TLUD-30 TEST REPORT

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Date: March 14, 2009

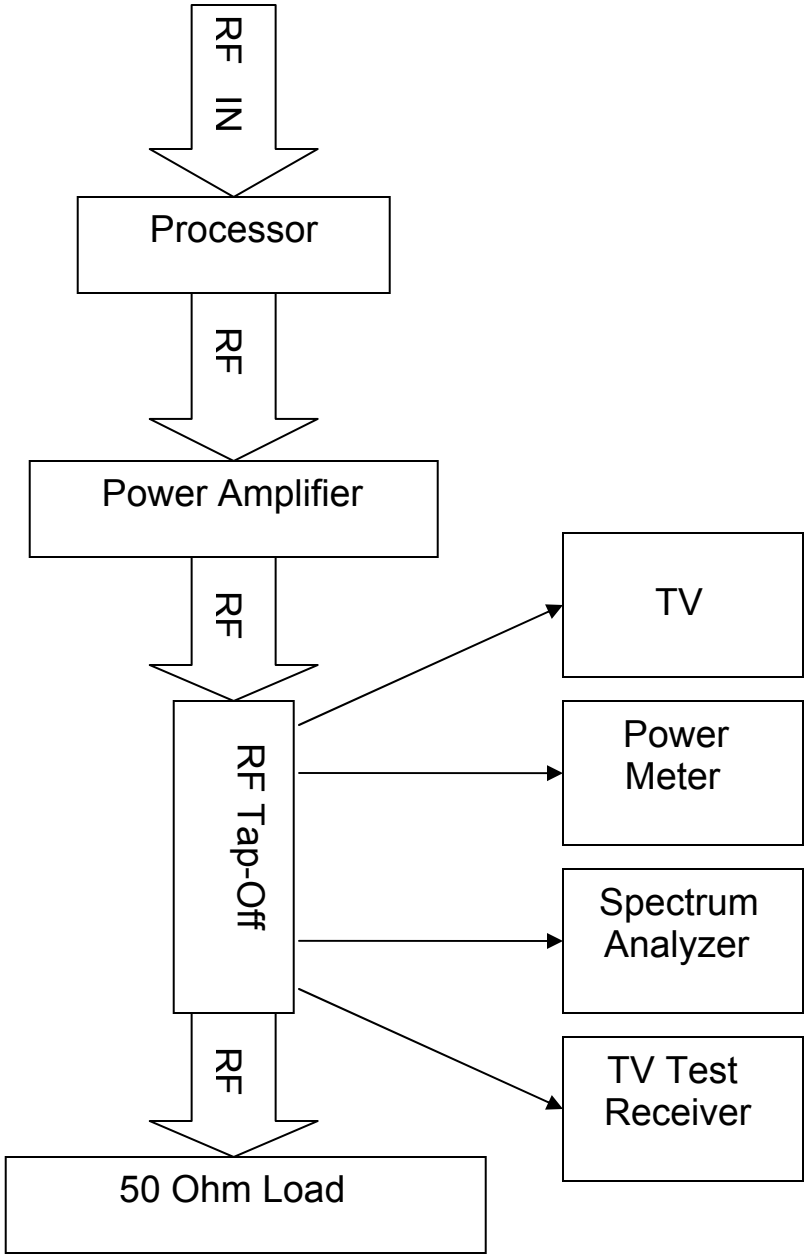
Contents

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	-
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



Performance Specifications

POWER OUTPUT 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.

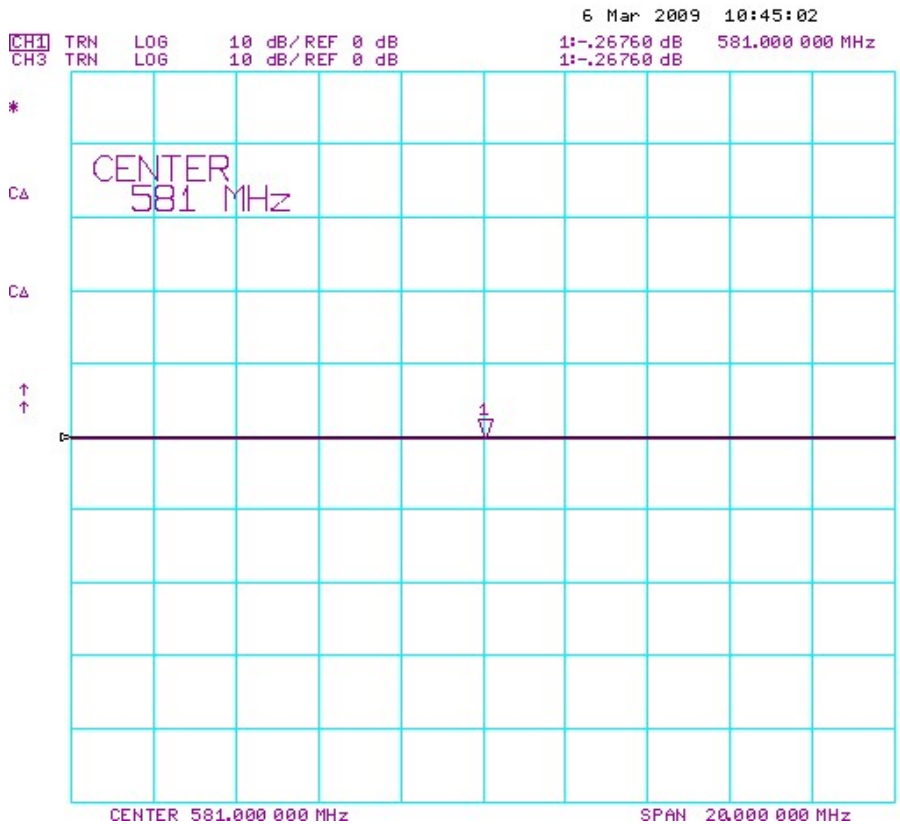
Measurement:

Rated Output Power = 30 Watts

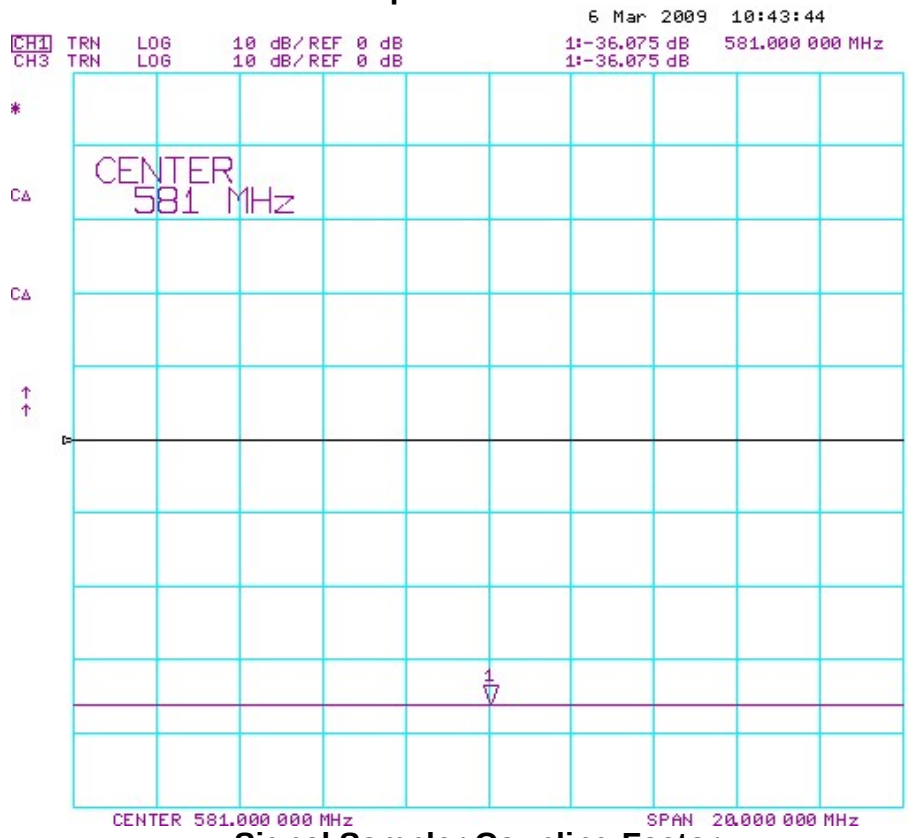
	95%	100%	105%
Measured Power	28.5 Watts	30 Watts	31.5 Watts

Exhibit of Output Power:

Power Meter



Output Cable Loss



Signal Sampler Coupling Factor

Calculations:

For the Output Power

a) Loss of the output cable going into the signal sampler = -0.27 dB.
b) Coupling Factor at the midpoint of the 6MHz band = -36.07 dB.
c) Measured Output Power = 6.943 mW.

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

Total Loss = 0.27 dB + 36.07 dB = 36.34 dB

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

36.34 dB = 10 log ($Power_{actual}$ /0.006943W)

Inv log 3.634 = $Power_{actual}$ /0.006943W

4305.266 (0.006943W) = $Power_{actual}$

$Power_{actual}$ = Output Power = 29.89W

Output power stability vs. input level variations

The processor's AGC allows dynamically adjusting the power level of the TP600-8VSB. The nominal input level is -55 dBm for best performance, but accepts a range of -10 dBm to -75 dBm.

The nominal output power level of the TP600-8VSB is equal to 0dBm.

RF input level <dBm> (processor RF in)	**Output Power <Watts RMS> (amplifier RF out)**
45	29.78
50	29.81
55	29.89
65	29.85
70	29.93
75	29.88

Maximum PA output change: 0.15 Watts (less than 0.1 dBm)

FREQUENCY OFFSET

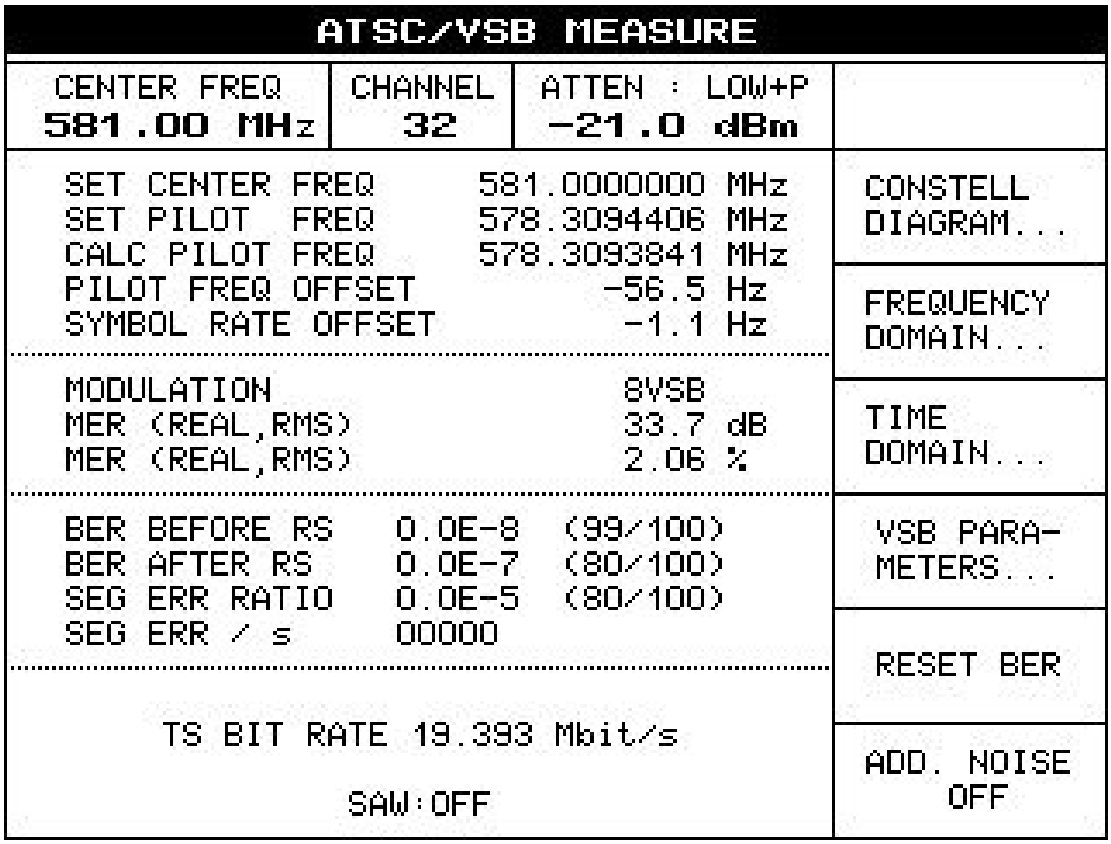
ATSC Standard A/64, Rev. A Section 4.1.6 - The 8-VSB pilot should be 309.441 kHz (± 1 kHz) above the lower edge of the channel assigned to the DTV transmitter.

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) = 578.3094406 MHz
Pilot Frequency (Actual) = 578.3093841 MHz
Pilot Frequency Offset = -56.5 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°C to 50°C and the pilot frequency was measured at 10 degree increments.

Measurement:

Line Voltage		Measured Pilot Frequency (MHz)
Volts (V)	Percentage (%)	
104	85	578.3093501
120 (nominal)	100	578.3093841
140	115	578.3094183

Temperature (°C)	Measured Pilot Frequency (MHz)
0	578.3092554
10	578.3093498
20	578.3093615
25	578.3093841
30	578.3093992
40	578.3094086
50	578.3094277

Summary:

Pilot Frequency Deviation with respect to Line Voltage Range: 68.2 Hz

Pilot Frequency Deviation with respect to Temperature Range: 172.3 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:

$$\text{Emissions} \leq -[46+(|\Delta F|^2/1.44)]\ \text{dB}$$

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 = -49.40 dB
Upper Shoulder = -51.71 dB

b) Spurious Emissions (up to 8 GHz) ≤ -95.76 dB

Harmonic Emissions (up to 8 GHz) ≤ -95.76 dB

Harmonic	Frequency (GHz)	Measured Value (dBm)	Corrected* Value (dBm)	Total Channel Power (dBm)	Harmonic Emission (dB)	
					Limit	Result
2	1.162	-85.19	-88.34	7. 42	-71	-95.76
3	1.743	-86.15	-96.18	7. 42	-71	-103.60
4	2.324	-86.39	-97.05	7. 42	-71	-104.47
5	2.905	-86.73	-108.43	7. 42	-71	-115.85
6	3.486	-86.88	-105.80	7. 42	-71	-113.22
7	4.067	-86.57	-105.55	7. 42	-71	-112.97
8	4.648	-85.52	-102.98	7. 42	-71	-110.40
9	5.229	-85.88	-109.99	7. 42	-71	-112.41
10	5.810	-84.88	-104.10	7.42	-71	-111.52

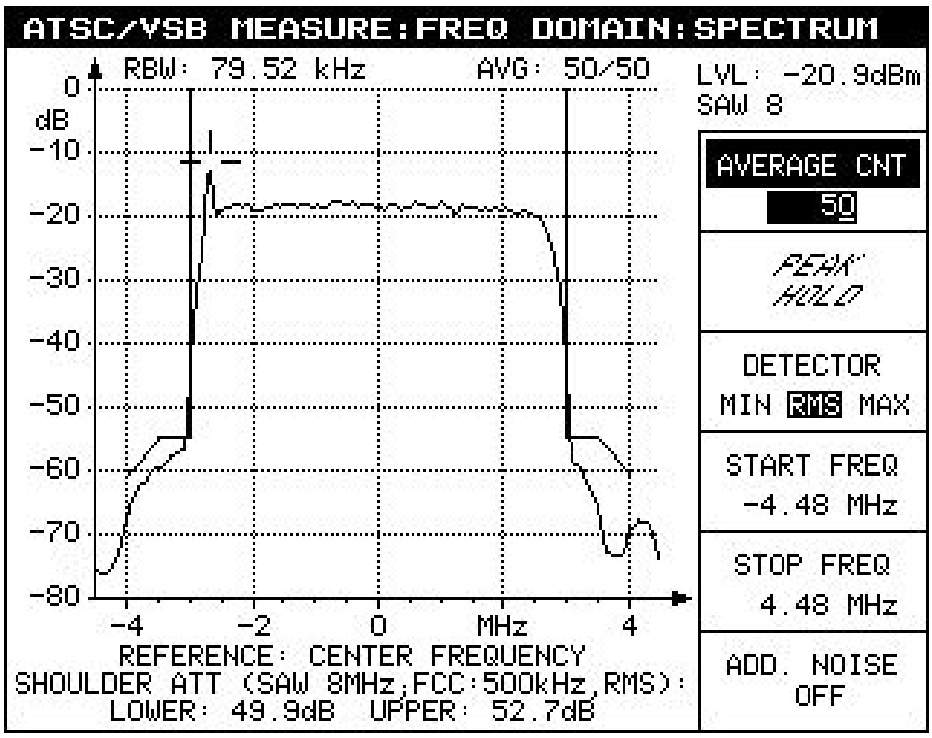
c) Lower adjacent Channel Measurements

Sub-band	Frequency (MHz)	Measured Value (dBm)	Noise Corrected (dBm)	Channel Power (dBm)	Emission Mask (dB)	
					Limit	Result
1	577.75	-51.98	-51.98	-2. 58	-46.0	-49.40
2	577.25	-56.20	-56.20	-2. 58	-46.4	-53.62
3	576.75	-64.36	-64.38	-2. 58	-47.1	-61.80
4	576.25	-63.67	-66.68	-2. 58	-48.1	-64.10
5	575.75	-61.00	-61.00	-2. 58	-49.5	-58.42
6	575.25	-60.63	-60.63	-2. 58	-51.3	-58.05
7	574.75	-61.03	-61.03	-2. 58	-53.3	-58.45
8	574.25	-61.86	-61.87	-2. 58	-55.8	-59.29
9	573.75	-62.74	-62.75	-2. 58	-58.5	-60.17
10	573.25	-65.65	-65.67	-2. 58	-61.7	-63.09
11	572.75	-72.54	-72.65	-2. 58	-65.1	-70.07
12	572.25	-74.59	-74.78	-2. 58	-69.0	-72.20

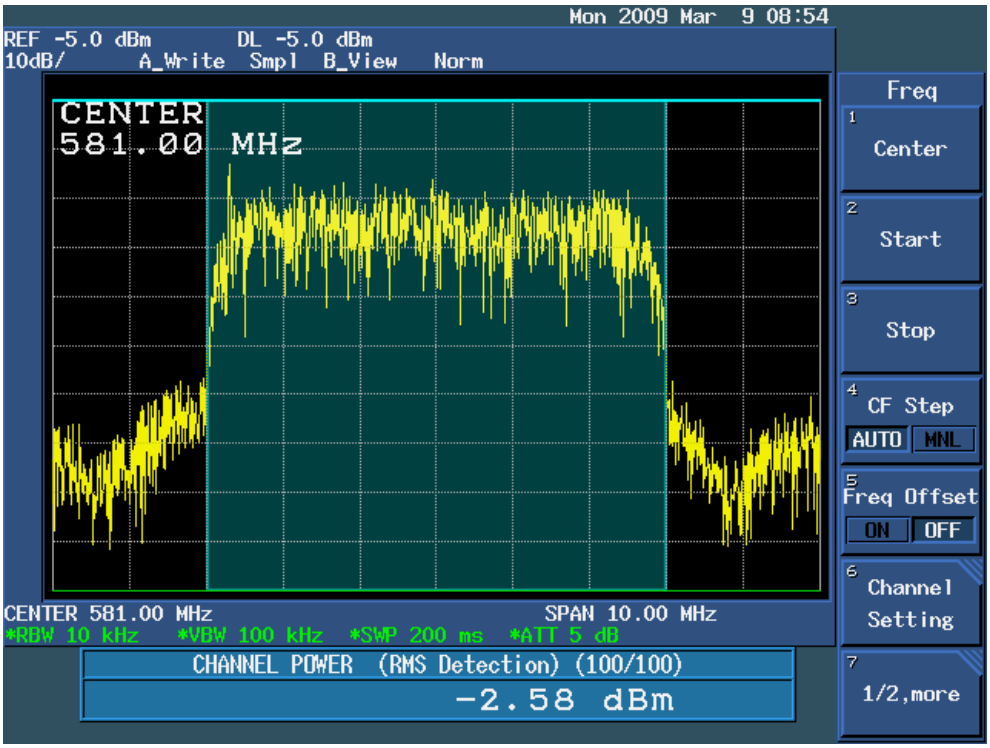
Upper adjacent Channel Measurements

Sub-band	Frequency (MHz)	Measured Value (dBm)	Noise Corrected (dBm)	Channel Power (dBm)	Emission Mask (dB)	
					Limit	Result
1	584.25	-54.29	-54.29	-2.58	-46	-51.71
2	584.75	-65.31	-65.33	-2.58	-46.4	-62.75
3	585.25	-60.90	-60.90	-2. 58	-47.1	-58.32
4	585.75	-58.25	-58.25	-2. 58	-48.1	-55.67
5	586.25	-57.91	-57.91	-2. 58	-49.5	-55.33
6	586.75	-58.47	-58.47	-2. 58	-51.3	-55.89
7	587.25	-59.61	-59.61	-2. 58	-53.3	-67.03
8	587.75	-61.25	-61.25	-2. 58	-55.8	-58.67
9	588.25	-63.97	-63.98	-2. 58	-58.5	-61.39
10	588.75	-69.49	-69.54	-2. 58	-61.7	-66.96
11	589.25	-75.15	-75.36	-2. 58	-65.1	-72.78
12	589.75	-76.82	-77.14	-2. 58	-69	-74.24

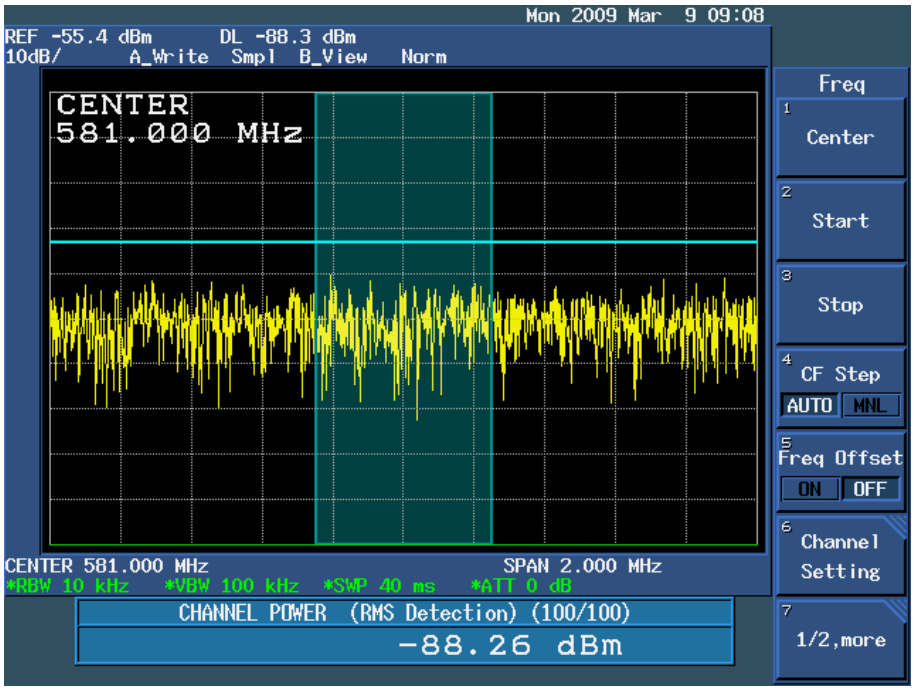
Exhibit of Emission Mask:



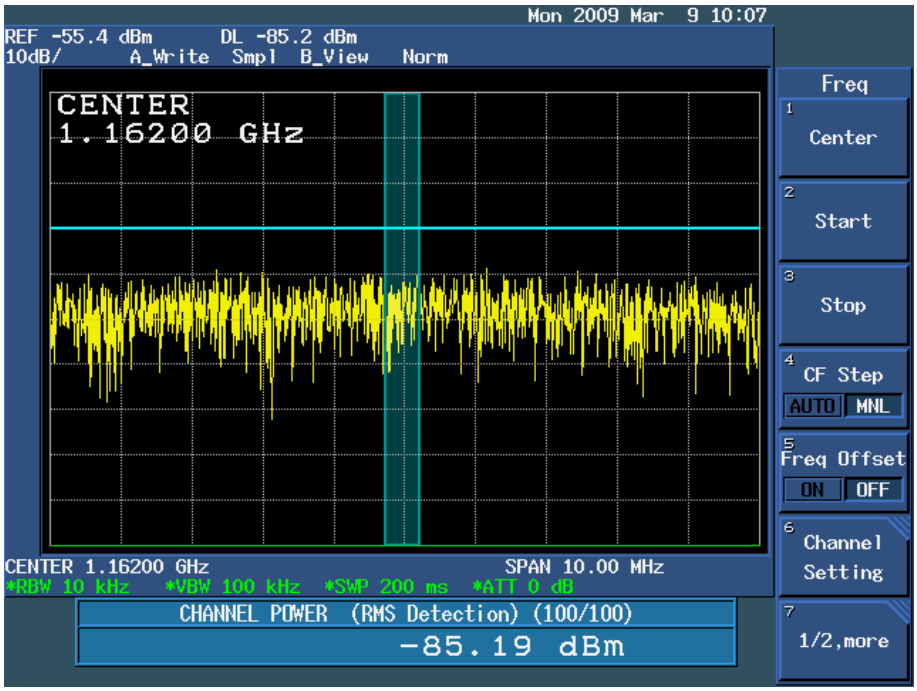
Upper and Lower Shoulder Attenuation



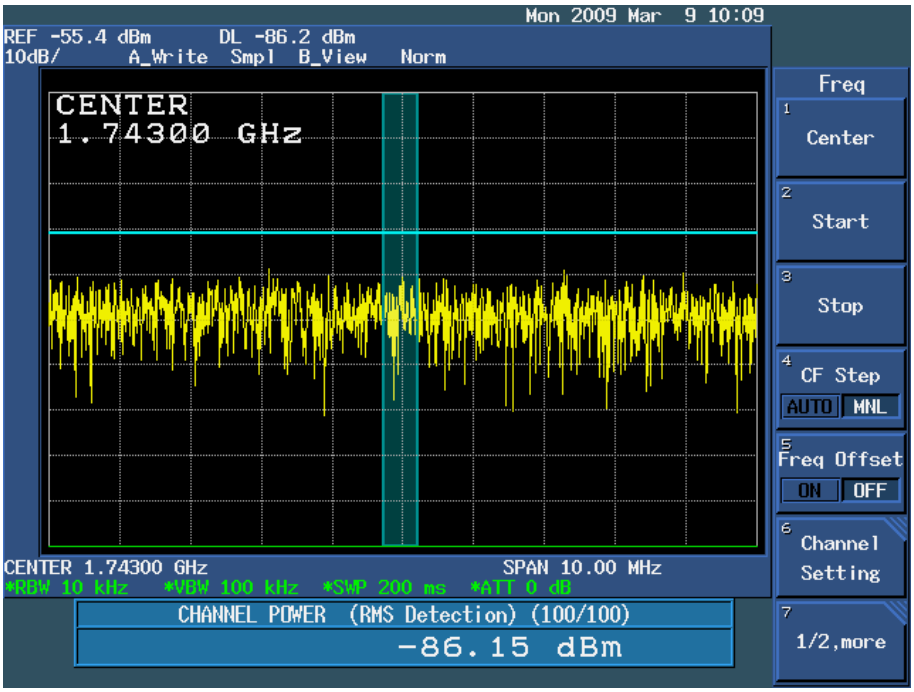
Total Average Channel Power



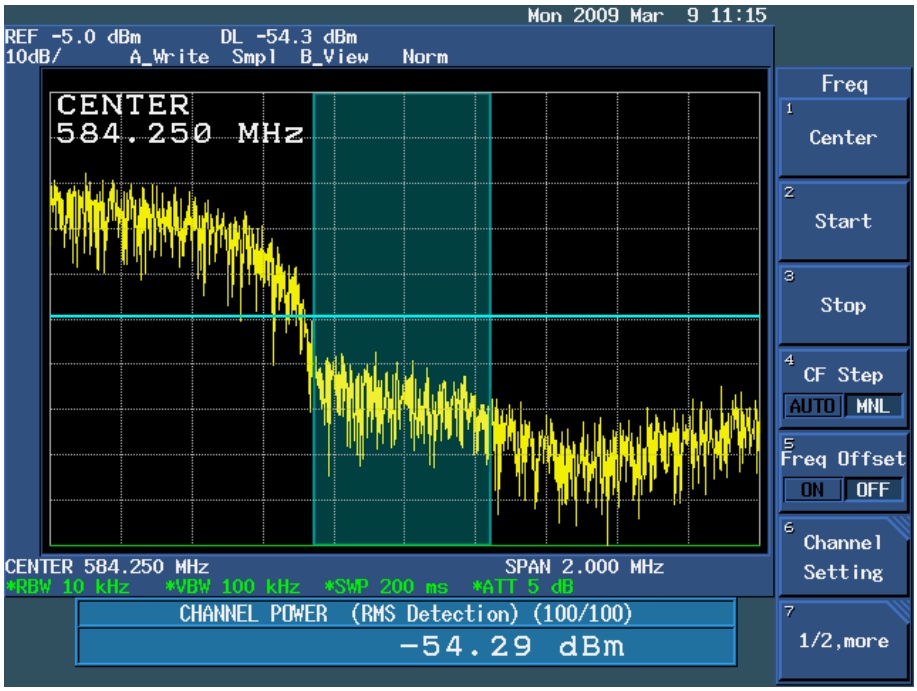
Noise Floor Power (Input Terminated)



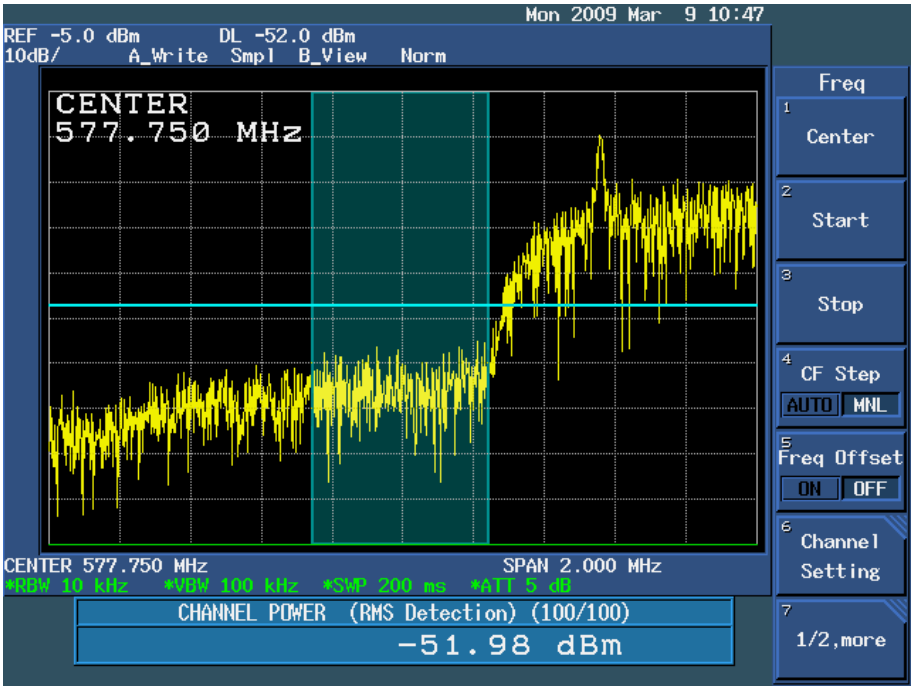
2nd Harmonic Channel Power (worst 500 KHz segment)



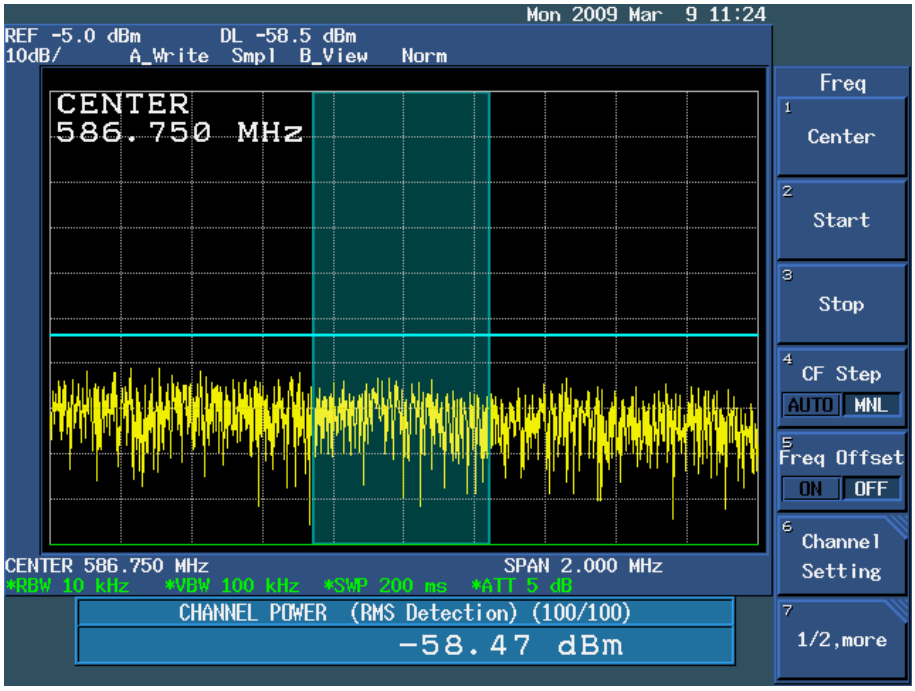
3rd Harmonic Channel Power (worst 500 KHz segment)



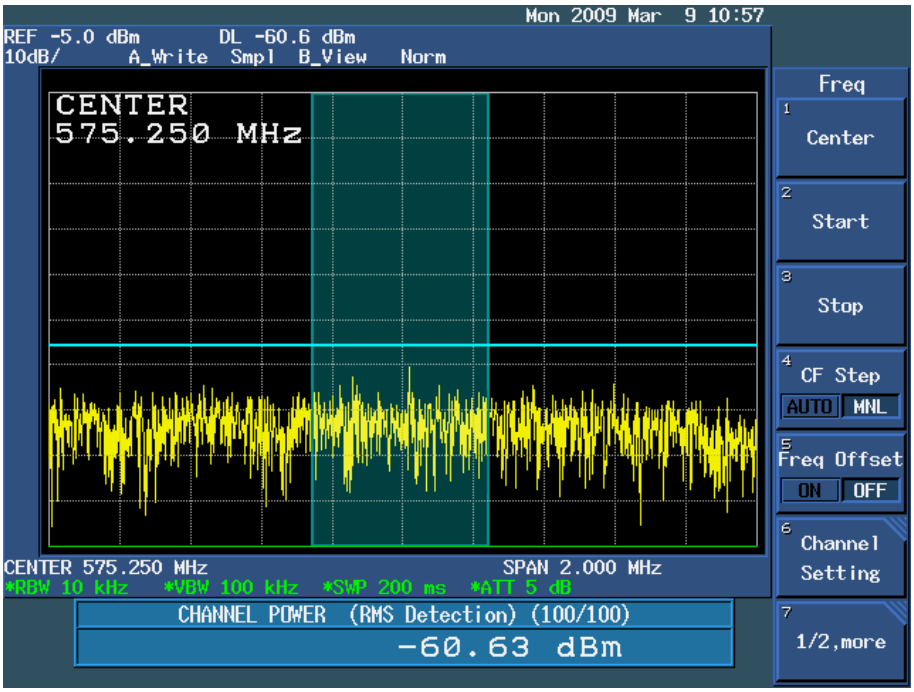
Upper Shoulder Channel Power in a 500 KHz band (+1 Sub-band)



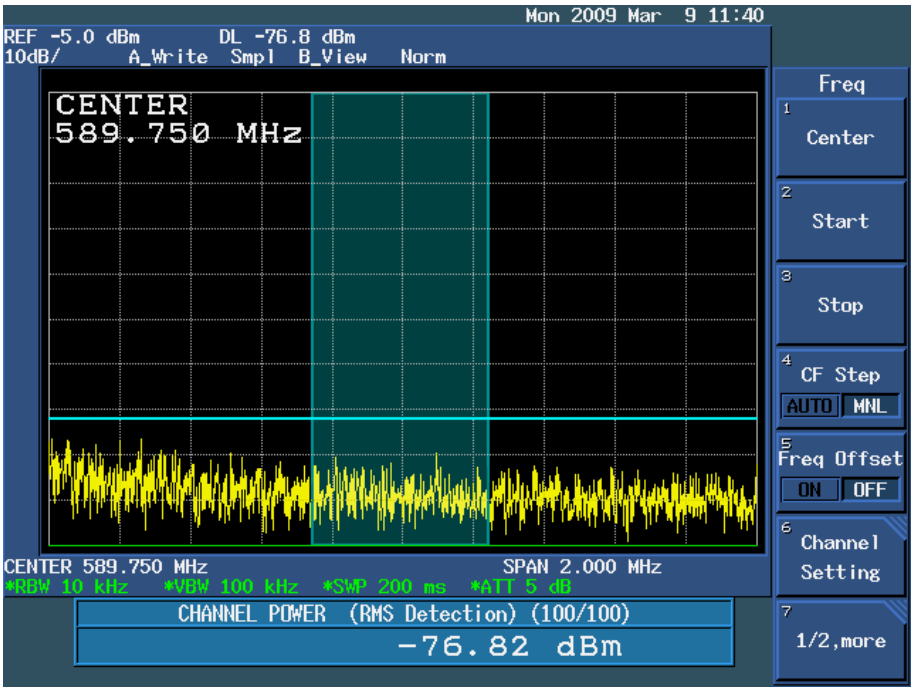
Lower Shoulder Channel Power in a 500 KHz band (-1 Sub-band)



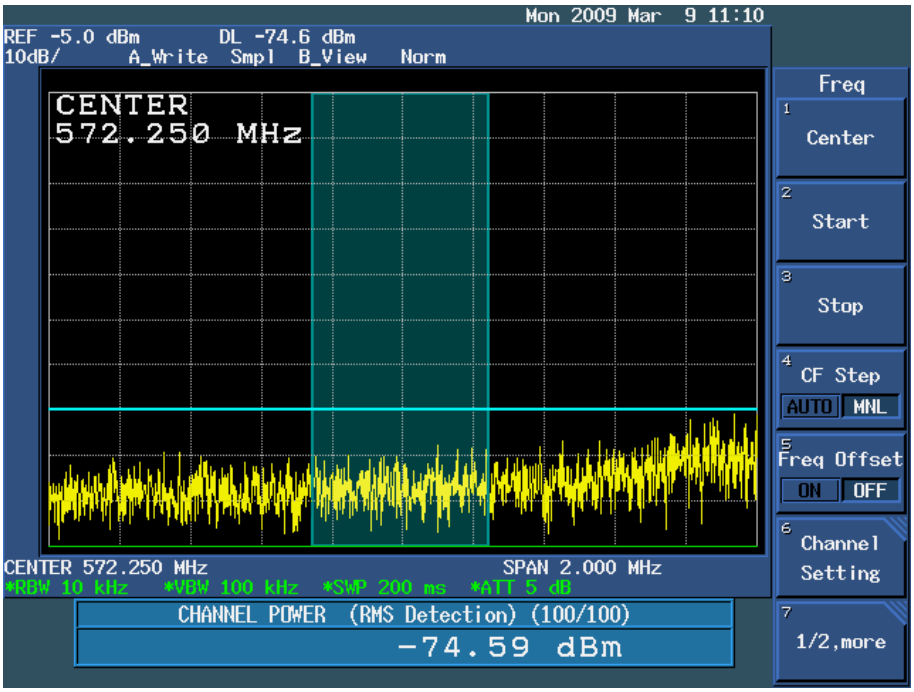
+6 Sub-band Channel power



-6 Sub-band Channel power



+12 Sub-band Channel power



-12 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 = 0.47 dB.

b) Coupling Factor measurement:

- Fundamental = -36.07 dB.
- 2nd Harmonic = -35.40 dB.

b) Measurement: without the High Pass Filter:

- External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 10 dB.
- Measured channel power of the 6 MHz band = -2.58 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) = -88.26 dBm.
- Measured channel power of the 2nd Harmonic = -85.19 dBm.

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

Total Channel Power (6 MHz band) = -2.58 dBm + 10 dB = 7.42 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 ($10^{-85.19/10} - 10^{-88.26/10}$) = -88.14^{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) = -88.14 dBm + 0 dB + 0.47 dB + (-36.07 dB - -35.40 dB)

Total Channel Power (2nd Harmonic) = -88.14 dBm + 0 dB + 0.47 dB + (-0.67 dB) = -88.34 dBm

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

Emission at the 2nd Harmonic = -88.34 dBm – (7.42 dBm)

Emission at the 2nd Harmonic = -95.76 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 = 0.48 dB.

b) Coupling Factor measurement:

- Fundamental = -36.07 dB.
- 3rd Harmonic = -29.70 dB.

b) Measurement: without the High Pass Filter:

- External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 10 dB.
- Measured channel power of the 6 MHz band = -2.58 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) = -88.26 dBm.
- Measured channel power of the 3rd Harmonic = -86.15 dBm.

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

Total Channel Power (6 MHz band) = -2.58 dBm + 10 dB = 7.42 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 ($10^{-86.15/10} - 10^{-88.26/10}$) = -90.29[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) = -90.29 dBm + 0 dB + 0.48 dB + (-36.07 dB - -29.70 dB)

Total Channel Power (3rd Harmonic) = -90.29 dBm + 0 dB + 0.48 dB + (-6.37 dB) = -96.18 dBm

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

Emission at the 3rd Harmonic = -96.18 dBm – (7.42 dBm)

Emission at the 3rd Harmonic = -103.60 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 +/-6 and +/-12 sub-bands are shown.

For +6 Sub-band:

a) Measured channel power of the 6 MHz band = -2.58 dBm.
b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 10 dB.
c) Equipment noise floor power in a 500 KHz band = -88.26 dBm.
d) Measured channel power of the +6 sub-band = -58.47 dBm.

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

Total Channel Power (6 MHz band) = -2.58 dBm + 10 dB = 7.42 dBm

2. Noise Corrected Amplitude = $10 \log (10^{\text{Measured channel power of the +6 sub-band}/10} - 10^{\text{Noise Floor Power}/10})$

Noise Corrected Amplitude = $10 \log (10^{-58.47/10} - 10^{-88.48/10})$ = -58.47[1] dBm

3. Total Channel Power (+6 sub-band) = Noise Corrected Amplitude + External Attenuator
Total Channel Power (+6 sub-band) = -58.47 dBm + 10 dB = -48.47 dBm

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

Emission at +6 sub-band = -48.47 dBm – (7.42 dBm)

Emission at +6 sub-band = -55.89 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 -6 Sub-band:

a) Measured channel power of the 6 MHz band = -2.58 dBm.
b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 10 dB.
c) Equipment noise floor power in a 500 KHz band = -88.26 dBm.
d) Measured channel power of the -6 sub-band = -60.63 dBm.

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

Total Channel Power (6 MHz band) = -2.58 dBm + 10 dB = 7.42 dBm

2. Noise Corrected Amplitude = 10 log ($10^{\text{Measured channel power of the -6 sub-band}/10} - 10^{\text{Noise Floor Power}/10}$)

Noise Corrected Amplitude = 10 log ($10^{-60.63/10} - 10^{-88.26/10}$) = -60.63[1] dBm

3. Total Channel Power (+6 sub-band) = Noise Corrected Amplitude + External Attenuator

Total Channel Power (-6 sub-band) = -60.63 dBm + 10 dB = -50.63 dBm

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

Emission at -6 sub-band = -50.63 dBm – (7.42 dBm)

Emission at -6 sub-band = -58.05 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 +12 Sub-band:

a) Measured channel power of the 6 MHz band = -2.58 dBm.

b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 10 dB.

c) Equipment noise floor power in a 500 KHz band = -88.26 dBm.

d) Measured channel power of the +12 sub-band = -76.82 dBm.

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

Total Channel Power (6 MHz band) = -2.58 dBm + 10 dB = 7.42 dBm

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

Noise Corrected Amplitude = 10 log ($10^{-76.82/10}$-$10^{-88.26/10}$) = -77.14[1] dBm

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

Total Channel Power (+12 sub-band) = -77.14 dBm + 10 dB = -66.14 dBm

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

Emission at +12 sub-band = -66.14 dBm – (7.42 dBm)

Emission at +12 sub-band = -73.56 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 -12 Sub-band:

a) Measured channel power of the 6 MHz band = -2.58 dBm.

b) External Attenuator when the mixer input amplitude is set to the analyzer's Sweet Spot = 10 dB.

c) Equipment noise floor power in a 500 KHz band = -88.26 dBm.

d) Measured channel power of the -12 sub-band = -74.59 dBm.

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

Total Channel Power (6 MHz band) = -2.58 dBm + 10 dB = 7.42 dBm

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

Noise Corrected Amplitude = 10 log ($10^{-74.59/10}$-$10^{-88.26/10}$) = -74.78[1] dBm

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

Total Channel Power (-12 sub-band) = -74.78 dBm + 10 dB = -64.78 dBm

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

Emission at -12 sub-band = -64.78 dBm – (7.42 dBm)

Emission at -12 sub-band = -72.20 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

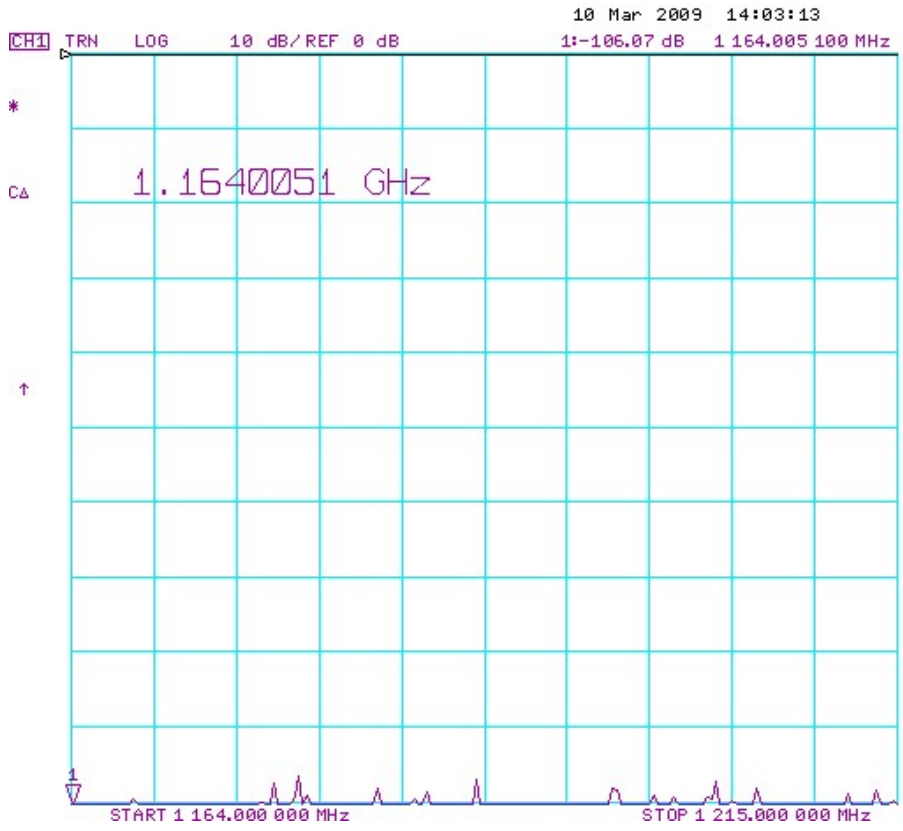
FCC 47CFR§74.794(b) - A transmitter authorized to operate on TV channels 22-24 (518-536 MHz), 32-36 (578-608 MHz), 38 (614-620 MHz), and 65-69 (776-806 MHz) must provide specific "out of band" protection to Radio Navigation Satellite Services (RNSS) in the bands: L5 (1164-1215 MHz); L2 (1215-1240 MHz) 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.

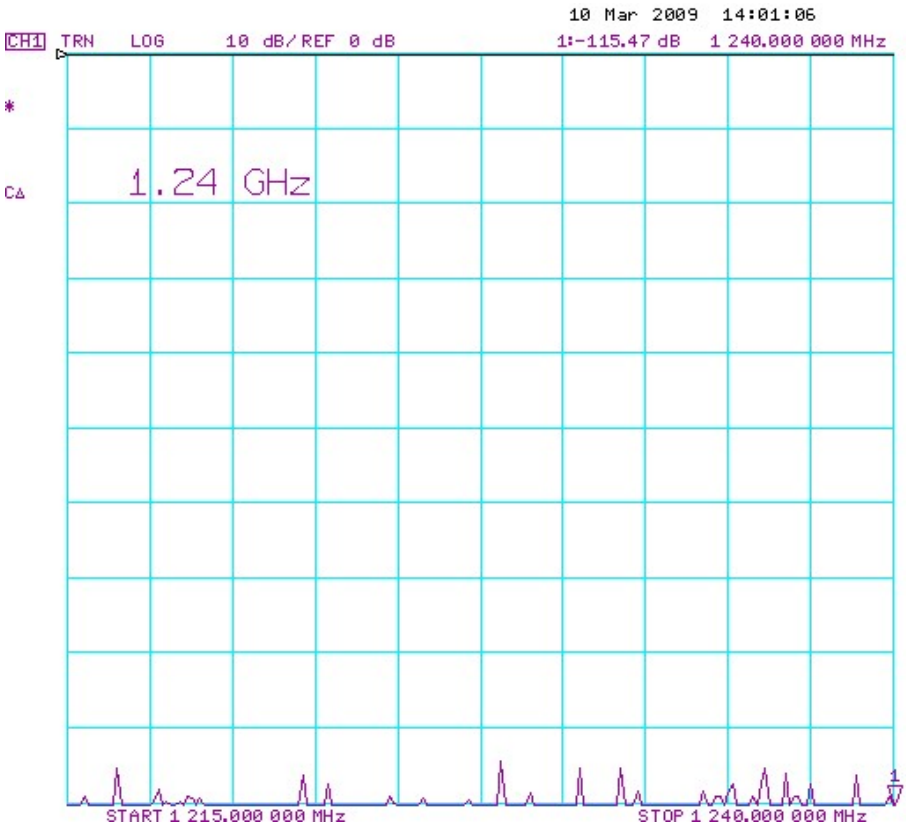
Measurement:

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

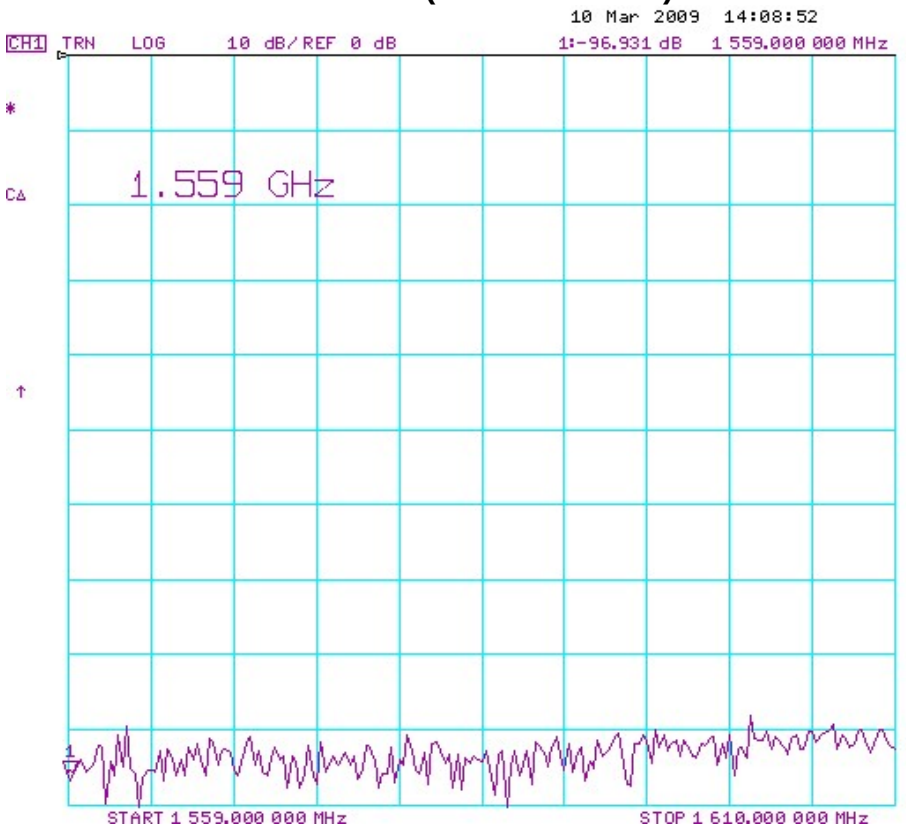
Exhibit of Spectrum Mask Filter Sweep:



L5 band (1164-1215 MHz)

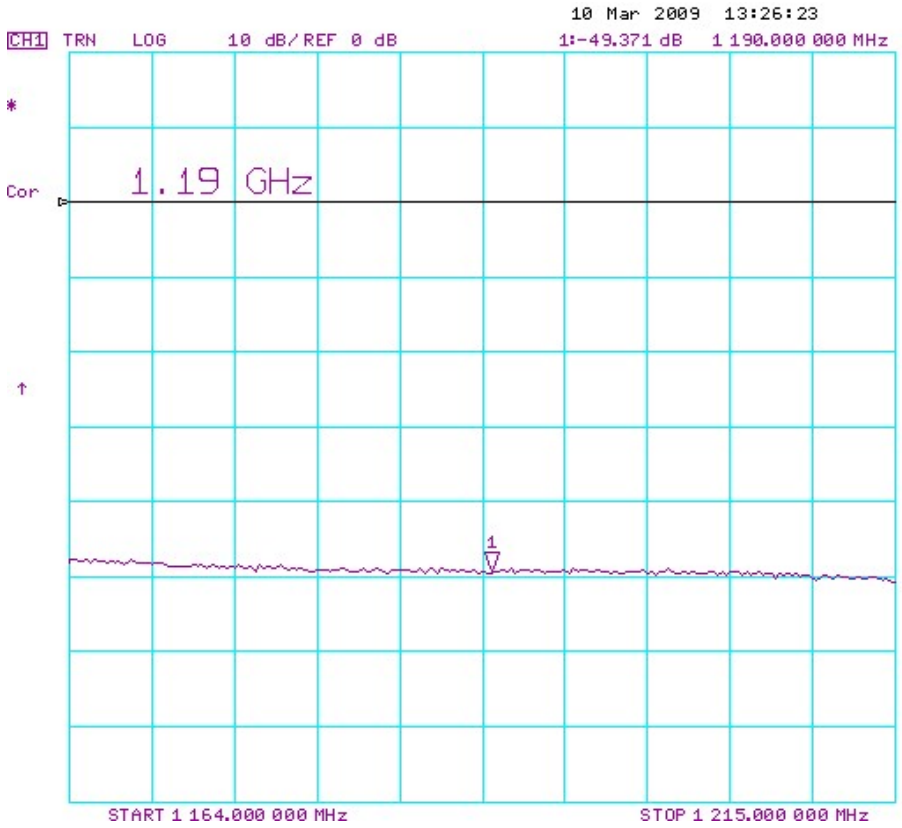


L2 band (1215-1240 MHz)

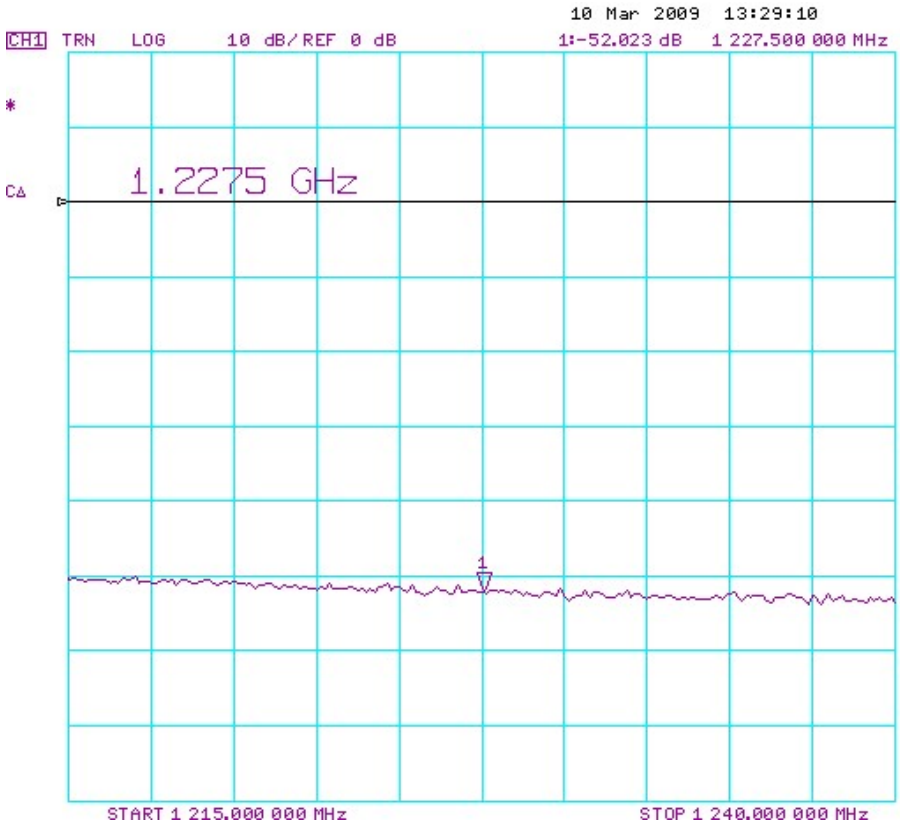


L1 band (1559-1610 MHz)

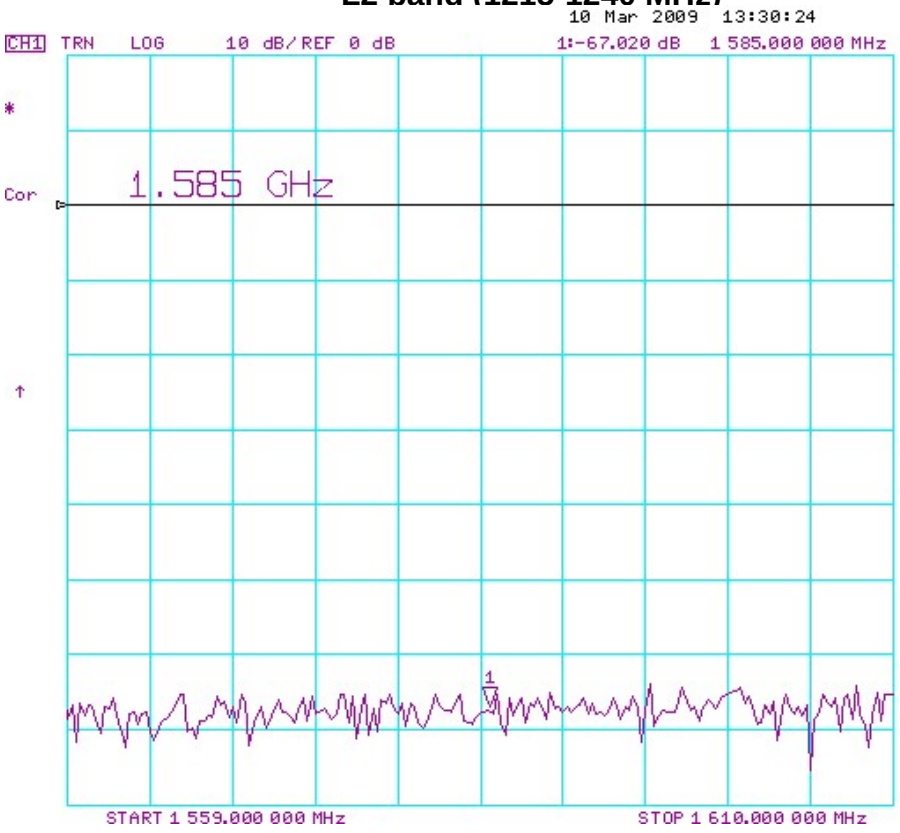
Exhibit of Low Pass Filter Sweep:



L5 band (1164-1215 MHz)



L2 band (1215-1240 MHz)

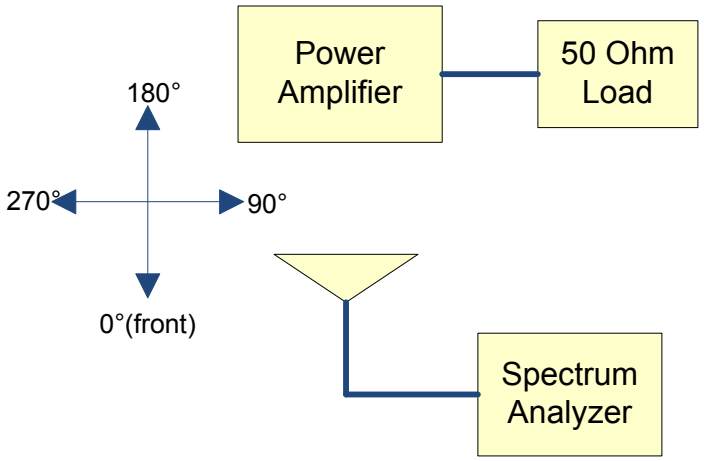


L1 band (1559-1610 MHz)

CABINET RADIATION

FCC 47CFR§2.1053 to 47CFR§2.1057 - cabinet radiation should be no greater than -16 dBm.

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 __-77.54__ dBm at the seventh harmonic (the "Cabinet Radiation Test Setup Photo" shows this particular measurement).

All Cabinet Radiation measured is __>16__ dB.

0˚ VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dB)	Status P=Pass
Fc*2	1.162	-88.14	0.285	4.6	53.804123	-38.650	-16	P
Fc*3	1.743	-86.95	0.365	4.5	57.325948	-33.759	-16	P
Fc*4	2.324	-86.57	0.412	4.9	59.824722	-31.233	-16	P
Fc*5	2.905	-86.79	0.482	5.0	61.762923	-29.545	-16	P
Fc*6	3.486	-86.81	0.511	5.1	63.346548	-28.052	-16	P
Fc*7	4.067	-86.48	0.575	4.9	64.685483	-26.119	-16	P
Fc*8	4.648	-85.33	0.621	5.2	65.845322	-24.063	-16	P
Fc*9	5.229	-85.61	0.665	5.3	66.868373	-23.376	-16	P
Fc*10	5.810	-84.62	0.705	5.2	67.783523	-21.331	-16	P

90˚ VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dB)	Status P=Pass
Fc*2	1.162	-88.35	0.285	4.6	53.804123	-38.860	-16	P
Fc*3	1.743	-87.14	0.365	4.5	57.325948	-33.949	-16	P
Fc*4	2.324	-86.59	0.412	4.9	59.824722	-31.253	-16	P
Fc*5	2.905	-86.82	0.482	5.0	61.762923	-29.575	-16	P
Fc*6	3.486	-86.86	0.511	5.1	63.346548	-28.102	-16	P
Fc*7	4.067	-86.53	0.575	4.9	64.685483	-26.169	-16	P
Fc*8	4.648	-85.35	0.621	5.2	65.845322	-24.083	-16	P
Fc*9	5.229	-85.60	0.665	5.3	66.868373	-23.366	-16	P
Fc*10	5.810	-84.65	0.705	5.2	67.783523	-21.361	-16	P

180˚ VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dB)	Status P=Pass
Fc*2	1.162	-88.38	0.285	4.6	53.804123	-38.890	-16	P
Fc*3	1.743	-87.02	0.365	4.5	57.325948	-33.829	-16	P
Fc*4	2.324	-86.61	0.412	4.9	59.824722	-31.273	-16	P
Fc*5	2.905	-86.75	0.482	5.0	61.762923	-29.505	-16	P
Fc*6	3.486	-86.80	0.511	5.1	63.346548	-28.042	-16	P
Fc*7	4.067	-86.51	0.575	4.9	64.685483	-26.149	-16	P
Fc*8	4.648	-85.36	0.621	5.2	65.845322	-24.093	-16	P
Fc*9	5.229	-85.71	0.665	5.3	66.868373	-23.476	-16	P
Fc*10	5.810	-84.64	0.705	5.2	67.783523	- 21.351	-16	P

270˚ VIEW								
Harmonic	Frequency (GHz)	**Signal Level** (dBm)	**Cable Loss** (dB)	**Antenna Gain** (dB)	**Path Loss** (dB)	**Adjusted Level** (dBm)	**Maximum Level** (dB)	Status P=Pass
Fc*2	1.162	-88.29	0.285	4.6	53.804123	-38.801	-16	P
Fc*3	1.743	-87.15	0.365	4.5	57.325948	-33.959	-16	P
Fc*4	2.324	-86.68	0.412	4.9	59.824722	-31.344	-16	P
Fc*5	2.905	-86.80	0.482	5.0	61.762923	-29.555	-16	P
Fc*6	3.486	-86.67	0.511	5.1	63.346548	-27.912	-16	P
Fc*7	4.067	-86.52	0.575	4.9	64.685483	-26.159	-16	P
Fc*8	4.648	-85.41	0.621	5.2	65.845322	-24.143	-16	P
Fc*9	5.229	-85.68	0.665	5.3	66.868373	-23.446	-16	P
Fc*10	5.810	-84.63	0.705	5.2	67.783523	-21.341	-16	P

*Note: Signal levels are measured in 10 KHz RBW and scaled to 500 KHz bandwidth.

Calculations:

Noise Floor = -88.26 dBm

For the 10th Harmonic (5.810 GHz) at 0˚ VIEW:

a) Signal Level = -84.62 dBm.
b) Cable Loss = 0.705 dB.
c) Antenna Gain = 5.20 dB.

Path Loss (dB) = 32.5 + 20 log f (Ghz) +20 log d (m)
= 32.5 + 20 log 5.810 + 20 log 10
= 32.5 + 12.874974 + 20
= 67.783523 dB

Adjusted Level (dB) = Signal Level + Cable Loss – Antenna Gain + Path Loss
= -84.62 + 0.705 – 5.20 + 67.783523
= -21.331 dB

VOLTAGE AND CURRENT MEASUREMENTS

RF Output Power = 30 Watts Digital (100%)
- AC Supply Voltage = 118.0 Volts
- AC Current Draw = 3.1 Amps
- DC Voltage = 30.0 Volts
- DC Current = 10.12 Amps
- Final amplifier Current = 6.48 Amps
- Final Amplifier Power = 194.4 Watts

RF Output Power = 7.5 Watts Digital (25%)
- AC Supply Voltage = 118.0 Volts
- AC Current Draw = 2.3 Amps
- DC Voltage = 30.0 Volts
- DC Current = 6.89 Amps
- Final amplifier Current = = 3.88 Amps
- Final Amplifier Power = 116.4 Watts

Photos

General Test Setup

Cabinet Radiation Test Setup