Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
An Inquiry Into The FCC's Policies and	)	MM Docket No. 93-177
Rules Regarding AM Radio Service	)	RM-7594
Directional Antenna Performance	)	
Verification	)	

REPLY COMMENTS OF
RADIOHIO INCORPORATED

These reply comments are submitted on behalf of RadiOhio, Inc. to the comments filed in MM Docket No. 93-177. The comments for MM Docket No. 93-177 were initially filed in response to the FCC Public Notice released May 23, 2007 with reference to proposed rules permitting directional antenna performance verification.[1]

Various comments have been reviewed including those submitted by Mullaney Engineering, Inc.

The AM Directional Performance Verification Coalition ("Coalition") has offered further guidance on the structure and form that must be undertaken in order to setup, readjust or reconfirm a directional antenna pattern.

Basically, the Coalition has placed its faith that the modeling technique, if properly applied, will result in an antenna directional pattern which will meet all the Commission's Rules regarding proper radiation pattern null and suppression requirements, and achieve appropriate major lobe(s) and RMS values without separate off-site field measurements locations performed

[1]*Comments Sought on Proposed Rules Permitting Antenna Modeling to Verify AM Directional Performance, DA 07-2143, MM Docket No. 93-177.*

at the time the directional array adjustment is performed. If true, this could yield the next step whereby a new array could be premanufactured, shipped and erected at the transmitter site and licensed without any intervening pattern verification. Further, this technique would allow for installation in a hostile environment which would induce serious reradiation and thereby thwart the Commission's stated goal set forth in MM Docket 87-267[2]. Therefore, unbridled use of this technique could adversely affect the overall interference by creating additional undocumented interference situations which could harm distant station service area.

As indicated in RadiOhio's comments, the vertical radiation pattern of antennas should be examined. RadiOhio has identified a possible source for such a software program[3] which has the ability to model the elevation pattern and incorporate it into a prediction methodology. While this model is not yet uniquely suited for immediate implementation, it nevertheless could serve as a foundation to better predict protection to other significant allocation constraints and to examine the influence of new modulation techniques used by IBOC.[4] The model, once suited for implementation, could help serve to meet the interference objectives outlined in MM Docket 87-267 adopted in September 26, 1991.

A brief overview is provided for industry and the Commission consideration as follows:

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[2]*In the Matter of Review of the Technical Assignment Criteria for the AM Broadcast Service,* MM Docket No. 87-267, Adopted: September 26, 1991, Released: October 25, 1991.

[3]See report entitled, *"Medium Frequency Propagation Prediction Techniques and Antenna Modeling for Intelligent Transporation Systems (ITS) Broadcast Applications"* authored by Nicholas DeMinco, NTIA Report 99-368

[4]In-Band On-Channel – MB Docket No. 99-325, entitled, "*Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Radio Broadcast Service*"

Medium Frequency Propagation Techniques

The National Telecommunications and Information Administration ("NTIA") published report NTIA Report 99-368 entitled, "Medium Frequency Propagation Prediction Techniques and Antenna Modeling for Intelligent Transportation System (ITS) Broadcast Applications" and provides the equations used to develop a software evaluation ITS model authored by Nicholos DeMinco dated August 1999. From that a software program has been developed and described in the "User Manual for Low and Medium Frequency Propagation Model" by N DeMinco J Geikas dated July 1998.

A brief description of the input is as follows:

1. Ground Wave Model
   a. Smooth Earth – calculations for ground-wave field strengths assume homogeneous earth
   b. Mixed Path, Smooth Earth – calculations for ground-wave field strengths are made in sections with different ground constants
   c. Irregular Terrain, Mixed Path – uses elevation and ground constants at regular intervals to calculate field strengths (takes time to run)
2. Skywave Model
   a. FCC – Uses a curve of field strength versus distance (FCC,1982)
   b. CCIR – Uses USSR Model with modifications (Haakinson, 1988)
   c. WANG – model independent from frequency (Wang, 1985)
3. Frequency
   a. 150kHz < f <1750kHz
   b. System 1 requires a single frequency, but System 2 and 3 creates a range around the input value
4. Propagation
   a. For System 1, sky-wave predictions are made for both daytime and nighttime
   b. For Systems 2 and 3, if daytime is chosen no sky-wave predictions will be made, and if nighttime is chosen, only interfering transmitters that broadcast at night will be considered
5. Transmitter Site Parameters
   a. input coordinates (NAD 83)
6. Receiver Site Parameters
   a. For System 1, input coordinates (NAD 83)
   b. For System 2, input coordinates and radius searched around for interfering transmitters
   c. For System 3, make a boundary rectangle using longitudinal or latitudinal lines,

and the distance beyond this rectangle to search for interfering transmitters

7. Required Reliability: 0 -100%
    a. The noise power is adjusted by the reliability. A 90% reliability implies that the computed signal to noise power ratio will be available for 90% of the time in a 1 hour/3 month season time block
8. Earth Radius Ratio: .5 – 3.0
    a. The ratio of the effective earth radius to the actual earth radius is used in ground-wave predictions.
    b. Using 1.33 gives a standard refractive atmosphere
9. Seasons
    a. The season chosen effects the noise variables that are included in the calculations
    b. For system 1, multiple can be selected
    c. For system 2, one must be selected
    d. System 3 is independent of the season
10. Man-Made Noise
    a. Select the type of environment of the receiver. The values give the median man-made noise in 1 Hz bandwidth at 1 MHZ. the value is adjusted for the selected frequency
    b. System 3 does not require this input
11. Time of Day
    a. This is the local time of day at the receiver, it affects the noise calculations.
    b. For system 1, multiple can be selected
    c. For system 2, one must be selected
    d. System 3 does not require this input
12. Ground Constants
    a. If "Smooth Earth" was selected, a person may enter values manually or use the default values which are extracted from the database
    b. For manual input, enter a segment length, ground constant and dielectric constant for each segment you desire along a path up to a maximum of 50 segments
13. Terrain
    a. If "Irregular Terrain, Mixed Path" was selected, terrain data is necessary
    b. They all use values extracted from the database, or input manually for System 1
    c. For manual input, insert a terrain interval value (km) and then the elevation value for each interval
14. Transmitter, Receiver Antenna
    a. Vertical Monopole – the gain changed with elevation angle
        i. Antenna feed point height above ground (m)
        ii. Vertical monopole length (.01λ to.7λ)
        iii. Antenna monopole efficiency (1.00 to 100%
        iv. Ground Screen (yes or no)
            1. Ground screen radius (.01λ to.6λ)

2. number of radials (5 – 360)

b. Field Strength – this option allows the user to specify a fixed field strength at a fixed distance from the transmitter whose transmitter power is at a fixed reference level. The algorithm computes the equivalent antenna gain to be used in calculations.
   i. Antenna feed point height above ground (m)
   ii. Antenna field strength (mV/m)
   iii. Antenna reference power (kW)
   iv. Antenna reference distance (km)

c. User Gain – this option allows the user to enter a fixed antenna gain relative to an isotropic that is used for all azimuths and elevations.
   i. Antenna feed point height above ground (m)
   ii. Antenna power gain relative to isotropic radiator (dBi)

d. Ferrite Loop – this antenna is modeled to approximate the antenna found in MF receivers. The antenna is not directional and is very lossy with gains of -40 to -80 dBi typically.

The second item of concern, as very aptly described in Mullaney Engineering, Inc. comments, is the variable nature of each of the current array environment. As cited by Mullaney Engineering, Inc. on Page 4, provides the following observation and abstracted in part:

Artificial Adjustment of Radiator Height and Width

‘The Coalition proposes to allow artificially adjusting the height and width (radius) of the antenna radiator as part of the modeling process. It is assumed that these adjustments are being permitted to allow the model to match the measured impedance values as part of the model validation process. This seems to negate the claim that method of moments can accurately model AM broadcast direction antennas.”

RadiOhio agrees with that observation and desires to offer impedance measurements taken over the years for both non-directional and directional situations. This information was compiled from the Commission's records maintained by a former FCC employee, Mr. John Sadler. The data were compiled by the firm of Cohen, Dippell and Everist, P.C. at the request of Commission staff which was engaged in bilateral and multi-lateral discussions and specifically addressed in the Study Groups JIWP 10-3-8, Study Period: 1986-1990, Recommendation 6 of the Report to the Second Session of the MFBC conference looking toward the Panel of Experts Meeting[5] in Geneva.

As the attached information reflects there is a wide variation in impedance measurements both resistance and reactance. It is expected that these data cover a wide variety of tower structures and configurations.

RadiOhio believes that this data supports Mullaney Engineering, Inc. Comments.

Summary

RadiOhio submits that the Commission should revisit its AM technical evaluation criteria and standards and adopt revised rules governing the assignment of AM radio stations. Further, RadiOhio submits that the Commission should not adopt or permit unrestricted use of the current proposed method of moments modeling offered by the Coalition without adequate off-site measurement data that is a part of the license.

RadiOhio submits, to do otherwise, the prospect of unregulated interference situations will arise which will require the Commission to expend additional Commission valuable resources.

[5]Donald G. Everist was an industrial delegate to this Panel of Experts Meeting

Respectfully submitted,

Donald G. Everist
District of Columbia
Professional Engineer
Registration No. 5714

September 7, 2007

Cohen, Dippell and Everist, P.C.

EXHIBIT E-1

MEASURED NON-DIRECTIONAL
RESISTANCE AND REACTANCE DATA
ABSTRACTED IN 1987 FROM THE
FEDERAL COMMUNICATIONS COMMISSION
RECORDS
SEPTEMBER 2007

Cohen, Dippell and Everist, P.C.

MEASURED NON-DIRECTIONAL RESISTANCE
AND REACTANCE DATA IN ORDER OF
FREQUENCY ABSTRACTED IN 1987 FROM
FEDERAL COMMUNICATIONS COMMISSION
RECORDS
SEPTEMBER 2007

COHEN, DIPPELL AND EVERIST, P. C.

MEASURED NON-DIRECTIONAL RESISTANCE AND REACTANCE DATA IN ORDER OF FREQUENCY JULY 1987

Call	State	Impedance	Frequency kHz	Electrical Height degrees
WARO	PA	18.5-j125.9	540	63.5
WGTO	FL	29.5-j48.1	540	69
KNMX	NM	46.5+j71.8	540	90
WKRC		23.8-j42.9	550	70.5
WDLV	NC	44+j64.9	550	90
KTWO	MO	38.5+j46	560	88
WIND	IL	140+j180	560	100.8
WFSO	FL	24.9-j49.1	570	73
WKBN		44.5+j92.1	570	89
WHP		28.9+j20.7	580	65
WHP	PA	34.3+j43	580	84.9
WTCM	MI	49+j70	580	90
KTHO		20-j69.3	590	65
KCSJ	CO	50+j110	590	90.5
WROW		64+j159.3	590	105
WICC		10-j28.8	600	65.9
WAYS	NC	27.8-j22.6	610	68.2
KVNU	UT	32-j13	610	78.1
KOJM		34.0-j33	610	78.1
WHJB	PA	21.5-j164.5	620	56.7
WDNC	NC	12.2-j58	620	67
WQBS	PR	16.7-j128.6	630	57.62
WPRO		43.5+j56.3	630	87.5
KSXX		48.5+j78.8	630	92.27
WLAP		710-j238	630	152
WHLO		33.5+j23	640	82.4
WMJJ		16.5-j119	680	60
WRNG	GA	30.5+j1	680	79.4

Call	State	Impedance	Frequency kHz	Electrical Height degrees
WMPS		230-j475	680	149
WADS	CT	25-j65	690	70
WYIS	PA	70+j137	690	109.8
WQKI	SC	14.6+j128.2	710	59
KAPZ	AR	27-j72.5	710	67
WQBX		49.5+j74.2	710	88.5
KEEL	LA	70+j104	710	96
KFIA	CA	98+j203	710	103.9
KIRO	WA	473+j324	710	134
KQRX		44+j56.9	720	90
WRNR		23.1-j43.2	740	70
KCRL		49.1+j60	780	90
WAEB	PA	37.5+j71	790	94
KULF	TX	71+j158	790	98.2
WTAR		100+j212	790	104
WAKY		113.65+j311.45	790	136.8
WKVE		30.5+j1	800	82
WJJQ	WI	64+j55	810	88.9
KGOE	CA	29-j8.7	850	77.8
KGOE	GA	26.8-j9	850	77.8
WPTB	GA	42+j87.9	850	90
KRVN		51+j119	880	96.6
WEAK		33.8+j18	900	82.3
WAVL	PA	39.5+j36	910	83.27
WLAS	NC	47.0+j92	910	90
WPLA	FL	50+j64	910	90
WJCW	TN	155+j302	910	130
WMEL	FL	29+j3.26	920	76.1
WOKY	WI	31.5+j35.9	920	80.8
KKLS	SD	48.5-j113	920	89.2

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KITN	WA	81.5+j125	920	100.95
KYST	TX	178+j257	920	110
WEKU		12.3-j114	930	54.5
KSDN	SD	38+j118.3	930	90
WJBY	AL	51+j90.1	930	91.9
KIXZ	TX	34+j53.9	940	82.5
WINZ	FL	154+j217	940	103
WMIX	IL	110+j159	940	103.2
WEOO	VA	36.5-j21	940	169
WCPC	MS	122-j306	940	189
KRRP		38.8+j32.6	950	85
KMTX		48+j71	950	90.4
KAKC	OK	45+j94.9	970	92.3
WFIA	FL	66-j249	970	201.3
WPIP	FL	49.7+j86	980	89.7
WCAP	MA	47+j88	980	90
WMUF	TN	59+j94	1000	89.6
WRNJ	DE	47+j57	1000	90
KOTD		47+j67	1000	90
KANI	TX	111+j86	1000	98.7
WPMH		62+j118.8	1010	90
KKIK	TX	45.3+j117	1010	99.8
KTNQ	CA	85-j202	1020	180
KTWO	WY	48+j72	1030	90
WOSO	PR	48+j107	1030	90
WSKE	PA	26.5+j0.8	1050	76.8
KBUF	KS	65.5+j164	1050	104.4
WCMG	FL	245+j924	1050	146
KAYR	AR	21-j44	1060	64
WMCL	IL	34+j67.9	1060	85

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KERR	MT	90+j171	1070	97.8
WQRO	PA	43+j49.7	1080	86.9
WVCG	FL	55.5+j67	1080	90
WEEP		126+j264	1080	111
WPNS		339+j187	1080	114.5
KBOZ		71+j117	1090	95.7
KFAX	CA	46+j52	1100	90
WVNH	NH	12-j115.6	1110	52.82
KAKA	AR	46.81+j69.2	1110	89.3
WZAM		48+j54.1	1110	89.3
WUNN	MI	50+j84	1110	89.8
KTEK	TX	50+j70	1110	90
WKEG		52+j75	1110	90
WHYT	IN	115+j184.6	1110	105.6
WHYT		150+j207	1110	105.6
WKED	KY	36+j70	1130	80
WEEO		56.5+j76	1130	91
KQTI	TX	57.5+j80	1130	91
KWBY		58.3+j83.2	1130	91
KQTI	TX	58+j75	1130	91
WKWM	MI	49.1+j72	1140	90
KMJJ	NEW	88.5+j138.9	1140	100.1
KWBZ	CO	15.11-j90	1150	58.9
WYFE		26+j17.4	1150	76.8
KCCT	TX	55+j94.88	1150	90
KSUZ	TX	54+j68	1150	92.5
WTMP	FL	54+j113	1150	100.17
KFND	ND	41+j92.3	1170	89.9
WBRW		48.5+j104.3	1170	90
WJMQ	MA	49+j88	1170	90

Call	State	Impedance	Frequency kHz	Electrical Height degrees
VLC		225-j350	1170	145.5
KJNP		596-j270	1170	180
KHAD	MO	34+j2	1190	78.4
KRZJ	KS	54+j37.8	1190	78.4
KAYO		64.2+j109.3	1190	91.5
WBDY	VA	89+j128.6	1190	100
KKOY	MN	234+j277	1190	113.2
KGYN		46.4+j64.5	1210	90
WHOY		66+j66	1210	90.3
WHOY	PR	61+j69	1210	90.8
WKRS		134.8+j22	1220	142
KNCO	CA	66+j95.2	1250	86.9
KUKA		68+j116	1250	92
WARE	MA	44+j28	1250	94.7
KBRF	MN	169+j280	1250	114
WGHB	NC	54.5+j409.6	1250	152.8
WXCE	DC	15.7-j63.5	1260	63.1
WNRK	DE	55+j87	1260	90
WVOY	MI	27.3+j7.8	1270	73.4
WMRL	TN	60+j96.8	1270	93
WWCA	IN	227+j288	1270	116
WTJZ	VA	85-j189.2	1270	192.9
KBDF	OR	62.5+j105	1280	90
KMAS	WA	66.1+j105.04	1280	93.77
KFRN	CA	178+j90.5	1280	137.7
KLEH	IA	25-j12	1290	70.8
WTNX	TN	49+j79.2	1290	89.6
WOPP	AL	46+j76	1290	90
WCHK	GA	47+j75.2	1290	90
WHIO		340-j55	1290	130

Call	State	Impedance	Frequency kHz	Electrical Height degrees
WXRL	NY	56+j96	1300	90
KRWL		52+j87	1300	90.5
WIBR	LA	61+j99	1300	93.2
KHUG	OR	82-j218	1300	190.3
WAUC	FL	20.75-j65	1310	65
WKKX	AZ	50.5+j147.1	1310	92.5
WICH		133-j286	1310	168
WTTL	KY	24-j214	1310	186
KAAM	TX	31.5-j118	1310	225
WOBL	OH	37.0+j16	1320	76
WAGY	NC	69+j115	1320	96.6
KOZY	MN	84.5+j144	1320	100
KGNR	CA	320+j289	1320	120
WKIN	TN	194+j343	1320	125
KCPX	UT	80.5-j150	1320	142
WAMR	FL	130-j265.9	1320	150
WASA	MD	128+j268	1330	121.7
WHET	MA	121-j541	1330	185
WEGA		59+j88.9	1350	90
WNIS	VA	98+j144.5	1350	99
WABT	AL	19.3-j28.2	1360	69.8
KKBJ	MN	52.2+j77.2	1360	89.1
WKYO		52+j106	1360	90
WCQL	WI	21.8-j34.6	1370	70.7
WLLN	NC	44+j50.4	1370	90
KLBA	IW	52+j72.9	1370	90
WCOA	FL	83+j182	1370	100
KSOP	UT	103+j167	1370	100.3
KSUM	MN	530+j292	1370	130.3
WSOL	SC	842-j86.3	1370	150

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KDTH	IW	100-j222	1370	210
WDAT	FL	106.5+j163	1380	100.9
WPHM		95+j185	1380	101
WTVR	VA	187+j298	1380	121.2
KWK	MO	267-j390	1380	161
WIZO	TN	548-j210	1380	164
KWK	MO	66-j196	1380	200
WTJS	TN	64+j61.9	1390	94.6
WPLM	MA	36-j142	1390	190
WDOT	VT	39.5+j106.6	1390	225
KBCC	MO	11.2-j53	1410	51.6
WTIM	IL	92-j220	1410	89.7
KUCH		127+j219.9	1410	103
KLLO		47.5-j228	1410	226
KLFB	TX	11.5-j87	1420	62.4
WINI	IL	20.4-j23.9	1420	67
KPAR	TX	34.5-j23.9	1420	75.3
KITI	WA	55+j69.58	1420	88.4
KBTN	MO	57.9+j94	1420	89.8
WLNA	NY	200+j224.4	1420	110
WYMC	KY	27.5-j1.5	1430	73
KALV	OK	31.8-j6.96	1430	78.5
WBEV	WI	88.5+j190.9	1430	102
WQDI	FL	133+j236	1430	104.6
KLO		507.2-j457.98	1430	157
WVAM		92-j249	1430	188
WRDD	MI	164+j297	1440	115
KEYS		248.7+j418	1440	146
WEWO	NC	46.3+j76.8	1460	89.8
WACO	TX	82+j175	1460	106.9

Call	State	Impedance	Frequency kHz	Electrical Height degrees
WKCK	PR	76.4+j153.55	1470	99.49
KVLH	CO	212.9+j270	1470	107
KNDE		582+j410	1470	108
KBOX	TX	26.1-j22.2	1480	69.3
KQLA	WA	32.3+j27.01	1480	81
WTHI		55+j93	1480	89.4
WISM		79+j204	1480	108
KVAN	WA	215.1+j253.8	1480	110
KWUN	CA	50+j130	1480	110
KYOS	CA	242+j412	1480	119.3
WCIN	OH	28.5-j53.0	1480	227.2
WUIV	NC	16.7-j71.6	1500	69.4
WGFT		55+j98	1500	90
WKRP	GA	59.5+j90	1500	93.3
WINU		38+j47	1510	83
WRGI		51.5+j96	1510	88.4
KYKR	TX	57.9+j84	1510	93.9
KDKO		193+j205	1510	110.5
WNLC	CT	140+j298	1510	121.53
WPOE	MA	95+j193	1520	109
WTGR		56-j297	1520	166.8
KOMA		158-j222	1520	181
KOLM	MN	36-j82	1520	225
WKDC		36.5+j44.4	1530	89.6
WDJZ	CT	57.5+j64.3	1530	100.8
WCKY	OH	52-j113	1530	198.7
WCRJ		56-j156	1530	210
WNRE		88.5+j176	1540	101
WAAY	AL	60.5+j113.5	1550	90
WMAD		58+j107.2	1550	90

Call	State	Impedance	Frequency kHz	Electrical Height degrees
WCTW	IN	560+j292	1550	138
WKVL	TN	32.2-j136.4	1550	219.5
KCJJ	IW	37.5+j40.4	1560	80
WSHY		55.2+j85.3	1560	90
KAJN		56.8+j82	1560	90
WOBL		123+j130.6	1570	90
WPGC		73+j134	1580	95.5
WPMP	MS	215+j341	1580	116
KDJS	MN	55+j107	1590	90
WJBT	NY	62+j117.7	1590	91.7
KRAD	MN	94+j111	1590	93
WHPY		68+j121	1590	93.1
WEEZ	PA	28+j155	1590	153
WEEZ	PA	800+j315	1590	153
KMTI	UT	142-j268	1590	202.5
WAIK	IL	116-j865	1590	203.7
WRBN	GA	40+j77.5	1600	87.7
WLUZ	PR	45.25+j75.2	1600	88
WLPQ	KY	39+j43	1600	89.6
KATZ	MO	51+j76.2	1600	90
KXEW	AZ	63.5+j114.4	1600	91.9
WIXY	MA	200+j237.5	1600	110
KGST		117.33+j232.25	1600	114.2
WEUP	AL	50+j121.9	1600	149
WOKB	FL	212-j405	1600	166.8
WPOM	FL	51.5-j166.8	1600	212

Cohen, Dippell and Everist, P.C.

MEASURED NON-DIRECTIONAL
RESISTANCE AND REACTANCE DATA
IN ORDER OF ELECTRICAL HEIGHT
ABSTRACTED IN 1987 FROM
FEDERAL COMMUNICATIONS COMMISSION
RECORDS
SEPTEMBER 2007

COHEN, DIPPELL AND EVERIST, P. C.

MEASURED NON-DIRECTIONAL RESISTANCE AND REACTANCE DATA IN ORDER OF ELECTRICAL HEIGHT JULY 1987

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KBCC	MO	11.2-j53	1410	51.6
WVNH	NH	12-j115.6	1110	52.82
WEKU		12.3-j114	930	54.5
WHJB	PA	21.5-j164.5	620	56.7
WQBS	PR	16.7-j128.6	630	57.62
KWBZ	CO	15.11-j90	1150	58.9
WQKI	SC	14.6+j128.2	710	59
WMJJ		16.5-j119	680	60
KLFB	TX	11.5-j87	1420	62.4
WXCE	DC	15.7-j63.5	1260	63.1
WARO	PA	18.5-j125.9	540	63.5
KAYR	AR	21-j44	1060	64
WHP		28.9+j20.7	580	65
KTHO		20-j69.3	590	65
WAUC	FL	20.75-j65	1310	65
WICC		10-j28.8	600	65.9
WDNC	NC	12.2-j58	620	67
KAPZ	AR	27-j72.5	710	67
WINI	IL	20.4-j23.9	1420	67
WAYS	NC	27.8-j22.6	610	68.2
WGTO	FL	29.5-j48.1	540	69
KBOX	TX	26.1-j22.2	1480	69.3
WUIV	NC	16.7-j71.6	1500	69.4
WABT	AL	19.3-j28.2	1360	69.8
WADS	CT	25-j65	690	70
WRNR		23.1-j43.2	740	70
WKRC		23.8-j42.9	550	70.5
WCQL	WI	21.8-j34.6	1370	70.7

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KLEH	IA	25-j12	1290	70.8
WFSO	FL	24.9-j49.1	570	73
WYMC	KY	27.5-j1.5	1430	73
WVOY	MI	27.3+j7.8	1270	73.4
KPAR	TX	34.5-j23.9	1420	75.3
WOBL	OH	37.0+j16	1320	76
WMEL	FL	29+j3.26	920	76.1
WSKE	PA	26.5+j0.8	1050	76.8
WYFE		26+j17.4	1150	76.8
KGOE	CA	29-j8.7	850	77.8
KGOE	GA	26.8-j9	850	77.8
KVNU	UT	32-j13	610	78.1
KOJM		34.0-j33	610	78.1
KHAD	MO	34+j2	1190	78.4
KRZJ	KS	54+j37.8	1190	78.4
KALV	OK	31.8-j6.96	1430	78.5
WRNG	GA	30.5+j1	680	79.4
WKED	KY	36+j70	1130	80
KCJJ	IW	37.5+j40.4	1560	80
WOKY	WI	31.5+j35.9	920	80.8
KQLA	WA	32.3+j27.01	1480	81
WKVE		30.5+j1	800	82
WEAK		33.8+j18	900	82.3
WHLO		33.5+j23	640	82.4
KIXZ	TX	34+j53.9	940	82.5
WINU		38+j47	1510	83
WAVL	PA	39.5+j36	910	83.27
WHP	PA	34.3+j43	580	84.9
KRRP		38.8+j32.6	950	85
WMCL	IL	34+j67.9	1060	85

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KMAS	WA	66.1+j105.04	1280	93.77
KYKR	TX	57.9+j84	1510	93.9
WAEB	PA	37.5+j71	790	94
WTJS	TN	64+j61.9	1390	94.6
WARE	MA	44+j28	1250	94.7
WPGC		73+j134	1580	95.5
KBOZ		71+j117	1090	95.7
KEEL	LA	70+j104	710	96
KRVN		51+j119	880	96.6
WAGY	NC	69+j115	1320	96.6
KERR	MT	90+j171	1070	97.8
KULF	TX	71+j158	790	98.2
KANI	TX	111+j86	1000	98.7
WNIS	VA	98+j144.5	1350	99
WKCK	PR	76.4+j153.55	1470	99.49
KKIK	TX	45.3+j117	1010	99.8
WBDY	VA	89+j128.6	1190	100
KOZY	MN	84.5+j144	1320	100
WCOA	FL	83+j182	1370	100
KMJJ	NEW	88.5+j138.9	1140	100.1
WTMP	FL	54+j113	1150	100.17
KSOP	UT	103+j167	1370	100.3
WIND	IL	140+j180	560	100.8
WDJZ	CT	57.5+j64.3	1530	100.8
WDAT	FL	106.5+j163	1380	100.9
KITN	WA	81.5+j125	920	100.95
WPHM		95+j185	1380	101
WNRE		88.5+j176	1540	101
WBEV	WI	88.5+j190.9	1430	102
WINZ	FL	154+j217	940	103

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KUCH		127+j219.9	1410	103
WMIX	IL	110+j159	940	103.2
KFIA	CA	98+j203	710	103.9
WTAR		100+j212	790	104
KBUF	KS	65.5+j164	1050	104.4
WQDI	FL	133+j236	1430	104.6
WROW		64+j159.3	590	105
WHYT	IN	115+j184.6	1110	105.6
WHYT		150+j207	1110	105.6
WACO	TX	82+j175	1460	106.9
KVLH	CO	212.9+j270	1470	107
KNDE		582+j410	1470	108
WISM		79+j204	1480	108
WPOE	MA	95+j193	1520	109
WYIS	PA	70+j137	690	109.8
KYST	TX	178+j257	920	110
WLNA	NY	200+j224.4	1420	110
KVAN	WA	215.1+j253.8	1480	110
KWUN	CA	50+j130	1480	110
WIXY	MA	200+j237.5	1600	110
KDKO		193+j205	1510	110.5
WEEP		126+j264	1080	111
KKOY	MN	234+j277	1190	113.2
KBRF	MN	169+j280	1250	114
KGST		117.33+j232.25	1600	114.2
WPNS		339+j187	1080	114.5
WRDD	MI	164+j297	1440	115
WWCA	IN	227+j288	1270	116
WPMP	MS	215+j341	1580	116
KYOS	CA	242+j412	1480	119.3

Call	State	Impedance	Frequency kHz	Electrical Height degrees
KGNR	CA	320+j289	1320	120
WTVR	VA	187+j298	1380	121.2
WNLC	CT	140+j298	1510	121.53
WASA	MD	128+j268	1330	121.7
WKIN	TN	194+j343	1320	125
WJCW	TN	155+j302	910	130
WHIO		340-j55	1290	130
KSUM	MN	530+j292	1370	130.3
KIRO	WA	473+j324	710	134
WAKY		113.65+j311.45	790	136.8
KFRN	CA	178+j90.5	1280	137.7
WCTW	IN	560+j292	1550	138
WKRS		134.8+j22	1220	142
KCPX	UT	80.5-j150	1320	142
VLC		225-j350	1170	145.5
WCMG	FL	245+j924	1050	146
KEYS		248.7+j418	1440	146
WMPS		230-j475	680	149
WEUP	AL	50+j121.9	1600	149
WAMR	FL	130-j265.9	1320	150
WSOL	SC	842-j86.3	1370	150
WLAP		710-j238	630	152
WGHB	NC	54.5+j409.6	1250	152.8
WEEZ	PA	28+j155	1590	153
WEEZ	PA	800+j315	1590	153
KLO		507.2-j457.98	1430	157
KWK	MO	267-j390	1380	161
WIZO	TN	548-j210	1380	164
WTGR		56-j297	1520	166.8

Call	State	Impedance	Frequency kHz	Electrical Height degrees
WOKB	FL	212-j405	1600	166.8
WICH		133-j286	1310	168
WEOO	VA	36.5-j21	940	169
KTNQ	CA	85-j202	1020	180
KJNP		596-j270	1170	180
KOMA		158-j222	1520	181
WHET	MA	121-j541	1330	185
WTTL	KY	24-j214	1310	186
WVAM		92-j249	1430	188
WCPC	MS	122-j306	940	189
WPLM	MA	36-j142	1390	190
KHUG	OR	82-j218	1300	190.3
WTJZ	VA	85-j189.2	1270	192.9
WCKY	OH	52-j113	1530	198.7
KWK	MO	66-j196	1380	200
WFIA	FL	66-j249	970	201.3
KMTI	UT	142-j268	1590	202.5
WAIK	IL	116-j865	1590	203.7
KDTH	IW	100-j222	1370	210
WCRJ		56-j156	1530	210
WPOM	FL	51.5-j166.8	1600	212
WKVL	TN	32.2-j136.4	1550	219.5
KAAM	TX	31.5-j118	1310	225
WDOT	VT	39.5+j106.6	1390	225
KOLM	MN	36-j82	1520	225
KLLO		47.5-j228	1410	226
WCIN	OH	28.5-j53.0	1480	227.2

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PLOT OF
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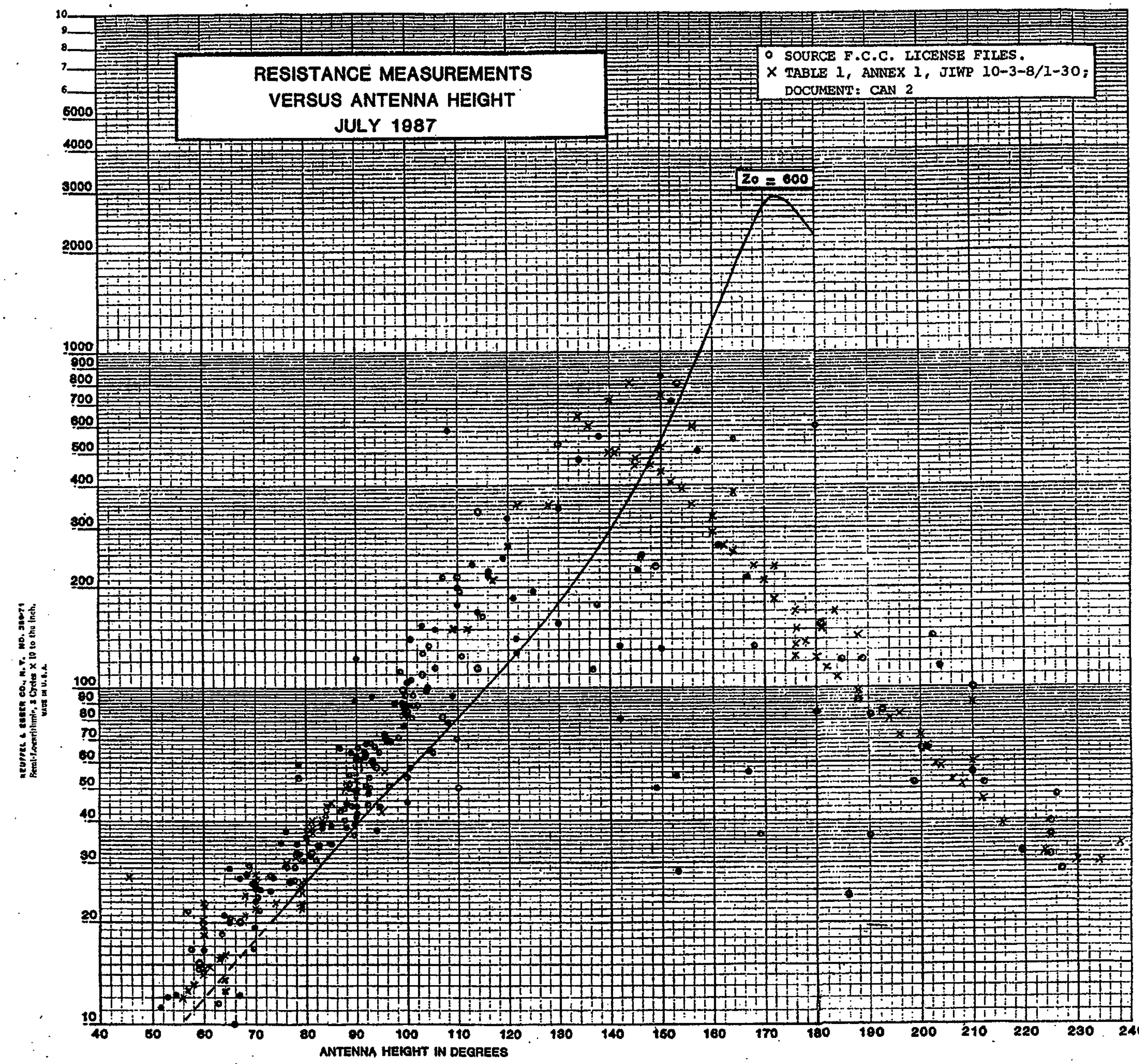

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