FM & IBOC RF EMISSIONS TEST
VPR Master Antenna

TEST DATE: 08/03/2012

MEASUREMENT LOCATION:
South Summit of Mount Ascutney, VPT Building

CALL LETTERS: WNCH

Tested by:

Ira A. Wilner (WILNER ASSOCIATES)
FCC License or Permit # PG-16381

CARRIER POWER 2,200 W. Maximum required suppression -77 dBc.

PASS=☒ FAIL=☐ (See spectrum analyzer hardcopy printout.)

Pursuant to FCC rules and regulations an FM radio transmitter's emissions 120 kHz to 240 removed from the carrier must be attenuated at least 25 dB below unmodulated carrier level. Emissions 240 kHz to 600 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level. Emissions removed by more than 600 kHz must be the lessor of 80 dB or 43+10*log(power) below carrier level.

MEASUREMENT PROCEDURES

The VPR master antenna system is comprised of a two station combiner for WVPR (89.5 MHz) and WHDQ (106.1 MHz) and an entirely separate filter and coaxial feed line for WNCH (88.1 MHz). As such there is no single combiner output with all three signals. Thus I measured WNCH through its own feed behind its channel pass filter and then measured WVPR & WHDQ together on the output of their combiner. Final combining of all three stations occurs in the panel antenna itself where additional isolation is provided by tower mounted hybrids and attenuators to control WNCH's directional pattern.

An Anritsu model MS2712E digital spectrum analyzer was connected to a directional coupler on the output of the FM transmitter after the harmonic filter. Using 300 kHz RBW filter the maximum carrier reference level was established. Analyzer was then set to 200 kHz per division to cover a bandwidth of 1 MHz with a resolution bandwidth of 300 Hz. Attenuation was set to keep carrier at reference level. Peak hold was used to capture the emissions for 5 minutes. See (1) WNCH NRSC TX OUT.pdf. NRSC mask shows the more stringent -80 dB ref to carrier.

For the second measurement, the analyzer was set to 1 kHz RBW with max hold and RMS detection to show the detailed noise floor out beyond WVPR. See (2) WNCH IBOC TX OUT_#2.pdf which also picks up a religious translator (W216CB) operating from the same site.

For the third measurement, the analyzer was set to 1 kHz RBW with RMS detection and trace averaging for 100 traces. The IBOC mask represents -10 dBc digital carrier level maximum upper limits. No spectral regrowth is seen. See (3) WNCH IBOC LIMITS.pdf.

For the fourth measurement analyzer was set to 1kHz RBW with RMS detection but no trace averaging. Across the entire FM band noise is well below the more stringent -80 dBc limit. Only visible signals above the lower limit are WVPR & WHDQ. See (4) WNCH IBOC TX OUT wide sweep.pdf.

For the fifth measurement the analyzer looked at the WVPR signal using peak detection and max hold, standard NRSC setup. Note that the WVPR carrier reference was above the analyzer's top reference. The mask was moved up to compensate.

For the sixth measurement analyzer was moved to the directional coupler on the output of the WVPR/WHDQ combiner. Standard FM NRSC measurement was made with an RBW of 1 kHz, peak hold and peak detection. WHDQ meets or betters the limits. See (6) VPR MASTER ANTENNA WHDQ.pdf.

The seventh measurement was provided to show the overall noise floor of the FM band via an on air pickup since there was no single combined output source for all three stations. The Anritsu spectrum analyzer was connected to an FCC-2 calibrated measurement dipole adjusted for resonance in the middle of the FM band. See (7) WNCH NRSC WIDE FCC2 ANTENNA.pdf. The overall noise floor remains below -80 dBc but at the height of the master antenna it picks up lots of signals that interfere with the measurement.

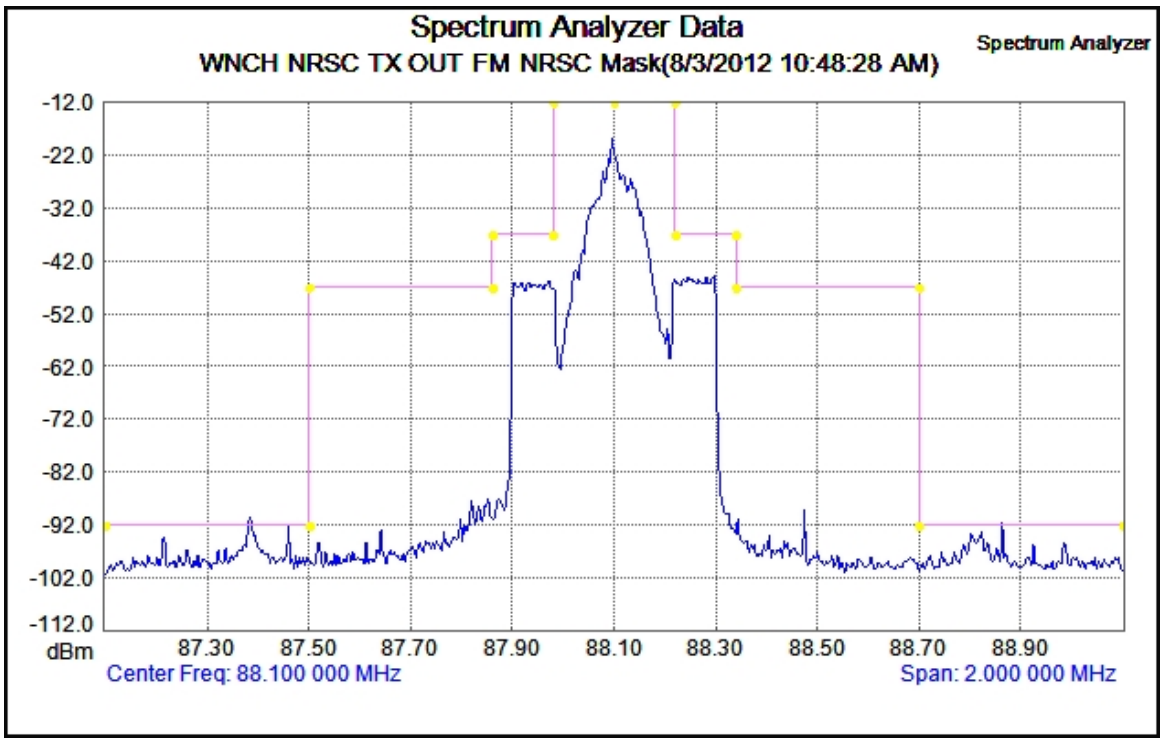
All three transmitters appear to be clean and within FCC noise and occupied bandwidth limits.

Ira A. Wilner
Wilner Associates

WNCH Master Antenna RF Proof

Wilner Associates

Prepared for: **Vermont Public Radio**
Date: Date: 8/3/2012 10:48:28 AM



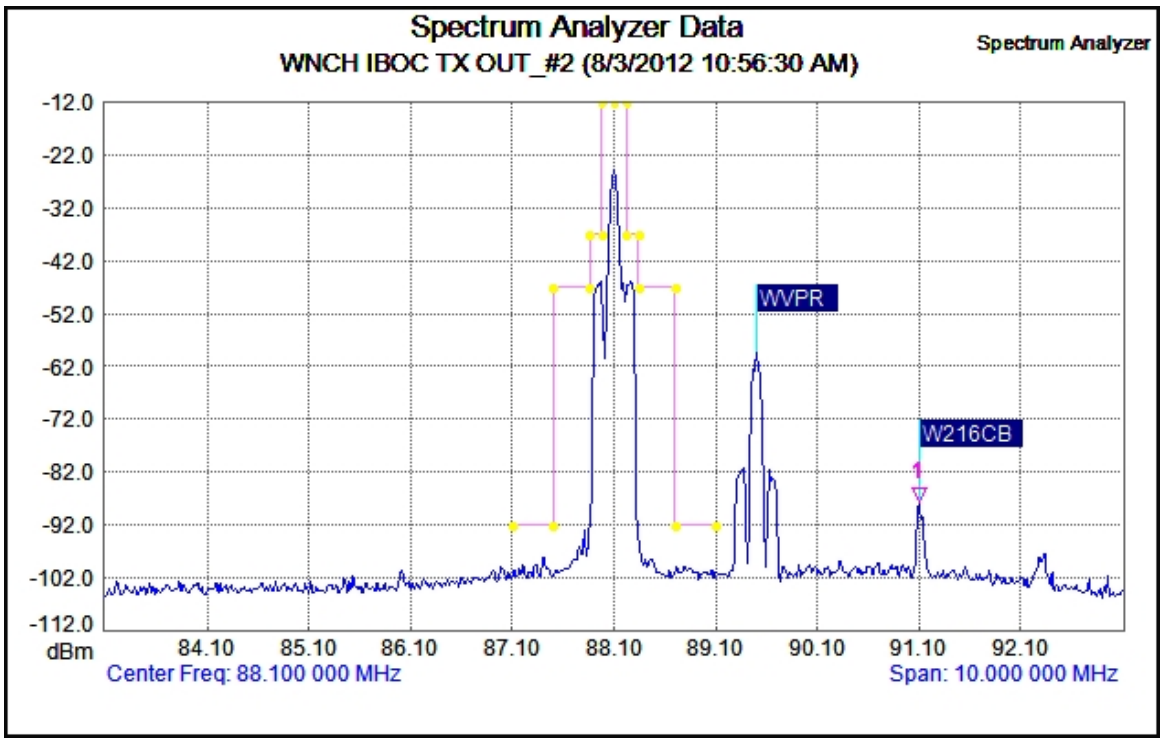
Measurement Summary			
Trace A data		VBW	3.0 kHz
Trace Mode	Max Hold	Detection	Peak
Preamp	OFF	Center Frequency	88.100 000 MHz
Min Sweep Time	0.1 S	Start Frequency	87.100 000 MHz
Reference Level Offset	0 dB	Stop Frequency	89.100 000 MHz
Input Attenuation	10.0 dB	Frequency Span	2.000 000 MHz
RBW	300.0 Hz	Reference Level	-12.000 dBm

Device Summary			
Serial Number	1014036	Model	MS2712E
Base Ver.	V4.12	Options	31
App Ver.	V5.26	Date	8/3/2012 10=48=28 AM

WNCH Master Antenna RF Proof

Wilner Associates

Prepared for: **Vermont Public Radio**
Date: Date: 8/3/2012 10:56:30 AM



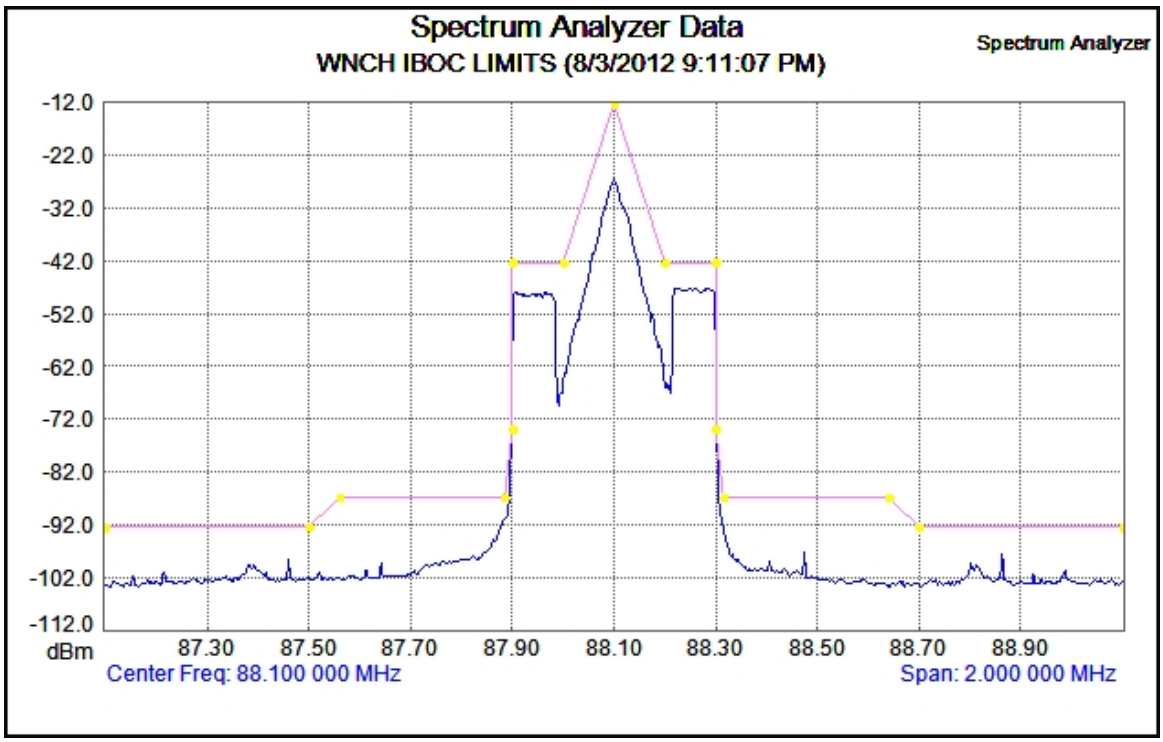
Measurement Summary			
Trace A data		VBW	3.0 kHz
Trace Mode	Max Hold	Detection	RMS
Preamp	OFF	Center Frequency	88.100 000 MHz
Min Sweep Time	0.1 S	Start Frequency	83.100 000 MHz
Reference Level Offset	0 dB	Stop Frequency	93.100 000 MHz
Input Attenuation	10.0 dB	Frequency Span	10.000 000 MHz
RBW	1.0 kHz	Reference Level	-12.000 dBm

Device Summary			
Serial Number	1014036	Model	MS2712E
Base Ver.	V4.12	Options	31
App Ver.	V5.26	Date	8/3/2012 10=56=30 AM

WNCH Master Antenna RF Proof

Wilner Associates

Prepared for: **Vermont Public Radio**
Date: Date: 8/3/2012 9:11:07 PM



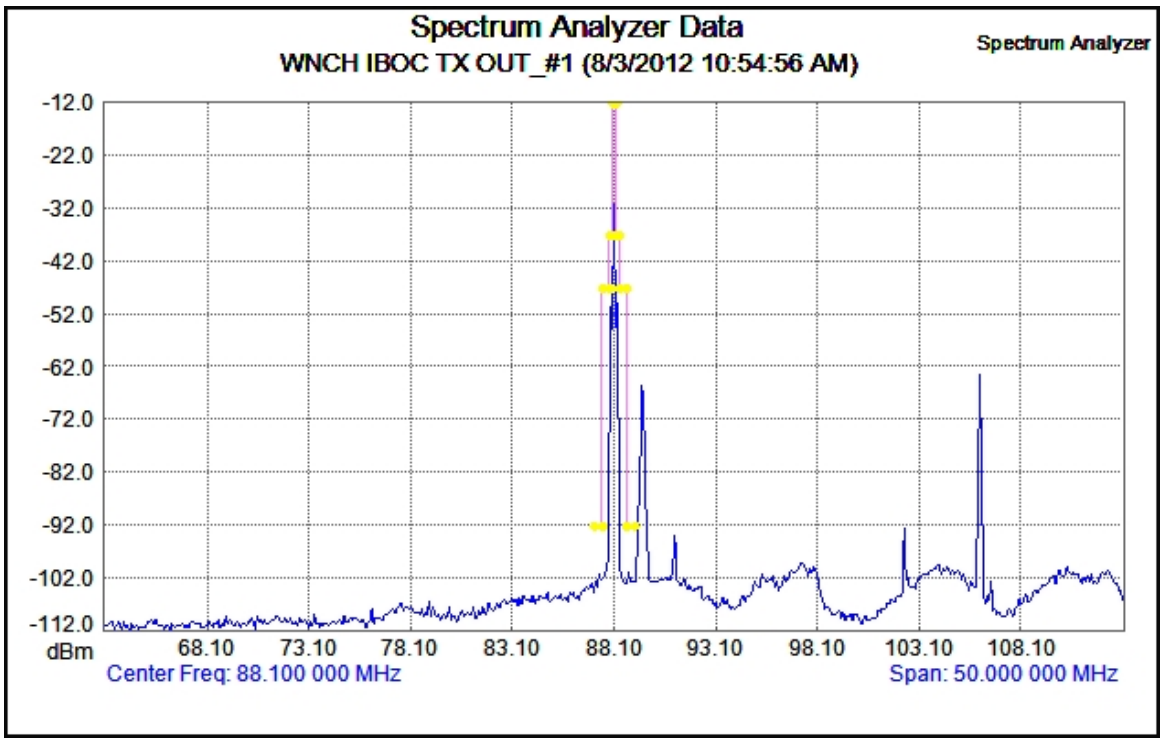
Measurement Summary			
Trace A data	Trace Average=100	VBW	3.0 kHz
.	.	Detection	RMS
Trace Mode	Average	Center Frequency	88.100 000 MHz
Preamp	OFF	Start Frequency	87.100 000 MHz
Min Sweep Time	0.1 S	Stop Frequency	89.100 000 MHz
Reference Level Offset	0 dB	Frequency Span	2.000 000 MHz
Input Attenuation	10.0 dB	Reference Level	-12.000 dBm
RBW	1.0 kHz	Scale	10.0 dB/div

Device Summary			
Serial Number	1014036	Model	MS2712E
Base Ver.	V4.12	Options	31
App Ver.	V5.26	Date	8/3/2012 9=11=07 PM

WNCH Master Antenna RF Proof

Wilner Associates

Prepared for: **Vermont Public Radio**
Date: Date: 8/3/2012 10:54:56 AM



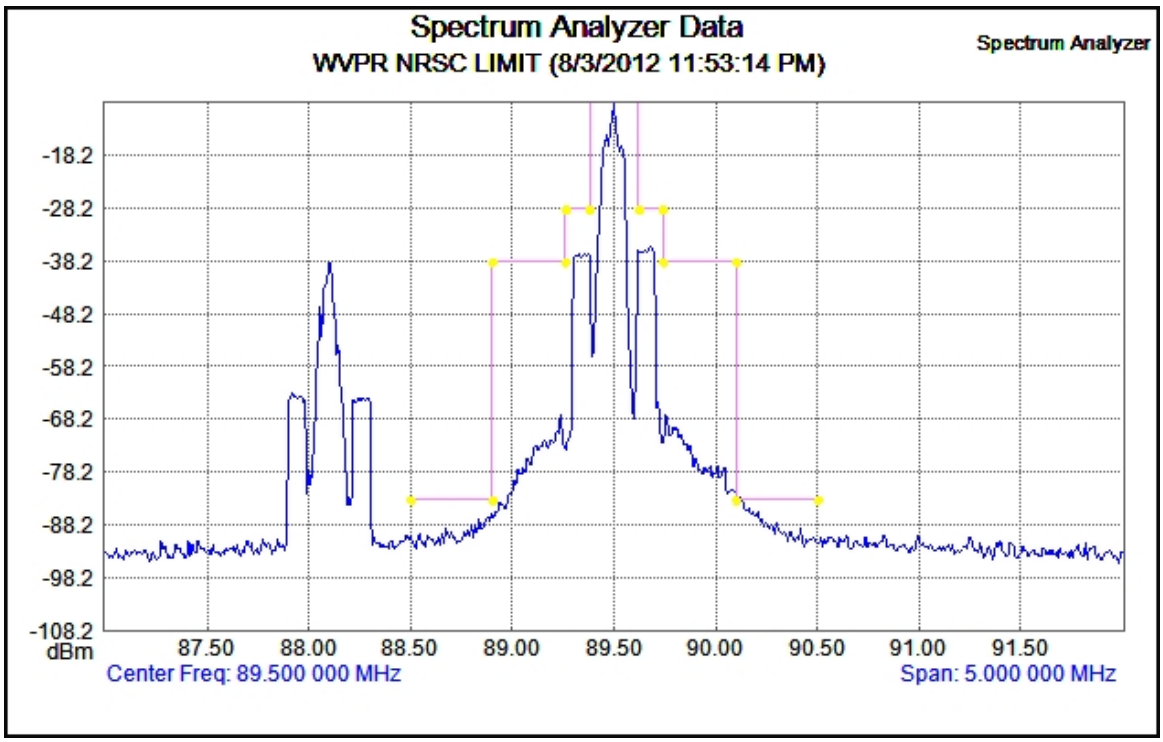
Measurement Summary			
Trace A data		VBW	3.0 kHz
Trace Mode	Normal	Detection	RMS
Preamp	OFF	Center Frequency	88.100 000 MHz
Min Sweep Time	0.1 S	Start Frequency	63.100 000 MHz
Reference Level Offset	0 dB	Stop Frequency	113.100 000 MHz
Input Attenuation	10.0 dB	Frequency Span	50.000 000 MHz
RBW	1.0 kHz	Reference Level	-12.000 dBm

Device Summary			
Serial Number	1014036	Model	MS2712E
Base Ver.	V4.12	Options	31
App Ver.	V5.26	Date	8/3/2012 10=54=56 AM

WNCH Master Antenna RF Proof

Wilner Associates

Prepared for: **Vermont Public Radio**
Date: Date: 8/3/2012 11:53:14 PM



Measurement Summary			
Trace A data		VBW	3.0 kHz
Trace Mode	Max Hold	Detection	Peak
Preamp	OFF	Center Frequency	89.500 000 MHz
Min Sweep Time	0.1 S	Start Frequency	87.000 000 MHz
Reference Level Offset	0 dB	Stop Frequency	92.000 000 MHz
Input Attenuation	15.0 dB	Frequency Span	5.000 000 MHz
RBW	1.0 kHz	Reference Level	-8.199 dBm

Device Summary			
Serial Number	1014036	Model	MS2712E
Base Ver.	V4.12	Options	31
App Ver.	V5.26	Date	8/3/2012 11=53=14 PM

WNCH Master Antenna RF Proof

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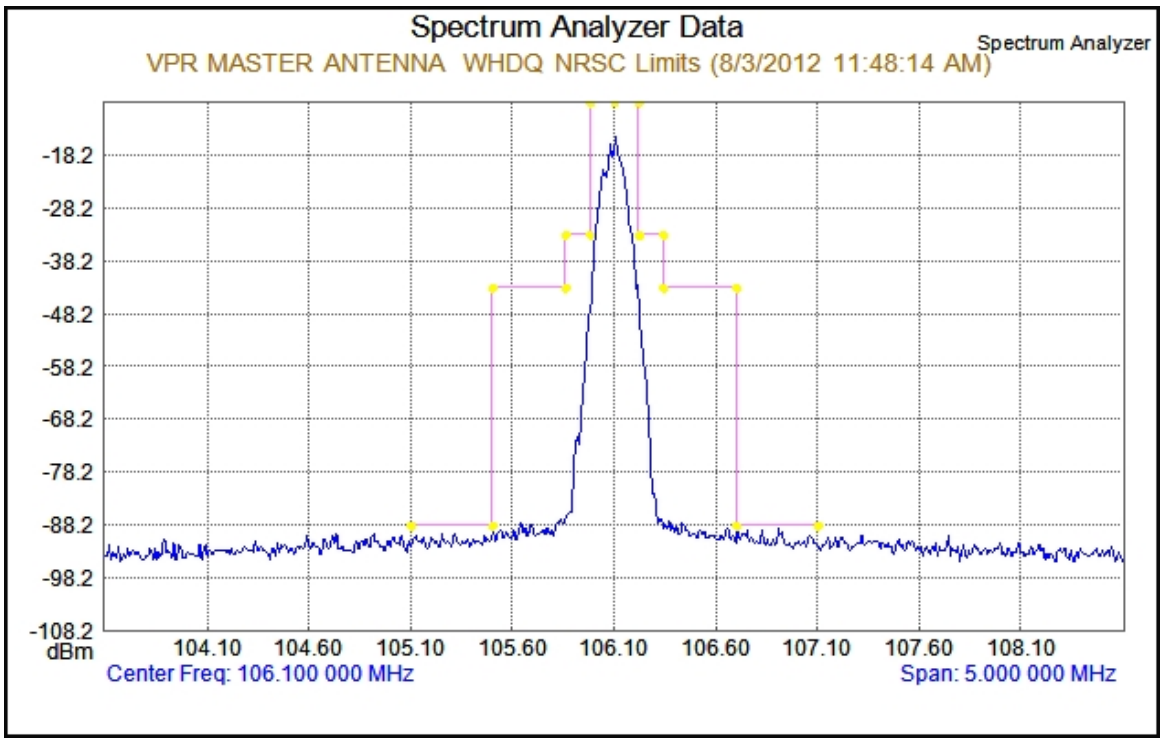
Date: Date: 8/3/2012 11:48:14 AM



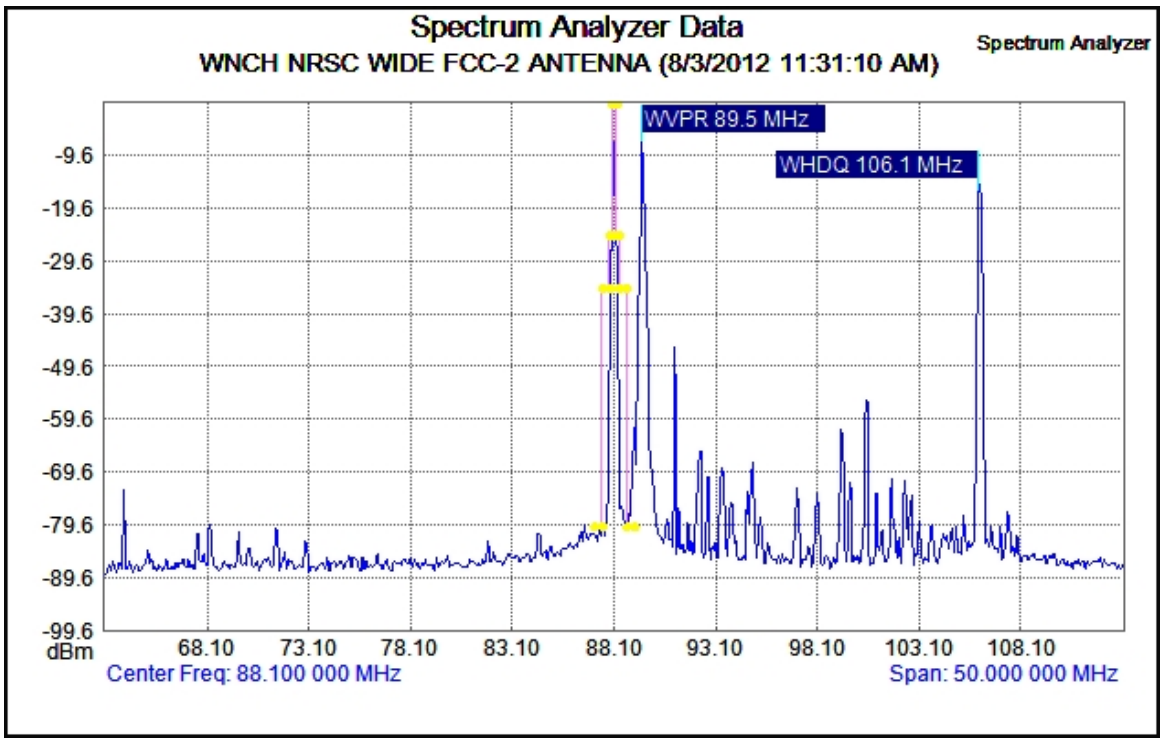
Measurement Summary			
Trace A data		VBW	3.0 kHz
Trace Mode	Max Hold	Detection	Peak
Preamp	OFF	Center Frequency	106.100 000 MHz
Min Sweep Time	0.1 S	Start Frequency	103.600 000 MHz
Reference Level Offset	0 dB	Stop Frequency	108.600 000 MHz
Input Attenuation	15.0 dB	Frequency Span	5.000 000 MHz
RBW	1.0 kHz	Reference Level	-8.199 dBm

Device Summary			
Serial Number	1014036	Model	MS2712E
Base Ver.	V4.12	Options	31
App Ver.	V5.26	Date	8/3/2012 11=48=14 AM

WNCH Master Antenna RF Proof

Wilner Associates

Prepared for: **Vermont Public Radio**
Date: Date: 8/3/2012 11:31:10 AM



Measurement Summary			
Trace A data		VBW	3.0 kHz
Trace Mode	Max Hold	Detection	Peak
Preamp	OFF	Center Frequency	88.100 000 MHz
Min Sweep Time	0.1 S	Start Frequency	63.100 000 MHz
Reference Level Offset	0 dB	Stop Frequency	113.100 000 MHz
Input Attenuation	25.0 dB	Frequency Span	50.000 000 MHz
RBW	1.0 kHz	Reference Level	0.401 dBm

Device Summary			
Serial Number	1014036	Model	MS2712E
Base Ver.	V4.12	Options	31
App Ver.	V5.26	Date	8/3/2012 11=31=10 AM