

W219DW COMPLIANCE WITH SPECIAL OPERATING CONDITION #2  
AND CALCULATION OF TRANSMITTER POWER OUTPUT

The applicant recognizes the responsibility to reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency electromagnetic fields in excess of FCC guidelines.

Special Operating Condition #2: The attached occupied bandwidth and spurious emission measurements were taken by Sol Samet, assistant Chief Engineer under the supervision of Jon Hardee, Chief Engineer of WUNC-North Carolina which indicate that the authorized W219DW operation complies with the spurious emission requirements of Section 73.317.

Calculation of Transmitter Power Output (TPO): The 0.114 kW (-9.43 dBk) figure is based on consideration of total transmission system attenuation of 1.375 dB (72.87%). Given an antenna power gain of 1.446 (1.602 dB), a TPO of 0.114 kW produces the authorized ERP of 0.12 kW (-9.20 dBk).

New Buxton Site Occupied Bandwidth, Mixing, and Harmonic Measurements for WBUX-FM 90.5MHz,  
W219DW 91.7MHz, and WHDZ-FM 101.5MHz

Measurements conducted by Sol Samet, Assistant Chief Engineer, under the supervision of Jon Hardee, Chief Engineer of WUNC-  
North Carolina Public Radio on 08/09/2023

Equipment used: Agilent E4402B, tunable notch filters, and attenuators as needed from the forward  
power sample port on the Shively directional coupler on the filter and combiner network.

Resolution and Video bandwidth 1kHz

Analyzer Noise Floor -90dBm

Analyzer Full Scale 0dBm

Notch Filter depth of notch 28.2dB at 90.5MHz, 32dB at 91.7MHz, and 27.2dB at 101.5MHz.

**Occupied bandwidth measurements were taken with normal program material with all frequencies  
present and the frequencies not under test for occupied bandwidth, notched.**

For 90.5MHz and 101.5MHz, an attenuator was used to prevent overloading of the analyzer. 100  
averages were taken, and the analyzer displayed a noise floor -93dBm in averaging mode. The reference  
level used was obtained from setting the resolution and video bandwidth to 1MHz. These reference  
levels are as follows: for 90.5MHz -12dBm, 91.7MHz -7.4dBm, and 101.5MHz -6.2dBm. The occupied  
bandwidth was measured with the 1kHz resolution and video bandwidth.

Occupied Bandwidth						
Fund. Freq	Reference level		deviation from carrier		FCC limit	Clearanc e
90.5	12 dBm		93.2 dBm	120-240kHz	-25	68.2
			93.8 dBm	240-600kHz	-35	58.8
			93.9 dBm	>600kHz	-80	13.9
91.7	6.2 dBm		95.5 dBm	120-240kHz	-25	70.5
			96.1 dBm	240-600kHz	-35	61.1
			96.2 dBm	>600kHz	-64.14	32.06
101.5	7.4 dBm		78 dBm	120-240kHz	-25	53
			93 dBm	240-600kHz	-35	58
			94 dBm	>600kHz	-80	7.8

Harmonic measurements were made to the 5<sup>th</sup> order with modulation present and notch filters in place .

The additional losses of the cables and filters were measured as follows:

-2.5dB 2<sup>nd</sup> , -3dB 3<sup>rd</sup> -3dB 4<sup>th</sup> ,-6.7dB 5<sup>th</sup> ,-8.5dB 6<sup>th</sup> ,-10dB 7<sup>th</sup> ,-15.4dB 8<sup>th</sup> , and -13dB 9<sup>th</sup>

Calculated measurements are as follows:

Harmonic Emissions						
Fund. Freq	Reference level	additional loss (dB)	Reading	Calculated	FCC limit	Clearance
90.5	14.8dBm	(cables and filters)	(-dBm)	(-dBm)		dB
X2=181		2.5	75	89.1	-80	9.1
X3=271.5		3	81.3	94.5	-80	14.5
X4=362		3	87.6	101.2	-80	21.2
X5=452.5		6.7	88.06	97	-80	17
91.7	-4.9dBm					
X2=183.4		2.5	87.3	81.7	-64.14	17.56
X3=275.1		3	88	81.9	-64.14	17.76
X4=366.8		3	87.13	82	-64.14	17.86
X5=458.5		6.7	88.06	76.4	-64.14	12.26
101.5	+4.9dBm					
X2=203		2.5	87.9	92.2	-80	12.2
X3=304.5		3	87.7	91.5	-80	11.5
X4=406		3	87.53	88.7	-80	8.7
X5=507.5		6.7	88.06	87.2	-80	7.2

Based on Reference levels of: +14.8dBm 90.5MHz, -4.9dBm 91.7MHz, +4.96dBm 101.5MHz

Calculated values compensate for the additional loss in the output filters at the harmonic frequencies.  
Calculated numbers are dB down from reference.

The only visible harmonics were 2<sup>nd</sup> and 3<sup>rd</sup> on 90.5MHz and they are within the -80 dB requirement.  
The rest of these measurements reflect residual noise of the test equipment cables and filters.

Intermodulation performance was measured without modulation. The only measurement that was noted was a small spur measured at -77.7dBm at 92.9MHz from the mixing of  $91.7-90.5=1.2$  and  $1.2+91.7=92.9$ . With the measurement reference of -4.9dBm and the notch filter still providing an additional 1.8dB of loss at 92.9MHz, this is 71dB below 91.7MHz. Per the 130 watts at 91.7MHz, this should be  $43+10\log_{10}(130)$  or more down which is -64.14dB. This measurement is better than the allowed amount by 6.86dB.

Intermodulation Emissions						
Fund. Freq	Reference level		observed IM product		FCC limit	Clearance
F1 90.5	14.8	$(F2-F1)+F2$	92.9 mHz	-77.7	-80	12.5
F2 91.7	-4.9	$(F2-F1)+F2$	92.9 mHz	-77.7	-64.14	6.86
F3 101.5	4.9		none observed to 2nd order		-80	OK