

24 July 1944

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NAVY DEPARTMENT

FR-2324

REPORT ON

DECLASSIFIED

ANTENNA PATTERN MEASUREMENTS ON
USS MT. OLYMPUS (AGC-8)

~~CONFIDENTIAL~~

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON 20, D.C.

Authorization: CNO Speedletter Ser. 0230620 of 17 May 1944

Date of Test : 15 - 17 June 1944

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INTRODUCTION

ANTENNA PATTERN MEASUREMENTS ON
USS MT. OLYMPUS (AGC-8)

- 0-1. CNO Speedletter Serial 0230620 of 17 May 1944 requested that pattern measurements be made on all antennas of AGC class ships. AGC-8, the USS MT. OLYMPUS, was made available for pattern measurements off the Chesapeake Bay Annex of the Naval Research Laboratory on 15-17 June 1944.
- 0-2. Pattern measurements were made on all communication antennas, and on most of the radar and IFF antennas. These patterns show the relative coverage afforded by each antenna versus relative ship's heading.
- 0-3. This report is divided into three sections. Section I deals with the pattern measurements of the communication antennas. Section II gives the results of measurements on the SK-2, BM, and amidships BN antennas, while Section III gives the coverage patterns of the SG antennas.
- 0-4. Summary of conclusions:
- 0-4-1. Some of the HF communication antenna patterns show large dips in certain directions. It is anticipated that a study of the patterns made on ships of this class will lead to specific recommendations for improving these patterns. The VHF antennas which are mounted horizontally on these ships radiate horizontally ^{polarized} waves, and give the usual nulls off the ends of the radiator. These antennas should be mounted vertically to correspond to the polarization used on other ships of this class.
- 0-4-2. The SK-2 and BM antennas give quite uniform coverage. From measurements made on AGC-7, it seems that better performance from the IFF antennas would be obtained if one BN and one BK were mounted on each side of the ship, rather than with both BN's on one side and both BK's on the other.
- 0-4-3. The two SG's each have slight blind spots, but the composite coverage of the two is excellent. The portable SQ equipment may be expected to have blind spots in its coverage in directions where the beam shoots through the ship's superstructure.

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SECTION 1

COMMUNICATION ANTENNA PATTERNS

Enclosures: (HW)
(A) Tables I, II and III
(B) 52 Plates

1-1 Abstract

1-1-1 On 15 June 1944 the USS MOUNT OLYMPUS was made available to a task group of Laboratory engineers for the purpose of determining the directional characteristics of various transmitting and receiving antennas. Field intensity measurements of most of the transmitters were made on 16 June 1944. These tests were similar to those made on somewhat different frequencies for the USS MOUNT McKINLEY on 26/29 May 1944, which have been reported in NRL Report R-2312, and for the USS WASATCH on 9 June 1944, which have been reported in NRL Report R-2323.

1-2 Recommendations

1-2-1 It is recommended:

(a) That all of the VHF antennas be installed vertically on ships of this class.

1-3 Discussion

1-3-1 The schedules shown as Tables I, II, and III of enclosure (A) were arranged with the ship's force upon arrival of the ship off CBA. Groups of 6 transmitting antennas were measured simultaneously with separate receiver-recorder systems set up on shore. The receiver used for each test is designated in the first column of the tables. All receivers were arranged to operate recorders so that a continuous record could be obtained during the tests. The equipments were set up on the second floor of building #5 at CBA except for the absolute field intensity measurements, which were made at a point about 200 feet south of the Naval Boat Dock at Chesapeake Beach, Md., while the ship was at anchor about 3 miles away and bearing approximately 100 degrees from the dock. The patterns for the receiving antennas were obtained by exciting the antennas with low power transmitters aboard the ship.

1-3-2 The ship was swung in circles of approximately one-half-mile diameter around a boat anchored as a marker buoy bearing

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135° and at a distance of $4\frac{1}{2}$ miles from Building #1 CBA. Relative bearings of the test locations from the ship's heading were given by the ship every 30 degrees over the auxiliary communication channel, and the locked-key transmissions of the transmitters under test were simultaneously broken momentarily. Radar plots of the ship were also made from Building #1 at CBA in the event that poor visibility should prevent giving relative bearings from the ship. The ship's headings as shown on the plots are believed to be accurate within plus or minus 3 degrees.

1-3-3 The receiver-recorder equipments were calibrated with signal generators to determine the correct intensity values for various recorder scale readings. The decibel values are plotted to a different scale on the curves for the 126-megacycle antennas. This was necessary to show the magnitude of the shadows at certain azimuths.

1-3-4 These antennas were mounted horizontally on this vessel, whereas, on the AGC-5, AGC-7, and AGC-9 they were mounted vertically. The graphic recordings obtained on these antennas for the subject vessel exhibited rapid variations of intensity level with bearing. Many of the variations were of a character that did not repeat on successive circles of the ship. This may have been caused by wave interference due to passing ships. Whenever the variations did not show up on successive circles of the ship they were not included on the polar plot.

1-3-5 Measurements of field intensities of the signals on schedule 3 were made at a point about 20 feet south of the Naval Boat Dock at Chesapeake Beach, Md. During these measurements, the ship was at anchor at a point about 3 miles distant and bearing about 100 degrees from the dock. The values measured were used to compute the zero decibel level of the corresponding polar plots of schedule 1, by reference to the decibel level shown on the polar plots for the bearing of the field intensity measuring equipment from the ship. Insufficient relative bearings were obtained from the ship during this schedule to permit very great accuracy in obtaining the reference decibel levels.

1-3-6 The numbers given for the 126-megacycle antennas were taken from the antenna panel in Radio I. The numbering scheme top-side was not known by the ship's force or the Laboratory group. There were only four of these antennas on this ship and they were all mounted horizontally. Other ships of this class have had all of these antennas mounted vertically and an additional antenna aft of the yardarm.

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1-3-7

The receiving antenna arrangement was considerably different from that found on other ships of this type in that ten vertical spirals (Almour type) were permanently mounted and connected to Radio I. No numbers were found on these antennas, therefore a numbering system was assigned as shown on plate 52 of enclosure B. This is a rough sketch of the arrangement and is not necessarily drawn to scale. The antenna numbers were assigned in accordance with a previously arranged schedule which assumed an installation as found on other ships of this class. This accounts for the apparent unsystematic numbering arrangement shown on the sketch.

1-3-8

Time limitations permitted little chance for double-checking the results. When six transmitters are operated and keyed simultaneously at close range the chances for errors are numerous because of the difficulty of identifying the desired fundamental frequencies from all possible harmonics. This was recognized at the time the tests were made and due care was exercised to minimize the likelihood of a mistake in identity. The proximity of certain harmonics of some transmitters to the fundamental frequencies of other transmitters made identity more difficult. In spite of the care exercised, it is felt that the possibility of errors from this source does exist.

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Enclosure (A)
Section 1

TABLE 1

Schedule 1 - Transmitting Antenna Tests

Equip	Channel	Test 1	Test 2	Test 3	Test 4	Test 5
NC200	A	TCS 14 2000 kc	TDE 5* 2100 kc	TBL 8* 2200 kc	TBL 9 2300 kc	
32B	B	TCS 11 3000 kc	TBL 20 3200 kc	TBK 3* 3400 kc	TBK 2* 3600 kc	Spiral 355 (TAQ)*
OF	C	TCS 12 4000 kc	TCS 17 4300 kc	TDE 6 4500 kc	TBA 1 4700 kc	Spiral 2600 (TDE)*
308A	D	TCS 10 6000 kc	TCS 16 6500 kc	TDE 10* 7000 kc	TBK 4 7500 kc	-
308A	E	TCS 15 8000 kc	TCS 13 9000 kc	TBL 18 11000 kc	TDE 7* 14000 kc	Spiral 475 (TAJ)*
58	F	TBS Fwd 72.5	TDQ 1 126.1	TDQ 2 126.1	TDQ 3 126.1	TDQ 4 126.1

Notes: XSignal not received
*Transmitter in Radio III
TBL 19 was in service on 2716 kc during the tests.
Special antenna was of the "Almour" type and located near trunk #17.
Numbers after transmitter type refer to position.

TABLE 2

Schedule 2 - Receiving Antenna Tests

Equip	Channel	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
32B & Bristol 633	A	Ant 16 2060 kc	Ant 17	Ant 18	Ant 19 same	Ant 20	Ant 21
OF 41 & Truck Recorder	B	Ant 11 4000 kc	Ant 12	Ant 13	Ant 14 same	Ant 15	Ant 22
RCA 308A #600 EA 30509	C	Ant 6 8000 kc	Ant 7	Ant 8	Ant 9 same	Ant 10	Ant 23
NC200 #D647 & EA 29327	D	Ant 1 13000 kc	Ant 2	Ant 3	Ant 4 same	Ant 5	Ant 24

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Enclosure (A)
Section 1

TABLE 3

Schedule 3 - Transmitter Data for Field Intensity Tests

Test Letter	Transmitter	Test 1	Test 2	Test 3	Test 4	Test 5
A	Type	TCS 10	TDE	TBL 7	TBL 7	TAJ 18
	Position	14	(5)	(8)	(9)	(4)
	Freq. KC	2000	2100	2200	2300	475
	Ep volts	--	2100	2000	2000	2600
	Ip MA	165	90	315	140	360
	Ia Amps	2.8	2.8	3.5	1.0	13.7 * 2
B	Type	TCS 10	TBL 17	TBK 13	TBK 13	TAQ 9
	Position	11	20	(3)	(2)	(Not used)
	Freq. KC	3000	3200	3400	3600	
	Ep volts	--	2000	3000	3000	
	Ip MA	175	260	330	220	
	Ia Amps	2.5	0	5.8	7.4	
C	Type	TCS 10	TCS 10	TDE	TBA 6	TDE
	Position	12	17	6	1	(10)
	Freq. KC	4000	4300	4500	4700	2600
	Ep volts	-	-	2000	2000	2000
	Ip MA	155	175	170	500	155
	Ia Amps	2.0	1.7	1.0	7.2 * 1	7.0 * 3
D	Type	TCS 10	TCS 10	TDE	TBK 13	
	Position	10	16	(10)	4	
	Freq. KC	6000	6500	7000	7500	
	Ep volts	-	-	2000	3000	
	Ip MA	150	175	160	185	
	Ia Amps	1.7	2.2	5.0	14.5	
E	Type	TCS 10	TCS 10	TBL 7	TDE	
	Position	15	13	18	7	
	Freq. KC	8000	9000	11000	14000	
	Ep volts	-	-	2000	2000	
	Ip MA	170	175	350	175	
	Ia Amps	2.5	2.0	0	2.0	
F	Type	TBS	TDQ	TDQ	TDQ	TDQ
	Position	Forward	#1	#2	#3	#4
	Freq. KC	72,500	126,100	126,100	126,100	126,100
	Ep volts	-	-	-	-	-
	Ip MA	"normal"	200	220	212	215
	Ia Amps	-	-	-	-	-
	Ig MA		12	14.3	14.0	10.0

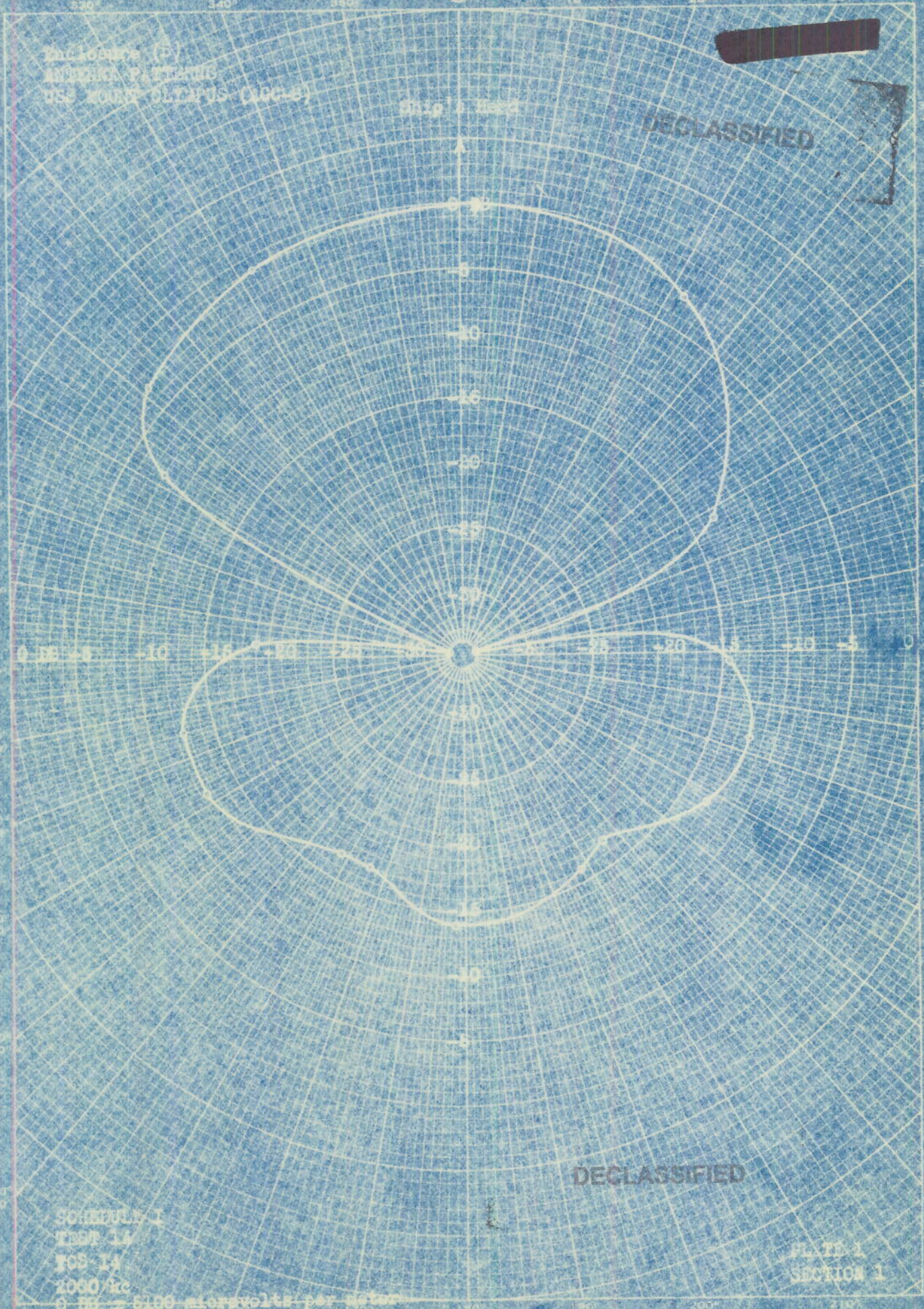
Notes: *1 Antenna tuning capacitor flashes over on higher currents.
*2 Using Almour antenna. Xmtr flashover with higher ant. current.
*3 " " " "

Position numbers in parenthesis refer to Radio III

ENCLOSURE (E)
ANNUAL REPORT
NSA 2000-11-15 (APC-0)



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SCHEMATIC I
TEST 14
TOS 14
2000/kc
0 Hz = 5000 microvolts per meter

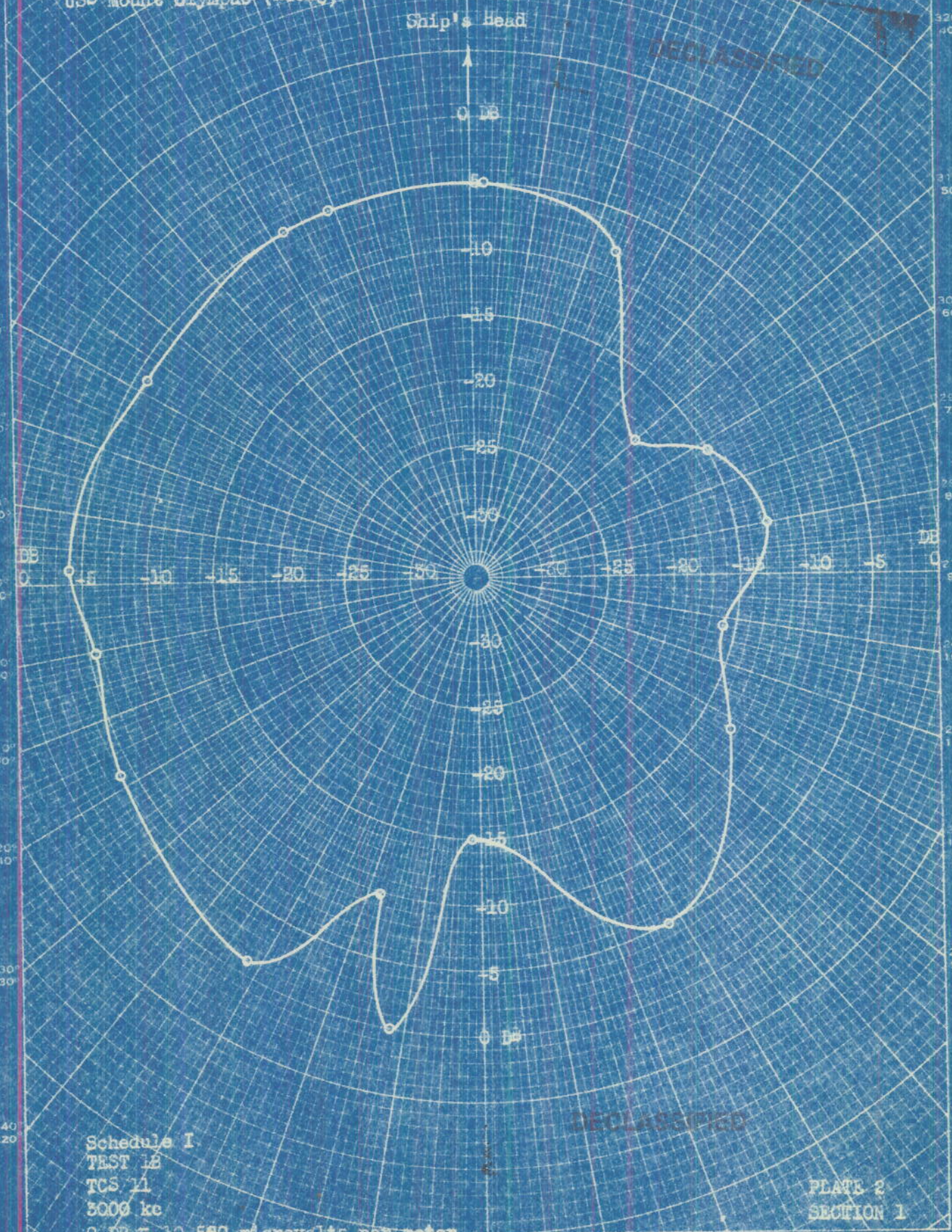
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PAGE 1
SECTION 1

Enclosure (B)
ANTENNA PATTERNS
USS Mount Olympus (AGC-8)

Ship's Head
↑

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Schedule I
TEST 1B
TCS 11
5000 kc
0 dB = 10,560 microvolts per meter

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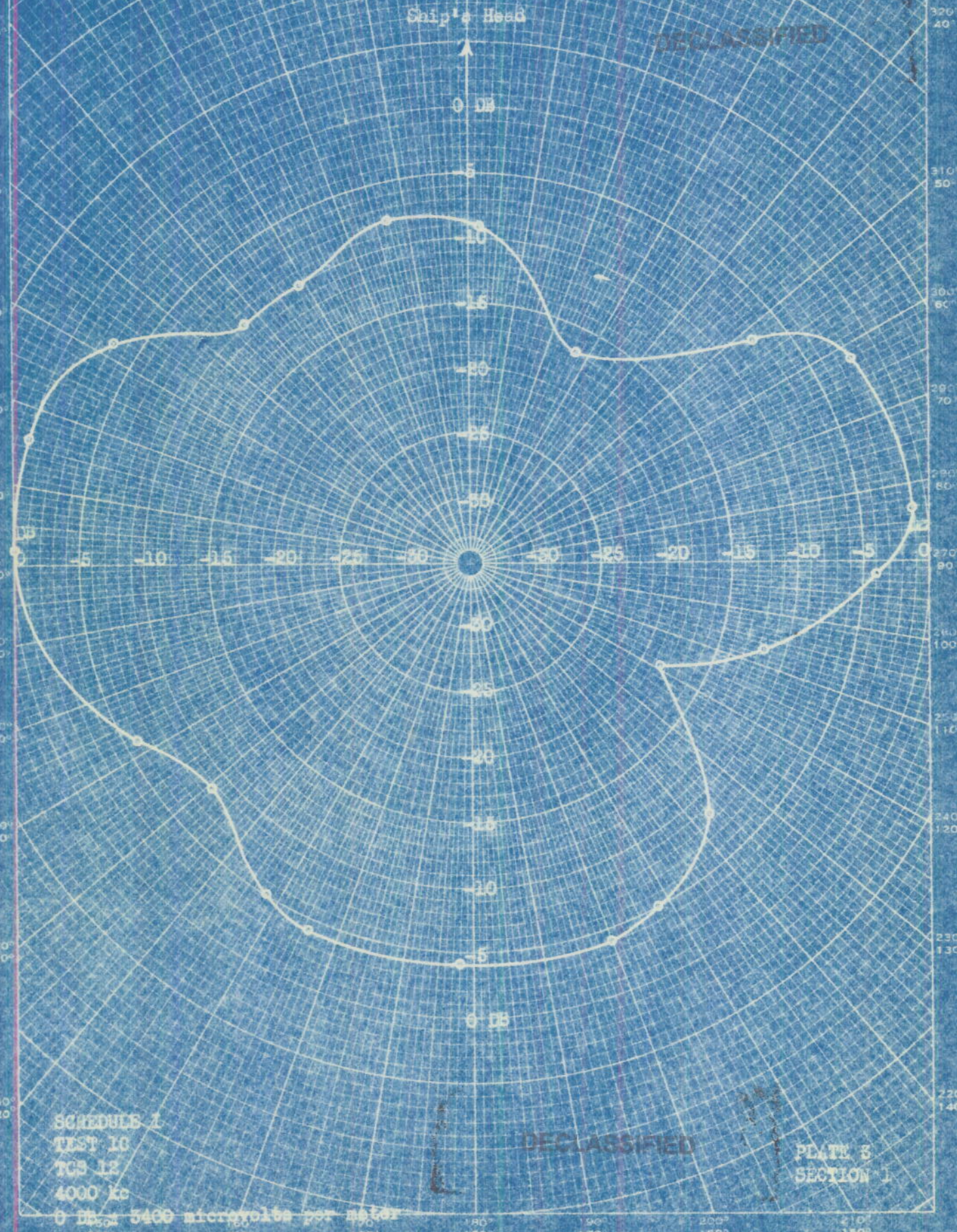
PLATE 2
SECTION 1

DIETZGEN CO.
NO. 340/F. DIETZGEN
POLAR CO-ORD.

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

Ship's Head
↑

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SCHEDULE 1
TEST 10
TCS 12
4000 kc

0 dB = 5400 microvolts per meter

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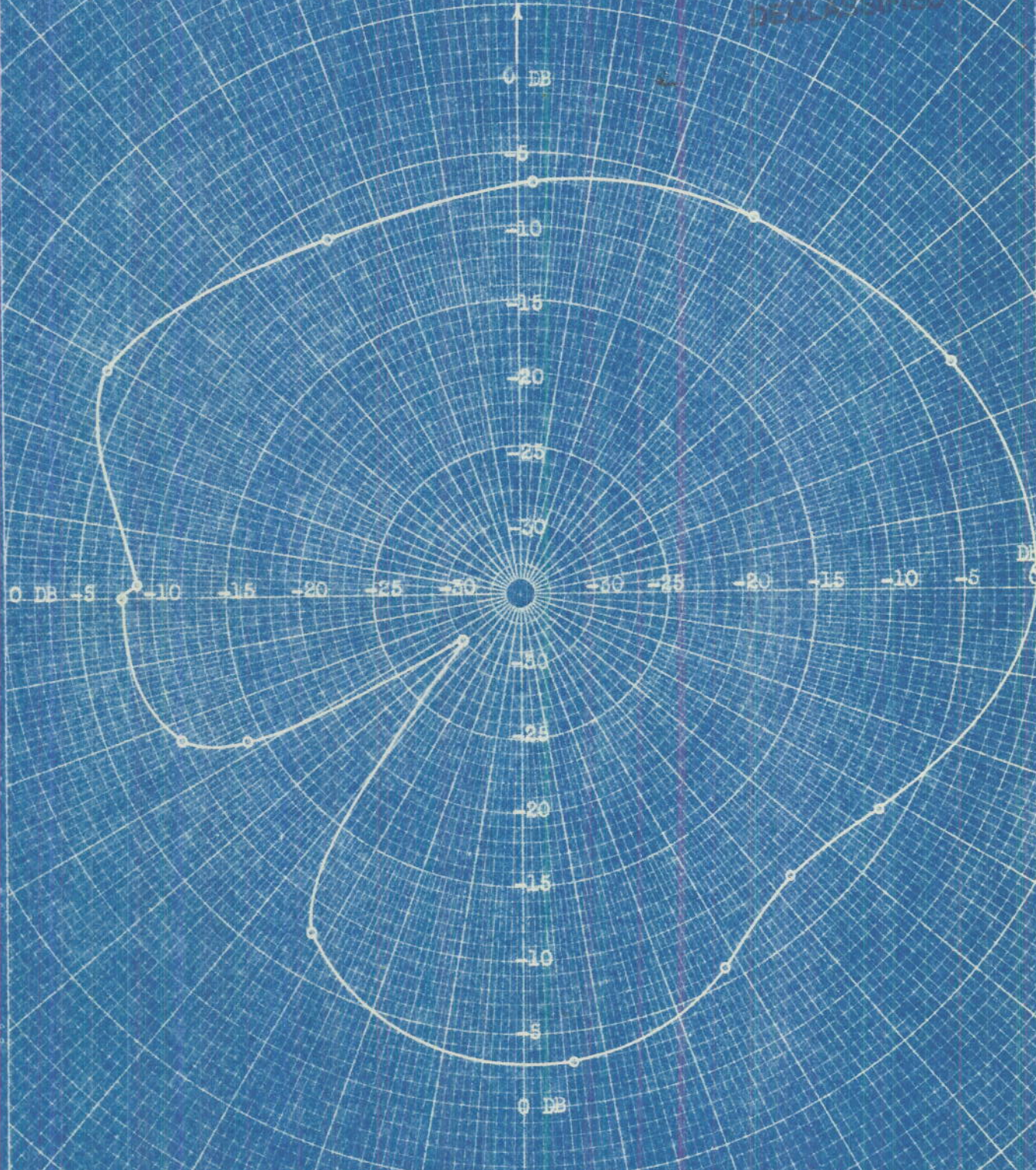
PLATE 3
SECTION 1

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

TOP SECRET

Ship's Head

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SCHEDULE I
TEST 2D
TCS 10
6000 kc
0 DB = 10,000 microvolts per meter

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PLATE 4
SECTION 1

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

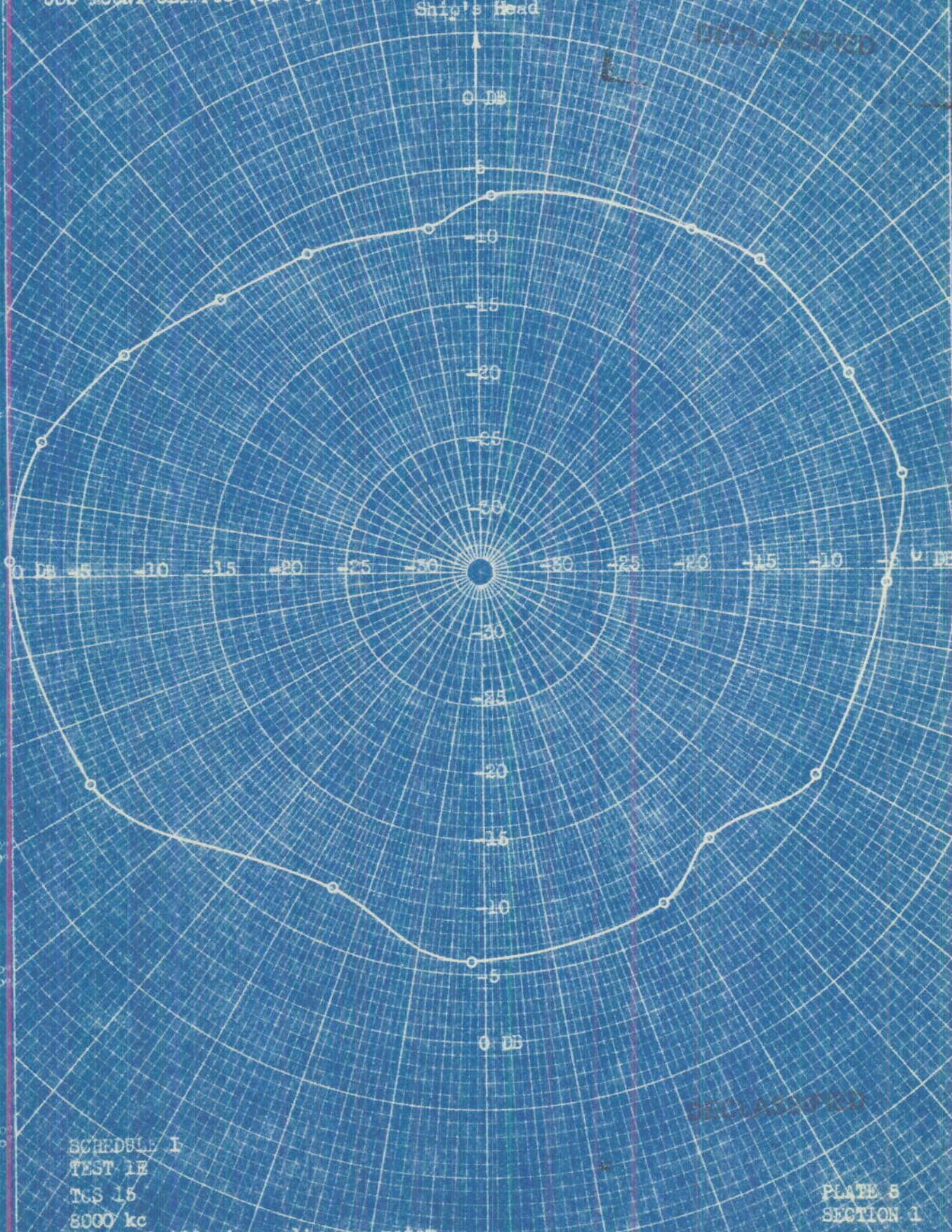
EUGEN DIETZGEN CO.
340 P. DIETZGEN PAPER
POLAR CO-ORDINATE

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

[REDACTED]

Ship's head

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SCHEDULE 1
TEST 1E
T/S 15
8000 kc
3 DB = 3,000 microvolts per meter

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PLATE 5
SECTION 1

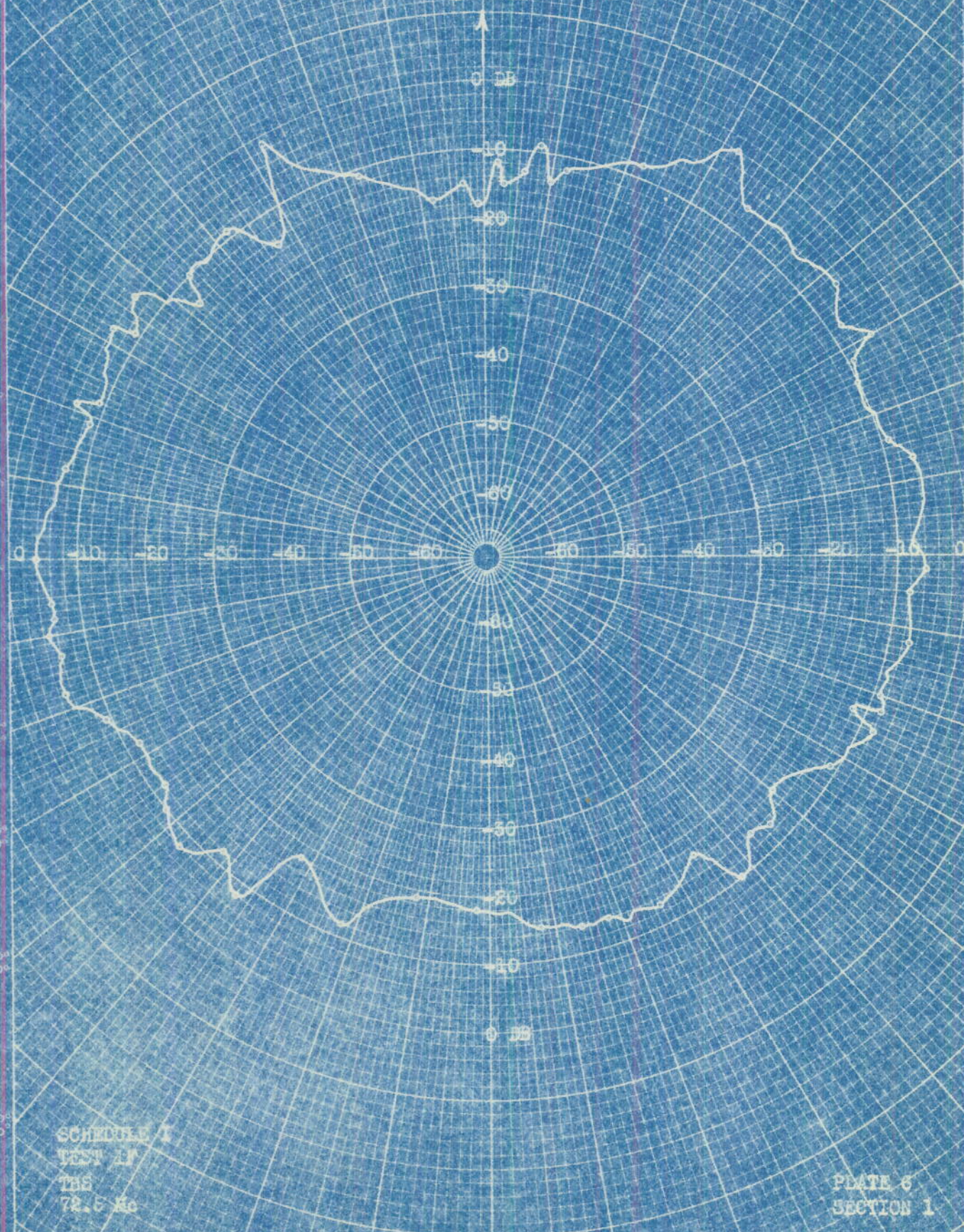
EU DIETZEN CO.
30 W. U. S. A.

NO. 340-P DIETZEN GRAPH PAPER
MILWAUKEE, WISCONSIN

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-5)

Ship's Head



SCHEDULE 1
TEST 17
TBS
72.6 Mc

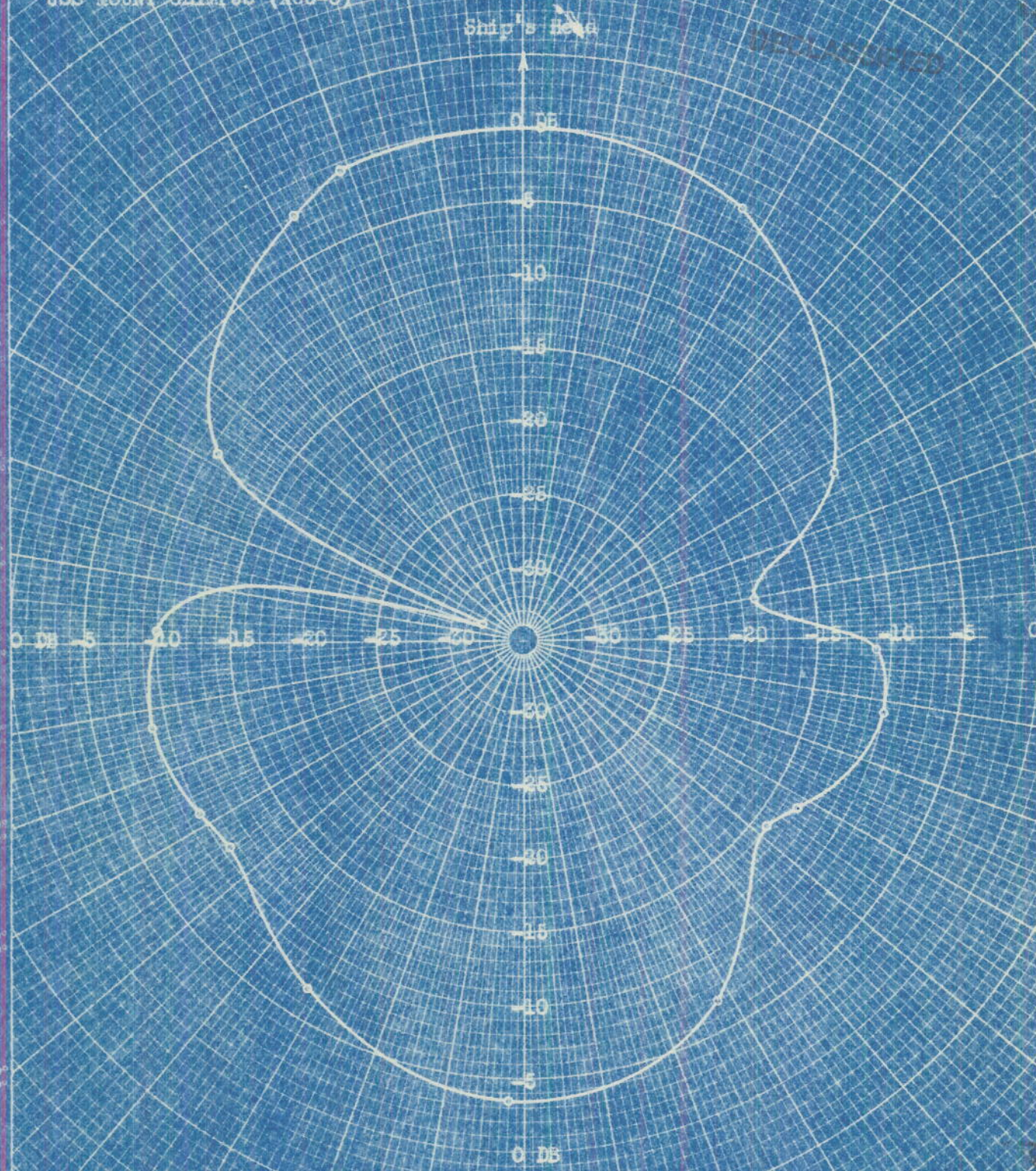
PLATE 6
SECTION 1

FUB DIETZEN CO.
NO. 340 F DIETZEN PAPER
POLAR COORDINATE

Enclosure (3)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED

Ship's Head



DECLASSIFIED

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SCHEDULE I
TEST 2A
TDE 5
2100 kc
0 DB = 22,000 microvolts per meter

PLATE 7
SECTION 1

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

EUDG
METZEN CO. 3
74 U.S.A.

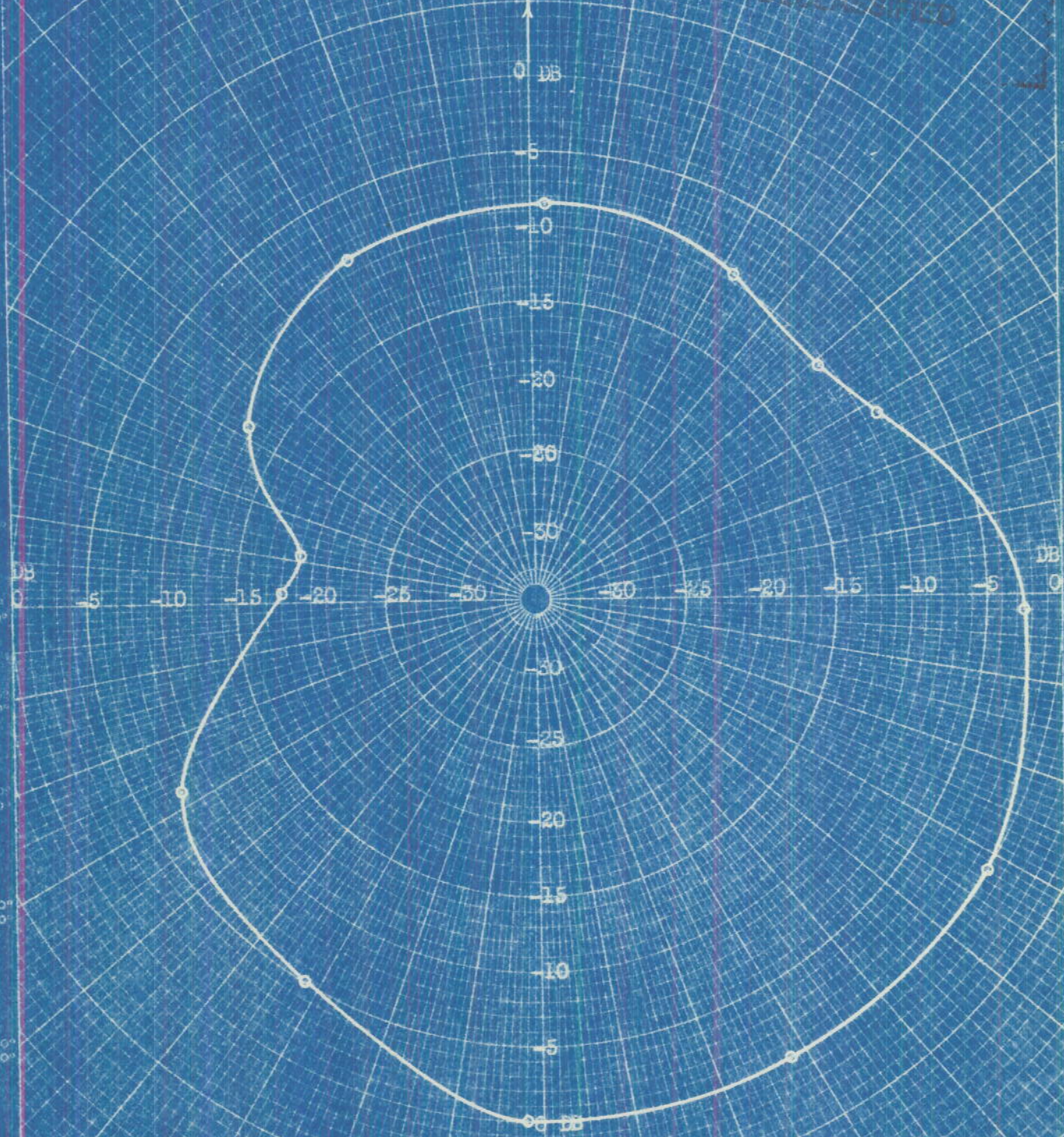
NO. 340-R METZEN PAPER
POLAR CO. ORIGINAL

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

[REDACTED]

Ship's Head
↑

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EUROPEAN PAPER
NO. 340 P. DISTZEN POLAR DB GR

SCHEDULE I
TEST 2B
TBL 20
3200 kc
0 dB = 10,200 microvolts per meter

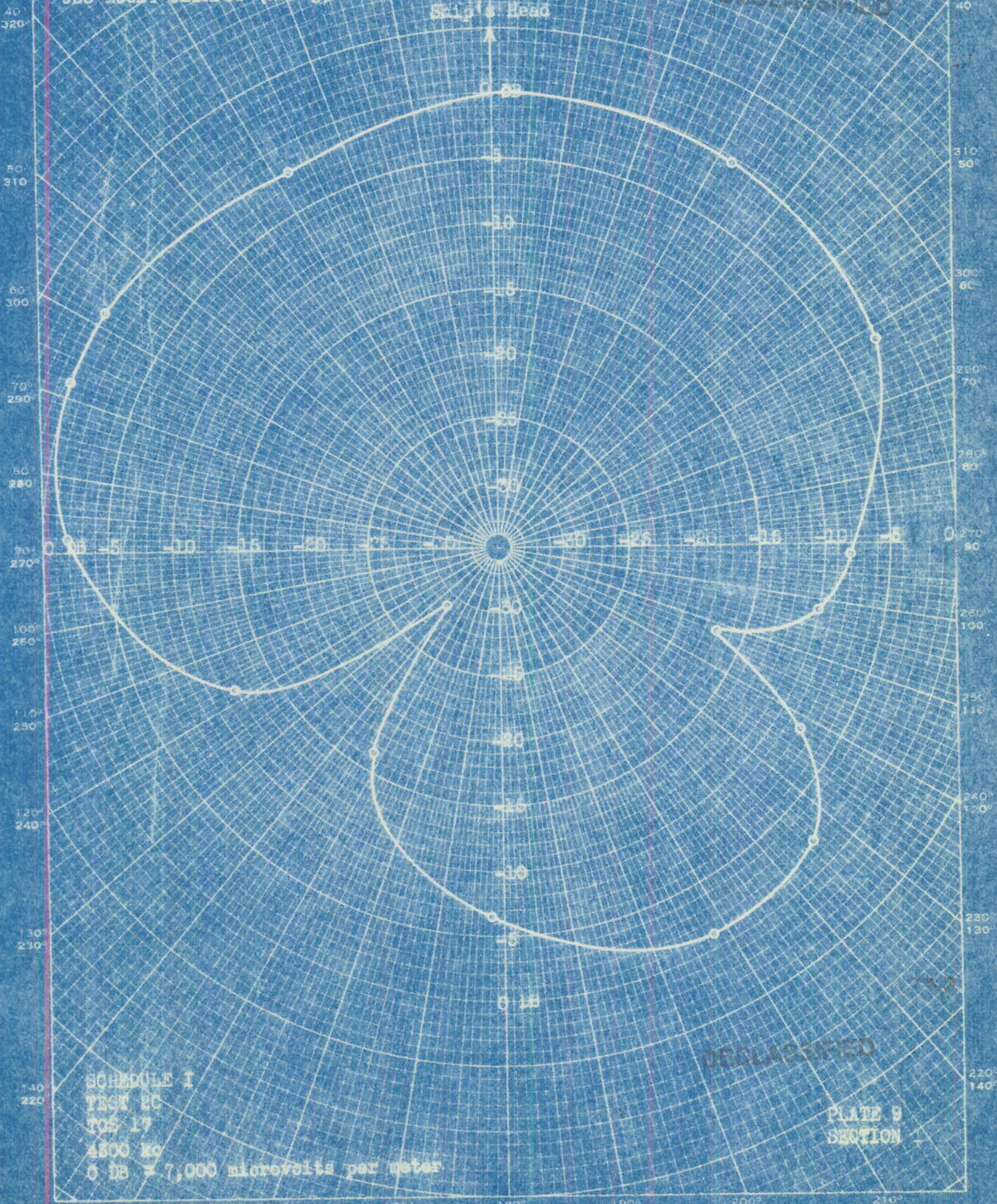
DECLASSIFIED

PLATE 8
SECTION 1

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED

Ship's Head



SCHEDULE I
TRST BC
TOS 17
4800 Mc
0 DB = 7,000 microvolts per meter

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PLATE 9
SECTION 1

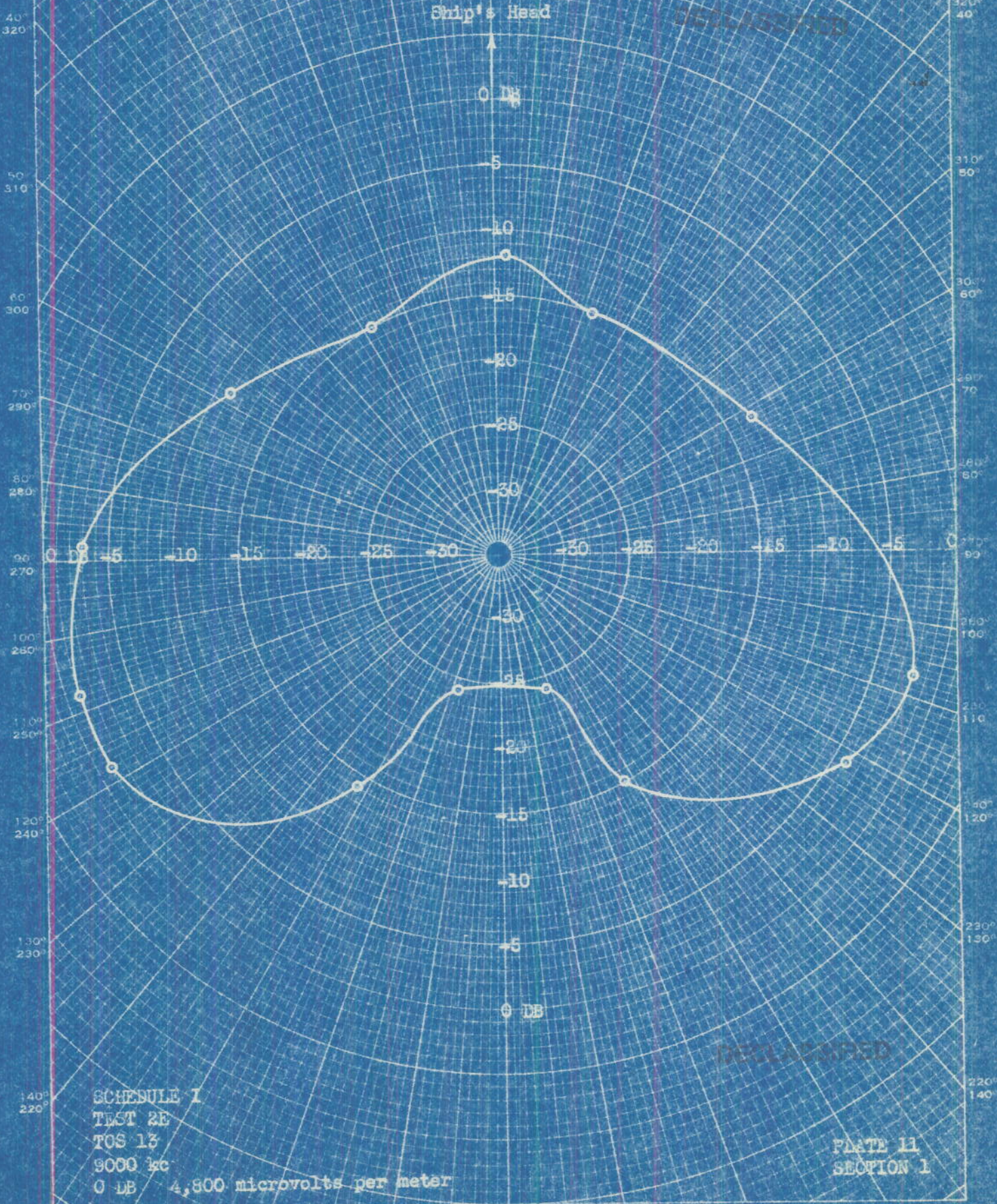
DIETZEN CO.
PAPER
AND 340P DIETZEN
ECLAIR CO-BR

Enclosure (B)
ANTENNA PATTERN
USS MOUNT OLYMPUS (AGC-9)

~~SECRET~~

Ship's Head
↑

~~SECRET~~



SCHEDULE I
TEST 2E
TOS 13
9000 kc
0 LB 4,500 microvolts per meter

~~SECRET~~

PLATE 11
SECTION 1

EUREKA PAPER
IND. 34-P DISTZEN CO. ORD. E

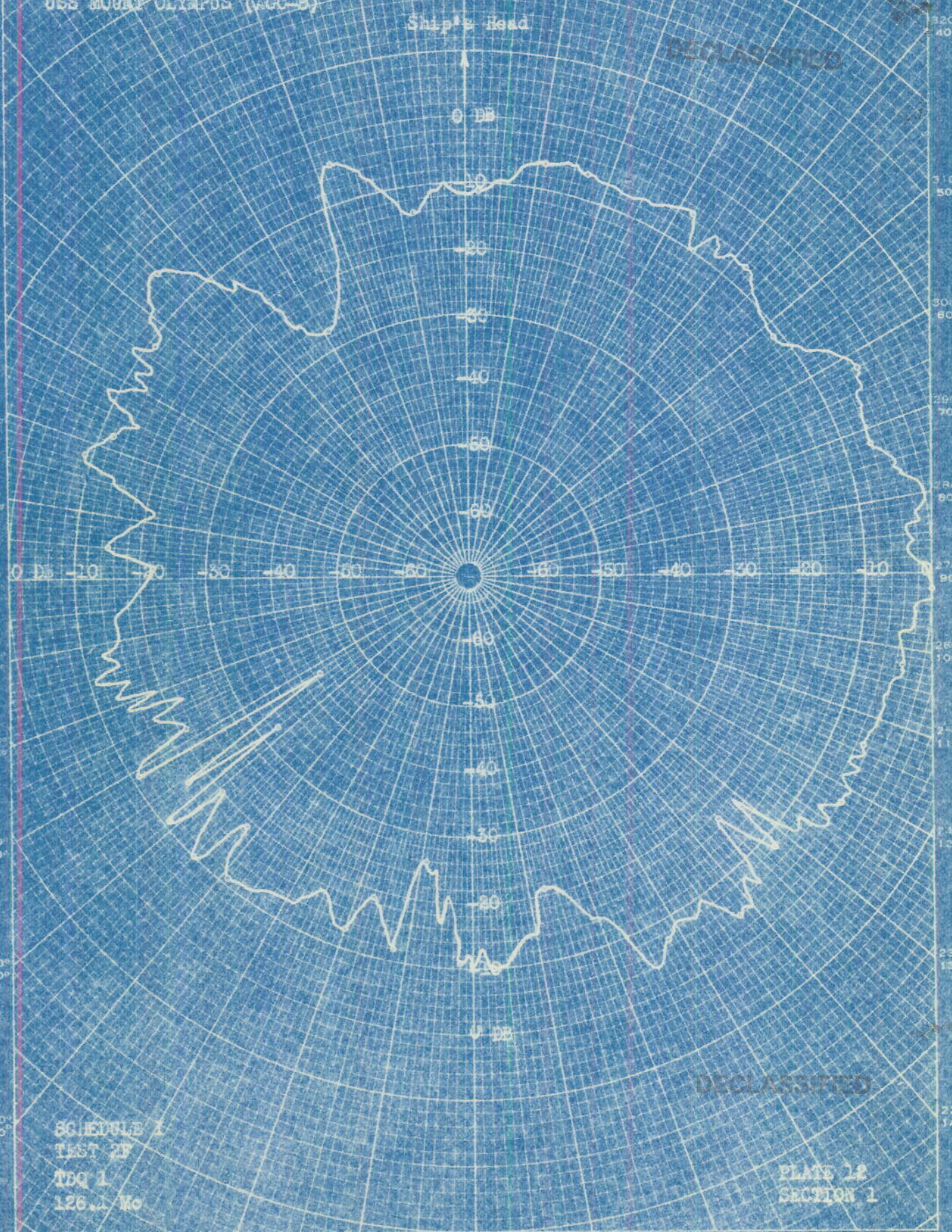
DISTZEN CO.

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-5)

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Ship's Head
↑

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ENCLOSURE (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-5)

SCHEDULE 1
TEST 2F
TBO 1
126.1 Mc

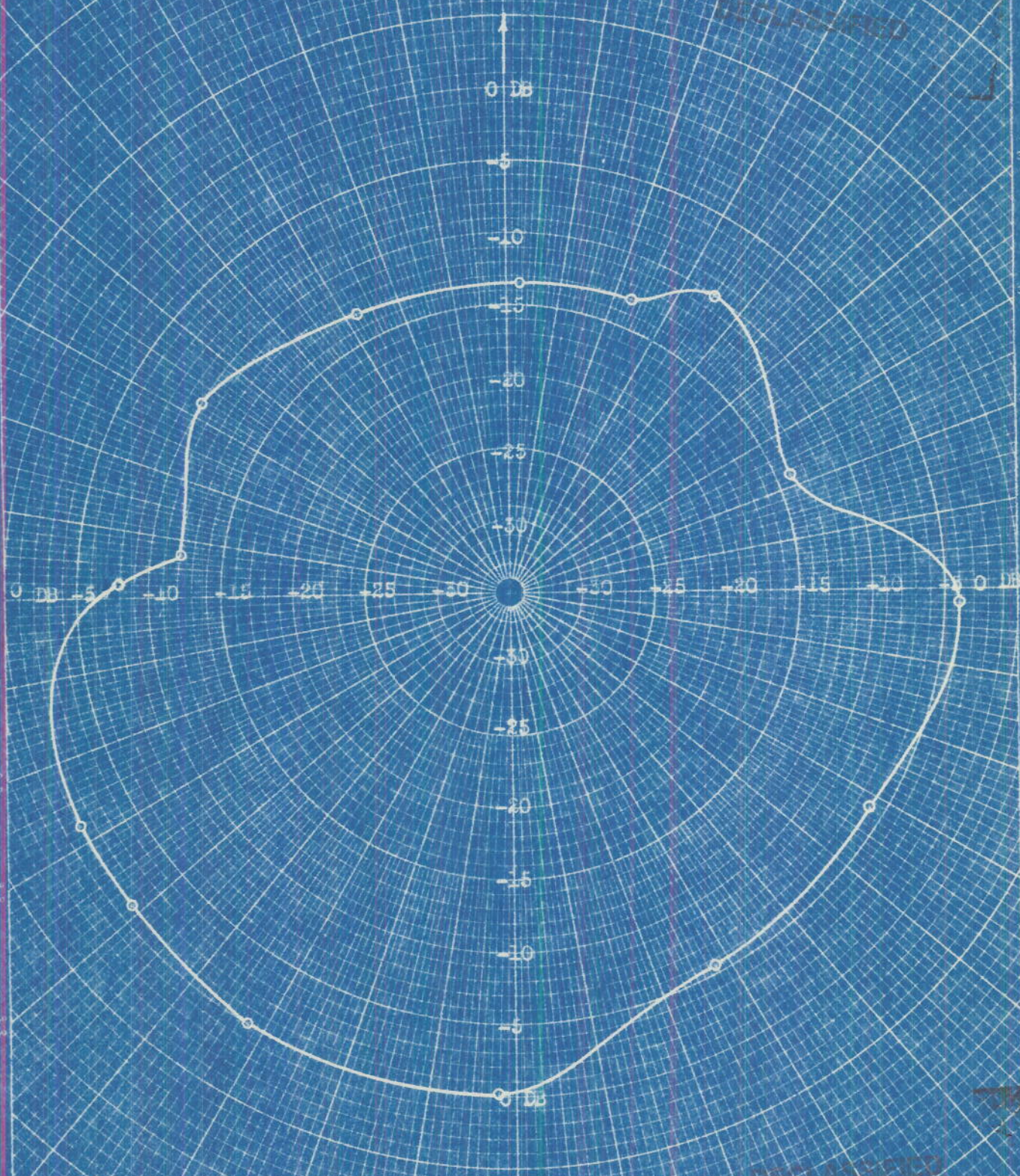
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PLATE 12
SECTION 1

ENCLOSURE (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-5)

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-9)

Ship's Head



SCHEDULE I
TEST 3B
TRK 5
3400 kc
0 dB = 20,500 microvolts per meter

PLATE 14
SECTION 1

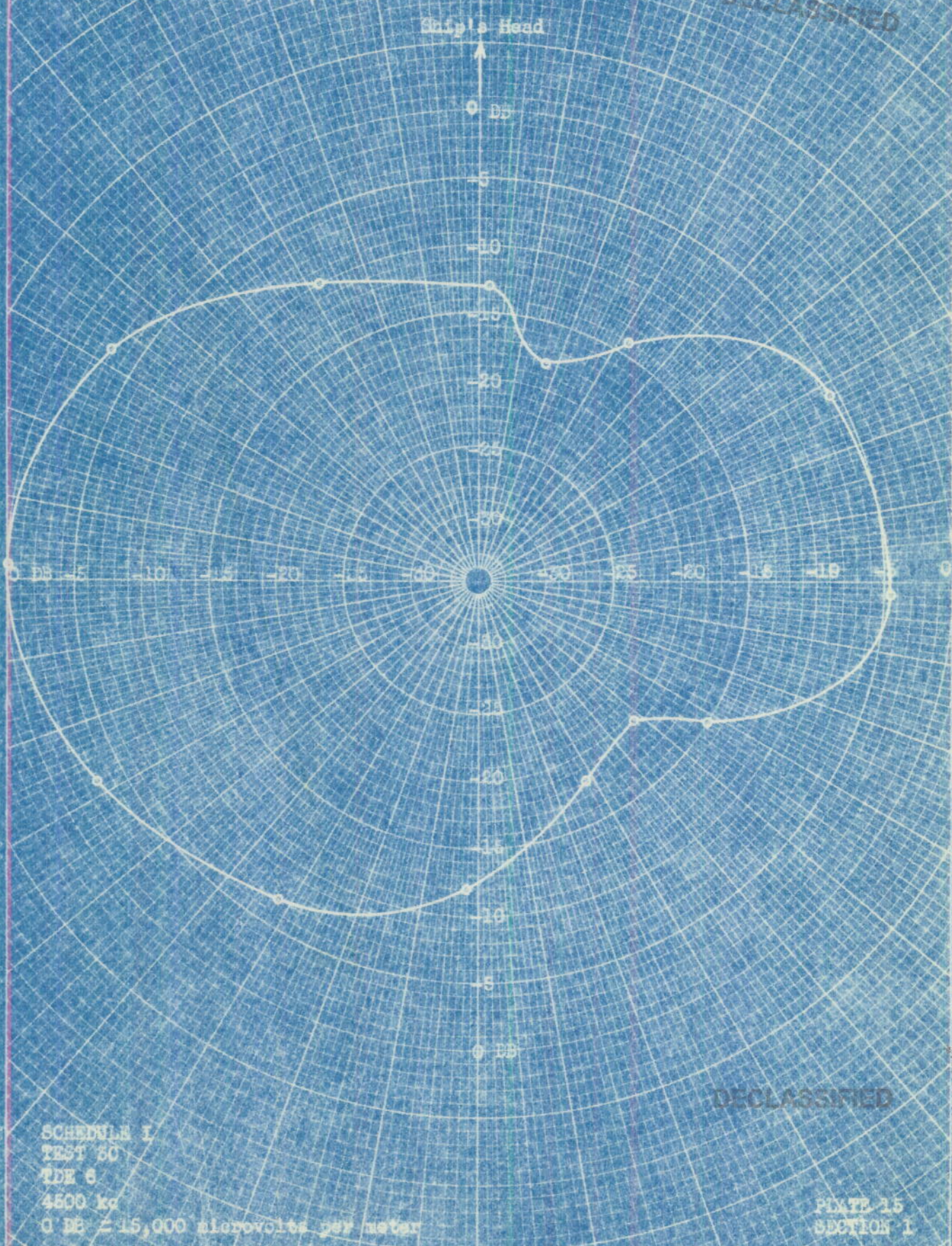
EUS DIETZEN CO.
P. H. V. S. P.

INO 340-P DIETZEN CO. PAPER
POLAR COORDINATE

Enclosure (L)
ANTENNA PATTERN
OSS MOUNT OLYMPUS (AGC-8)

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Ship's Head
↑



SCHEDULE I
TEST 50
TDE 8
4800 kg
0 dB = 15,000 microvolts per meter

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PLATE 25
SECTION 1

ELI DIETZEN CO.
U.S.A.

NO. 340, P. DIETZEN
MIL. PAPER
MILWAUKEE, WIS.

150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330
210 200 190 180 170 160 150

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

~~TOP SECRET~~

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Ship's Head
↑

0 DB

-5

-15

-20

-25

-30

-35

-40

-45

-50

DB

SCHEDULE 1
TEST 3D
TDE 10/
7000 Kc
0 DB = 10,000 microvolts per meter

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PLATE 16
SECTION 1

EUGEN DIETZEN CO.
R.W.D.F.

NO. 340-P DIETZEN
POLAR CO-ORD

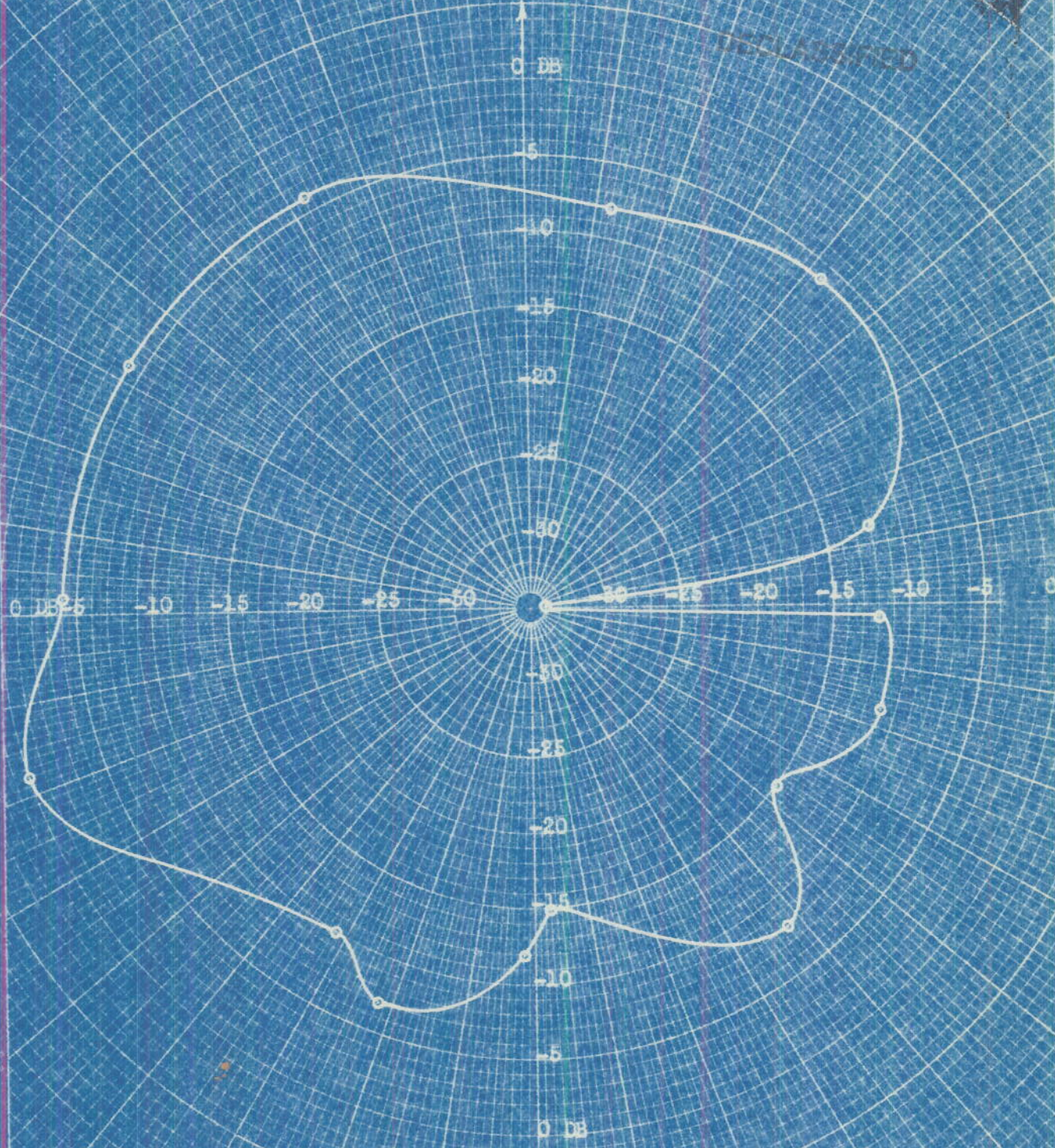
140°
220°

150° 210° 160° 200° 170° 180° 190° 180° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (E)
ANTENNA PATTERNS
USS MOUNT OLIMPUS (AGC-8)

Ship's Head
↑

0 DB



0 DB -5 -10 -15 -20 -25 -30 -35 -40 -45 -50

SCHEDULE I
TWT 5E
TBL 18
11,000 kc
0 DB = 12,000 microvolts per meter

PLATE 17
SECTION 1

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

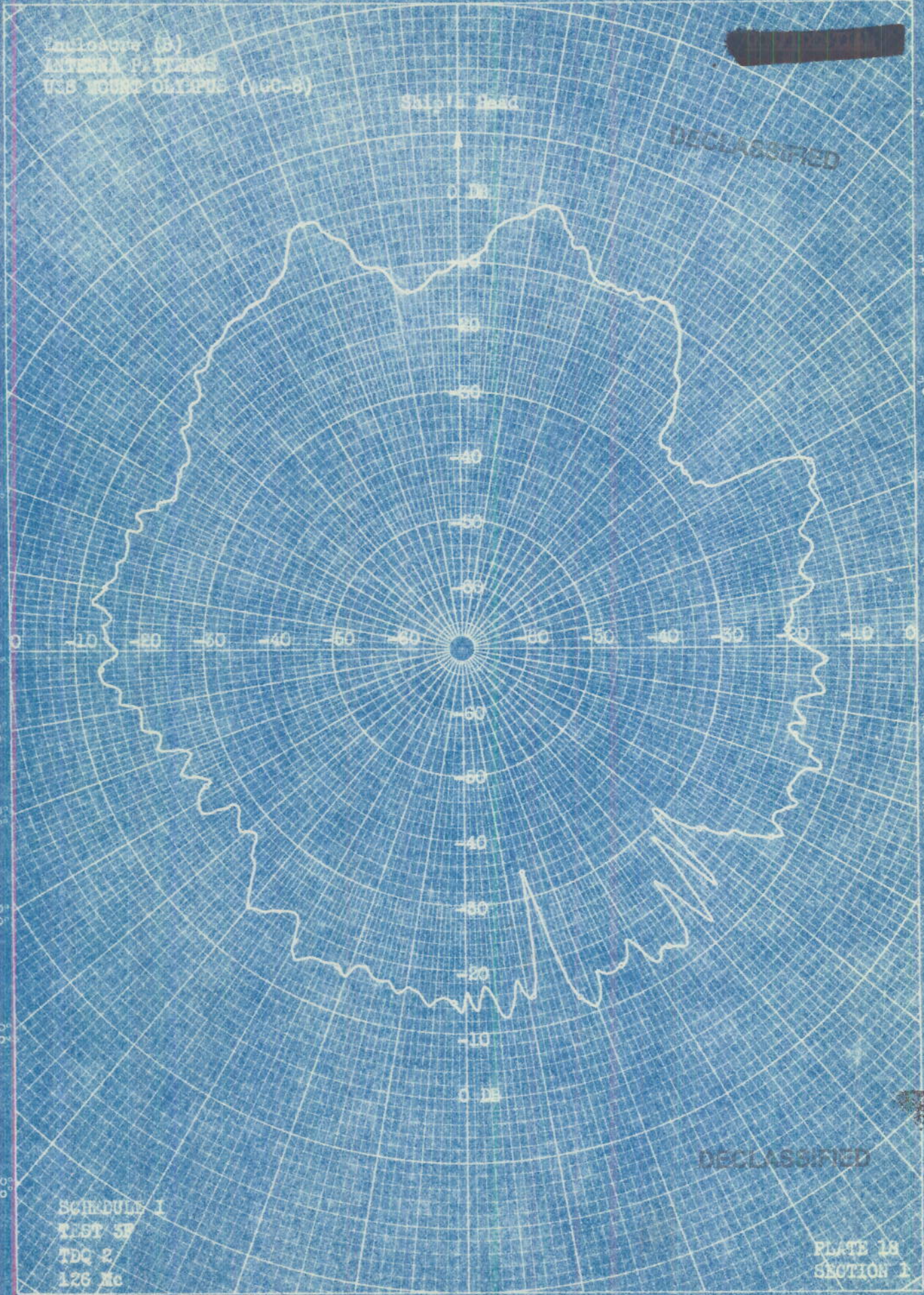
ENCLOSURE (E)

ENCLOSURE (E)

Envelope (B)
ANTENNA PATTERNS
USC MOUNT OLYMPUS (100-6)

Skirt Head

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SCHEDULE I
TEST 5F
TDC 2
126 Mc

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PLATE 1B
SECTION 1

ELECTRICAL ENGINEERING
POLAR CO-ORDINATE

Enclosure (B)
ANTENNA PATTERN
USS MOUNT OLYMPUS (AGC-8)

[REDACTED]

Ship's Head

0 DB

-5

-10

-15

-20

-25

-30

-35

-40

-45

-50

-55

-60

-65

-70

-75

-80

-85

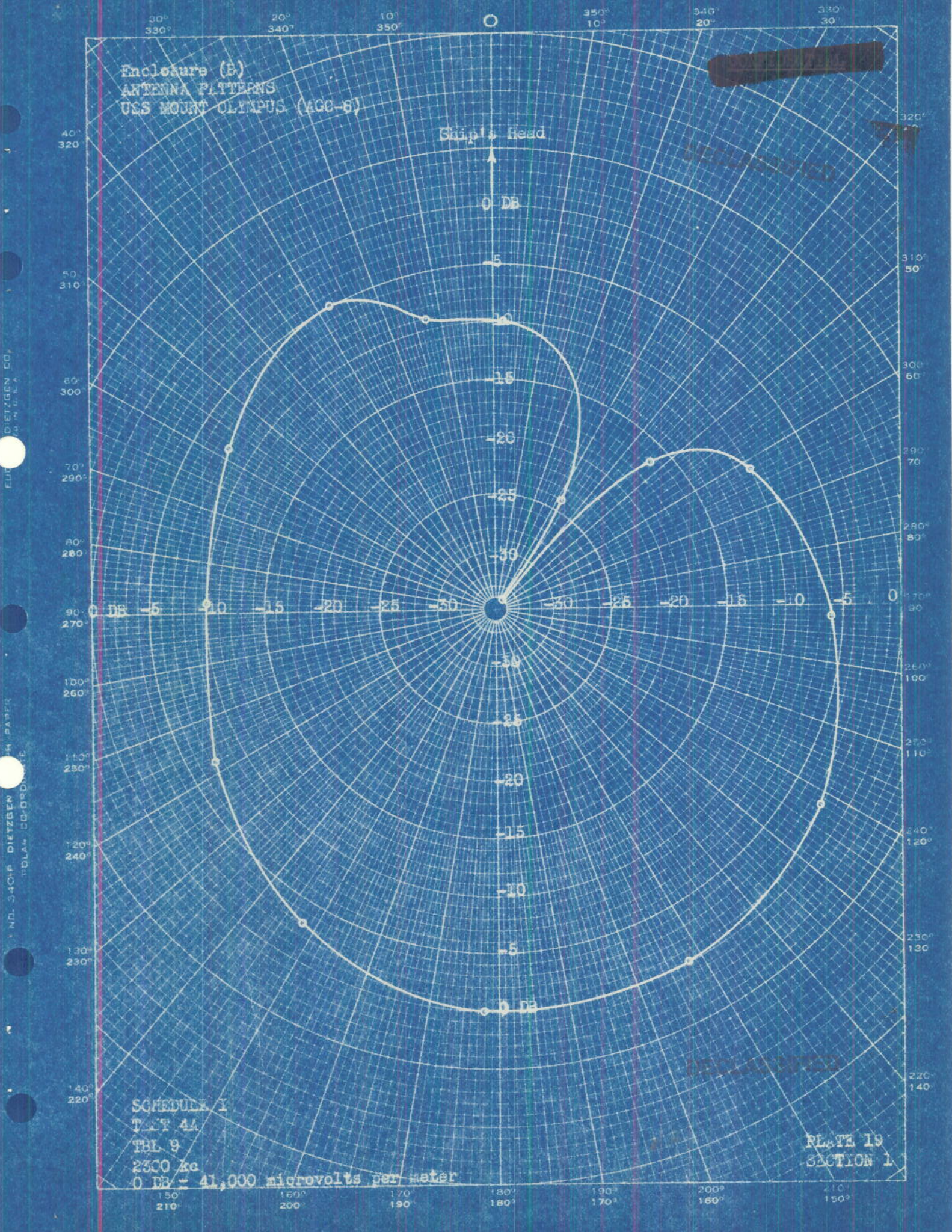
-90

0 DB -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90

SCHEDULE 1
TYPE 4A
TBL 9
2500 Mc
0 DB = 41,000 microvolts per meter

PLATE 19
SECTION 1

DIETZEN CO. PAPER
NO. 340-B
"BLANK CO-ORDINATE"



3)
STERN
OLYMPUS (AGG-8)

Ship's Head

0 DB

-5

-10

-15

-20

-25

-30

-35

-40

-45

-50

-55

-60

-65

-70

-75

-80

-85

-90

DIETZEN CO.
POLAR COORDINATE

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SCHEDULE I
TEST AB
TBK 2
3600 kc
0 DB = 29,700 microvolts per meter

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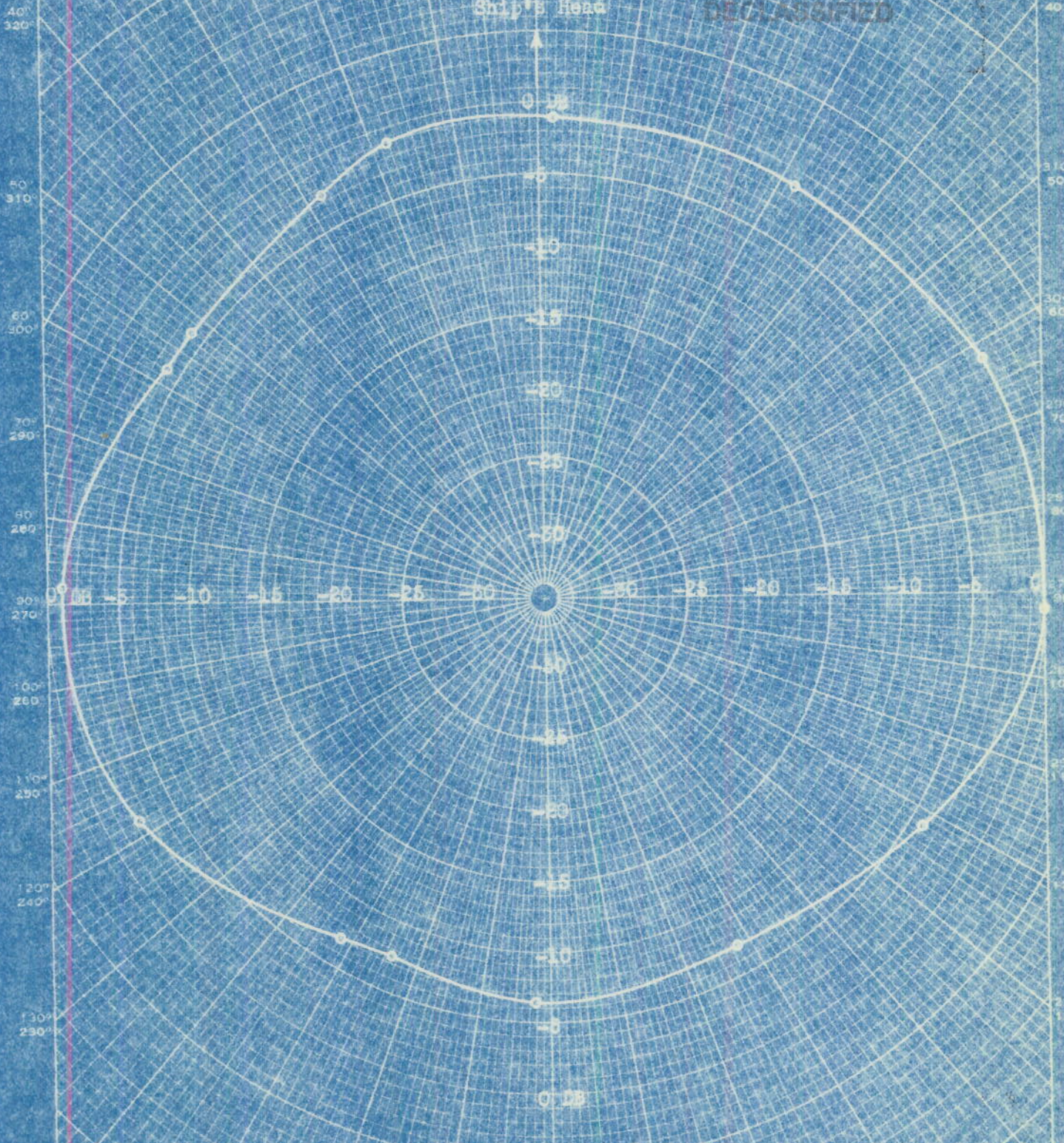
PLATE 20
SECTION 1

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-3)

Ship's Head

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SCHEDULE I
TEST 40
TBA 1
4700 kc
0 DB = 16,000 microvolts per meter

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PLATE 21
SECTION 1

TOP DIEZEL EN
TOP DIEZEL EN
TOP DIEZEL EN

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

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Ship's Head

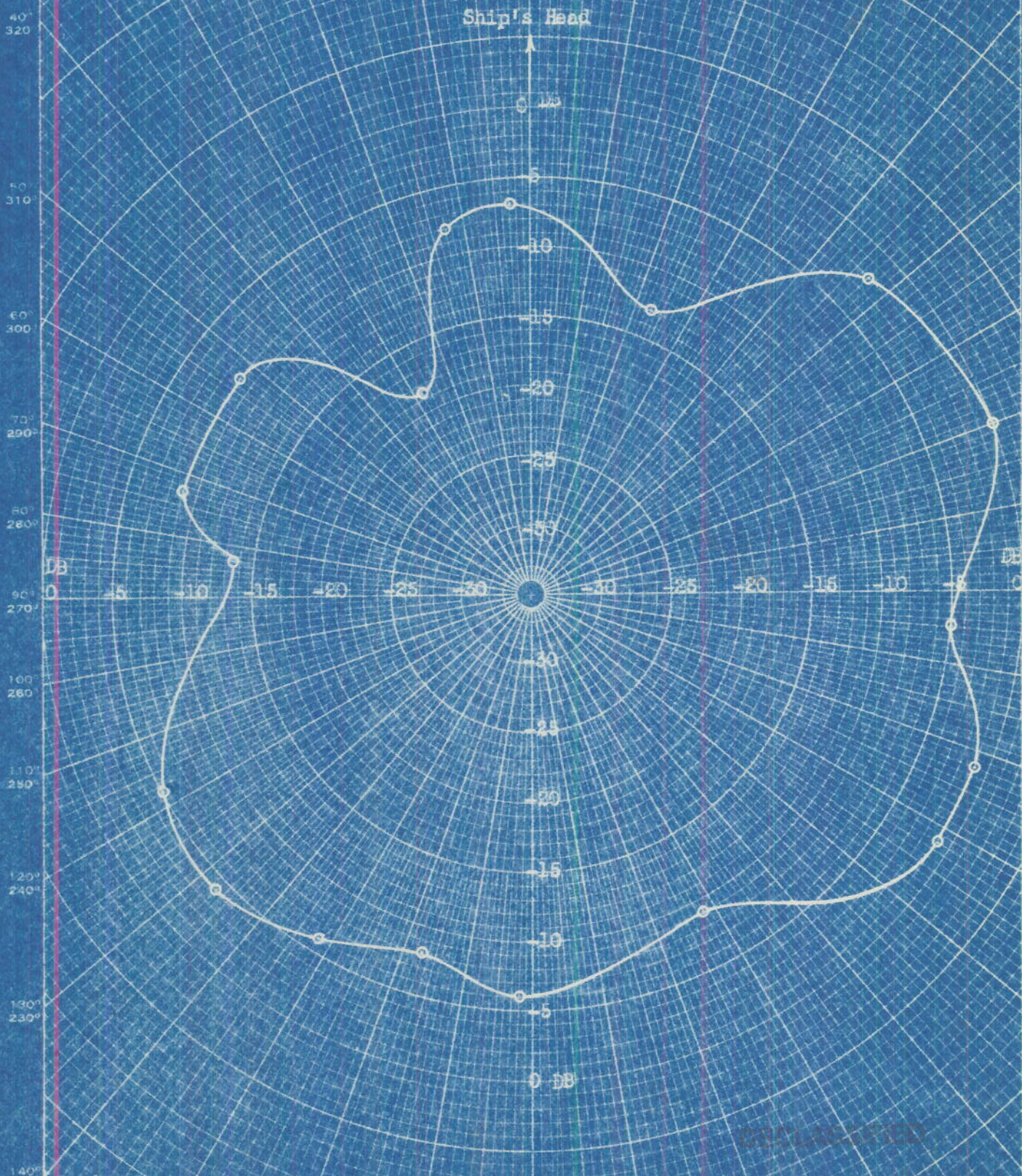


FIGURE 20

FIGURE 20

SCHEDULE I
TEST 4D
TBK 4
7500 kc
0 DB = 16,000 microvolts per meter

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PLATE 22
SECTION 1

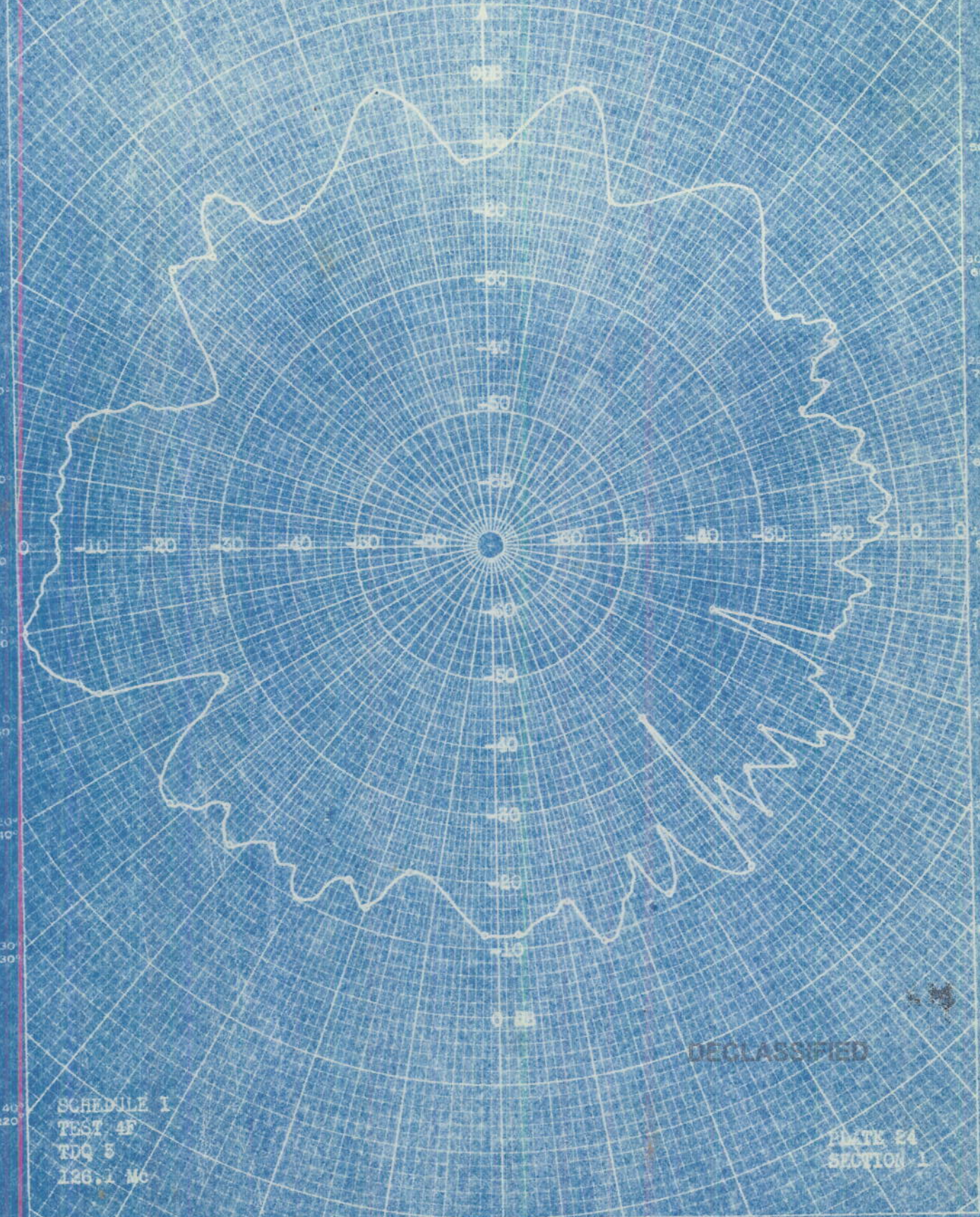
150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (2)
ANTENNA PATTERNS
USC MOUNT OLIVENS (AGL-8)



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5000 ft. Base



SCHEDULE 1
TEST 4F
TDQ 5
126.1 MC

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PLATE 24
SECTION 1

EDU DIETZEN CO.

NO. 340-P. DIETZEN IN PAPER RECORD

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-5)

DECLASSIFIED

TOP SECRET

Ship's Head

40°
320°

320°
40°

50°
310°

310°
50°

60°
300°

300°
60°

70°
290°

290°
70°

80°
280°

280°
80°

90°
270°

270°
90°

100°
260°

260°
100°

110°
250°

250°
110°

120°
240°

240°
120°

130°
230°

230°
130°

140°
220°

220°
140°

FUGO DIETZEN CO.
CINCINNATI

NO. SAC F. DIETZEN
H. PAPER
FOLIA, CO. ORD.

SCHEDULE I
TEST 5E
TAF 4 (Spiral Ant.)
475 kg
0 DB = 3200 microvolts per meter

DECLASSIFIED

PLATE 26
SECTION 1

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLIMPIUS (AGC-3)

DECLASSIFIED



Ship's Head

0 DB

10

20

30

40

50

60

70

80

90

100

110

120

130

140

150

160

170

180

190

200

SCHEDULE I
TEST 5F
TDQ 4
120.1 Mc

DECLASSIFIED

PLATE 27
SECTION 1

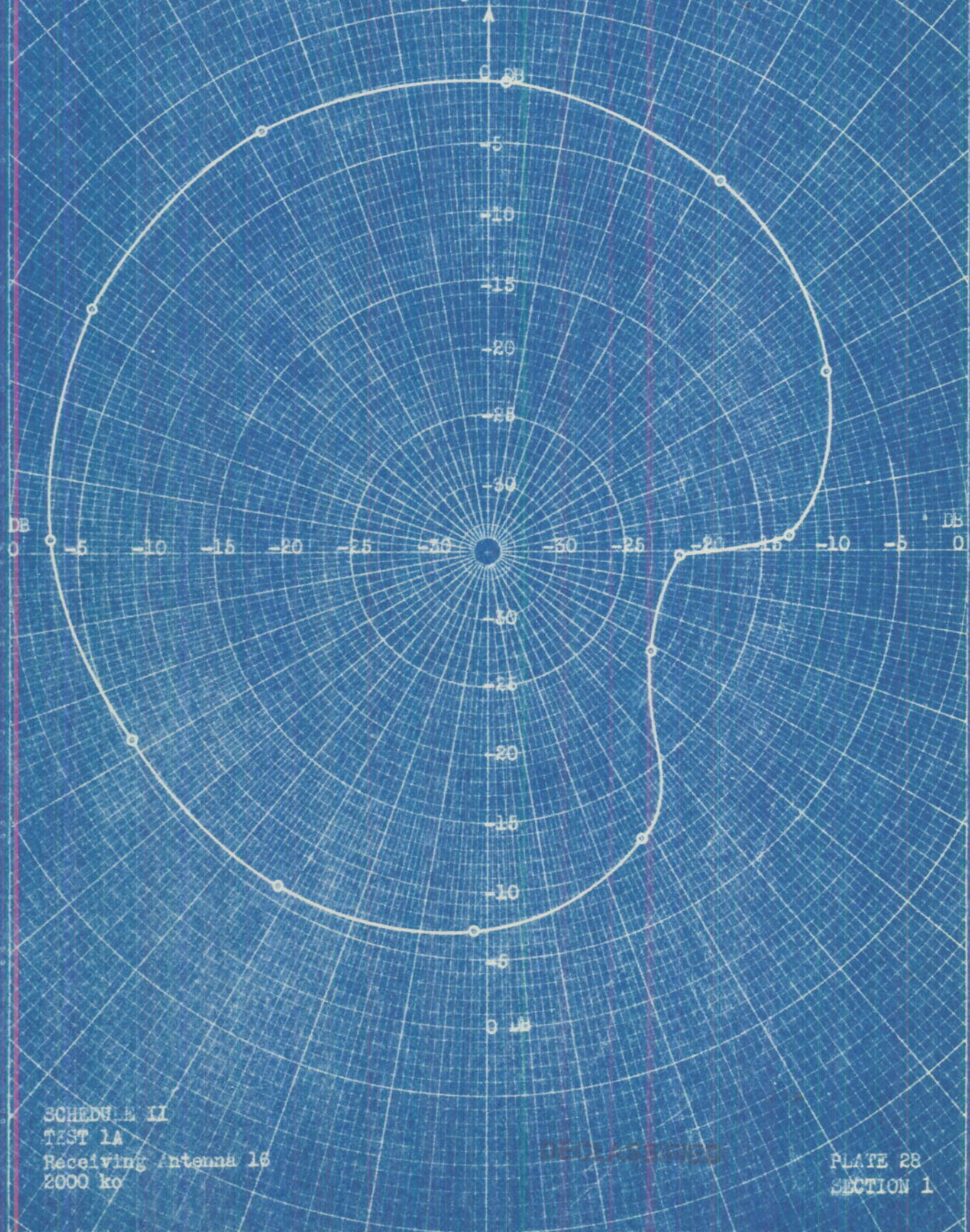
FILED DIETZEN CO. NO. 340 P. DIETZEN H. WAFER EDLAI. CO. DRG.

150° 150° 175° 180° 150° 200° 210° 210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

~~RESTRICTED~~

Ship's Head
↑



SCHEDULE II
TEST 1A
Receiving Antenna 16
2000 kc

~~RESTRICTED~~

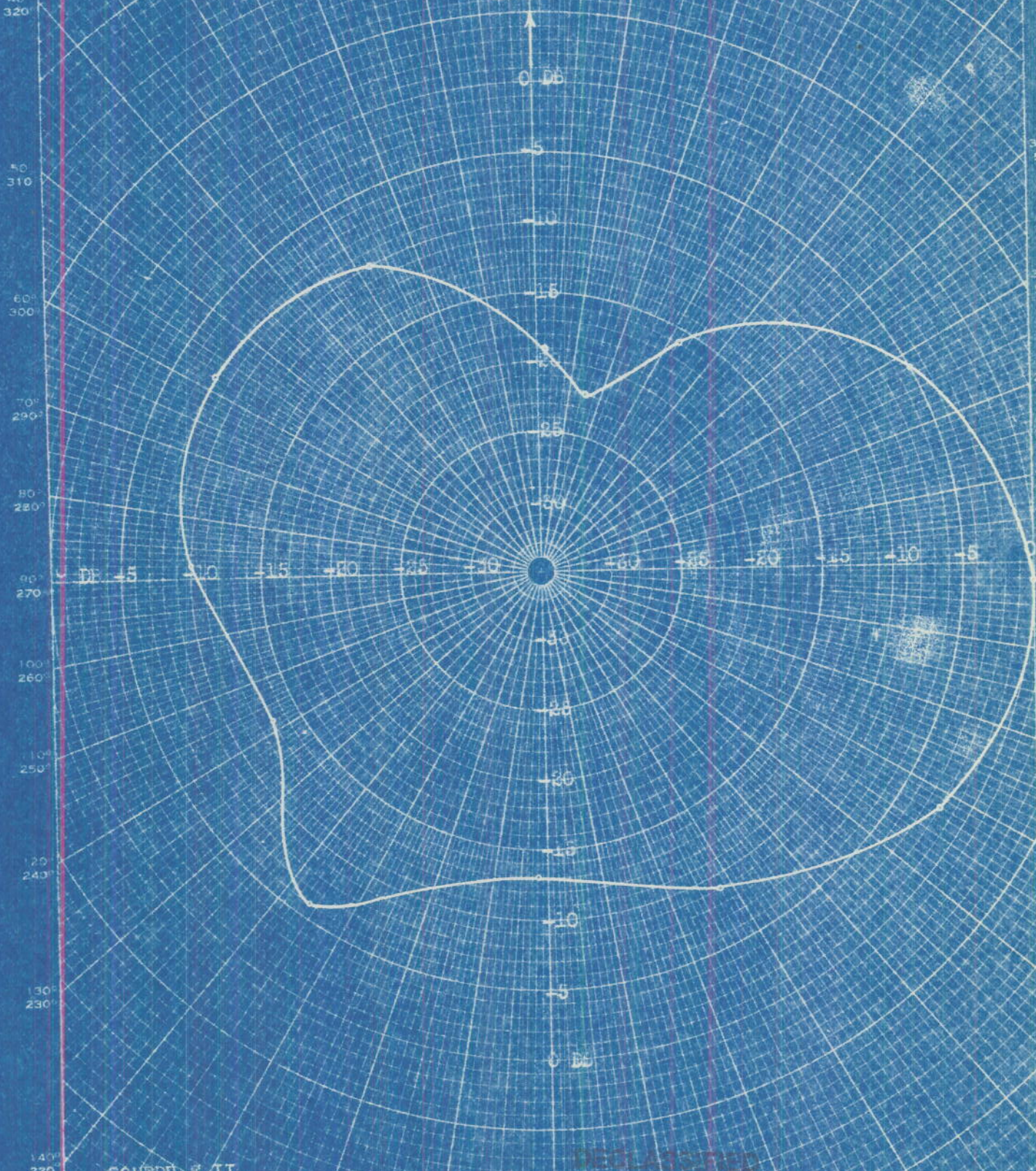
PLATE 28
SECTION 1

150° 210° 160° 200° 170° 190° 180° 180° 90° 170° 100° 160° 210° 150°

NO. 340-B DIEZIGEN E.P. PAPER
FOR DISTINGUISHED
P.L.A. 01-01-05

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

Ship's Head
↑



SCHEDULE II
TEST 1H
Receiving Antenna II
4000 kc

DECLASSIFIED

PLATE 29
SECTION 1

EMU DIETZEN CO
POLAR EQ. GR.

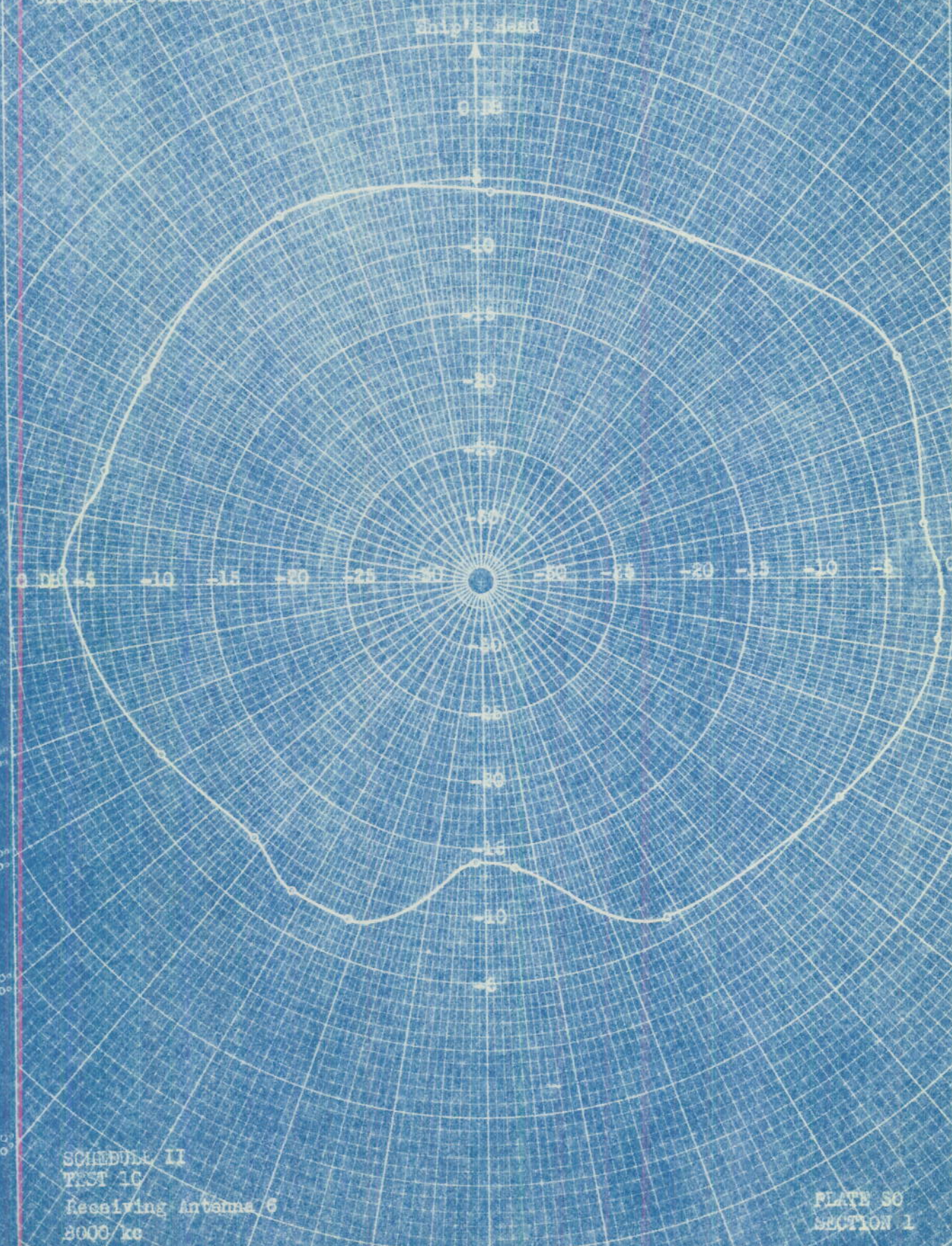
EMU DIETZEN CO
POLAR EQ. GR.

30° 20° 10° 380° 340° 300° 320° 40° 320° 50° 310° 60° 300° 70° 290° 80° 280° 90° 270° 100° 260° 110° 250° 120° 240° 130° 230° 140° 220° 150° 210° 160° 200° 170° 190° 180° 180° 190° 200° 210° 220° 230° 240° 250° 260° 270° 280° 290° 300° 310° 320° 330° 340° 350° 360°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT CLEMENS (AGC-6)



Ship's Head



SCHEDULE II
TEST 10
Receiving Antenna 6
8000 kc

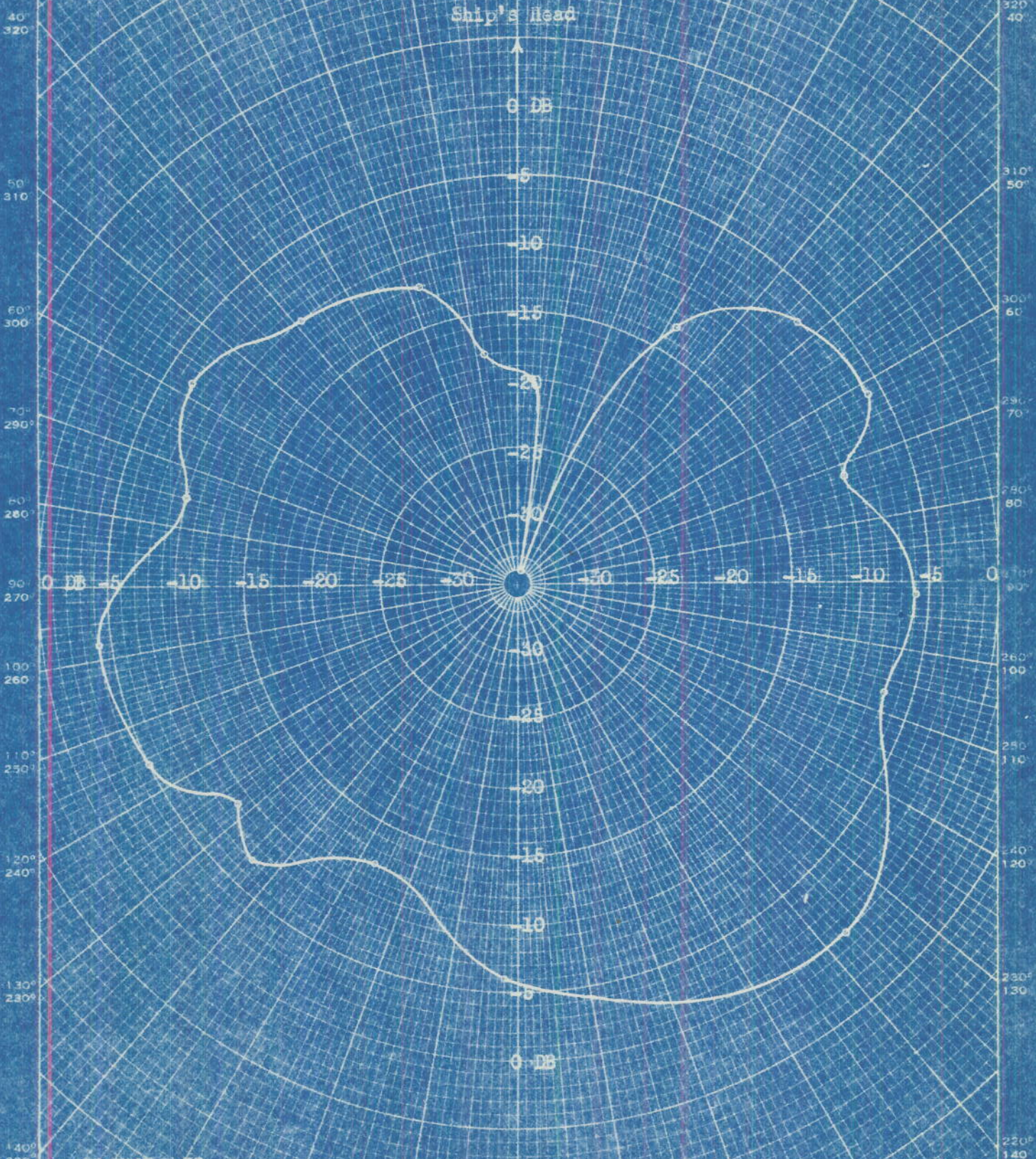
PLATE 50
SECTION 1

ELIUS DIETZGEN CO.
NO. 340 F. DIETZGEN
HOLAN, SD, U.S.A.

Enclosure (b)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)



Ship's head
↑



SCHEDULE II
TEST ID
Receiving Antenna 1
12000 kc

UNCLASSIFIED

PLATE 51
SECTION 1

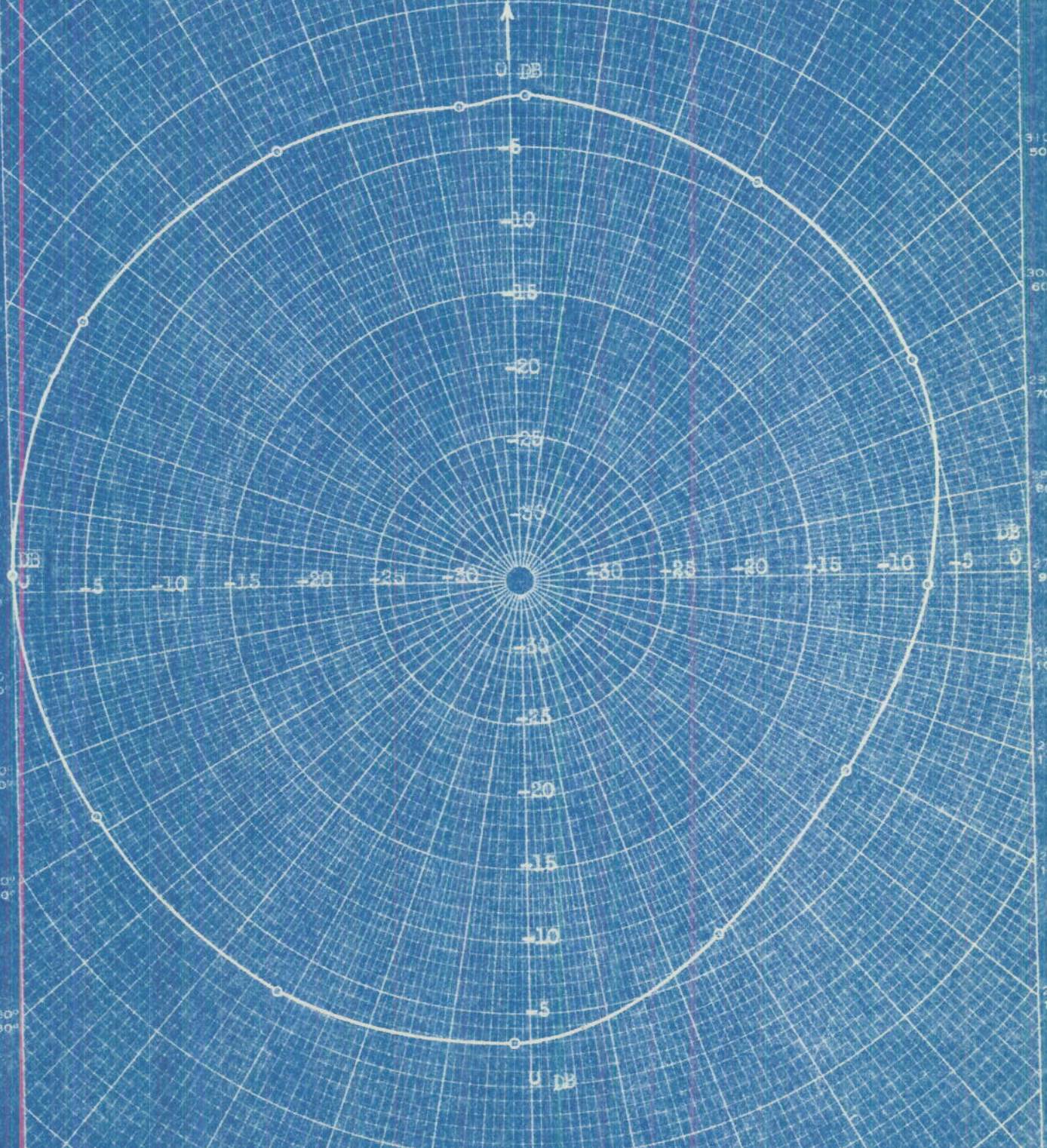
EUGEN DIETZEN CO.

NO. 340-P DIETZEN SOLAR CO. ORG.

150° 160° 170° 180° 190° 200° 210°
10° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT CLYMBUS (AGC-8)

Ship's Head
↑



SCHEDULE II
TEST 2A
Receiving Antenna 17
2000 kc

DECLASSIFIED

PLATE 52
SECTION 1

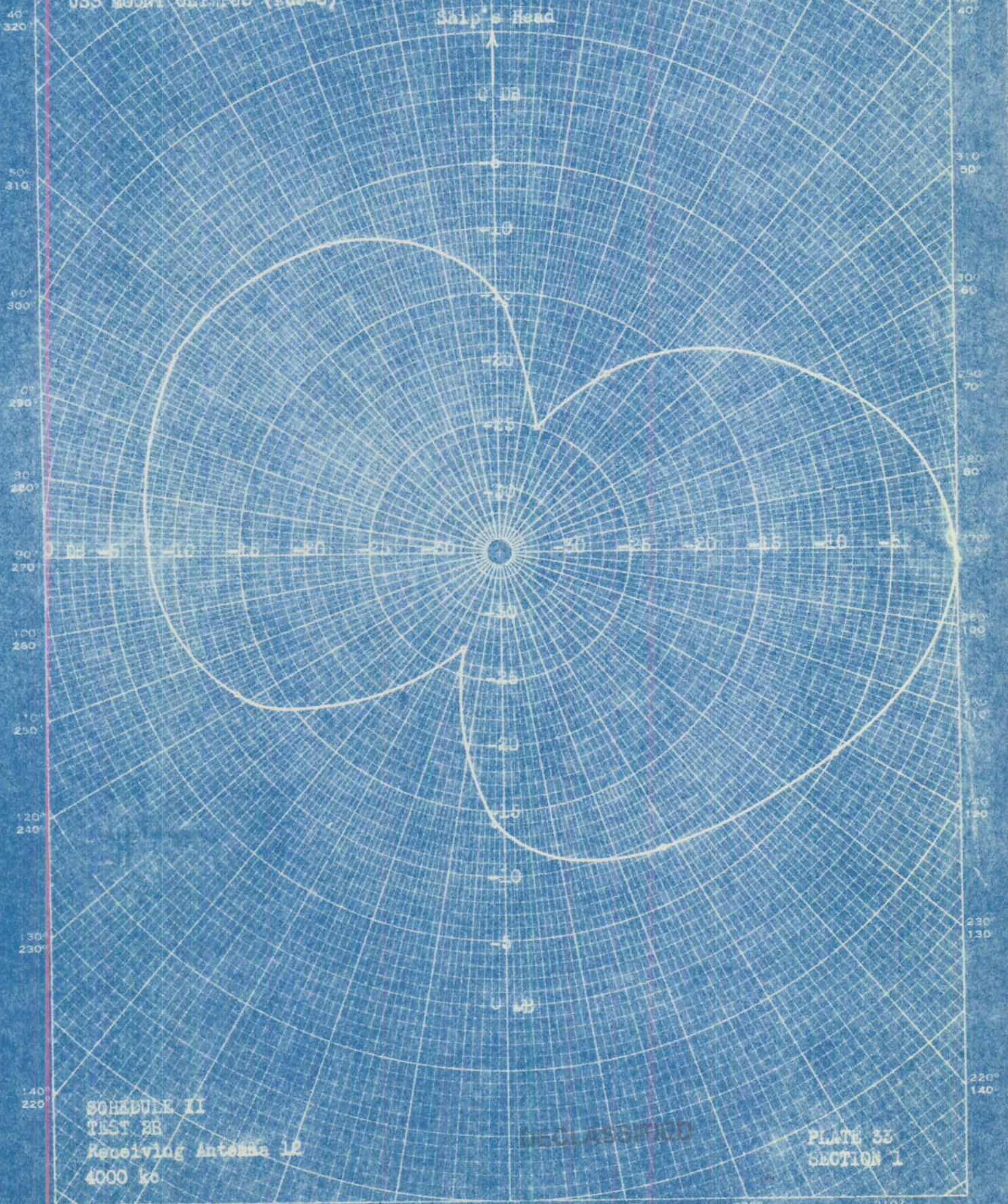
DIETZGEN CO.

DIETZGEN

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-5)

DECLASSIFIED

Ship's Head
↑



SCHEDULE II
TEST 2B
Receiving Antenna 12
4000 kc

DECLASSIFIED

PLATE 53
SECTION 1

FLUOROGRAPHIC PAPER

1-ND 360° DIETZEN PAPER
POLAR CO-ORD. PL.

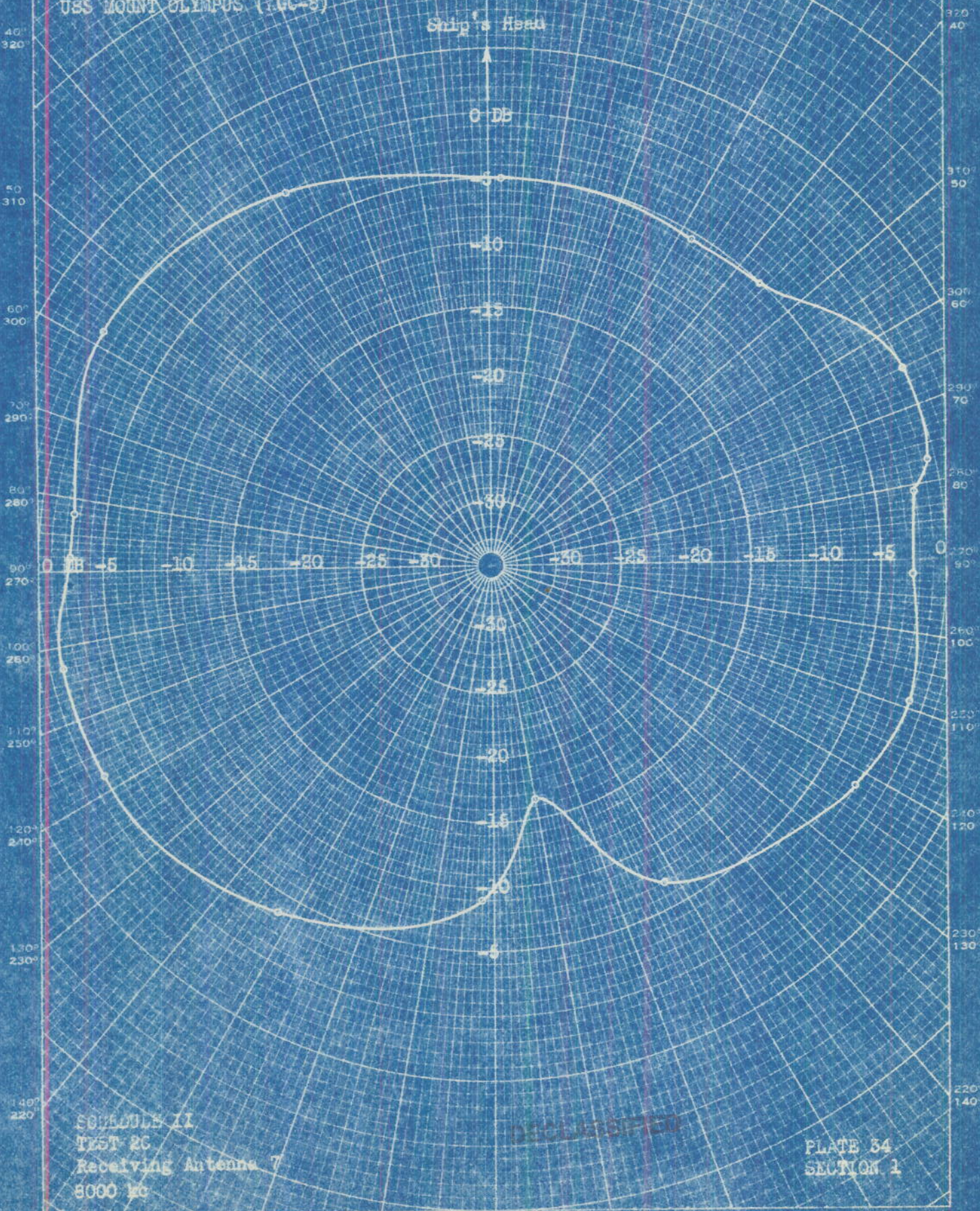
150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

40° 320°
50° 310°
60° 300°
70° 290°
80° 280°
90° 270°
100° 260°
110° 250°
120° 240°
130° 230°
140° 220°

320° 40°
310° 50°
300° 60°
290° 70°
280° 80°
270° 90°
260° 100°
250° 110°
240° 120°
230° 130°
220° 140°

Enclosure (B)
ANTENNA PATTERN
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED



SCHEDULE II
TEST 2C
Receiving Antenna 7
8000 kc

DECLASSIFIED

PLATE 54
SECTION 1

EDDY DIETZEN CO.
MILWAUKEE

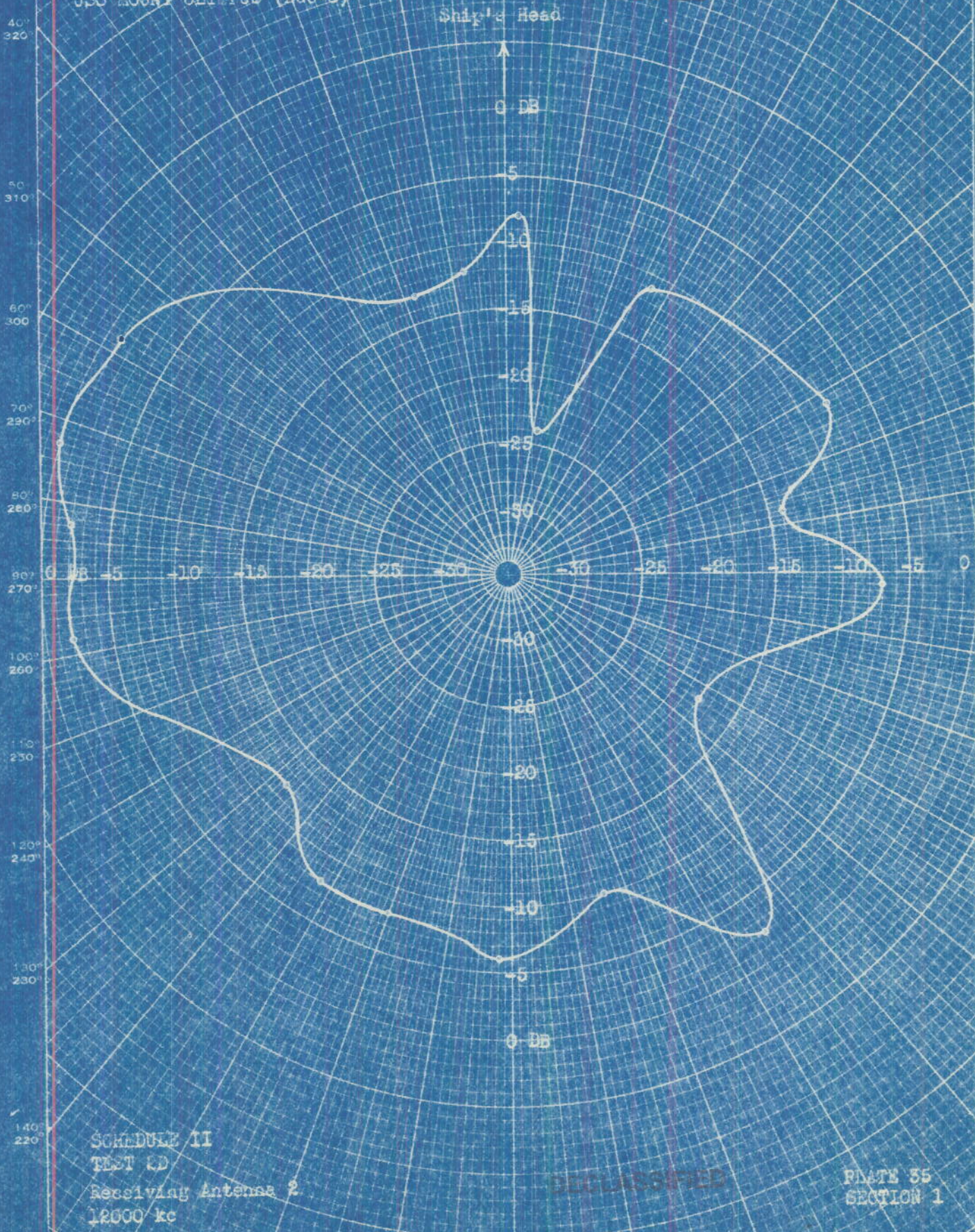
NO. 340-B DIETZEN CO. PAPER
POLAR CO-ORDINATE

30° 330° 20° 340° 10° 350° 350° 10° 340° 20° 330° 150° 210° 160° 200° 170° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-45)

DECLASSIFIED

Ship's Head



EUGEN DIETZGEN CO.

NO. 340-B DIETZGEN PAPER POLAR CO. ORD.

SCHEDULE II
TEST RD
Receiving Antenna 2
12000 kc

DECLASSIFIED

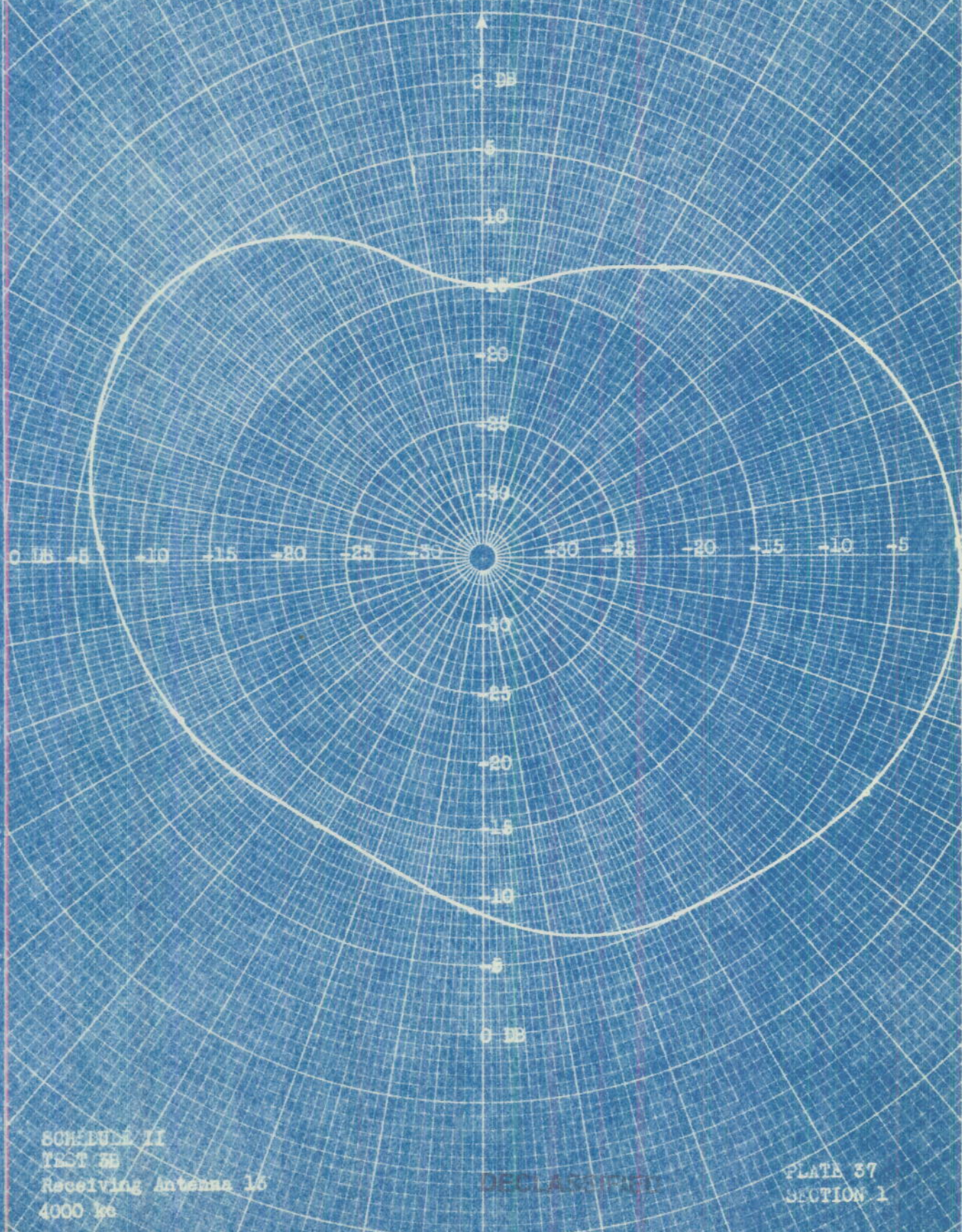
RMATE 35
SECTION 1

160 165 170 180 185 190 195 200 205 210
210 200 190 180 170 160 150

Enclosure (B)
ANTENNA PATTERNS
DS6 MORDAK OLYMPIUS (AGC-8)



Ship's Head



SCHEDULE II
TEST 5B
Receiving Antenna 16
4000 kc

DECLASSIFIED

PLATE 37
SECTION 1

EUGEN WEITZEN CO. POLAR COORDINATE PAPER

30° 20° 10° 0° 10° 20° 30°
330° 340° 350° 360° 350° 340° 330°

40° 320°
50° 310°
60° 300°
70° 290°
80° 280°
90° 270°
100° 260°
110° 250°
120° 240°
130° 230°
140° 220°

320° 40°
310° 50°
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290° 70°
280° 80°
270° 90°
260° 100°
250° 110°
240° 120°
230° 130°
220° 140°

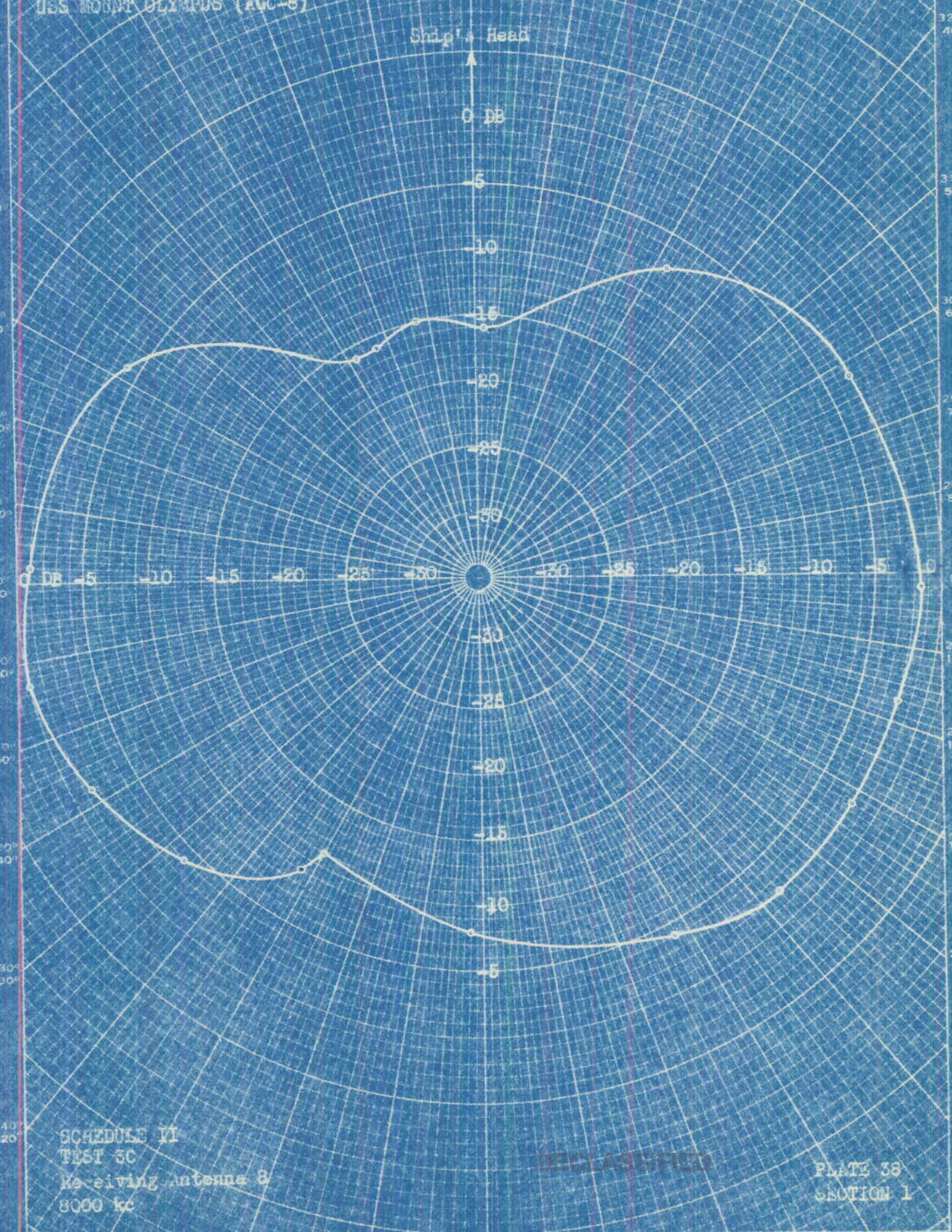
150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED



Ship's Head



SCHEDULE VI
TEST 5C
Receiving Antenna 8
8000 kc

DECLASSIFIED

PLATE 38
SECTION 1

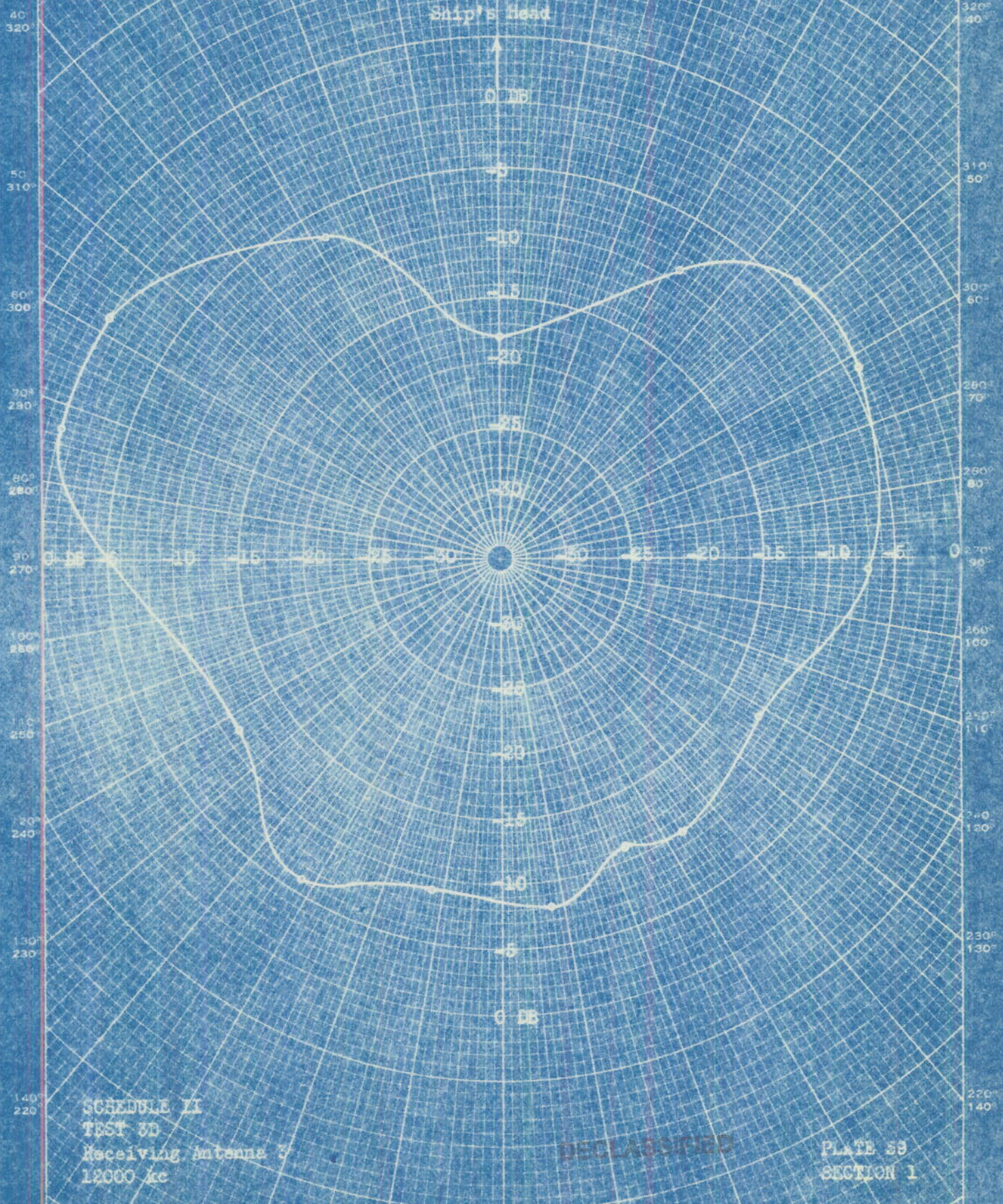
DIETZGEN CO.
NO. 340-P DIETZGEN PAPER
DIA. CO-ORD.

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED



Ship's head



SCHEDULE VI
TEST 3D
Receiving Antenna 3
12000 kc

DECLASSIFIED

PLATE 59
SECTION 1

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

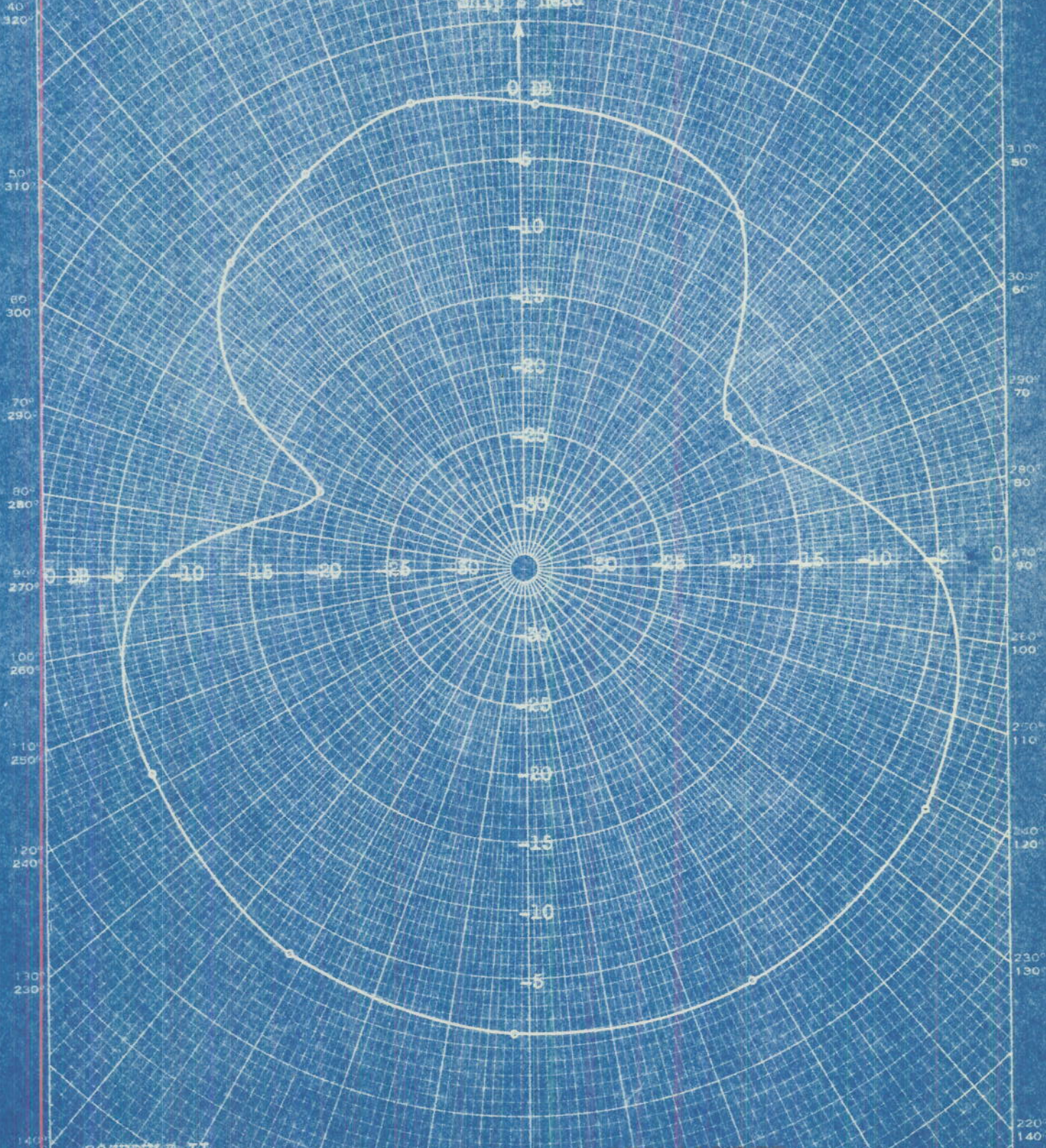
DIETZEN CO.
P.M. U.S.A.

DIETZEN CO.
POLAR CO-ORD.

Enclosure (F)
ANTENNA PATTERNS
USS HOWL OLYMPIOS (AGC-8)

DECLASSIFIED

Ship's Head



SCHEDULE II
TEST 4A
Receiving Antenna 19
2000 kc

DECLASSIFIED

PLATE 40
SECTION 1

EUREKA DIEZGEN CO.
NO. 340-S DIEZGEN CO. PAPER
POLAR, GEORGE

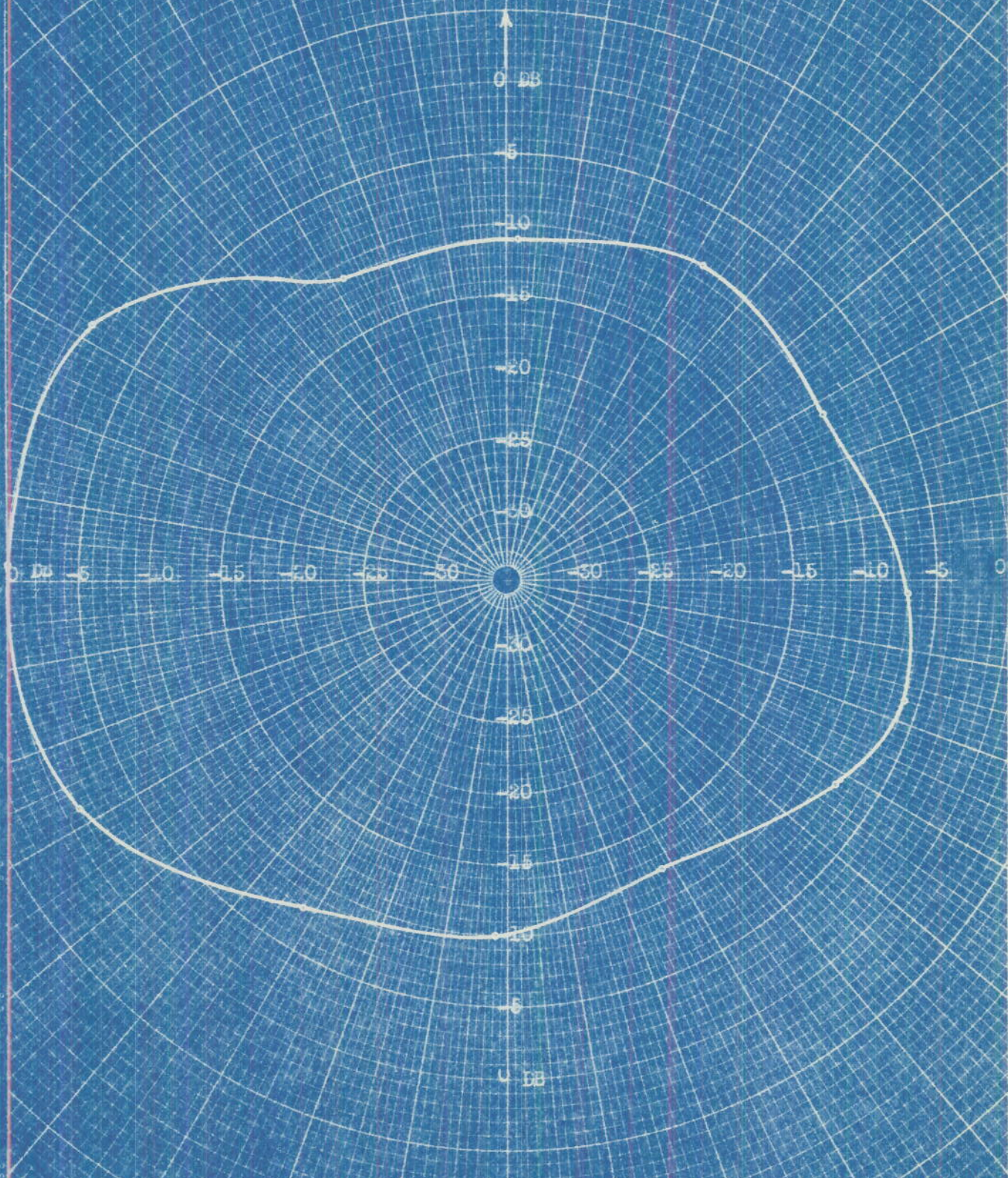
Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED



Ship's Head

0 DB
-5
-10



4 DB

SCHEDULE II
TEST 4B
Receiving Antenna 14
4000 kc

DECLASSIFIED

PLATE 41
SECTION 1

150° 210° 160° 200° 170° 190° 180° 180° 170° 200° 210° 150°

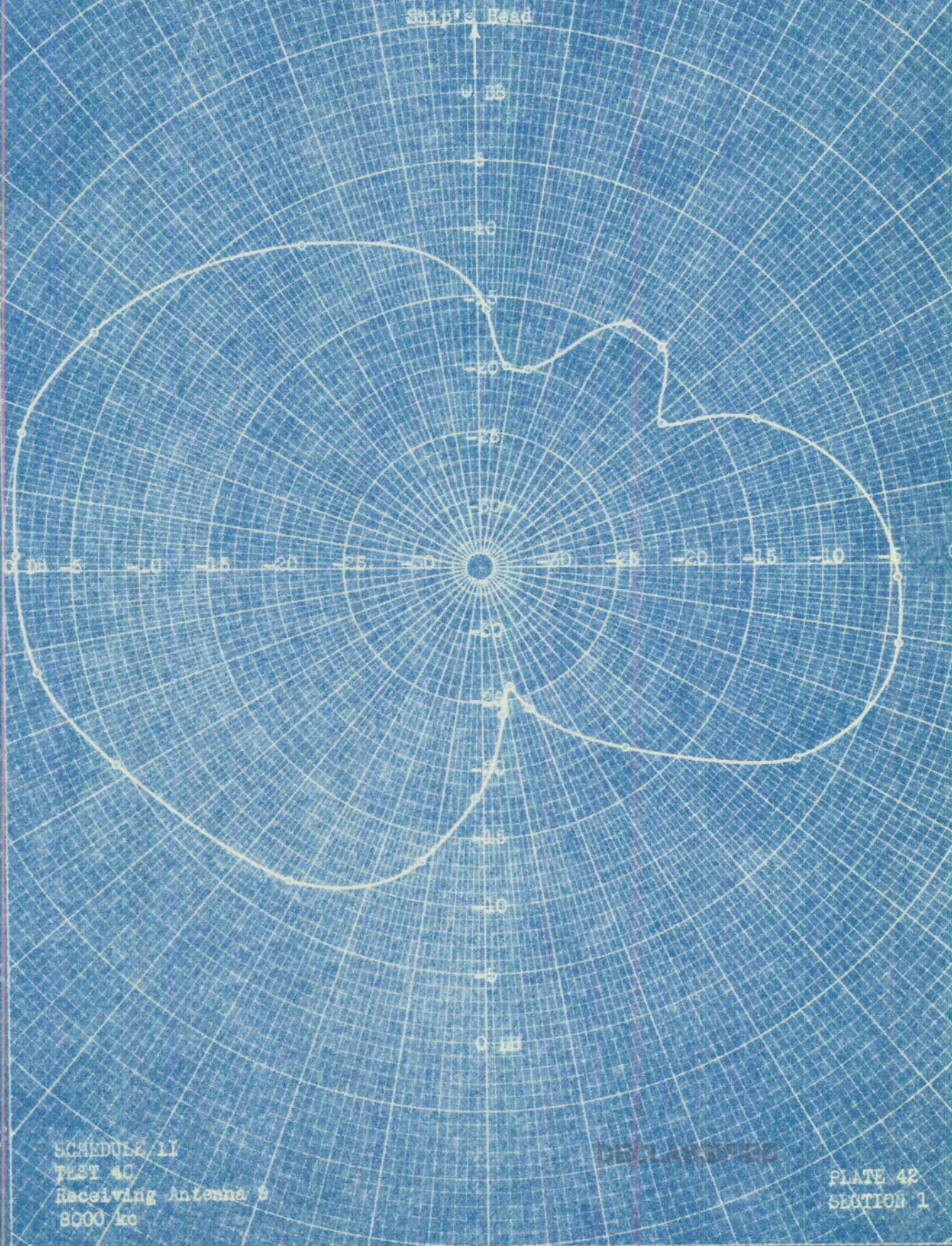
EUSHI DIETZEN CO.
NO. 340-F DIETZEN PAPER
PLA-DE-ORD

Enclosure (1)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED

CONFIDENTIAL

Ship's Head



SCHEDULE 11
TEST 40
Receiving Antenna 5
8000 kc

DECLASSIFIED

PLATE 42
SECTION 1

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

EUG. DIEZGEN CO.

NO. 340-P DIEZGEN PAPER POLA. 101330

Enclosure (5)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED

Ship's Head

0 DB

-5

-10

-15

-20

-25

-30

-35

-40

-45

-50

-55

-60

-65

-70

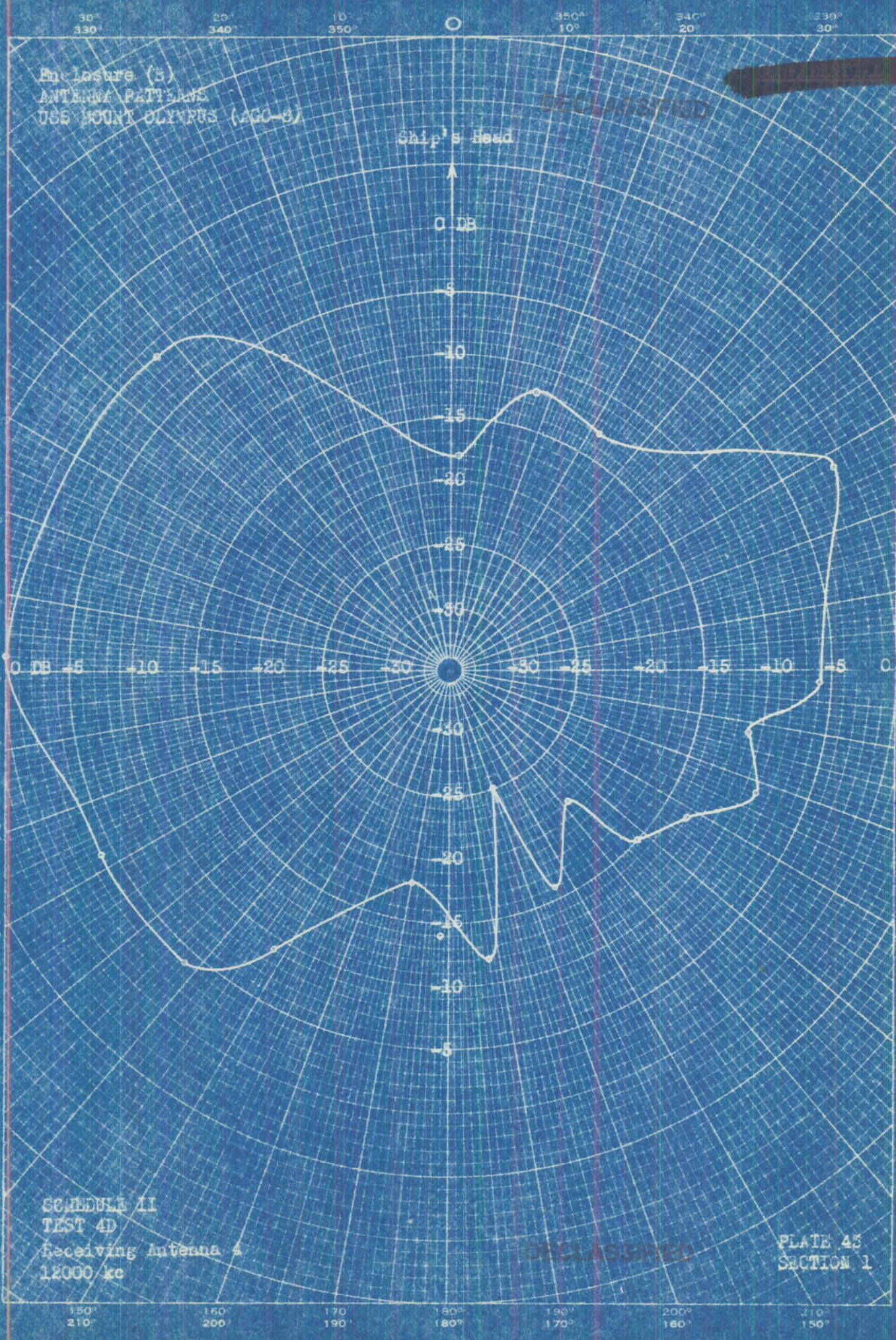
-75

SCHEDULE II
TEST 4D
Receiving Antenna 4
12000 kc

DECLASSIFIED

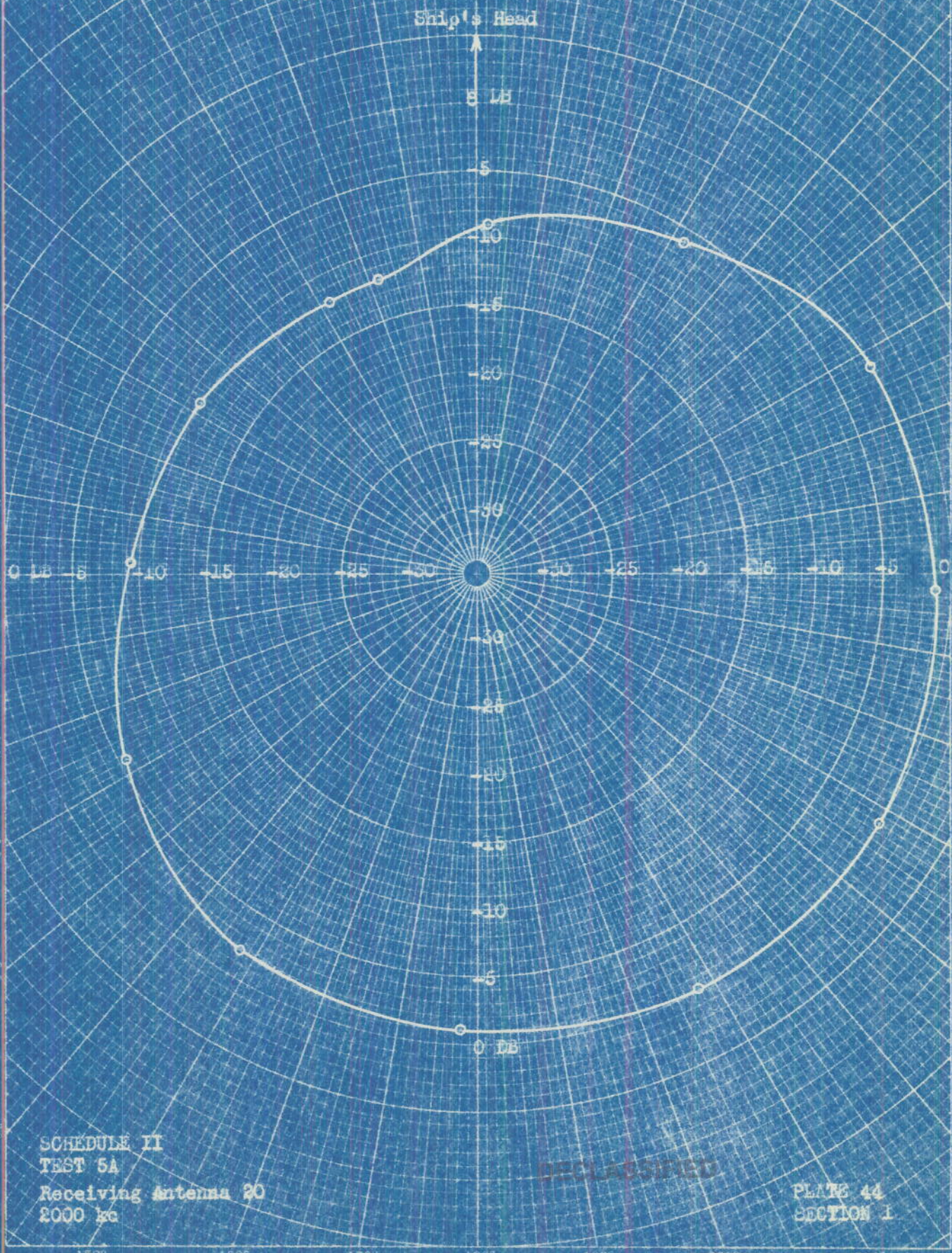
PLATE 45
SECTION 1

FIG. 1
N. 340 P. DIETZEN
POLAR CO. (500)



Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

~~DECLASSIFIED~~



SCHEDULE II
TEST 5A
Receiving Antenna 20
2000 kc

~~DECLASSIFIED~~

PLATE 44
SECTION 1

DIETZEN CO.
U.S.A.

DIETZEN CO.
PAPER

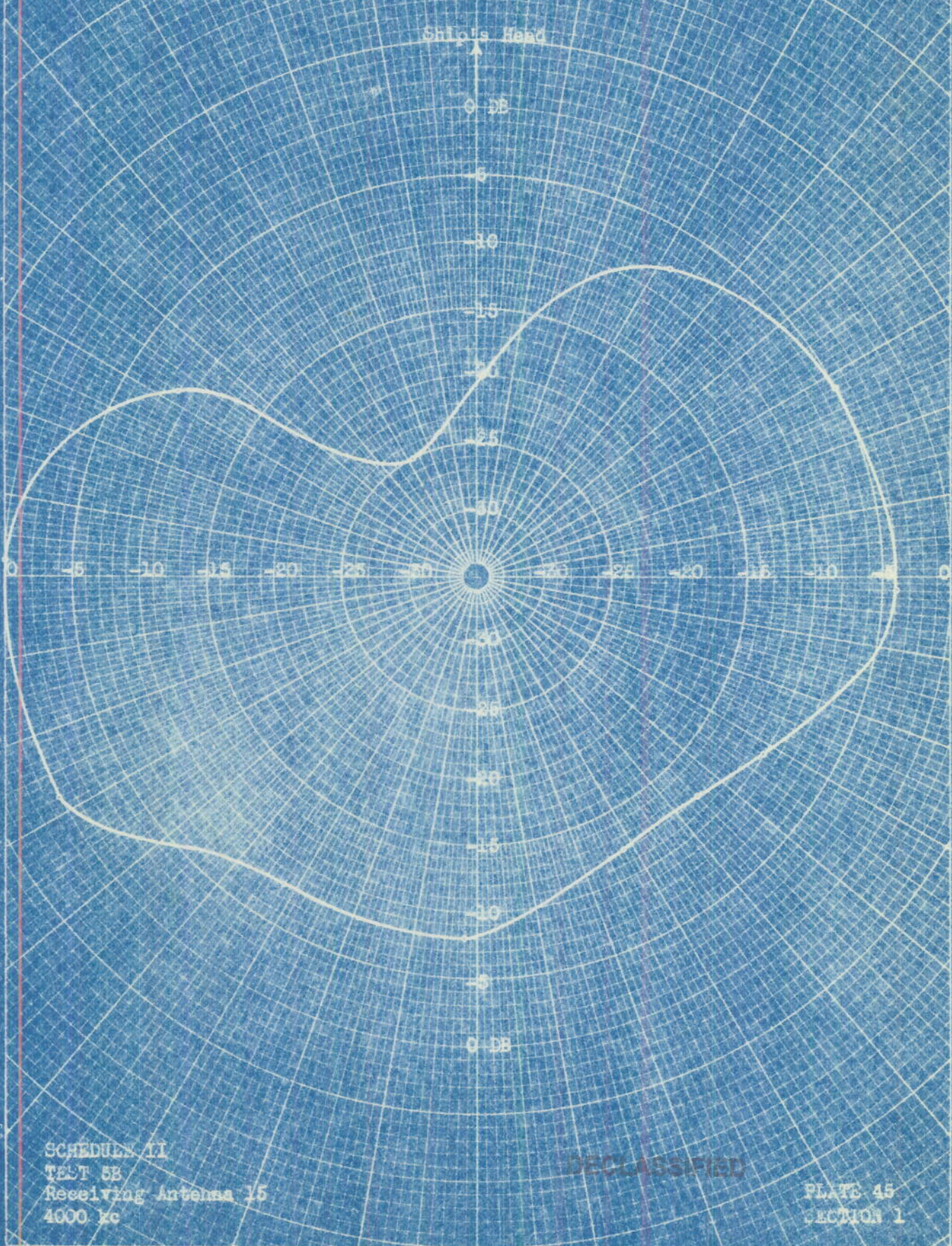
150° 210° 160° 200° 170° 190° 180° 180° 190° 170° 200° 160° 210° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED



Ship's Head



SCHEDULE II
TEST 5B
Receiving Antenna 15
4000 kc

DECLASSIFIED

PLATE 45
SECTION 1

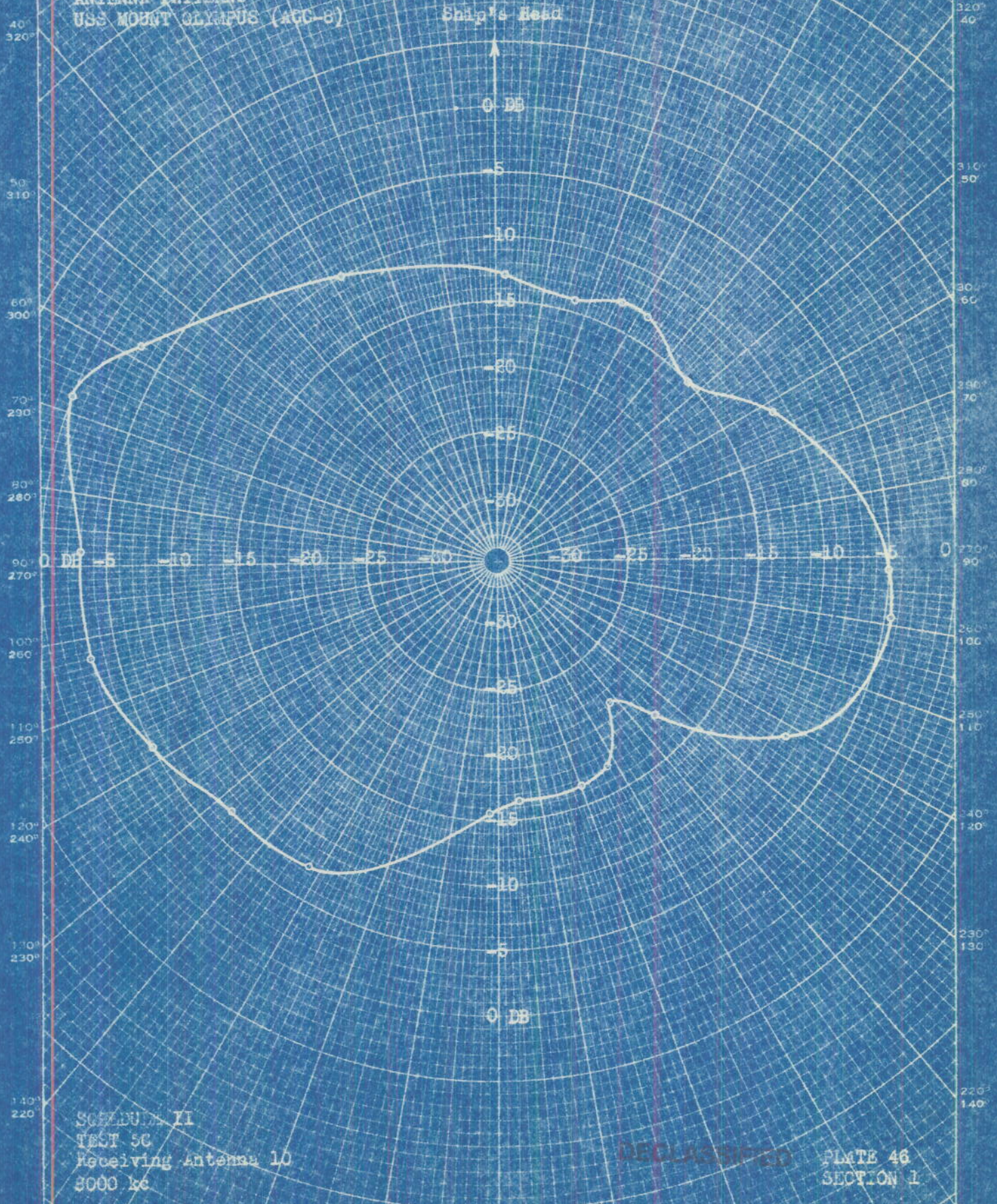
EUC DIETZEN CO. PAPER POLAR CO-ORD.

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED [REDACTED]

Ship's Head



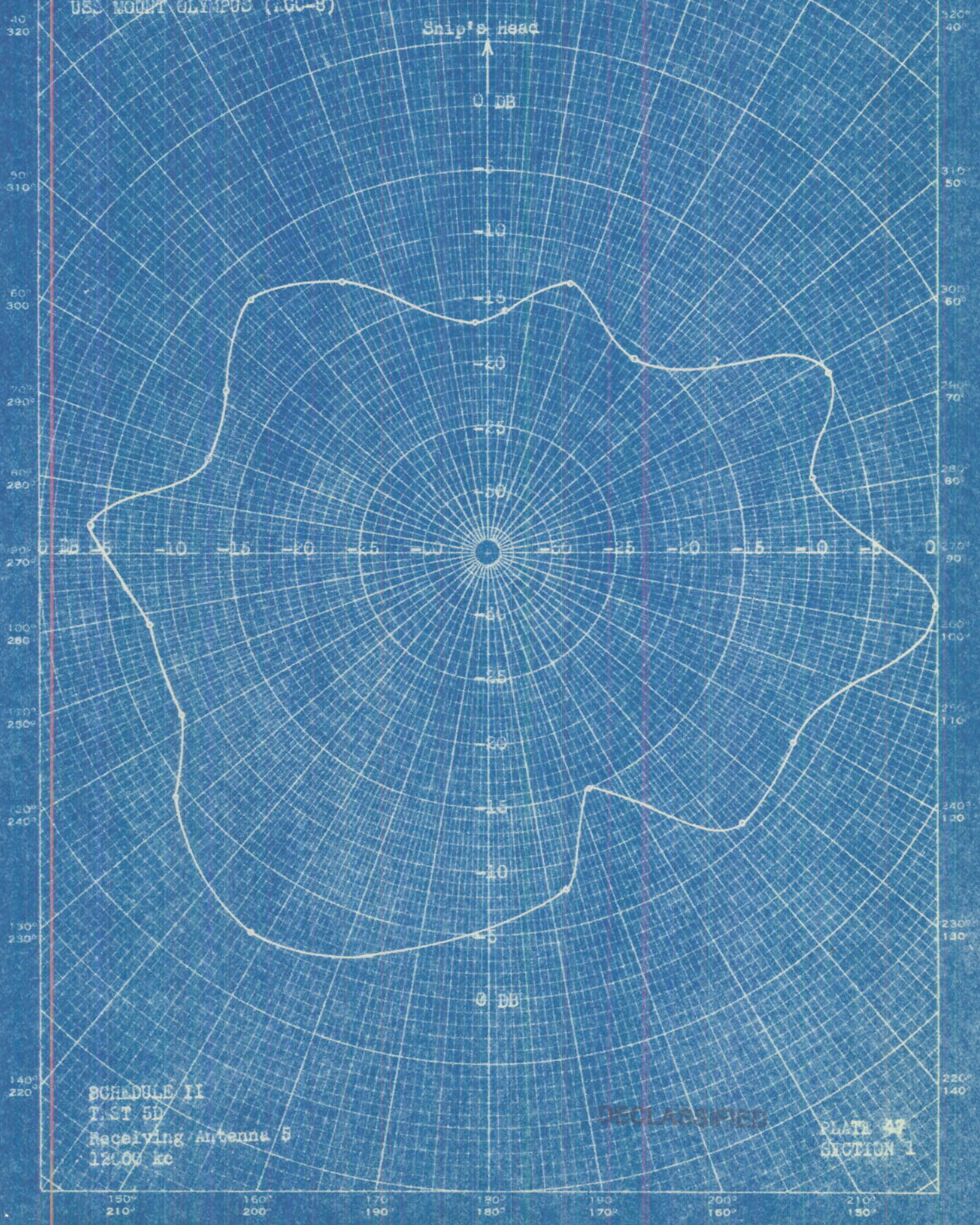
SCHEDULE II
TEST 5C
Receiving Antenna 10
3000 kc

DECLASSIFIED PLATE 46
SECTION 1

NO. 34C-R DIETZEN CO. PAPER
EUGENE DIETZEN CO. PULASKI CO. IOWA

Enclosure (B)
ANTENNA PATTERN
U.S. MOUNT OLYMPUS (.6U-8)

DECLASSIFIED



SCHEDULE II
T. ST 5D
Receiving Antenna 5
12000 kc

DECLASSIFIED

PLATE 47
SECTION 1

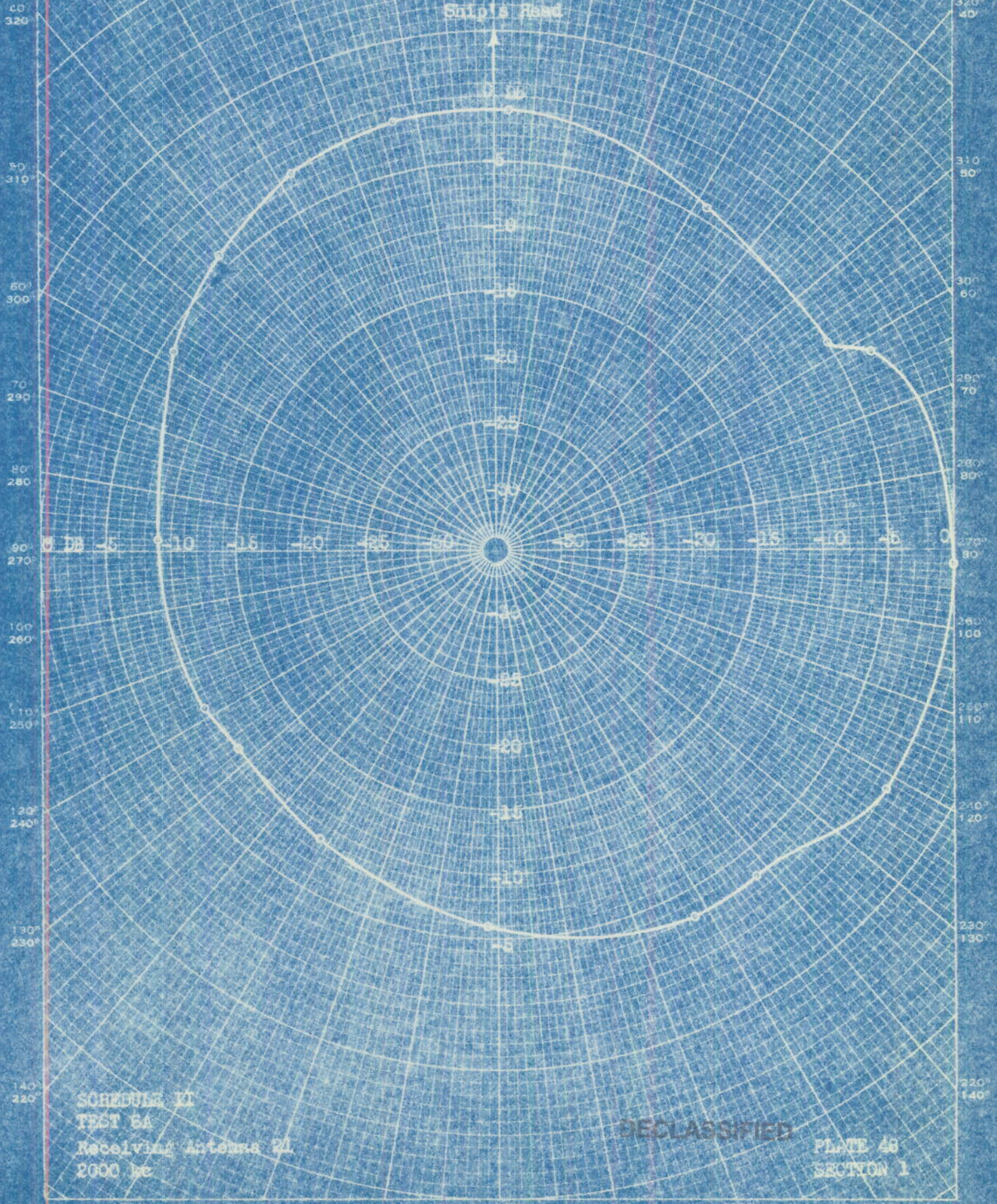
EDD OREZBER CO.
NO. 340
DIEZGER
PLAN CO-ORD

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLIMPIUS (AGC-8)

DECLASSIFIED



Ship's Head



SCHEDULE VI
TEST 6A
Receiving Antenna 21
2000 Mc

DECLASSIFIED

PLATE 48
SECTION 1

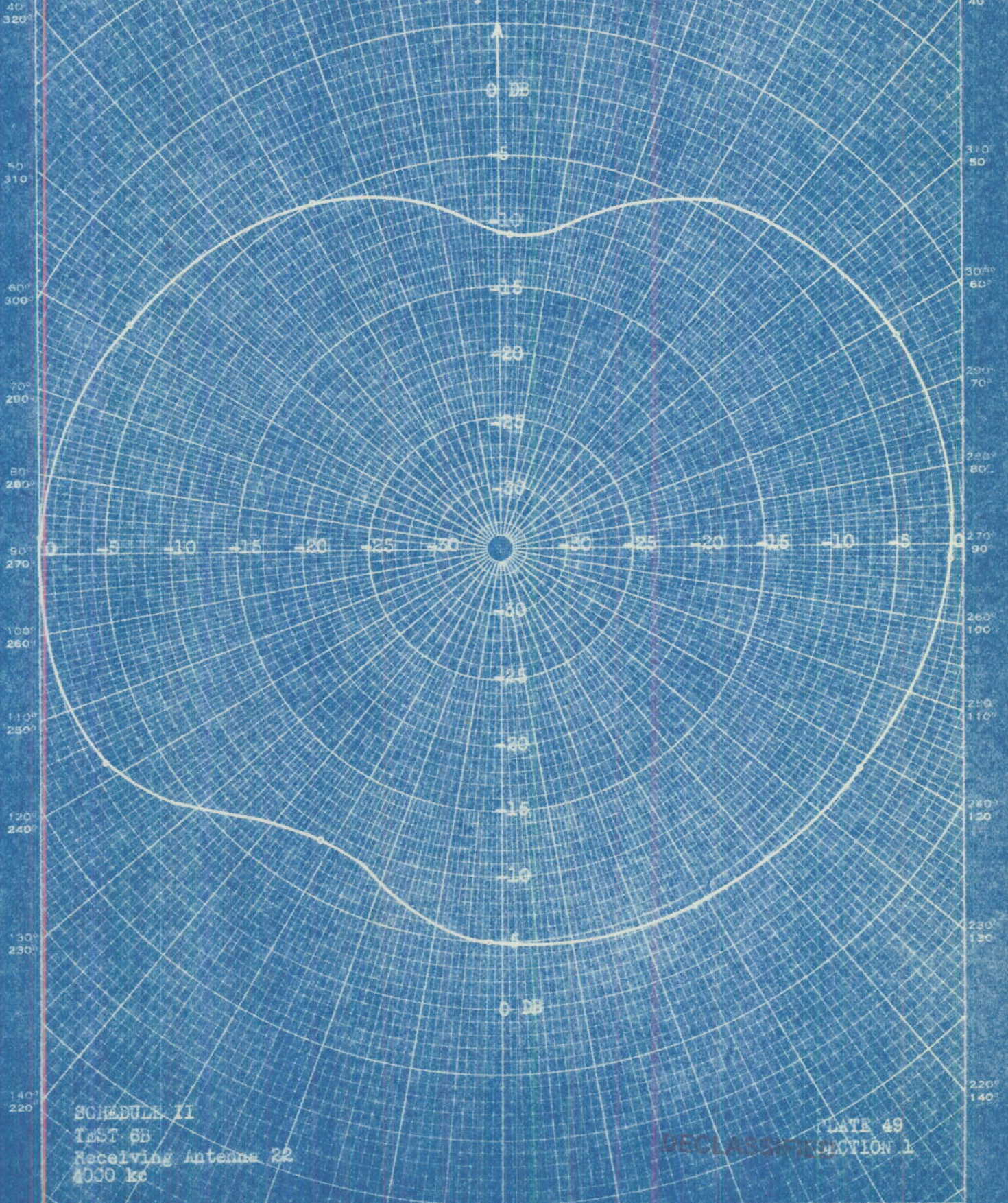
FULL DIETZGEN COPY

U.S. AIR FORCE DIETZGEN COPY

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLIMPOS (AGC-8)

DECLASSIFIED

Ship's Head



SCHEDULE II
TEST 6B
Receiving Antenna 22
4000 kc

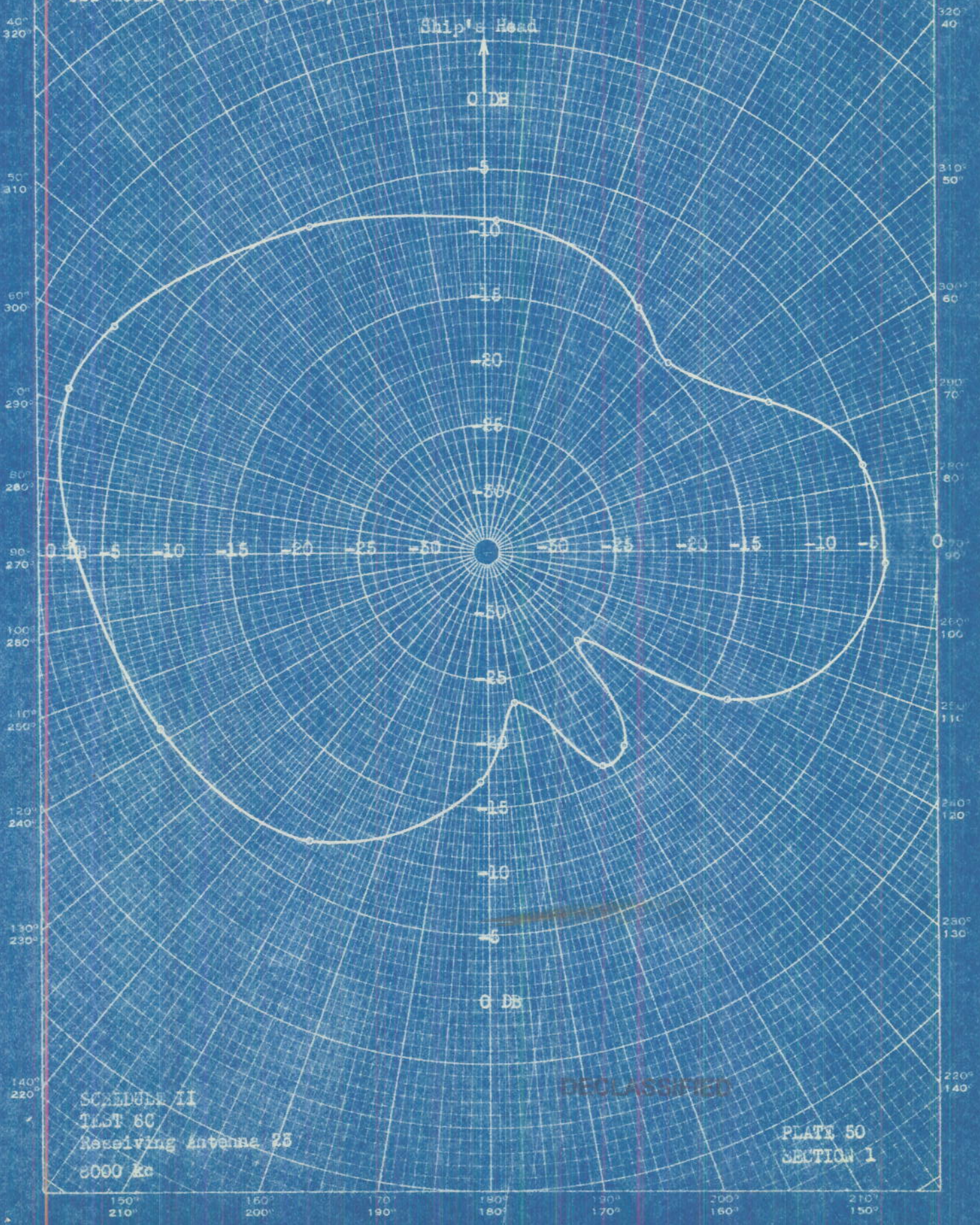
LATE 49
DECLASSIFICATION 1

ELIUS DIETZGEN CO.

NO. 340-F DIETZGEN POLAR GRAPH PAPER

Enclosure (B)
ANTENNA PATTERN
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED



SCHEDULE II
11ST 6C
Receiving Antenna 23
8000 Kc

DECLASSIFIED

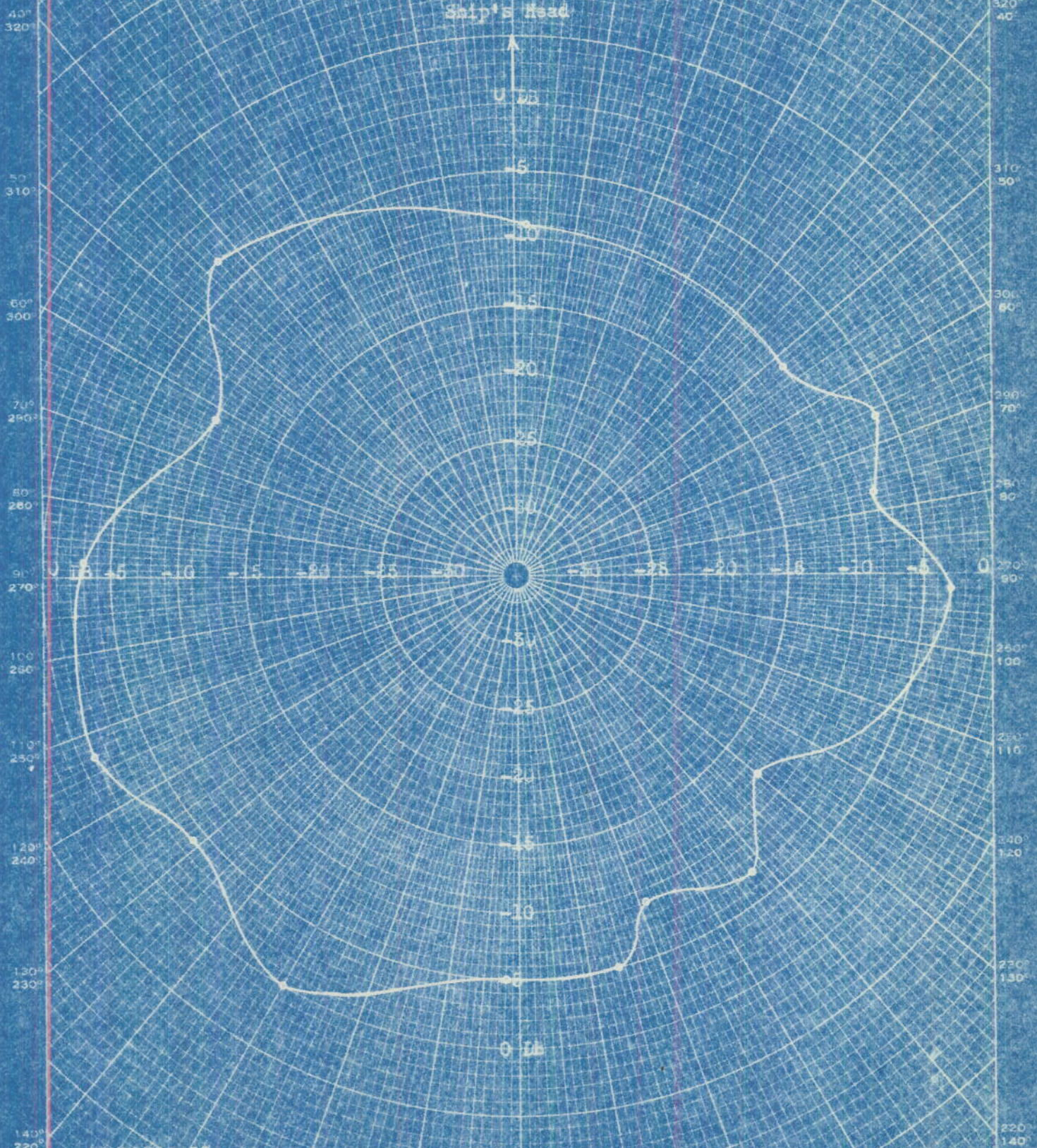
PLATE 50
SECTION 1

Enclosure (B)
ANTENNA PATTERNS
USS MOUNT OLYMPUS (AGC-8)

DECLASSIFIED



Ship's head



SCHEDULE II
TEST 8D
Receiving Antenna 24
12000 kc

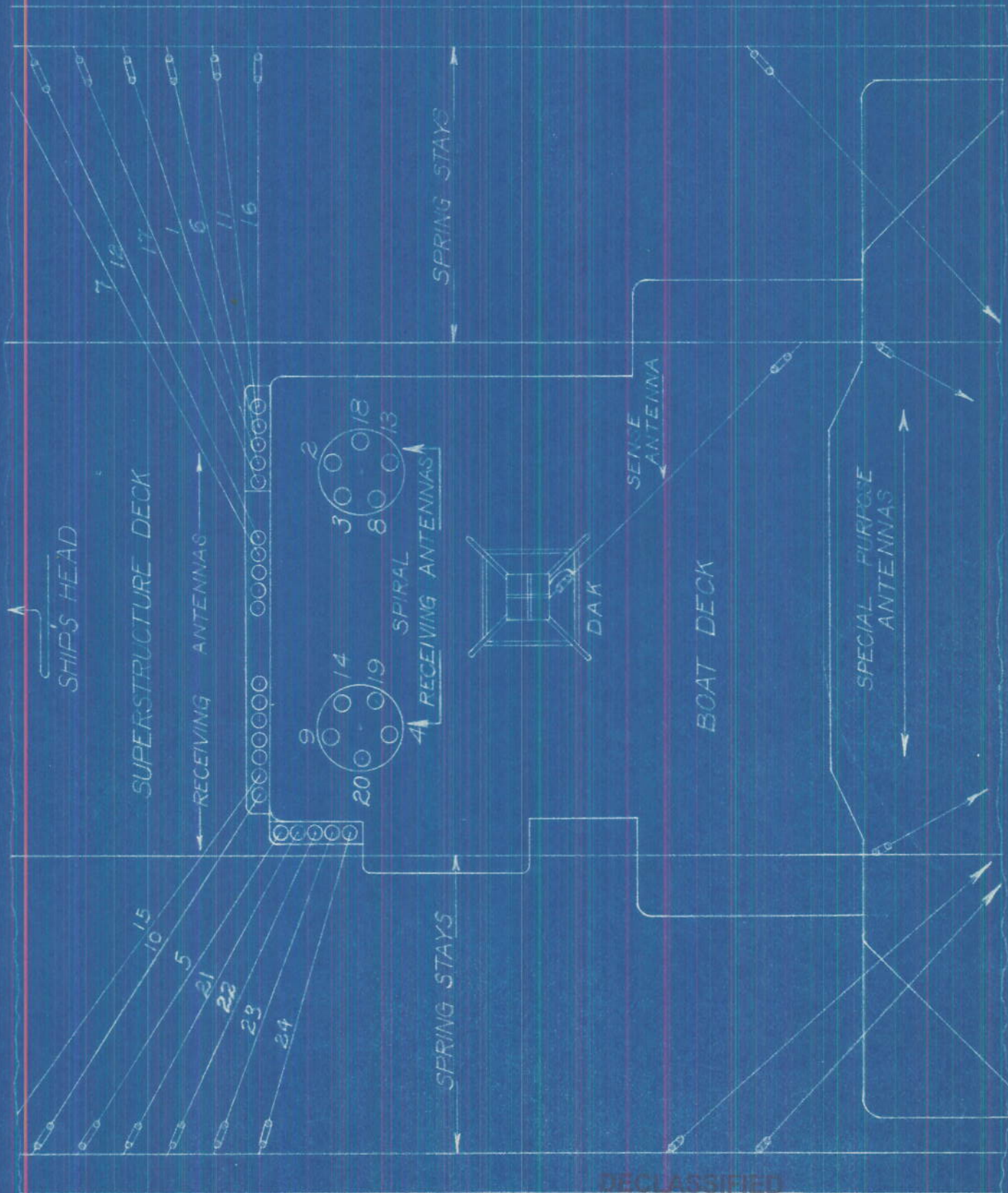
DECLASSIFIED

PLATE 51
SECTION 1

NO 340-P. DIEZSEN CO. PAPER
DIEZSEN CO. PAPER
NO 340-P. DIEZSEN CO. PAPER

150° 160° 170° 180° 190° 200° 210°
210° 200° 190° 180° 170° 160° 150°

DECLASSIFIED



DECLASSIFIED

ENCLOSURE B
RECEIVING ANTENNA NUMBERS
USS MOUNT OLYMPUS (AGC-8)

SECTION I
PLATE 52

SECTION 2

Coverage Diagrams of Radar Equipments
on U.S.S. Mt. Olympus (AGC-8).

Enclosures: Graphs (Plates 1 through 12).

- 2-1. This report covers tests made on radar and IFF antennas on the U.S.S. Mt. Olympus (AGC-8) on 17 June 1944 near the Naval Research Laboratory Chesapeake Bay Annex. Measurements were made on the SK-2, BM, and amidships BN antennas. The results obtained from these measurements are shown in Plates 1, 3 and 6 respectively. Results of tests on other antennas on the U.S.S. Mt. McKinley (AGC-7), and U.S.S. Wasatch (AGC-9) which were made at previous dates are included for further information.
- 2-2. In obtaining the coverage diagram for a non-directional antenna such as the BN, the antenna was excited with a low power cw oscillator. The signal was received by an APR-1 receiver aboard a test vessel (YP-354) which circled the ship at approximately 2000 yards. SG radar equipment was used to determine the range and relative bearing of the YP-354. This information was relayed to the YP-354 by radio where it was recorded with the received field strength data. The procedure for determining the coverage of the directional antennas was the same except that the antenna was kept trained on the test vessel by means of the bearings obtained on the SG.
- 2-3. Patterns of the SK-2 and BM antennas (AGC-9) were obtained by anchoring the test vessel at 2000 yards and 290° relative bearing, and rotating the antenna manually. The received signal on the APR-1 receiver was recorded for various bearings. The pattern of the YG-1 antenna (AGC-9) which could not be controlled manually was obtained by holding the antenna fixed at 220° relative while the test vessel circled the ship.
- 2-4. The observed signal strengths were corrected to a range of 2000 yards by the following formulas:

For vertical polarization:

$$F_{2000} = F_d \cdot \frac{d}{2000} \left[(1-k)^2 + 4k \cos^2 \frac{\phi}{2} \right]^{-\frac{1}{2}}$$

For horizontal polarization:

$$F_{2000} = F_d \cdot \frac{d}{2000} \left[2 \sin (0.122^\circ \cdot \frac{f_{h_{thr}}}{d}) \right]^{-1}$$

where:

F_{2000} = field strength at 2000 yards.

F_d = field strength at d yards.

d = range in yards.

h_t = height of transmitting antenna in feet.

h_r = height of receiving antenna in feet (28 ft.).

f = frequency in megacycles per second.

k = absolute value of reflection coefficient of sea water at frequency used.

$$\phi = \delta - \alpha$$

α = phase lag in degrees on reflection for sea water.

δ = phase lag in degrees due to path difference of direct and reflected rays = $0.244^\circ \cdot \frac{h_t h_r}{d}$

2-5. The field strength corrected to 2000 yards was plotted against relative bearings for each of the tests. The results are given in Plates 1 to 11, which are largely self-explanatory. The coverage diagrams may be interpreted as the relative maximum ranges at which aircraft may be detected at different bearings, providing the comparison is made on aircraft at the same angle of elevation. This follows from the law of radar response which states that received power is inversely proportional to the fourth power of the range, in the case of aircraft. The present coverage patterns are plotted in "one-way" field strength, so that the received power in radar operation will be proportional to the fourth power of these curves. Thus maximum range is proportional to the coverage curves. On surface targets the maximum range is proportional to the square root of the coverage curve because of the inverse eighth power of the distance law which applies in that case.

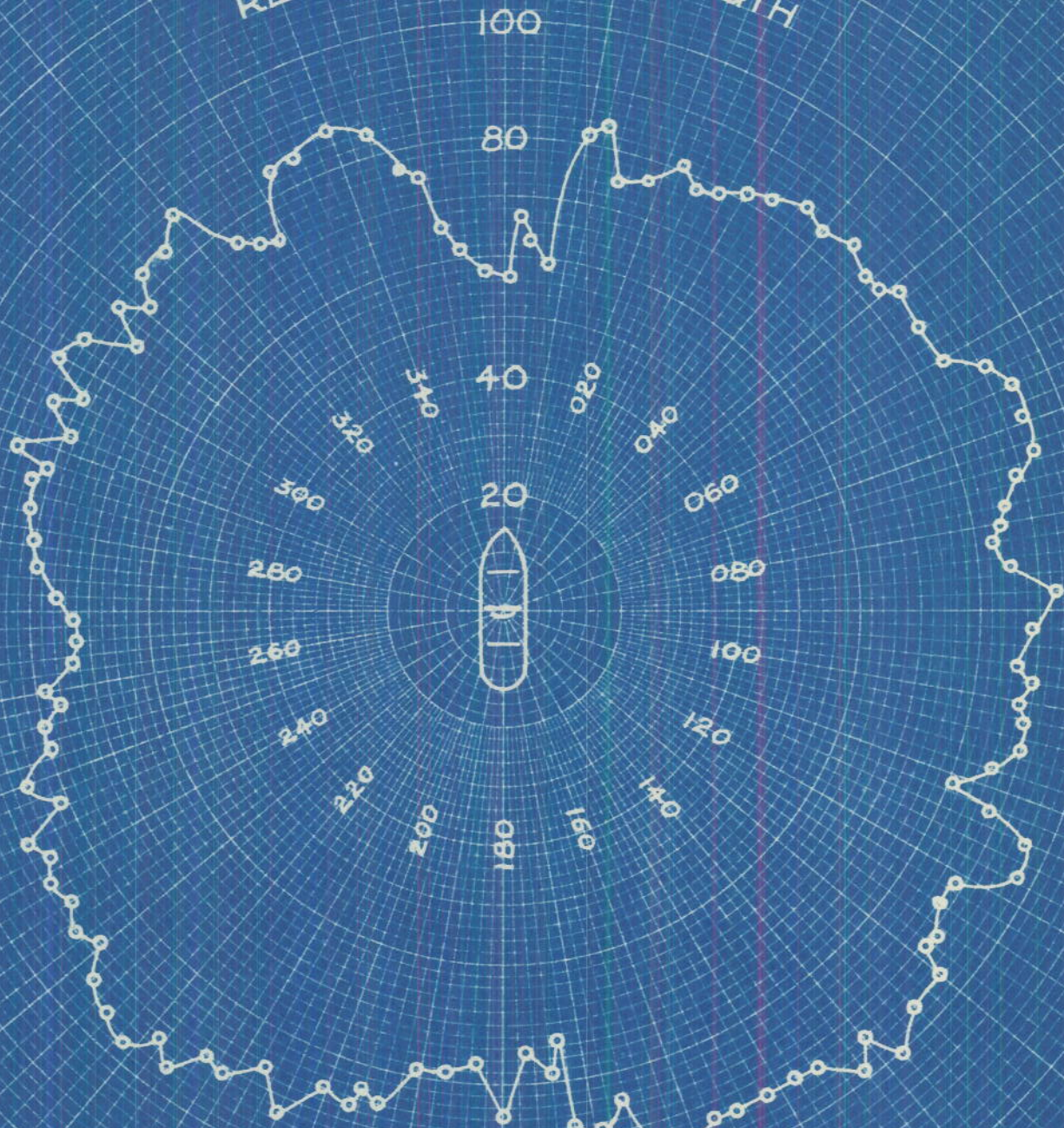
2-6. Most of the dips in the coverage patterns are due to definite parts of the ship's superstructure, such as the SK-2, SG, and YG-1 antennas and their masts, the yard arms, and the king posts. Some of the fine structure in the patterns may be due to the vertical feeders to the communication antennas. It should be borne in mind that metal parts a few degrees below the level of the antenna may obstruct the wave that would otherwise reflect from the water and thus produce a dip in the coverage pattern.

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2-7. The coverage of the SK-2 and the BM are similar and quite uniform, with the exception of a slight dip near 000° and a rather broad one near 180° . The diagrams of the BN's and BK's are extremely ragged. Since the worst dip occurs on the side of the ship opposite the antenna, it is believed that better performance would be obtained with one BN and one BK on each side of the ship, rather than with both BN's on one side and both BK's on the other.

2-8. Plate 12 is an approximate theoretical vertical coverage diagram of the SK-2, showing the locations of the lobes and nulls for an antenna height of 110 feet.

RELATIVE FIELD STRENGTH

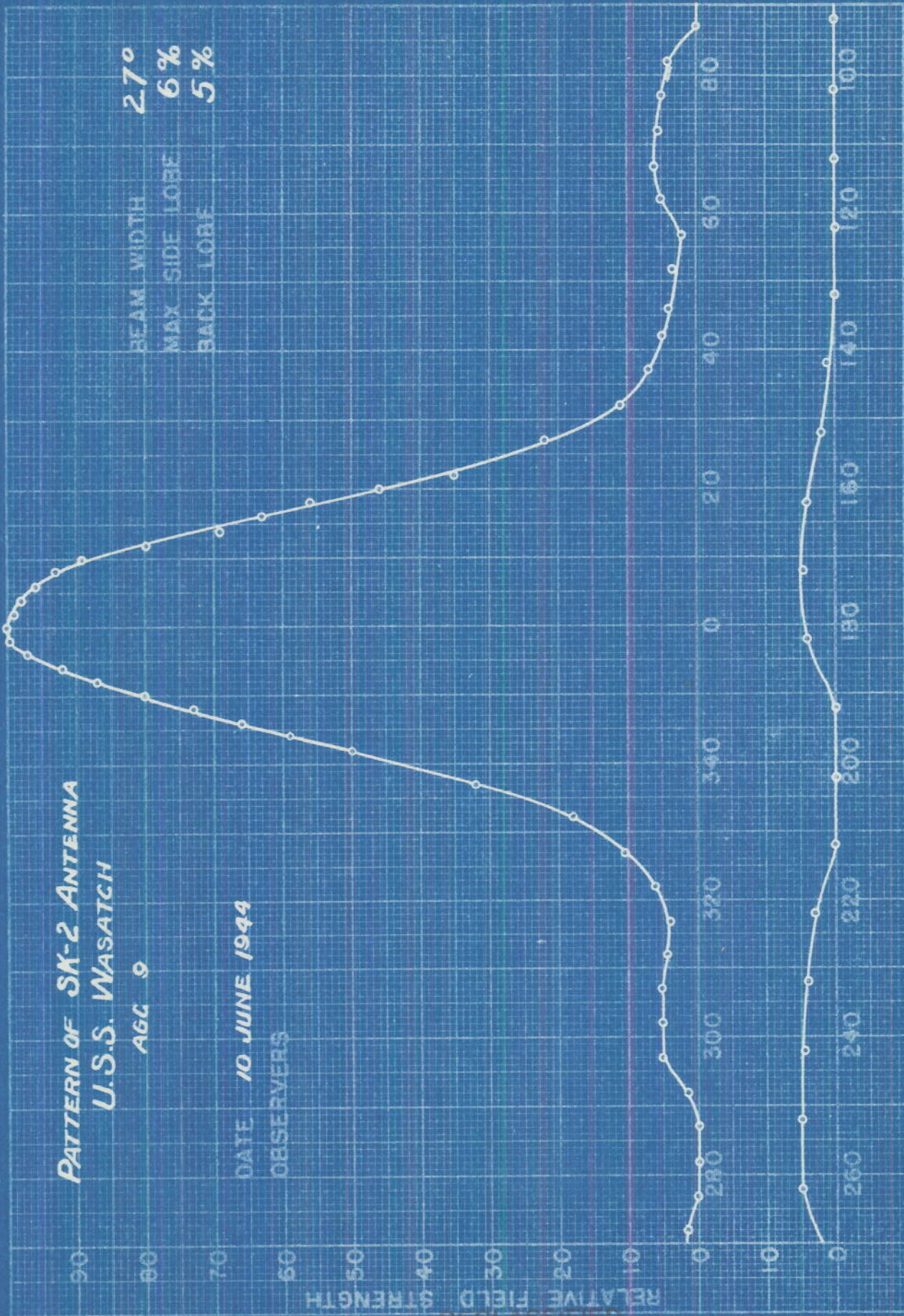


COVERAGE OF SK-2 ANTENNA
USS MT. OLYMPUS
AGC - 8

17 JUNE 1944

PLATE 1

SEC. 2



PATTERN OF SK-2 ANTENNA
U.S.S. WASATCH

AGC 9

DATE 10 JUNE 1944

OBSERVERS

BEAM WIDTH 27°
MAX SIDE LOBE 6%
BACK LOBE 5%

PLATE 2
SEC. 2

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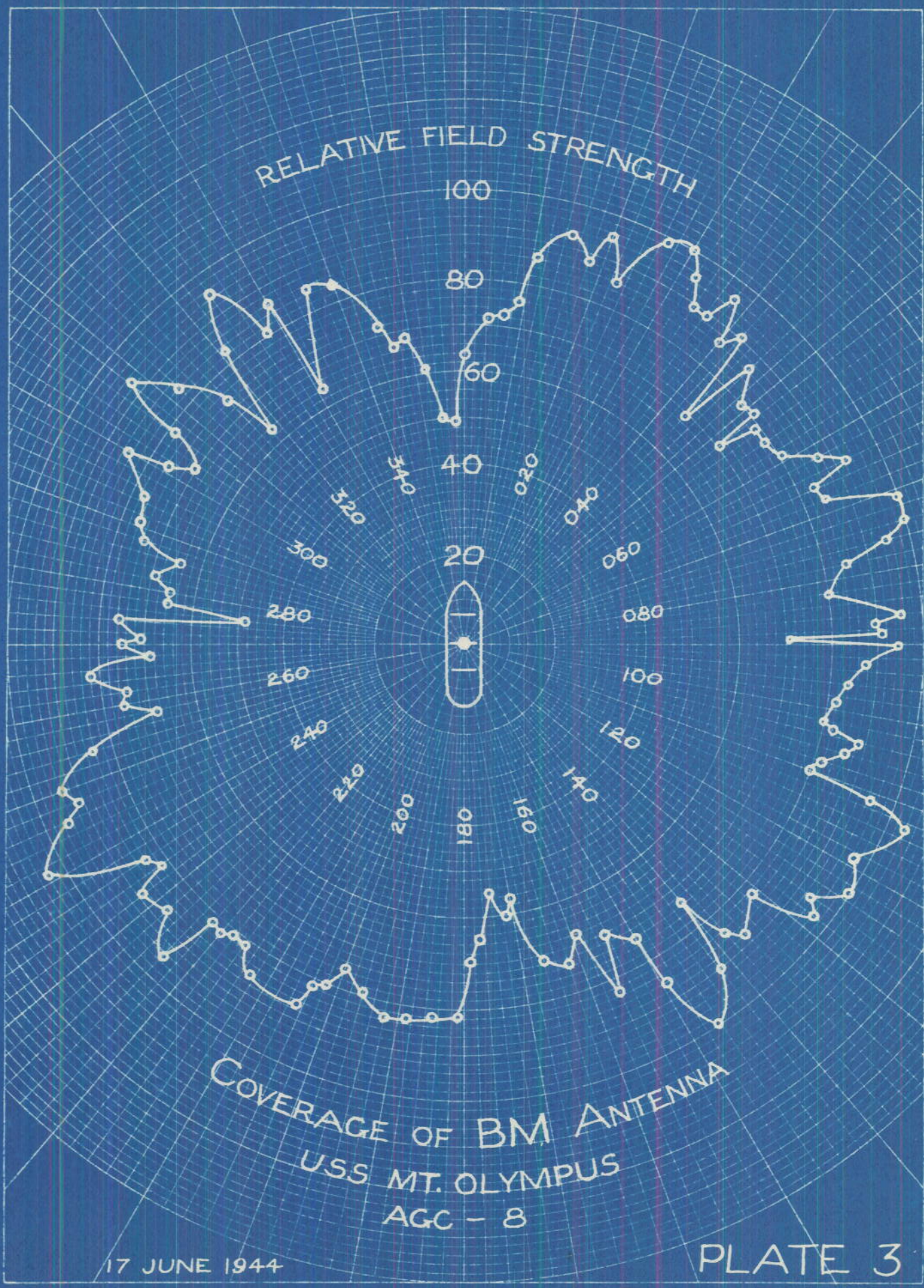
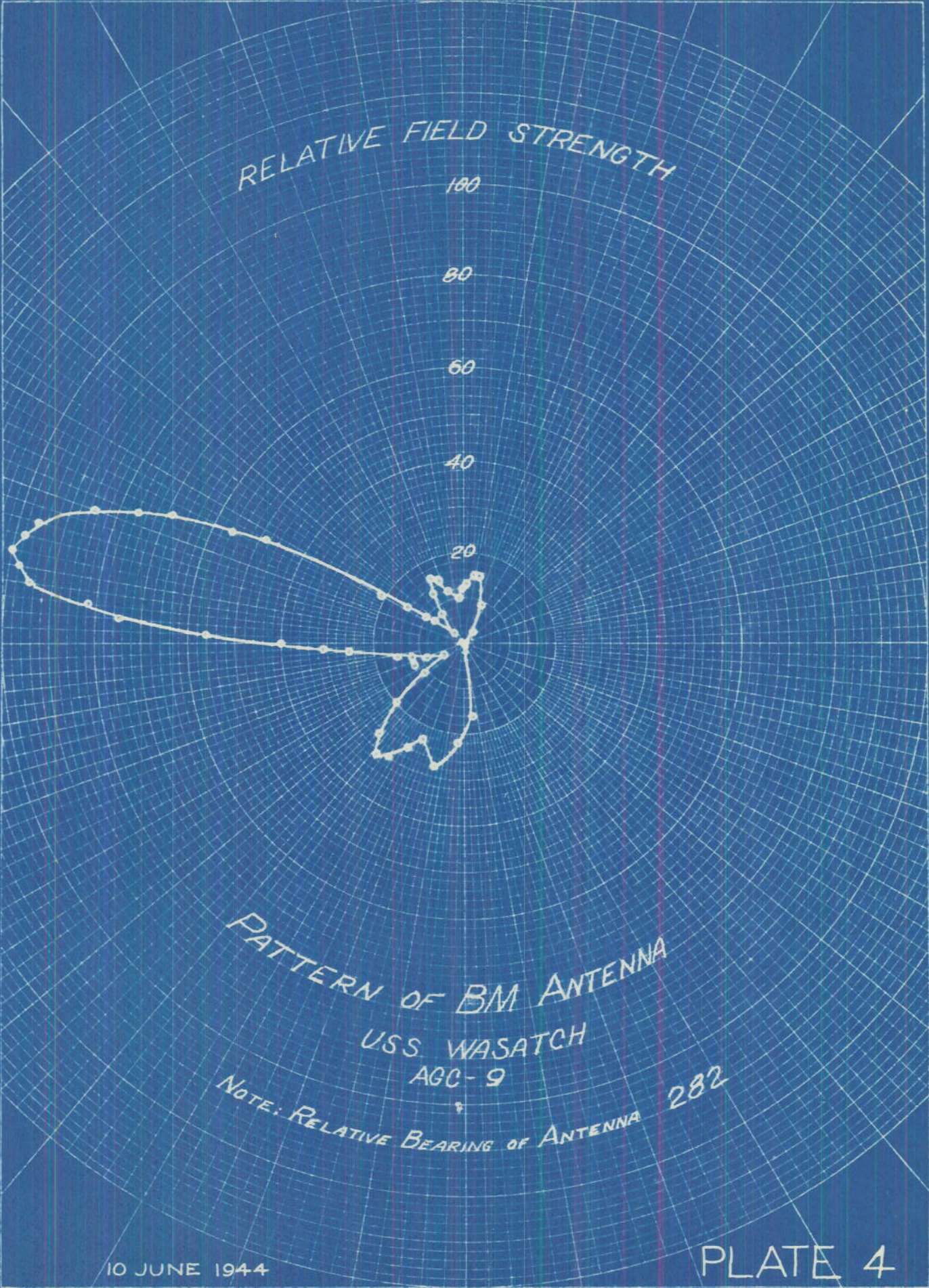
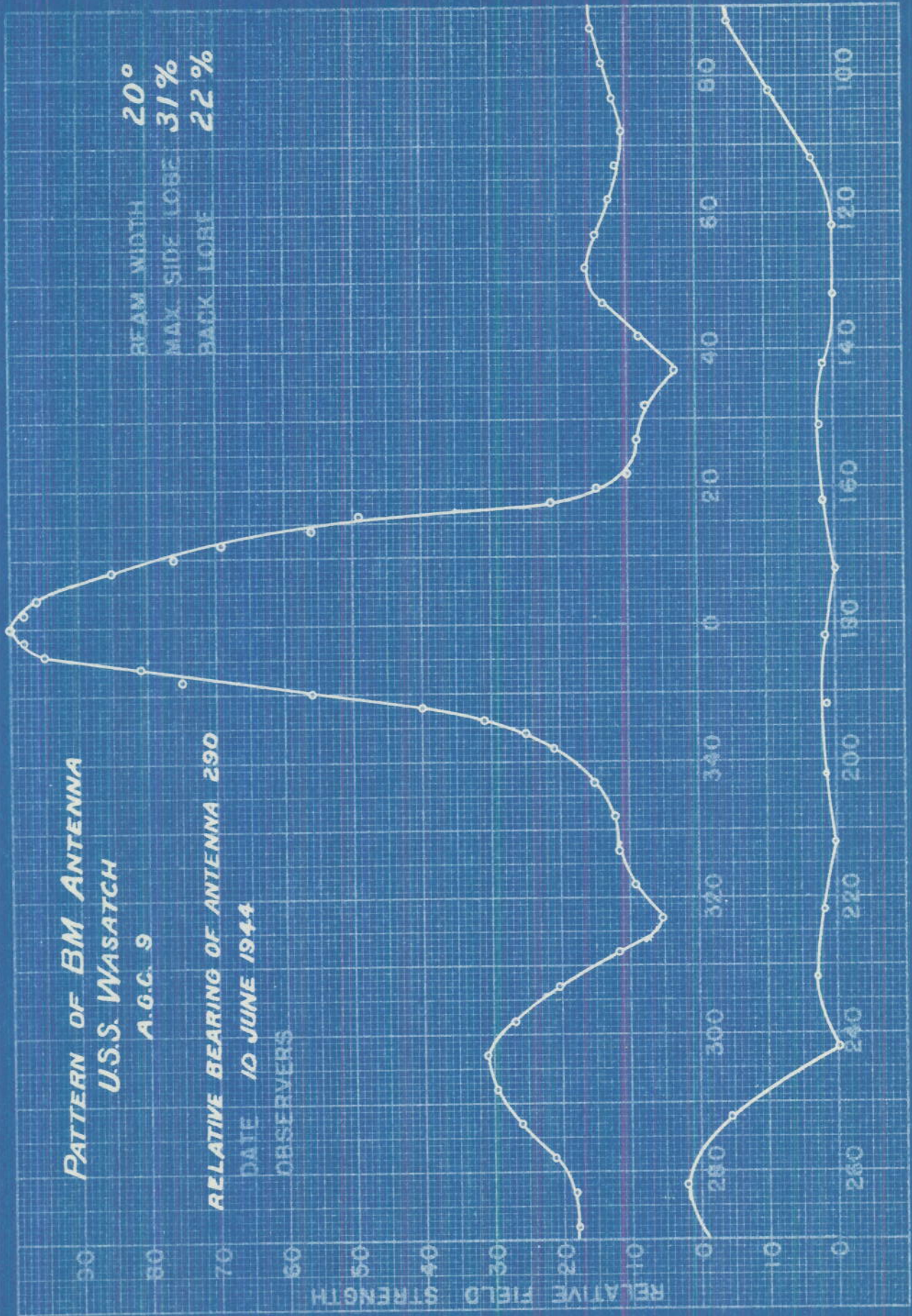


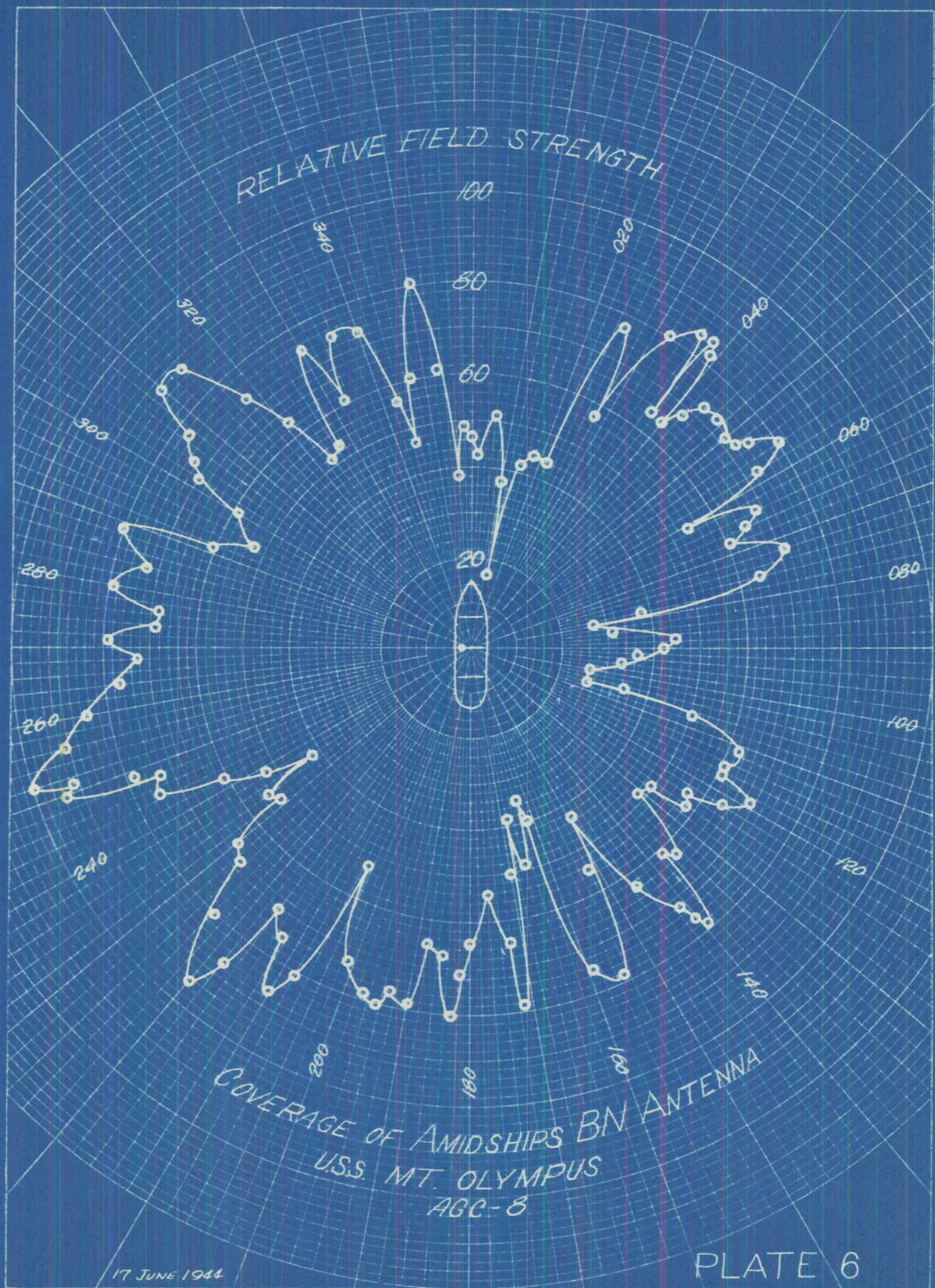
PLATE 3



10 JUNE 1944

PLATE 4





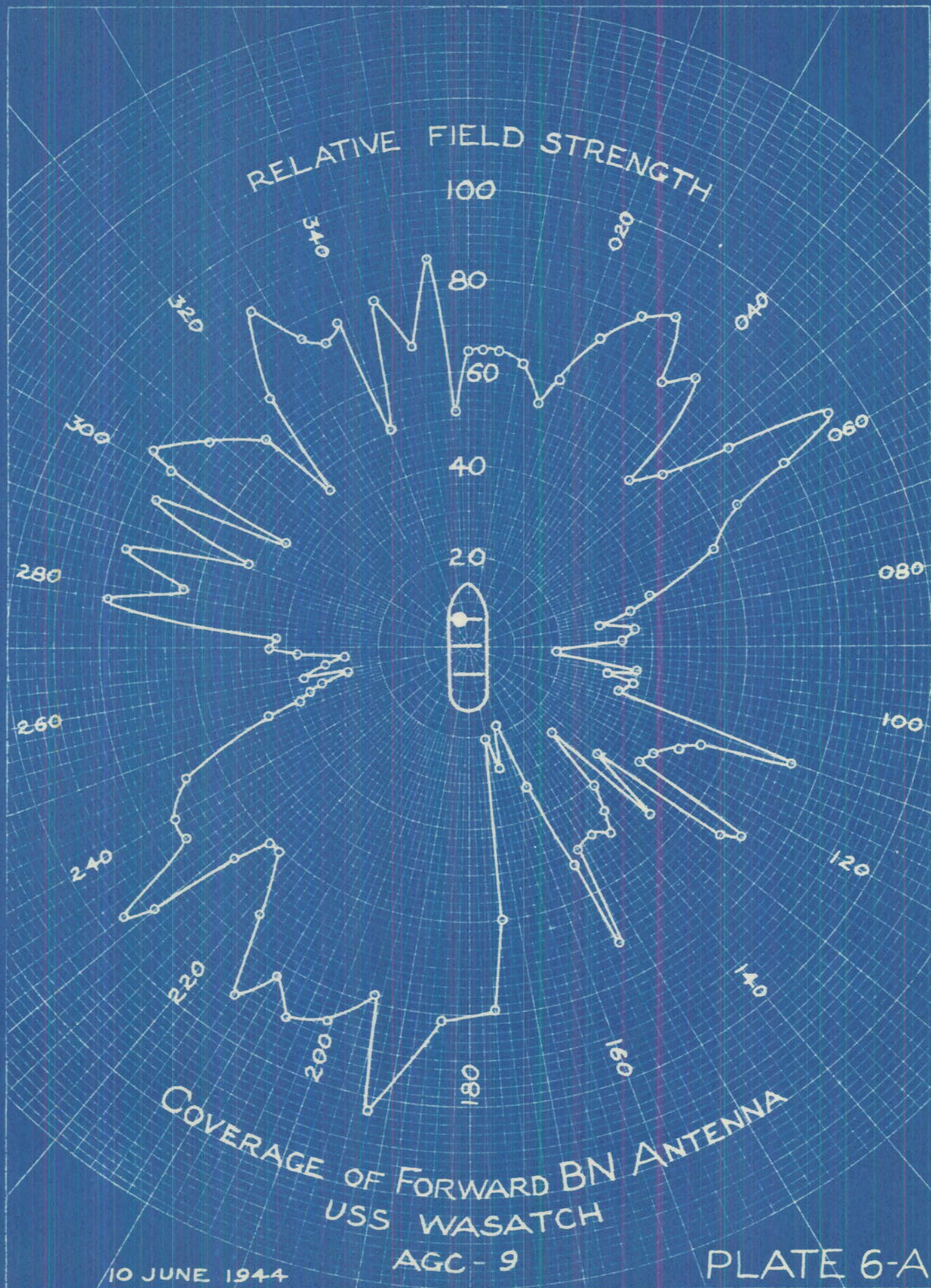
17 JUNE 1944

PLATE 6

SEC. 2

KEUFFEL & ESSER CO., N. Y. NO. 5418

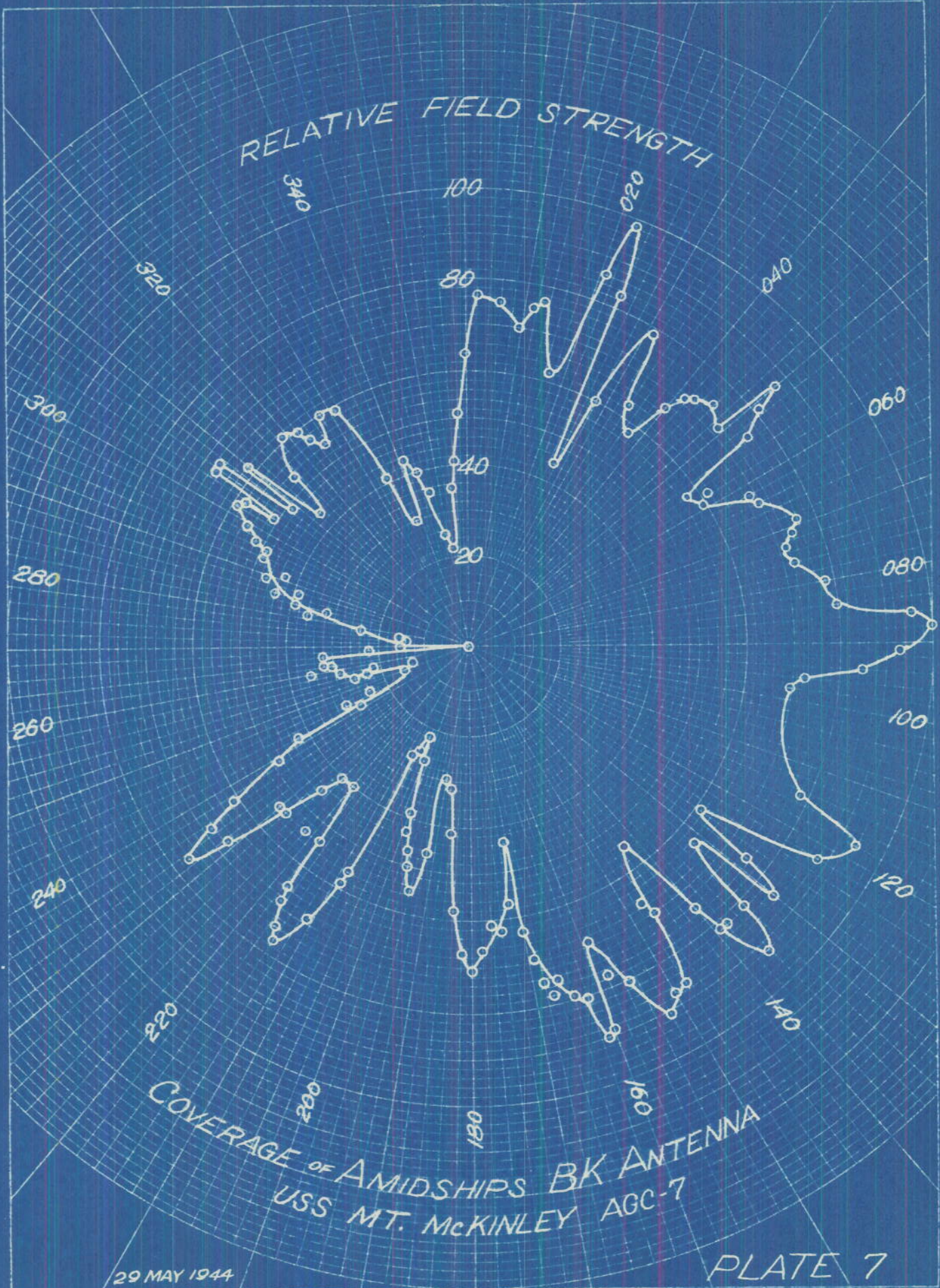
POLAR CO-ORDINATE



10 JUNE 1944

AGC-9

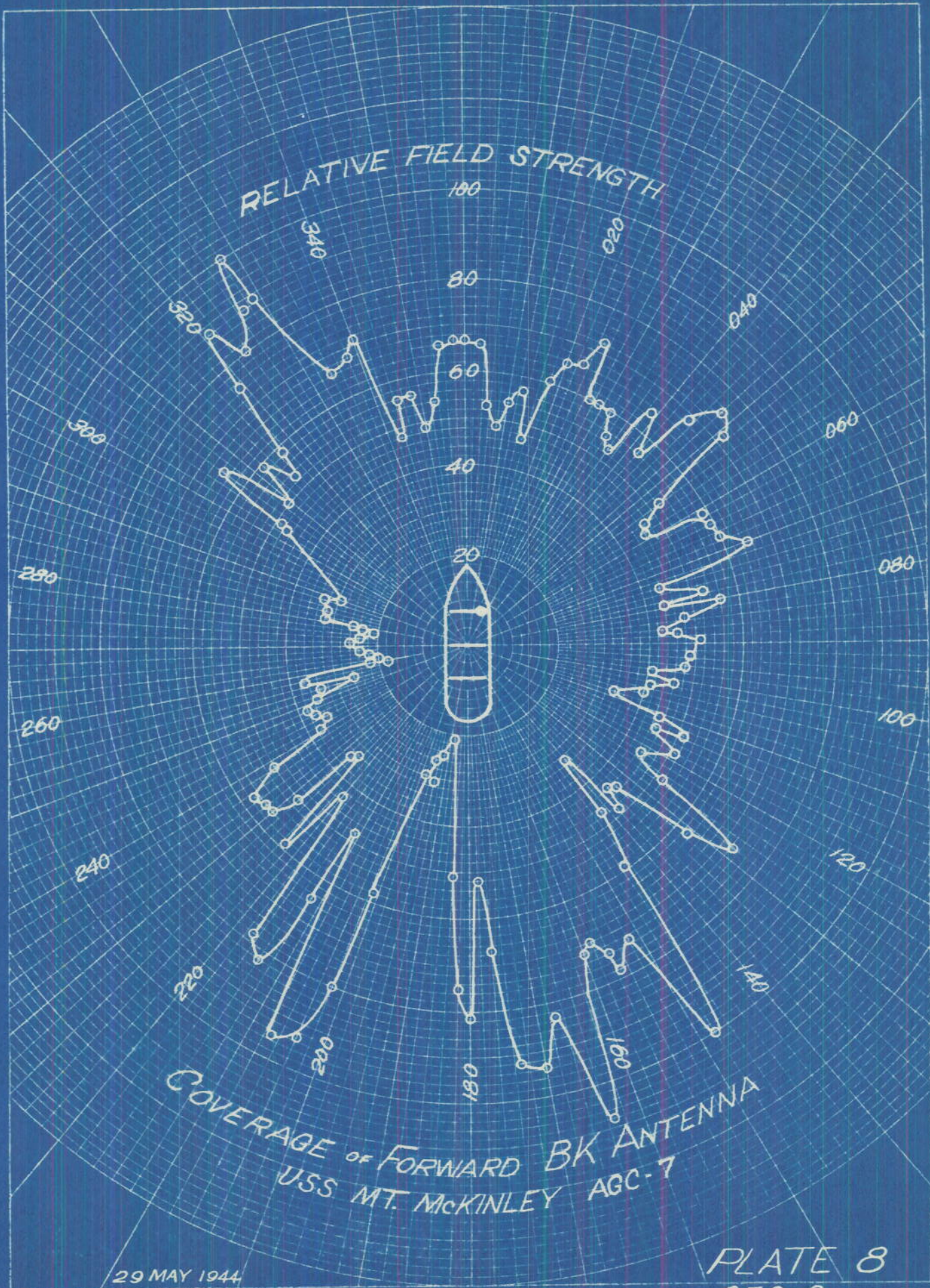
PLATE 6-A



29 MAY 1944

PLATE 7
SEC. 2

KEUFFEL & ESSER CO. N. Y. NO. 2438
POLAR COORDINATE

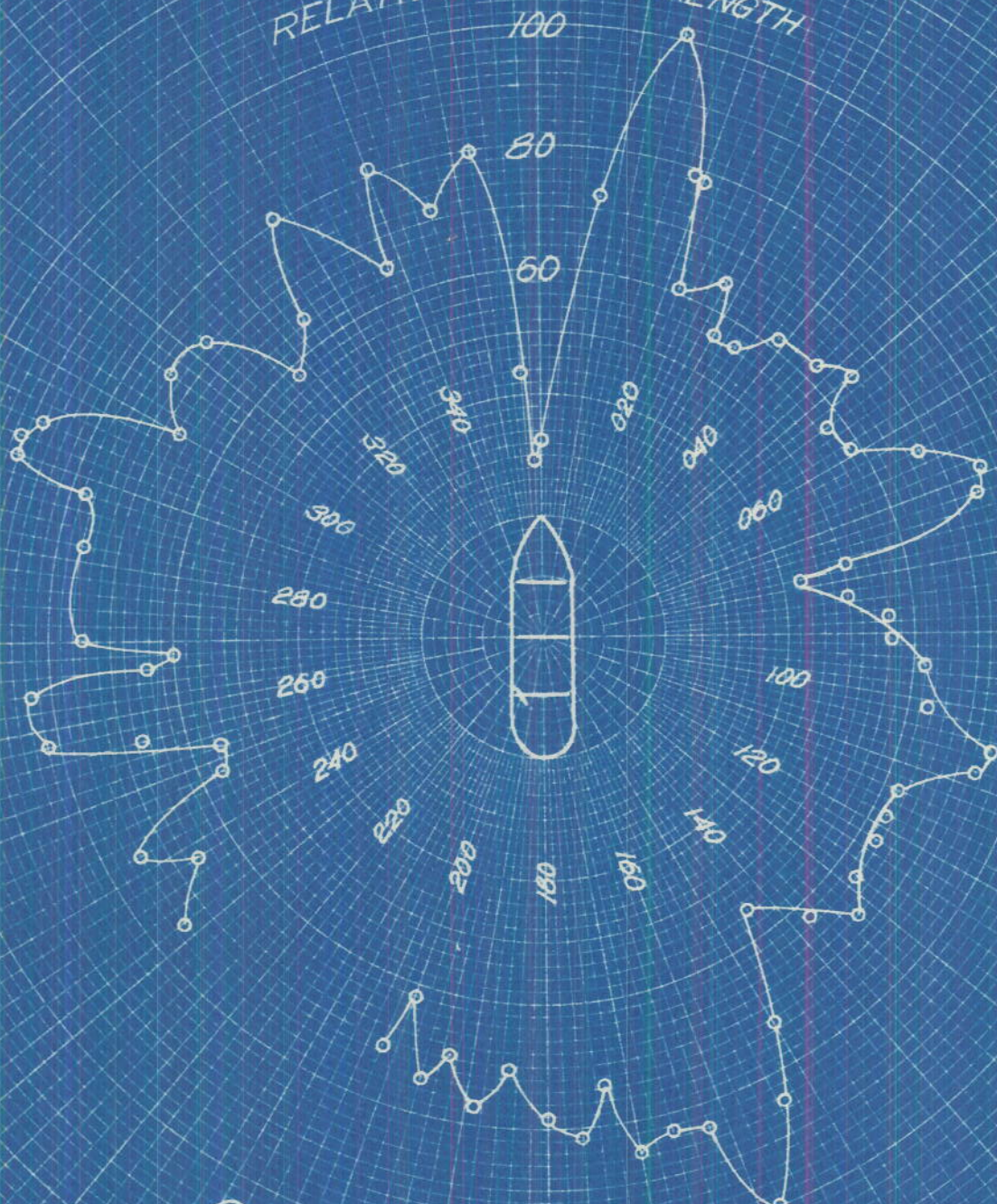


29 MAY 1944

PLATE 8
SEC. 2

UNCLASSIFIED

RELATIVE FIELD STRENGTH



COVERAGE OF YG ANTENNA
USS MT. MCKINLEY
AGC-7

29 MAY 1944

UNCLASSIFIED

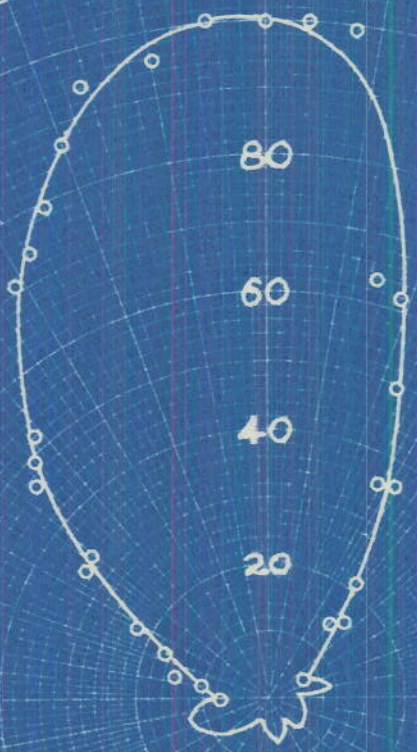
PLATE 9

SEC. 2

KEUFFEL & ESSER CO., N. Y., NO. 3418
POLAR CO-ORDINATE

DECLASSIFIED

RELATIVE FIELD STRENGTH



PATTERN OF YG ANTENNA
USS WASATCH
AGC-9

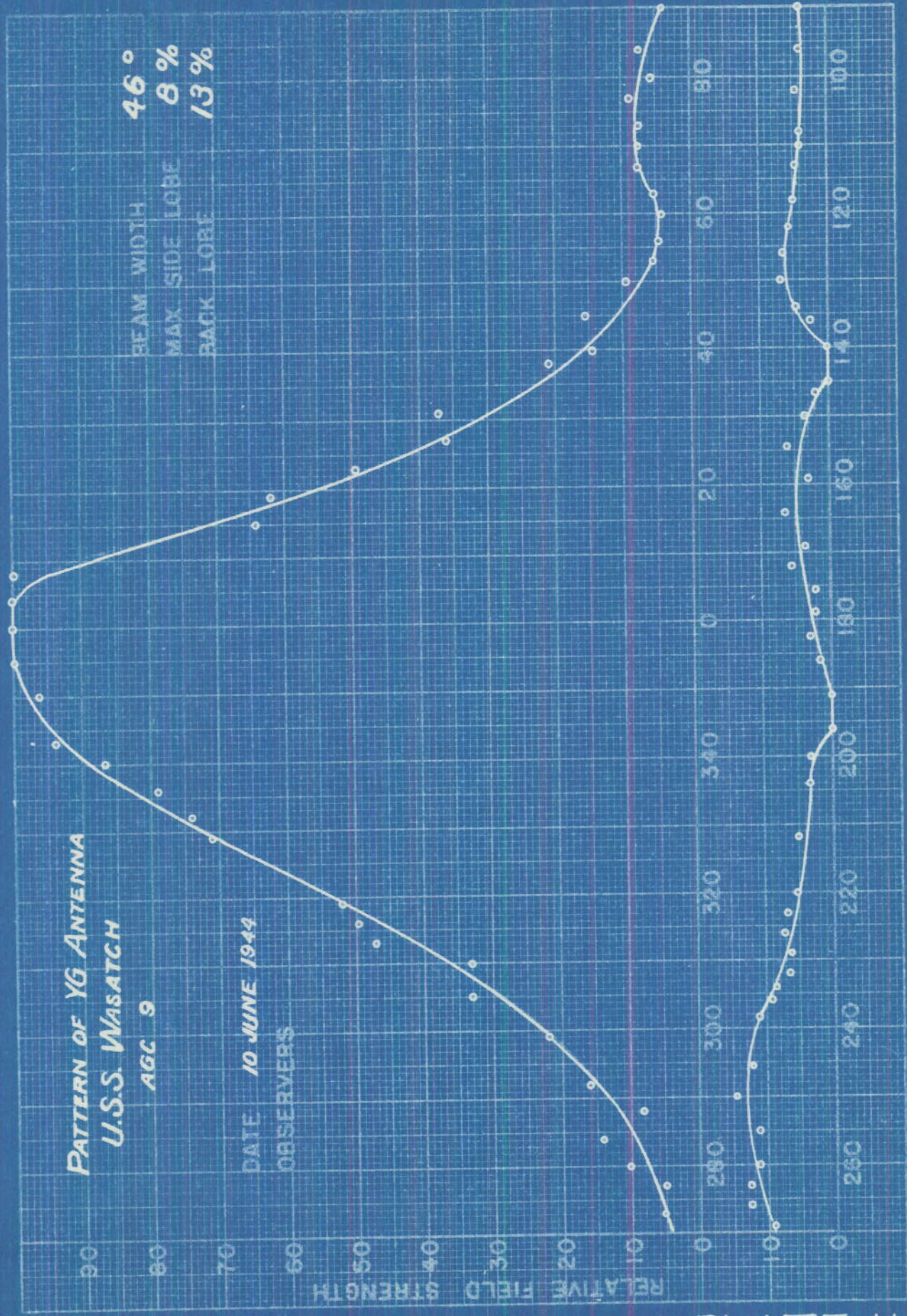
NOTE: ANTENNA TRAINED 220° RELATIVE

10 JUNE 1944

PLATE 10

SEC. 2

KEUFFEL & ESSER CO., N. Y. NO. 1428
POLAR COORDINATE



DECLASSIFIED

SK-2 VERTICAL COVERAGE DIAGRAM - ANTENNA HT. 110 FT.

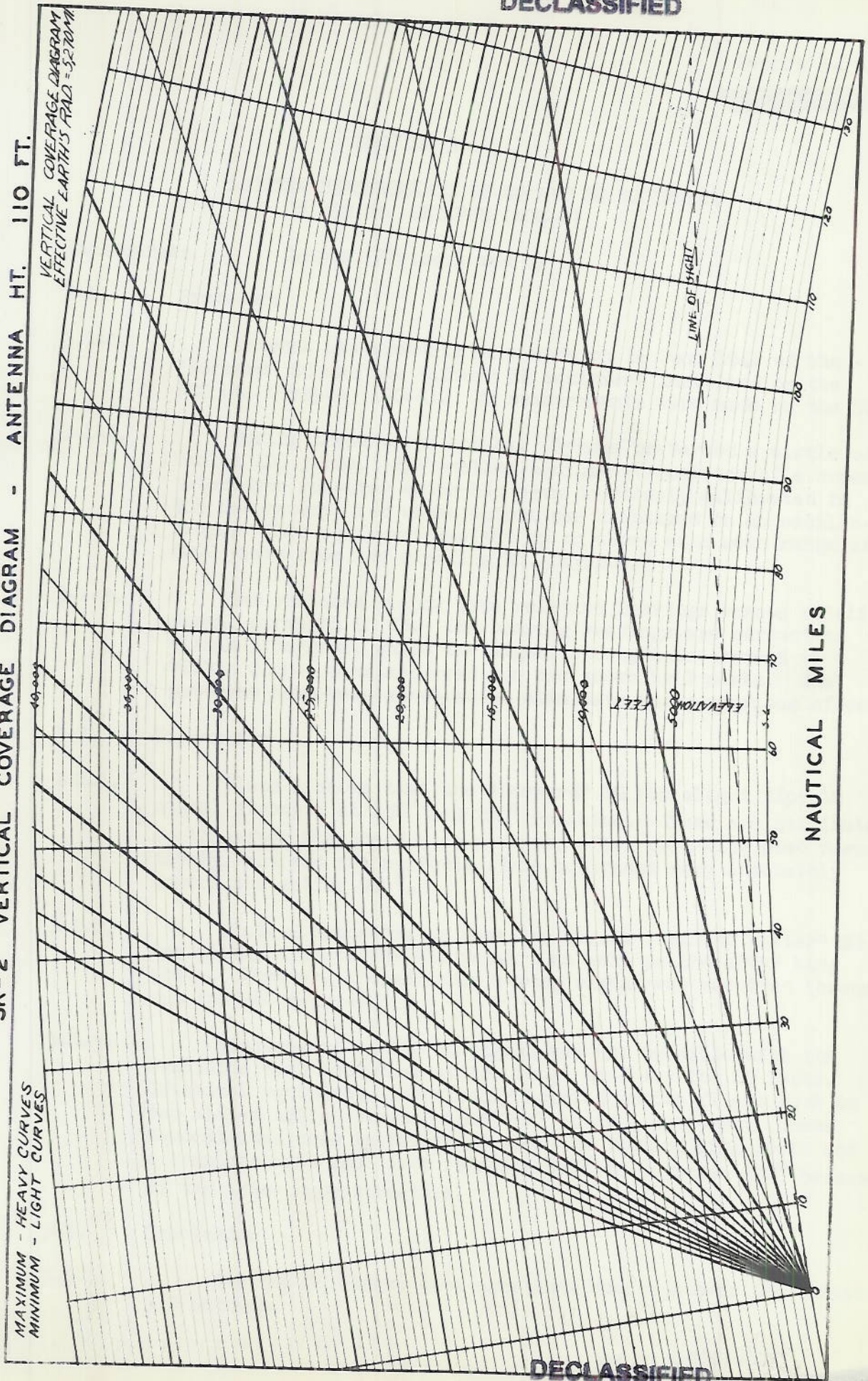
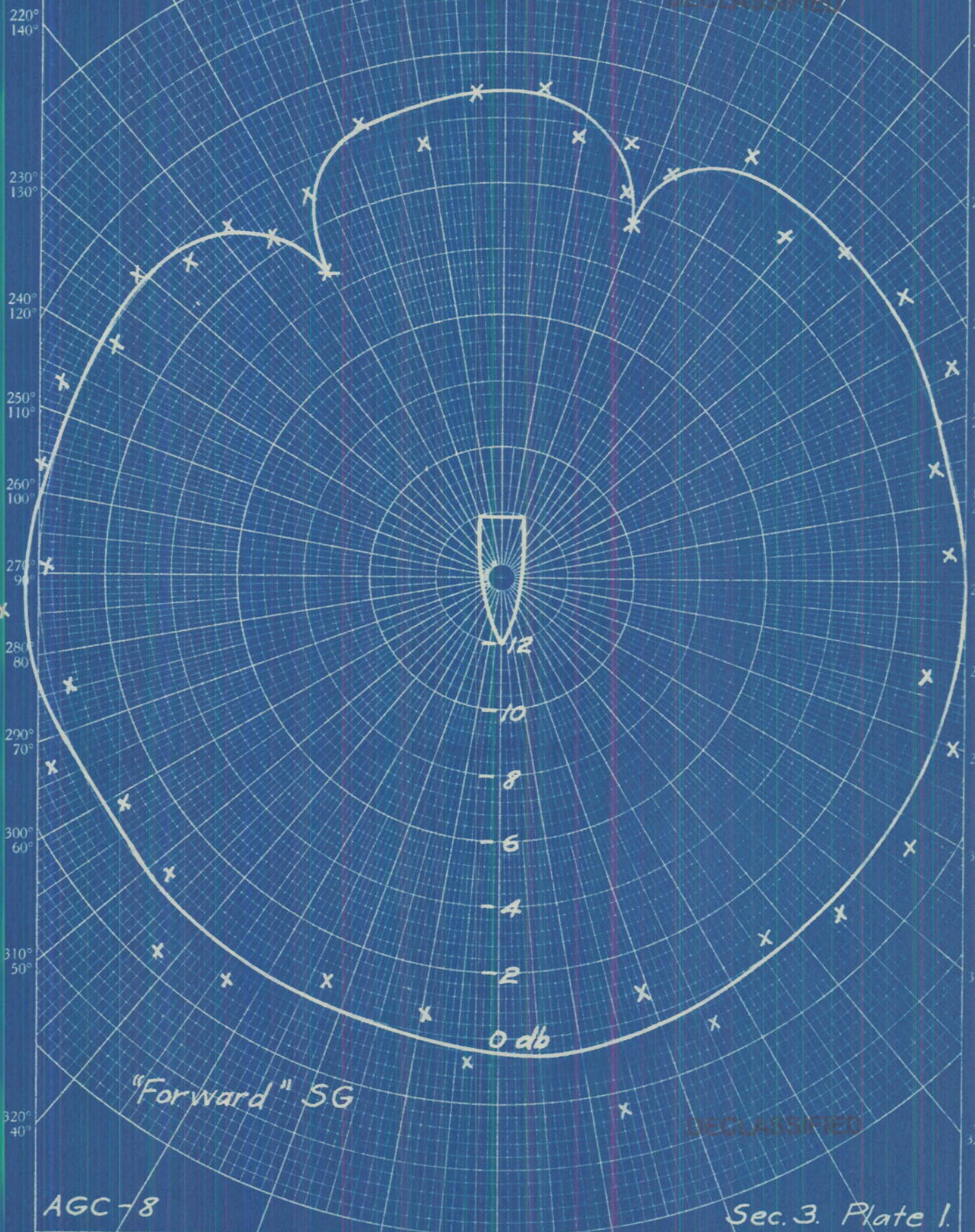


PLATE 12
SEC. 2

DECLASSIFIED

210° 150° 200° 160° 180° 170° 190° 200° 150° 210°



KEUFEL & ESSER CO. NO. 359-31
Polar Coordinate
MADE IN U.S.A.

AGC-8

Sec. 3. Plate 1.

330° 30° 340° 20° 350° 10° 0 10° 350° 20° 340° 30° 330°