TEST REPORT

NV830X

NV830X TRANSMITTER TECHNICAL REPORT

The following information is provided to support the technical performance of the R & S NV830X DTV transmitter. The information is supplied for broadcast service according to applicable portions of Part 74 of the FCC Rules.

The information in this report is provided in support of certification that the transmitter meets the appropriate requirements. Measurements outlined below were recorded of spectrum and other data to demonstrate compliance.

1. Power Output Measurements
2. Frequency stability tests versus AC input voltage and temperature
3. Measurements to demonstrate the transmitter meets the DTV emission mask as specified in FCC Rule 74.794 (a) (2) (ii) and 74.794 (b) (1).
4. Measurement of cabinet radiation for spurs and harmonics as specified in FCC Rule 2.1053 and Rule 2.1057

Measurements for power output and emission mask compliance were conducted at power output levels of both 1800 watts and 900 watts and thus this is the range over which type certification for these transmitters is sought.

The test equipment used for the measurements is listed at the end of this document.

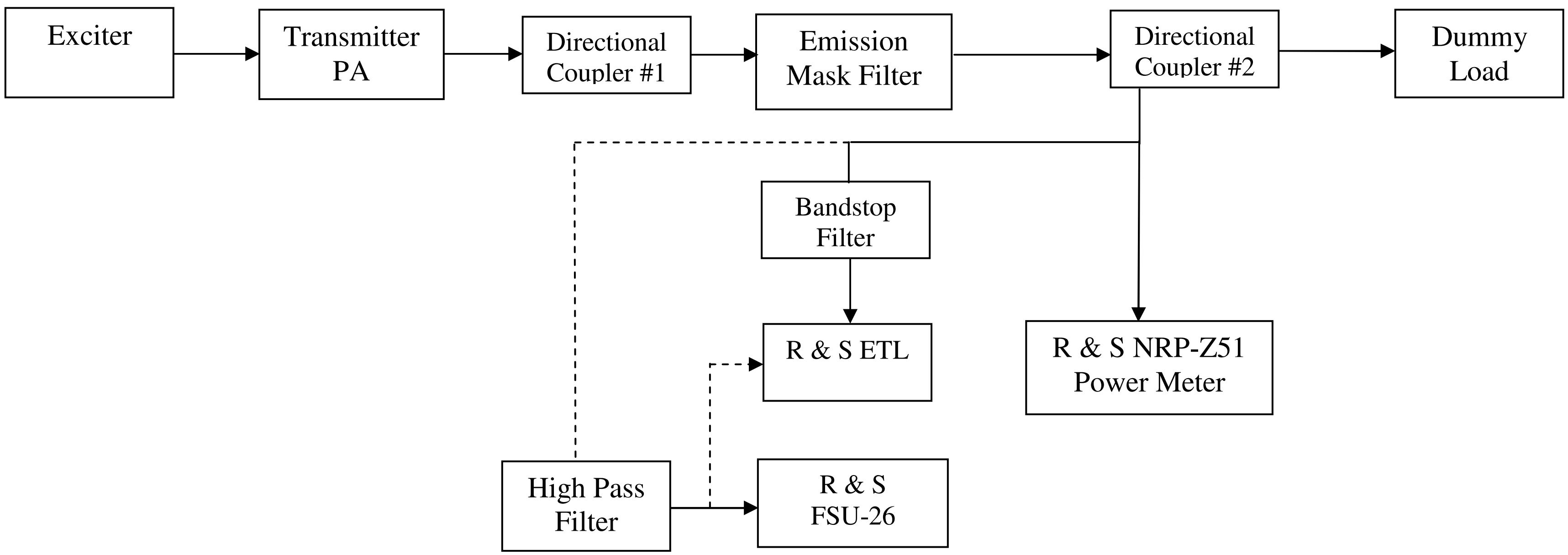


FIGURE 1—TEST EQUIPMENT CONFIGURATION

Note: The coupling factor of directional coupler #2 was determined to be 50.0 dB at channel 43.

RF Power Output Measurements

The equipment was configured as shown in Figure 1. The coupling factor of directional coupler #2 was calibrated at the center frequency of the channel 43 DTV signal of 647 MHz. The coupling value was 50.0 dB. Average power was measured with the R & S NRP-Z51 power sensor and displayed on the R & S FSU-26 spectrum analyzer. The indicated reading is shown below.

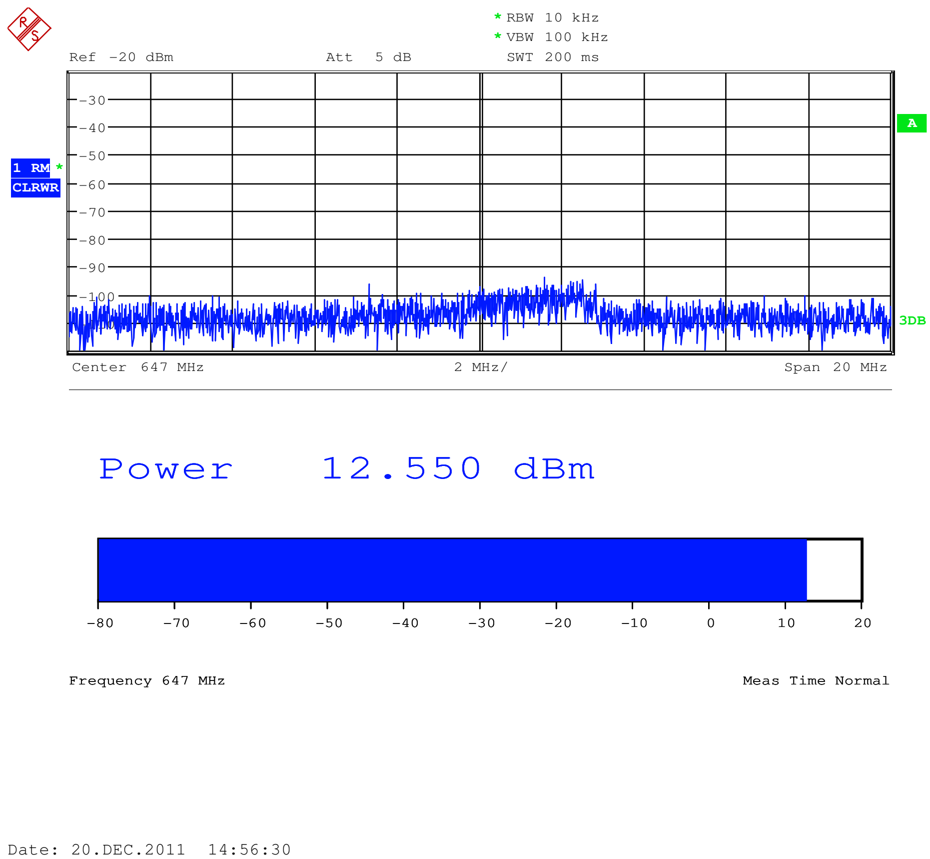


Figure 2—Power Meter Reading at Nominal Transmitter Power

Calculation of Output Power: An offset of 50dB from the directional coupler, added to the displayed power of 12.55 dBm, equals the measured power in watts. The NRP-Z51 power sensor reads 12.55 dBm plus the 50 dB offset or the total value of 62.55 dBm. The equivalent linear measurement of power is 1800 Watts. With this operating state, measured transmitter final amplifier voltage is 31.6 VDC and final amplifier current is 200.2 Amps.

Emission Mask Compliance

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 and for harmonic and spurious measurements, the R & S FSU26 was used. The transmitter was tested for compliance with the 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 1800 watts on Channel 43 (center frequency of 647 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 bandstop filter amplitude vs frequency response was previously determined using a spectrum analyzer 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. The attenuation has been tabulated in the next section with the spreadsheet of measured emission values.

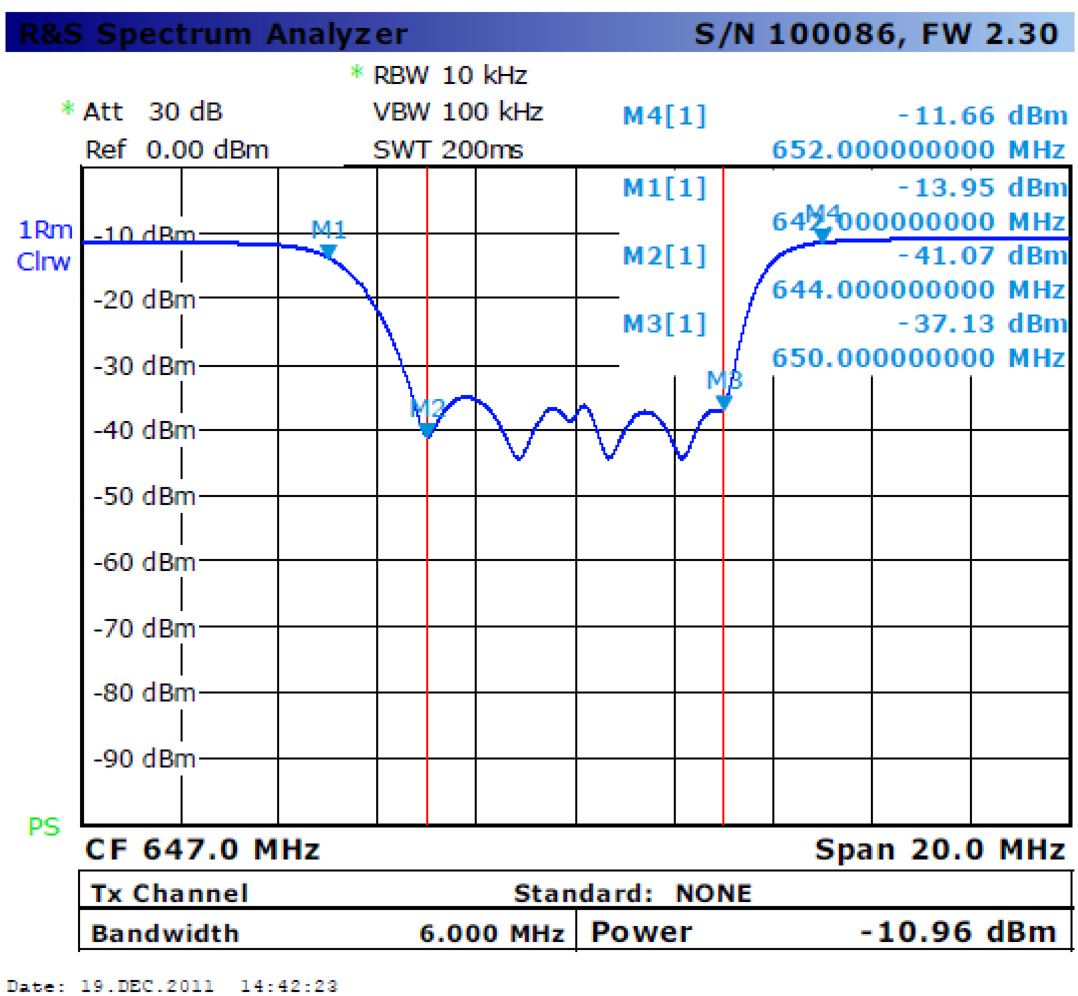
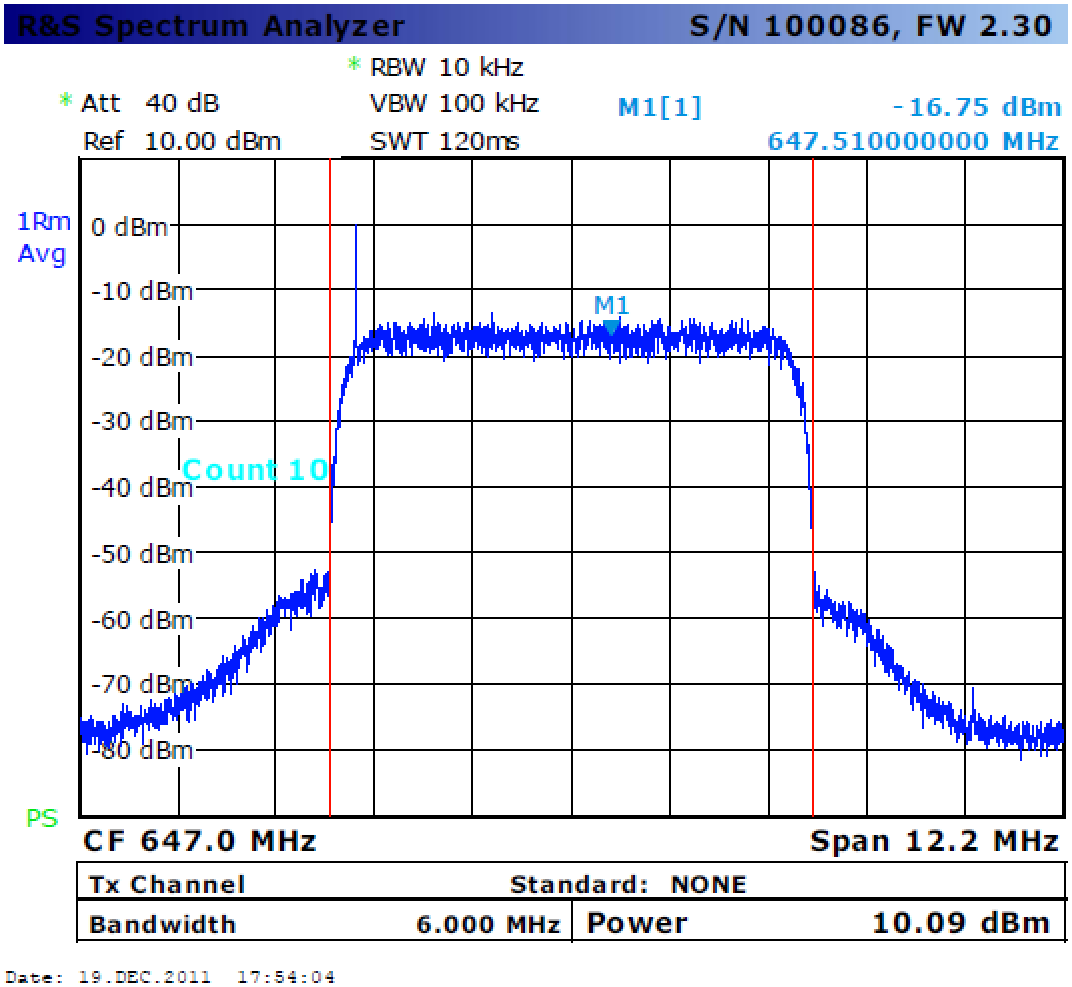


Figure 3 Bandstop Filter Response

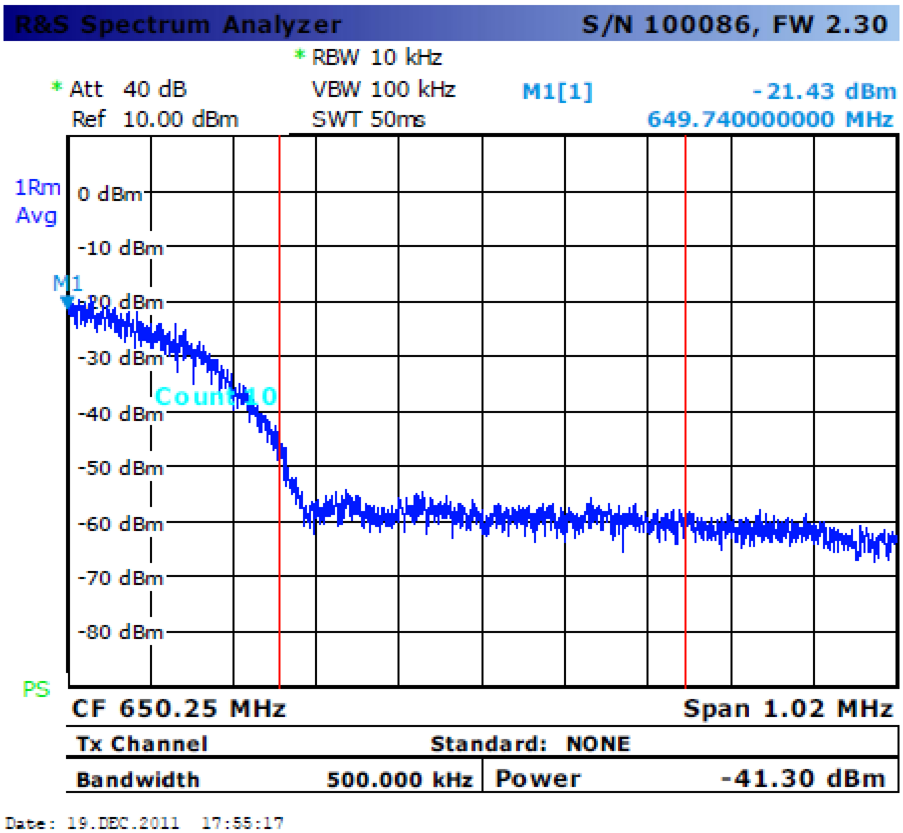
The noise floor of the spectrum analyzer in the adjacent channels to channel 43 was found and from that value, the minimum RF sample level was determined (assuming the transmitter exactly met the emission mask requirements identified in the FCC rules). The actual RF sample level was well above the required minimum RF sample so plenty of margin was available with the test configuration used.

The transmitter was energized at 1800 W and optimized for linearity. The 6 MHz DTV channel power was first measured for the channel 43 signal. Then the twelve 500 kHz segments on both sides of the channel 43 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 43 signal were measured without the use of the bandstop filter because those signals were above the noise floor of the ETL spectrum analyzer with the existing attenuator setting. Spectrum analyzer screen shots were captured for the channel power of the desired signal and the upper and lower sidebands for reference. The bandstop filter was 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 43 were measured and the data was recorded in the emission mask spreadsheet provided on the next page.

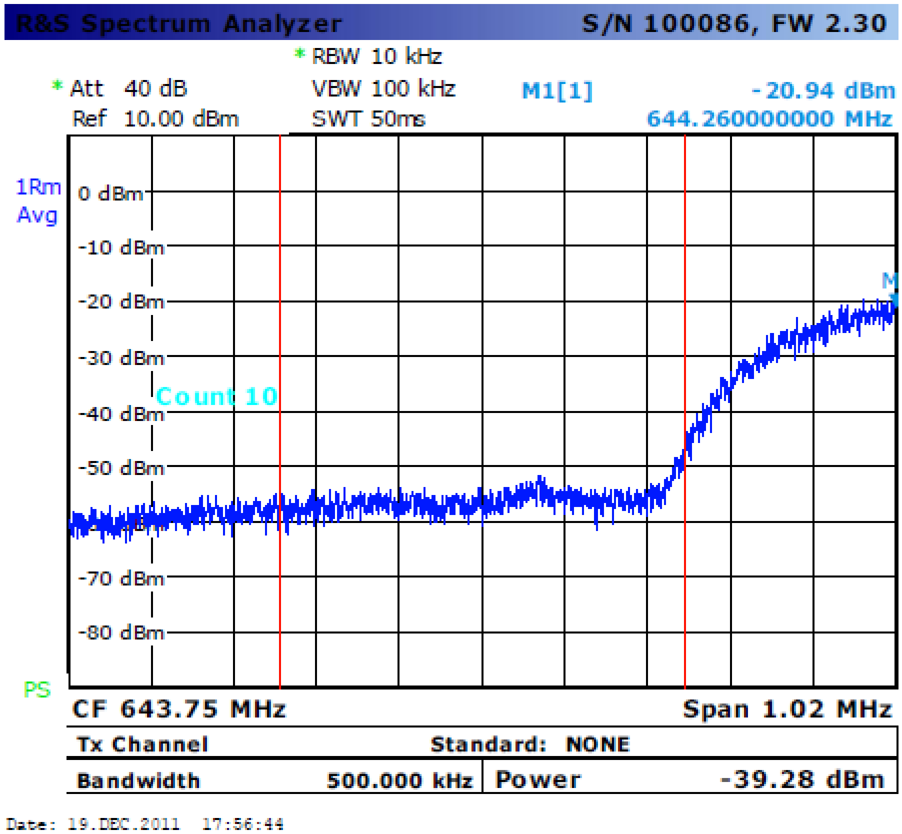
The measured values were corrected for proximity to the noise floor first and then for the bandstop filter insertion loss. The transmitter emissions met the requirements as indicated by comparison with the FCC Emission Mask from FCC Rule 74.794 (a) (2) (ii).



CHANNEL POWER MEASUREMENT OF CHANNEL 43 DESIRED SIGNAL



UPPER SHOULDER



LOWER SHOULDER

ATSC TRANSMITTER
TEST REPORT 1.8 KW

Spectrum Analyzer 10kHz RBW Noise Floor [dBm]	-110.0
Spectrum Analyzer 500kHz RBW Noise Floor [dBm]	-93.0
Noise floor proximity upper threshold [dBm]	-83.0
Noise floor proximity lower threshold [dBm]	-90.0

Min. Sample Level [dBm]	-16.8

ATSC TRANSMISSION MASK COMPLIANCE TEST
Stringent Mask

Channel Power [dBm]	10.1
Channel Number	43
Center Frequency [MHz]	647

Delta Frequency [MHz]	Frequency [MHz]	Measured Amplitude [dBm]	Corrected for Noise Floor [dBm]	Bandstop Filter (dB)	Corrected Amplitude [dBm]	Amplitude below Channel Power [dB]	FCC Limit [dB]	Pass/Fail
3.25	650.25	-41.3	-41.3		-41.3	51.4	47.0	**Pass**
3.75	650.75	-46.9	-46.9		-46.9	57.0	49.9	**Pass**
4.25	651.25	-54.0	-54.0		-54.0	64.1	55.6	**Pass**
4.75	651.75	-58.9	-58.9		-58.9	69.0	61.4	**Pass**
5.25	652.25	-74.4	-74.4	1.0	-73.4	83.5	67.1	**Pass**
5.75	652.75	-81.1	-81.1	1.0	-80.1	90.2	71.9	**Pass**
6.25	653.25	-86.6	-87.7	0.8	-86.9	97.0	76.0	**Pass**
6.75	653.75	-90.1	-93.0	0.8	-92.2	102.3	76.0	**Pass**
7.25	654.25	-91.6	-93.0	0.7	-92.3	102.4	76.0	**Pass**

7.75	654.75	-92.1	-93.0	0.7	-92.3	102.4	76.0	**Pass**
8.25	655.25	-92.3	-93.0	0.7	-92.3	102.4	76.0	**Pass**
8.75	655.75	-92.4	-93.0	0.7	-92.3	102.4	76.0	**Pass**
-3.25	643.75	-39.2	-39.2		-39.2	49.3	47.0	**Pass**
-3.75	643.25	-43.9	-43.9		-43.9	54.0	49.9	**Pass**
-4.25	642.75	-50.8	-50.8		-50.8	60.9	55.6	**Pass**
-4.75	642.25	-56.1	-56.1		-56.1	66.2	61.4	**Pass**
-5.25	641.75	-69.7	-69.7	2.4	-67.3	77.4	67.1	**Pass**
-5.75	641.25	-75.3	-75.3	1.7	-73.6	83.7	71.9	**Pass**
-6.25	640.75	-80.8	-80.8	1.4	-79.4	89.5	76.0	**Pass**
-6.75	640.25	-85.2	-86.0	1.3	-84.7	94.8	76.0	**Pass**
-7.25	639.75	-88.7	-90.7	1.2	-89.5	99.6	76.0	**Pass**
-7.75	639.25	-90.8	-93.0	1.2	-91.8	101.9	76.0	**Pass**
-8.25	638.75	-91.8	-93.0	1.2	-91.8	101.9	76.0	**Pass**
-8.75	638.25	-91.9	-93.0	1.2	-91.8	101.9	76.0	**Pass**

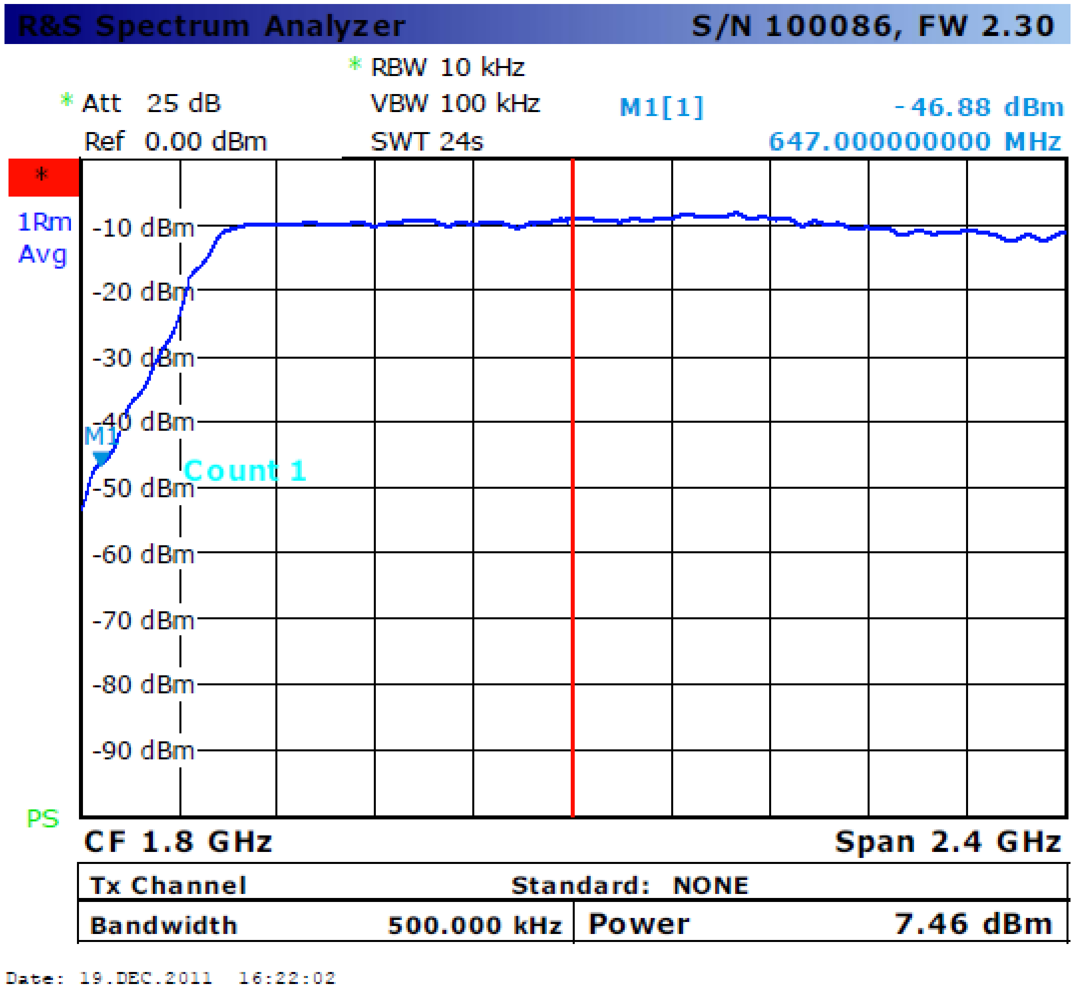
The next set of tests provides measurements of conducted radiation harmonic and spurious energy. The frequency spectrum up to the 10th harmonic was investigated for harmonic and spurious energy. The test setup of Figure 1 was used with the RF sample feeding the high pass filter and then the spectrum analyzer. Directional coupler #2 coupling values were estimated using coupling values supplied by the manufacturer. The measurements up to 3 GHz were taken from connection to the R & S ETL and for frequencies above 3 GHz, all measurements were recorded using the R & S FSU26. A high pass filter was used to permit the spectrum analyzer attenuation to be minimized without the spectrum analyzer being overloaded from the channel 43 signal. The only energy coming from the transmitter was found to be harmonics. Channel power measurements using a 500 kHz bandwidth were taken at harmonics up to the 10th and the level of the energy was recorded on the spreadsheet following on the next page. The measured values were converted back to an equivalent power at the transmitter output using the directional coupler factor and compared with the total power of the channel 43 power. Screen shots of the high pass filter and harmonic energy at the worst case conditions (2nd and 3rd harmonics) were taken and are provided on the pages following the spreadsheet.

ATSC TRANSMISSION MASK COMPLIANCE TEST

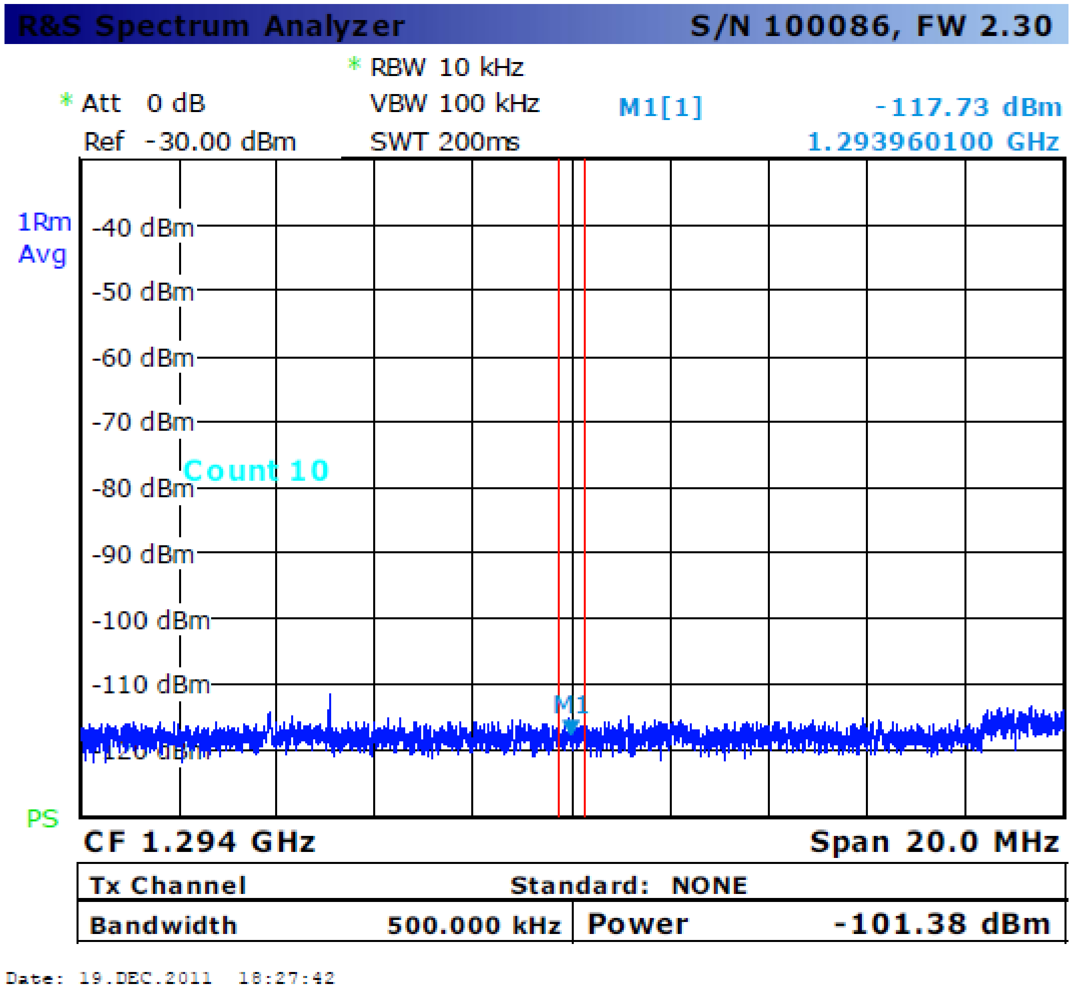
HARMONICS

Channel Power [dBm]	62.55
Channel Number	43
Center Frequency [MHz]	647

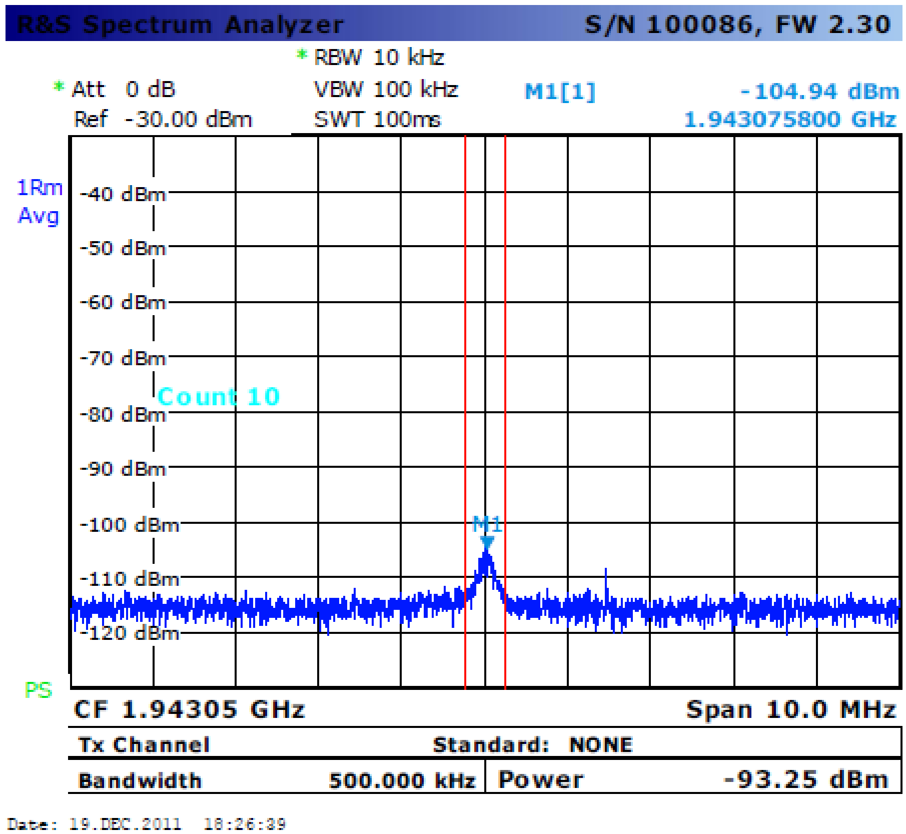
Harmonic	Frequency [MHz]	Measured Amplitude [dBm]	COUPLING	Corrected Amplitude [dBm]	Amplitude below Channel Power[dB]	FCC Limit [dB]	Pass/Fail
2nd	1294	-101.0	44.0	-57.0	119.6	76.0	**Pass**
3rd	1941	-93.3	40.5	-52.8	115.4	76.0	**Pass**
4th	2588	-94.0	38.0	-56.0	118.6	76.0	**Pass**
5th	3235	-94.0	36.0	-58.0	120.6	76.0	**Pass**
6th	3882	-94.8	34.4	-60.4	123.0	76.0	**Pass**
7th	4529	-94.8	33.1	-61.7	124.3	76.0	**Pass**
8th	5176	-95.5	31.9	-63.6	126.2	76.0	**Pass**
9th	5823	-95.4	30.9	-64.5	127.1	76.0	**Pass**
10th	6470	-95.5	30.0	-65.5	128.1	76.0	**Pass**



SWEPT RESPONSE OF HIGH PASS FILTER USING
TRACKING GENERATOR AND SPECTRUM ANALYZER



Worst case Harmonic Energy at 2nd Harmonic

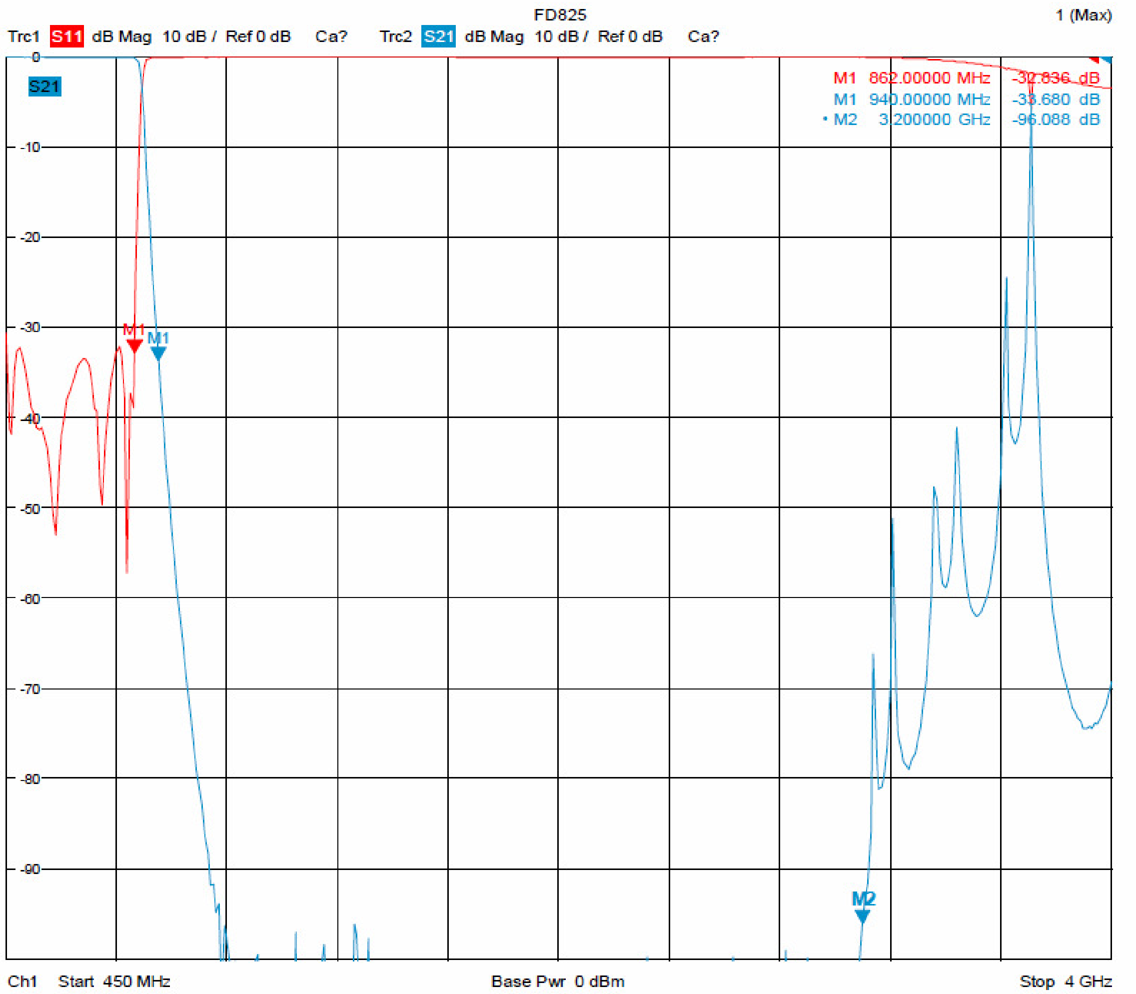


Worst case Harmonic Energy at 3rd Harmonic

Filter Attenuation to GPS Band Frequencies

The plot on the following page indicates the amount of attenuation to energy that would fall into the GPS bands from 1.1 GHz to 1.61 GHz. As can be seen by these plots, the attenuation by the harmonic filter alone is equal to or 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



FREQUENCY STABILITY

For temperature stability measurements, the exciter only was placed inside a temperature chamber equipped with a R & S PTM Digital Thermometer. The frequency stability of the transmitter is determined solely by the exciter used so no additional power amplifiers were used for this test. The exciter was measured by itself at a separate time and environmental test facility. The frequency stability was measured versus temperature and versus line voltage. The temperature range was measured from -30 ℃ to 50 ℃ in steps of 10 ℃. The test frequency was 750 MHz. For the test, the exciter was operated in a temperature rack without input signal. The monitoring output of the RF local oscillator signal of the synthesizer was measured with a R&S FSQ spectrum analyzer. A GPS 10 MHz reference was connected to the reference input of the FSU. A marker was set to the local oscillator signal and the signal counter was activated to provide a resolution of 0.1 Hz. The exciter synthesizer board was working in internal mode, so it was not locked to an external reference. The exciter was switched on at 20 ℃ and allowed to stabilize from 11:00 to 16:00 and was cooled down to -30℃ during the period between 16:00 and 09:00 of the following day. The temperature was stabilized at each measurement increment. The test results are located on the following page.

FREQUENCY STABILITY VERSUS TEMPERATURE RESULTS

Date	Time	Nominal Temperature °C	Measured Temperature °C	Frequency (Hz)	Difference (Hz)
9/27/2007	16:00	20	20.7	749999999.6	-0.4
9/28/2007	09:00	-30	-30.5	750000002.3	2.3
9/28/2007	10:00	-20	-20.2	750000001.7	1.7
9/28/2007	11:00	-10	-10.8	750000001.2	1.2
9/28/2007	12:00	0	0..5	750000000.8	0.8
9/28/2007	13:00	10	9.8	750000000.4	0.4
9/28/2007	14:00	20	20.8	750000000.0	0.0
9/28/2007	15:00	30	29.9	749999999.5	-0.5
9/28/2007	16:00	40	40.3	749999999.0	-1.0
9/28/2007	17:00	50	49.8	749999998.4	-1.6

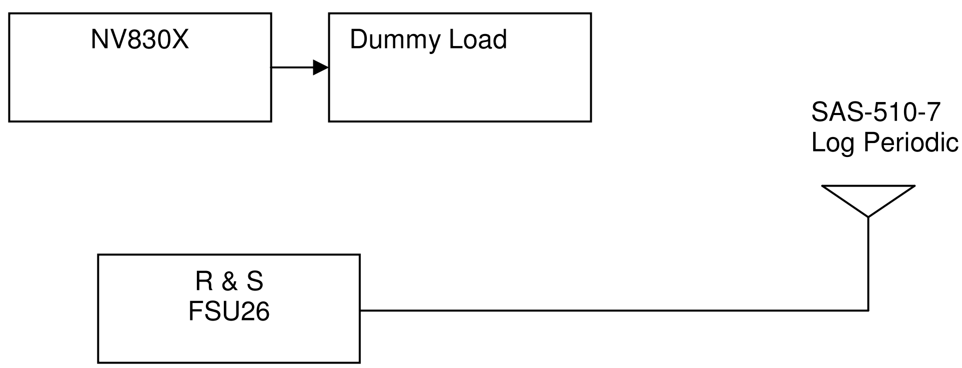
The line voltage was adjusted for nominal voltage and the frequency was recorded. Then the line voltage was adjusted to 85% and 115% of the nominal voltage and the frequency was recorded at each voltage level. The results are tabulated below:

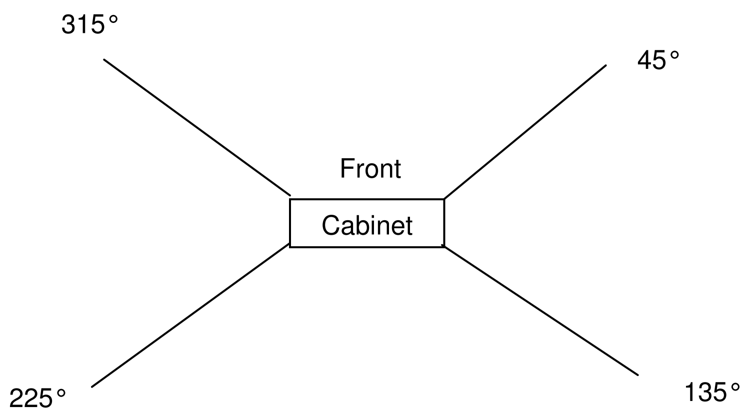
Line Voltage (Volts)	Frequency (MHz)	Difference (Hz)
103 (85%)	750000000.1	0.1
121 (Nominal)	750000000.0	0.0
139 (115%)	750000000.2	0.2

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 1.8 kW average power. The free space path loss, cable loss and antenna gain characteristics were obtained at the fundamental frequency and at each of the harmonics of the center of DTV channel 43 in order to accurately assess the level of the signal radiated from the cabinet. Radiation from the cabinet was measured at a distance of 3 meters in 4 different physical rotation angles: 45, 135, 225, and 315 degrees (0 degrees being the front of the cabinet). The cabinet radiation was measured in four directions ~90 degrees apart so that all angles of the transmitter were evaluated. The measured value for each spectrum emission emanating from the cabinet was recorded in the tables beginning on the next page.

Test Equipment Configuration for Cabinet Radiation





Cabinet Radiation Test Results

As calculated from the spreadsheet data on the following pages, the worst case measurement was -95.1 dB using a 500 kHz bandwidth compared to the total DTV channel power. The measurement tables for the corresponding view angles of the transmitter are shown on the following pages.

Test Inputs	**Conditions and Parameters**
Test Date	December 20, 2011
Test Engineer	Greg Best
Transmitter Model Number	NV830X
Operating Power Output Level	62.55 dBm 1800 watts
Center Frequency	0.647 GHz Channel 43
Antenna Model Number	A H Systems SAS 510-7 Log Periodic Serial Number 9112-1053 (Cable = 6.5 ft ¼" Superflex)
Spectrum Analyzer Model	R & S FSU26
Distance to Transmitter	3 meters

(Power levels were measured in 500 kHz segments between the lower frequency edge and the upper frequency edge of the spectrum associated with each harmonic. Center frequency of highest amplitude signal in the 500 kHz band segment is recorded below). Data is not recorded for the fundamental frequency due to the fact that in normal operation the transmit antenna will be the dominant radiator.

45 DEGREE VIEW

Harmonic	Center Frequency GHz	Signal Level dBm	Cable Loss dB	Antenna Gain dB	Path Loss dB	Adj Level dBm	Maximum Permitted Level dBm	Status P=Pass
Fundamental	0.647	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	1.294	-71	0.4	7.2	44.28	-33.5	2.55	P
3	1.941	-81	0.6	6.5	47.80	-39.0	2.55	P
4	2.588	-87	0.65	5.8	50.30	-41.8	2.55	P
5	3.235	-88	0.67	7.2	52.24	-42.3	2.55	P
6	3.882	-90	0.73	7.2	53.82	-42.6	2.55	P
7	4.529	-89.7	0.85	7.2	55.16	-40.9	2.55	P
8	5.176	-90	0.9	7.6	56.32	-40.4	2.55	P
9	5.823	-90	0.95	6.4	57.35	-38.1	2.55	P
10	6.47	-90	1	6.0	58.26	-36.7	2.55	P

315 DEGREE VIEW

Harmonic	Center Frequency GHz	Signal Level dBm	Cable Loss dB	Antenna Gain dB	Path Loss dB	Adj. Level dBm	Maximum Level dBm	Status
Fundamental	0.647	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	1.294	-72	0.4	7.2	44.28	-34.52	2.55	P
3	1.941	-83.8	0.6	6.5	47.80	-41.85	2.55	P
4	2.588	-85	0.65	5.8	50.30	-39.85	2.55	P
5	3.235	-87	0.67	7.2	52.24	-41.29	2.55	P
6	3.882	-88.7	0.73	7.2	53.82	-41.35	2.55	P
7	4.529	-89	0.85	7.2	55.16	-40.19	2.55	P
8	5.176	-90	0.9	7.6	56.32	-40.38	2.55	P
9	5.823	-90	0.95	6.4	57.35	-38.10	2.55	P
10	6.47	-90	1	6.0	58.26	-36.74	2.55	P

135 DEGREE VIEW

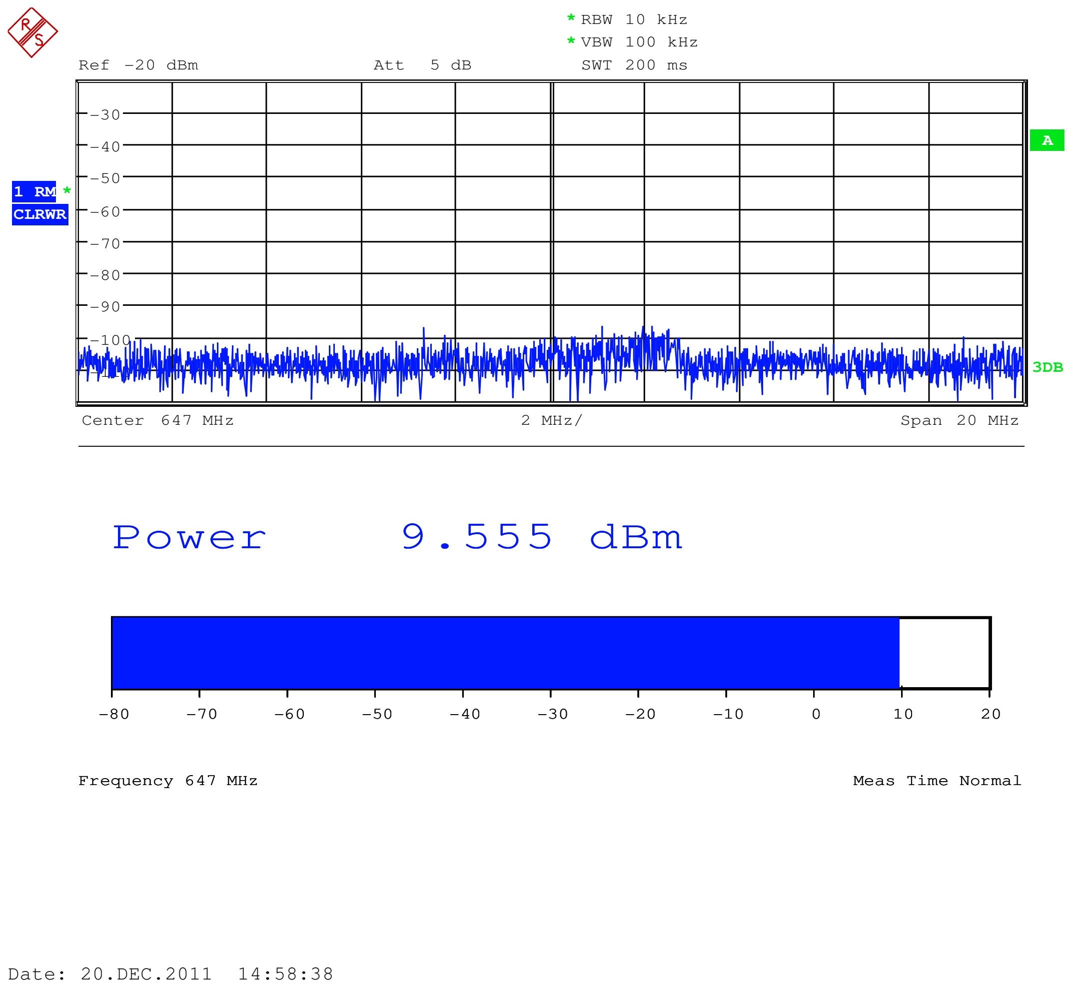
Harmonic	Center Frequency GHz	Signal Level dBm	Cable Loss dB	Antenna Gain dB	Path Loss dB	Adj. Level dBm	Maximum Level dBm	Status
Fundamental	0.647	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	1.294	-70	0.4	6.0	38.26	-34.52	2.55	P
3	1.941	-87	0.6	7.2	44.28	-41.85	2.55	P
4	2.588	-88	0.65	6.5	47.80	-39.85	2.55	P
5	3.235	-88	0.67	5.8	50.30	-41.29	2.55	P
6	3.882	-89	0.73	7.2	52.24	-41.35	2.55	P
7	4.529	-90	0.85	7.2	53.82	-40.19	2.55	P
8	5.176	-90	0.9	7.2	55.16	-40.38	2.55	P
9	5.823	-90	0.95	7.6	56.32	-38.10	2.55	P
10	6.47	-90	1	6.4	57.35	-36.74	2.55	P

225 DEGREE VIEW

Harmonic	Center Frequency GHz	Signal Level dBm	Cable Loss dB	Antenna Gain dB	Path Loss dB	Adj. Level dBm	Maximum Level dBm	Status
Fundamental	0.647	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	1.294	-75	0.4	6.0	38.26	-32.52	2.55	P
3	1.941	-86	0.6	7.2	44.28	-45.05	2.55	P
4	2.588	-88	0.65	6.5	47.80	-42.85	2.55	P
5	3.235	-88	0.67	5.8	50.30	-42.29	2.55	P
6	3.882	-90	0.73	7.2	52.24	-41.65	2.55	P
7	4.529	-90	0.85	7.2	53.82	-41.19	2.55	P
8	5.176	-90	0.9	7.2	55.16	-40.38	2.55	P
9	5.823	-90	0.95	7.6	56.32	-38.10	2.55	P
10	6.47	-90	1	6.4	57.35	-36.74	2.55	P

Low Power Operation---900 Watts

For operation at power levels below 1800 watts, power output and emission mask compliance data was 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 900 watts. The power was read on the R & S FSU-26 spectrum analyzer after measurement with the R & S NRP-Z51 power sensor. The indicated reading is shown below.



Calculation of Output Power: An offset of 50dB from the directional coupler, added to the displayed power of 9.55 dBm, equals the measured power of 59.55 dBm. The measured linear power value is 900 Watts. With this operating state, measured transmitter final amplifier voltage is 31.8 VDC and final amplifier current is 149.4 Amps.

Emission Mask Compliance   900 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 and for frequencies above 3 GHz, the R & S FSU26 was used. The transmitter was tested for compliance with the 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 900 watts on Channel 43 (center frequency of 647 MHz) as determined by the directional coupler and a reference was established on the spectrum analyzer (using the channel power measurement mode). The same bandstop filter used in the first set of measurements at 1800 watts was also used for this set of measurements at 900 watts.

The noise floor of the spectrum analyzer was found and from that the minimum RF sample level was determined (assuming the transmitter exactly met the emission mask requirements identified in the FCC rules). The actual RF sample level was well above the required minimum RF sample so plenty of margin was available with the test configuration used.

The transmitter was optimized for linearity. The 6 MHz DTV channel power was first measured for the channel 43 signal. Then the twelve 500 kHz segments on both sides of the channel 43 signal were measured. The closest four 500 kHz segments on either side of the Channel 43 signal were measured without the use of the bandstop filter because those signals were above the noise floor with the spectrum analyzer with the existing attenuator setting. The bandstop filter was inserted in the path according to the set-up in Figure 1. The spectrum analyzer attenuator was reduced to the minimum without overloading the spectrum analyzer. The remaining 500 kHz segments on each side of channel 43 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 noise floor first and then for the bandstop filter insertion loss. The transmitter emissions met the requirements as indicated by comparison with the FCC Emission Mask from FCC Rule 74.794 (a) (2) (ii) as shown on the following page.

ATSC TRANSMITTER
TEST REPORT 900 W

Spectrum Analyzer 10kHz RBW Noise Floor [dBm]	-114.0
Spectrum Analyzer 500kHz RBW Noise Floor [dBm]	-97.0
Noise floor proximity upper threshold [dBm]	-87.0
Noise floor proximity lower threshold [dBm]	-94.0

Min. Sample Level [dBm]	-20.8

ATSC TRANSMISSION MASK COMPLIANCE TEST
Stringent Mask

Channel Power [dBm]	7.1
Channel Number	43
Center Frequency [MHz]	647

Delta Frequency [MHz]	Frequency [MHz]	Measured Amplitude [dBm]	Corrected for Noise Floor [dBm]	Bandstop Filter (dB)	Corrected Amplitude [dBm]	Amplitude below Channel Power [dB]	FCC Limit [dB]	Pass/Fail
3.25	650.25	-44.5	-44.5		-44.5	51.6	47.0	**Pass**
3.75	650.75	-49.3	-49.3		-49.3	56.4	49.9	**Pass**
4.25	651.25	-56.5	-56.5		-56.5	63.6	55.6	**Pass**
4.75	651.75	-62.2	-62.2		-62.2	69.3	61.4	**Pass**
5.25	652.25	-75.0	-75.0	1.0	-74.0	81.1	67.1	**Pass**
5.75	652.75	-81.9	-81.9	1.0	-80.9	88.0	71.9	**Pass**
6.25	653.25	-88.5	-89.2	0.8	-88.4	95.5	76.0	**Pass**
6.75	653.75	-93.5	-96.1	0.8	-95.3	102.4	76.0	**Pass**
7.25	654.25	-95.9	-97.0	0.7	-96.3	103.4	76.0	**Pass**

7.75	654.75	-96.5	-97.0	0.7	-96.3	103.4	76.0	**Pass**
8.25	655.25	-96.8	-97.0	0.7	-96.3	103.4	76.0	**Pass**
8.75	655.75	-97.0	-97.0	0.7	-96.3	103.4	76.0	**Pass**
-3.25	643.75	-44.0	-44.0		-44.0	51.1	47.0	**Pass**
-3.75	643.25	-49.1	-49.1		-49.1	56.2	49.9	**Pass**
-4.25	642.75	-55.9	-55.9		-55.9	63.0	55.6	**Pass**
-4.75	642.25	-60.8	-60.8		-60.8	67.9	61.4	**Pass**
-5.25	641.75	-76.5	-76.5	2.4	-74.1	81.2	67.1	**Pass**
-5.75	641.25	-82.3	-82.3	1.7	-80.6	87.7	71.9	**Pass**
-6.25	640.75	-87.2	-87.7	1.4	-86.3	93.4	76.0	**Pass**
-6.75	640.25	-90.7	-91.9	1.3	-90.6	97.7	76.0	**Pass**
-7.25	639.75	-93.3	-95.7	1.2	-94.5	101.6	76.0	**Pass**
-7.75	639.25	-95.0	-97.0	1.2	-95.8	102.9	76.0	**Pass**
-8.25	638.75	-96.0	-97.0	1.2	-95.8	102.9	76.0	**Pass**
-8.75	638.25	-96.2	-97.0	1.2	-95.8	102.9	76.0	**Pass**

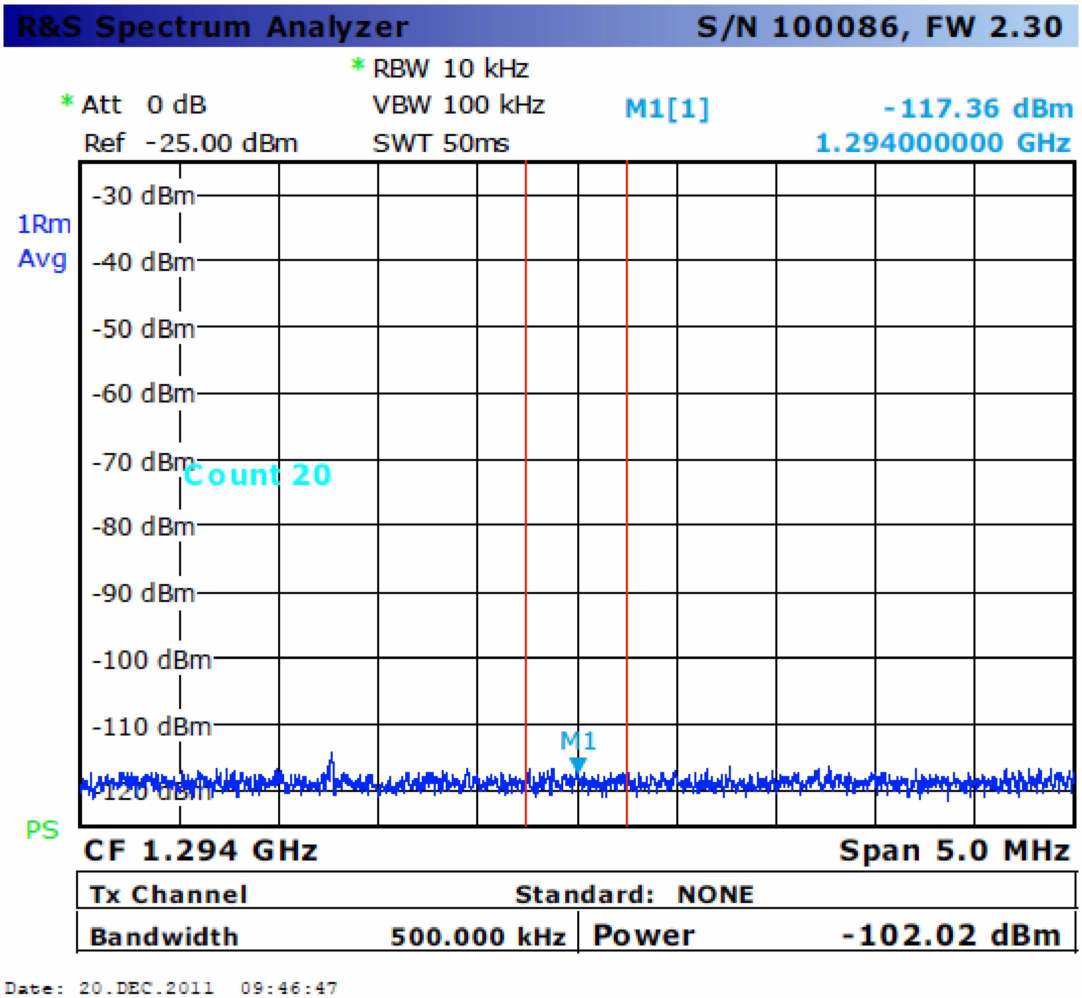
The next set of tests provides measurements of conducted radiation harmonic and spurious energy. The frequency spectrum up to the 10th harmonic was investigated for harmonic and spurious energy. The test setup of Figure 1 was used with the RF sample feeding the high pass filter and then the spectrum analyzer. Directional coupler #2 coupling values were estimated using coupling values supplied by the manufacturer. The measurements up to 3 GHz were taken from connection to the R & S ETL and for frequencies above 3 GHz, all measurements were recorded using the R & S FSU26. A high pass filter was used to permit the spectrum analyzer attenuation to be minimized without the spectrum analyzer being overloaded from the channel 43 signal. The only energy coming from the transmitter was found to be harmonics. Channel power measurements using a 500 kHz bandwidth were taken at harmonics up to the 10th and the level of the energy was recorded on the spreadsheet following on the next page. The measured values were converted back to an equivalent power at the transmitter output using the directional coupler factor and compared with the total power of the channel 43 power. Screen shots of the harmonic energy at the worst case conditions (2nd and 3rd harmonics) were taken and are provided on the pages following the spreadsheet. As can be seen from the measurements, all measured values are in compliance with the appropriate FCC rule.

ATSC TRANSMISSION MASK COMPLIANCE TEST

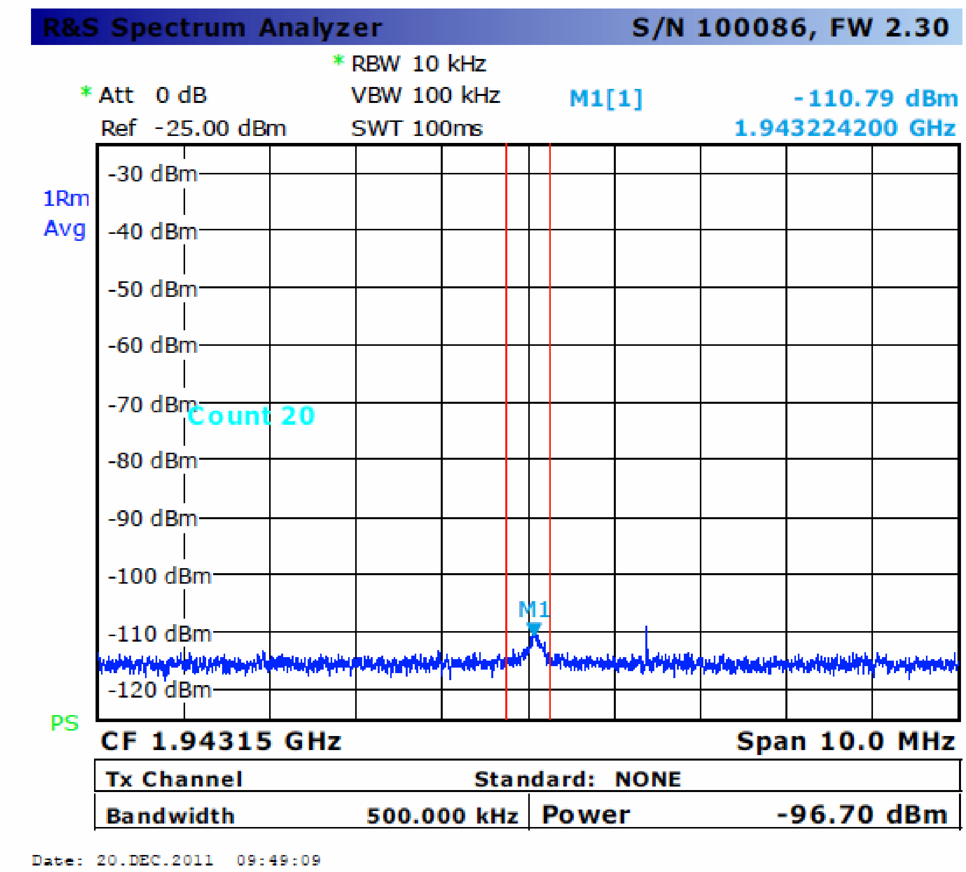
HARMONICS

Channel Power [dBm]	59.5
Channel Number	43
Center Frequency [MHz]	647

Harmonic	Frequency [MHz]	Measured Amplitude [dBm]	COUPLING	Corrected Amplitude [dBm]	Amplitude below Channel Power[dB]	FCC Limit [dB]	Pass/Fail
2nd	1294	-102.0	44.0	-58.0	117.6	76.0	**Pass**
3rd	1941	-96.7	40.5	-56.2	115.8	76.0	**Pass**
4th	2588	-99.0	38.0	-61.0	120.6	76.0	**Pass**
5th	3235	-93.9	36.0	-57.9	117.5	76.0	**Pass**
6th	3882	-95.2	34.4	-60.8	120.4	76.0	**Pass**
7th	4529	-95.4	33.1	-62.3	121.9	76.0	**Pass**
8th	5176	-96.0	31.9	-64.1	123.7	76.0	**Pass**
9th	5823	-95.6	30.9	-64.7	124.3	76.0	**Pass**
10th	6470	-96.1	30.0	-66.1	125.7	76.0	**Pass**



Worst case Harmonic Energy at 2nd Harmonic



Worst case Harmonic Energy at 3rd Harmonic

Test Equipment List

The following test equipment was used in the various test equipment configurations or to create calibration of equipment at various frequencies. All equipment was within its calibration period.

VENDOR	MODEL NUMBER	DESCRIPTION	SERIAL NUMBER
Rohde & Schwarz	FSU26	Spectrum Analyzer	1313.9000.26
Mini-Circuits	NHP-1000	Hi Pass Filter	15542
Microwave Filter Company	R16560-43	DTV Bandstop Filter	N/A
Rohde & Schwarz	NRP-Z51	Power Sensor	1138.0005.02
Bird Electronics	8892-300	2500 Watt Dummy Load	N/A
Rohde & Schwarz	ETL	TV Test Receiver/Spectrum Analyzer	100086
AH Systems	SAS-510-7	Log Periodic Antenna	N/A