



ELECTRONICS RESEARCH, INC.

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Report Of Intermodulation Product Findings

*EMPIRE STATE BUILDING MINI MASTER FM BROADCAST FACILITY
NEW YORK, NEW YORK*

<i>WPLJ</i>	<i>95.5 MHz.</i>
<i>WQHT</i>	<i>97.1 MHz.</i>
<i>WCBS-F</i>	<i>101.1 MHz.</i>

February 2005

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REPORT OF FINDINGS EMPIRE STATE BUILDING MINI MASTER FM BROADCAST FACILITY NEW YORK, NEW YORK

Introduction : This report of findings is based on data collected at the Empire State Building ERI Master FM broadcast facility located in New York, NY. The report includes measurements offered as proof that the combined operations of WPLJ (95.5 MHz.), WQHT (97.1 MHz.) and WCBS (101.1 Mhz.) into the (1) one bay ERI Mini Master Antenna are in compliance with the FCC Rules and Regulations as required by the Code of Federal Regulations (CFR) Title 47 section 73.317 paragraph (b) through (d). In brief, the collection of measurements presented in this report shows that all possible third order inter-modulation (IM) products generated by this multiplex system are less than the maximum allowable level as required by section 73.317 paragraph (b) through (d). WXRK (92.3 MHz.), WPAT (93.1 MHz.) WNYC (93.9 MHz.) WQXR (96.3 MHz.), WSKQ (97.9 MHz.), WRKS (98.7 MHz.), WBAI (99.5 MHz.), WHTZ (100.3 MHz.), WQCD (101.9 MHz.), WNEW (102.7 MHz.), WKTU (103.5 MHz.), WAXQ (104.3 MHz.), WWPR (105.1 MHz.), WCAA (105.9 MHz.), WLTW (106.7 MHz.) and WBLS (107.5 Mhz.) operate into separate Master antenna located on top of the Empire State Building. Their effects on the stations operating from the multiplexed system has been considered in this report. Mark Steapleton of Electronics Research, Inc. located in Chandler, Indiana performed the measurements summarized herein on February 4, 2005.

The following exhibits are provided:

Exhibit A:

A-1 Drawing Depicting Antenna.

A-2 Drawing Depicting Multiplexing Scheme.

Exhibit B:

B-1 Equipment Employed In Intermodulation Product Measurement.

B-2 Broadcasting Scheme of the Multiplexed Systems.

Table 1. Mini Master Antenna Carrier Reference Levels.

Table 2. Calculated Third Order Products from the Mini Master Antenna Transmitters.

Table 3. Mini Master Intermodulation Analysis Measurements.

Table 4. Master Antenna Carrier Reference Levels.

Table 5. Calculated Third Order Products from the Master Antenna Transmitters.

Table 6. Master Antenna Intermodulation Analysis Measurements

Exhibits Accompanying Report: Exhibit A, provides comprehensive information on both antenna and filters used by these radio stations. Exhibit B, illustrates the broadcasting scheme of each station, the layout of the equipment used to isolate and measure potential intermodulation products and forward carrier reference levels. Found within Table 1 and Table 4 are the narrow band carrier frequency measurements that provide relative output signal levels for the IM analysis. Table 2 and Table 5 lists the calculated third order products that can be generated from FM transmitters broadcasting from both multiplexed systems. The IM Analysis Measurements, in Table 3 and Table 6, provides detailed information obtained from the product frequency investigation.

The Nature Of Intermodulation Products (IM) : Intermodulation products result from inadequate transmitter-to-transmitter isolation. Intermodulation products are commonly generated from radio stations operating into multiplexed facilities and congested antenna broadcast sites. The mechanics associated with the phenomenon have been well documented. When two or more transmitters are coupled to each other, new spectral components are produced by the mixing of the station frequencies in the active circuits of each transmitter. The common term used to describe this phenomenon is third order product denoted by the mathematical expression $[2(F_1)-(F_2)]$, where F_1 signifies the frequency of the transmitter that is generating the intermodulation product, and F_2 signifies the frequency causing the interference.

The Mini Master Multiplexed Systems : At the time of my measurements three (3) stations were operating from the Mini Master combined antenna system. The Mini Master FM multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The COG 1084-1 CP antenna and 970 Constant Impedance Modules are products of Electronics Research, Inc, whereas the feed line is manufactured by Myat. There were sixteen (16) stations operating into the Master Antenna system during all the IM Analysis measurements, Refer to Exhibit B-1, for an illustration of the Broadcasting Schemes of these stations.

To accomplish the aggregation of three (3) transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a multiplexing scheme consisting of Combiner modules is used. Specifically, three ERI 970-8 combiner modules with non-adjacent coupling and Group Delay Compensation are used. The combiner is illustrated in the attached Exhibit A-2. Performance measurements, such as match, insertion loss, group-delay, etc, revealed that the multiplexer unit was in proper working condition.

The IM Investigation : ERI Directional Couplers were used to monitor and maintain the multiplexers performance. All couplers furnished with the both systems are factory calibrated and capable of delivering accurate and repeatable RF measurements. To facilitate the taking of the measurements, the couplers located at the antenna output of the multiplexed systems was used. Care was taken in the selection of the measurement location to insure that the measurements would be made far removed from transmitters and any filtering used to reduce broadcast emissions. The coupler selected would normally be used for antenna reflection measurements and thus would provide greater than 33 dB directivity and a forward signal sample of -47 dB.

The forward port of the couplers was used for sampling the outgoing carrier levels and IM products. The IM sampled signal was fed by shielded cable into a Band Pass Filter where all extraneous energy was steeply attenuated. Various attenuation pads were used, when needed, on the band pass filter and/or the FIM71 to ensure an adequate signal level for measurements without overloading the measurement equipment. A Potomac Instruments FIM-71 Field Strength Receiver was employed to record the level of all signals investigated. To facilitate the selective tuning of the Receiver and Band Pass Filter a Wavetek Model 3000 signal generator was used. An IFR Model 2399 Spectrum Analyzer was used to measure the close in spectral attenuation of each carrier and wide band search for any anomalies that may need further investigation. See attached Exhibit B-2 for an illustration of the measurement equipment.

Prior to recording measurements, all pertinent broadcasting equipment including Transmitters, Multiplexer, Feed Line and Antenna were adjusted to optimal performance. Also, it was confirmed before taking any measurements that all stations of concern were operating at their full licensed power level. From the equipment setup described above, the relative output signal level of each stations forward carrier was made. The resulting signal levels of these measurements are listed in Table 1 and Table 4, column labeled "Adjusted Level". This level will be used as the reference level for possible IM products of each carrier and was necessary to confirm that no significant levels of spurious energy, referenced to each carrier, were present from any transmitter operating from the multiplexed system.

Table 1 - Mini Master Carrier Reference Levels

Carrier Frequency (MHz)	Pad One (dB)	Bandpass Filter Loss (dB)	Full Scale Range (dB:)	Scale Reading (dB)	Adjusted Level (dB:)	Notes
WPLJ (95.5)	6	---	140	-13.2	132.8	
WQHT (97.1)	6	---	140	-13.1	132.9	
WCBS-FM(101.1)	6	---	140	-12.9	133.1	

Predictable third-order products due to system harmonics mixed with all on-site interfering frequencies that could be generated from the multiplexed systems are calculated and listed in Table 2. The frequencies listed across the top are the primary transmitters operating into Master FM antenna. The frequencies listed on the left indicate the secondary mixing frequencies that would cause the predictable third order product listed inside the table.

Table 2 - Mini Master Third Order Products.

Interfering Frequency (MHz)	Carrier Frequency (MHz)		
	WPLJ 95.5	WQHT 97.1	WCBS-FM 101.1
WXRK (92.3)	98.7	101.9	109.9
WPAT (93.1)	97.9	101.1	109.1
WNYC (93.9)	97.1	100.3	108.3
WPLJ (95.5)	---	98.7	106.7
WQXR (96.3)	94.7	97.9	105.9
WQHT (97.1)	93.9	---	105.1
WSKQ (97.9)	93.1	96.3	104.3
WRKS (98.7)	92.3	95.5	103.5
WBAI (99.5)	91.5	94.7	102.7
WHTZ (100.3)	90.7	93.9	101.9
WCBS-FM (101.1)	89.9	93.1	---
WQCD (101.9)	89.1	92.3	100.3
WNEW (102.7)	88.3	91.5	99.5
WKTU (103.5)	87.5	90.7	98.7
WAXQ (104.3)	86.7	89.9	97.9
WWPR (105.1)	85.9	89.1	97.1
WCAA (105.9)	85.1	88.3	96.3
WLTW (106.7)	84.3	87.5	95.5
WBSL (107.5)	83.5	86.7	94.7

Using the equipment previously described the IM product measurements were recorded and are listed in Table 3. The signal levels referenced to the carriers are calculated and listed in the column labeled "Level Referenced to Carrier". Refer to Exhibit B for a layout of the measurement equipment.

Table 3 Mini Master Intermodulation Measurements

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
83.5	95.5	107.5	6	9.9	15.9	20	20	15.9	132.8	-116.9	
84.3	95.5	106.7	6	9.9	15.9	20	20	15.9	132.8	-116.9	
85.1	95.5	105.9	6	9.8	15.8	20	20	15.8	132.8	-117	
85.9	95.5	105.1	6	9.8	15.8	20	19.1	16.7	132.8	-116.1	
86.7	97.1	107.5	6	9.8	15.8	20	20	15.8	132.9	-117.1	
86.7	95.5	104.3	6	9.8	15.8	20	19.1	16.7	132.8	-116.1	
87.5	97.1	106.7	6	9.6	15.6	20	20	15.6	132.9	-117.3	
87.5	95.5	103.5	6	9.6	15.6	20	20	15.6	132.8	-117.2	
88.3	97.1	105.9	6	9.7	15.7	20	5.2	30.5	132.9	-102.4	
88.3	95.5	102.7	6	9.7	15.7	20	5.2	30.5	132.8	-102.3	
89.1	95.5	101.9	6	9.5	15.5	20	5.5	30	132.8	-102.8	
89.1	97.1	105.1	6	9.5	15.5	20	5.5	30	132.9	-102.9	
89.9	97.1	104.3	6	9.5	15.5	40	14.2	41.3	132.9	-91.6	
89.9	95.5	101.1	6	9.5	15.5	20	14.2	21.3	132.8	-111.5	
90.7	97.1	103.5	6	9.2	15.2	20	4.2	31	132.9	-101.9	
90.7	95.5	100.3	6	9.2	15.2	20	4.2	31	132.8	-101.8	
91.5	97.1	102.7	16	9.3	25.3	20	8.5	36.8	132.9	-96.1	
91.5	95.5	99.5	16	9.3	25.3	20	8.5	36.8	132.8	-96	
92.3	97.1	101.9	6	9.1	15.1	20	19.5	15.6	132.9	-117.3	1
92.3	95.5	98.7	6	9.1	15.1	20	19.5	15.6	132.8	-117.2	1
93.1	95.5	97.9	6	9.2	15.2	20	0.5	34.7	132.8	-98.1	1
93.1	97.1	101.1	6	9.2	15.2	20	0.5	34.7	132.9	-98.2	1
93.9	97.1	100.3	16	9.2	25.2	20	20	25.2	132.9	-107.7	1
93.9	95.5	97.1	16	9.2	25.2	20	20	25.2	132.8	-107.6	1
94.7	97.1	99.5	6	9.1	15.1	20	5.1	30	132.9	-102.9	
94.7	101.1	107.5	6	9.1	15.1	20	5.1	30	133.1	-103.1	
94.7	95.5	96.3	6	9.1	15.1	20	5.1	30	132.8	-102.8	
95.5	97.1	98.7	9	8.9	17.9	20	2.1	35.8	132.9	-97.1	2
95.5	101.1	106.7	9	8.9	17.9	20	2.1	35.8	133.1	-97.3	2
96.3	97.1	97.9	9	9.1	18.1	20	10.9	27.2	132.9	-105.7	1
96.3	101.1	105.9	9	9.1	18.1	20	10.9	27.2	133.1	-105.9	1
97.1	95.5	93.9	9	8.7	17.7	20	20	17.7	132.8	-115.1	2
97.1	101.1	105.1	9	8.7	17.7	20	2	35.7	133.1	-97.4	2
97.9	97.1	96.3	9	8.9	17.9	20	9.9	28	132.9	-104.9	1

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
97.9	101.1	104.3	9	8.9	17.9	20	9.9	28	133.1	-105.1	1
97.9	95.5	93.1	9	8.9	17.9	20	9.9	28	132.8	-104.8	1
98.7	97.1	95.5	9	8.7	17.7	20	6.5	31.2	132.9	-101.7	1
98.7	101.1	103.5	9	8.7	17.7	20	6.5	31.2	133.1	-101.9	1
98.7	95.5	92.3	9	8.7	17.7	20	6.5	31.2	132.8	-101.6	1
99.5	101.1	102.7	9	8.5	17.5	20	5.5	32	133.1	-101.1	1
100.3	97.1	93.9	9	8.5	17.5	20	7.9	29.6	132.9	-103.3	1
100.3	101.1	101.9	9	8.5	17.5	20	7.9	29.6	133.1	-103.5	1
101.1	97.1	93.1	9	8.5	17.5	20	20	17.5	132.9	-115.4	2
101.9	97.1	92.3	9	8.5	17.5	20	9.9	27.6	132.9	-105.3	1
101.9	101.1	100.3	9	8.5	17.5	20	9.9	27.6	133.1	-105.5	1
102.7	101.1	99.5	9	8.5	17.5	20	10.6	26.9	133.1	-106.2	1
103.5	101.1	98.7	9	8.1	17.1	20	20	17.1	133.1	-116	1
104.3	101.1	97.9	9	8.2	17.2	20	20	17.2	133.1	-115.9	1
105.1	101.1	97.1	9	8.2	17.2	20	14.8	22.4	133.1	-110.7	1
105.9	101.1	96.3	9	8.1	17.1	20	18.1	19	133.1	-114.1	1
106.7	101.1	95.5	9	8.1	17.1	20	16.8	20.3	133.1	-112.8	1
108.3	101.1	93.9	9	8.2	17.2	20	20	17.2	133.1	-115.9	
109.1	101.1	93.1	9	8.1	17.1	20	20	17.1	133.1	-116	
109.9	101.1	92.3	9	8.1	17.1	20	20	17.1	133.1	-116	

NOTES:

- 1) Local transmitter was turned off for this measurement.
- 2) System transmitter was turned off for this measurement.

Table 4 - Master Carrier Reference Levels

Carrier Frequency (MHz)	Pad One (dB)	Bandpass Filter Loss (dB)	Full Scale Range (dB:)	Scale Reading (dB)	Adjusted Level (dB:)	Notes
WXRK (92.3)	3	---	140	16.1	126.9	
WPAT (93.1)	3	---	140	19.7	123.3	
WNYC (93.9)	3	---	140	18.1	124.9	
WQXR (96.3)	3	---	140	16.8	126.2	
WSKQ (97.9)	3	---	140	17.5	125.5	
WRKS (98.7)	3	---	140	16.5	126.5	
WBAI (99.5)	3	---	140	18.2	124.8	
WHTZ (100.3)	3	---	140	17.2	125.8	
WQCD (101.9)	3	---	140	17.1	125.9	
WNEW (102.7)	3	---	140	17.8	125.2	
WKTU (103.5)	3	---	140	17.9	125.1	
WAXQ (104.3)	3	---	140	17.6	125.4	
WWPR (105.1)	3	---	140	17.1	125.9	
WCAA (105.9)	3	---	120	7.5	115.5	
WLTW (106.7)	3	---	140	15.9	127.1	
WBLS (107.5)	3	---	140	17.8	125.2	

Predictable third-order products due to system harmonics mixed with all on-site interfering frequencies that could be generated from the multiplexed systems are calculated and listed in Table 5. The frequencies listed across the top are the primary transmitters operating into Master FM antenna. The frequencies listed on the left indicate the secondary mixing frequencies that would cause the predictable third order product listed inside the table.

Table 5. - Mini Master Third Order Products.

Mix Freq- uency MHz.	Carrier Frequency (MHz)															
	92.3	93.1	93.9	96.3	97.9	98.7	99.5	100.3	101.9	102.7	103.5	104.3	105.1	105.9	106.7	107.5
92.3	---	93.9	95.5	100.3	103.5	105.1	106.7	108.3	111.5	113.1	114.7	116.3	117.9	119.5	121.1	122.7
93.1	91.5	---	94.7	99.5	102.7	104.3	105.9	107.5	110.7	112.3	113.9	115.5	117.1	118.7	120.3	121.9
93.9	90.7	92.3	---	98.7	101.9	103.5	105.1	106.7	109.9	111.5	113.1	114.7	116.3	117.9	119.5	121.1
95.5	89.1	90.7	92.3	97.1	100.3	101.9	103.5	105.1	108.3	109.9	111.5	113.1	114.7	116.3	117.9	119.5
96.3	88.3	89.9	91.5	---	99.5	101.1	102.7	104.3	107.5	109.1	110.7	112.3	113.9	115.5	117.1	118.7
97.1	87.5	89.1	90.7	95.5	98.7	100.3	101.9	103.5	106.7	108.3	109.9	111.5	113.1	114.7	116.3	117.9
97.9	86.7	88.3	89.9	94.7	---	99.5	101.1	102.7	105.9	107.5	109.1	110.7	112.3	113.9	115.5	117.1
98.7	85.9	87.5	89.1	93.9	97.1	---	100.3	101.9	105.1	106.7	108.3	109.9	111.5	113.1	114.7	116.3
99.5	85.1	86.7	88.3	93.1	96.3	97.9	---	101.1	104.3	105.9	107.5	109.1	110.7	112.3	113.9	115.5
100.3	84.3	85.9	87.5	92.3	95.5	97.1	98.7	---	103.5	105.1	106.7	108.3	109.9	111.5	113.1	114.7
101.1	83.5	85.1	86.7	91.5	94.7	96.3	97.9	99.5	102.7	104.3	105.9	107.5	109.1	110.7	112.3	113.9
101.9	82.7	84.3	85.9	90.7	93.9	95.5	97.1	98.7	---	103.5	105.1	106.7	108.3	109.9	111.5	113.1
102.7	81.9	83.5	85.1	89.9	93.1	94.7	96.3	97.9	101.1	---	104.3	105.9	107.5	109.1	110.7	112.3
103.5	81.1	82.7	84.3	89.1	92.3	93.9	95.5	97.1	100.3	101.9	---	105.1	106.7	108.3	109.9	111.5
104.3	80.3	81.9	83.5	88.3	91.5	93.1	94.7	96.3	99.5	101.1	102.7	---	105.9	107.5	109.1	110.7
105.1	79.5	81.1	82.7	87.5	90.7	92.3	93.9	95.5	98.7	100.3	101.9	103.5	---	106.7	108.3	109.9
105.9	78.7	80.3	81.9	86.7	89.9	91.5	93.1	94.7	97.9	99.5	101.1	102.7	104.3	---	107.5	109.1
106.7	77.9	79.5	81.1	85.9	89.1	90.7	92.3	93.9	97.1	98.7	100.3	101.9	103.5	105.1	---	108.3
107.5	77.1	78.7	80.3	85.1	88.3	89.9	91.5	93.1	96.3	97.9	99.5	101.1	102.7	104.3	105.9	—

Using the equipment previously described the IM product measurements were recorded and are listed in Table 6. The signal levels referenced to the carriers are calculated and listed in the column labeled "Level Referenced to Carrier". Refer to Exhibit B for a layout of the measurement equipment.

Table 6. Mini Master Intermodulation Measurements

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
77.1	92.3	107.5	6	10.1	16.1	40	14.4	41.7	126.9	-76.5	1
77.9	92.3	106.7	6	10.3	16.3	20	10.8	25.5	126.9	-92.7	
78.7	92.3	105.9	6	10.2	16.2	20	15.7	20.5	126.9	-97.7	
78.7	93.1	107.5	6	10.2	16.2	20	15.7	20.5	123.3	-102.8	
79.5	93.1	106.7	6	10.2	16.2	20	17.3	18.9	123.3	-96.3	
79.5	92.3	105.1	6	10.2	16.2	20	17.3	18.9	126.9	-108	
80.3	93.1	105.9	6	10.2	16.2	20	17.8	18.4	123.3	-104.9	
80.3	92.3	104.3	6	10.2	16.2	20	17.8	18.4	126.9	-108.5	
80.3	93.9	107.5	6	10.2	16.2	20	17.8	18.4	124.9	-106.5	
81.1	92.3	103.5	6	10.1	16.1	20	14.8	21.3	126.9	-105.6	
81.1	93.1	105.1	6	10.1	16.1	20	14.8	21.3	123.3	-102	
81.1	93.9	106.7	6	10.1	16.1	20	14.8	21.3	124.9	-103.6	
81.9	92.3	102.7	6	10.1	16.1	40	14	42.1	126.9	-84.8	
81.9	93.1	104.3	6	10.1	16.1	40	14	42.1	123.3	-81.2	
81.9	93.9	105.9	6	10.1	16.1	40	14	42.1	124.9	-82.8	
82.7	92.3	101.9	6	10	16	20	14.2	21.8	126.9	-105.1	
82.7	93.1	103.5	6	10	16	20	14.2	21.8	123.3	-101.5	
82.7	93.9	105.1	6	10	16	20	14.2	21.8	124.9	-103.1	
83.5	93.1	102.7	6	9.9	15.9	20	11.5	24.4	123.3	-98.9	
83.5	92.3	101.1	6	9.9	15.9	20	11.5	24.4	126.9	-102.5	
83.5	93.9	104.3	6	9.9	15.9	20	11.5	24.4	124.9	-100.5	
84.3	93.1	101.9	6	9.9	15.9	20	11.1	24.8	123.3	-98.5	
84.3	92.3	100.3	6	9.9	15.9	20	11.1	24.8	126.9	-102.1	
84.3	93.9	103.5	6	9.9	15.9	20	11.1	24.8	124.9	-100.1	

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
85.1	92.3	99.5	6	9.5	15.5	20	9.6	25.9	126.9	-101	
85.1	93.1	101.1	6	9.5	15.5	20	9.6	25.9	123.3	-97.4	
85.1	96.3	107.5	6	9.5	15.5	20	9.6	25.9	126.2	-100.3	
85.1	93.9	102.7	6	9.5	15.5	20	9.6	25.9	124.9	-99	
85.9	92.3	98.7	6	9.7	15.7	20	8.8	26.9	126.9	-100	
85.9	93.1	100.3	6	9.7	15.7	20	8.8	26.9	123.3	-96.4	
85.9	96.3	106.7	6	9.7	15.7	20	8.8	26.9	126.2	-99.3	
85.9	93.9	101.9	6	9.7	15.7	20	8.8	26.9	124.9	-98	
86.7	92.3	97.9	6	9.4	15.4	20	8.2	27.2	126.9	-99.7	
86.7	93.1	99.5	6	9.4	15.4	20	8.2	27.2	123.3	-96.1	
86.7	96.3	105.9	6	9.4	15.4	20	8.2	27.2	126.2	-99	
86.7	93.9	101.1	6	9.4	15.4	20	8.2	27.2	124.9	-97.7	
87.5	93.1	98.7	6	9.5	15.5	20	6.3	29.2	123.3	-94.1	
87.5	92.3	97.1	6	9.5	15.5	20	6.3	29.2	126.9	-97.7	
87.5	96.3	105.1	6	9.5	15.5	20	6.3	29.2	126.2	-97	
87.5	93.9	100.3	6	9.5	15.5	20	6.3	29.2	124.9	-95.7	
88.3	93.1	97.9	9	9.5	18.5	20	4.3	34.2	123.3	-89.1	
88.3	92.3	96.3	9	9.5	18.5	20	4.3	34.2	126.9	-92.7	
88.3	96.3	104.3	9	9.5	18.5	20	4.3	34.2	126.2	-92	
88.3	93.9	99.5	9	9.5	18.5	20	4.3	34.2	124.9	-90.7	
88.3	97.9	107.5	9	9.5	18.5	20	4.3	34.2	125.5	-91.3	
89.1	92.3	95.5	9	9.3	18.3	20	7.1	31.2	126.9	-95.7	
89.1	93.1	97.1	9	9.3	18.3	20	7.1	31.2	123.3	-92.1	
89.1	96.3	103.5	9	9.3	18.3	20	7.1	31.2	126.2	-95	
89.1	93.9	98.7	9	9.3	18.3	20	7.1	31.2	124.9	-93.7	
89.1	97.9	106.7	9	9.3	18.3	20	7.1	31.2	125.5	-94.3	
89.9	93.1	96.3	6	9.8	15.8	40	12.5	43.3	123.3	-80	2
89.9	96.3	102.7	6	9.8	15.8	40	12.5	43.3	126.2	-82.9	2
89.9	93.9	97.9	6	9.8	15.8	40	12.5	43.3	124.9	-81.6	2
89.9	97.9	105.9	6	9.8	15.8	40	12.5	43.3	125.5	-82.2	2
89.9	98.7	107.5	6	9.8	15.8	40	12.5	43.3	126.5	-83.2	2
90.7	92.3	93.9	6	9.6	15.6	20	1	34.6	126.9	-92.3	
90.7	93.1	95.5	6	9.6	15.6	20	1	34.6	123.3	-88.7	
90.7	96.3	101.9	6	9.6	15.6	20	1	34.6	126.2	-91.6	

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
90.7	98.7	106.7	6	9.6	15.6	20	1	34.6	126.5	-91.9	
90.7	93.9	97.1	6	9.6	15.6	20	1	34.6	124.9	-90.3	
90.7	97.9	105.1	6	9.6	15.6	20	1	34.6	125.5	-90.9	
91.5	92.3	93.1	9	9.5	18.5	20	0.8	37.7	126.9	-89.2	
91.5	96.3	101.1	9	9.5	18.5	20	0.8	37.7	126.2	-88.5	
91.5	98.7	105.9	9	9.5	18.5	20	0.8	37.7	126.5	-88.8	
91.5	99.5	107.5	9	9.5	18.5	20	0.8	37.7	124.8	-87.1	
91.5	93.9	96.3	9	9.5	18.5	20	0.8	37.7	124.9	-87.2	
91.5	97.9	104.3	9	9.5	18.5	20	0.8	37.7	125.5	-87.8	
92.3	93.1	93.9	6	9.7	15.7	20	0.5	35.2	123.3	-88.1	3
92.3	96.3	100.3	6	9.7	15.7	20	0.5	35.2	126.2	-91	3
92.3	99.5	106.7	6	9.7	15.7	20	0.5	35.2	124.8	-89.6	3
92.3	93.9	95.5	6	9.7	15.7	20	0.5	35.2	124.9	-89.7	3
92.3	97.9	103.5	6	9.7	15.7	20	0.5	35.2	125.5	-90.3	3
92.3	98.7	105.1	6	9.7	15.7	20	0.5	35.2	126.5	-91.3	3
93.1	96.3	99.5	9	9.5	18.5	20	13.2	25.3	126.2	-100.9	3
93.1	99.5	105.9	9	9.5	18.5	20	13.2	25.3	124.8	-99.5	3
93.1	100.3	107.5	9	9.5	18.5	20	13.2	25.3	126.8	-101.5	3
93.1	97.9	102.7	9	9.5	18.5	20	13.2	25.3	125.5	-100.2	3
93.1	98.7	104.3	9	9.5	18.5	20	13.2	25.3	126.5	-101.2	3
93.9	93.1	92.3	9	9.4	18.4	20	4.1	34.3	123.3	-89	3
93.9	96.3	98.7	9	9.4	18.4	20	4.1	34.3	126.2	-91.9	3
93.9	100.3	106.7	9	9.4	18.4	20	4.1	34.3	126.8	-92.5	3
93.9	97.9	101.9	9	9.4	18.4	20	4.1	34.3	125.5	-91.2	3
93.9	98.7	103.5	9	9.4	18.4	20	4.1	34.3	126.5	-92.2	3
93.9	99.5	105.1	9	9.4	18.4	20	4.1	34.3	124.8	-90.5	3
94.7	96.3	97.9	9	9.4	18.4	20	0.2	38.2	126.2	-88	3
94.7	100.3	105.9	9	9.4	18.4	20	0.2	38.2	126.8	-88.6	3
94.7	98.7	102.7	9	9.4	18.4	20	0.2	38.2	126.5	-88.3	3
94.7	99.5	104.3	9	9.4	18.4	20	0.2	38.2	124.8	-86.6	3
94.7	93.9	93.1	9	9.4	18.4	20	0.2	38.2	124.9	-86.7	3
94.7	97.9	101.1	9	9.4	18.4	20	0.2	38.2	125.5	-87.3	3
95.5	96.3	97.1	13	9.1	22.1	20	10.8	31.3	126.2	-94.9	4
95.5	98.7	101.9	13	9.1	22.1	20	10.8	31.3	126.5	-95.2	4

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
95.5	99.5	103.5	13	9.1	22.1	20	10.8	31.3	124.8	-93.5	4
95.5	100.3	105.1	13	9.1	22.1	20	10.8	31.3	126.8	-95.5	4
95.5	93.9	92.3	13	9.1	22.1	20	10.8	31.3	124.9	-93.6	4
95.5	97.9	100.3	13	9.1	22.1	20	10.8	31.3	125.5	-94.2	4
96.3	99.5	102.7	9	9.3	18.3	20	15.6	22.7	124.8	-102.1	3
96.3	100.3	104.3	9	9.3	18.3	20	15.6	22.7	126.8	-104.1	3
96.3	97.9	99.5	9	9.3	18.3	20	15.6	22.7	125.5	-102.8	3
96.3	98.7	101.1	9	9.3	18.3	20	15.6	22.7	126.5	-103.8	3
96.3	101.9	107.5	9	9.3	18.3	20	15.6	22.7	126.9	-104.2	3
97.1	96.3	95.5	13	9.2	22.2	20	0.5	41.7	126.2	-84.5	4
97.1	99.5	101.9	13	9.2	22.2	20	0.5	41.7	124.8	-83.1	4
97.1	100.3	103.5	13	9.2	22.2	20	0.5	41.7	126.8	-85.1	4
97.1	97.9	98.7	13	9.2	22.2	20	0.5	41.7	125.5	-83.8	4
97.1	98.7	100.3	13	9.2	22.2	20	0.5	41.7	126.5	-84.8	4
97.1	101.9	106.7	13	9.2	22.2	20	0.5	41.7	126.9	-85.2	4
97.9	100.3	102.7	13	9.1	22.1	20	6.5	35.6	126.8	-91.2	3
97.9	98.7	99.5	13	9.1	22.1	20	6.5	35.6	126.5	-90.9	3
97.9	99.5	101.1	13	9.1	22.1	20	6.5	35.6	124.8	-89.2	3
97.9	101.9	105.9	13	9.1	22.1	20	6.5	35.6	126.9	-91.3	3
97.9	102.7	107.5	13	9.1	22.1	20	6.5	35.6	126.2	-90.6	3
98.7	96.3	93.9	13	9.1	22.1	20	2.5	39.6	126.2	-86.6	3
98.7	100.3	101.9	13	9.1	22.1	20	2.5	39.6	126.8	-87.2	3
98.7	99.5	100.3	13	9.1	22.1	20	2.5	39.6	124.8	-85.2	3
98.7	102.7	106.7	13	9.1	22.1	20	2.5	39.6	126.2	-86.6	3
98.7	97.9	97.1	13	9.1	22.1	20	2.5	39.6	125.5	-85.9	3
98.7	101.9	105.1	13	9.1	22.1	20	2.5	39.6	126.9	-87.3	3
99.5	96.3	93.1	9	9	18	20	1.1	36.9	126.2	-89.3	3
99.5	98.7	97.9	9	9	18	20	1.1	36.9	126.5	-89.6	3
99.5	100.3	101.1	9	9	18	20	1.1	36.9	126.8	-89.9	3
99.5	102.7	105.9	9	9	18	20	1.1	36.9	126.2	-89.3	3
99.5	103.5	107.5	9	9	18	20	1.1	36.9	126.1	-89.2	3
99.5	97.9	96.3	9	9	18	20	1.1	36.9	125.5	-88.6	3
99.5	101.9	104.3	9	9	18	20	1.1	36.9	126.9	-90	3
100.3	96.3	92.3	13	8.9	21.9	20	5.7	36.2	126.2	-90	3

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
100.3	99.5	98.7	13	8.9	21.9	20	5.7	36.2	124.8	-88.6	3
100.3	103.5	106.7	13	8.9	21.9	20	5.7	36.2	126.1	-89.9	3
100.3	97.9	95.5	13	8.9	21.9	20	5.7	36.2	125.5	-89.3	3
100.3	98.7	97.1	13	8.9	21.9	20	5.7	36.2	126.5	-90.3	3
100.3	101.9	103.5	13	8.9	21.9	20	5.7	36.2	126.9	-90.7	3
100.3	102.7	105.1	13	8.9	21.9	20	5.7	36.2	126.2	-90	3
101.1	99.5	97.9	13	8.9	21.9	20	0.5	41.4	124.8	-83.4	4
101.1	100.3	99.5	13	8.9	21.9	20	0.5	41.4	126.8	-85.4	4
101.1	103.5	105.9	13	8.9	21.9	20	0.5	41.4	126.1	-84.7	4
101.1	104.3	107.5	13	8.9	21.9	20	0.5	41.4	126.4	-85	4
101.1	98.7	96.3	13	8.9	21.9	20	0.5	41.4	126.5	-85.1	4
101.1	101.9	102.7	13	8.9	21.9	20	0.5	41.4	126.9	-85.5	4
101.1	102.7	104.3	13	8.9	21.9	20	0.5	41.4	126.2	-84.8	4
101.9	100.3	98.7	13	8.9	21.9	20	1.5	40.4	126.8	-86.4	3
101.9	104.3	106.7	13	8.9	21.9	20	1.5	40.4	126.4	-86	3
101.9	97.9	93.9	13	8.9	21.9	20	1.5	40.4	125.5	-85.1	3
101.9	98.7	95.5	13	8.9	21.9	20	1.5	40.4	126.5	-86.1	3
101.9	99.5	97.1	13	8.9	21.9	20	1.5	40.4	124.8	-84.4	3
101.9	102.7	103.5	13	8.9	21.9	20	1.5	40.4	126.2	-85.8	3
101.9	103.5	105.1	13	8.9	21.9	20	1.5	40.4	126.1	-85.7	3
102.7	100.3	97.9	9	8.8	17.8	20	0.5	37.3	126.8	-89.5	3
102.7	104.3	105.9	9	8.8	17.8	20	0.5	37.3	126.4	-89.1	3
102.7	105.1	107.5	9	8.8	17.8	20	0.5	37.3	126.9	-89.6	3
102.7	99.5	96.3	9	8.8	17.8	20	0.5	37.3	124.8	-87.5	3
102.7	103.5	104.3	9	8.8	17.8	20	0.5	37.3	126.1	-88.8	3
102.7	97.9	93.1	9	8.8	17.8	20	0.5	37.3	125.5	-88.2	3
102.7	101.9	101.1	9	8.8	17.8	20	0.5	37.3	126.9	-89.6	3
103.5	105.1	106.7	13	8.9	21.9	20	0.2	41.7	126.9	-85.2	3
103.5	98.7	93.9	13	8.9	21.9	20	0.2	41.7	126.5	-84.8	3
103.5	99.5	95.5	13	8.9	21.9	20	0.2	41.7	124.8	-83.1	3
103.5	100.3	97.1	13	8.9	21.9	20	0.2	41.7	126.8	-85.1	3
103.5	102.7	101.9	13	8.9	21.9	20	0.2	41.7	126.2	-84.5	3
103.5	104.3	105.1	13	8.9	21.9	20	0.2	41.7	126.4	-84.7	3
103.5	97.9	92.3	13	8.9	21.9	20	0.2	41.7	125.5	-83.8	3

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
103.5	101.9	100.3	13	8.9	21.9	20	0.2	41.7	126.9	-85.2	3
104.3	105.1	105.9	9	8.6	17.6	40	17.1	40.5	126.9	-86.4	3
104.3	100.3	96.3	9	8.6	17.6	20	17.1	20.5	126.8	-106.3	3
104.3	103.5	102.7	9	8.6	17.6	20	17.1	20.5	126.1	-105.6	3
104.3	98.7	93.1	9	8.6	17.6	20	17.1	20.5	126.5	-106	3
104.3	101.9	99.5	9	8.6	17.6	20	17.1	20.5	126.9	-106.4	3
104.3	102.7	101.1	9	8.6	17.6	20	17.1	20.5	126.2	-105.7	3
104.3	105.9	107.5	9	8.6	17.6	20	17.1	20.5	115.5	-95	3
105.1	99.5	93.9	9	8.7	17.7	20	0.5	37.2	124.8	-87.6	3
105.1	100.3	95.5	9	8.7	17.7	20	0.5	37.2	126.8	-89.6	3
105.1	103.5	101.9	9	8.7	17.7	20	0.5	37.2	126.1	-88.9	3
105.1	104.3	103.5	9	8.7	17.7	20	0.5	37.2	126.4	-89.2	3
105.1	98.7	92.3	9	8.7	17.7	20	0.5	37.2	126.5	-89.3	3
105.1	101.9	98.7	9	8.7	17.7	20	0.5	37.2	126.9	-89.7	3
105.1	102.7	100.3	9	8.7	17.7	20	0.5	37.2	126.2	-89	3
105.1	105.9	106.7	9	8.7	17.7	20	0.5	37.2	115.5	-78.3	5
105.9	104.3	102.7	9	8.5	17.5	40	16.5	41	126.4	-85.4	3
105.9	105.1	104.3	9	8.5	17.5	20	16.5	21	126.9	-105.9	3
105.9	99.5	93.1	9	8.5	17.5	20	16.5	21	124.8	-103.8	3
105.9	101.9	97.9	9	8.5	17.5	20	16.5	21	126.9	-105.9	3
105.9	102.7	99.5	9	8.5	17.5	20	16.5	21	126.2	-105.2	3
105.9	103.5	101.1	9	8.5	17.5	20	16.5	21	126.1	-105.1	3
105.9	106.7	107.5	9	8.5	17.5	20	16.5	21	127.1	-106.1	3
106.7	100.3	93.9	13	8.4	21.4	20	3.2	38.2	126.8	-88.6	3
106.7	104.3	101.9	13	8.4	21.4	20	3.2	38.2	126.4	-88.2	3
106.7	105.1	103.5	13	8.4	21.4	20	3.2	38.2	126.9	-88.7	3
106.7	99.5	92.3	13	8.4	21.4	20	3.2	38.2	124.8	-86.6	3
106.7	102.7	98.7	13	8.4	21.4	20	3.2	38.2	126.2	-88	3
106.7	103.5	100.3	13	8.4	21.4	20	3.2	38.2	126.1	-87.9	3
106.7	101.9	97.1	13	8.4	21.4	20	3.2	38.2	126.9	-88.7	3
106.7	105.9	105.1	13	8.4	21.4	20	3.2	38.2	115.5	-77.3	3
107.5	105.1	102.7	13	8.1	21.1	20	8.1	33	126.9	-93.9	3
107.5	100.3	93.1	13	8.1	21.1	20	8.1	33	126.8	-93.8	3
107.5	102.7	97.9	13	8.1	21.1	20	8.1	33	126.2	-93.2	3
107.5	103.5	99.5	13	8.1	21.1	20	8.1	33	126.1	-93.1	3

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
107.5	104.3	101.1	13	8.1	21.1	20	8.1	33	126.4	-93.4	3
107.5	106.7	105.9	13	8.1	21.1	20	8.1	33	127.1	-94.1	3
107.5	101.9	96.3	13	8.1	21.1	20	8.1	33	126.9	-93.9	3
107.5	105.9	104.3	13	8.1	21.1	20	8.1	33	115.5	-82.5	3
108.3	105.1	101.9	6	8.1	14.1	20	15.3	18.8	126.9	-108.1	
108.3	100.3	92.3	6	8.1	14.1	20	15.3	18.8	126.8	-108	
108.3	103.5	98.7	6	8.1	14.1	20	15.3	18.8	126.1	-107.3	
108.3	104.3	100.3	6	8.1	14.1	20	15.3	18.8	126.4	-107.6	
108.3	107.5	106.7	6	8.1	14.1	20	15.3	18.8	125.2	-106.4	
108.3	101.9	95.5	6	8.1	14.1	20	15.3	18.8	126.9	-108.1	
108.3	102.7	97.1	6	8.1	14.1	20	15.3	18.8	126.2	-107.4	
108.3	105.9	103.5	6	8.1	14.1	20	15.3	18.8	115.5	-96.7	
108.3	106.7	105.1	6	8.1	14.1	20	15.3	18.8	127.1	-108.3	
109.1	103.5	97.9	9	8.1	17.1	20	11.2	25.9	126.1	-100.2	
109.1	104.3	99.5	9	8.1	17.1	20	11.2	25.9	126.4	-100.5	
109.1	105.1	101.1	9	8.1	17.1	20	11.2	25.9	126.9	-101	
109.1	107.5	105.9	9	8.1	17.1	20	11.2	25.9	125.2	-99.3	
109.1	102.7	96.3	9	8.1	17.1	20	11.2	25.9	126.2	-100.3	
109.1	105.9	102.7	9	8.1	17.1	20	11.2	25.9	115.5	-89.6	
109.1	106.7	104.3	9	8.1	17.1	20	11.2	25.9	127.1	-101.2	
109.9	104.3	98.7	9	8	17	20	19.3	17.7	126.4	-108.7	
109.9	105.1	100.3	9	8	17	20	19.3	17.7	126.9	-109.2	
109.9	101.9	93.9	9	8	17	20	19.3	17.7	126.9	-109.2	
109.9	102.7	95.5	9	8	17	20	19.3	17.7	126.2	-108.5	
109.9	103.5	97.1	9	8	17	20	19.3	17.7	126.1	-108.4	
109.9	105.9	101.9	9	8	17	20	19.3	17.7	115.5	-97.8	
109.9	106.7	103.5	9	8	17	20	19.3	17.7	127.1	-109.4	
109.9	107.5	105.1	9	8	17	20	19.3	17.7	125.2	-107.5	
110.7	104.3	97.9	9	8	17	20	19.4	17.6	126.4	-108.8	
110.7	105.1	99.5	9	8	17	20	19.4	17.6	126.9	-109.3	
110.7	103.5	96.3	9	8	17	20	19.4	17.6	126.1	-108.5	
110.7	106.7	102.7	9	8	17	20	19.4	17.6	127.1	-109.5	
110.7	107.5	104.3	9	8	17	20	19.4	17.6	125.2	-107.6	
110.7	101.9	93.1	9	8	17	20	19.4	17.6	126.9	-109.3	

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
110.7	105.9	101.1	9	8	17	20	19.4	17.6	115.5	-97.9	
111.5	105.1	98.7	9	8	17	20	20	17	126.9	-109.9	
111.5	102.7	93.9	9	8	17	20	20	17	126.2	-109.2	
111.5	103.5	95.5	9	8	17	20	20	17	126.1	-109.1	
111.5	104.3	97.1	9	8	17	20	20	17	126.4	-109.4	
111.5	106.7	101.9	9	8	17	20	20	17	127.1	-110.1	
111.5	107.5	103.5	9	8	17	20	20	17	125.2	-108.2	
111.5	101.9	92.3	9	8	17	20	20	17	126.9	-109.9	
111.5	105.9	100.3	9	8	17	20	20	17	115.5	-98.5	
112.3	105.1	97.9	9	8	17	20	20	17	126.9	-109.9	
112.3	104.3	96.3	9	8	17	20	20	17	126.4	-109.4	
112.3	107.5	102.7	9	8	17	20	20	17	125.2	-108.2	
112.3	102.7	93.1	9	8	17	20	20	17	126.2	-109.2	
112.3	105.9	99.5	9	8	17	20	20	17	115.5	-98.5	
112.3	106.7	101.1	9	8	17	20	20	17	127.1	-110.1	
113.1	103.5	93.9	9	8	17	20	20	17	126.1	-109.1	
113.1	104.3	95.5	9	8	17	20	20	17	126.4	-109.4	
113.1	105.1	97.1	9	8	17	20	20	17	126.9	-109.9	
113.1	107.5	101.9	9	8	17	20	20	17	125.2	-108.2	
113.1	102.7	92.3	9	8	17	20	20	17	126.2	-109.2	
113.1	105.9	98.7	9	8	17	20	20	17	115.5	-98.5	
113.1	106.7	100.3	9	8	17	20	20	17	127.1	-110.1	
113.9	105.1	96.3	3	7.6	10.6	20	17.2	13.4	126.9	-113.5	
113.9	103.5	93.1	3	7.6	10.6	20	17.2	13.4	126.1	-112.7	
113.9	105.9	97.9	3	7.6	10.6	20	17.2	13.4	115.5	-102.1	
113.9	106.7	99.5	3	7.6	10.6	20	17.2	13.4	127.1	-113.7	
113.9	107.5	101.1	3	7.6	10.6	20	17.2	13.4	125.2	-111.8	
114.7	104.3	93.9	3	7.5	10.5	20	20	10.5	126.4	-115.9	
114.7	105.1	95.5	3	7.5	10.5	20	20	10.5	126.9	-116.4	
114.7	103.5	92.3	3	7.5	10.5	20	20	10.5	126.1	-115.6	
114.7	106.7	98.7	3	7.5	10.5	20	20	10.5	127.1	-116.6	
114.7	107.5	100.3	3	7.5	10.5	20	20	10.5	125.2	-114.7	
114.7	105.9	97.1	3	7.5	10.5	20	20	10.5	115.5	-105	
115.5	104.3	93.1	3	7.5	10.5	20	20	10.5	126.4	-115.9	

Product Frequency (MHz)	Transmitter Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Total Loss	Full Scale Range (dBμ)	Scale Reading (dBμ)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ)	Level Referenced to Carrier (dB)	Notes*
115.5	106.7	97.9	3	7.5	10.5	20	20	10.5	127.1	-116.6	
115.5	107.5	99.5	3	7.5	10.5	20	20	10.5	125.2	-114.7	
115.5	105.9	96.3	3	7.5	10.5	20	20	10.5	115.5	-105	
116.3	105.1	93.9	3	7.5	10.5	20	20	10.5	126.9	-116.4	
116.3	104.3	92.3	3	7.5	10.5	20	20	10.5	126.4	-115.9	
116.3	107.5	98.7	3	7.5	10.5	20	20	10.5	125.2	-114.7	
116.3	105.9	95.5	3	7.5	10.5	20	20	10.5	115.5	-105	
116.3	106.7	97.1	3	7.5	10.5	20	20	10.5	127.1	-116.6	
117.1	105.1	93.1	3	7.6	10.6	20	20	10.6	126.9	-116.3	
117.1	107.5	97.9	3	7.6	10.6	20	20	10.6	125.2	-114.6	
117.1	106.7	96.3	3	7.6	10.6	20	20	10.6	127.1	-116.5	
117.9	105.1	92.3	3	7.7	10.7	20	20	10.7	126.9	-116.2	
117.9	105.9	93.9	3	7.7	10.7	20	20	10.7	115.5	-104.8	
117.9	106.7	95.5	3	7.7	10.7	20	20	10.7	127.1	-116.4	
117.9	107.5	97.1	3	7.7	10.7	20	20	10.7	125.2	-114.5	
118.7	107.5	96.3	3	7.9	10.9	20	20	10.9	125.2	-114.3	
118.7	105.9	93.1	3	7.9	10.9	20	20	10.9	115.5	-104.6	
119.5	106.7	93.9	3	7.9	10.9	20	20	10.9	127.1	-116.2	
119.5	107.5	95.5	3	7.9	10.9	20	20	10.9	125.2	-114.3	
119.5	105.9	92.3	3	7.9	10.9	20	20	10.9	115.5	-104.6	
120.3	106.7	93.1	3	8	11	20	20	11	127.1	-116.1	
121.1	107.5	93.9	3	8	11	20	20	11	125.2	-114.2	
121.1	106.7	92.3	3	8	11	20	20	11	127.1	-116.1	
121.9	107.5	93.1	3	8	11	20	20	11	125.2	-114.2	
122.7	107.5	92.3	3	8	11	20	20	11	125.2	-114.2	

1. Measured Signal is a local TV carrier WNYW Transmitting at Channel 5: No discernable signal was measured.
2. Measured signal is local carrier WSIA Transmitting on 88.9 MHz: No discernable signal was measured.
3. System carrier assigned to this frequency was turned off for this measurement.
4. Local carrier assigned to this frequency was turned off for this measurement.
5. Allowable spurious level is -72.5 dB for a TPO of 890 watts.

The Spectrum Analyzer was used to check the close in spectral attenuation of each carrier on both systems to confirm the operation of these transmitters are in compliance with Sections (b) and (c) of the FCC Rules and Regulations.

As a final proof of the systems IM Product performance, a wide band search was undertaken using the Spectrum Analyzer. The purpose for this measurement was to look for suspicious anomalies that may warrant further investigation. My search ranged the complete frequency span of the receiver and resulted in no additional investigations

Conclusion : Based upon my observations and measurements taken February 4, 2005 as summarized in this document, I, Mark Steapleton, find the subject multiplexed system- specifically the transmitters and combiner system for the operation of the WPLJ, WQHT and WCBS-FM into the COG 1084-1 CP antenna- to be in proper working order. Furthermore, based on the measured data, it is my opinion that there are no inter-modulation products in excess of 80 dB (or greater than $43 + 10 \log_{10}(\text{Power in watts})$ dB below carrier levels generated from or within the stations operating on both the Mini Master and Master installed system. Also, based on this recorded data. I conclude that WPLJ, WQHT and WCBS-FM are in compliance with the requirements of Section 73.317 paragraph (b) through (d) of the FCC Rules and Regulations.

Respectfully submitted,
Electronics Research, Inc.

By 
Mark Steapleton Field Technician

WARRICK COUNTY)

) SS:

STATE OF INDIANA)


AFFIDAVIT

I, Mark Steapleton, hereby declare that the following statements are true and correct to the best of my knowledge and belief :

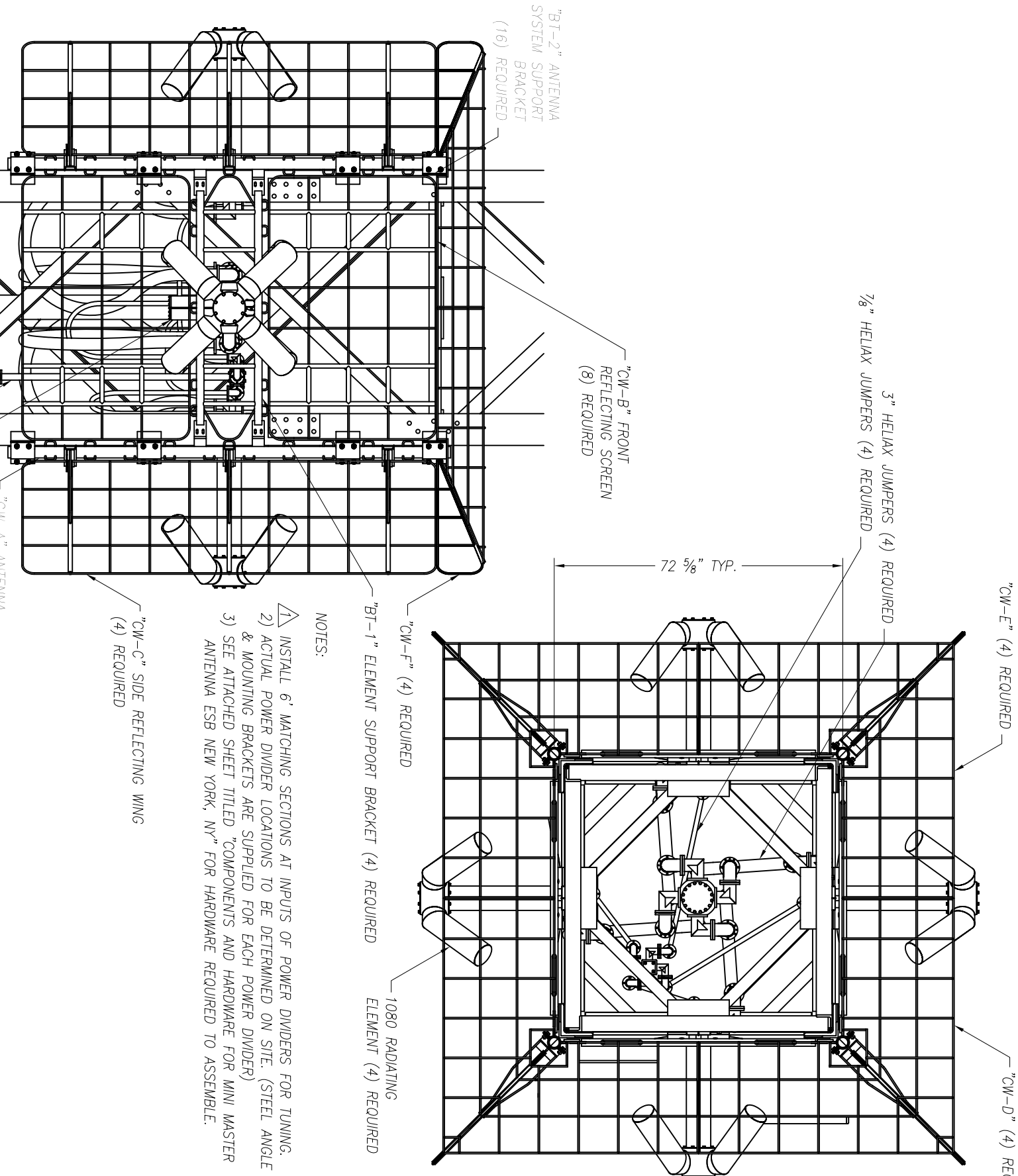
- 1.) I am a Field Technician for Electronics Research, Inc (“ERI “) and have been employed by ERI for 24 years. I am familiar with and have assisted in the design, manufacturing and installation of FM Antennas and FM Multiplexers in my long tenure with ERI.
- 2.) I have either prepared and/or directly supervised the preparation of all technical information contained in this Report Of Findings and to my knowledge to be accurate and true.
- 3.) ERI has been requested by Mini Master Operations Group, on behalf of radio Stations WPLJ, WQHT and WCBS-FM to prepare this Report Of Findings.

Mark Steapleton
Mark Steapleton: Field Technician

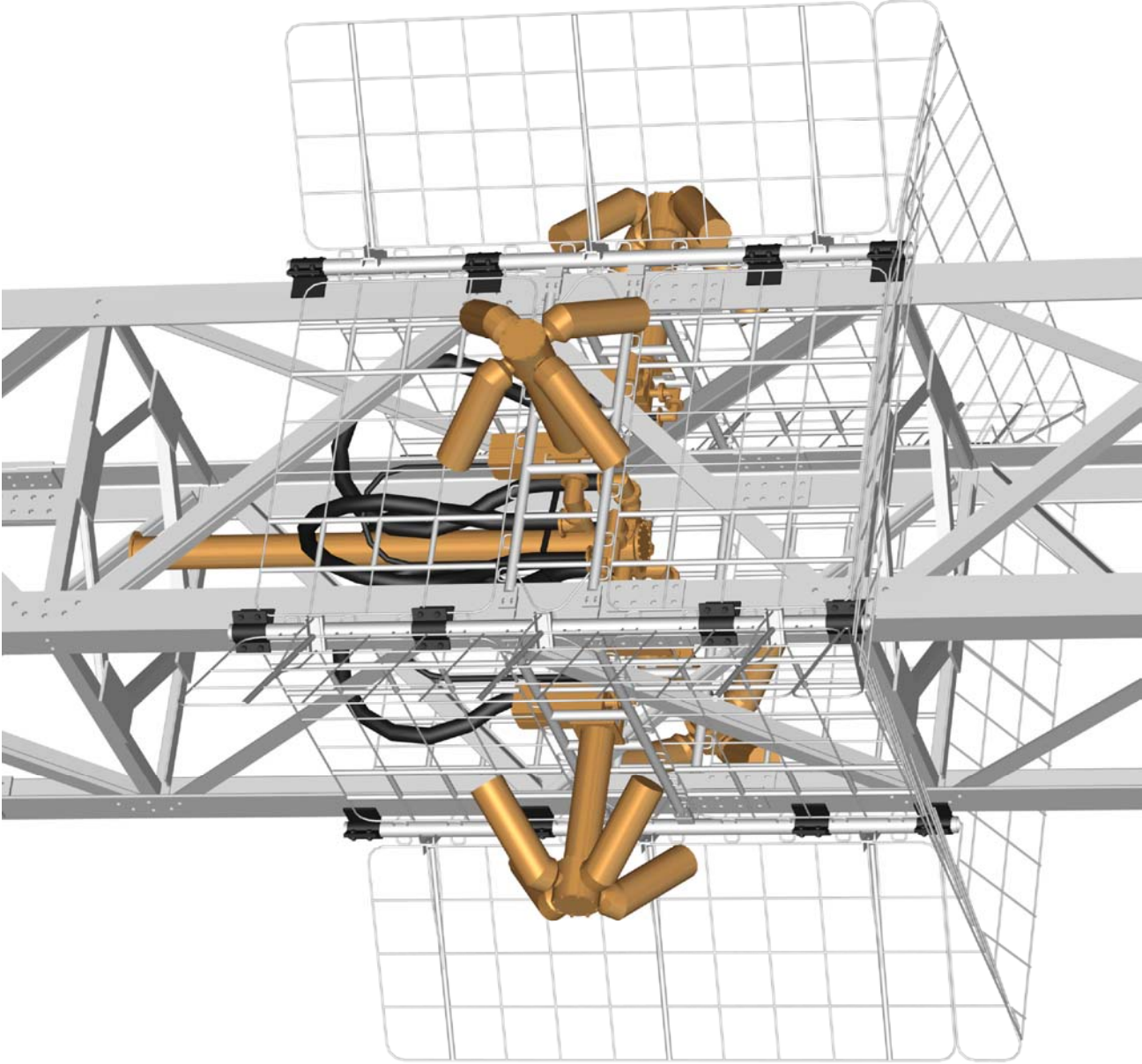
Subscribed and sworn to before me on this 11th. day of February 2005.


 Jacquelyn Kinney; Notary Public
 My commission expires July 5, 2007





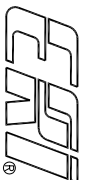
- NOTES:
- 1) INSTALL 6' MATCHING SECTIONS AT INPUTS OF POWER DIVIDERS FOR TUNING.
 - 2) ACTUAL POWER DIVIDER LOCATIONS TO BE DETERMINED ON SITE. (STEEL ANGLE & MOUNTING BRACKETS ARE SUPPLIED FOR EACH POWER DIVIDER)
 - 3) SEE ATTACHED SHEET TITLED "COMPONENTS AND HARDWARE FOR MINI MASTER ANTENNA ESB NEW YORK, NY" FOR HARDWARE REQUIRED TO ASSEMBLE.



ELEVATION VIEW

NAME INSTALLATION DETAIL					
6					STATION: ESB - NEW YORK, NY
5					FREQUENCY: N/A PROJECT NO.: 11237
4					PATH C:\DRAWING\ALL\PROJECTS\11237\1
3					FILE I \A - DRAWN BAW FACTOR NIS
2					DATE 10/14/04 APP'D DWG. NO.
1					MODEL COG-60S-120-1/A -
NO REVISION APP'D DATE					
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Established 1943
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CHANDLER, IN. 47610-9637
PHONE: (812) 925-6000
FAX: (812) 925-4026



A-2 ERI Antenna Specification Sheet

Empire State Building, New York

General Specifications

Antenna Type High Power FM-Broadcast, Suitable For Triplexing
 Model Number COG4-60S-120-1
 Number Of Bay Levels One
 Polarization Right Hand Circular

Electrical Specifications

Antenna Input Power Capability (Single Feed) 120 kW Max ⁽¹⁾
 Operating Frequency Band 88-108 Megahertz.
 VSWR 1.09:1 @ Operating Frequencies⁽²⁾
 Azimuthal Pattern Circularity Less Than +/- 1.5 dB From RMS (Free Space)
 Power Split 50/50 (Horizontal & Vertical)
 Quarter Wave Shorting Stub None
 Frequency Specific Information:

<u>Frequency</u>	<u>Station ERP</u>	<u>Beam Tilt</u>	<u>First Null Fill</u>	<u>Second Null Fill</u>	<u>Power Gain</u>	<u>Line Loss</u>	<u>Filter Loss</u> ⁽⁶⁾	<u>Computed TPO</u>
95.5	6.7 (kW)	0.0°	0.0°	0%	.438	.290 dB ⁽³⁾	.639 dB	18.94 (kW)
97.1	6.7 (kW)	0.0°	0.0°	0%	.438	.305 dB ⁽⁴⁾	.558 dB	18.66 (kW)
101.1	6.7 (kW)	0.0°	0.0°	0%	.438	.319 dB ⁽⁵⁾	.554 dB	18.70 (kW)

Mechanical Specifications

Antenna Feed System Fed With Single Line
 Input Connector 6 1/8" 50-Ohm EIA Flanged
 Element Deicing None Ordered
 Array Length 92"
 Construction Material (Antenna) All Noncorrosive
 Construction Material (Mounting) All Stainless Steel

1) Power Capability Has Been Rated Assuming An Operating Transmission VSWR Of 1.09:1

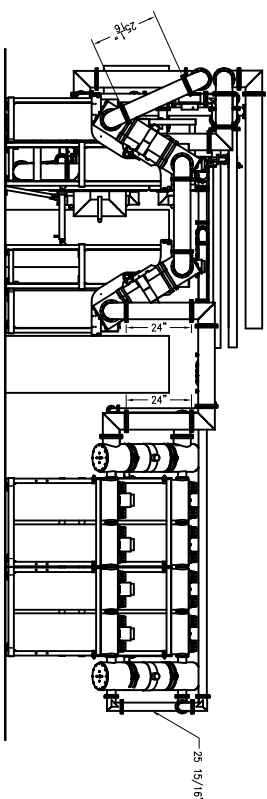
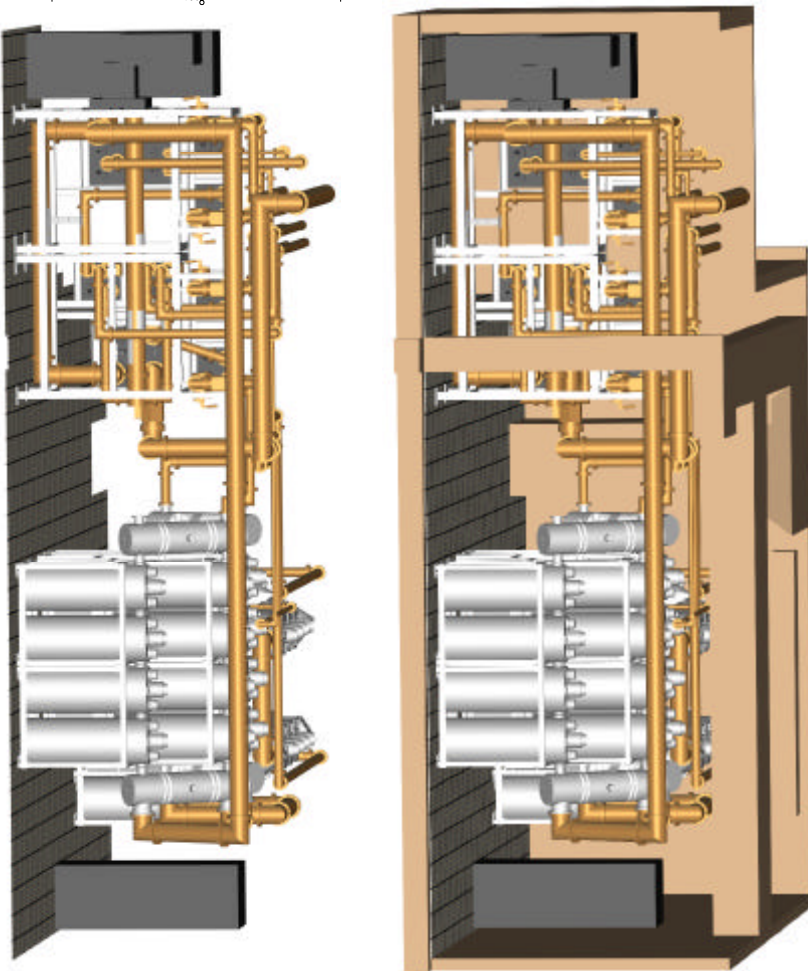
2) VSWR 1.25:1, Maximum with ½" Of Radial Ice.

3) WPLJ Line Loss Includes The Inside Feed Run Of 85' And One Dielectric Model 5000 Switches With A Loss Of .02 dB Each.

4) WQHT Line Loss Includes The Inside Feed Run Of 99' And Two Dielectric Model 5000 Switches With A Loss Of .02 dB Each.

5) WCBS-FM Line Loss Includes The Inside Feed Run Of 130' And One Dielectric Model 5000 Switch With A Loss Of .02 dB.

6) Losses Taken From Actual Multiplexer Measurements.



A-2 ERI Combiner Specification Sheet
EMPIRE STATE BUILDING, NEW YORK

General Specifications:

Multiplexer Model # MA970F8-000-036
Combiner Type 970-8 Constant Impedance Combiner with Group Delay Compensation
Number Of Combining Units Three
Injected Port to Injected Port Isolation - 55 dB
Output Connector 6 1/8 " 50 Ohm EIA (Flanged)
Output Power (Designed) 120 kW⁽¹⁾
Combiner Units, Size and Weight :

Type 970-8 Tuned To 95.5 MHz. 49" ht. X 3' 9 1/2" wd. X 8' 6 1/2" lg. & 1100 Lbs.
Type 970-8 Tuned To 97.1 MHz. 49" ht. X 3' 9 1/2" wd. X 8' 6 1/2" lg. & 1100 Lbs.
Type 970-8 Tuned To 101.1 MHz. 49" ht. X 3' 9 1/2" wd. X 8' 6 1/2" lg. & 1100 Lbs.

Heat Removal Natural Convection
Physical Arrangement All Components Free Standing

Injected Port Specifications:

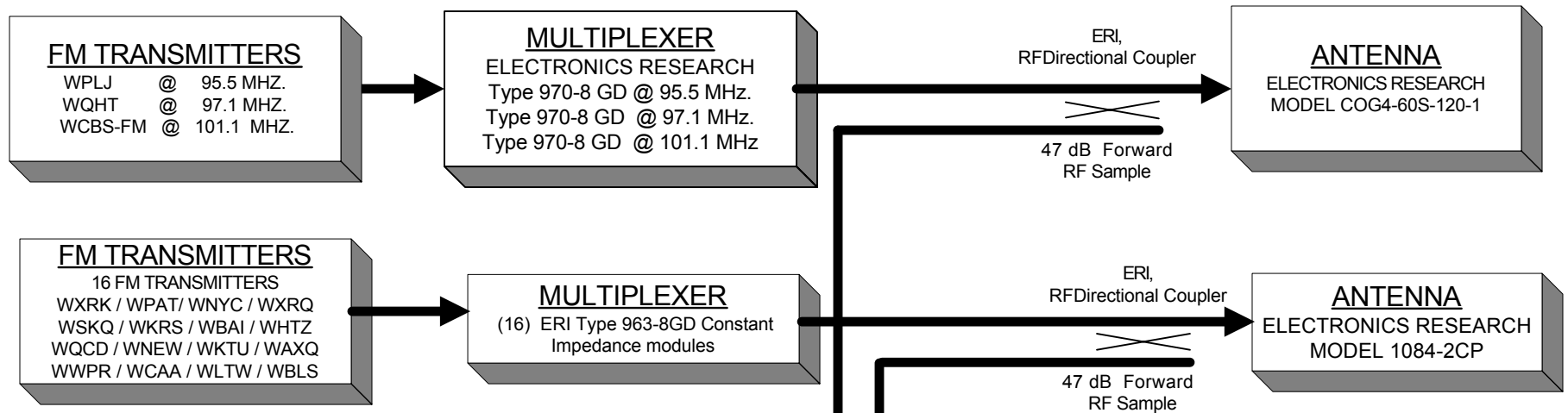
Frequency Assignment 95.5 MHz., 97.1 Mhz. and 101.1 MHz.
Power Rating, Each Injected Port (Designed) 19.5 kW
Input Connector 3-1/8" 50 Ohm EIA (Flanged)
VSWR Less than 1.07:1 @ +/-200 KHz⁽²⁾
Group Delay Less than 50 ns Overall Variation, Carrier @ +/- 150 KHz
Insertion Loss (Measured):

95.5 MHz. - 0.639 dB
97.1 MHz. - 0.558 dB
101.1 MHz. - 0.554 dB

1) Power Rating Listed is as Designed Only. Actual Power Capabilities May Vary.
2) When Terminated in 50 Ohm Resistive Load.

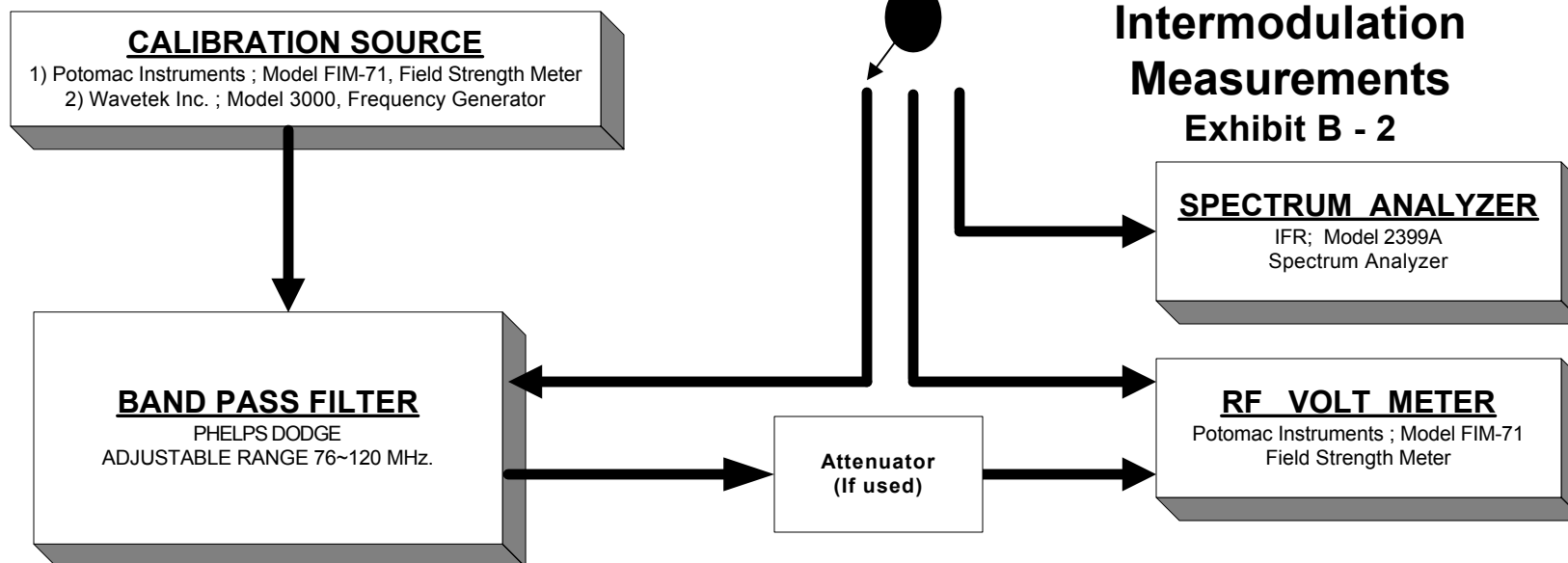
Broadcasting Scheme, WPLJ~WQHT~WCBS-FM New York, New York

Broadcasting Scheme EXHIBIT - B1



Equipment Employed in Intermodulation Measurements

Exhibit B - 2



Note *
All RF Connecting Cable Used In
Measurement Setup Is Double Shielded.

Broadcasting Scheme and Equipment Employed in Intermodulation Measurements

EXHIBIT B