Link Design: Onsat – Hub (Salt Lake) to Remote (Miami), Wide -Band

Site Information

	Downlink Miami, FL	Uplink Salt Lake City, UT
Latitude:	25.77 North	40.77 North
Longitude:	20.22 West	111.88 West
AMSL:	0 meters	1000 meters
Antenna Elevation angle	54.52 degrees	40.44 degrees
Antenna Azimuth angle	214.78 deg.	143.96 deg.
Antenna Diameter	3.7 meters	3.8 meters
Polarization:	V	H
Antenna Efficiency:	60 %	70 %
Antenna Gain:	41.7 dB	45.8 dB
System Noise Temp. (Clear)	75 deg. K	
Earth Station G/T	23.0 dB	
Crane Rain Rate Region	E	F

Satellite Information

Satellite:	Telestar 5 (Transponder 17 C)
Longitude:	97 degrees W.
Transponder Bandwidth	36 MHz
G/T @ Salt Lake	+2.0 dB
SFD @ Salt Lake	- 94.7 dBW/m^2
Saturated EIRP @ Miami	38 dBW

Transponder Utilization

% of avail. Power and Bandwidth:	16.7 %
Carrier Output Backoff	11.4 dB
Carrier EIRP	26.6 dBW

Carrier Information

Modulation:	QPSK
Information Rate:	6.0 Mb/s
FEC Coding:	Rate ¾
Threshold Eb/No @ BER= !0^-7	5.5 dB

Link Calculation

Downlink	Clear Weather	Upfade	Downfade
Carrier EIRP (dBW)	26.6		26.6
Free Space Loss (dB)	196.0		
Rain Attenuation – 99.99% availability (dB)		.11	0.53
Added Noise from Rain (dB)			1.45
Pointing Error Loss (dB)	0.5		
Earth Station G/T (dB)	23.0		
Boltzmann's Constant	- 228.6		
(C/No)down (dB)	81.7	81.6	79.72
(C/Io)down – total (dB)	85.8		
(C/No+Io) down (dB)	80.3	80.2	78.8
Uplink			
Satellite G/T (dB)	+2.0		
SFD (dBW/m^2)	- 94.7		
Carrier Input Backoff (dB)	13.4		
Flux Density @ Satellite (dBW/m^2)	- 108.1		
Isotropic Gain (dB)	-37.0		
Boltzmann's Constant	- 228.6		
Rain Attenuation (dB)		.11	
(C/No)up (dB)	83.5	83.4	
(C/Io)up – total (dB)	85.8		
(C/No+Io) up (dB)	81.5	81.4	
Total Link			
(C/No+Io)system (dB)	77.8	77.7	76.9
Threshold Eb/No (dB)	5.5		
Implementation Loss (dB)	1.0		
Threshold (C/No+Io)system (dB)	74.3		
Excess Margin (dB)	3.5	3.4	2.6

Uplink EIRP and EIRP density per 4 kHz

Flux density at the satellite (dBW/m^2)	-108.1
Spreading Loss (dBmeter^2	162.7
Antenna Pointing Error (dB)	0.4
Uplink EIRP (dB)	+55.0
Uplink EIRP density per 4 kHz	+23.2

Link Design: Onsat – Hub (Salt Lake City) to Remote (Miami) Narrow

Site Information

	Downlink Miami, FL	Uplink Salt Lake City, UT
Latitude:	25.77 North	40.77 North
Longitude:	20.22 West	111.88 West
AMSL:	0 meters	1000 meters
Antenna Elevation angle	54.52 degrees	40.44 degrees
Antenna Azimuth angle	214.78 deg.	143.96 deg.
Antenna Diameter	3.7 meters	3.8 meters
Polarization:	H	V
Antenna Efficiency:	60 %	70 %
Antenna Gain:	41.7 dB	45.8 dB
System Noise Temp. (Clear)	75 deg. K	
Earth Station G/T	23.0 dB	
Crane Rain Rate Region	E	F

Satellite Information

Satellite:	Telestar 5 (Transponder 17 C)
Longitude:	97 degrees W.
Transponder Bandwidth	36 MHz
G/T @ Salt Lake	+2.0 dB
SFD @ Salt Lake	-94.7 dBW/m^2
Saturated EIRP @ Salt Lake City	38 dBW

Transponder Utilization

% of avail. Power and Bandwidth:	1.0 %
Carrier Output Backoff	24 dB
Carrier EIRP	15 dBW

Carrier Information

Modulation:	QPSK
Information Rate:	128 kb/s
FEC Coding:	Rate ½
Threshold Eb/No @ BER= !0^-7	7.0 dB

Link Calculation

Downlink	Clear Weather	Upfade	Downfade
Carrier EIRP (dBW)	15.0		15.0
Free Space Loss (dB)	196.0		
Rain Attenuation – 99.99% availability (dB)		.11	0.53
Added Noise from Rain (dB)			1.45
Pointing Error Loss (dB)	0.5		
Earth Station G/T (dB)	23.0		
Boltzmann's Constant	- 228.6		
(C/No)down (dB)	70.1	70.0	68.12
(C/Io)down – total (dB)	71.0		
(C/No+Io) down (dB)	67.5	67.4	66.3
Uplink			
Satellite G/T (dB)	+2.0		
SFD (dBW/m^2)	- 94.7		
Carrier Input Backoff (dB)	26.0		
Flux Density @ Satellite (dBW/m^2)	- 120.7		
Isotropic Gain (dB)	-37.0		
Boltzmann's Constant	- 228.6		
Rain Attenuation (dB)		.11	
(C/No)up (dB)	72.9	72.8	
(C/Io)up – total (dB)	71.0		
(C/No+Io) up (dB)	68.8	68.8	
Total Link			
(C/No+Io)system (dB)	65.1	65.0	64.3
Threshold Eb/No (dB)	7.0		
Implementation Loss (dB)	1.0		
Threshold (C/No+Io)system (dB)	59.1		
Excess Margin (dB)	6.0	5.9	5.2

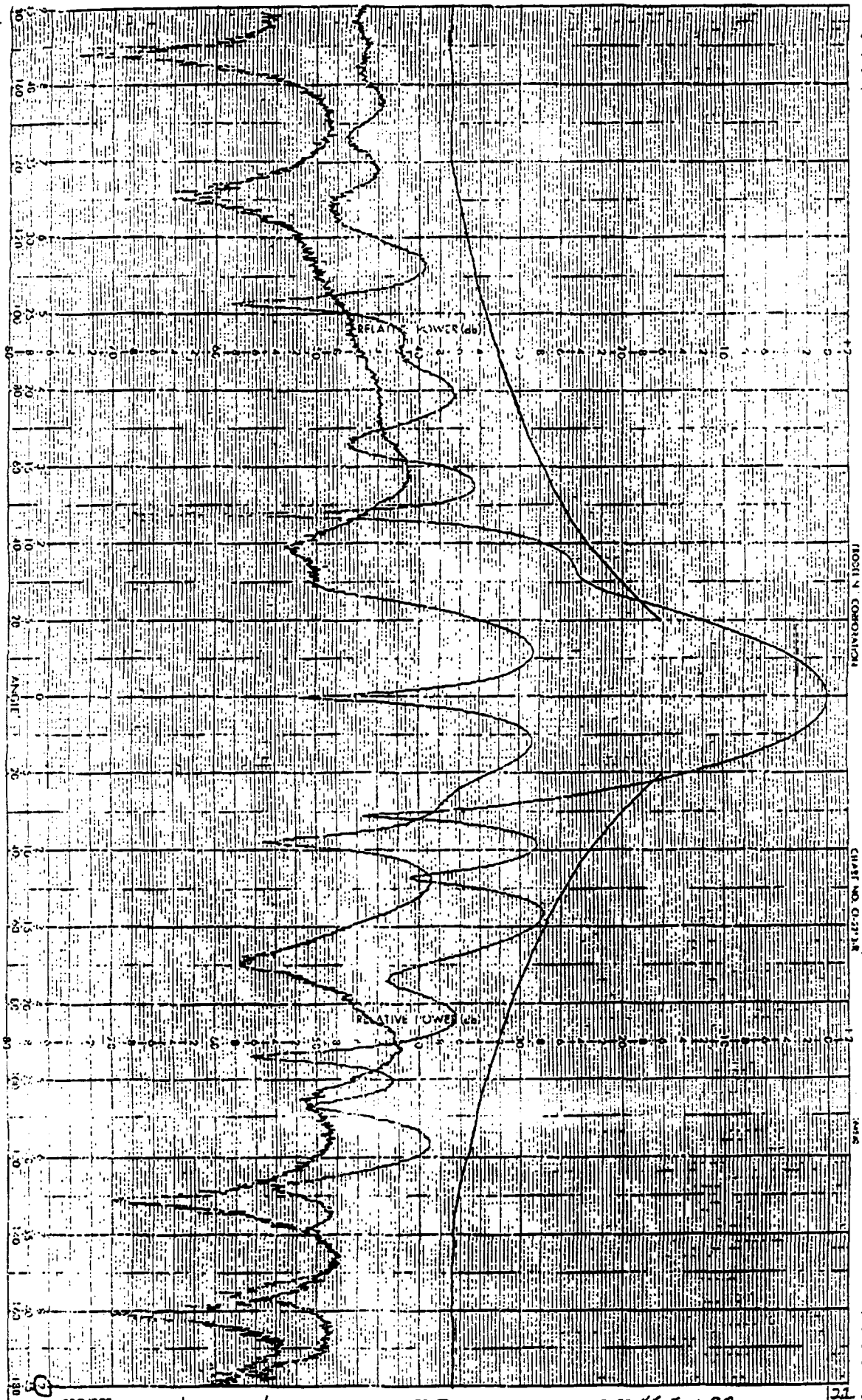
Uplink EIRP and EIRP density per 4 kHz

Flux density at the satellite (dBW/m^2)	-120.7
Spreading Loss (dBmeter^2	162.7
Antenna Pointing Error (dB)	0.4
Uplink EIRP (dB)	+42.4
Uplink EIRP density per 4 kHz	+25.9

Exhibit B

EXHIBIT B

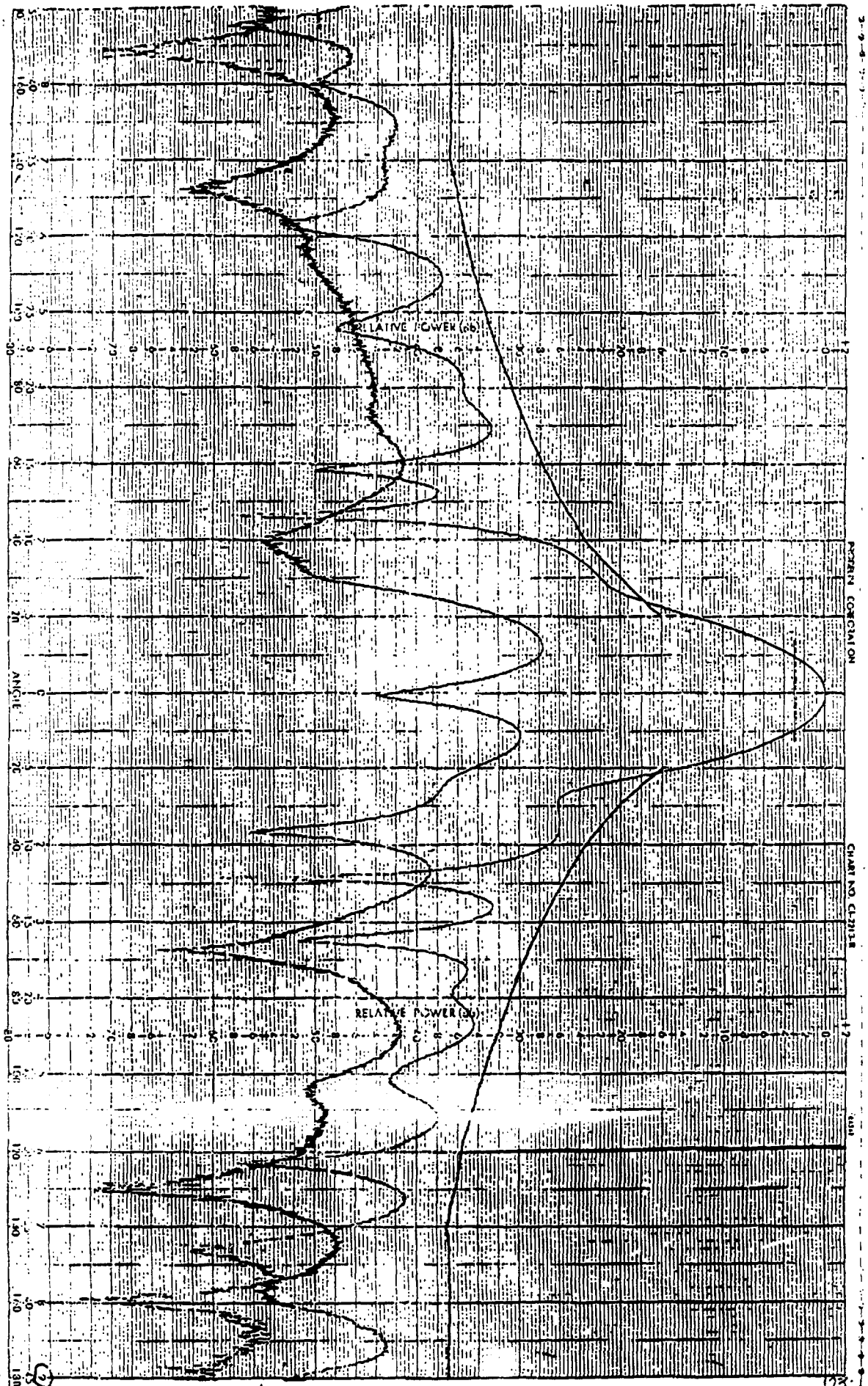
ANTENNA RADIATION PATTERN FOR PRODELIN MODEL # 1374 - 370



PROJECT 3.7m W/C-Band RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

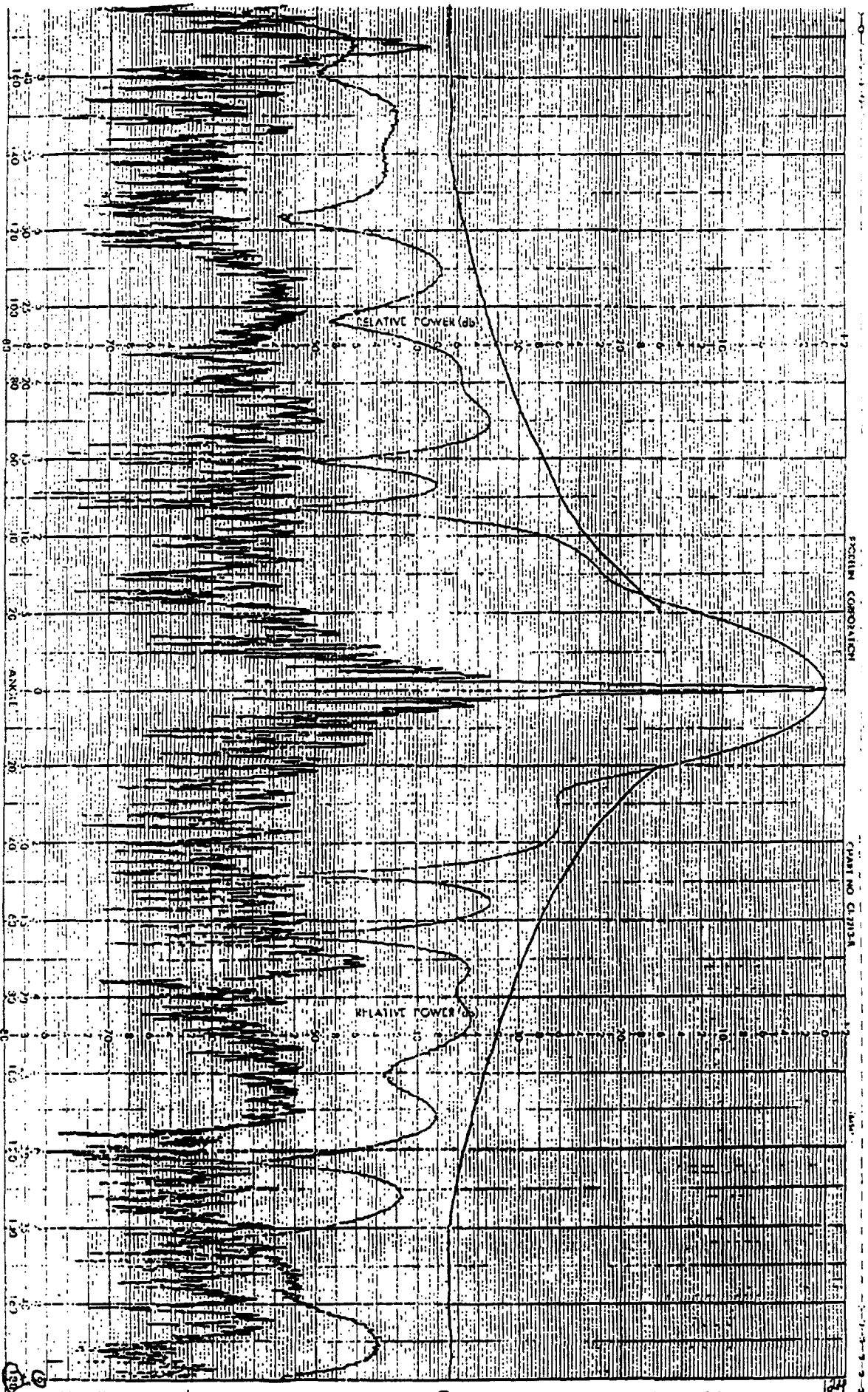
1.425 GHz H-PLANE ± 90° M-Pol & X-Pol



PROJECT 3.7m w/C-BAND RX/TX FEED ENGR DBL DATE 25 JUN 92

REMARKS

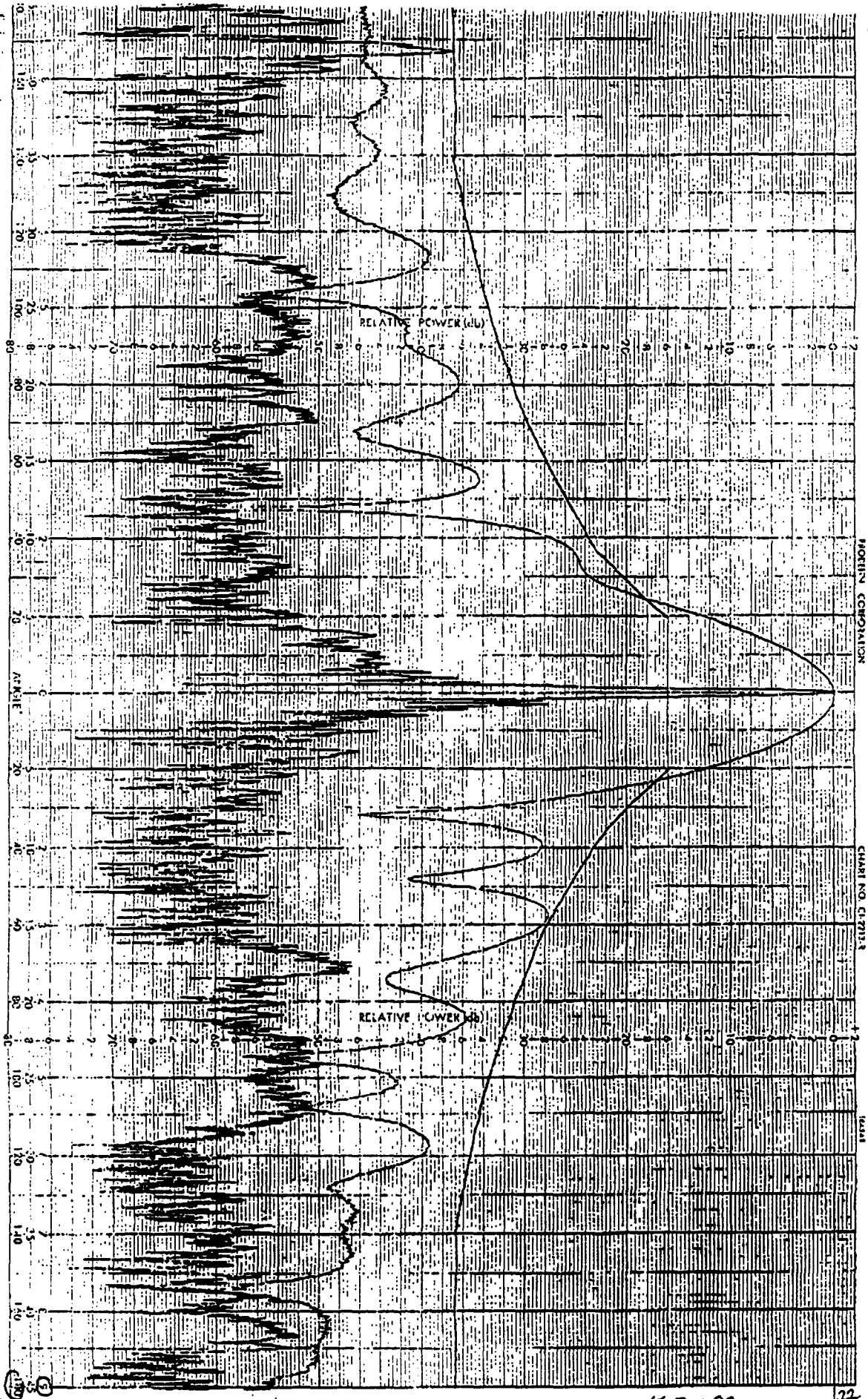
1.425GHz E-Plane ±9° Nominal & V-Pol



PROJECT 3.7m W/C-BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

6.425 GHz E-PLANE ±9° & ±180° Co-Pol

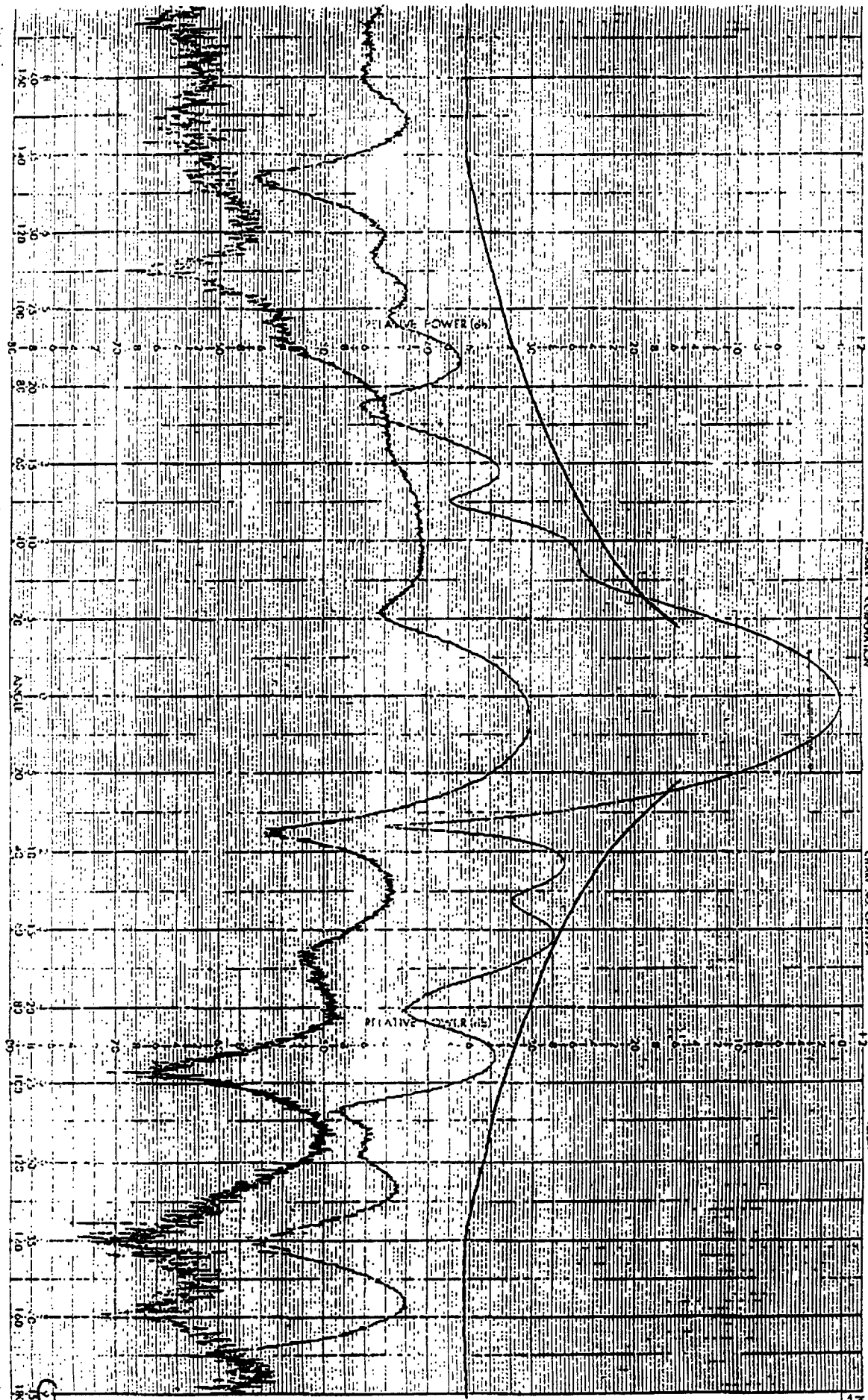


PROJECT 3.7m w/C-Band RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

6.425 GHz H-PLANE ±90 & ±180° CO-POL

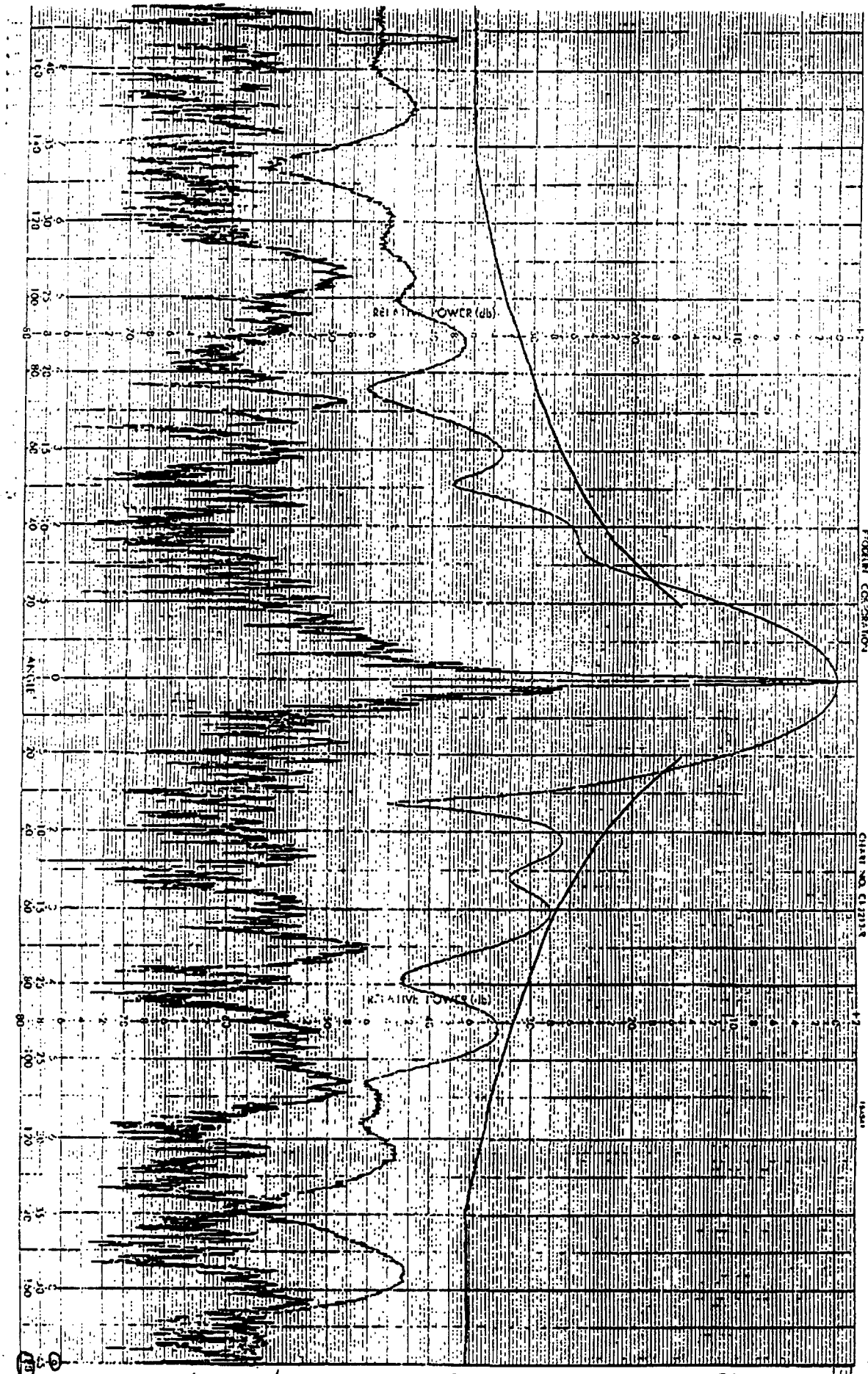
22



PROJECT 3.7m W/C-BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

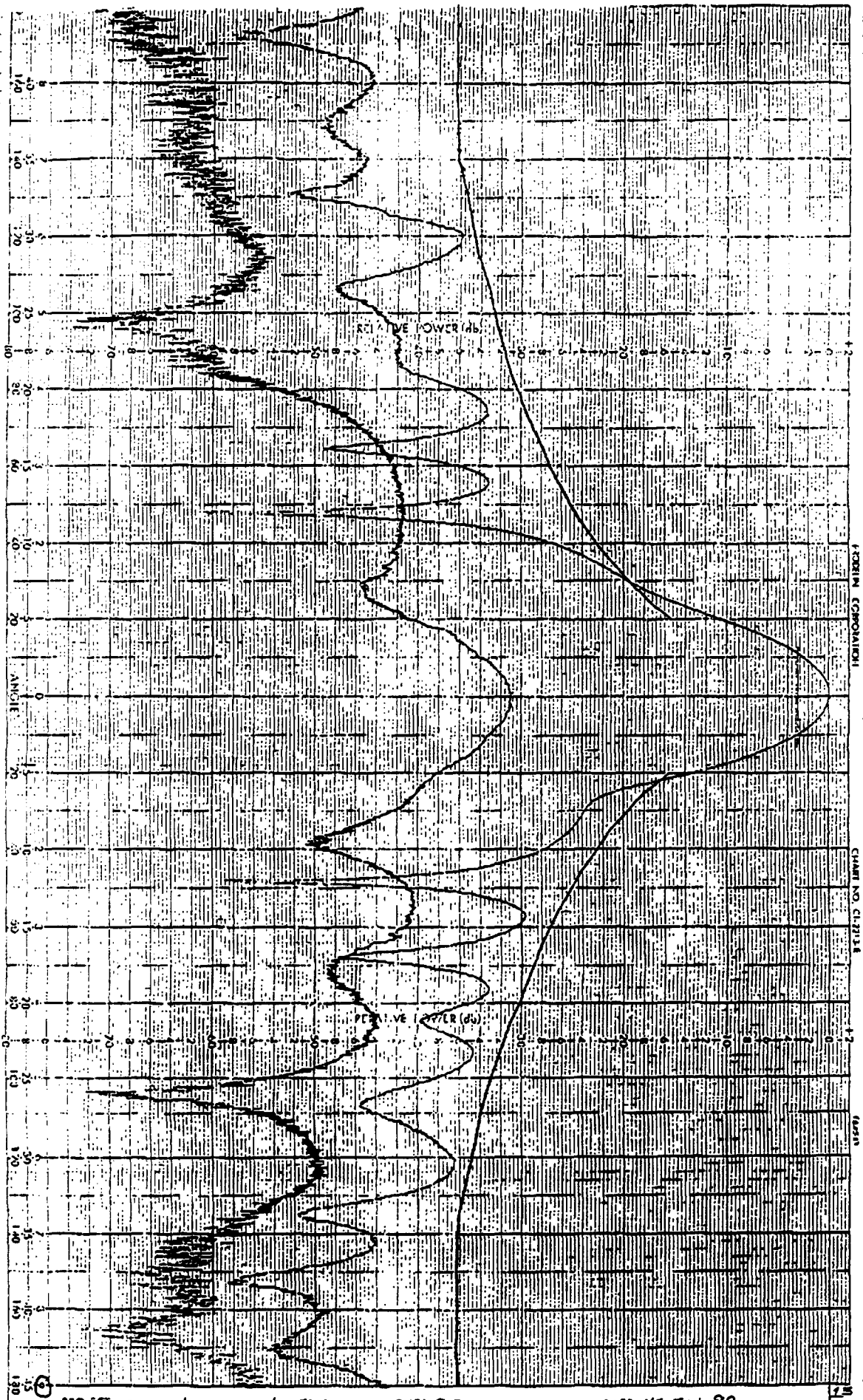
5.925GHz H-PLANE ± 9° Co-Pol & X-Pol



PROJECT 3.7m w/c-BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

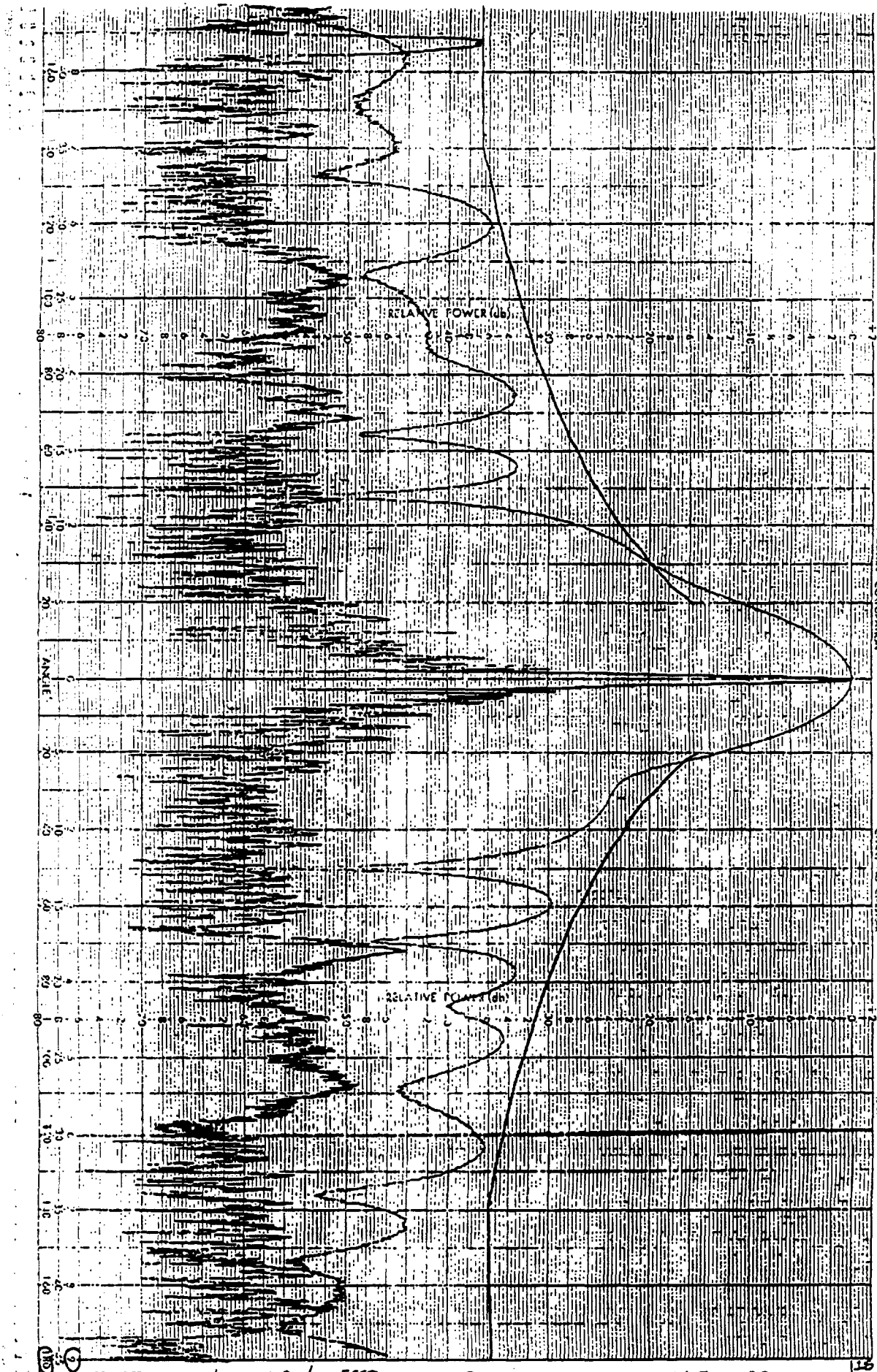
5.925 GHz H-PLANE ±90° @ ±180° Co-Pol



PROJECT 3.7m W/C BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

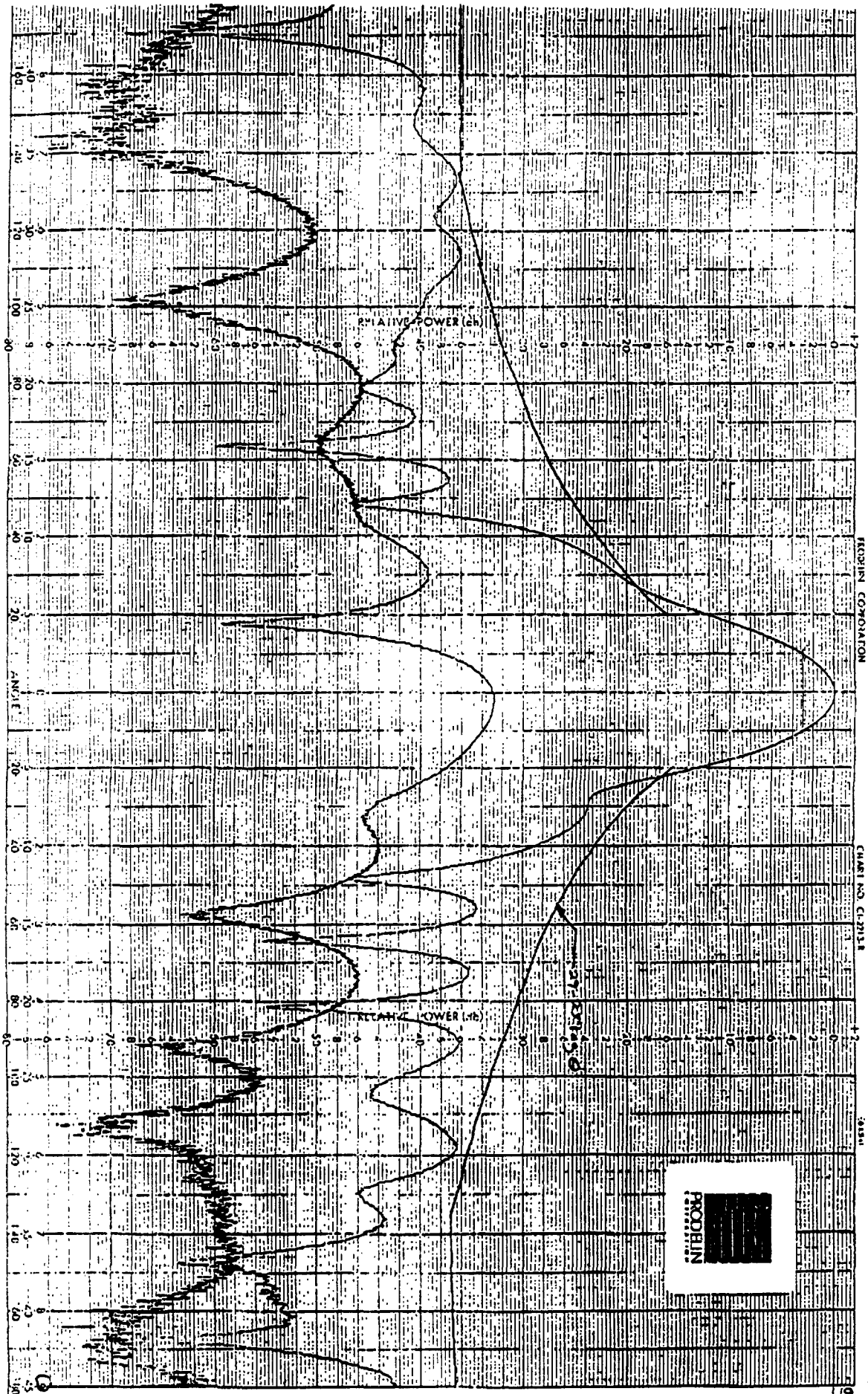
5.925GHz E-PLANE ± 9° Co-Pol & X-Pol



PROJECT 3.7m W/C-BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

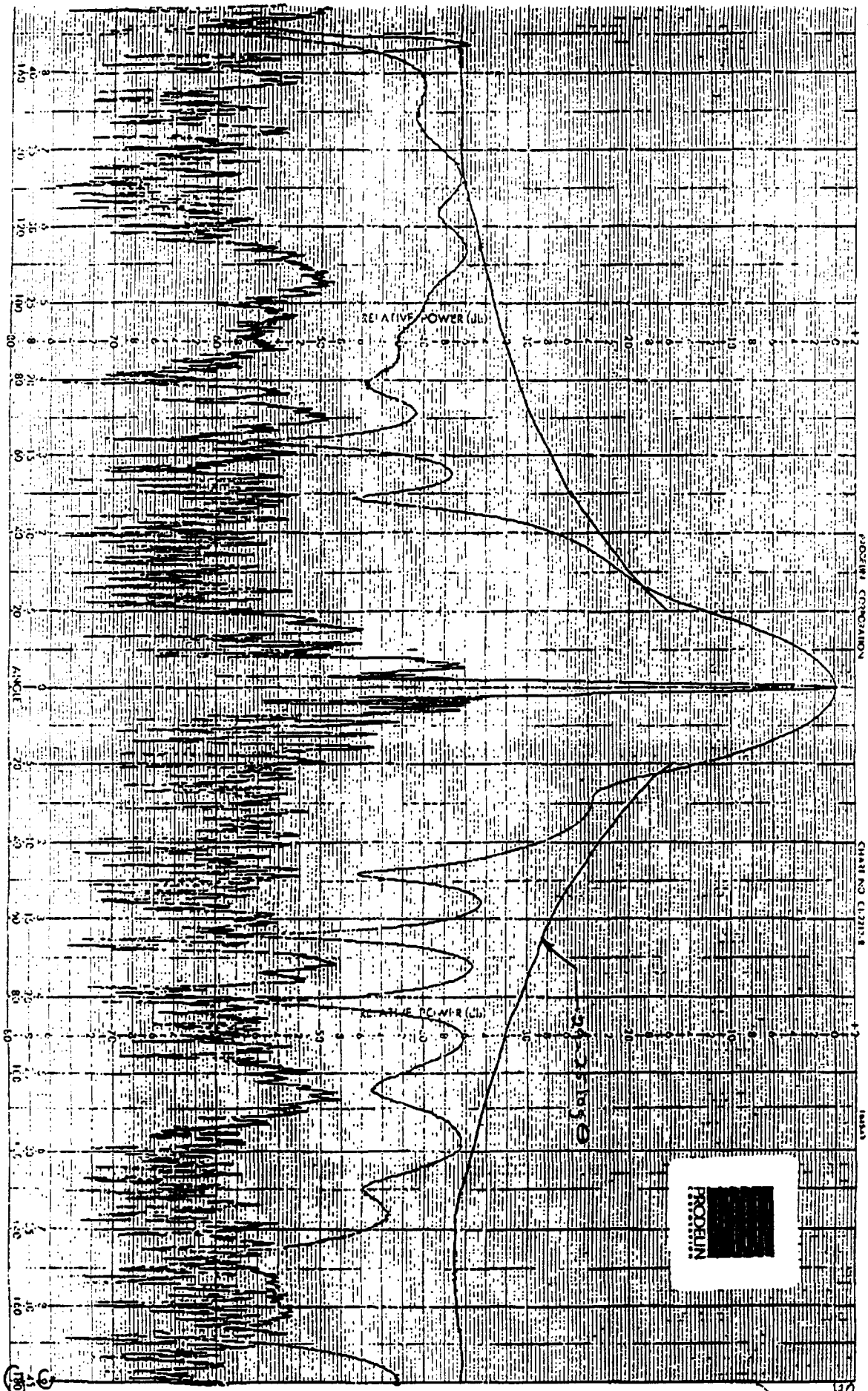
5.925 GHz E-PLANE ±90° & ±180° CO-POL



PROJECT 3.7m W/C-BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

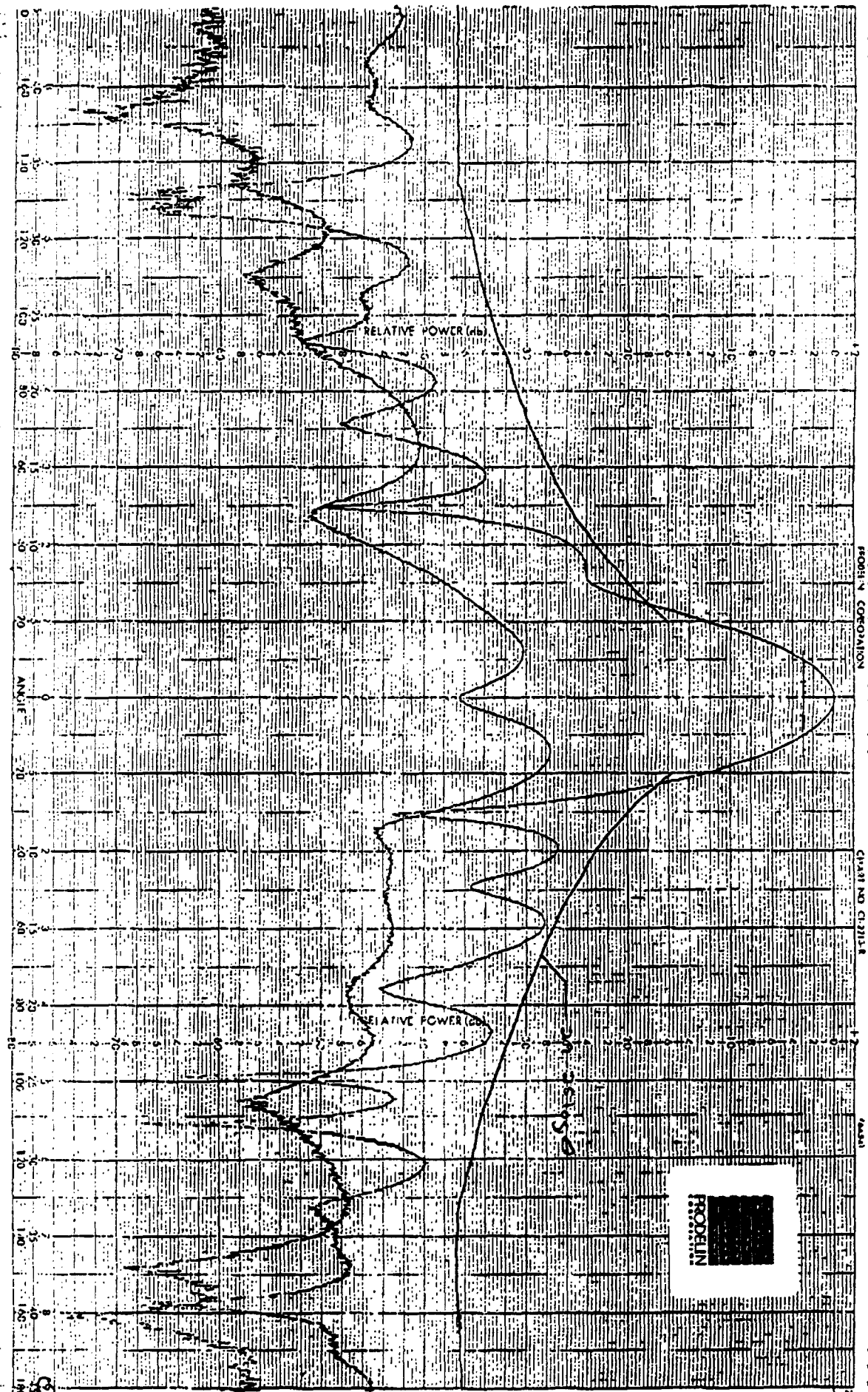
6.175 GHz E-PLANE ±9° CO-POL & X-POL



PROJECT 3.7m W/C-BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

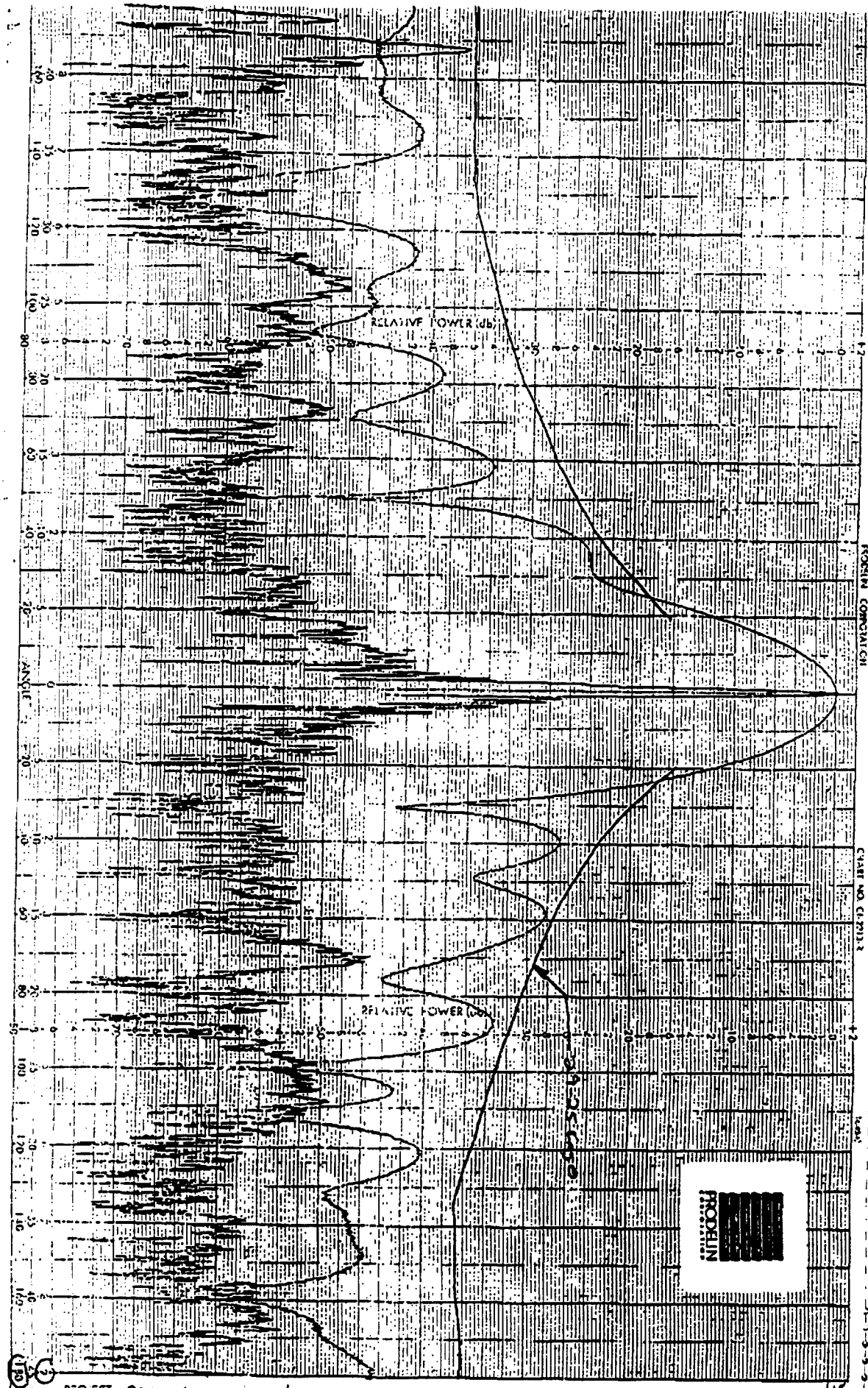
6.175GHz E-PLANE ± 9° @ ± 180° CO-POL



PROJECT 3.7m w/C-BAND RX/TX FEED ENGR DBL DATE 05 JUN 92

REMARKS

6.1756GHz H-PLANE ± 9° CO-POL & X-POL

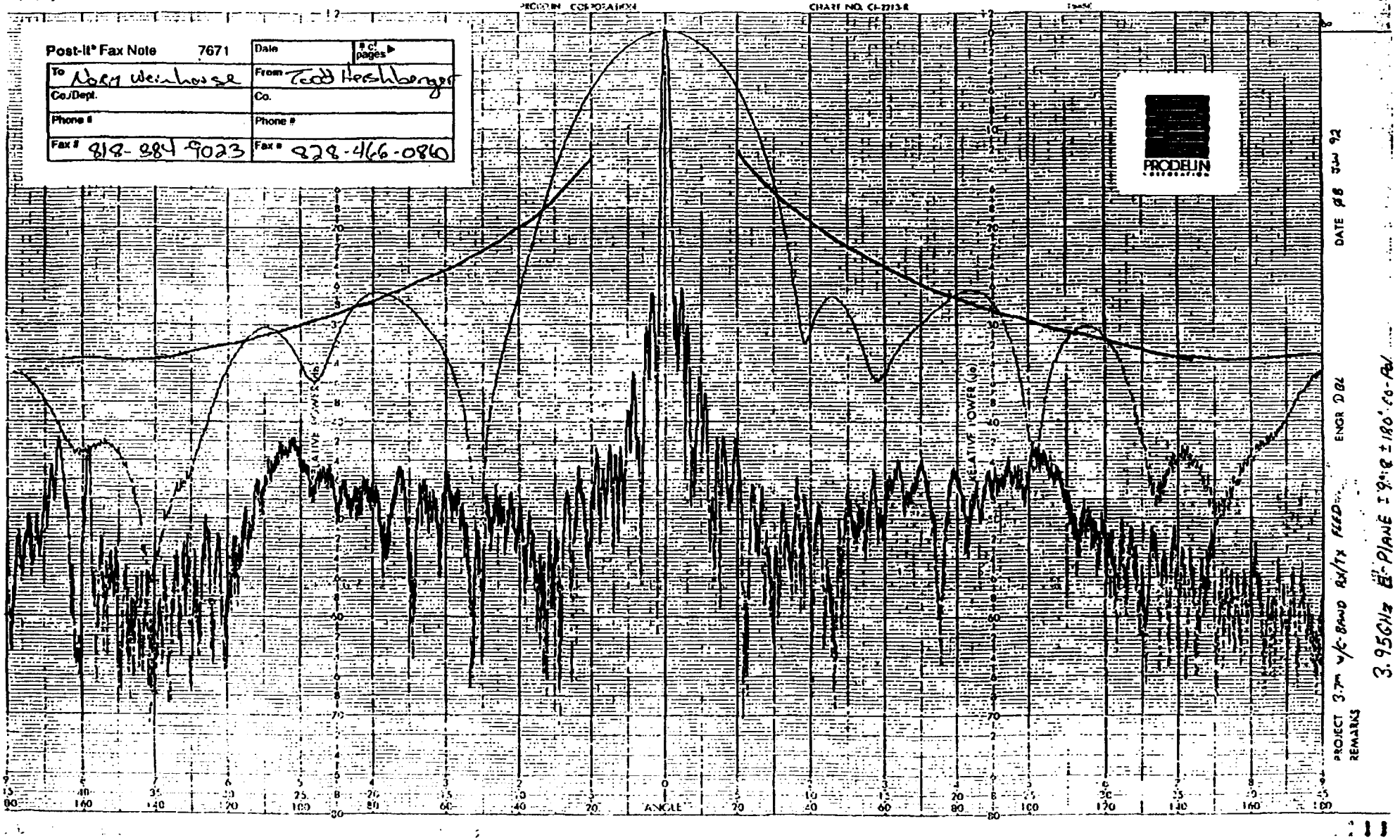


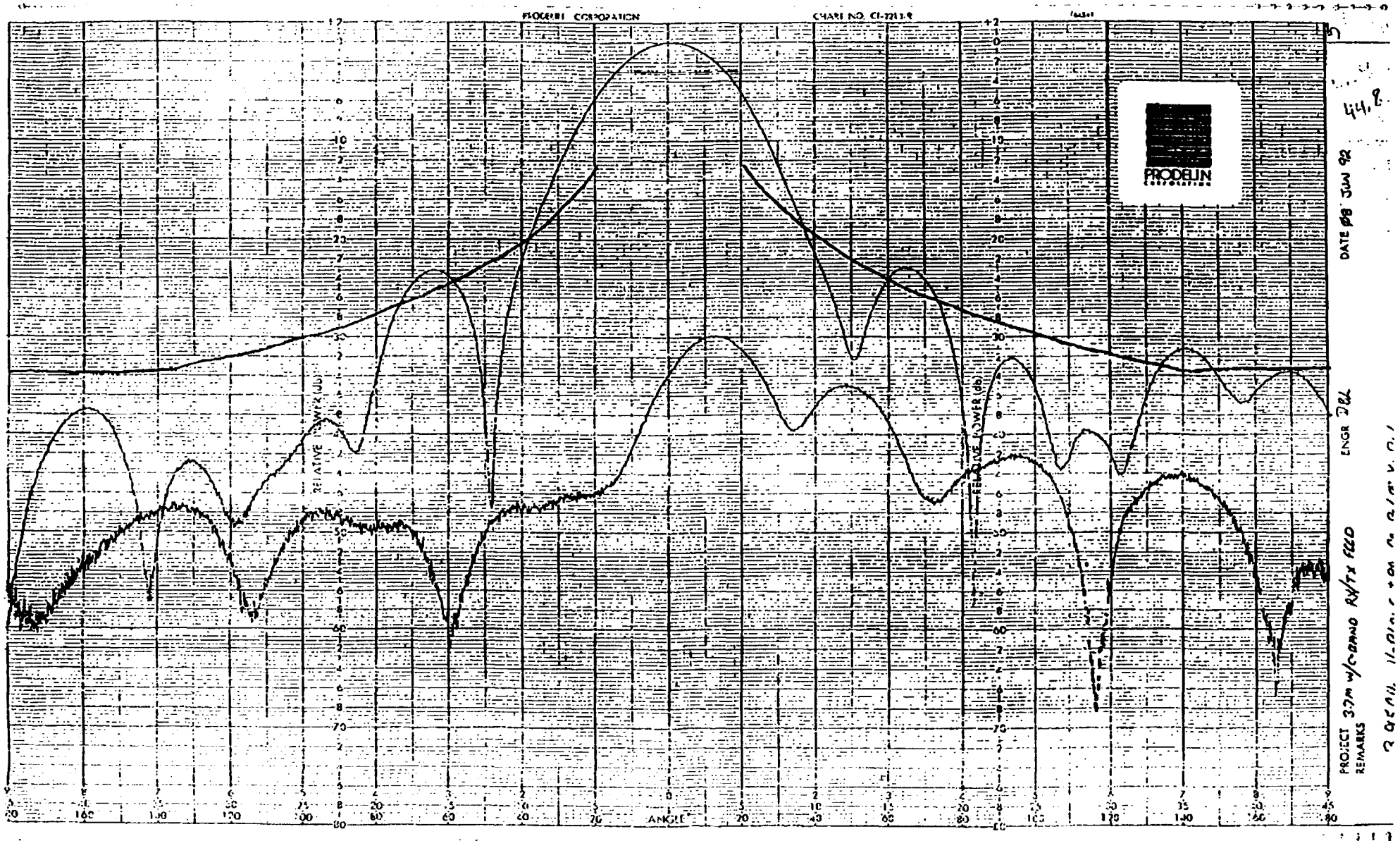
PROJECT 3.7m w/C-BAND RX/TX FEED ENGR DBL DATE 25 JUN 92

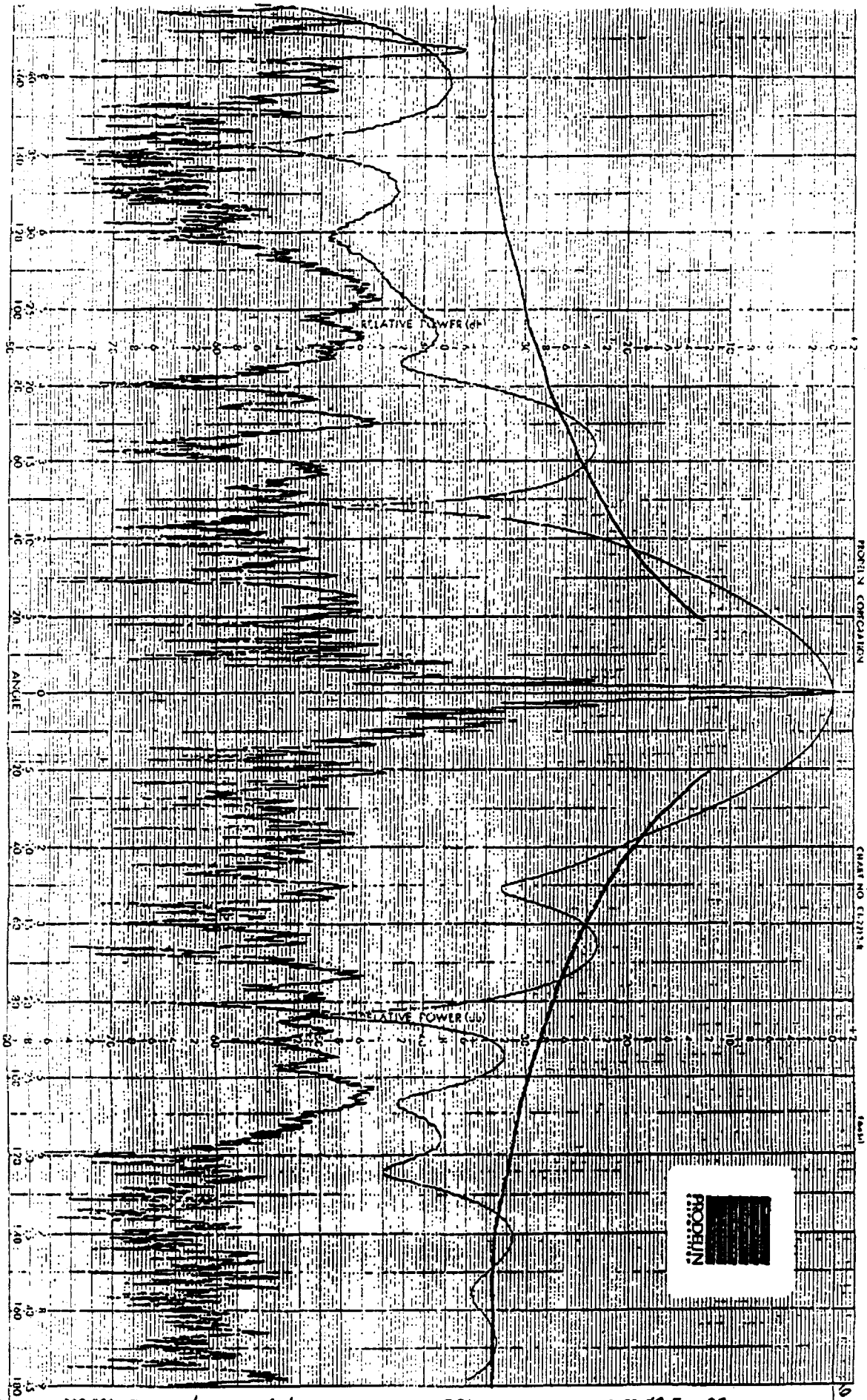
REMARKS

6.175GHz H-PLANE ±9° @ ±180° CO-POL

Post-it® Fax Note 7671	Date	# of pages ▶
To Norm Weinhouse	From Todd Hershberger	
Co./Dept.	Co.	
Phone #	Phone #	
Fax # 818-884-9023	Fax # 828-466-0860	



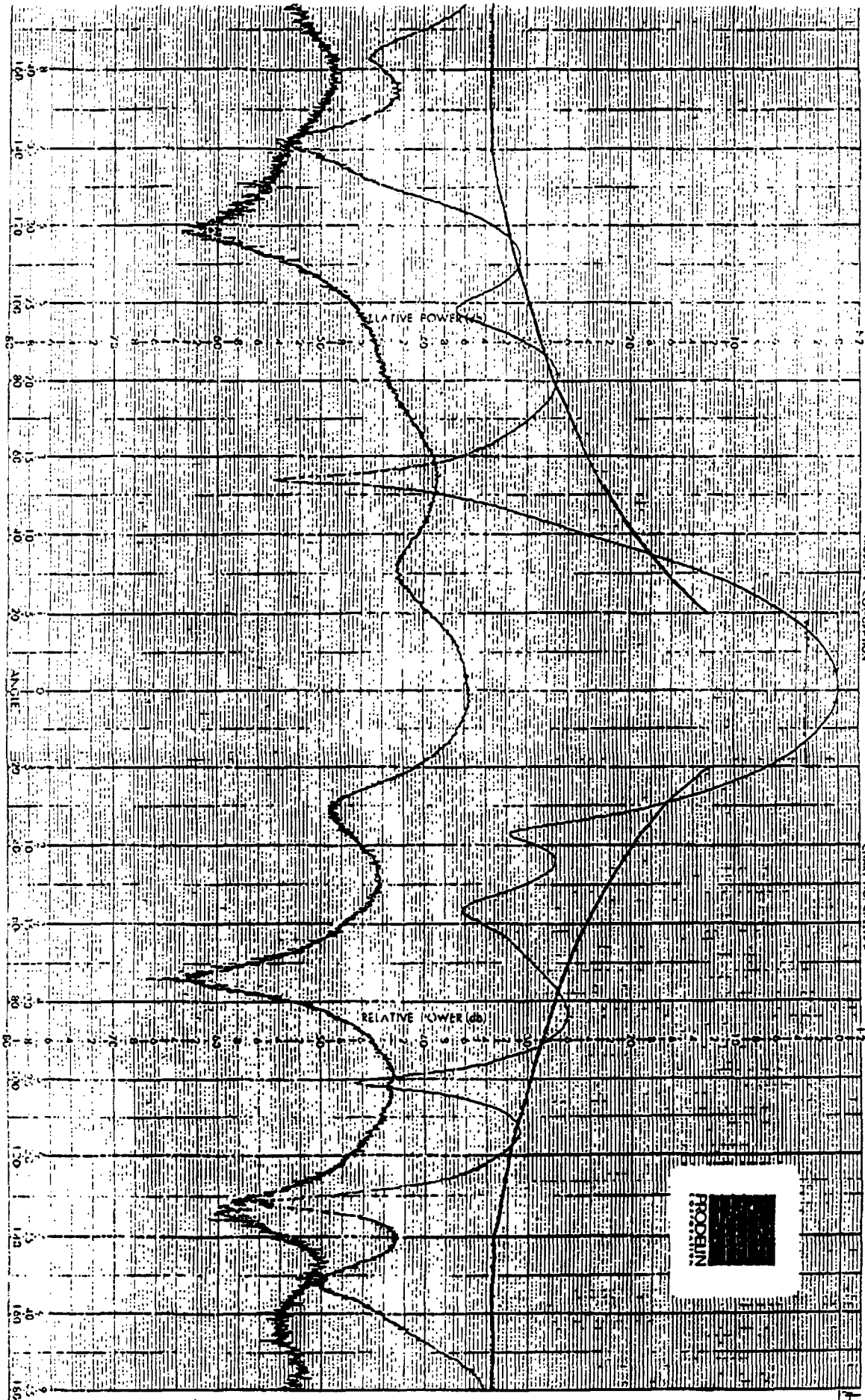

PRODELIN CORPORATION
CHART NO. CI-7213-9
RELATIVE POWER (db)
ANGLE
PRODELIN
DATE 28 JUN 92
ENGR DBL
PROJECT 37m w/C-BAND RX/TX FEED
REMARKS



PROJECT 3.7m w/C-BAND RX/TX FEED ENGR DBL DATE 08 JUN 93

REMARKS

3.95GHz H-PLANE ± 9° & ± 180° Co-Pol



PROJECT 3.7m W/C-BAND RX-TX FEED ENGR DBL DATE 08 JUN 92

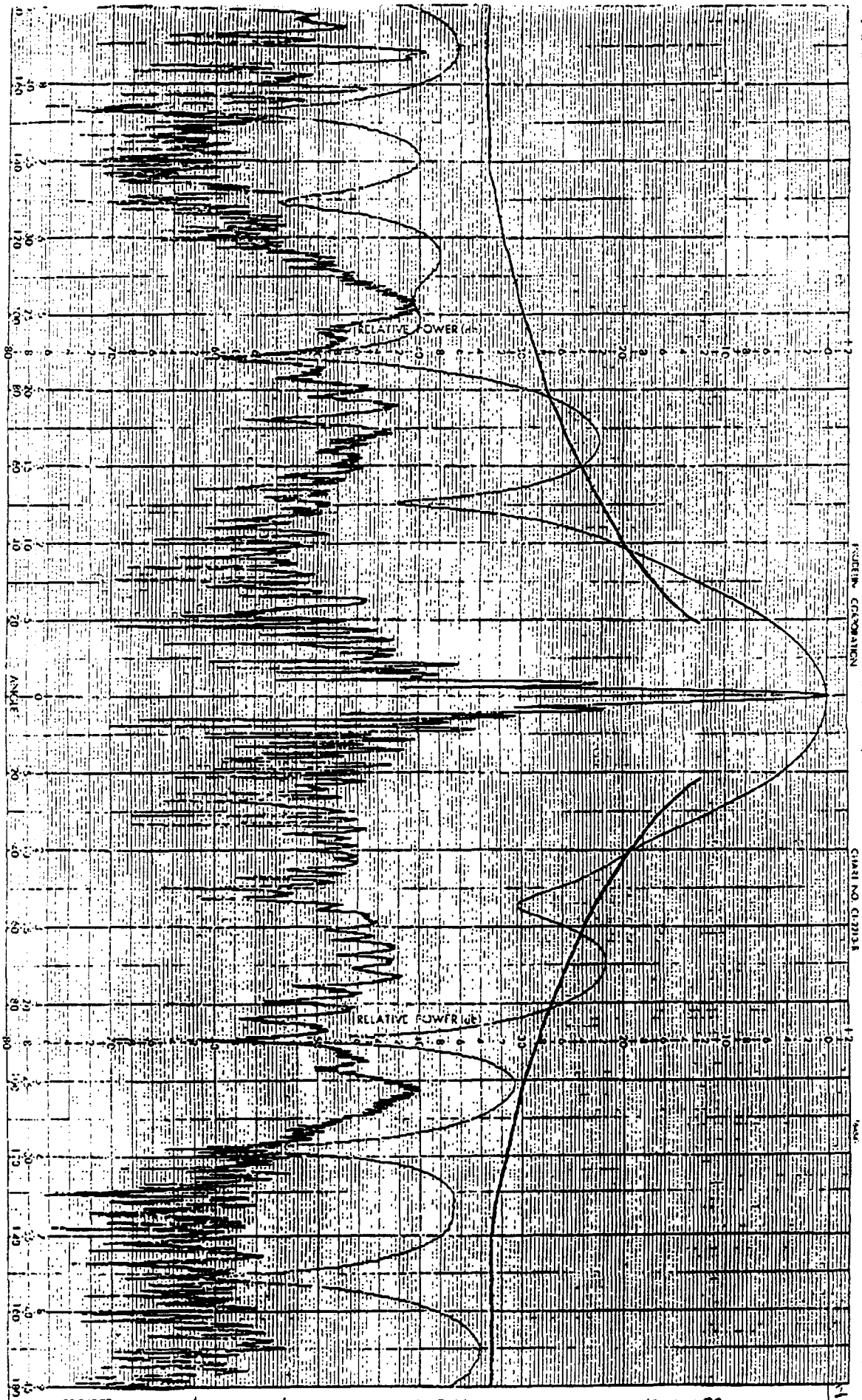
REMARKS

3.95GHz E-PLANE ±90 CoPol & X-Pol

PROJECT 3.7m w/c-Band RX/TX FEED ENGR DBL DATE Ø8 JUN 92

REMARKS

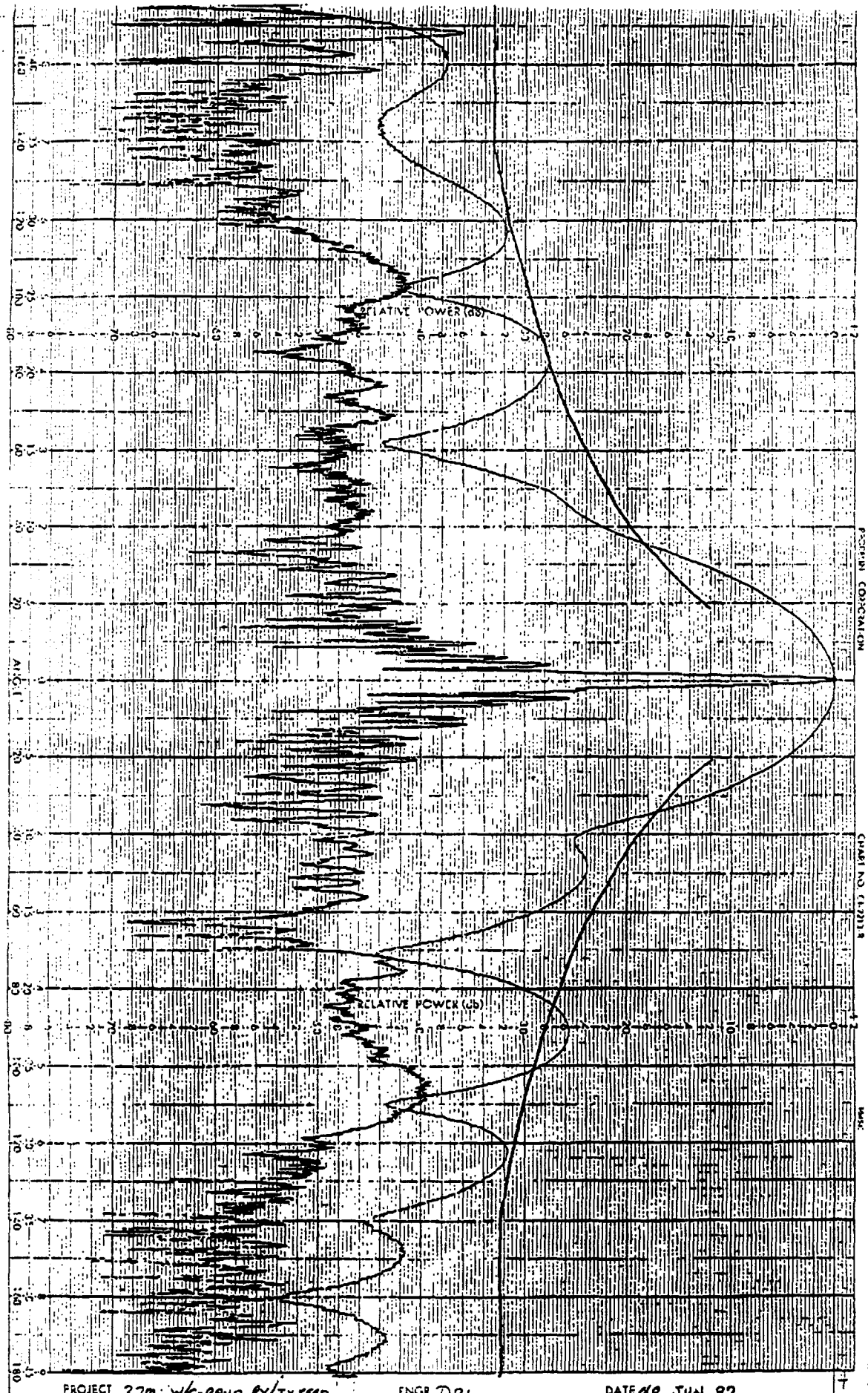
3.70 GHz H-PLANE ± 9° Co-Pol. & X-Pol.



PROJECT 3.7m W/C-BAND RX/TX FEED ENGR DBL DATE Ø8 JUN 92

REMARKS

3.70GHz H-PLANE 390 @ 2 KRA° CO-POL



PROJECT 3.7m w/c-BAND RX/TX FEED ENGR DBL DATE 08 JUN 92

REMARKS

3.70GHz E-PLANE ±9° & ±180° CO-POL