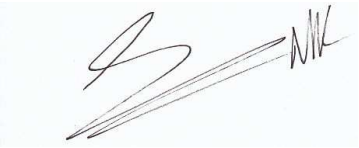
TXUD-1000 TEST REPORT

Prepared by: Mohammad Kashi , Test Technician



Reviewed by: Aaron Sivacoe, P.ENG

Date: Apr 14, 2011

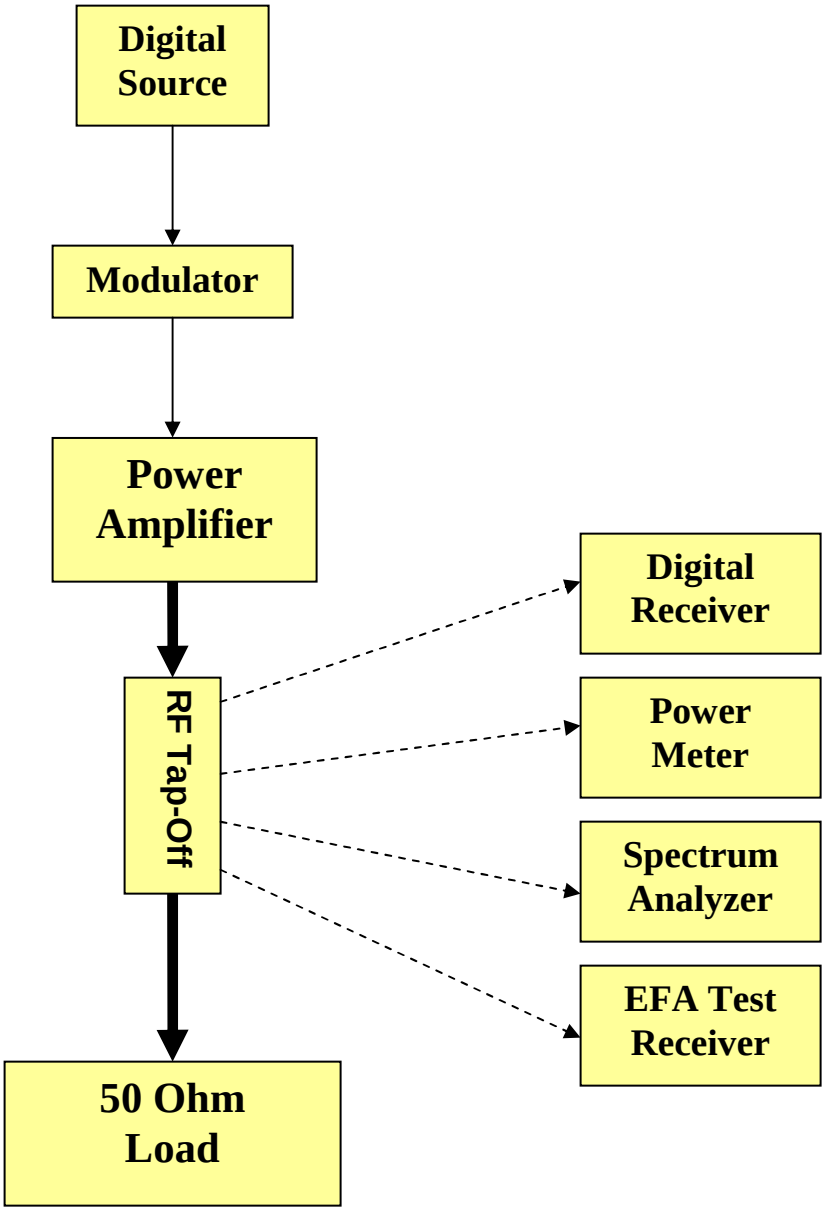
Contents

Test Equipments

Equipment	Manufacturer	Model Number	Serial Number
Spectrum Analyzer	Advantest	R3162	110301419
TV Test Receiver	Rohde & Schwarz	EFA-53	100209
Network Analyzer	Agilent	8753ET	US39170436
Digital Power Meter	Bird	5000-EX	4593
Power Sensor	Bird	5011	0746
Clamp on meter	Extech Instruments	MA220	05144301
Antenna	Aaronia	Hyperlog 4060	04275
RF Load (600W)	Bird	8402	1595
RF Signal Sampler	Bird	4275	-
RF Signal Sampler	Coaxial Dynamics	7992	-
High Pass Filter	Mini-Circuits	NHP-900+	V8718600825
High Pass Filter	Mini-Circuits	VHF-2700A+	30823
Attenuator	Mini-Circuits	HAT-10	-

Test Setup

Block Diagram



OUTPUT POWER MEASUREMENT

ATSC Standard A/64, Rev. A Section 4.1.5 - The lower allowed power value should be 95% of authorized power and the upper allowed value should be 105% of authorized power.

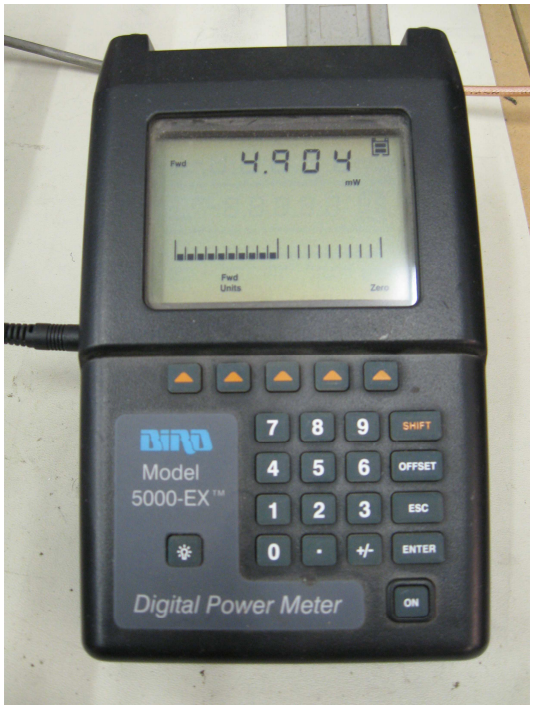
Procedure: Power was measured using a precision Digital Power Meter through a directional coupler. The Power Meter was calibrated to take into account the loss of the cable used and the coupling factor.

Measurement:

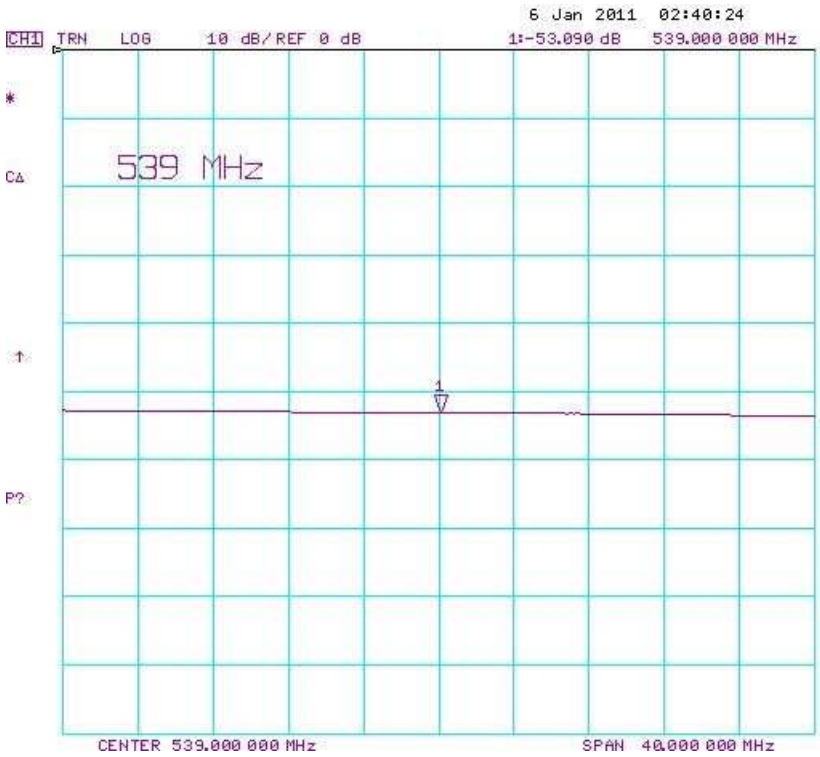
Rated Output Power = 1000 Watts

	95%	100%	105%
Measured Power	950 Watts	1000 Watts	1050 Watts

Exhibit of Output Power:

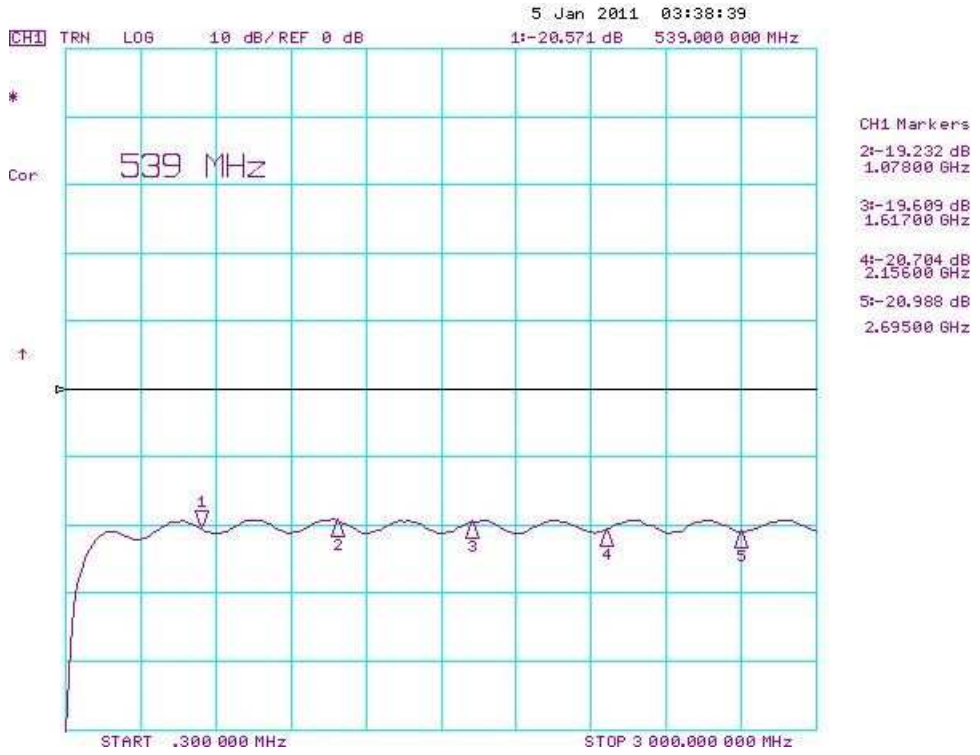


Power Meter

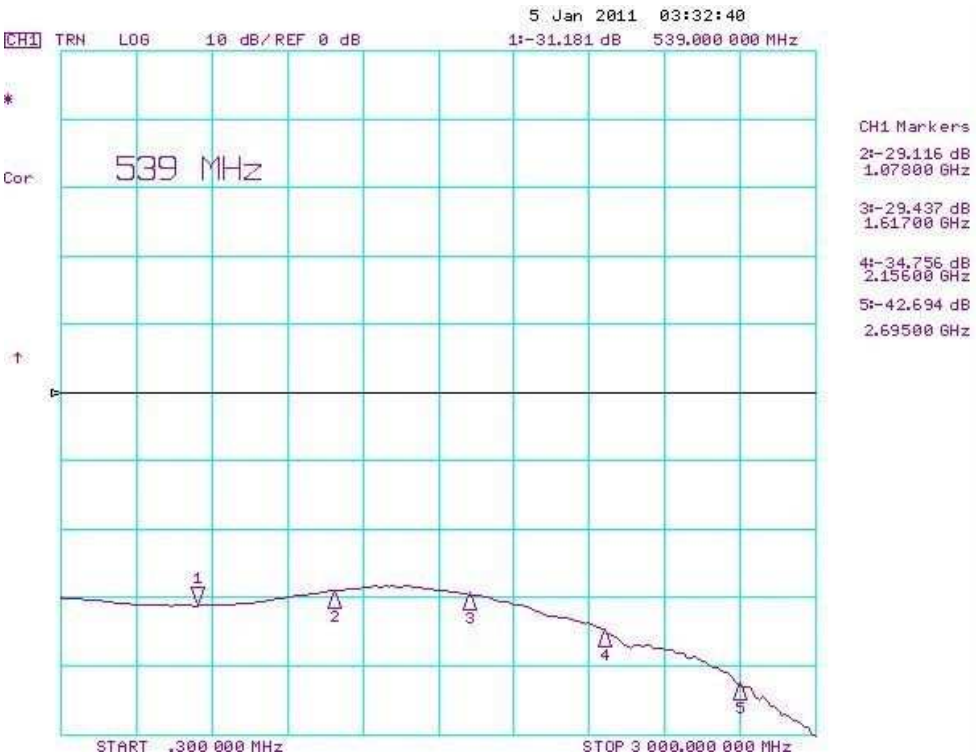


Total Loss (40MHz span)
Output Cables+Attenuation+Signal Sampler

Total Loss (Wide span)
Output Cables+Attenuation+Signal Sampler



Signal Sampler Coupling Factor



30dB Attenuation

Calculations:

For the Output Power
a) Total loss including: output cable,
30dB Attenuation
and signal sampler = 53.090 dB.

b) Measured Output Power = 4.904 mW.

1. Total Loss of the transmission line = Output Cable Loss + Attenuation +Signal Sampler Coupling Factor

Total Loss = 53.090 dB

2. Total Loss = 10 log ($Power_{actual}$ /$Power_{measured}$)

53.090 dB = 10 log ($Power_{actual}$ /0.004904W)

Inv log 5.3090 = $Power_{actual}$ /0.004904W

203704.20 (0.004904W) = $Power_{actual}$

$Power_{actual}$ = Output Power = 998.96W

FREQUENCY OFFSET

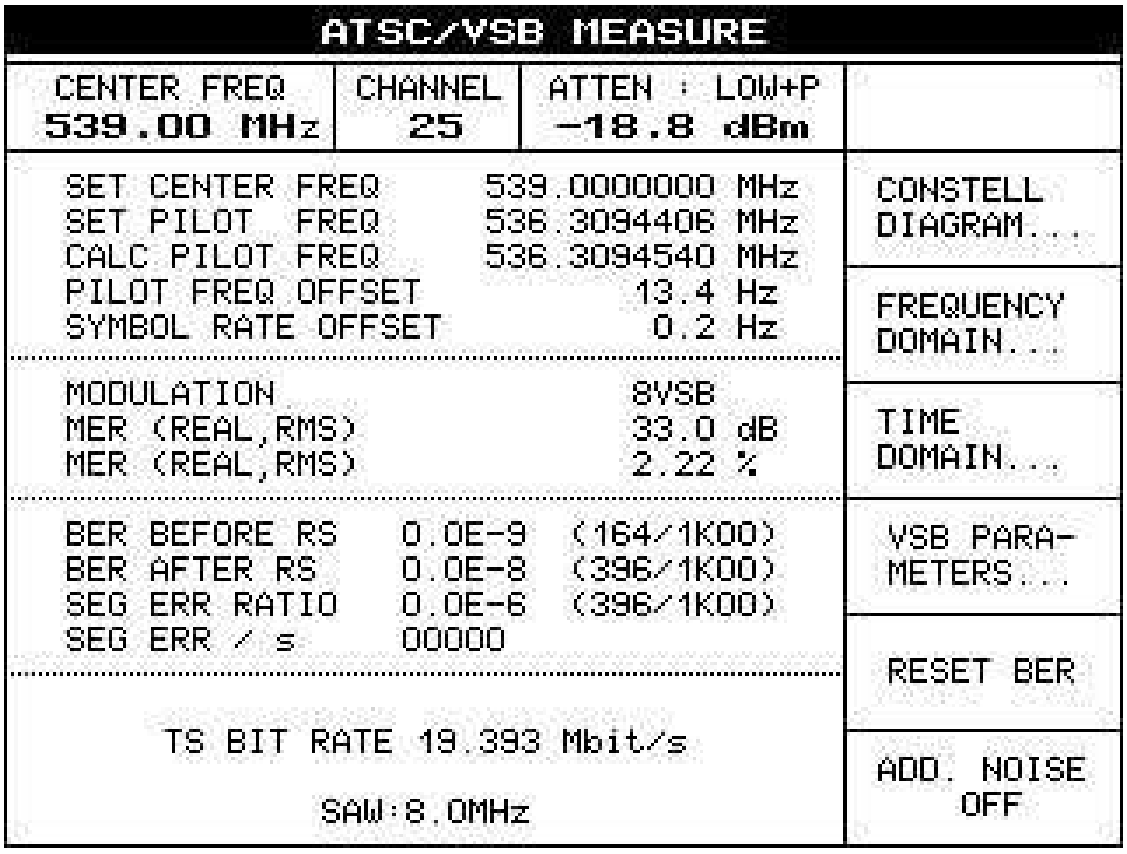
ATSC Standard A/64, Rev. A Section 4.1.6 - The 8-VSB pilot should be 309.441 kHz (± 1 kHz) above the lower edge of the channel assigned to the DTV transmitter.

Procedure: The pilot frequency was measured by taking a sample from a directional coupler to a TV Analyzer. The offset in the pilot frequency was displayed on the Analyzer screen automatically.

Measurement:

Pilot Frequency (Ideal) = 536.3094406 MHz
Pilot Frequency (Actual) = 536.3094540 MHz
Pilot Frequency Offset = +13.4 Hz

Exhibit of Pilot Frequency Offset:



FREQUENCY STABILITY

ATSC Standard A/64, Rev. A Section 4.1.6 / FCC 47CFR§2.1055 - The output frequency must not exceed +/- 10 KHz from the designated frequency for the pilot.

Procedure: The pilot frequency was measured by taking a sample from a directional coupler to a TV Analyzer. Using a "Variac", the pilot frequency was measured at 85%, 100%, and 115% of the nominal line. In addition, the temperature was varied from 0℃ to 50℃ and the pilo t frequency was measured at 10 degree increments.

Measurement:

Modulator Line Voltage		Measured Pilot Frequency (MHz)
Volts (V)	Percentage (%)	
104	85	536.3095345
120 (nominal)	100	536.3094540
140	115	536.3095986

Temperature (℃)	P.A. Measured Pilot Frequency (MHz)
0	536.3094393
10	536.3094411
20	536.3094540
30	536.3094555
40	536.3094997
50	536.3095435

Summary:
Reference pilot frequency (20℃, 120VAC) : 536.3094 540 MHz

Pilot Frequency Deviation with respect to Line Voltage Range: 64.1 Hz

Pilot Frequency Deviation with respect to Temperature Range: 104.2 Hz

OUT-OF-BAND EMISSION

SIMPLE MASK

FCC 47CFR§74.794(a)(2)(i)

a) In the range between ½ the width of the Resolution Bandwidth filter used and 500 KHz from the Band Edge:

Emissions ≤ -46 dB

b) More than 6 MHz from the Band Edge:

Emissions ≤ -71 dB

c) At any frequency between 500 KHz and 6 MHz from the Band Edge:

Emissions ≤ $-[46+(|\Delta F|^2/1.44)]$ dB

where: ΔF is the frequency difference, in MHz, from the edge of the transmitter's Frequency Band

Procedure:

a) The emission at 500 KHz from the band edge was measured by taking a sample from a directional coupler to a TV Analyzer. The upper and lower shoulder attenuation was displayed on the Analyzer screen automatically.
b) The harmonic emissions were measured using the spectrum analyzer's channel power measurement capabilities. The difference between the total average power of the 6 MHz band and the channel power of each of the harmonics up to 8 GHz (spectrum analyzer's limitation) including all the *corrections** determines if the emissions are within the limits of the 8-VSB Mask. The same measurement applied to spurious emissions but only those of visible amplitude with respect to noise floor were measured (where noise floor ≤ required).
c) The emissions between 500 KHz and 6 MHz from the band edge were measured using the spectrum analyzer's channel power measurement capabilities. The difference between the total average power of the 6 MHz band and the channel power of each of the 24 500 KHz sub-band

(6 MHz from upper and lower band edge into 500 KHz segments) including all the *corrections** determines if the emissions are within the limits of the 8-VSB Mask.

Note: **Corrections* are calculations to offset the external attenuators used before the input of the spectrum analyzer, the noise amplitude of the spectrum analyzer, the coupling factor of the signal sampler used, and the losses introduced with the insertion of a Band-Stop filter (when necessary) and/or a high pass filter.

Measurements:

a) Lower Shoulder = -50.63 dB
Upper Shoulder = -50.97 dB

b) Spurious Emissions (up to 8 GHz) ≤ -76.77 dB

Harmonic Emissions (up to 8 GHz) ≤ -76.77 dB

Harmonic	Frequency (GHz)	Measured Value (dBm)	Corrected* Value (dBm)	Total Channel Power (dBm)	Harmonic Emission (dB)	
					Limit	Result
2	1.078	-81.04	-82.31	4.61	-71	-86.92
3	1.617	-82.89	-84.69	4.61	-71	-89.30
4	2.156	-78.87	-72.41	4.61	-71	-77.02
5	2.695	-84.89	-72.16	4.61	-71	-76.77
6	3.234	-85.26	-88.19	4.61	-71	-92.80
7	3.773	-87.01	-88.19	4.61	-71	-92.80
8	4.312	-85.87	-88.19	4.61	-71	-92.80
9	4.851	-86.07	-88.19	4.61	-71	-92.80
10	5.390	-85.22	-88.19	4.61	-71	-92.80

Note: **Corrections* are calculations to offset the external attenuators used before the input of the spectrum analyzer, the noise amplitude of the spectrum analyzer, the coupling factor of the signal sampler used, and the losses introduced with the insertion of a Band-Stop filter (when necessary) and/or a high pass filter.

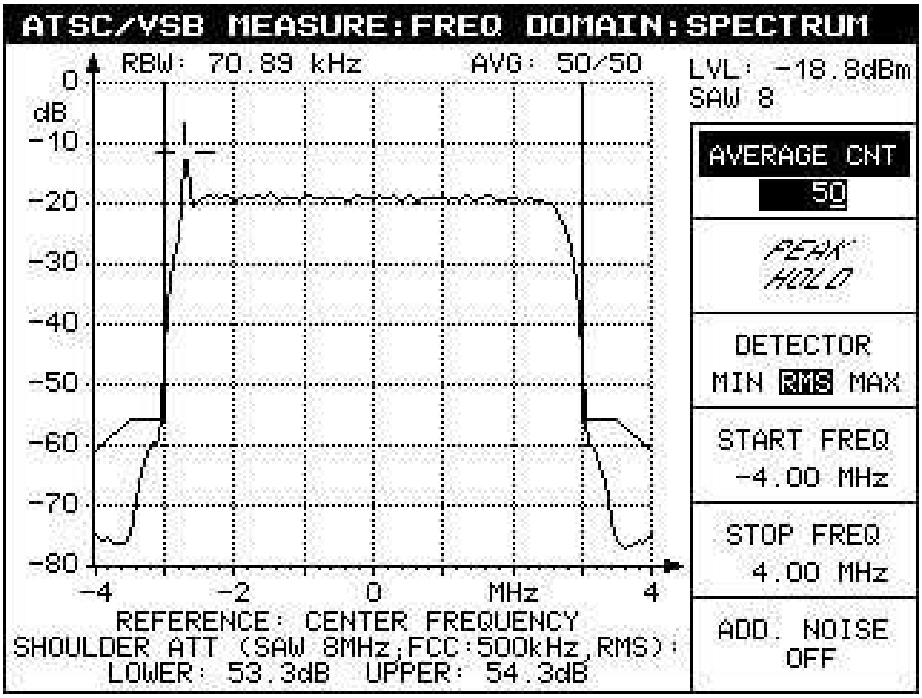
c) Lower adjacent Channel Measurements

Sub-band	Frequency (MHz)	Measured Value (dBm)	Noise Corrected (dBm)	Channel Power (dBm)	Emission Mask (dB)	
					Limit	Result
1	535.75	-51.02	-46.02	4.61	-46.0	-50.63
2	535.25	-68.67	-63.67	4.61	-46.4	-68.28
3	534.75	-66.84	-61.84	4.61	-47.1	-66.45
4	534.25	-69.13	-64.13	4.61	-48.1	-68.74
5	533.75	-71.64	-66.64	4.61	-49.5	-71.25
6	533.25	-73.20	-68.20	4.61	-51.3	-72.81
7	532.75	-73.94	-68.94	4.61	-53.3	-73.56
8	532.25	-74.17	-69.17	4.61	-55.8	-73.78
9	531.75	-74.32	-69.32	4.61	-58.5	-73.93
10	531.25	-74.34	-69.34	4.61	-61.7	-73.95
11	530.75	-74.35	-69.35	4.61	-65.9	-73.96
12	530.25	-74.34	-69.34	4.61	-69.0	-73.95

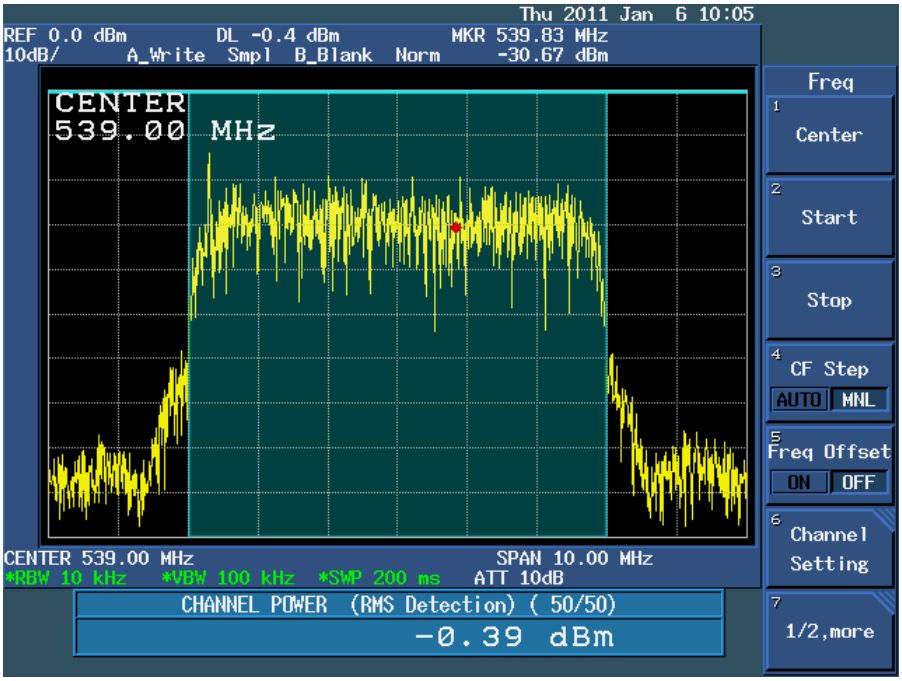
d) Upper adjacent Channel Measurements

Sub-band	Frequency (MHz)	Measured Value (dBm)	Noise Corrected (dBm)	Channel Power (dBm)	Emission Mask (dB)	
					Limit	Result
1	542.25	-51.36	-46.36	4.61	-46.0	-50.97
2	542.75	-67.94	-62.94	4.61	-46.4	-67.55
3	543.25	-66.11	-61.11	4.61	-47.1	-65.72
4	543.75	-68.08	-63.08	4.61	-48.1	-67.69
5	544.25	-70.44	-65.44	4.61	-49.5	-70.05
6	544.75	-72.26	-67.26	4.61	-51.3	-71.87
7	545.25	-73.29	-68.29	4.61	-53.3	-72.90
8	545.75	-73.97	-68.97	4.61	-55.8	-73.58
9	546.25	-74.32	-69.32	4.61	-58.5	-73.93
10	546.75	-74.39	-69.39	4.61	-61.7	-74.00
11	547.25	-74.47	-69.47	4.61	-65.9	-74.08
12	547.75	-74.45	-69.45	4.61	-69.0	-74.06

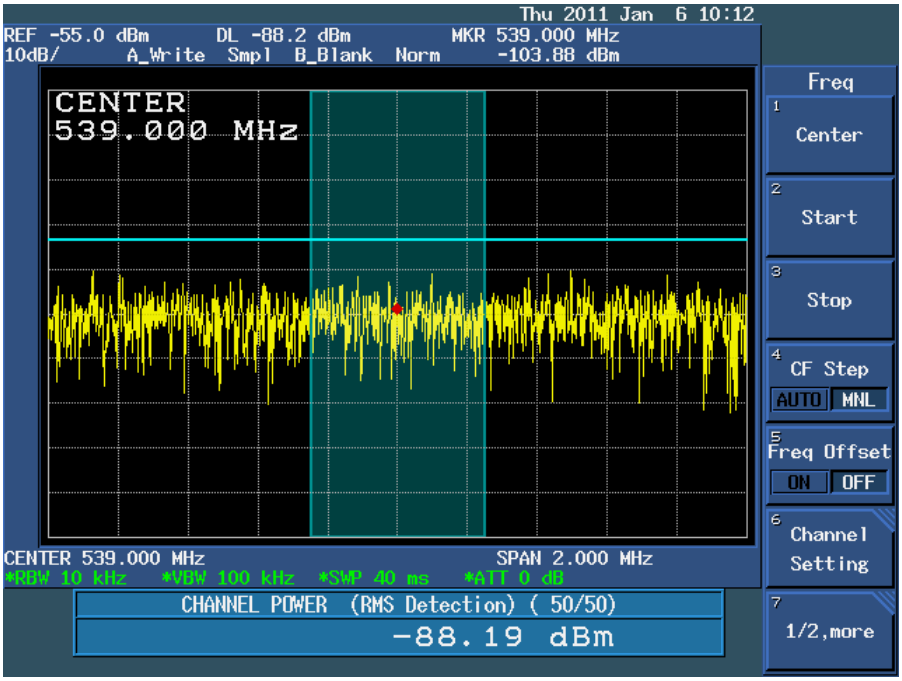
Exhibit of Emission Mask:



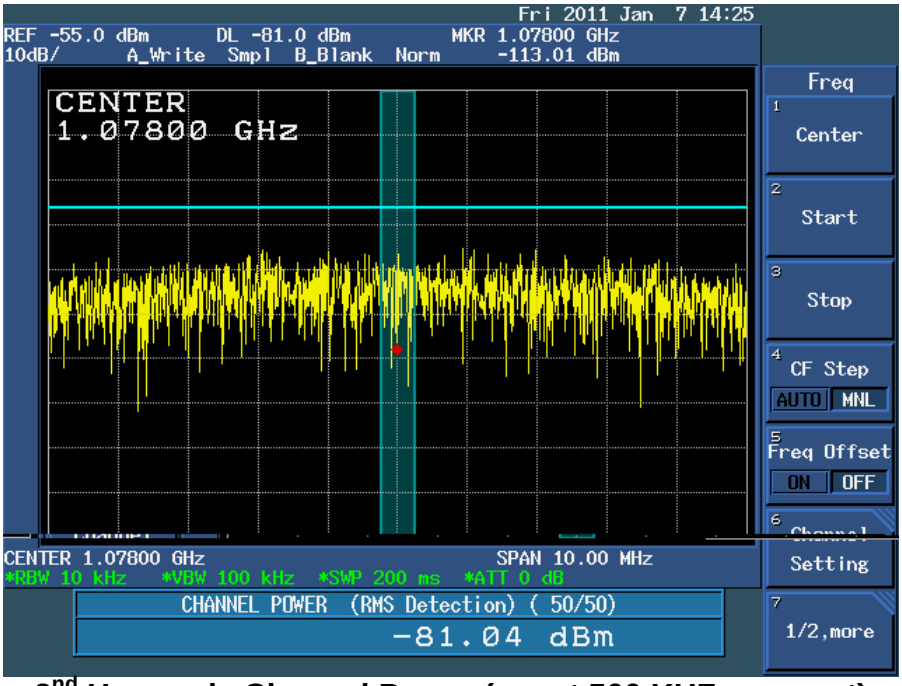
Upper and Lower Shoulder Attenuation



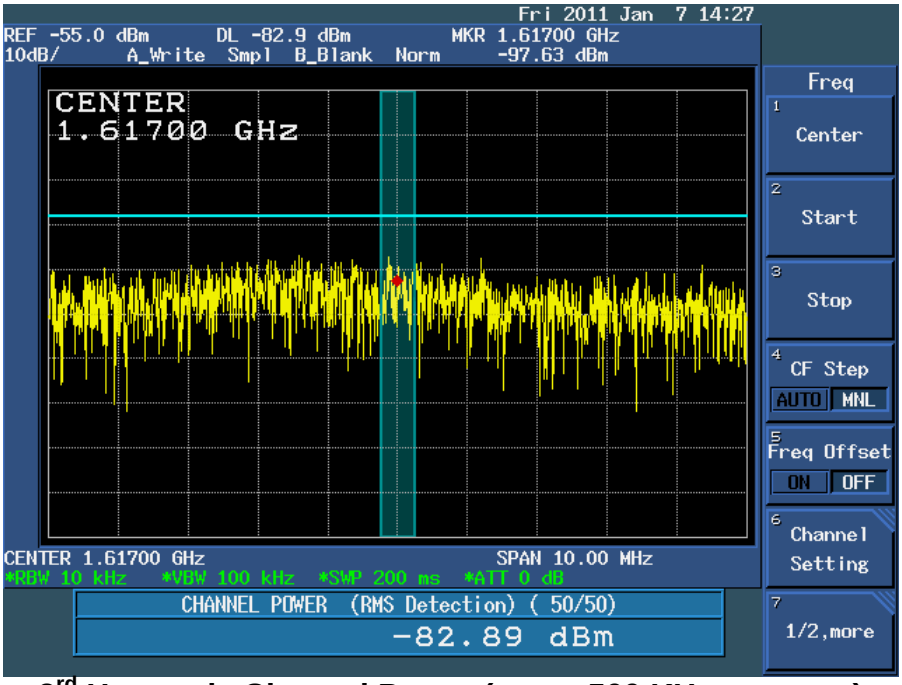
Total Average Channel Power



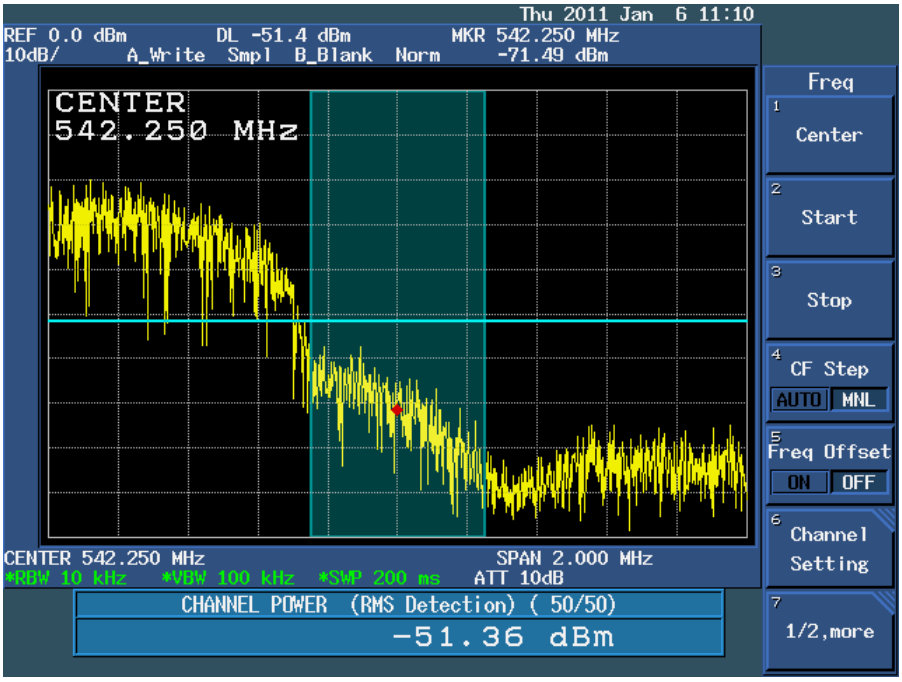
Noise Floor Power (Input Terminated)



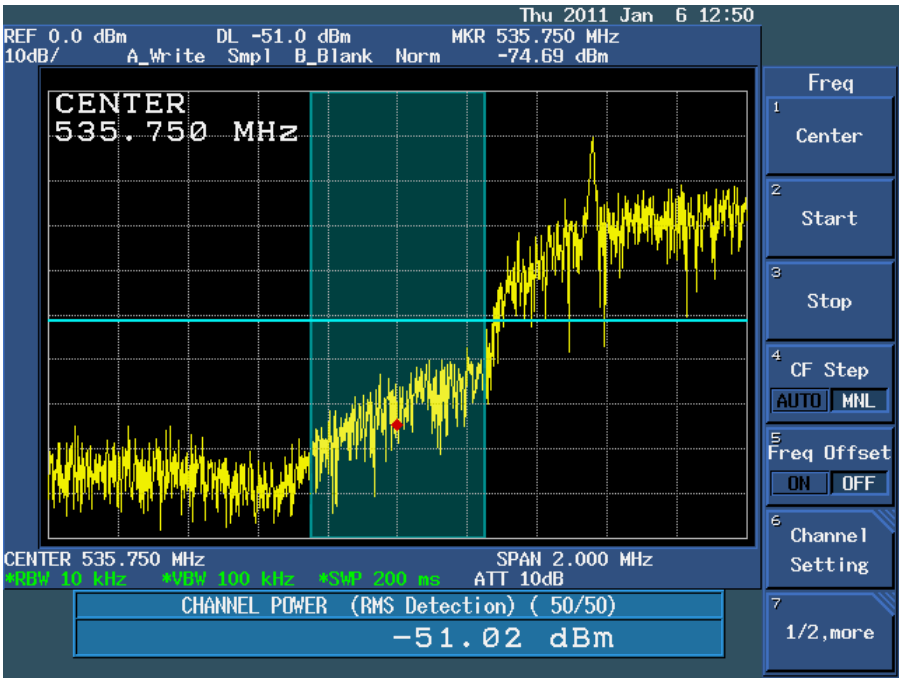
2nd Harmonic Channel Power (worst 500 KHZ segment)



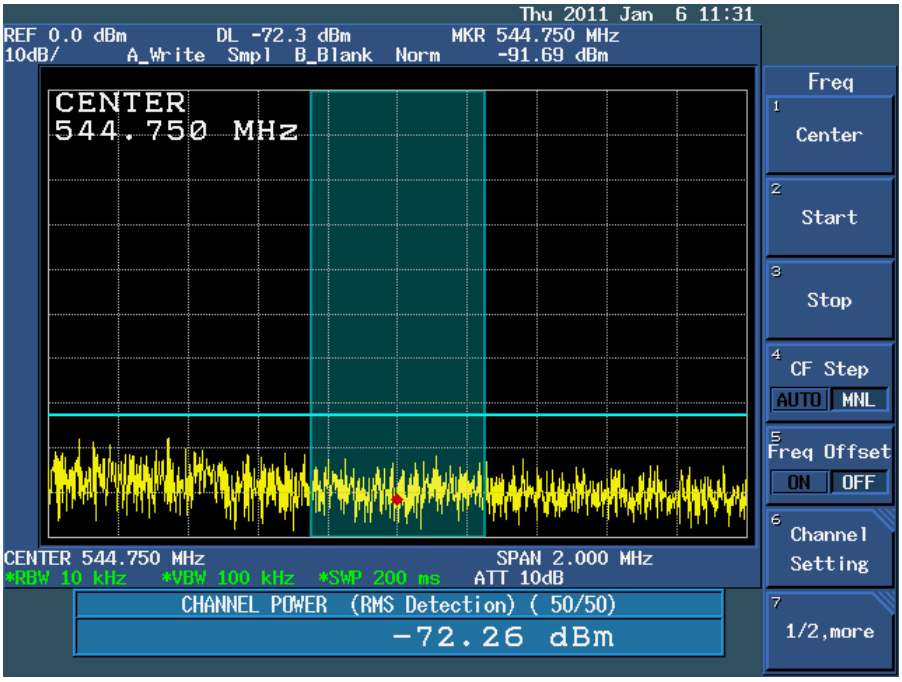
3rd Harmonic Channel Power (worst 500 KHz segment)



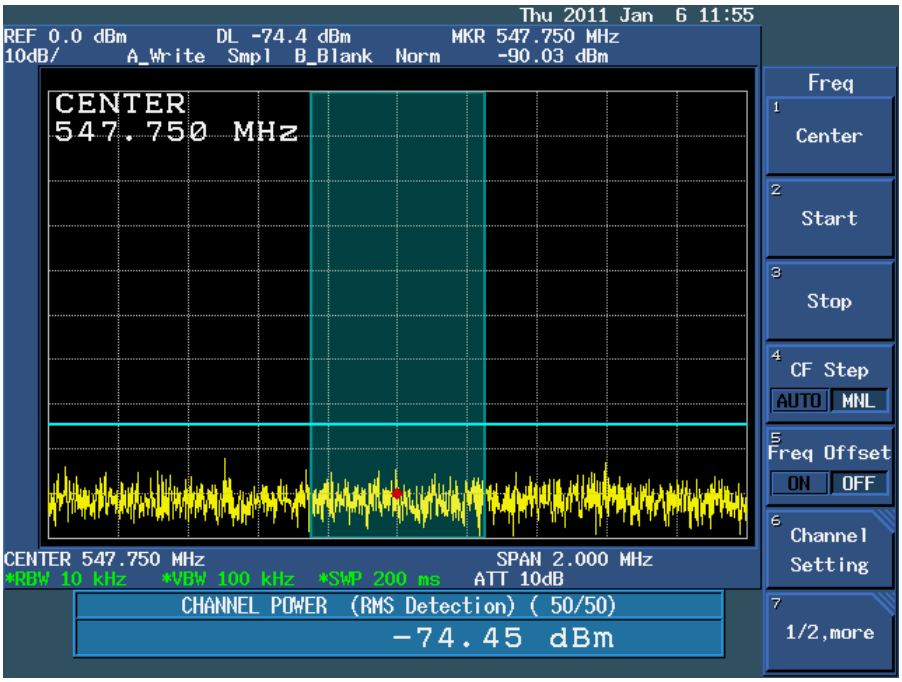
Upper Shoulder Channel Power in a 500 kHZ band (+1 Sub-band)



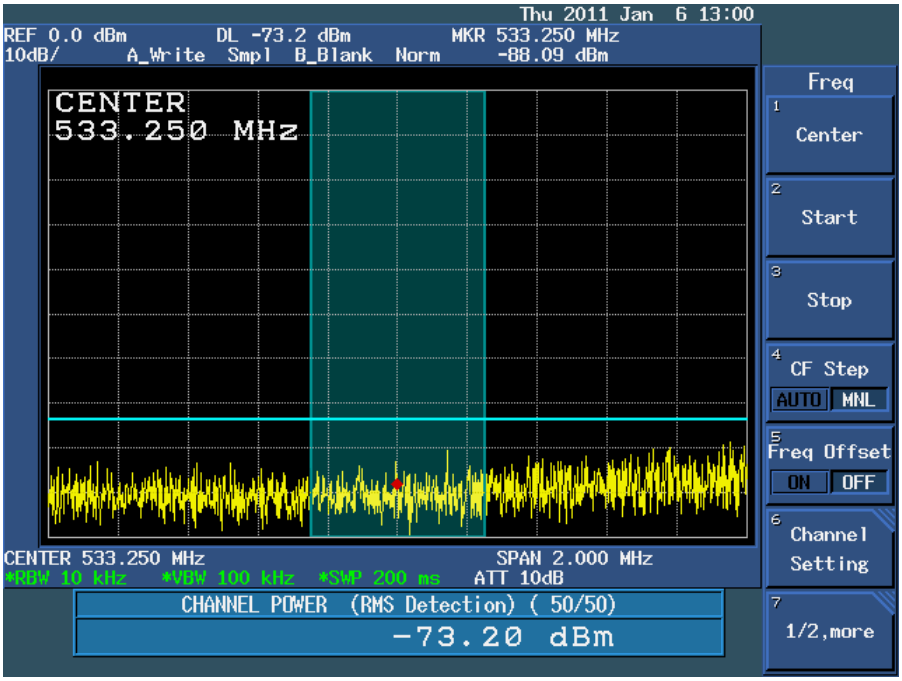
Lower Shoulder Channel Power in a 500 KHz band (-1 Sub-band)



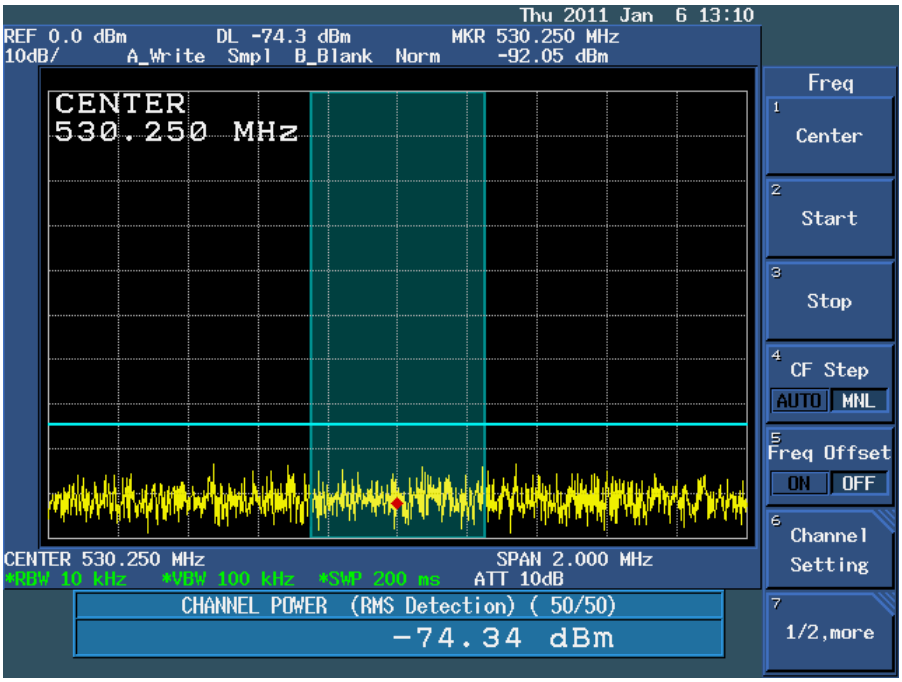
+6MHz Sub-band Channel power



+12MHz Sub-band Channel power



-6MHz Sub-band Channel power



-12MHz Sub-band Channel power

Calculations:

Spurious Emissions: No visible spurious emission.

Harmonic Emissions: Only the 2nd and 3rd Harmonics are shown.

For the 2nd Harmonic
a) High Pass Filter measurement:
Measured loss of the High Pass Filter at the midpoint of the 2nd Harmonic = 0.52 dB.

Coupling Factor measurement:
Fundamental = -53.50 dB.
2nd Harmonic = -52.64 dB.

b) Measurement: without the High Pass Filter:
External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 5 dB.
Measured channel power of the 6 MHz band = -0.39 dBm.

c) Measurement with the High Pass Filter in the signal sample path:
External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 0 dB.
Equipment noise floor power in a 500 KHZ band (Input Terminated) = -88.19 dBm.
Measured channel power of the 2nd Harmonic = -81.04 dBm.

1. Total Channel Power (6 MHz band) = Measured channel power of the 6 MHz band + External Attenuator

Total Channel Power (6 MHz band) = -0.39 dBm + 5 dB = 4.61 dBm

2. Noise Corrected Amplitude = 10 log ($10^{\text{Measured channel power of the 2nd Harmonic}/10}$ - $10^{\text{Noise Floor Power}/10}$)

Noise Corrected Amplitude = 10 log ($10^{-81.04/10}$-$10^{-88.19/10}$) = -81.97[2] dBm

3. Total Channel Power (2nd Harmonic) = Noise Corrected Amplitude + External Attenuator + High Pass Filter Loss at the 2nd Harmonic + (Coupling Factor of Fundamental – Coupling Factor of 2nd Harmonic)

Total Channel Power (2nd Harmonic) = -81.97 dBm + 0 dB + 0.52 dB + (-53.50 dB - -52.64 dB)

Total Channel Power (2nd Harmonic) = -82.31 dBm

4. Emission at the 2nd Harmonic = Total Channel Power (2nd Harmonic) - Total Channel Power (6 MHz band)

Emission at the 2nd Harmonic = -82.31 dBm – (4.61 dBm)

Emission at the 2nd Harmonic = -86.92 dB

Note: [1]Noise Corrected Amplitude is only applicable if one or more of the signal amplitude measured is within 10 dB of the instruments noise floor. [2]If the measured amplitude is <3 dB above the analyzer's noise floor, it is recommended that the measured value be replaced with the instruments noise floor amplitude.

For the 3rd Harmonic

a) High Pass Filter measurement:

Measured loss of the High Pass Filter at the midpoint of the 3rd Harmonic = 0.46 dB.

Coupling Factor measurement:

Fundamental = -53.50 dB.

3rd Harmonic = -52.76 dB.

b) Measurement: without the High Pass Filter:

External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 5 dB.

Measured channel power of the 6 MHz band = -0.39 dBm.

c) Measurement with the High Pass Filter in the signal sample path:

External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 0 dB.

Equipment noise floor power in a 500 KHZ band (Input Terminated) = -88.19 dBm.

Measured channel power of the 3rd Harmonic = -82.89 dBm.

1. Total Channel Power (6 MHz band) = Measured channel power of the 6 MHz band + External Attenuator

Total Channel Power (6 MHz band) = -0.39 dBm + 5 dB = 4.61 dBm

2. Noise Corrected Amplitude = 10 log ($10^{\text{Measured channel power of the 3rd Harmonic}/10} - 10^{\text{Noise Floor Power}/10}$)

Noise Corrected Amplitude = 10 log ($10^{-82.89/10} - 10^{-88.19/10}$) = -84.41[1] dBm

3. Total Channel Power (3rd Harmonic) = Noise Corrected Amplitude + External Attenuator + High Pass Filter Loss at the 3rd Harmonic + (Coupling Factor of Fundamental – Coupling Factor of 3rd Harmonic)

Total Channel Power (3rd Harmonic) = -84.41 dBm + 0 dB + 0.46 dB + (-53.50 dB - -52.76 dB)

Total Channel Power (3rd Harmonic) = 84.69 dBm

4. Emission at the 3rd Harmonic = Total Channel Power (3rd Harmonic) - Total Channel Power (6 MHz band)

Emission at the 3rd Harmonic = -84.69 dBm – (4.61 dBm)

Emission at the 3rd Harmonic = -89.30 dB

Note: [1]Noise Corrected Amplitude is only applicable if one or more of the signal amplitude measured is within 10 dB of the instruments noise floor. [2]If the measured amplitude is <3 dB above the analyzer's noise floor, it is recommended that the measured value be replaced with the instruments noise floor amplitude.

Adjacent Channel Emissions: Only +/-6MHz and +/-12MHz sub-bands are shown.

For -6MHz Sub-band:
a) Measured channel power of the 6 MHz band = -0.39 dBm.

b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 5 dB.

c) Equipment noise floor power in a 500 KHZ band = -88.19 dBm.

d) Measured channel power of the -6MHz sub-band = -73.20 dBm.

1. Total Channel Power (6 MHz band) = Measured channel power of the 6 MHz band + External Attenuator

Total Channel Power (6 MHz band) = -0.39 dBm + 5 dB = 4.61 dBm

2. Noise Corrected Amplitude = 10 log ($10^{\text{Measured channel power of the +6MHz sub-band/10}}$ - $10^{\text{Noise Floor Power/10}}$)
Correction formula does not apply since it is not within 10dB of noise floor.

Noise Corrected Amplitude = Measured Value= -73.20 dBm

3. Total Channel Power (-6MHz sub-band) = Noise Corrected Amplitude + External Attenuator
Total Channel Power (-6MHz sub-band) = -73.20 dBm + 5 dB = -68.20 dBm

4. Emission at -6MHz sub-band = Total Channel Power (+6MHz sub-band) - Total Channel Power (6 MHz band)

Emission at -6MHz sub-band = -68.20 dBm – (4.61 dBm)

Emission at -6MHz sub-band = -72.81 dB

Note: [1]Noise Corrected Amplitude is only applicable if one or more of the signal amplitude measured is within 10 dB of the instruments noise floor. [2]If the measured amplitude is <3 dB above the analyzer's noise floor, it is recommended that the measured value be replaced with the instruments noise floor amplitude.

For -12MHz Sub-band:

a) Measured channel power of the 6 MHz band = -0.39 dBm.

b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 5 dB.

c) Equipment noise floor power in a 500 KHZ band = -88.19 dBm.

d) Measured channel power of the -12MHz sub-band = -74.34 dBm.

1. Total Channel Power (6 MHz band) = Measured channel power of the 6 MHz band + External Attenuator

Total Channel Power (6 MHz band) = -0.39 dBm + 5 dB = 4.61 dBm

2. Noise Corrected Amplitude = 10 log ($10^{\text{Measured channel power of the +12MHz sub-band/10}}$ - $10^{\text{Noise Floor Power/10}}$)

Correction formula does not apply since it is not within 10dB of noise floor.

Noise Corrected Amplitude = Measured Value = -74.34[1] dBm

3. Total Channel Power (-12MHz sub-band) = Noise Corrected Amplitude + External Attenuator

Total Channel Power (-12MHz sub-band) = -74.34 dBm + 5 dB = -69.34 dBm

4. Emission at -12MHz sub-band = Total Channel Power (-12MHz sub-band) - Total Channel Power (6 MHz band)

Emission at -12MHz sub-band = -69.34 dBm – (4.61 dBm)

Emission at -12MHz sub-band = -73.95 dB

Note: [1]Noise Corrected Amplitude is only applicable if one or more of the signal amplitude measured is within 10 dB of the instruments noise floor. [2]If the measured amplitude is <3 dB above the analyzer's noise floor, it is recommended that the measured value be replaced with the instruments noise floor amplitude.

For +6MHz Sub-band:

a) Measured channel power of the 6 MHz band = -0.39 dBm.

b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 5 dB.

c) Equipment noise floor power in a 500 KHZ band = -88.19 dBm.

d) Measured channel power of the -6 sub-band = -72.26 dBm.

1. Total Channel Power (6 MHz band) = Measured channel power of the 6 MHz band + External Attenuator

Total Channel Power (6 MHz band) = -0.39 dBm + 5 dB = 4.61 dBm

2. Noise Corrected Amplitude = 10 log ($10^{\text{Measured channel power of the +6MHz sub-band}/10}$ - $10^{\text{Noise Floor Power}/10}$)
Correction formula does not apply since it is not within 10dB of noise floor.

Noise Corrected Amplitude = Measured Value = -72.26[1] dBm

3. Total Channel Power (+6MHz sub-band) = Noise Corrected Amplitude + External Attenuator
Total Channel Power (+6MHz sub-band) = -72.26 dBm + 5 dB = -67.26 dBm

4. Emission at +6MHz sub-band = Total Channel Power (-6MHz sub-band) - Total Channel Power (6 MHz band)

Emission at +6MHz sub-band = -67.26 dBm – (4.61 dBm)

Emission at +6MHz sub-band = -71.87 dB

Note: [1]Noise Corrected Amplitude is only applicable if one or more of the signal amplitude measured is within 10 dB of the instruments noise floor. [2]If the measured amplitude is <3 dB above the analyzer's noise floor, it is recommended that the measured value be replaced with the instruments noise floor amplitude.

For +12MHz Sub-band:

a) Measured channel power of the 6 MHz band = -0.39 dBm.

b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 5 dB.

c) Equipment noise floor power in a 500KHZ band = -88.19 dBm.

d) Measured channel power of the +12MHz sub-band = -74.45 dBm.

1. Total Channel Power (6 MHz band) = Measured channel power of the 6 MHz band + External Attenuator

Total Channel Power (6 MHz band) = -0.39 dBm + 5 dB = 4.61 dBm

2. Noise Corrected Amplitude = 10 log ($10^{\text{Measured channel power of the -12MHz sub-band /10}}$ - $10^{\text{Noise Floor Power/10}}$)
Correction formula does not apply since it is not within 10dB of noise floor.

Noise Corrected Amplitude = Measured Value = --74.45[1] dBm

3. Total Channel Power (+12MHz sub-band) = Noise Corrected Amplitude + External Attenuator

Total Channel Power (+12MHz sub-band) = -74.45 dBm + 5 dB = -69..45 dBm

4. Emission at +12MHz sub-band = Total Channel Power (+12MHz sub-band) - Total Channel Power (6 MHz band)

Emission at +12MHz sub-band = -69.45 dBm – (4.61 dBm)

Emission at +12MHz sub-band = -74.06 dB

Note: [1]Noise Corrected Amplitude is only applicable if one or more of the signal amplitude measured is within 10 dB of the instruments noise floor. [2]If the measured amplitude is <3 dB above the analyzer's noise floor, it is recommended that the measured value be replaced with the instruments noise floor amplitude.

RADIO NAVIGATION SATELLITE SERVICES PROTECTION

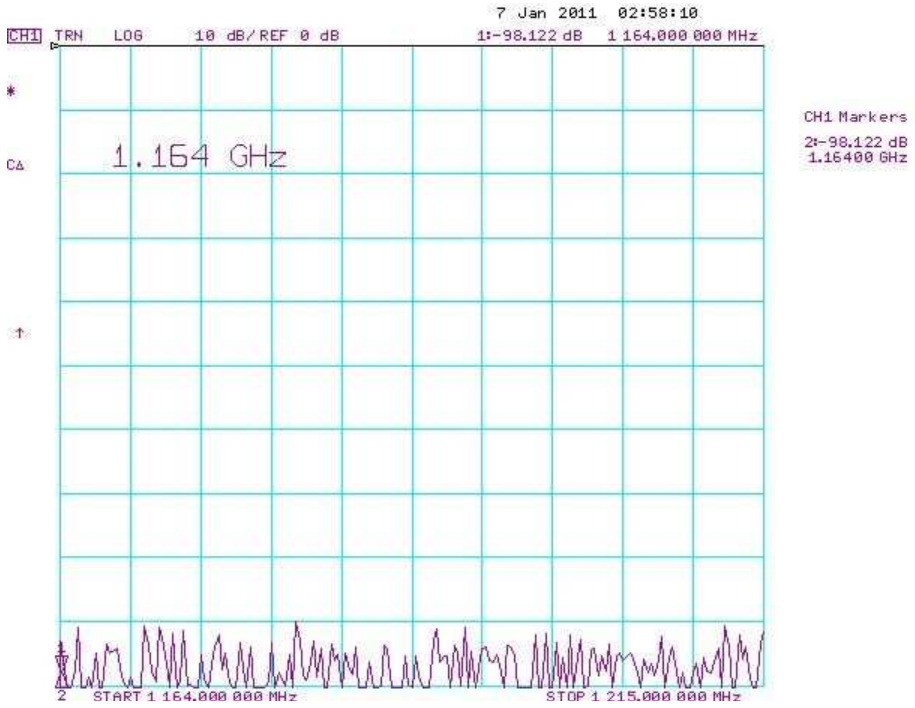
FCC 47CFR§74.794(b) - A transmitter authorized to operate on TV channels 22-24 (518-536 MHz), 32-36 (578-608 MHz), 38 (614-620 MHz), and 65-69 (776-806 MHz) must provide specific “out of band” protection to Radio Navigation Satellite Services (RNSS) in the bands: L5 (1164-1215 MHz); L2 (1215-1240 MHz) and L1 (1559-1610 MHz). The filtering must demonstrate an attenuation of not less than 85 dB in the bands mentioned above.

Procedure: Using the Network Analyzer, a sweep of the spectrum mask filter and the additional low pass filter was performed on the L5, L2 and L1 bands.

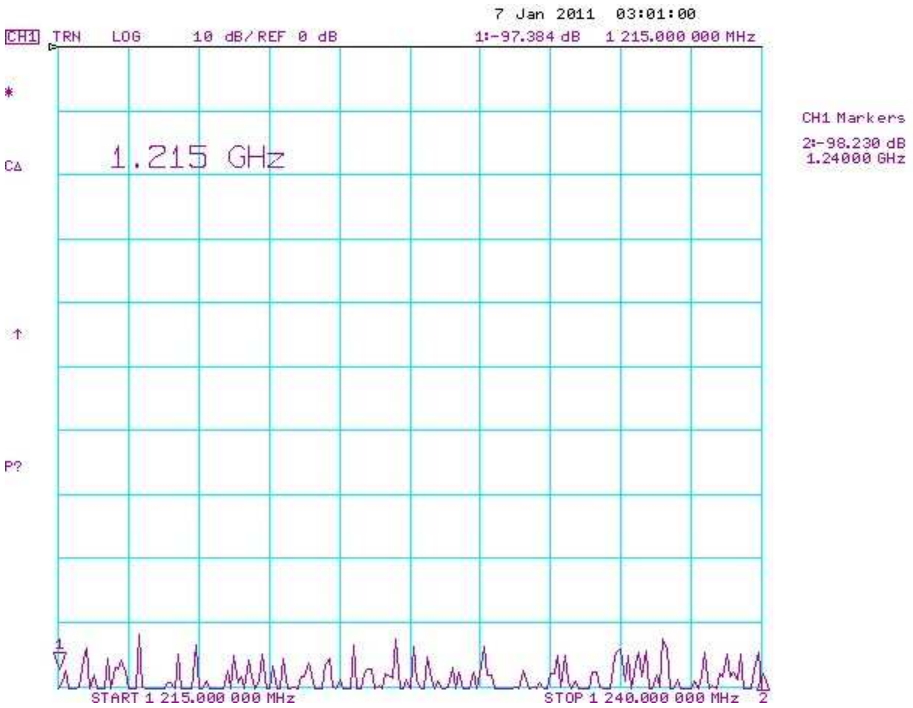
Measurement:

The attenuation on the L5, L2 and L1 bands is __>85__ dB

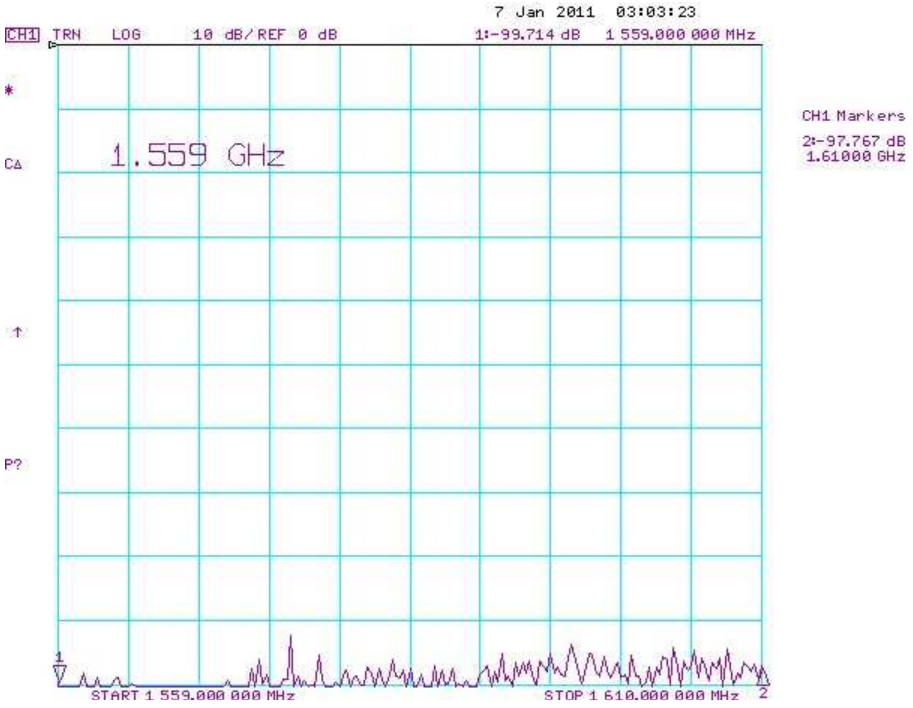
Exhibit of Spectrum Mask Filter Sweep:



L5 band (1164-1215 MHz)

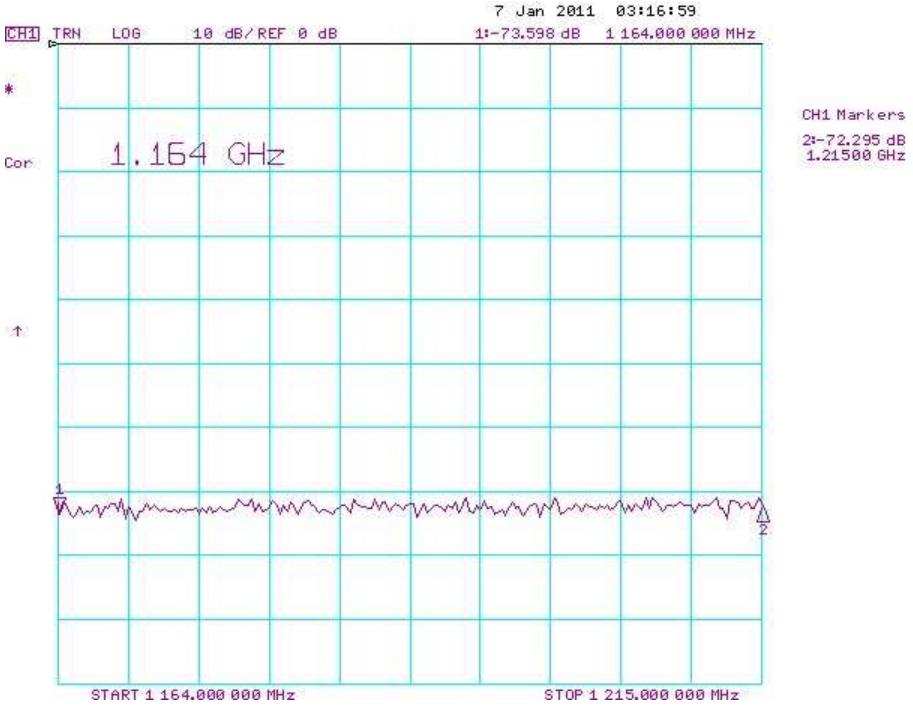


L2 band (1215-1240 MHz)

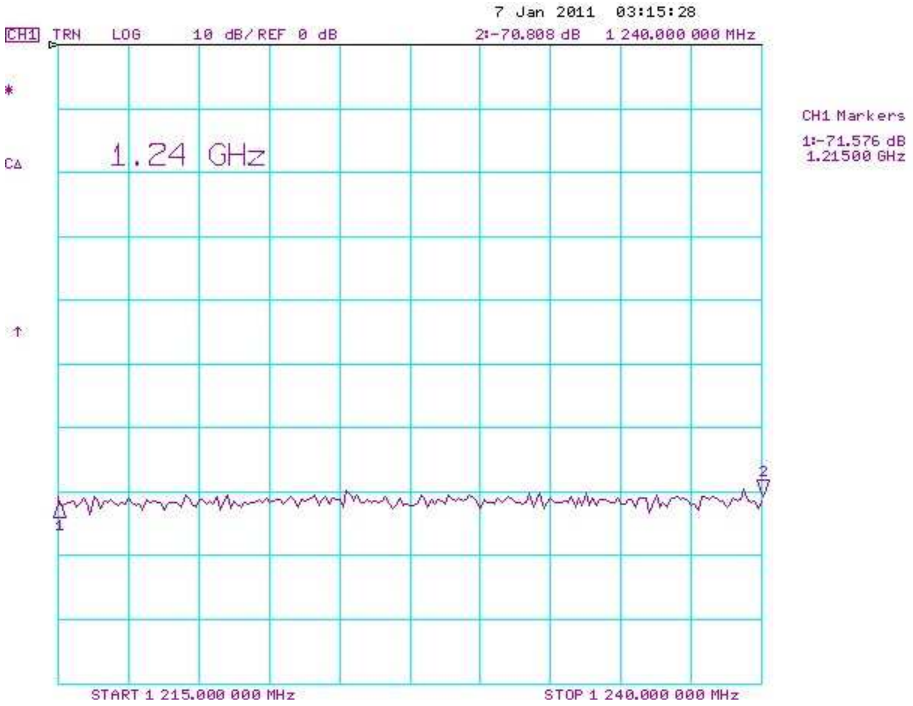


L1 band (1559-1610 MHz)

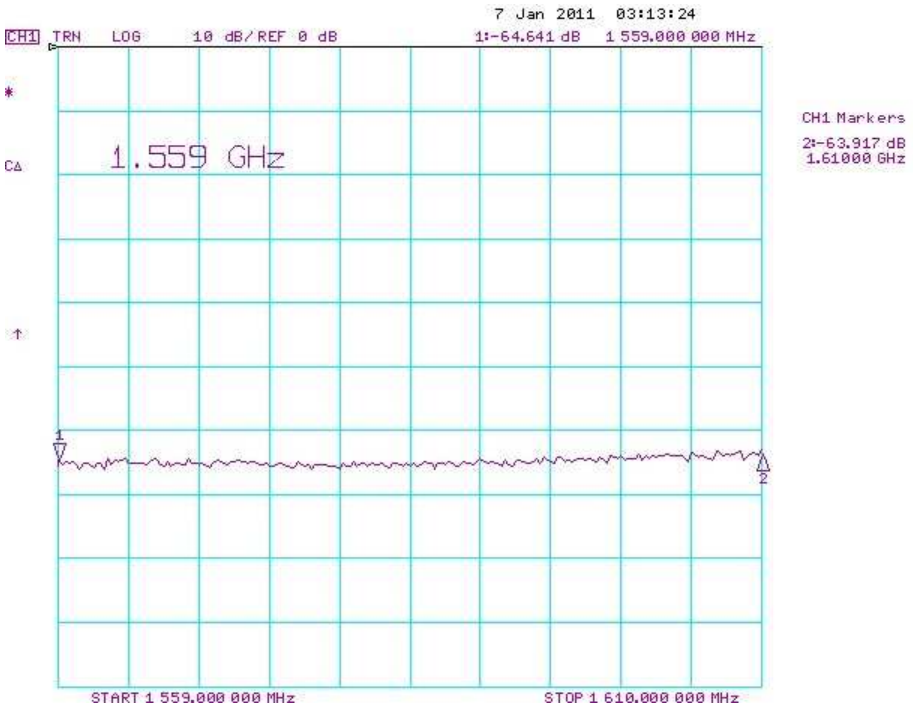
Exhibit of Low Pass Filter Sweep:



L5 band (1164-1215 MHz)



L2 band (1215-1240 MHz)



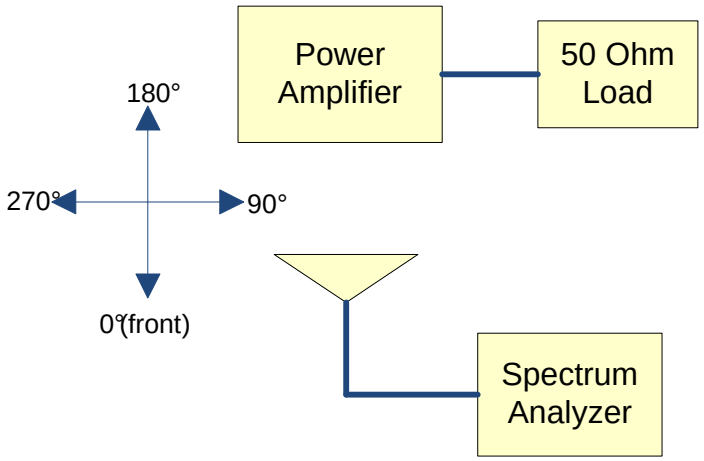
L1 band (1559-1610 MHz)

CABINET RADIATION

FCC-73.687
Cabinet radiation must be 60dB or less referenced to total channel output level.

Maximum cabinet radiation = (1000W or 60dBm – 60) = 0dBm

Procedure: The Transmitter and test equipment were configured as shown below including the angles of measurement with respect to the transmitter cabinet. The free space path loss, cable loss, and antenna gain characteristics are obtained at the fundamental frequency and at each of the harmonics of the center frequency in order to asses the level of signal radiated from the cabinet. Radiation from the cabinet is measured at a distance of 10 meters in four different physical rotation angles: 0, 90, 180, and 270 degrees (0 degrees being the front of the cabinet). All spectral components above the noise floor referenced to average power radiated from the cabinet are recorded.



Measurement:

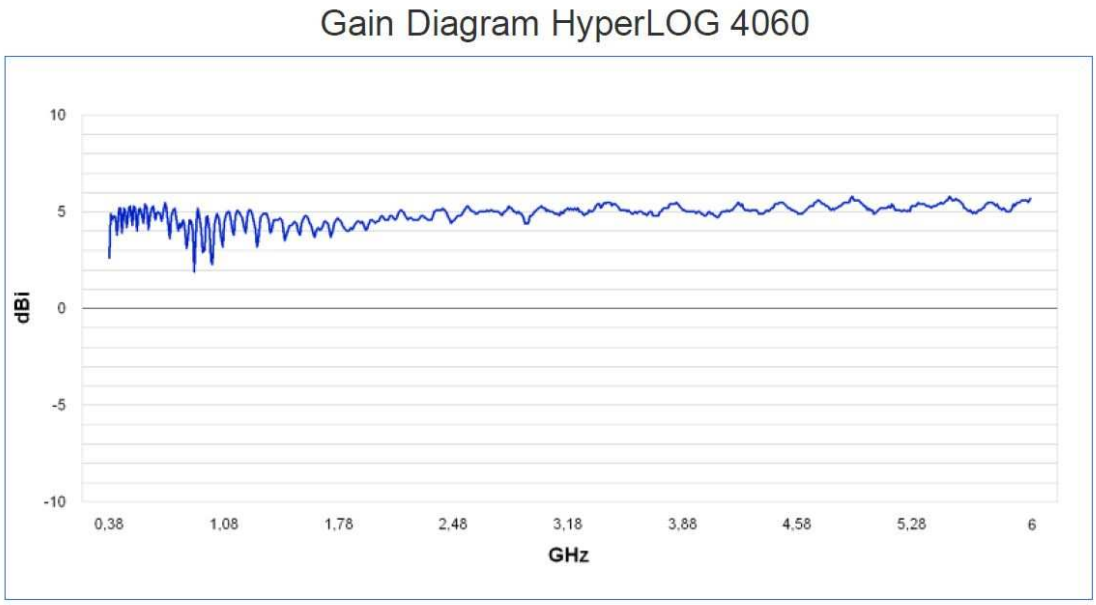
The maximum value at each frequency on different views was recorded while rotating the antenna in the azimuth and turning it to vary the polarization, the worst case observed was __-52.22__ dBm at the first harmonic (the "Cabinet Radiation Test Setup Photo" shows this particular measurement).
All Cabinet Radiation measured is __< 0__ dBm.

0° VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dBm)	Status P=Pass
Fc*1	0.539	-52.22	0.46	4.9	48.63716	-21.5328	0	P
Fc*2	1.078	-73.46	0.62	4.5	54.65776	-25.2922	0	P
Fc*3	1.617	-75.00	0.62	4.4	58.17959	-23.2204	0	P
Fc*4	2.165	-78.04	0.74	4.8	60.67836	-22.0916	0	P
Fc*5	2.695	-79.37	1.52	5	62.61656	-21.3034	0	P

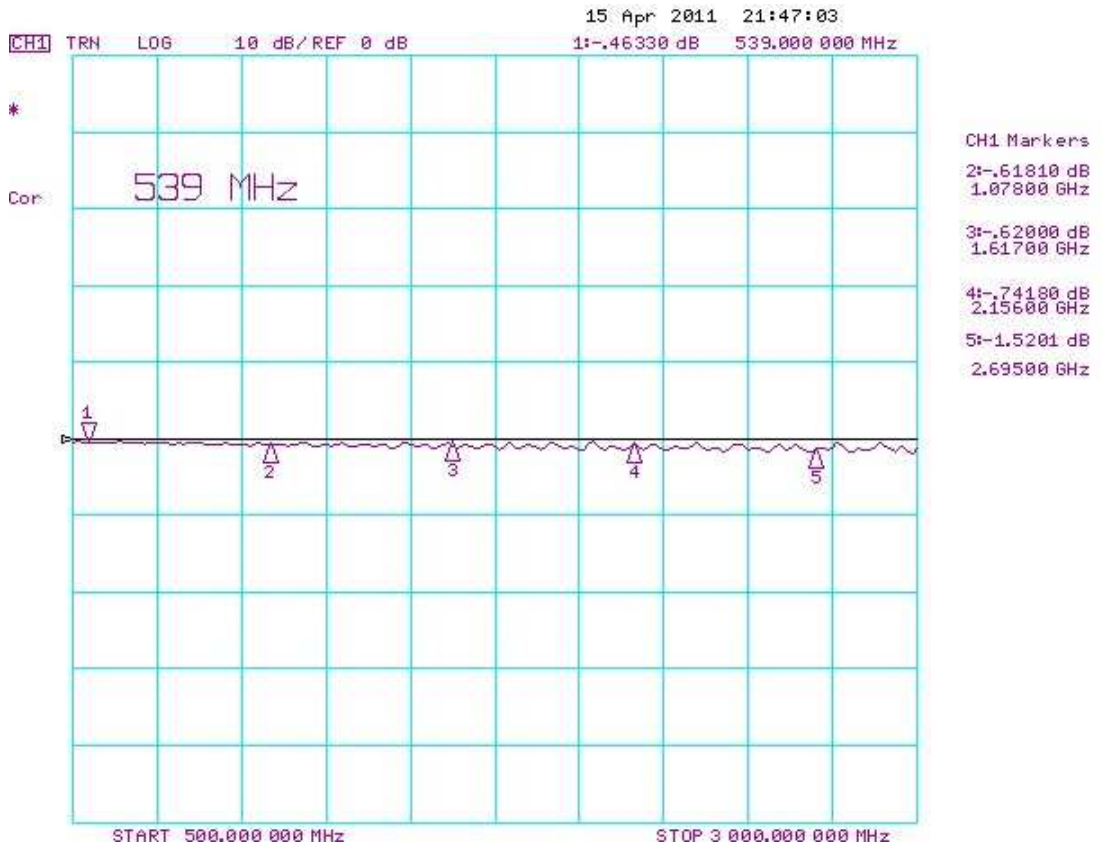
90° VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dBm)	Status P=Pass
Fc*1	0.539	-55.70	0.46	4.9	48.63716	-22.4928	0	P
Fc*2	1.078	-79.67	0.62	4.5	54.65776	-25.0222	0	P
Fc*3	1.617	-82.21	0.62	4.4	58.17959	-23.3404	0	P
Fc*4	2.165	-80.30	0.74	4.8	60.67836	-22.2416	0	P
Fc*5	2.695	-82.15	1.52	5	62.61656	-21.8634	0	P

180° VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dBm)	Status P=Pass
Fc*1	0.539	-59.24	0.46	4.9	48.63716	-21.4528	0	P
Fc*2	1.078	-79.23	0.62	4.5	54.65776	-24.4722	0	P
Fc*3	1.617	-82.19	0.62	4.4	58.17959	-22.8104	0	P
Fc*4	2.165	-78.07	0.74	4.8	60.67836	-22.4516	0	P
Fc*5	2.695	-82.10	1.52	5	62.61656	-21.7234	0	P

270° VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dBm)	Status P=Pass
Fc*1	0.539	-58.93	0.46	4.9	48.63716	-22.9328	0	P
Fc*2	1.078	-77.11	0.62	4.5	54.65776	-25.0622	0	P
Fc*3	1.617	-81.74	0.62	4.4	58.17959	-23.5904	0	P
Fc*4	2.165	-77.28	0.74	4.8	60.67836	-22.4716	0	P
Fc*5	2.695	-82.04	1.52	5	62.61656	-22.0934	0	P



Antenna Gain Diagram



Cable Loss

Calculations:

Noise Floor = -88.19 dBm

For the 1st Harmonic (0.539 GHz) at 0˚ VIEW:
a) Signal Level = -52.22 dBm.
b) Cable Loss = 0.46 dB.
c) Antenna Gain = 4.9 dB.

Path Loss (dB) = 32.5 + 20 log f (Ghz) +20 log d (m)
= 32.5 + 20 log 0.539 + 20 log 10
= 32.5 + 12.874974 + 20
= 47.13 dB

Adjusted Level (dB) = Signal Level + Cable Loss – Antenna Gain + Path Loss
= -52.22 + 0.46 – 4.9 + 47.13
= -9.53 dB