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Intermodulation Measurements

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March 2011

**INTERMODULATION MEASUREMENTS
ON SIX STATION FM TRANSMITTING FACILITY**

TAMPA, FLORIDA

INTRODUCTION

This report covers the results of measurements made on the American Tower master FM transmitting facility located in Tampa, FL. The stations transmitting from this site are WMNF, 88.5 MHZ, WFLZ, 93.3 MHZ, WMTX, 100.7 MHZ, WFUS, 103.5 MHZ, WWRM, 94.9 MHZ, WPOI, 101.5 MHZ and WMNF.

The carrier reference level was the lowest TPO of the commercial stations which was WFUS. All possible third order IM products from 10 MHZ to 470 MHZ were below the maximum allowable level as required by Section 73.317 (b) through (d).

MEASURING SYSTEM

A directional coupler is mounted on the output of the combiner for sampling. This coupler is set up to measure any and all products and carriers in the forward direction. The coupling factor increases by 6 dB per active. This is factored into the calculations.

To prevent an intermod product from being generated in the measuring system, a filter is connected between the directional coupler output and the input of a spectrum analyzer which measures the level of any intermod products.

For measuring products outside the FM band, a band reject filter, K & L Model 11N53-98/30-N/NP, Serial Number WF032-1, is used to notch out all 6 carriers. This allows measuring the spectrum from 10 MHz to 88 MHz and 108 MHz to 470 MHz. To measure products between 88 MHz and 108 MHz, a two (2) cavity bandpass filter is available. This filter, Sinclair Radio Laboratory Model 1-70-1S7SP, Serial Number (5364)6518-1 is tuned to the product frequency. This allows the intermod product to pass but rejects all other frequencies. The output of the filters is connected to an Agilent spectrum analyzer Model E441B.

MEASUREMENTS

Before making any measurements all possible intermodulation products from 10 MHz to 470 MHz were calculated to the third order. These are attached to this report as Appendix 1. Each of the product frequencies were measured. In those cases where a number of combinations fell on a station carrier, the transmitter was shut down and that frequency checked for intermod products. One such case was found at 88.3 MHz. The HD carrier of WMNF , 88.5 MHz was shut down and no intermod was present.

All six (6) stations were operating at their normal TPO and with normal programing while measurements were made.

While all frequencies were measured, many were in the noise level of the spectrum analyzer. Due to this and to keep this report to a minimum, only those frequencies that would not meet the requirements of section 73.317 (a) through (d) would be recorded. Appendix 2 is measurements that are typical of all measurements made on the system. No spurious products were

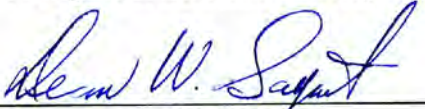
found that did not meet the requirements of section 73.317.

COMMENTS

The six (6) station multiplexed system consists of an SPX Communications Technology bandpass combiner feeding an SPX Communications Technology FMV analog antenna.

Respectfully submitted,

D. W. Sargent Broadcast Service, Inc.

By, 
Dean W. Sargent

APPENDIX 1

CALCULATED INTERMOD PRODUCTS

AMERICAN TOWER
TAMPA, FLORIDA
ANALOG ANTENNA SYSTEM
INTERMODULATION PRODUCTS

Date: January 15, 2011

Job Number: 56 BBBB 101

<u>Station Number</u>	<u>Xmit Frequency</u>
1	88.5 MHz
2	93.3 MHz
3	94.9 MHz
4	100.7 MHz
5	101.5 MHz
6	103.5 MHz

Receive Frequency: 240 MHz

Receive Band Width: 460 MHz

Maximum Order: 3
:

ORDER	SPUR	COMPONENTS			PAGE 1
2	10.2000	-F2	+F6		
2	12.2000	-F1	+F5		
2	13.0000	-F1	+F4		
2	15.0000	-F1	+F6		
2	177.000	+2F1			
2	181.000	+F1	+F2		
2	183.400	+F1	+F3		
2	186.600	+2F2			
2	188.200	+F2	+F3		
2	189.200	+F1	+F5		
2	189.800	+2F3			
2	190.000	+F1	+F4		
2	192.000	+F1	+F6		
2	194.000	+F2	+F5		
2	194.000	+F2	+F4		
2	195.600	+F3	+F5		
2	196.400	+F3	+F4		
2	196.800	+F2	+F6		
2	198.400	+F3	+F6		
2	201.400	+2F5			
2	202.200	+F4	+F5		
2	203.000	+2F4			
2	204.200	+F5	+F6		
2	205.000	+F4	+F6		
2	207.000	+2F6			
3	73.5000	+2F1	-F6		
3	75.5000	+2F1	-F4		
3	76.3000	+2F1	-F5		
3	78.3000	+F1	+F2	-F6	
3	79.9000	+F1	+F3	-F6	
3	80.3.000	+F1	+F2	-F4	
3	81.1000	+F1	+F2	-F5	
3	81.9000	+F1	+F3	-F4	
3	82.1000	+2F1	-F3		
3	82.7000	+F1	+F3	-F5	

ORDER SPUR COMPONENTS

PAGE 2

3	83.1000	+2F2	-F6	
3	83.7000	+2F1	-F2	
3	84.7000	+F2	+F3	-F6
3	85.1000	+2F2	-F4	
3	85.7000	+F1	+F5	-F6
3	85.9000	+2F2	-F5	
3	86.3000	+2F3	-F6	
3	86.5000	+F1	+F4	-F6
3	86.7000	+F2	+F3	-F4
3	86.9000	+F1	+F2	-F3
3	87.5000	+F2	+F3	-F5
3	87.7000	+F1	+F4	+F5
3	88.3000	+2F3	-F4	
3	89.1000	+2F3	-F5	
3	89.3000	+F1	+F4	-F5
3	90.1000	+F1	-F2	+F3
3	90.5000	+F1	-F4	+F6
3	90.5000	+F2	+F5	-F6
3	91.3000	+F1	-F5	+F6
3	91.3000	+F2	+F4	-F6
3	91.7000	2F2	-F3	
3	92.1000	+F3	+F5	-F6
3	92.5000	+F2	-F4	+F5
3	92.9000	+F3	+F4	-F6
3	94.1000	+F2	+F4	-F5
3	94.1000	+F3	-F4	+F5
3	94.3000	+F1	-F3	+F5
3	95.1000	+F1	-F3	+F4
3	95.3000	+F2	-F4	+F6
3	95.7000	+F3	+F4	-F5
3	95.9000	+F1	-F2	+F5
3	96.1000	+F2	-F5	+F6
3	96.5000	-F2	+2F3	
3	96.7000	+F1	-F2	+F4
3	96.9000	+F3	-F4	+F6

ORDER	SPUR	COMPONENTS			PAGE 3
3	97.1000	+F1	-F3	+F6	
3	97.7000	+F3	-F5	+F6	
3	97.9000	+2F5	-F6		
3	98.1000	-F1	+2F2		
3	98.7000	+F1	-F2	+F6	
3	98.7000	+F4	+F5	-F6	
3	99.1000	+F2	-F3	+F5	
3	99.5000	+2F4	-F6		
3	99.7000	-F1	+F2	+F3	
3	99.9000	+F2	-F3	+F4	
3	99.9000	-F4	+2F5		
3	101.300	-F1	+2F3		
3	101.900	+F2	-F3	+F6	
3	102.300	+2F4	-F5		
3	102.300	-F2	+F3	+F5	
3	102.700	-F4	+F5	+F6	
3	103.100	-F2	+F3	+F4	
3	104.300	+F4	-F5	+F6	
3	105.100	-F2	+F3	+F6	
3	105.500	-F4	+2F6		
3	105.500	-F1	+F2	+F5	
3	106.300	-F5	+2F6		
3	106.300	-F1	+F2	+F4	
3	106.500	-F3	+2F5		
3	107.100	-F1	+F3	+F5	
3	107.300	-F3	+F4	+F5	
3	107.900	-F1	+F3	+F4	
3	108.100	-F3	+2F4		
3	108.100	-F2	+2F5		
3	108.300	-F1	+F2	+F6	
3	108.900	-F2	+F4	+F5	
3	109.300	-F3	+F5	+F6	
3	109.700	-F2	+2F4		
3	109.900	-F1	+F3	+F6	
3	110.100	-F3	+F4	+F6	

ORDER	SPUR	COMPONENTS
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PAGE 4

3	110.900	-F2 +F5 +F6
3	111.700	-F2 +F4 +F6
3	112.100	-F3 +2F6
3	112.900	-F1 +2F5
3	113.700	-F2 +2F6
3	113.700	-F1 +F4
3	114.500	-F1 +2F4
3	115.700	-F1 +F5 +F6
3	116.500	-F1 +F4 +F6
3	118.500	-F1 +2F6
3	265.500	3F1
3	270.300	+2F1 +F2
3	271.900	+2F1 +F3
3	275.100	+F1 +2F2
3	276.700	+F1 +F2 +F3
3	277.700	+2F1 +F5
3	278.300	+F1 +2F3
3	278.500	+2F1 +F4
3	279.900	+3F2
3	280.500	+2F1 +F6
3	281.500	+2F2 +F3
3	282.500	+F1 +F3
3	283.100	+F2 +F3
3	283.300	+F1 +F2 +F4
3	284.100	+F1 +F3 +F5
3	284.700	+3F3
3	284.900	+F1 +F3 +F4
3	285.300	+F1 +F2 +F6
3	286.900	+F1 +F3 +F6
3	287.300	+2F2 +F5
3	288.100	+2F2 +F4
3	288.900	+F2 +F3 +F5
3	289.700	+F2 +F3 +F4
3	289.900	+F1 +2F5
3	290.100	+2F2 +F6

ORDER	SPUR	COMPONENTS
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PAGE 5

3	290.500	+2F3 +F5
3	290.700	+F1 +F4 +F5
3	291.300	+2F3 +F4
3	291.500	+F1 +2F4
3	291.700	+F2 +F3 +F6
3	292.700	+F1 +F5 +F6
3	293.300	+2F3 +F6
3	293.500	+F1 +F4 +F6
3	294.700	+F2 +2F5
3	295.500	+F1 +2F6
3	295.500	+F2 +F4 +F5
3	296.300	+F2 +2F4
3	296.300	+F3 +2F5
3	297.100	+F3 +F4 +F5
3	297.500	+F2 +F5 +F6
3	297.900	+F3 +2F4
3	298.300	+F2 +F4 +F6
3	299.100	+F3 +F5 +F6
3	299.900	+F3 +F4 +F6
3	300.300	+F2 +2F6
3	301.900	+F3 +2F6
3	302.100	+3F5
3	302.900	+F4 +2F5
3	303.700	+2F4 +F5
3	304.500	+3F4
3	304.900	+2F5 +F6
3	305.700	+F4 +F5 +F6
3	306.500	+2F4 +F6
3	307.700	+F5 +2F6
3	308.500	+F4 +2F6
3	310.500	3F6

APPENDIX 2

INTERMOD MEASUREMENTS

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