APPENDIX J

WDMM FIELD STRENGTH MEASUREMENTS

Extracted from WDMN (formerly WTTO)1967 Full Proof
of Performance for the daytime antenna system (BL-11,577)

CES #10

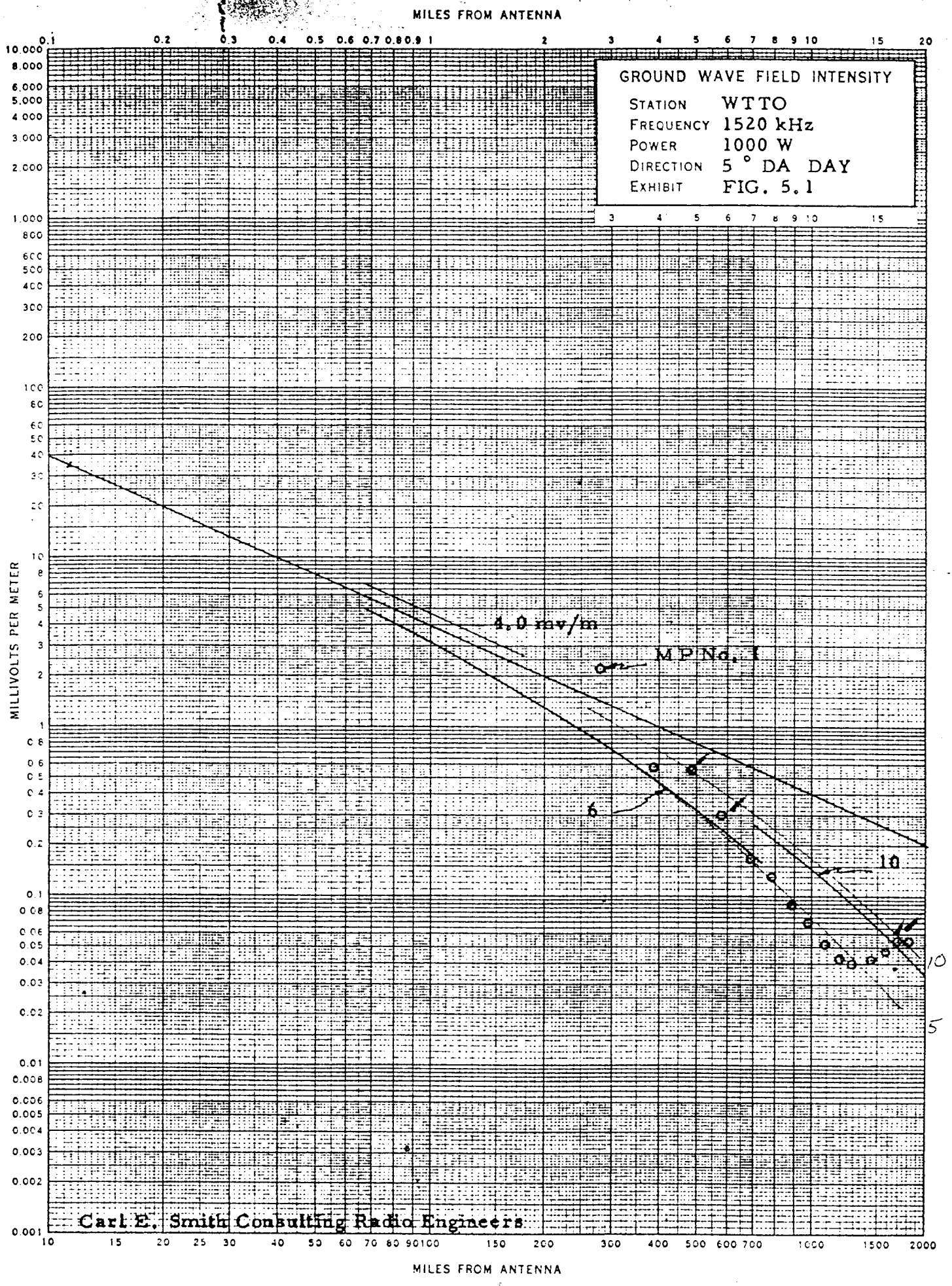
TABLE 5.1

FIELD STRENGTH MEASUREMENTS ON 5° RADIAL DAY

Station WTTO Freq. 1520 kc City Toledo State Ohio

Non-Directional	Directional
Date ____ By ____	Date 12/18/66 By R. W. Minton
Meter Model ____ Serial ____	Meter Model WX2C Serial 863

Point No.	Radial Miles	Field Strength mv/m N.D. Time	N.D.	D.A. Time	D.A.	Notes
						9/66
21R	2.8			8:40	2.2	1.4 MP # 1
22Q	3.35					2.3 Inaccessible except by walking
23P	3.85				0.58	1.5
24O	4.35					— " " "
25N	4.85				0.55	1.20 *
26M	5.35					— " " "
27L	5.85				0.3	0.92 *
28K	6.85				0.168	0.20
29J	7.85				0.13	0.31
30I	8.85				0.088	0.21
31H	9.85				0.070	0.15
32G	10.85				0.052	0.15
33F	11.95				0.043	0.17
34E	12.9				0.040	0.025
35D	14.3				0.043	0.05
36C	15.75				0.048	0.06
37B	16.95				0.055	0.06 *
38A	18.0			11:00	0.055	0.055 *



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K & E 99 1101 24952

CES #10

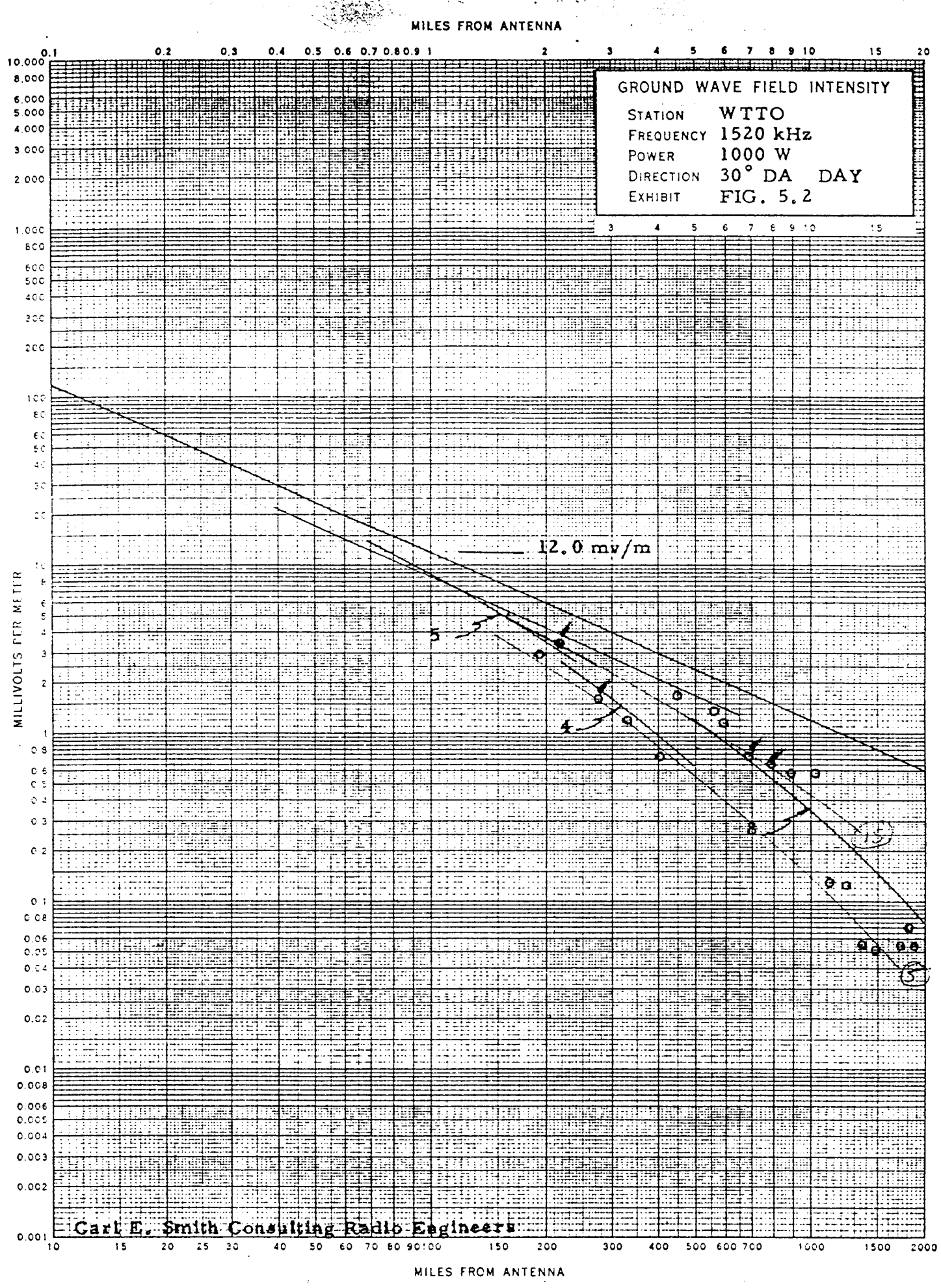
TABLE 5.2

FIELD STRENGTH MEASUREMENTS ON 30° RADIAL DAY

Station WTTO Freq. 1520 kc City Toledo State Ohio

Non-Directional	Directional
Date ____ By ____	Date 12/18/66 By R. W. Minton
Meter Model ____ Serial ____	Meter Model WX 2C Serial 863

Point No.	Radial Miles	Field Strength mv/m N. D. Time	N. D.	D. A. Time	D. A.	Notes
						(M) 9-66
18	1.9			3:22	2.9	—
20	2.15				3.47	6.0 *
21	2.75				1.6	4.2 *
22	3.3				1.18	3.1
23	4.05				0.73	2.1
24	4.5				1.68	2.15
25	5.6				1.33	1.2
26	5.95				1.15	1.1
27	6.8				0.73	1.4 *
28	7.9				0.66	2.0 *
28A	8.9				0.58	—
29	10.3				0.58	1.3
30	11.25				0.13	1.05
31	12.4				0.123	0.64
32	13.6				0.055	0.57
33	14.75				0.052	0.3
34	17.25				0.055	0.34
35	18.15				0.070	0.29
36	18.7			12:29	0.055	


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 30° DA DAY
EXHIBIT FIG. 5.2
12.0 mv/m
MILLIVOLTS PER METER
MILES FROM ANTENNA
Carl E. Smith Consulting Radio Engineers

CES #10

TABLE 5.3

FIELD STRENGTH MEASUREMENTS ON 50° RADIAL DAY

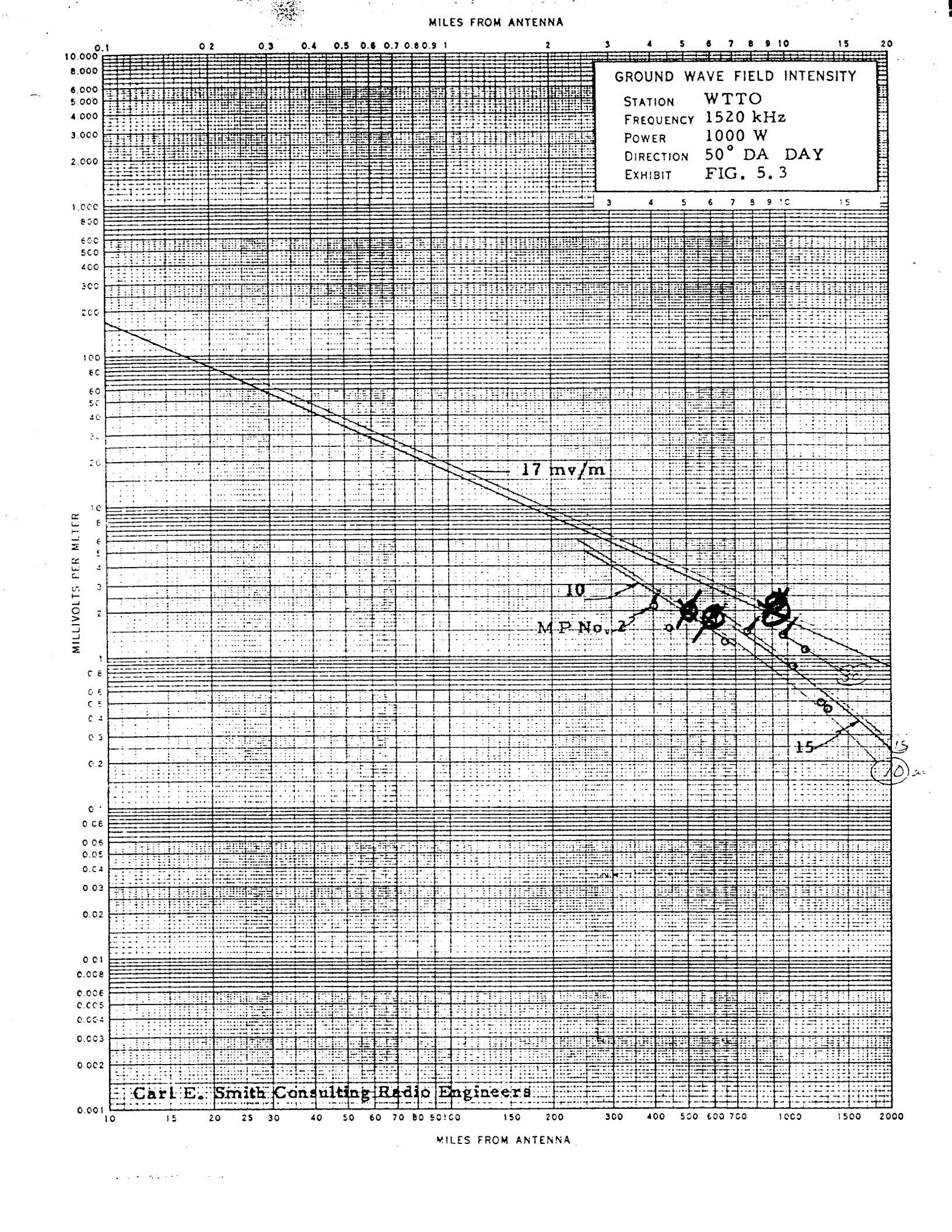
Station WTTO Freq. 1520 kHz City Toledo State Ohio

Non-Directional	Directional
Date ____ By ____	Date 12/21/66 By J. F. Brown
Meter Model ____ Serial ____	Meter Model 120 E Serial 1300

Point No.	Radial Miles	Field Strength mv/m N. D. Time	N. D.	Field Strength mv/m D. A. Time	D. A.	Notes
						9/66 (M)
23	4.0			10:05	2.15	5.0 ✱ MP # 2
24	4.45				1.55	2.5
25	5.05				1.8	4.4 ✱ Power Lines RR
26	5.95				1.7	3.1 ✱ RR
27	6.50				1.25	2.4
28	7.6				1.45	1.95 ✱
29	9.1			✱	2.1	2.7 ✱ Power Lines RR
30	9.7				1.4	2.0 ✱ Co-channel Flutter
31	10.45				0.86	1.25 " "
32	11.3				1.1	1.35 " "
33	12.55				0.49	1.0 " "
34	13.1			11:15	0.45	0.85 " "

Note: All Max.-Min. Ratios except Pt#29 less than 10:1 because of Co-channel Signal.

Co-channel Adapter not used


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 50° DA DAY
EXHIBIT FIG. 5.3
17 mv/m
10
MP No. 2
15
MILLIVOLTS PER METER
Carl E. Smith Consulting Radio Engineers
MILES FROM ANTENNA

CES #10

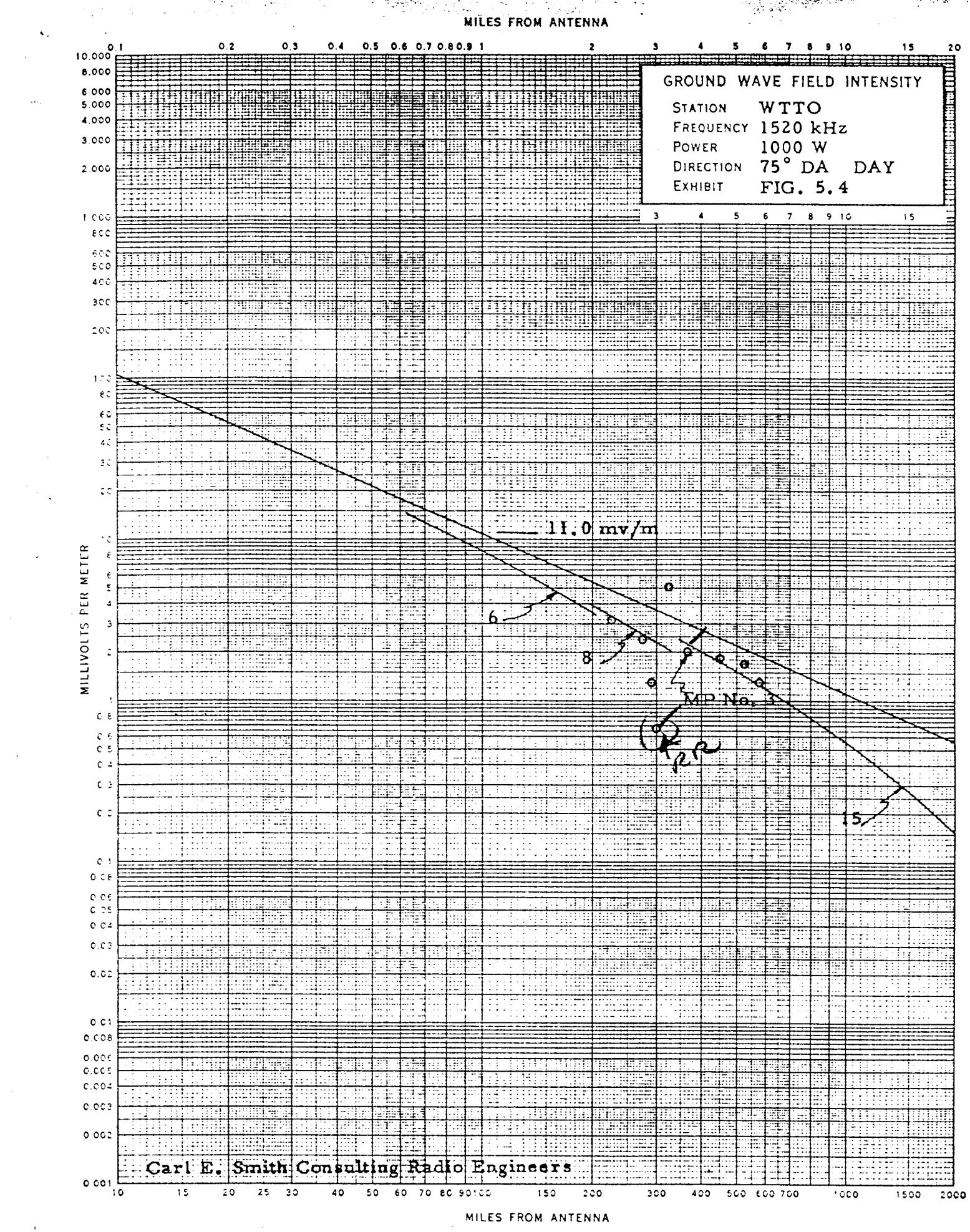
TABLE 5.4

FIELD STRENGTH MEASUREMENTS ON 75° RADIAL DAY

Station WTTO Freq. 1520 kHz City Toledo State Ohio

Non-Directional	Directional
Date ____ By ____	Date 12/19/66 By J.F. Brown
Meter Model ____ Serial ____	Meter Model 120 E Serial 1300

Point No.	Radial Miles	Field Strength mv/m N.D. Time	N.D.	Field Strength mv/m D.A. Time	D.A.	Notes
						9-66 (M)
20	2.25			2:05	~~3.15~~ 3.45	
21	2.75				2.4 ~~3.35~~	
22	2.90				1.3 ~~1.85~~	
23	3.0				0.68 ~~2.05~~ RR	
24	3.25				~~5.1~~ 4.20	
25	3.65				2.0 ~~1.50~~ MP # 3	
26	4.5				1.85 ~~1.05~~	
27	5.22				1.7	Parking area at East end of School building
28	5.75			3:05	1.3 ~~1.65~~	On Alt 24 at N.W. end of guard rail at bridge.
	Note:	All Max.-Min. Ratios except Pt#20 and #24 less than 10:1 because of Co-channel signal. Co-channel adapter not used.				


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 75° DA DAY
EXHIBIT FIG. 5.4
11.0 mv/m
6
8
15
MP No. 3
MILLIVOLTS PER METER
Carl E. Smith Consulting Radio Engineers
MILES FROM ANTENNA

CES #10

TABLE 5.5

FIELD STRENGTH MEASUREMENTS ON 100° RADIAL DAY

Station WTTO Freq. 1520 kHz City Toledo State Ohio

Non-Directional

Date _____ By _____

Meter Model _____ Serial _____

Directional

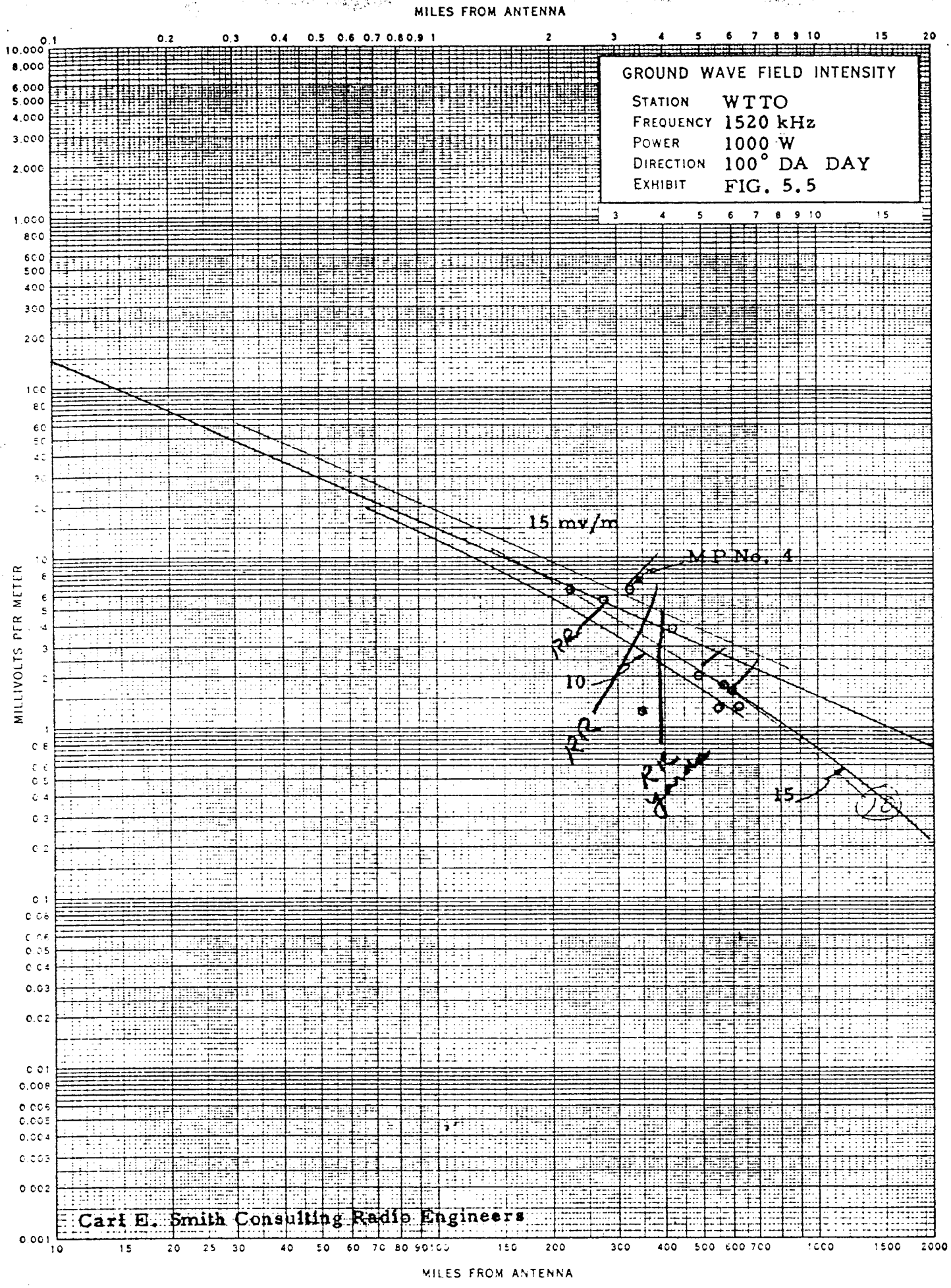
Date 12/19/66 By J.F. Brown

Meter Model 120 E Serial 1300

Point No.	Radial Miles	Field Strength mv/m N.D. Time		Field Strength mv/m D.A. Time		Notes	
						9/66 (M)	DA_{12}/DA_9
20	2.25			11:20	6.5	11	.5909
21	2.75				5.6	8.5 RV	.6588
22	3.25				6.4	7.6 * MP # 4	.8421
23	3.50				1.25	6.0	.2083
24	4.20				3.75	4.3	.8721
25	4.90				2.0	3.55 *	.5634
26	5.52				1.3	1.75	.7429
27	5.7				1.75	2.15 Bridge	.5556
28	5.98			✓	1.65	2.3 * Custom	.7174
29	6.24			12:25	1.3	1.75	.7429
							10 (6.4944
							0.6494 (20
							= 19.4

Note: All Max. - Min. Ratios except Pt. 28 less than 10:1

Because of Co-channel signal. Co-channel adapter not used.


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 100° DA DAY
EXHIBIT FIG. 5.5
15 mv/m
MP No. 4
10
15
MILLIVOLTS PER METER
MILES FROM ANTENNA
Carl E. Smith Consulting Radio Engineers

CES #10

TABLE 5.6

FIELD STRENGTH MEASUREMENTS ON 140° RADIAL DAY

Station WTTO Freq. 1520 kHz City Toledo State Ohio

Non-Directional

Date ______ By ______

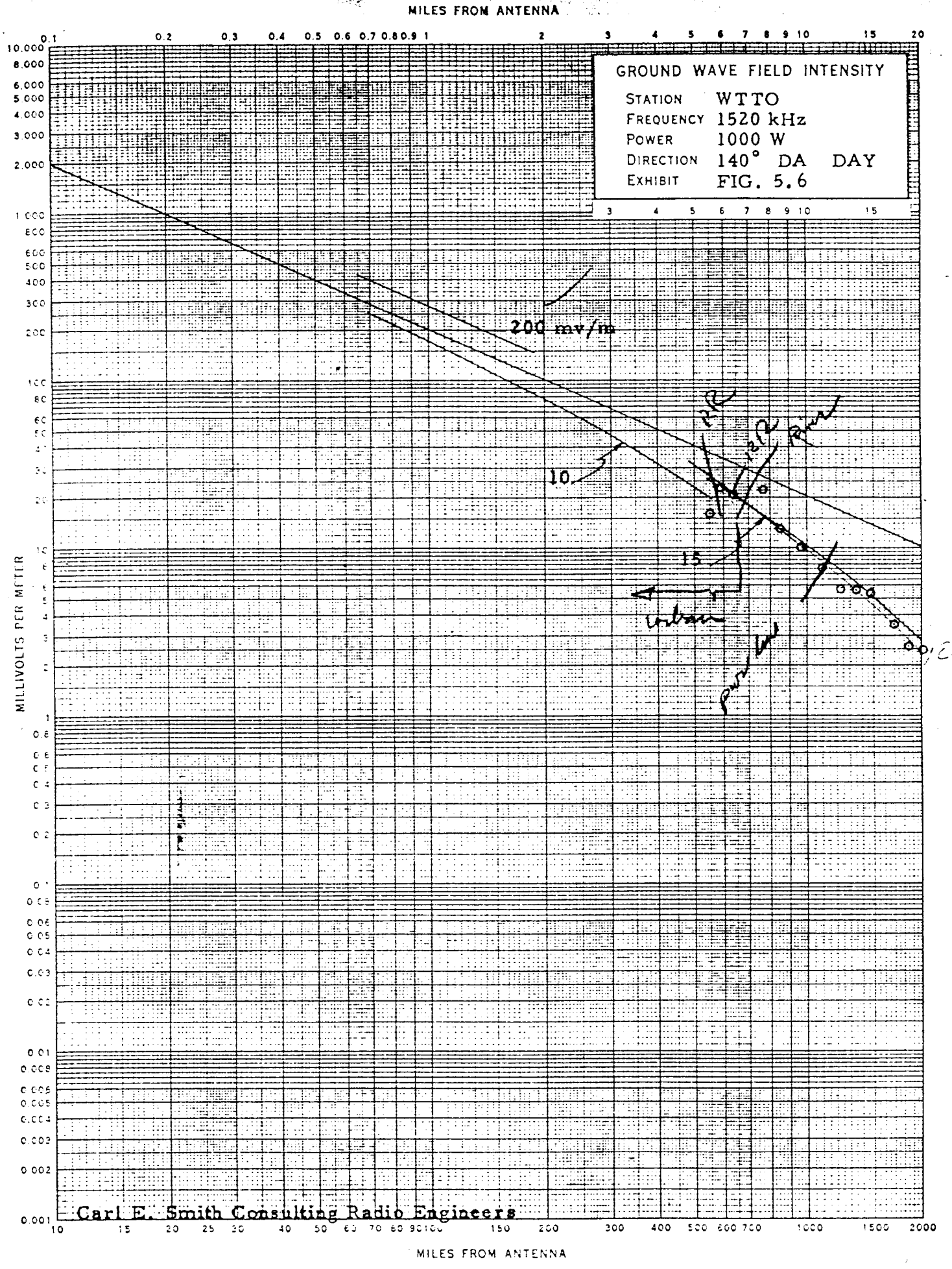
Meter Model ______ Serial ______

Directional

Date 12/18/66 By J. F. Brown

Meter Model 120 E Serial 1300

Point No.	Radial Miles	Field Strength mv/m N.D. Time	N.D.	D.A. Time	D.A.	Notes
						9/66
26	5.5			9:00	16	17
RR 27	5.95				23	25
RR 28	6.4				20.5	23 [illegible] DA12/DA[illegible]
29	7.7				22	19 1.1578
30	8.5				13	14.9 0.8725
31	9.65				10	10.5 0.9524
32	10.9				7.6	7.6 1.0000
33	12.35				5.7	6.2 0.9194
34	13.5				5.6	6.1 0.9180
35	14.7				5.4	5.6 1.0370
36	16.95				3.5	3.35 1.0448
37	18.5				2.6	2.45 1.061
38	20.1			10:35	2.45	2.23 [illegible]
						10/10.0618
						[illegible]



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CES #10

TABLE 5.7

FIELD STRENGTH MEASUREMENTS ON 170° RADIAL DAY

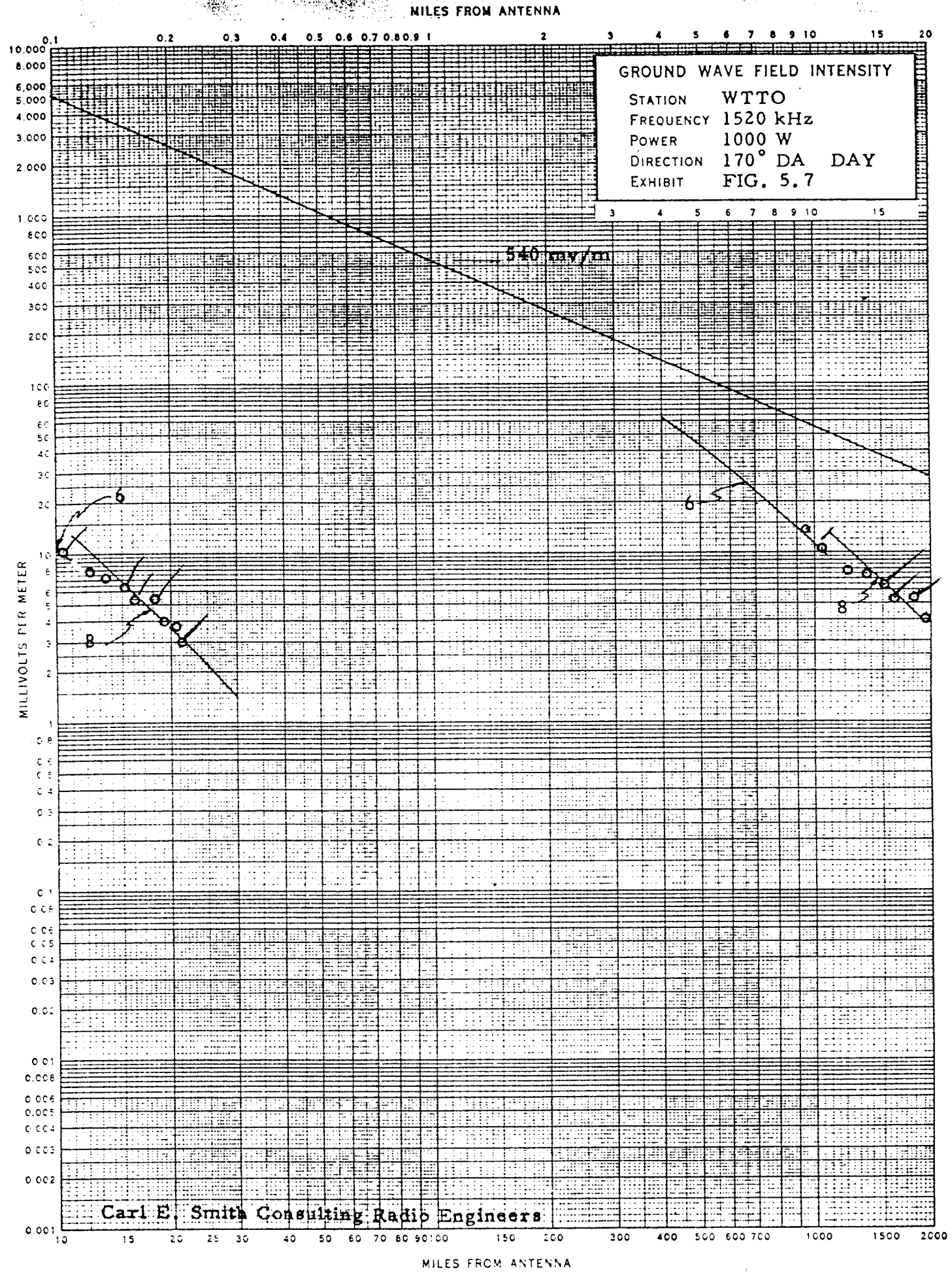
Station WTTO Freq. 1520 kHz City Toledo State Ohio

Non-Directional	Directional
Date ____ By ____	Date 12/18/66 By J.F. Brown
Meter Model ____ Serial ____	Meter Model 120 E Serial 1300

Point No.	Radial Miles	Field Strength mv/m N.D. Time	N.D.	Field Strength mv/m D.A. Time	D.A.	Notes
						9-66 (M)
31	9.55	✓		12:11	13.7	135
32	10.4	✓			10.3	11 *
33	12.2	—			7.8	7.6
34	13.6				7.2	6.4
35	15.1				6.4	5.85 *
36	16.15				5.4	5.85 * 40
37	18.1				5.4	5.3 *
38	19.35				4.0	3.9
39	20.65				3.75	3.6
40	21.2			11:10	3.0	2.45 *

1:1 ratio PA-1/DA-2

Note: All Max. - Min. Ratios except Pt. #33, 34, 39 & 40 Greater than 10:1. High Minima on 39 & 40 probably due to Co-channel signals. Co-channel adapter not used.


MILES FROM ANTENNA
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 2 3 4 5 6 7 8 9 10 15 20
10.000 8.000 6.000 5.000 4.000 3.000 2.000 1.000 800 600 500 400 300 200 100 80 60 50 40 30 20 10 8 6 5 4 3 2 1 0.8 0.6 0.5 0.4 0.3 0.2 0.1 0.08 0.06 0.05 0.04 0.03 0.02 0.01 0.008 0.006 0.005 0.004 0.003 0.002 0.001
MILLIVOLTS PER METER
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 170° DA DAY
EXHIBIT FIG. 5.7
540 mv/m
6
6
8
8
Carl E. Smith Consulting Radio Engineers
10 15 20 25 30 40 50 60 70 80 90 100 150 200 300 400 500 600 700 1000 1500 2000
MILES FROM ANTENNA

CES #10

TABLE 5.8

FIELD STRENGTH MEASUREMENTS ON 200° RADIAL DAY

Station WTTO Freq. 1520 kHz City Toledo State Ohio

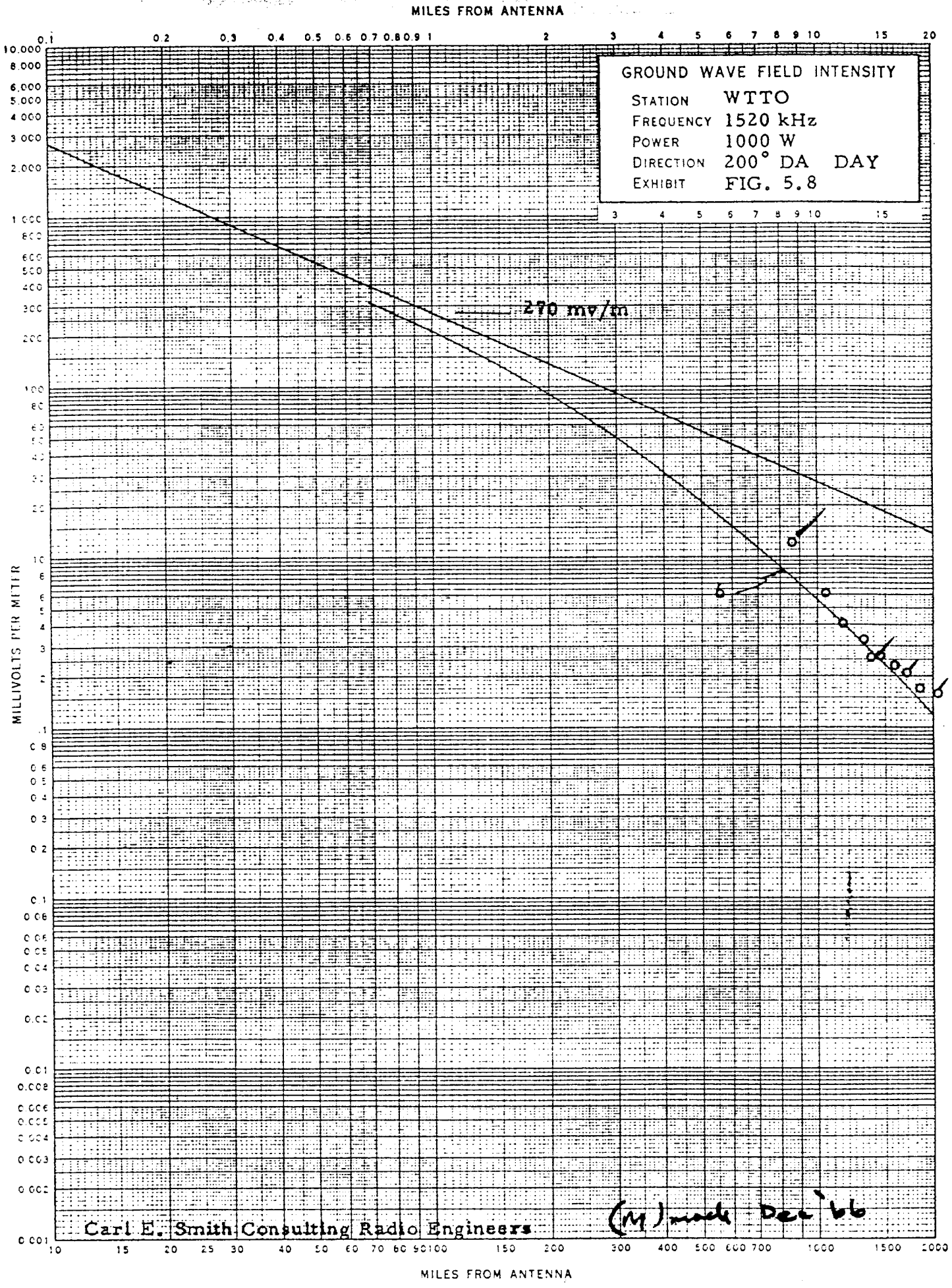
Non-Directional		Directional
Date	By	Date 12/18/66 By J.F. Brown
Meter Model	Serial	Meter Model 120 E Serial 1300

Point No.	Radial Miles	Field Strength mv/m N.D. Time	N.D.	Field Strength mv/m D.A. Time	D.A.	Notes
30	8.65			1:52	12.0	7.5 *
31	10.5				6.0	4.4
32	11.55				4.0	3.0
33	13.15				3.25	2.65
34	13.8				2.55	2.16
35	14.5				2.60	1.6* House # 26700
36	15.8				2.30	1.58
37	16.9				2.10	1.75 *
38	18.5				1.70	1.2
39	20.35			12:44	1.55	1.2 *

Note: All Max.-Min. Ratios except Pt. #33, 38 & 39 greater than 10:1

High Minima on 38 & 39 probably due to Co-channel signals.

Co-channel adapter not used.


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 200° DA DAY
EXHIBIT FIG. 5.8
270 mv/m
MILLIVOLTS PER METER
Carl E. Smith Consulting Radio Engineers
(M) mod Dec '66
MILES FROM ANTENNA

CES #10

TABLE 5.9

FIELD STRENGTH MEASUREMENTS ON 240° RADIAL DAY

Station WTTO Freq. 1520 kc City Toledo State Ohio

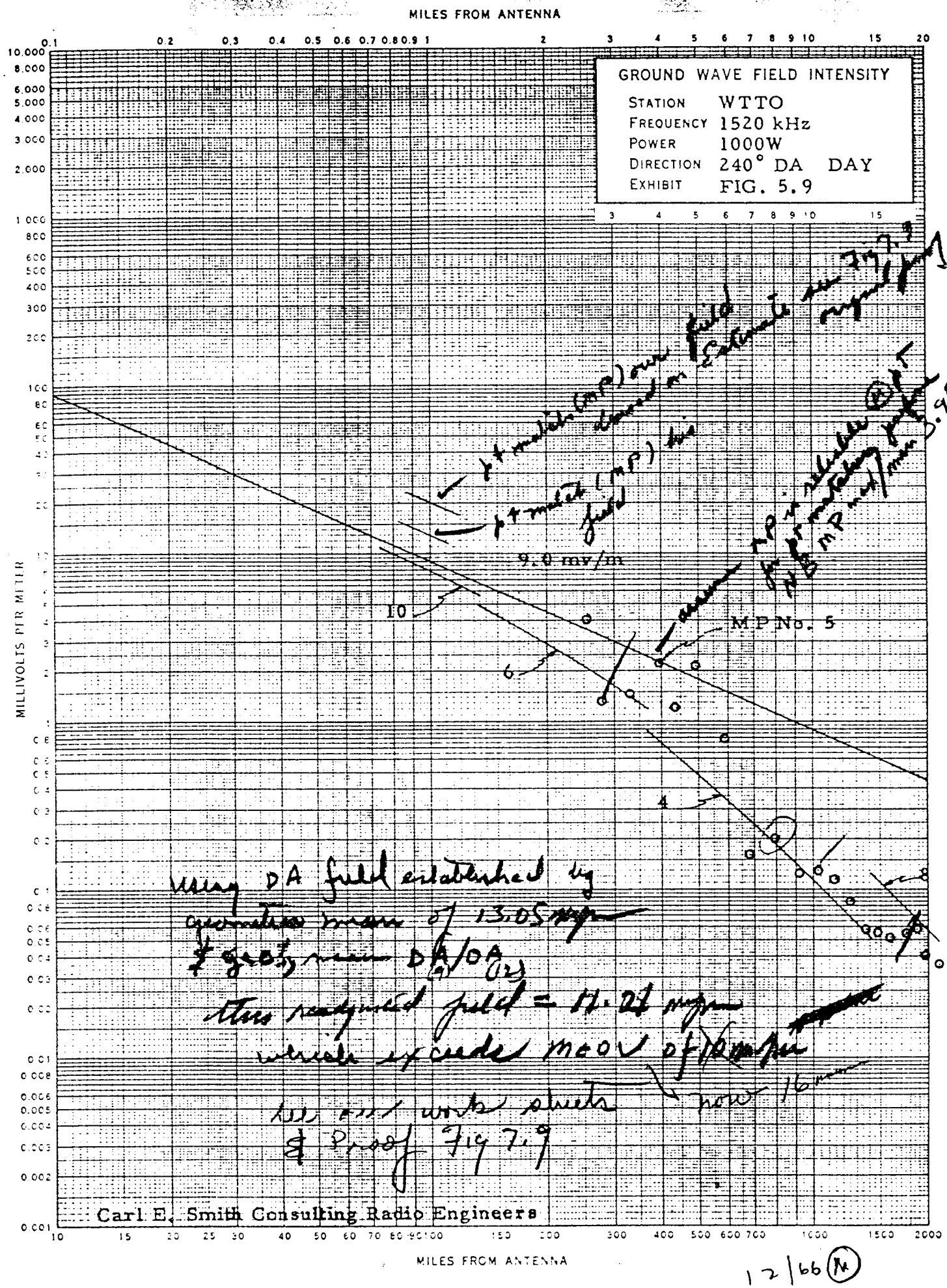
Non-Directional		Directional	
Date	By	Date	By R. W. Minton
Meter Model	Serial	Meter Model WX2C	Serial 863

Point No.	Radial Miles	Field Strength mv/m N.D.	N.D. Time	D.A. Time	D.A.	Notes
						9/66 DA-2/DA-1
						12/18/66
20	2.55	✓		4:03	4.1	5.7 — 0.7193
21	2.78	✓			1.32	5.0 * — 0.2640 out
22	3.3	✓			1.45	1.3 — 1.1154
23	3.95	✓			2.2	1.5 MP # 5 — 1.4667
24	4.35	✓			1.22	1.7 — 0.7176
25	4.95	✓			2.15	1.4 — 1.5357
(26)	5.9	✓			0.78	—
27	6.8	✓		4;59	0.16	2.5 — 0.0640 out
						12/19/66
28	8.0	✓		11:35	0.2	0.24 — 0.8333 Thursday Hi Temp 69 KW
29	9.15	✓			0.123	0.13 — 0.9462
30	10.3	✓			0.13	0.078 * — 1.3265
31	11.4	✓			0.11	0.088 — 1.3181
32	12.55	✓			0.085	0.098 — 0.8673
33	13.7	✓			0.058	0.06 — 0.7250
34	14.85	✓			0.055	0.098 — 0.5612
35	15.93	✓		12:59	0.051	0.06 — 0.1821 out
						12/22/66
36	17.56	✓		11:19	0.055	0.21 — 0.1774 out
37	18.7	✓			0.058	0.066 — 0.8529
38	19.88	✓			0.040	0.082 — 0.4878
39	21.06	✓			0.036	0.09 — 0.3913

NVL

~~13.3430~~ ~~.8853~~

13.3430
− .3120
14 | 13.0310
93078



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12/66 (N)

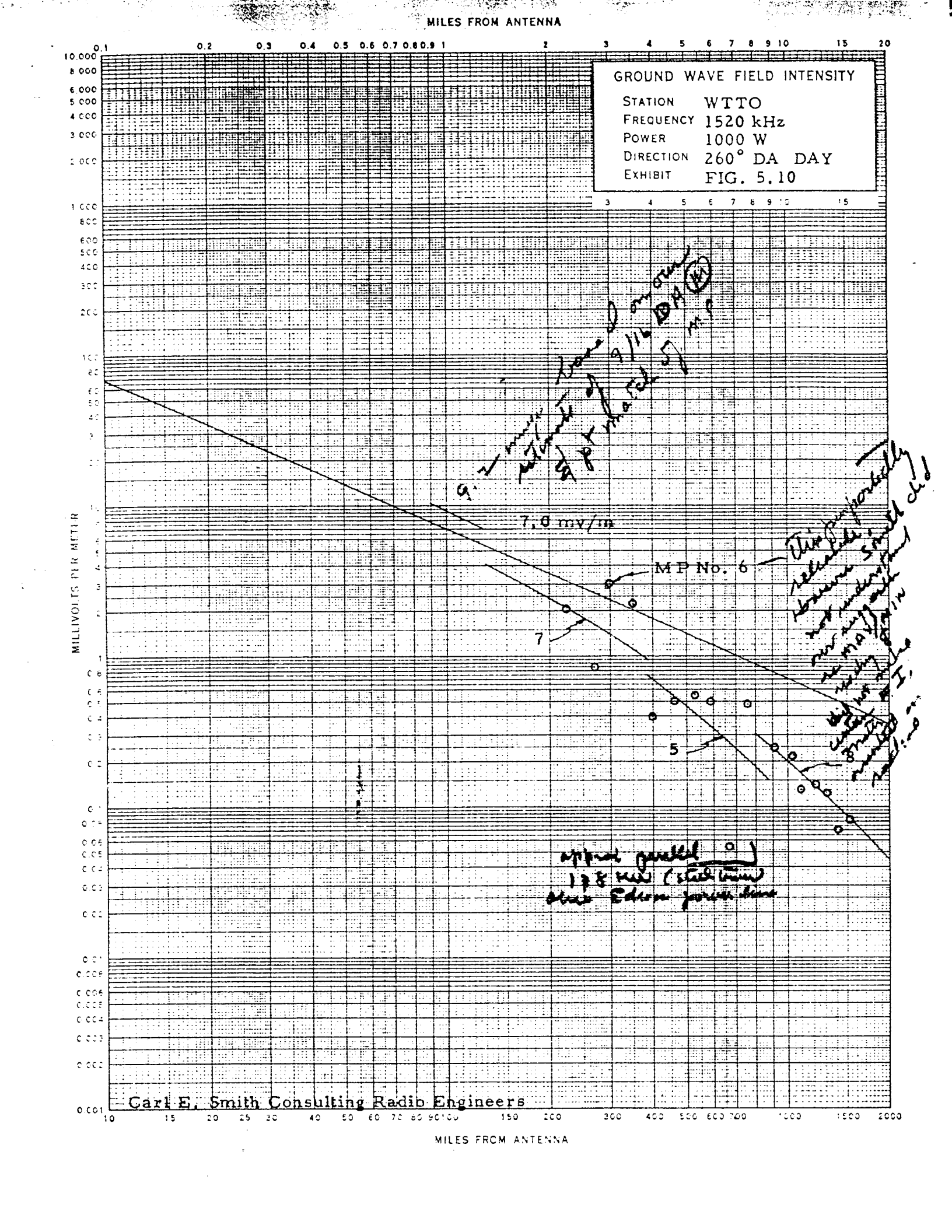
CES #10 TABLE 5.10

FIELD STRENGTH MEASUREMENTS ON 260° RADIAL DAY

Station WTTO Freq. 1520 kc City Toledo State Ohio

Non-Directional		Directional
Date	By	Date 12/19/66 By R. W. Minton
Meter Model	Serial	Meter Model WX2C Serial 863

Point No.	Radial Miles	Field Strength mv/m N. D. Time	N. D.	D. A. Time	D. A.	Notes
						9-66 (M)
20	2.25			4:15	2.03	3.1
21R	2.7				0.85	3.5
22Q	3.0				3.0	6.0* MP# 6
23P	3.5				2.23	—
24O	4.0				0.4	0.8
25N	4.65				0.5	0.2
26M	5.3				0.55	0.38
27L	5.95				0.5	2.8
28K	6.7				0.055	0.1
29J	7.6				0.48	—
30I	9.15				0.25	0.32
31H	10.4				0.22	0.16
32G	10.95				0.13	0.072
33F	12:15				0.14	0.166*
34A	13.15				0.123	0.130
35B	14.15				0.070	0.078
36C	15.3			1:14	0.082	—


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 260° DA DAY
EXHIBIT FIG. 5.10
MILLIVOLTS PER METER
7.0 mv/m
MP No. 6
7
5
MILES FROM ANTENNA
Carl E. Smith Consulting Radio Engineers

CES #10

TABLE 5.11

FIELD STRENGTH MEASUREMENTS ON 285° RADIAL DAY

Station WTTO Freq. 1520 kc City Toledo State Ohio

Non-Directional

Date ____ By ____

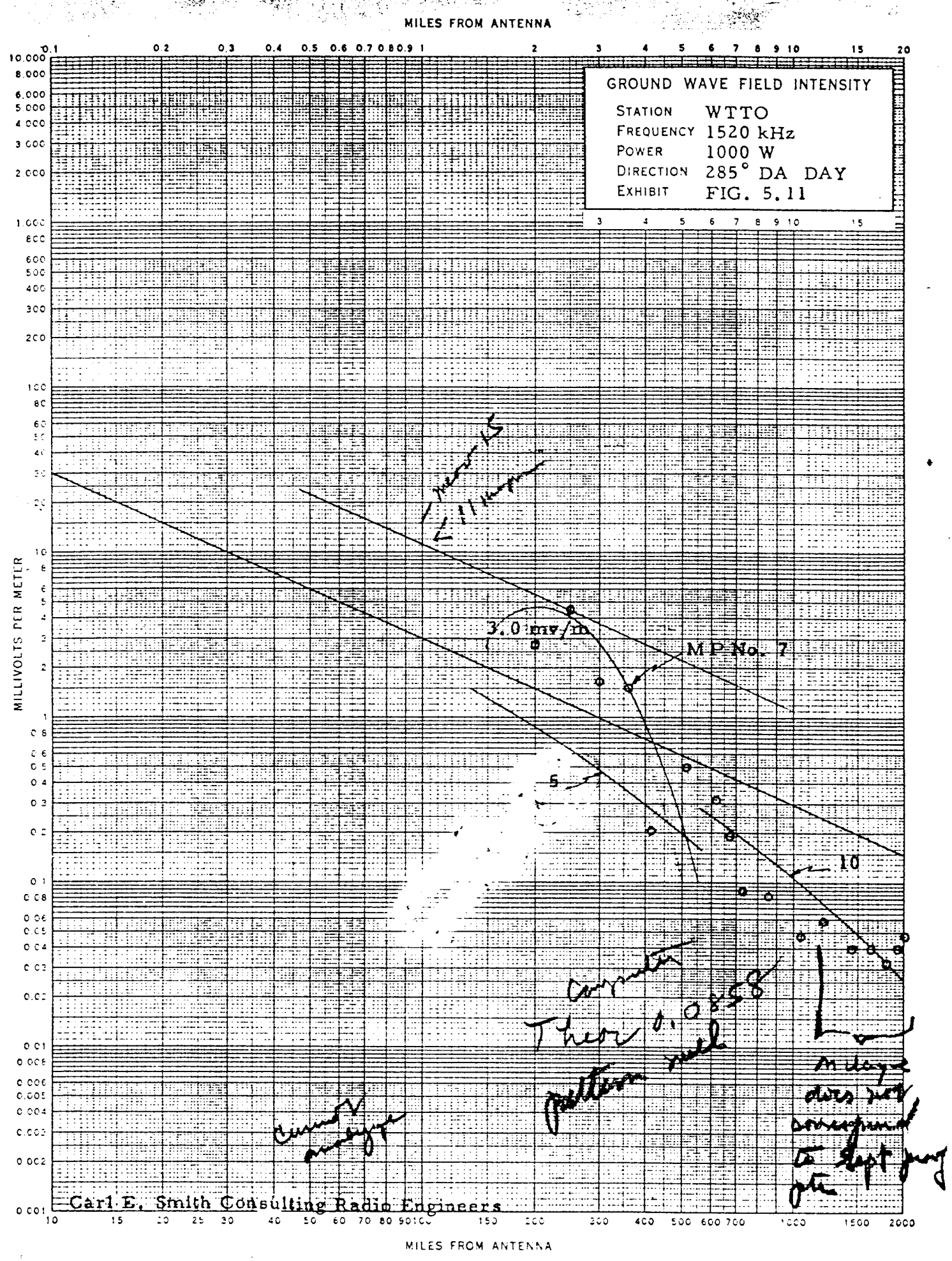
Meter Model ____ Serial ____

Directional

Date 12/20/66 By R. W. Minton

Meter Model WX2C Serial 863

Point No.	Radial Miles	Field Strength mv/m N.D. Time		Field Strength mv/m D.A. Time		Notes	
						9 pts	DA12/DA9
19	2.0	✓		10:00	2.72	2.25	1.2089
20	2.5	—			4.5	—	Junc. Colonial & Brookside - No null
21	3.0	✓			1.65	1.2	1,3750
22	3.6	✓			1.5	1.6 MP#7	0.9375
23	4.15	—			0.205	—	
24	5.15	5.1			0.50	0.42	1.1905
25	6.15	✓			0.32	0.52	0.6154
26	6.7	✓			0.19	0.40	0.4750
27	7.3	✓			0.088	0.30	0.2933
28	8.5	✓			0.082	0.17	0.4824
29	10.4	✓			0.0475	0.42	0.1131
30	12.1	11.7			0.058	0.25	0.2320
31	14.4	13.5			0.040	0.11+	0.3636
32	16.3	15.65			0.040	0.15+	0.2667
33	18.0	17.2			0.033	0.12+	0.2750
34	19.4	19.0			0.040	0.093+	0.4301
35	20.1			1:07	0.0475	—	
						14) 8.2585 all points	
						= 0.589892	
						× 9 = 5.31 mvpm	
						(do not use)	


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 285° DA DAY
EXHIBIT FIG. 5.11
MILLIVOLTS PER METER
3.0 mv/m
MP No. 7
5
10
Carl E. Smith Consulting Radio Engineers
MILES FROM ANTENNA

CES #10 TABLE 5.12

FIELD STRENGTH MEASUREMENTS ON 311° RADIAL DAY

Station WTTO Freq. 1520 kHz City Toledo State Ohio

Non-Directional		Directional
Date	By	Date 12/28/66 By R. W. Minton
Meter Model	Serial	Meter Model WX2C Serial 863

Point No.	Radial Miles	Field Strength mv/m N.D. Time	N.D.	Field Strength mv/m D.A. Time	D.A.	Notes
						9/66 (m) DA sgl / DA sgl
19	2.0	✓		11:05	5.4	4.7 * 0.6207
20Q	2.65	✓			3.8	2.9 1.3103
21P	3.4	✓			3.8	4.0 * 0.9500
22O	3.8	✓			2.65	3.3 MP#8 * 0.8030
23N	4.15	—			1.36	— —
24M	4.95	✓			1.09	1.8 * 0.6056
25L	5.4	✓			0.82	1.25 0.6560
26K	6.25	✓			0.57	1.1 0.5182
27J	6.75	✓			0.59	0.84 0.7024
28I	8.05	✓			0.42	0.75 0.5600
29H	9.55	✓			0.35	0.82 0.4268
30G	10.4	10.05			0.29	0.74 0.3919
31F	11.5	✓			0.174	0.28 0.6214
32E	13.6	13.1 (32°F)			0.149	0.28 0.5321
33D	14.6	✓			0.124	0.27 0.4593
34C	16.1	✓			0.149	0.25 0.5960
35B	17.5	—			0.099	— —
36A	19.1	—		1:55	0.078	— —

all @ pts

9.753

15 0.6502

Note: Measured at 500 watts; Readings Corrected to 1kw.

Measurements made in Freezing Rain at 28°F.

20

= 13.0

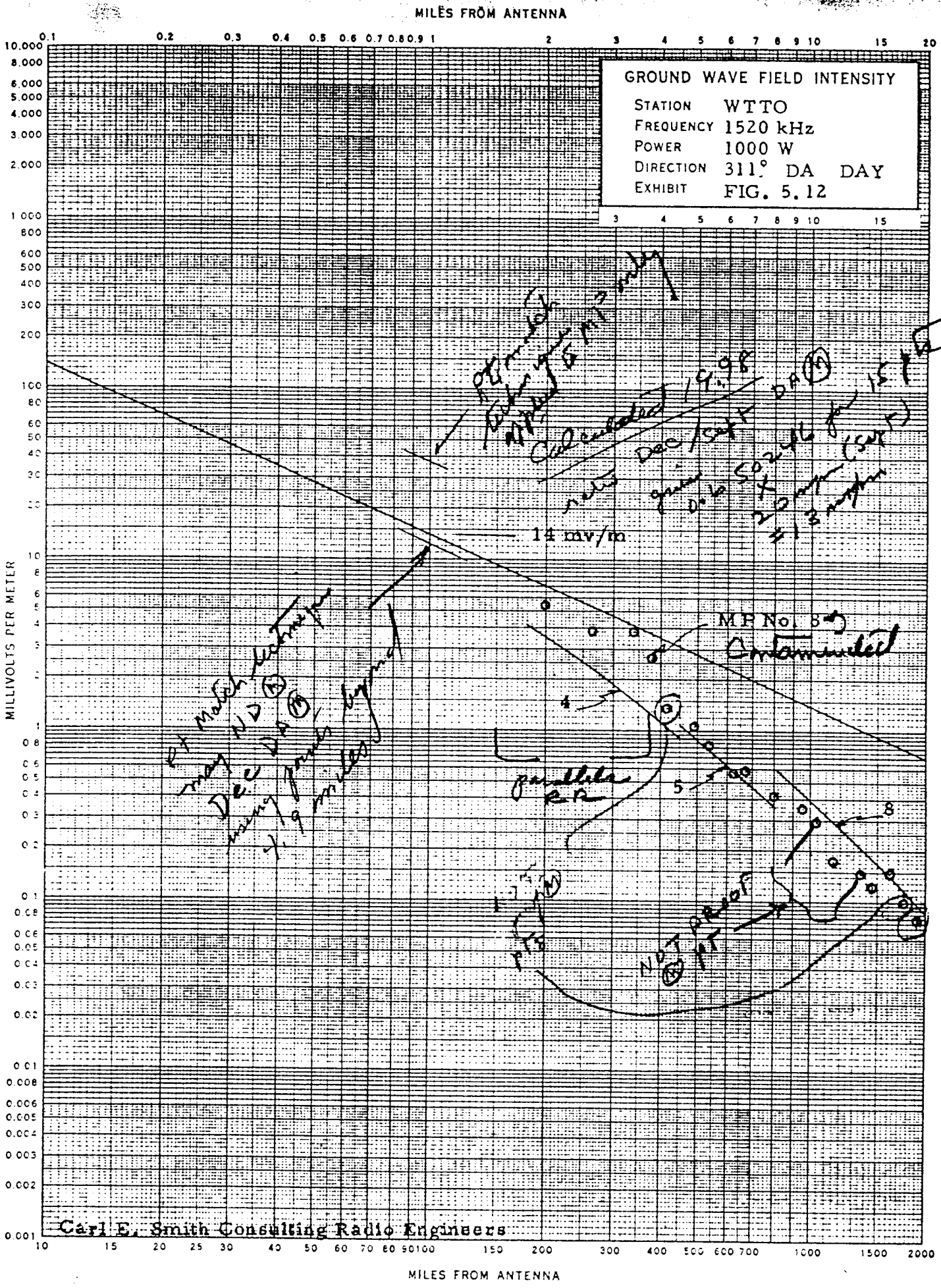
mv/m

see pt matrix

Modified figures

Sheet 2 of 2

1/2 R.12


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 311° DA DAY
EXHIBIT FIG. 5.12
MILLIVOLTS PER METER
14 mv/m
MP No. 8
Carl E. Smith Consulting Radio Engineers
MILES FROM ANTENNA

CES #10

TABLE 5.13

FIELD STRENGTH MEASUREMENTS ON 350° RADIAL DAY

Station WTTO Freq. 1520 kHz City Toledo State Ohio

Non-Directional	Directional
Date ______ By ______	Date 12/17/66 By R. W. Minton
Meter Model ______ Serial ______	Meter Model WX2C Serial 863

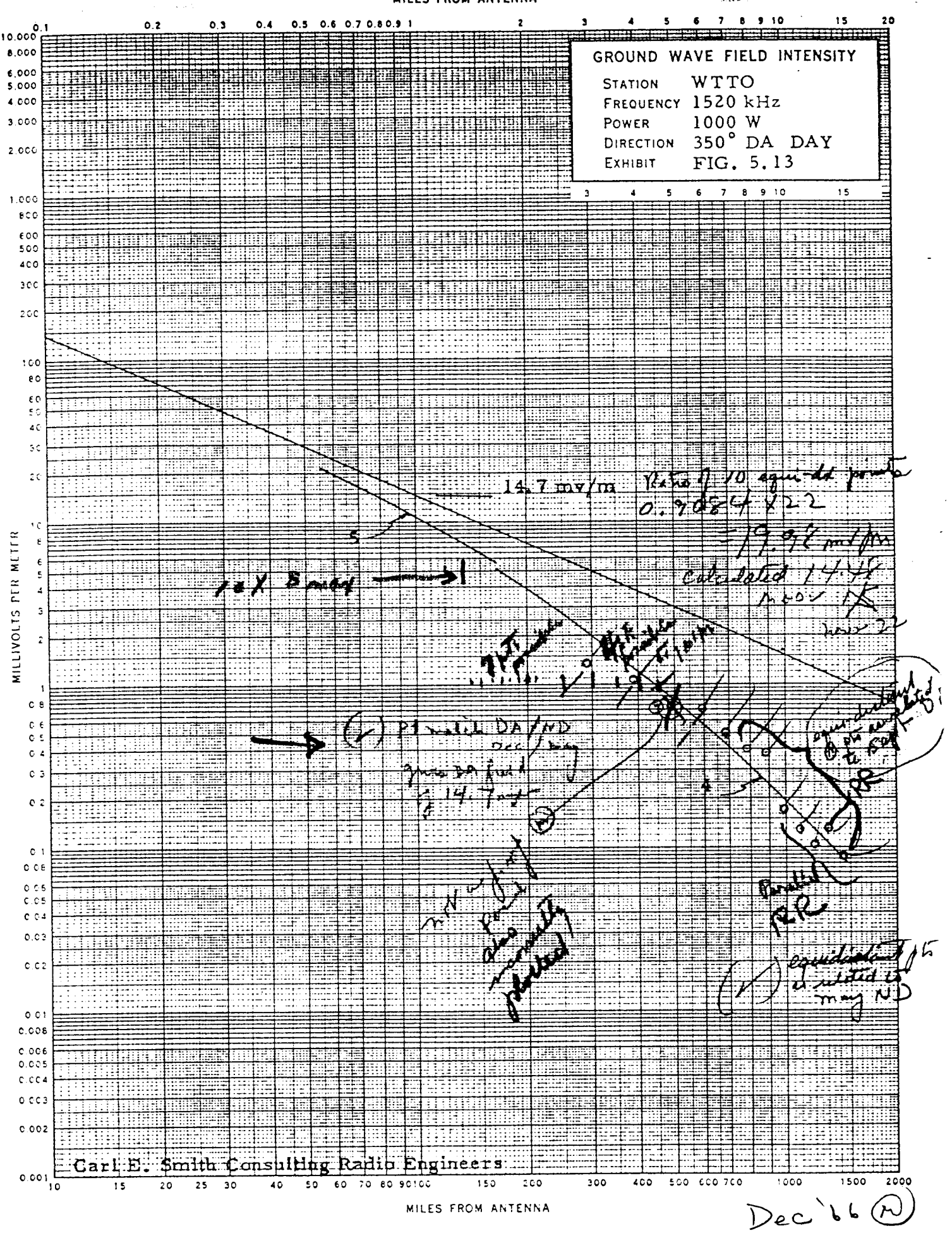
Point No.	Radial Miles	N.D. Time	N.D.	D.A. Time	D.A.	Notes
21	2.9	3.4	2.9	1:55	1.33	3.3 0.4030
22						Inaccessible except by Foot
23	3.9	4.1	3.9		1.03	1.5 * 0.6867
24						" " "
25	4.45	5.4	4.85		0.74	1.1 out 0.6727
26	5.3	5.9	5.3			0.94 " " "
27	5.9	6.25	5.9		0.70	0.75 0.9333
28	6.9	—	6.9		0.50	— DA/DA 2.6457
29	7.85	✓	7.85		0.40	0.48 0.8333
30	8.9	✓	8.9		0.38	0.34 1.1176
31	9.9	✓	9.9		0.167	0.19 0.8789
32	10.9	✓	10.9		0.13	0.32 0.4063
33	12.0	✓	12.0		0.105	0.25 0.4200
34	13.05	✓	13.05		0.13	0.085 * 1.5294
35	14.4	✓	14.4	4:15	0.088	0.075 1.1733

6.3588 / 7 = 0.9084 × 2 = 1.98

* Pur probably meets criterion max/min > 10

6.3588 + 2.6457 = 9.0545 (11) = .8231 × 2 = 18.10 mv/m

(Margin notes: 1/20/67 — these pts are [illegible] — MP; 1.n RR)


MILES FROM ANTENNA
GROUND WAVE FIELD INTENSITY
STATION WTTO
FREQUENCY 1520 kHz
POWER 1000 W
DIRECTION 350° DA DAY
EXHIBIT FIG. 5.13
MILLIVOLTS PER METER
14.7 mv/m
Carl E. Smith Consulting Radio Engineers
MILES FROM ANTENNA
Dec '66