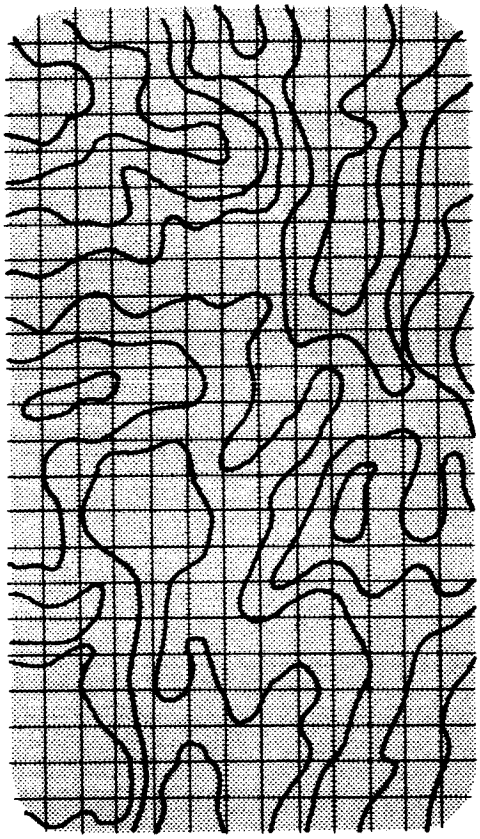


FACILITY FORM 602

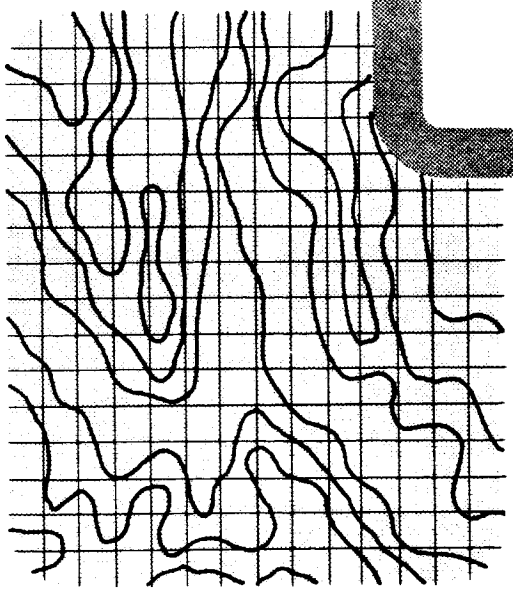
N66-16070 (ACCESSION NUMBER) (THRU) 1

283 (PAGES) (CODE) 07

CR 69697 (NASA CR OR TMX OR AD NUMBER) (CATEGORY)

SATURN ANTENNA SYSTEMS SA-5

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



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VOLUME 3

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

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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, Chief
Antenna Development Unit

SA-5

SATURN ANTENNA SYSTEMS

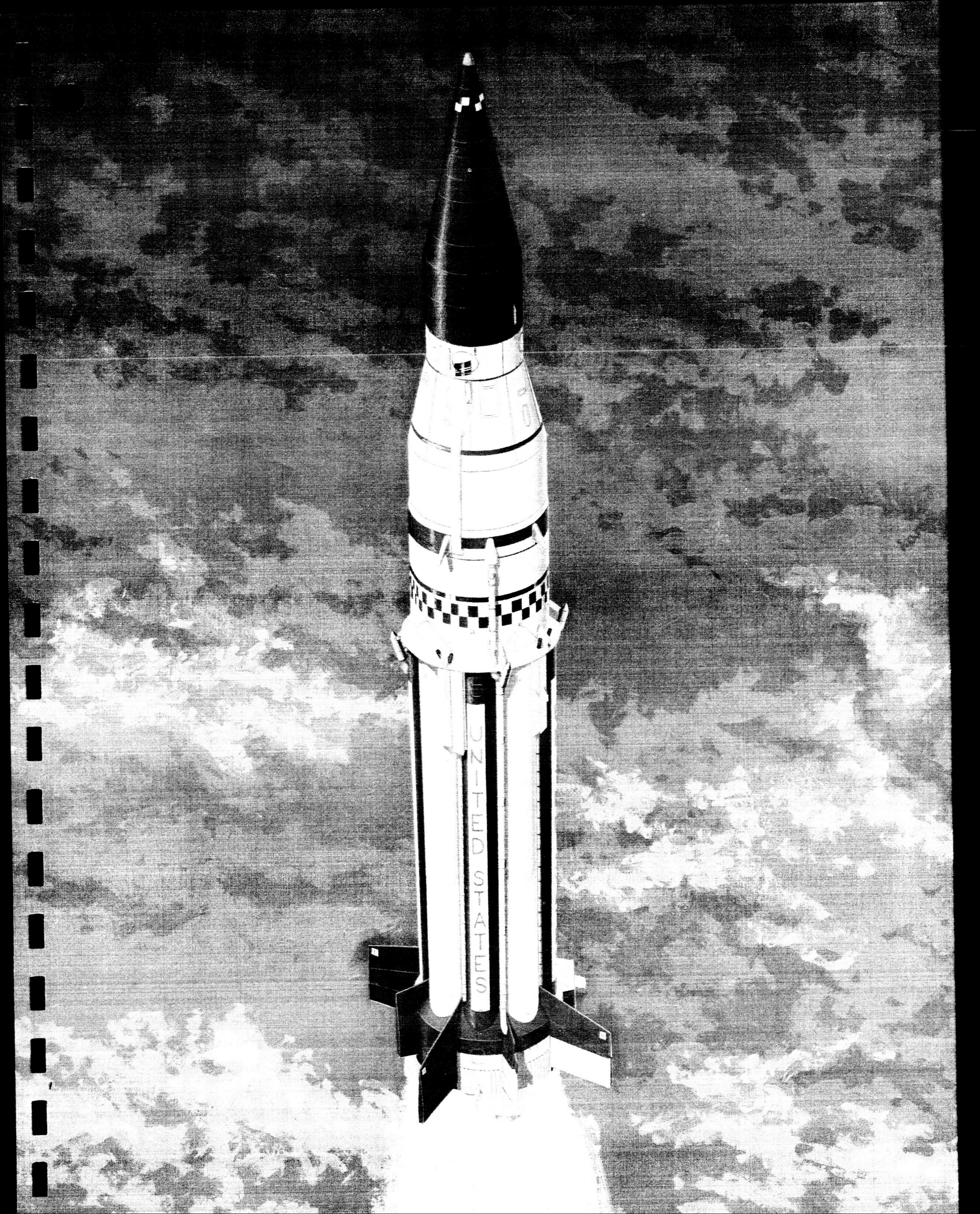
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UNITED STATES

SA-5

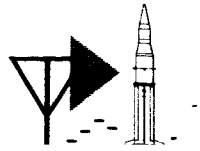
SATURN ANTENNA SYSTEMS

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

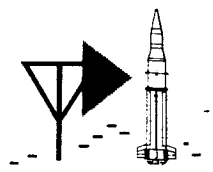
INTRODUCTION
(Cont.)

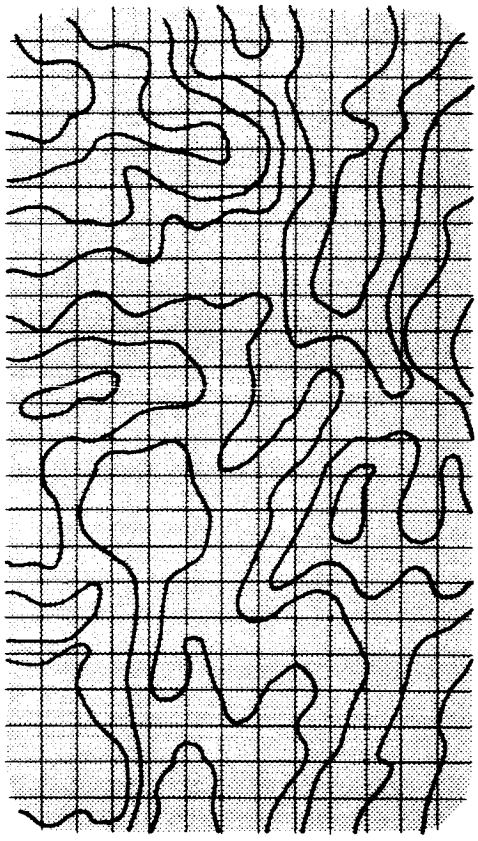
Instrument Unit - The instrument unit consists of four 40-inch-diameter tubes which extend radially from a vertical 70-inch diameter center tube. The C-Band Radar, Azusa, Udop Transmitting and Receiving, Altimeter, Mistram, and two of the six VHF Telemetry antennas are located on the instrument unit.

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.

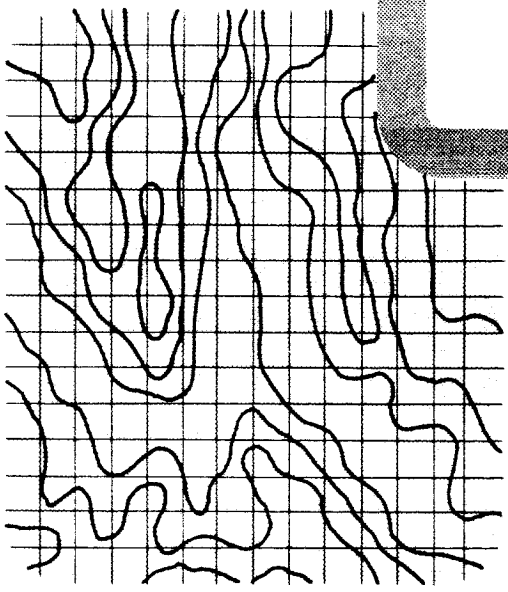
Predicted look angles are provided in the back of each volume of this publication. These are on transparent sheets that may be removed and placed over a contour plot to determine the field strength (in db) versus time of any antenna during the flight trajectory.

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





ALTIMETER ANTENNA SA-5



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TECHNICAL DATA UNIT

SA-5 ALTIMETER ANTENNA

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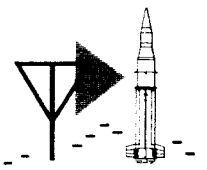
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SA-5 ALTIMETER ANTENNA

DESCRIPTION

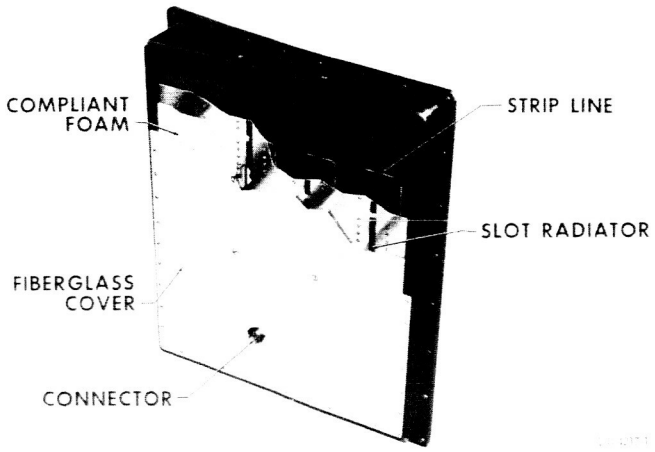
The Altimeter antenna, Model 502, is a planar 3 by 4 slot array. The slots are etched on one side of a 1/8 inch thick copper laminated rexolite sheet. The other side of this sheet has an etched feed line which divides the power equally and in phase among the slots. To block one side of the slots, another 1/8-inch thick copper laminated rexolite sheet is used duplicating the power divider on one side where the lamination on the other side is left intact.

One antenna is used for both transmitting and receiving. This antenna configuration produces a pattern normal to its aperture having 16 db gain at the center of the lobe. The level of side lobes is relatively low, but high enough to assure adequate signal strength during the early portion of the flight trajectory. The transmission line between transponder and antenna is RG-214/U coaxial cable.



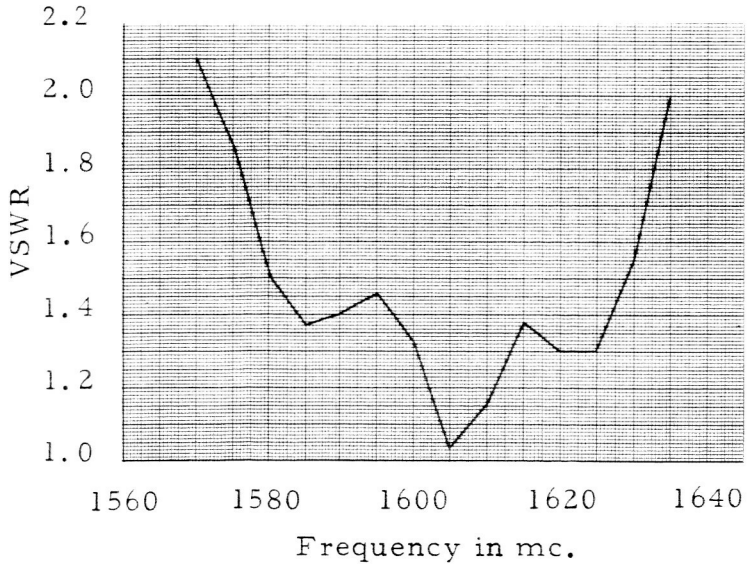
SA-5 ALTIMETER ANTENNA

SPECIFICATIONS
MODEL 502

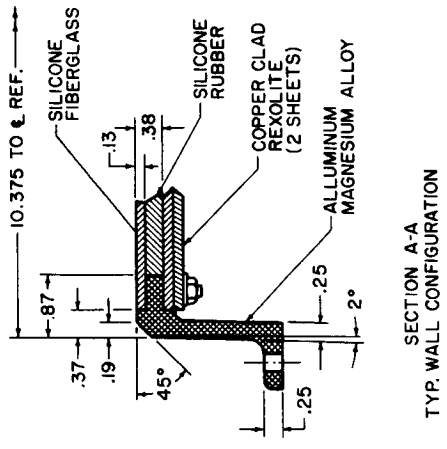


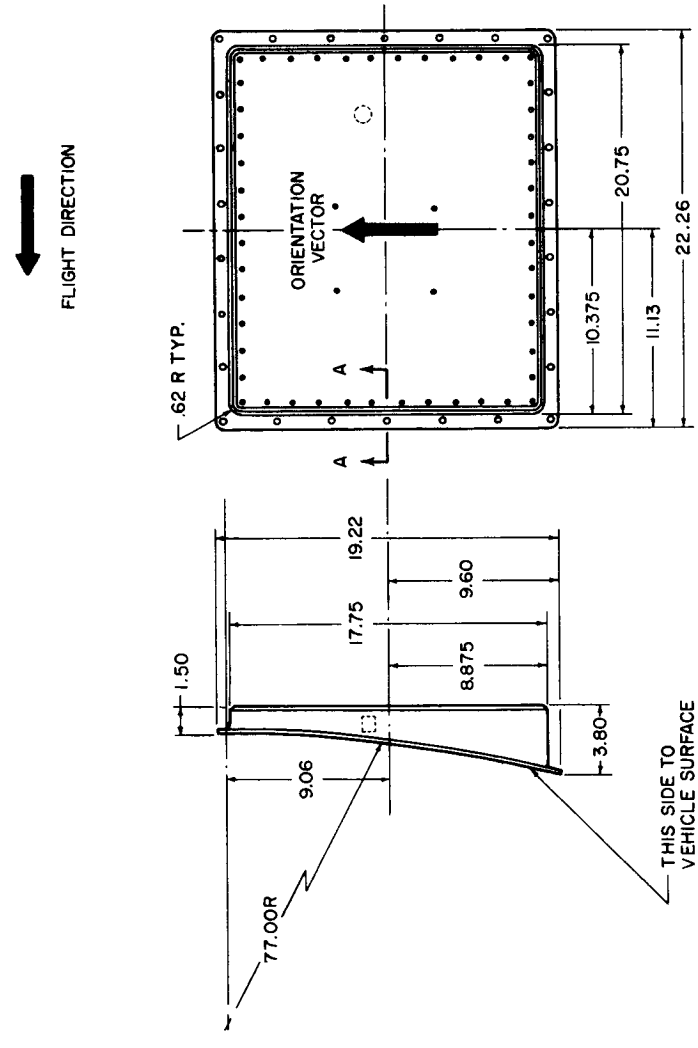
-Location-
Station 1475
6° 30' I→IV

Drawing number - 50M10344
Type - planar 12 slot printed circuit array
Frequency - 1610 (±1) mc.
Bandwidth - 45 mc. for 1.5:1 VSWR
Number required - 1
Polarization - linear
Gain - 16 db.
Connector type - N female
Weight - 18 lbs.
Dimensions - 20 by 17 by 3.8 inches



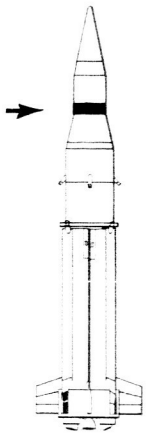
SA-5 ALTIMETER ANTENNA

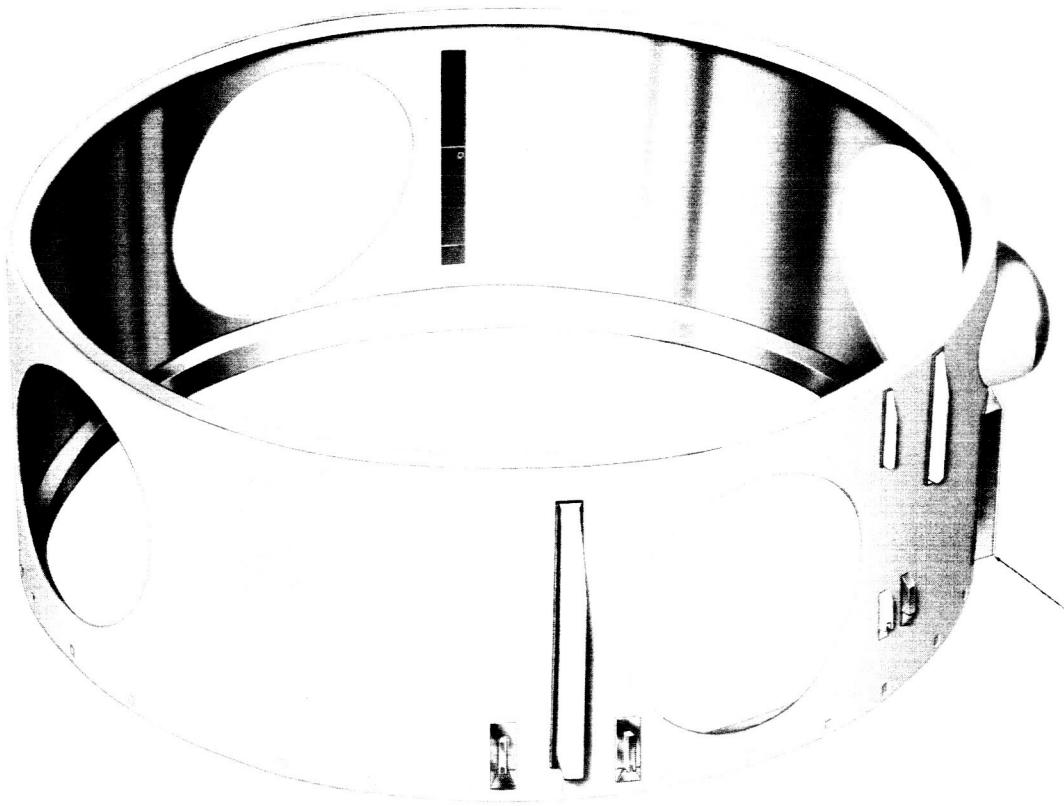




DIMENSIONAL SKETCH

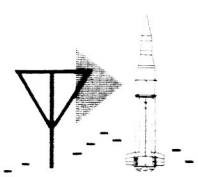
SA-5 ALTIMETER ANTENNA





LOCATIONAL VIEW

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SA-5 ALTIMETER ANTENNA

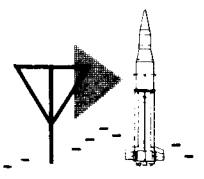
RADIATION PATTERNS

ALTIMETER ANTENNA

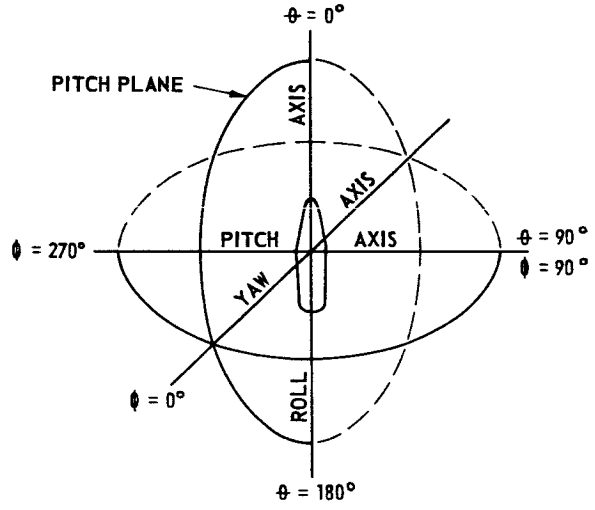
ANTENNA MODEL 502

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.

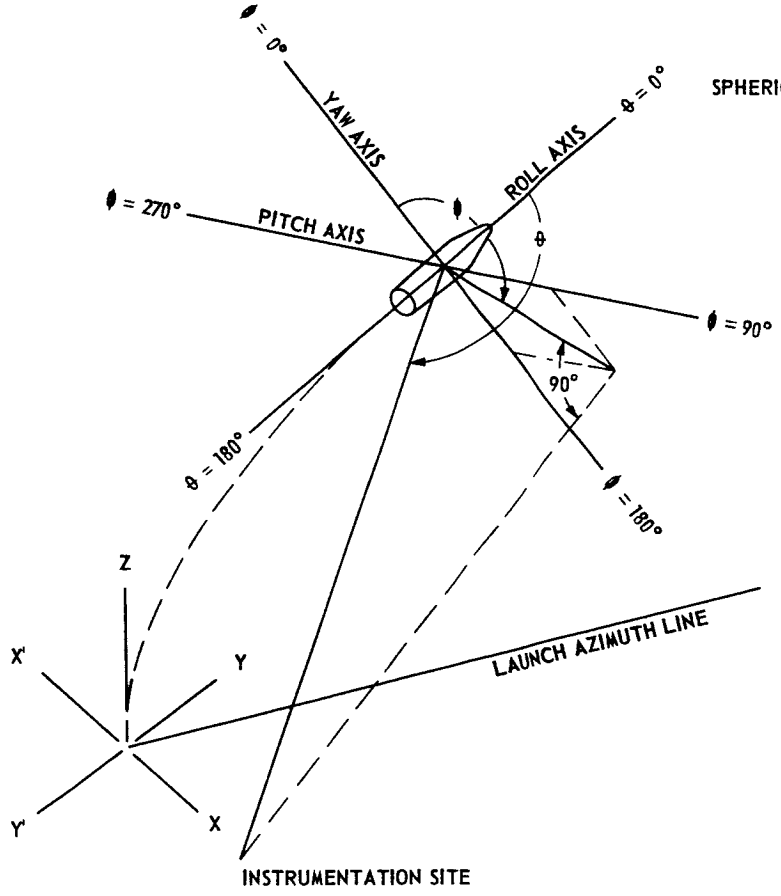
Rectangular and polar patterns are cut by placing the vehicle in the horizontal position with the antenna located at $\phi = 0°$. Patterns are then plotted through 360° of θ in 10° increments of ϕ (great circle cuts). The 10° increments are made through 180° by rotating the vehicle counter-clockwise,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



SA-5 ALTIMETER ANTENNA



SPHERICAL COORDINATE SYSTEM



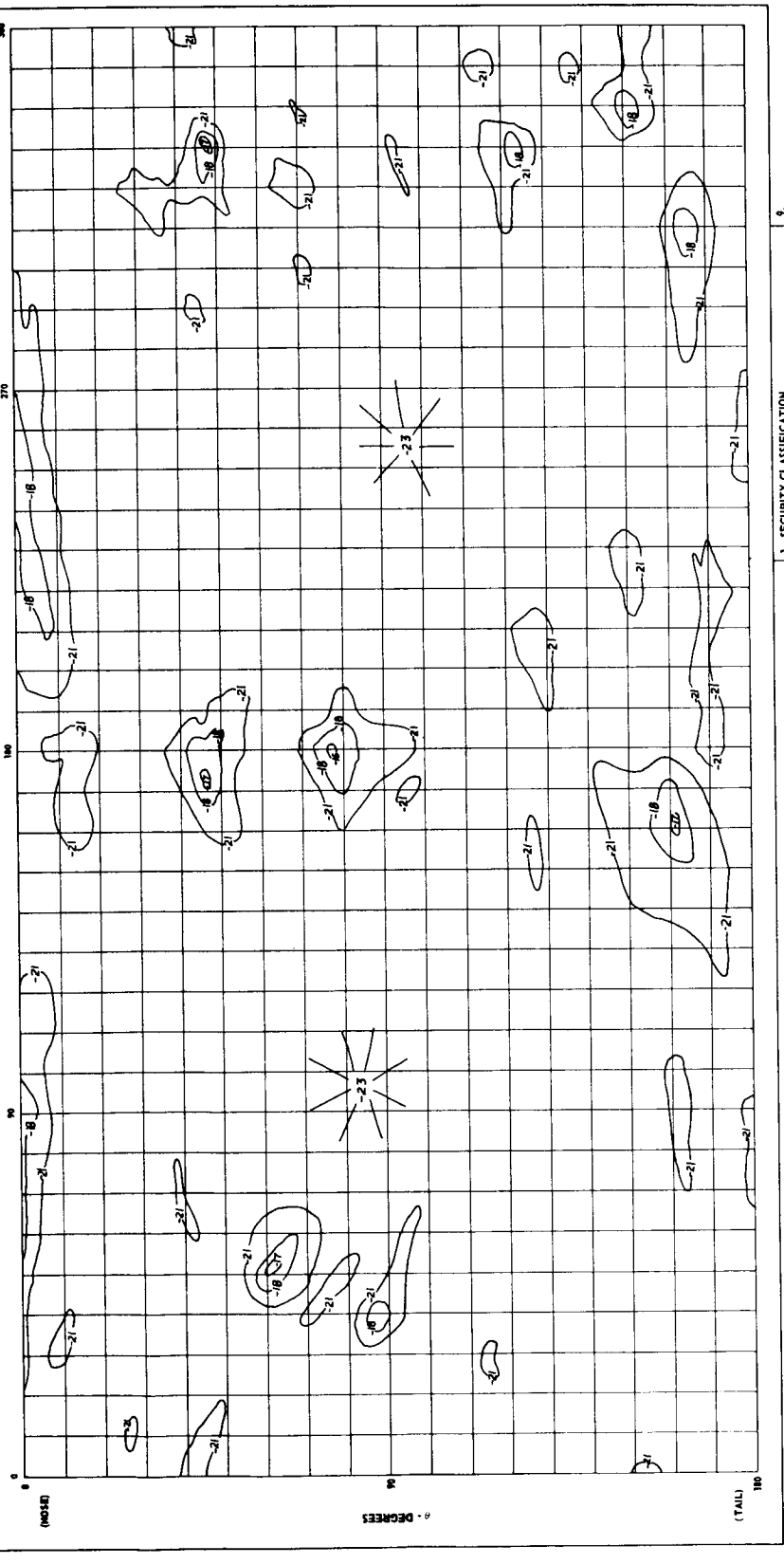
INSTRUMENTATION SITE

TRAJECTORY GEOMETRY

SA-5 ALTIMETER ANTENNA

ANTENNA PATTERN

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

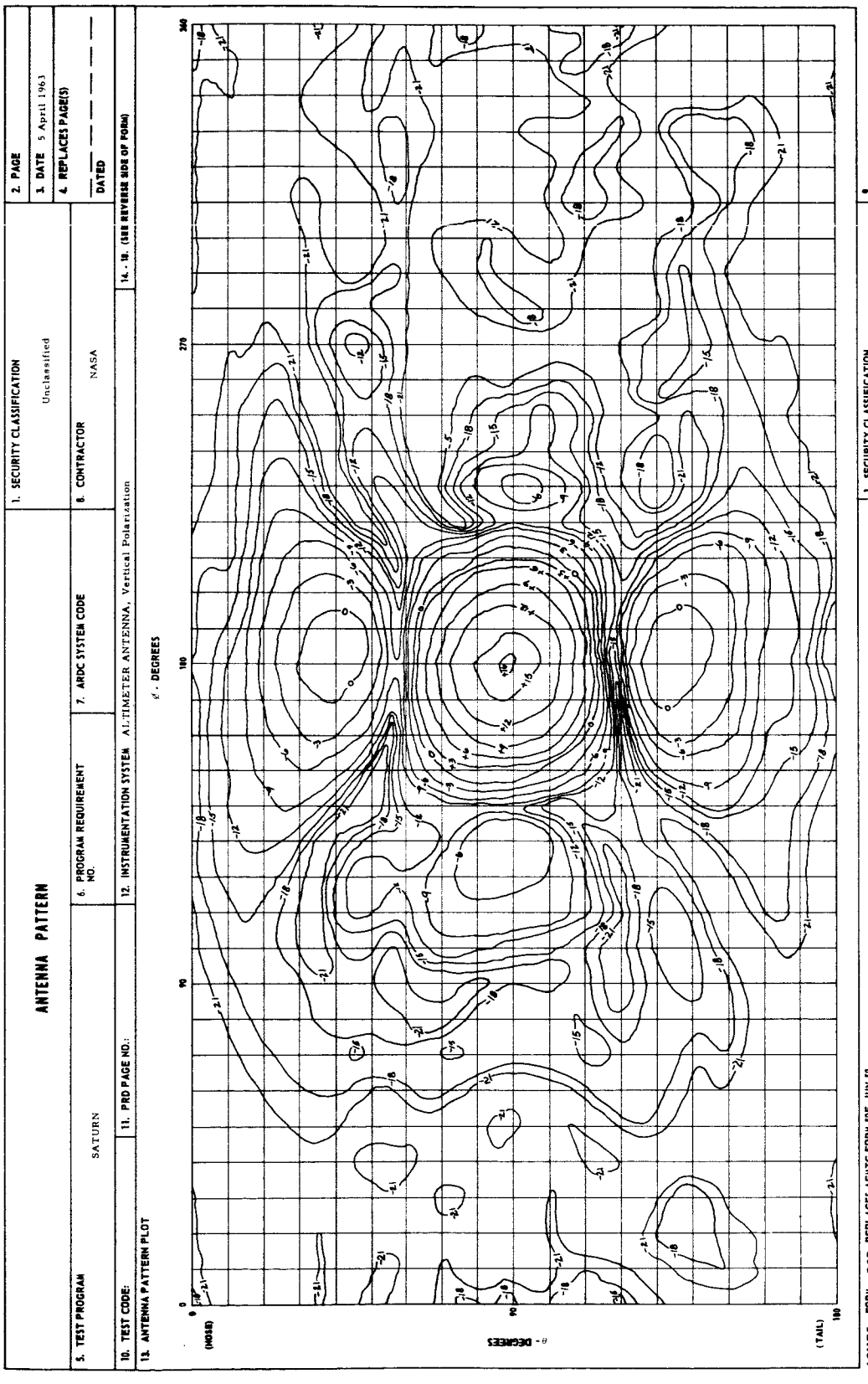


1. SECURITY CLASSIFICATION | 9. REVISION NO.

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

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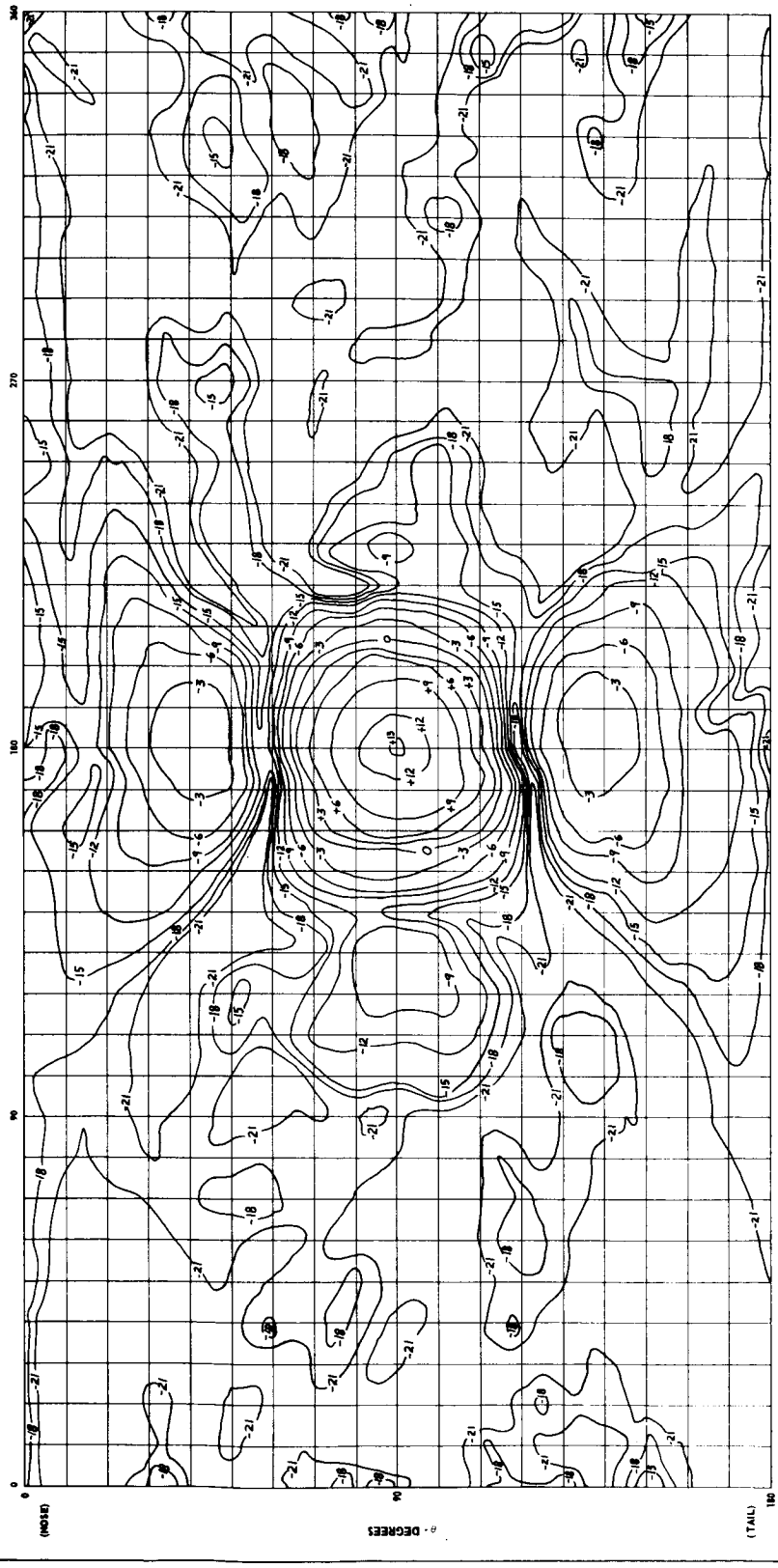
SA-5 ALTIMETER ANTENNA



SA-5 ALTIMETER ANTENNA

ANTENNA PATTERN

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			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: ALTIMETER ANTENNA, Right Circular Polarization	14. - 18. (SEE REVERSE SIDE OF FORM)
13. ANTENNA PATTERN PLOT			

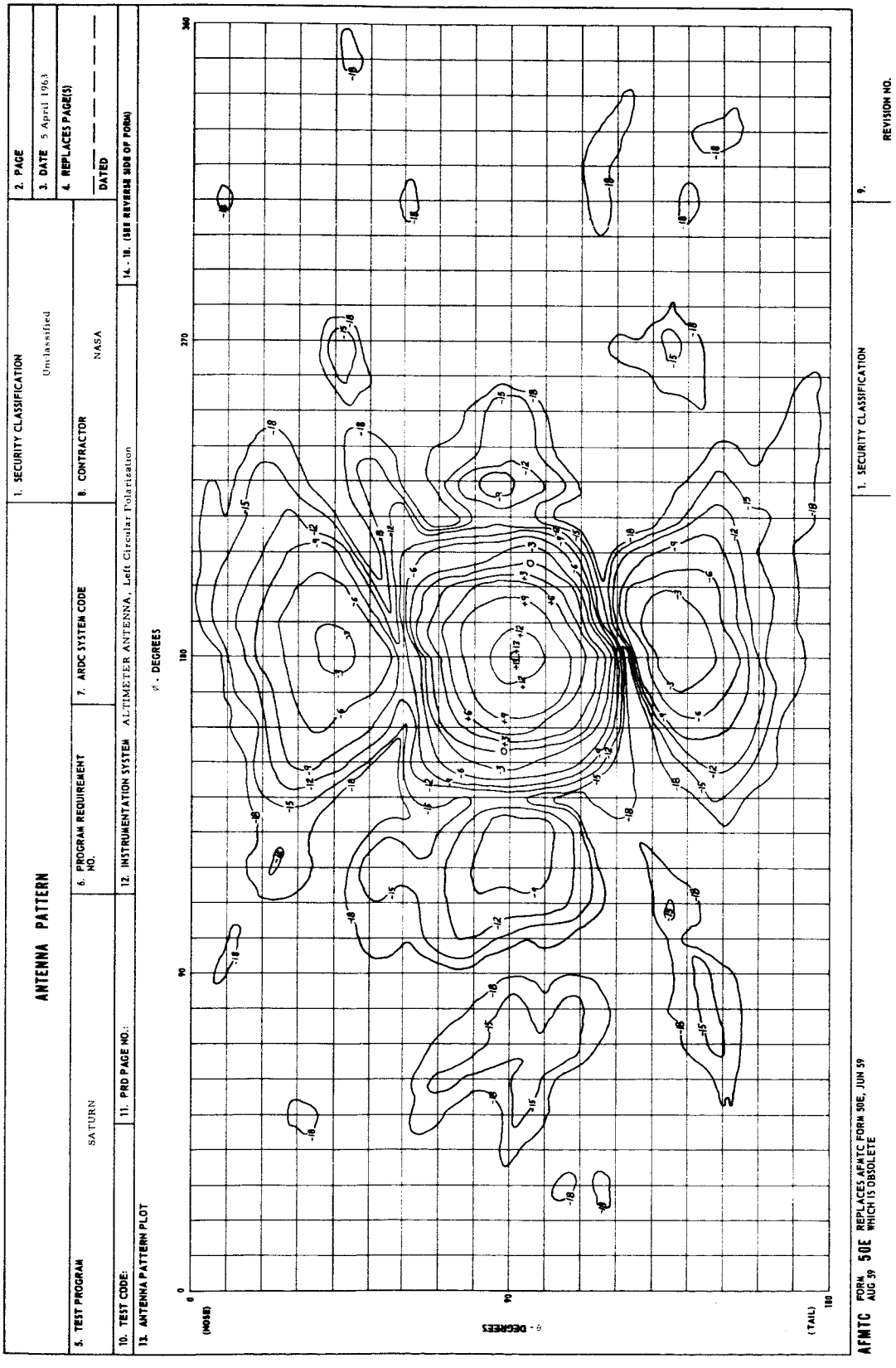


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SA-5 ALTIMETER ANTENNA

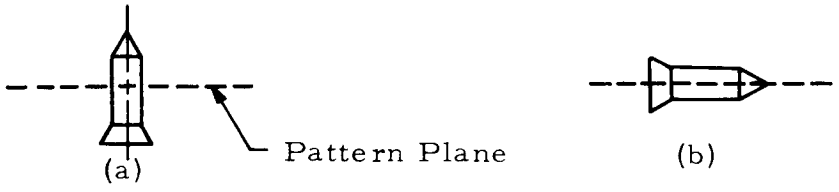


SA-5 ALTIMETER ANTENNA

DESCRIPTION OF PATTERN AND POLARIZATION SYMBOLS AND GAIN DETERMINATION

PATTERN PLANE

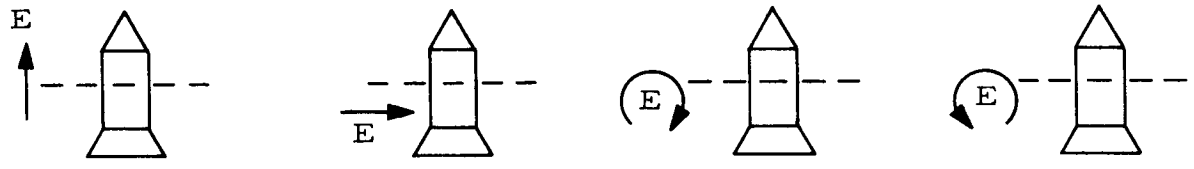
The plane of the pattern is indicated by a broken line passing horizontally through a sketch of the model. This line represents the pattern plane as seen from a point in that plane. The model is then shown in its proper orientation to the line representing the pattern plane.



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

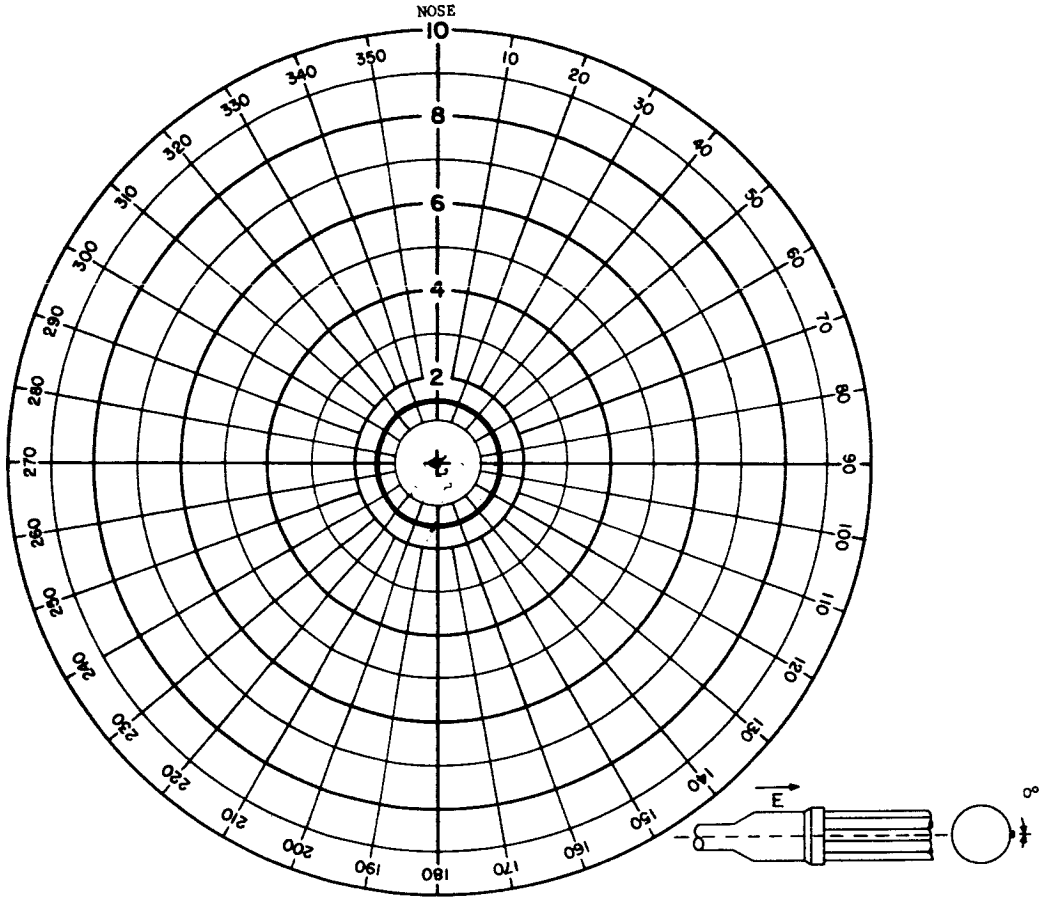
Right circular polarization

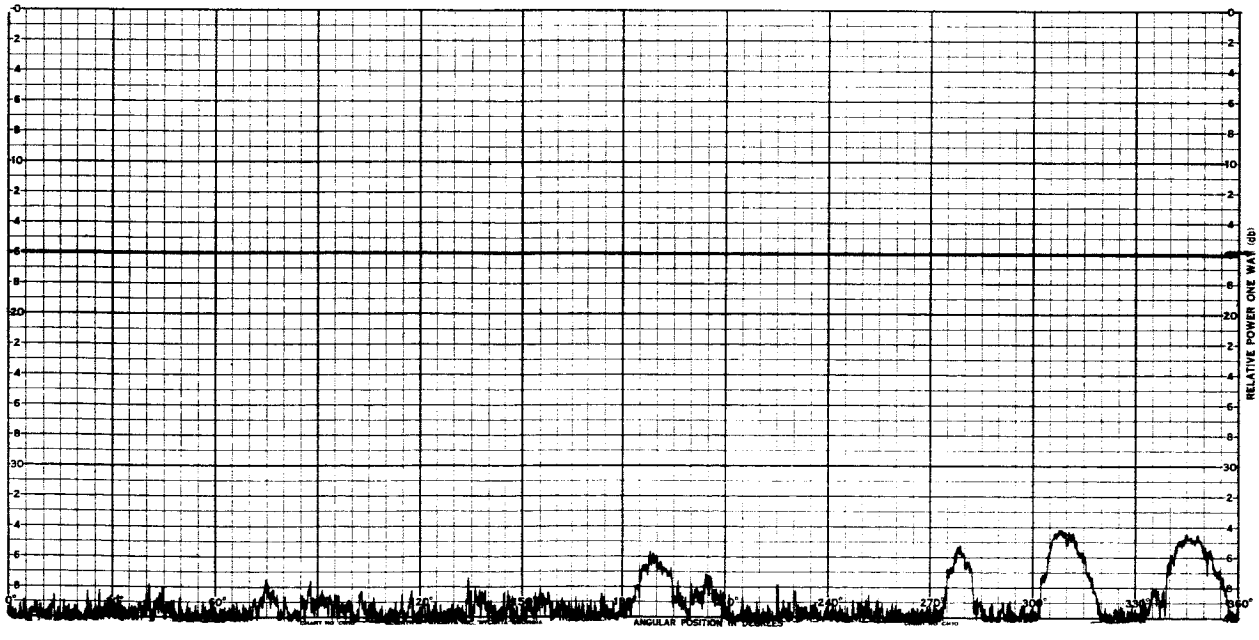
Left circular polarization

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.

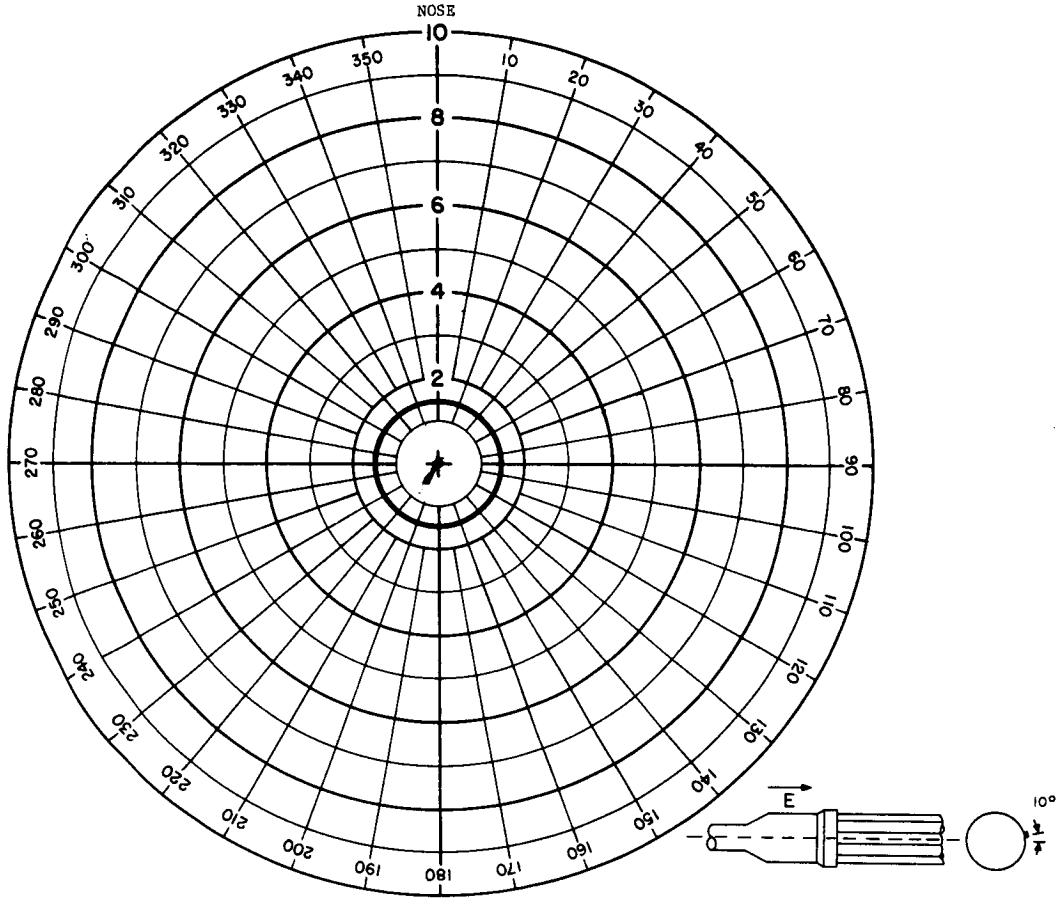
SA-5 ALTIMETER ANTENNA

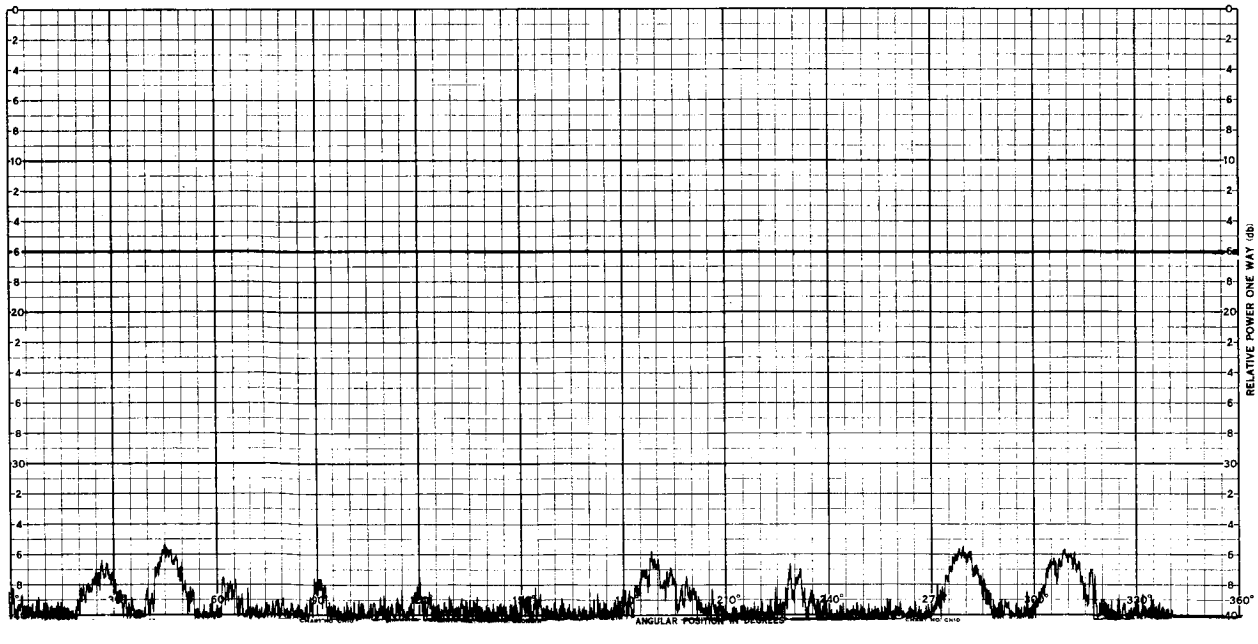




ANTENNA RADIATION PATTERN NO. 201-1

SA-5 ALTIMETER ANTENNA

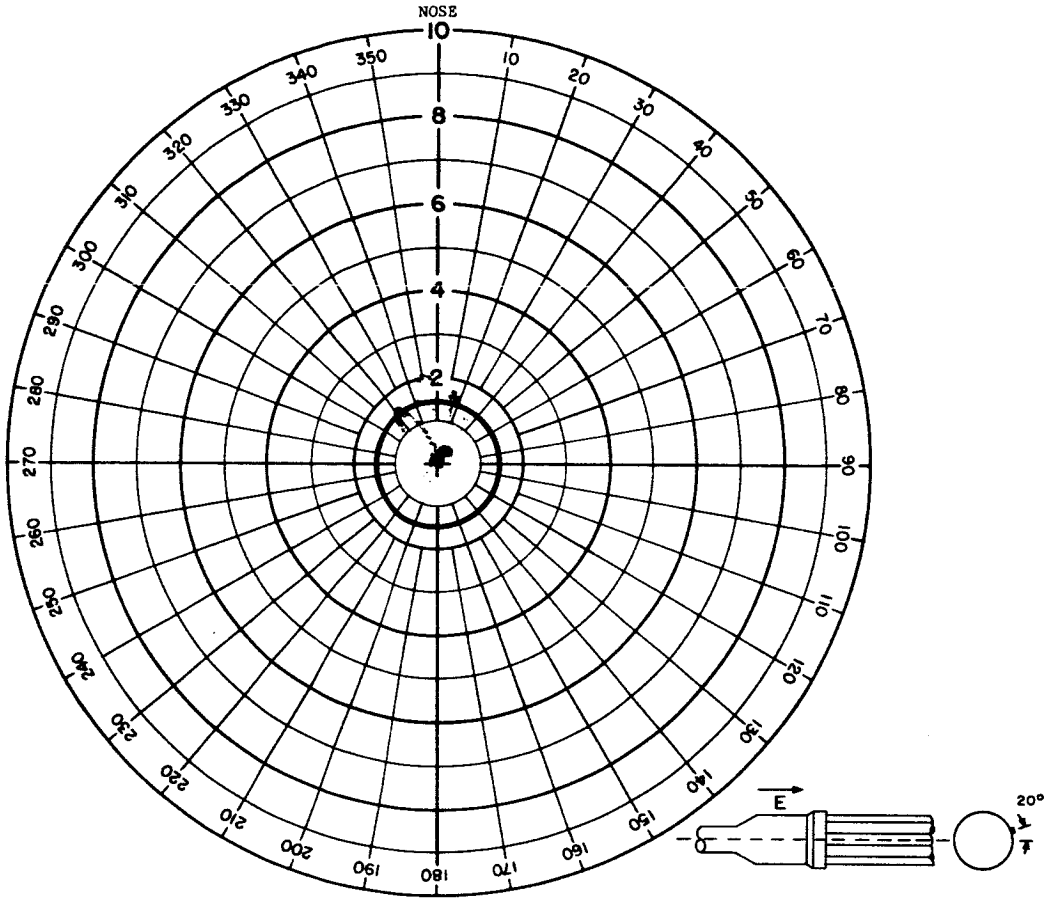


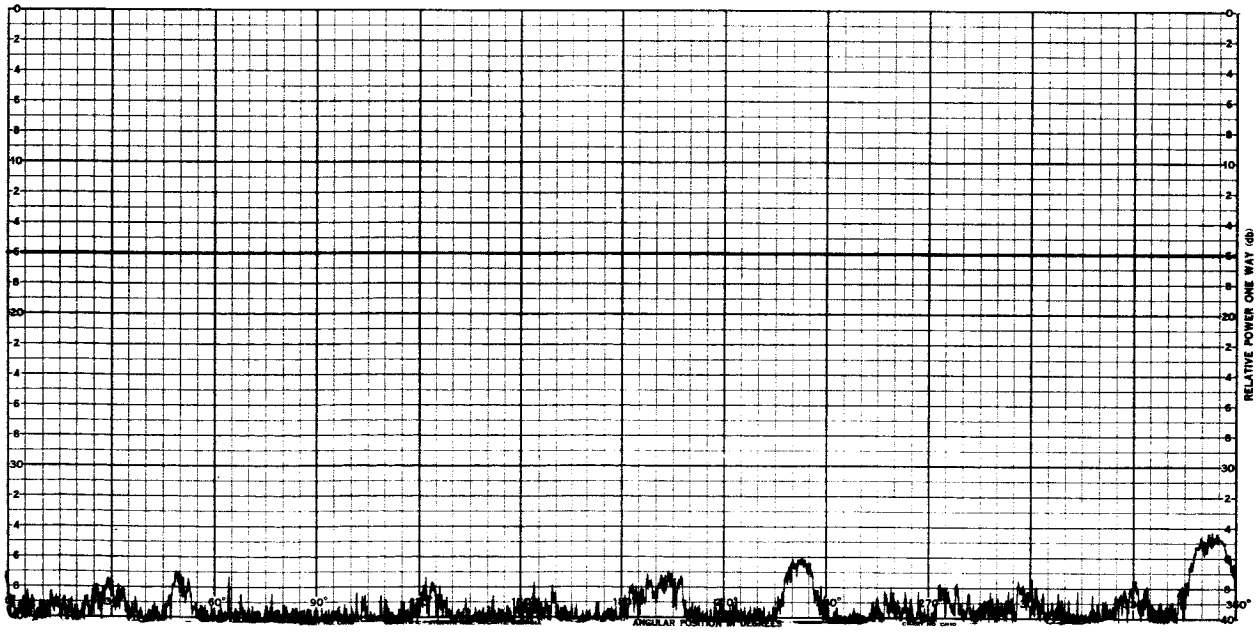


ANTENNA RADIATION PATTERN NO. 201-2

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TECHNICAL DATA UNIT

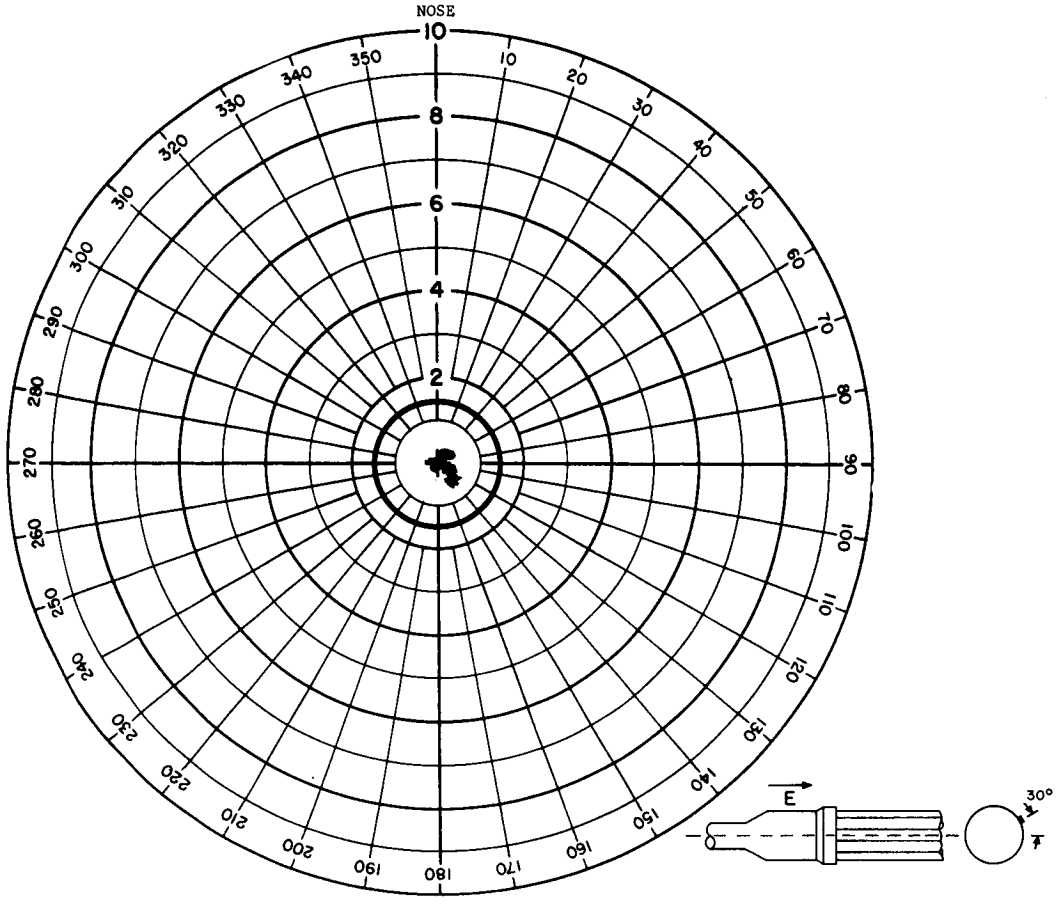
SA-5 ALTIMETER ANTENNA

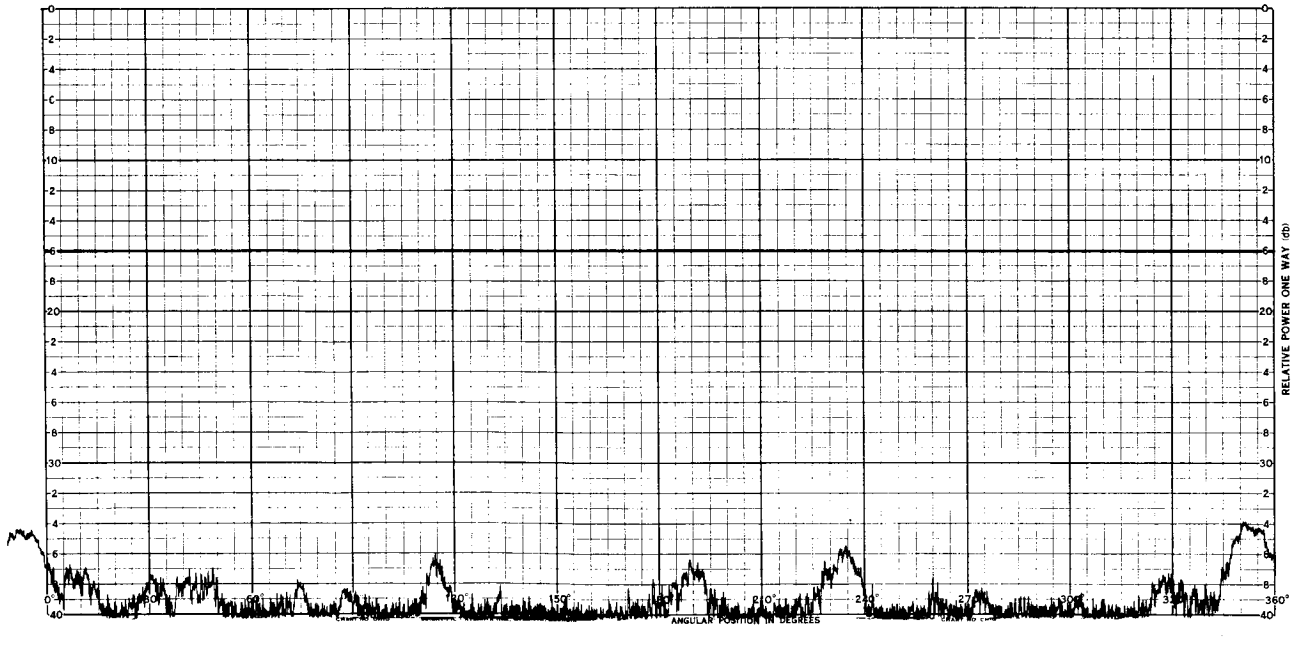




ANTENNA RADIATION PATTERN NO. 201-3

SA-5 ALTIMETER ANTENNA

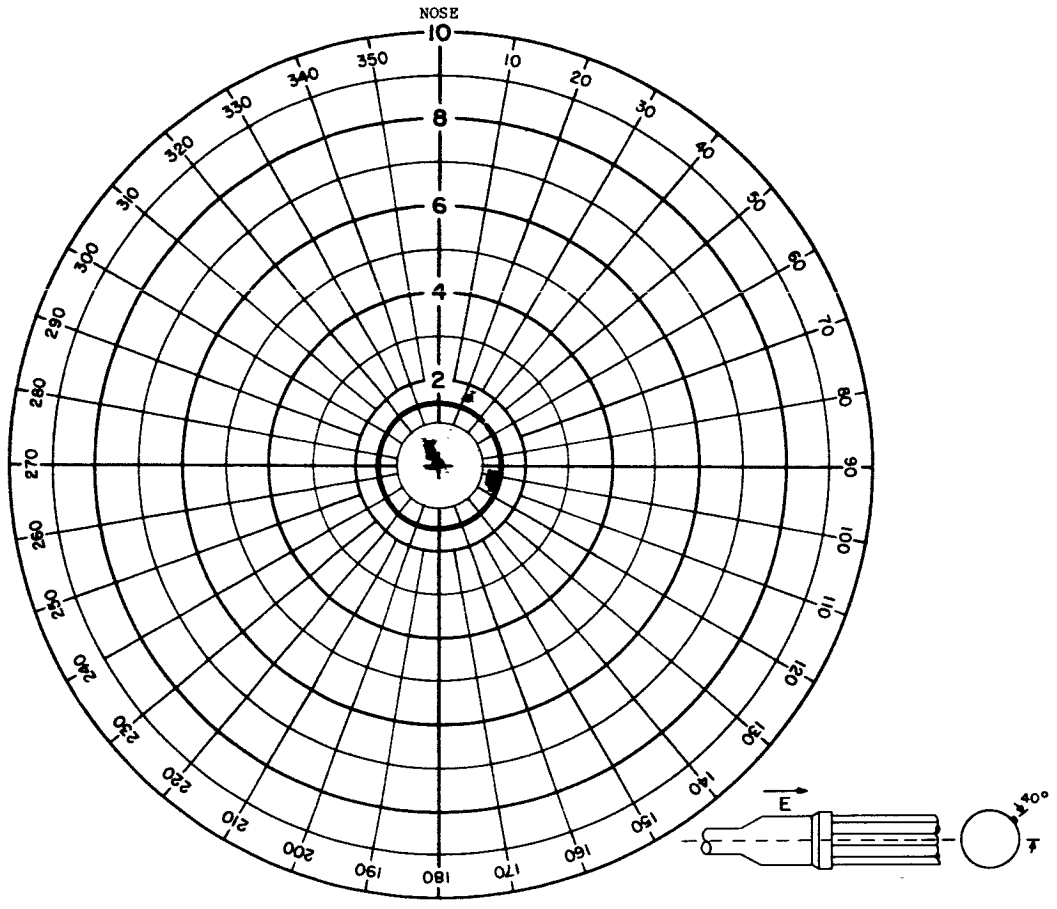


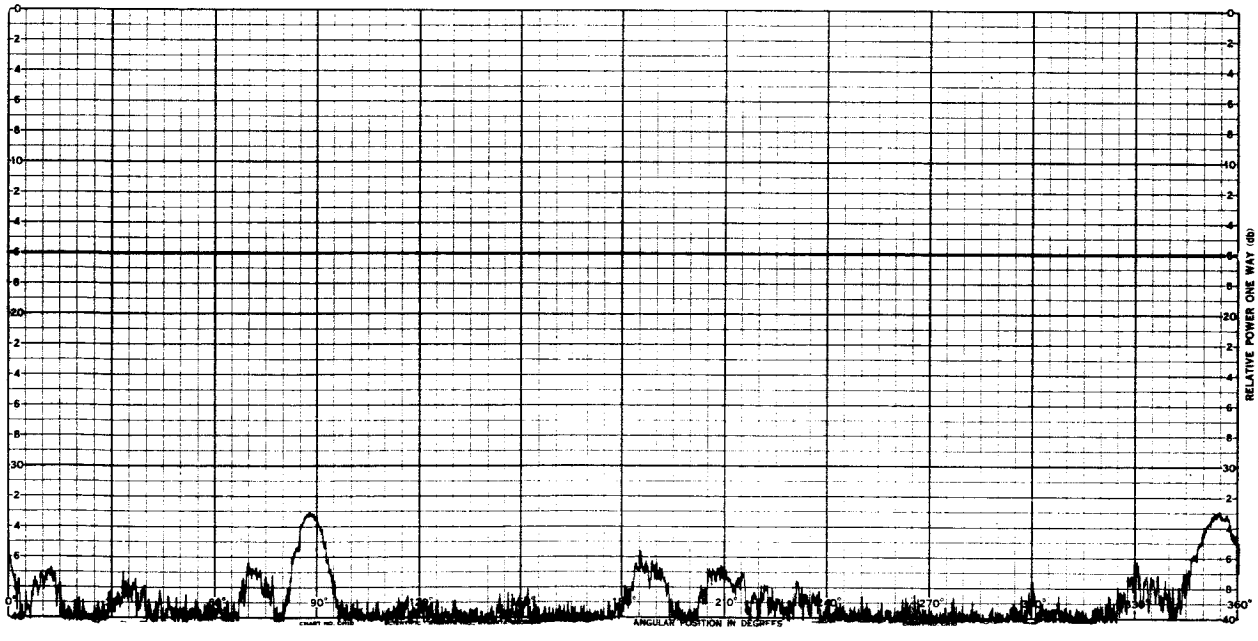


ANTENNA RADIATION PATTERN NO. 201-4

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

SA-5 ALTIMETER ANTENNA

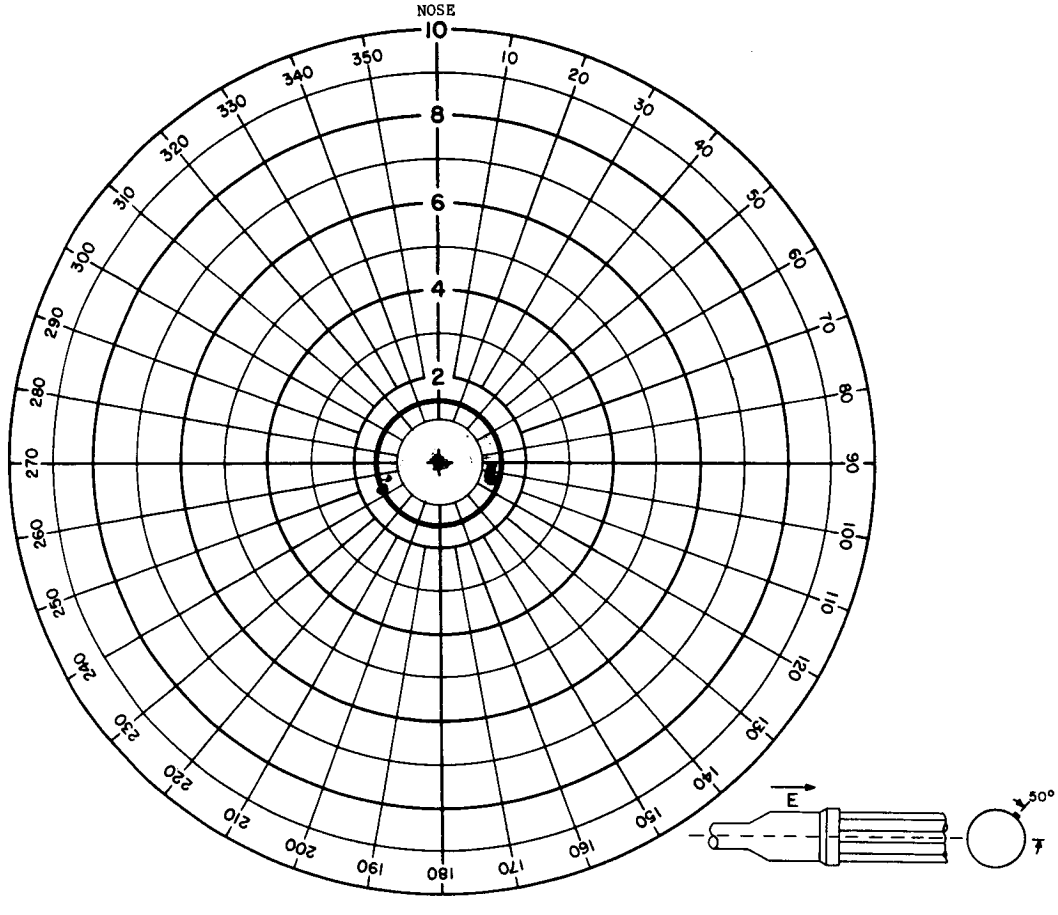


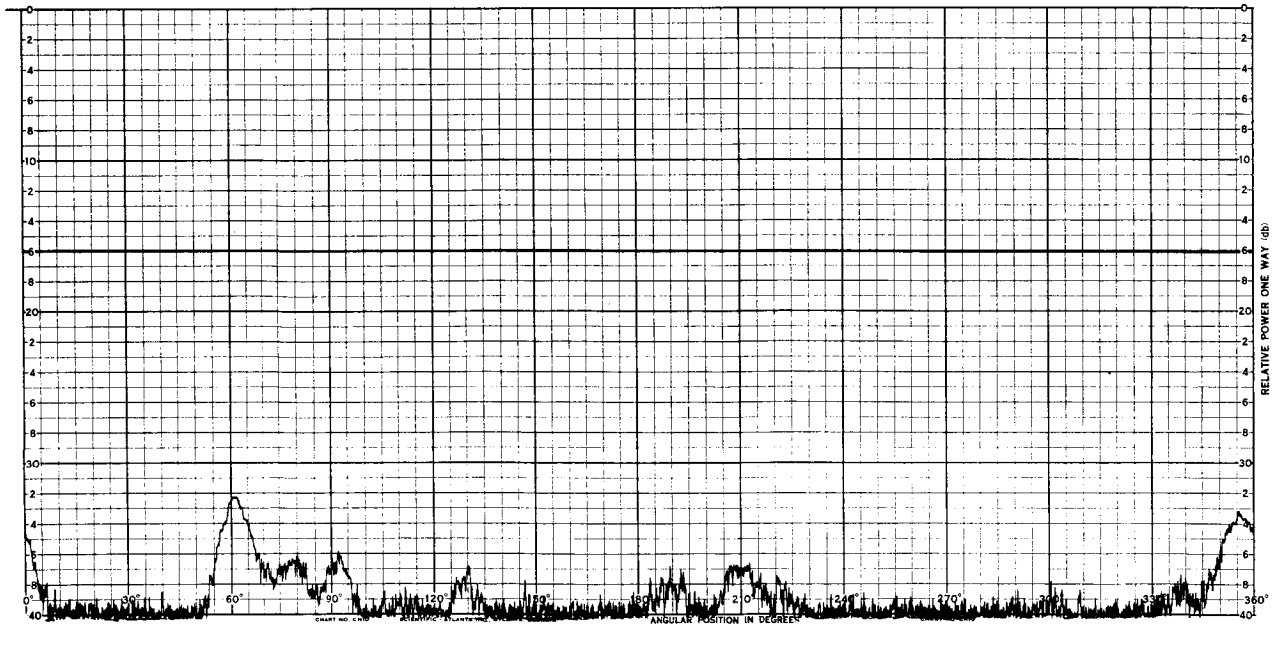


ANTENNA RADIATION PATTERN NO. 201-5

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

SA-5 ALTIMETER ANTENNA

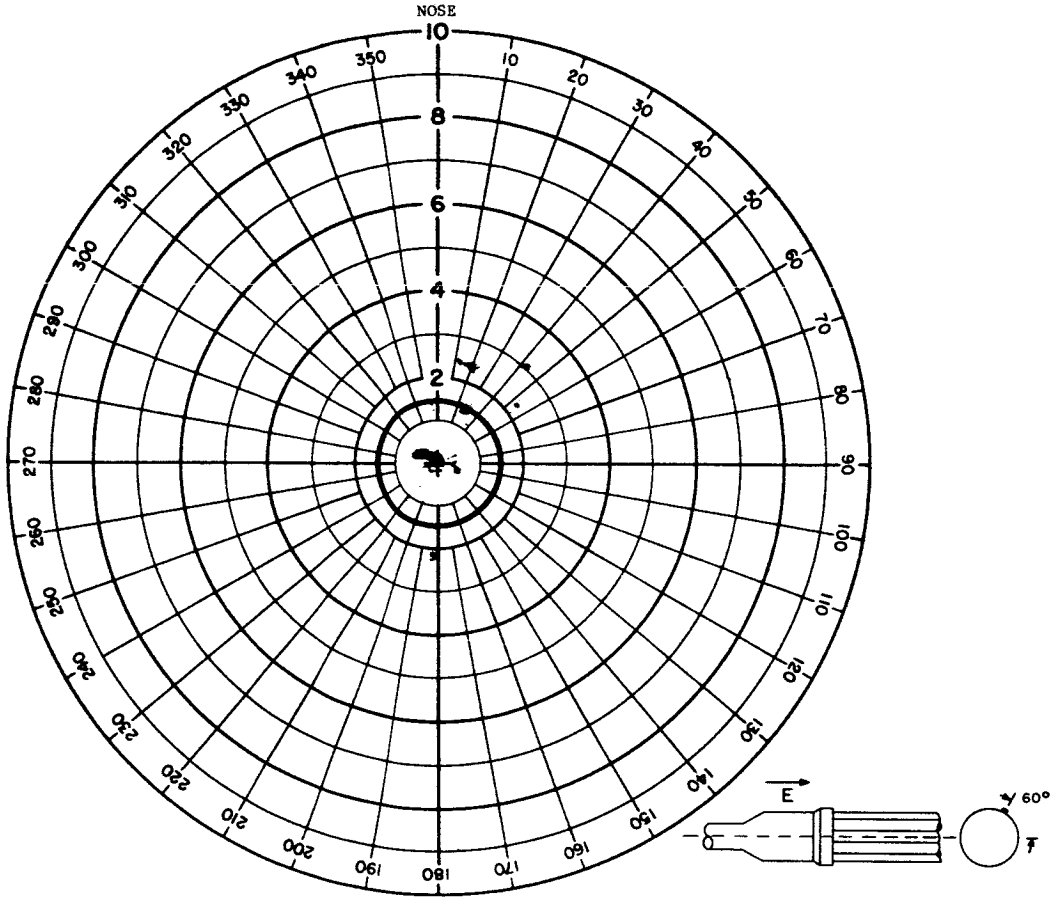


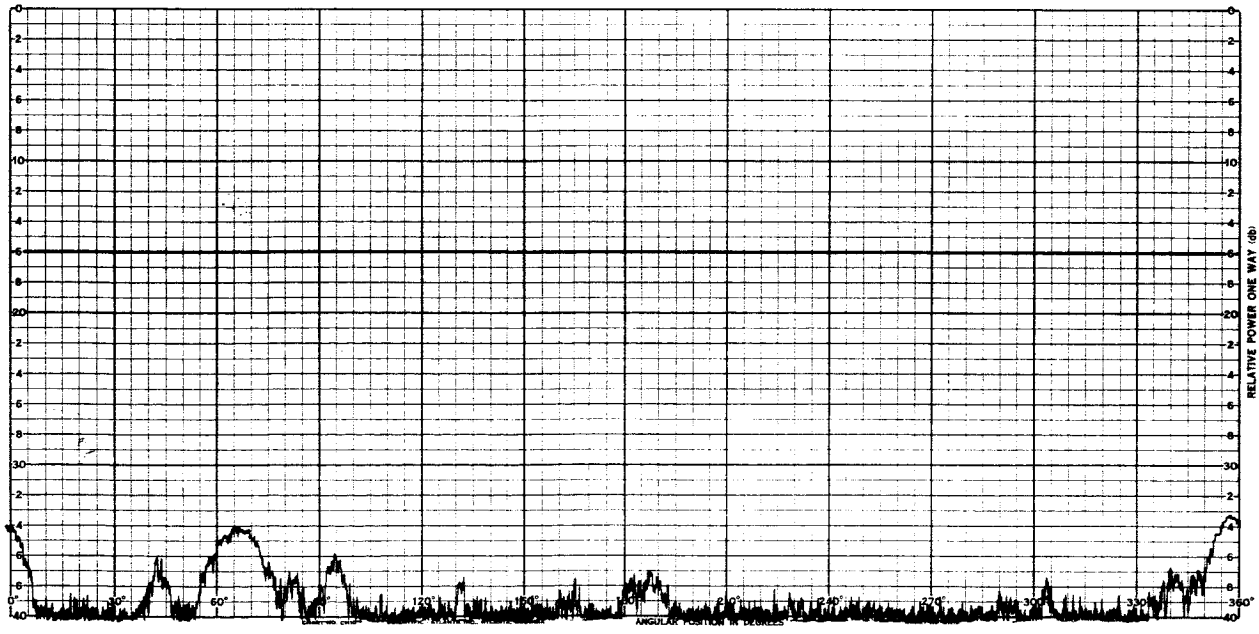


ANTENNA RADIATION PATTERN NO. 201-6

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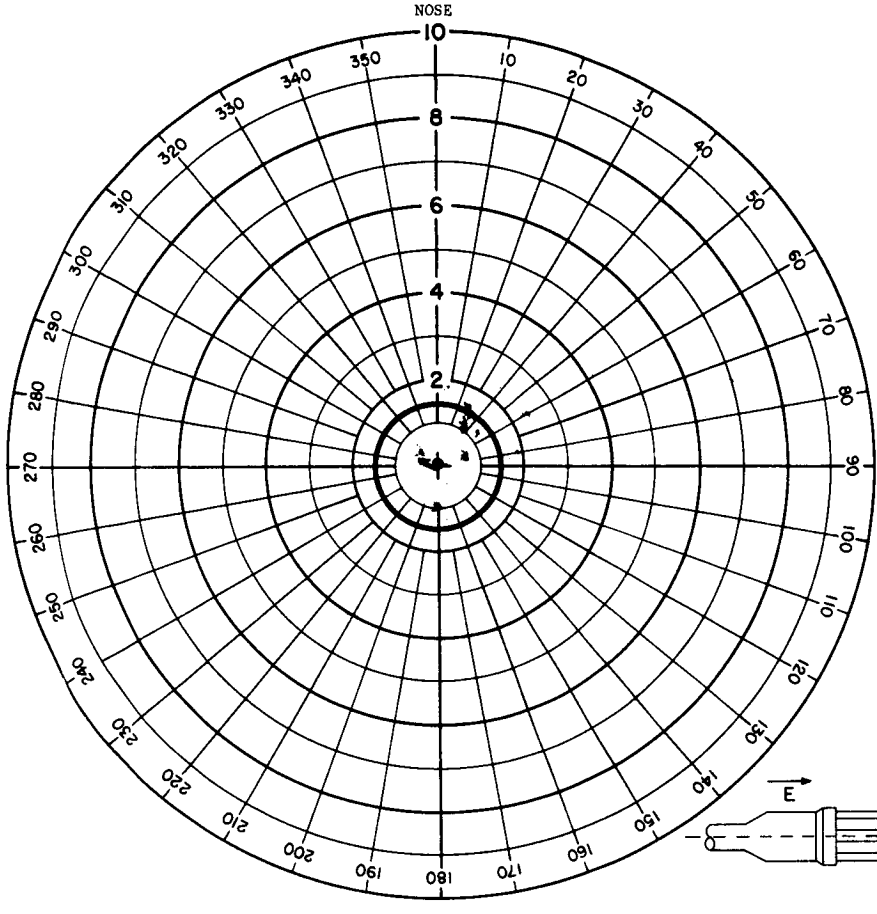
SA-5 ALTIMETER ANTENNA

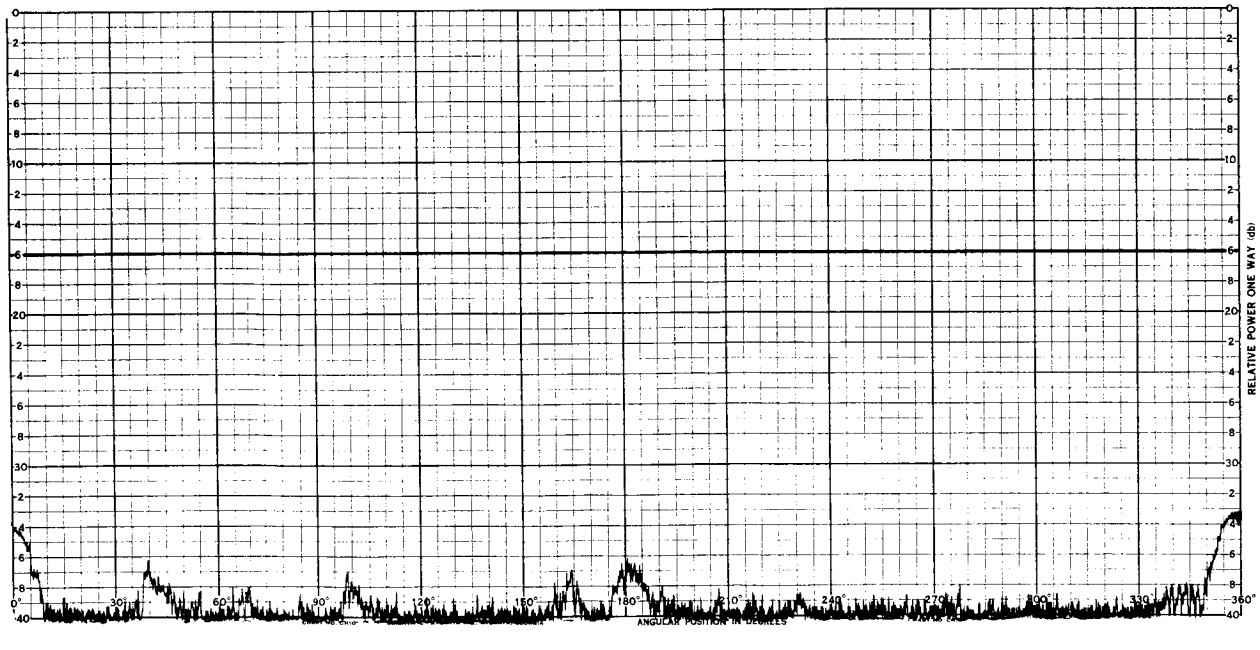




ANTENNA RADIATION PATTERN NO. 201-7

SA-5 ALTIMETER ANTENNA

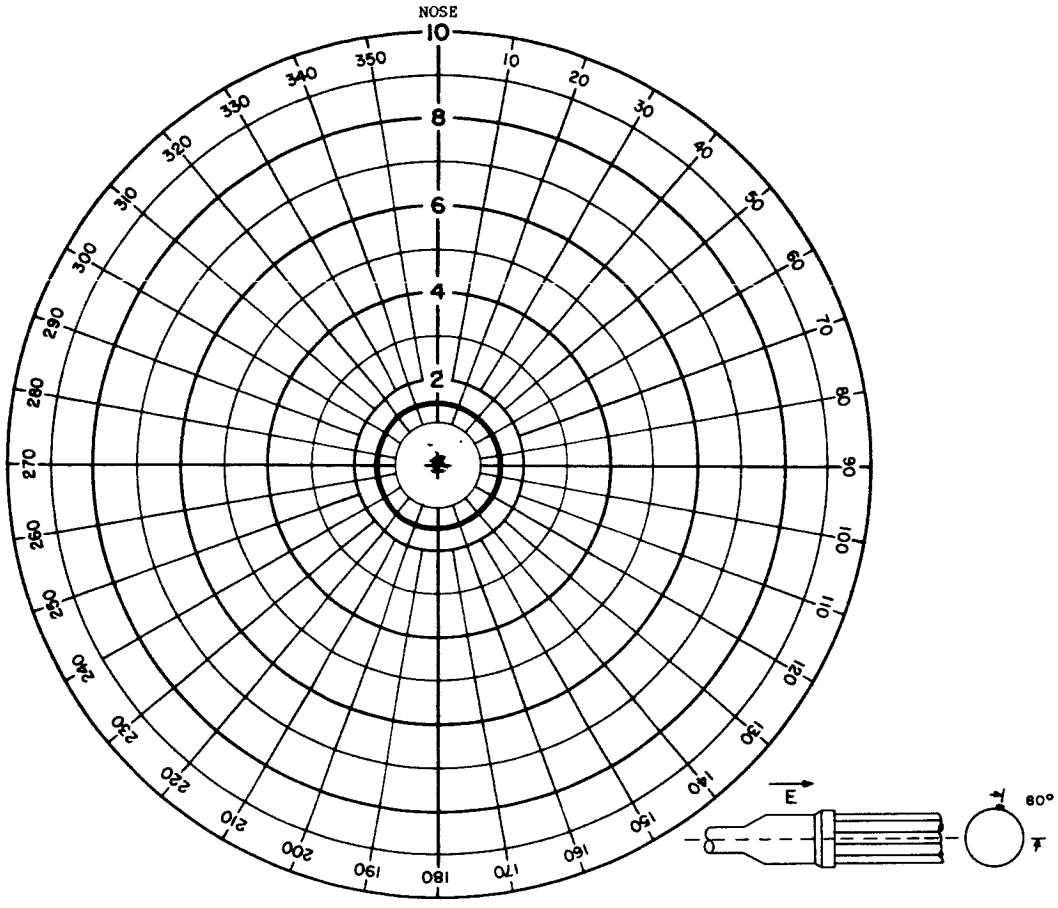


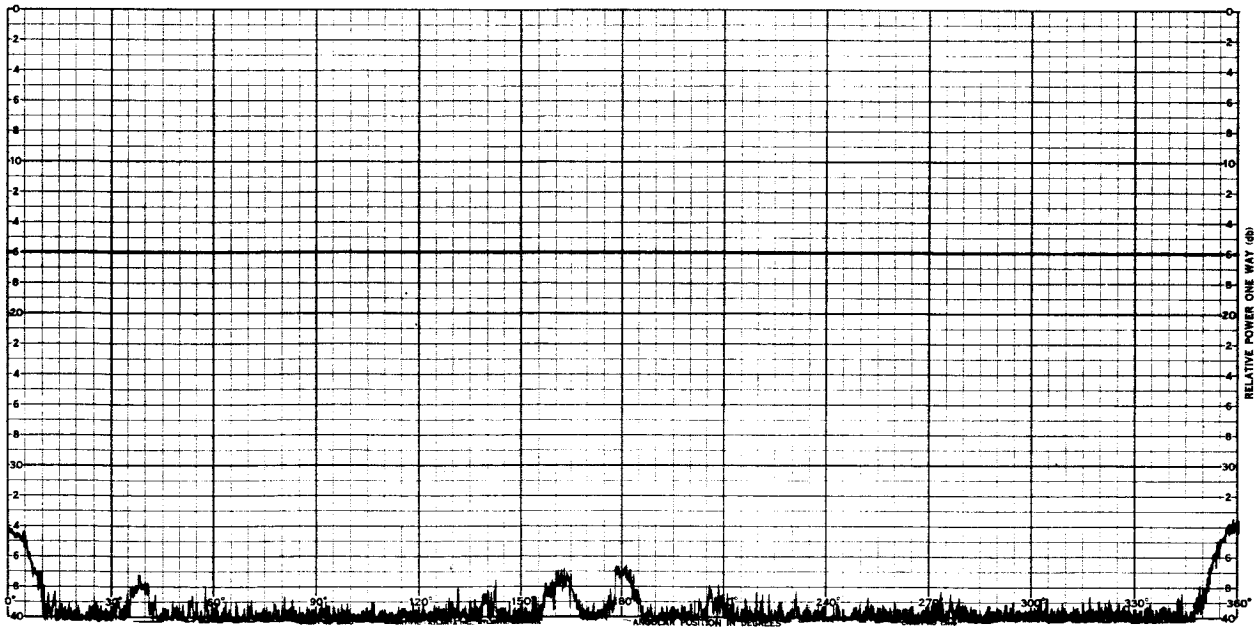


ANTENNA RADIATION PATTERN NO. 201-8

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

SA-5 ALTIMETER ANTENNA

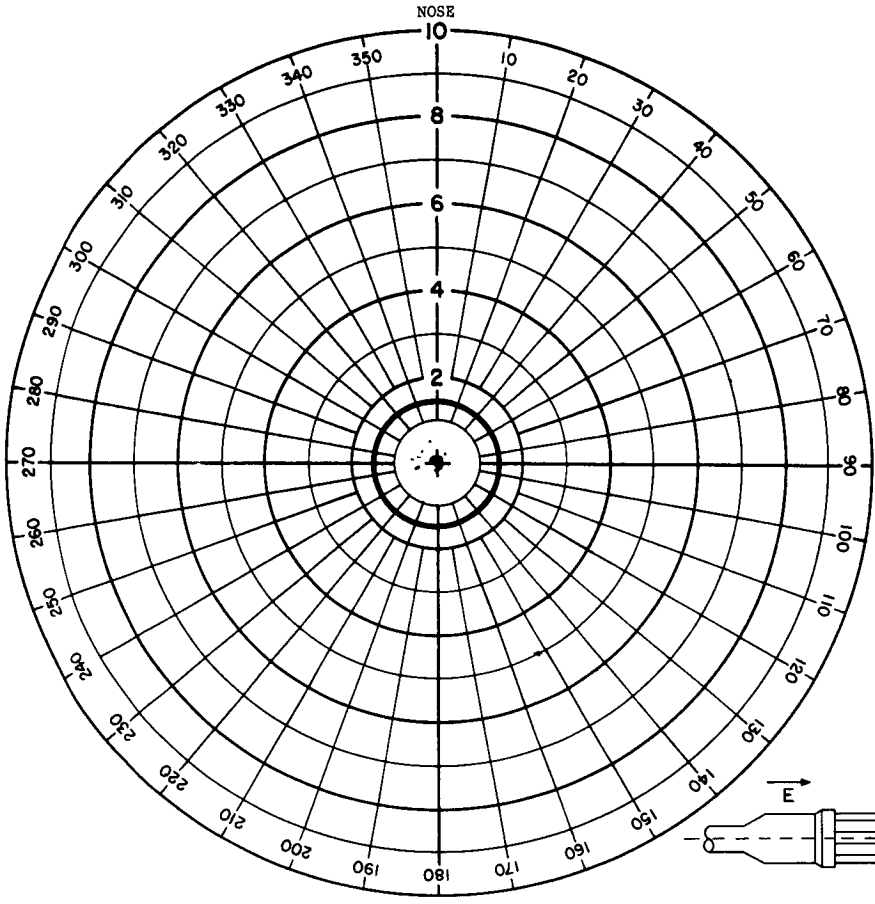


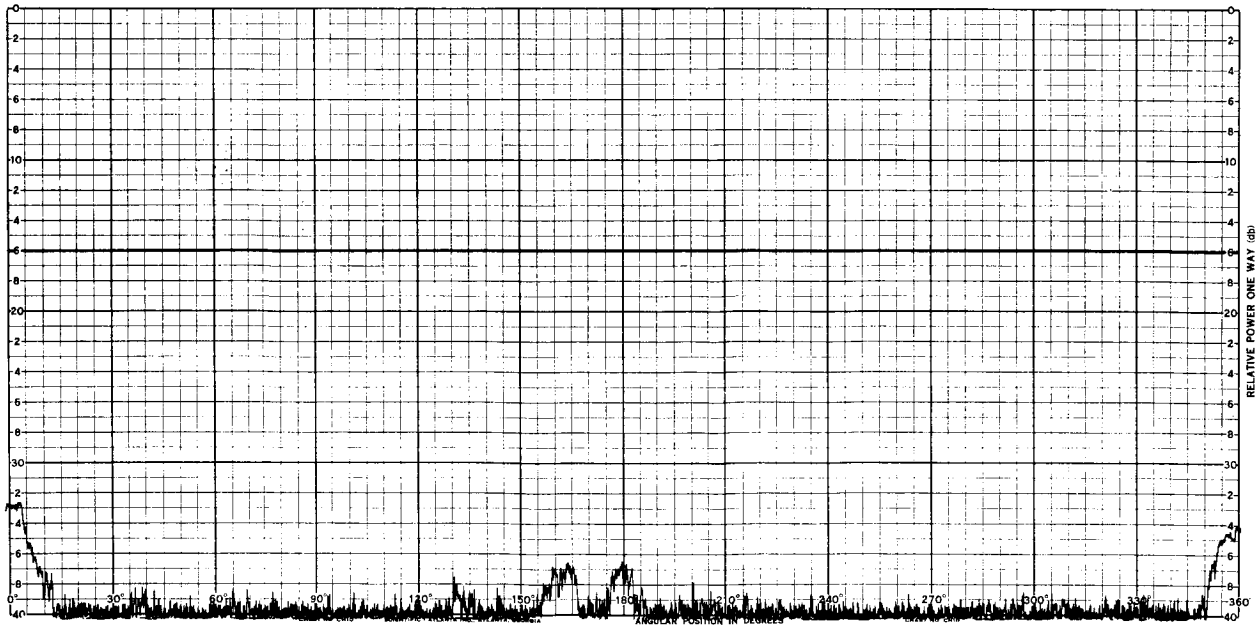


ANTENNA RADIATION PATTERN NO. 201-9

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

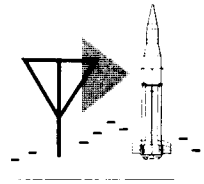
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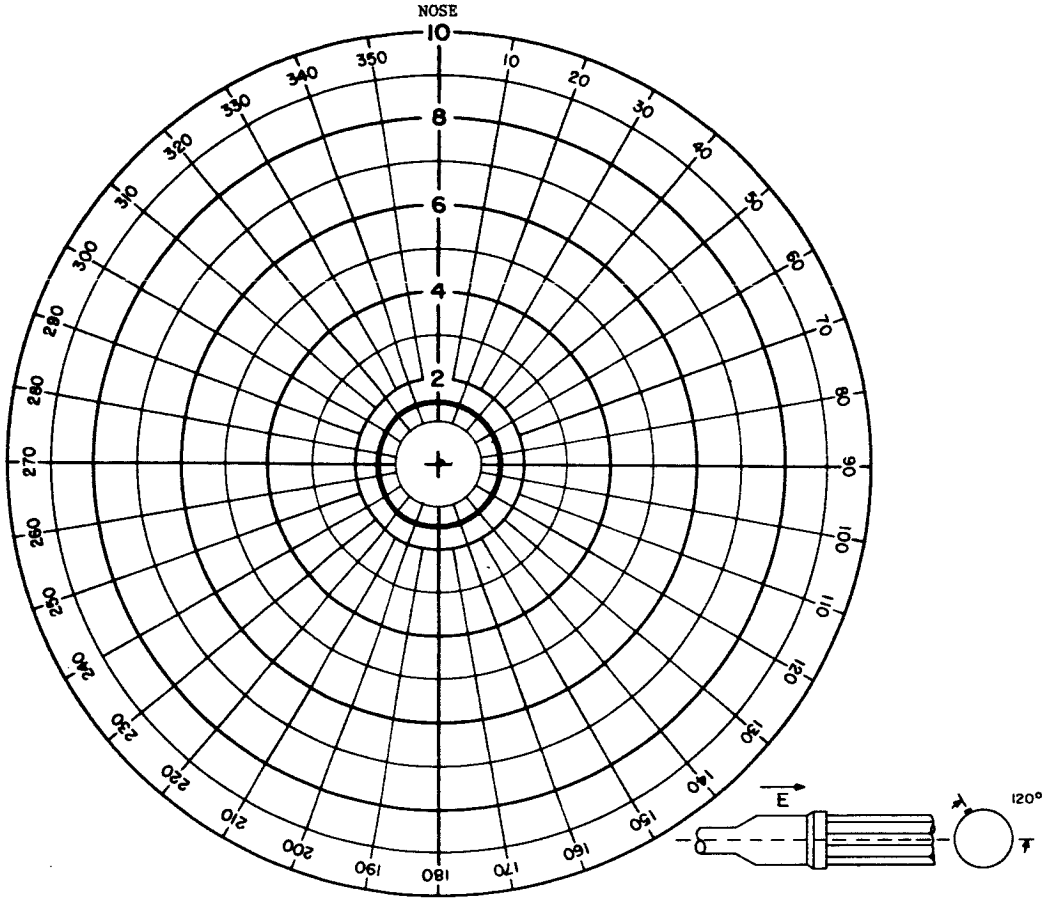


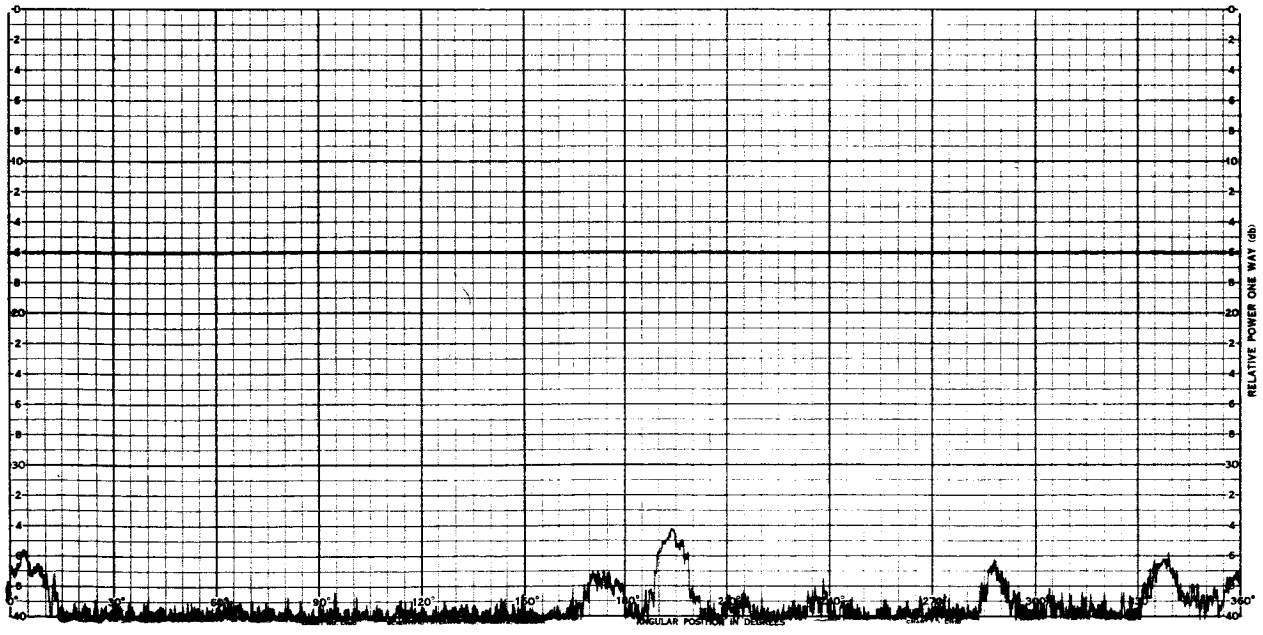
ANTENNA RADIATION PATTERN NO. 201-10

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



SA-5 ALTIMETER ANTENNA

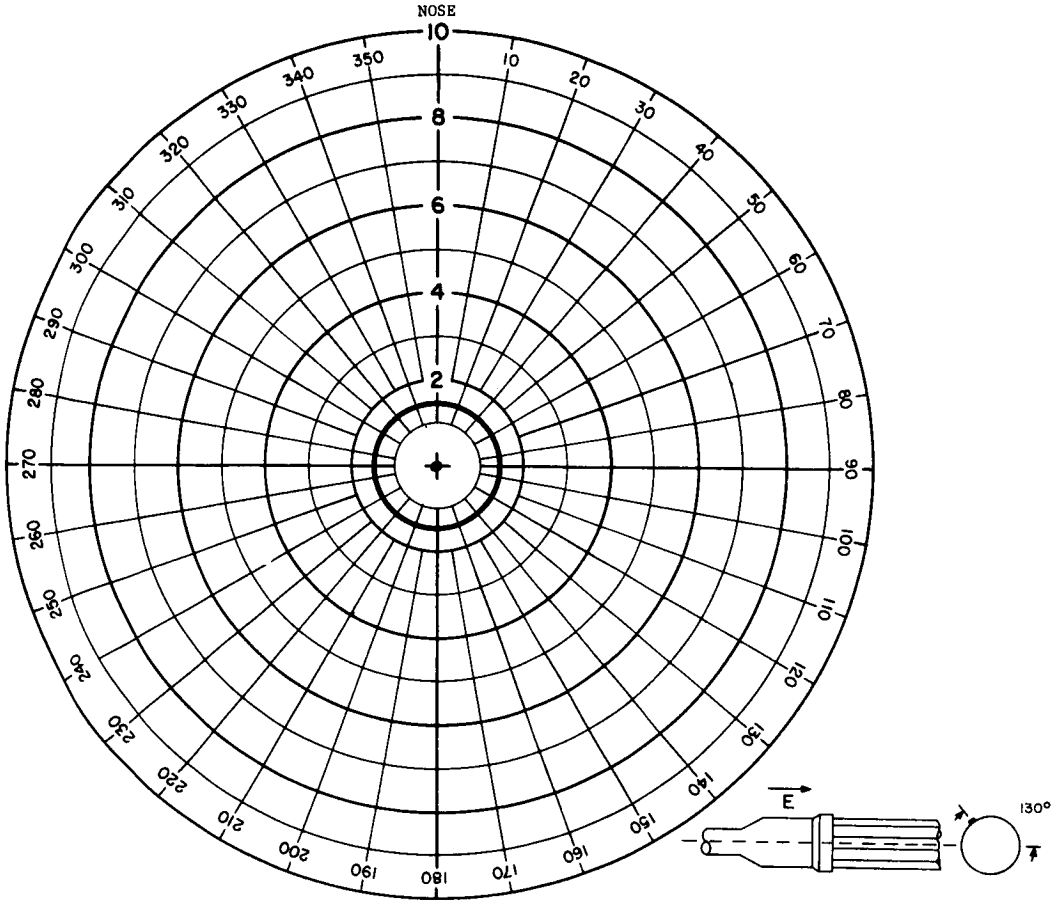


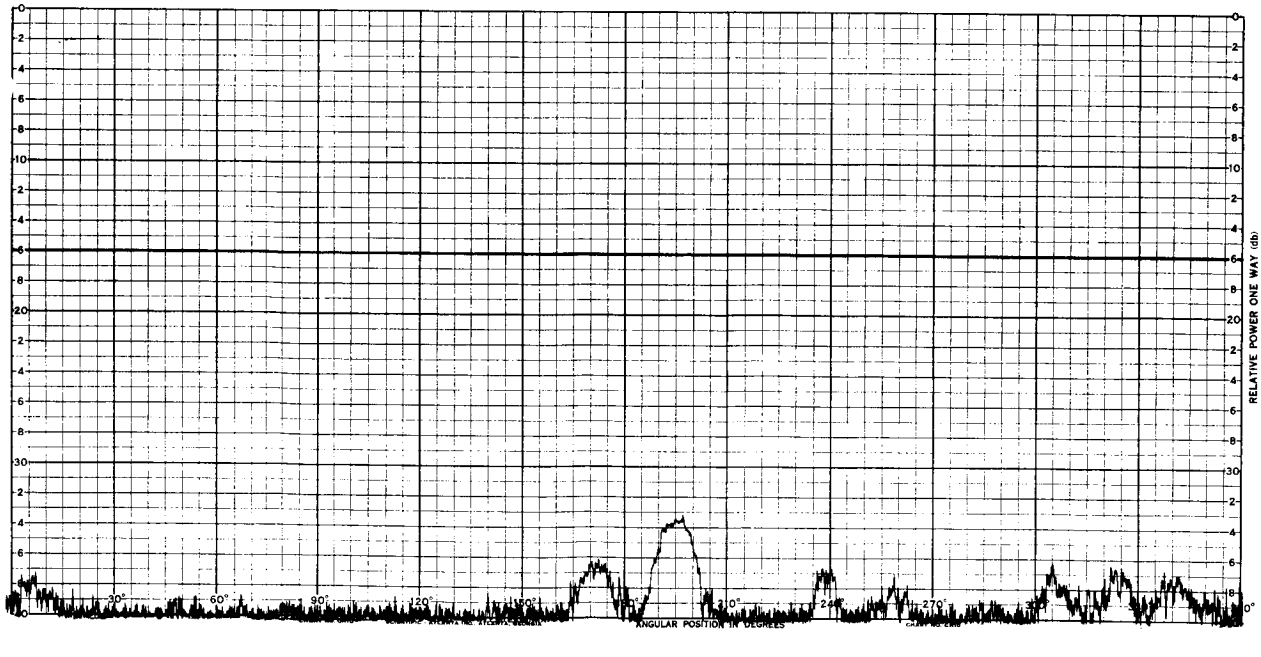


ANTENNA RADIATION PATTERN NO. 201-13

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

SA-5 ALTIMETER ANTENNA

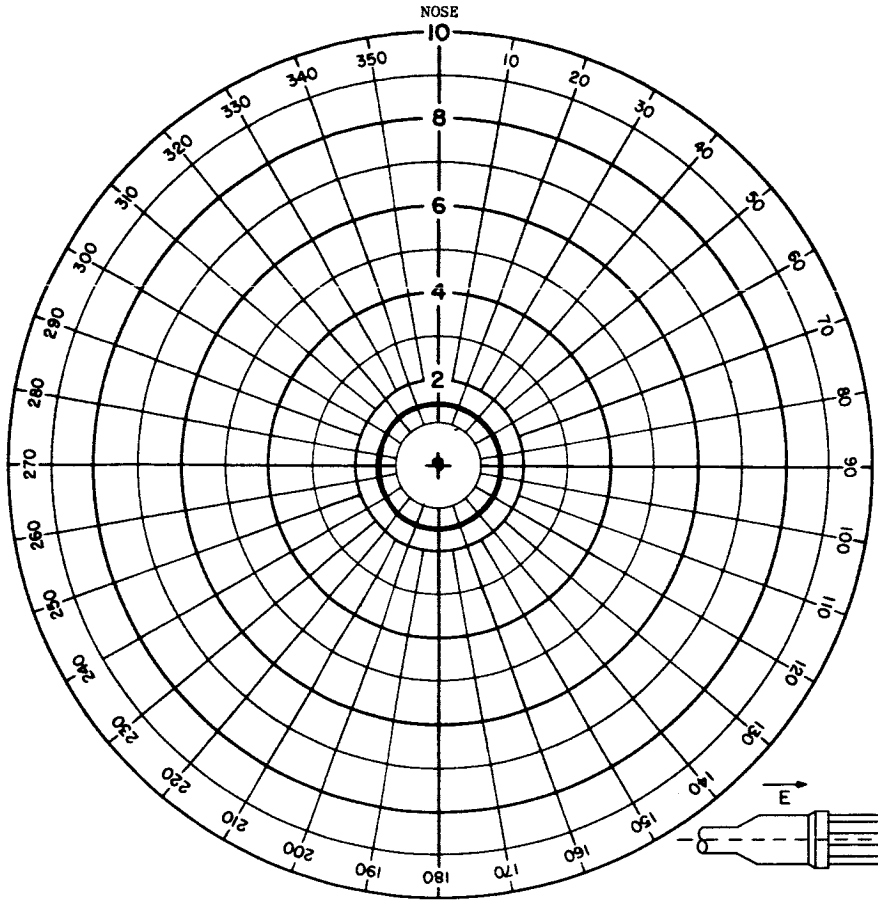


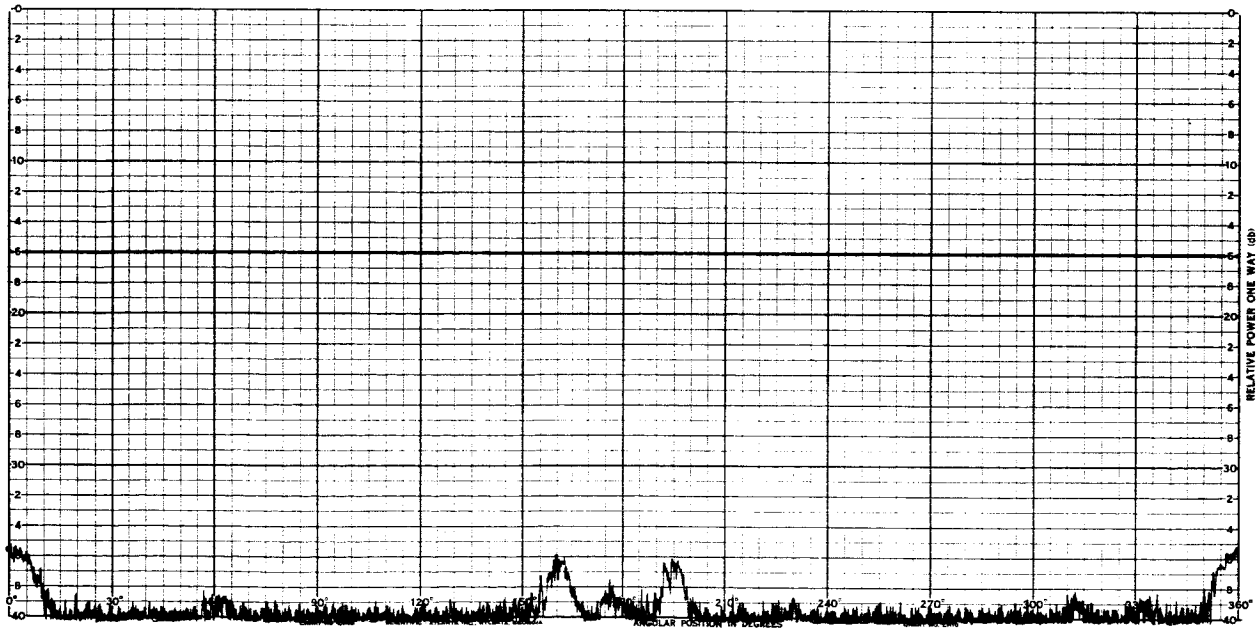


ANTENNA RADIATION PATTERN NO. 201-14

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

SA-5 ALTIMETER ANTENNA

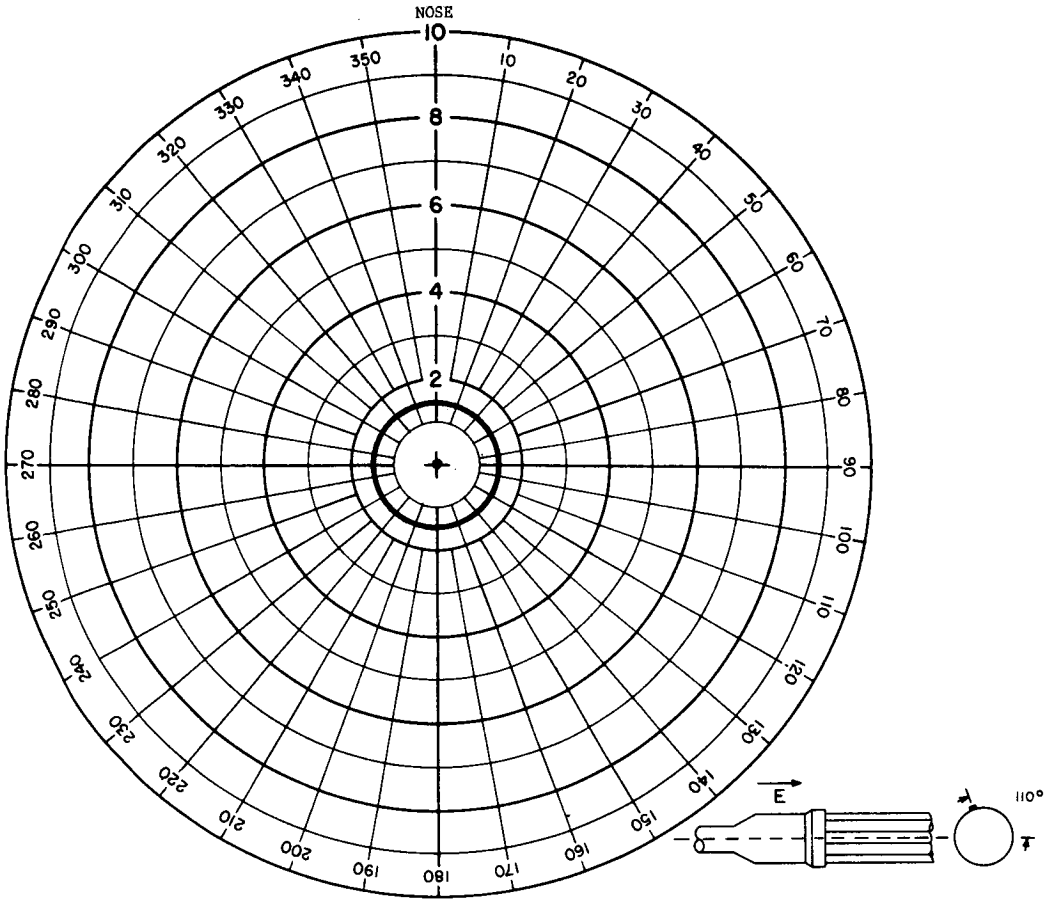


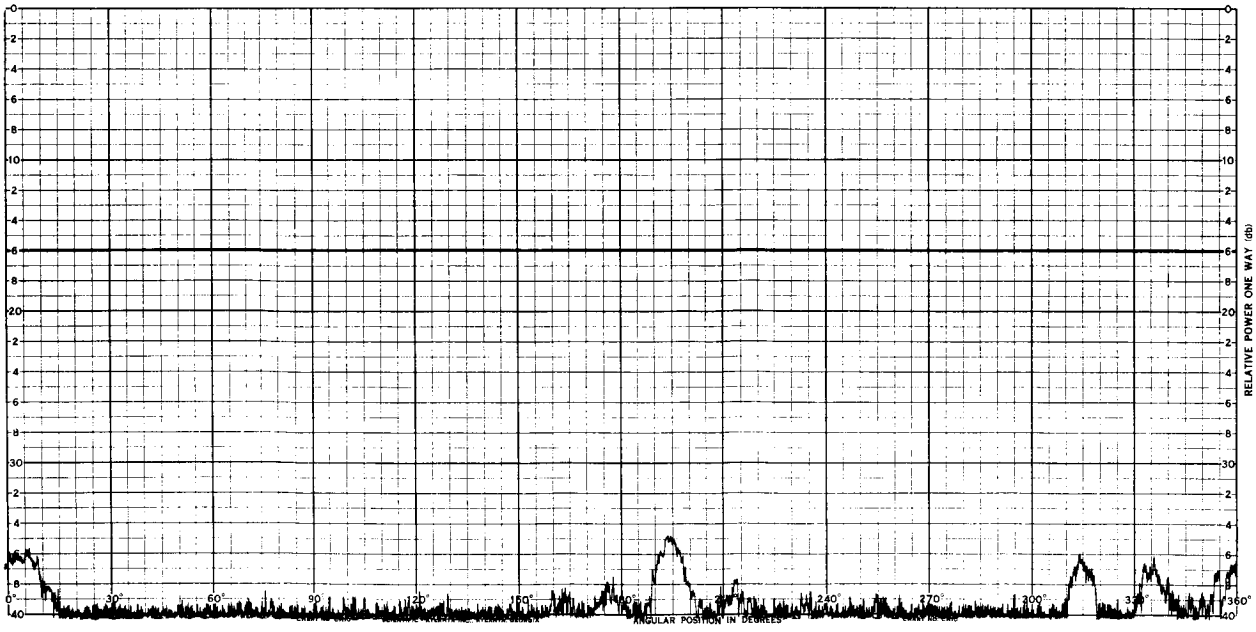


ANTENNA RADIATION PATTERN NO. 201-11

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

SA-5 ALTIMETER ANTENNA

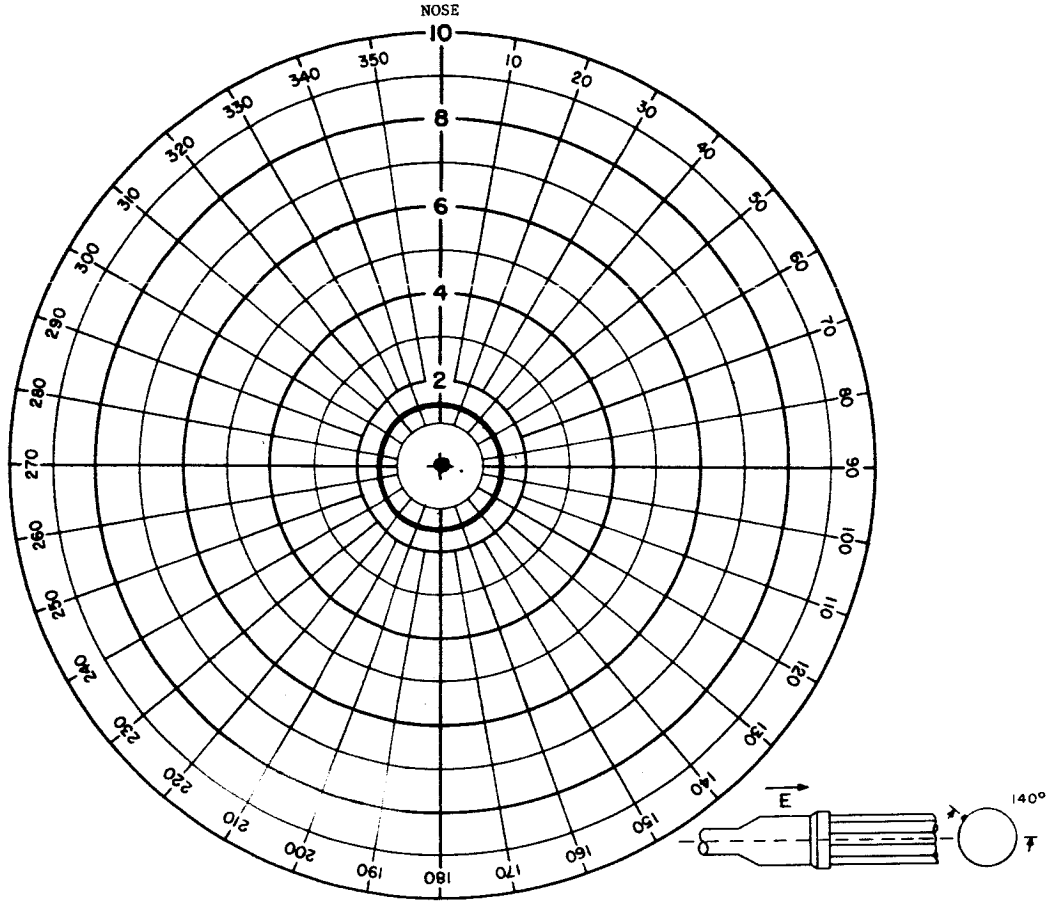


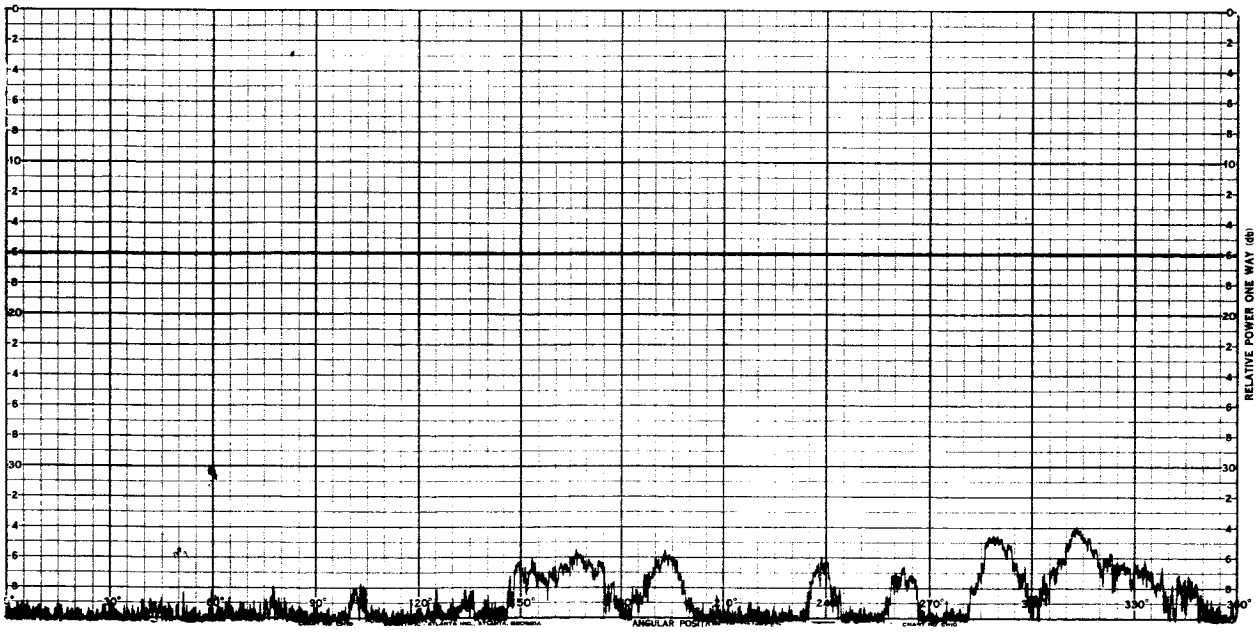


ANTENNA RADIATION PATTERN NO. 201-12

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

SA-5 ALTIMETER ANTENNA

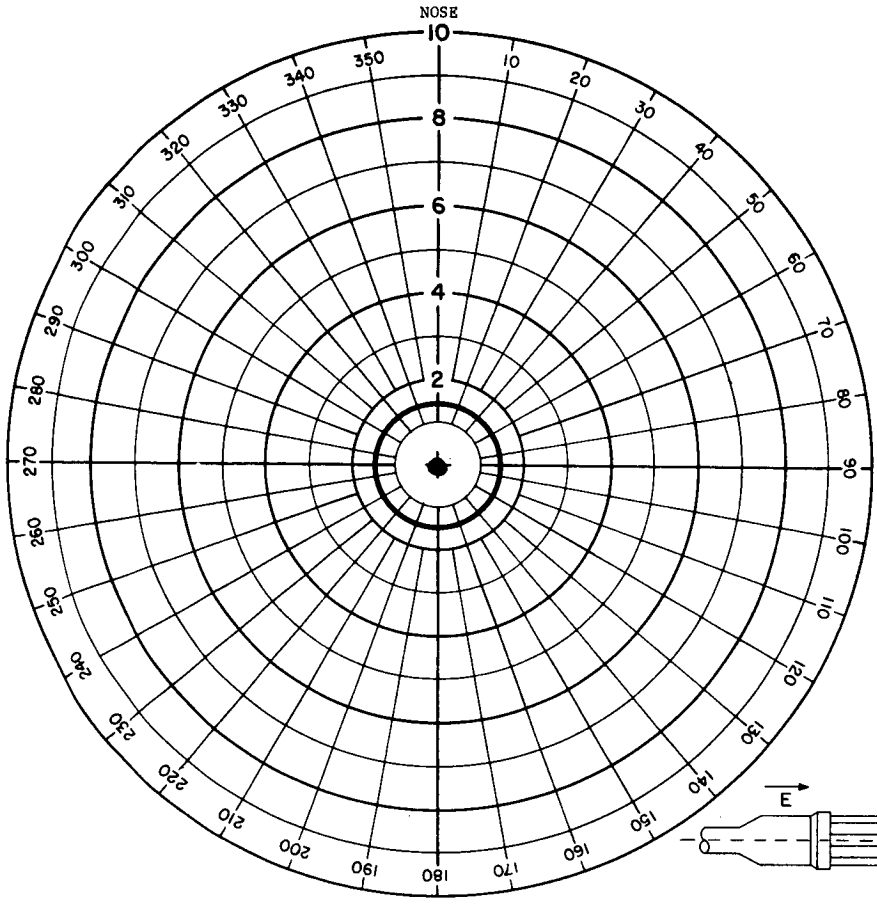


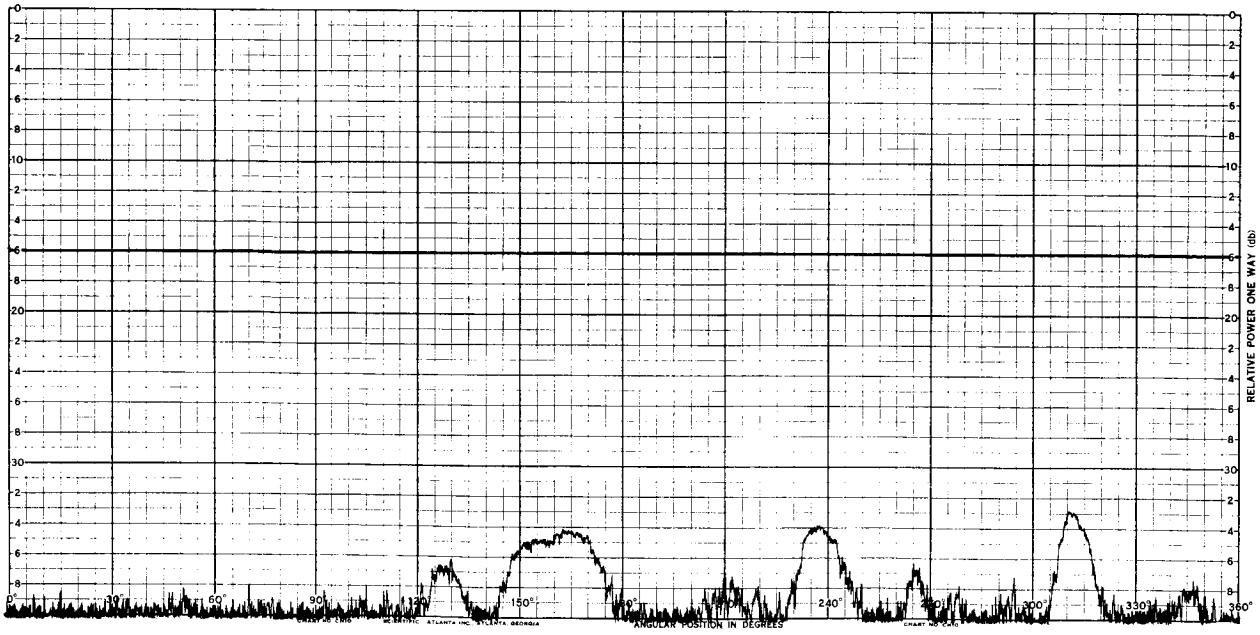


ANTENNA RADIATION PATTERN NO. 201-15

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

SA-5 ALTIMETER ANTENNA

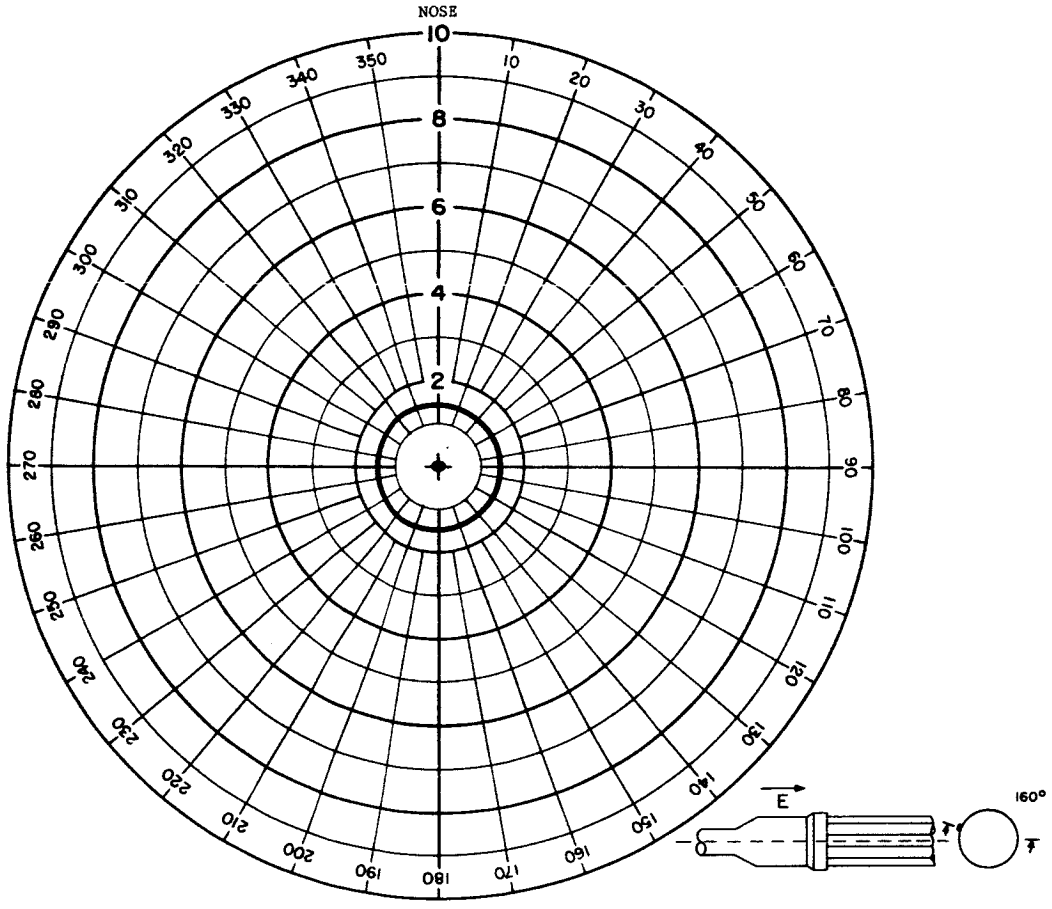


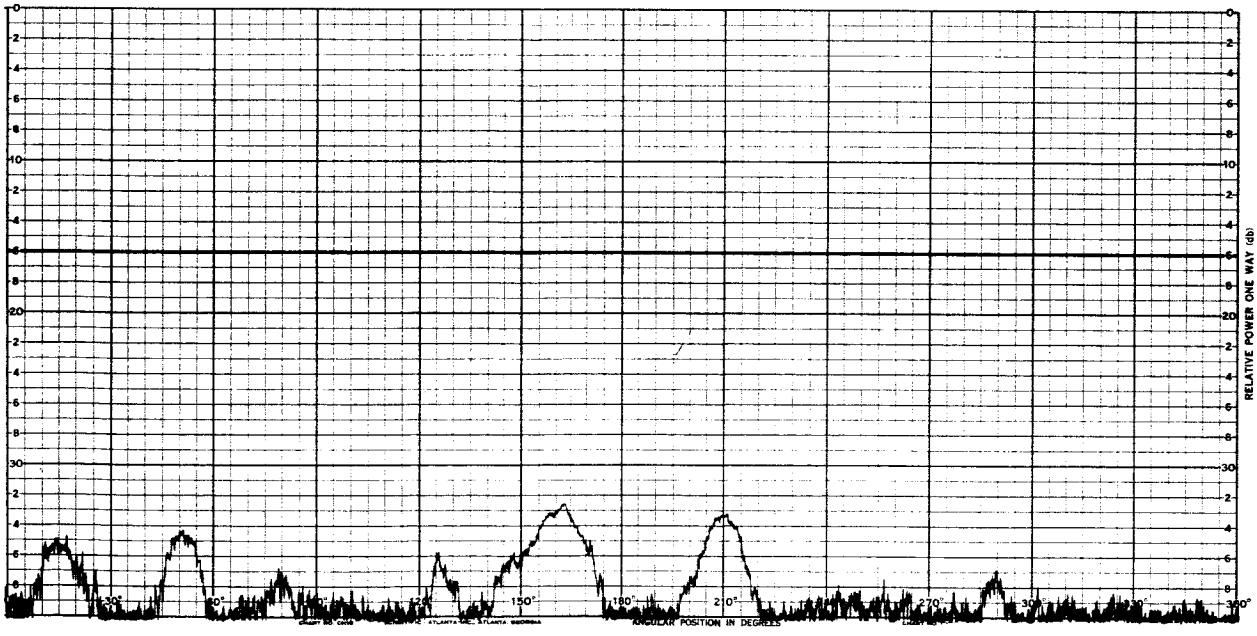


ANTENNA RADIATION PATTERN NO. 201-16

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

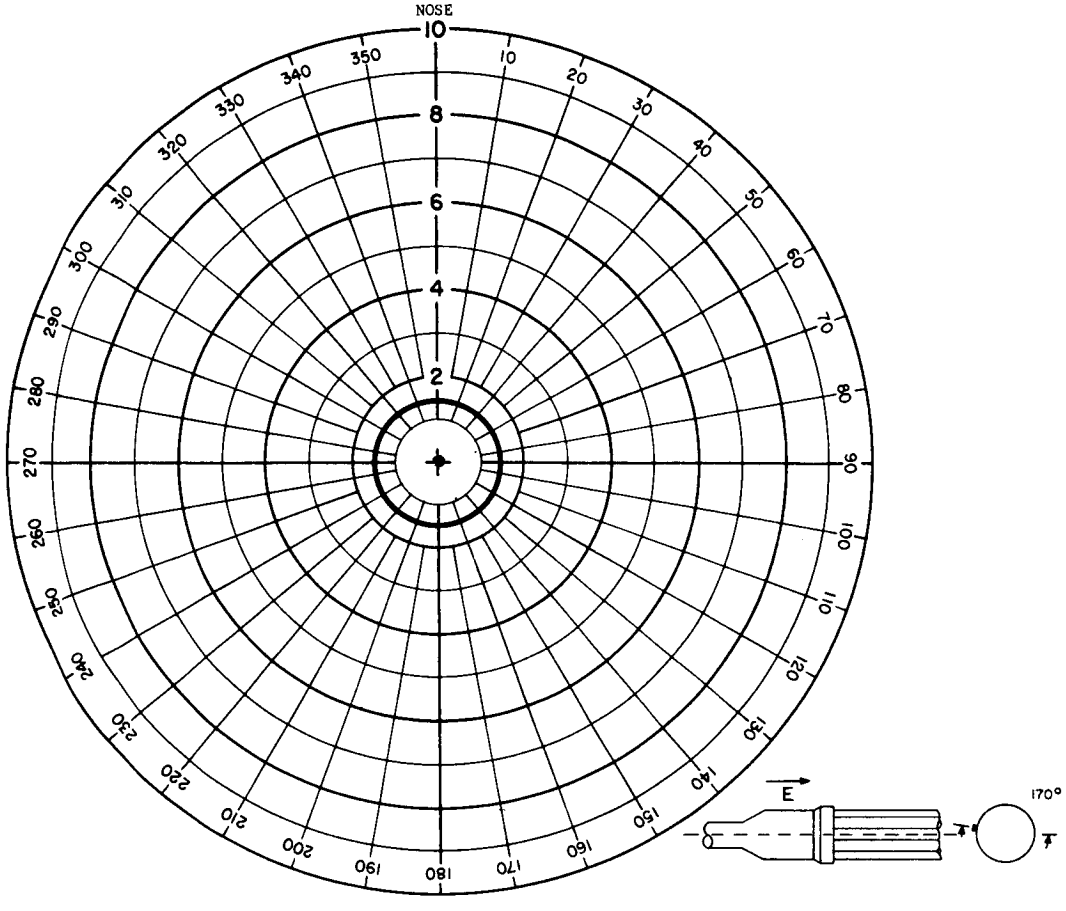
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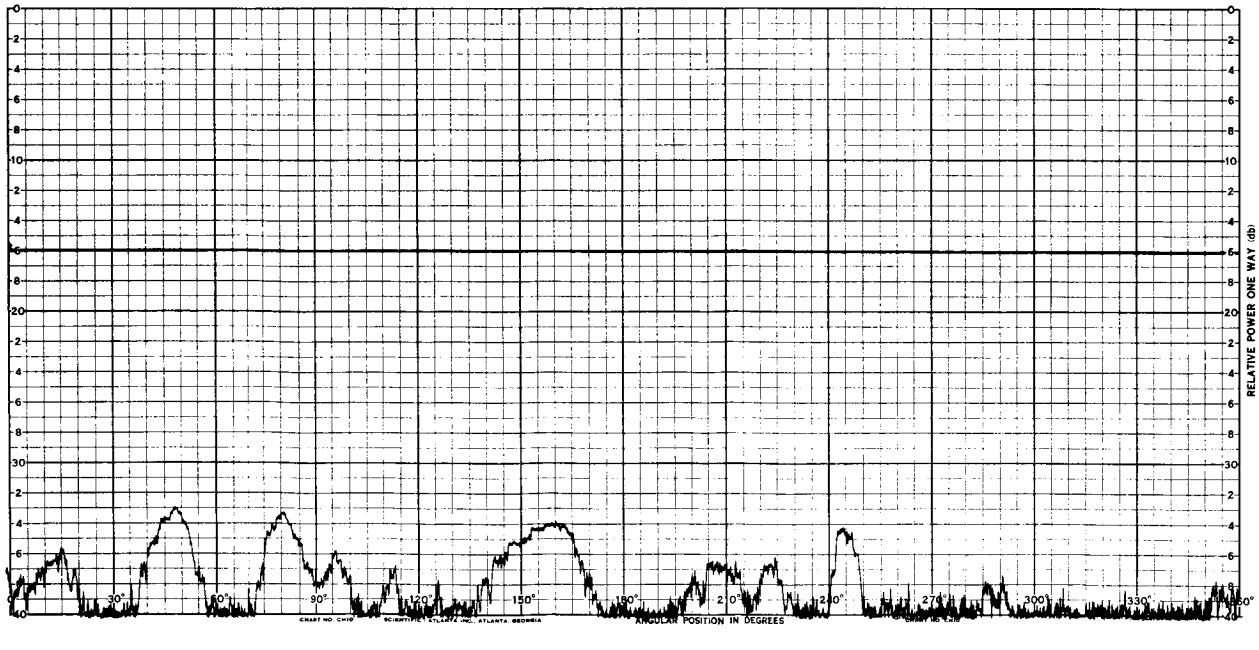




ANTENNA RADIATION PATTERN NO. 201-17

SA-5 ALTIMETER ANTENNA

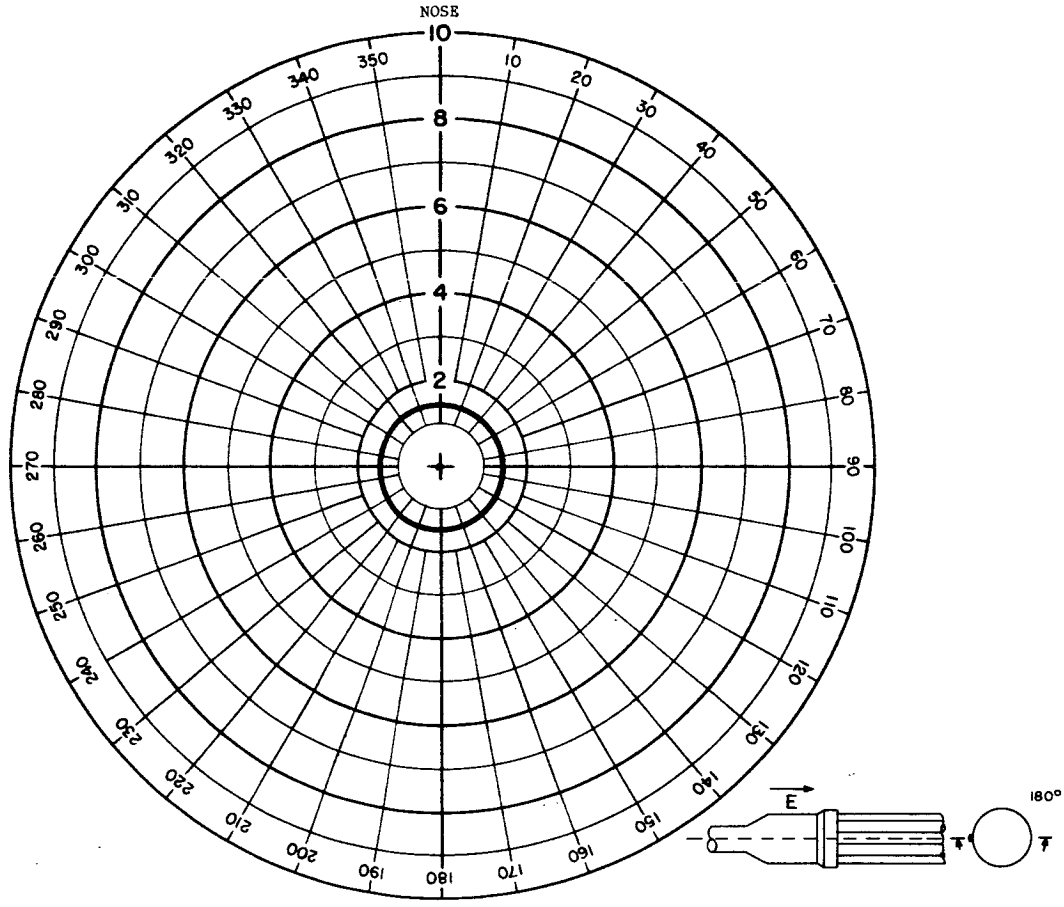


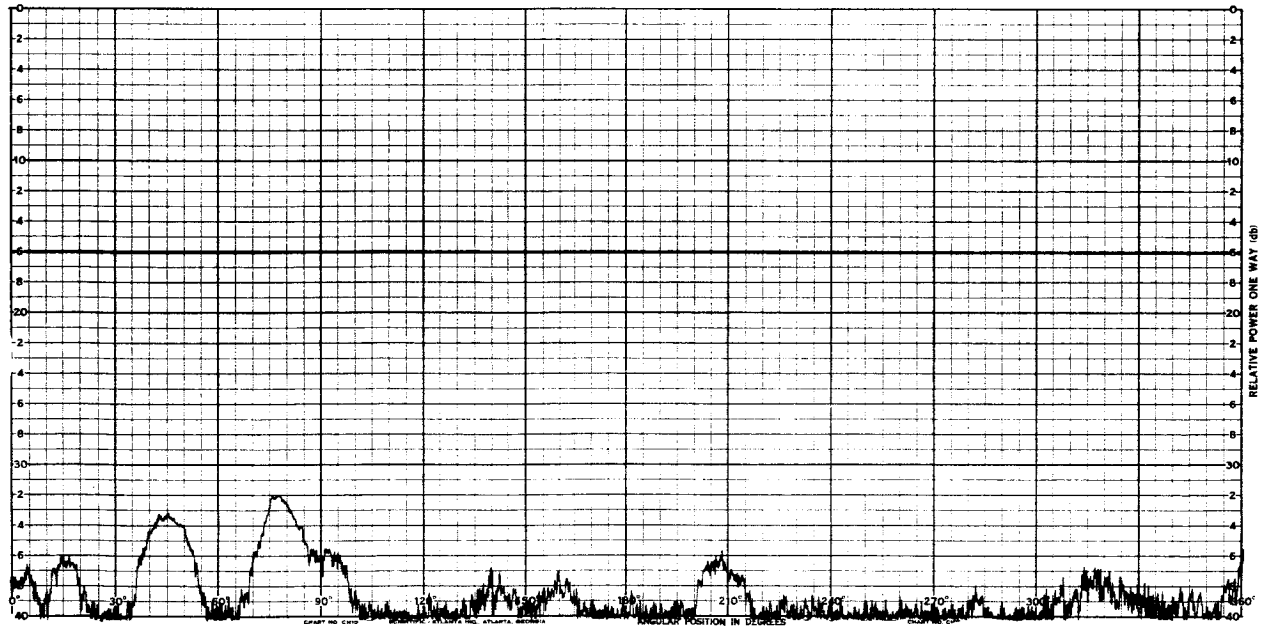


ANTENNA RADIATION PATTERN NO. 201-18

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

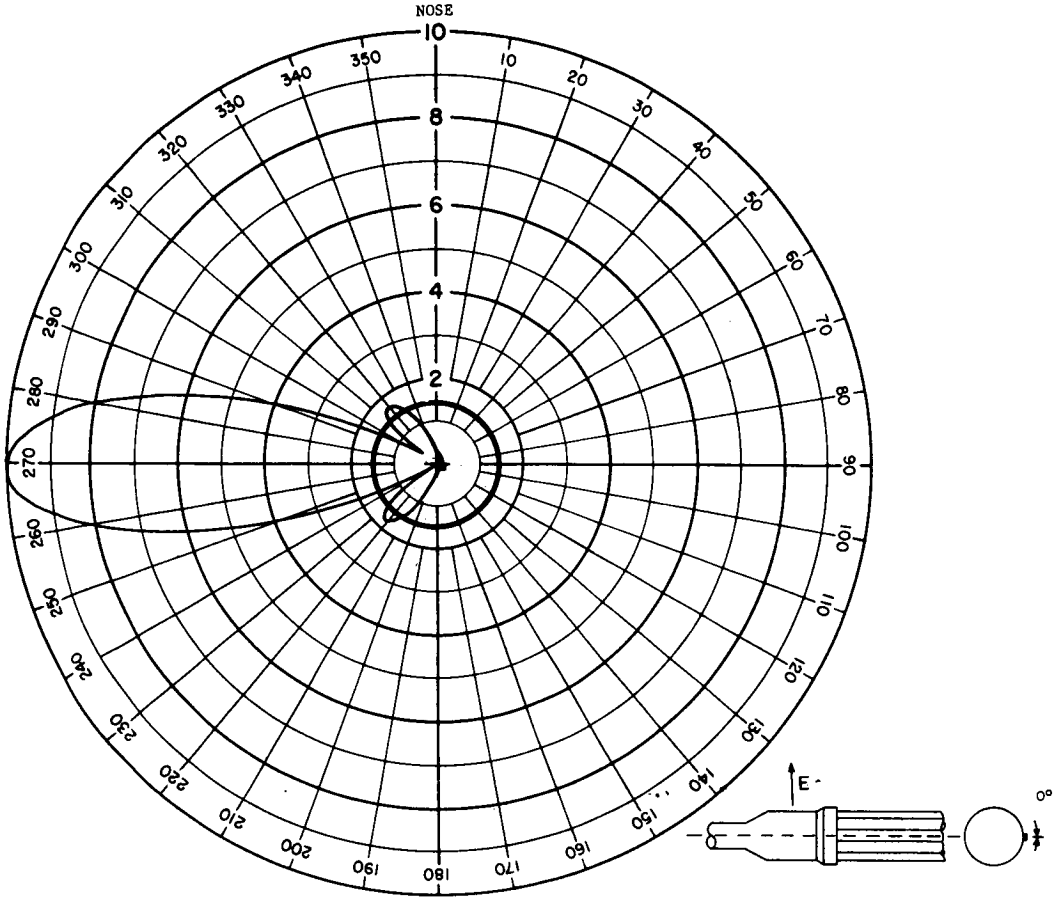
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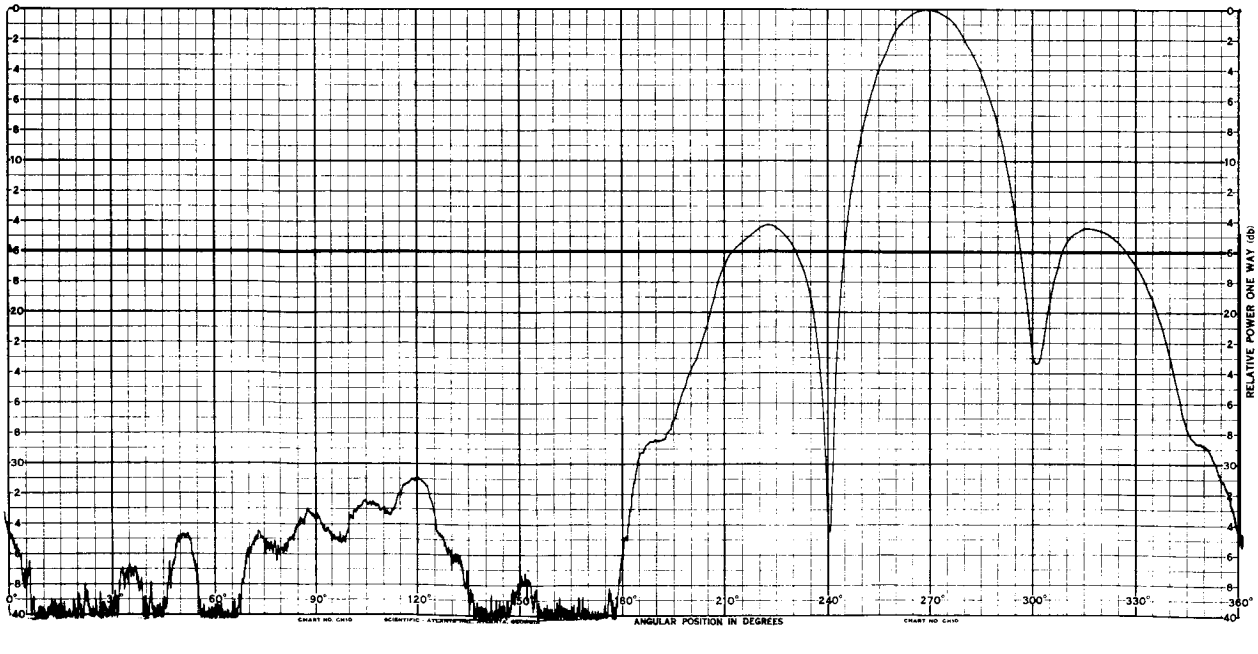




ANTENNA RADIATION PATTERN NO. 201-19

SA-5 ALTIMETER ANTENNA

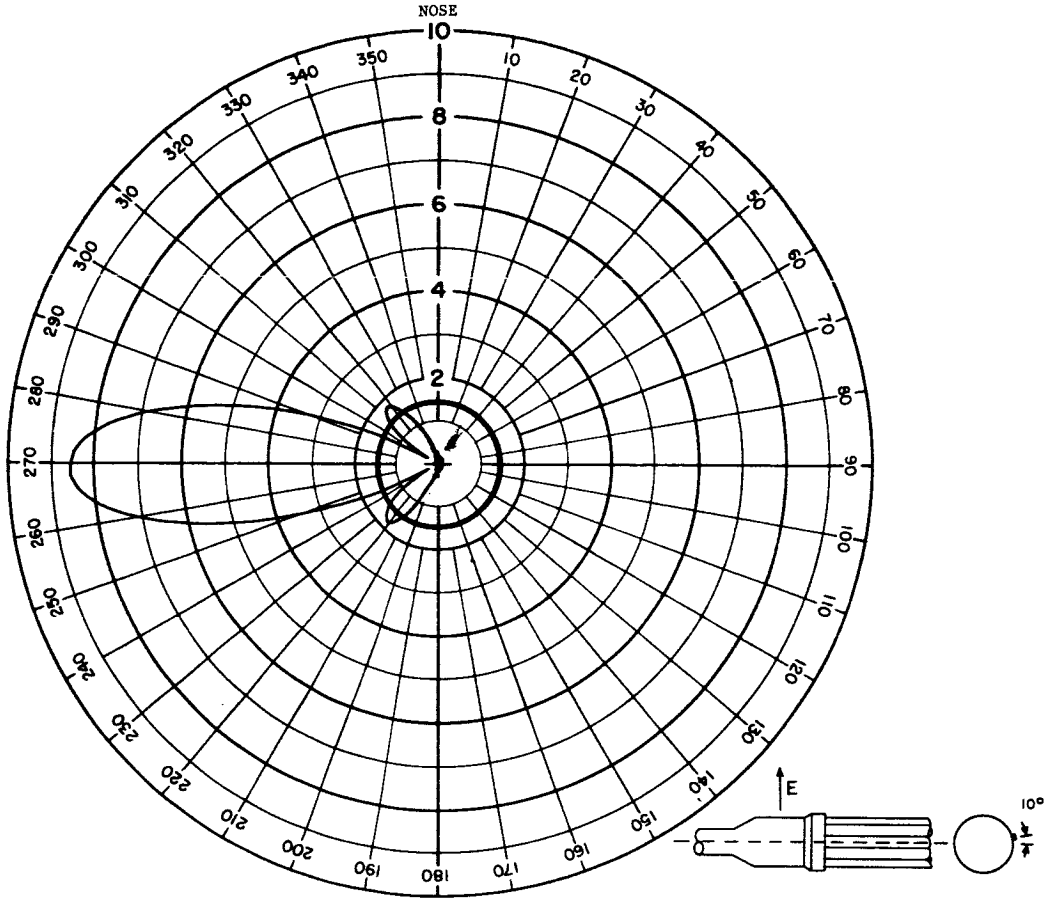


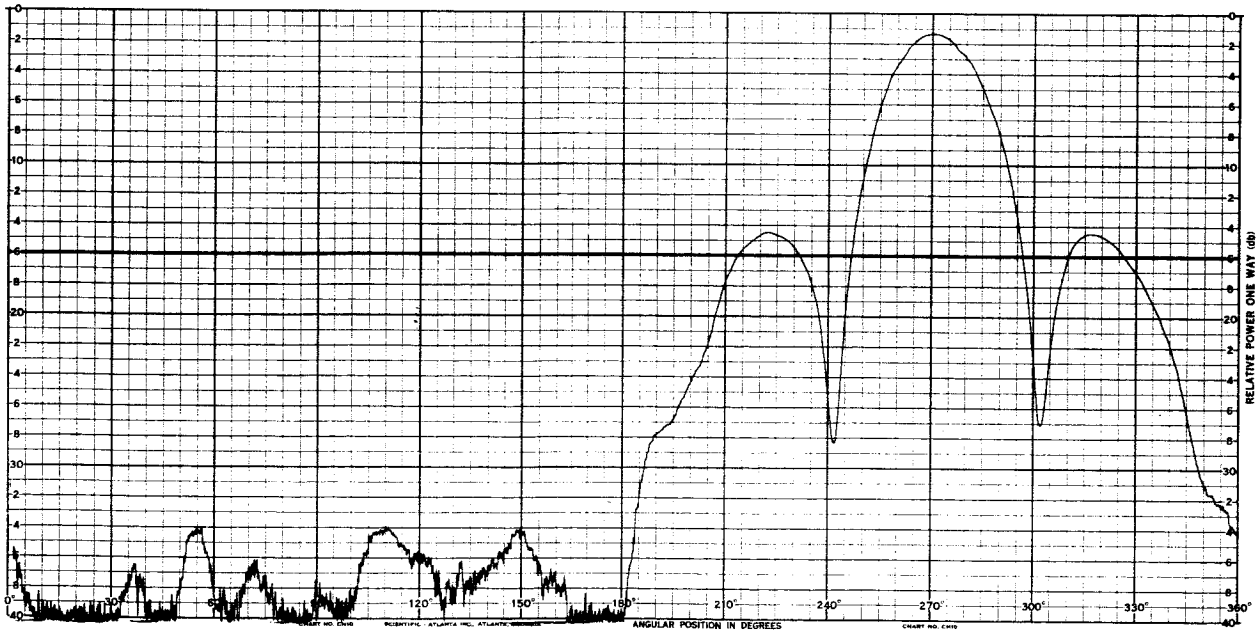


ANTENNA RADIATION PATTERN NO. 201-20

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

SA-5 ALTIMETER ANTENNA

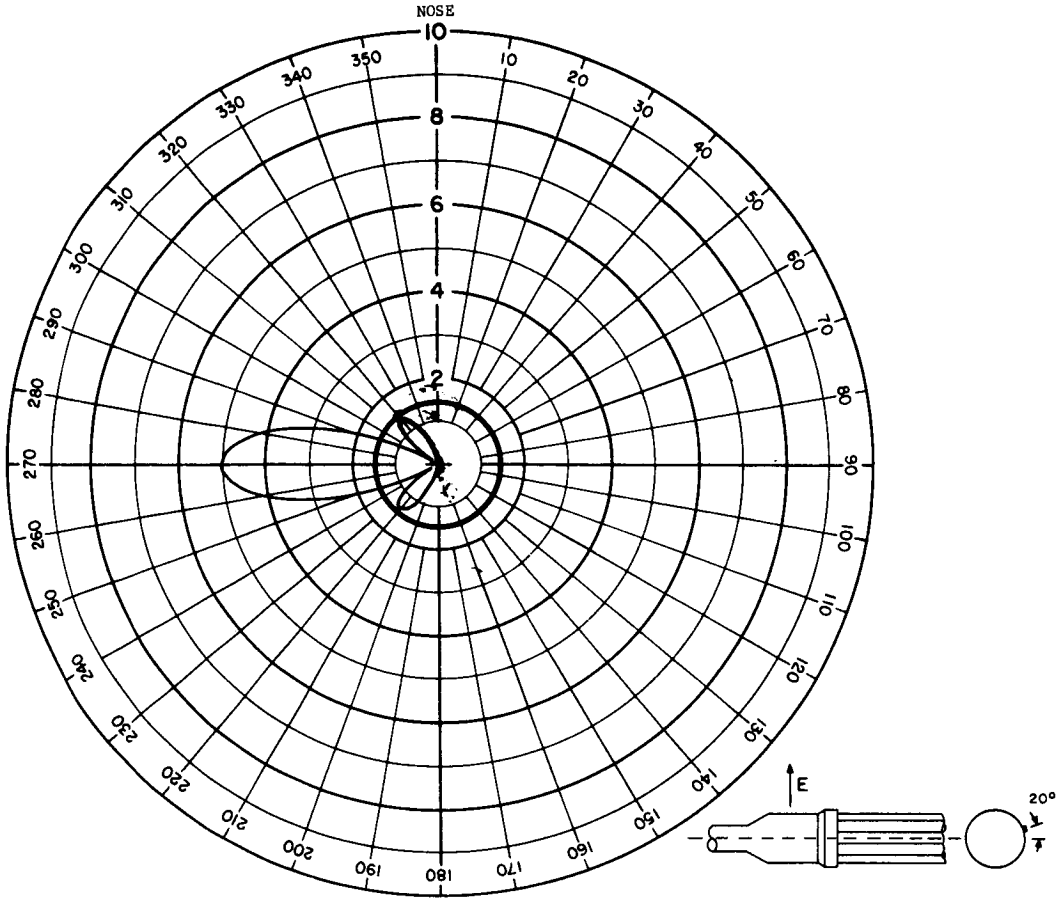


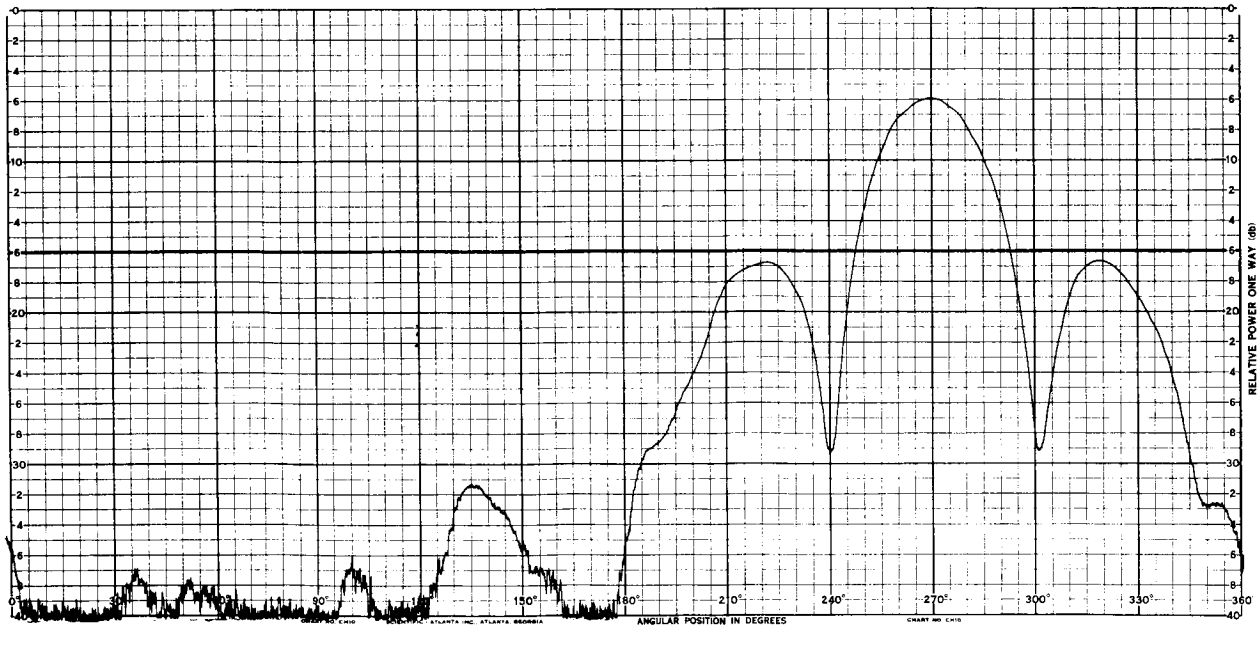


ANTENNA RADIATION PATTERN NO. 201-21

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

SA-5 ALTIMETER ANTENNA

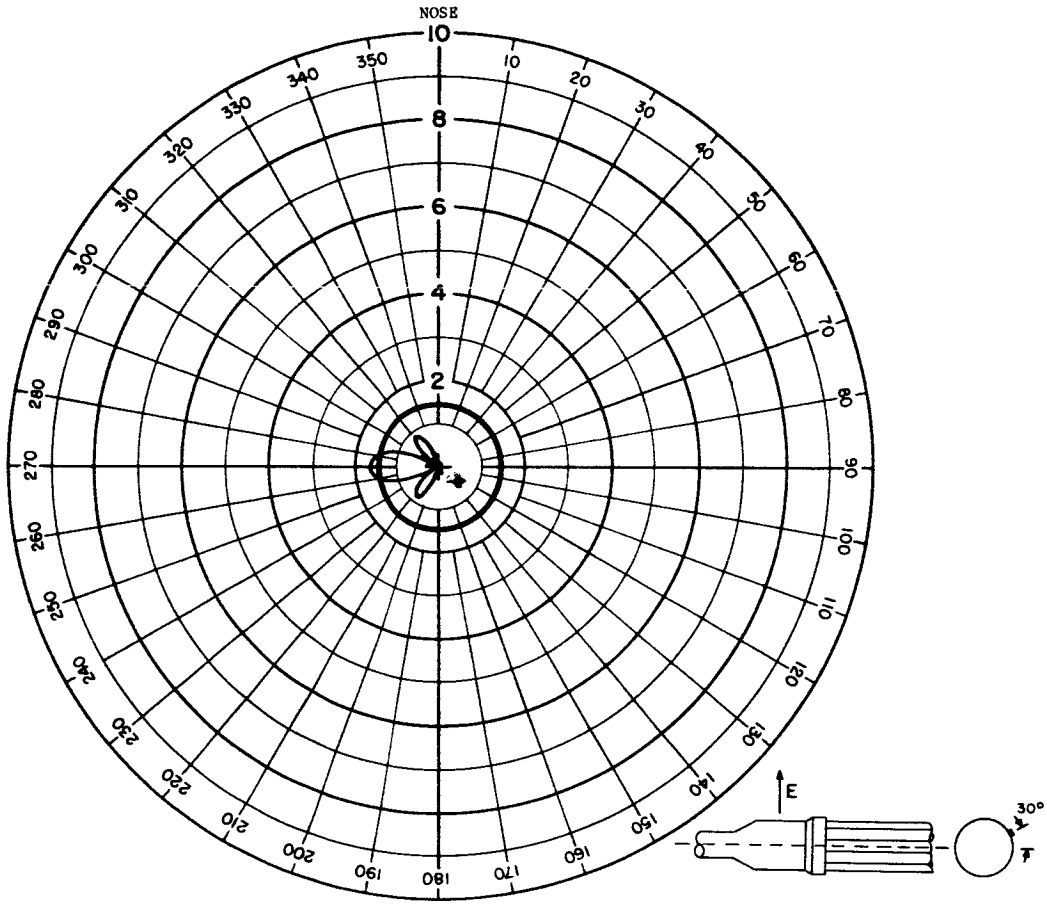


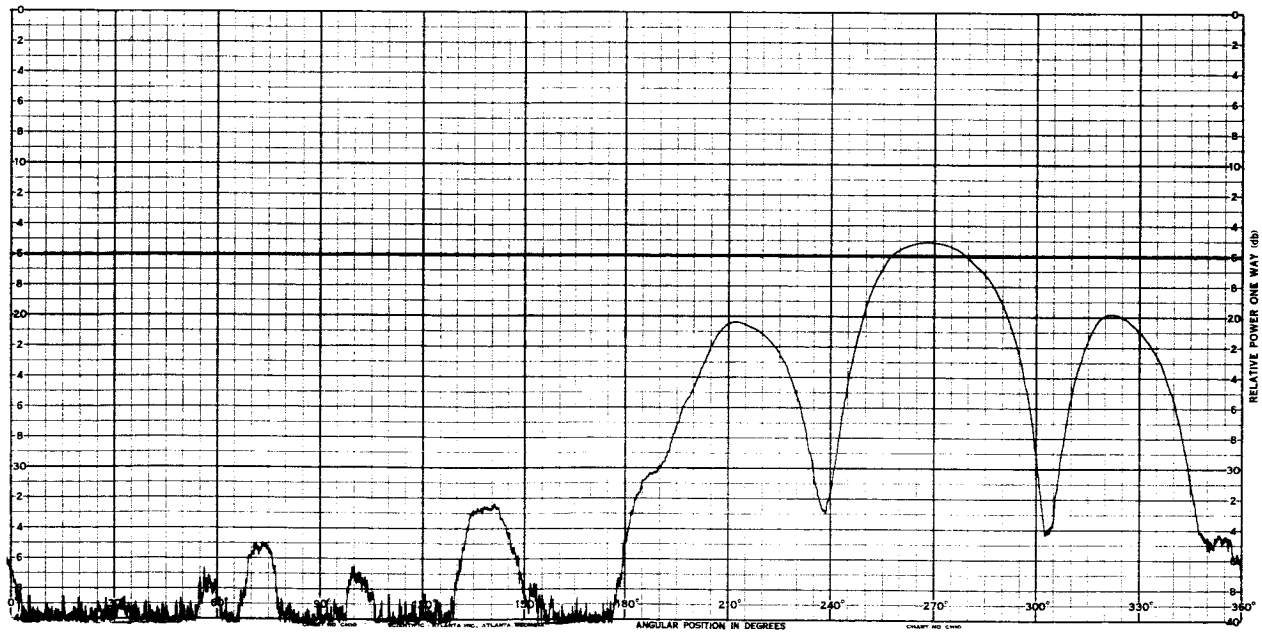


ANTENNA RADIATION PATTERN NO. 201-22

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

SA-5 ALTIMETER ANTENNA

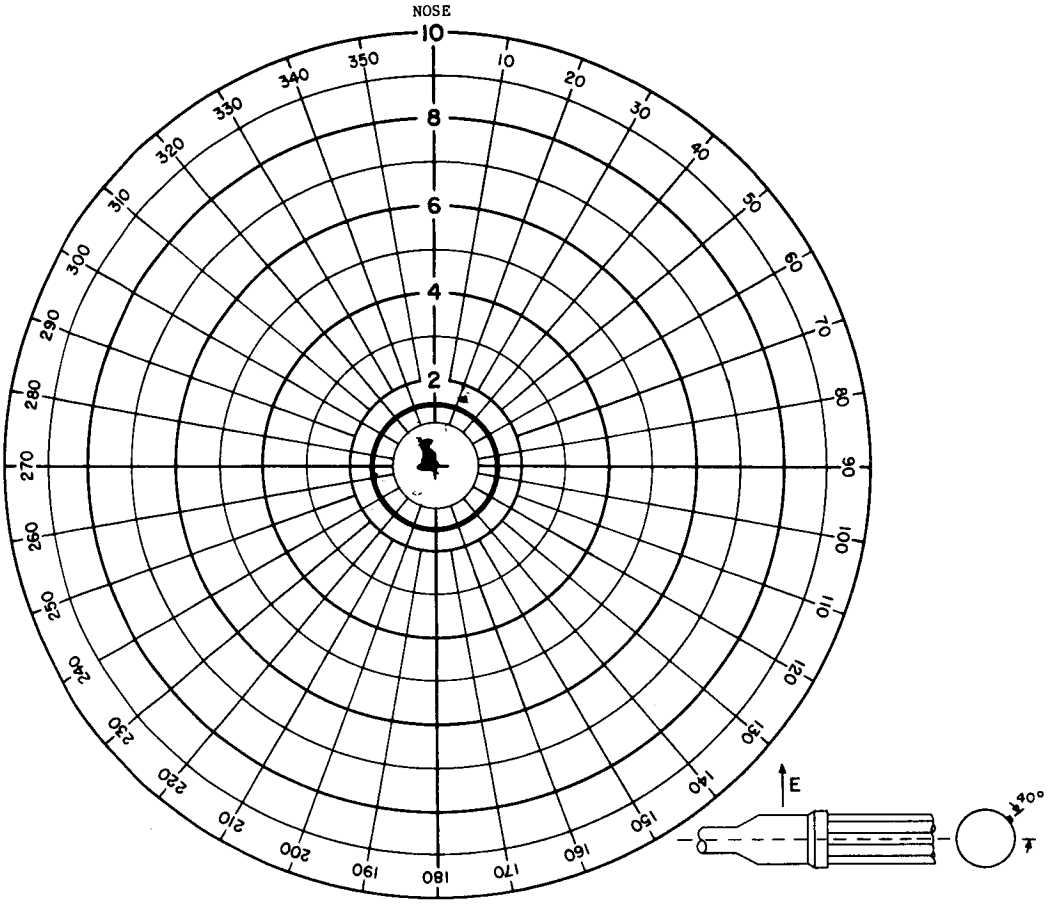


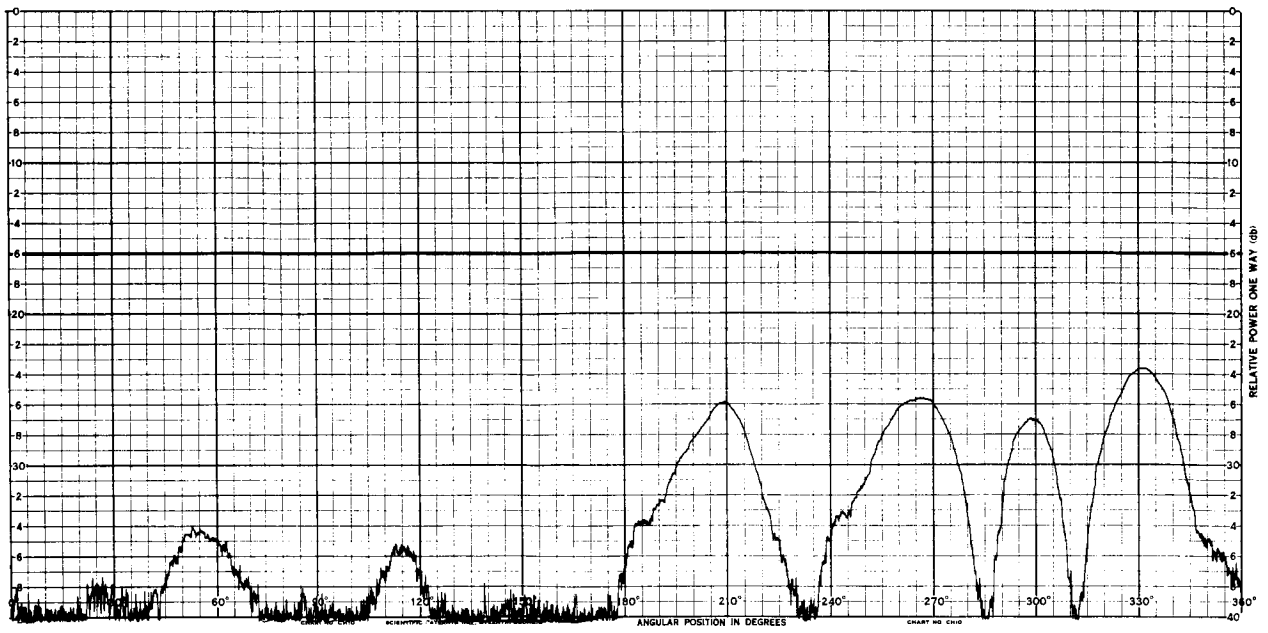


ANTENNA RADIATION PATTERN NO. 201-23

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

SA-5 ALTIMETER ANTENNA

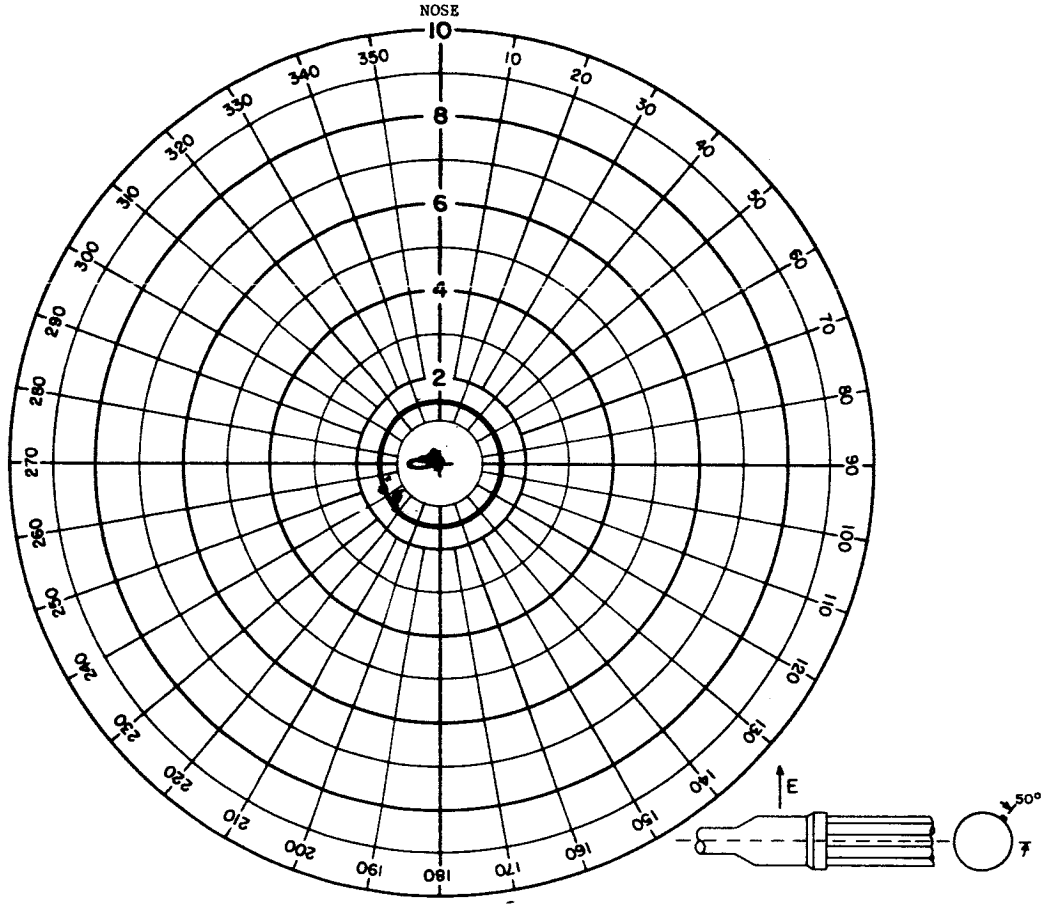


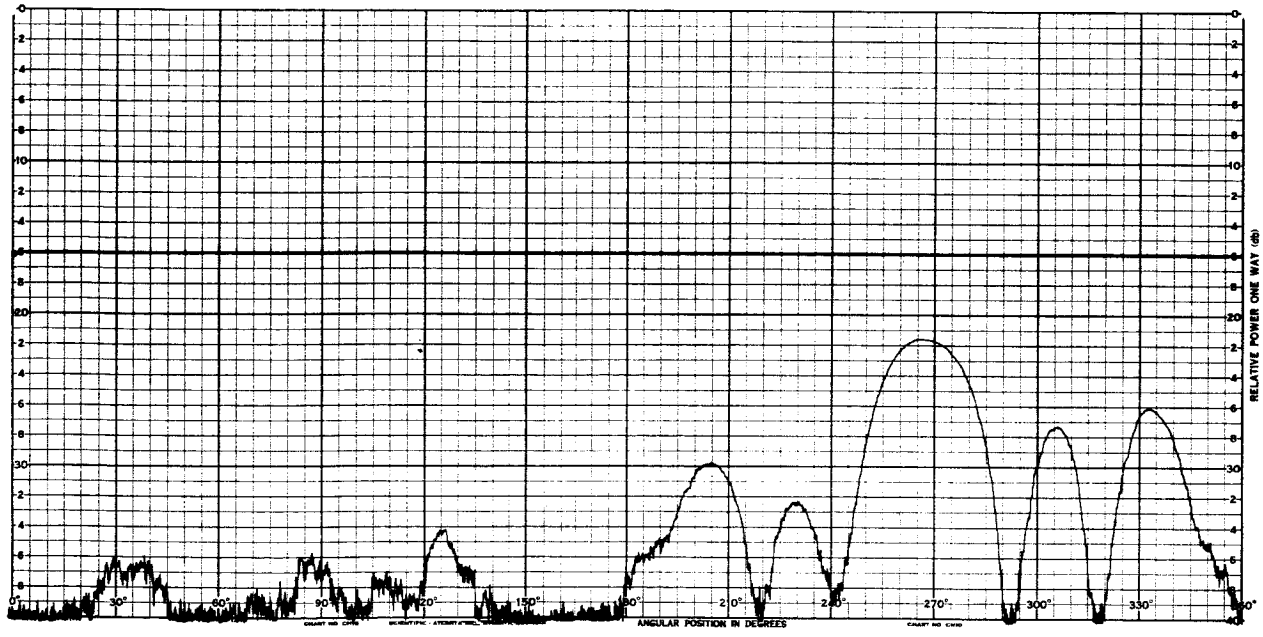


ANTENNA RADIATION PATTERN NO. 201-24

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

SA-5 ALTIMETER ANTENNA

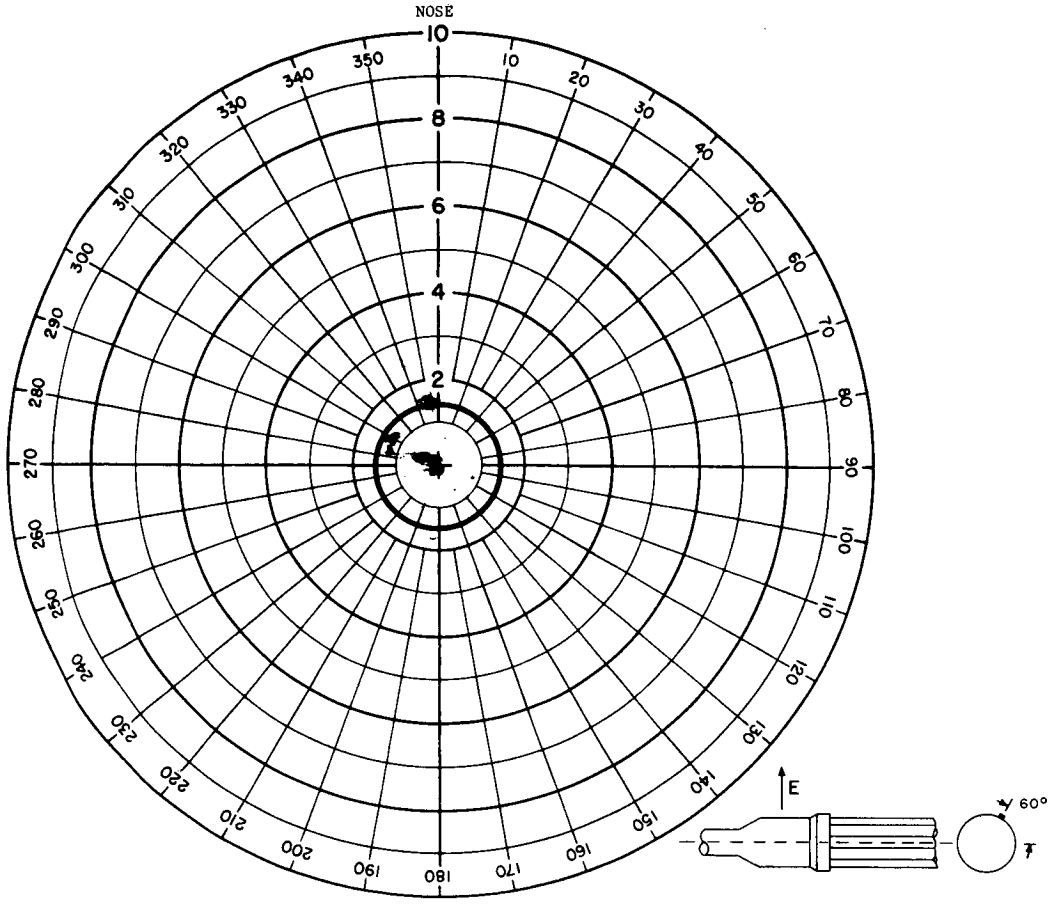


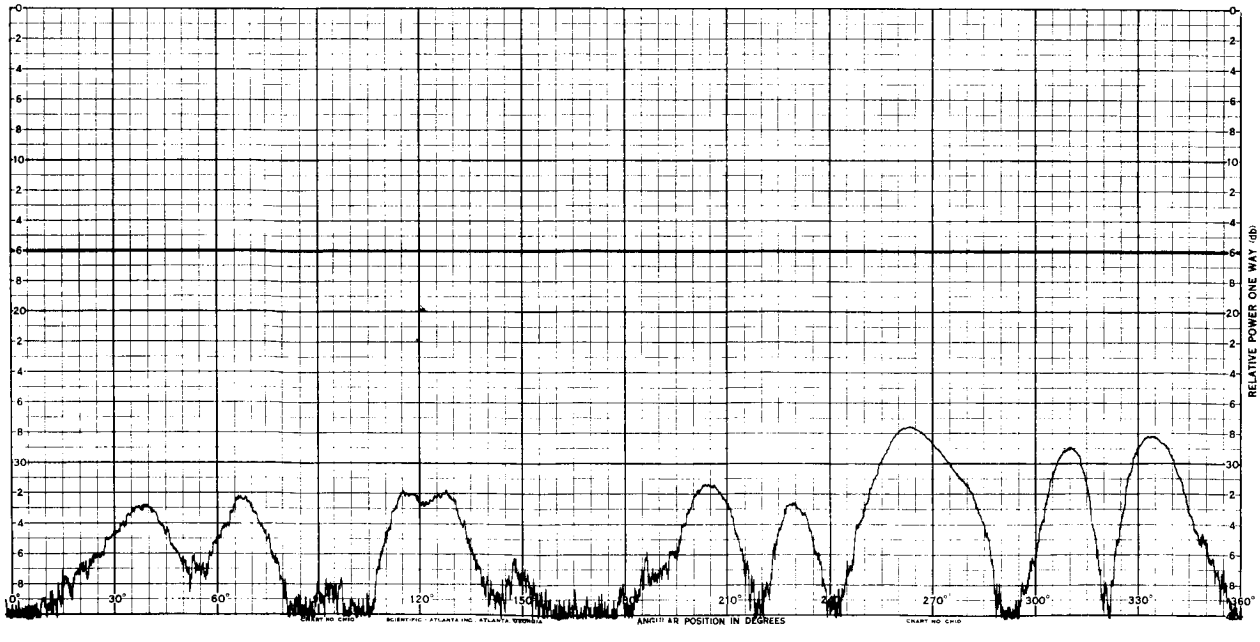


ANTENNA RADIATION PATTERN NO. 201-25

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

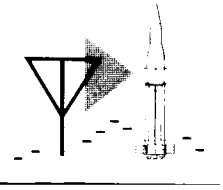
SA-5 ALTIMETER ANTENNA



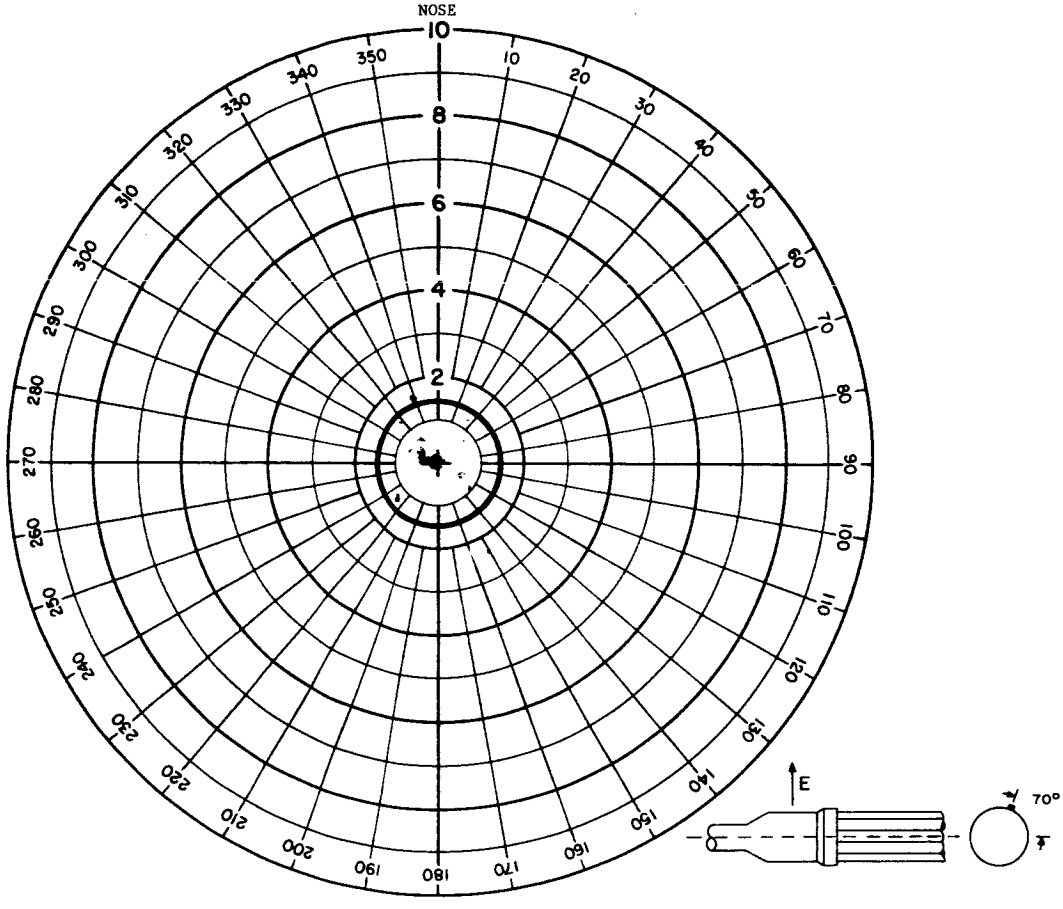


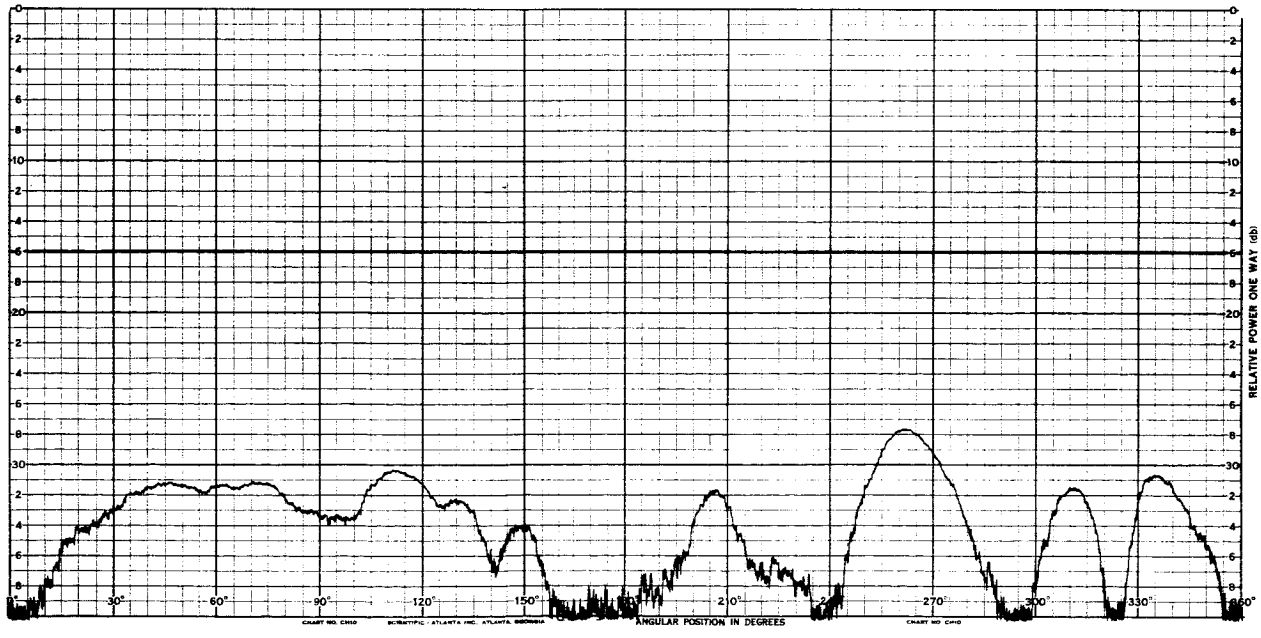
ANTENNA RADIATION PATTERN NO. 201-26

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



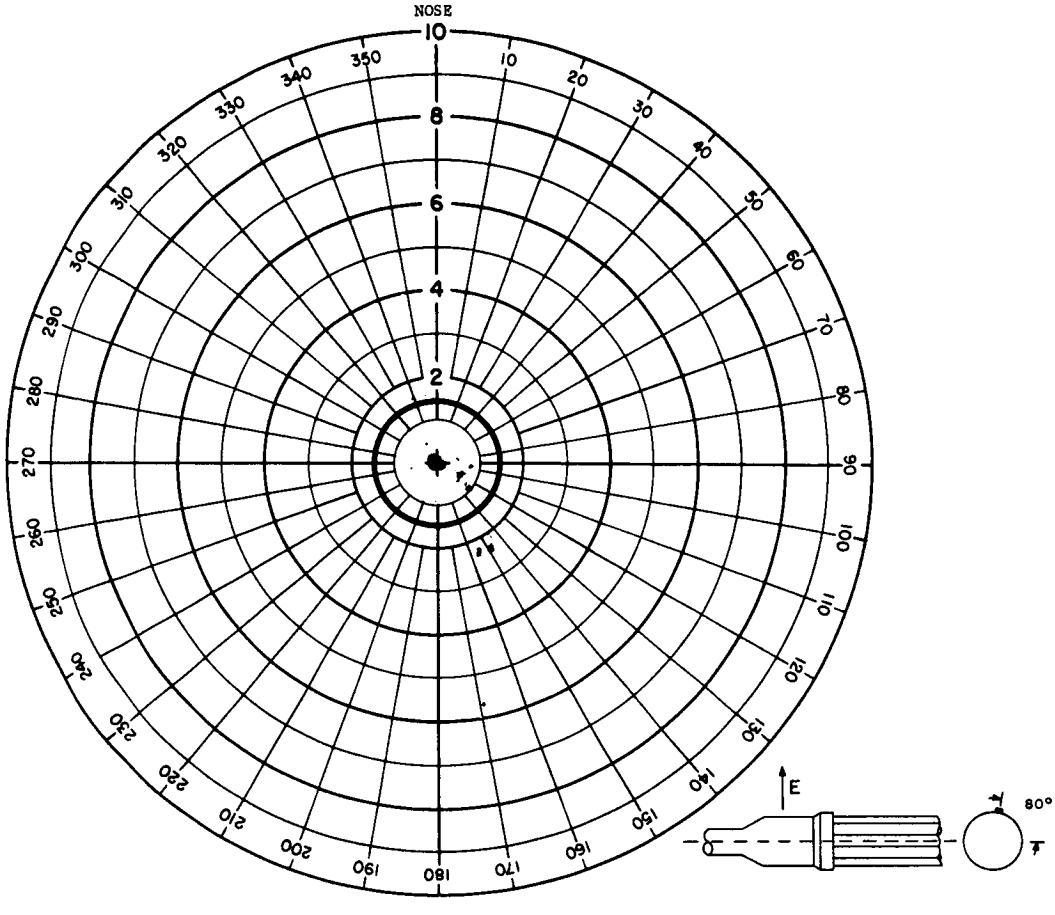
SA-5 ALTIMETER ANTENNA

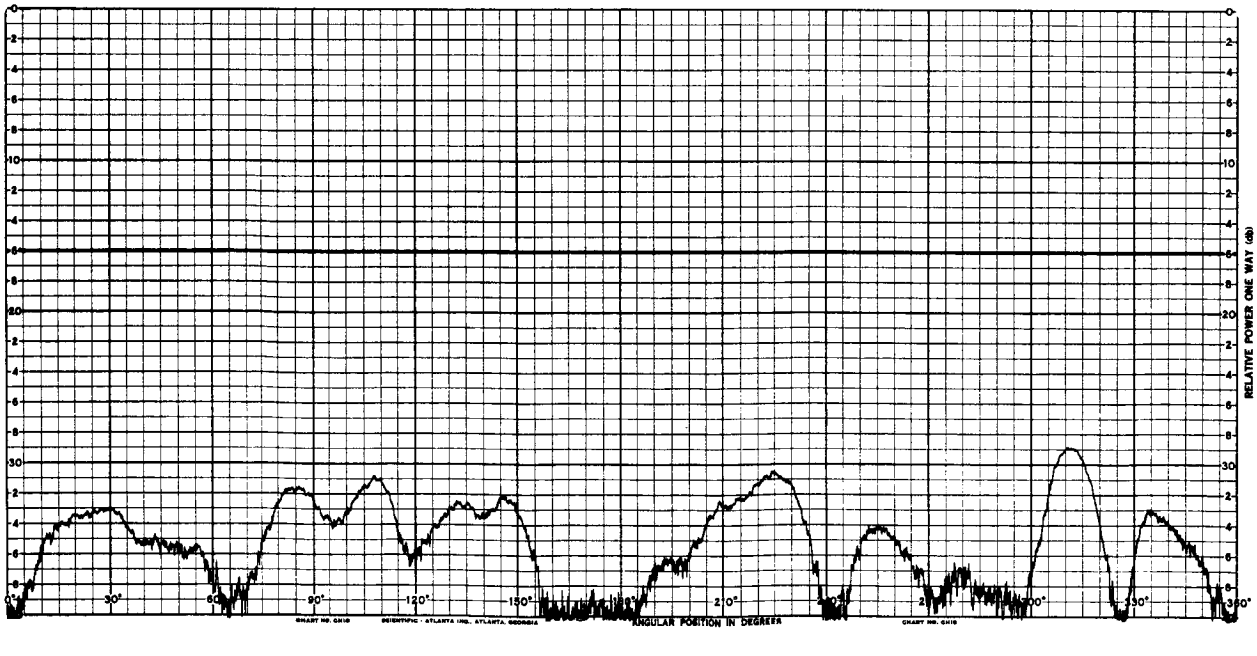




ANTENNA RADIATION PATTERN NO. 201-27

SA-5 ALTIMETER ANTENNA

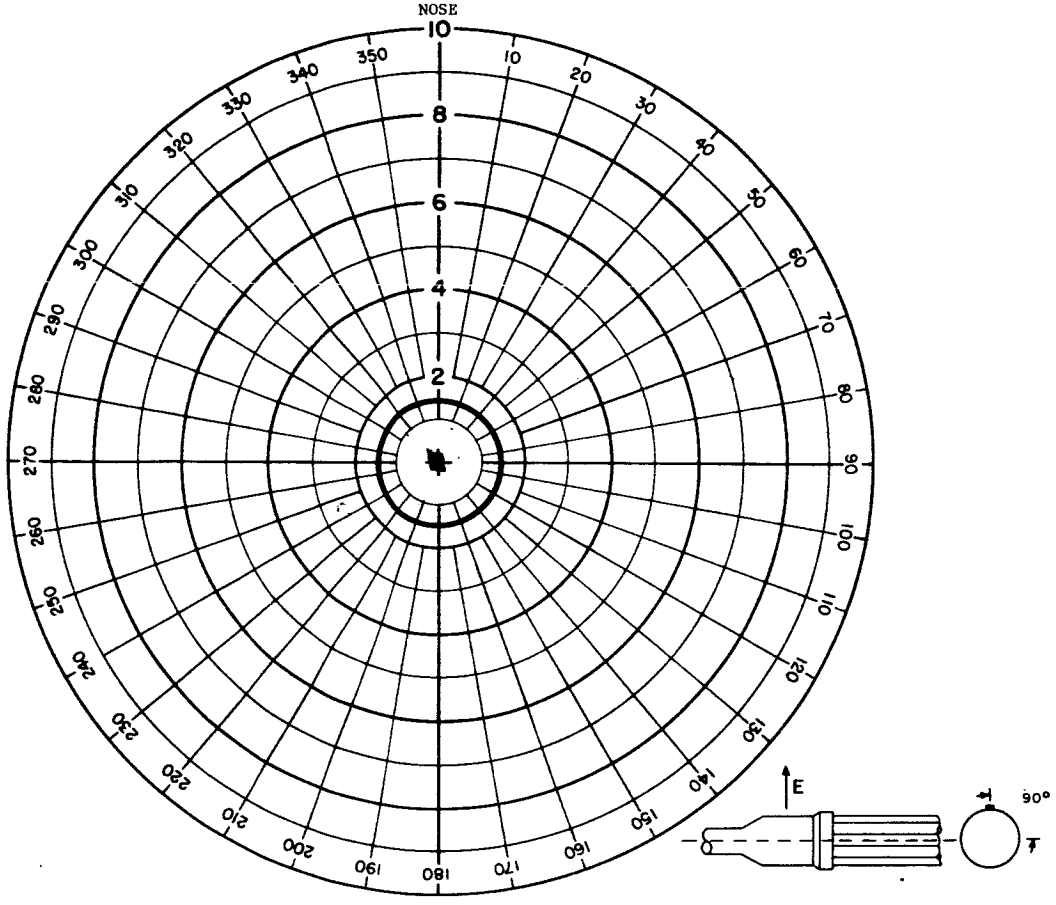


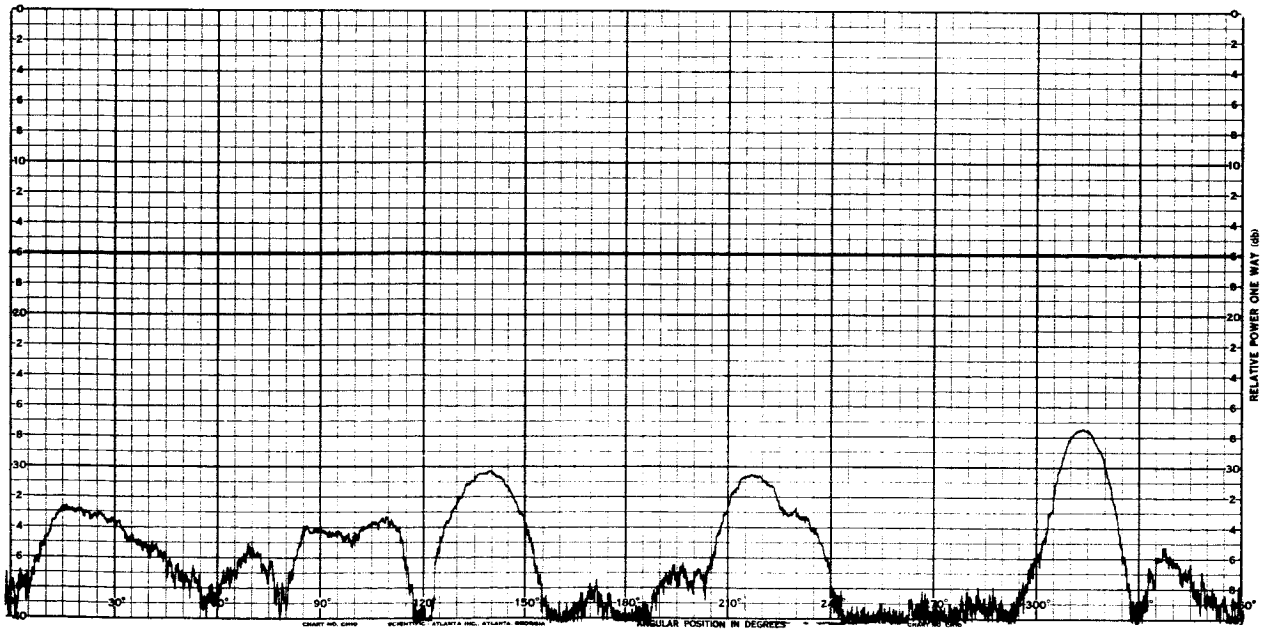


ANTENNA RADIATION PATTERN NO. 201-28

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

SA-5 ALTIMETER ANTENNA

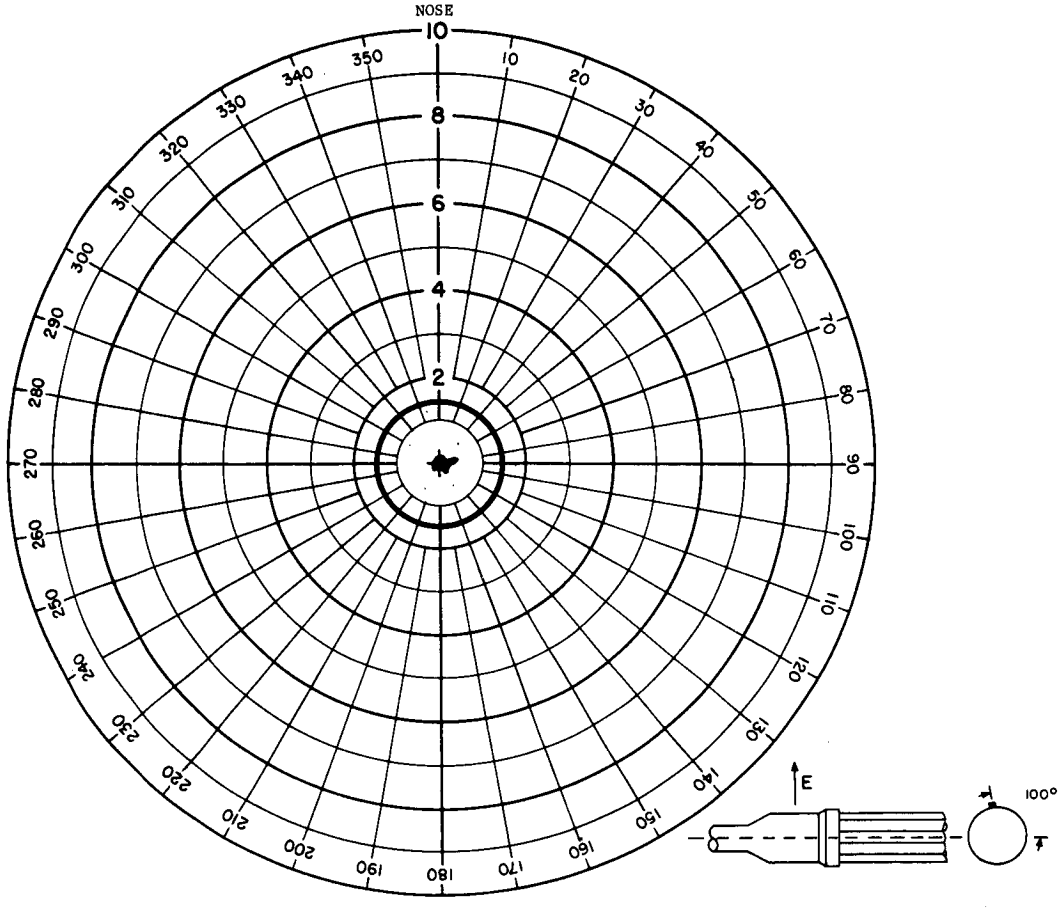


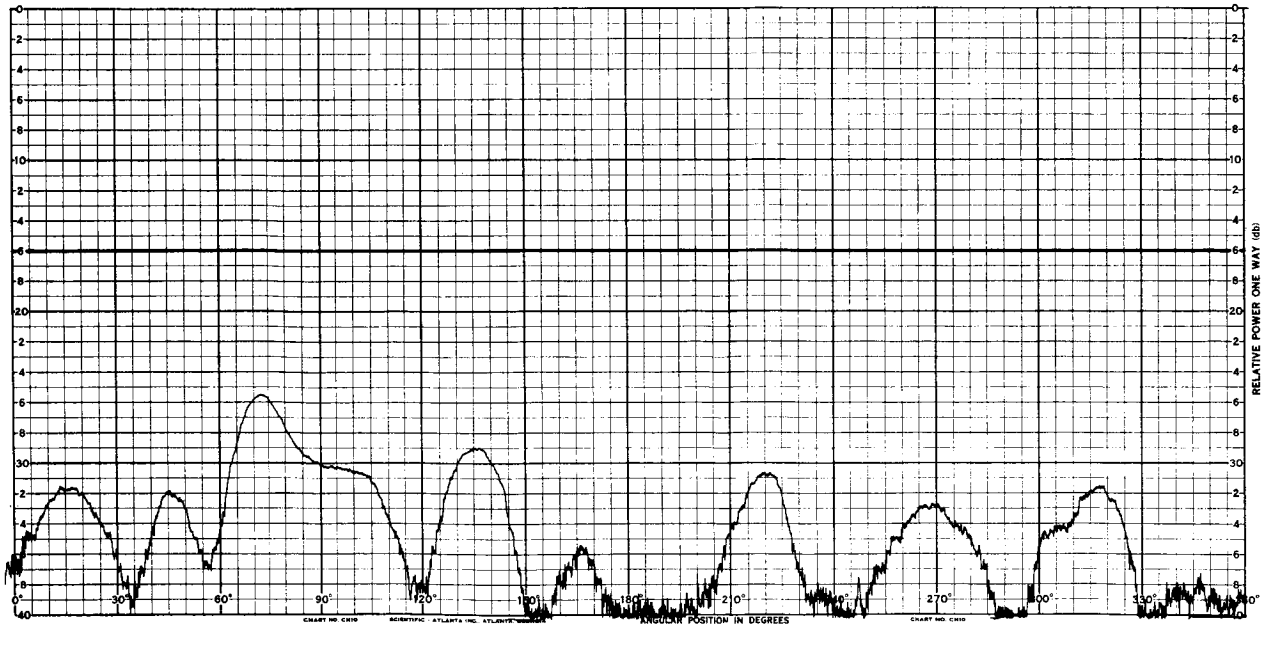


ANTENNA RADIATION PATTERN NO. 201-29

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

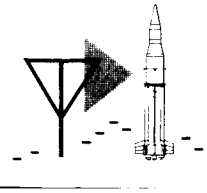
SA-5 ALTIMETER ANTENNA



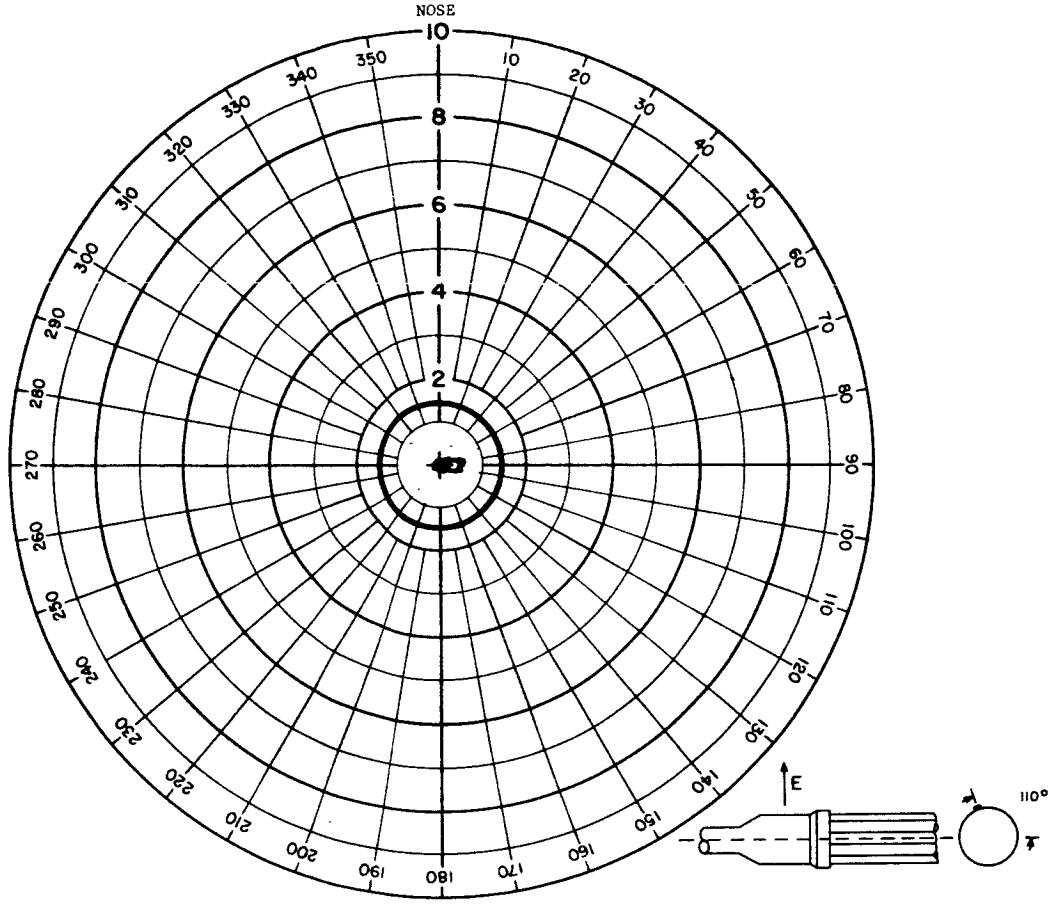


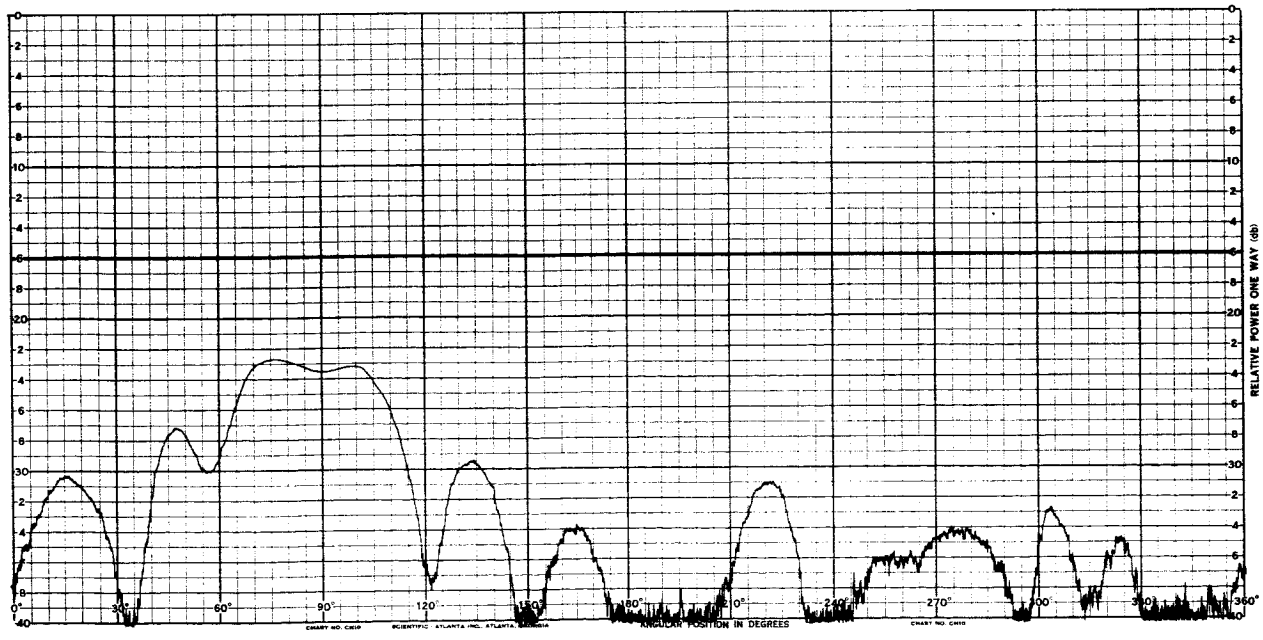
ANTENNA RADIATION PATTERN NO. 201-30

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



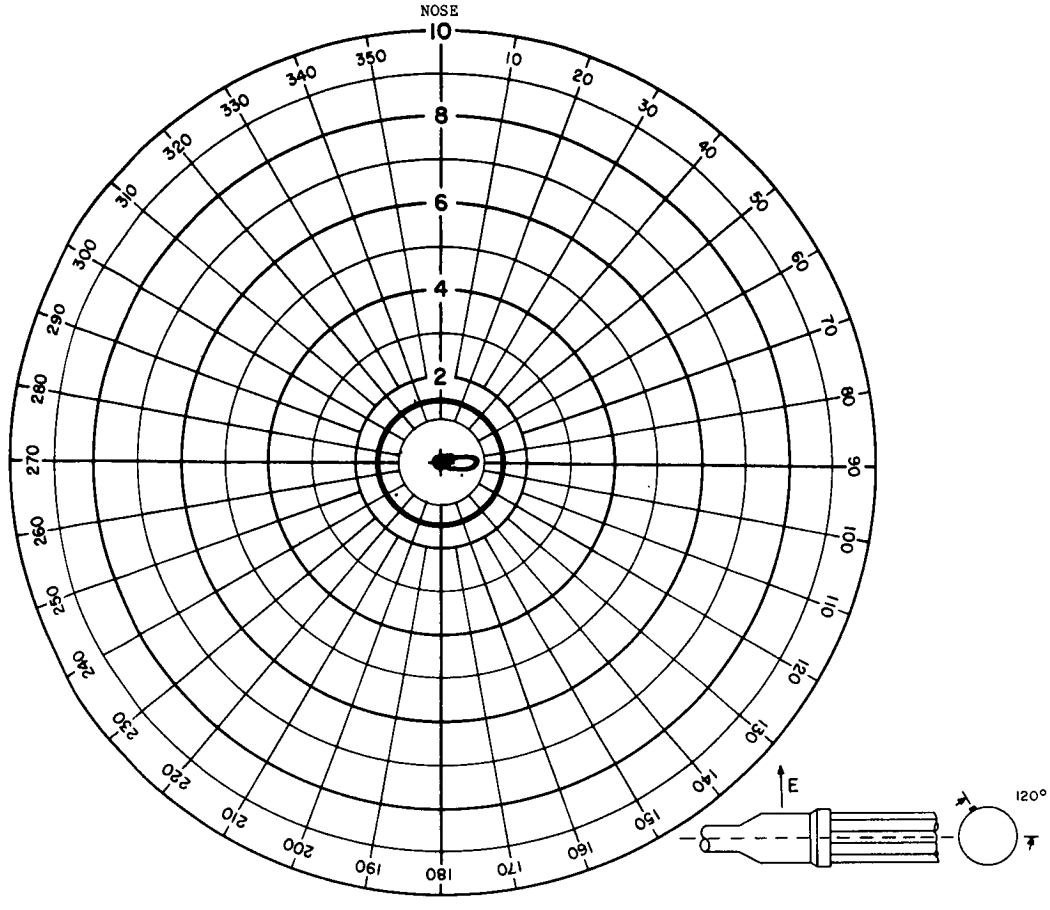
SA-5 ALTIMETER ANTENNA

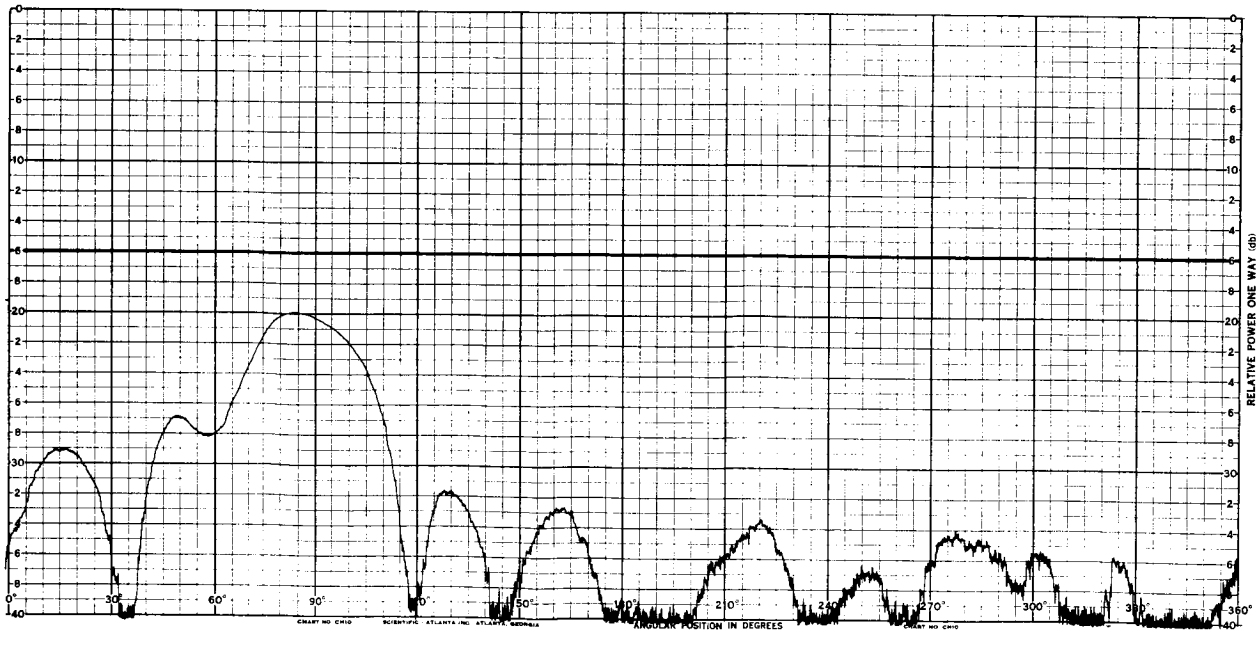




ANTENNA RADIATION PATTERN NO. 201-31

SA-5 ALTIMETER ANTENNA

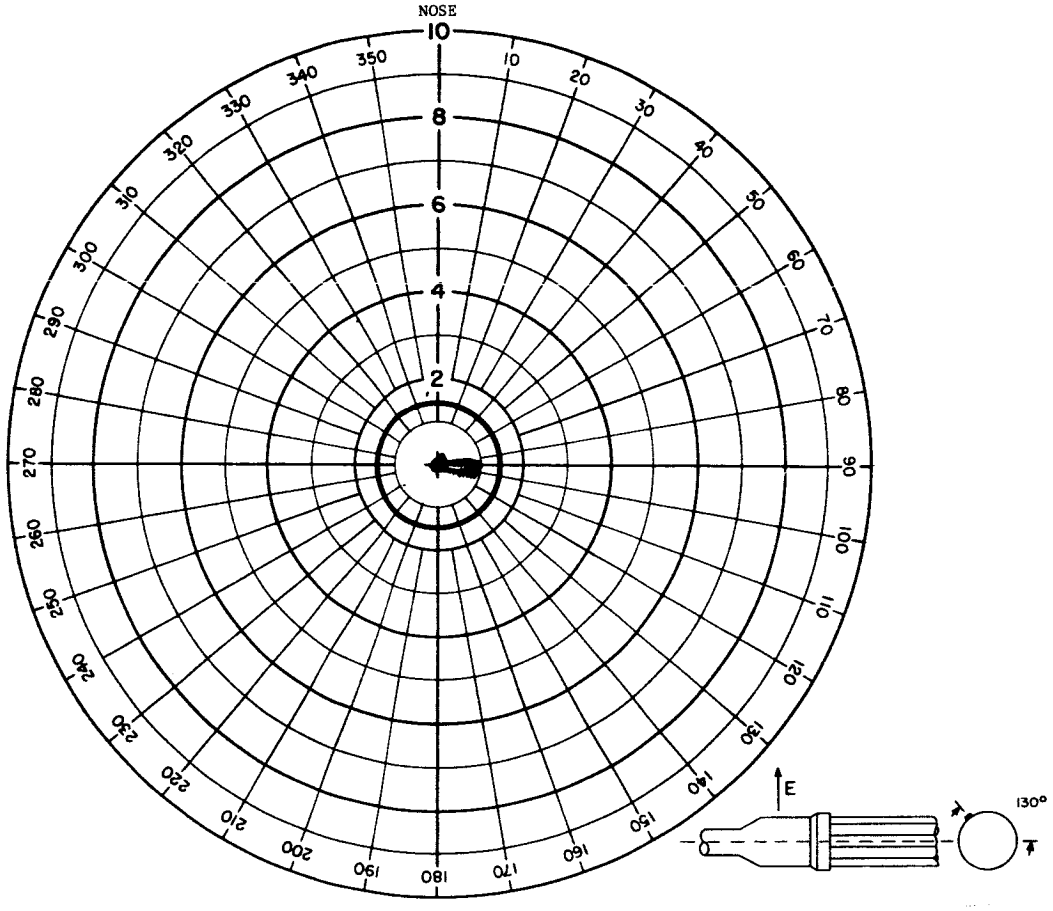


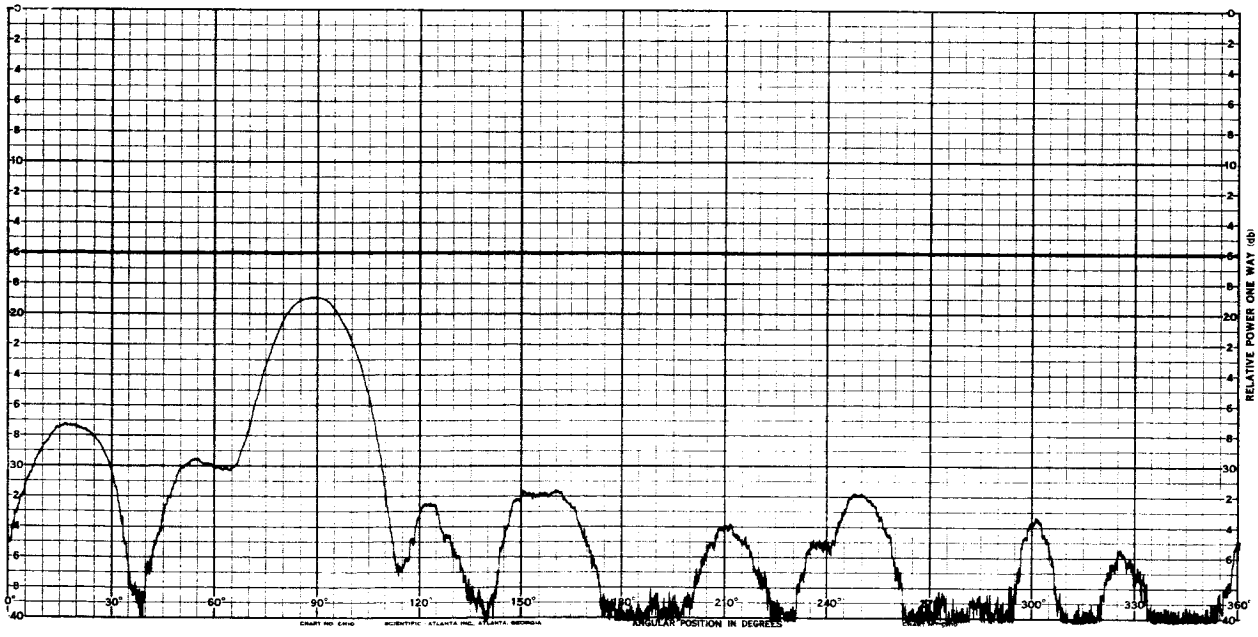


ANTENNA RADIATION PATTERN NO. 201-32

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

SA-5 ALTIMETER ANTENNA

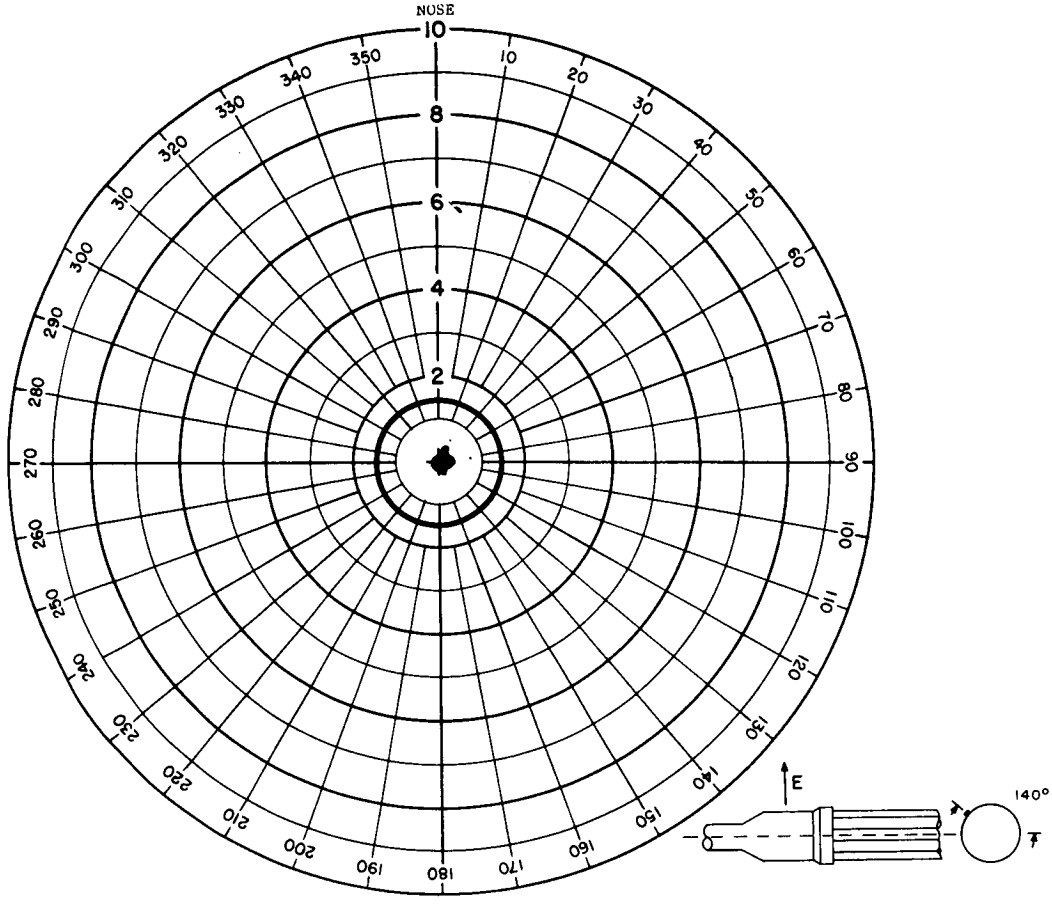


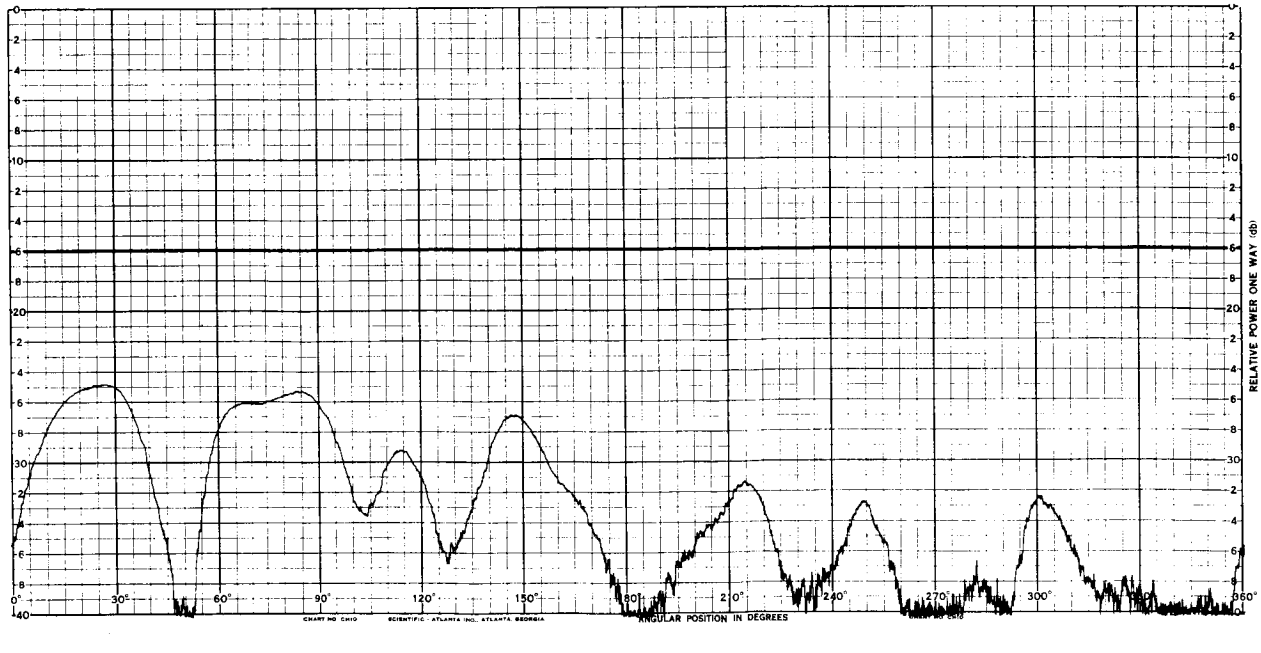


ANTENNA RADIATION PATTERN NO. 201-33

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

SA-5 ALTIMETER ANTENNA

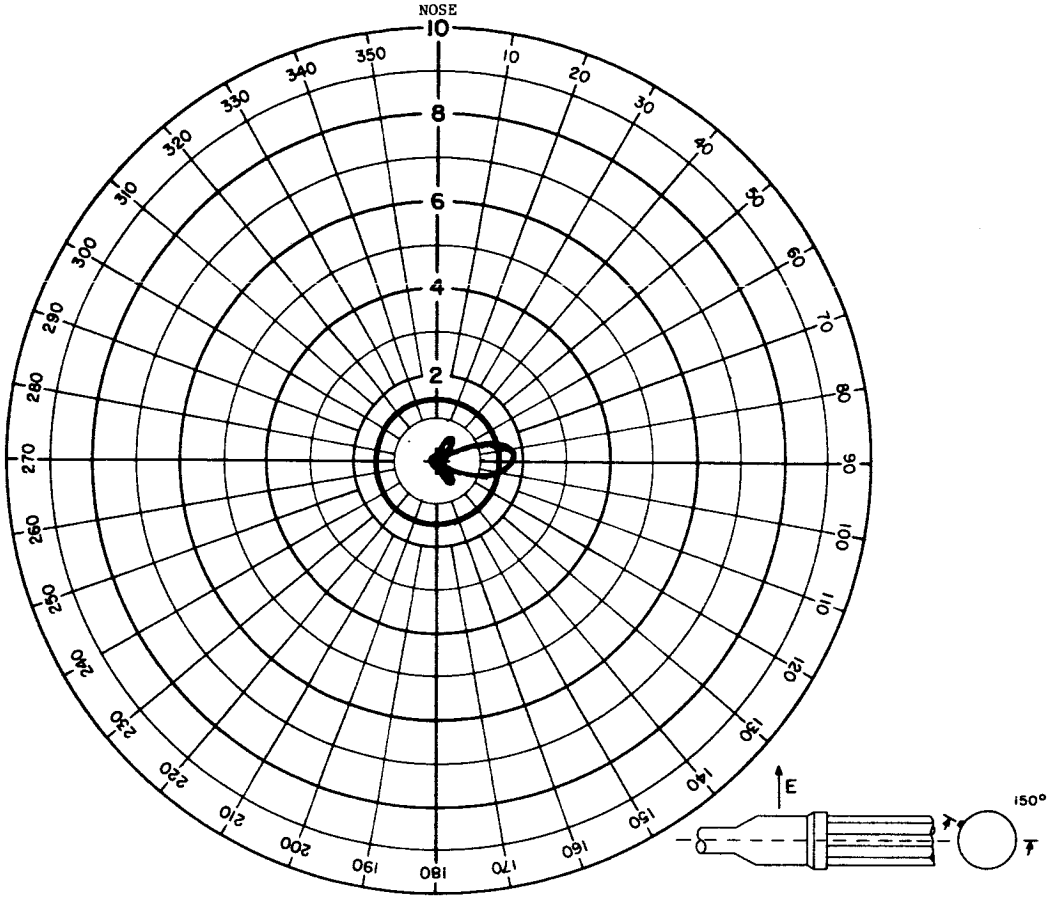


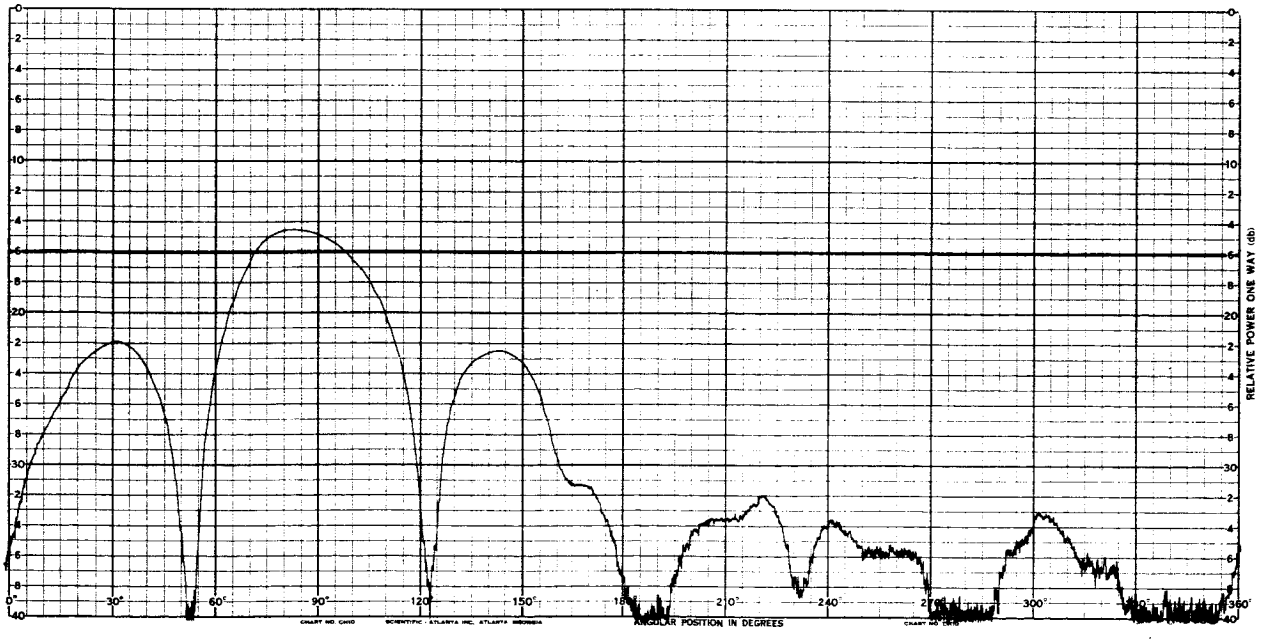


ANTENNA RADIATION PATTERN NO. 201-34

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

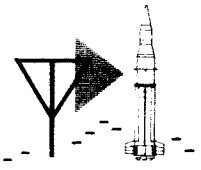
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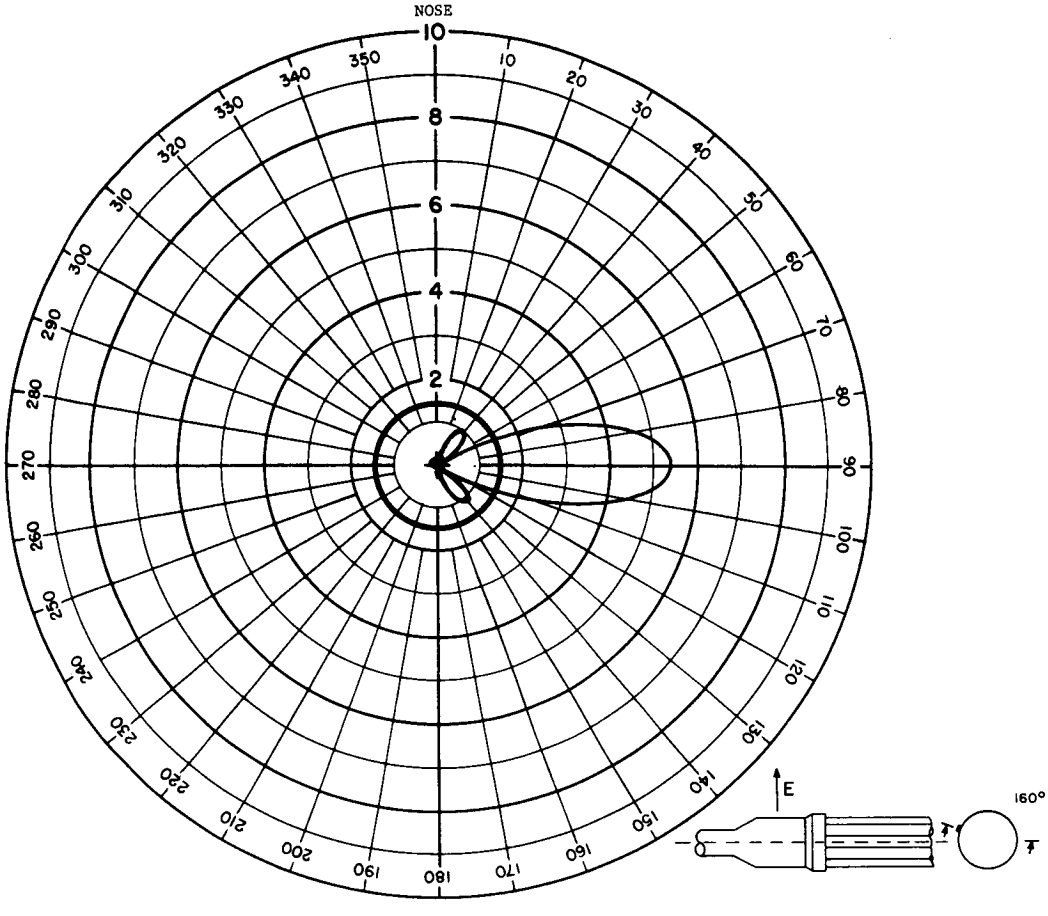


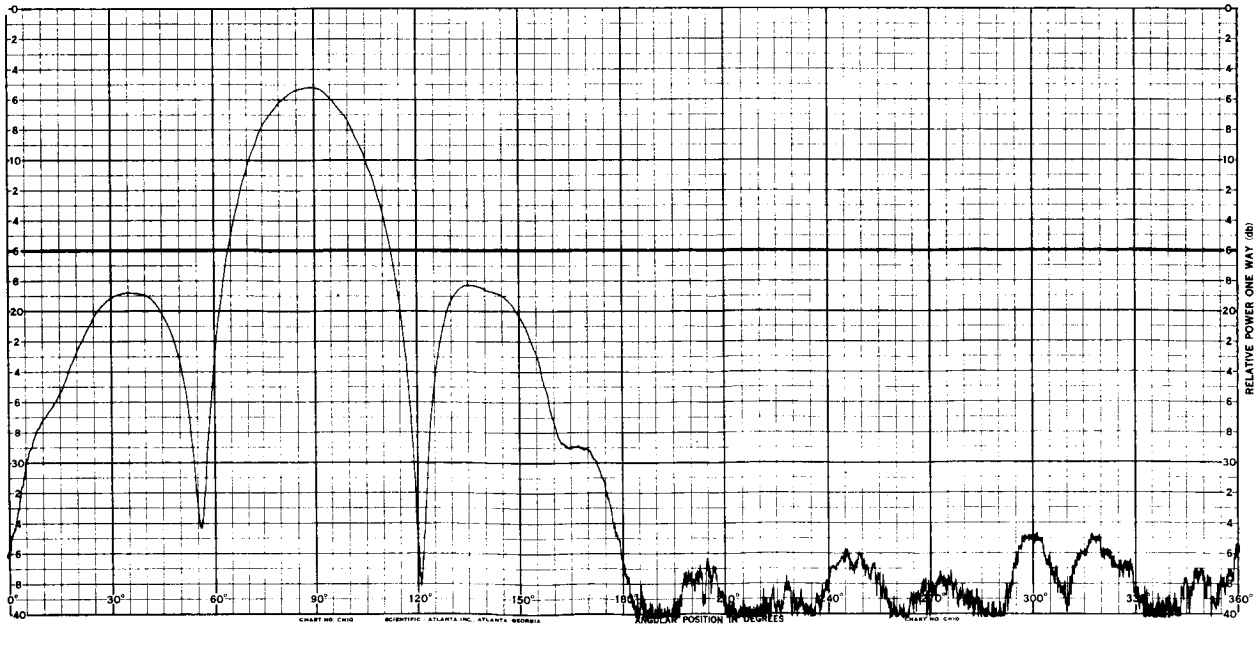
ANTENNA RADIATION PATTERN NO. 201-35

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



SA-5 ALTIMETER ANTENNA

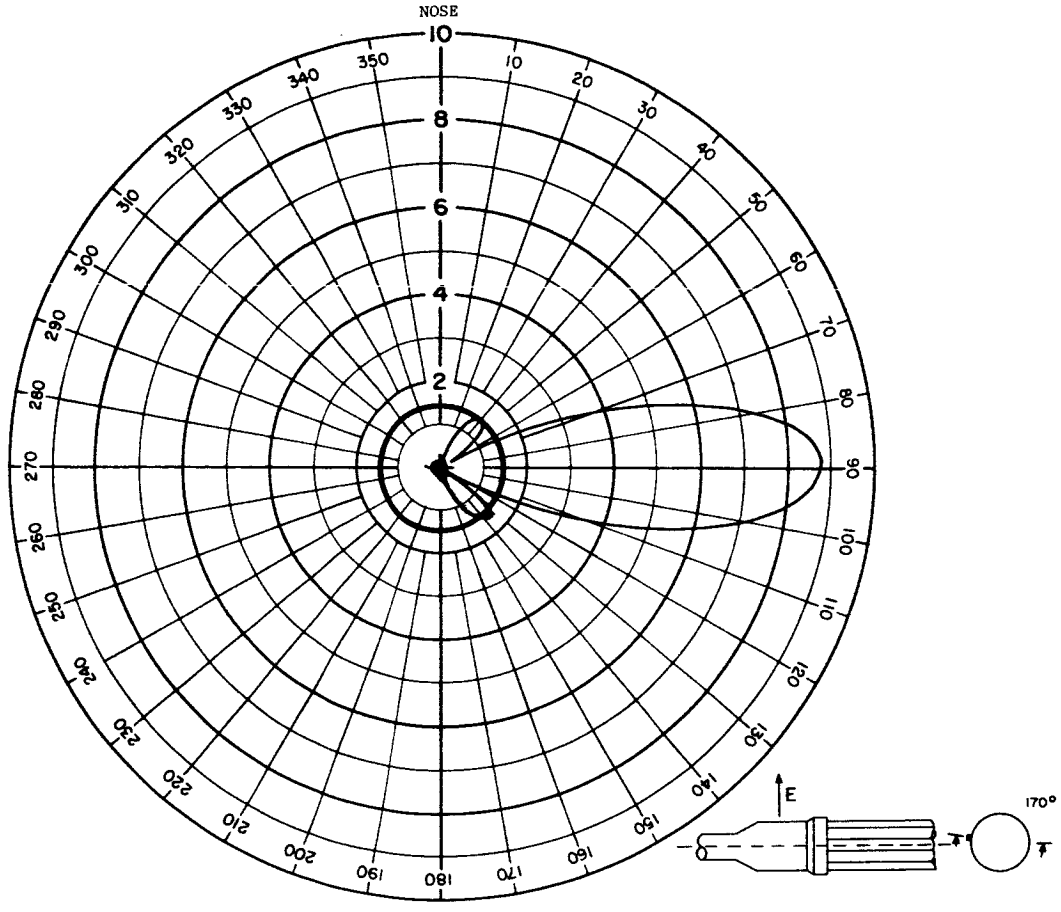


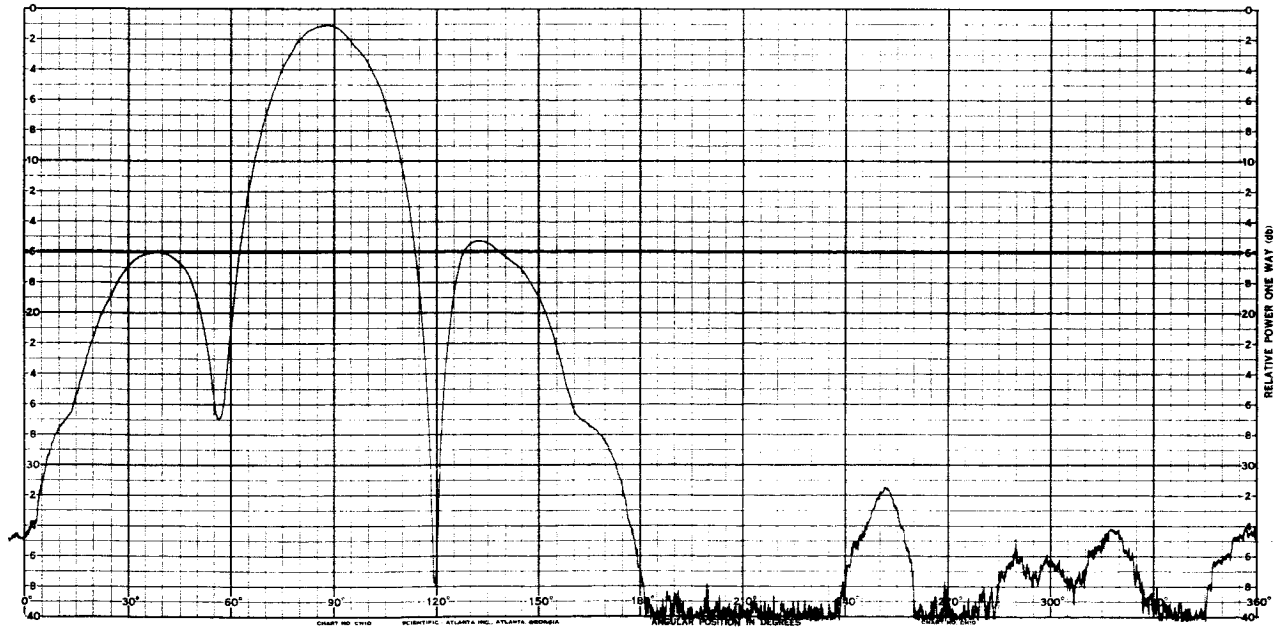


ANTENNA RADIATION PATTERN NO. 201-36

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

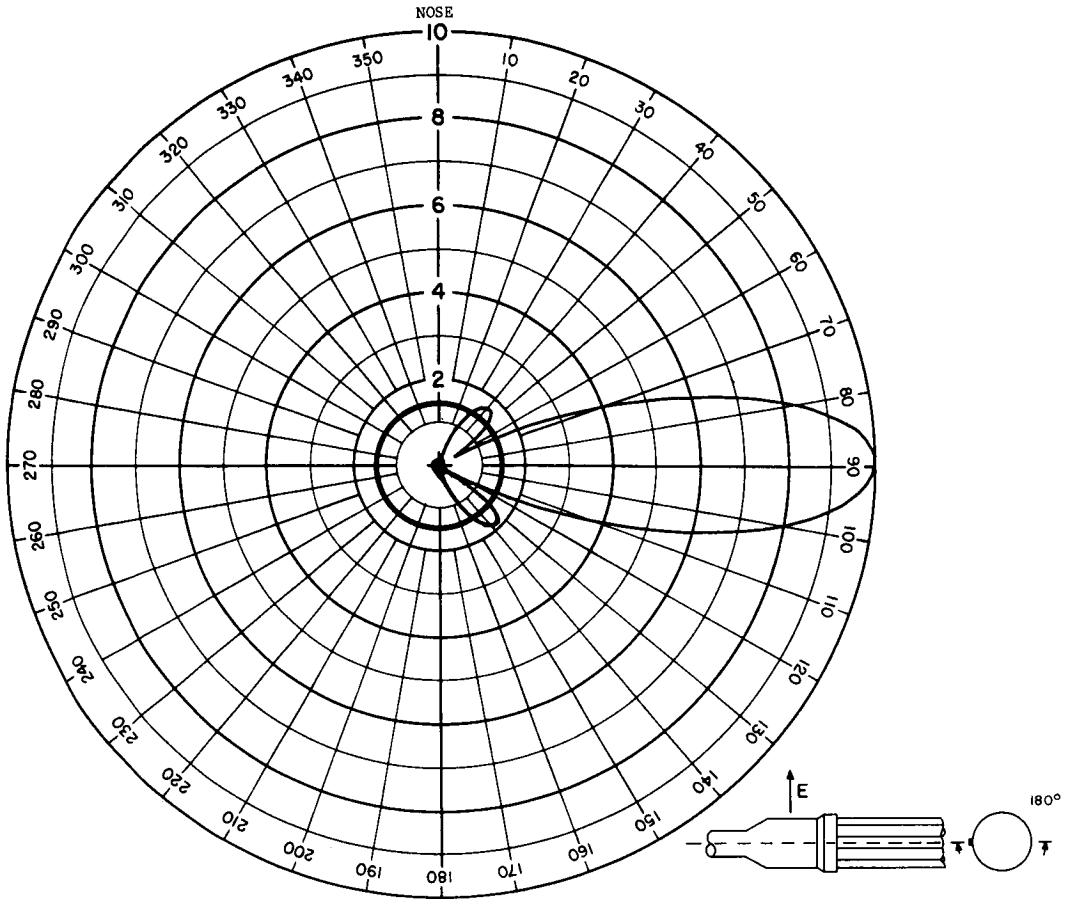
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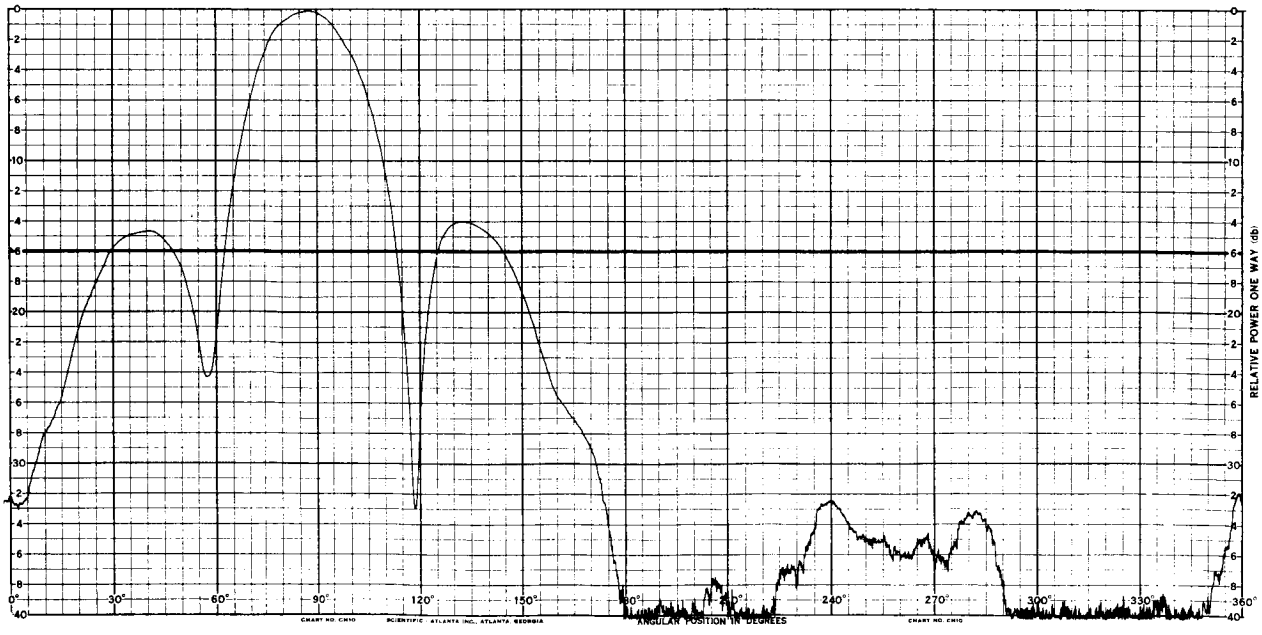




ANTENNA RADIATION PATTERN NO. 201-37

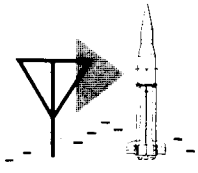
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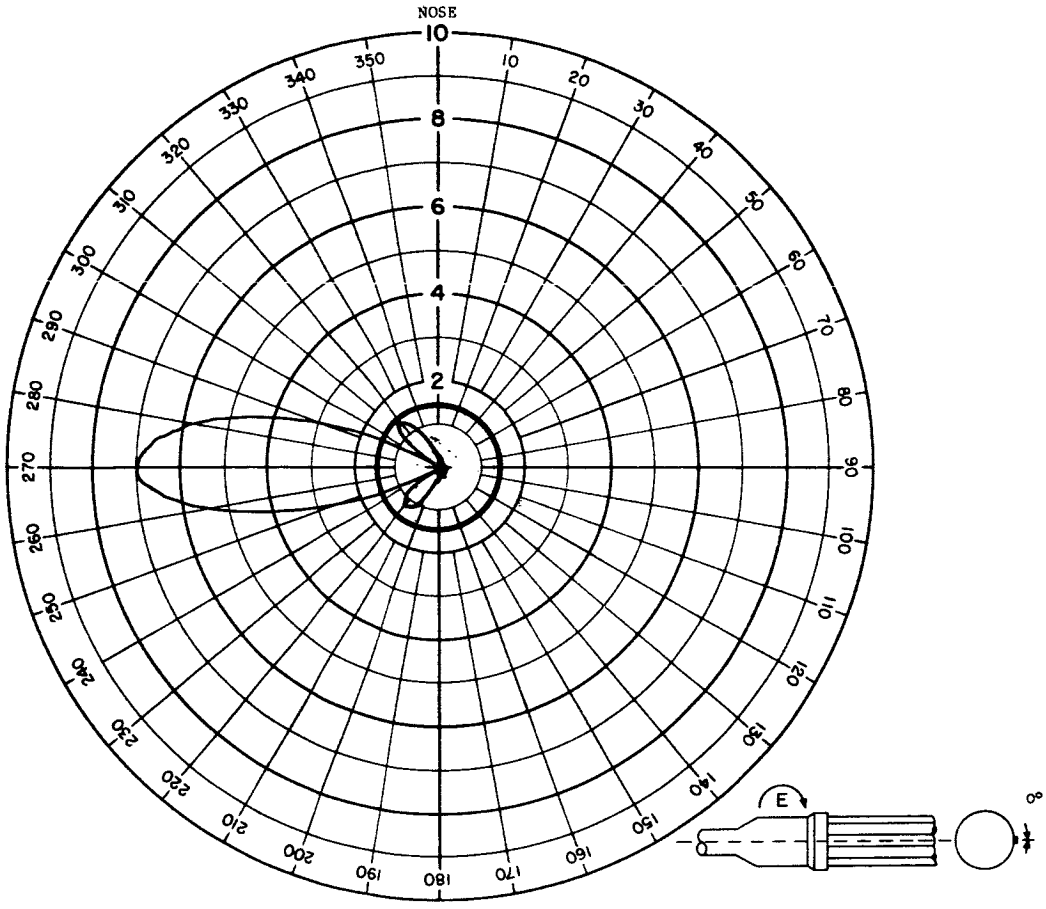


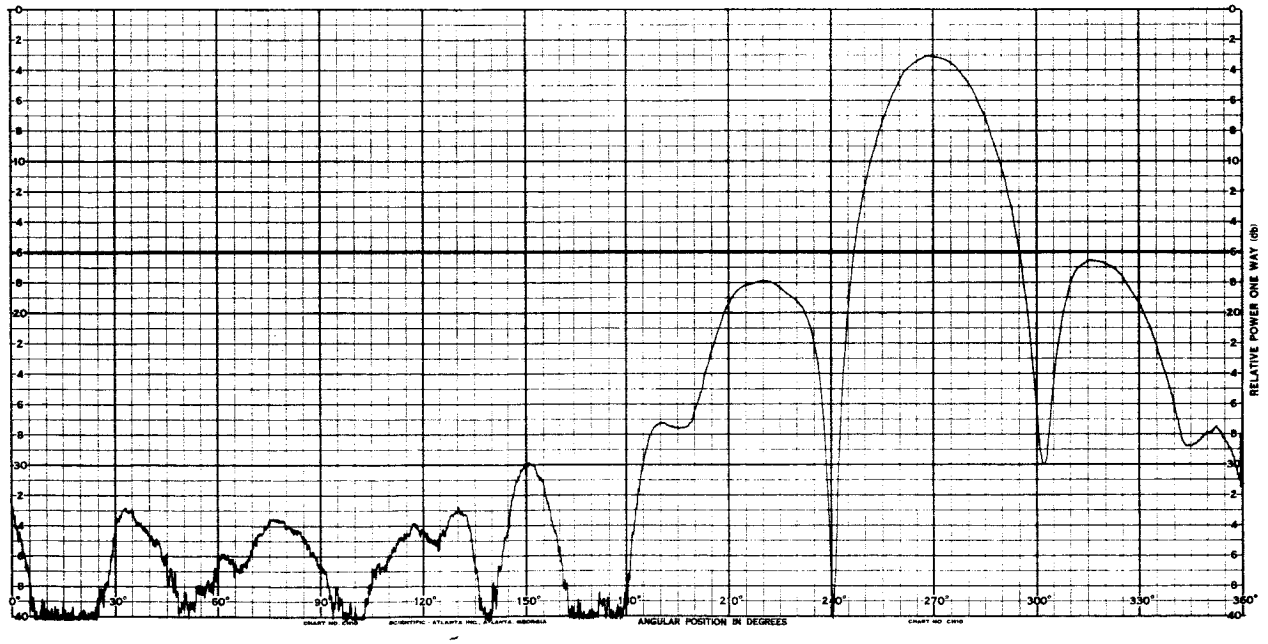
ANTENNA RADIATION PATTERN NO. 201-38

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



SA-5 ALTIMETER ANTENNA

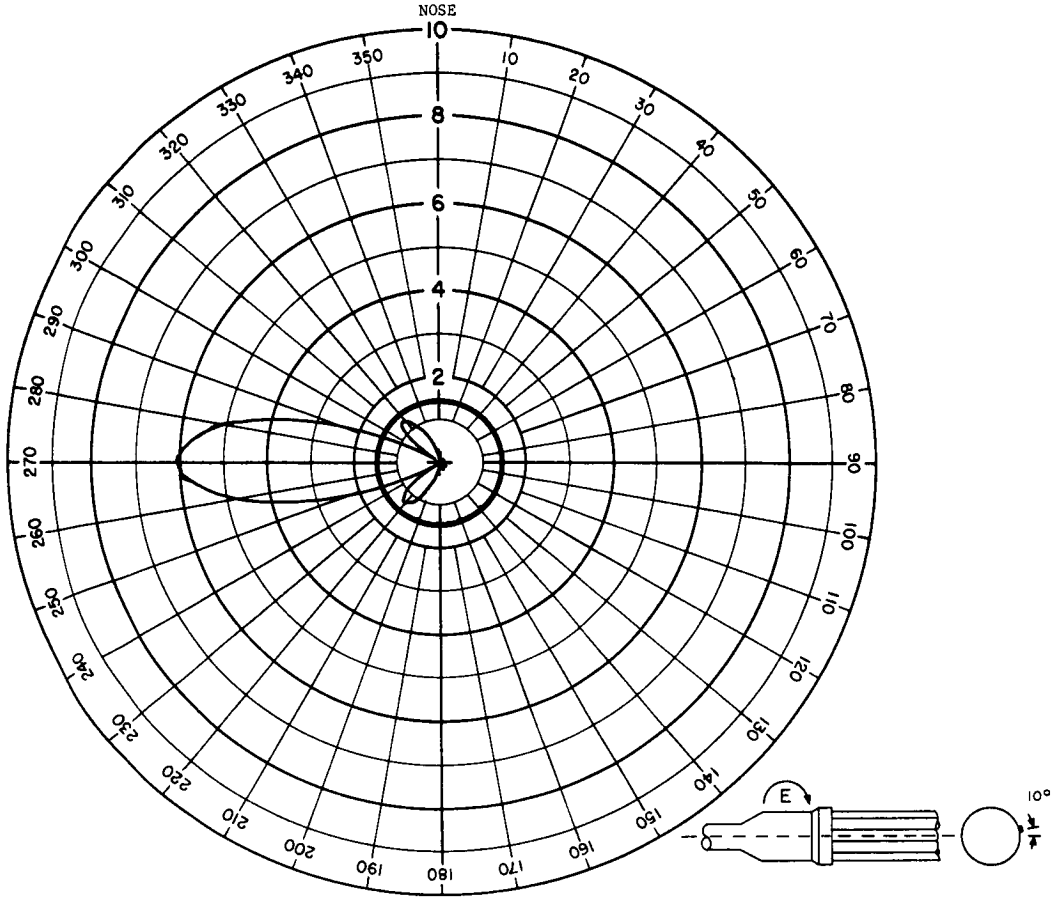


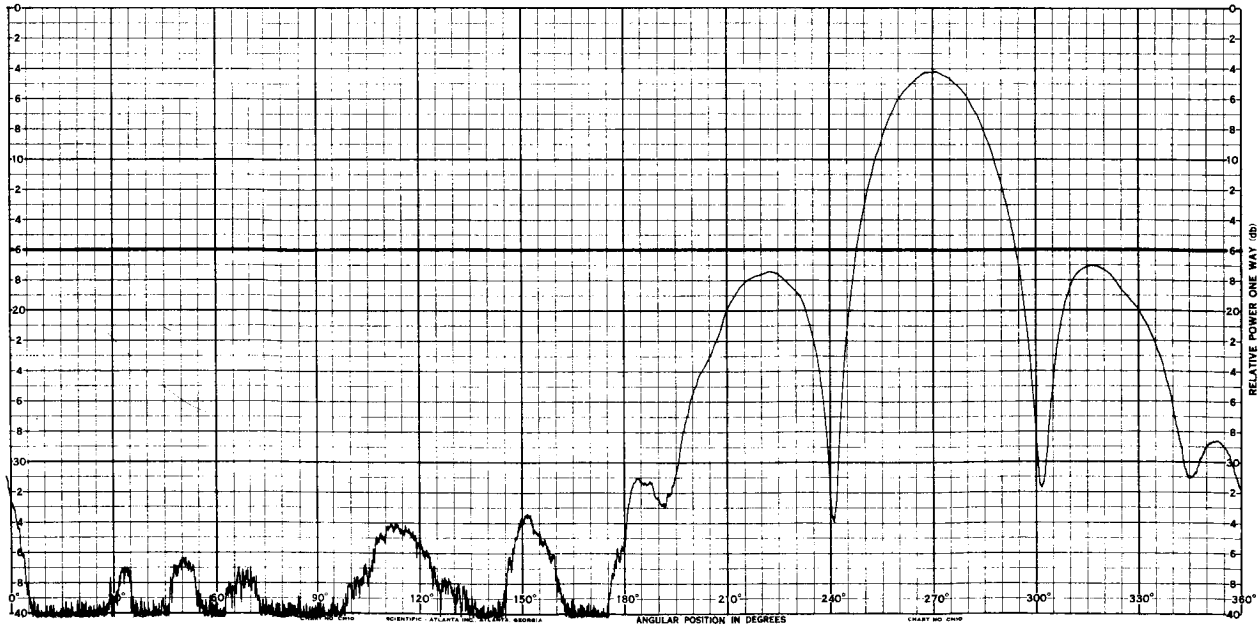


ANTENNA RADIATION PATTERN NO. 201-39

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

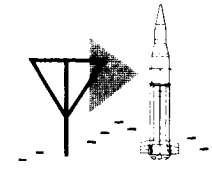
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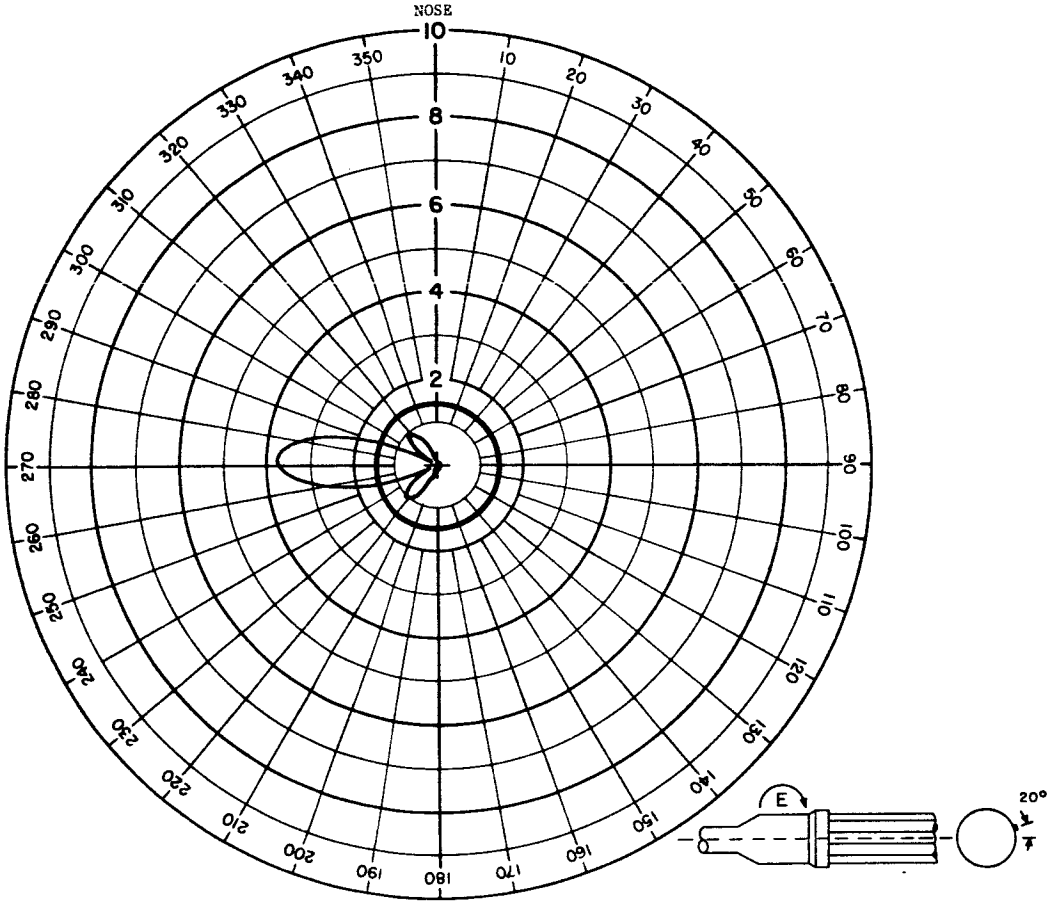


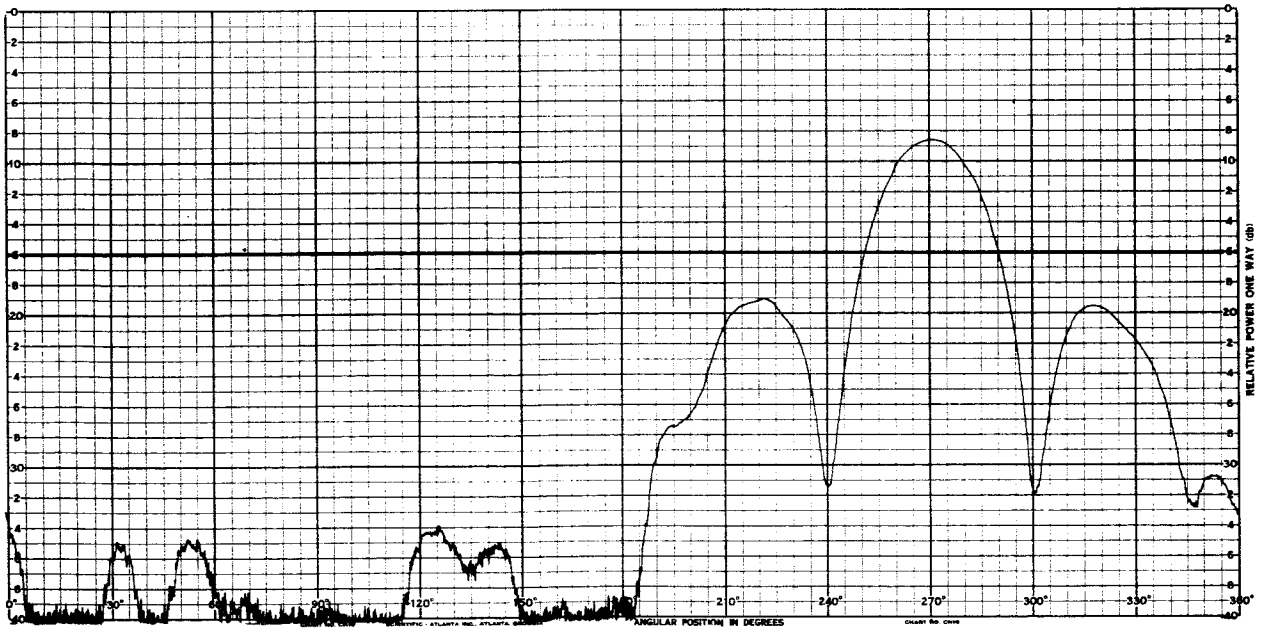
ANTENNA RADIATION PATTERN NO. 201-40

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



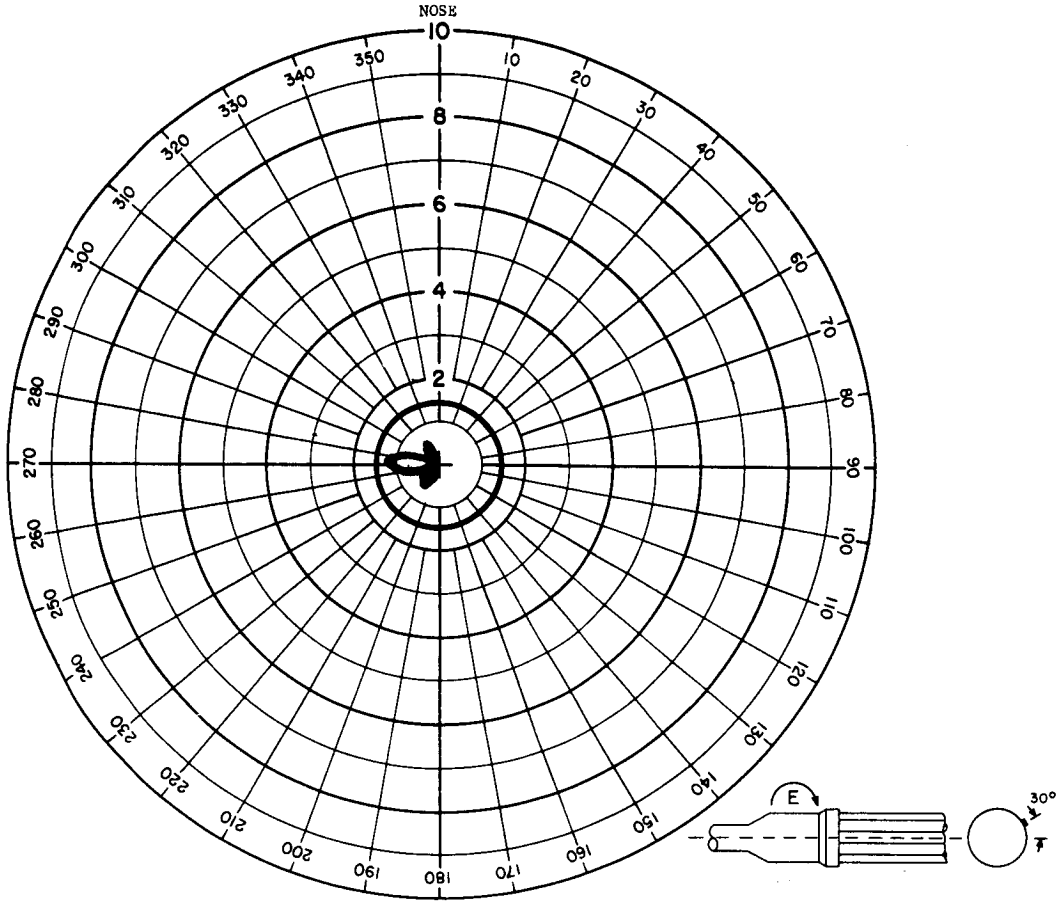
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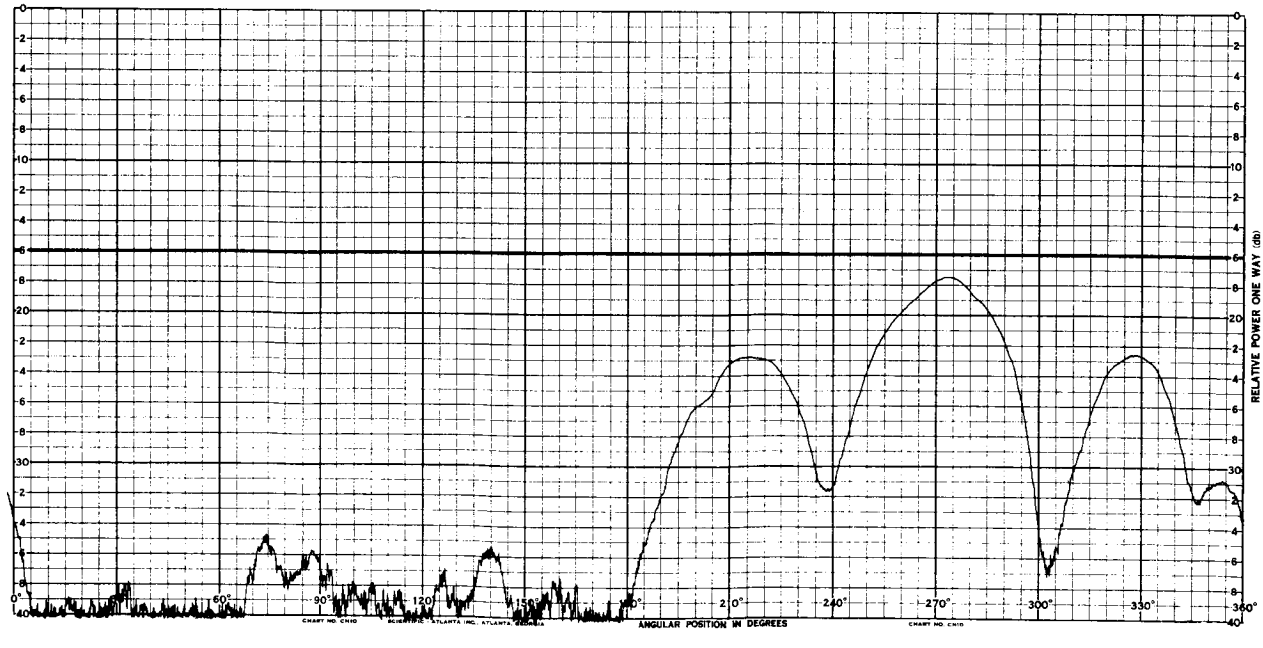




ANTENNA RADIATION PATTERN NO. 201-41

SA-5 ALTIMETER ANTENNA

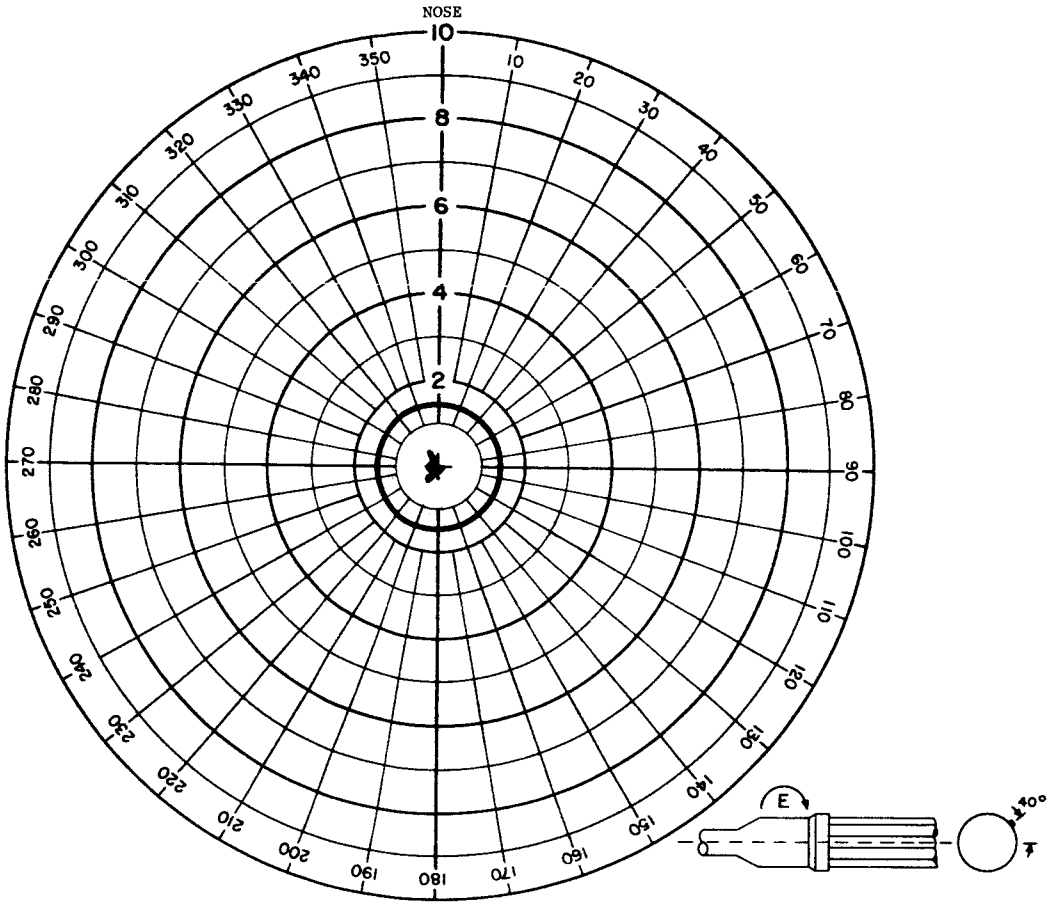


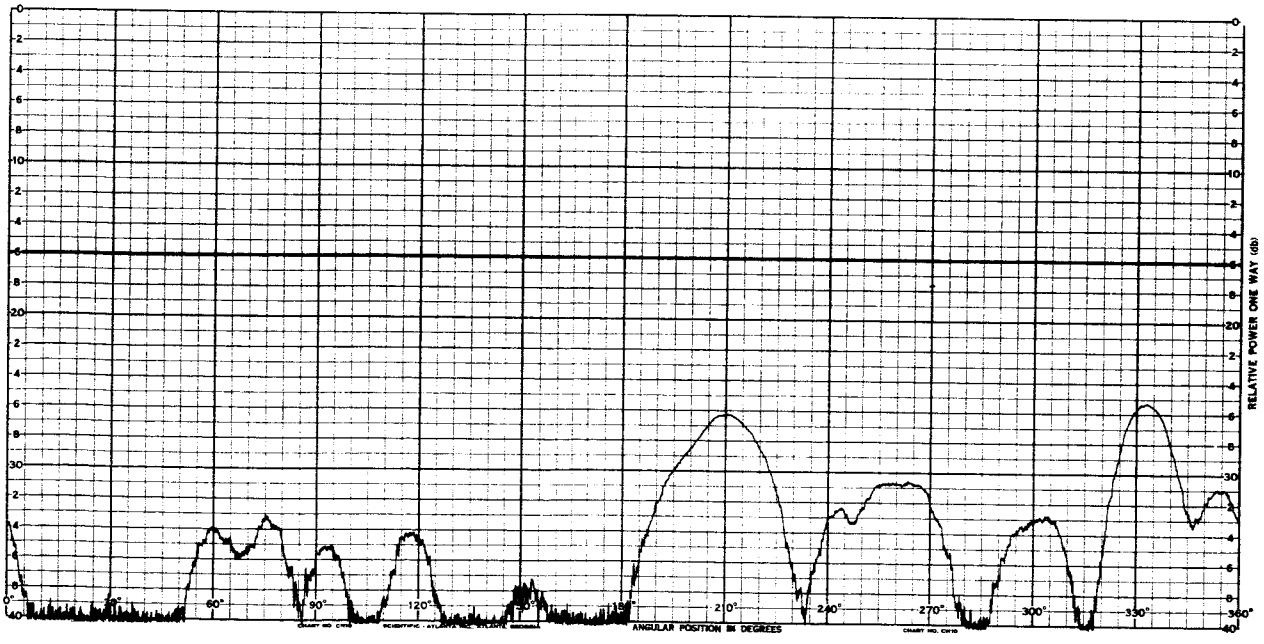


ANTENNA RADIATION PATTERN NO. 201-42

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

SA-5 ALTIMETER ANTENNA

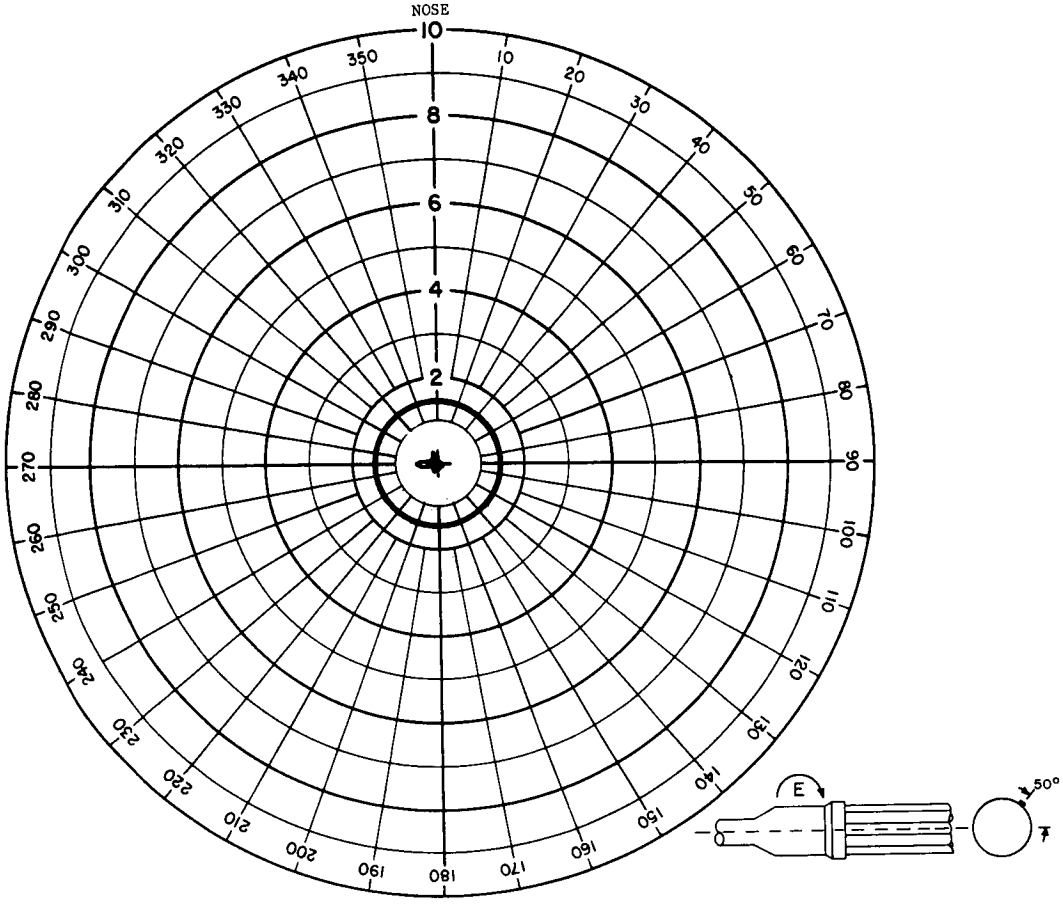


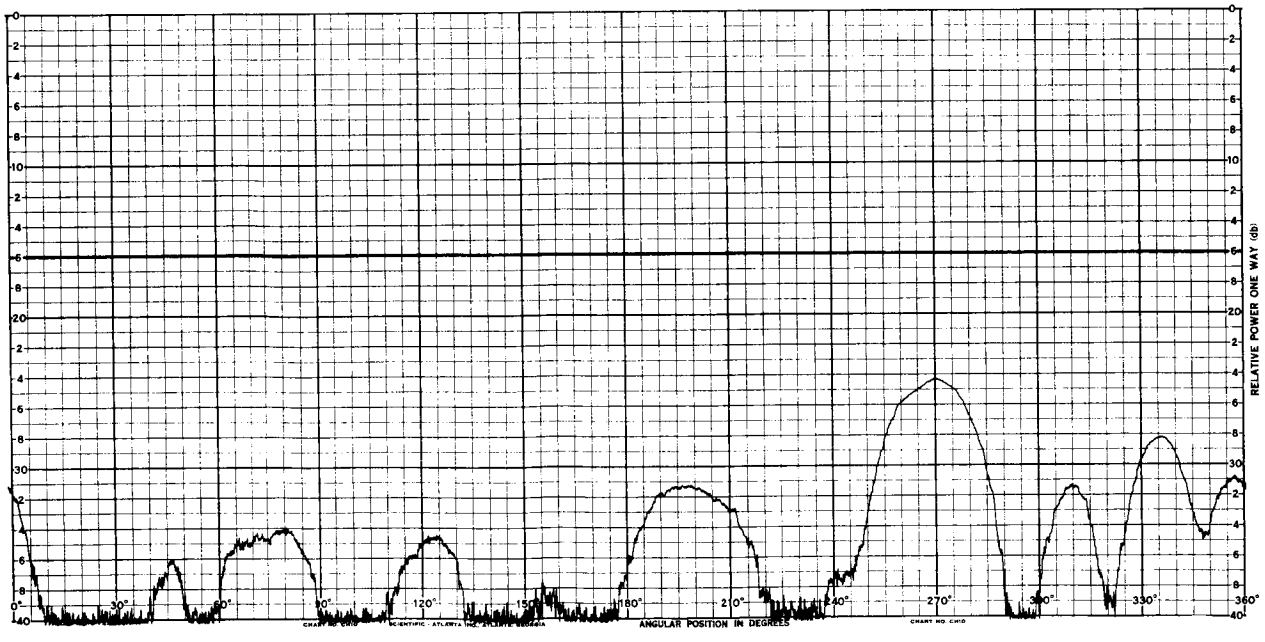


ANTENNA RADIATION PATTERN NO. 201-43

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

SA-5 ALTIMETER ANTENNA

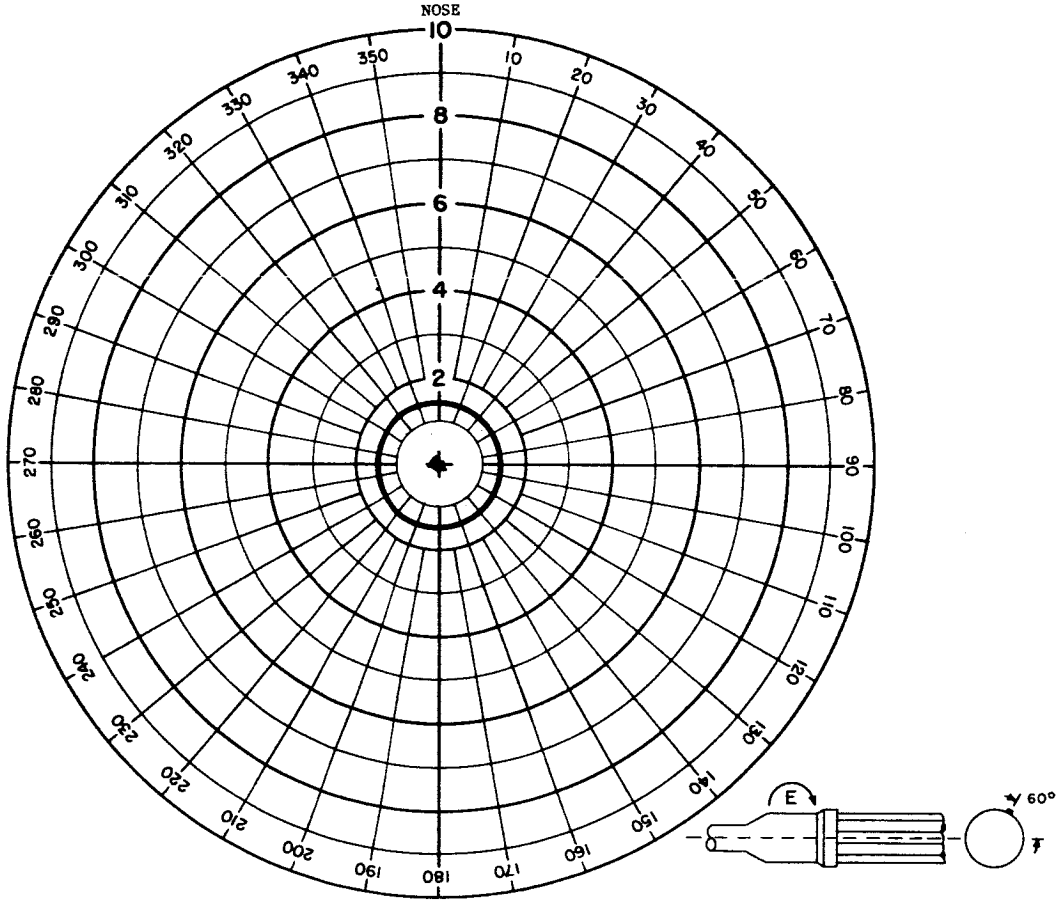


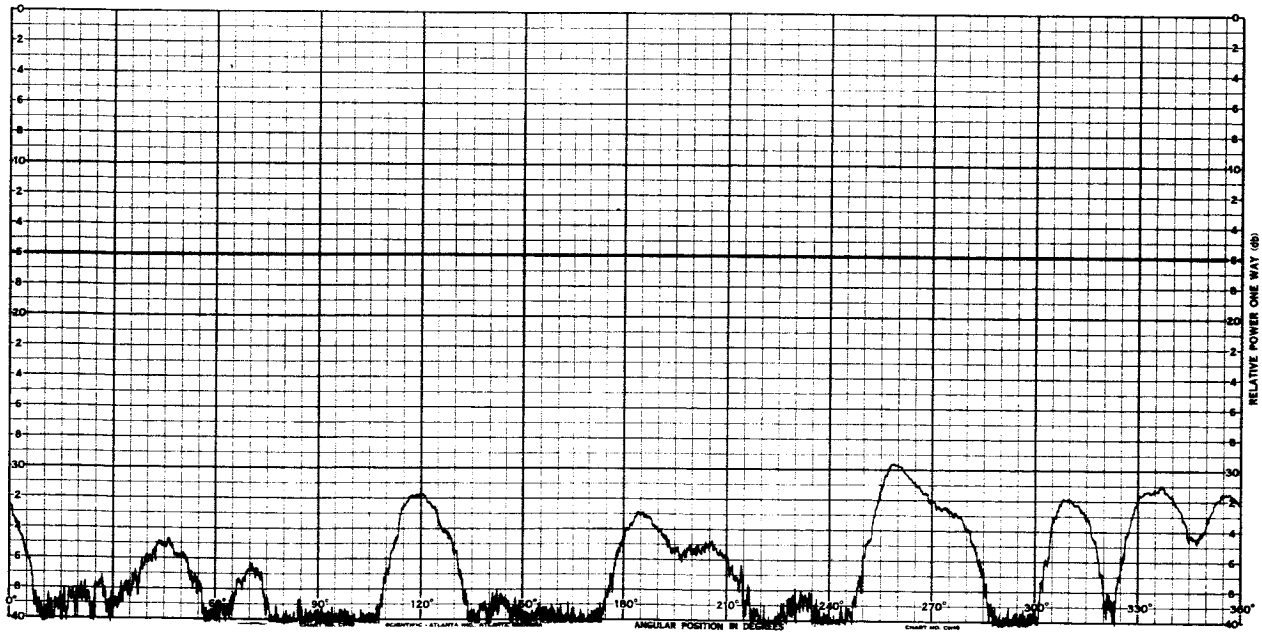


ANTENNA RADIATION PATTERN NO. 201-44

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

SA-5 ALTIMETER ANTENNA

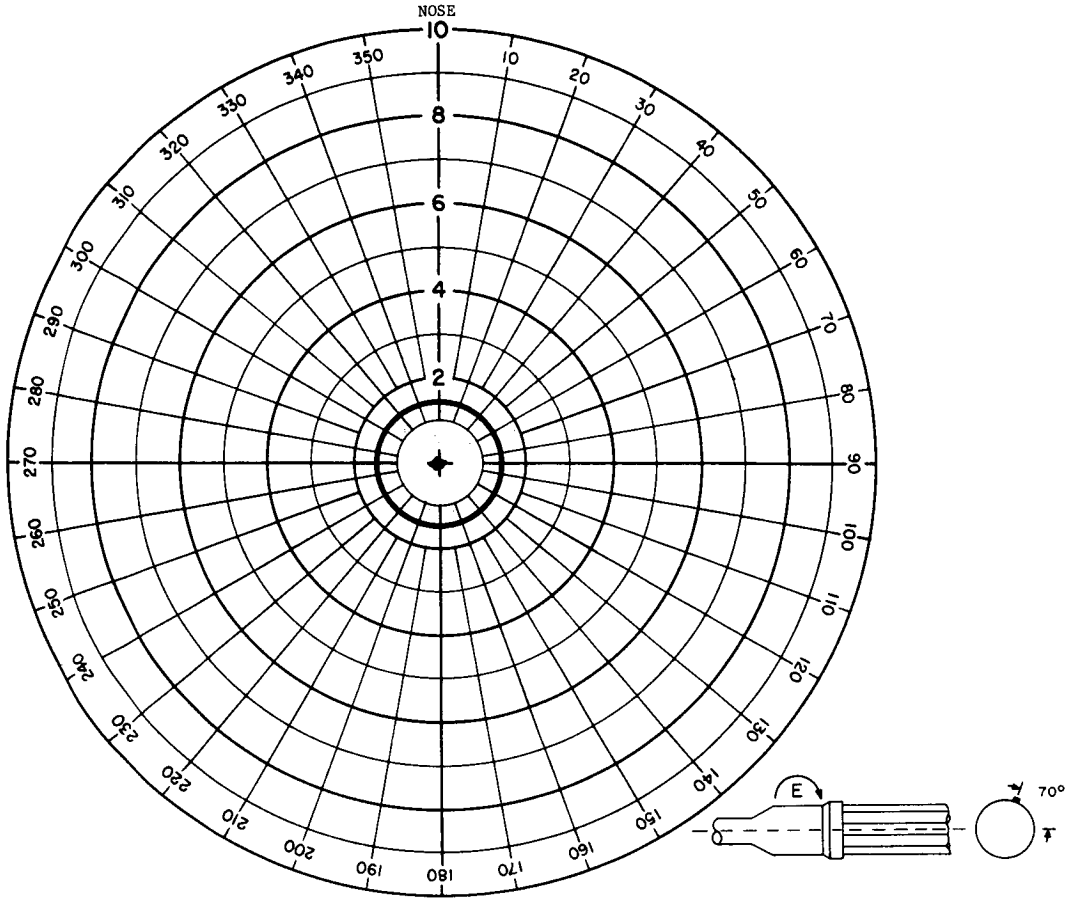


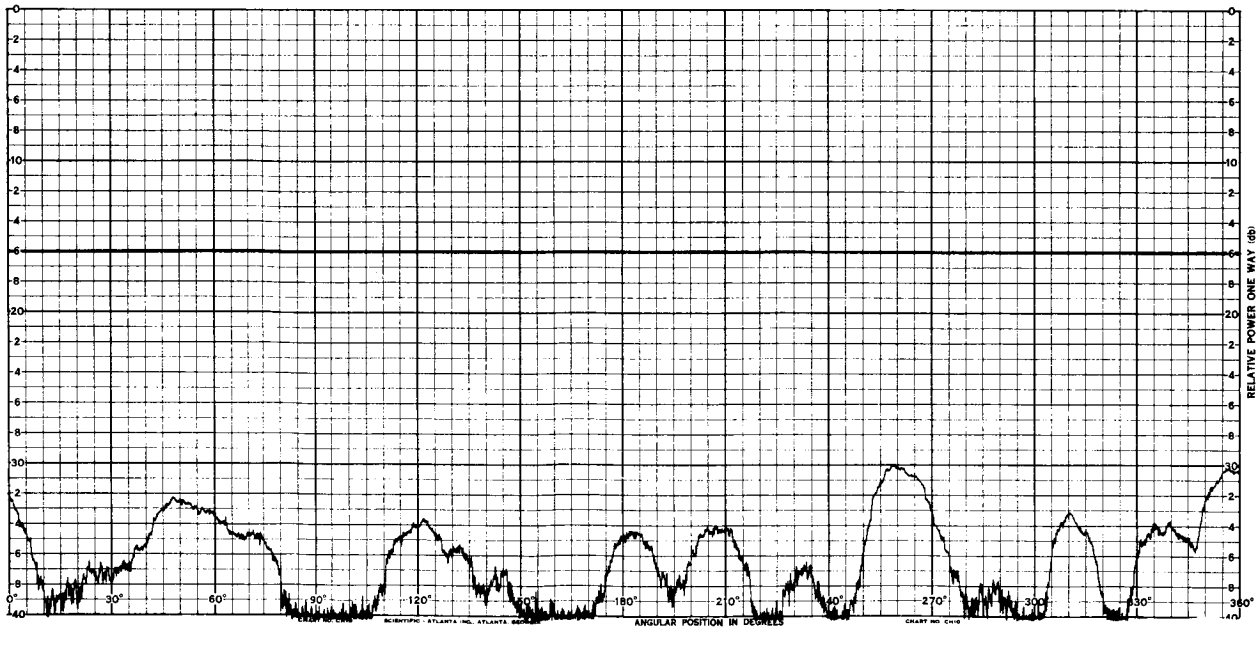


ANTENNA RADIATION PATTERN NO. 201-45

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

SA-5 ALTIMETER ANTENNA

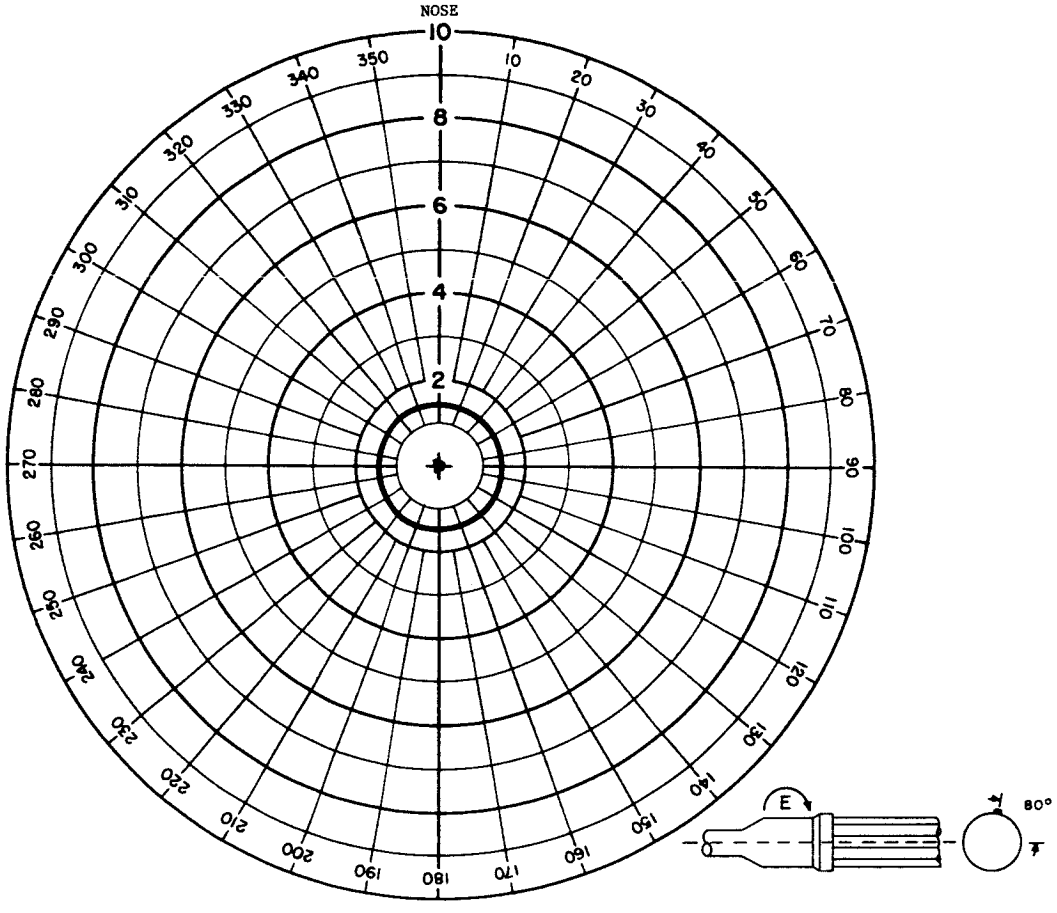


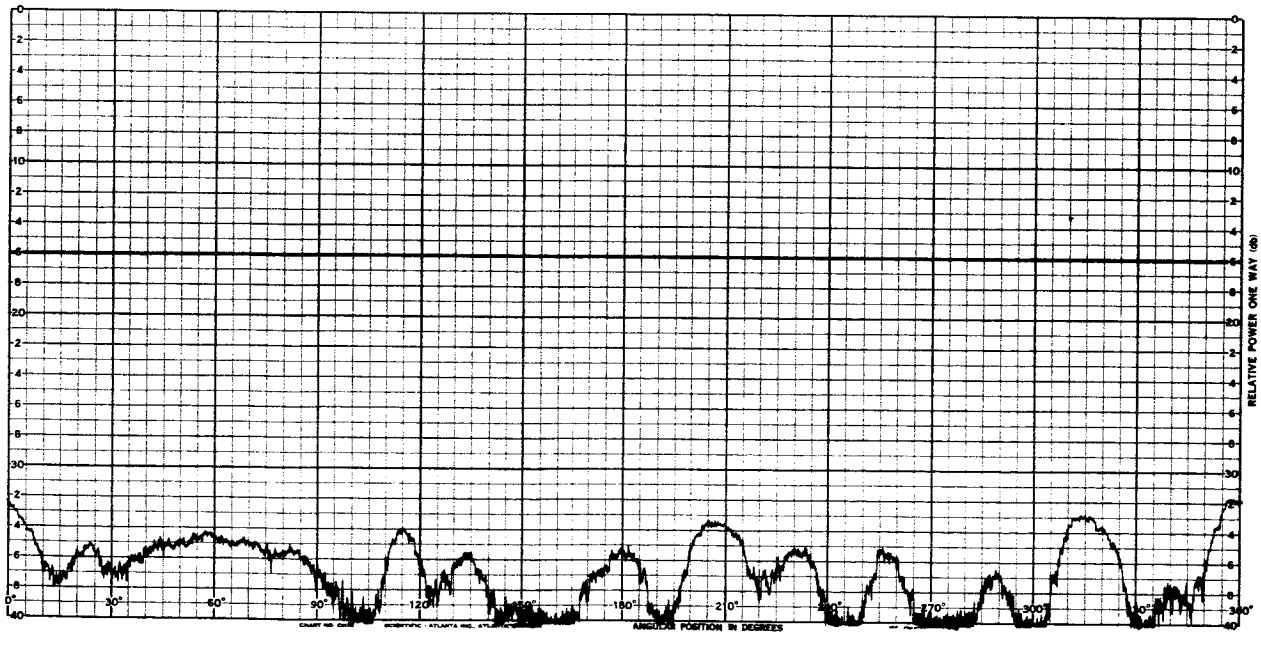


ANTENNA RADIATION PATTERN NO. 201-46

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

SA-5 ALTIMETER ANTENNA

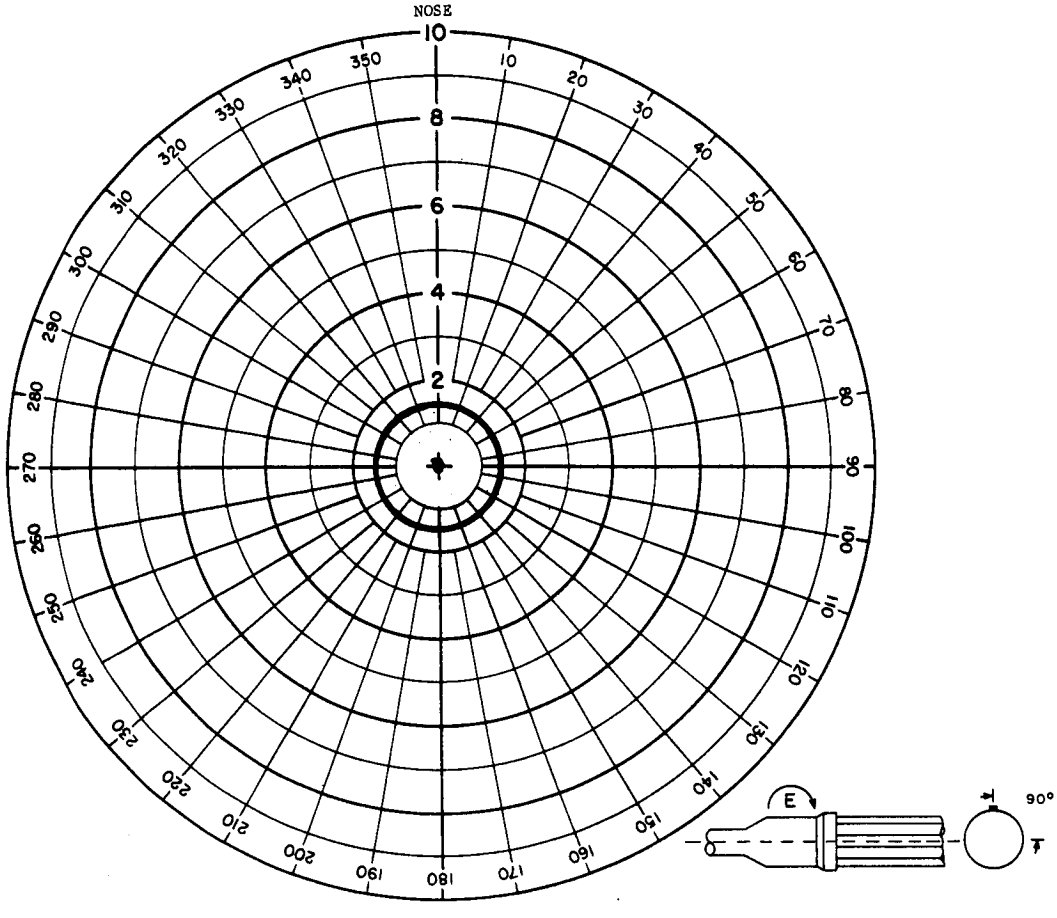


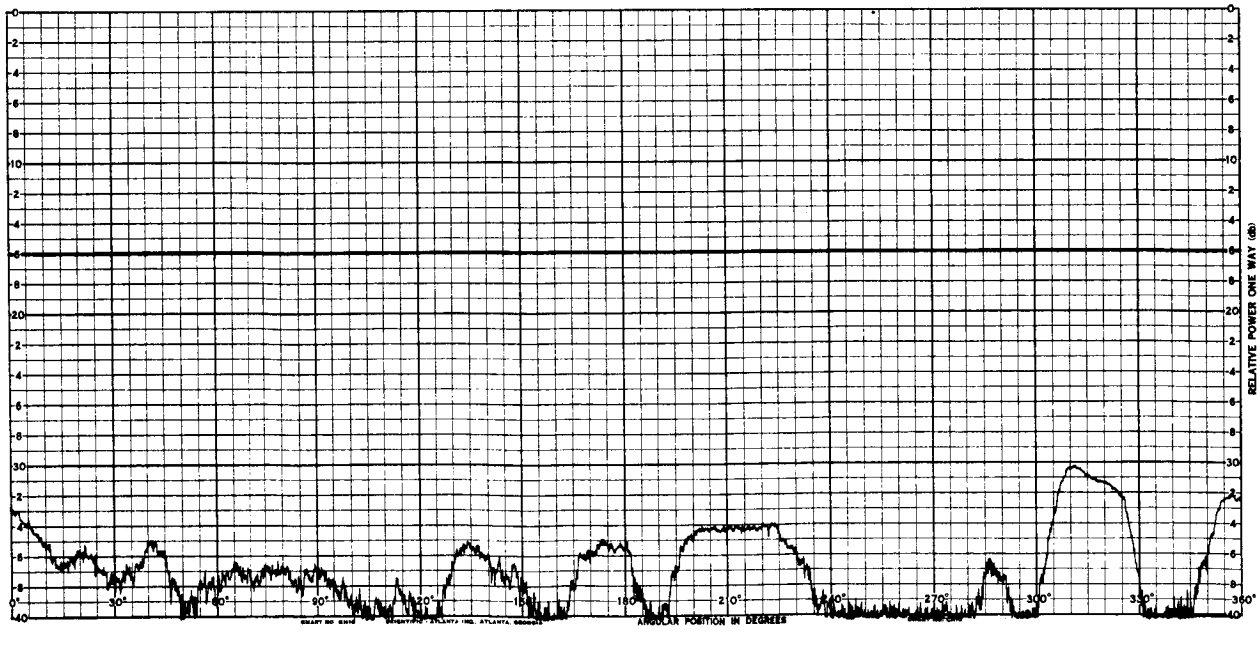


ANTENNA RADIATION PATTERN NO. 201-47

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

SA-5 ALTIMETER ANTENNA

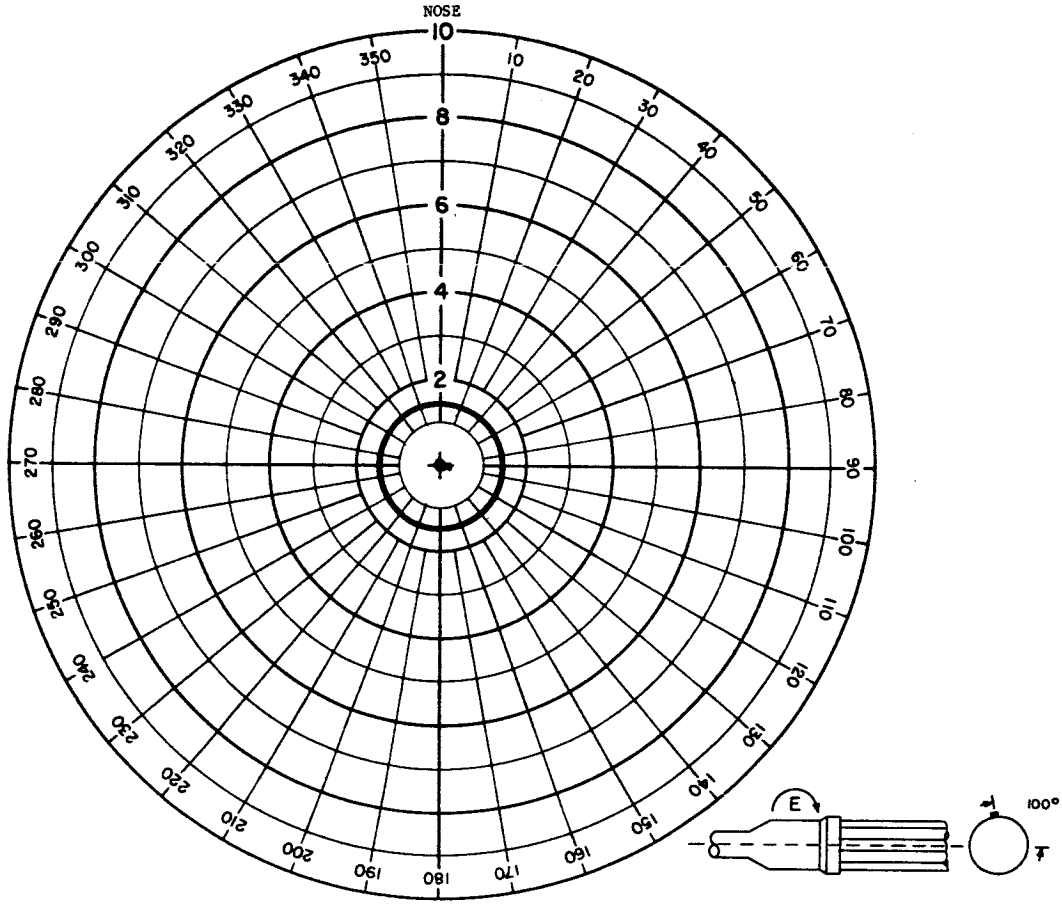


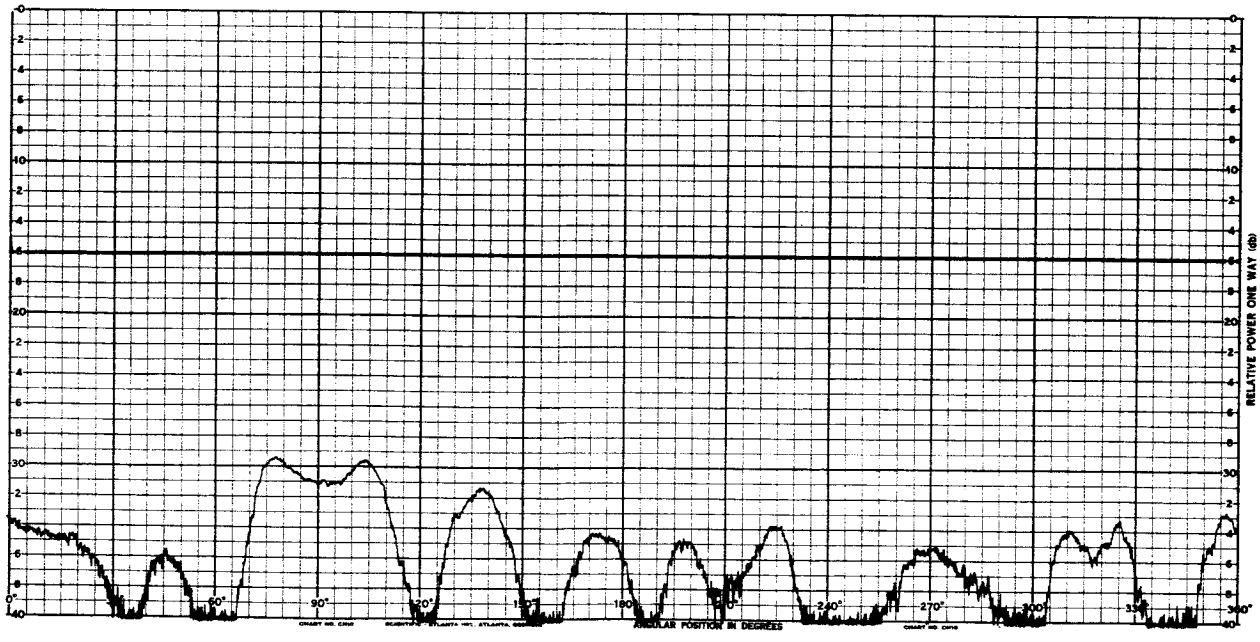


ANTENNA RADIATION PATTERN NO. 201-48

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

SA-5 ALTIMETER ANTENNA

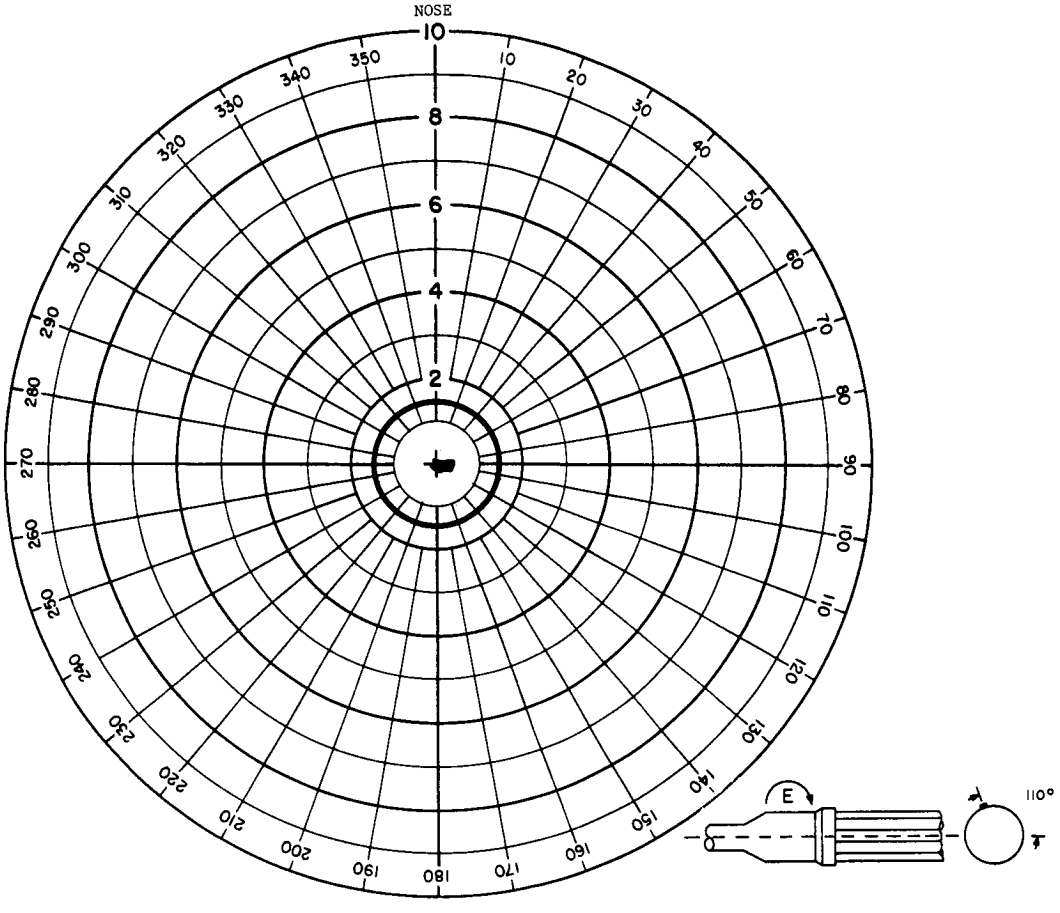


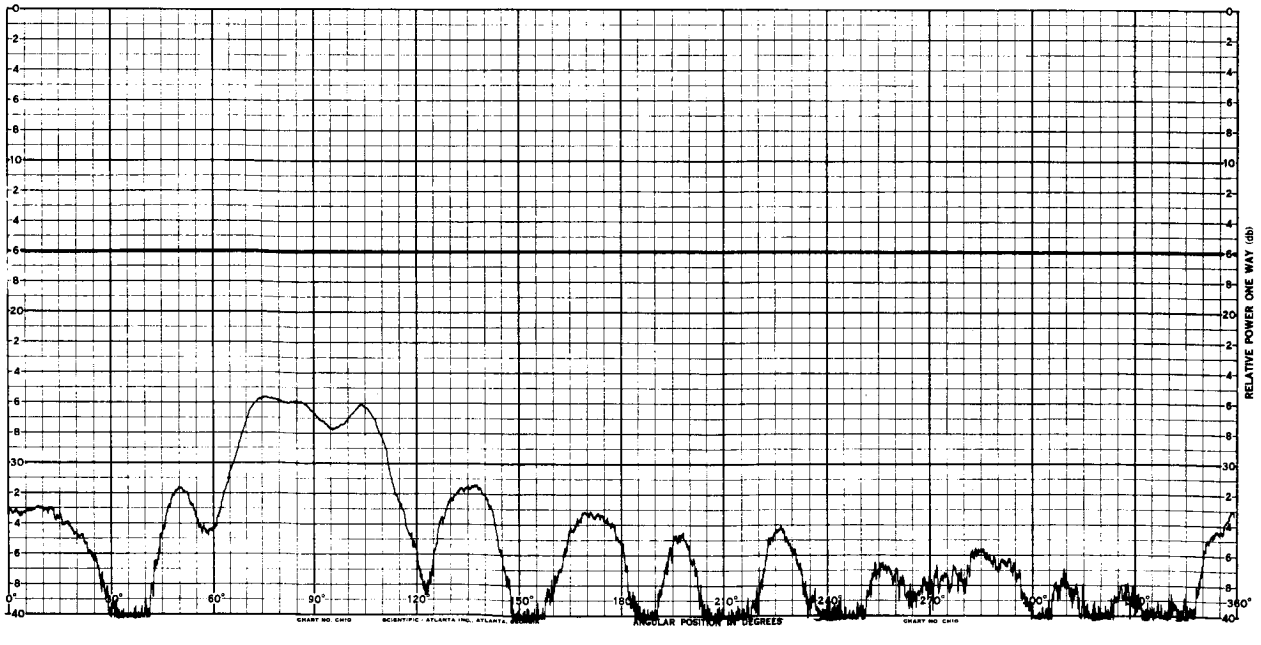


ANTENNA RADIATION PATTERN NO. 201-49

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

SA-5 ALTIMETER ANTENNA

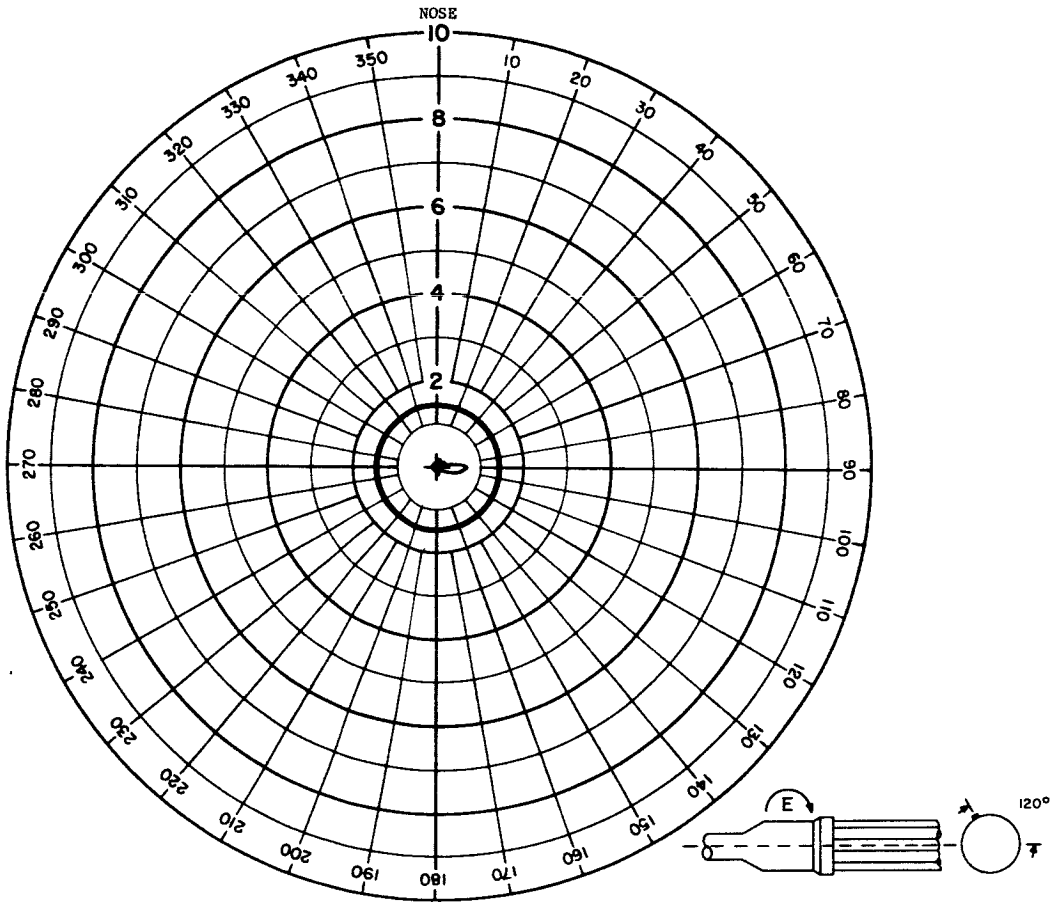


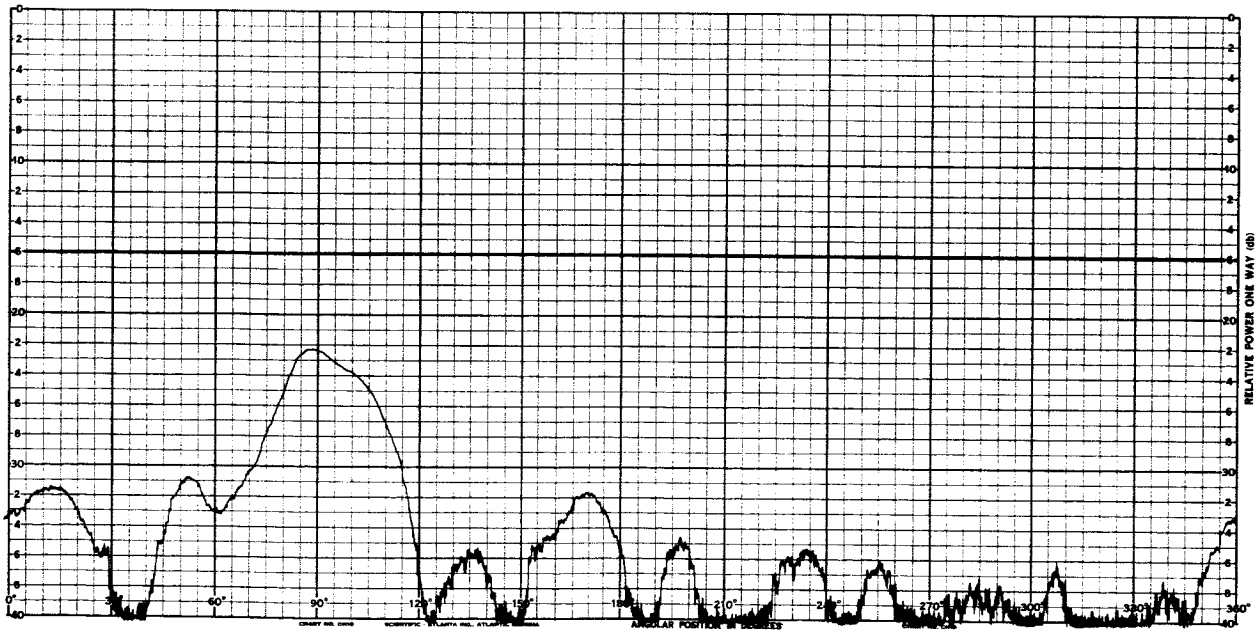


ANTENNA RADIATION PATTERN NO. 201-50

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

SA-5 ALTIMETER ANTENNA

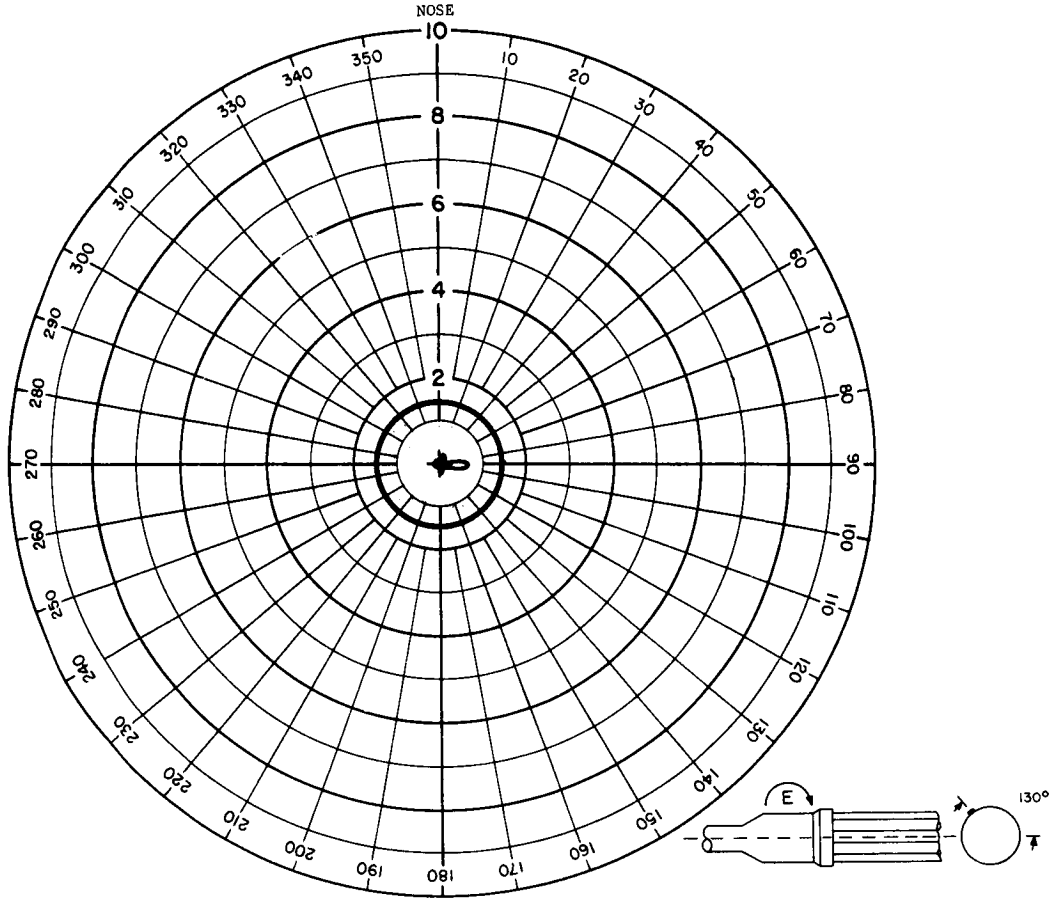


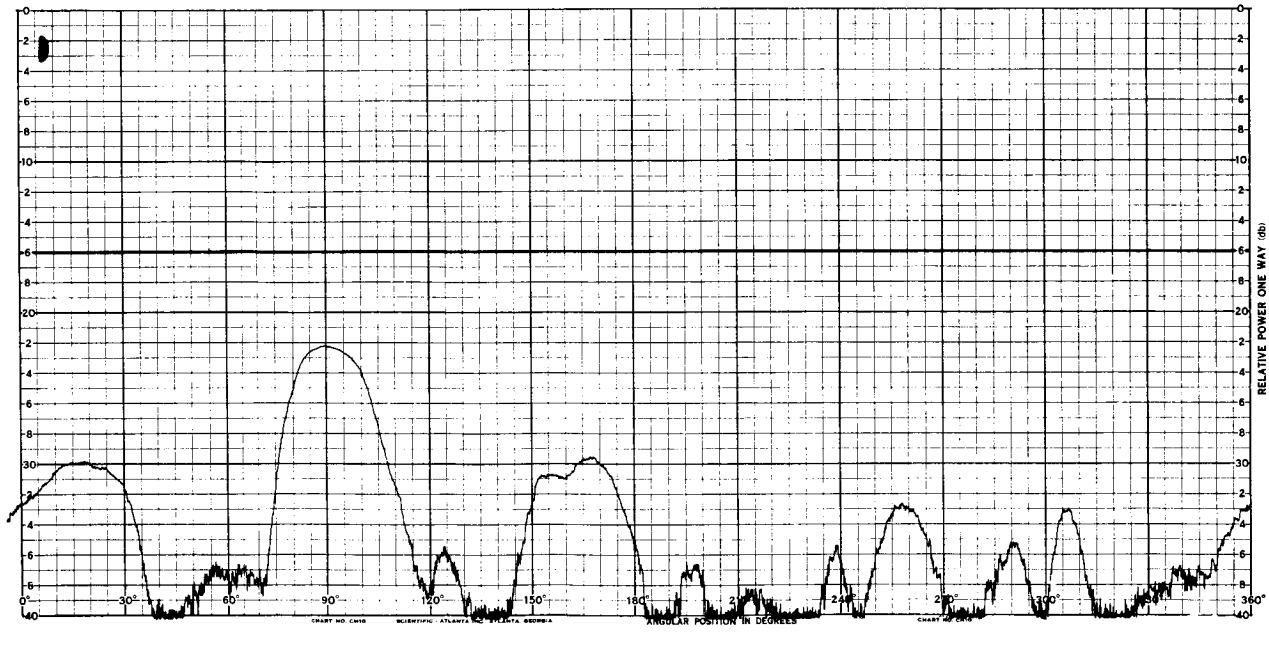


ANTENNA RADIATION PATTERN NO. 201-51

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

SA-5 ALTIMETER ANTENNA

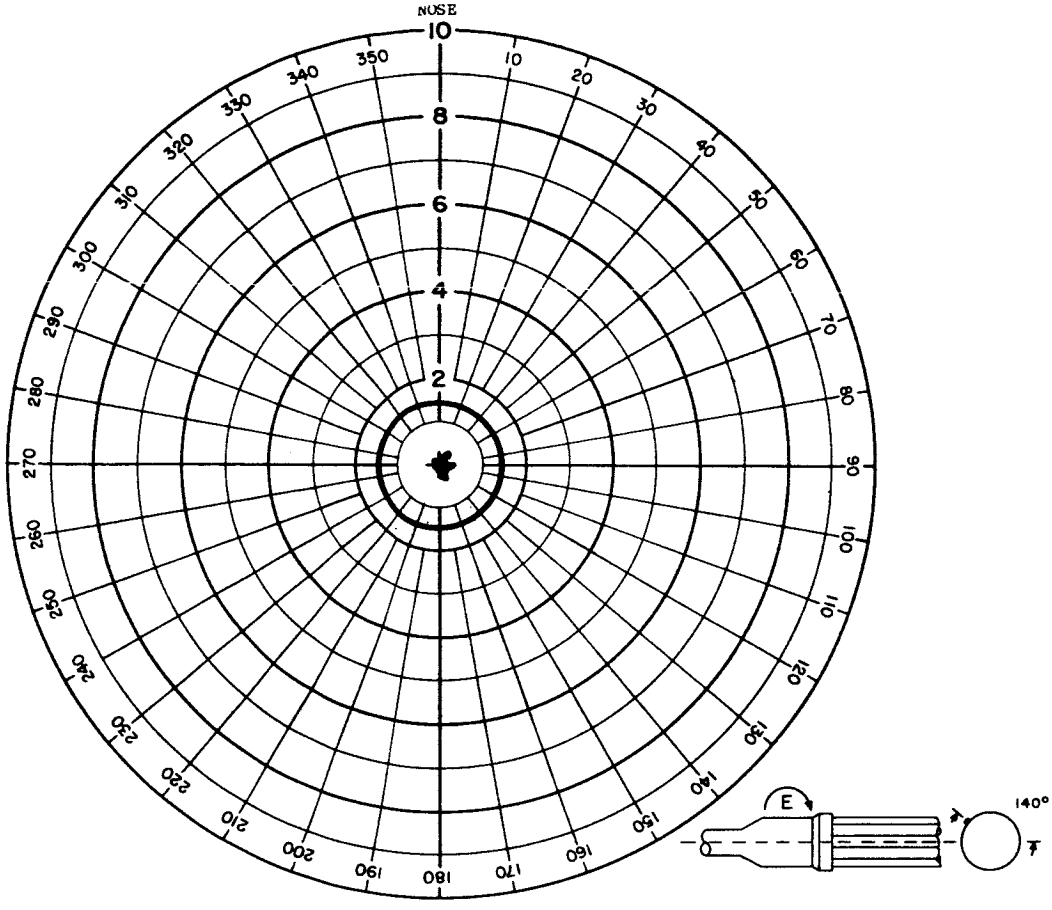


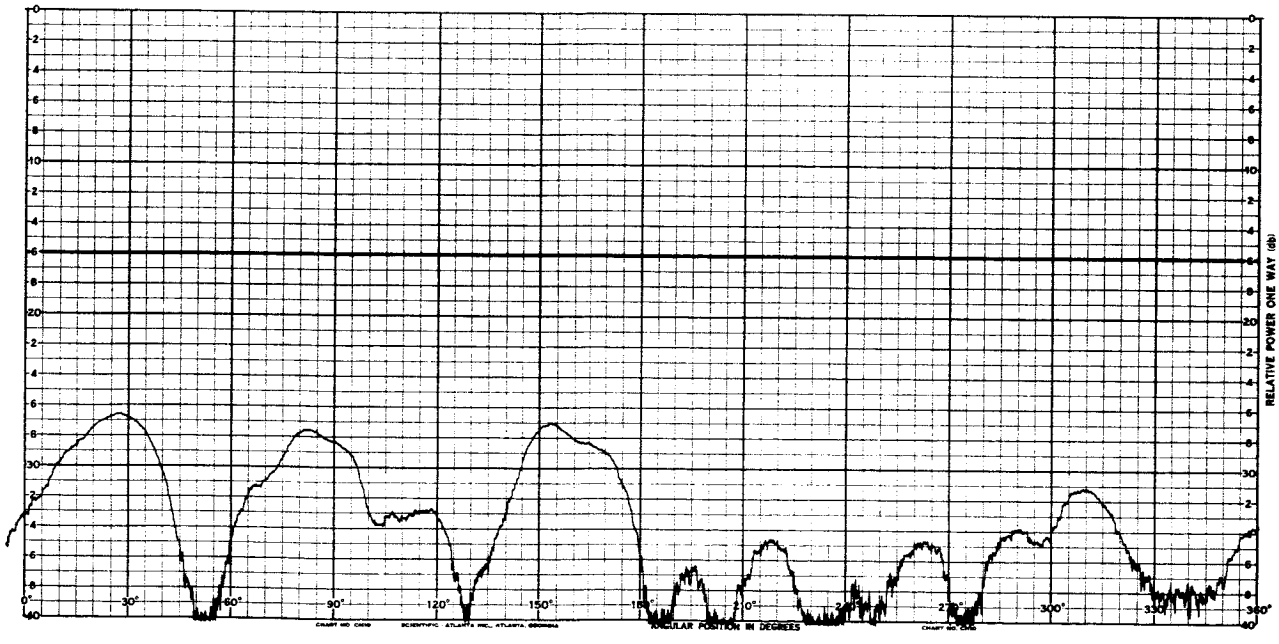


ANTENNA RADIATION PATTERN NO. 201-52

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

SA-5 ALTIMETER ANTENNA

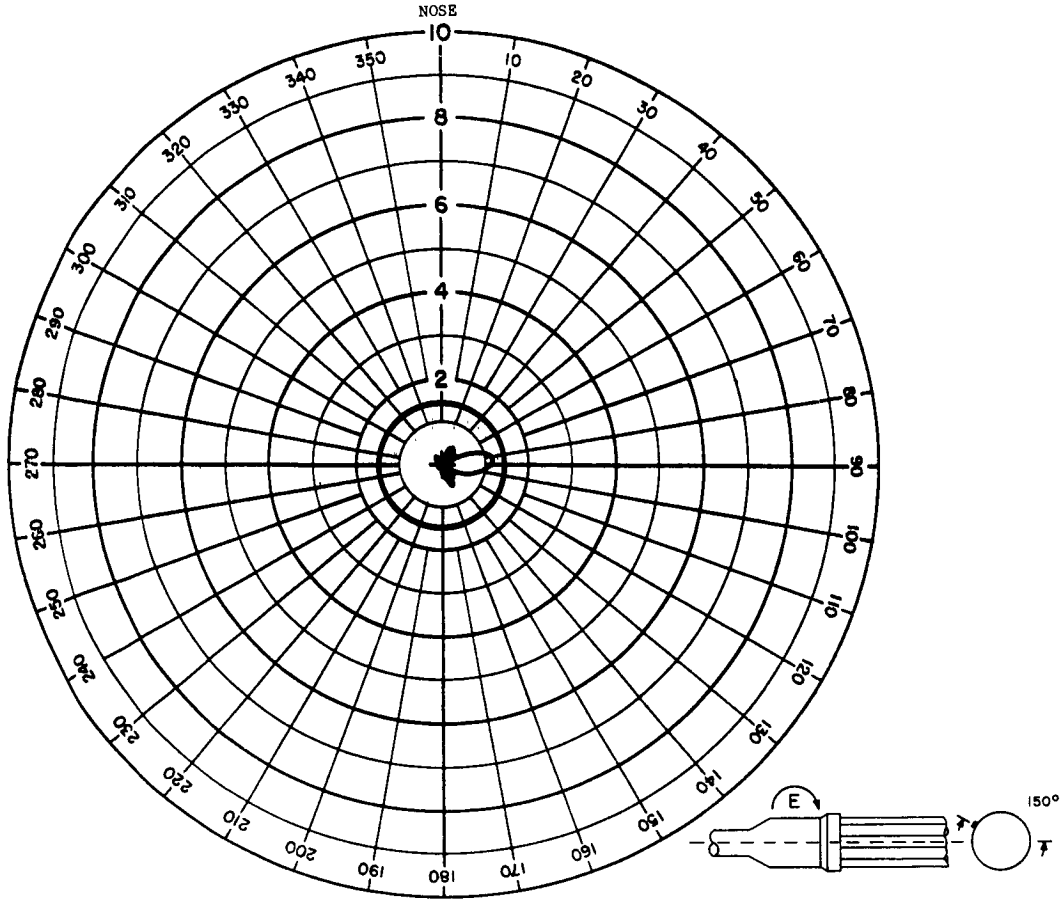


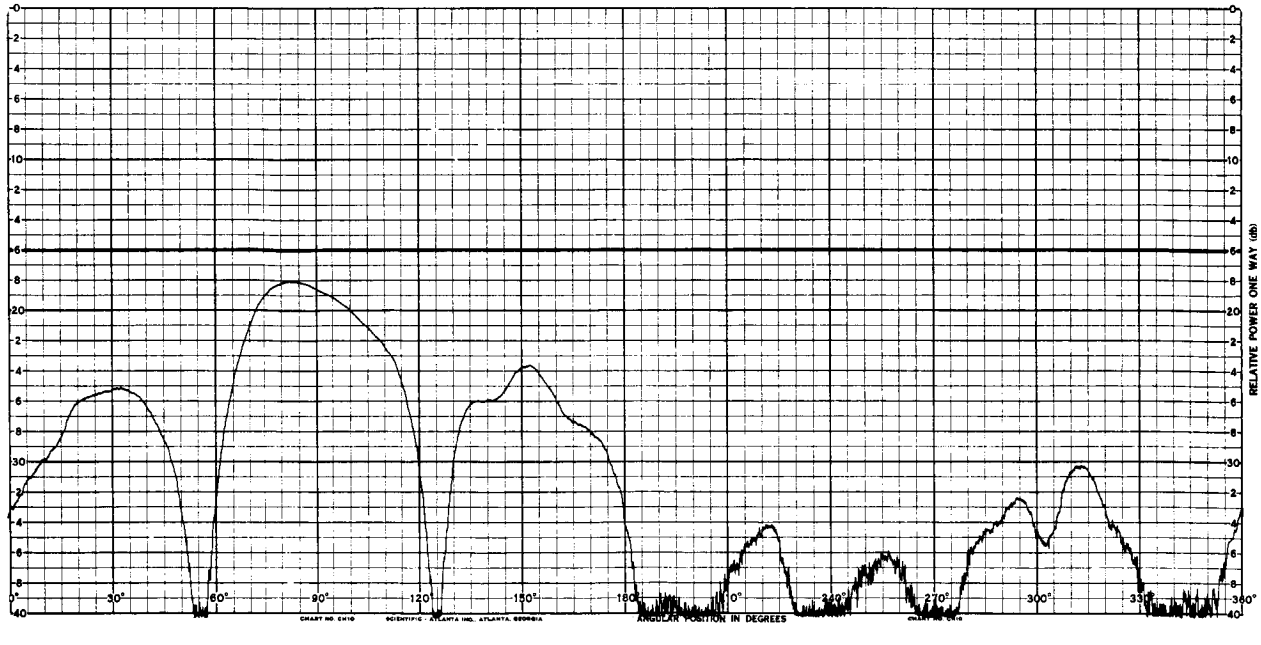


ANTENNA RADIATION PATTERN NO. 201-53

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

SA-5 ALTIMETER ANTENNA

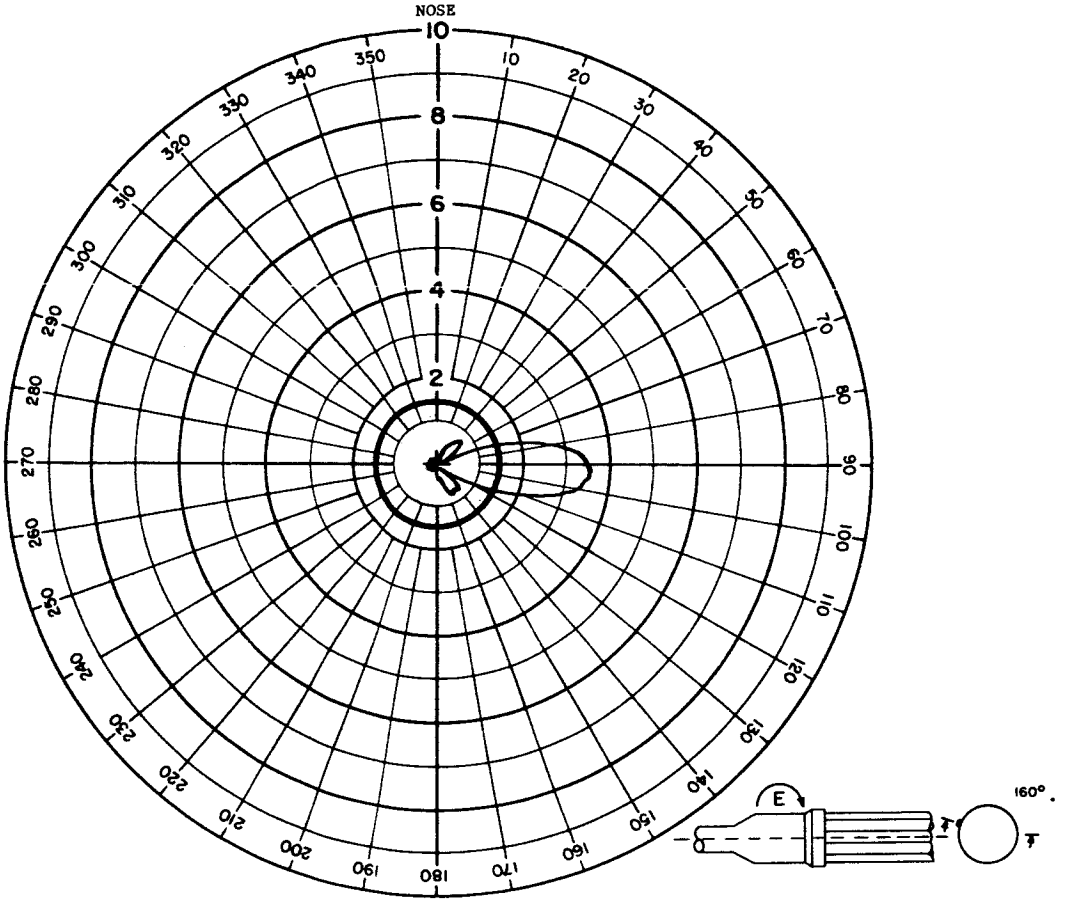


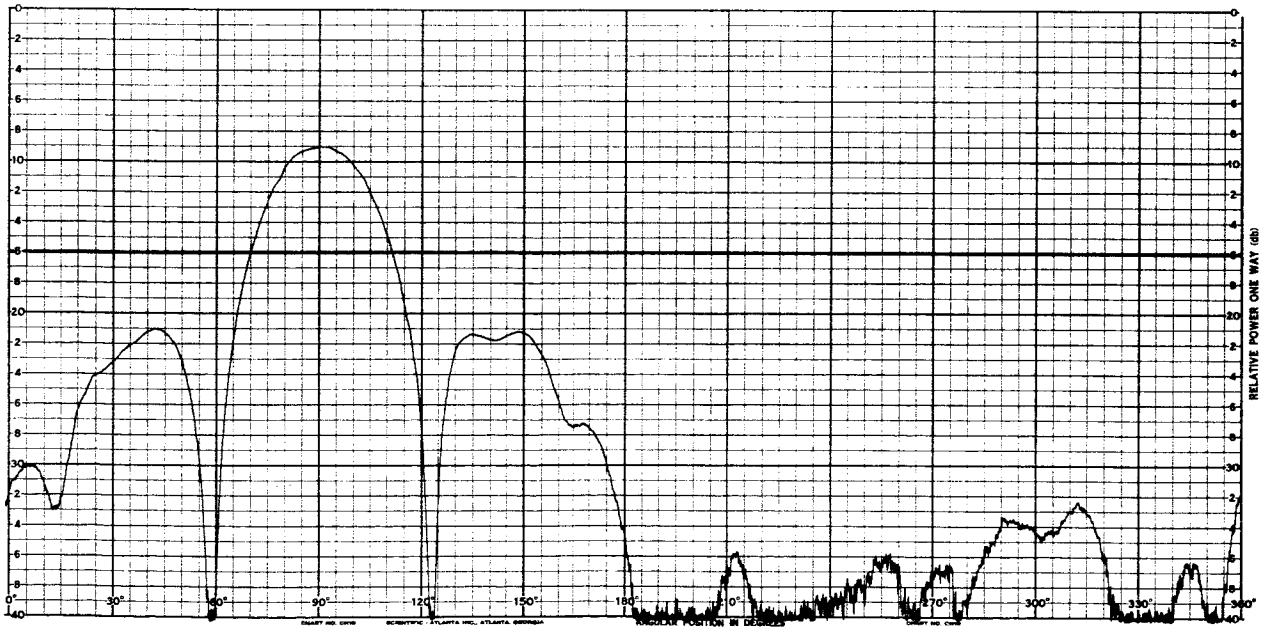


ANTENNA RADIATION PATTERN NO. 201-54

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

SA-5 ALTIMETER ANTENNA

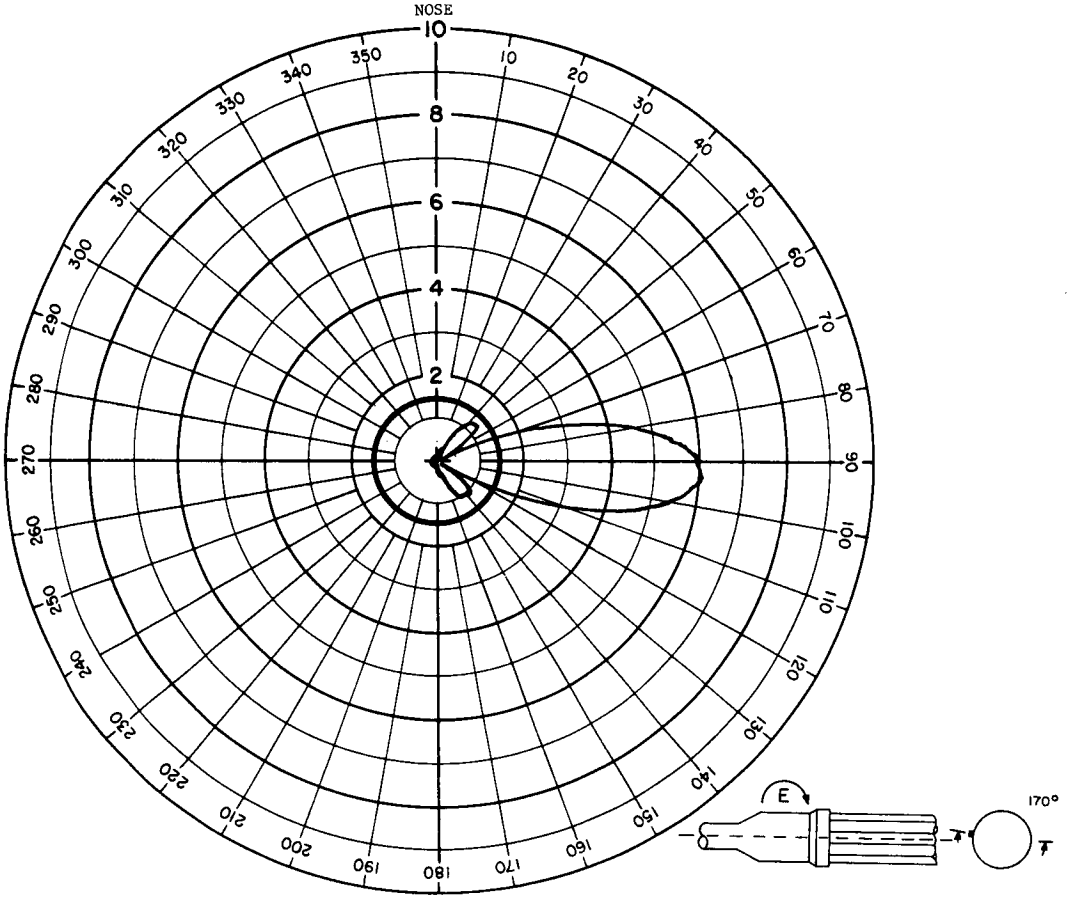


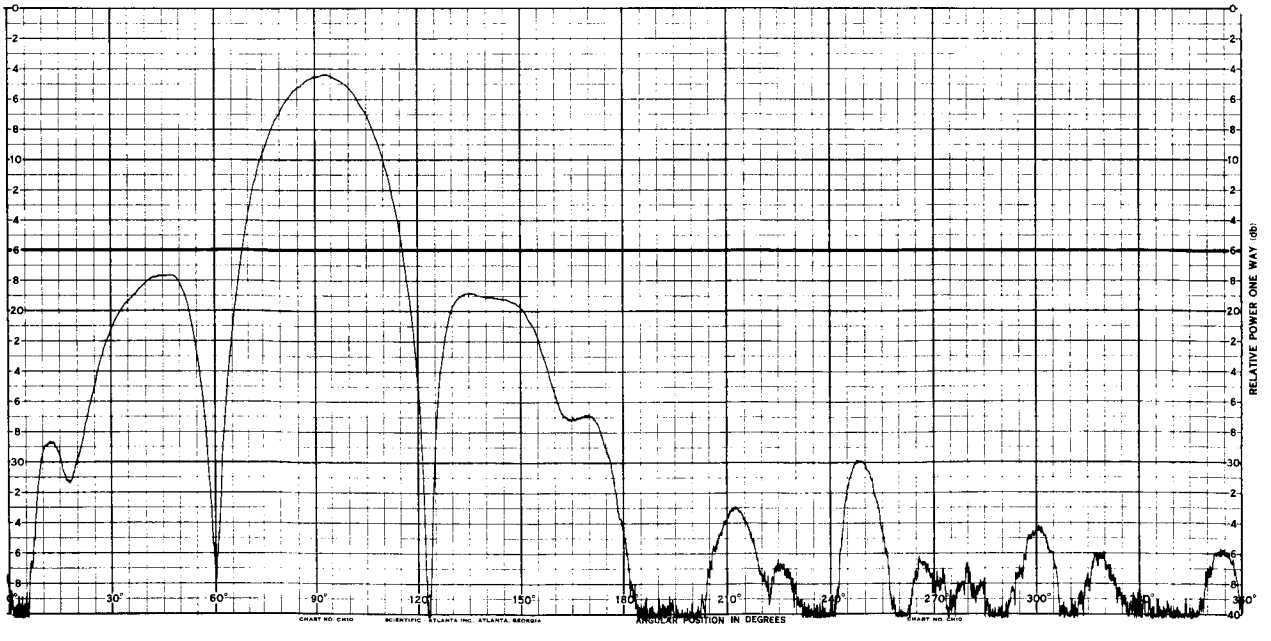


ANTENNA RADIATION PATTERN NO. 201-55

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

SA-5 ALTIMETER ANTENNA

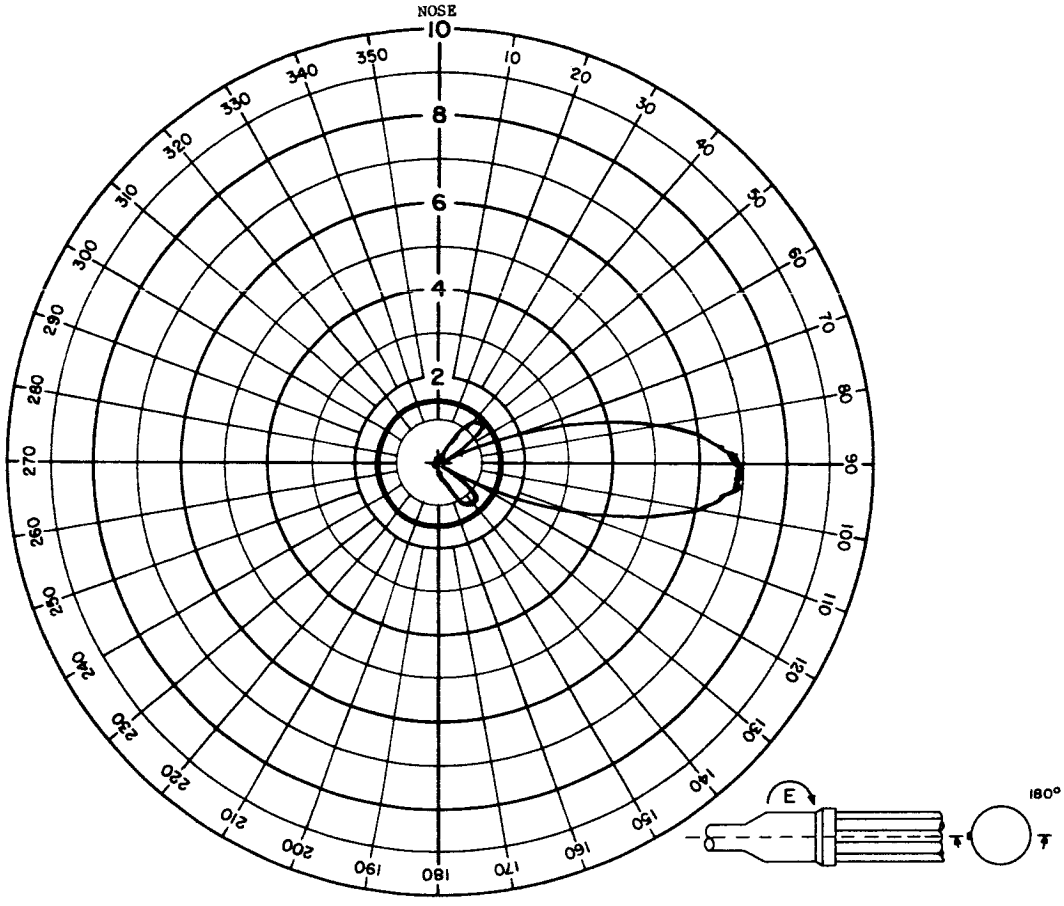


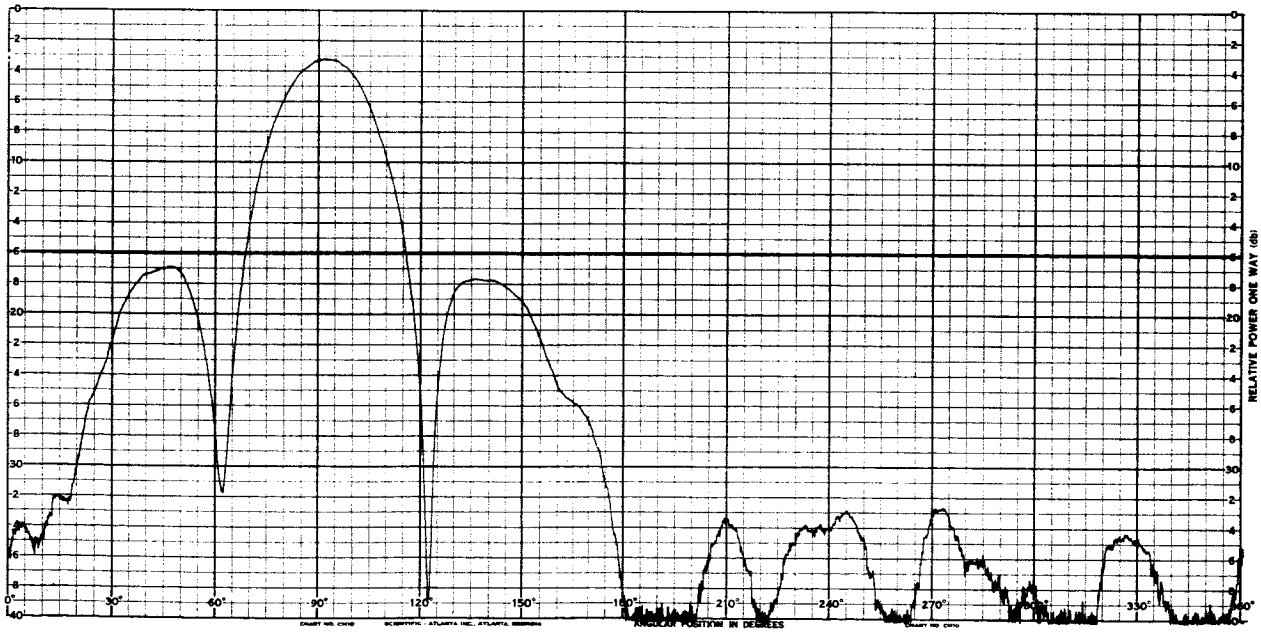


ANTENNA RADIATION PATTERN NO. 201-56

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

SA-5 ALTIMETER ANTENNA

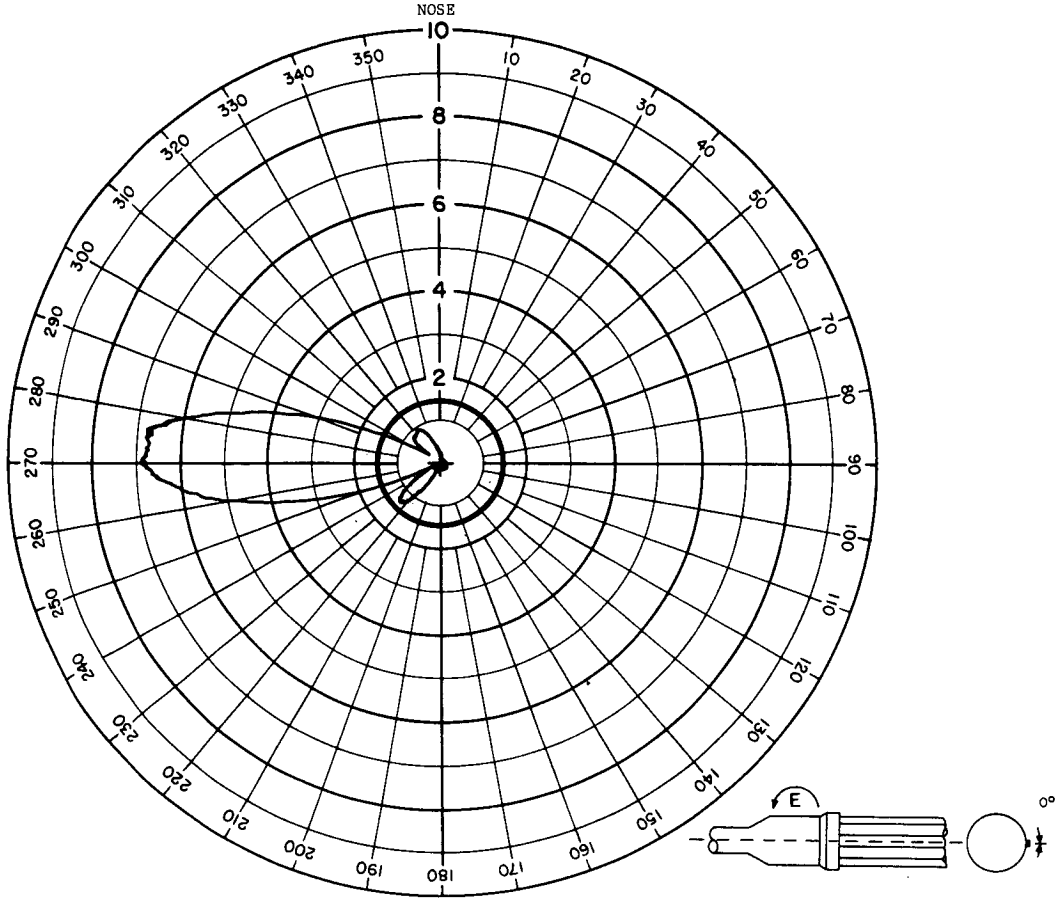


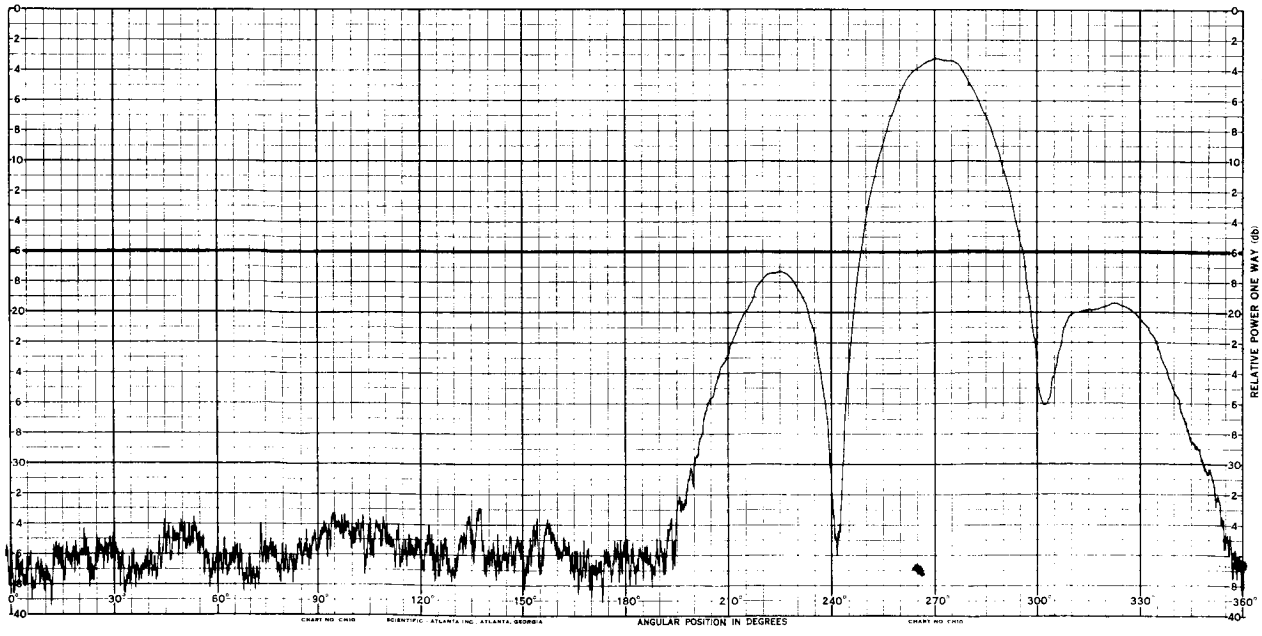


ANTENNA RADIATION PATTERN NO. 201-57

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

SA-5 ALTIMETER ANTENNA

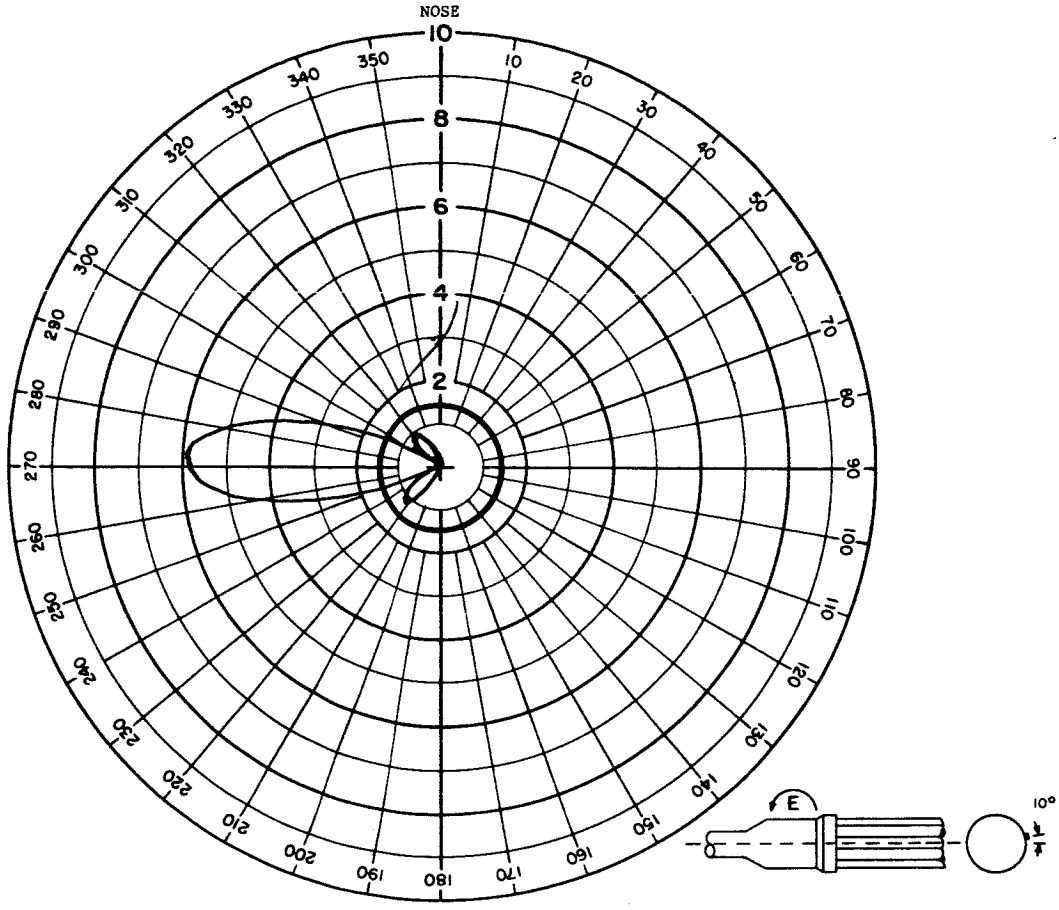


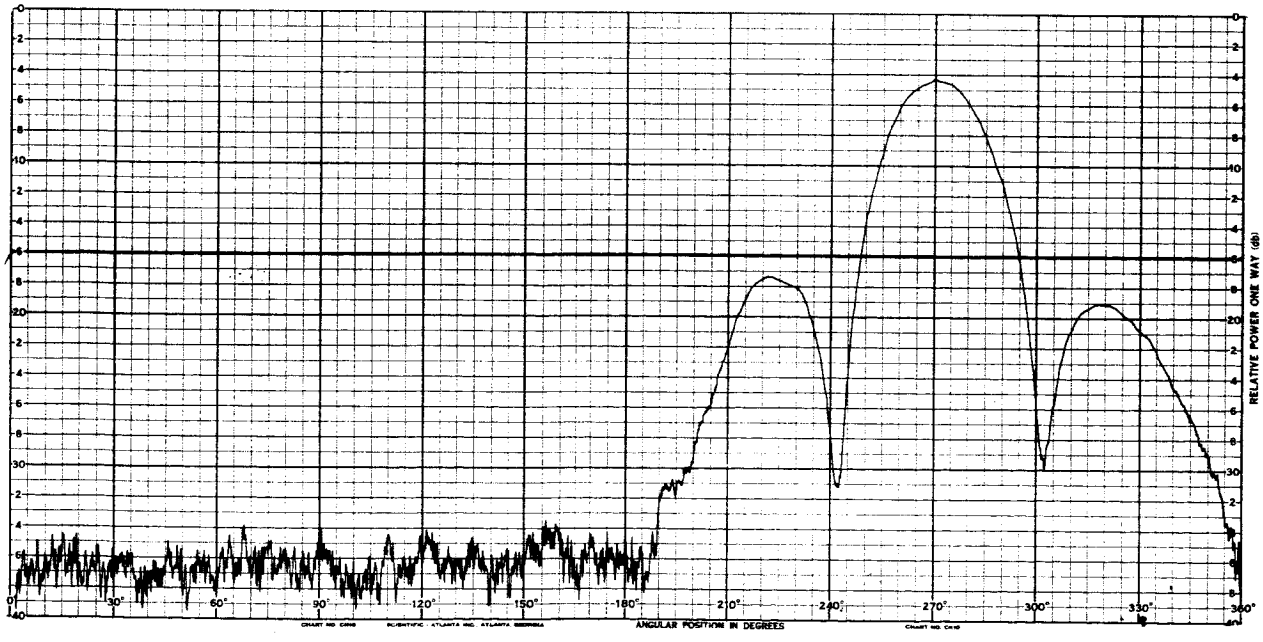


ANTENNA RADIATION PATTERN NO. 201-58

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

SA-5 ALTIMETER ANTENNA

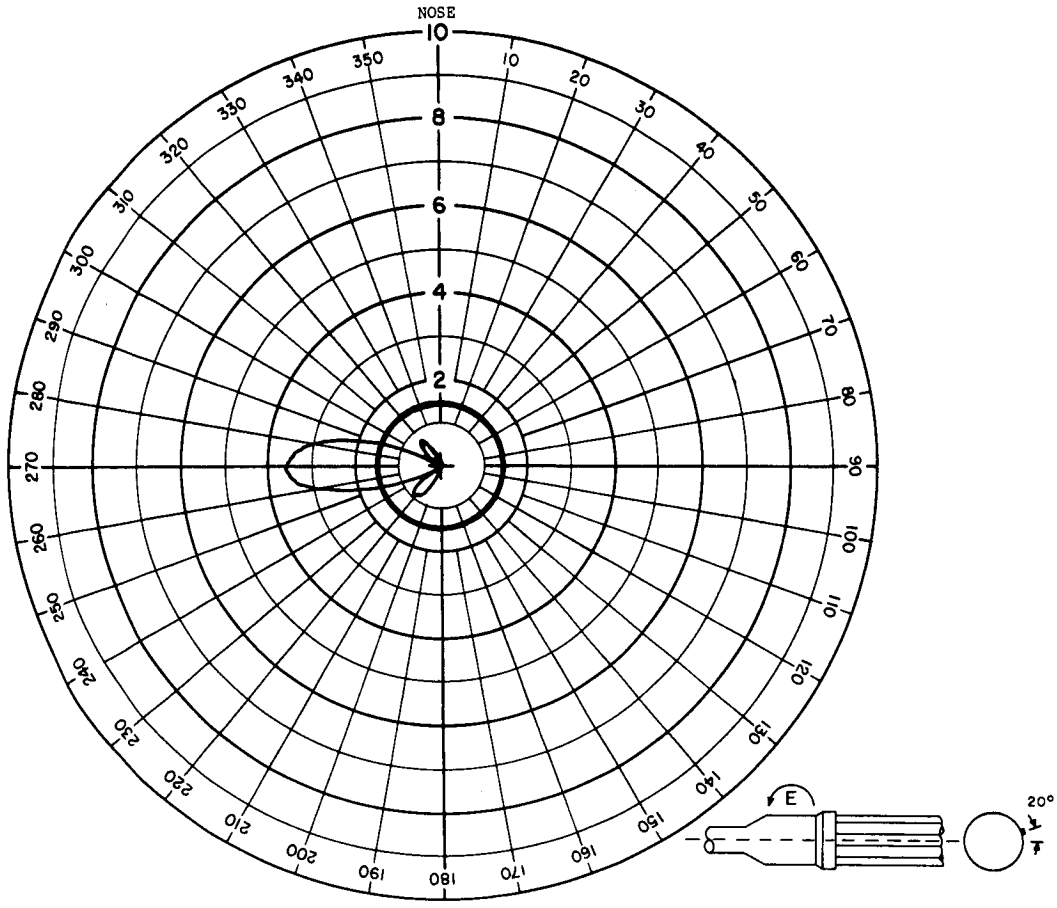


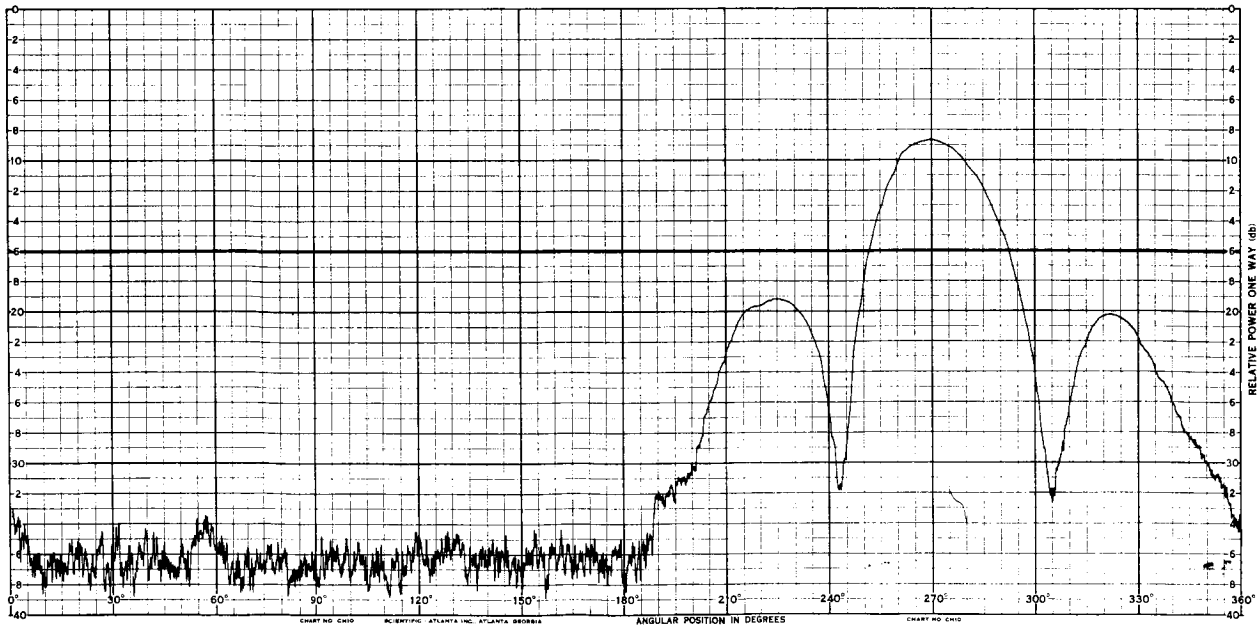


ANTENNA RADIATION PATTERN NO. 201-59

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

SA-5 ALTIMETER ANTENNA

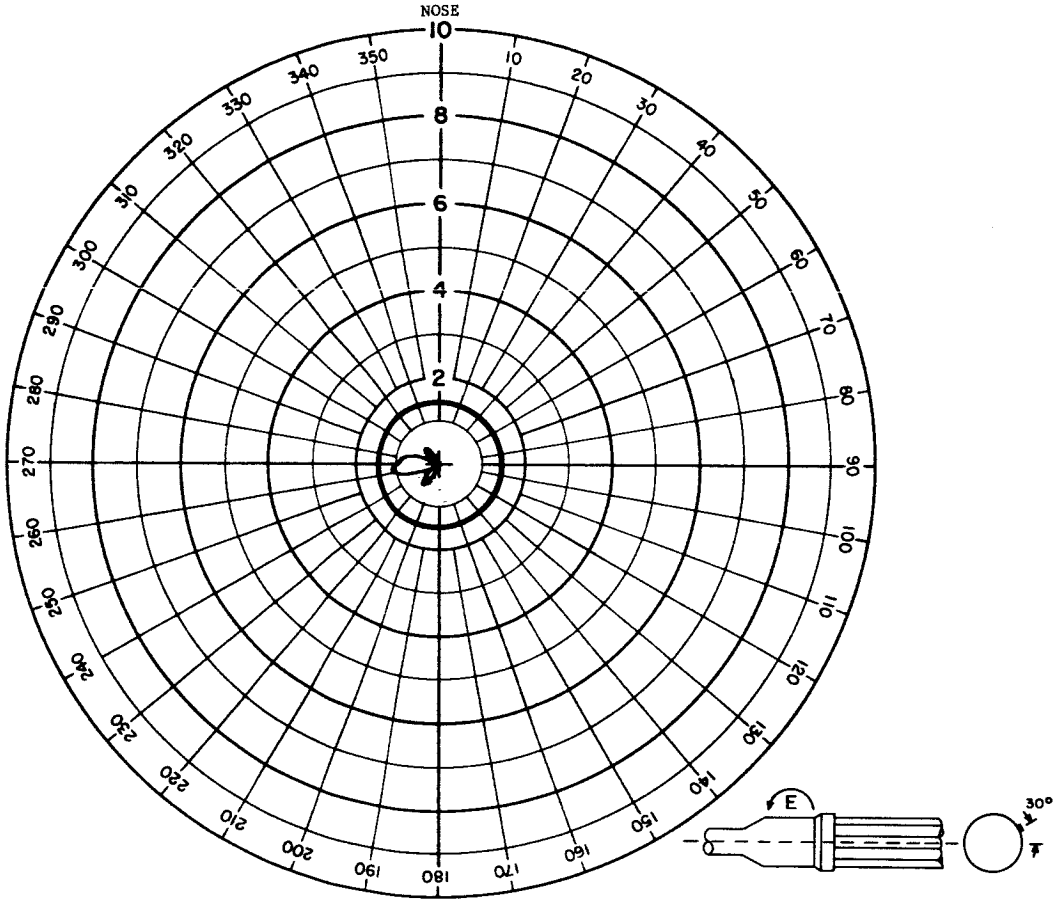


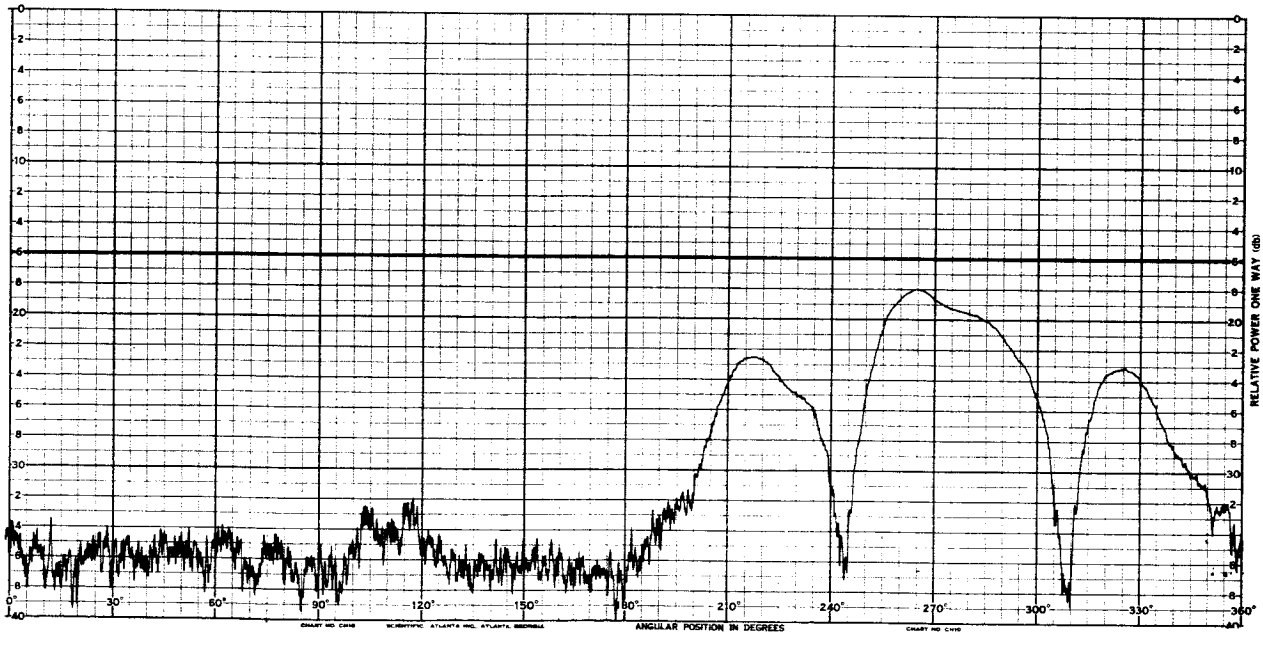


ANTENNA RADIATION PATTERN NO. 201-60

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

SA-5 ALTIMETER ANTENNA

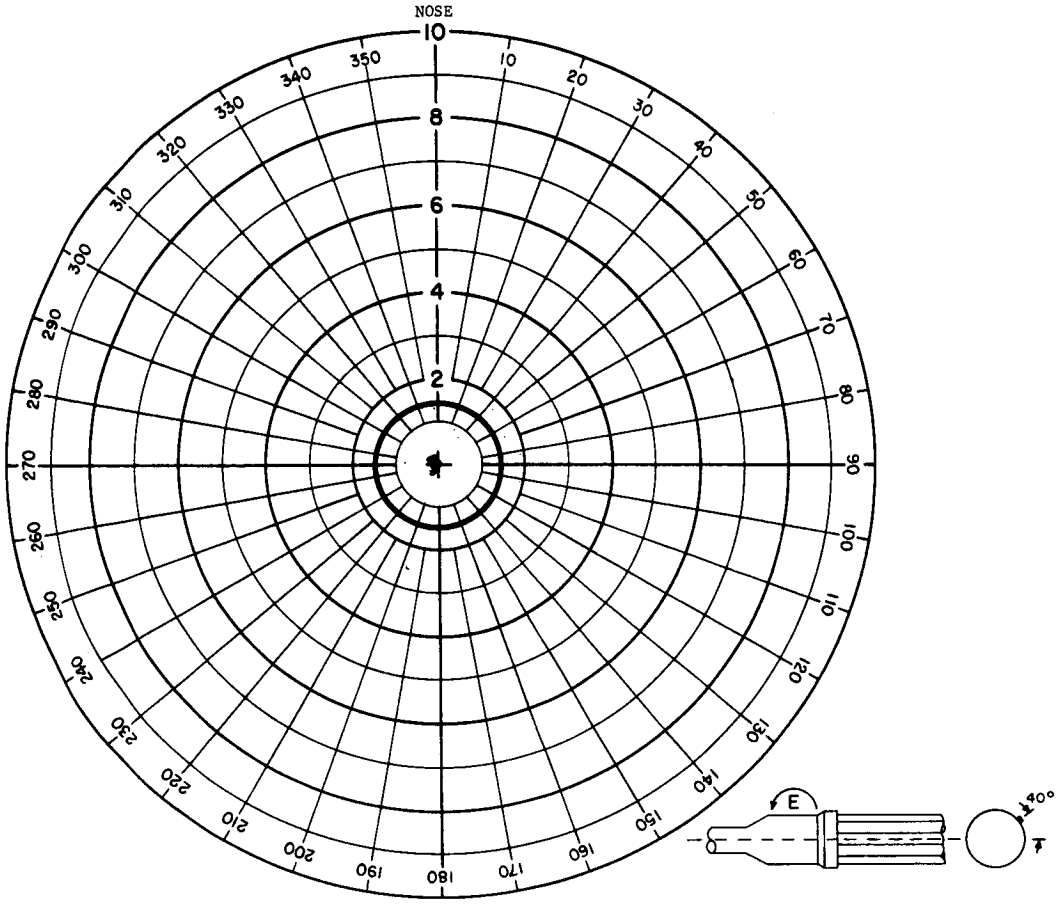


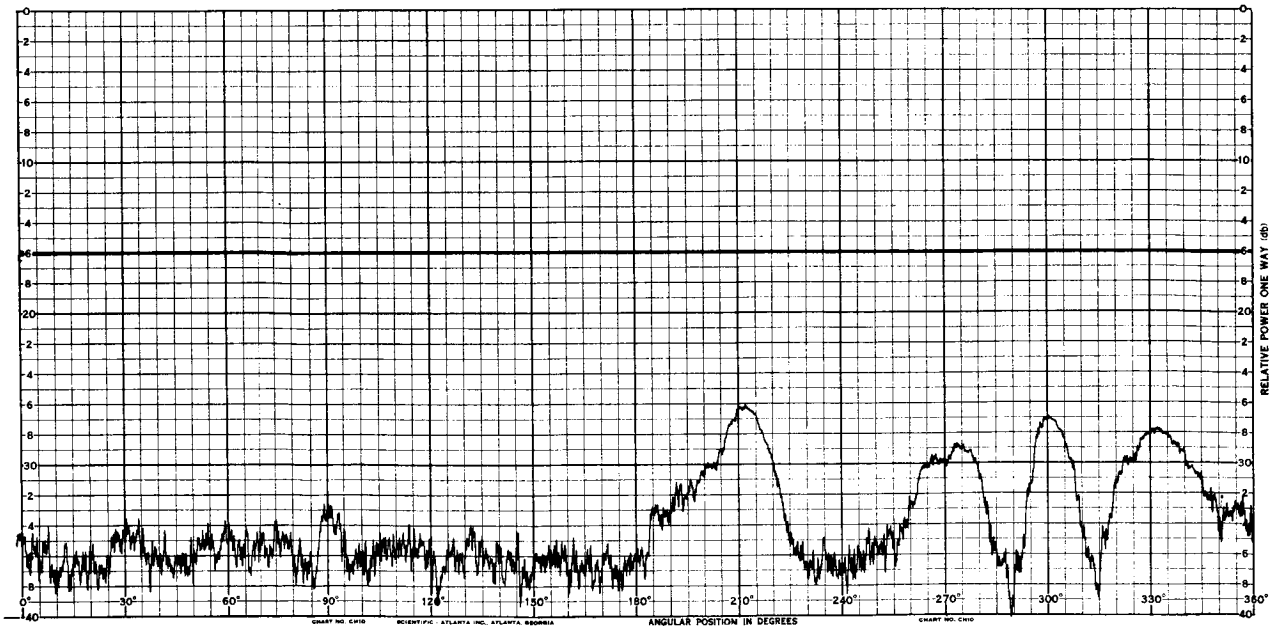


ANTENNA RADIATION PATTERN NO. 201-61

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

SA-5 ALTIMETER ANTENNA

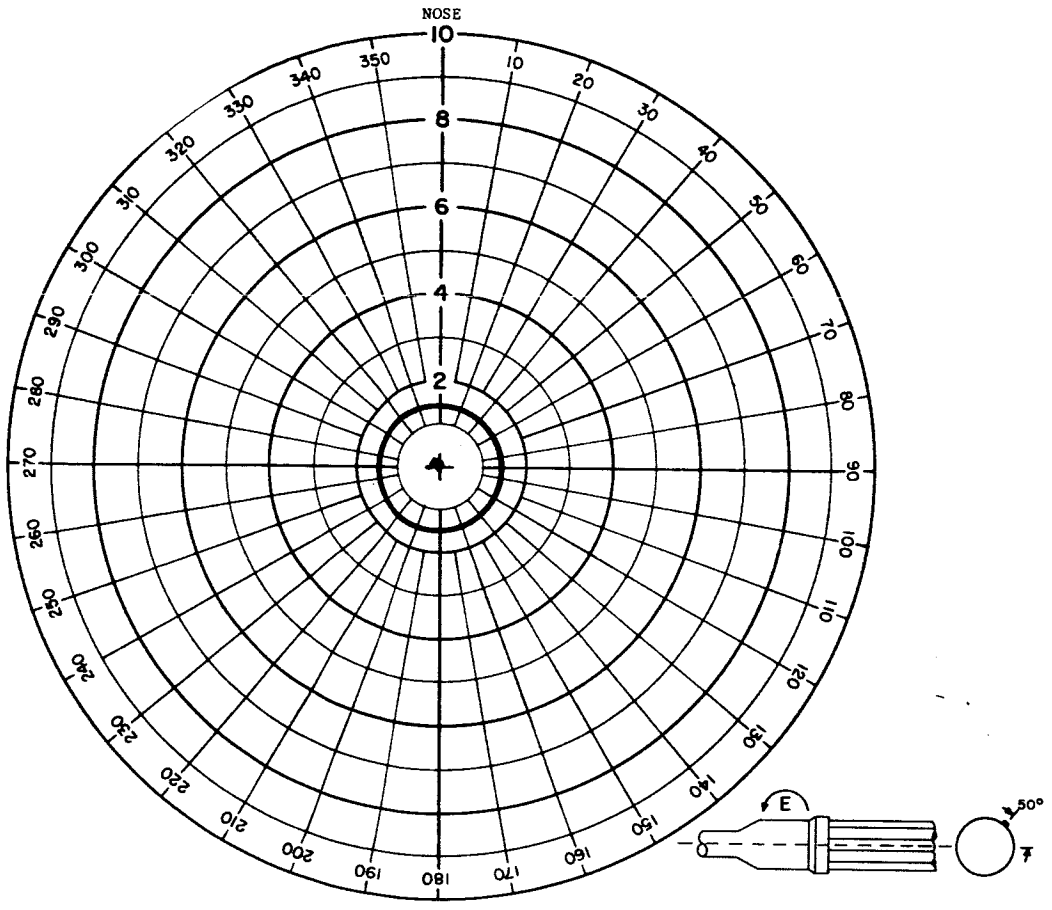


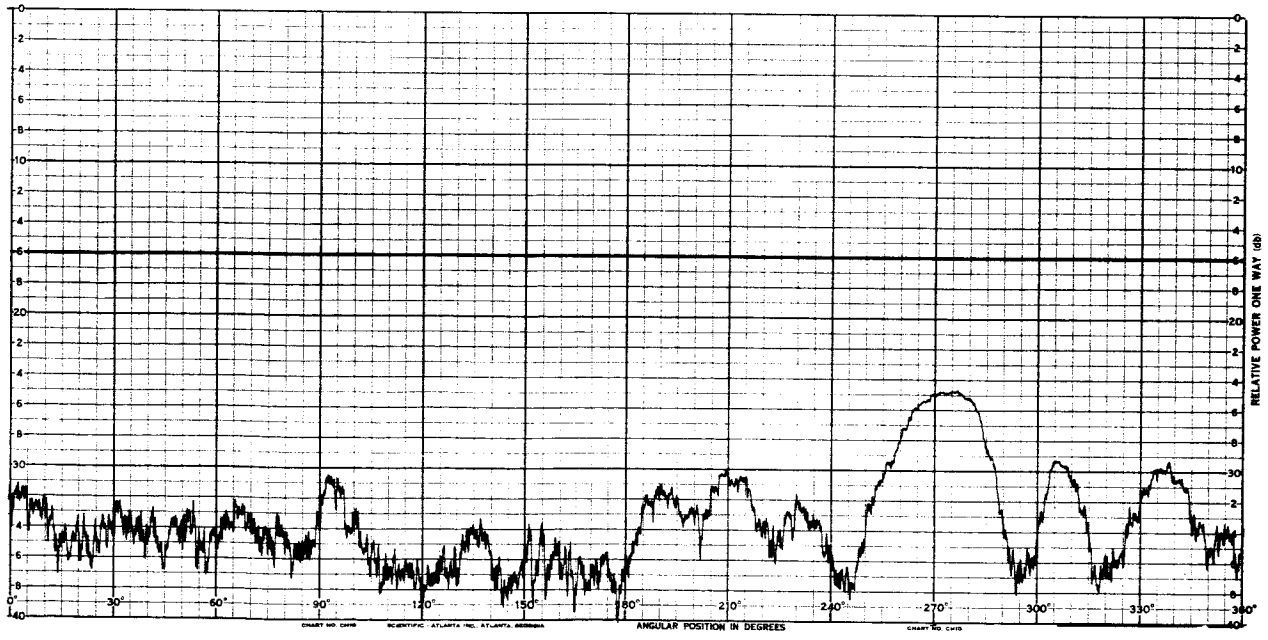


ANTENNA RADIATION PATTERN NO. 201-62

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

SA-5 ALTIMETER ANTENNA

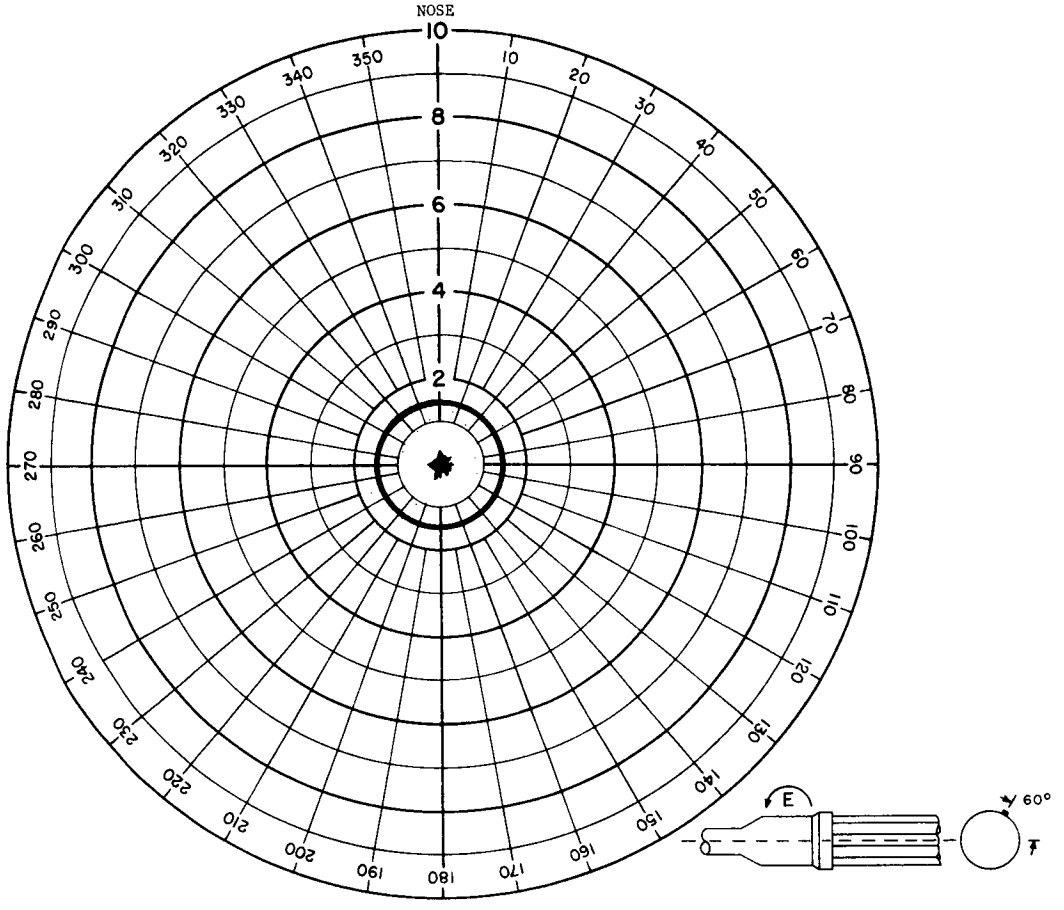


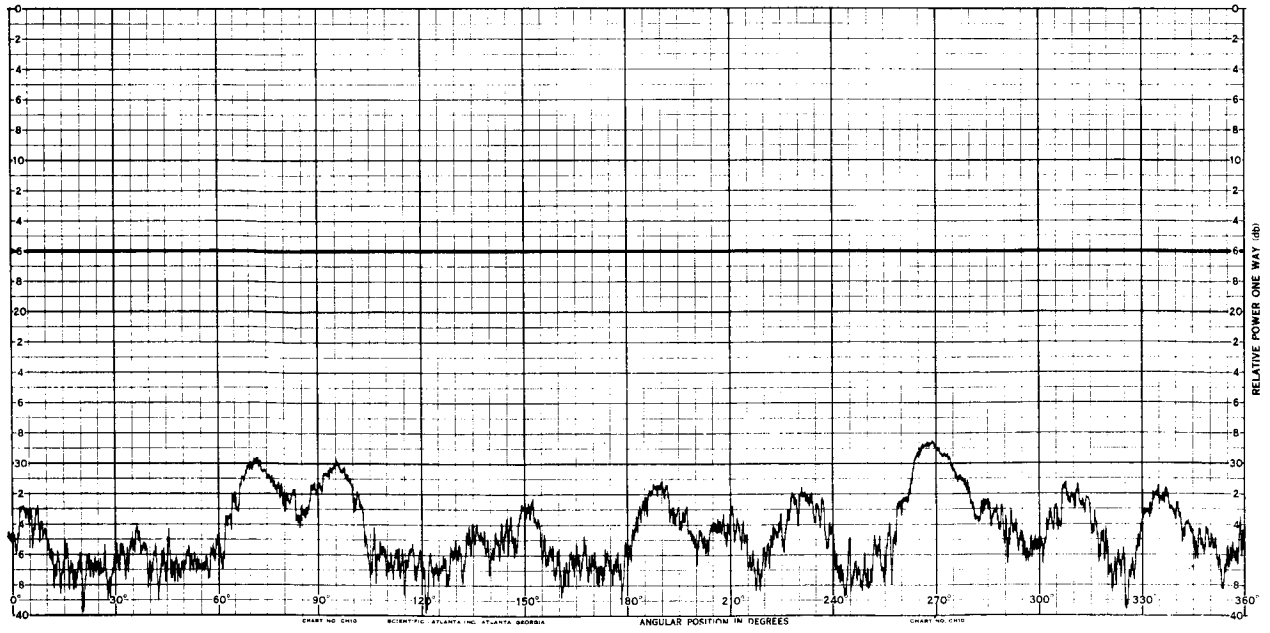


ANTENNA RADIATION PATTERN NO. 201-63

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

SA-5 ALTIMETER ANTENNA

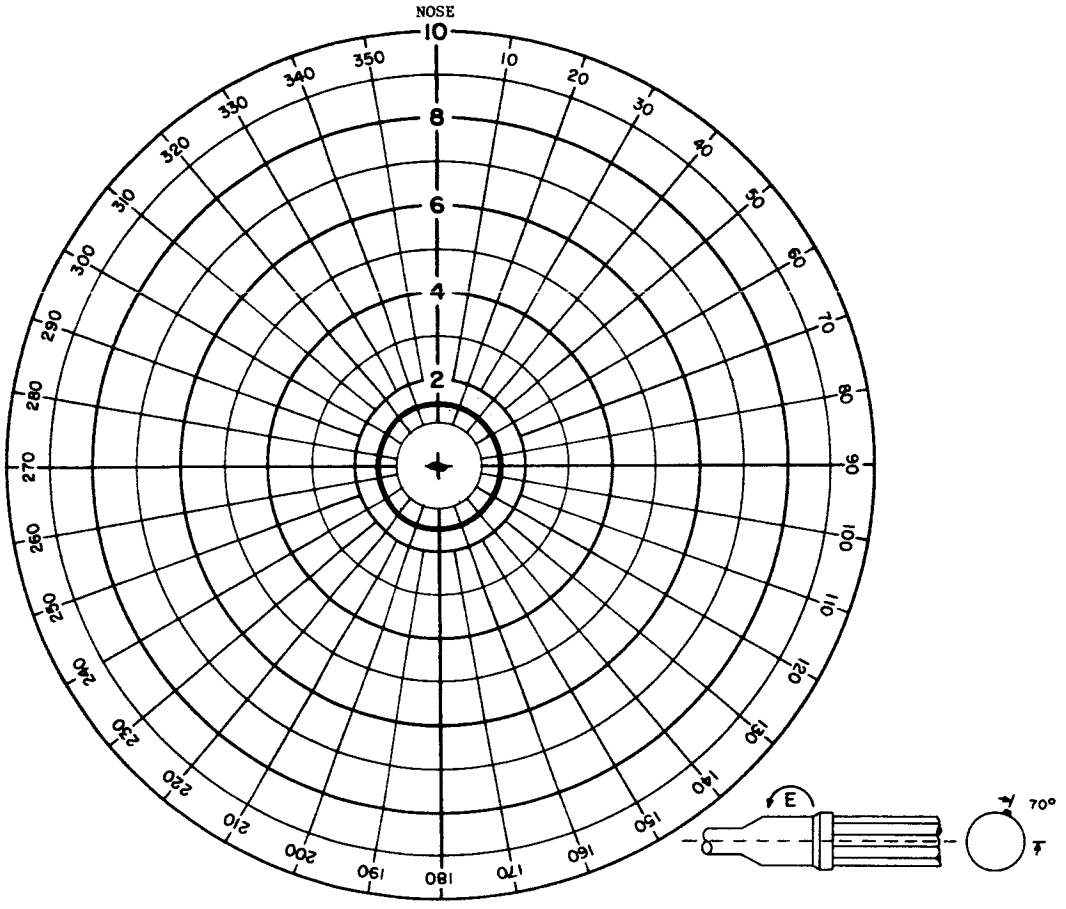


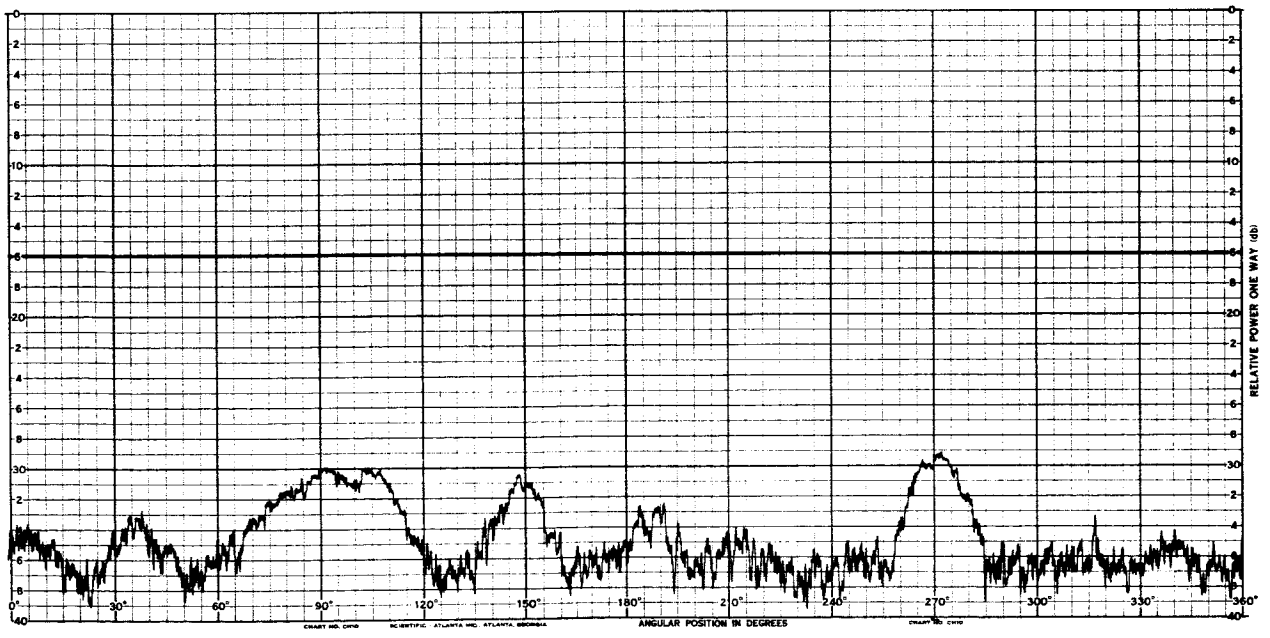


ANTENNA RADIATION PATTERN NO. 201-64

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

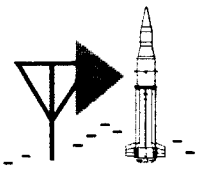
SA-5 ALTIMETER ANTENNA



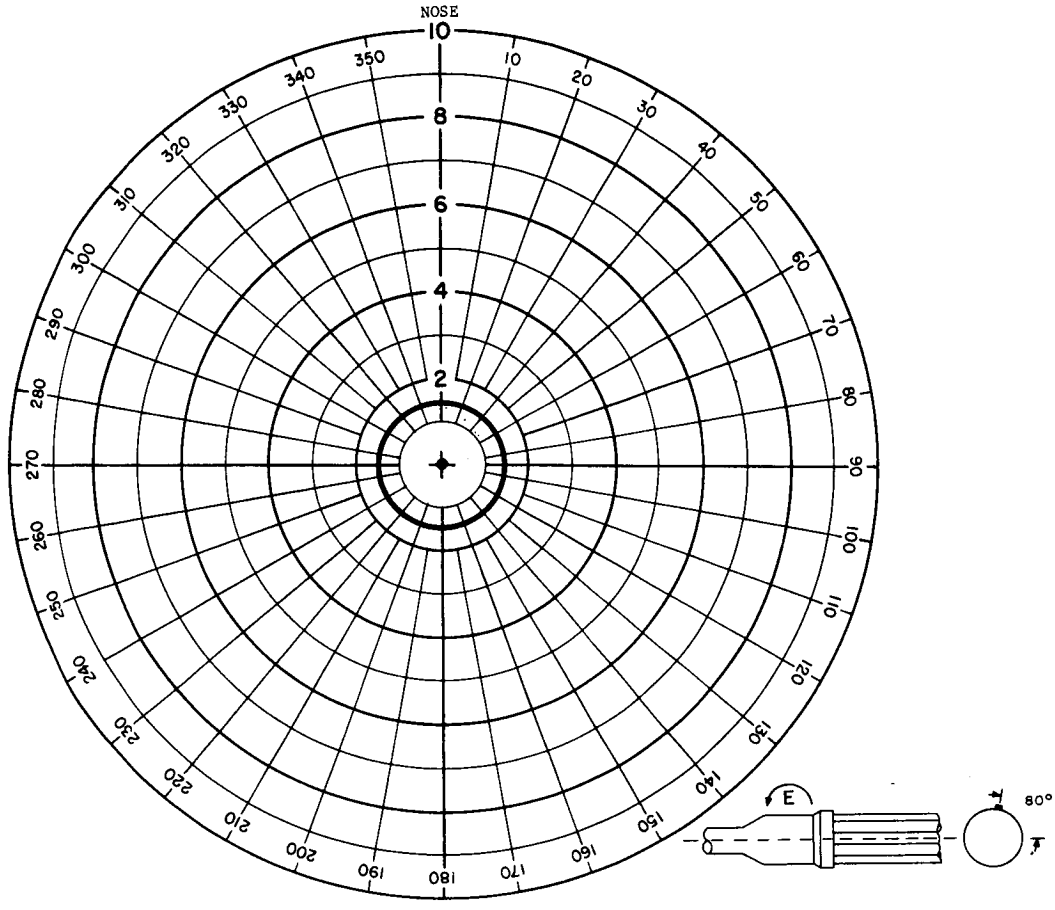


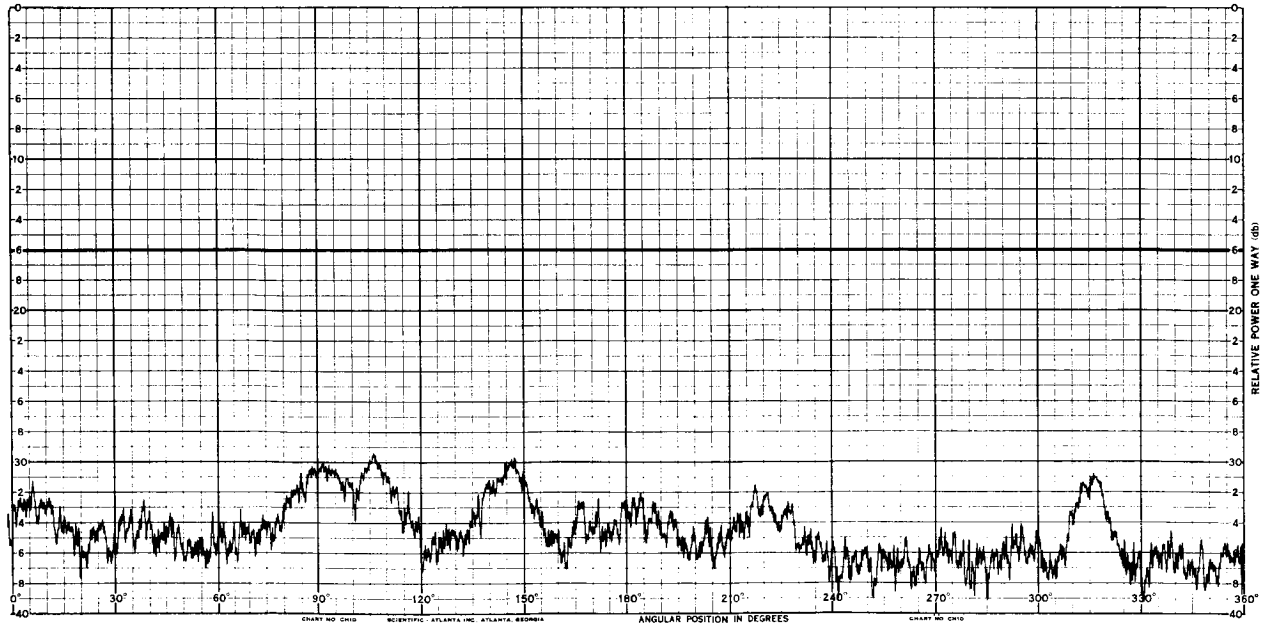
ANTENNA RADIATION PATTERN NO. 201-65

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



SA-5 ALTIMETER ANTENNA

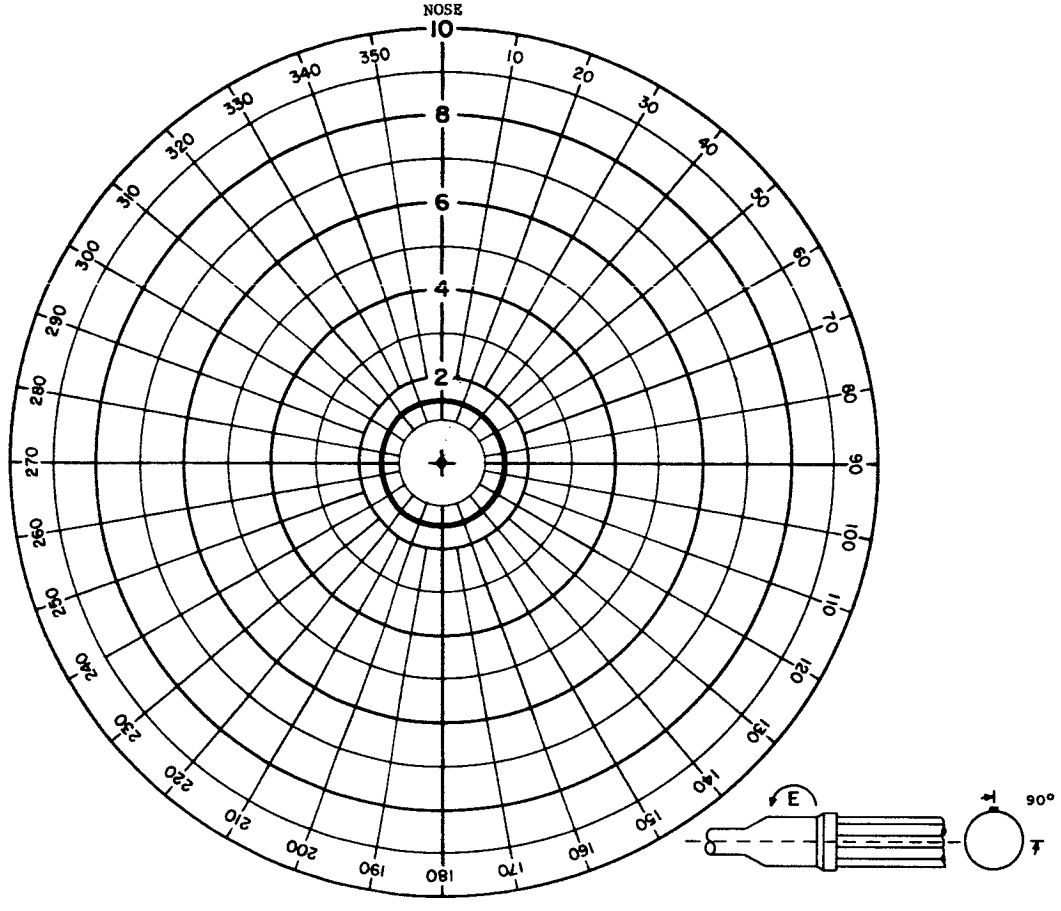


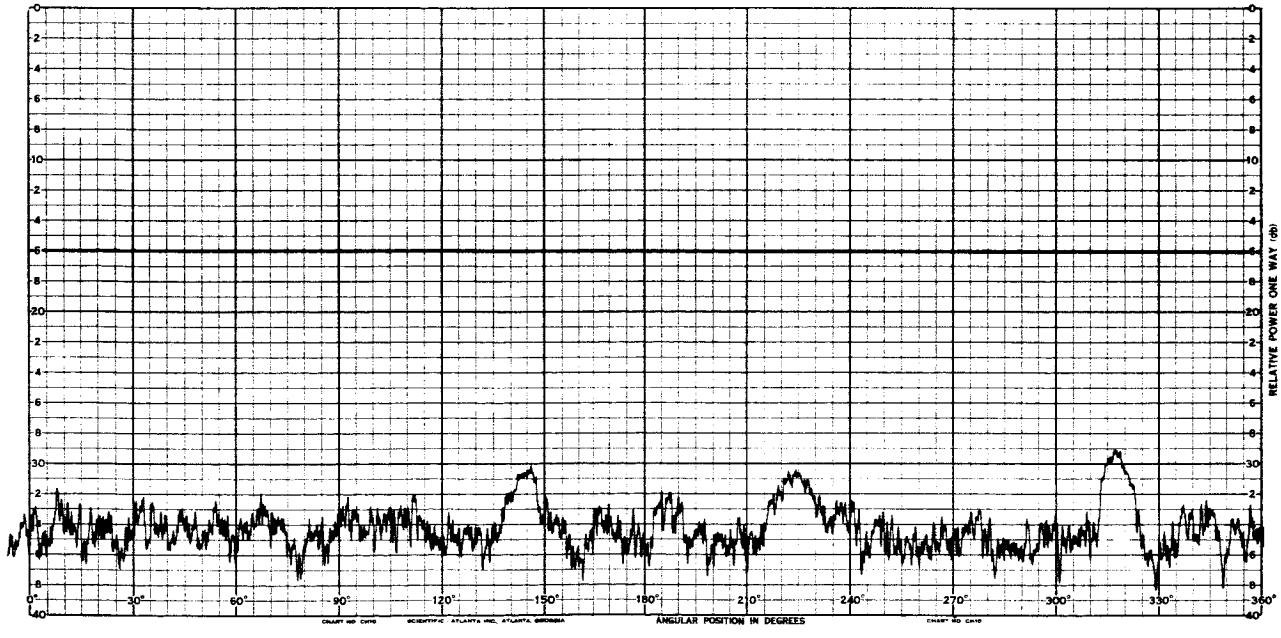


ANTENNA RADIATION PATTERN NO. 201-66

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

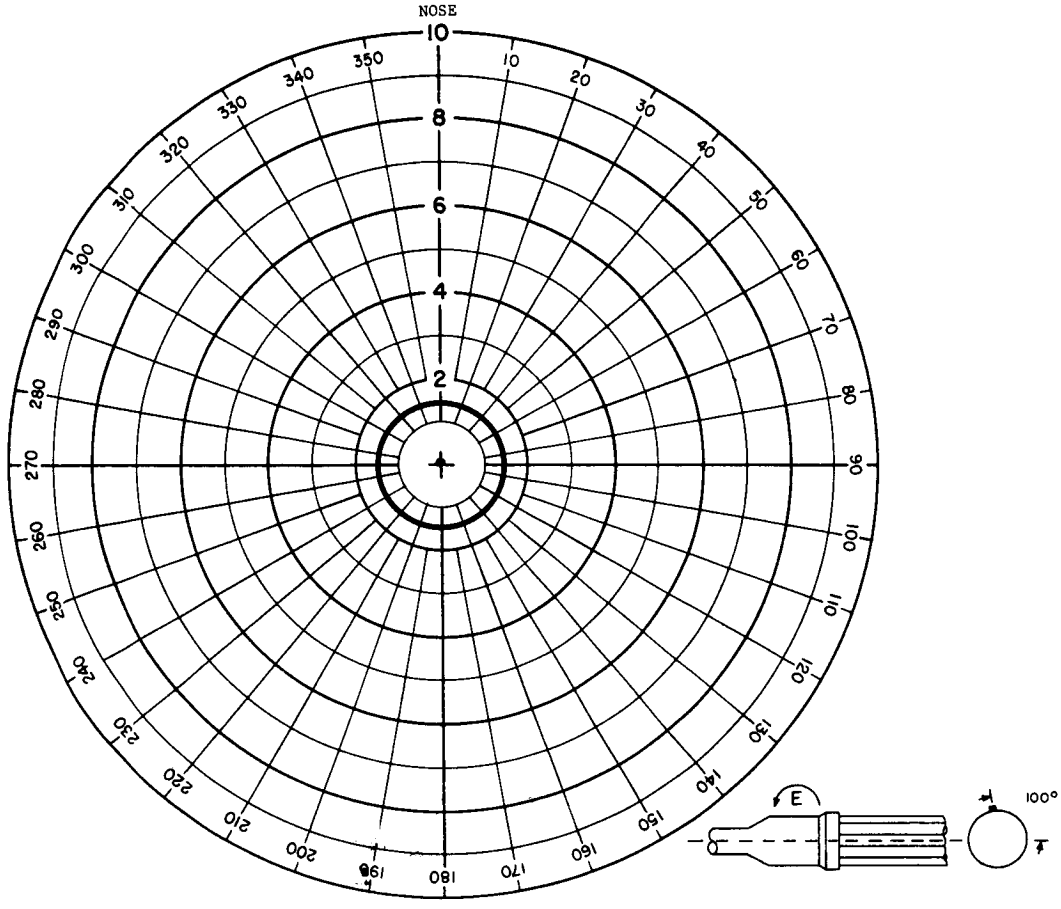
SA-5 ALTIMETER ANTENNA

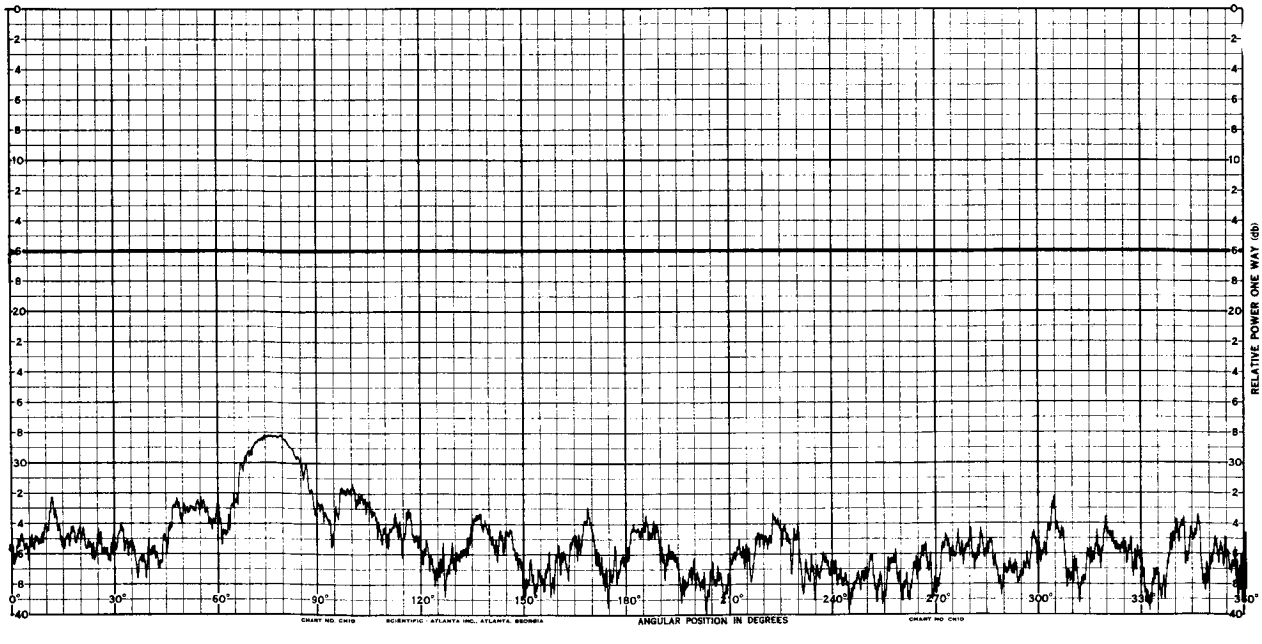




ANTENNA RADIATION PATTERN NO. 201-67

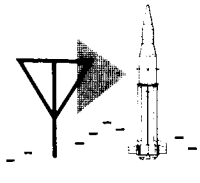
SA-5 ALTIMETER ANTENNA



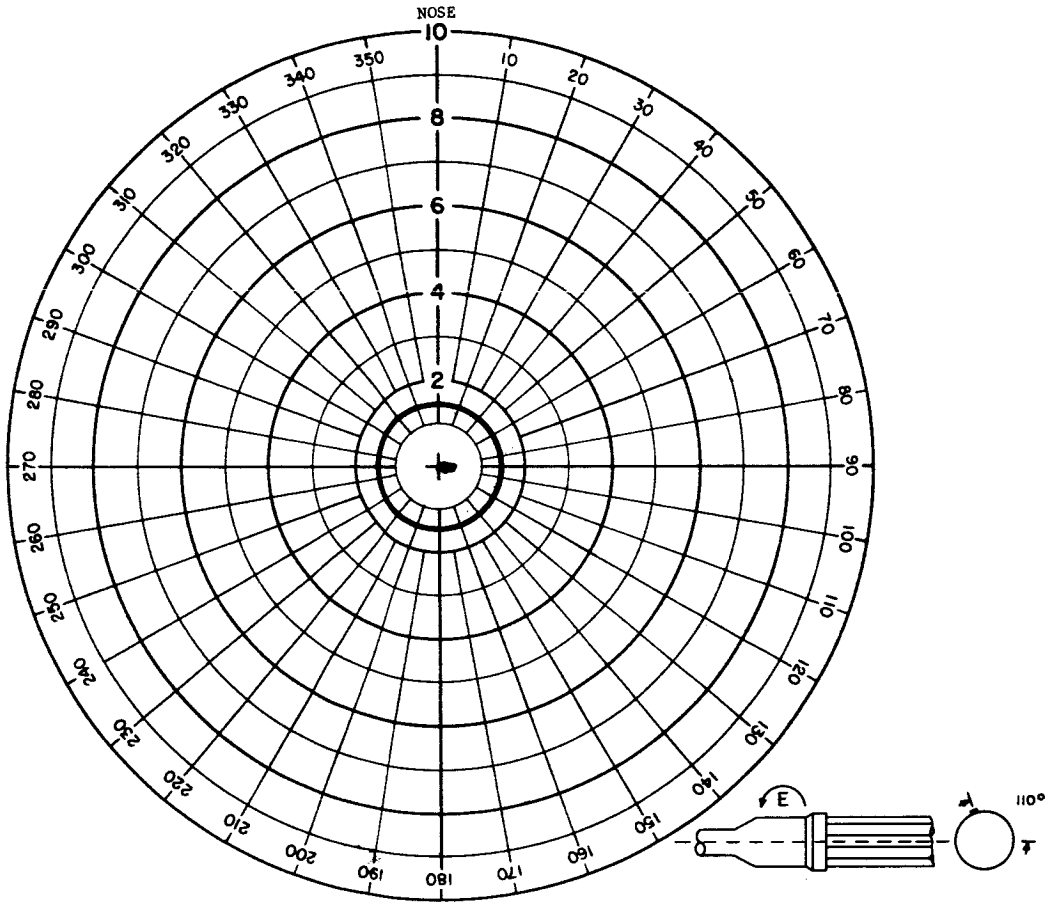


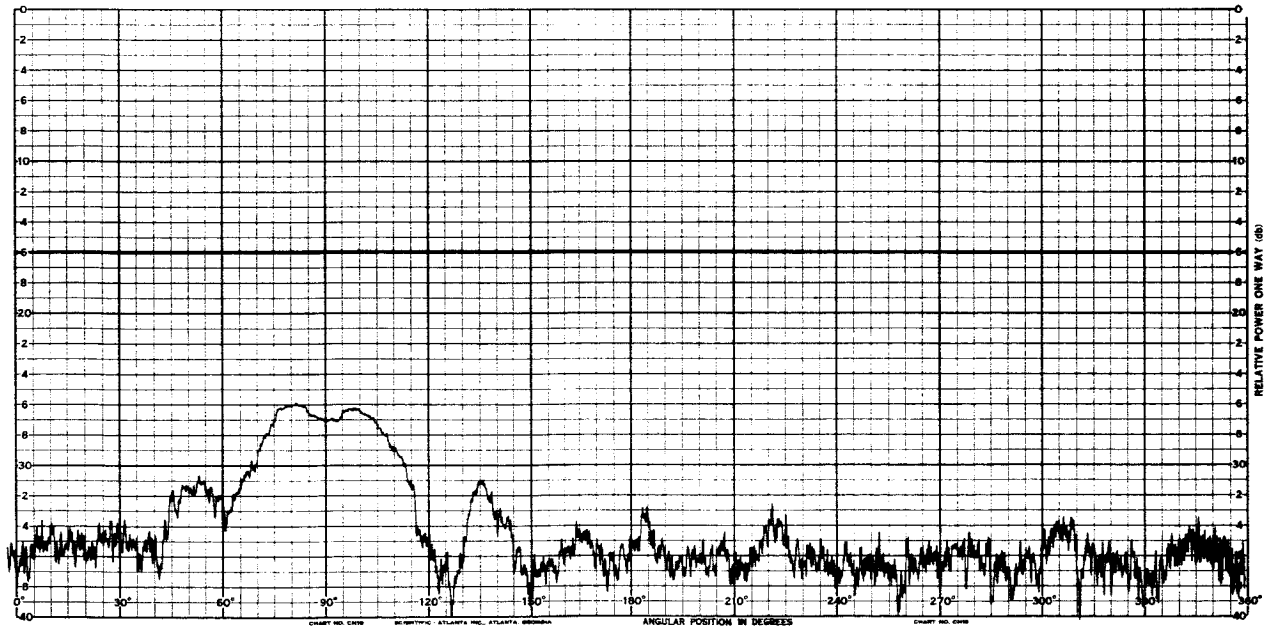
ANTENNA RADIATION PATTERN NO. 201-68

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



SA-5 ALTIMETER ANTENNA

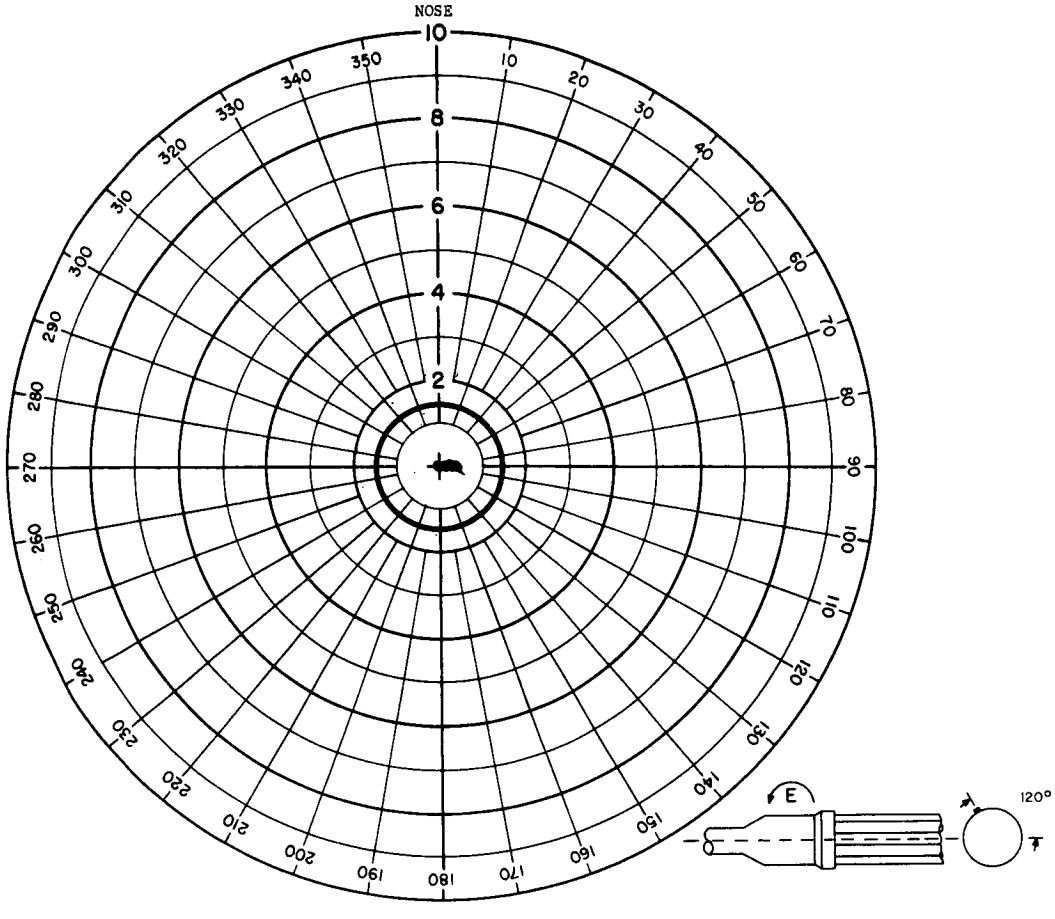


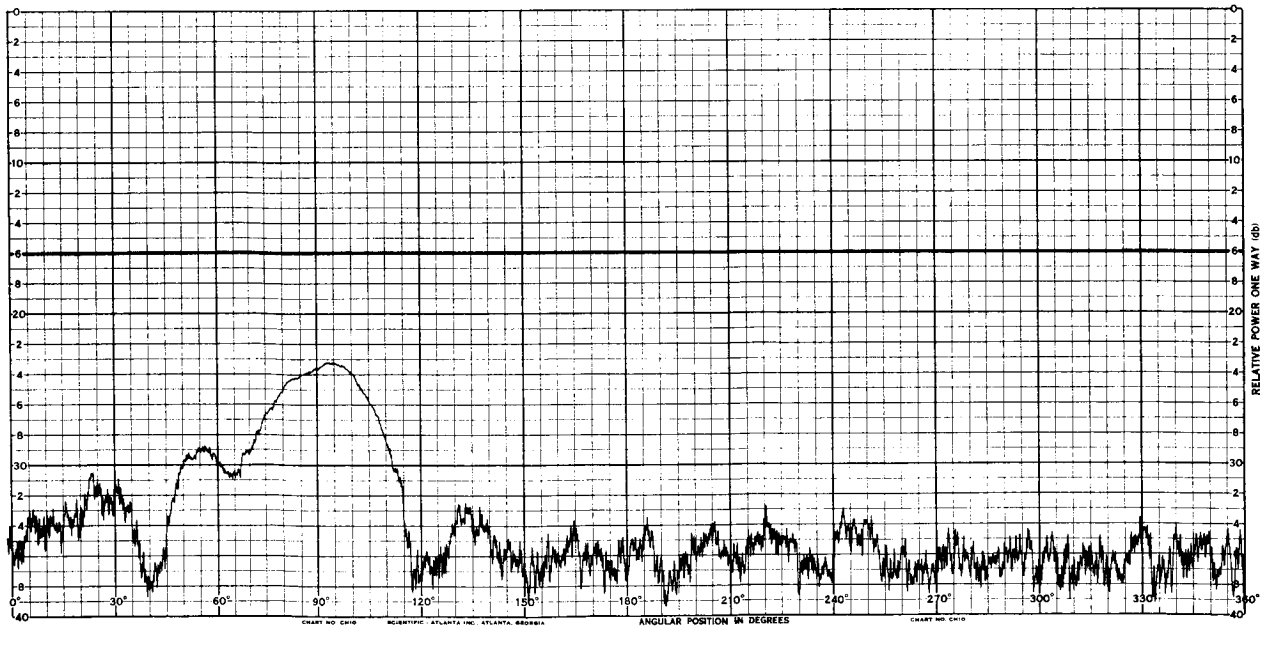


ANTENNA RADIATION PATTERN NO. 201-69

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

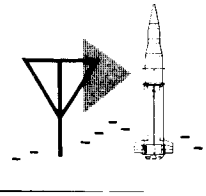
SA-5 ALTIMETER ANTENNA



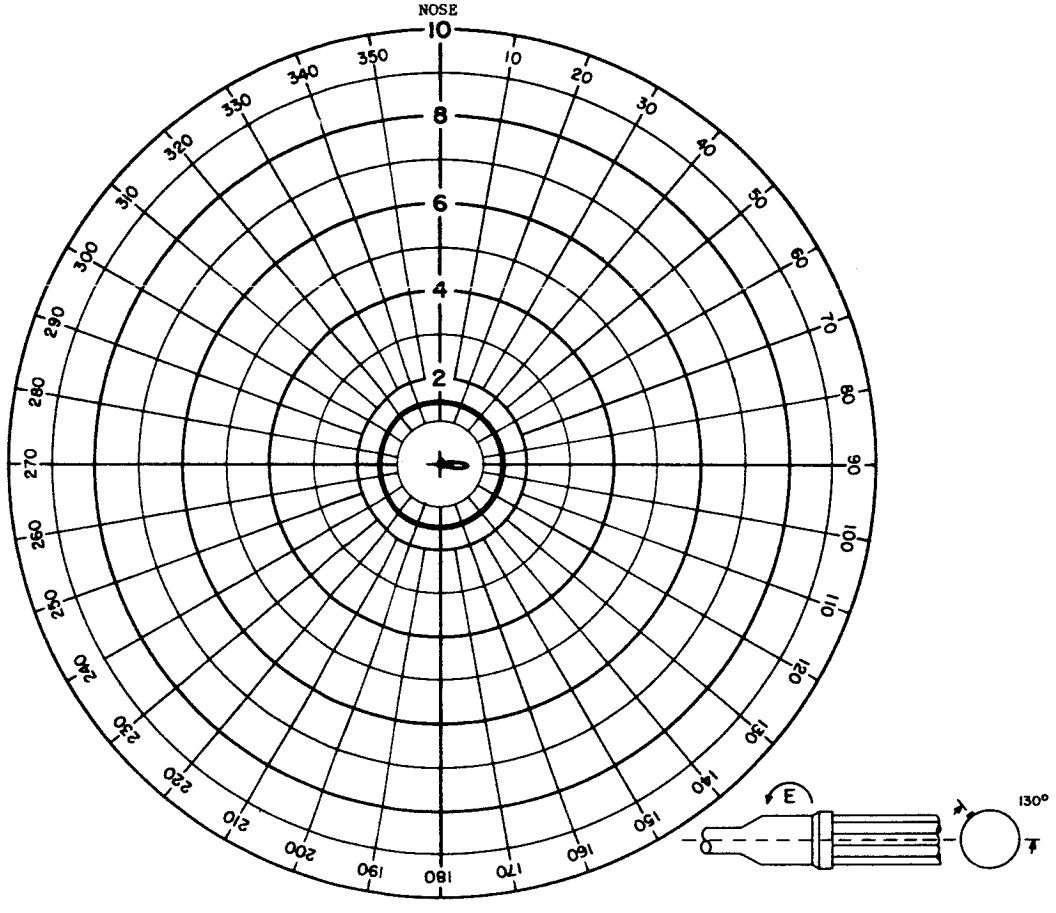


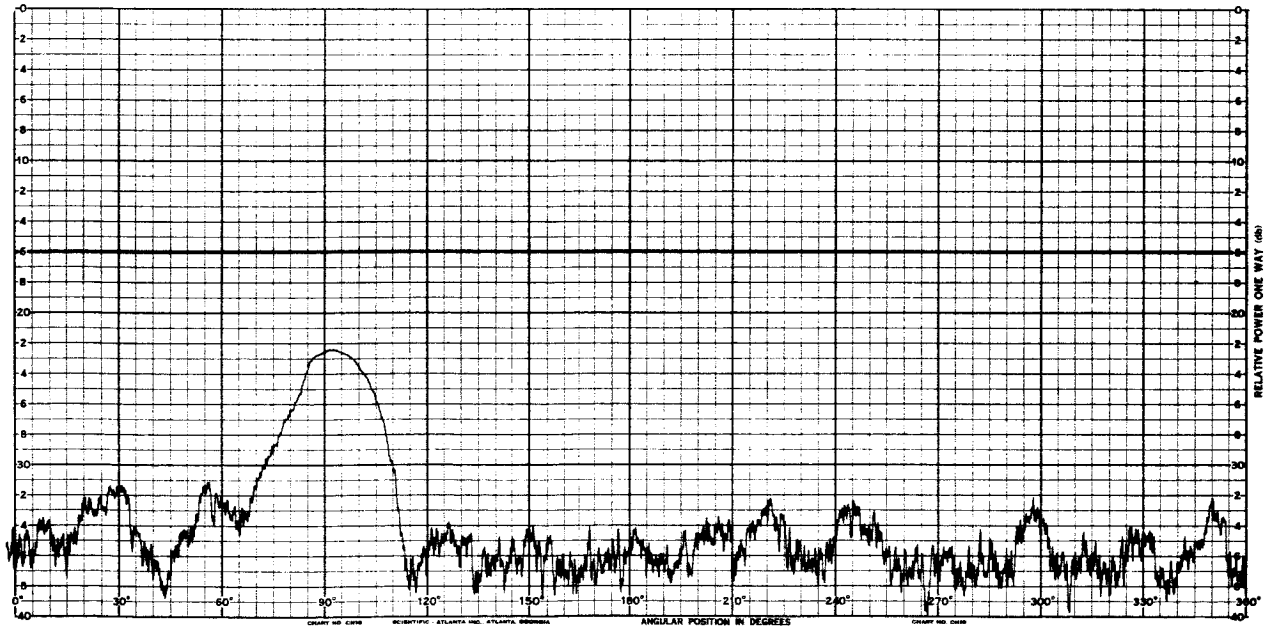
ANTENNA RADIATION PATTERN NO. 201-70

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



SA-5 ALTIMETER ANTENNA

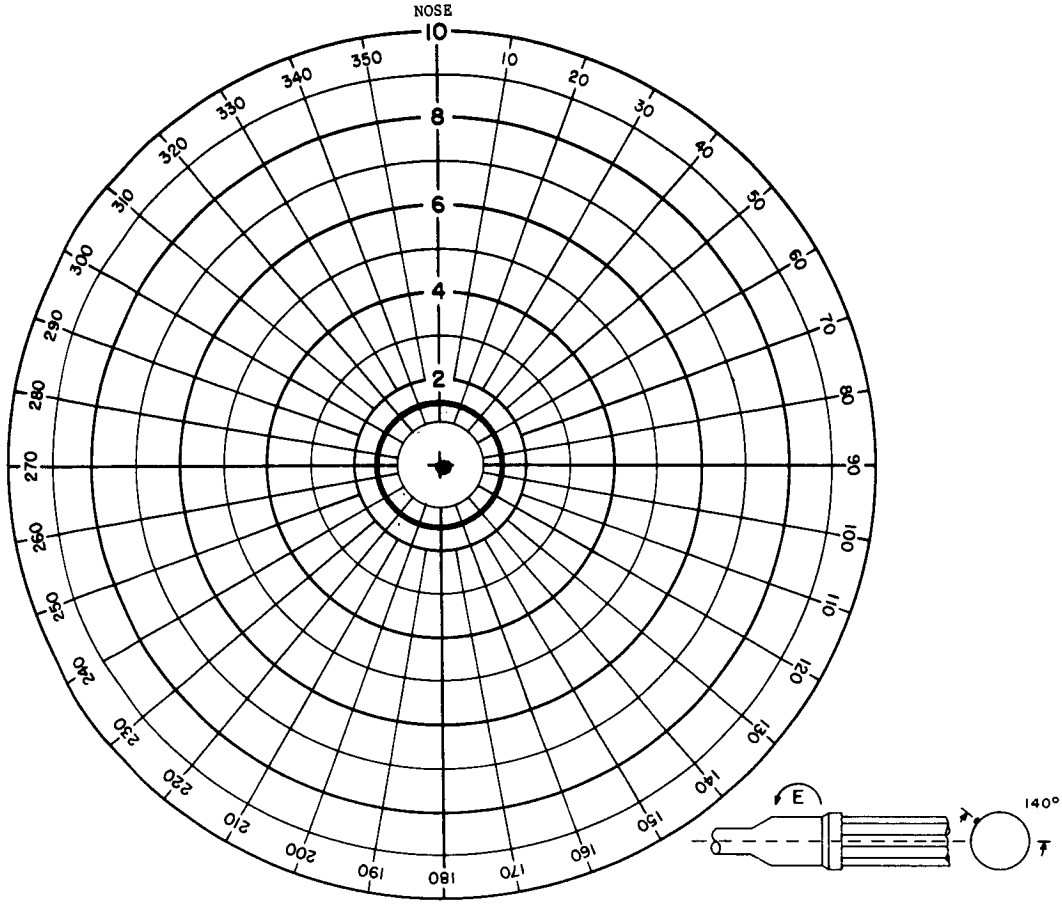


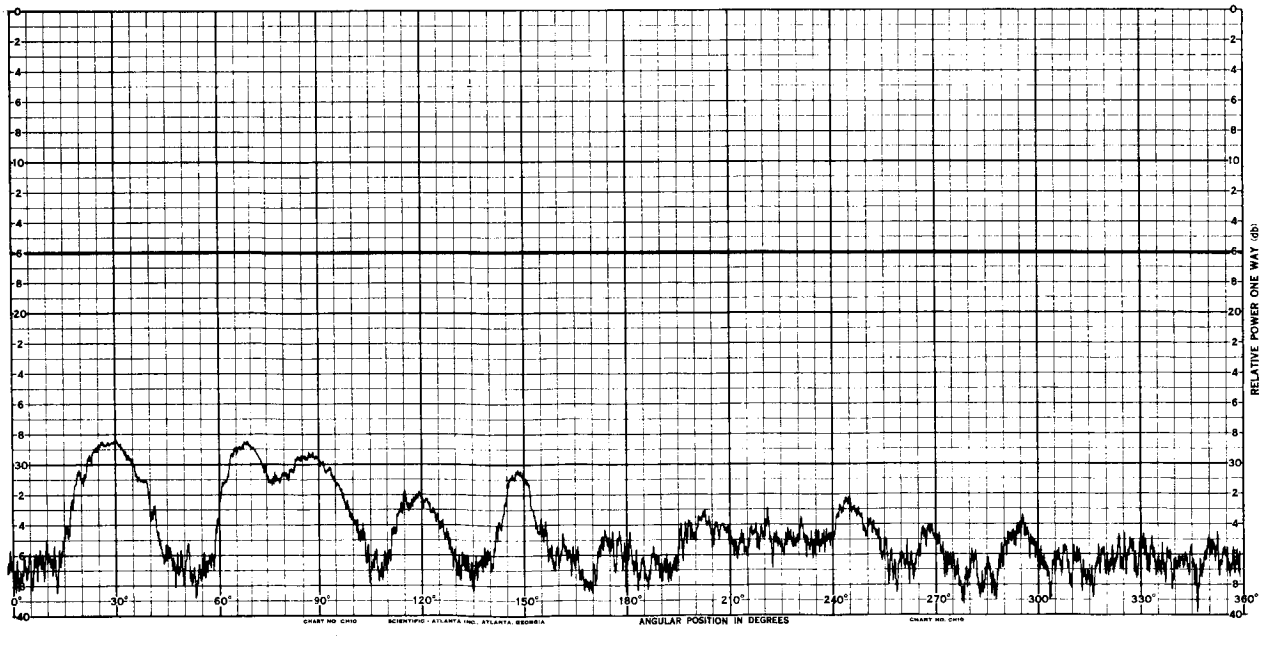


ANTENNA RADIATION PATTERN NO. 201-71

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

SA-5 ALTIMETER ANTENNA

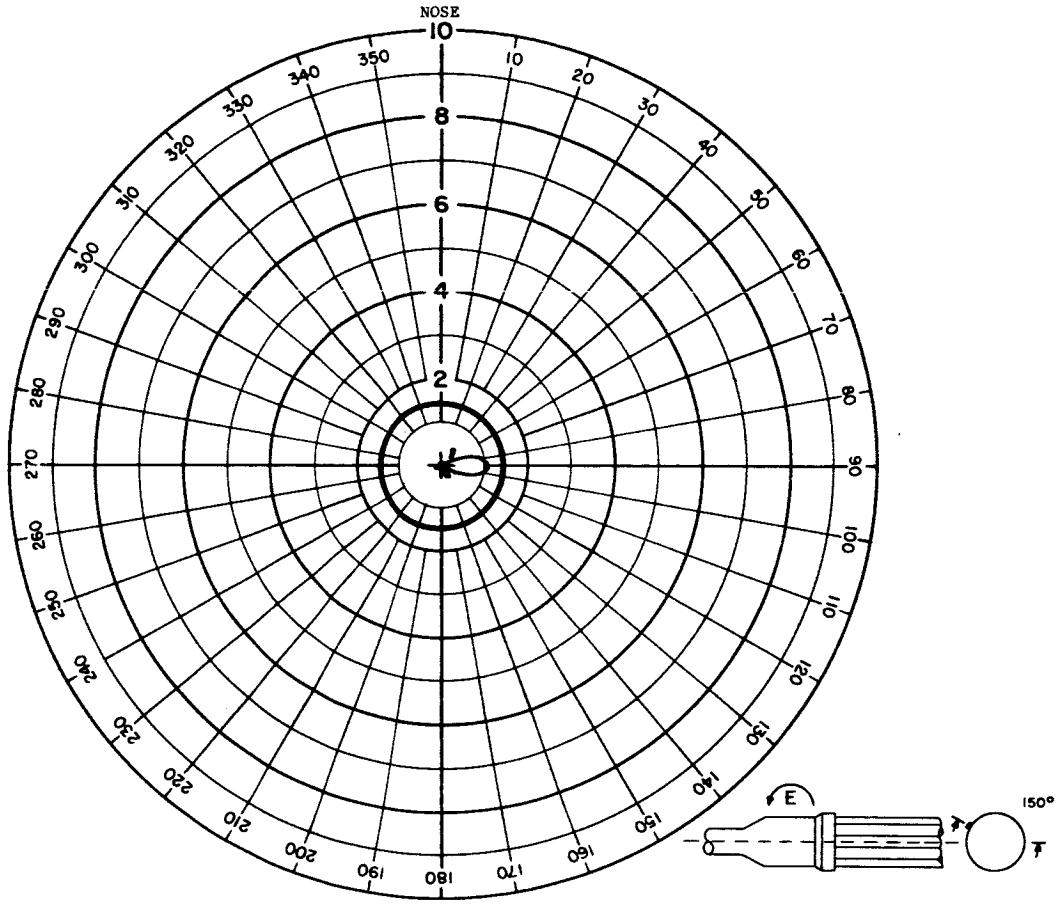


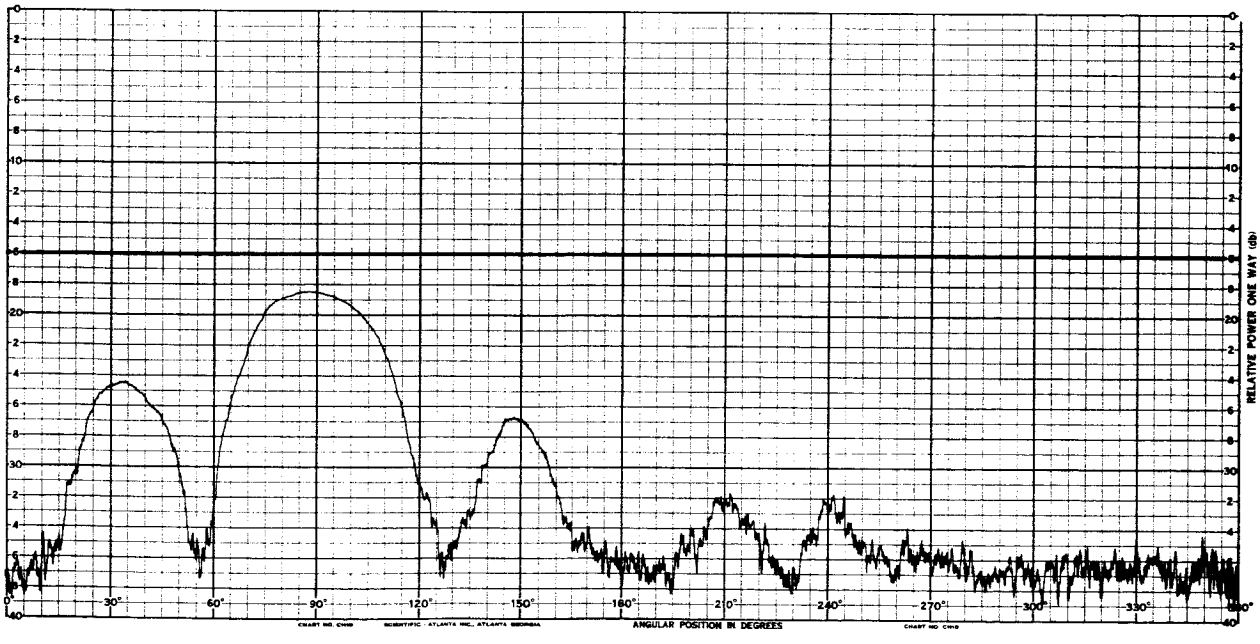


ANTENNA RADIATION PATTERN NO. 201-72

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

SA-5 ALTIMETER ANTENNA

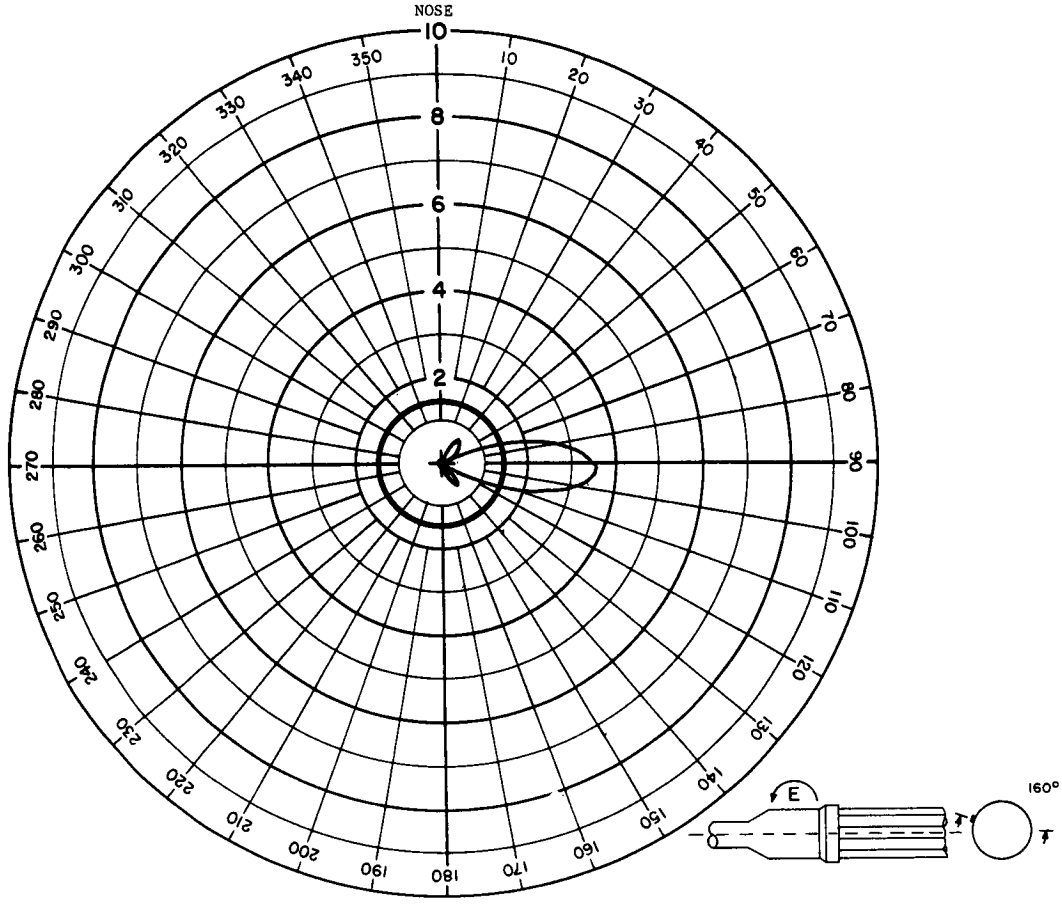


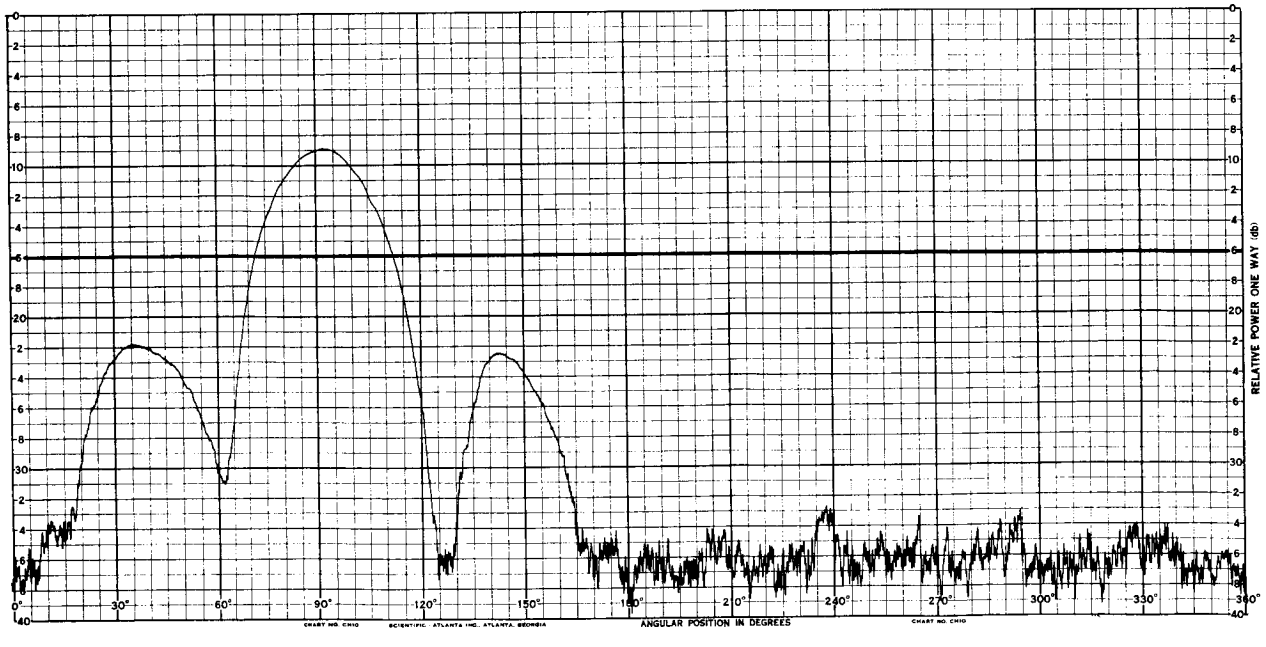


ANTENNA RADIATION PATTERN NO. 201-73

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

SA-5 ALTIMETER ANTENNA

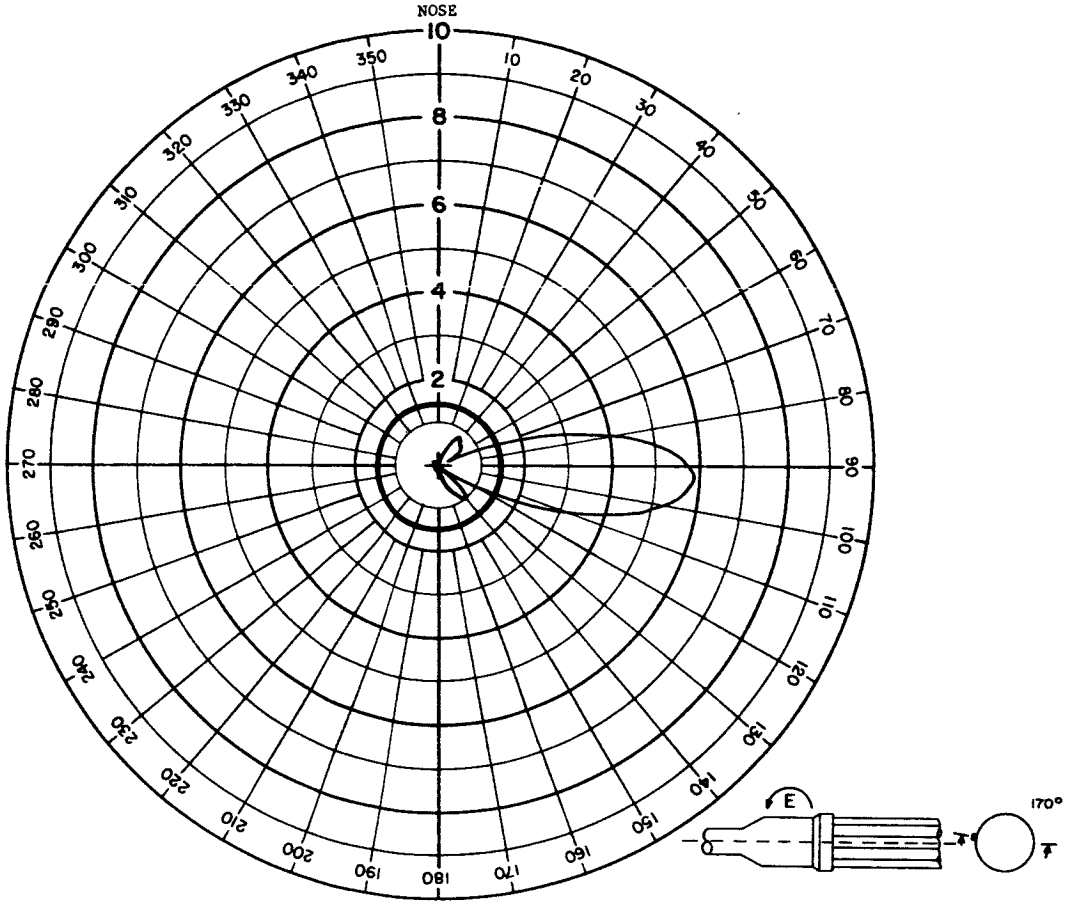


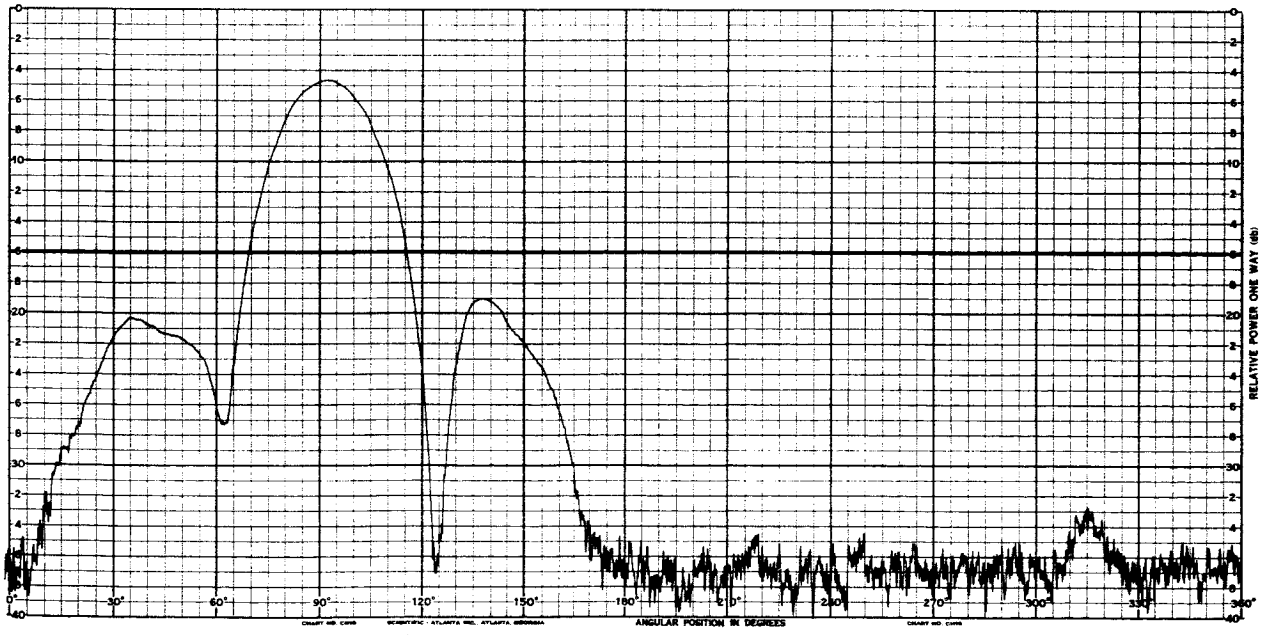


ANTENNA RADIATION PATTERN NO. 201-74

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

SA-5 ALTIMETER ANTENNA

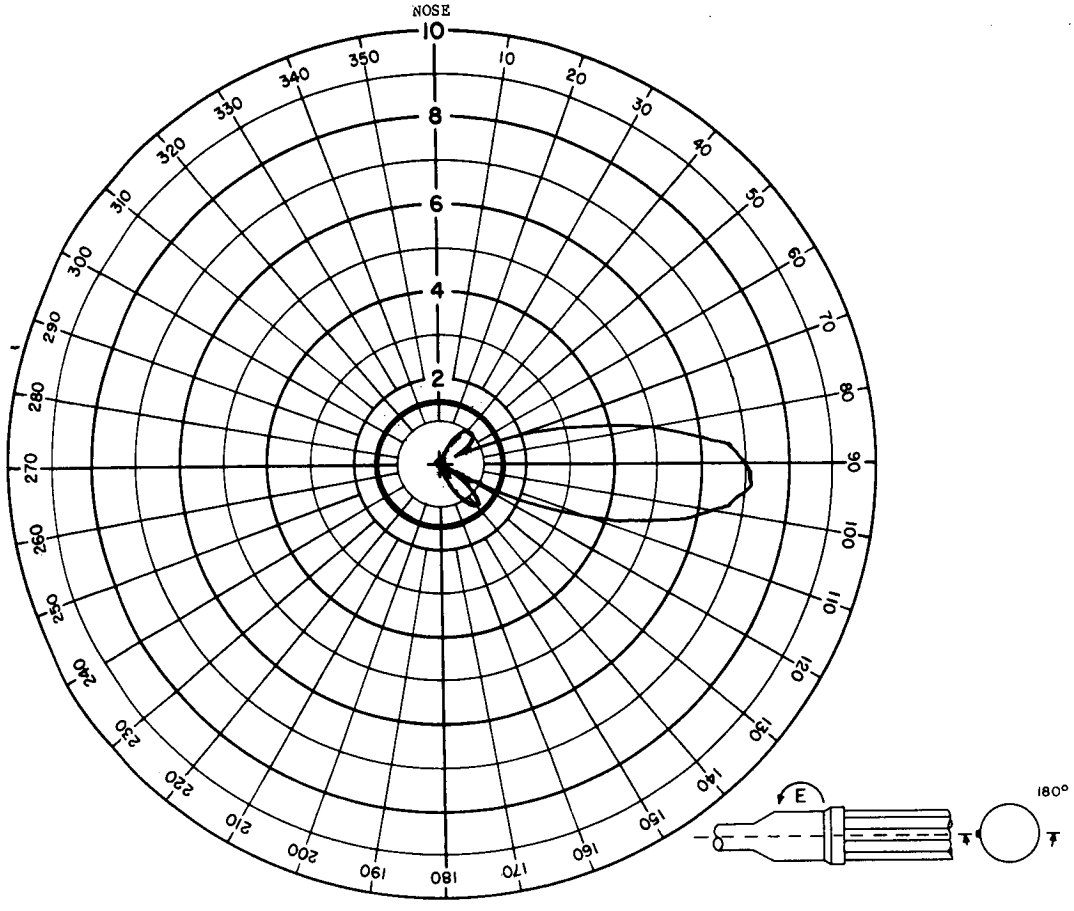


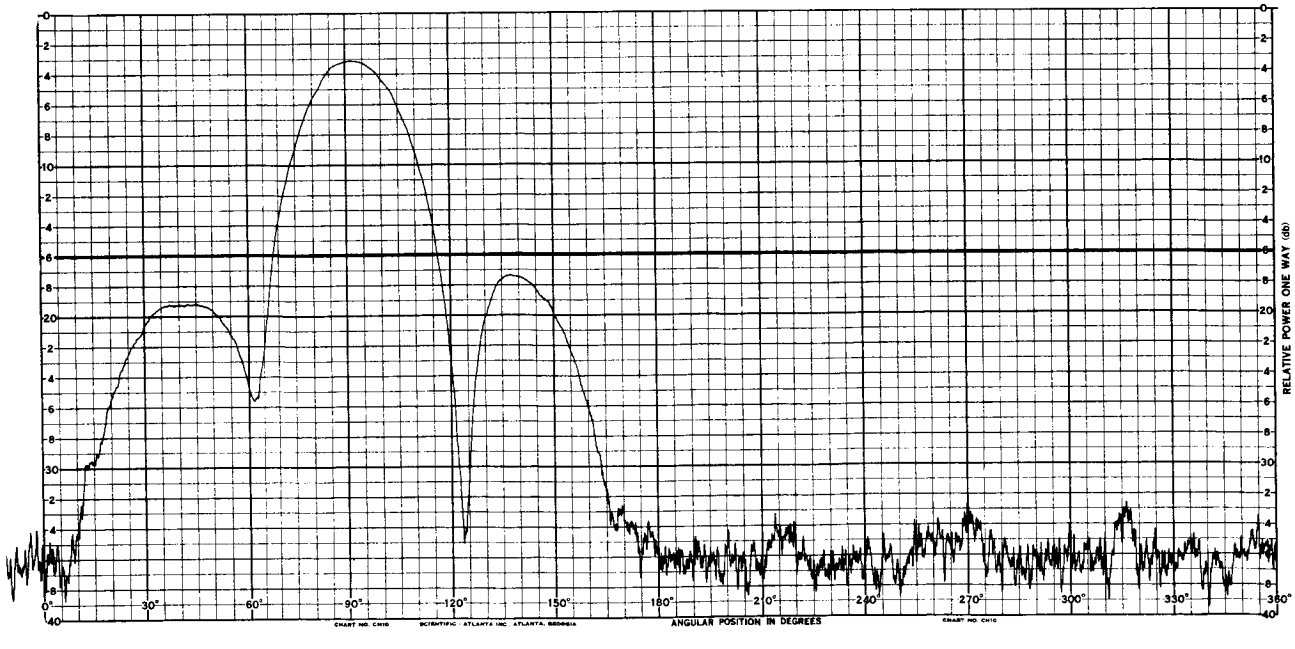


ANTENNA RADIATION PATTERN NO. 201-75

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

SA-5 ALTIMETER ANTENNA

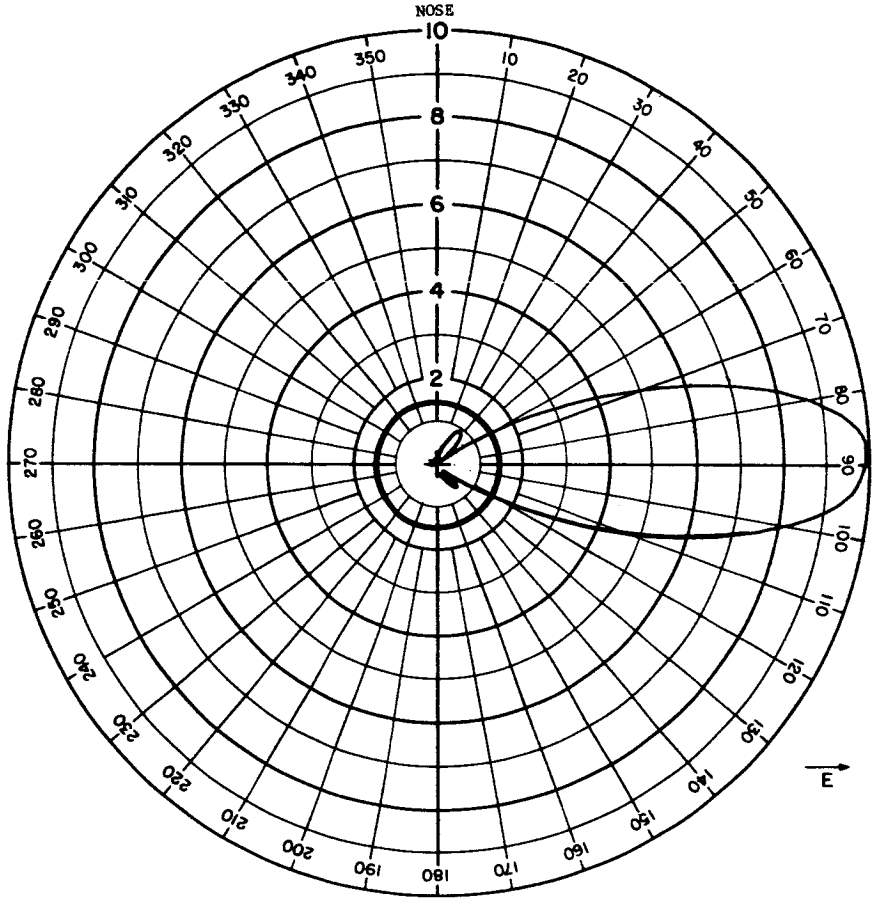


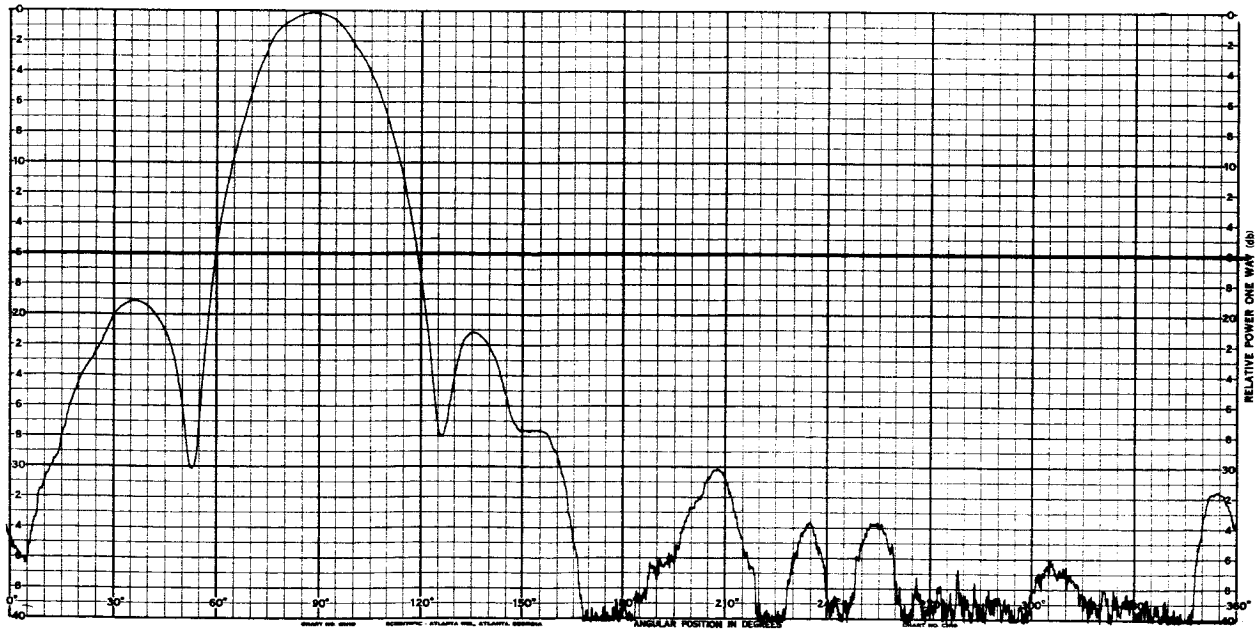


ANTENNA RADIATION PATTERN NO. 201-76

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

SA-5 ALTIMETER ANTENNA

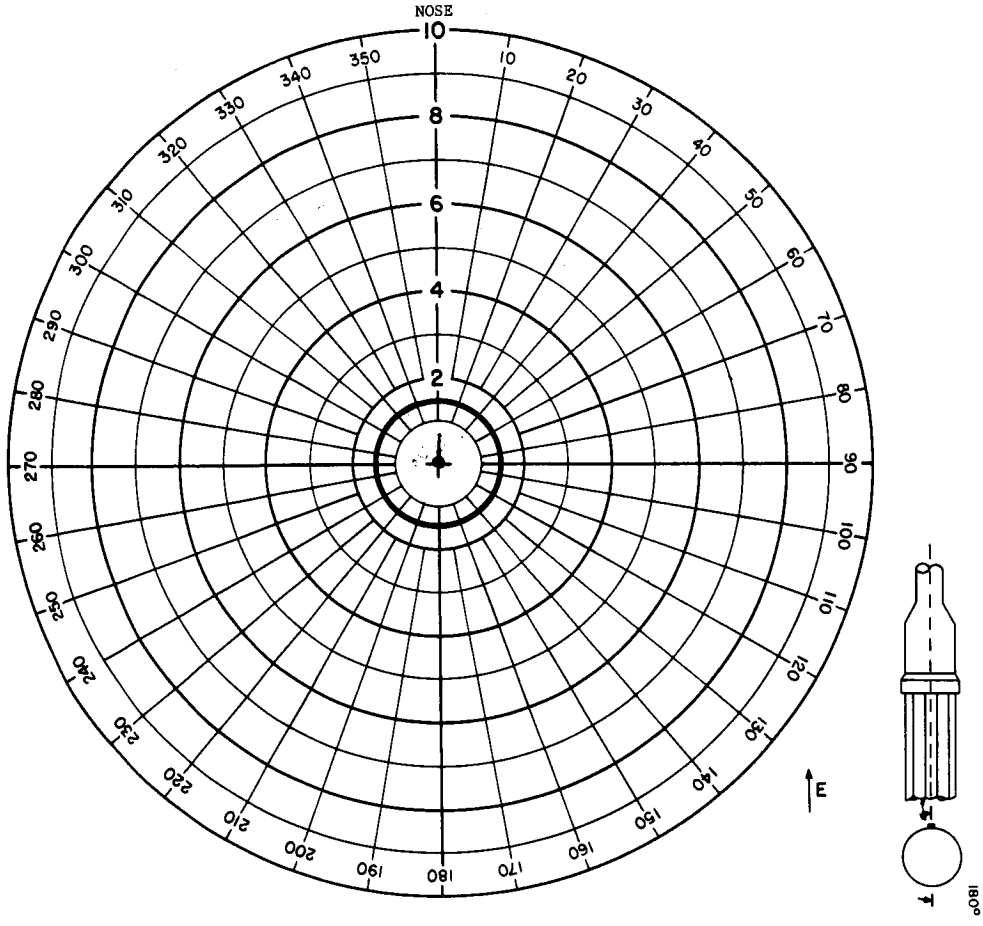


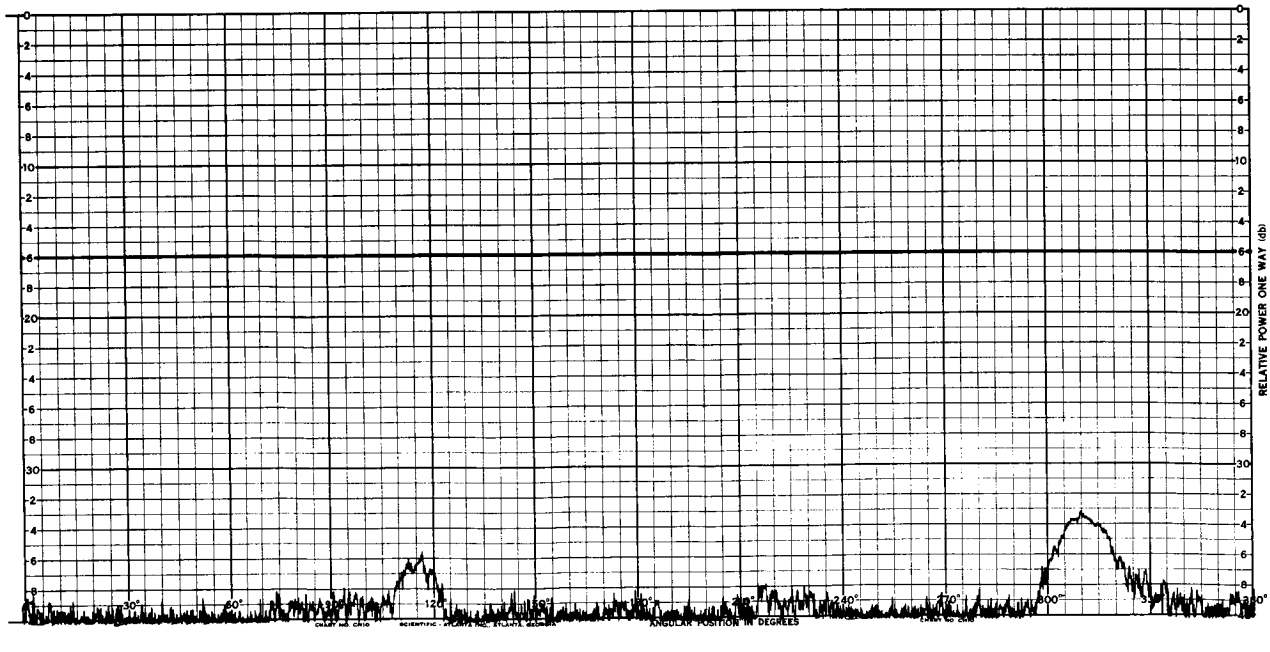


ANTENNA RADIATION PATTERN NO. 201-77

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

SA-5 ALTIMETER ANTENNA

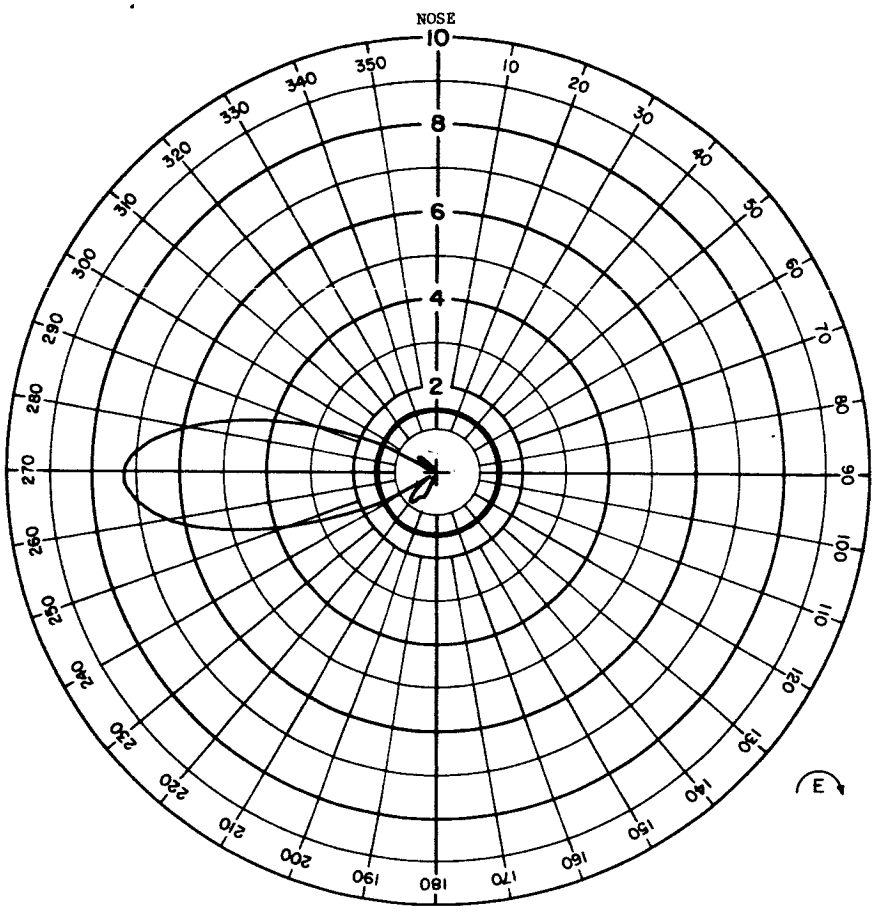


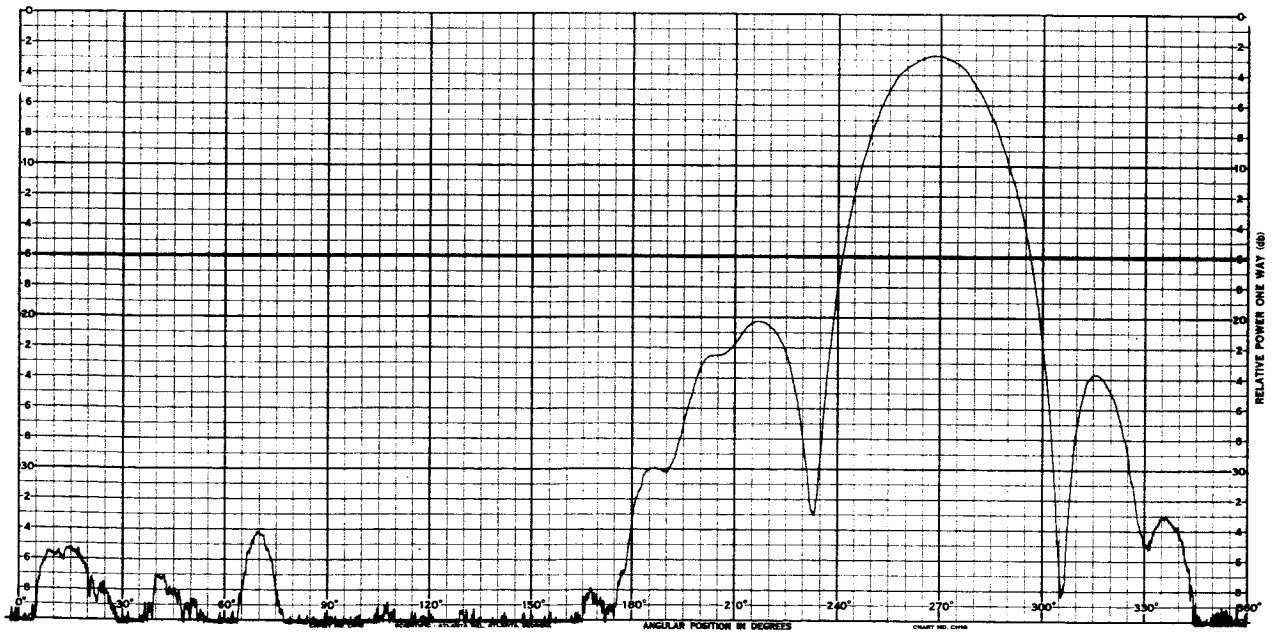


ANTENNA RADIATION PATTERN NO. 201-78

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

SA-5 ALTIMETER ANTENNA

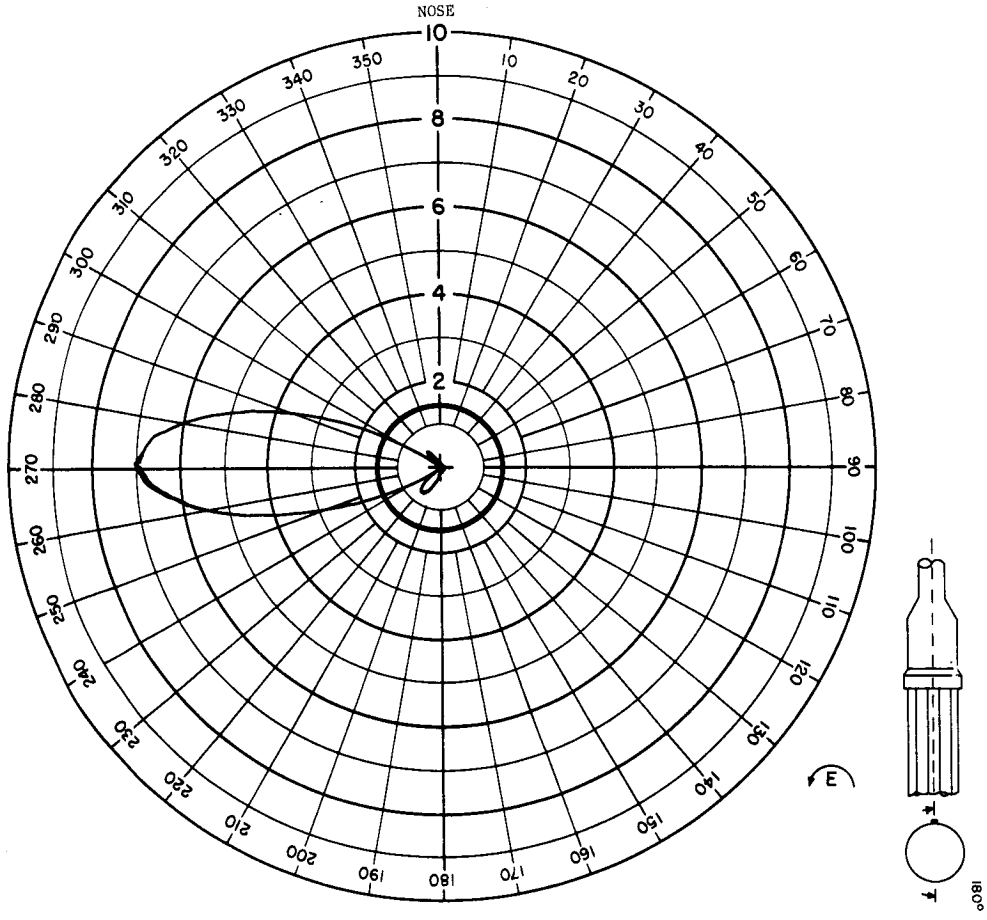


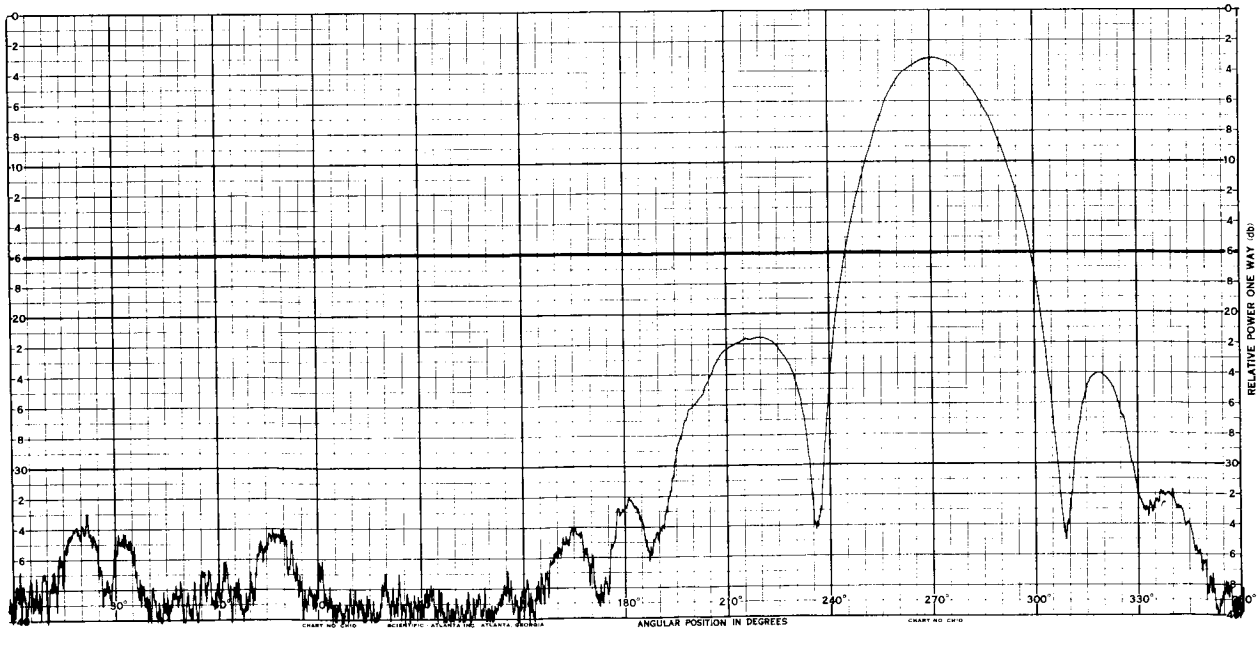


ANTENNA RADIATION PATTERN NO. 201-79

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

SA-5 ALTIMETER ANTENNA



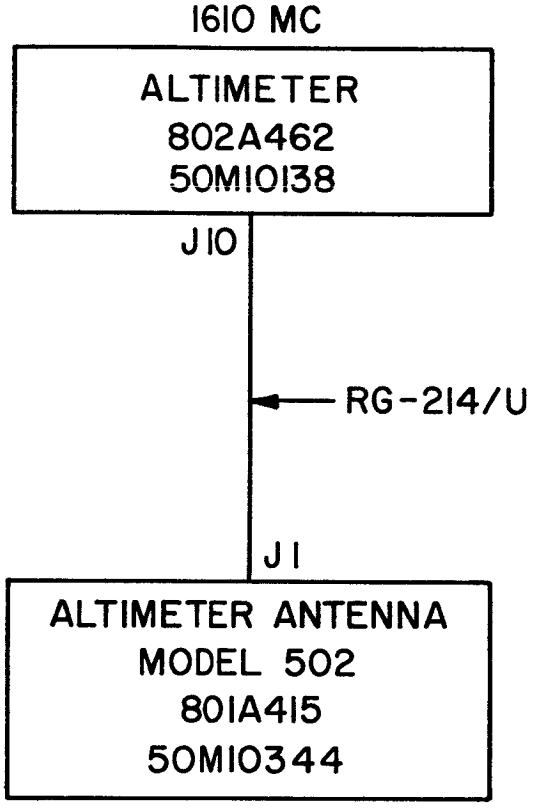


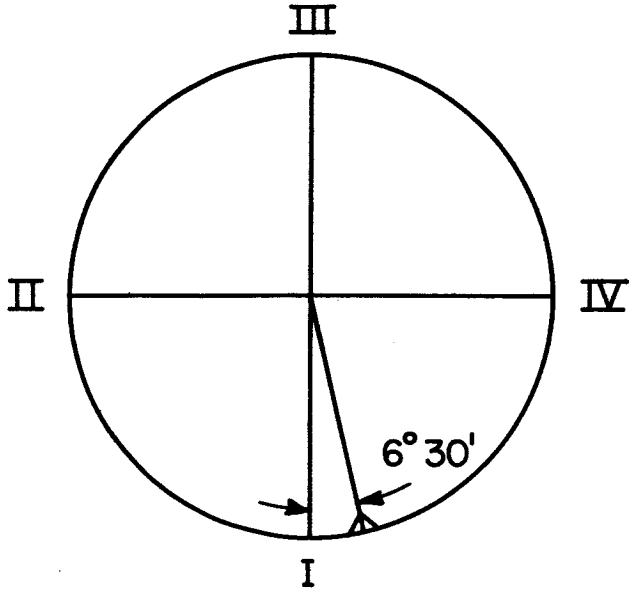
ANTENNA RADIATION PATTERN NO. 201-80

GEORGE C. MARSHALL SPACE FLIGHT CENTER
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TECHNICAL DATA UNIT

SA-5 ALTIMETER ANTENNA

BLOCK DIAGRAM





STA. 1475

SA-5 ALTIMETER ANTENNA

CHECKOUT PROCEDURE

I. RECOMMENDED TEST EQUIPMENT

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

Name	Mfr. & Model No.
Signal Generator	HP-614
Standing Wave Indicator	HP-415B
Slotted Section	HP-805A
Microwave Power Meter	HP-430C
Thermistor Mount	HP-477
Detector Probe	--
Ohmmeter	--
High-Resistance Ohmmeter	--
50-Ohm Resistive Load	--

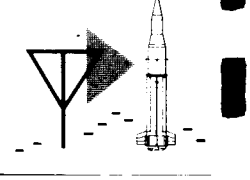
II. FINAL CHECKOUT STEPS

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 larger, 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.



SA-5 ALTIMETER ANTENNA

A. 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 the 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 1.25:1.

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.

B. Antenna

Impedance Match - Check the antenna for satisfactory impedance match at the operating frequency through a length of coaxial cable with an attenuation not to exceed 1 db at the frequency of measurement. Measurements shall be made at the following points, with the equipment shown in figure 1:

1. at the antenna input connector,
2. through the antenna feed cable, and
3. at the output of the transponder.

Calibrate the signal generator with its crystal calibrator. The measured VSWR shall be $\leq$ 1.25:1 at the antenna input connector, $\leq$ 1.25:1 through the antenna feed cable, and $\leq$ 1.25:1 at the output of the transponder.

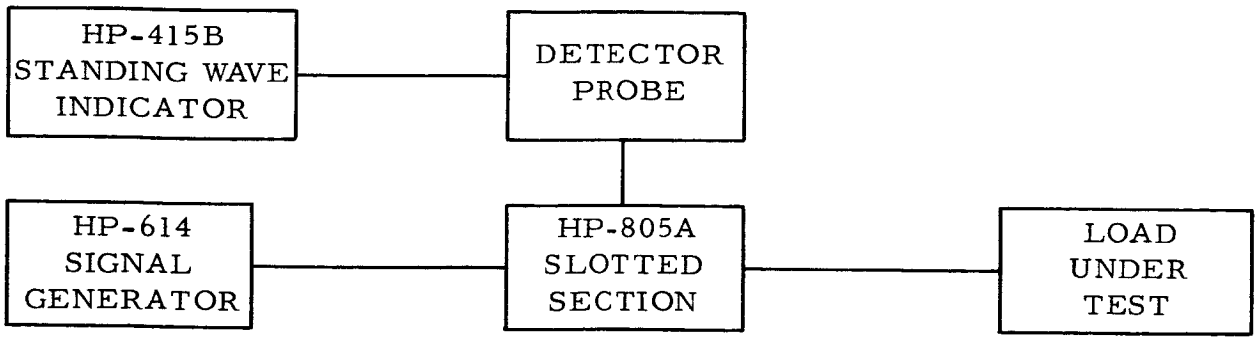


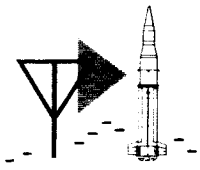
Figure 1.

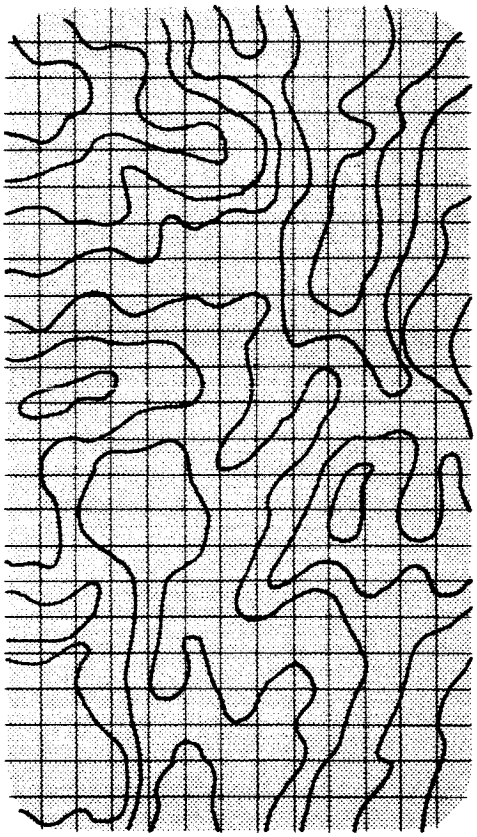
SA-5

ALTIMETER ANTENNA

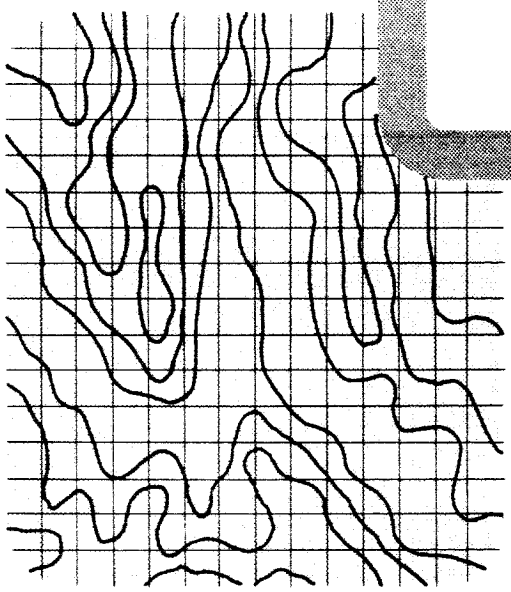
NOTES

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TECHNICAL DATA UNIT





AZUSA ANTENNA SA-5



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

SA-5 AZUSA ANTENNA

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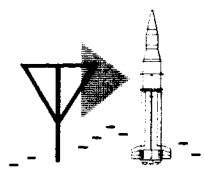
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Explanation of Radiation Patterns	4
Trajectory Geometry	5
Antenna Pattern Contour Plots	6
Description of Pattern and Polarization Symbols and Gain Determination	8
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SA-5

AZUSA ANTENNA

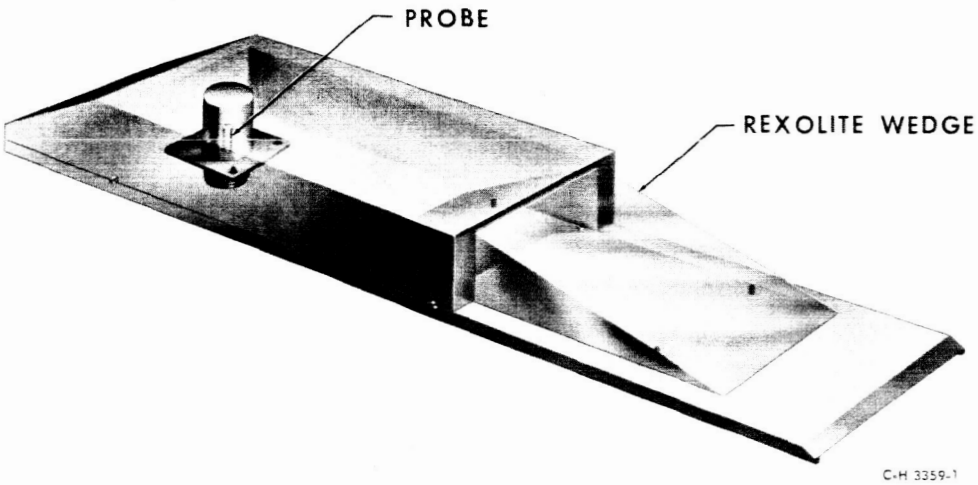
DESCRIPTION

The Azusa antenna, Model 706, is of the surface-wave launcher type and consists of a section of waveguide terminated in a dielectric wedge. This configuration produces a pattern directed toward the tail and provides about 12 db gain at the center of the lobe. The single antenna serves for both transmitting and receiving. It is located to provide an adequate horizontal polarization component throughout the programmed trajectory. The transmission line between transponder and antenna is RG-214/U coaxial cable.



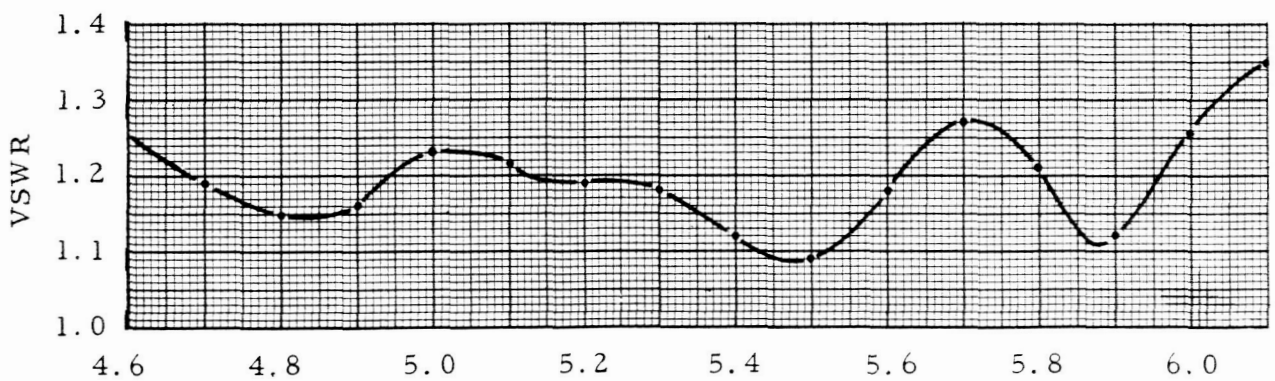
SA-5 AZUSA ANTENNA SPECIFICATIONS

MODEL 706

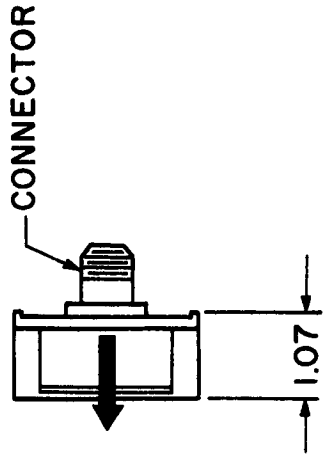


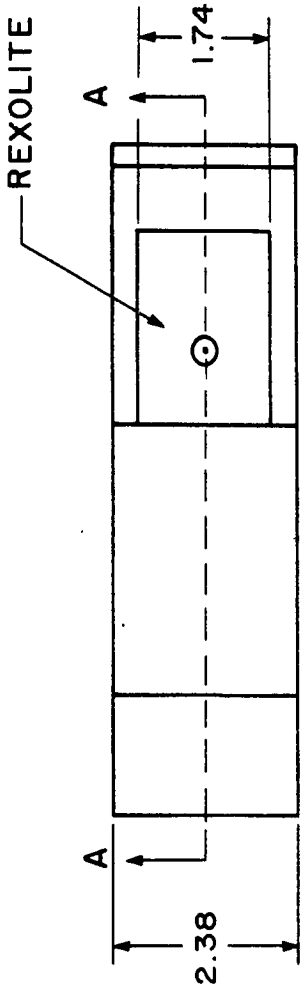
-Location-
Station 1473.596
44° 15' IV→I

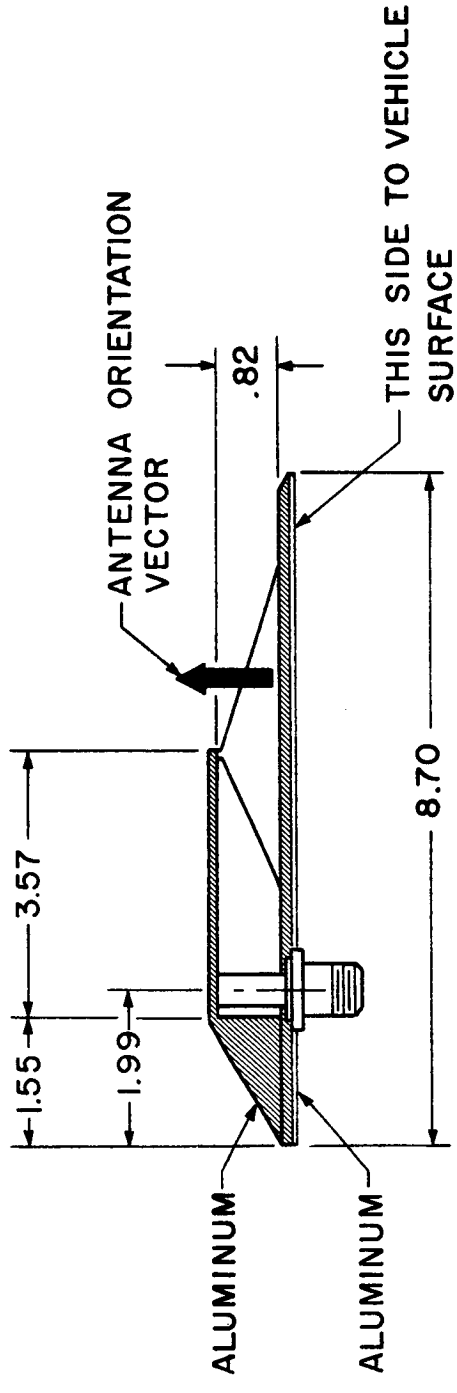
Drawing number - 8961064
Type - surface wave
Frequency range - 4500 to 6000 mc. for 1.5:1 VSWR
Number required - 1
Polarization - linear
Gain - 12 db. (single lobe to rear of vehicle)
Connector type - N
Weight - 0.84 lb.
Dimensions - 8-3/4 by 1-1/8 by 2-3/8 inches



SA-5 AZUSA ANTENNA



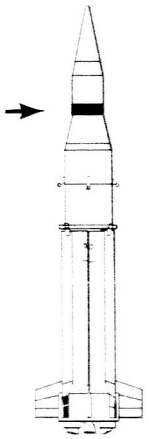


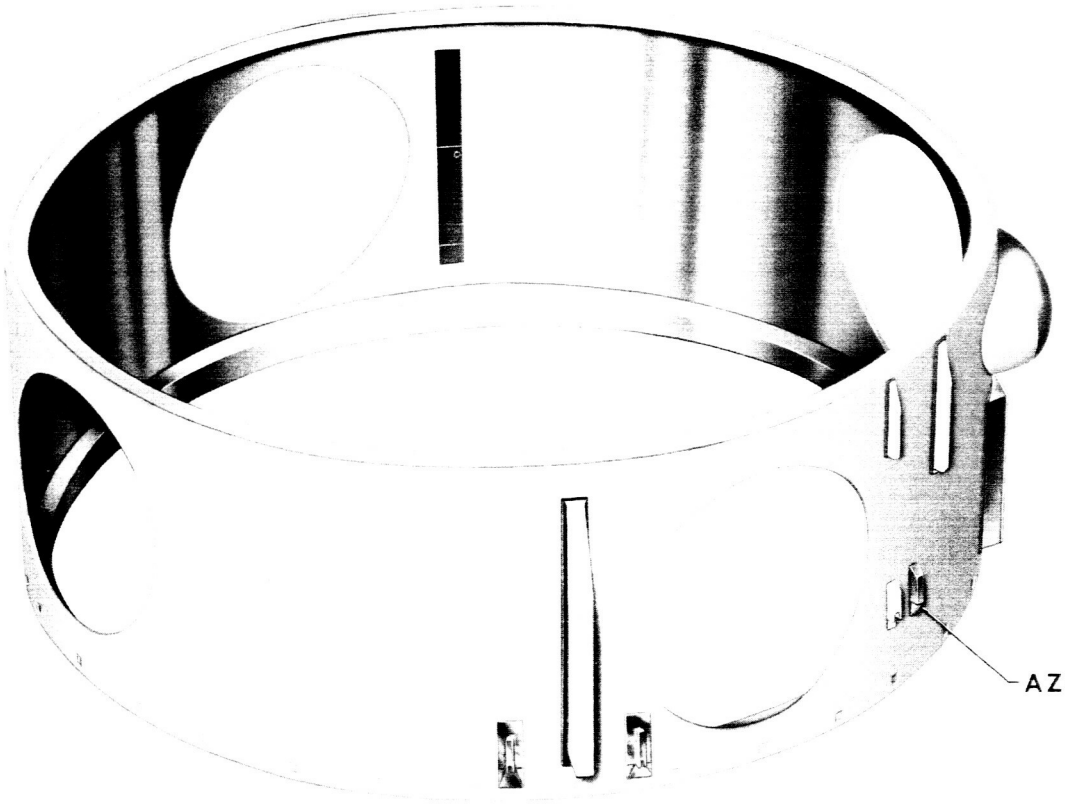


SECT. A-A

DIMENSIONAL SKETCH

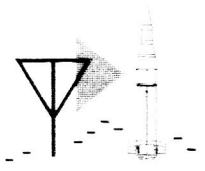
SA-5 AZUSA ANTENNA





LOCATIONAL VIEW

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SA-5 AZUSA ANTENNA

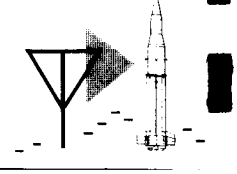
RADIATION PATTERNS

AZUSA ANTENNA

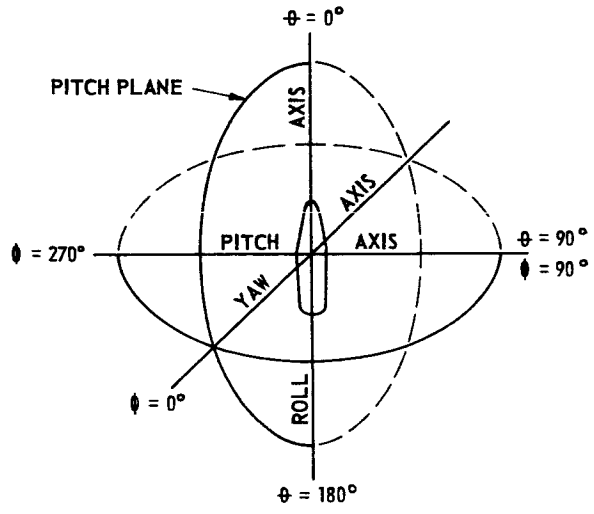
ANTENNA MODEL 706

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.

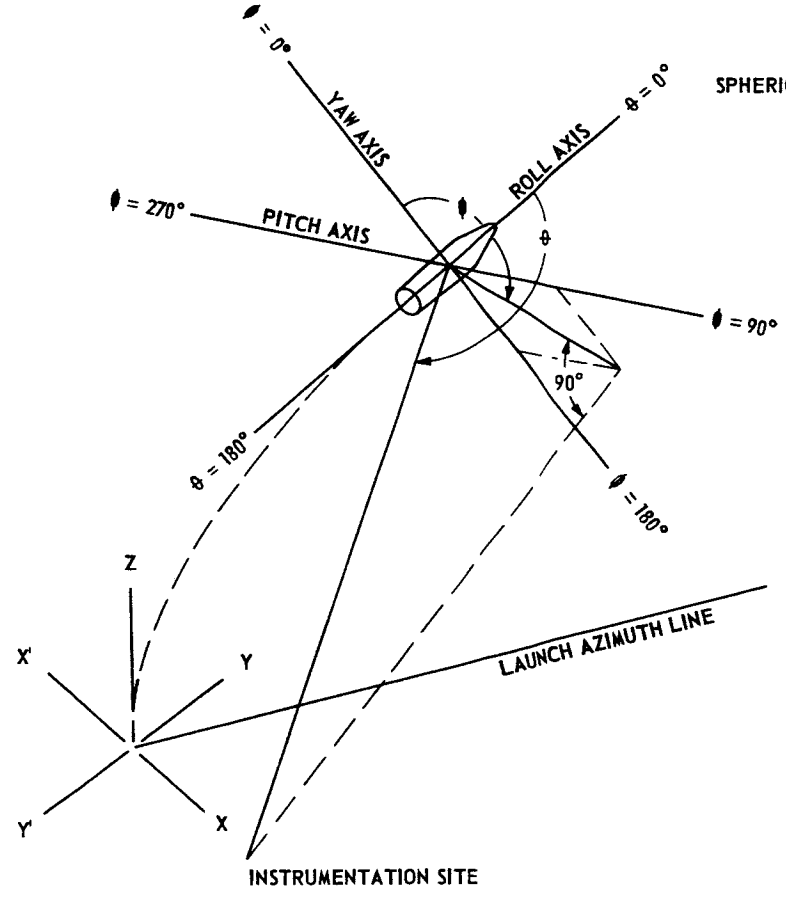
Rectangular and polar patterns are cut by placing the vehicle in the horizontal position with the antenna located at $\phi = 0^\circ$. Patterns are then plotted through 360° of θ in 10° increments of ϕ (great circle cuts). The 10° increments are made through 180° by rotating the vehicle counter-clockwise,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



SA-5 AZUSA ANTENNA



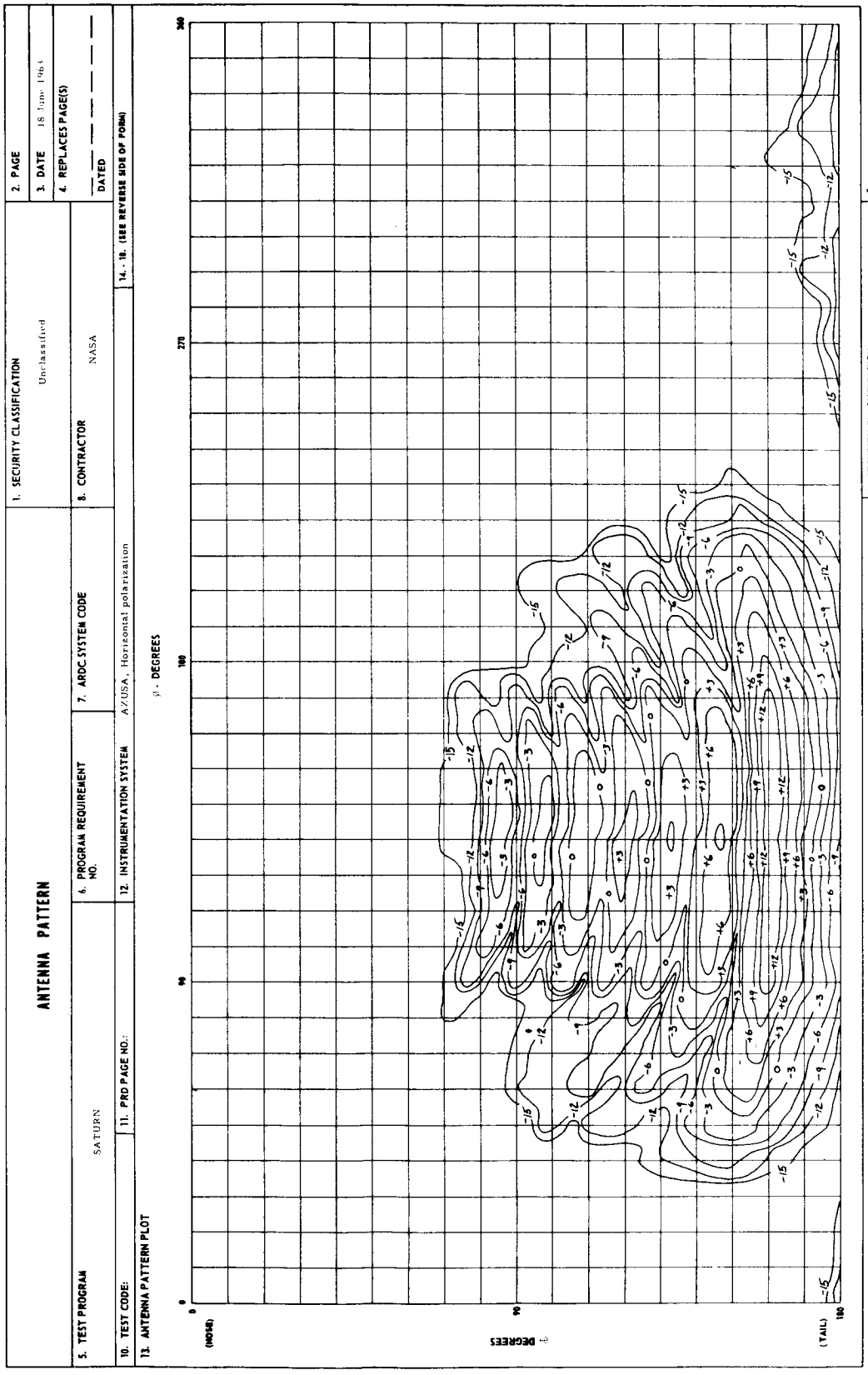
SPHERICAL COORDINATE SYSTEM



INSTRUMENTATION SITE

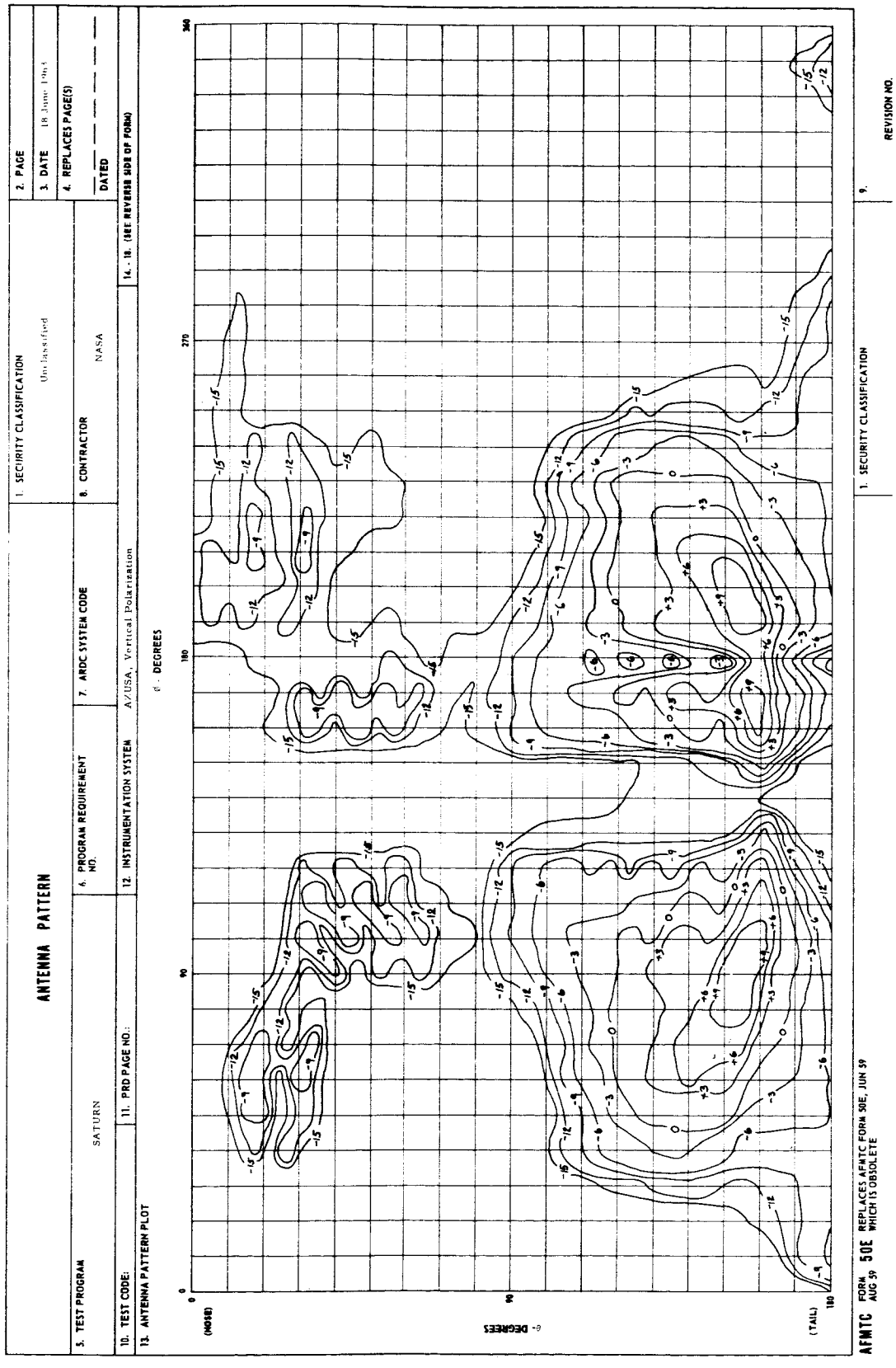
TRAJECTORY GEOMETRY

SA-5 AZUSA ANTENNA



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SA-5 AZUSA ANTENNA

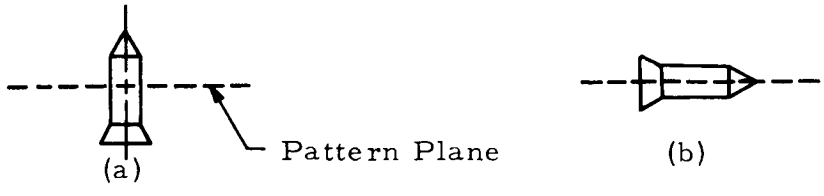


SA-5 AZUSA ANTENNA

DESCRIPTION OF PATTERN AND POLARIZATION SYMBOLS AND GAIN DETERMINATION

PATTERN PLANE

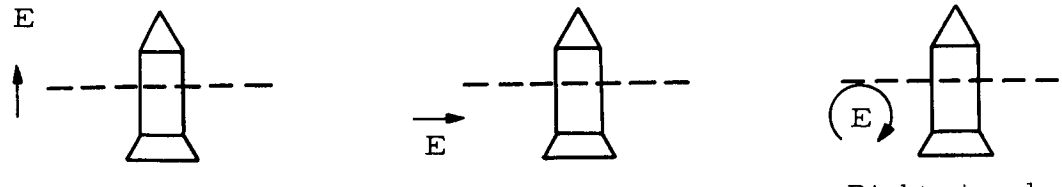
The plane of the pattern is indicated by a broken line passing horizontally through a sketch of the model. This line represents the pattern plane as seen from a point in that plane. The model is then shown in its proper orientation to the line representing the pattern plane.



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

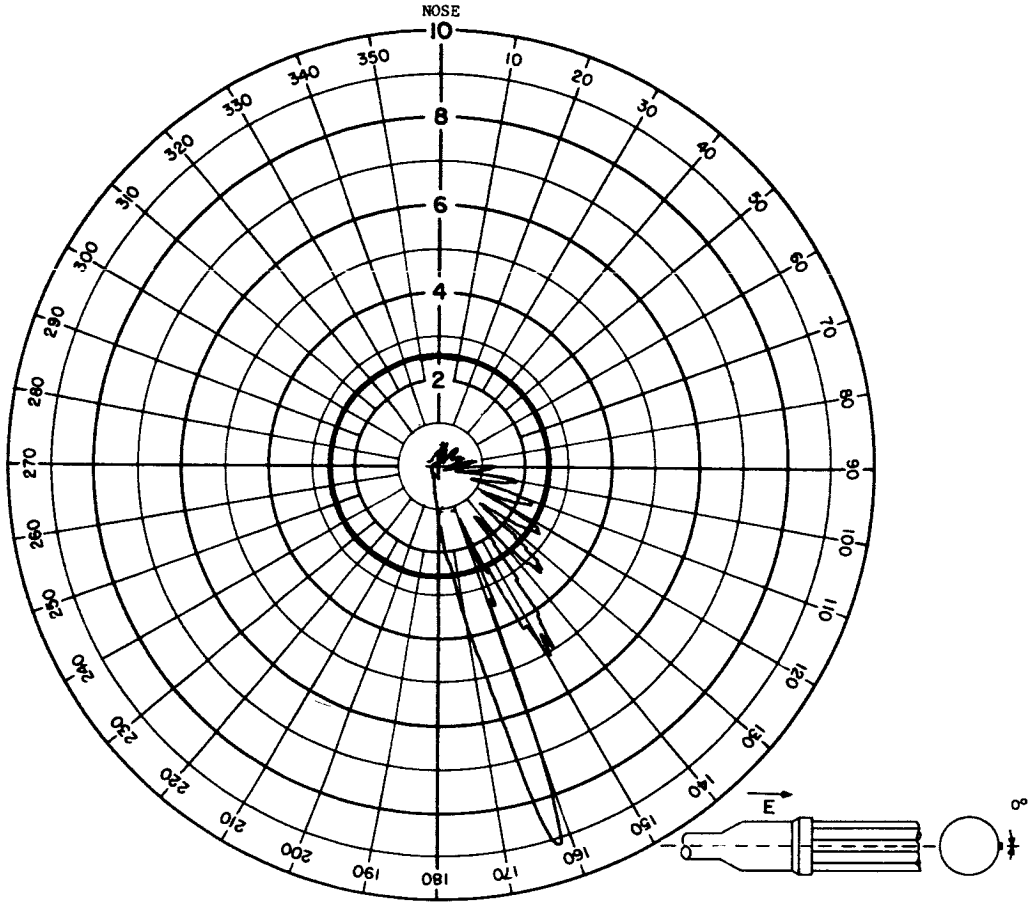
Polarization vector parallel to pattern plane

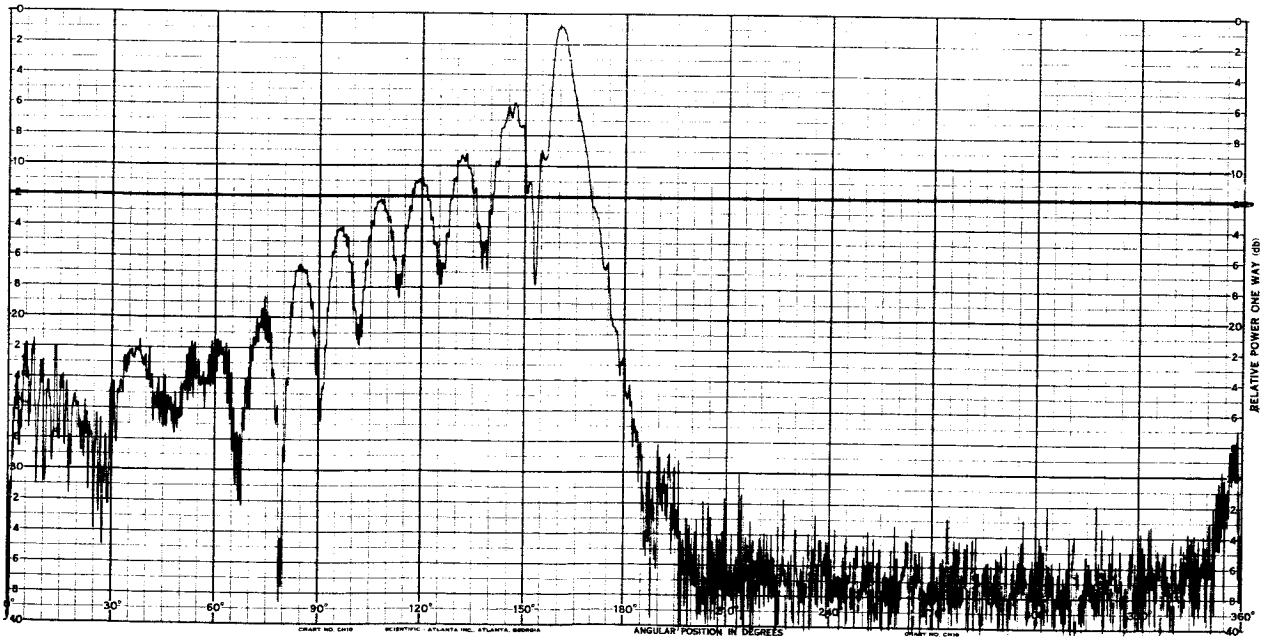
Right circular polarization

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 AZUSA ANTENNA

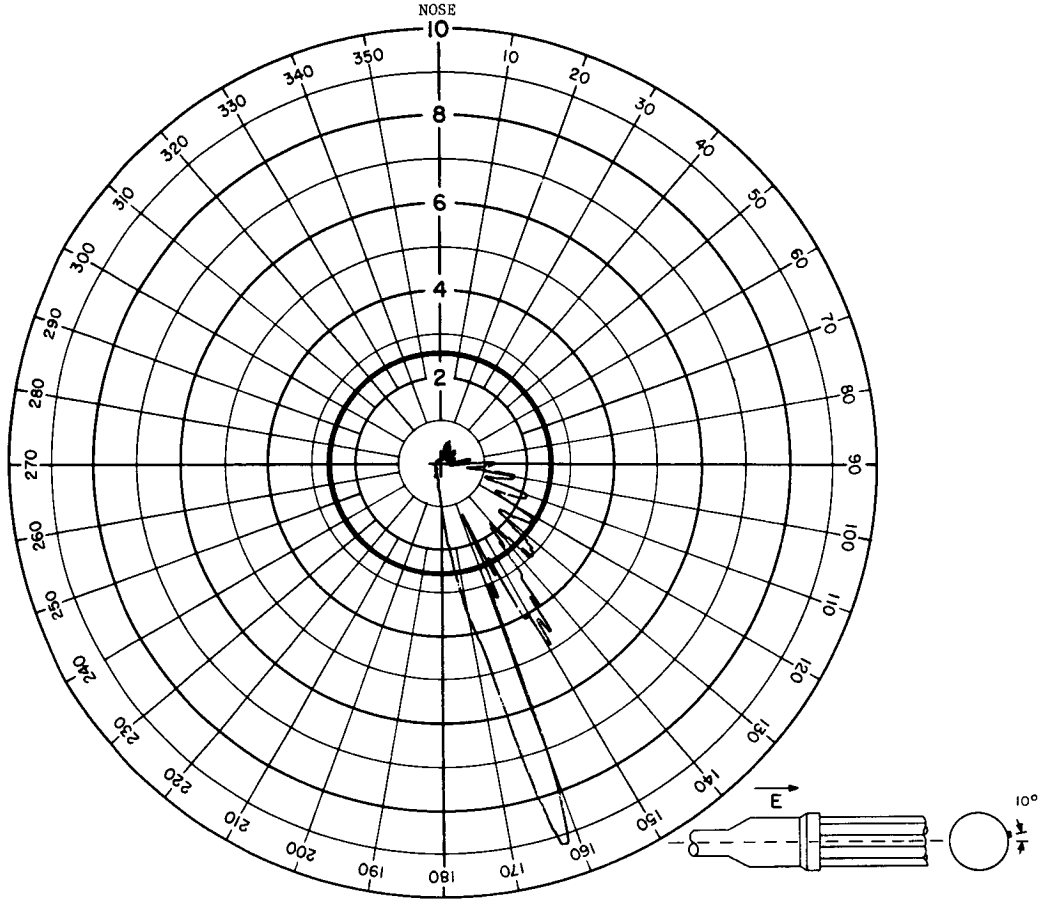


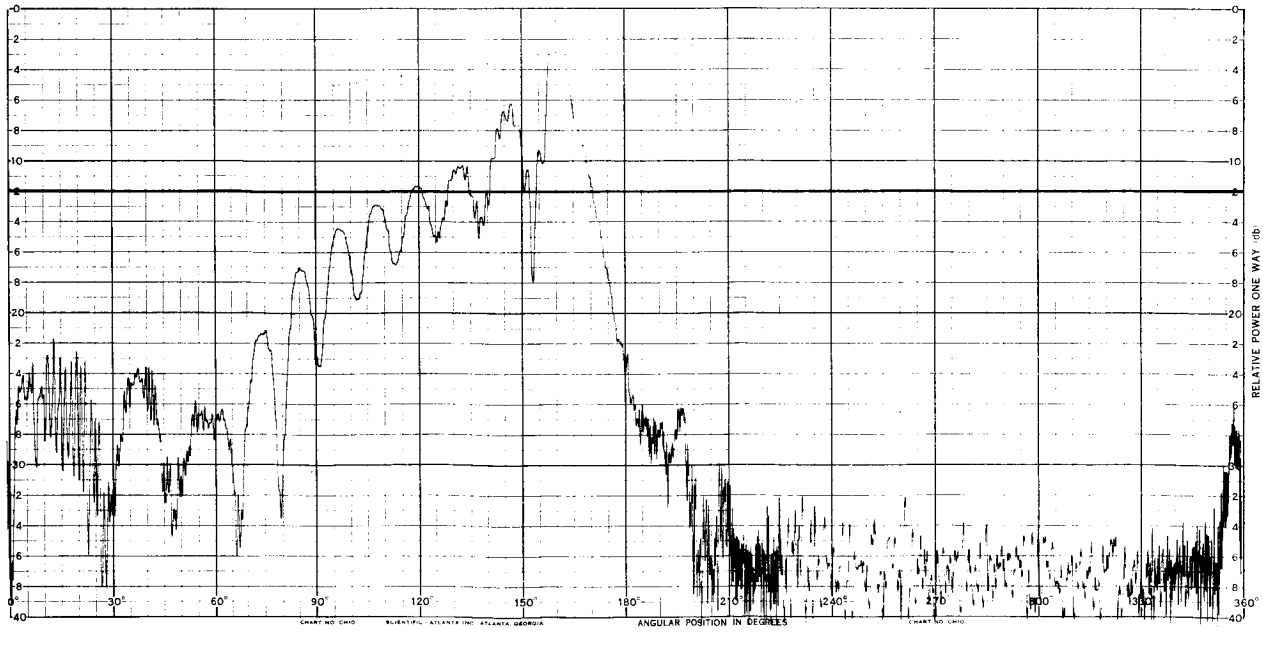


ANTENNA RADIATION PATTERN NO. 214-1

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

SA-5 AZUSA ANTENNA

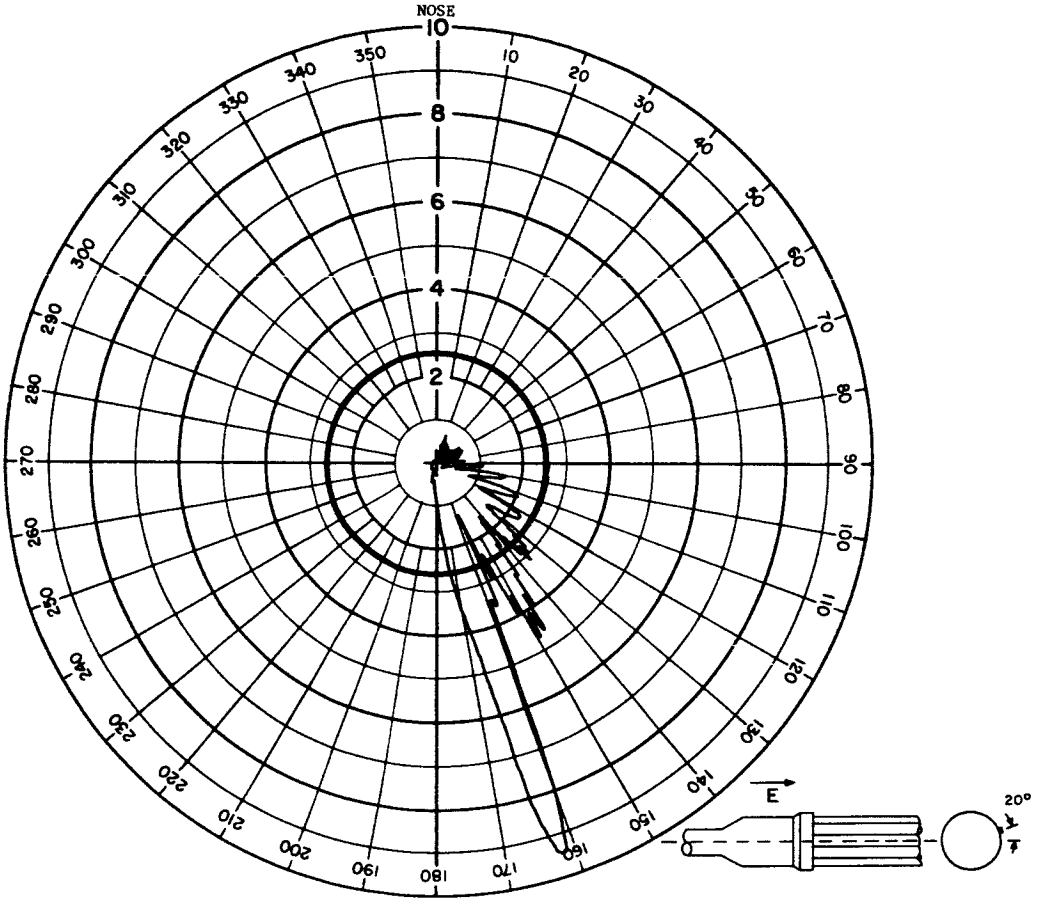


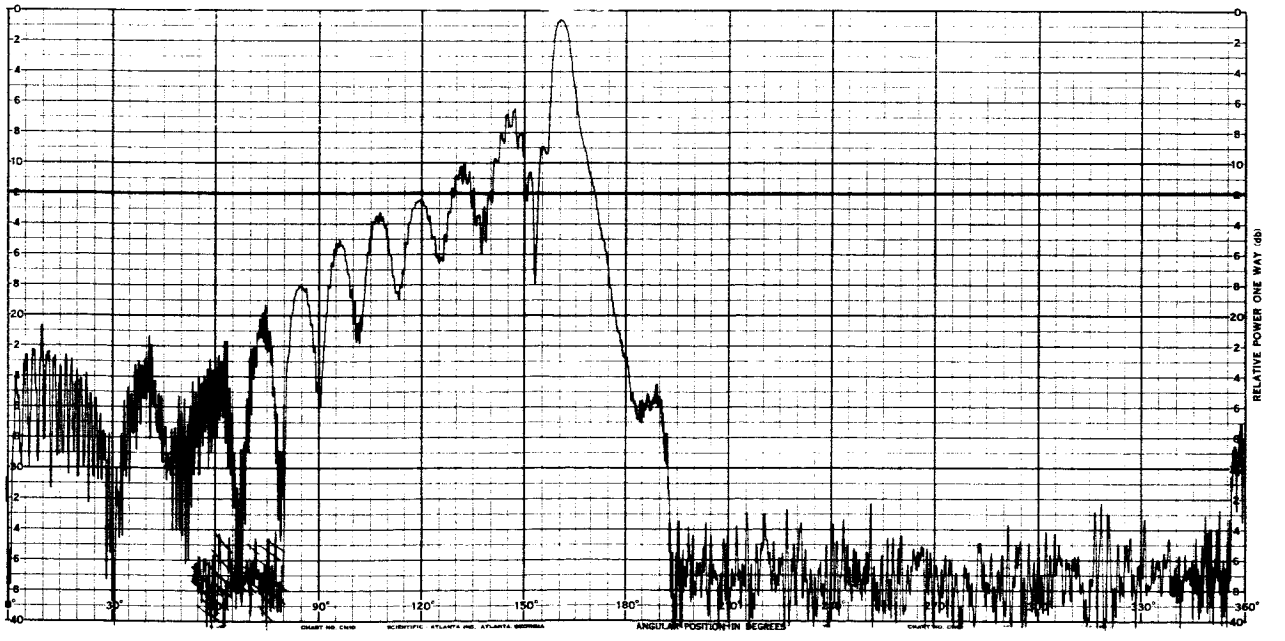


ANTENNA RADIATION PATTERN NO. 214-2

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

SA-5 AZUSA ANTENNA

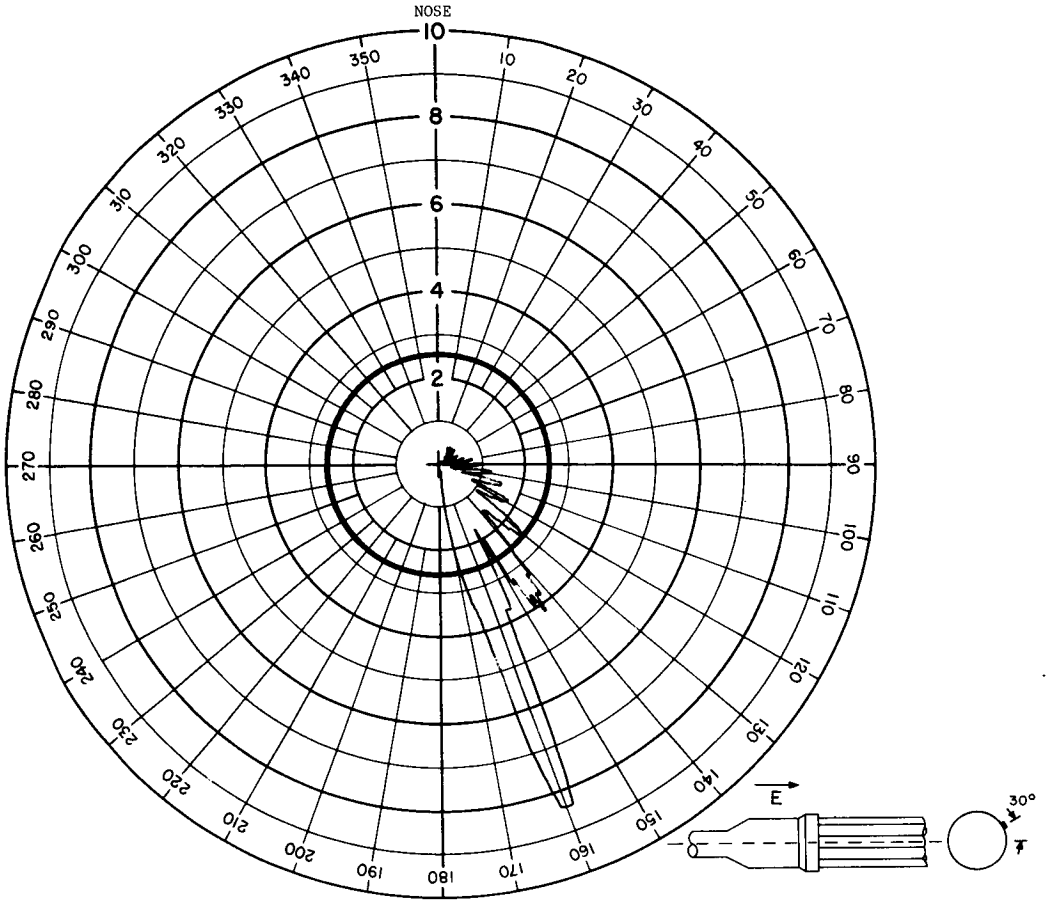


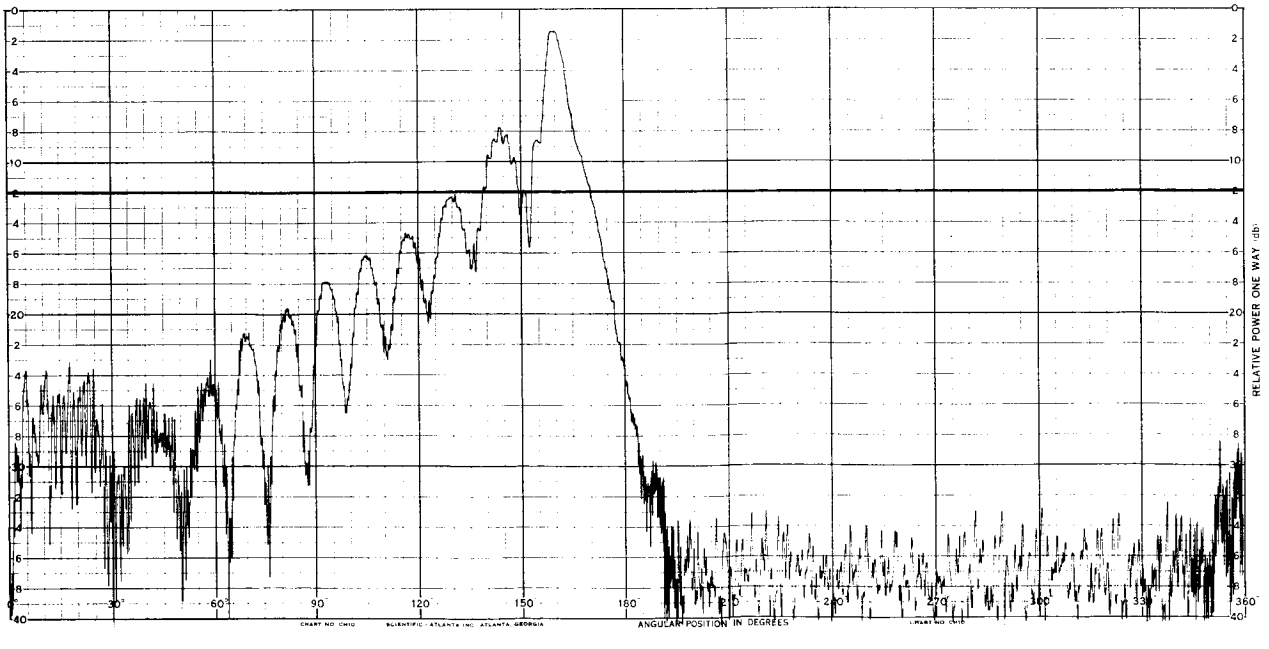


ANTENNA RADIATION PATTERN NO. 214-3

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

SA-5 AZUSA ANTENNA

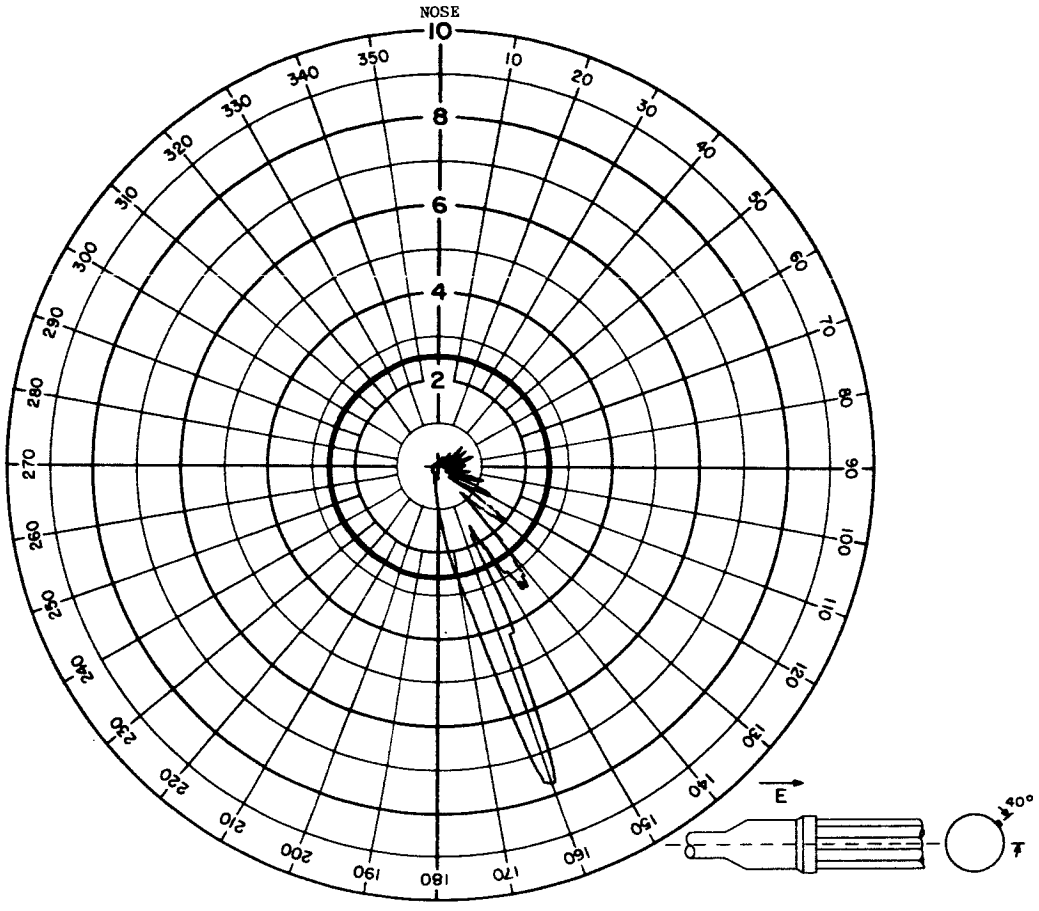


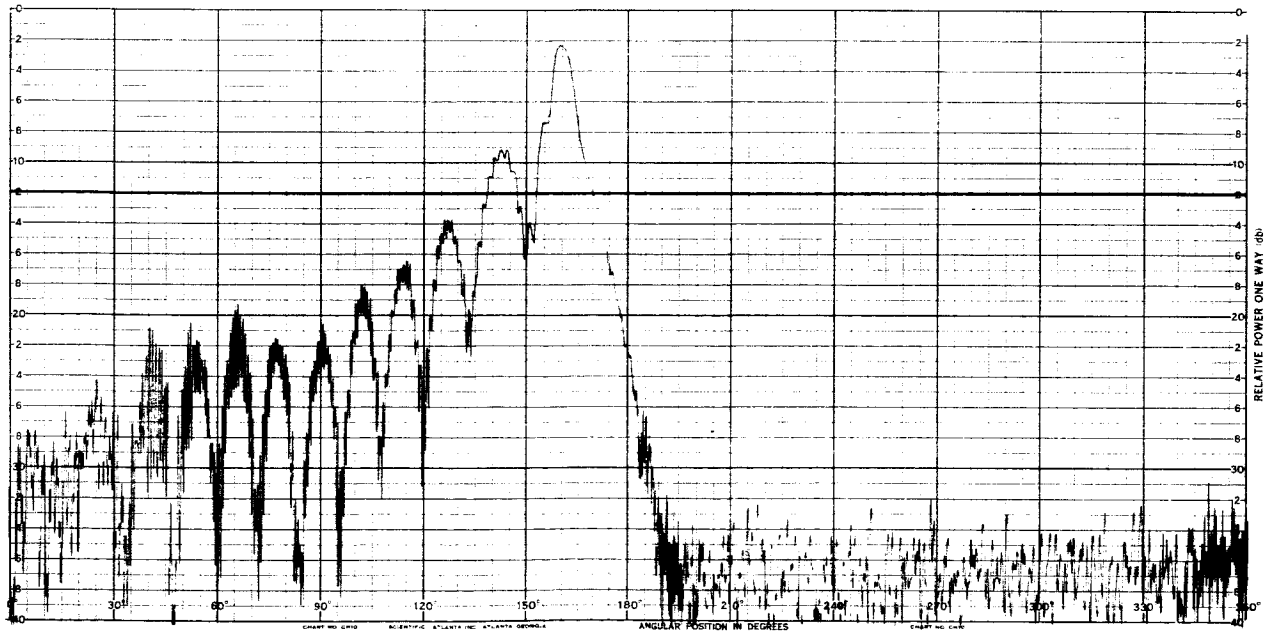


ANTENNA RADIATION PATTERN NO. 214-4

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

SA-5 AZUSA ANTENNA

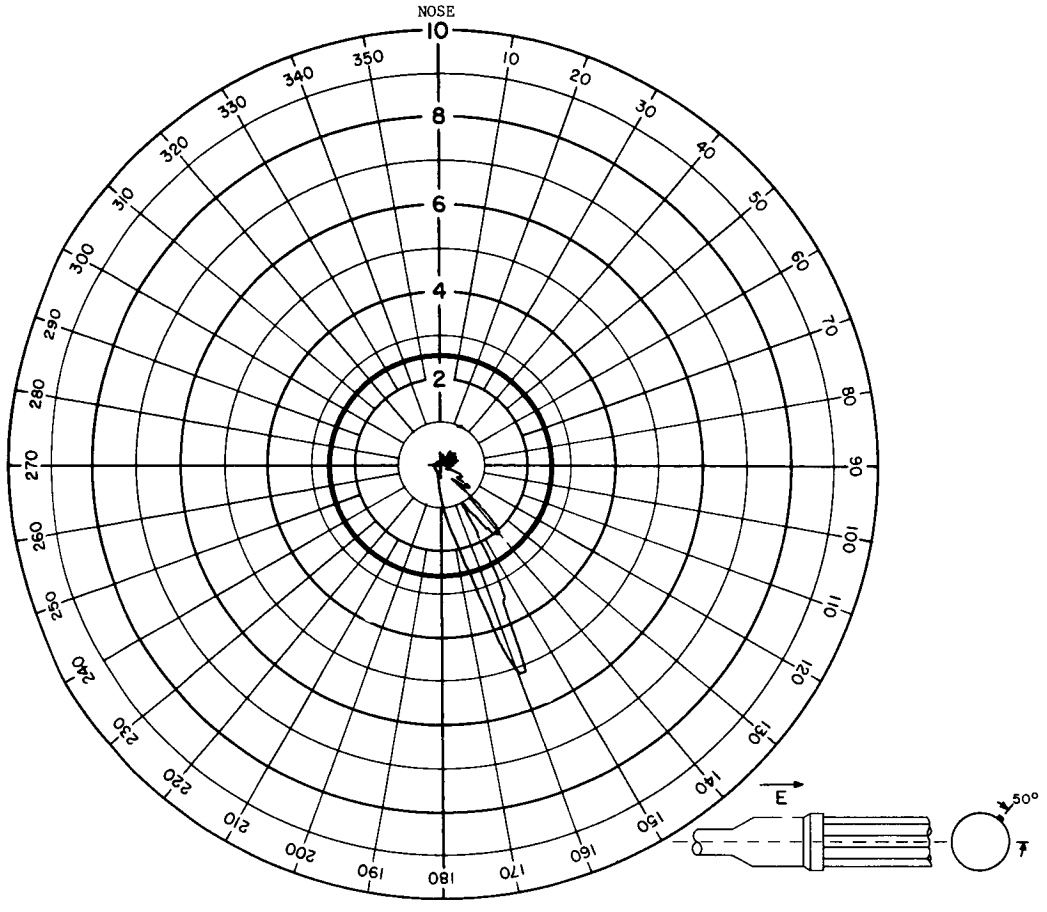


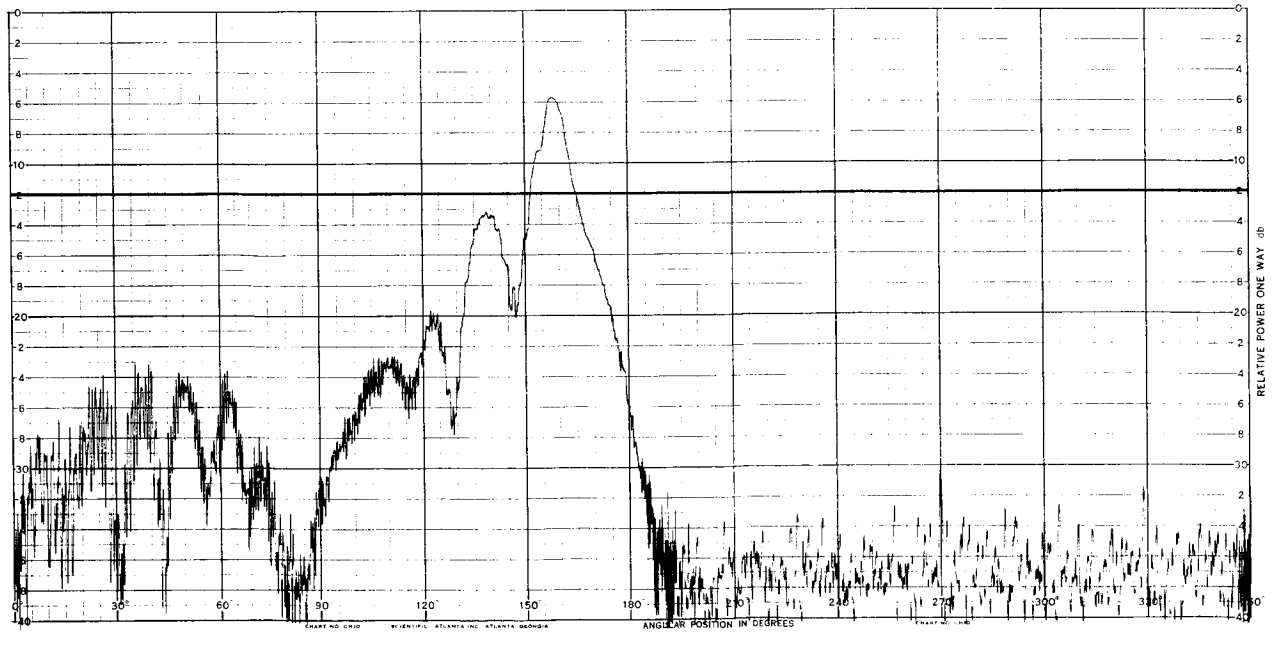


ANTENNA RADIATION PATTERN NO. 214-5

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

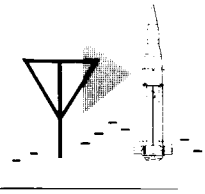
SA-5 AZUSA ANTENNA



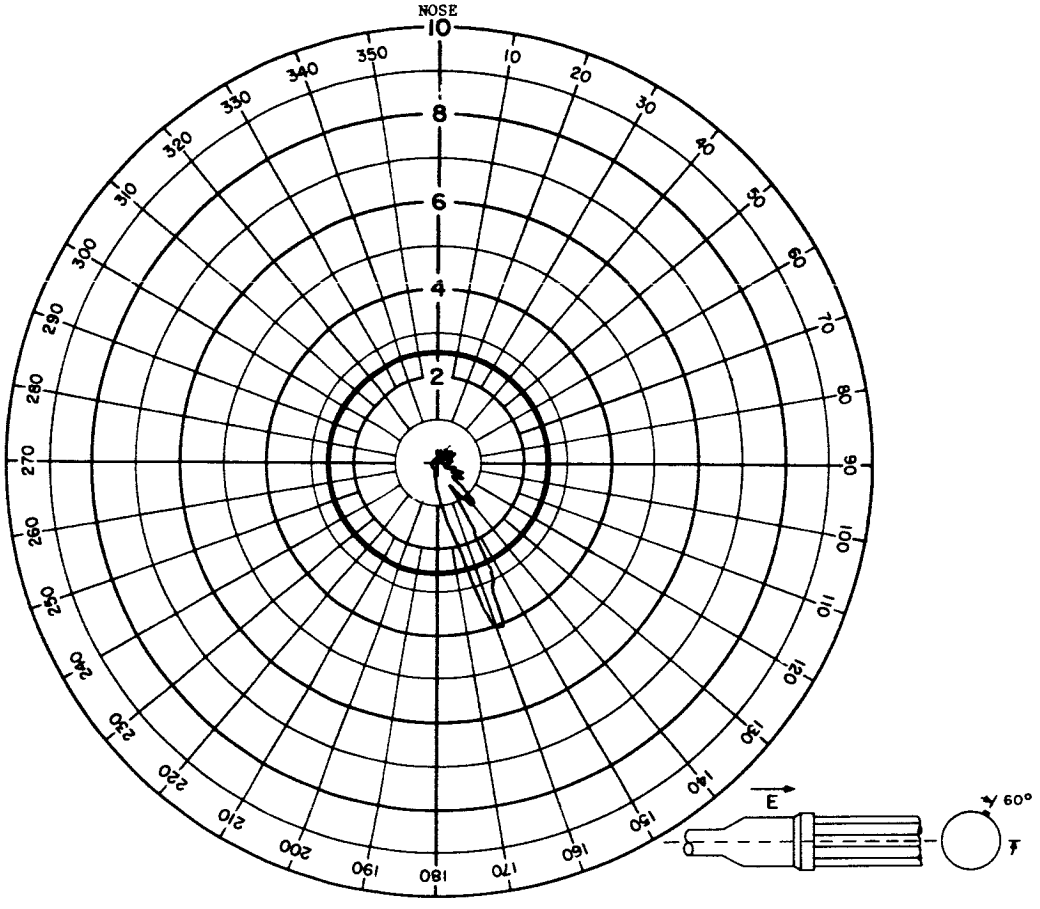


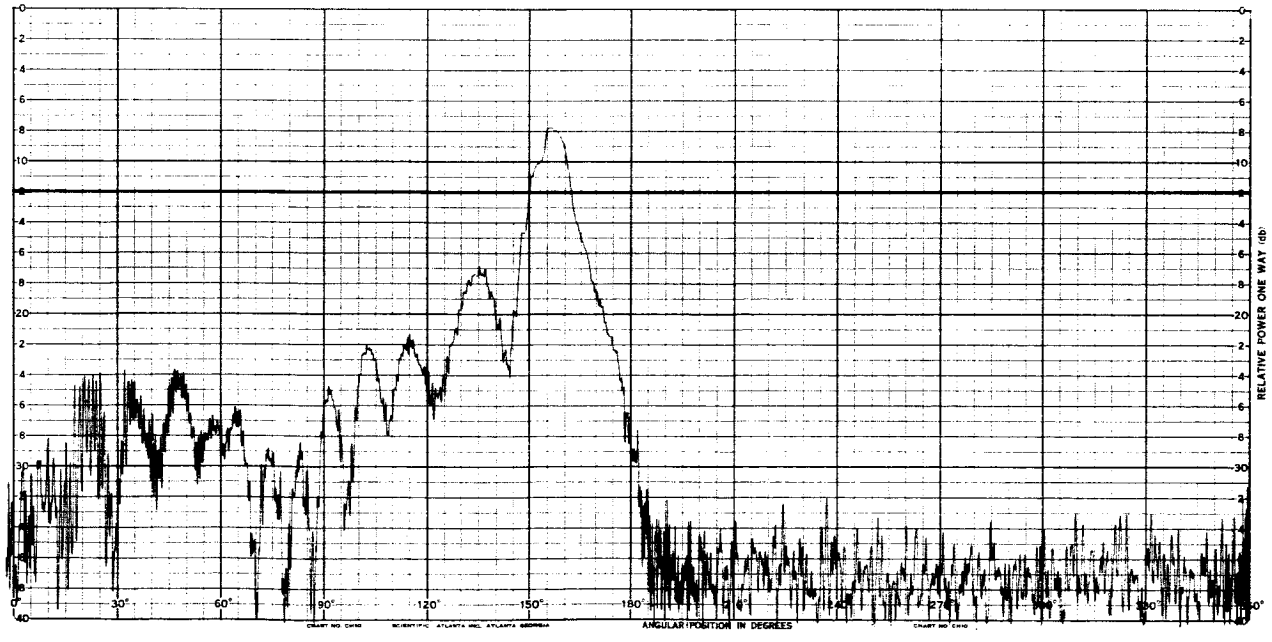
ANTENNA RADIATION PATTERN NO. 214-6

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



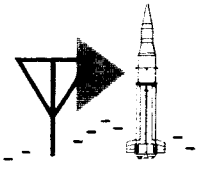
SA-5 AZUSA ANTENNA



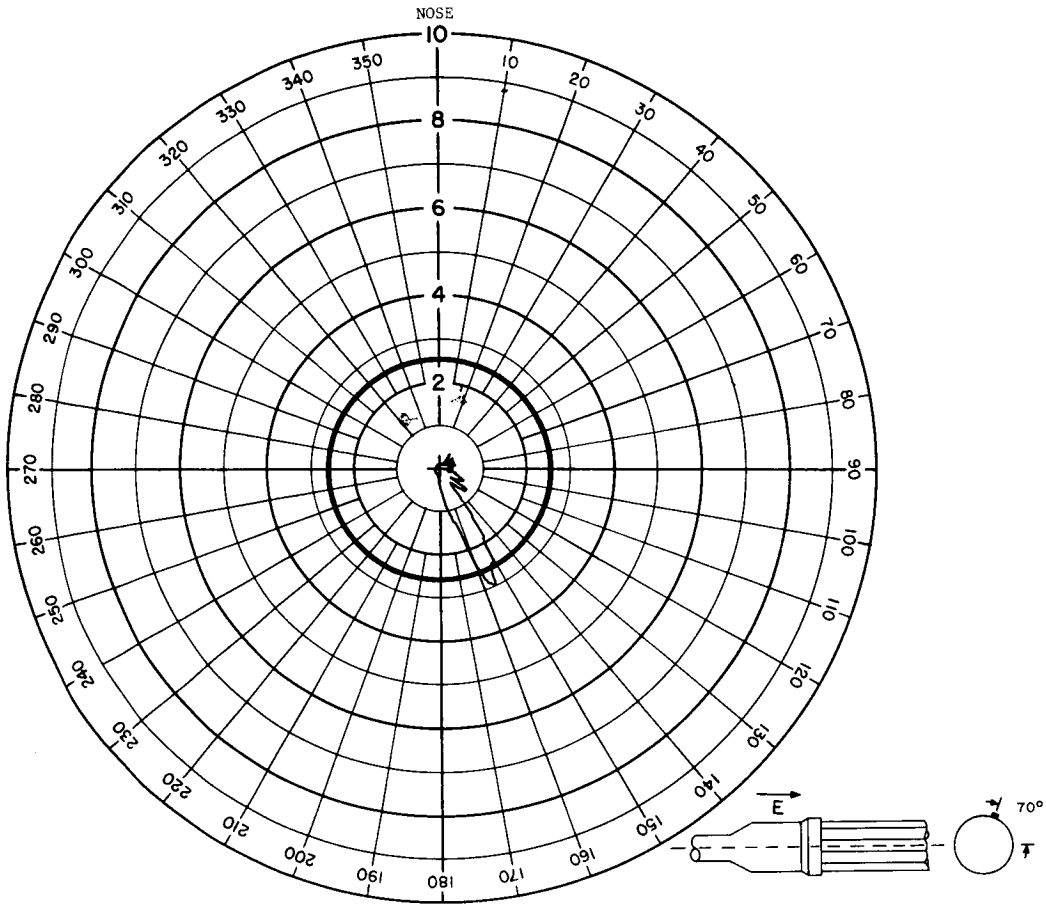


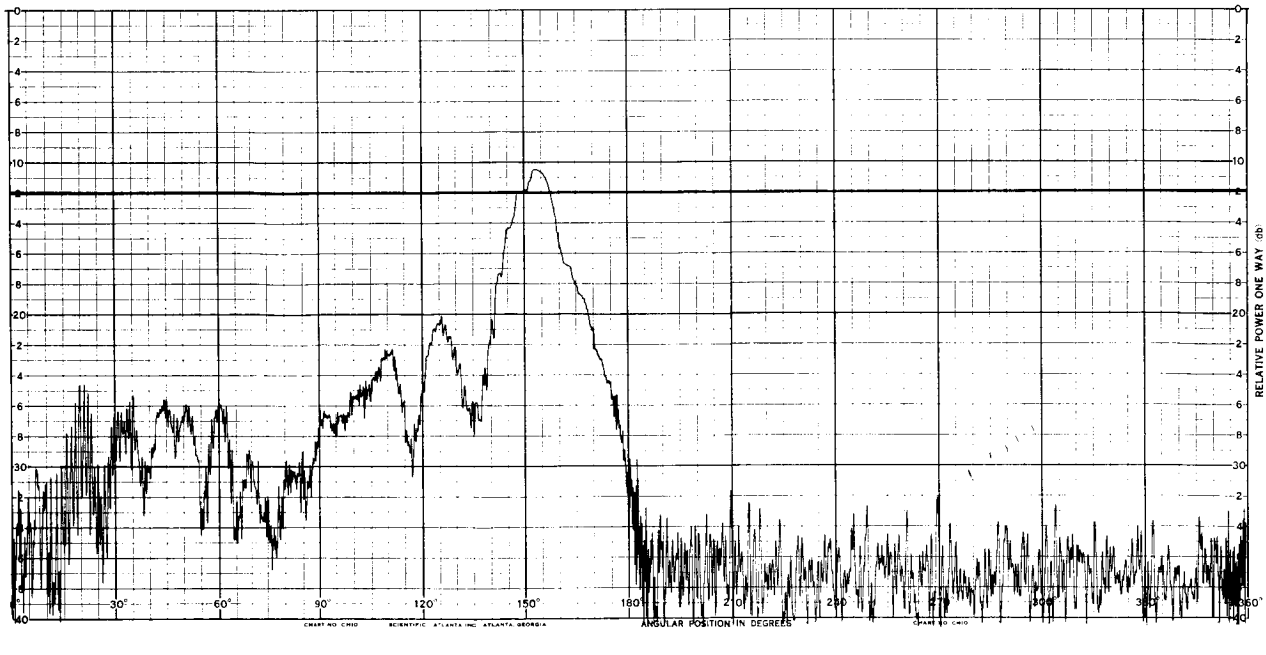
ANTENNA RADIATION PATTERN NO. 214-7

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



SA-5 AZUSA ANTENNA

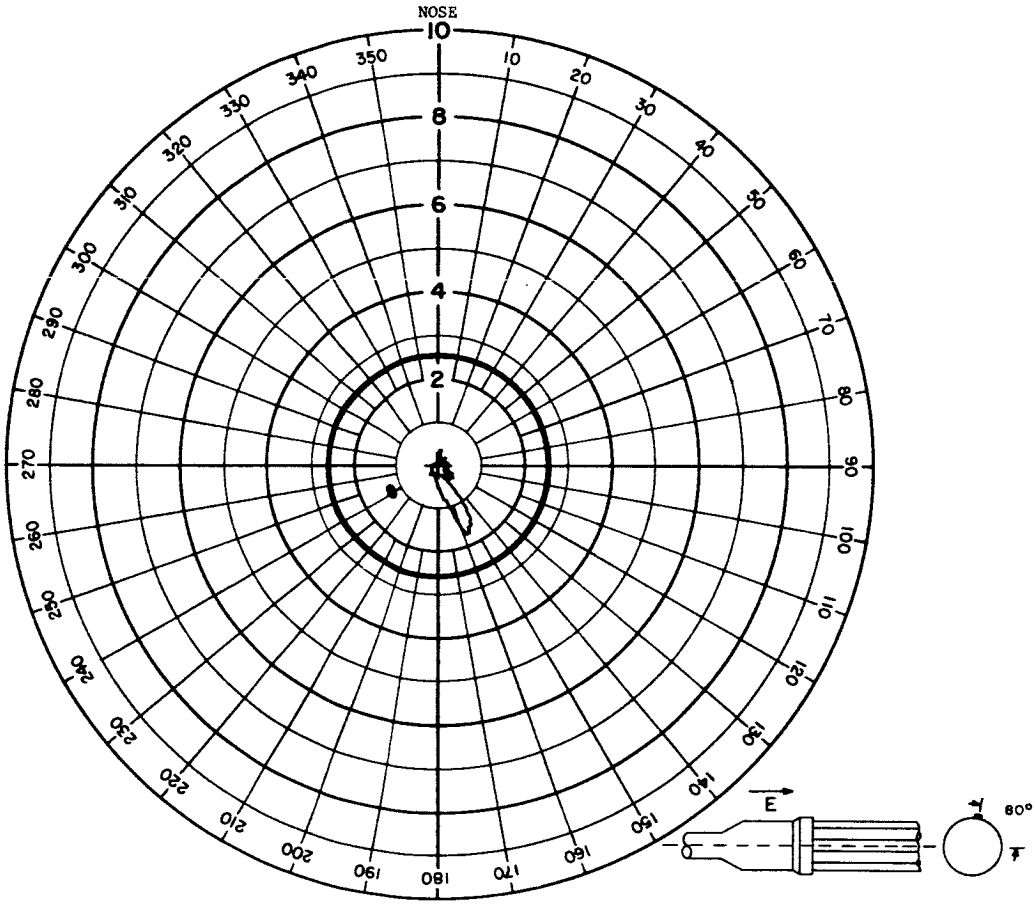


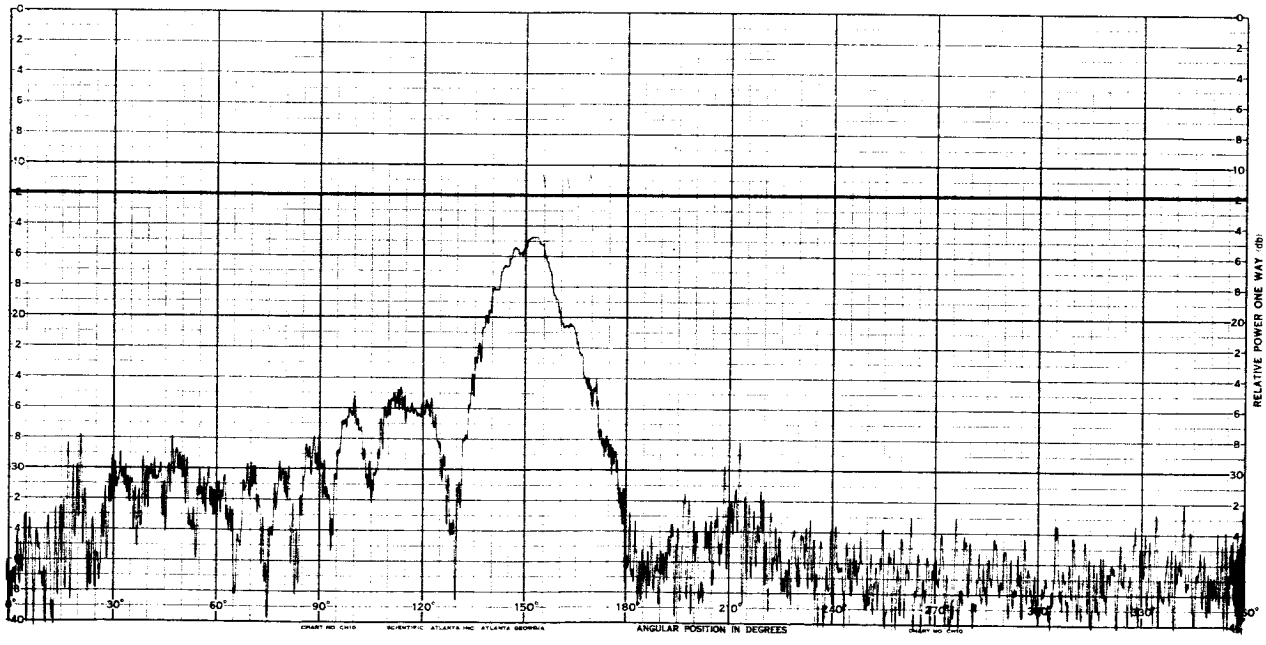


ANTENNA RADIATION PATTERN NO. 214-8

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

SA-5 AZUSA ANTENNA

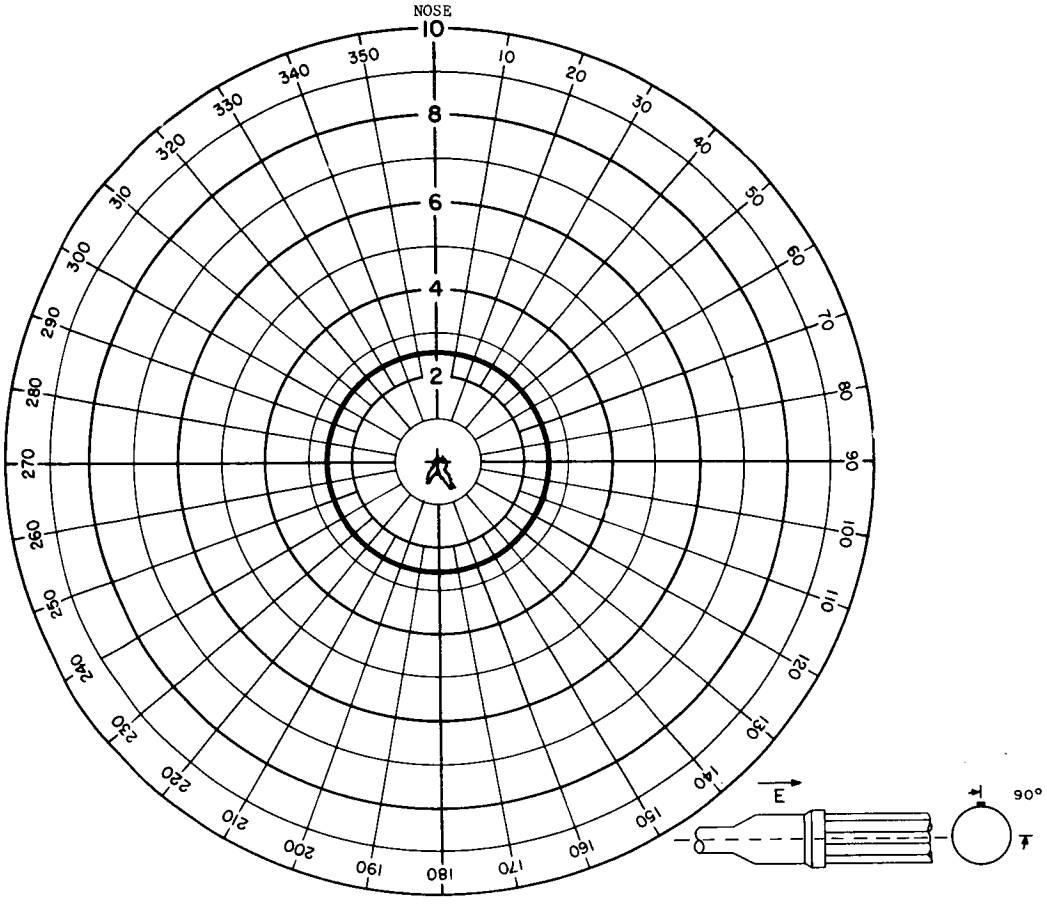


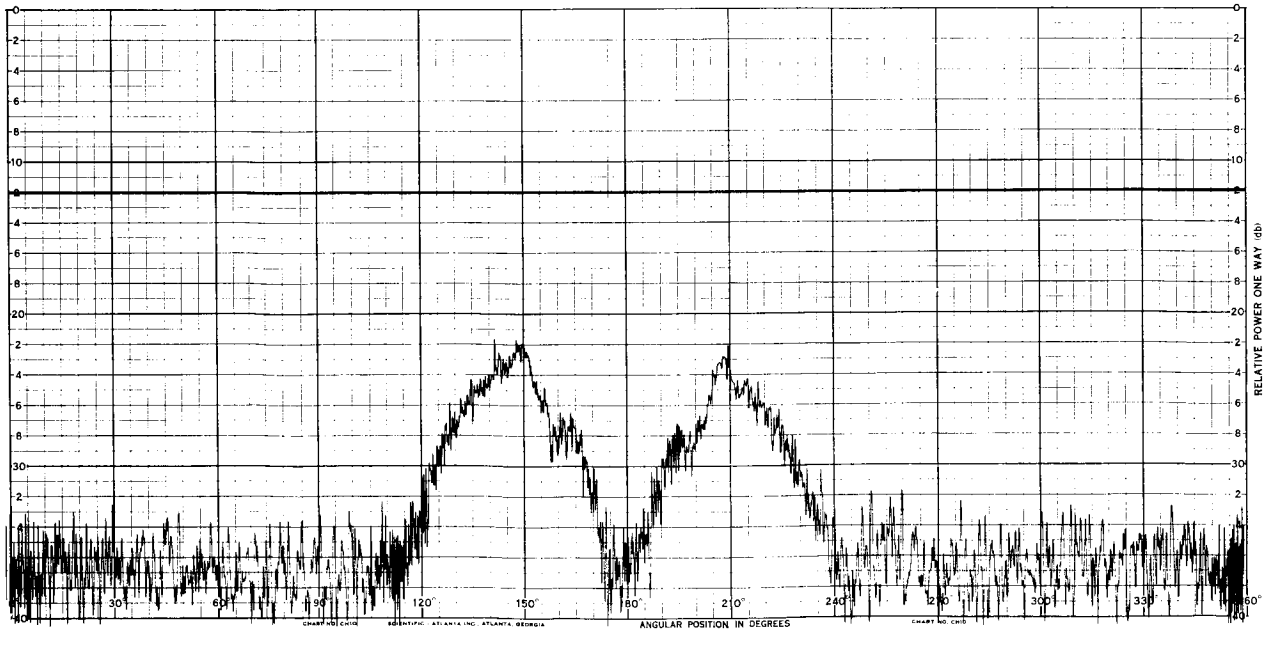


ANTENNA RADIATION PATTERN NO. 214-9

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

SA-5 AZUSA ANTENNA

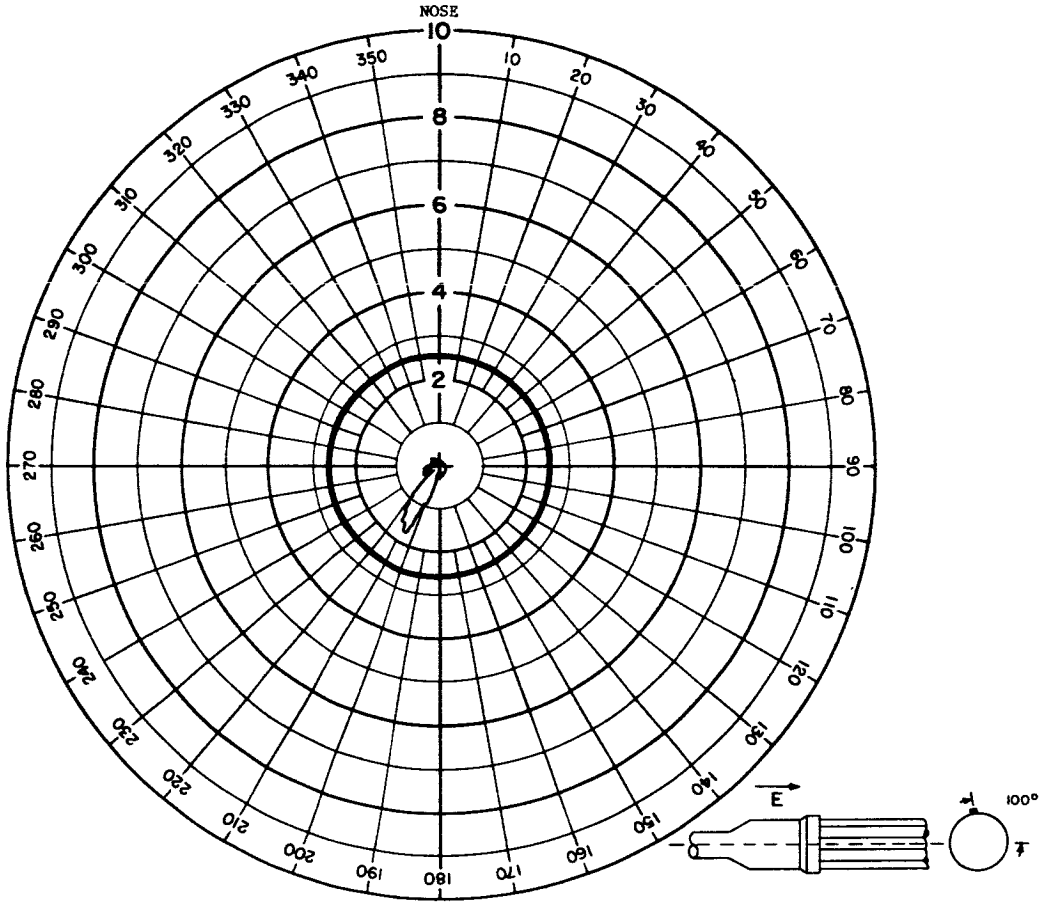


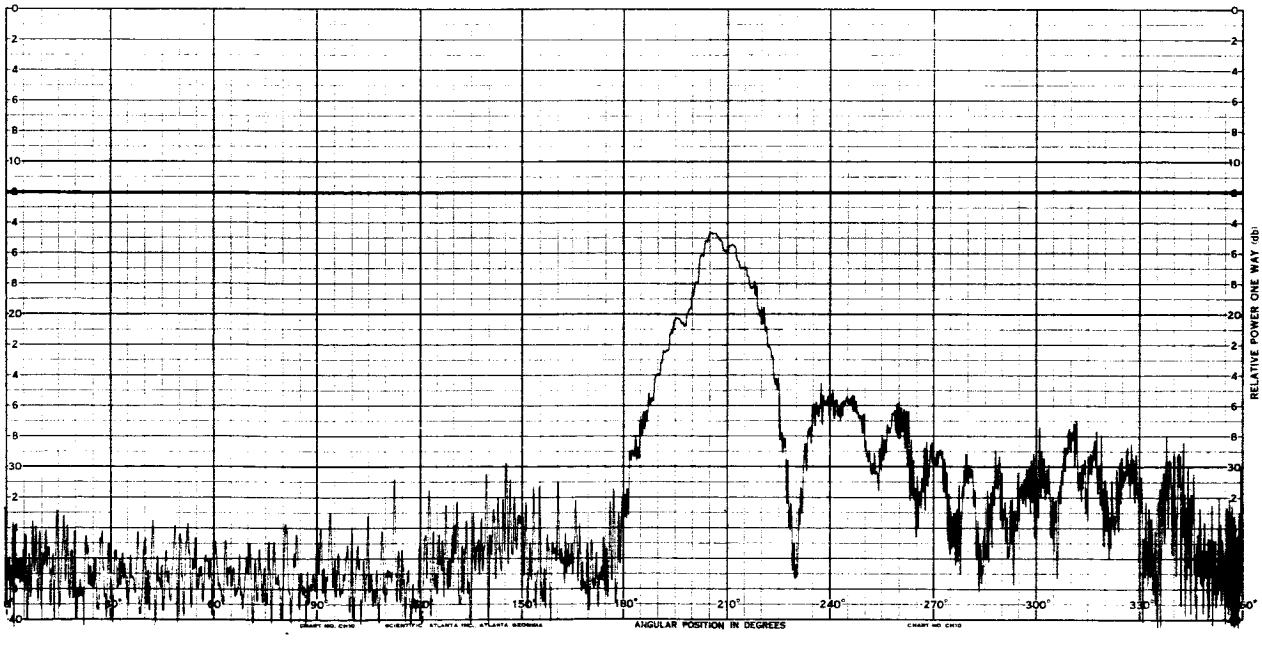


ANTENNA RADIATION PATTERN NO. 214-10

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

SA-5 AZUSA ANTENNA

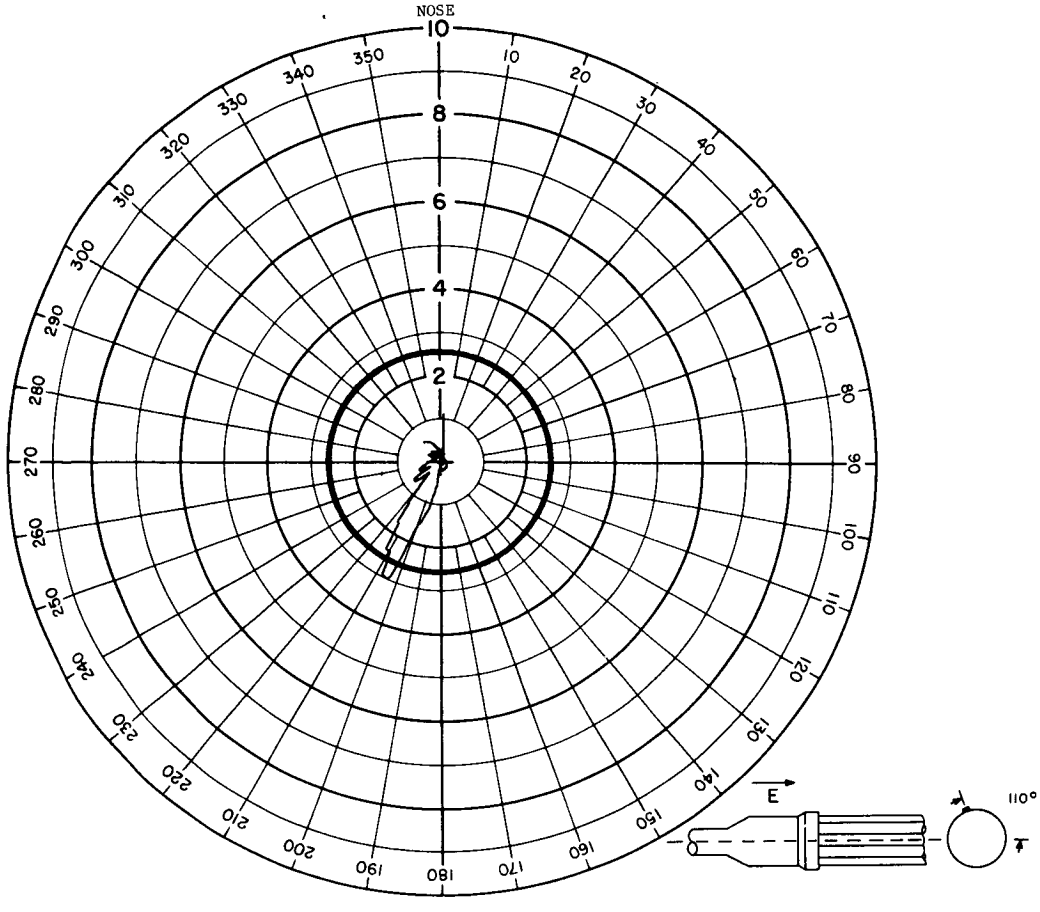


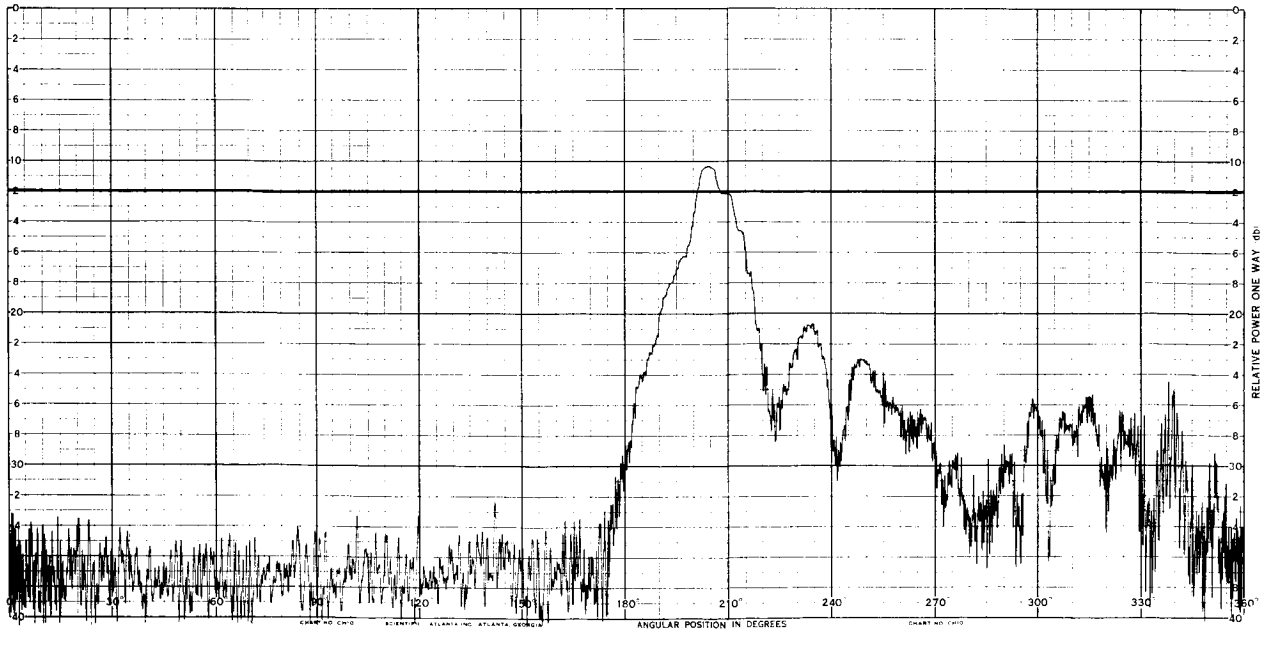


ANTENNA RADIATION PATTERN NO. 214-11

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

SA-5 AZUSA ANTENNA

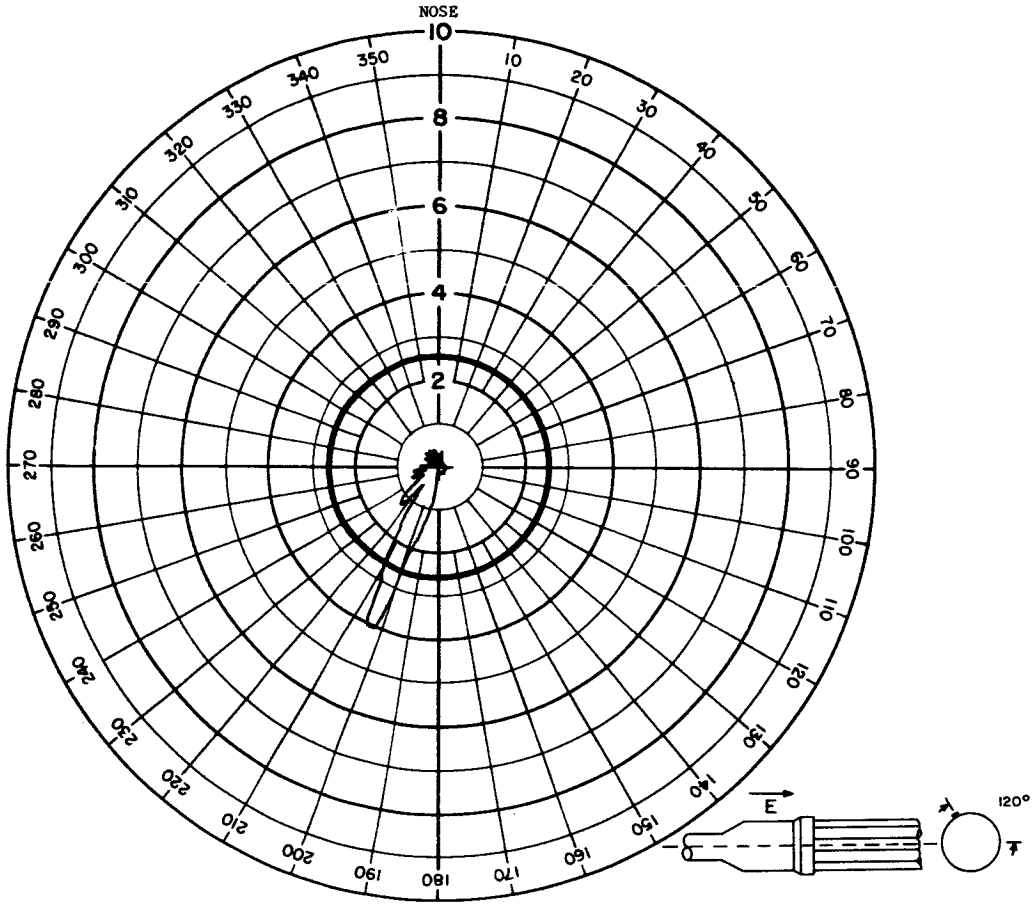


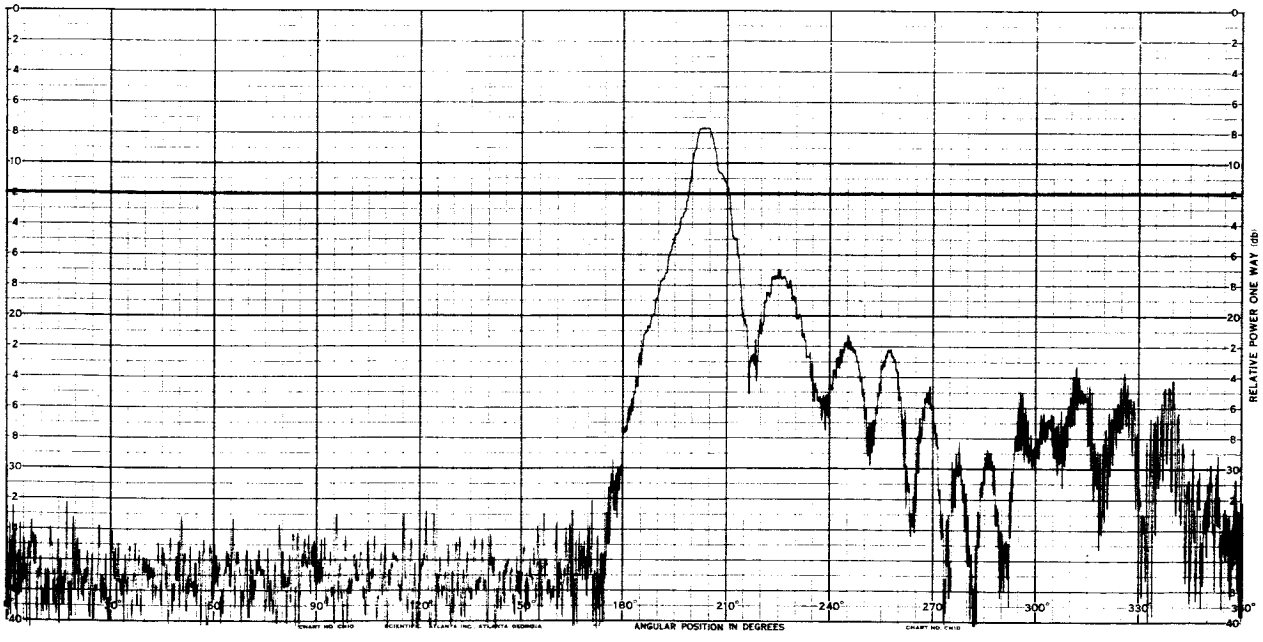


ANTENNA RADIATION PATTERN NO. 214-12

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

SA-5 AZUSA ANTENNA

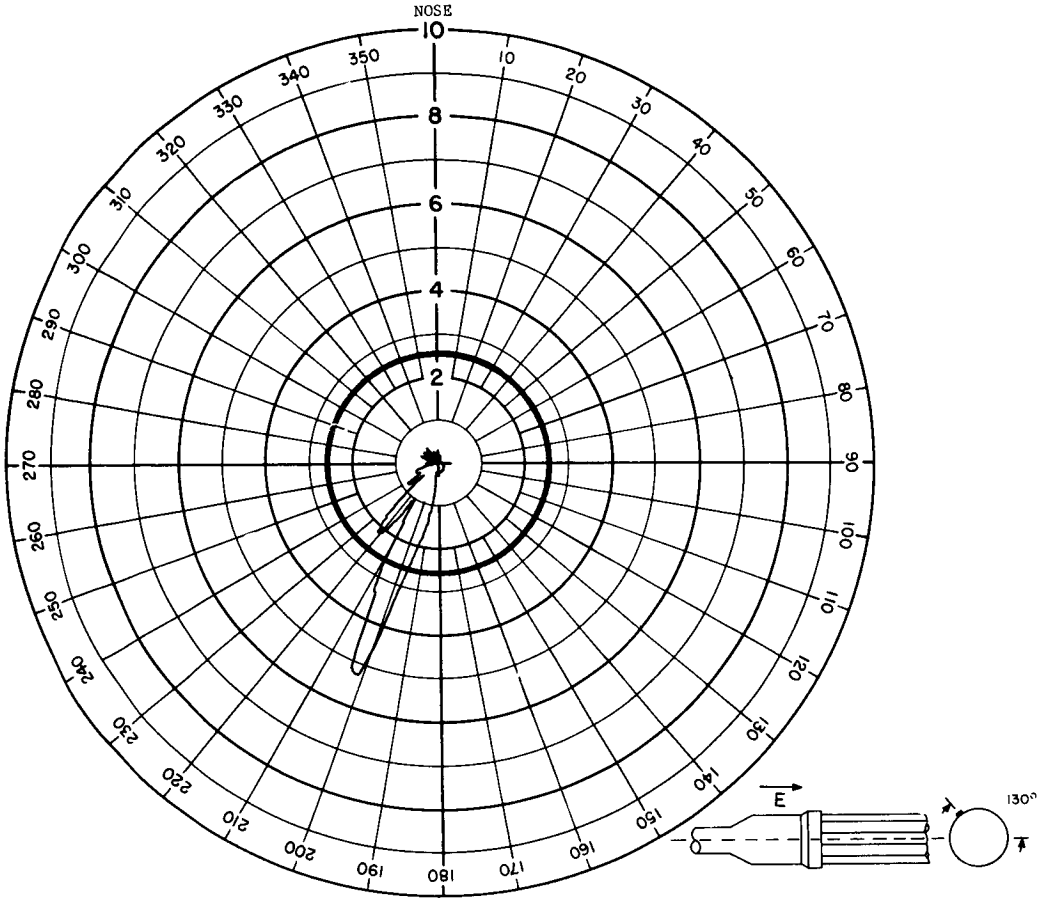


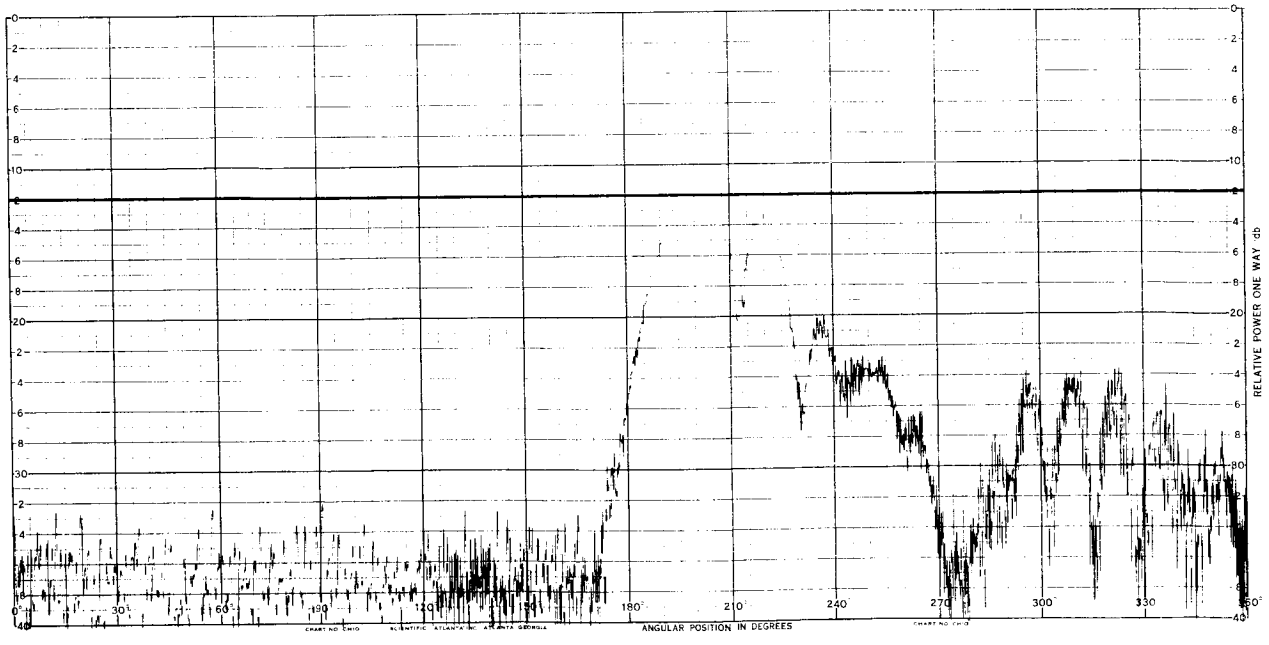


ANTENNA RADIATION PATTERN NO. 214-13

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

SA-5 AZUSA ANTENNA

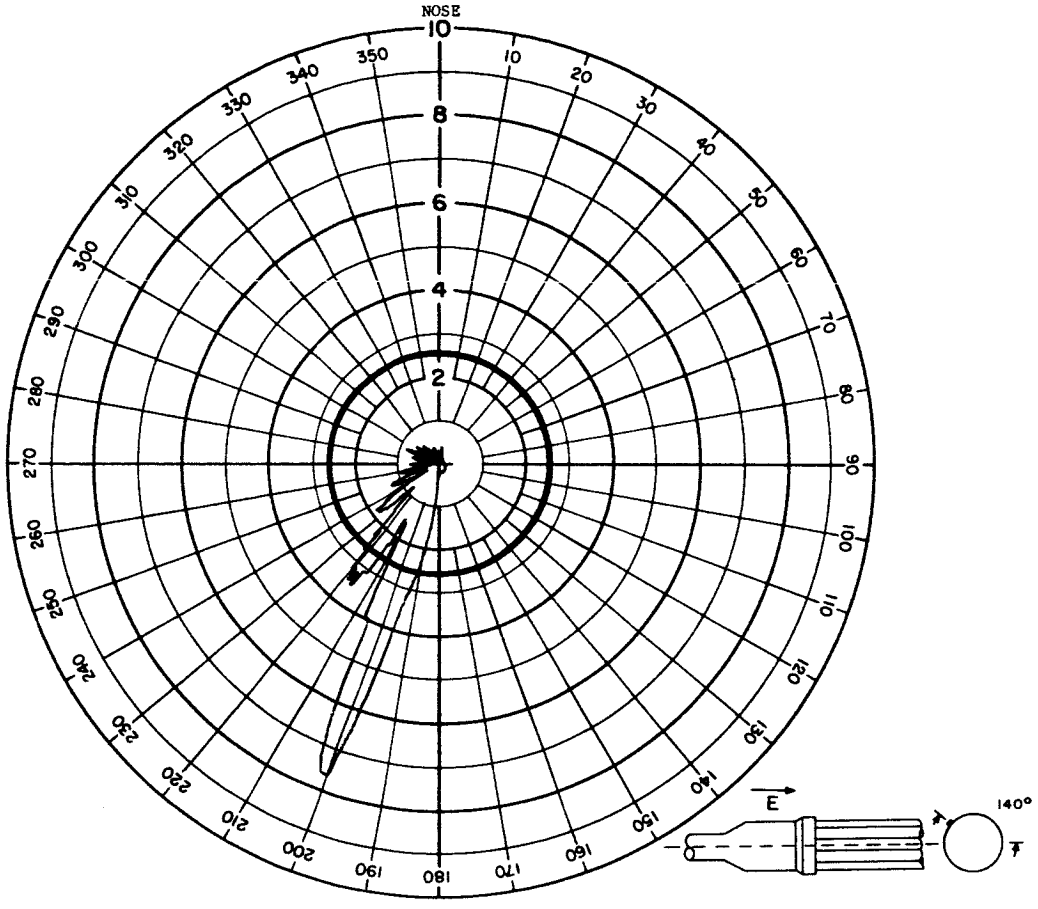


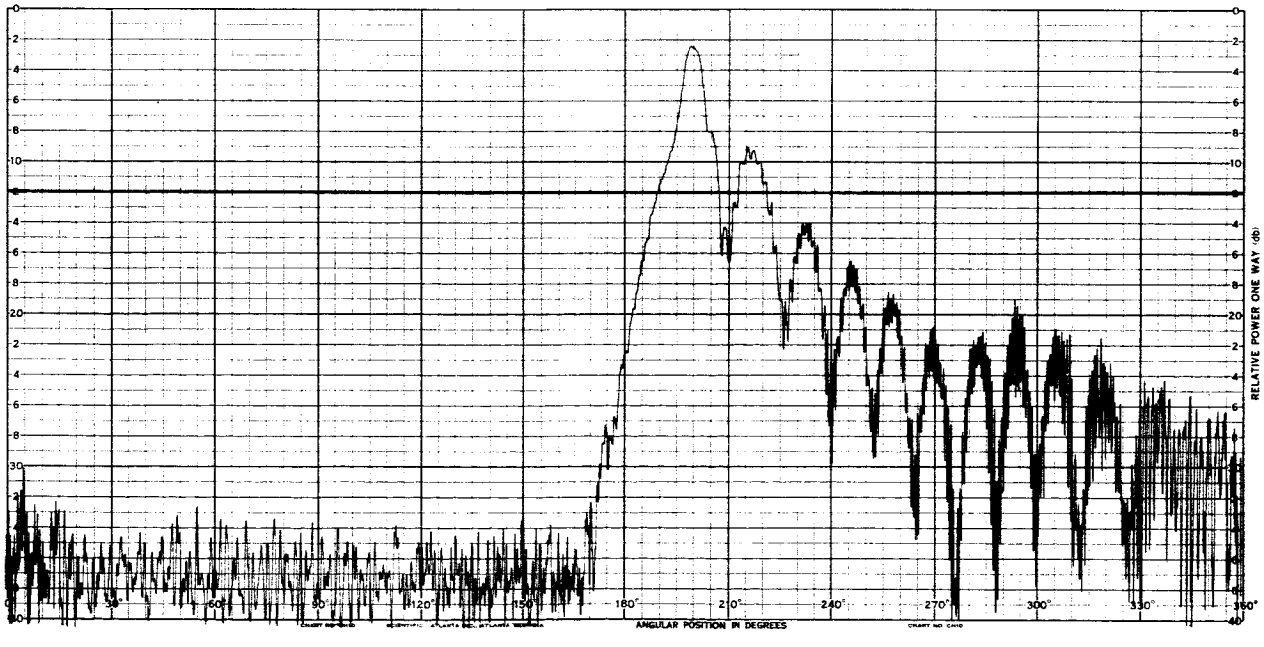


ANTENNA RADIATION PATTERN NO. 214-14

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

SA-5 AZUSA ANTENNA

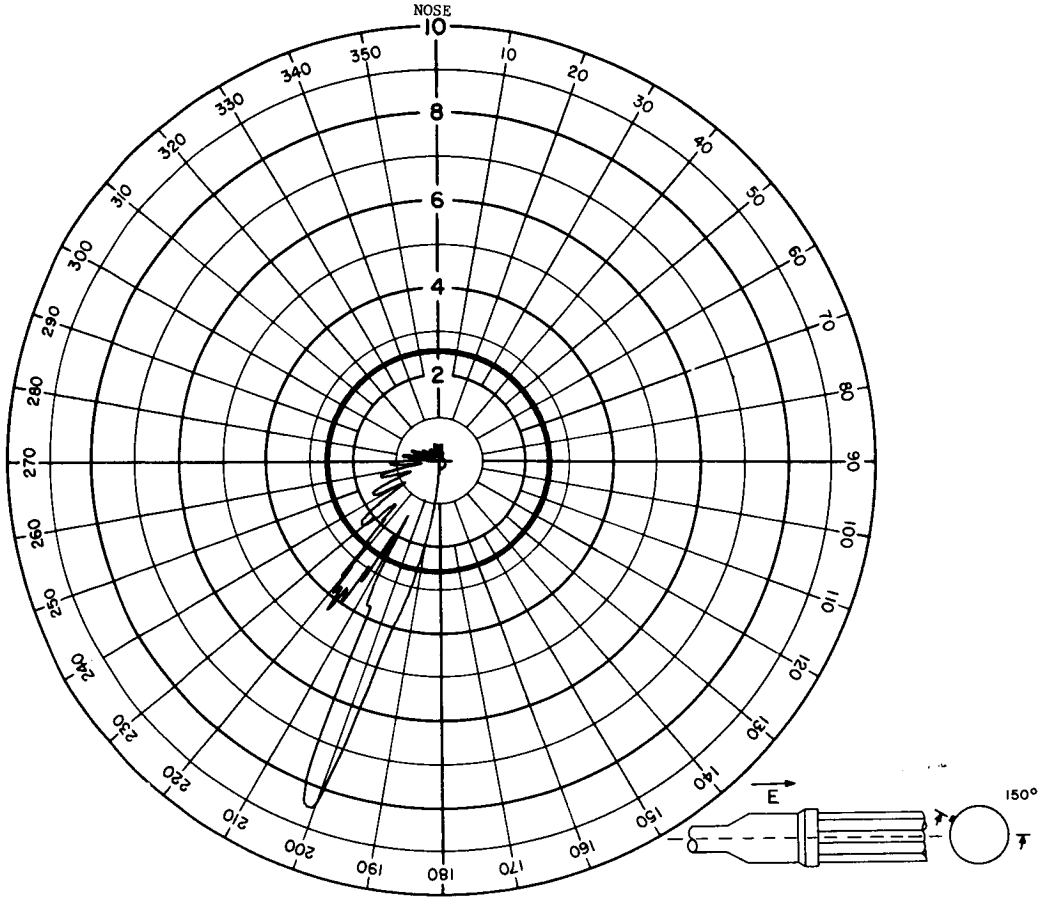


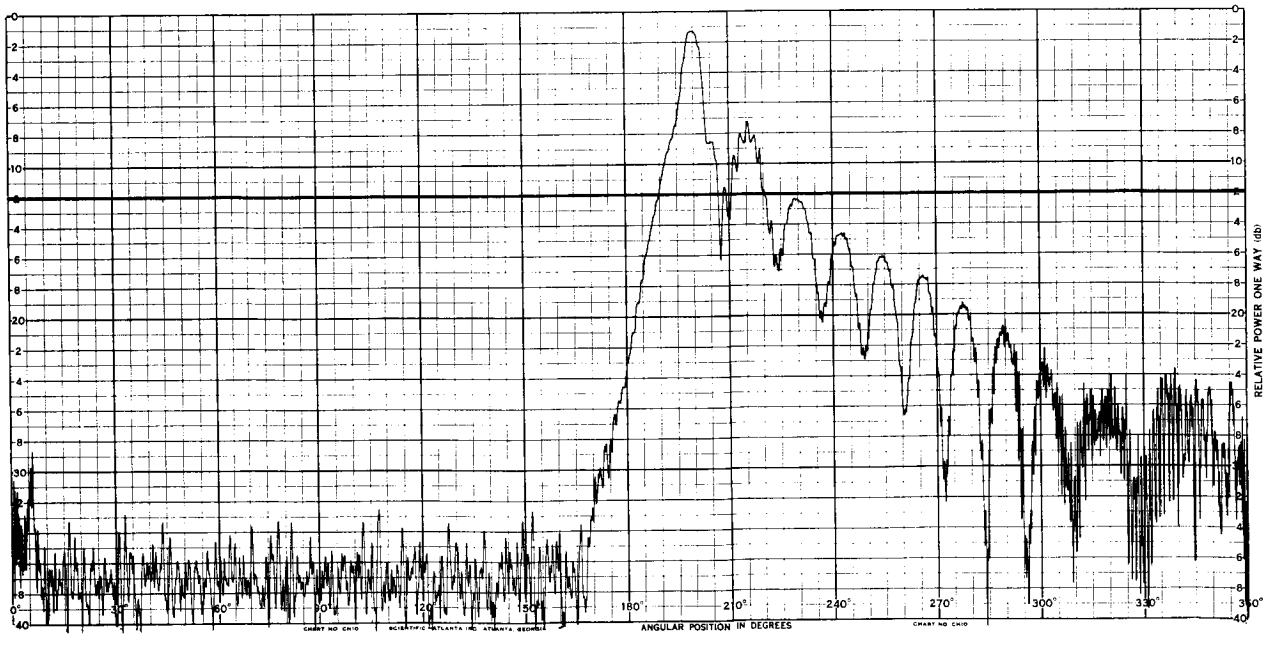


ANTENNA RADIATION PATTERN NO. 214-15

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

SA-5 AZUSA ANTENNA

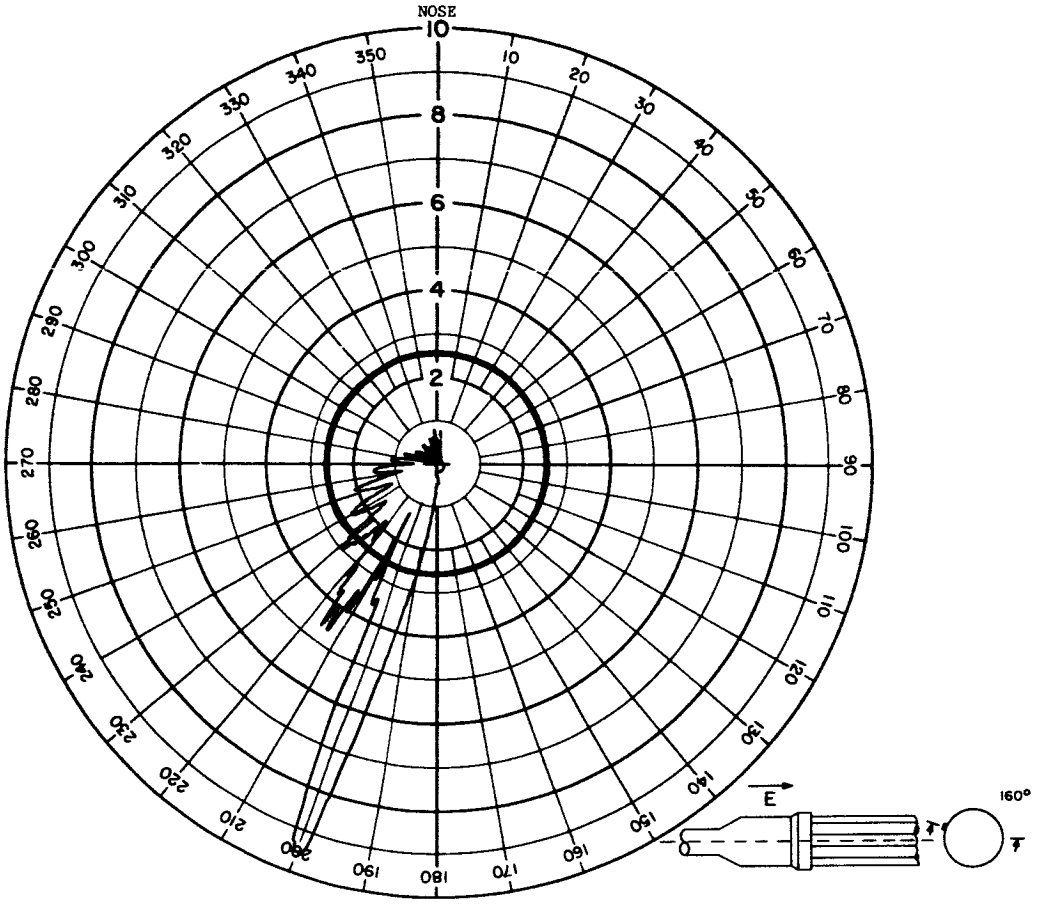


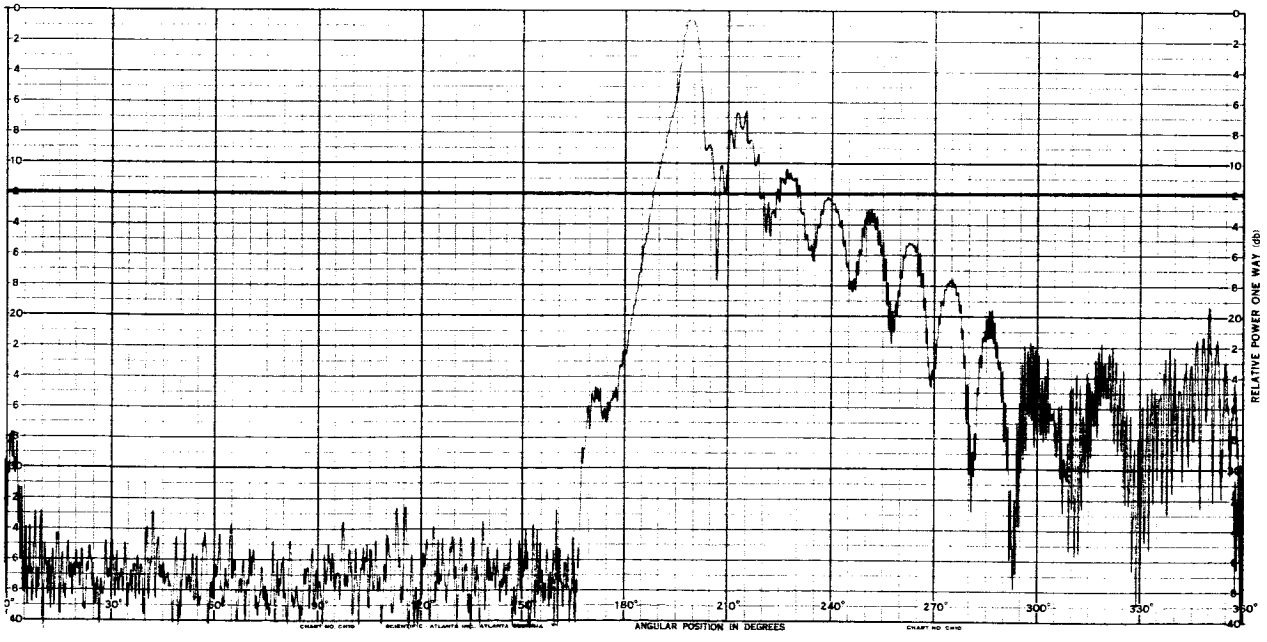


ANTENNA RADIATION PATTERN NO. 214-16

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

SA-5 AZUSA ANTENNA

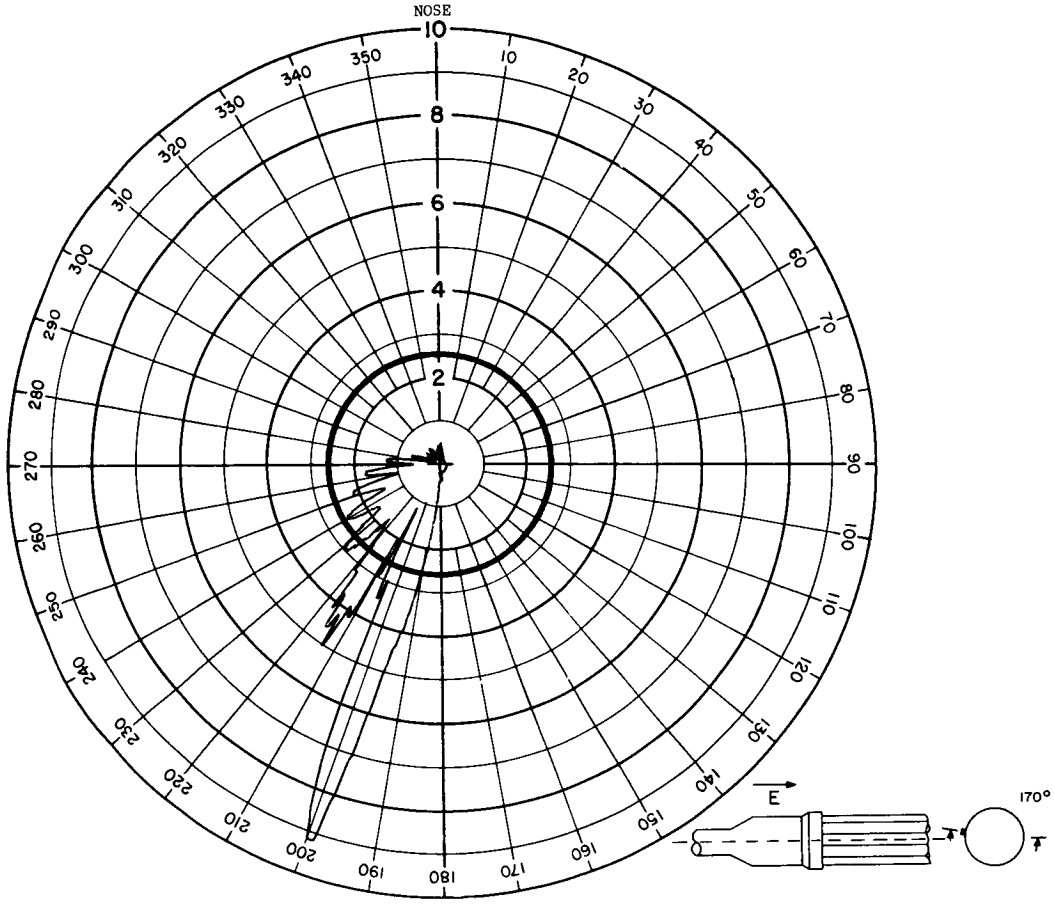


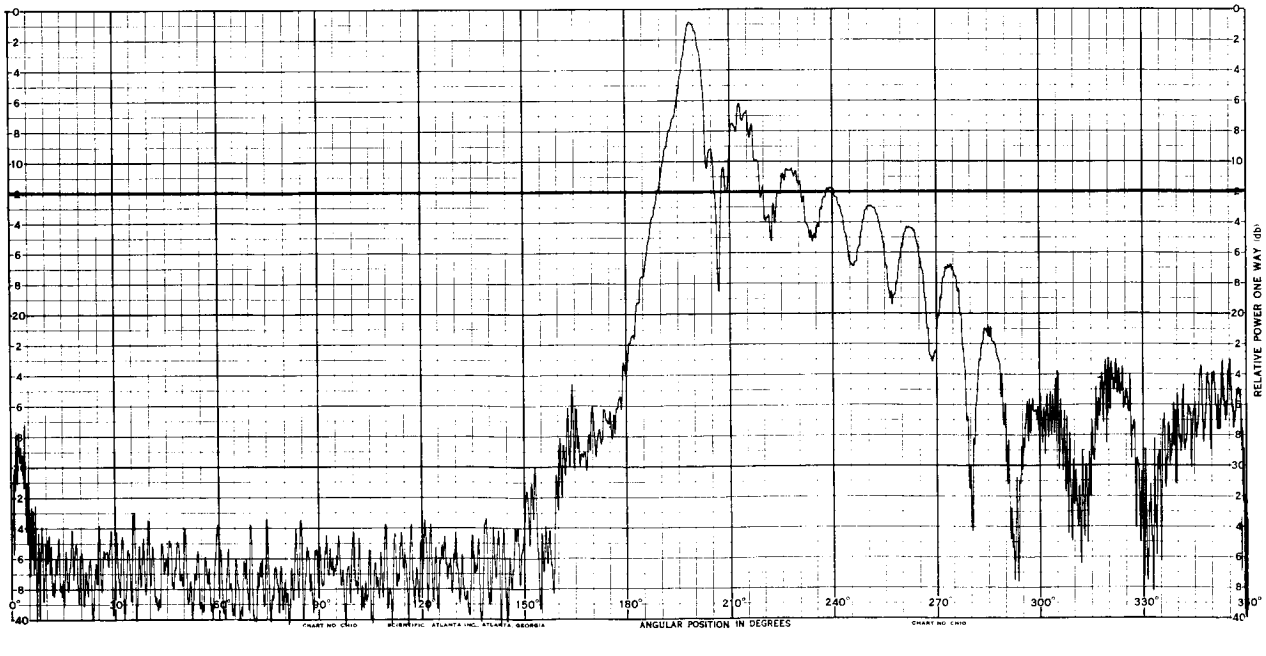


ANTENNA RADIATION PATTERN NO. 214-17

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

SA-5 AZUSA ANTENNA

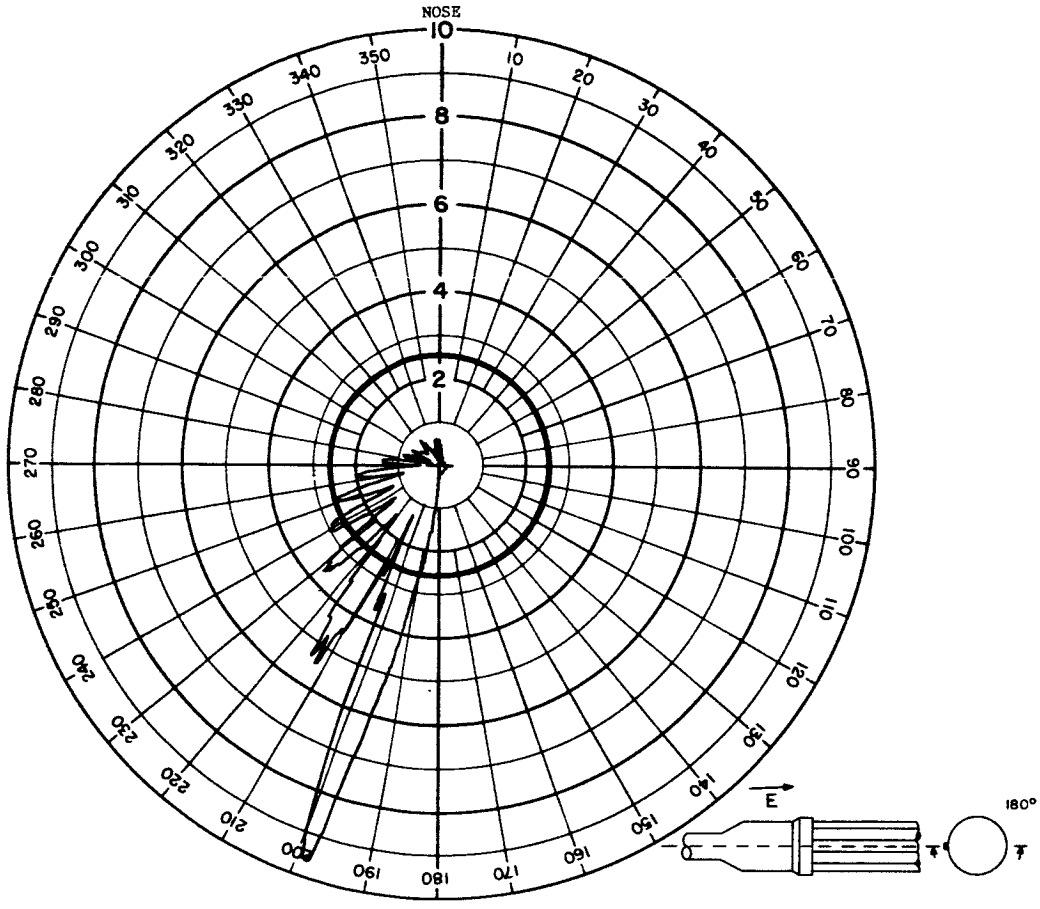


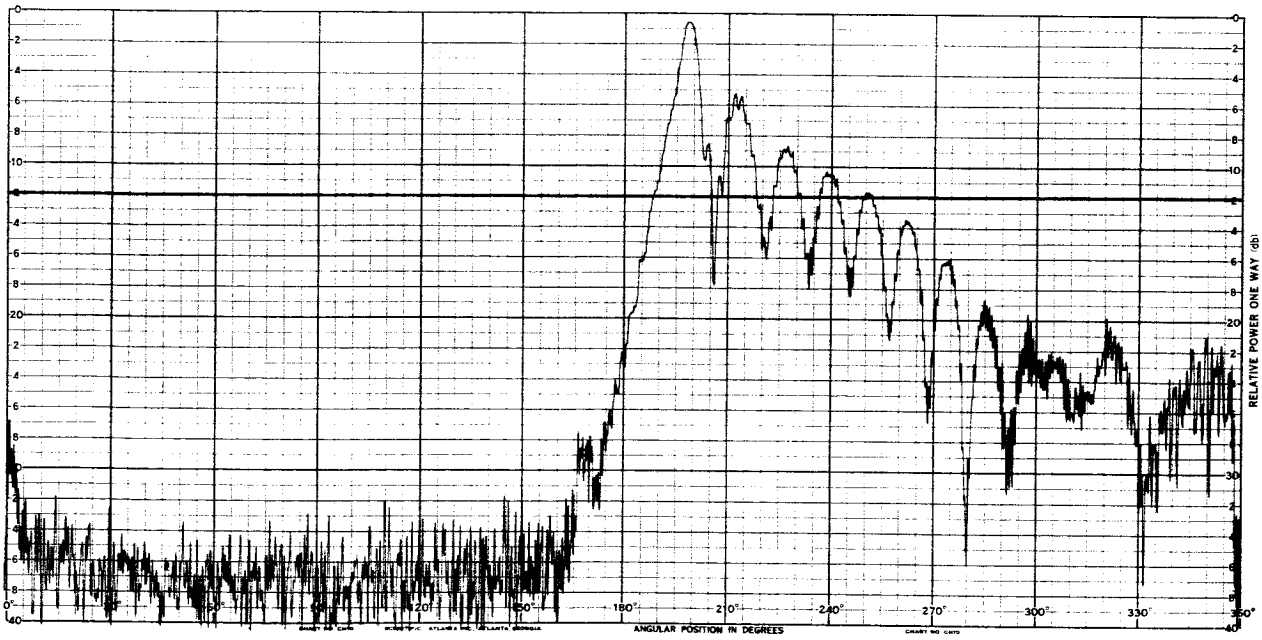


ANTENNA RADIATION PATTERN NO. 214-18

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

SA-5 AZUSA ANTENNA

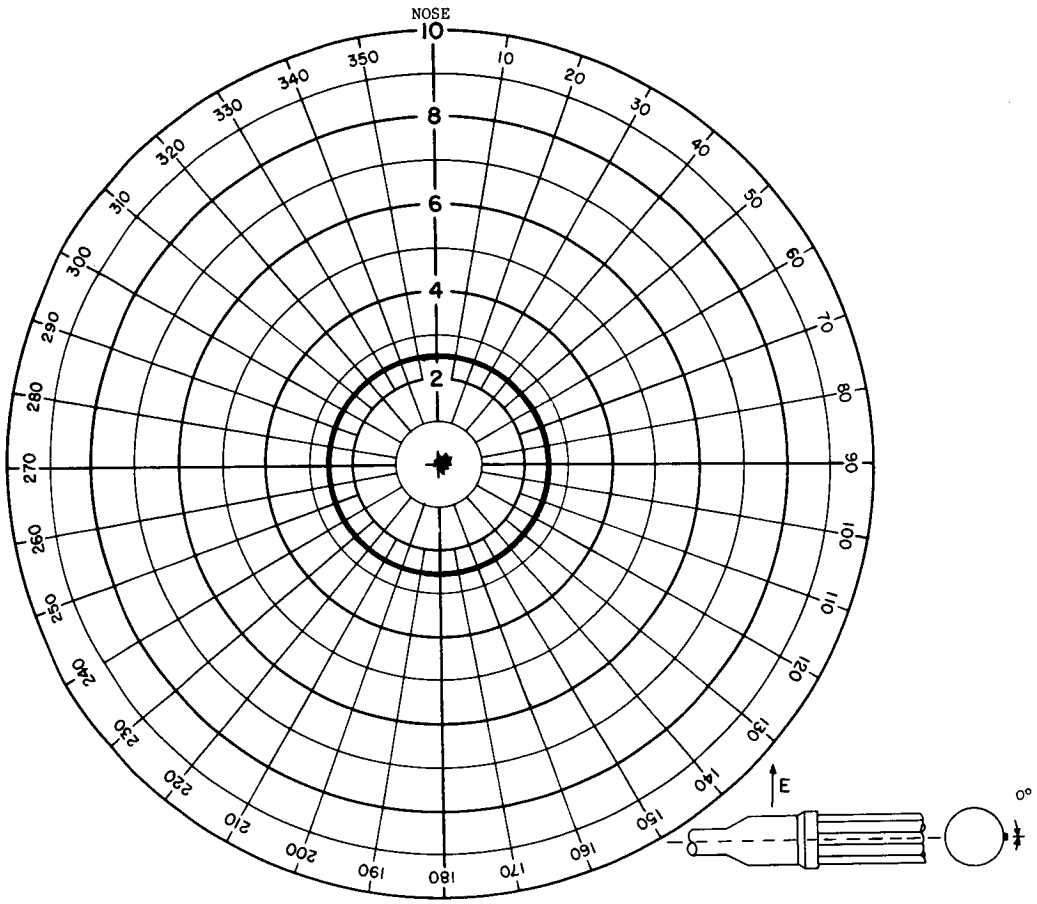


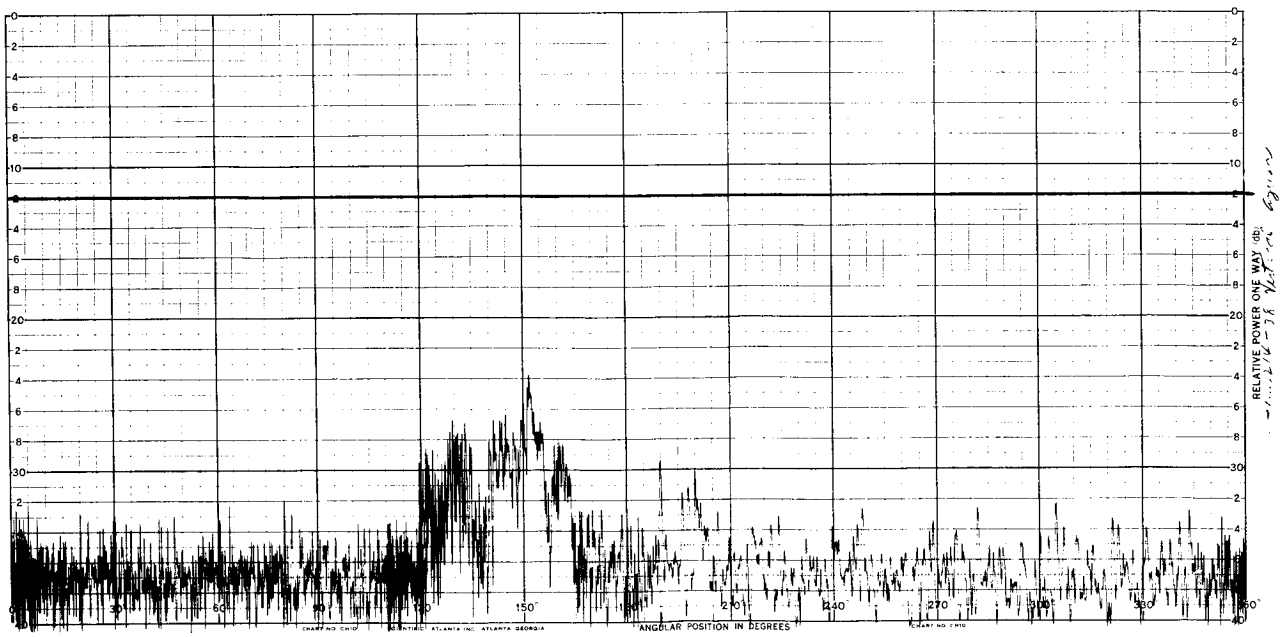


ANTENNA RADIATION PATTERN NO. 214-19

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

SA-5 AZUSA ANTENNA

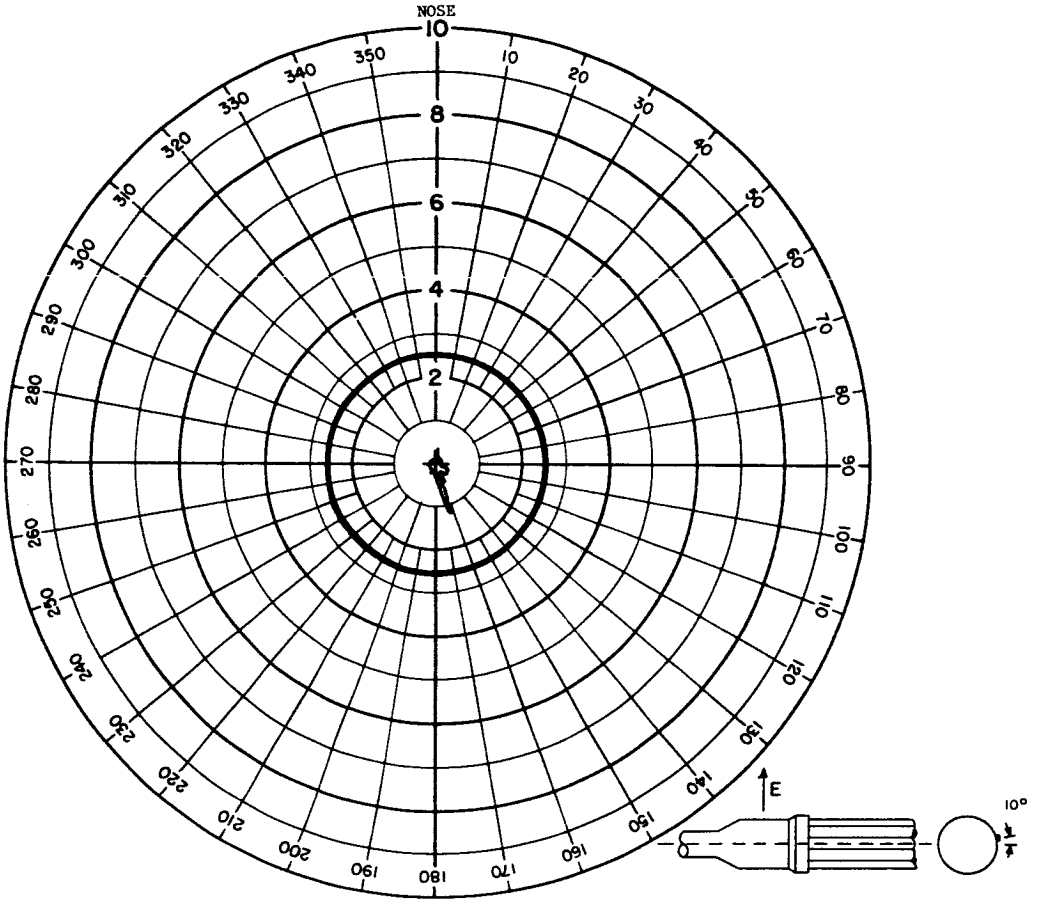


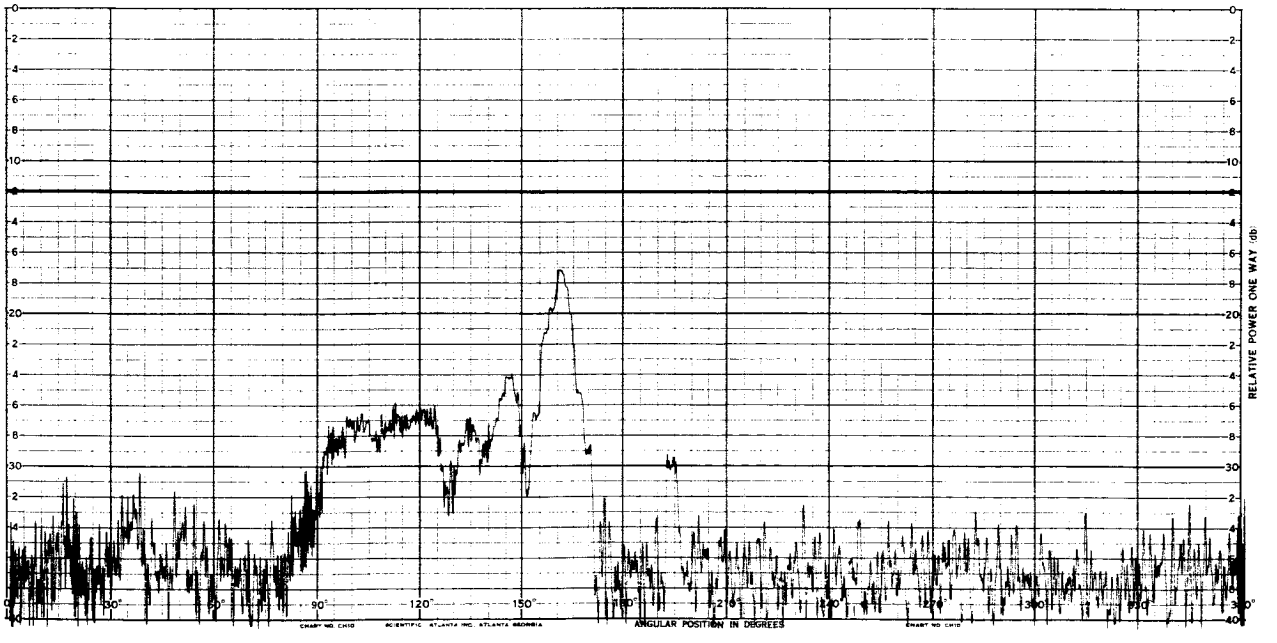


ANTENNA RADIATION PATTERN NO. 214-20

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

SA-5 AZUSA ANTENNA

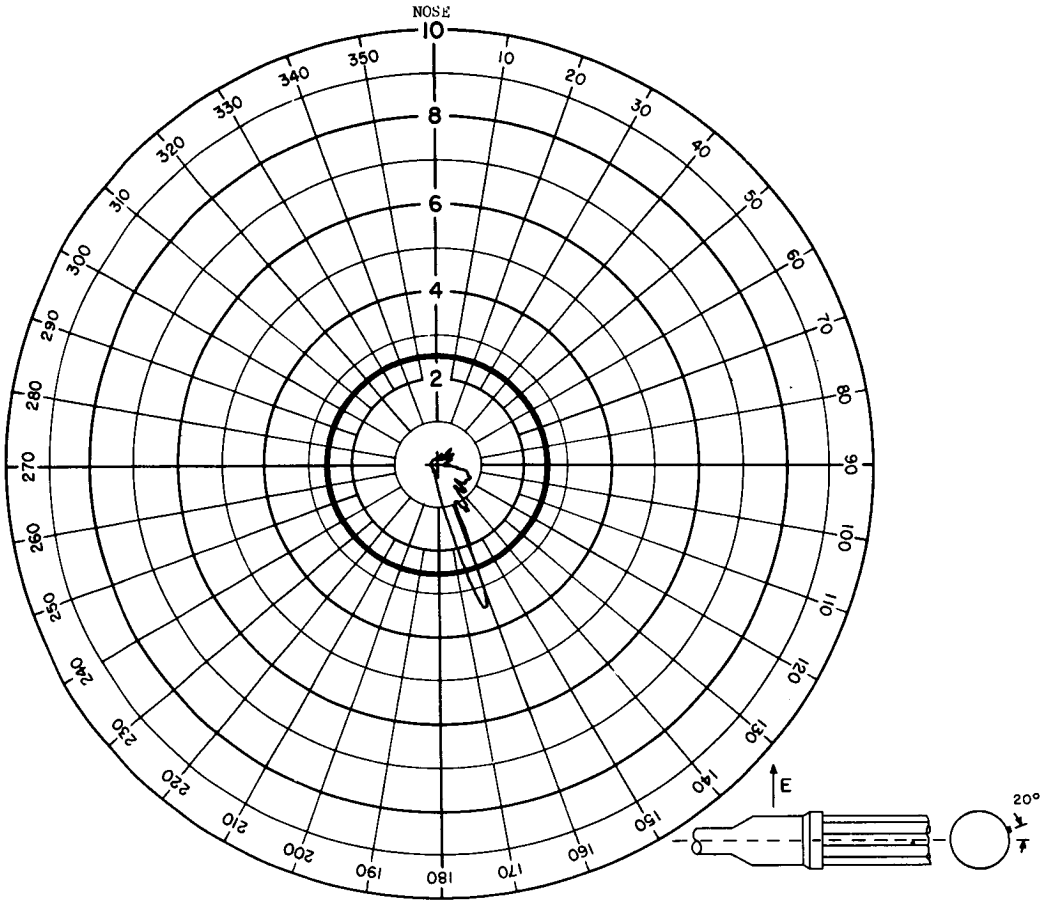


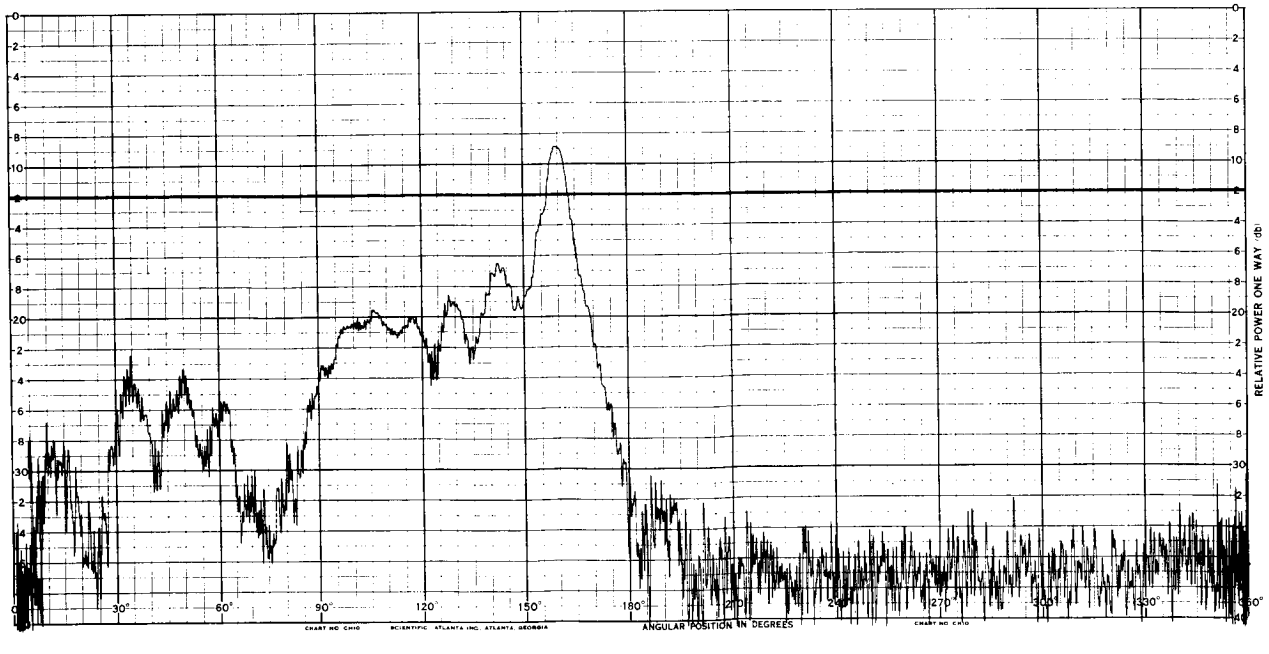


ANTENNA RADIATION PATTERN NO. 214-21

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

SA-5 AZUSA ANTENNA

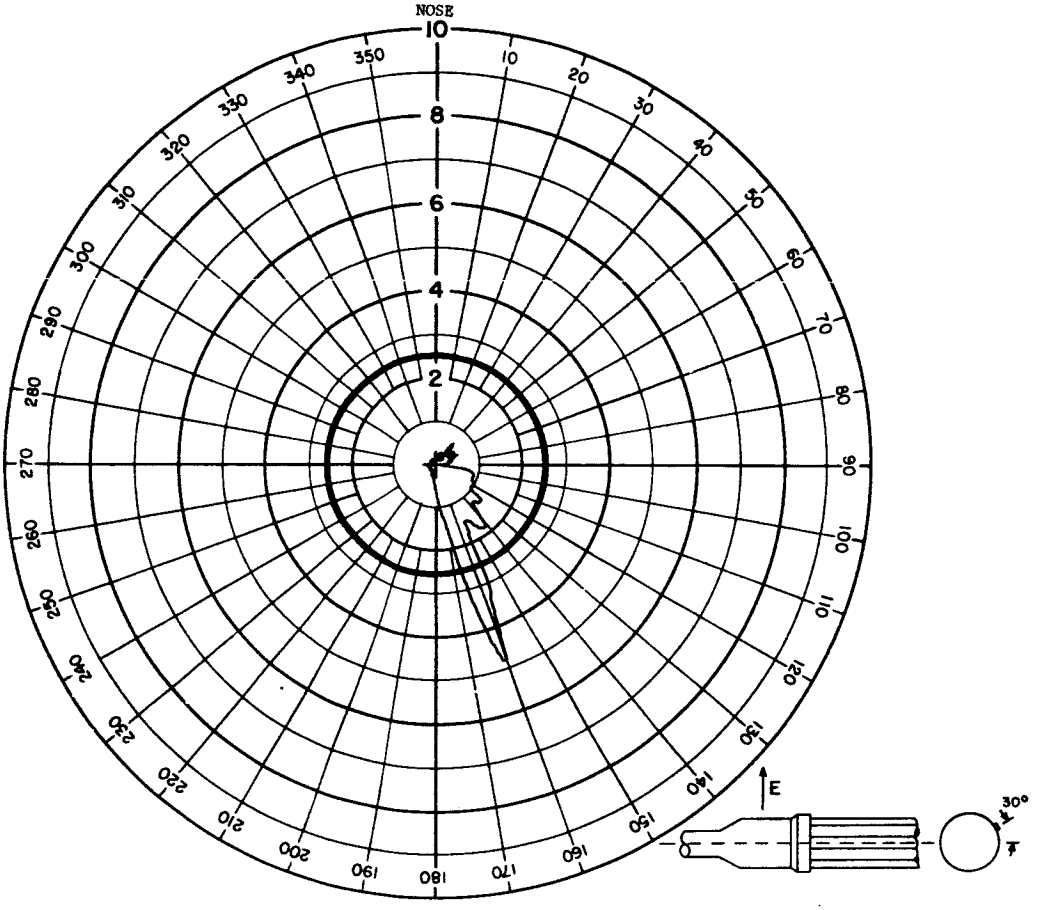


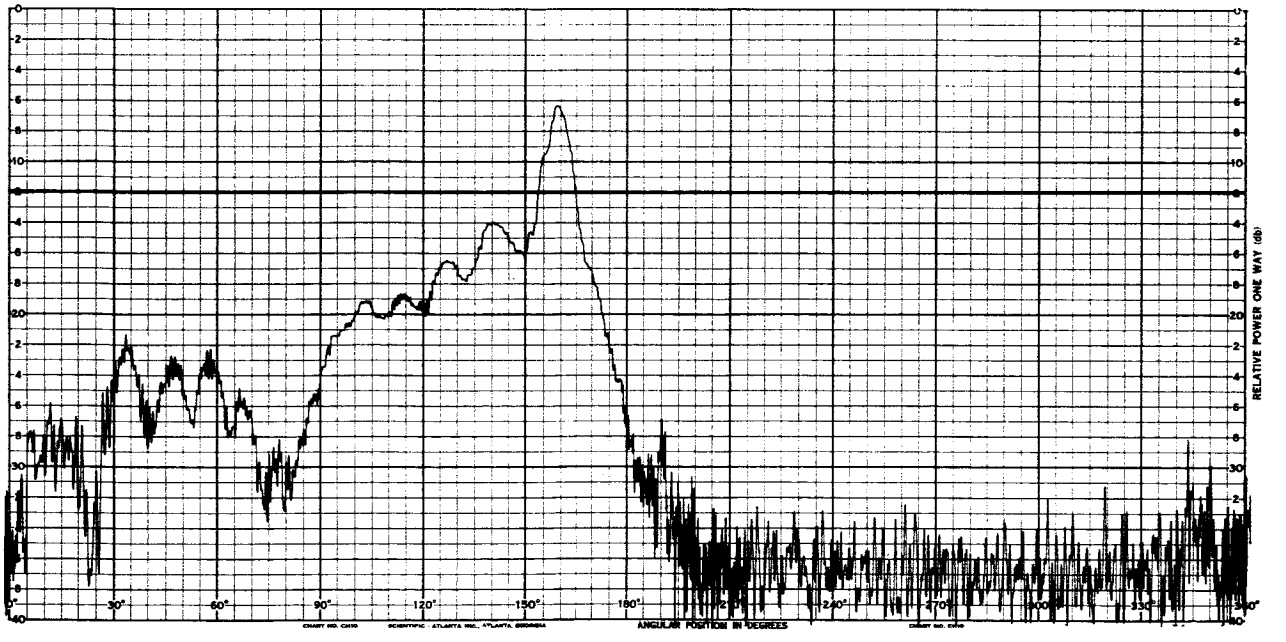


ANTENNA RADIATION PATTERN NO. 214-22

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

SA-5 AZUSA ANTENNA

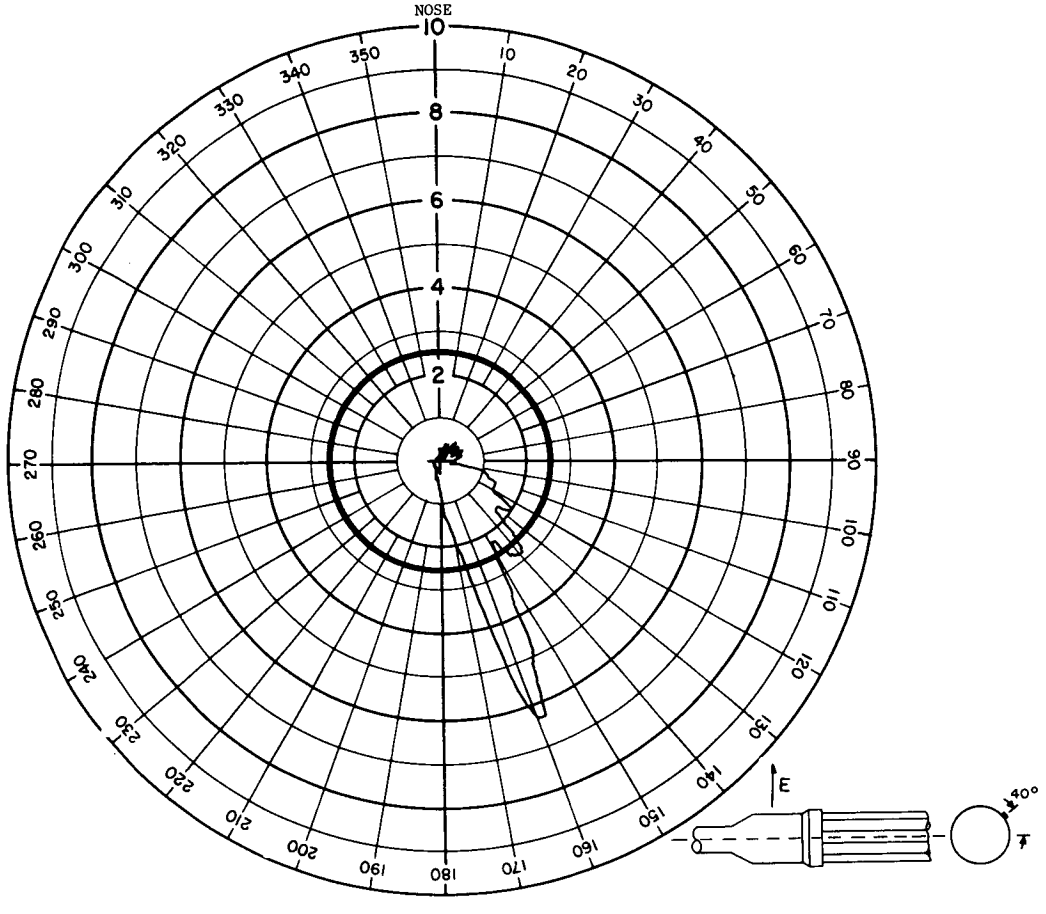


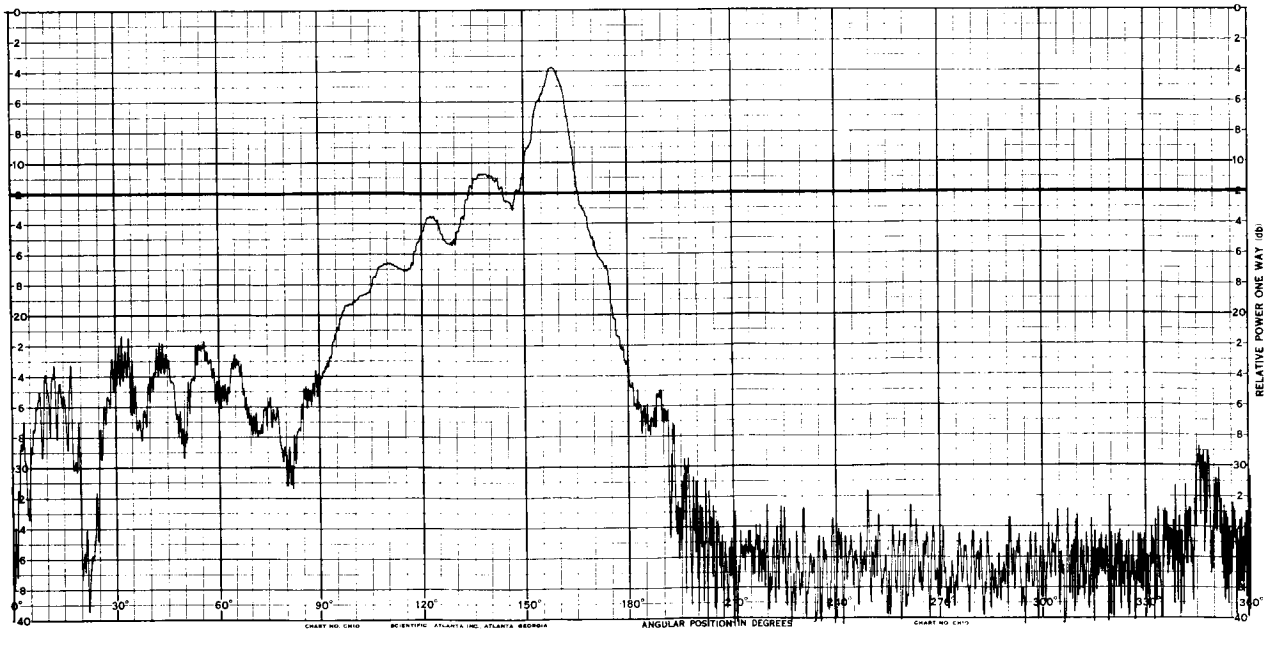


ANTENNA RADIATION PATTERN NO. 214-23

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

SA-5 AZUSA ANTENNA

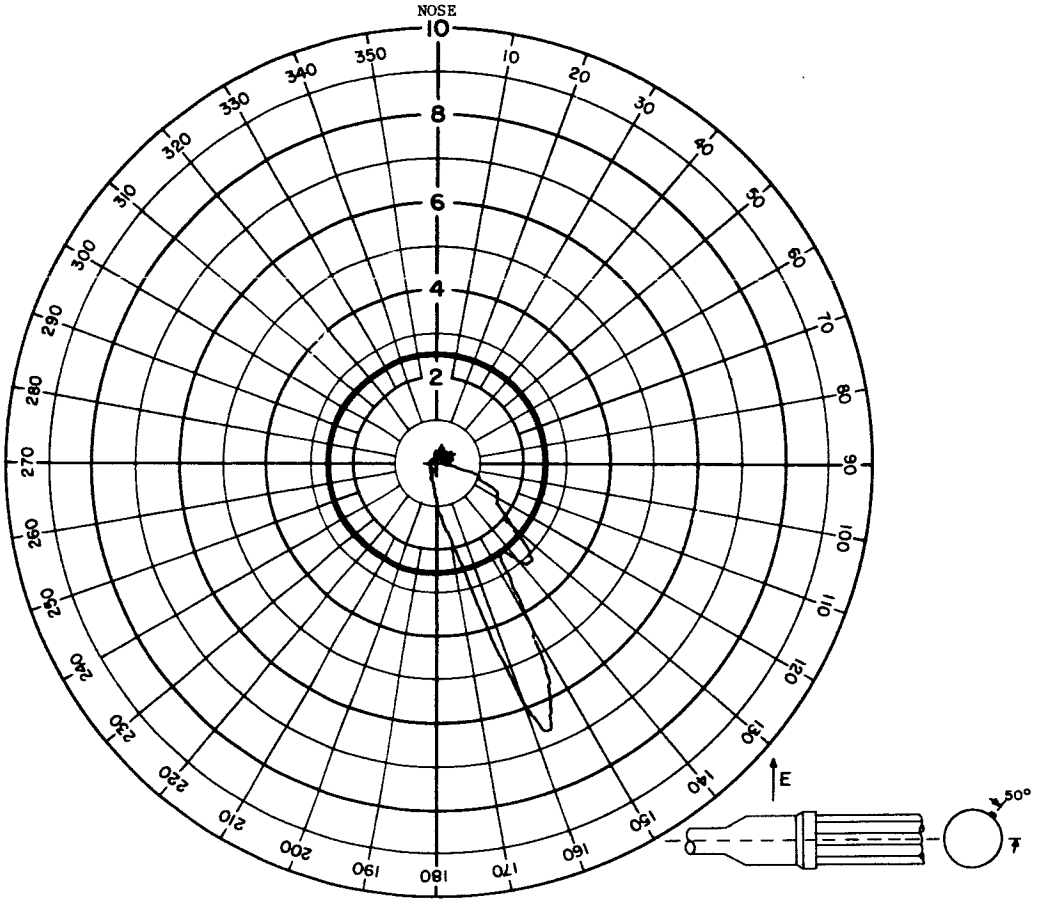


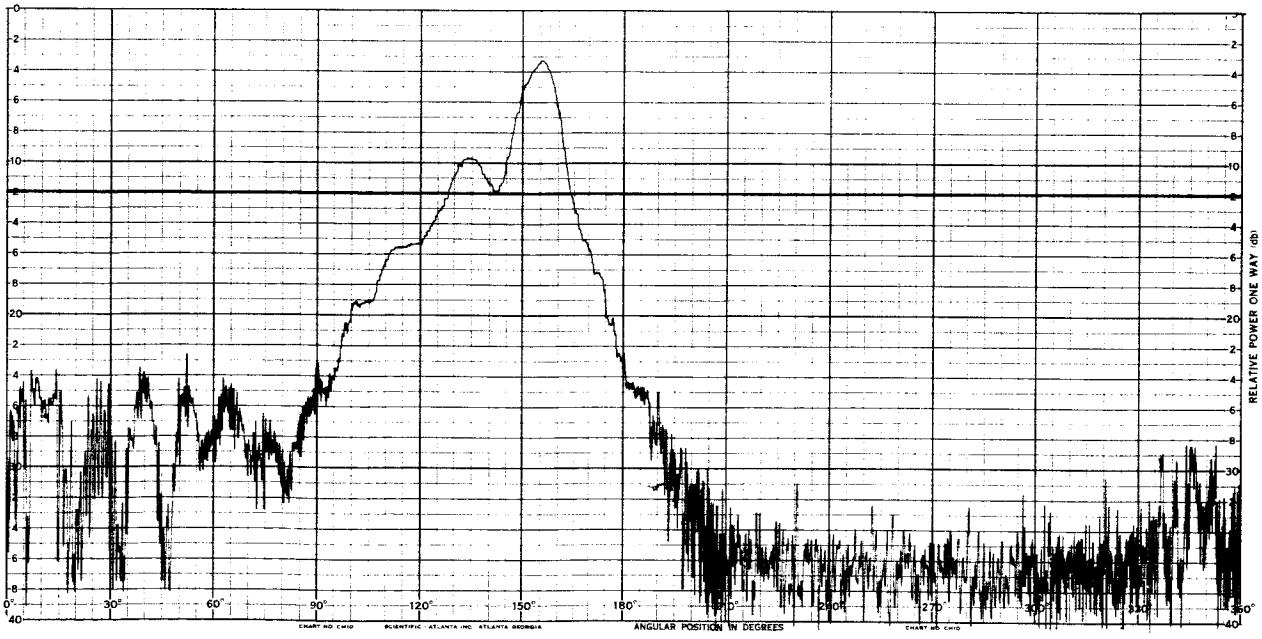


ANTENNA RADIATION PATTERN NO. 214-24

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

SA-5 AZUSA ANTENNA

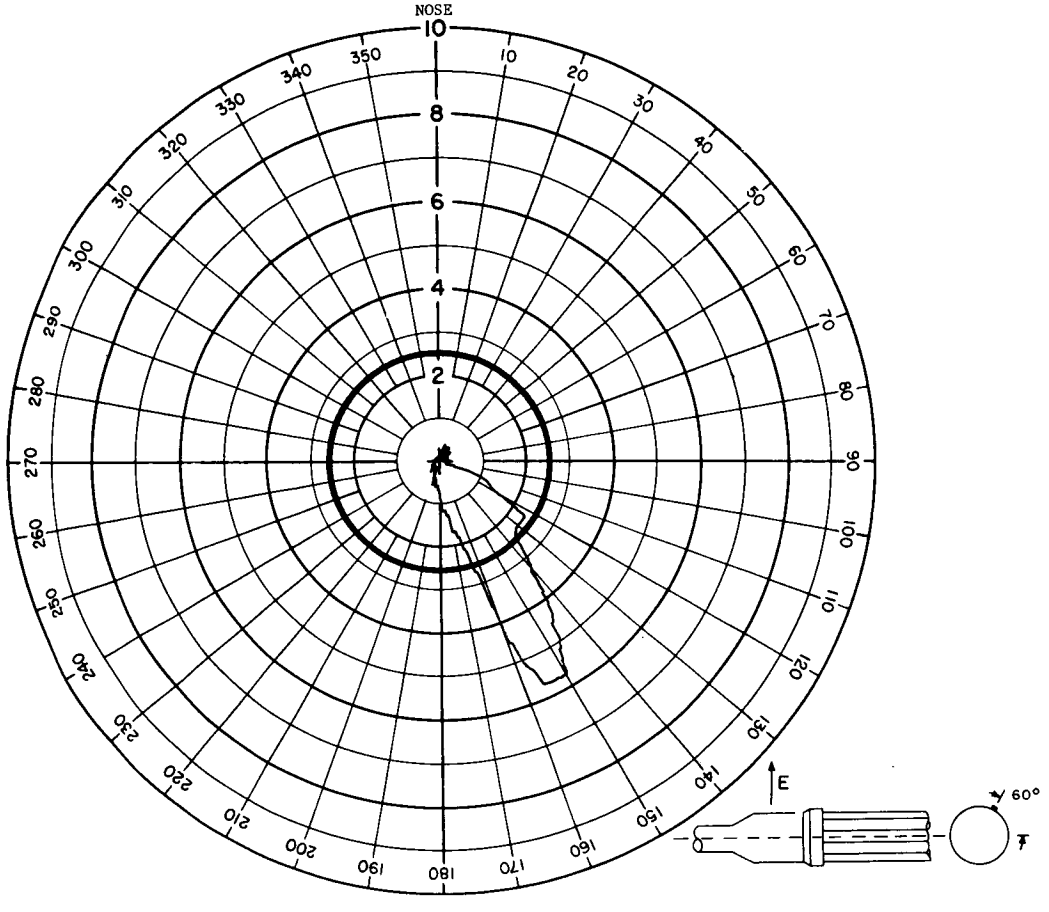


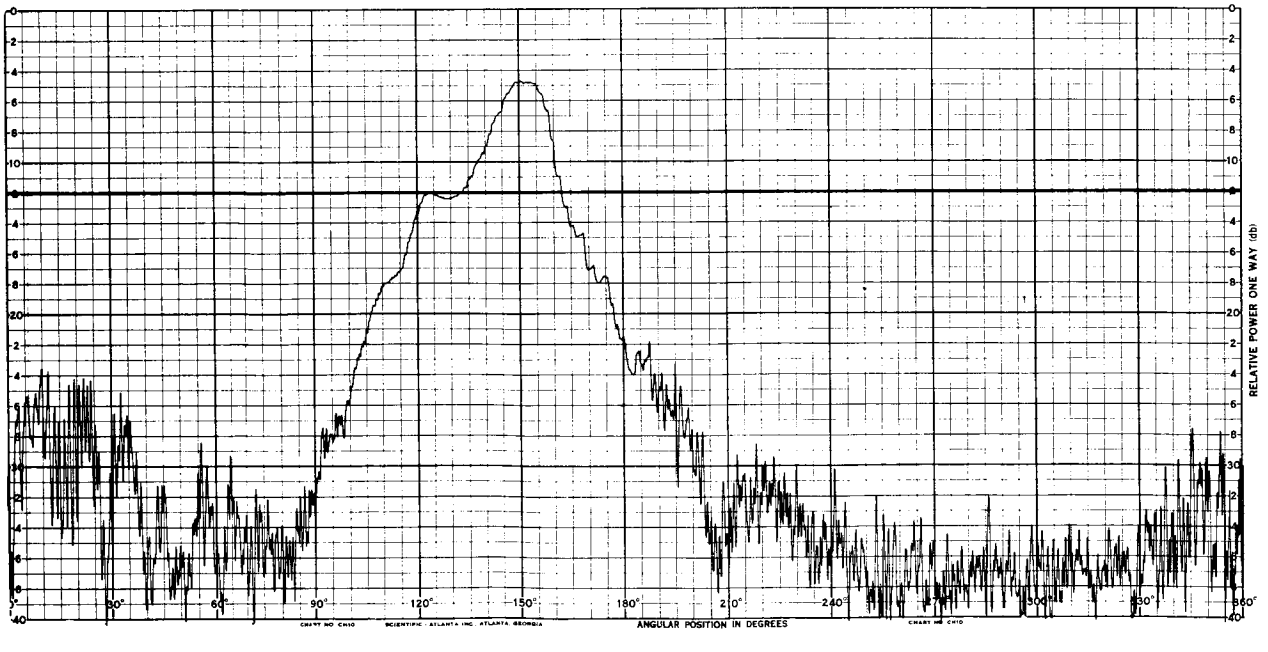


ANTENNA RADIATION PATTERN NO. 214-25

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

SA-5 AZUSA ANTENNA

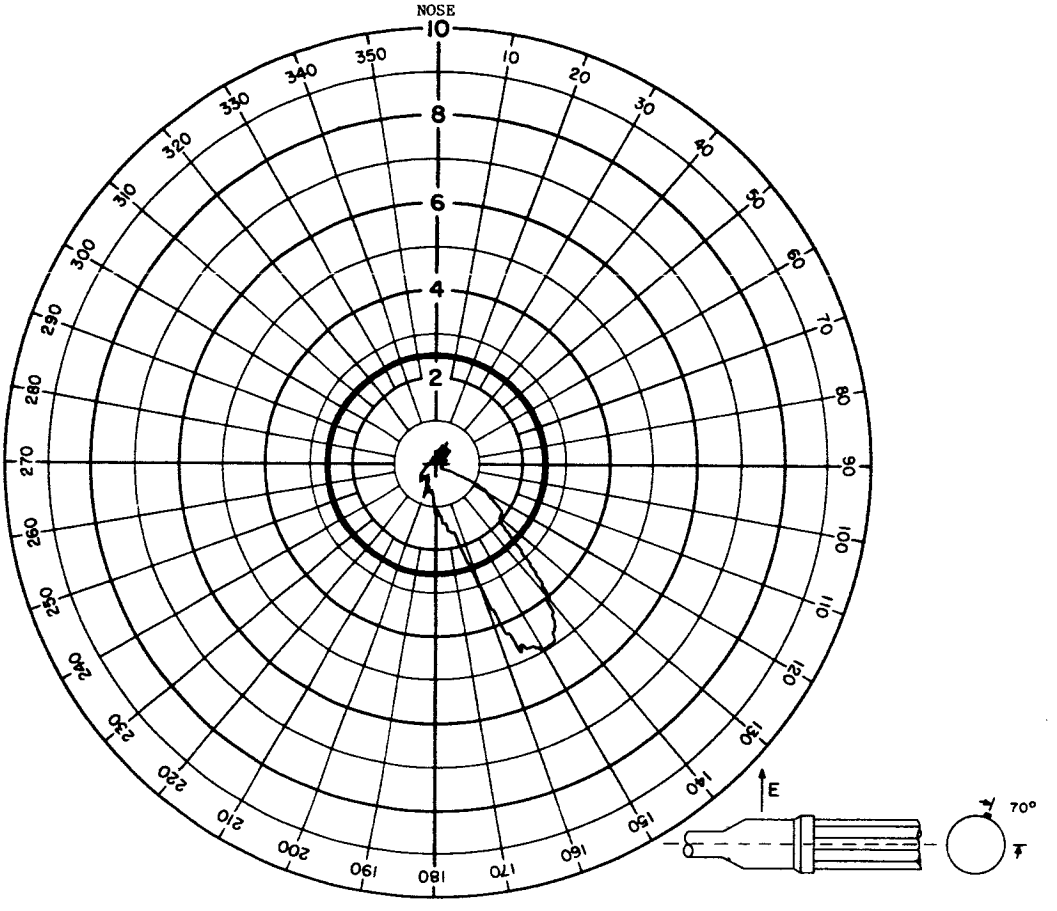


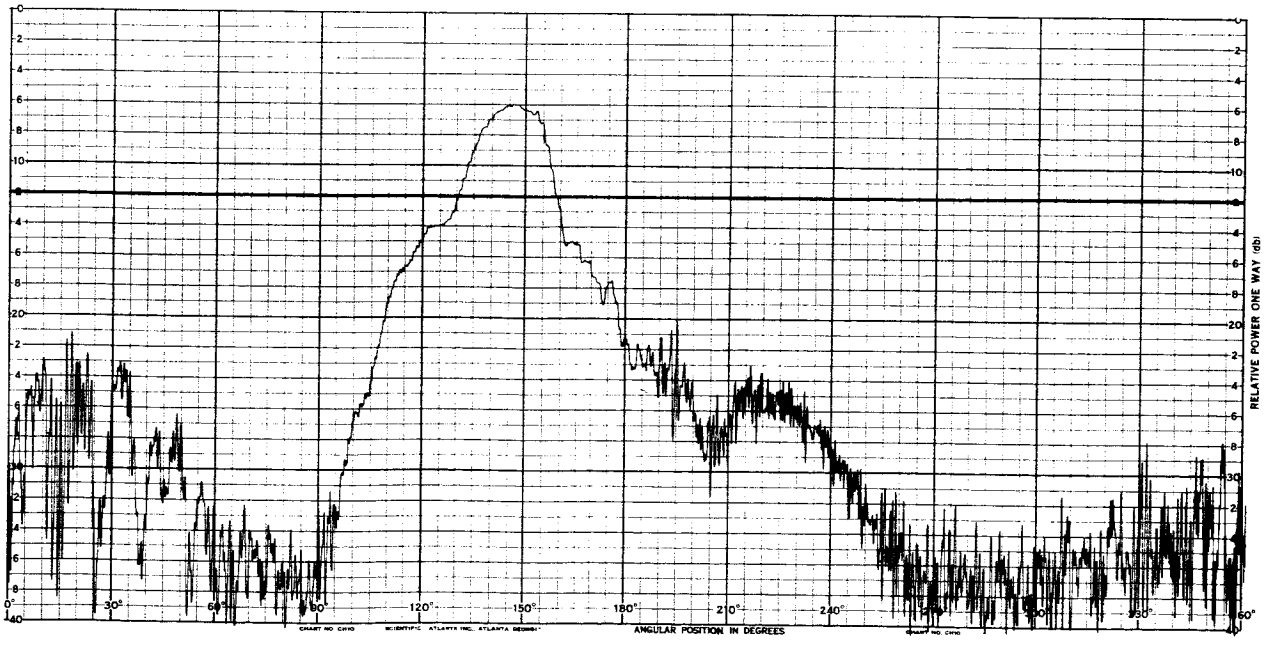


ANTENNA RADIATION PATTERN NO. 214-26

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

SA-5 AZUSA ANTENNA

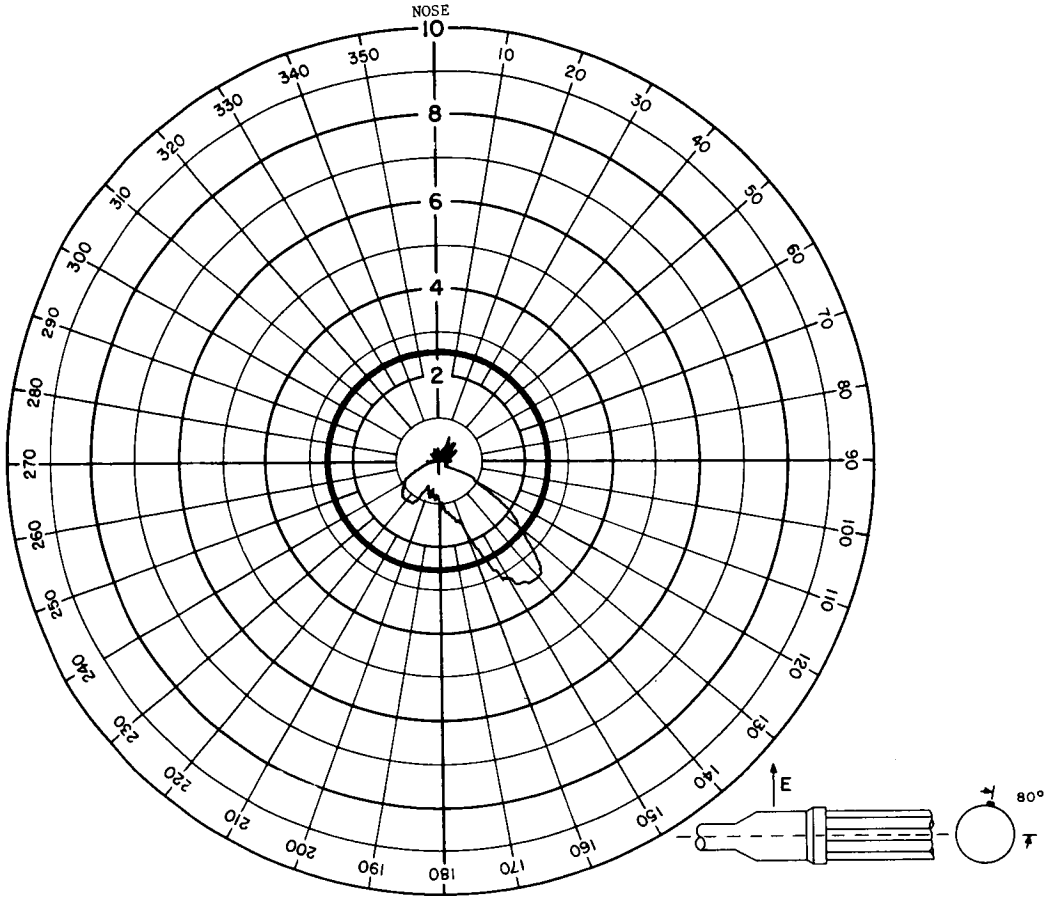


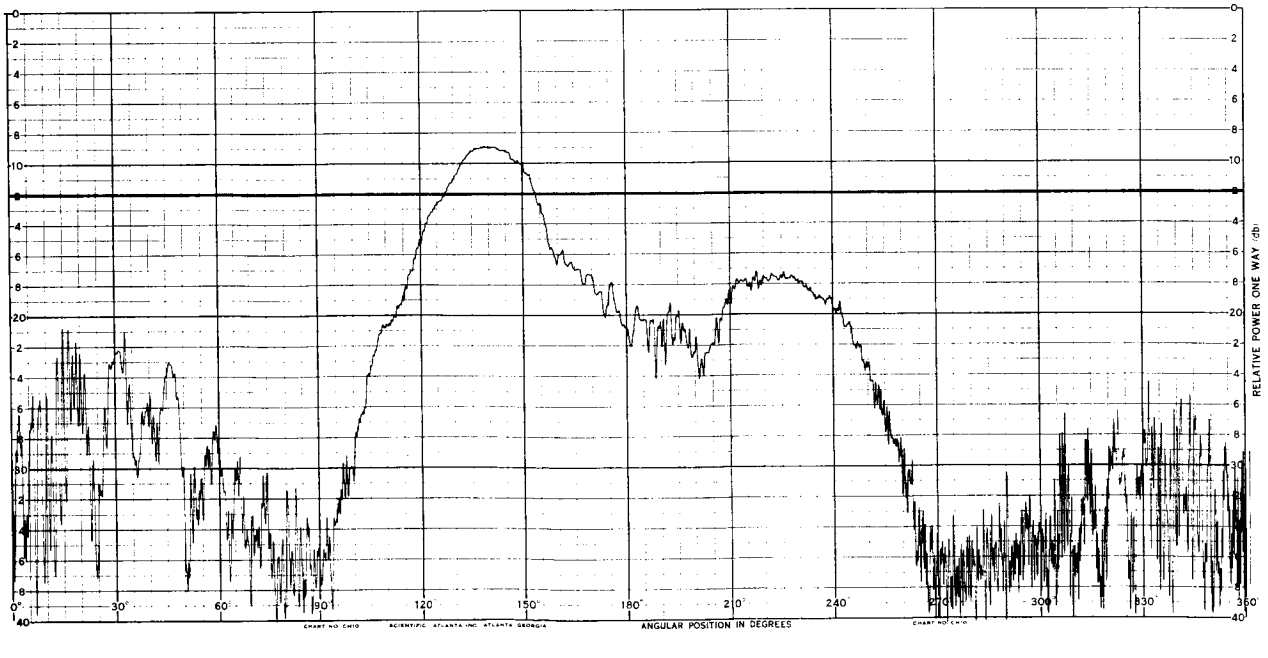


ANTENNA RADIATION PATTERN NO. 214-27

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

SA-5 AZUSA ANTENNA

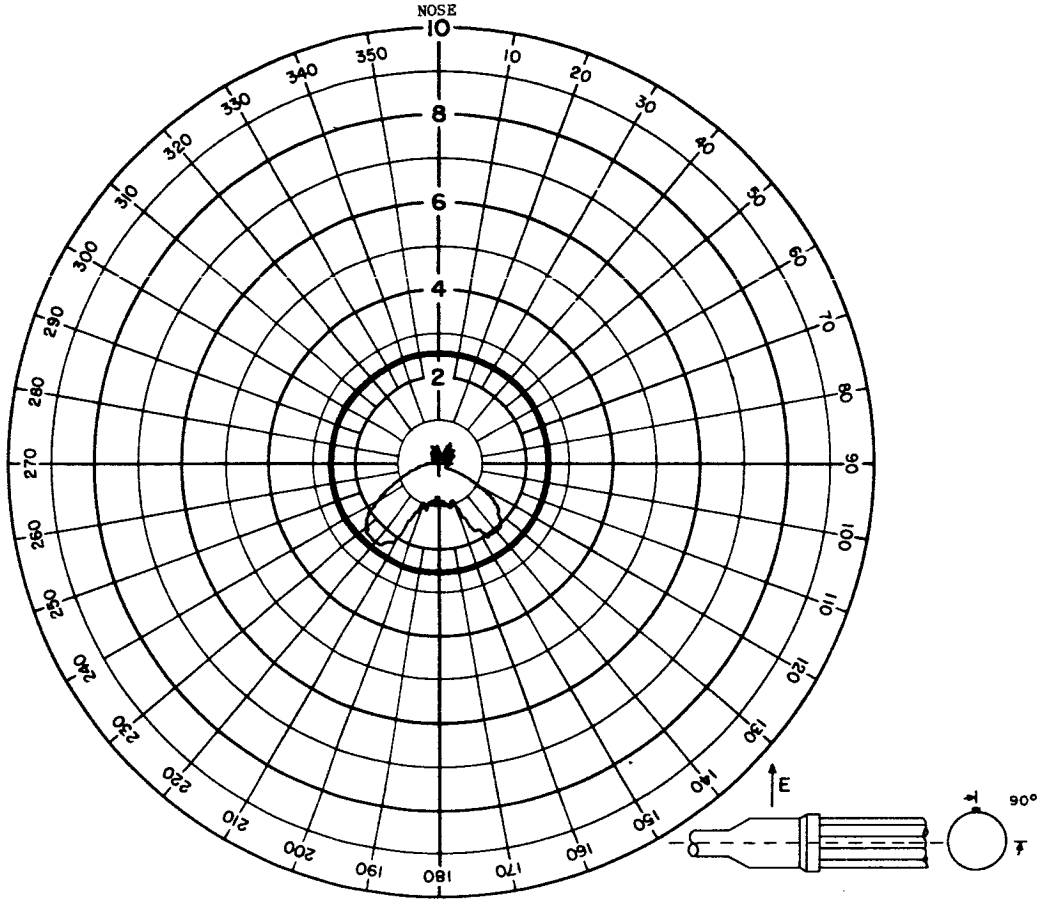


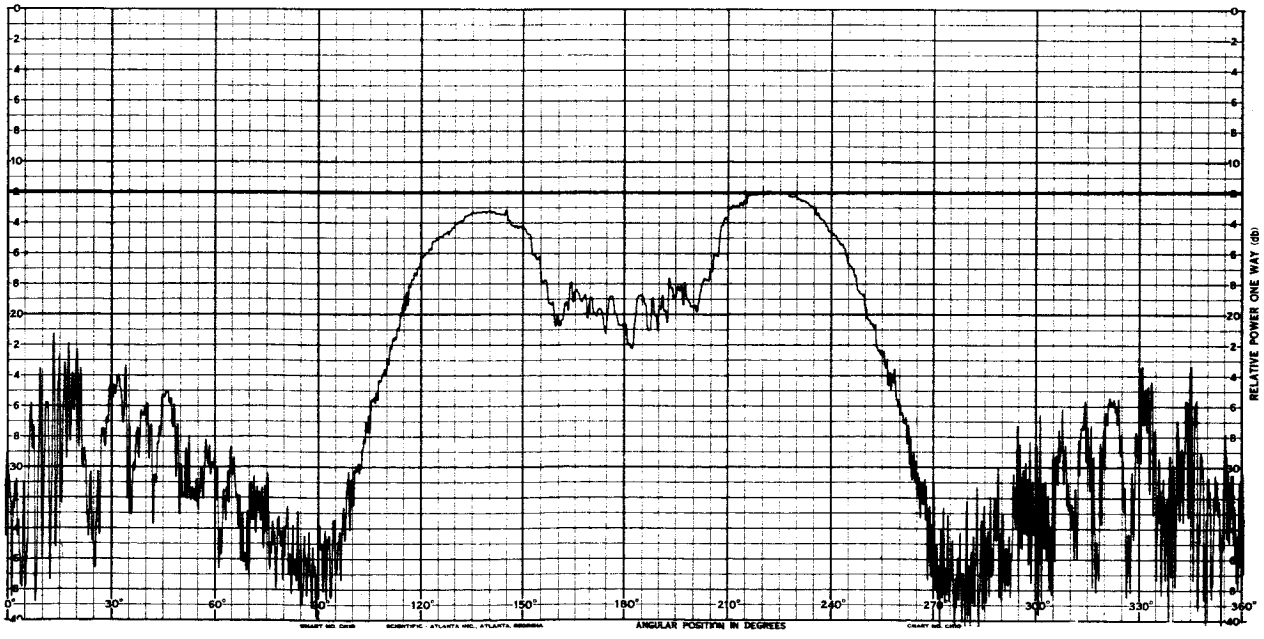


ANTENNA RADIATION PATTERN NO. 214-28

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

SA-5 AZUSA ANTENNA

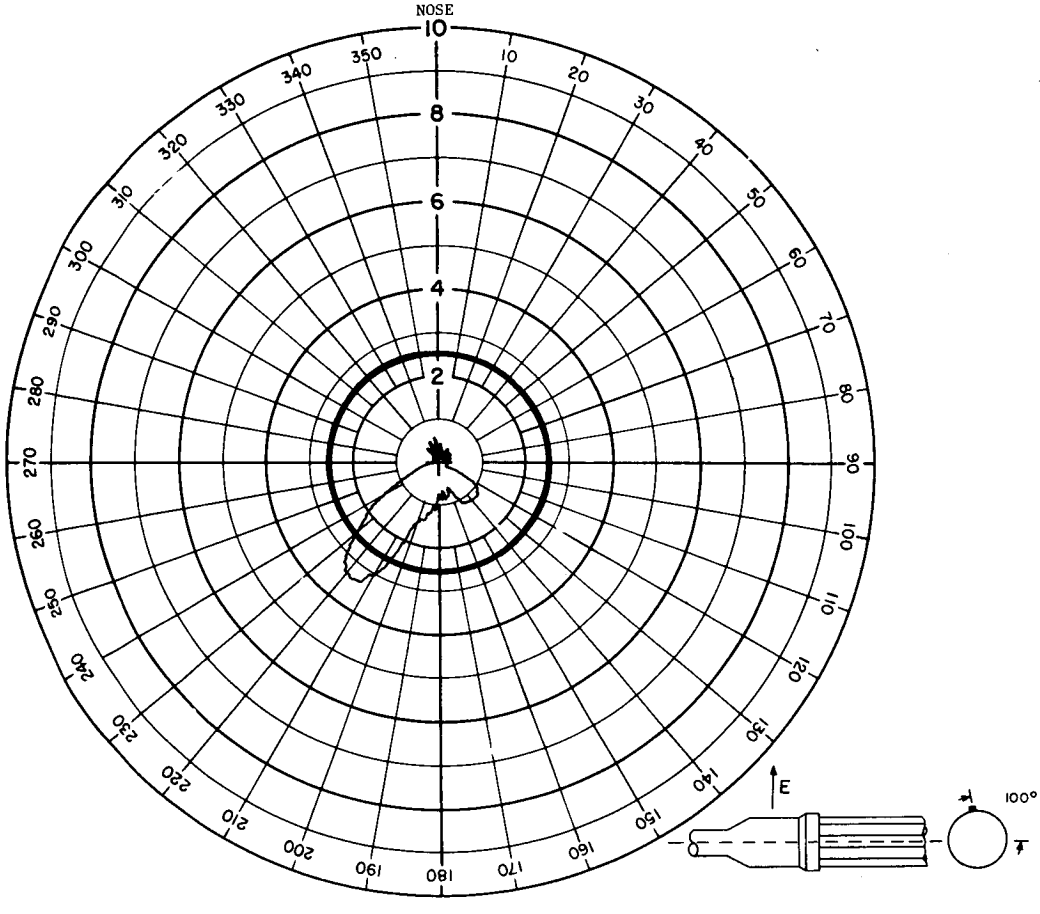


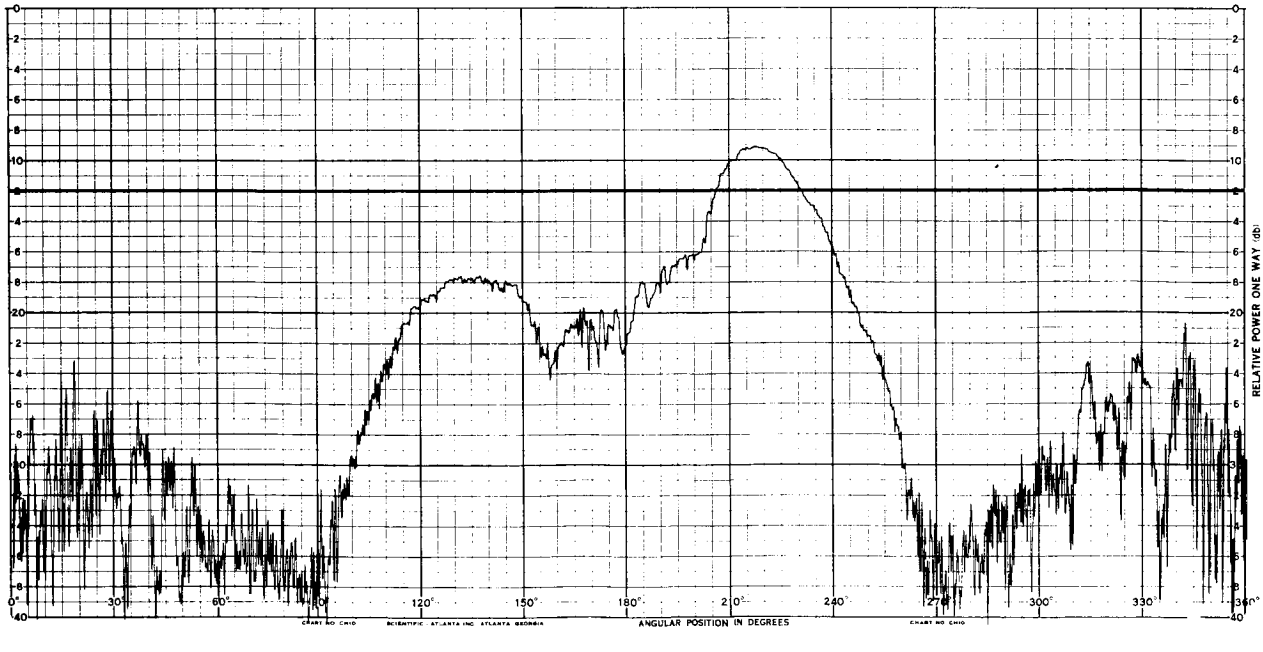


ANTENNA RADIATION PATTERN NO. 214-29

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

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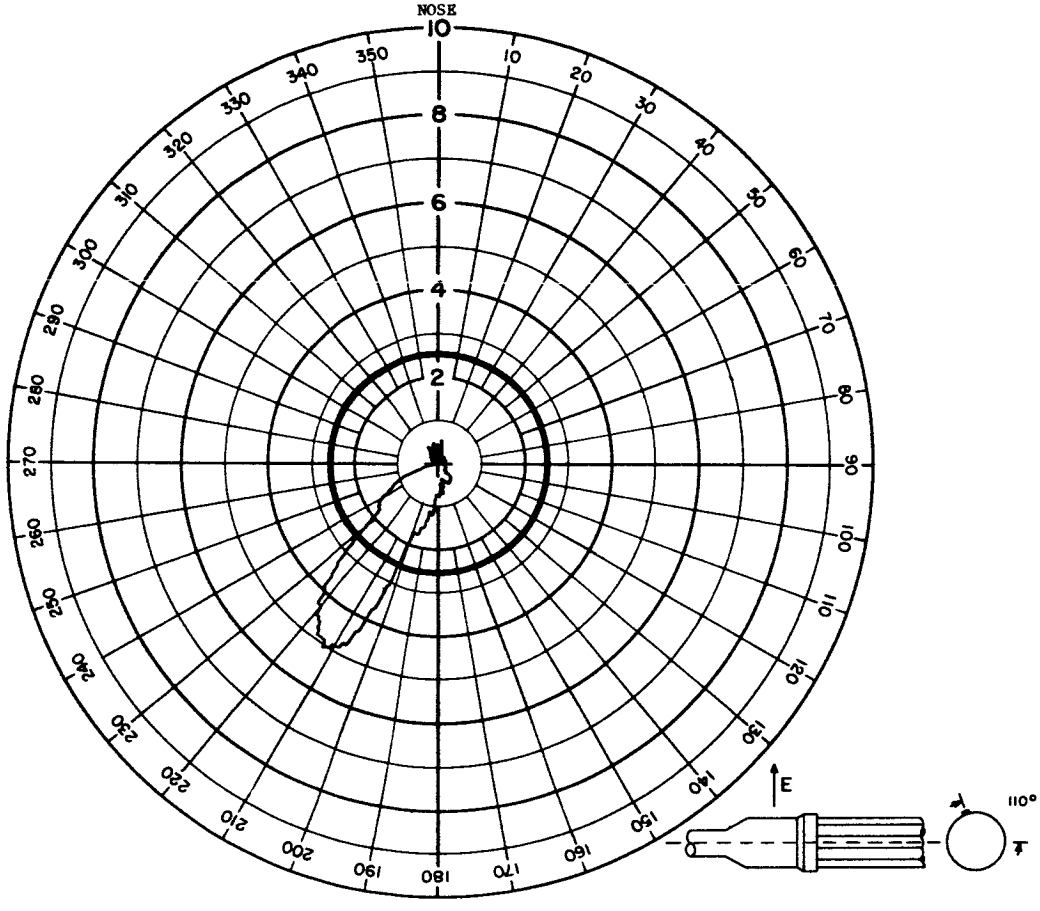


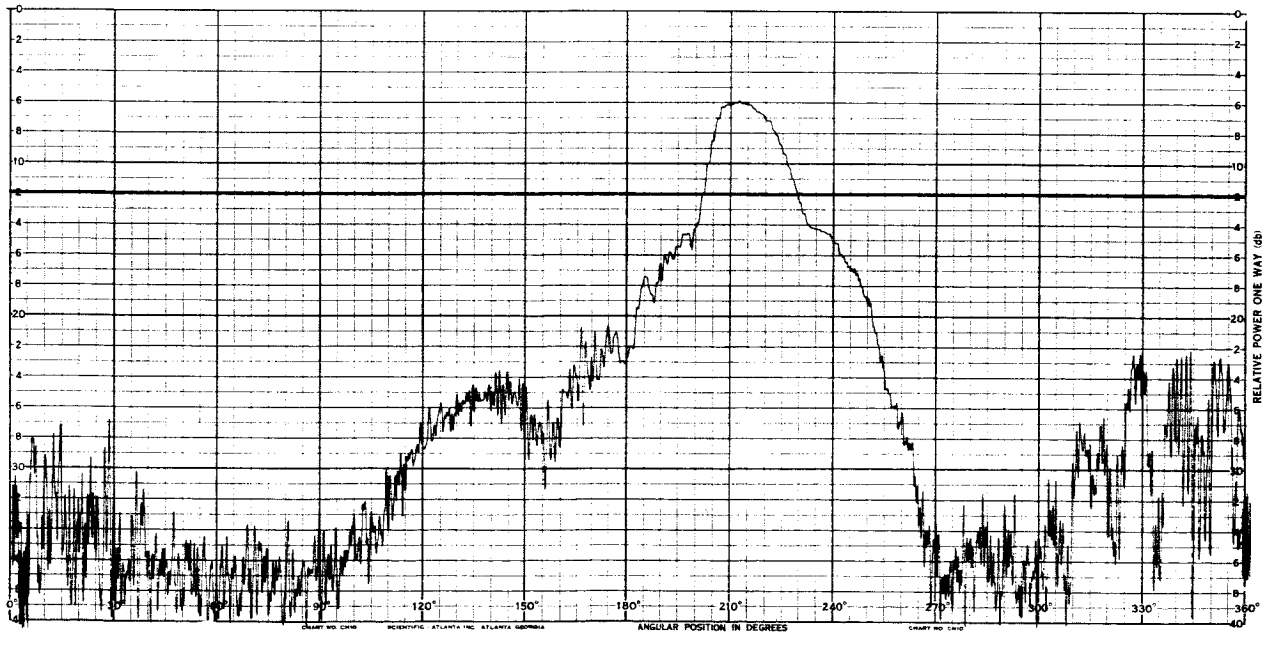


ANTENNA RADIATION PATTERN NO. 214-30

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

SA-5 AZUSA ANTENNA

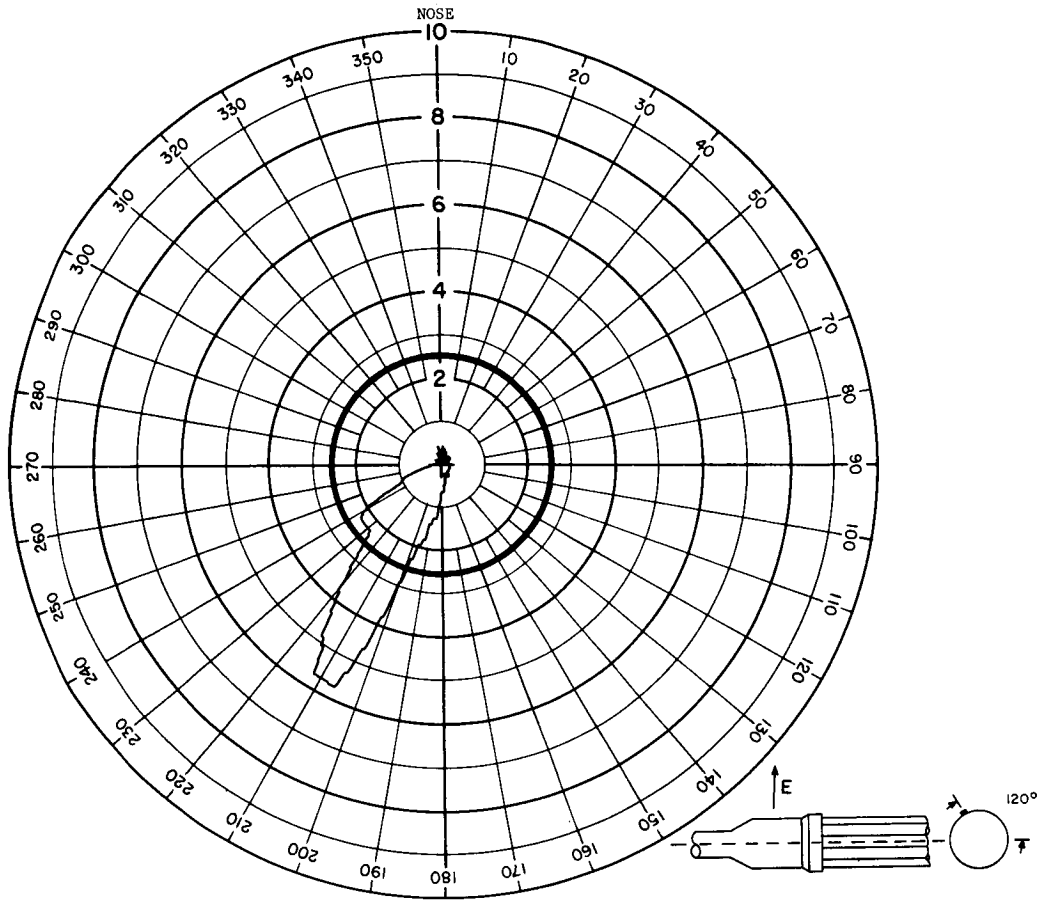


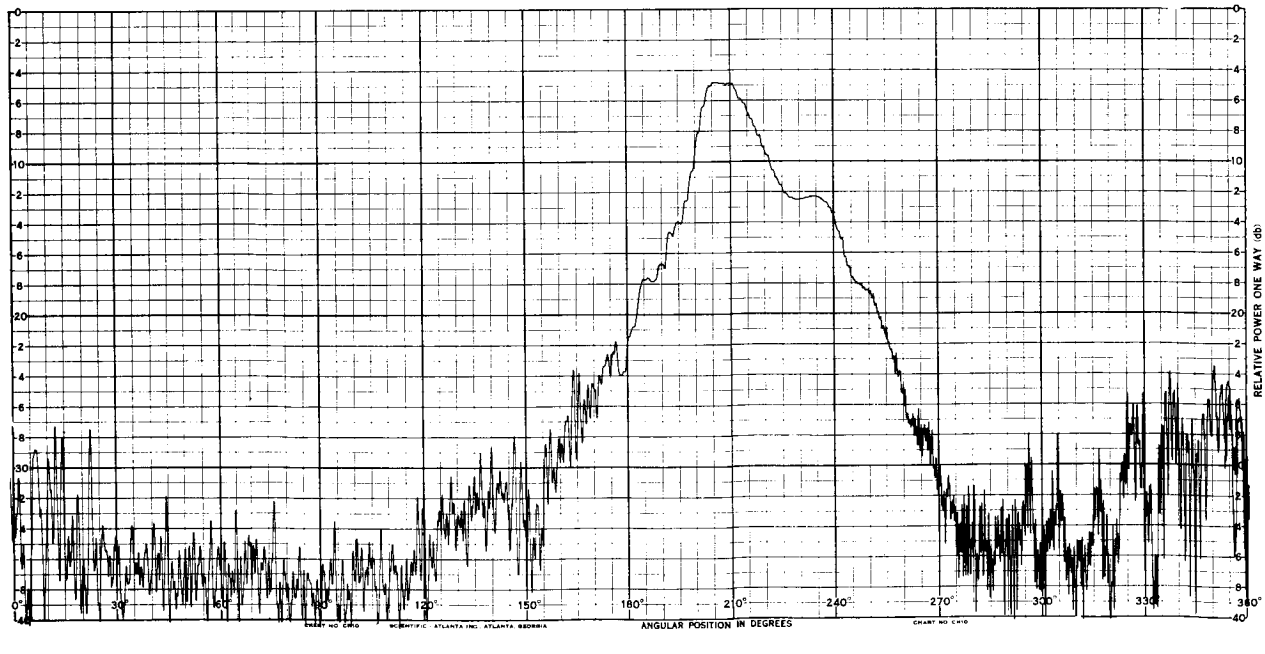


ANTENNA RADIATION PATTERN NO. 214-31

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

SA-5 AZUSA ANTENNA

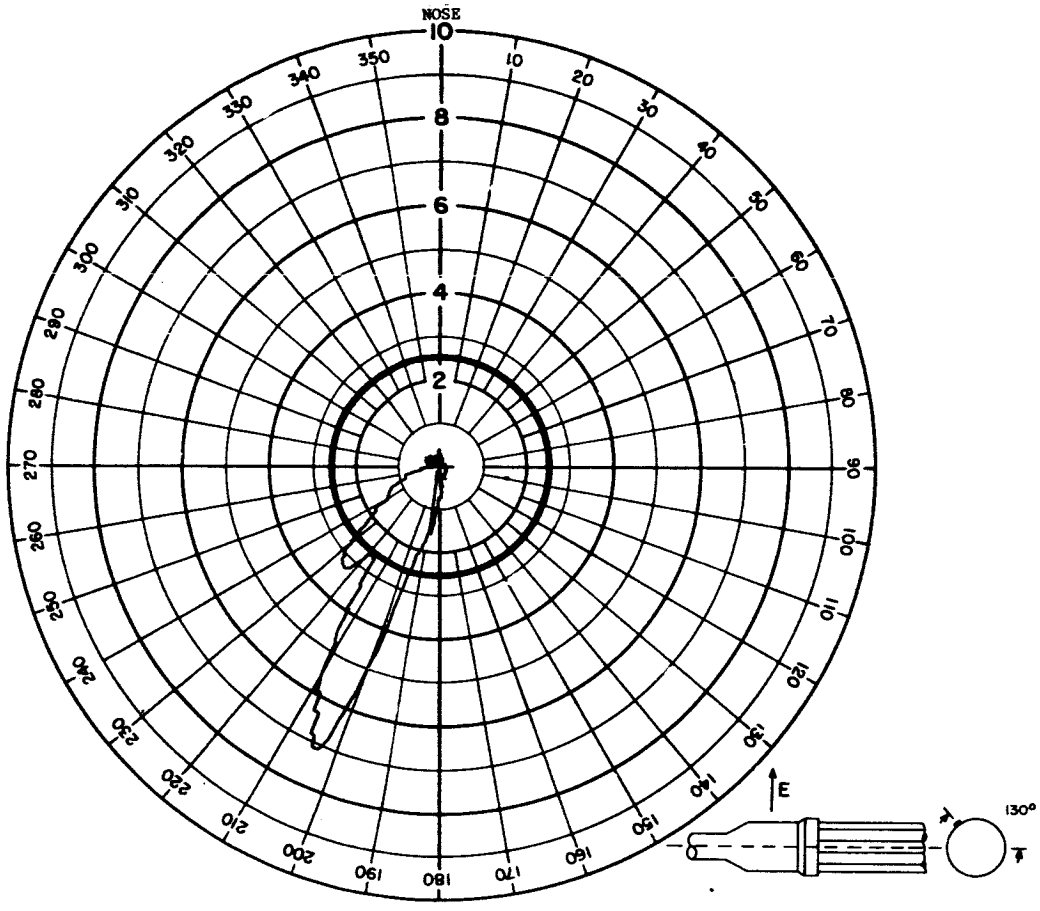


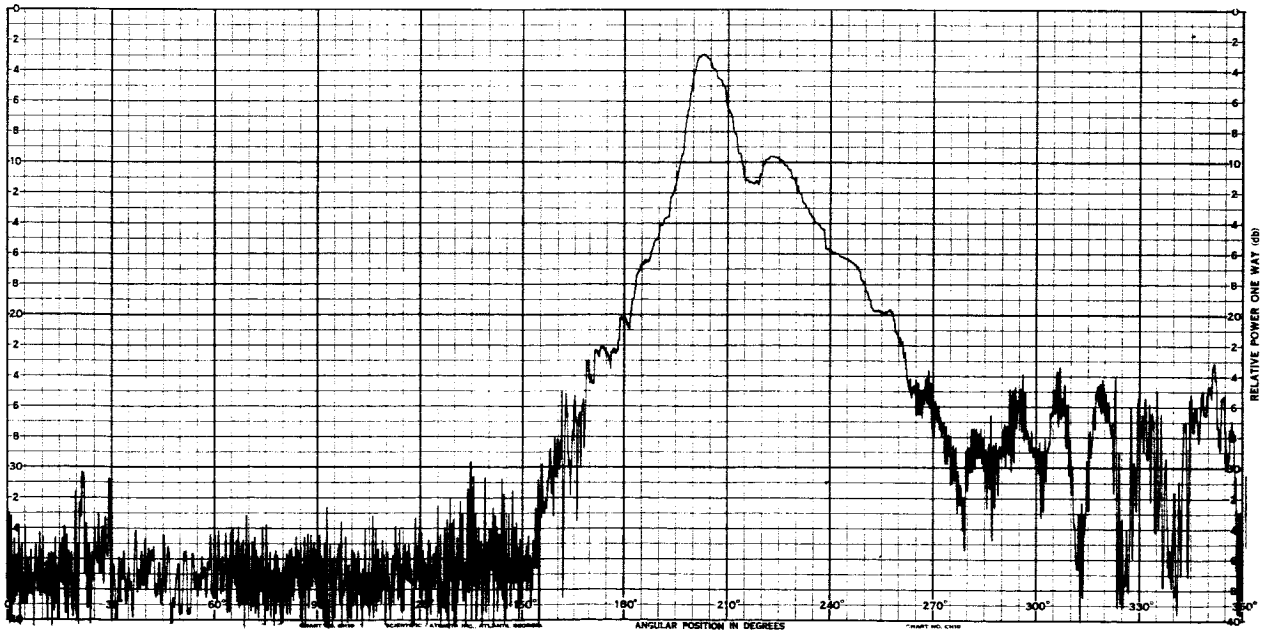


ANTENNA RADIATION PATTERN NO. 214-32

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

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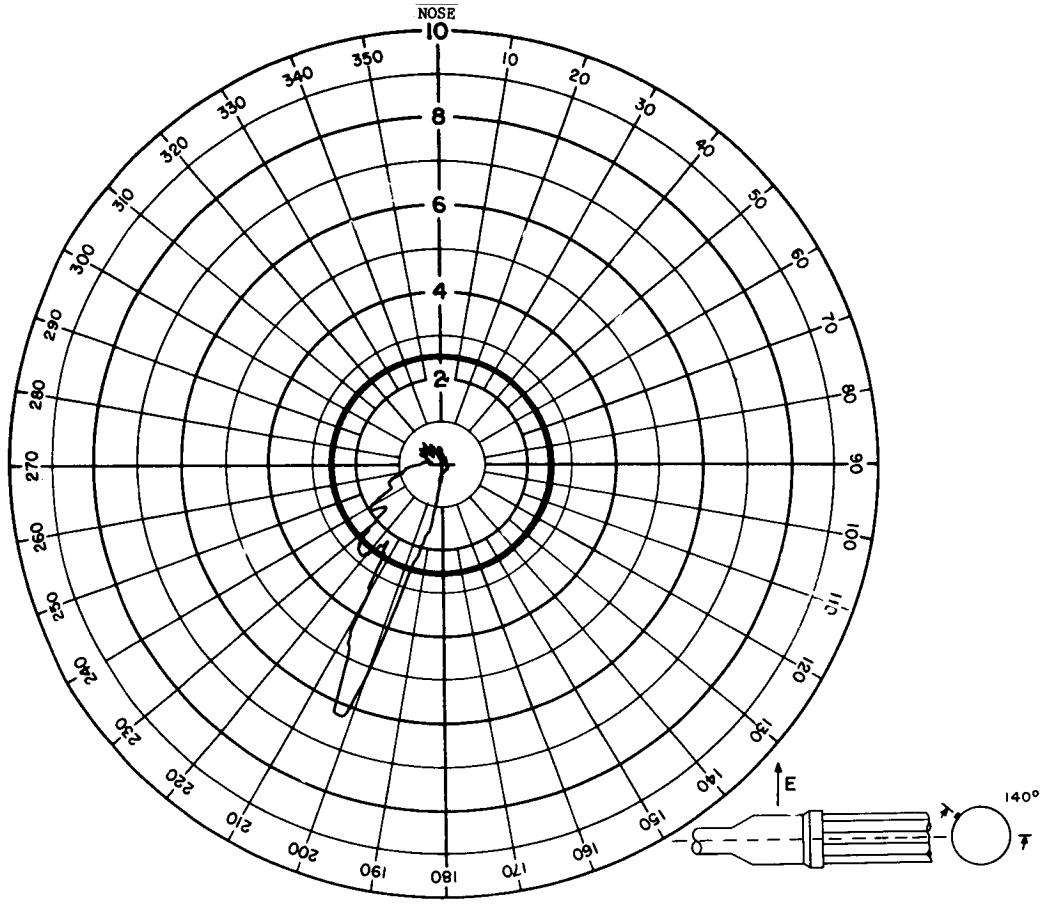


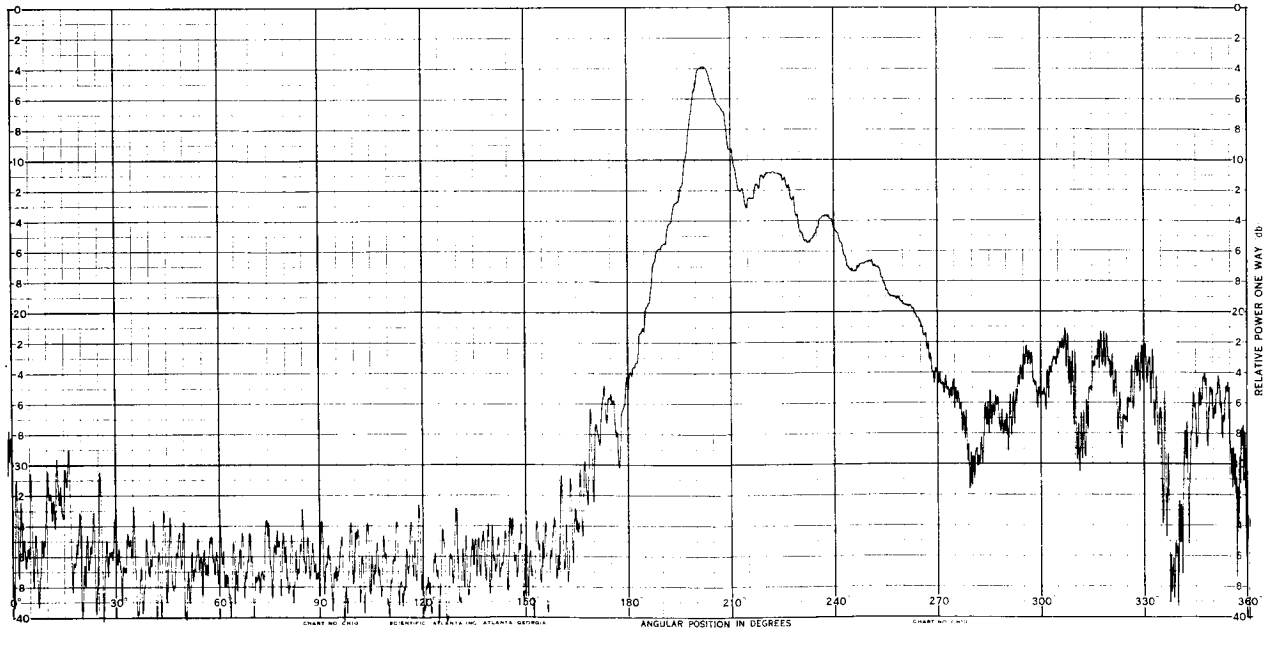


ANTENNA RADIATION PATTERN NO. 214-33

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

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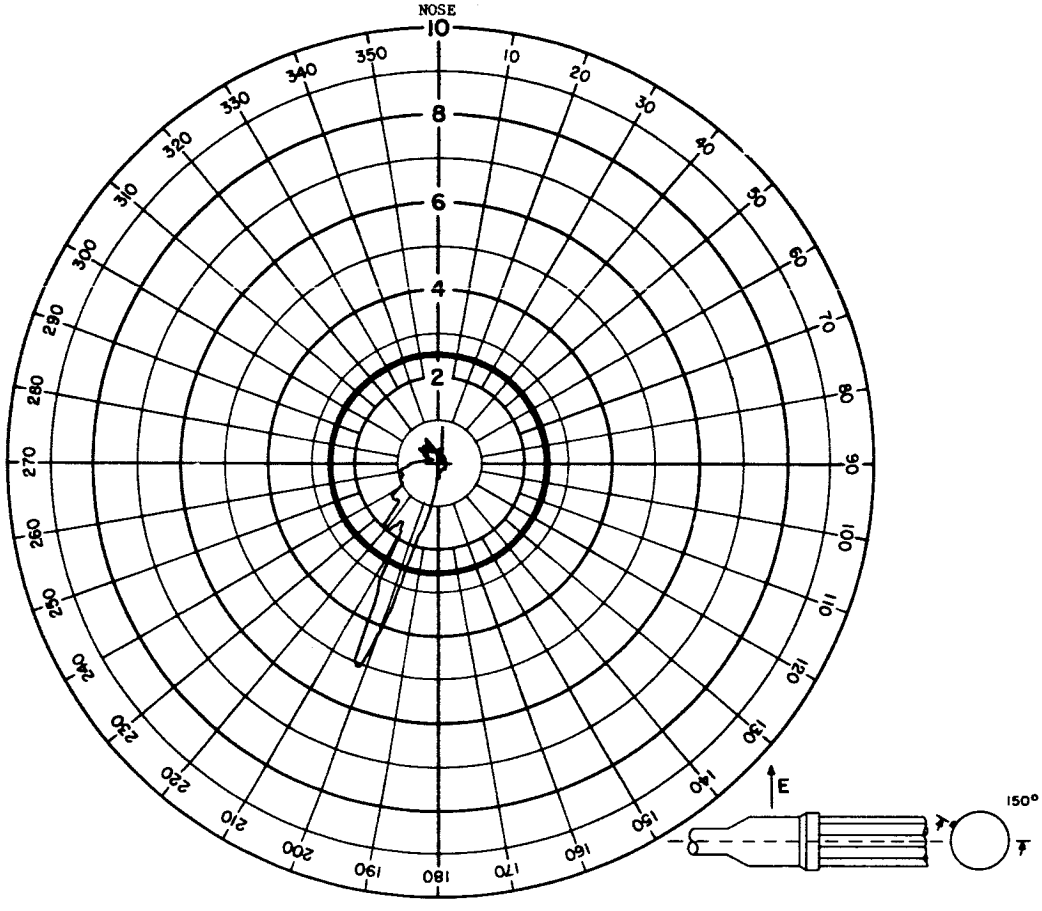


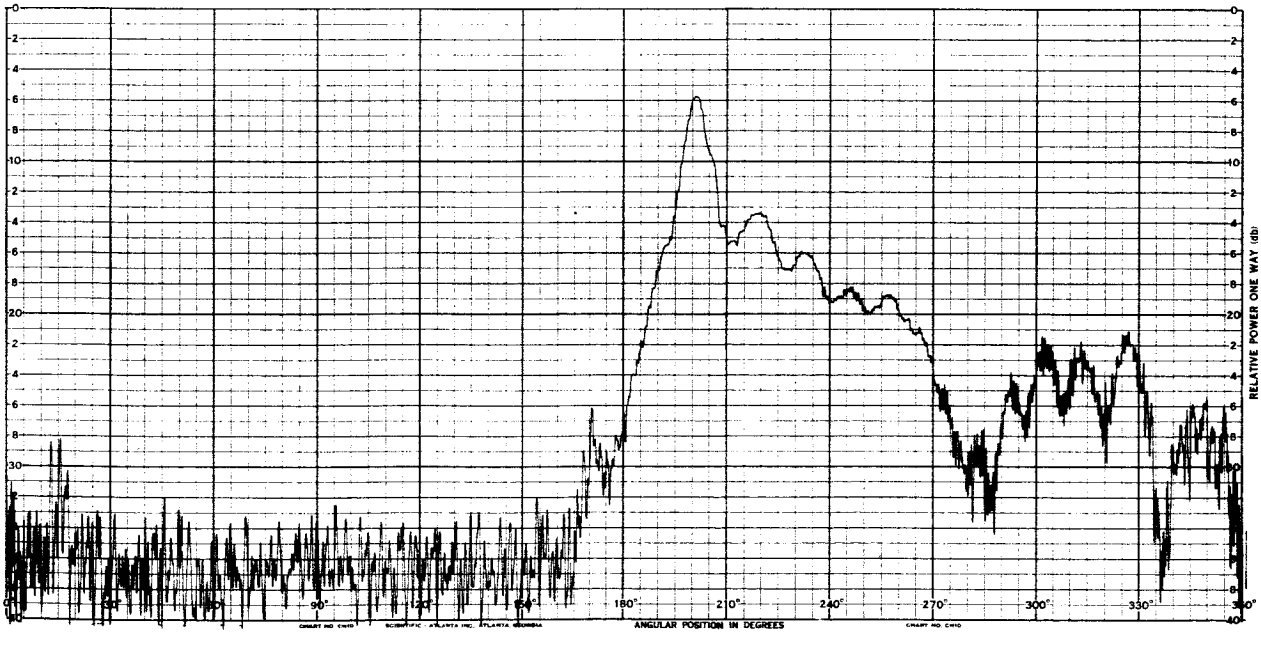


ANTENNA RADIATION PATTERN NO. 214-34

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

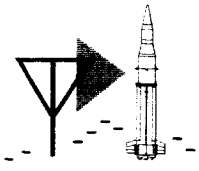
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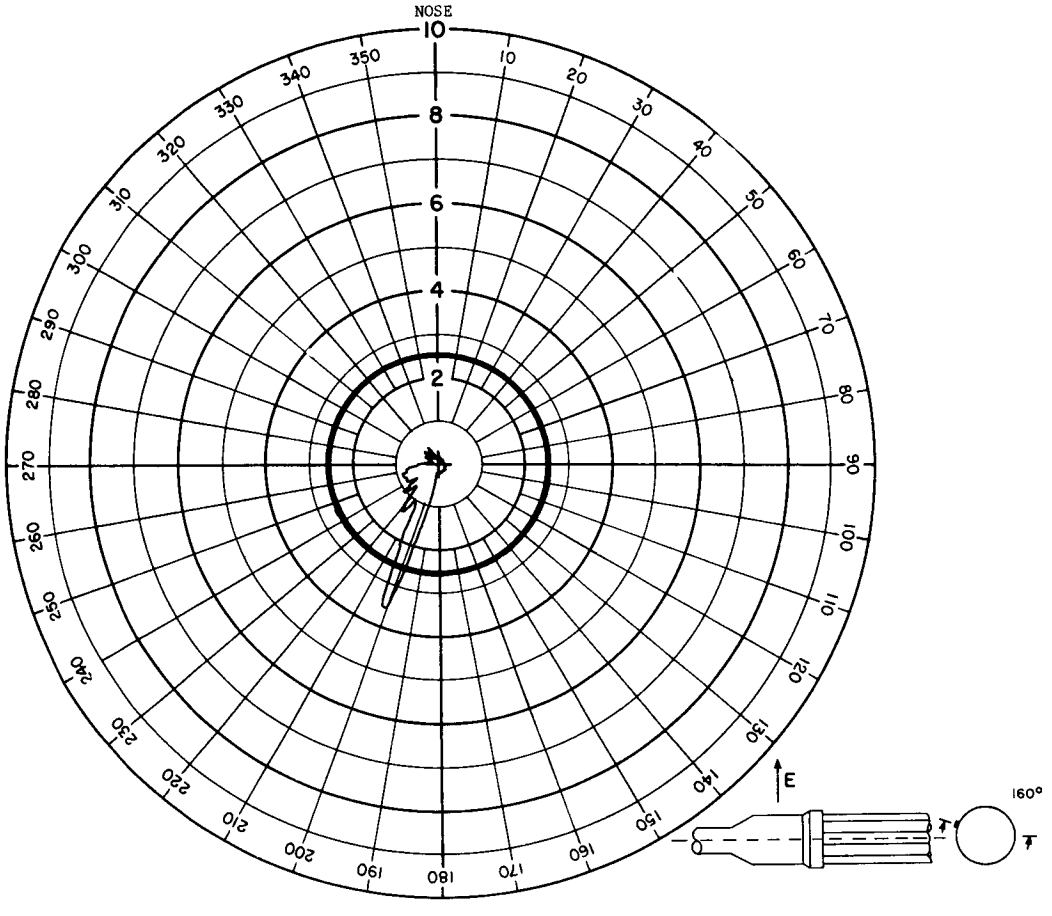


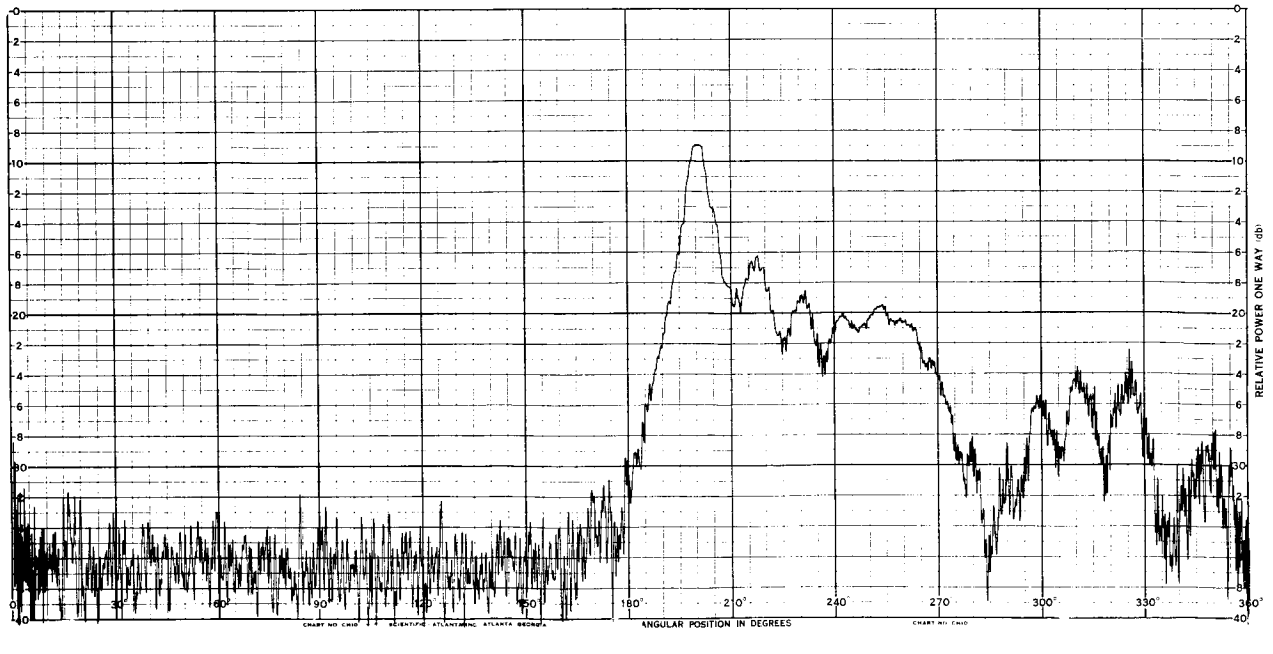
ANTENNA RADIATION PATTERN NO. 214-35

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



SA-5 AZUSA ANTENNA

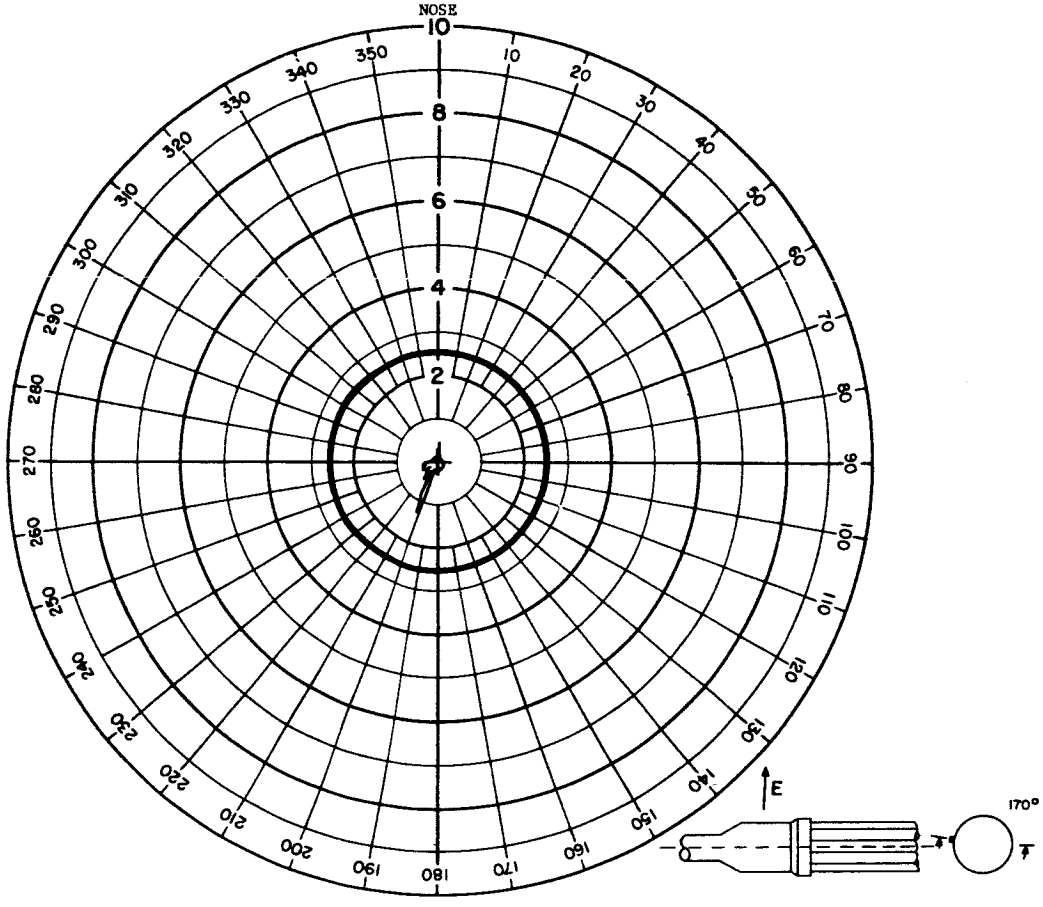


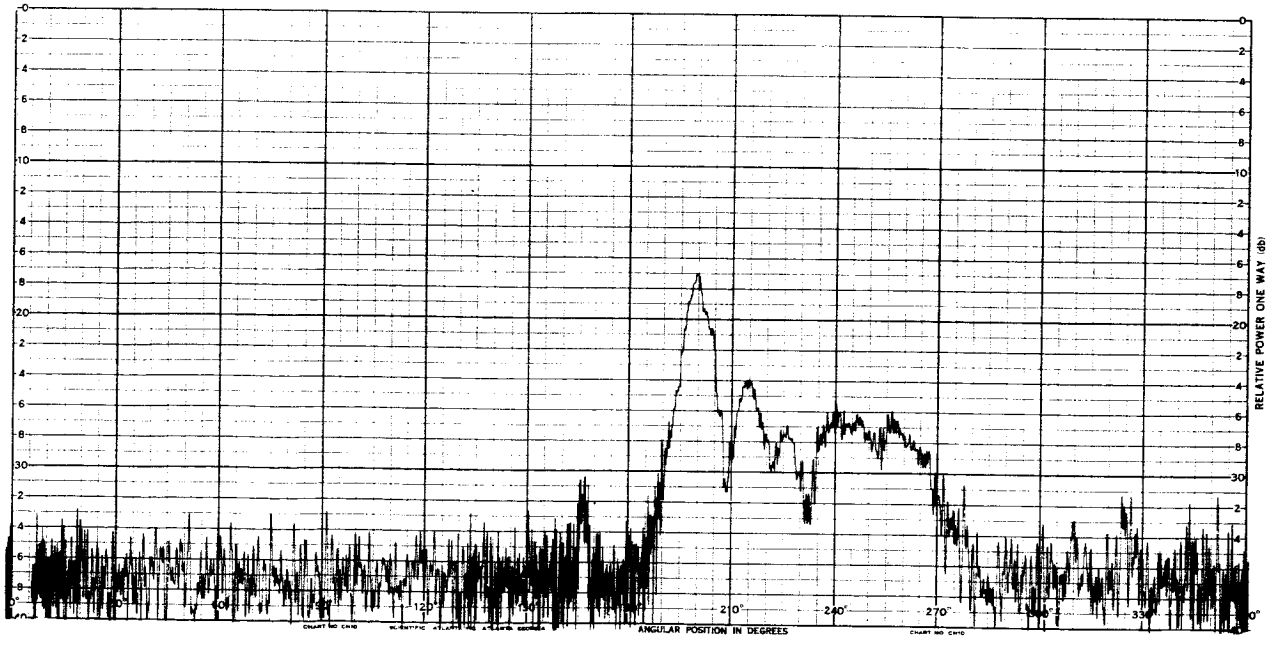


ANTENNA RADIATION PATTERN NO. 214-36

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

SA-5 AZUSA ANTENNA

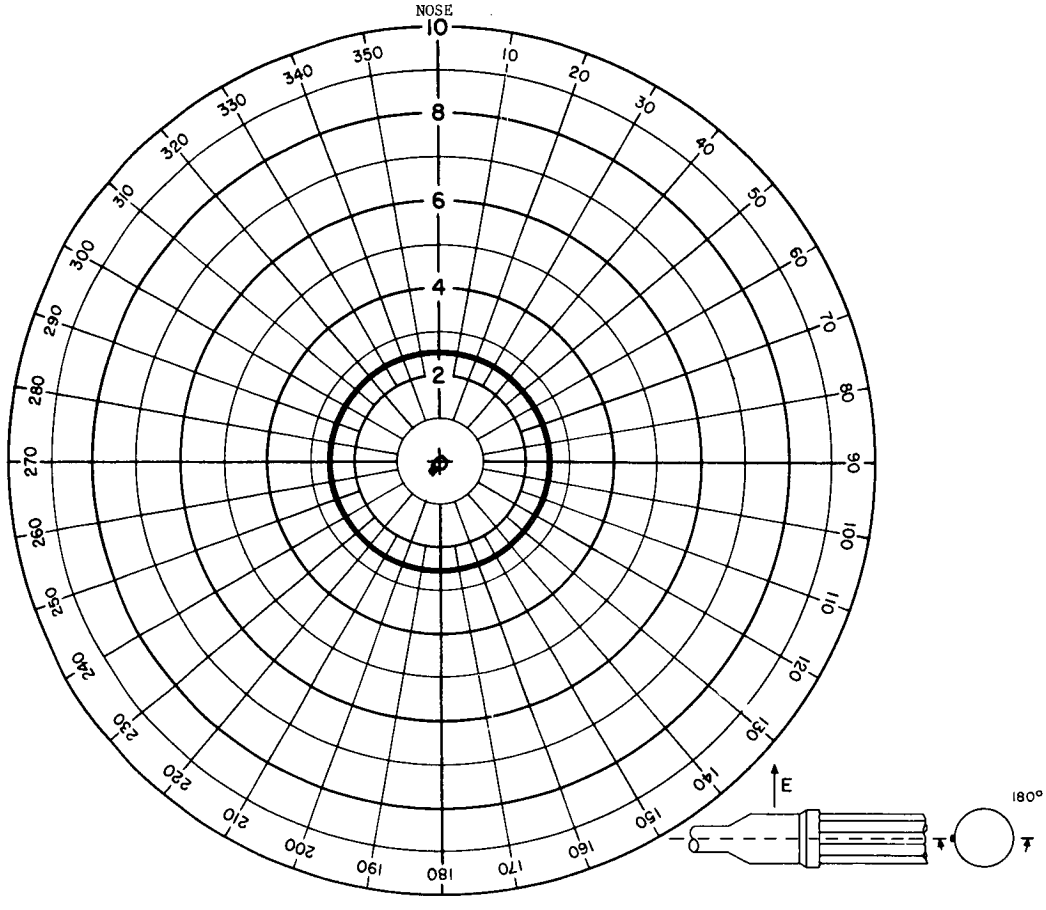


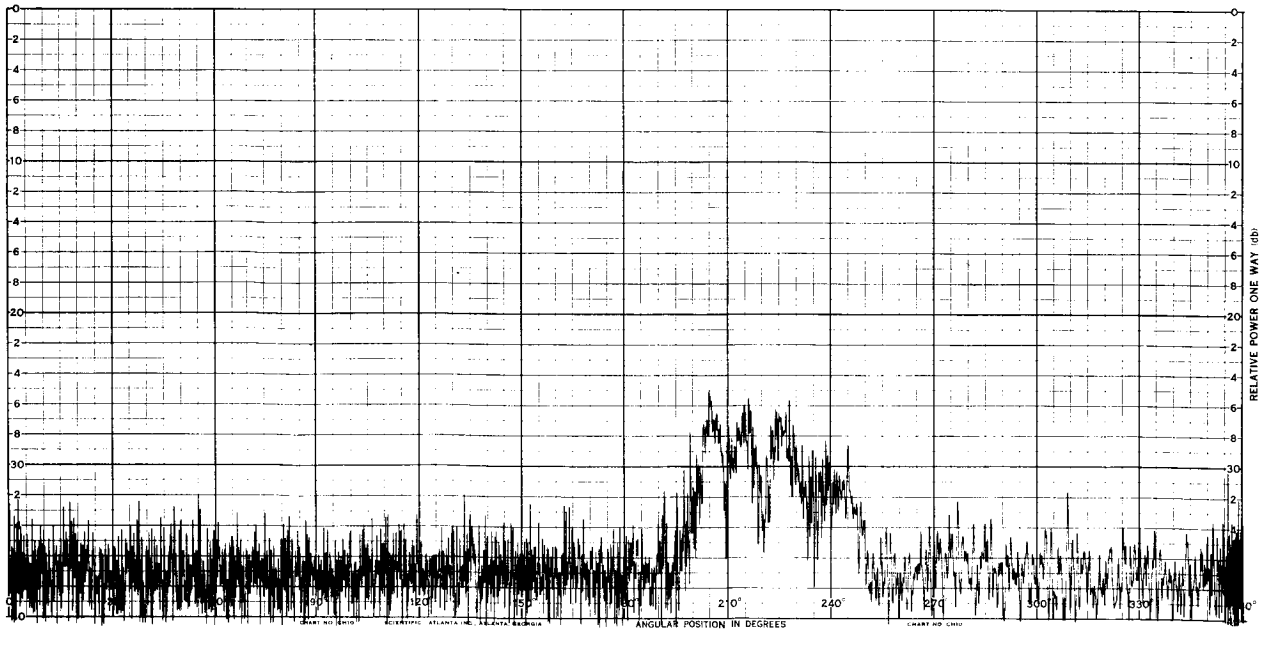


ANTENNA RADIATION PATTERN NO. 214-37

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

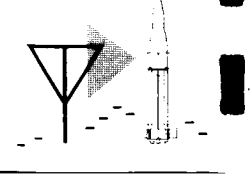
SA-5 AZUSA ANTENNA





ANTENNA RADIATION PATTERN NO. 214-38

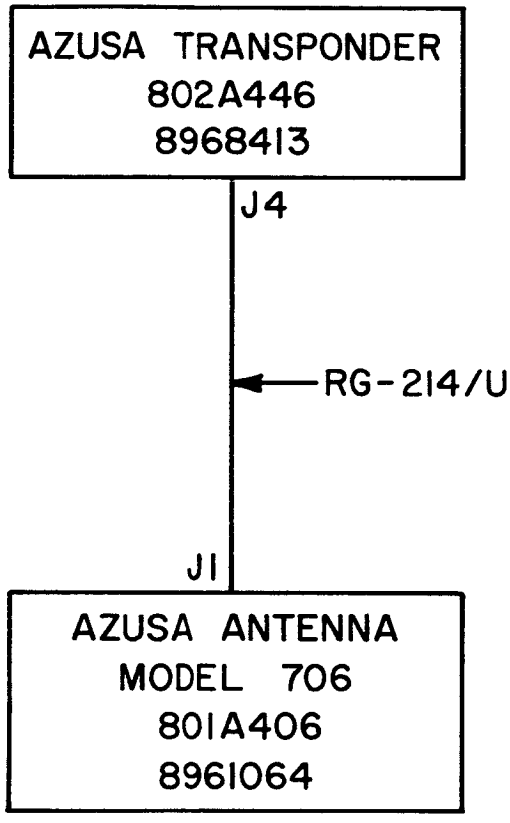
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

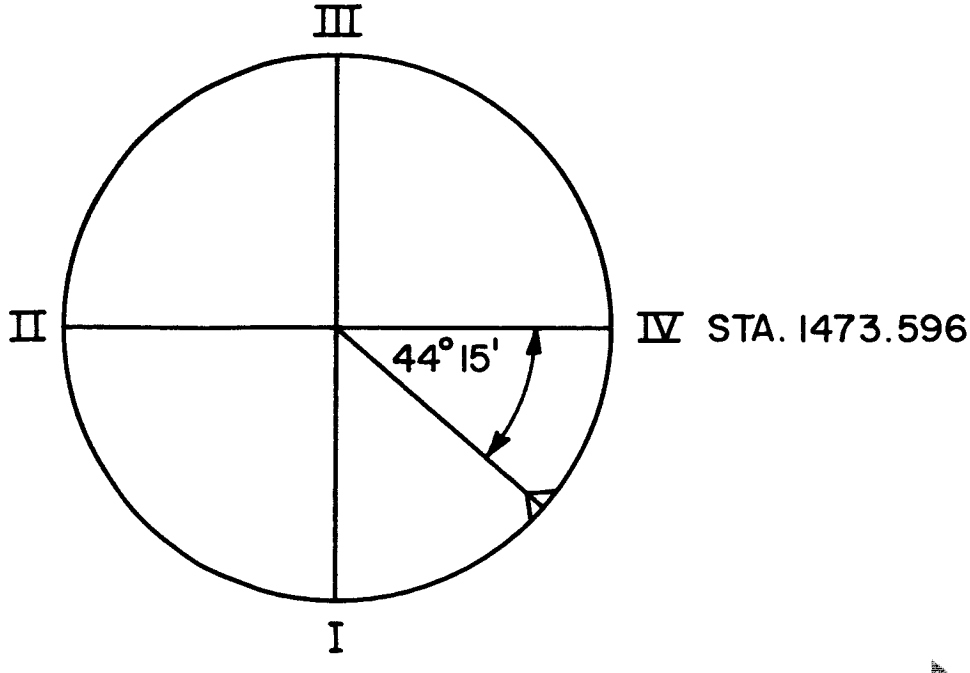


SA-5

AZUSA ANTENNA

BLOCK DIAGRAM





SA-5

AZUSA ANTENNA

CHECKOUT PROCEDURE

I. RECOMMENDED TEST EQUIPMENT

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

Name	Mfr. & Model No.
Standing Wave Indicator	HP-415B
Signal Generator	HP-618
Slotted Section	HP-806B
Power Meter	HP-430C
Thermistor Mount	HP-477
Detector Probe	--
Ohmmeter	--
High-Resistance Ohmmeter	--
50-Ohm Resistive Load	--

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 larger, 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 flish 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.

SA-5 AZUSA ANTENNA

A. 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 1.7:1.

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.

B. Antenna

Impedance Match - Check the antenna for satisfactory impedance match at each operating frequency through a length of coaxial cable with an attenuation not to exceed 1 db at the frequency of measurement. Measurements shall be made at the following points, with the equipment shown in figure 1:

1. at the antenna input connector and
2. through the antenna feed cable at the transponder output.

Calibrate the signal generator with its crystal calibrator. The measured VSWR shall be $\leq$ 1.3:1 at the antenna input connector, and $\leq$ 1.7:1 at the output of the transponder.

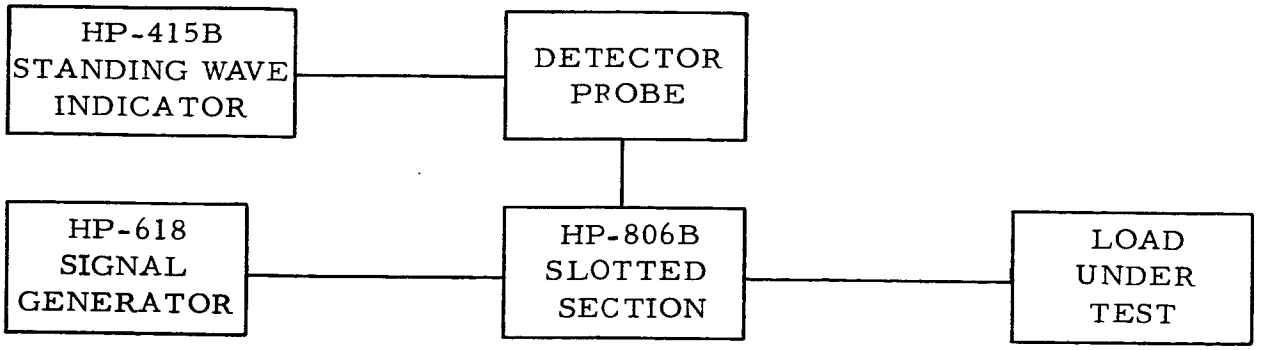
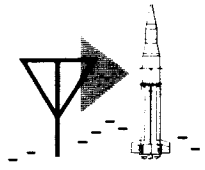


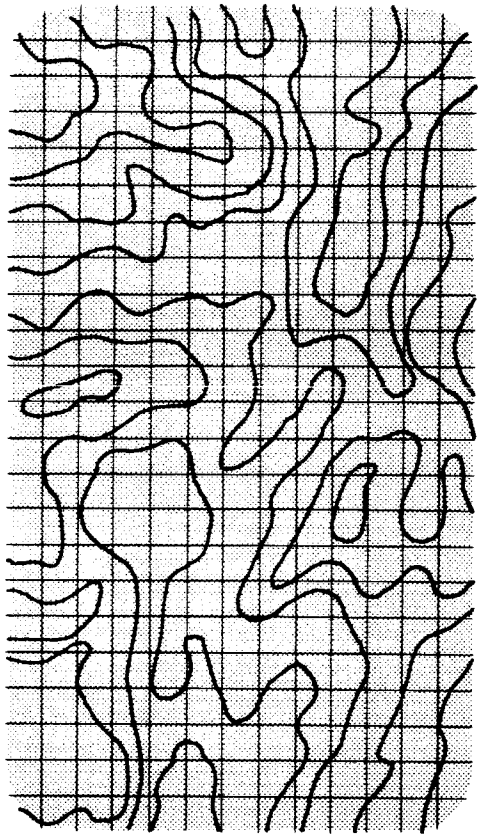
Figure 1.

SA-5

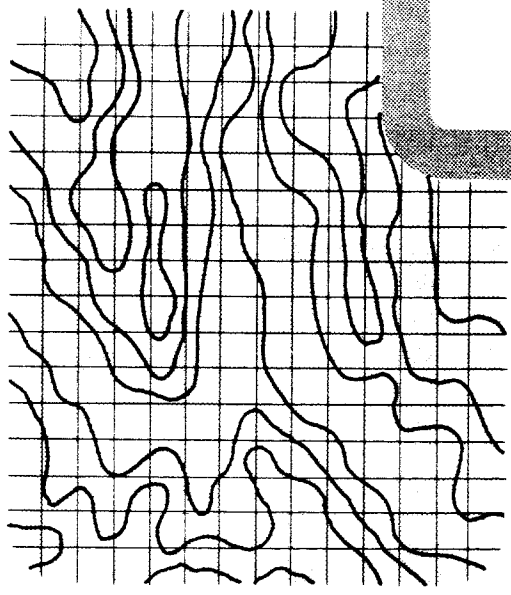
AZUSA ANTENNA

NOTES





C-BAND RADAR ANTENNA SA-5



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TECHNICAL DATA UNIT

SA-5 C-BAND RADAR ANTENNA

CONTENTS

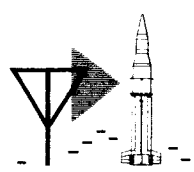
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Specifications	1
Dimensional Sketch	2
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Explanation of Radiation Patterns	4
Trajectory Geometry	5
Antenna Pattern Contour Plots	6
Description of Pattern and Polarization Symbols and Gain Determination	8
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SA-5

C-BAND RADAR ANTENNA

DESCRIPTION

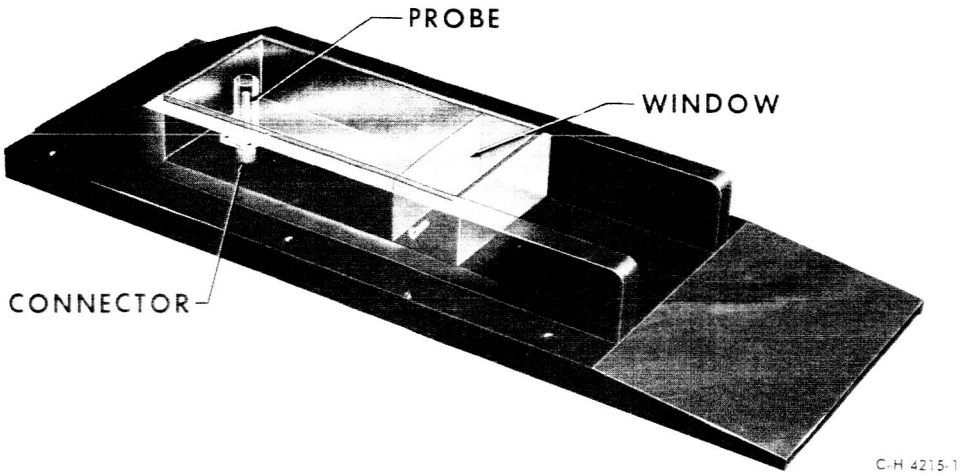
The C-Band radar antenna, Model 708, is a waveguide aperture type. The aperture configuration produces a pattern directed mainly aft, while providing sufficient signal prior to launch for system checkout. One antenna serves for both transmitting and receiving. Its angular location on the vehicle assures a sufficient vertical polarization component at the ground station throughout the programmed trajectory. The transmission line between transponder and antenna is RG-214/U coaxial cable.



SA-5

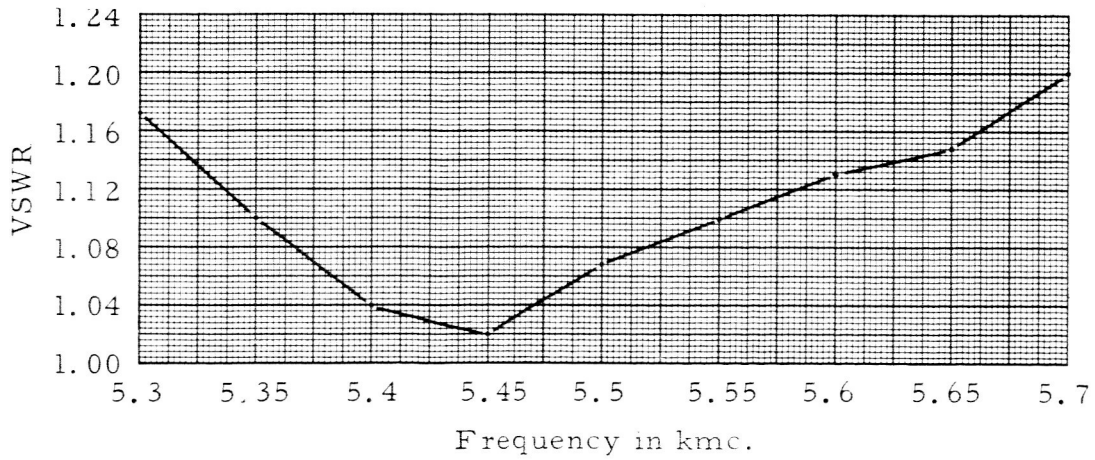
C-BAND RADAR ANTENNA SPECIFICATIONS

MODEL 708

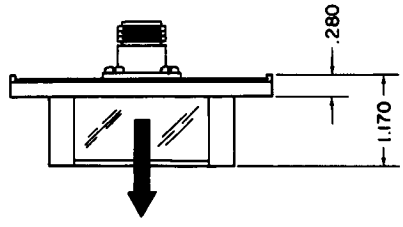


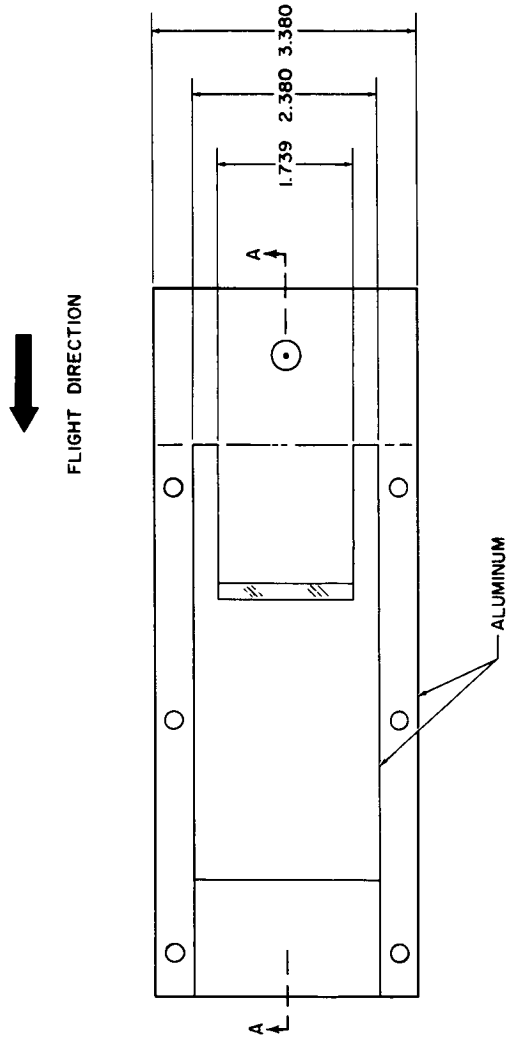
-Location-
Station 1471.346
39° 15' IV→I

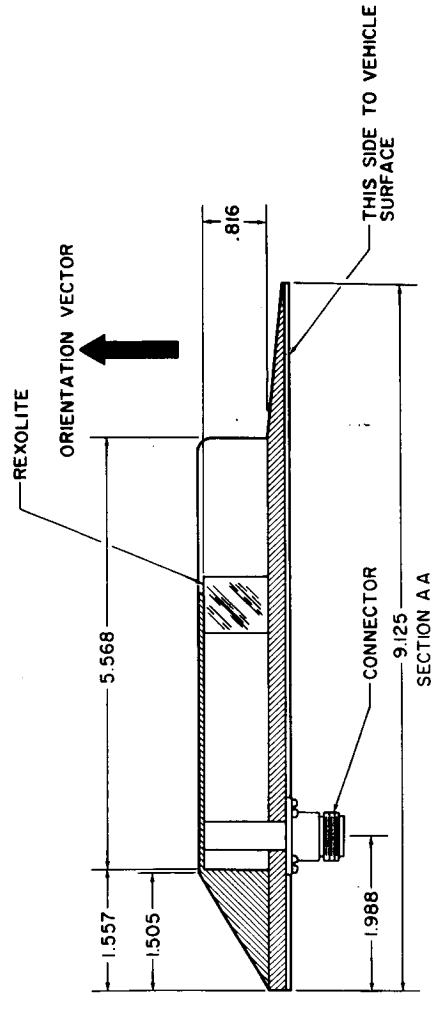
Drawing number - 50M10347
Type - waveguide aperture
Bandwidth - 5300 to 5700 mc. for 1.2:1 VSWR
Number required - 1
Polarization - linear
Gain - 9 db.
Connector type - N
Weight - 1.23 lbs.
Dimensions - 9.1 by 3.4 by 1.1 inches



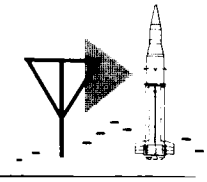
SA-5 C-BAND RADAR ANTENNA



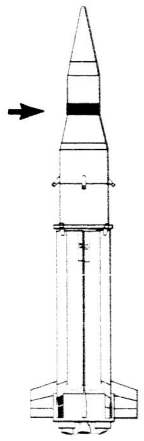


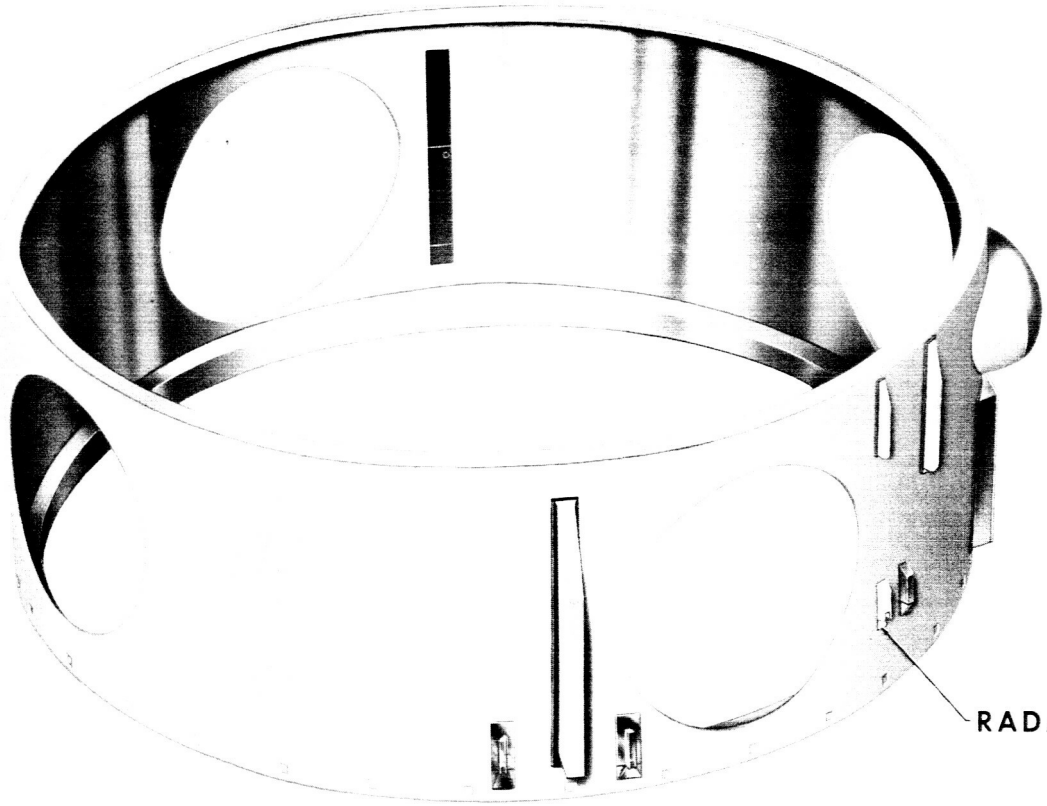


DIMENSIONAL SKETCH



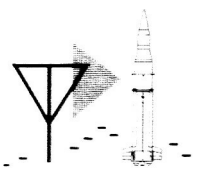
SA-5 C-BAND RADAR ANTENNA





LOCATIONAL VIEW

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TECHNICAL DATA UNIT



SA-5 C-BAND RADAR ANTENNA

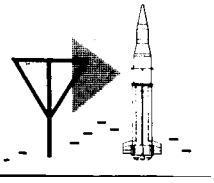
RADIATION PATTERNS

C-BAND RADAR ANTENNA

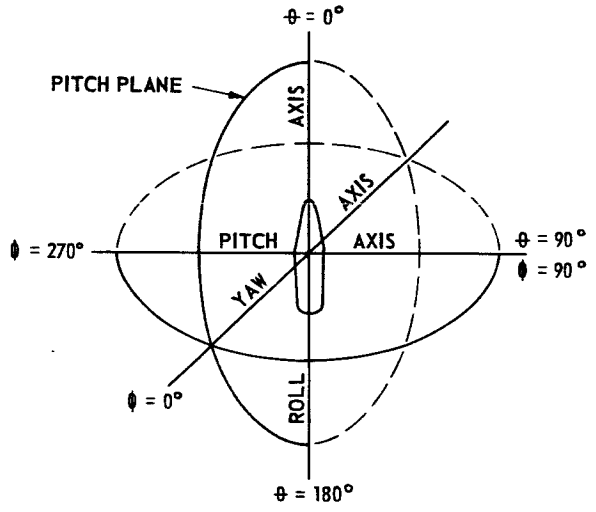
ANTENNA MODEL 708

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.

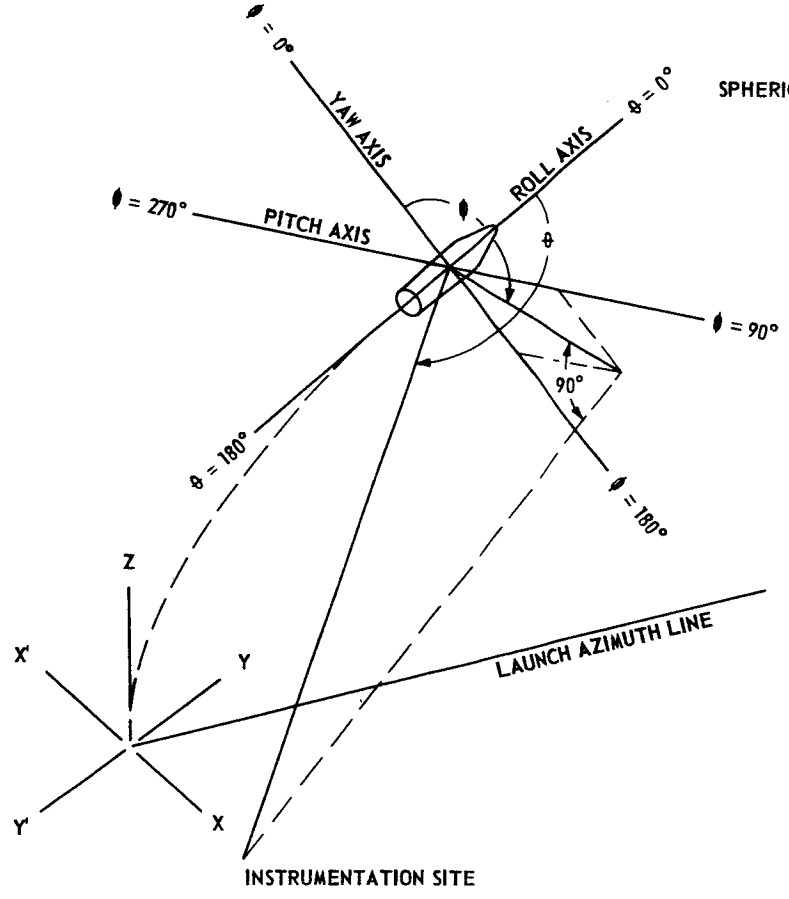
Rectangular and polar patterns are cut by placing the vehicle in the horizontal position with the antenna located at $\phi = 0°$. Patterns are then plotted through 360° of θ in 10° increments of ϕ (great circle cuts). The 10° increments are made through 180° by rotating the vehicle counter-clockwise,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



SA-5 C-BAND RADAR ANTENNA

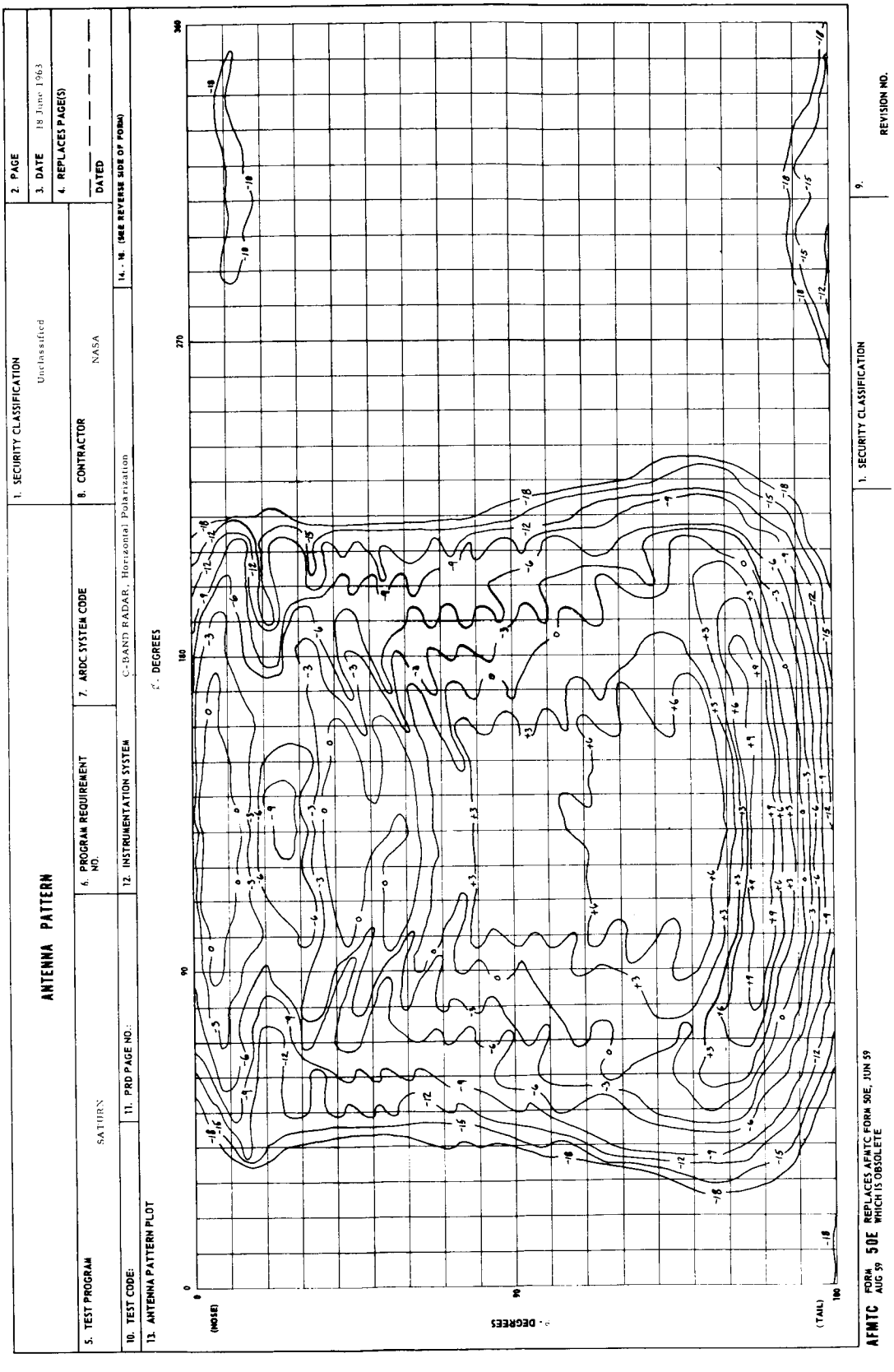


SPHERICAL COORDINATE SYSTEM



TRAJECTORY GEOMETRY

SA-5 C-BAND RADAR ANTENNA

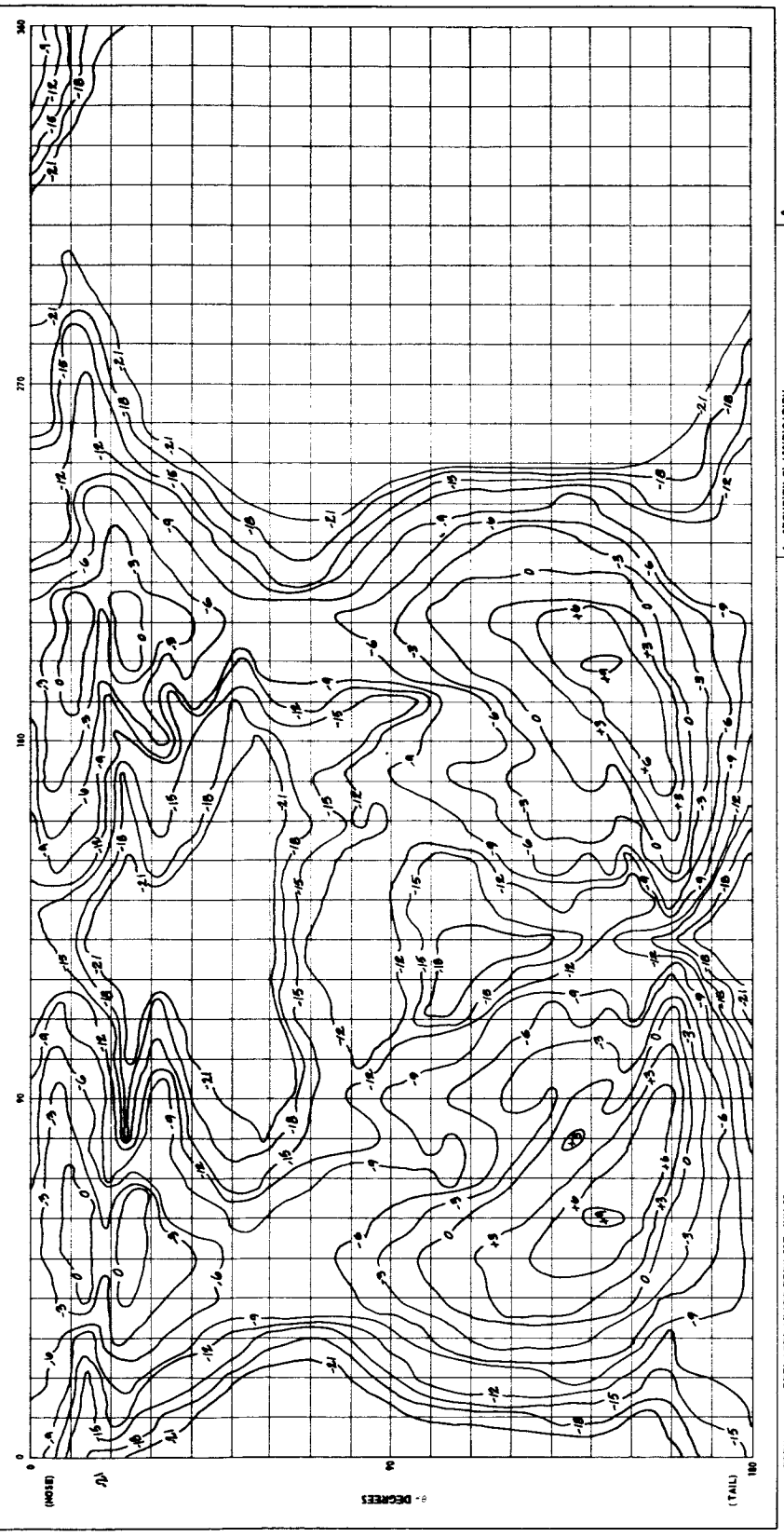


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SA-5 C-BAND RADAR ANTENNA

ANTENNA PATTERN

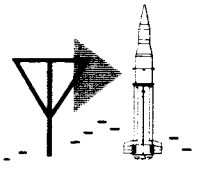
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3. DATE 18 June 1963
4. REPLACES PAGE(S) — — — — — — — — DATED
5. TEST PROGRAM: SATURN
6. PROGRAM REQUIREMENT NO.
7. ARDC SYSTEM CODE
8. CONTRACTOR: NASA
9. REVISION NO.
10. TEST CODE:
11. PRD PAGE NO.:
12. INSTRUMENTATION SYSTEM: C-BAND RADAR, Vertical Polarization
13. ANTENNA PATTERN PLOT
14. - 18. (SEE REVERSE SIDE OF FORM)



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

1. SECURITY CLASSIFICATION

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

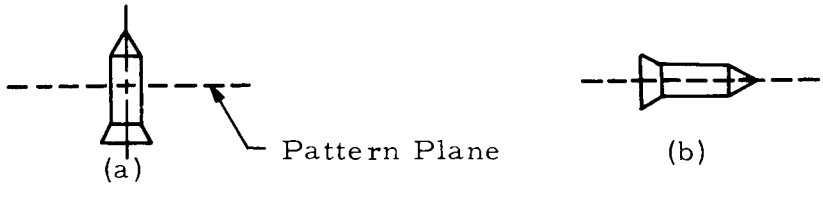


SA-5 C-BAND RADAR ANTENNA

DESCRIPTION OF PATTERN AND POLARIZATION SYMBOLS AND GAIN DETERMINATION

PATTERN PLANE

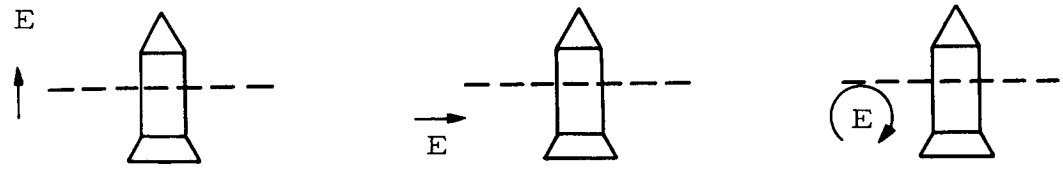
The plane of the pattern is indicated by a broken line passing horizontally through a sketch of the model. This line represents the pattern plane as seen from a point in that plane. The model is then shown in its proper orientation to the line representing the pattern plane.



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.



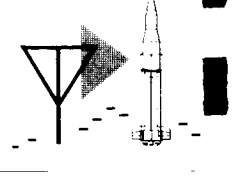
Polarization vector normal to pattern plane

Polarization vector parallel to pattern plane

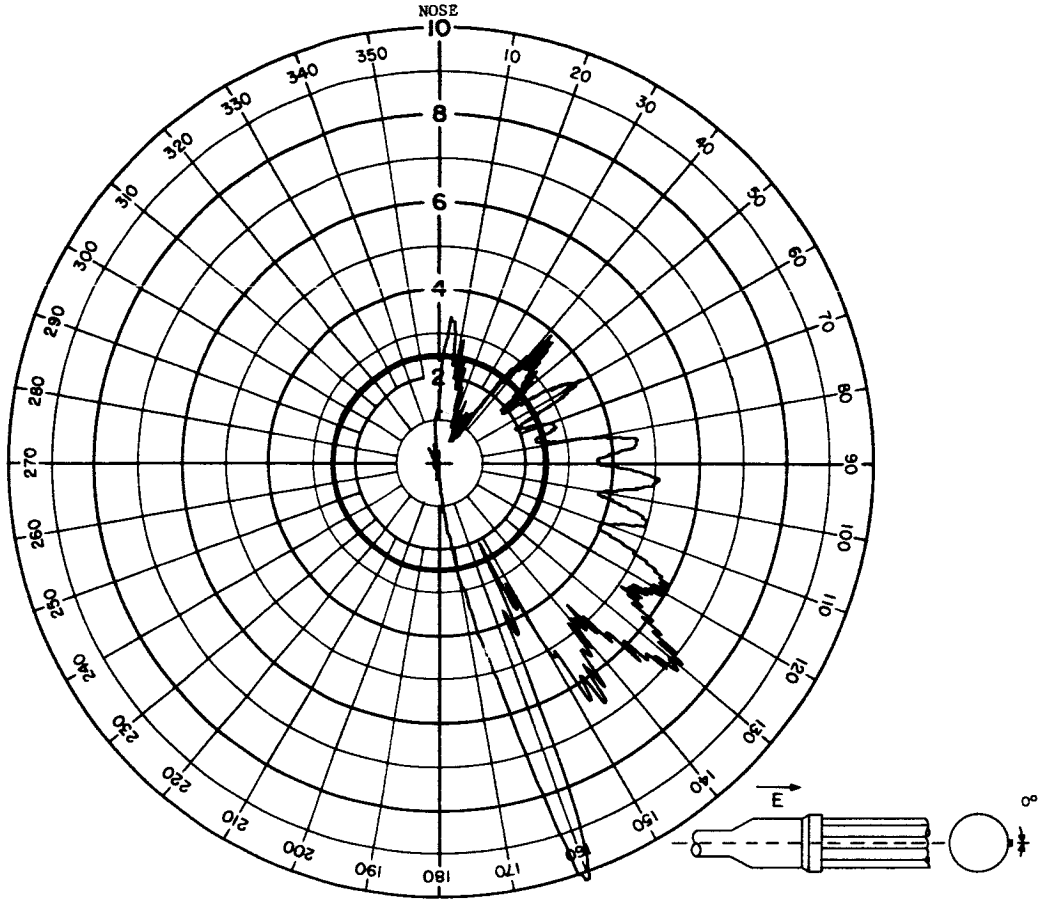
Right circular polarization

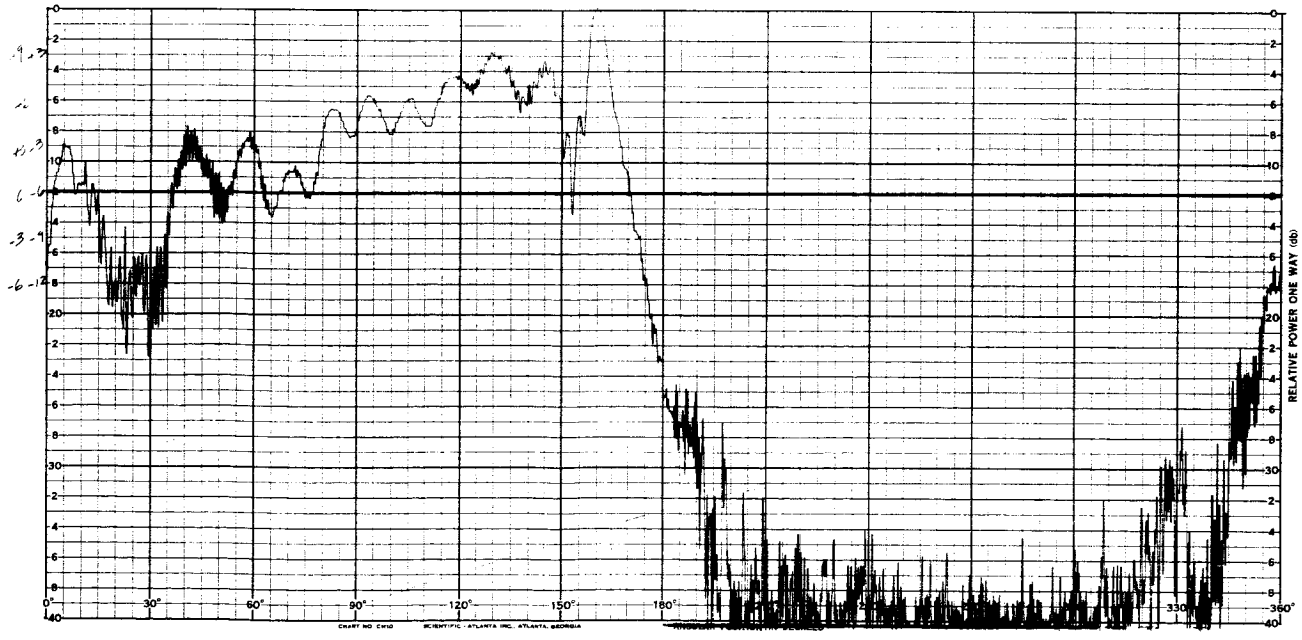
GAIN

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 C-BAND RADAR ANTENNA

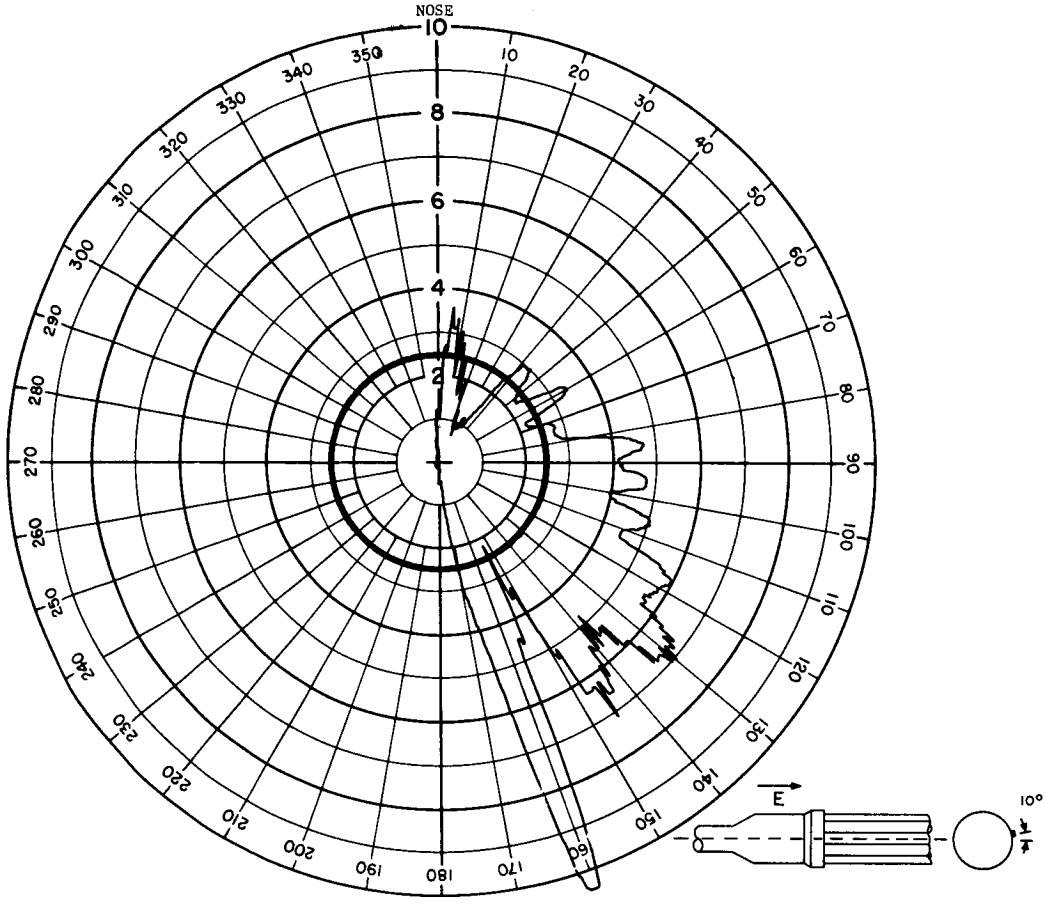


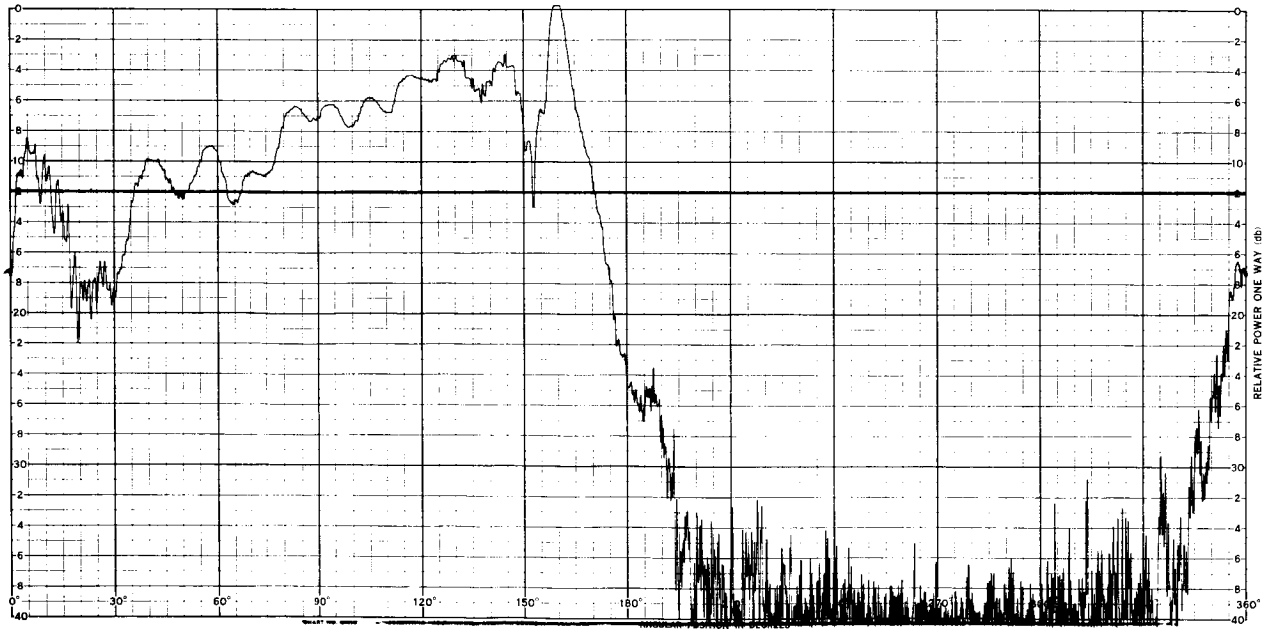


ANTENNA RADIATION PATTERN NO. 215-1

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

SA-5 C-BAND RADAR ANTENNA

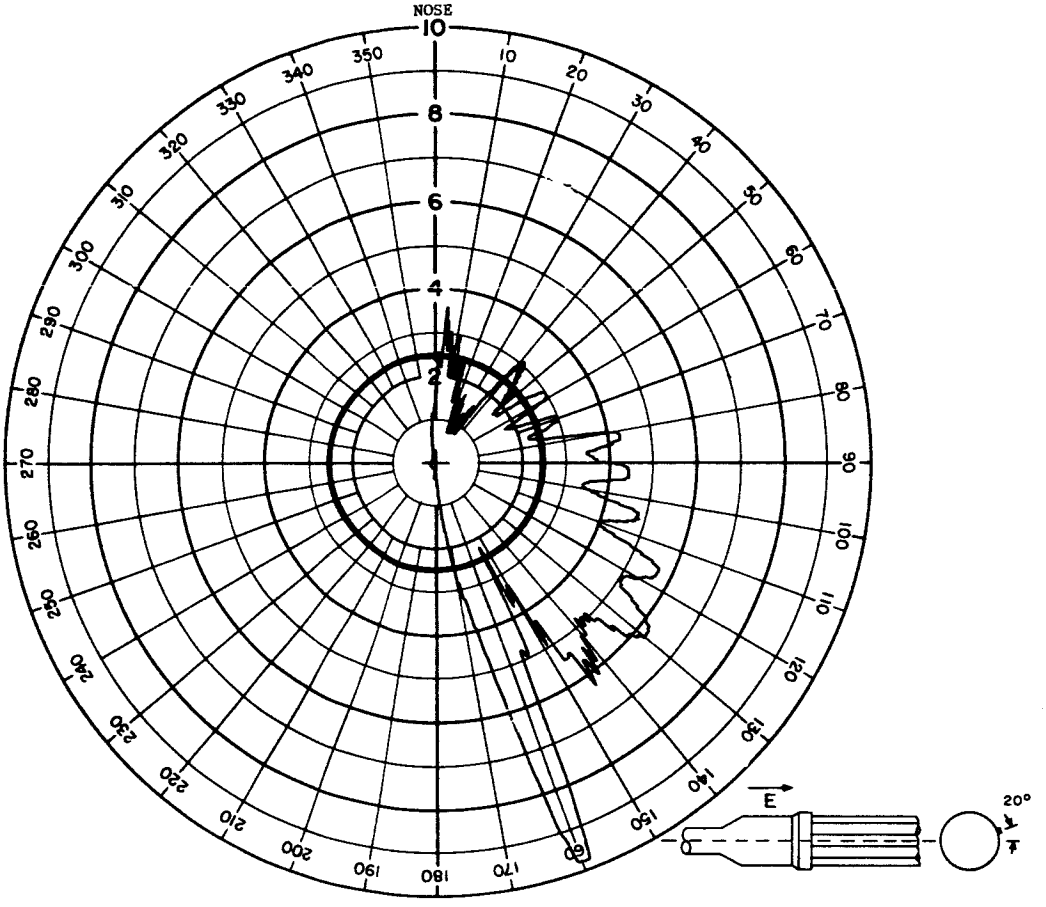


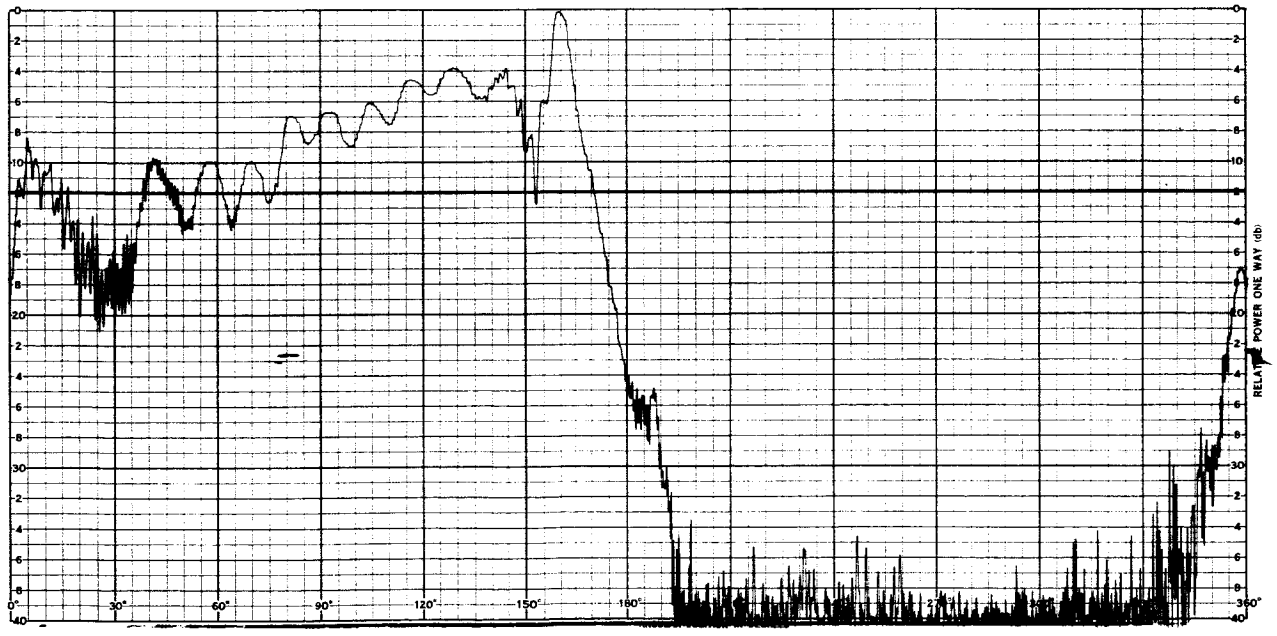


ANTENNA RADIATION PATTERN NO. 215-2

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

SA-5 C-BAND RADAR ANTENNA

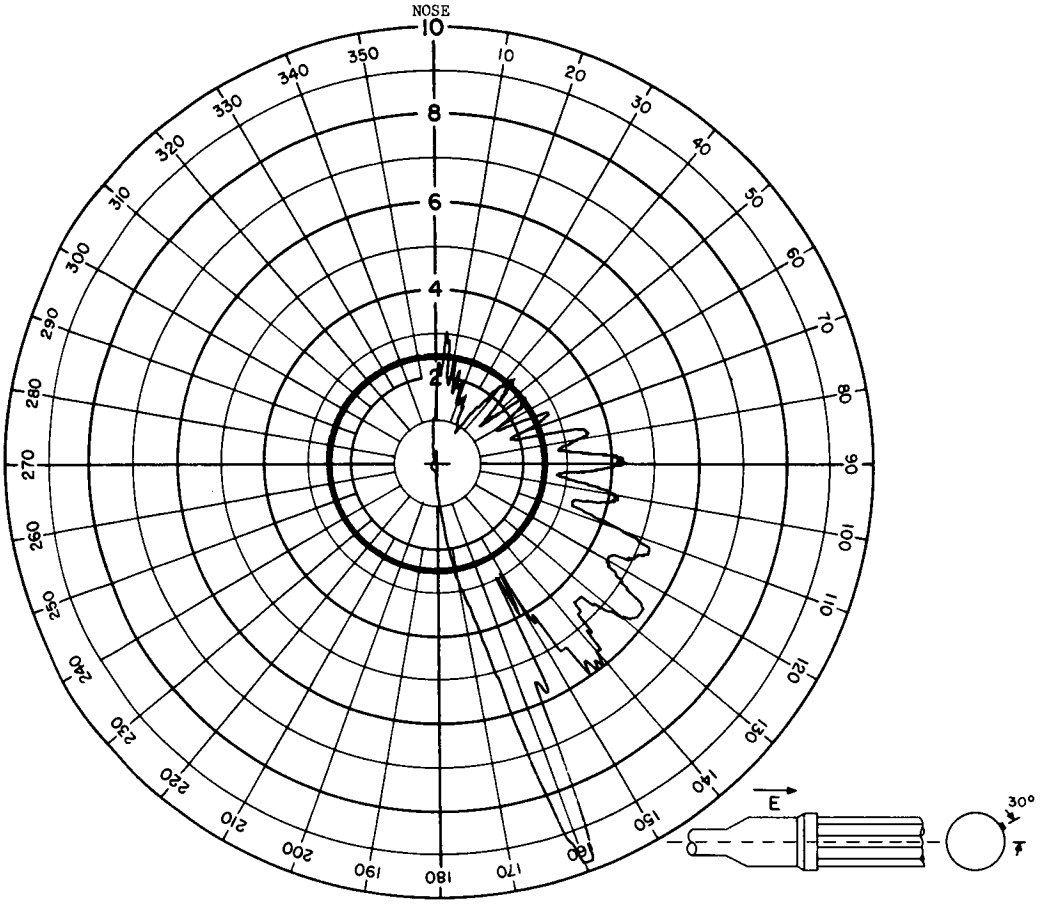


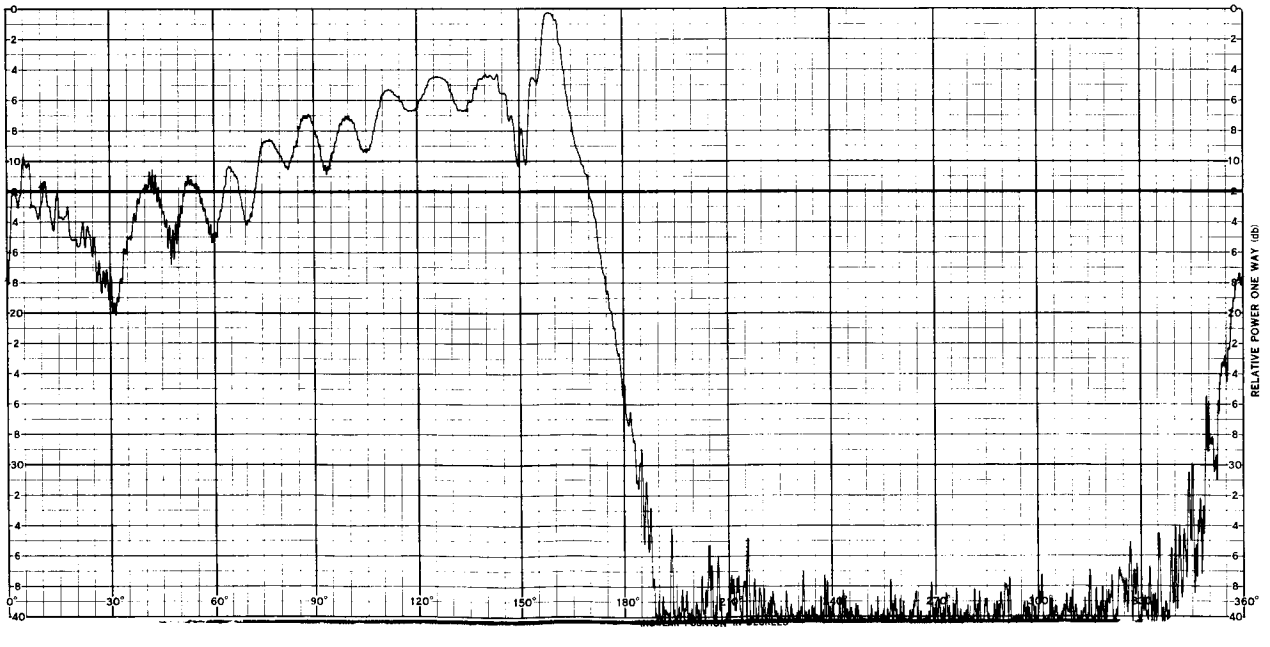


ANTENNA RADIATION PATTERN NO. 215-3

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

SA-5 C-BAND RADAR ANTENNA

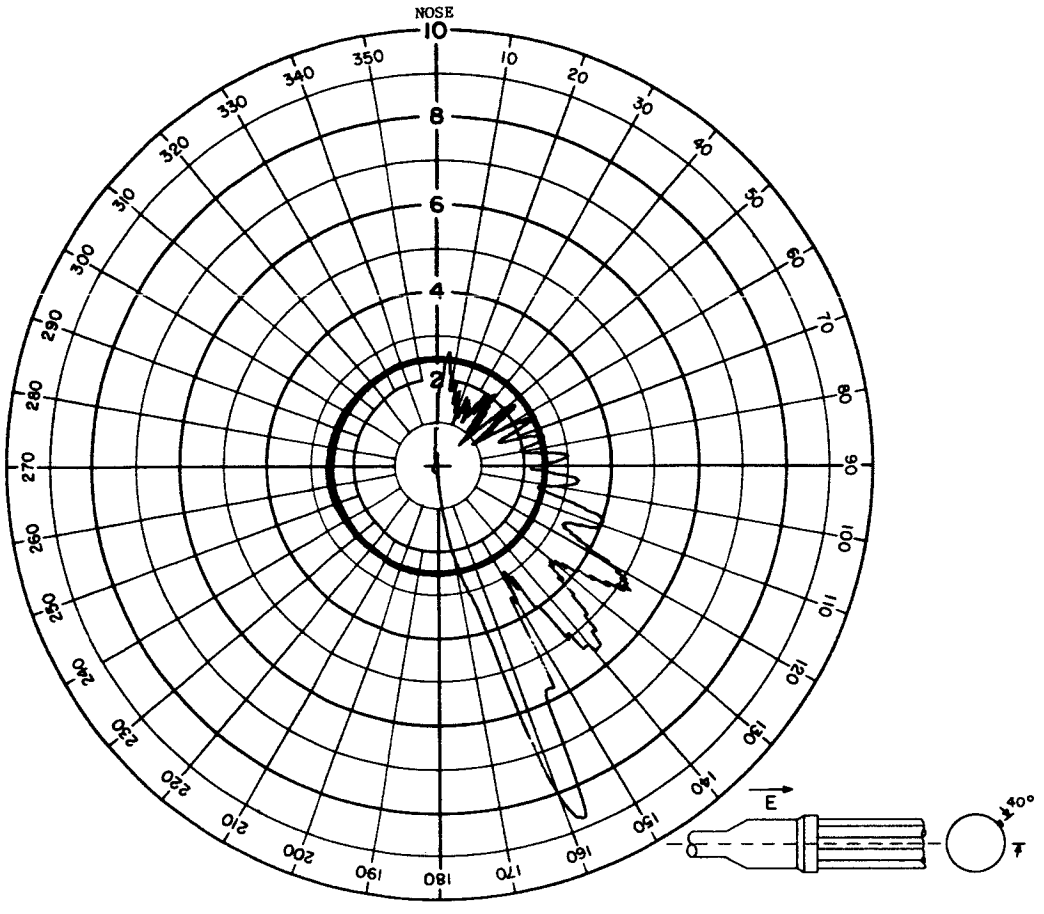


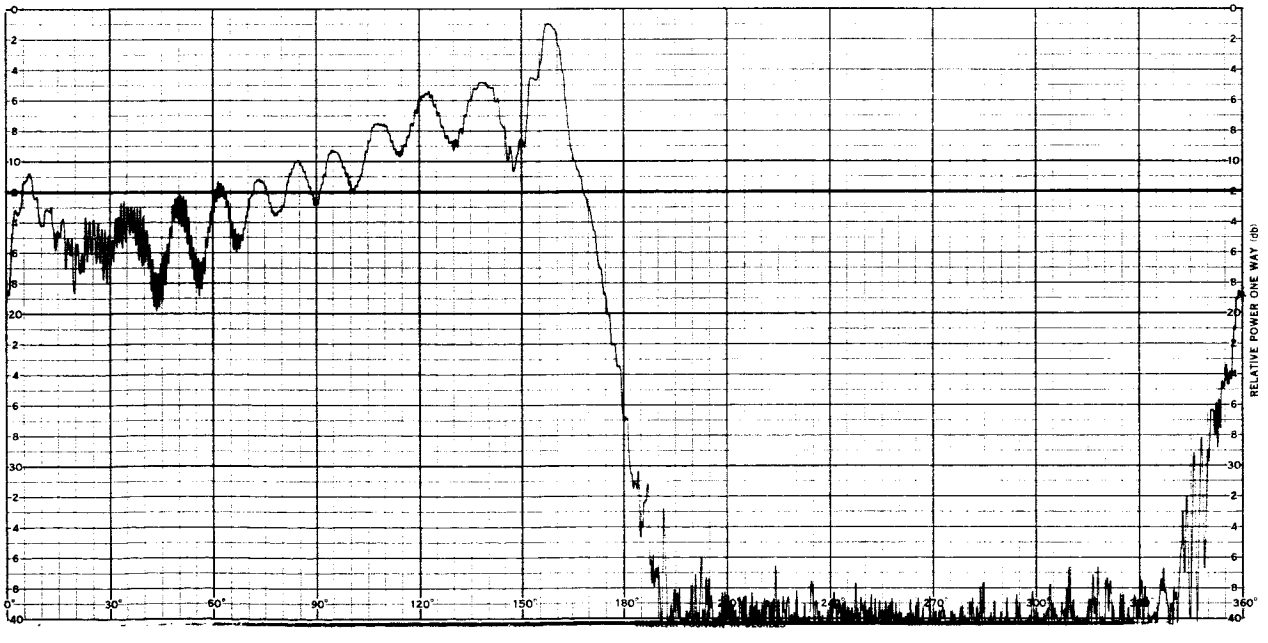


ANTENNA RADIATION PATTERN NO. 215-4

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

SA-5 C-BAND RADAR ANTENNA

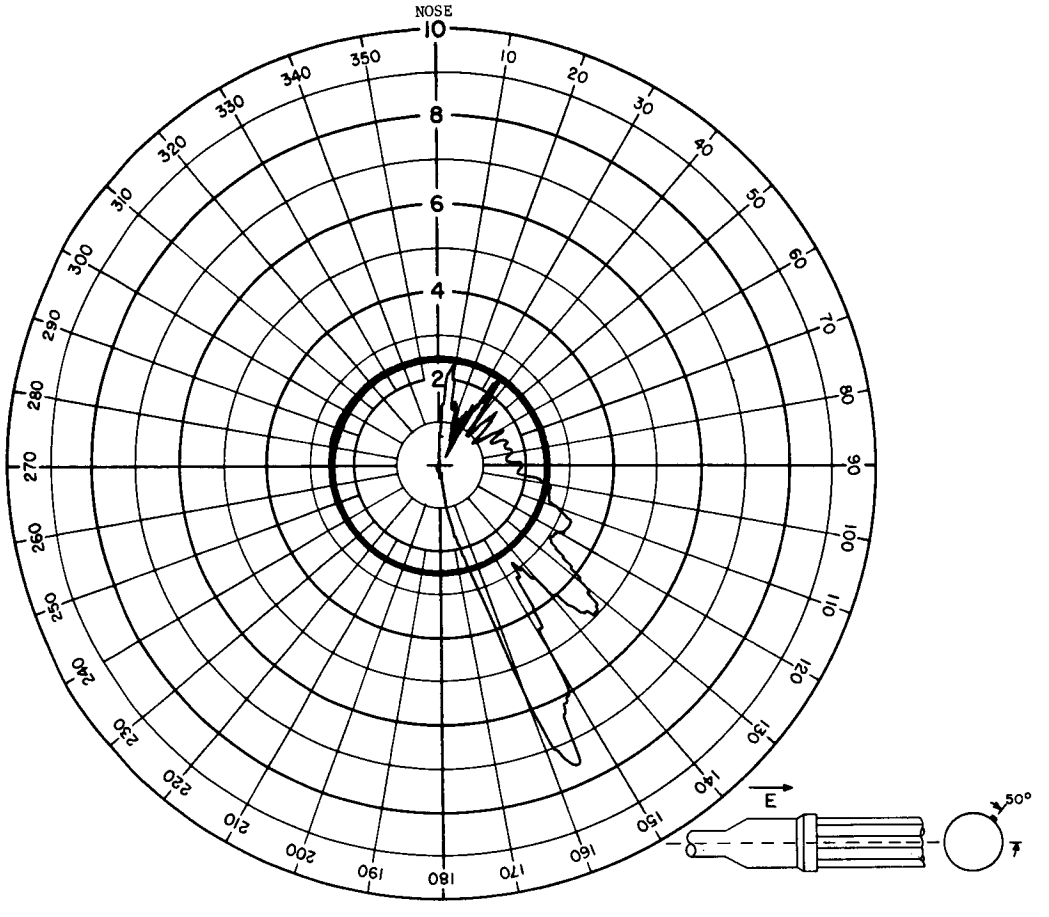


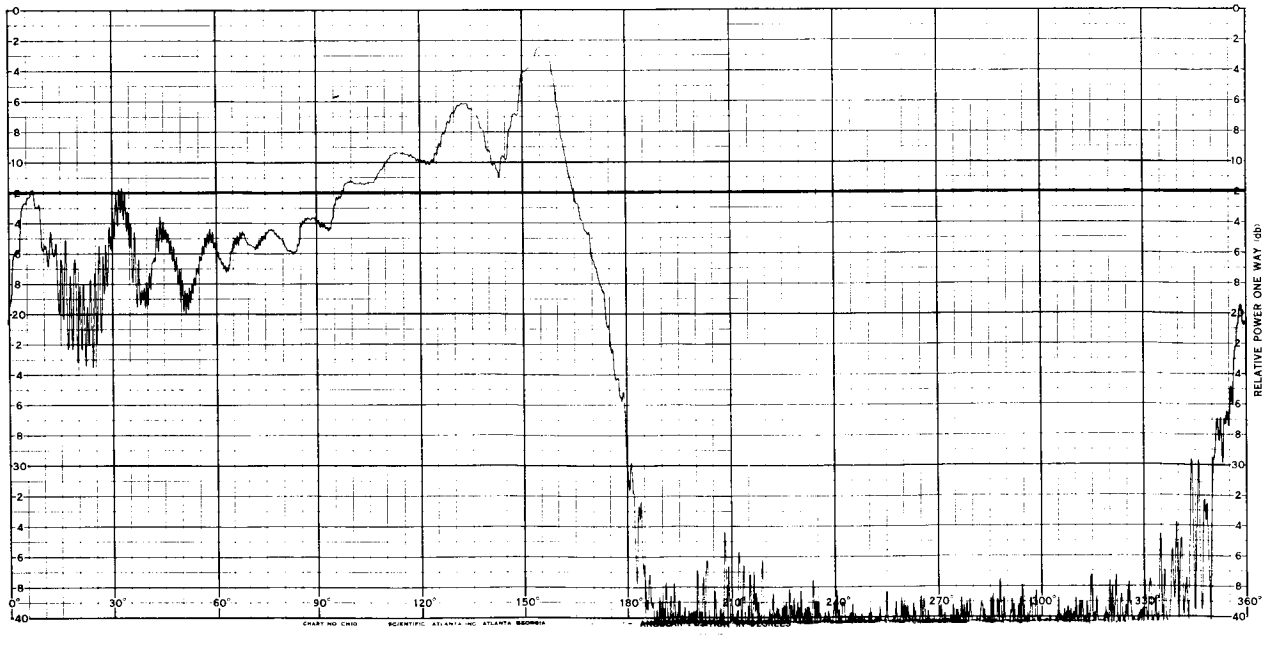


ANTENNA RADIATION PATTERN NO. 215-5

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

SA-5 C-BAND RADAR ANTENNA

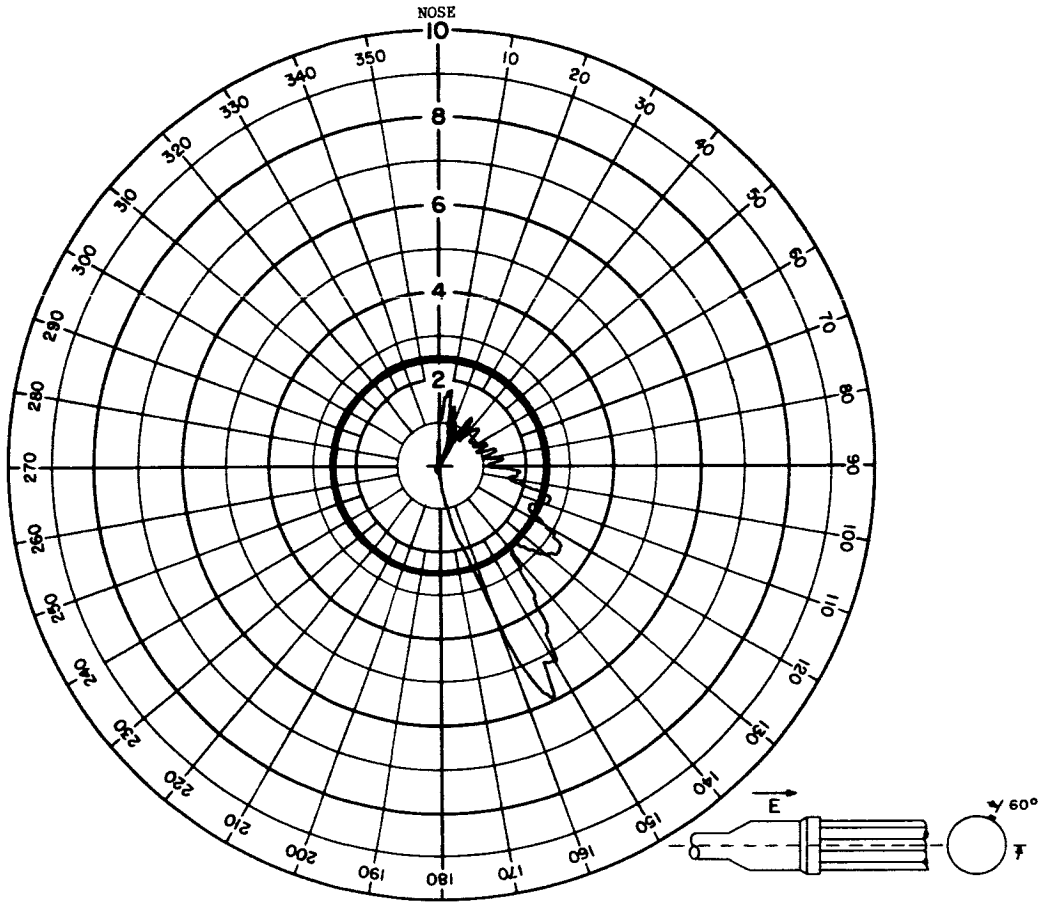


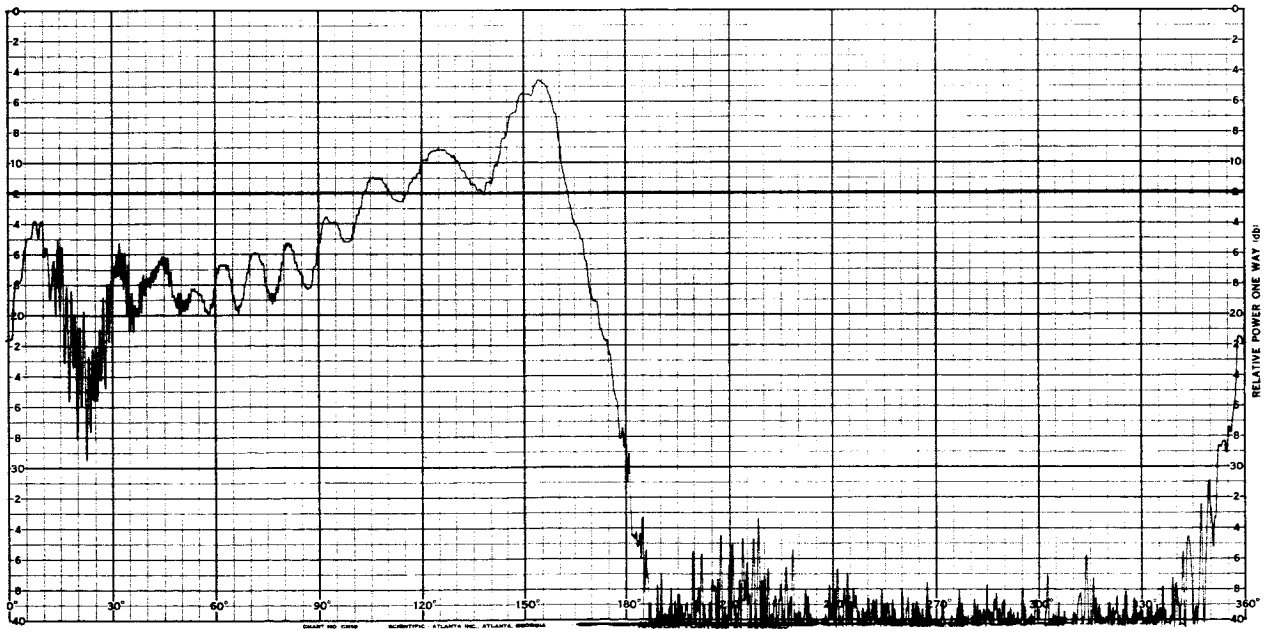


ANTENNA RADIATION PATTERN NO. 215-6

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

SA-5 C-BAND RADAR ANTENNA

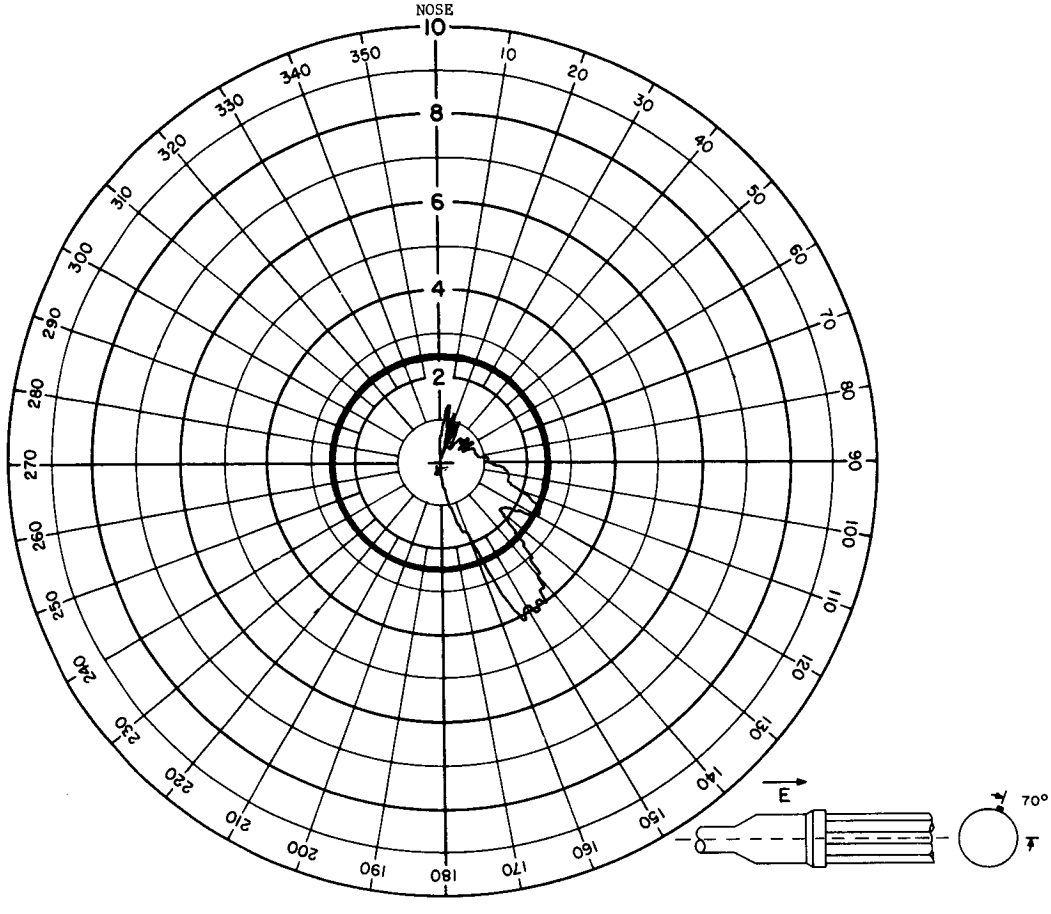


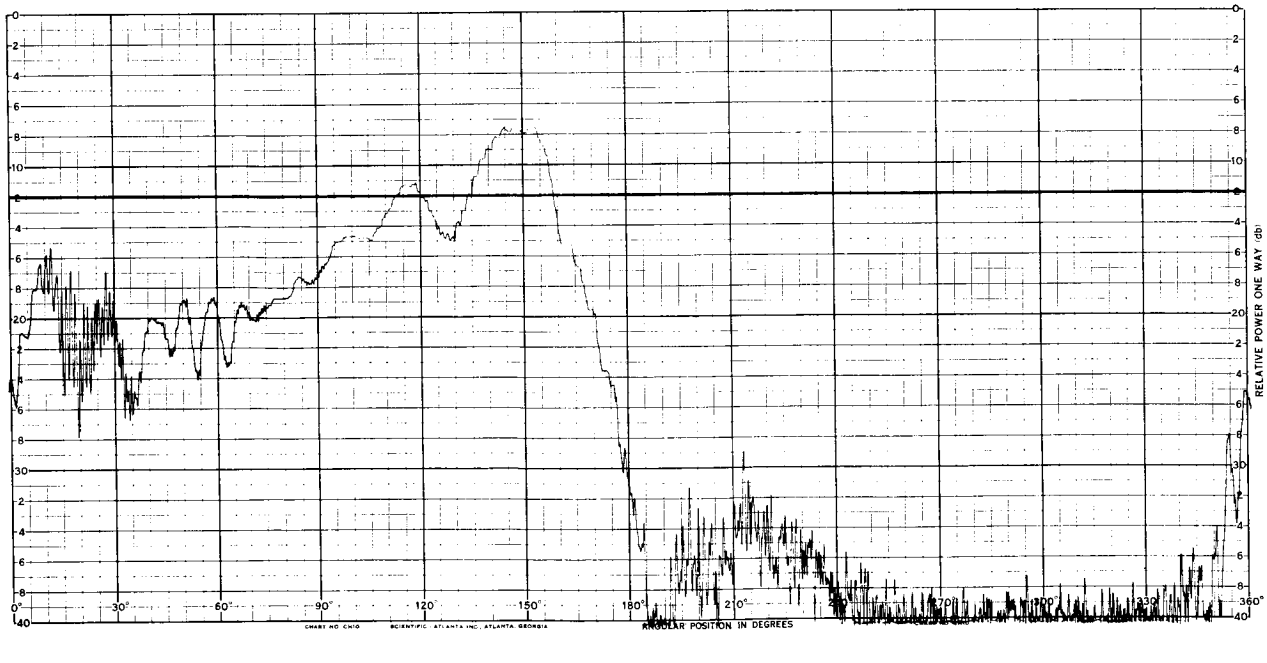


ANTENNA RADIATION PATTERN NO. 215-7

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

SA-5 C-BAND RADAR ANTENNA

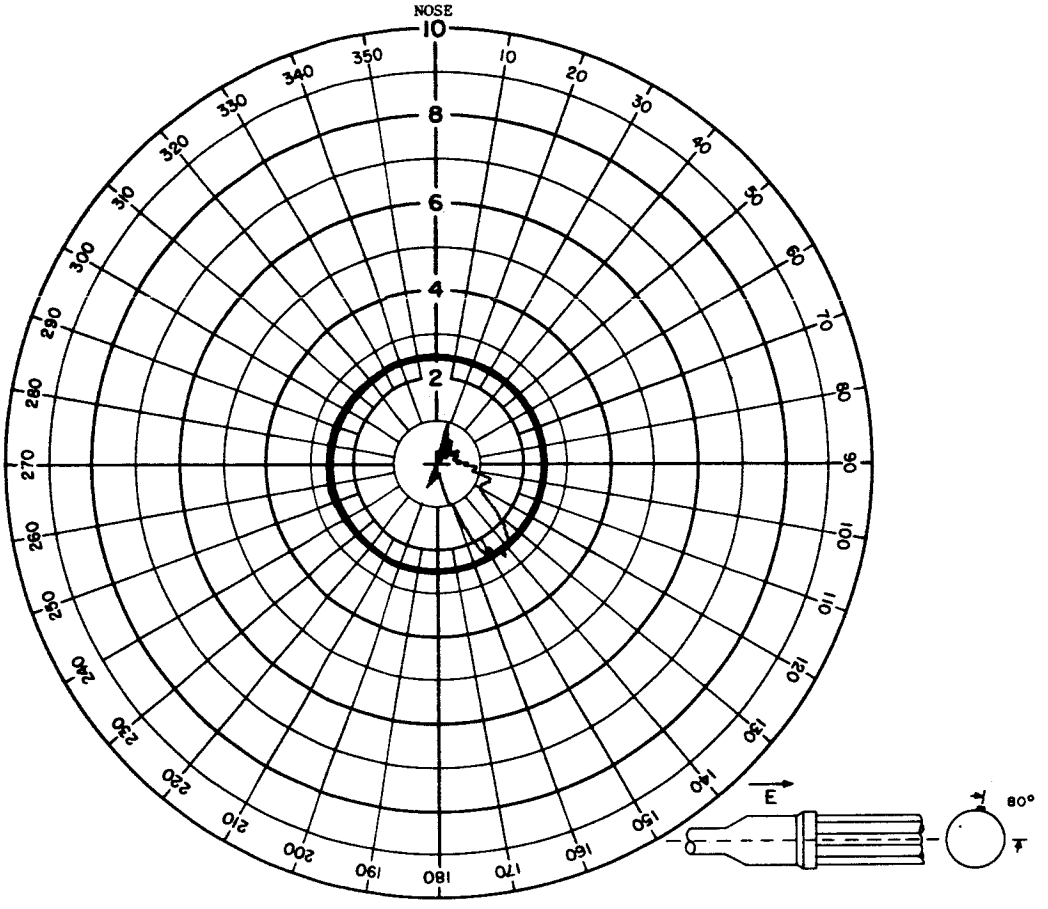


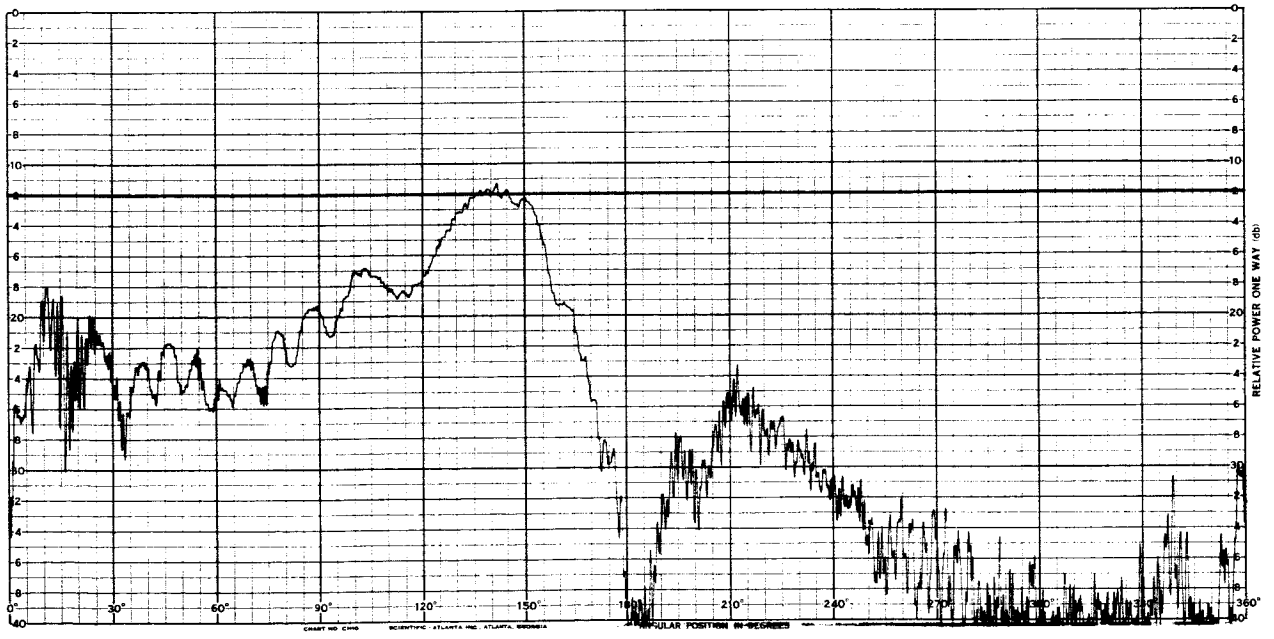


ANTENNA RADIATION PATTERN NO. 215-8

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

SA-5 C-BAND RADAR ANTENNA

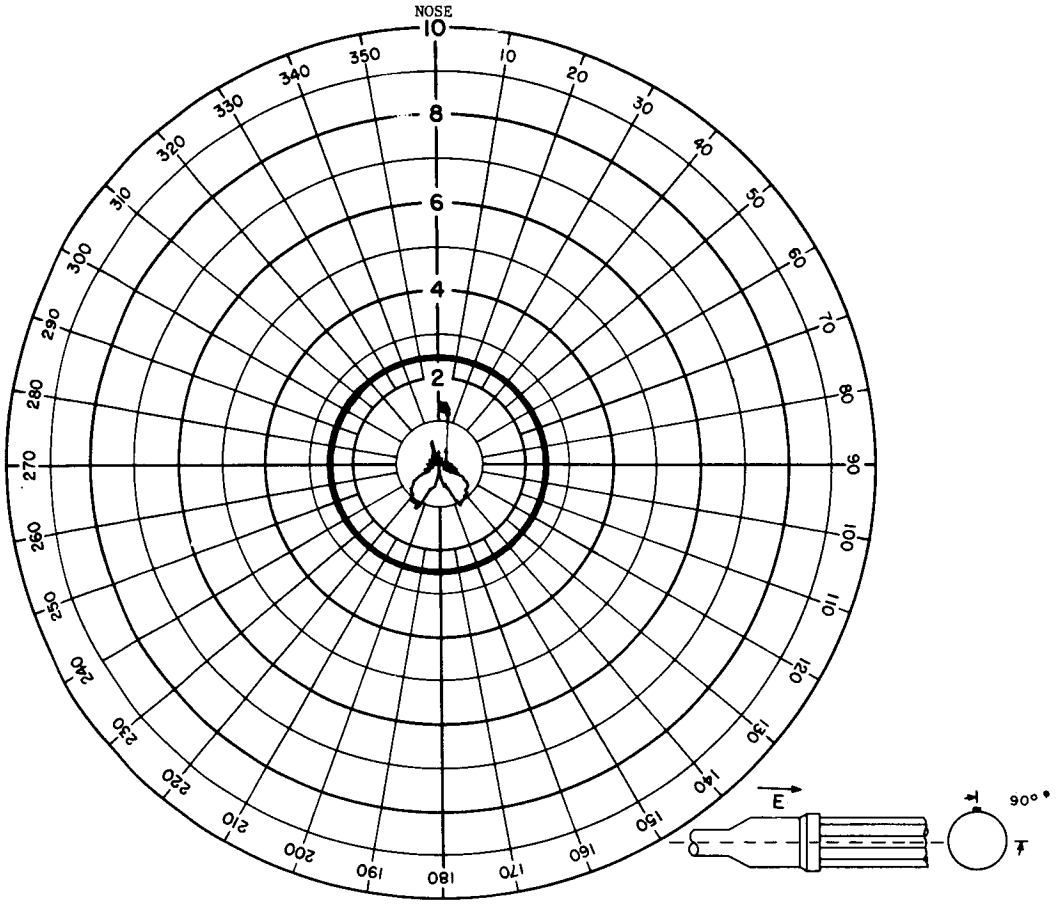


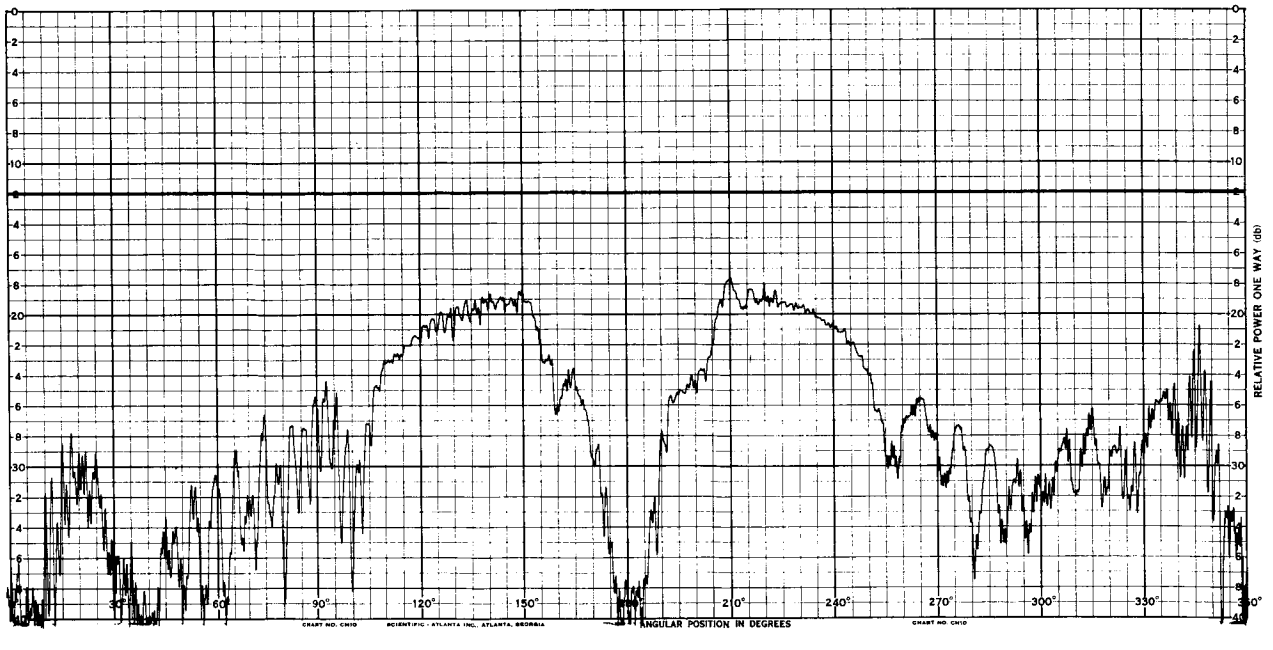


ANTENNA RADIATION PATTERN NO. 215-9

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

SA-5 C-BAND RADAR ANTENNA

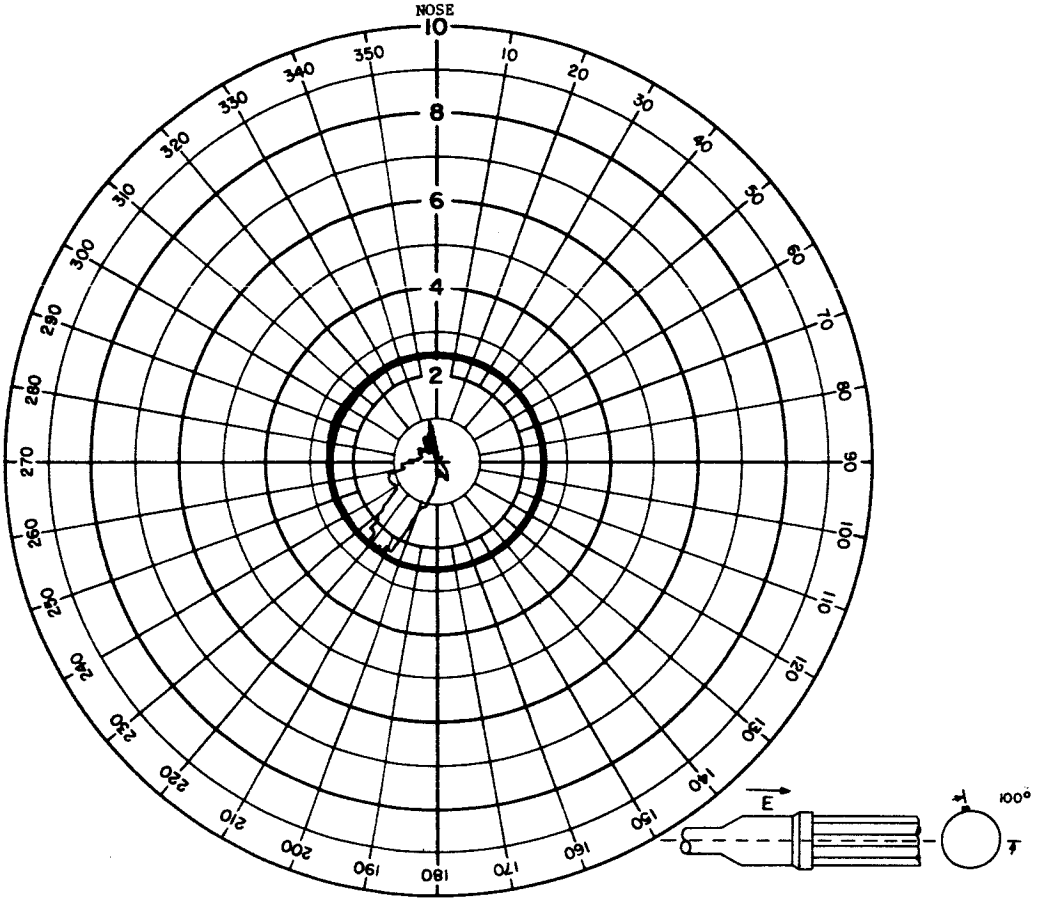


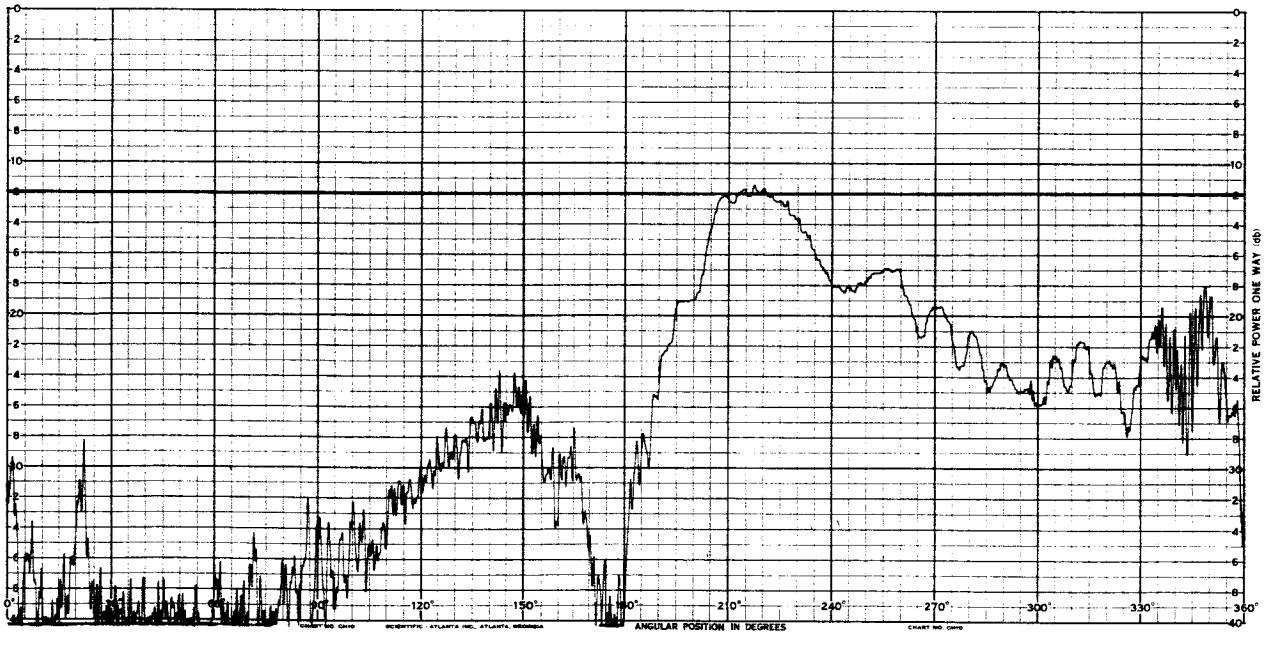


ANTENNA RADIATION PATTERN NO. 215-10

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

SA-5 C-BAND RADAR ANTENNA

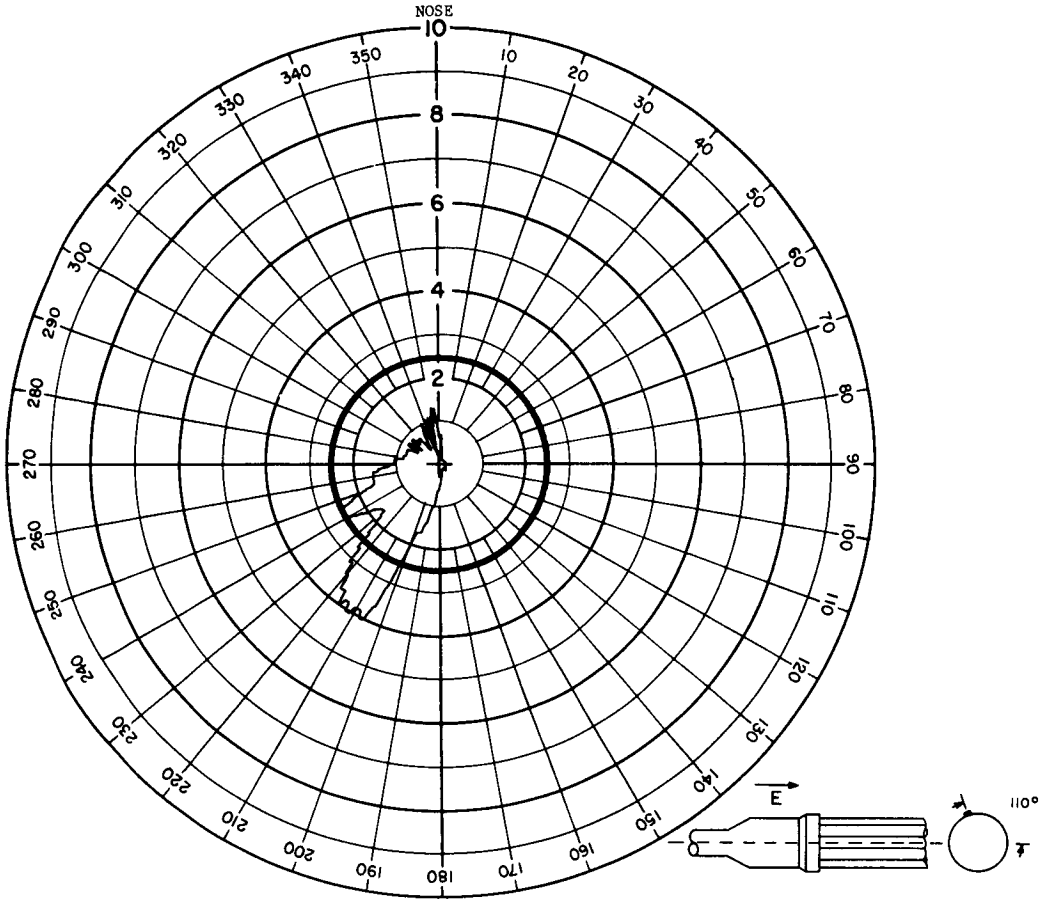


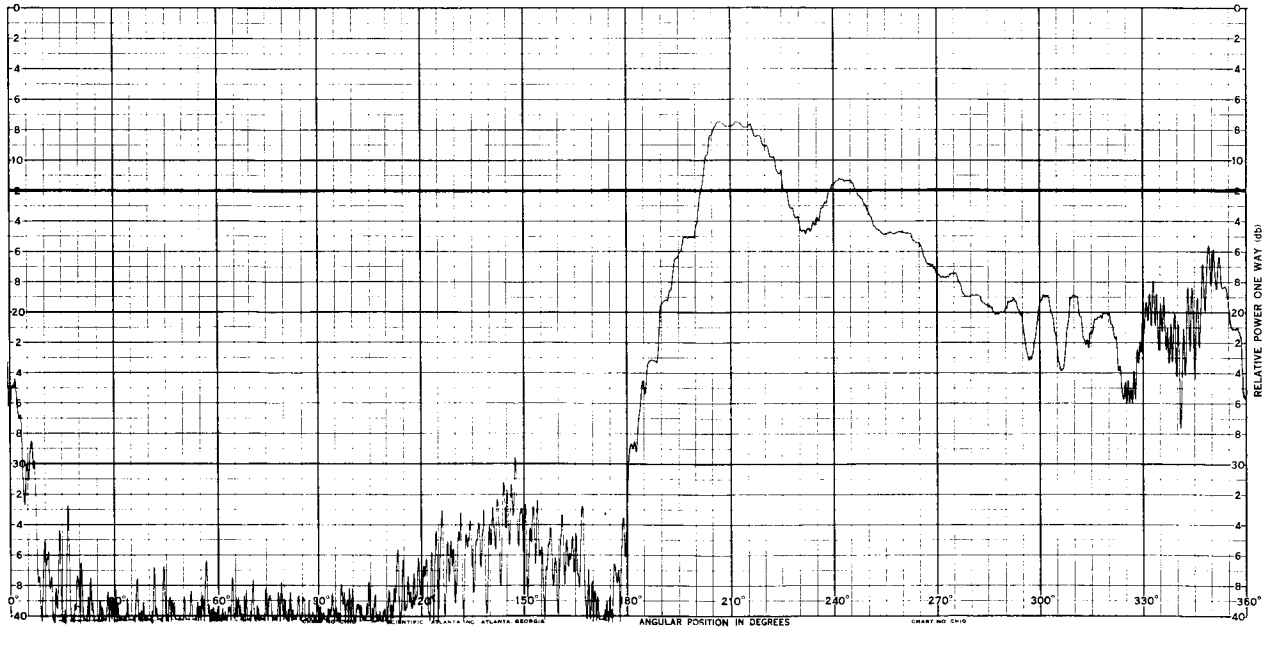


ANTENNA RADIATION PATTERN NO. 215-11

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

SA-5 C-BAND RADAR ANTENNA

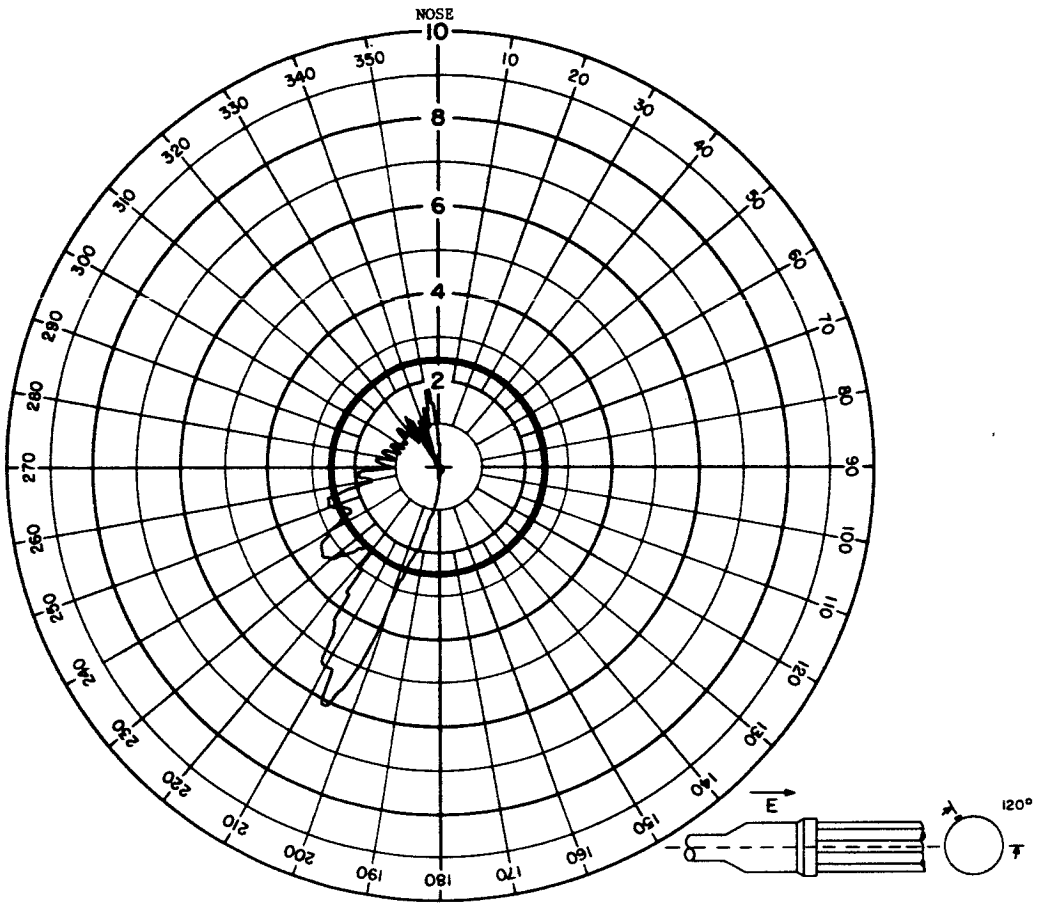


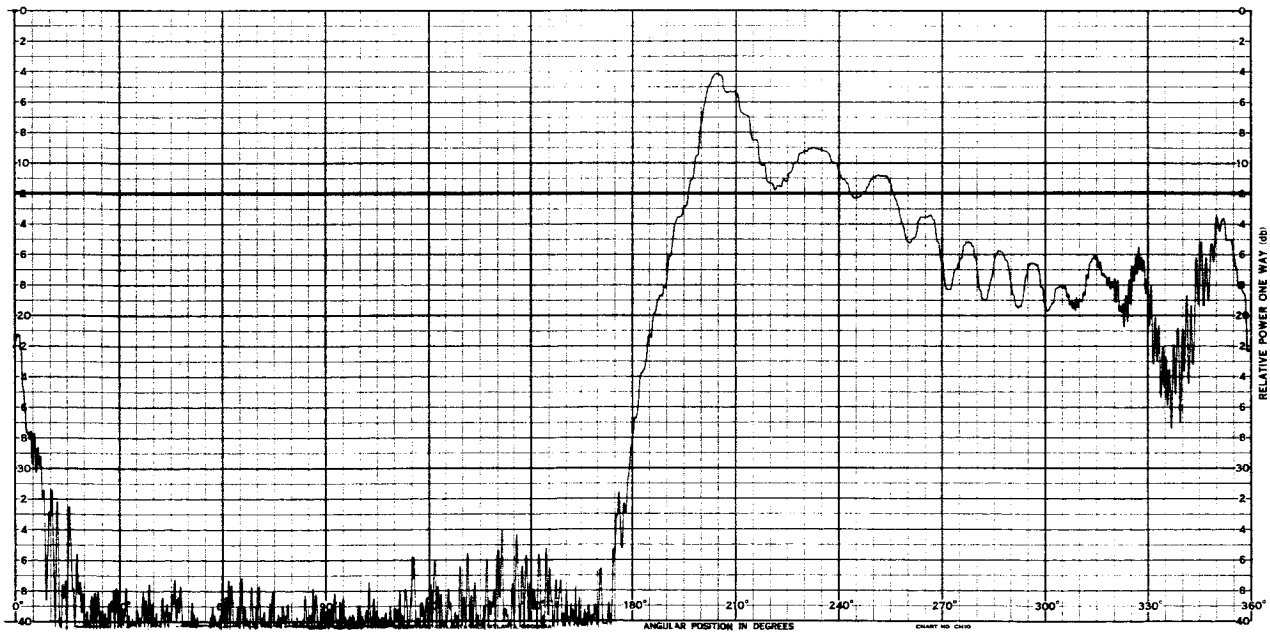


ANTENNA RADIATION PATTERN NO. 215-12

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

SA-5 C-BAND RADAR ANTENNA

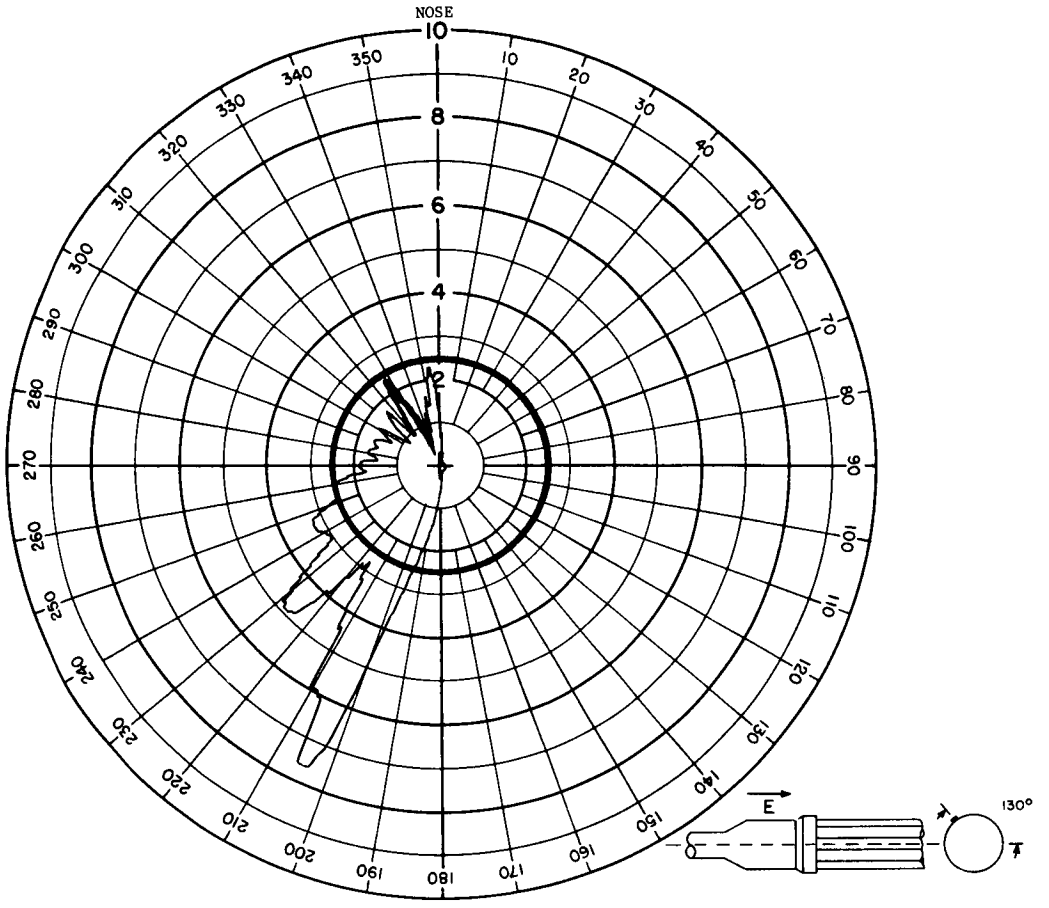


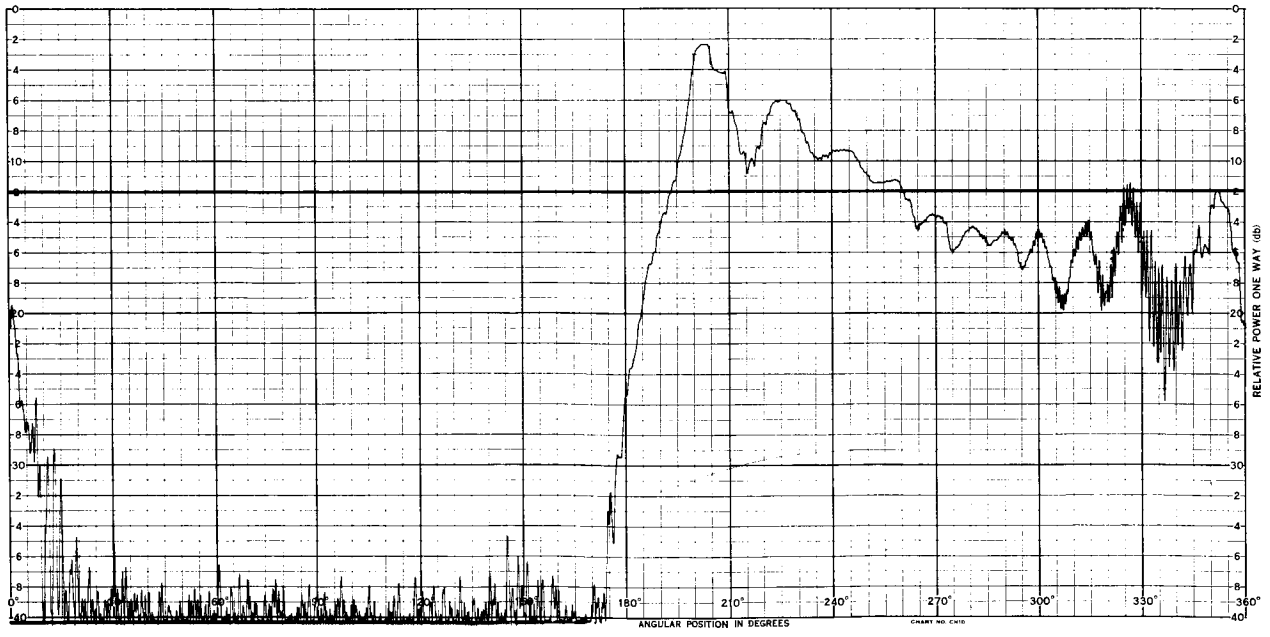


ANTENNA RADIATION PATTERN NO. 215-13

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

SA-5 C-BAND RADAR ANTENNA

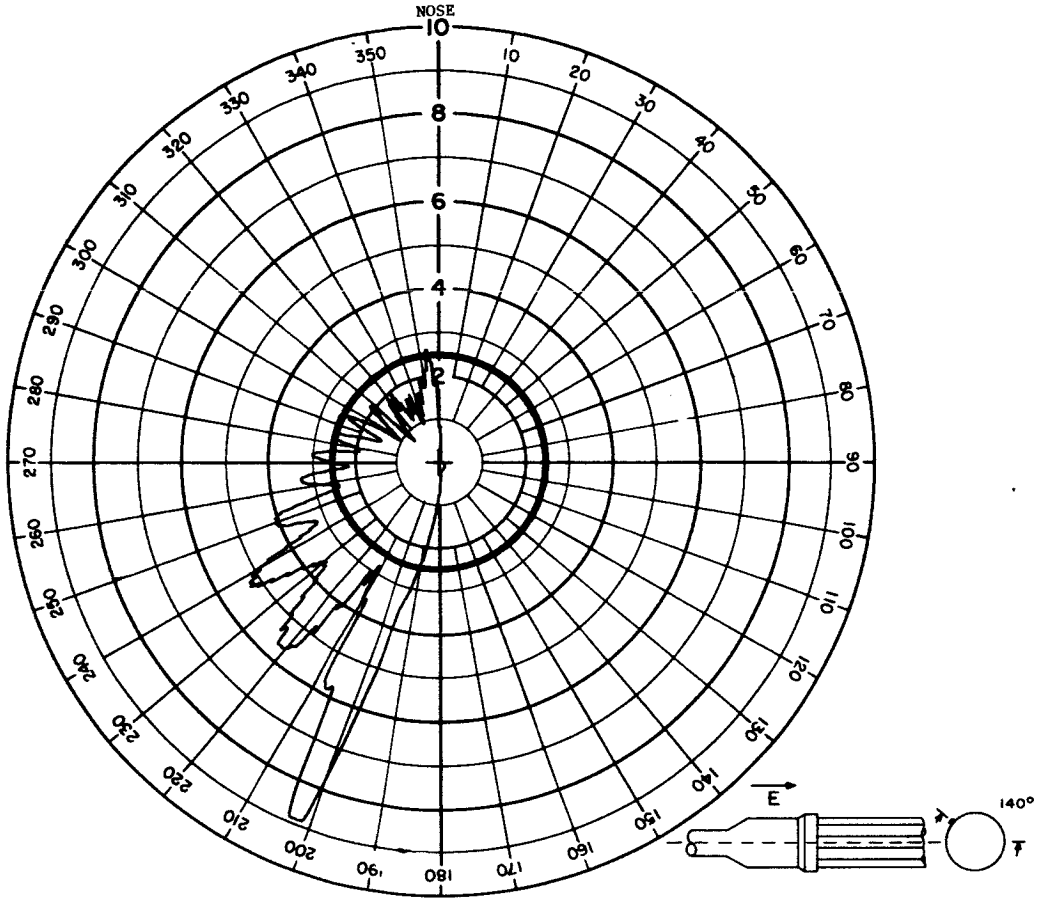


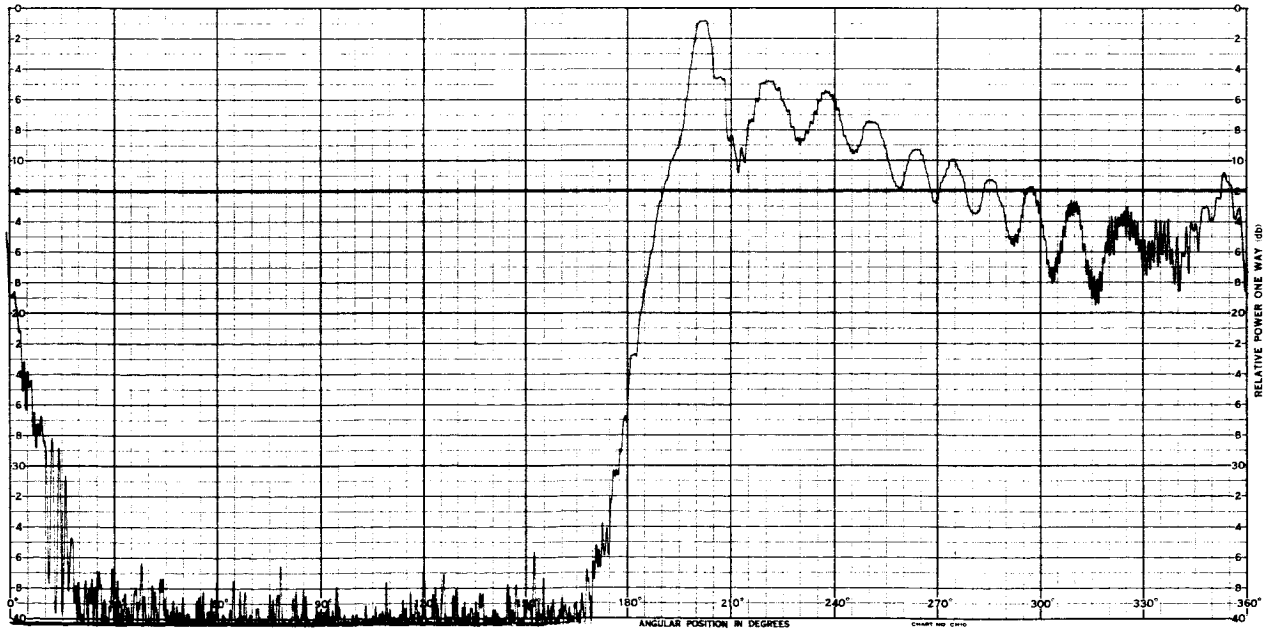


ANTENNA RADIATION PATTERN NO. 215-14

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

SA-5 C-BAND RADAR ANTENNA

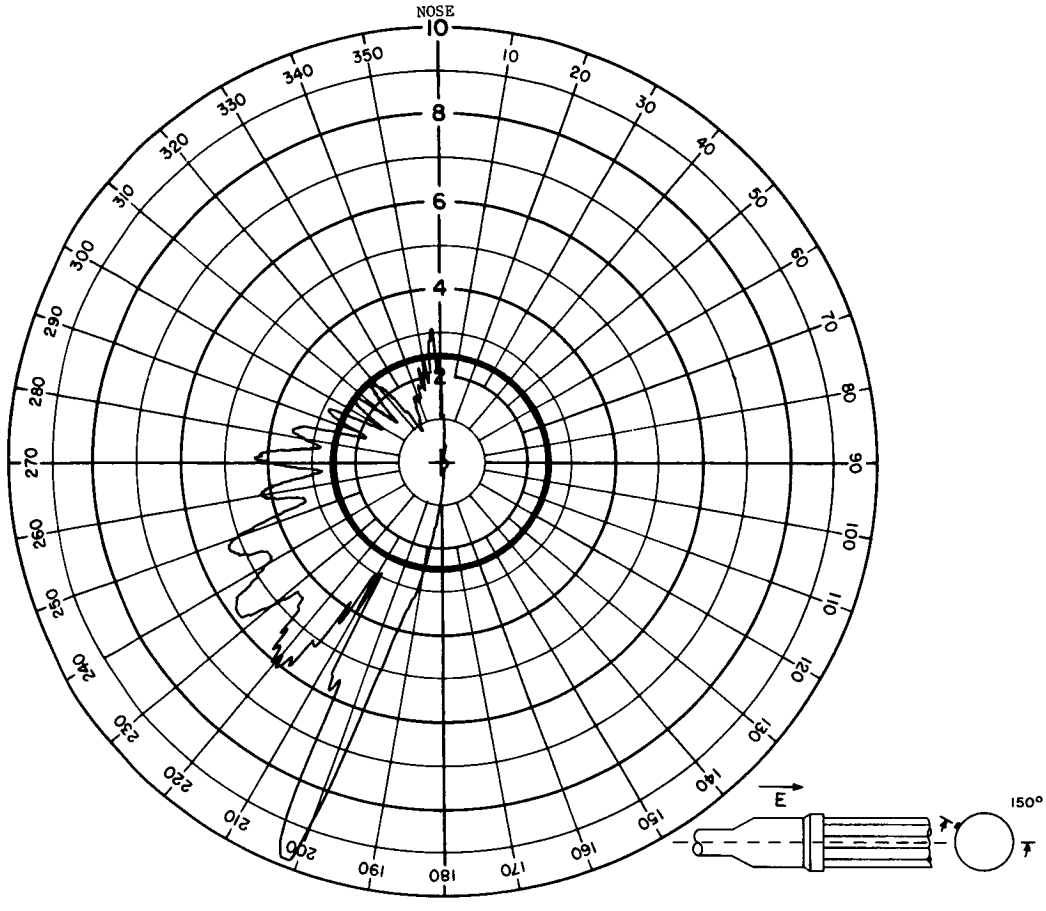


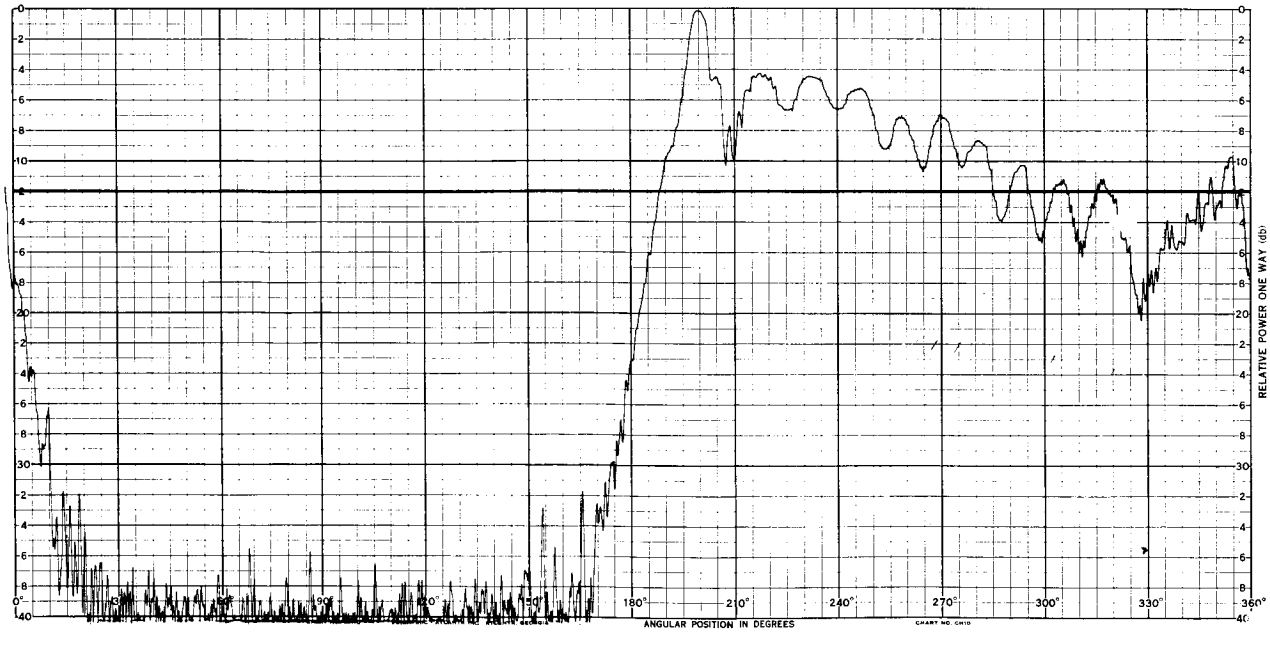


ANTENNA RADIATION PATTERN NO. 215-15

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

SA-5 C-BAND RADAR ANTENNA

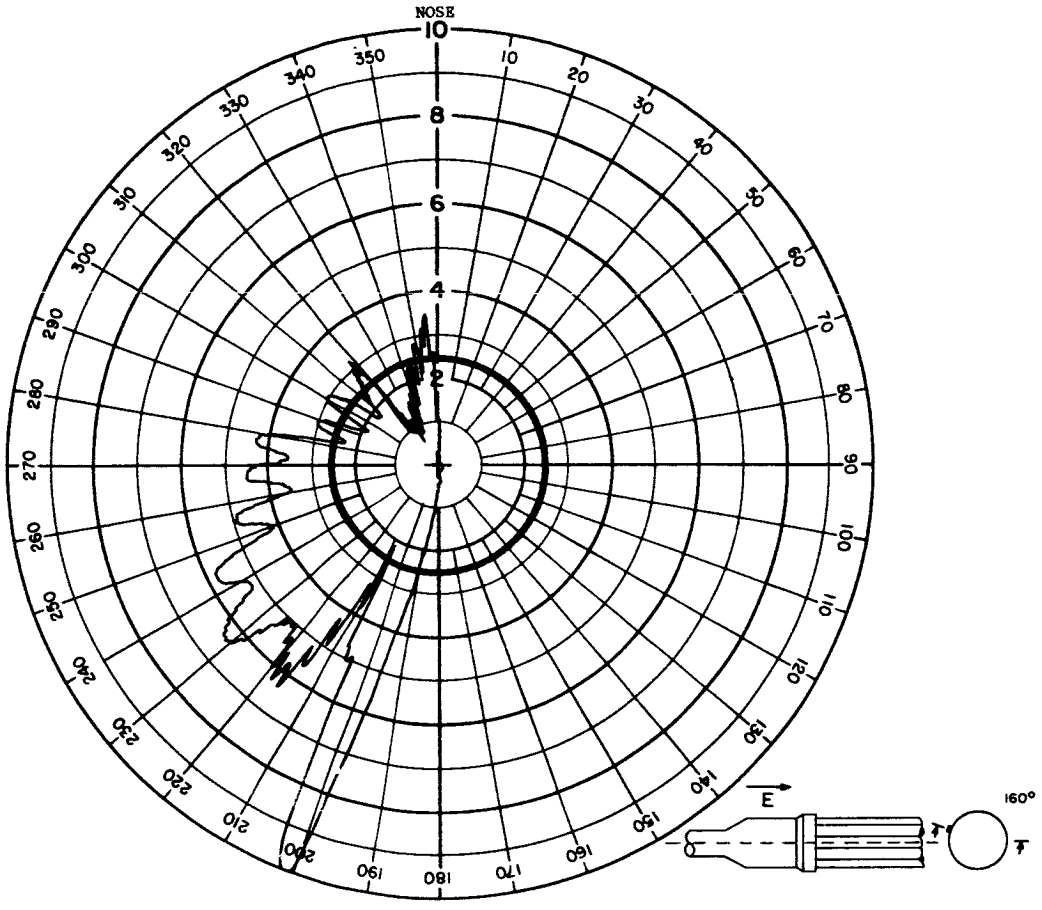


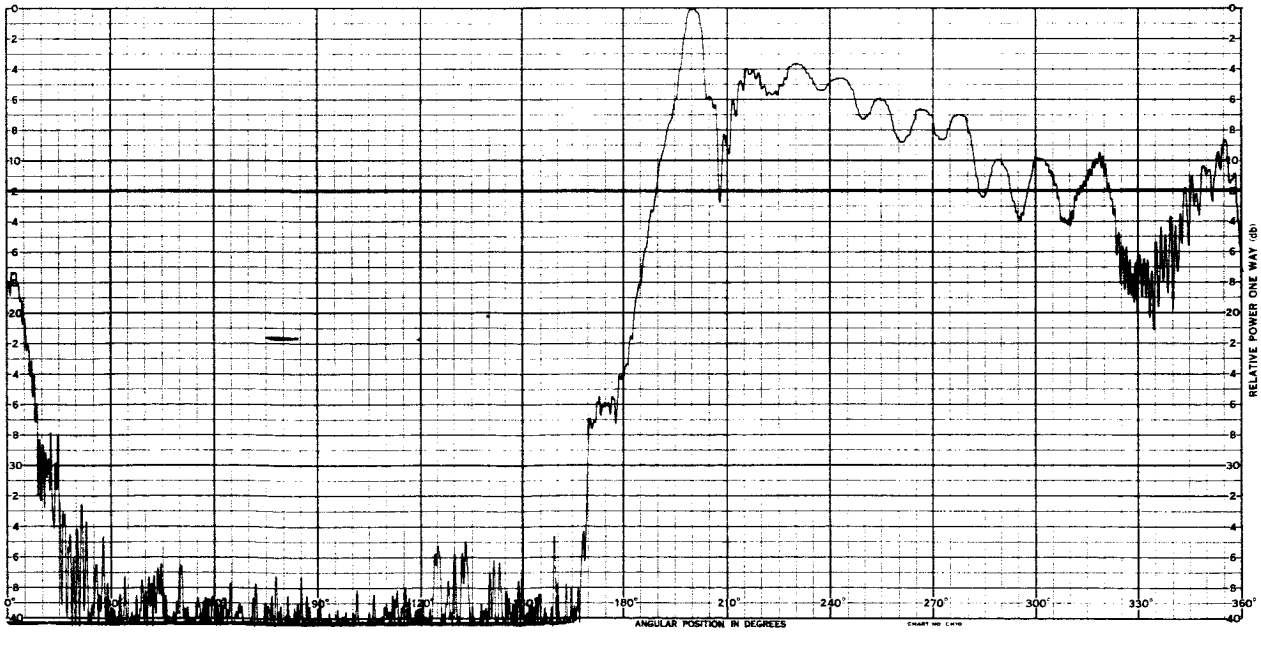


ANTENNA RADIATION PATTERN NO. 215-16

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

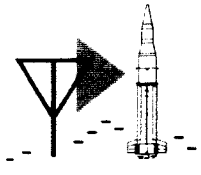
SA-5 C-BAND RADAR ANTENNA



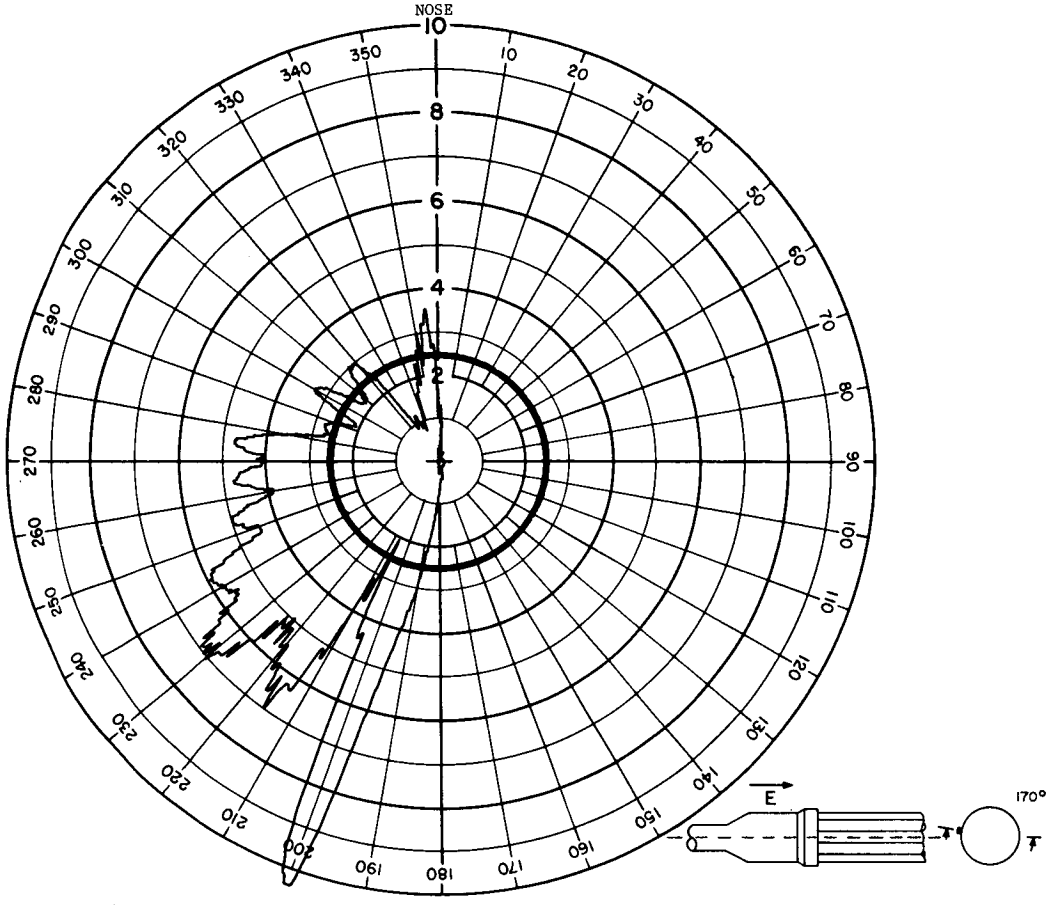


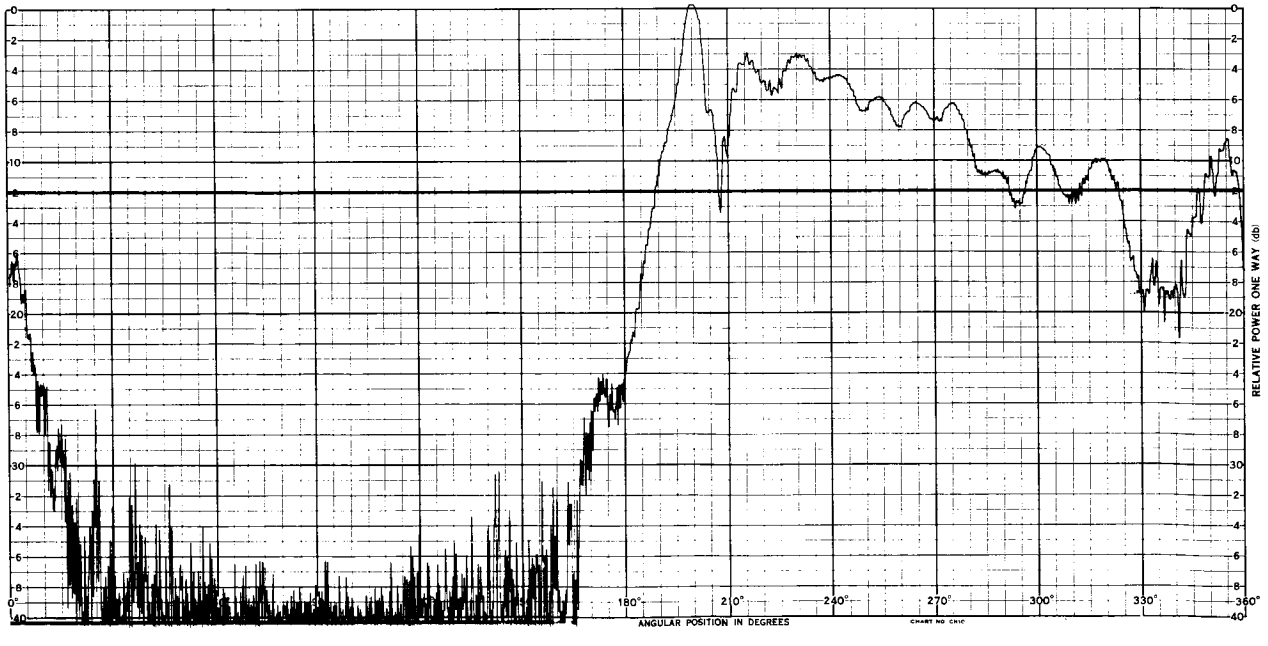
ANTENNA RADIATION PATTERN NO. 215-17

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



SA-5 C-BAND RADAR ANTENNA

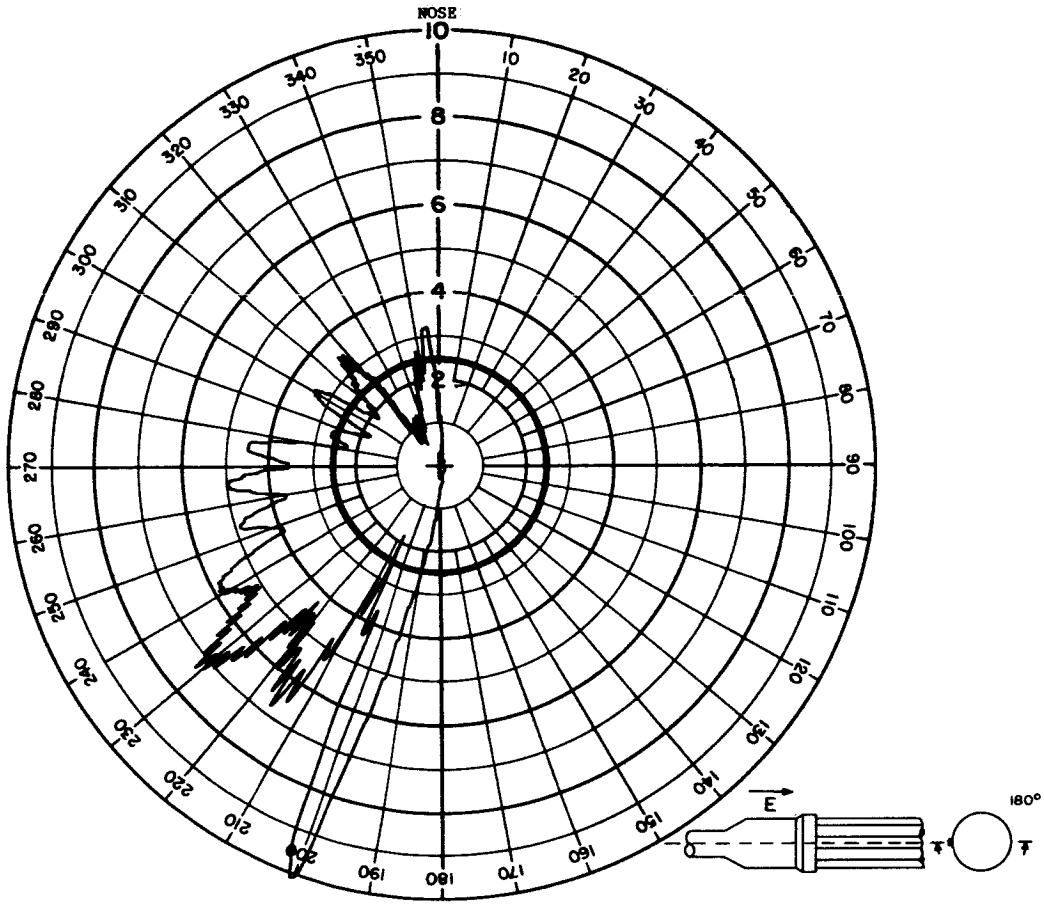


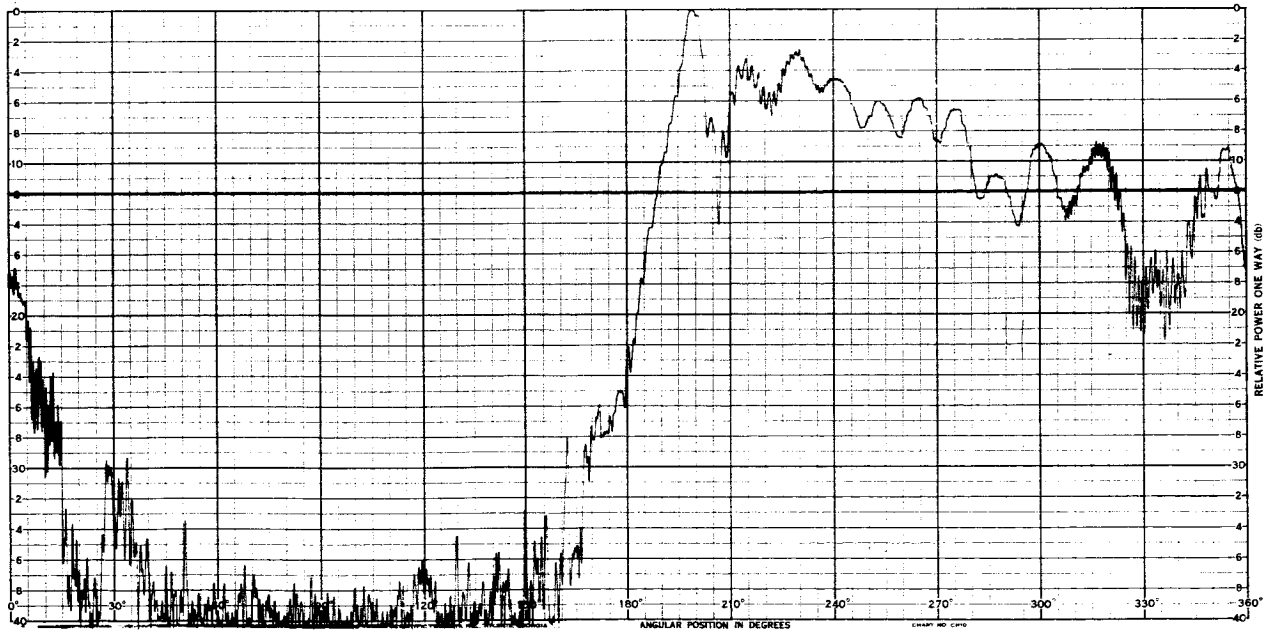


ANTENNA RADIATION PATTERN NO. 215-18

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

SA-5 C-BAND RADAR ANTENNA

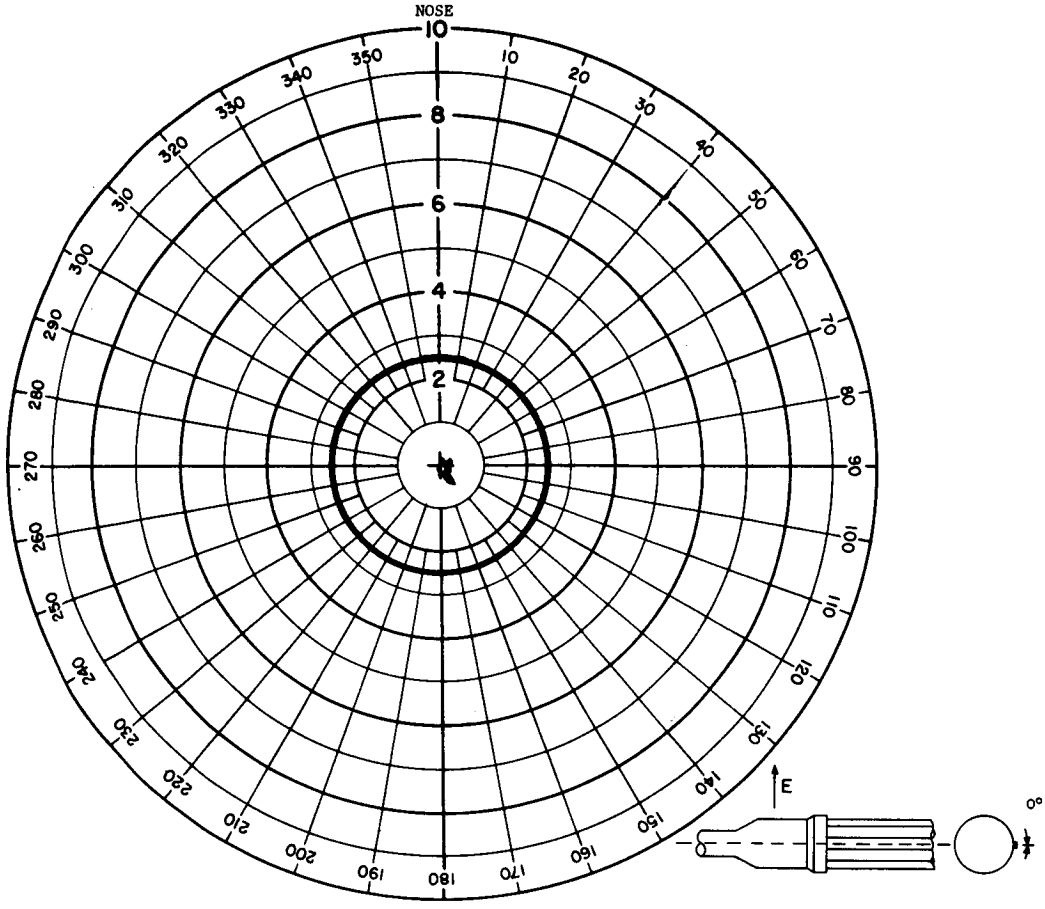


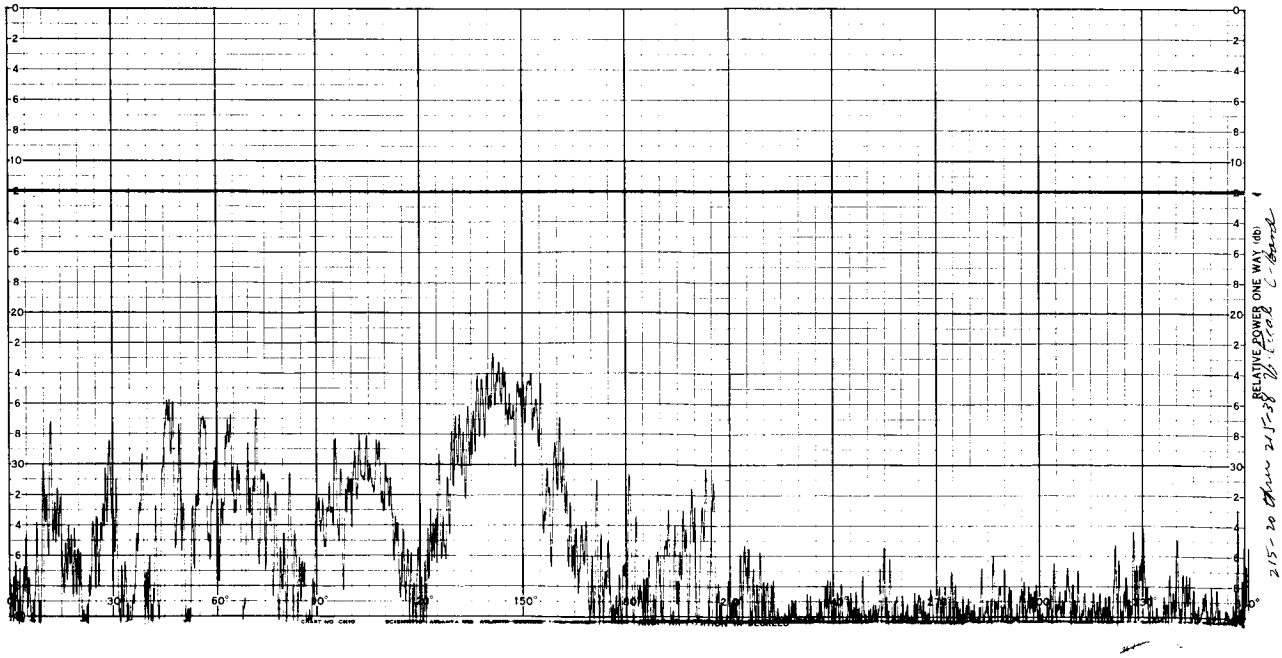


ANTENNA RADIATION PATTERN NO. 215-19

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

SA-5 C-BAND RADAR ANTENNA

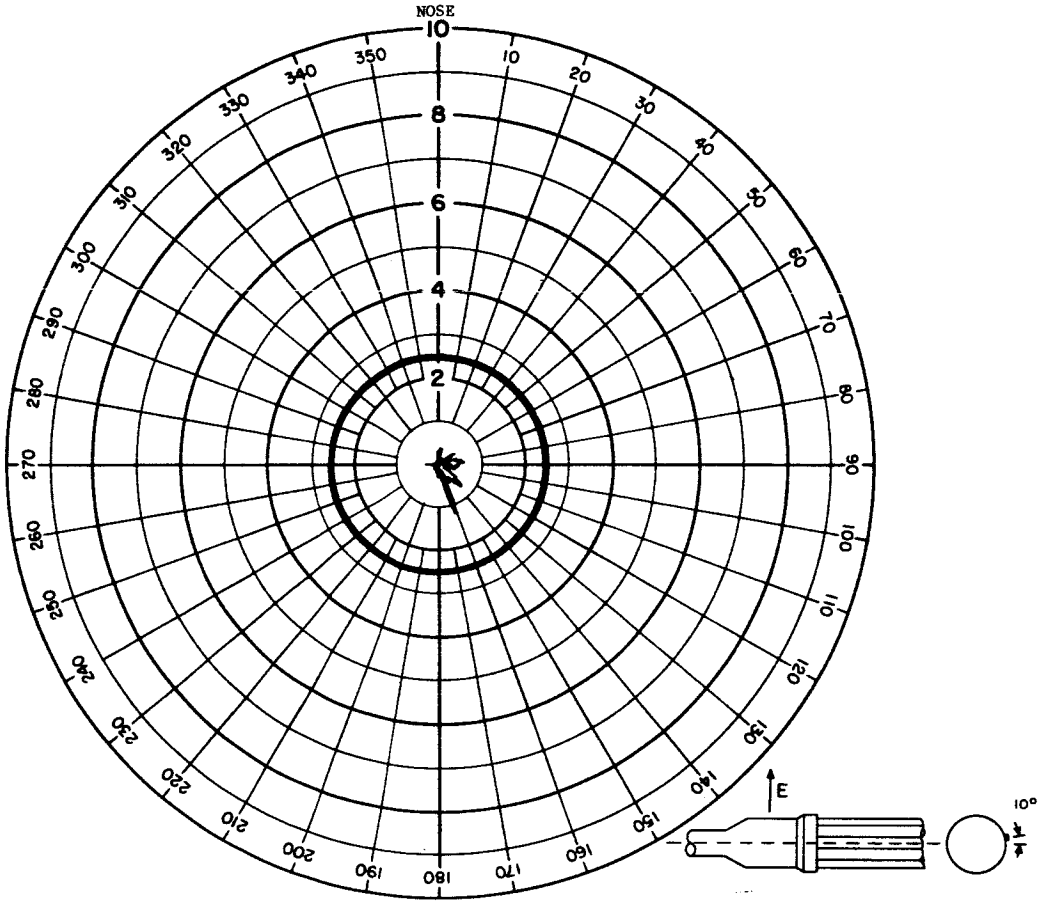


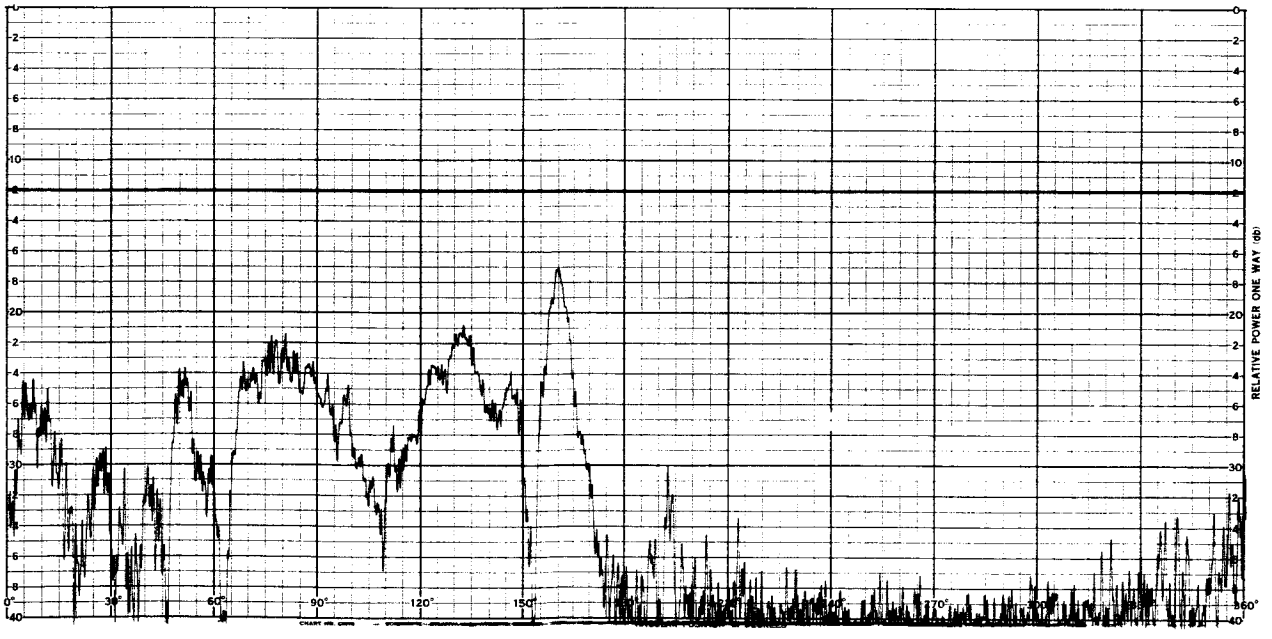


ANTENNA RADIATION PATTERN NO. 215-20

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

SA-5 C-BAND RADAR ANTENNA

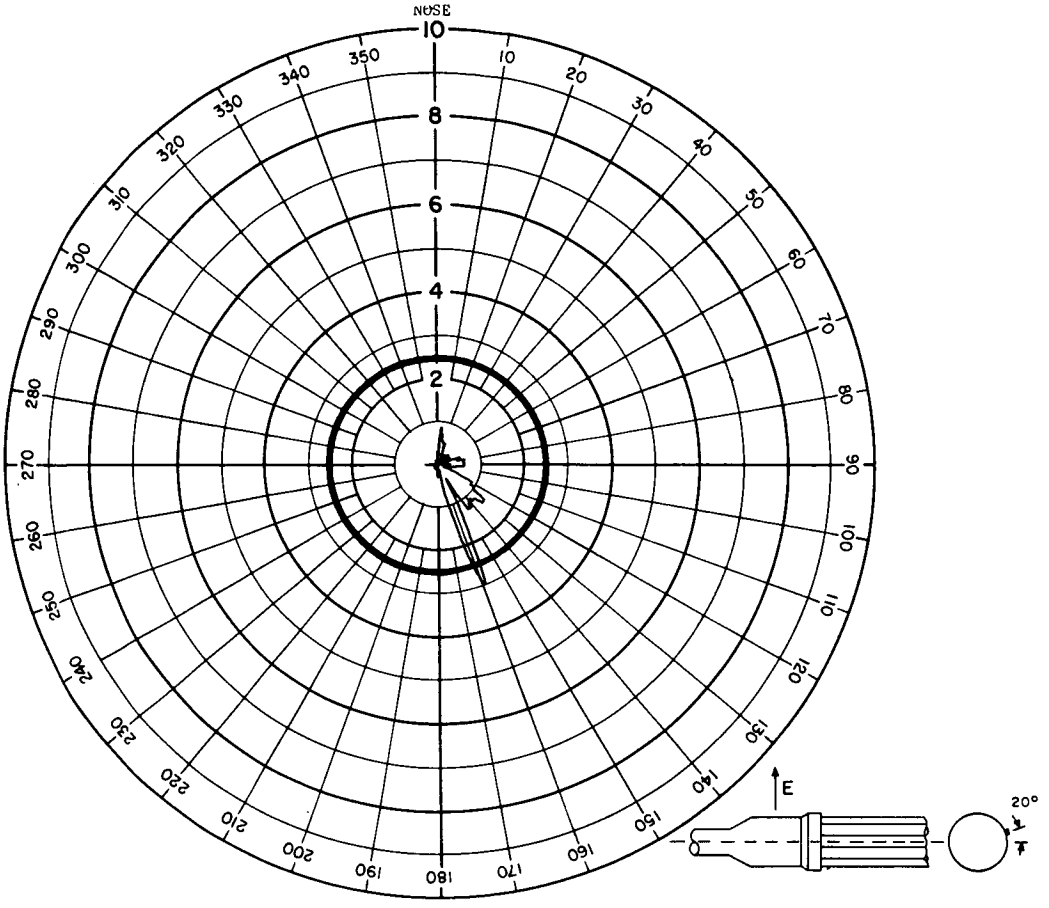


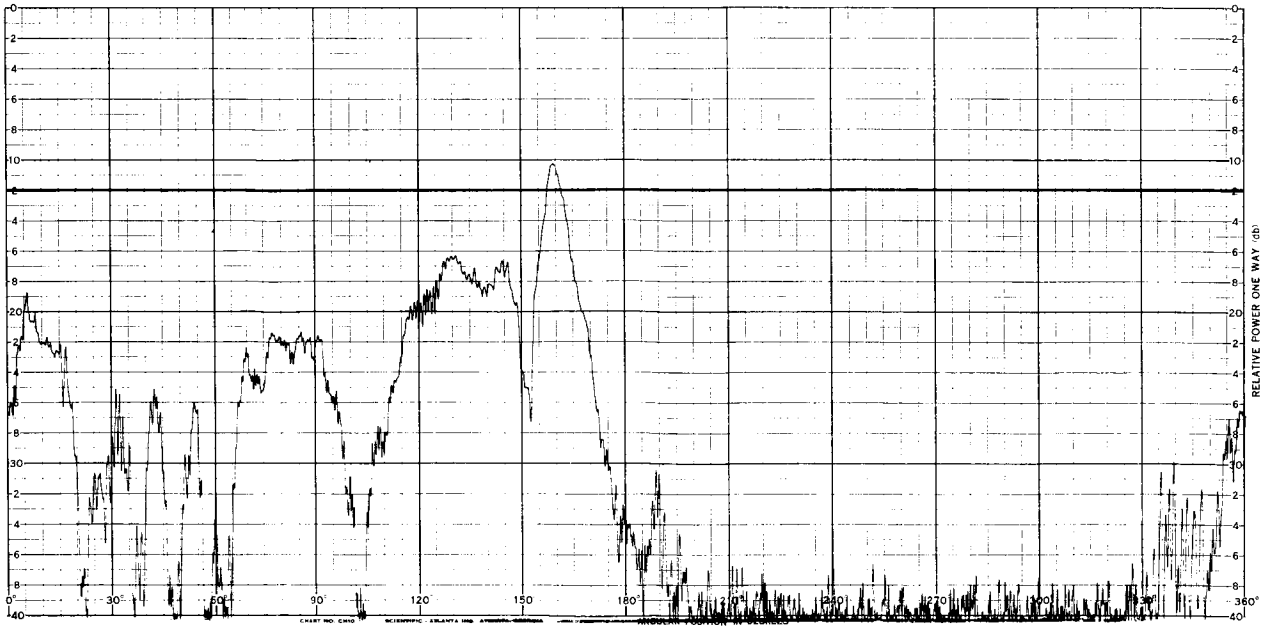


ANTENNA RADIATION PATTERN NO. 215-21

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

SA-5 C-BAND RADAR ANTENNA

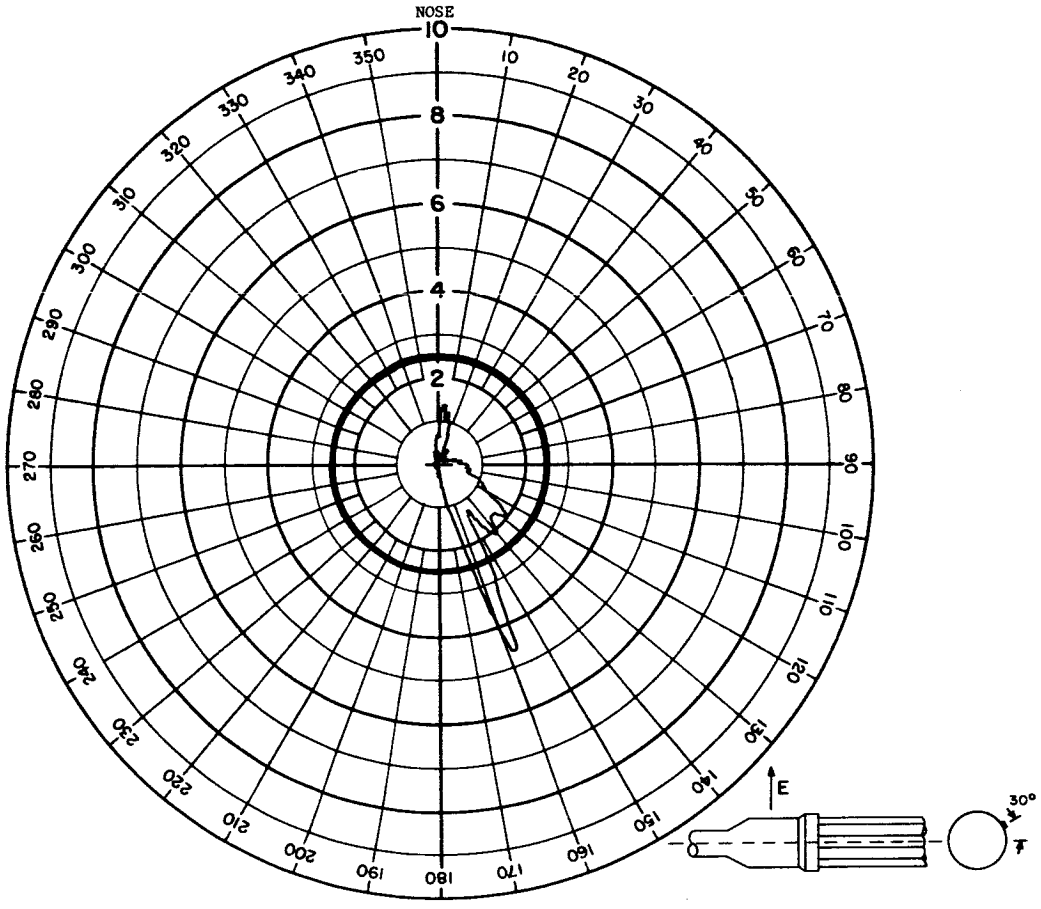


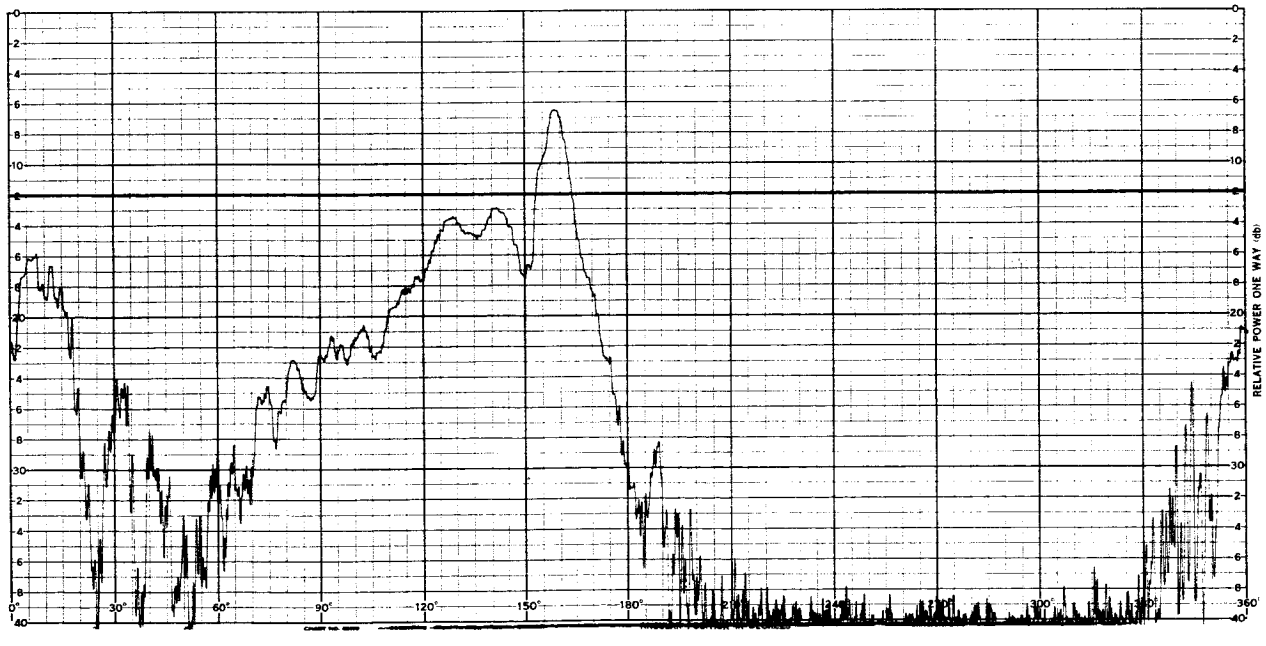


ANTENNA RADIATION PATTERN NO. 215-22

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

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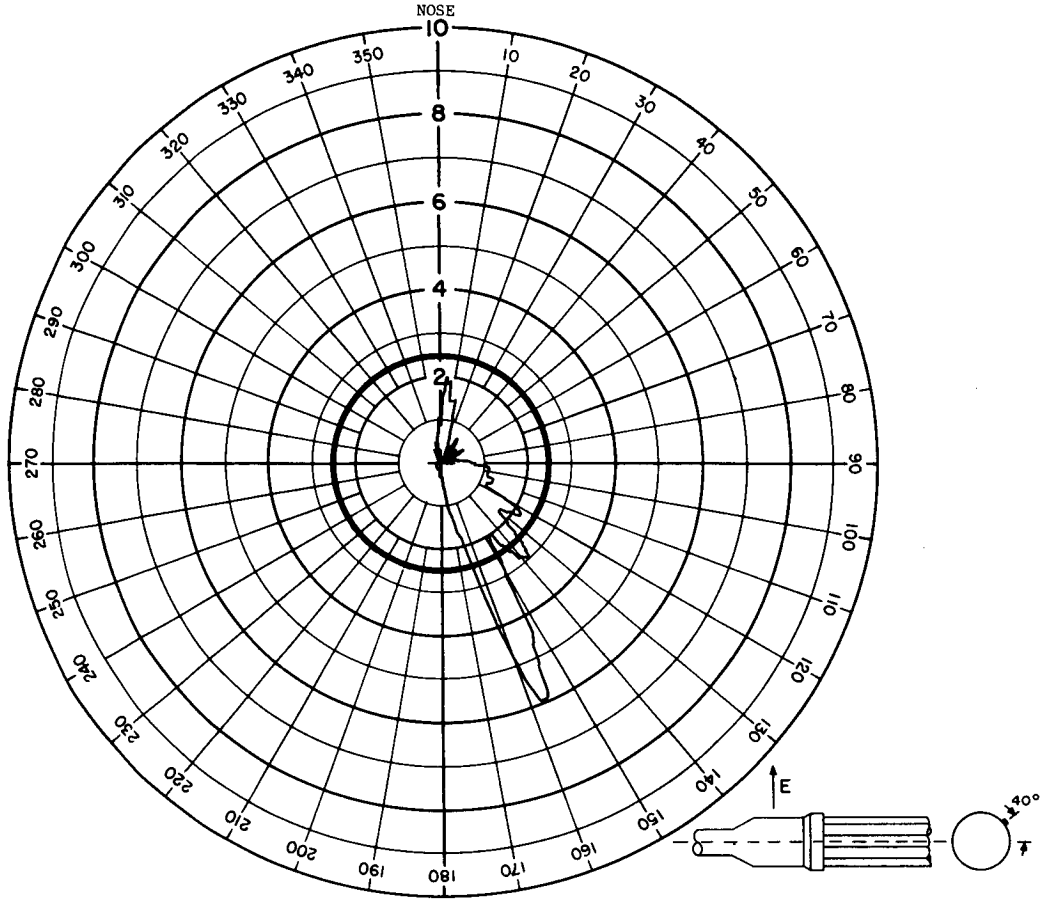


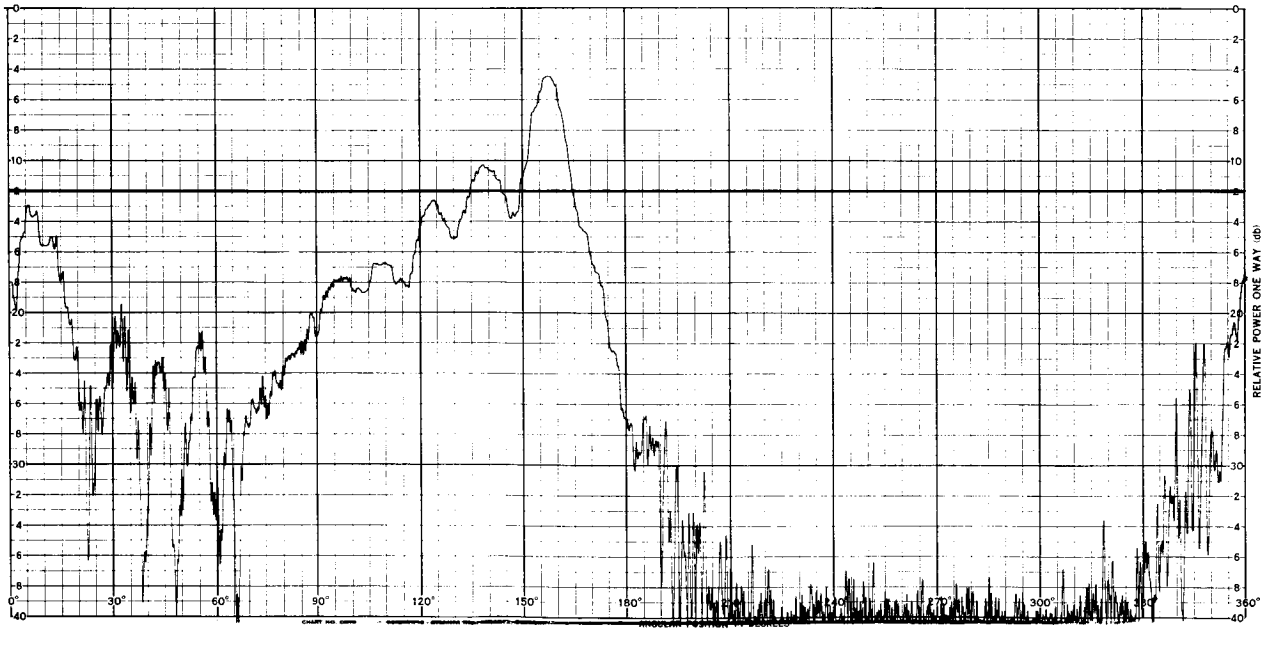


ANTENNA RADIATION PATTERN NO. 215-23

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

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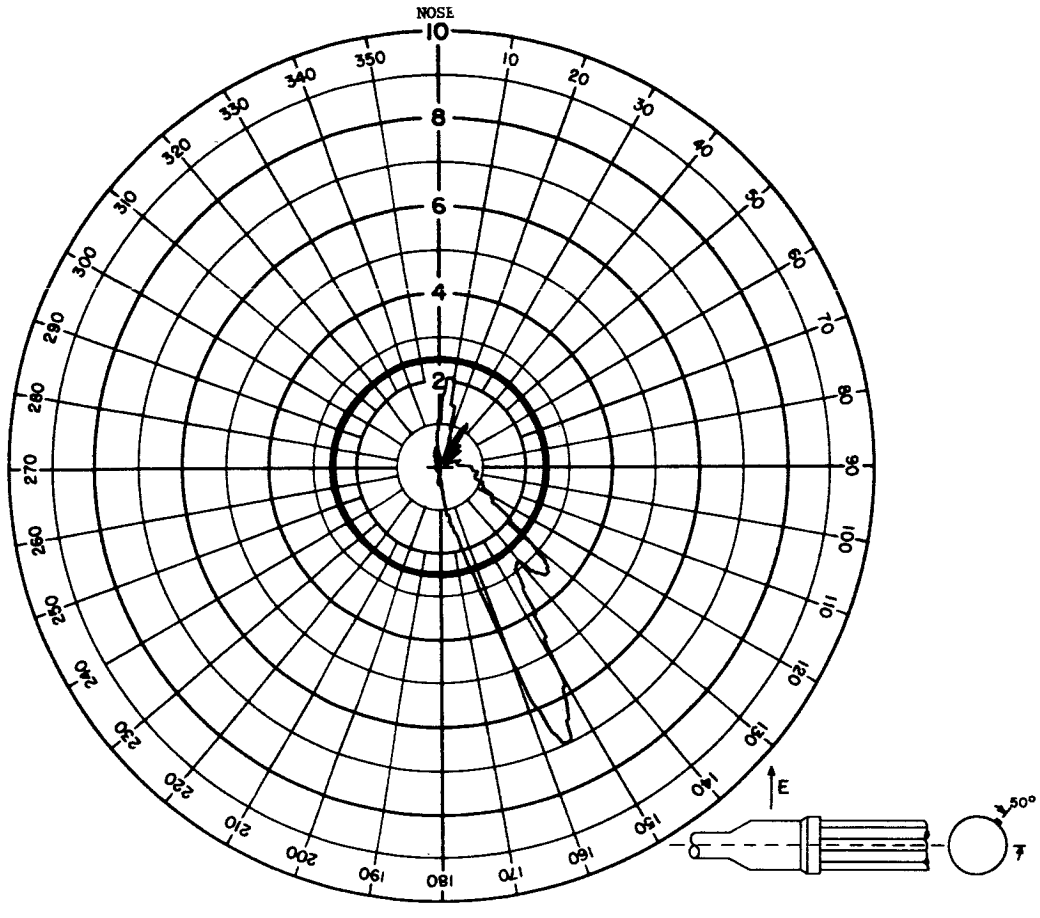


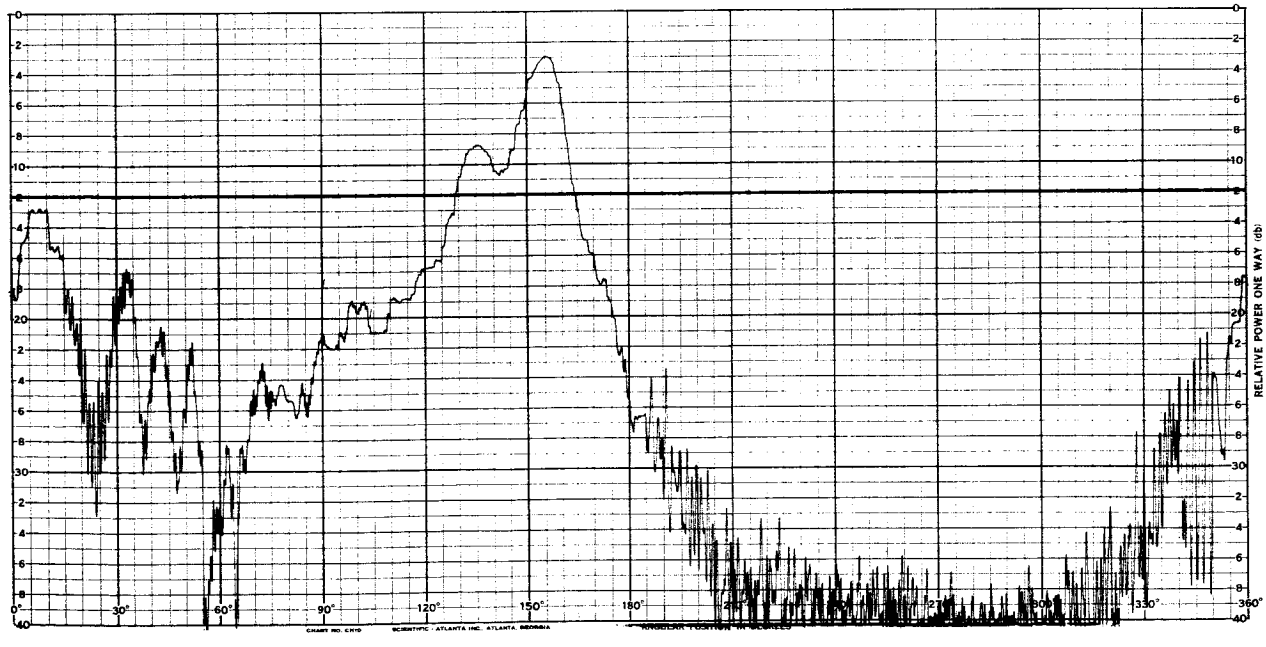


ANTENNA RADIATION PATTERN NO. 215-24

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

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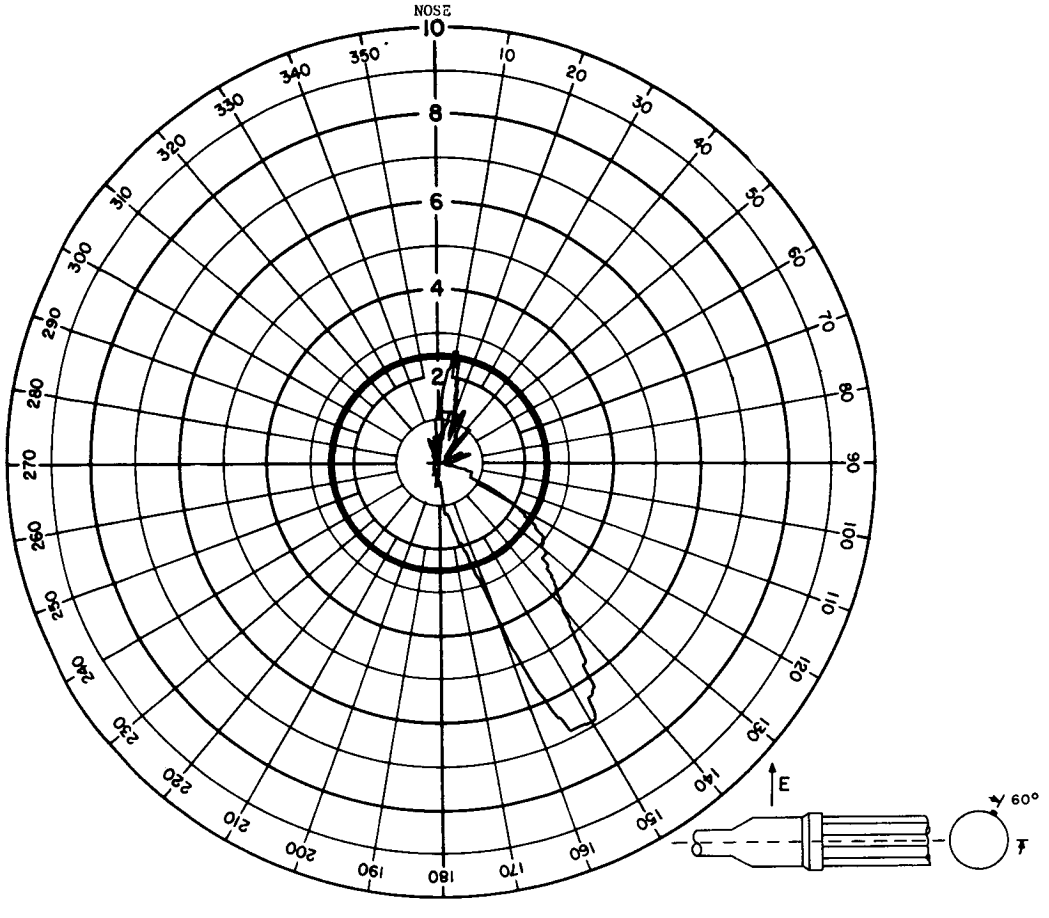


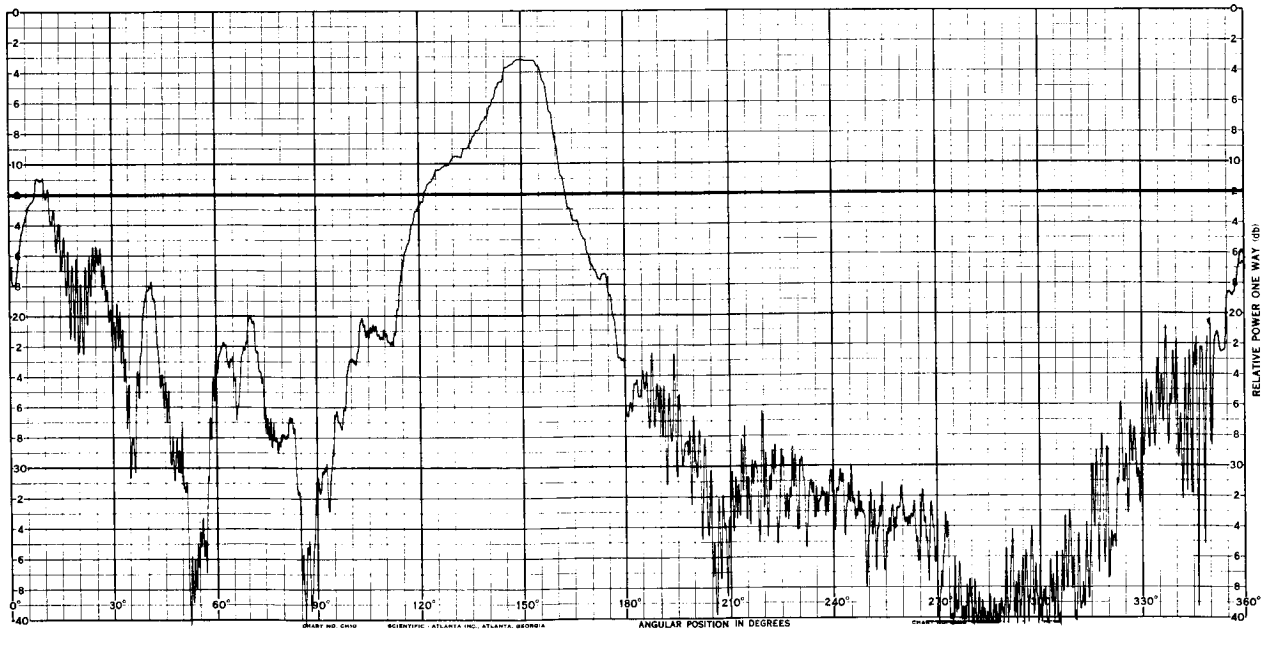


ANTENNA RADIATION PATTERN NO. 215-25

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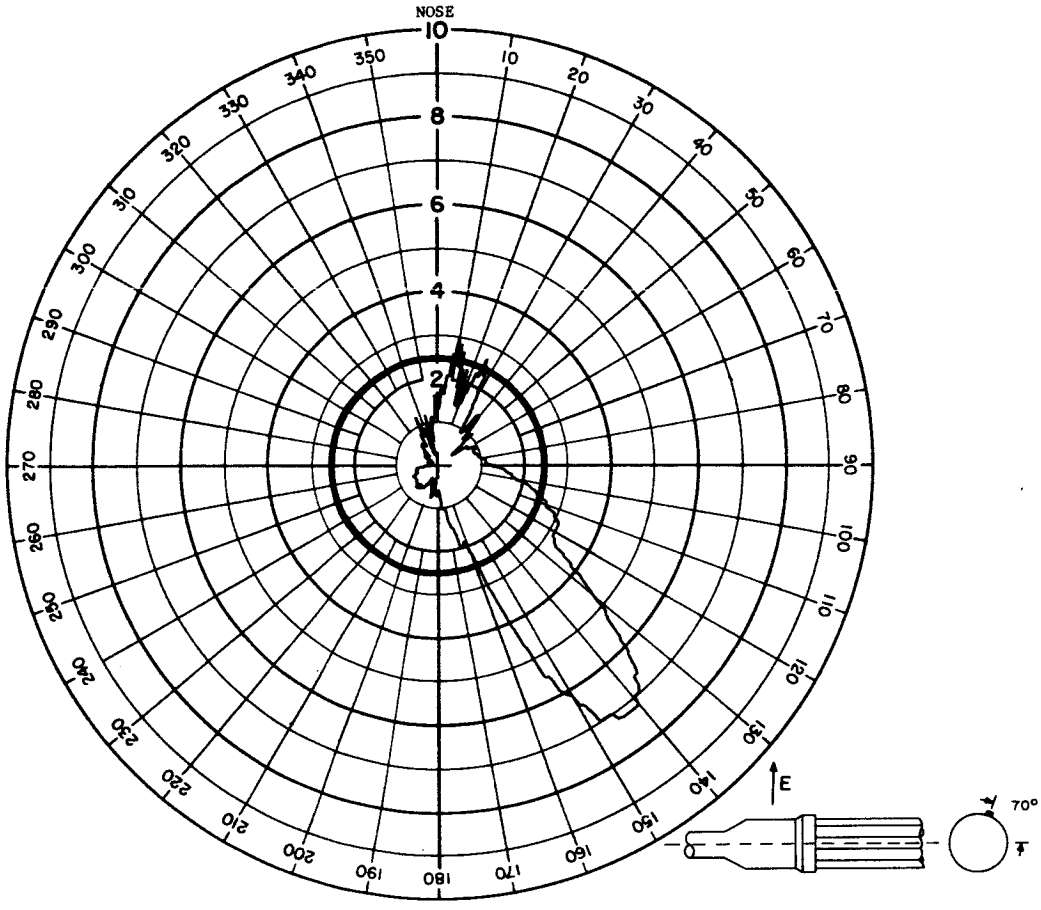


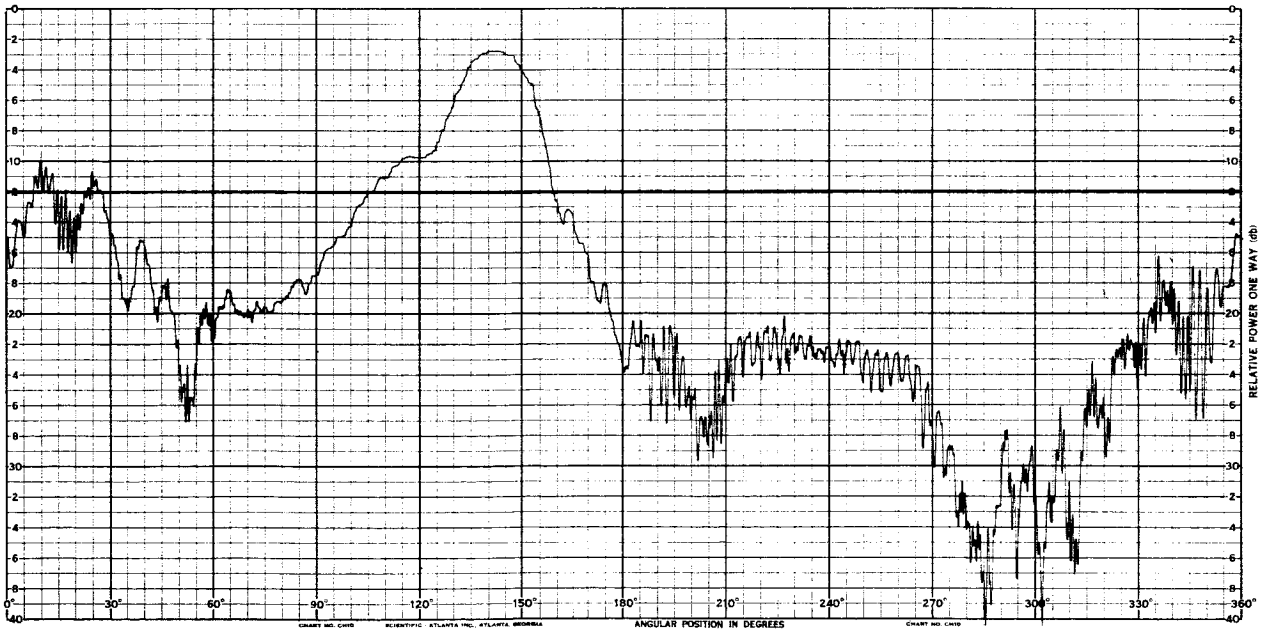


ANTENNA RADIATION PATTERN NO. 215-26

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

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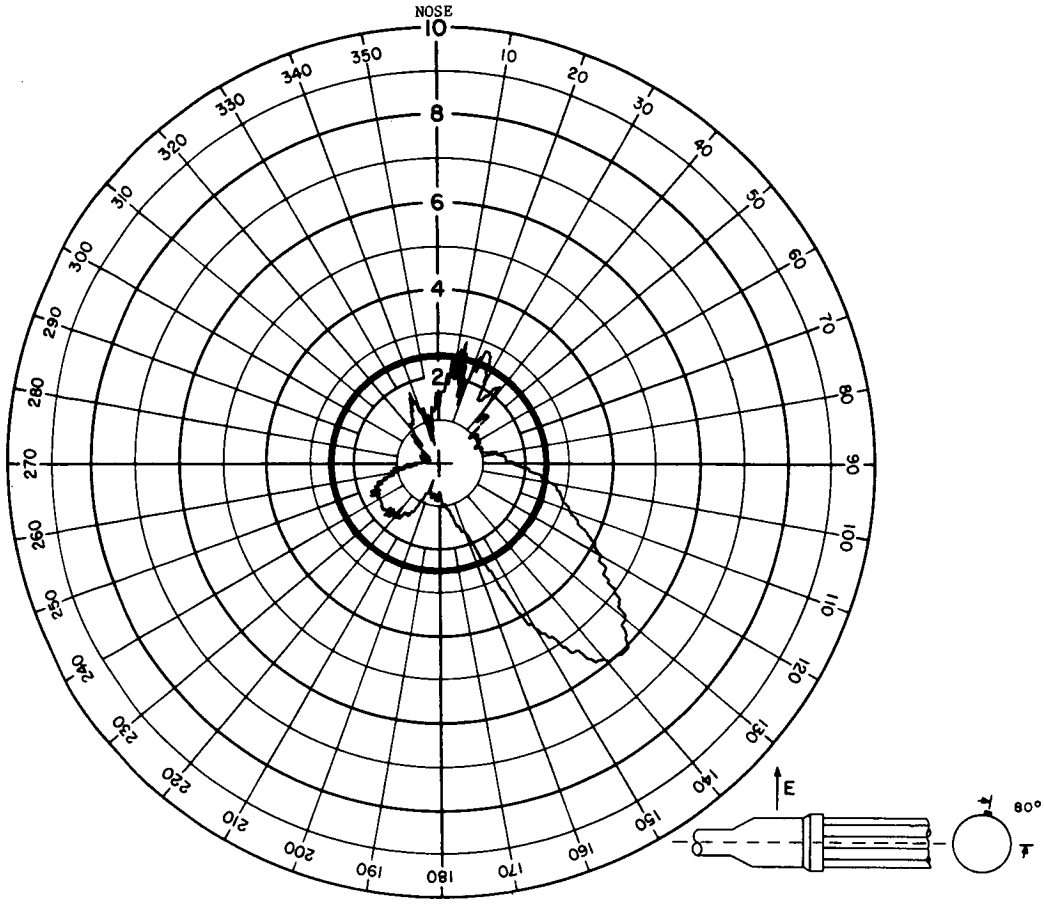


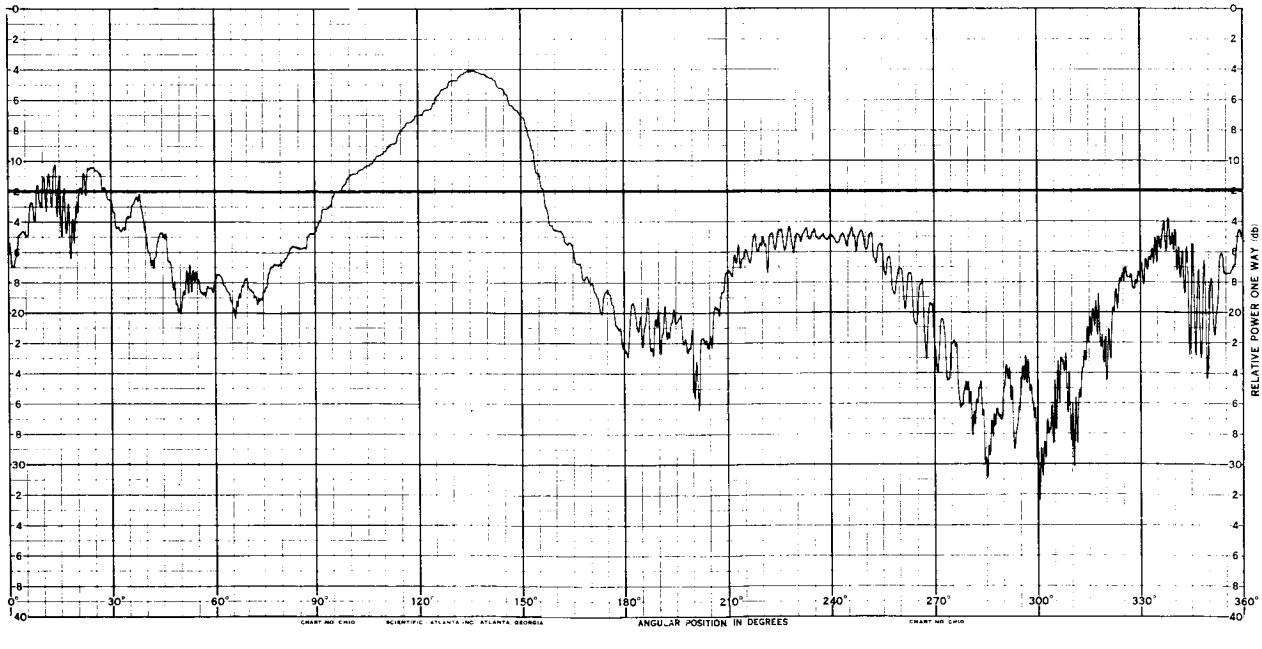


ANTENNA RADIATION PATTERN NO. 215-27

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

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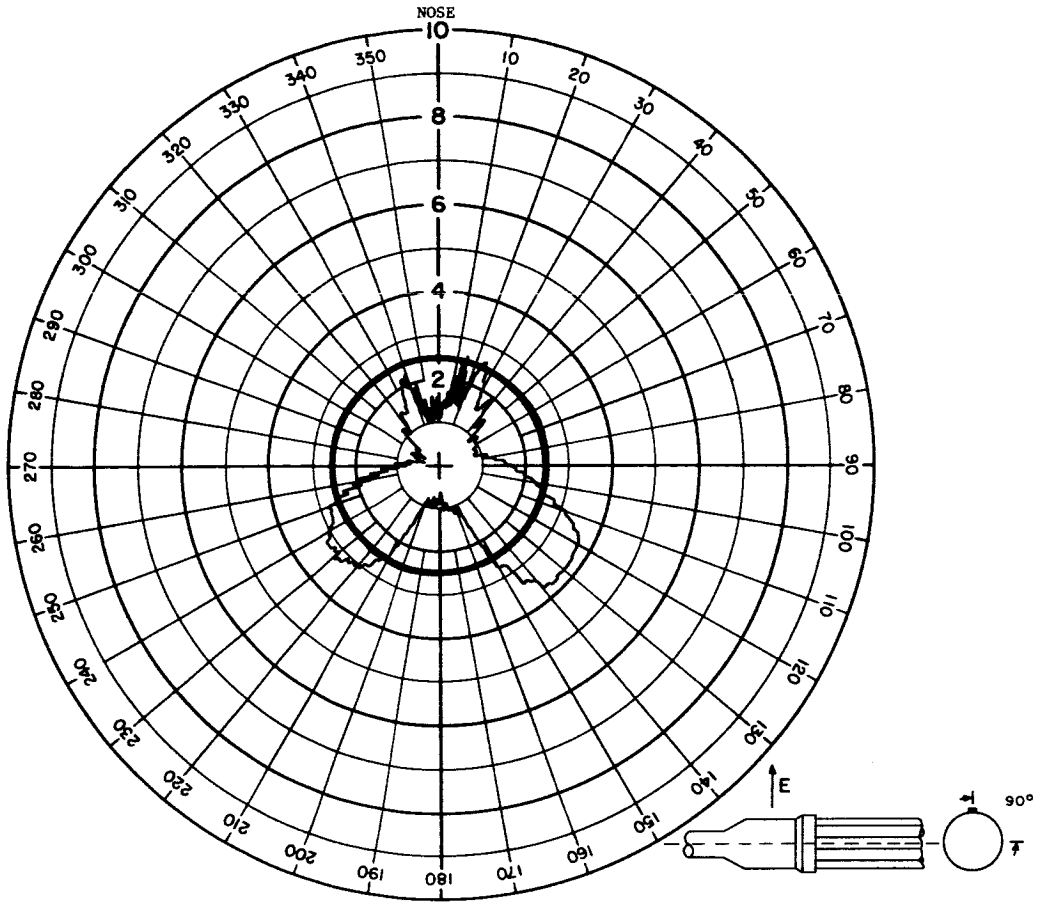


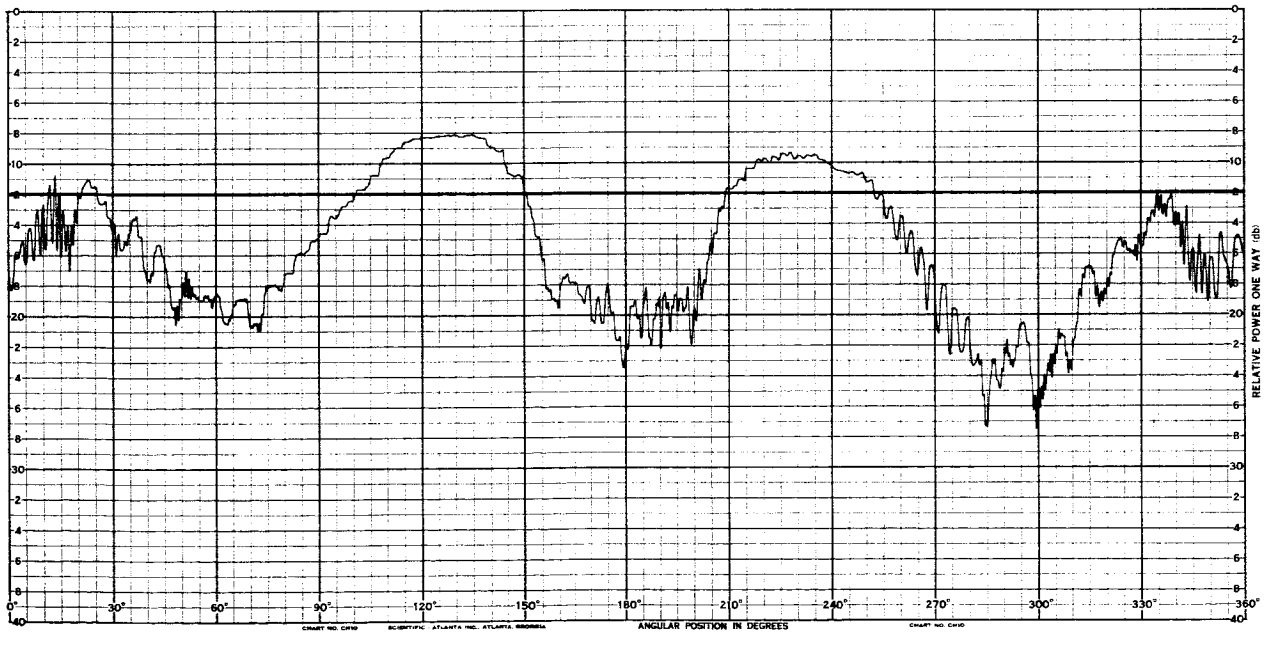


ANTENNA RADIATION PATTERN NO. 215-28

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

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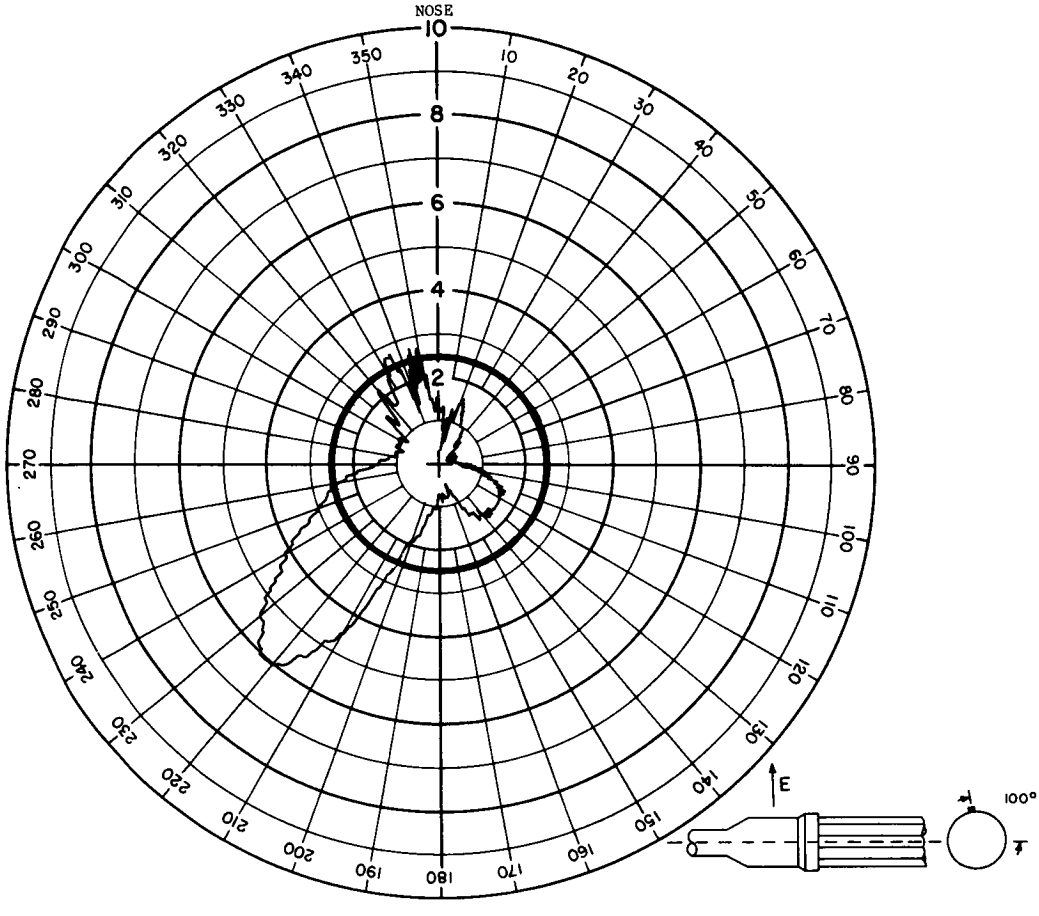


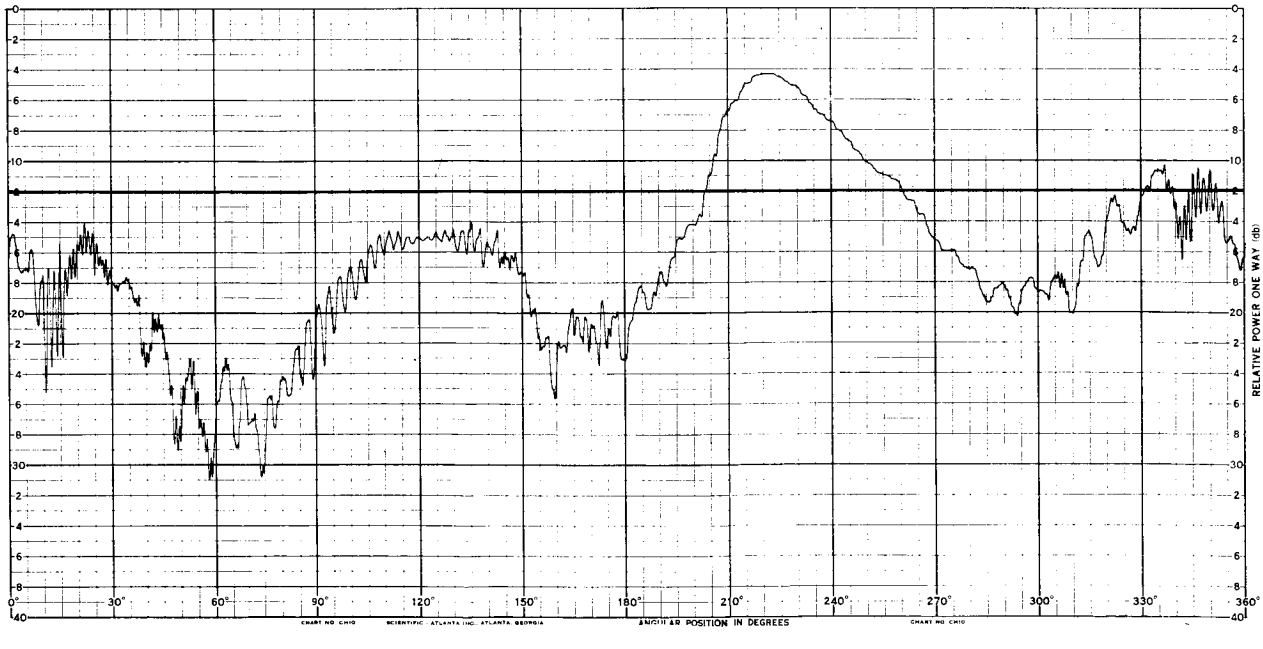


ANTENNA RADIATION PATTERN NO. 215-29

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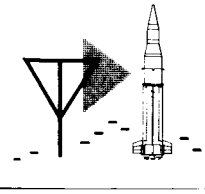
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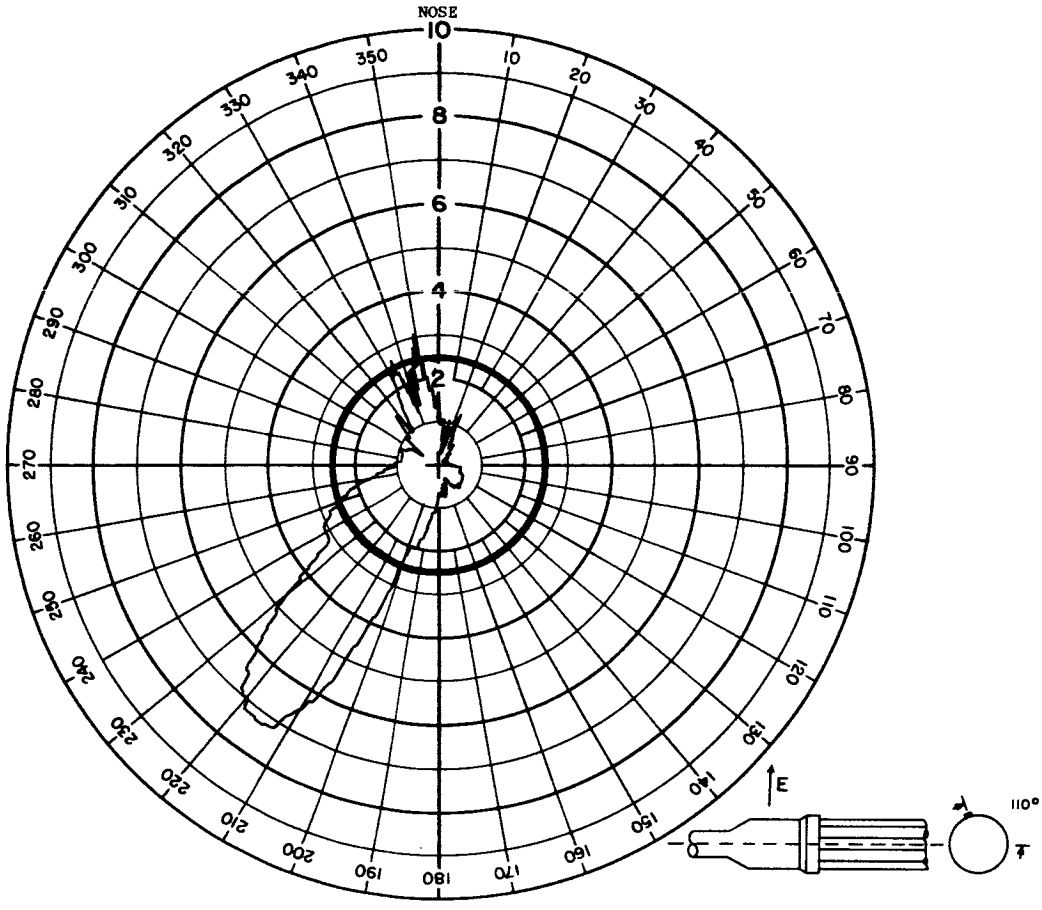


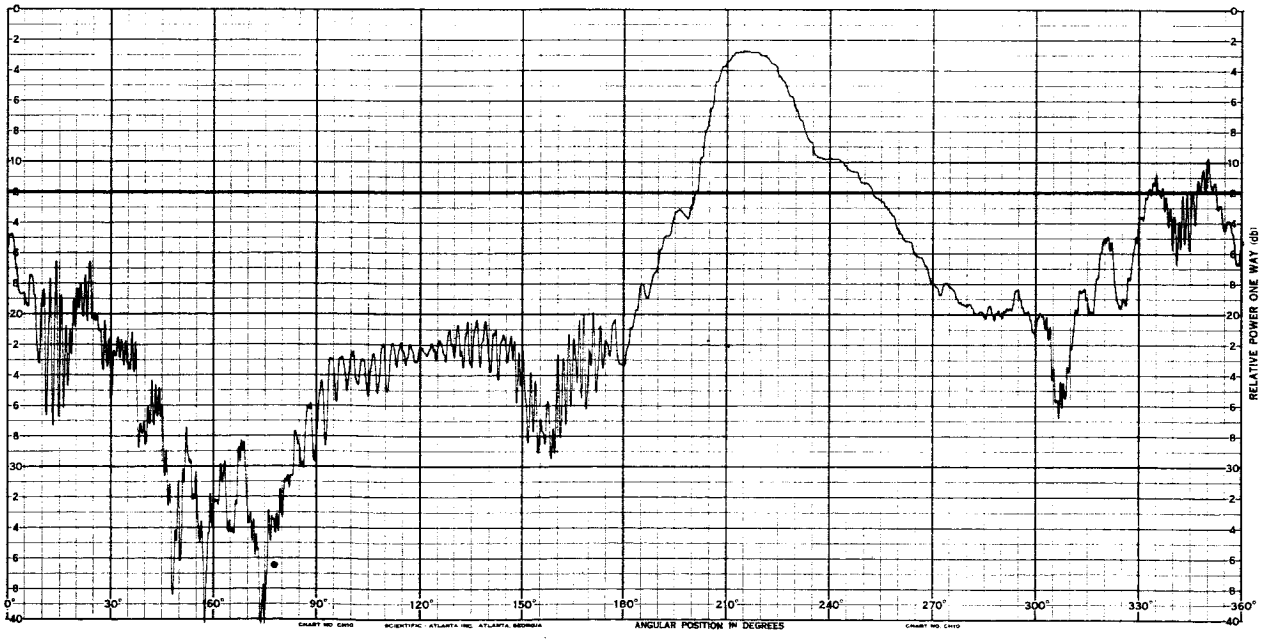
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GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT



SA-5 C-BAND RADAR ANTENNA

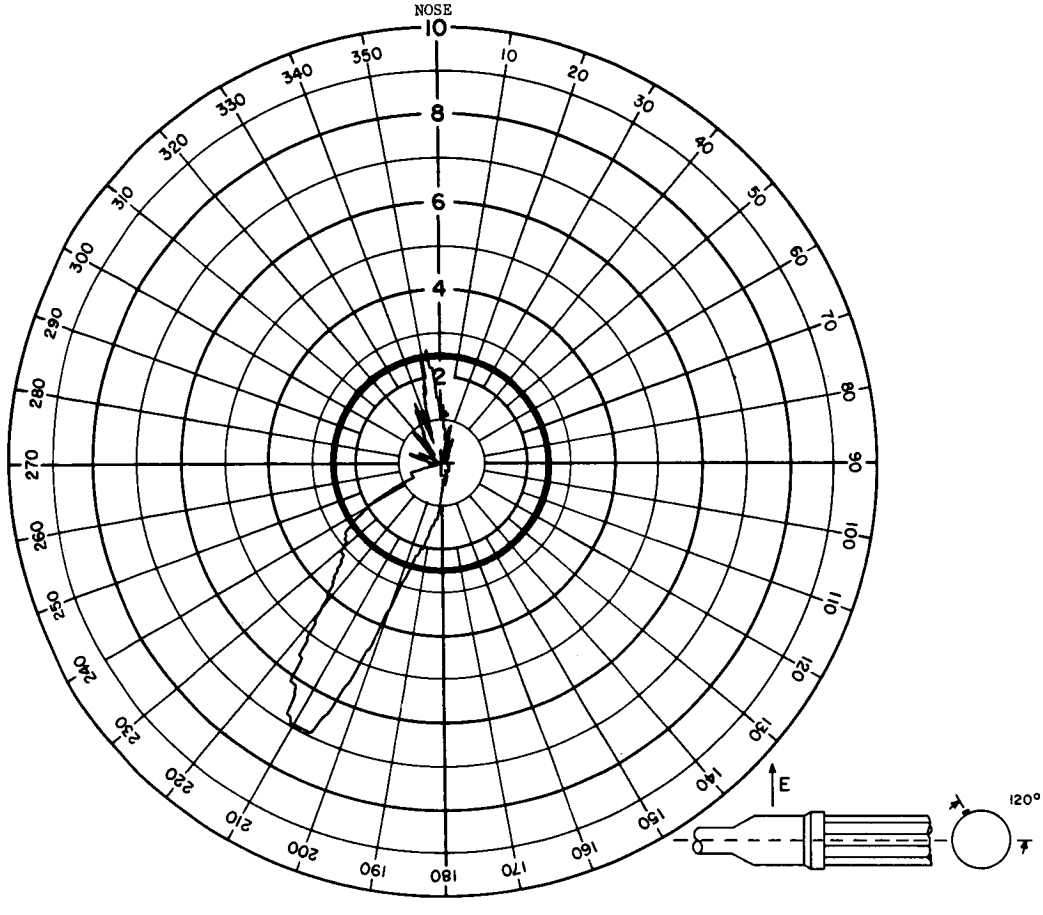


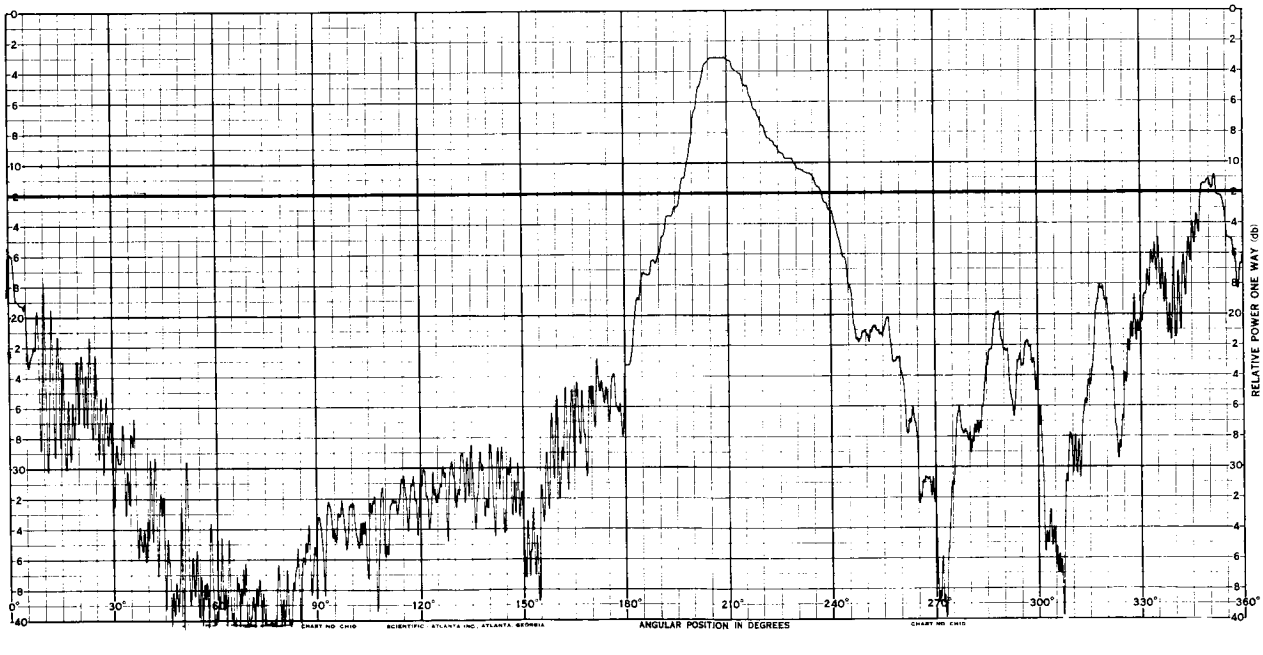


ANTENNA RADIATION PATTERN NO. 215-31

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

SA-5 C-BAND RADAR ANTENNA

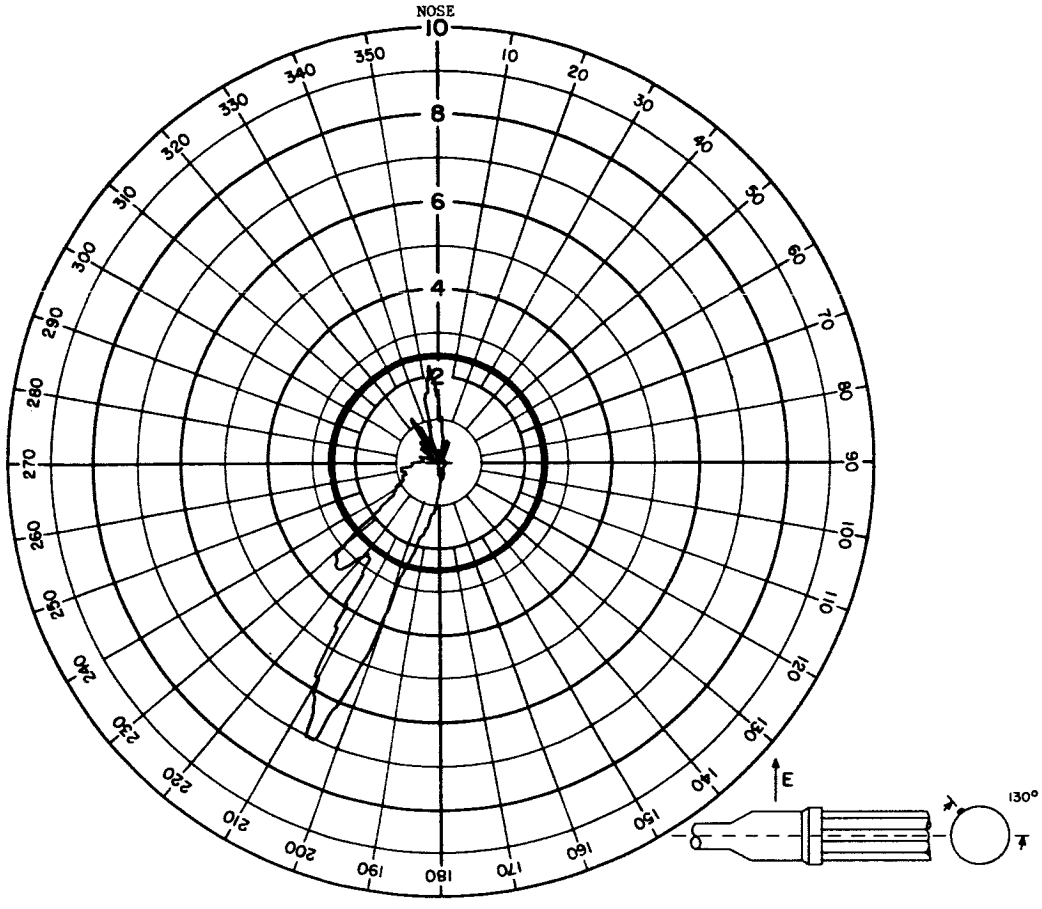


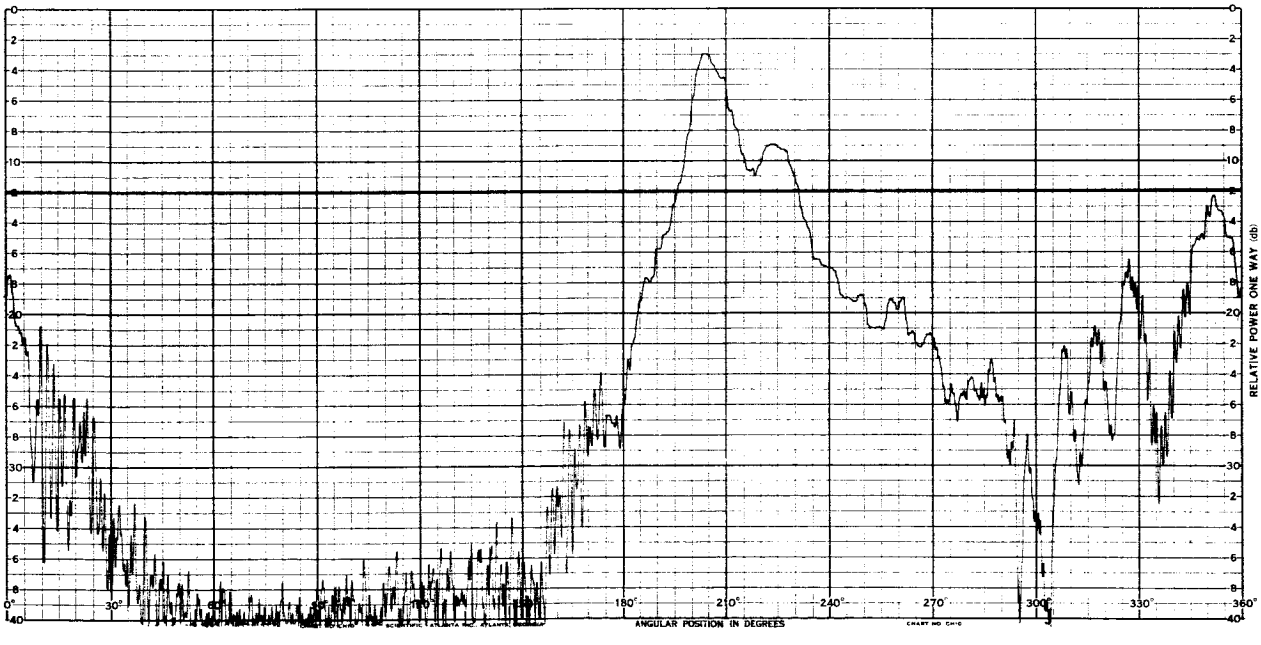


ANTENNA RADIATION PATTERN NO. 215-32

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

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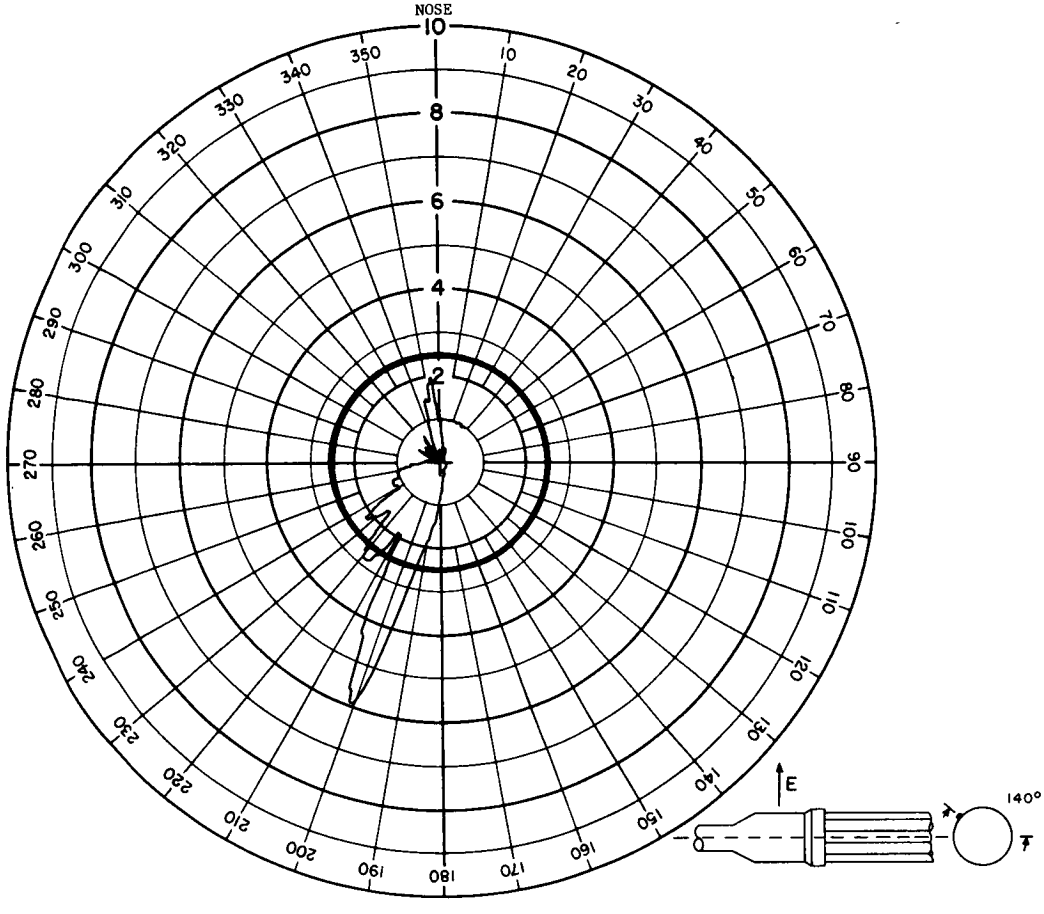


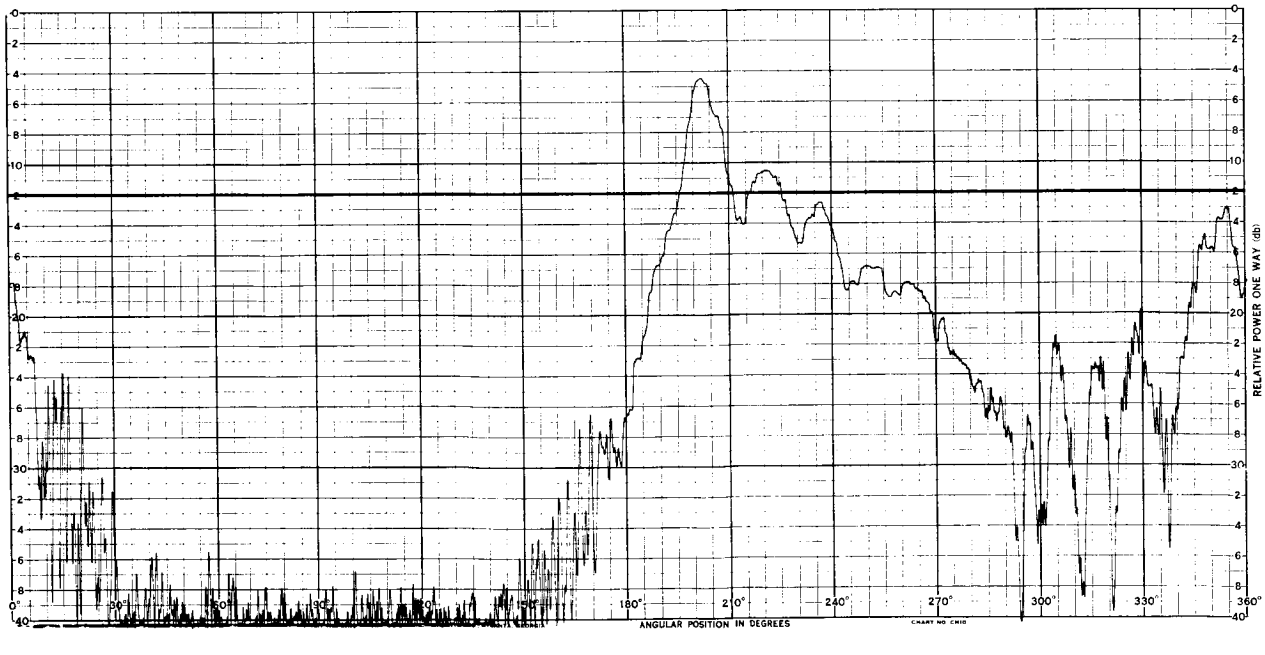


ANTENNA RADIATION PATTERN NO. 215-33

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

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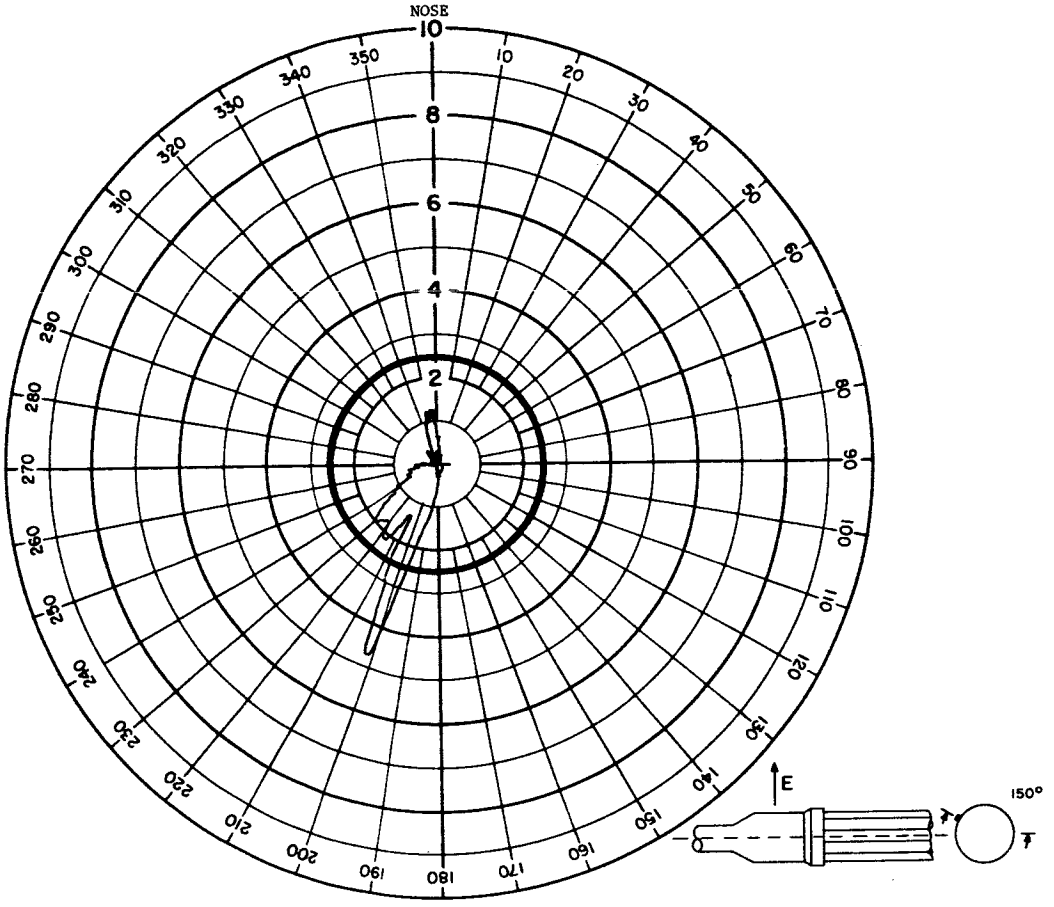


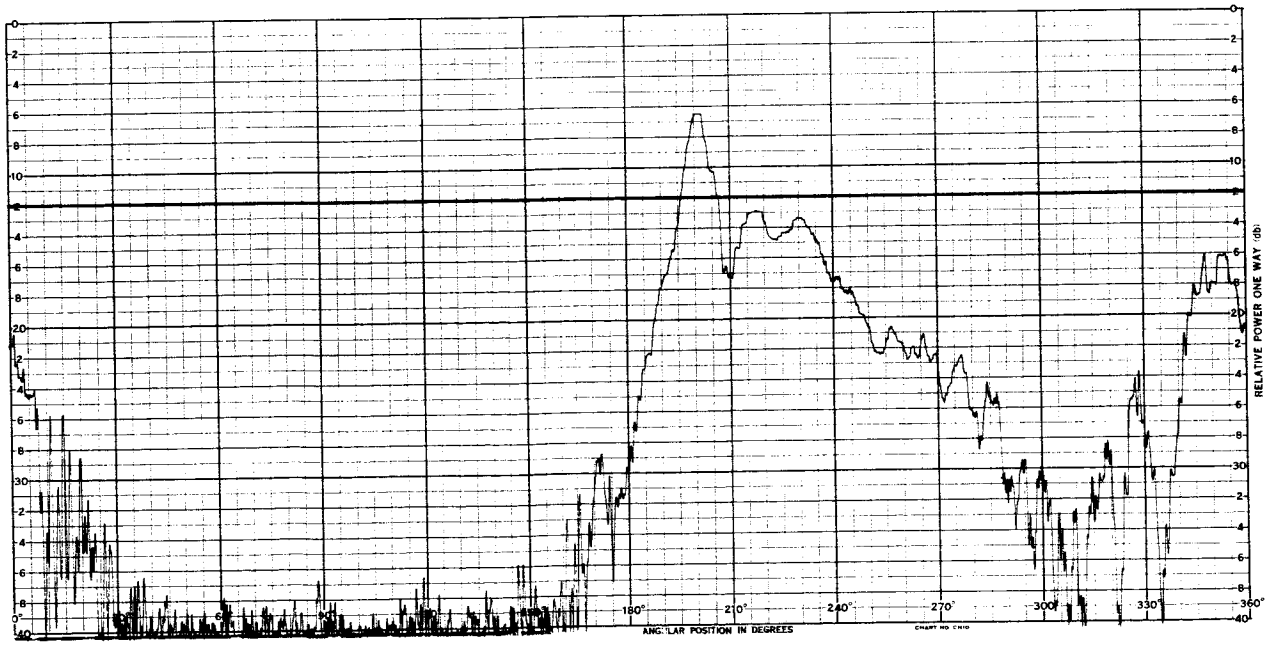


ANTENNA RADIATION PATTERN NO. 215-34

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

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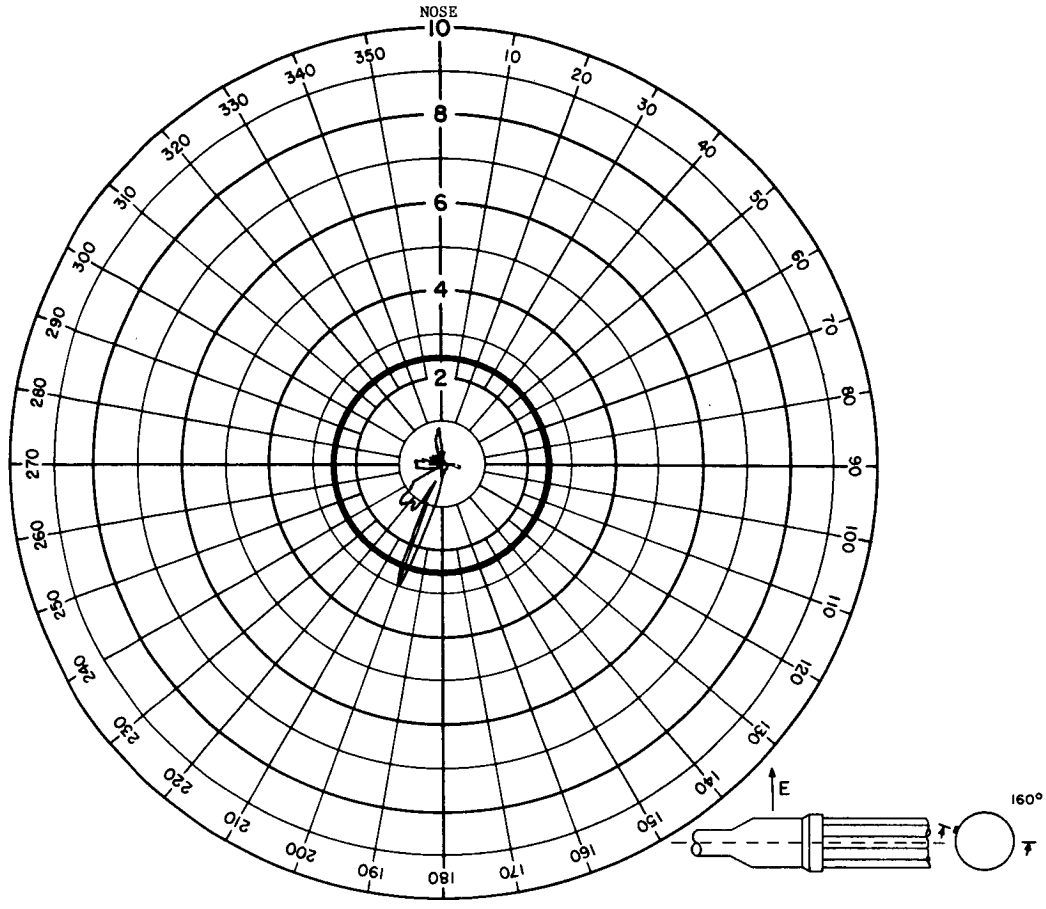


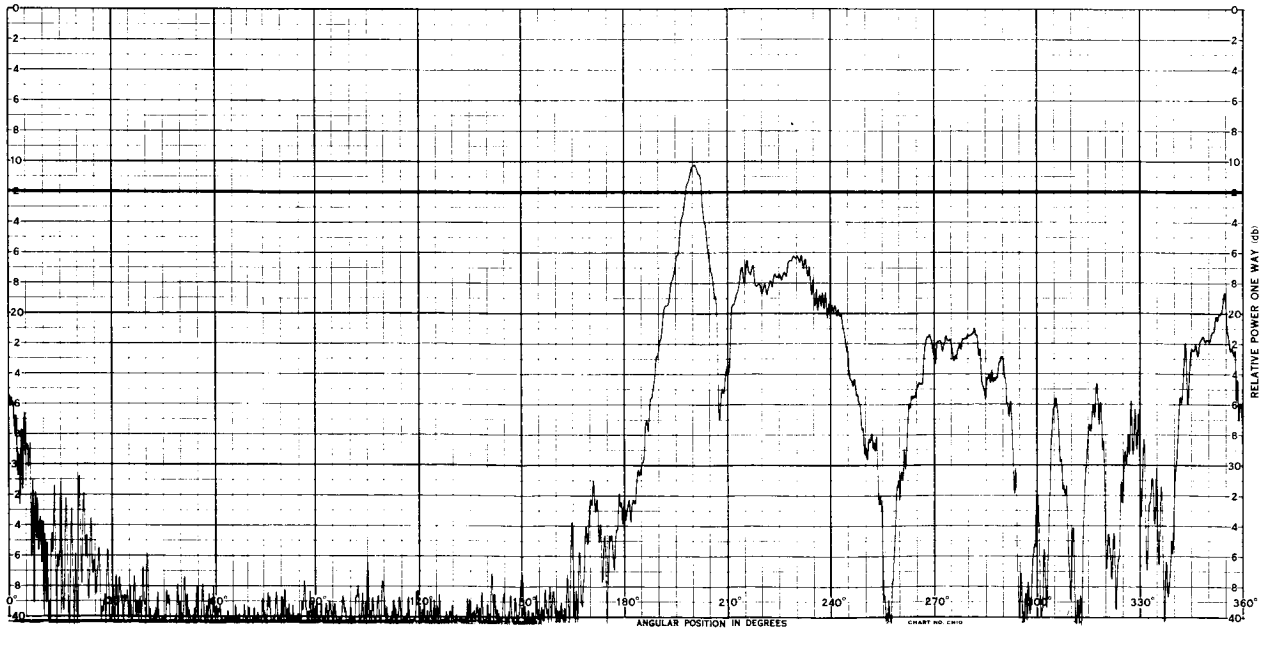


ANTENNA RADIATION PATTERN NO. 215-35

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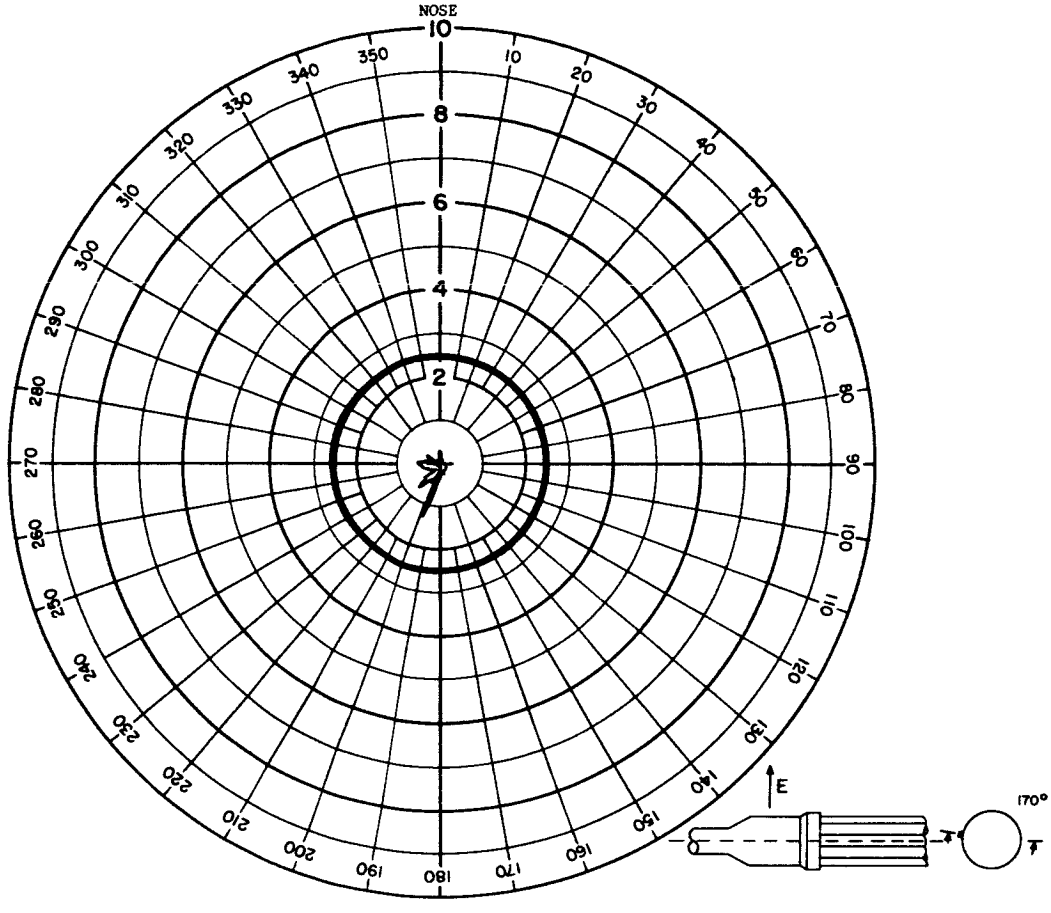


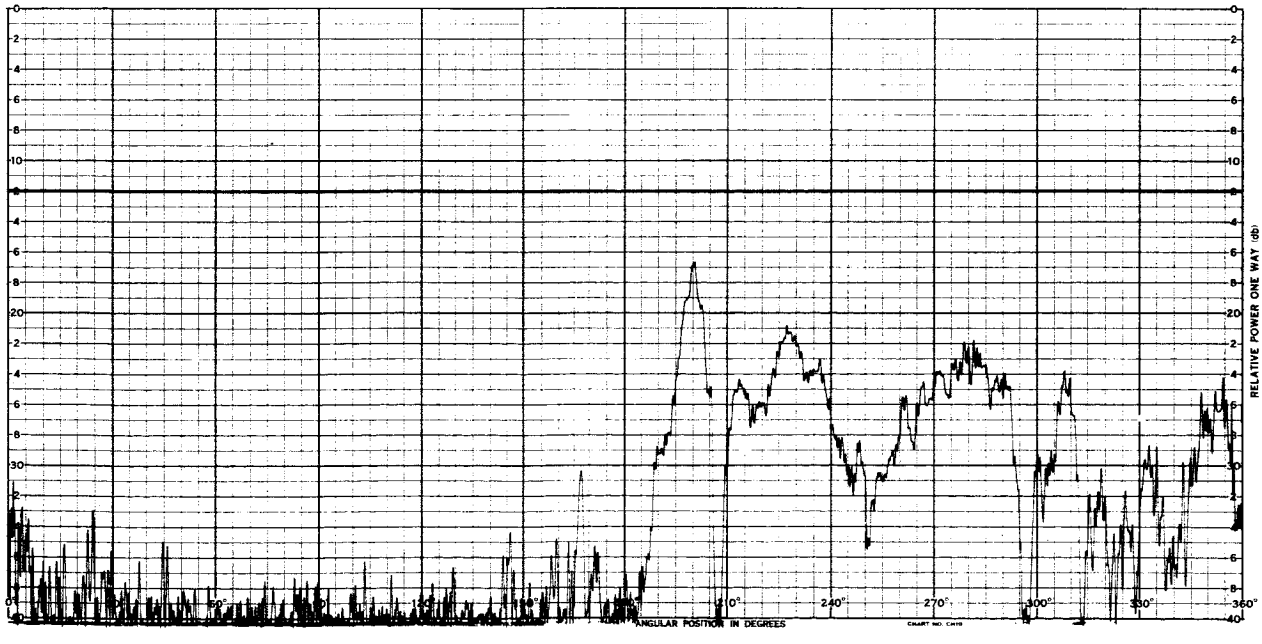


ANTENNA RADIATION PATTERN NO. 215-36

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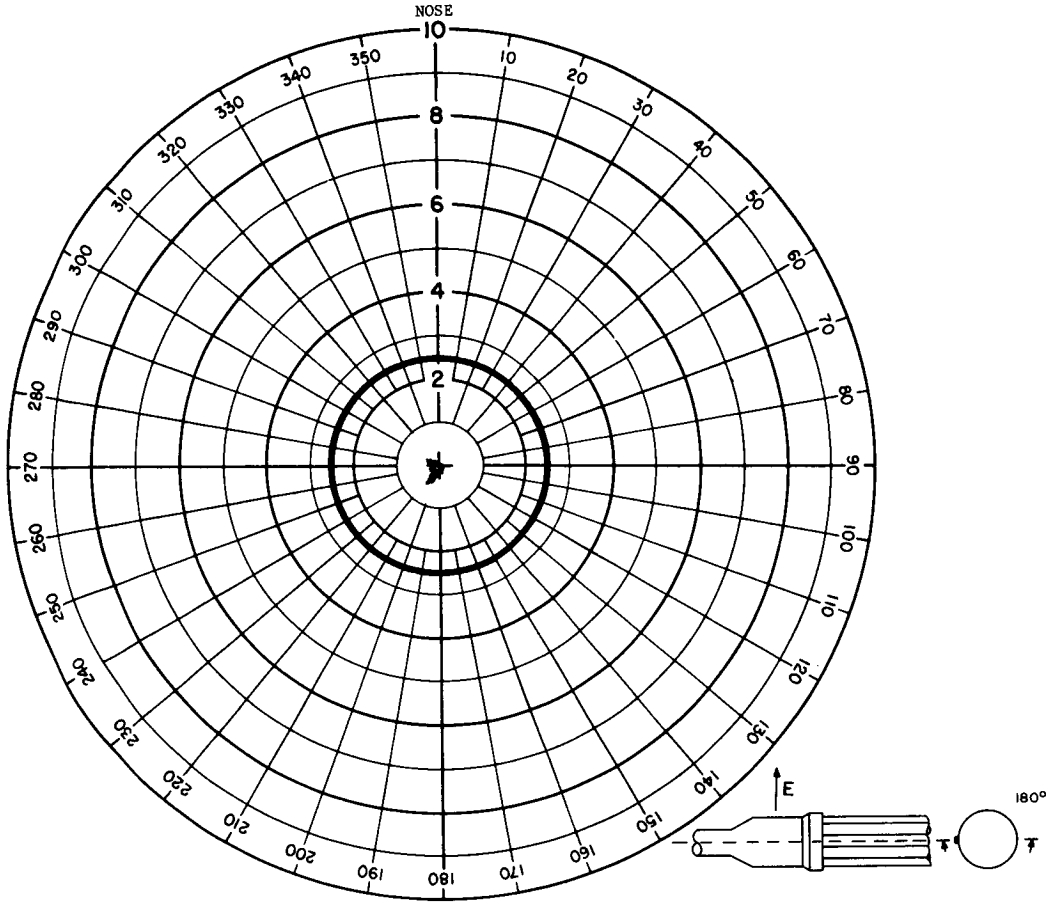


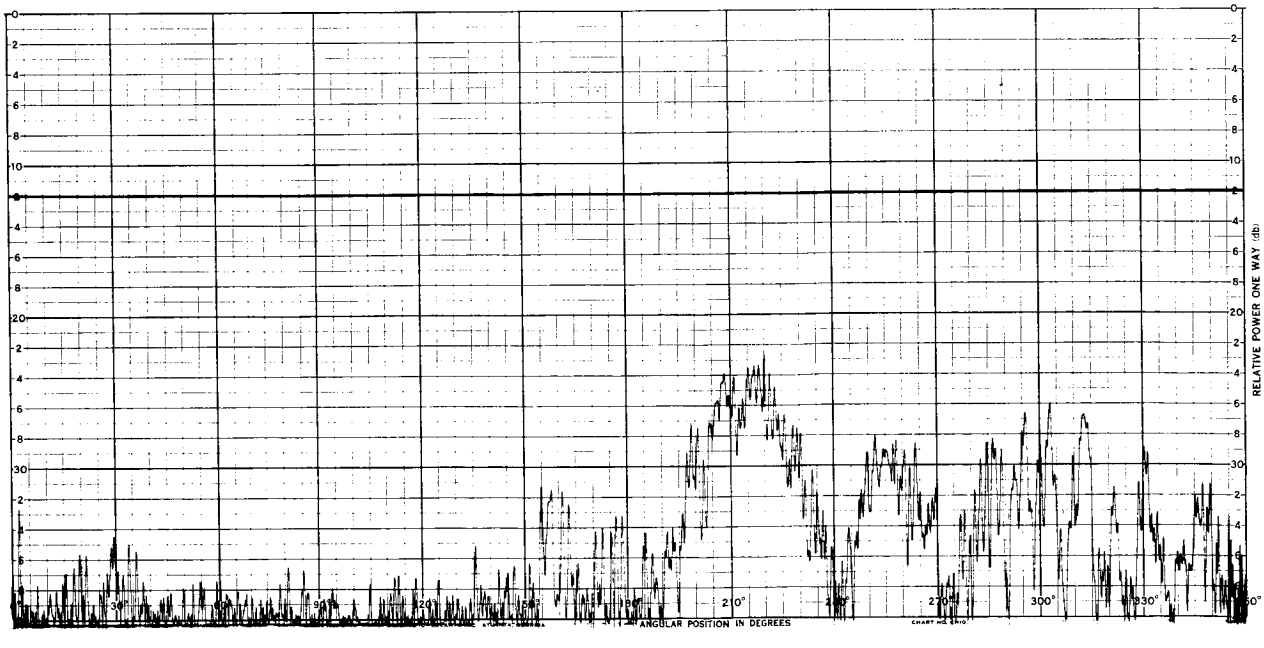


ANTENNA RADIATION PATTERN NO. 215-37

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

SA-5 C-BAND RADAR ANTENNA





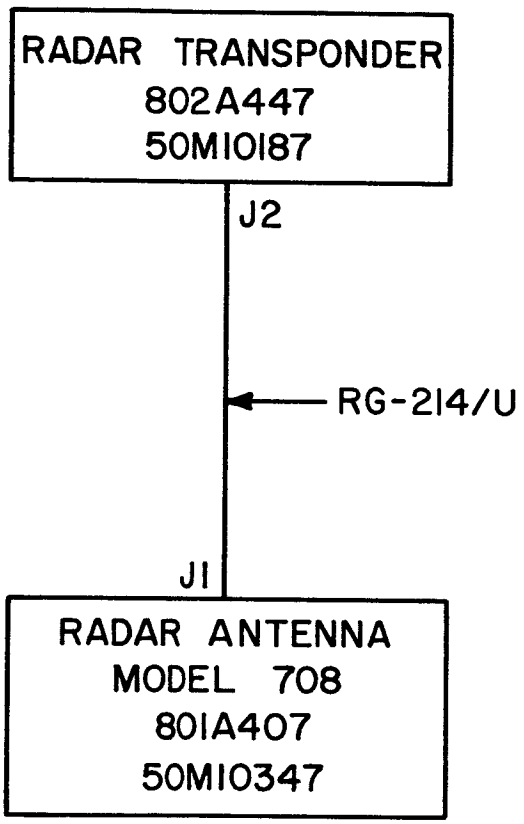
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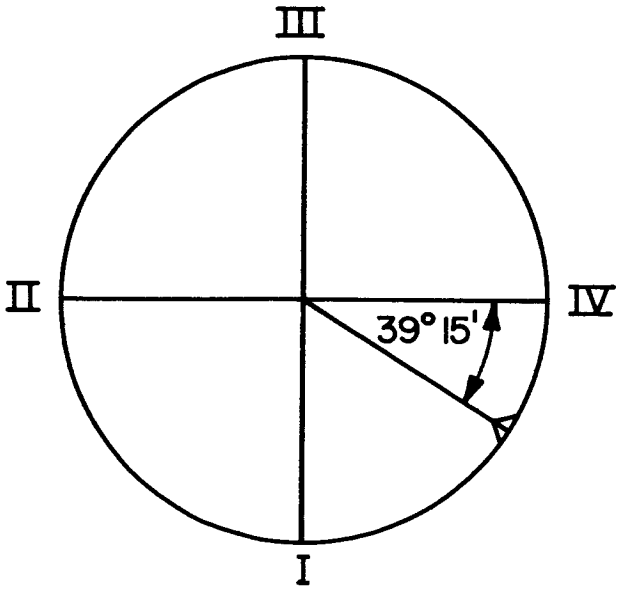
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5

C-BAND RADAR ANTENNA

BLOCK DIAGRAM





STA. 1471.346

SA-5 C-BAND RADAR ANTENNA

CHECKOUT PROCEDURE

I. RECOMMENDED TEST EQUIPMENT

The following test equipment (or equivalent) is recommended for final checkout of the C-Band Radar Antenna:

Name	Mfr. & Model No.
Standing Wave Indicator	HP-415B
Signal Generator	HP-618
Slotted Section	HP-806B
Power Meter	HP-430C
Thermistor Mount	HP-477
Detector Probe	--
Ohmmeter	--
High-Resistance Ohmmeter	--
50-Ohm Resistive Load	--

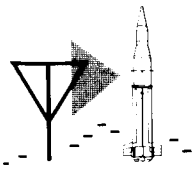
II. FINAL CHECKOUT STEPS

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 larger, 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.



SA-5 C-BAND RADAR ANTENNA

A. 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 into a 50-ohm load and measure the VSWR at the other end. The measured VSWR shall not exceed 1.70:1.

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.

B. Antenna

Impedance Match - Check the antenna for satisfactory impedance match at each operating frequency through a length of coaxial cable with an attenuation not to exceed 1 db at the frequency of measurement. Measurements shall be made at the following points, with the equipment shown in figure 1:

1. at the antenna input connector, and
2. through the antenna feed cable at the transponder output.

Calibrate the signal generator with its crystal calibrator. The measured VSWR shall be $\leq$ 1.3:1 at the antenna input connector, and $\leq$ 1.6:1 at the transponder output.

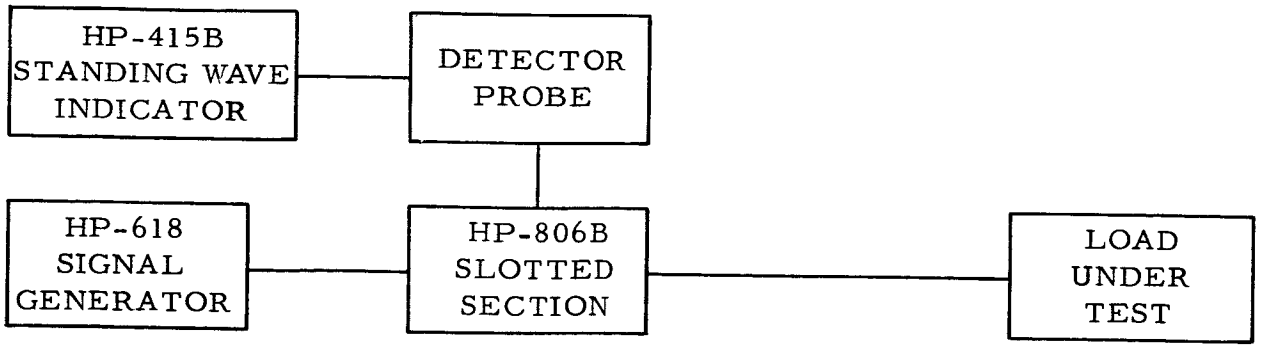


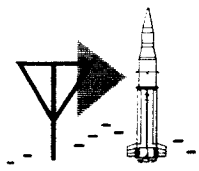
Figure 1.

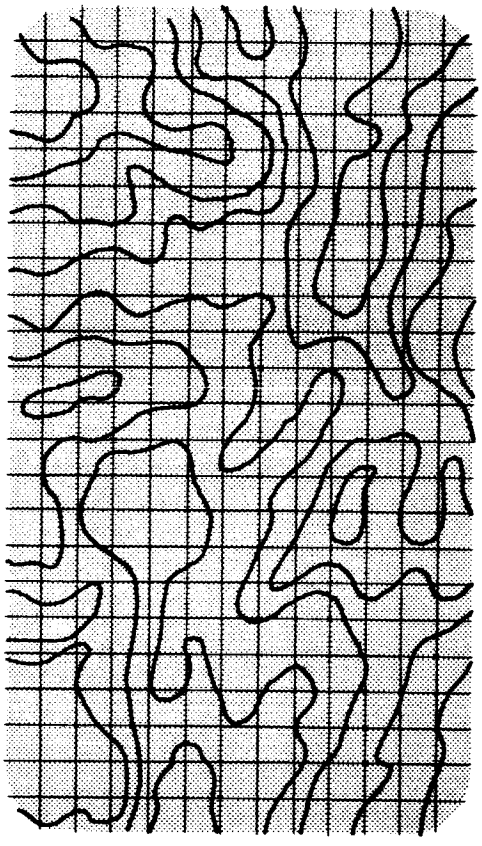
SA-5

C-BAND RADAR ANTENNA

NOTES

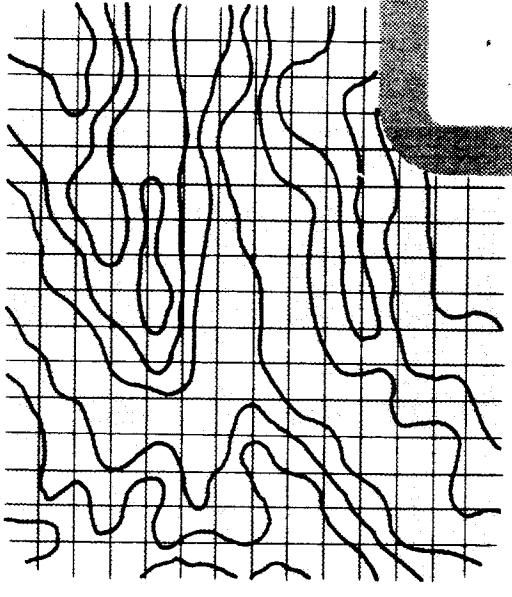
GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT





MISTRAM ANTENNA SYSTEM

SA-5



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

SA-5 MISTRAM ANTENNA SYSTEM

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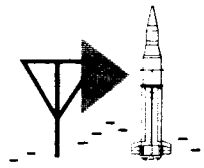
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MISTRAM ANTENNA SYSTEM

DESCRIPTION

The Mistram antenna system consists of two, Model 802, waveguide aperture type antennas. The aperture configuration produces a pattern directed mainly aft, while providing sufficient signal prior to launch for system checkout. One antenna is used for transmitting and one for receiving. The antennas are separated a minimum of six inches to provide 60 db decoupling between the transmitting and receiving antennas. A waveguide is used to connect the antenna to the transponder.

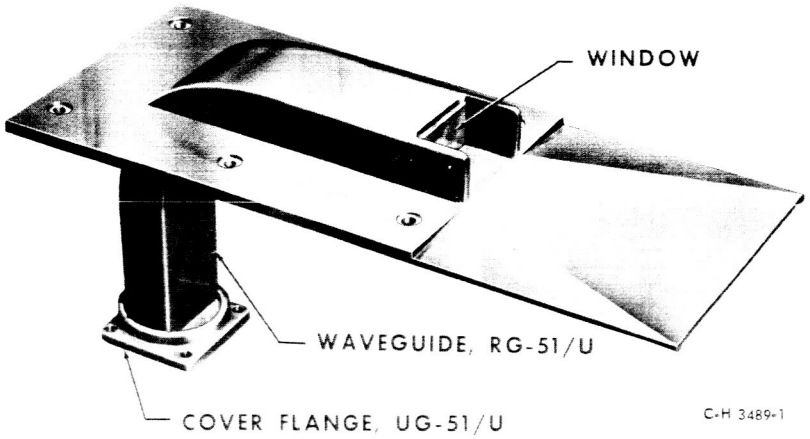


SA-5

MISTRAM ANTENNA SYSTEM

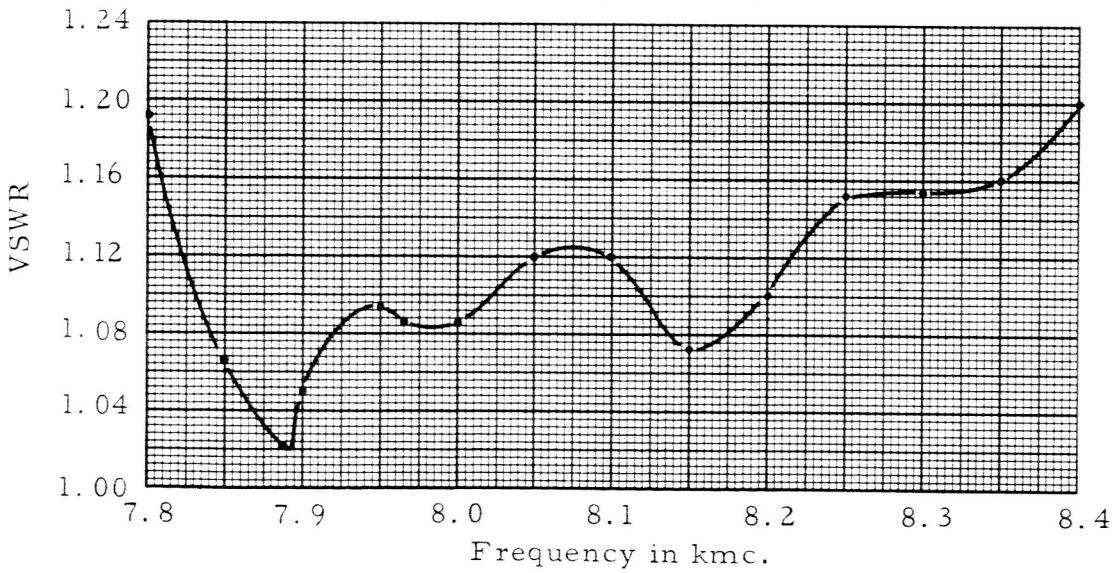
SPECIFICATIONS

MODEL 802

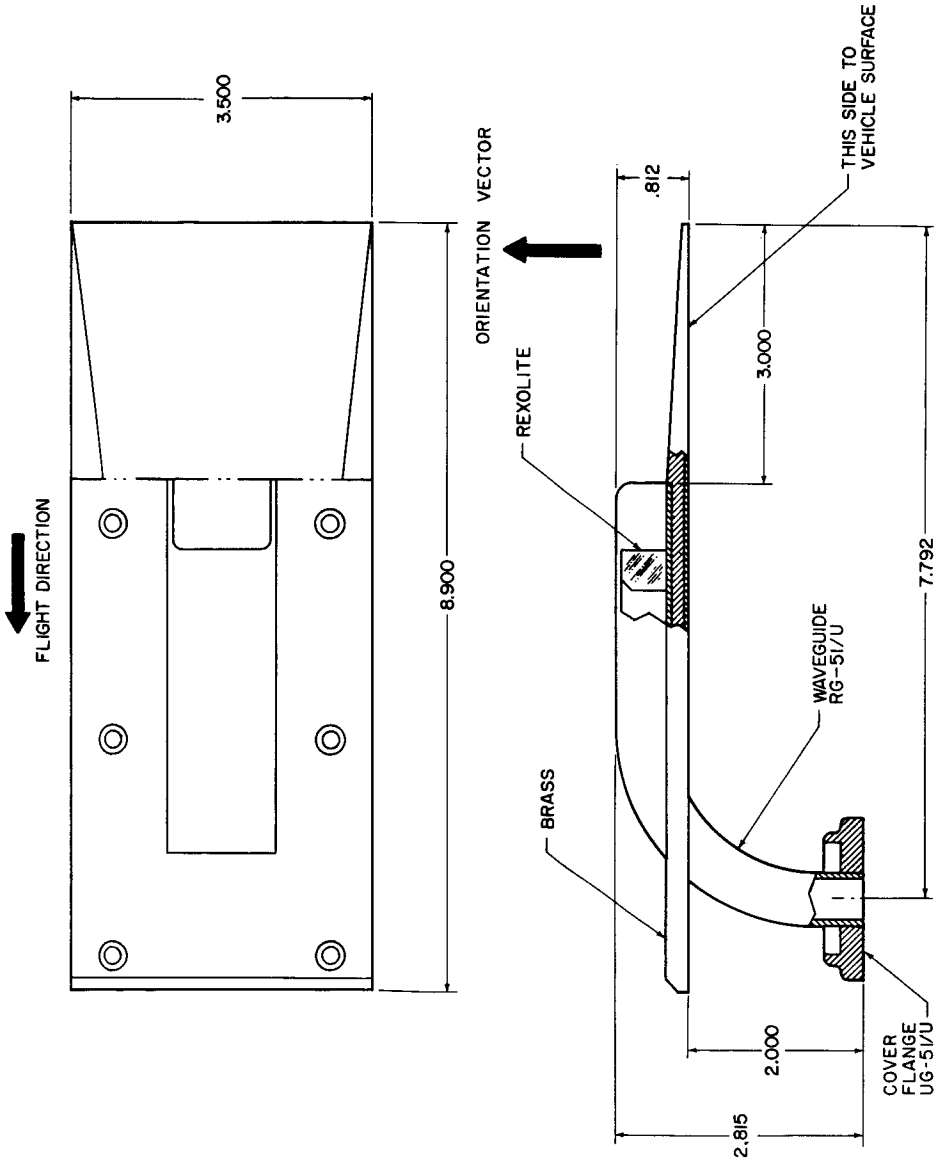


-Location-
Station 1466.396
7° 30' IV→I
7° 30' IV→III

Drawing number - 50M10343
Type - waveguide
Frequency range - 8.75 to 8.4 kmc.
Bandwidth - 650 mc. for 1.2:1 VSWR
Number required - 2
Polarization - linear
Gain - 8 db.
Waveguide flange - UG-51/U
Weight - 1.5 lbs.
Dimensions - 8-29/32 by 3-1/2 by 2-13/16 inches

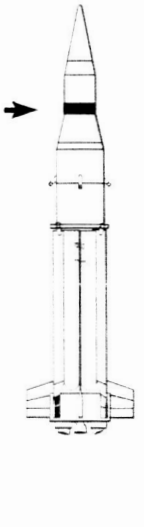


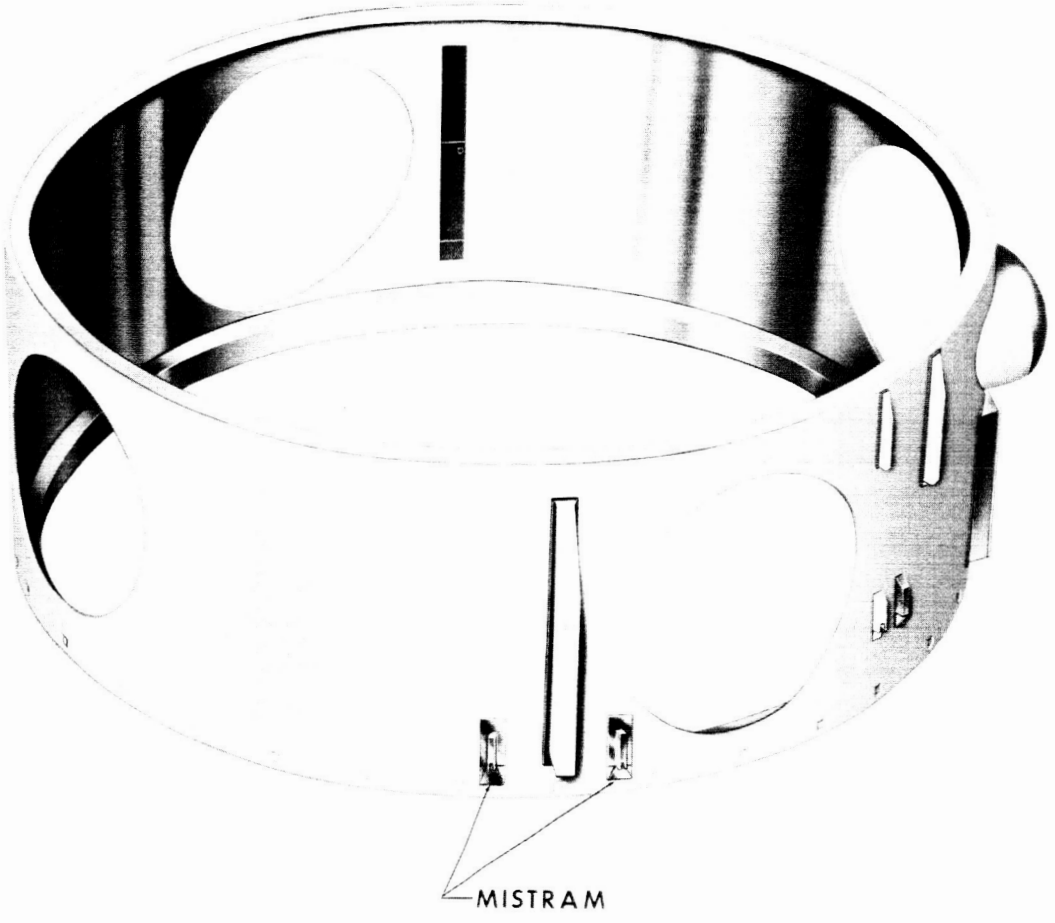
SA-5 MISTRAM ANTENNA SYSTEM



DIMENSIONAL SKETCH

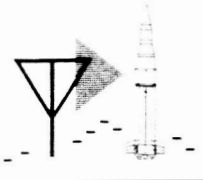
SA-5 MISTRAM ANTENNA SYSTEM





LOCATIONAL VIEW

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



SA-5 MISTRAM ANTENNA SYSTEM

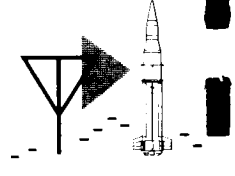
RADIATION PATTERNS

MISTRAM ANTENNA SYSTEM

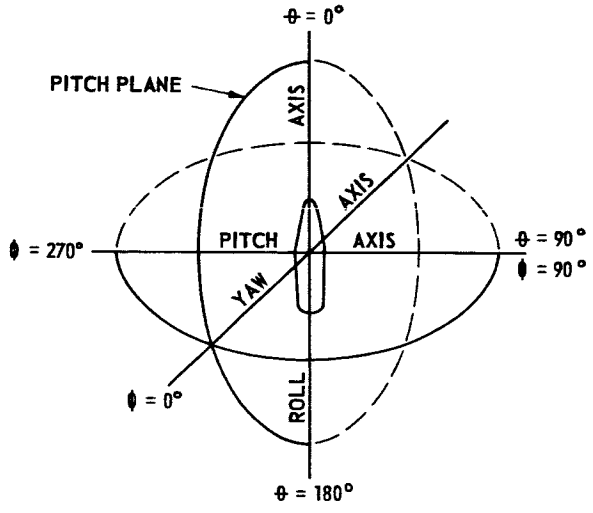
ANTENNA MODEL 802

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.

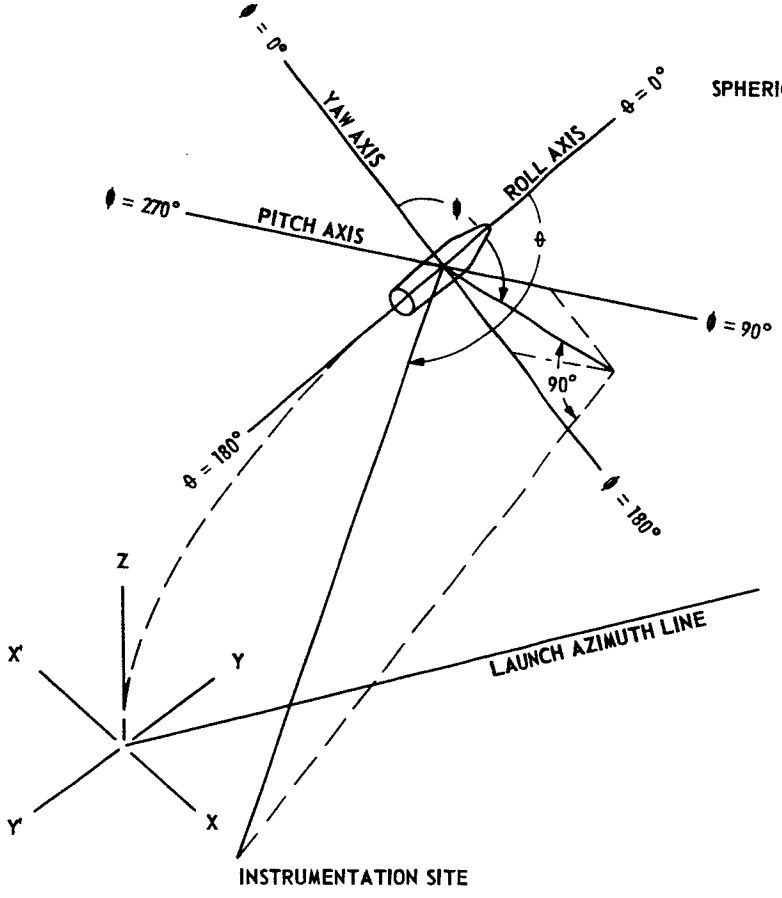
Rectangular and polar patterns are cut by placing the vehicle in the horizontal position with the antenna located at $\phi = 0^\circ$. Patterns are then plotted through 360° of θ in 10° increments of ϕ (great circle cuts). The 10° increments are made through 180° by rotating the vehicle counter-clockwise,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



SA-5 MISTRAM ANTENNA SYSTEM

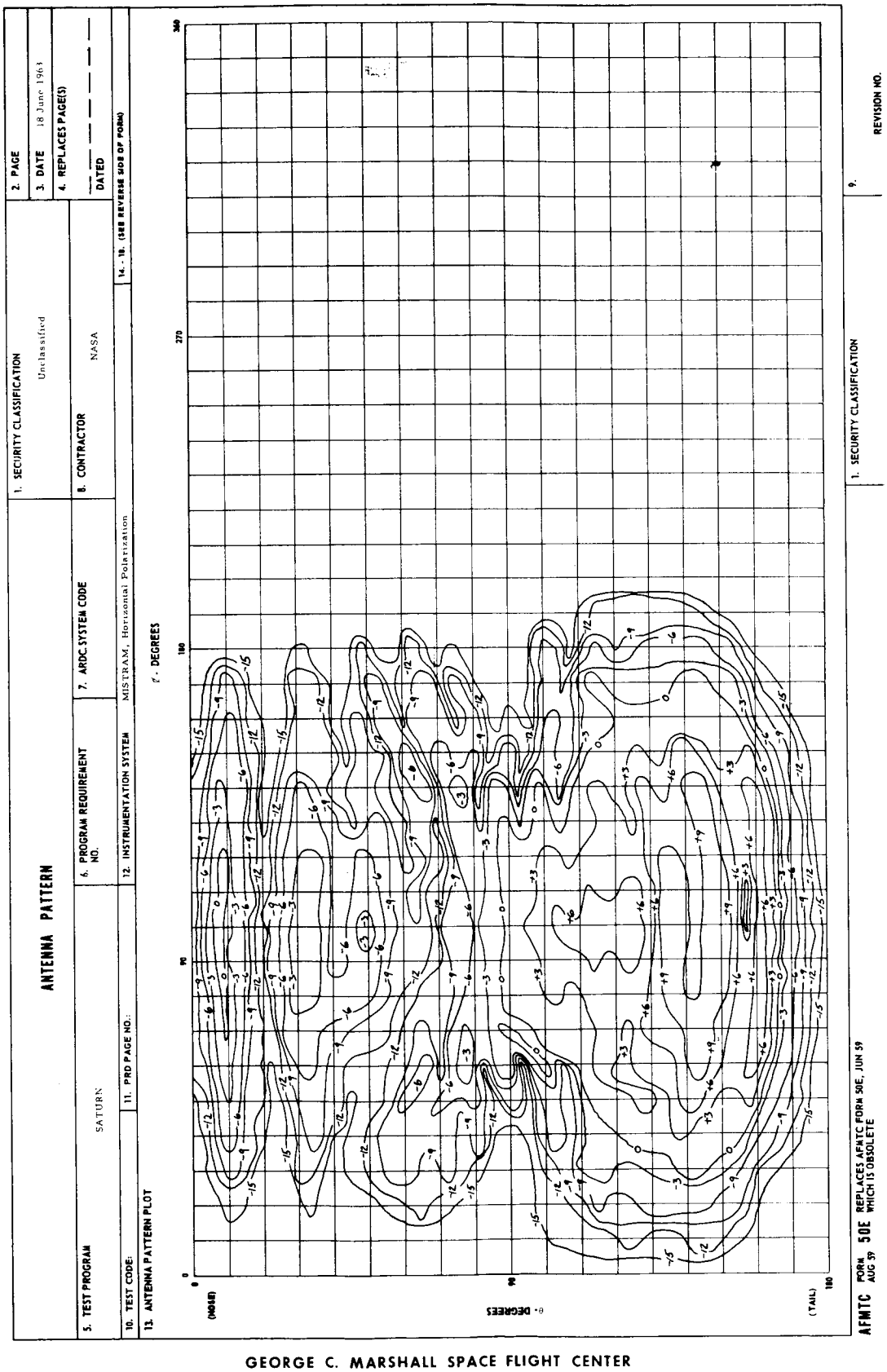


SPHERICAL COORDINATE SYSTEM



TRAJECTORY GEOMETRY

SA-5 MISTRAM ANTENNA SYSTEM

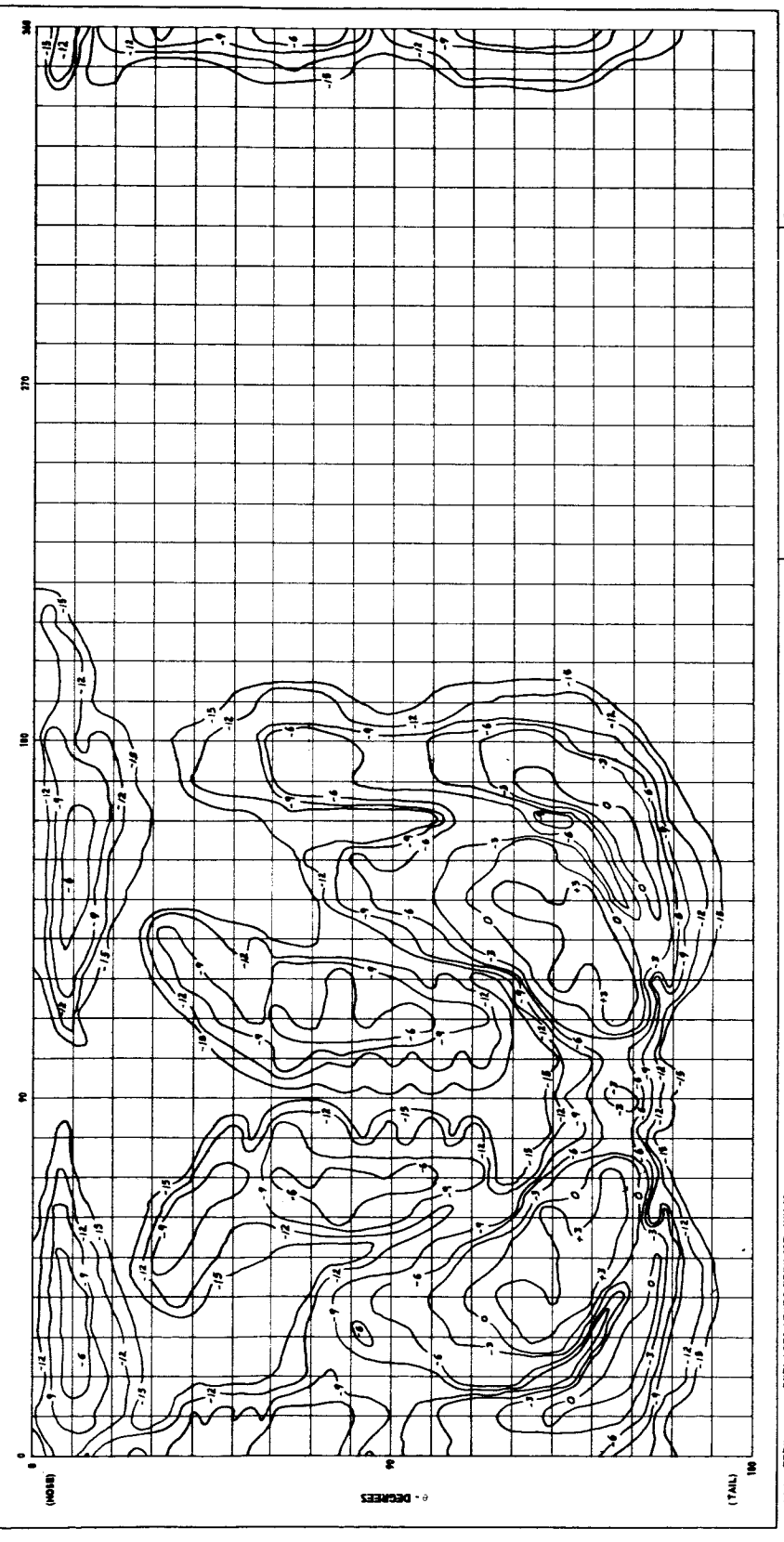


GEORGE C. MARSHALL SPACE FLIGHT CENTER
ASTRIONICS DIVISION - INSTRUMENTATION BRANCH - PLANNING AND ENGINEERING SECTION
TECHNICAL DATA UNIT

SA-5 MISTRAM ANTENNA SYSTEM

ANTENNA PATTERN

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



1. SECURITY CLASSIFICATION

9. REVISION NO.

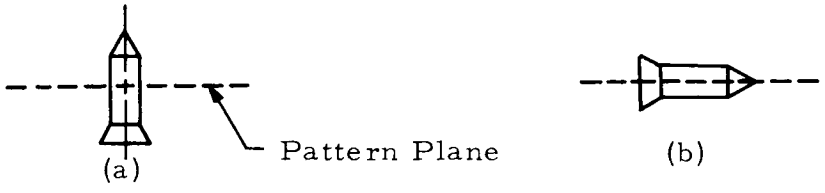
AFMTC FORM 50E, JUN 59 REPLACES AFMTC FORM 50E, AUG 59 WHICH IS OBSOLETE

SA-5 MISTRAM ANTENNA SYSTEM

DESCRIPTION OF PATTERN AND POLARIZATION SYMBOLS AND GAIN DETERMINATION

PATTERN PLANE

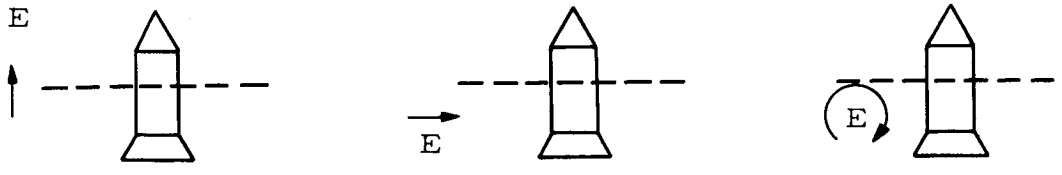
The plane of the pattern is indicated by a broken line passing horizontally through a sketch of the model. This line represents the pattern plane as seen from a point in that plane. The model is then shown in its proper orientation to the line representing the pattern plane.



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

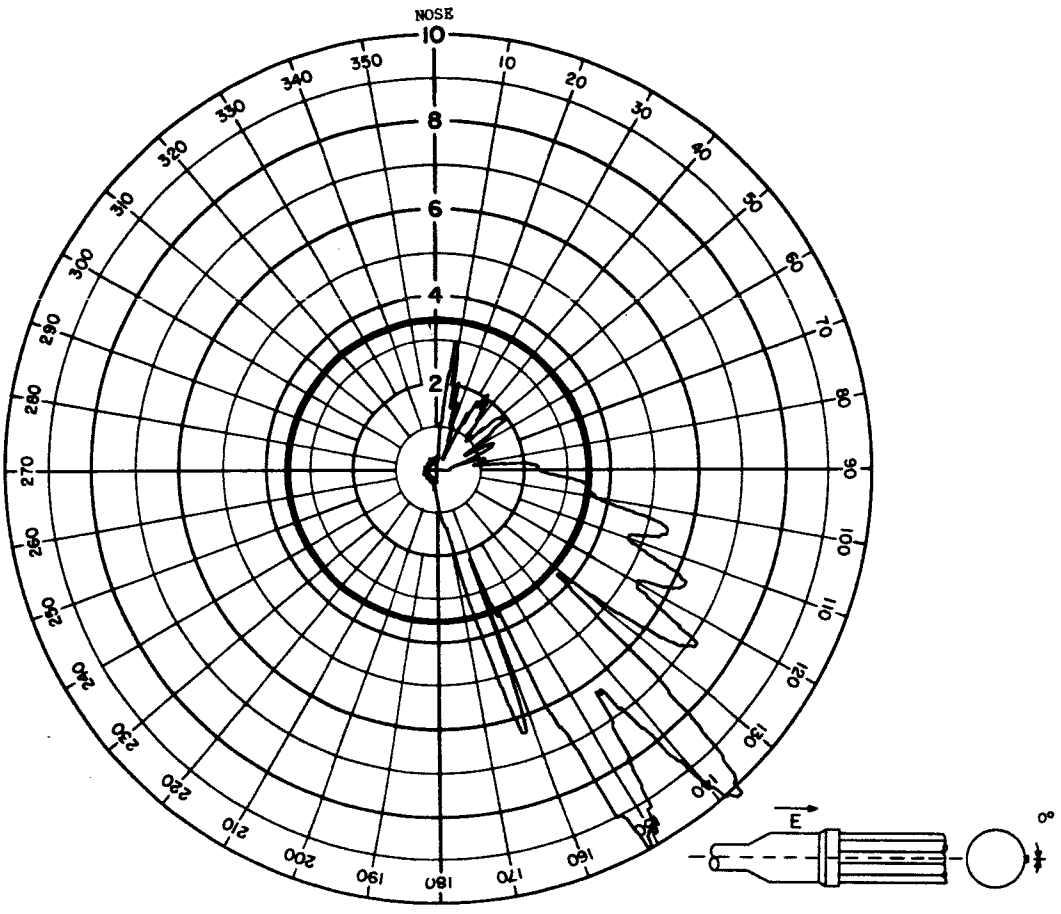
Polarization vector parallel to pattern plane

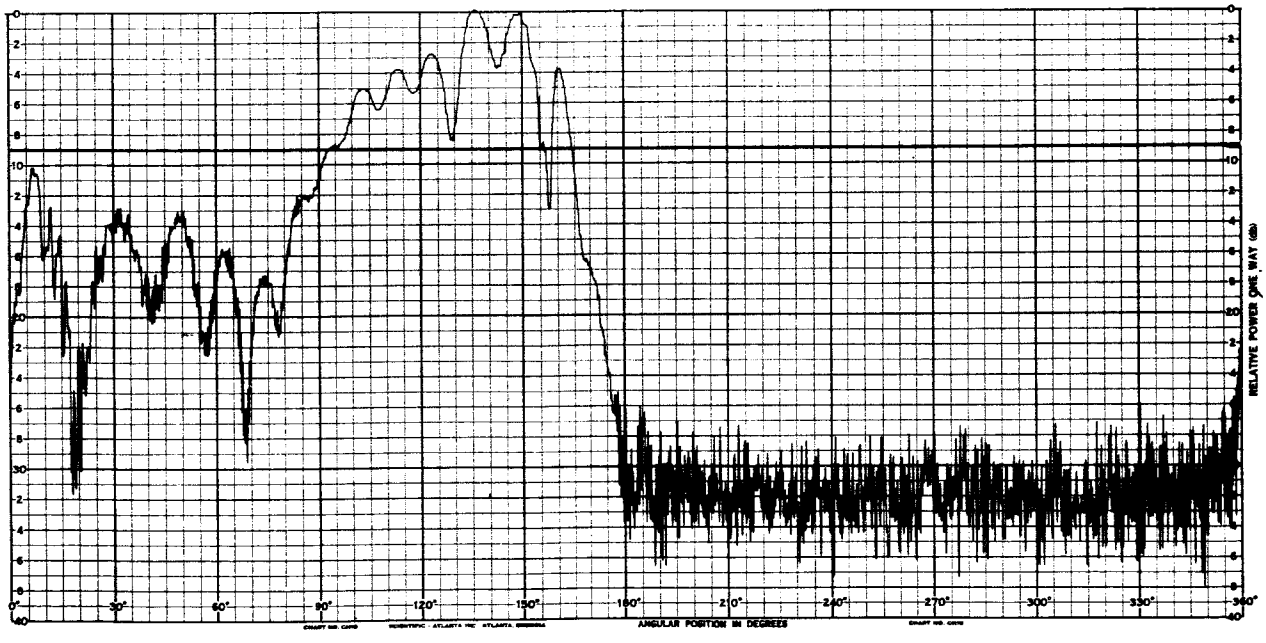
Right circular polarization

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.

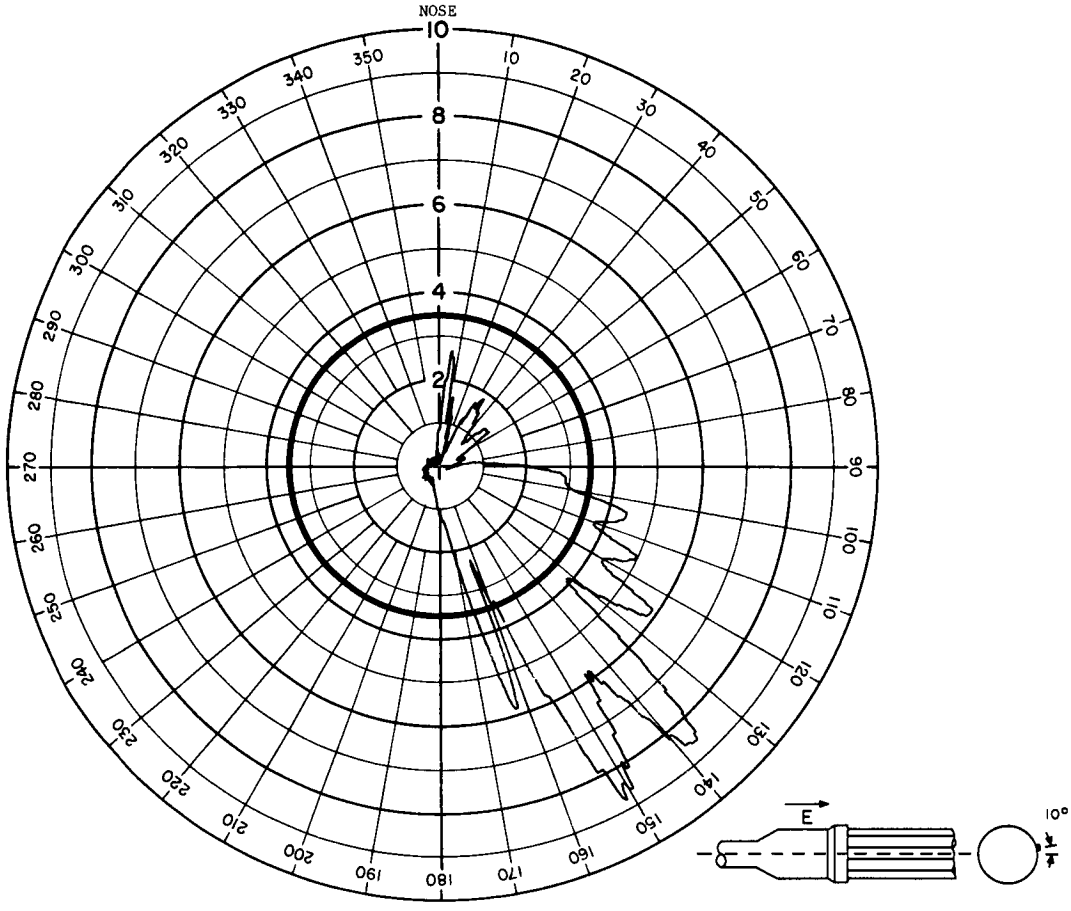
SA-5 MISTRAM ANTENNA SYSTEM

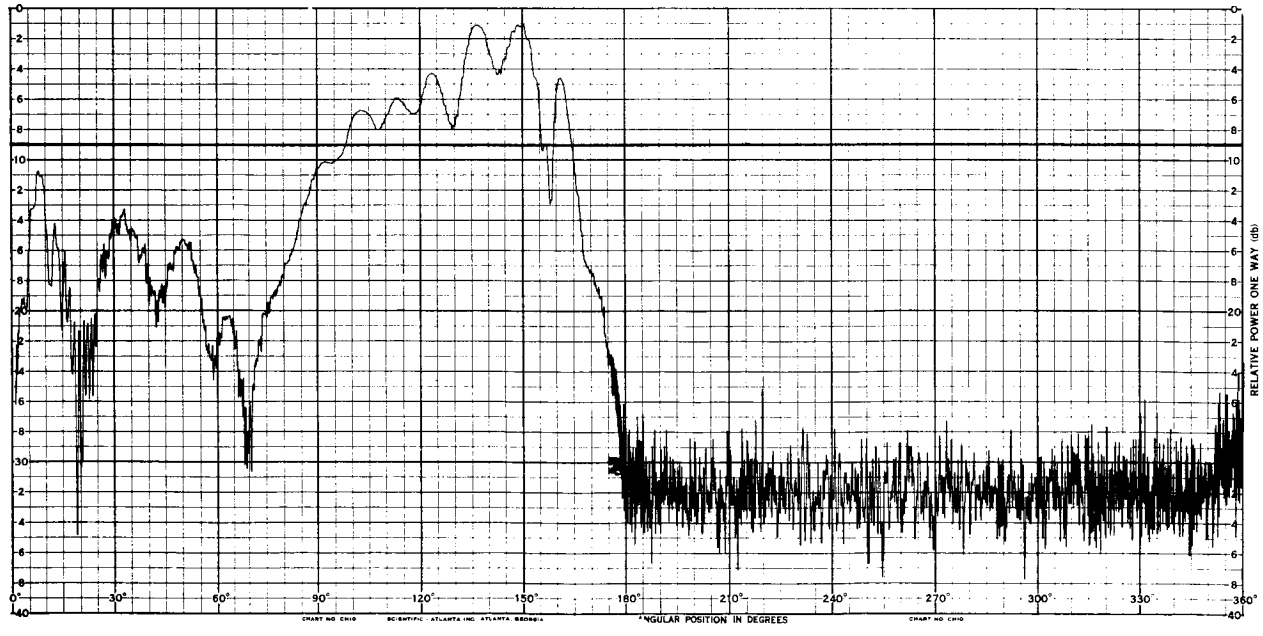




ANTENNA RADIATION PATTERN NO. 213-1

SA-5 MISTRAM ANTENNA SYSTEM

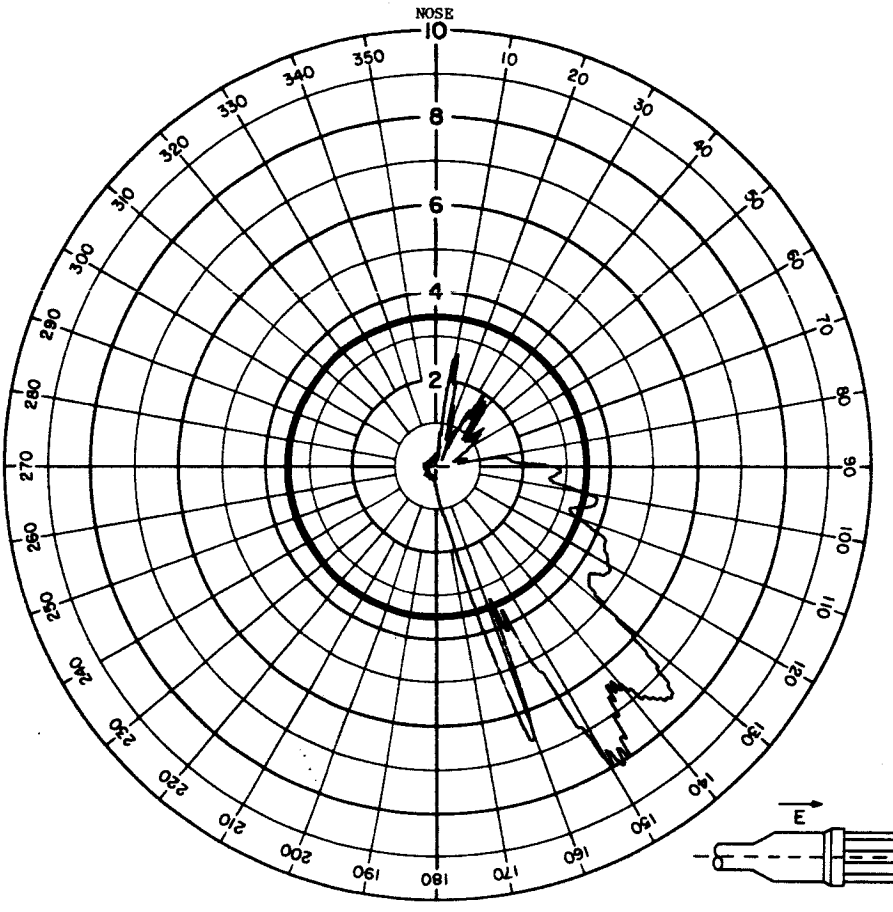


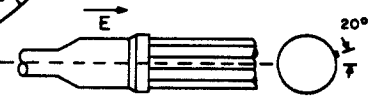


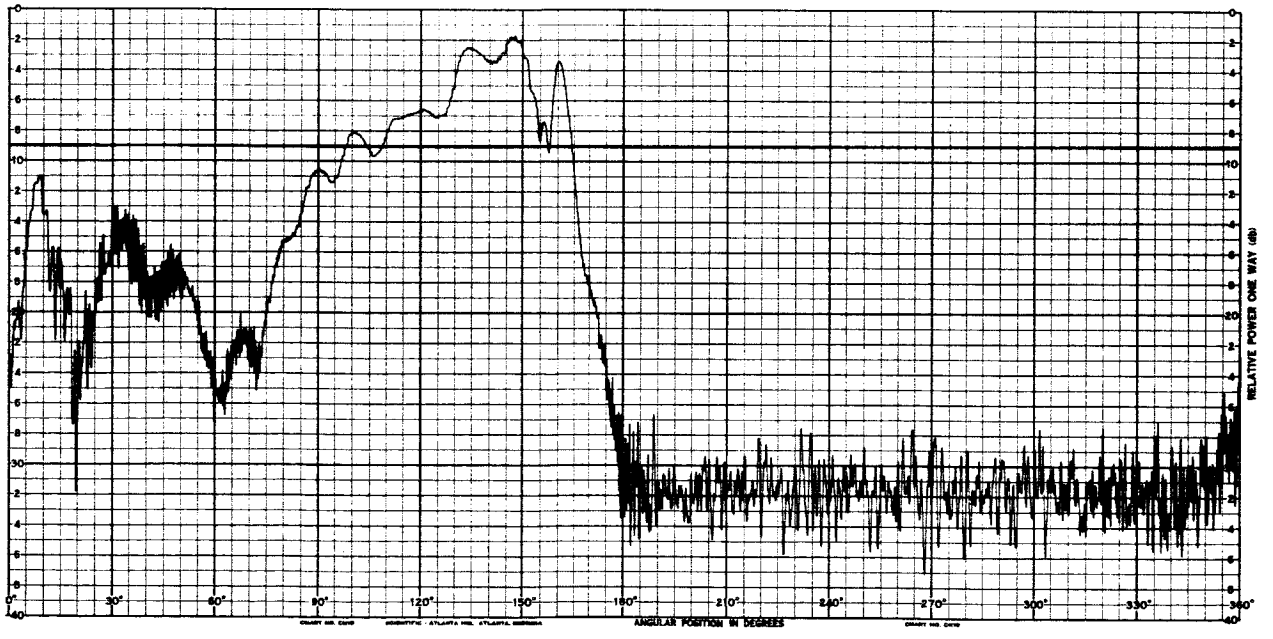
ANTENNA RADIATION PATTERN NO. 213-2

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

SA-5 MISTRAM ANTENNA SYSTEM



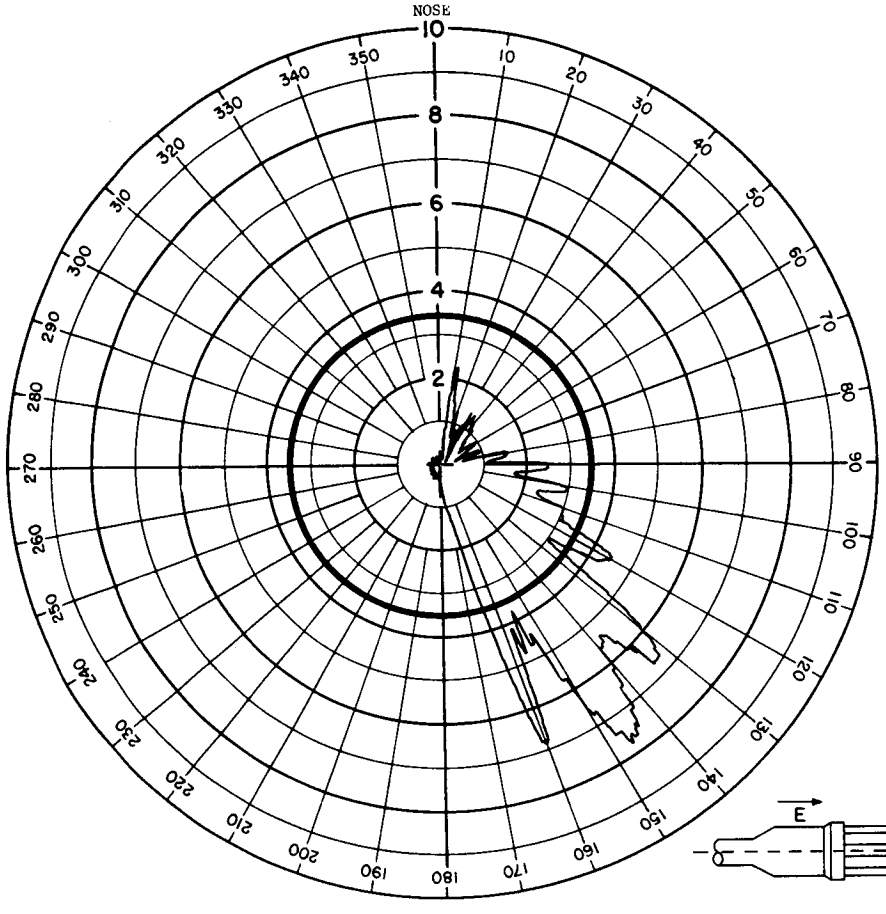


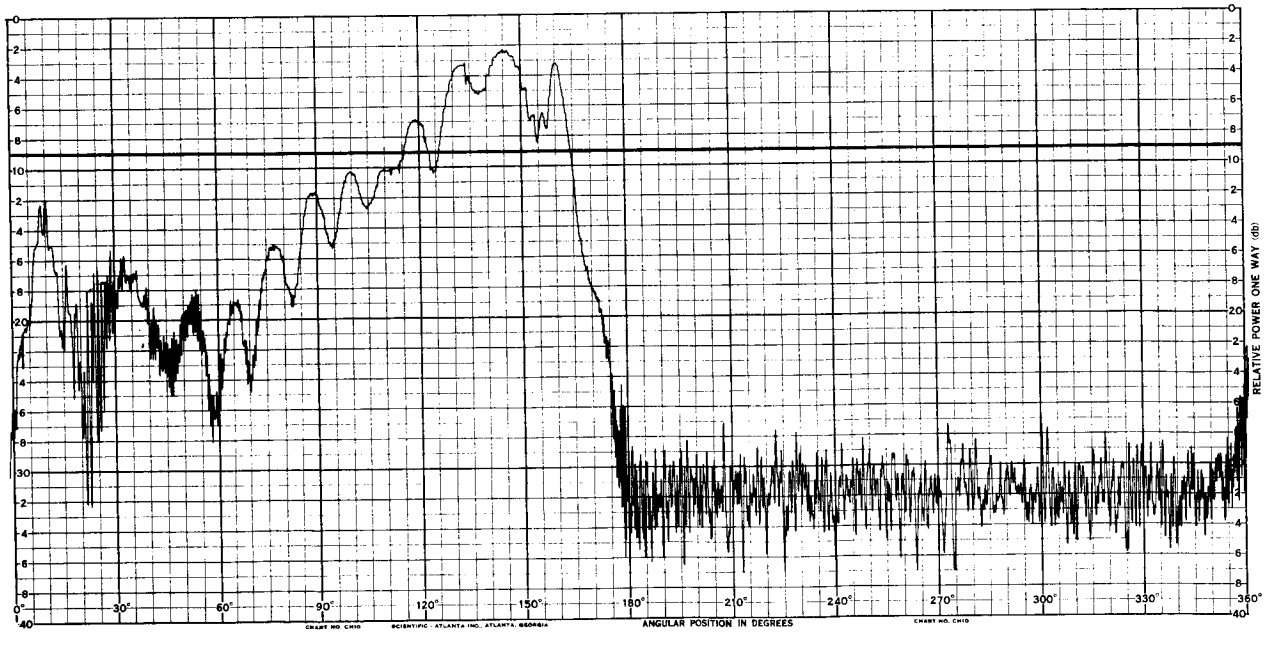


ANTENNA RADIATION PATTERN NO. 213-3

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

SA-5 MISTRAM ANTENNA SYSTEM

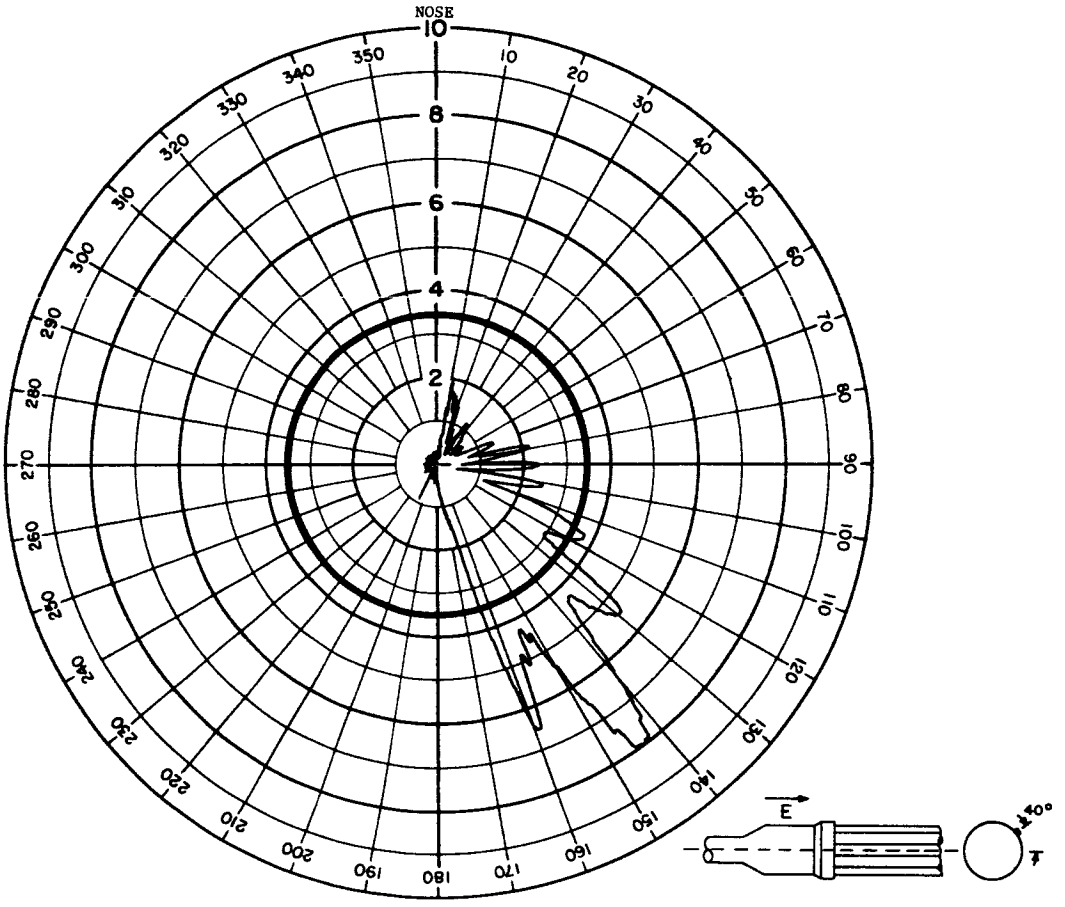


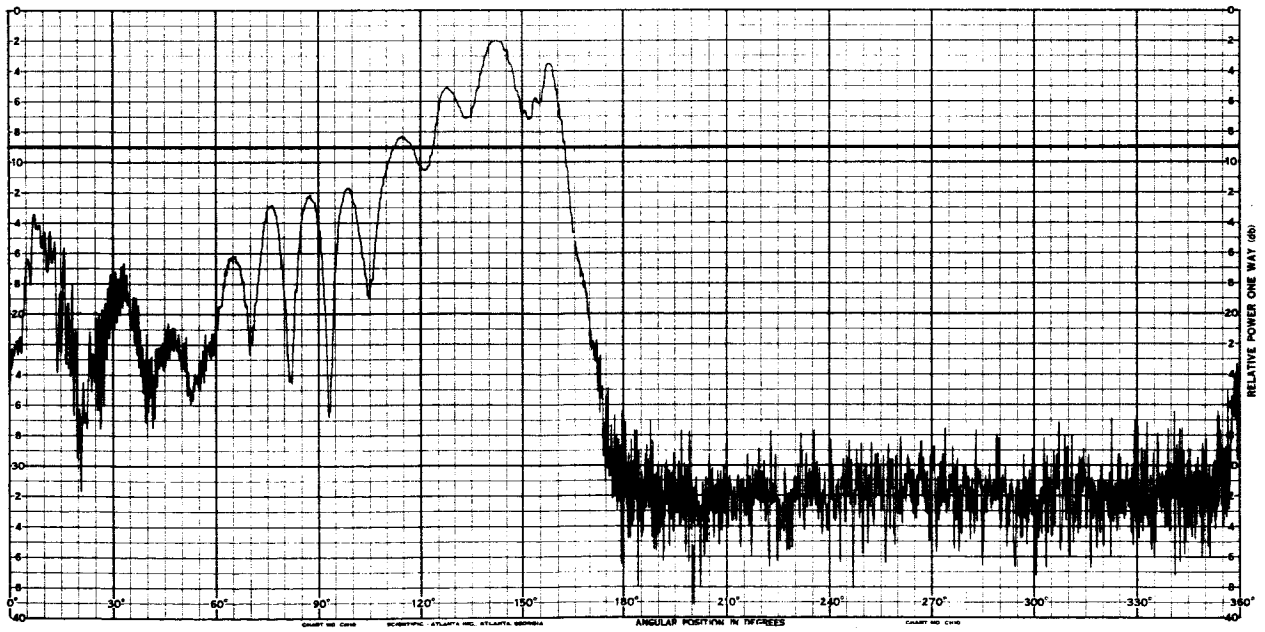


ANTENNA RADIATION PATTERN NO. 213-4

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

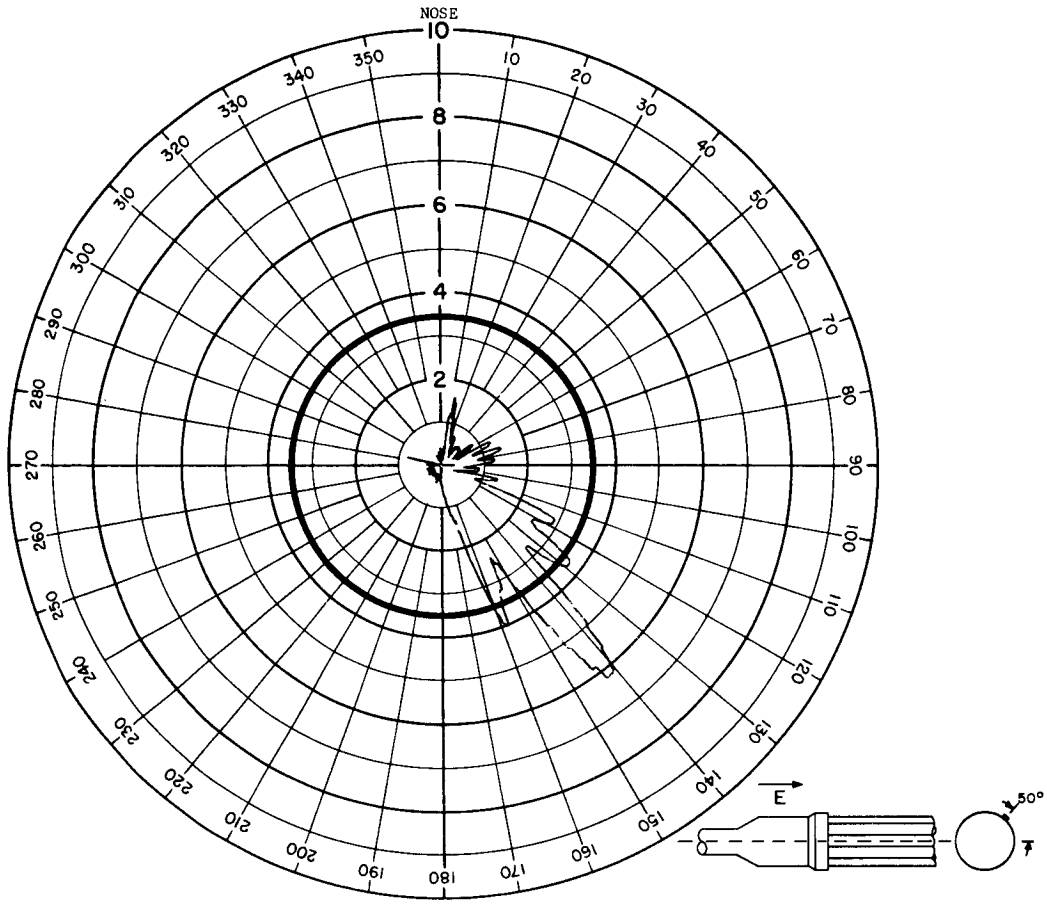
SA-5 MISTRAM ANTENNA SYSTEM

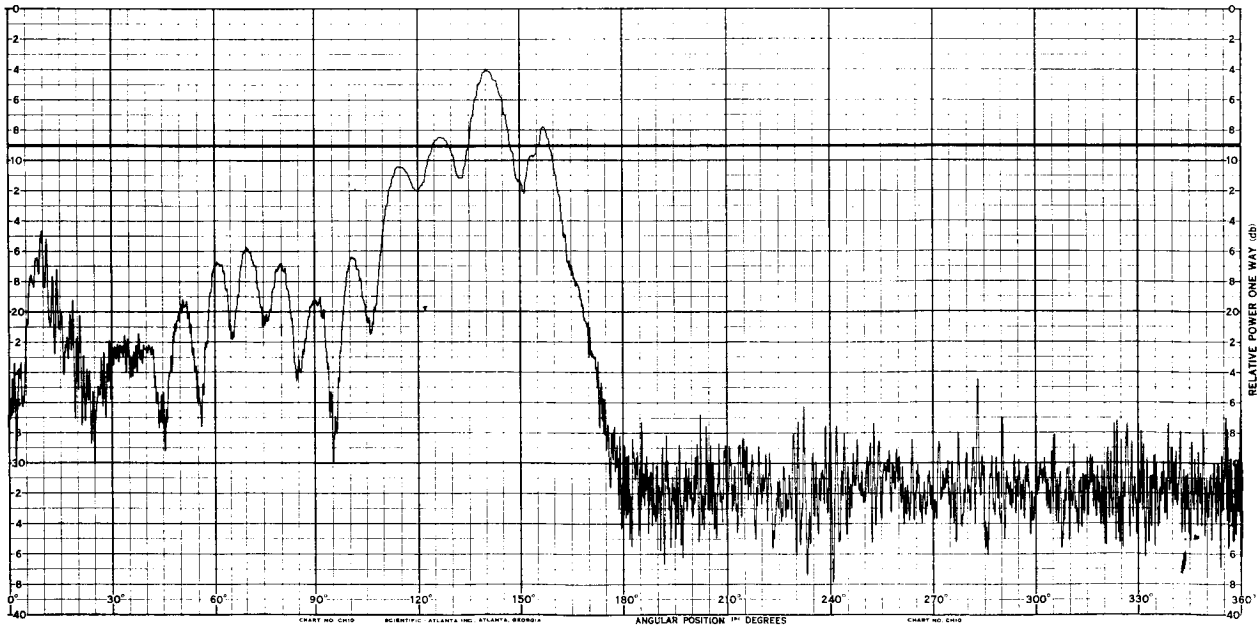




ANTENNA RADIATION PATTERN NO. 213-5

SA-5 MISTRAM ANTENNA SYSTEM



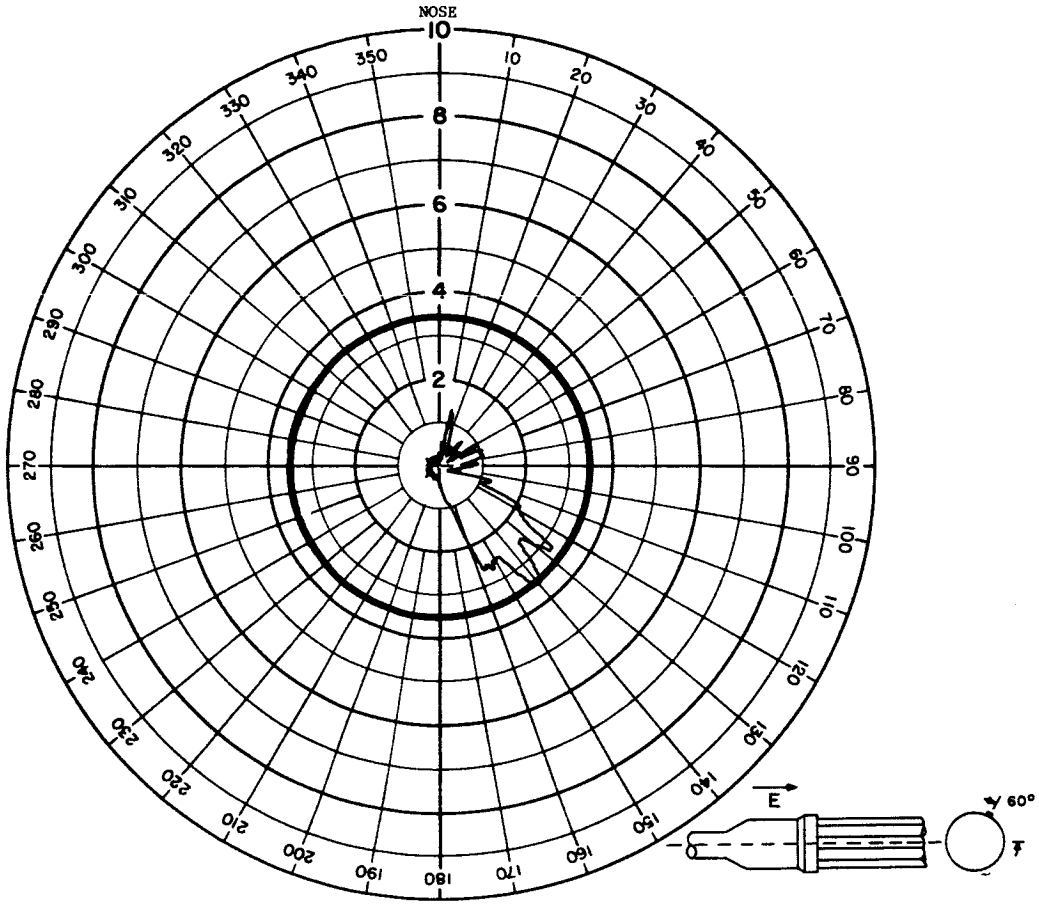


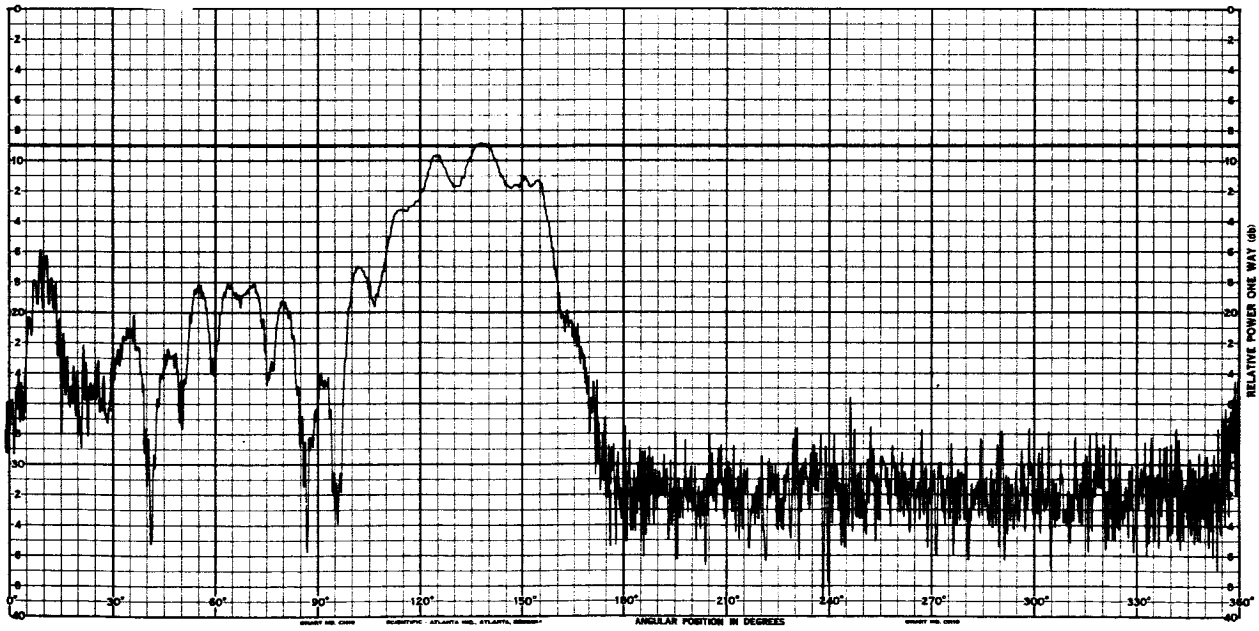
ANTENNA RADIATION PATTERN NO. 213-6

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

SA-5

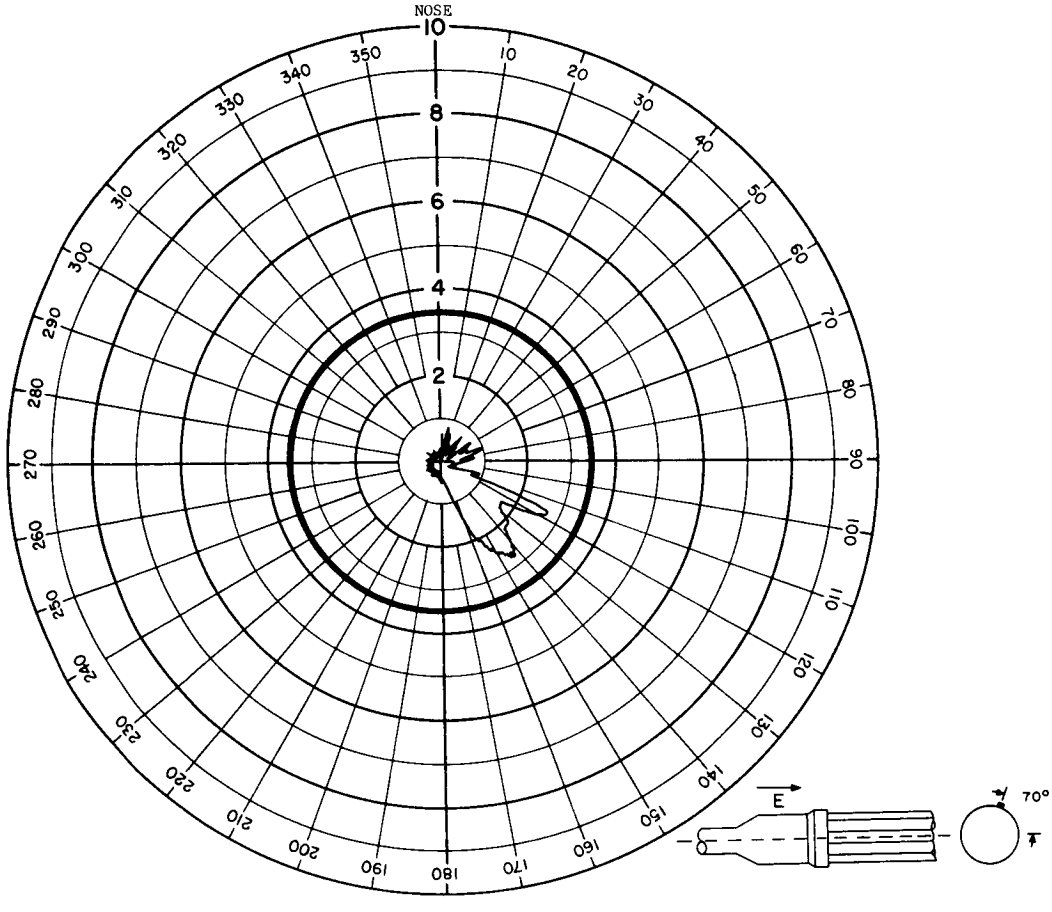
MISTRAM ANTENNA SYSTEM

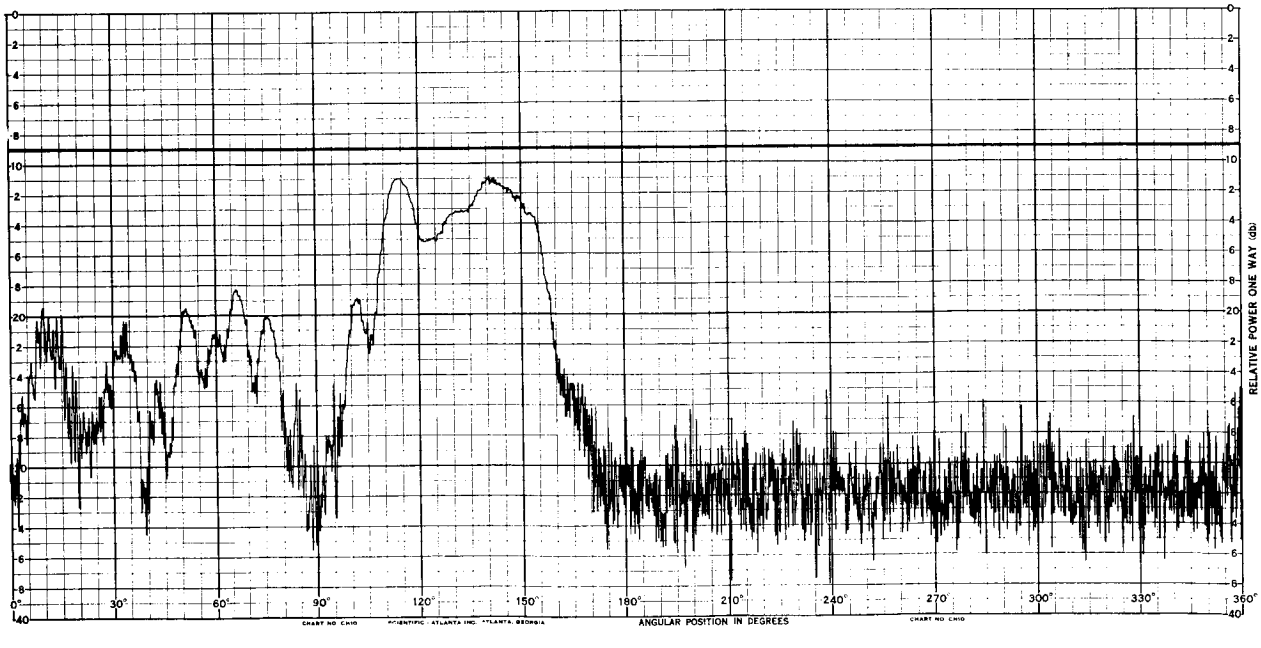




ANTENNA RADIATION PATTERN NO. 213-7

SA-5 MISTRAM ANTENNA SYSTEM

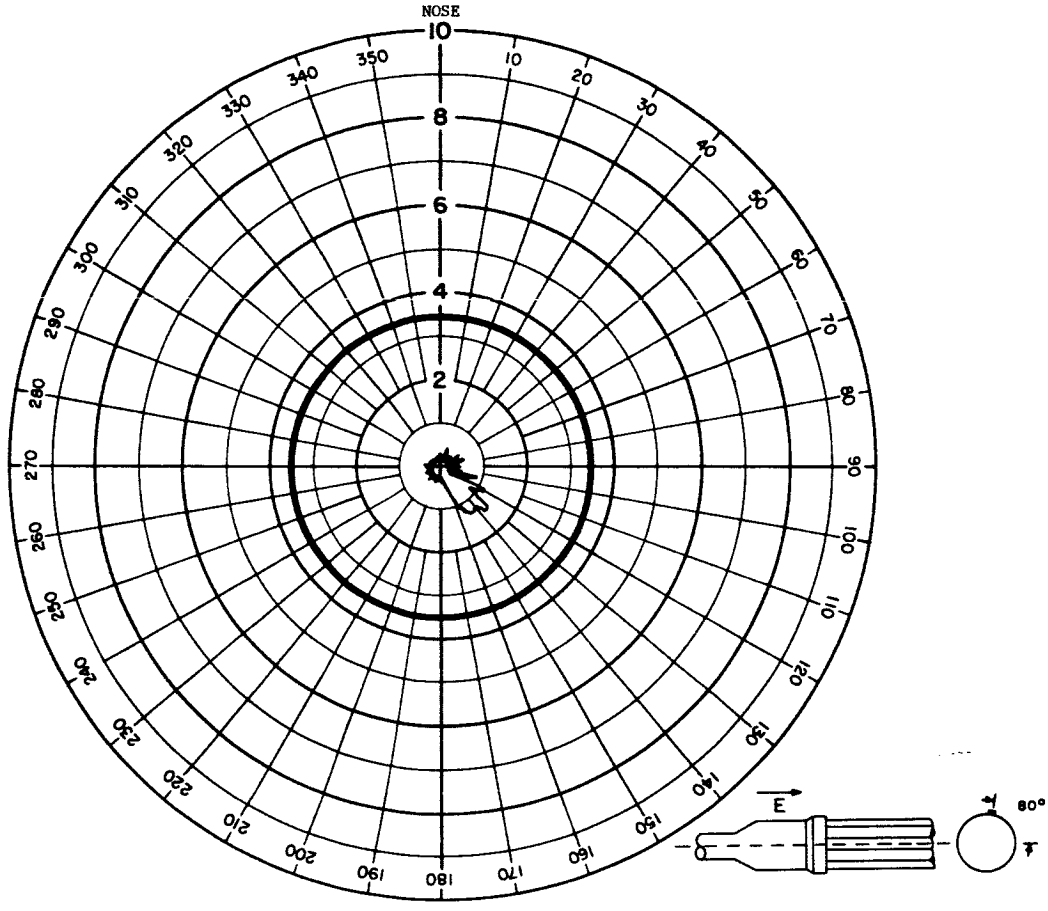


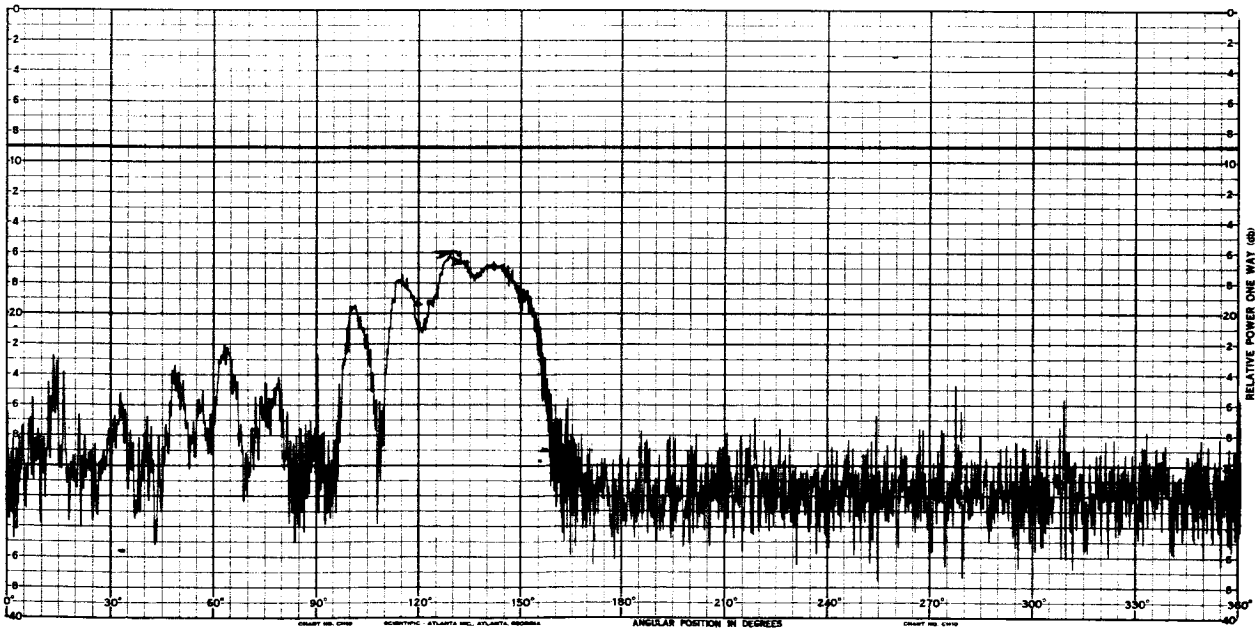


ANTENNA RADIATION PATTERN NO. 213-8

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

SA-5 MISTRAM ANTENNA SYSTEM

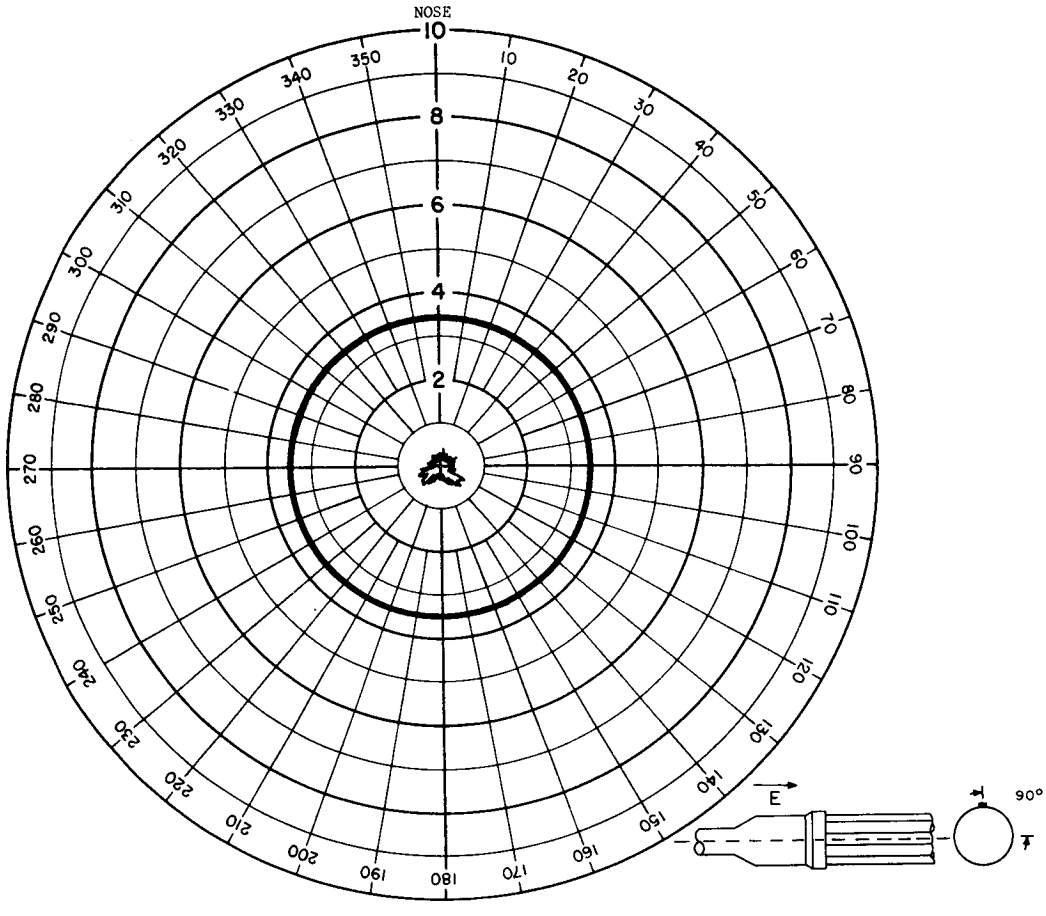


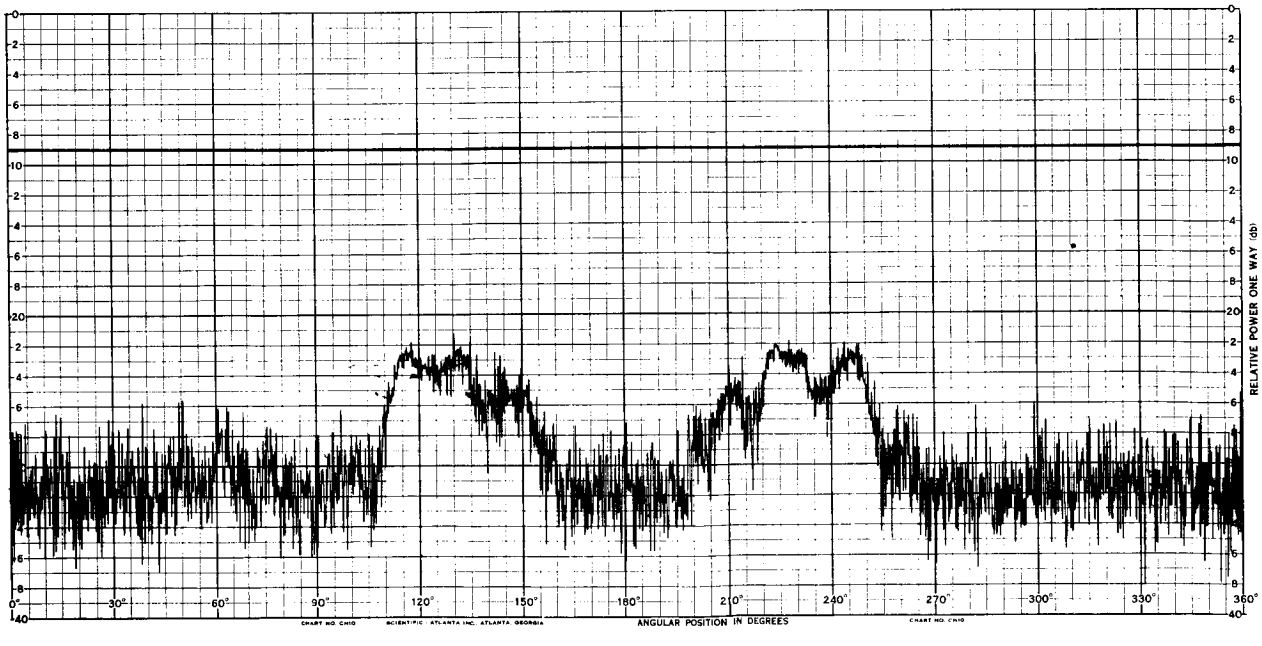


ANTENNA RADIATION PATTERN NO. 213-9

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

SA-5 MISTRAM ANTENNA SYSTEM



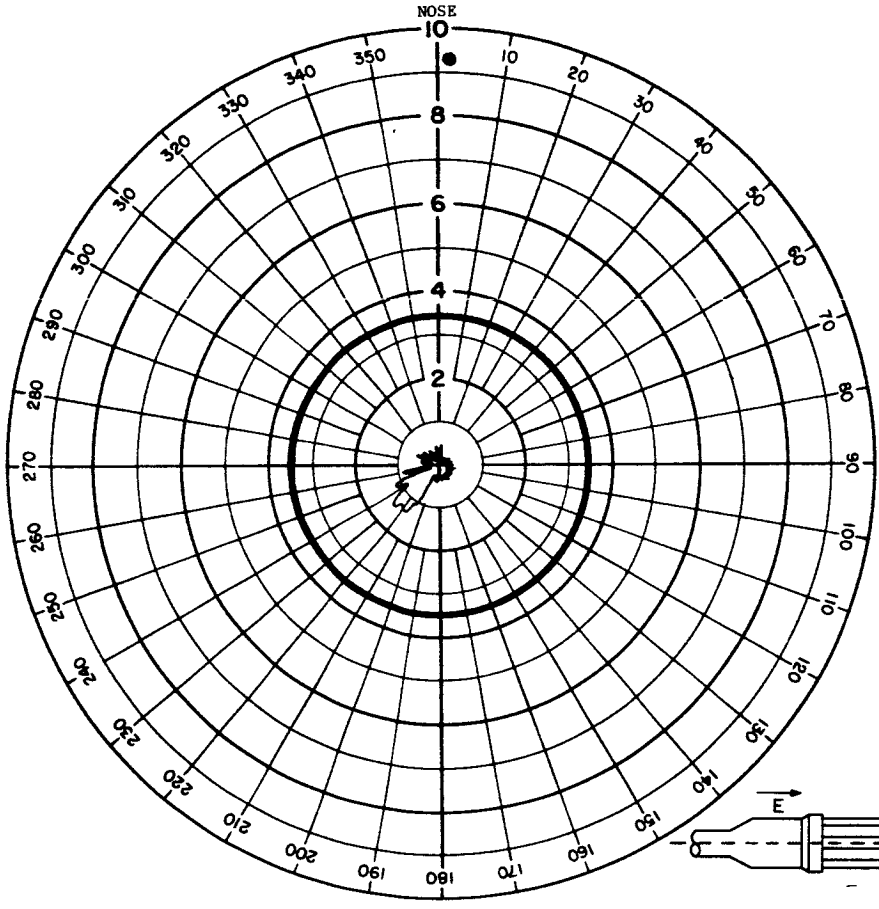


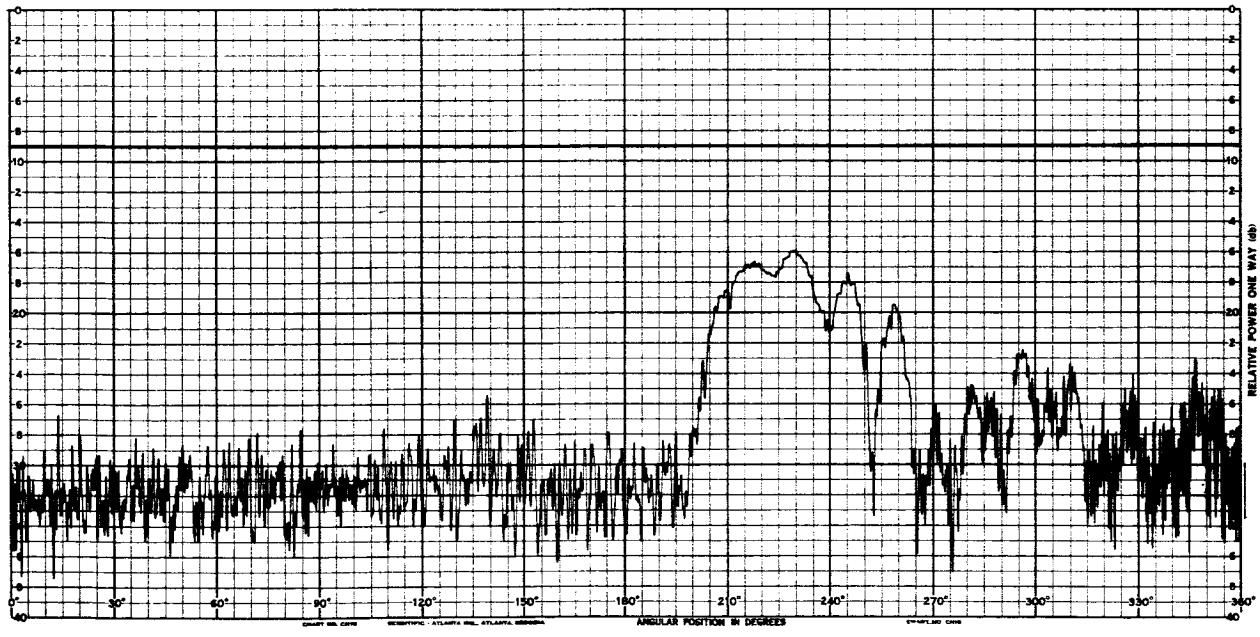
ANTENNA RADIATION PATTERN NO. 213-10

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

SA-5

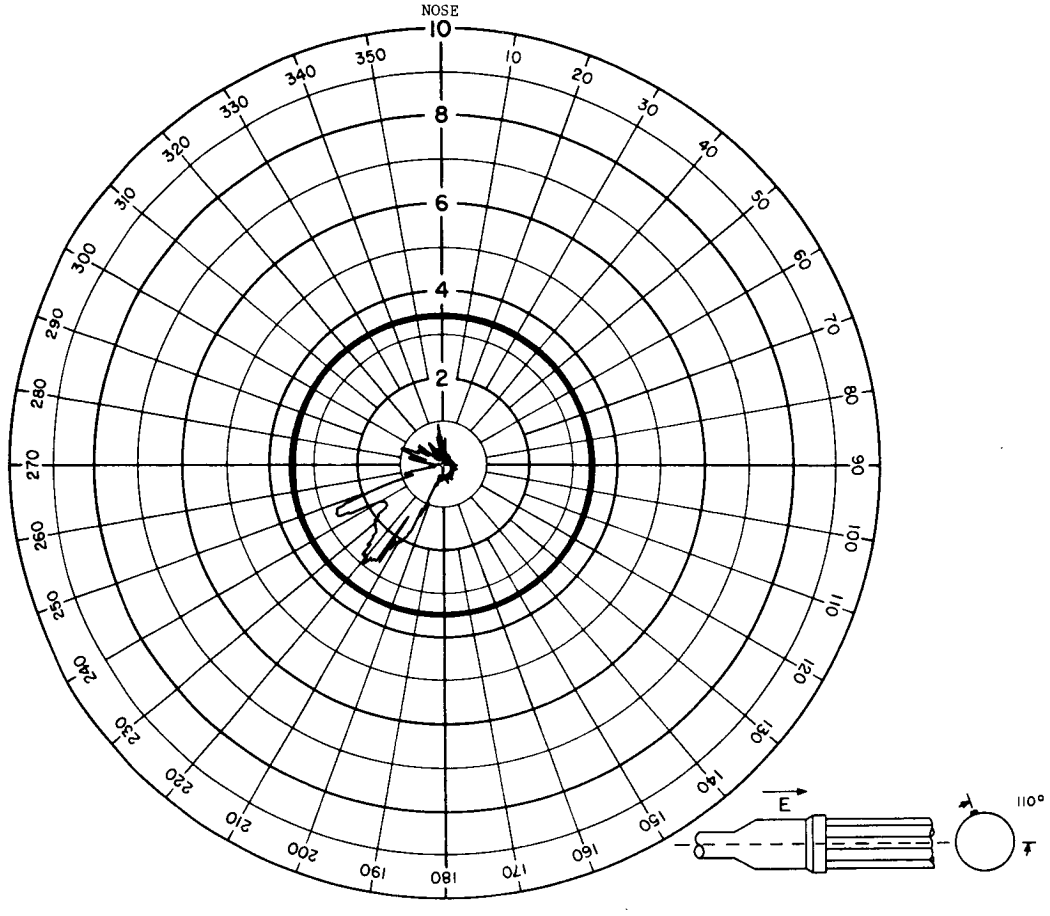
MISTRAM ANTENNA SYSTEM

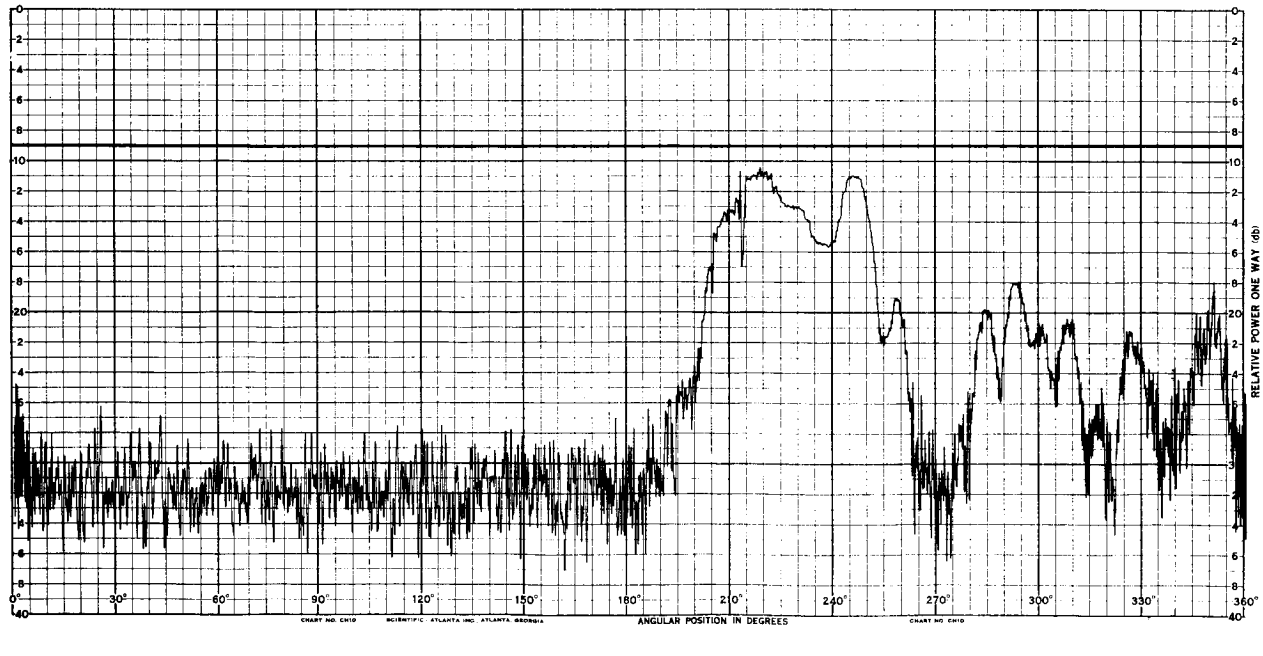




ANTENNA RADIATION PATTERN NO. 213-11

SA-5 MISTRAM ANTENNA SYSTEM

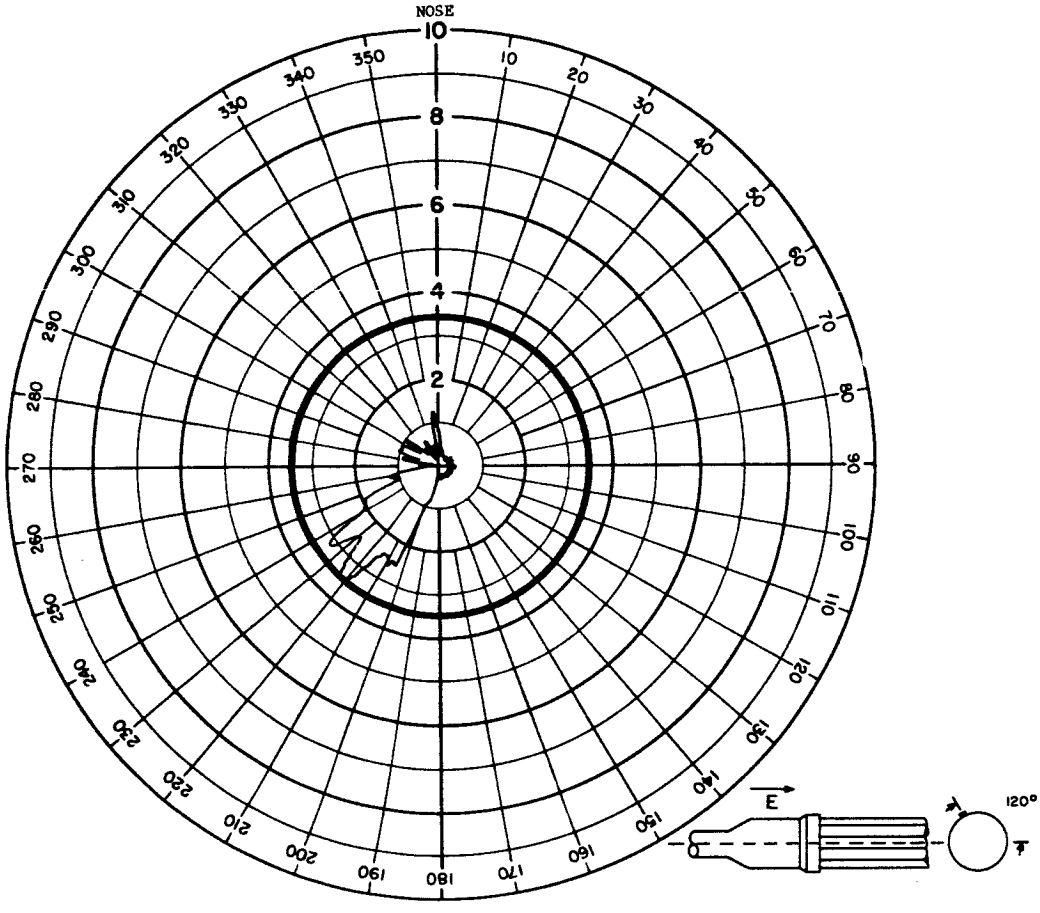


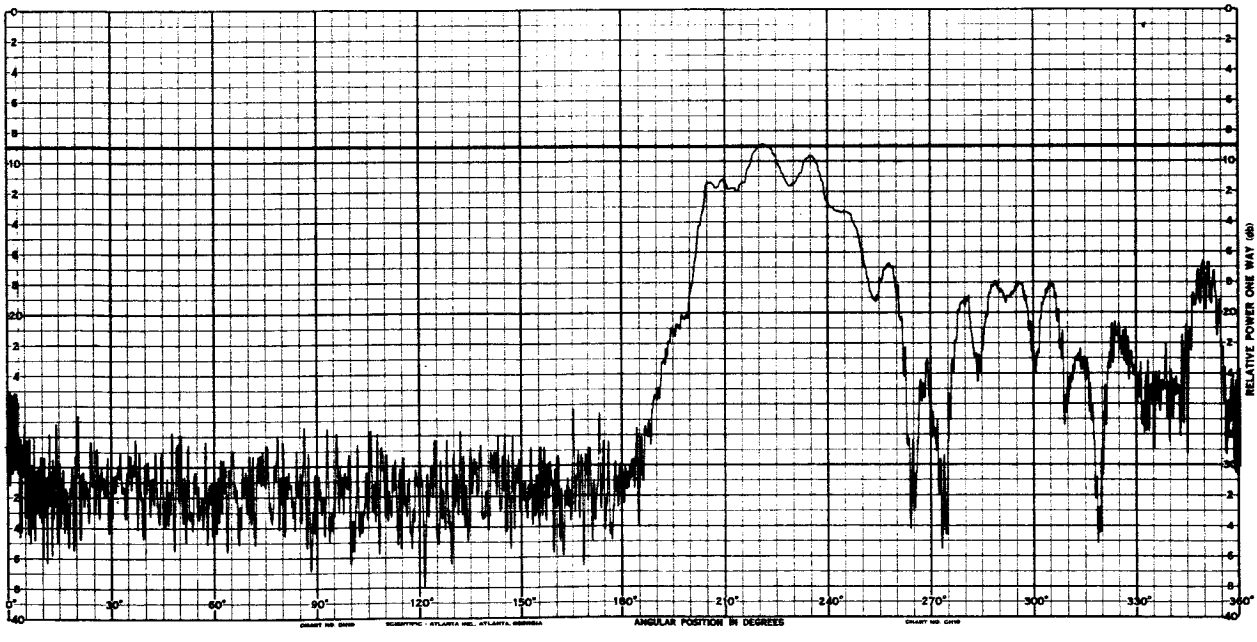


ANTENNA RADIATION PATTERN NO. 213-12

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

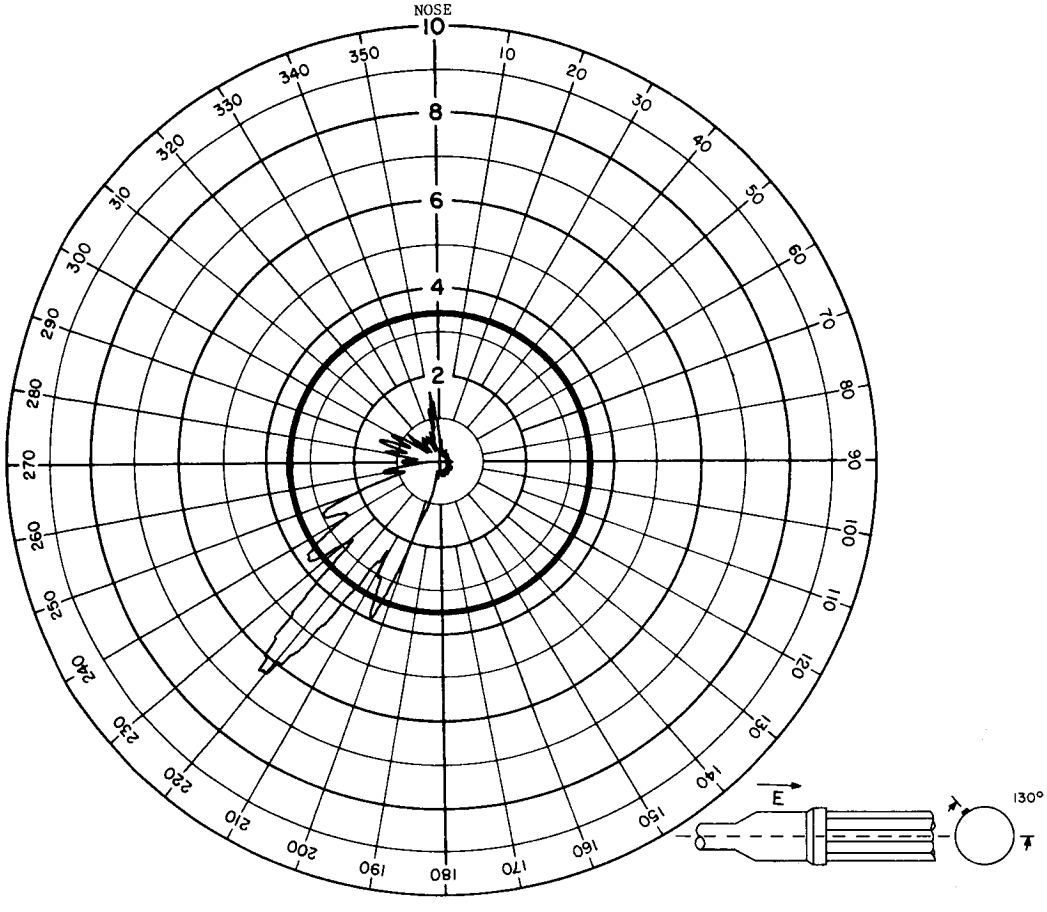
SA-5 MISTRAM ANTENNA SYSTEM

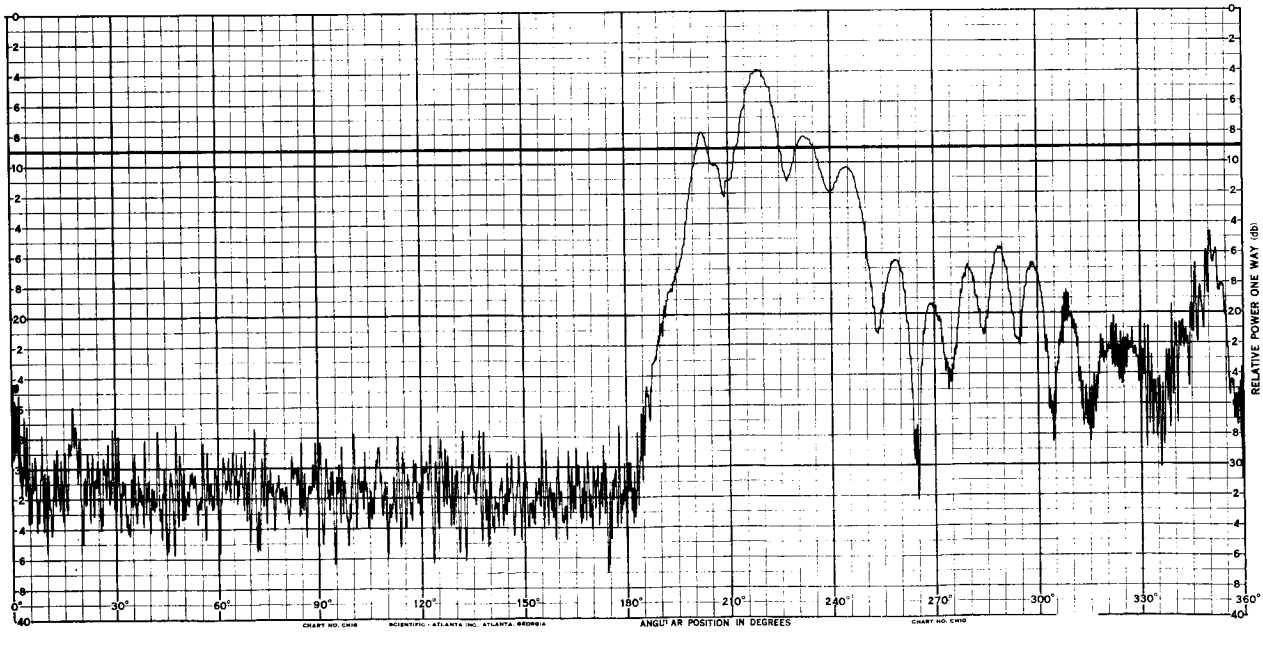




ANTENNA RADIATION PATTERN NO. 213-13

SA-5 MISTRAM ANTENNA SYSTEM

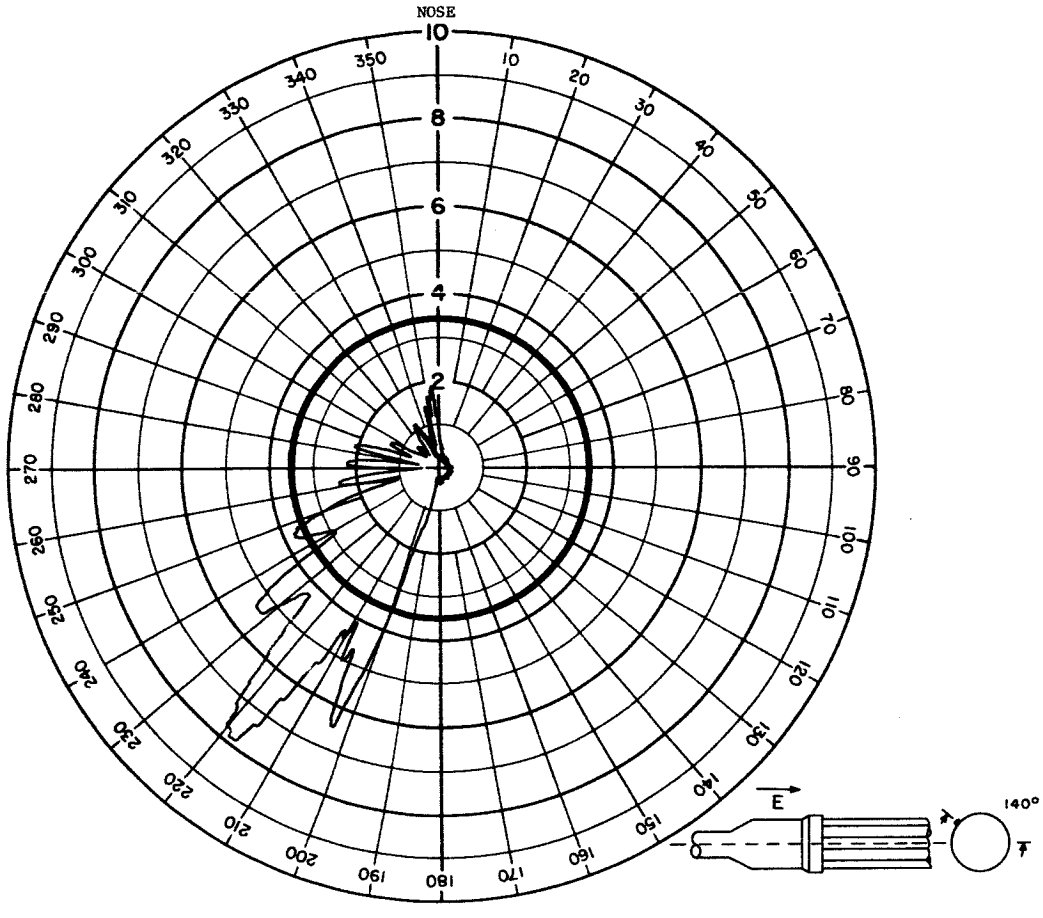


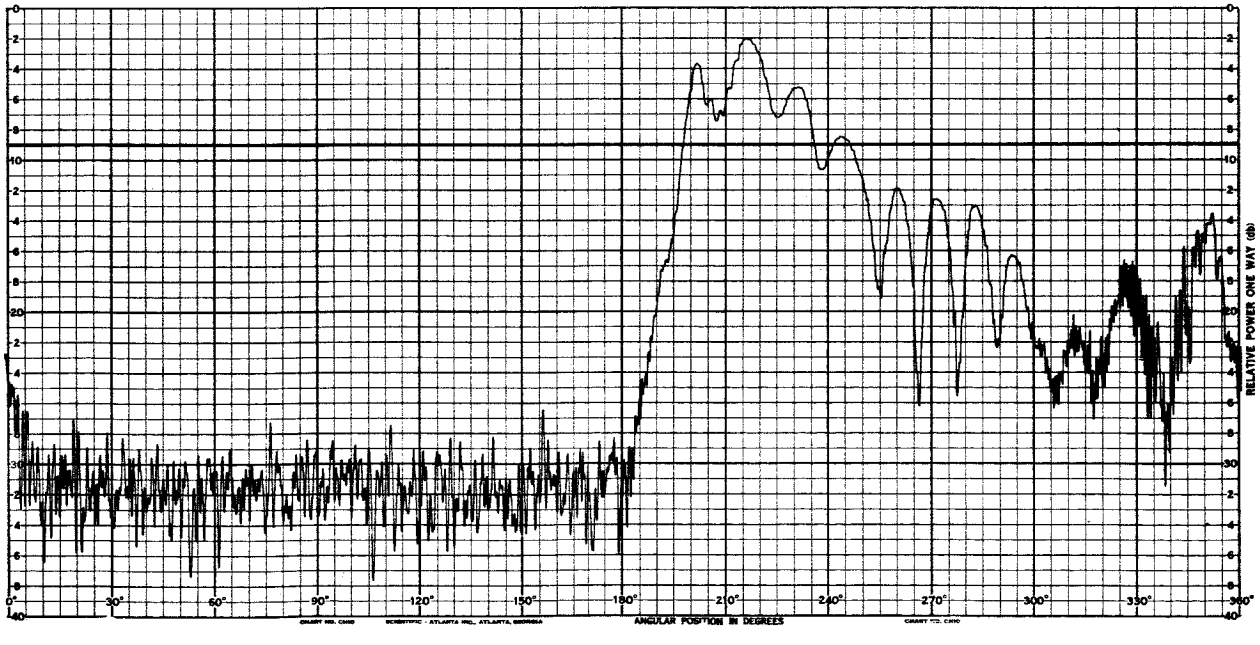


ANTENNA RADIATION PATTERN NO. 213-14

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

SA-5 MISTRAM ANTENNA SYSTEM

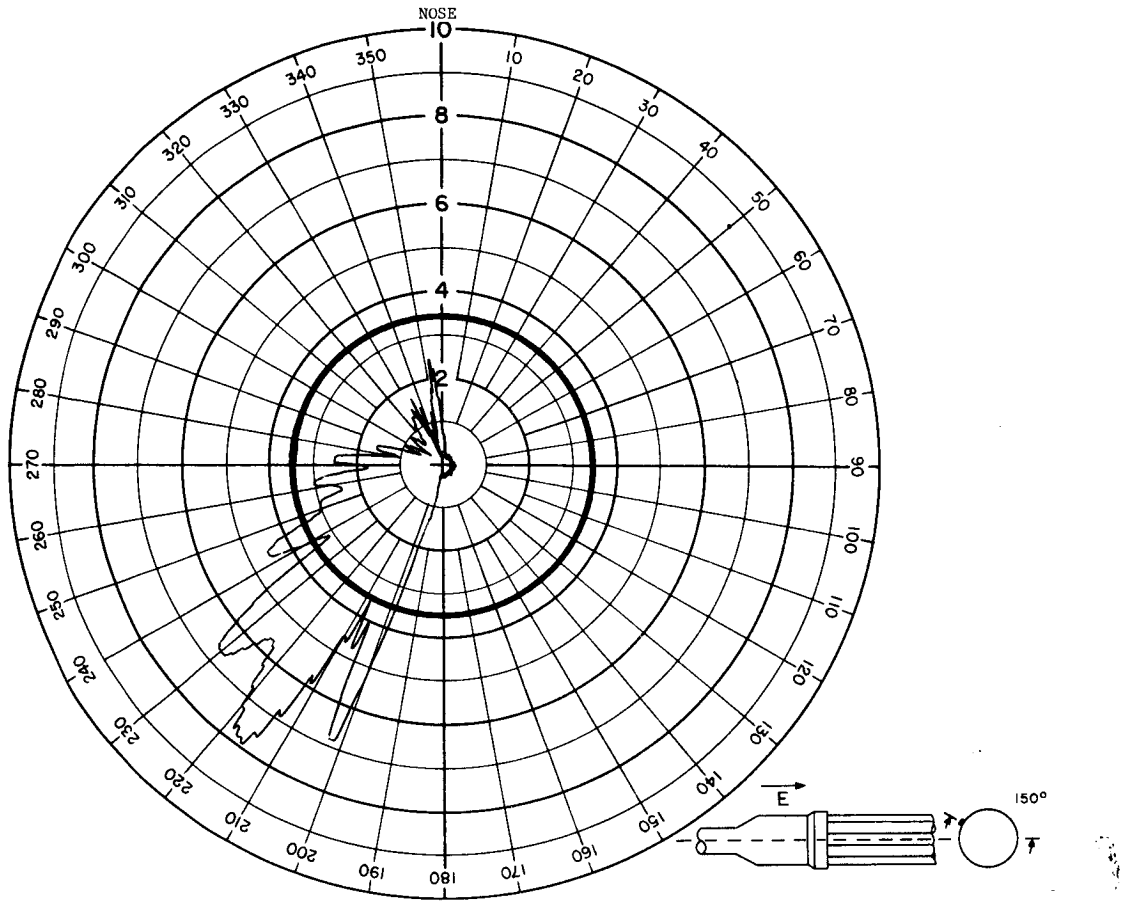


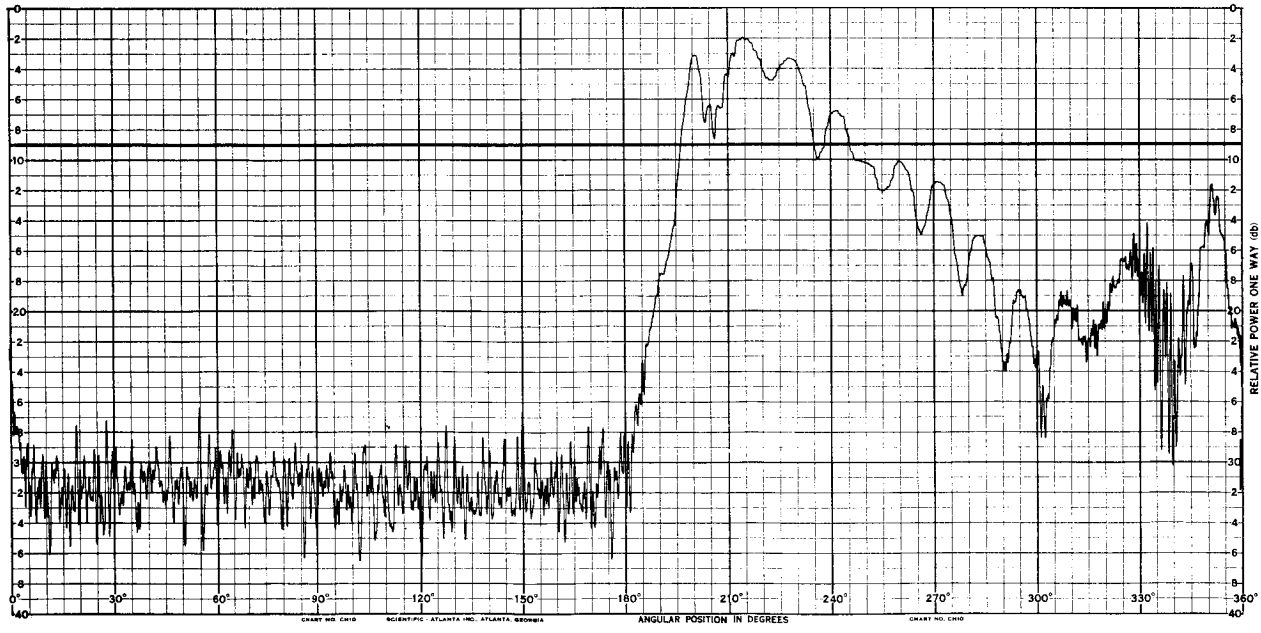


ANTENNA RADIATION PATTERN NO. 213-15

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

SA-5 MISTRAM ANTENNA SYSTEM

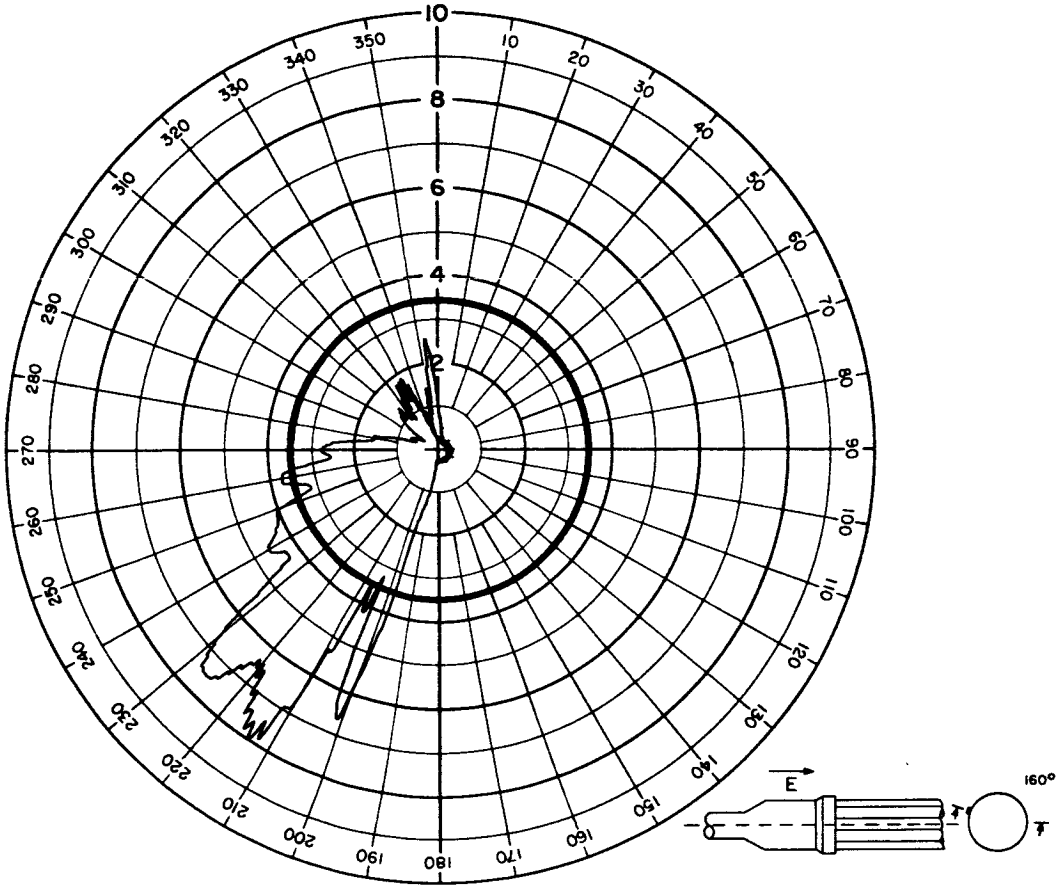


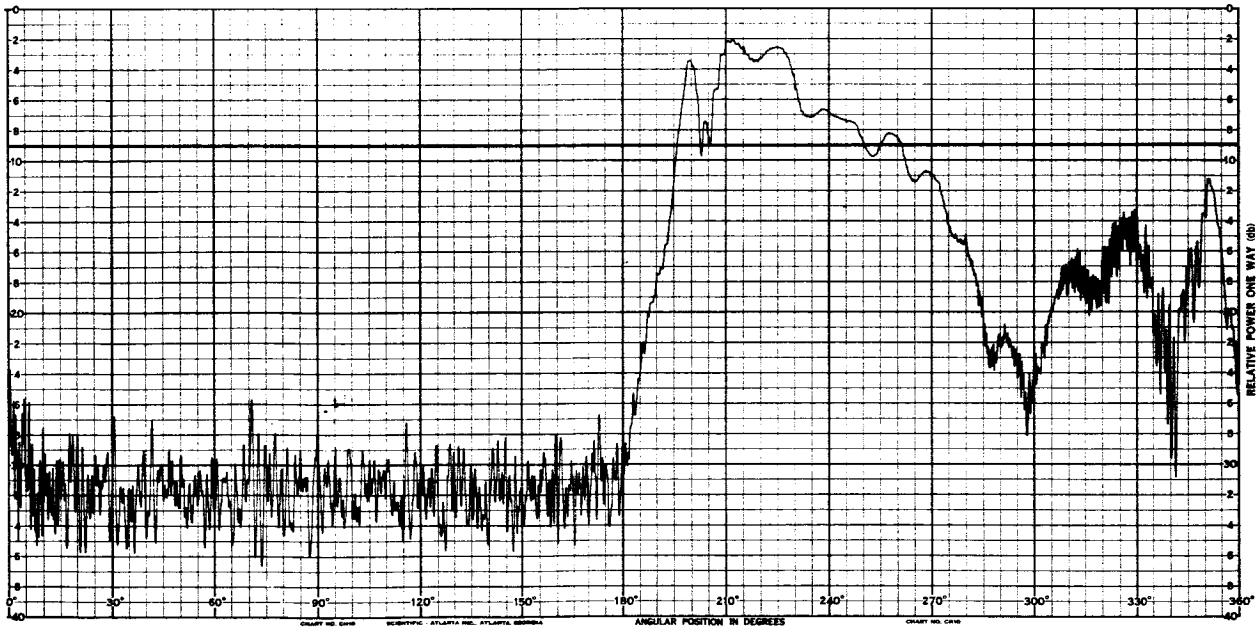


ANTENNA RADIATION PATTERN NO. 213-16

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

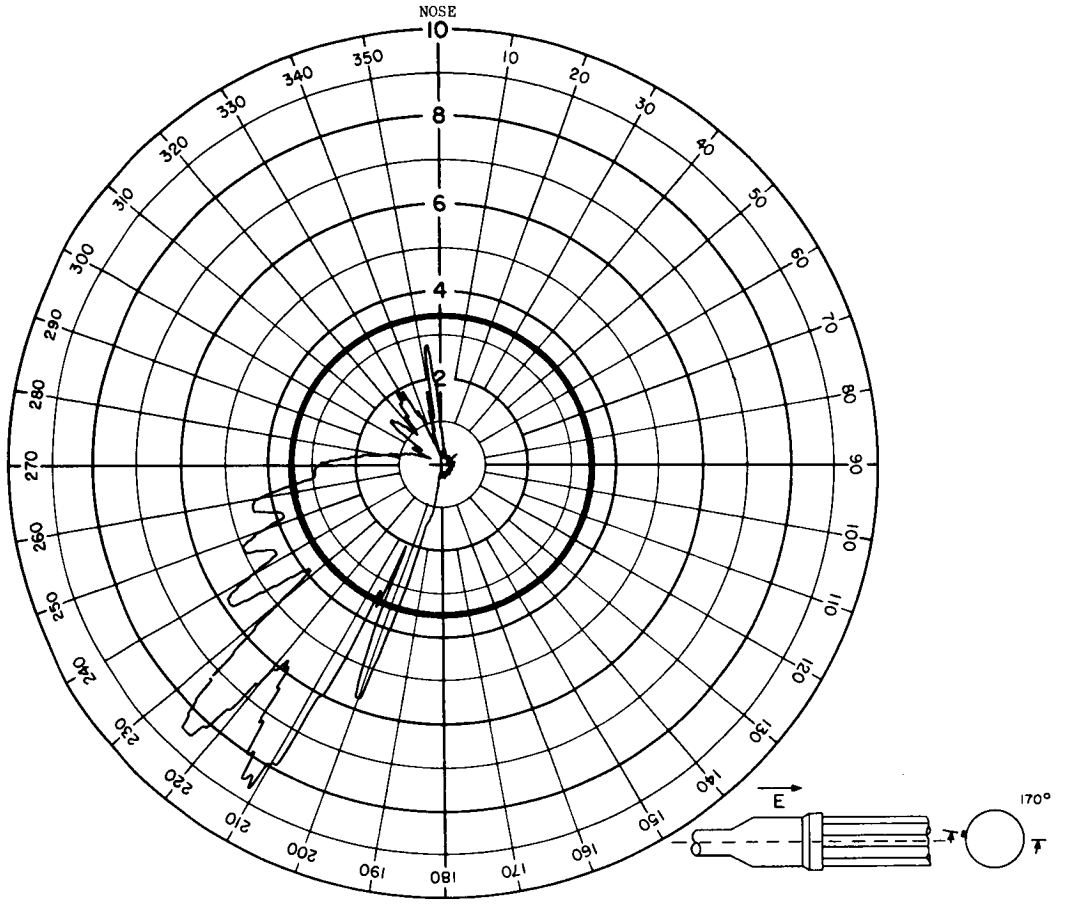
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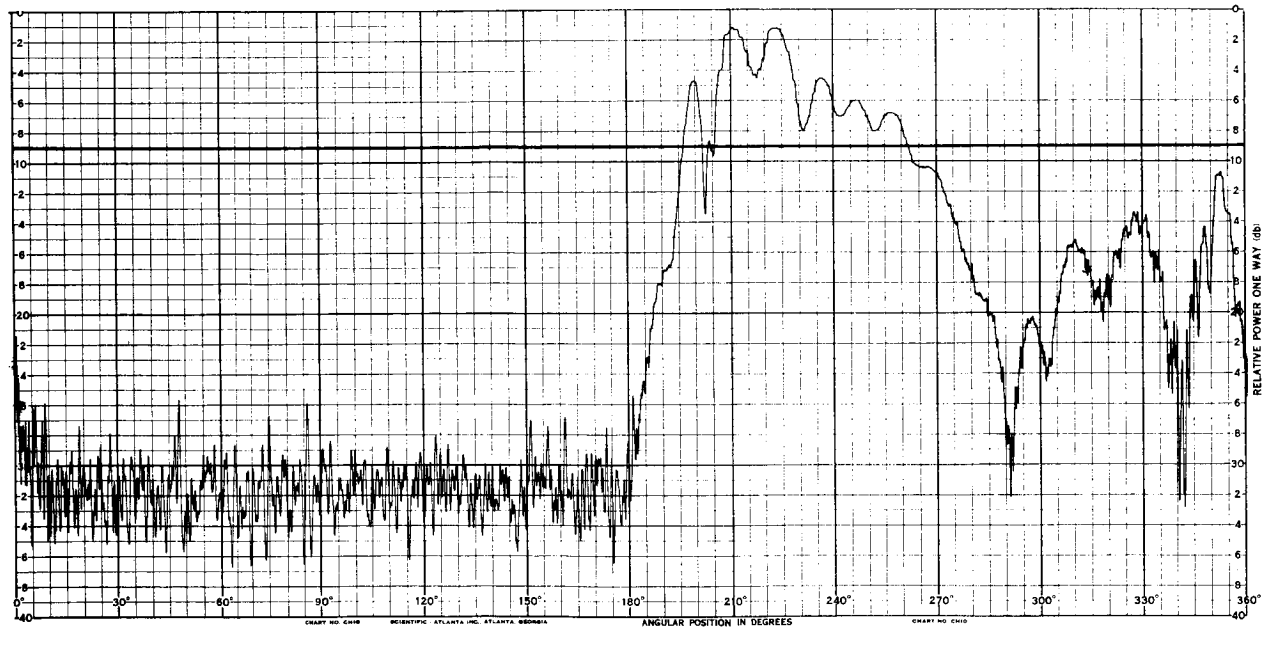




ANTENNA RADIATION PATTERN NO. 213-17

SA-5 MISTRAM ANTENNA SYSTEM

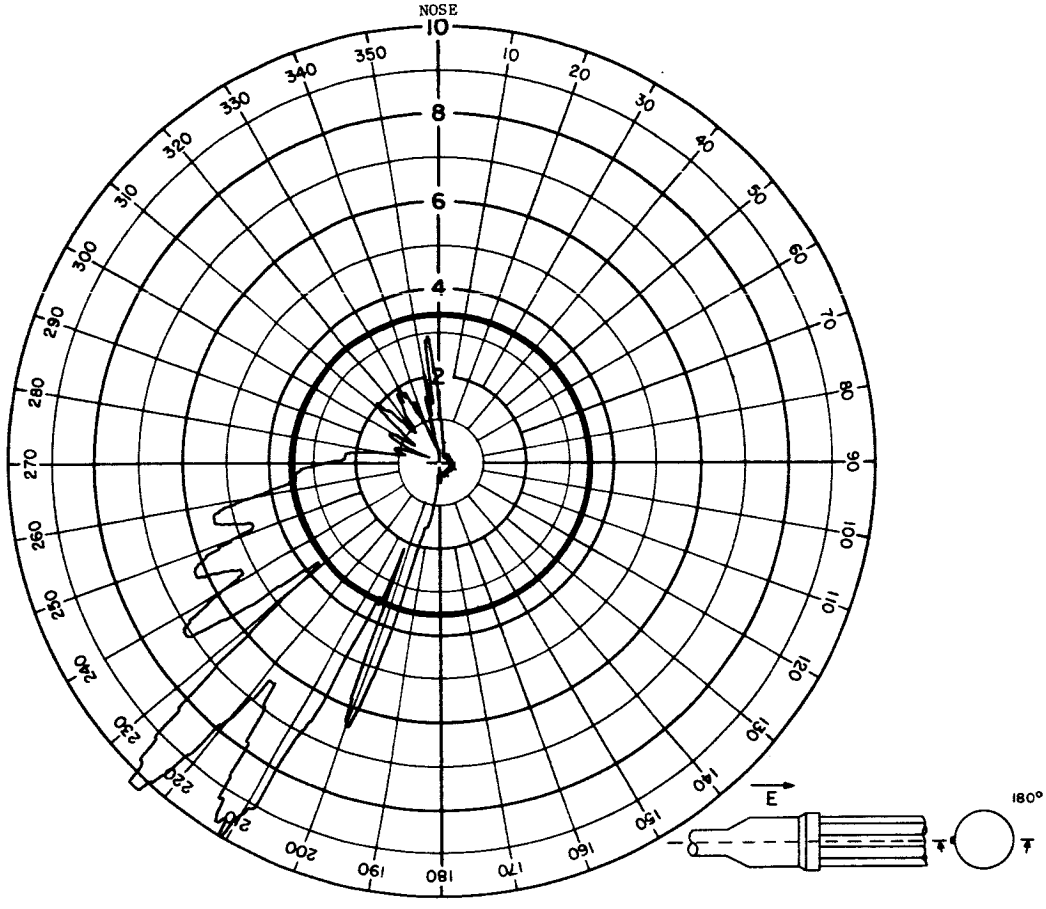


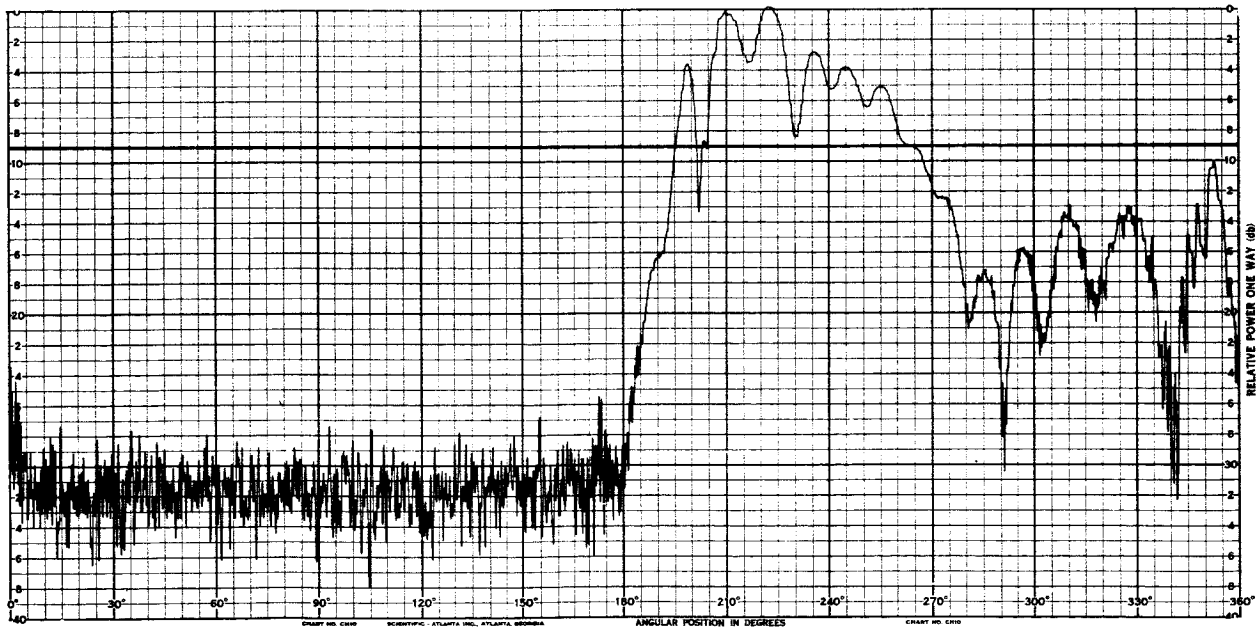


ANTENNA RADIATION PATTERN NO. 213-18

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

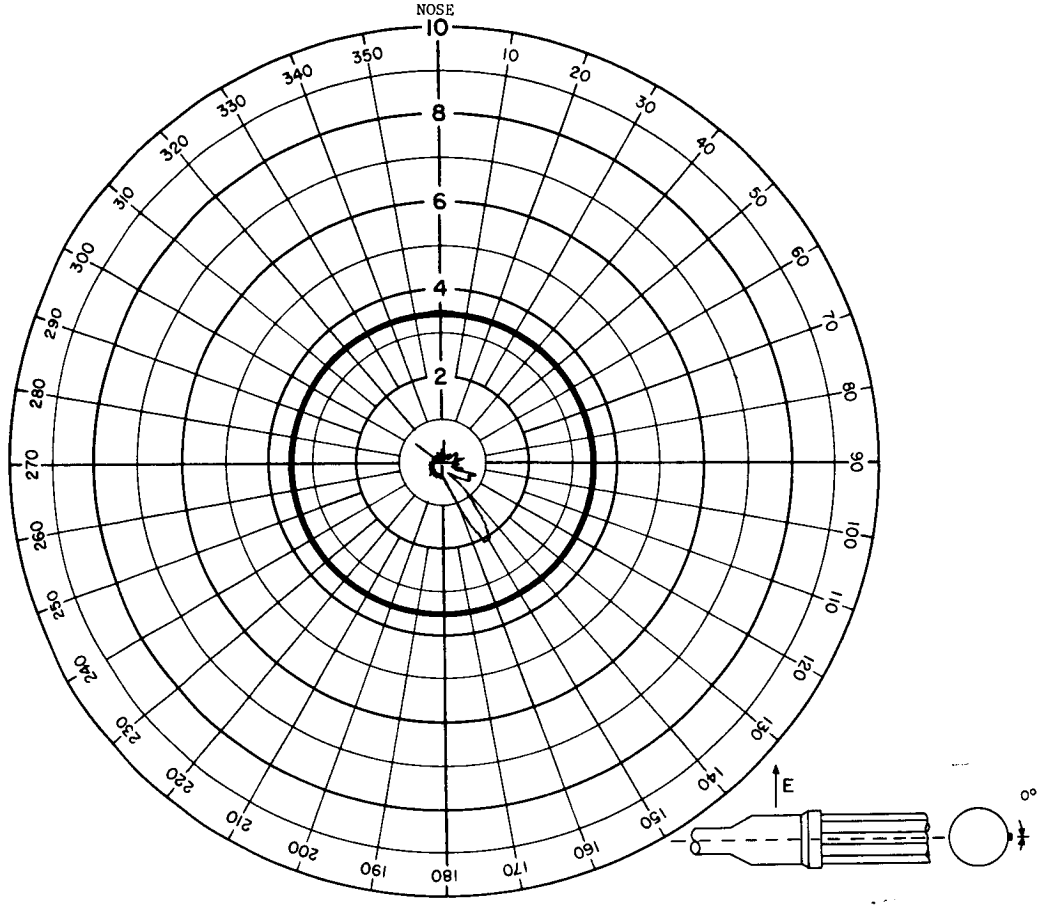
SA-5 MISTRAM ANTENNA SYSTEM

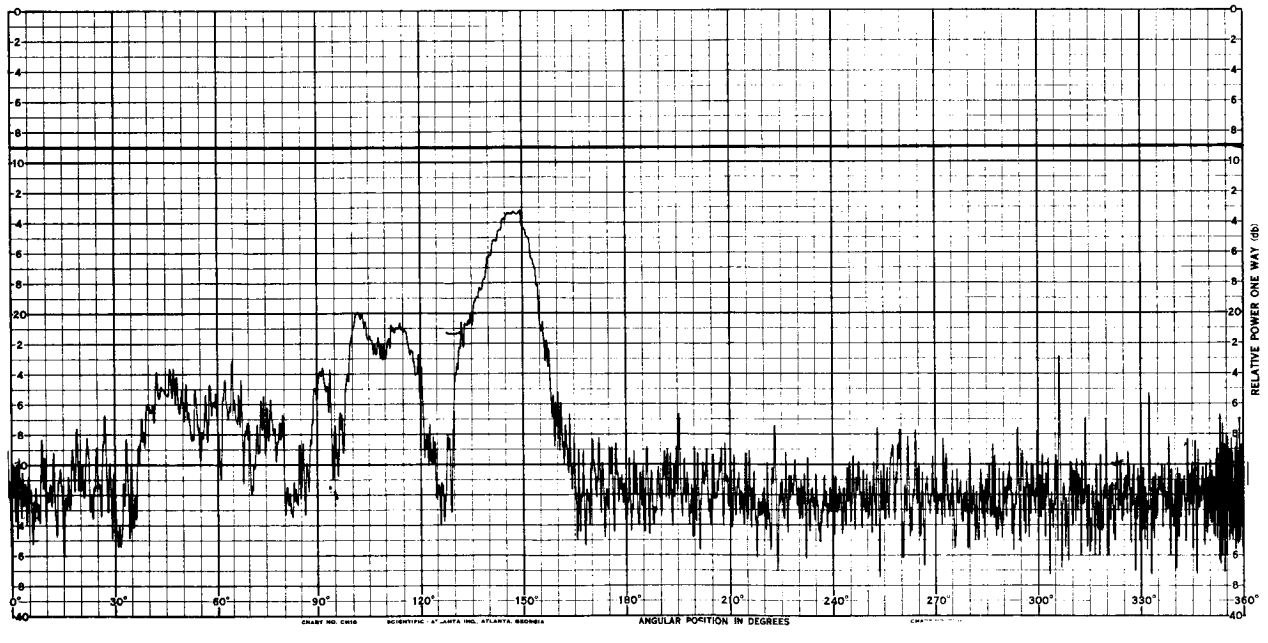




ANTENNA RADIATION PATTERN NO. 213-19

SA-5 MISTRAM ANTENNA SYSTEM

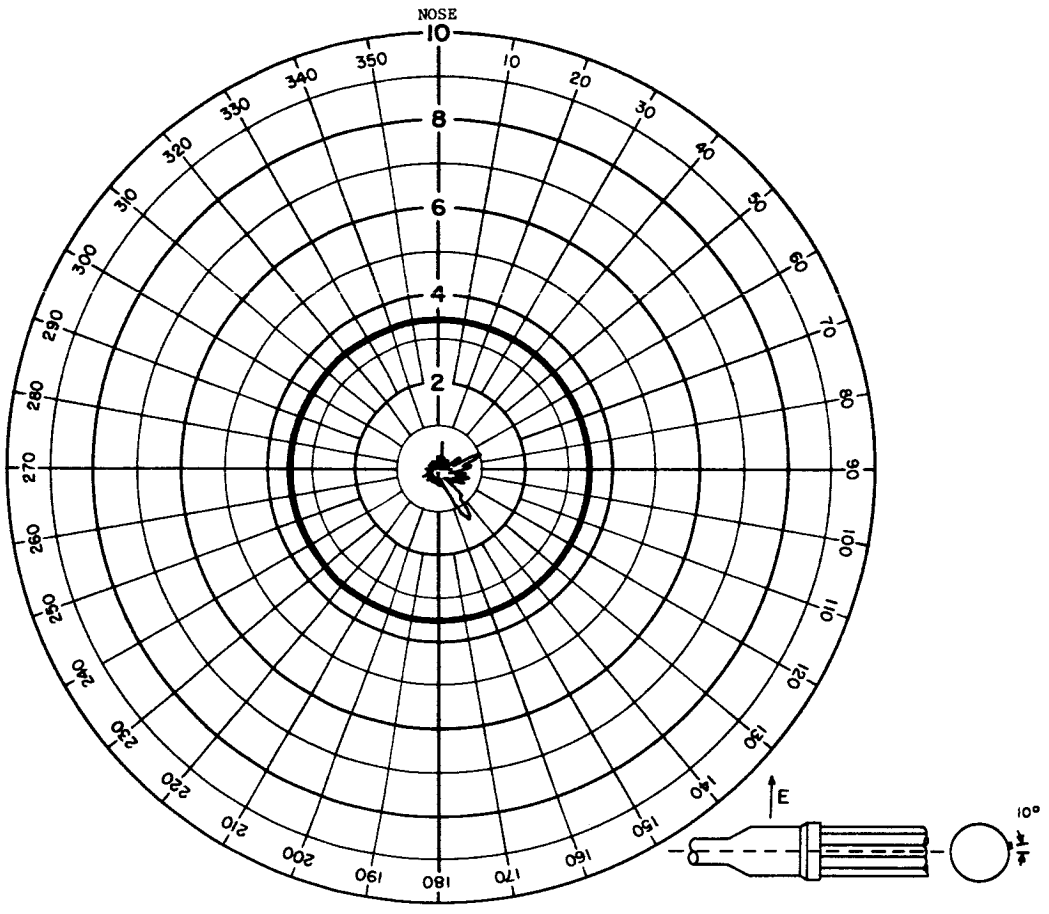


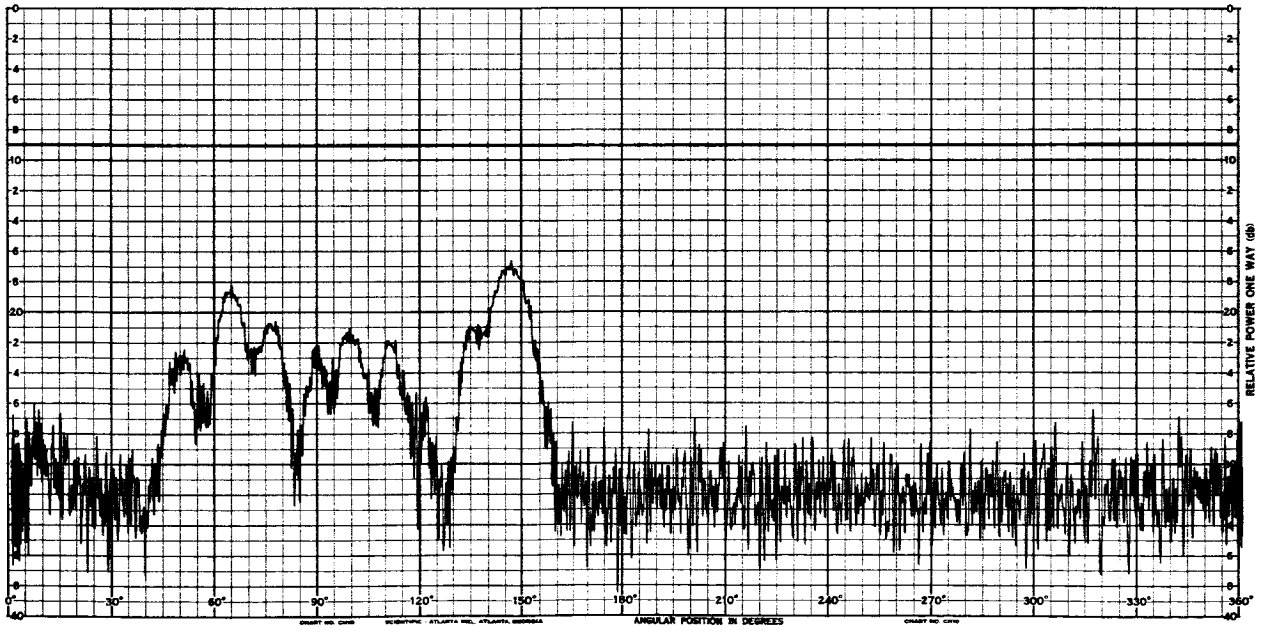


ANTENNA RADIATION PATTERN NO. 213-20

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

SA-5 MISTRAM ANTENNA SYSTEM

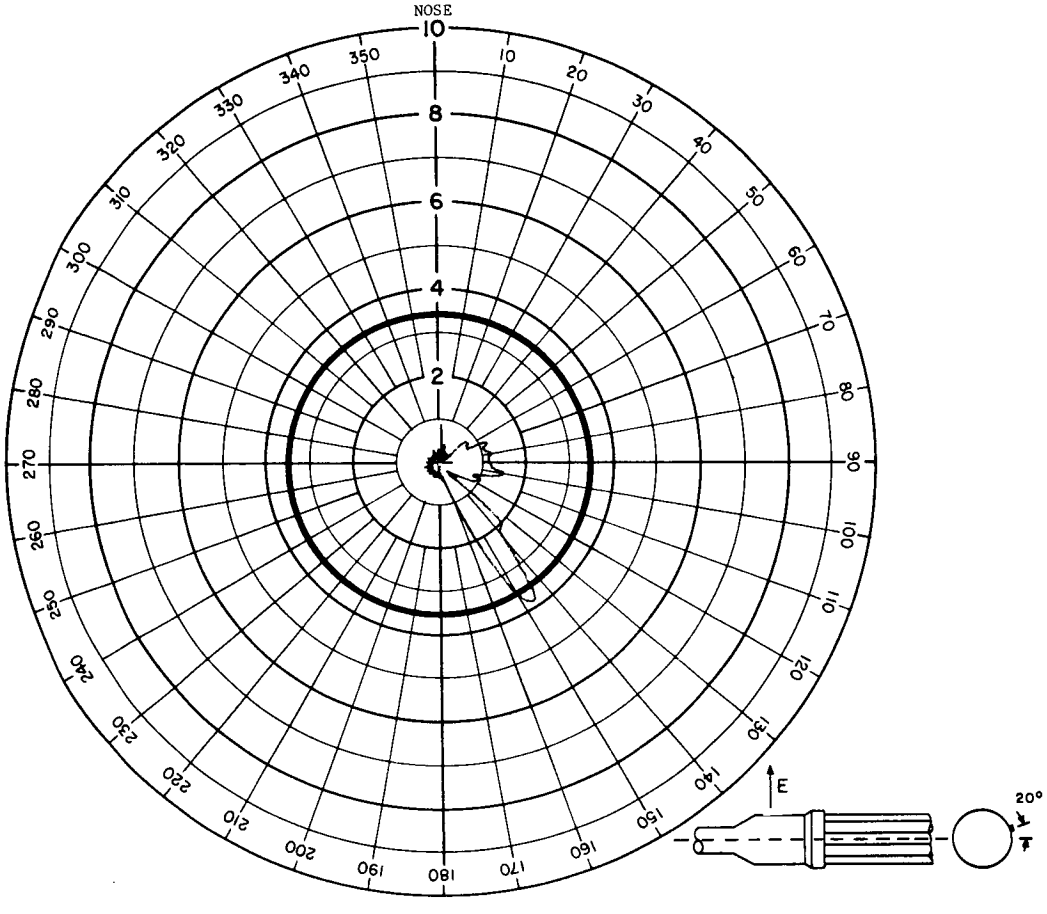


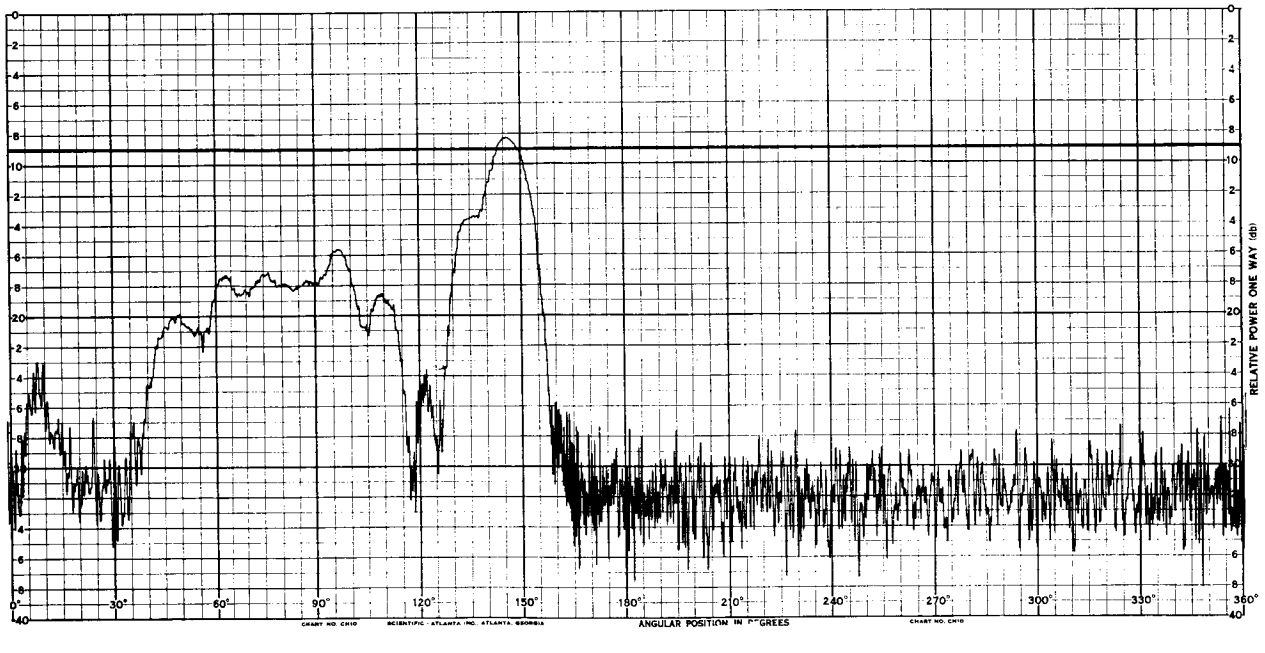


ANTENNA RADIATION PATTERN NO. 213-21

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

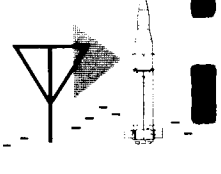
SA-5 MISTRAM ANTENNA SYSTEM



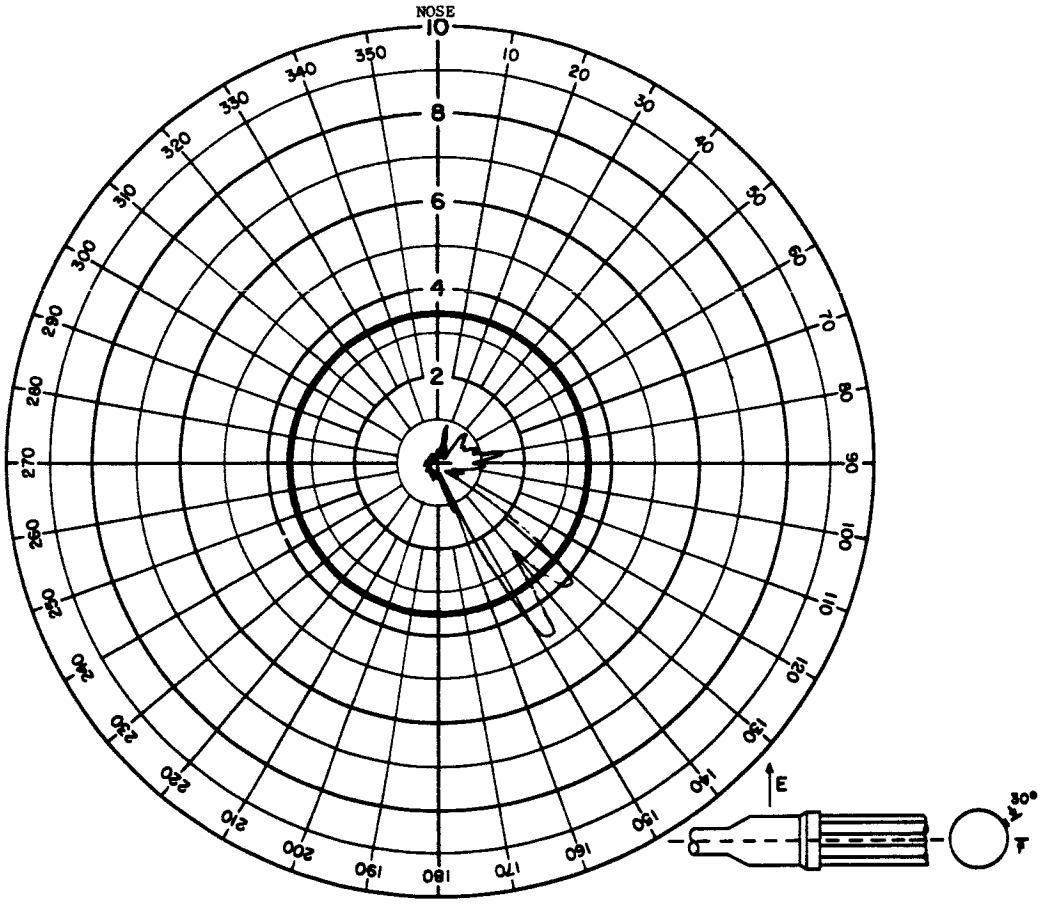


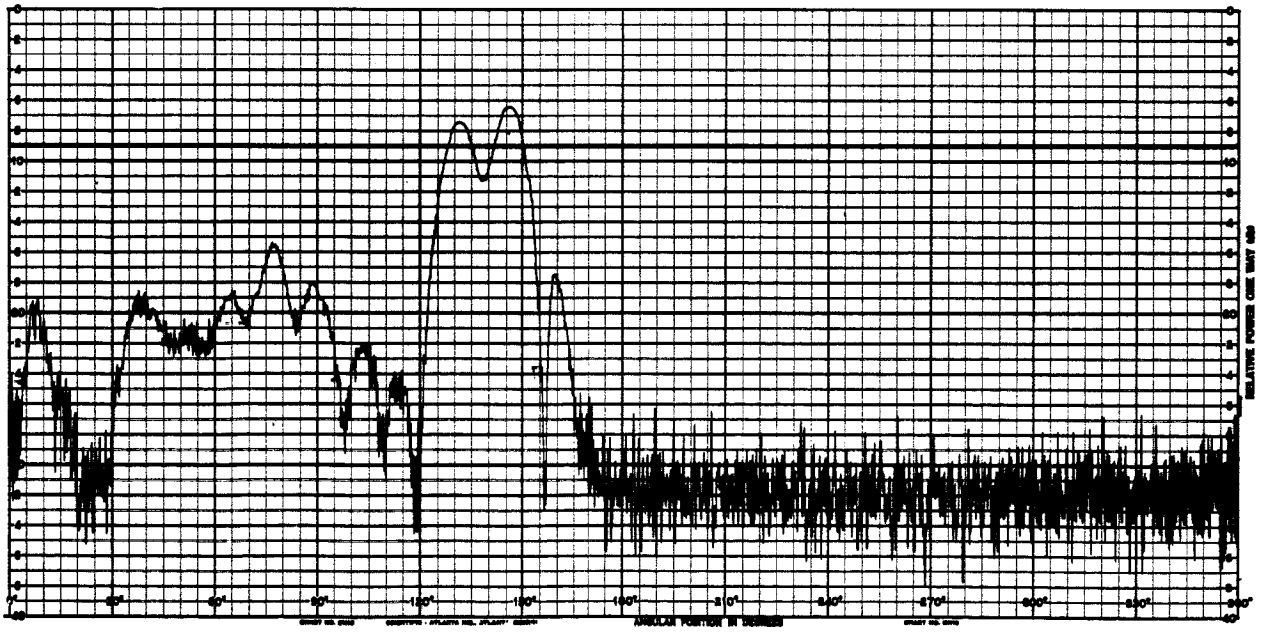
ANTENNA RADIATION PATTERN NO. 213-22

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



SA-5 MISTRAM ANTENNA SYSTEM

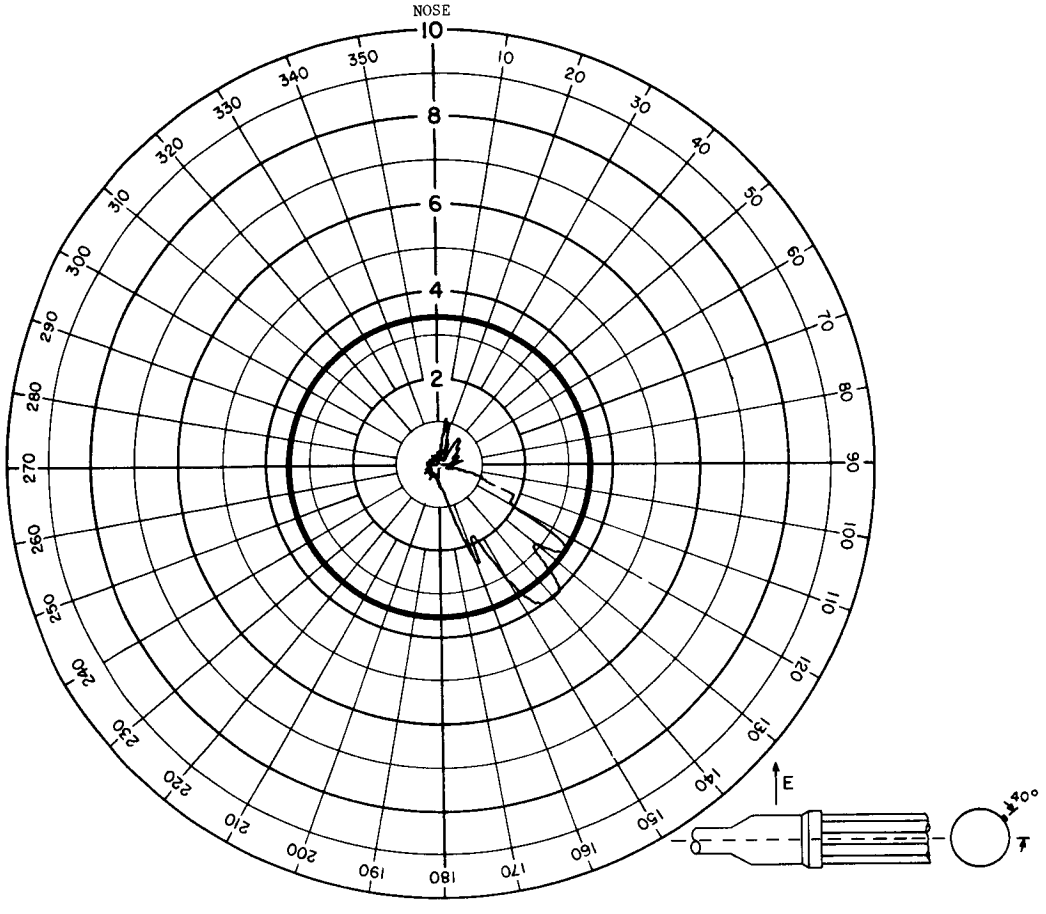


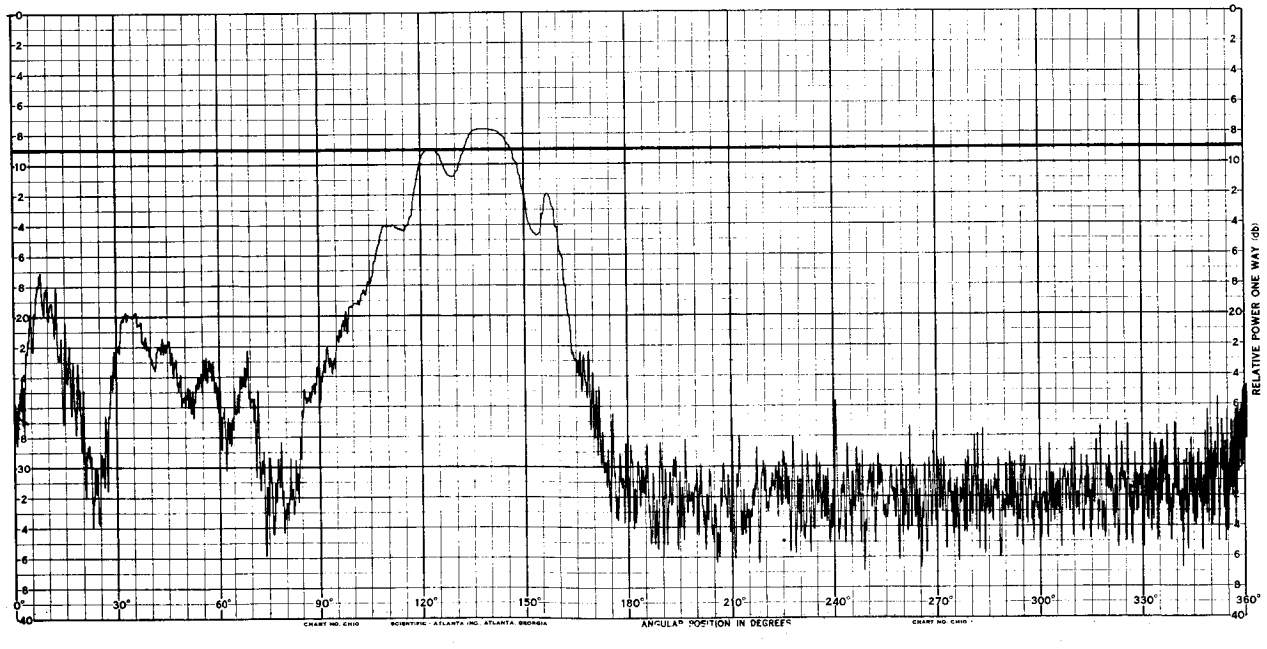


ANTENNA RADIATION PATTERN NO. 213-23

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

SA-5 MISTRAM ANTENNA SYSTEM

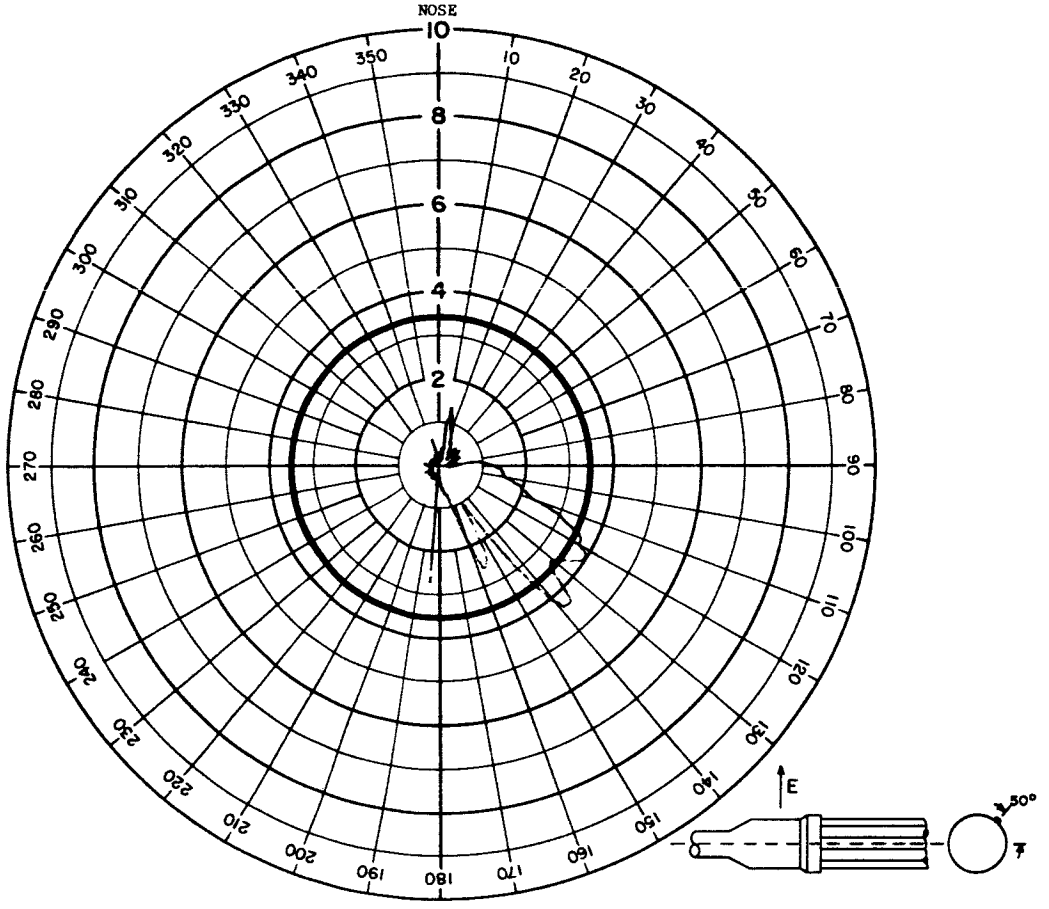


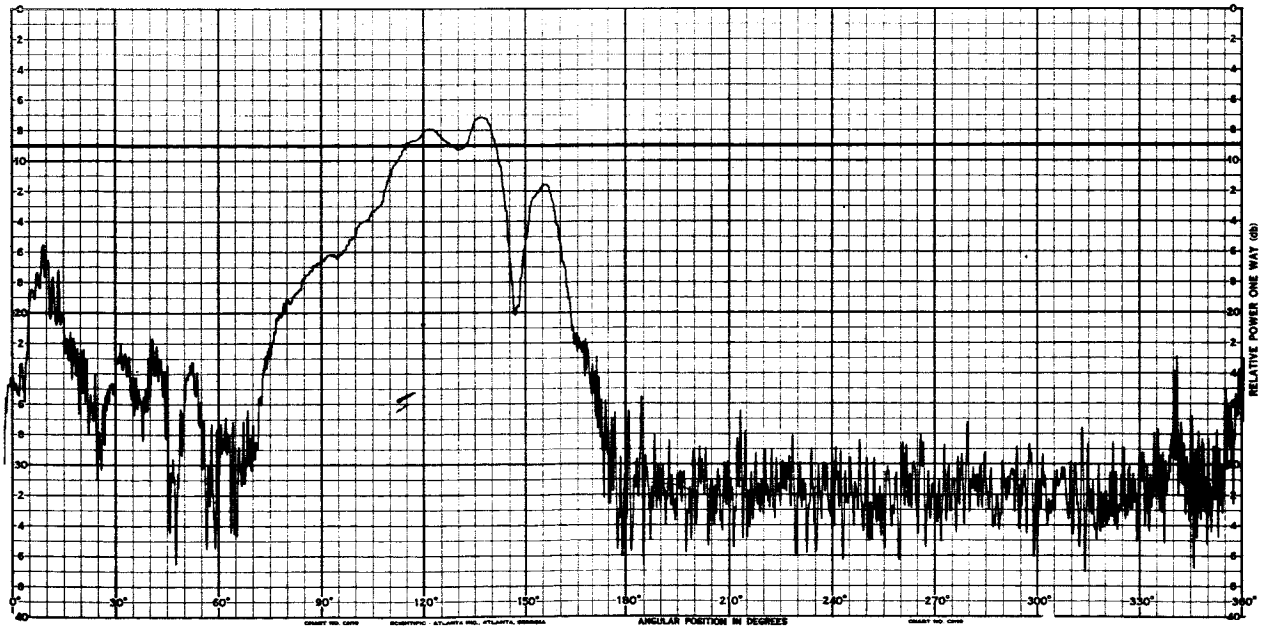


ANTENNA RADIATION PATTERN NO. 213-24

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

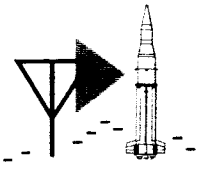
SA-5 MISTRAM ANTENNA SYSTEM



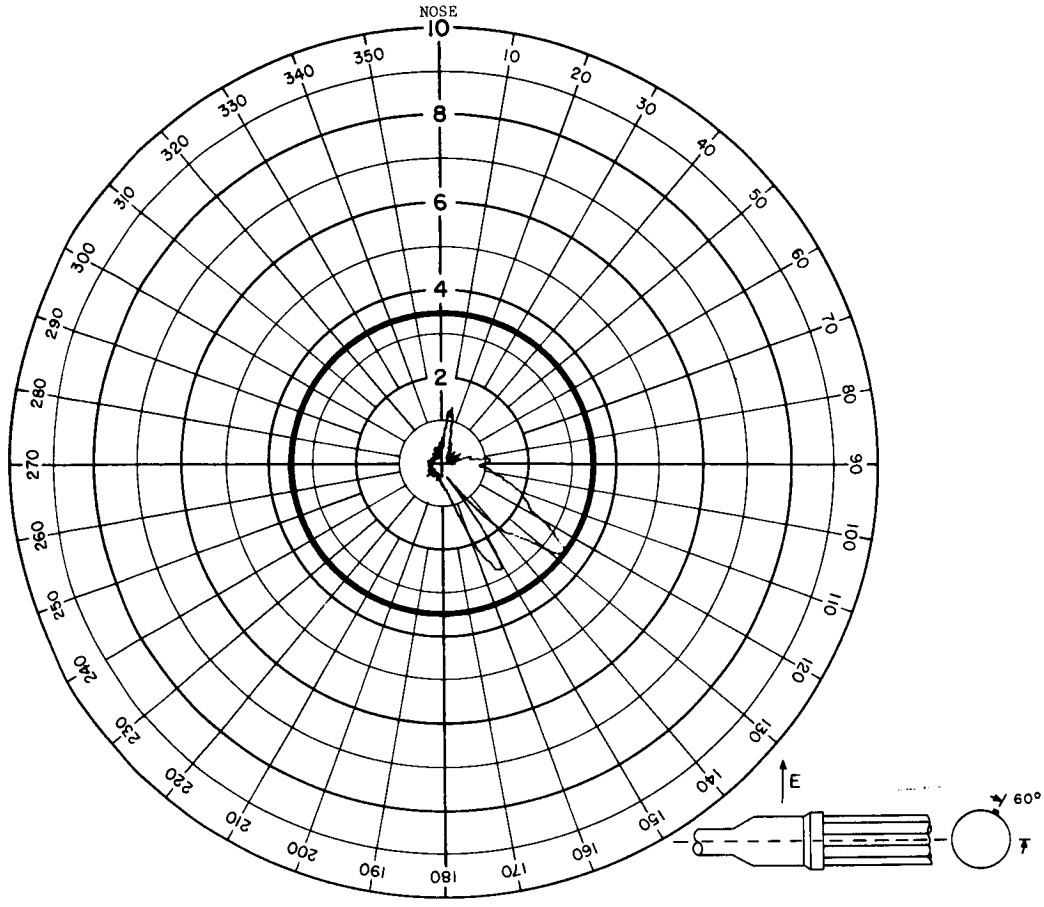


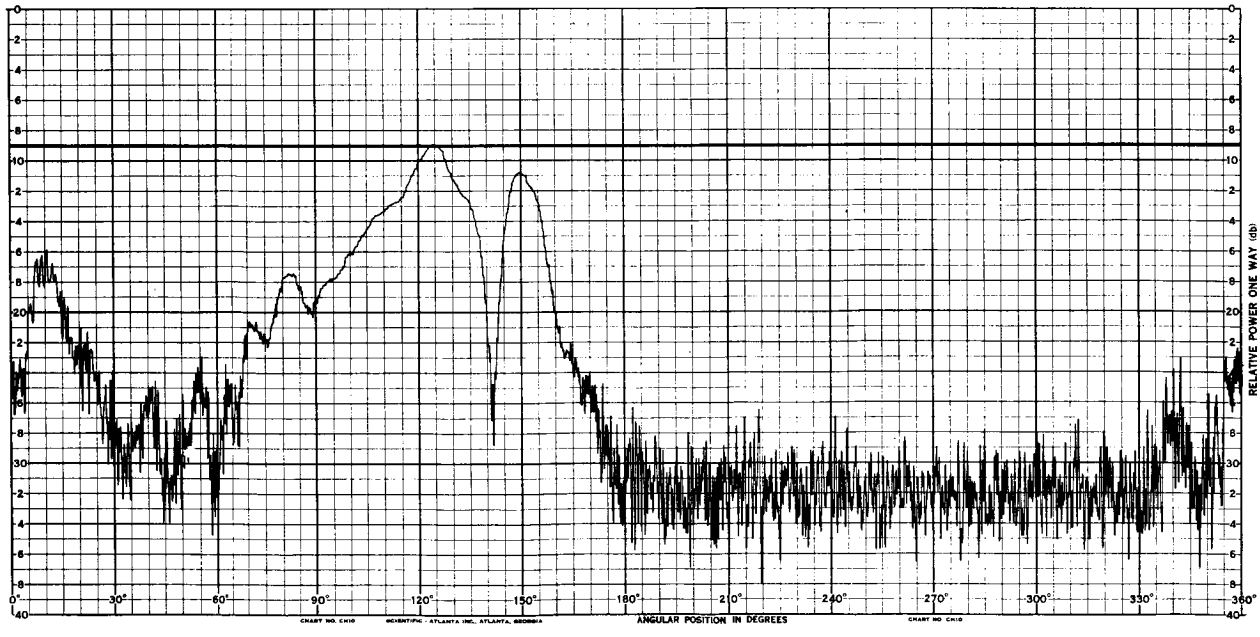
ANTENNA RADIATION PATTERN NO. 213-25

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



SA-5 MISTRAM ANTENNA SYSTEM

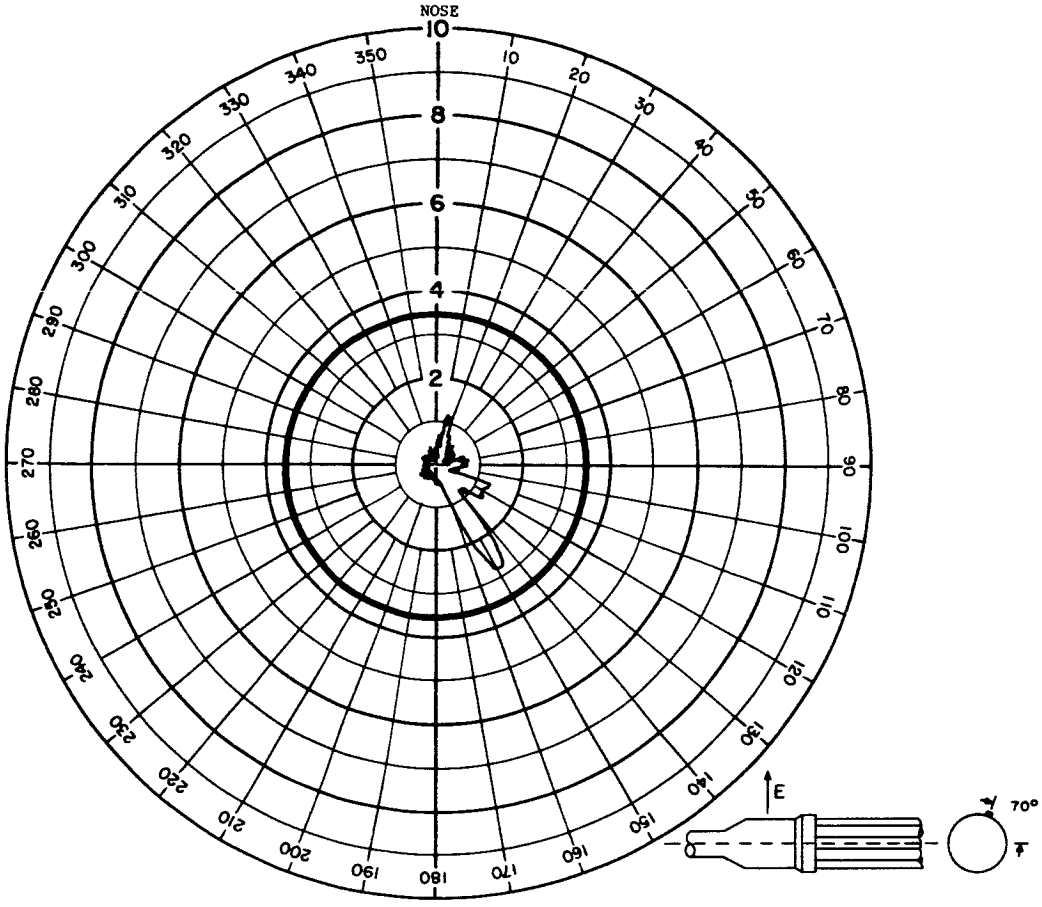


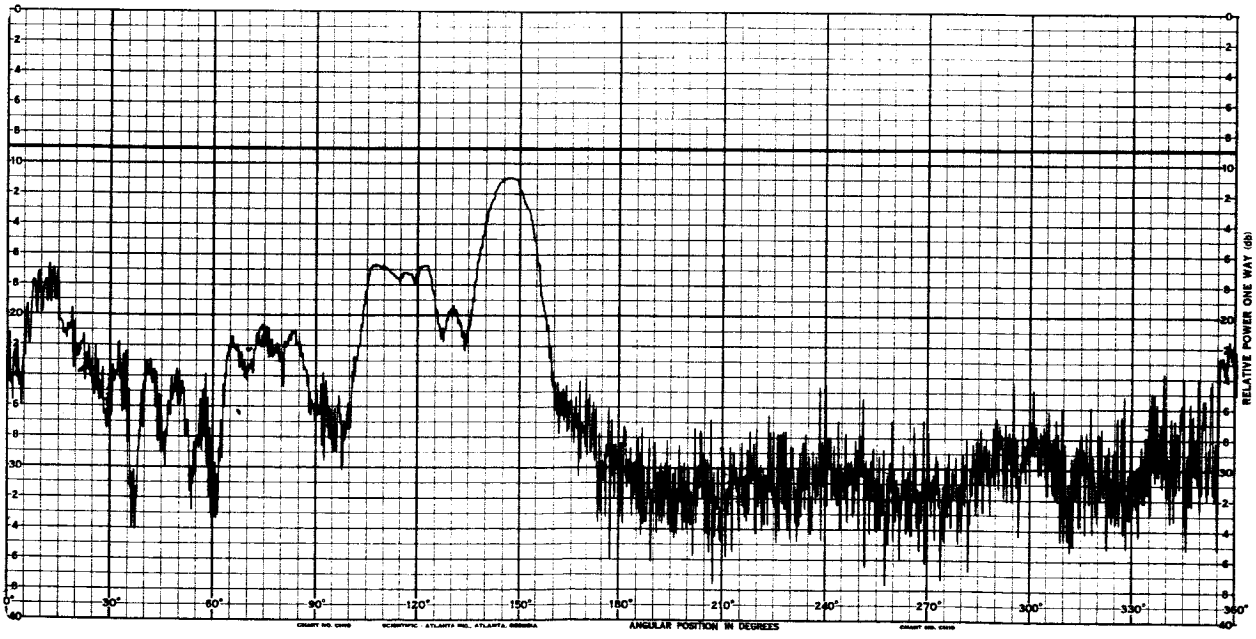


ANTENNA RADIATION PATTERN NO. 213-26

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

SA-5 MISTRAM ANTENNA SYSTEM

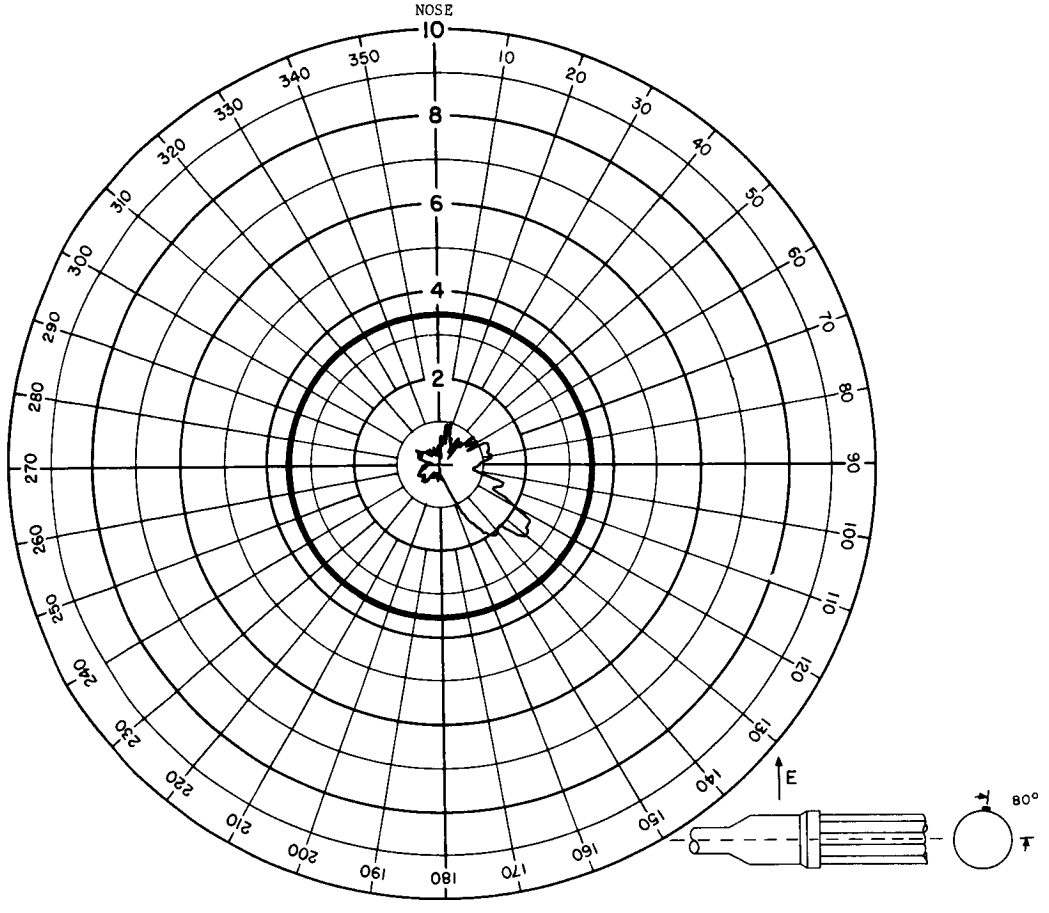


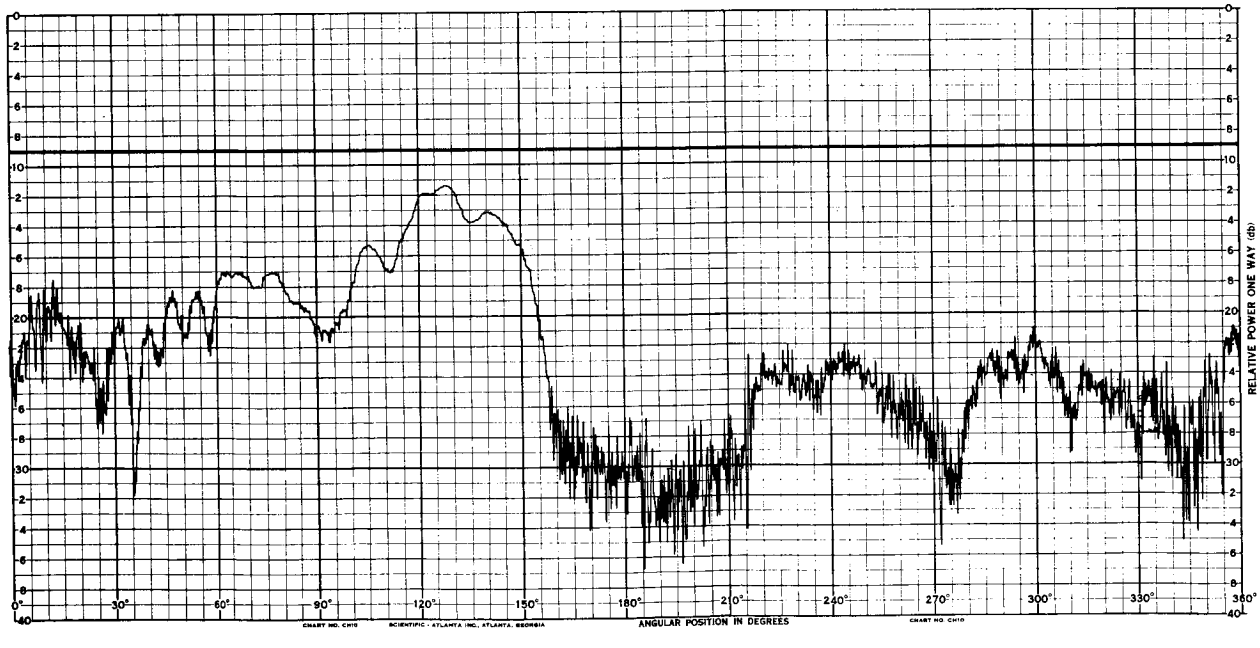


ANTENNA RADIATION PATTERN NO. 213-27

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

SA-5 MISTRAM ANTENNA SYSTEM

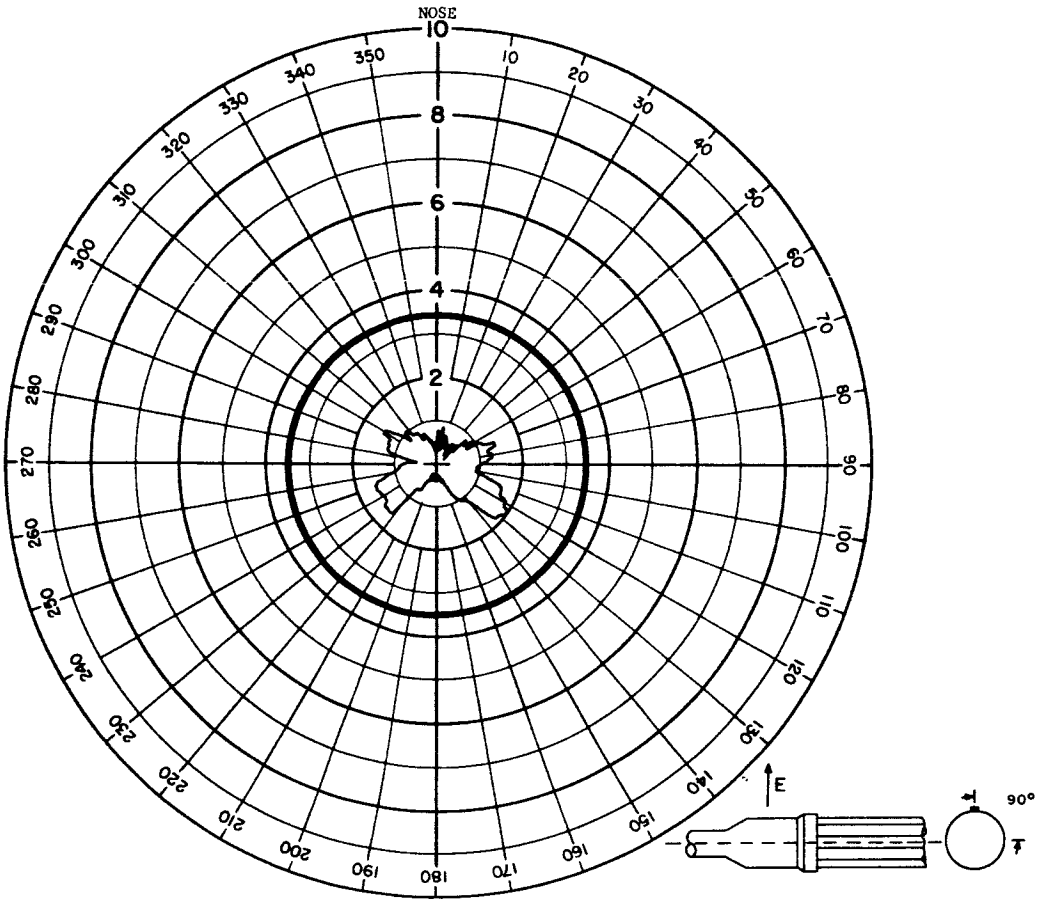


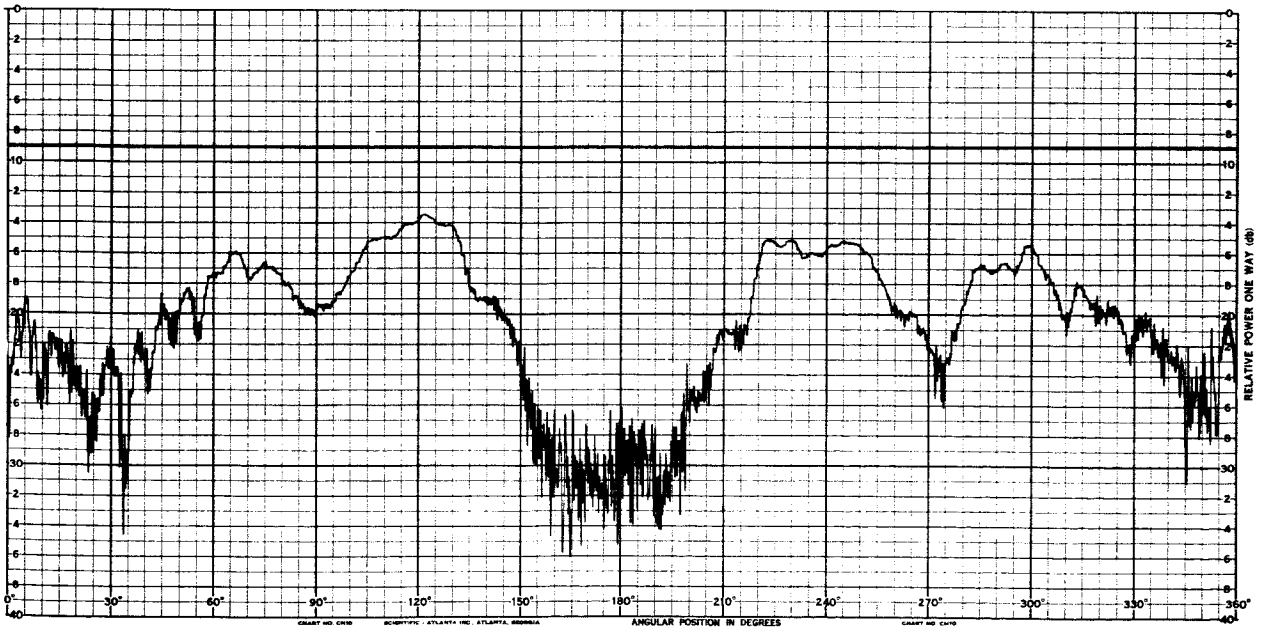


ANTENNA RADIATION PATTERN NO. 213-28

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

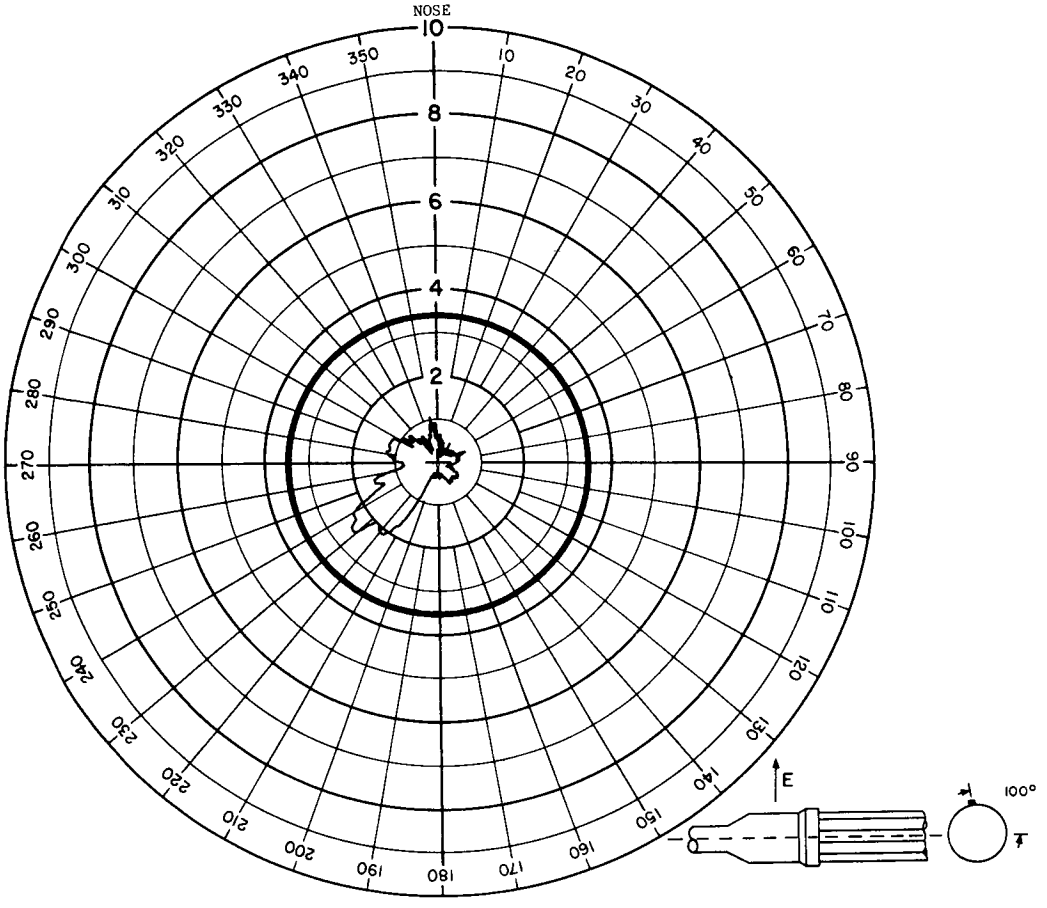
SA-5 MISTRAM ANTENNA SYSTEM

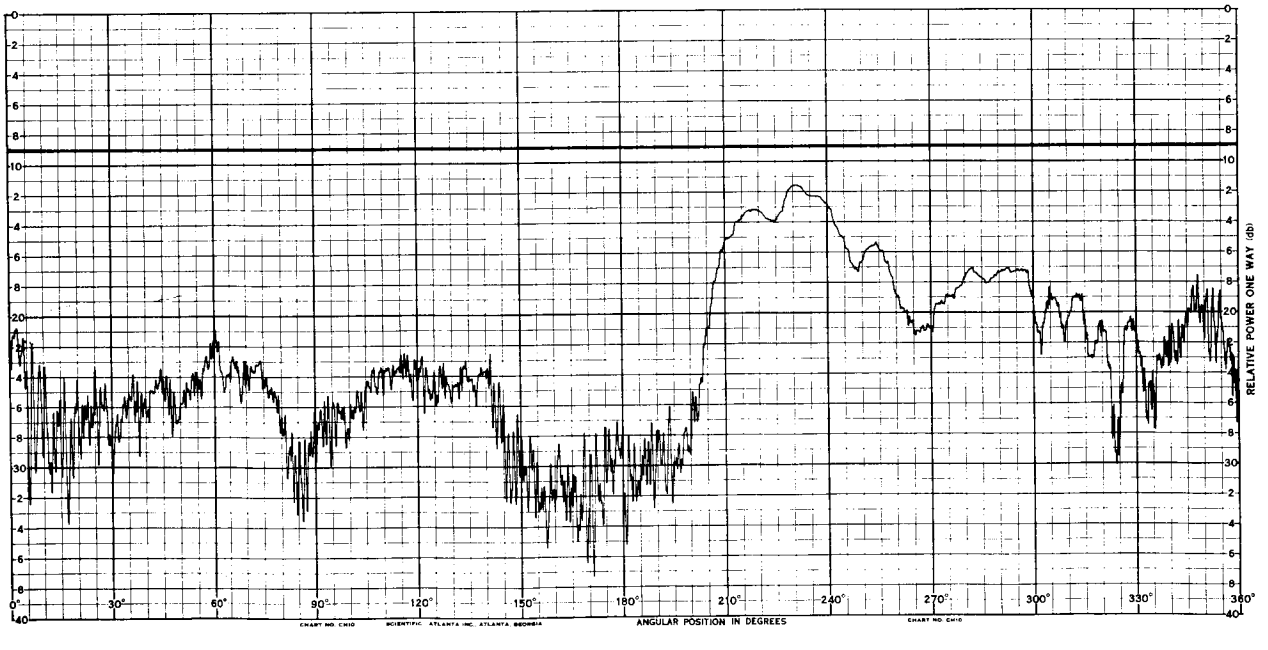




ANTENNA RADIATION PATTERN NO. 213-29

SA-5 MISTRAM ANTENNA SYSTEM

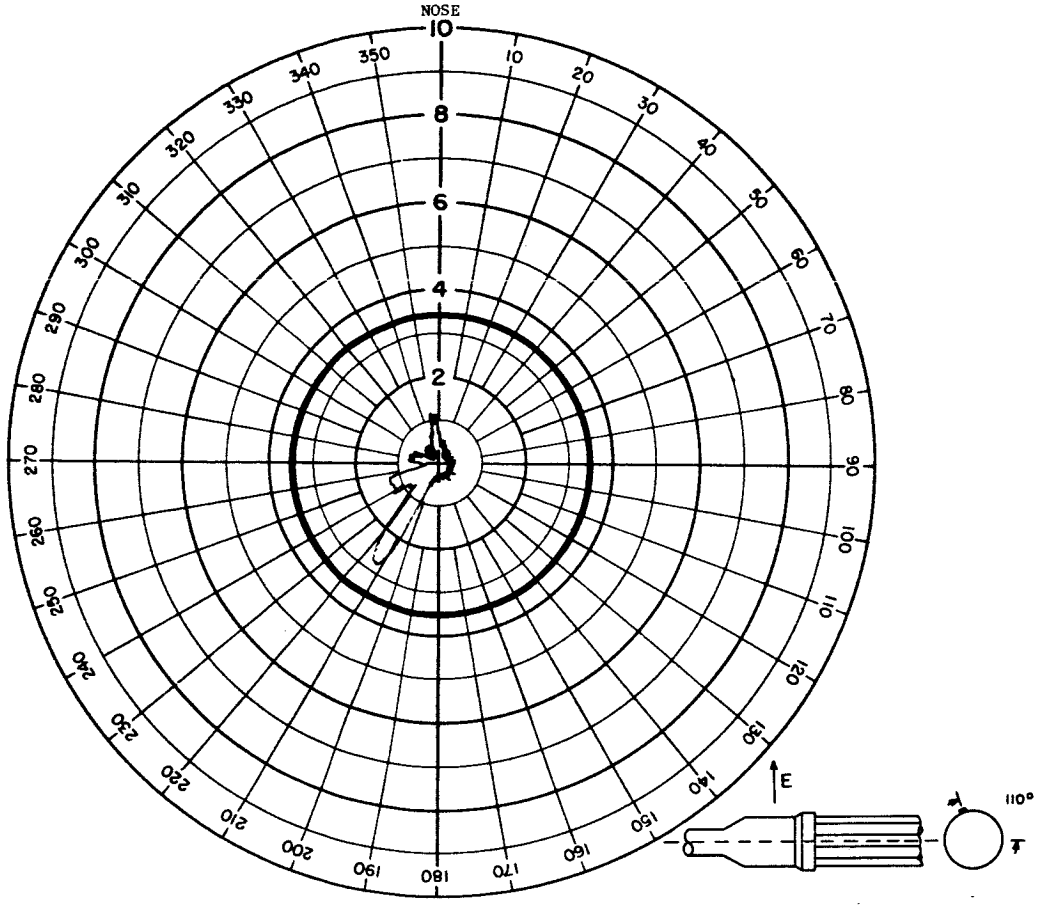


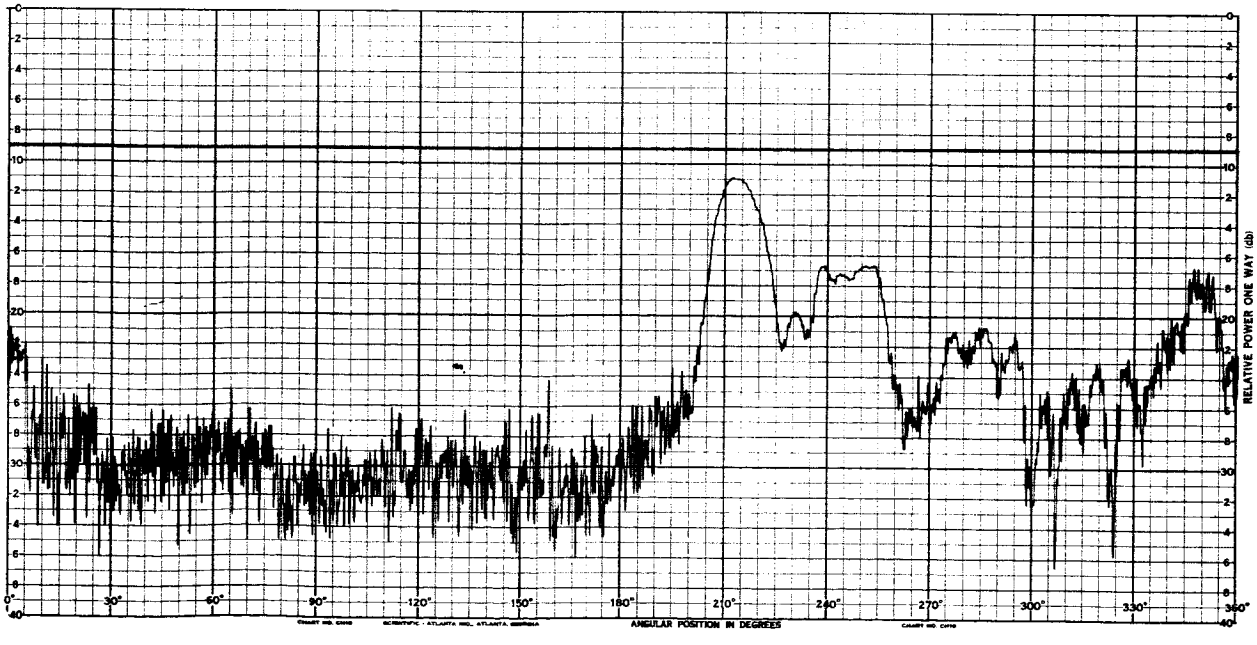


ANTENNA RADIATION PATTERN NO. 213-30

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

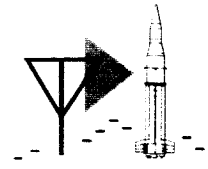
SA-5 MISTRAM ANTENNA SYSTEM



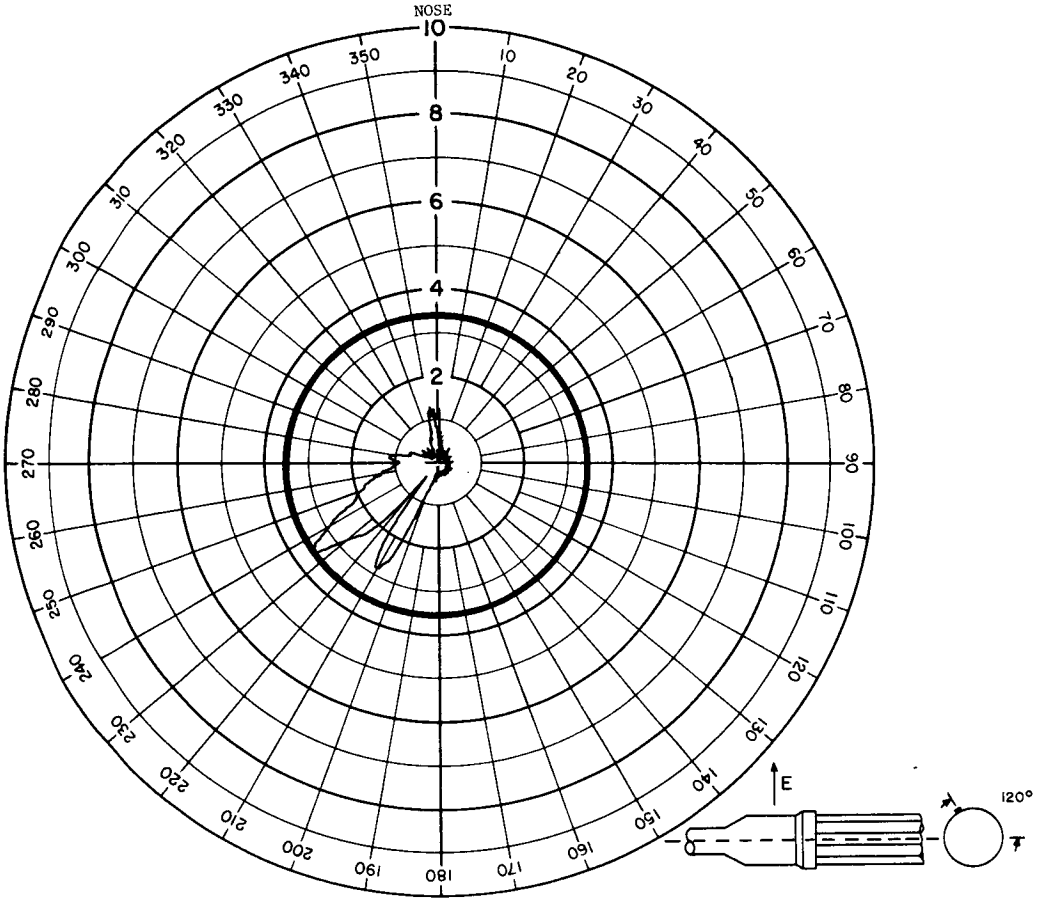


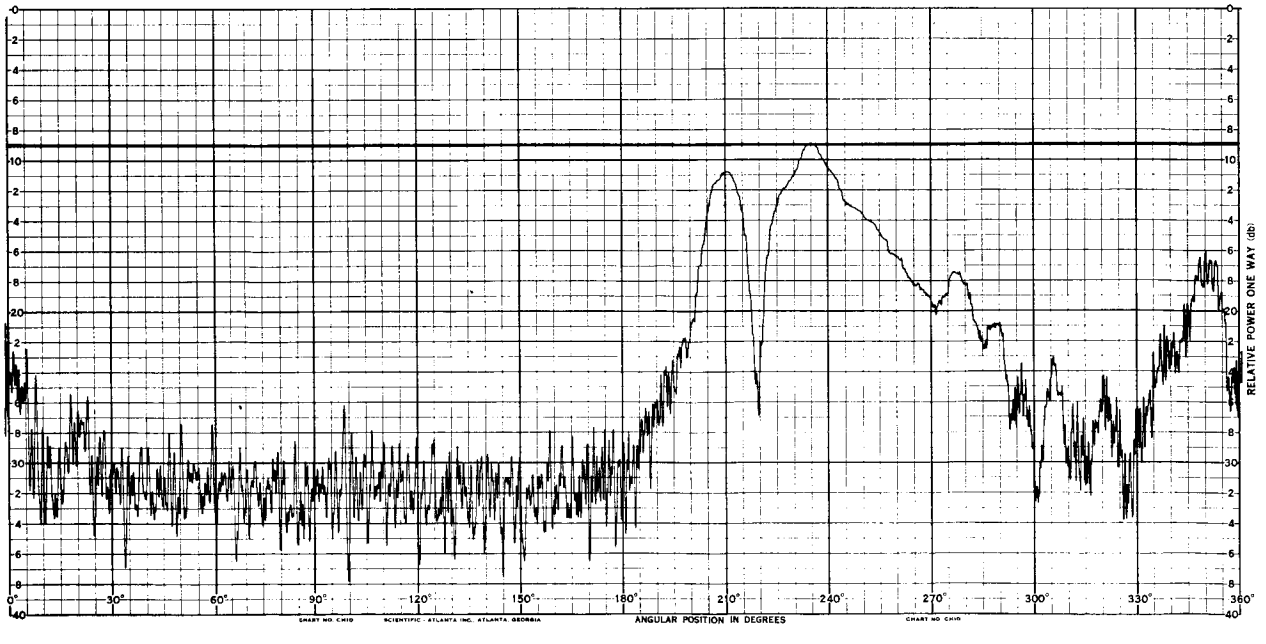
ANTENNA RADIATION PATTERN NO. 213-31

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



SA-5 MISTRAM ANTENNA SYSTEM

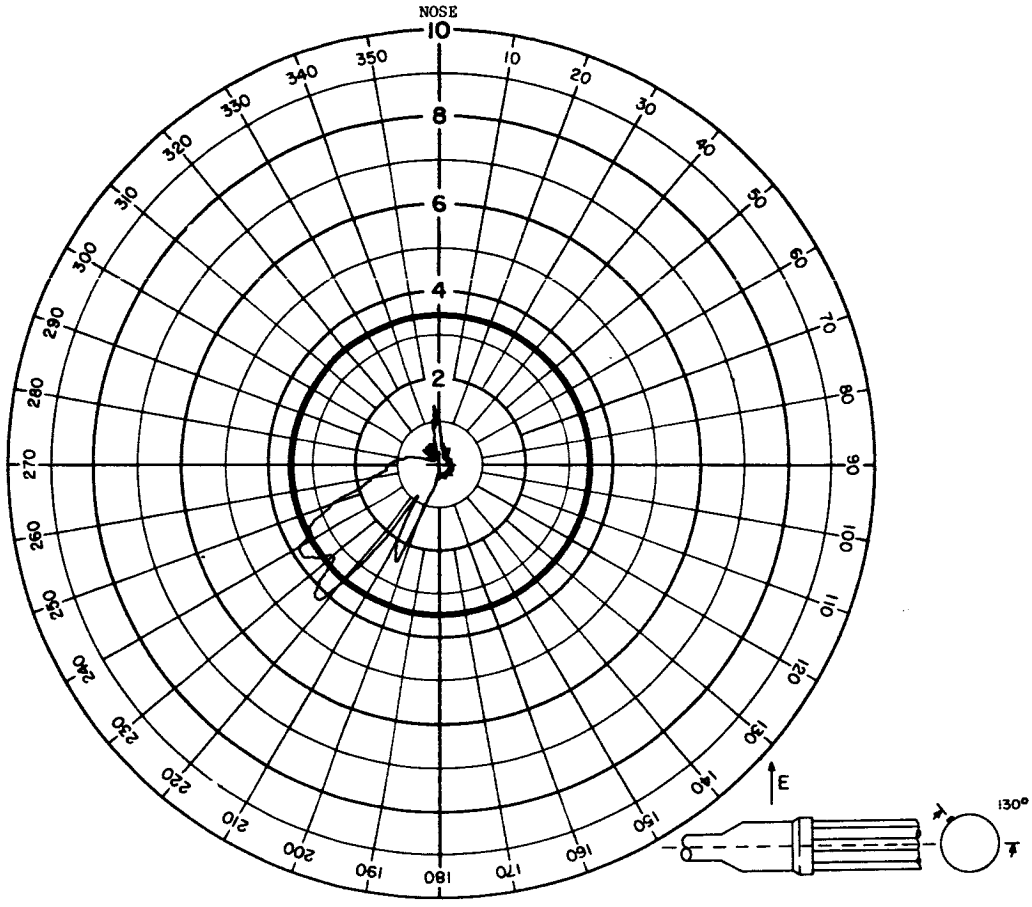


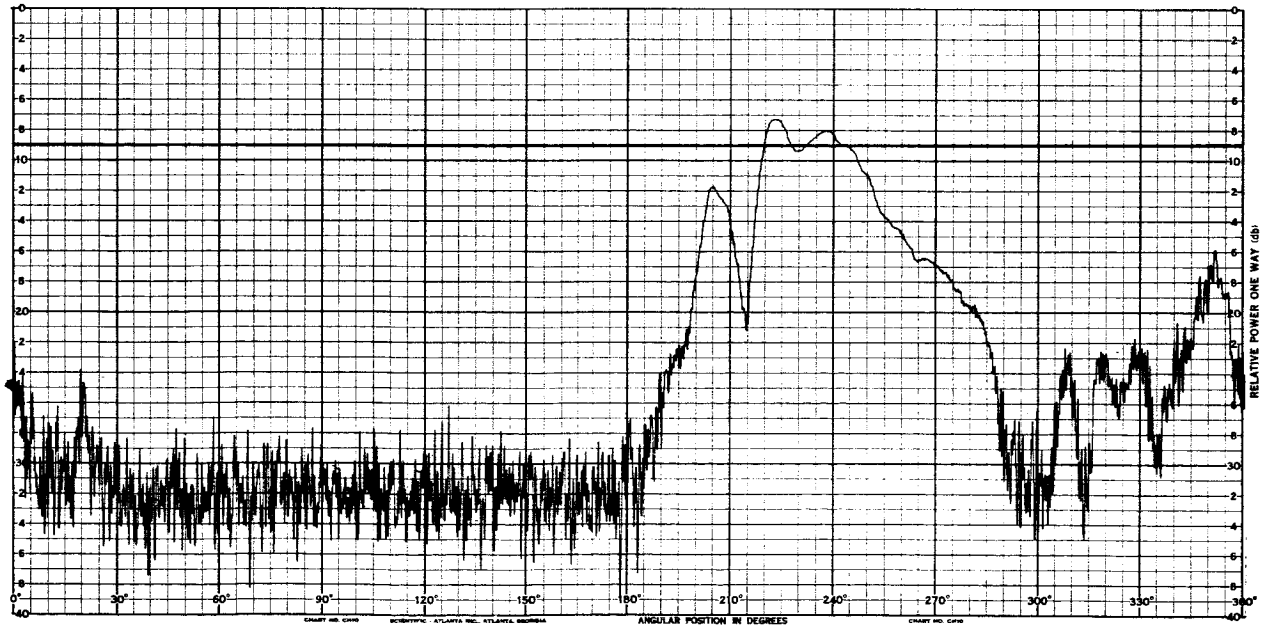


ANTENNA RADIATION PATTERN NO. 213-32

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

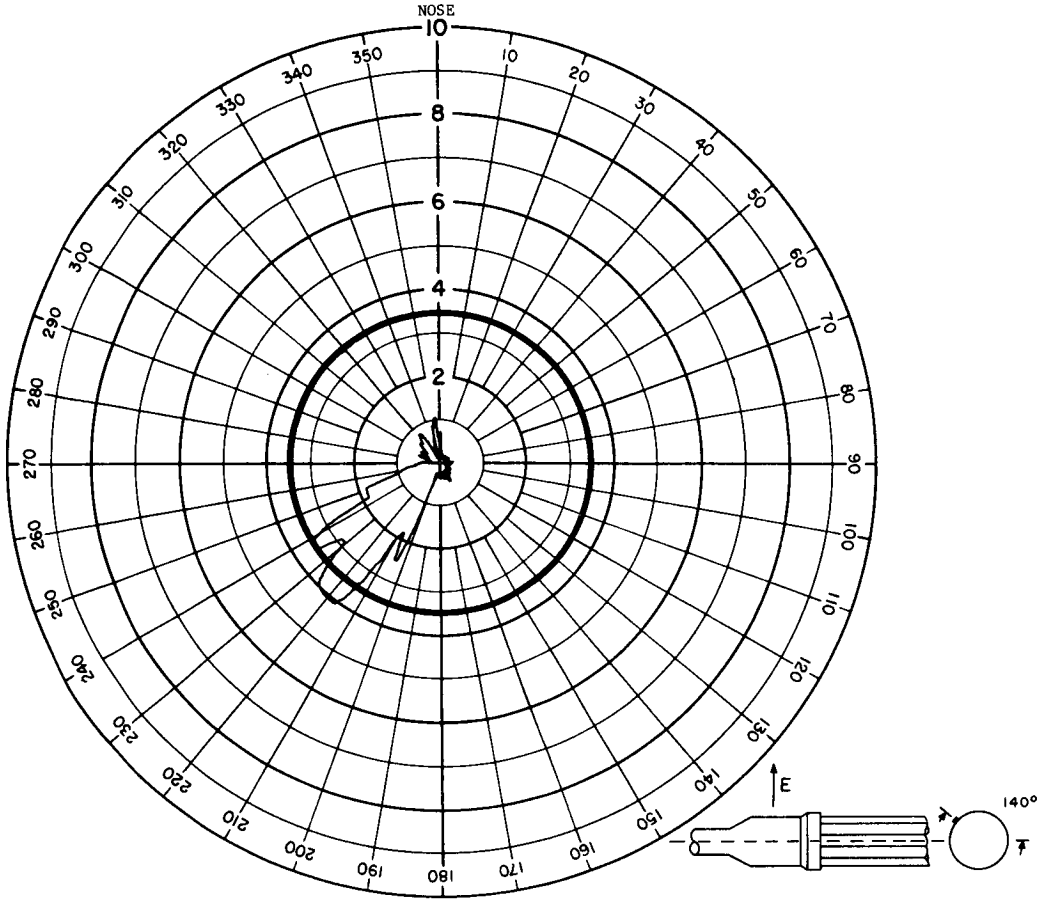
SA-5 MISTRAM ANTENNA SYSTEM

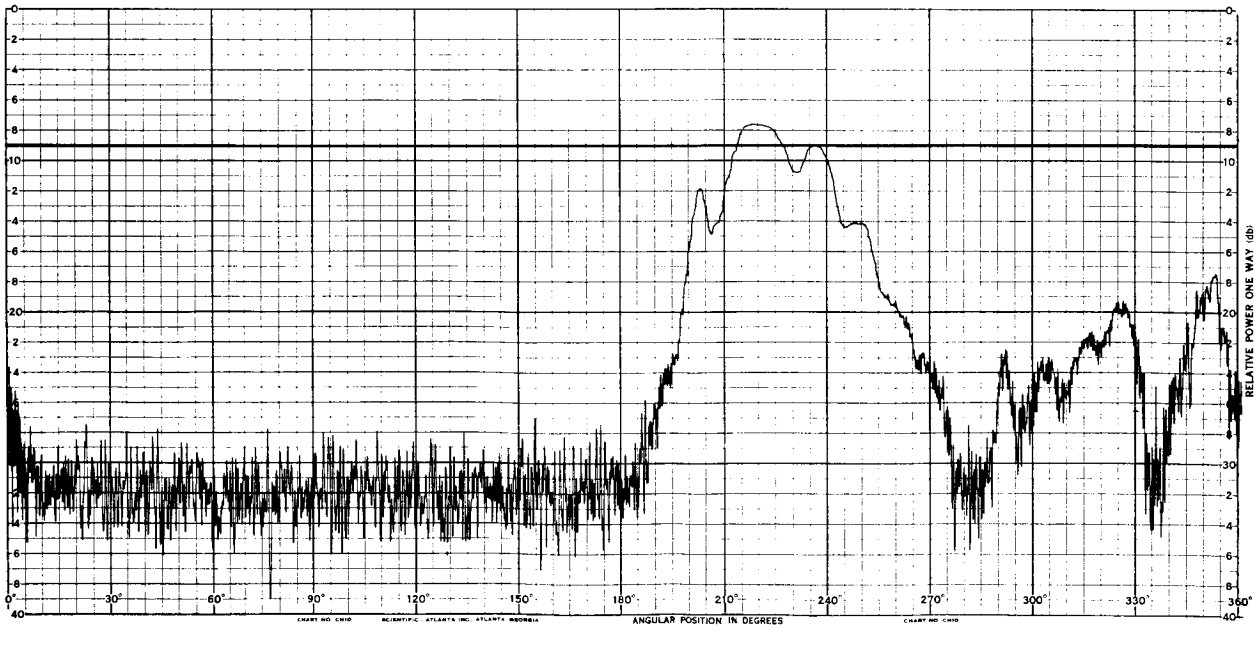




ANTENNA RADIATION PATTERN NO. 213-33

SA-5 MISTRAM ANTENNA SYSTEM

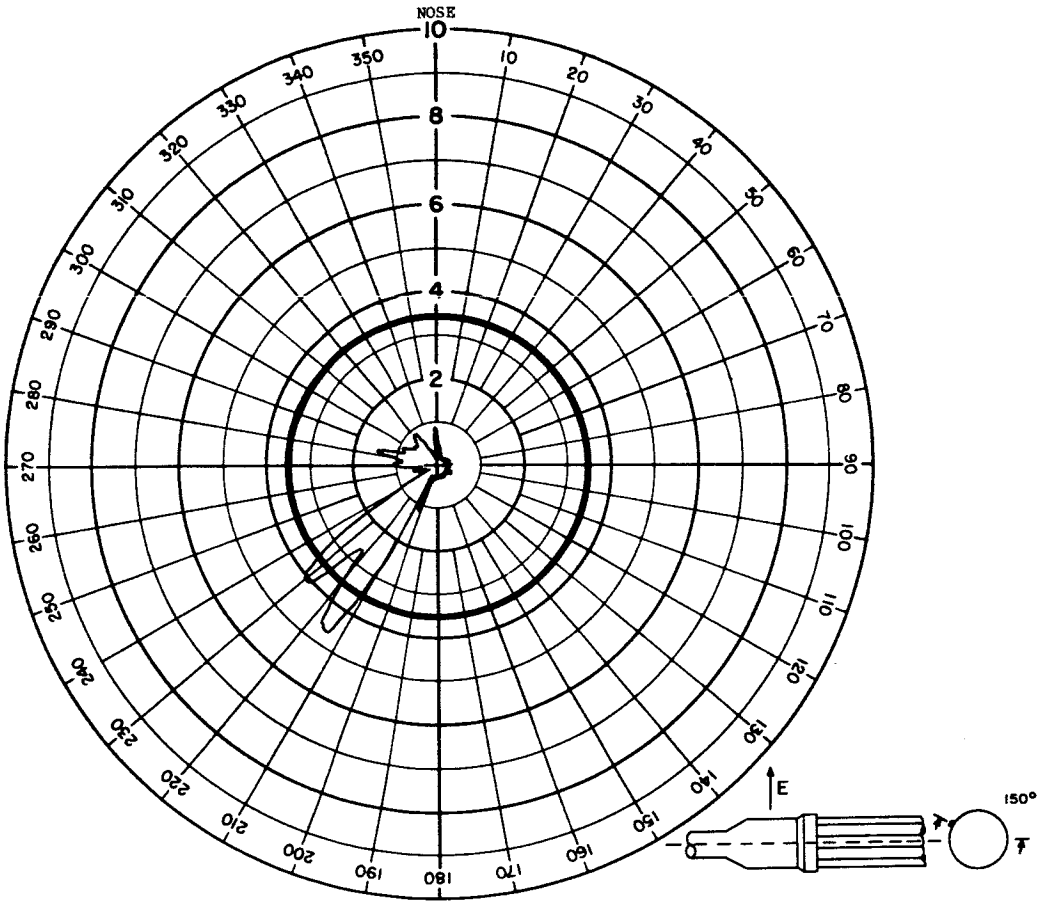


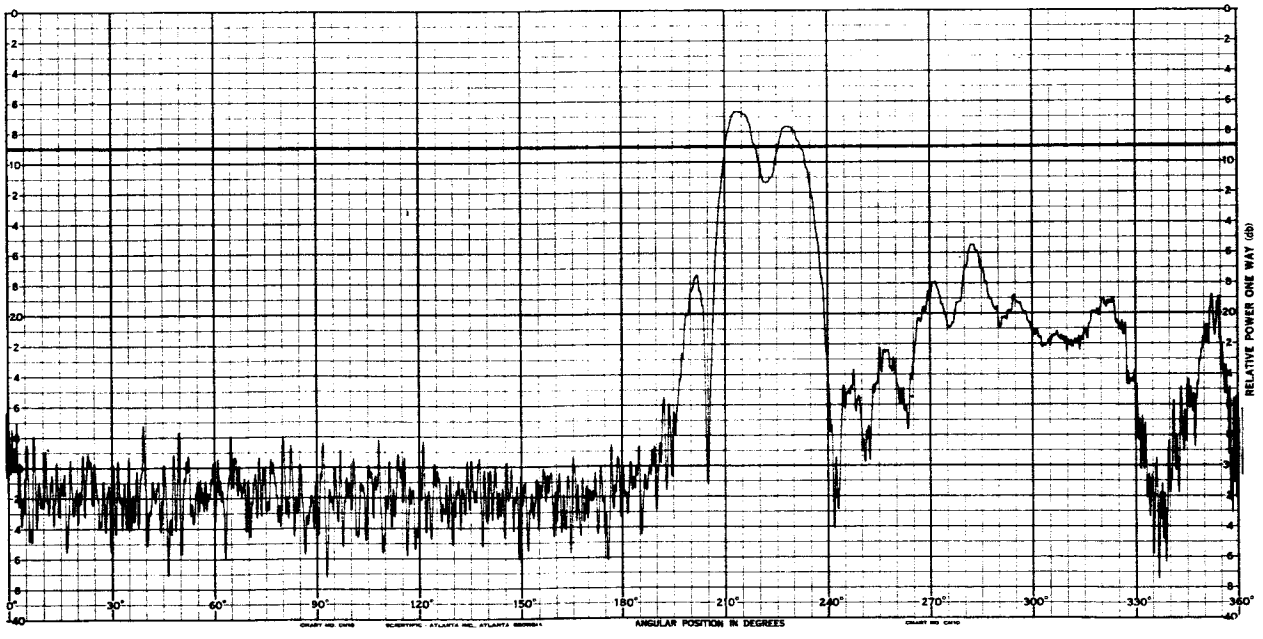


ANTENNA RADIATION PATTERN NO. 213-34

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

SA-5 MISTRAM ANTENNA SYSTEM

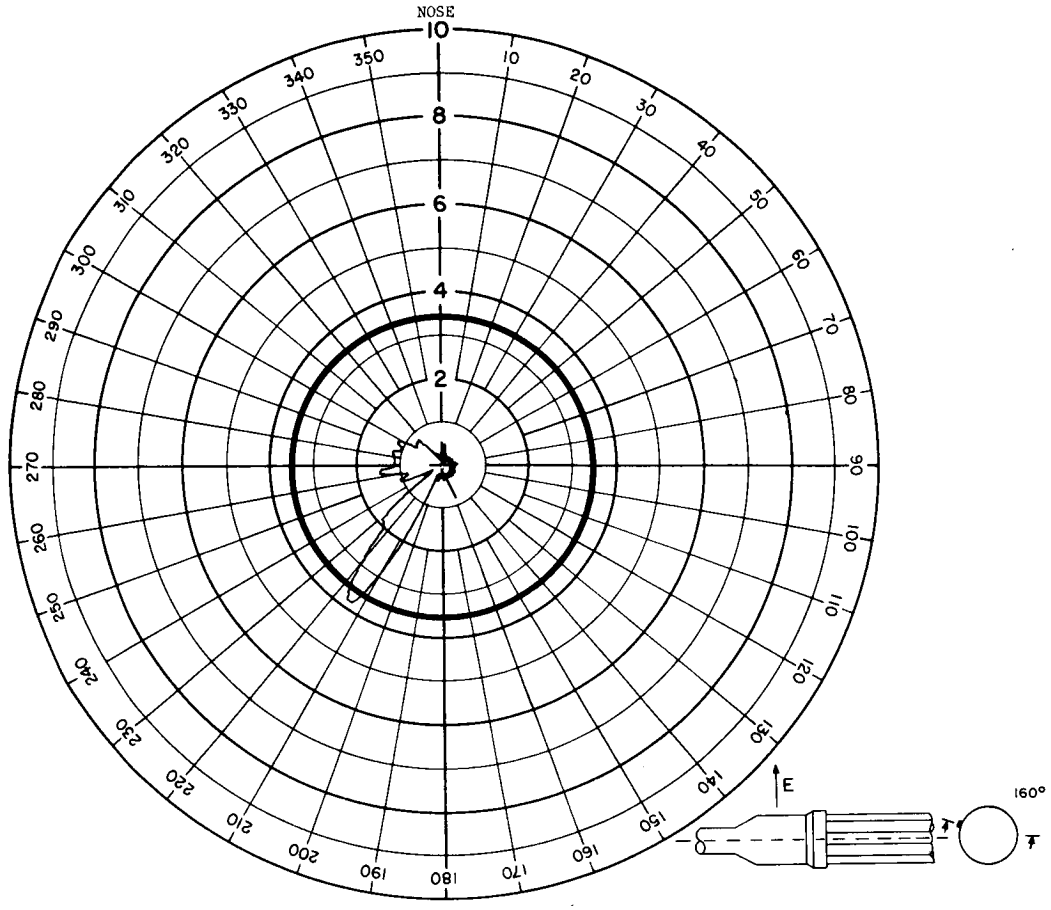


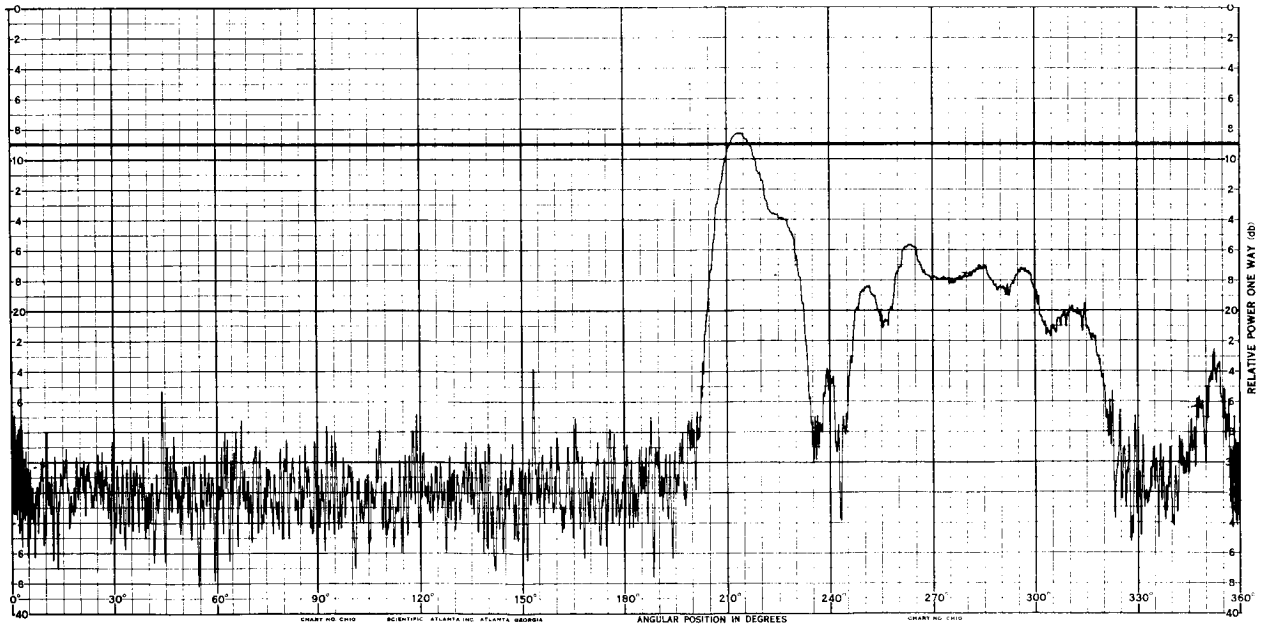


ANTENNA RADIATION PATTERN NO. 213-35

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

SA-5 MISTRAM ANTENNA SYSTEM

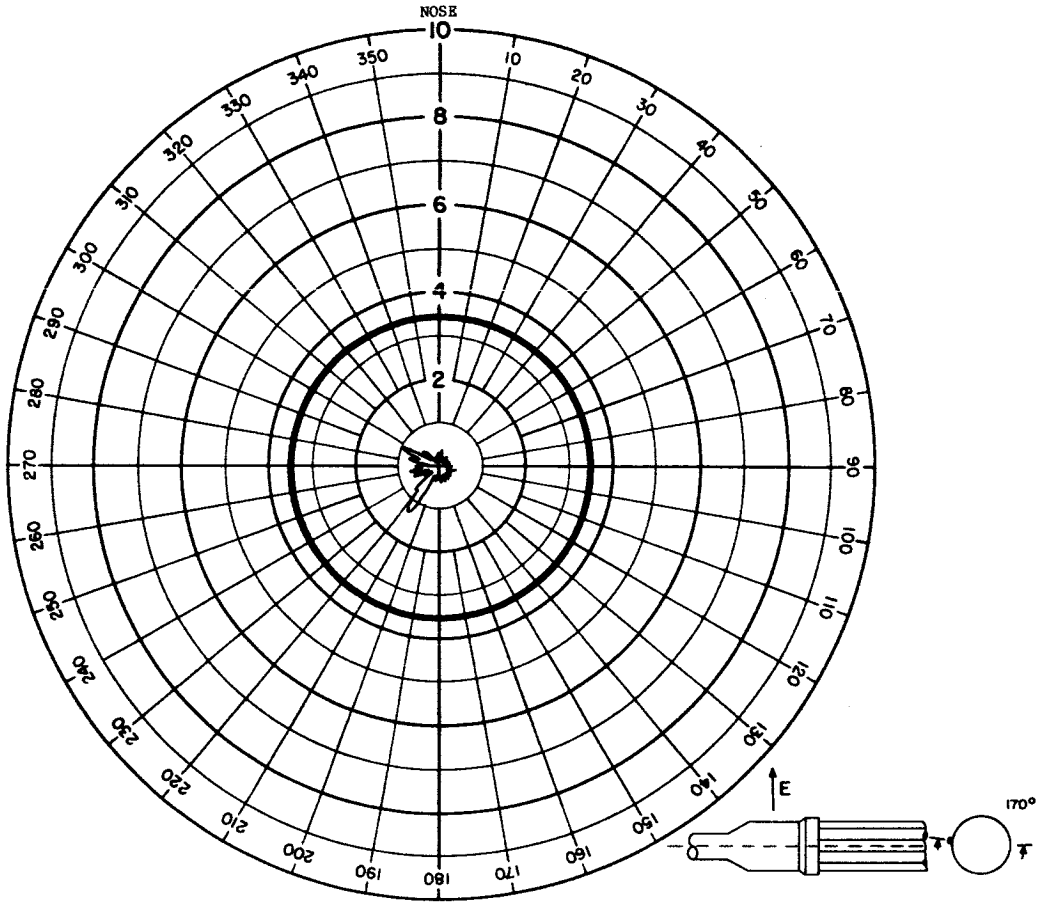


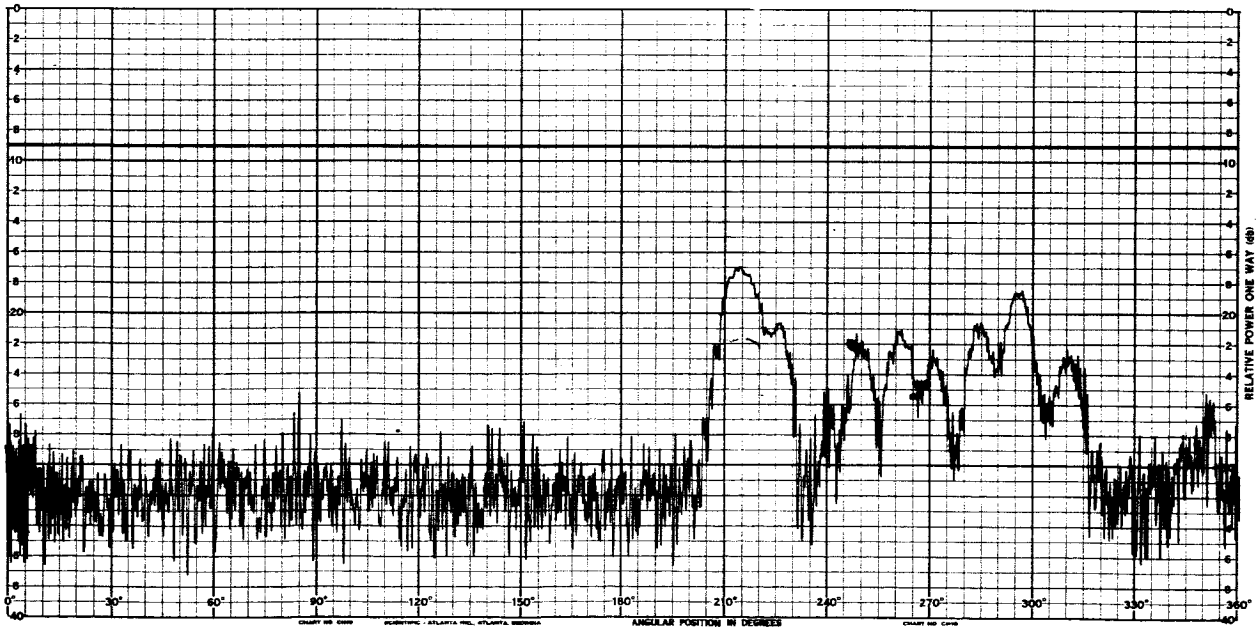


ANTENNA RADIATION PATTERN NO. 213-36

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

SA-5 MISTRAM ANTENNA SYSTEM

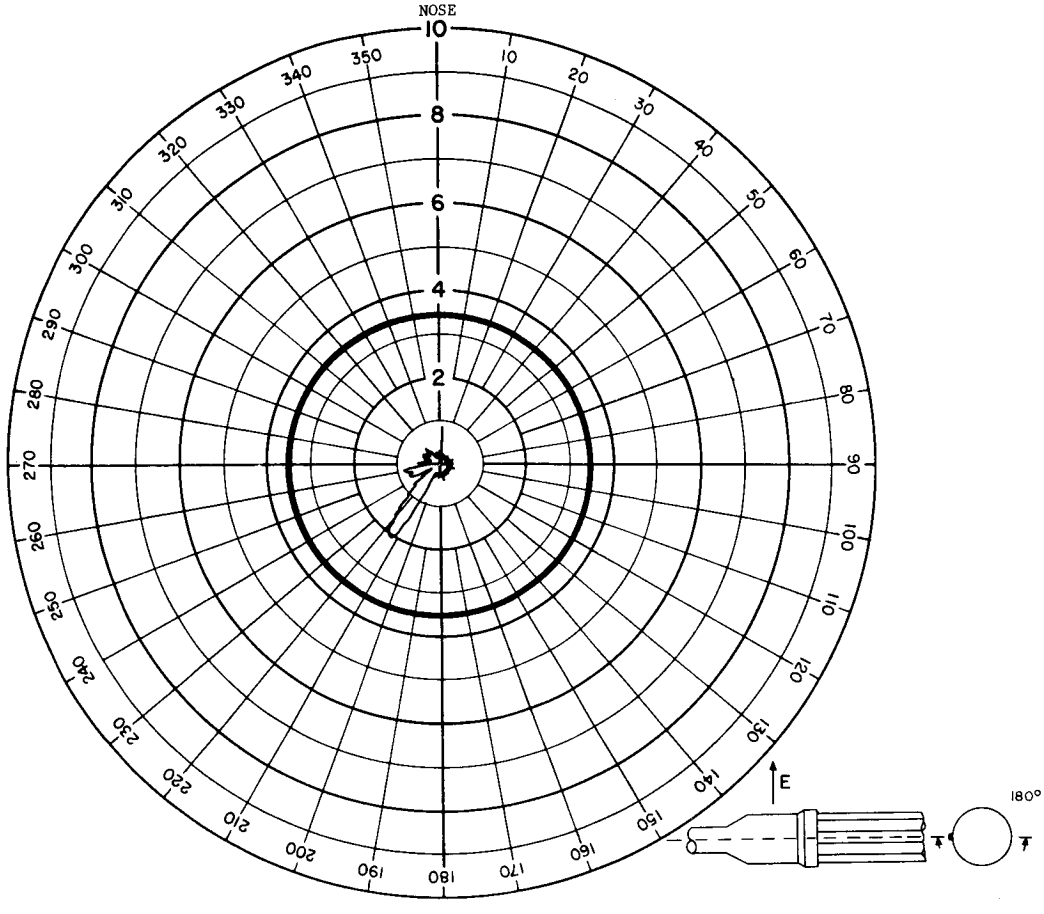


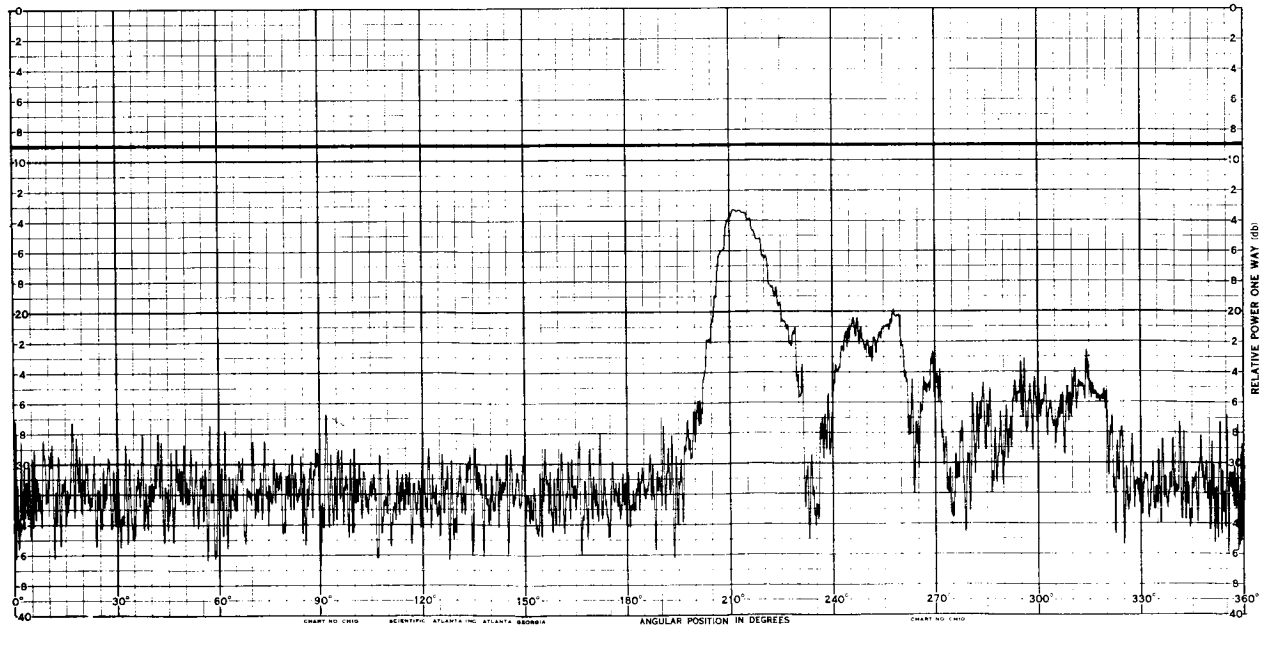


ANTENNA RADIATION PATTERN NO. 213-37

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

SA-5 MISTRAM ANTENNA SYSTEM





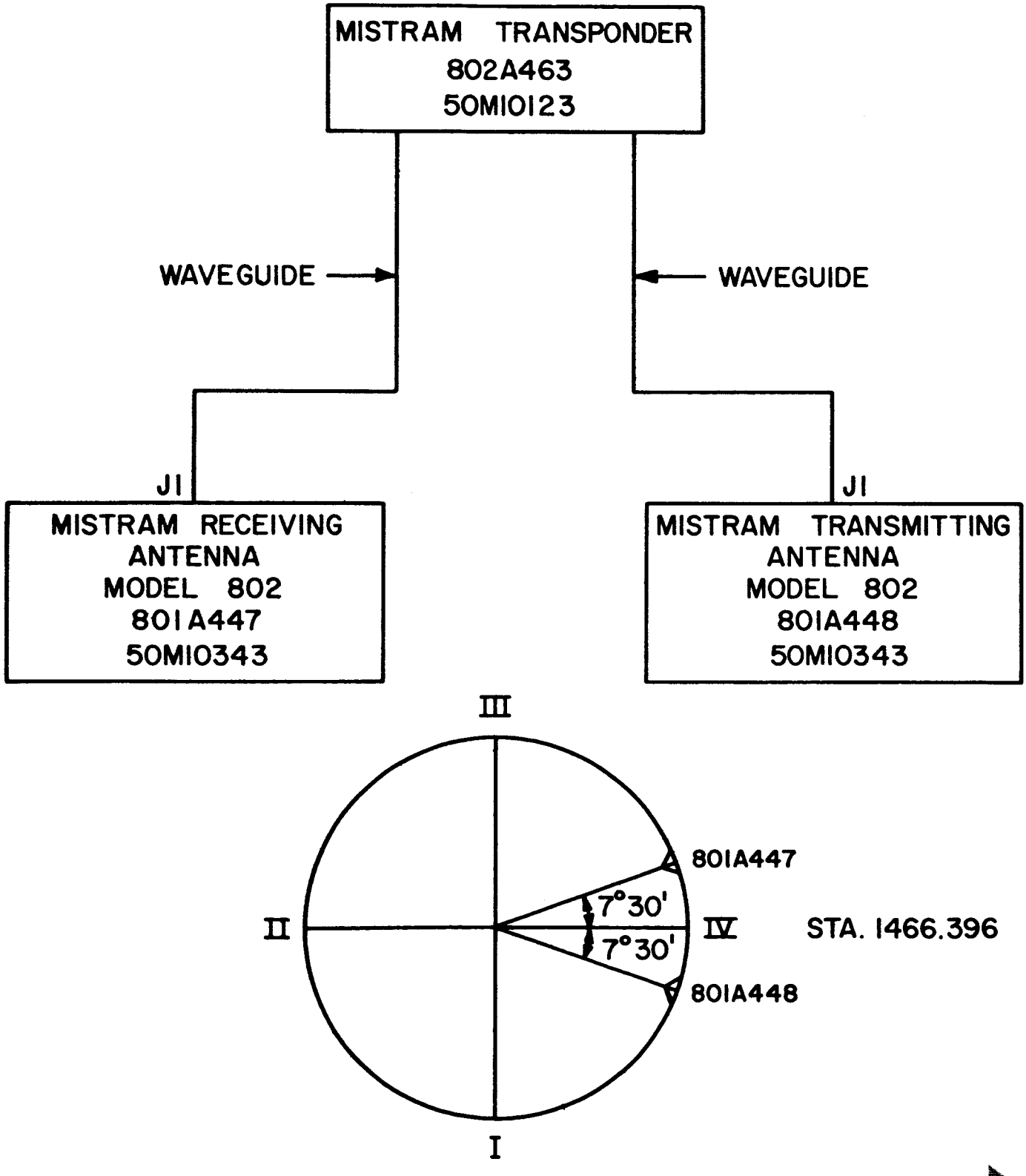
ANTENNA RADIATION PATTERN NO. 213-38

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

SA-5

MISTRAM ANTENNA SYSTEM

BLOCK DIAGRAM



SA-5 MISTRAM ANTENNA SYSTEM

CHECKOUT PROCEDURE

I. RECOMMENDED TEST EQUIPMENT

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

Name	Mfr. & Model No.
Standing Wave Indicator	HP-415B
Signal Generator	HP-620
Slotted Section	HP-810B
Field Strength Meter	Empire Devices
Detector Probe	--

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 larger, 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.

Antennas

1. VSWR - Connect the equipment as shown in figure 1. Disconnect each flexible waveguide at the transponder and connect the slotted section directly to the flexible guide. The VSWR shall not exceed 1.25:1.

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2. Radiation - Cover each antenna with a reflecting material (aluminum foil) to determine that they are operating. The VSWR should be high. Exact VSWR will be determined by the effectiveness of the short-circuiting foil.

3. Isolation - Inject a known level of power, at the transmitting frequency, into the transmitting antenna at the flexible guide test point. Disconnect the guide nearest the transponder. Measure the signal level at the receiving antenna input with the field strength meter or a sensitive receiver. The measured signal level shall not be less than -60 db with typical readings obtained between -60 and -65 db. Signals measured at -59 db will not be acceptable.

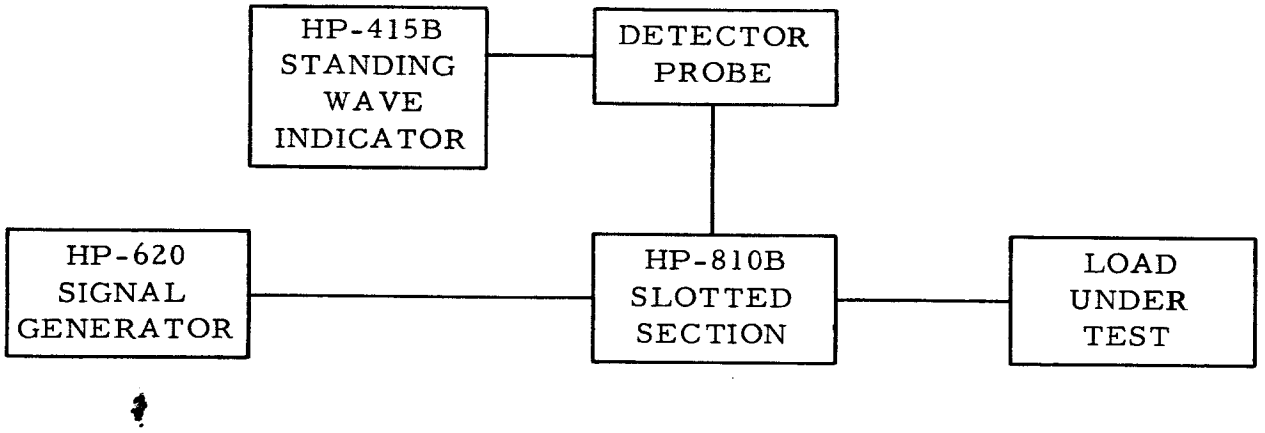


Figure 1.

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NOTES

