



Lone Star Electronics Co.

EM Technologies, Inc.

Antenna Systems Company

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TEST DATA ON 12X12 AND 12X30 ANTENNAS

August 19, 2002

1. Freq. in MHz VSWR of 12x12 VSWR of 12x30

900	1.26	1.21
902	1.15	1.18
905	1.08	1.16
910	1.07	1.09
915	1.25	1.11
920	1.31	1.05
925	1.33	1.21
928	1.42	1.24
930	1.50	1.22

The 12x30 is the
finer antenna. The
12x12 is a Sevey
antenna for
comparison

2. 3db Beam Width over RHCP source

Freq. in MHz	12x12		12x30	
	Horizontal cut	Vertical cut	Horizontal cut	Vertical cut
902	75°	90°	65°	18°
915	75°	80°	67°	19°
928	72°	89°	62°	21°

3. Measured Antenna Gain

Note: Antenna gain measurements were made on horizontal plane with a vertically polarized standard gain antenna.

Freq. in MHz	Gain in dbi	
	12x12	12x30
902	-2.09	+5.51
915	-4.03	+6.97
928	+0.43	+5.02

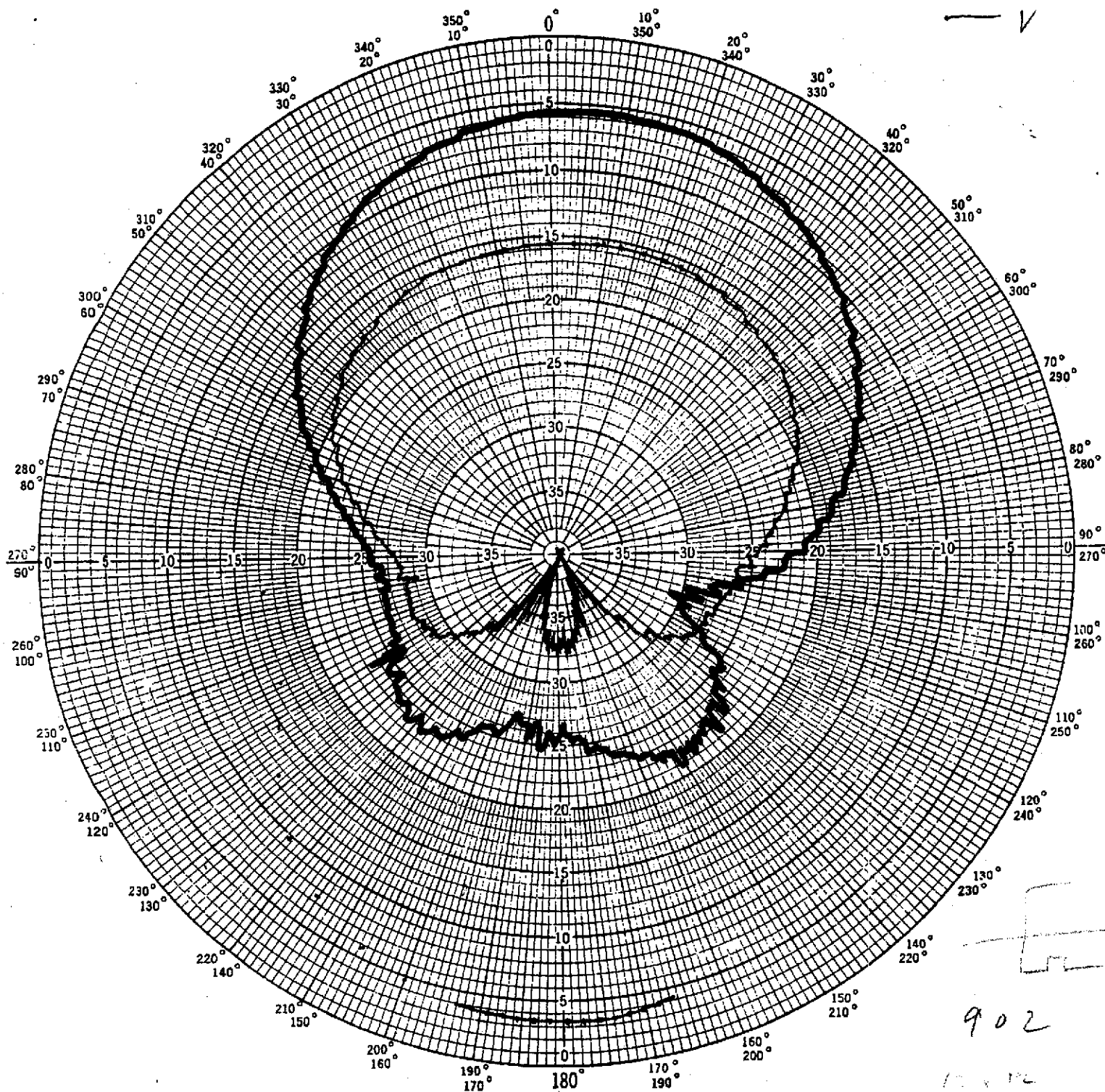
4. Axial Ratio at Bore-sight

Freq. in MHz	12x12		12x30	
	Horizontal plane	Vertical plane	Horizontal plane	Vertical plane
902	10.0 db	7.5 db	5.0 db	6.5 db
915	12.5	8.0	4.0	7.0
928	8.0	5.5	3.0	3.5



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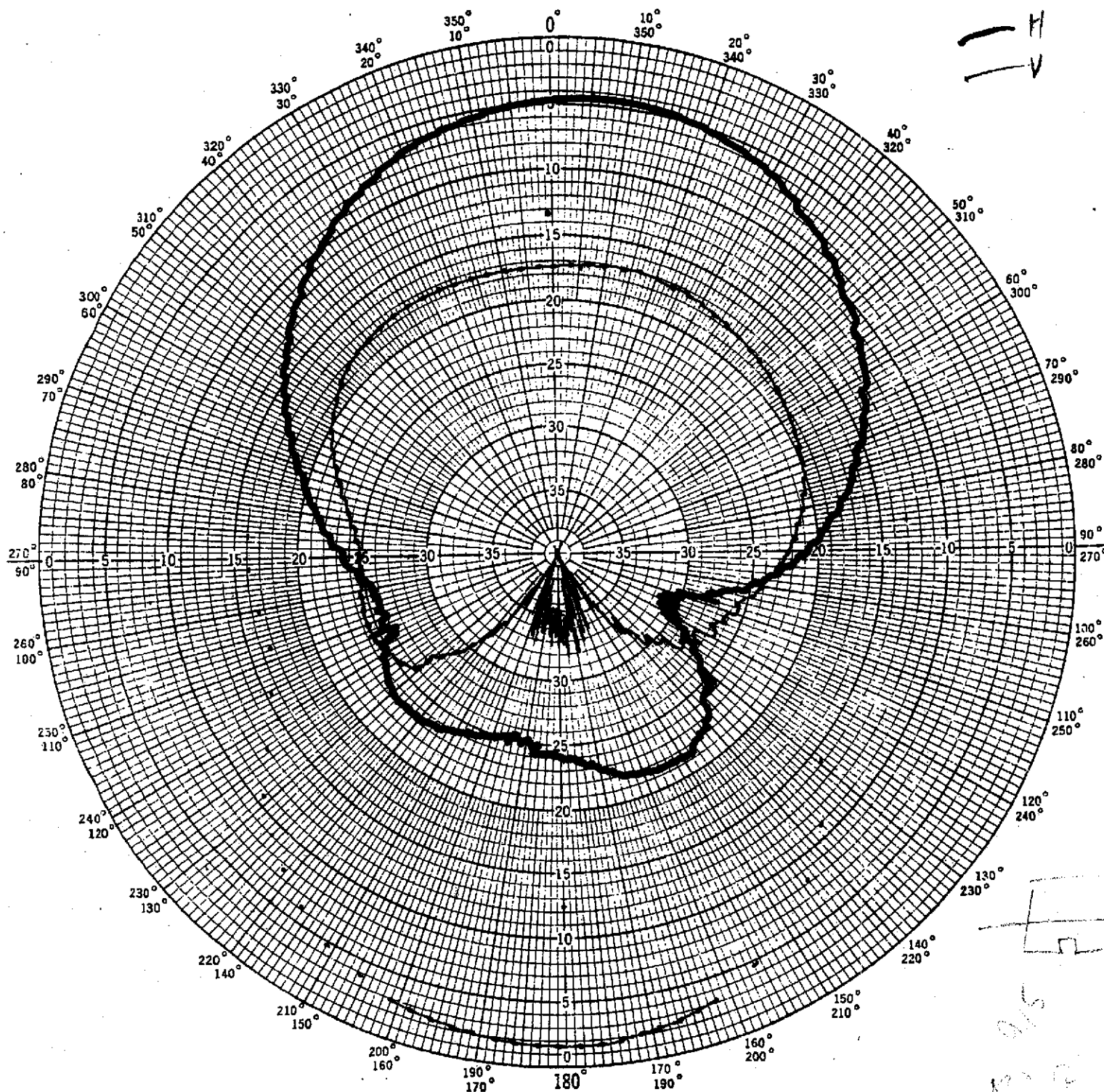


902

ANTENNA TYPE	LOCATION	USE	
TEST MODEL: 12x12		FREQUENCY: 902 MHz	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHz	☐
CONDITIONS: _____		POLARIZATION:	W/ Linear Source
CURVES PLOTTED IN:		E ϕ : _____	Red - Vertical Pol
VOLTAGE: _____		E ϕ : Horizontal	Blk - Horizontal Pol
POWER: _____		PATTERN AREA: _____	
ENGINEER okk	OPERATOR okk	FILE NO. 02815-0	DATE 8-15-02



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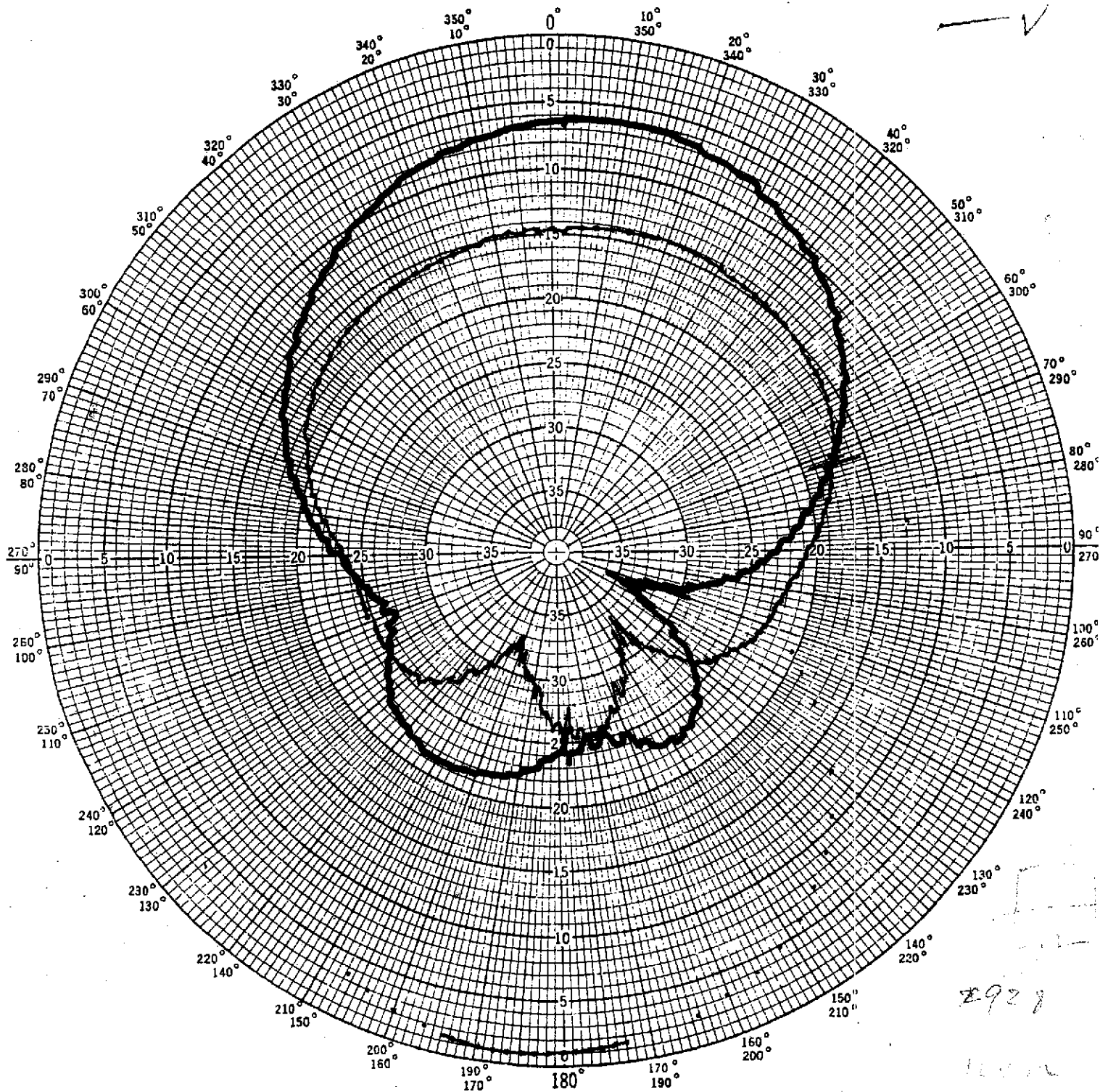


ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x12</u>		FREQUENCY: <u>915</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	W/ Linear Source
CURVES PLOTTED IN:		E ϕ : _____	Red - Vertical Pol.
VOLTAGE: _____		E ϕ : <u>Horizontal</u>	Blk - Horizontal Pol.
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>pkk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02815-1</u>	DATE <u>8-15-02</u>



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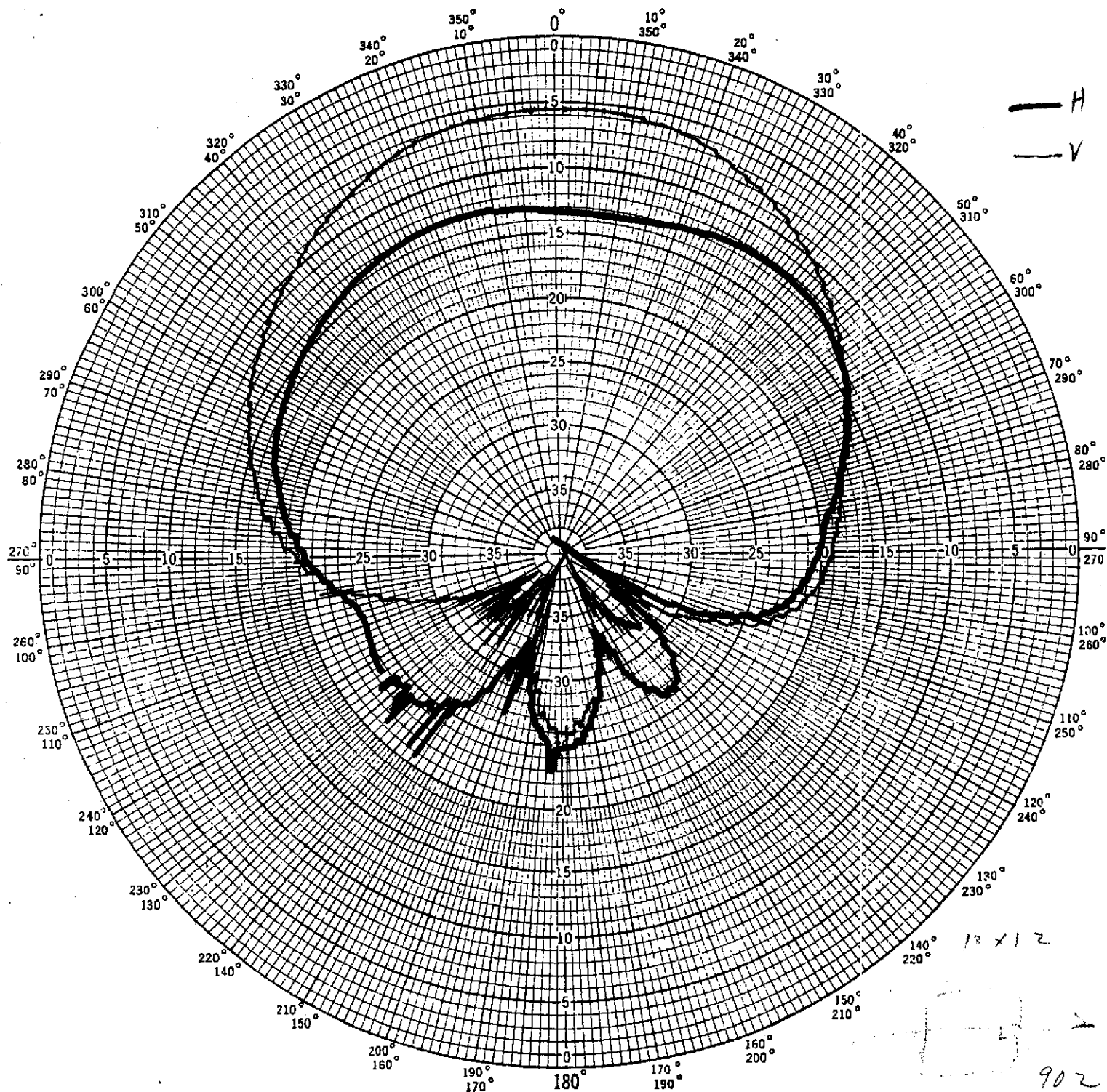
— H
— V



ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x12</u>		FREQUENCY: <u>928</u> MHZ	☐ w/ Linear Source Red - Vertical Pol Blk - Horizontal pol.
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	
CONDITIONS: _____		POLARIZATION: _____	
CURVES PLOTTED IN:		E ϕ : _____	
VOLTAGE: _____		E ϕ : <u>Horizontal</u>	
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02815-2</u>	DATE <u>8-15-02</u>



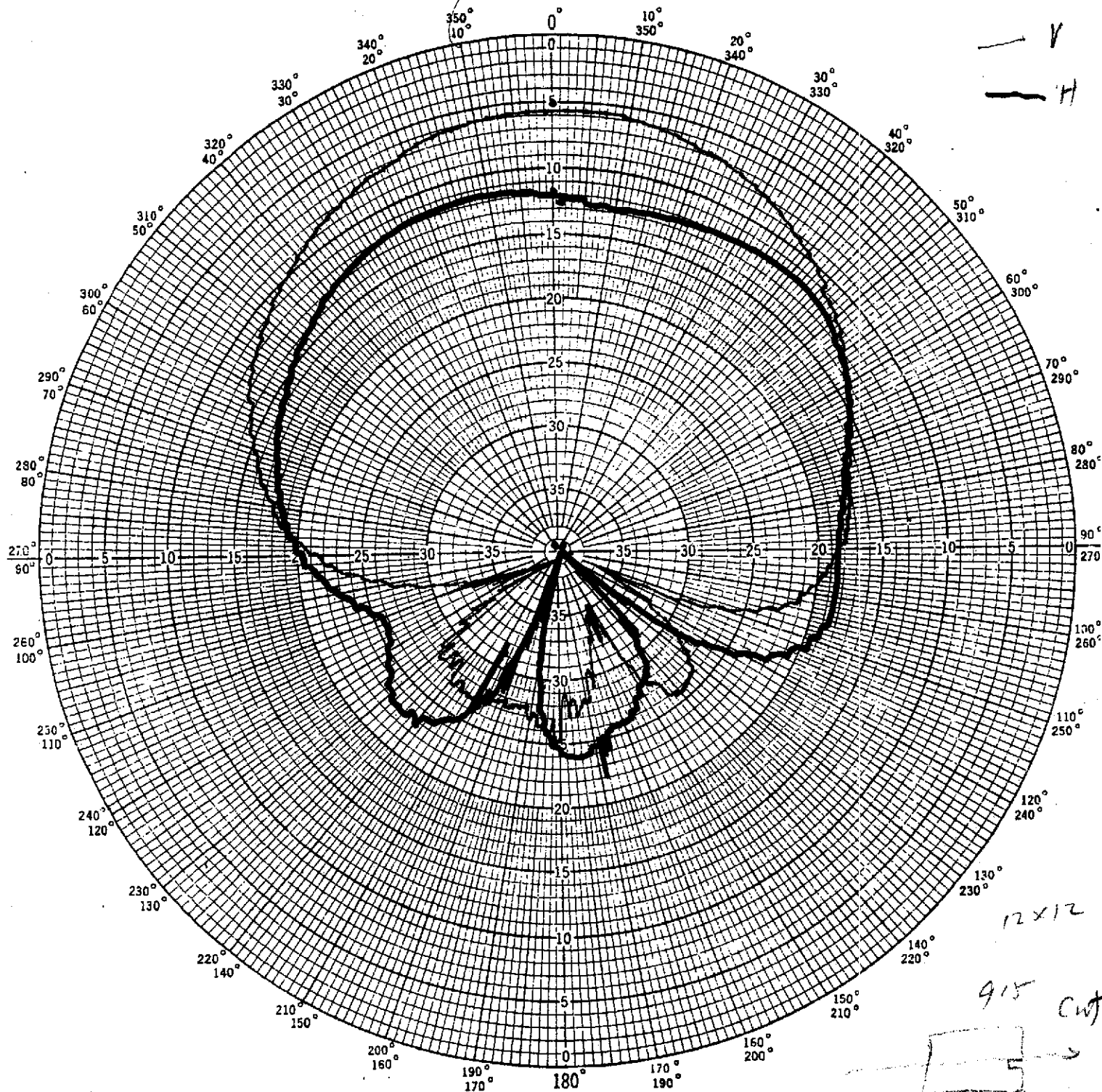
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x12</u>		FREQUENCY: <u>902</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	W/ Linear Source
CURVES PLOTTED IN:		E ϕ : <u>Vertical</u>	Red -- Vertical Pol.
VOLTAGE: _____		E ϕ : _____	Blk -- Horizontal Pol.
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02819-0</u>	DATE <u>19-02</u>



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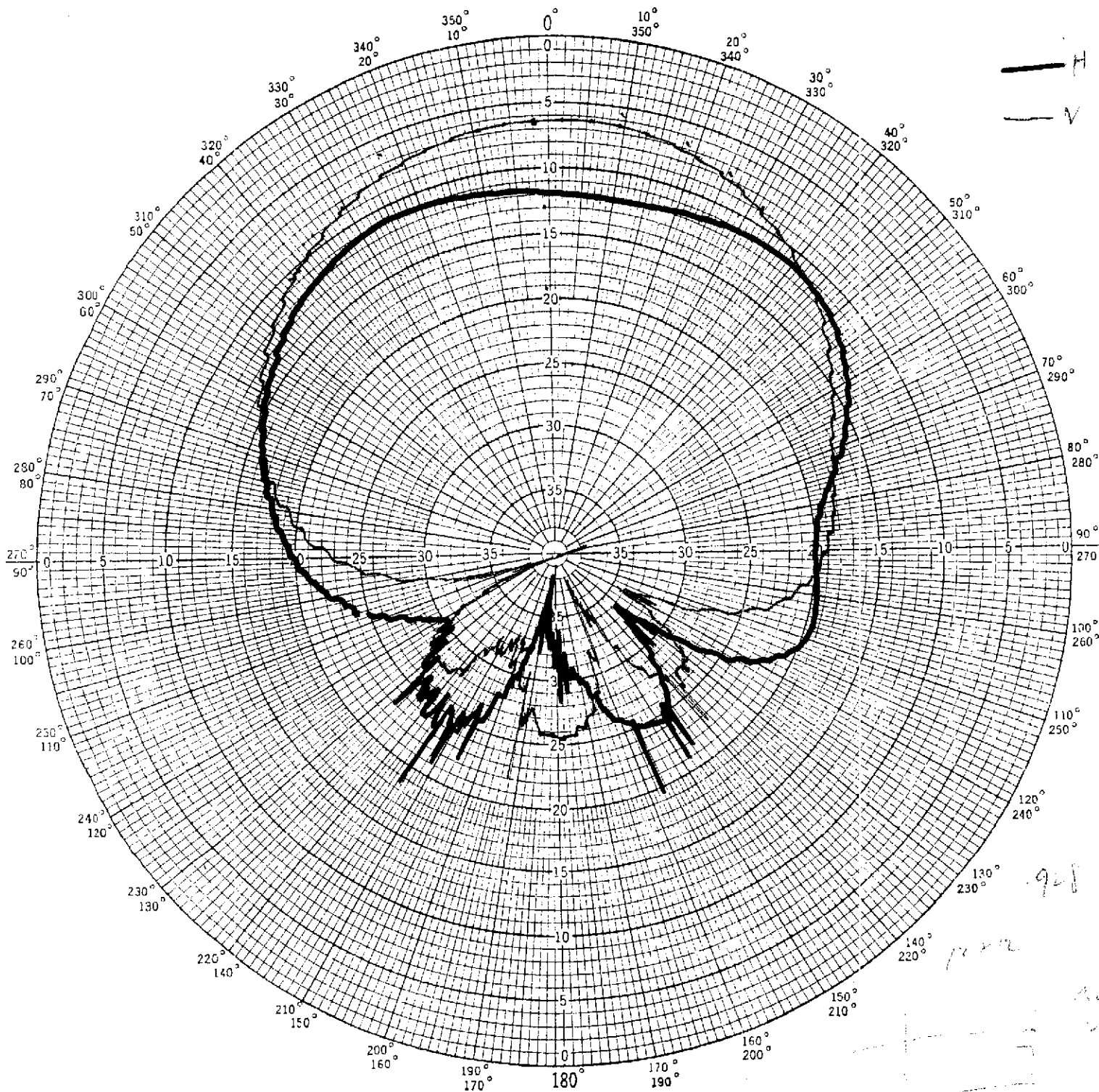


ANTENNA TYPE	LOCATION	USE
TEST MODEL: <u>12x12</u>		FREQUENCY: <u>915</u> MHZ
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ
CONDITIONS: _____		POLARIZATION: _____
CURVES PLOTTED IN: _____		E ϕ : <u>Vertical</u>
VOLTAGE: _____		E ϕ : _____
POWER: _____		PATTERN AREA: _____
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02819-1</u>
		DATE <u>8-19-02</u>

☐
W/ Linear Source
Red - Vertical Pol.
Blk - Horizontal Pol.



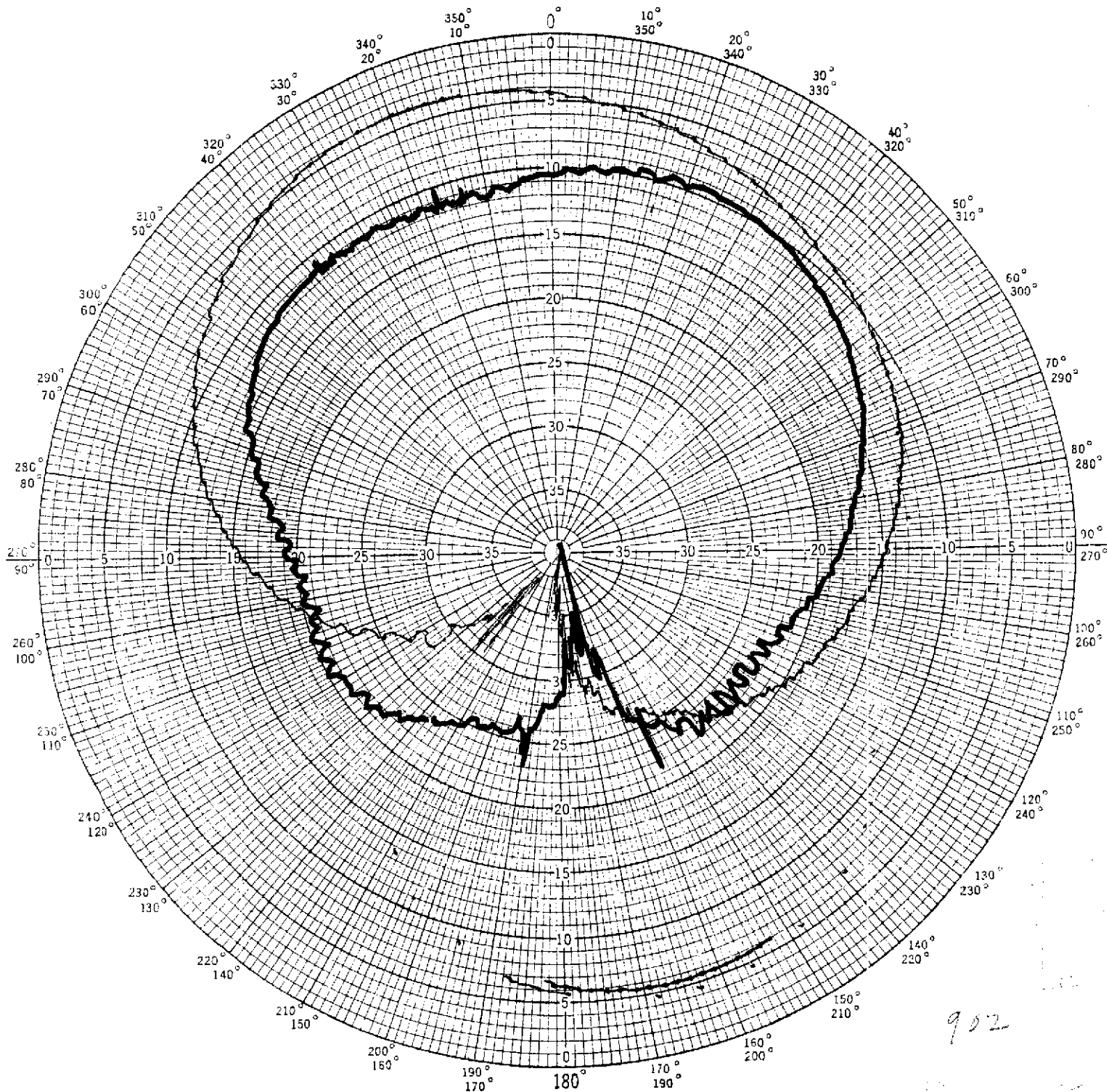
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x12</u>		FREQUENCY: <u>928</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	W/ Linear Source
CURVES PLOTTED IN:		E θ : <u>Vertical</u>	Red - Vertical Pol.
VOLTAGE: _____		E ϕ : _____	Blk - Horizontal Pol.
POWER: _____		PATTERN AREA: _____	
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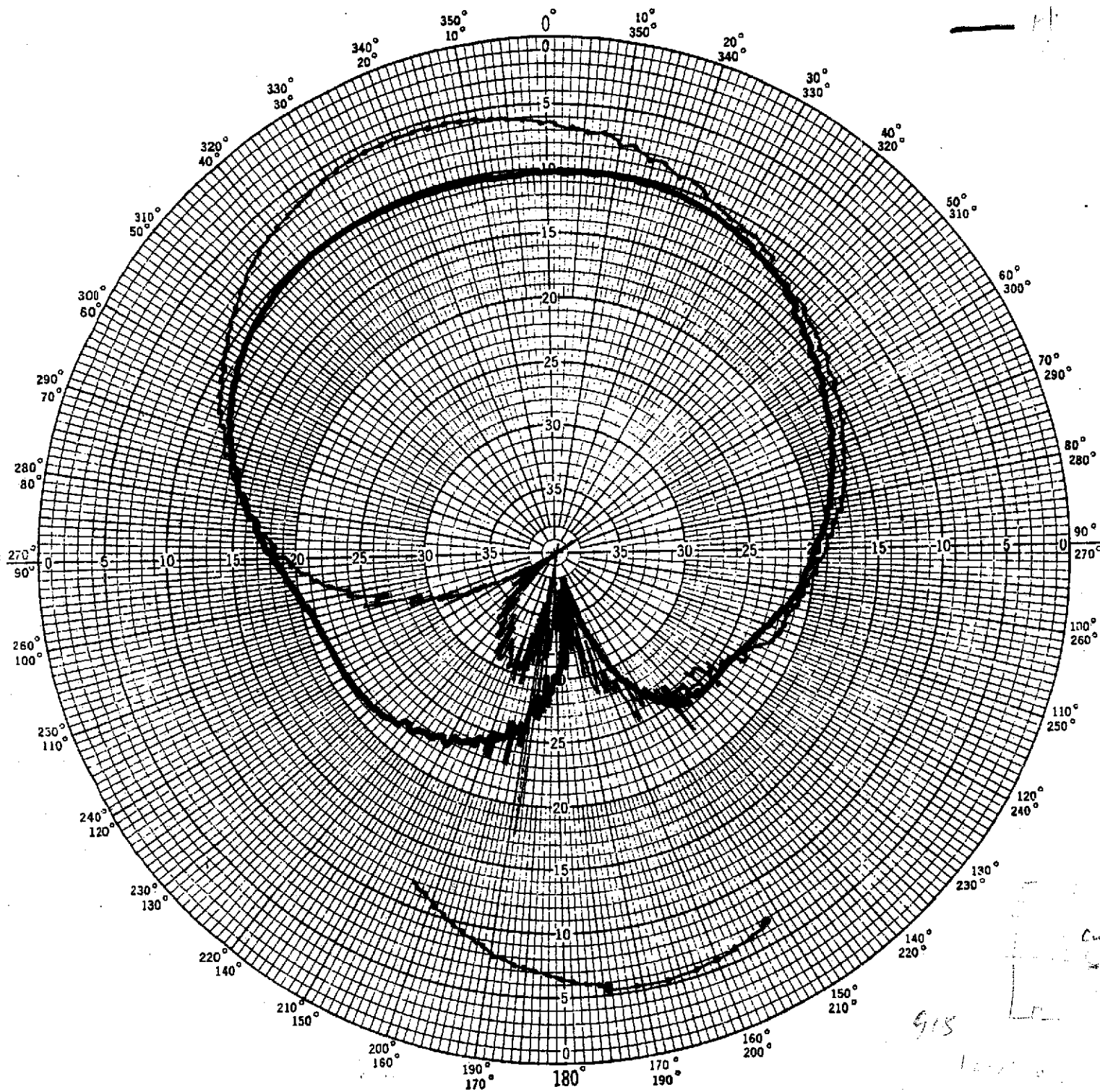
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: 12x30		FREQUENCY: 902 MHZ	☐
MODEL SCALE:		SCALE FREQUENCY:	☐
CONDITIONS:		POLARIZATION:	W/ Linear Source
CURVES PLOTTED IN:		$E \theta$:	Red - Vertical Pol.
VOLTAGE:		$E \phi$: Horizontal	Blk - Horizontal pol.
POWER:		PATTERN AREA:	
ENGINEER okk	OPERATOR okk	FILE NO. 02816-0	DATE 8-16-02



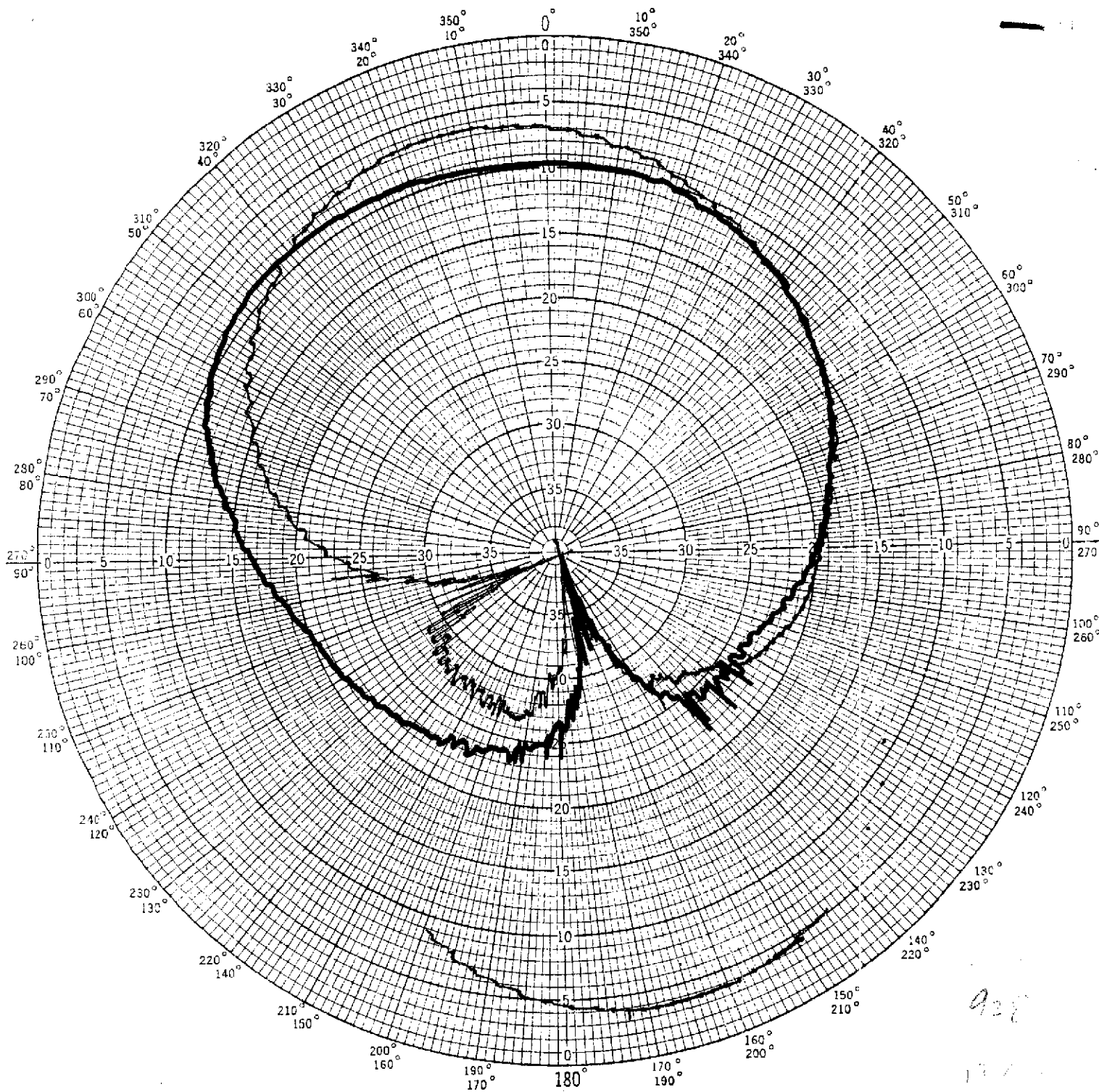
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>915</u> MHZ	☐ W/ Linear ☒ Source Red - Vertical Pol. Blk - Horizontal pol.
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	
CONDITIONS: _____		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ : _____	
VOLTAGE: _____		E ϕ : <u>Horizontal C</u>	
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02816-1</u>	DATE <u>8-16-02</u>



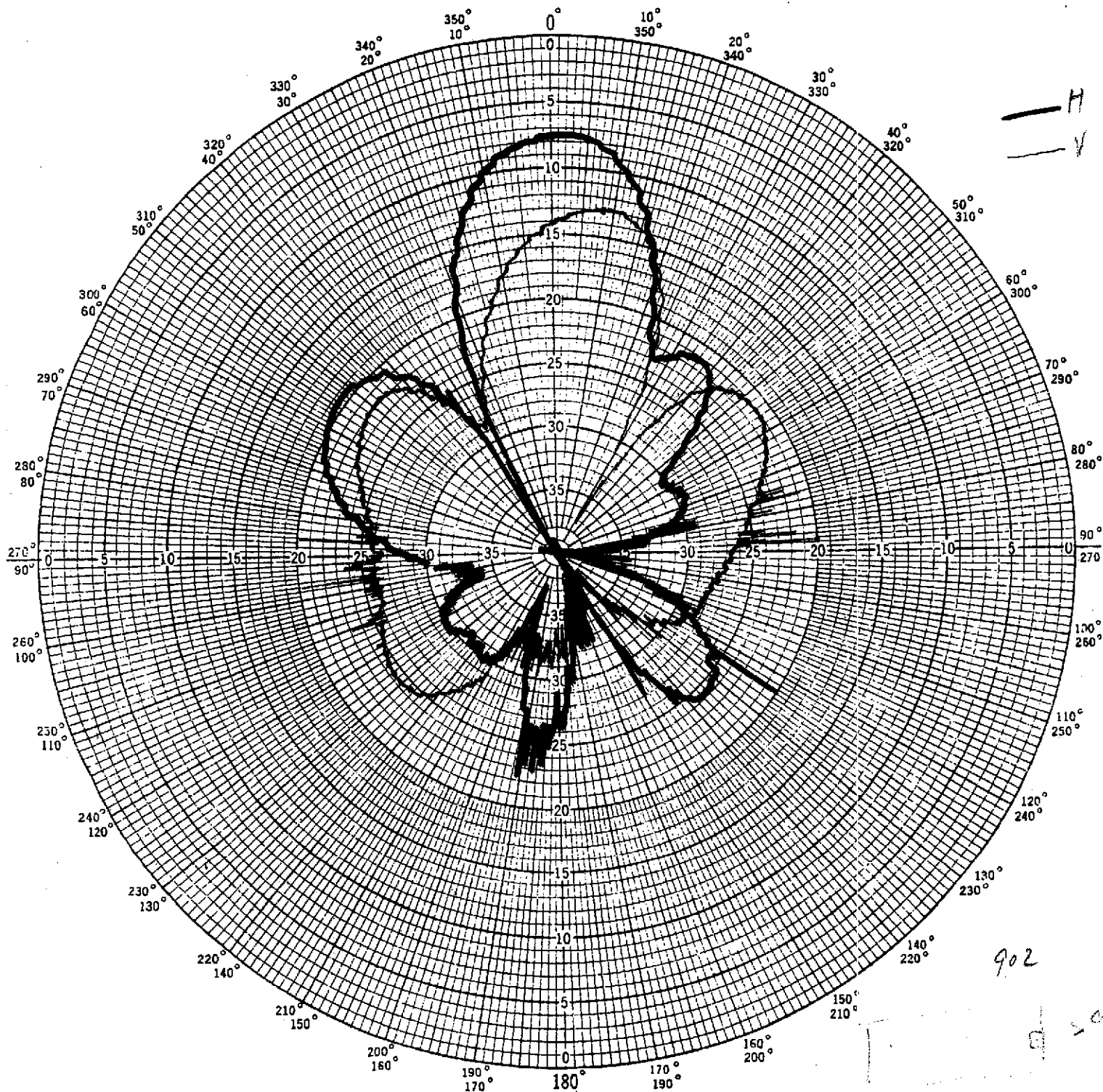
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>928</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	W/ Linear Source
CURVES PLOTTED IN:		$E \theta$: _____	Red - Vertical Pol.
VOLTAGE: _____		$E \phi$: <u>Horizontal</u>	Blk - Horizontal Pol.
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02816-2</u>	DATE <u>8-16-02</u>



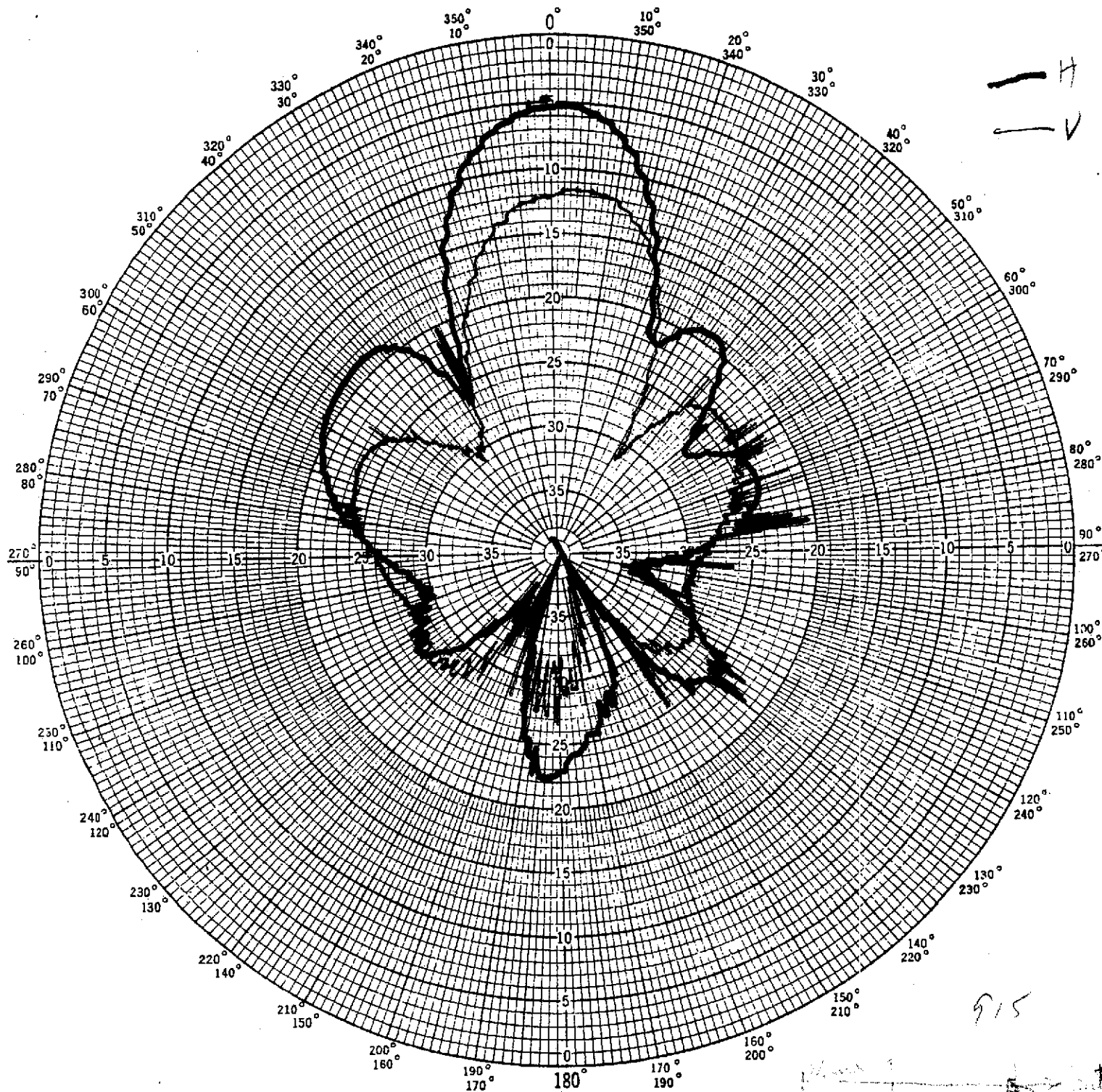
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: 12x30		FREQUENCY: 902 MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	W/ Linear ☐ Source
CONDITIONS: _____		POLARIZATION:	Red - Vertical pol.
CURVES PLOTTED IN:		E ϕ : Vertical	Blk - Horizontal pol.
VOLTAGE: _____		E ϕ : _____	
POWER: _____		PATTERN AREA: _____	
ENGINEER okk	OPERATOR okk	FILE NO. 02816-3	DATE 8-19-02



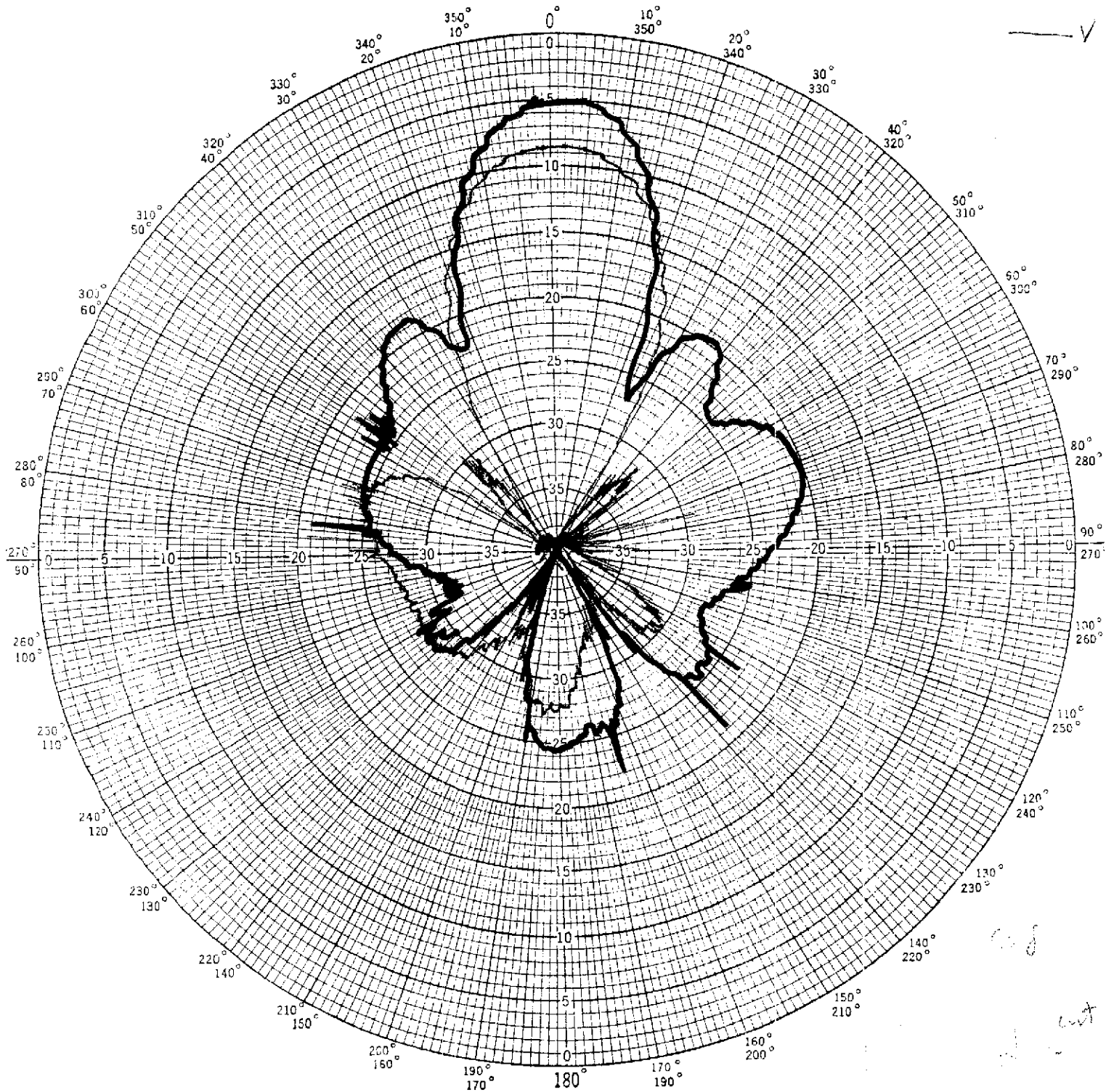
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>915</u> MHZ	☐ W/ Linear Source Red - Vertical pol. Blk - Horizontal pol.
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	
CONDITIONS: _____		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ : <u>Vertical</u>	
VOLTAGE: _____		E ϕ : _____	
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02816-4</u>	DATE <u>8-19-02</u>



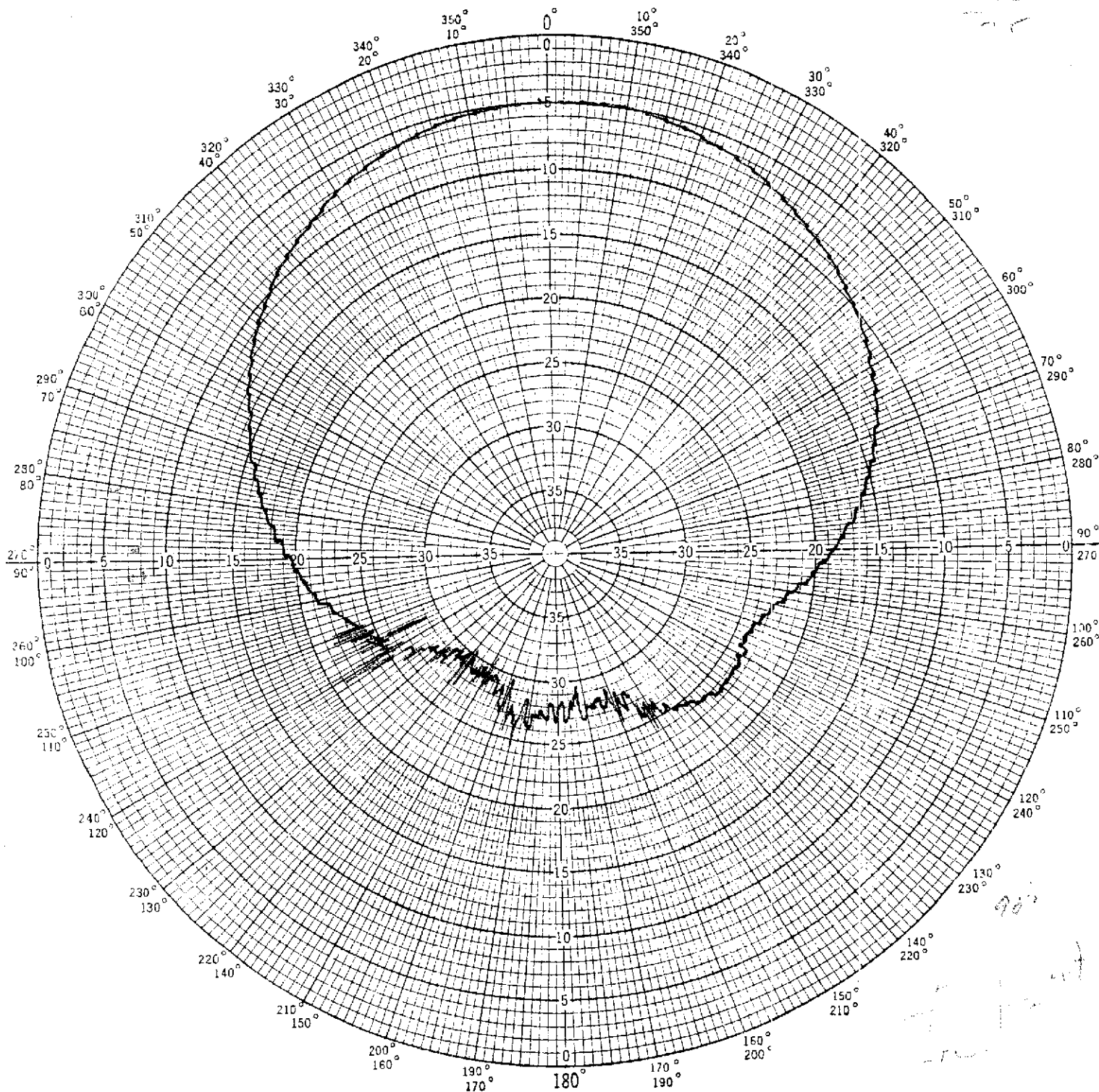
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>928</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	w/ Linear source
CONDITIONS: _____		POLARIZATION:	Red - Vertical pol.
CURVES PLOTTED IN:		$\Sigma \phi$: <u>Vertical</u>	Elk - Horizontal pol.
VOLTAGE: _____		$E \phi$: _____	
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>02816-5</u>	DATE <u>8-19-02</u>



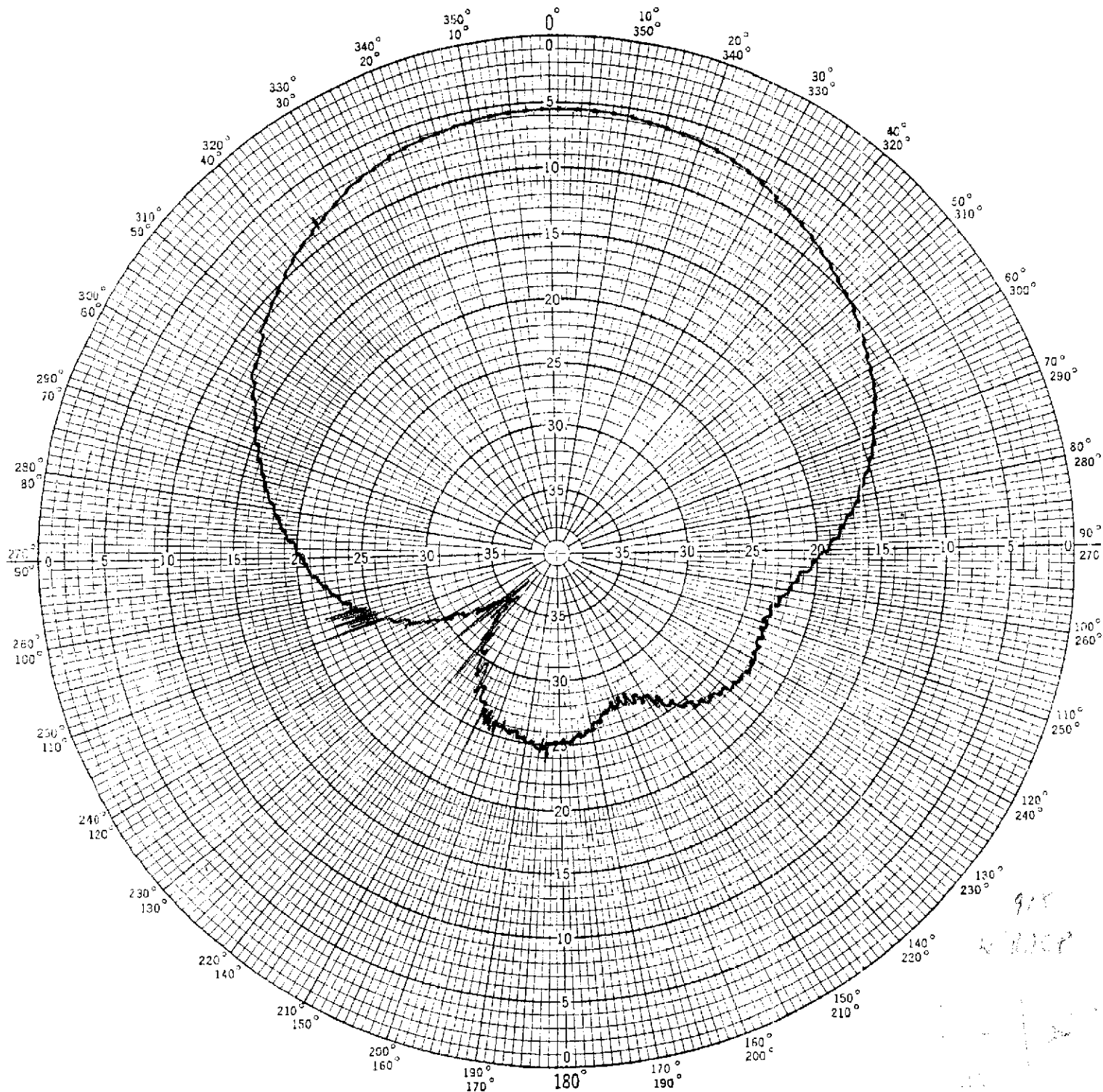
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: 12x12		FREQUENCY: 902 MHz	☐
MODEL SCALE:		SCALE FREQUENCY: MHz	☐
CONDITIONS:		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ :	
VOLTAGE:		E ϕ : Horizontal	W/RHCP Source
POWER:		PATTERN AREA:	
ENGINEER okk	OPERATOR pkk	FILE NO. 028196	DATE 8-19-02



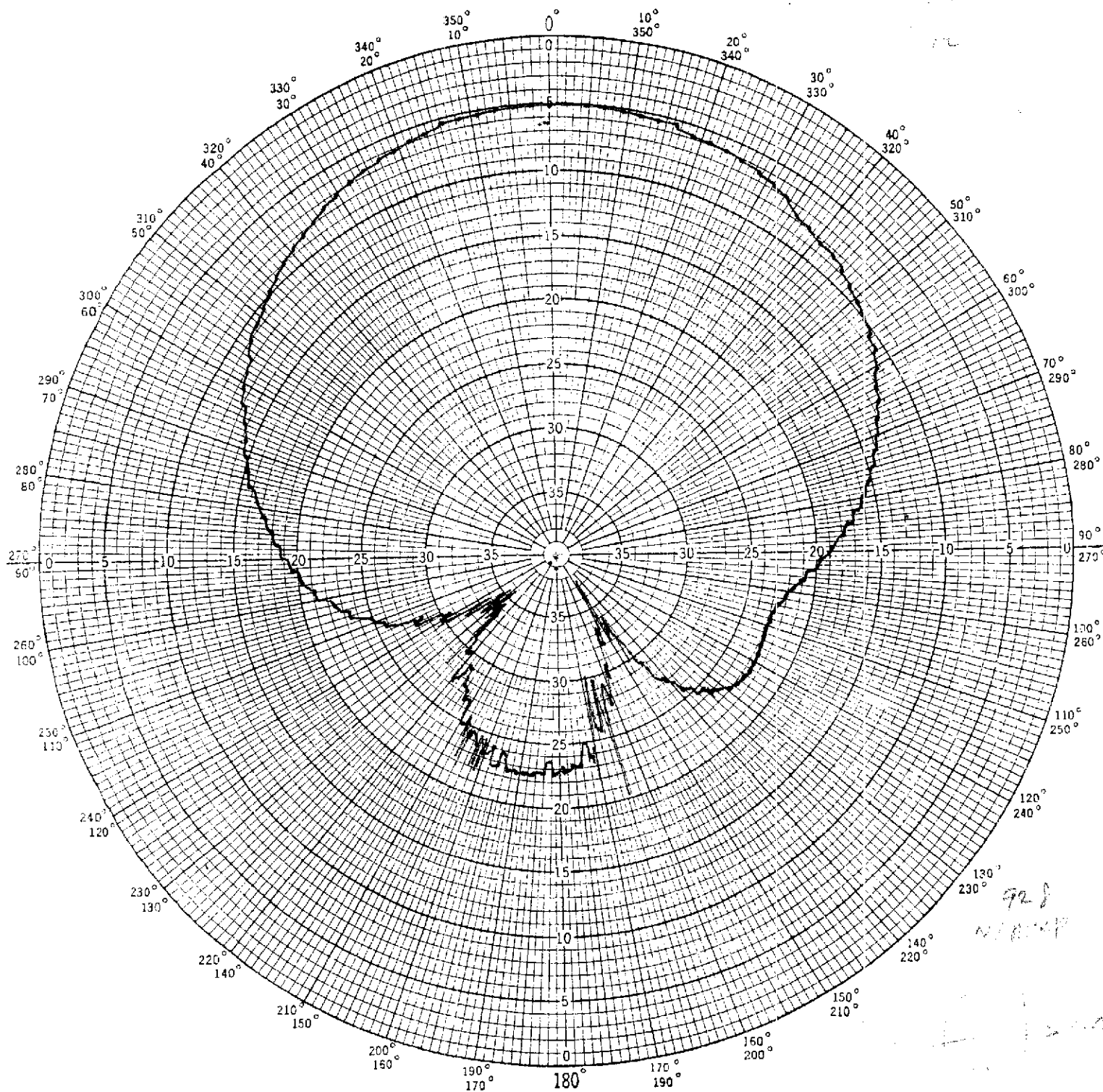
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x12</u>		FREQUENCY: <u>915</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION: _____	
CURVES PLOTTED IN: _____		E ϕ : _____	
VOLTAGE: _____		E ϕ : <u>Horizontal</u>	☒ W/ RHCP Source
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>OKK</u>	OPERATOR <u>OKK</u>	FILE NO. <u>028197</u>	DATE <u>8-19-02</u>



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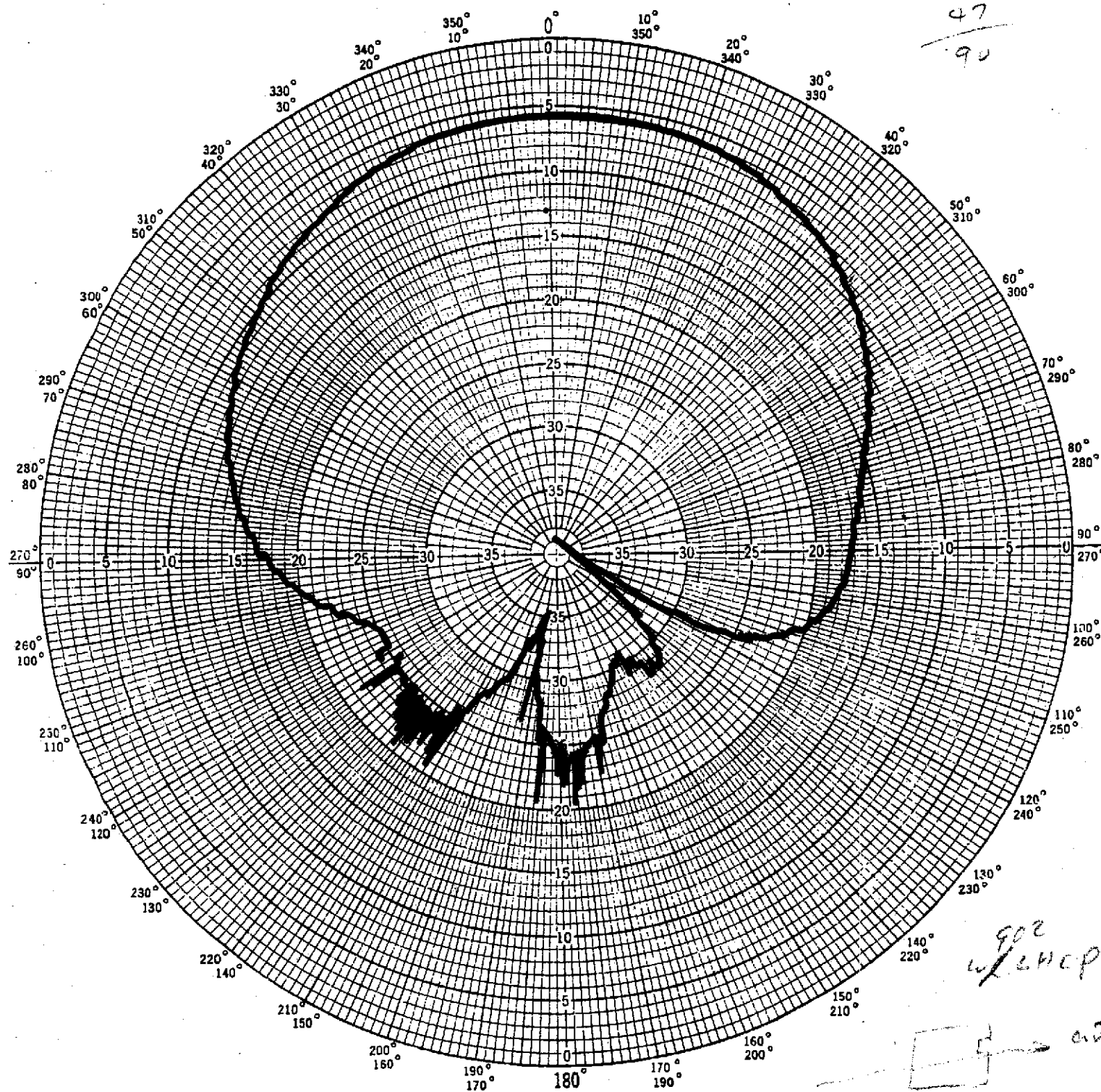
ANTENNA TYPE	LOCATION	USE
TEST MODEL: 12x12		FREQUENCY: 928 MHZ
MODEL SCALE:		SCALE FREQUENCY: MHZ
CONDITIONS:		POLARIZATION:
CURVES PLOTTED IN:		E ϕ :
VOLTAGE:		E ϕ : Horizontal
POWER:		PATTERN AREA:
ENGINEER okk	OPERATOR okk	FILE NO. 028198
		DATE 8-19-02

☐
☐
w/ RHCP Source



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43
47
90

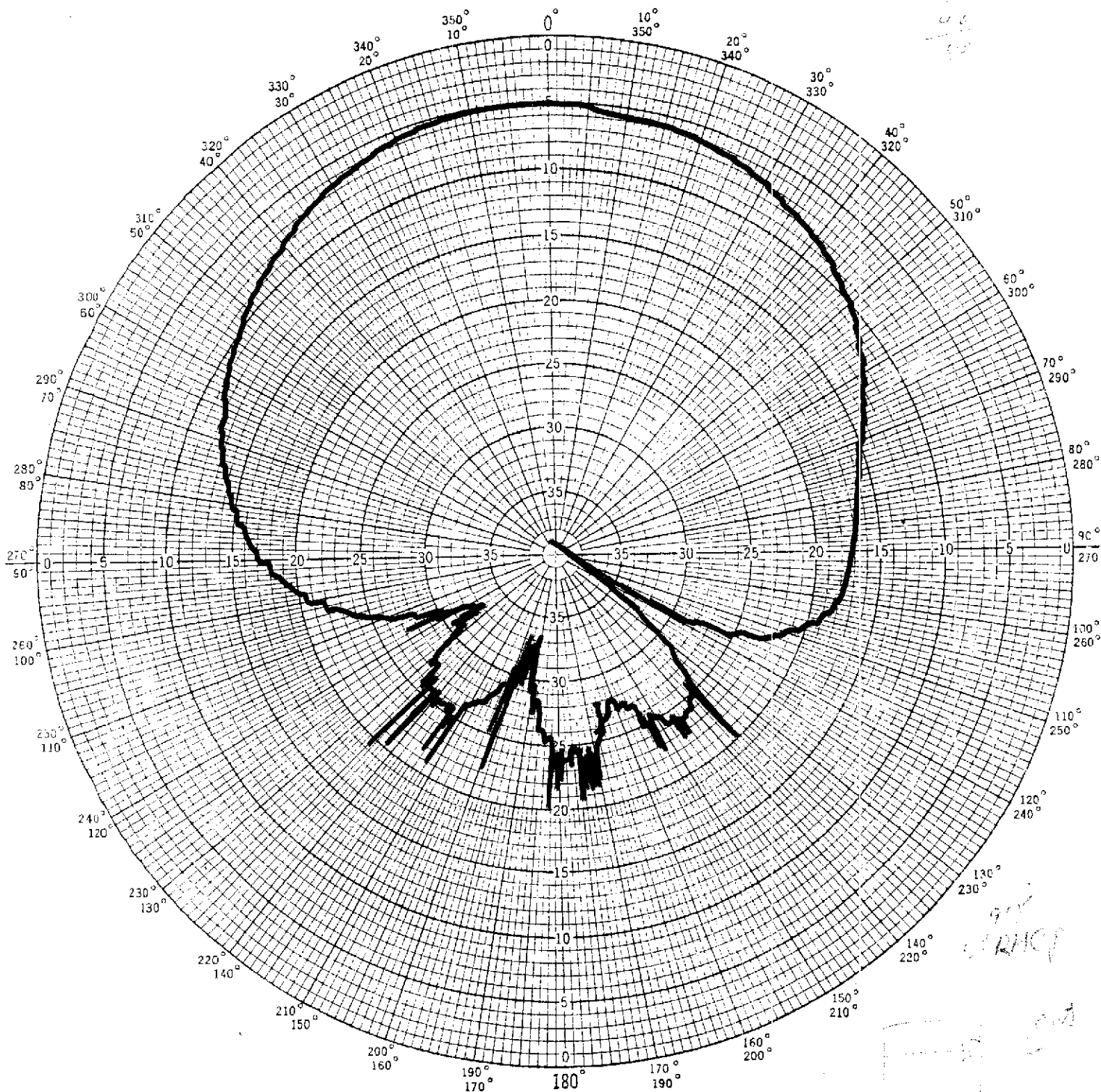


902
W/ RHCP

ANTENNA TYPE	LOCATION	USE	
TEST MODEL: 12x12		FREQUENCY: 902 MHZ	☐
MODEL SCALE:		SCALE FREQUENCY: MHZ	☐
CONDITIONS:		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ : Vertical	W/ RHCP Source
VOLTAGE:		E ϕ :	
POWER:		PATTERN AREA:	
ENGINEER okk	OPERATOR okk	FILE NO. 028199	DATE 8-19-02



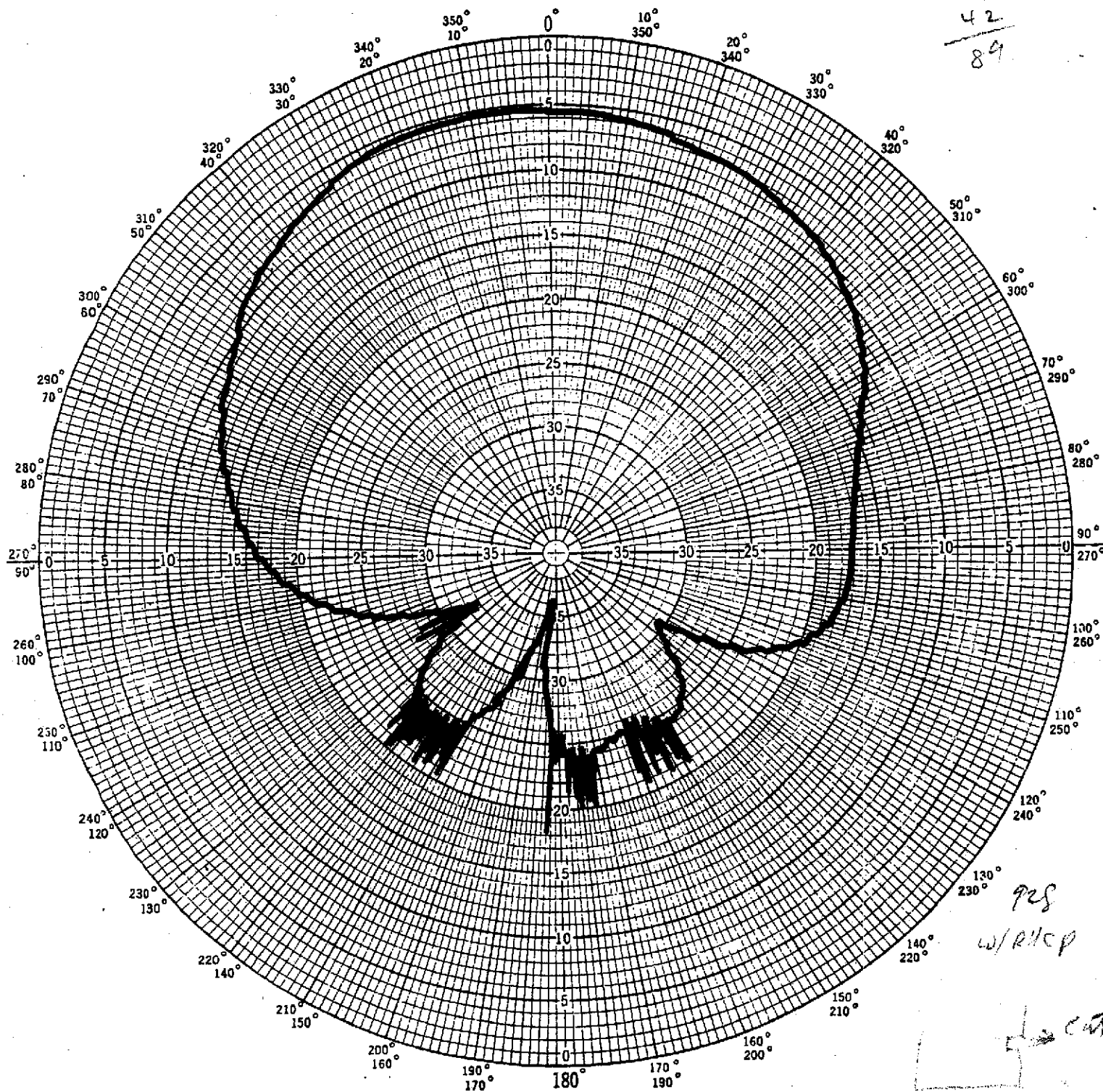
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x12</u>		FREQUENCY: <u>915</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	
CURVES PLOTTED IN:		$\epsilon\phi$: <u>Vertical</u>	W/ RHCP ☐
VOLTAGE: _____		$E\phi$: _____	☐
POWER: _____		PATTERN AREA: _____	☐
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>023200</u>	DATE <u>8-19-02</u>



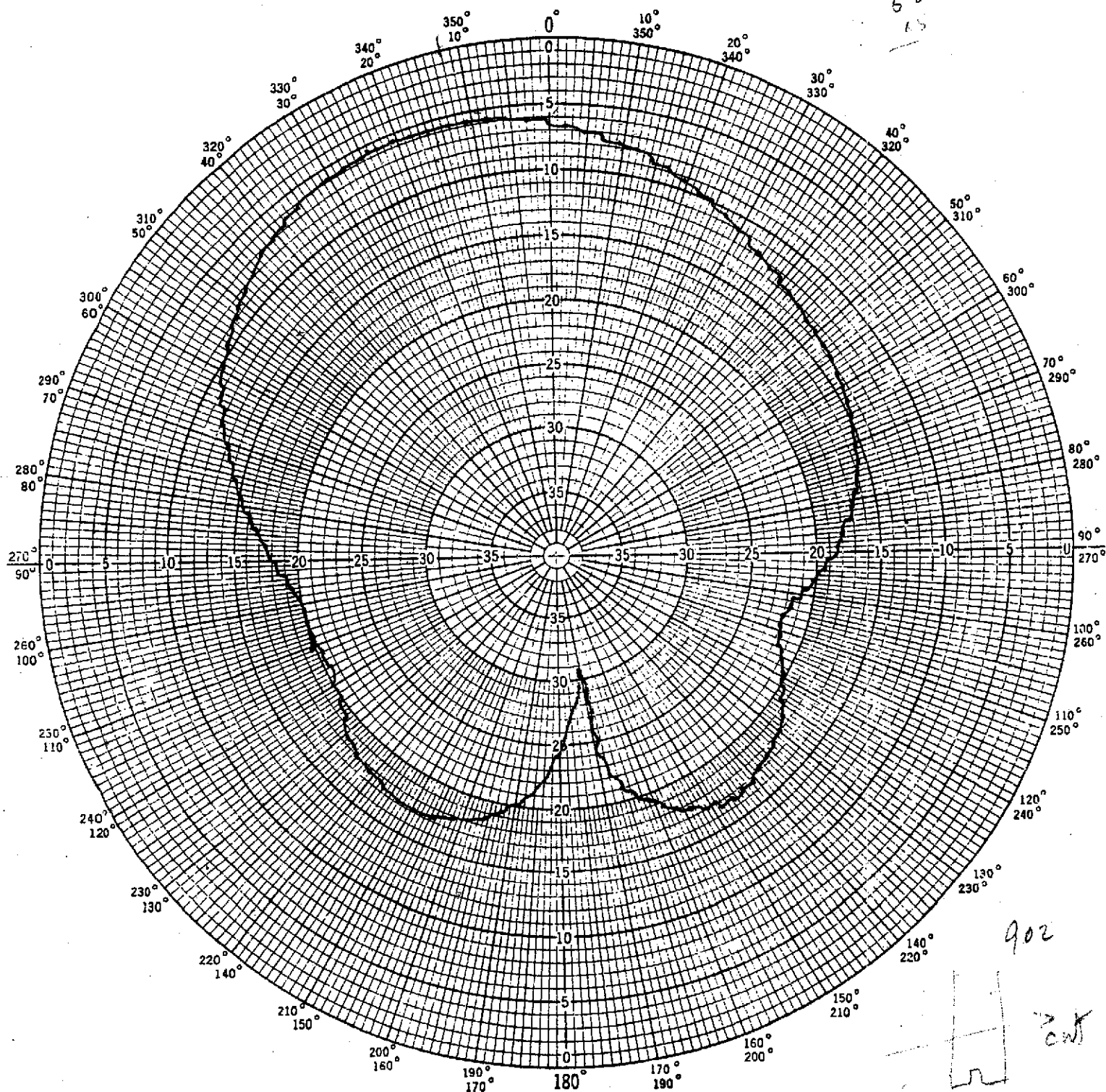
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: 12x12		FREQUENCY: 1928 MHZ	☐
MODEL SCALE:		SCALE FREQUENCY:	☐
CONDITIONS:		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ : Vertical	W/ RHCP Source .
VOLTAGE:		E ϕ :	
POWER:		PATTERN AREA:	
ENGINEER okk	OPERATOR okk	FILE NO. 028201	DATE 8-19-02



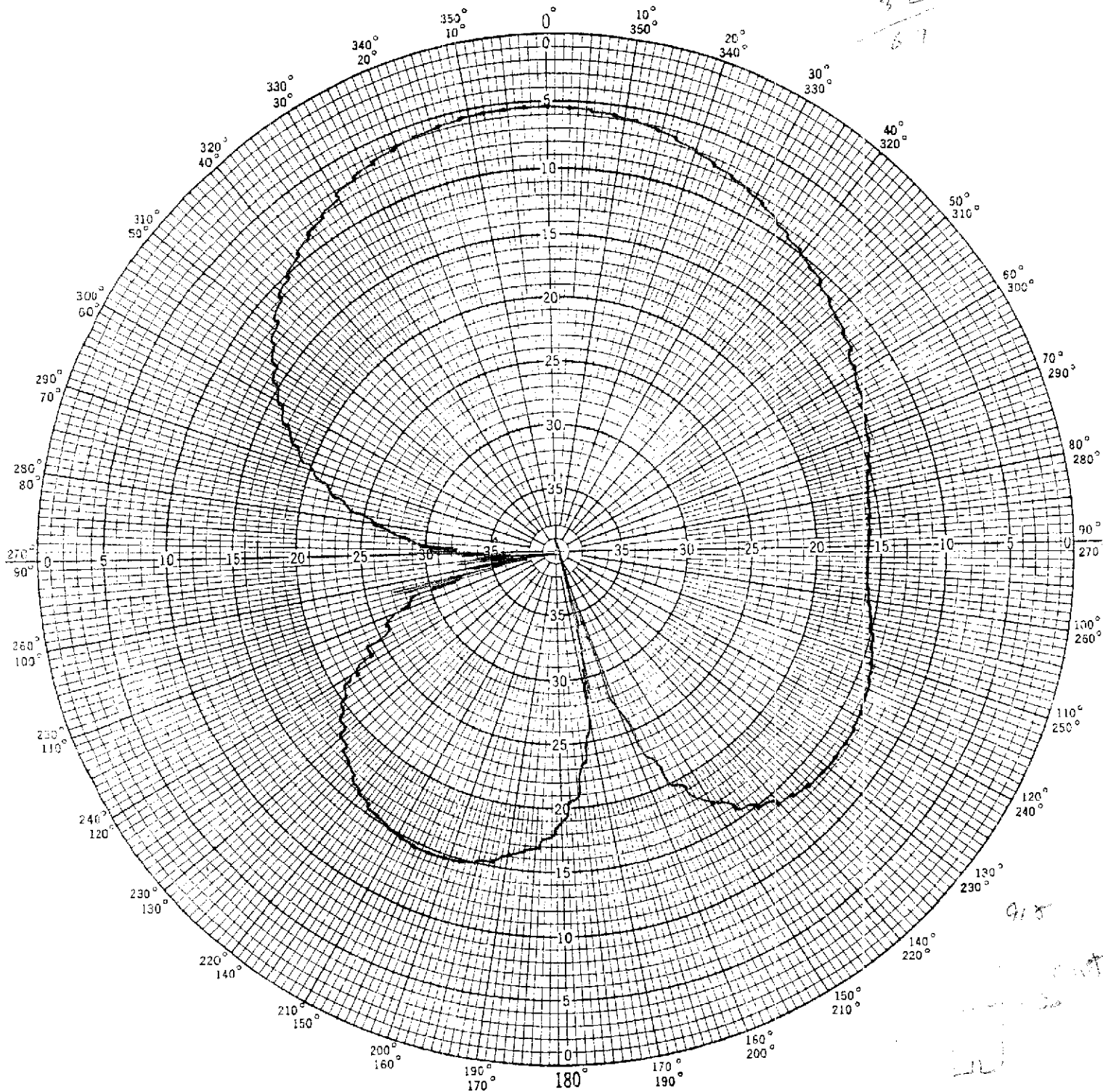
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>902</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ : _____	
VOLTAGE: _____		E ϕ : <u>Horizontal</u>	W/RHCP Source
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>028190</u>	DATE <u>8-19-02</u>



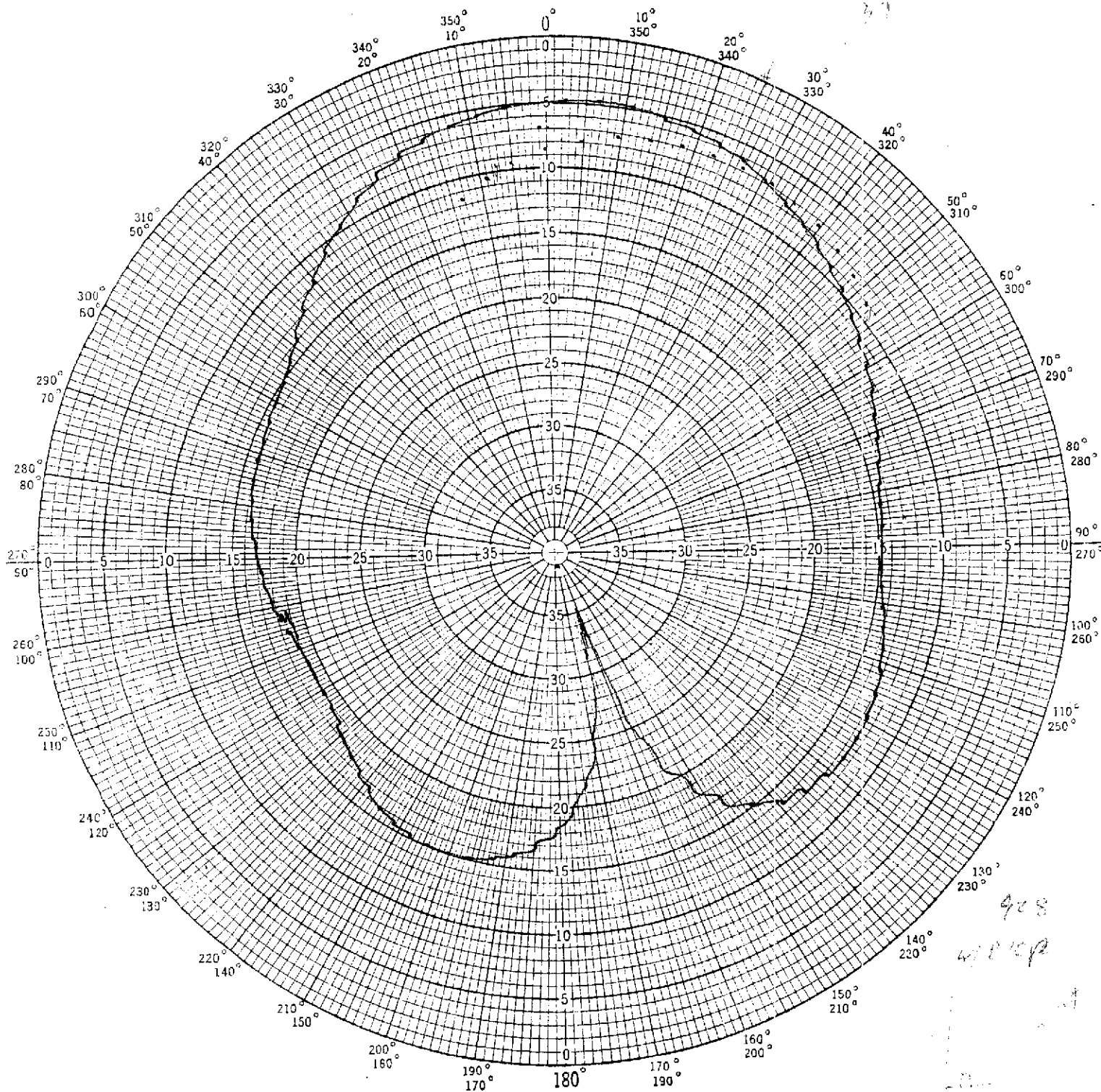
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ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>915</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ : _____	
VOLTAGE: _____		E ϕ : <u>Horizontal</u>	W/RHCP source
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>028191</u>	DATE <u>8-19-02</u>



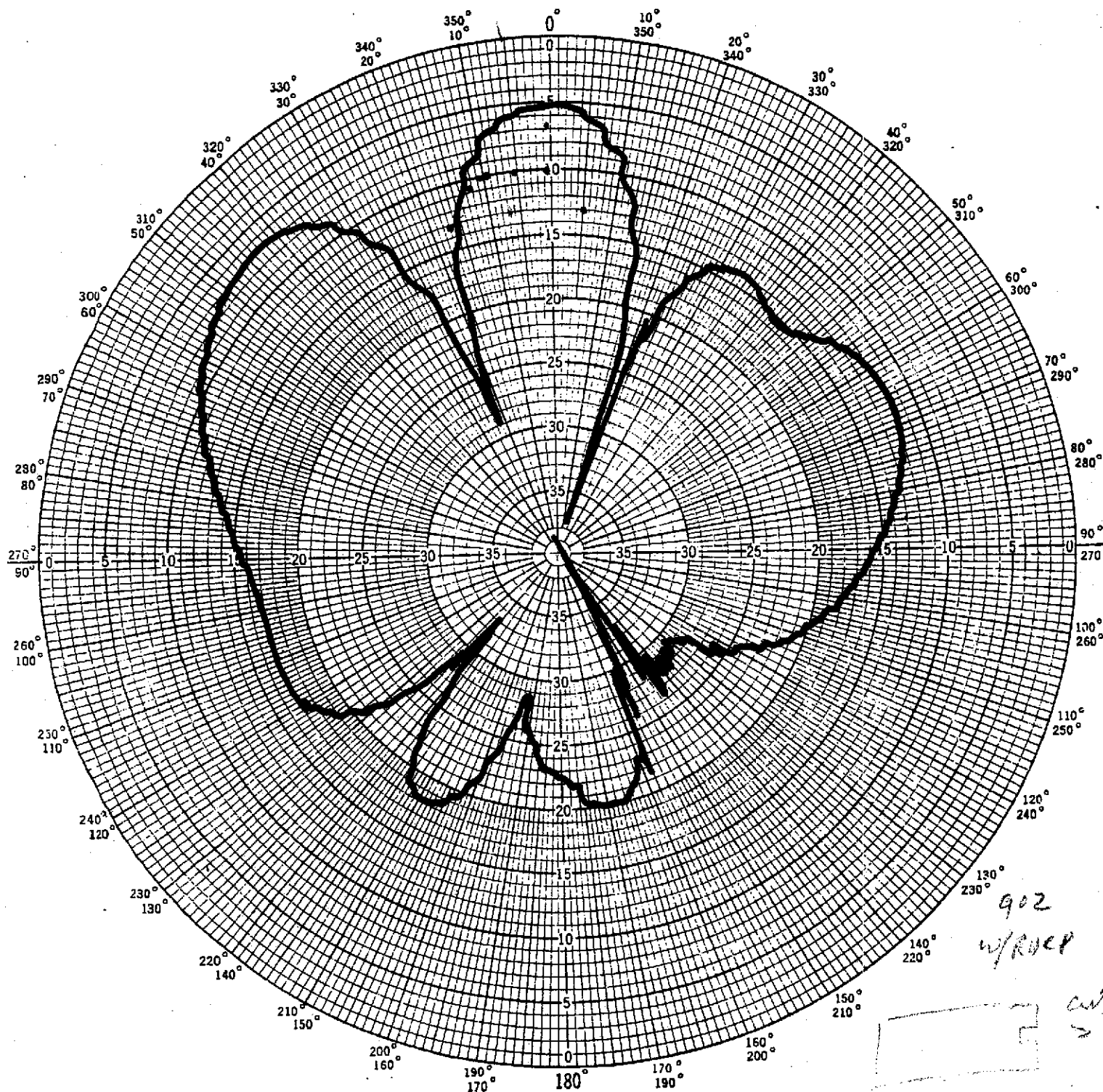
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ANTENNA TYPE	LOCATION	USE
TEST MODEL: 12x30	FREQUENCY: 928	MHZ
MODEL SCALE:	SCALE FREQUENCY:	MHZ
CONDITIONS:	POLARIZATION:	
CURVES PLOTTED IN:	E θ :	
VOLTAGE:	E ϕ : Horizontal	N/RHCP
POWER:	PATTERN AREA:	
ENGINEER okk	OPERATOR okk	FILE NO. 128192
		DATE 8-19-02



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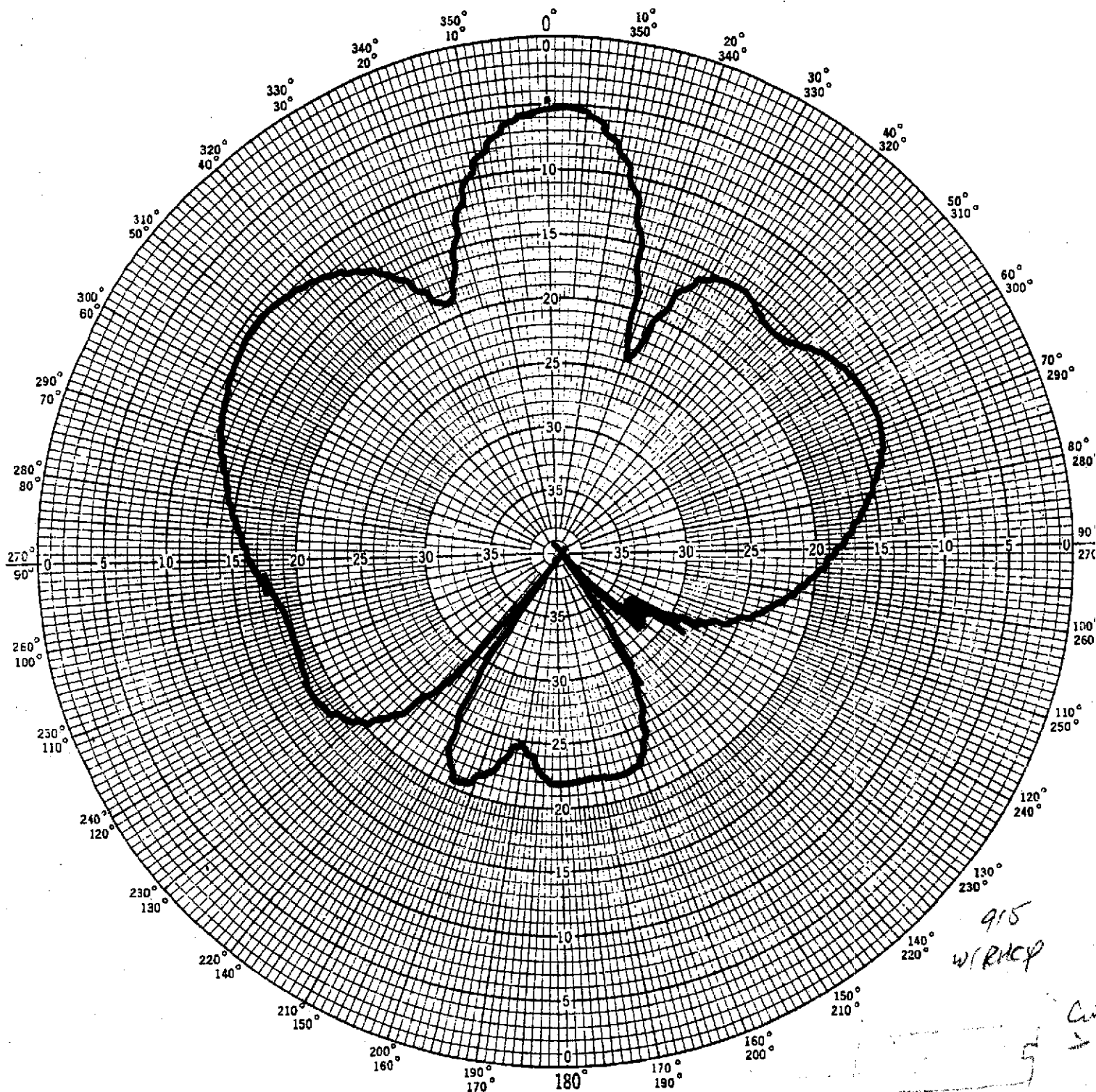


902
w/RHCP

ANTENNA TYPE	LOCATION	USE	
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>902</u> MHZ	☐
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ	☐
CONDITIONS: _____		POLARIZATION:	
CURVES PLOTTED IN:		E ϕ : <u>Vertical</u>	W/ RHCP Source .
VOLTAGE: _____		E ϕ : _____	
POWER: _____		PATTERN AREA: _____	
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>028193</u>	DATE <u>19-02</u>



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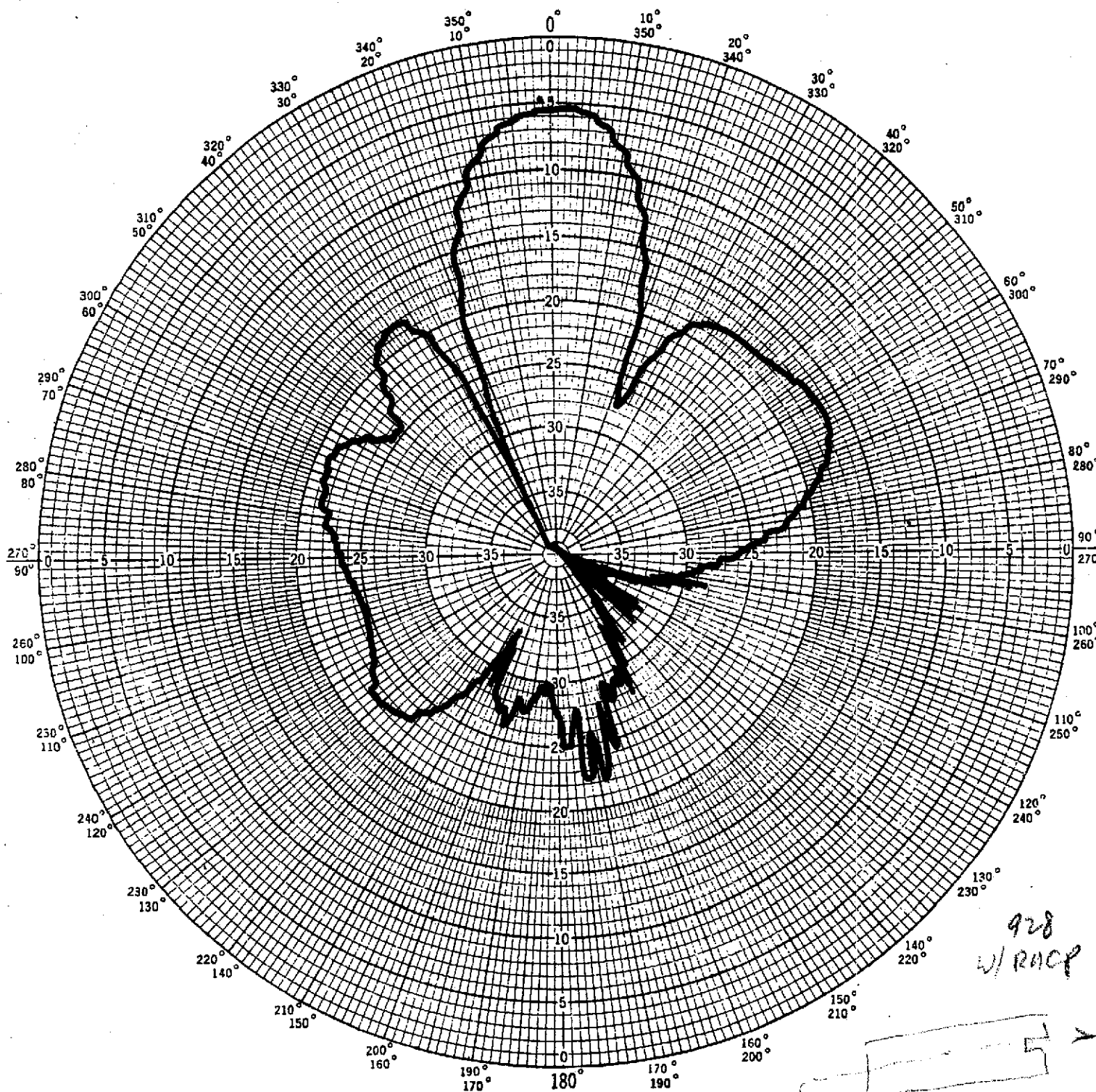


ANTENNA TYPE	LOCATION	USE
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>915</u> MHZ
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ
CONDITIONS: _____		POLARIZATION: _____
CURVES PLOTTED IN: _____		E ϕ : <u>Vertical</u>
VOLTAGE: _____		E ϕ : _____
POWER: _____		PATTERN AREA: _____
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>028194</u>
		DATE <u>8-19-02</u>

☐
☐
W/RHCP Source .
C



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ANTENNA TYPE	LOCATION	USE
TEST MODEL: <u>12x30</u>		FREQUENCY: <u>928</u> MHZ
MODEL SCALE: _____		SCALE FREQUENCY: _____ MHZ
CONDITIONS: _____		POLARIZATION: <u>Vertical</u>
CURVES PLOTTED IN:		E ϕ : _____
VOLTAGE: _____		E ϕ : _____
POWER: _____		PATTERN AREA: _____
ENGINEER <u>okk</u>	OPERATOR <u>okk</u>	FILE NO. <u>028195</u>
		DATE <u>8-19-02</u>

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☐
w/ RHCP Source