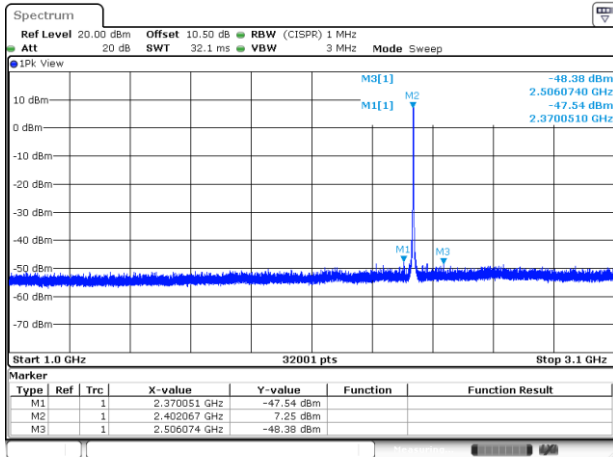
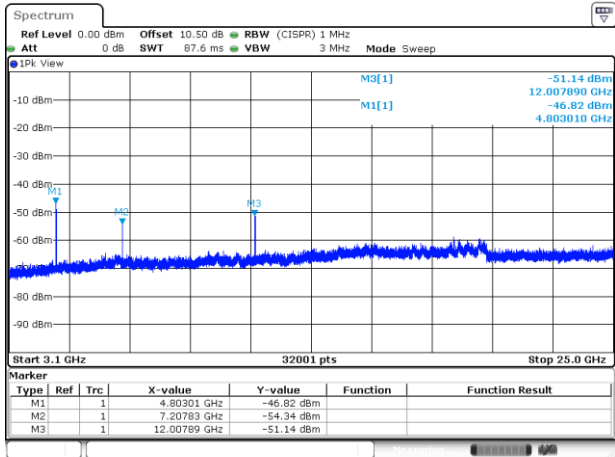


BT LE-2Mbps - Full Range Scan Test Plot

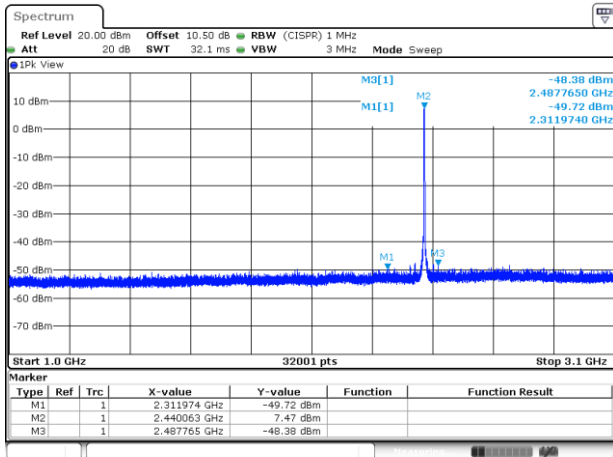
2402MHz



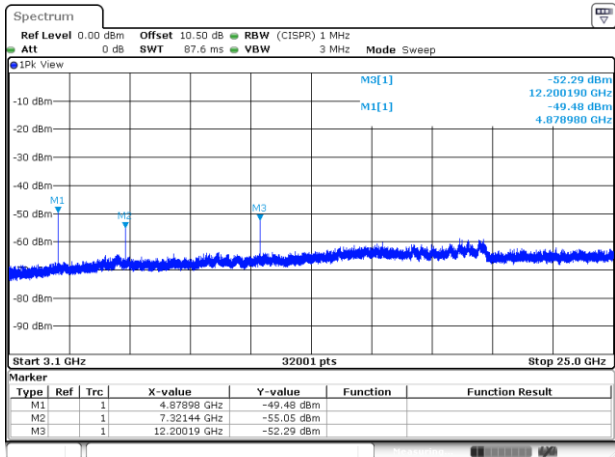
2402MHz



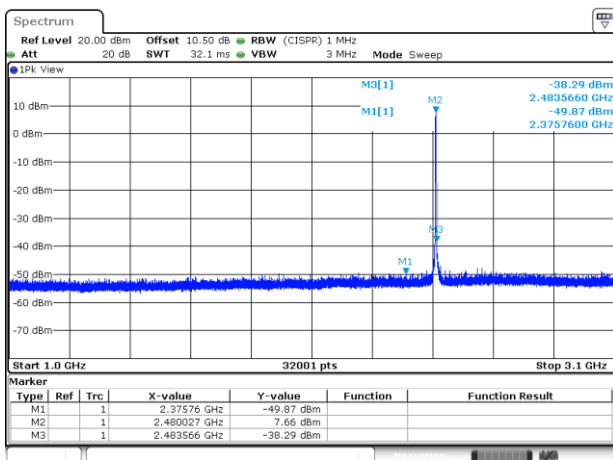
2440MHz



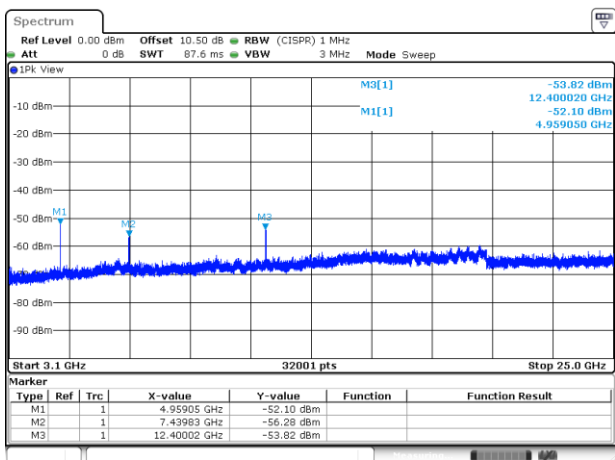
2440MHz



2480MHz



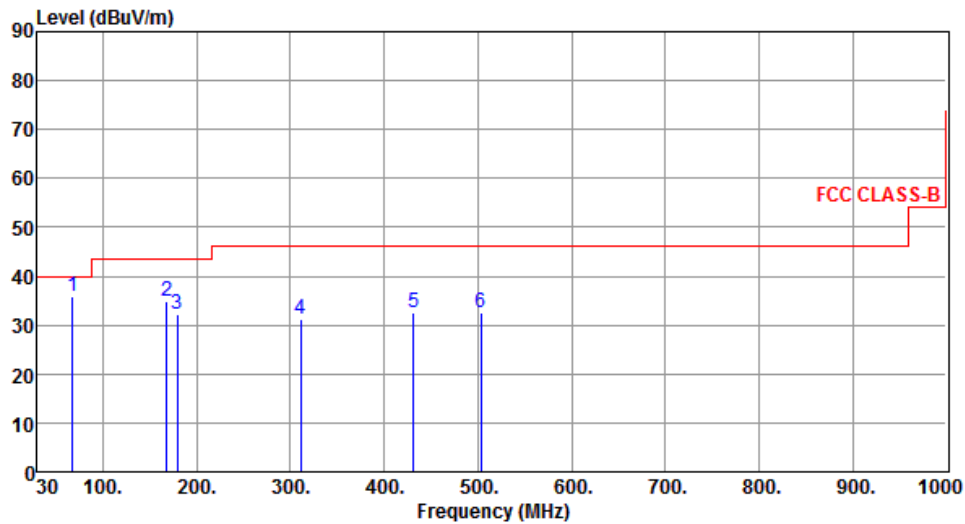
2480MHz



Test configuration 3: High Power with MHF4 connector antenna

3.5.12 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	67.83	35.95	40.00	-4.05	45.91	-9.96	Peak	---	---
2	167.74	34.87	43.50	-8.63	43.57	-8.70	Peak	---	---
3	179.38	32.28	43.50	-11.22	42.09	-9.81	Peak	---	---
4	311.30	31.09	46.00	-14.91	38.78	-7.69	Peak	---	---
5	431.58	32.46	46.00	-13.54	37.05	-4.59	Peak	---	---
6	503.36	32.64	46.00	-13.36	35.64	-3.00	Peak	---	---

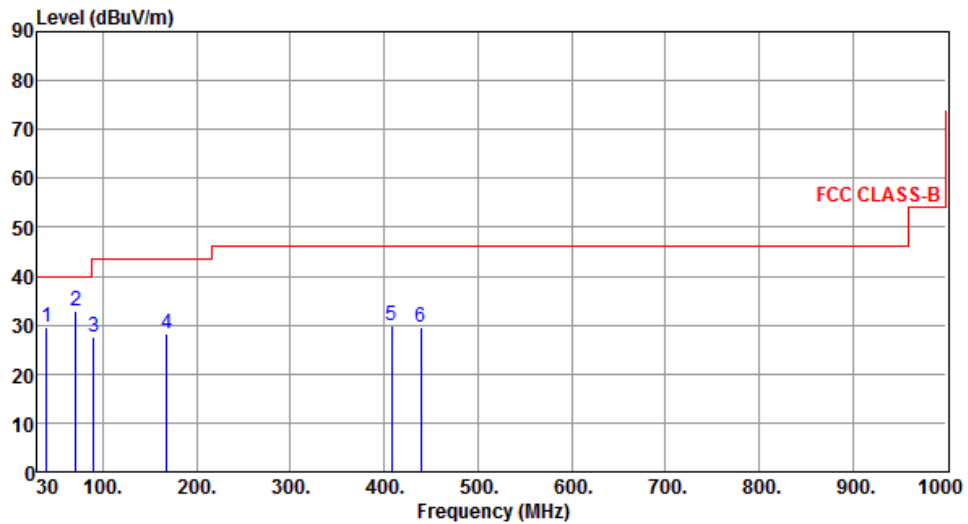
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor, cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.70	29.44	40.00	-10.56	38.16	-8.72	Peak	---	---
2	70.74	32.92	40.00	-7.08	43.64	-10.72	Peak	---	---
3	90.14	27.58	43.50	-15.92	41.85	-14.27	Peak	---	---
4	167.74	28.08	43.50	-15.42	36.78	-8.70	Peak	---	---
5	408.30	29.84	46.00	-16.16	35.20	-5.36	Peak	---	---
6	439.34	29.67	46.00	-16.33	34.01	-4.34	Peak	---	---

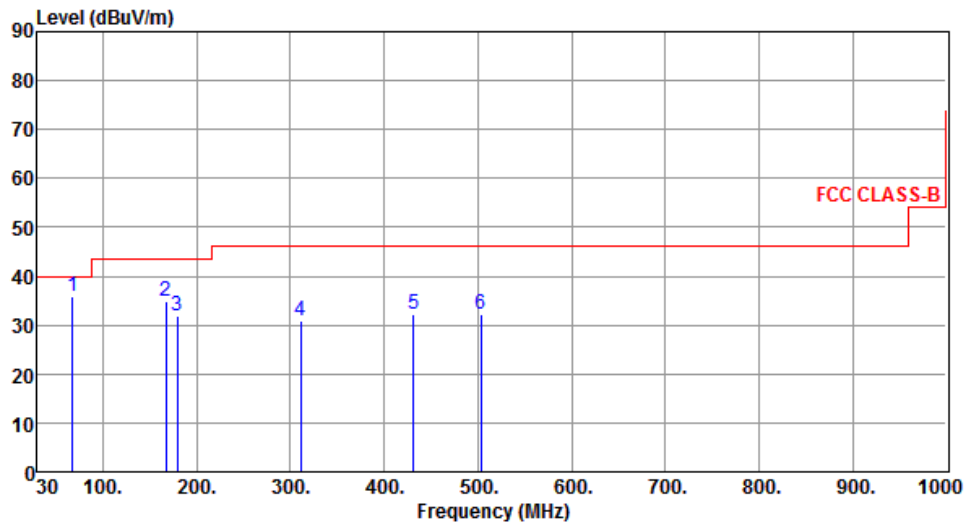
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	67.22	35.77	40.00	-4.23	45.74	-9.97	Peak	---	---
2	167.25	34.71	43.50	-8.79	43.41	-8.70	Peak	---	---
3	179.52	32.02	43.50	-11.48	41.84	-9.82	Peak	---	---
4	311.22	30.89	46.00	-15.11	38.58	-7.69	Peak	---	---
5	431.66	32.21	46.00	-13.79	36.79	-4.58	Peak	---	---
6	502.88	32.33	46.00	-13.67	35.34	-3.01	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		
Level (dBuV/m)			

3.5.13 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	BT-LE (1Mbps)		Test Freq. (MHz)		2402	
Polarization	Vertical					
Level (dBUV/m) <						

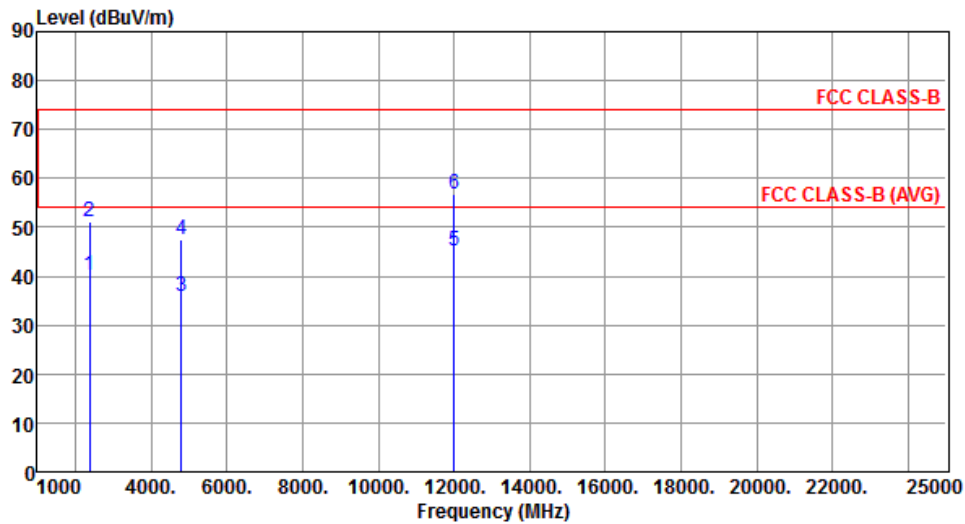
Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2440
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	BT-LE (1Mbps)		Test Freq. (MHz)		2440	
Polarization	Vertical					
Level (dBUV/m)						

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		
Level (dBUV/m) <			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.09	54.00	-13.91	42.89	-2.80	Average	111	152
2	2390.00	51.07	74.00	-22.93	53.87	-2.80	Peak	111	152
3	4804.00	35.92	54.00	-18.08	32.39	3.53	Average	100	344
4	4804.00	47.33	74.00	-26.67	43.80	3.53	Peak	100	344
5	12010.00	45.21	54.00	-8.79	31.49	13.72	Average	100	280
6	12010.00	56.69	74.00	-17.31	42.97	13.72	Peak	100	280

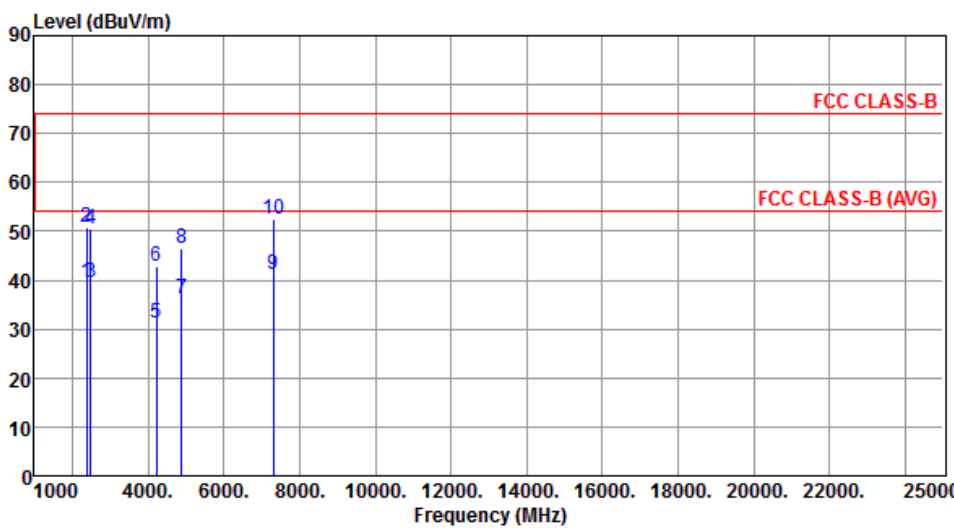
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	BT-LE (2Mbps)		Test Freq. (MHz)		2402	
Polarization	Vertical					
Level (dBUV/m)						

Modulation	BT-LE (2Mbps)		Test Freq. (MHz)		2440	
Polarization	Horizontal					



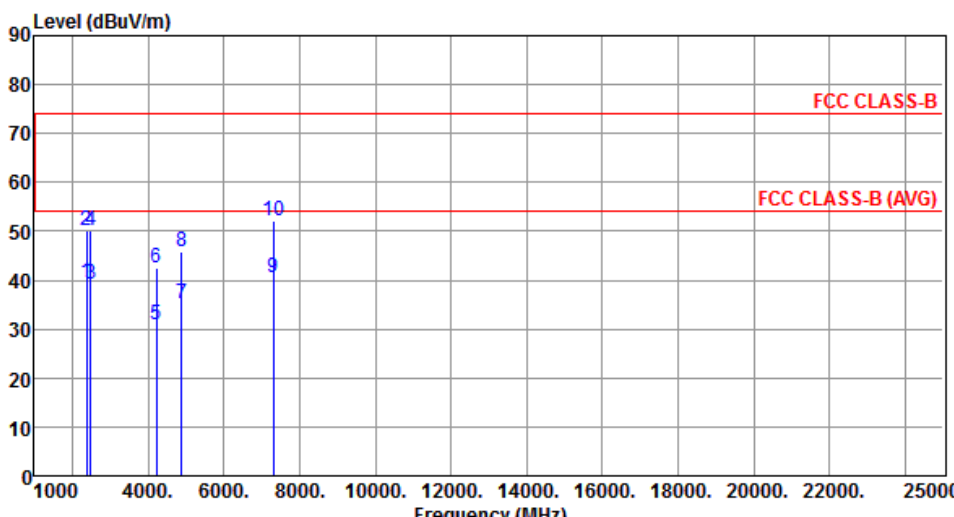
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level			reading			High	Table
		dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	39.65	54.00	-14.35	42.45	-2.80	Average	106	200
2	2390.00	50.72	74.00	-23.28	53.52	-2.80	Peak	106	200
3	2483.50	39.38	54.00	-14.62	42.41	-3.03	Average	106	200
4	2483.50	50.43	74.00	-23.57	53.46	-3.03	Peak	106	200
5	4230.00	31.29	54.00	-22.71	29.60	1.69	Average	100	145
6	4230.00	42.88	74.00	-31.12	41.19	1.69	Peak	100	145
7	4880.00	36.20	54.00	-17.80	32.57	3.63	Average	242	344
8	4880.00	46.44	74.00	-27.56	42.81	3.63	Peak	242	344
9	7320.00	41.19	54.00	-12.81	31.97	9.22	Average	238	239
10	7320.00	52.31	74.00	-21.69	43.09	9.22	Peak	238	239

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2440
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.62	54.00	-14.38	42.42	-2.80	Average	100	162
2	2390.00	50.29	74.00	-23.71	53.09	-2.80	Peak	100	162
3	2483.50	39.28	54.00	-14.72	42.31	-3.03	Average	100	162
4	2483.50	50.19	74.00	-23.81	53.22	-3.03	Peak	100	162
5	4230.00	30.99	54.00	-23.01	29.30	1.69	Average	100	91
6	4230.00	42.57	74.00	-31.43	40.88	1.69	Peak	100	91
7	4880.00	35.11	54.00	-18.89	31.48	3.63	Average	308	102
8	4880.00	46.00	74.00	-28.00	42.37	3.63	Peak	308	102
9	7320.00	40.65	54.00	-13.35	31.43	9.22	Average	100	21
10	7320.00	52.04	74.00	-21.96	42.82	9.22	Peak	100	21

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		
Level (dBUV/m)			

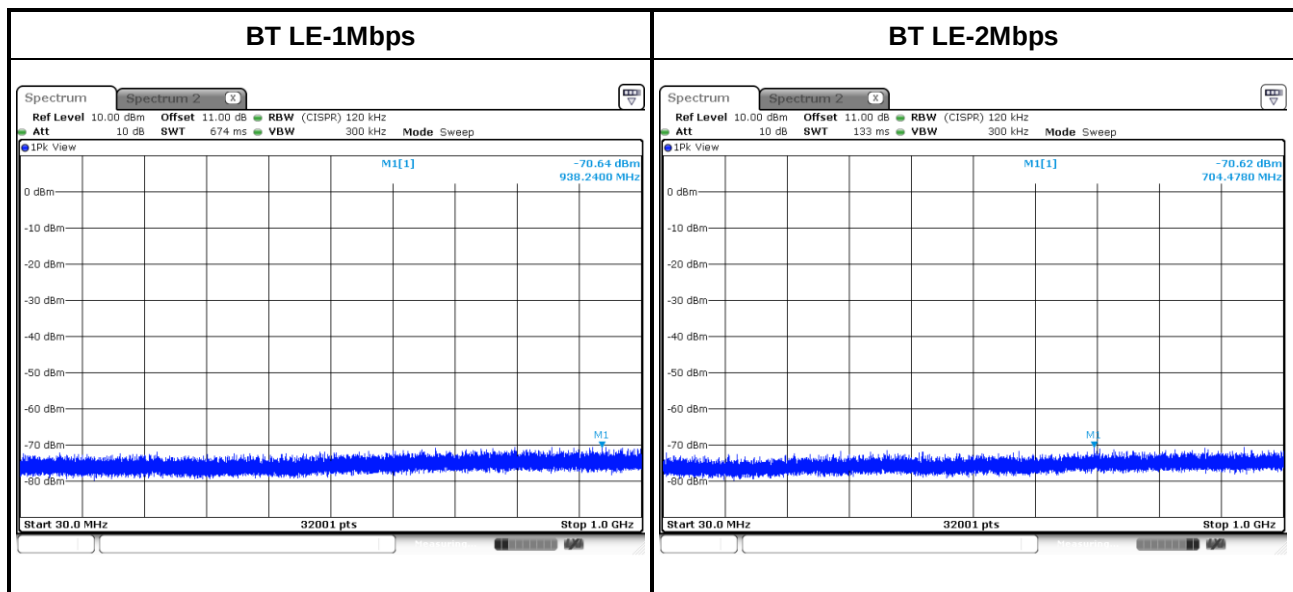
3.5.14 Transmitter Conducted Unwanted Emissions (Below 1 GHz)

Modulation Mode		BT LE-1Mbps		Frequency		2480MHz	
Range (MHz)	Max Value chain0 (dBm)	DG (dBi)	GRF (dB)	EIRP (dBm)	E-Field (dBuV/m)	Min E-Field Limit (dBuV/m)	E-Field Margin (dB)
30~1000	-70.64	2.00	4.70	-63.94	31.32	40.00	-8.68

Modulation Mode		BT LE-2Mbps		Frequency		2480MHz	
Range (MHz)	Max Value chain0 (dBm)	DG (dBi)	GRF (dB)	EIRP (dBm)	E-Field (dBuV/m)	Min E-Field Limit (dBuV/m)	E-Field Margin (dB)
30~1000	-70.62	2.00	4.70	-63.92	31.34	40.00	-8.66

Note:

1. GRF = Ground Reflection Factor.
2. DG = Directional Gain.
3. Worst case of emission limit below 1GHz is selected to be limit.



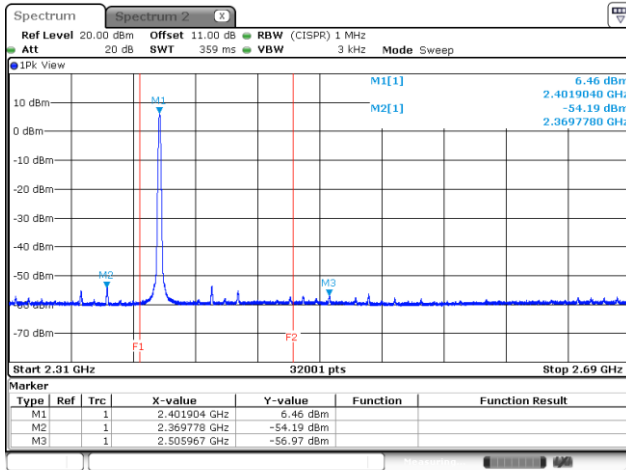
3.5.15 Transmitter Conducted Unwanted Emissions (Above 1GHz) in Band Edge

Transmitter Conducted Unwanted Emissions Results in Band Edge								
Modulation Mode		BT LE-1Mbps						
Test ch. Freq. (MHz)	Range (MHz)	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBuV/m)	E-Field Margin (dB)	Remark
2402	2310~2390	-45.88	2.00	-43.88	51.38	74.00	-22.62	PK
	2310~2390	-54.19	2.00	-52.19	43.07	54.00	-10.93	AV
	2483.5~2690	-46.09	2.00	-44.09	51.17	74.00	-22.83	PK
	2483.5~2690	-56.97	2.00	-54.97	40.29	54.00	-13.71	AV
2440	2310~2390	-46.92	2.00	-44.92	50.34	74.00	-23.66	PK
	2310~2390	-58.14	2.00	-56.14	39.12	54.00	-14.88	AV
	2483.5~2500	-47.36	2.00	-45.36	49.90	74.00	-24.10	PK
	2483.5~2500	-56.14	2.00	-54.14	41.12	54.00	-12.88	AV
2480	2310~2390	-46.64	2.00	-44.64	50.62	74.00	-23.38	PK
	2310~2390	-56.75	2.00	-54.75	40.51	54.00	-13.49	AV
	2483.5~2690	-38.22	2.00	-36.22	59.04	74.00	-14.96	PK
	2483.5~2690	-54.26	2.00	-52.26	43.00	54.00	-11.00	AV

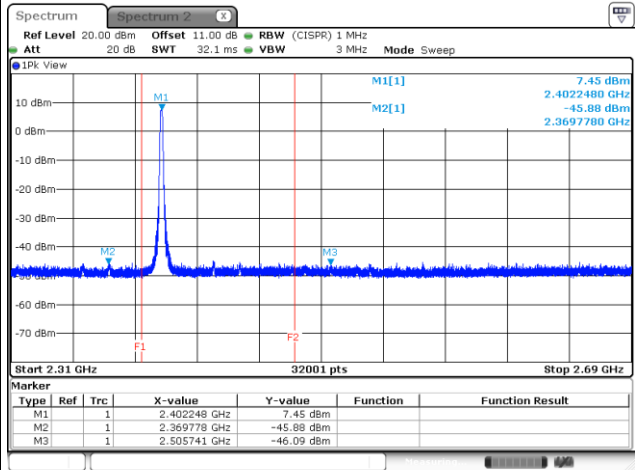
Note: DG = Directional Gain.

Band Edge Test Plot

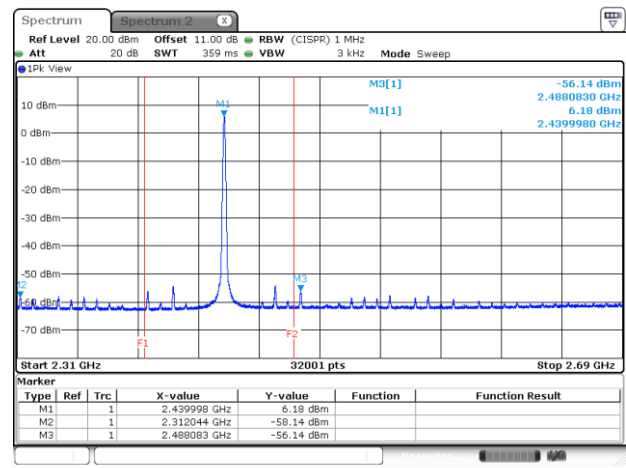
2402MHz - AV



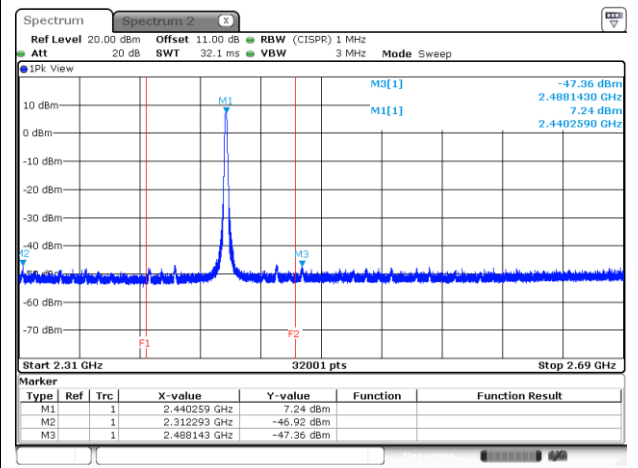
2402MHz - PK



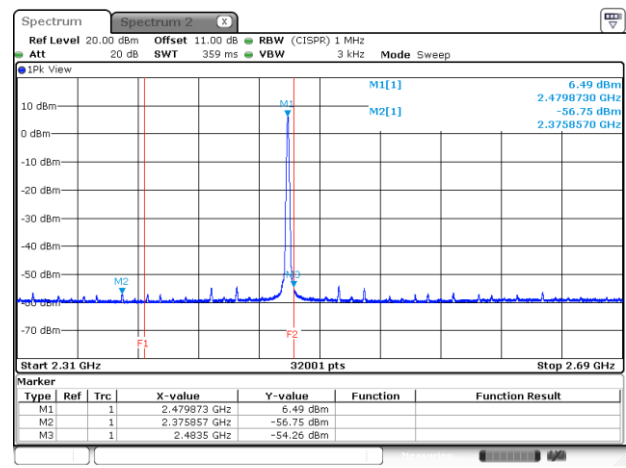
2440MHz - AV



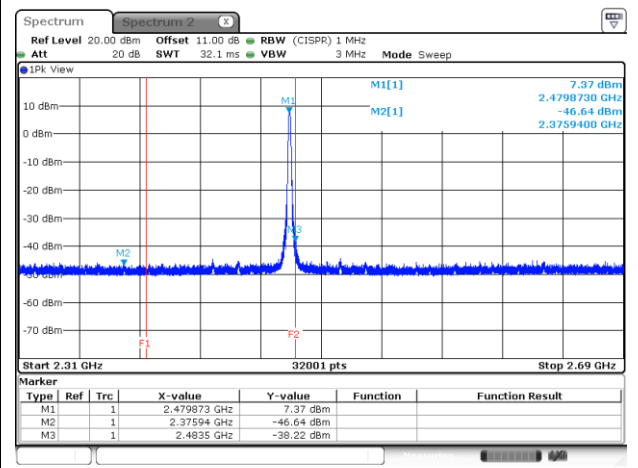
2440MHz - PK



2480MHz - AV



2480MHz - PK

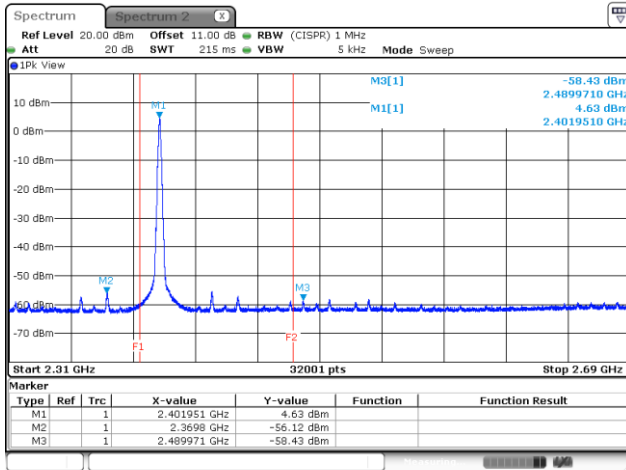


Transmitter Conducted Unwanted Emissions Results in Band Edge								
Modulation Mode		BT LE-2Mbps						
Test ch. Freq. (MHz)	Range (MHz)	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBuV/m)	E-Field Margin (dB)	Remark
2402	2310~2390	-47.65	2.00	-45.65	49.61	74.00	-24.39	PK
	2310~2390	-56.12	2.00	-54.12	41.14	54.00	-12.86	AV
	2483.5~2500	-49.48	2.00	-47.48	47.78	74.00	-26.22	PK
	2483.5~2500	-58.43	2.00	-56.43	38.83	54.00	-15.17	AV
2440	2310~2390	-49.26	2.00	-47.26	48.00	74.00	-26.00	PK
	2310~2390	-59.63	2.00	-57.63	37.63	54.00	-16.37	AV
	2483.5~2500	-48.44	2.00	-46.44	48.82	74.00	-25.18	PK
	2483.5~2500	-57.71	2.00	-55.71	39.55	54.00	-14.45	AV
2480	2310~2390	-46.13	2.00	-44.13	51.13	74.00	-22.87	PK
	2310~2390	-57.48	2.00	-55.48	39.78	54.00	-14.22	AV
	2483.5~2690	-38.69	2.00	-36.69	58.57	74.00	-15.43	PK
	2483.5~2690	-49.96	2.00	-47.96	47.30	54.00	-6.70	AV

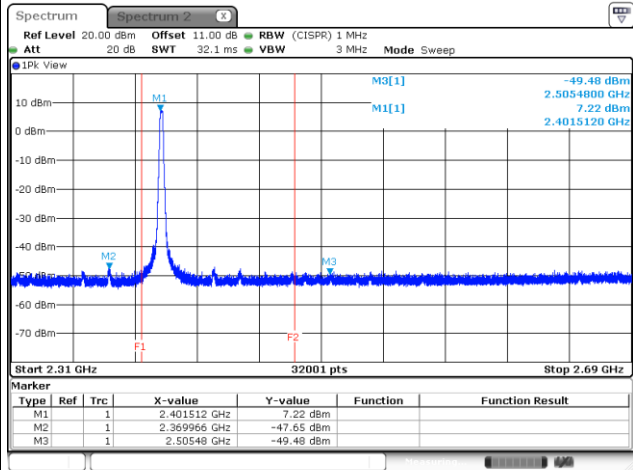
Note: DG = Directional Gain.

Band Edge Test Plot

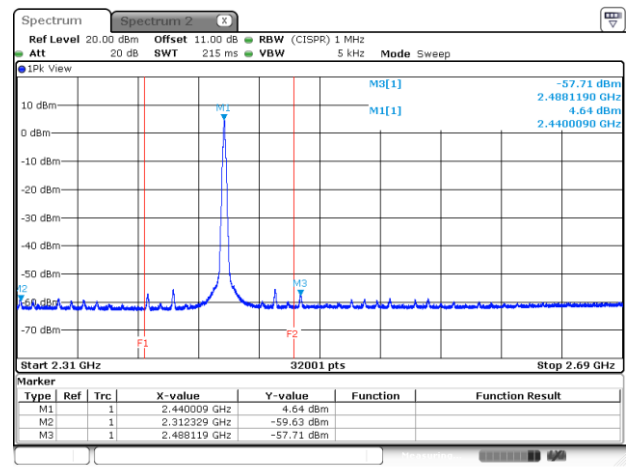
2402MHz - AV



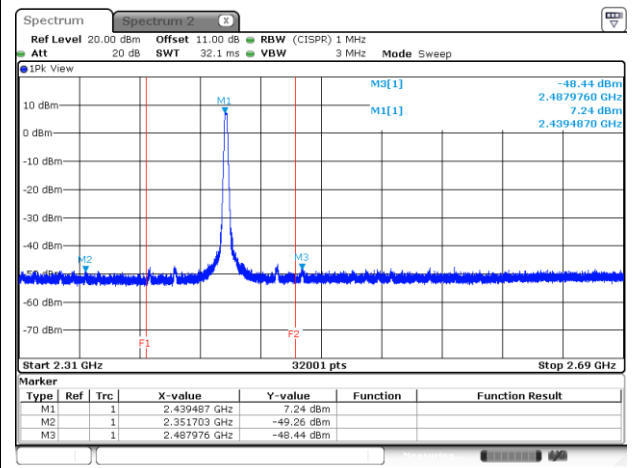
2402MHz - PK



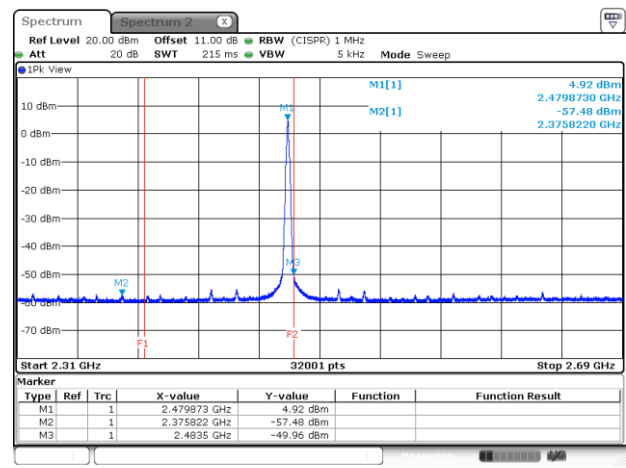
2440MHz - AV



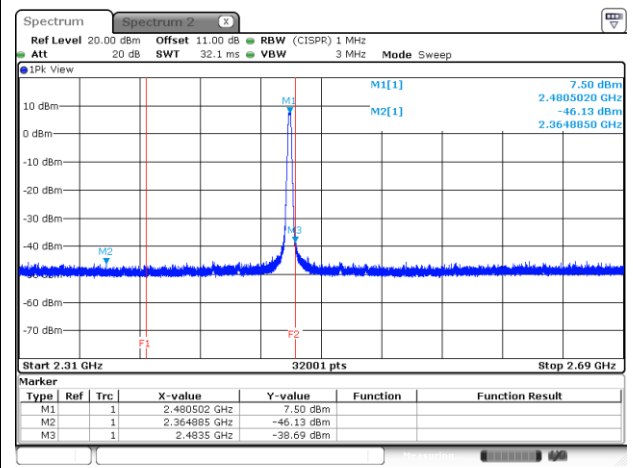
2440MHz - PK



2480MHz - AV



2480MHz - PK



Transmitter Conducted Unwanted Emissions Results in Restricted Frequency Band							
Modulation Mode		BT LE-1Mbps		Frequency		2402MHz	
Freq. (MHz)	Remark	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBm)	E-Field Margin (dB)
4804.00	PK	-42.67	2.00	-40.67	54.59	74.00	-19.41
4804.00	AV	-46.70	2.00	-44.70	50.56	54.00	-3.44

Transmitter Conducted Unwanted Emissions Results in Restricted Frequency Band							
Modulation Mode		BT LE-1Mbps		Frequency		2440MHz	
Freq. (MHz)	Remark	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBm)	E-Field Margin (dB)
4880.00	PK	-44.51	2.00	-42.51	52.75	74.00	-21.25
7320.00	PK	-60.41	2.00	-58.41	36.85	74.00	-37.15

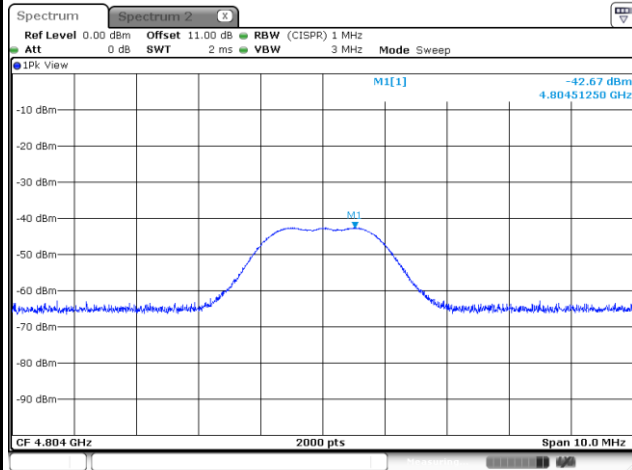
Transmitter Conducted Unwanted Emissions Results in Restricted Frequency Band							
Modulation Mode		BT LE-1Mbps		Frequency		2480MHz	
Freq. (MHz)	Remark	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBm)	E-Field Margin (dB)
4960.00	PK	-46.65	2.00	-44.65	50.61	74.00	-23.39
7440.00	PK	-57.43	2.00	-55.43	39.83	74.00	-34.17

Note:

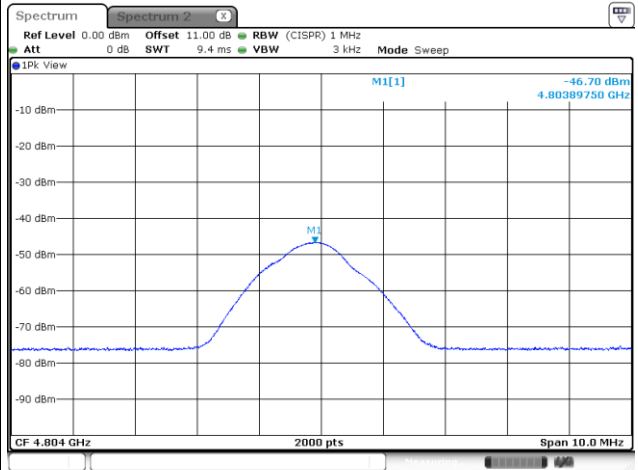
1. If the PK margin greater than 20 dB, there is no need to get AVG reading.
2. DG = Directional Gain.

Test Plots

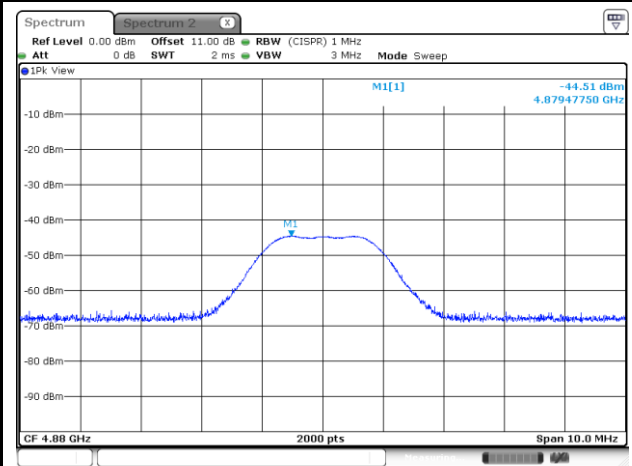
4804MHz - PK



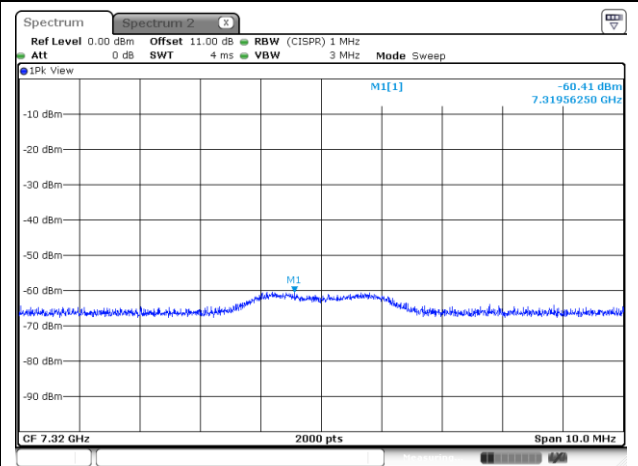
4804MHz - AV



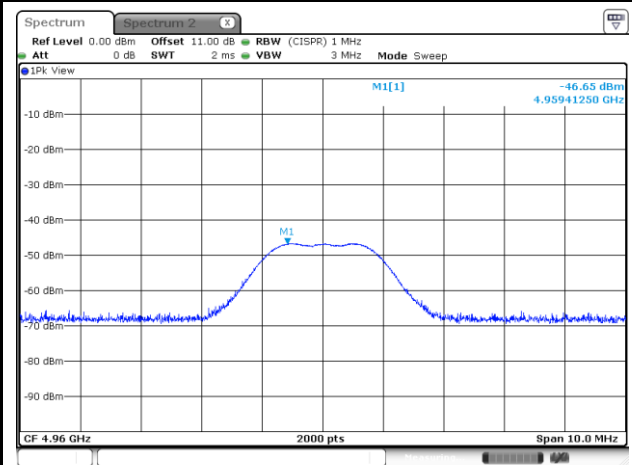
4880MHz - PK



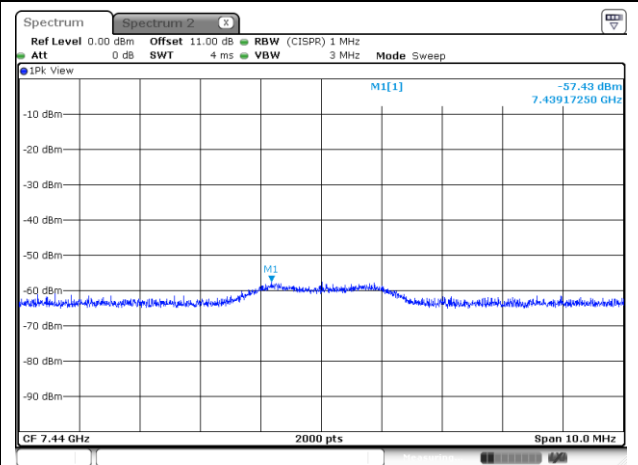
7320MHz - PK



4960MHz - PK



7440MHz - PK



Transmitter Conducted Unwanted Emissions Results in Restricted Frequency Band							
Modulation Mode		BT LE-2Mbps		Frequency		2402MHz	
Freq. (MHz)	Remark	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBm)	E-Field Margin (dB)
4804.00	PK	-43.02	2.00	-41.02	54.24	74.00	-19.76
4804.00	AV	-52.40	2.00	-50.40	44.86	54.00	-9.14

Transmitter Conducted Unwanted Emissions Results in Restricted Frequency Band							
Modulation Mode		BT LE-2Mbps		Frequency		2440MHz	
Freq. (MHz)	Remark	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBm)	E-Field Margin (dB)
4880.00	PK	-44.64	2.00	-42.64	52.62	74.00	-21.38
7320.00	PK	-60.81	2.00	-58.81	36.45	74.00	-37.55

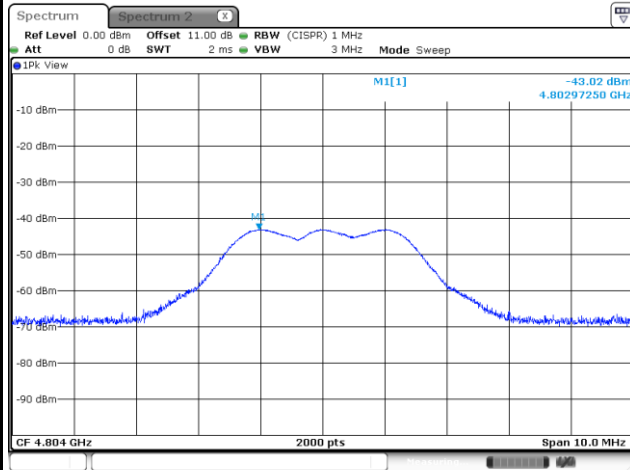
Transmitter Conducted Unwanted Emissions Results in Restricted Frequency Band							
Modulation Mode		BT LE-2Mbps		Frequency		2480MHz	
Freq. (MHz)	Remark	Max Value chain0 (dBm)	DG (dBi)	EIRP (dBm)	E-Field (dBuV/m)	E-Field Limit (dBm)	E-Field Margin (dB)
4960.00	PK	-46.80	2.00	-44.80	50.46	74.00	-23.54
7440.00	PK	-60.61	2.00	-58.61	36.65	74.00	-37.35

Note:

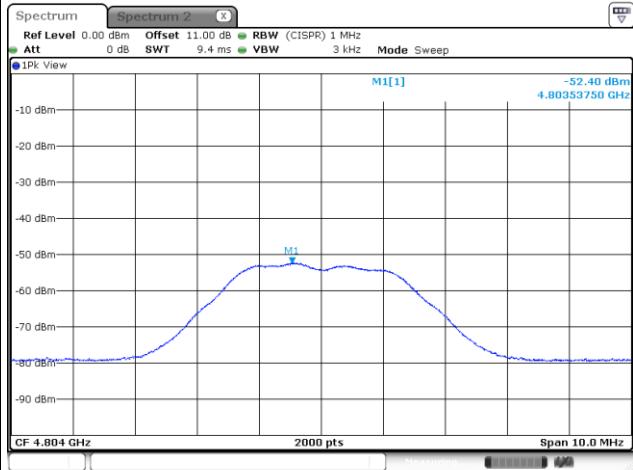
1. If the PK margin greater than 20 dB, there is no need to get AVG reading.
2. DG = Directional Gain.

Test Plots

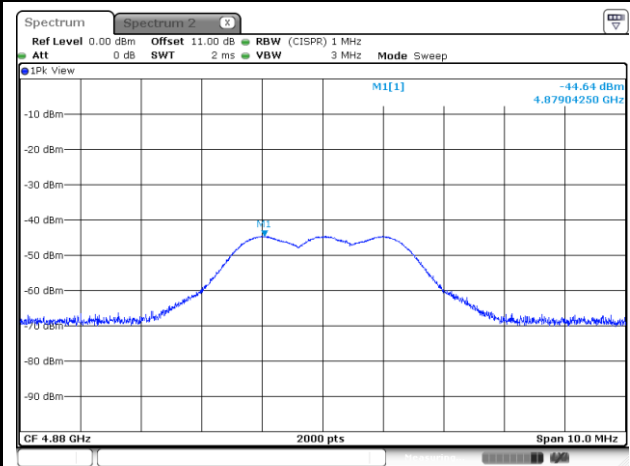
4804MHz - PK



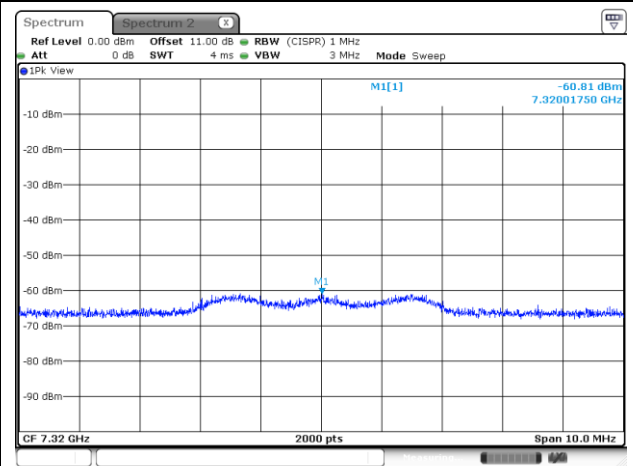
4804MHz - AV



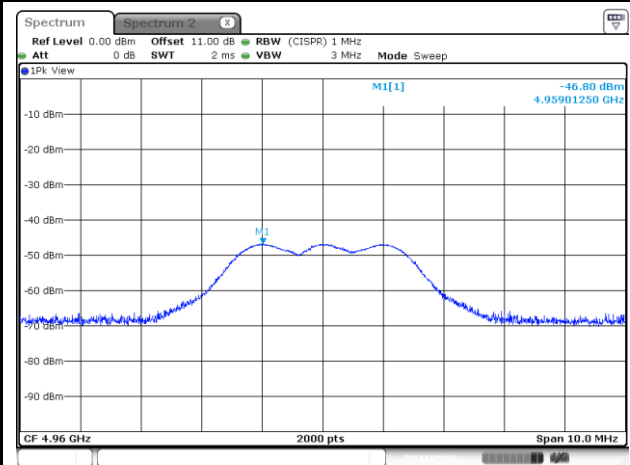
4880MHz - PK



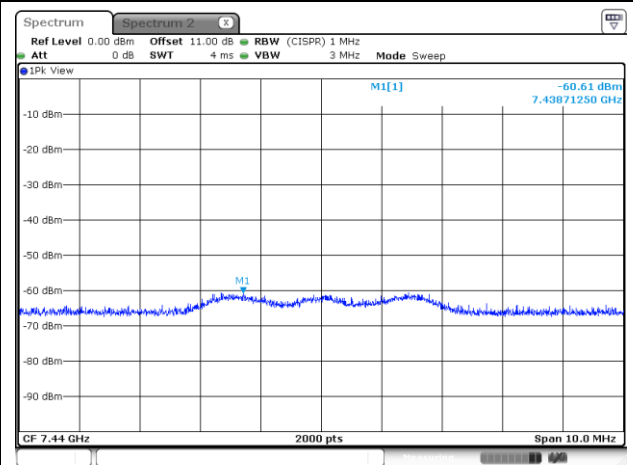
7320MHz - PK



4960MHz - PK

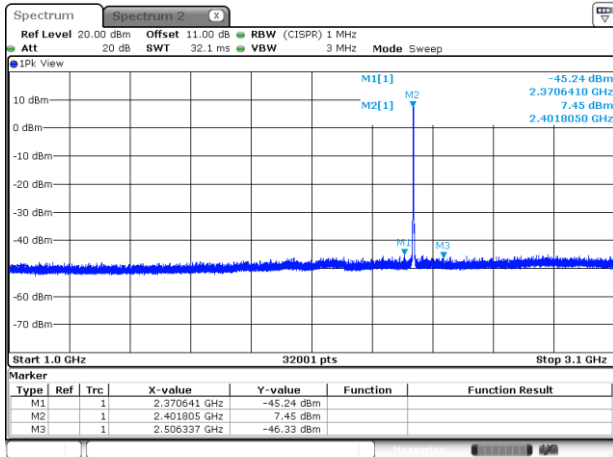


7440MHz - PK

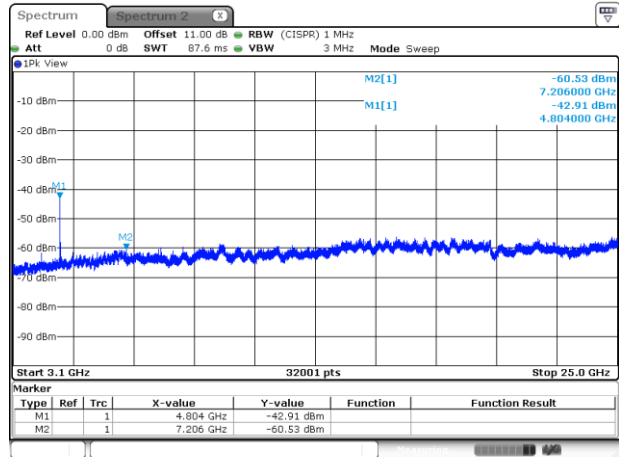


BT LE-1Mbps - Full Range Scan Test Plot

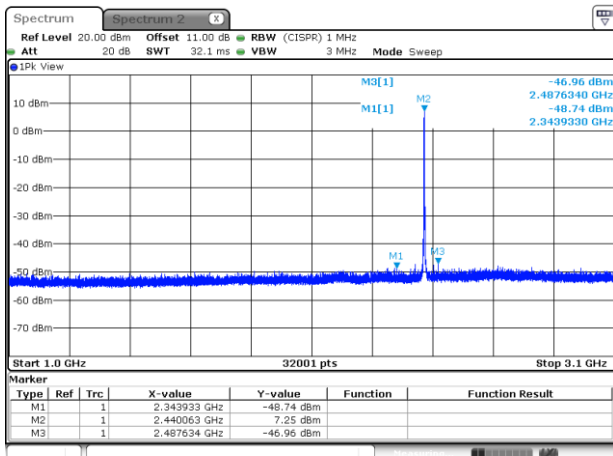
2402MHz



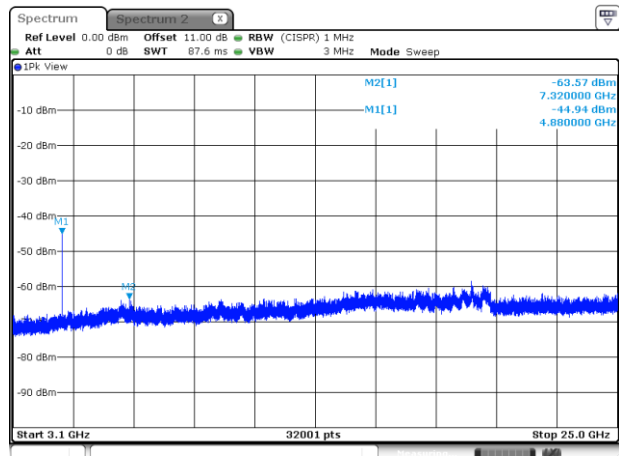
2402MHz



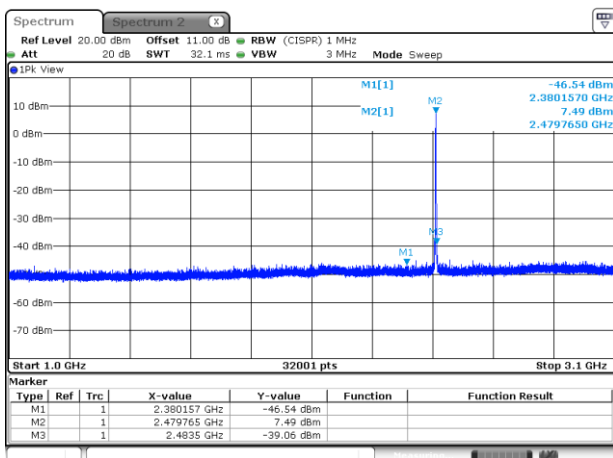
2440MHz



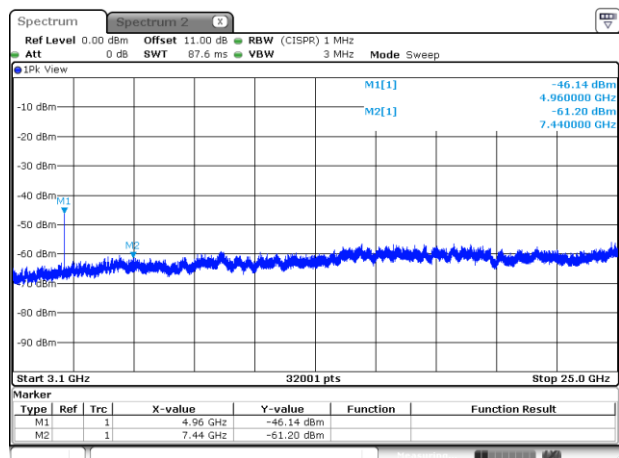
2440MHz



2480MHz

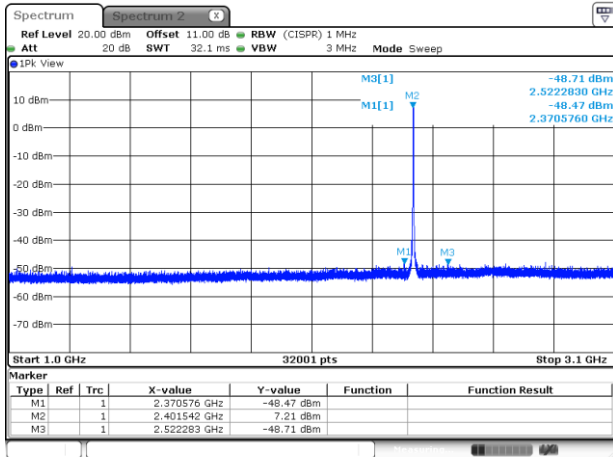


2480MHz

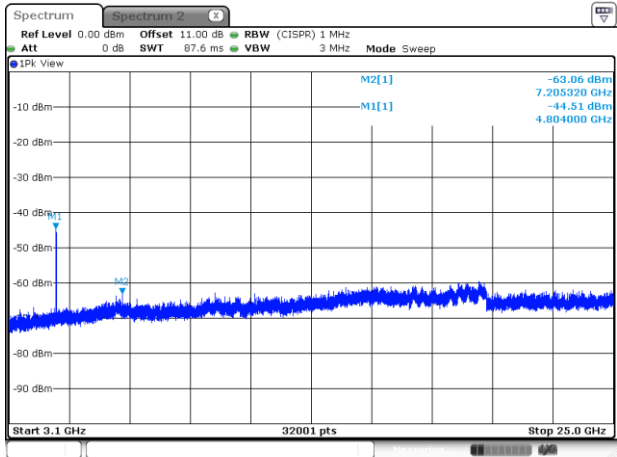


BT LE-2Mbps - Full Range Scan Test Plot

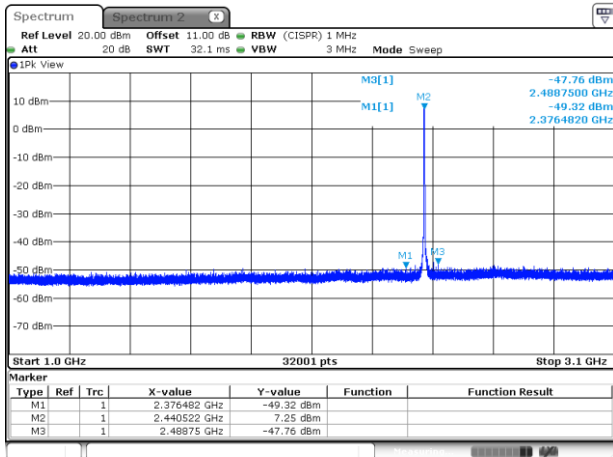
2402MHz



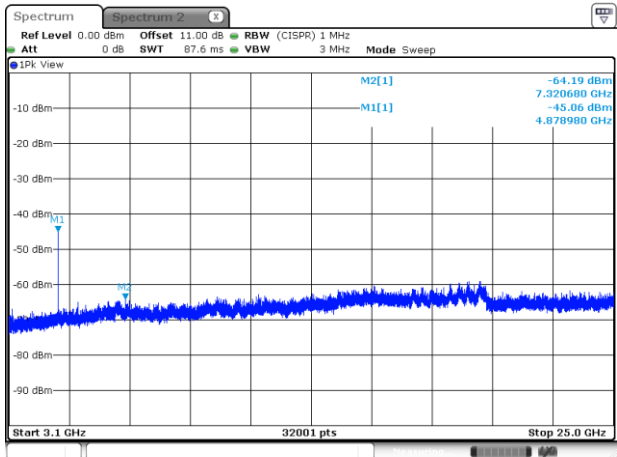
2402MHz



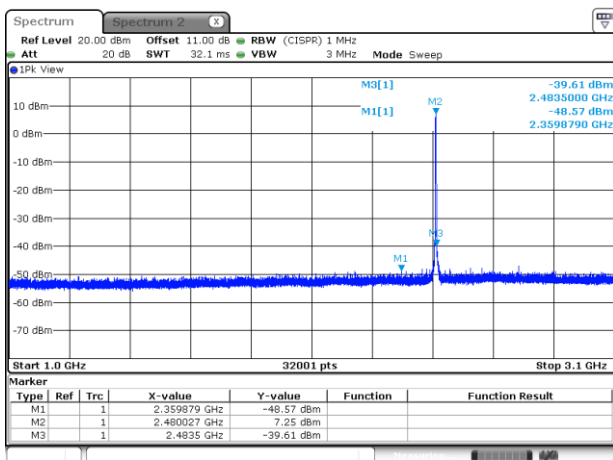
2440MHz



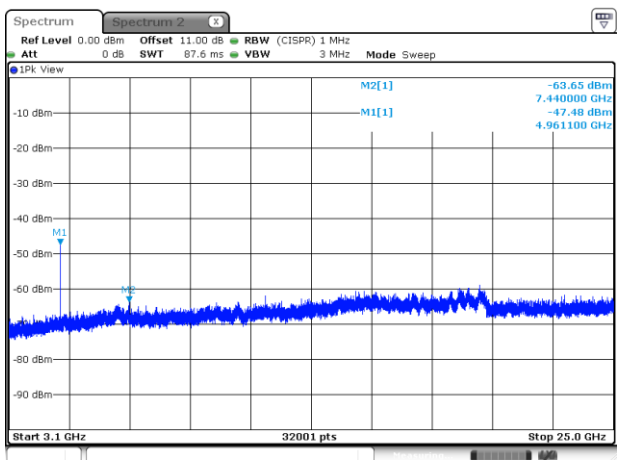
2440MHz



2480MHz



2480MHz



3.6 Emissions in non-restricted Frequency Bands

3.6.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

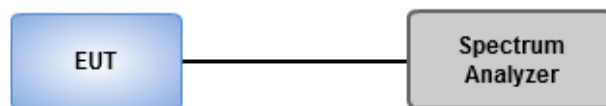
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

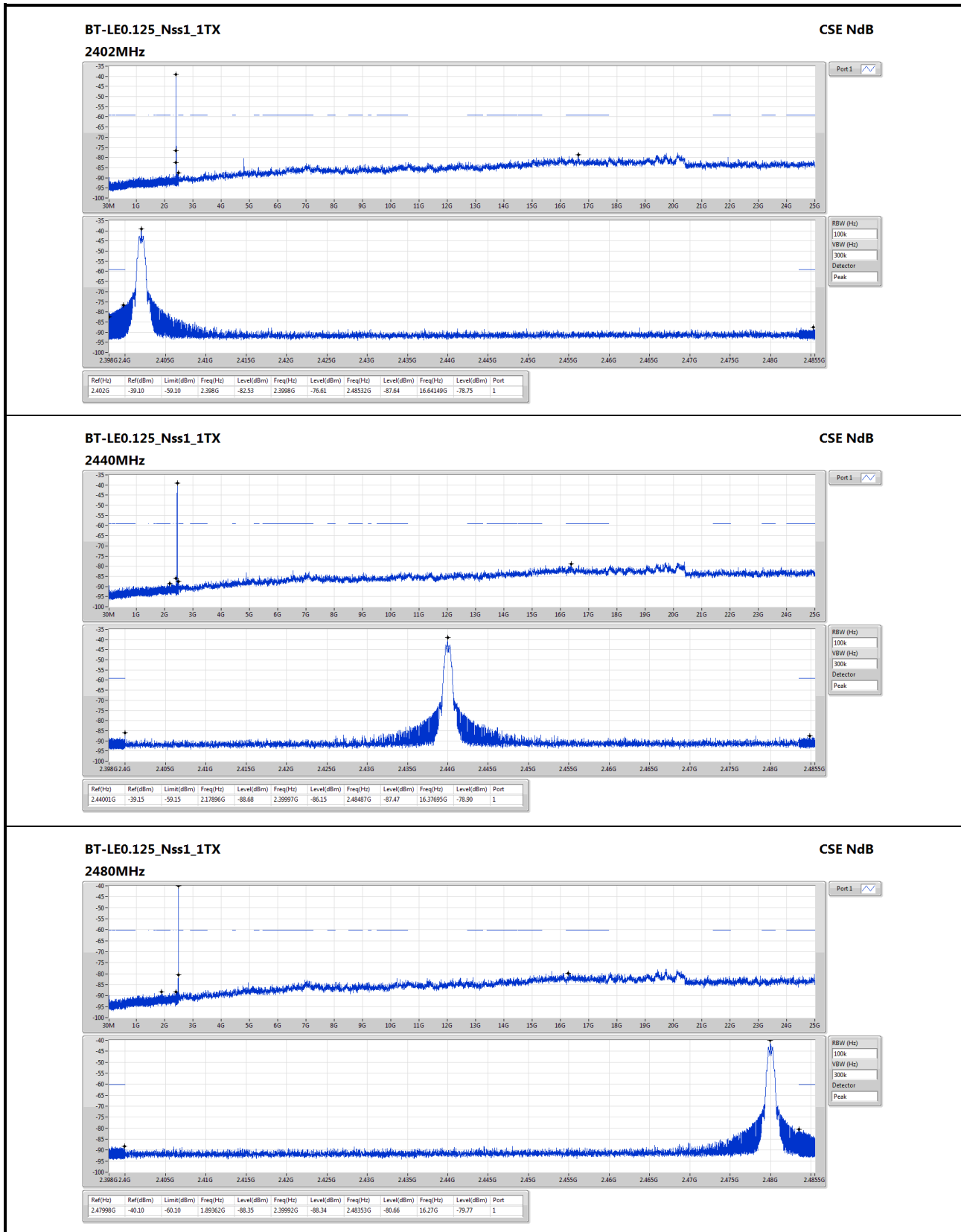
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.3 Test Setup



Test configuration 1: Low Power with Printed PCB antenna

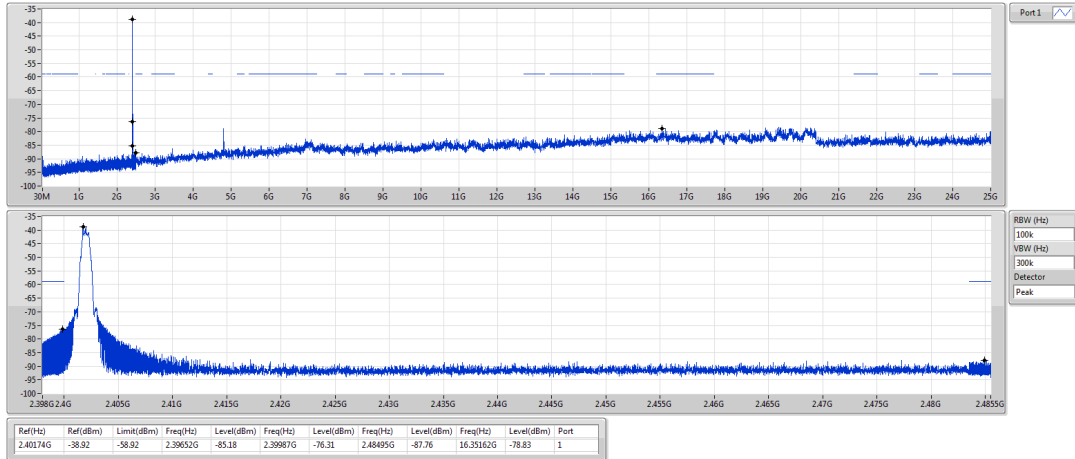
3.6.4 Test Result of Emissions in non-restricted Frequency Bands



BT-LE0.5_Nss1_1TX

CSE NdB

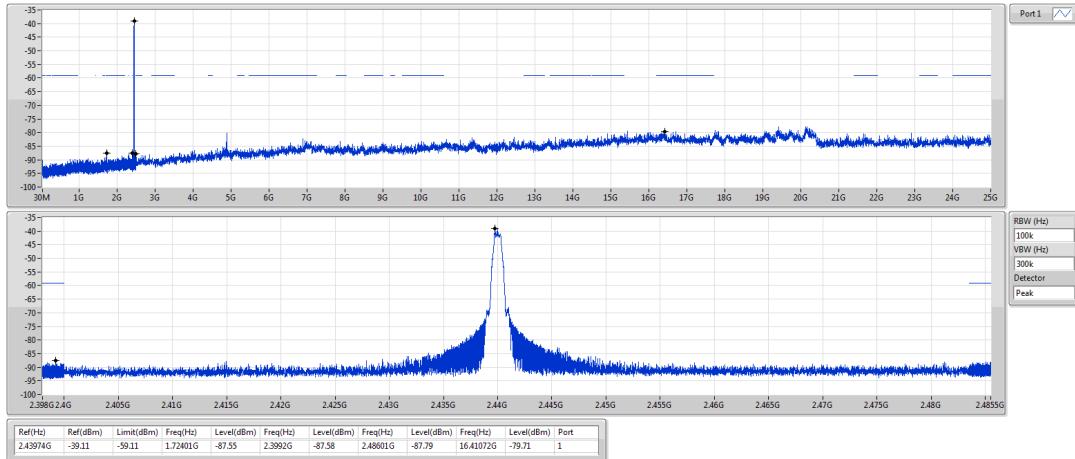
2402MHz



BT-LE0.5_Nss1_1TX

CSE NdB

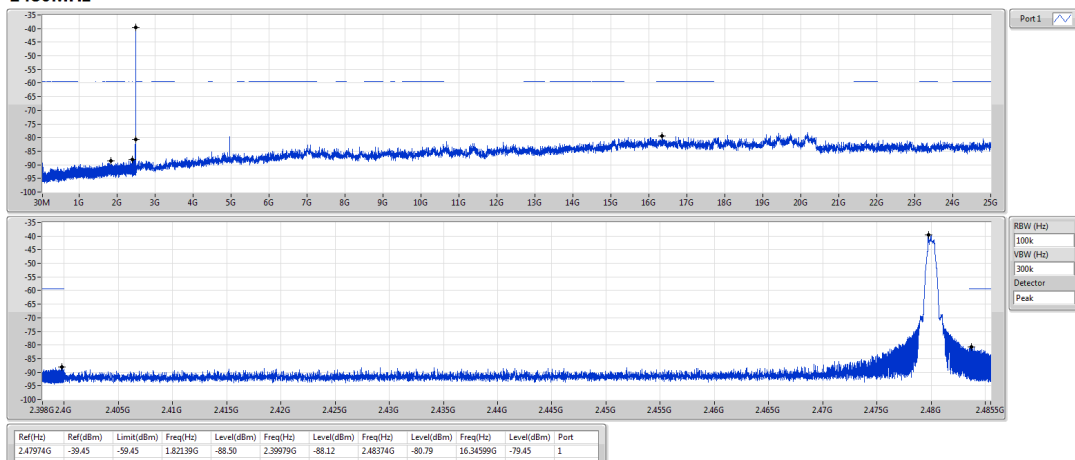
2440MHz



BT-LE0.5_Nss1_1TX

CSE NdB

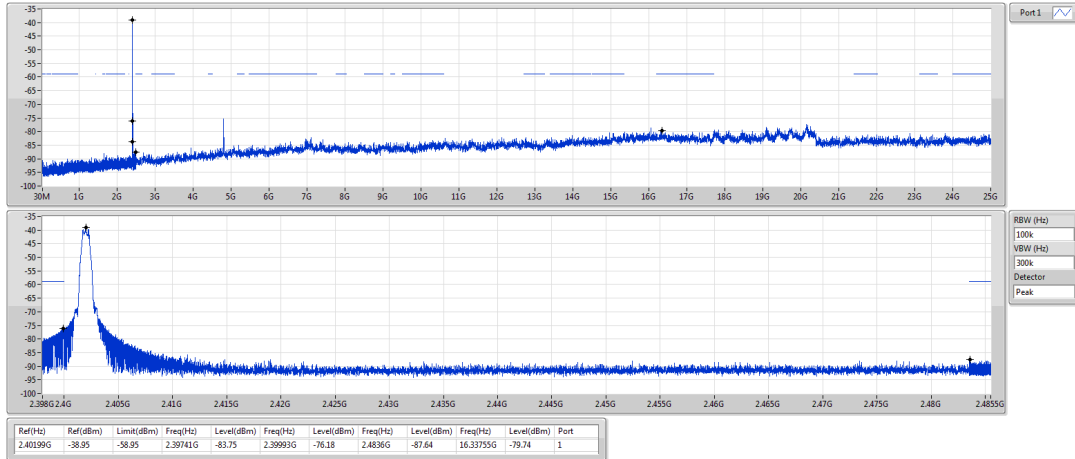
2480MHz



BT-LE(1Mbps)

CSE NdB

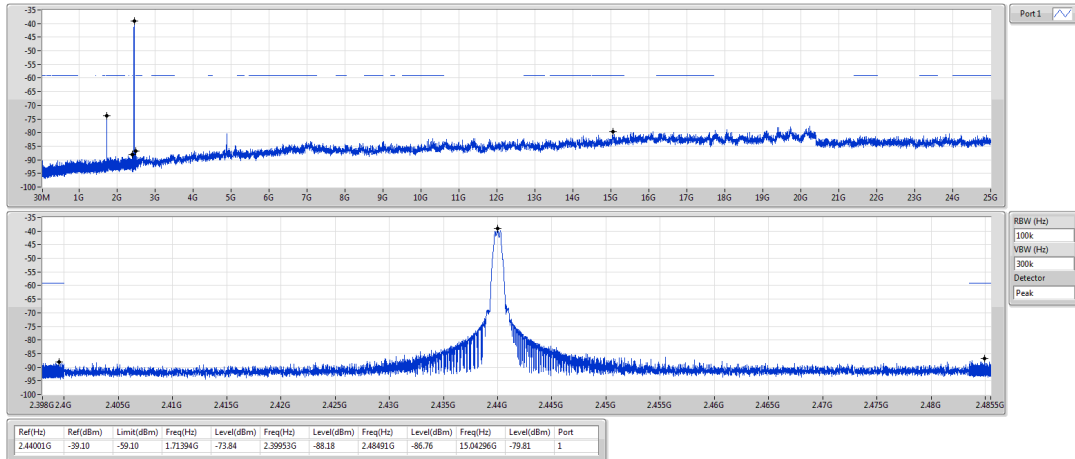
2402MHz



BT-LE(1Mbps)

CSE NdB

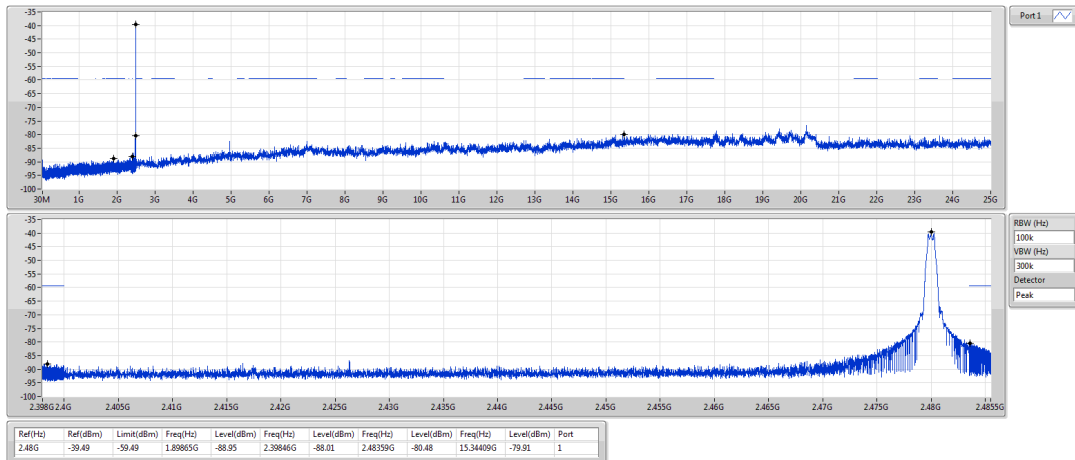
2440MHz



BT-LE(1Mbps)

CSE NdB

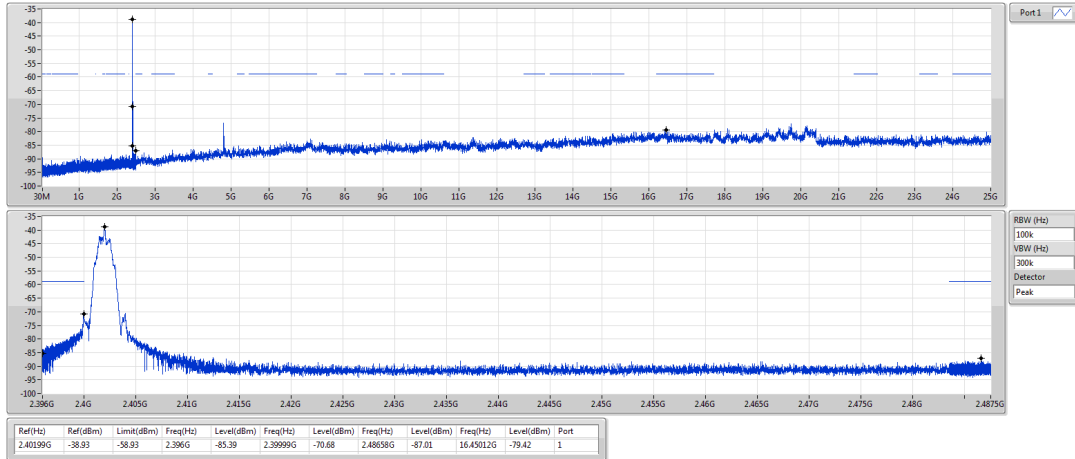
2480MHz



BT-LE(2Mbps)

CSE NdB

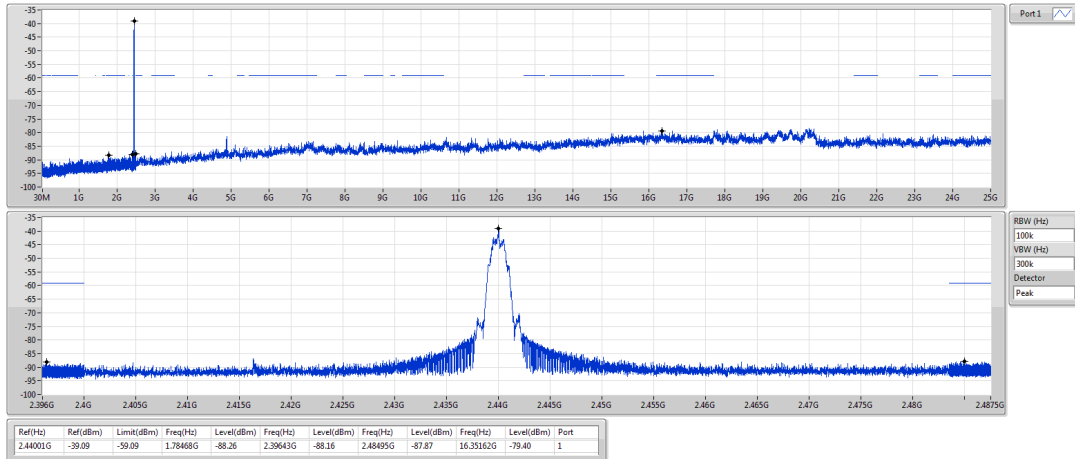
2402MHz



BT-LE(2Mbps)

CSE NdB

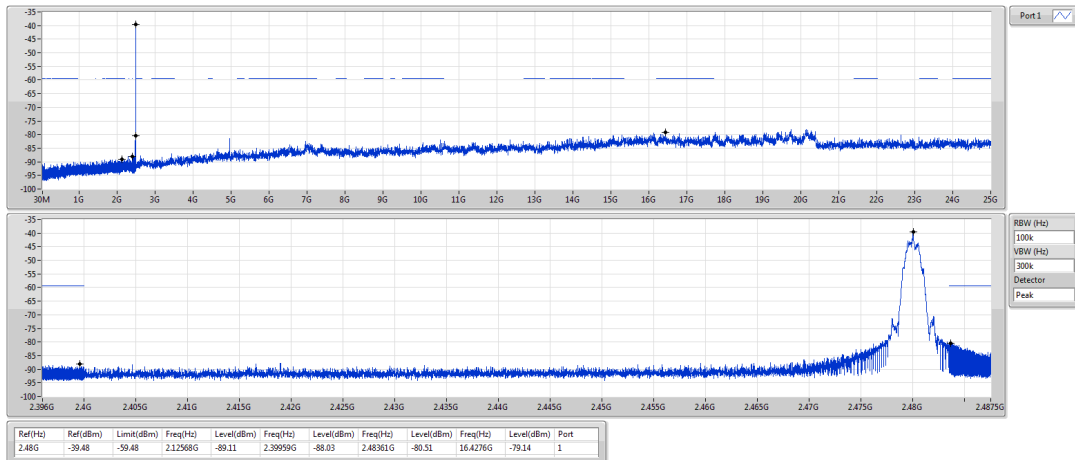
2440MHz



BT-LE(2Mbps)

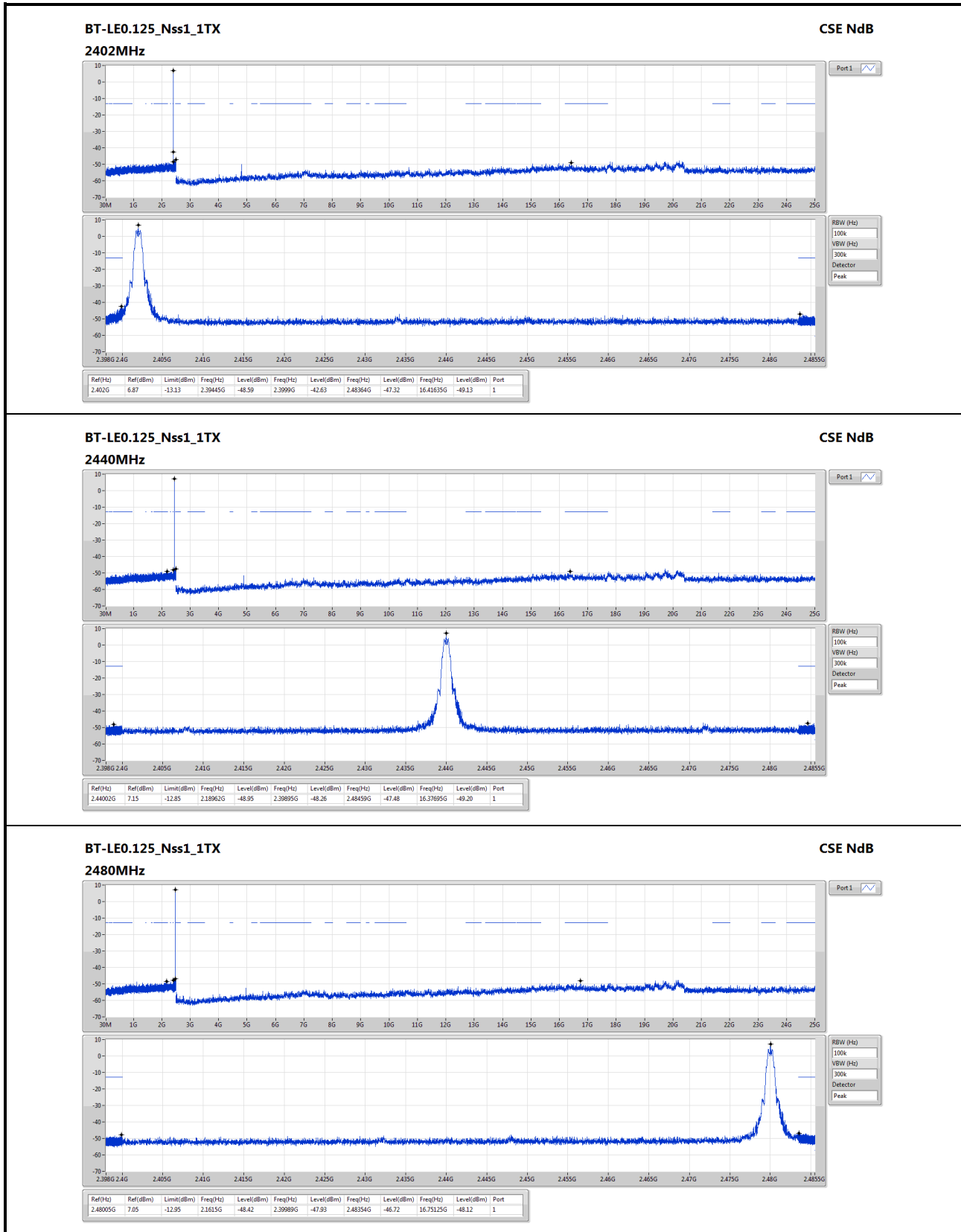
CSE NdB

2480MHz



Test configuration 2: High Power with Printed PCB antenna

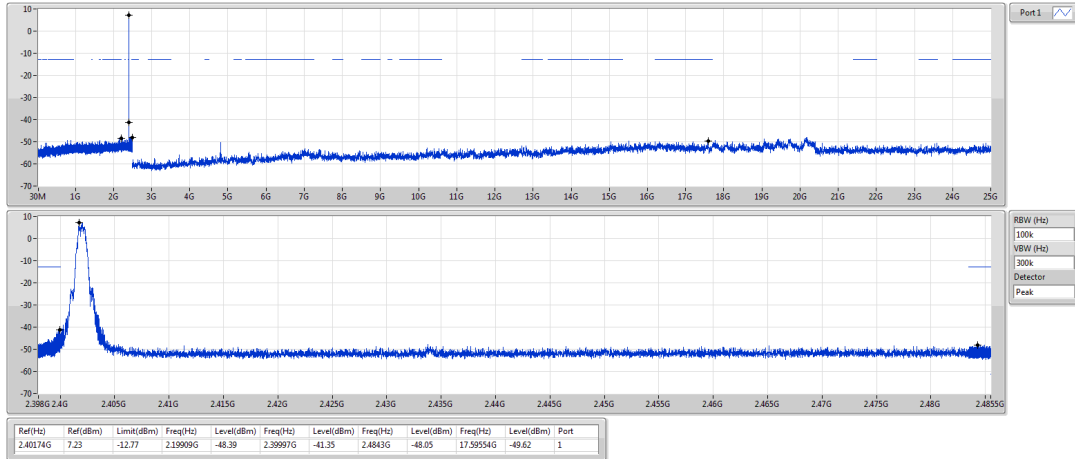
3.6.5 Test Result of Emissions in non-restricted Frequency Bands



BT-LE0.5_Nss1_1TX

CSE NdB

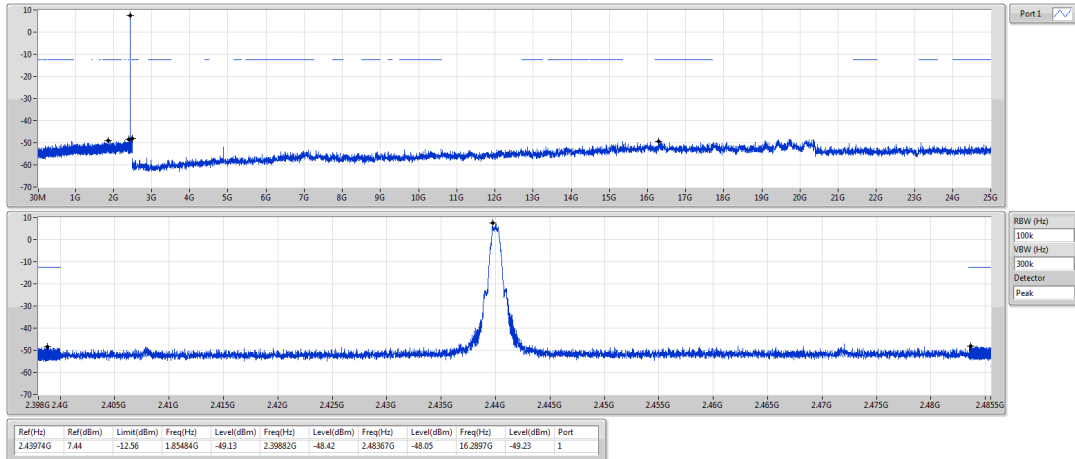
2402MHz



BT-LE0.5_Nss1_1TX

CSE NdB

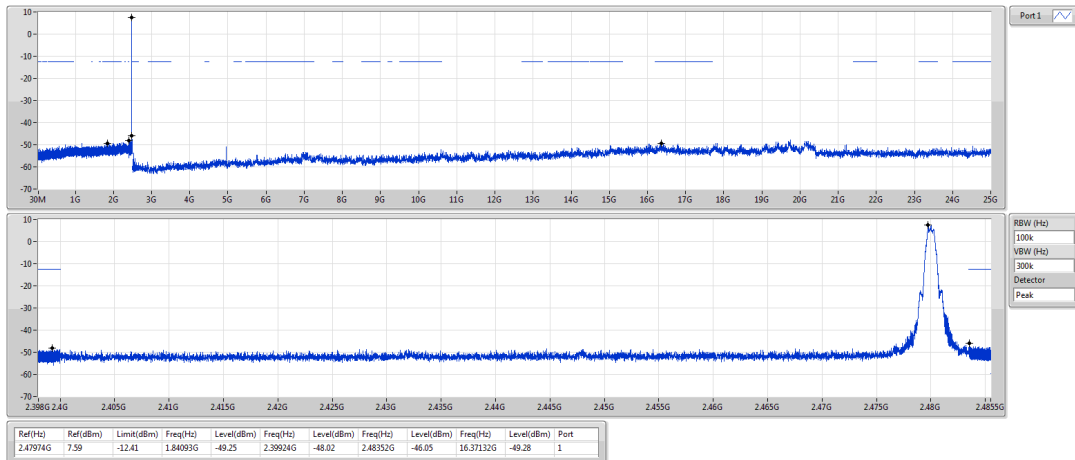
2440MHz



BT-LE0.5_Nss1_1TX

CSE NdB

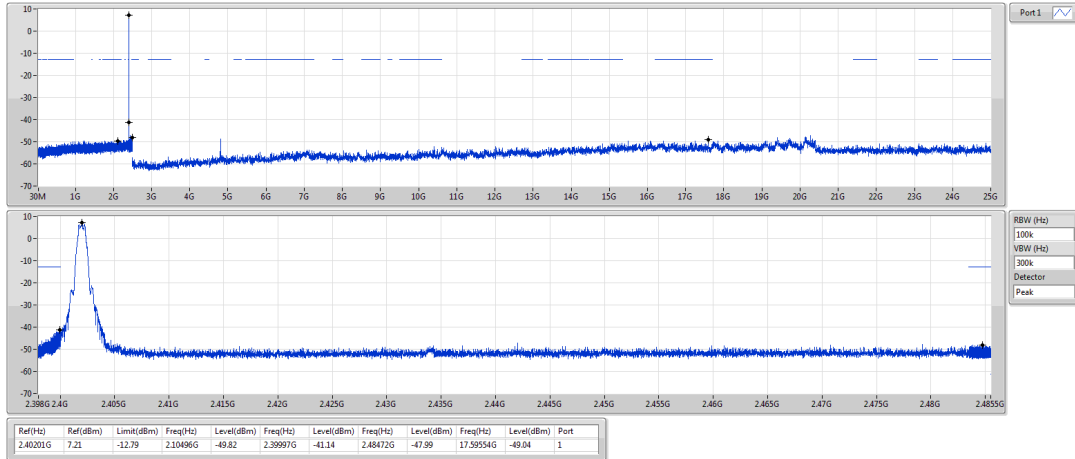
2480MHz



BT-LE(1Mbps)

CSE NdB

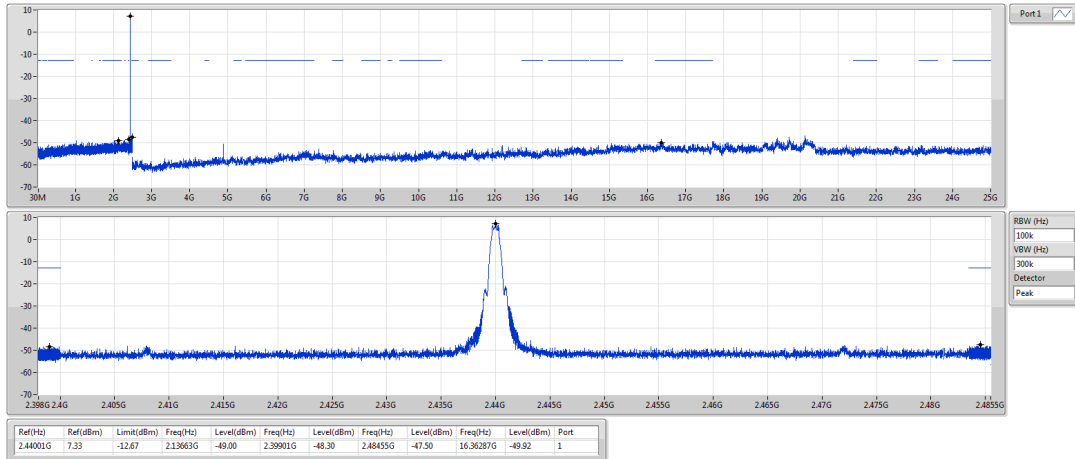
2402MHz



BT-LE(1Mbps)

CSE NdB

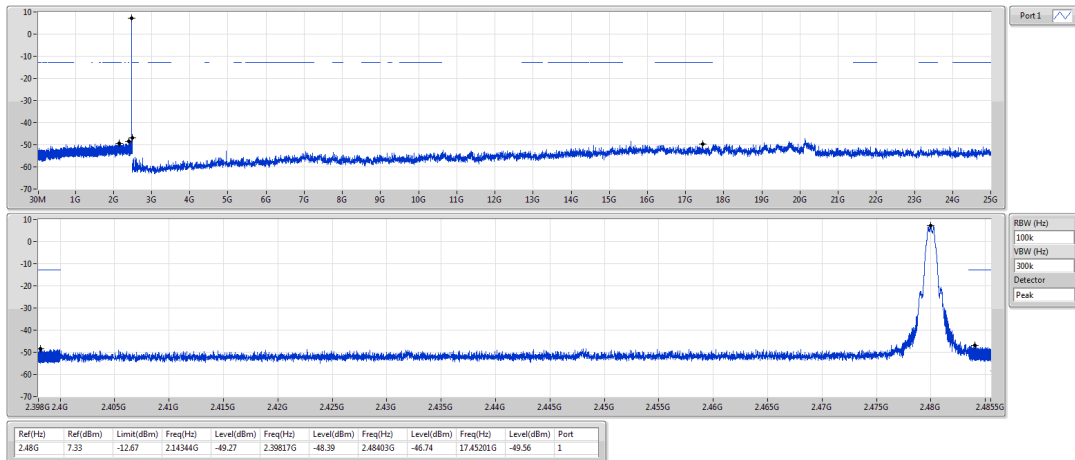
2440MHz



BT-LE(1Mbps)

CSE NdB

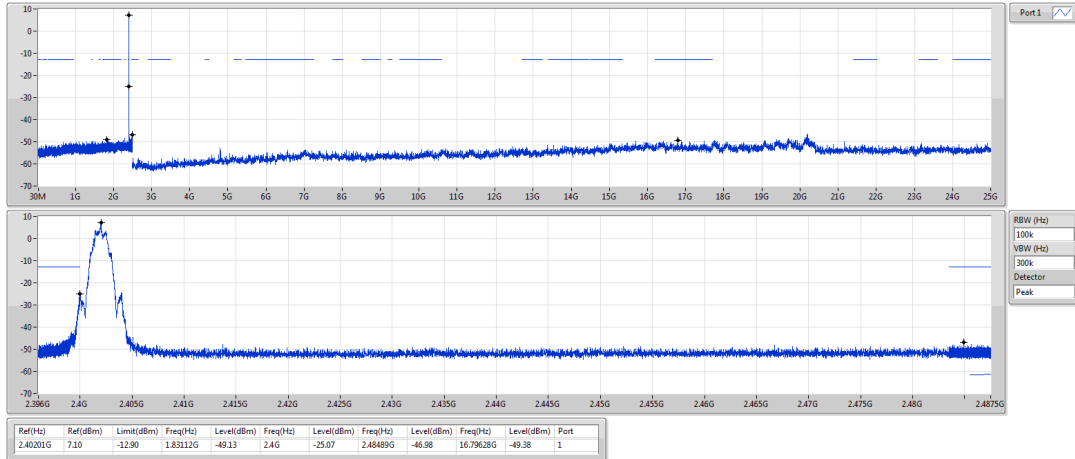
2480MHz



BT-LE(2Mbps)

CSE NdB

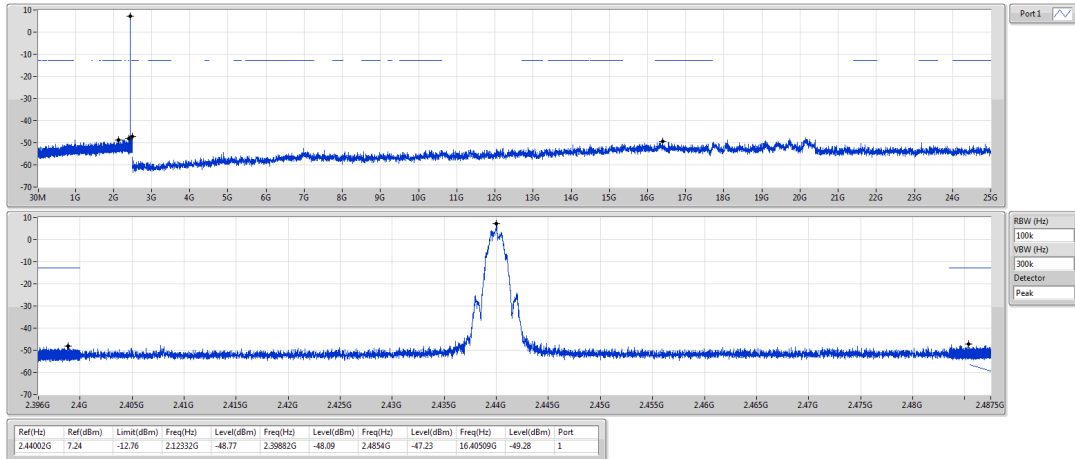
2402MHz



BT-LE(2Mbps)

CSE NdB

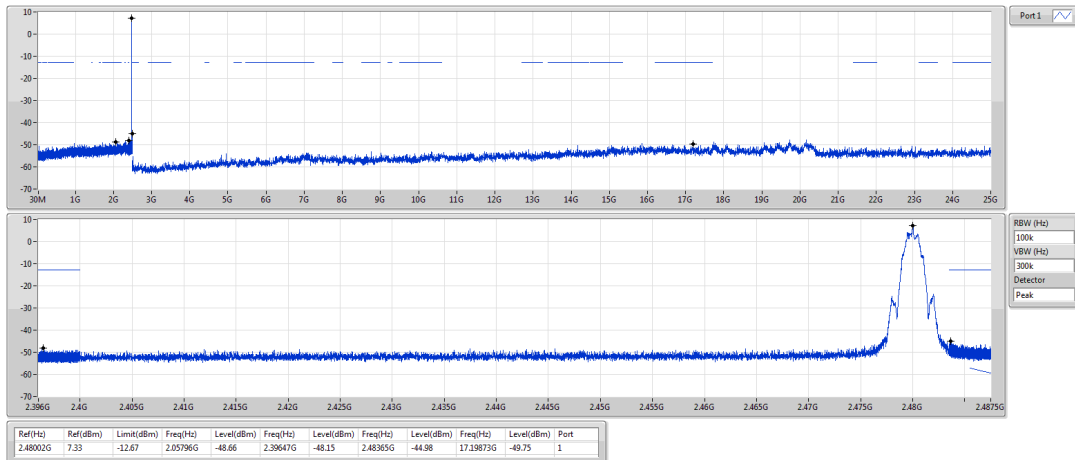
2440MHz



BT-LE(2Mbps)

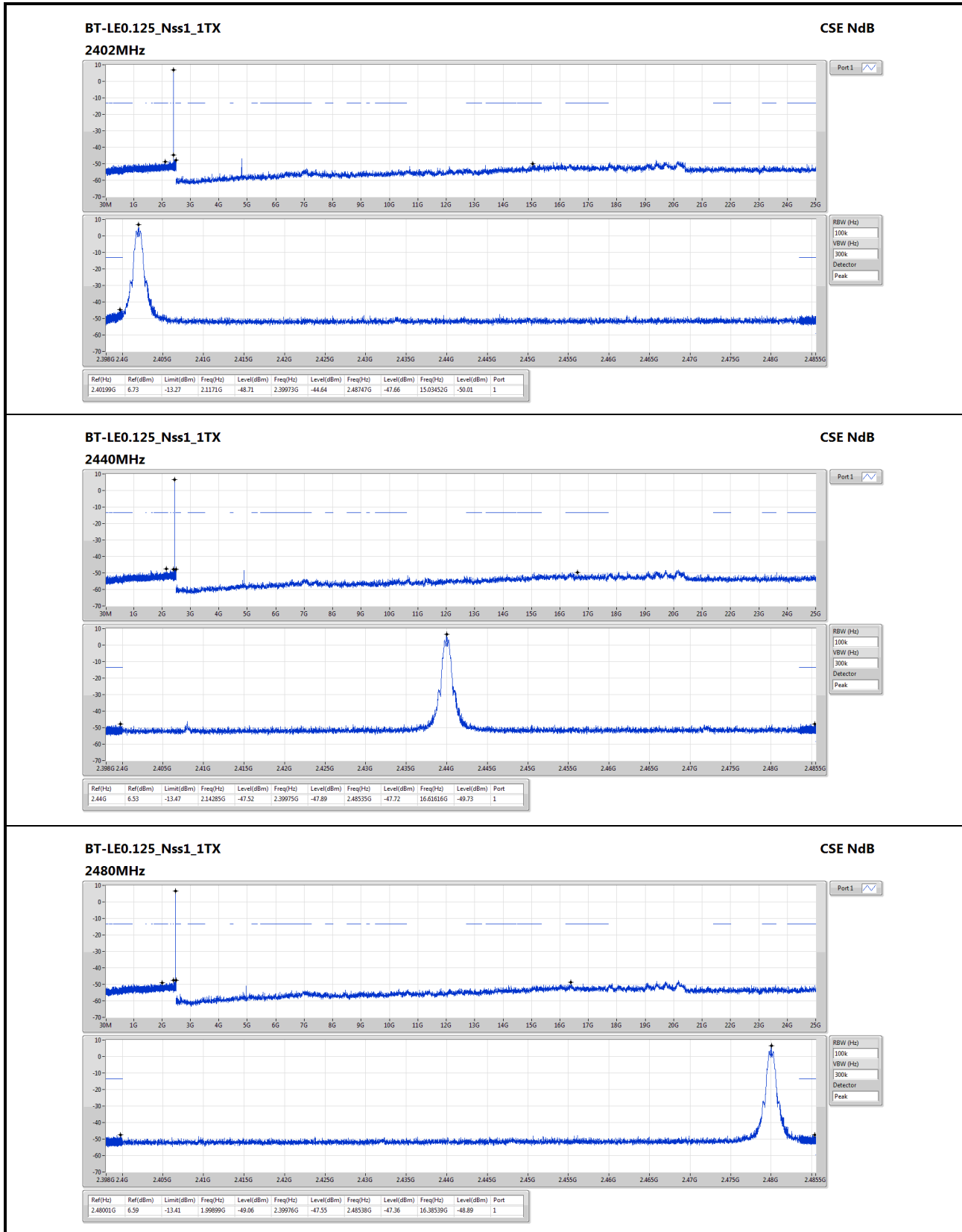
CSE NdB

2480MHz



Test configuration 3: High Power with MHF4 connector antenna

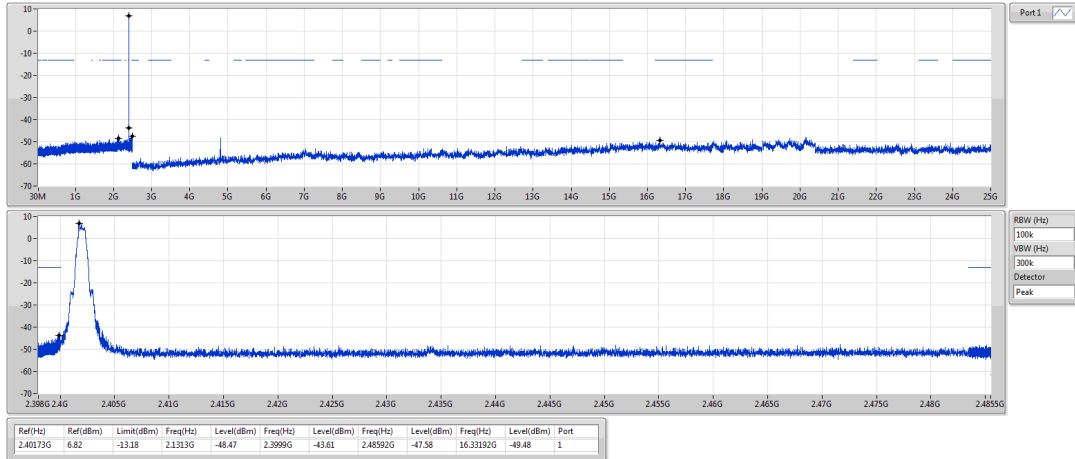
3.6.6 Test Result of Emissions in non-restricted Frequency Bands



BT-LE0.5_Nss1_1TX

CSE NdB

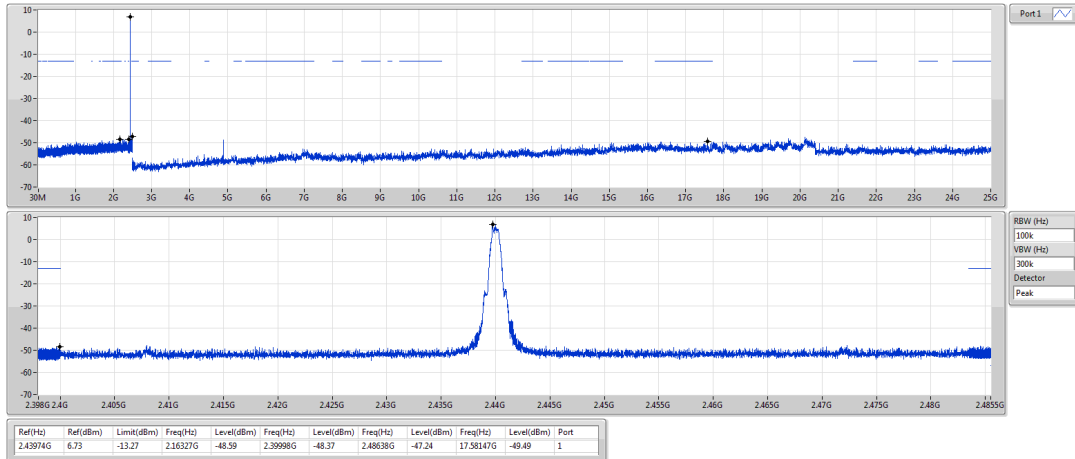
2402MHz



BT-LE0.5_Nss1_1TX

CSE NdB

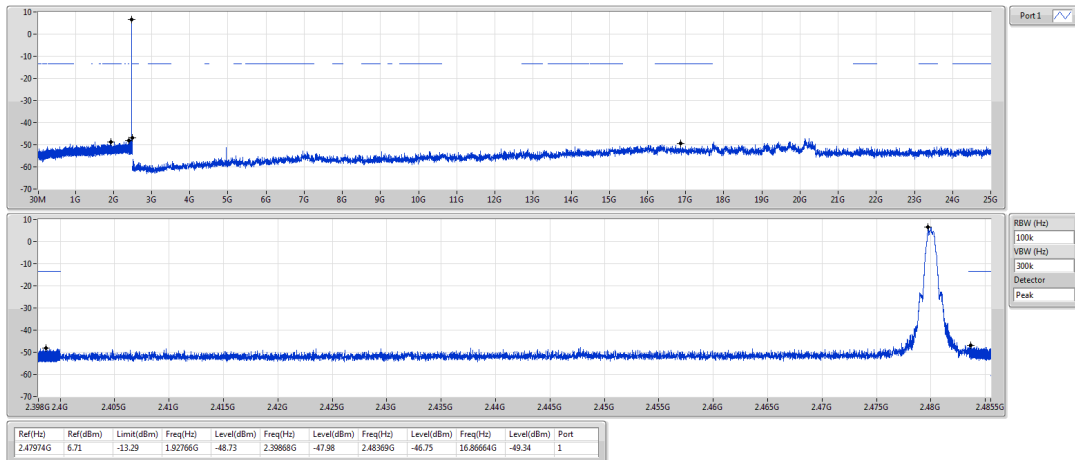
2440MHz



BT-LE0.5_Nss1_1TX

CSE NdB

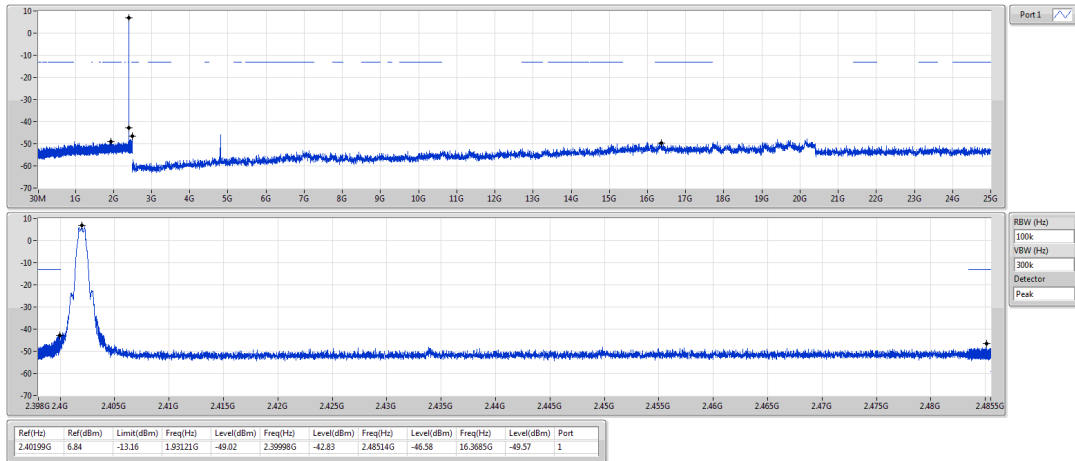
2480MHz



BT-LE(1Mbps)

2402MHz

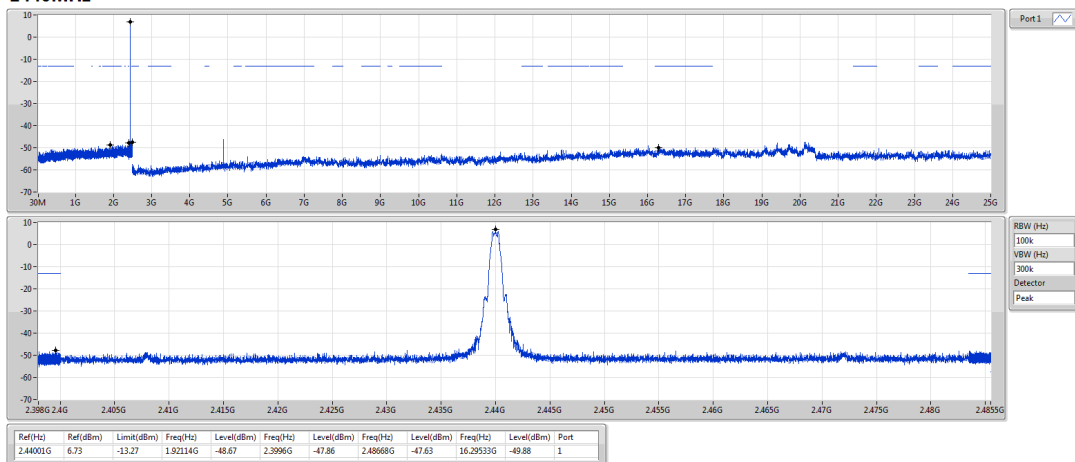
CSE NdB



BT-LE(1Mbps)

2440MHz

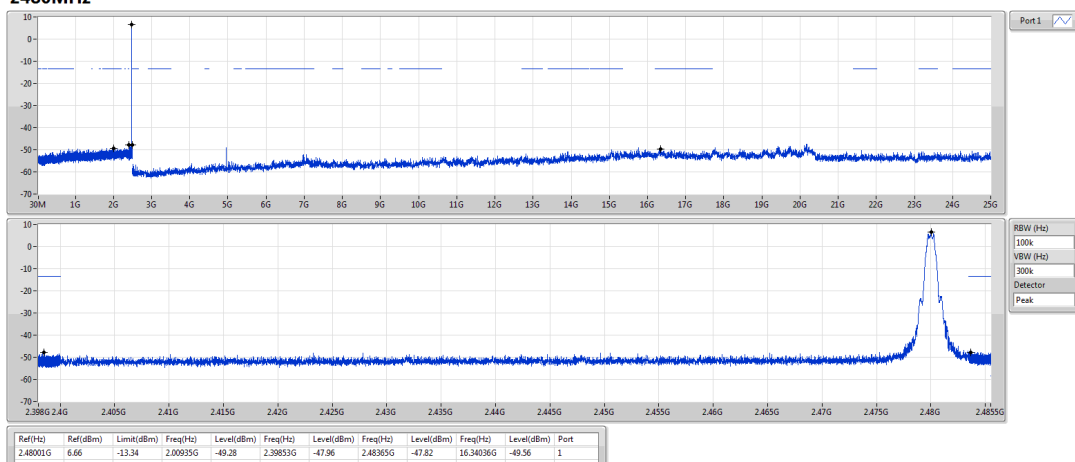
CSE NdB



BT-LE(1Mbps)

2480MHz

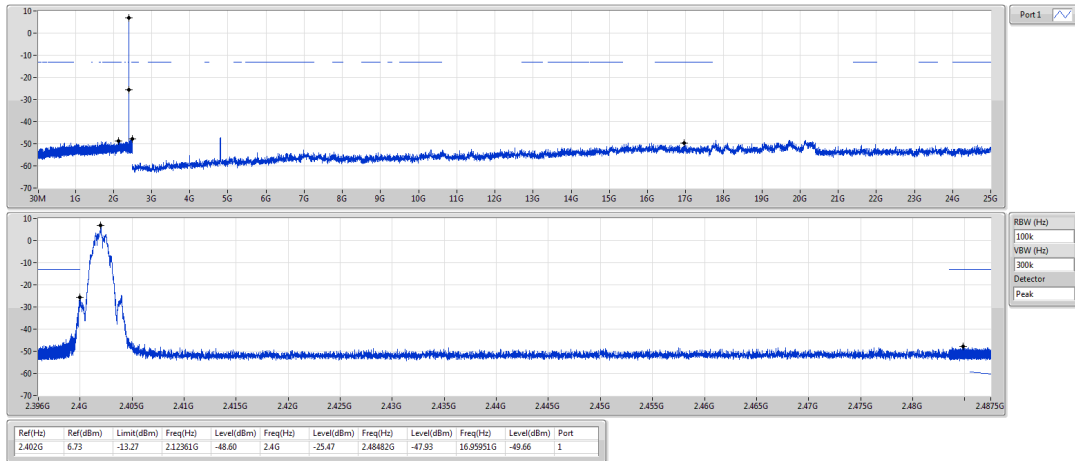
CSE NdB



BT-LE(2Mbps)

2402MHz

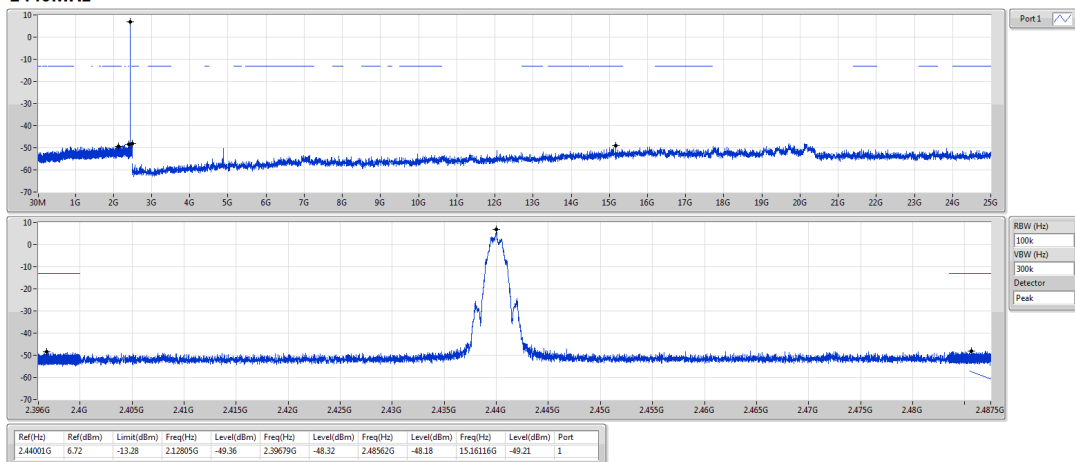
CSE NdB



BT-LE(2Mbps)

2440MHz

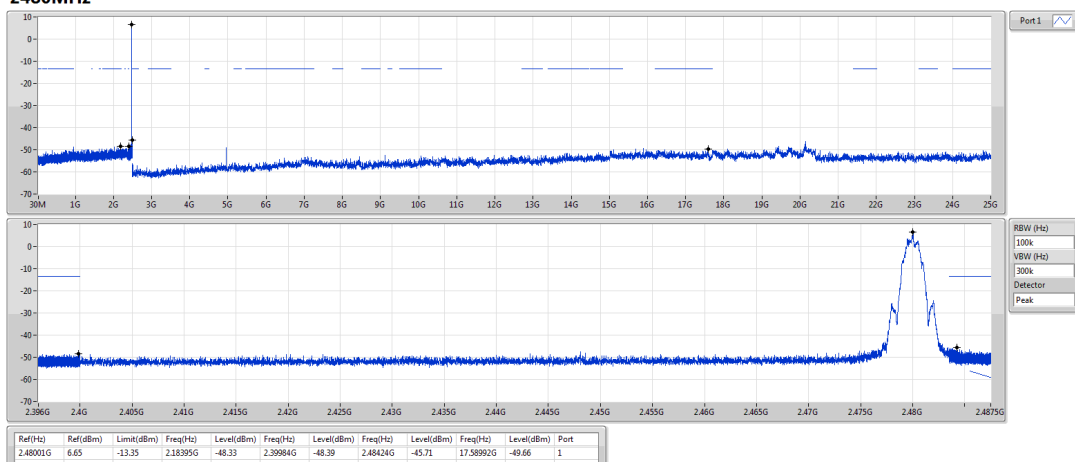
CSE NdB



BT-LE(2Mbps)

2480MHz

CSE NdB



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin
Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==