2 Test and Measurements (Cont'd)

2.13 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

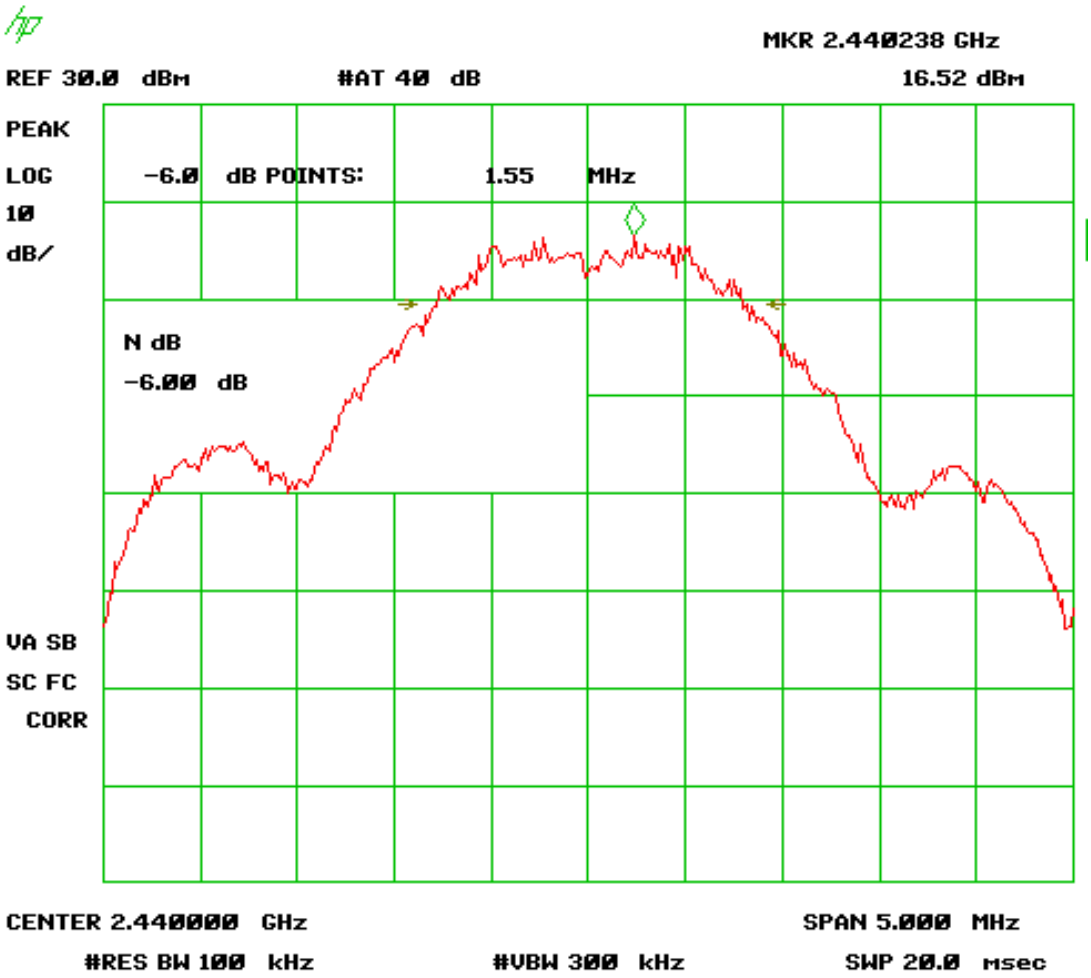


Figure 19 – Six dB Bandwidth - 15.247 (a)(2) - Mid Channel.

2 Test and Measurements (Cont'd)

2.13 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

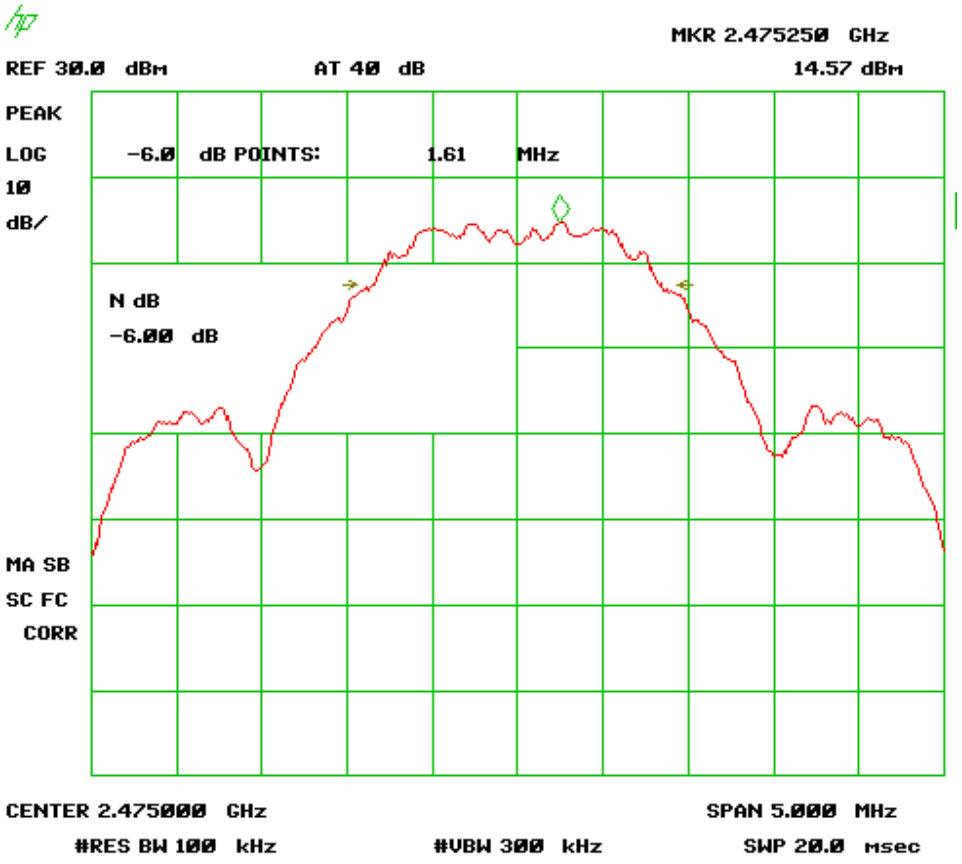


Figure 20 - Six dB Bandwidth - 15.247 (a)(2) - High Channel, Ch. 14.

2 Test and Measurements (Cont'd)

2.13 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

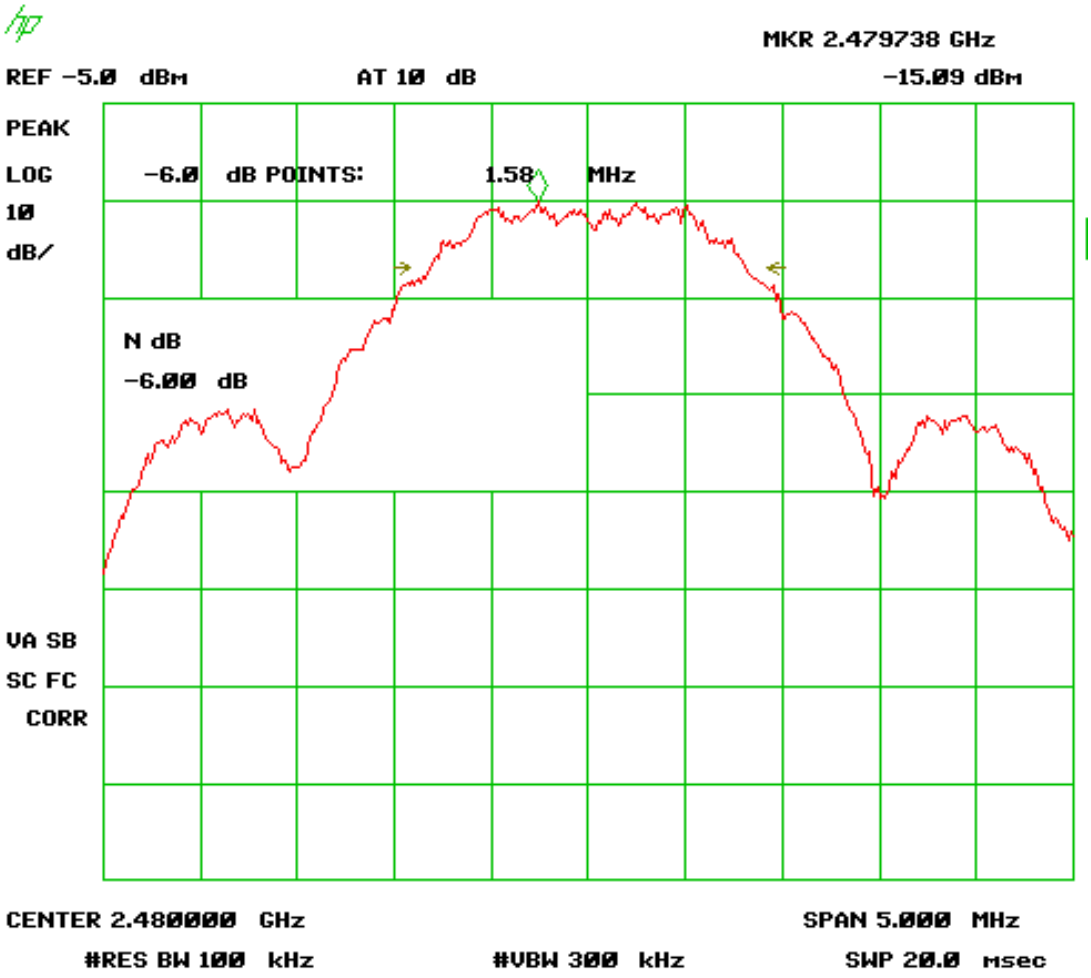


Figure 21 - Six dB Bandwidth - 15.247 (a)(2) – High Channel, Ch. 15.

2 Test and Measurements (Cont'd)

2.14 Peak Power Output (CFR 15.247 (b) (3))

For the Raptor model, the transmitter was programmed to operate at a maximum of +20 dBm across the band with the exception of the highest channel, Channel 15, which will operate at -11.45 dBm max.

Peak power within the band 2400 MHz to 2483.5 MHz was measured per FCC KDB Publication 558074 as an Antenna Conducted test with a spectrum analyzer by connecting the spectrum analyzer directly, via a short RF cable, to the antenna output terminals on the EUT. The spectrum analyzer was set for a 50 Ω impedance with the RBW set greater than the 6 dB bandwidth of the EUT, and the VBW ≥ RBW. The loss of the short cable is 0.2 dB, and the final values were determined by adding 0.2 dB to the measured values. Peak antenna conducted output power is tabulated in Table 13 below.

Antenna Conducted Output Power was measured at Low Channel, Mid Channel and High Channel frequencies. See Figures 35 through 38 below.

Table 13 - Peak Antenna Conducted Output Power per Part 15.247 (b) (3)

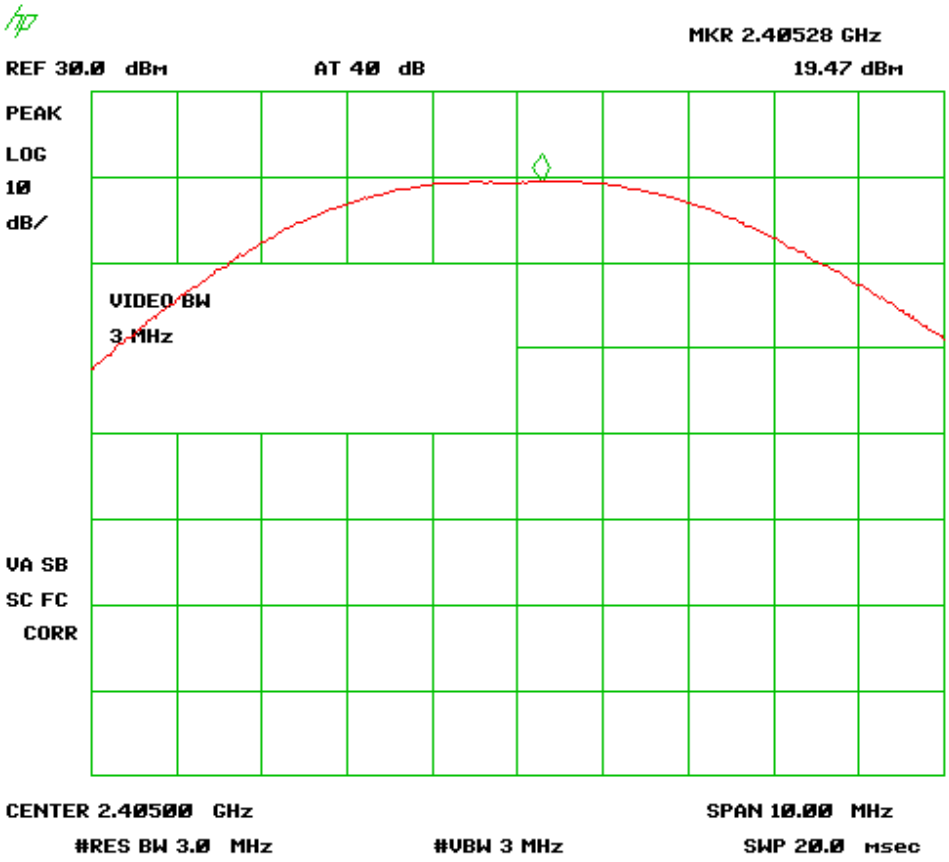
Frequency of Fundamental (MHz)	Measurement (dBm)	Measurement (mW)	FCC Limit (mW Maximum)
Low Band (ch00) 2405.28	19.67	92.68	1000
Mid Band (ch07) 2440.38	19.58	90.78	1000
High Band (ch14) 2474.45	17.90	61.66	1000
High Band (ch15) 2479.50	-11.45	13.96	1000

Measurement values increased by 0.2 dB to correct for cable loss.

Tester Signature:  Name: Daniel Aparaschivei

2 Test and Measurements (Cont'd)

2.14 Peak Power Output (CFR 15.247 (b)(3))



Add 0.2 dB loss for cable attenuation

Figure 22. Peak Antenna Conducted Output Power, Low Channel

2 Test and Measurements (Cont'd)

2.14 Peak Power Output (CFR 15.247 (b)(3))

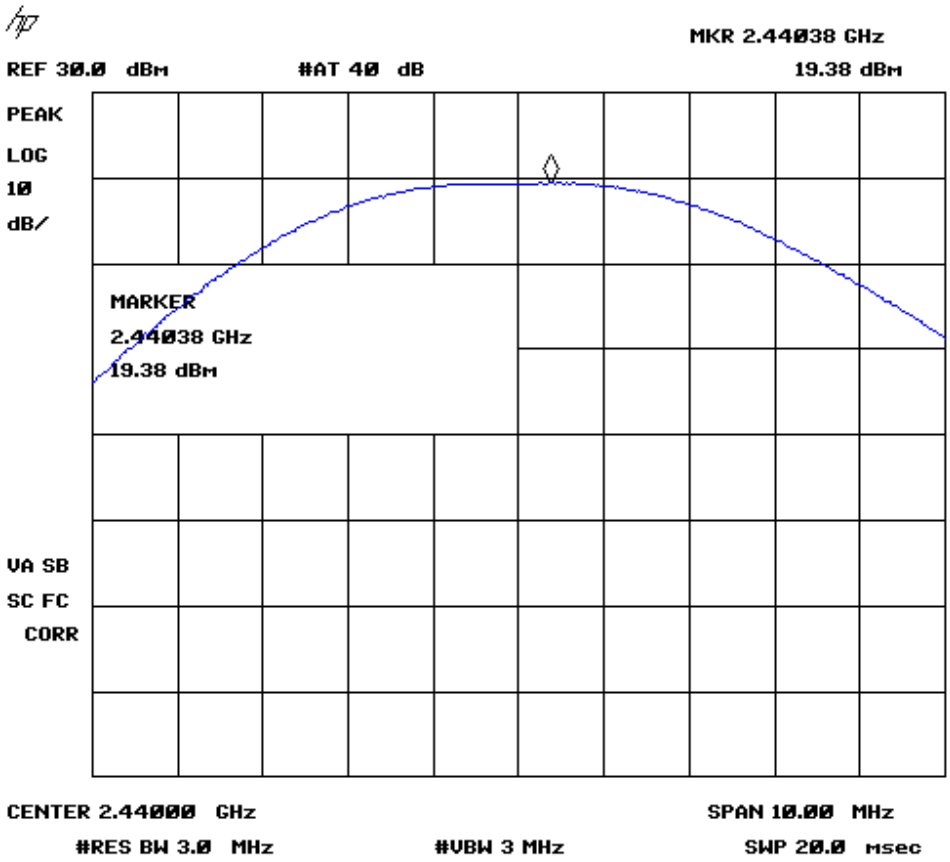
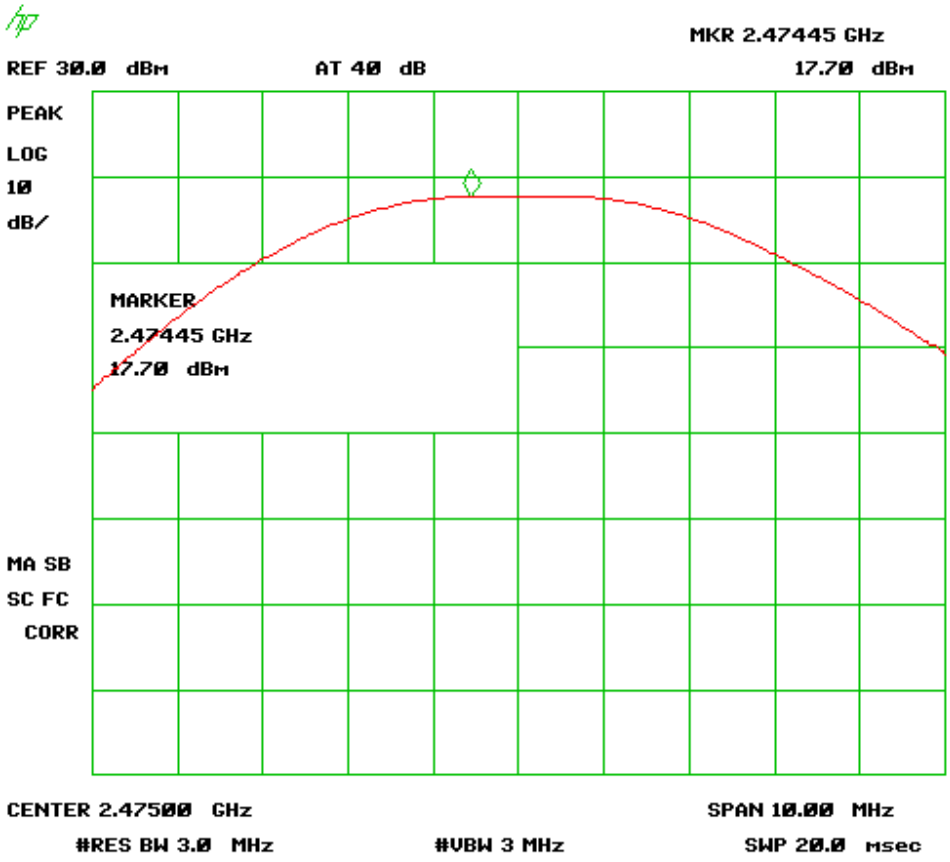


Figure 23 - Peak Antenna Conducted Output Power, Mid Channel

Add 0.2 dB loss for cable assembly.

2 Test and Measurements (Cont'd)

2.14 Peak Power Output (CFR 15.247 (b)(3))

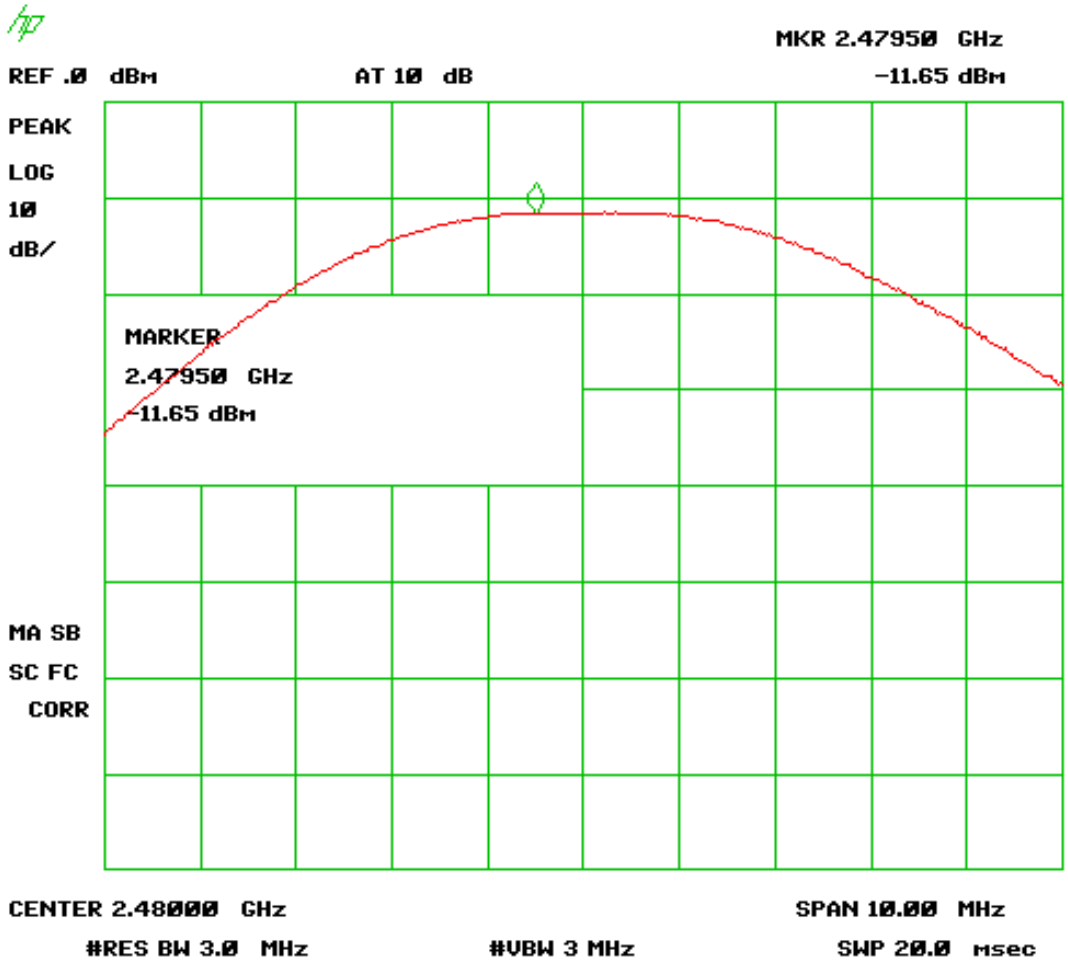


Add 0.2 dB loss for cable assembly.

Figure 24 - Peak Antenna Conducted Output Power, High Channel (Ch 14)

2 Test and Measurements (Cont'd)

2.14 Peak Power Output (CFR 15.247 (b)(3))



Add 0.2 dB loss for cable assembly.

Figure 25 - Peak Antenna Conducted Output Power, High Channel (Ch 15)

2.15 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

The transmitter was placed into a continuous mode of operation at all applicable frequencies. The measurements were performed per the procedures of FCC KDB Procedure 558074. The RBW was set to 3 kHz and the Video Bandwidth was set to ≥ RBW. The trace capture time was set to (Span/3 kHz).

The power spectral density shall be no greater than +8 dBm per any 3 kHz band.

Results are shown in the table and figures below. Results are corrected by adding 0.2 dB to the measured value to account for the cable loss. All are less than +8 dBm per 3 kHz band.

Table 14. Power Spectral Density for Low, Mid and High Bands.

Frequency (MHz)	Test Data (dBm)	Results (dBm/3 kHz)	FCC Limit (dBm/3 kHz)
Low-2405	6.47	6.67	8.0
Mid-2440	5.56	5.76	8.0
High- (14) 2475	3.75	3.95	8.0
High- (15) 2480	-26.04	-25.84	8.0

Tester Signature: Daniel Aparaschivei Name: Daniel Aparaschivei

2 Test and Measurements (Cont'd)

2.15 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

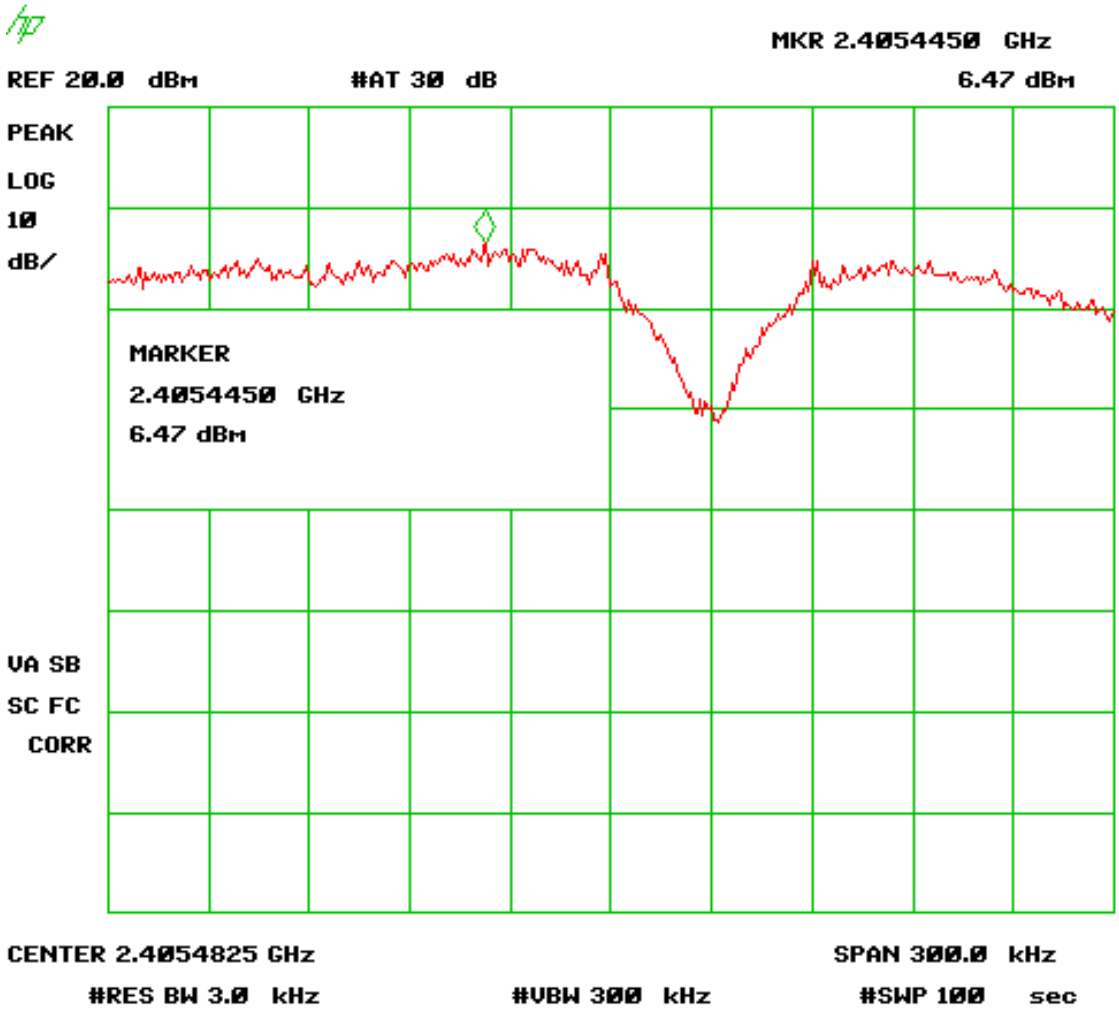


Figure 26. Peak Power Spectral Density - Part 15.247 (e) - Low Channel

2 Test and Measurements (Cont'd)

2.15 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

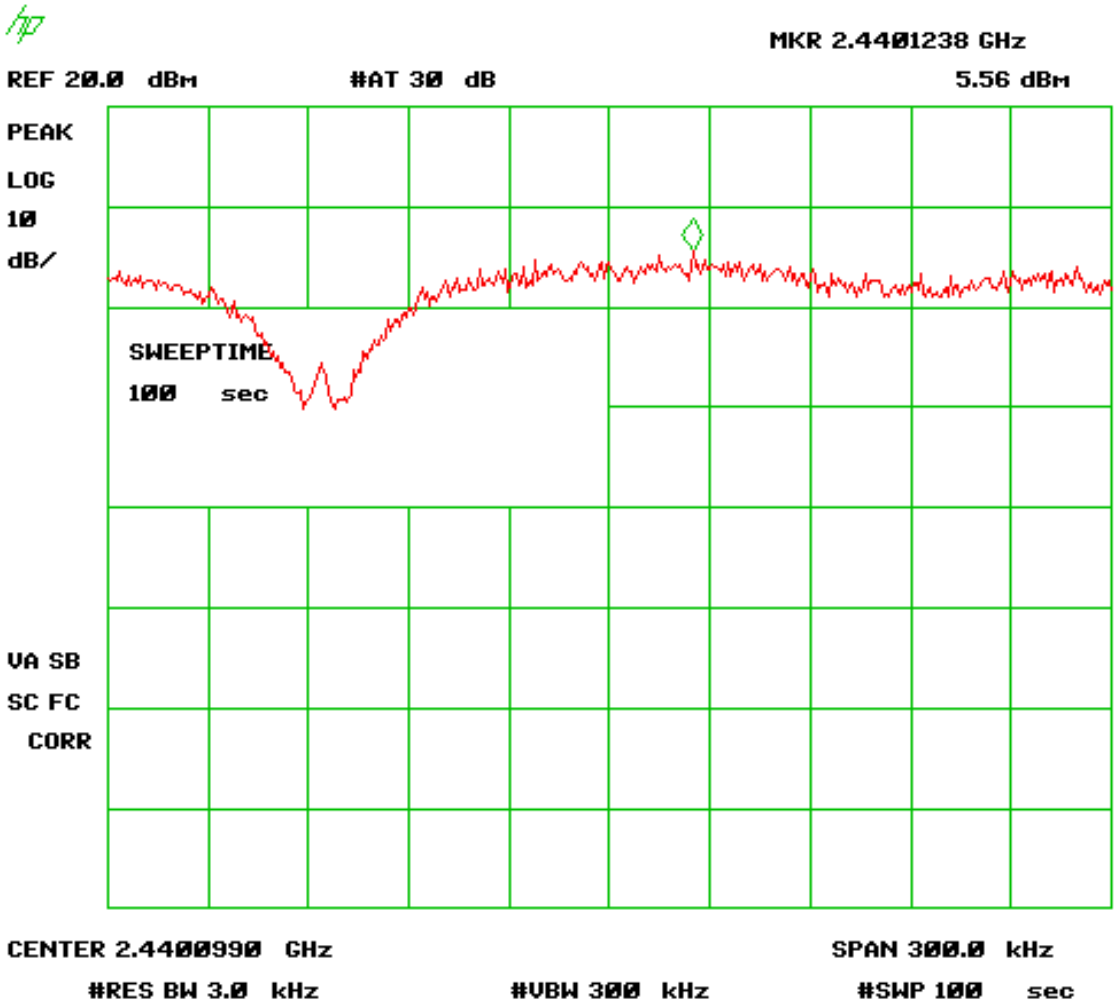


Figure 27 - Power Spectral Density - Part 15.247 (e) - Mid Channel

2 Test and Measurements (Cont'd)

2.15 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

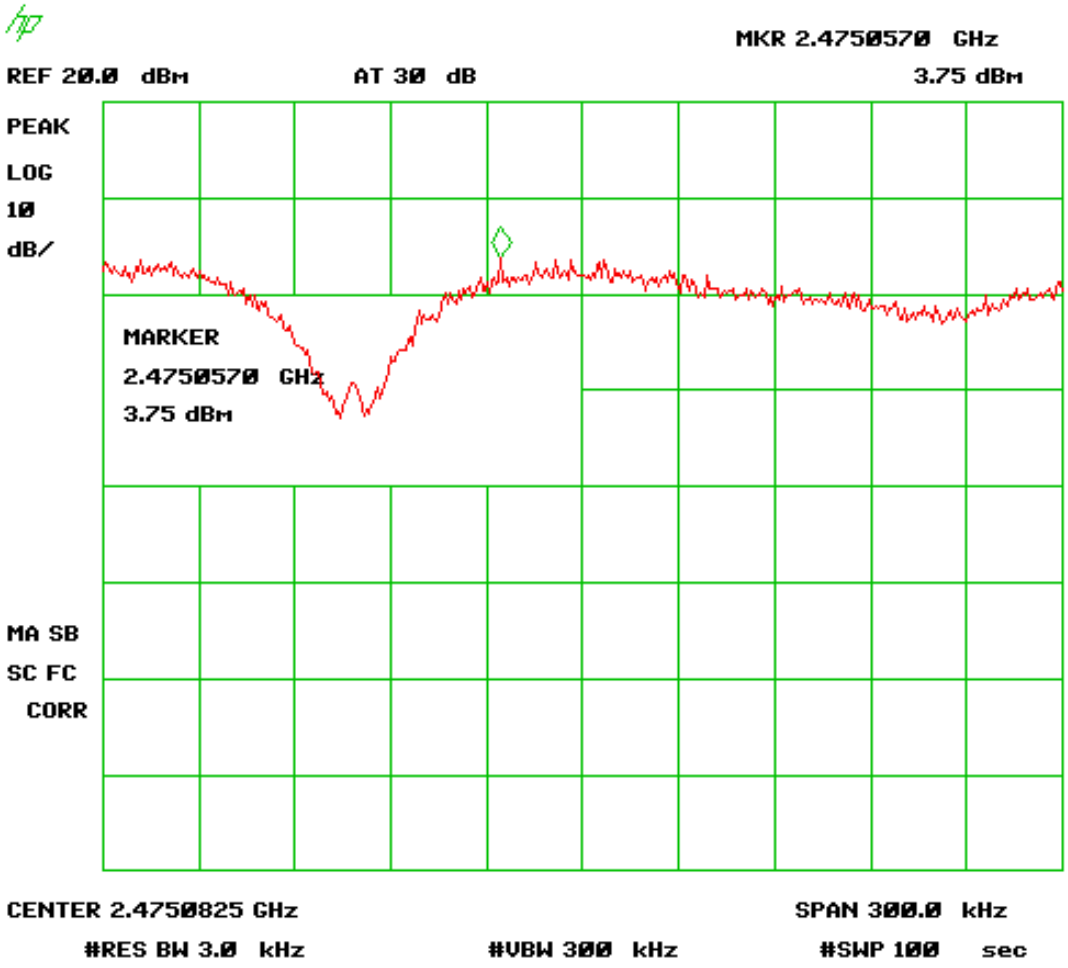


Figure 28 - Peak Power Spectral Density - Part 15.247 (e) - High Channel 14

2 Test and Measurements (Cont'd)

2.15 Power Spectral Density (CFR 15.247(e)) (IC RSS 210 A8.5)

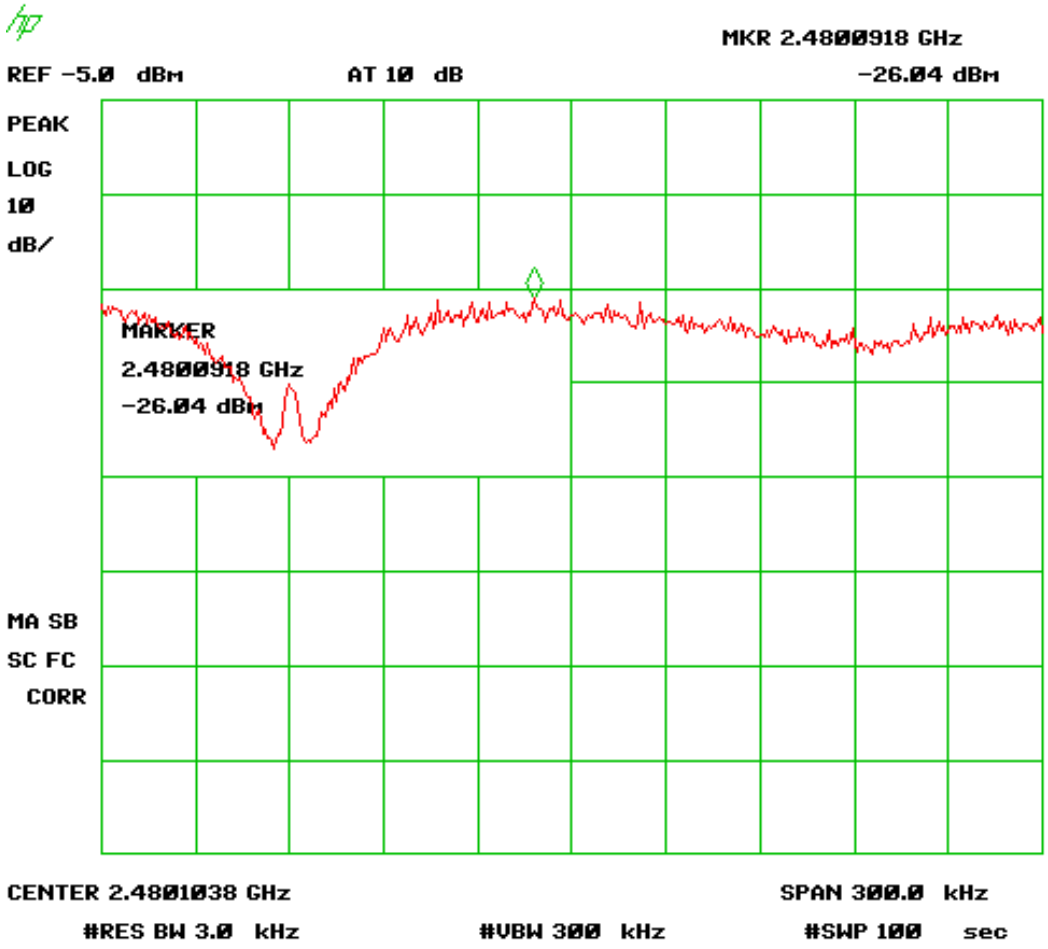


Figure 29 - Peak Power Spectral Density - Part 15.247 (e) - High Channel 15

2 Test and Measurements (Cont'd)

2.16 Band Edge Measurements – (CFR 15.247 (d))

Band Edge measurements were made for the EUT operating first on the Low Channel and then on the High Channel. Conducted measurements were performed to demonstrate compliance with the requirement of 15.247(d) that all emissions be attenuated by at least 20 dB outside the band. Radiated measurements were performed at the upper band edge to demonstrate compliance with the radiated emission limits of 15.209 for signals that fall within the restricted bands as defined in section 15.205. Conducted measurements were performed with RBW = 100 kHz, while radiated measurements were performed with a minimum RBW = 1 MHz. In all cases, the VBW was set ≥ RBW.

Using the "Marker-Delta" method for radiated band edge, the emission of greatest magnitude up to two standard bandwidths (~3 MHz) outside of the band was marked, and then a delta measurement between that emission and the peak of the fundamental emission was taken. That delta value was subtracted from the value of the fundamental frequency of the highest operating channel to compute the field strength.

2.16.1 Lower Band Edge (Conducted Measurement)

With the transmitter set to its lowest operating channel, the signal level at 2.400 GHz, the lower band edge, is more than 20 dB down from the peak per the requirements of 15.247(d). That level is marked by the "Display Line" on the graph; the actual level of attenuation is measured by the delta marker as 41.9 dB down. The conducted measurement, compared to the radiated measurements, was worse case, and so the conducted measurement has been selected for illustration in Figure 43 below.

2.16.2 Upper Band Edge (Radiated Measurement)

The transmitter was set to its highest channel of operation, and its fundamental emission was maximized and measured for both antenna configurations. The marker-delta method was then applied to the largest spurious emission of the two occurring outside the band edge, shown in the figures below.

Compliance was demonstrated on both Channel 14 and Channel 15 for both antennas. Channel 14 operates at full power, while Channel 15 will operate at a reduced power. Both channels comply in these configurations. Using peak data from Table 8 above and the raw values from the images below:

Peak Results: Pass Margin = Limit (dBuV/m) – [Field Strength (dBuV/m) – delta(dB)]

Ch14 Pass Margin = 74 – (116.1 – 45.22) = 3.12 dB
Ch15 Pass Margin = 74 – (87.95 – 45.22) = 31.0 dB

2.16.2.1 Average Limits

The limit for the average value of radiated emissions in a Restricted Band is 54 dBuV/m. The EUT passes the average limit requirements for both Channels 14 and 15 for both antennas. The results from the worst-case antenna, Antenna 2, are reported below.

2.16.2.1 a) Channel 14 Average Results:

There were no average emissions detected within 20 dB of the 54 dBuV/m limit above the band edge.

2.16.2.1 b) Channel 15 Average Results:

As shown in Figure 47 above, the raw, measured field strength using a video-averaging technique at 2483.5 MHz (RBW = 1 MHz, VBW = 10 Hz) is 59.3 dBuV. After correcting for cable loss, preamp gain, and the duty cycle, the result is as follows:

Result = V_{SA}(dBuV) + [Cable Loss(db) + Antenna Factor (dB/m) – Amp Gain (dB)] + Duty Cycle(dB)

= 59.3 + [-4.61] + (-7.42) = 47.23 dBuV/m

Ch15 Pass Margin = 54 – (47.23) = 6.8 dB

Tester Signature: Daniel Aparaschivei Name: Daniel Aparaschivei

2 Test and Measurements (Cont'd)

2.16 Band-Edge Measurements (Cont'd)

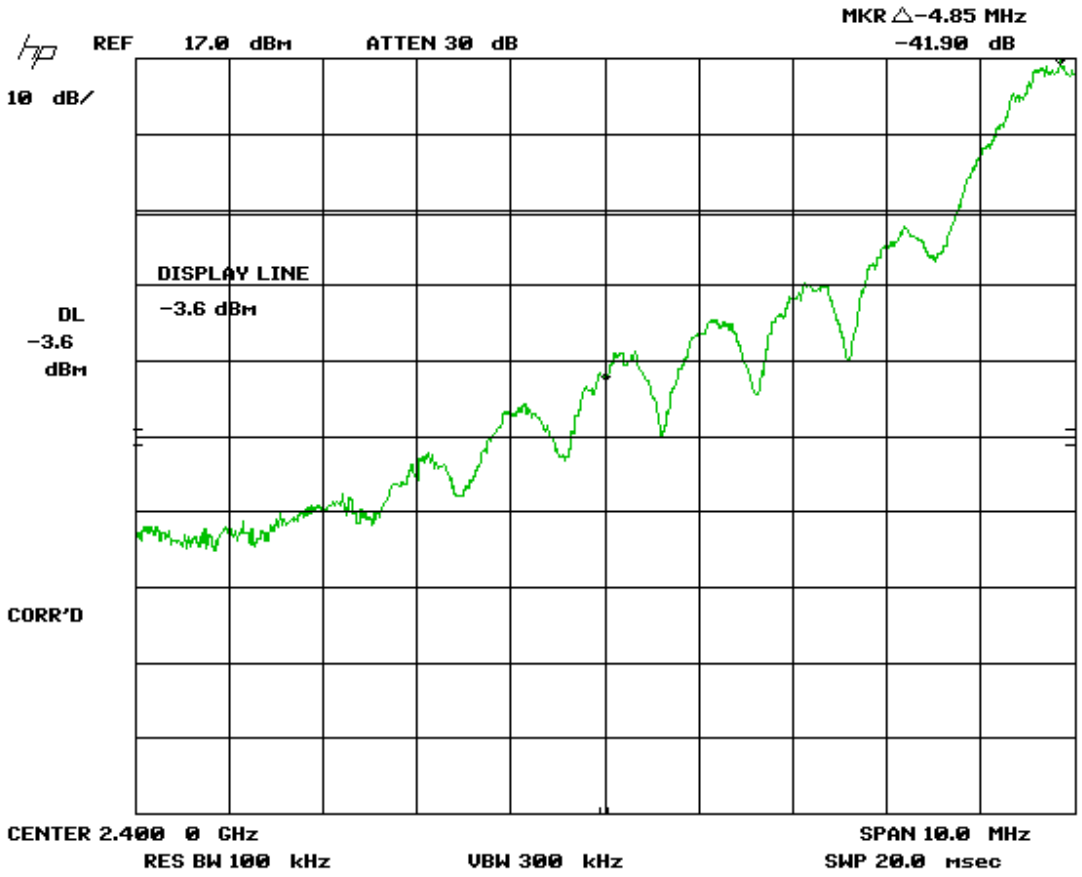


Figure 30. Conducted Band Edge Compliance – Low Channel

2 Test and Measurements (Cont'd)

2.16 Band Edge Measurements (Cont'd)

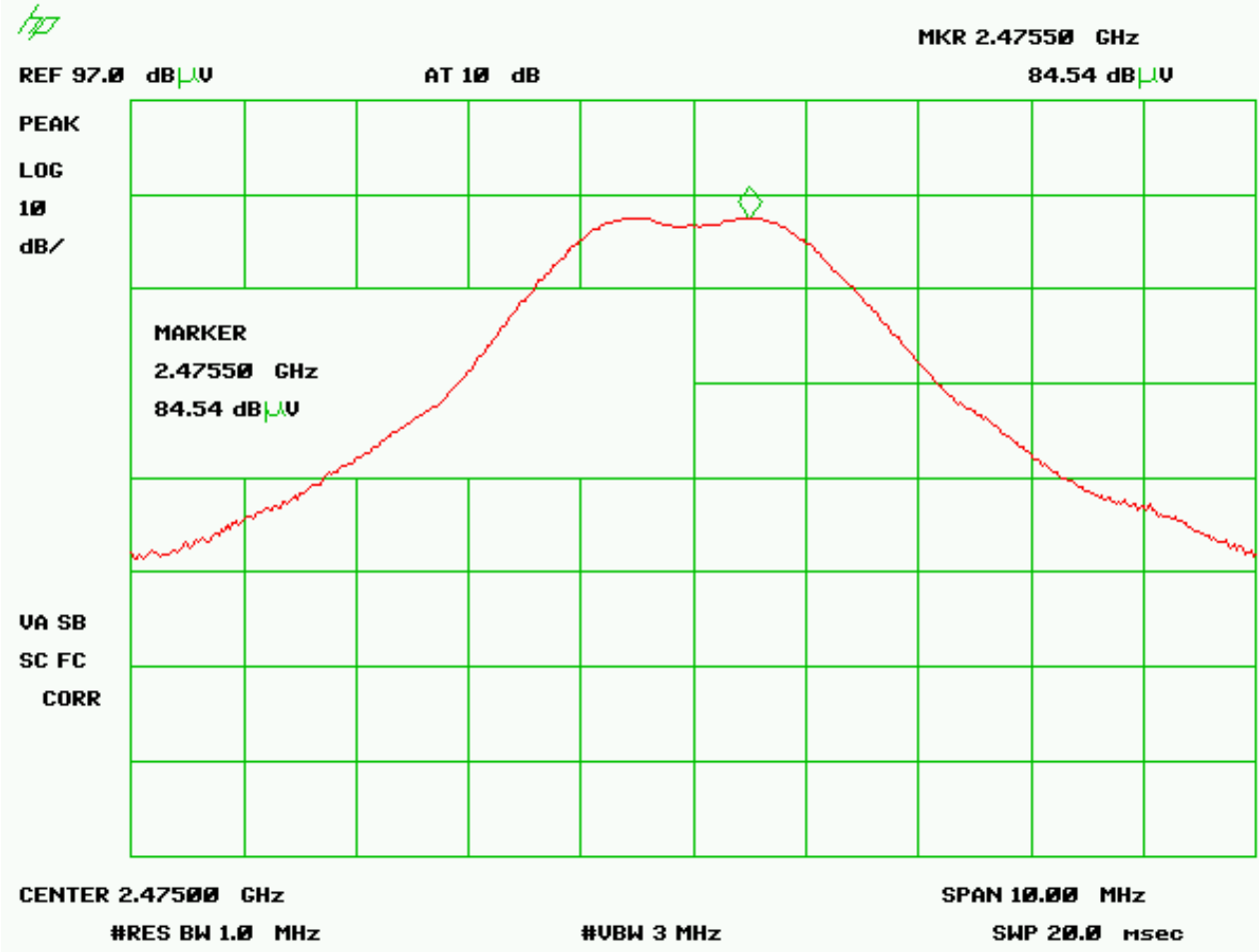


Figure 31. Radiated Band Edge Compliance - 15.247 (d) - Fundamental, Channel 14, Antenna 1

2 Test and Measurements (Cont'd)

2.16 Band Edge Measurements (Cont'd)

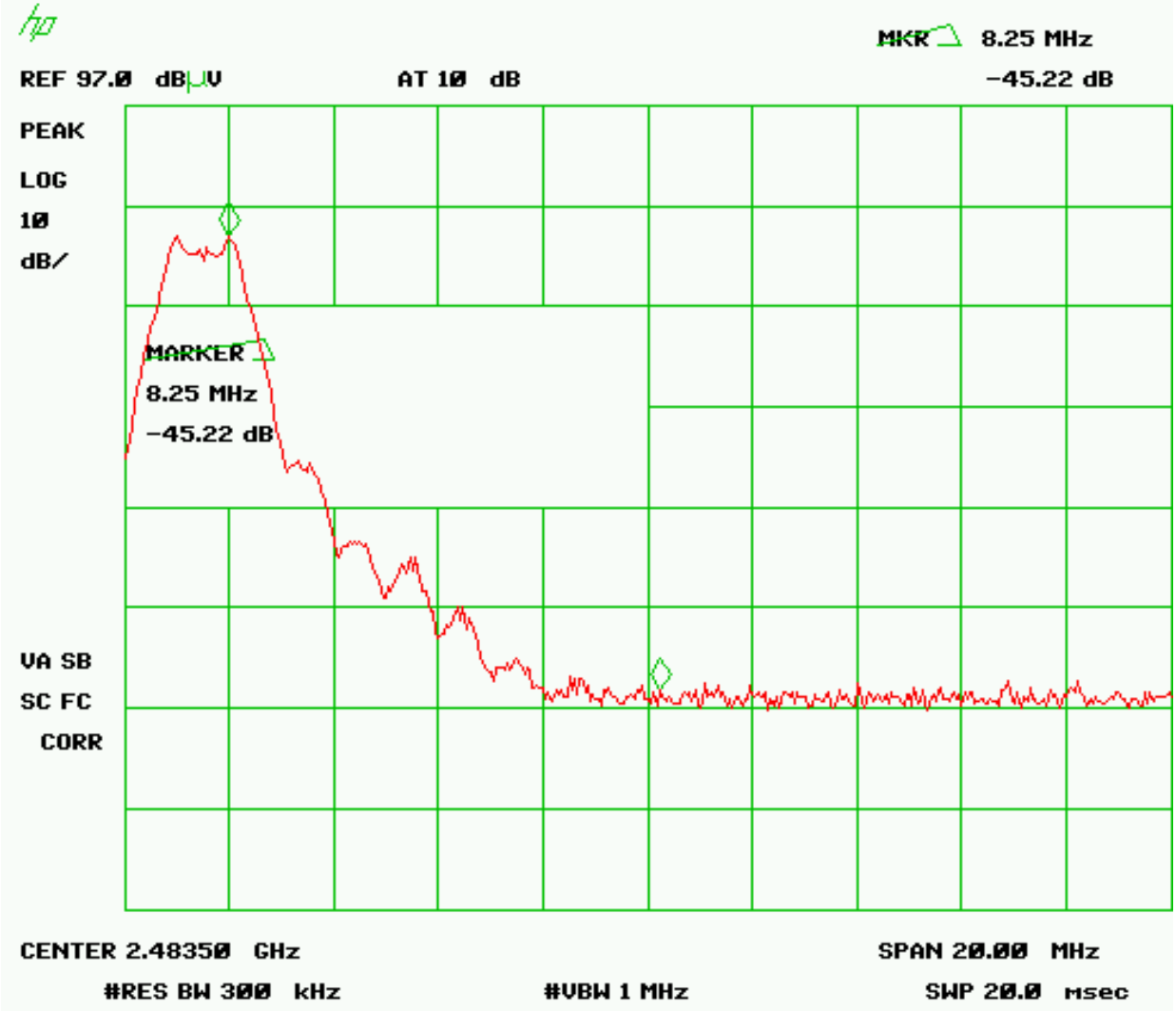


Figure 32 - Radiated Band Edge Compliance - 15.247 (d) - Fundamental, Channel 14 – Marker Delta, Antenna 1

2 Test and Measurements (Cont'd)

2.16 Band Edge Measurements (Cont'd)

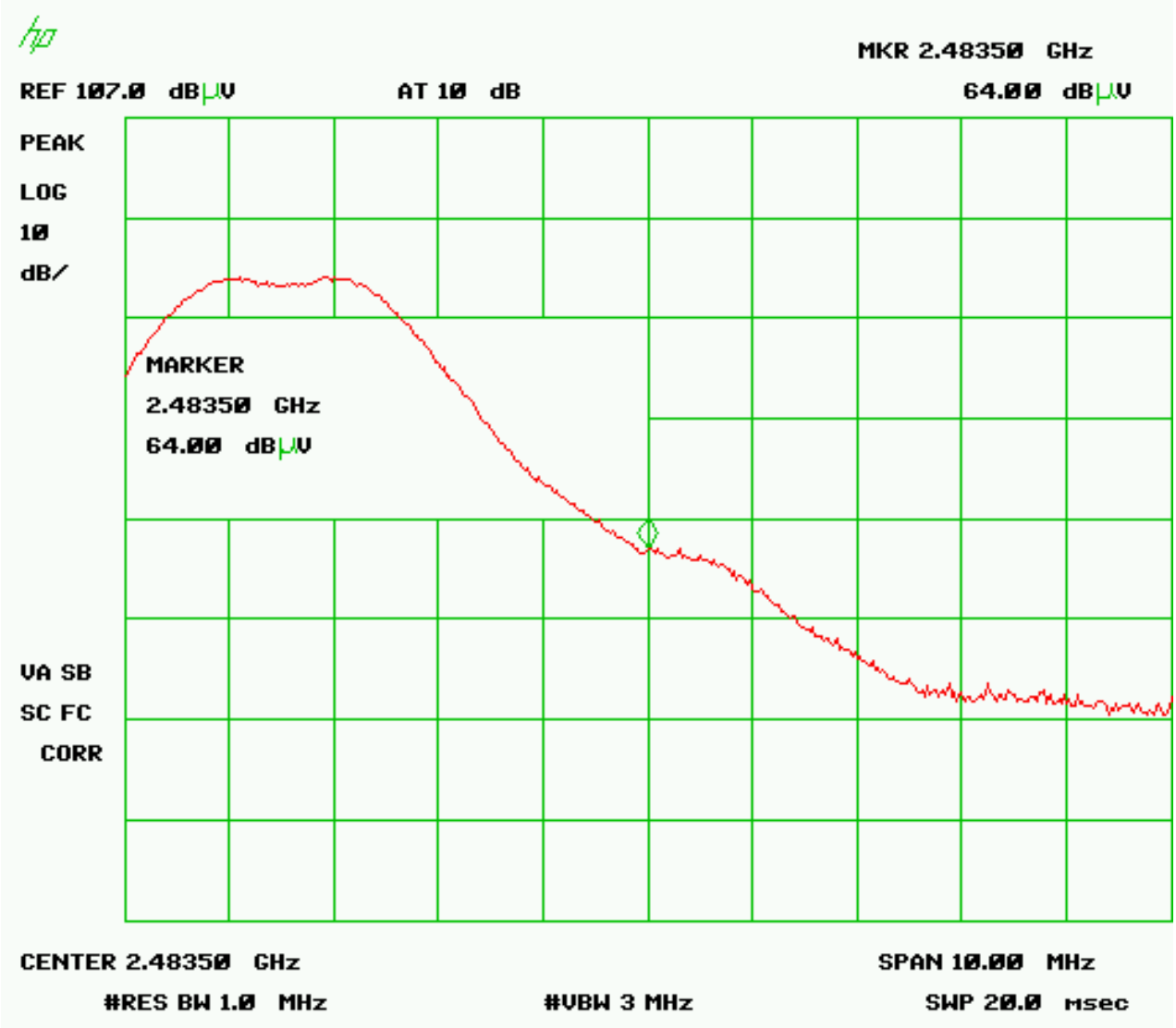


Figure 33 - Radiated Band Edge Compliance - 15.247 (d) - Fundamental, Peak, Channel 15 (w/preamp), Antenna 2

2 Test and Measurements (Cont'd)

2.16 Band Edge Measurements (Cont'd)

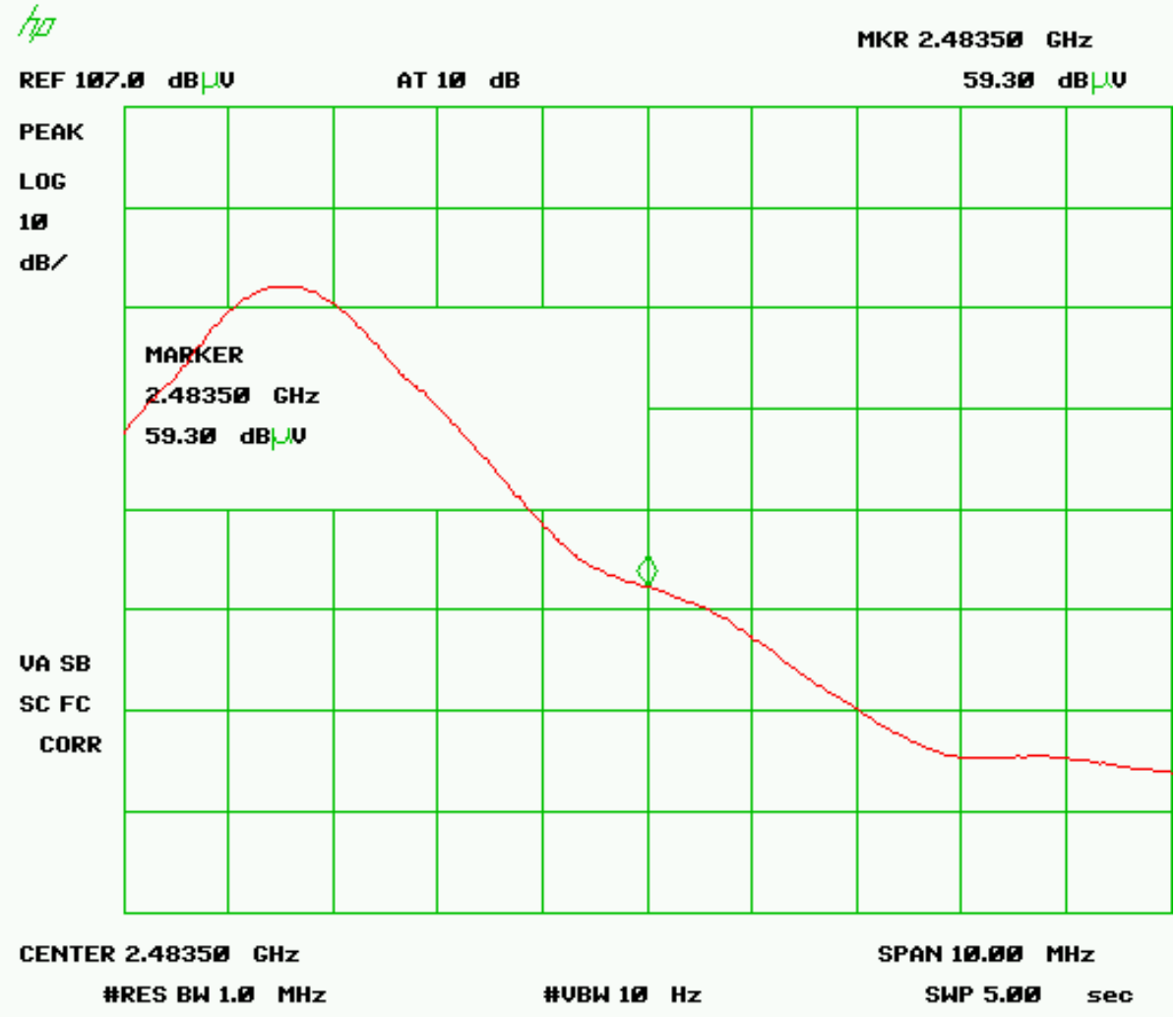


Figure 34 - Radiated Band Edge Compliance - 15.247 (d) - Fundamental, Avg. Channel 15 (w/pre-amp), Antenna 2

2 Test and Measurements (Cont'd)

2.17 Maximum Public Exposure to RF (MPE) CFR 15.247 (i)

The maximum exposure level to the public from the RF power of the EUT shall not exceed a power density, **S**, of 1 mW/cm^2 at a distance, d, of 20 cm from the EUT.

Therefore, for :

Peak Power (Watts) = 0.09268 (from Table 13, herein)
Gain of Transmit Antenna = 2.0 dB_i = 1.58, numeric (from Table 4, herein)
d = Distance = 20 cm = 0.2 m

S = $(PG/ 4\pi d^2)$ = EIRP/4A = 0.09268(1.58)/4*π*0.2*0.2
=0.146/0.502 = 0.291 w/m^2
= $(0.291W/m^2)(1m^2/W)(0.1 mW/cm^2)$
= 0.0291 mW/cm^2

which is << less than 1 mW/cm^2

5 Photographs of the Tested EUT

The following photos are attached:

Photograph 1. Top of EUT with Shield
Photograph 2. Top of EUT, Shield Removed
Photograph 3. Bottom of EUT, Shield Removed