Tx. Spurious BLE 1M 2480MHz Ref

Tx. Spurious BLE 1M 2480MHz Emission

Tx. Spurious BLE 2M 2402MHz Ref

Tx. Spurious BLE 2M 2402MHz Emission

Tx. Spurious BLE 2M 2440MHz Ref

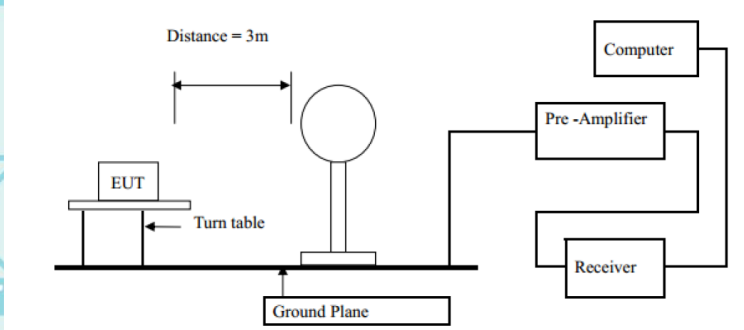
Tx. Spurious BLE 2M 2440MHz Emission

Tx. Spurious BLE 2M 2480MHz Ref

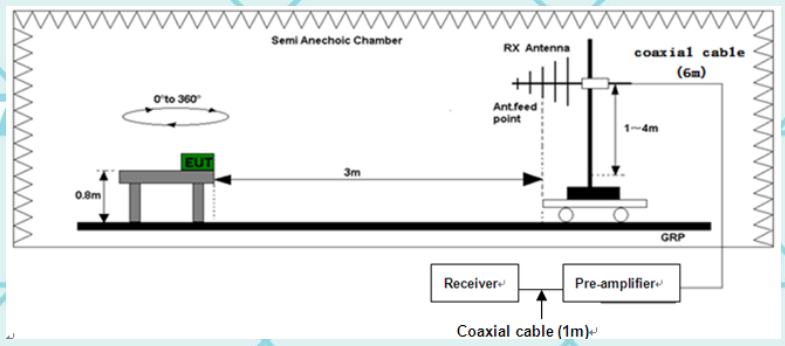
Tx. Spurious BLE 2M 2480MHz Emission

6.7. Radiated Spurious Emission Measurement

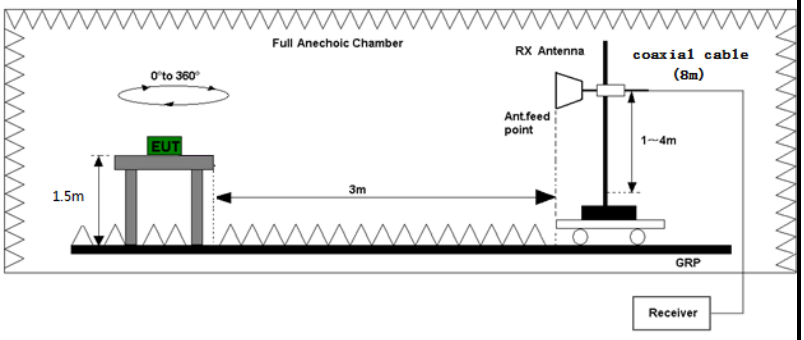
6.7.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2020</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Refer to item 4.1</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Field Strength (microvolts/meter)</th><th>Measurement Distance (meters)</th></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705-30</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
<table>
<tr><th>Frequency</th><th>Field Strength (microvolts/meter)</th><th>Measurement Distance (meters)</th><th>Detector</th></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>3</td><td>Average</td></tr>
<tr><td>5000</td><td>3</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions below 30MHz
 

30MHz to 1GHz</td></tr>
</table>



Above 1GHz



Test Procedure:

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.1 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
2. Corrected Reading: Antenna Factor + Cable Loss +

	Read Level - Preamp Factor = Level 3. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported. 4. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for f 1 GHz for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Test mode:	Refer to section 4.1 for details
Test results:	PASS

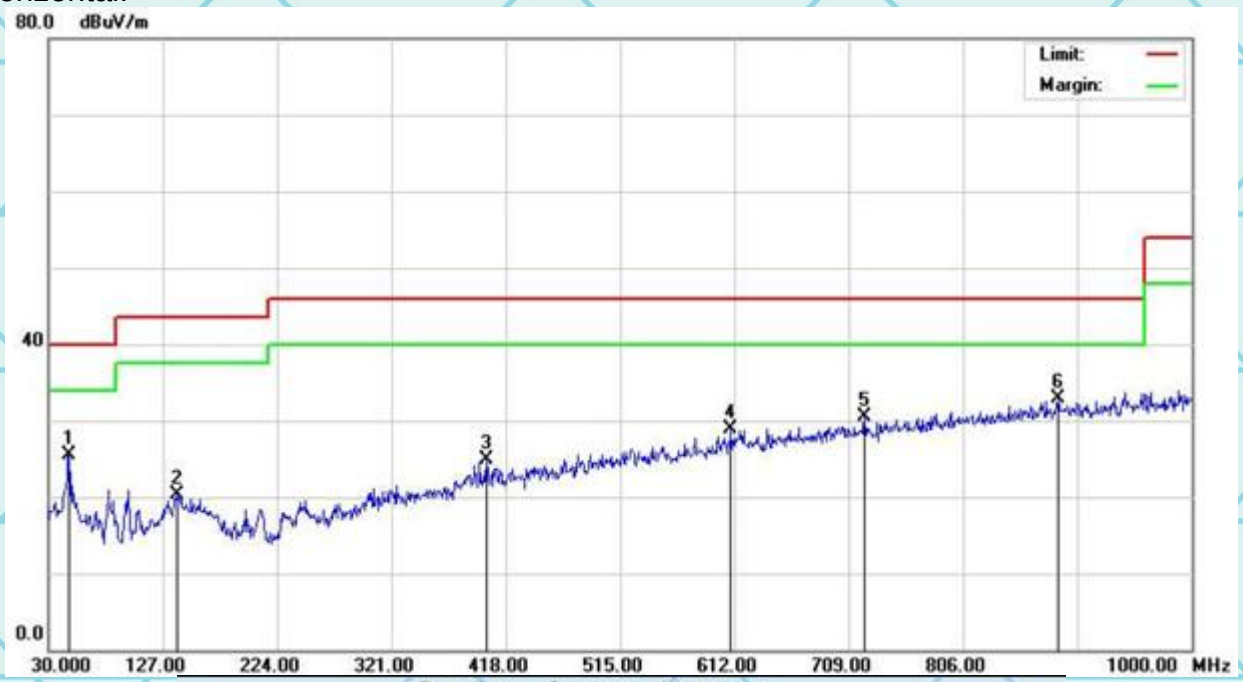
Note: Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading
Corr. Factor (dB) = Attenuation factor + Cable loss
Level (dBμV) = Reading level (dBμV) + Corr. Factor (dB)
Limit (dBμV) = Limit stated in standard
Margin (dB) = Level (dBμV) – Limits (dBμV)

6.7.2. Test Data(Worst case)

Please refer to following diagram for individual

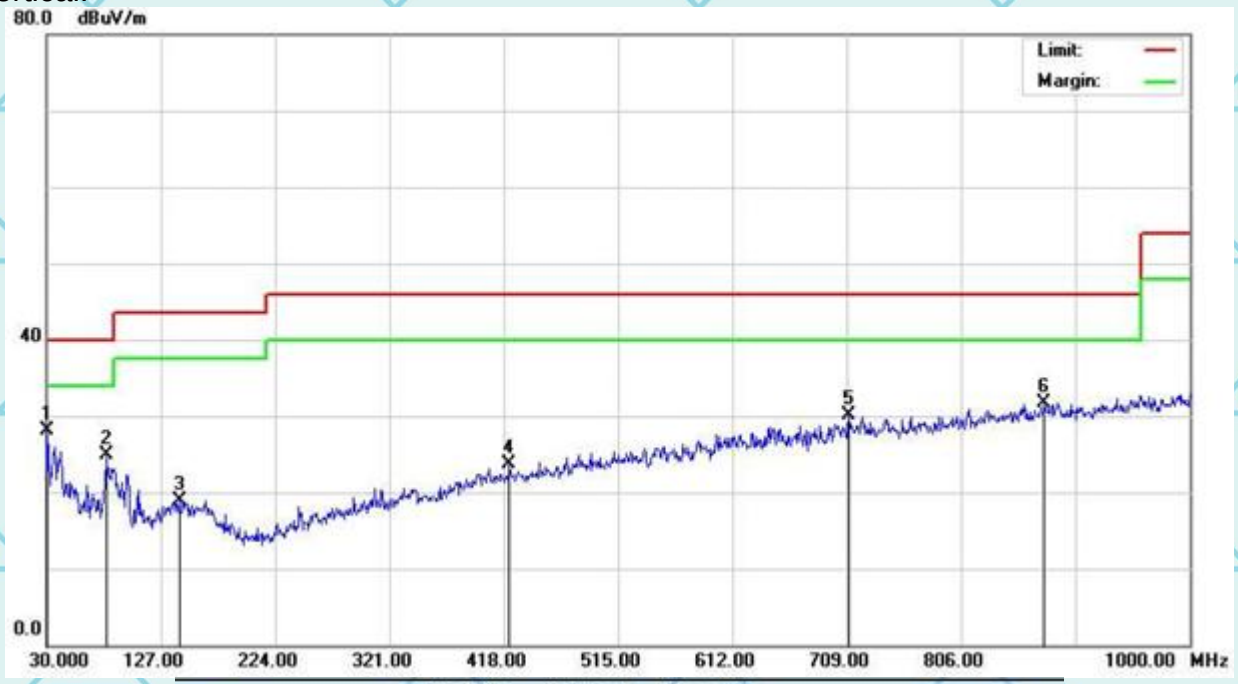
Below 1GHz

The worst mode is BLE1M Low Channel
Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		47.4600	33.26	-7.67	25.59	40.00	-14.41	QP
2		138.6400	27.47	-7.24	20.23	43.50	-23.27	QP
3		401.5100	28.40	-3.50	24.90	46.00	-21.10	QP
4		609.0900	27.28	1.58	28.86	46.00	-17.14	QP
5		722.5800	26.83	3.67	30.50	46.00	-15.50	QP
6	*	886.5100	26.54	6.46	33.00	46.00	-13.00	QP

Vertical:

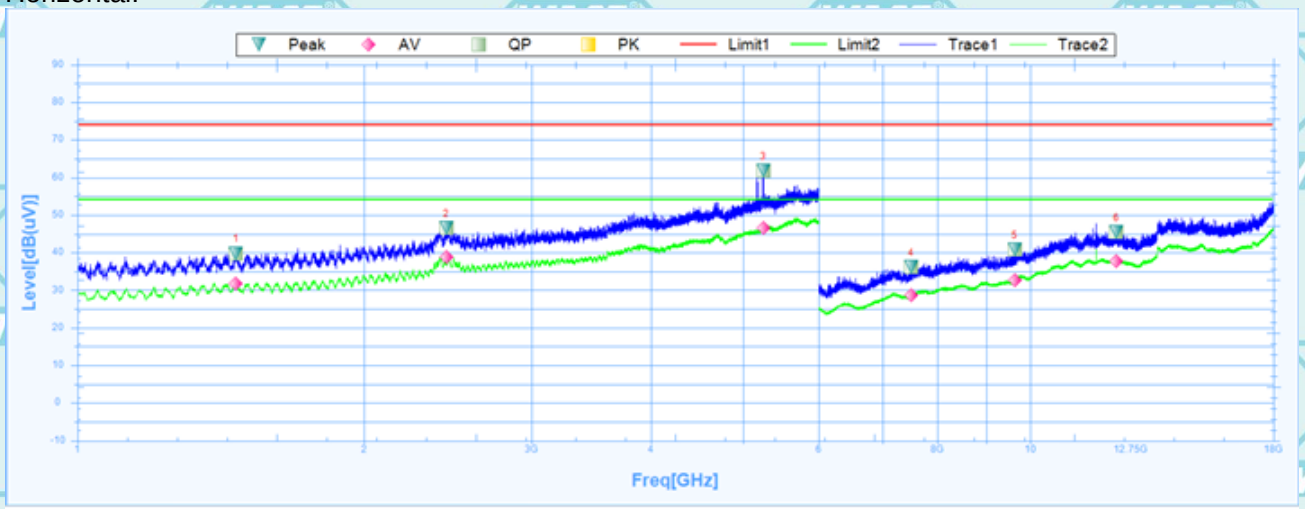


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	30.9700	48.61	-20.52	28.09	40.00	-11.91	QP
2		80.4400	45.01	-20.19	24.82	40.00	-15.18	QP
3		142.5200	38.88	-19.98	18.90	43.50	-24.60	QP
4		422.8500	42.32	-18.65	23.67	46.00	-22.33	QP
5		710.9400	47.26	-17.14	30.12	46.00	-15.88	QP
6		876.8100	47.88	-16.13	31.75	46.00	-14.25	QP

Note1:
Freq. = Emission frequency in MHz
Reading level (dBµV) = Receiver reading
Corr. Factor (dB) = Antenna factor + Cable loss - Amplifier factor.
Measurement (dBµV) = Reading level (dBµV) + Corr. Factor (dB)
Limit (dBµV) = Limit stated in standard
Margin (dB) = Measurement (dBµV) – Limits (dBµV)

Above 1GHz

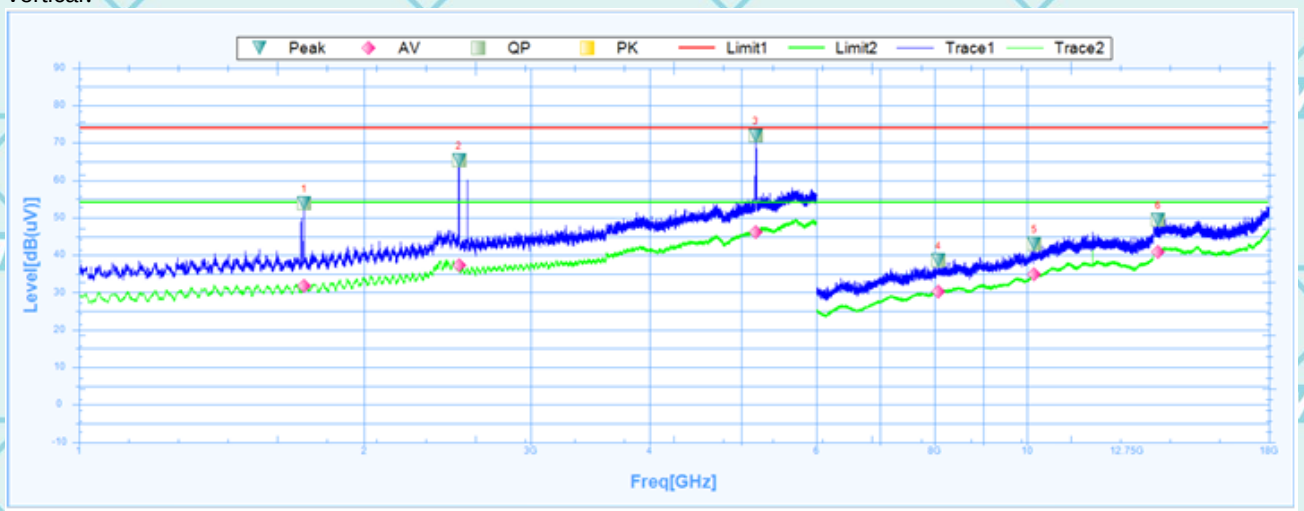
Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.
Note 2: The spurious above 18G is noise only, do not show on the report.
Note 3 BLE 1M and 2M both tested the report and only recorded the worst-case scenario 1M
Low channel: 2402MHz
Horizontal:



Susputed Data List

NO.	Freq. [MHz]	Level [dB(uV)]	Factor [dB]	Reading [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
1	1467.5000	39.81	25.03	14.78	74	-34.19	195.4	Horizontal	PK	Pass
1	1467.5000	31.72	25.03	6.69	54	-22.28	195.4	Horizontal	AV	Pass
2	2439.3750	46.48	27.39	19.09	74	-27.52	228.8	Horizontal	PK	Pass
2	2439.3750	38.83	27.39	11.44	54	-15.17	228.8	Horizontal	AV	Pass
3	5248.1250	61.73	31.8	29.93	74	-12.27	360	Horizontal	PK	Pass
3	5248.1250	46.5	31.8	14.7	54	-7.5	360	Horizontal	AV	Pass
4	7500.0000	36.24	7.53	28.71	74	-37.76	150.3	Horizontal	PK	Pass
4	7500.0000	28.61	7.53	21.08	54	-25.39	150.3	Horizontal	AV	Pass
5	9636.0000	40.78	11.47	29.31	74	-33.22	57	Horizontal	PK	Pass
5	9636.0000	32.63	11.47	21.16	54	-21.37	57	Horizontal	AV	Pass
6	12318.0000	45.46	16.48	28.98	74	-28.54	335.6	Horizontal	PK	Pass
6	12318.0000	37.78	16.48	21.3	54	-16.22	335.6	Horizontal	AV	Pass

Vertical:

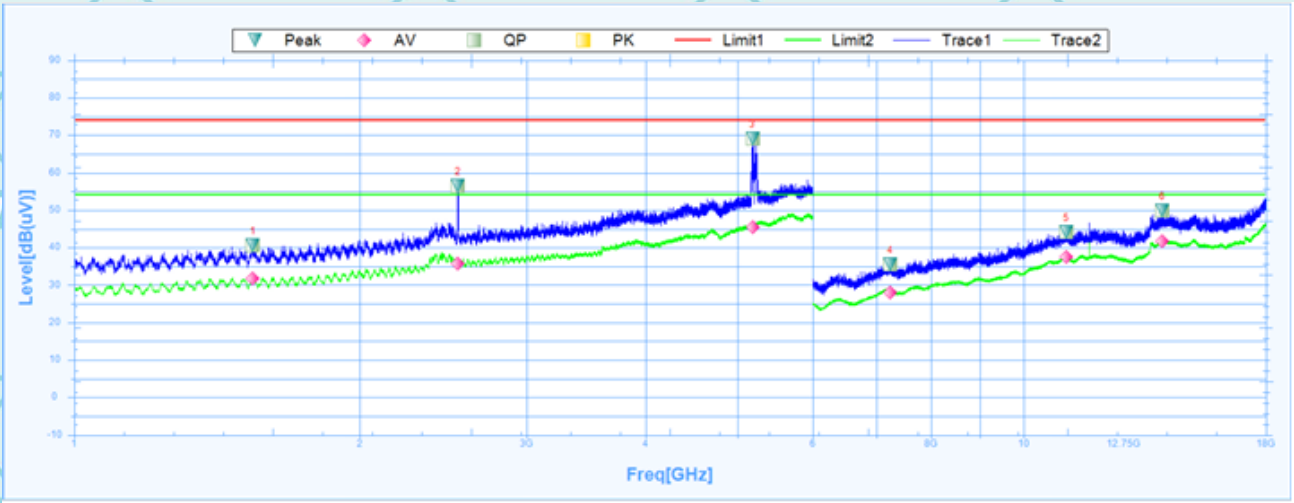


Susputed Data List

NO.	Freq. [MHz]	Level [dB(uV)]	Factor [dB]	Reading [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
1	1728.1250	53.79	24.96	28.83	74	-20.21	51.9	Vertical	PK	Pass
1	1728.1250	31.79	24.96	6.83	54	-22.21	51.9	Vertical	AV	Pass
2	2517.5000	65.35	27.62	37.73	74	-8.65	126	Vertical	PK	Pass
2	2517.5000	37.19	27.62	9.57	54	-16.81	126	Vertical	AV	Pass
3	5177.5000	71.86	31.74	40.12	74	-2.14	14.2	Vertical	PK	Pass
3	5177.5000	46.21	31.74	14.47	54	-7.79	14.2	Vertical	AV	Pass
4	8068.5000	38.53	8.41	30.12	74	-35.47	265	Vertical	PK	Pass
4	8068.5000	30.28	8.41	21.87	54	-23.72	265	Vertical	AV	Pass
5	10188.0000	42.94	12.93	30.01	74	-31.06	163.5	Vertical	PK	Pass
5	10188.0000	34.94	12.93	22.01	54	-19.06	163.5	Vertical	AV	Pass
6	13761.0000	49.33	18.43	30.9	74	-24.67	304.6	Vertical	PK	Pass
6	13761.0000	40.76	18.43	22.33	54	-13.24	304.6	Vertical	AV	Pass

Middle channel: 2440MHz

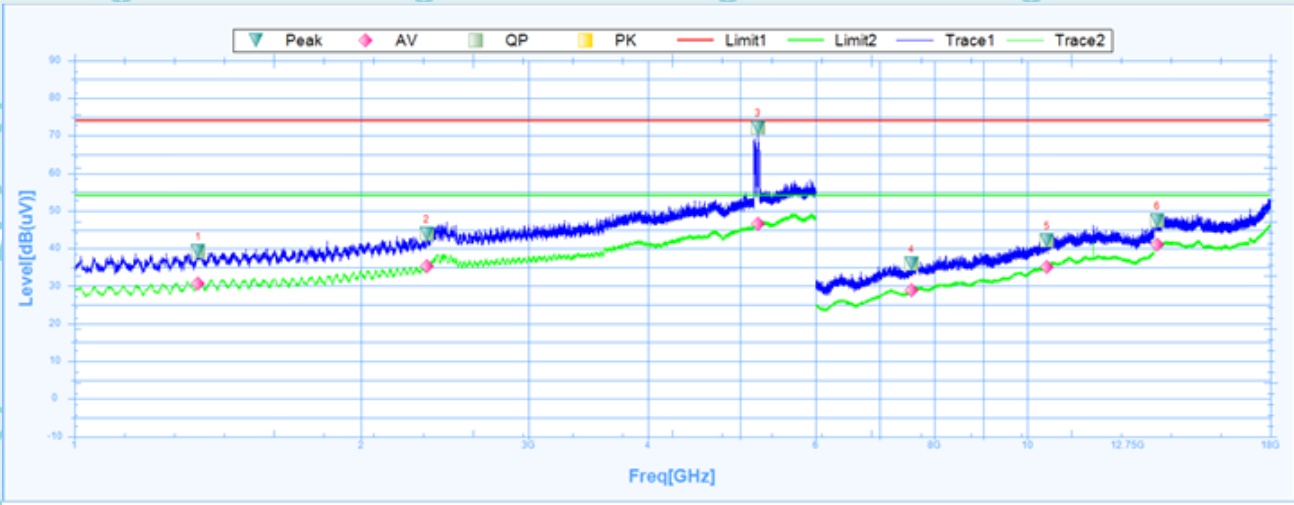
Horizontal:



Susputed Data List

NO.	Freq. [MHz]	Level [dB(uV)]	Factor [dB]	Reading [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
1	1543.1250	40.65	24.96	15.69	74	-33.35	0.5	Horizontal	PK	Pass
1	1543.1250	31.69	24.96	6.73	54	-22.31	0.5	Horizontal	AV	Pass
2	2537.5000	56.42	27.64	28.78	74	-17.58	285	Horizontal	PK	Pass
2	2537.5000	35.7	27.64	8.06	54	-18.3	285	Horizontal	AV	Pass
3	5183.1250	69.17	31.75	37.42	74	-4.83	299.4	Horizontal	PK	Pass
3	5183.1250	45.49	31.75	13.74	54	-8.51	299.4	Horizontal	AV	Pass
4	7240.5000	35.49	6.95	28.54	74	-38.51	274.6	Horizontal	PK	Pass
4	7240.5000	27.99	6.95	21.04	54	-26.01	274.6	Horizontal	AV	Pass
5	11095.5000	44.17	15.88	28.29	74	-29.83	7	Horizontal	PK	Pass
5	11095.5000	37.57	15.88	21.69	54	-16.43	7	Horizontal	AV	Pass
6	14007.0000	49.87	19.12	30.75	74	-24.13	358.8	Horizontal	PK	Pass
6	14007.0000	41.66	19.12	22.54	54	-12.34	358.8	Horizontal	AV	Pass

Vertical:

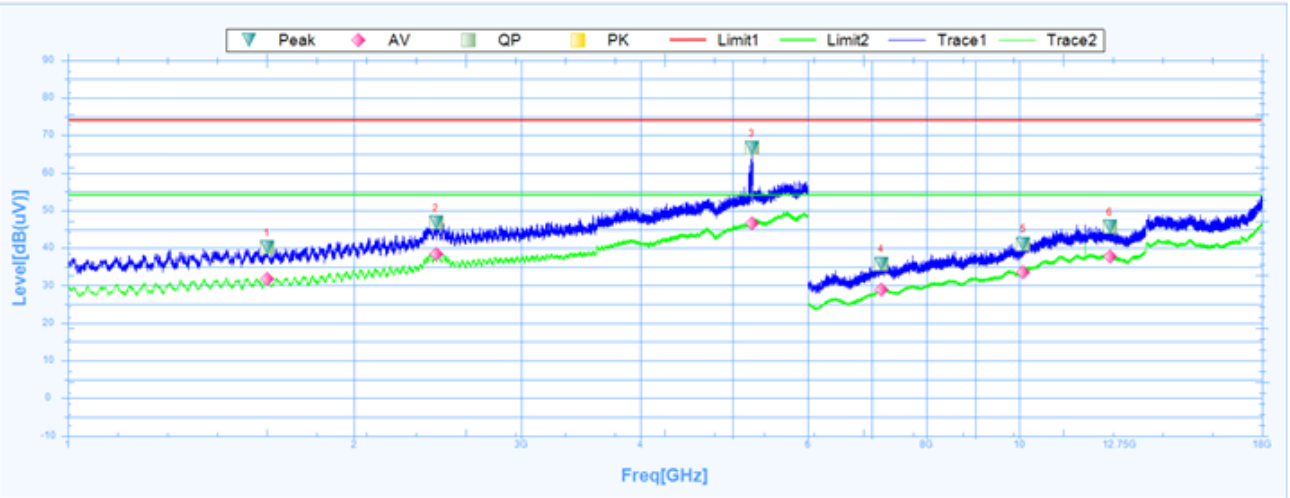


Susputed Data List

NO.	Freq. [MHz]	Level [dB(uV)]	Factor [dB]	Reading [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
1	1348.7500	39.24	24.92	14.32	74	-34.76	316.2	Vertical	PK	Pass
1	1348.7500	30.69	24.92	5.77	54	-23.31	316.2	Vertical	AV	Pass
2	2343.1250	43.88	27.07	16.81	74	-30.12	259.9	Vertical	PK	Pass
2	2343.1250	35.37	27.07	8.3	54	-18.63	259.9	Vertical	AV	Pass
3	5220.0000	72.26	31.78	40.48	74	-1.74	360.1	Vertical	PK	Pass
3	5220.0000	46.48	31.78	14.7	54	-7.52	360.1	Vertical	AV	Pass
4	7563.0000	35.97	7.77	28.2	74	-38.03	358.2	Vertical	PK	Pass
4	7563.0000	28.8	7.77	21.03	54	-25.2	358.2	Vertical	AV	Pass
5	10495.5000	42.1	13.92	28.18	74	-31.9	208.8	Vertical	PK	Pass
5	10495.5000	35.01	13.92	21.09	54	-18.99	208.8	Vertical	AV	Pass
6	13695.0000	47.51	18.25	29.26	74	-26.49	290.2	Vertical	PK	Pass
6	13695.0000	41	18.25	22.75	54	-13	290.2	Vertical	AV	Pass

High channel: 2480MHz

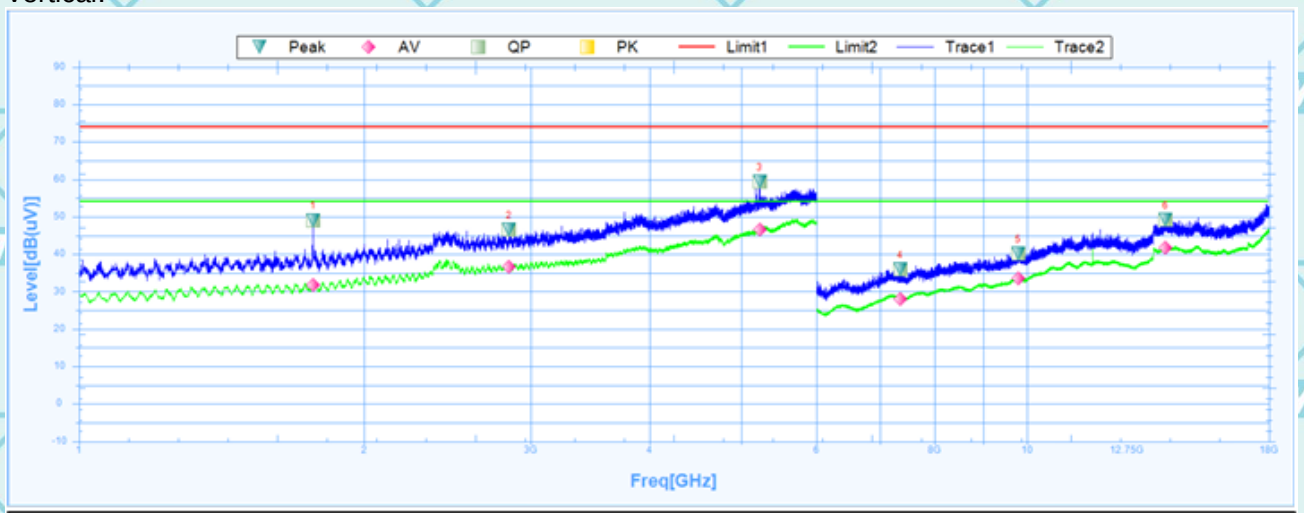
Horizontal:



Susputed Data List

NO.	Freq. [MHz]	Level [dB(uV)]	Factor [dB]	Reading [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
1	1619.3750	40.06	24.91	15.15	74	-33.94	220.4	Horizontal	PK	Pass
1	1619.3750	31.67	24.91	6.76	54	-22.33	220.4	Horizontal	AV	Pass
2	2438.1250	46.8	27.39	19.41	74	-27.2	249.1	Horizontal	PK	Pass
2	2438.1250	38.28	27.39	10.89	54	-15.72	249.1	Horizontal	AV	Pass
3	5236.8750	66.63	31.79	34.84	74	-7.37	118.8	Horizontal	PK	Pass
3	5236.8750	46.59	31.79	14.8	54	-7.41	118.8	Horizontal	AV	Pass
4	7159.5000	35.84	7	28.84	74	-38.16	-0.1	Horizontal	PK	Pass
4	7159.5000	28.83	7	21.83	54	-25.17	-0.1	Horizontal	AV	Pass
5	10104.0000	41.14	12.67	28.47	74	-32.86	153.8	Horizontal	PK	Pass
5	10104.0000	33.46	12.67	20.79	54	-20.54	153.8	Horizontal	AV	Pass
6	12453.0000	45.75	16.46	29.29	74	-28.25	298.5	Horizontal	PK	Pass
6	12453.0000	37.8	16.46	21.34	54	-16.2	298.5	Horizontal	AV	Pass

Vertical:



Susputed Data List

NO.	Freq. [MHz]	Level [dB(uV)]	Factor [dB]	Reading [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
1	1766.2500	49.09	24.98	24.11	74	-24.91	307.8	Vertical	PK	Pass
1	1766.2500	31.86	24.98	6.88	54	-22.14	307.8	Vertical	AV	Pass
2	2843.7500	46.52	28.01	18.51	74	-27.48	320.9	Vertical	PK	Pass
2	2843.7500	36.67	28.01	8.66	54	-17.33	320.9	Vertical	AV	Pass
3	5225.6250	59.32	31.78	27.54	74	-14.68	275.4	Vertical	PK	Pass
3	5225.6250	46.49	31.78	14.71	54	-7.51	275.4	Vertical	AV	Pass
4	7353.0000	35.88	6.99	28.89	74	-38.12	141.9	Vertical	PK	Pass
4	7353.0000	27.93	6.99	20.94	54	-26.07	141.9	Vertical	AV	Pass
5	9790.5000	40.15	11.87	28.28	74	-33.85	359.5	Vertical	PK	Pass
5	9790.5000	33.43	11.87	21.56	54	-20.57	359.5	Vertical	AV	Pass
6	14004.0000	49.22	19.11	30.11	74	-24.78	329.7	Vertical	PK	Pass
6	14004.0000	41.74	19.11	22.63	54	-12.26	329.7	Vertical	AV	Pass

Note:

1. *All emissions not reported were more than 20dB below the specified limit or in the noise floor.*
2. *Emission Level= Reading Level+Probe Factor +Cable Loss.*
3. *Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

6.7.3. Restricted Bands Requirements

Test result for GFSK Mode（the worst case）

Frequency	Reading	Correct Factor	Emission Level	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel							
2390	60.04	-8.76	51.28	74	22.72	H	PK
2390	54.23	-8.76	45.47	54	8.53	H	AV
2390	59.35	-8.73	50.62	74	23.38	V	PK
2390	55.51	-8.73	46.78	54	7.22	V	AV
High Channel							
2483.5	64.55	-8.76	55.79	74	18.21	H	PK
2483.5	55.89	-8.76	47.13	54	6.87	H	AV
2483.5	60.91	-8.73	52.18	74	21.82	V	PK
2483.5	57.94	-8.73	49.21	54	4.79	V	AV

Note: Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading
Corr. Factor (dB) = Attenuation factor + Cable loss
Level (dBμV) = Reading level (dBμV) + Corr. Factor (dB)
Limit (dBμV) = Limit stated in standard
Margin (dB) = Level (dBμV) – Limits (dBμV)

*******END OF REPORT*******