ELECTRONICS RESEARCH, INC.
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Report Of Intermodulation Product Findings

KHTS, KMYI, KGB-FM 52nd. STREET BROADCAST FACILITY
SAN DIEGO, CALIFORNIA

September 2002

Electronics Research Inc.
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REPORT OF FINDINGS
SAN DIEGO, CALIFORNIA BROADCAST FACILITY
SAN DIEGO, CALIFORNIA
September 14, 2002

Introduction : This report of findings is based on data collected at the 52 nd. Street FM broadcast facility located in San Diego, CA. The report includes measurements offered as proof that the combined operations of KHTS (93.3 MHz.), KMYI (94.1 MHz.) and KGB-FM (101.5 MHz.) 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 second order inter-modulation (IM) products generated by this multiplex system are less than the maximum allowable level as required by section 73.317 (b through d). Mark Steapleton of Electronics Research, Inc. located in Chandler, Indiana performed the measurements summarized herein on September 14, 2002.

The following exhibits are provided:

Exhibit A:

A-1 Drawing Depicting Antenna.
A-2 G5CPS-8BC-HW-SP Antenna Specification Sheet.
A-3 Drawing Depicting Multiplexing Scheme.
A-4 Multiplexer Specification Sheet.
A-5 Theoretical Vertical Plane Relative Field Antenna Plots

Exhibit B:

B-1 Equipment Employed In Intermodulation Product Measurement.
B-2 Broadcasting Scheme of the Multiplexed Systems.

Table 1. Carrier Reference Levels.
Table 2. Calculated Second Order Products.
Table 3. 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 are the narrow band carrier frequency measurements that provide relative output signal levels for the IM analysis. Table 2 lists the calculated second order products that can be generated from FM transmitters broadcasting from the multiplexed system. The IM Analysis Measurements, in Table 3, 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 second 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 Multiplexed System : At the time of my measurements three FM stations were operating from the combined antenna system. The KHTS, KMYI and KGB-FM multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. The G5CPS-8BC-HW-SP antenna and Branch Type multiplexer unit are products of Electronics Research, Inc, whereas the feed line is manufactured by Myat, Refer to Exhibit B-2, for an illustration of the Broadcasting Scheme of these stations.

To accomplish the aggregation of three transmitter signals into a common antenna feed and provide transmitter-to-transmitter isolation, a multiplexing scheme consisting of a Branch Combiner was installed. Specifically, the Multiplexer utilizes four ERI Model 946 Notch filters and eleven ERI Model 963 Bandpass filters. Two interconnecting TEE's is required to complete the multiplexer module. The Multiplexer is illustrated in the attached Exhibit A-3. The multiplexer, fully assembled, exhibited transmitter port-to-port isolation in excess of -64 dB. Other performance measurements, such as match, loss, group-delay, etc, revealed that the multiplexer unit was in proper working condition. Refer to Exhibit A-4 for the Combiner Specification Sheet.

The IM Investigation : Directional Couplers were placed at key locations throughout the combiner to monitor and maintain the multiplexers performance. All couplers furnished with the system are factory calibrated and capable of delivering accurate and repeatable RF measurements. To facilitate the taking of the measurements, the coupler located at the antenna output of the multiplexed system 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 coupler 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. See attached Exhibit B-1 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, 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 - Carrier Reference Levels

Carrier Frequency (MHz)	Pad One (dB)	Bandpass Filter Loss (dB)	Full Scale Range (dB_{μ})	Scale Reading (dB)	Adjusted Level (dB_{μ})	Notes
KHTS (93.3)	10	---	140	-16.1	**133.9**	
KMYI (94.1)	10	---	140	-19.3	**130.7**	
KGB-FM (101.5)	10	---	140	-16.2	**133.8**	

Predictable second-order products due to system harmonics mixed with all on-site interfering frequencies that could be generated from the multiplexed system are calculated and listed in Table 2.

Table 2 - Second order Products.

	Carrier Frequency (MHz)		
Interfering Frequency (MHz)	**KHTS 93.3**	**KMYI 94.1**	**KGB-FM 101.5**
KHTS 93.3	---	94.9	109.7
KMYI 94.1	92.5	---	108.9
KGB-FM 101.5	85.1	86.7	---

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 Intermodulation Measurements

Product Frequency (MHz)	Carrier Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Full Scale Range (dBμ)	Scale reading (dB)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ) (See Table 1)	**Level Referenced to Carrier (dB)**	Notes*
85.1	93.3	101.5	10	6.9	20	-15.8	21.1	133.9	**-112.8**	
86.7	94.1	101.5	6	6.8	20	-16.9	15.9	130.7	**-114.8**	
92.5	93.3	94.1	6	6.7	40	-1.5	51.2	133.9	**-82.7**	1
94.9	94.1	93.3	6	6.7	40	-1.7	51.0	130.7	**-79.7**	2
108.9	101.5	94.1	0	6.0	20	-10.2	15.8	133.8	**-118.0**	
109.7	101.5	93.3	6	5.8	20	-12.3	19.5	133.8	**-114.3**	

NOTES

1) Measured signal is XHRM licensed in Mexico, local carrier transmitting at 92.5 MHz: No discernable signal was measured.

2) Measured signal is KBZT local carrier transmitting at 94.9 MHz: No discernable signal was measured.

The Spectrum Analyzer was used to check the close- in spectral attenuation of each transmitter operating into the combined antenna system. At the time of my measurements, all stations were 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 September 14th. 2002 as summarized in this document, I, Mark Steapleton, find the subject multiplexed system- specifically the transmitters and combiner system for the operation of the KHTS, KMYI and KGB-FM into the G5CPS-8BC-HW-SP 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 below carrier levels generated from or within the stations operating on the installed system. Also, based on this recorded data. I conclude that KHTS, KMYI and KGB-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
Mark Steapleton Field Technician

State of Indiana)
) SS:
County of Warrick)

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 22 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 Clear Channel Communications on behalf of radio Stations KHTS KMYI and KGB-FM in San Diego, CA. to prepare this Report Of Findings.

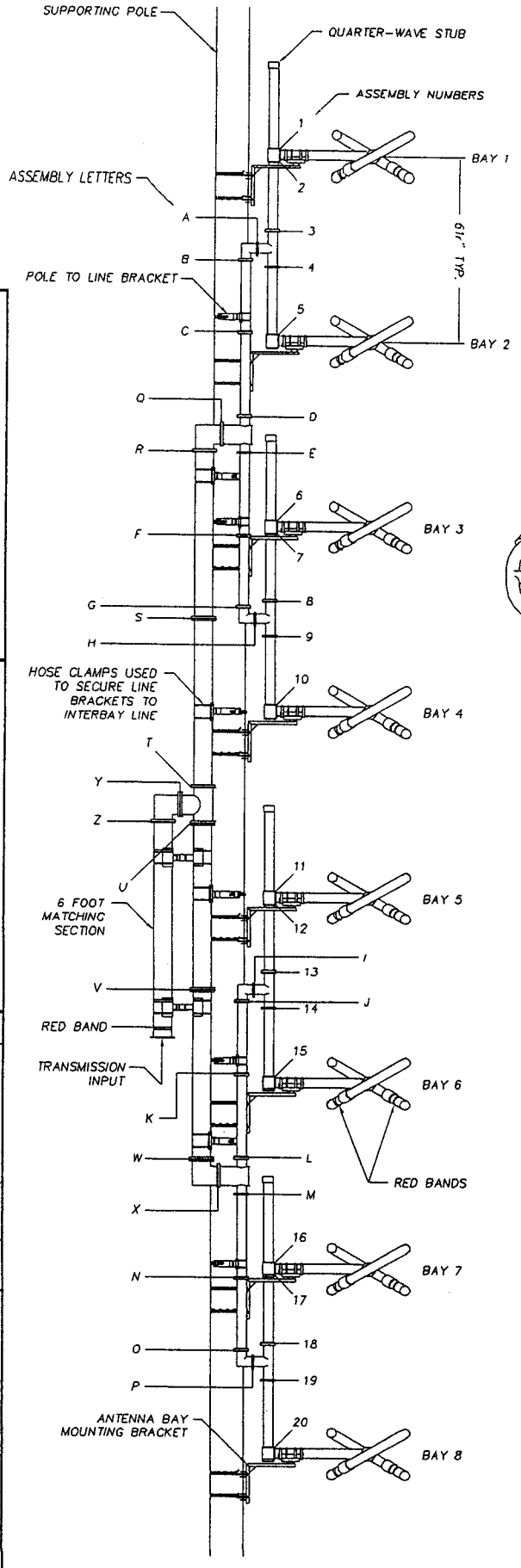
Mark Steapleton

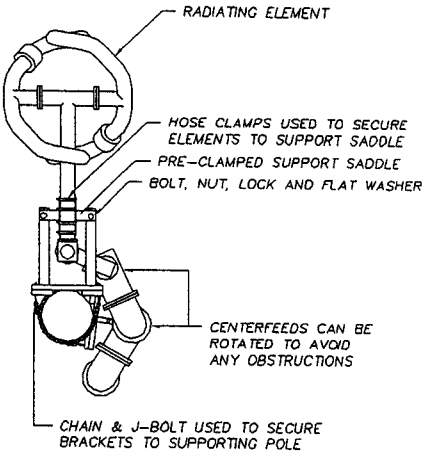
Mark Steapleton; Field Technician

Subscribed and sworn to before me on this 3rd. day of October 2002.

Jacquelyn S Kinney

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





NOTES:
1. ALL RED BANDS DESIGNATE SIDE TO BE MOUNTED DOWNWARD
2. ASSEMBLE ANTENNA SYSTEM BY MATING CORRESPONDING NUMBERS AND LETTERS
3. OVERALL LENGTH OF ANTENNA SYSTEM IS 38' 5g" APPROX.
4. ENSURE TO PLUMB ANTENNA VERTICALLY BY LOOSENING HOSE CLAMPS ON PRE-CLAMPED SUPPORT SADDLES AND ADJUSTABLE LINE BRACKETS
5. ROTATE CENTERFEED ASSEMBLIES AS CLOSE TO TOWER AS POSSIBLE
6. FINAL ORIENTATION TO BE DETERMINED BY STATION PERSONNEL

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NO	REVISION	APP'D	DATE
1			
2			
3			
4			
5			
6			

NAME INSTALLATION DRAWING
FOR SAN DIEGO, CA
CALL/FREQ. KHTS/833/914.1/910.5 MHz
DRAWN FATHERA APP'D
TYPE CSOS-ARK-4M-4P DATE 06/07/99
PATH G:\DRAFTING\BASIC\
PROJ. NO. 06315A
FACTOR NTS
DWG. NO. 06315A

A-2 ERI Antenna Specification Sheet
SAN DIEGO, CALIFORNIA

General Specifications

Antenna Type ..... High Power FM-Broadcast, Suitable For Diplexing
Model Number G5CPS-8BC-HW-SP
Number Of Bay Levels ....., Eight
Polarization ..... Right Hand Circular

Electrical Specifications

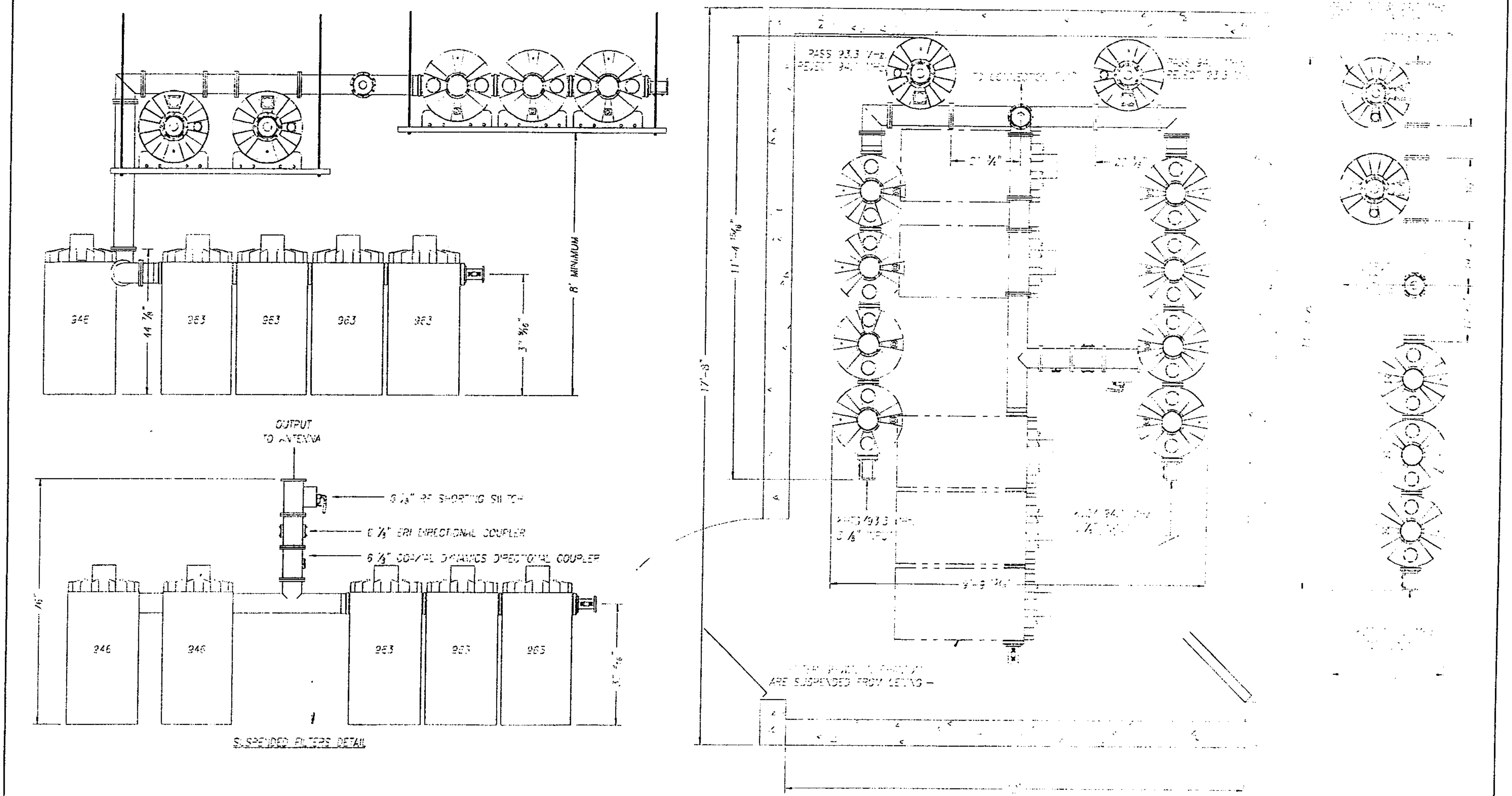
Antenna Input Power Capability ..... 64 KW. Maximum (1)
Operating Frequency Band ..... 93.3, 94.1 and 101.5 Megahertz.
VSWR ..... 1.1 : 1 @ Operating Frequencies.(2)
Azimuthal Pattern Circularity ..... +/- 2dB From RMS (Free Space)
Power Split ..... 50/50 (Horizontal & Vertical)
Quarter Wave Shorting Stub ..... Yes (4)
Frequency Specific Information:

Frequency	Station ERP	Beam Tilt	First Null Fill	Second Null Fill	Power Gain	Line Loss (3)	Filter Loss (4)	Computed TPO
93.3	50 (KW)	0.0°	0 %	00%	2.455	.445 dB	.463 dB	25.10 (KW)
94.1	22 (KW)	0.0°	0 %	00%	2.474	.460 dB	.551 dB	11.22 (KW)
101.5	50 (KW)	0.0°	0 %	00%	2.654	.462 dB	.348dB	22.70 (KW)

Mechanical Specifications

Antenna Feed System ..... Fed With Single Feed Lines
Input Connector ..... 6-1/8" 50- Ohm EIA Flanged
Element Deicing ..... Not Ordered
Interbay Spacing ..... 61.250 Inch Center to Center
Array Length ..... 38 Feet, 5 3/4 Inches
Construction Material (Antenna) ..... All Noncorrosive
Construction Material (Mounting) ..... All Stainless Steel
Mounting ..... Pole
Weight (Antenna Only No Ice) ..... 1,050 Lbs.
Wind Load (Antenna Effective Area [CaAa]) ..... 48 Sq. Ft.

1) Power Capability Has Been Rated Assuming An Operating Transmission VSWR Of 1.5:1
2) VSWR Specification Achieved After On Site Tuning For User Specific Frequencies.
3) Line Loss Assumes A Feed Run Of 750 Feet, Myat Type 601 Rigid 6 1/8" Coax. Each Transmitter Incorporates a Dielectric Type 5000 3" Motorized Coax Switch and Myat Type 301 Rigid Coax Between The Filter And Multiplexer, 49 Feet for 93.3 MHz., 64 Feet for 94.1 Mhz., and 49 Feet for 101.5 MHz.
4) Losses Taken From Actual Multiplexer Measurements.



NOTE: THE MULTIPLEXING SCHEME PROVIDED CONSISTS OF TWO INDEPENDENT COMBINING MODULES. A TEE-TYPE (KHTS/93.3 MHZ & KUOY/94.1 MHZ) AND A NOTCH COMBINER (KGB/101.5 MHZ) ARE FURNISHED. THE TWO UNITS ARE INTER-CONNECTED AT POINTS LABELED "__". THE LENGTH OF 6⅛" RIGID COAX REQUIRED FOR THIS CONNECTION IS NOT CRITICAL BUT SHOULD BE MINIMIZED TO A REASONABLE LENGTH

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NO.	REVISION	APP'D	DATE
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A-4 ERI Combiner Specification Sheet

San Diego, California

General Specifications:

Multiplexer Type ..... Branch Combiner
Number Of Combining Units ..... Three
Injected Port to Injected Port Isolation ..... - 64 dB
Output Connector ..... 6 1/8 " 50 Ohm EIA (Flanged)
Output Power ..... 65 KW
Combiner Units, Size and Weight : (Approx.)

Type 963-4 Tuned To 93.9 MHz. ..... 5' ht. X 2' wd. X 8' lg. & 800 Lbs.
Type 963-4 Tuned To 94.1 MHz. ..... 5' ht. X 2' wd. X 8' lg. & 800 Lbs.
Type 963-3 Tuned To 101.5 MHz. ..... 5' ht. X 2' wd. X 6' lg. & 585 Lbs.
Type 946-1 (Pass 93.3 MHz. Rejcct 94.1). ..... 5' ht. X 2' wd. X 2' lg. & 175 Lbs.
Type 946-1 (Pass 94.1 MHz. Rejcct 93.3). ..... 5' ht. X 2' wd. X 2' lg. & 175 Lbs.
Type 946-2 (Pass 93.3 & 94.1 MHz. Reject 101.5 MHz.). ..... 5' ht. X 2' wd. X 4.6' lg. & 360 Lbs.

Heat Removal (All Multiplexer Components) ..... Forced Air (1)
Physical Arrangement ..... All the 93.9 and 94.1 MHz. Components Floor Standing 101.5 MHz. 963-3 bandpass and 946-2 Notch Filters are mounted Horizontal on a rack.

Injected Port Specifications:

Frequency Assignment ..... 93.3, 94.1 and 101.5 MHz.
Power Rating, Each Injected Port (Maximum) ..... 26 KW
Input Connector ..... 3-1/8" 50 Ohm EIA (Flanged)
VSWR ..... Less than 1.08:1 @ Carrier (2)
Group Delay ..... Less than ***100 ns*** Overall Variation, Carrier @ +/- 150 KHz
Insertion Loss (Measured):

93.3 MHz. ..... - 0.463 dB
94.1 MHz. ..... - 0.551 dB
101.5 MHz ..... - 0.348 dB

1) Filter room ambient temperature must be maintained at 70 degrees F.
2) When Terminated in 50 Ohm Resistive Load.

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CHANDLER, IN. 47610

FIGURE 1

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

G8CPS-8BC-HW-SP FM BROADCAST ANTENNA
0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 2.455 IN THE HORIZONTAL PLANE(2.455 IN THE MAX.)

January 19, 1998

93.3 MHz.

ELEMENT SPACING:
61.2815 INCHES

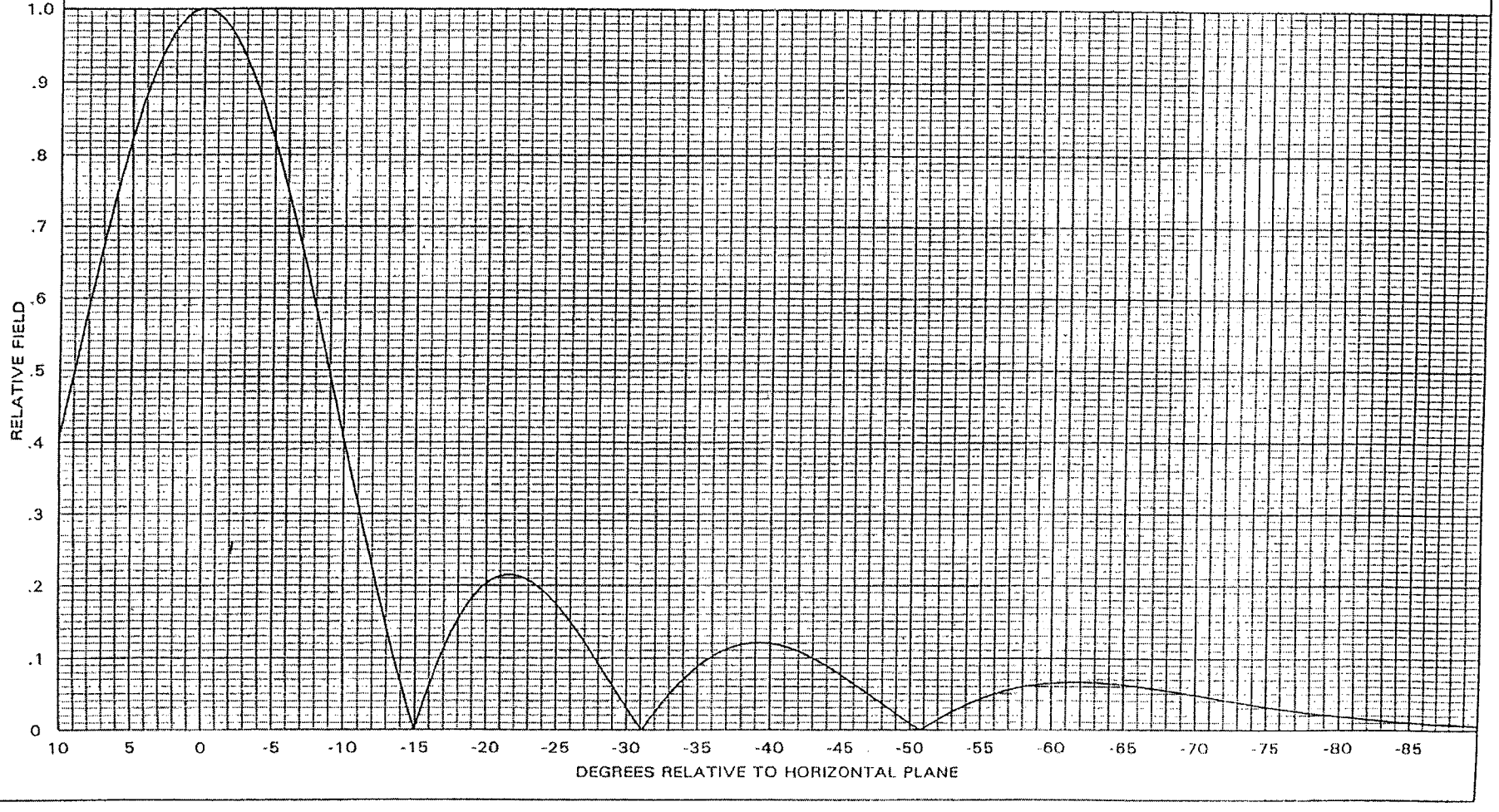

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FIGURE 1

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

G8CPS-8BC-HW-SP FM BROADCAST ANTENNA
0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 2.474 IN THE HORIZONTAL PLANE(2.474 IN THE MAX.)

January 19, 1998

94.1 MHz.

ELEMENT SPACING:
61.2815 INCHES

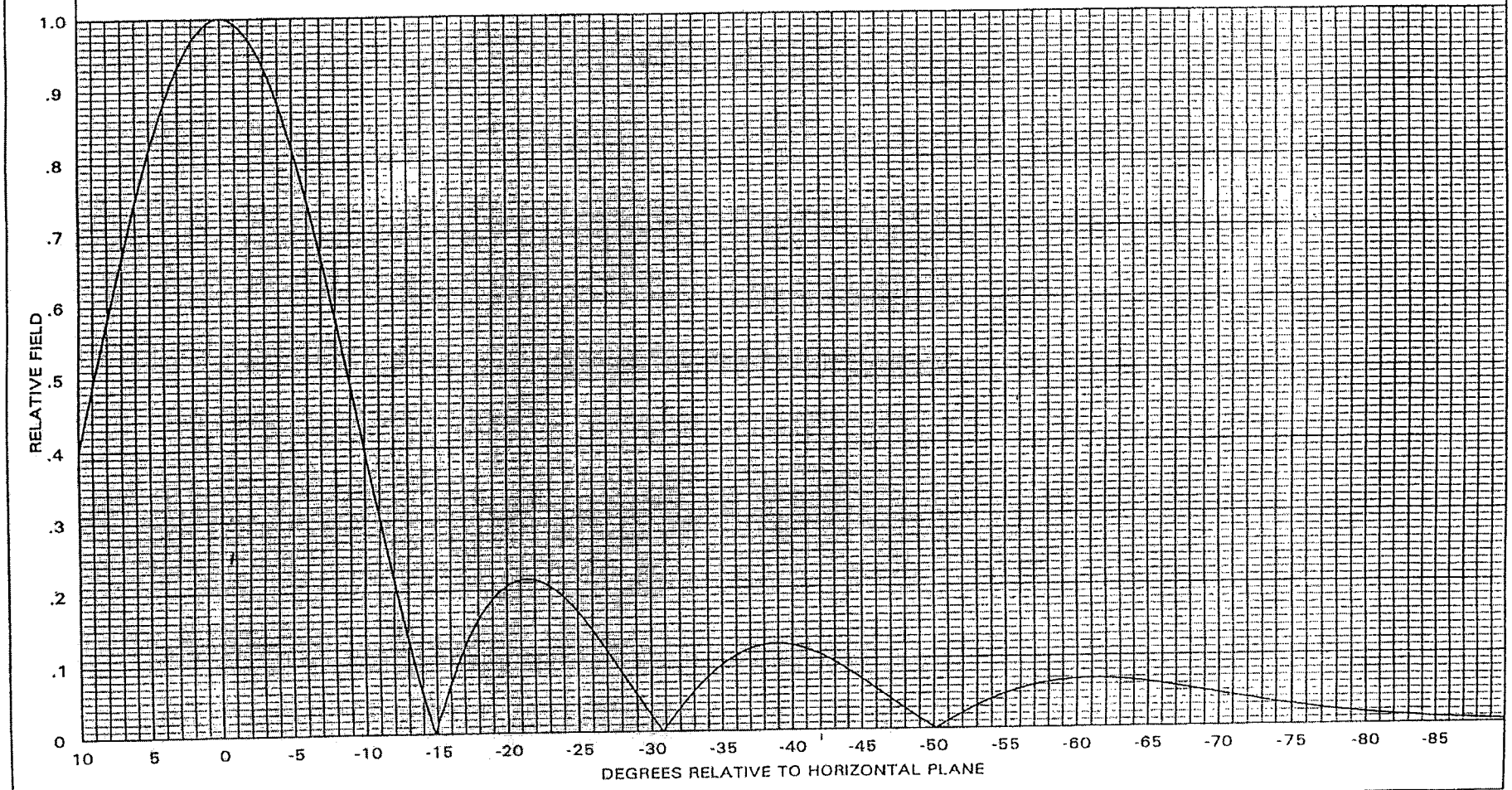

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FIGURE 1

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

G8CPS-8BC-HW-SP FM BROADCAST ANTENNA
0.00 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL
POWER GAIN IS 2.654 IN THE HORIZONTAL PLANE(2.654 IN THE MAX.)

January 19, 1998

101.5 MHz.

ELEMENT SPACING:
61.2815 INCHES

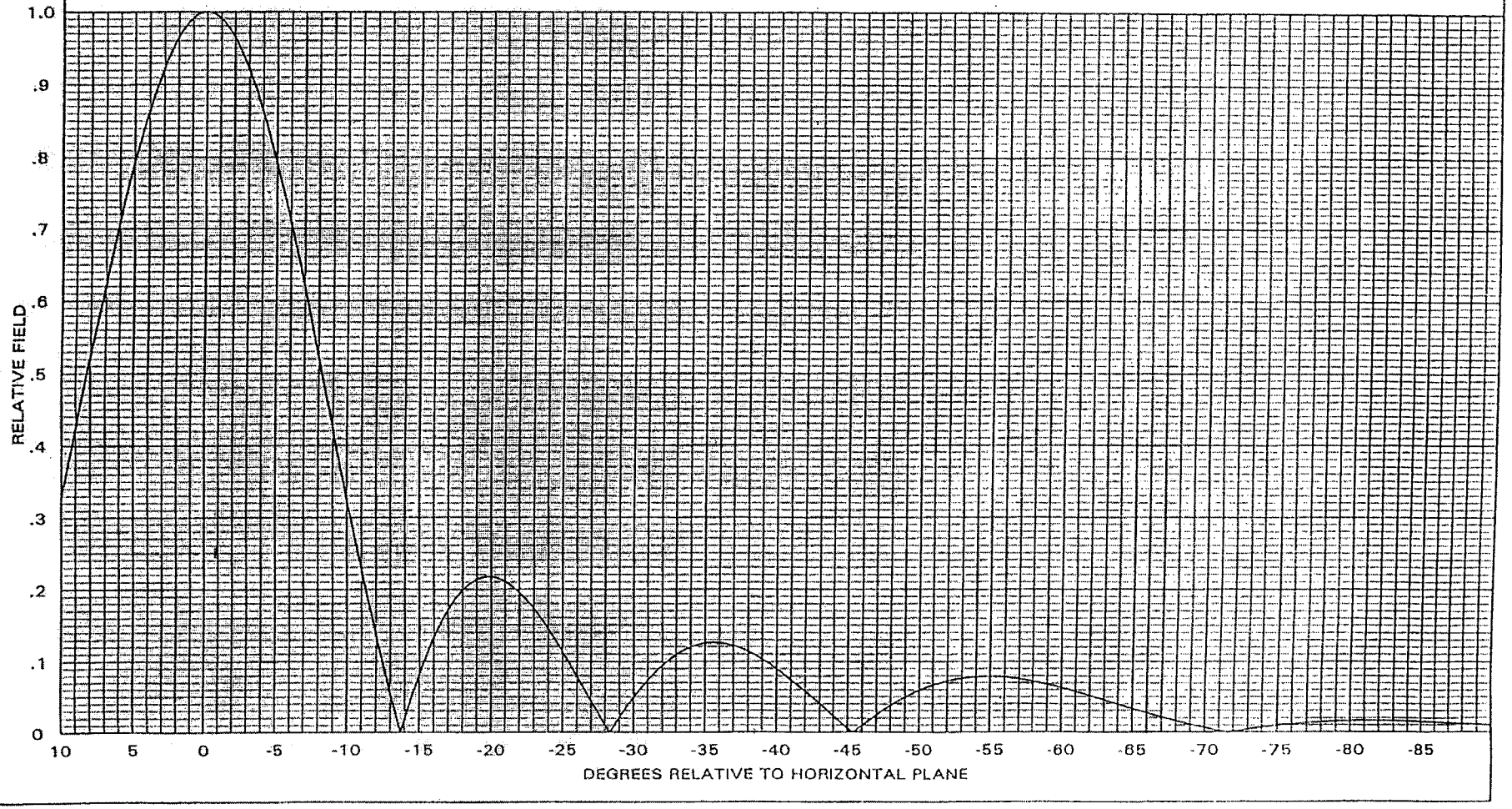

EXHIBIT B

Broadcasting Scheme and Equipment Employed in Intermodulation Measurements