

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

Capstar TX Limited Partnership
WQBT(FM) – 94.1 MHz
Savannah, GA (Facility ID No: 8594)
WAEV(FM) – 97.3 MHz
Savannah, GA (Facility ID No: 50403)
May 16, 2002

Measurements were conducted to demonstrate that WQBT(FM), Savannah, GA and WAEV(FM) Savannah, GA operating into a combined antenna system as specified in Construction Permits BMPH-20020107AAF and BMPH-20020107AAE, comply with section 73.317(b) through 73.317(d) of the FCC Rules and Regulations. The measurements were conducted on May 16, 2002 by Randall L. Mullinax, with both stations simultaneously utilizing the shared antenna as specified in "Special operating conditions or restrictions 1." of both Construction Permits. The spectrum analyzer used for the measurements was a Tektronix model 2710, S/N B020735. A sample of the WQBT(FM) and WAEV(FM) signals was derived from the main transmission line at the output of the combiner and was coupled to the analyzer using a short length of RG-142 50Ω double-shielded coaxial cable. Two 6 dB pads (Bird model 5-A-MFN-06) were inserted ahead of the analyzer to avoid overload and to provide isolation.

The measured unmodulated carrier level of both WQBT(FM) and WAEV(FM) was +15 dBm and this level 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 unmodulated 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 between the two 6 dB pads so that the spectrum analyzer gain could be increased by 20 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 54.6 dB at 94.1 MHz and 42.1 dB at 97.3 MHz.

All harmonic and intermodulation frequencies in the range of frequencies between 5 MHz and 1000 MHz through the 3rd order that could be produced by the combined operation of WQBT(FM) and WAEV(FM) were predicted with a computer program, the results of which are shown in Table 1.

TABLE 1

#	Order	x	Freq.	Sum/Dif	Order	x	Freq.	=	Product
1.	1	x	94.1	+	1	x	97.3	=	191.4
2.	1	x	97.3	+	1	x	94.1	=	191.4
3.	1	x	94.1	+	2	x	97.3	=	288.7
4.	1	x	97.3	+	2	x	94.1	=	285.5
5.	1	x	94.1	+	3	x	97.3	=	386
6.	1	x	97.3	+	3	x	94.1	=	379.6
7.	2	x	94.1	=				=	188.2
8.	2	x	94.1	+	1	x	97.3	=	285.5
9.	2	x	94.1	-	1	x	97.3	=	90.9
10.	2	x	97.3	=				=	194.6
11.	2	x	97.3	+	1	x	94.1	=	288.7
12.	2	x	97.3	-	1	x	94.1	=	100.5
13.	2	x	94.1	+	2	x	97.3	=	382.8
14.	2	x	97.3	+	2	x	94.1	=	382.8
15.	2	x	97.3	-	2	x	94.1	=	6.4
16.	2	x	94.1	+	3	x	97.3	=	480.1
17.	2	x	97.3	+	3	x	94.1	=	476.9
18.	3	x	94.1	=				=	282.3
19.	3	x	94.1	+	1	x	97.3	=	379.6
20.	3	x	94.1	-	1	x	97.3	=	185
21.	3	x	97.3	=				=	291.9
22.	3	x	97.3	+	1	x	94.1	=	386
23.	3	x	97.3	-	1	x	94.1	=	197.8
24.	3	x	94.1	+	2	x	97.3	=	476.9
25.	3	x	94.1	-	2	x	97.3	=	87.7
26.	3	x	97.3	+	2	x	94.1	=	480.1
27.	3	x	97.3	-	2	x	94.1	=	103.7
28.	3	x	94.1	+	3	x	97.3	=	574.2
29.	3	x	97.3	+	3	x	94.1	=	574.2
30.	3	x	97.3	-	3	x	94.1	=	9.6

While special attention was given to the “product” frequencies listed in Table 1, measurements were conducted covering the entire range of frequencies between 5 MHz and 1000 MHz. The only signals detected at levels attenuated by less than 80 dB below the unmodulated carrier levels and appearing on frequencies removed from the WQBT(FM) and WAEV(FM) 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 -65 dBm (80 dB below the unmodulated carrier level of WQBT(FM) and WAEV(FM) which was +15 dBm) both the WQBT(FM) and WAEV(FM) transmitters were 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 WQBT(FM) and WAEV(FM).

Results of the measurements at the specific frequencies where harmonic or intermodulation products were predicted to possibly occur are shown in Table 2.

TABLE 2

DESCRIPTION	FREQ. MHz	ATTENUATION dB	DESCRIPTION	FREQ. MHz	ATTENUATION dB
94.1 + 97.3	191.4	100	(3 X 94.1) - (2 X 97.3)	87.7	100
(2 X 94.1) + 97.3	285.5	99	(3 X 97.3) - (2 X 94.1)	103.7	100
(2 X 97.3) + 94.1	288.7	100	(3 X 94.1) + (3 X 97.3)	574.2	100
(3 X 94.1) + 97.3	379.6	98	(3 X 97.3) - (3 X 94.1)	9.6	96
(3 X 97.3) + 94.1	386.0	100	4 X 94.1	376.4	100
2 X 94.1	188.2	97	4 X 97.3	389.2	100
(2 X 94.1) - 97.3	90.9	99	5 X 94.1	470.5	100
2 X 97.3	194.6	99	5 X 97.3	486.5	100
(2 X 97.3) - 94.1	100.5	100	6 X 94.1	564.6	100
(2 X 94.1) + (2 X 97.3)	382.8	100	6 X 97.3	583.8	100
(2 X 97.3) - (2 X 94.1)	6.4	92	7 X 94.1	658.7	100
(2 X 94.1) + (3 X 97.3)	480.1	100	7 X 97.3	681.1	100
(2 X 97.3) + (3 X 94.1)	476.9	96	8 X 94.1	752.8	92
3 X 94.1	282.3	89	8 X 97.3	778.4	100
(3 X 94.1) - 97.3	185.0	100	9 X 94.1	846.9	100
3 X 97.3	291.9	100	9 X 97.3	875.7	100
(3 X 97.3) - 94.1	197.8	100	10 X 94.1	941.0	100
			10 X 97.3	973.0	100

The results of these measurements confirm that the combined operations of WQBT(FM) and WAEV(FM) 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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