



**Occupied Bandwidth and
Spurious Emissions Measurements**
To Demonstrate Compliance with
Section 73.317(b) through 73.317(d) of the FCC Rules and Regulations and
hybrid FM specifications.

**WRDU– 291 C1 106.1 Mhz
FCC ID:73936
Knightdale NC**

**WRVA-264 C 100.7 Mhz 93.9 Mhz
FCC ID:74125
Wake Forest NC**

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There are multiple construction permits granted for this combined antenna installation in addition to the WRVA permit BXPB-20090824ADA in which this study supports, there are also permits BXPB-20090824AER and BXPB-20090824AEK for WKSL Cary, and WDCG Durham NC respectfully. Since this installation is designed such that only one of these permits may operate simultaneously with WRDU, only WRVA and WRDU are addressed in this study.

Measurements were conducted to demonstrate that WRDU, and WRVA operating into a combined antenna system comply with section 73.317(b) through 73.317(d) of the FCC Rules and Regulations. The measurements were completed on 7/12/2012 by Benjamin H Brinitzer CPBE with Analog carriers of both stations simultaneously utilizing a shared antenna. The spectrum analyzer used for the measurements was a Agilent model 4402B, S/N my44211565 calibrated 10/2011. A sample of WRDU and WRVA Analog signals was derived from the main transmission line at the output of the combiner filters. RF was coupled to the analyzer using a short length of RG-142 50Ω double-shielded coaxial cable. One switchable 20 db pad (Bird model 5-A-MFN-06) was inserted ahead of the analyzer and after testing Notch filters to avoid overload, increase sample gain and to provide isolation. Because A dual feed antenna was employed, two samples were taken and combined in a mini-circuits 3 db combiner z99sc-62+. Each sample input was isolated with an additional 3 db resistive pad to stabilize the sample during level calibration.

The unmodulated carrier level of WRDU was +17.7 dBm and the unmodulated carrier level of WRVA was +16.1 dBm. Since the WRVA reference level was lower, it was used as the reference for all harmonic, spurious and intermodulation measurements. All measurements were conducted with the transmitters and associated equipment adjusted as used in normal program operation.

For all occupied bandwidth measurements, the spectrum analyzer was placed in the peak hold mode for at least 10 minutes per measurement before the waveforms were observed. Both transmitters were observed to be in full compliance with section 73.317(b) of the FCC Rules with emissions appearing on frequencies removed from the carrier frequencies by between 120 kHz and 240 kHz attenuated by at least 25 dB below the modulated carrier level indicating the occupied bandwidth of each transmitter to be 240 kHz or less. Both transmitters were also observed to be in full compliance with section 73.317(c) of the FCC Rules with emissions appearing on frequencies removed from the carrier frequencies by between 240 kHz and 600 kHz attenuated by at least 35 dB.

Extensive measurement were also conducted to insure that emissions appearing on frequencies removed from the carrier frequencies by more than 600 kHz were attenuated by at least 80 dB as required by section 73.317(d) of the FCC Rules. To facilitate these measurements, notch filters were placed before the switchable 20 dB pad so that the spectrum analyzer gain could be increased by 27 dB. The filters were necessary to avoid the possible generation of false spurious or intermodulation products in the analyzer. The attenuation of the notch filters was 28.7 dB at 291 C1 106.1 Mhz and 32.7 dB at 264 C 100.7 Mhz.

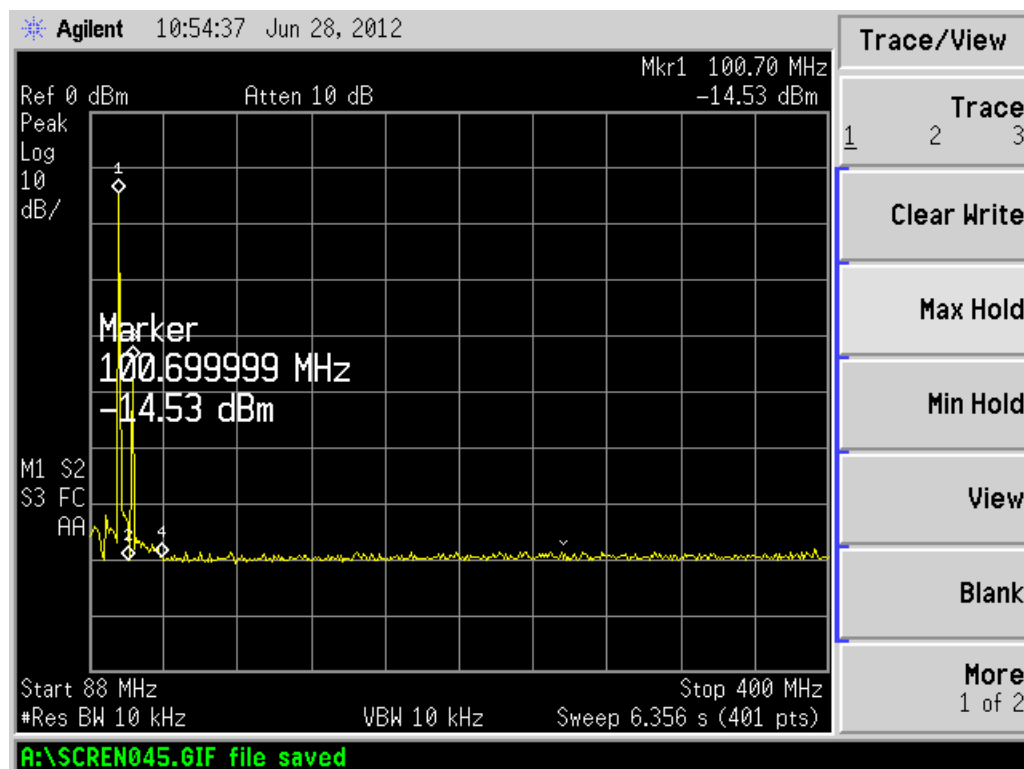
All harmonic and intermodulation frequencies in the range of frequencies between 3 MHz and 500 MHz through the 3rd order that could be produced by the combined operation of WRDU and WRVA were predicted with a computer program, the results of which are shown in Table 1.

TABLE 1

#	Mult	x	Freq.	Sum/Dif	Mult	x	Freq.	=	Product
1.	1	x	106.1	+	1	x	100.7	=	206.8
2.	1	x	100.7	+	1	x	106.1	=	206.8
3.	1	x	106.1	+	2	x	100.7	=	307.5
4.	1	x	100.7	+	2	x	106.1	=	312.9
5.	1	x	106.1	+	3	x	100.7	=	408.2
6.	1	x	100.7	+	3	x	106.1	=	419
7.	2	x	106.1	=				=	212.2
8.	2	x	106.1	+	1	x	100.7	=	312.9
9.	2	x	106.1	-	1	x	100.7	=	111.5
10.	2	x	100.7	=				=	201.4
11.	2	x	100.7	+	1	x	106.1	=	307.5
12.	2	x	100.7	-	1	x	106.1	=	95.3
13.	2	x	106.1	+	2	x	100.7	=	413.6
14.	2	x	100.7	+	2	x	106.1	=	413.6
15.	3	x	106.1	=				=	318.3
16.	3	x	106.1	+	1	x	100.7	=	419
17.	3	x	106.1	-	1	x	100.7	=	217.6
18.	3	x	100.7	=				=	302.1
19.	3	x	100.7	+	1	x	106.1	=	408.2
20.	3	x	100.7	-	1	x	106.1	=	196
21.	3	x	106.1	-	2	x	100.7	=	116.9
22.	3	x	100.7	-	2	x	106.1	=	89.9

While special attention was given to the “product” frequencies listed in Table 1, measurements were conducted covering the entire range of frequencies between 3 MHz and 500 MHz. The only signals detected at levels attenuated by less than 80 dB below the modulated carrier levels and appearing on frequencies removed from the WRDU and WRVA carrier frequencies by more than 600 kHz were the carriers of nearby FM and Television stations. In each case where these signals were observed to be at a level greater than -75 dBm (80 dB below the modulated carrier level of WRVA) WRVA transmitter was turned off while the amplitude of the signal was observed to be unchanged, indicating that the signal was not the result of the combined operation of WRDU and WRVA.

Table 2



Results of the measurements at the specific frequencies where harmonic or intermodulation products were predicted to possibly occur resulted in levels less than 80 DB under the fundamentals

The results of these measurements confirm that the combined operations of WRDU and WRVA into a shared antenna are in full compliance with section 73.317(b) through 73.317(d) of the FCC Rules and Regulations.



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