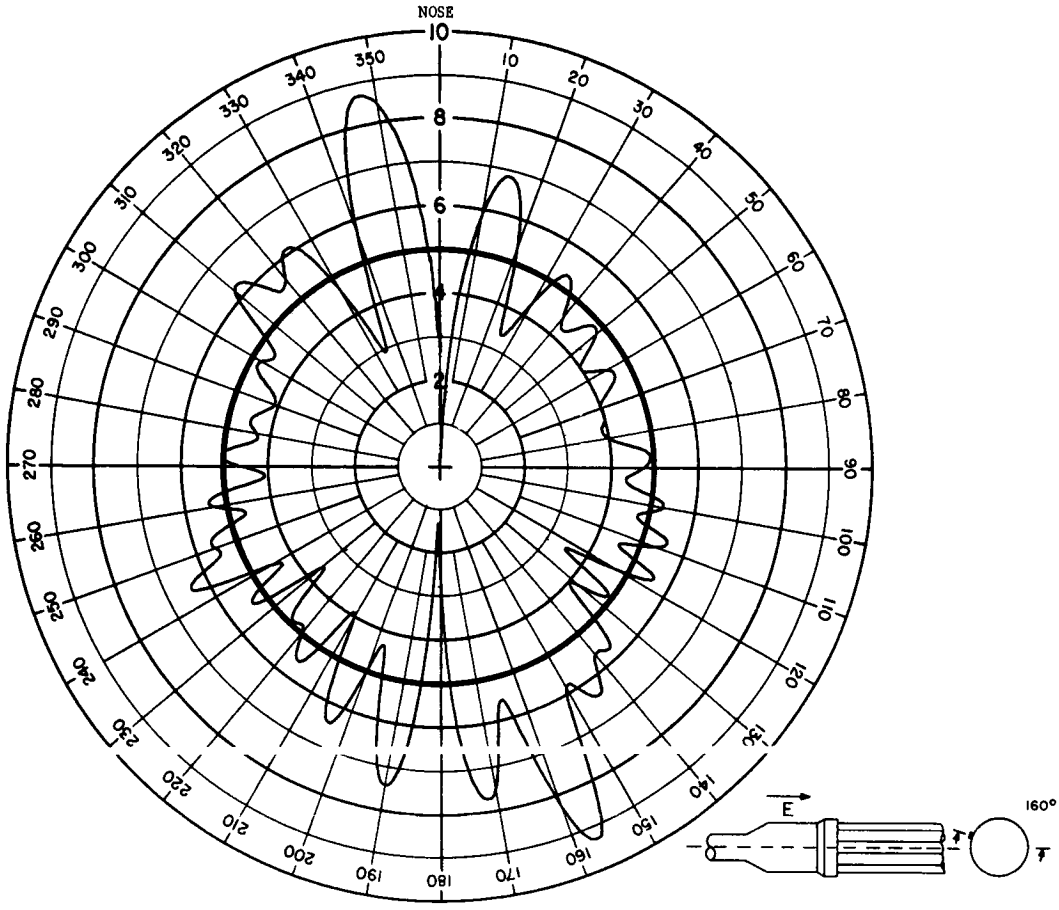
ANTENNA RADIATION PATTERN NO. 200-16

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK

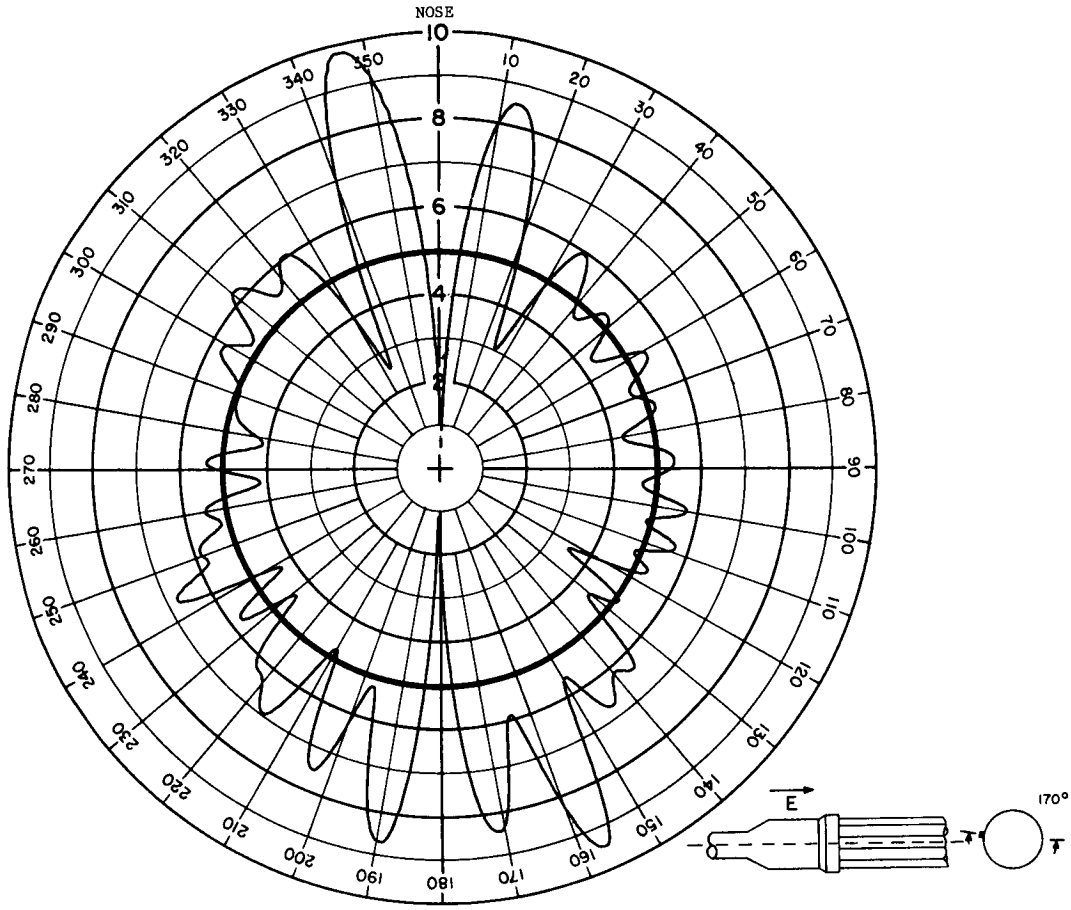


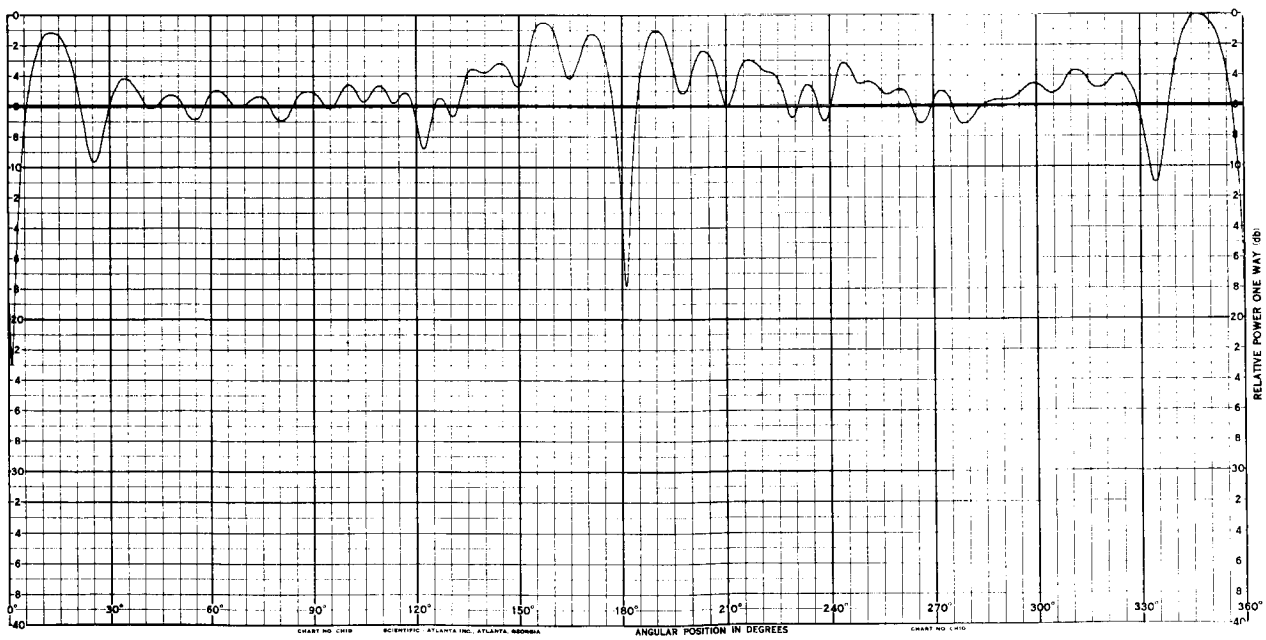
ANTENNA RADIATION PATTERN NO. 200-17

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





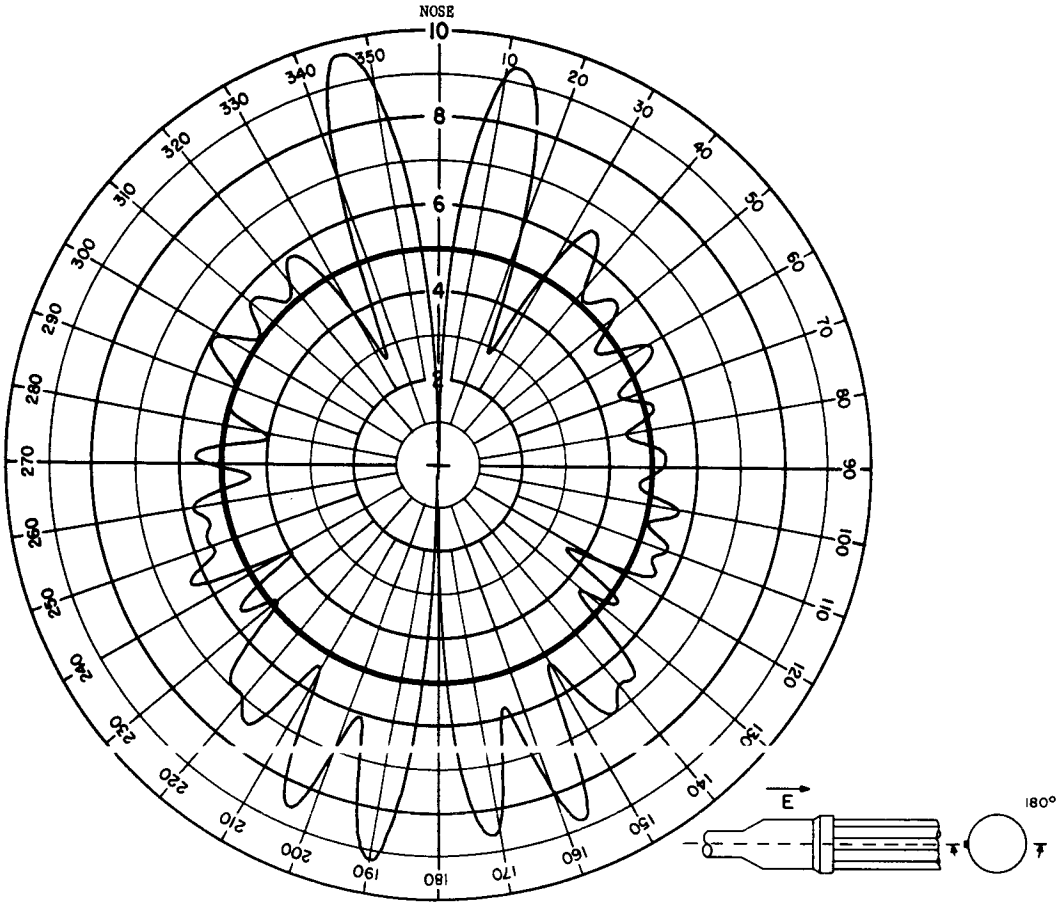
ANTENNA RADIATION PATTERN NO. 200-18

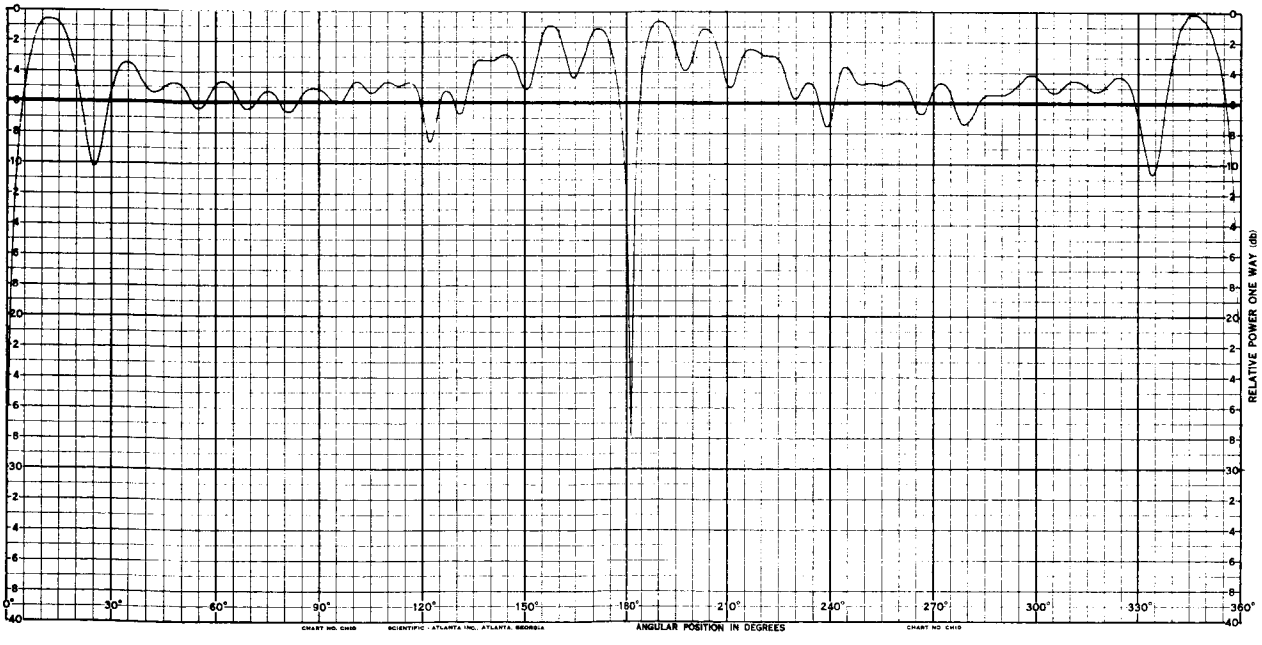
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



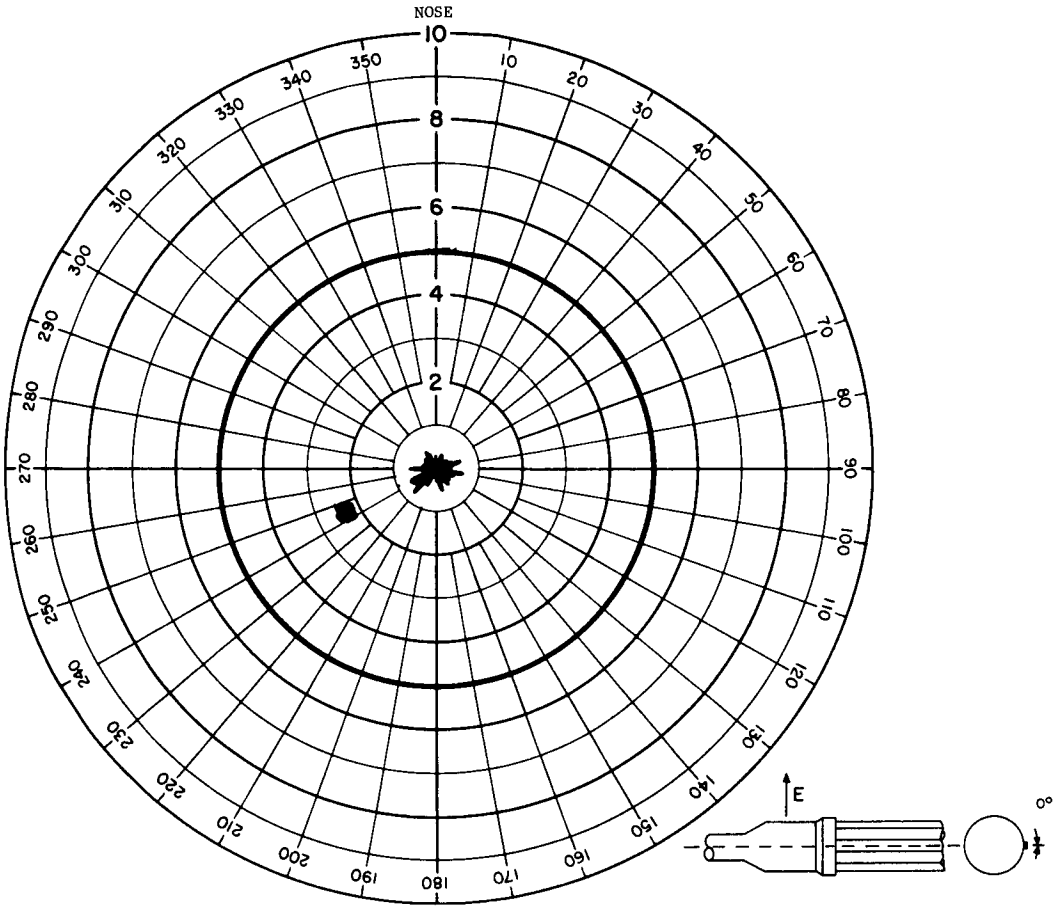


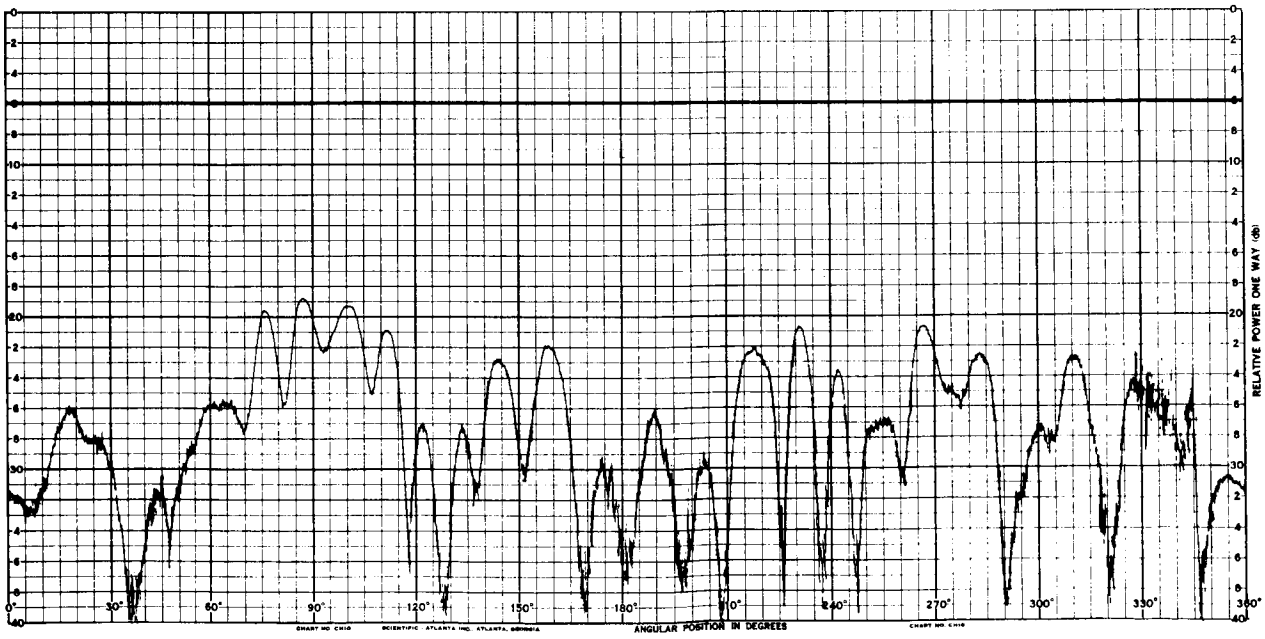
ANTENNA RADIATION PATTERN NO. 200-19

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





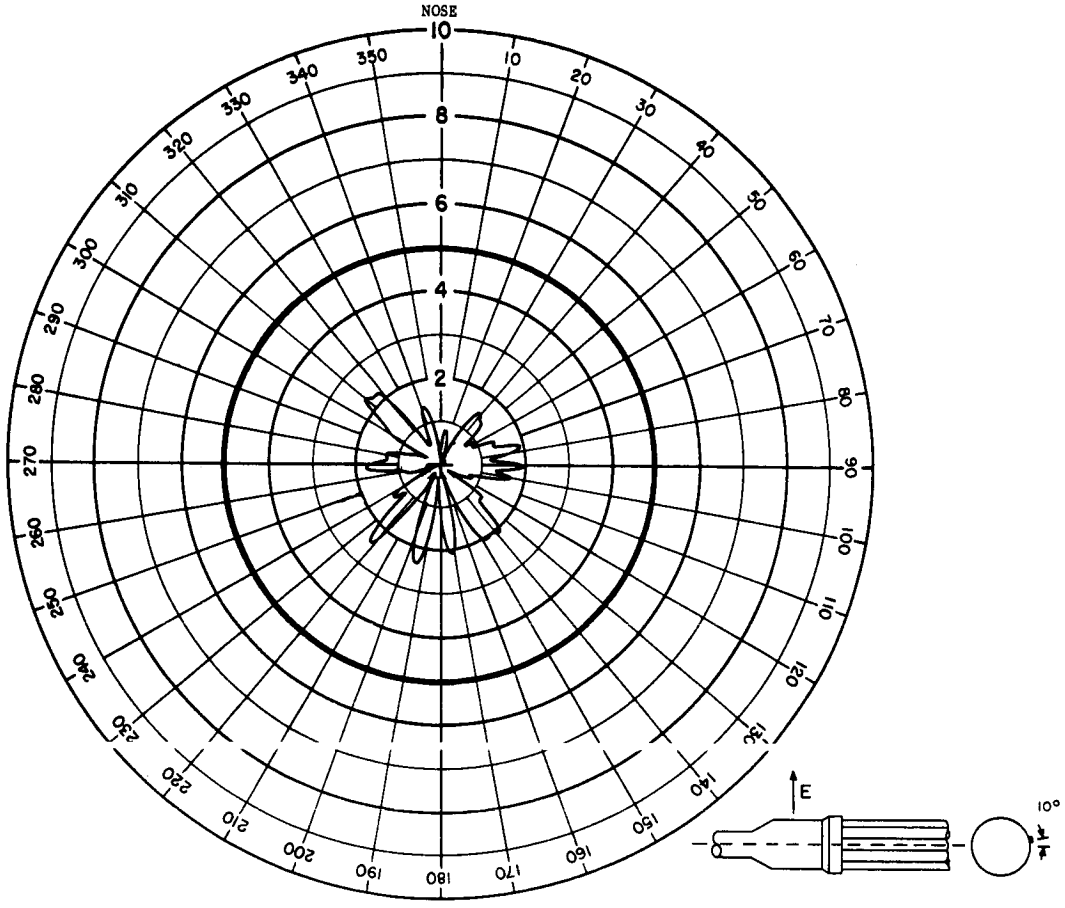
ANTENNA RADIATION PATTERN NO. 200-20

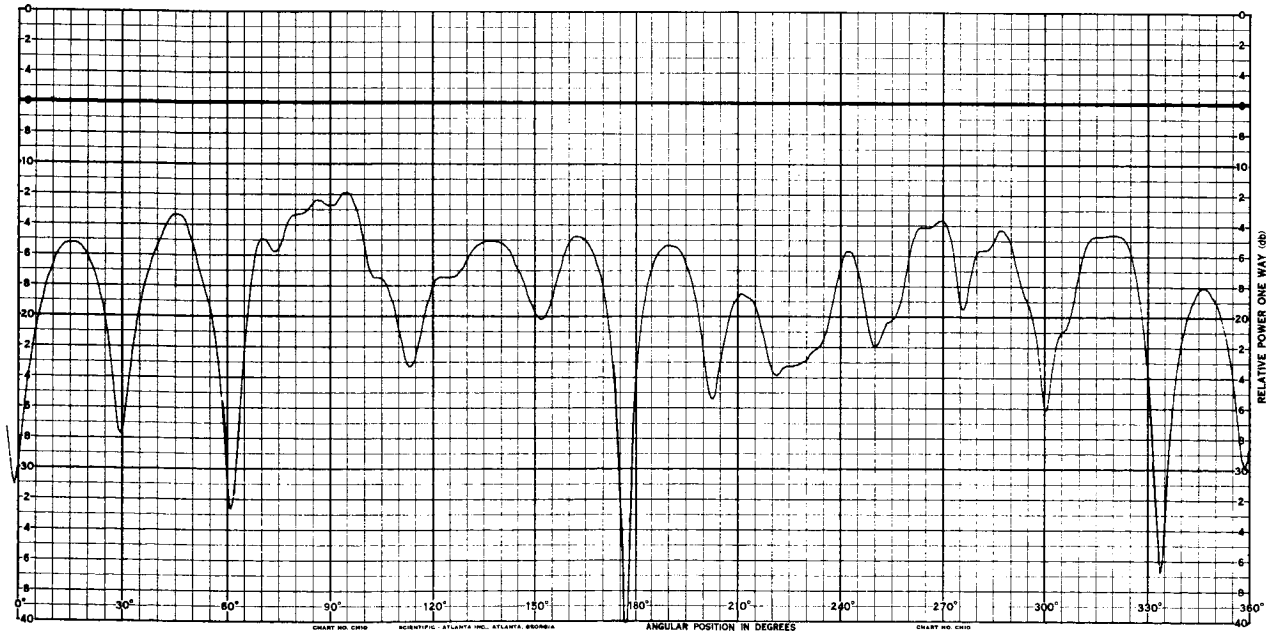
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





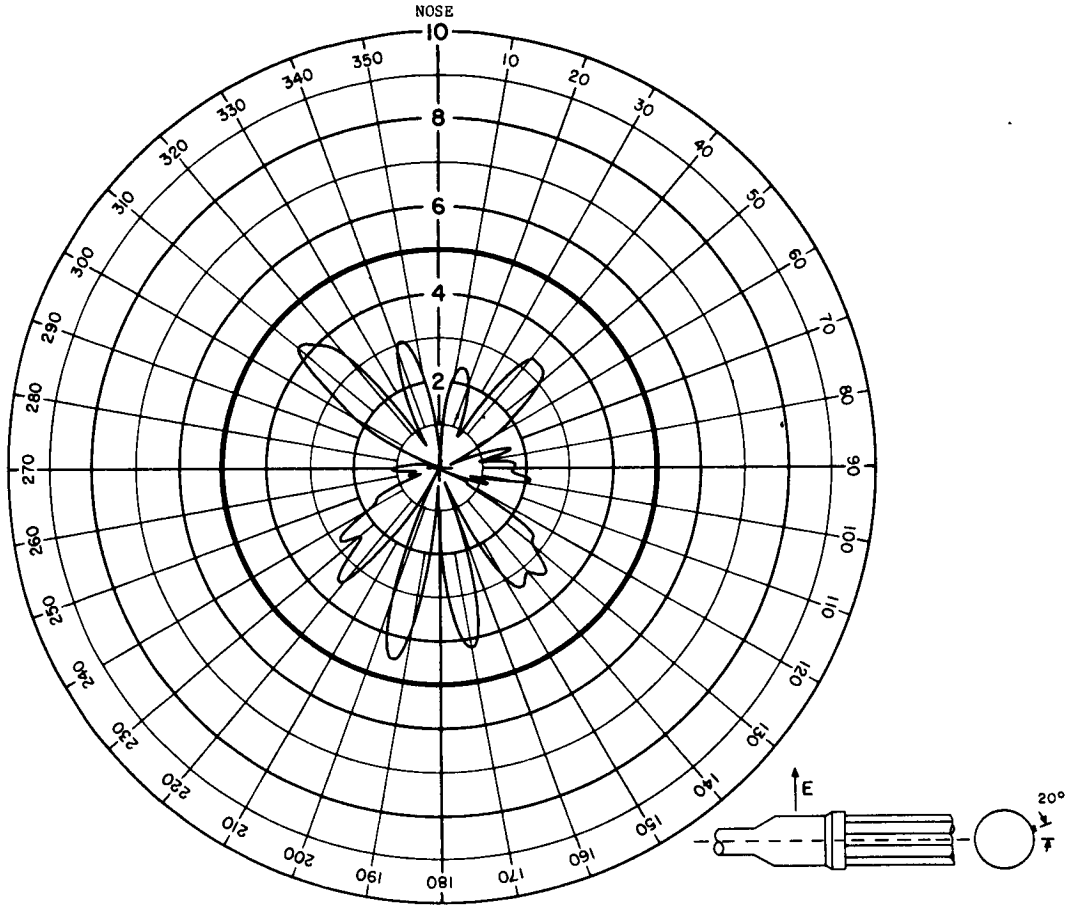
ANTENNA RADIATION PATTERN NO. 200-21

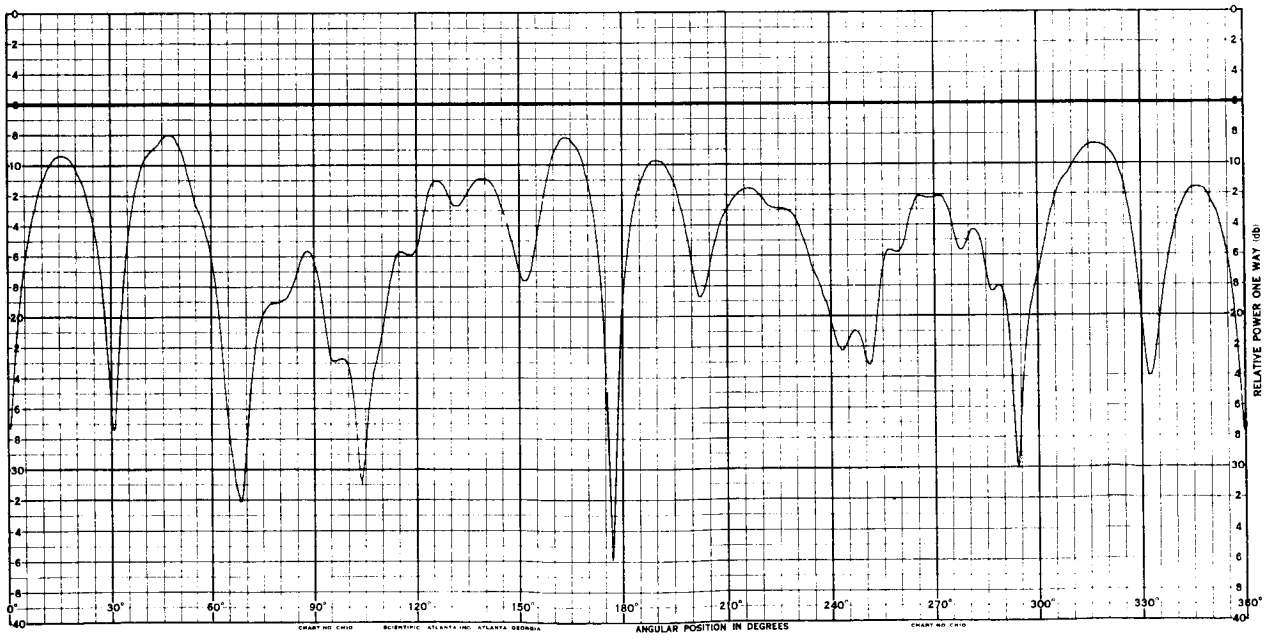
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





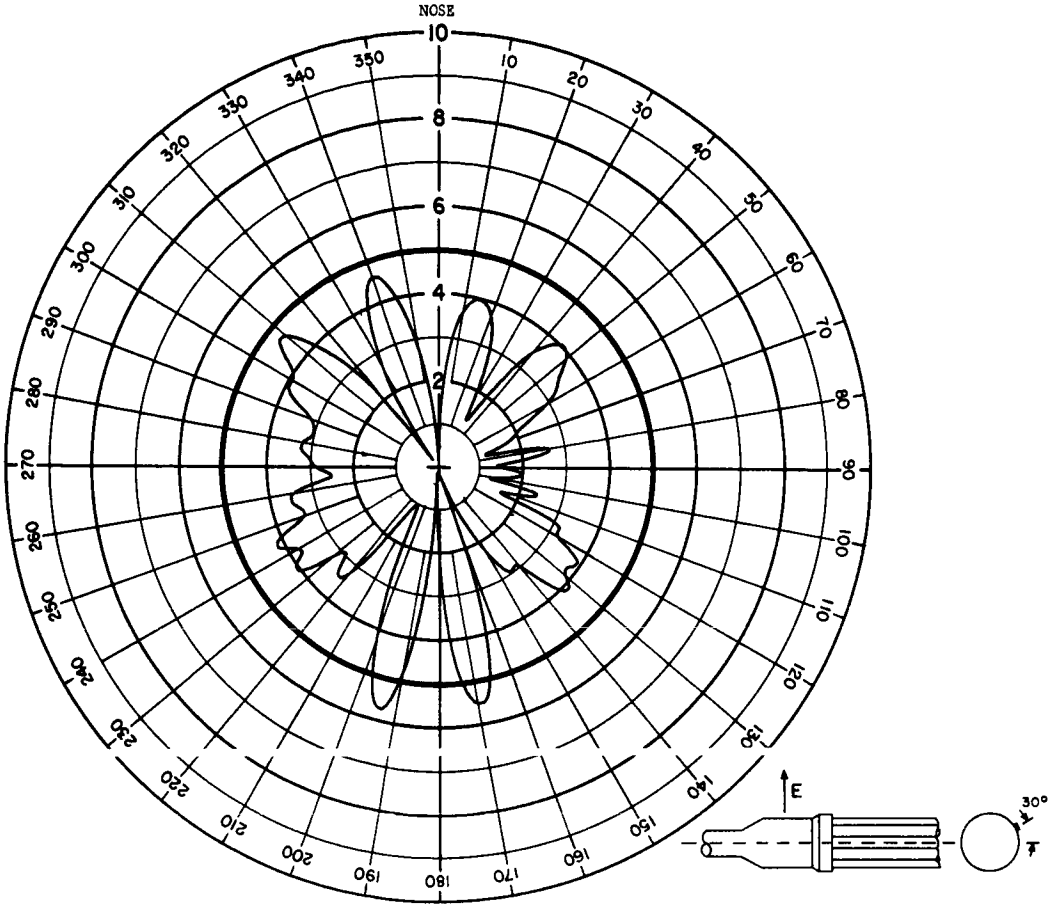
ANTENNA RADIATION PATTERN NO. 200-22

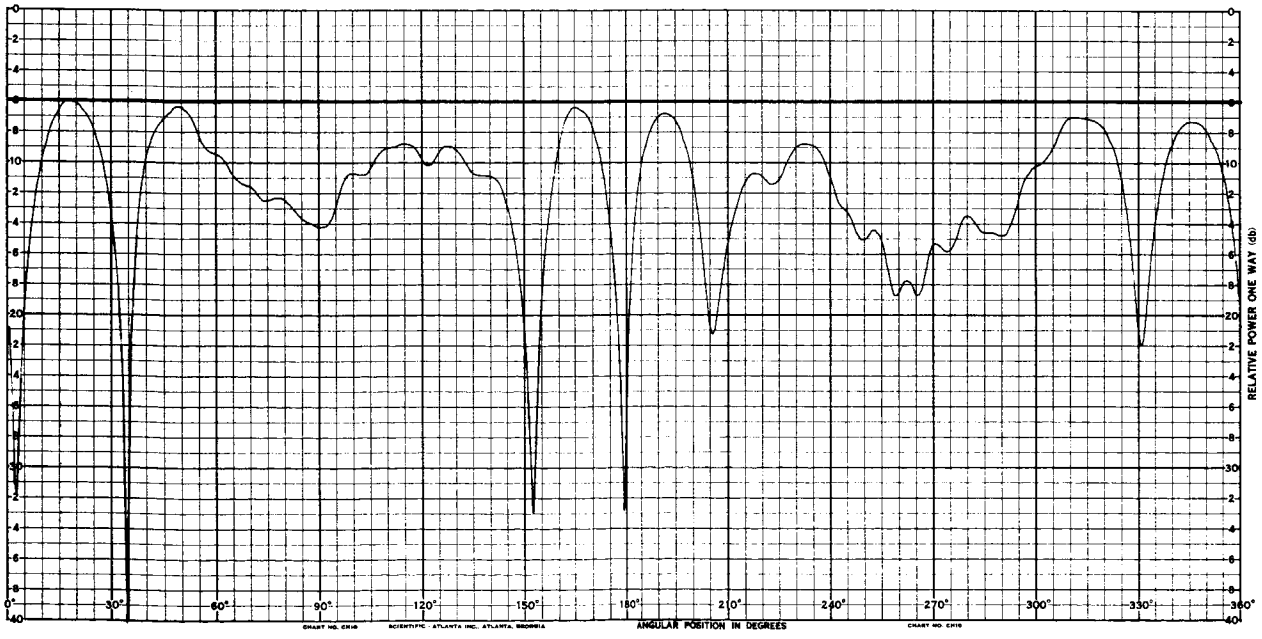
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





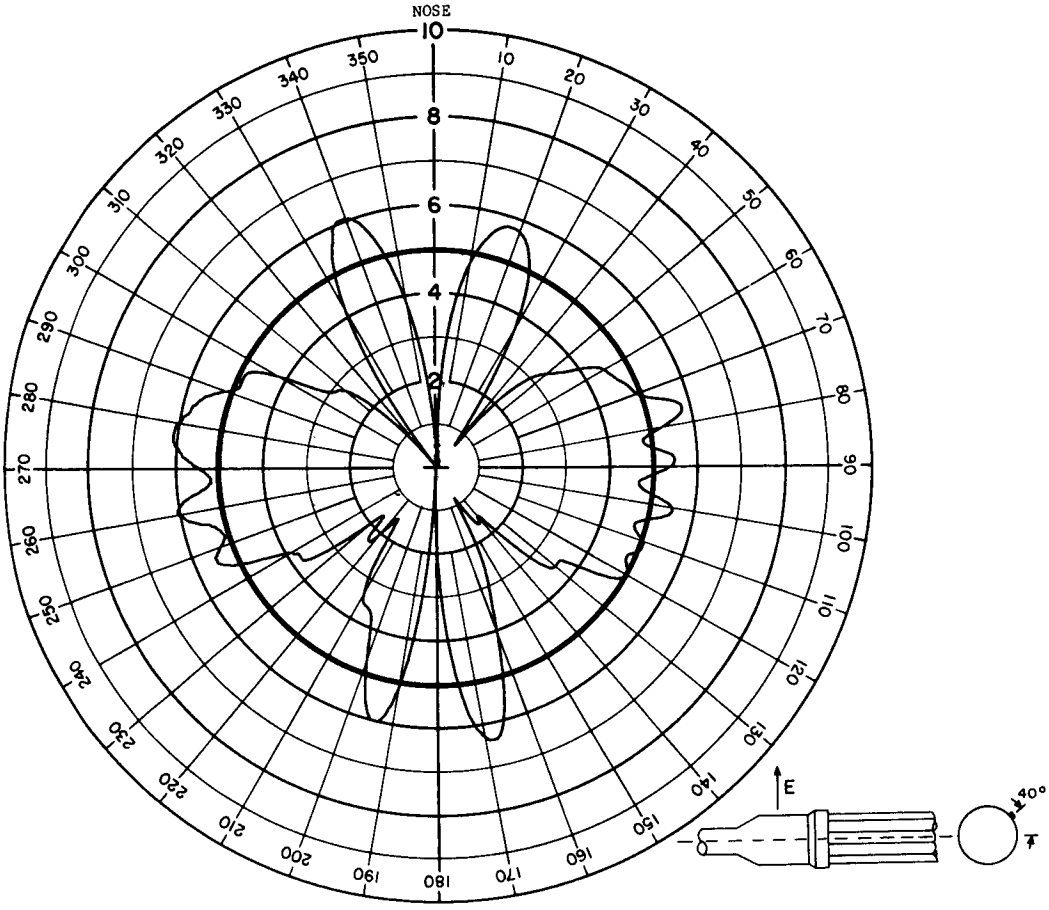
ANTENNA RADIATION PATTERN NO. 200-23

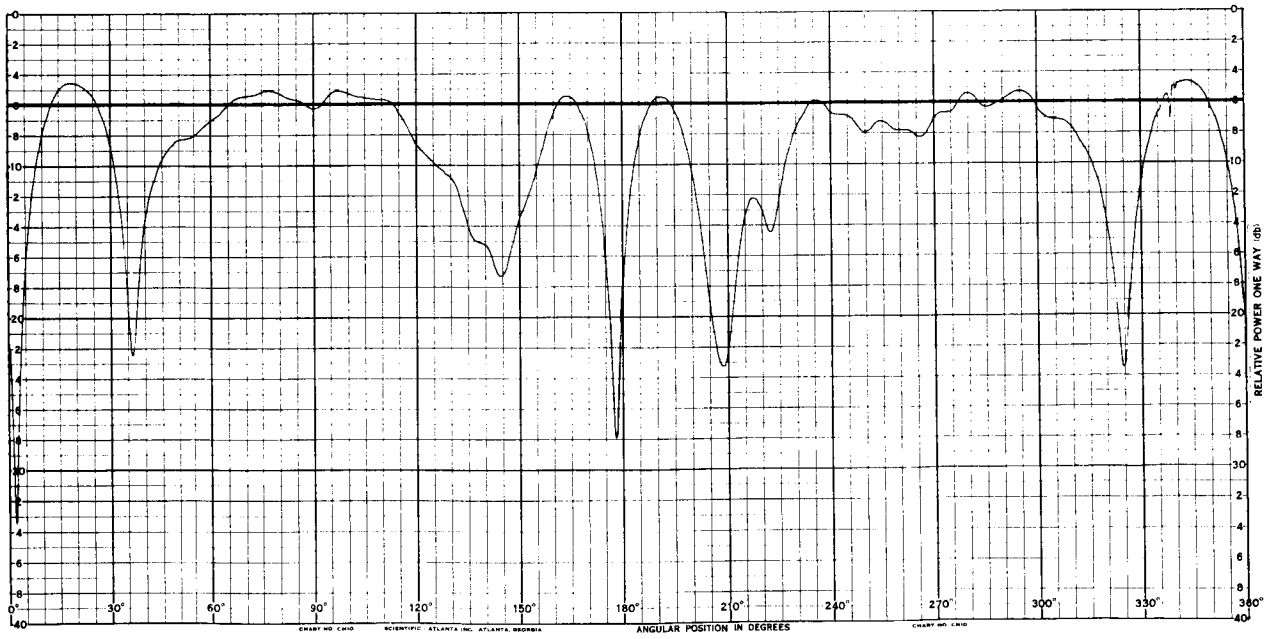
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





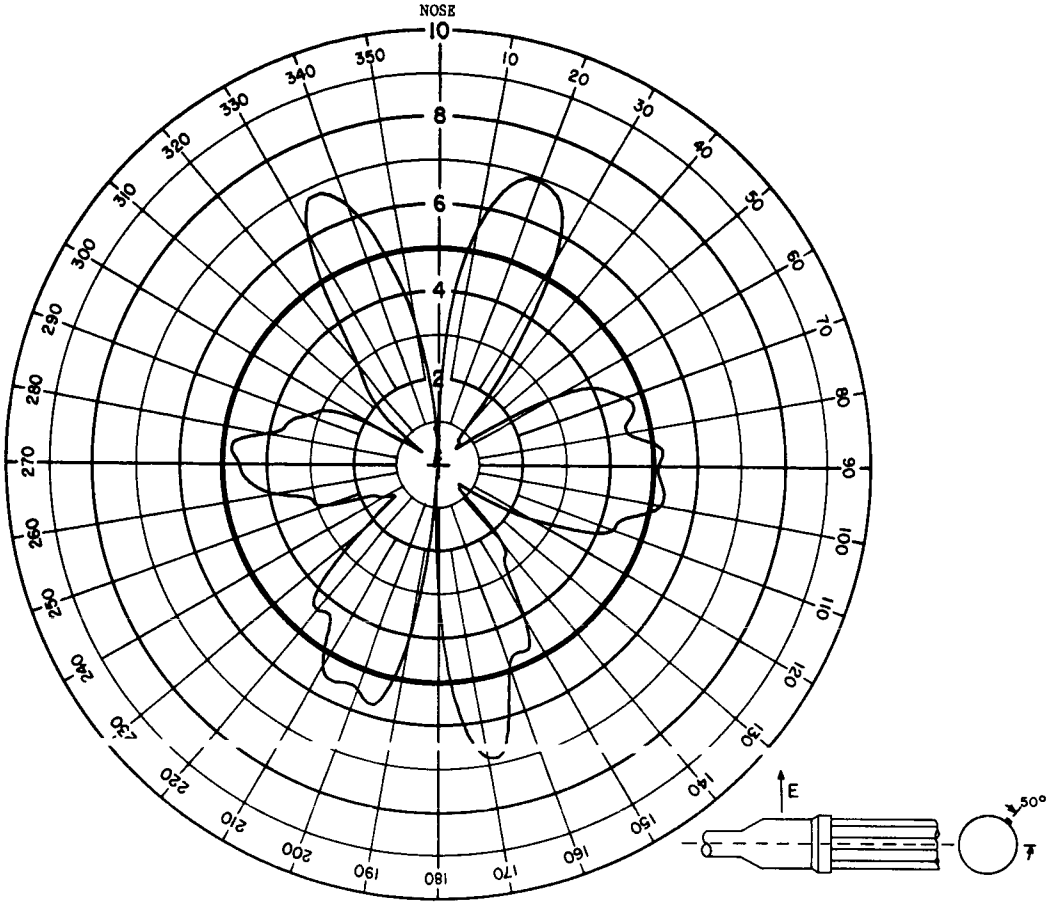
ANTENNA RADIATION PATTERN NO. 200-24

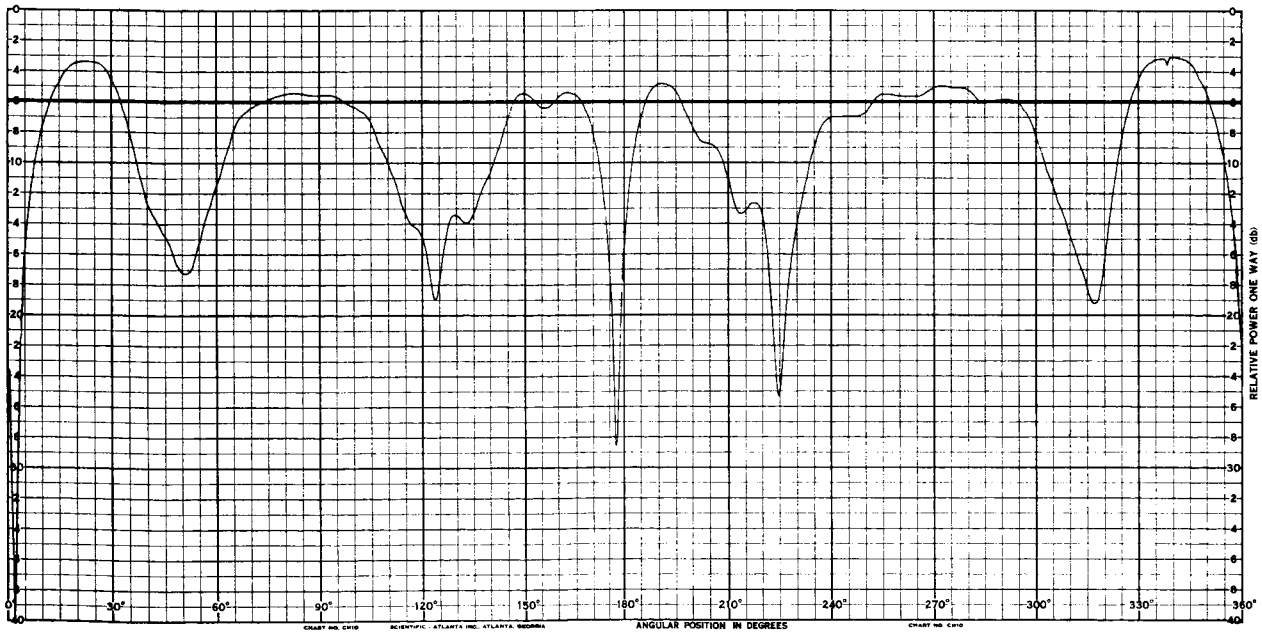
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



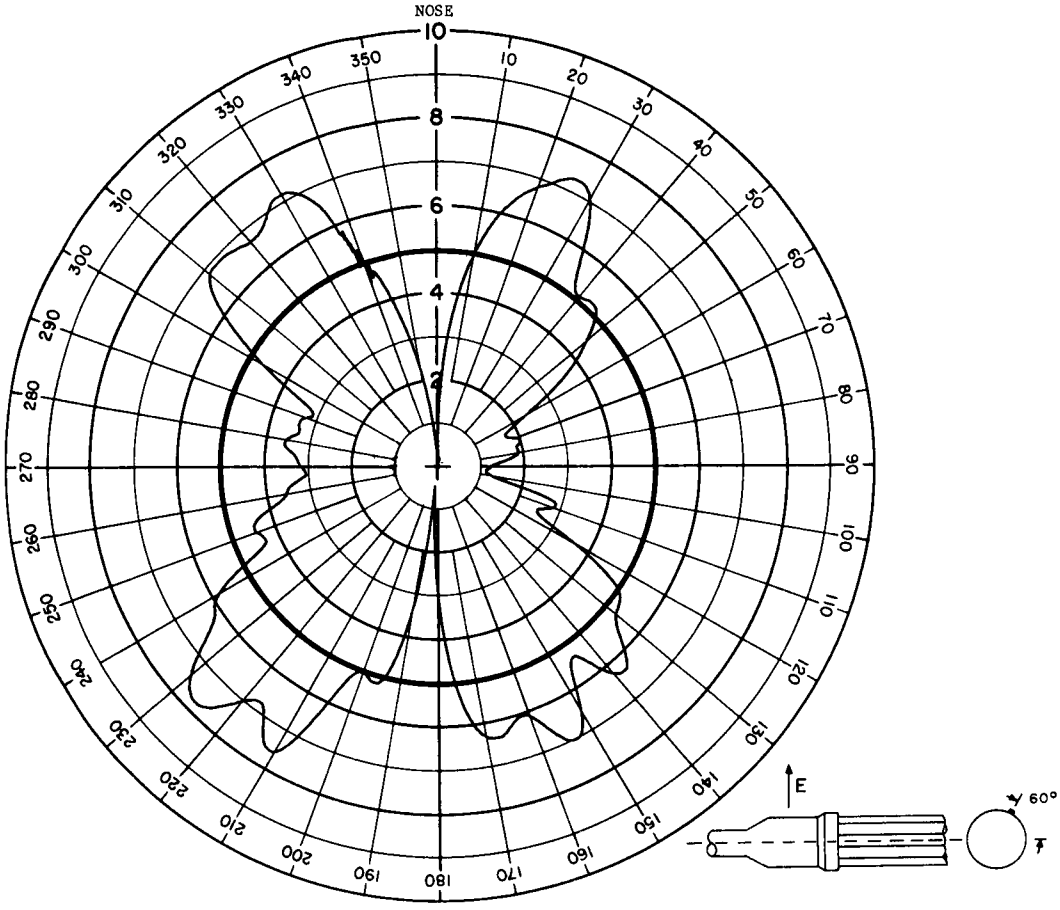


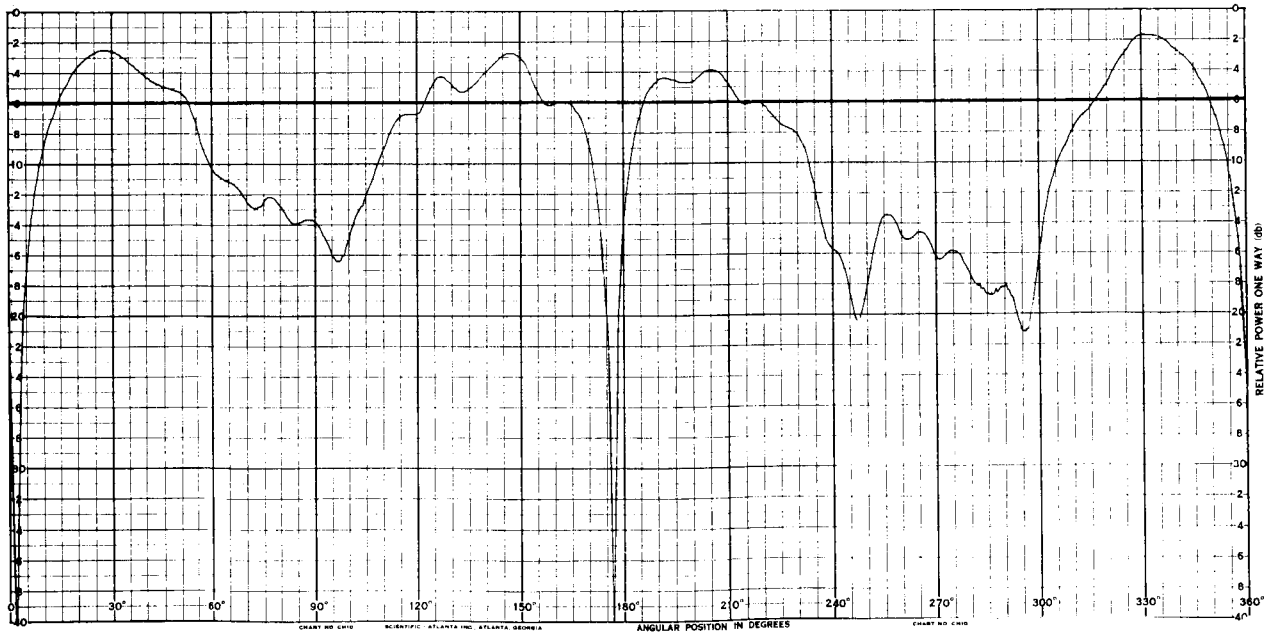
ANTENNA RADIATION PATTERN NO. 200-25

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





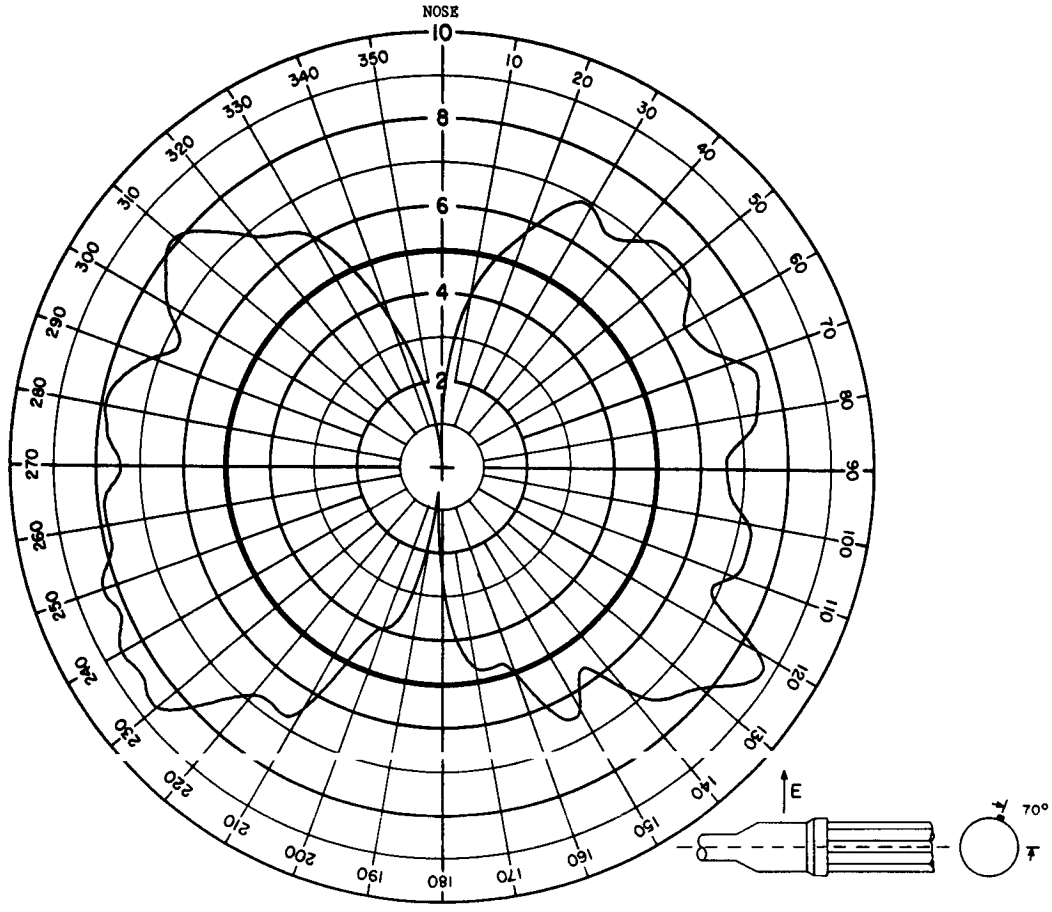
ANTENNA RADIATION PATTERN NO. 200-26

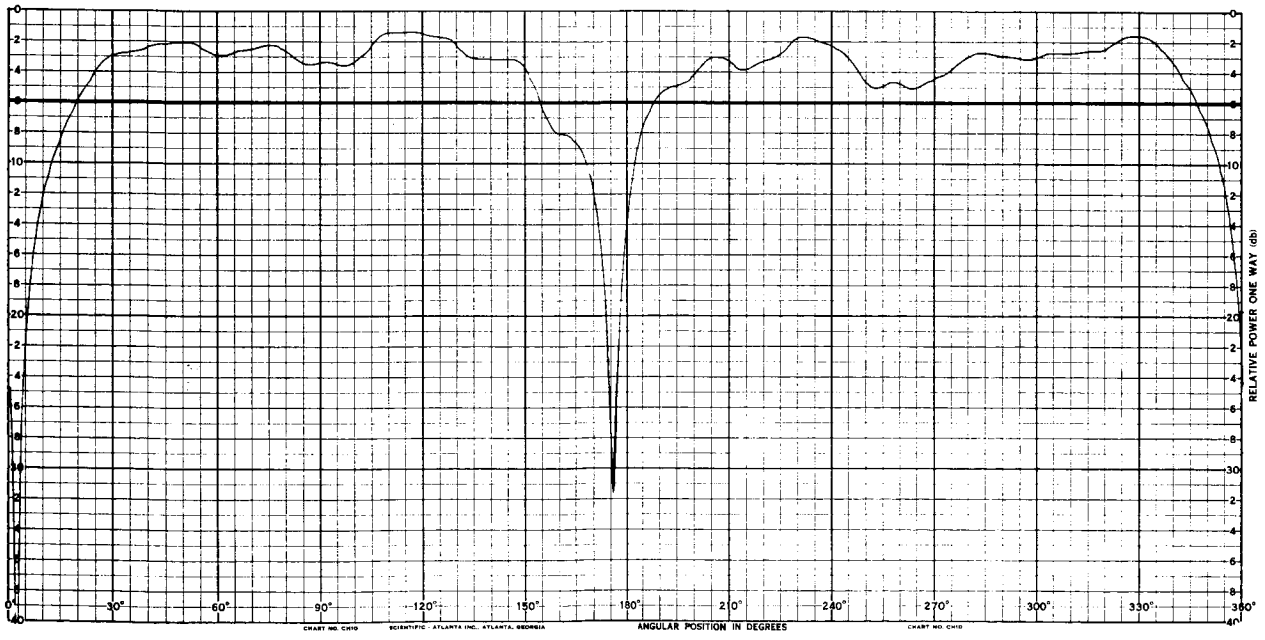
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



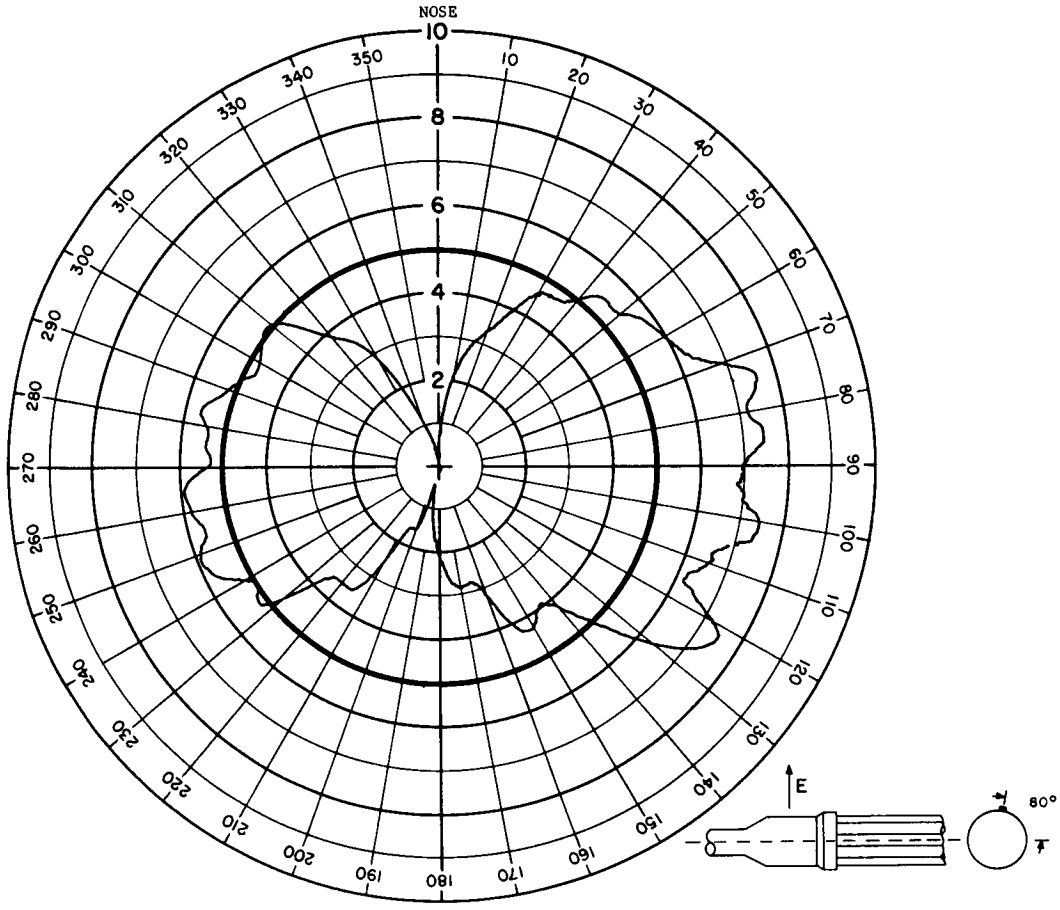


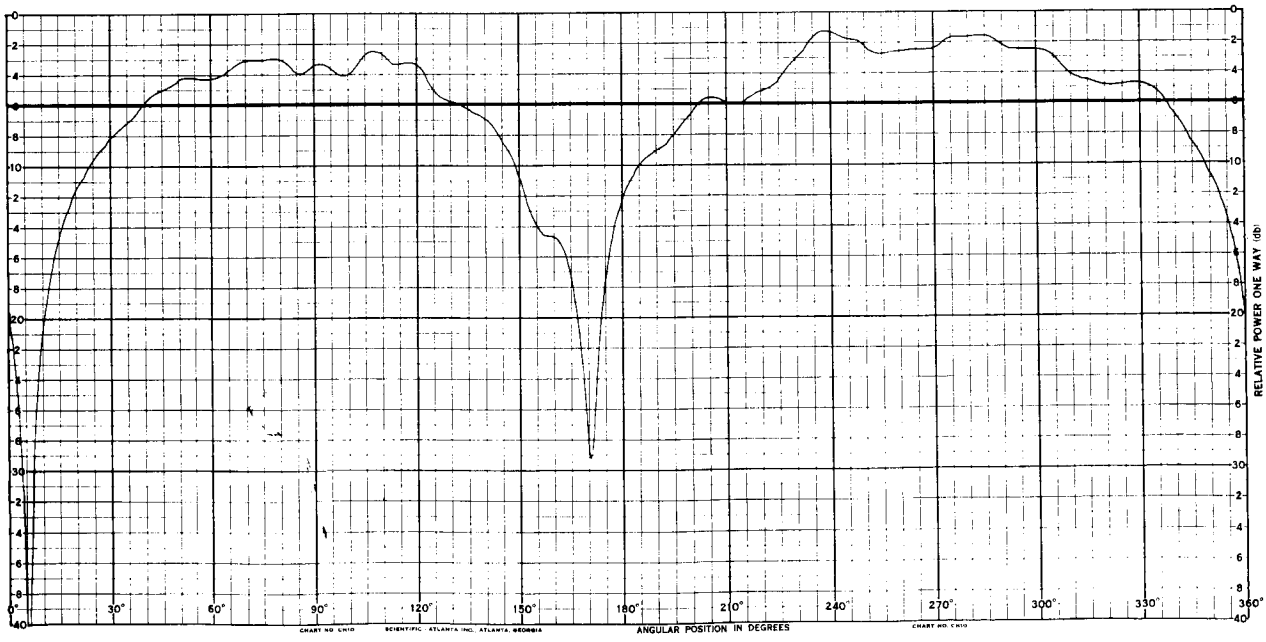
ANTENNA RADIATION PATTERN NO. 200-27

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





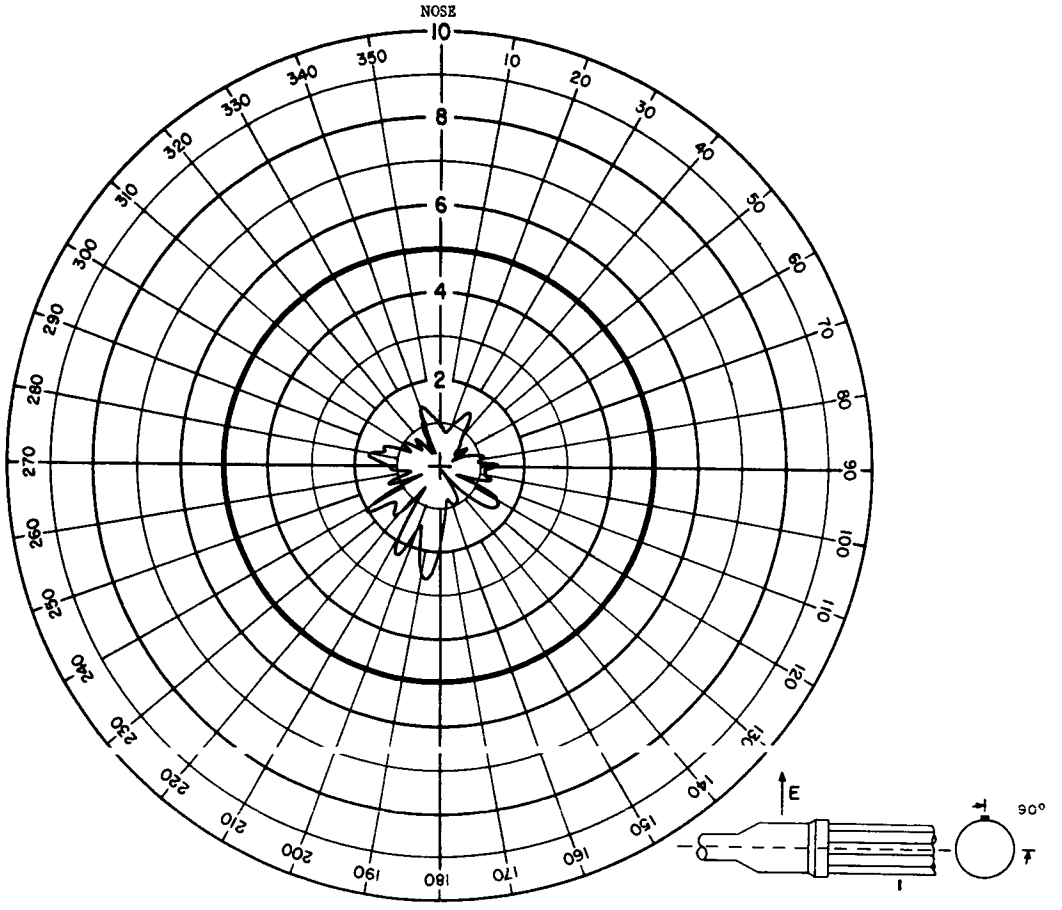
ANTENNA RADIATION PATTERN NO. 200-28

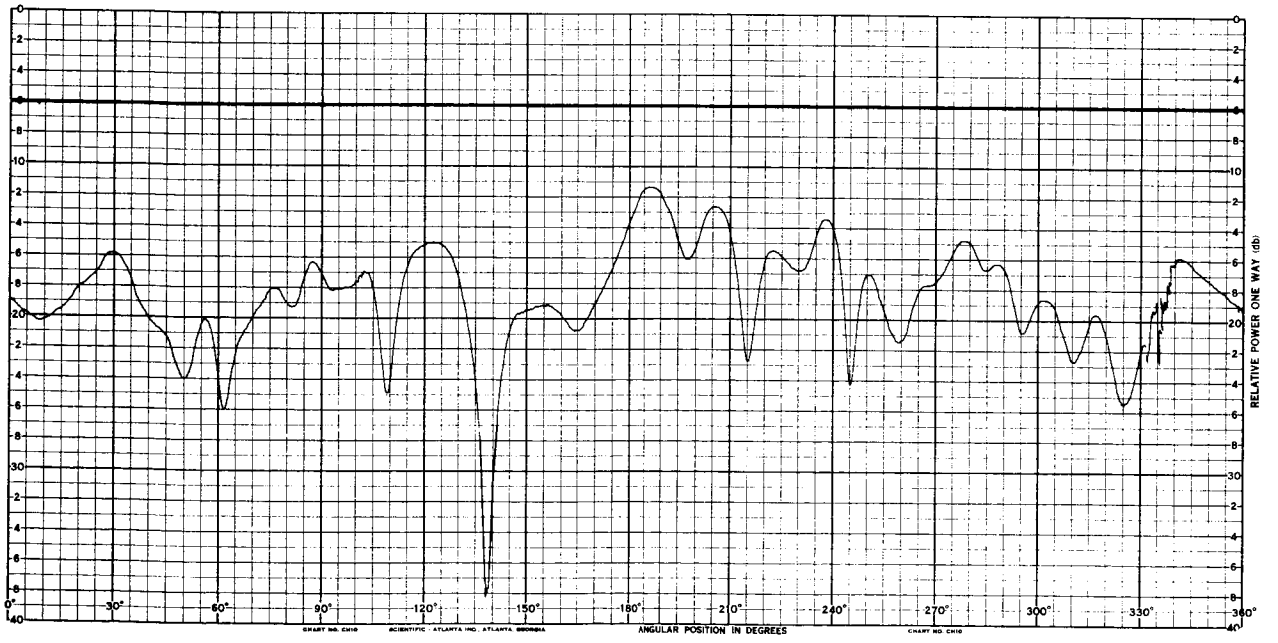
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





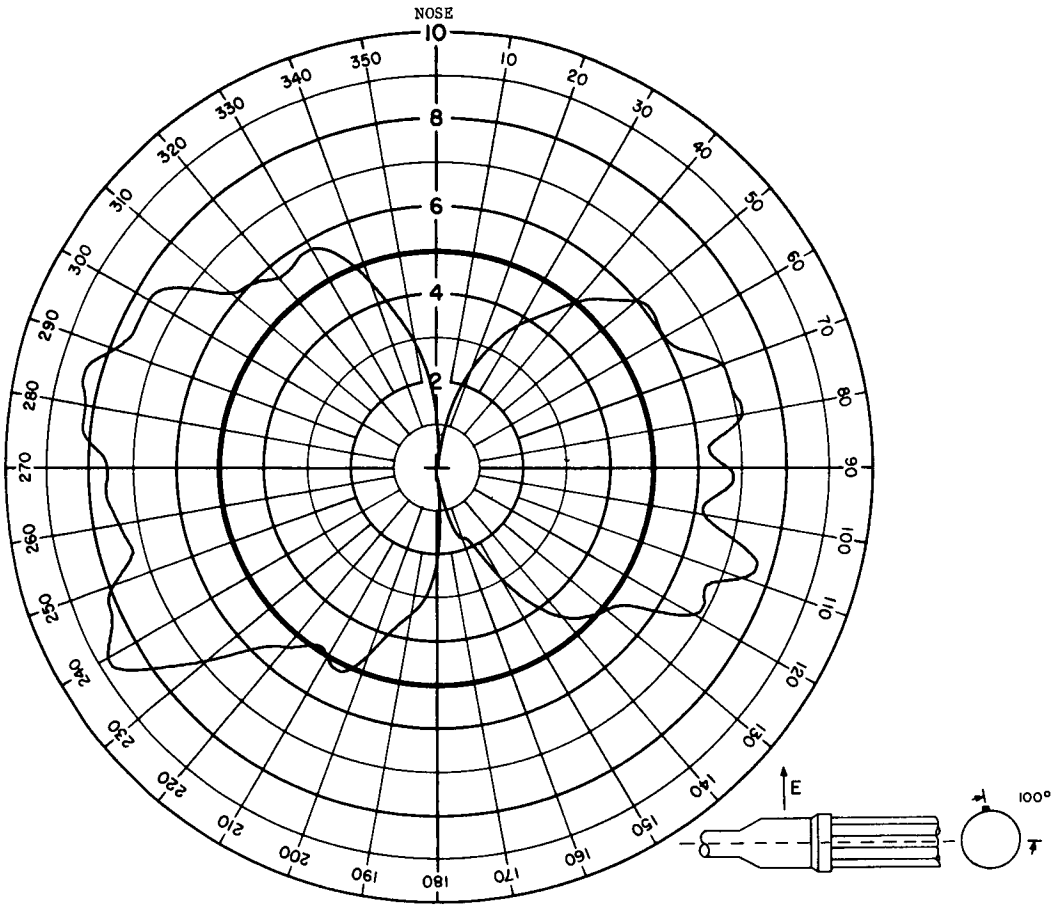
ANTENNA RADIATION PATTERN NO. 200-29

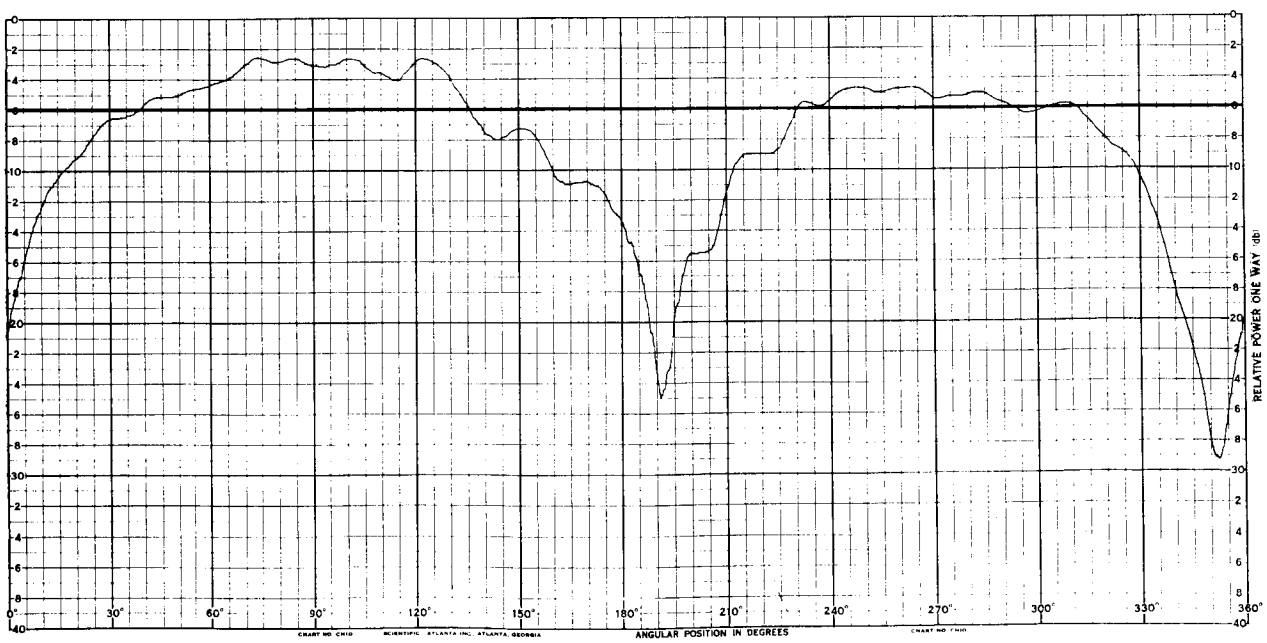
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





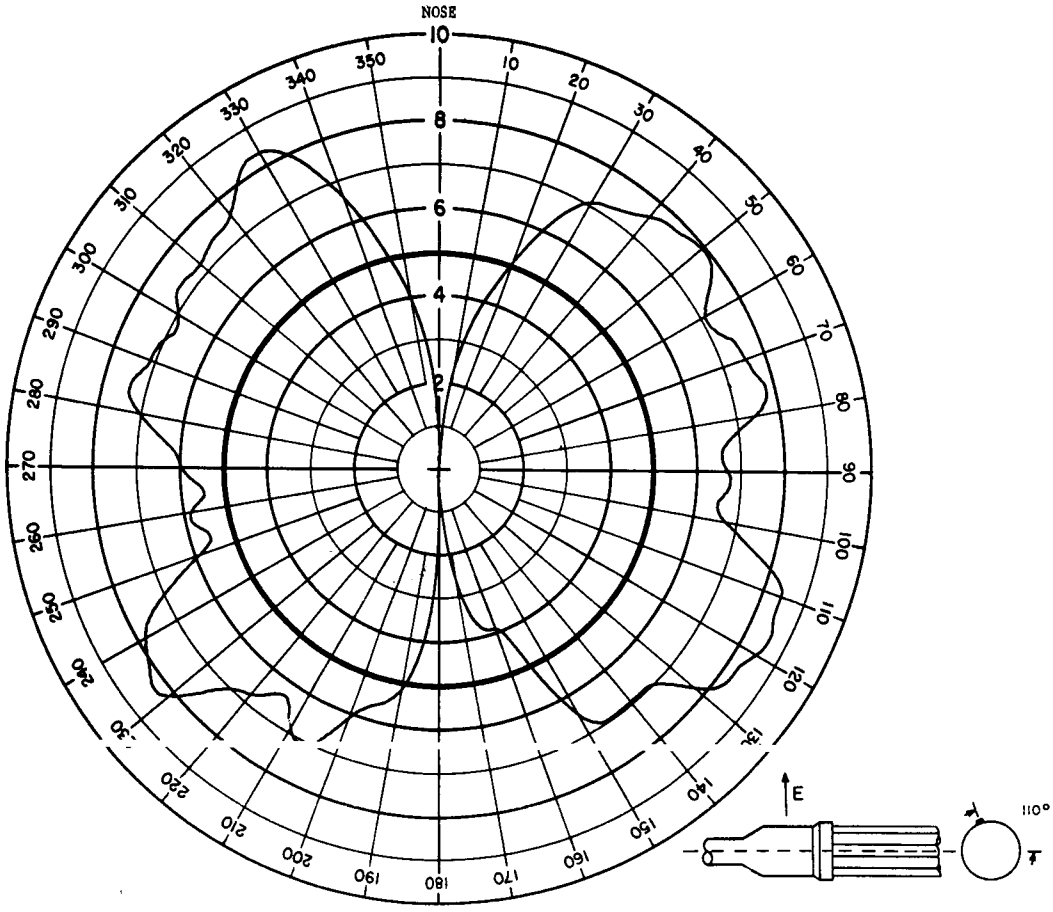
ANTENNA RADIATION PATTERN NO. 200-30

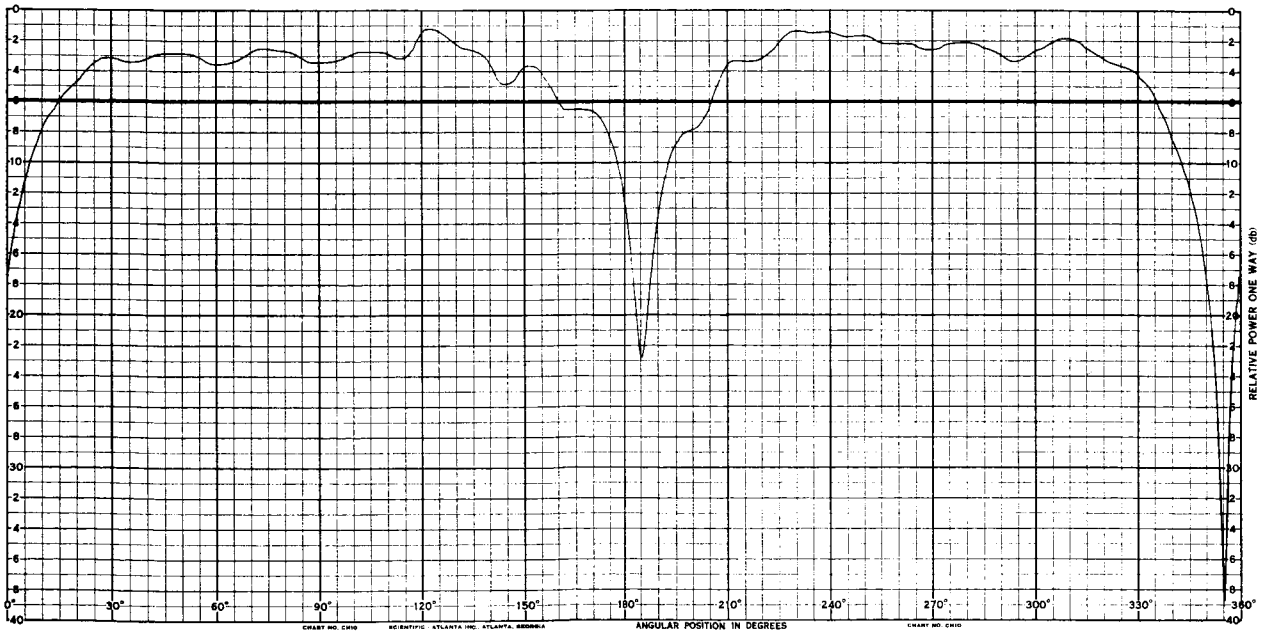
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



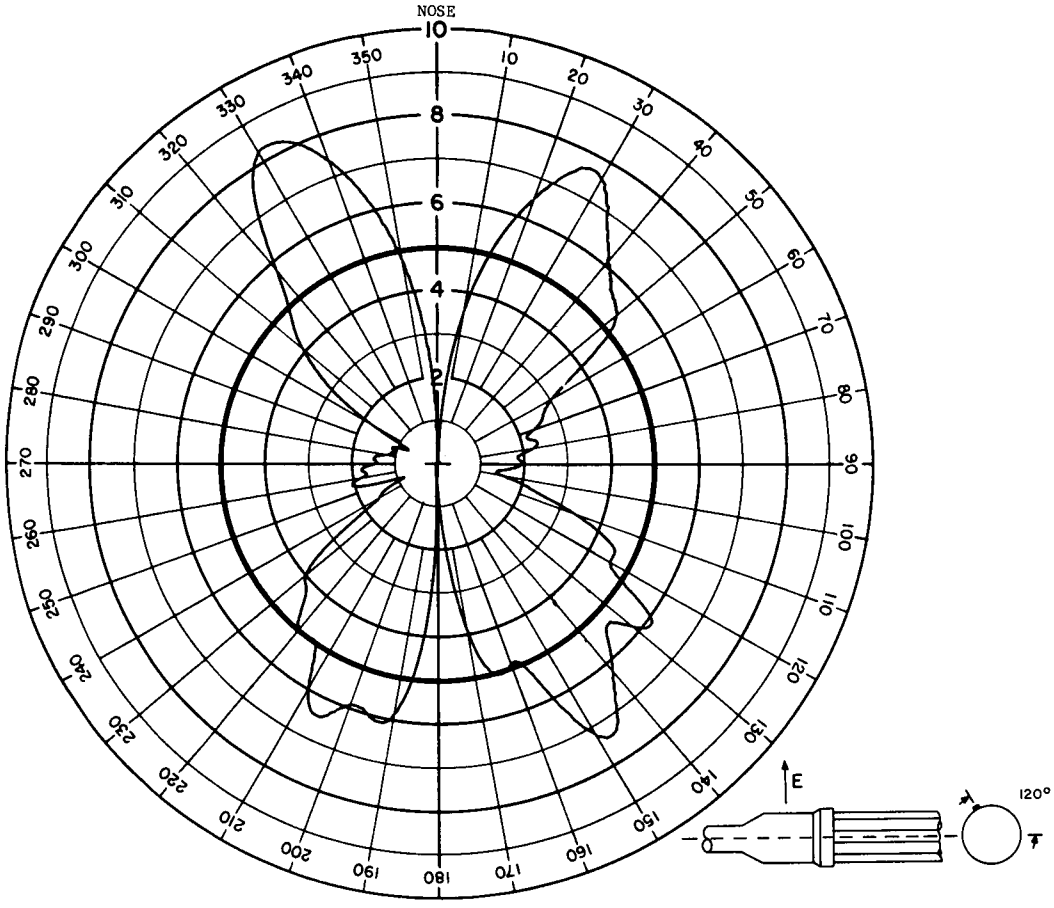


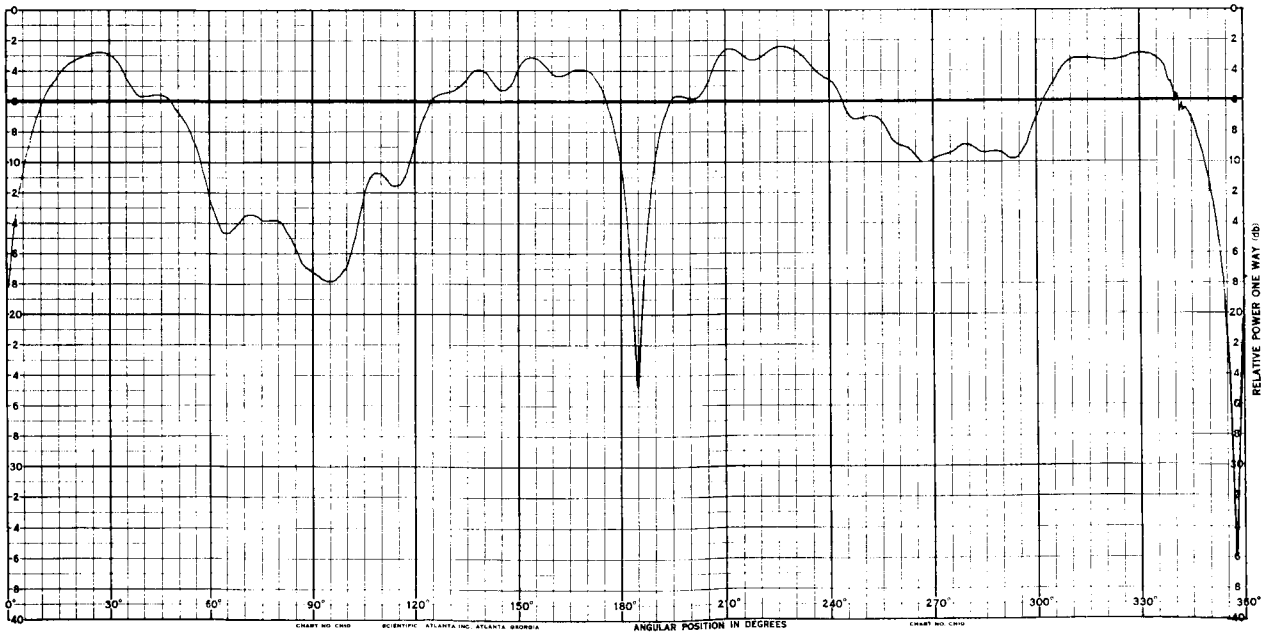
ANTENNA RADIATION PATTERN NO. 200-31

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





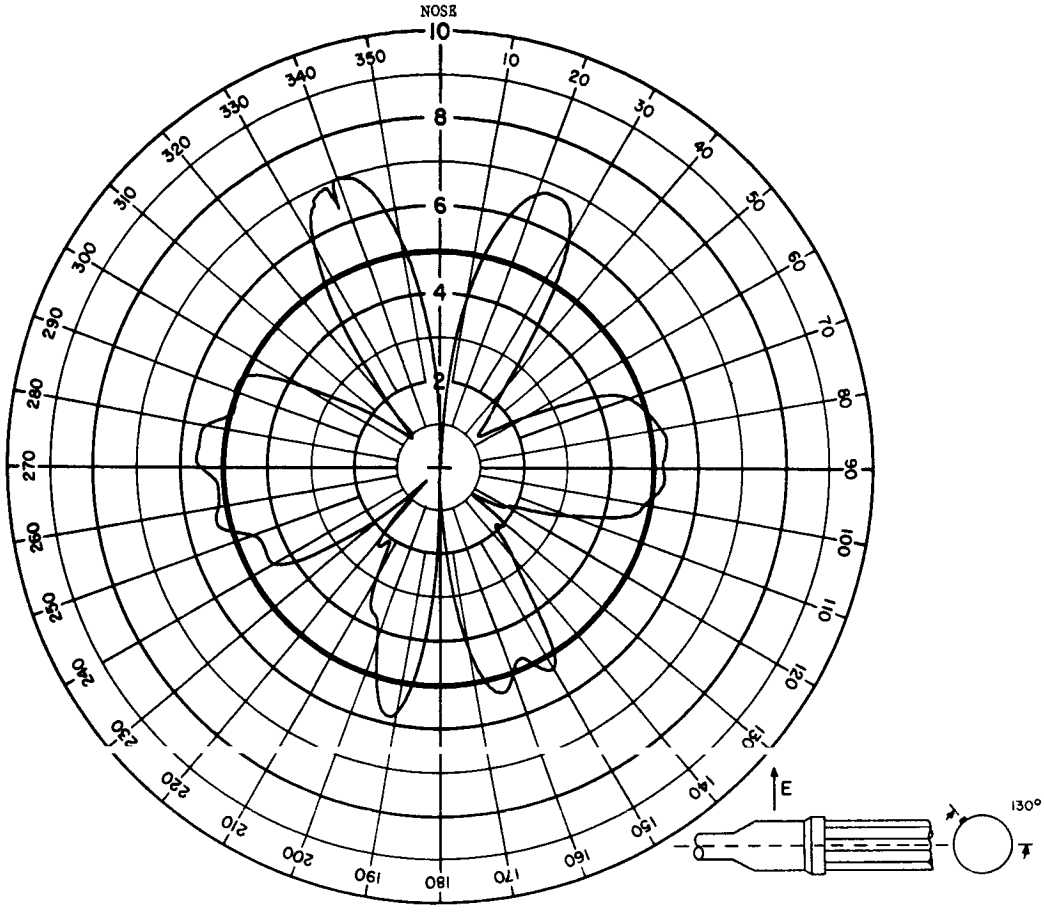
ANTENNA RADIATION PATTERN NO. 200-32

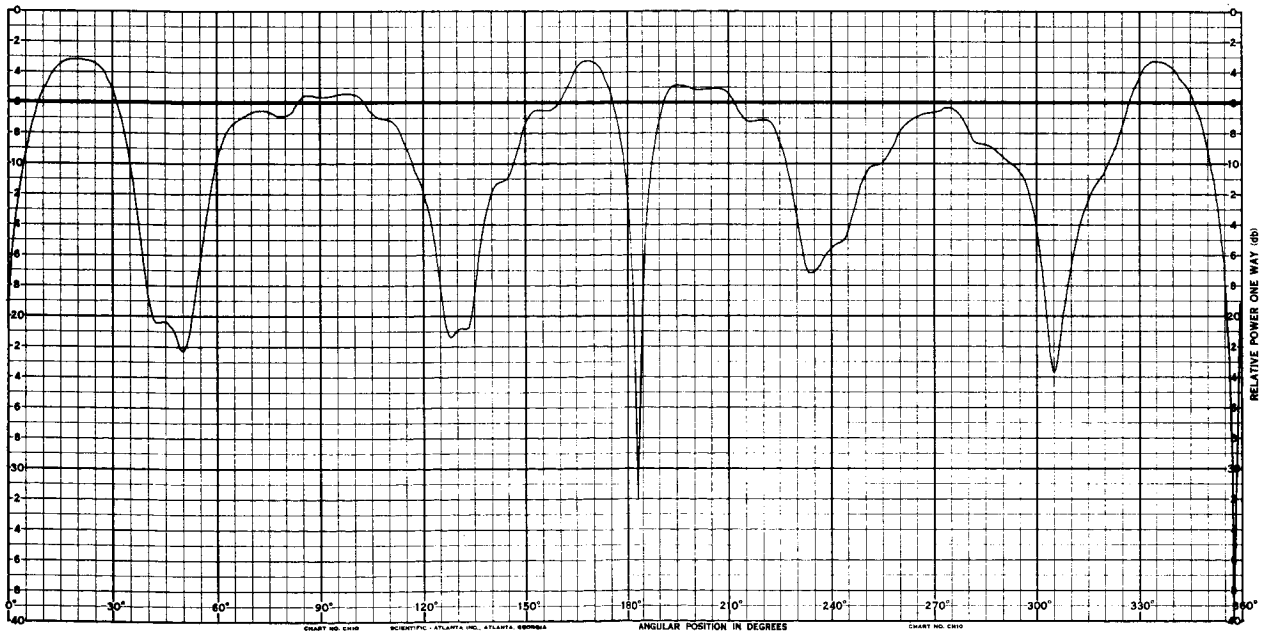
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



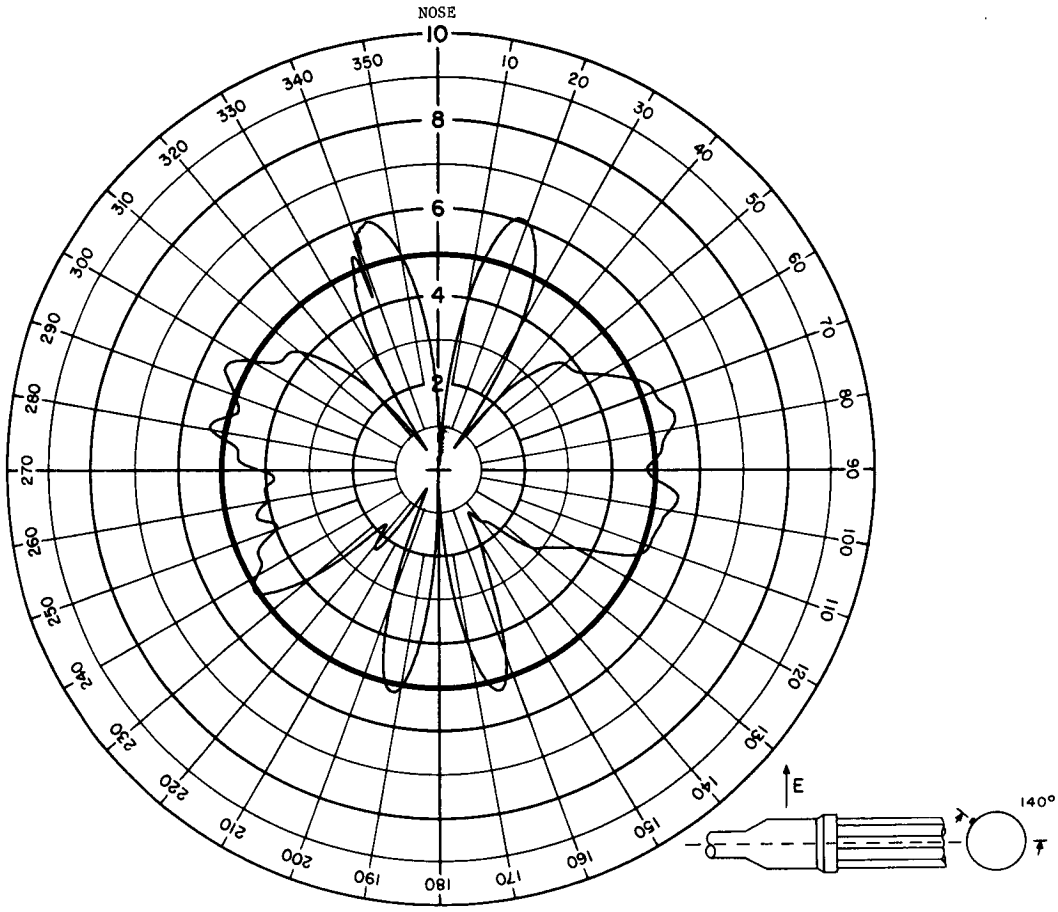


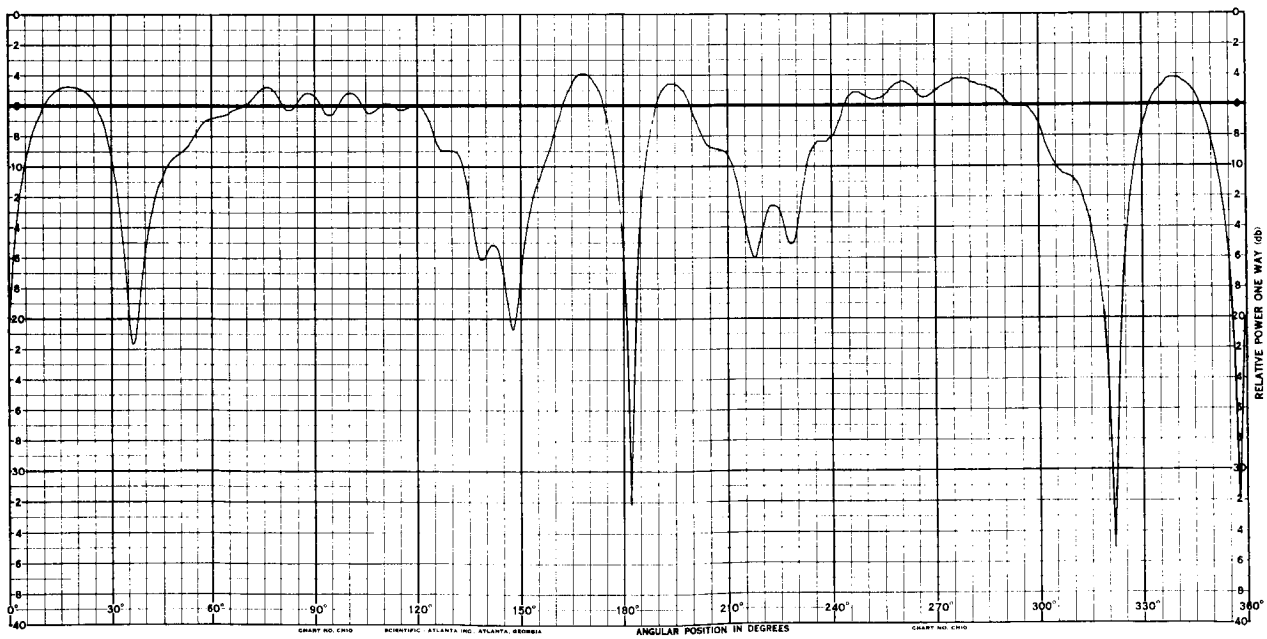
ANTENNA RADIATION PATTERN NO. 200-33

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





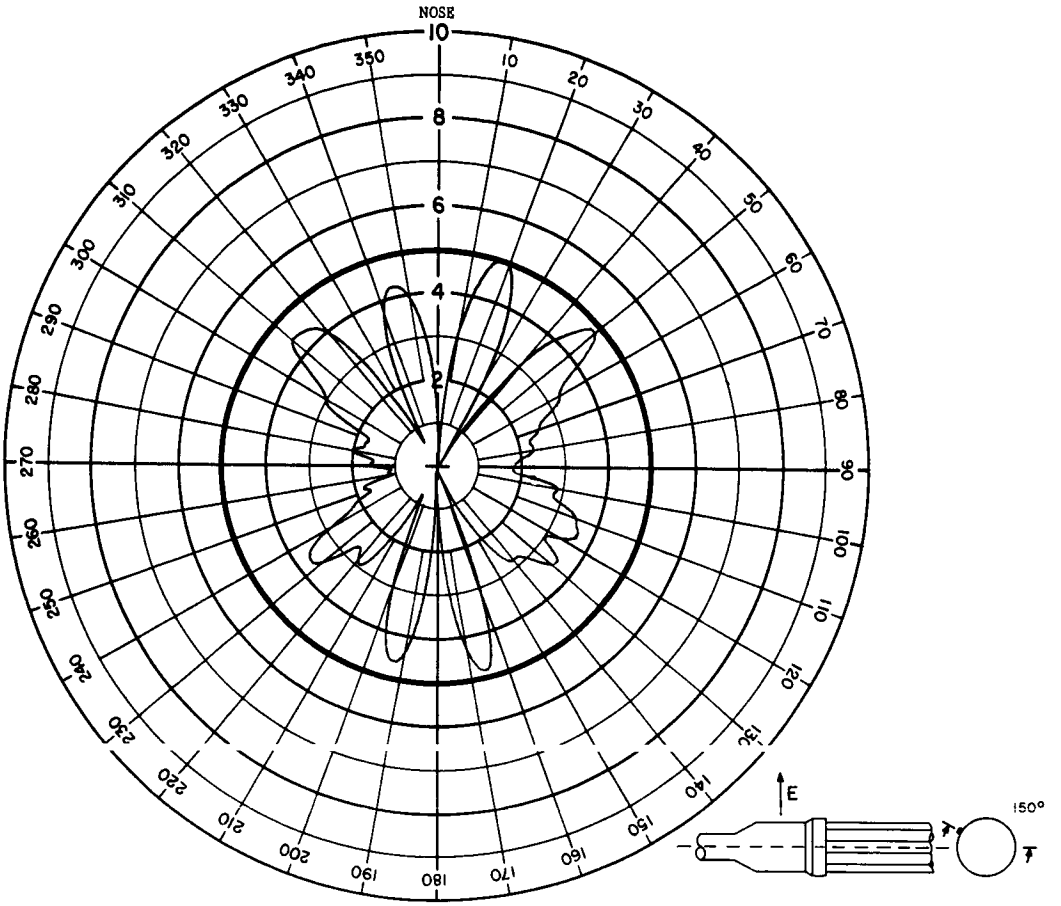
ANTENNA RADIATION PATTERN NO. 200-34

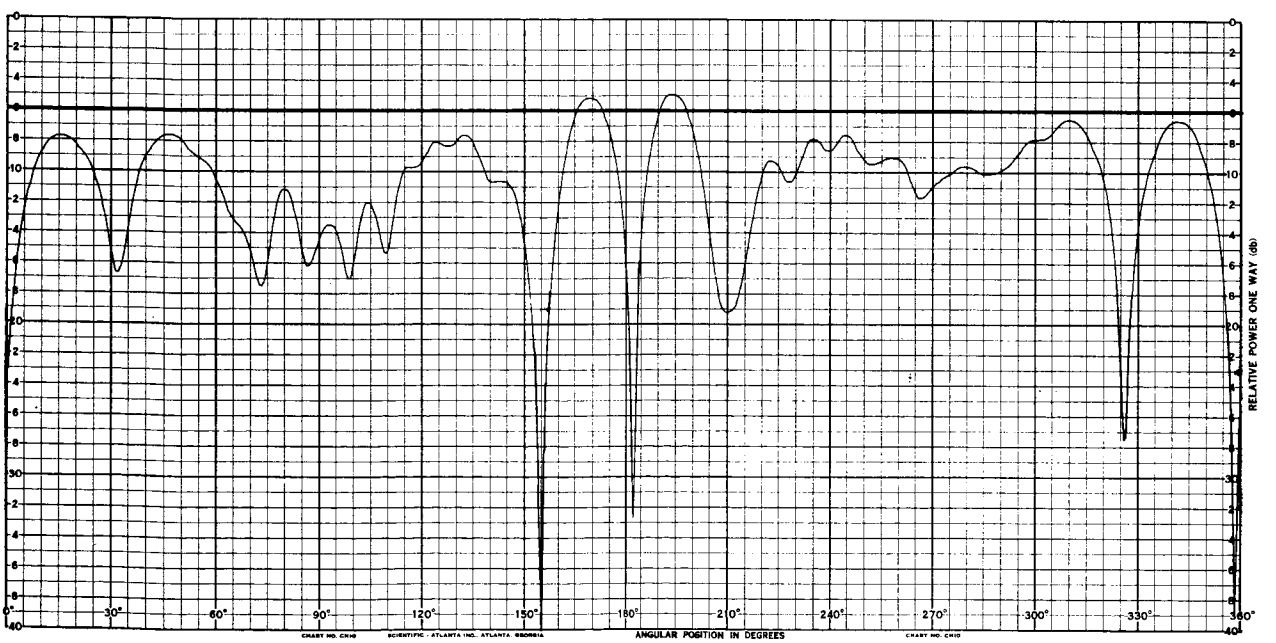
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



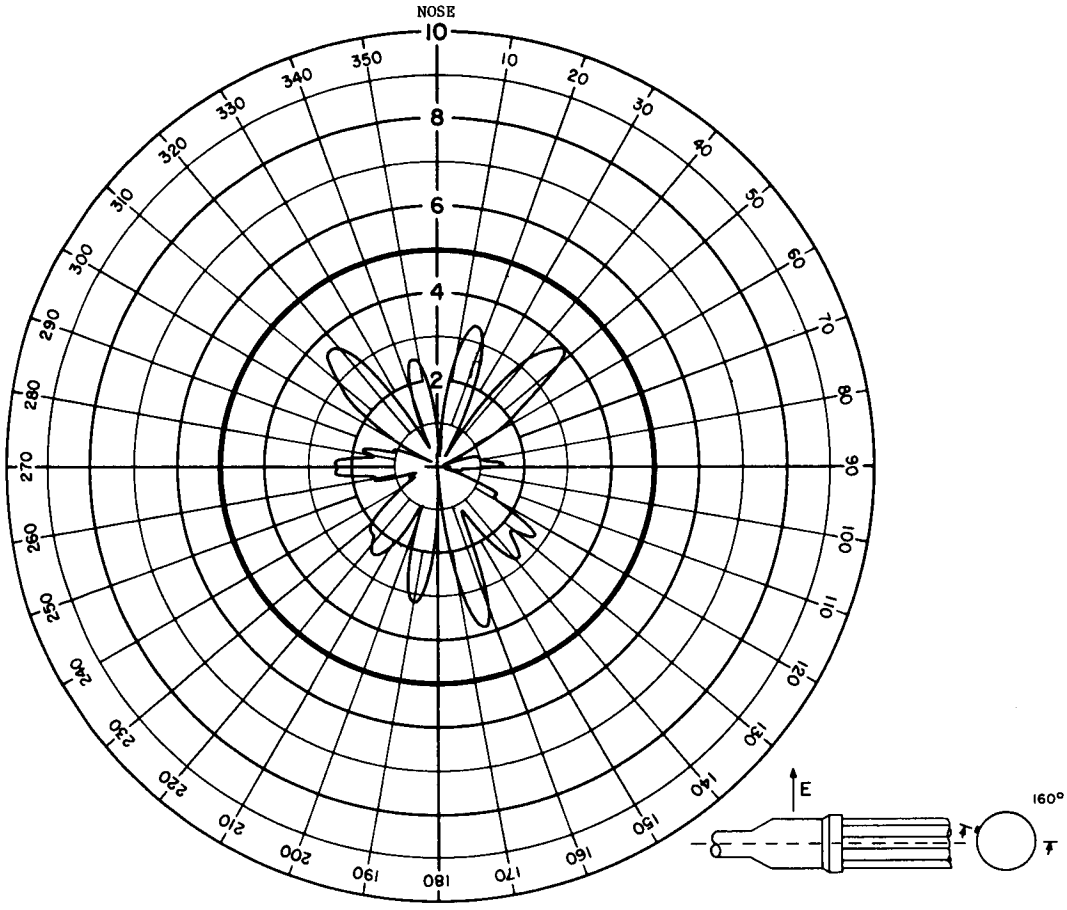


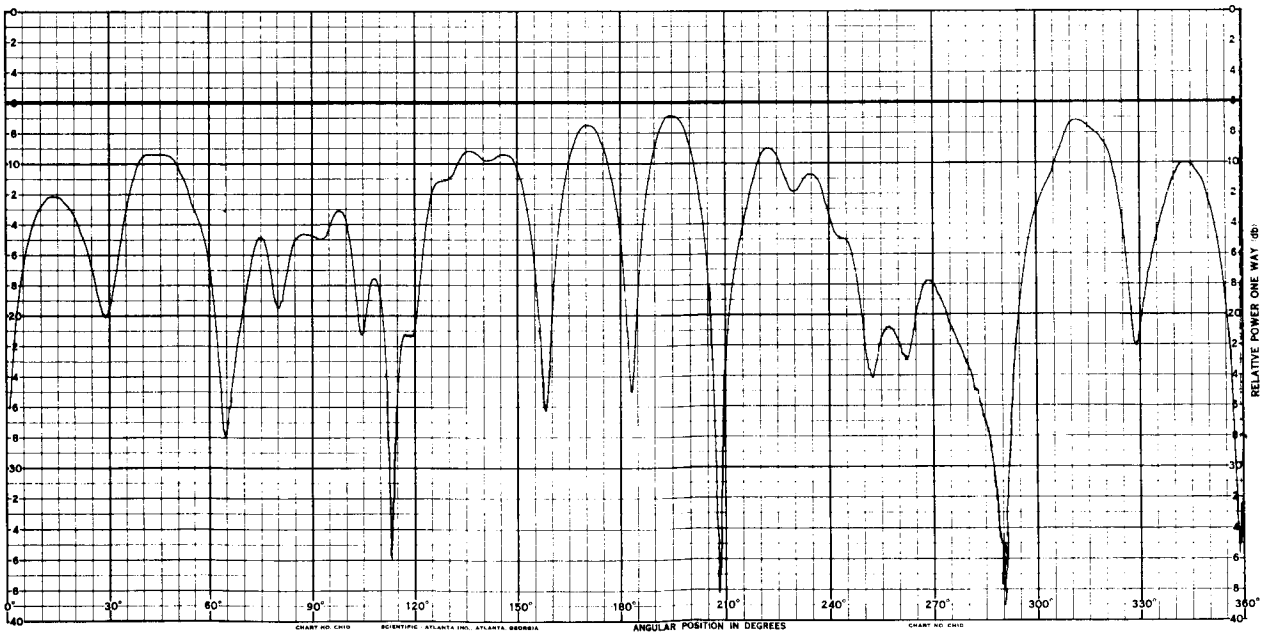
ANTENNA RADIATION PATTERN NO. 200-35

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



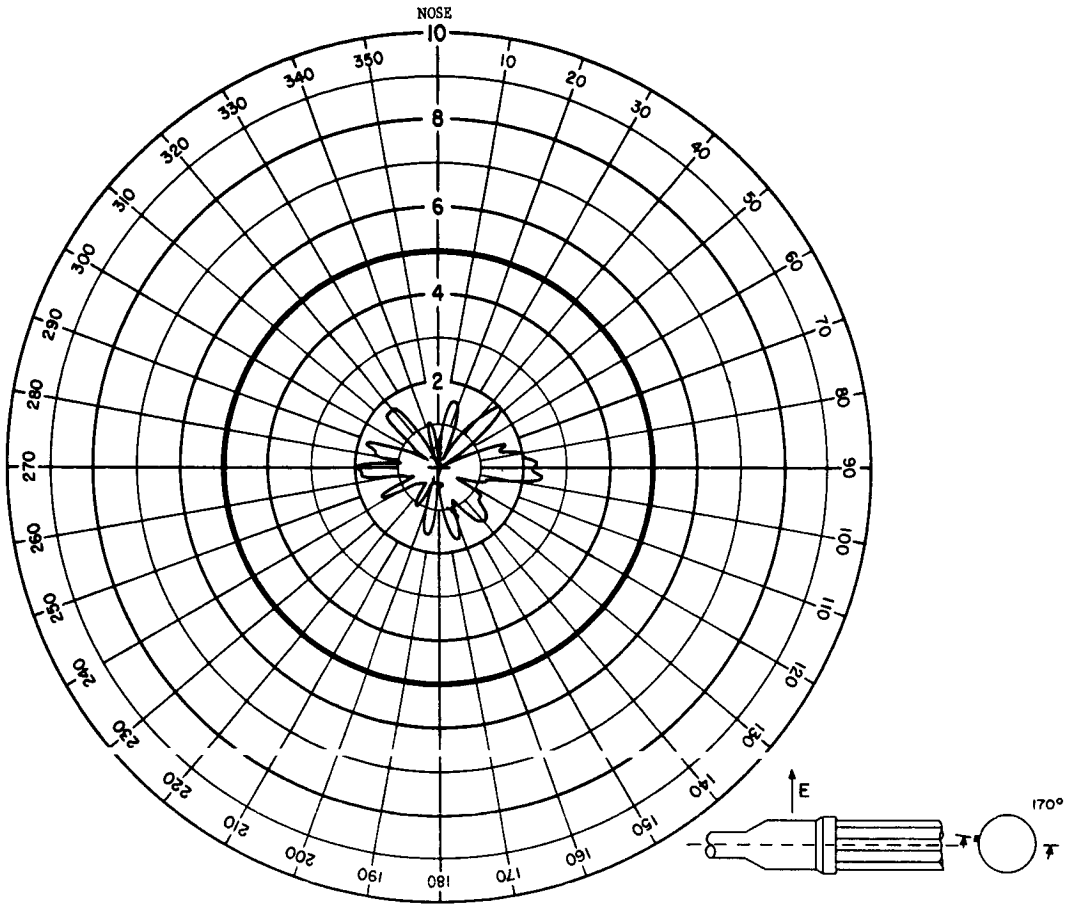


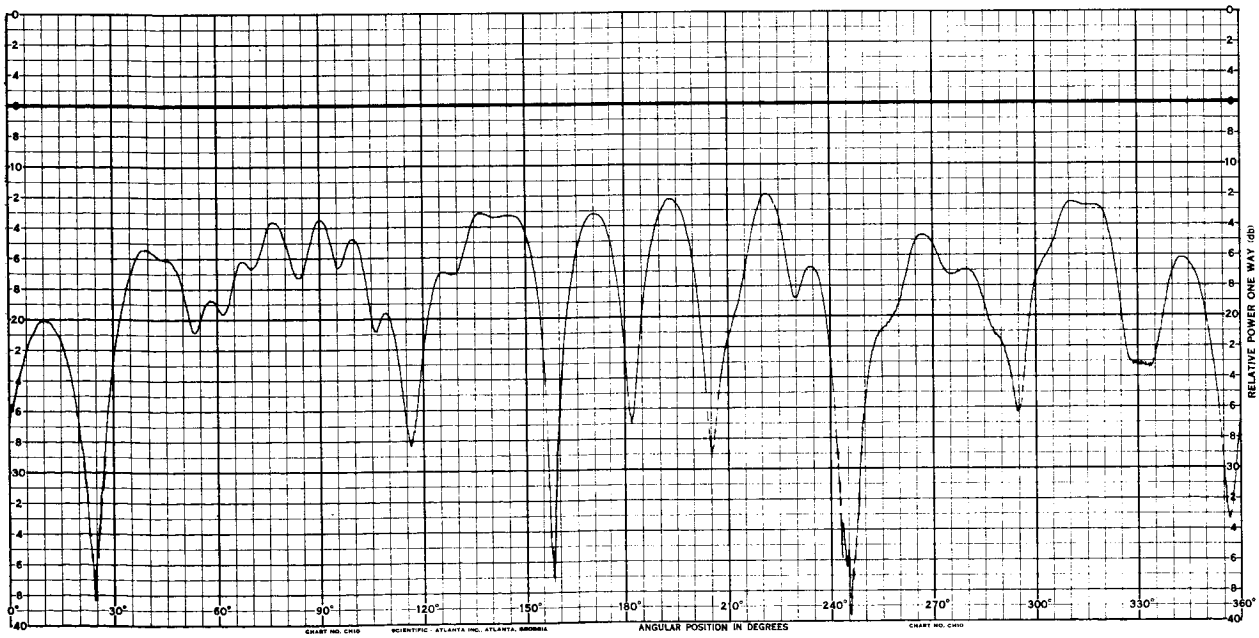
ANTENNA RADIATION PATTERN NO. 200-36

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





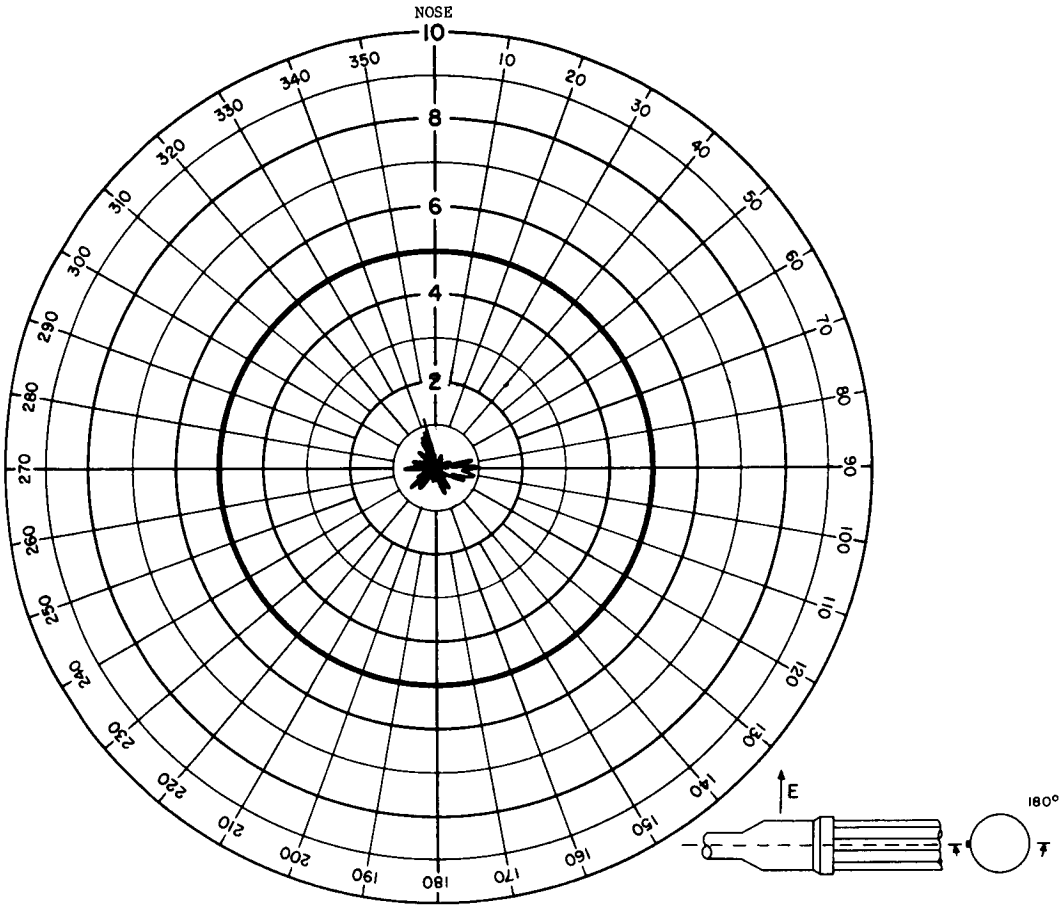
ANTENNA RADIATION PATTERN NO. 200-37

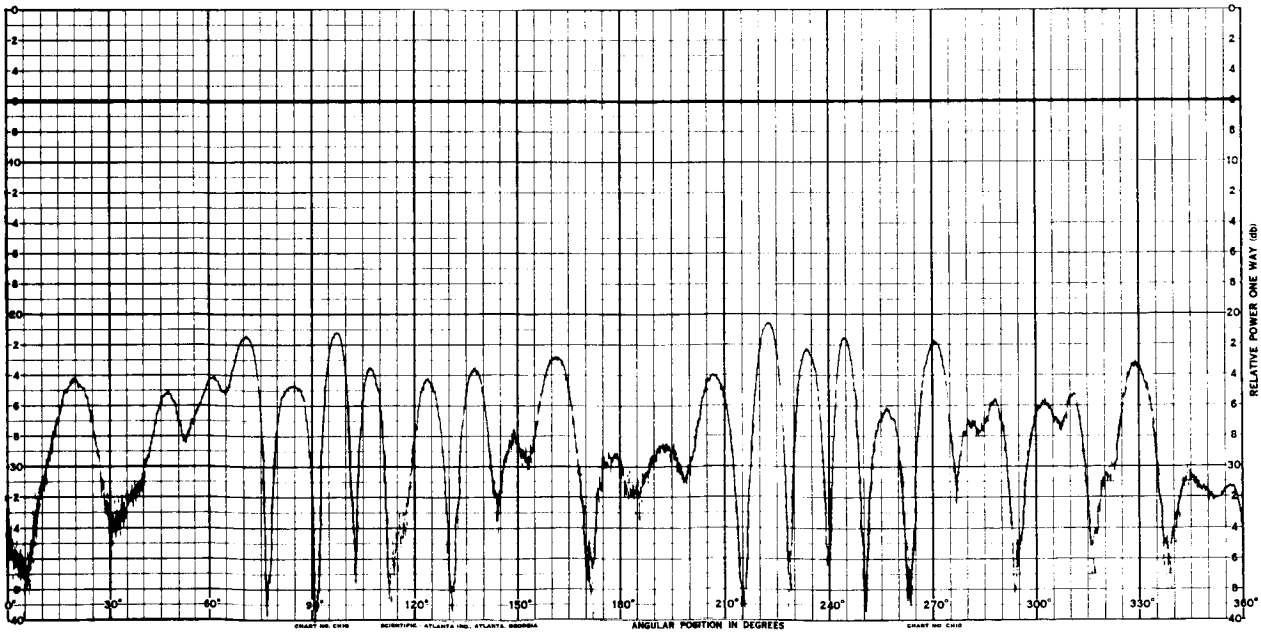
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



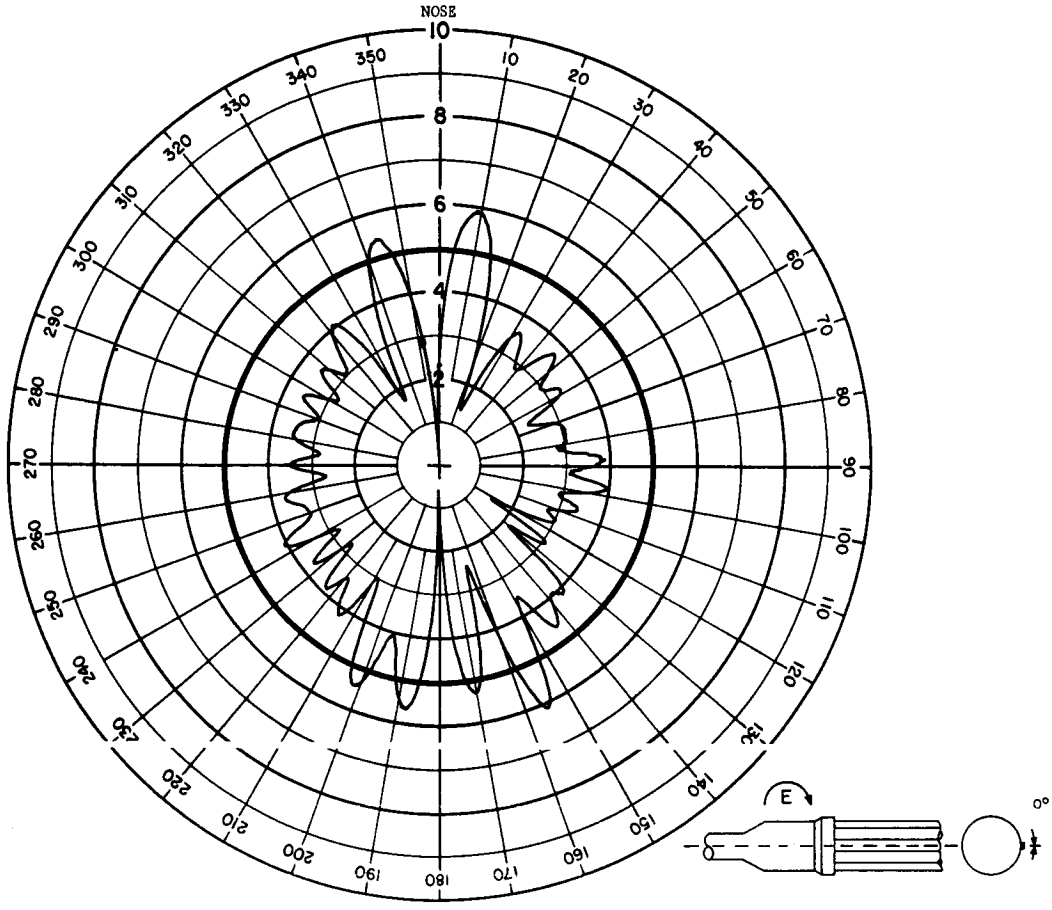


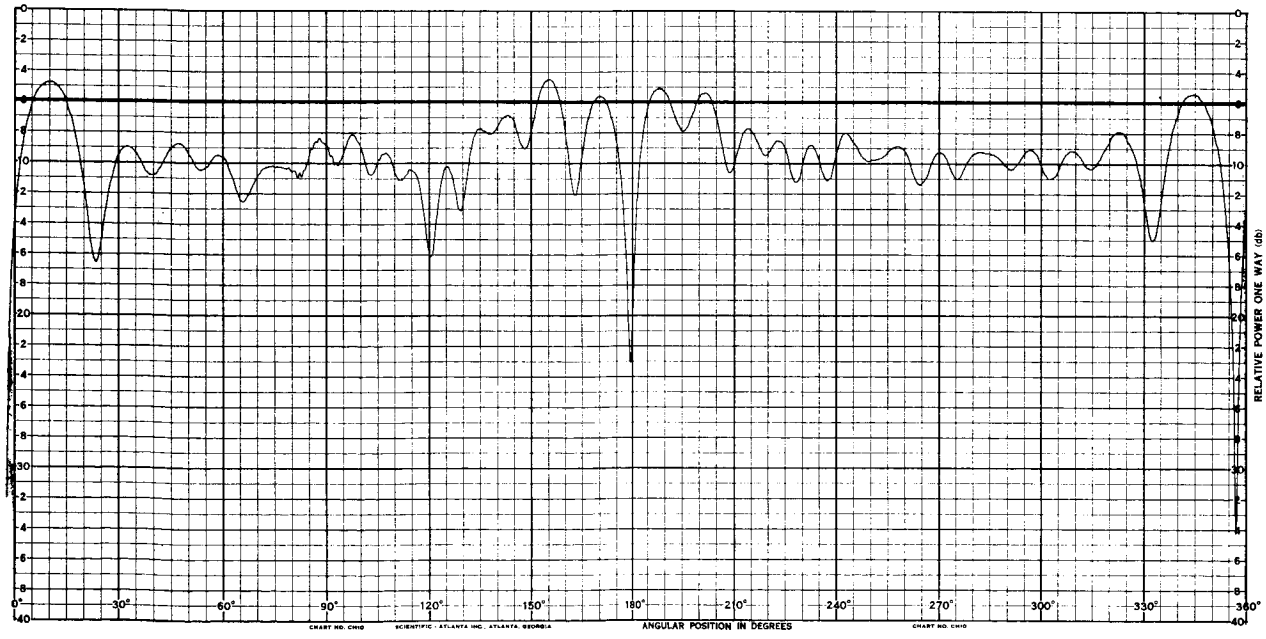
ANTENNA RADIATION PATTERN NO. 200-38

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



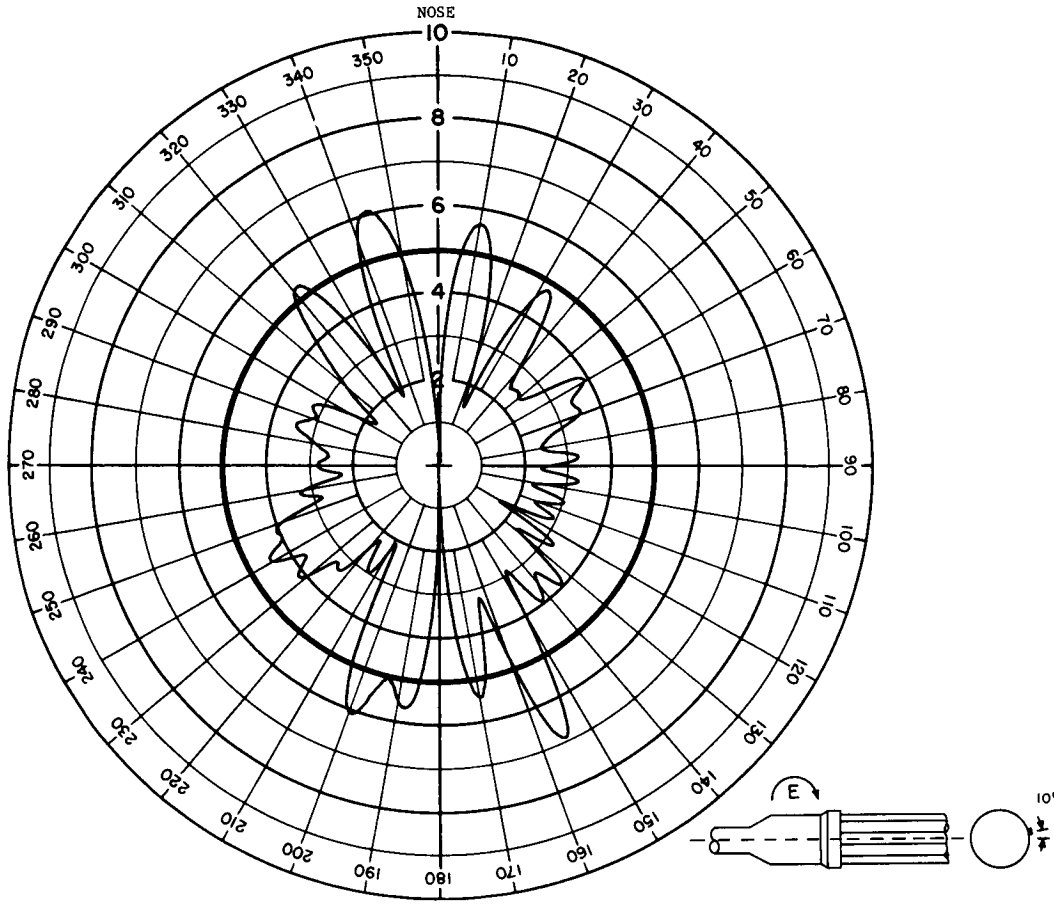


ANTENNA RADIATION PATTERN NO. 200-39

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



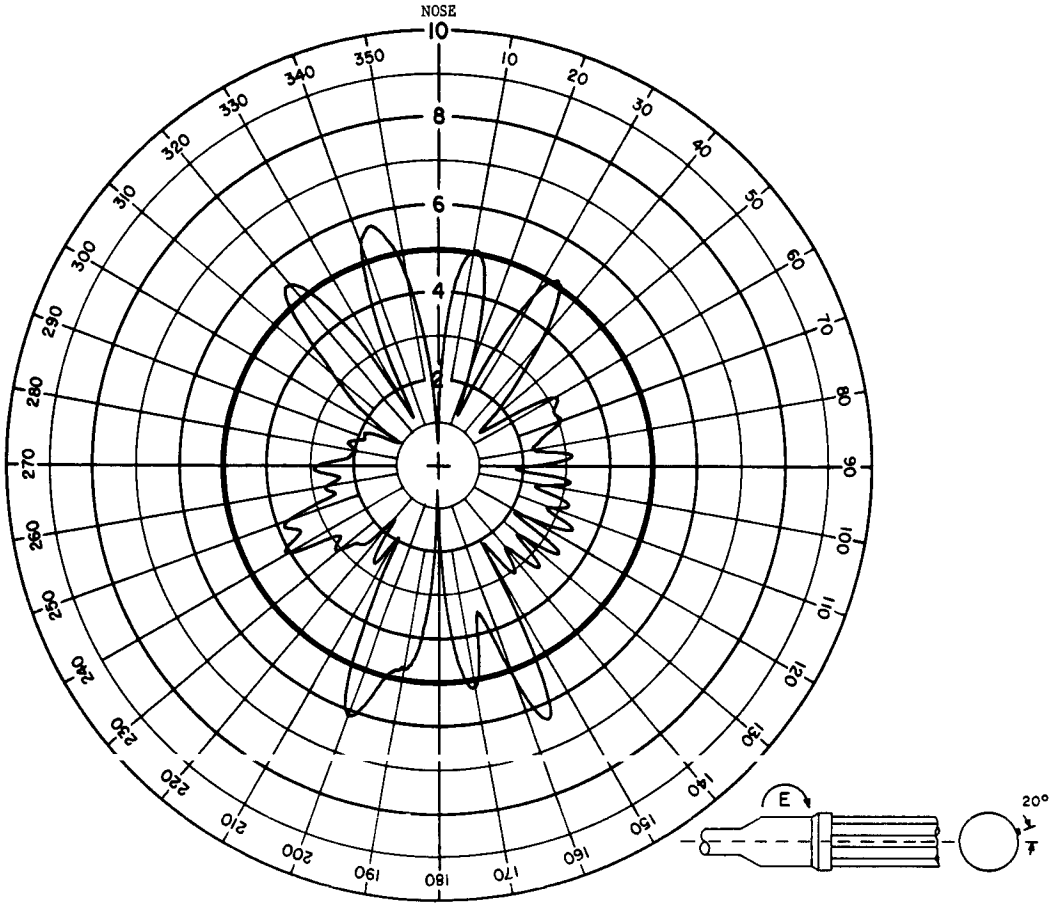
ANTENNA RADIATION PATTERN NO. 200-40

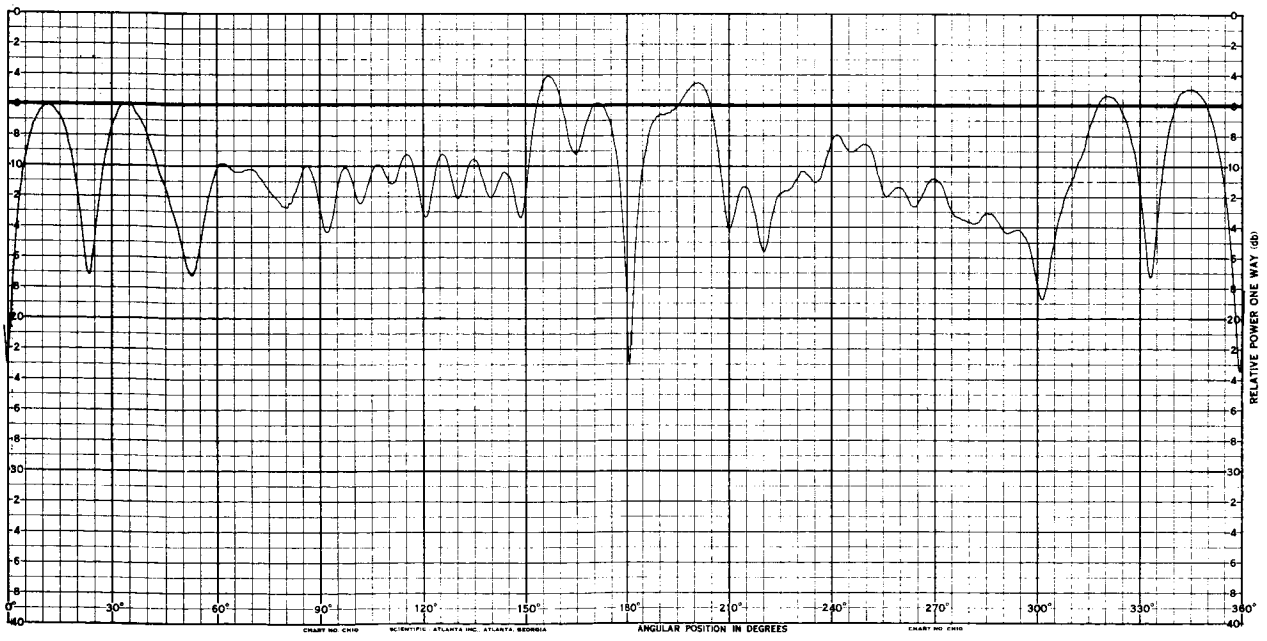
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



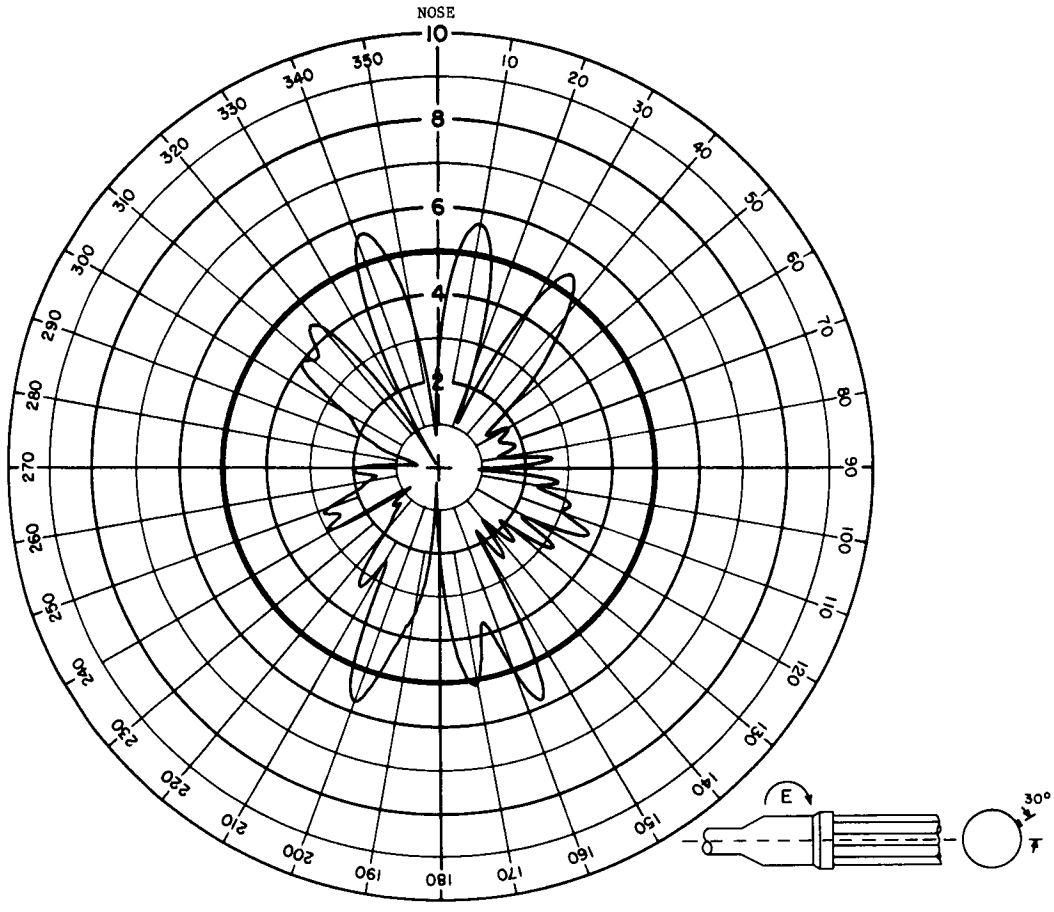


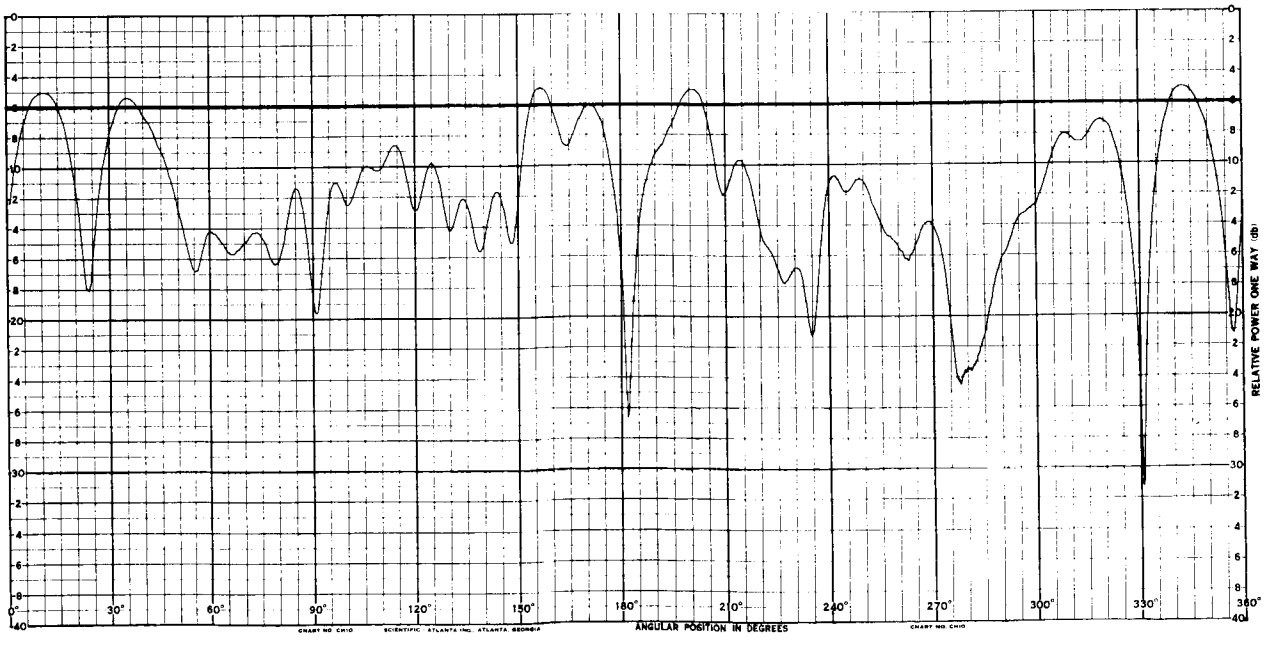
ANTENNA RADIATION PATTERN NO. 200-41

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





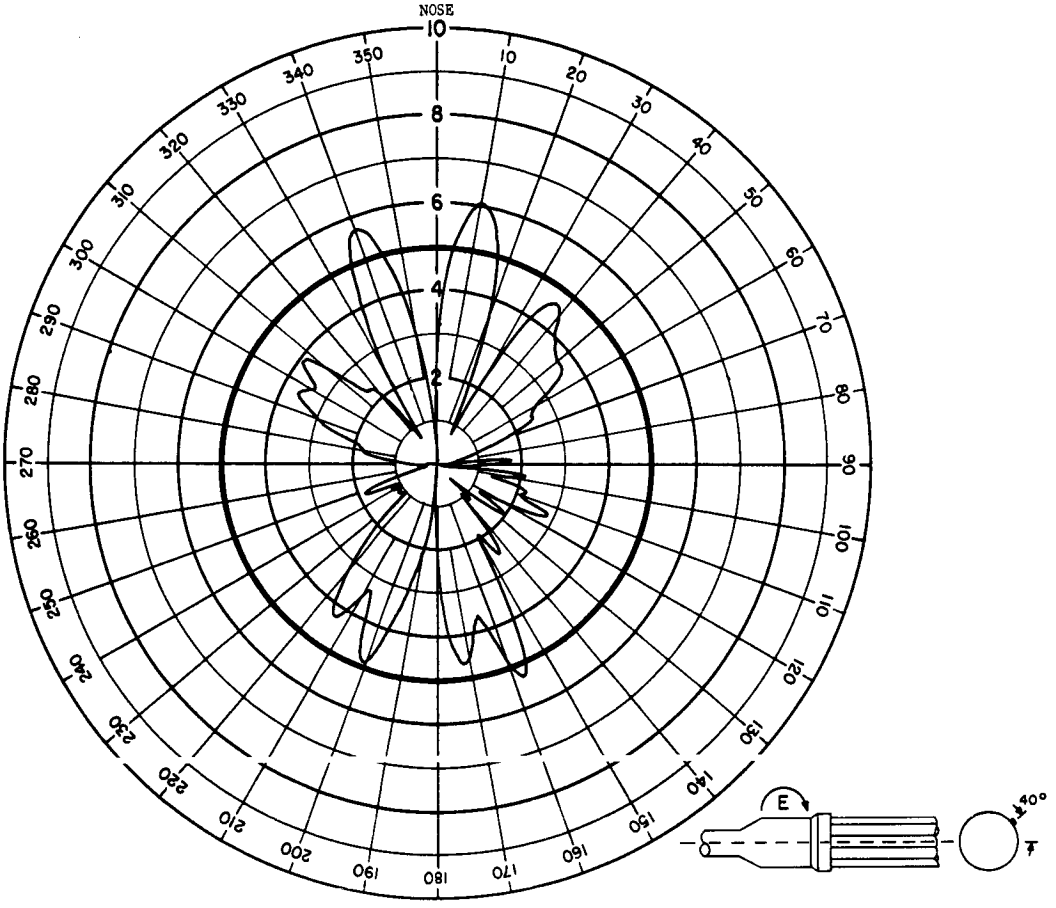
ANTENNA RADIATION PATTERN NO. 200-42

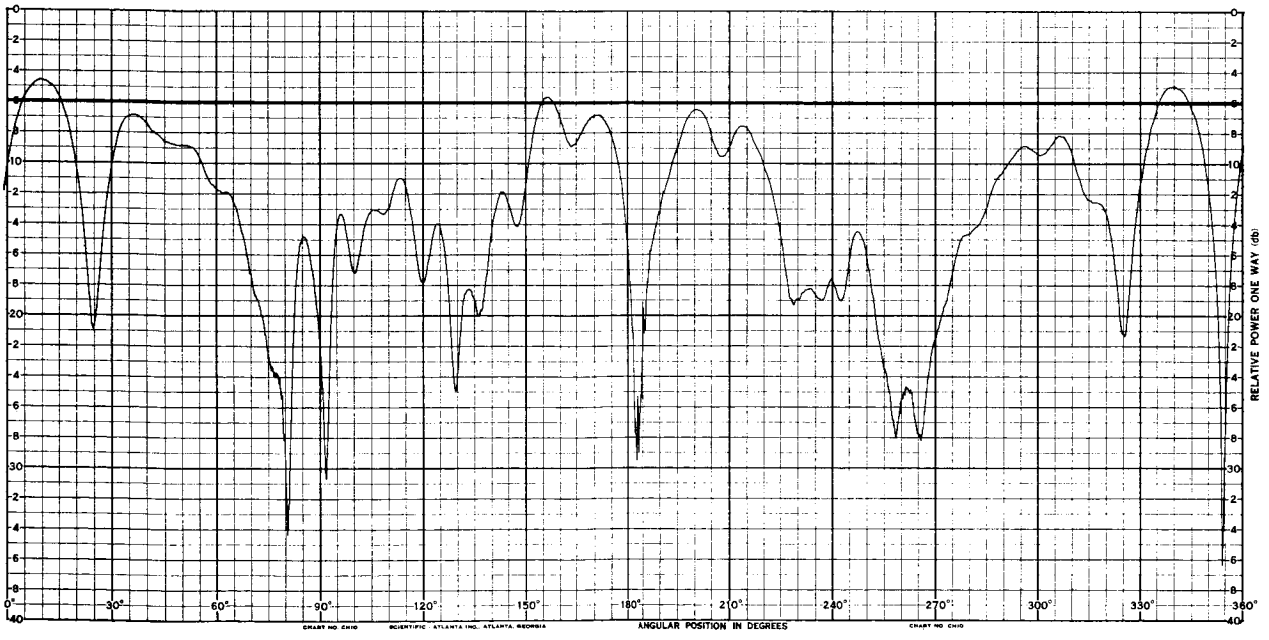
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





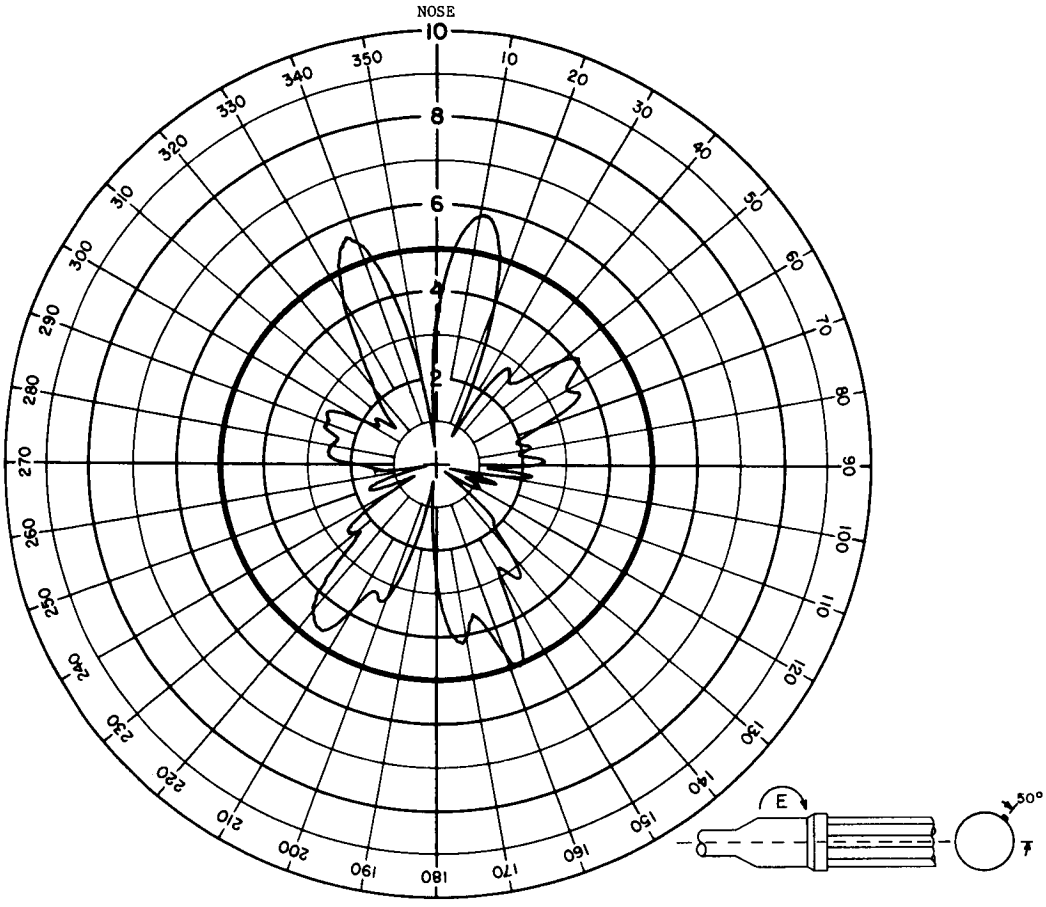
ANTENNA RADIATION PATTERN NO. 200-43

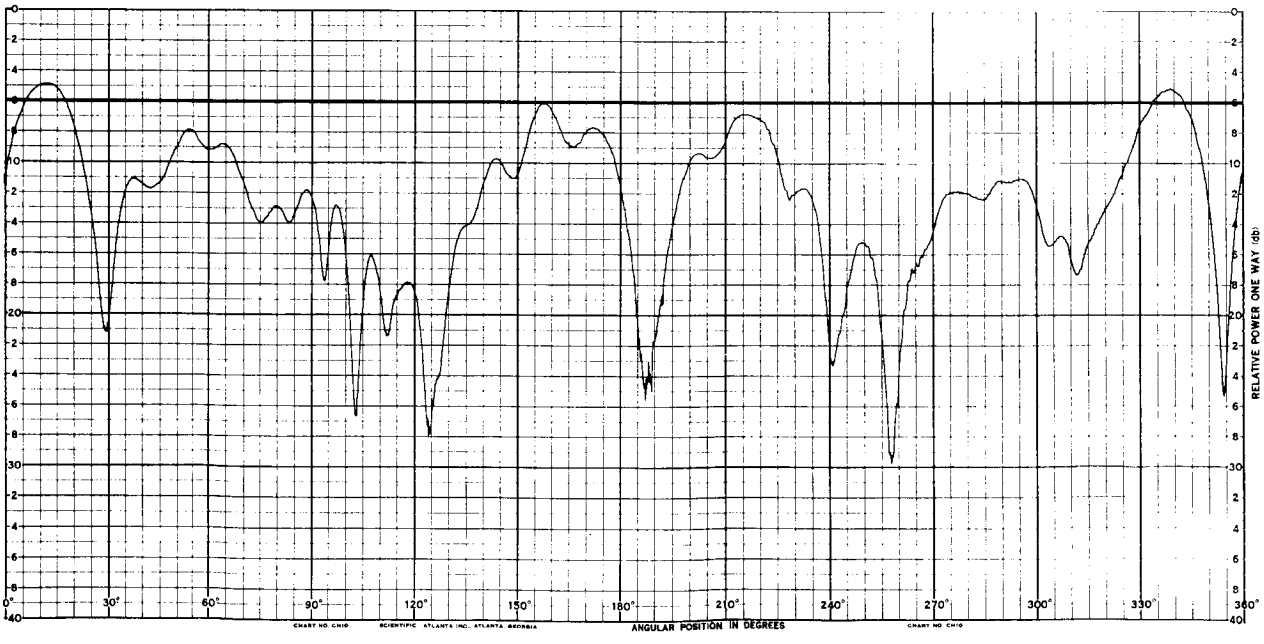
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



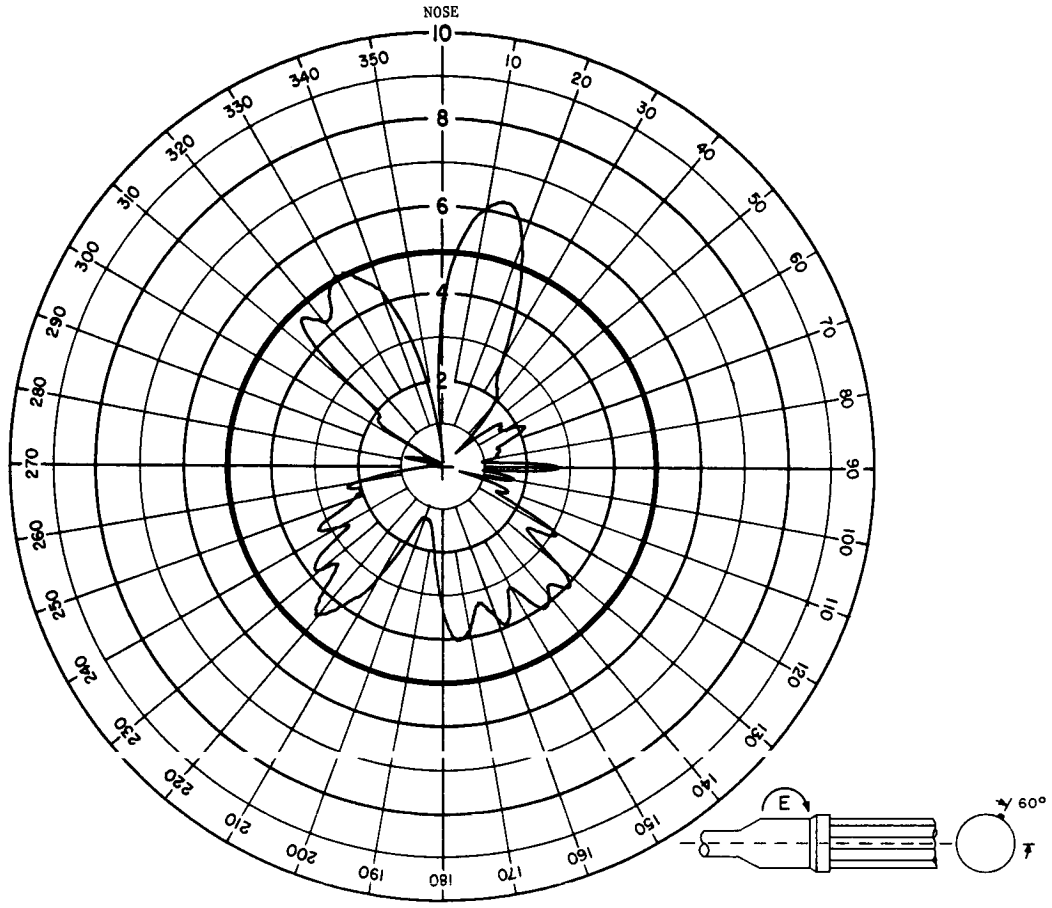


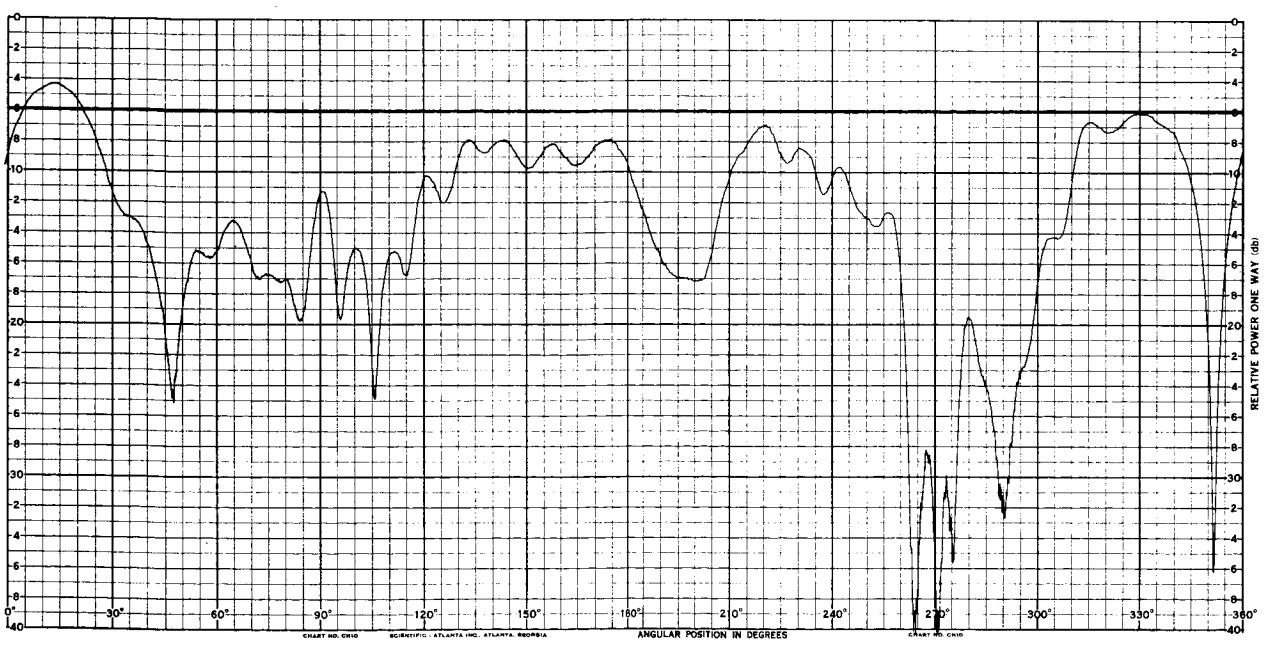
ANTENNA RADIATION PATTERN NO. 200-44

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



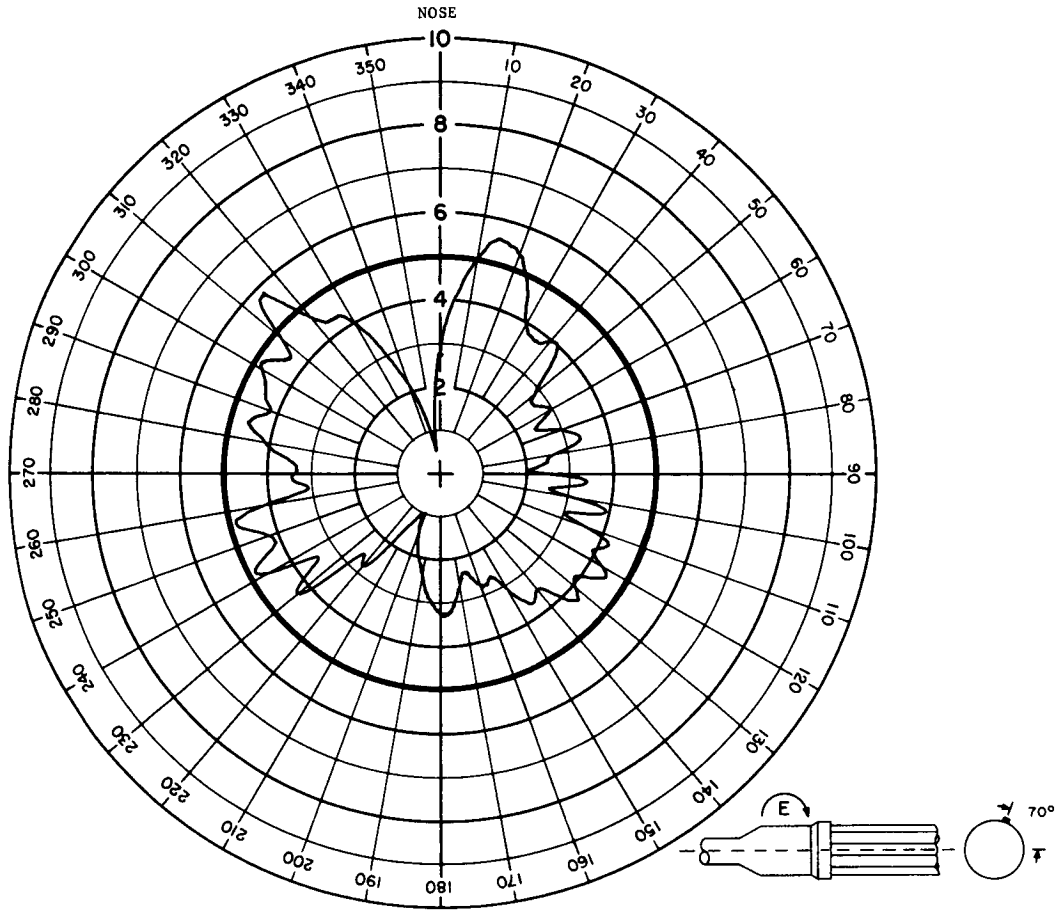


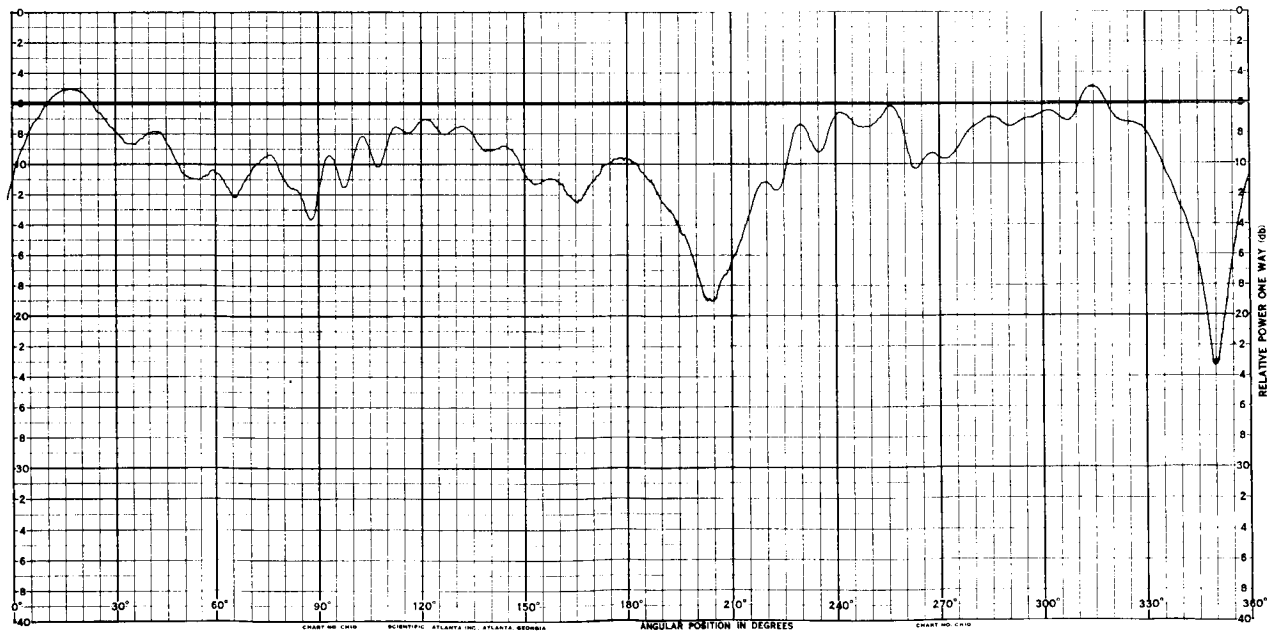
ANTENNA RADIATION PATTERN NO. 200-45

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



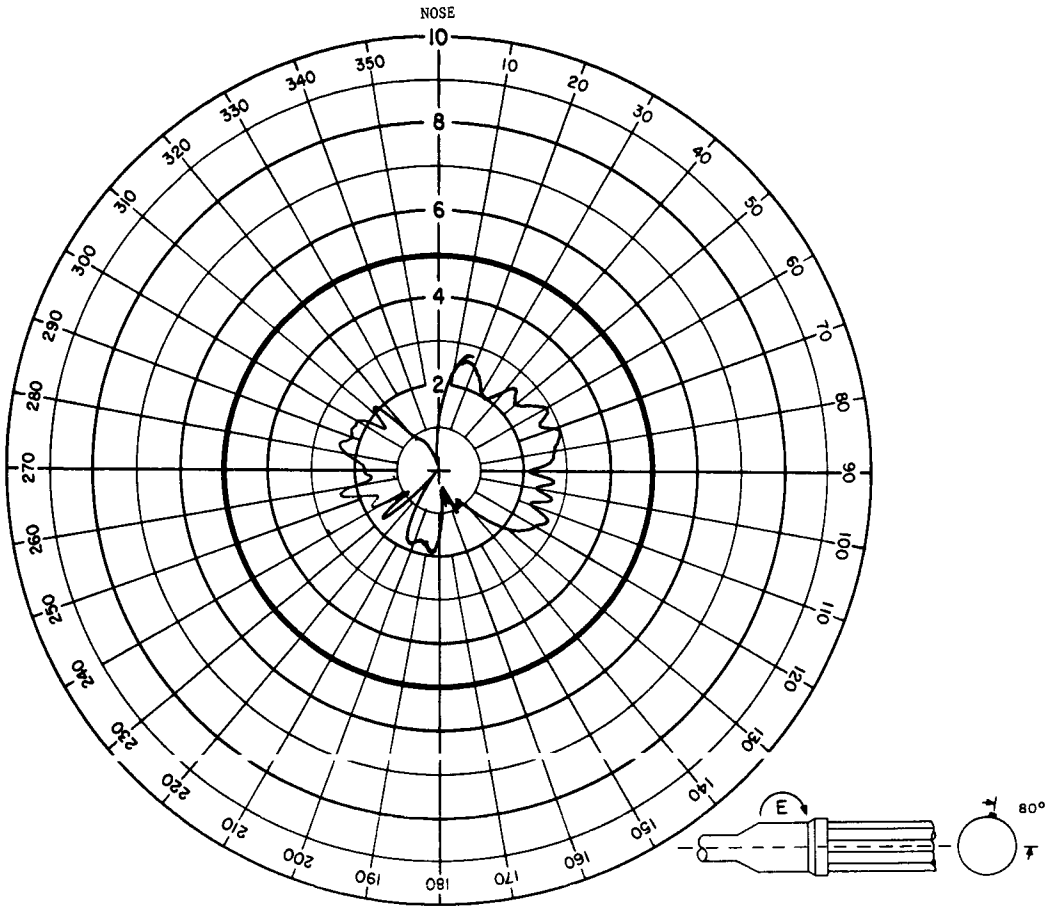


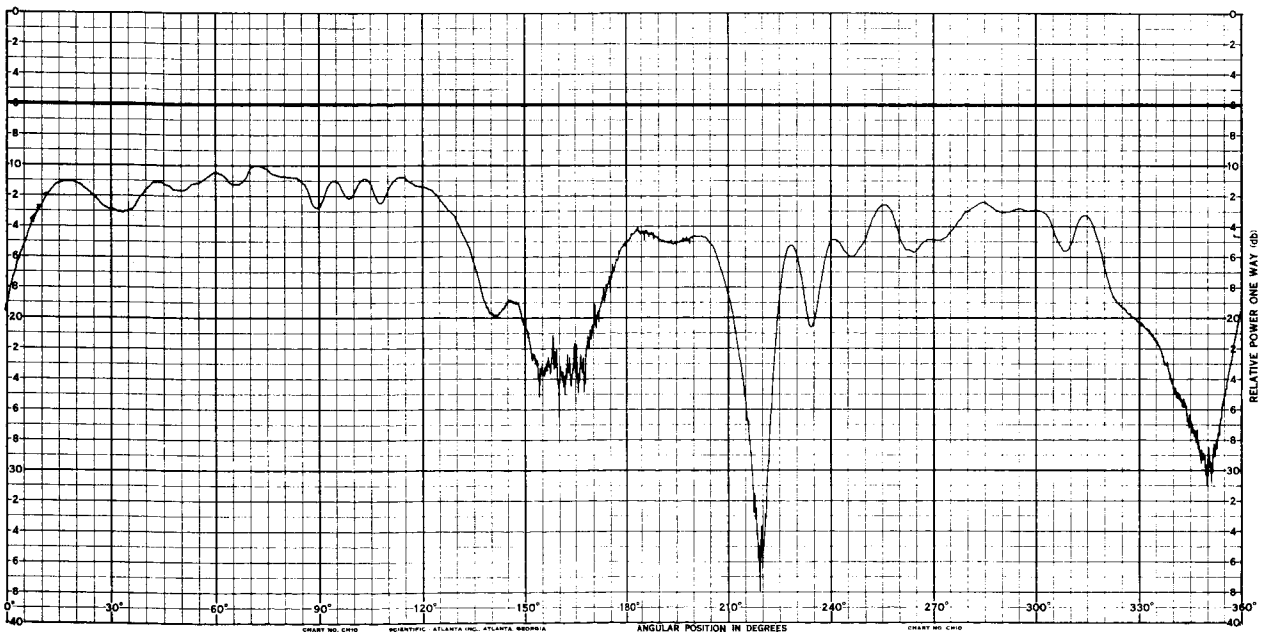
ANTENNA RADIATION PATTERN NO. 200-46

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



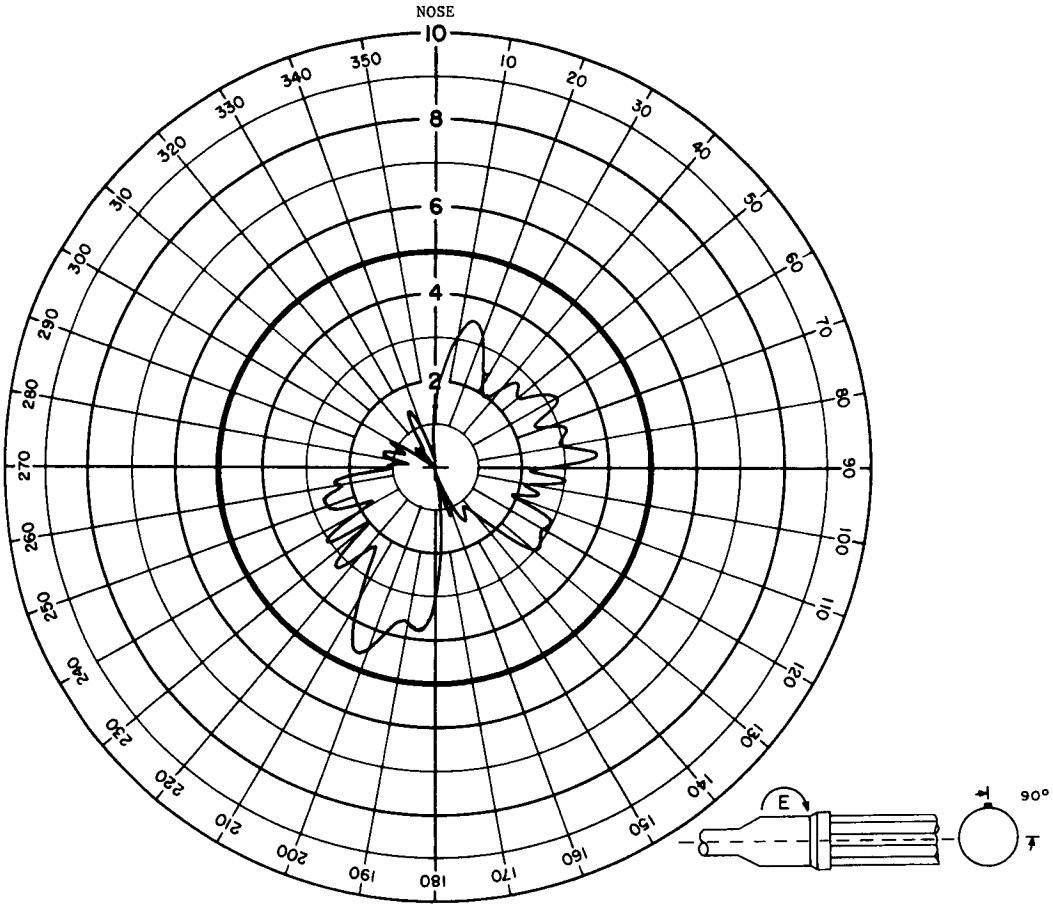


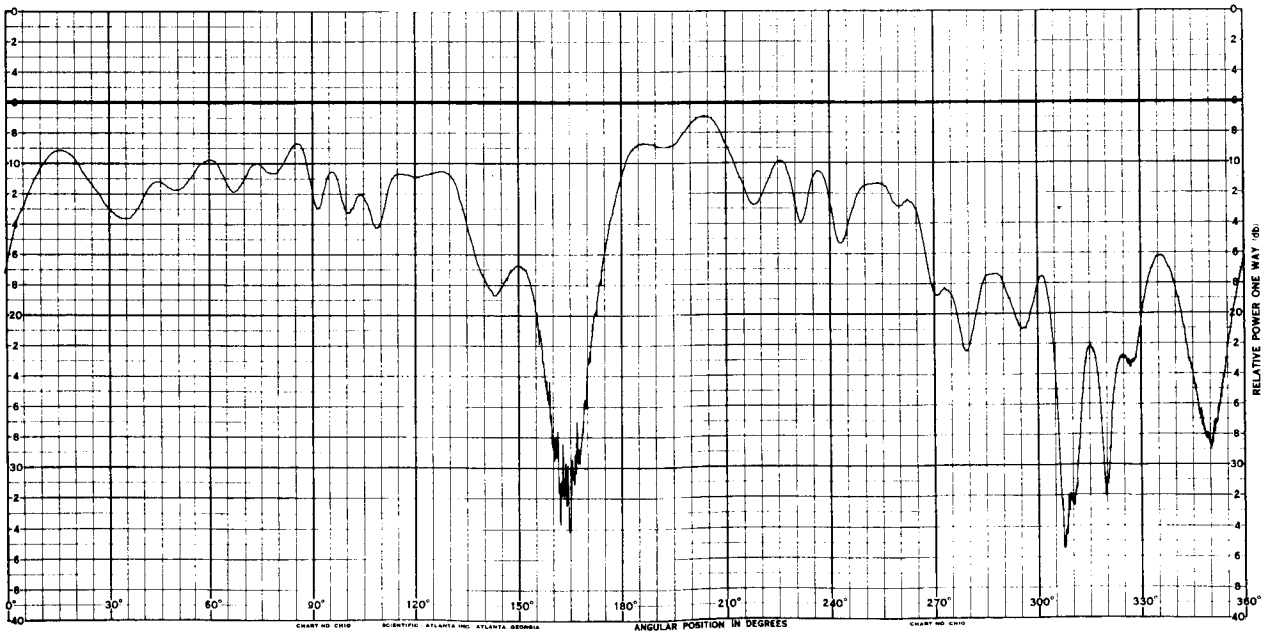
ANTENNA RADIATION PATTERN NO. 200-47

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



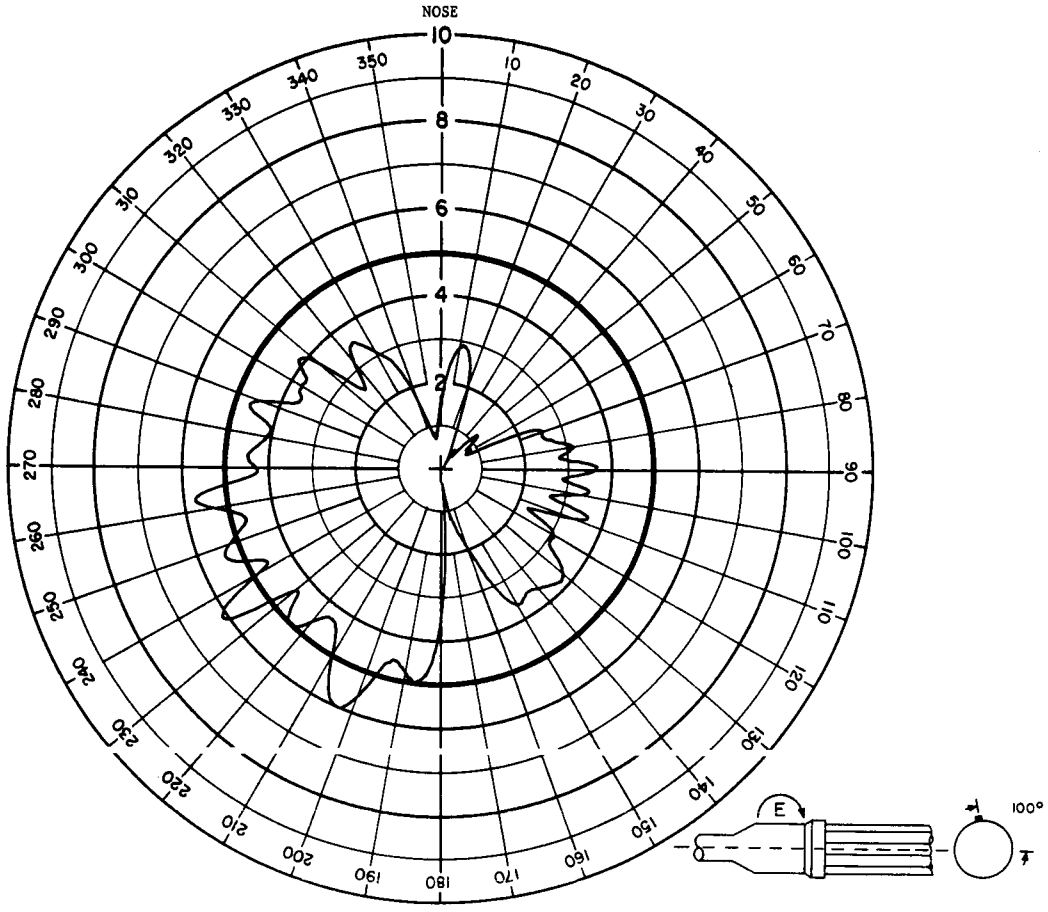


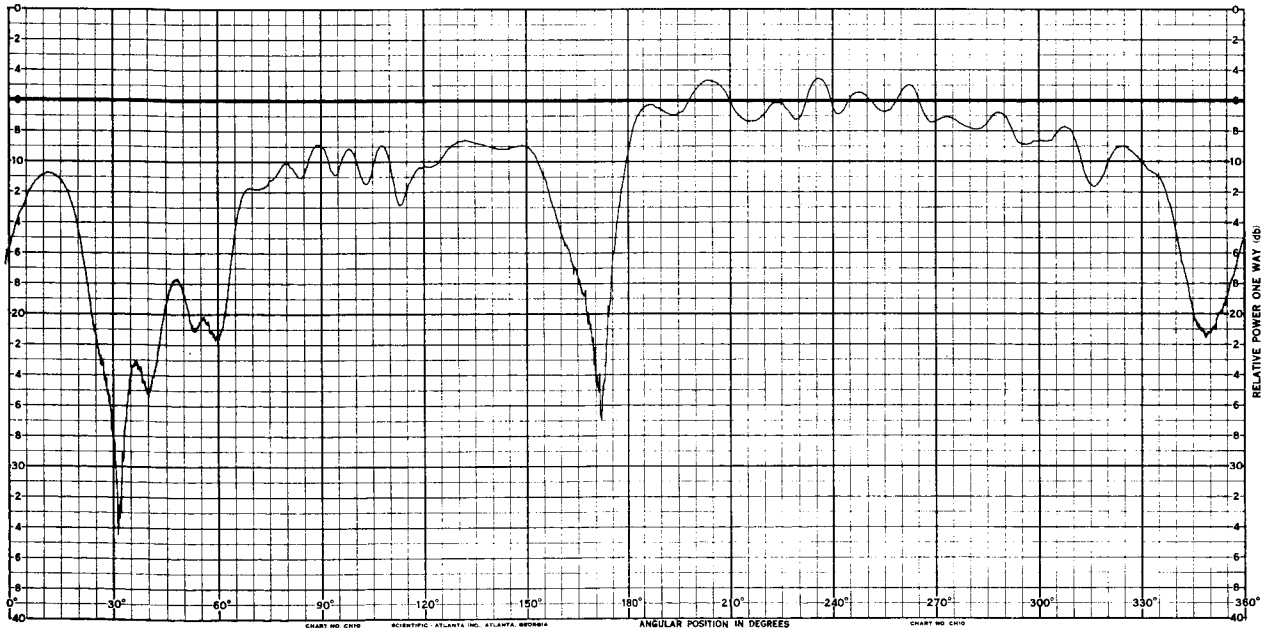
ANTENNA RADIATION PATTERN NO. 200-48

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





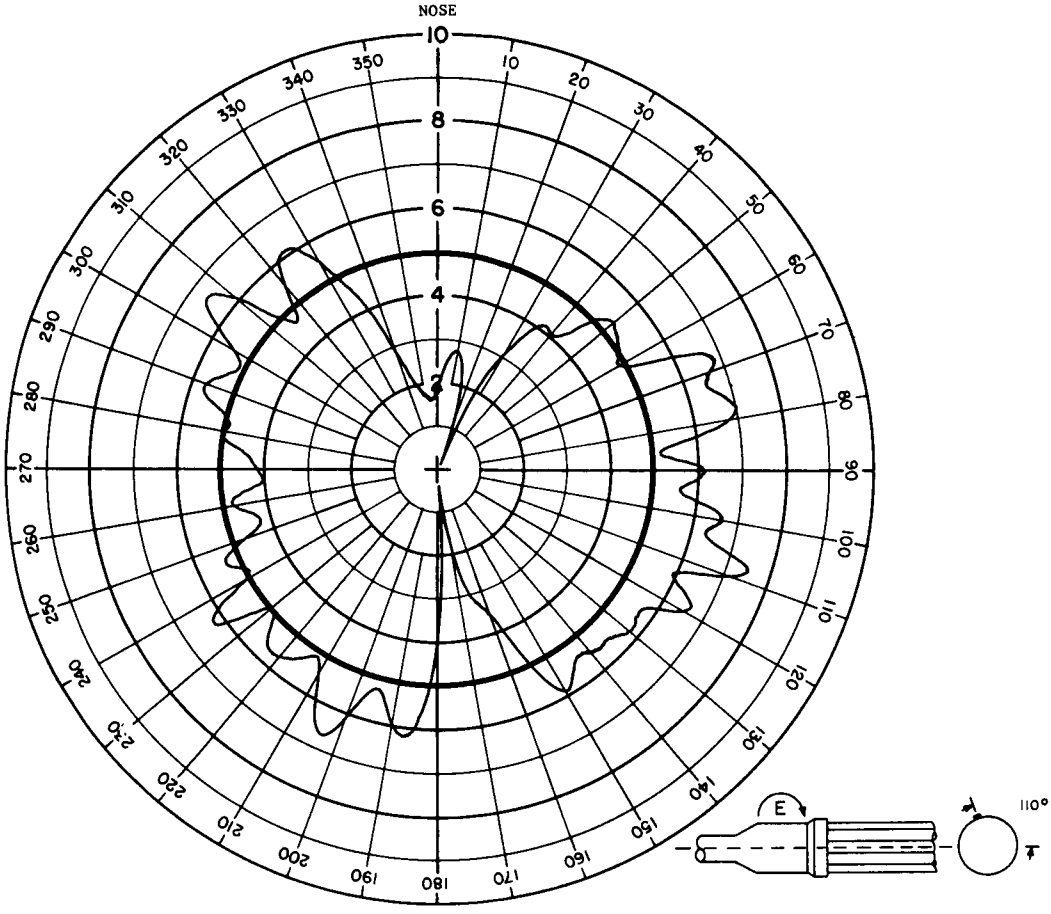
ANTENNA RADIATION PATTERN NO. 200-49

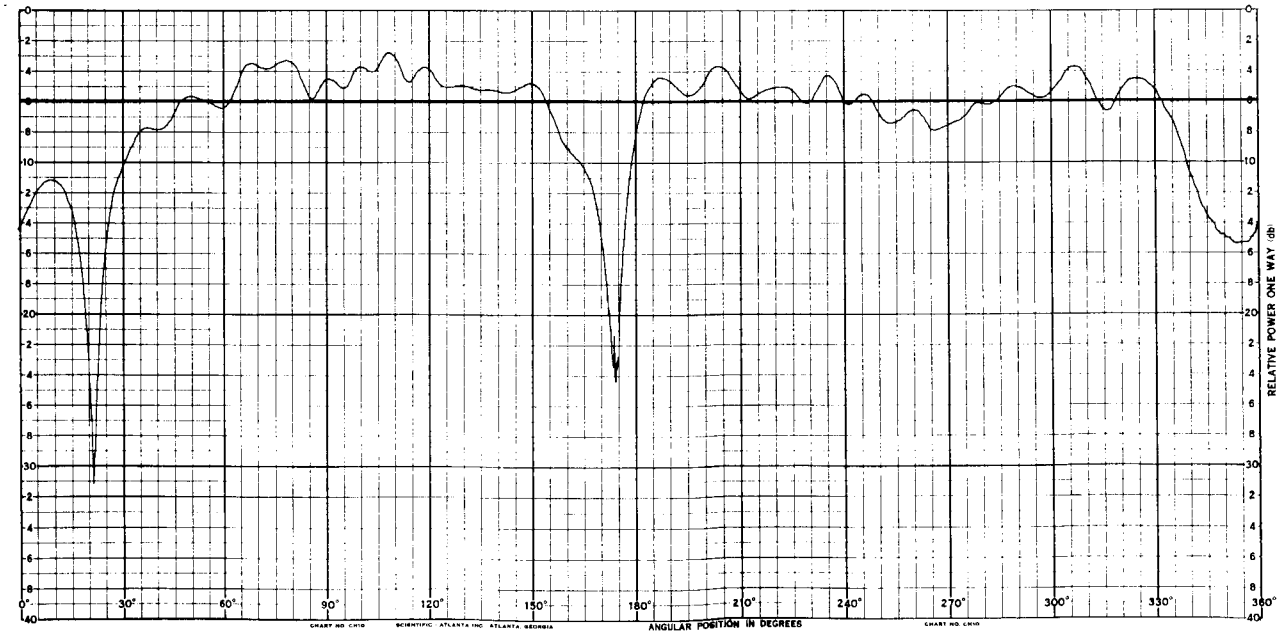
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



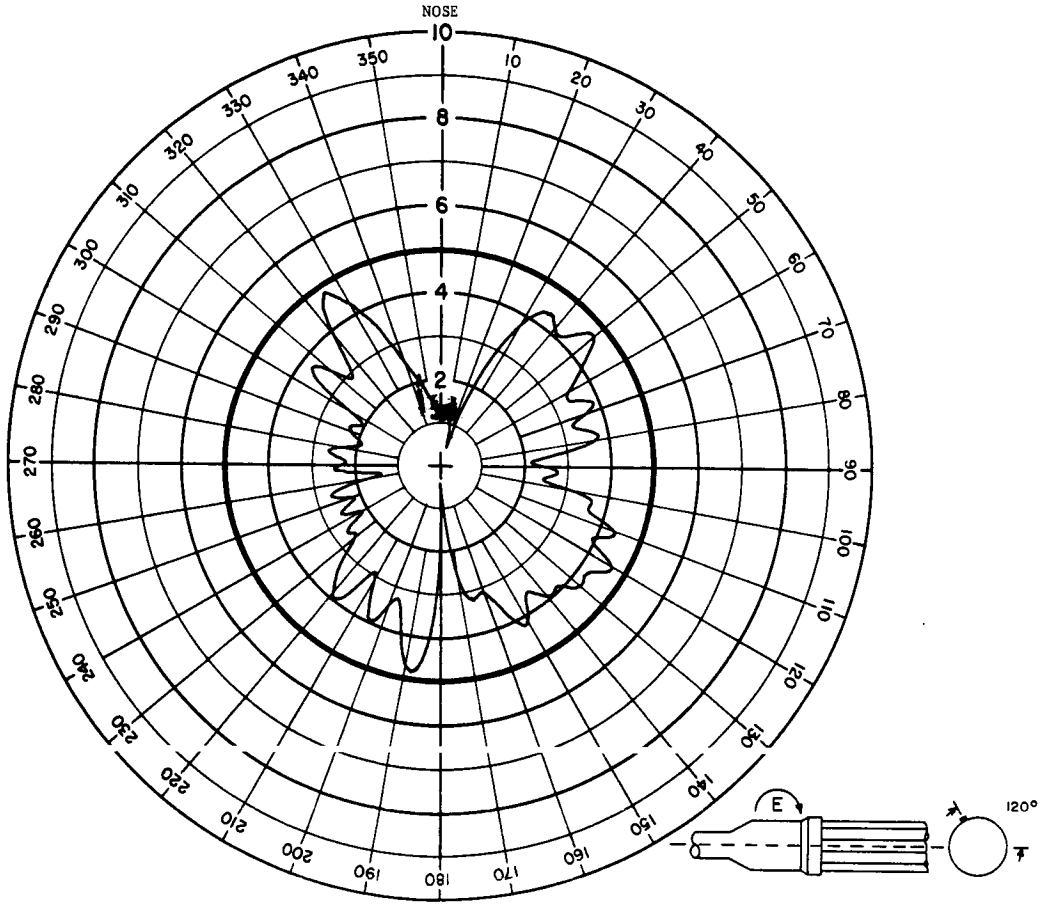


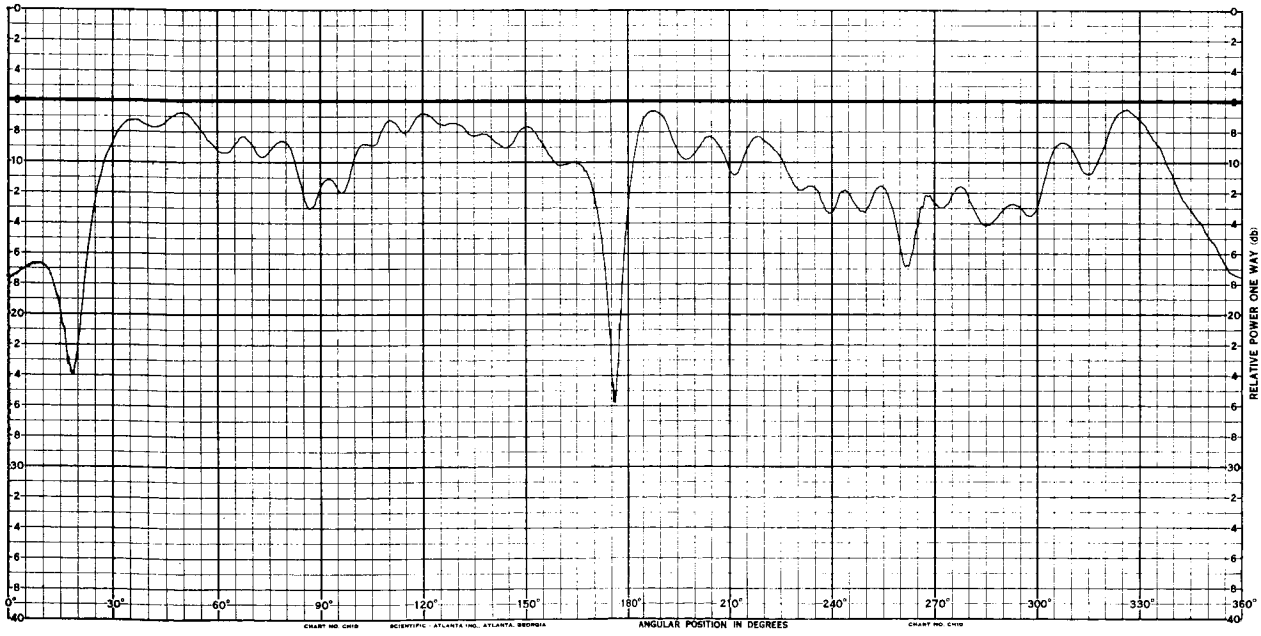
ANTENNA RADIATION PATTERN NO. 200-50

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



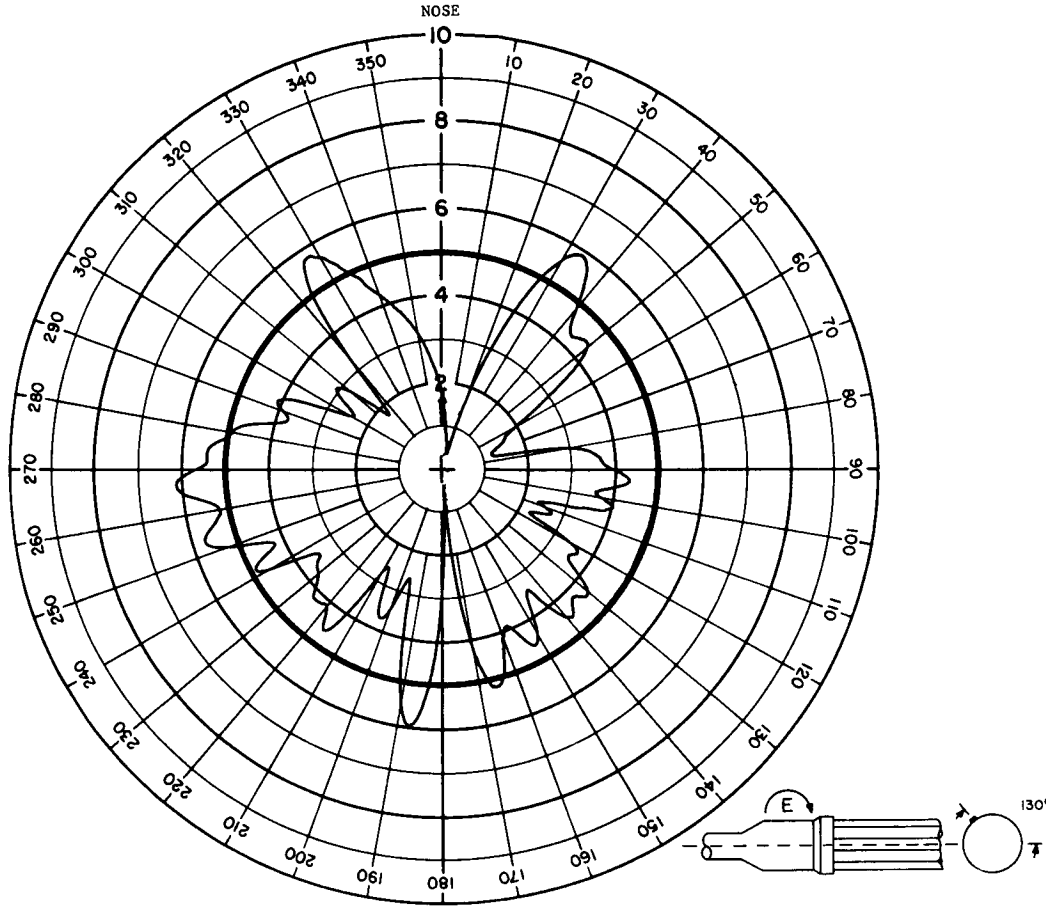


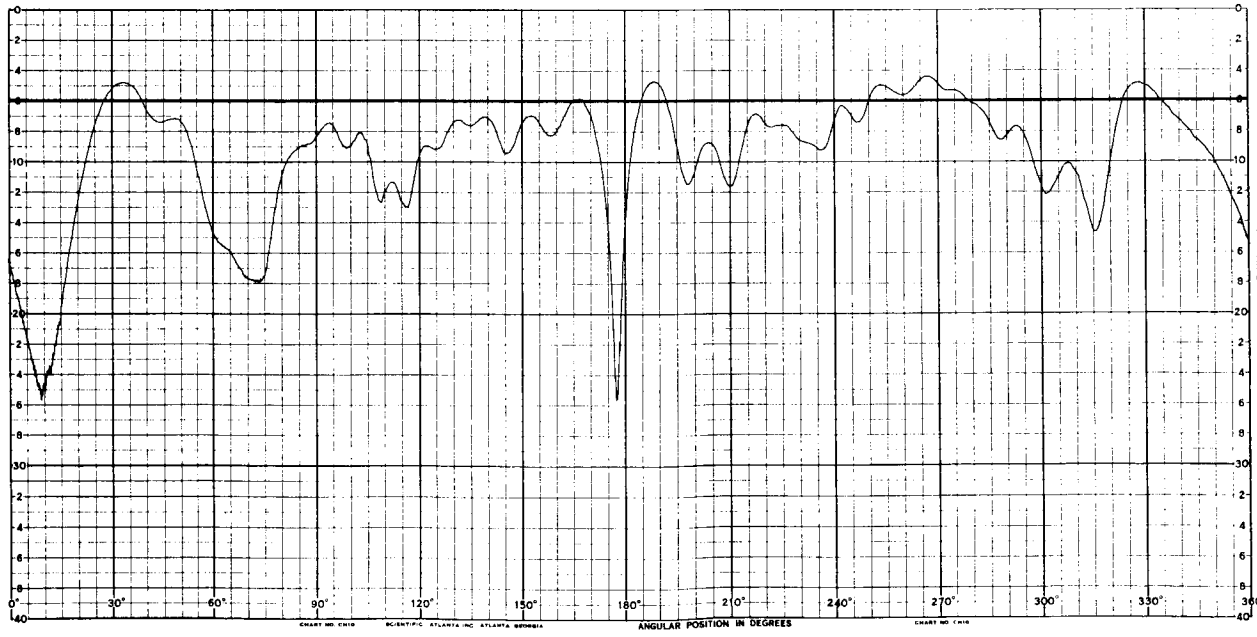
ANTENNA RADIATION PATTERN NO. 200-51

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





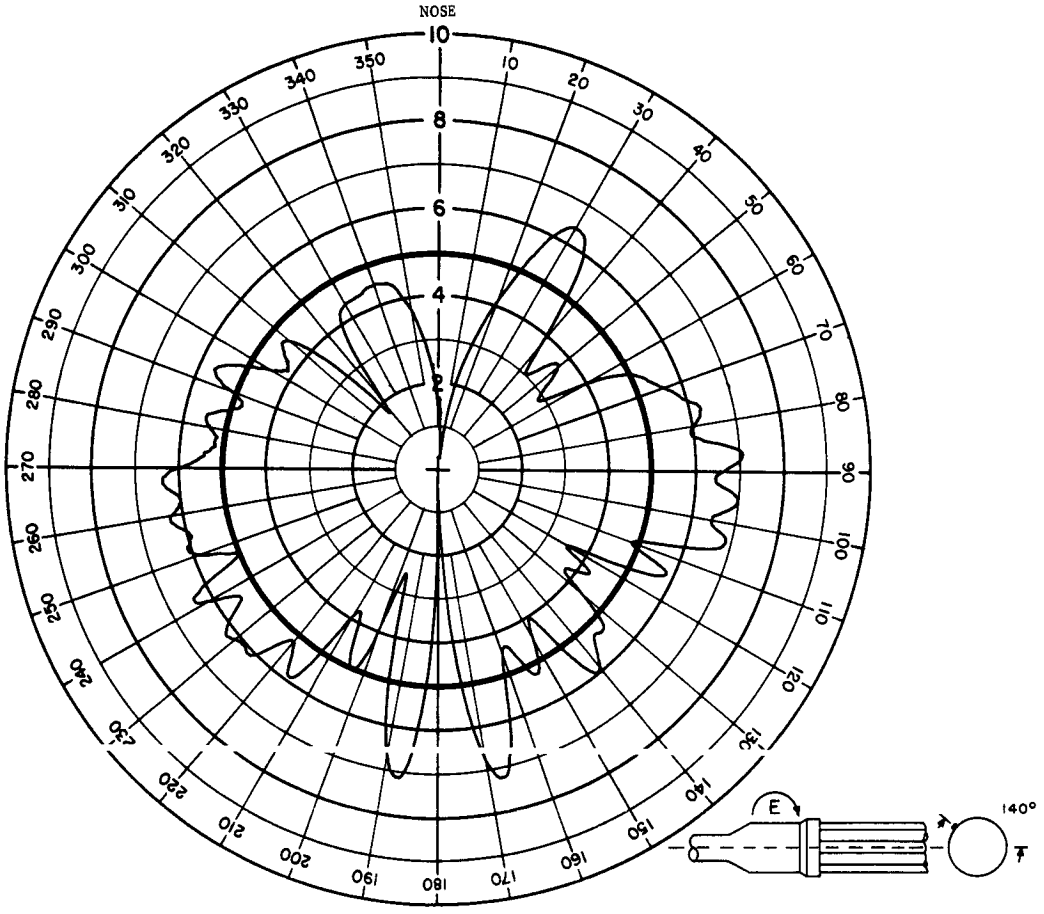
ANTENNA RADIATION PATTERN NO. 200-52

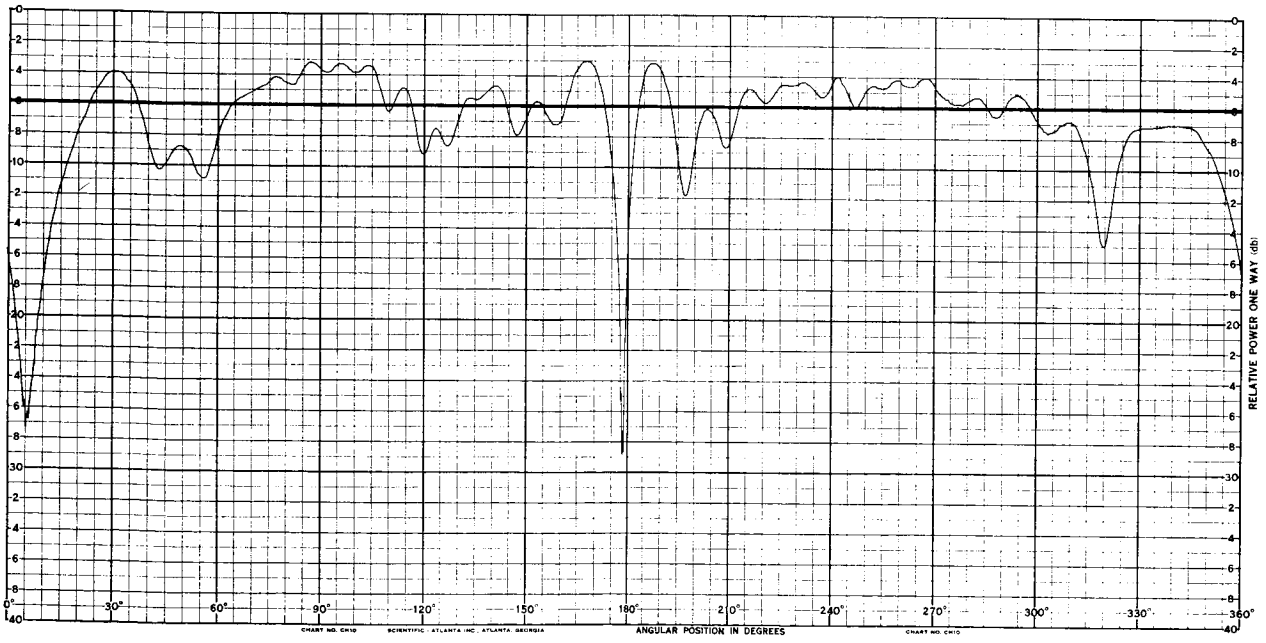
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



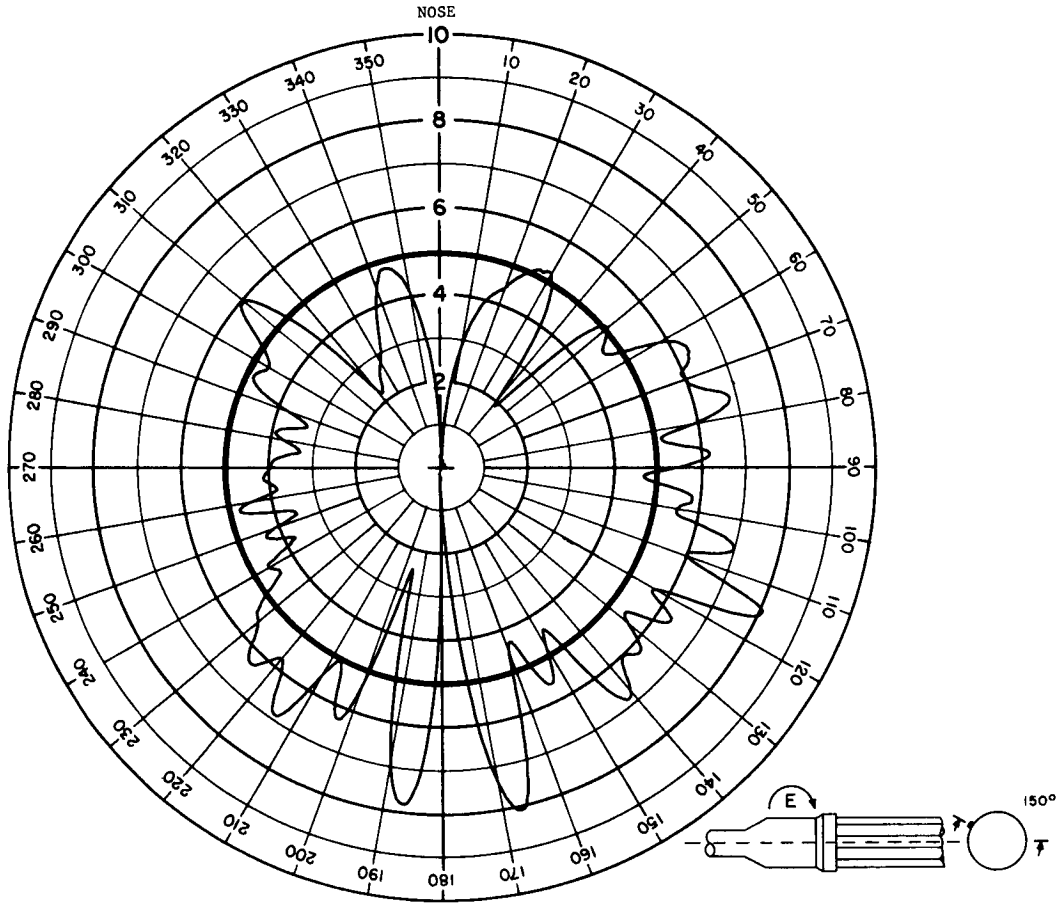


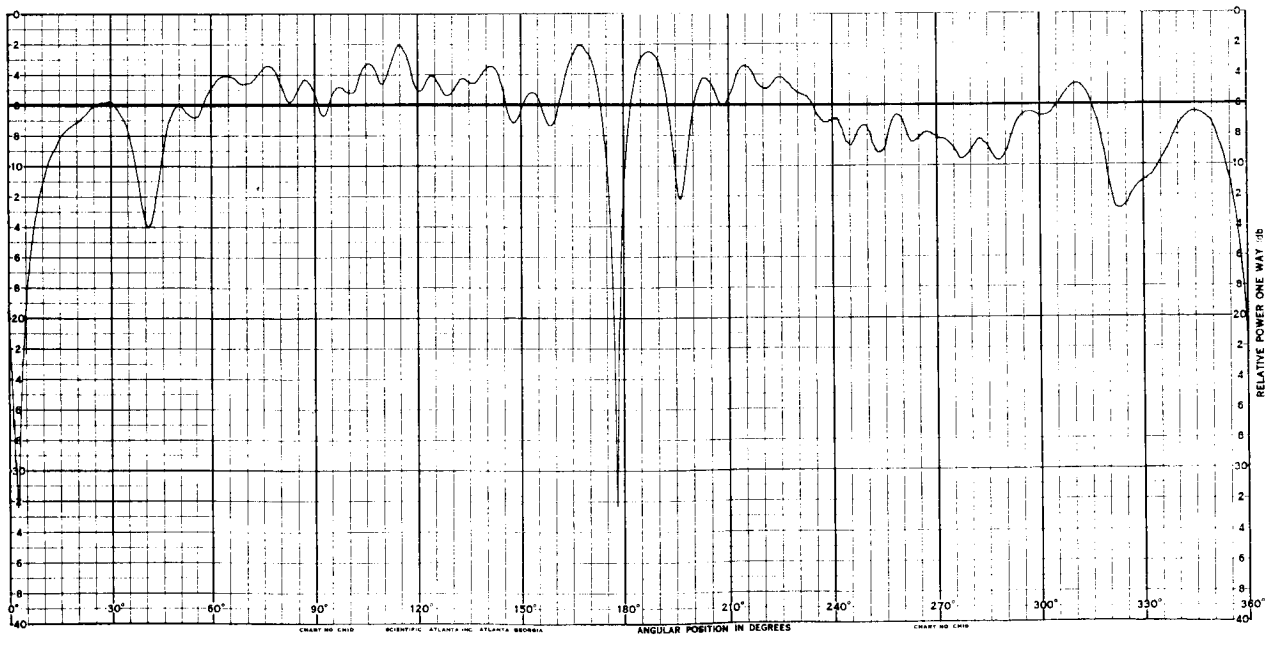
ANTENNA RADIATION PATTERN NO. 200-53

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





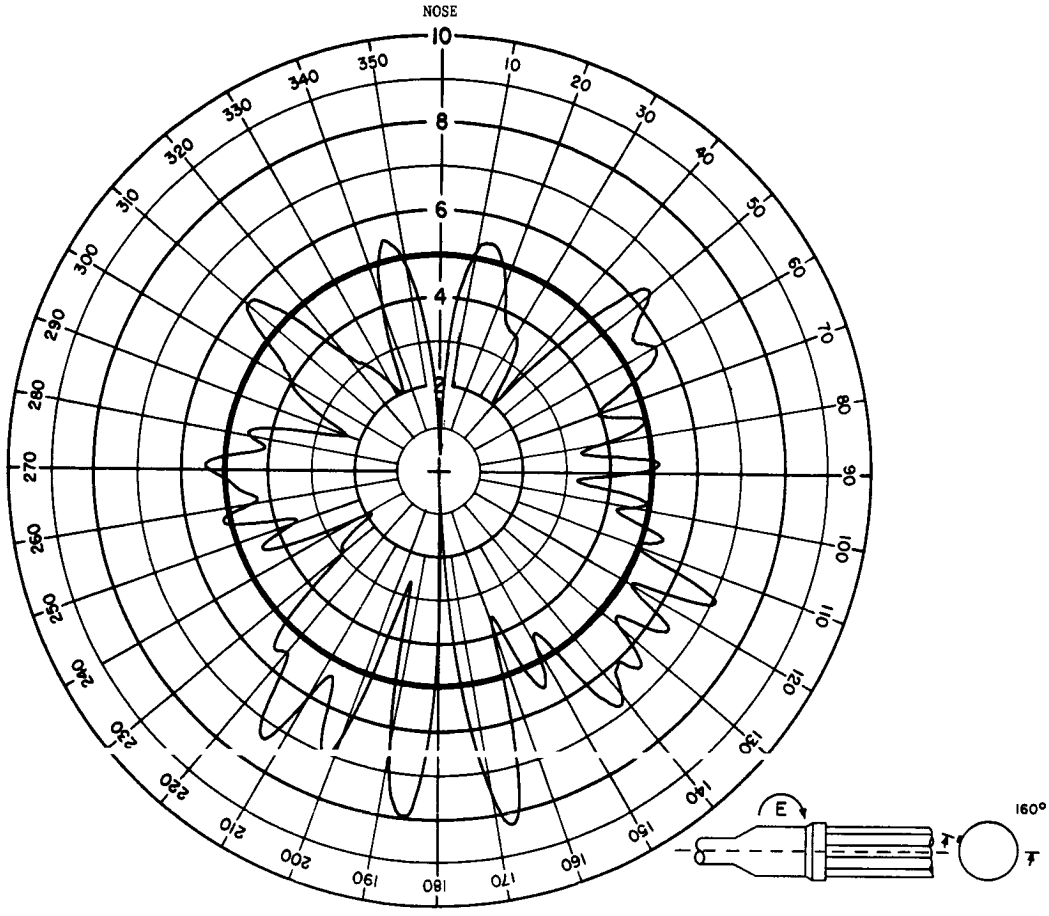
ANTENNA RADIATION PATTERN NO. 200-54

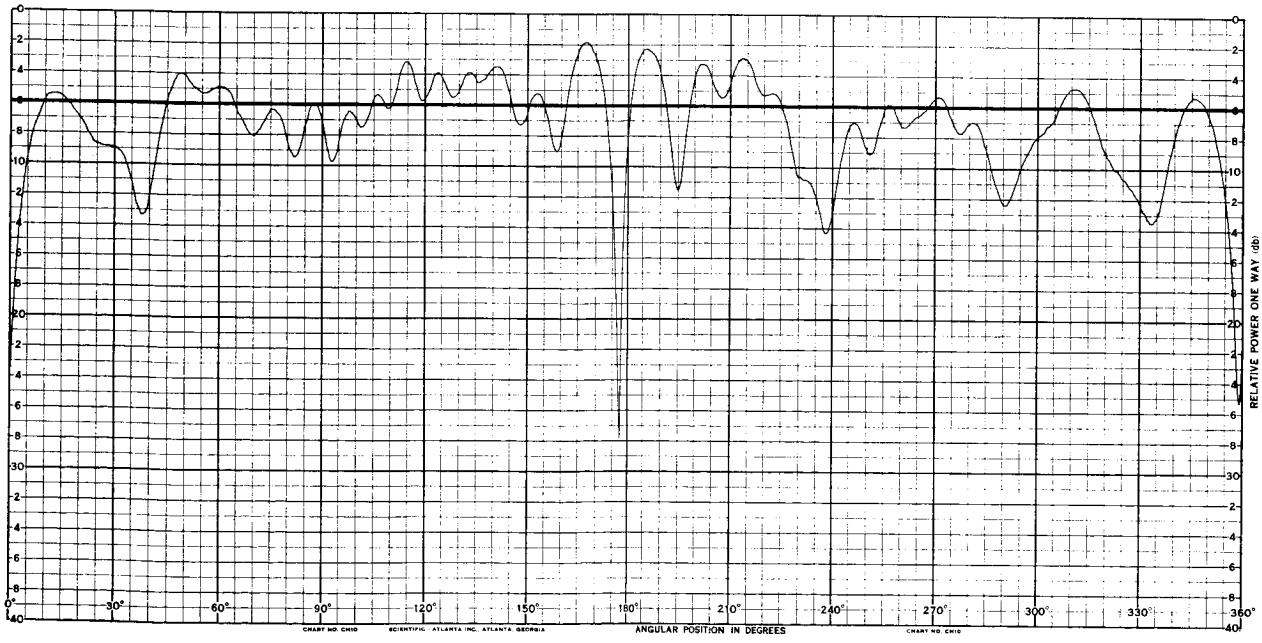
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





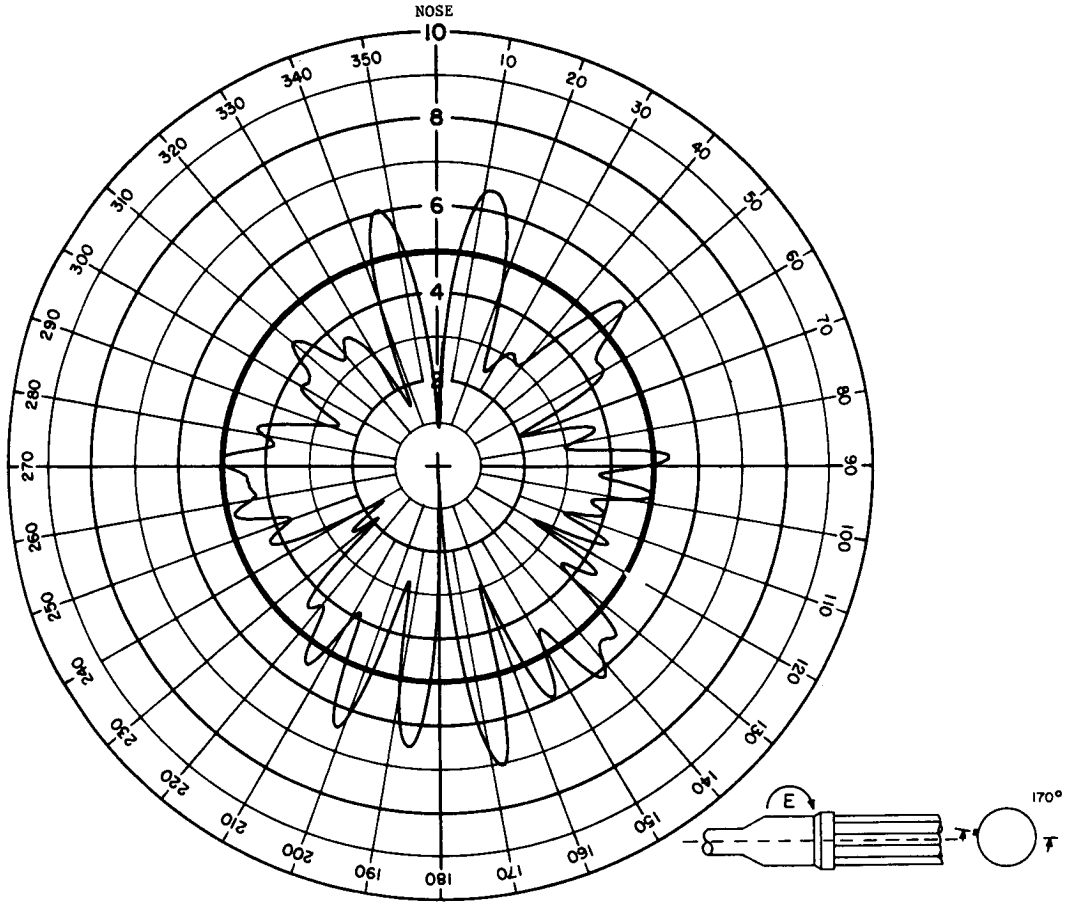
ANTENNA RADIATION PATTERN NO. 200-55

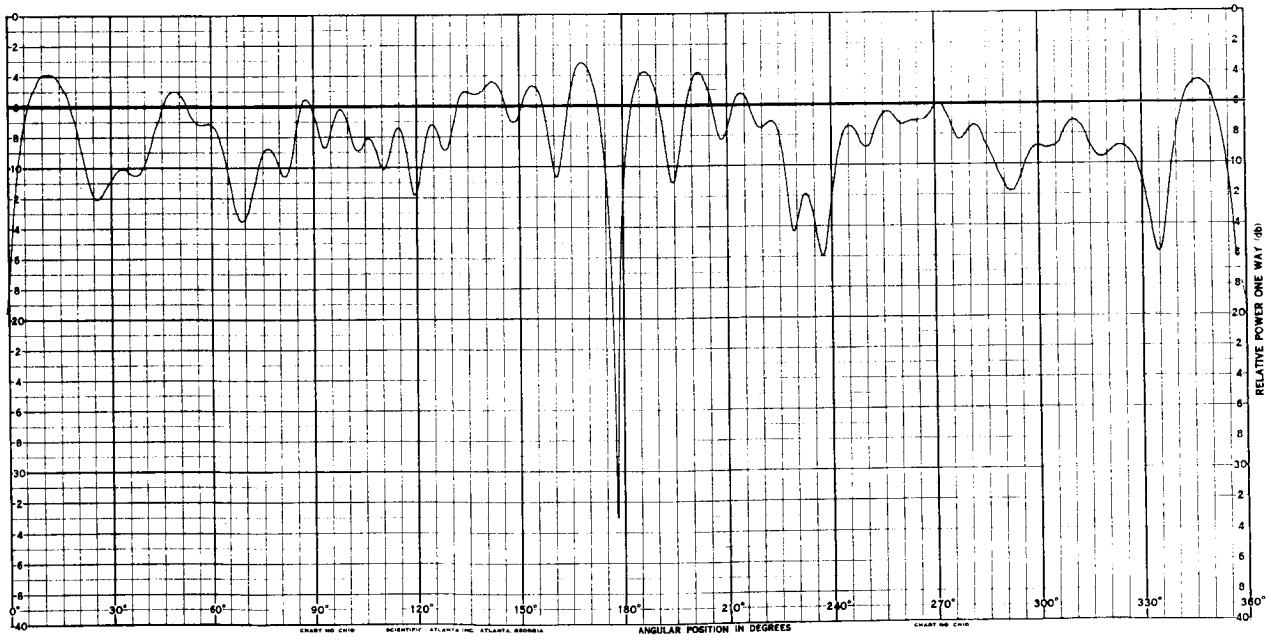
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





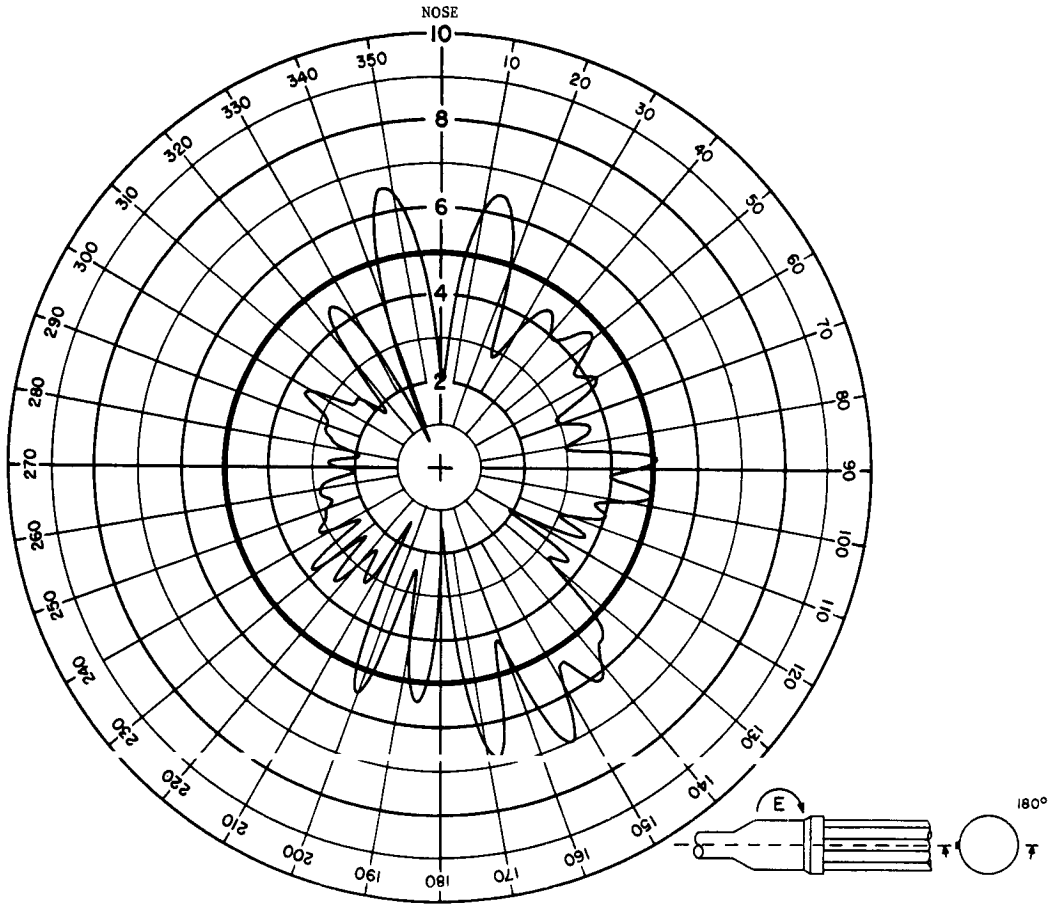
ANTENNA RADIATION PATTERN NO. 200-56

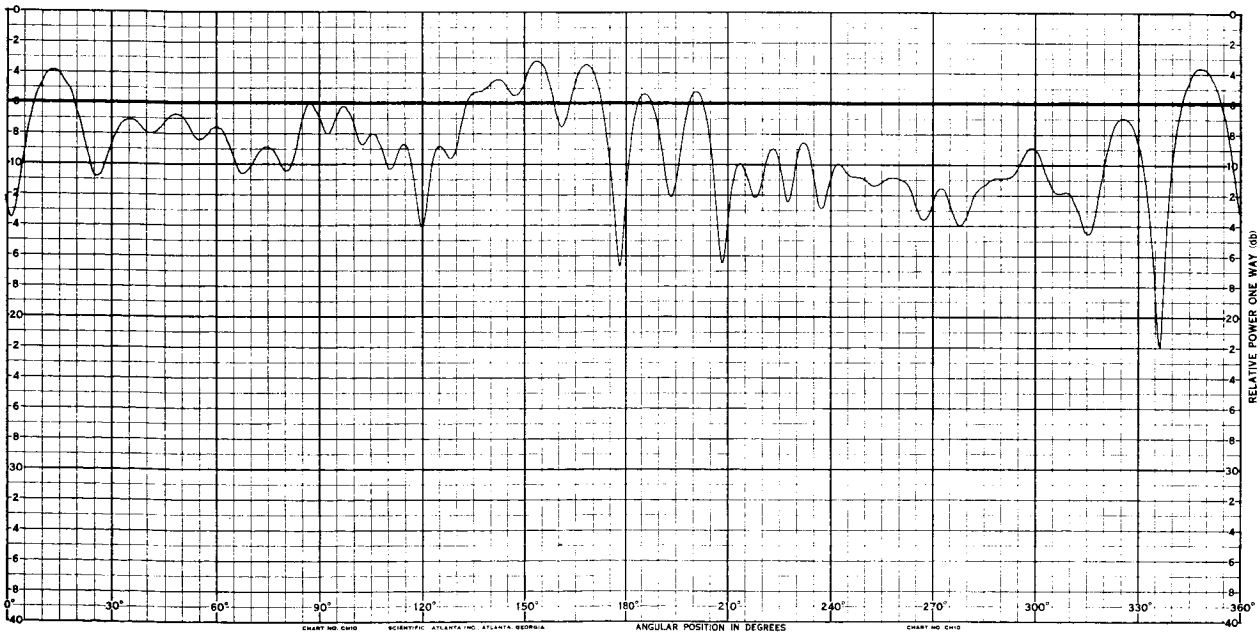
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



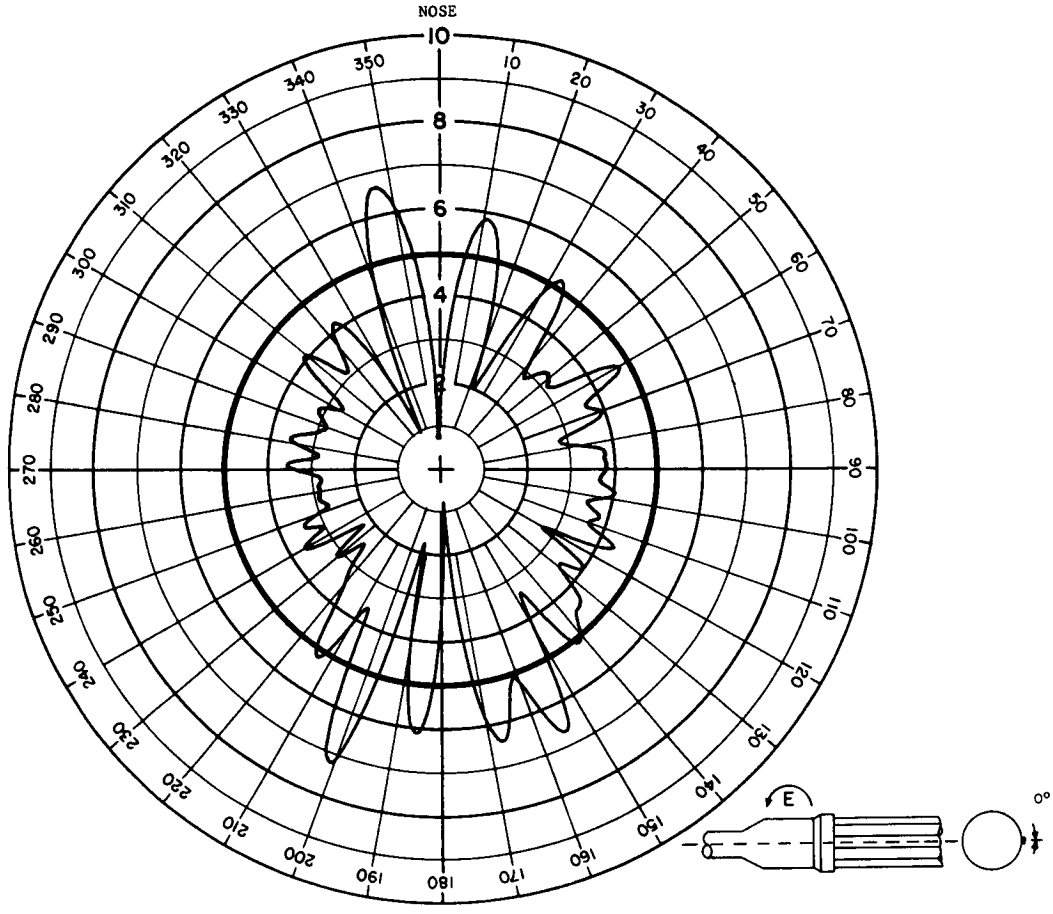


ANTENNA RADIATION PATTERN NO. 200-57

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK

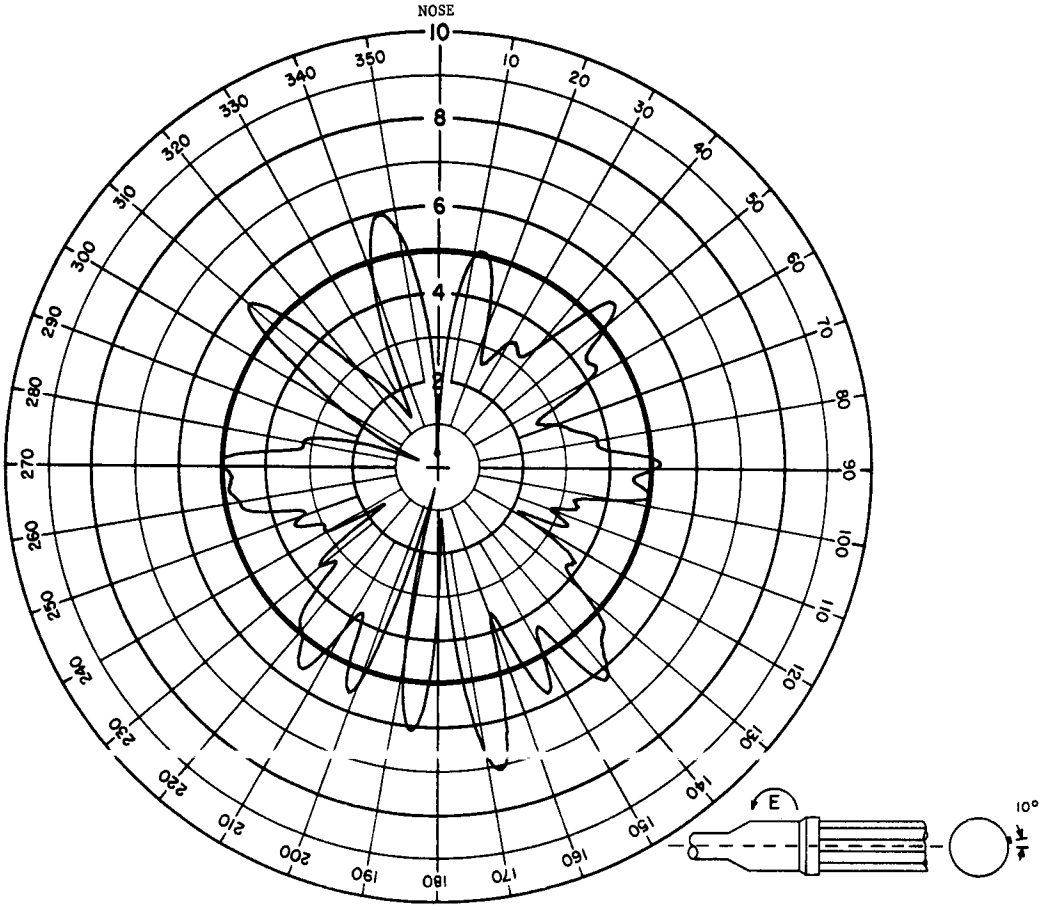


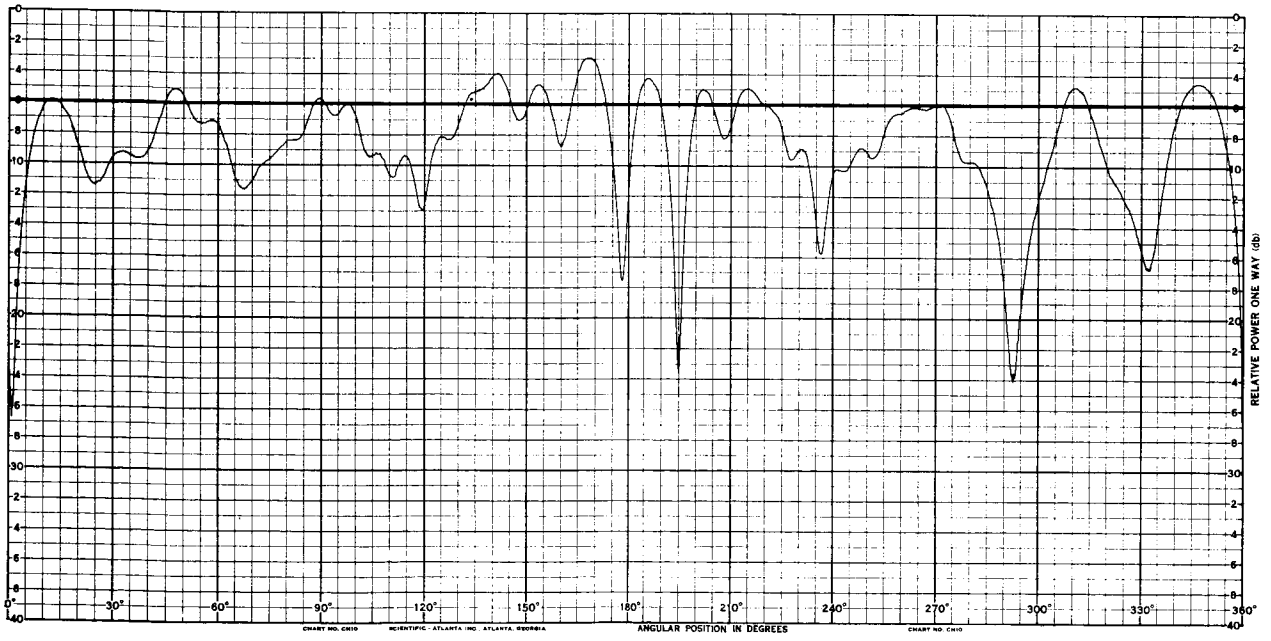
ANTENNA RADIATION PATTERN NO. 200-58

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



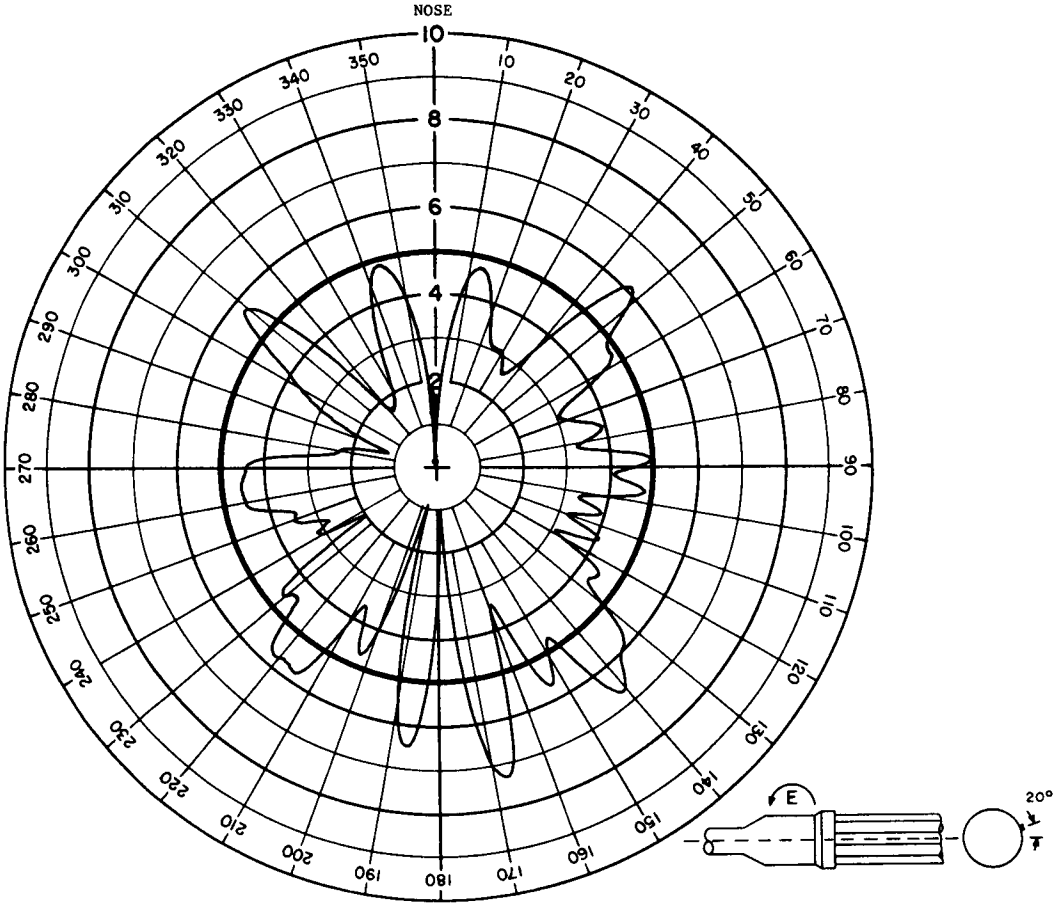


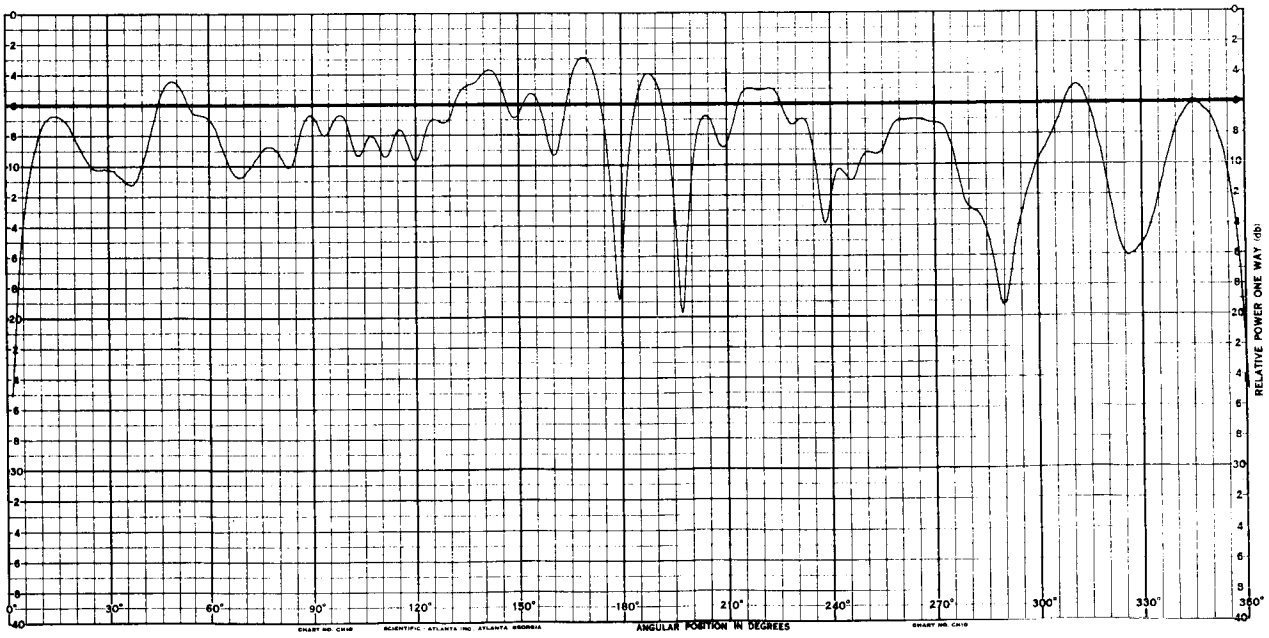
ANTENNA RADIATION PATTERN NO. 200-59

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



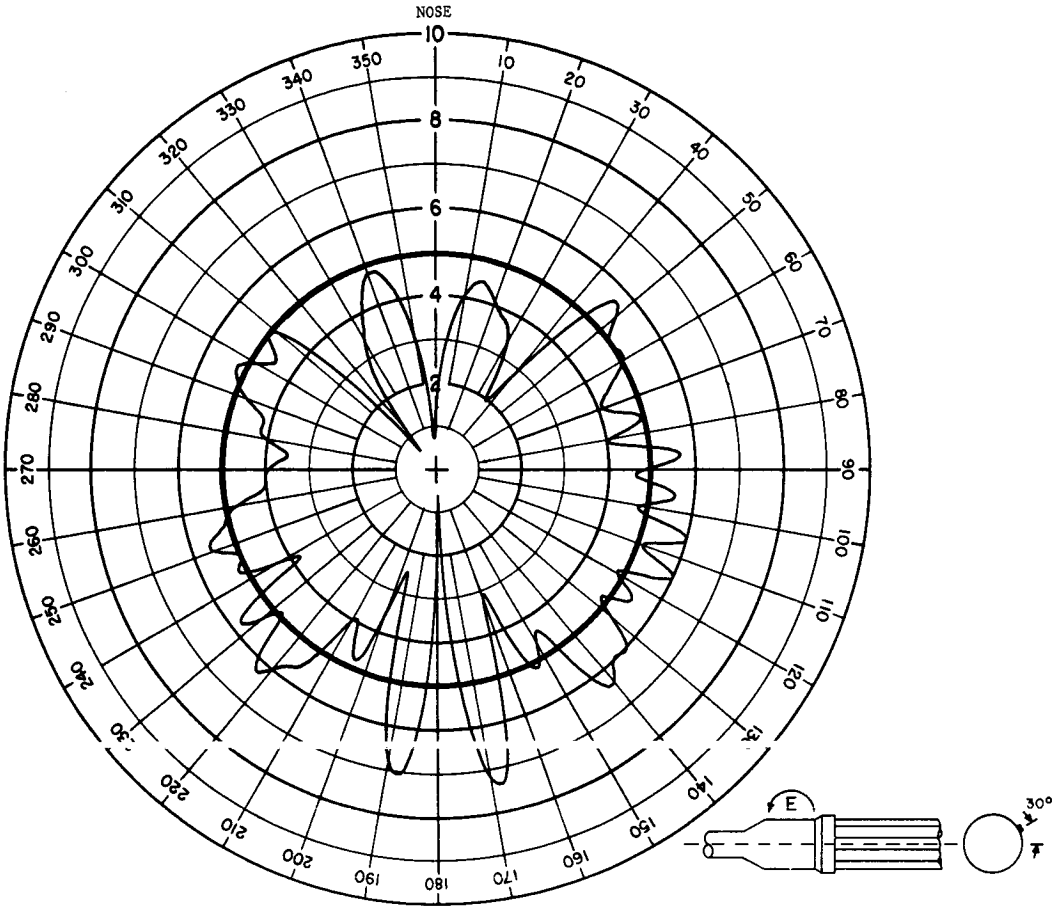


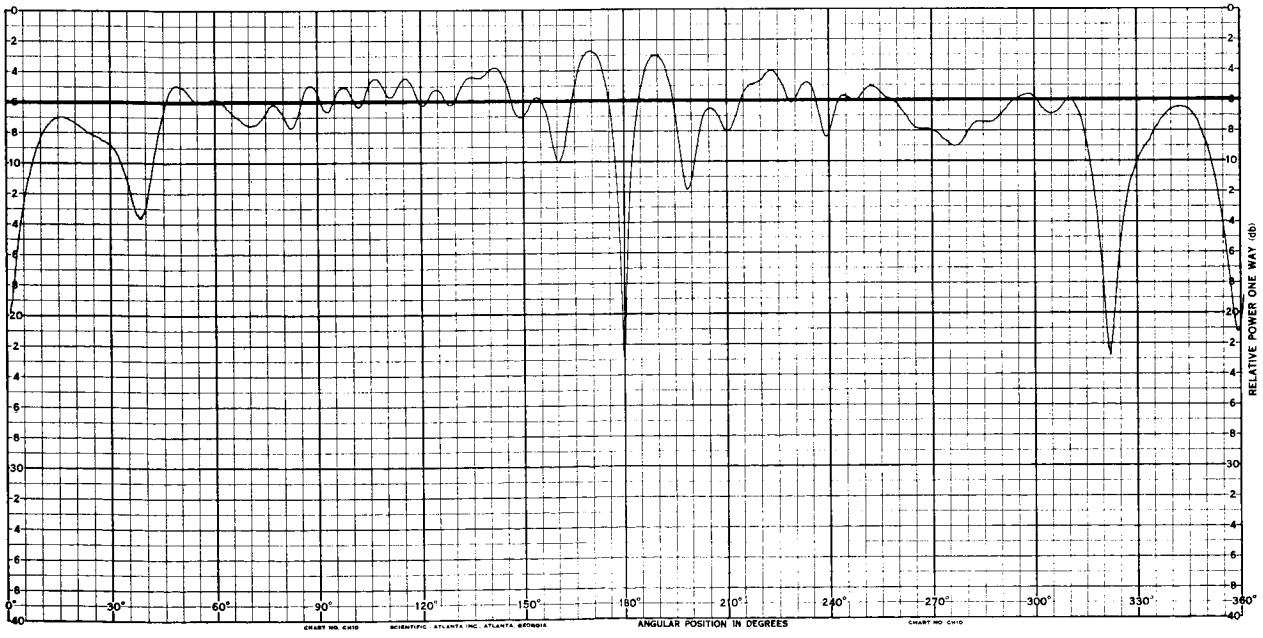
ANTENNA RADIATION PATTERN NO. 200-60

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





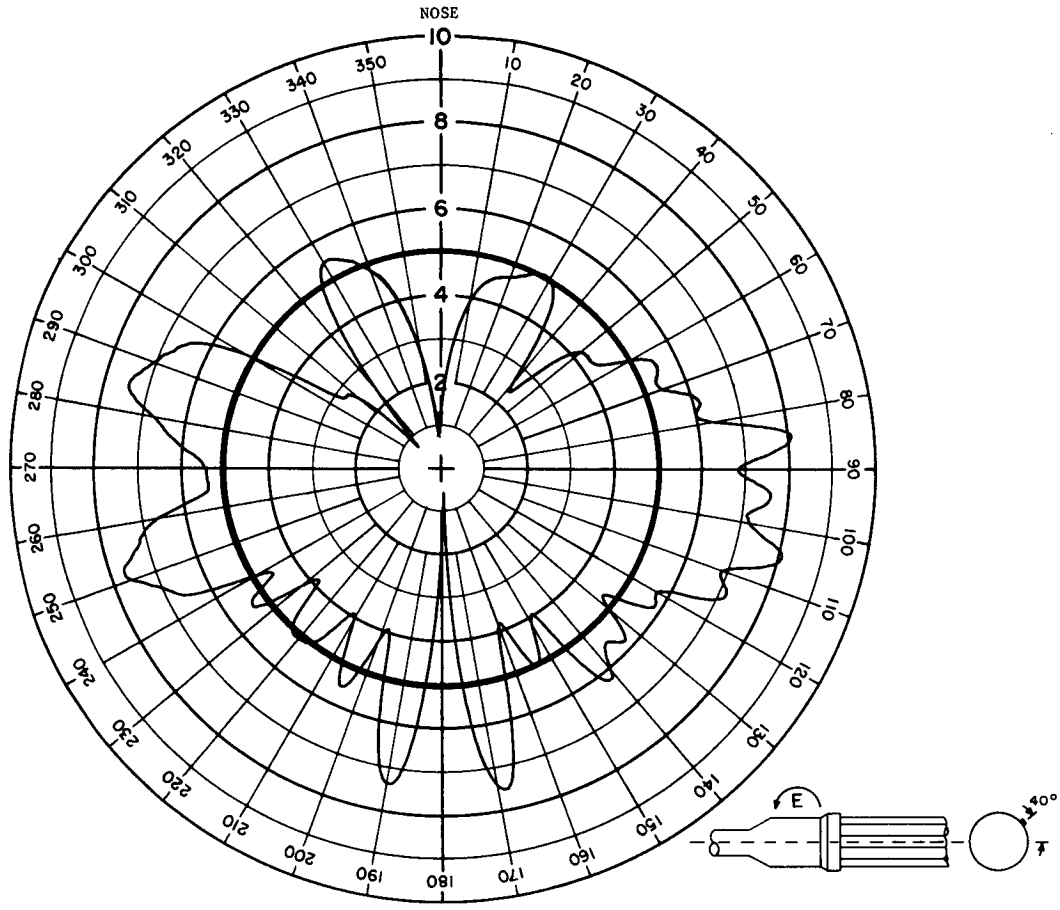
ANTENNA RADIATION PATTERN NO. 200-61

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



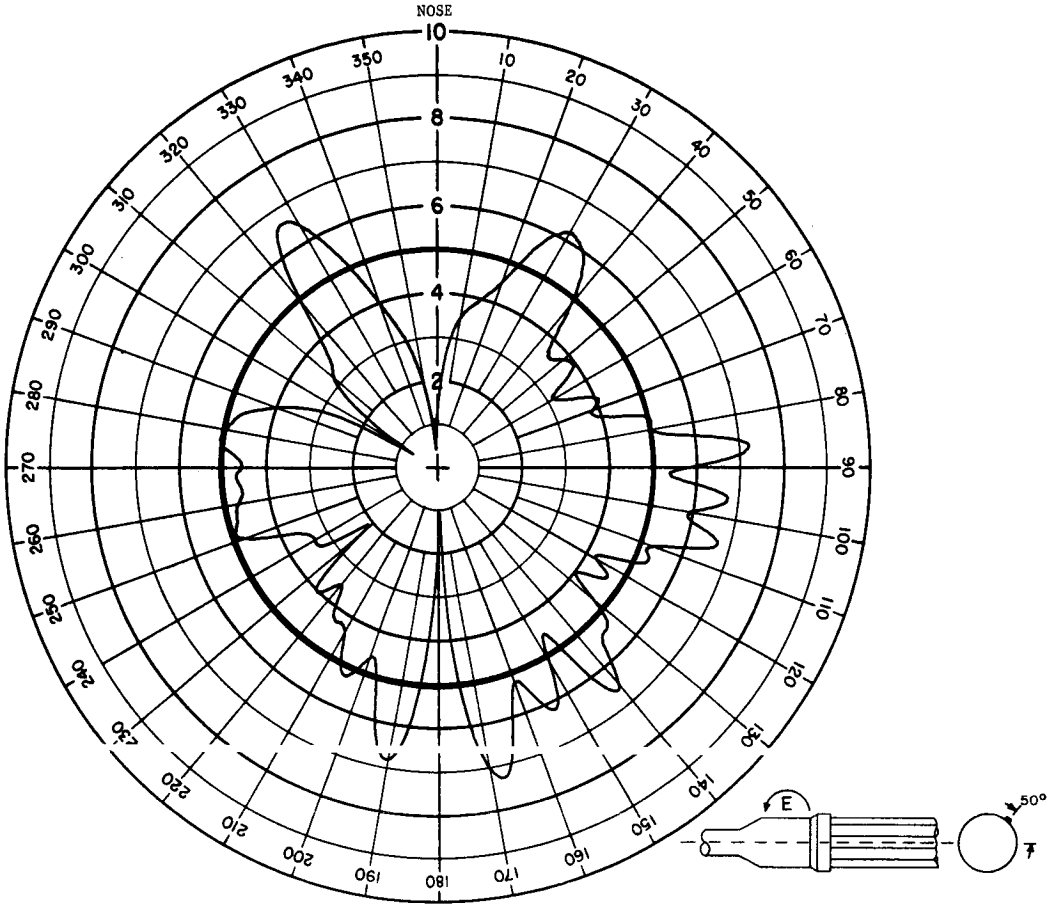
ANTENNA RADIATION PATTERN NO. 200-62

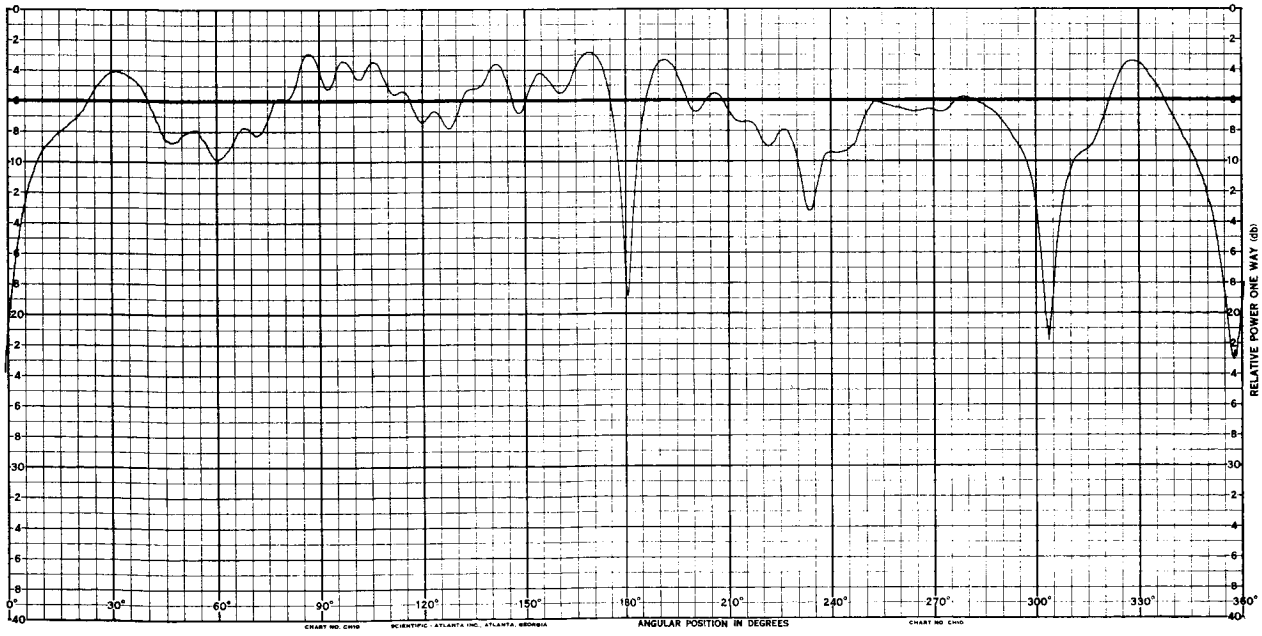
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



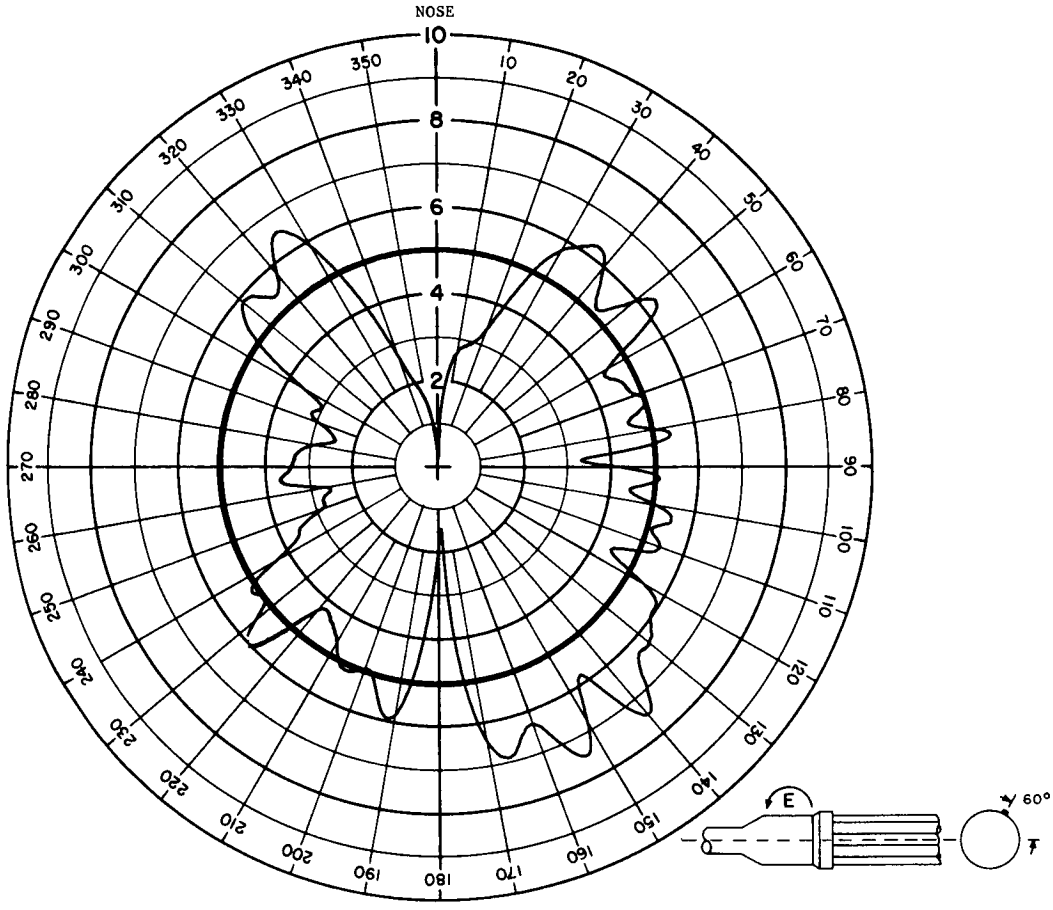


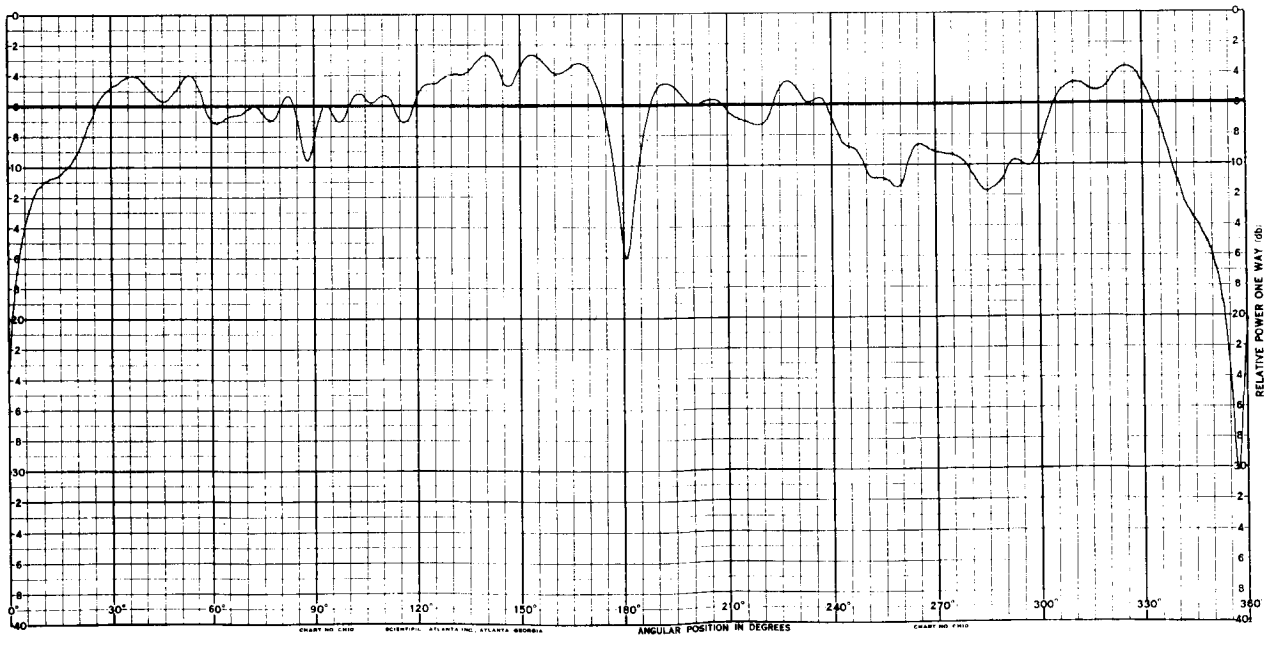
ANTENNA RADIATION PATTERN NO. 200-63

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



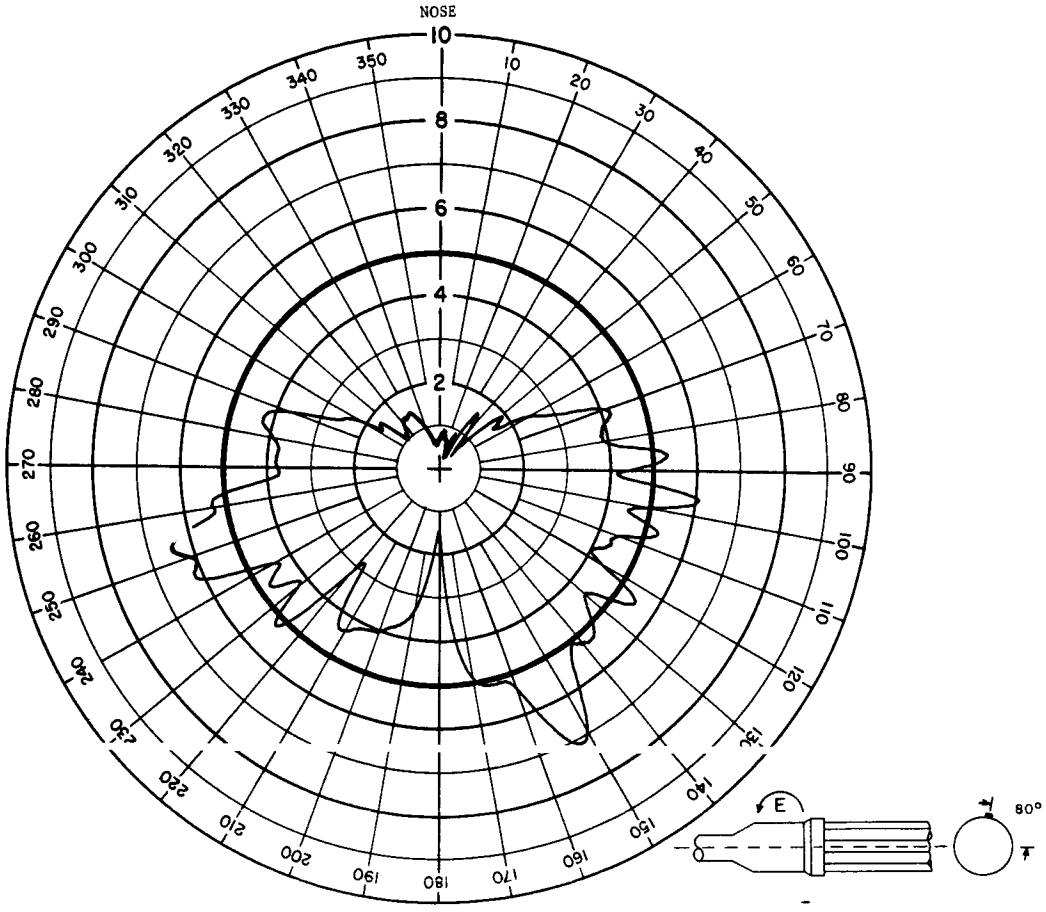


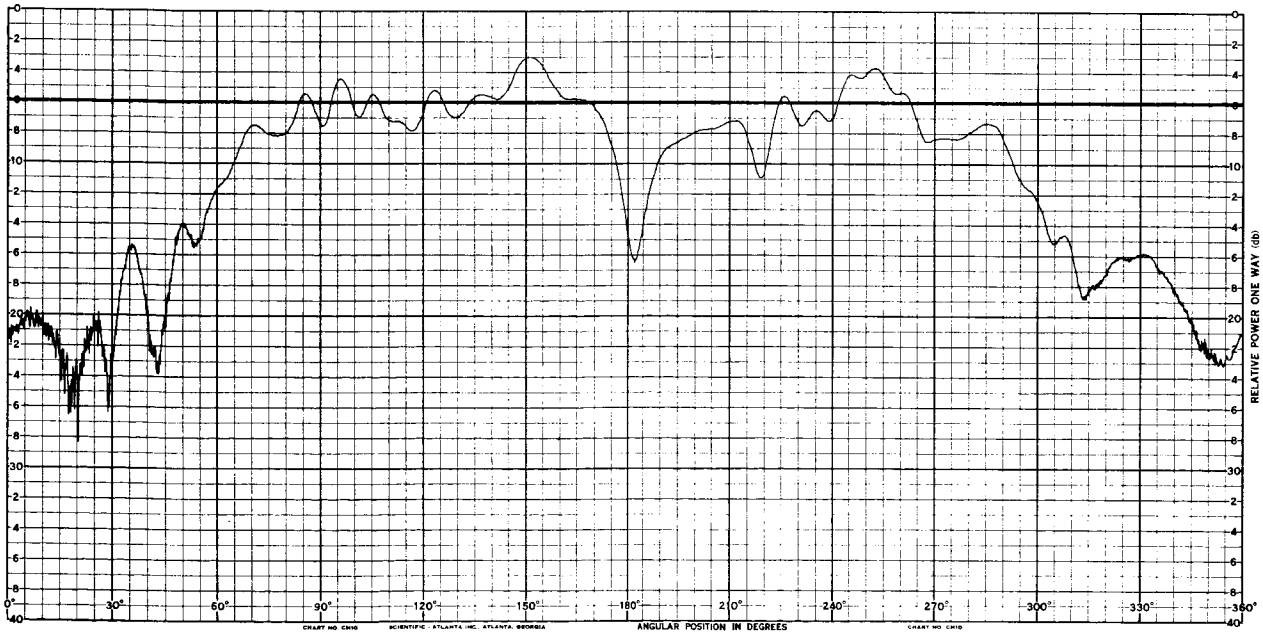
ANTENNA RADIATION PATTERN NO. 200-64

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





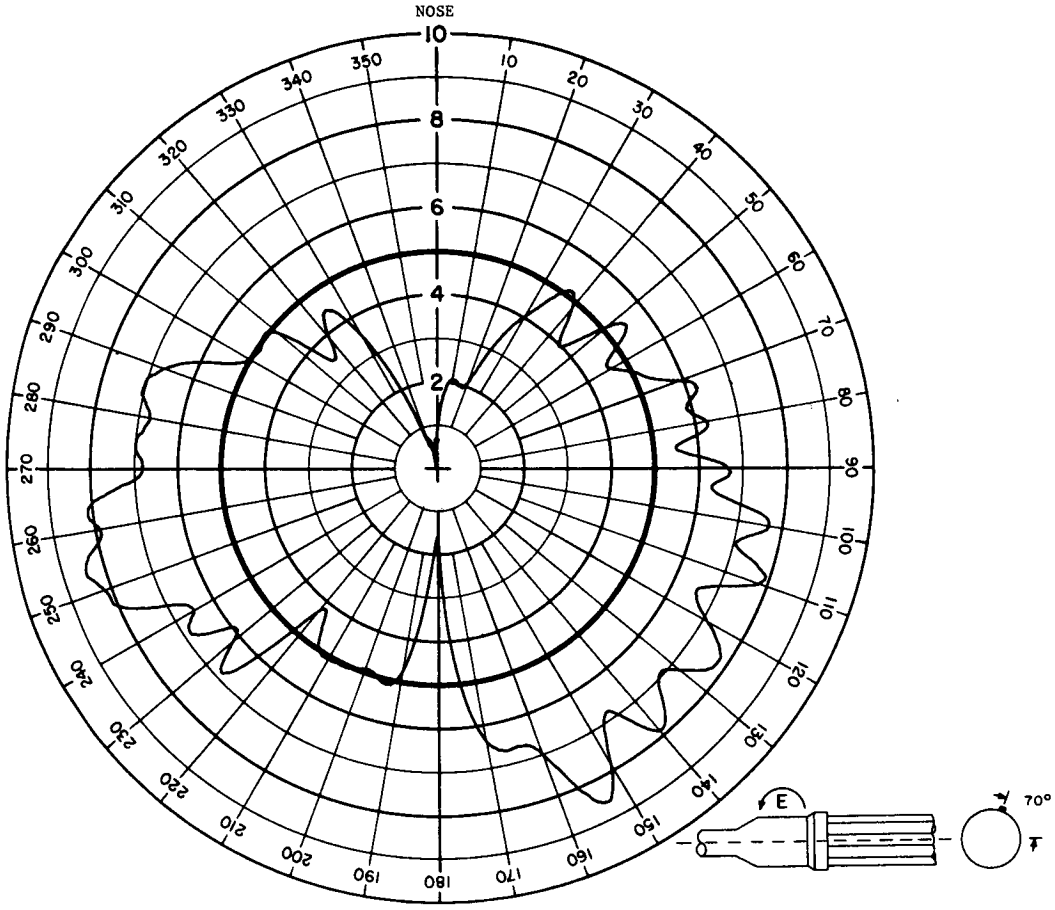
ANTENNA RADIATION PATTERN NO. 200-66

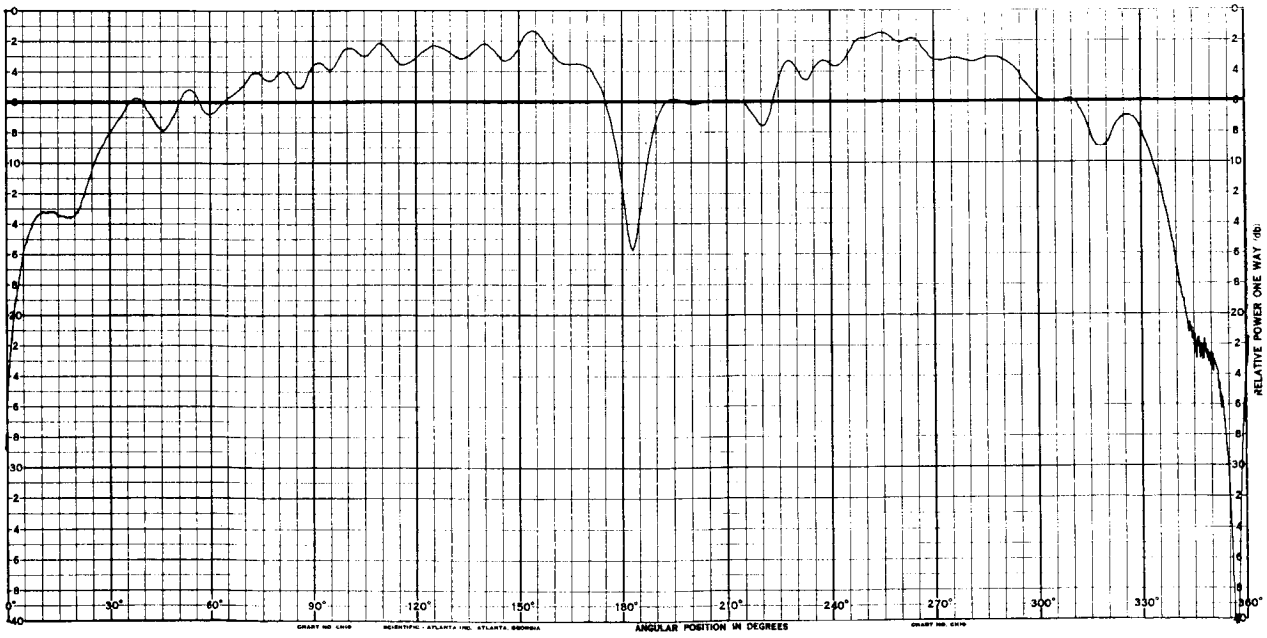
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





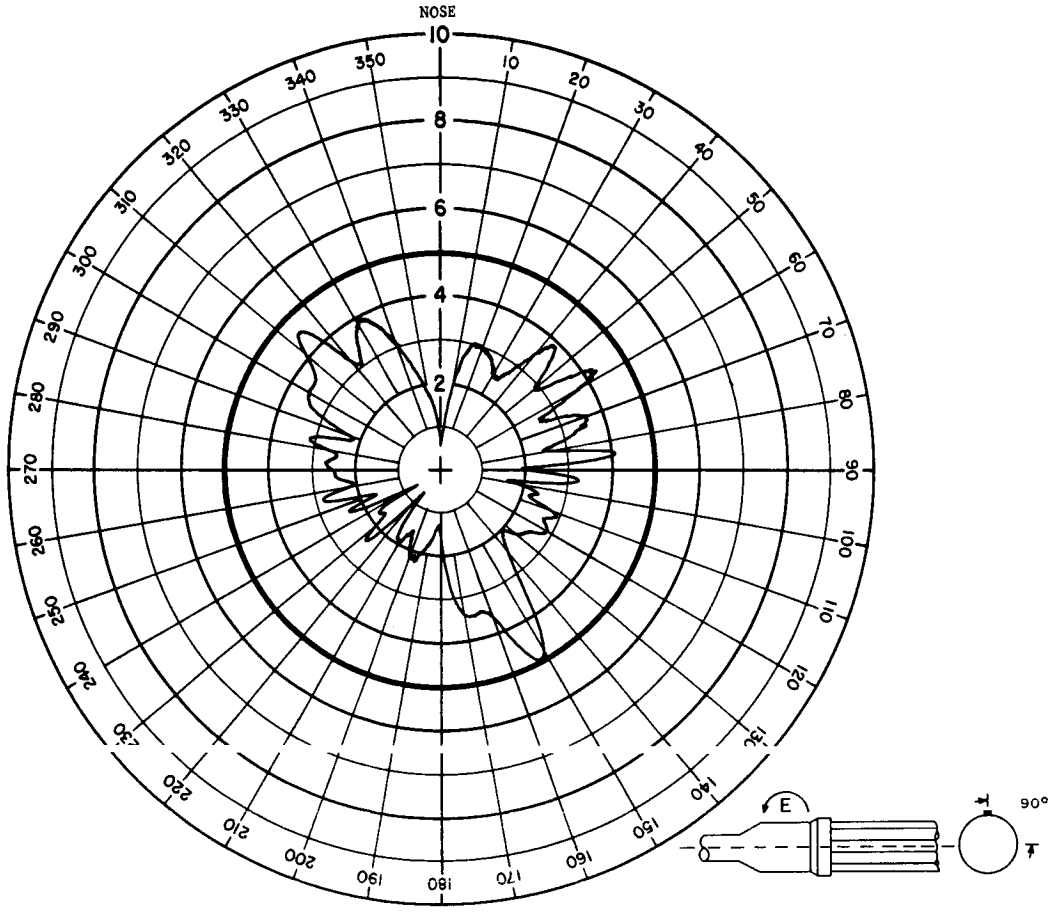
ANTENNA RADIATION PATTERN NO. 200-65

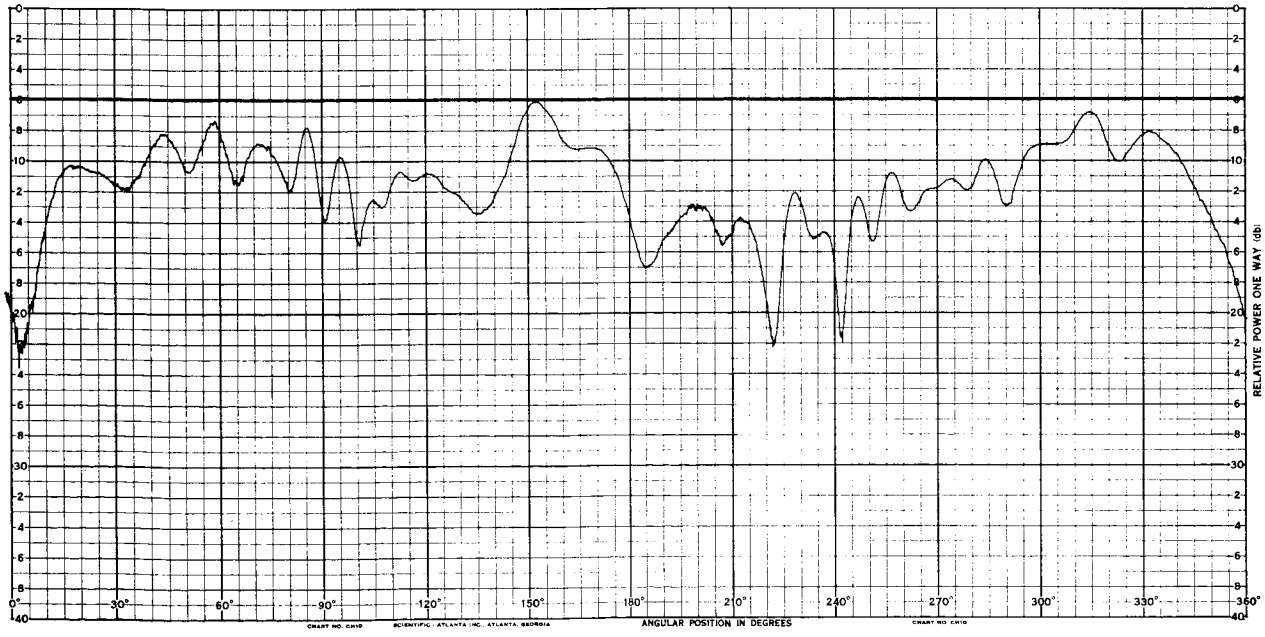
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



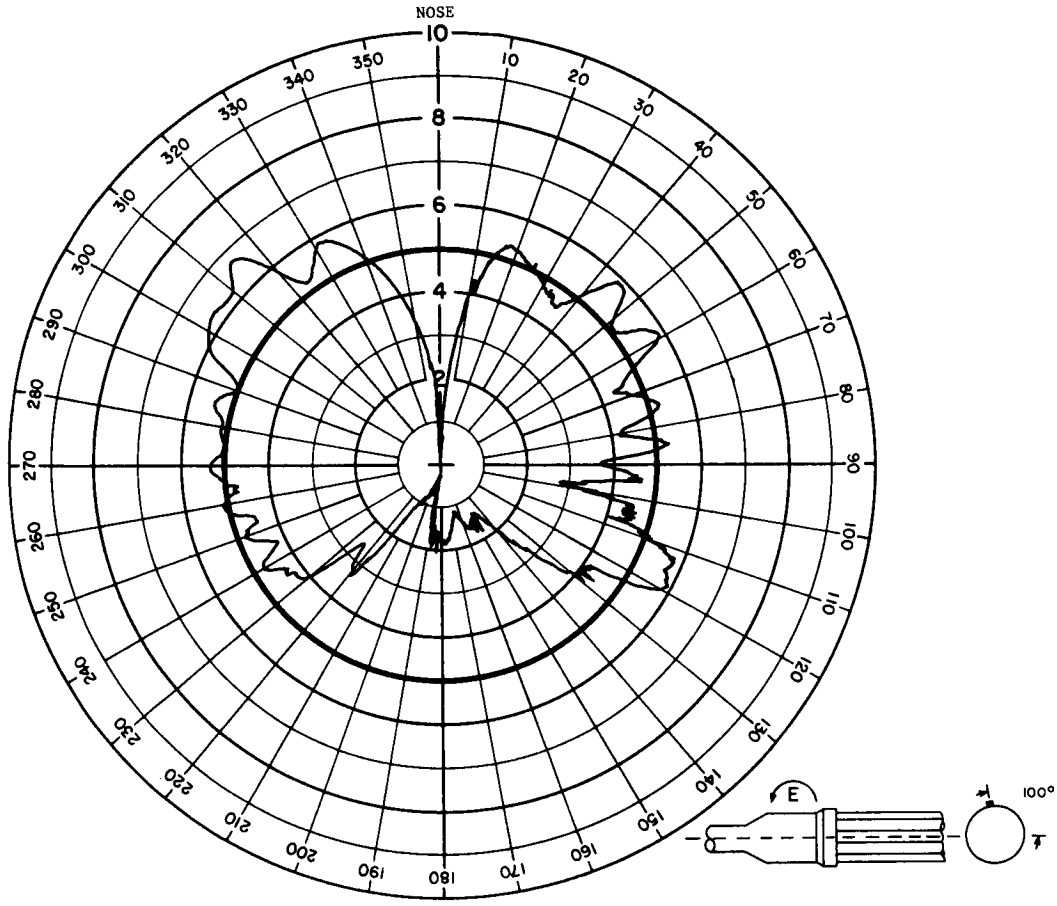


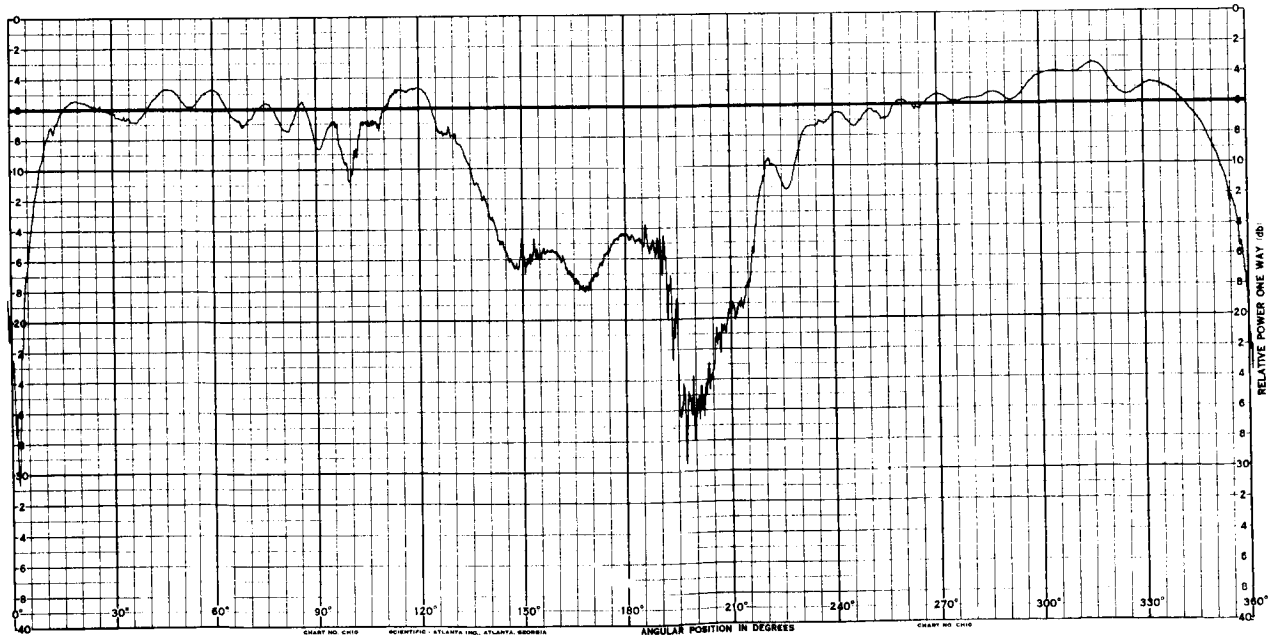
ANTENNA RADIATION PATTERN NO. 200-67

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



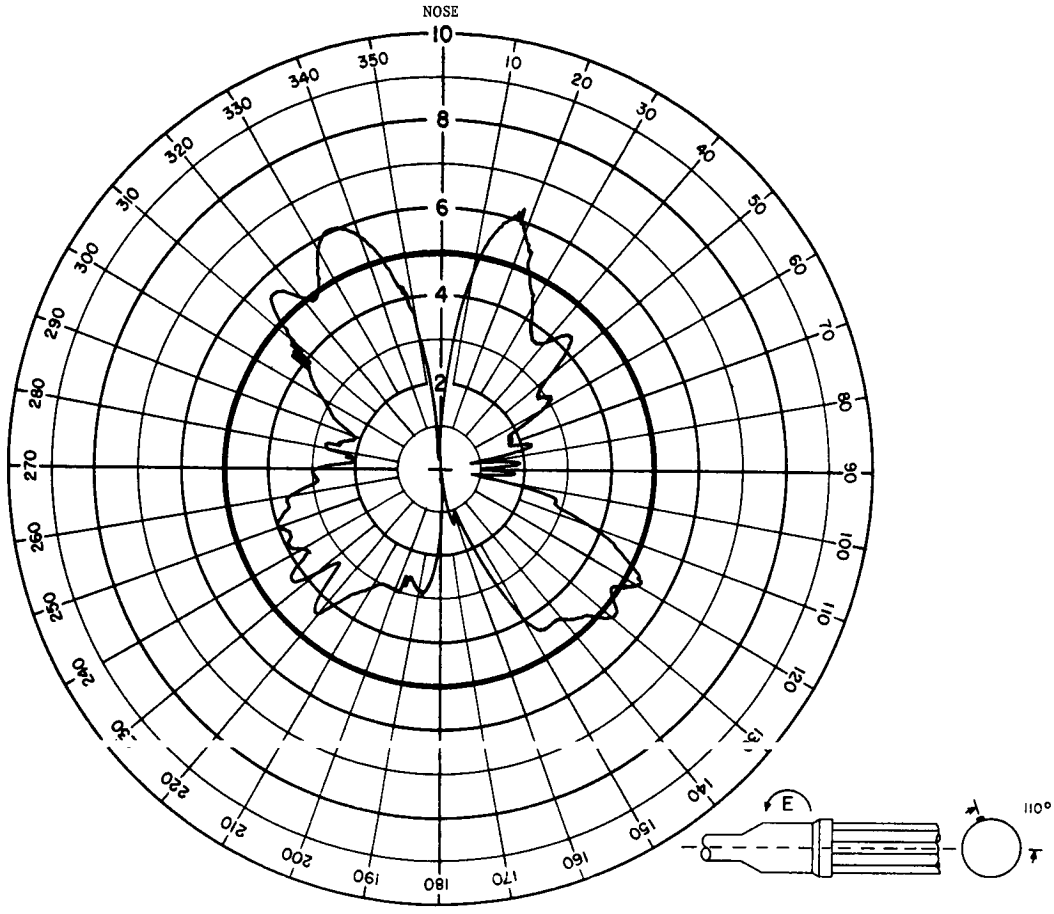


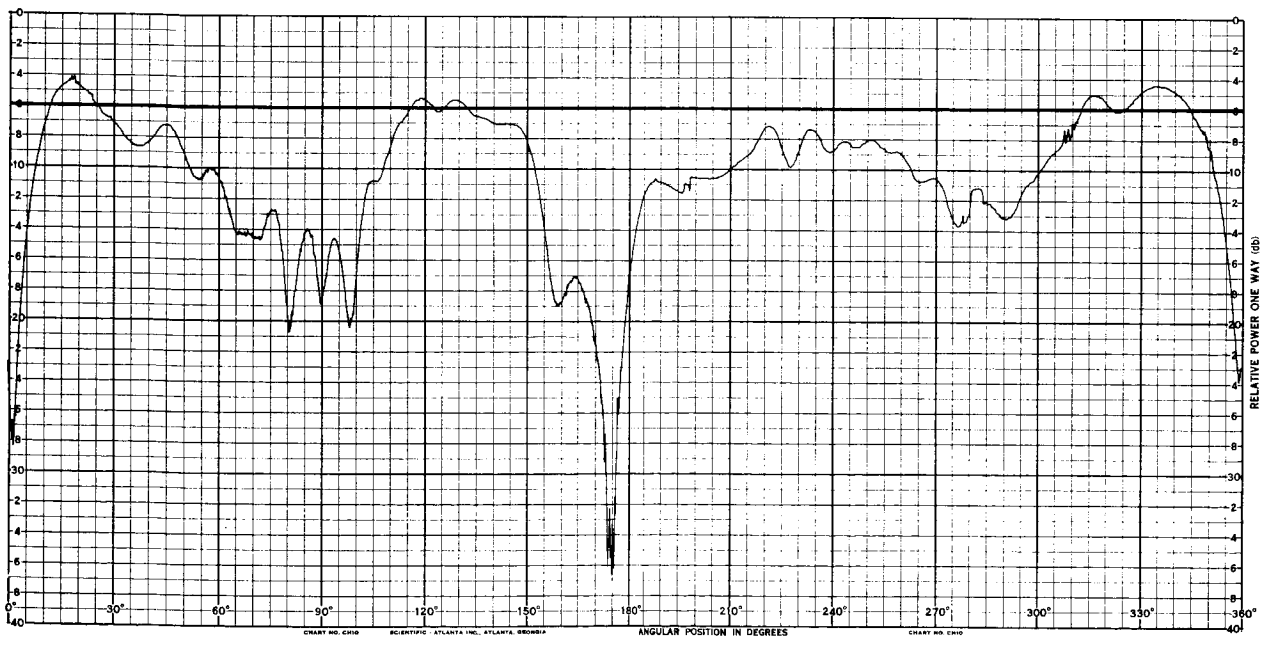
ANTENNA RADIATION PATTERN NO. 200-68

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



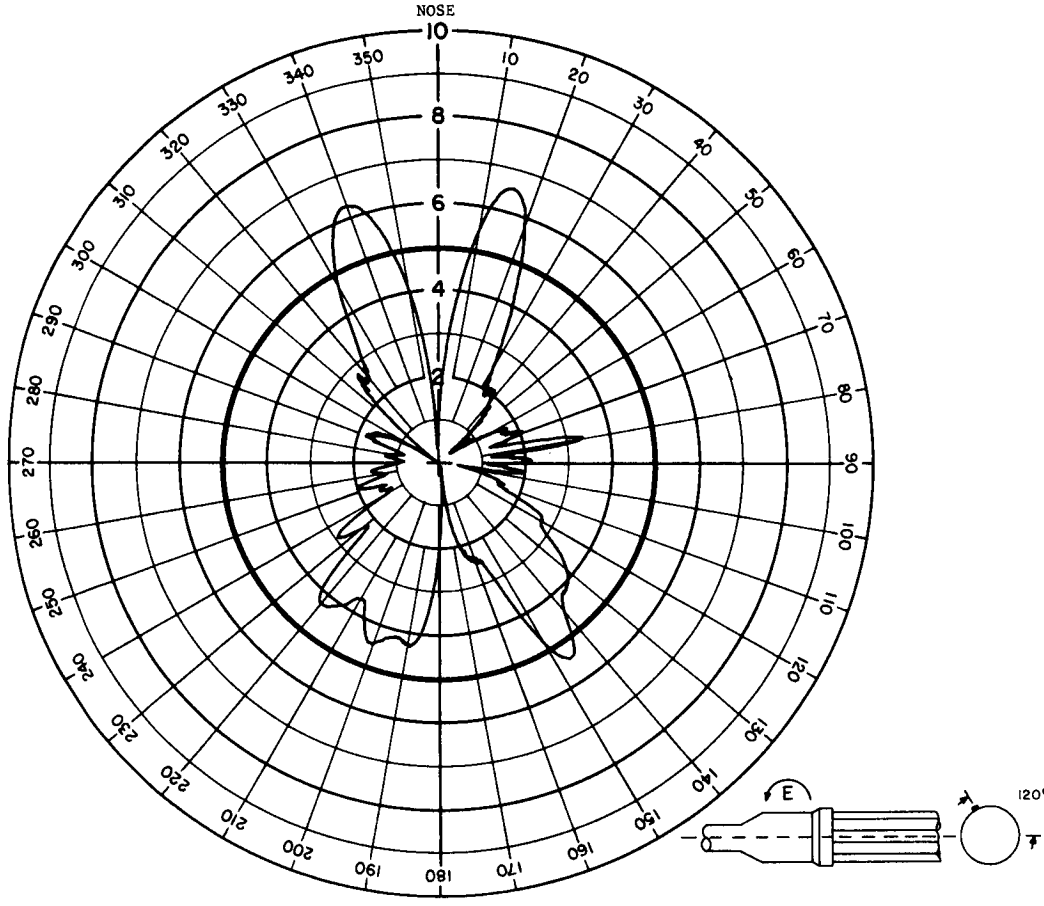


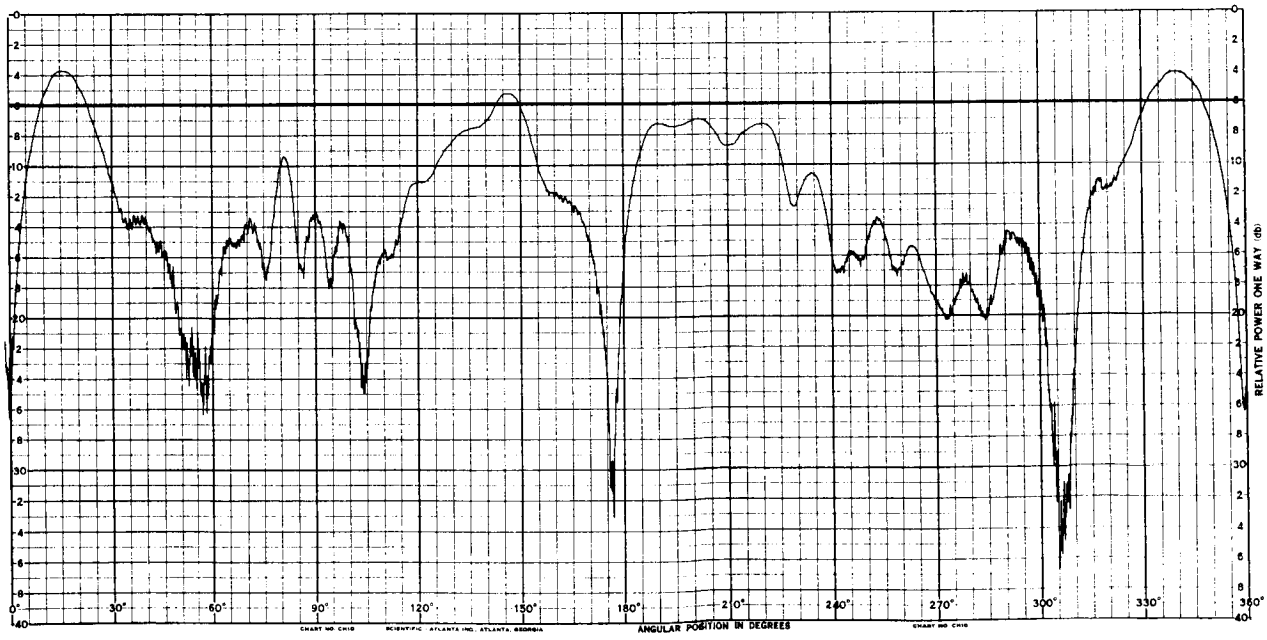
ANTENNA RADIATION PATTERN NO. 200-69

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



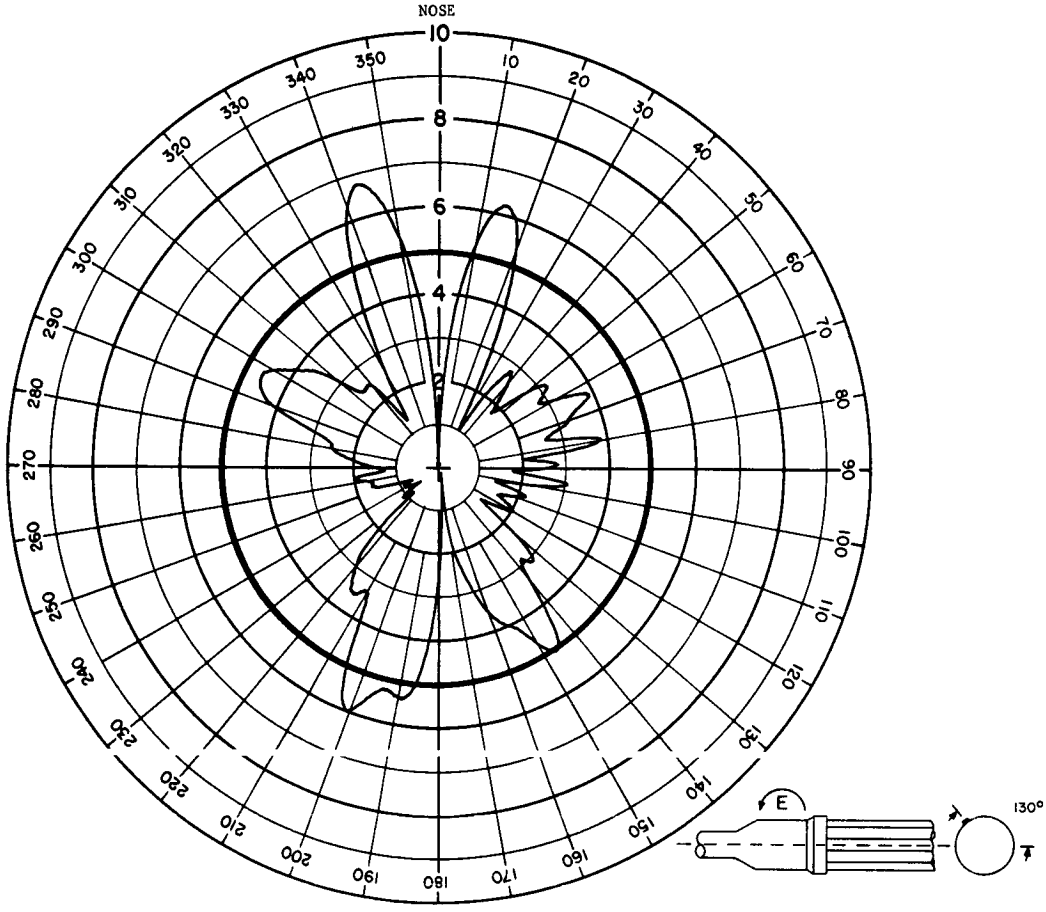


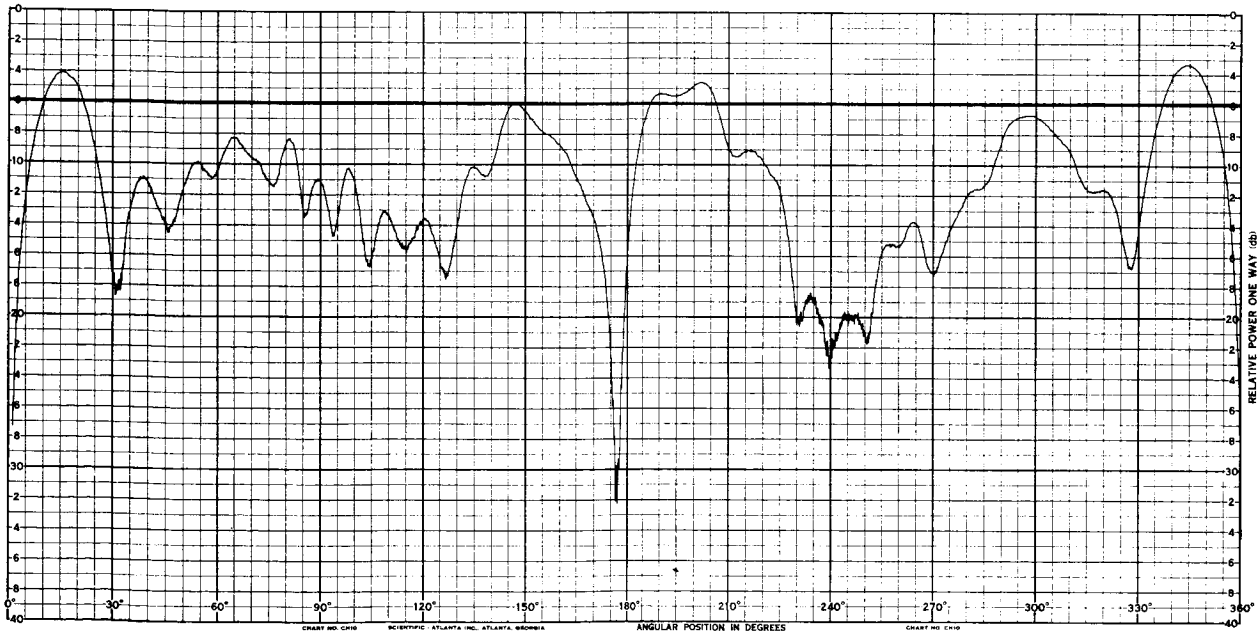
ANTENNA RADIATION PATTERN NO. 200-70

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



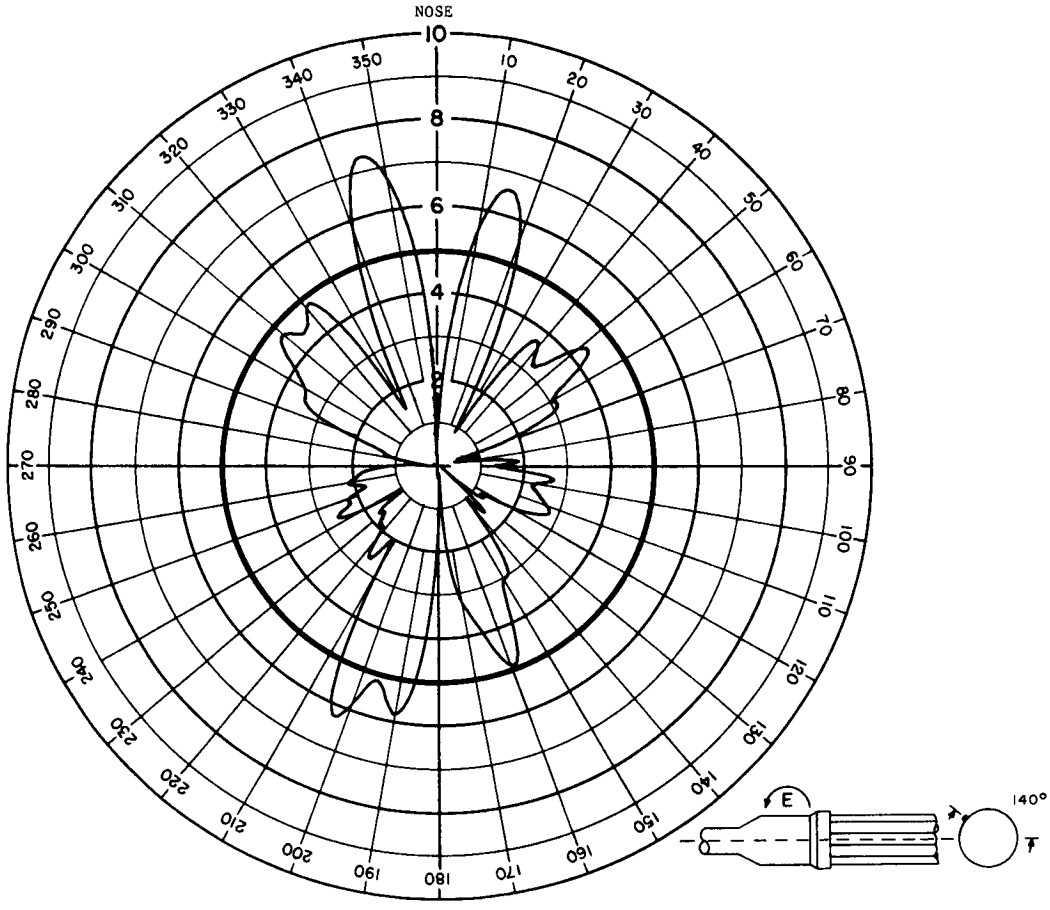


ANTENNA RADIATION PATTERN NO. 200-71

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK

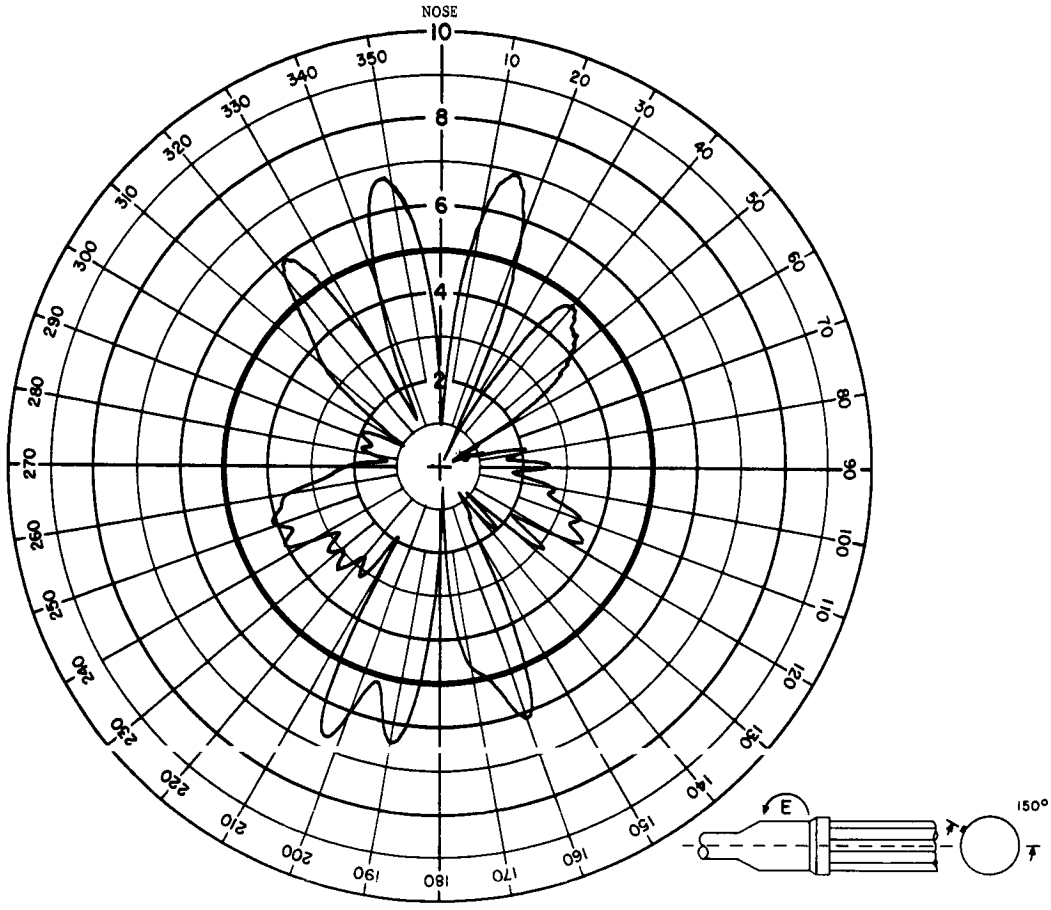


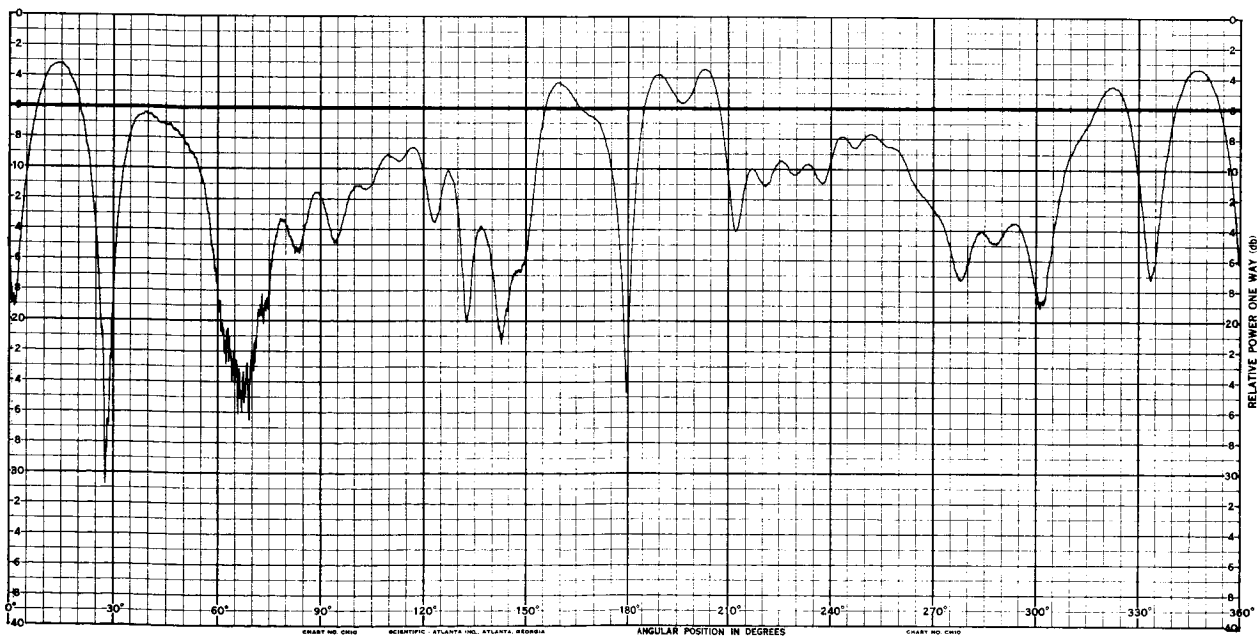
ANTENNA RADIATION PATTERN NO. 200-72

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



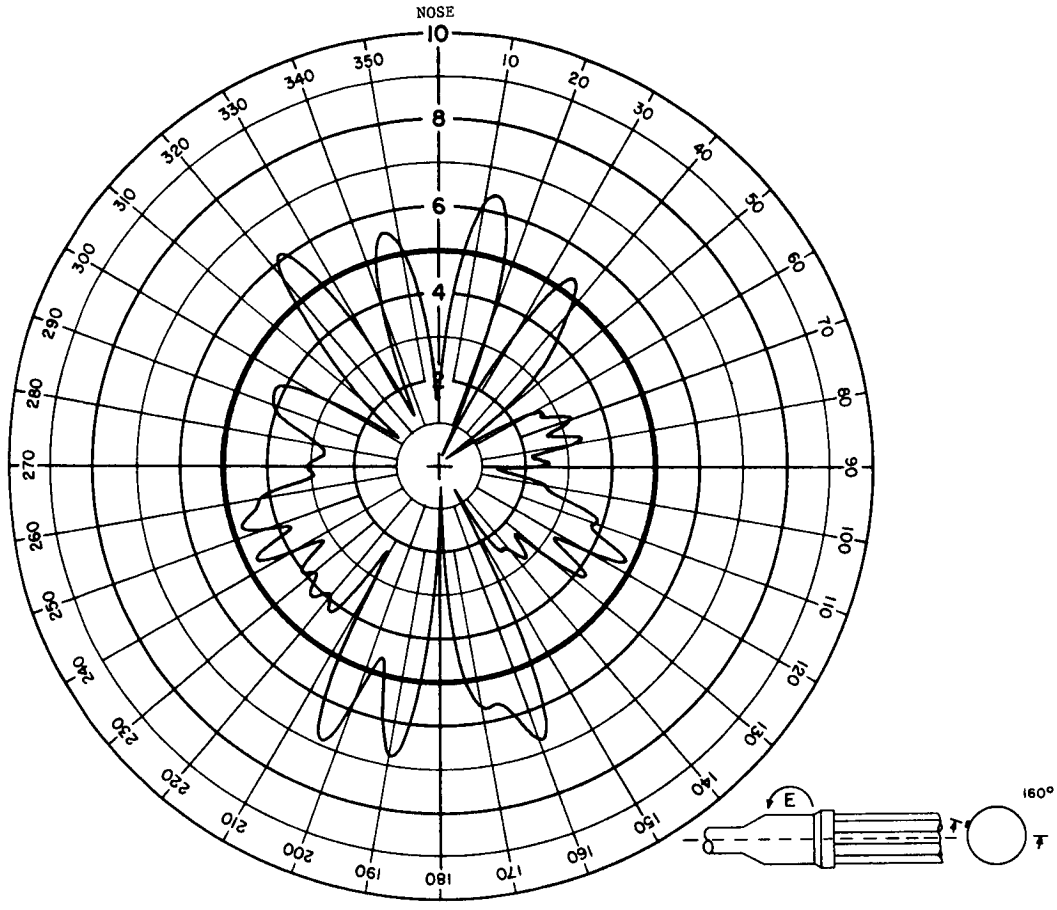


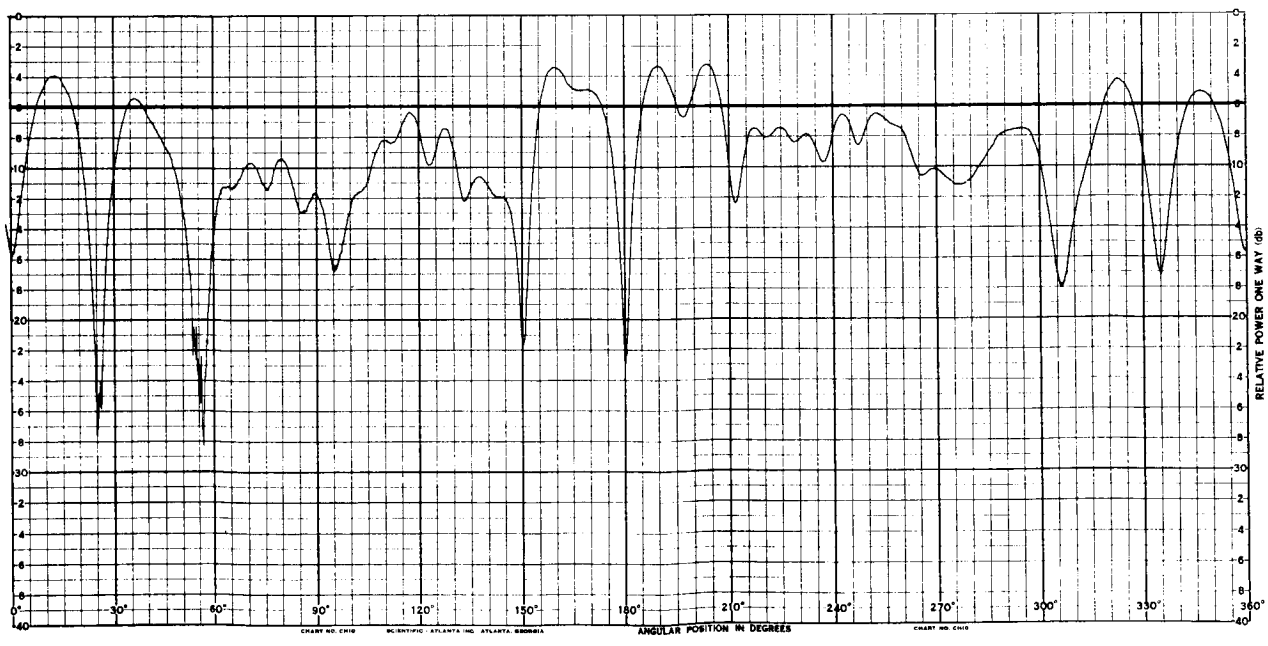
ANTENNA RADIATION PATTERN NO. 200-73

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK



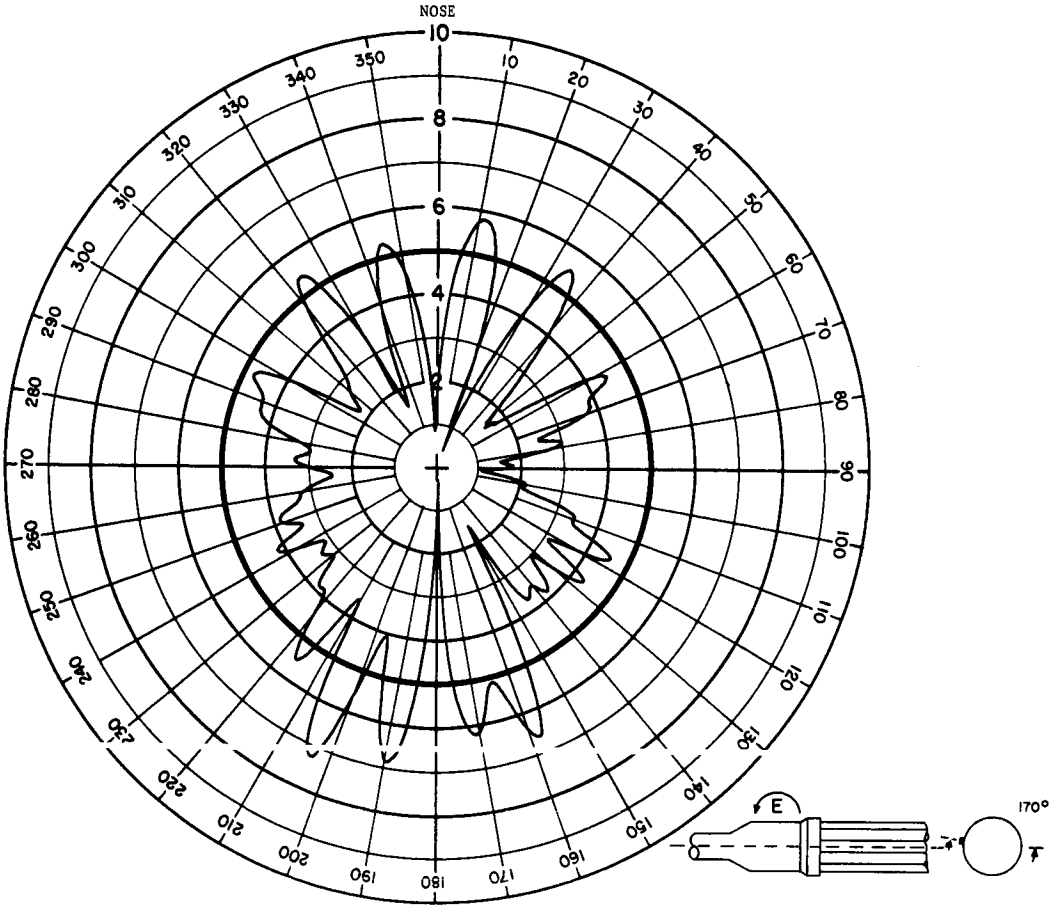


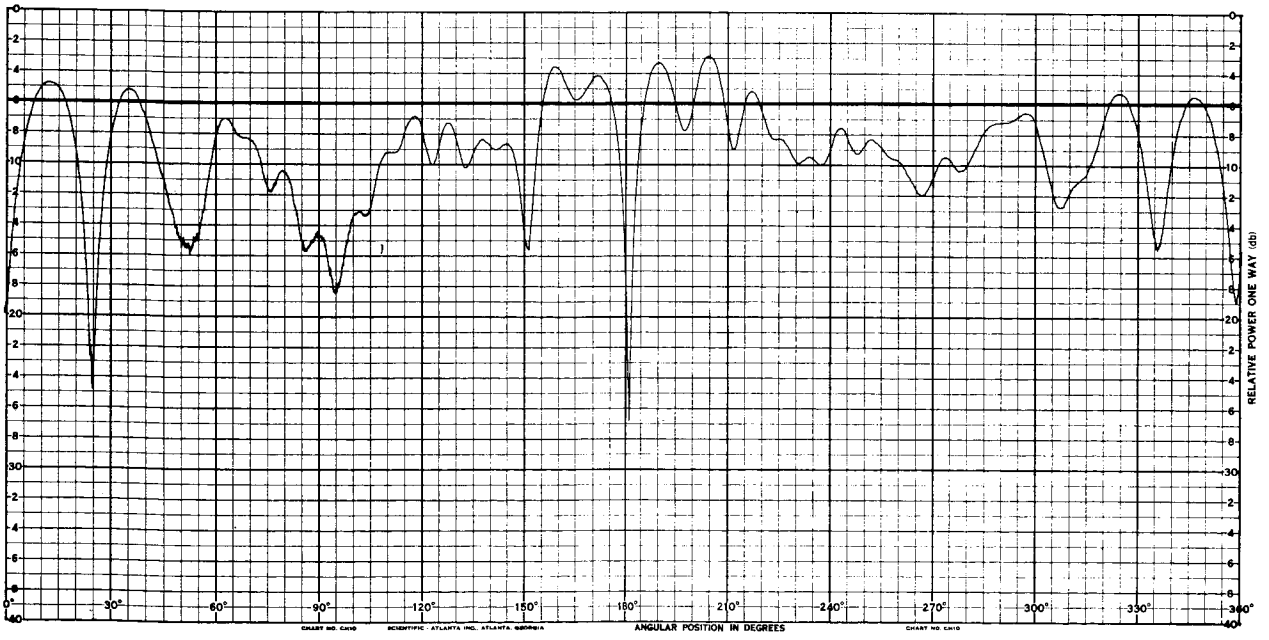
ANTENNA RADIATION PATTERN NO. 200-74

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





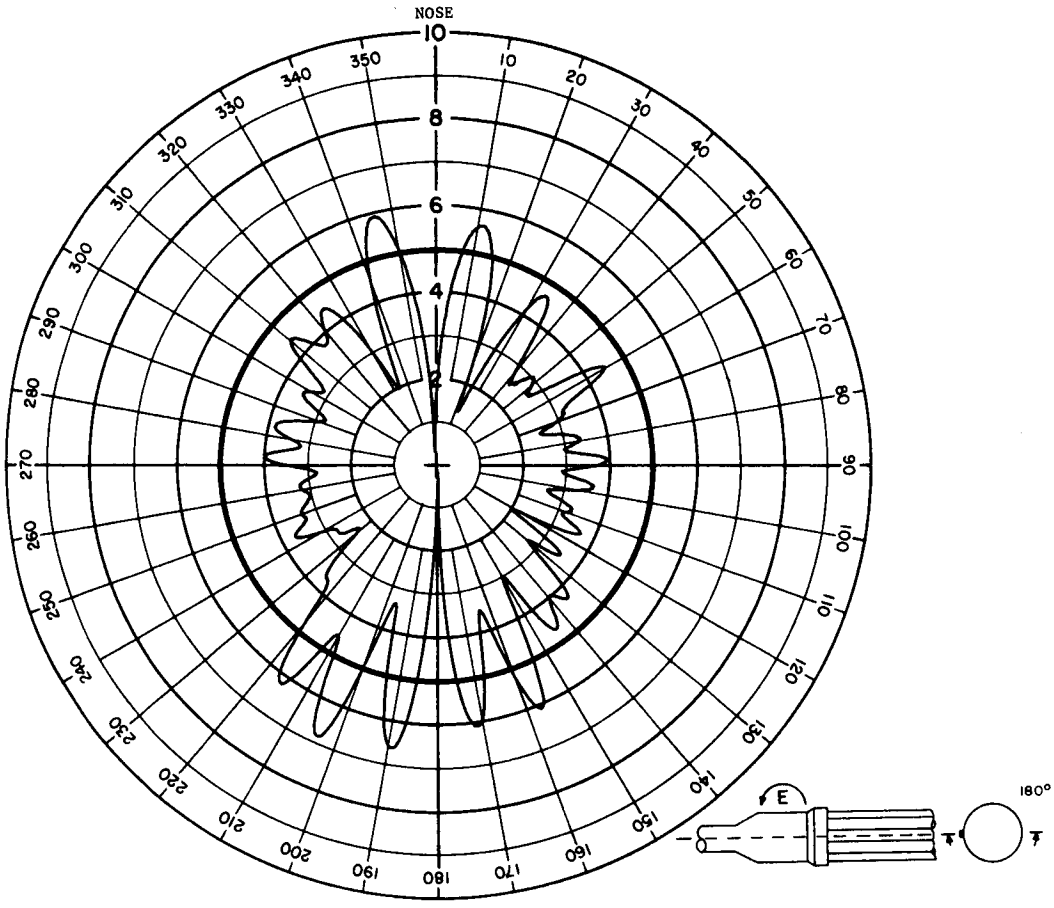
ANTENNA RADIATION PATTERN NO. 200-75

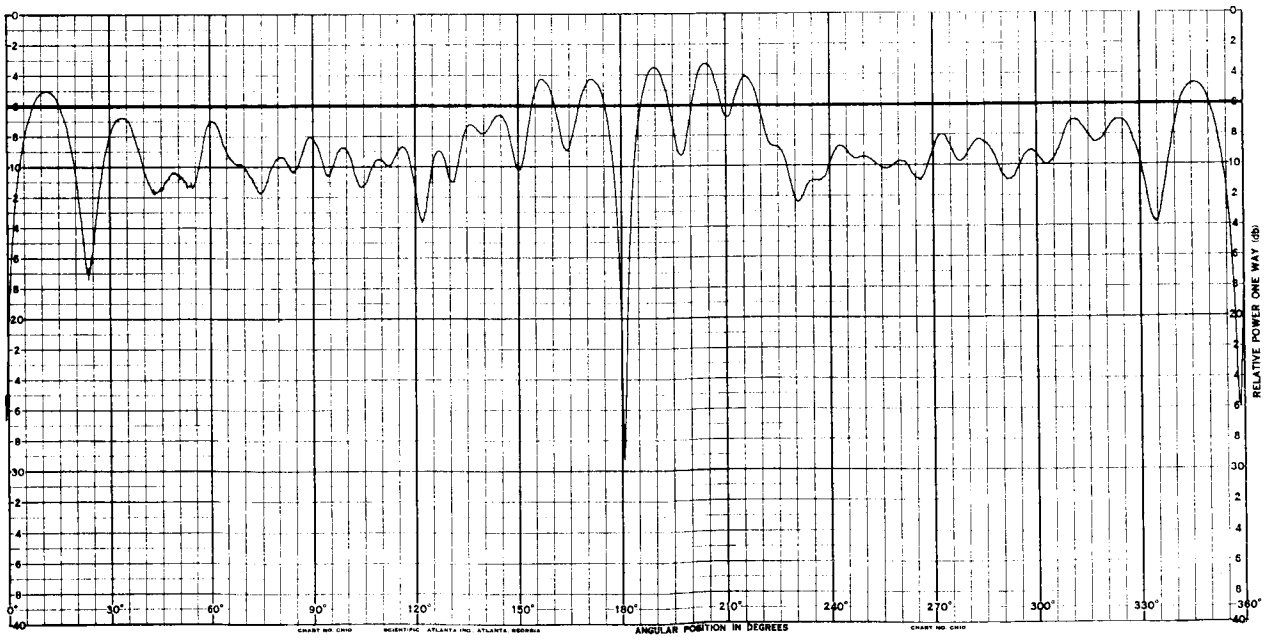
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

MINITRACK





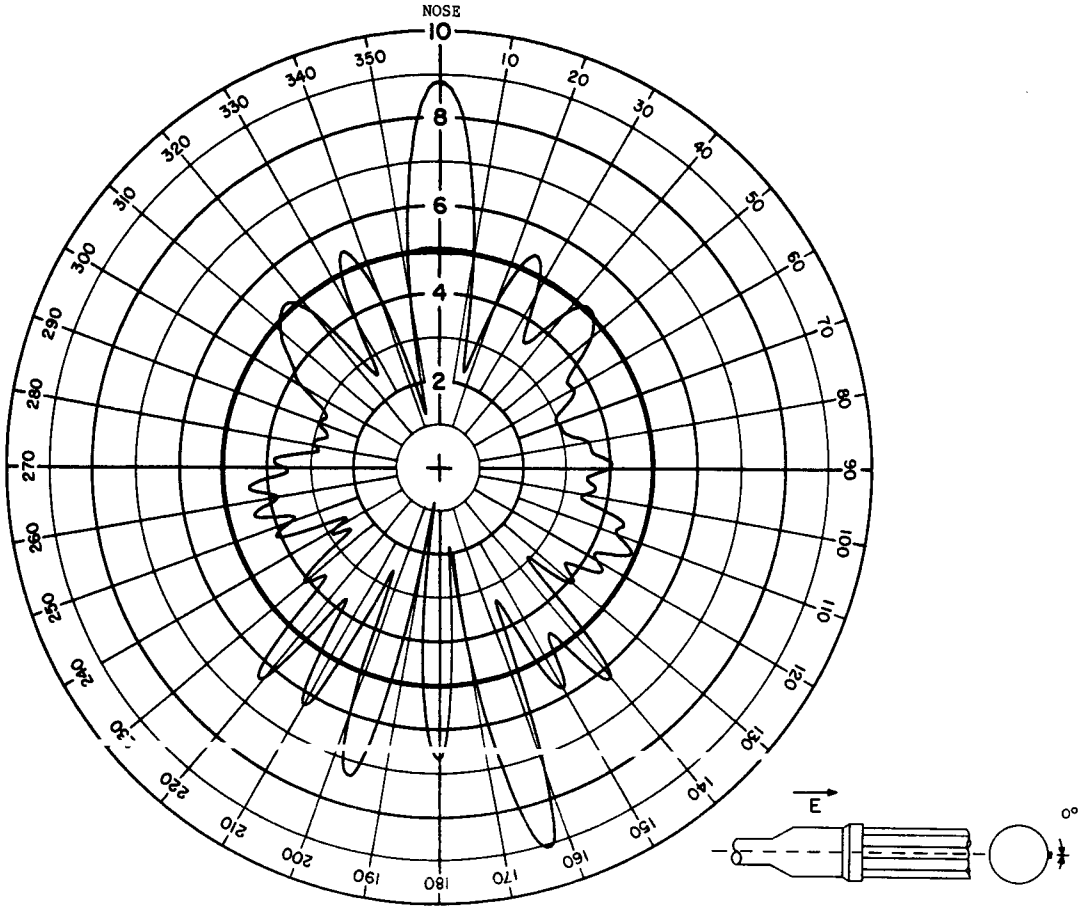
ANTENNA RADIATION PATTERN NO. 200-76

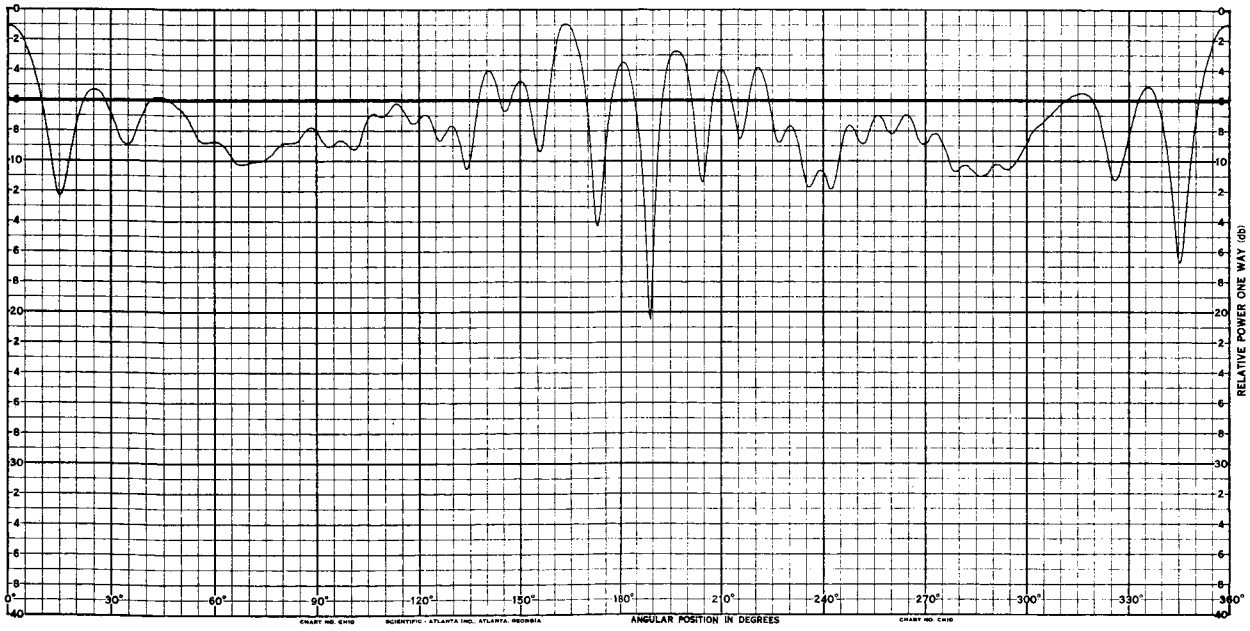
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





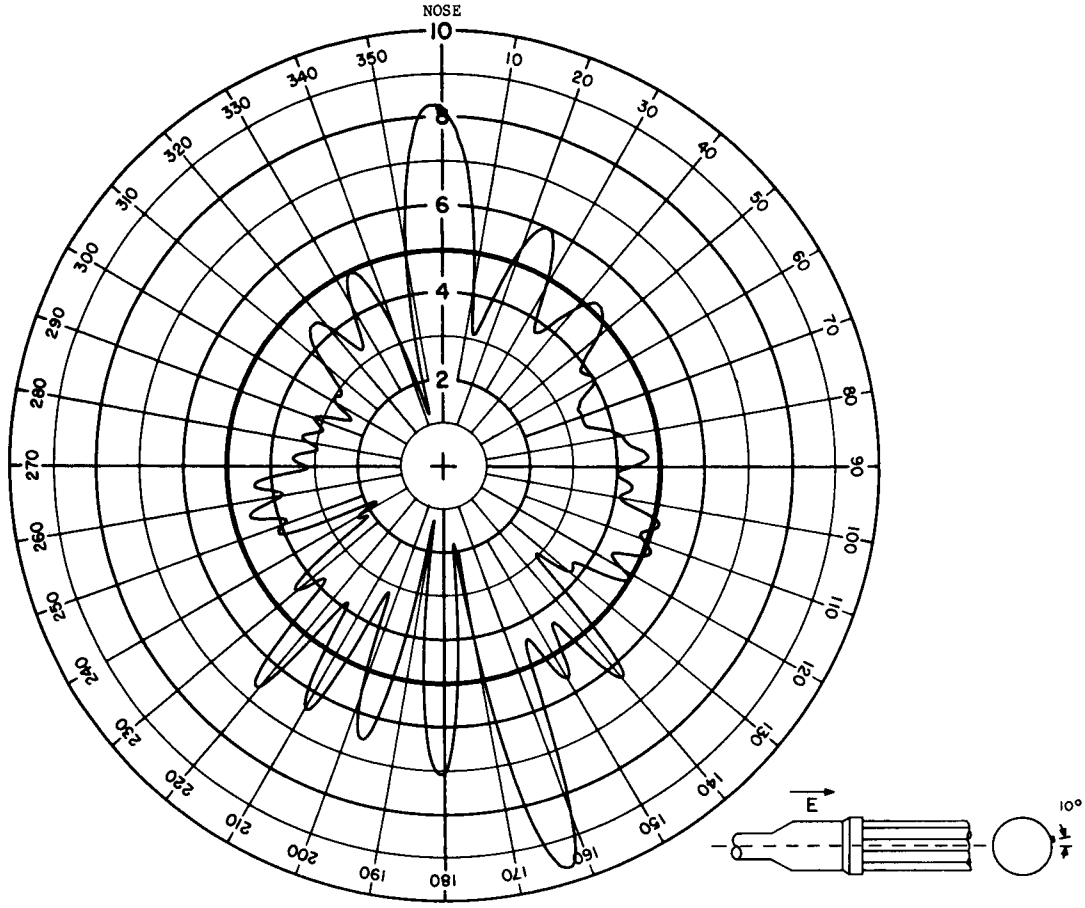
ANTENNA RADIATION PATTERN NO. 202-1

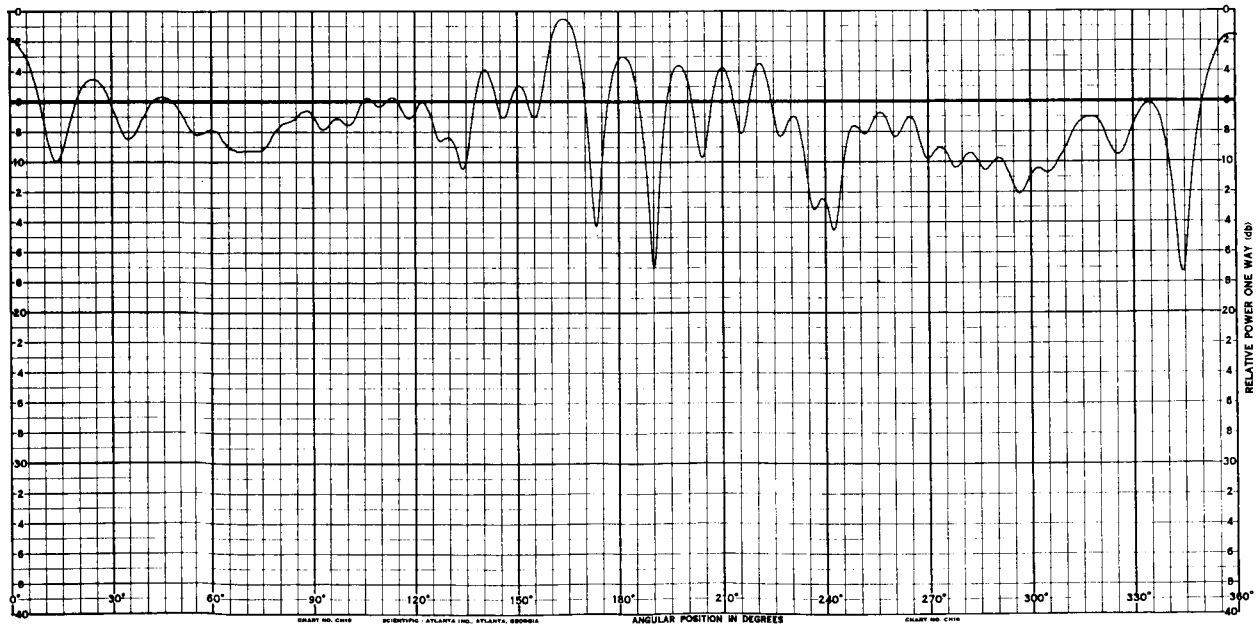
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





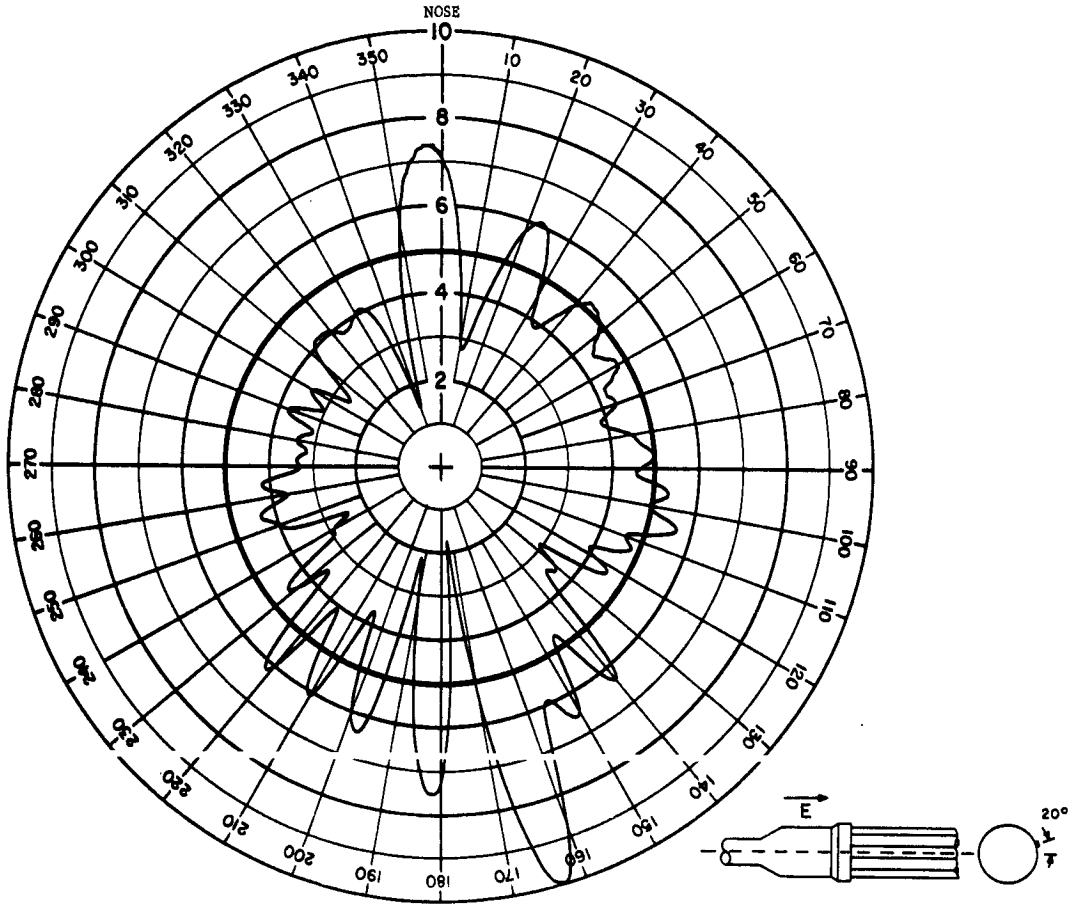
ANTENNA RADIATION PATTERN NO. 202-2

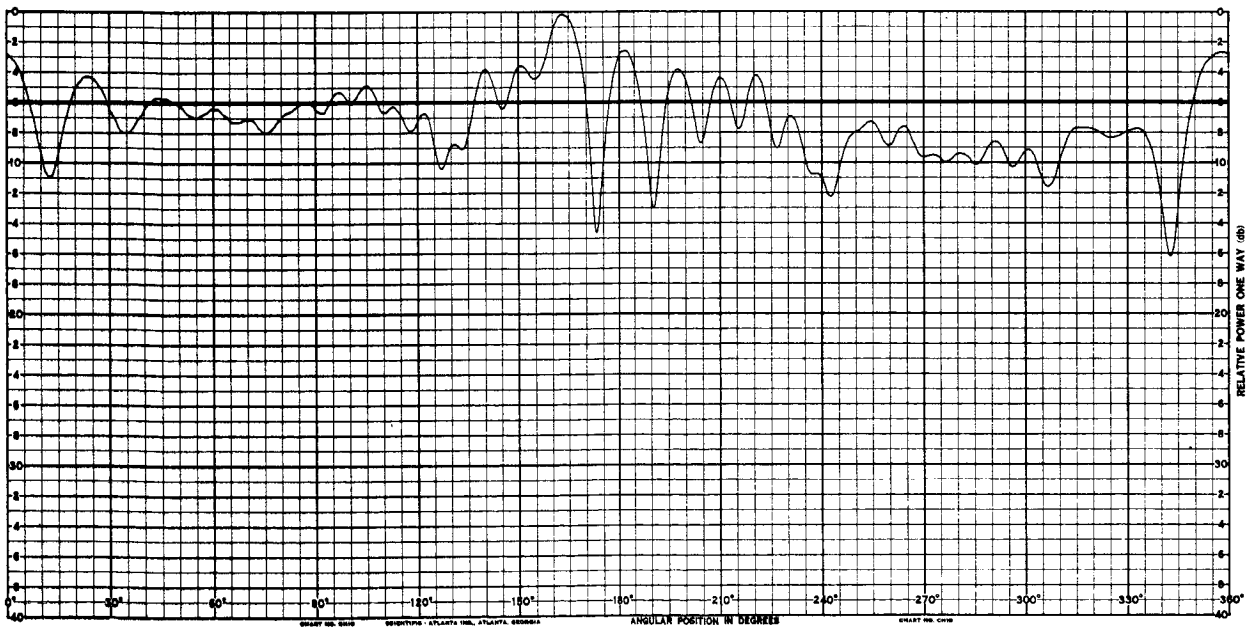
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





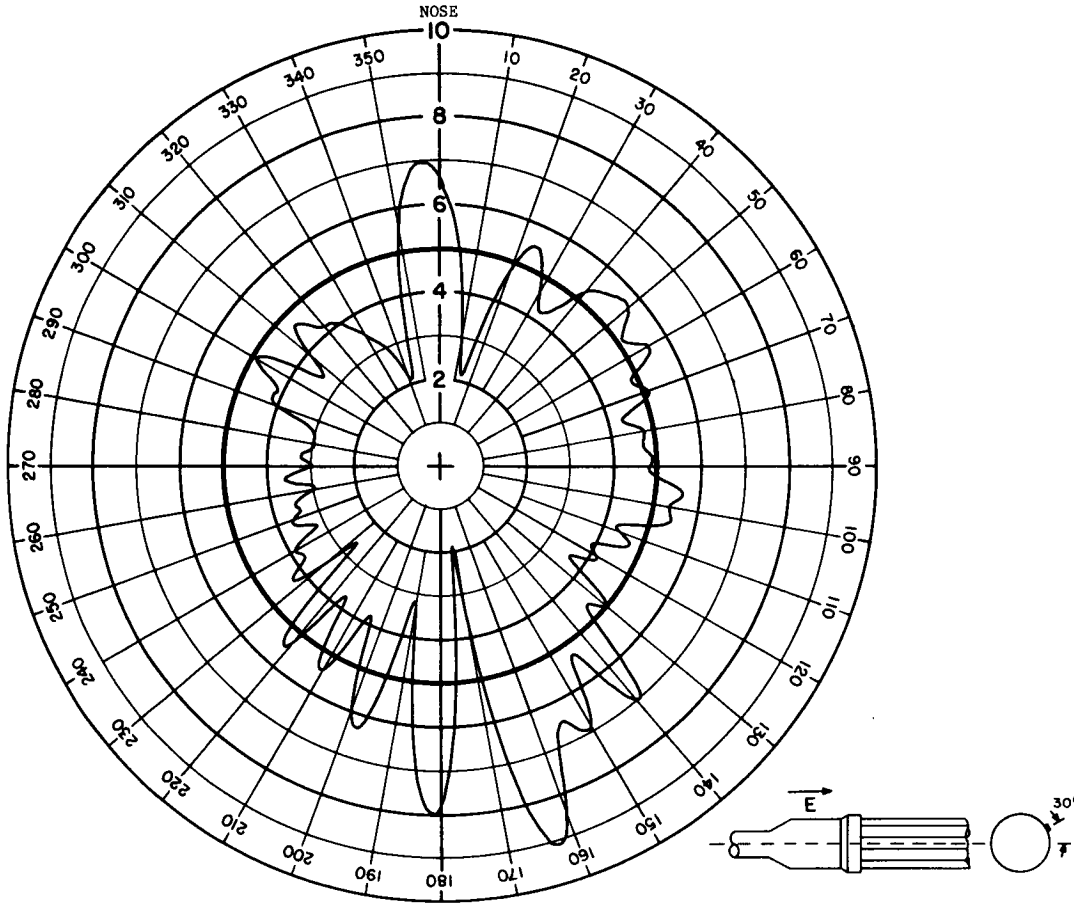
ANTENNA RADIATION PATTERN NO. 202-3

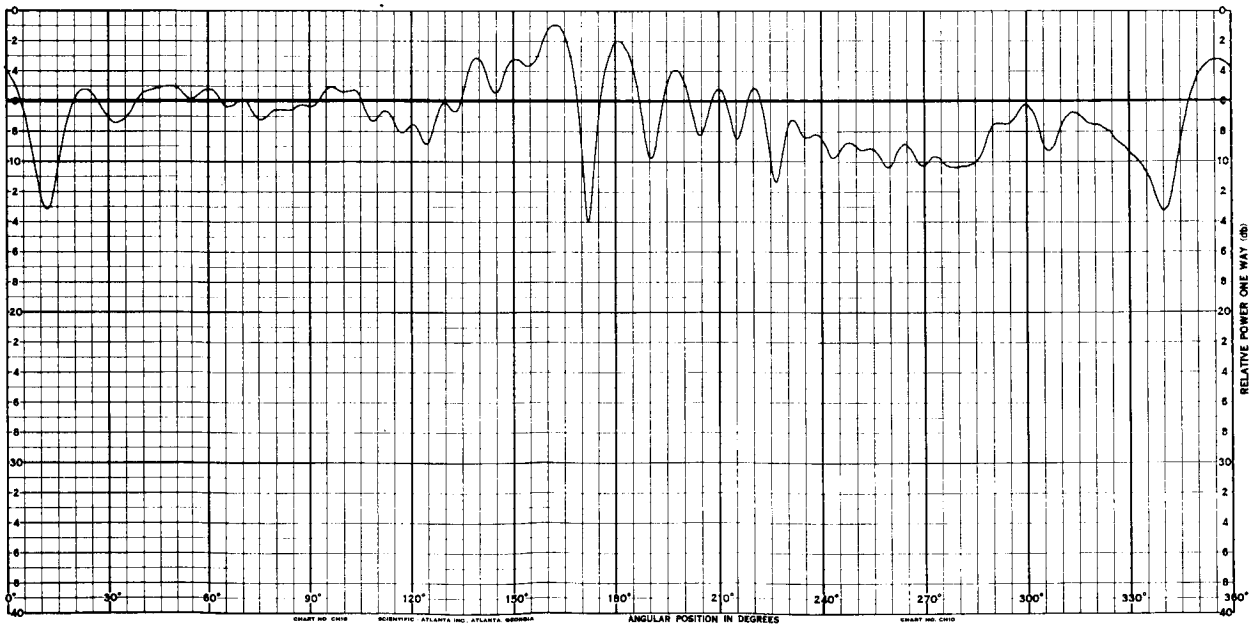
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



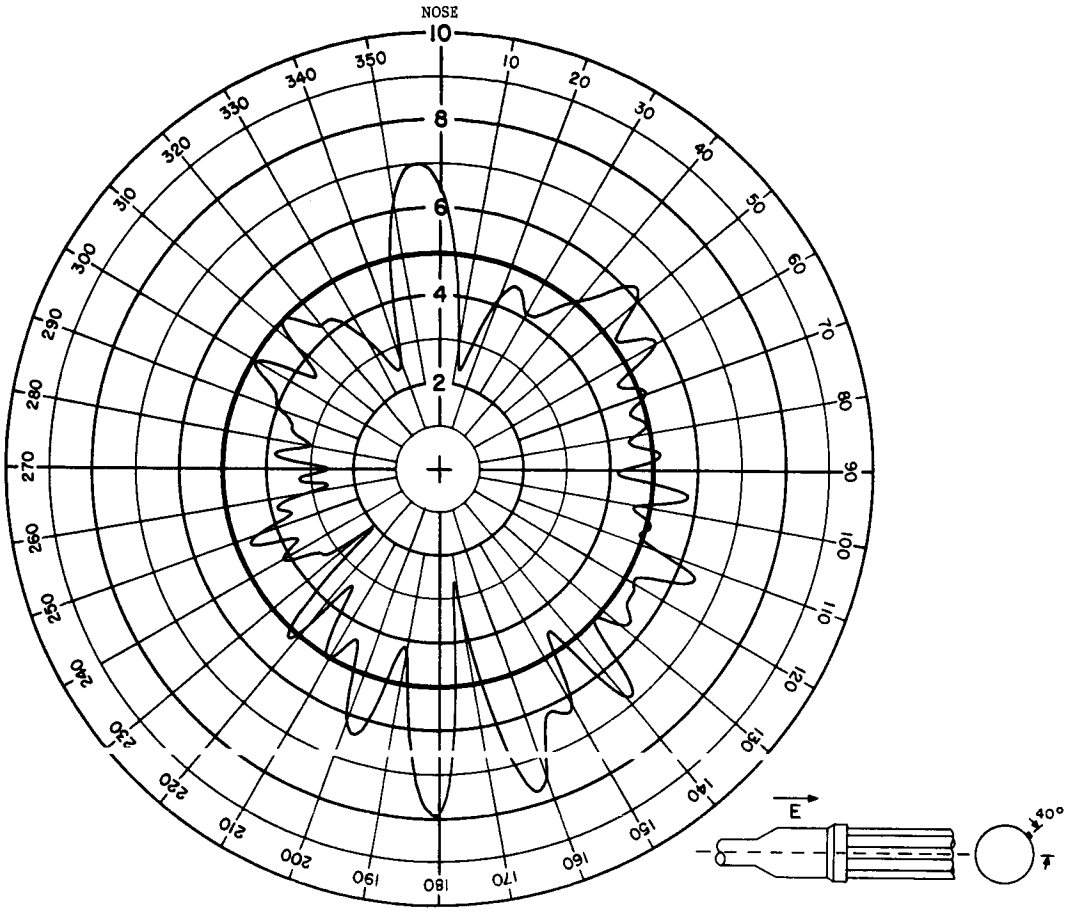


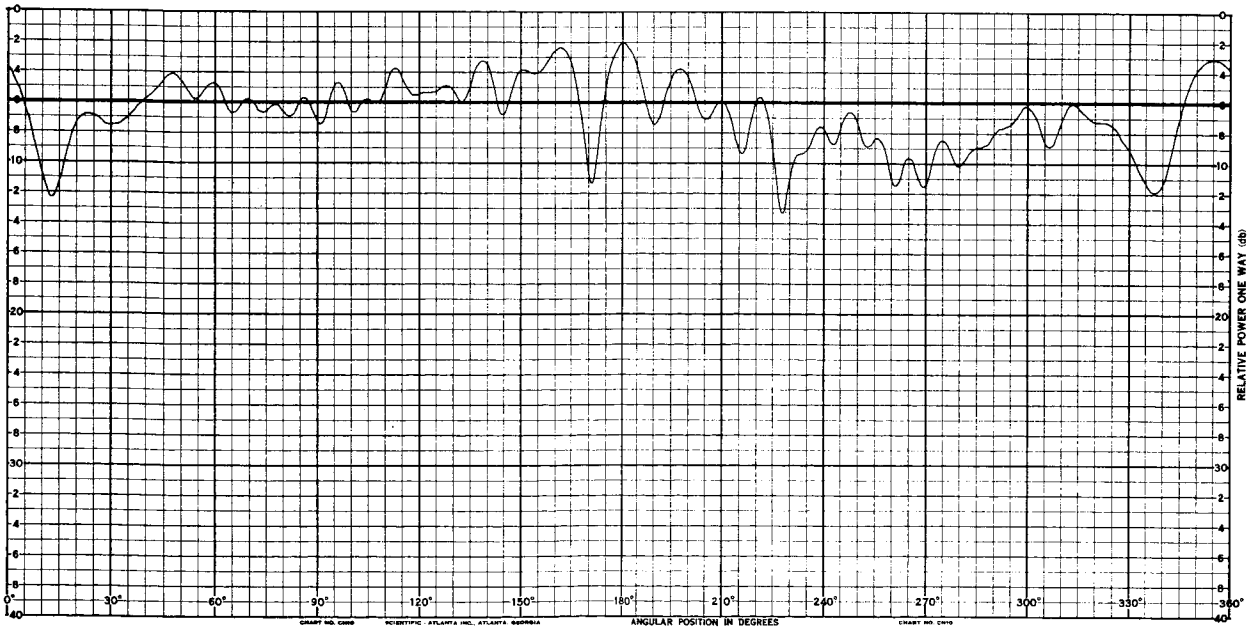
ANTENNA RADIATION PATTERN NO. 202-4

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



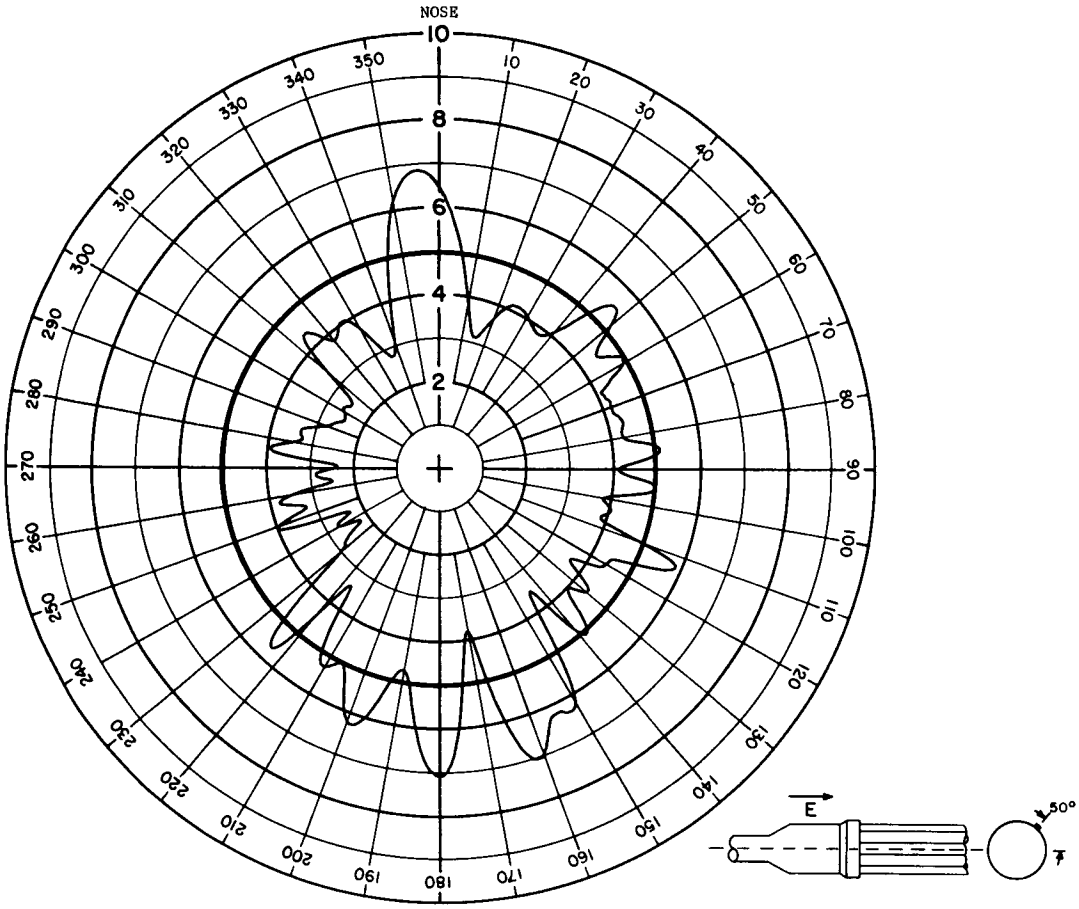


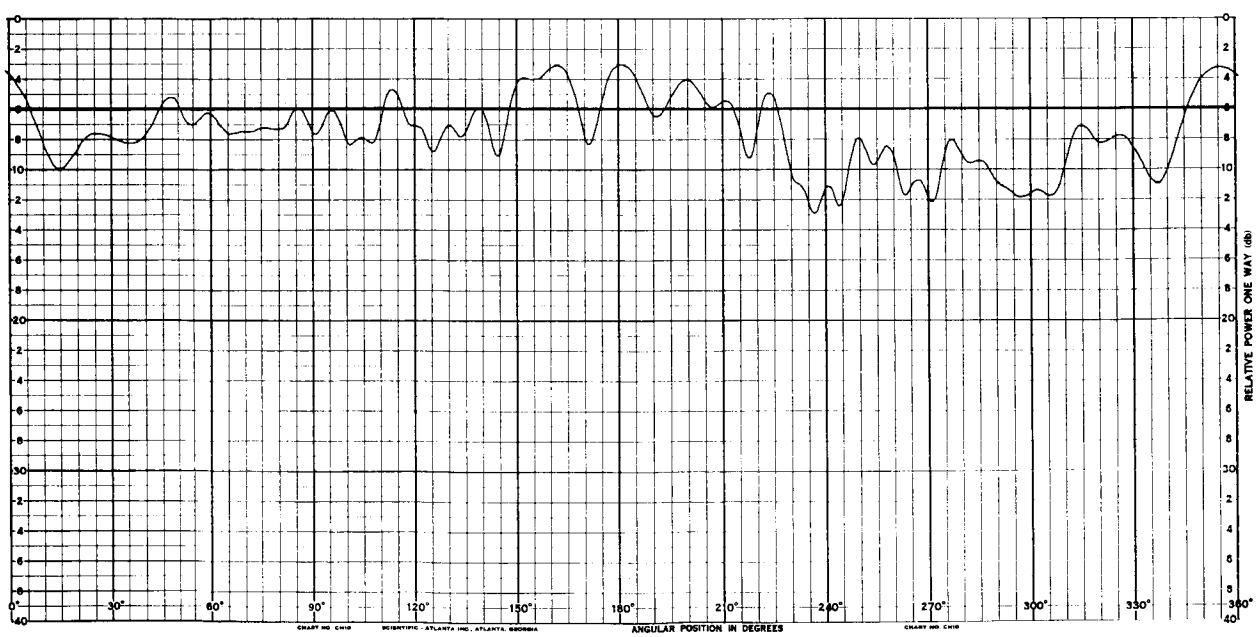
ANTENNA RADIATION PATTERN NO. 202-5

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



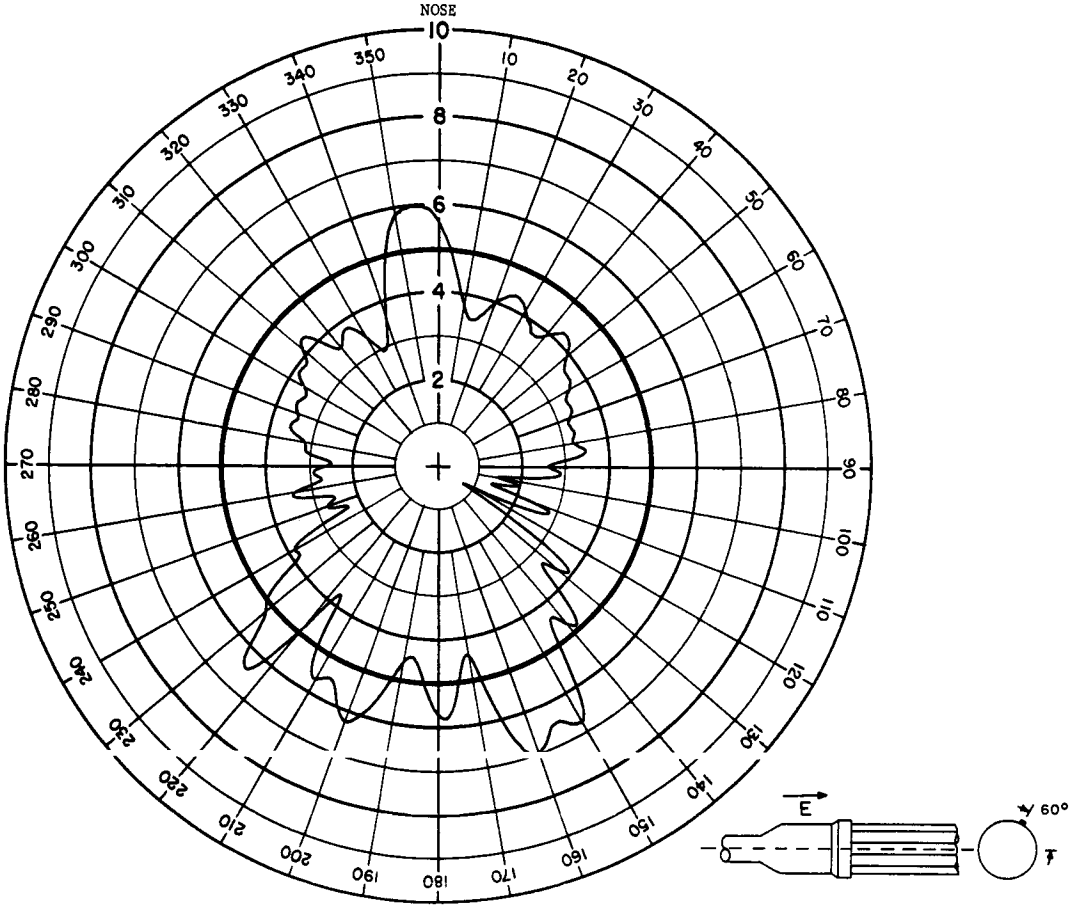


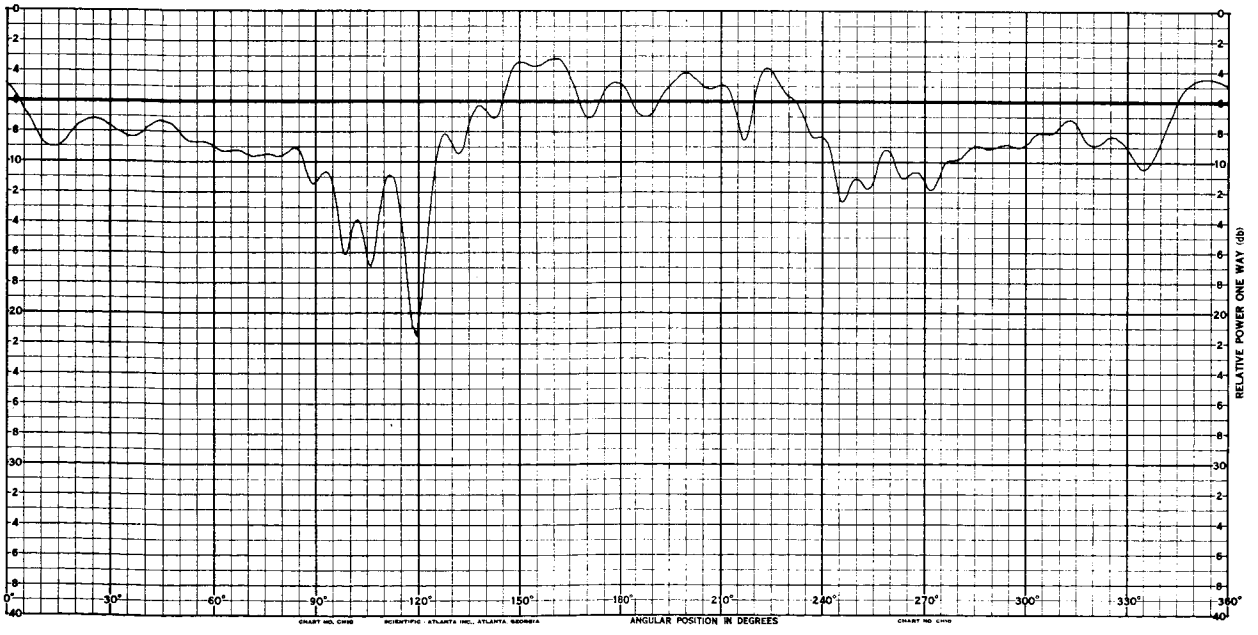
ANTENNA RADIATION PATTERN NO. 202-6

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



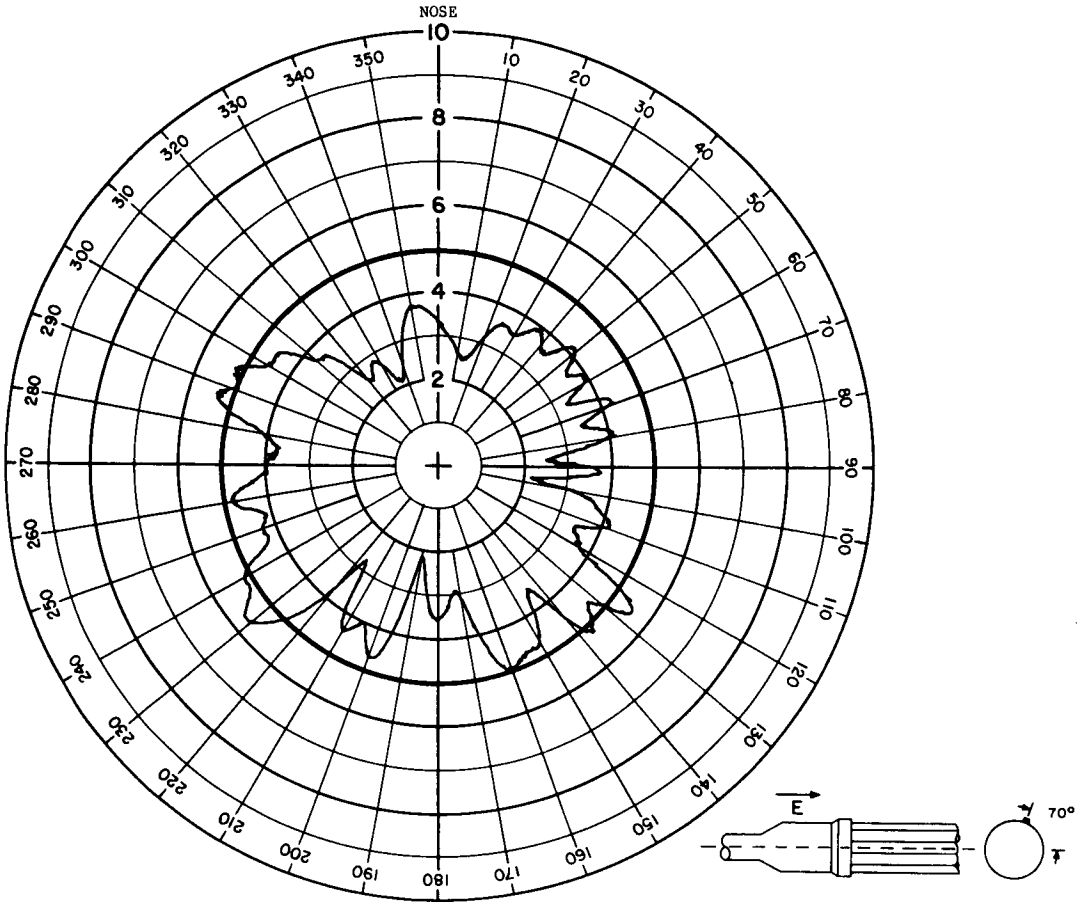


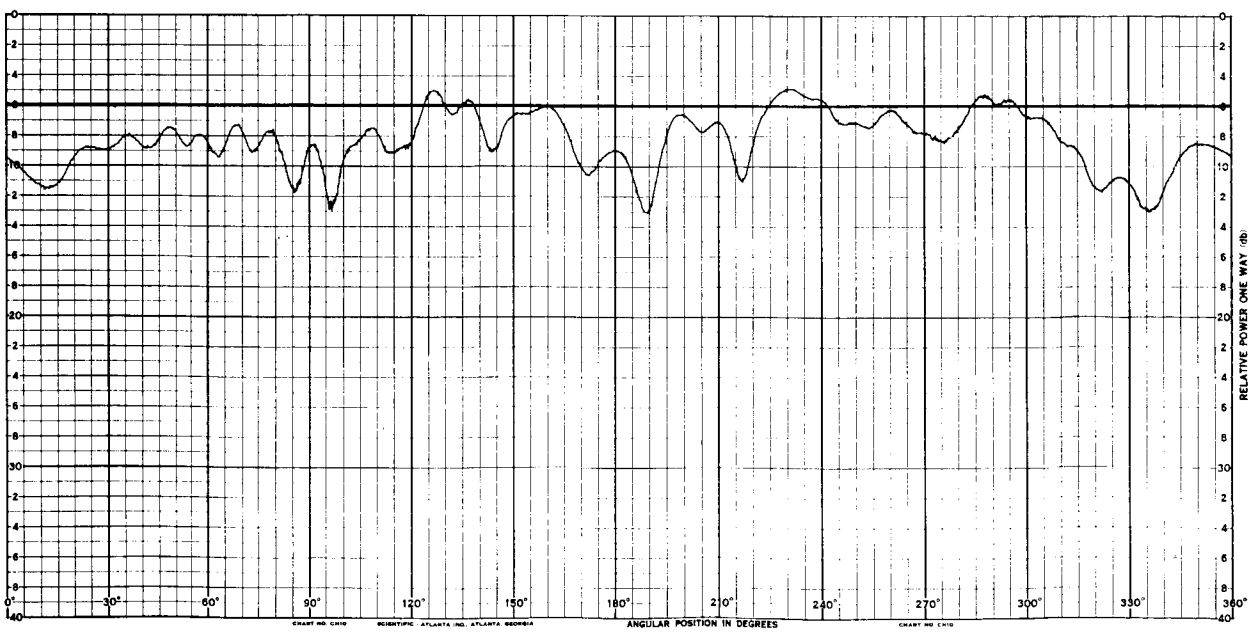
ANTENNA RADIATION PATTERN NO. 202-7

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





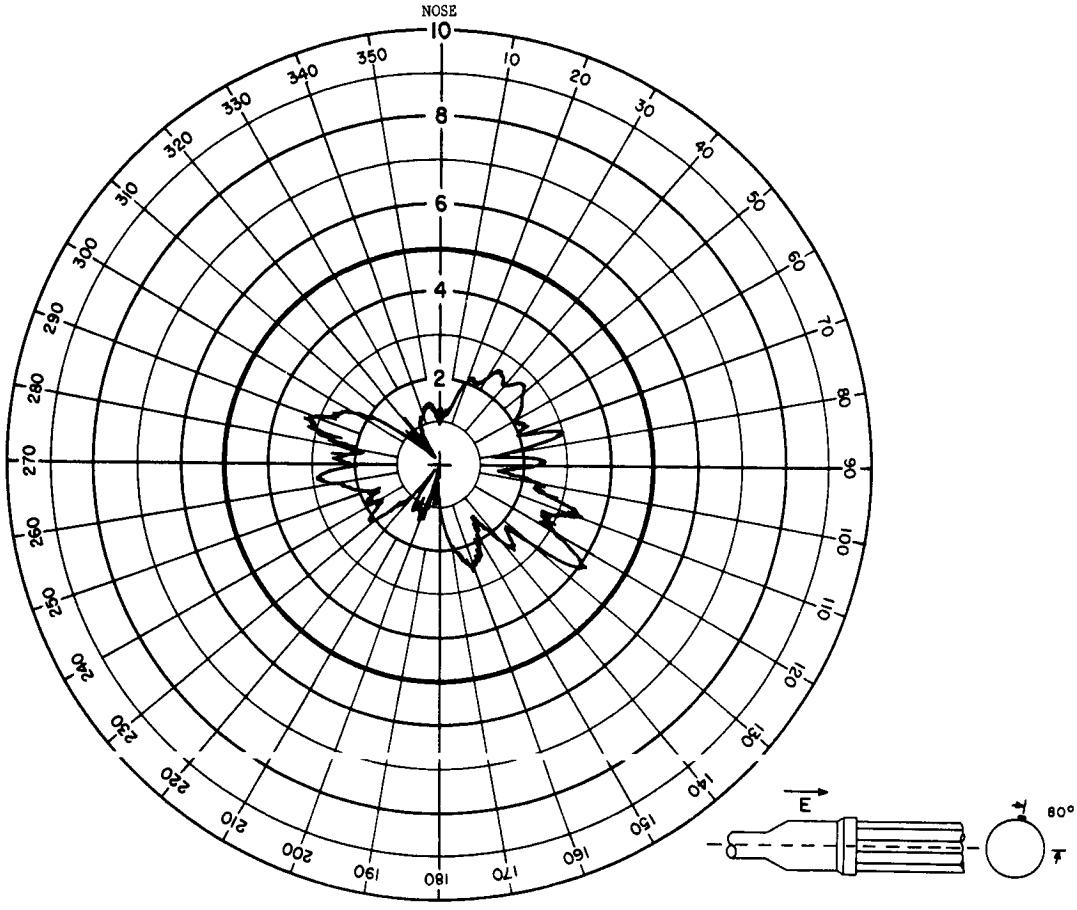
ANTENNA RADIATION PATTERN NO. 202-8

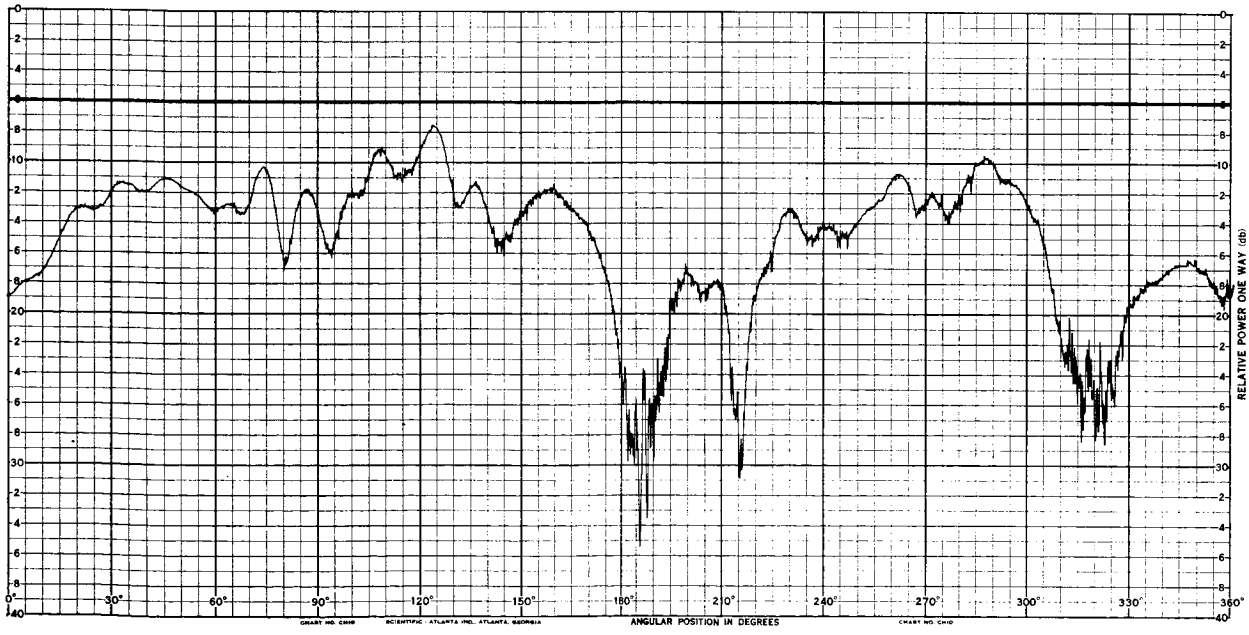
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





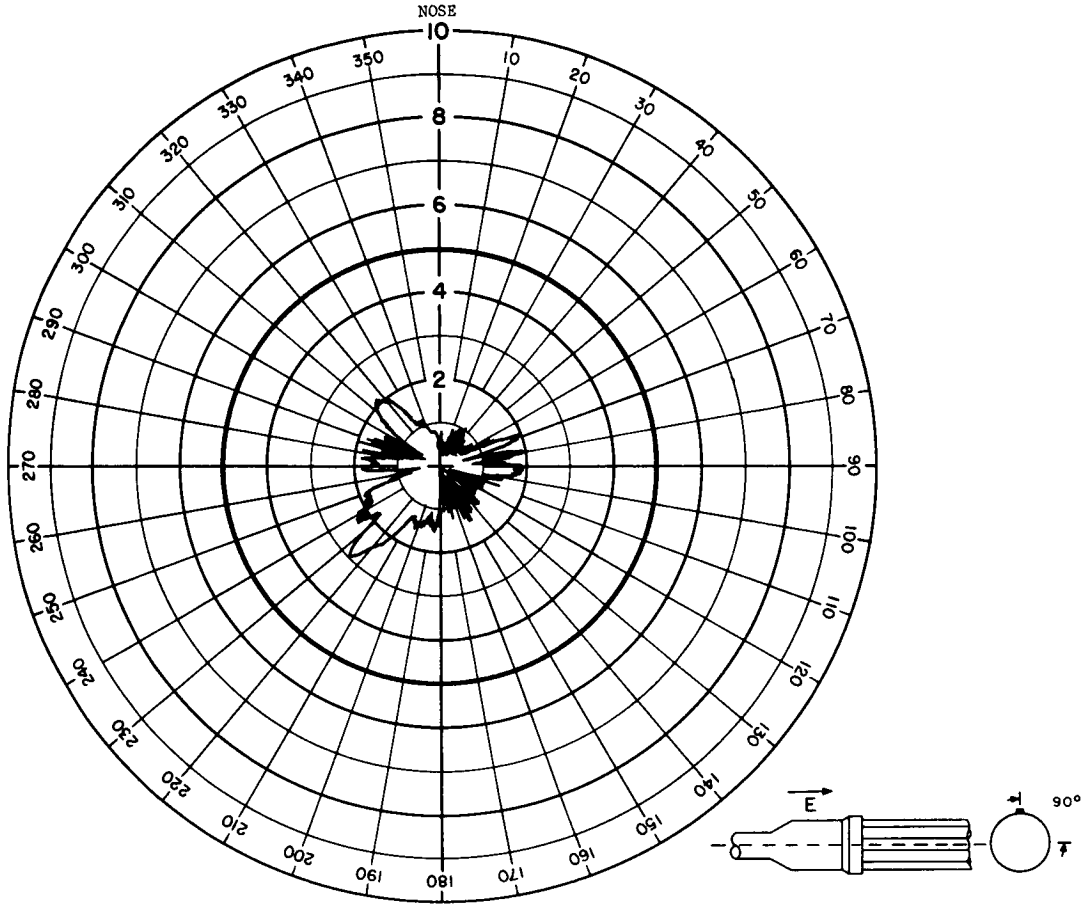
ANTENNA RADIATION PATTERN NO. 202-9

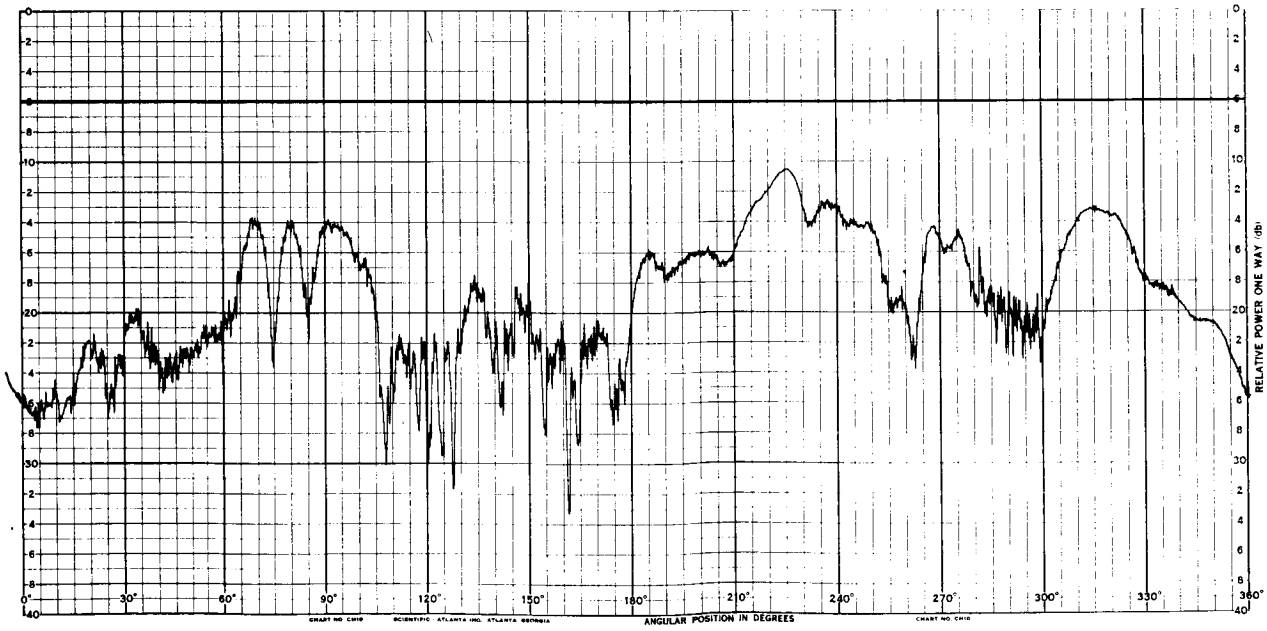
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





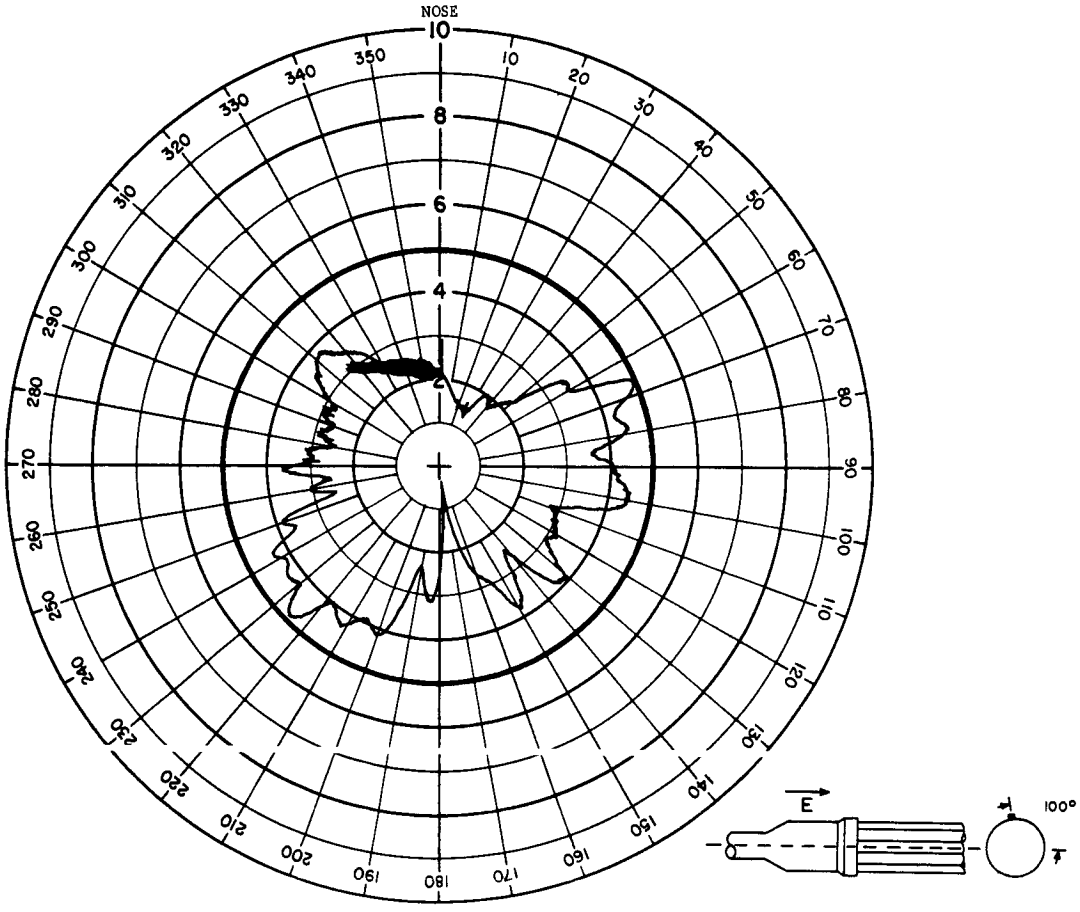
ANTENNA RADIATION PATTERN NO. 202-10

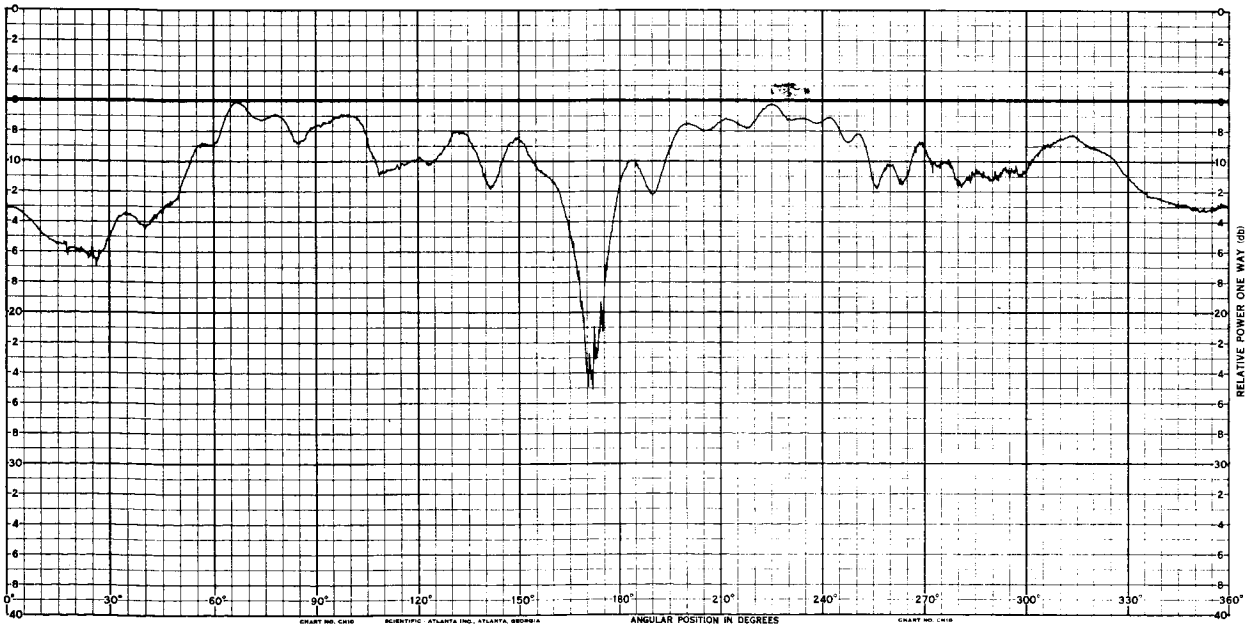
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





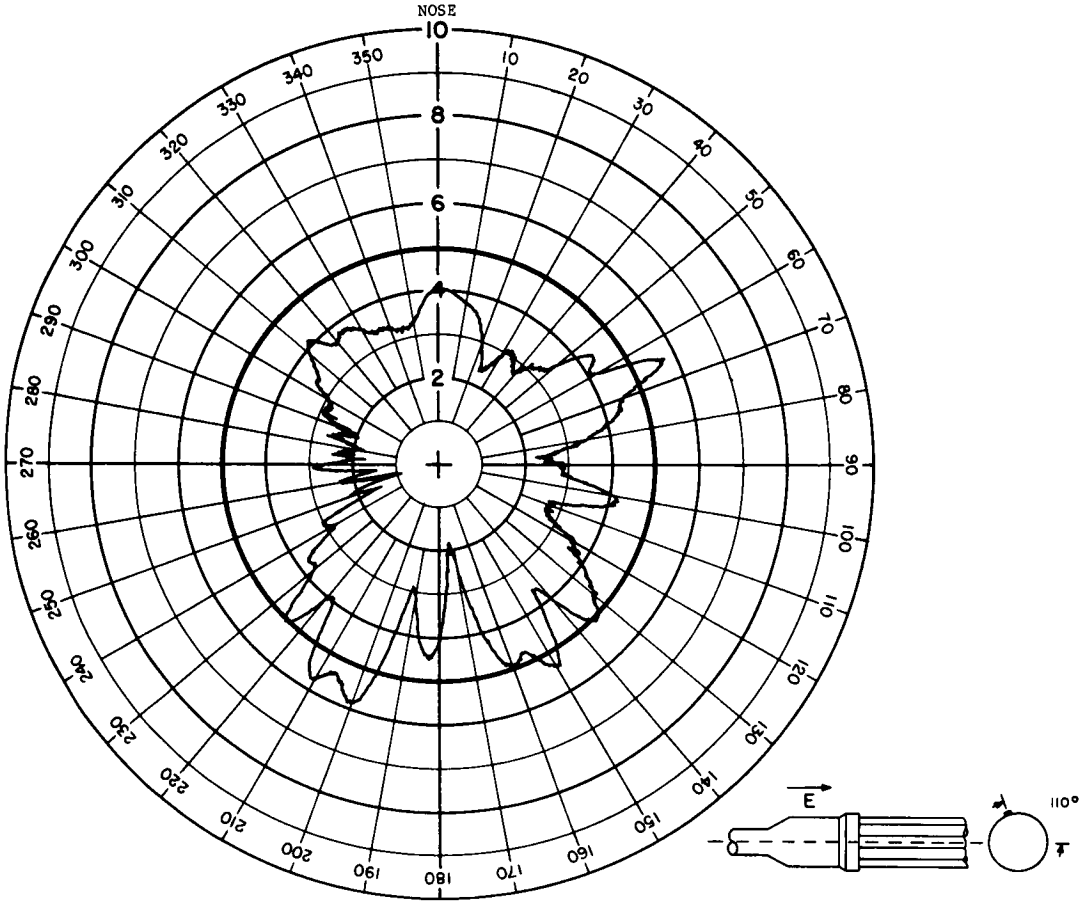
ANTENNA RADIATION PATTERN NO. 202-11

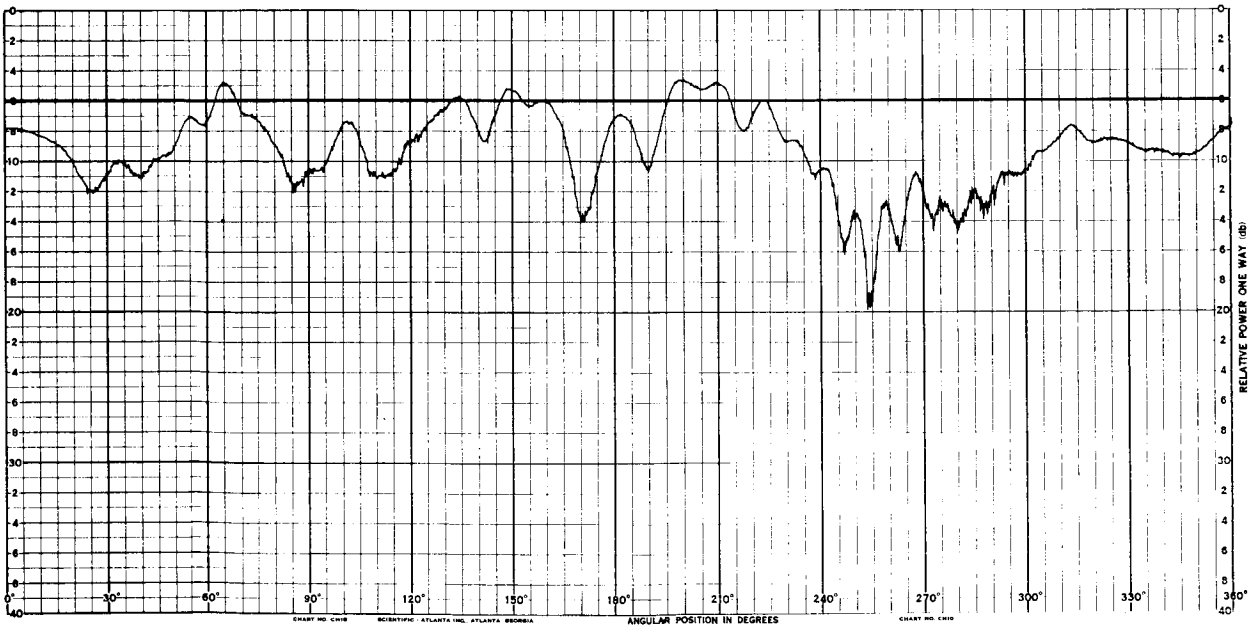
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



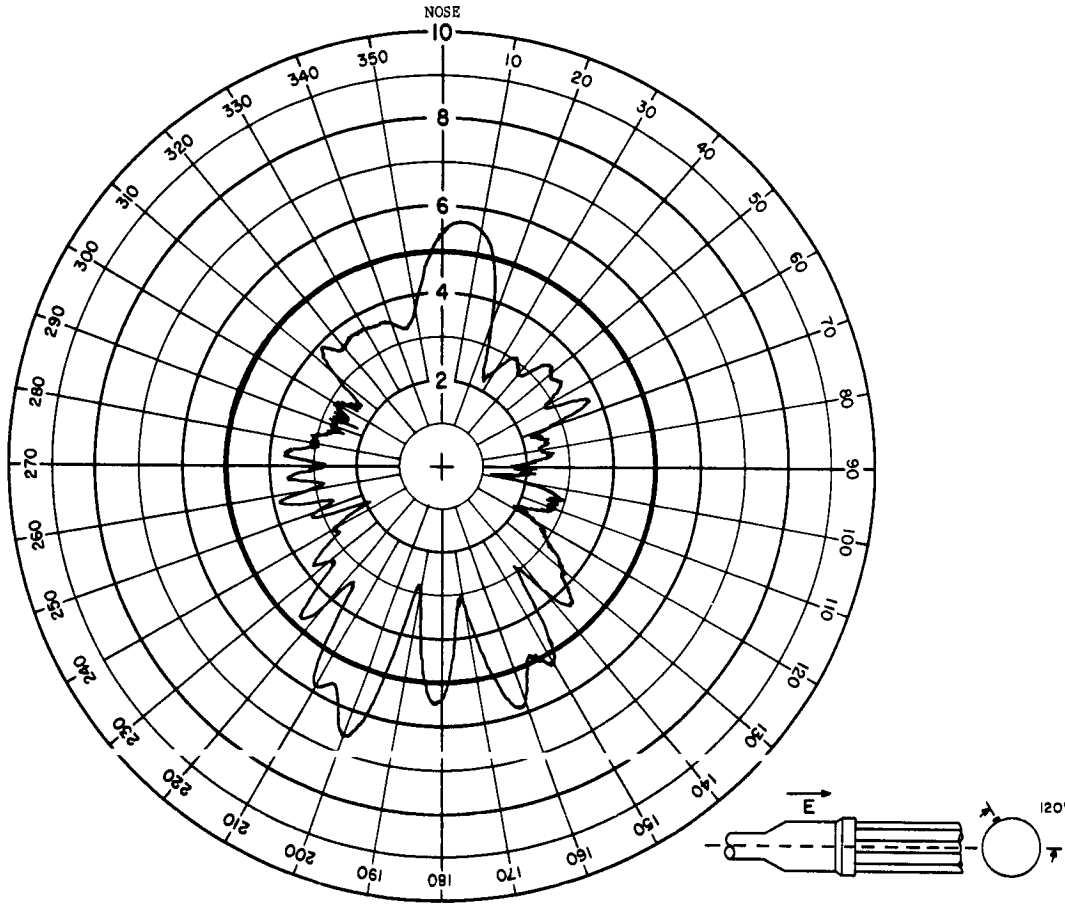


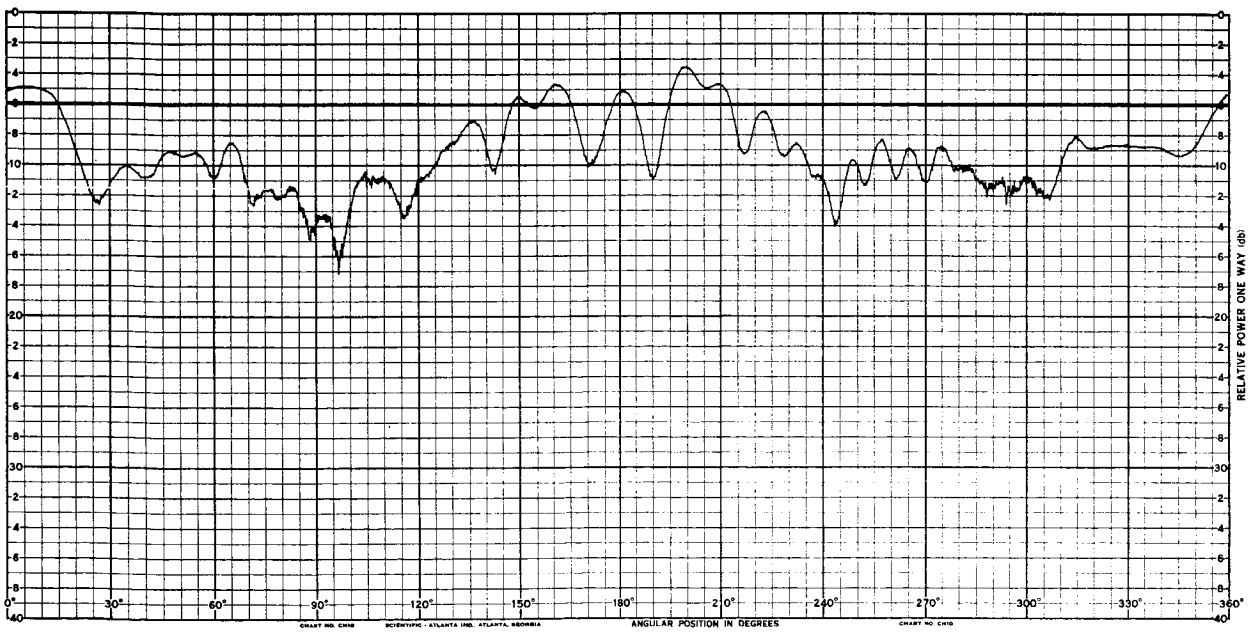
ANTENNA RADIATION PATTERN NO. 202-12

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





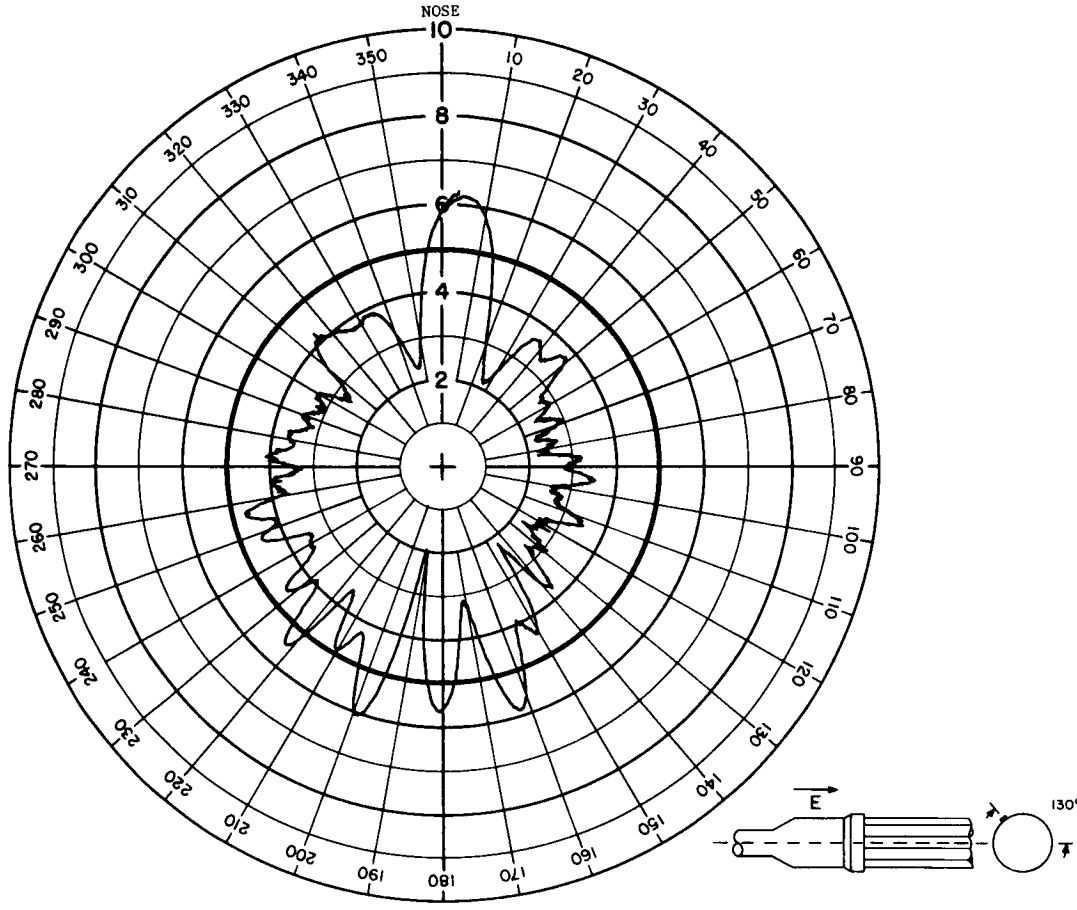
ANTENNA RADIATION PATTERN NO. 202-13

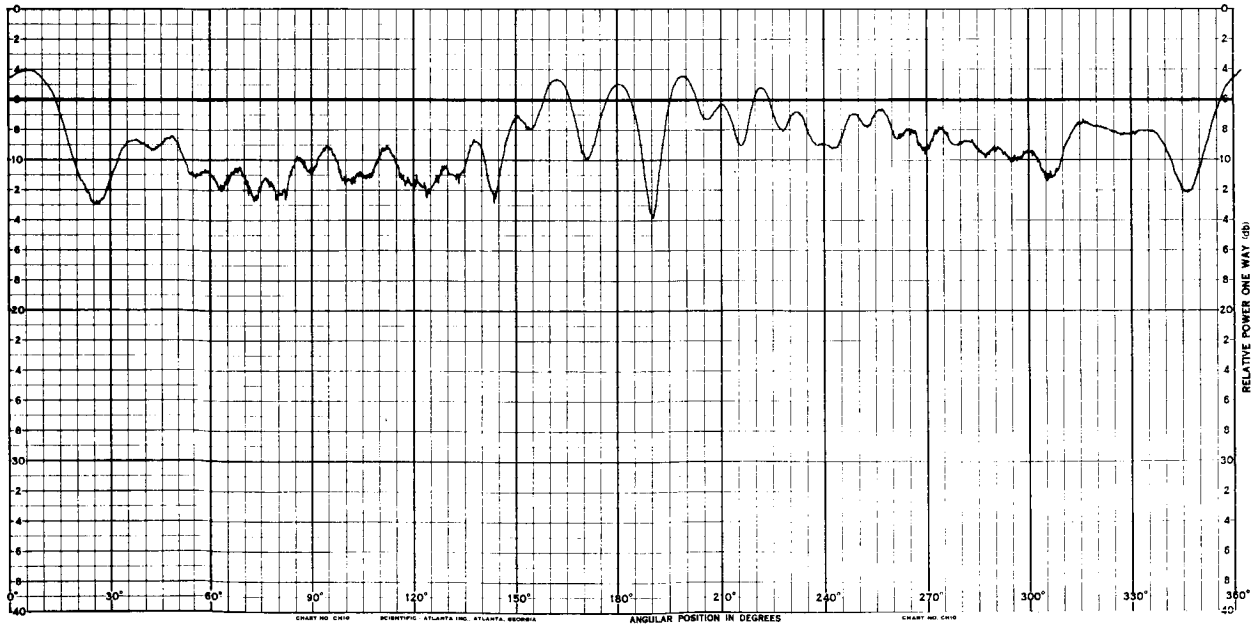
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





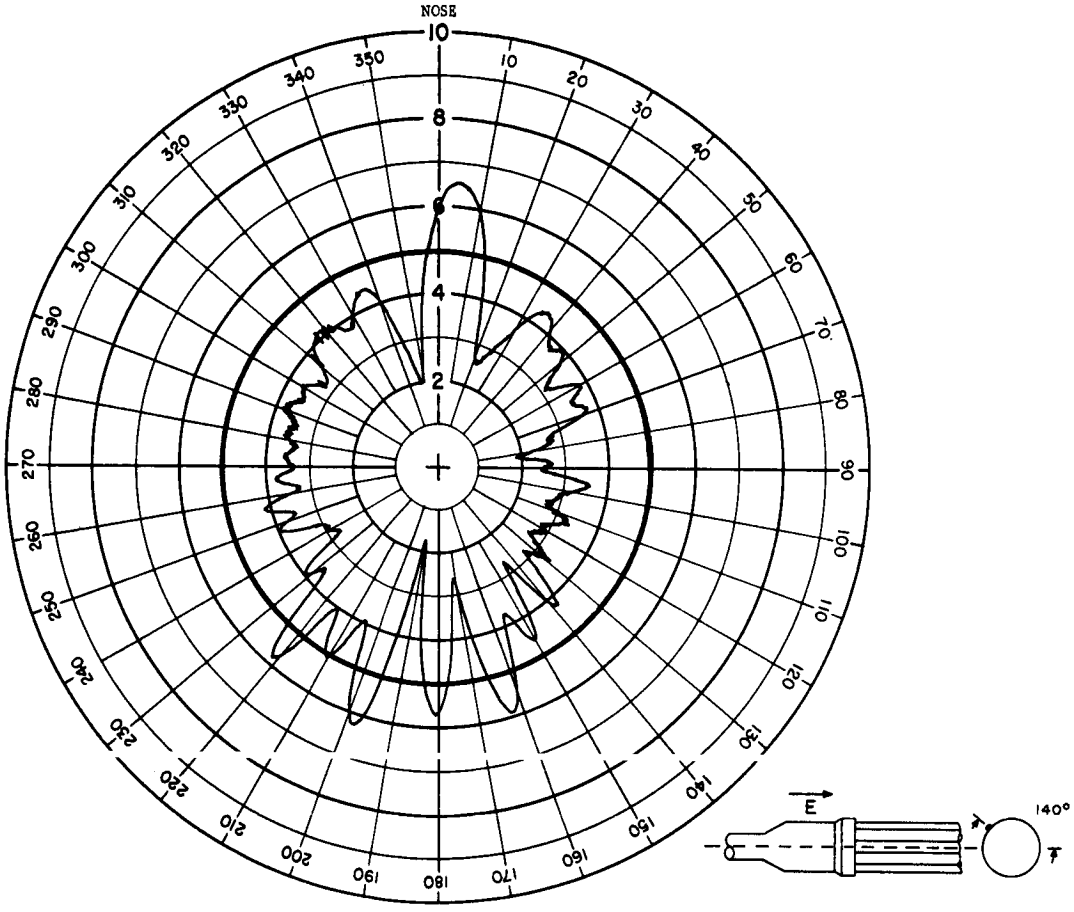
ANTENNA RADIATION PATTERN NO. 202-14

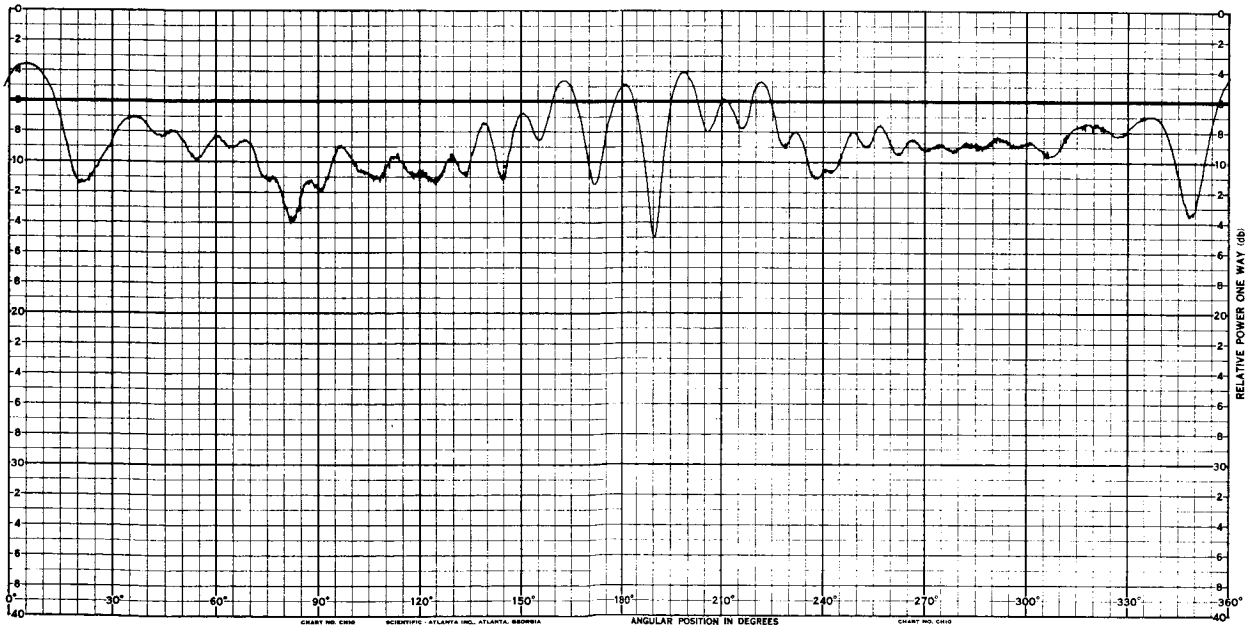
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





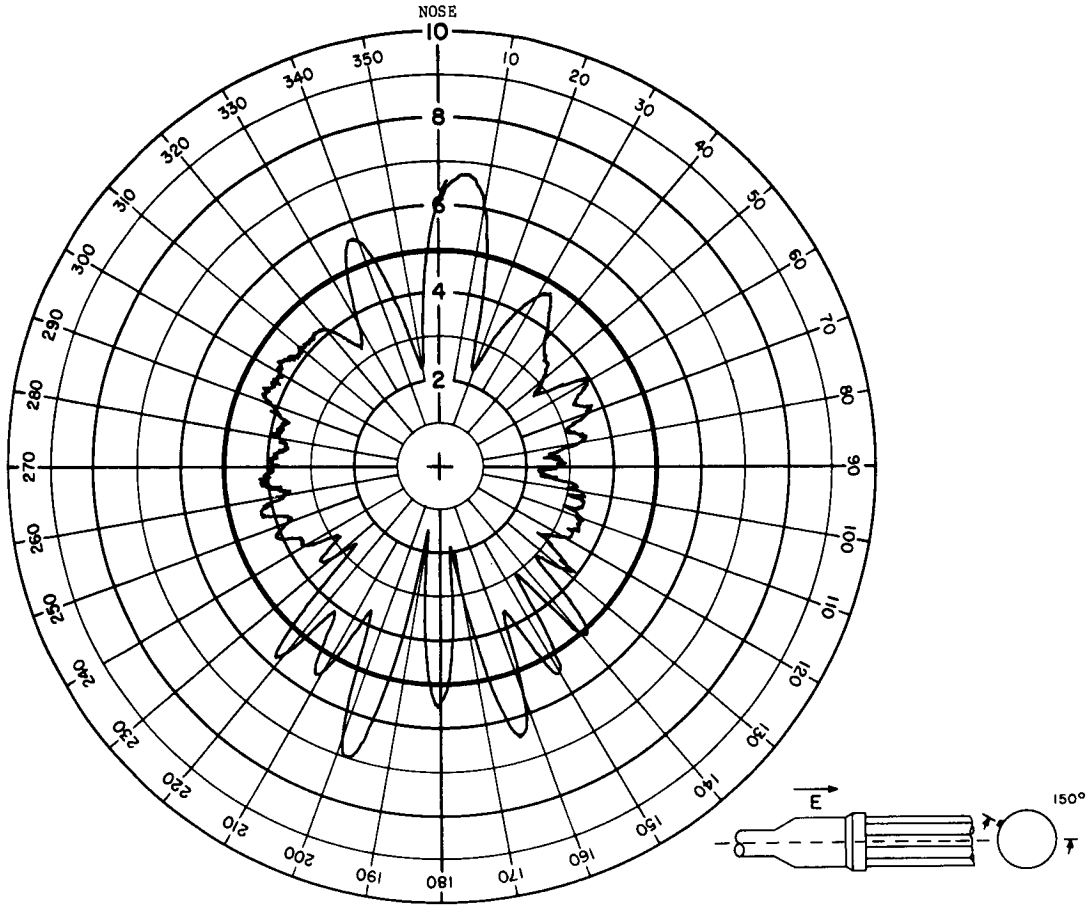
ANTENNA RADIATION PATTERN NO. 202-15

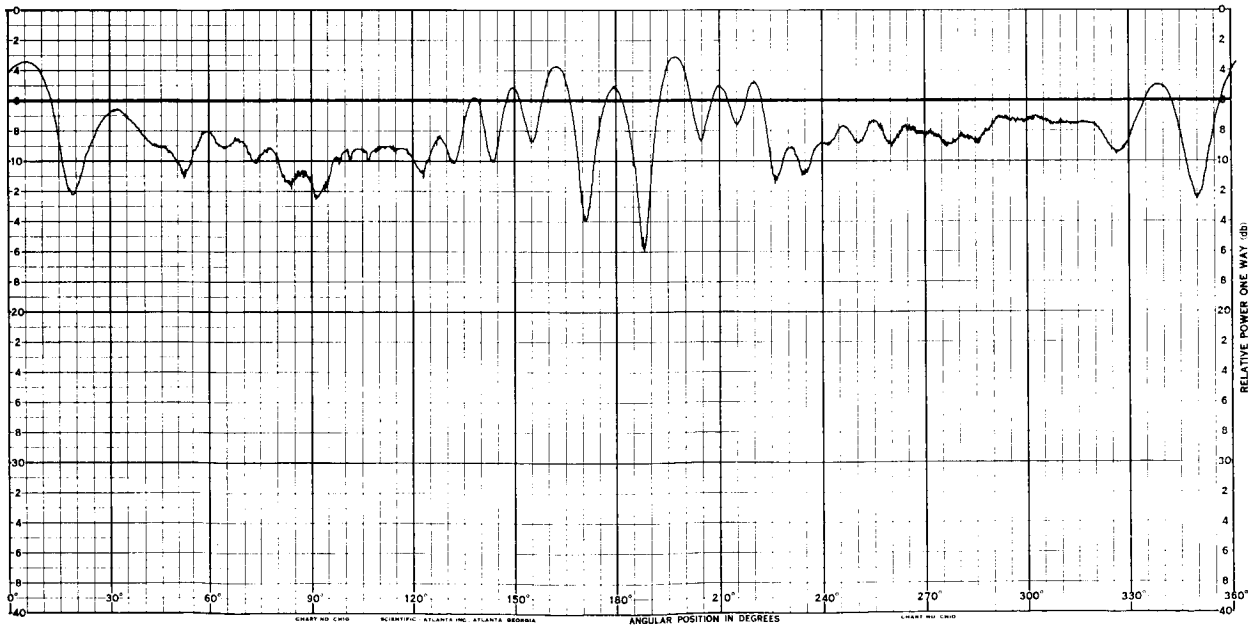
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





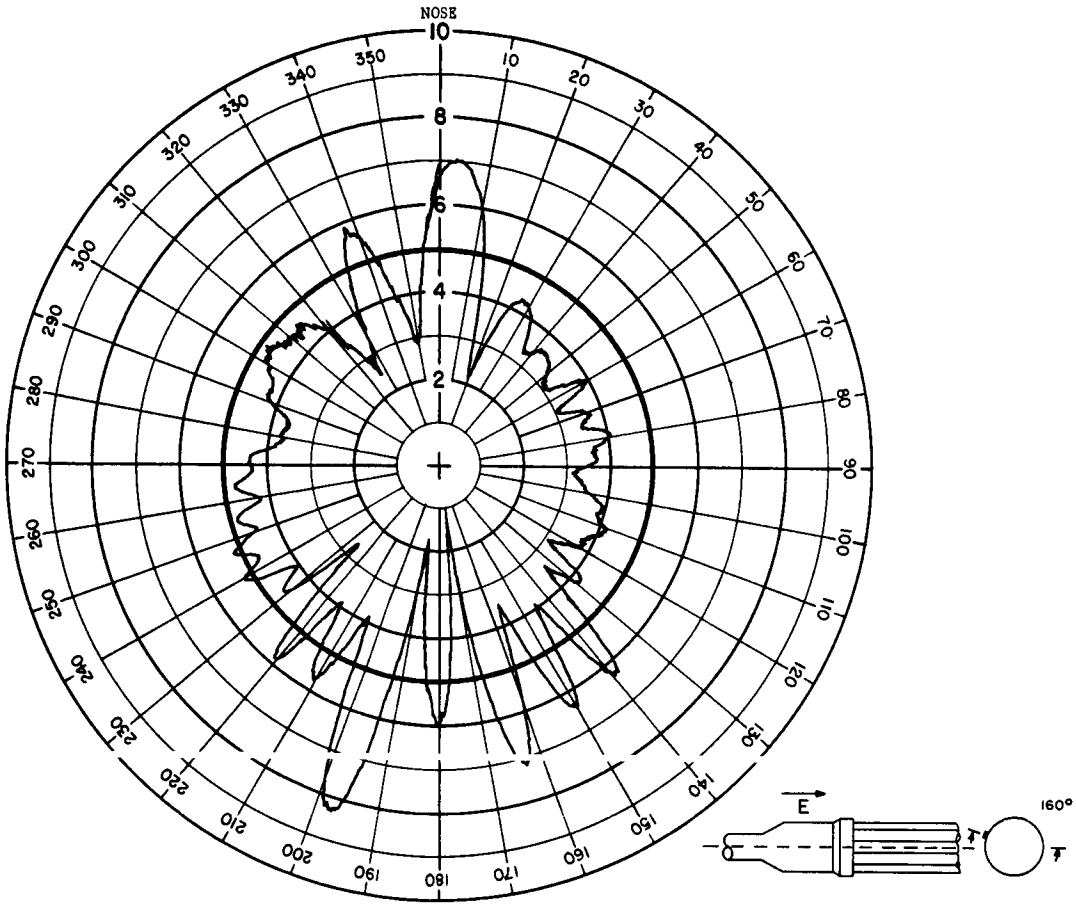
ANTENNA RADIATION PATTERN NO. 202-16

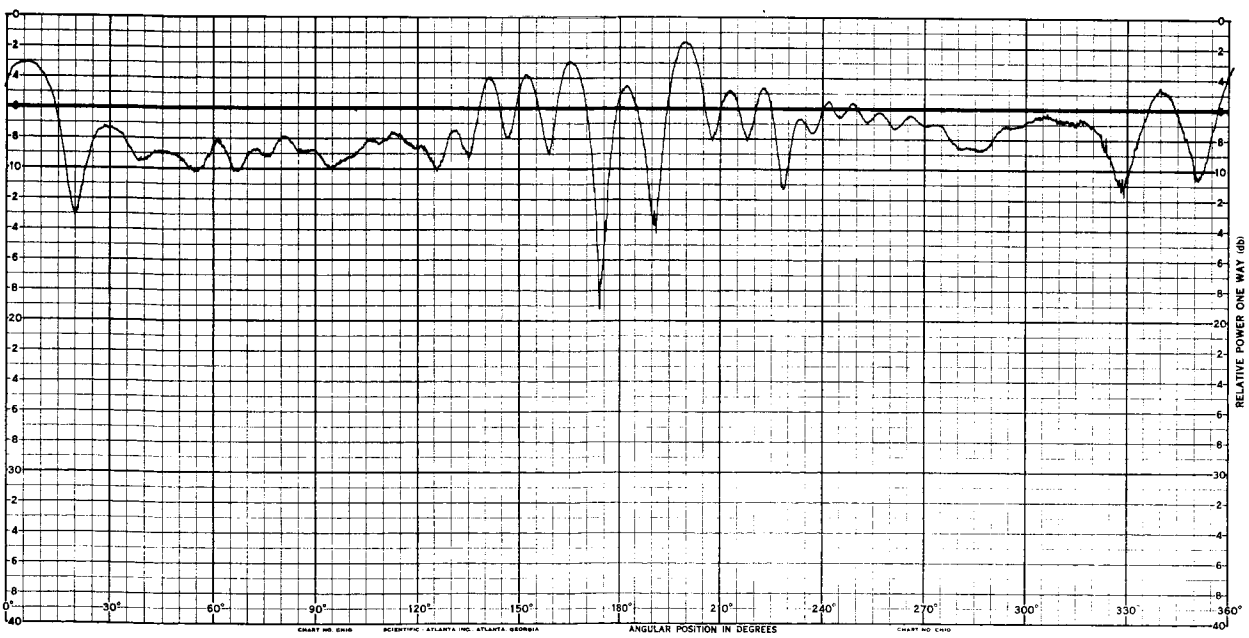
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





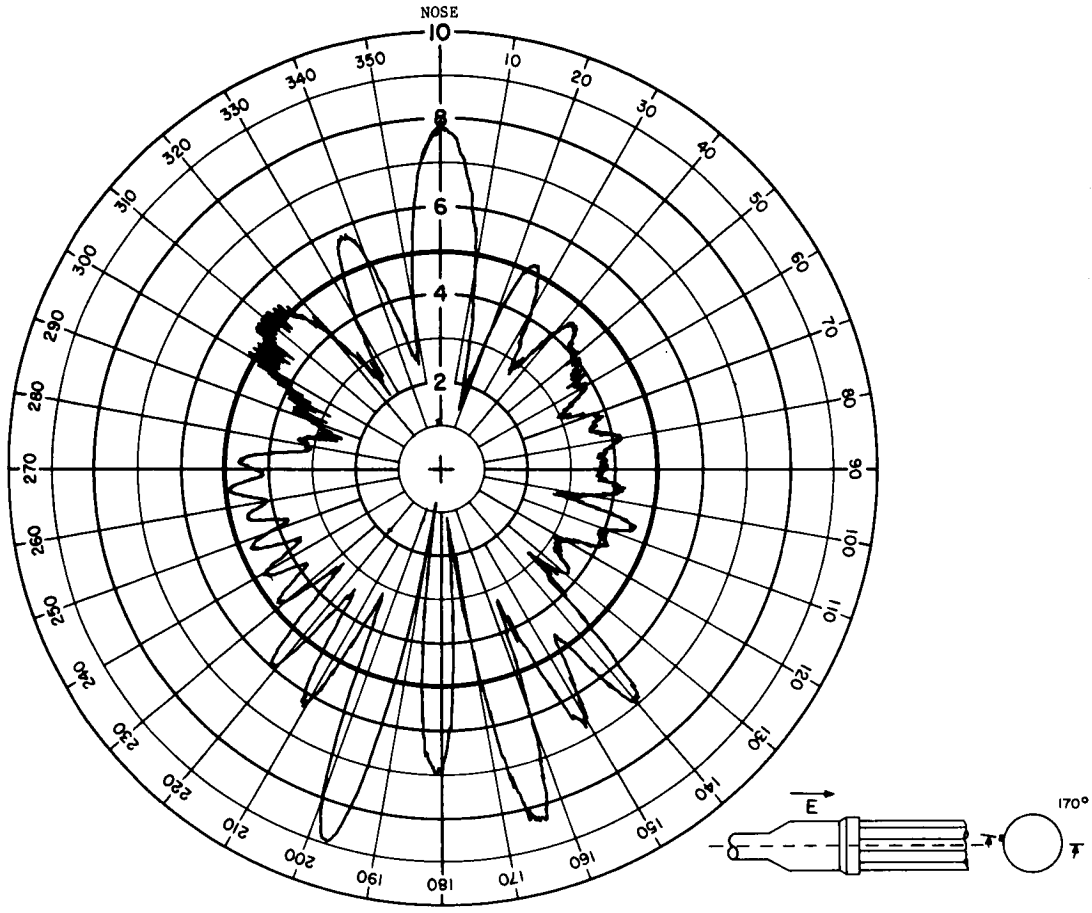
ANTENNA RADIATION PATTERN NO. 202-17

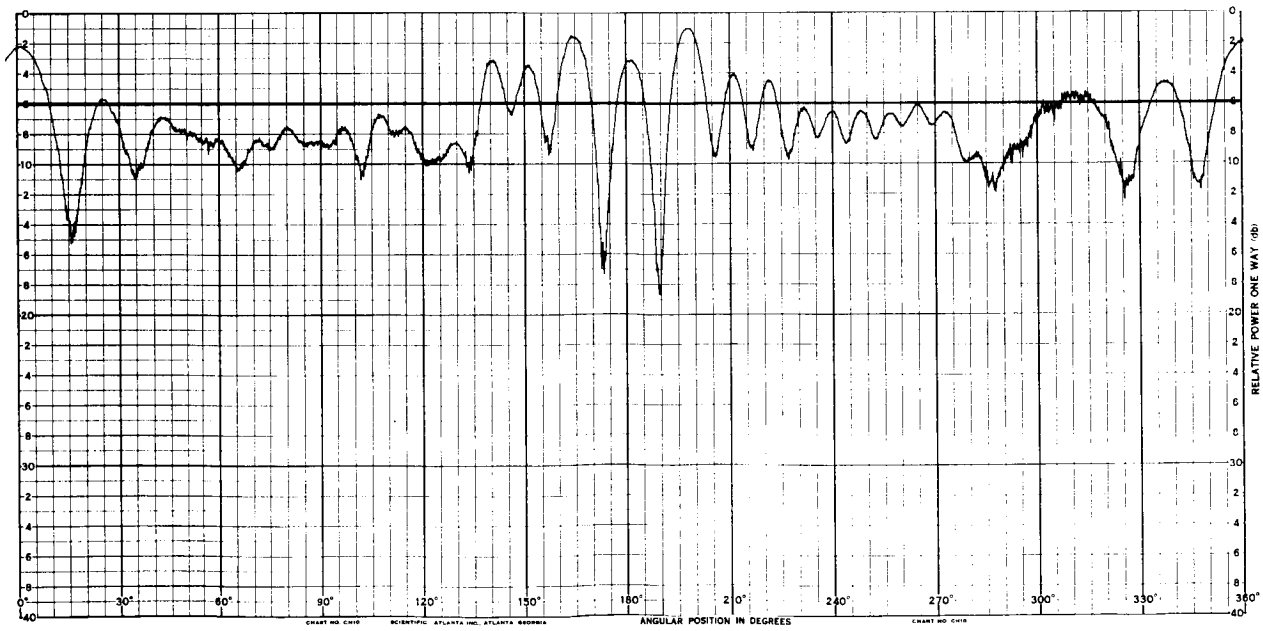
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



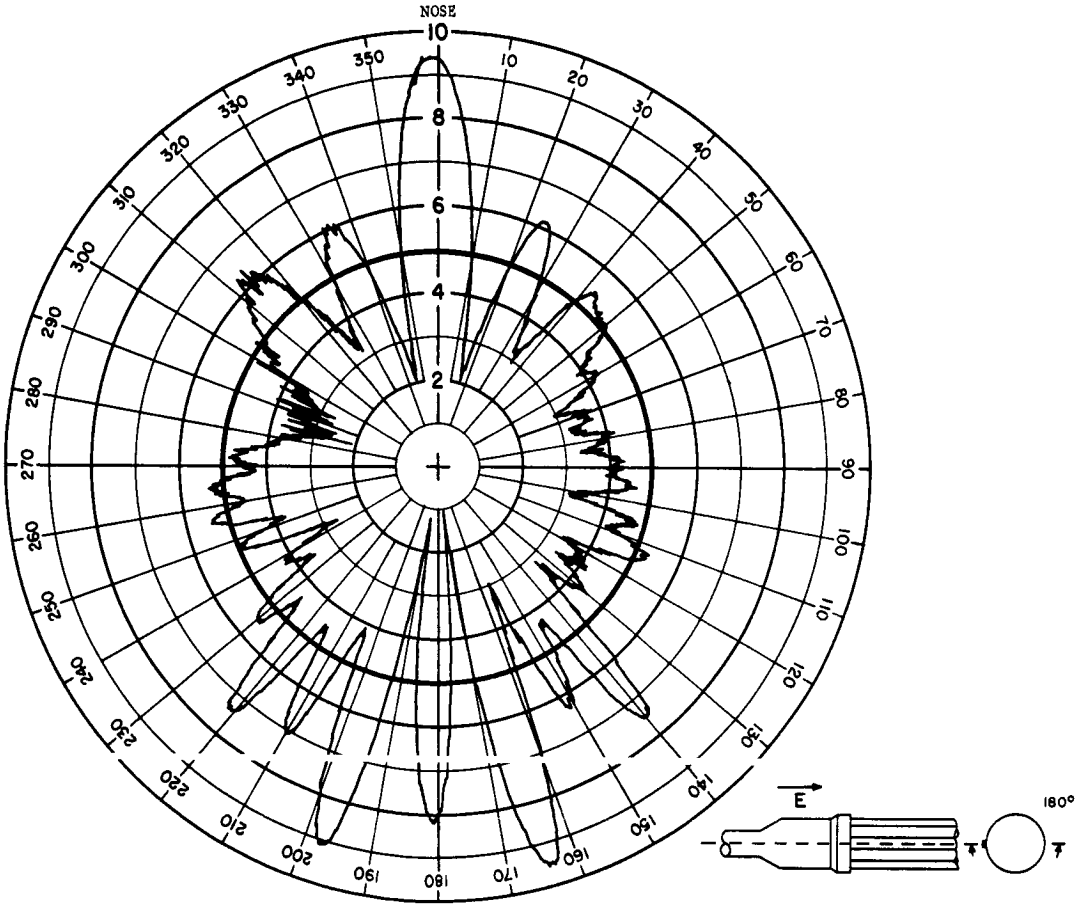


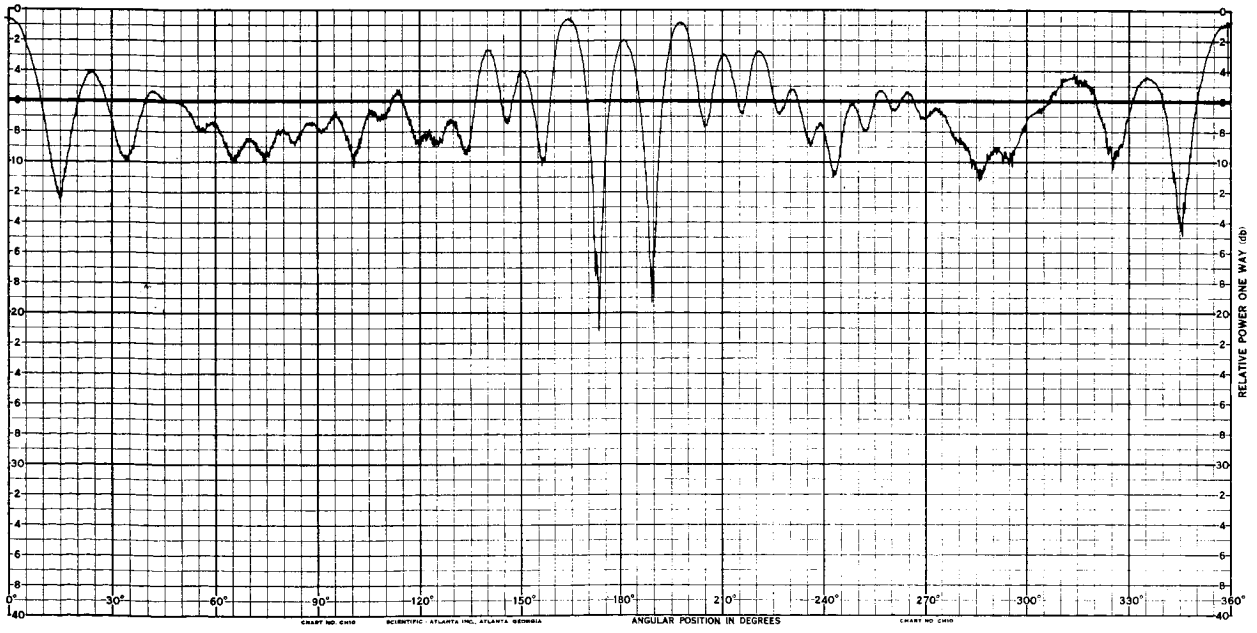
ANTENNA RADIATION PATTERN NO. 202-18

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





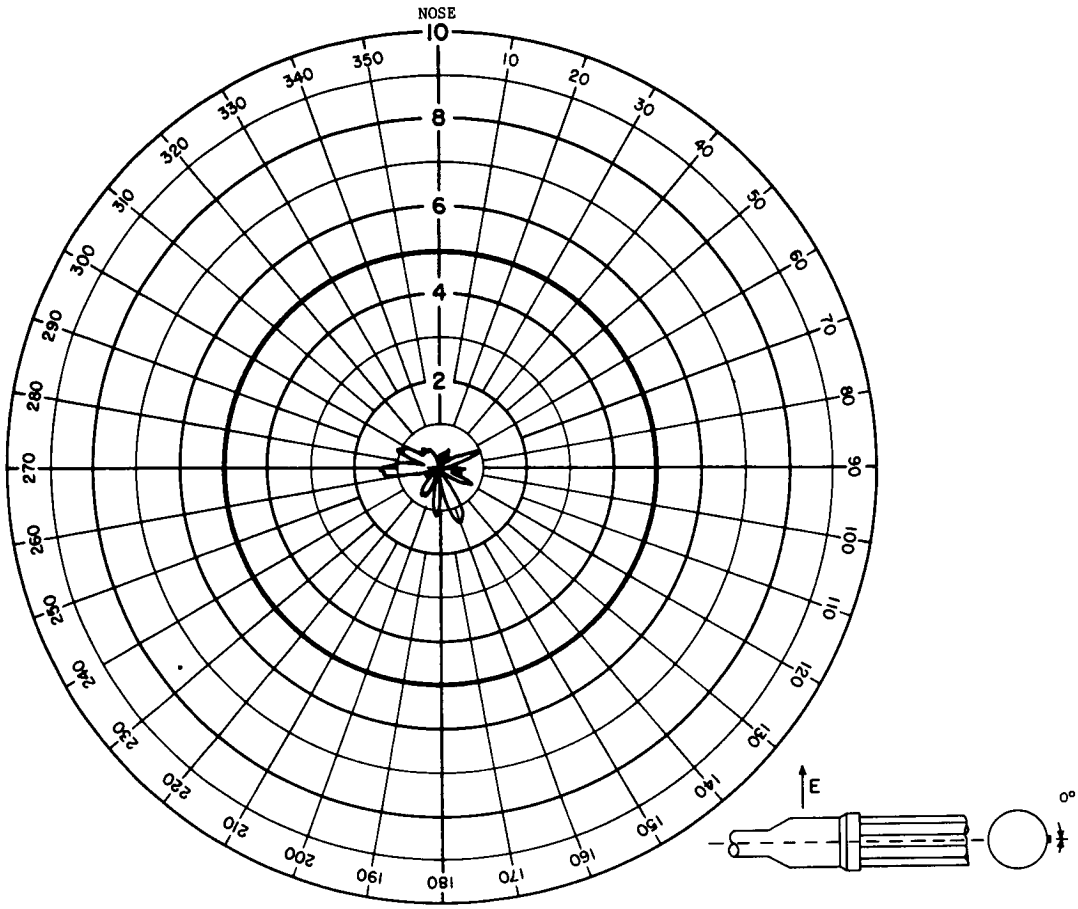
ANTENNA RADIATION PATTERN NO. 202-19

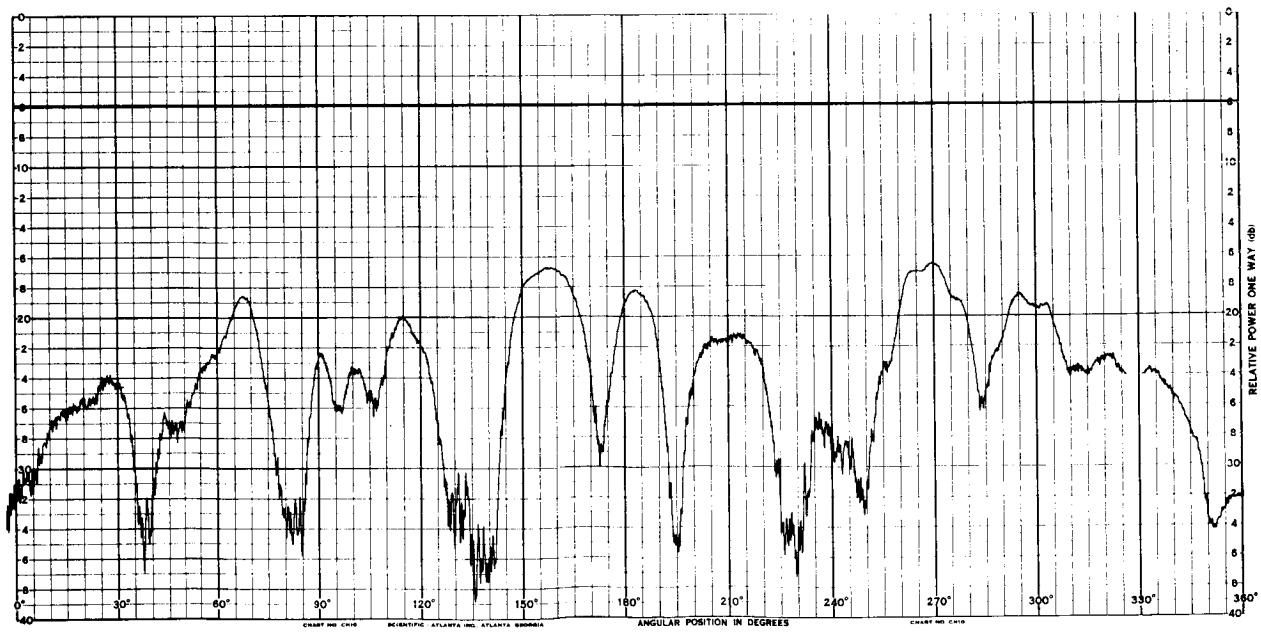
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





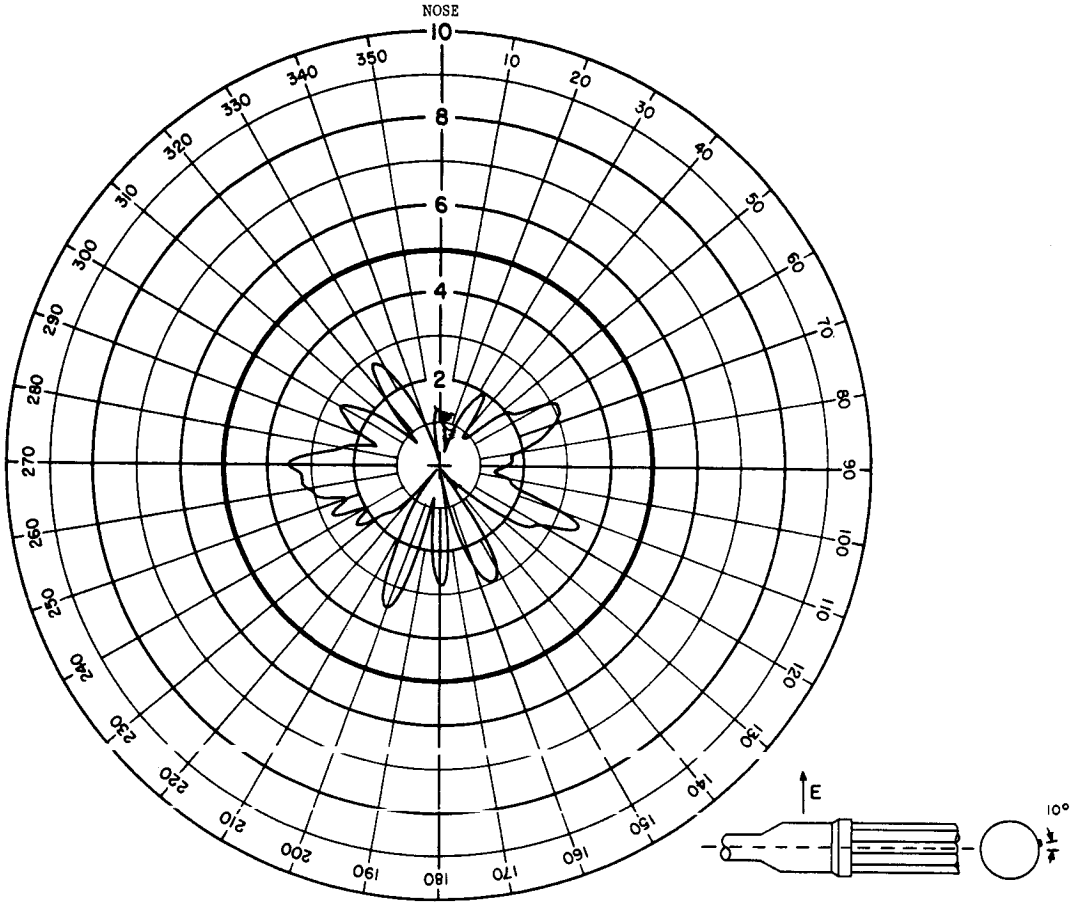
ANTENNA RADIATION PATTERN NO. 202-20

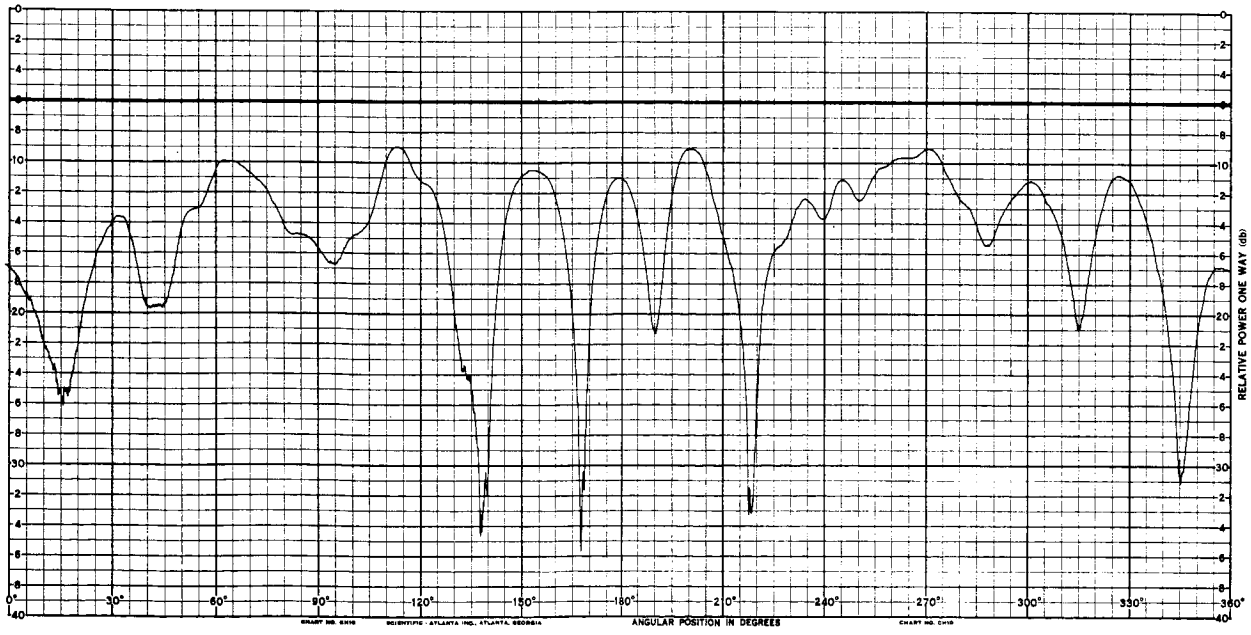
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



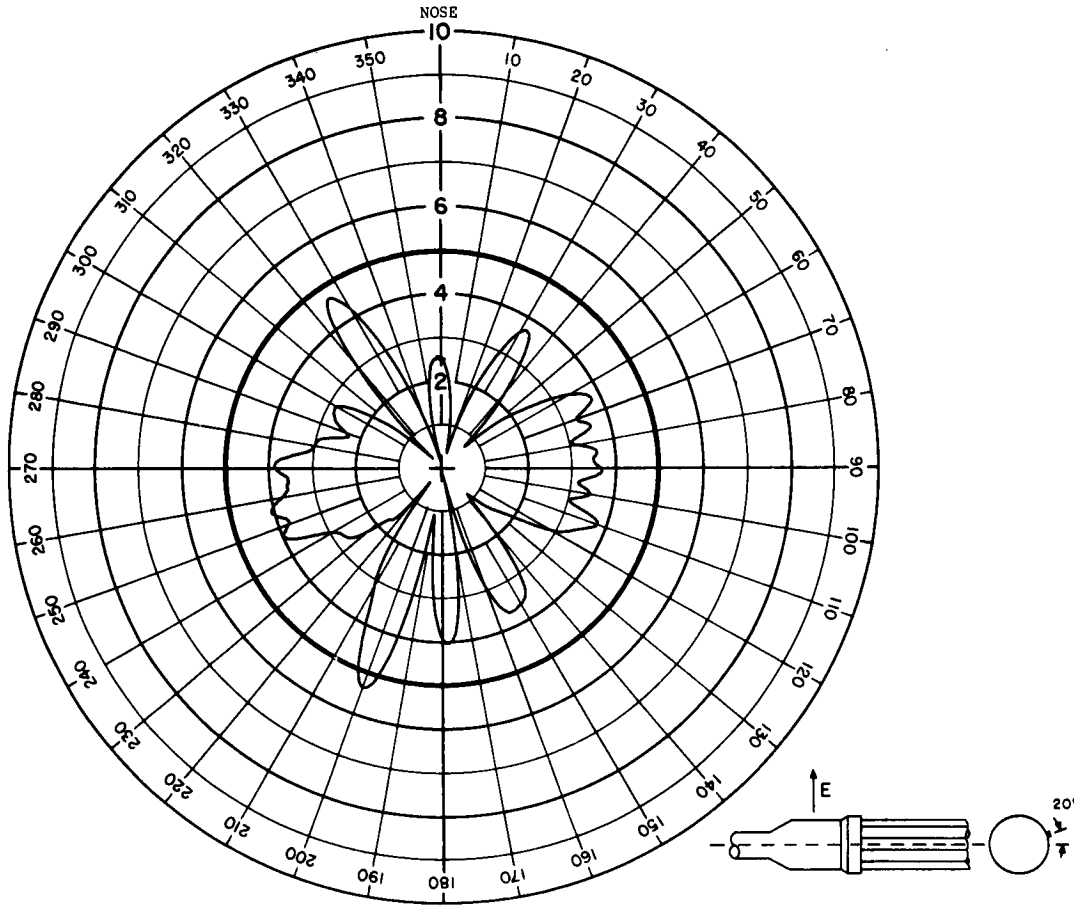


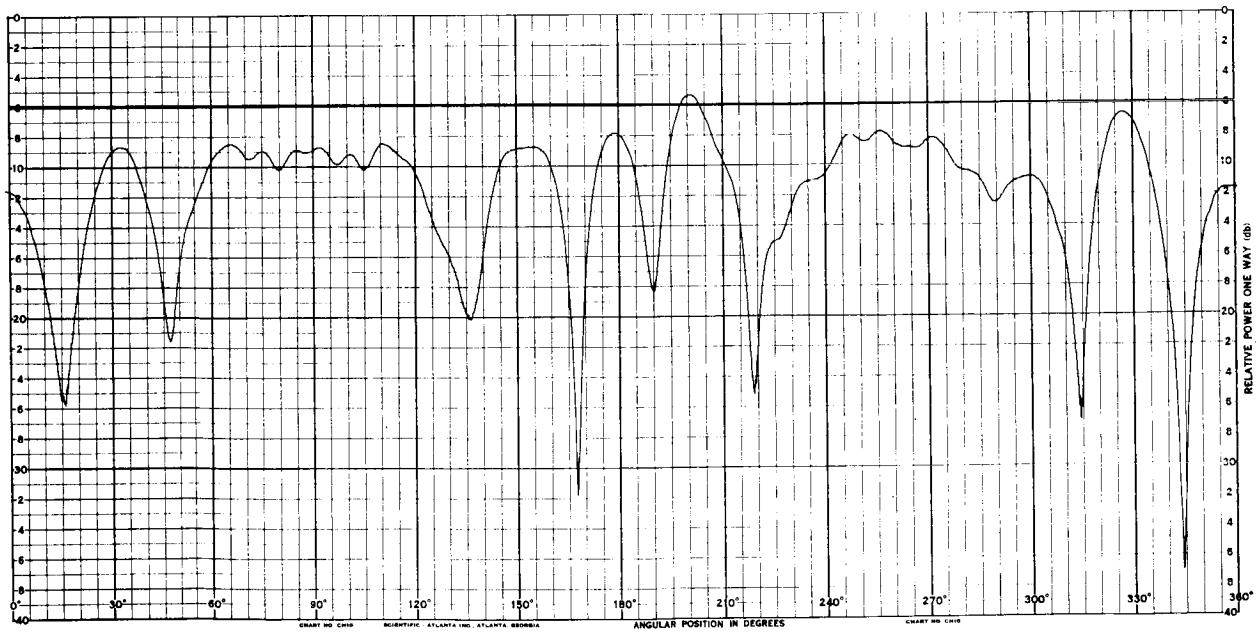
ANTENNA RADIATION PATTERN NO. 202-21

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM
VOT





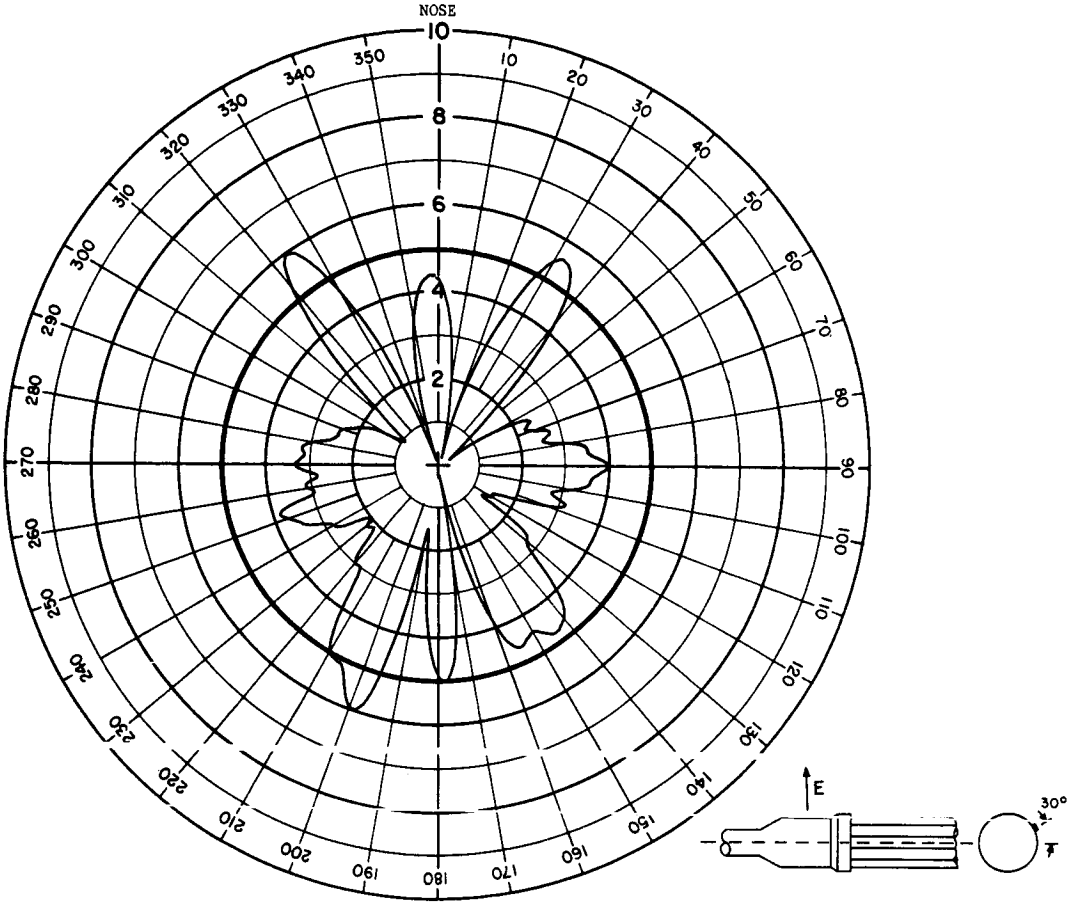
ANTENNA RADIATION PATTERN NO. 202-22

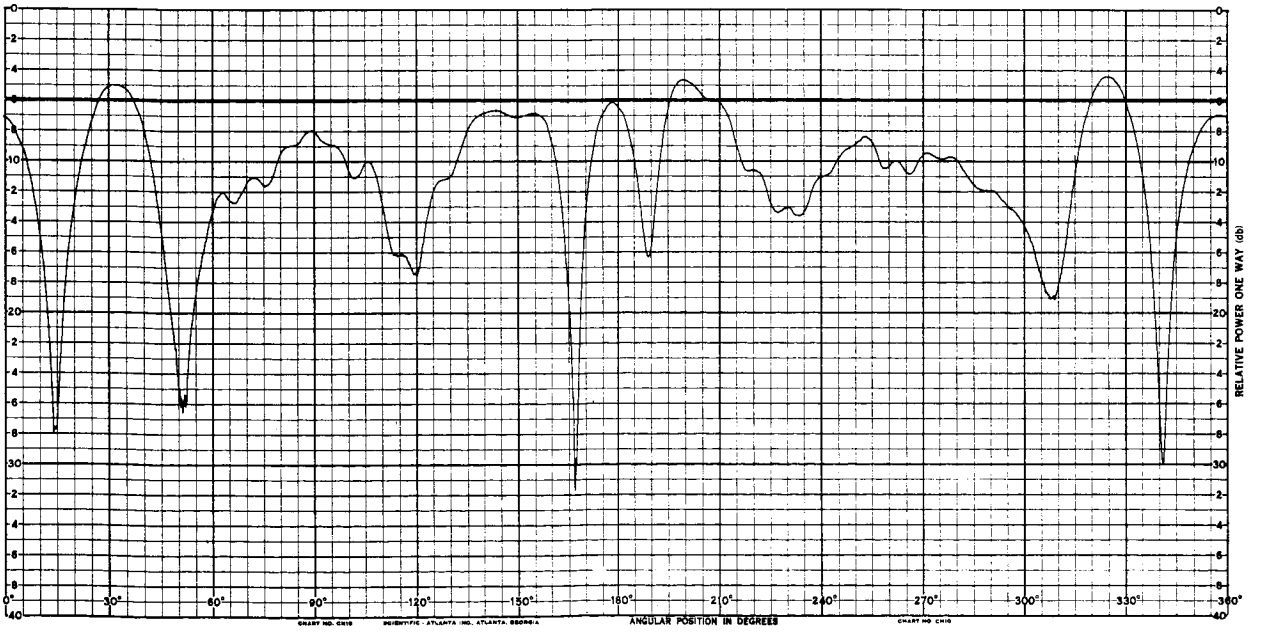
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





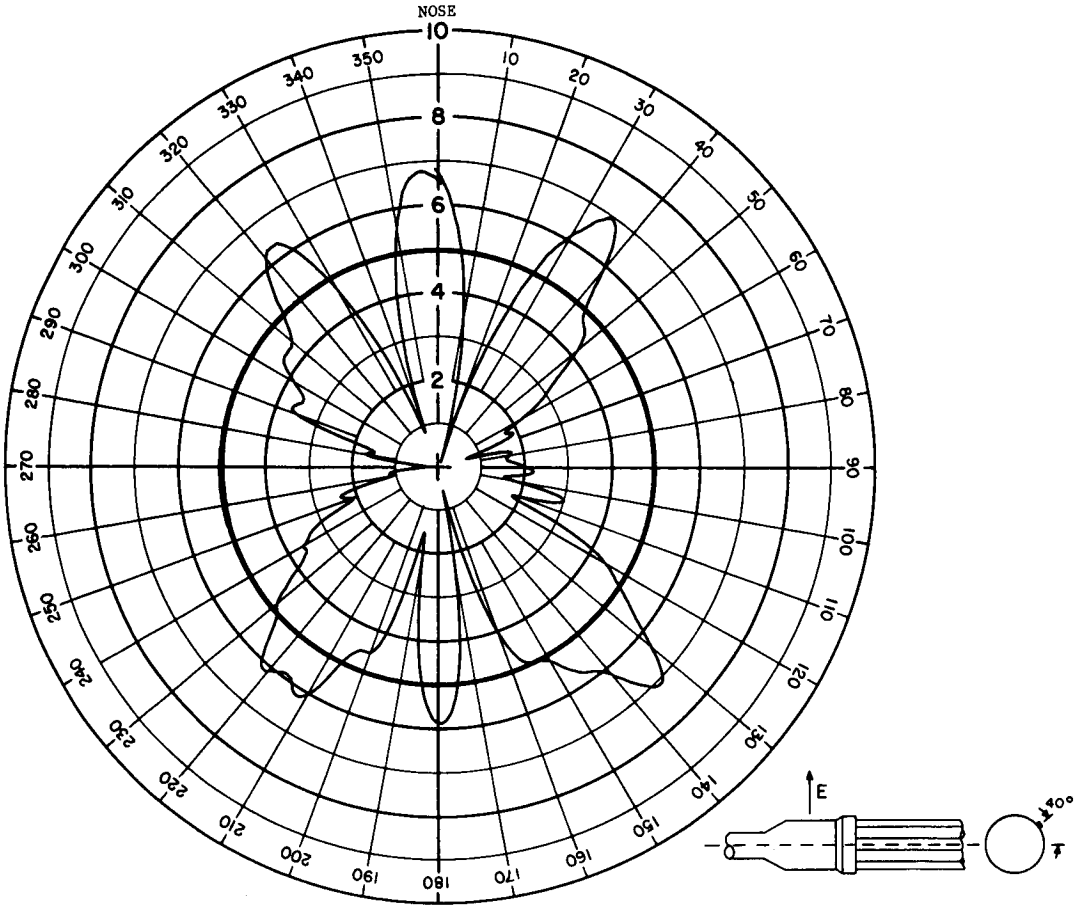
ANTENNA RADIATION PATTERN NO. 202-23

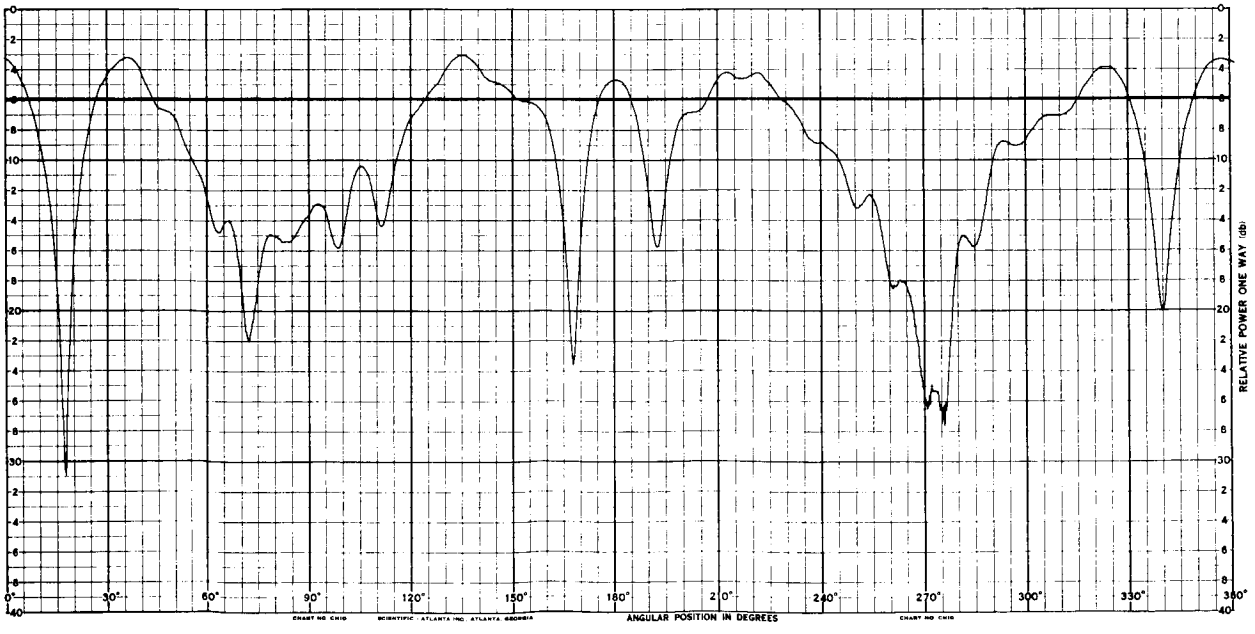
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





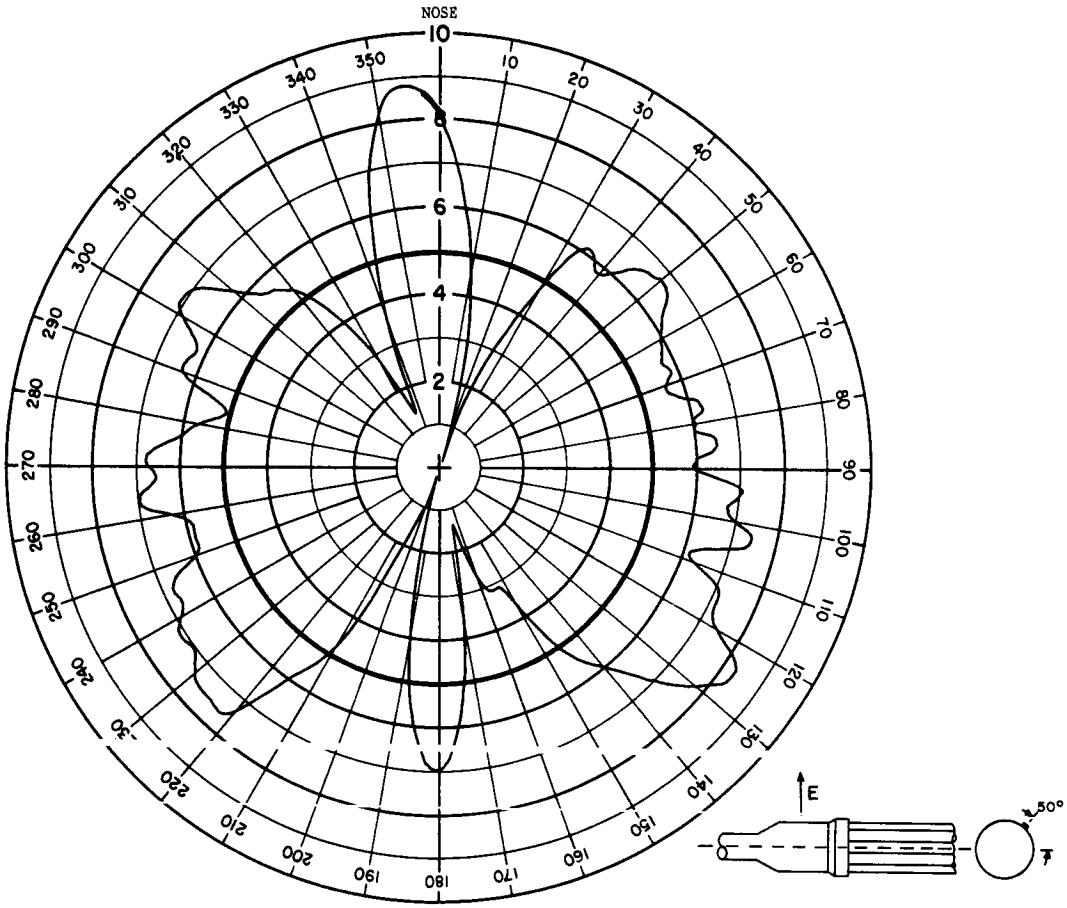
ANTENNA RADIATION PATTERN NO. 202-24

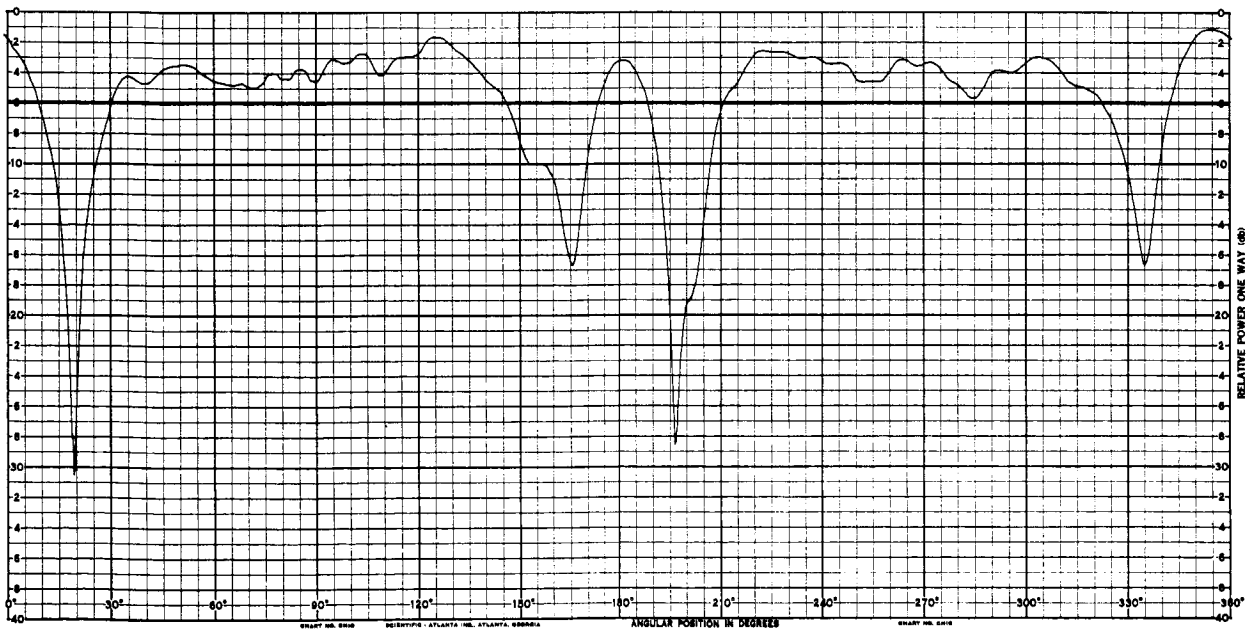
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



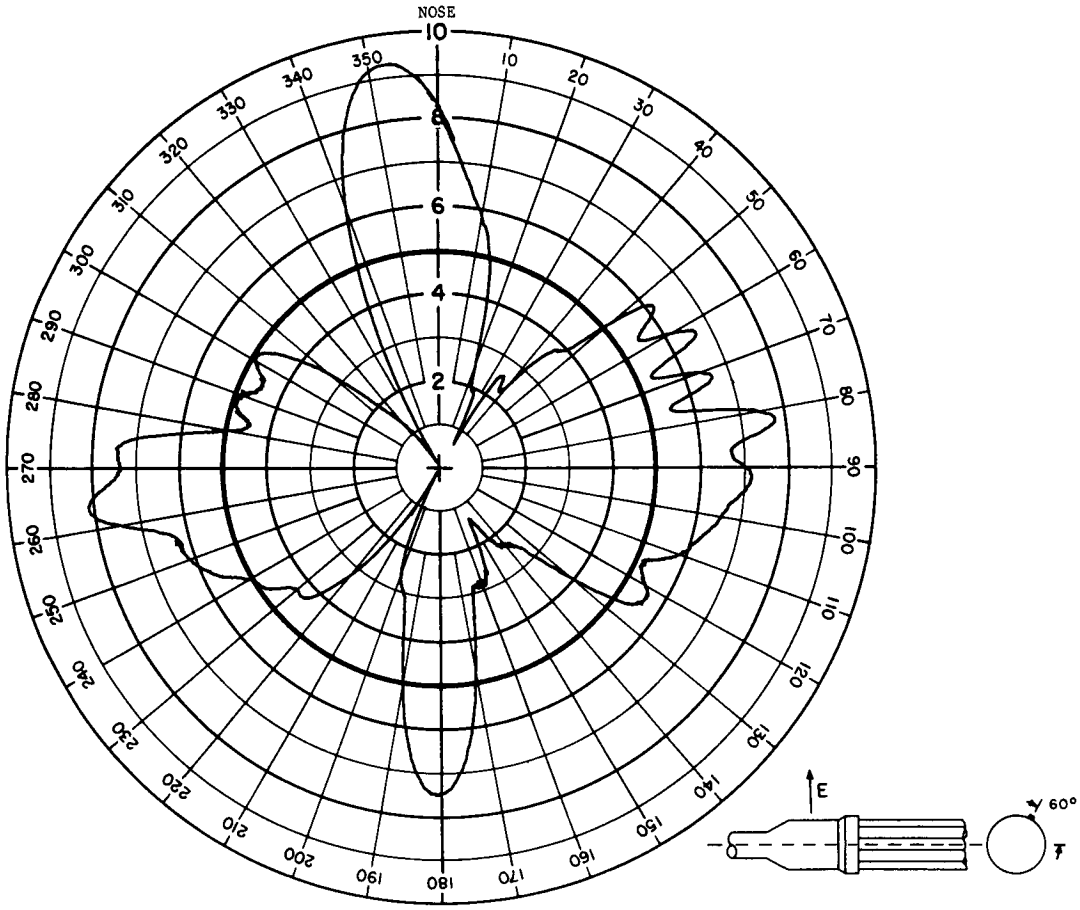


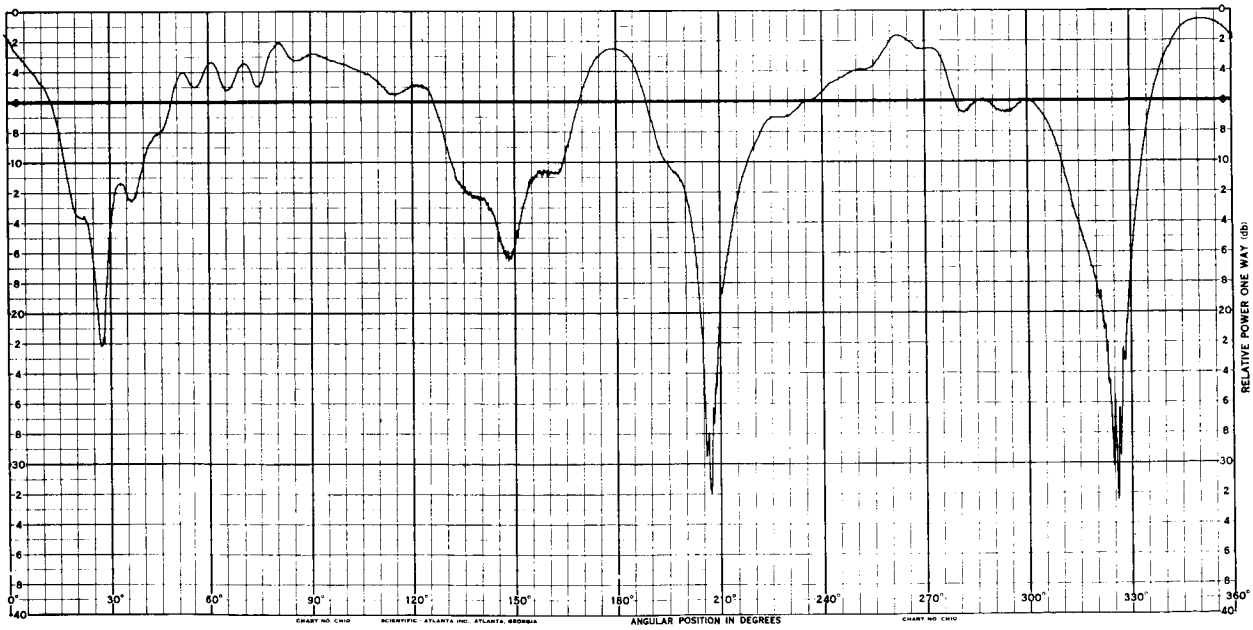
ANTENNA RADIATION PATTERN NO. 202-25

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



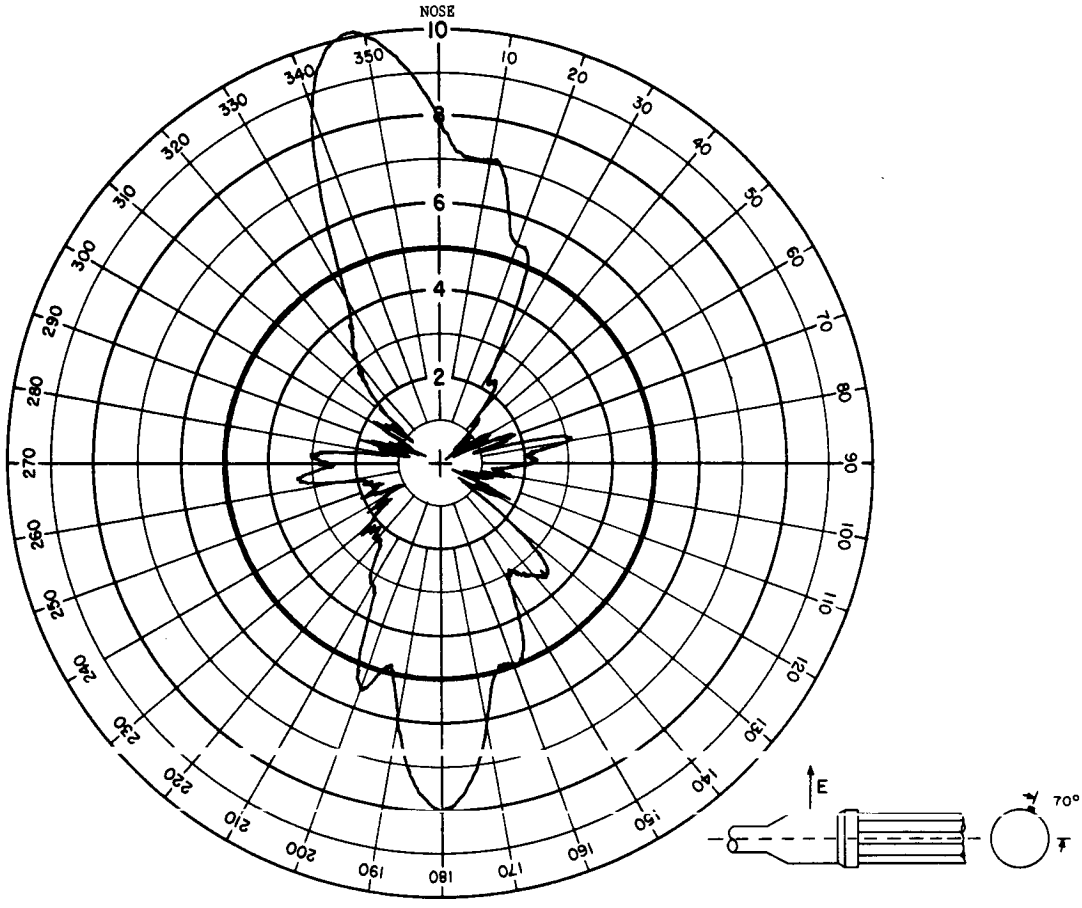


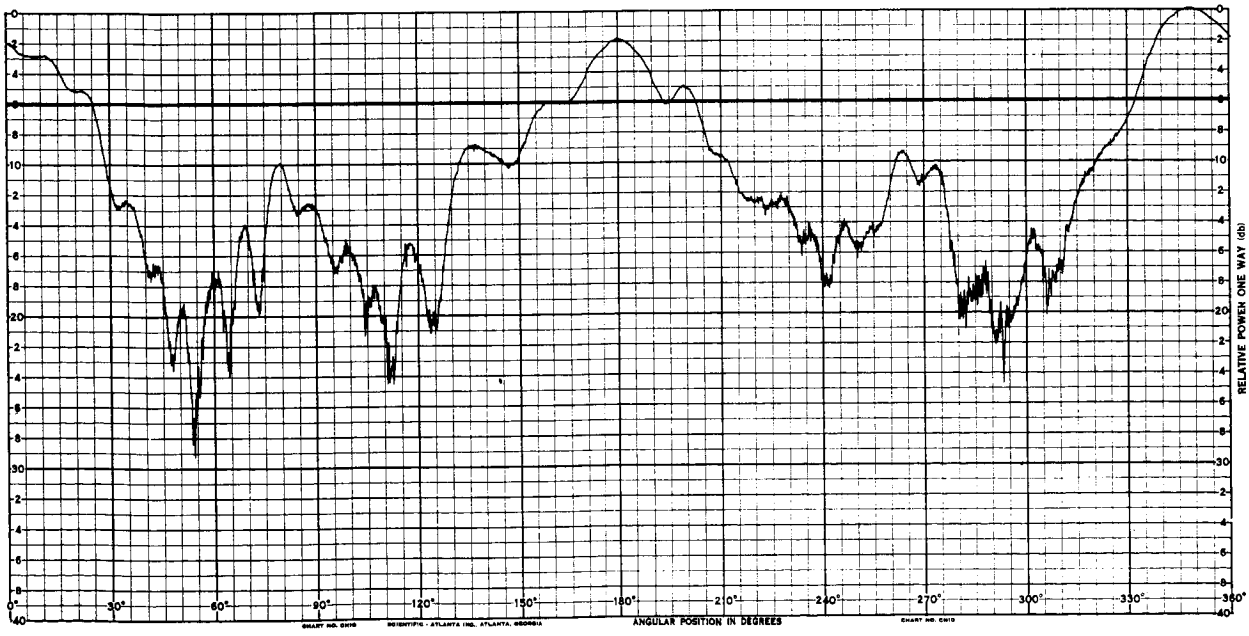
ANTENNA RADIATION PATTERN NO. 202-26

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



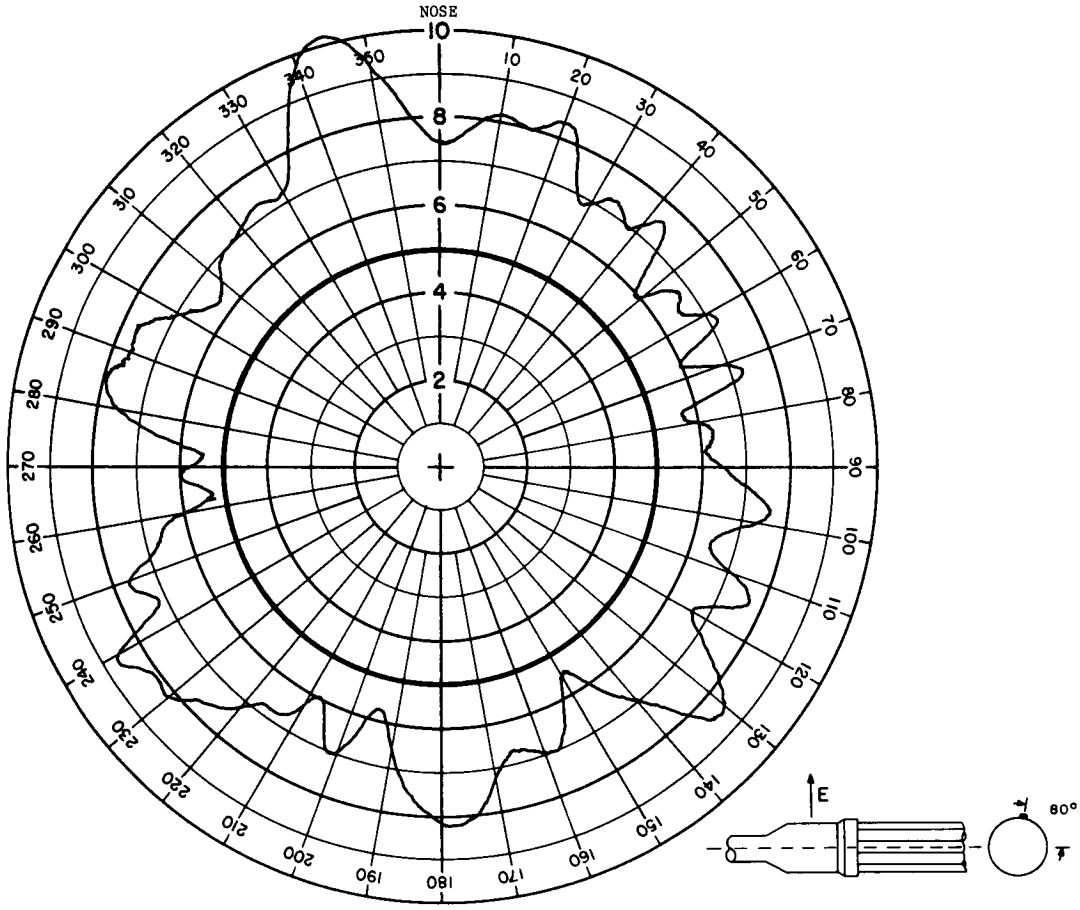


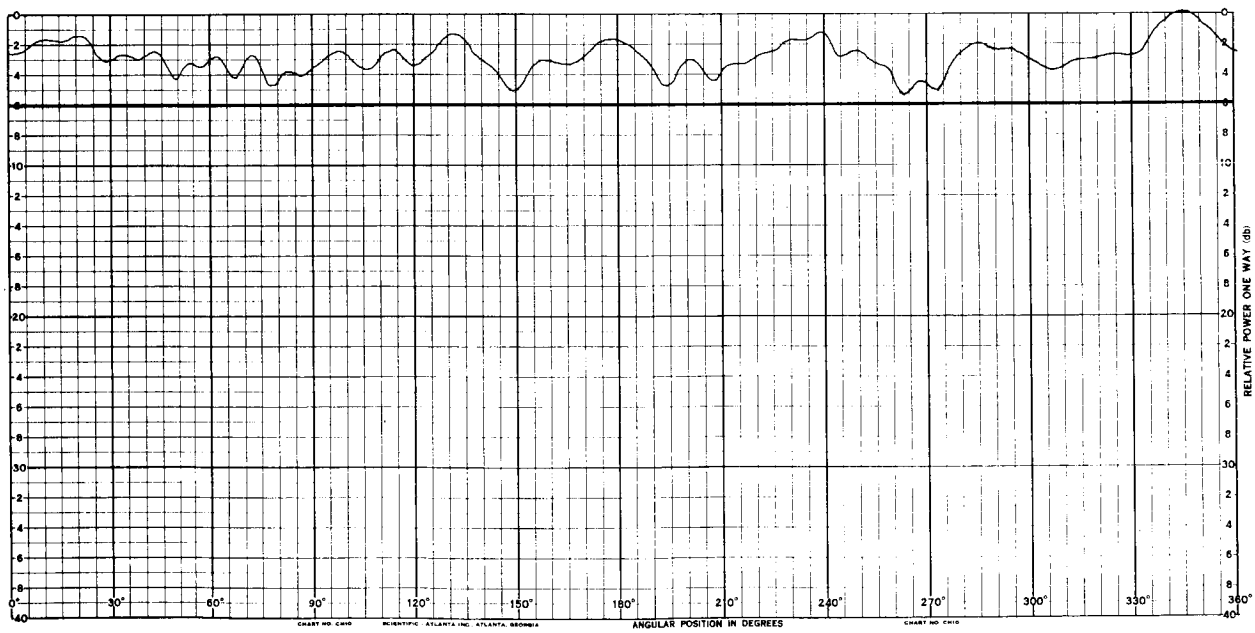
ANTENNA RADIATION PATTERN NO. 202-27

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



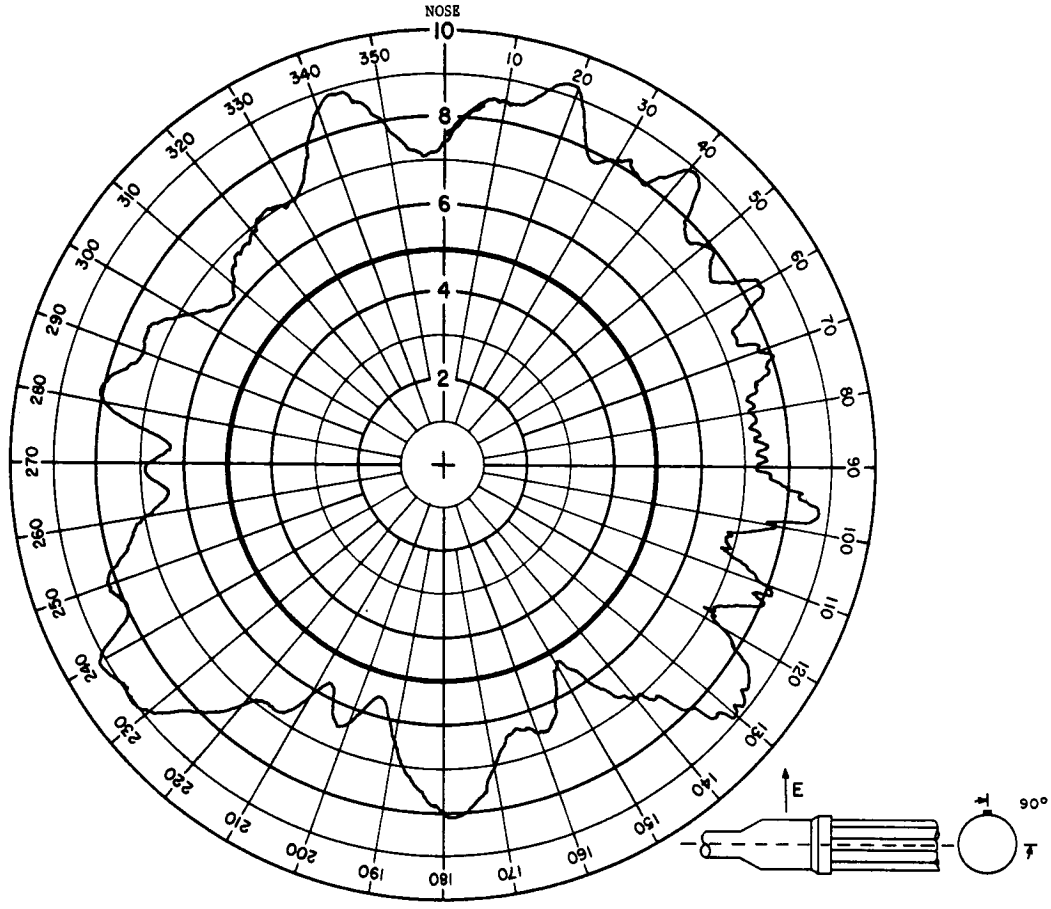


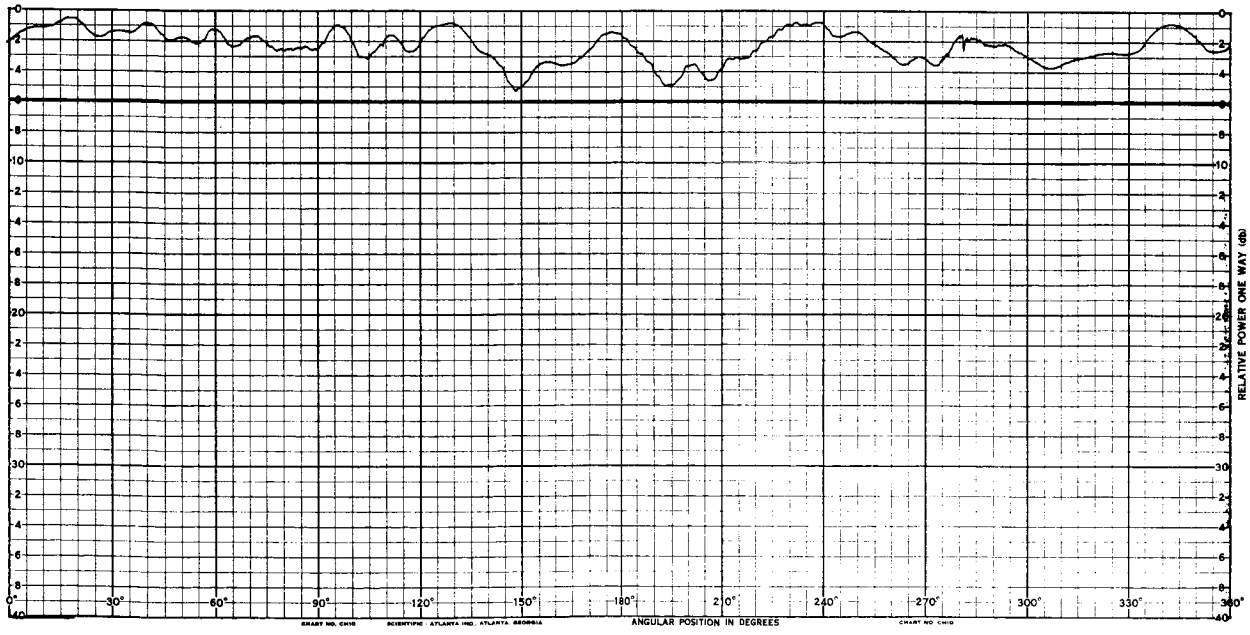
ANTENNA RADIATION PATTERN NO. 202-28

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



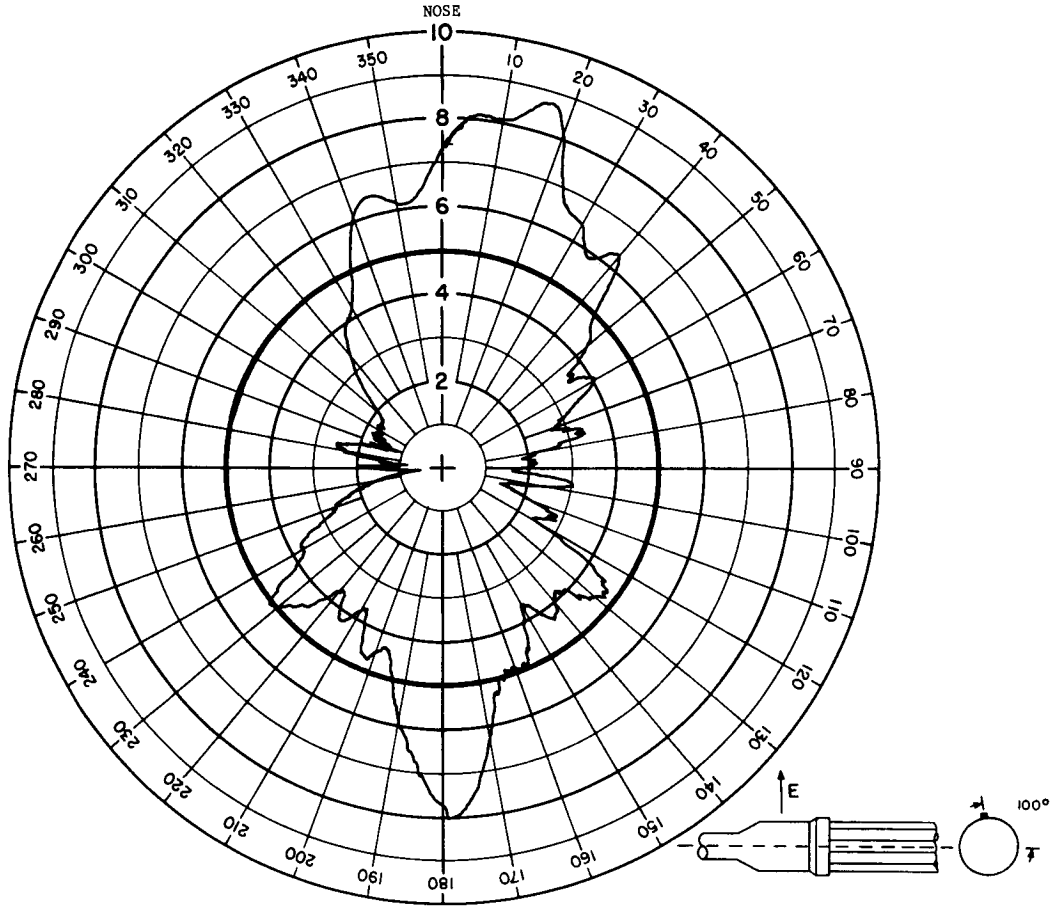


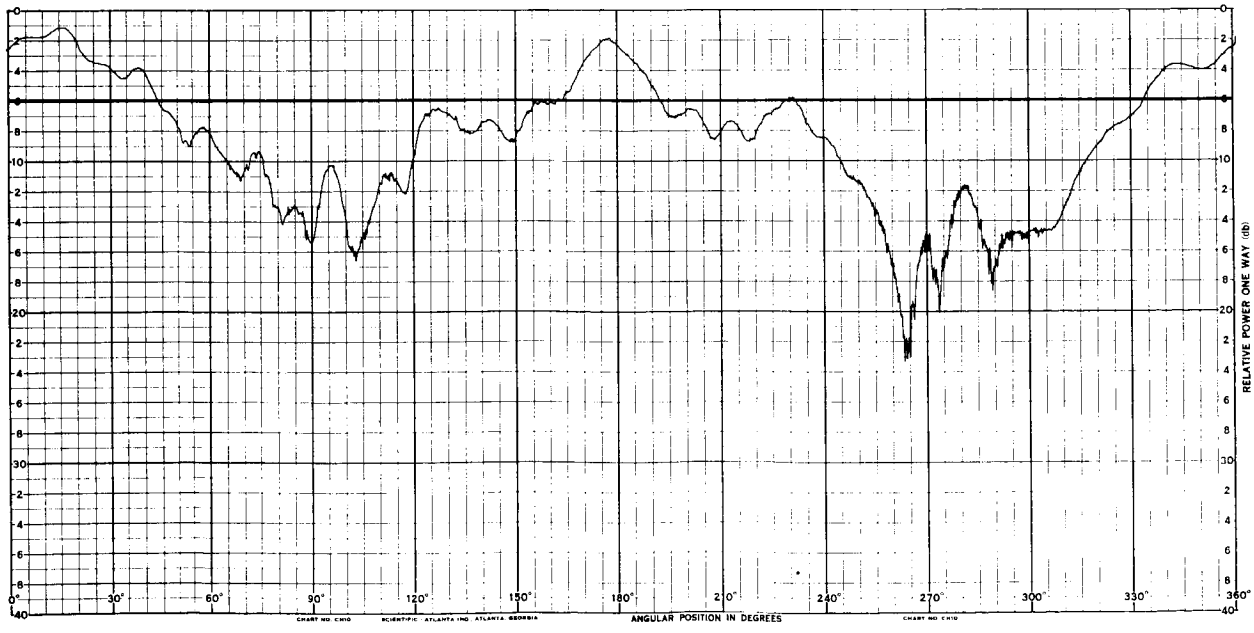
ANTENNA RADIATION PATTERN NO. 202-29

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





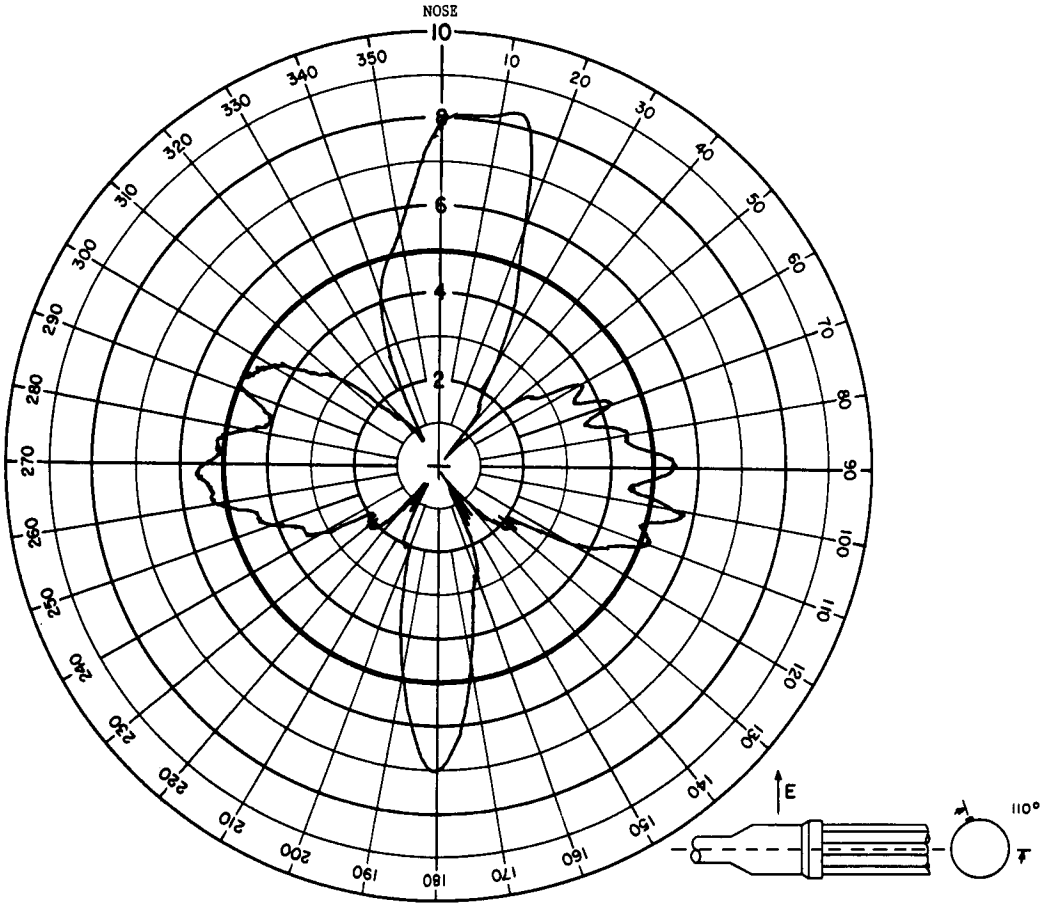
ANTENNA RADIATION PATTERN NO. 202-30

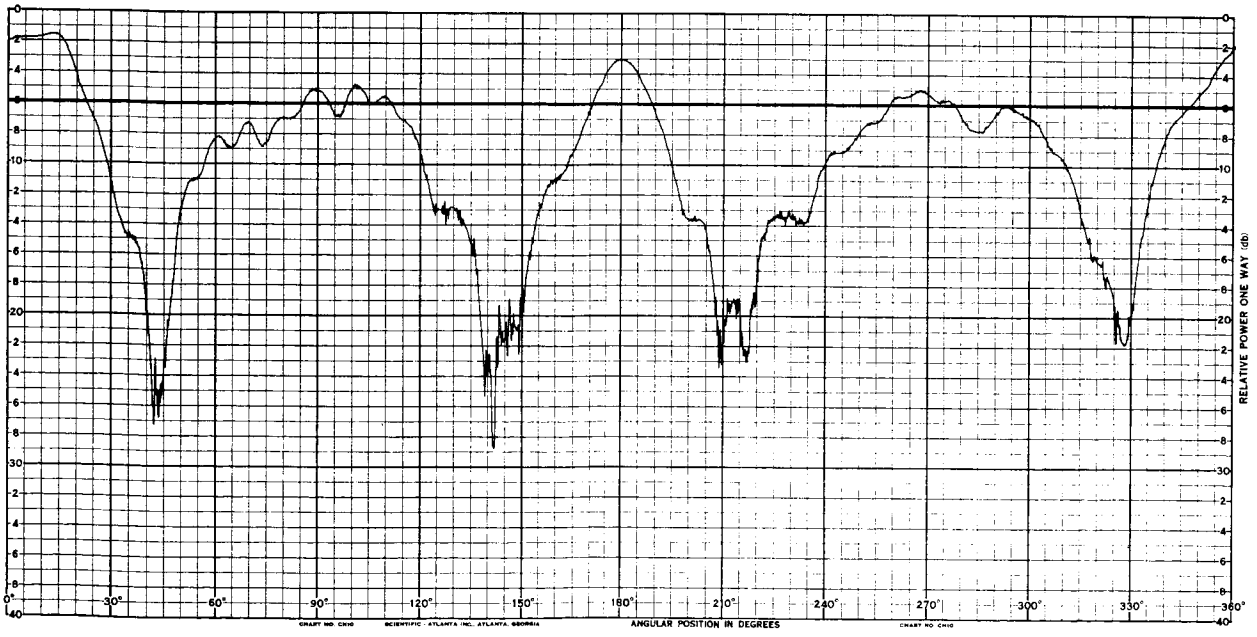
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





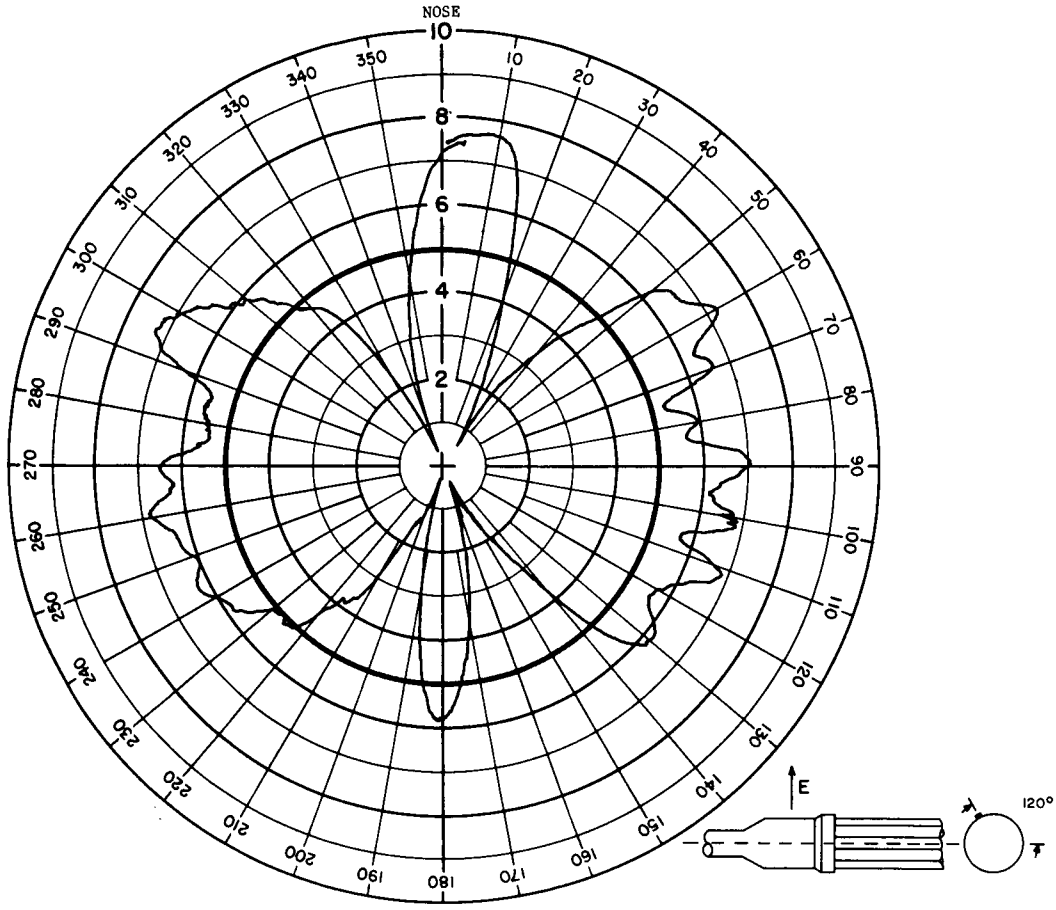
ANTENNA RADIATION PATTERN NO. 202-31

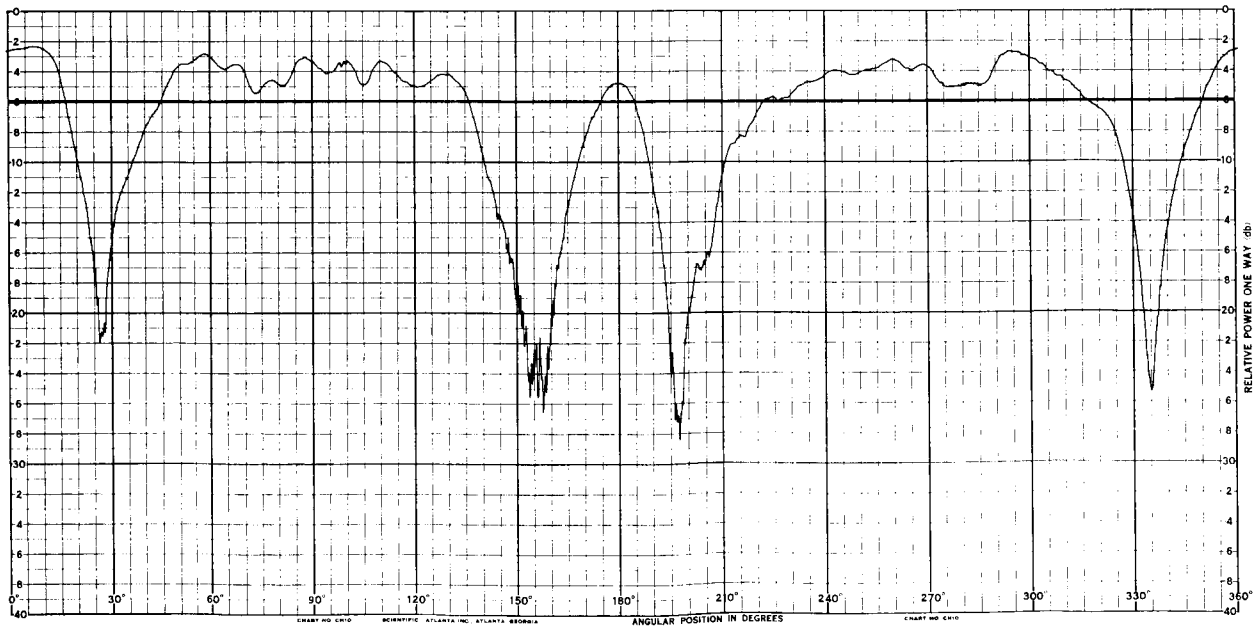
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





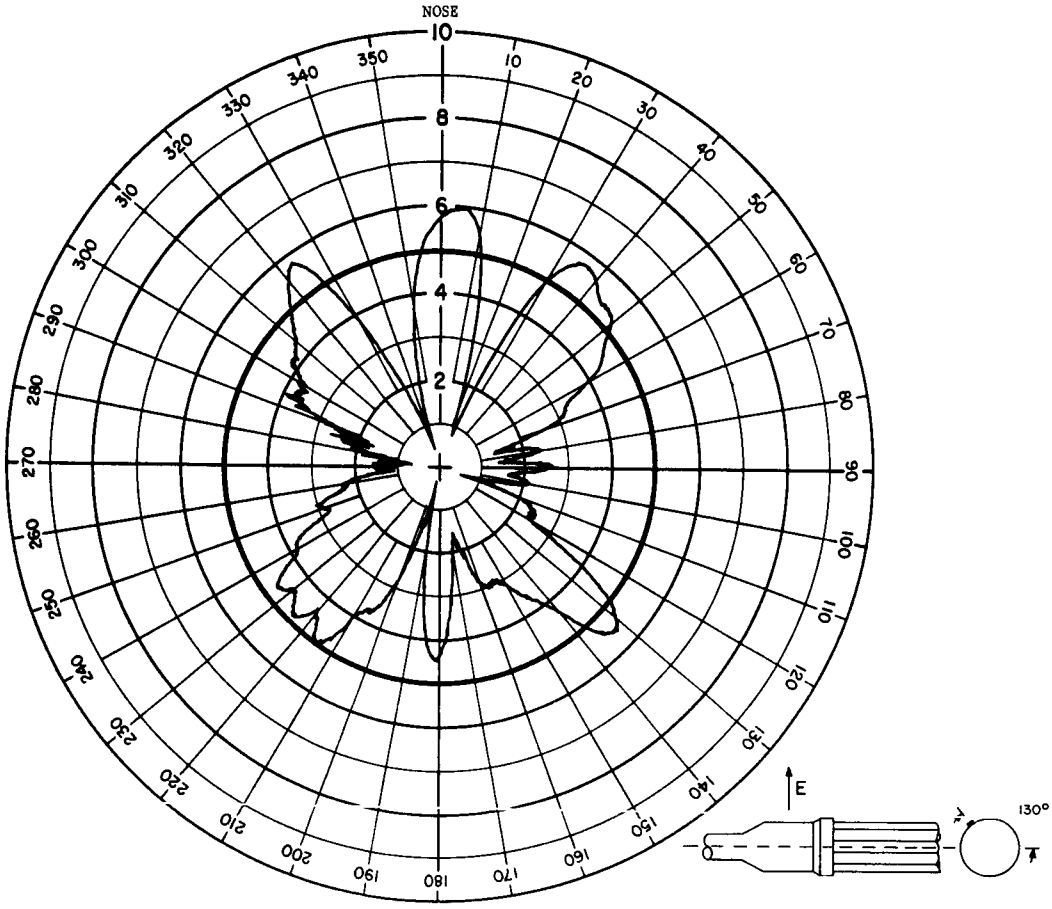
ANTENNA RADIATION PATTERN NO. 202-32

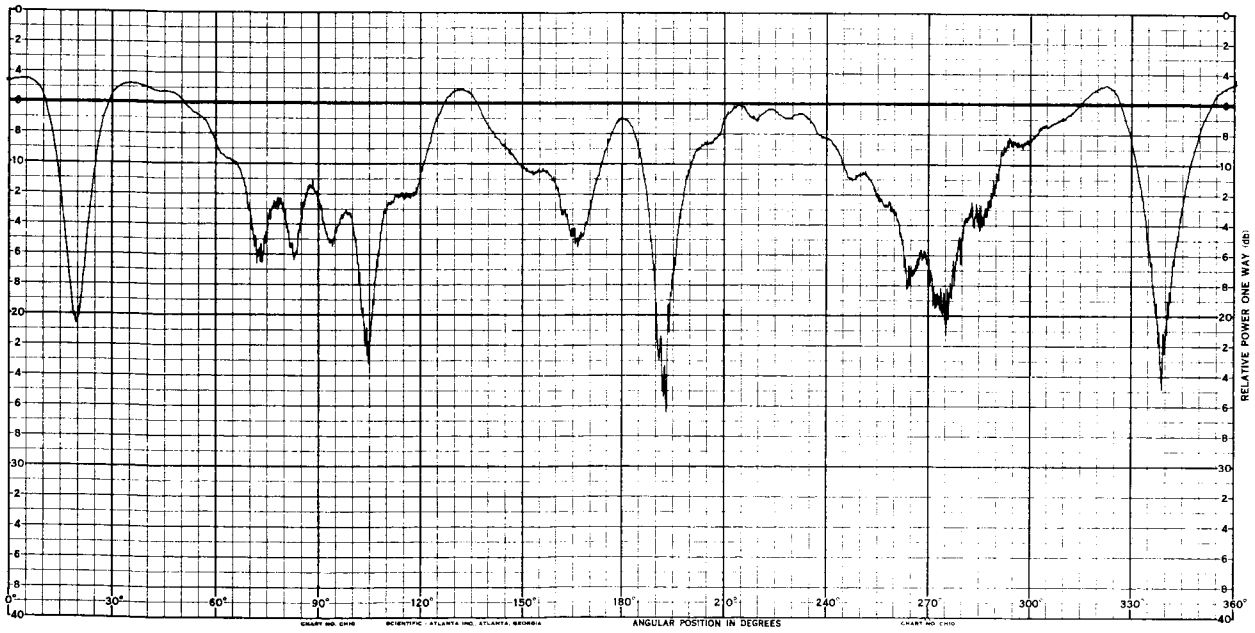
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



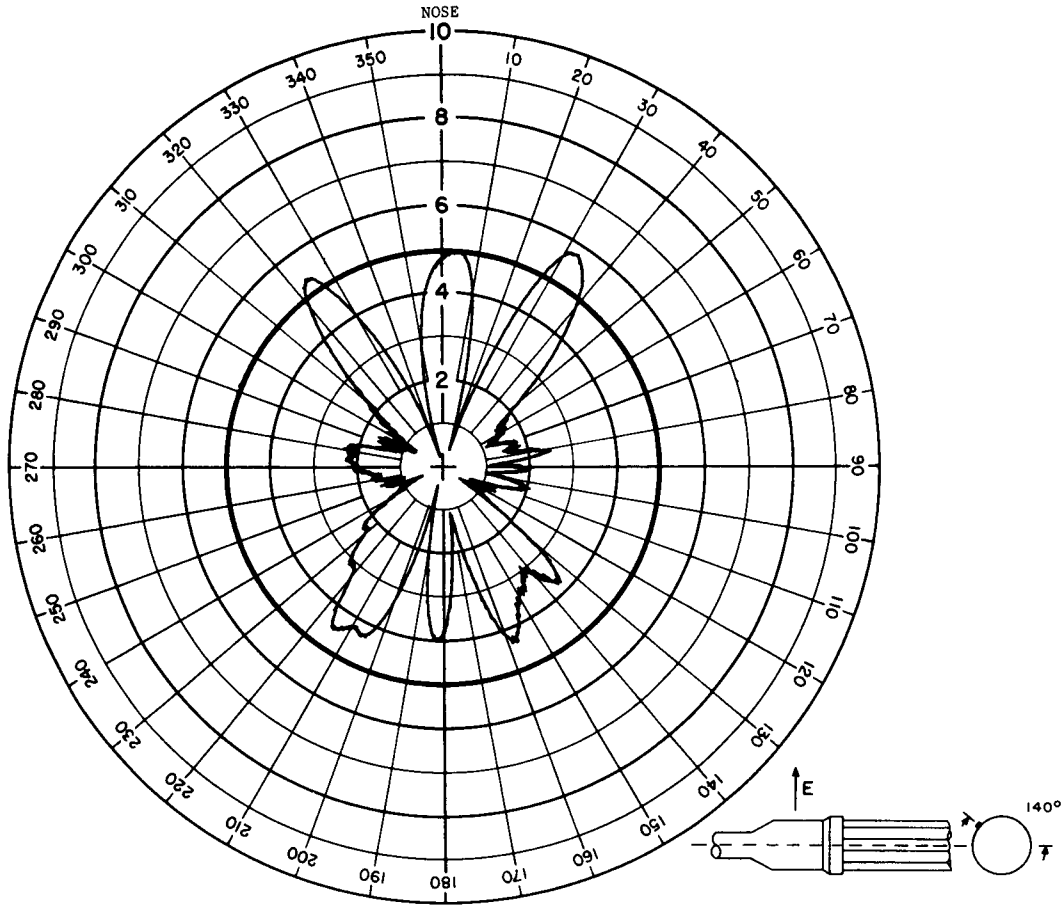


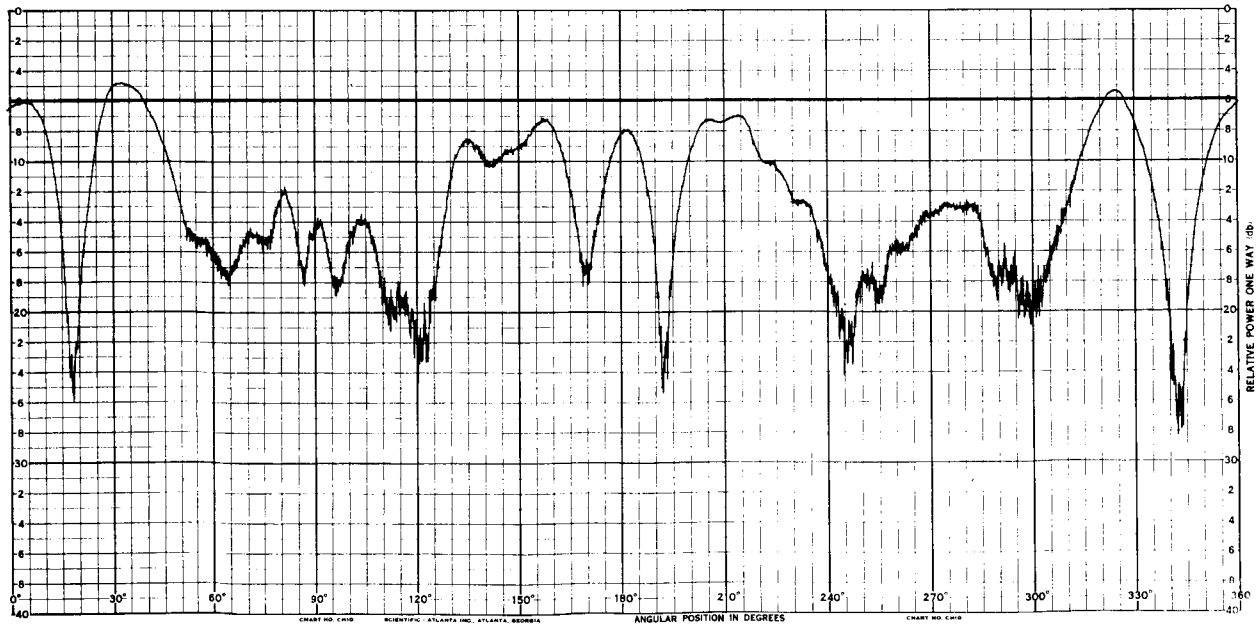
ANTENNA RADIATION PATTERN NO. 202-33

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



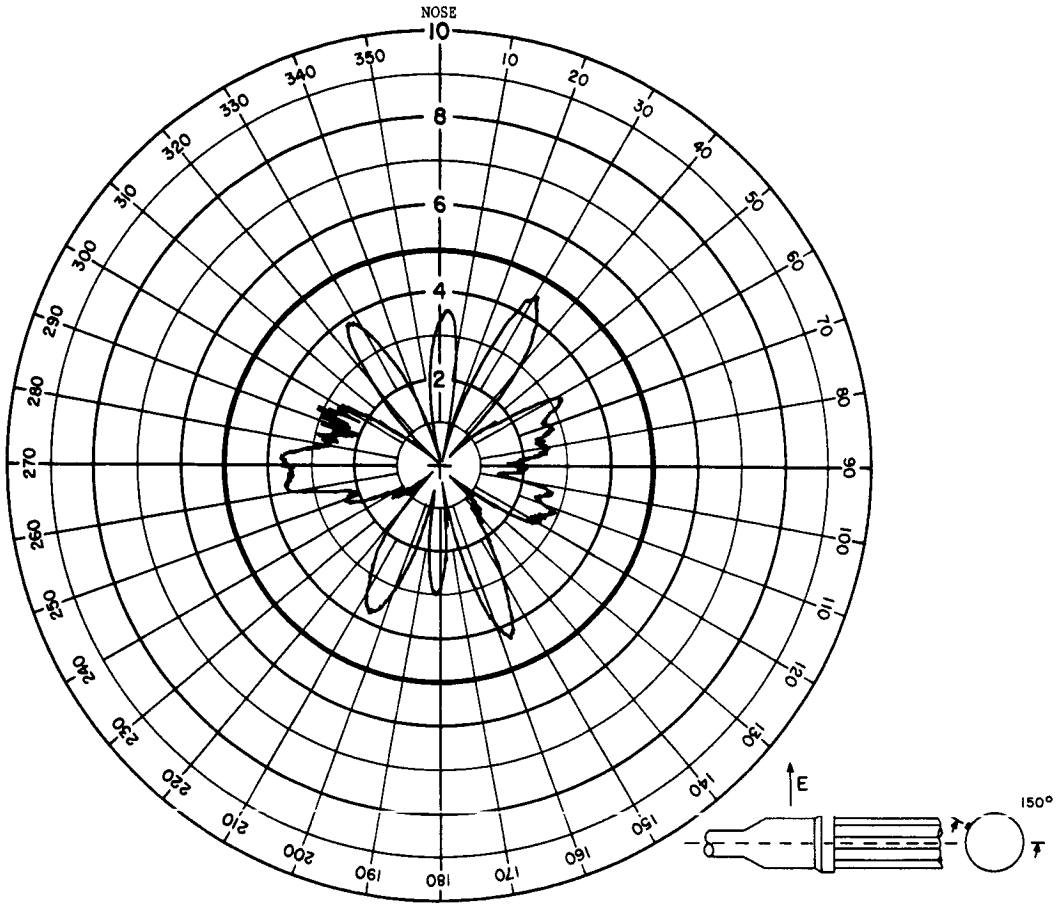


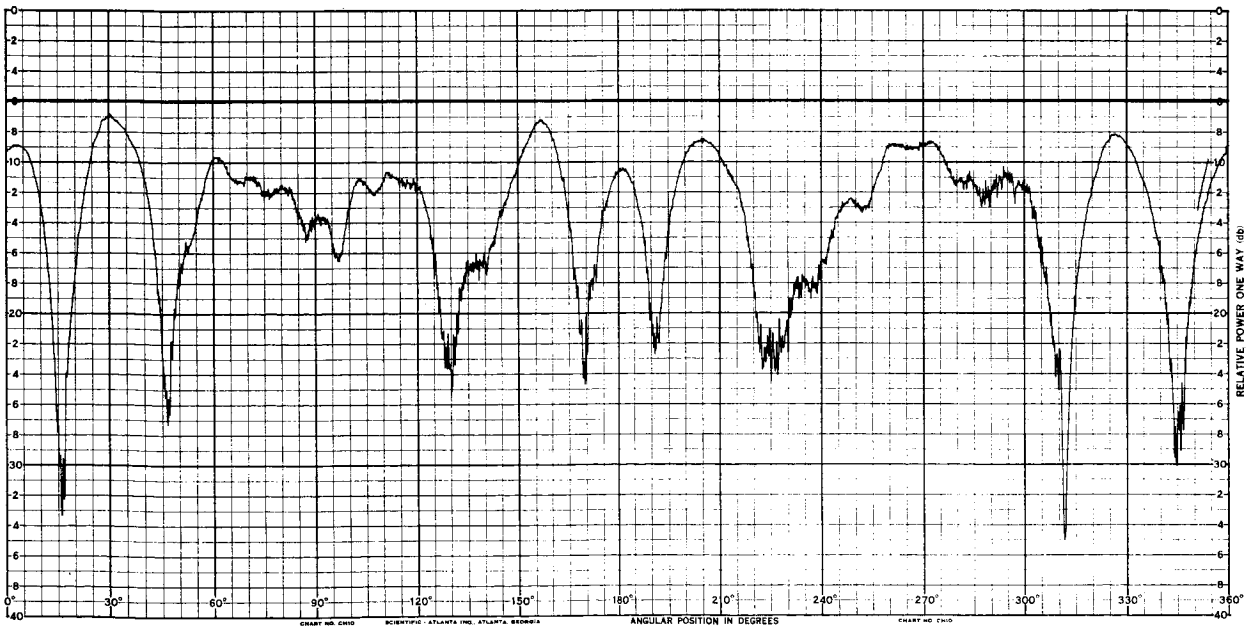
ANTENNA RADIATION PATTERN NO. 202-34

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





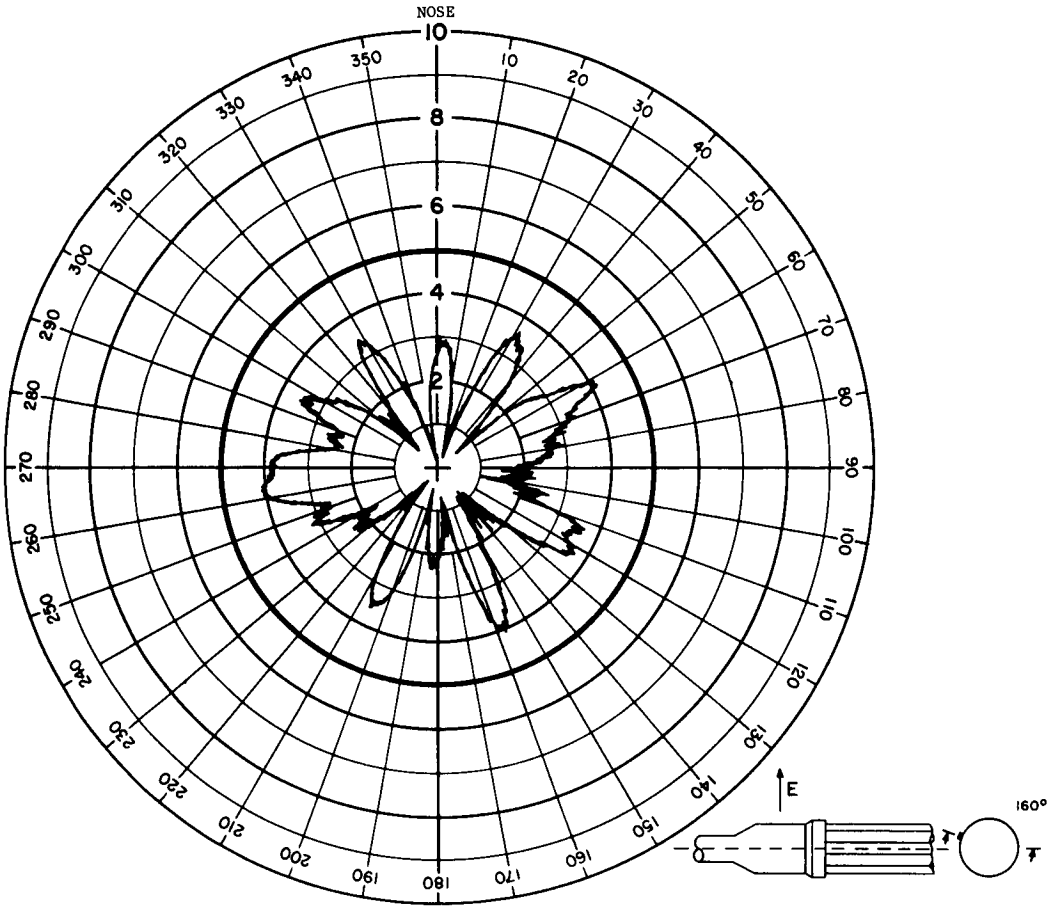
ANTENNA RADIATION PATTERN NO. 202-35

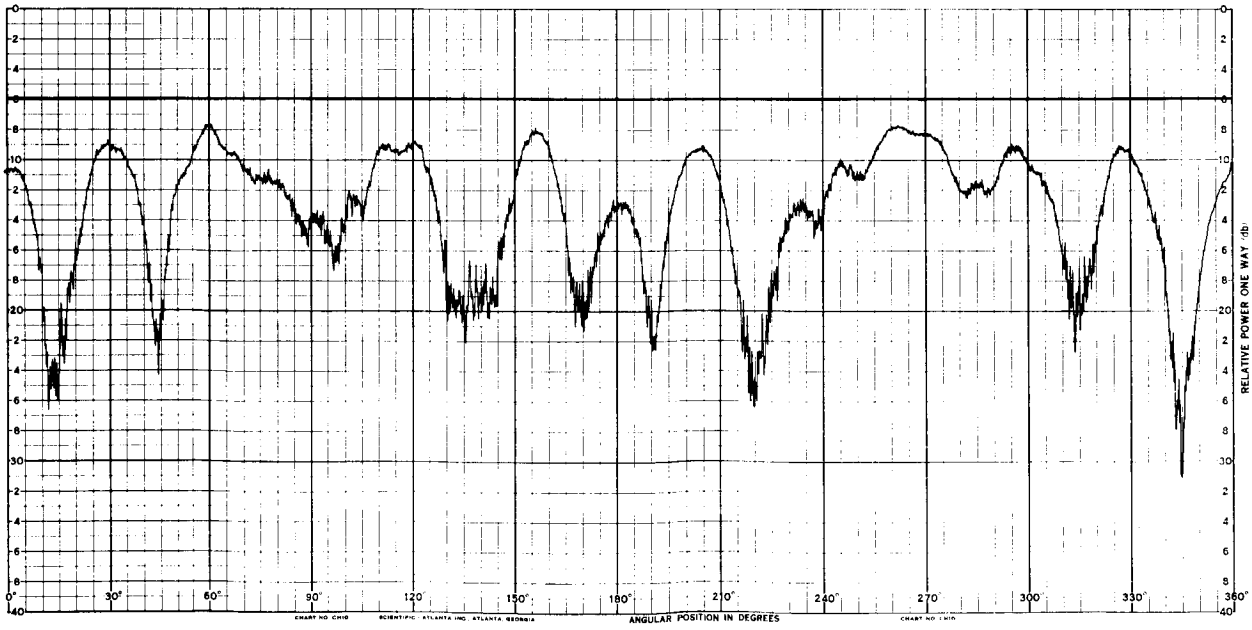
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





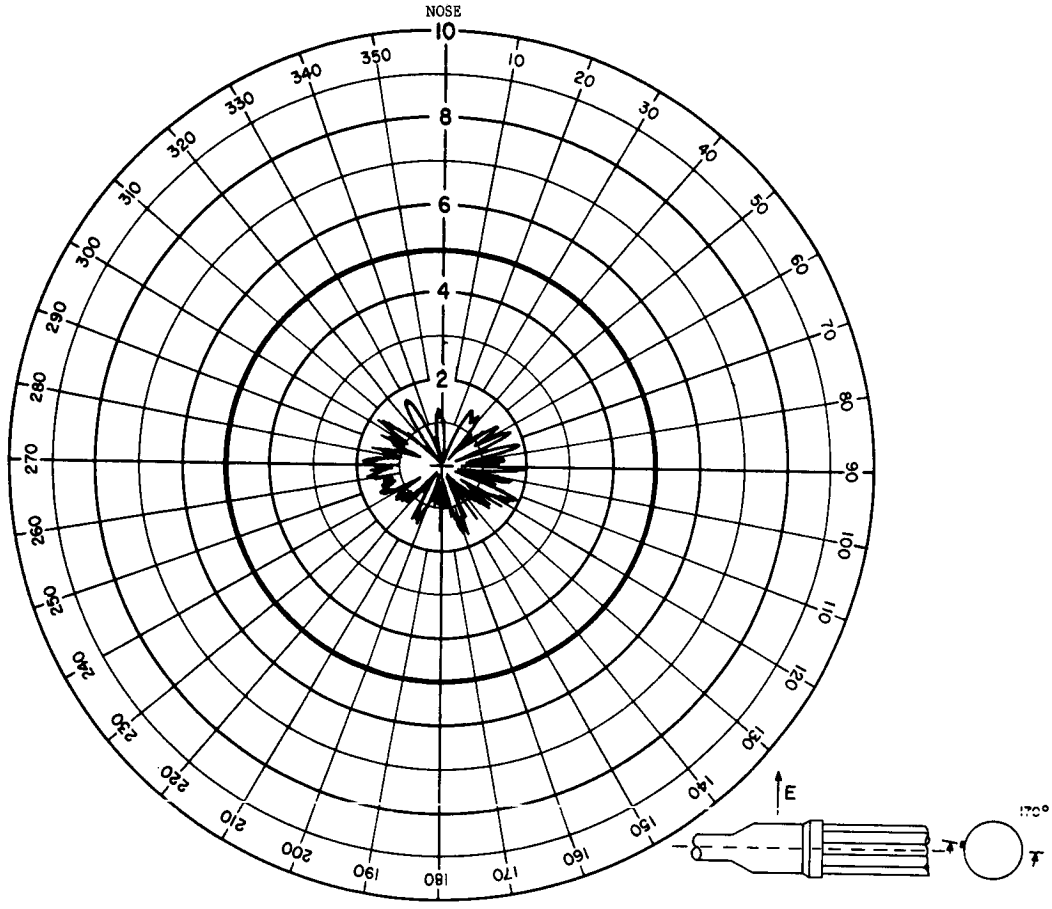
ANTENNA RADIATION PATTERN NO. 202-36

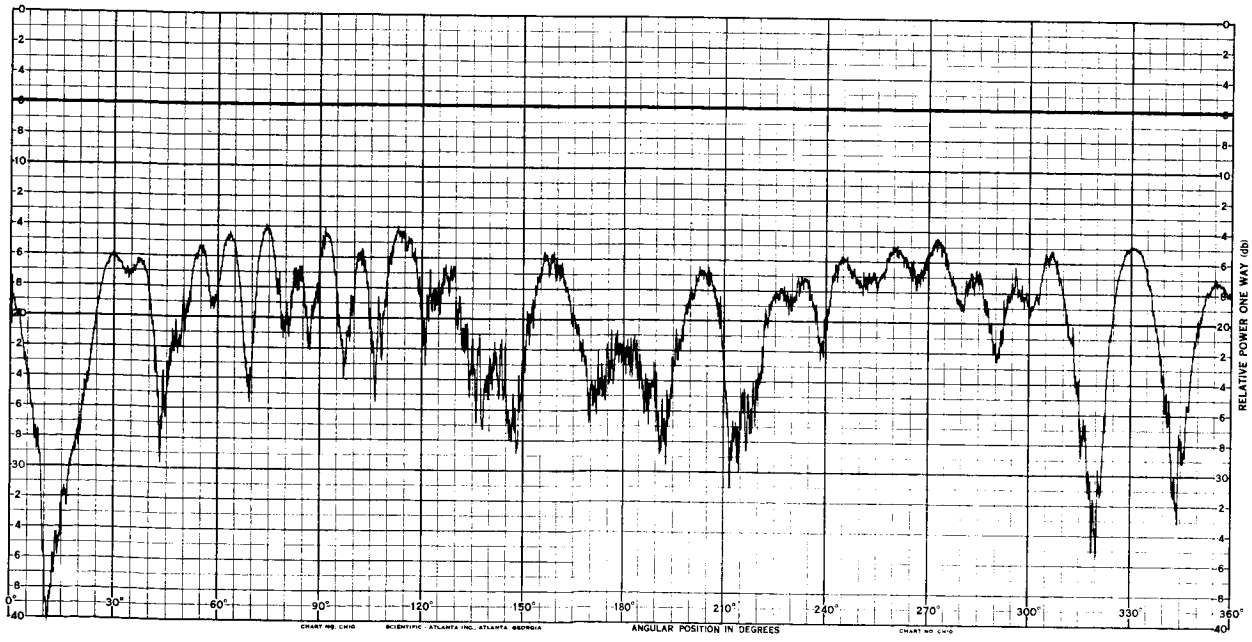
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





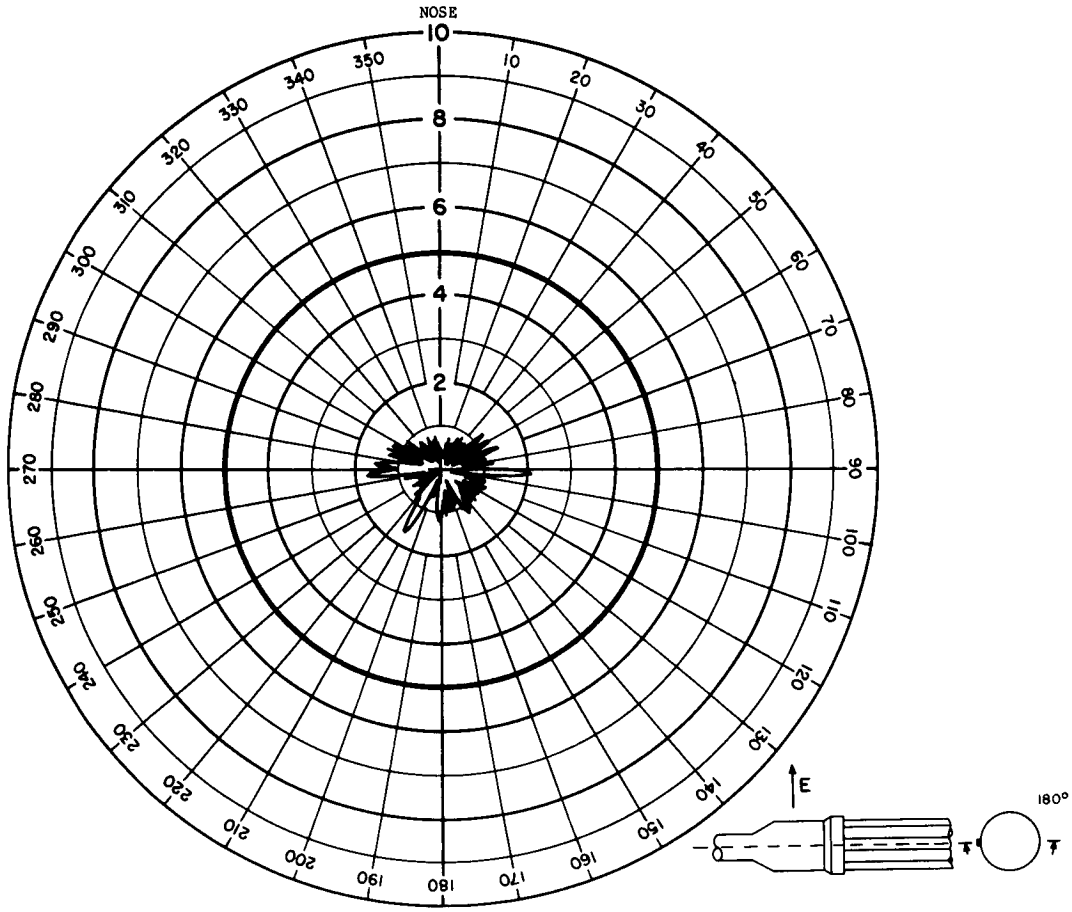
ANTENNA RADIATION PATTERN NO. 202-37

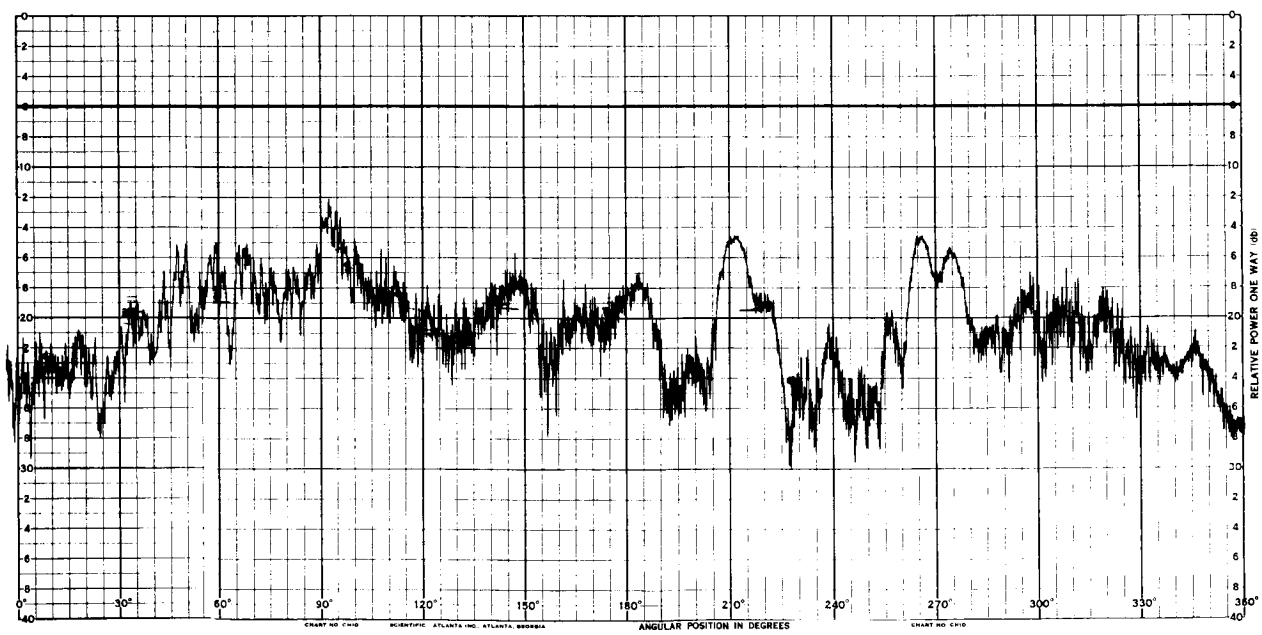
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT

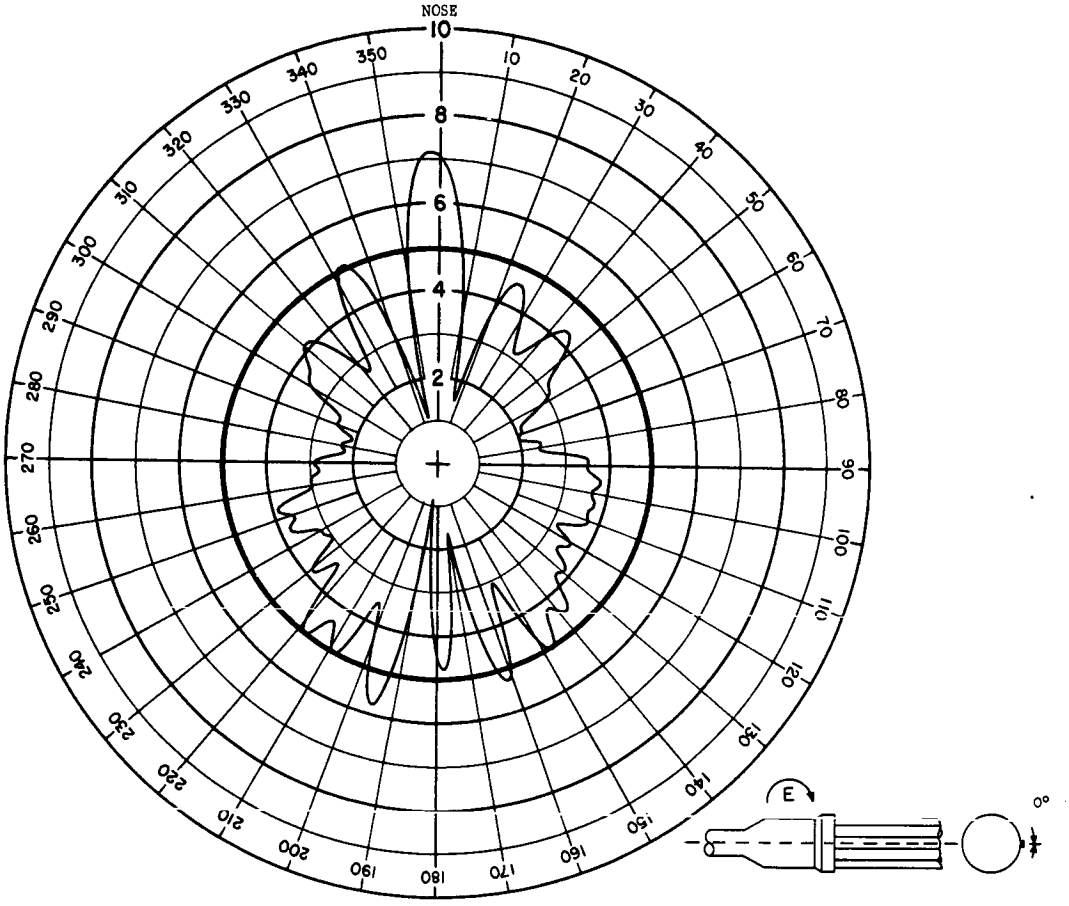


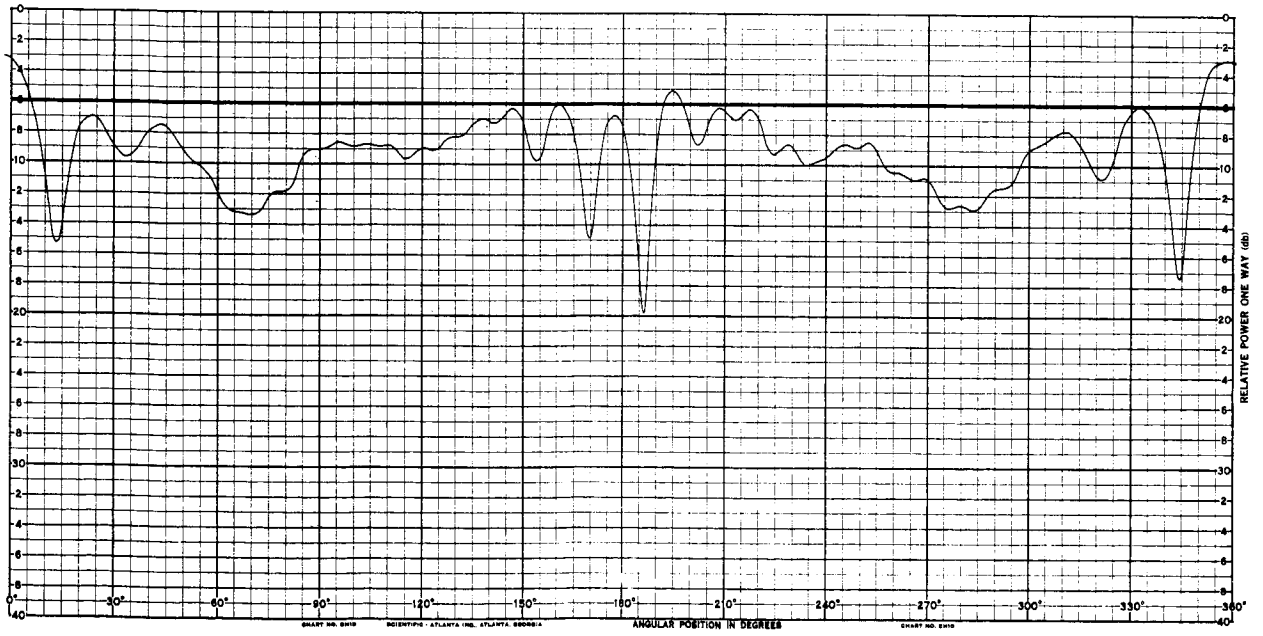


ANTENNA RADIATION PATTERN NO. 202-38

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM
VOT





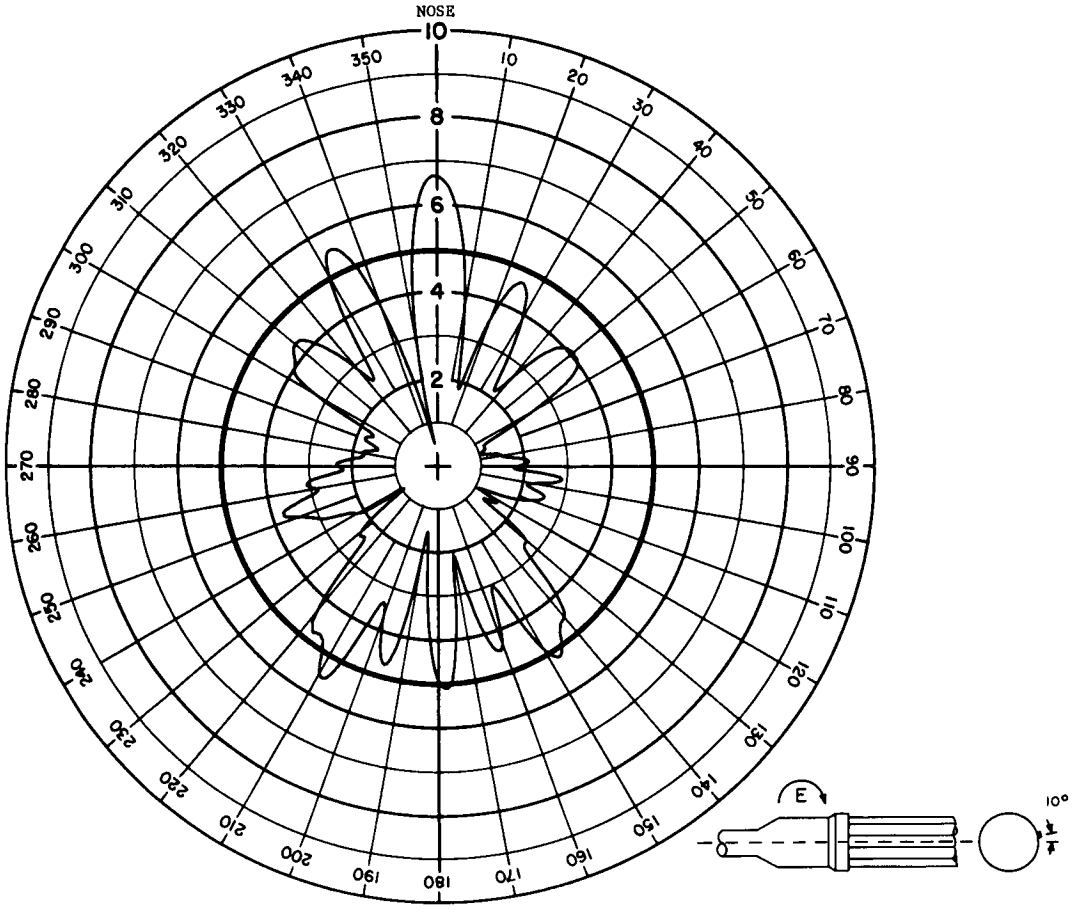
ANTENNA RADIATION PATTERN NO. 202-39

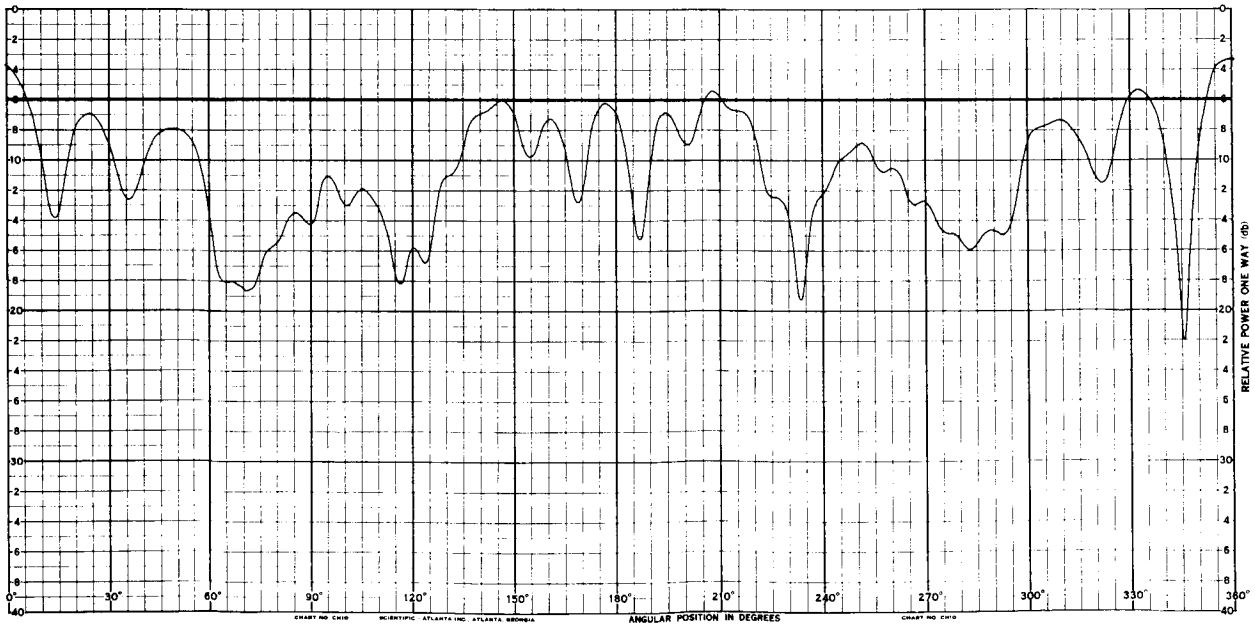
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



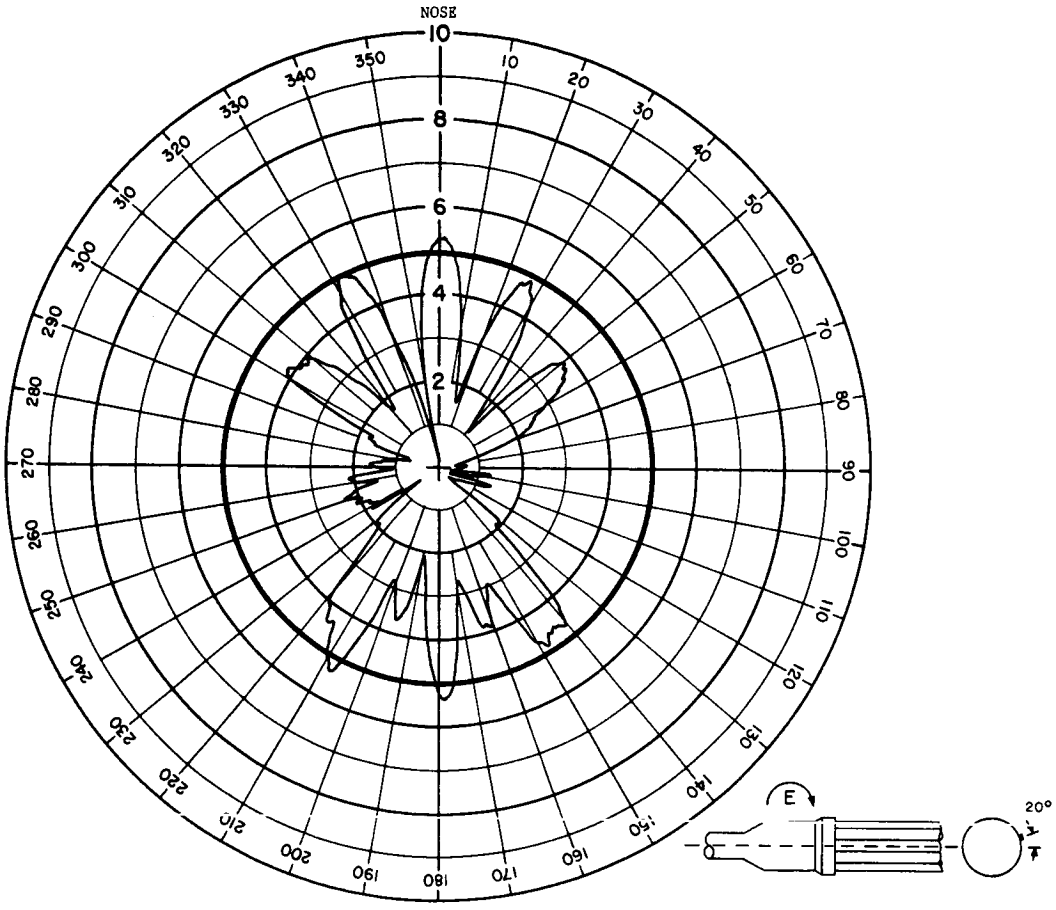


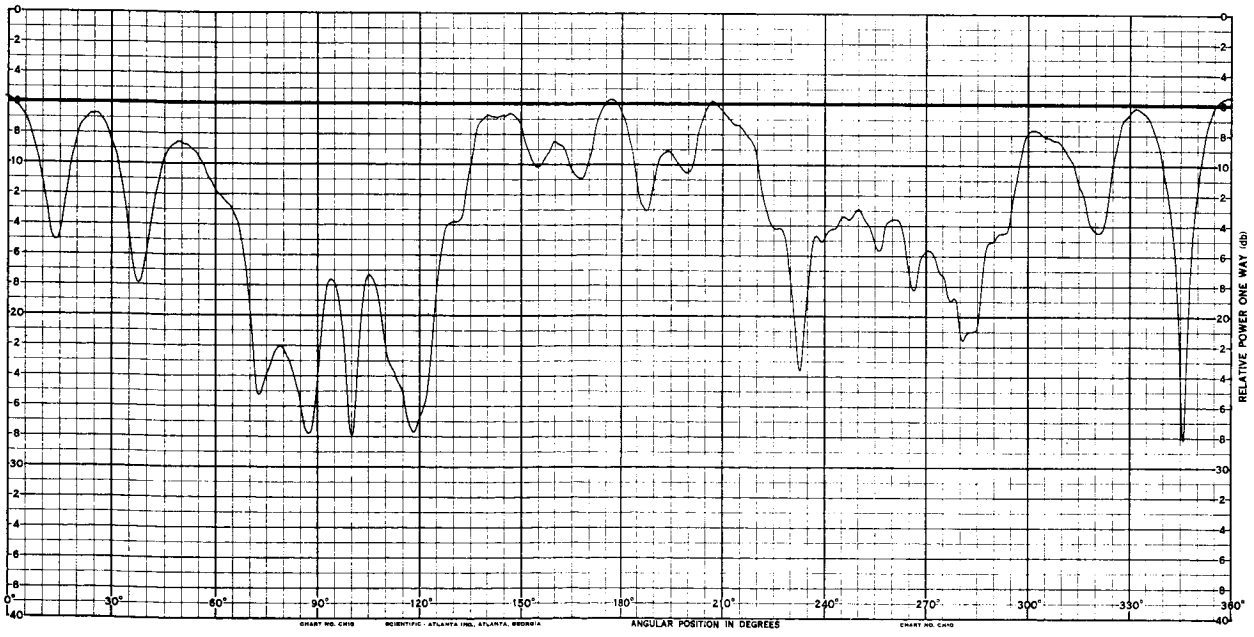
ANTENNA RADIATION PATTERN NO. 202-40

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





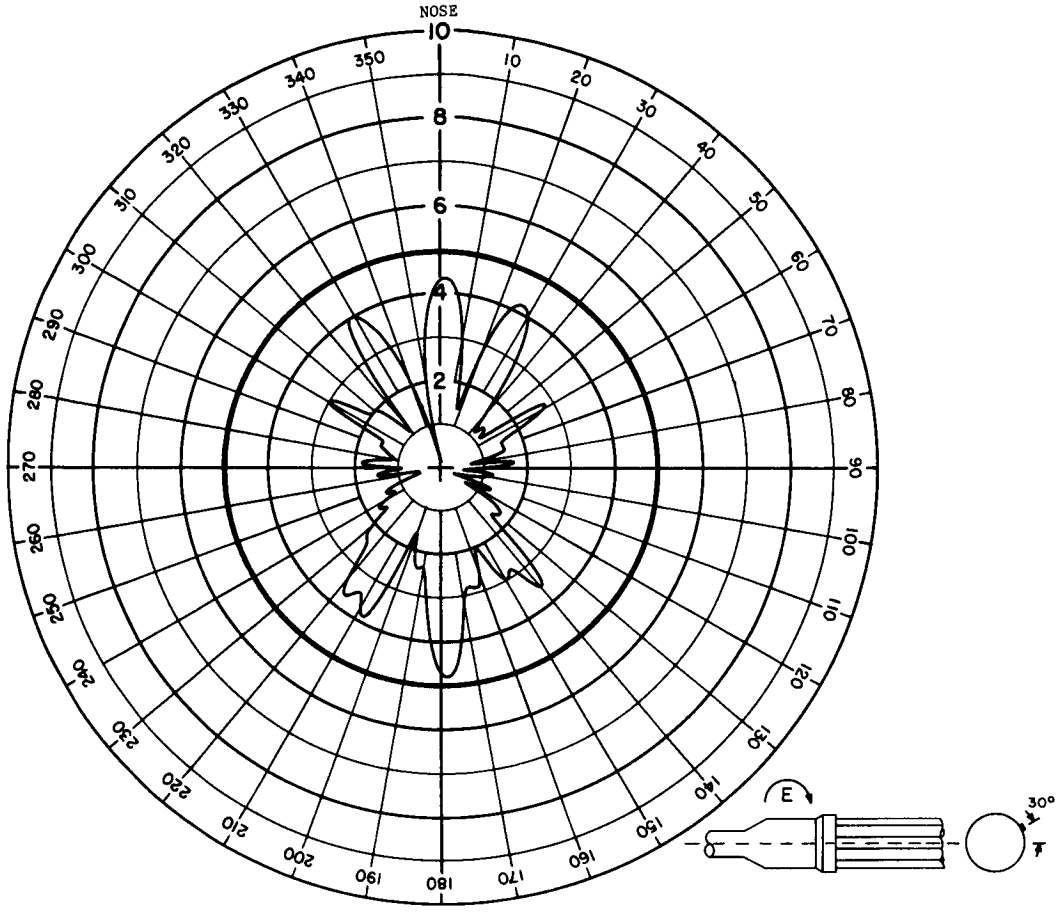
ANTENNA RADIATION PATTERN NO. 202-41

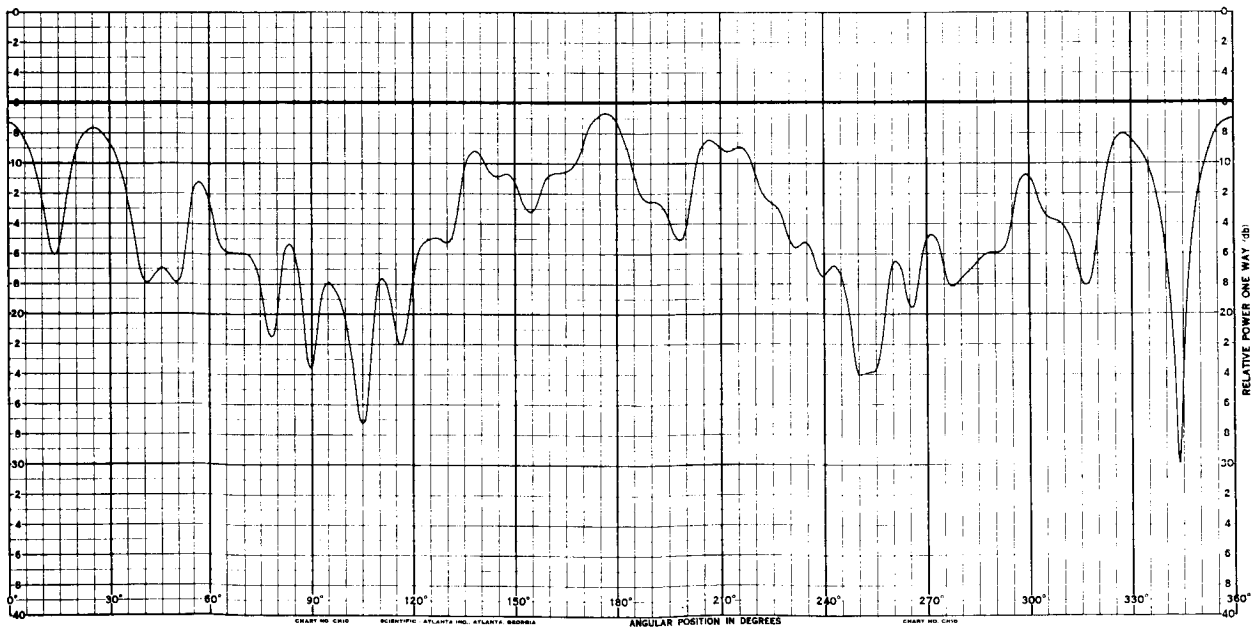
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



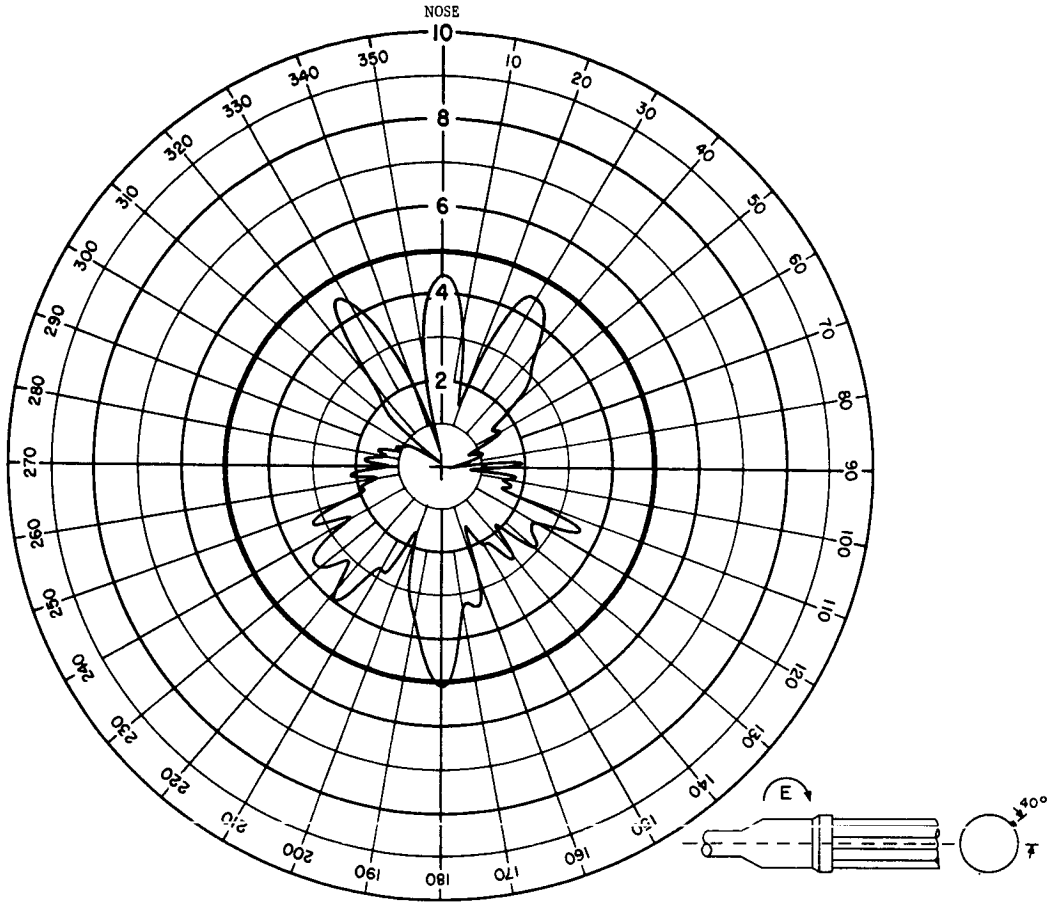


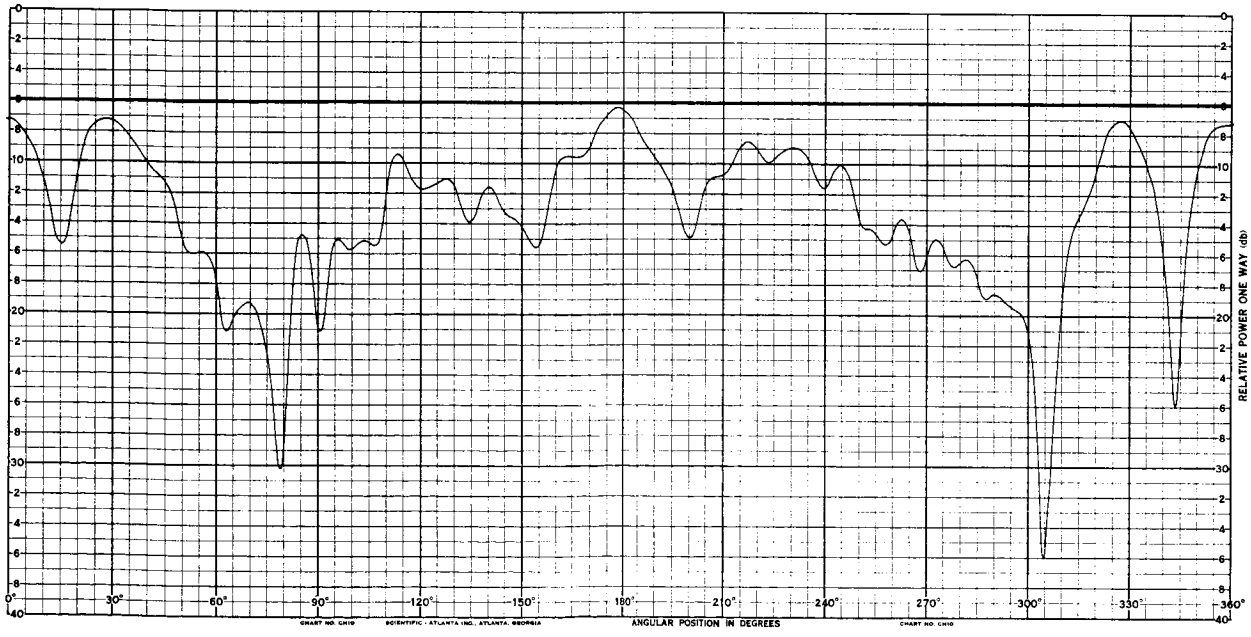
ANTENNA RADIATION PATTERN NO. 202-42

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





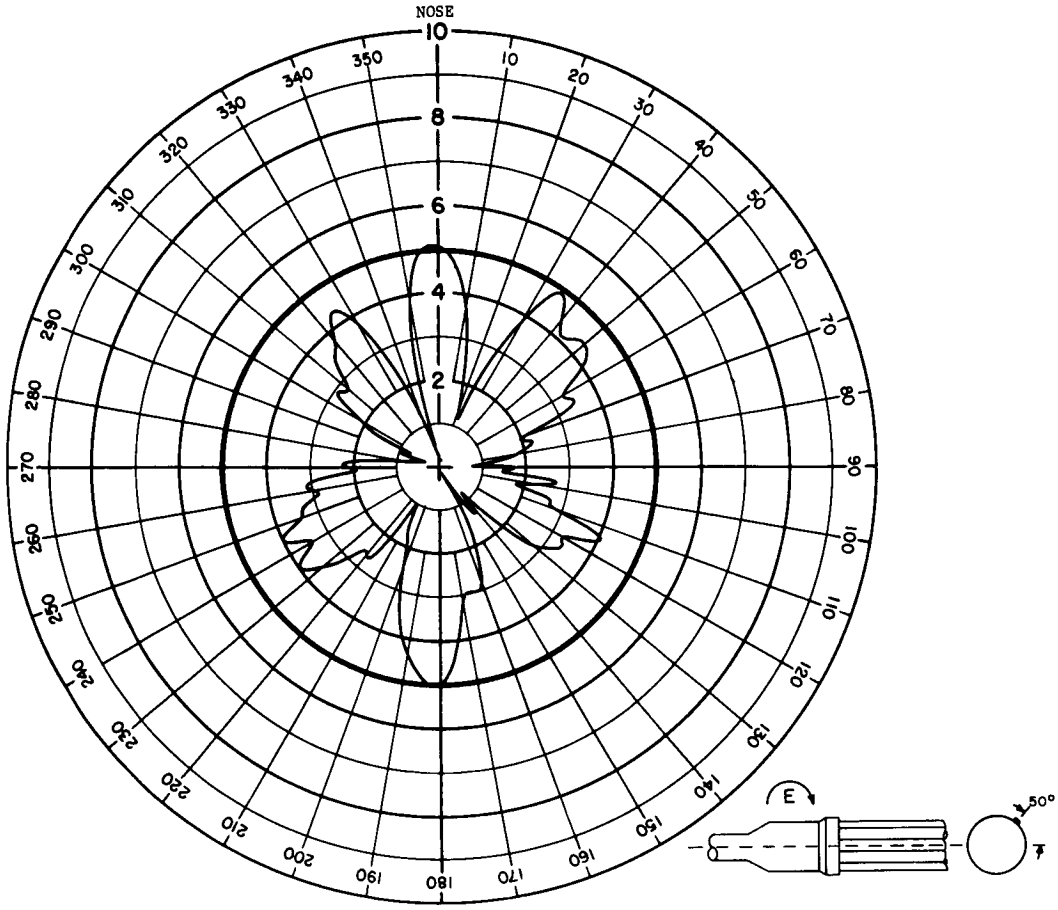
ANTENNA RADIATION PATTERN NO. 202-43

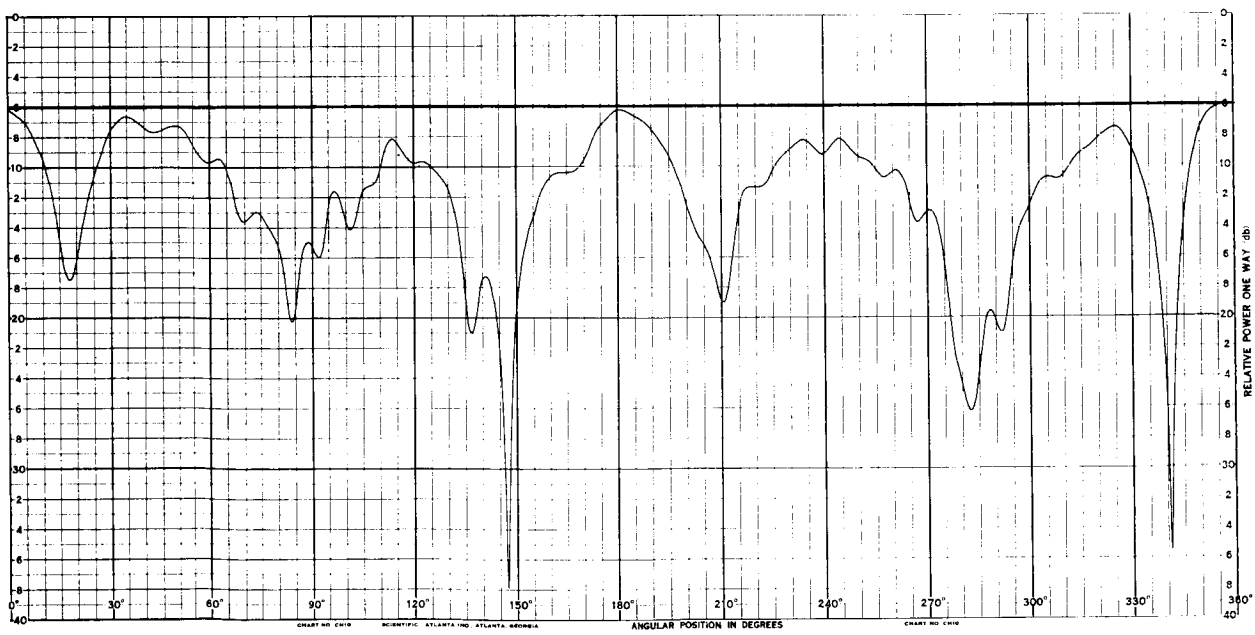
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



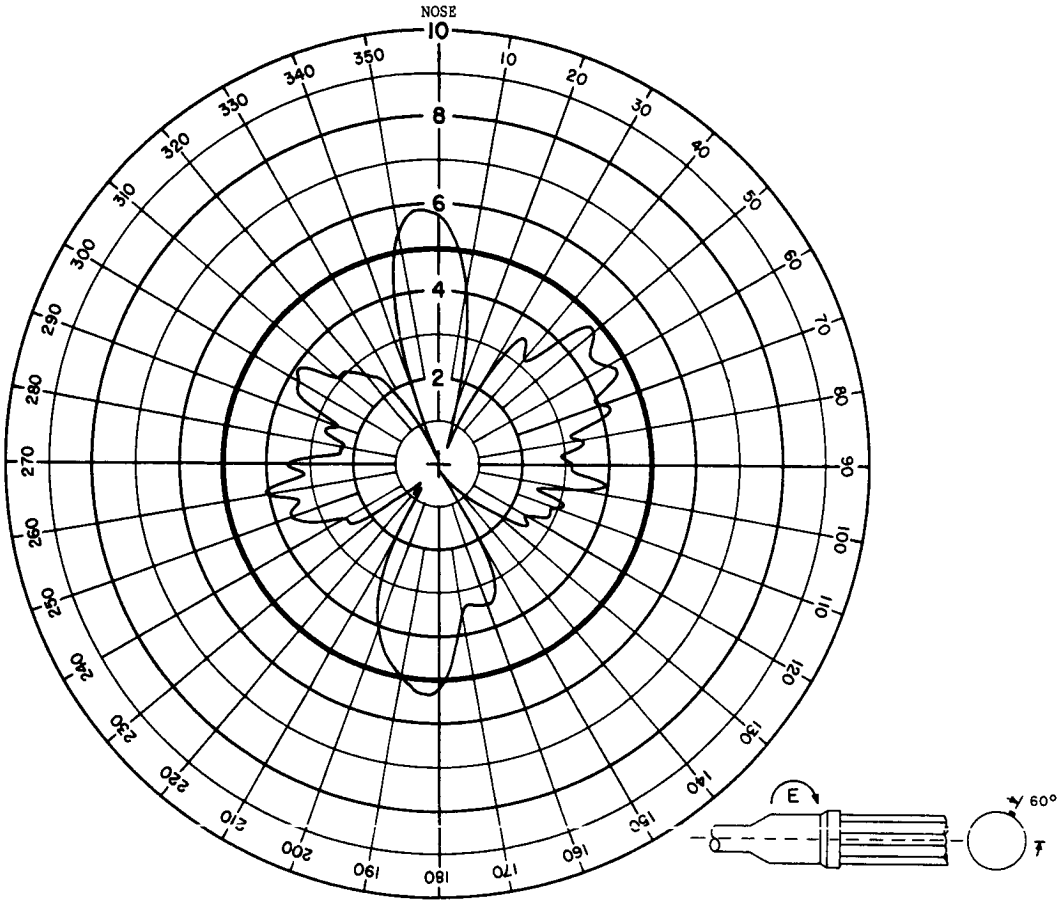


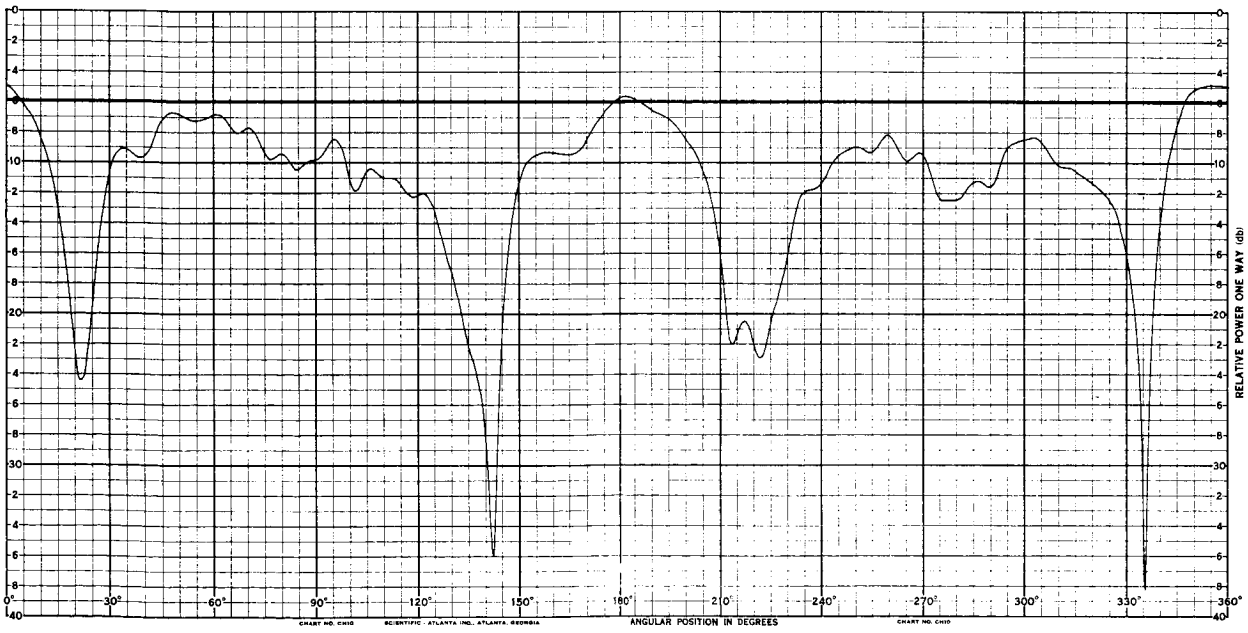
ANTENNA RADIATION PATTERN NO. 202-44

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



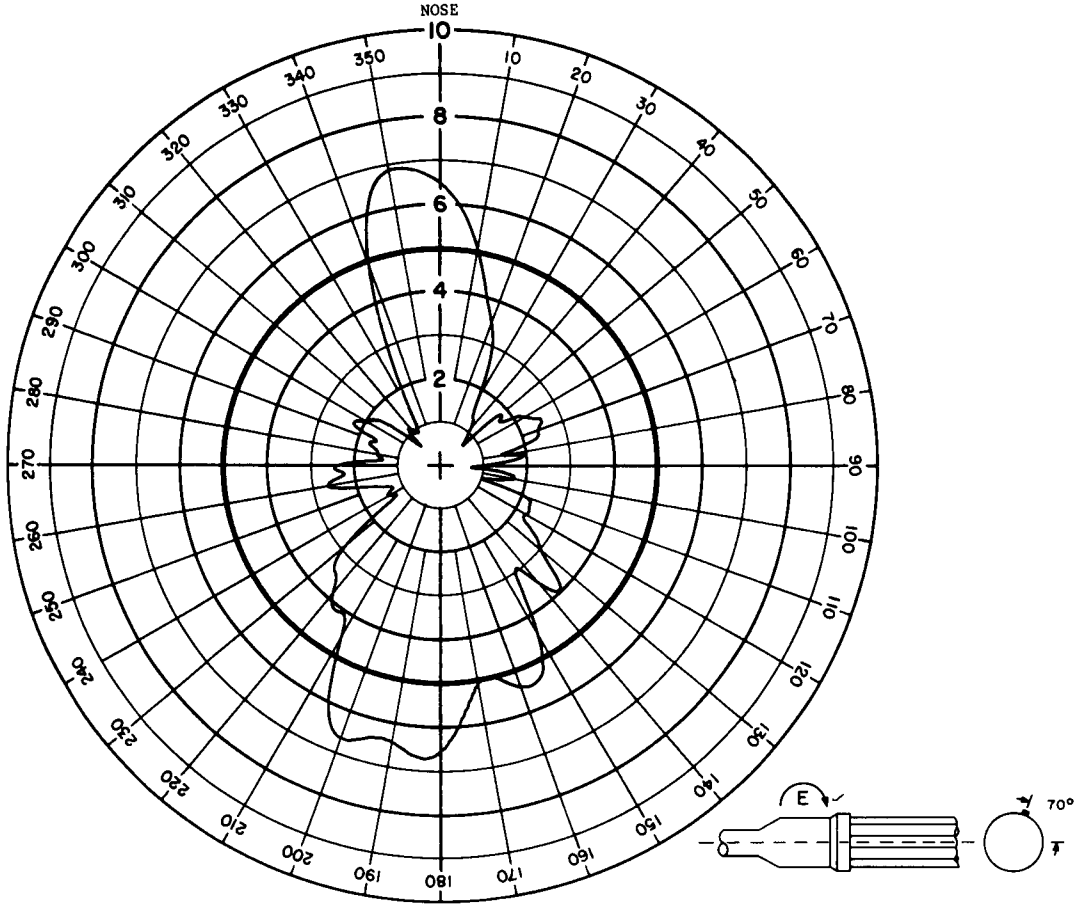


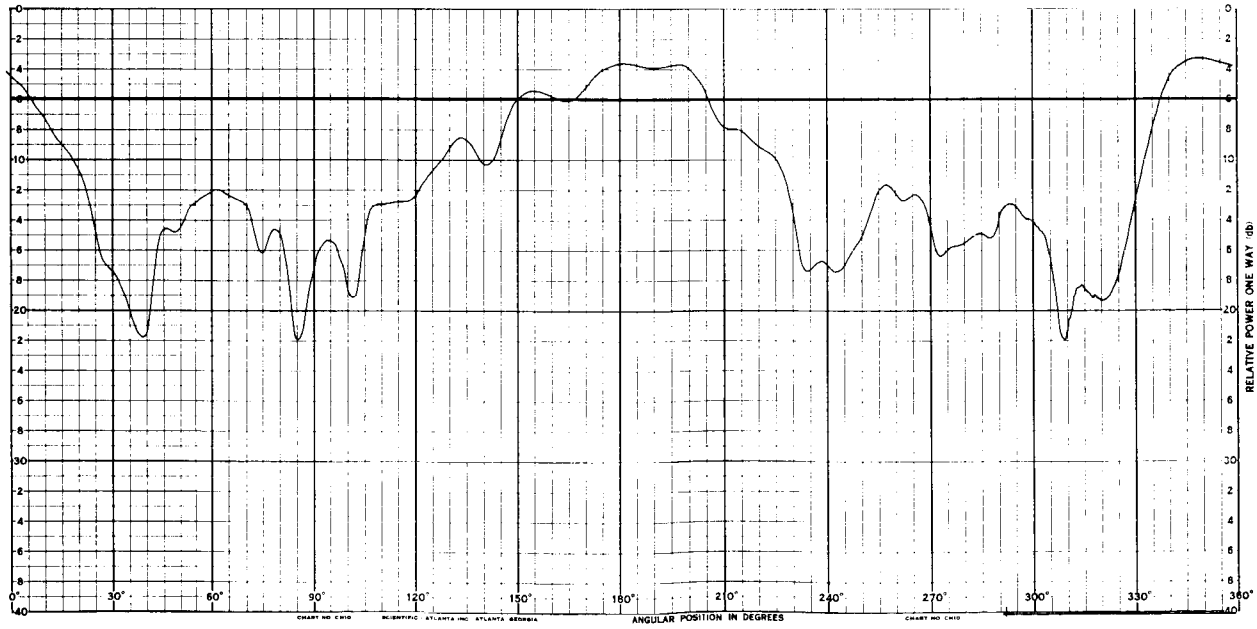
ANTENNA RADIATION PATTERN NO. 202-45

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



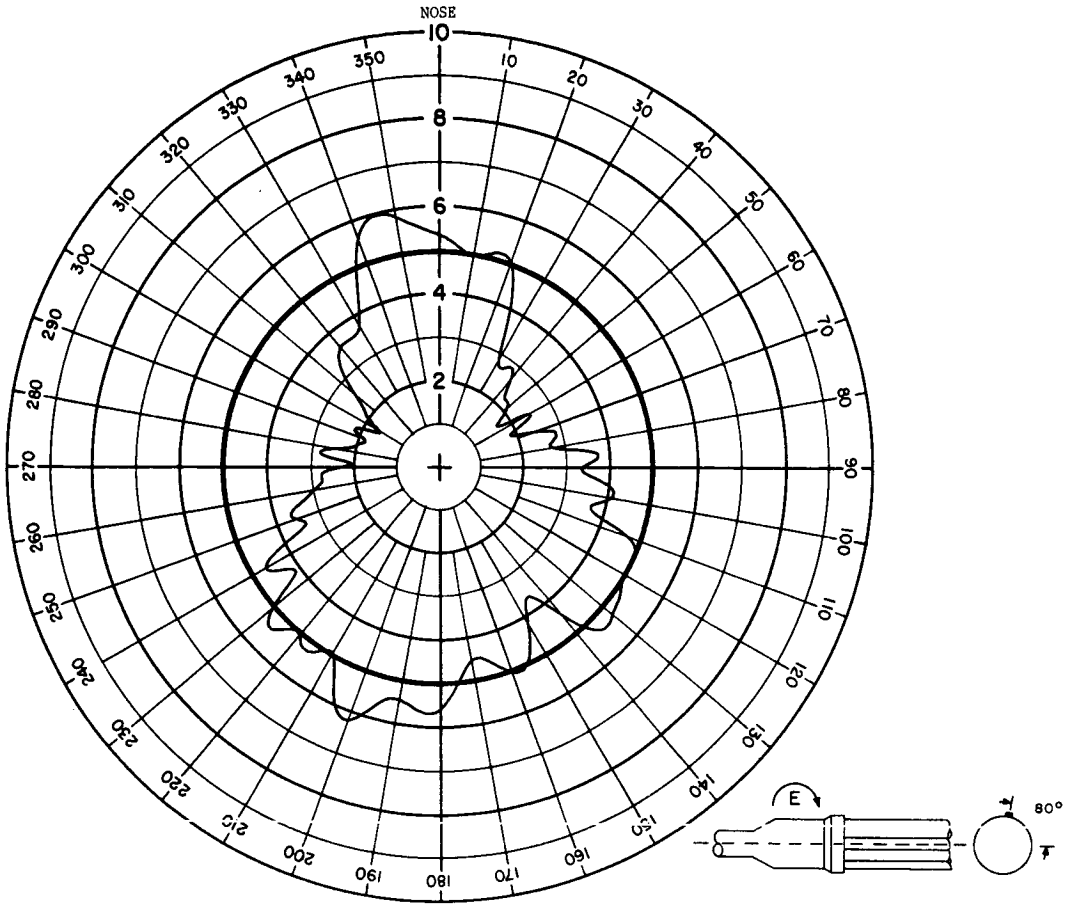


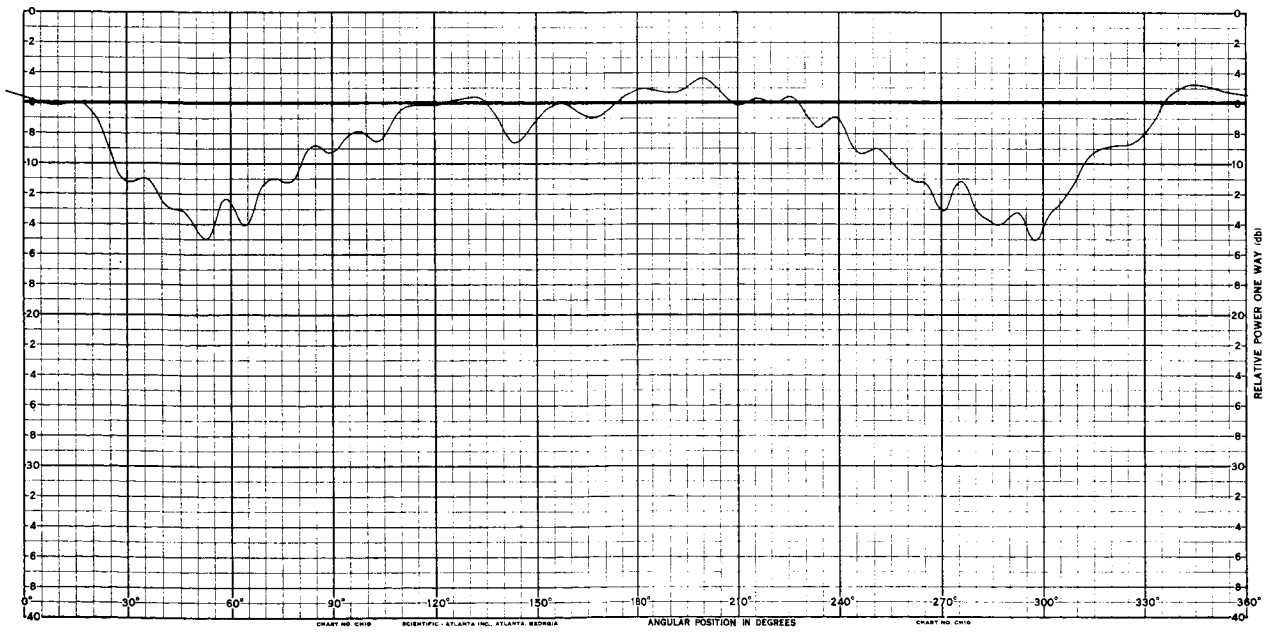
ANTENNA RADIATION PATTERN NO. 202-46

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



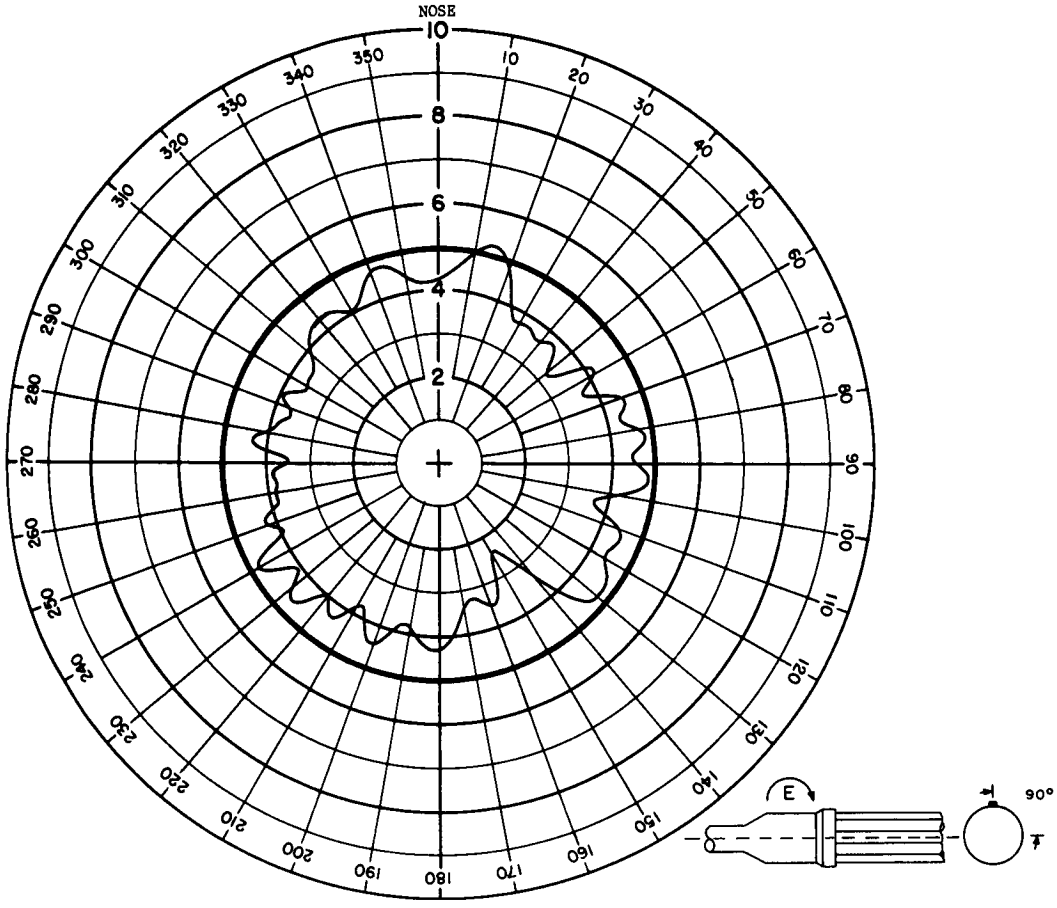


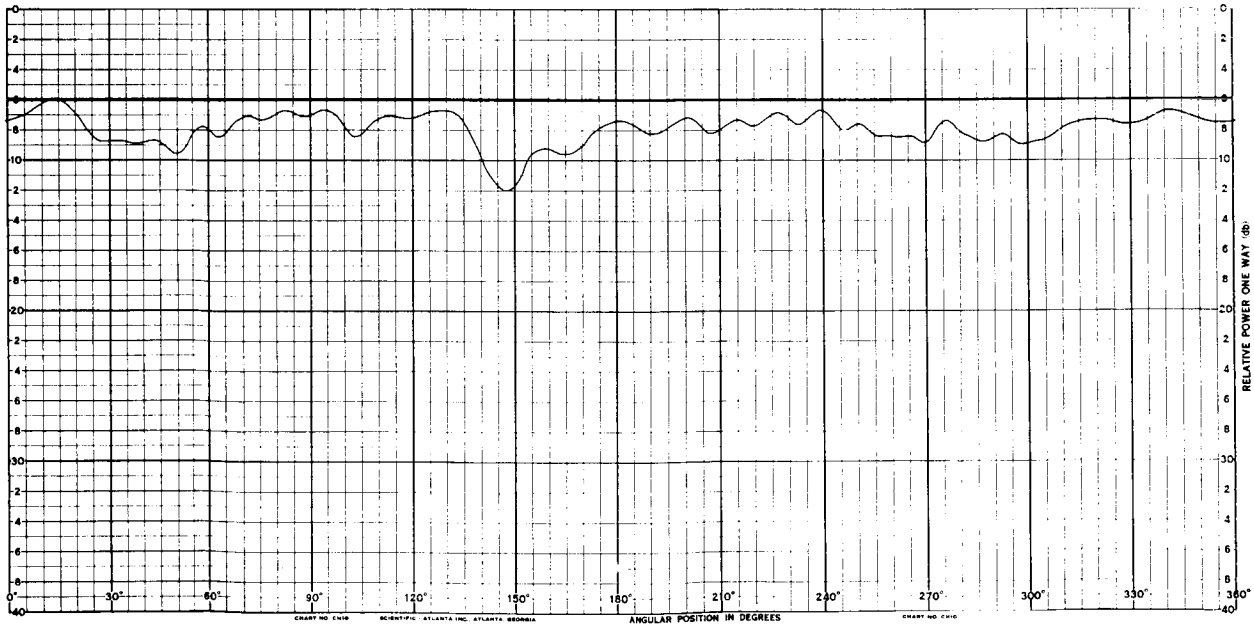
ANTENNA RADIATION PATTERN NO. 202-47

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



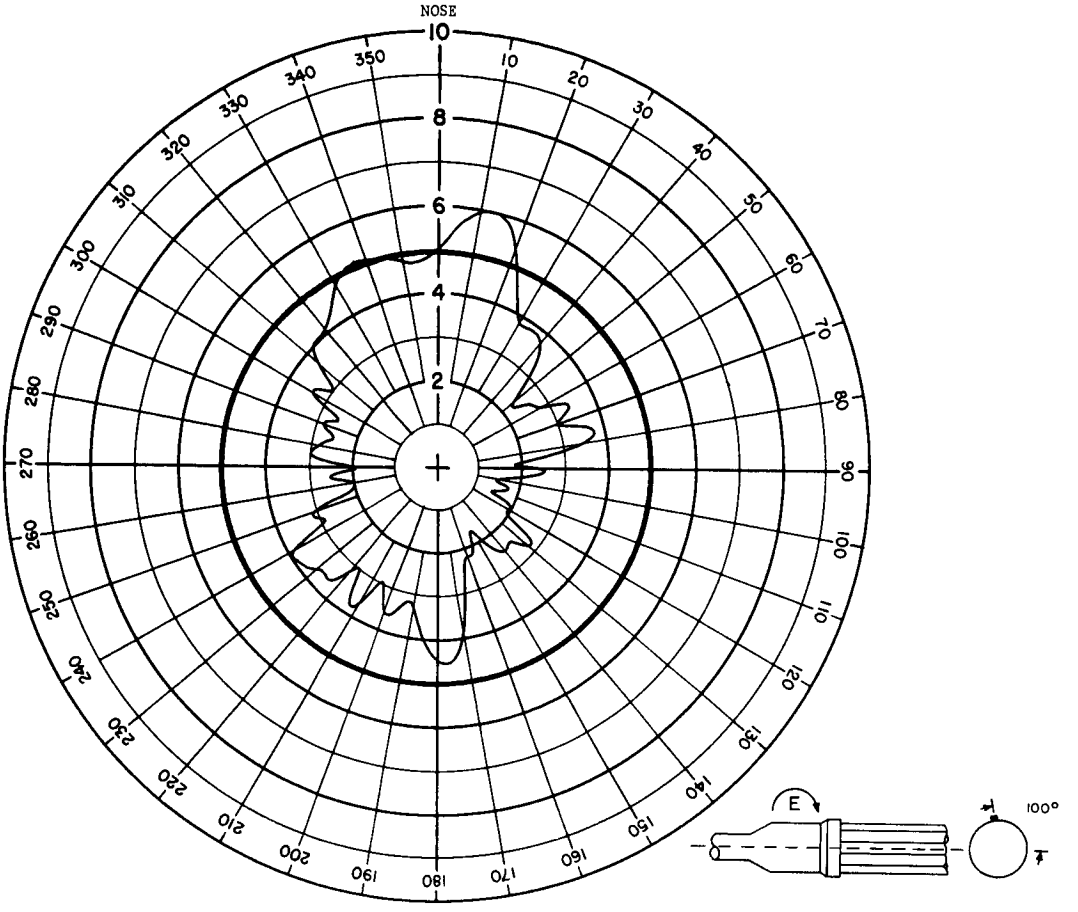


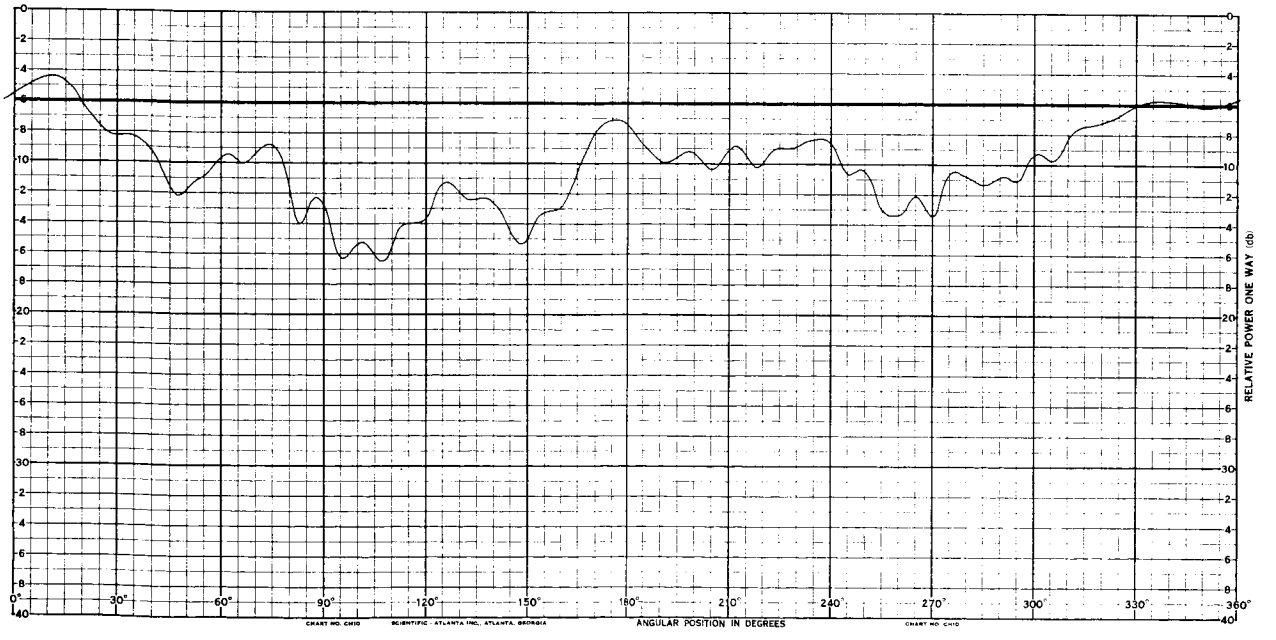
ANTENNA RADIATION PATTERN NO. 202-48

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





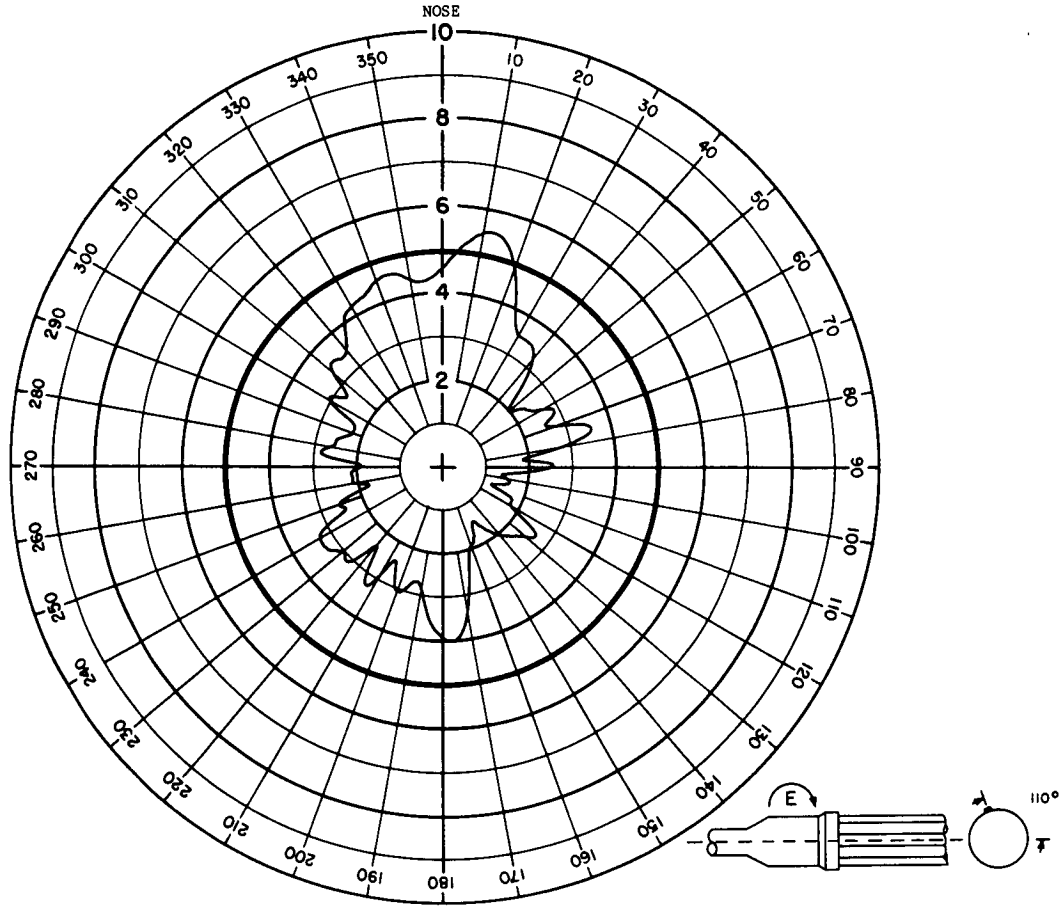
ANTENNA RADIATION PATTERN NO. 202-49

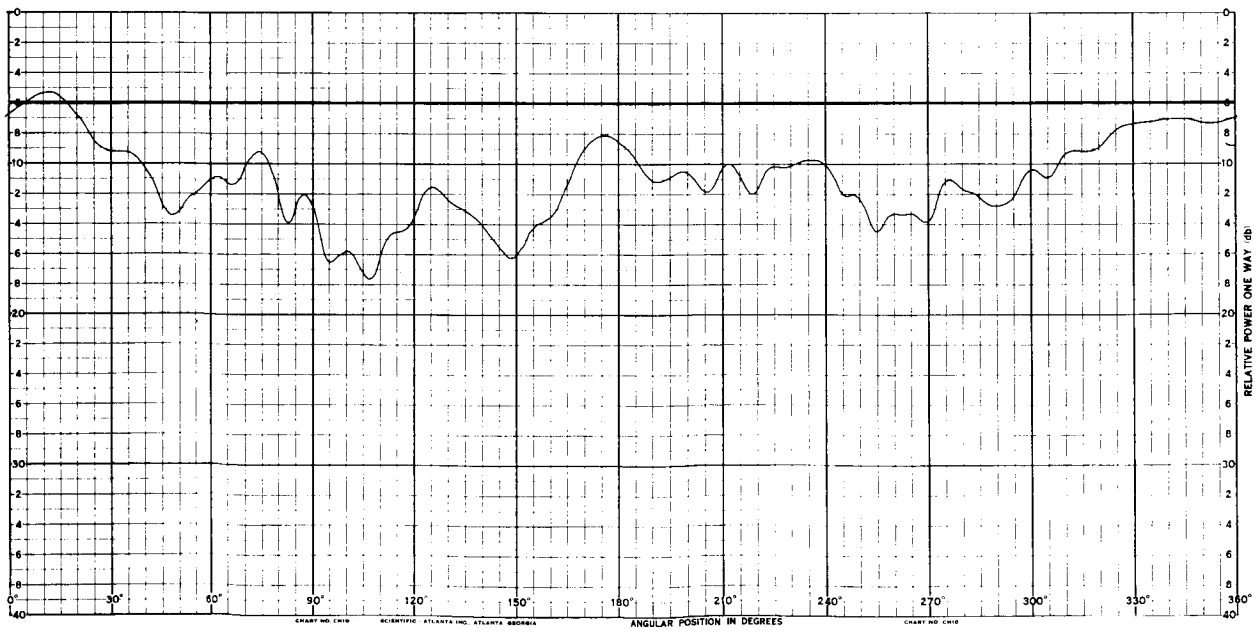
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



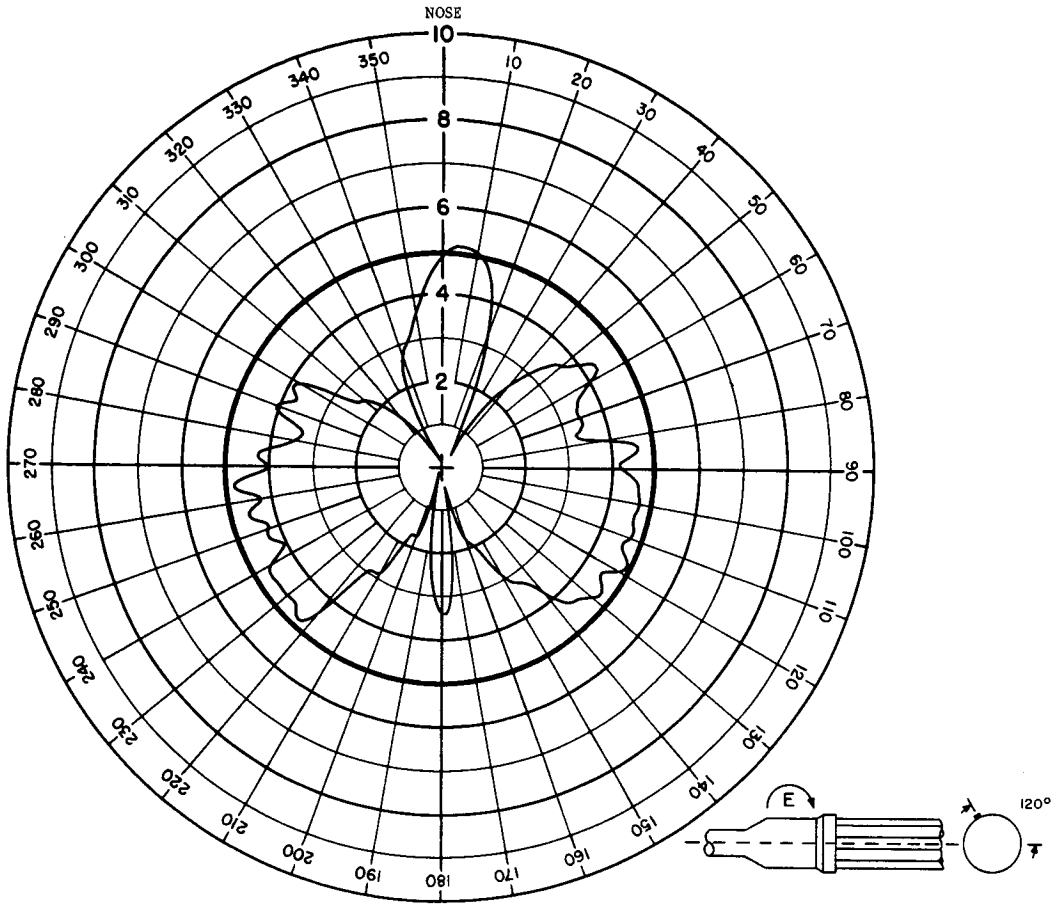


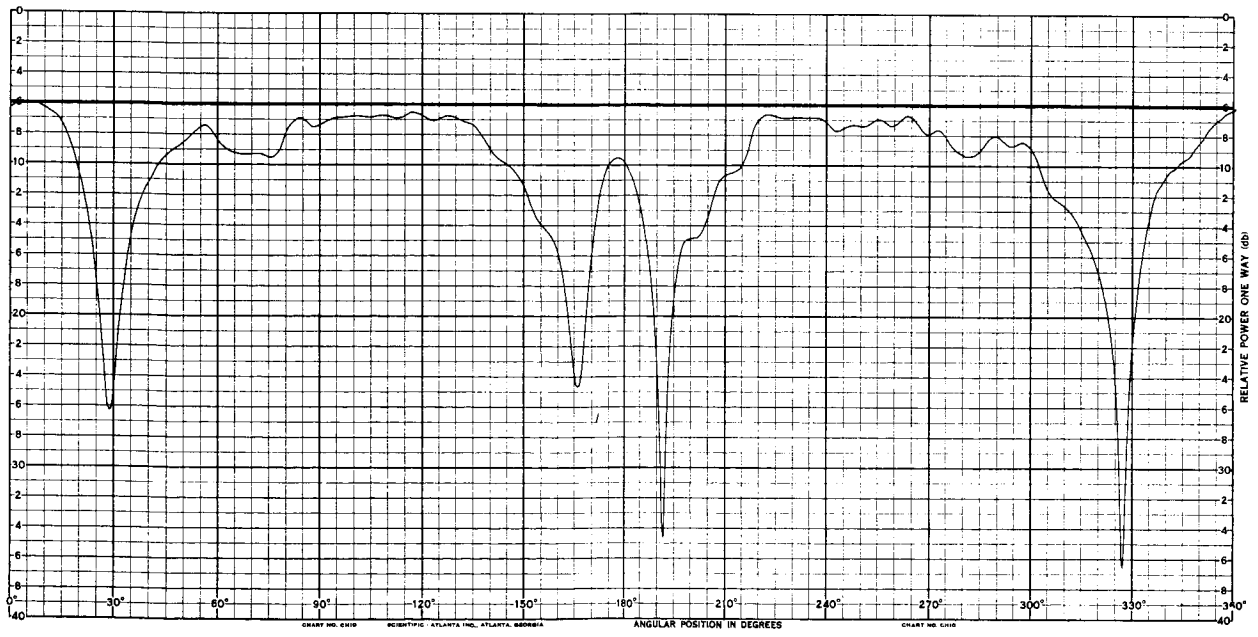
ANTENNA RADIATION PATTERN NO. 202-50

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





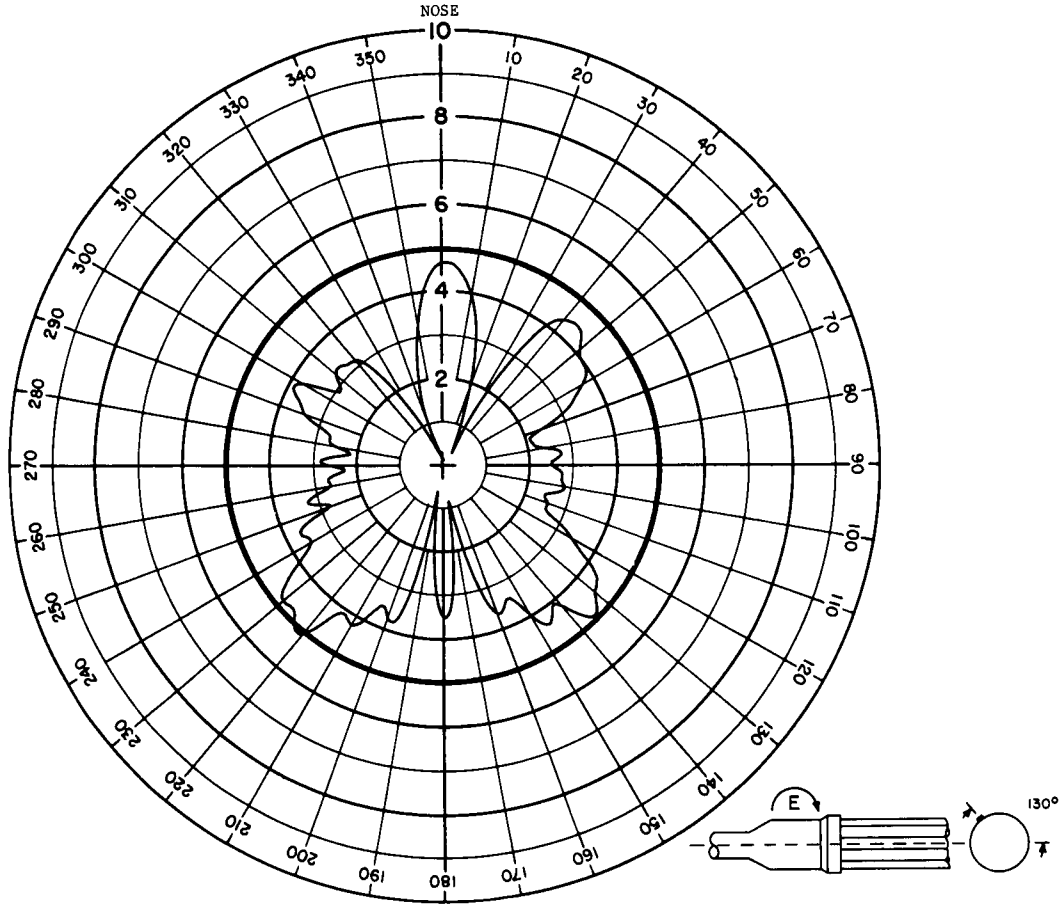
ANTENNA RADIATION PATTERN NO. 202-51

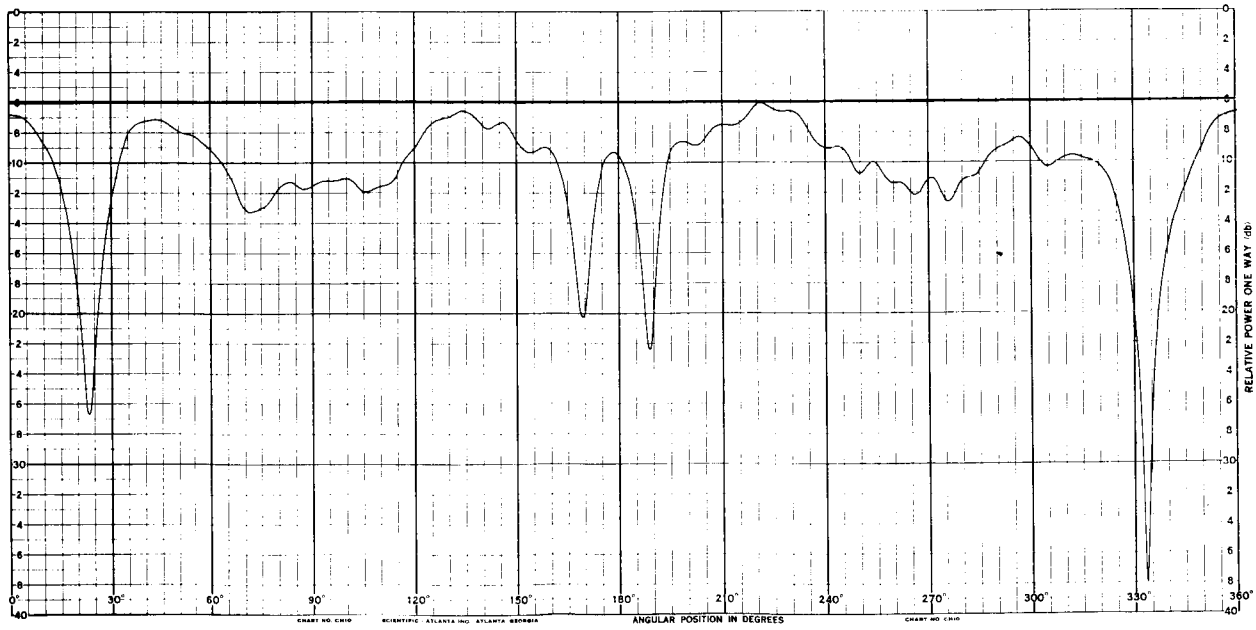
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



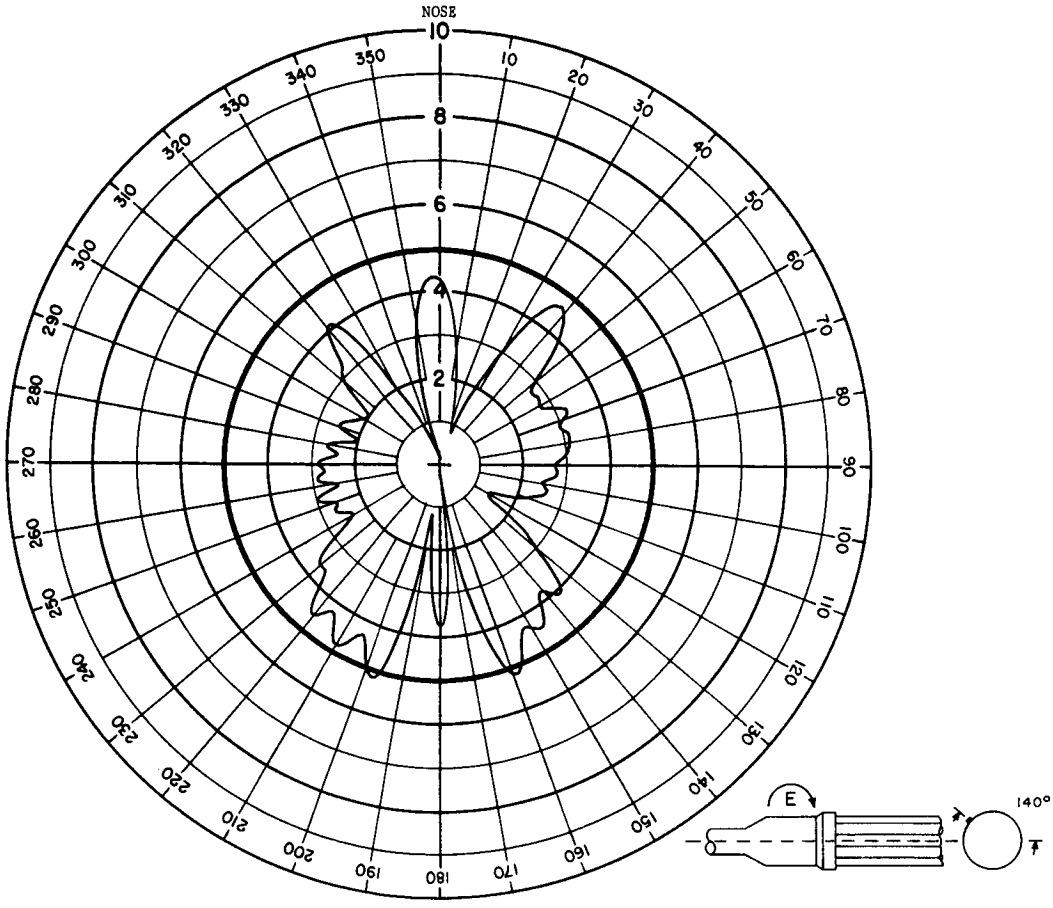


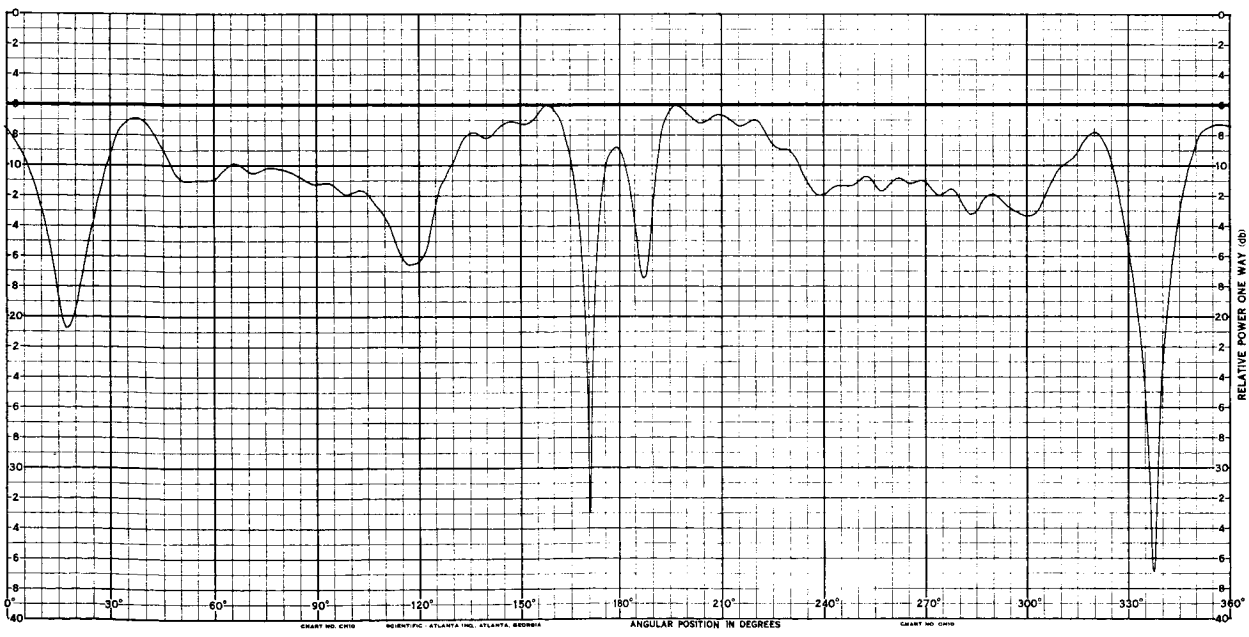
ANTENNA RADIATION PATTERN NO. 202-52

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



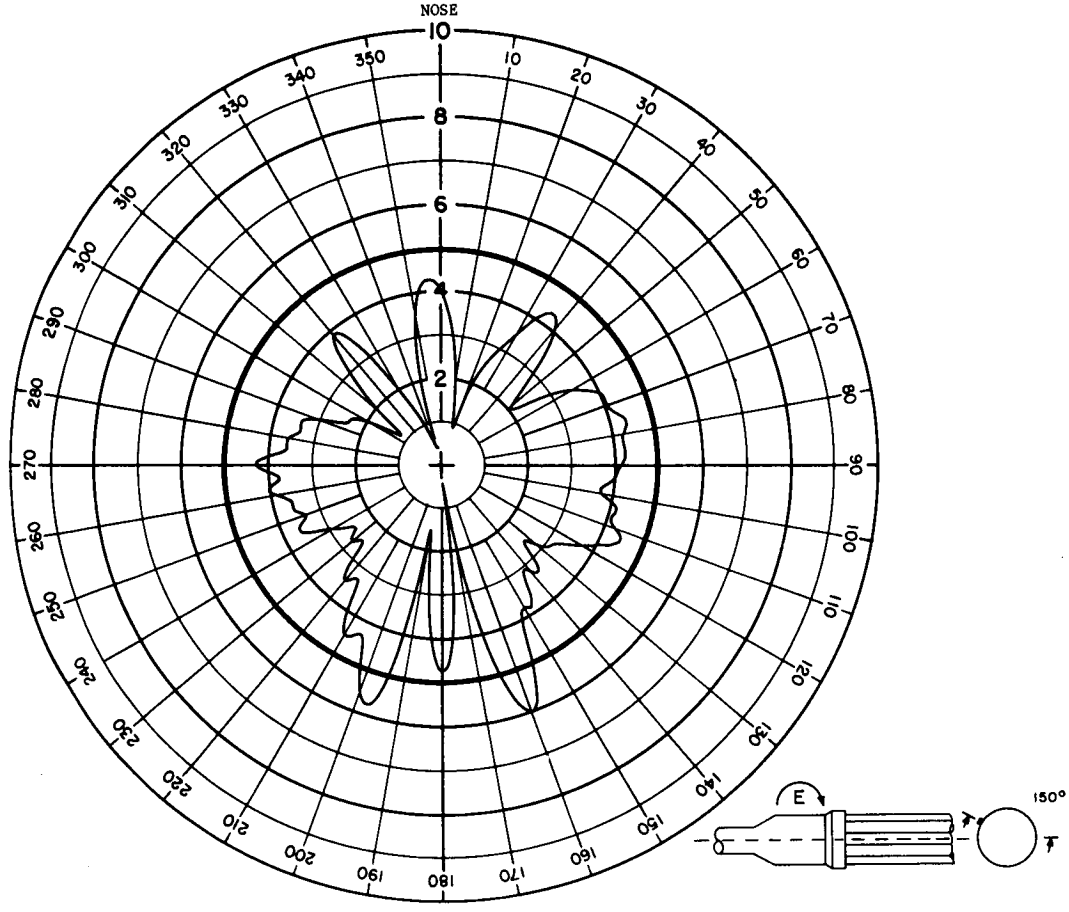


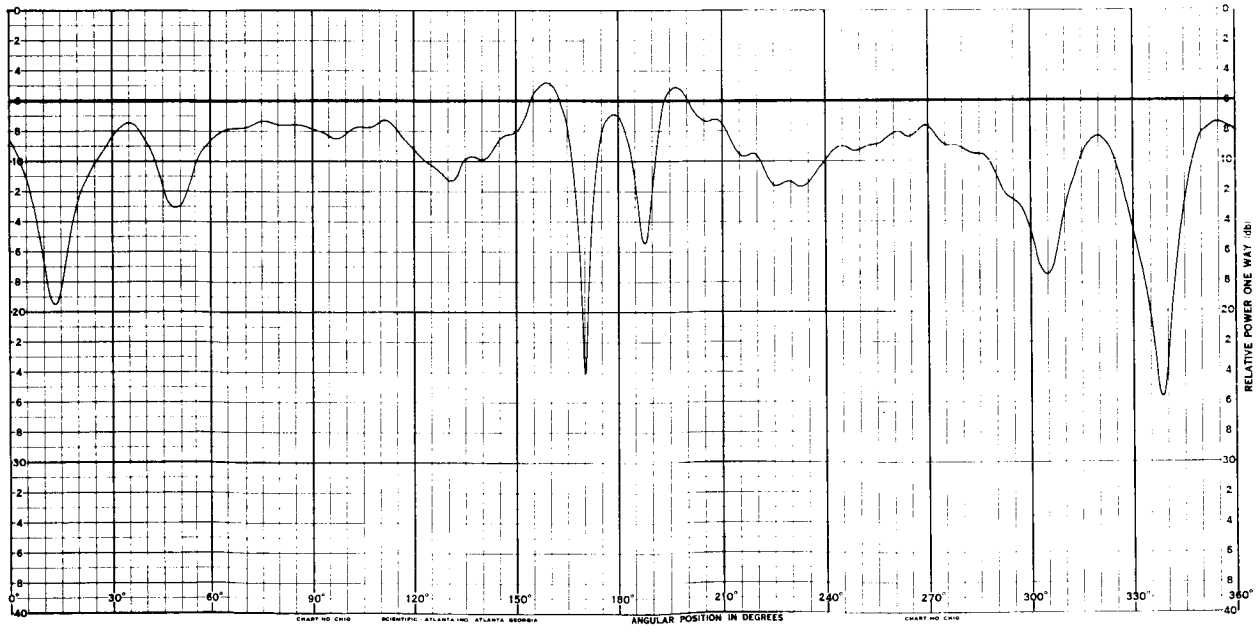
ANTENNA RADIATION PATTERN NO. 202-53

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



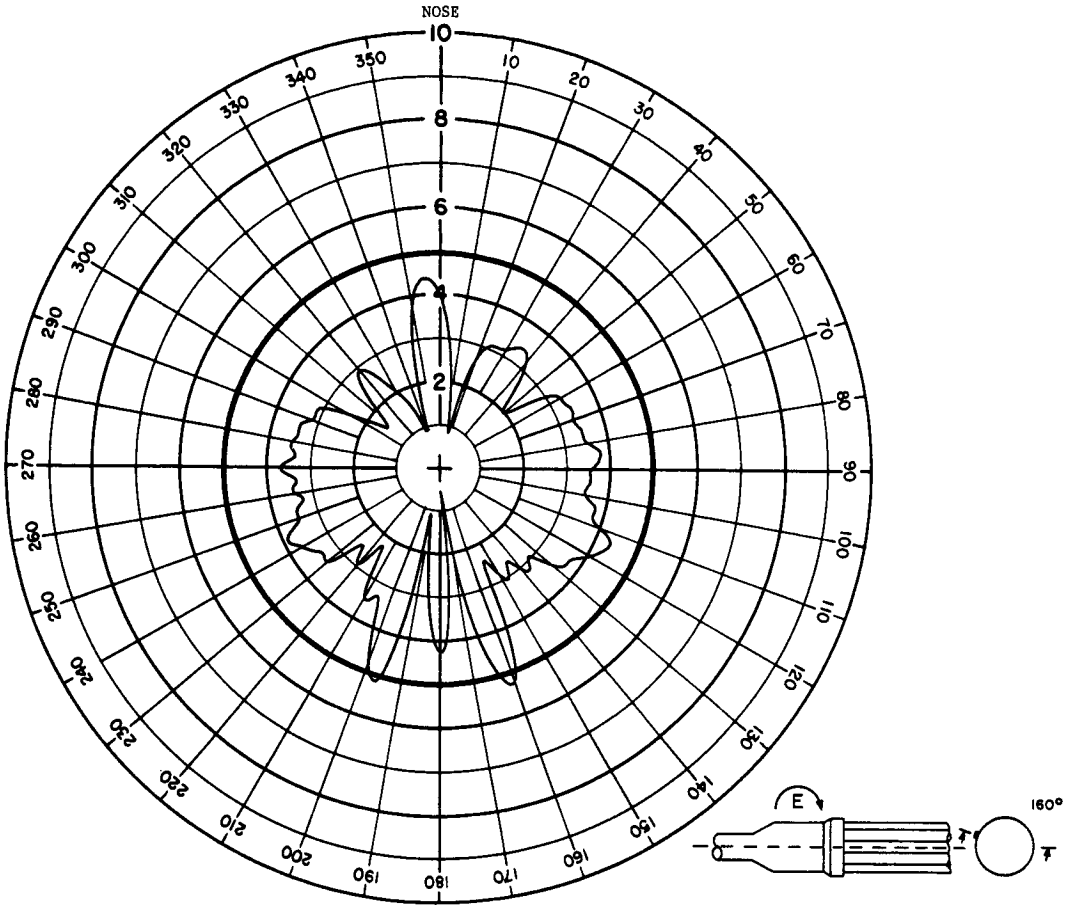


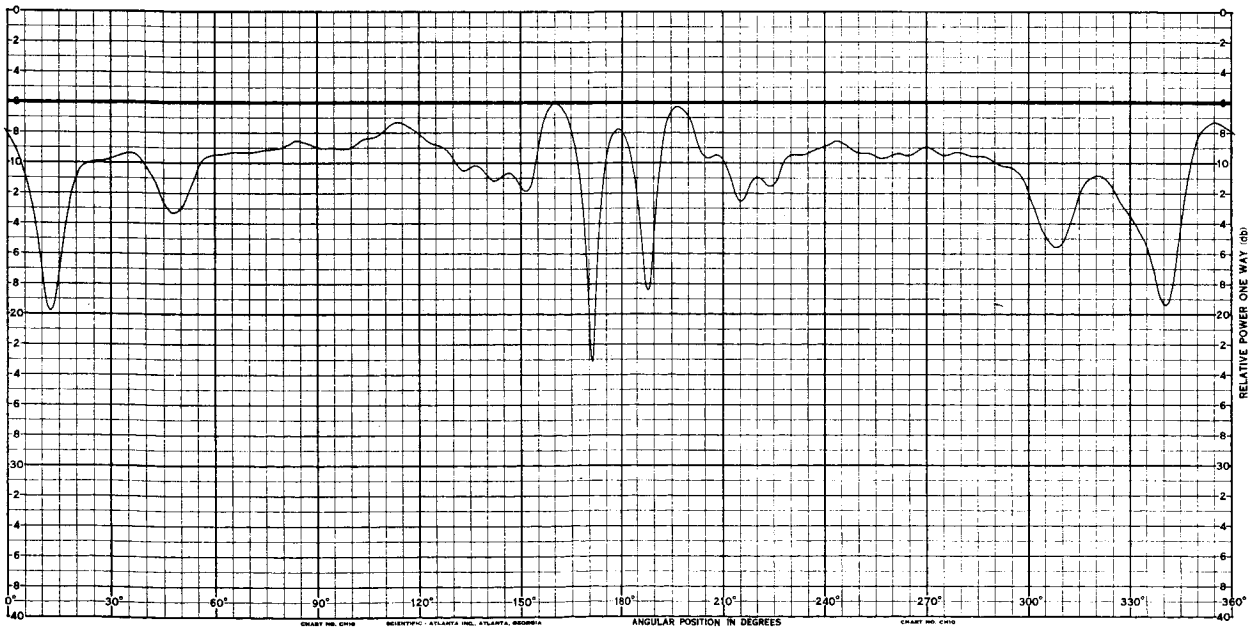
ANTENNA RADIATION PATTERN NO. 202-54

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





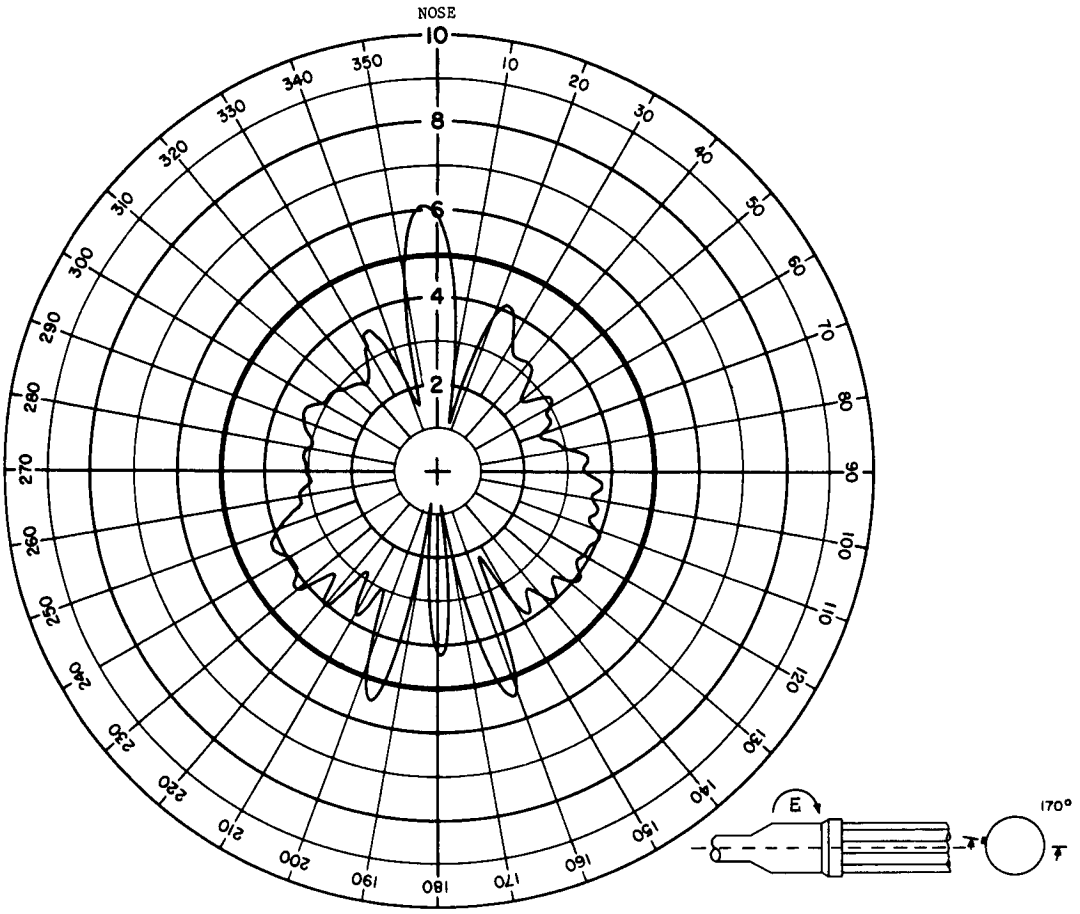
ANTENNA RADIATION PATTERN NO. 202-55

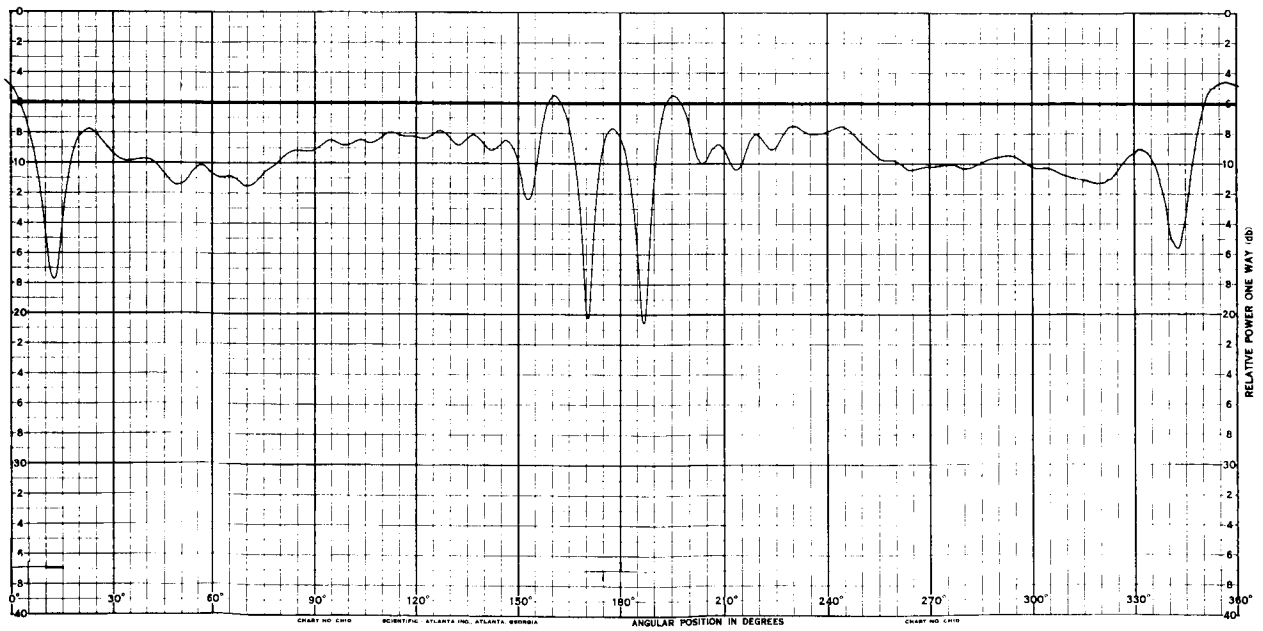
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



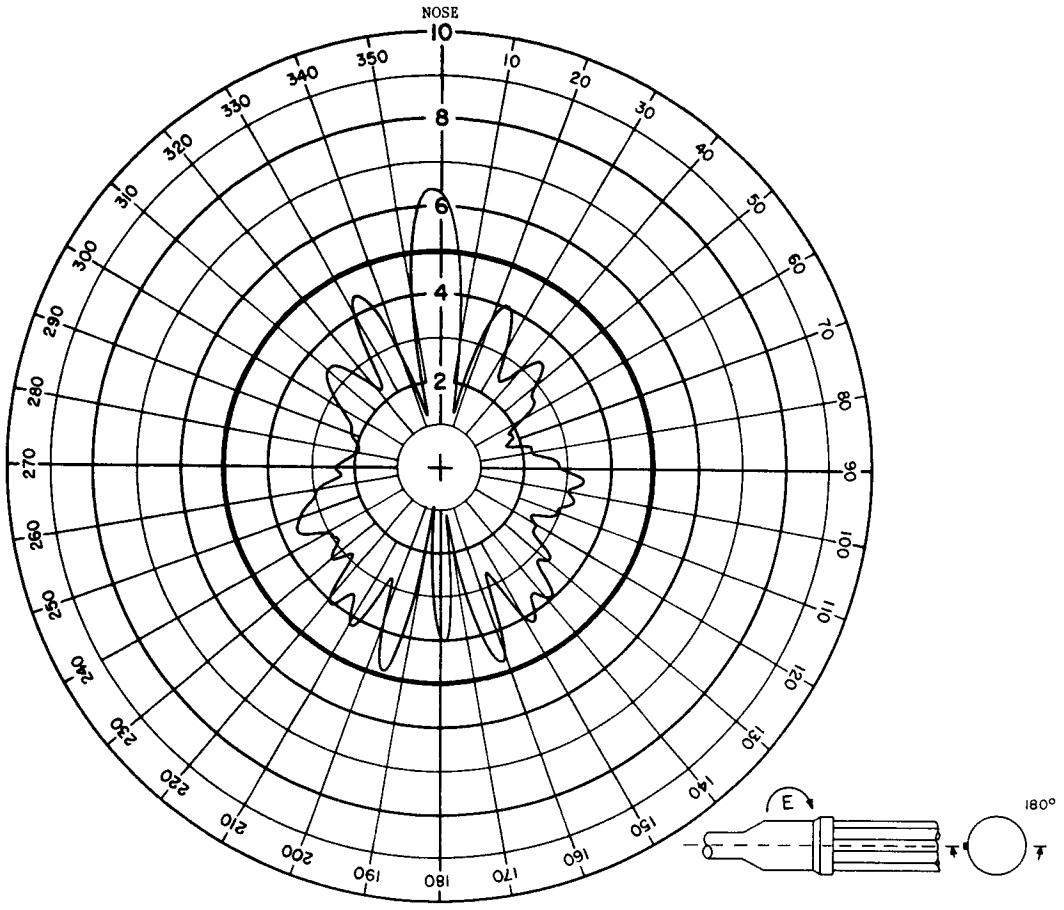


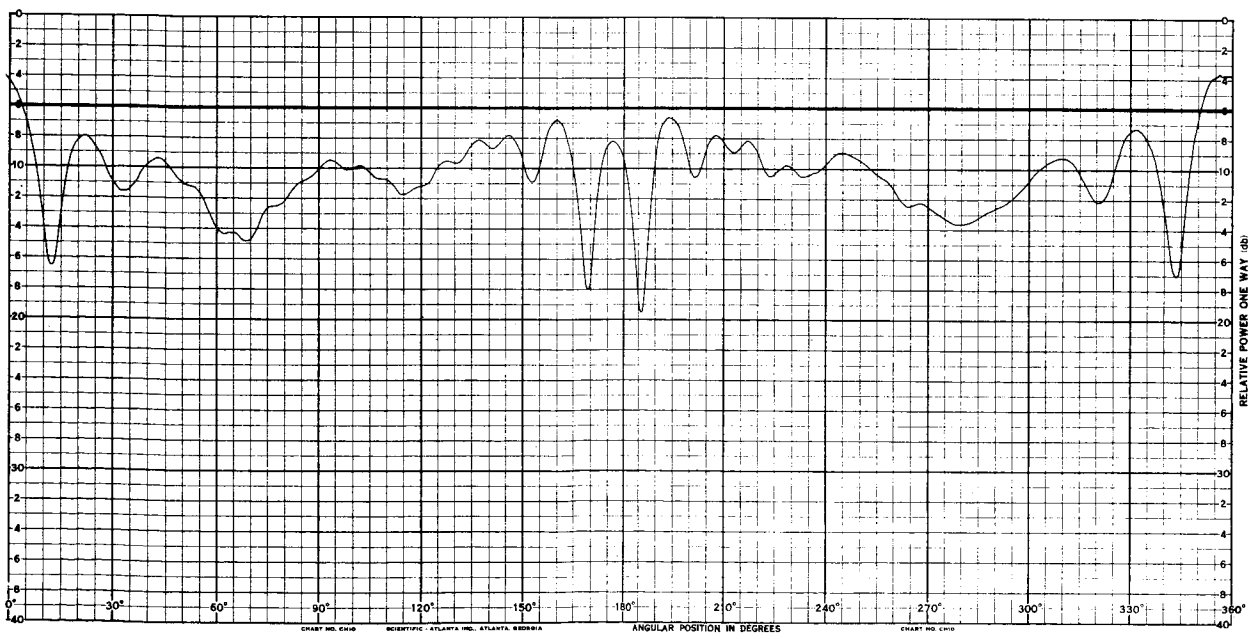
ANTENNA RADIATION PATTERN NO. 202-56

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



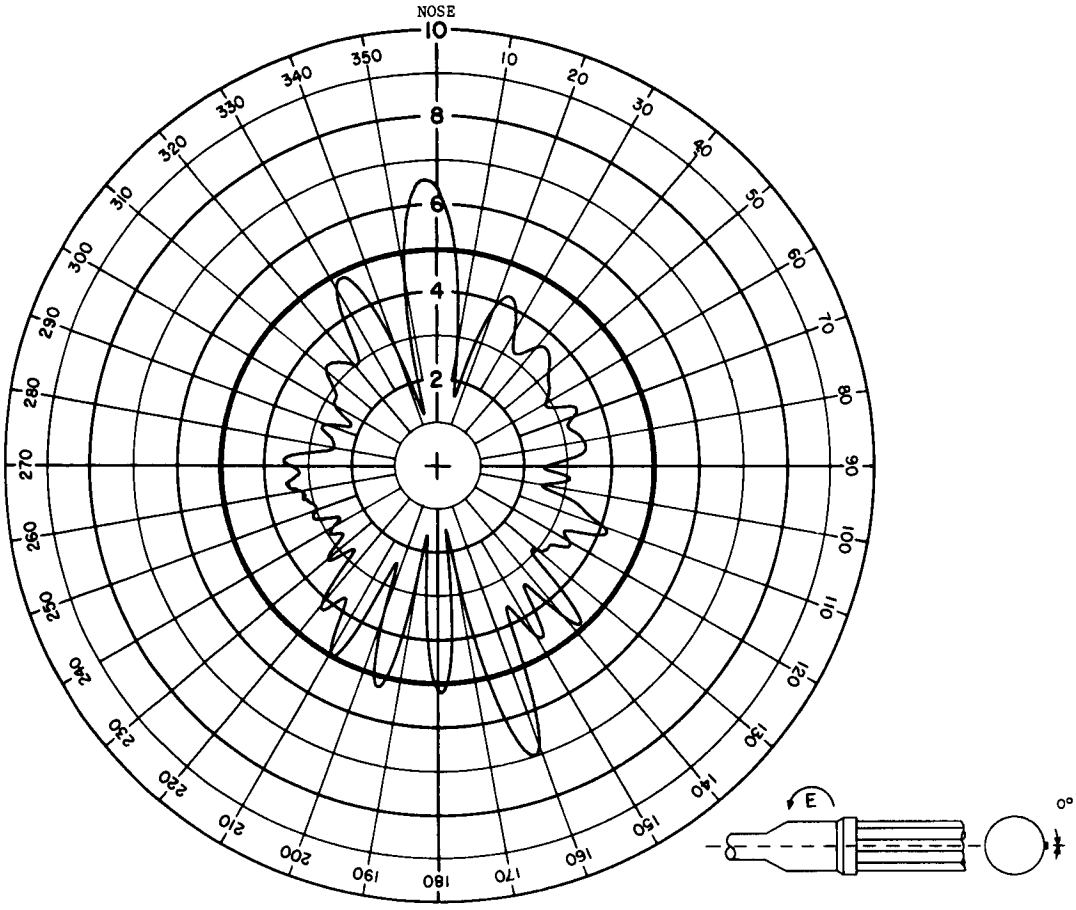


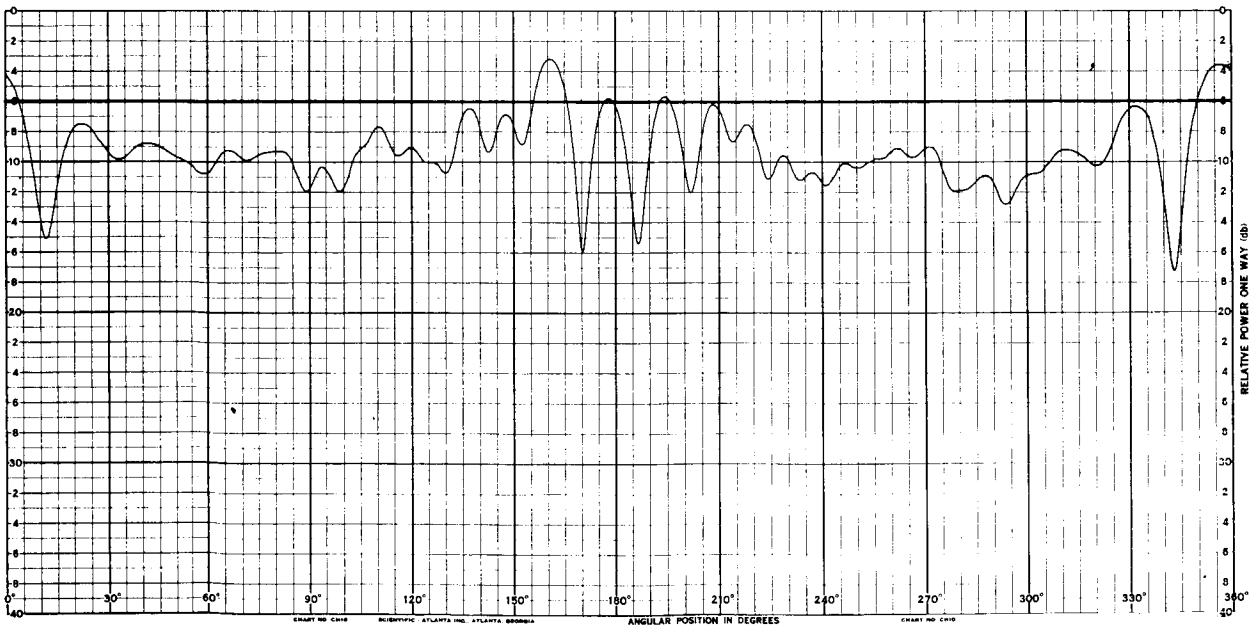
ANTENNA RADIATION PATTERN NO. 202-57

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



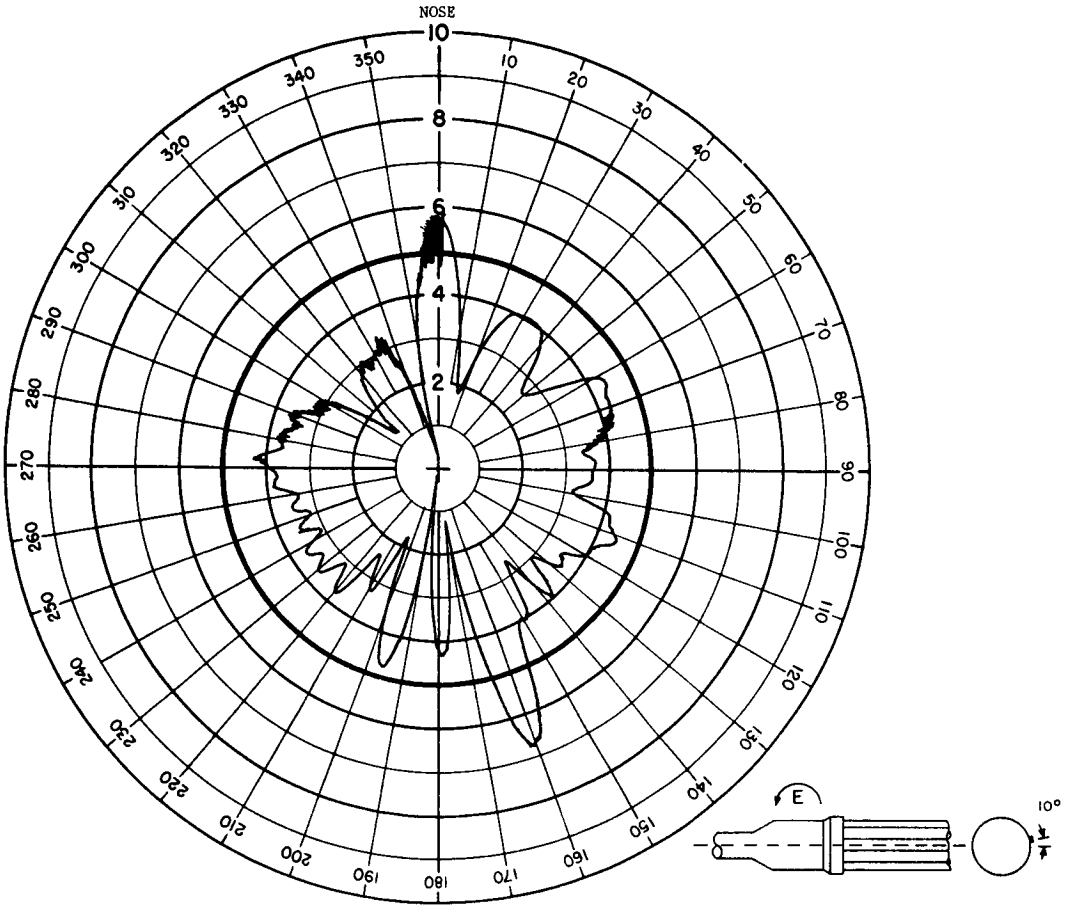


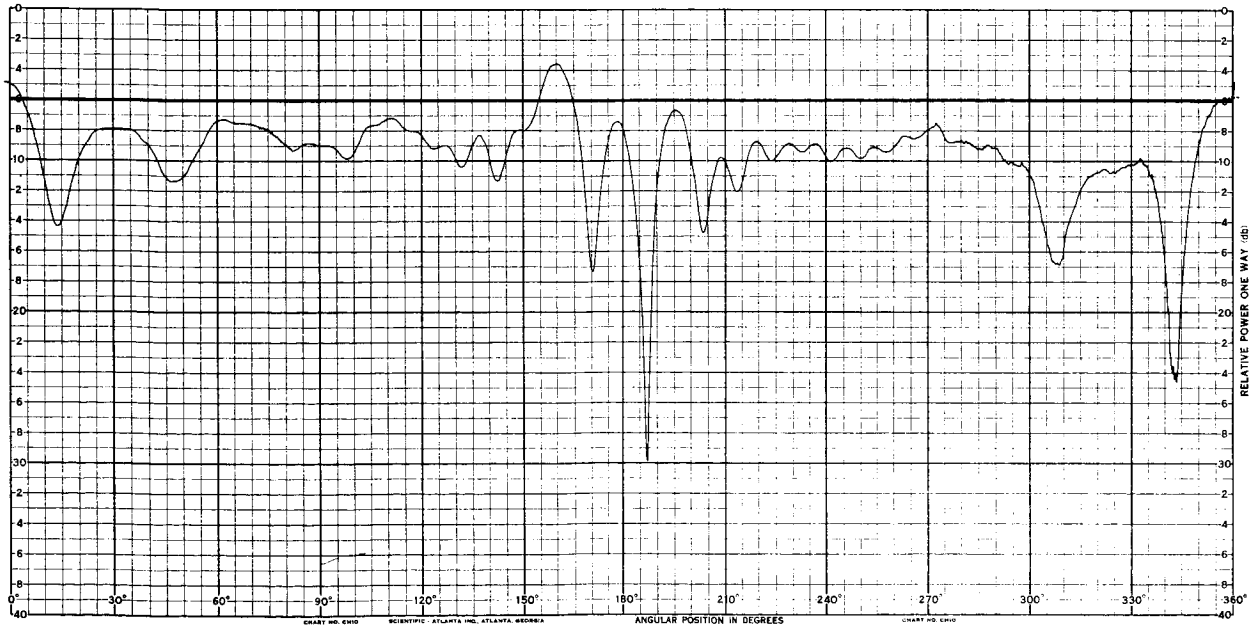
ANTENNA RADIATION PATTERN NO. 202-58

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





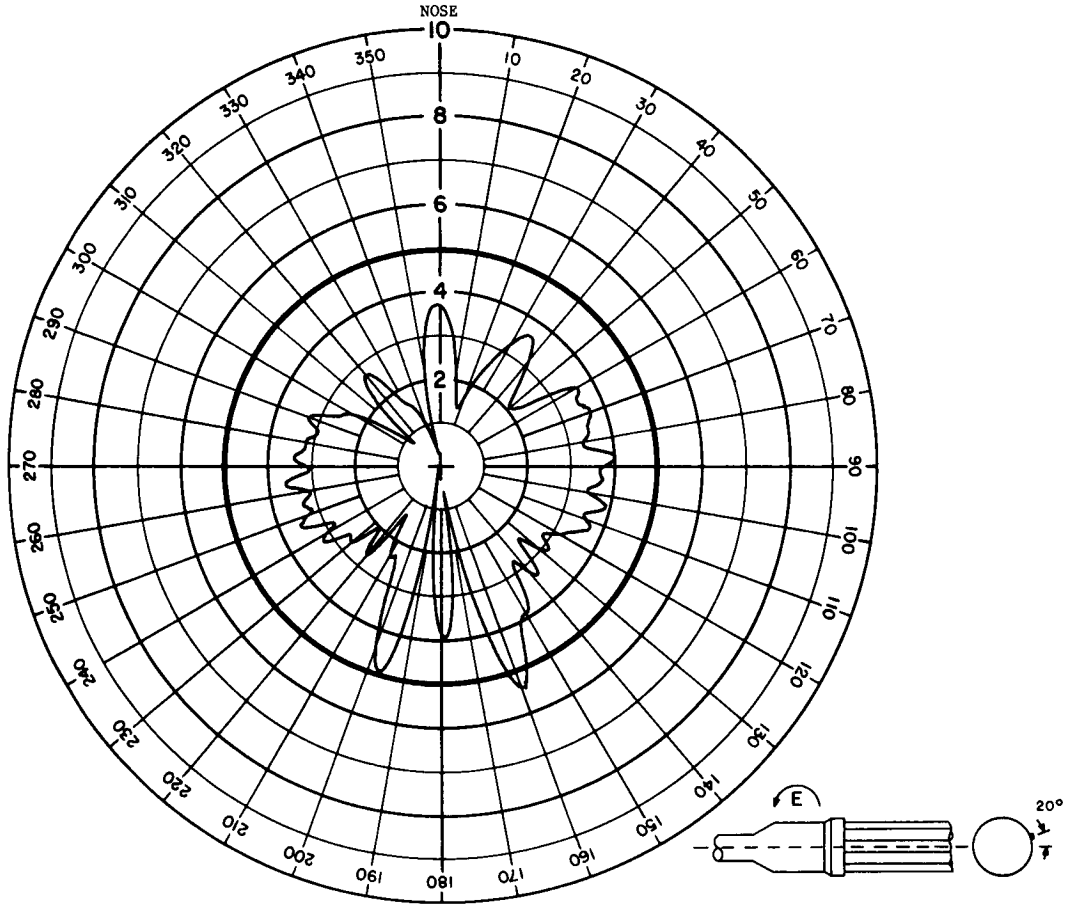
ANTENNA RADIATION PATTERN NO. 202-59

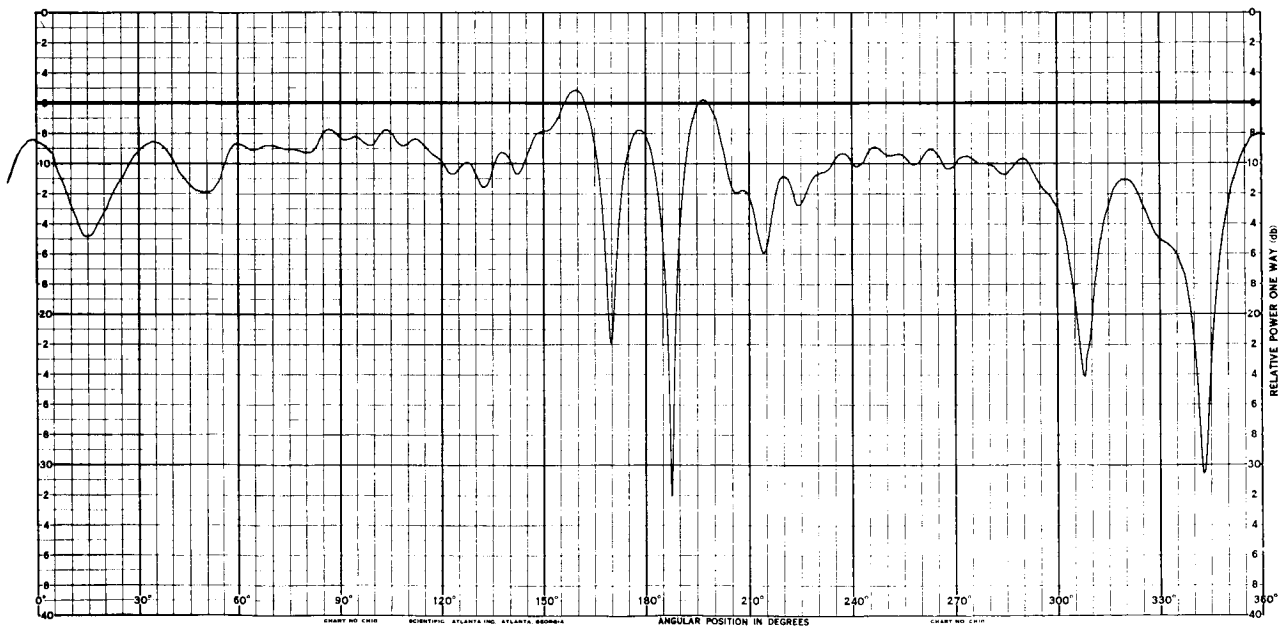
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



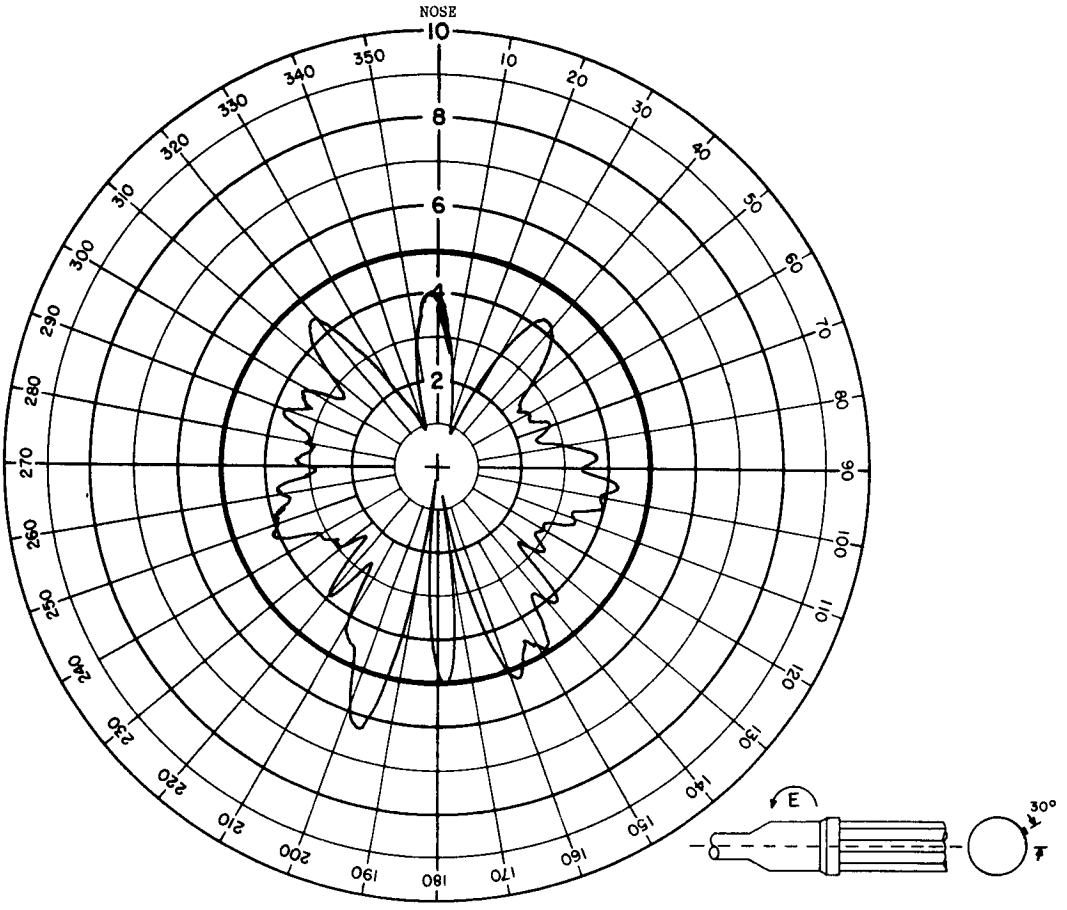


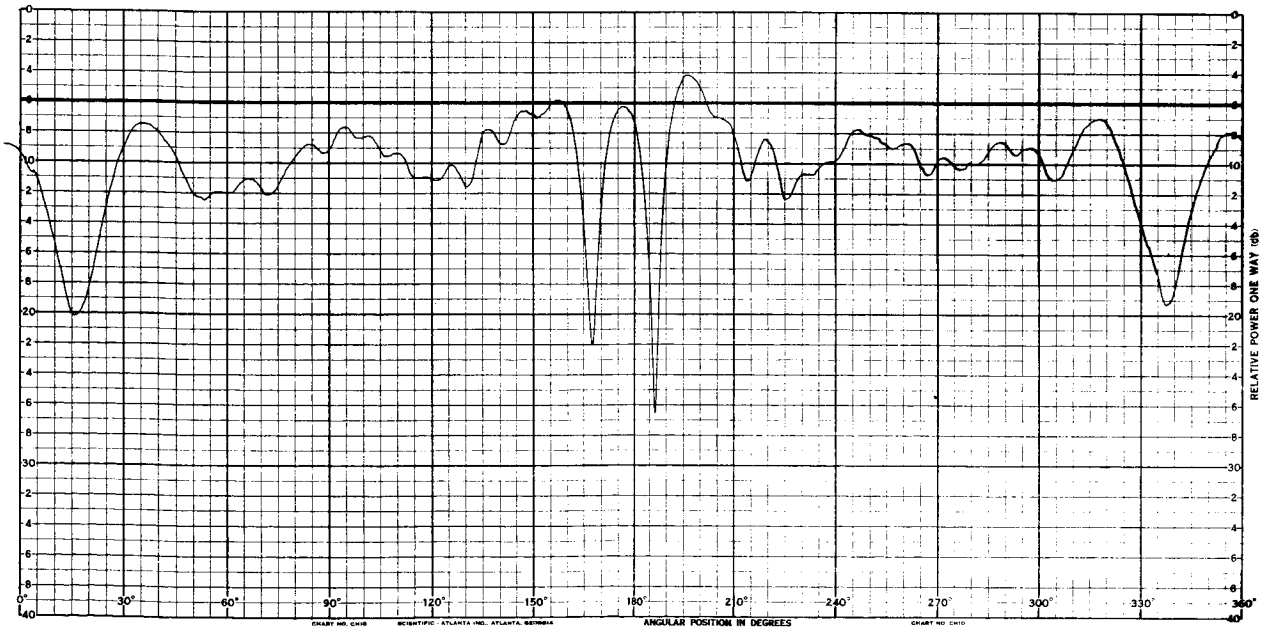
ANTENNA RADIATION PATTERN NO. 202-60

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT



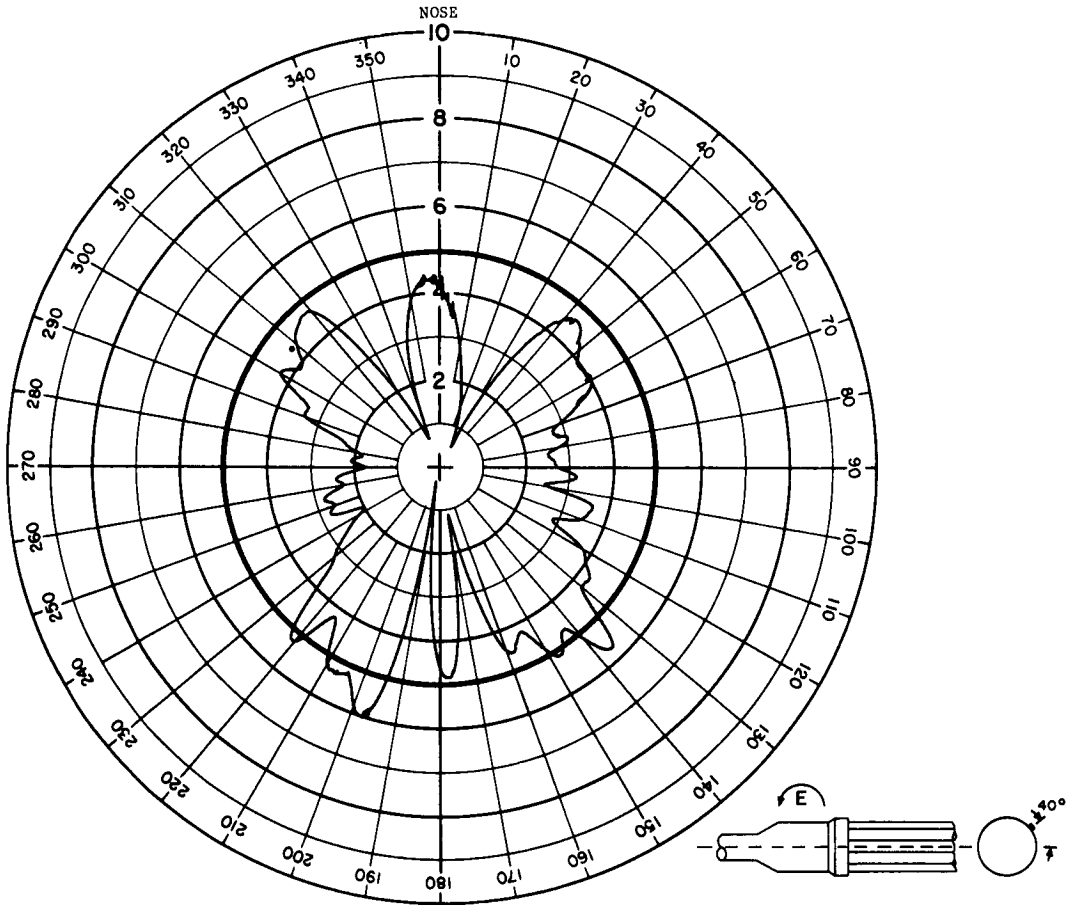


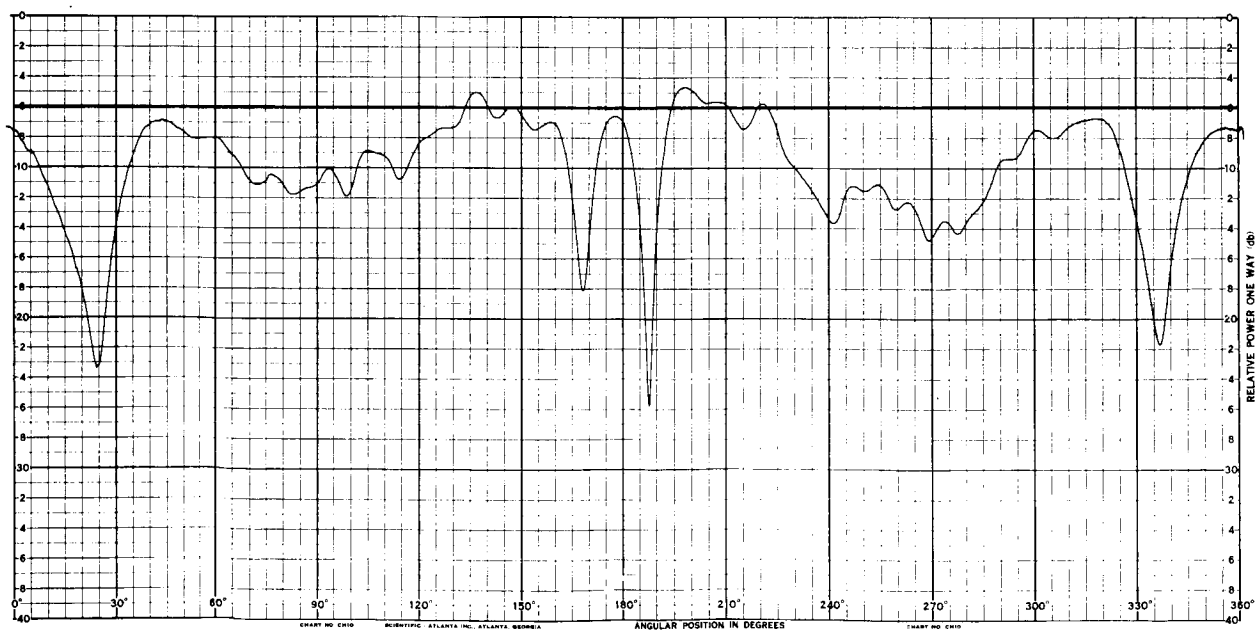
ANTENNA RADIATION PATTERN NO. 202-61

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT

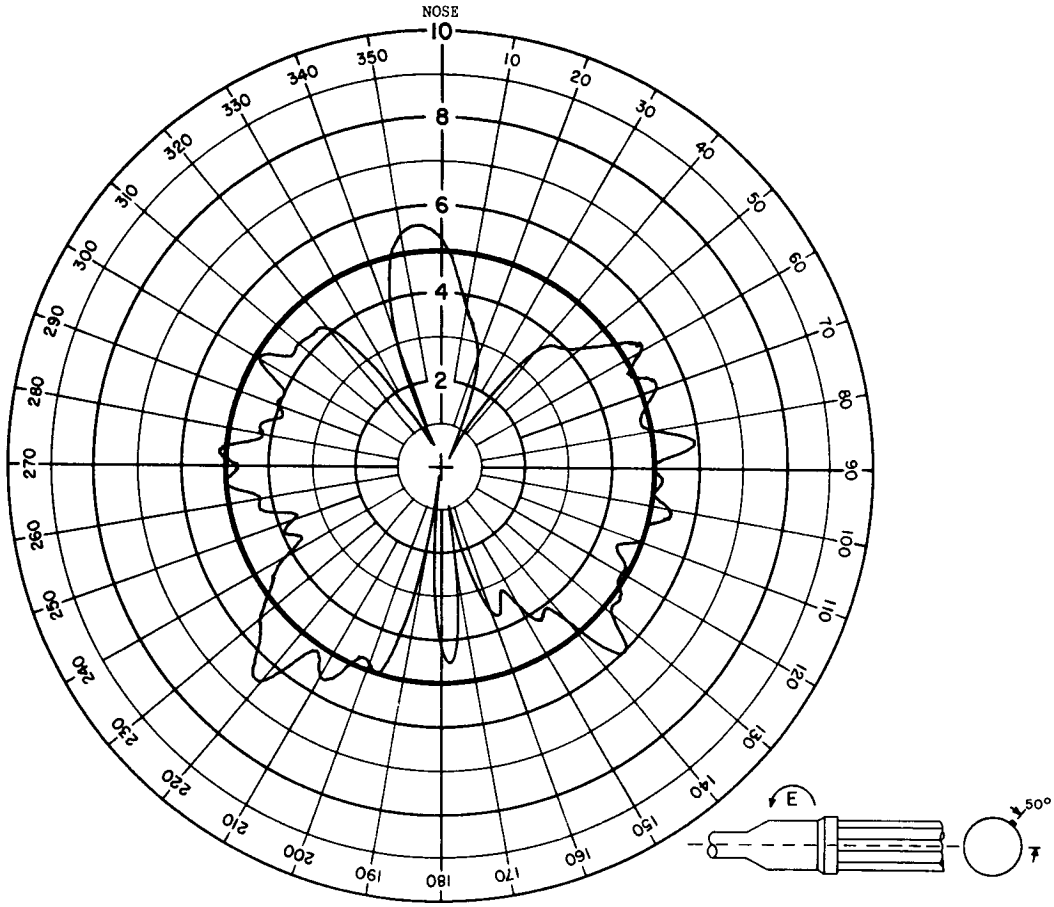


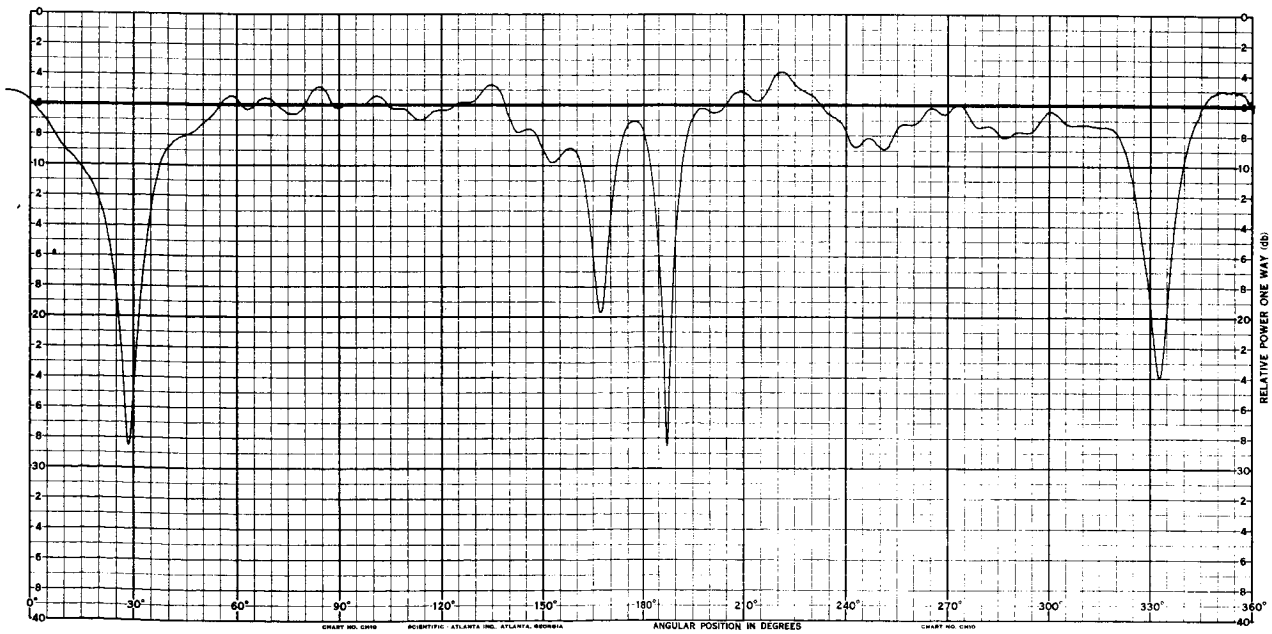


ANTENNA RADIATION PATTERN NO. 202-62

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM
VOT



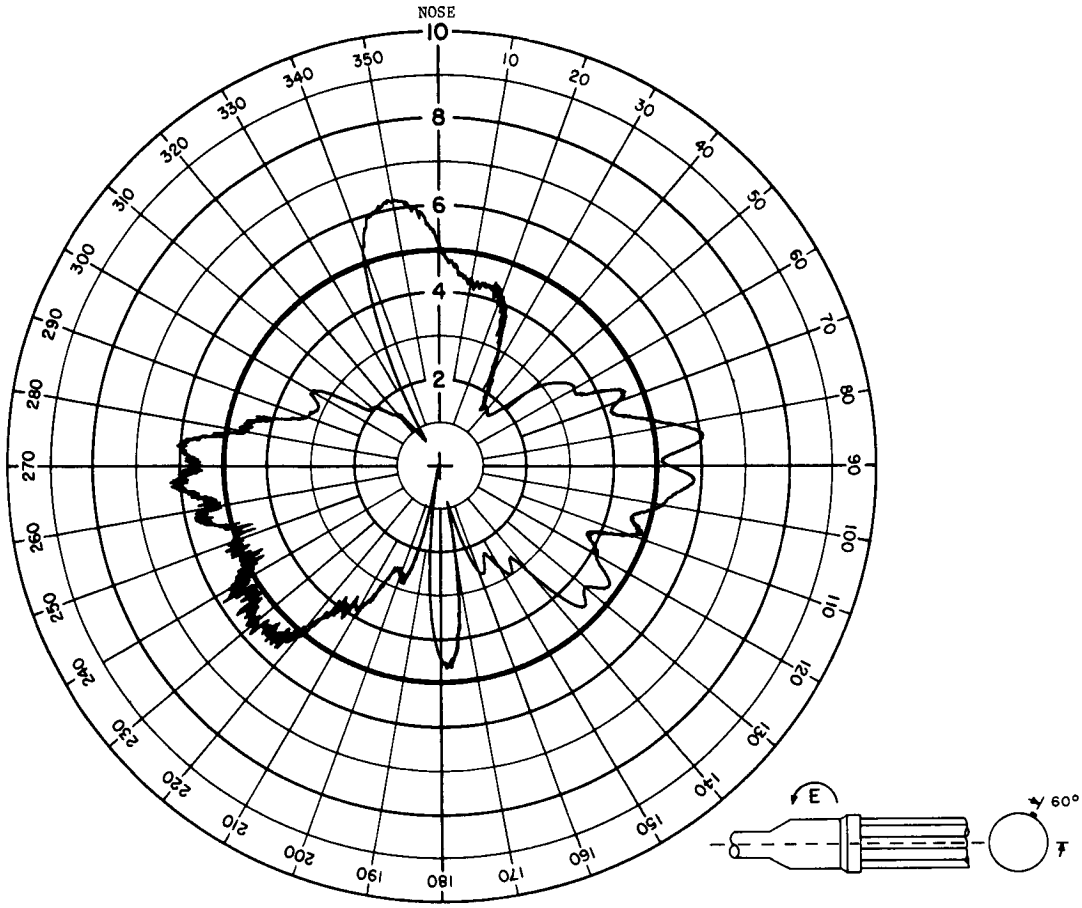


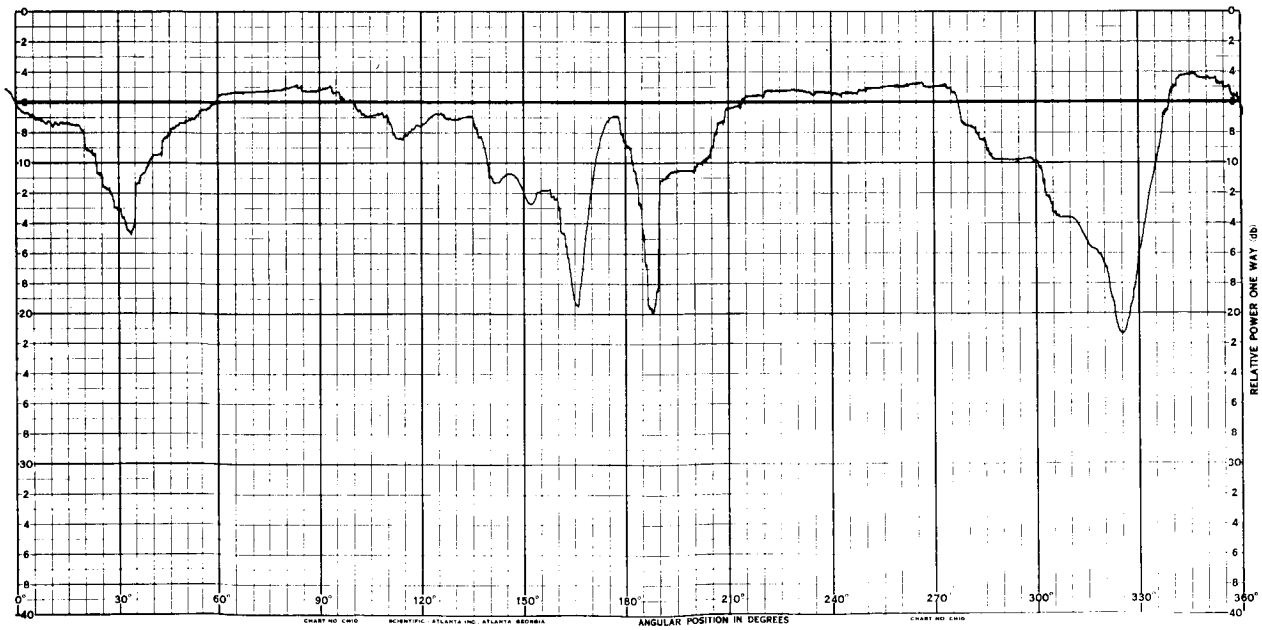
ANTENNA RADIATION PATTERN NO. 202-63

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





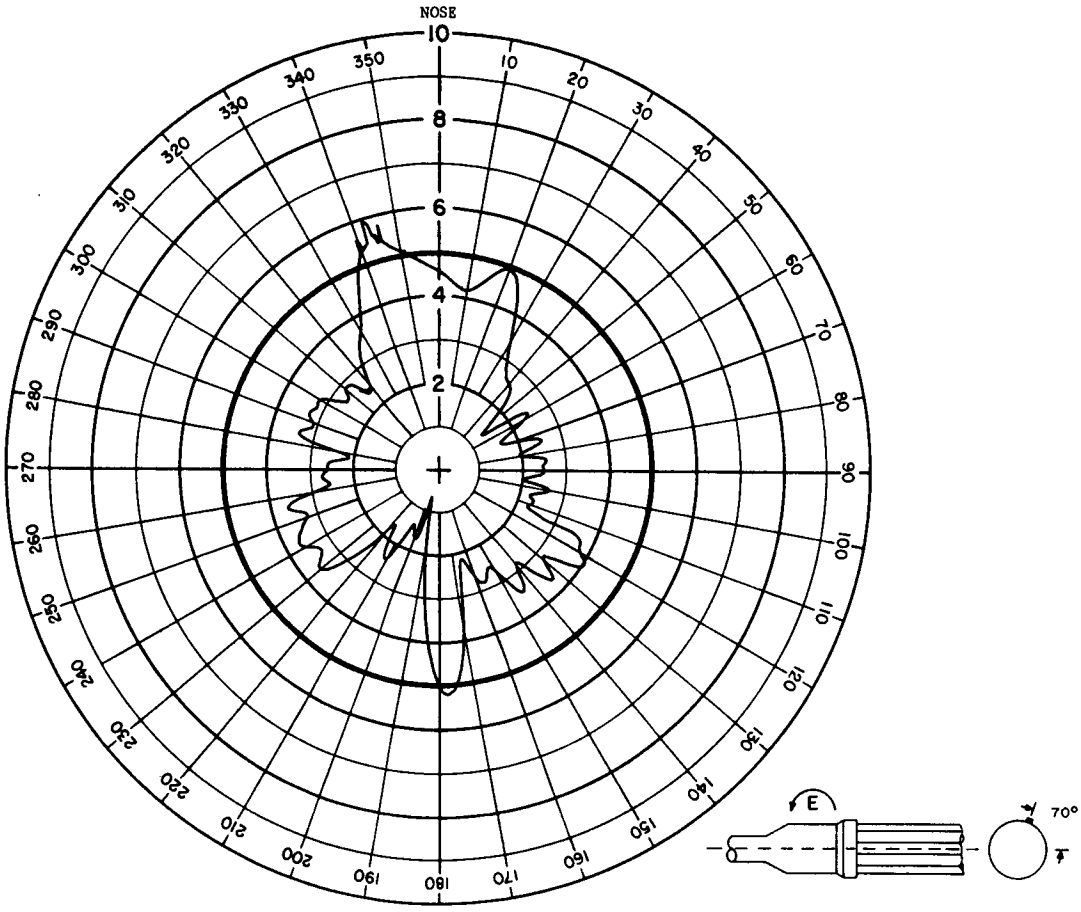
ANTENNA RADIATION PATTERN NO. 202-64

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



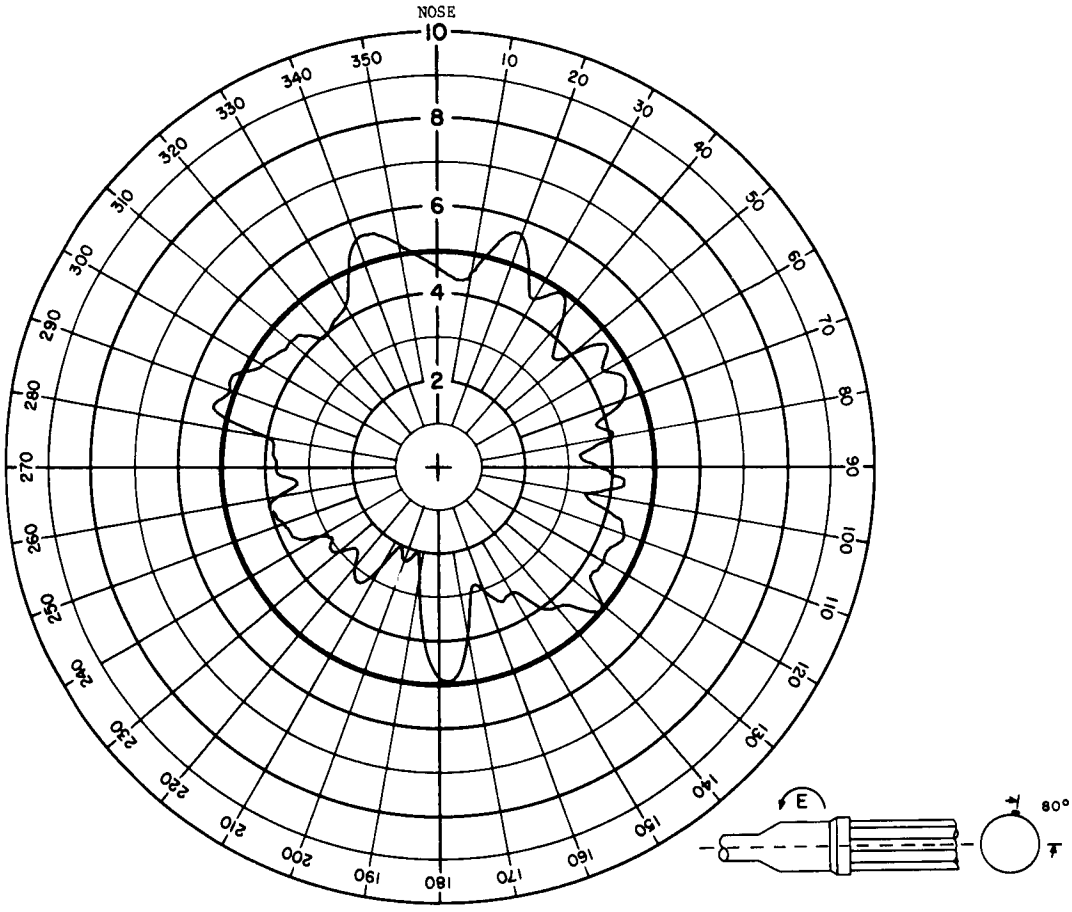
ANTENNA RADIATION PATTERN NO. 202-65

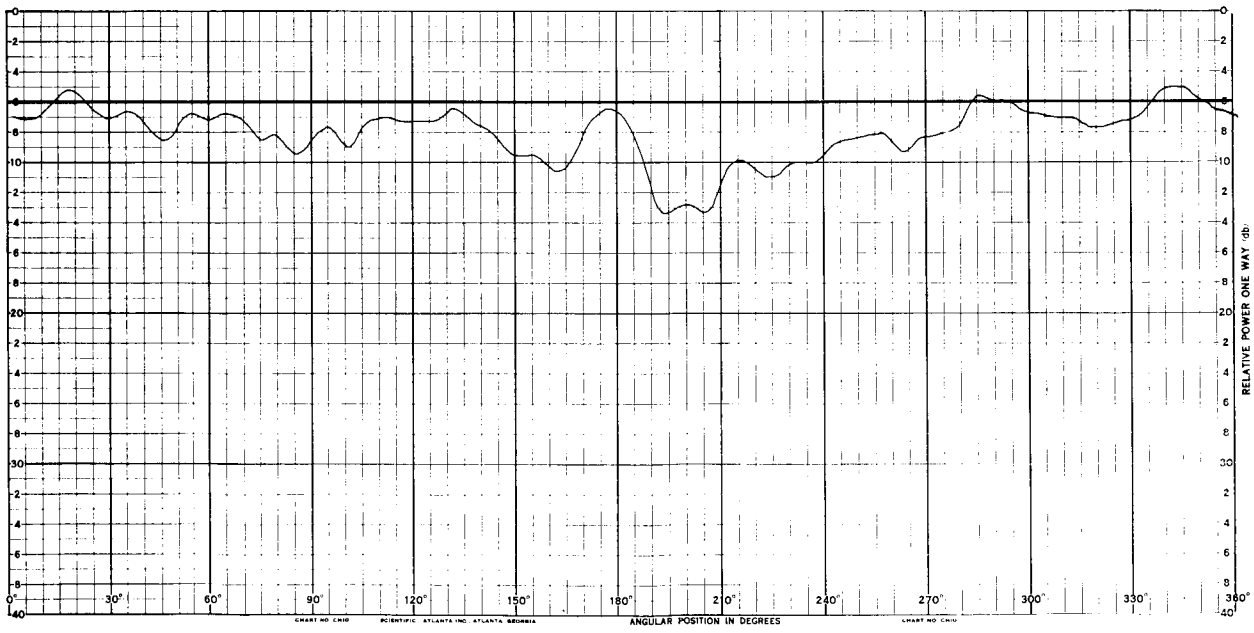
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





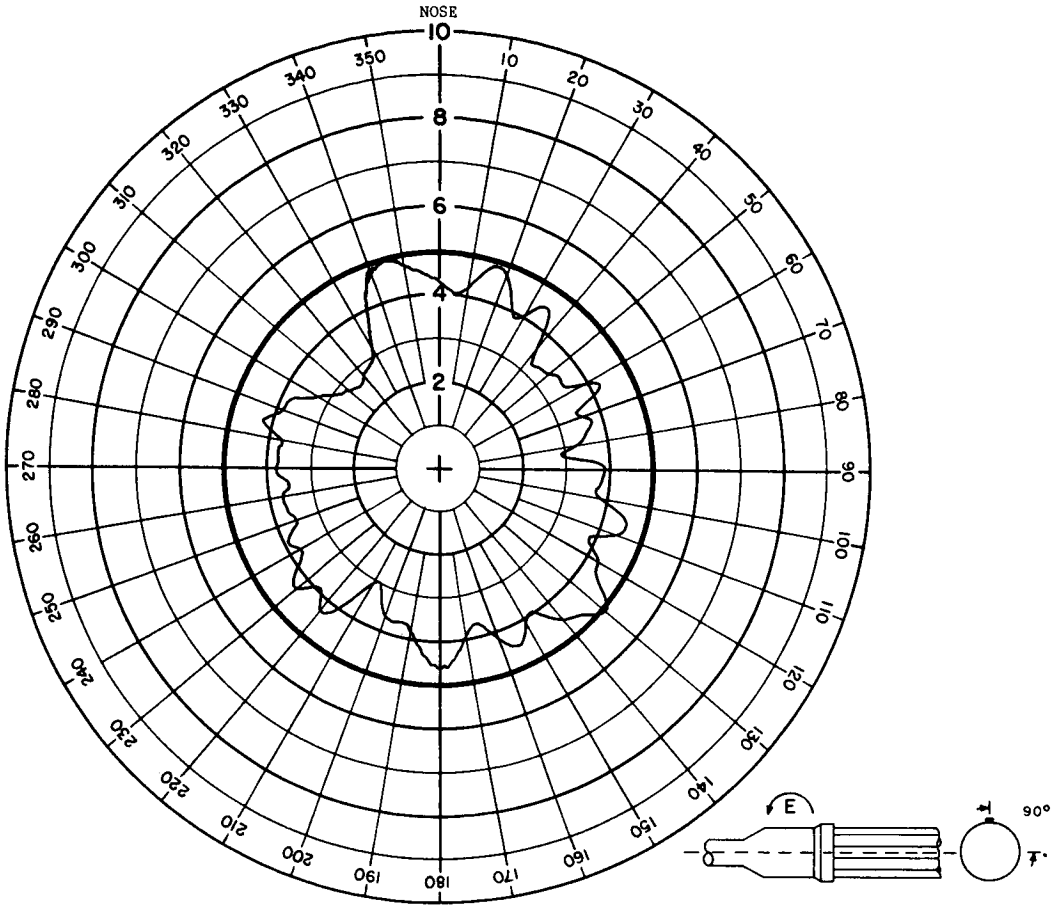
ANTENNA RADIATION PATTERN NO. 202-66

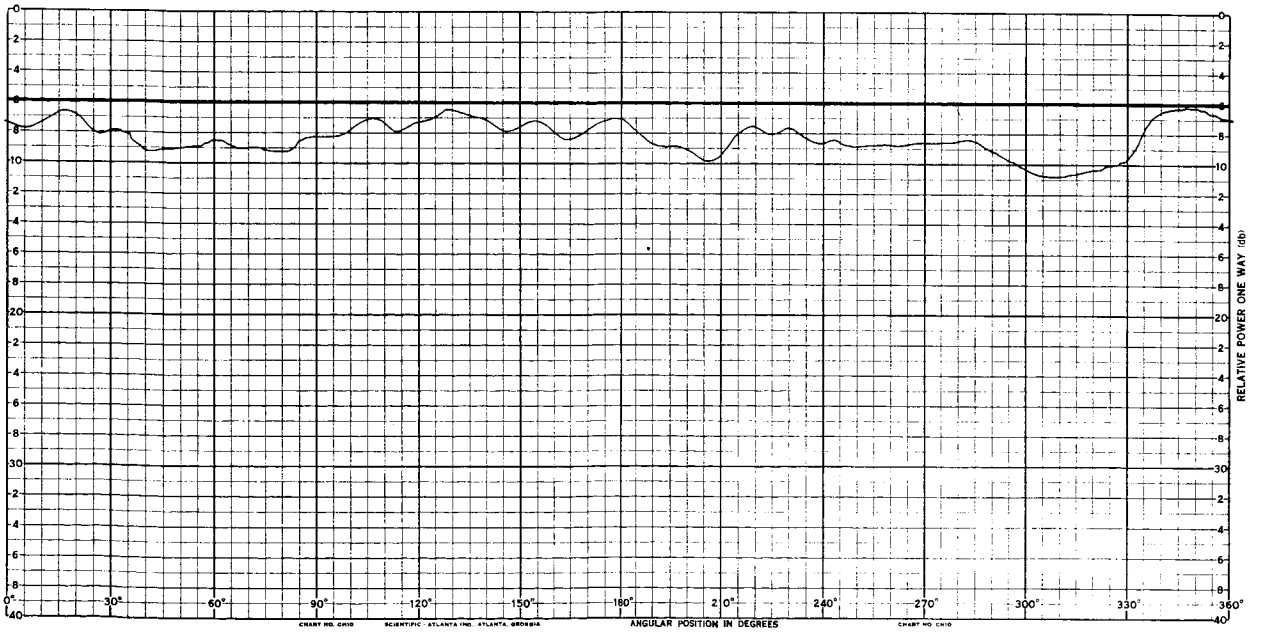
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT





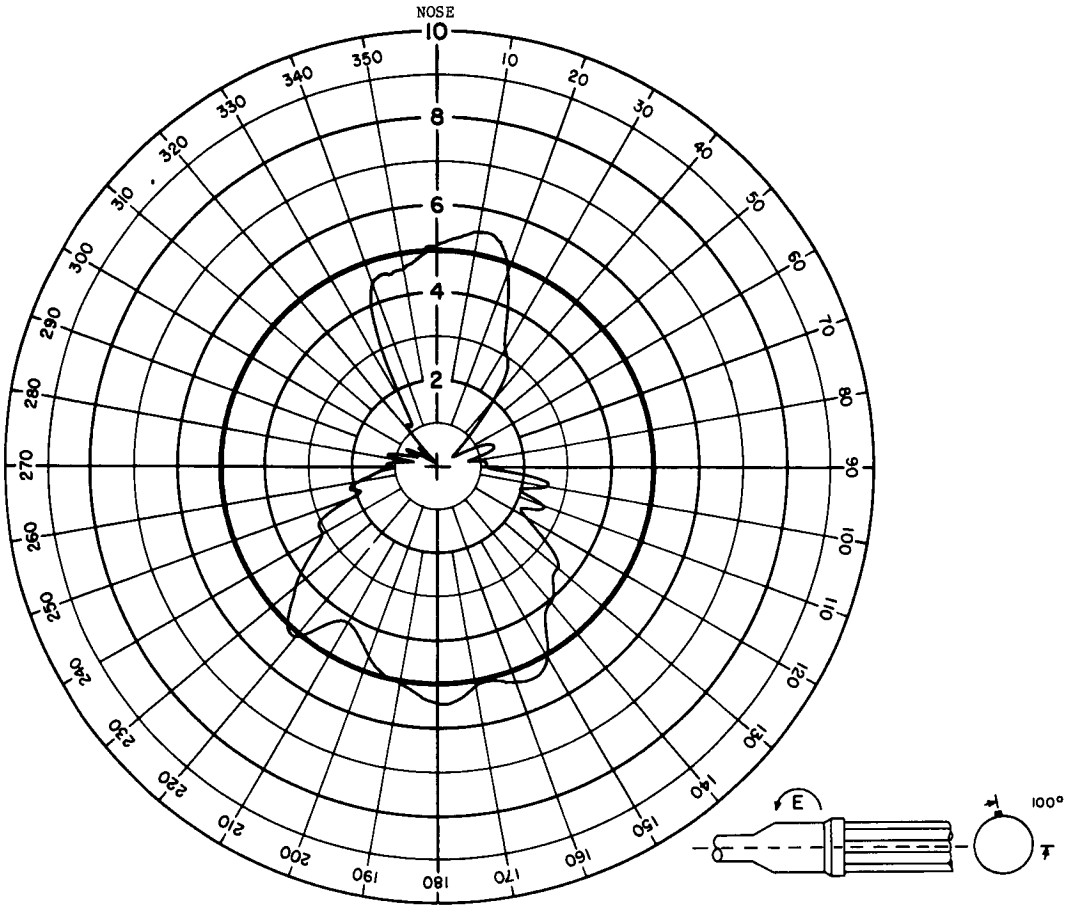
ANTENNA RADIATION PATTERN NO. 202-67

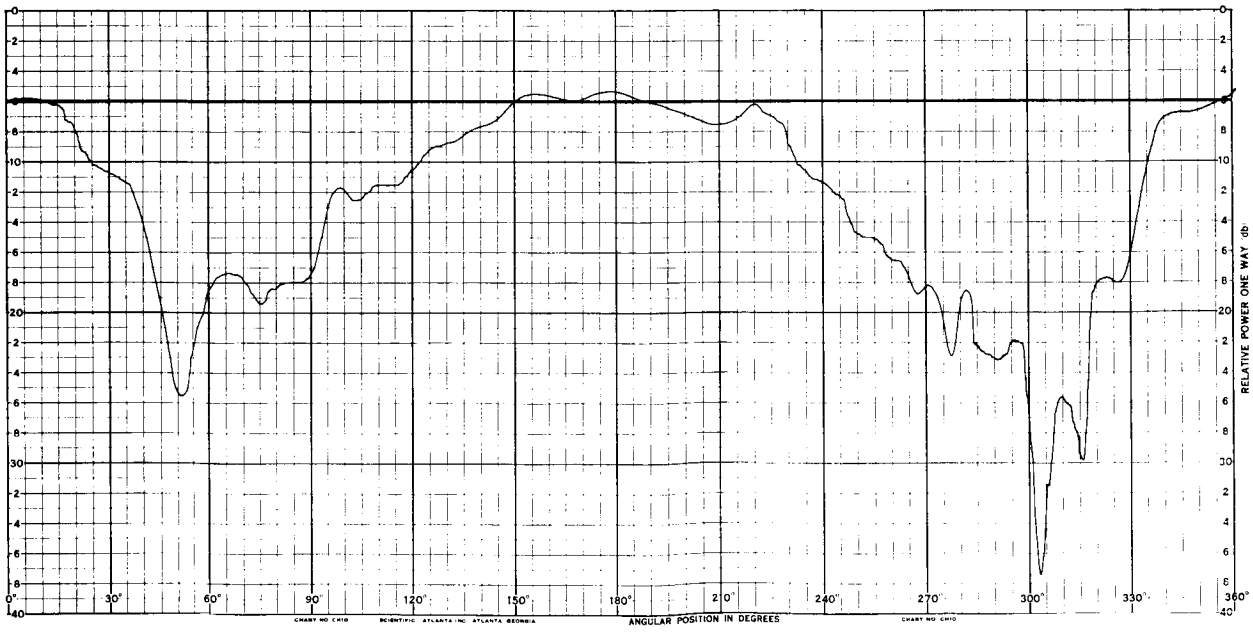
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



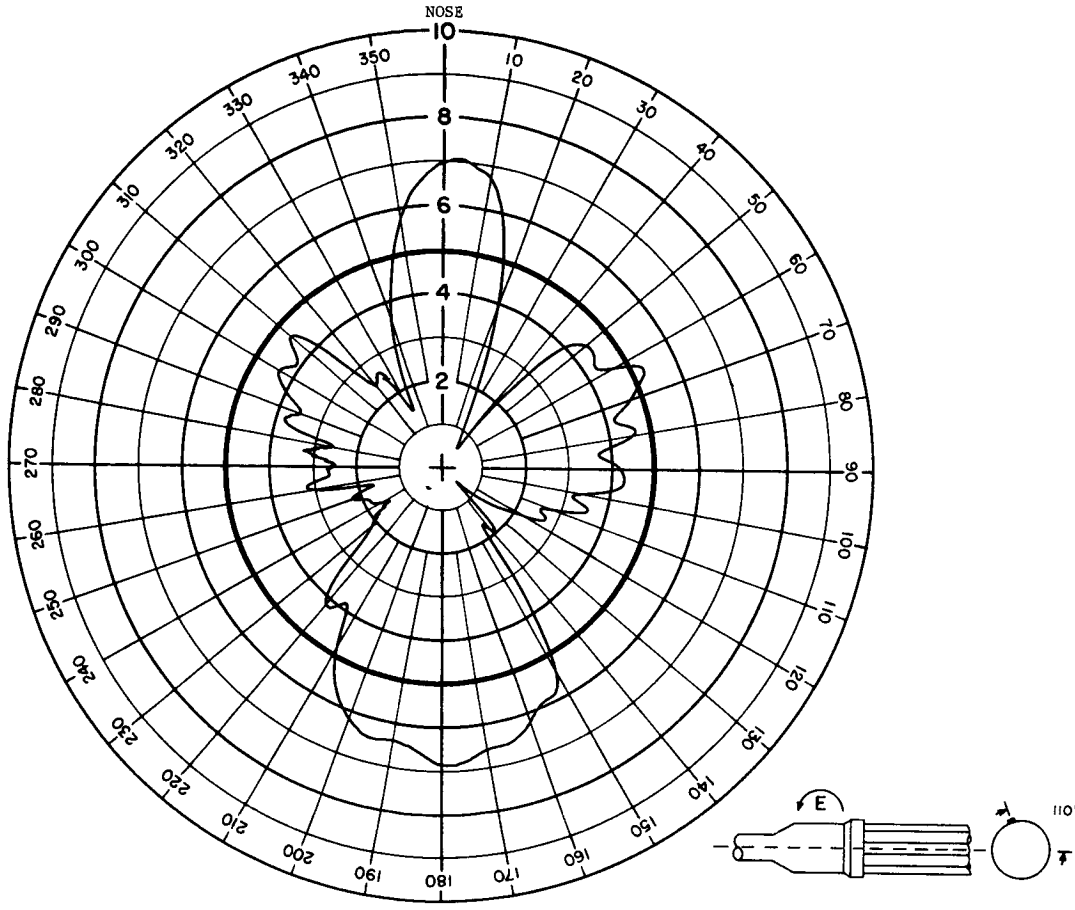


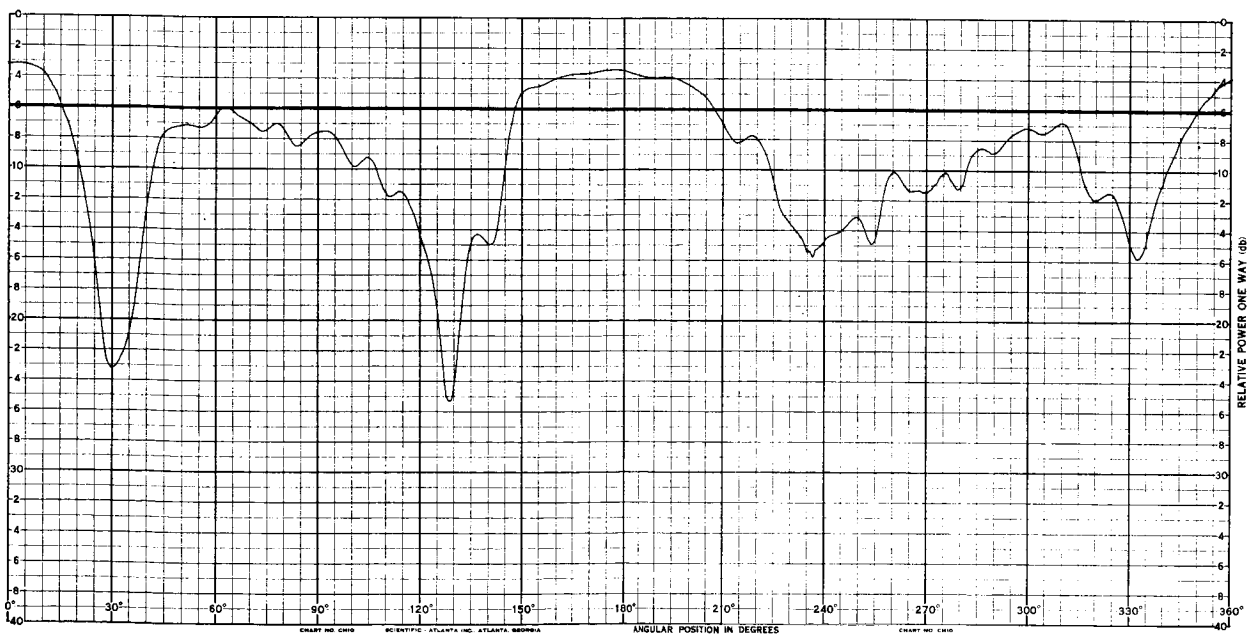
ANTENNA RADIATION PATTERN NO. 202-68

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





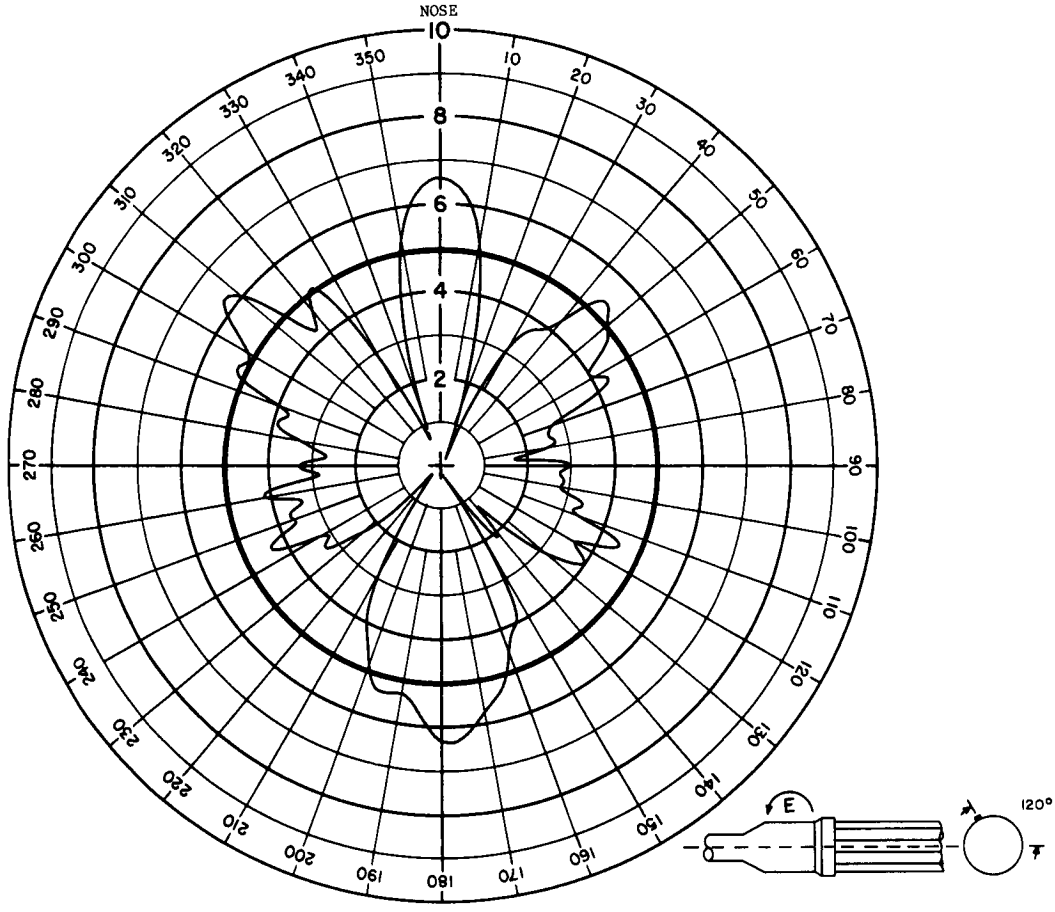
ANTENNA RADIATION PATTERN NO. 202-69

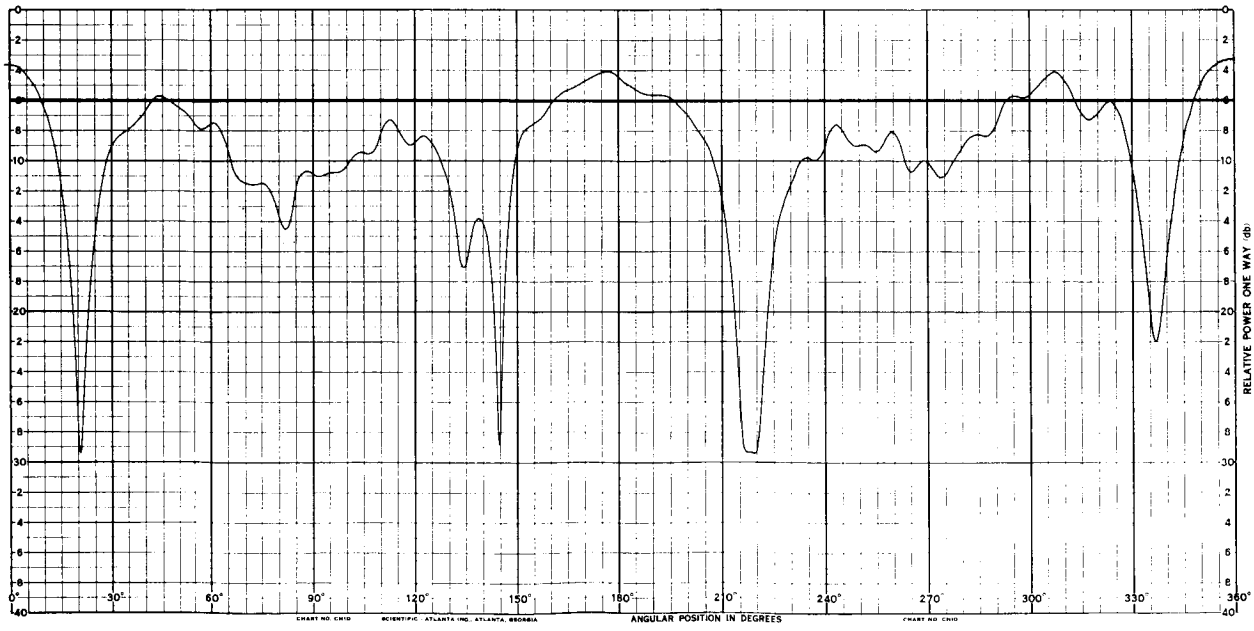
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



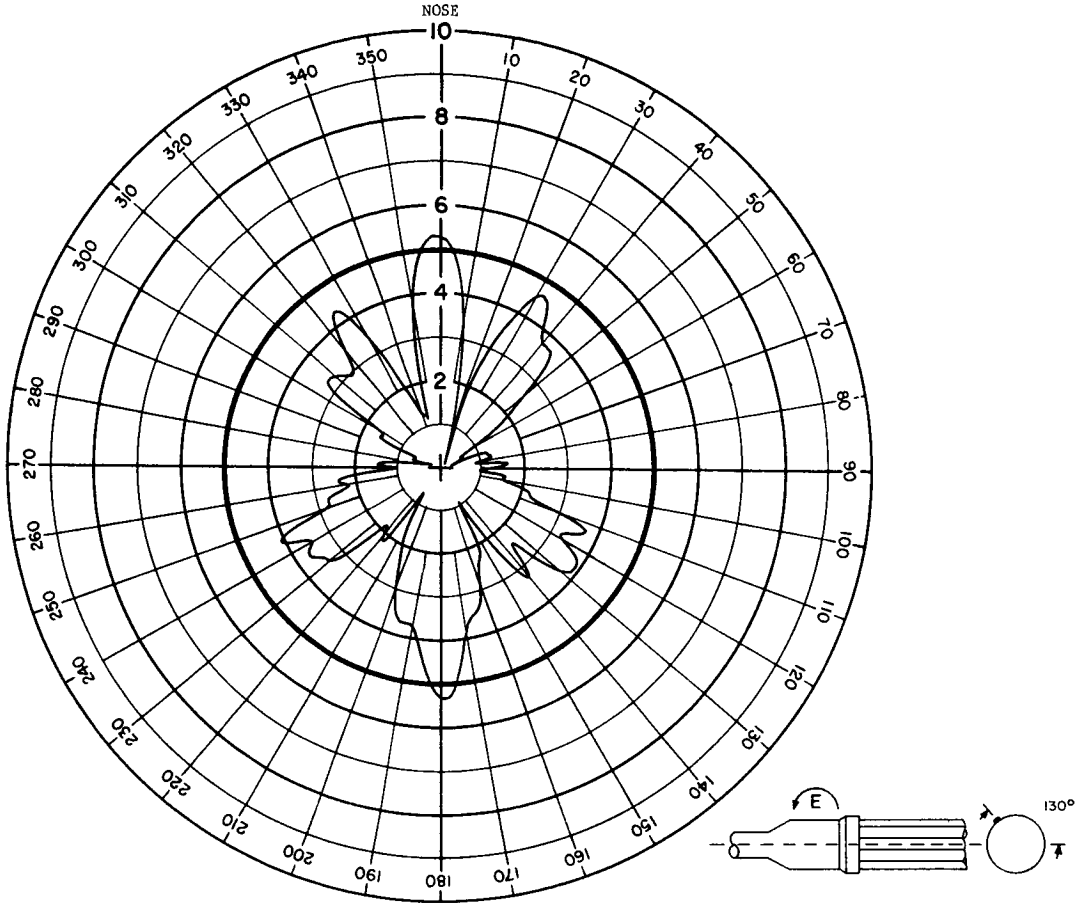


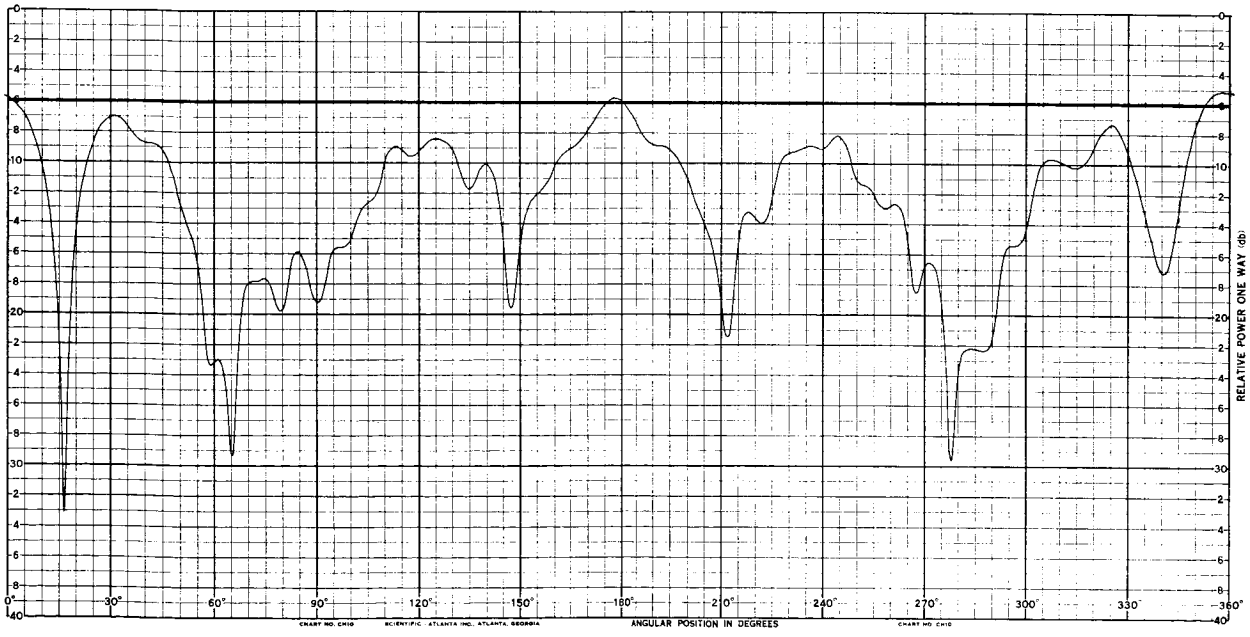
ANTENNA RADIATION PATTERN NO. 202-70

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





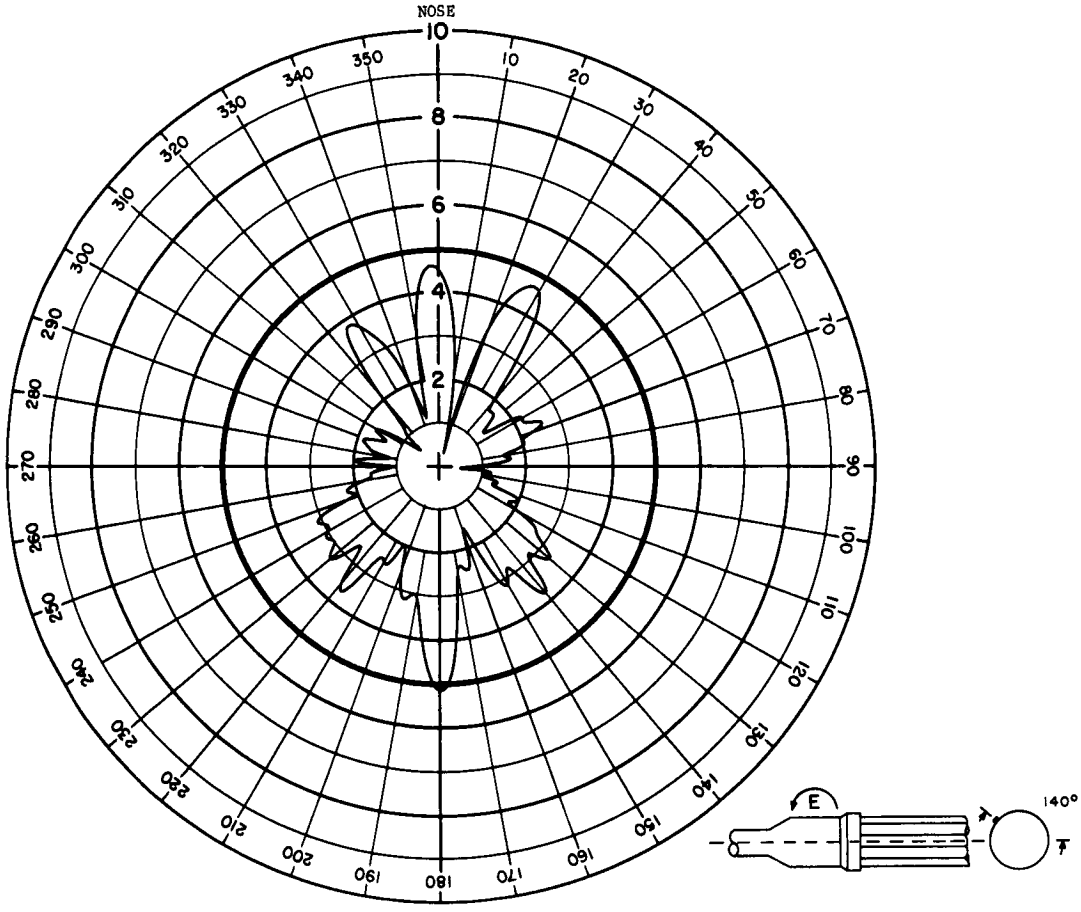
ANTENNA RADIATION PATTERN NO. 202-71

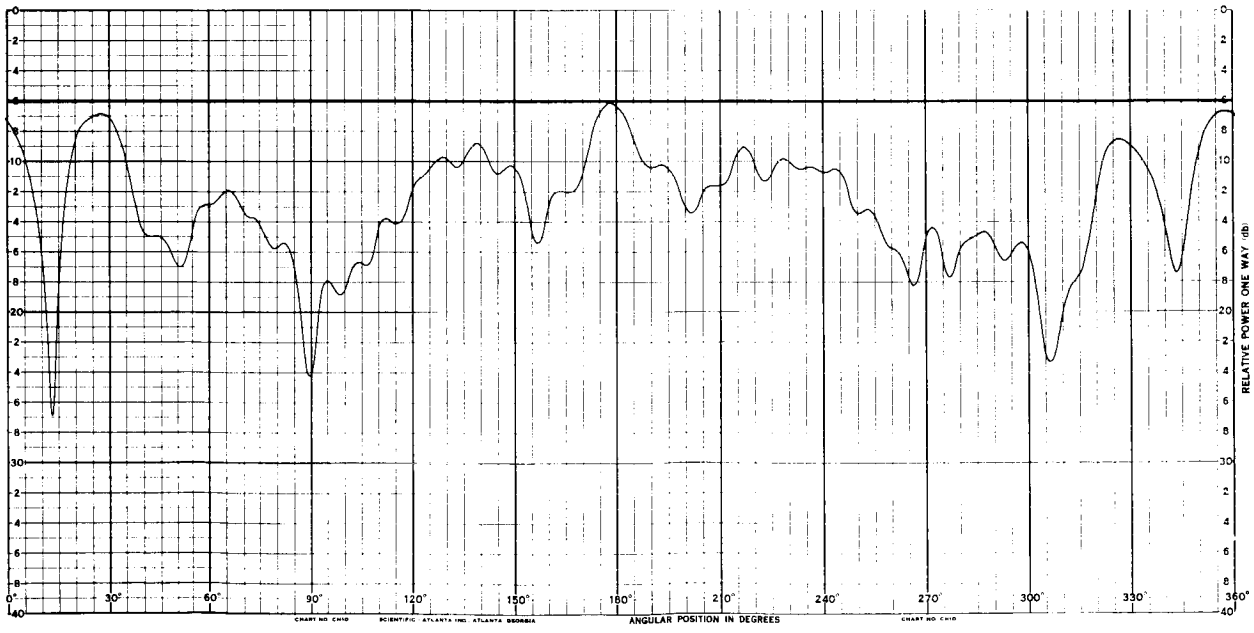
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



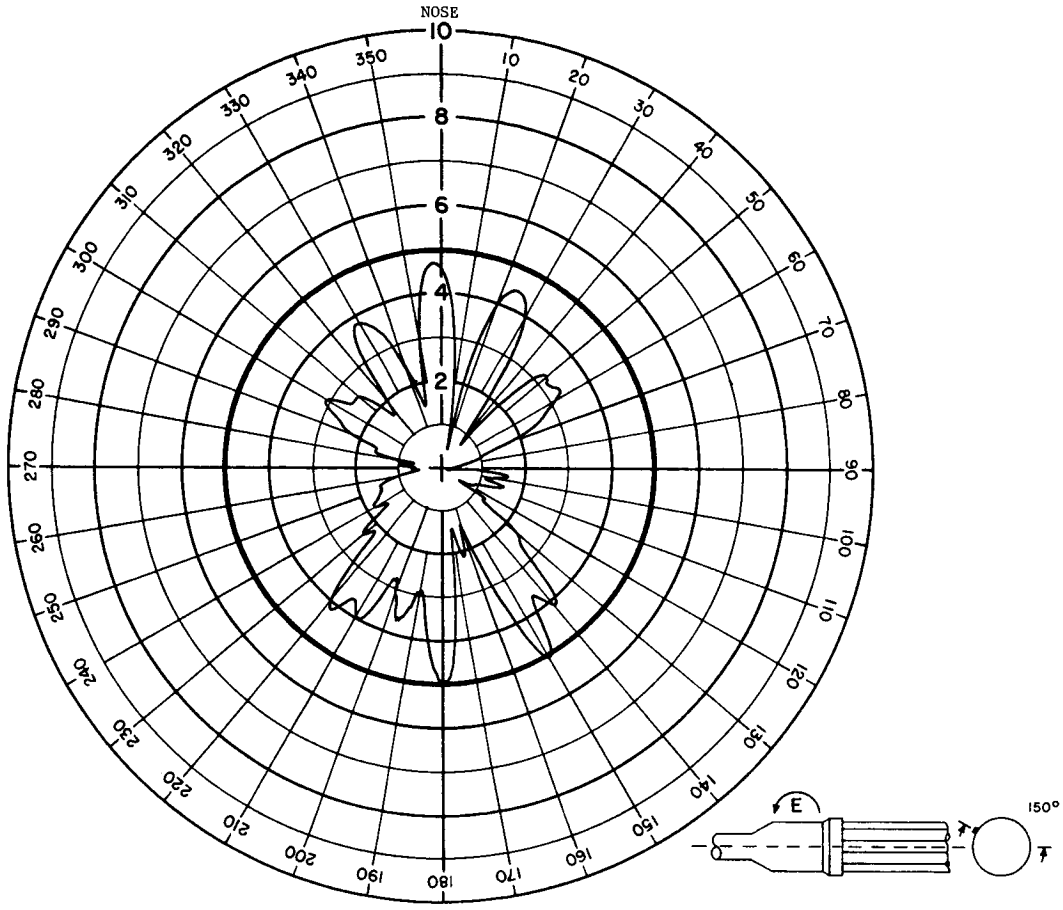


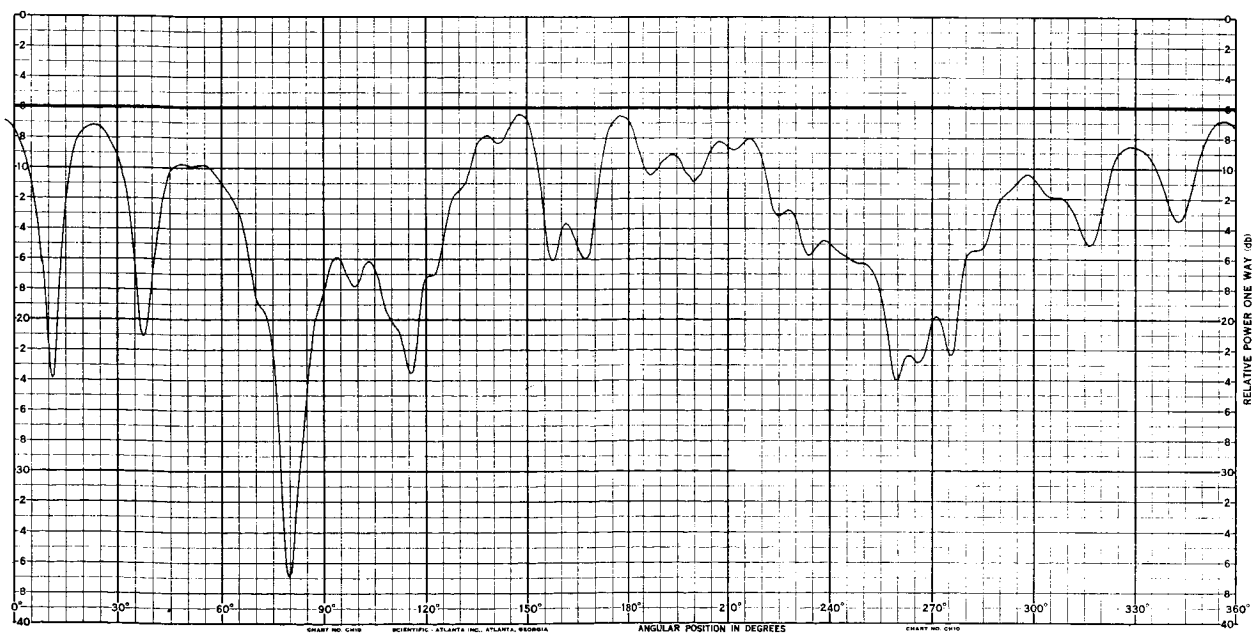
ANTENNA RADIATION PATTERN NO. 202-72

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





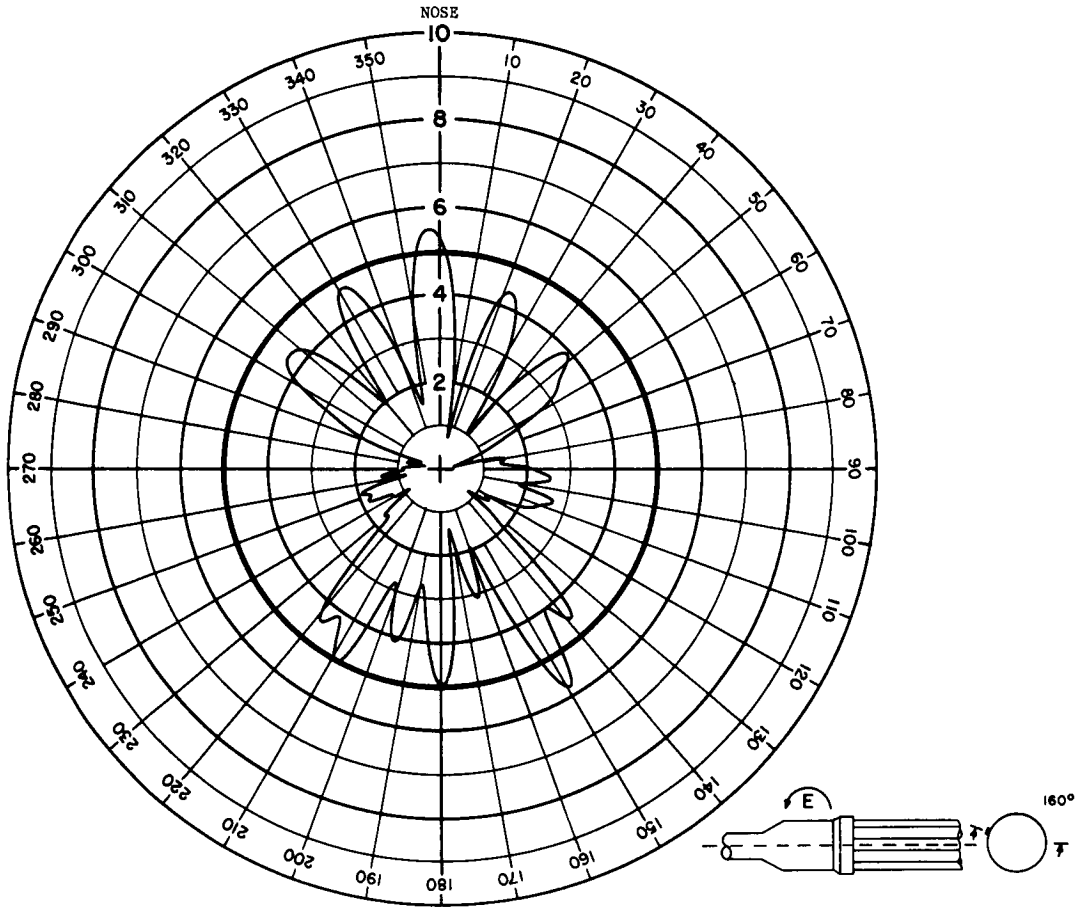
ANTENNA RADIATION PATTERN NO. 202-73

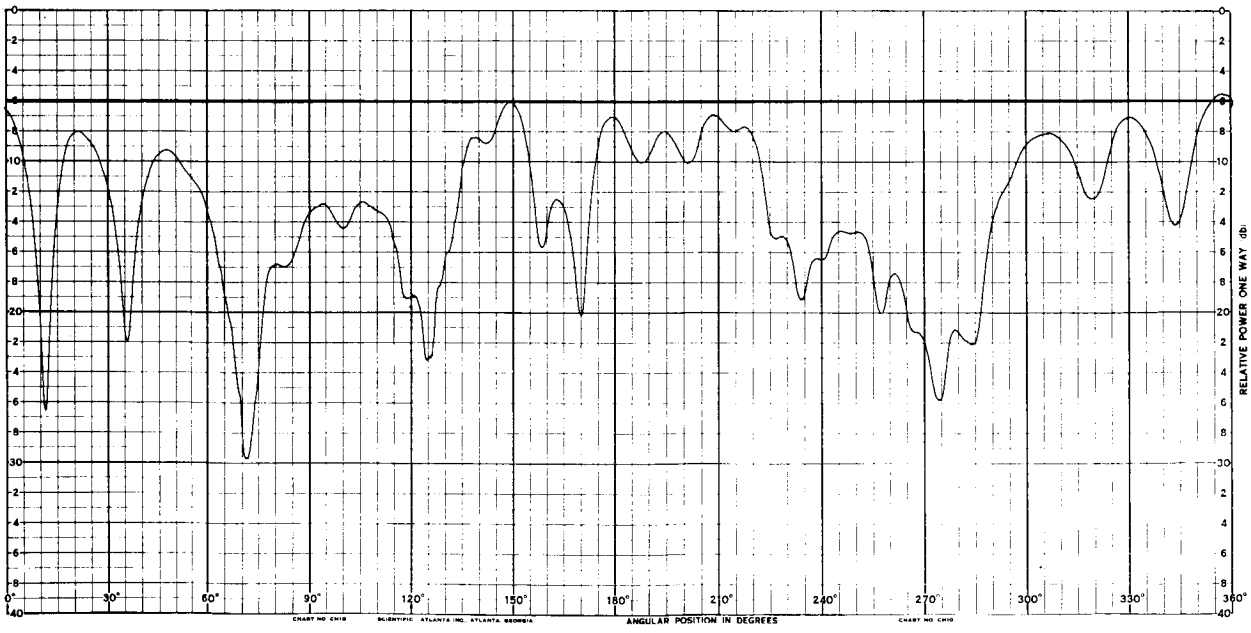
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



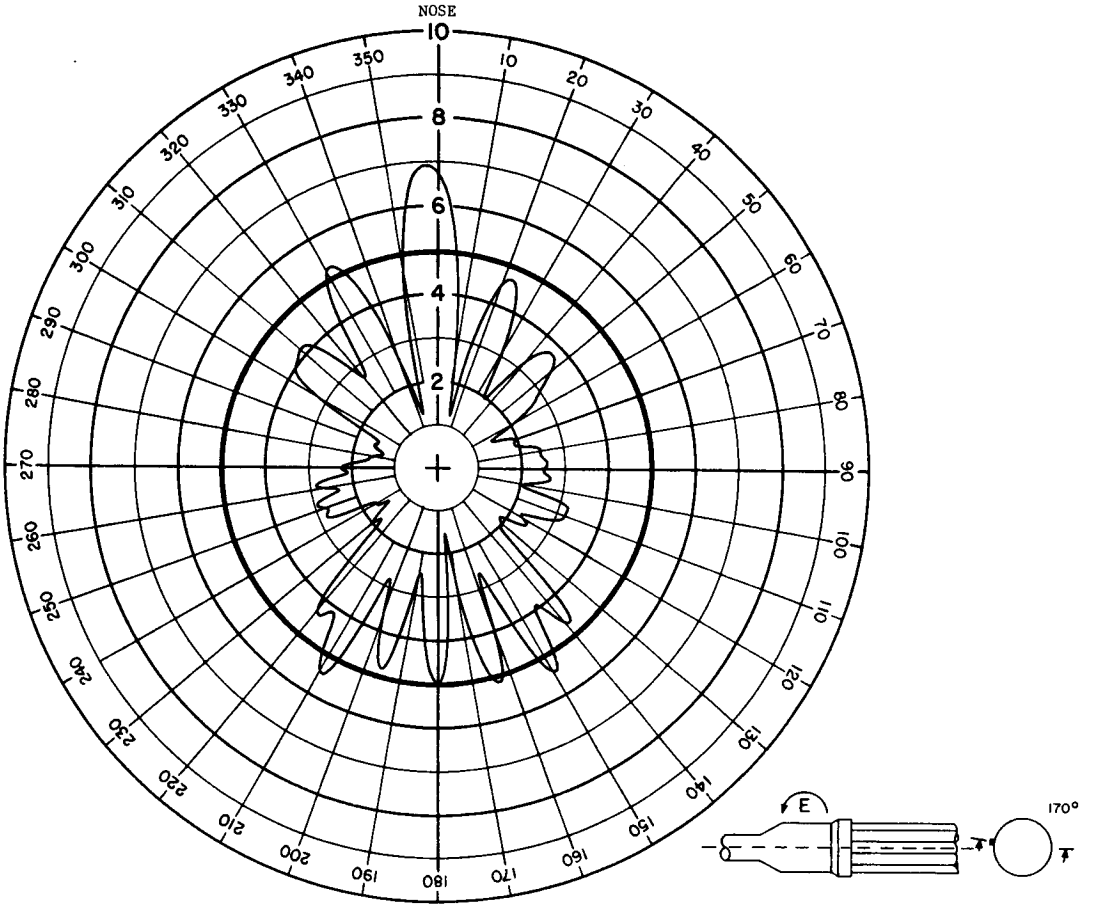


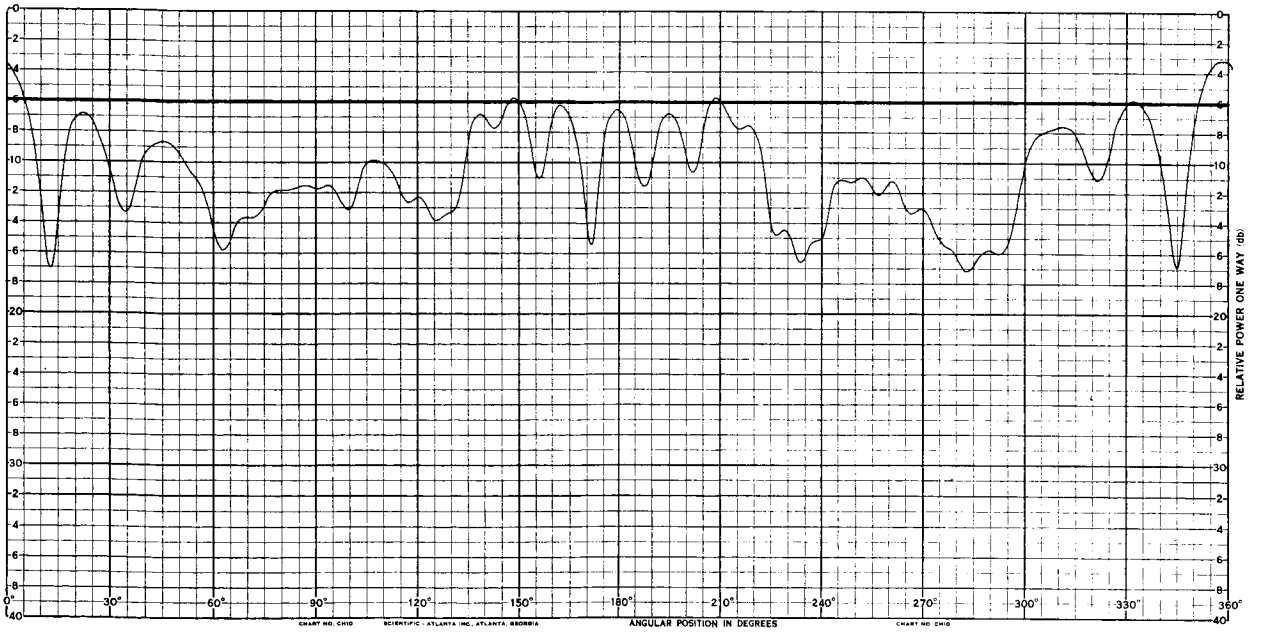
ANTENNA RADIATION PATTERN NO. 202-74

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

VOT





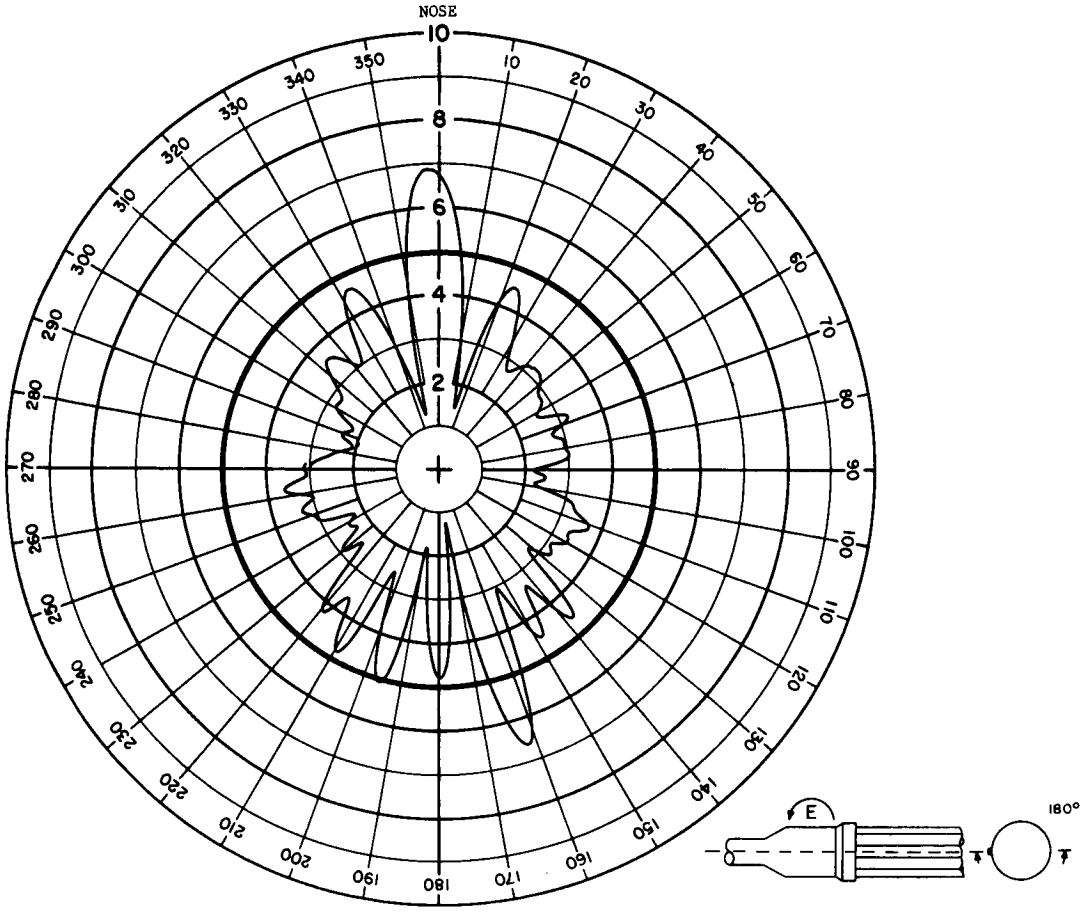
ANTENNA RADIATION PATTERN NO. 202-75

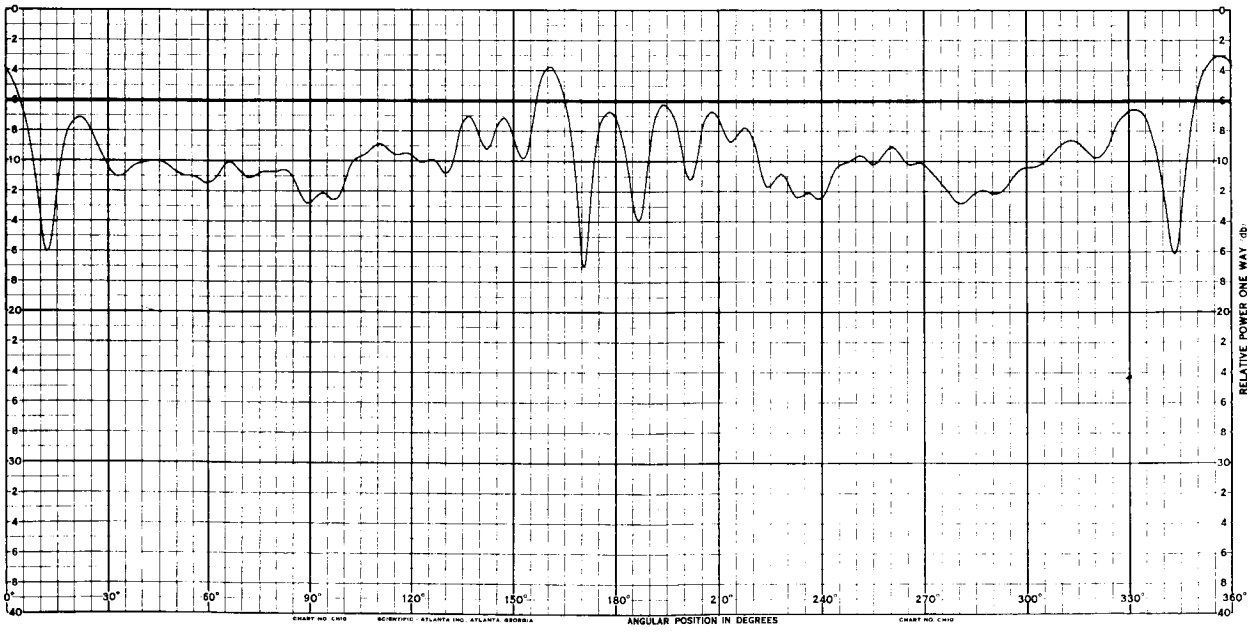
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

MINITRACK-VOT ANTENNA SYSTEM

VOT



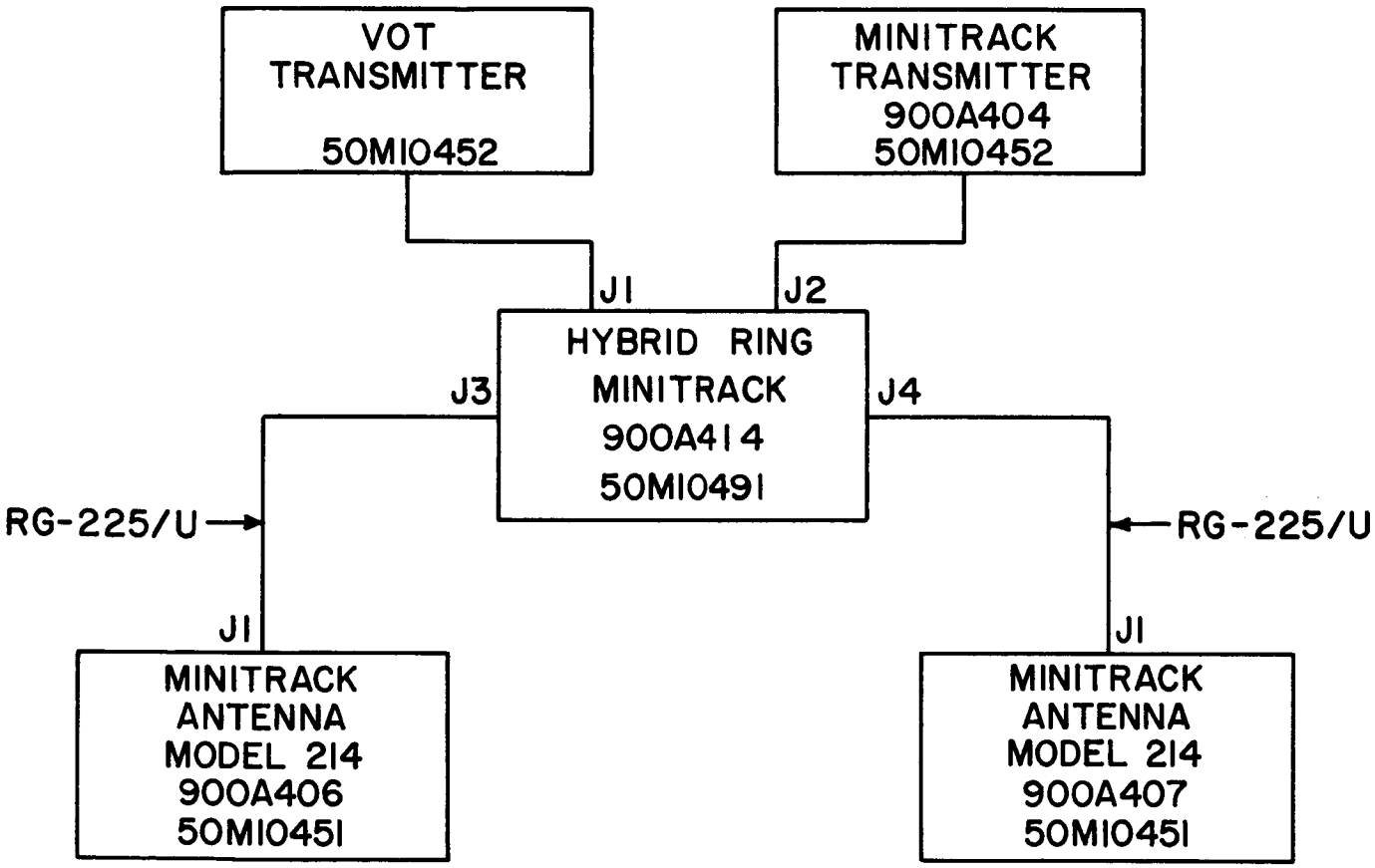


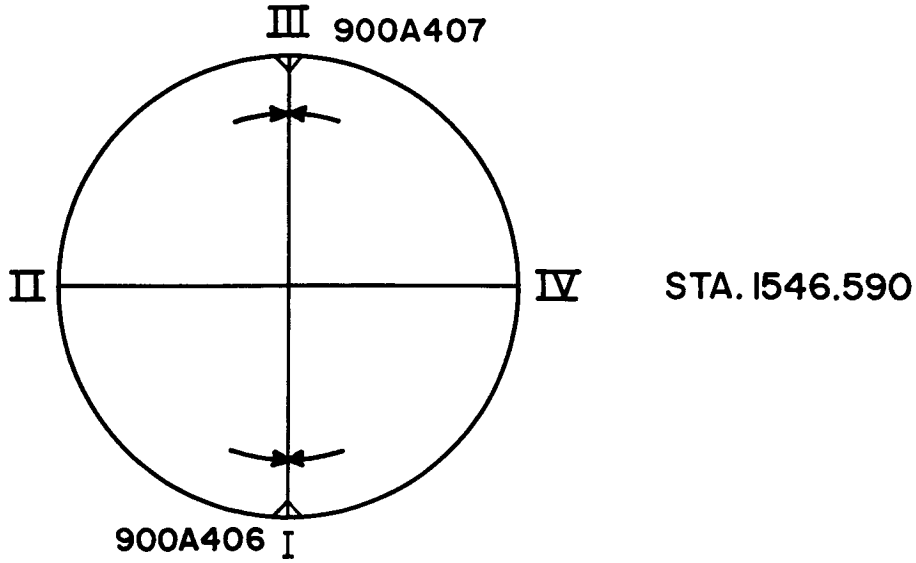
ANTENNA RADIATION PATTERN NO. 202-76

GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MINITRACK-VOT ANTENNA SYSTEM

BLOCK DIAGRAM





SA-5 MINITRACK-VOT ANTENNA SYSTEM

CHECKOUT PROCEDURE

I. RECOMMENDED TEST EQUIPMENT

The following test equipment (or equivalent) is recommended for final checkout of the Minitrack-VOT Antenna System:

Name	Mfr. & Model No.
Standing Wave Indicator	HP-415B
Signal Generator	HP-608
VHF Bridge	HP-803A
Shielded Receiver	HP-417A
Microwave Power Meter	HP-430C
Thermistor Mount	HP-477
Crystal Detector	HP-420B
Ohmmeter	--
High-Resistance Ohmmeter	--
50-Ohm Resistive Load (3 required)	--

II. FINAL CHECKOUT STEPS

CAUTION

The area immediately adjacent to the vehicle skin on which the antenna undergoing tests is mounted shall be reasonably free of reflecting objects. Flat plane metallic objects with a surface dimension of 1/4 wavelength or longer, or cables or other conductors in close proximity to the antenna installation are particularly objectionable. These objects must be removed during the tests to a distance not less than three wavelengths in the direction seen by the antenna. One wavelength will be sufficient if the offending object can be taped flush to the skin of the vehicle.

Where neither of the above steps is practical, it will be necessary to experiment with the conditions to determine the seriousness of the reflections.

A. Hybrid Ring Check the hybrid ring at 137 mc. in accordance with the following check list:

1. Continuity - Check conductor continuity between all connectors with an ohmmeter.

2. Resistance - Check for shorts or leakage with a high-resistance ohmmeter between center and outer conductors of each connector.

3. VSWR - Connect the equipment as shown in figure 1. Measure the VSWR at each connector with the three remaining connectors terminated with 50-ohm loads. The measured VSWR shall not exceed 1.2:1.

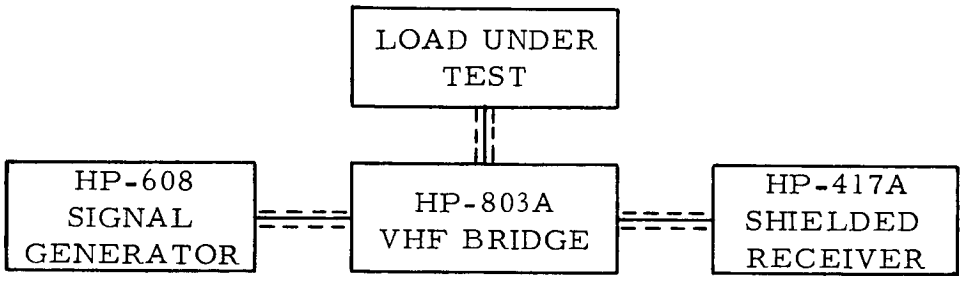


Figure 1.

4. Isolation - Using the signal generator, connected directly to the indicator, obtain full scale (0 db) deflection on the indicator at the highest db range possible. Insert the hybrid ring as shown in figure 2. The isolation (insertion loss) between J1 and J2, indicated on the db scale of the indicator, shall be greater than 35 db.

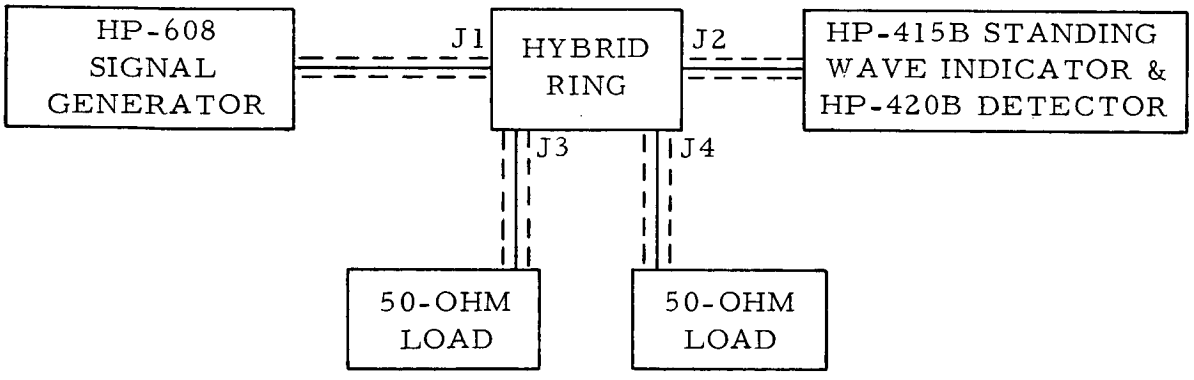


Figure 2.

5. Power Division - Using the equipment shown in figure 3, measure the power division (insertion loss) as indicated below:

a. Terminate J1 and J4 with 50-ohm loads and measure between J2 to J3.

b. Terminate J1 and J3 with 50-ohm loads and measure between J2 to J4.

c. Terminate J2 and J4 with 50-ohm loads and measure between J1 to J3.

d. Terminate J2 and J3 with 50-ohm loads and measure between J1 to J4.

During the above measurements, the power level shall be 3 (±0.5) db down from the reference level of 0 db.

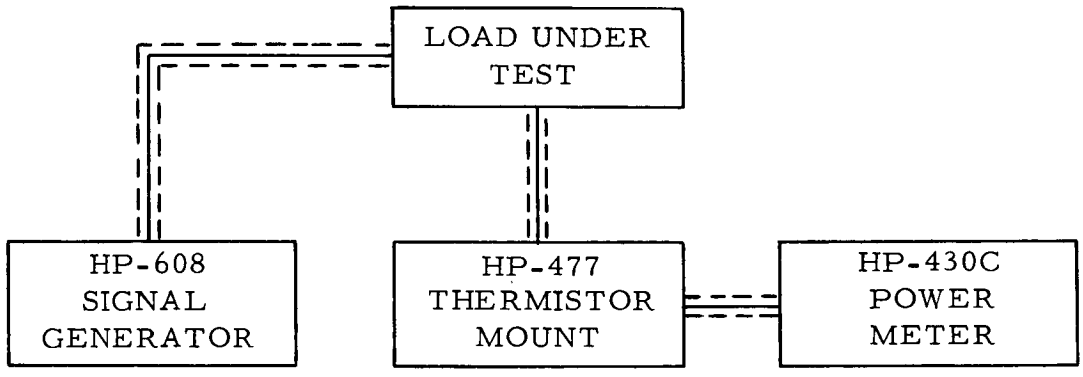


Figure 3.

6. Phase Measurements - Connect the equipment as shown in figure 1.

a. Connect J1 to the bridge. Terminate J3 with a short and obtain a null on the bridge. Do not terminate J2 and J4 during this step.

b. Remove the short from J3. Terminate J4 with a short and obtain a null on the bridge.

c. Remove the bridge from J1 and connect to J2. Terminate J3 with a short and obtain a null on the bridge.

d. Remove the short from J3. Terminate J4 with a short and obtain a null on the bridge.

During the four preceding steps, the null obtained shall not change more than 10°. This indicates that the internal electrical paths to J3 and J4 are either equal, from either input connector J1 and J2, or differ by a multiple of a half wavelength. The 180° ambiguity is eliminated in the installation check.

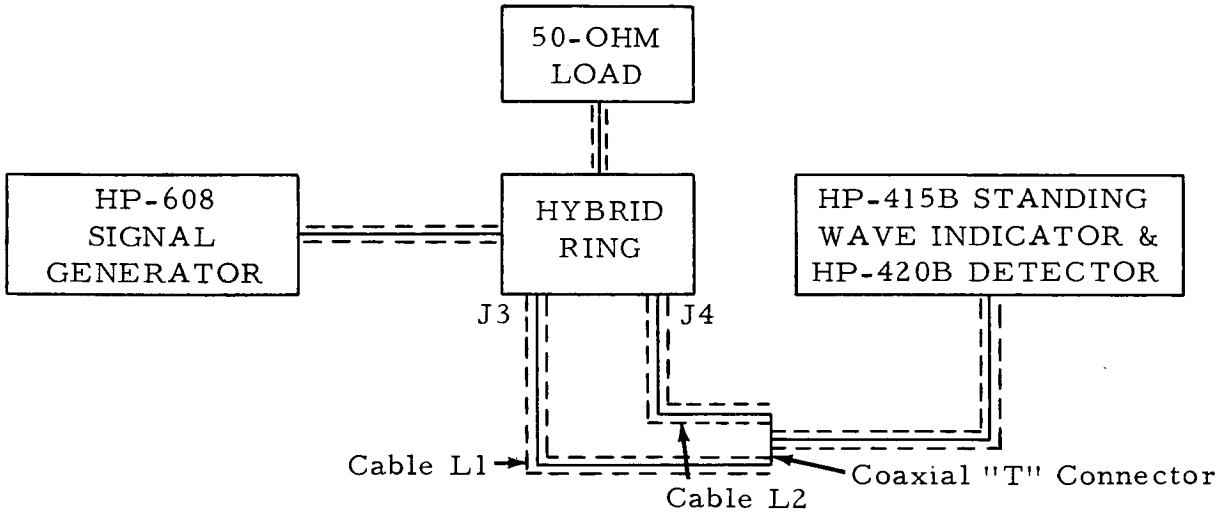
7. Phase Ambiguity and Installation Check - Connect the equipment as shown in figure 4.

a. Transmit an rf power, at the Minitrack frequency, into connector J2 and reference the standing wave indicator to 0 db on the highest possible db range.

b. Interchange the 50-ohm load and the signal generator. (The rf power is now transmitted into J1.)

c. With the power transmitted into connector J1, the output level measured by the standing wave indicator shall be greater than 10 db below the previous reference level of 0 db.

The above steps indicate that the power transmitted from J3 and J4 will be in-phase for a transmitter connected to J2 and 180° out-of-phase for a transmitter connected to J1. The VOT transmitter shall be connected to J1 and the Minitrack transmitter to J2.



Note: Cables L1 and L2 equal in length within five electrical degrees.

Figure 4.

B. Cables

1. Continuity - Check the continuity of the conductors of each cable, from connector to connector, with an ohmmeter.

2. Resistance - Check the resistance between conductors with a high-resistance ohmmeter for short circuits and leakage.

3. VSWR - Terminate one end of the cable with a 50-ohm load and measure the VSWR at the other end. The measured VSWR shall not exceed 1.3:1.

4. Attenuation - Perform attenuation tests at the frequencies at which the cable is to be used by transmitting rf energy, from the signal generator, through the cable. Measure the output power with the power

meter and thermistor mount. Determine the insertion loss by comparing the input power with the output power. The measured attenuation shall not exceed the manufacturer's attenuation rating for the cable by more than 1 db for the manufacturer's attenuation rating for the total length of the cable between the antenna and any cable junction.

5. Electrical Length - Determine the electrical length of the cable as follows:

a. Terminate one end of the cable with a short and measure the impedance at the other end, using the equipment shown in figure 1. The electrical length shall be within ±0.014 wavelength or ±5° difference between the two cables.

b. Repeat the above test at 40 mc. to eliminate the possibility of a 180° phase ambiguity which could occur in the previous test.

C. Antennas

Impedance Match - Connect the equipment as shown in figure 1. Measure the VSWR at each operating frequency, as specified in steps a through c below. During these measurements, the specified frequency shall be set precisely with the crystal calibrator.

a. Measure the VSWR at each antenna input connector. The measured VSWR shall not exceed 1.3:1.

b. Connect the cables to the antennas and measure the VSWR at the input to each cable. The measured VSWR shall not exceed 1.5:1.

c. Connect the antenna cables to the hybrid ring. Measure the VSWR at input connector J1 at the VOT frequency, and at input connector J2 at the Minitrack frequency. The measured VSWR shall not exceed 1.5:1.

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MINITRACK-VOT ANTENNA SYSTEM

NOTES