LARGE SPACE SYSTEMS ANTENNA TECHNOLOGY

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LESSONS LEARNED

- Build accuracy off by factor-of-two.
- Manual adjustment better than spec.
- Finite element model development.
- Antenna pattern calculations OK with notable exceptions.
- Surface RMS - sidelobe relation.
- Near field diagnostics.

CSEI
PROGRAM OBJECTIVE

Develop Large Space Antenna Technology

For Optimizing RF Performance

Using An Interdisciplinary Approach.
EXTEND 15-METER ANTENNA TESTS TO INCLUDE:

- Surface Control For Reflector Figure Improvement
- Adaptive Feed Techniques For Surface Distortion Compensation
- Integrated Experiments
  - Structural Dynamics
  - Electromagnetics
  - Controls
- Real Time Figure Measurements

**PHASE I TEST FACILITY**

*Bldg. 1293B*
SURFACE CONTROL CORDS

TRUSS HARD POINT

SET SCREW

SLEEVE

CABLE BEAD

LOWER STOP BRACKET

CORD GUIDE
WHAT FREQUENCIES TO USE

Gain (G)(db)

Freq. GHz

Diameter/Wavelength (D/\lambda)

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Freq. GHz

Diameter/Wavelength (D/\lambda)
WHAT FREQUENCIES TO USE

Gain (G)(dB)

- ε = 69 mils (Design)
- ε = 61 mils (Adj. Levels)
- ε = 150 mils (Before Adj.)

Freq. GHz

10 20 40 80 120

Diameter/Wavelength (D/λ)

10^1 10^2 10^3 10^4 10^5
RADIATION PATTERNS FOR HOOP/COLUMN REFLECTOR ANTENNA

E-PLANE (11.6 GHz)

H-PLANE (11.6 GHz)
SURFACE CHARACTERIZATION OF LARGE SCALE ANTENNAS

SURFACE-PLAN VIEW

15-Meter Deployable Antenna in Martin Marietta Near Field

ORIGINAL PAGE IS OF POOR QUALITY
Antenna Surface Target Locations

QUADRANT 4 SURFACE SHAPE
(Tie points only)
MULTIMODE NETWORK CONFIGURATION
ADAPTIVE FEED COMPENSATION

C-BAND

Gain
Loss, db

0.5
0

0
10
20
30
40
No. of Elements

61 Mils
36 Mils
17 Mils

CSEI OUTSIDE PARTICIPANTS

NC State
VPI

SDIO
RADC

JPL

Draper Lab.

15-Meter Antenna CSEI Program
LaRC

Harris Corp.

Lewis Research Center

Intelsat Corp./Foldes

Martin Marietta Aerospace

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TECHNOLOGY BENEFITS OF CSEI PROGRAM

- Expand RF Performance Data Base on Large Space Antennas
- Obtain Accurate Evaluation Of Interdisciplinary Analytical Codes
- Development of Surface Control & Adaptive Feed Concepts
- Verification of Design Methodology for Optimizing RF Performance for Large Aperture Systems