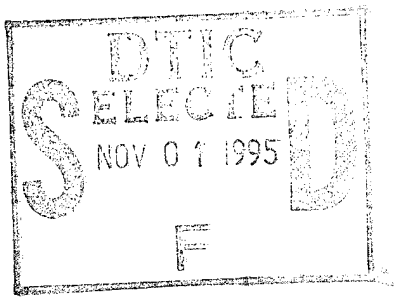
# FIELD EMITTER ARRAY BASED DICKE SWITCH ARRAY FOR MM-WAVE




**RADIOMETRIC SYSTEMS**

**Contract No: N00014-94-C-0243**

**MONTHLY REPORT NO. 3**

**Period Ending December 1994**

**Prepared For**

**BALLISTIC MISSLE DEFENSE ORGANIZATION**

**OFFICE OF NAVAL RESEARCH**

**CODE 251A**

**BALLSTON TOWER ONE**

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**Prepared By.**

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**TASK 1.3. Software Analysis of Array.**

The preliminary analysis of the array has been completed. Based on this analysis an array has been designed and a prototype circuit is being readied. The array will be first tested statically so that its performance is documented for comparison later. In order to conduct the testing of the array, illumination and receiving horn antennas at 30 Ghz have been designed . Once the transmission characteristics of the array have been completed, the final array with the switches will be implemented to test the overall objective of the program.

**TASK 2.0 Fabrication**

A preliminary design of the array has been completed. A protoype array has been layed out for fabrication in order to test its transmission characteristics. The Experiment will consist of the array illuminated by circular horn for the source and the energy will be received by a second circular horn, after it has passed through the array. The design of the horns have also been concluded and submitted for fabrication.

**Plans for next month:**

During the next month the testing of the switch will be completed. It is expected to complete the testing of the switch array in its transmission mode.

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Figures 1 and 2 shown the specificatons of the planar array and its radiation pattern. Figures 3,4,5 and 6 detail the design parameters associated with the test horn antennas.

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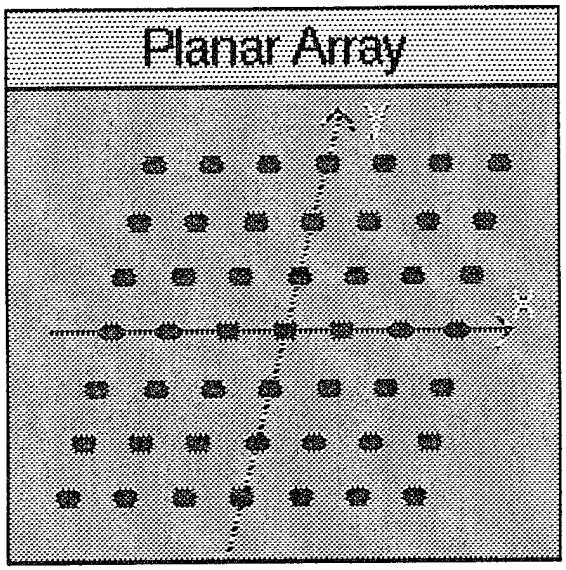
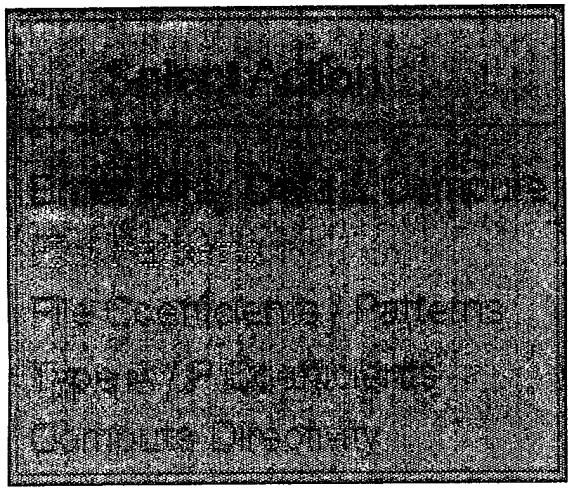



Array Specifications

Number of elements in x: 2 in y: 2
Element spacing (cm) in x: .5 in y: .5
Operating frequency (GHz): 30

Amplitude Distribution: Uniform

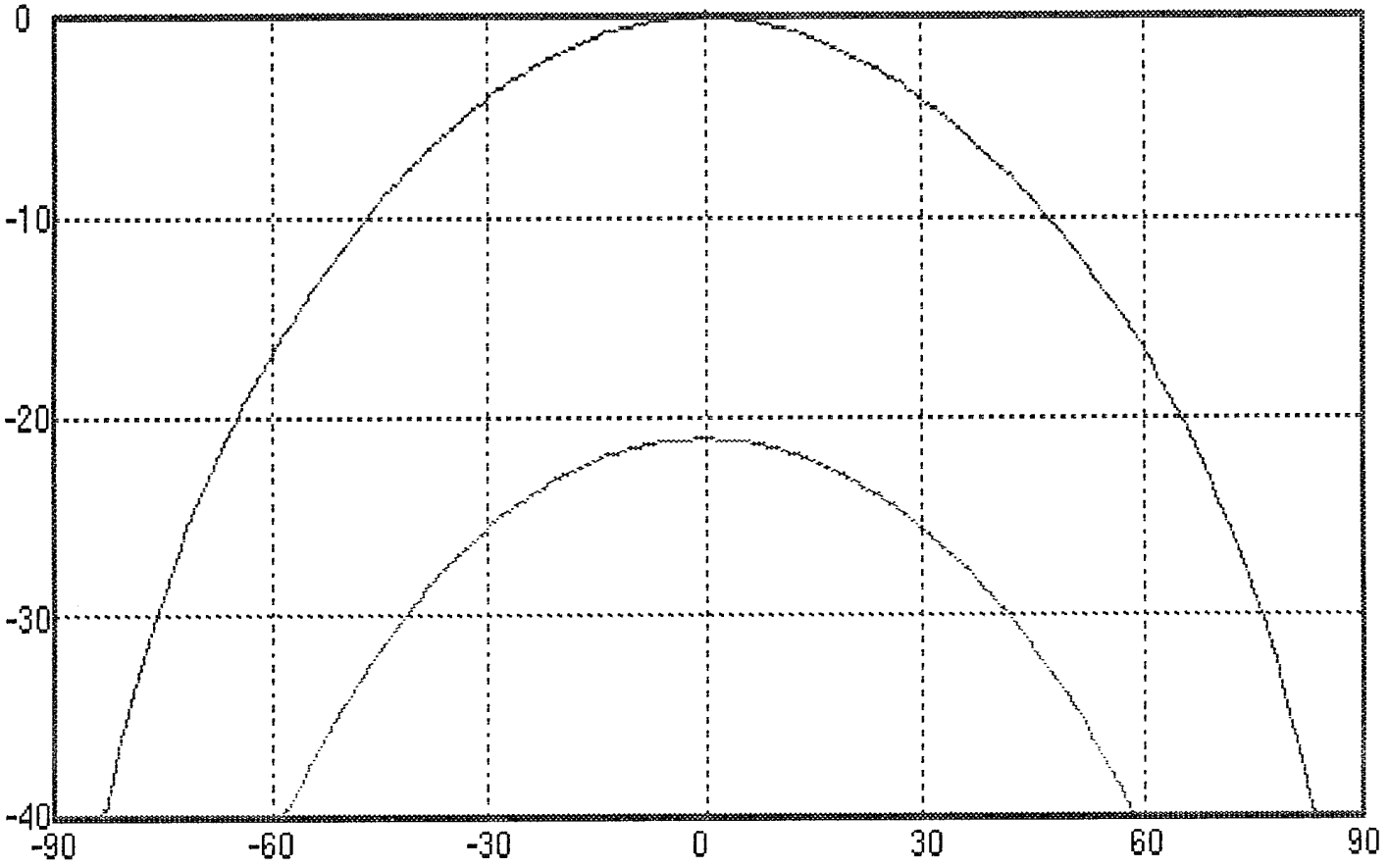
Phase Distribution: Broadside Beam
Phase shift in x: 0.0 in y: 0.0
Scan angle: θ= 0.0 ϕ= 0.0 deg.

Element type: Rectangular Patch
Polarization of elements: (X/Y)? X
Resonant length (cm): .3
Patch width (cm): .3

Pattern cut: ϕ (deg)= 5
Pattern increment (deg): 1

Use ↑↓ and Enter for menus; Esc to backup or quit

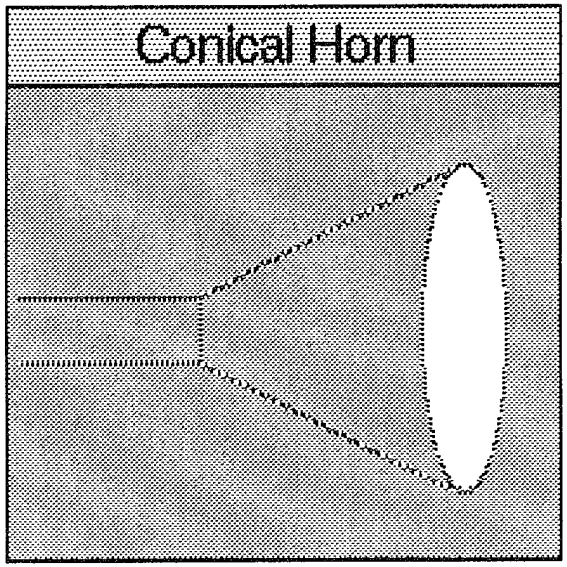
FIGURE 1: 2 x 2 ARRAY AT 30 GHz




Use ↔ to move cursor
PrtSc for EGAD
Esc to quit

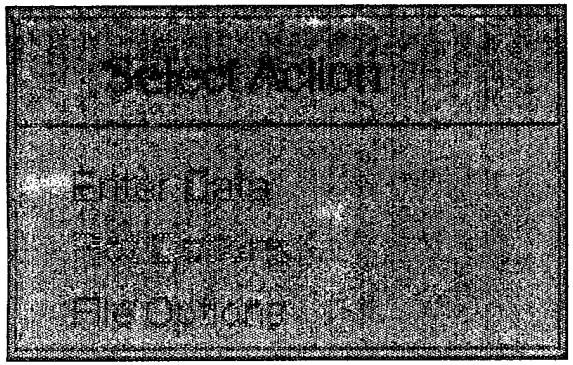
E-theta = 0.00 dB
E-phi = -21.16 dB
at Theta= 0.0 deg.

FIGURE 2: Pattern Associated with Figure 1




Input Data

Enter the frequency (GHz): 30
Enter aperture radius (cm): 3.9
Enter axial horn length (to apex)(cm): 20
Enter pattern increment (deg): 2

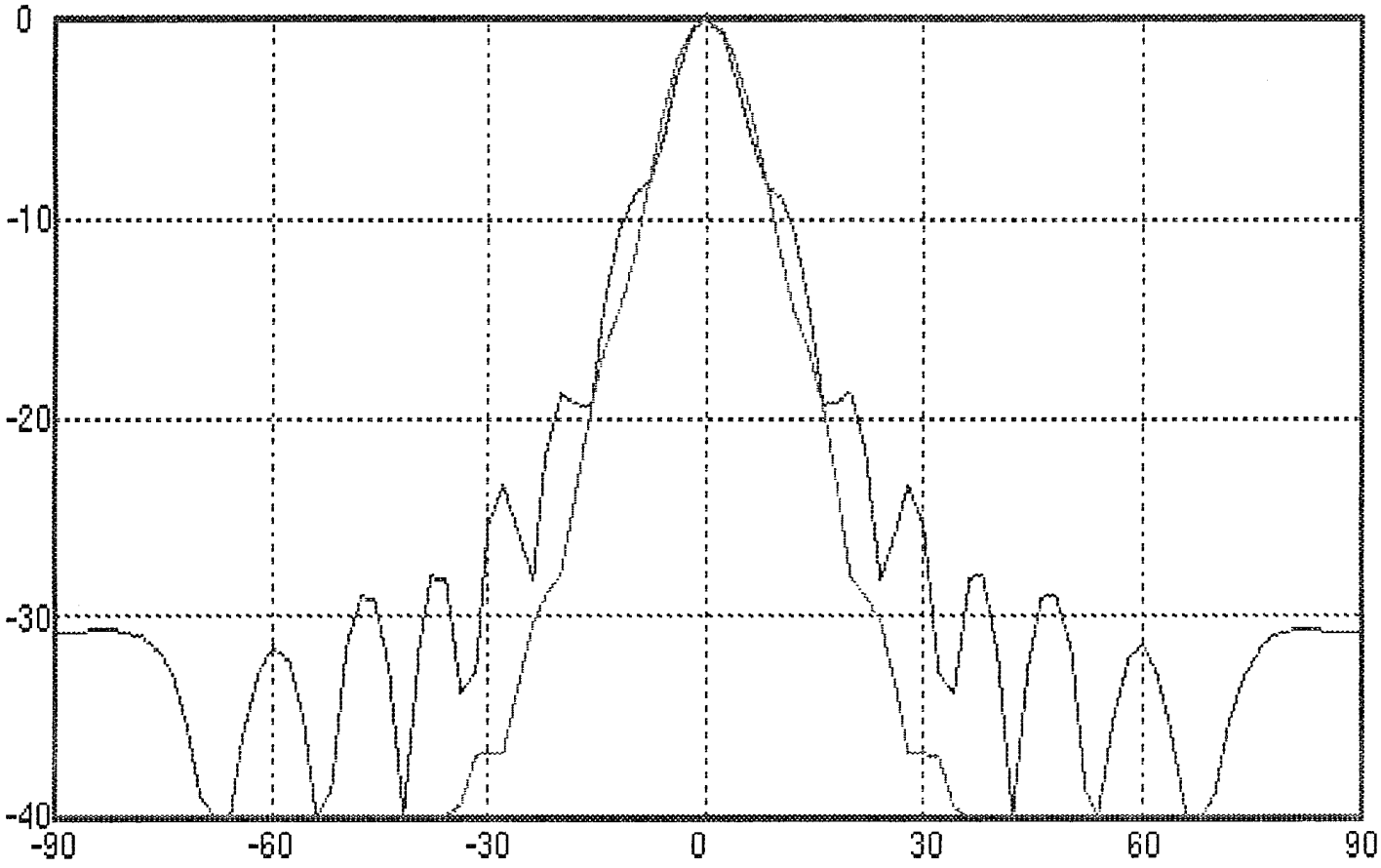



Horn Characteristics

Maximum phase error is 136.9°
Optimum aperture radius is 3.9 cm
The directivity is 24.8 dB

Use ↑↓ and Enter for menus; Esc to backup or quit

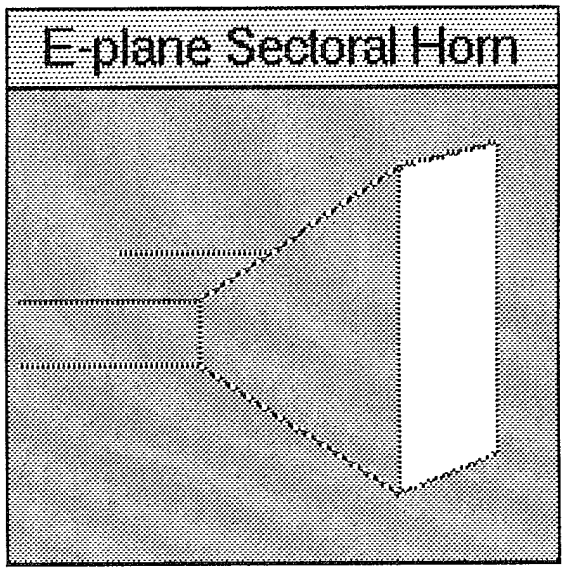
Figure 3: Illuminating Horn at 30 GHz




Use ↔ to move cursor
PrtSc for EGAD
Esc to quit

E-plane = 0.00 dB
H-plane = 0.00 dB
at Theta= 0.0 deg.

Figure 4: Pattern of Illuminating Conical Horn




Input Data

Enter the frequency (GHz): 30
Enter E-plane aperture dimension (cm): 6
Enter H-plane aperture dimension (cm): 6
Enter axial horn length (to apex)(cm): 20
Enter pattern increment (deg): 2

Plot Options

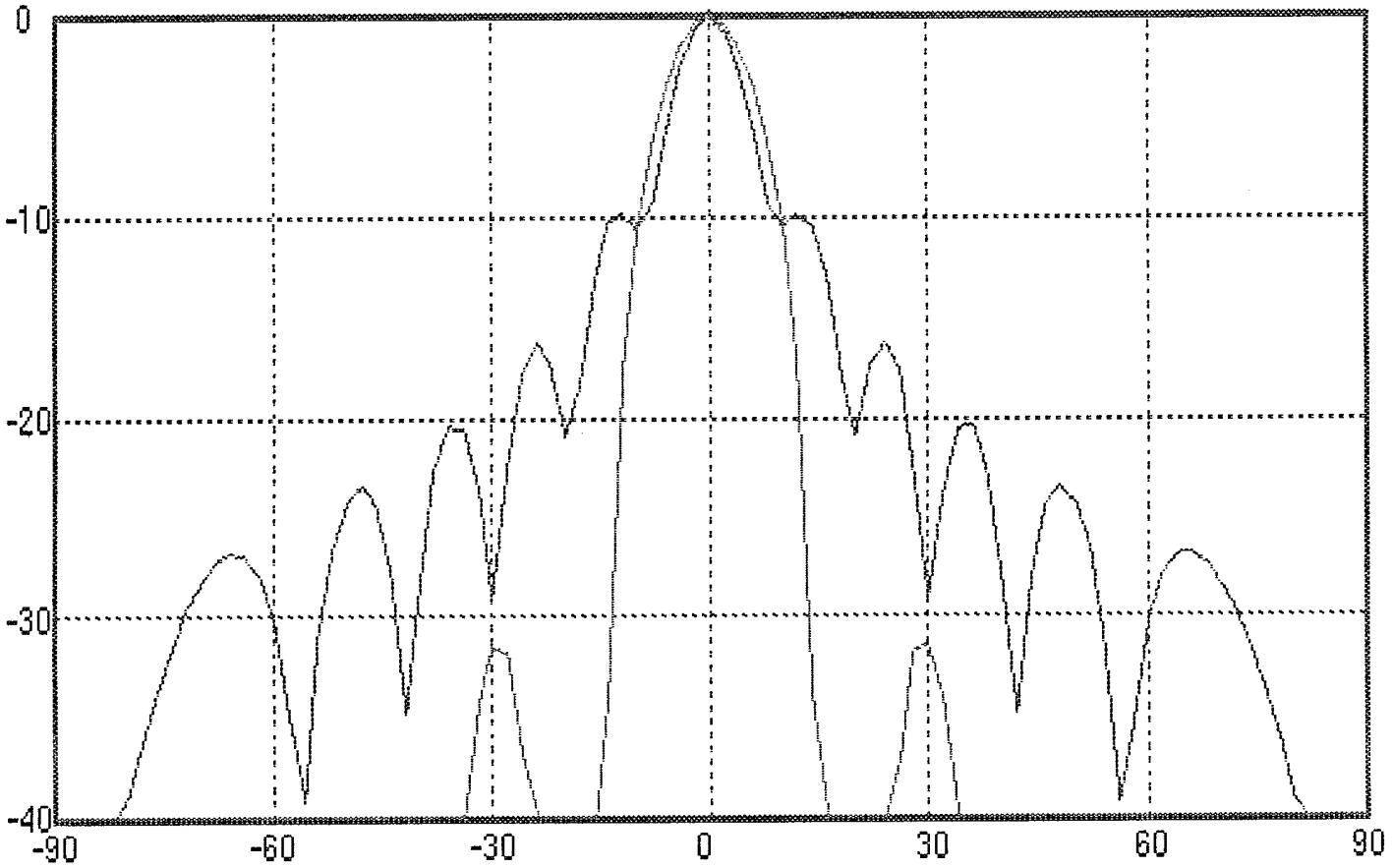
Plot type (P/R): R

Horn Characteristics

Maximum phase error is 81.0°
Optimum E-plane dimension is 6.3 cm
The directivity is 24.9 dB

Use ↑↓ and Enter for menus; Esc to backup or quit

Figure 5: illuminating Horn at 30 GHz




Use ↔ to move cursor
PrtSc for EGAD
Esc to quit

E-plane = 0.00 dB
H-plane = 0.00 dB
at Theta= 0.0 deg.

Figure 6: Pattern of Rectangular illuminating Horn at 30 GHz.

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2. The Defense Technical Information Center received the enclosed report (referenced below) which is not marked in accordance with the above reference.

**MONTHLY REPORT #3**
**N00014-94-C-0243**
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**BASED DICKE SWITCH ARRAY FOR**
**MM-WAVE**

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