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Handle via BYEMAN
Control System

~~TOP SECRET~~ - HANDLE VIA BYEMAN CONTROL SYSTEM

From: Director, Naval Research Laboratory, Washington, D.C.
To: Chief of Naval Operations (OP-922Y3)

Subj: Technical Description for Mission 7105; forwarding of

Encl: (1) Copies 1 through 10 of Technical Description for Mission 7105

1. Enclosure (1) is forwarded herewith.

[redacted]

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TECHNICAL DESCRIPTION FOR MISSION 7105

I. DESCRIPTION OF BASIC FUNCTIONS -

Four satellites have been developed by the Naval Research Laboratory for launch into orbit from the Pacific Test Range in May 1967, for use in the PROGRAM-C (POPPY) SIGINT collection effort of MISSION 7105. The satellites will be known by their respective assigned nomenclature: 7105A, 7105B, 7105C and 7105D.

The forty-four primary collection systems contained in this series of satellites are designed to fulfill two basic requirements:

(1) To perform general search surveillance of the electromagnetic spectrum from 153 mc to 14.8 gc against pulsed type emissions.

(2) To enhance the Radar-Order-Of-Battle emitter location data of the Sino-Soviet-Bloc.

Each SIGINT collection system is designed to cover a specific portion of the frequency spectrum. There are at least ten separate collection bands in each of the four satellites, any combination of which can be tasked at one time.

II. OVERALL OPERATIONAL DESCRIPTION -

The basic POPPY type collection system uses a crystal video type receiver designed for an operational life of at least one year in orbit. Any combination of the collection systems in each satellite may be commanded "ON", and at the end of a fifty minute collection period they are automatically "RESET" (turned off) by a timer system in the satellite. As an additional capability for MISSION 7105 the following two additional timer modes are provided:

(1) Delayed timer cycle

(2) Re-cycling mode

These allow considerable flexibility in tasking.

When the pulsed signals from a radar illuminate the satellite with sufficient signal strength, the signal is intercepted by the satellite collection systems, then is stretched in time duration to either 135 or 200 microseconds ("narrow or "Wide" respectively), and retransmitted on a pulse-for-pulse basis by one of the two Data-Link systems contained in the satellite. The radar's pulse repetition rate and scan characteristics are preserved in the data

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being radiated from the satellites. The frequency of the intercepted signal is determined by the calibrated bandpass filters in the particular satellite collection system.

The pulse data from the satellite transponding (Data Link) systems are received and recorded along with precise ground station timing information at [redacted] ground based stations situated around the periphery of the Sino-Soviet-Bloc. Provision is made at these sites to allow the monitoring of two satellites at the same time by duplicate receiving and recording equipment.

This dual receiving and recording capability permits increased data collection as well as simultaneous reception of data from two satellites, to be used in emitter location with the [redacted]

[redacted]

The specific payload characteristics are given in Table 1 below:

Item or Characteristic	7105A	7105B	7105C	7105D
Weight, in orbit (lbs.)	108.6	181.5	161.8	221.8
Diameter (inches)	24	27	27	27
Separation Velocity from Launch Vehicle (mi/day)	42.63	44.34	10.23	8.53
Telemetry - Chan. A (MC.)	136.830	136.740	136.770	136.980
Radiated Power (MW.) Channel A (TM) Channel B (DL-1) Channel C (DL-2)	 88 490 483	 67.7 591 553	 51 400 470	 65 480 443
Transmitter Antenna	Turnstile Array at -36°			Turnstile at +36°
Receiving Antenna	Turnstile Plus South Pole Monopole			

The parameters in the table are self explanatory. However, it should be noted that the order of arrival over the horizon of the four payloads is: First - 7105D, followed by 7105C, 7105B and 7105A.

IV. SATELLITE COLLECTION SYSTEMS

A. The collection systems utilized are basically crystal-video receivers, with omni-directional antenna systems and providing broad frequency coverage and high probability of intercept. This type of receiving system is ideal for emitter location using [redacted] Systems were designed so that [redacted]

In addition to the standard sensitivity, 7105B provides a HIGH sensitivity mode, selectable by command. In this mode, the standard sensitivity is increased by 10 to 15 db, depending upon the particular band.

B. Detailed descriptions and electrical performance characteristics of the SIGINT collection systems are provided in Tables 2, 3, 4 and 5.

1. Receiving Antenna Systems

Figures 1 through 19 are measured patterns of antenna systems used in 7105A, B, C and D and represent the variety of antennas and arrays used throughout the frequency spectrum. These patterns are plotted in a conical cut with the antennas directed down toward signals eminating from the horizon. The horizon is 30° below the azimuth plane of the satellite which is stabilized at 500 nautical miles altitude.

The number after the mission and payload designation refers to the frequency band.

For patterns of 7105B and D with 3-axis stabilization, the patterns are plotted with the satellite flight line along the 0°-180° axis, with 0° azimuth on the pattern looking forward.

The antenna systems employed in 7105 may be categorized as follows:

(a) Bands below 3600 mc use arrays of various types of monipoles arranged symmetrically around the polar axis at various latitudes of the satellite. Combination of the detected video signals results in an omni-directional pattern for reception of either vertically or horizontally polarized signals.

(b) To a great extent, each band above 3600 mc consists of 4 half-wave dipoles spaced in quadrature around the satellite's equatorial band. Each dipole is mounted on a ground plane sloping downward 20° toward the horizon. Each element is rotated about its axis to 35° from the horizontal plane to optimize the beamwidth for horizontal and vertical polarization. In 7105C, opposite antennas are combined (through RF hybrids for isolation) and the two resulting channels (fore-aft and port-starbord for example) are further combined video-wise for a composite pattern of 360° in azimuth (figures 10 and 17).

The equivalent 7105D bands using dipoles have no video addition, but instead, each pattern of oppositely paired dipoles performs independently and two orthogonal patterns overlap to provide full azimuth coverage (figures 15 and 16).

In 7105C, bands 6 and 10, and also 7105D, bands 2 and 8, a back-up capability is provided in which either of the two channels in these bands may be switched off by command leaving approximately half of the original azimuth coverage. This feature is useful in operating condition where the signal density is excessive. Figures 11 and 12 show the patterns for one particular channel in the back-up mode.

The interferometer effect evidenced in figures 11 and 12 is not effective in normal operation, since the regions in which it takes place are covered by an adjacent pair of dipoles. However, even in the back-up mode the interaction takes place at a signal level approaching the threshold level and therefore is not serious. The overall antenna gain in this configuration is approximately 3 db.

(c) Several bands in Mission 7105 are not used in the [redacted] mode and therefore omni-directional coverage in these bands is.

not essential. In such bands, directive horn antennas or open-end waveguide antennas were used as described in Table 5.

In the high sensitivity mode, bands 6 through 10 of 7105B use is made of a common open-ended waveguide antenna to limit the data density.

2. RF Preamplifiers

Preamplification is used in all bands in frequency ranges higher than 3600 mc to achieve the required high sensitivities. Tunnel diode amplifiers with 20 to 40 db of gain are integrated with the filter-detector system, temperature compensated and biased to operate in combination. Dc-dc converters provide the necessary regulated low voltage to bias the tunnel diodes.

Bands 6 through 10 of 7105B use a common 20 db tunnel diode amplifier in the high sensitivity mode.

Bands 3, 4 and 5 of 7105B incorporate 16 db transistorized amplifiers in the high sensitivity mode.

3. Filter-Detector

The bandpass definition filters incorporate integrated sensitive detectors matched to provide maximum flatness over the bandpass. The degree of filtering and skirt selectivity are designed as a function of the frequency range in which they are used. For example, as many as twenty (20) resonant sections of filtering are used in the VHF range (adjacent to the transmitter frequencies) compared to five sections in the X-band region.

The frequencies tabulated in the Tables 2 through 5 define the bandpass characteristics at points 3, 10 and 20 db down on the upper and lower skirts. This data is derived from composite response curves of the individual measured responses, providing the absolute system bandpass response in each band.

4. Crystal-Video Amplifiers

The crystal video amplifiers utilized throughout these systems are of the same POPPY basic design, providing miniaturization with high reliability and extremely low power consumption. There are minor differences which reflect additional requirements of extended dynamic range and faster rise time. Multiple inputs permit combination of several collection channels (antenna through detector) to provide a single video output. Each input also applies detector crystal bias, optimized for the particular type crystal used.

In the high frequency bands of 7105D (C-band through X-band) each channel incorporates a separate video amplifier (necessitating a separate threshold detector for each channel). This technique allows each channel to be handled as a separate receiver up to the modulator, at which point combination occurs. Inherently, a 3 db sensitivity increase results by elimination of the usual video combination loss.

Tables 2 through 5 show the number of amplifiers as well as the rise time response for each band.

5. System Sensitivity

Section 3 in Tables 2, 3, 4 and 5 provides the overall system sensitivity of each band as follows:

(a) The line referred to as Tang. Sig. (dbm) gives the measured tangential signal level of each band from antenna input terminal to video amplifier output. This series of measurements includes all system losses encountered, including losses due to RF cabling, RF combining hybrids, diplexing and video combination at the amplifier input. An additional 2 to 3 db loss of sensitivity inherent in the threshold detector adjustment is not included. The latter loss is approximately offset by the addition of the antenna gain and therefore the values of tangential signal level given in the tables may be directly used for range computations. Bands 6A (cw) and 10 (Ku Band) are exceptions since they both use horn antennas with considerable gain.

(b) The "power density" is the computed power level (in dbm per square centimeter) necessary at the satellite for solid (pulse for pulse) triggering, by the illuminating signal. This data is derived from RF measurements of the complete system in an RF test range with known distance between transmitter antenna and the collection system and with calibrated transmitter antenna and power level. These levels include the threshold level settings and therefore are suitable for computing collection system capability against any given radar with known parameters.

[redacted]

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7105A (2-axis)

1. System Band No.	1	2	3	4	5	6	7	8	9	10
2. R.F. Bandpass (Mc):										
A. 3 db	153.5-165	166-200	550-650	654-855	820-920	920-1108	2560-2695	2678-2930	2915-3128	3105-3315
B. 10 db	153.2-165.7	164.5-202	547-654	646-862	816-927	913-1113	2550-2707	2667-2943	2905-3140	3090-3332
C. 20db	152.6-166.5	163-203.5	542-658	627-870	812-934	905-1120	2535-2720	2650-2957	2895-3150	3073-3350
3. System Sensitivity:										
A. Tang. SIG (dbm)	-40	-47	-50	-48	-48	-47	-50	-50.5	-51	-50.5
B. Power density (dbm/cm^2)	-65	-73	-73	-71	-70	-68	-63	-63	-61	-60.5
Antenna System:										
A. Type	Turnstile		Monopole Arrays				Conical Monopoles			
B. No. & Location	4 at +36°		4 at +25°	4 at +25°	Diplexed /Band 3	Diplexed /Band 4	4 Equator + 1 So. Pole Per Band			
C. Pattern Hor. Pol.	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI
Vert. Pol.	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI
Video Amplifiers:										
A. Number	1	1	1	1	1	1	1	1	1	1
B. Response (uSEC.)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
R&D Experiments:	[redacted] MEASUREMENT ON EACH BAND									
.D.L. Transmitter and [redacted]	N2	N1	N1	W1	N2	W2	W1	W2	N2	N1
8. Preferred Orientation	BOOM UP									

7105A SIGINT SYSTEM CHARACTERISTICS
TABLE 2

7105B SIGINT SYSTEM CHARACTERISTICS
Table 3
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7105B-(3Axis)

1.System Band No.	1	2	3	4	5	6	7	8	9	10
2.R.F. Bandpass(Mc):										
A.Standard Sens. (a) 3db	154-165	166-200	550-651	652-857	820-922	2560-2705	2675-2933	2915-3130	3102-3315	3275-3615
(b)10db	153.2-166	164.5-201.5	547-654	643-867	818-927	2547-2713	2667-2945	2905-3143	3095-3330	3270-3625
(c)20db	152.6-166.5	162-205	543-658	630-880	813-931	2537-2725	2650-2960	2897-3155	3080-3345	3250-3645
B.High Sens. (a) 3db	NA	NA	548-650	651-855	821-920	2565-2690	2675-2935	2920-3123	3105-3320	3290-3615
(b)10db			545-655	647-865	819-923	2550-2710	2665-2945	2912-3135	3095-3330	3275-3625
(c)20db			540-650	637-873	814-928	2530-2725	2655-2963	2940-3150	3083-3345	3248-3650
3.System Sensitivity: A.Tang.SIG.Sens. Tang.SIG., STD (dbm)	-40	-48.5	-48	-47	-48	-49.5	-50	-49.5	-50	-49.5
Tang.SIG., HIGH (dbm)	NA	NA	-59	-58	-57	-64.0	-64	-68	-67	-66
B.Power Density (dbm/cm²) (a)Standard	-65	-74.5	-73	-67	-65	-64.5	-62	-60	-61	-60
(b)High	NA	NA	-81	-75	-75	-76	-75	-75	-76	-75
4.Antenna System (STD) A.Type	Turnstile	Array	Monopoles		Diplexed /Band 3	Conical Monopoles				
B.No.&Location	4 at +36°		4at+36°	4at+36°		5 Equator + 1 So. Pole Per Band				
C.Pattern (a)Hor.Pol.	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI
(b)Vert.Pol.	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI	OMNI
5.Antenna System (HIGH) A.Type	NA	NA	STD. SENS. ARRAY USED			---- OPEN ENDED WAVEGUIDE ------				
B.No.&Location	NA	NA	SAME AS STD.			1 at -45° Lat., forward looking				
C.Pattern (a)Hor.Pol.	NA	NA	OMNI	OMNI	OMNI	180° 10 DB Beamwidth				
(b)Vert.Pol.	NA	NA	OMNI	OMNI	OMNI	80° Lobe at ± 80° of Flightline				
6.Video Amplifiers A.Number&Mod.	1-SCL-68	1-SCL-68	2-SCL-68	2-SCL-68	2-SCL-68	2-SCL-68	2-SCL-68	2-SCL-68	2-SCL-68	2-SCL-68
B.Response(uSEC.)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
7.R&D Experiment:	SIGNAL LEVEL MEASUREMENT OF STD OR HIGH SENSITIVITY BANDS									
8.D.L. Transmitter	N2	N1	N1	W1	N2	W1	W2	N2	N1	W1
9.Preferred Orientation	BOOM-UP AND PANEL #6 FORWARD									

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7105C(2Axis)

1.System Band No.	1	2	3	4	5	6	7	8	9	10	11	12
2.R.F. Bandpass(Mc):												
A. 3db	100.5-124	196-350	350-550	1790-2520	3600-4055	4910-5080	6460-6710	7780-8510	8090-8630	8480-9360	9300-9520	920-1855
B. 10db	99.5-125.5	195-352	347-554	1760-2540	3580-4075	4885-5110	6470-6730	7600-8600	7900-8700	8350-9430	9280-9590	915-1875
C. 20db	99-126.5	194-354	344-558	1700-2580	3560-4105	4855-5140	6400-6765	7460-8700	7820-8800	8240-9520	9255-9565	910-1905
3.System Sensitivity:												
A. Tang. SIG. (dbm)	-51	-47	-47	-50.5	-67	-78	-75.5	-78	-74	-80	-83	-49
B. Power Dens. (dbm/cm^2)	-85 (3.7x10^{-8} w/m^2)	-77	-79to-73	-63	-75	-85	-81.5	-78.5	-75	-78.5	-83	-70 to -60
4.Antenna System A. Type B. No. & Location	Monopole 3 at +36°	Conical Monopole 3 at 36°		Conical Monopole 3 at 36°	Dipoles 4 at -45°	Dipoles 4-Equat. (-20°)	Dipoles 4-Equat. (-20°)	Dipoles 4-Equat. (-20°)	Dipoles 4-Equat. (-20°)	Dipoles 4 on Equat.(-20°)		Monopoles 3 sets of 3 (-45°)
C. Pattern (a) Hor. (b) Vert.	OMNI OMNI	OMNI OMNI	OMNI OMNI	OMNI OMNI	OMNI OMNI	OMNI [redacted]	OMNI OMNI	OMNI OMNI	OMNI OMNI	OMNI [redacted]	OMNI OMNI	OMNI OMNI
5.Filter Channels	3	3sets of 3	2 sets of 3	6	2	2	2	2	2	2	2	of^{3}3sets
6.Video Amplifiers A. Number Per Band B. Response (uSEC.)	1 0.4	2 0.4	1 0.4	1 0.4	1 0.1	1 0.1	1 0.1	1 0.1	1 0.1	1 0.1	1 0.1	1 0.4
7.D.L. Transmitter [redacted]	N1	N2	W2	N2	W2	N1	W-2	W1	N2	W2	N1	W1
8.Preferred Orientation	Boom Up											

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7105C SIGINT SYSTEM CHARACTERISTICS

Table 4

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7105D-(3Axis) 1.System Band No.	1	2	3	4	5	6	7	8	9	10	11	12	6A (CW)
2.R.F. Bandpass(Mc): A. 3db B. 10db C. 20db	1780-2520 1750-2540 1700-2590	4920-5080 4905-5120 4885-5200	6450-6725 6430-6755 6400-6780	6720-7300 6500-7380 6350-7500	7220-7930 7130-8020 7010-8120	7730-8450 7640-8530 7450-8650	8100-8620 7900-8700 7800-8800	8550-9370 8380-9450 8100-9500	9300-9515 9280-9535 9240-9570	14.5-14.8Gc 14.4-14.95Gc	196-553 195.5-555 194-560	920-1865 918-1885 915-1910	7800-8480 7600-8600 7480-8700
3.System Sensitivity: A.Tang.SIG. (dbm) B.Power Density (dbm/cm²)	-49 -62	-80 -85	-75 -80	-76 -81	-80 -85	-76 -75	-75 -75	-75 -76	-77 -77	-84 -87	-47 -75to-70	-48 -65to-61	-75.5 -78
4.Antenna System A.Type B.Number&Location C.Pattern (a)Hor.Pol. (b)Vert.Pol.	Monopoles 6 at +36° OMNI OMNI	Dipoles 4-Equat. OMNI OMNI (also selectable oppositely paired quadrants	Dipoles 4-Equat. OMNI OMNI	open-ended Waveguide at 45° 250-55° AZ [redacted] ths)	open-ended Waveguide at 45° 315°-100° AZ Split beam: 300-355° AZ 60°-130° AZ	Dipoles 4-Equat. OMNI OMNI	Dipoles 4-Equat. OMNI OMNI	Dipoles 4-Equat. OMNI OMNI [redacted]	Dipoles 4-Equat. OMNI OMNI	16 DB Horns 3 at -36° forward 3-30° Adjacent Beams	Monopoles 5 sets of 2 at -45° OMNI OMNI	Monopoles 2 sets of 3 at+36° OMNI OMNI	C.P.Horn -36° Looking Back 125-230° AZ
5.Filter Channels	6	2	2	1	1	2	2	2	2	3	10	9	1
6.Video Amplifiers Response(uSEC.)	1 0.4	2 0.1	2 0.1	1 0.1	1 0.1	2 0.1	2 0.1	2 0.1	2 0.1	3 0.1	1 0.4	1 0.4	1 + Test 0.1
7.R&D Experiment													[redacted]
8.D.L. Transmitter [redacted]	N2	N1	W2	N1	W1	W1	N2	W2	N1	N2	W2	W1	250PPS
9.Preferred Orientation	BOOM UP + PANEL 8 FORWARD - 0° AZ												

7105D SIGINT SYSTEM CHARACTERISTICS

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Table 5

information is converted to a binary word and transmitted on the transmitter not assigned for the normal data. The calibration data in Tables 8, 9, 10 and 11, derived from actual measurements, gives the signal level in db relative to tangential signal level required to reach a given bin number.

In tasking, it should be pointed out that although there is no limitation on the number of bands which can be turned on with either the SLX [redacted] these systems respond to each pulse received, and therefore the digital data may become difficult to read with high signal densities. It is therefore advantageous to use these measurement systems with only a single band, with normal data on one transmitter and digital data on the other.

VI. PAYLOAD TELEMETRY

The telemetry transmission is of the FM/AM type in which assigned (IRIG) channels 3 through 8 and 12 are used for the housekeeping satellite aspect and collection band assignments for the four satellites. The format utilized is 1/2 second samples (segments) repeated every 8 seconds.

IRIG channels 4, 5, 6 and 7 are used to describe the state of command for the collection bands of 7105A, B, C and D respectively. For back-up use, each of these four channels may be interchanged by command with IRIG 3, which is normally a housekeeping channel on all satellites.

Tables 12, 13, 14 and 15 relate the data segment assignments with the functions. It will be noted that the first 12 segments are reserved for the standard collection bands (DL 1 through DL 12) with the exception of segment 12 of 7105B which indicates the sensitivity level (low for standard and high).

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db per bit Calibration

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DL 1 STD	R.T.	11	1.5	3.0	4.0	4.5	5.0	6.5	9	11	12	15	19	22.5	25	-	-
		13	1.5	3.5	4.5	5.0	6.0	6.5	8.0	10.0	11.5	13.5	17.0	21.0	24.0	27.0	
	-5	12	2.7		5.2		6.2		8.2		12.0		15.0		24.4		27.4
	+60	12	1.5		4.0		6.0		11.0		18.0		25.5		30.0		-
	TYPICAL		1.5	3.2	4.2	4.7	6.0	6.5	8.5	10.5	12	14	18	22	24.5	27	-
DL 2 STD	R.T.	11	2.0	3.0	3.5	4.5	5.0	7.0	9.0	11.0	13.0	16.5	20.0	23.0	25.0	27.0	28
		13	2.0	3.0	4.0	4.5	5.0	6.0	8.0	10.0	12.0	14.5	19.0	21.5	24.5	26.0	27
	-5	12	2.2		4.9		6.0		7.8		11.8		15.0		22.0		26.
	+60	12	1.5		4.0		6.0		11.0		18.5		25.0		28.0		29.
	TYPICAL		2.0	3.0	3.7	4.5	5.0	6.5	8.5	10.5	12.5	15.5	19.5	22	25	26.5	28
DL 3 STD	R.T.	11	1.0	2.5	3.5	4.5	5.0	7.0	9.0	11.0	12.5	16.0	19.5	22.0	24.5	26.0	27.
		13	2.0	2.5	4.0	5.0	6.0	7.0	9.0	11.0	12.5	14.0	19.5	22.0	25.0	27.0	28.
	-5	12	2.8		4.5		6.3		8.3		12.2		15.2		22.3		26.
	+60	12	1.5		3.5		6.5		10.5		18.0		24.5		27.5		29.
	TYPICAL		1.5	2.5	3.7	4.7	5.5	7.0	9.0	11.0	12.5	15.0	19.5	22.0	24.7	26.5	27.
D1 4 STD	R.T.	11	1.5	3.5	4.0	4.5	5.5	7.5	10.0	11.5	13.5	17.5	21.5	24.5	28.5	36.5	-
		13	1.5	3.0	3.5	4.5	5.5	6.5	8.5	10.5	12.5	14.5	18.5	22.5	25.5	30.5	-
	-5	12	2.5		4.5		6.0		8.5		12.5		16.0		24.2		36.0
	+60	12	1.0		4.0		6.5		11.3		19.5		17.3		-		-
	TYPICAL		1.5	3.2	3.7	4.5	5.5	7.0	9.3	11.0	13.0	16.0	20.0	23.5	27.0	33.0	-

db per bit Calibration

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DL 5 STD	R.T.	11	2.0	3.5	4.5	5.0	6.0	8.0	10.5	12.0	14.0	18.0	21.5	24.0	26.0	27.0	28.
		13	2.0	3.0	4.0	5.0	6.0	6.5	9.5	11.0	13.0	16.0	20.0	22.5	25.0	26.5	28.
	-5	12	3.0		5.0		6.8		9.0		12.5		16.8		24.0		28.
	+60	12	1.5		3.5		6.3		11.0		19.5		24.5		28.0		29.
	TYPICAL		2.0	3.3	4.3	5.0	6.0	7.3	10.0	11.5	13.5	17.0	21	23	25.5	27	28.
DL 6 STD	R.T.	11	2.2	3.2	4.2	5.2	5.8	7.8	9.8	11.6	13.4	16.4	20.2	22.6	24.6	26.2	2[illegible].
		12	1.6	3.2	4.0	4.8	5.4	6.2	8.4	10.4	12.0	14.2	18.0	21.4	23.6	25.2	[illegible].
	-5	12	2.2		4.7		6.0		8.2		12.0		15.7		22.3		2[illegible].
	+60	12	1.1		3.8		6.0		10.9		17.8		23.4		26.6		2[illegible].4
	TYPICAL		2.0	3.2	4.1	5.0	5.6	7.0	9.0	11.0	12.5	15.0	19.0	22.0	24.0	26.0	2[illegible].1
DL 7 STD	R.T.	11	1.4	2.8	3.6	4.6	5.2	7.0	9.2	11.6	15.6	19.4	23.2	25.2	26.8	27.8	2[illegible].4
		13	1.2	2.6	3.6	4.6	5.2	6.2	8.6	10.4	13.6	17.6	22.2	24.2	26.2	27.6	2[illegible].0
	-5	12	1.8		3.8		5.2		7.6		11.0		18.8		25.2		2[illegible].8
	+60	12	1.0		6.0		7.7		11.9		21.2		25.9		28.9		3[illegible].8
	TYPICAL		1.3	2.7	3.6	4.6	5.2	6.8	9.0	11.0	14.6	18.5	22.8	24.7	26.6	27.7	2[illegible].2
DL 8 STD	R.T.	11	1.6	3.0	3.6	4.6	5.6	7.2	9.4	11.2	13.4	16.4	20.6	24.0	25.6	27.0	[illegible]8.6
		13	1.4	3.0	3.8	4.6	5.4	6.2	8.8	10.8	12.8	14.4	18.8	21.8	24.8	26.4	28.6
	-5	12	2.1		4.1		5.3		8.0		11.7		15.3		22.9		28.3
	+60	12	1.2		3.6		5.7		10.6		17.9		24.3		27.6		30.2
	TYPICAL		1.5	3.0	3.7	4.6	5.5	6.8	9.0	11.0	13.1	15.4	19.7	23	25.2	26.8	28.6

7105B SIGNAL LEVEL MEASUREMENT (SLX)

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~~TOP SECRET~~

HANDLE VIA BYEMAN CONTROL SYSTEM ~~TOP SECRET~~ db per bit Calibration

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
DL 9 STD	R T 11	2.0	2.8	3.8	4.6	5.3	7.4	9.8	11.4	13.4	17.4	21.6	23.8	26	27.2	28.4
	R T 13	1.4	2.8	3.8	4.6	5.4	6.0	8.4	11.6	12.2	14.8	19.2	22.4	24.8	26.2	27.8
	-5 12	2.7		4.8		6.2		8.4		12.3		16.2		23.8		28.0
	+60 12	0.9		3.3		5.7		11.1		18.9		24.5		27.5		29.3
	TYPICAL															
DL 3 HI	R.T 11	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	15.0	19.0	22.5	24.5	27	28	29
	R.T 13	1.5	3.0	3.5	4.5	5.5	7.5	9.0	11.0	13.0	16.0	21.0	23.0	25.0	27	2[illegible]
	-5 12	2.2		4.2		5.2		8.2		12.2		17.2		24.2		[illegible].2
	+60 12	1.5		3.5		6.5		12.0		20.3		15.5		28.5		[illegible]
	TYPICAL															
DL 4 HI	R.T. 11	1.5	2.5	3.5	4.5	5.5	6.5	9.5	11.0	13.0	16.5	20.5	23.0	25.5	27	2[illegible]
	R.T. 13	1.5	2.5	3.5	4.5	5.0	6.0	8.5	10.5	12.0	14.5	19.0	22.0	25.0	26	27.5
	-5° 12	2.5		4.5		6.0		8.5		12.0		15.5		23.0		28.0
	+60° 12	1.5		4.0		6.5		11.5		19.0		25.0		28.0		30.5
	TYPICAL	1.5	2.5	3.5	4.5	5.3	6.3	9.0	10.8	12.5	15.5	20	22.5	25.3	26.5	27.7
DL 5 HI.	R.T. 11	1.5	3.0	4.0	4 5	5.5	7.0	9.5	11.5	13.5	16.5	20.5	23	25.0	26.5	28.5
	R.T. 13	2.0	3.0	4.0	5.0	5.5	6.5	9.0	11.0	12.0	14.0	19.0	22.0	24.5	26.5	[illegible].0
	-5° 12	2.0		4.0		6.0		8.0		11.5		15.0		23.0		26.5
	+60° 12	2.0		4.0		6.5		11.5		19.5		25.0		28.0		30.5
	TYPICAL	1.7	3.0	4.0	4.7	5 5	6.7	9.3	11.3	12.8	15.0	19.8	22.5	24.7	26.5	28.3

~~TOP SECRET~~ 7105B SIGNAL LEVEL MEASUREMENT (SLX)

TABLE 10
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db per bit Calibration

				2	3	4	5	6	7	8	9	10	11	12	13	14	1
DL 6 HI	R.T.	11	1.8	3.2	4.2	5.0	5.8	7.2	9.8	11.2	12.8	16.0	20.2	23.4	26.4	28.6	31.0
		13	1.8	3.0	4.0	4.8	5.8	6.4	8.0	10.2	12.0	13.4	18.0	21.4	25.0	27.2	29.8
	-5°	12	2.3		4.7		6.0		8.0		11.8		15		19.8		27.8
	+60°	12	1.2		3.7		5.8		10.6		17.7		24.6		30.0		27.0
	TYPICAL		1.8	3.1	4.1	4.9	5.8	6.8	9.0	10.8	12.4	15.2	19.1	22.4	25.7	27.9	30.6
DL 7 HI	R.T.	11	1.2	2.6	3.6	4.4	5.0	6.8	9.0	10.6	12.6	16.0	19.8	21.4	25.4	27.6	3[illegible].2
		13	1.2	2.6	3.6	4.4	5.2	6.0	8.0	9.8	11.6	13.6	17.8	21.0	24.0	26.2	[illegible].8
	-5°	12	2.1		4.3		5.8		7.7		11.3		14.4		20.7		[illegible].0
	+60°	12	1.1		3.6		5.9		10.5		17.7		24.3		29.9		3[illegible].2
	TYPICAL		1.2	2.6	3.6	4.4	5.1	6.4	8.5	10.2	12.1	14.8	18.8	21.2	24.8	26.9	2[illegible].5
DL 8 HI	R.T.	11	1.4	2.6	3.4	4.4	5.2	6.0	8.4	10.2	13.0	15.2	19.6	22.2	24.6	26.6	2[illegible].8
		13	1.6	2.8	3.8	4.6	5.4	6.0	7.6	9.6	11.4	13.4	17.2	21.0	23.6	25.6	2[illegible].2
	-5°	12	2.2		4.0		5.6		7.2		10.7		14.2		20.9		2[illegible].4
	+60°	12	1.2		3.5		5.7		10.4		17.9		23.9		28.2		3[illegible].2
	TYPICAL		1.5	2.7	3.6	4.5	5.3	6.0	8.0	9.8	12.2	14.3	18.4	21.8	24.1	26.1	2[illegible].5
DL 9 HI	R.T.	11	1.4	2.4	3.2	4.2	6.0	8.0	9.6	12.2	15.6	19.6	22.6	25.2	27.2	29.2	[illegible].8
		13	1.2	2.4	3.2	4.0	5.6	7.4	9.4	11.6	14.4	17.2	21.6	24.0	26.4	28.2	30.0
	-5°	12	1.6		3.5		4.9		8.7		11.6		18.2		23.6		28.9
	+60°	12	1.0		3.2		6.9		12.8		21.1		26.0		30.0		34.8
	TYPICAL		1.3	2.4	3.2	4.1	5.8	7.7	9.5	11.9	15.0	18.4	22.2	24.6	26.8	28.7	30.4

7105B Signal Level Measurement (SLX)

Table 11

7105A Channel 4 Segment Data

SEGMENT	FUNCTION	LEVEL AND MEANING
1	DL 1 RPI	(a) Low - DL 1 Off (b) High - DL 1 On
2	DL 2 RPI	(a) Low - DL 2 Off (b) High - DL 2 On
3	DL 3 RPI	(a) Low - DL 3 Off (b) High - DL 3 On
4	DL 4 RPI	(a) Low - DL 4 Off (b) High - DL 4 On
5	DL 5 RPI	(a) Low - DL 5 Off (b) High - DL 5 On
6	DL 6 RPI	(a) Low - DL 6 Off (b) High - DL 6 On
7	DL 7 RPI	(a) Low - DL 7 Off (b) High - DL 7 On
8	DL 8 RPI	(a) Low - DL 8 Off (b) High - DL 8 On
9	DL 9 RPI	(a) Low - DL 9 Off (b) High - DL 9 On
10	DL 10 RPI	(a) Low - DL 10 Off (b) High - DL 10 On
11	Not Used	
12	Not Used	
13	Execute & Alternator RPI	(a) 4v - Execute (b) 3.1v - Mode 1 (c) 2.4v - Mode 3 (d) 2.1v - Mode 2 (e) 0.5v - Reset
14	R&D RPI	(a) 0.6v - PWX Off (b) 2.5v - [redacted] Slow Clock (c) 4.0v - Fast Clock
15	"0v" Calibrate	VCO Low Bandedge Calibration
16	"5v" Calibrate	VCO High Bandedge Calibration

Table 12

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7105B Channel 5 Segment Data (Segment Width—.5 Sec.)

SEGMENT	FUNCTION	LEVEL AND MEANING
1	DL 1 RPI	(a) Low - DL 1 Off (b) High - DL 1 On
2	DL 2 RPI	(a) Low - DL 2 Off (b) High - DL 2 On
3	DL 3 RPI	(a) Low - DL 3 Off (b) High - DL 3 On
4	DL 4 RPI	(a) Low - DL 4 Off (b) High - DL 4 On
5	DL 5 RPI	(a) Low - DL 5 Off (b) High - DL 5 On
6	DL 6 RPI	(a) Low - DL 6 Off (b) High - DL 6 On
7	DL 7 RPI	(a) Low - DL 7 Off (b) High - DL 7 On
8	DL 8 RPI	(a) Low - DL 8 Off (b) High - DL 8 On
9	DL 9 RPI	(a) Low - DL 9 Off (b) High - DL 9 On
10	DL 10 RPI	(a) Low - DL 10 Off (b) High - DL 10 On
11	Spare	Low
12	Hi-Lo RPI	(a) Low - Low Sensitivity (b) High - High Sensitivity
13	Execute and Alternator RPI	(a) 4.2v - Execute (b) 3.1v - Mode 1 (c) 2.5v - Mode 3 (d) 2.1v - Mode 2 (e) 0.6v - Reset
14	R&D RPI	(a) Low - SLX Off (b) High - SLX On
15	"0v" Calibrate	VCO Low Bandedge Calibration
16	"5v" Calibrate	VCO High Bandedge Calibration

Table 13

7105C Channel 6 Segment Data

SEGMENT	FUNCTION	LEVEL AND MEANING
1	DL 1 RPI	(a) Low - DL 1 Off (b) High - DL 1 On
2	DL 2 RPI	(a) Low - DL 2 Off (b) High - DL 2 On
3	DL 3 RPI	(a) Low - DL 3 Off (b) High - DL 3 On
4	DL 4 RPI	(a) Low - DL 4 Off (b) High - DL 4 On
5	DL 5 RPI	(a) Low - DL 5 Off (b) High - DL 5 On
6	DL 6 RPI	(a) Low - DL 6 Off (b) High - DL 6 On
7	DL 7 RPI	(a) Low - DL 7 Off (b) High - DL 7 On
8	DL 8 RPI	(a) Low - DL 8 Off (b) High - DL 8 On
9	DL 9 RPI	(a) Low - DL 9 Off (b) High - DL 9 On
10	DL 10 RPI	(a) Low - DL 10 Off (b) High - DL 10 On
11	DL 11 RPI	(a) Low - DL 11 Off (b) High - DL 11 On
12	DL 12 RPI	(a) Low - DL 12 Off (b) High - DL 12 On
13	Execute & Alternator RPI	(a) 4 v - Execute (b) 3.1 v - Mode 1 (c) 2.4 v - Mode 3 (d) 2.1 v - Mode 2 (e) 0.5 v - All off
14	Spare	Low level and should not change
15	"0 v" Calibrate	VCO Low Bandedge Calibration
16	"5 v" Calibrate	VCO High Bandedge Calibration

Table 14

7105D CHANNEL 7 SEGMENT DATA

SEGMENT	FUNCTION	LEVEL AND MEANING
1	DL 1 RPI	(a) Low - DL 1 Off (b) High - DL 1 On
2	DL 2 RPI	(a) Low - DL 2 Off (b) High - DL 2 On
3	DL 3 RPI	(a) Low - DL 3 Off (b) High - DL 3 On
4	DL 4 RPI	(a) Low - DL 4 Off (b) High - DL 4 On
5	DL 5 RPI	(a) Low - DL 5 Off (b) High - DL 5 On
6	DL 6 RPI	(a) Low - DL 6 Off (b) High - DL 6 On
7	DL 7 RPI	(a) Low - DL 7 Off (b) High - DL 7 On
8	DL 8 RPI	(a) Low - DL 8 Off (b) High - DL 8 On
9	DL 9 RPI	(a) Low - DL 9 Off (b) High - DL 9 On
10	DL 10 RPI	(a) Low - DL 10 Off (b) High - DL 10 On
11	DL 11 RPI	(a) Low - DL 11 Off (b) High - DL 11 On
12	DL 12 RPI	(a) Low - DL 12 Off (b) High - DL 12 On
13	Execute & Alternator RPI	(a) 4v - Execute (b) 3.1v - Mode 1 (c) 2.4v - Mode 3 (d) 2.1v - Mode 2 (e) 0.5v - All off
14	R&D RPI	(a) 0.5v - R&D OFF (b) 1.7v - R&D Tester On (c) 2.5v - R&D On (d) 3.4v - Tester and R&D On
15	"0v" Calibrate	VCO Low Bandedge Calibration
16	"5v" Calibrate	VCO High Bandedge Calibration

Table 15

VII. COMSEC PLANS:

1. No encryption of the data from the satellite has been attempted in this program, however, by careful limitations of the power transmitted and bandwidth restriction on the reception link, the probability of detection of this signal remains quite low if the satellite is placed in the desired 500 nautical mile high orbit. The antenna system required on the ground in order to consistently receive this data must have approximately 19 db gain relative to a dipole and must track in azimuth. The signal is sufficiently low in power so that a very low-noise receiving system is required to provide usable data. No residual power is radiated from the satellite data transmitter between the pulses of data so that the signal is spuriatic and intermittent in nature and thus additionally difficult to detect by accidental means. The information bandwidth of the data is reduced considerably by stretching out the time duration of the intercepted radar pulses thus reducing the transmitter power required from the satellite. Studies have indicated that interception of the data signals by conventional countermeasures installations is literally impossible and only through the use of high gain intercept antennas and considerable knowledge of the orbital elements of the satellites would intercept be likely.

VIII. GROUND SUPPORT EQUIPMENT:

1. MISSION 7105 receiving systems will be located at the same sites used previously, i.e. [redacted] [redacted] Command Control (Interrogation) Stations are co-located with the data receiving complexes at [redacted]

2. The receiving system electronic complexes at [redacted] and [redacted] have all been up-dated and consolidated into permanent quarters within operation buildings. Within the next twelve months it is anticipated that all the receiving sites will be similarily integrated into the main operating spaces.

IX. CHARACTERISTICS OF THE RECEIVING RECORDING SYSTEMS:

1. The receivers which will be utilized are the same R-390A/UAR type used for the previous POPPY missions at all sites except [redacted] where a new solid state experimental receiver is being used. The antenna systems are of two types, either manually or remotely trainable. The manual type is mounted on a vertical mast which extends above the electronic shelter hut which houses the complete electronic systems at some of the sites. When

the systems are moved indoors to permanent quarters the sites will all have the remote type antenna system with receiving capability for both horizontal and vertical polarization. The operator will have the option of recording that polarization which gives the best signal to noise ratio.

2. Tracking: The satellites of MISSION 7105 will be tracked manually in the same manner used previously, i.e. by observation of predicted azimuth versus time given in predictions promulgated by DIR NAV SEC GRU. Of great assistance to the operator is the monitoring of the 137 mc telemetry channel which is radiated continuously to provide evidence of the on-board temperatures, voltages and the state-of-command which exists in each satellite. Tracking with the manually trainable antenna is identical to that of the past missions, where a lobe-switching direction finding system is tuned to the 137 mc signal.

3. Recording System. The Model GR-2800 magnetic tape recorder built by the Consolidated Electrodynamic Corp. is presently being used throughout the MISSION 7104 data collection effort and will be available for MISSION 7105 data recording. This machine is a basic 100 kc (at 60 ips) instrumentation type seven track magnetic tape recorder. Provision is made for FM type recording of four tracks of SIGINT experiment transponded data utilizing tracks #1, #3, #5, and #7, and timing information on tracks #2, #4, and #6 via analogue electronics. The center frequency of the FM carrier is 54 kc at the 30 inch per second tape speed used for the recording. With this tape speed, and the use of one mil-thick 1/2 inch width magnetic tape the total recording time on a 10-1/2 inch diameter reel is 24 minutes, more than enough for the recording of one satellite passage.

4. Timing System for Data Collection System. The Astrodata Model 6140-500 Time Code Generator (TCG) is utilized to generate a 20-bit binary-coded decimal (BCD) timing signal for recording on Tracks 6 and 4 on the data tape so that absolute time may be derived during the analysis process. The carrier frequency of the timing signal is 2,000 cycles per second. The primary reference oscillator from which the Astrodata TCG derives its basic accuracy is a AN/URQ-10 which has a fractional frequency error of less than 5 parts in 10^{-10} or one millisecond drift in a period of 30-days after a stabilization period of 3-months.

The 1 megacycle sine wave signal from the AN/URQ-10 is used to drive the Astrodata Time Code Generator. The 100 kilocycle signal from the AN/URQ-10 is then divided down to 50 kc and 60 cycles per second. The 50 kc signal is recorded on tracks 2 and 6 of the tape with the Data. The 60 cycle signal is used to drive the capstan motor on the tape recorder so that the tape speed as well as the 50 kc and Time Code are directly related to the accuracy of the primary frequency standard (the AN/URQ-10) at each site. Careful checks are maintained on the drift of this standard oscillator and when the departure from the available time observatory signal is sufficient, an adjustment is made in the oscillator and the time code generator..

X. DATA PROCESSING

1. All Data from the Mission 7105 satellites like that from the predecessors of 7104, 7103, and 7102, will be delivered to NSA Fort Meade for processing. NSA must provide additional details concerning the processing of the 7105 data.

2. Analysis Equipment

As each of the sites has moved the instrumentation for POPPY indoors, the receiving-recording systems have been enhanced by the addition of an analysis complex which has been designed to fulfill two basic functions. First, it allows the training of site operator-personnel by providing a playback facility for both training tapes which have been promulgated by NSA and in addition it allows the facility for playback of POPPY tapes which have been recorded for retention at the site. It is through these trained operators and the use of these special Quality Control tapes that the product from each of the sites has been maintained at the consistent high level. The second function of this analysis complex is that of allowing the analyst at the site to carefully edit tapes for Signals of Interest (SOI) and notify NSA by message of the details of the intercept.

At [redacted] an experimental Analog to Digital A/D data conversion system has been installed, complete with a small general purpose computer which

[redacted]

resulted if the signal pulse had emanated from one geographic spot of high interest (given by longitude and latitude with up to nine locations possible for a single pass through the computer system...). This A/D conversion of the data at the overseas site will provide significant reduction of the time variations in the data. The new solid state receivers at [redacted] have also contributed to the reduction of the time variation of data by providing a linear phase response through the receiver.

XI. ESTIMATE OF SYSTEM PERFORMANCE -

The accuracy of Pulse Period measurement as well as antenna acan rate surpasses that now realized at most conventional peripheral intercept sites. Pulse Repetition Interval (PRI) is read and reported to 0.01 m sec. Levels of performance have demonstrated that in each intercept band, every known signal type (of suitable power level) has been intercepted, giving the system a very high confidence level. RF acceptance bands are carefully checked to assure that there are no spurious responses which might give rise to false intercept results. The reliability of the system's performance has been exceptionally good throughout the entire life. Compatibility of payload components in the vehicle as well as RFI problems have always been worked out prior to launch.

7103C with three years in orbit is still being tasked daily with no measurable degradation in performance. 7104A, B, and C have after more than two years been making full use of all of the on-board SIGINT collection systems. These satellites have demonstrated in a very real way the degree of reliability expected from MISSION 7105.

With the extension of frequency coverage, duplicated coverage in most instances and the increase in the sensitivity it can be expected that MISSION 7105 will exceed the performance of the past POPPY efforts by a good margin.

[redacted]

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Handle via Byeman
Control System

The following antenna patterns are plotted in decibels, range 0 to 40 db. The point and level of sensitivity measurement is shown on the graphs.

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[illegible]

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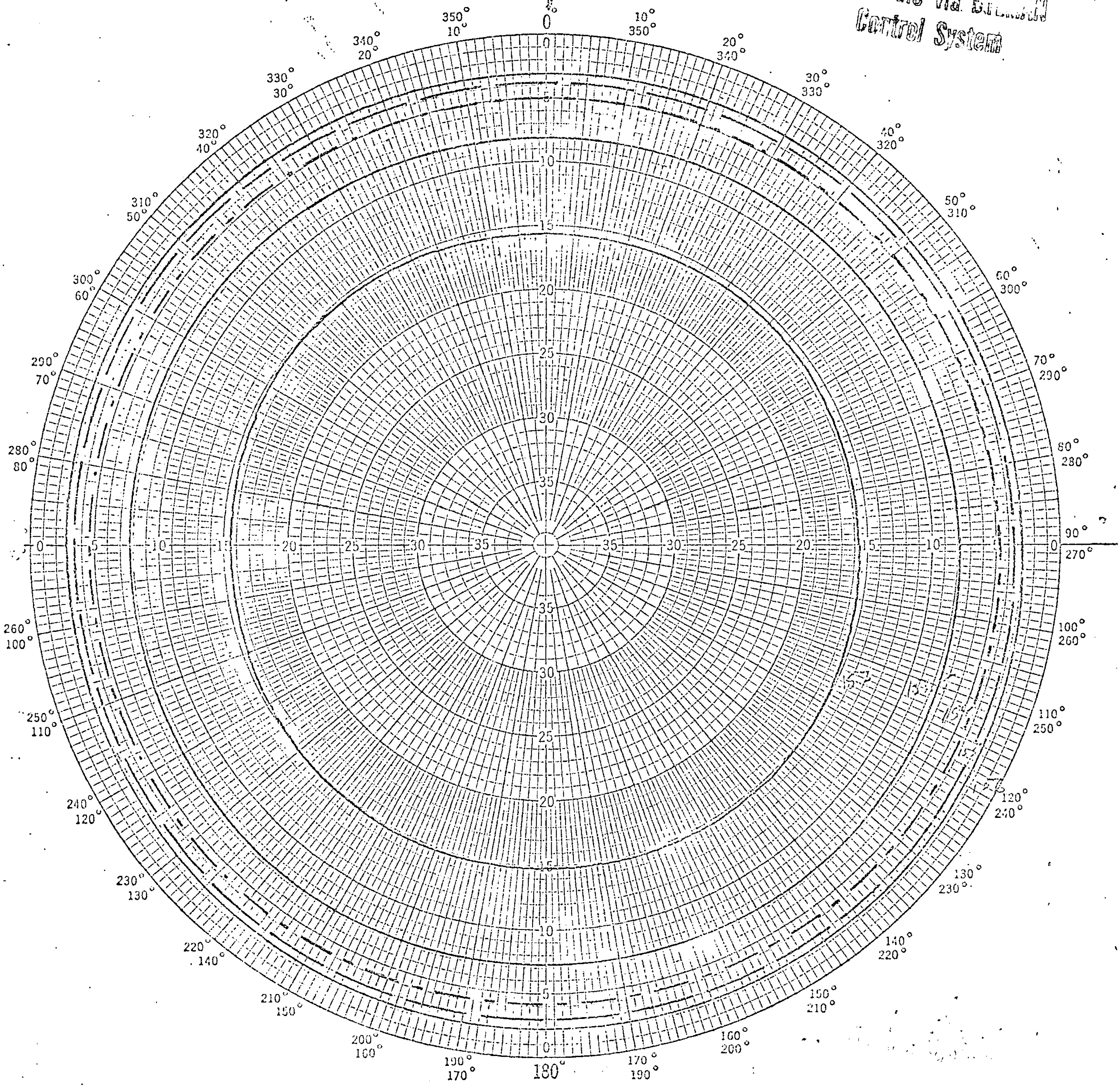
HANDLE VIA BYEMAN CONTROL SYSTEM

~~TOP SECRET~~ $P_D = -65 dbm/cm^2$

Handle via BYEMAN Control System



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

Figure 1

7105A-1
153,153.5,154,155,156 Mc
Vert. Pol.
Turnstile
Lower Edge of Bandpass

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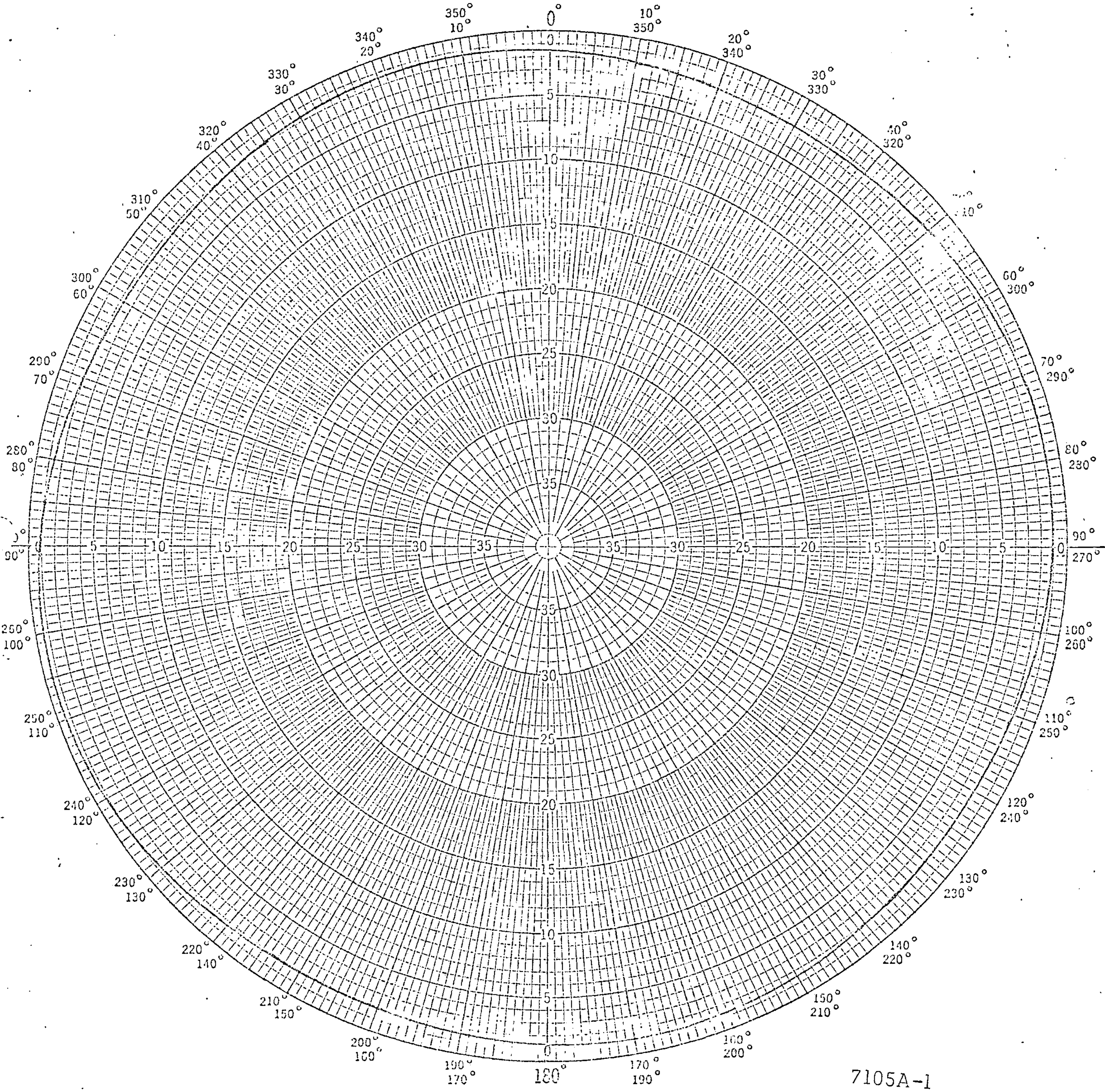
HANDLE VIA BYEMAN CONTROL SYSTEM

~~TOP SECRET~~

Handle Via [illegible]
Control System

$P_D = -65$ dbm/cm²



7105A-1
160 Mc
Hor. Pol.
Turnstile

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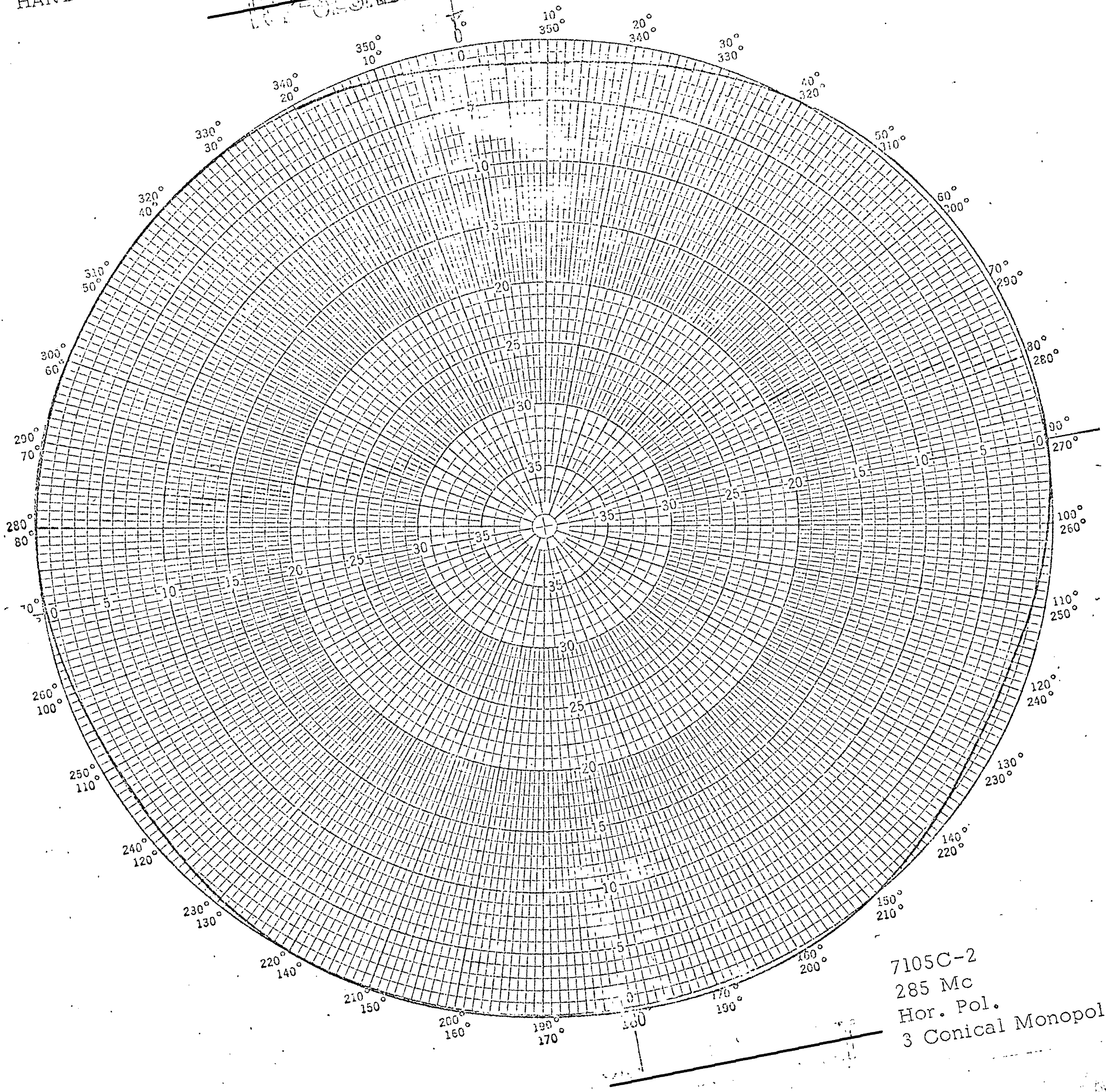
HANDLE VIA BYEMAN CONTROL SYSTEM

~~TOP SECRET~~ — 75 db uv/cm

Handle via BYEMAN
Control System



7105C-2
285 Mc
Hor. Pol.
3 Conical Monopol

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Control System

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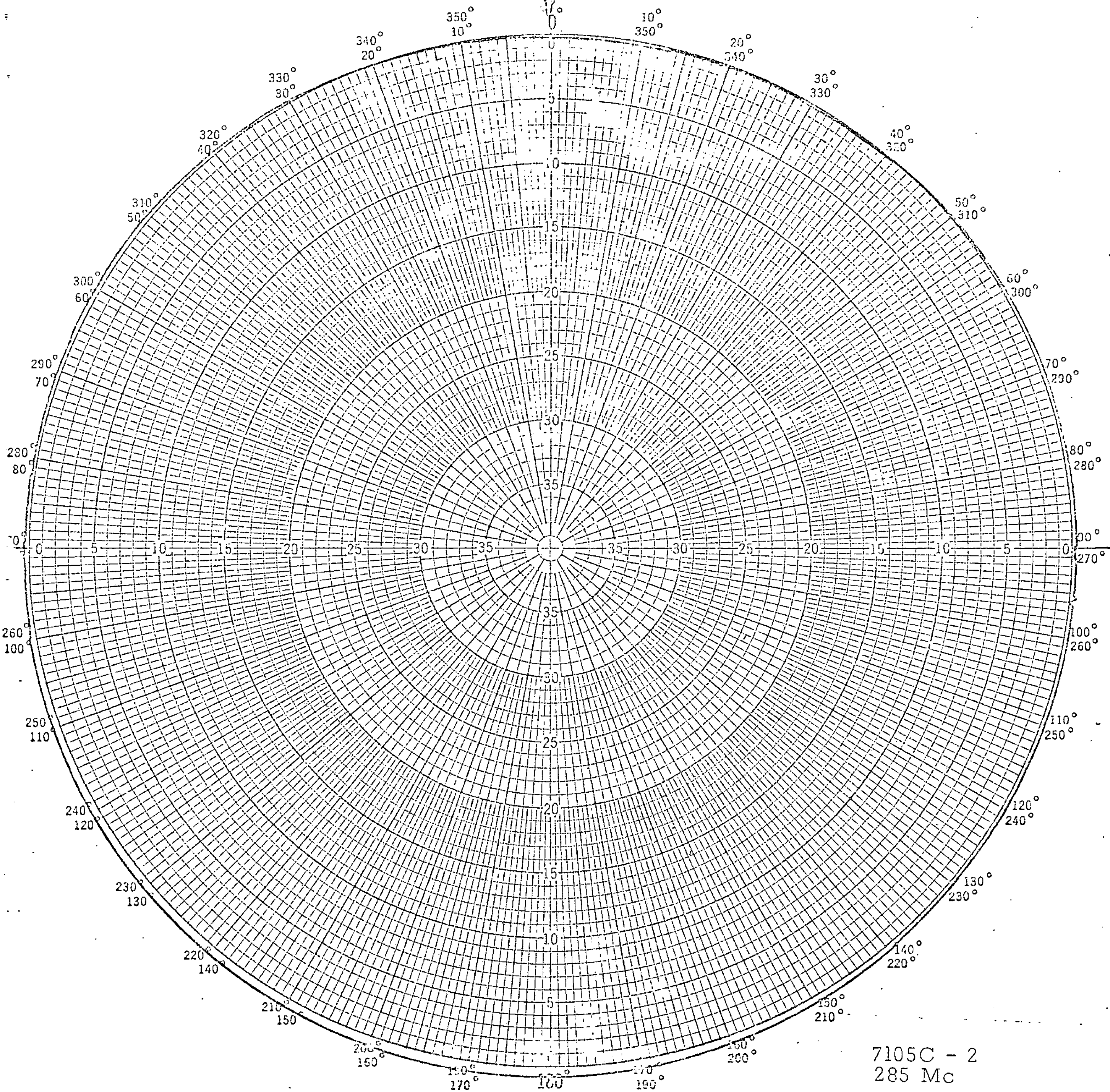
HANDLE VIA BYEMAN CONTROL SYSTEM

~~TOP SECRET~~ -75 dbm/cm^2

Handle via BYEMAN Control System



7105C - 2
285 Mc
Vert. Pol.
3 Conical Monopoles

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Figure 4

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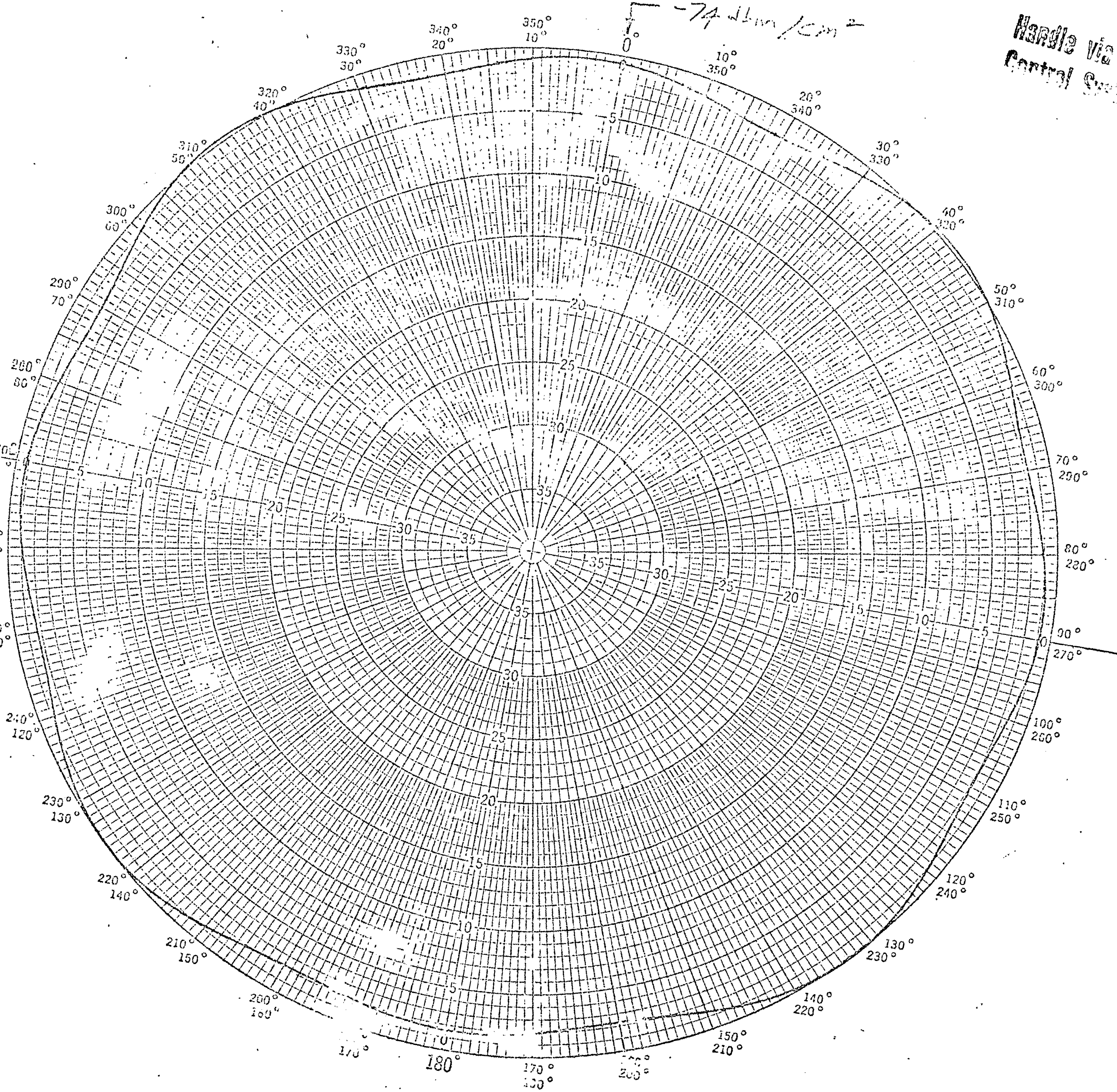
-74 dbm/cm²



r Chart No. 127D
IFIC-ATLANTA, INC.
LANTA, GEORGIA

7105A - 3
600 Mc
Hor.Pol.
4 Monopoles

Figure 5

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HANDLE VIA BYEMAN CONTROL SYSTEM

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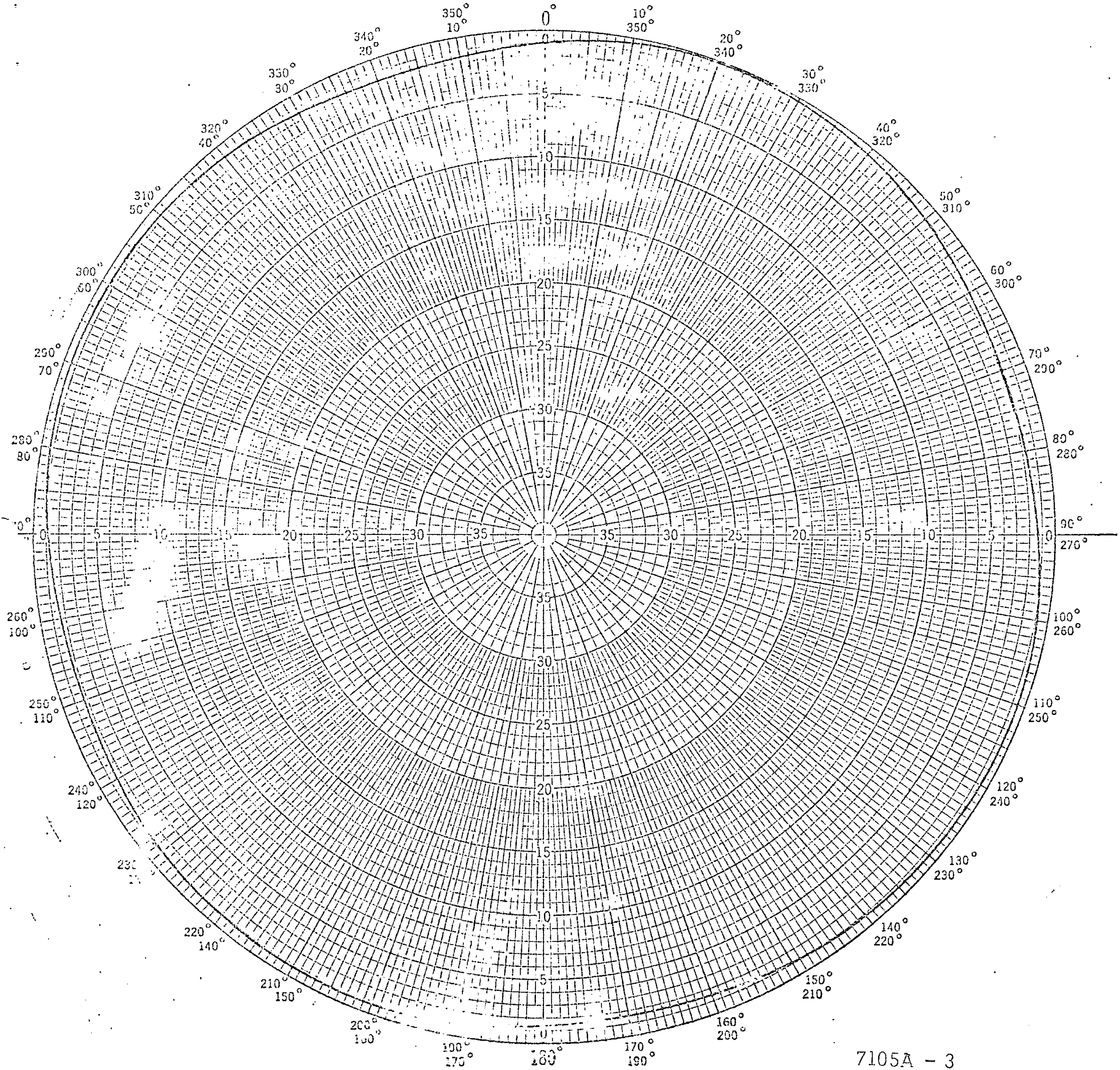
-73 dbm/cm



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7105A - 3
600 Mc.
Vert. Pol.
4 Monopoles

Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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HANDLE VIA BYEMAN CONTROL SYSTEM

Handle via BYEMAN
Control System

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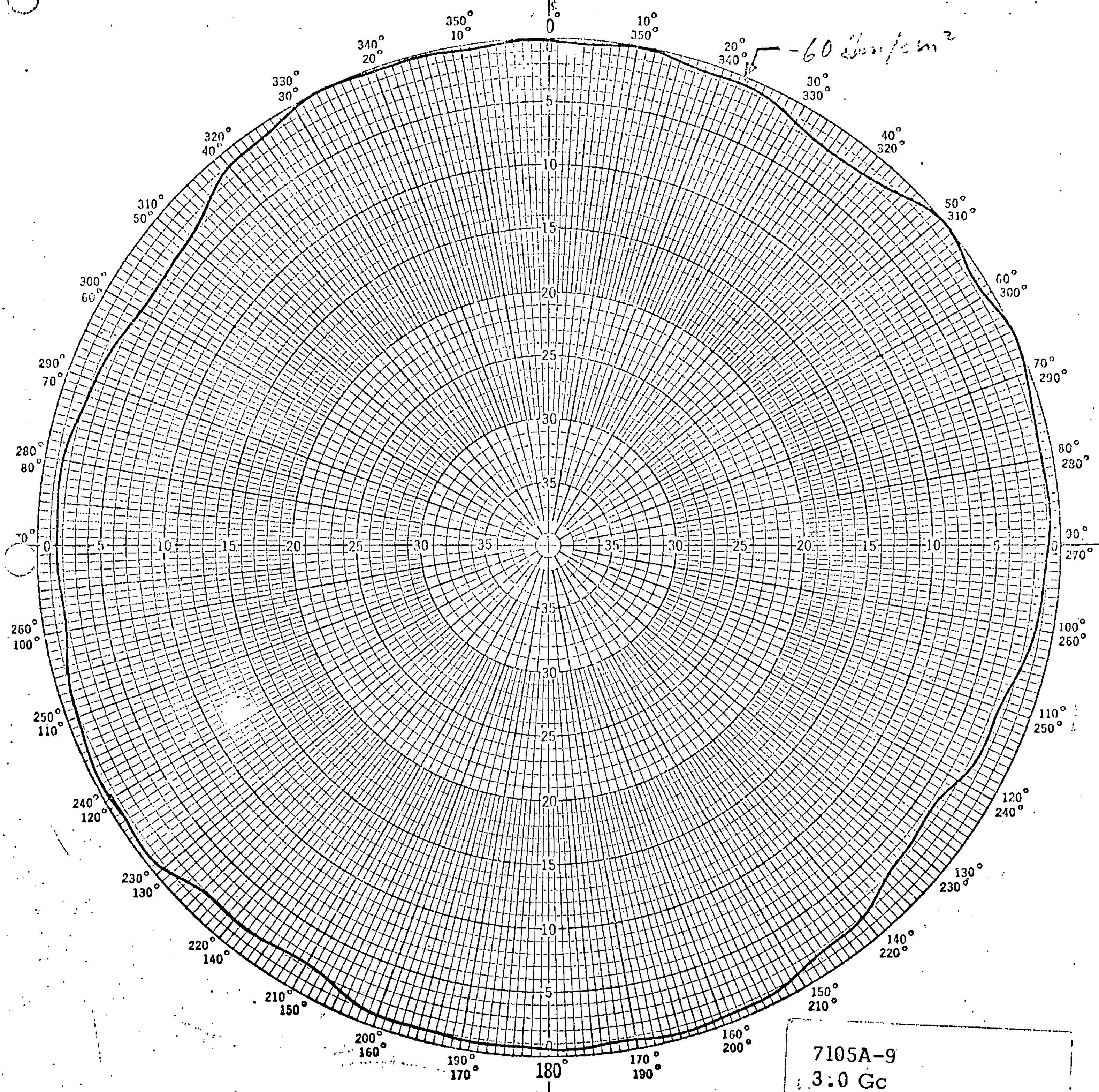

-60 dbm/cm²

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7105A-9
3.0 Gc
Hor. Pol.
Equatorial Monopoles

Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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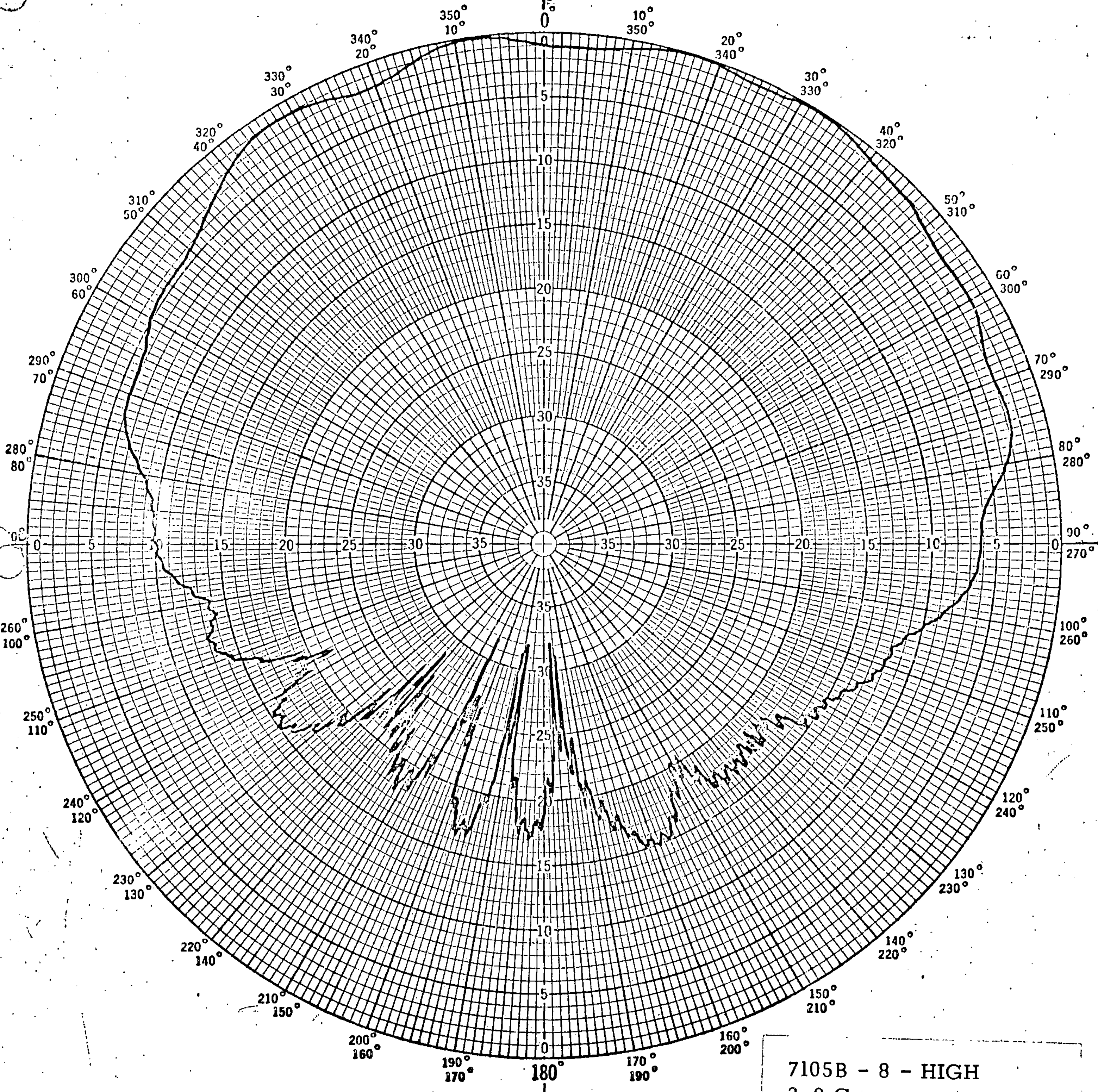
HANDLE VIA BYEMAN CONTROL SYSTEM

Control System

$P_D = -74 \text{ dbm/cm}^2$



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7105B - 8 - HIGH
3.0 Gc
Hor. Pol.
Open Ended Waveguide

Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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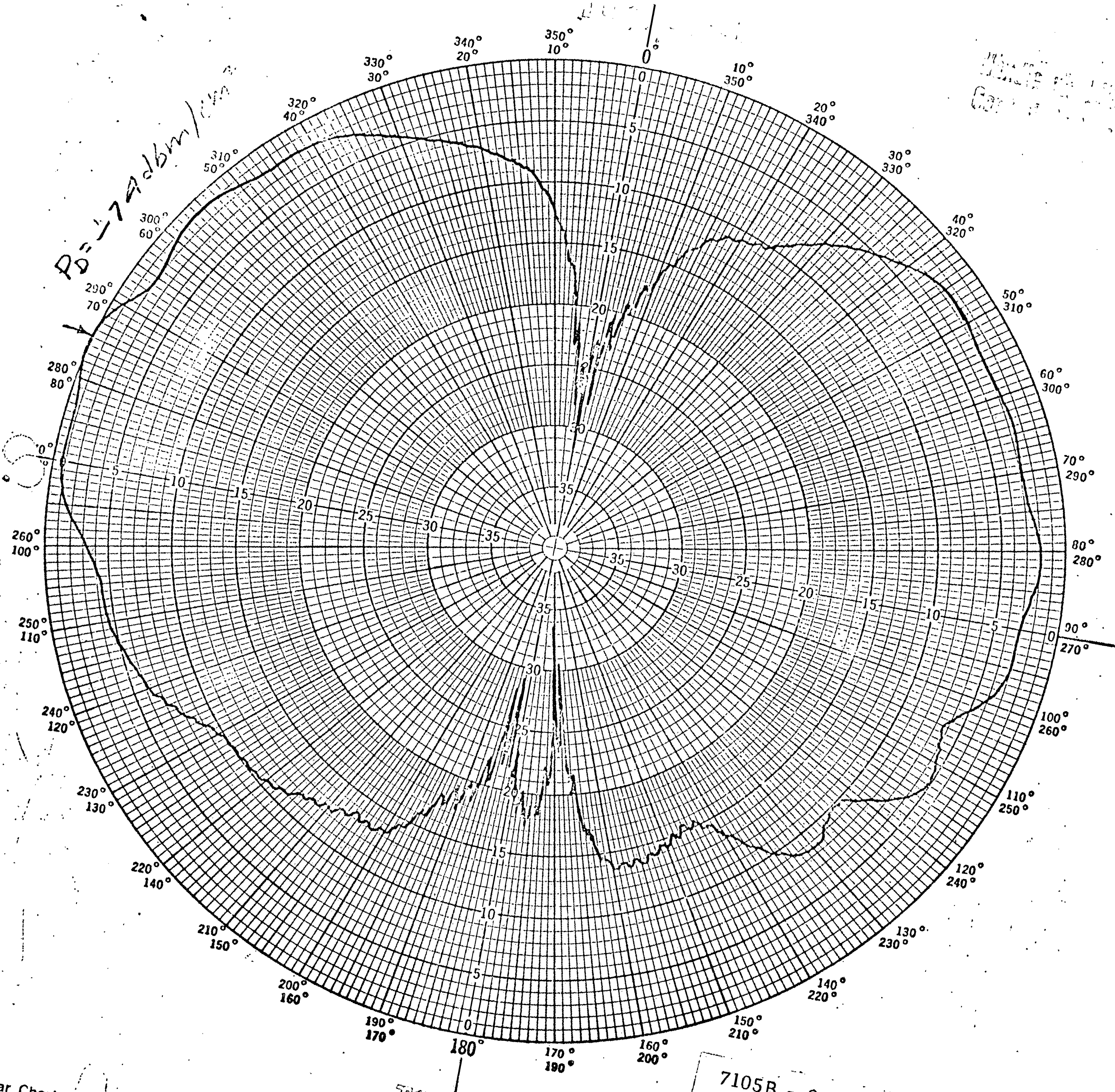
HANDLE VIA BYEMAN CONTROL SYSTEM



$P_o = -74$ dbm/cm

ar Chart No. 127D
TIFIC-ATLANTA, INC.
TLANTA, GEORGIA

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7105B - 8 - HIGH
3.0 Gc
Vert. Pol.
Open Ended Waveguide

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HANDLE VIA BYEMAN CONTROL SYSTEM

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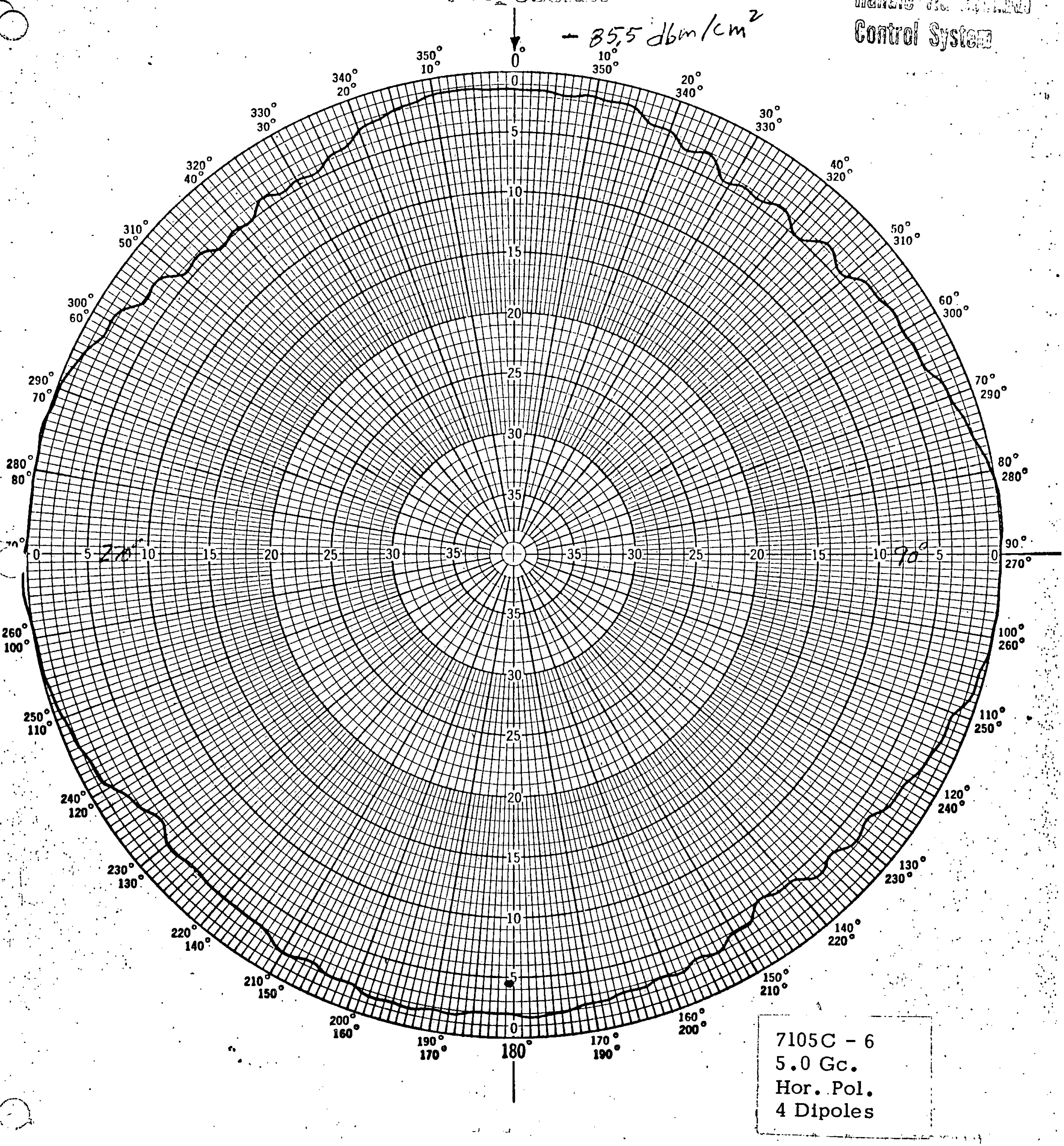
Handle via BYEMAN
Control System



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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Control System

HANDLE VIA BYEMAN CONTROL SYSTEM

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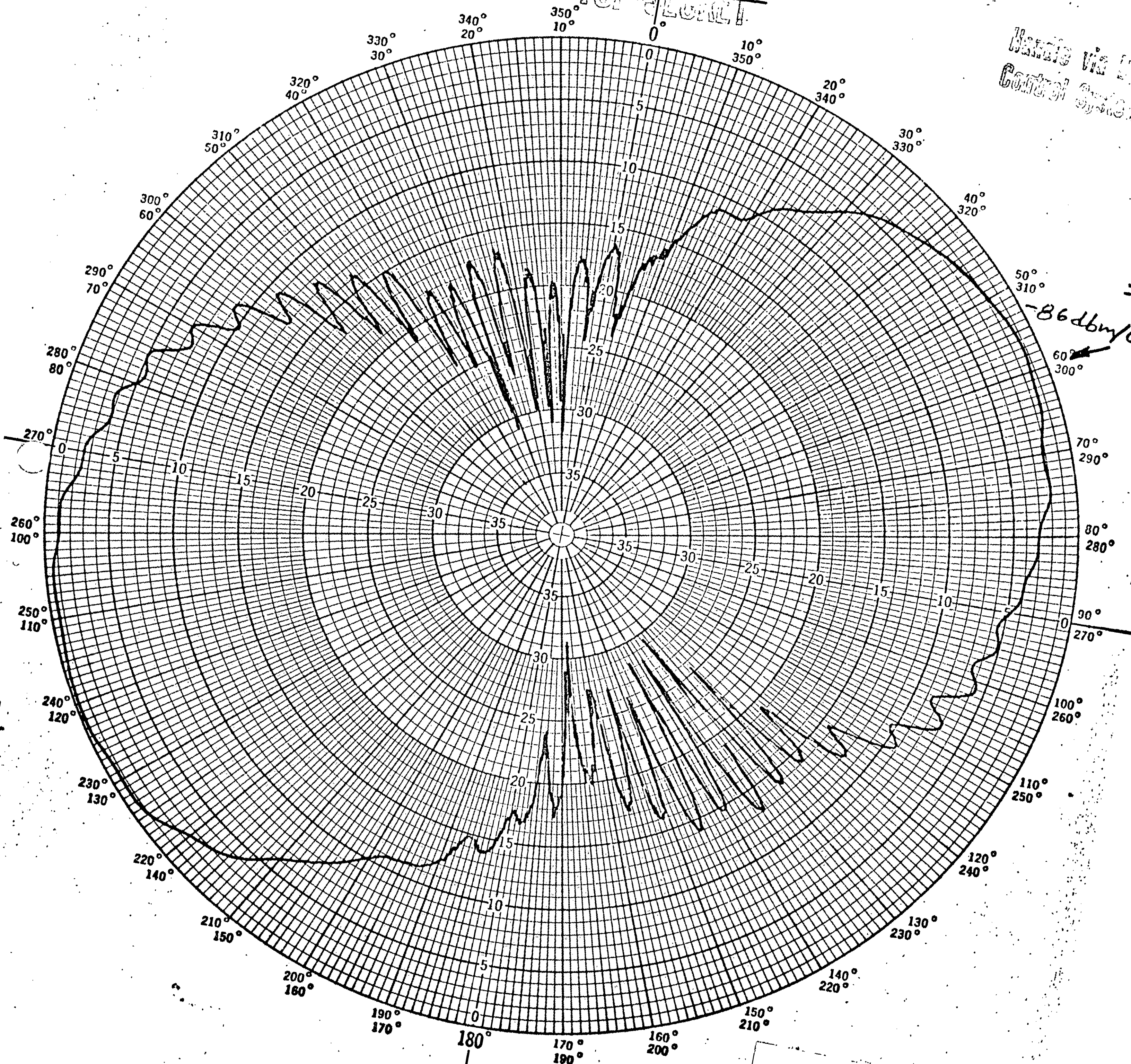
Handle via
Control Syste



-86 dbm/

ar Chart No. 127D
TIFIC-ATLANTA, INC.
TLANTA, GEORGIA

7105D - 2 BD
5.0 Gc
Hor. Pol.
Combined Dipoles

Figure 11
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Handle via BYEMAN
Control System

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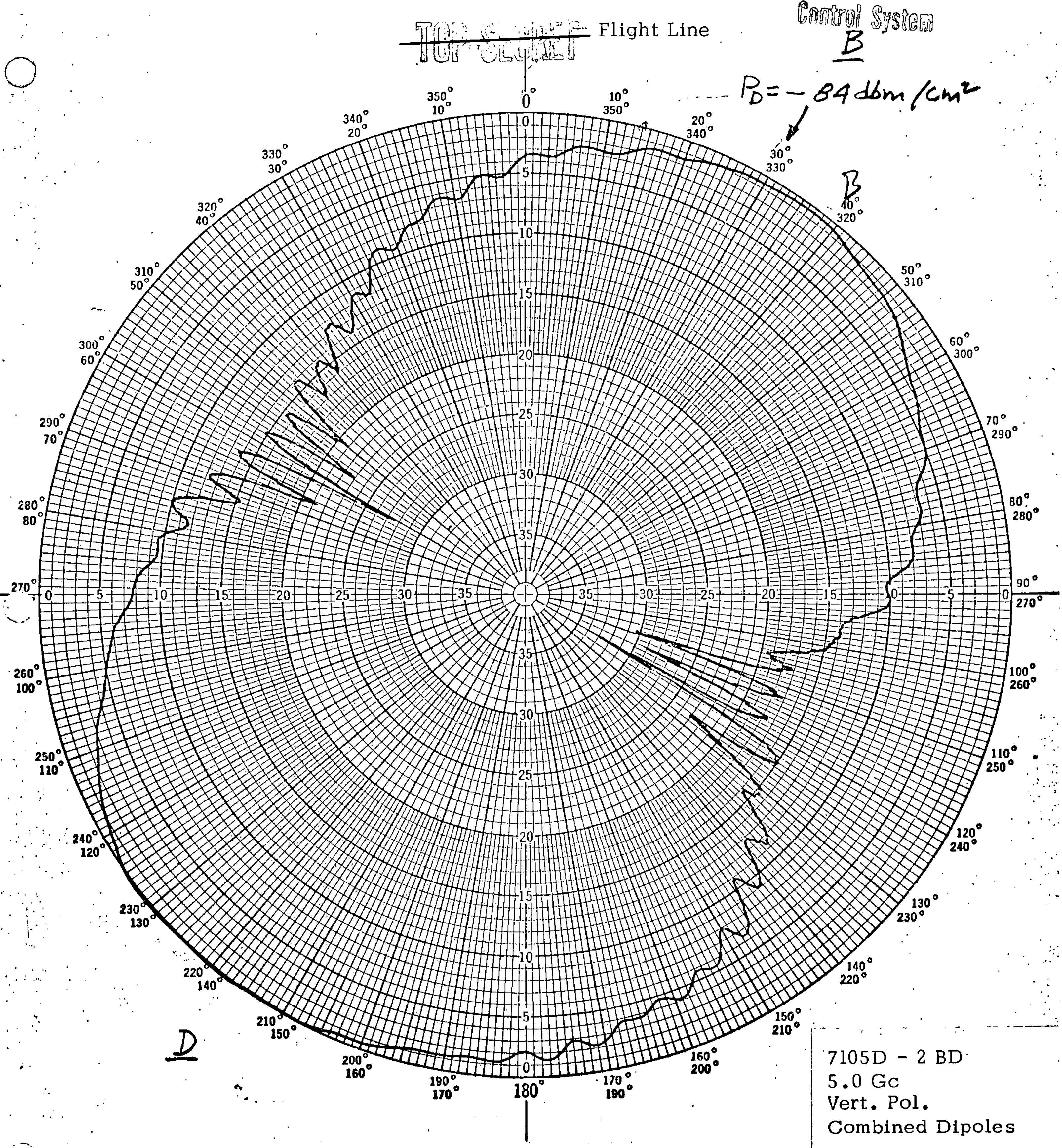

7105D - 2 BD
5.0 Gc
Vert. Pol.
Combined Dipoles

Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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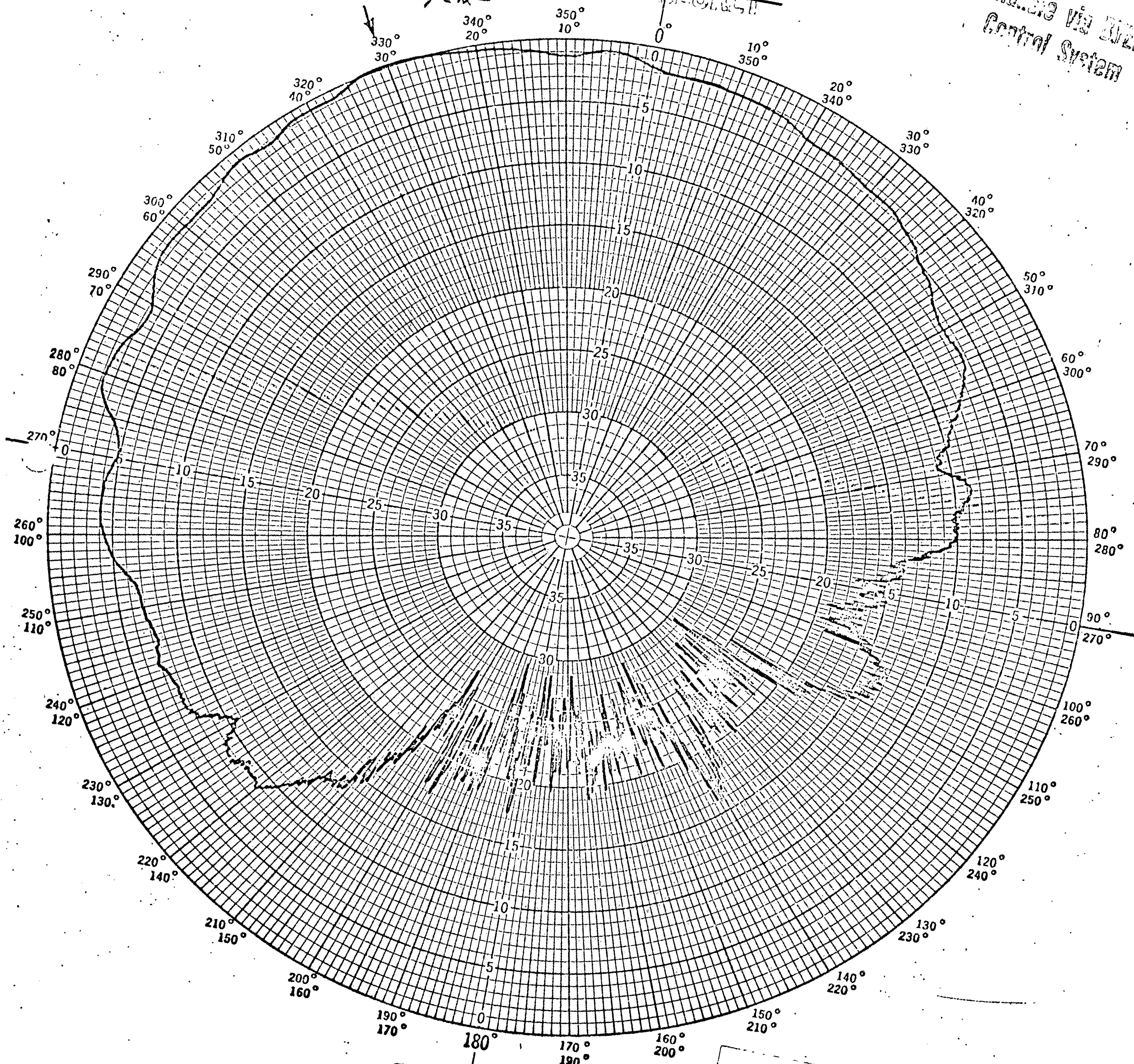
Handle via BYEMAN Control System

$P_D = -81.5$ dbm/cm²



lar Chart No. 127D
TIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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7105D - 4
7.1 Gc
Hor. Pol.
Open Ended Waveguide

Figure 13
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Control System

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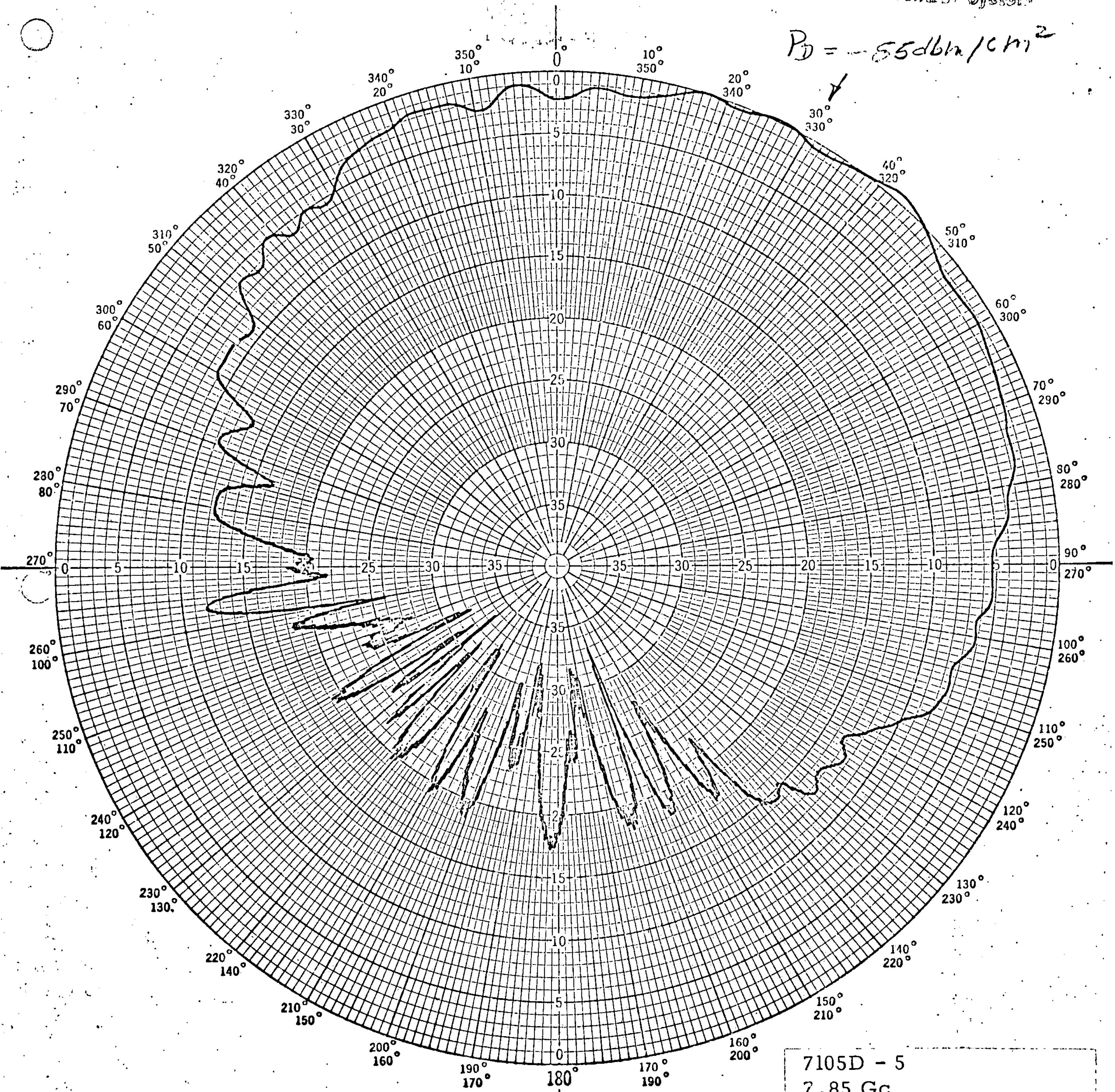
HANDLE VIA BYEMAN CONTROL SYSTEM

Handle via BYEMAN
Control System

$P_D = -55 dbm/cm^2$



7105D - 5
7.85 Gc
Hor. Pol.
Open Ended Waveguide

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Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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Handle via BYEMAN
Control System

Handle via BYEMAN
Control System

$P_D = -75.5$ dbm/cm²

A

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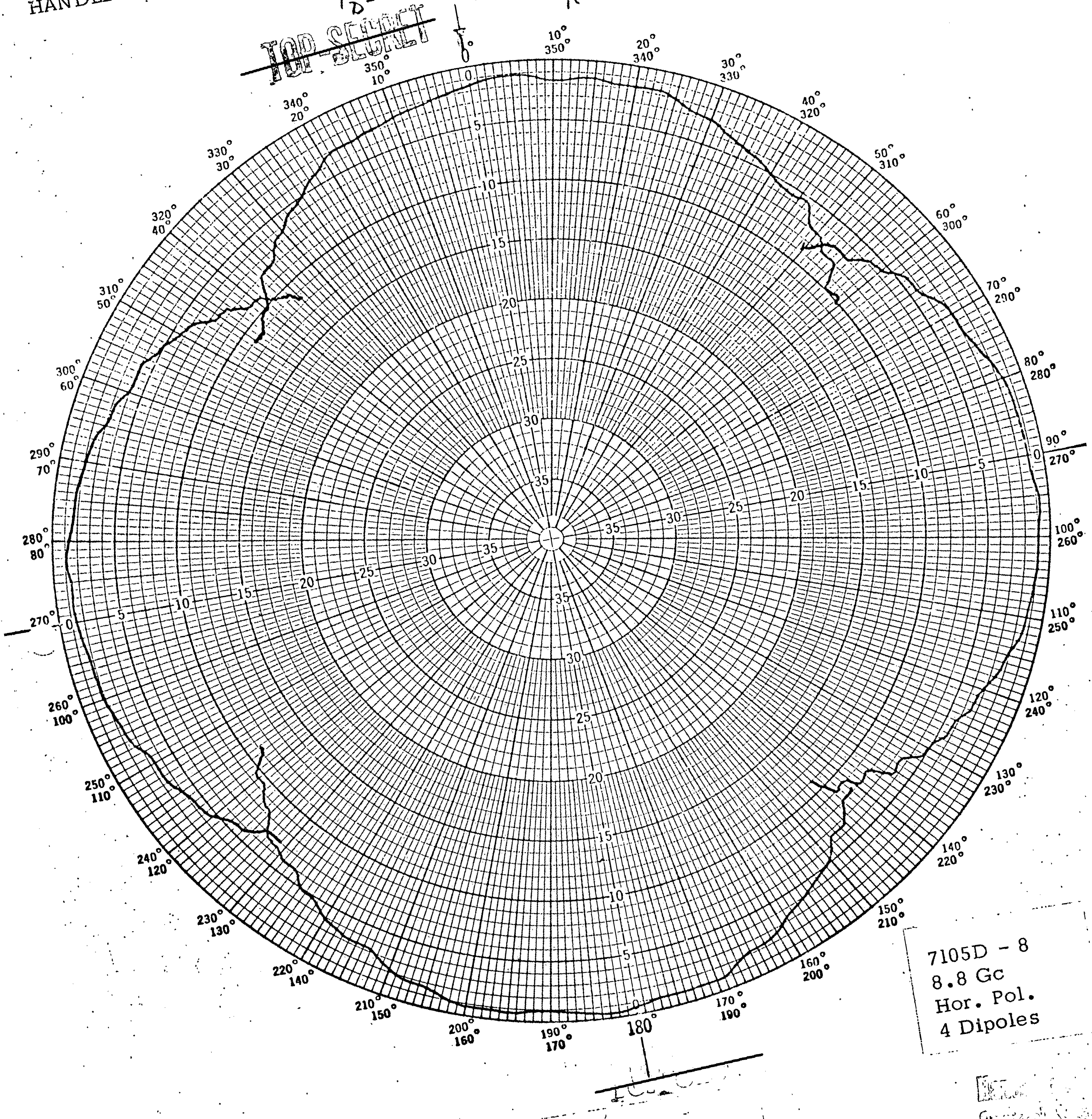

7105D - 8
8.8 Gc
Hor. Pol.
4 Dipoles

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ATLANTA, GEORGIA

HANDLE VIA BYEMAN CONTROL SYSTEM

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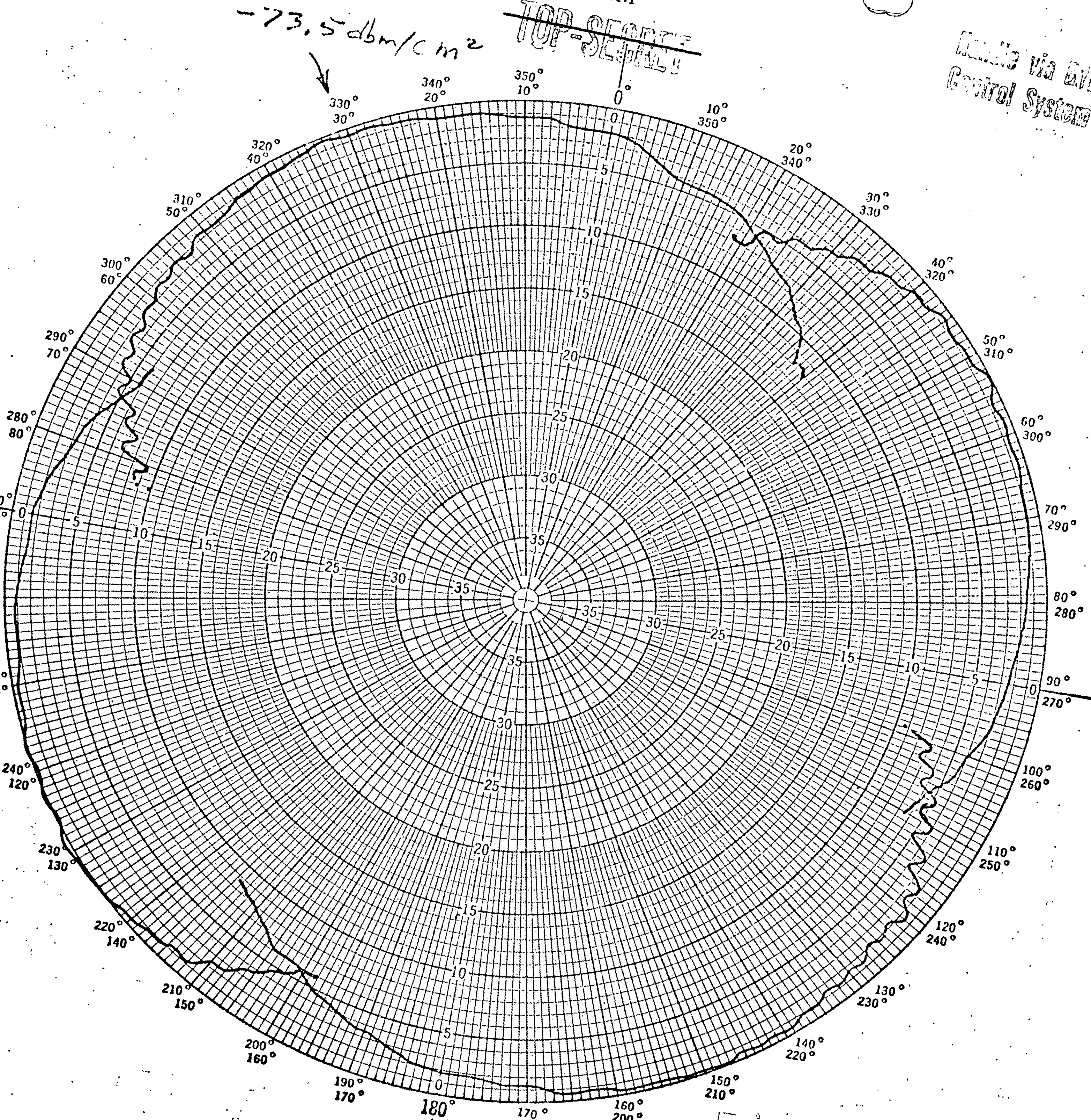
Handle Via BY
Control System



lar Chart No. 127D
NTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

7105D - 8
8.6 Gc
Vert. Pol.
4 Dipoles

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HANDLE VIA BYEMAN CONTROL SYSTEM

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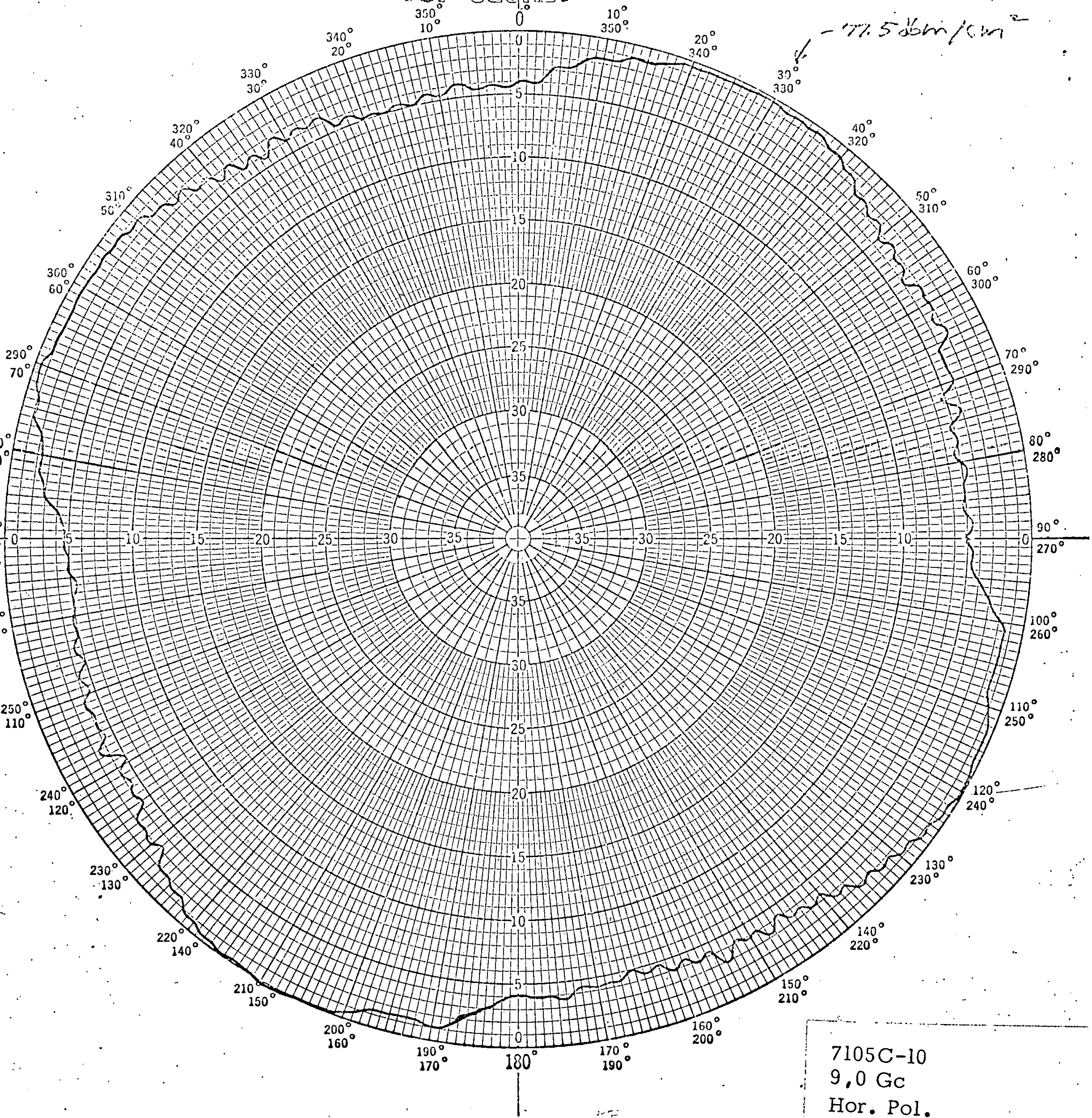
... via BYEMAN Control System



7105C-10
9,0 Gc
Hor. Pol.
4 Dipoles

Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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Hand
Control Sy

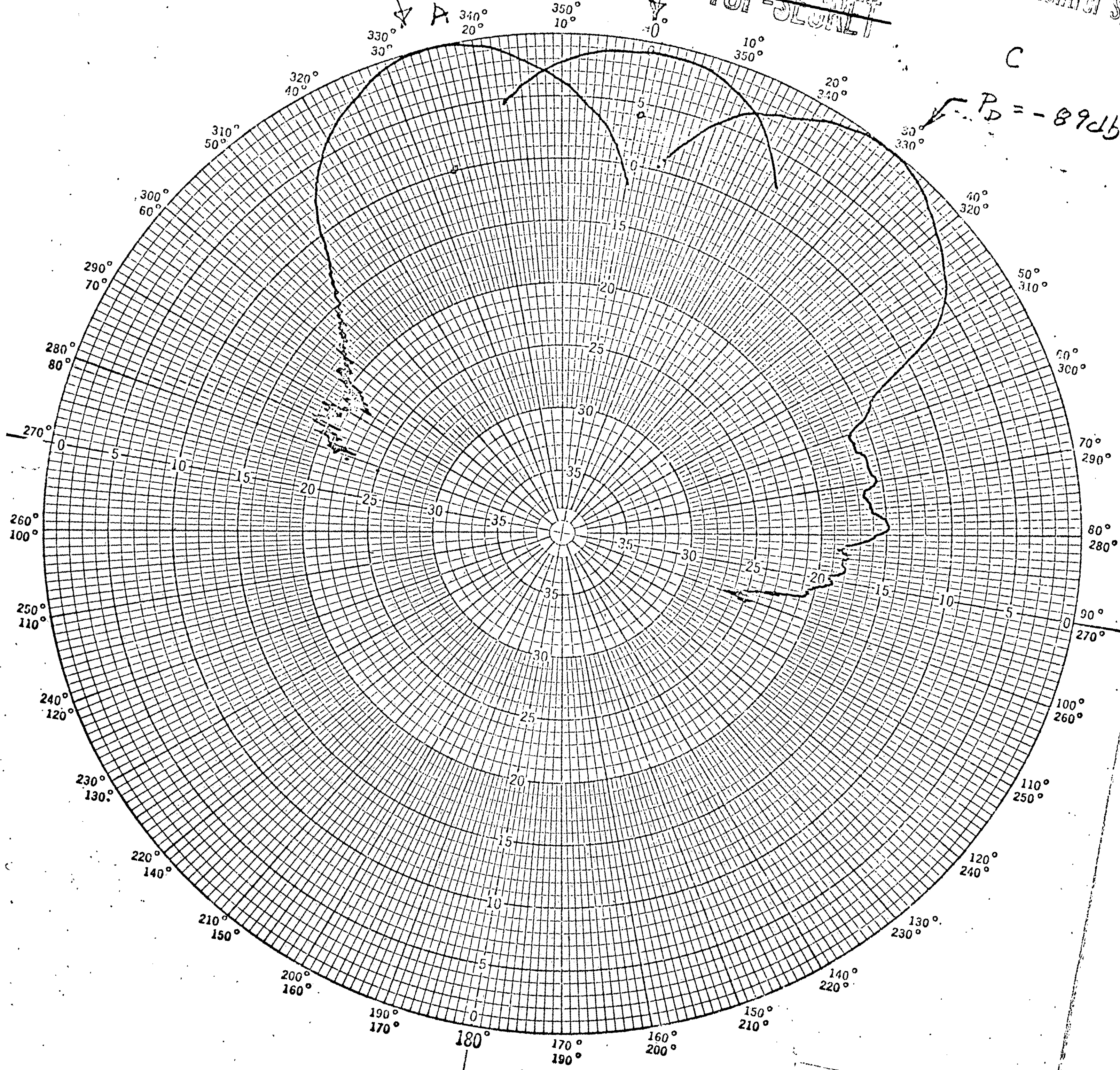
B - 89 dbm/cm²

P_D = -88 dbm/cm²

A

C

P_D = -89dbm



ar Chart No. 127D
TIFIC-ATLANTA, INC.
TLANTA, GEORGIA

7105D-10
14.65 Gc
Hor. Pol
16 db Horns

Figure 18
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HANDLE VIA BYEMAN CONTROL SYSTEM

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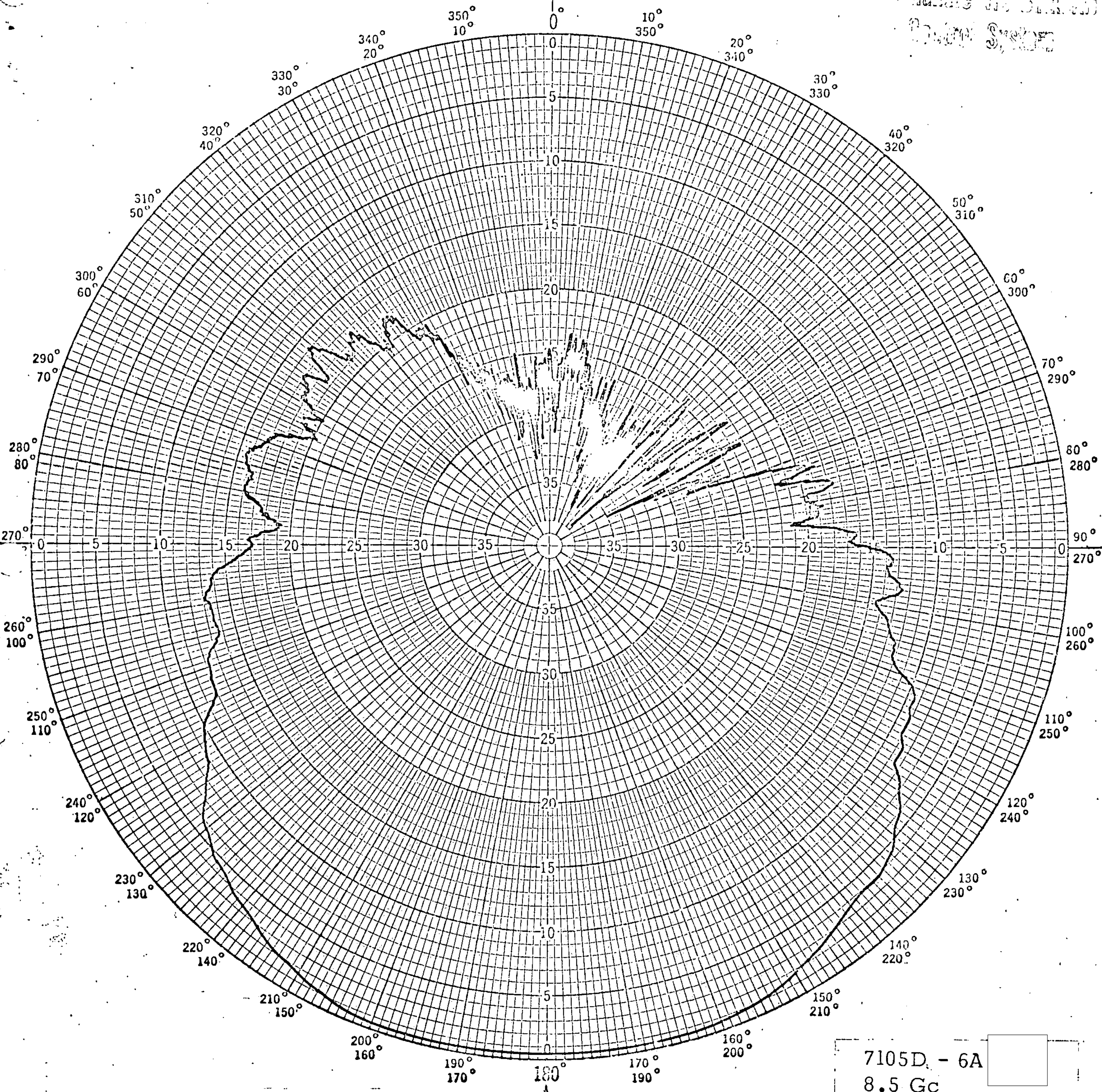
Handle via BYEMAN Control System



$P_D = -77.5$ dbm/cm^2

7105D - 6A
8.5 Gc
Hor.Pol.
C.P. Horn

Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

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