Per the above table, it can be seen that the transmitter as measured with the emission mask bandpass filter, did not meet the emission mask for the 6th harmonic at 3.63 GHz falling some 5 dB short. The transmitter as tested did not include a low pass filter. However, a lowpass filter will be supplied with each Anywave model LPTV transmitter to meet the harmonic attenuation specified in FCC Rule Section 74.794 (b) (1). The lowpass filter attenuation plot for the GPS bands is addressed in the next section of this report. Most importantly, the addition of this filter will also attenuate the energy at the 6th harmonic by approximately 60 dB in order for the complete transmitter to meet the stringent emission mask.

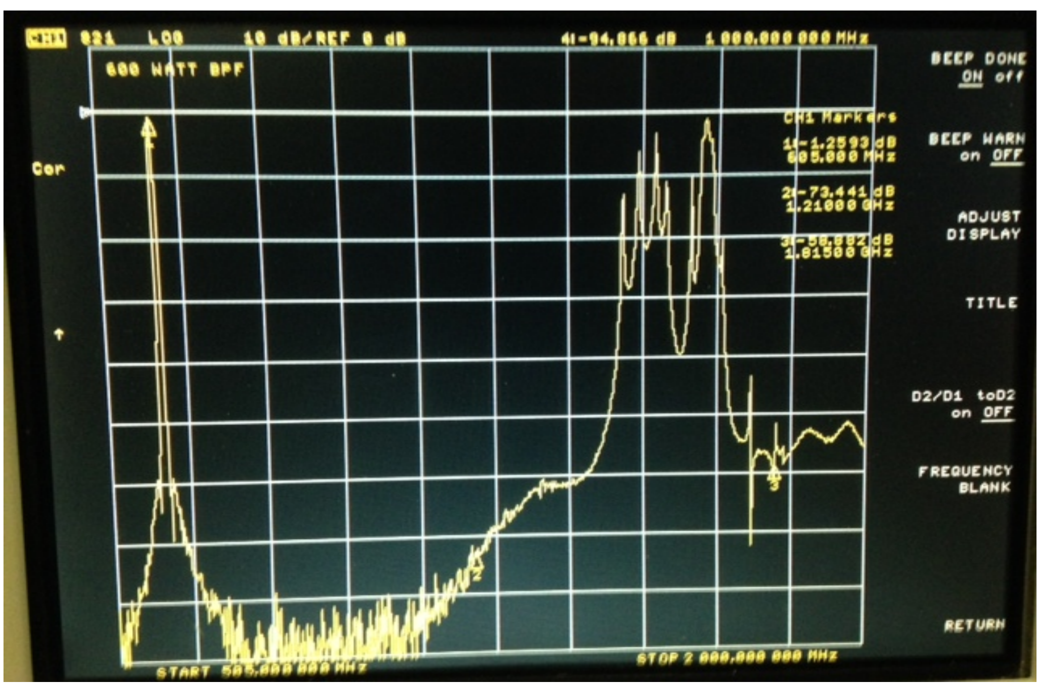
The lowpass filter attenuation at 3.63 GHz is plotted below to show the additional attenuation. In this case, 60 dB of additional attenuation (Marker #2) is supplied which more than makes up for the 5 dB shortfall (indicated in the table above) in the attenuation at the 6th harmonic. When the transmitter is measured with the lowpass filter in-place, there should be ~55 dB of margin in meeting the required emission mask. Every Anywave model LPTV transmitter will be supplied with the lowpass filter installed.

Lowpass Filter Attenuation at 3.6 GHz—60 dB

Filter Attenuation to GPS Band Frequencies

A lower frequency amplitude versus frequency plot of the lowpass filter located between the power amplifier combiner and the emission mask filter is shown below. As can be seen by plot, the attenuation by the harmonic filter alone is not quite sufficient to provide the 85 dB of attenuation needed for the frequency range from 1160 MHz to 1240 MHz but is enough for the GPS band from 1559 MHz to 1610 MHz. The attenuation provided by the emission mask filter is shown below the lowpass filter plot. The attenuation from the emission mask filter at 1200 MHz, 72 dB, plus the harmonic filter attenuation of 72 dB equals 144 dB which is greater than 85 dB as specified by FCC Rule 74.794 (b) (1). Therefore compliance to the rule is demonstrated.

Harmonic Filter Attenuation At GPS Band Frequencies

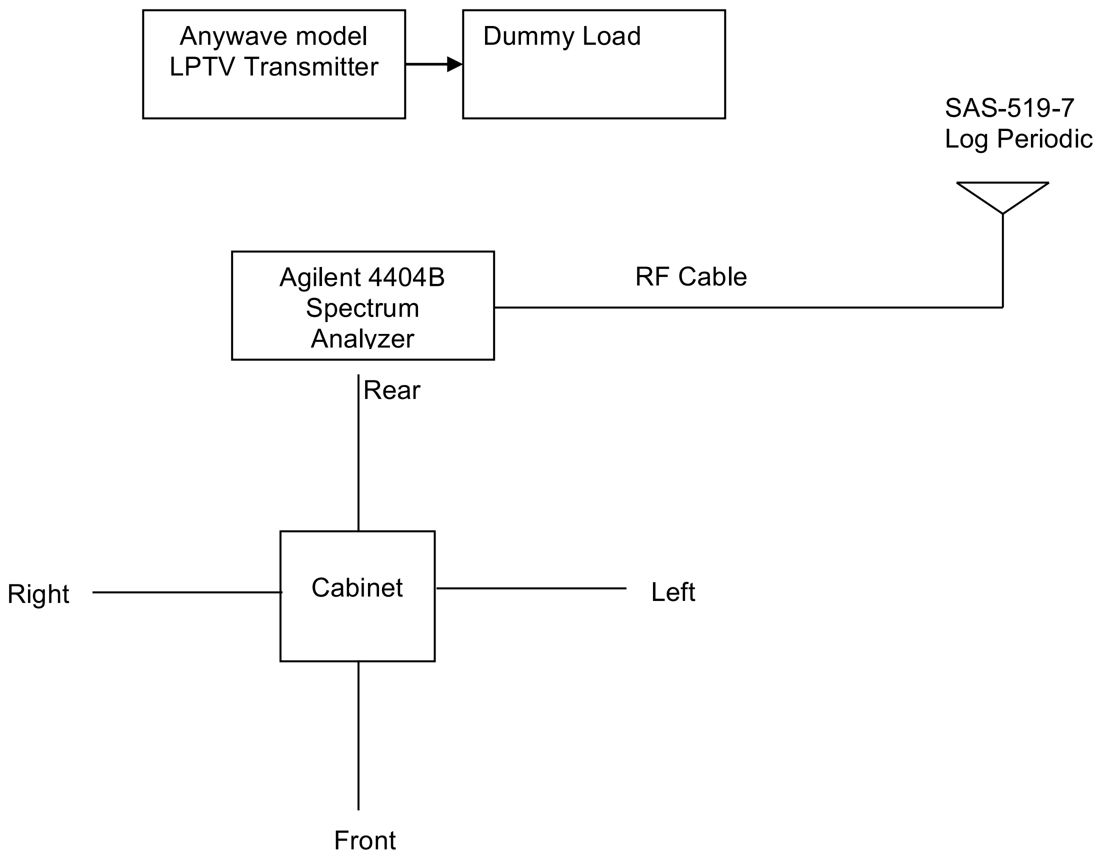


Attenuation versus Frequency of Emission Mask Filter up to 2.0 GHz

CABINET RADIATION

The transmitter and test equipment were configured as shown below including the angles of measurement with respect to the transmitter cabinet. The transmitter was operated at 560 W average power. Radiation from the cabinet was measured at a distance of 9.1 meters in 4 different physical rotation angles: 0° (front), 90° (right), 180° (Rear), and 270° (Left). The cabinet radiation was measured in four directions ~90 degrees apart so that all angles of the transmitter were evaluated. The only energy found associated with the transmitter was harmonic energy (i.e. no spurious energy was found). The measured value for each spectrum emission emanating from the cabinet was recorded in the tables beginning on the next page. The free space path loss, RF cable loss and antenna gain characteristics were obtained at the fundamental frequency and at each of the harmonics in order to accurately assess the level of the signal radiated from the cabinet.

Test Equipment Configuration for Cabinet Radiation



Cabinet Radiation Test Results

As calculated from the spreadsheet data on the following pages, the results show no problems with cabinet radiation from any angle. The spectrum between the lower frequency edge and the upper frequency edge of the spectrum associated with each harmonic was searched. A 10 kHz resolution bandwidth was used for the spectrum analyzer and the measured power level was scaled to a 500 kHz bandwidth. For each measured level, the antenna was rotated in azimuth and elevation to obtain the maximum reading. The largest power level segment of 500 kHz within the specific harmonic energy area was recorded as the measured level. From there, the power in the 500 kHz bandwidth was compared to the total DTV channel power. Data was not recorded for the fundamental frequency due to the fact that in normal operation the transmit antenna will be the dominant radiator. The measurement tables for the corresponding view angles of the transmitter are shown on the following pages.

CABINET RADIATION TEST

TEST INPUTS *CONDITIONS & PARAMETERS*

TEST DATE:	**3/18/14**			
TEST ENGINEER:	**Greg Best**			
TRASMITTER MODEL NO:	**LPTV**			
OPERATING POWER OUTPUT LEVEL	**57.5**	**dBm**	**560**	**Power in Watts**
OPERATING FREQUENCY IN GHz	**0.605**	**GHz**	**36**	**Channel**
ANTENNA MODEL NUMBER	**SAS-519-7**			
SPECTRUM ANALYZER MODEL	**Agilent E4404B**			
DISTANCE TO TRANSMITTER IN METERS	**9.1**			

FRONT (0 DEGREE) VIEW

Harmonic	Frequency	Measured	CABLE	ANTENNA	PATH	Corrected	MAXIMUM	STATUS
		LEVEL	LOSS dB	GAIN dB	LOSS dB	LEVEL	LEVEL	P=PASS
	GHz	dBm	dB	dB	dB	dBm	dBm	
Fc	0.605	-65	0.8	5.7	47.32	-22.58406466	-2.5	N/A
2nd	1.21	-81	1.0	7.7	53.34	-34.36346475	-2.5	P
3rd	1.815	-81	1.0	6.7	56.86	-29.84163957	-2.5	P
4th	2.42	-81	1.7	6.8	59.36	-26.74286483	-2.5	P
5th	3.025	-81	2.0	5.1	61.30	-22.80466457	-2.5	P
6th	3.63	-81	2.0	6.7	62.88	-22.82103965	-2.5	P
7th	4.235	-81	2.8	6.6	64.22	-20.58210386	-2.5	P
8th	4.84	-81	3.2	7.7	65.38	-20.12226492	-2.5	P
9th	5.445	-81	3.1	7.9	66.40	-19.39921447	-2.5	P
10th	6.05	-81	3.6	5.6	67.32	-15.68406466	-2.5	P

RIGHT (90 DEGREE) VIEW

Harmonic	Frequency	SIGNAL	CABLE	ANTENNA	PATH	ADJ	MAXIMUM	STATUS
		LEVEL	LOSS dB	GAIN dB	LOSS dB	LEVEL	LEVEL	
	GHz	dBm	dB	dB	dB	dBm	dBm	
Fc	0.605	-60	0.8	5.7	47.32	-17.6	-2.5	N/A
2nd	1.21	-81	1.0	7.7	53.34	-34.4	-2.5	P
3rd	1.815	-81	1.0	6.7	56.86	-29.8	-2.5	P
4th	2.42	-81	1.7	6.8	59.36	-26.7	-2.5	P
5th	3.025	-81	2.0	5.1	61.30	-22.8	-2.5	P
6th	3.63	-81	2.0	6.7	62.88	-22.8	-2.5	P
7th	4.235	-81	2.8	6.6	64.22	-20.6	-2.5	P
8th	4.84	-81	3.2	7.7	65.38	-20.1	-2.5	P
9th	5.445	-81	3.1	7.9	66.40	-19.4	-2.5	P
10th	6.05	-81	3.6	5.6	67.32	-15.7	-2.5	P

REAR (180 DEGREE) VIEW

Harmonic	Frequency	SIGNAL	CABLE	ANTENNA	PATH	ADJ	MAXIMUM	STATUS
		LEVEL	LOSS dB	GAIN dB	LOSS dB	LEVEL	LEVEL	
	GHz	dBm	dB	dB	dB	dBm	dBm	
Fc	0.605	-50	0.8	5.7	47.32	N/A	-2.5	N/A
2nd	1.21	-81	1.0	7.7	53.34	-34.4	-2.5	P
3rd	1.815	-81	1.0	6.7	56.86	-29.8	-2.5	P
4th	2.42	-81	1.7	6.8	59.36	-26.7	-2.5	P
5th	3.025	-81	2.0	5.1	61.30	-22.8	-2.5	P
6th	3.63	-81	2.0	6.7	62.88	-22.8	-2.5	P
7th	4.235	-81	2.8	6.6	64.22	-20.6	-2.5	P
8th	4.84	-81	3.2	7.7	65.38	-20.1	-2.5	P
9th	5.445	-81	3.1	7.9	66.40	-19.4	-2.5	P
10th	6.05	-81	3.6	5.6	67.32	-15.7	-2.5	P

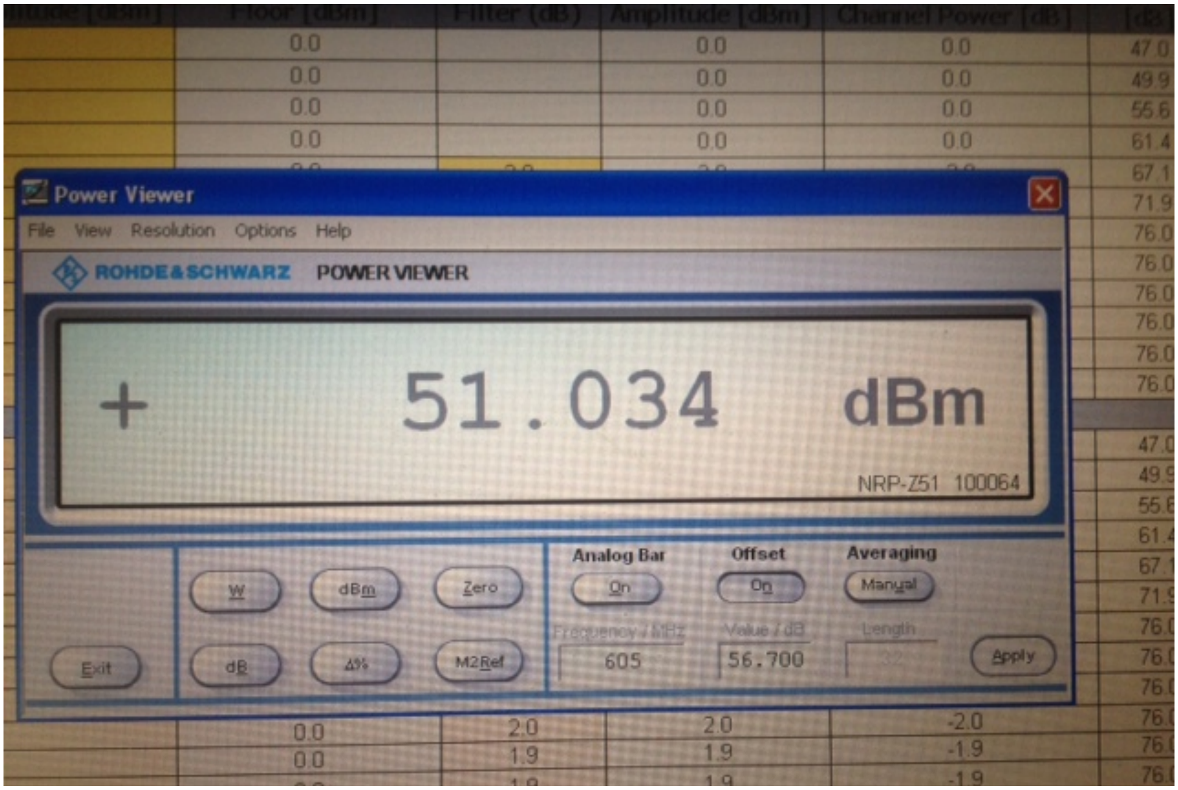
LEFT (270 DEGREE) VIEW

Harmonic	Frequency	SIGNAL	CABLE	ANTENNA	PATH	ADJ	MAXIMUM	STATUS
		LEVEL	LOSS dB	GAIN dB	LOSS dB	LEVEL	LEVEL	
	GHz	dBm	dB	dB	dB	dBm	dBm	
Fc	0.605	-57	0.8	5.7	47.32	N/A	-2.5	N/A
2nd	1.21	-81	1.0	7.7	53.34	-34.4	-2.5	P
3rd	1.815	-81	1.0	6.7	56.86	-29.8	-2.5	P
4th	2.42	-81	1.7	6.8	59.36	-26.7	-2.5	P
5th	3.025	-81	2.0	5.1	61.30	-22.8	-2.5	P
6th	3.63	-81	2.0	6.7	62.88	-22.8	-2.5	P
7th	4.235	-81	2.8	6.6	64.22	-20.6	-2.5	P
8th	4.84	-81	3.2	7.7	65.38	-20.1	-2.5	P
9th	5.445	-81	3.1	7.9	66.40	-19.4	-2.5	P
10th	6.05	-81	3.6	5.6	67.32	-15.7	-2.5	P

Note: -81 dBm was the spectrum analyzer noise level scaled to a 500 kHz bandwidth so the only measureable energy occurred at the fundamental frequency.

Low Power Operation---125 Watts

For operation at power levels below 560 watts, power output and emission mask compliance measurements were repeated for the transmitter operating at a lower power level. For this configuration, the transmitter was energized in the same test configuration as in Figure 1 except at the output power of 125 watts. Average power was measured with the R & S NRP-Z51 power sensor and displayed on the personal computer using Power Viewer. The indicated reading is shown on the following page.

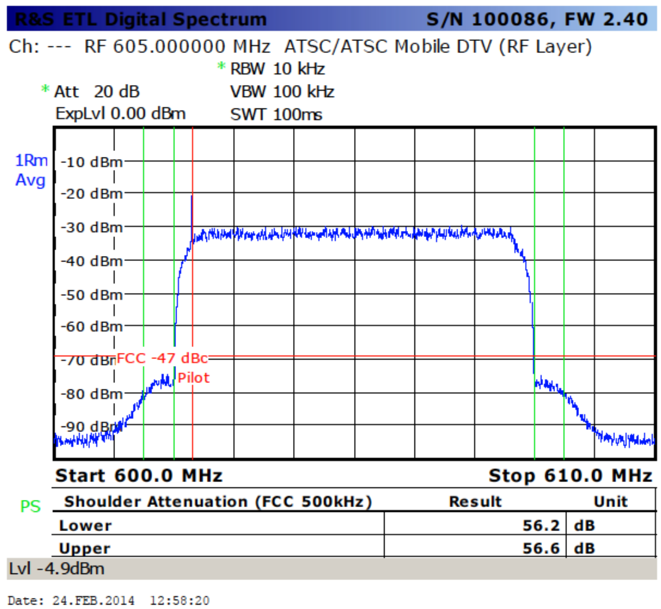


Calculation of Output Power and DC Input Power: An offset of 56.7 dB from the directional coupler was added to the Power Viewer program. The actual value of -5.67 dBm was measured on the Power Viewer Plus display and then the offset value of 56.7 dBm was added for the directional coupler coupling value to display the correct value of 51.03 dBm or 127 watts. In order to determine the total DC power to the final RF amplifier stage, currents and voltage from the final amplifier stage were measured and multiplied together. With this operating power, measured transmitter final amplifier voltage is 49.5 VDC and final amplifier current is 20.3 Amps. The DC power was calculated to be 1003 watts.

Emission Mask Compliance   125 Watts Output Power

To determine conducted radiation emission mask compliance, the test equipment configuration shown on Figure 1 was used. For adjacent channel measurements, the R & S ETL spectrum analyzer was used. For harmonic and spurious measurements, the R & S ETL was used for frequencies up to 3 GHz and then the Agilent 4404B was used frequencies above 3 GHz. The transmitter was tested for compliance with the stringent emission mask as specified in FCC rule 74.794 (a) (2) (ii). The IEEE 2008-1631 Recommended Practice On 8-VSB Digital Television Transmission Compliance Measurement was used as the test measurement methodology. The first part of the tests measured the adjacent channel emission and the second part of the tests measured the harmonic and spurious energy.

The transmitter was energized at 125 watts on Channel 36 (center frequency of 605 MHz) as measured at the output of Directional coupler #2 and a reference was established on the ETL spectrum analyzer (using the channel power measurement mode). The transmitter precorrections were engaged. The following screen shot was taken of the transmitter operating at 125 W to confirm excellent linearity and shoulder response.



The bandstop filter insertion loss versus frequency response was previously determined using the ETL spectrum analyzer function and tracking generator combination. The insertion loss at the center of each of the twelve 500 kHz segments either side of the main channel was tabulated. The bandstop filter response is shown as Figure 3 earlier in this document. The bandstop filter attenuation versus frequency in the adjacent channels was measured and tabulated in the spreadsheet.

The noise floor of the spectrum analyzer in the adjacent channels to channel 36 was found and from that value, the minimum RF sample level was determined (assuming the transmitter exactly met the emission mask limit requirements identified in the FCC rules). The actual RF sample level is listed in the table and was well above the required minimum RF sample so plenty of margin was available with the test configuration used.

To determine adjacent channel emission relative to the desired channel, the 6 MHz DTV channel power was first measured for the channel 36 signal and used as a reference. Then the twelve 500 kHz segments on both adjacent channels of the channel 36 signal were measured. Leaving the spectrum analyzer attenuator set at the same value as the channel power measurement, the closest four 500 kHz segments on either side of the channel 36 signal were measured without the use of the bandstop filter because those signals were above the noise floor of the ETL spectrum analyzer. The bandstop filter was then inserted in the path as shown in Figure 1. The attenuation of the spectrum analyzer was reduced to the minimum without overloading spectrum analyzer. The remaining 500 kHz segments on each side of channel 36 were measured and the data was recorded in the emission mask spreadsheet provided on the next page.

The measured values were corrected for proximity to the spectrum analyzer noise floor first and then for the bandstop filter insertion loss. As can be seen by examining the emission mask spreadsheet on the following page, the transmitter emissions met the requirements as indicated by comparison with the FCC Emission Mask from FCC Rule 74.794 (a) (2) (ii).

The top of the emission mask compliance table on the following page contains the minimum detectable signal level for the resolution bandwidth used, the minimum RF sample power in a 6 MHz bandwidth needed to be sure that if the transmitter just barely met the required emission mask, the measured level would be just above the spectrum analyzer noise floor, and other related information. The table can be read from left to right starting with the measured amplitude, correcting for the spectrum analyzer noise floor, adding the attenuation from the bandstop filter, and calculating the amount of attenuation compared to the channel power, and finally comparing that amount with the FCC emission mask. Figures 7 and 8 are shown to indicate the power in the upper and lower shoulder area before comparison to the actual channel power.

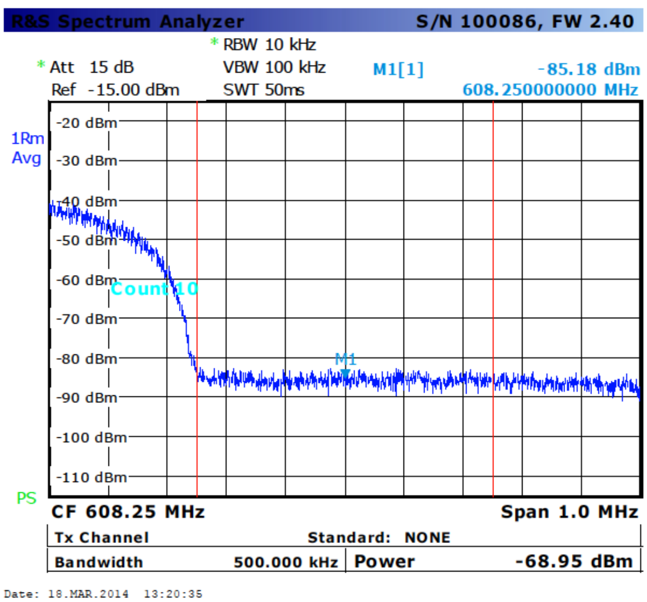


Figure 7—Upper DTV Emission Shoulder

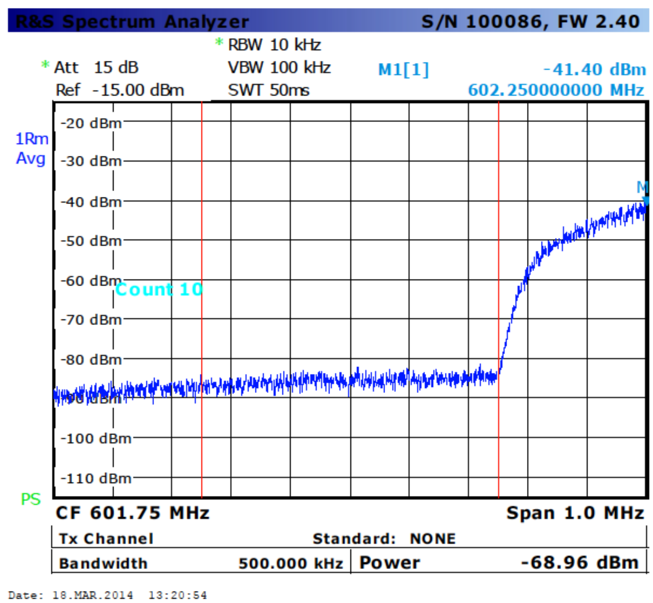


Figure 8—Lower DTV Emission Shoulder