Marker-Delta Method

In making radiated band-edge measurements, there can be a problem obtaining meaningful data since a measurement instrument that is tuned to a band-edge frequency may also capture some in-band signals when using the resolution bandwidth (RBW) required by measurement procedure ANSI *C63.4-1992* (hereafter *C63.4).* In an effort to compensate for this problem, we have developed the following technique for determining band-edge compliance.

STEP 1) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function required by *C63.4* and our Rules for the frequency being measured. For example, for a device operating in the 902-928 MHz band under Section 15.249, use a 120 kHz RBW with a CISPR QP detector (a peak detector with 100 kHz RBW may alternatively be used). For transmitters operating above 1 GHz, use a 1 MHz RBW, a 1 MHz VBW, and a peak detector (as required by Section 15.35). Repeat the measurement with an average detector (i.e., 1 MHz RBW with 10 Hz VBW). Note: For pulsed emissions, other factors must be included. Please contact the FCC Lab for details if the emission under investigation is pulsed. Also, please note that radiated measurements o~ the fundamental emission of a transmitter operating under 15.247 are not normally req' .. l1red, but they are necessary in connection with this procedure.

STEP 2) Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission (i .e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the bandedge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band-edge relative to the highest fundamental emission level.

STEP 3) Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge compliance as required by Section 15.205.

STEP 4) The above "delta" measurement technique may be used for measuring emissions that are up to two "standard" bandwidths away from the band-edge, where a "standard" bandwidth is the bandwidth specified by *C63.* 4 for the frequency being measured. For example, for band-edge measurements in the restricted band that begins at 2483.5 MHz, *C63.4* specifies a measurement bandwidth of at least **1** MHz. Therefore you may use the "delta" technique for measuring emissions up to 2 MHz removed from the band-edge. Radiated emissions that are removed by more than two ~standard" bandwidths must be measured in the conventional manner.

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EMISSIONS (TX1)
SAND NETWORK SYSTEMS, OEM TRX
2007-FEB-14, 15:21, WED

TUNED MHz	EMISSION MHz	LEVEL dBuV/m	@m	C.F. dB	CALC. dBuV/m	@m	LIMIT dBuV/m	MARG dB	FLAG
0.000	2478.500000	36.2	3	35.8	72.0	3	150.0	-78.0	A-
0.000	2478.833333	80.5	3	35.8	116.3	3	150.0	-33.7	P-
0.000	2483.500000	14.5	3	35.7	50.2	3	150.0	-99.8	AR
0.000	2483.500000	56.7	3	35.7	92.4	3	150.0	-57.6	PR

Duty cycle = 20 log (on time / period)
= 20 log (300/1210) for sand network
= -12.1 db

for data @ 2483.5 Band Edge

92.4 - 12.1 = 80.3 db peak

50.2 - 12.1 = 38.1 db average

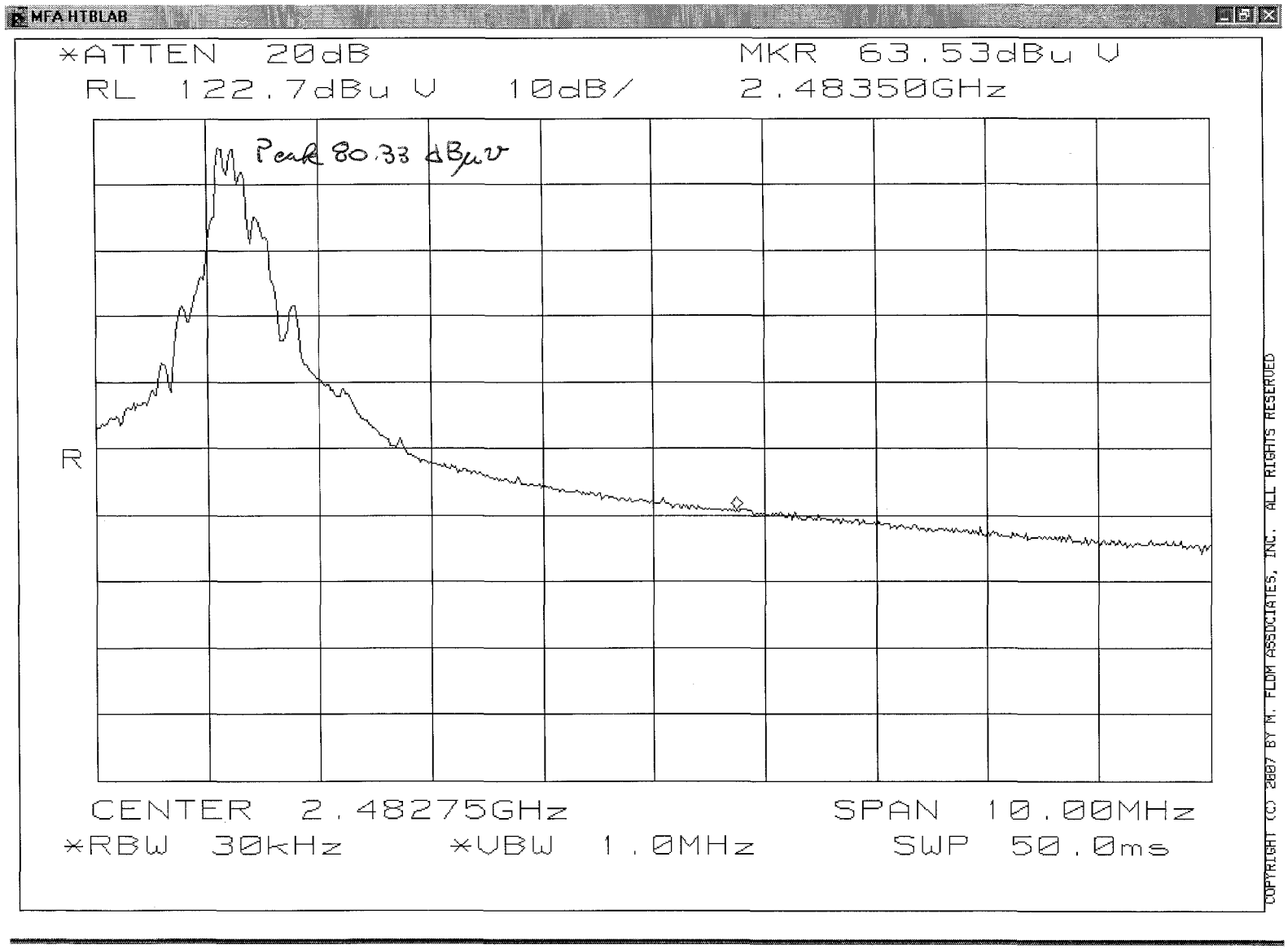
Using Marker - Delta method

Step ① 80.3 peak
38.1 avg

Step ② from graph the delta is 16.8 db

Step ③ 80.3 - 16.8 = 63.5 peak limit 74.0 db
38.1 - 16.8 = 21.3 average

Conclusion:
With marker-delta method and taking into account the duty cycle of the EUT, the unit PASSES the upper Band Edge/Restricted Band limits



step ②

This drops 16.8 dbµV from peak to 2483.5 Band edge

Δ = 16.8 dBµV