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### Selection of an antenna site for a 35-foot whip on DDH-280 for project TOBACCO

Wong, J. Y.; Gibson, G.

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SELECTION OF AN ANTENNA SITE FOR A 35-FOOT  
WHIP ON DDH-280 FOR PROJECT TOBACCO

CANADA INSTITUTE FOR S.T.I.  
N.R.C.C.

FEB 23 1992

- J. Y. WONG AND G. GIBSON

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SELECTION OF AN ANTENNA SITE FOR A 35-FOOT  
WHIP ON DDH-280 FOR PROJECT TOBACCO

— J.Y. Wong and G. Gibson —

OTTAWA  
SEPTEMBER 1970

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### ABSTRACT

Two locations, one forward of the foremast, the other between the funnels, have been suggested for a proposed 35-foot whip installation on DDH-280 for Project TOBACCO. A radiation pattern study was carried out on a  $\frac{1}{48}$  scale model to determine the optimum location. Results show that there is little to choose between the two sites.

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## SELECTION OF AN ANTENNA SITE FOR A 35-FOOT WHIP ON DDH-280 FOR PROJECT TOBACCO

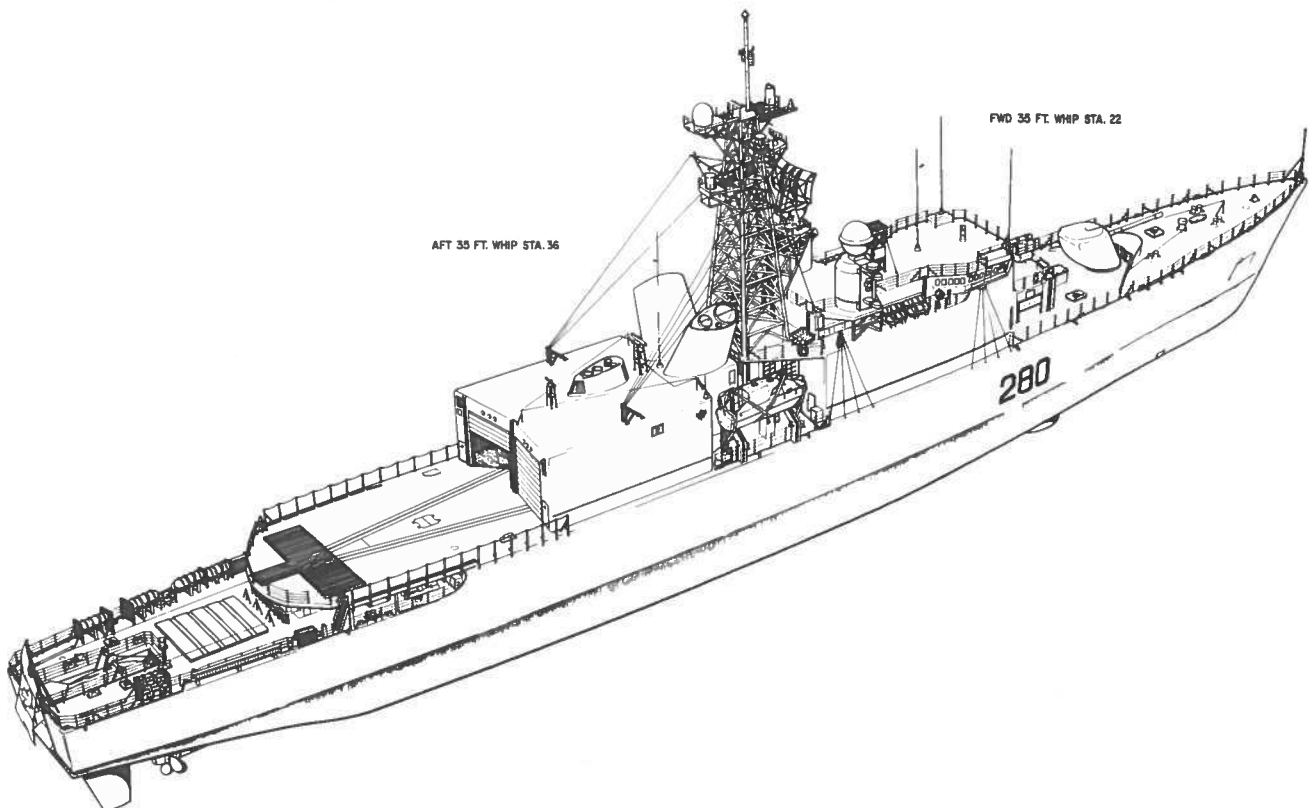
— J.Y. Wong and G. Gibson —

### Introduction

A number of antenna locations have been suggested for a proposed 35-foot whip installation on DDH-280 for project TOBACCO; however, for practical reasons the choice has been limited to two possible sites, namely,

- i) station 36 — aft of the foremast between the twin funnels
- ii) station 22 — forward of the foremast immediately in front of the TV antenna mast.

A drawing of the DDH-280 showing the two proposed locations is given in Fig. 1. In an attempt to determine which location gives the best performance, a radiation pattern study was carried out on a  $\frac{1}{48}$  scale model of the DDH-280.



*Figure 1 Proposed locations of 35-foot whip on DDH-280*

## Measurements

Three-dimensional patterns were obtained for two whips. For each frequency both  $E_\theta$  and  $E_\phi$  components of the radiated field were measured for a 5-degree increment in the vertical angle  $\theta$ , but only the principal-plane patterns which are plotted on a relative decibel scale are included in this report. To facilitate the pattern analysis, the patterns were also recorded digitally on paper tape. An IBM 360 computer was used to calculate the antenna figure of merit based on the method given in Reference 1. For each frequency,

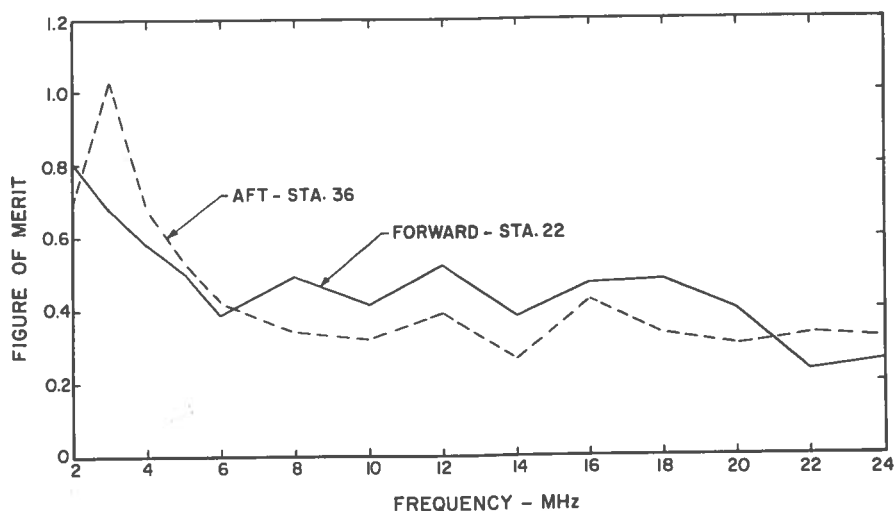


Figure 2 Figure of merit of 35-foot whip for the two locations

the figure of merit  $\zeta$  was compared with that of a  $\lambda/4$  base-fed monopole which is assumed to have a value of unity. The results are shown in Fig. 2. Generally speaking there is little significant difference between the two whips except at 3 MHz. For this frequency, the performance of the aft whip is significantly better and this fact becomes obvious if one refers to the radiation patterns.

## Conclusions

Based on our model measurements, there is little to choose between the aft and forward locations, and the final choice of a site will have to be made on considerations other than antenna performance.

## Reference

1. Wong, J.Y. An improved method for calculating the figure of merit of a non-uniform radiation pattern. NRC Report ERB-829, July 1969.

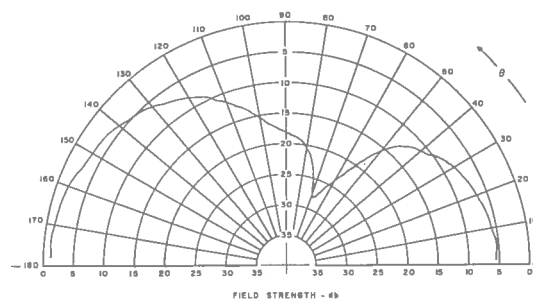
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## **Radiation Patterns**

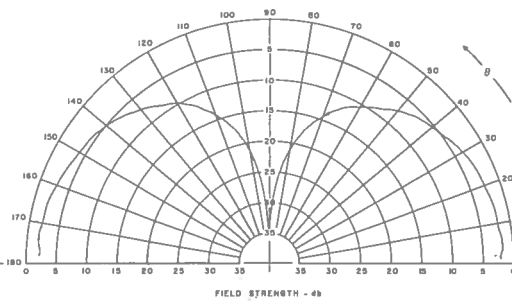
**Aft location – Station 36**



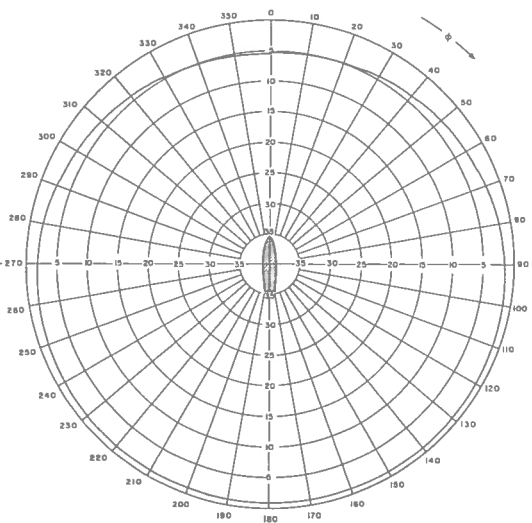
$E_{\theta}$



FWD-AFT

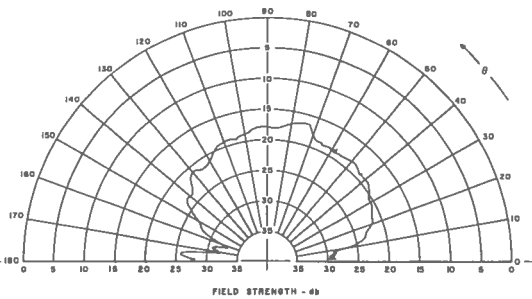
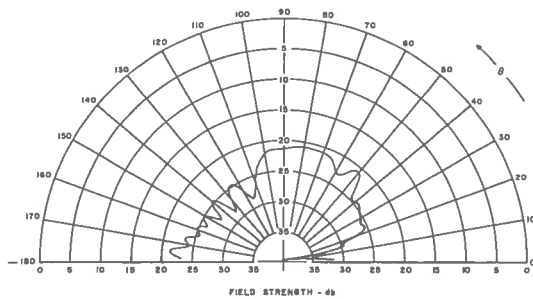


PORT-STBD



$\theta = 0^{\circ}$

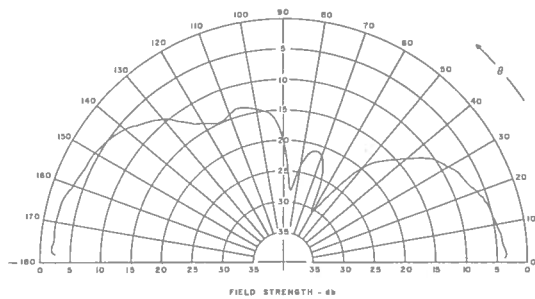
$E_{\phi}$



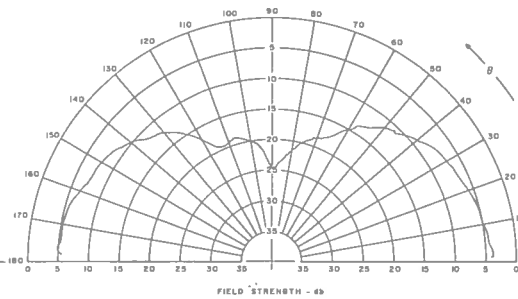
ANTENNA : AFT LOCATION - STA. 36

FREQ. : 2 MHz

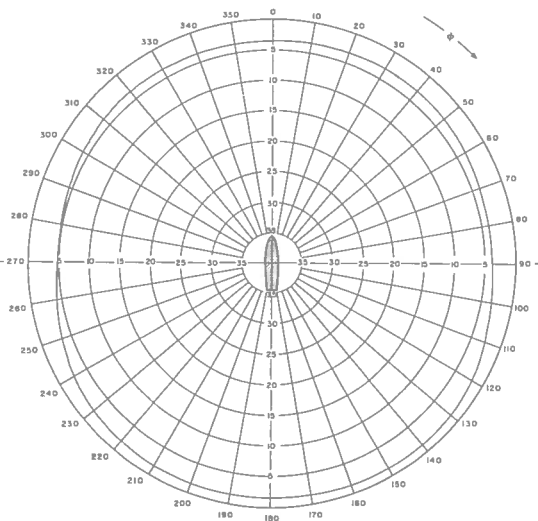
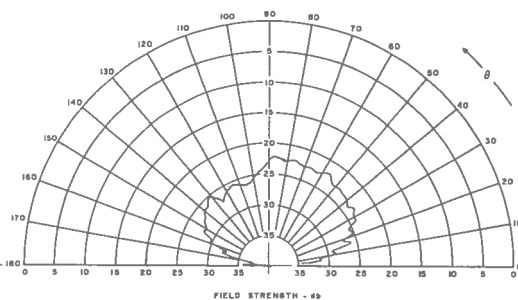
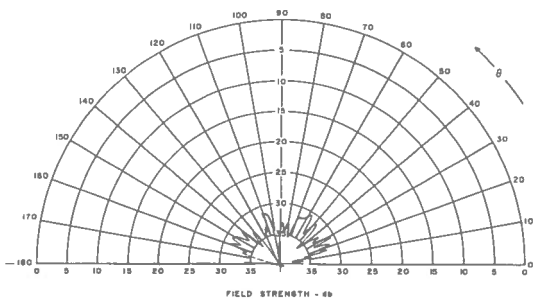
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TERMINATED IN 50Ω

$E_{\theta}$ 

FWD-AFT



PORT-STBD

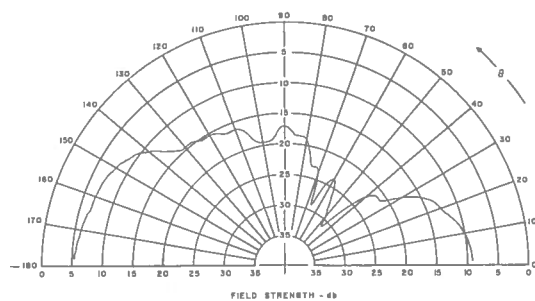
 $\theta = 0^\circ$  $E_{\phi}$ 

ANTENNA : AFT LOCATION - STA.36

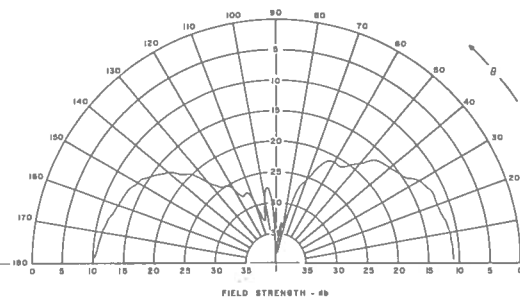
FREQ. : 3 MHz

REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

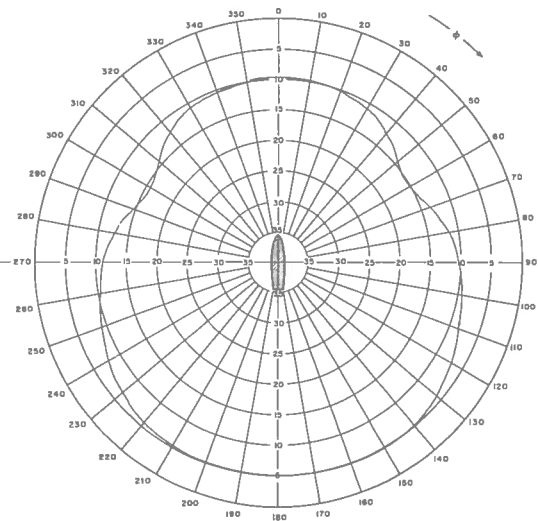
$E_\theta$



FWD-AFT

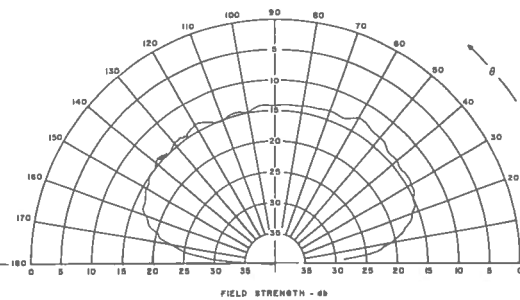
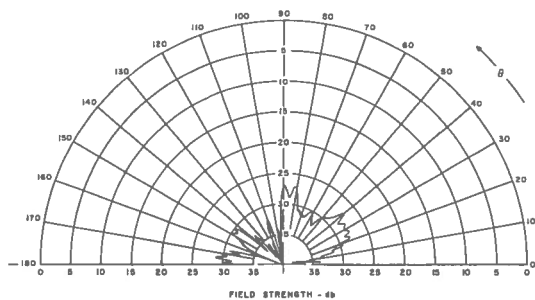


PORT-STBD

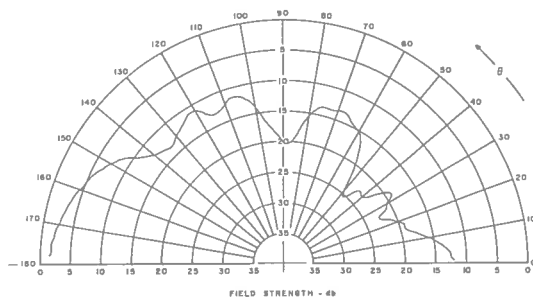


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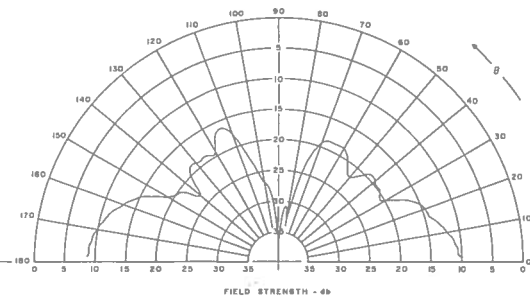
$E_\phi$



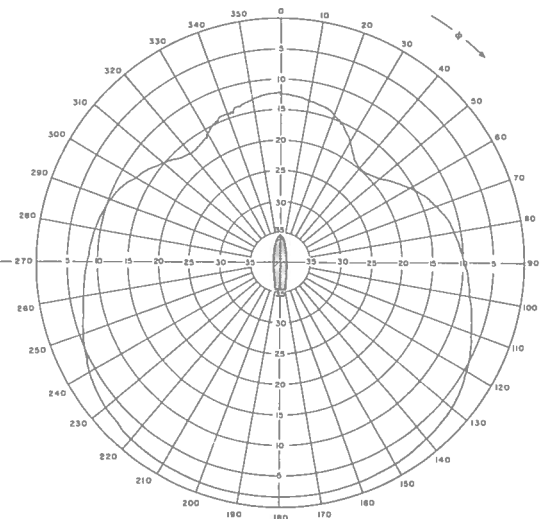
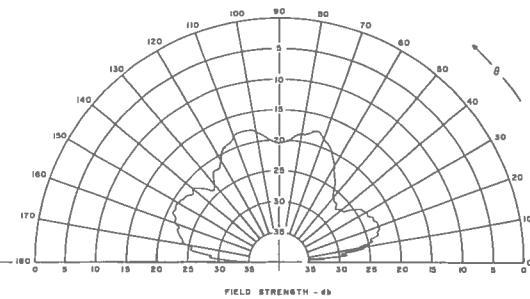
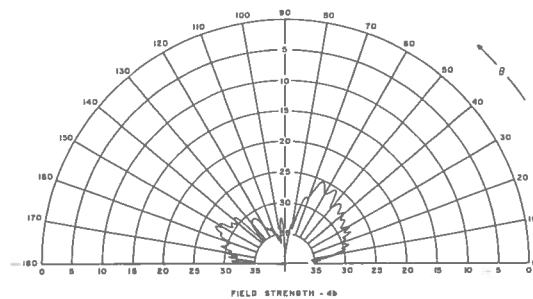
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 FREQ. : 4 MHz  
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 TERMINATED IN 50 $\Omega$

$E_\theta$ 

FWD-AFT



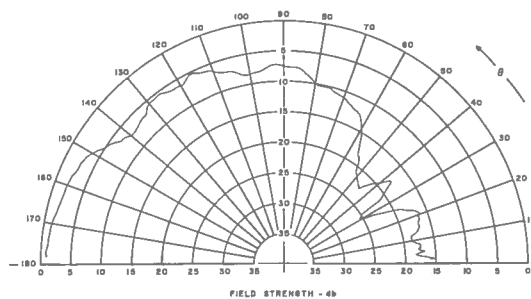
PORT-STBD

 $E_\phi$ 

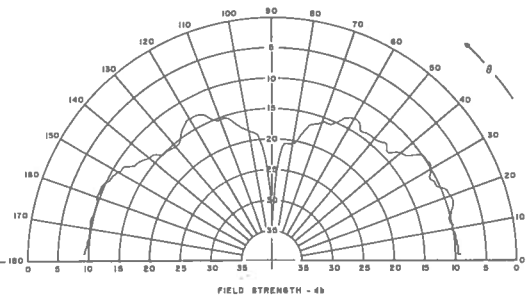
ANTENNA : AFT LOCATION - STA.36

FREQ. : 5 MHz

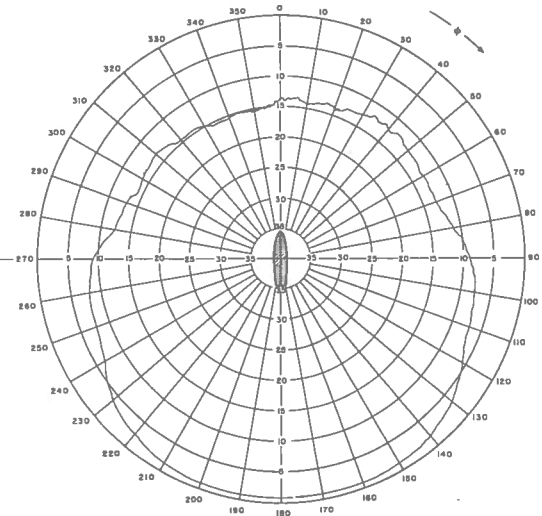
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TERMINATED IN 50 $\Omega$

$E_\theta$ 

FWD-AFT

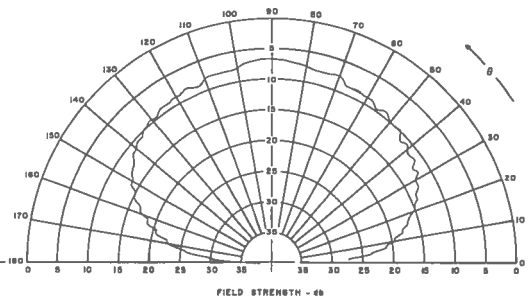
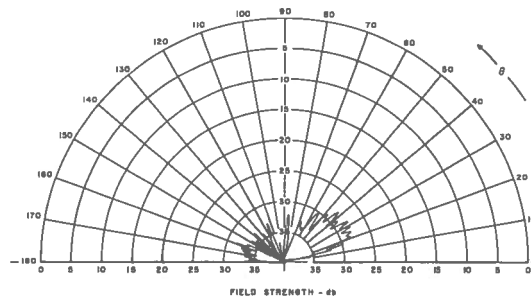


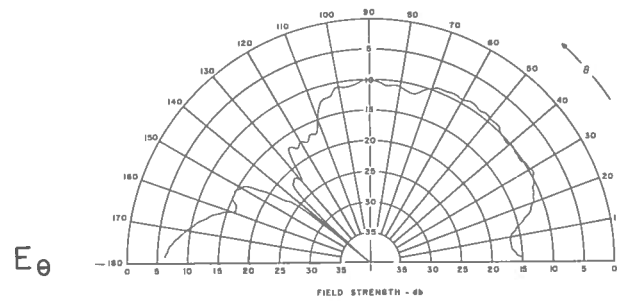
PORT-STBD

 $\theta = 0^\circ$ 

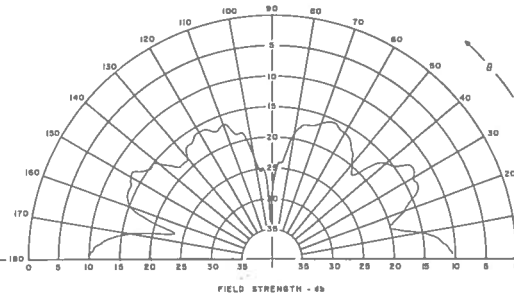
ANTENNA : AFT LOCATION - STA. 36

FREQ. : 6 MHz

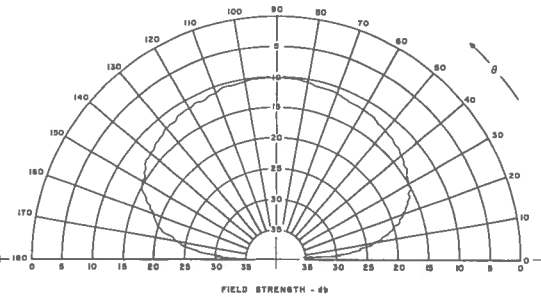
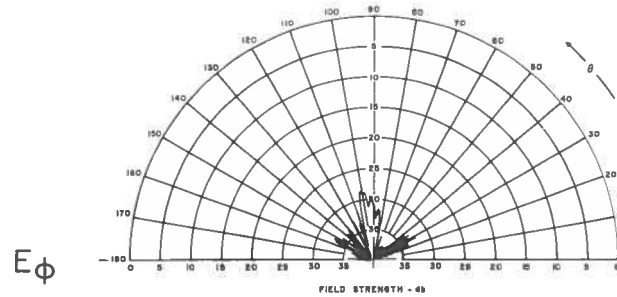
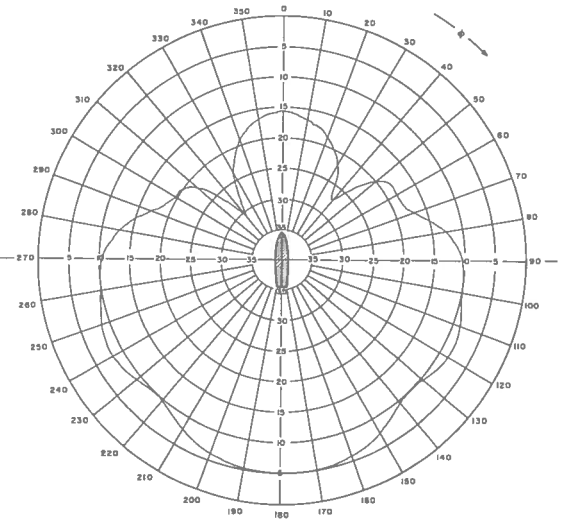
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TERMINATED IN 50Ω $E_\phi$ 



FWD-AFT



PORT-STBD

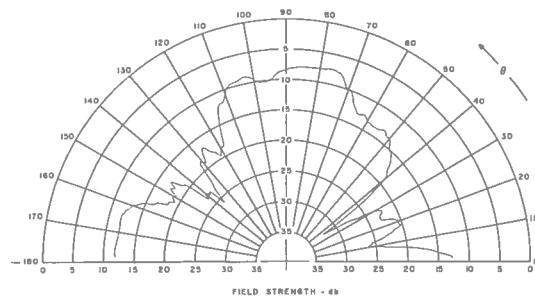


ANTENNA : AFT LOCATION - STA.36

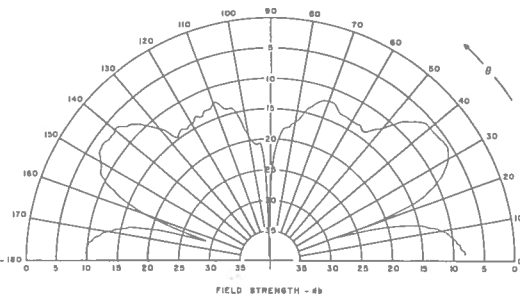
FREQ. : 8 MHz

REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω

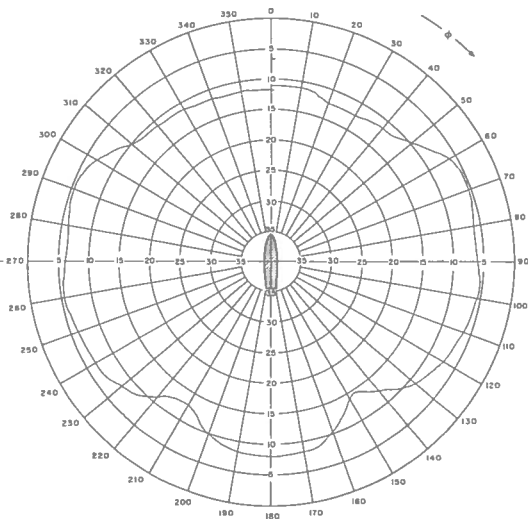
$E_{\theta}$



FWD-AFT

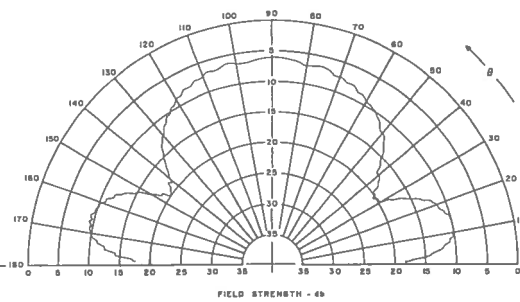
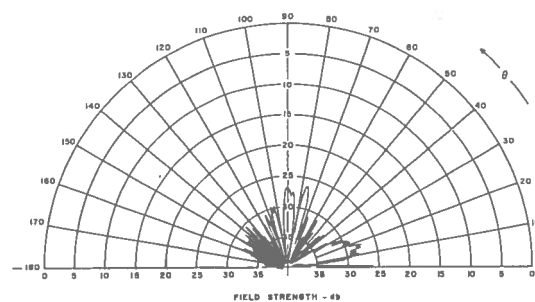


PORT-STBD



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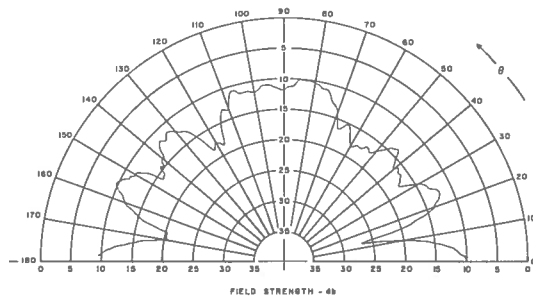
$E_{\phi}$



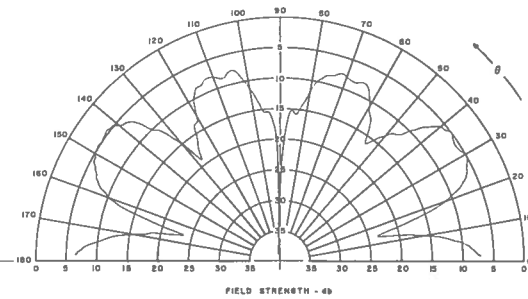
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FREQ. : 10 MHz

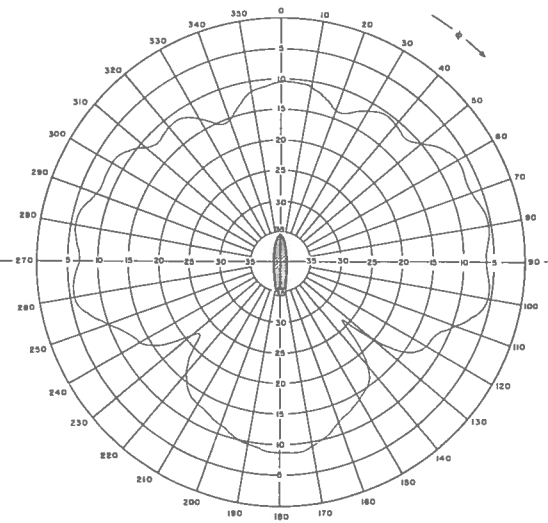
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TERMINATED IN 50 $\Omega$

$E_{\theta}$ 

FWD-AFT

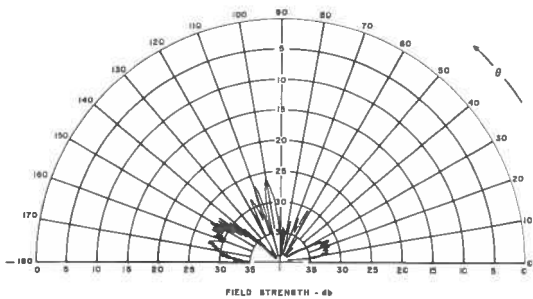


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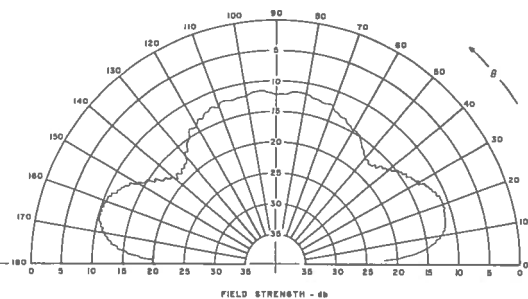
 $\theta = 0^\circ$ 

ANTENNA : AFT LOCATION - STA.36

FREQ. : 12 MHz

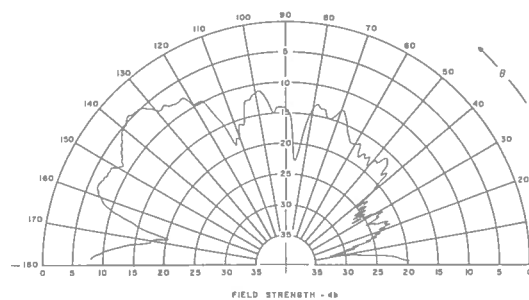
REMARKS : ALL OTHER ANTENNAS  
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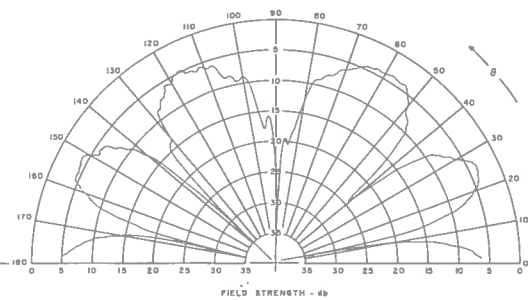


FIELD STRENGTH - dB

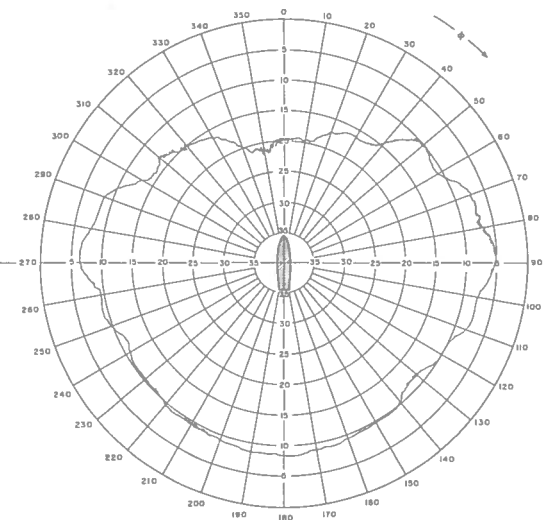
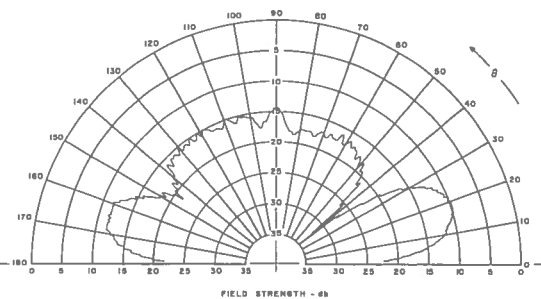
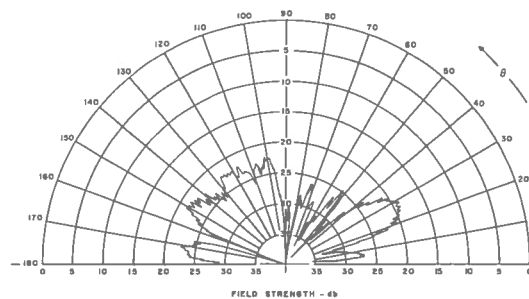


$E_{\theta}$ 

FWD-AFT



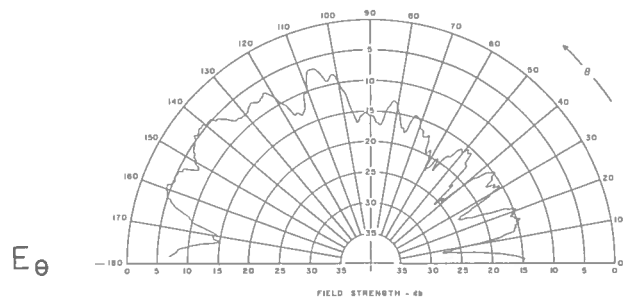
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 $\theta = 0^\circ$  $E_{\phi}$ 

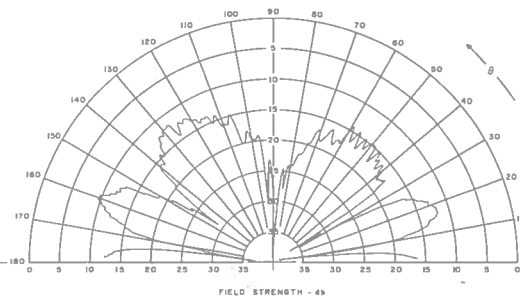
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FREQ. : 14 MHz

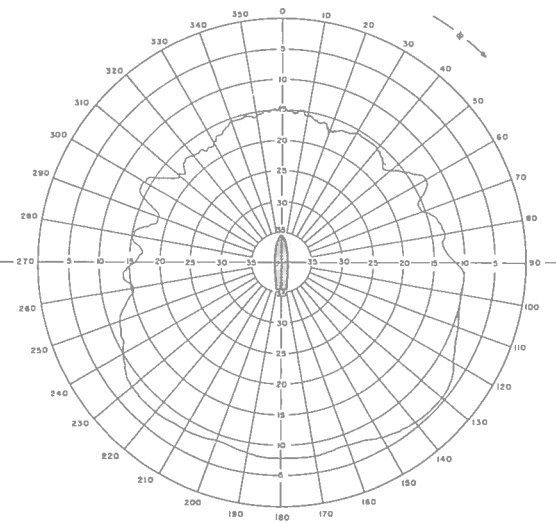
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FWD-AFT



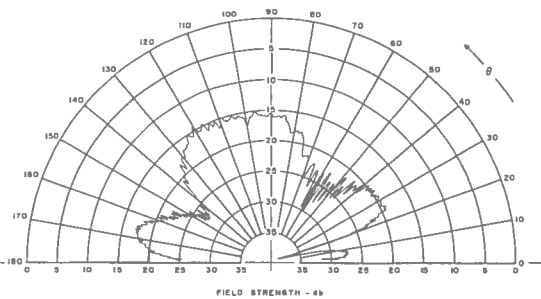
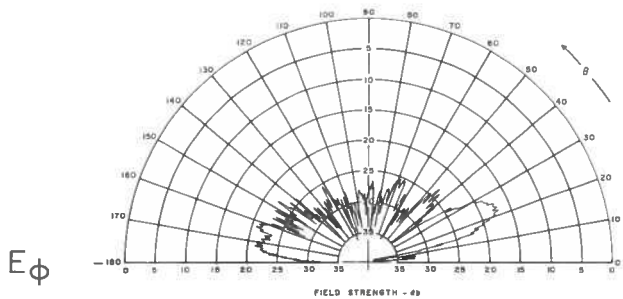
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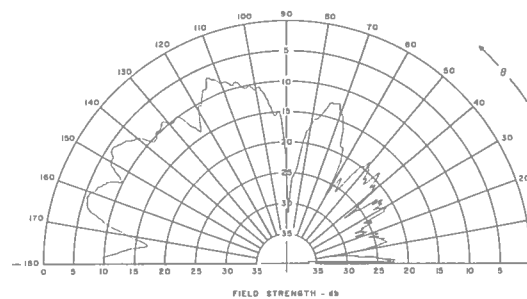
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FREQ. : 16 MHz

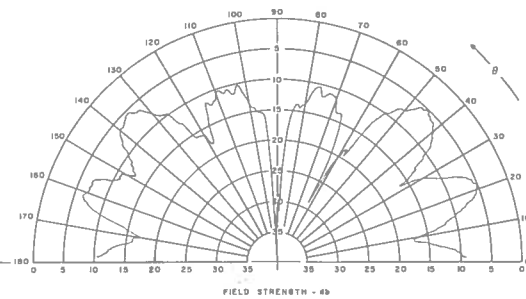
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω



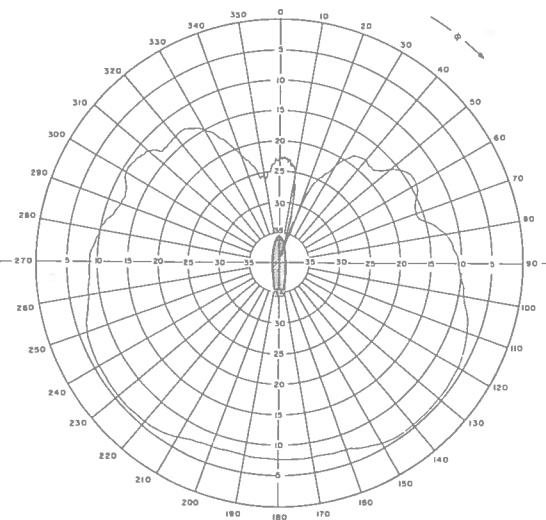
$E_{\theta}$



FWD-AFT

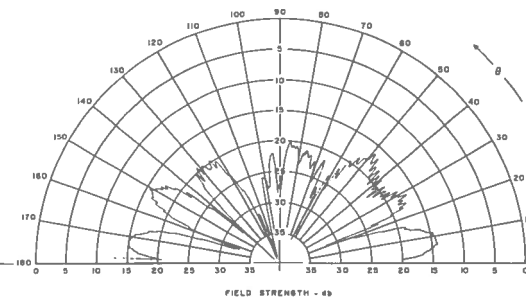
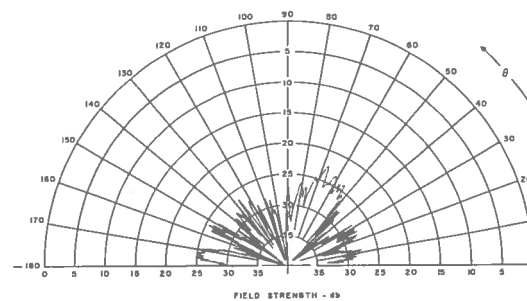


PORT-STBD



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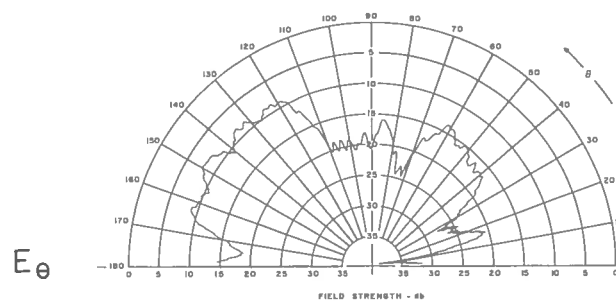
$E_{\phi}$



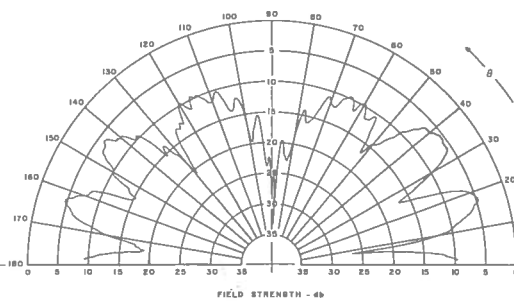
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FREQ. : 18 MHz

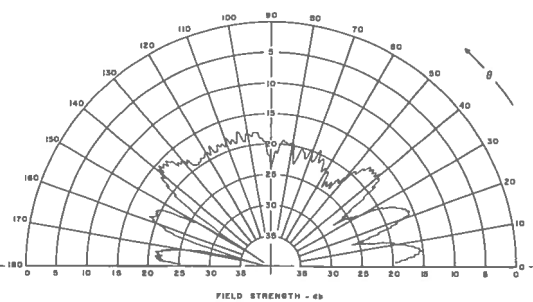
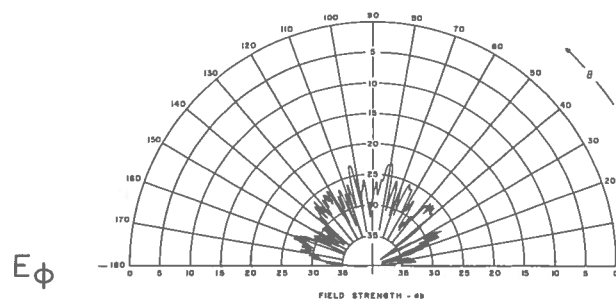
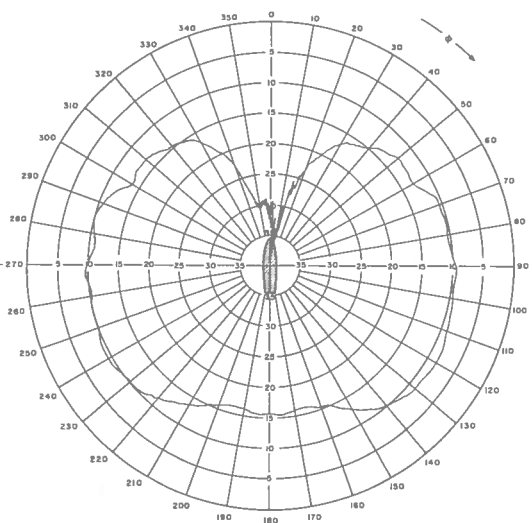
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω



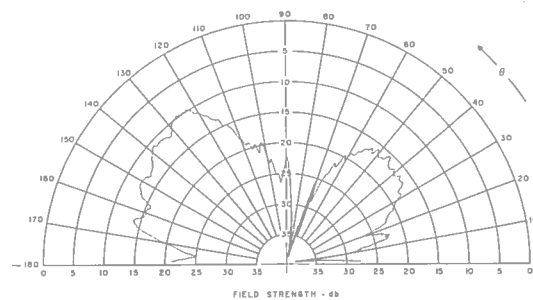
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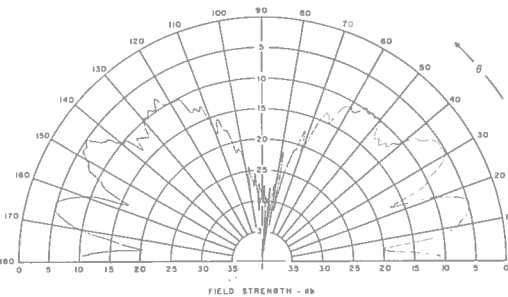
PORT-STBD



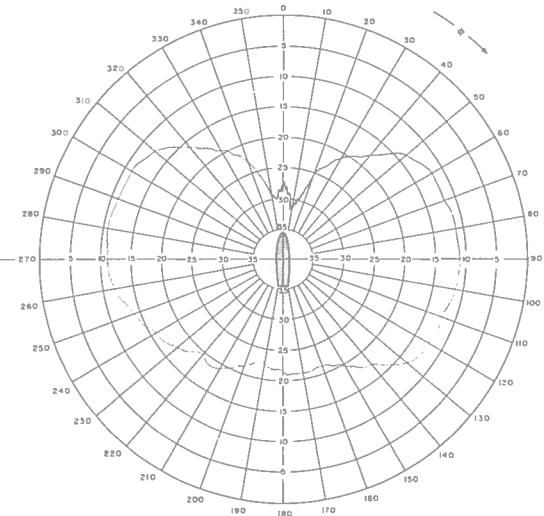
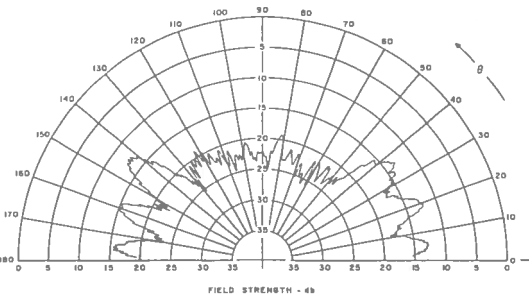
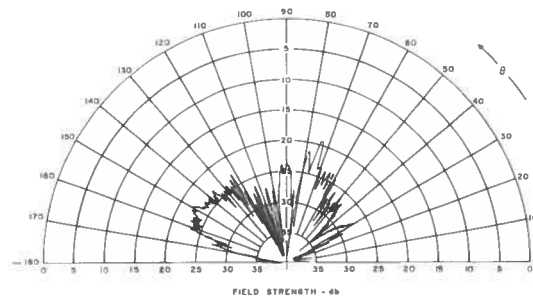
ANTENNA : AFT LOCATION - STA.36  
 FREQ. : 20 MHz  
 REMARKS : ALL OTHER ANTENNAS  
 TERMINATED IN 50Ω

$E_\theta$ 

FWD-AFT



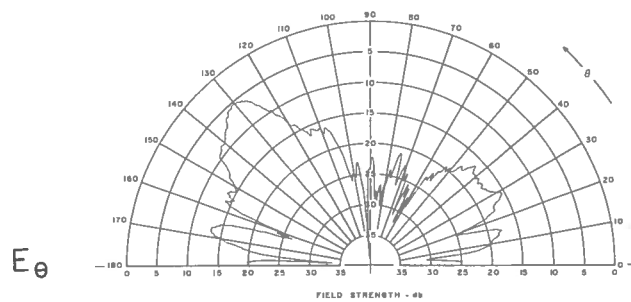
PORT-STBD

 $\theta=0^\circ$  $E_\phi$ 

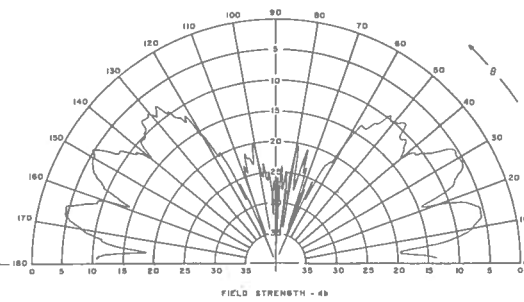
ANTENNA : AFT LOCATION - STA. 36

FREQ. : 22 MHz

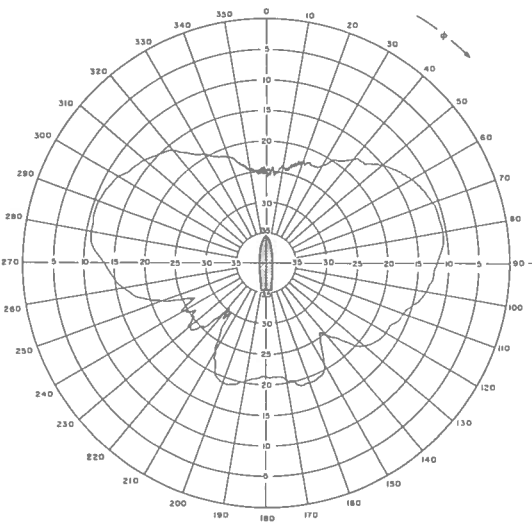
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω



FWD-AFT



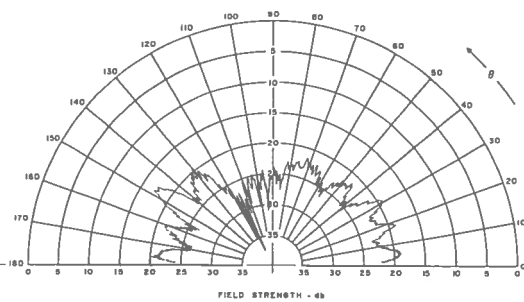
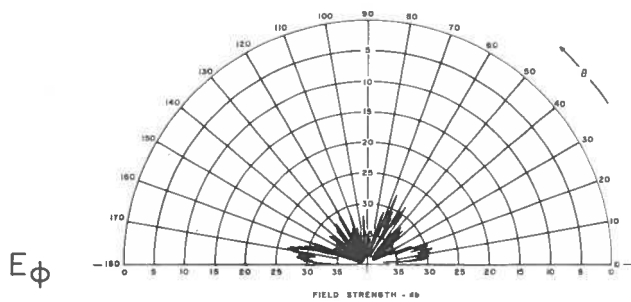
PORT-STBD

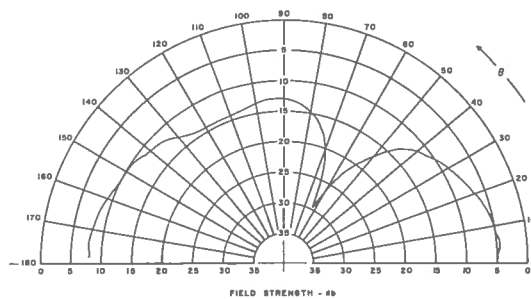


ANTENNA : AFT LOCATION - STA.36

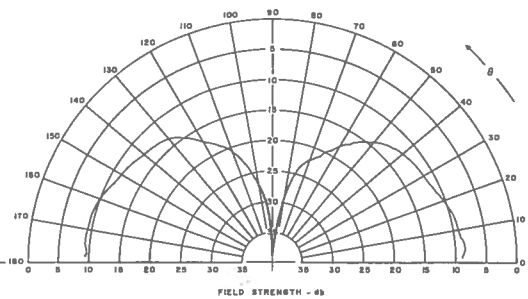
FREQ. : 24 MHz

REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

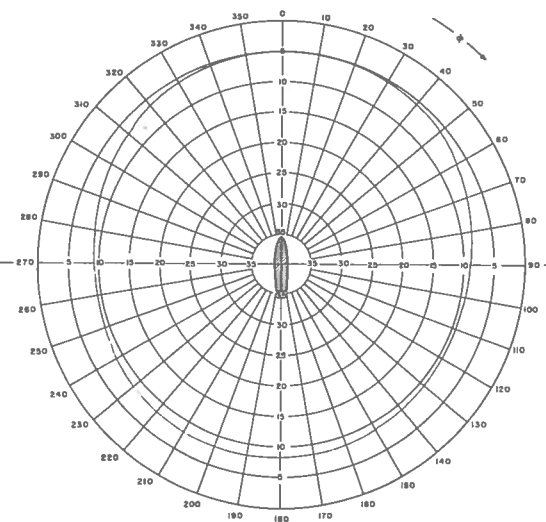
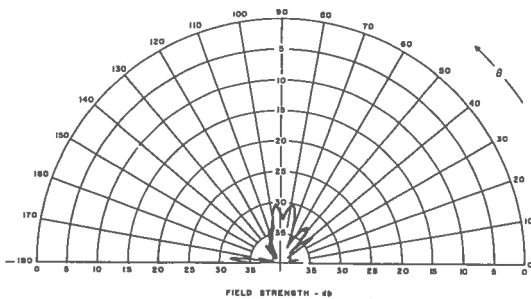


$E_{\theta}$ 

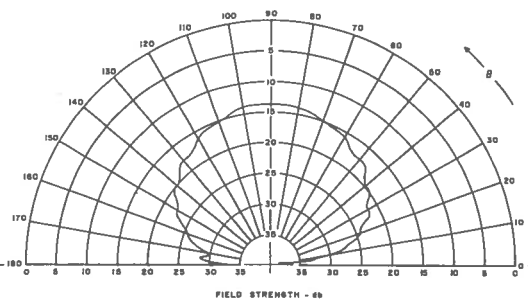
FWD-AFT



PORT-STBD

 $\theta = 0^\circ$  $E_{\phi}$ 

FIELD STRENGTH - dB



FIELD STRENGTH - dB

ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 2 MHz

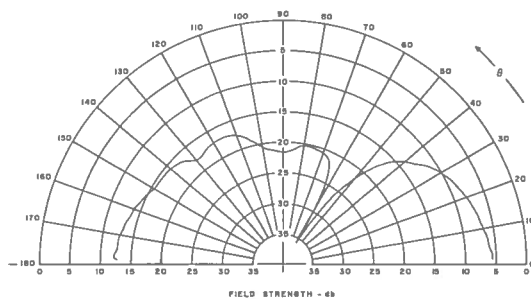
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

**Confidential**

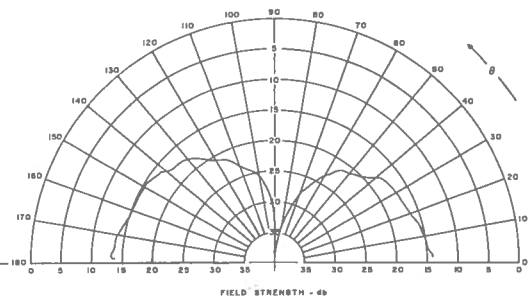
**Radiation Patterns**

**Forward location – Station 22**

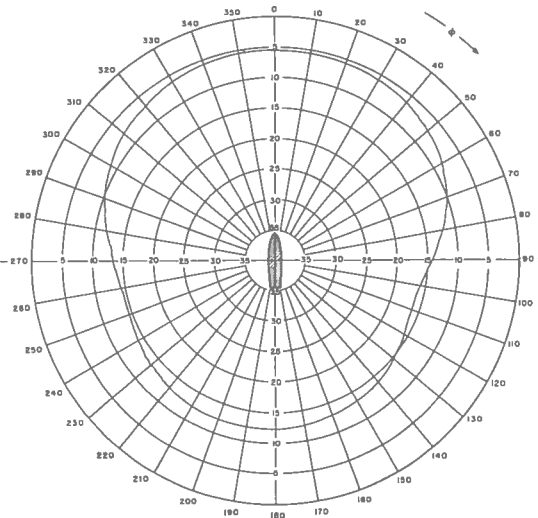
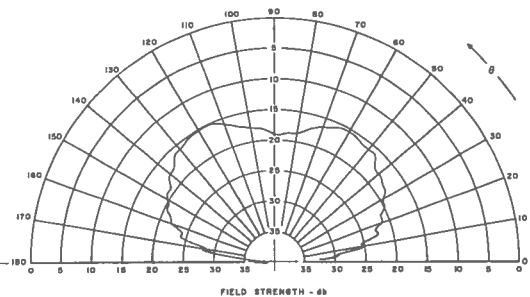
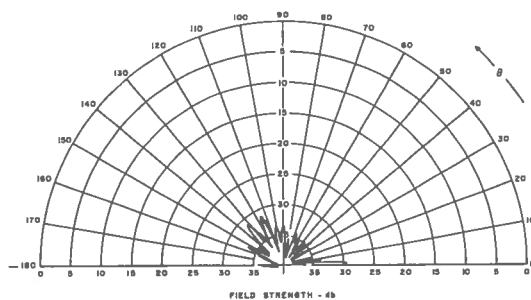


$E_{\theta}$ 

FWD-AFT



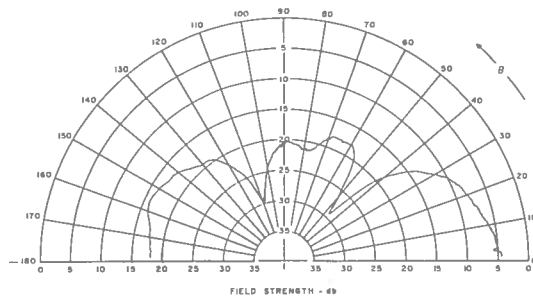
PORT-STBD

 $E_{\phi}$ 

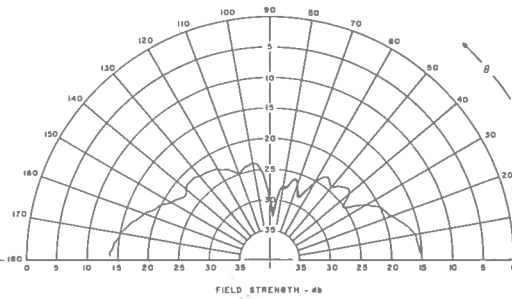
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 3 MHz

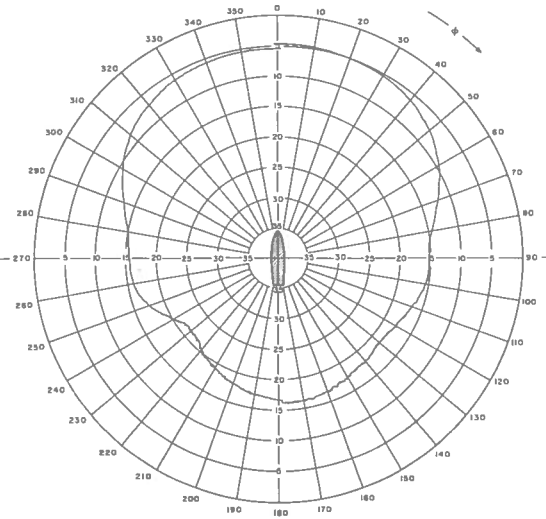
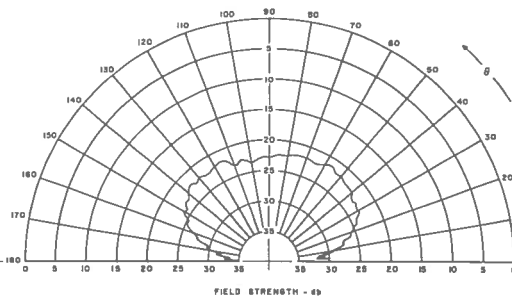
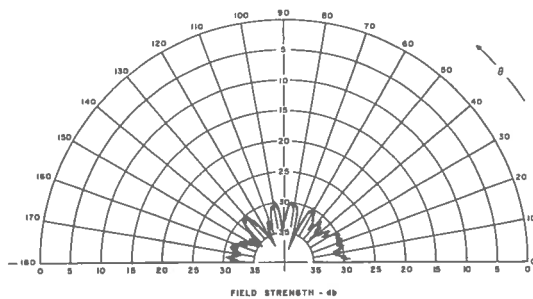
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

$E_\theta$ 

FWD-AFT



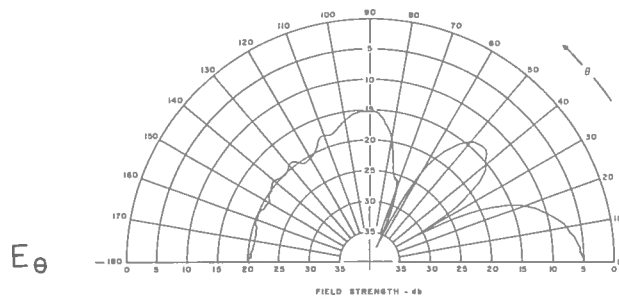
PORT-STBD

 $\theta = 0^\circ$  $E_\phi$ 

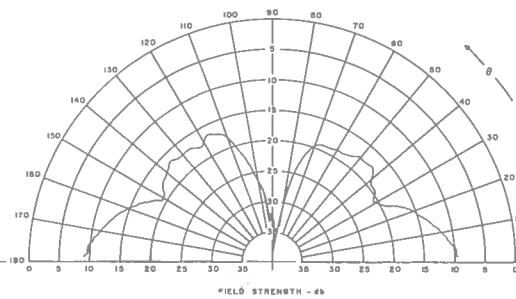
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 4 MHz

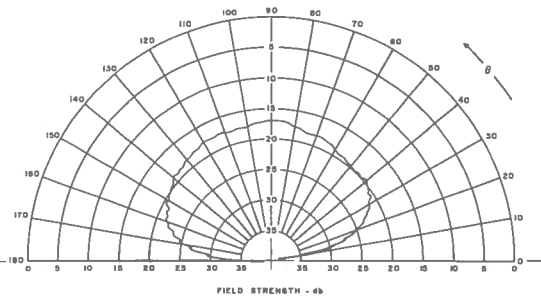
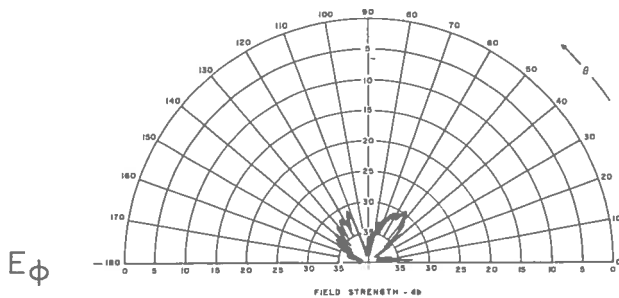
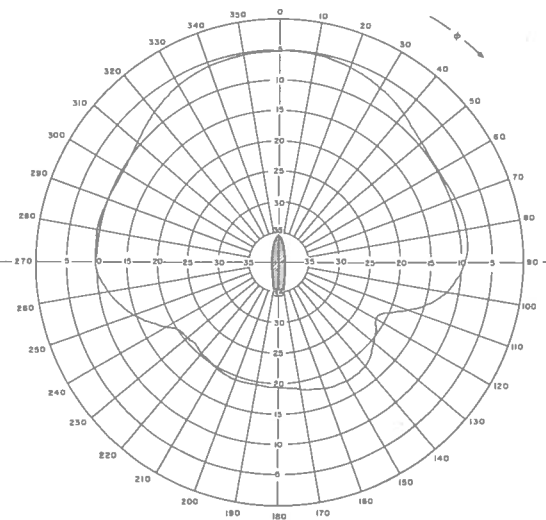
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω



FWD-AFT



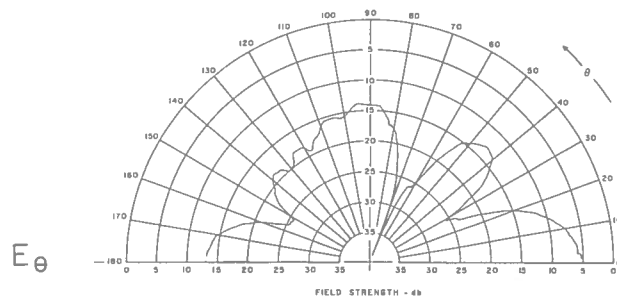
PORT-STBD



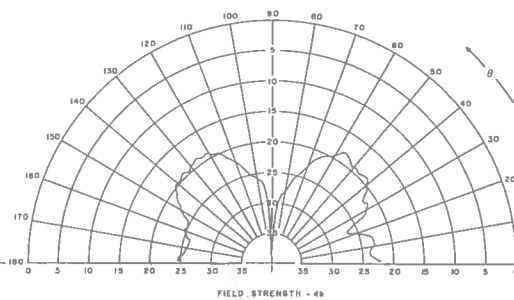
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 5 MHz

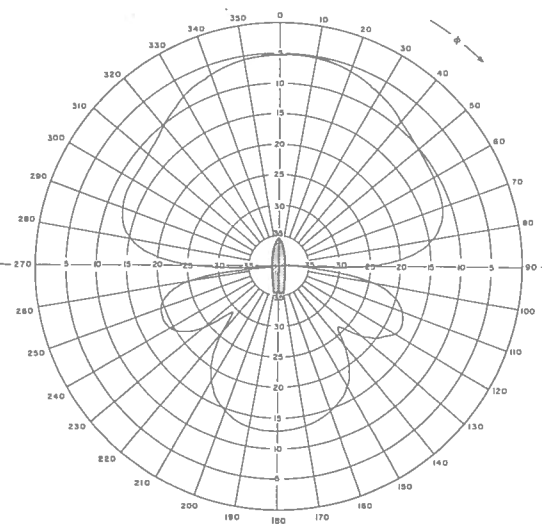
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω



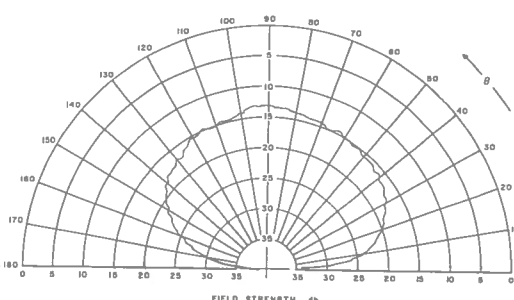
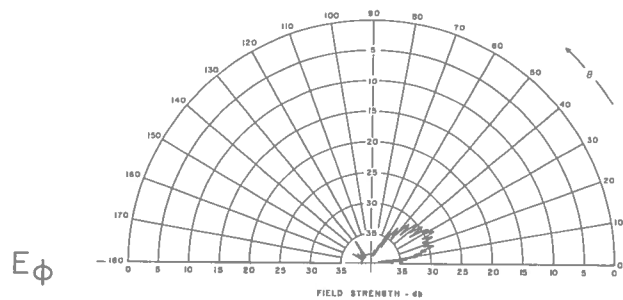
FWD-AFT



PORT-STBD



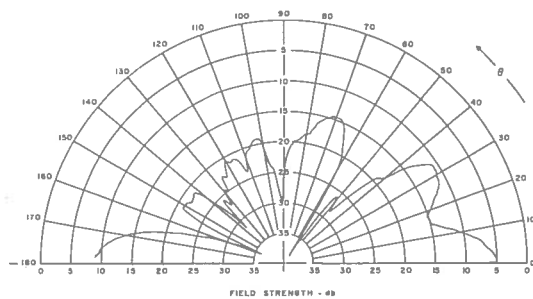
$\theta = 0^\circ$



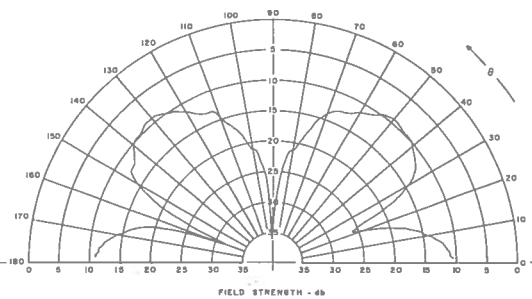
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 6 MHz

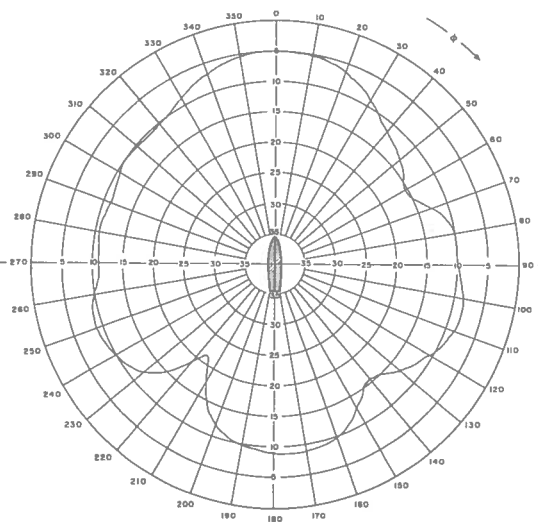
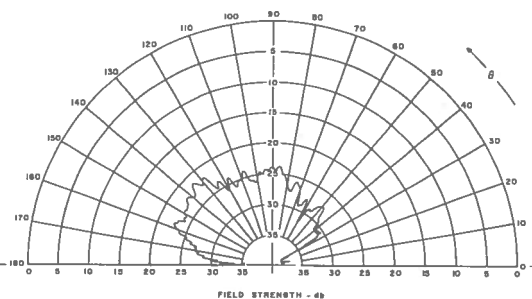
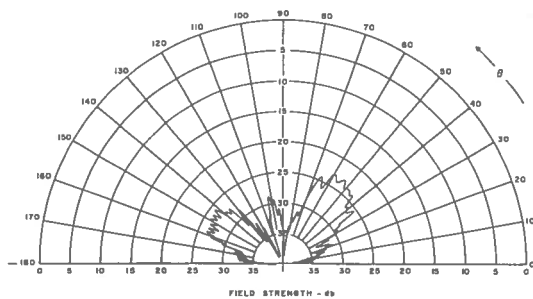
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω

$E_{\theta}$ 

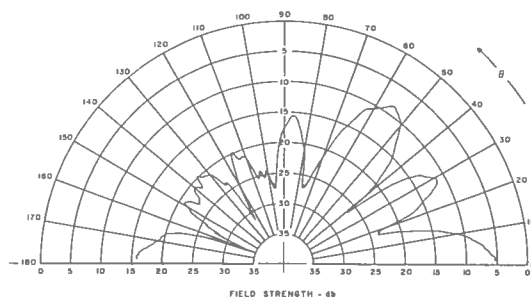
FWD-AFT



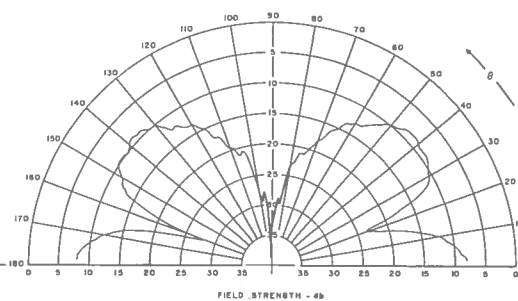
PORT-STBD

 $\theta = 0^\circ$  $E_{\phi}$ 

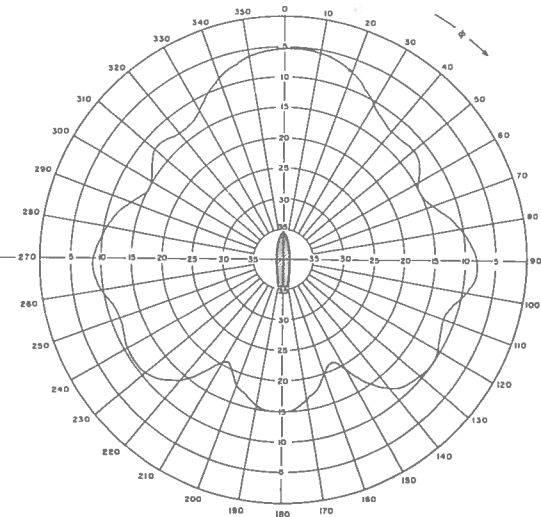
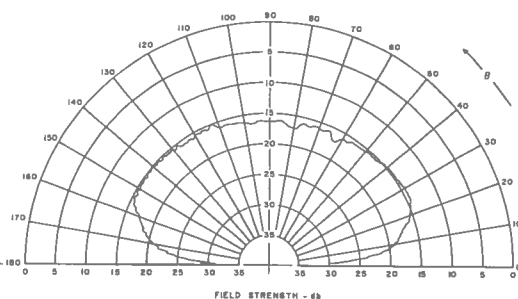
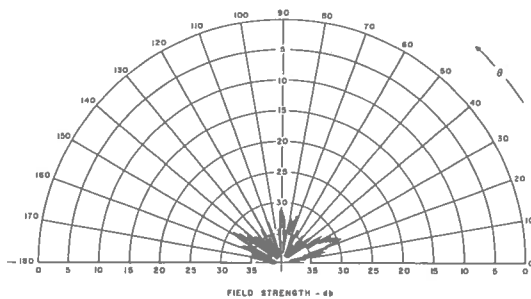
ANTENNA : FORWARD LOCATION - STA. 22  
FREQ. : 8 MHz  
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

$E_{\theta}$ 

FWD-AFT



PORT-STBD

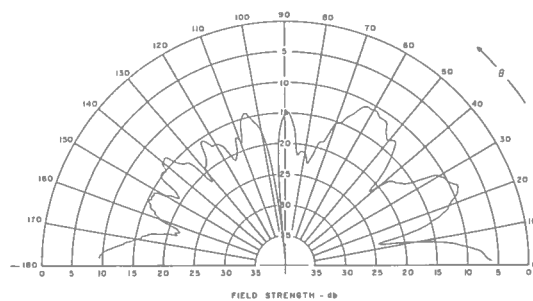
 $\theta = 0^\circ$  $E_{\phi}$ 

ANTENNA : FORWARD LOCATION - STA. 22

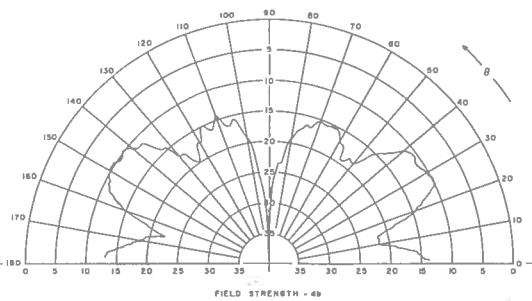
FREQ. : 10 MHz

REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω

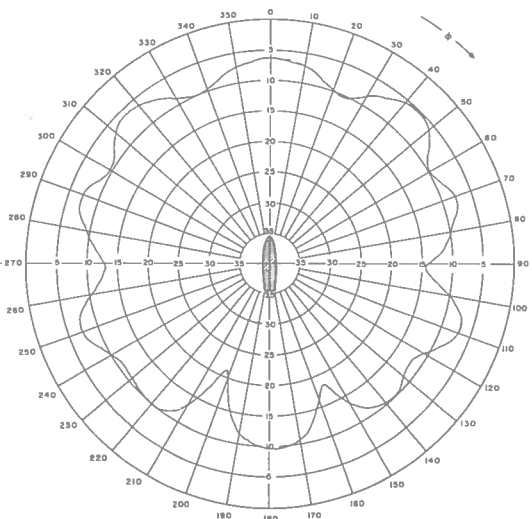
$E_{\theta}$



FWD-AFT

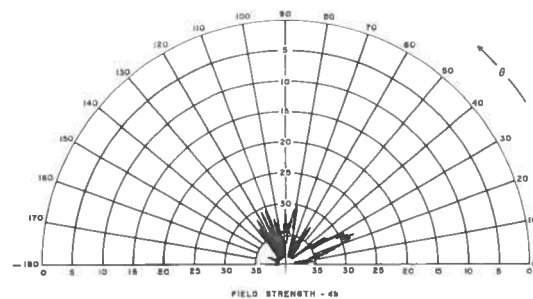


PORT-STBD

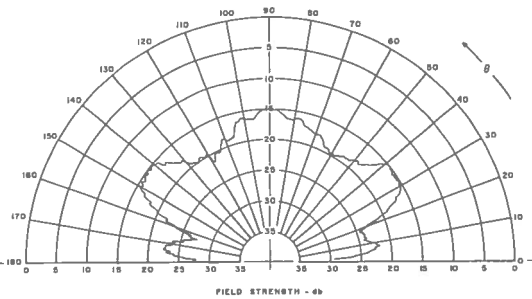


$\theta = 0^\circ$

$E_{\phi}$



FWD-AFT

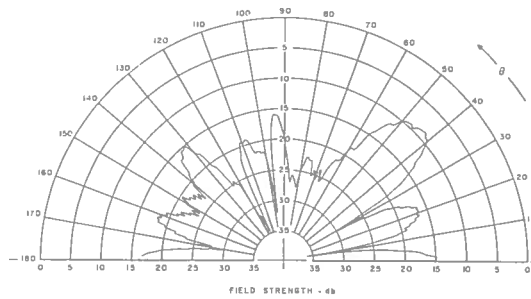


PORT-STBD

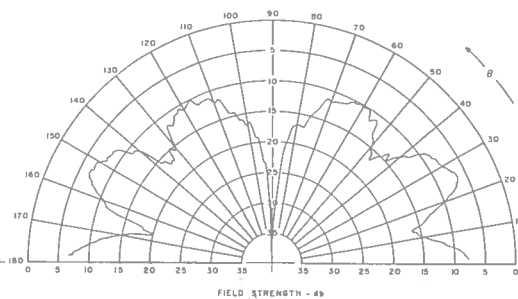
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 12 MHz

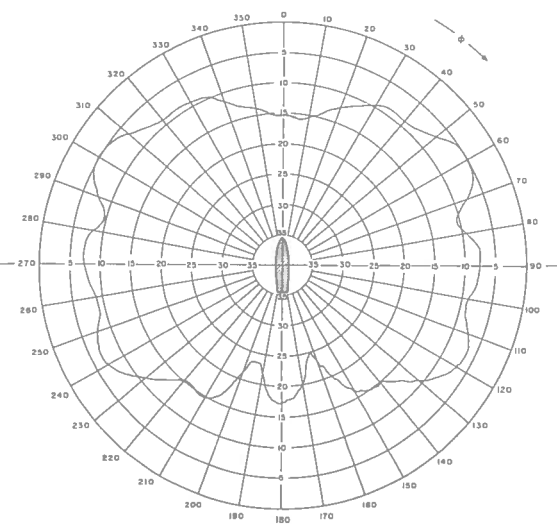
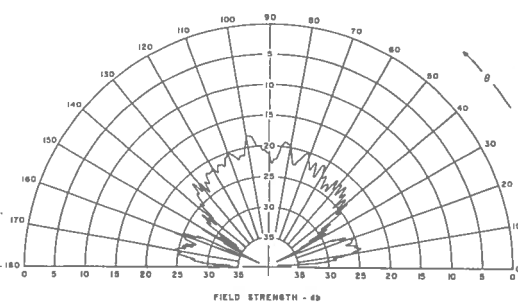
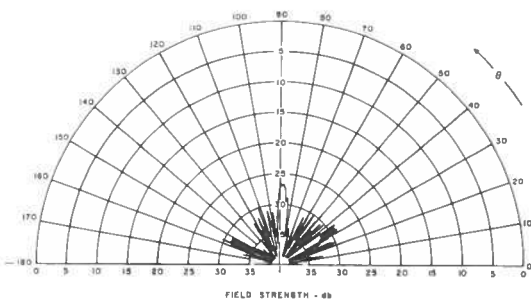
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω

$E_{\theta}$ 

FWD-AFT



PORT-STBD

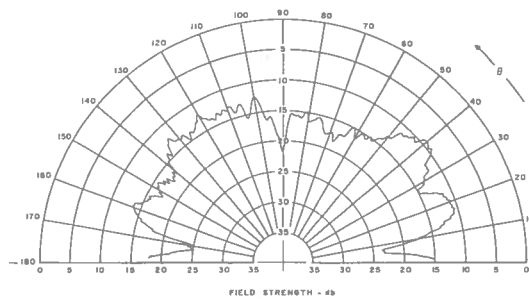
 $\theta = 0^\circ$  $E_{\phi}$ 

ANTENNA : FORWARD LOCATION - STA. 22

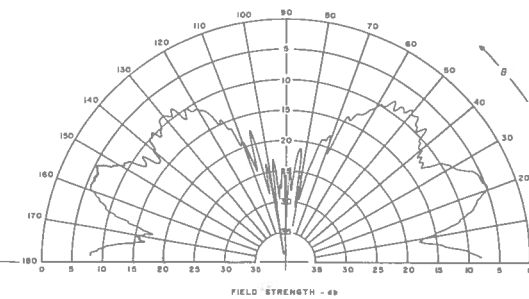
FREQ. : 14 MHz

REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

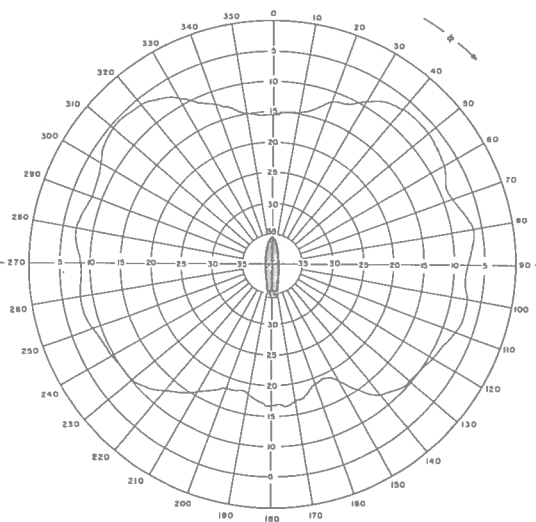
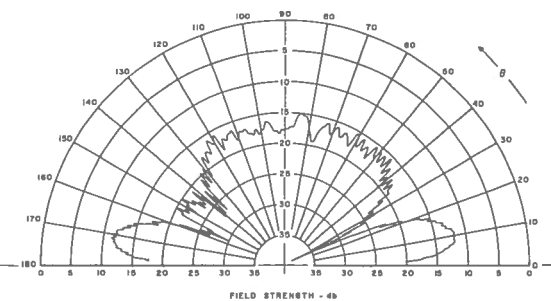
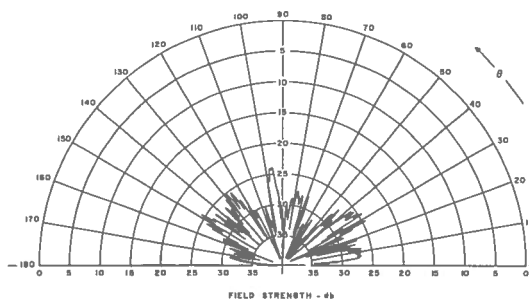


$E_{\theta}$ 

FWD-AFT



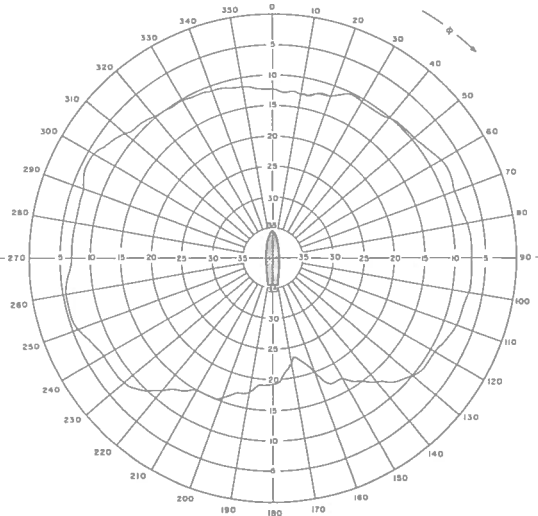
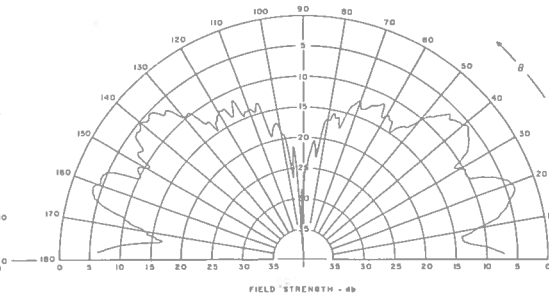
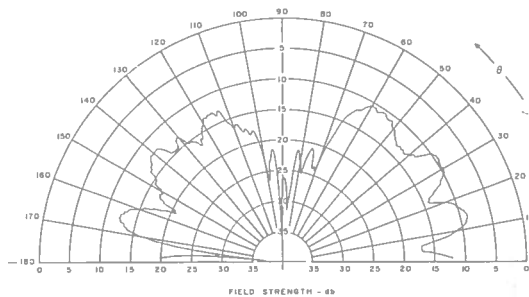
PORT-STBD

 $E_{\phi}$ 

ANTENNA : FORWARD LOCATION - STA. 22

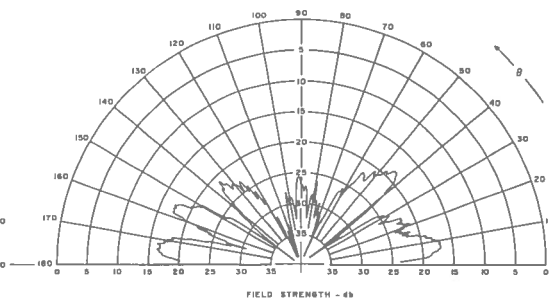
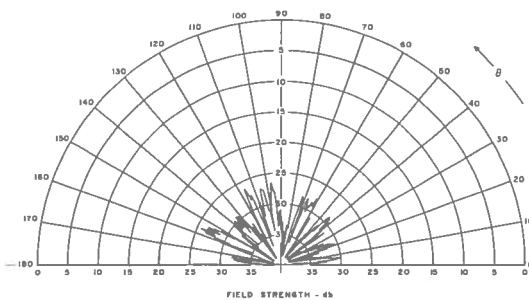
FREQ. : 16 MHz

REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50Ω

$E_{\theta}$ 

FWD-AFT

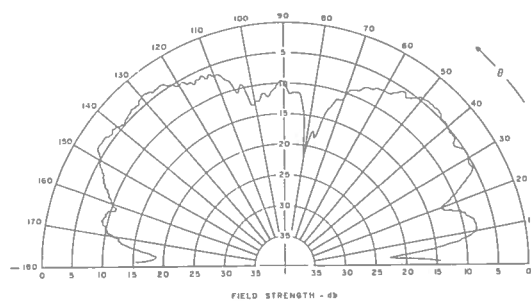
PORT-STBD

 $\theta = 0^\circ$  $E_{\phi}$ 

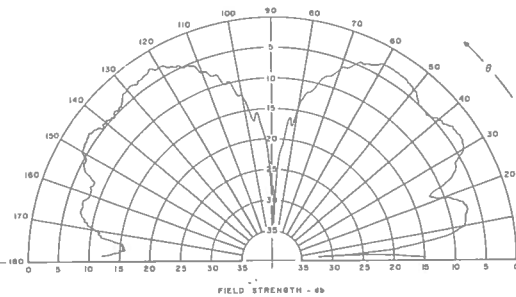
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 18 MHz

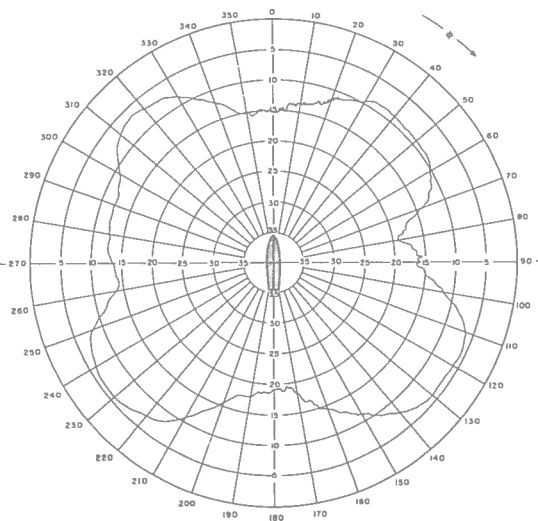
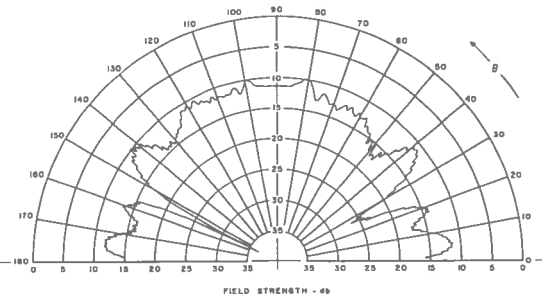
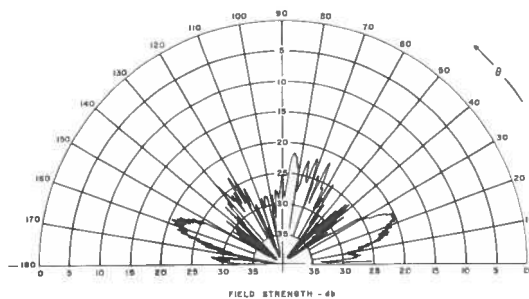
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

$E_\theta$ 

FWD-AFT



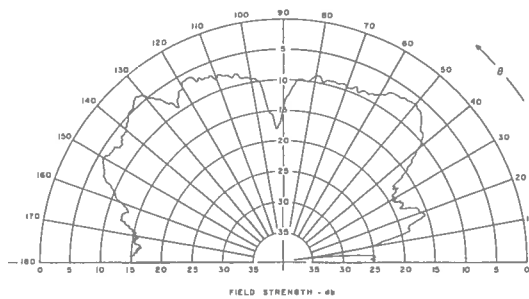
PORT-STBD

 $E_\phi$ 

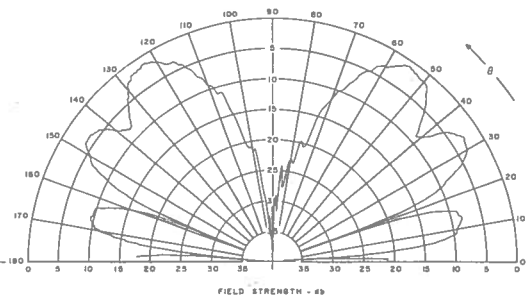
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 20 MHz

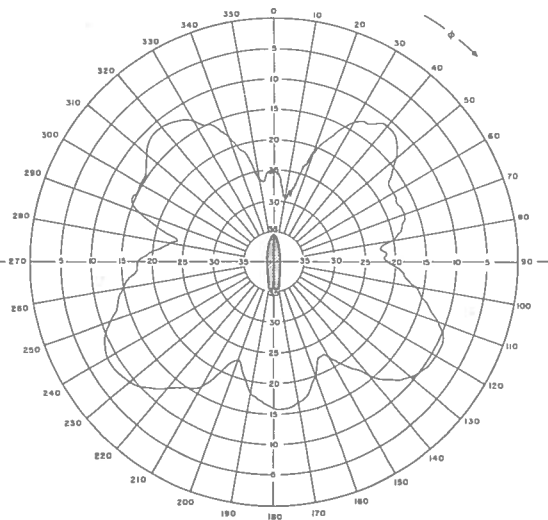
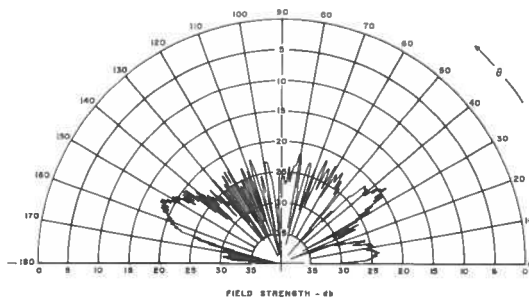
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

$E_{\theta}$ 

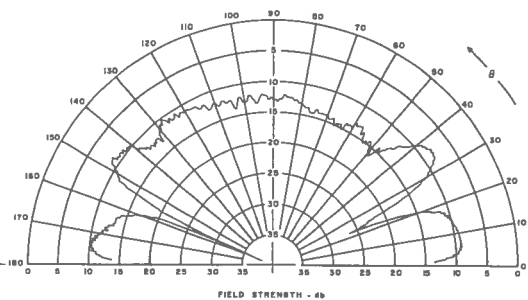
FWD-AFT



PORT-STBD

 $\theta = 0^\circ$  $E_{\phi}$ 

FIELD STRENGTH - dB

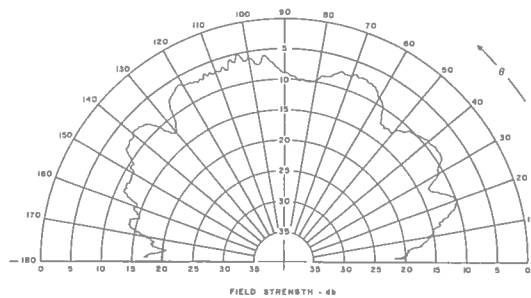


FIELD STRENGTH - dB

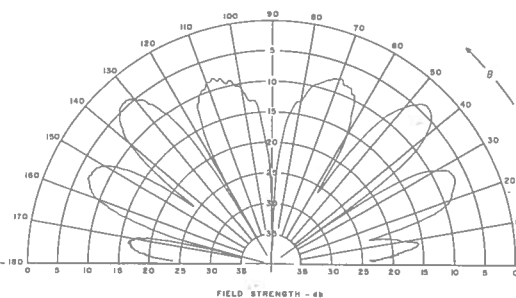
ANTENNA : FORWARD LOCATION - STA. 22

FREQ. : 22 MHz

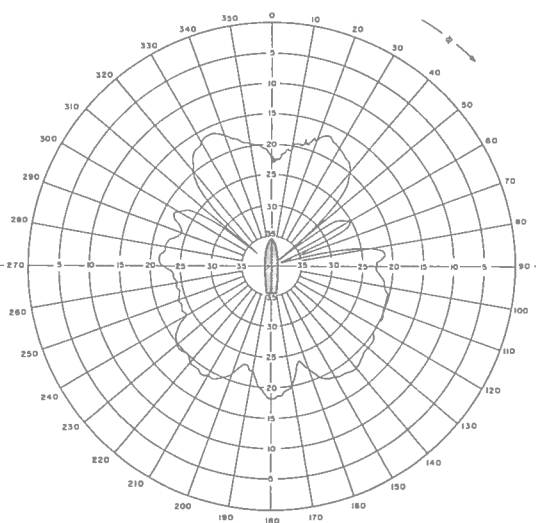
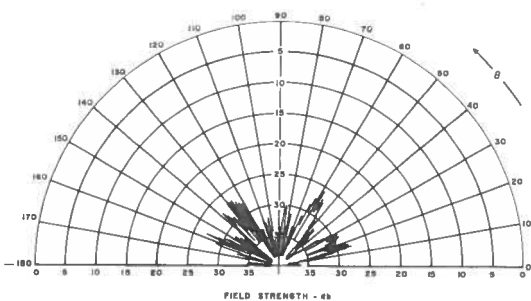
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$

$E_{\theta}$ 

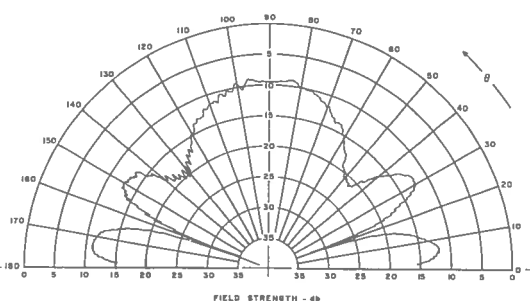
FWD-AFT



PORT-STBD

 $\theta = 0^\circ$  $E_{\phi}$ 

FIELD STRENGTH - dB



FIELD STRENGTH - dB

ANTENNA : FORWARD LOCATION - STA. 22  
FREQ. : 24 MHz  
REMARKS : ALL OTHER ANTENNAS  
TERMINATED IN 50 $\Omega$