FCC RADIO TEST REPORT

For

FCC ID: 2AMOF-840C

Report Reference No.	:	18EFAB10012 31
Date of issue	:	2018-11-20
Testing Laboratory	:	DongGuan ShuoXin Electronic Technology Co., Ltd.
Address	:	Zone A, 1F, No. 6, XinGang Road YuanGang Street, XinAn District, ChangAn Town, DongGuan City, GuangDong, China
Applicant's name	:	Eagle Matrix Co., Ltd.
Address	:	NGA Kioicho Building 6F, 3-29 Kioicho, Chiyoda-ku, Tokyo, Japan
Manufacturer	:	Jiangmen Benlida Printed Circuit Co.,Ltd.

Test specification:

Test item description	:	CALM. Module
Trade Mark	:	
Model/Type reference	:	SVN-840C
Ratings	:	I/P: DC 5V

Responsible Engineer : Smile Wang

Smile Wang

Authorized Signatory: King Wang

King Wang

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TEST REPORT DECLARE

Applicant	:	Eagle Matrix Co., Ltd.
Address	:	NGA Kioicho Building 6F, 3-29 Kioicho, Chiyoda-ku, Tokyo, Japan
Equipment under Test	:	CALM. Module
Test Model No	:	SVN-840C
Manufacturer	:	Jiangmen Benlida Printed Circuit Co.,Ltd.
Address	:	No.76, Longxi Road, Jianhai District, Jiangmen City, Guangdong Province. P.R. China

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C (15.247)

Test procedure used: ANSI C63.10:2013, 558074 D01 15.247 Meas Guidance v05

We Declare:

The equipment described above is tested by DongGuan ShuoXin Electronic Technology Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and DongGuan ShuoXin Electronic Technology Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these

tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	18EFAB10012 31		
Date of Test:	2018-10-30 To 2018-11-15	**Date of Report**:	2018-11-20

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of DongGuan ShuoXin Electronic Technology Co., Ltd.

1. Summary of test Standards and results

The EUT have been tested according to the applicable standards as referenced below.

Description of Test Item	Standard	Results
6dB Bandwidth And 99% Occupied Bandwidth	FCC Part 15.247 (a)(2)	PASS
Peak Output Power	FCC Part 15.247(b)(3)	PASS
Power Spectral Density	FCC Part 15.247(e)	PASS
Spurious Emissions at Antenna Port	FCC Part 15.247(d)	PASS
Spurious Emissions	FCC Part 15.205, 15.209, FCC Part 15.247(d)	PASS
100 kHz Bandwidth of Frequency Band Edge	FCC Part 15.247(d)	PASS
AC Line Conducted Emissions	FCC Part 15.207 (a)	PASS
Antenna requirement	FCC Part 15: 15.203	PASS

2. GENERAL TEST INFORMATION

2.1. Description of EUT

EUT* Name	:	CALM. Module
Model Number	:	SVN-840C
EUT function description	:	Please reference user manual of this device
Power supply	:	DC5V
Adaptor		N/A
Radio Technology	:	BLE
Operation frequency	:	2402-2480MHz
Modulation	:	GFSK
Antenna Type	:	Internal Antenna, maximum PK gain: 3.5dBi
Date of Receipt	:	2018/10/30
Sample Type	:	Single production

Note: EUT is the ab. of equipment under test.

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Other
/	/	/	/

2.3. Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	Other

2.4. Block diagram of EUT configuration for test

EUT enters the engineering interface by clicking the system version to control EUT work in test mode as blow table.

Tested mode, channel, and data rate information			
Mode	data rate (Mpbs) (see Note)	Channel	Frequency (MHz)
BLE	1	Low: CH 0	2402
BLE	1	Low: CH 19	2440
BLE	1	Low: CH 39	2480
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.			

2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test (9kHz-150kHz)	3.7 dB
Uncertainty for Conduction emission test (150kHz-30MHz)	3.3 dB
Uncertainty for Radiation Emission test (30MHz-200MHz)	4.60 dB (Polarize: V)
	4.60 dB (Polarize: H)
Uncertainty for Radiation Emission test (200MHz-1GHz)	6.10 dB (Polarize: V)
	5.08 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz-6GHz)	5.01 dB (Polarize: V)
	5.01 dB (Polarize: H)
Uncertainty for Radiation Emission test (6GHz-18GHz)	5.26 dB (Polarize: V)
	5.26 dB (Polarize: H)
Uncertainty for Radiation Emission test (18GHz-40GHz)	5.06 dB (Polarize: V)
	5.06 dB (Polarize: H)
Uncertainty for radio frequency	±0.048kHz
Uncertainty for conducted RF Power	±0.32dB

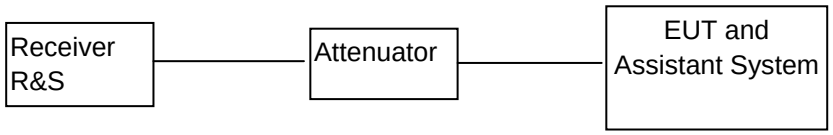
Note：This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. 6dB Bandwidth and 99% Occupied Bandwidth

3.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	05/25/2019	05/26/2018
2	Attenuator	Mini-Circuits	BW-S10W2	101109	12/17/2018	12/18/2017
3	RF Cable	Micable	C10-01-01-1	100309	12/17/2018	12/18/2017

3.2. Block diagram of test setup



3.3. Limits

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 KHz

3.4. Test Procedure

(1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

(2) Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

(3) Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.

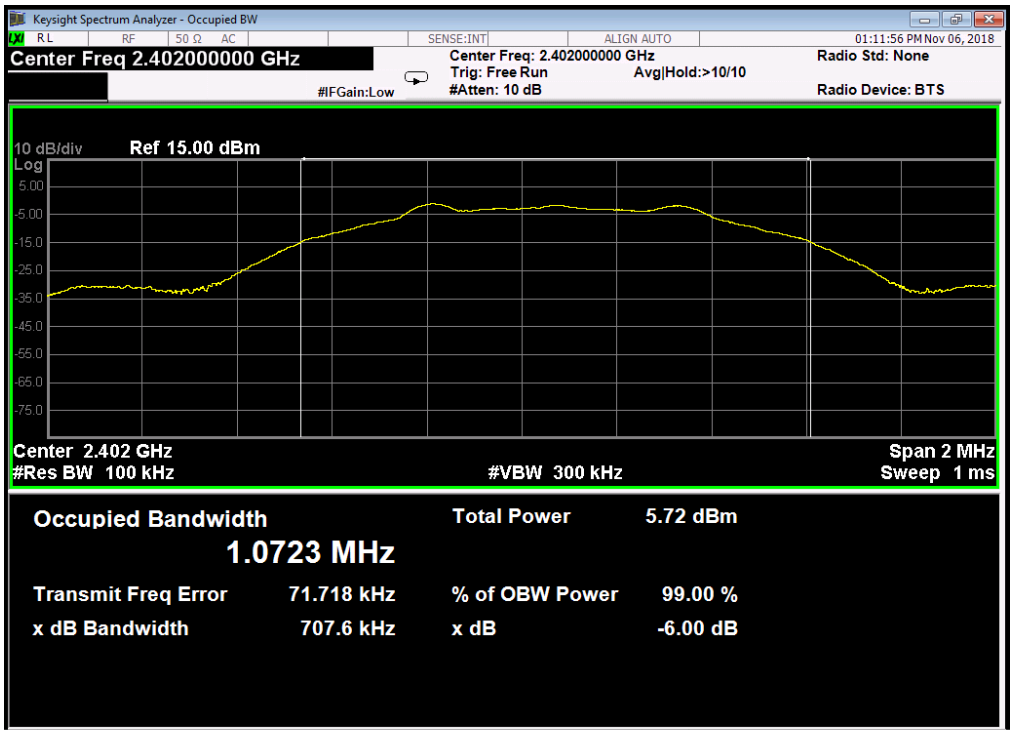
(4) Repeat above procedures until all frequencies measured were complete.

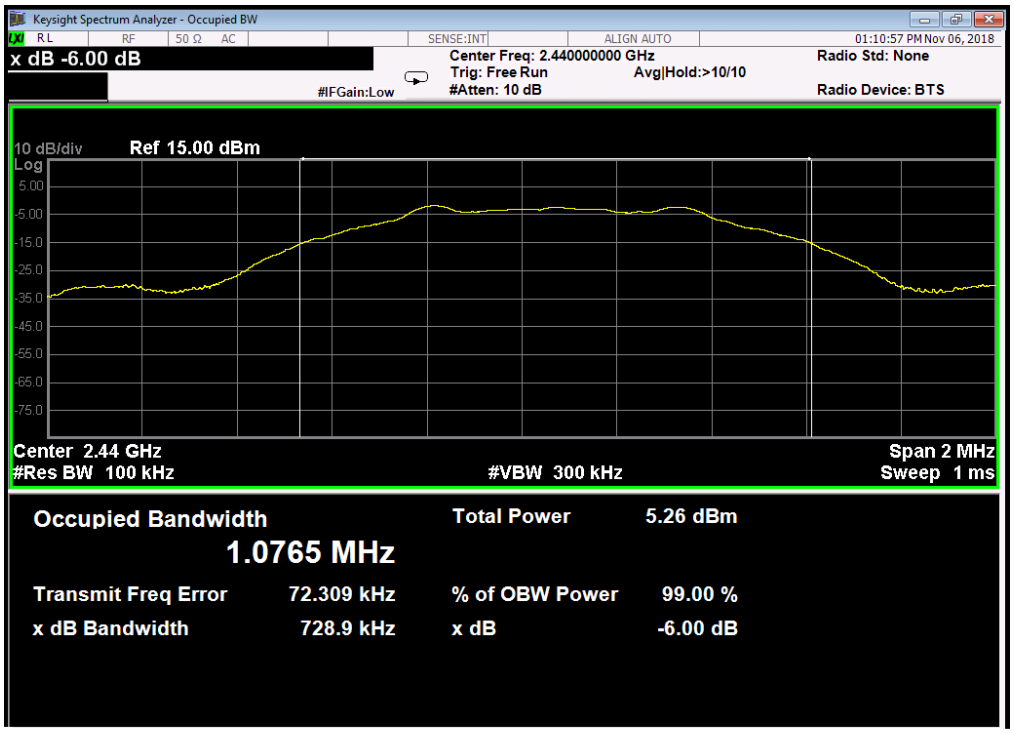
3.5. Test Result

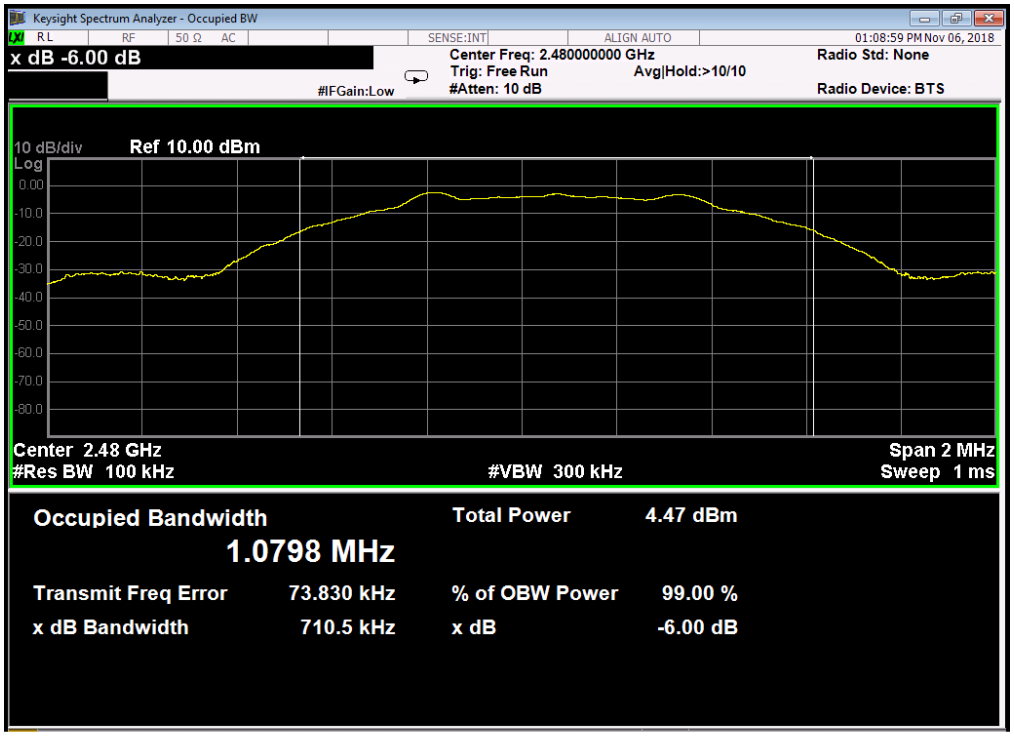
EUT Set Mode	CH or Frequency	6 dB bandwidth	99% dB bandwidth	Limt	Conclusion
		Result (MHz)	Result (MHz)	>500KHz	PASS
BLE	CH 0	0.708	1.072	>500KHz	PASS
BLE	CH 19	0.729	1.077	>500KHz	PASS
BLE	CH 39	0.711	1.080	>500KHz	PASS

3.6. Original test data

CH 0




Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:10:57 PM Nov 06, 2018
x dB -6.00 dB
Center Freq: 2.440000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 15.00 dBm
Log
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
-55.0
-65.0
-75.0
Center 2.44 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2 MHz
Sweep 1 ms
Occupied Bandwidth
1.0765 MHz
Total Power
5.26 dBm
Transmit Freq Error
72.309 kHz
% of OBW Power
99.00 %
x dB Bandwidth
728.9 kHz
x dB
-6.00 dB

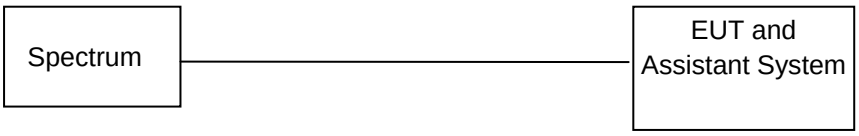

Keysight Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:08:59 PM Nov 06, 2018
x dB -6.00 dB
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2 MHz
Sweep 1 ms
Occupied Bandwidth
1.0798 MHz
Total Power
4.47 dBm
Transmit Freq Error
73.830 kHz
% of OBW Power
99.00 %
x dB Bandwidth
710.5 kHz
x dB
-6.00 dB

4. Maximum Peak Output Power

4.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	05/25/2019	05/26/2018
2	Attenuator	Mini-Circuits	BW-S10W2	101109	12/17/2018	12/18/2017
3	RF Cable	Micable	C10-01-01-1	100309	12/17/2018	12/18/2017

4.2. Block diagram of test setup



4.3. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

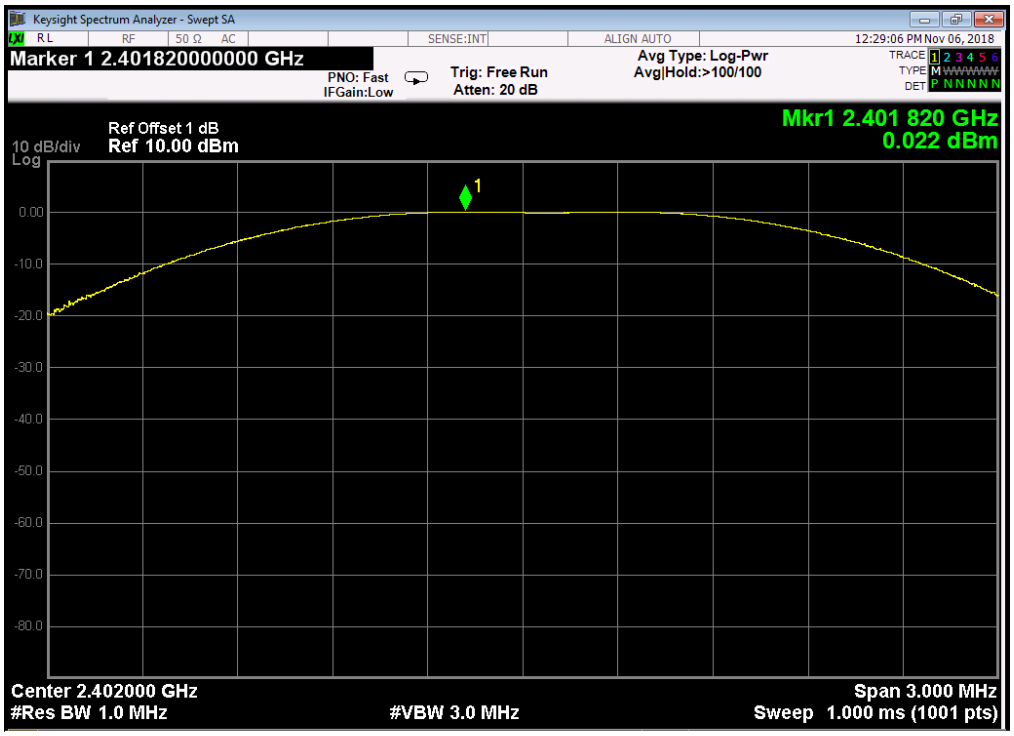
4.4. Test Procedure

1. Place the EUT on a bench and set it in transmitting mode. .
2. A wide band power meter with a matched thermocouple detector was used to directly measure the output power from the RF output port of the EUT in continuously transmitting mode.
3. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range.

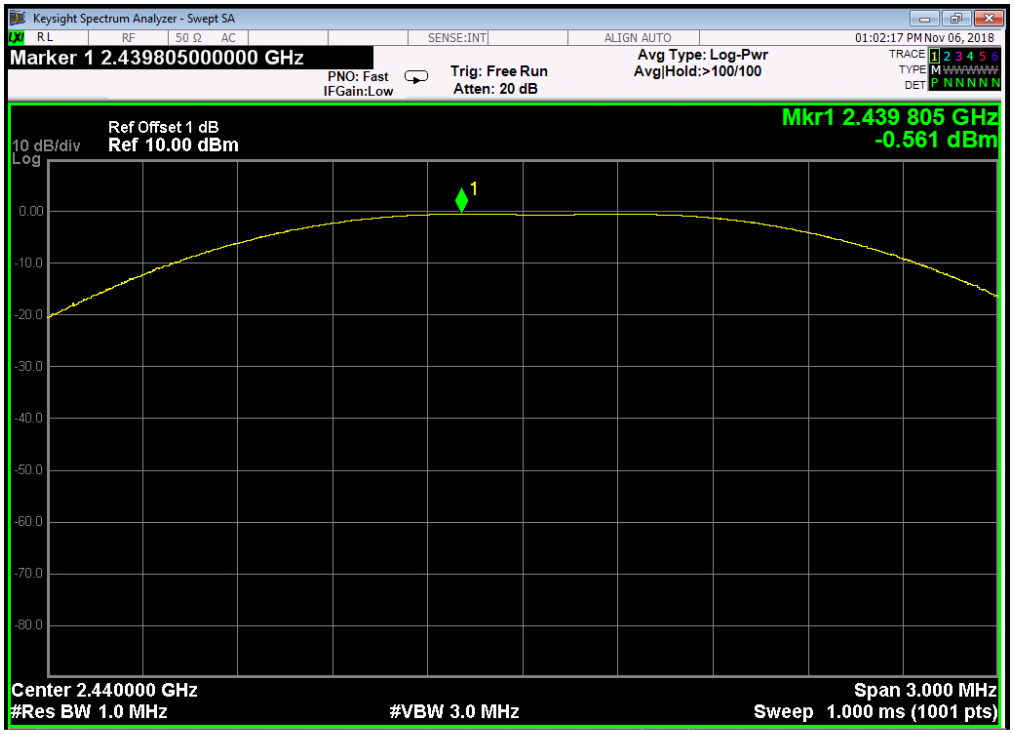
4.5. TEST RESULT

EUT Set Mode	Limit	Conclusion	CH	Result(dBm)
				Peak
BLE	30dBm	PASS	CH 0	0.022
BLE	30dBm	PASS	CH 19	-0.561
BLE	30dBm	PASS	CH 39	-1.166

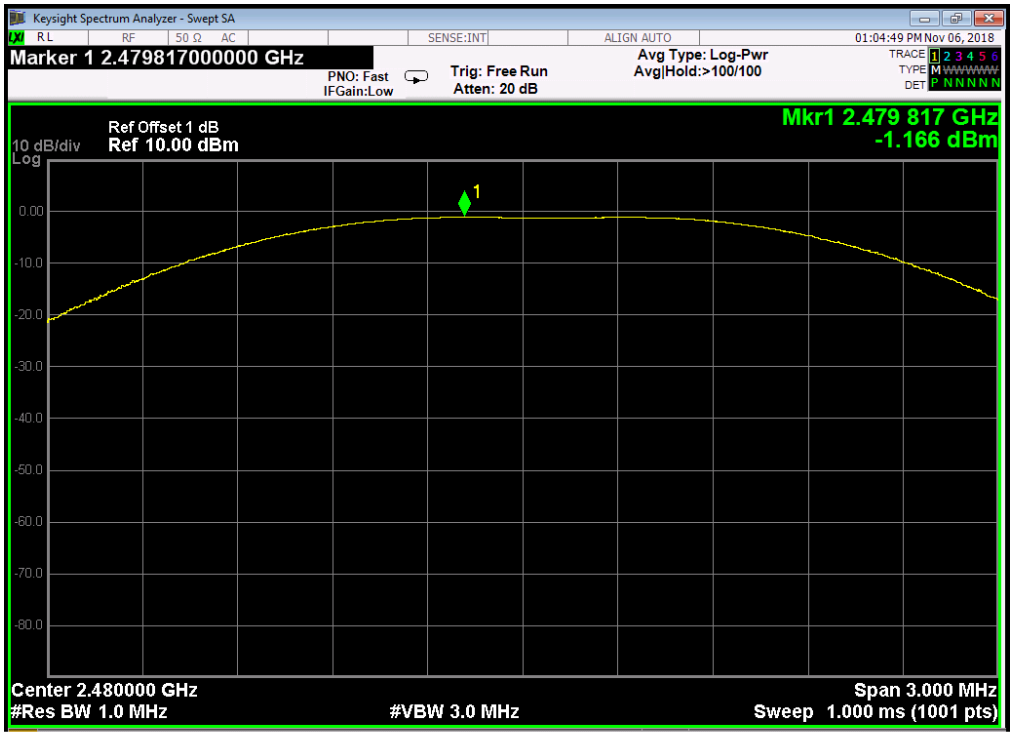
CH 0



CH 19


Keysight Spectrum Analyzer - Swept SA
RL RF 50 Ω AC SENSE:INT ALIGN AUTO 01:02:17 PM Nov 06, 2018
Marker 1 2.439805000000 GHz
PNO: Fast IFGain:Low
Trig: Free Run Atten: 20 dB
Avg Type: Log-Pwr Avg|Hold:>100/100
TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N
Ref Offset 1 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.439 805 GHz
-0.561 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.440000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 3.000 MHz
Sweep 1.000 ms (1001 pts)

CH 39

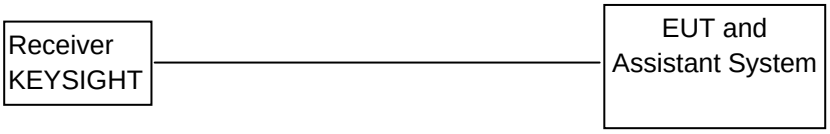

Keysight Spectrum Analyzer - Swept SA
RL RF 50 Ω AC SENSE:INT ALIGN AUTO 01:04:49 PM Nov 06, 2018
Marker 1 2.479817000000 GHz
PNO: Fast IFGain:Low
Trig: Free Run Atten: 20 dB
Avg Type: Log-Pwr Avg|Hold:>100/100
TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N
Ref Offset 1 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.479 817 GHz
-1.166 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 3.000 MHz
Sweep 1.000 ms (1001 pts)

5. Power Spectral Density

5.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	05/25/2019	05/26/2018
2	Attenuator	Mini-Circuits	BW-S10W2	101109	12/17/2018	12/18/2017
3	RF Cable	Micable	C10-01-01-1	100309	12/17/2018	12/18/2017

5.2. Block diagram of test setup



5.3. Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

5.4. TEST PROCEDURE

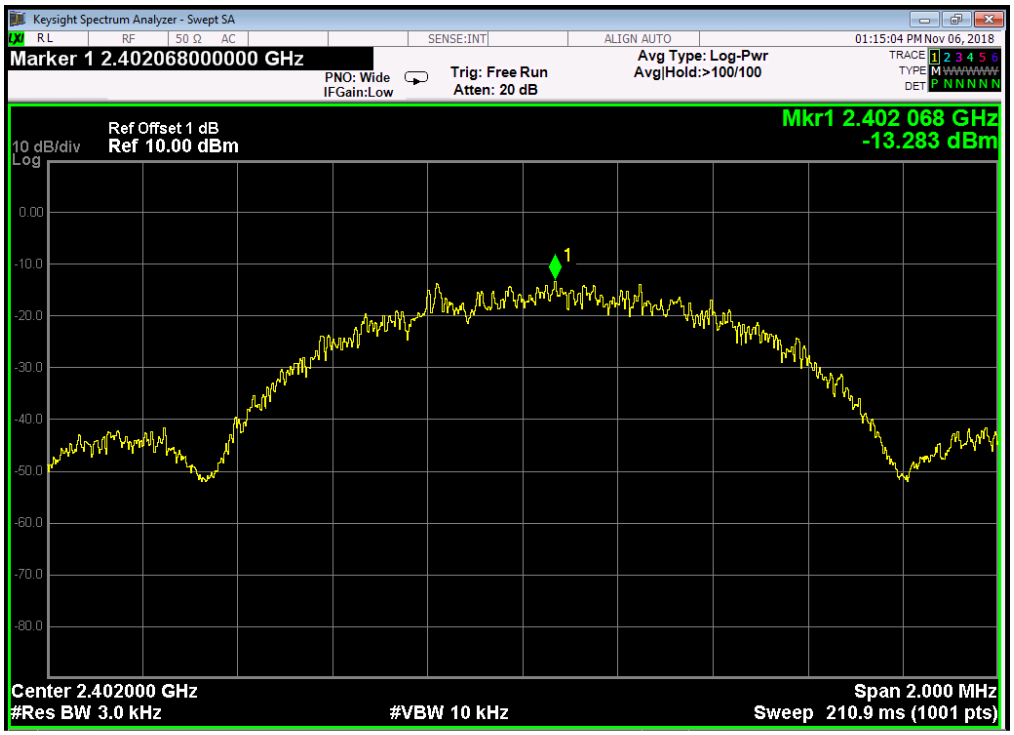
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generatorl.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range
3. According to KDB 558074 D01 DTS Meas Guidance v03, set the RBW = 3 kHz, VBW = 30 kHz, Set the span to 1.5 times the DTS channel bandwidth.
4. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW

5.5. Test Result

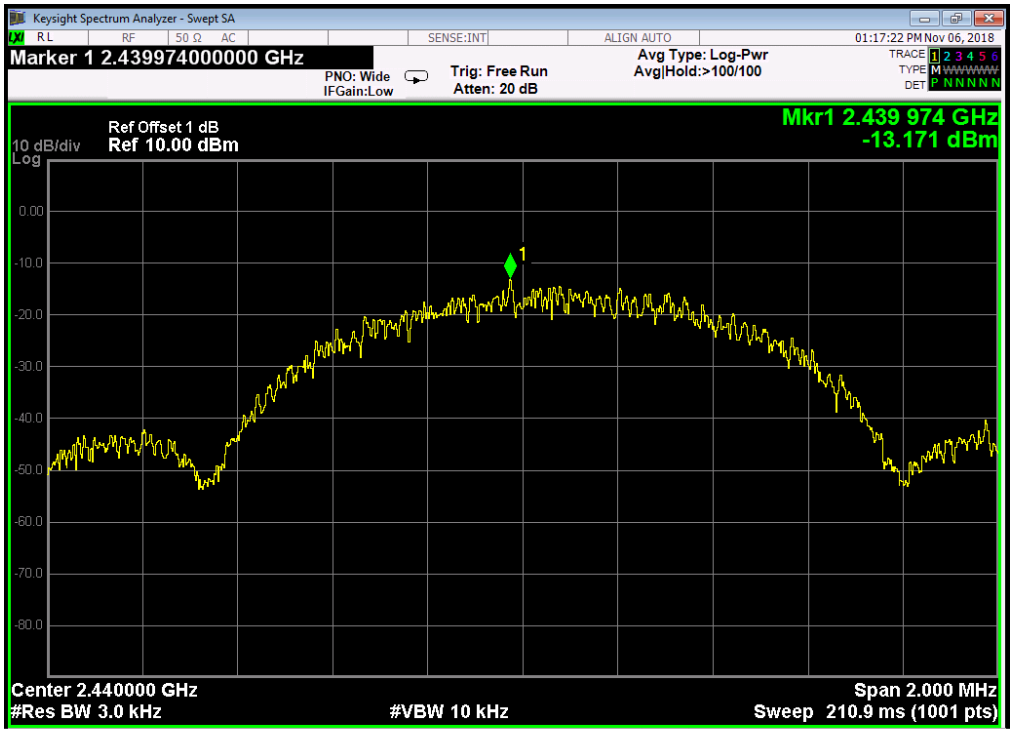
EUT Set Mode	CH or Frequency	Result	Limit: <dBm/3KHz	Conclusion
BLE	CH 0	-13.283	8	PASS
BLE	CH 19	-13.171	8	PASS
BLE	CH 39	-13.955	8	PASS

5.6. Original test data

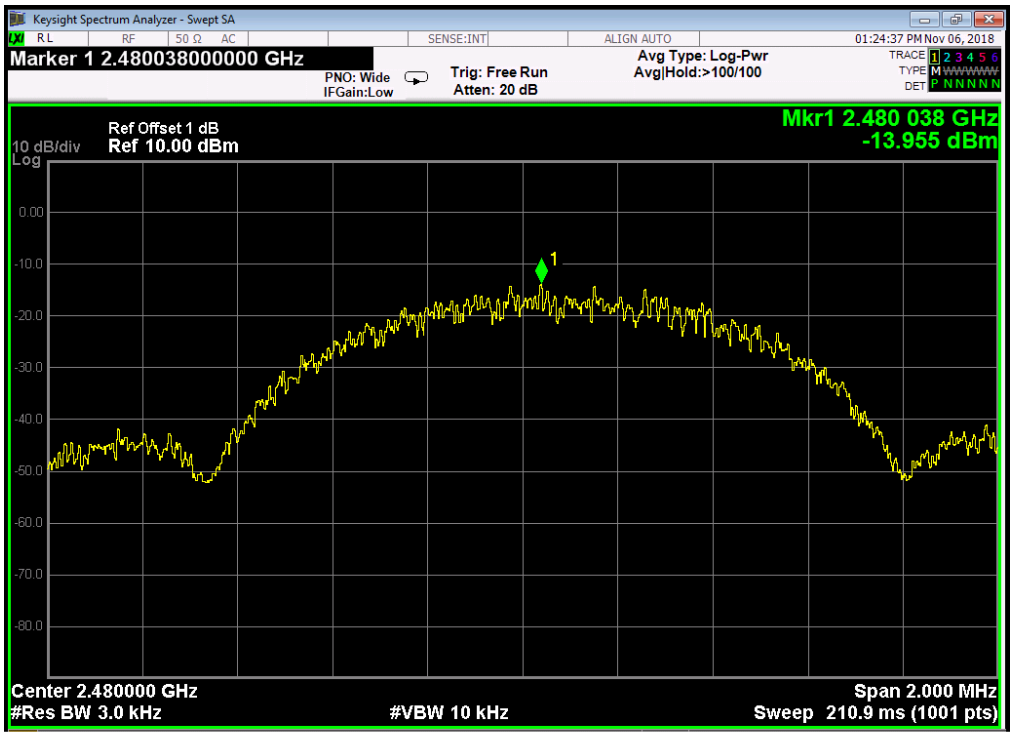
CH 0



CH19


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:17:22 PM Nov 06, 2018
Marker 1 2.439974000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr1 2.439 974 GHz
-13.171 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.440000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)

CH 39


Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:24:37 PM Nov 06, 2018
Marker 1 2.480038000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr1 2.480 038 GHz
-13.955 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)

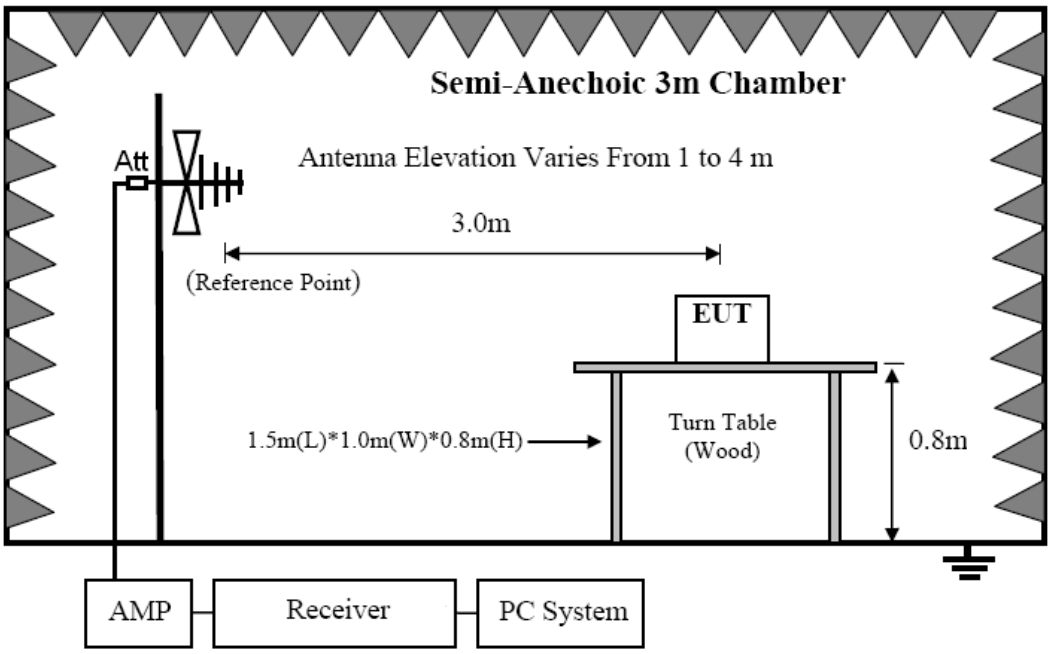
6. Spurious Emissions

6.1. Test equipment

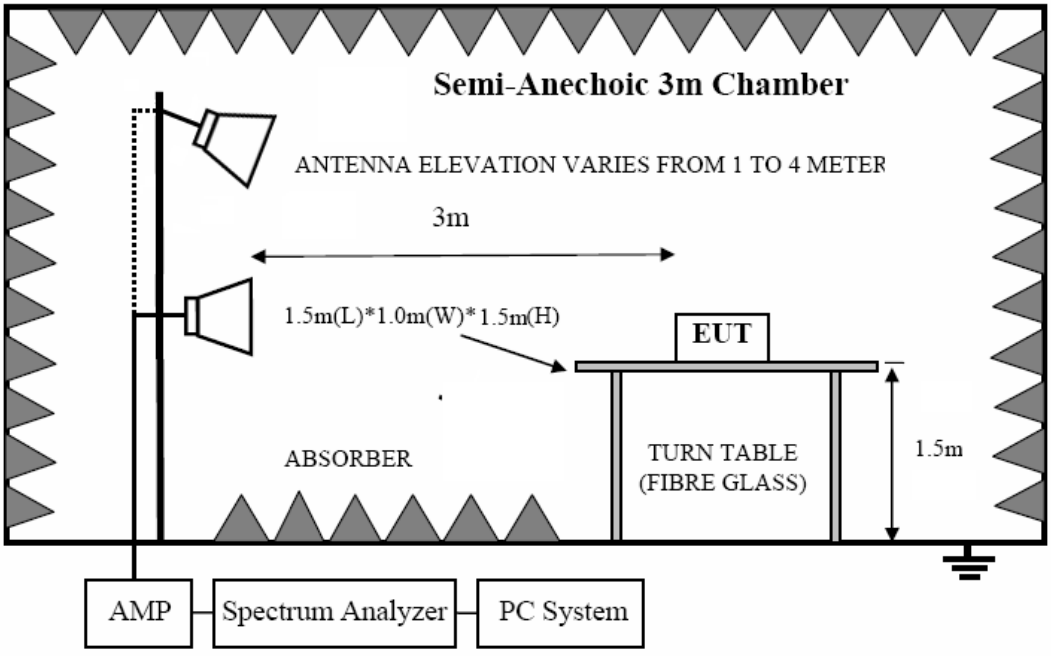
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	EMI Test Receiver	R&S	ESCI	101307	12/17/2018	12/18/2017
2	Spectrum analyzer	Agilent	E4407B	US40240708	07/03/2019	07/04/2018
3	Trilog Broadband Antenna	Schwarzbeck	VULB9168	VULB9168 -192	03/04/2019	03/05/2018
4	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D1065	100276	12/17/2018	12/18/2017
5	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D1065	100546	12/17/2018	12/18/2017
6	Dipole antenna	Schwarzbeck	UHAP	1101	12/17/2018	12/18/2017
7	Dipole antenna	Schwarzbeck	VHAP	1118	12/17/2018	12/18/2017
8	Pre-Amplifier	CY	EMC011830	980136	12/17/2018	12/18/2017
9	Pre-amplifier	HP	8447F	3113A05680	12/17/2018	12/18/2017
10	RF Cable	R&S	R01	10403	12/17/2018	12/18/2017
11	RF Cable	R&S	R02	10512	12/17/2018	12/18/2017
12	RF Cable	R&S	R01	10454	12/17/2018	12/18/2017
13	RF Cable	R&S	R02	10343	12/17/2018	12/18/2017
14	6 dB Attenuator	EMEC	ATT6000-6-NN	N/A	11/21/2018	11/22/2017
15	Turn Table	UC	UC3000	N/A	N/A	N/A
16	Antenna Mast	UC	UC3000	N/A	N/A	N/A
17	MeasurementSoftware	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A	N/A

6.2. Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

6.3. Limit

6.3.1 FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

6.3.2 FCC 15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

6.3.3 Limit for this EUT

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10:2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

6.4. TEST PROCEDURE

(1) EUT was placed on a non-metallic table, 80/150 cm above the ground plane inside a semi-anechoic chamber.

(2) Setup EUT and assistant system according clause 2.4 and 8.2

(3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Change modulation type of device if practicable.

(c) Change power supply range from 85% to 115% of the rated supply voltage

(d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

(4) Spectrum frequency from 9MHz to 25GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so below final test was performed with frequency range from 30MHz to 18GHz.

(5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.

(6) For emissions from 30MHz to 1GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 KHz.

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure, Detector is at PK; RBW is set at 1MHz, VBW is set at 3MHz for Average measure, Detector is at RMS.

6.5. TEST RESULT

Below 30M

EUT:	CALM. Module	**Model No.:**	SVN-840C
Temperature:	24℃	**Relative Humidity:**	55%
Distance:	3m	**Test Power:**	DC 3.3V
Polarization:	--	**Test Result:**	Pass
Test Mode:	Keeping TX mode	**Test By:**	Smile

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

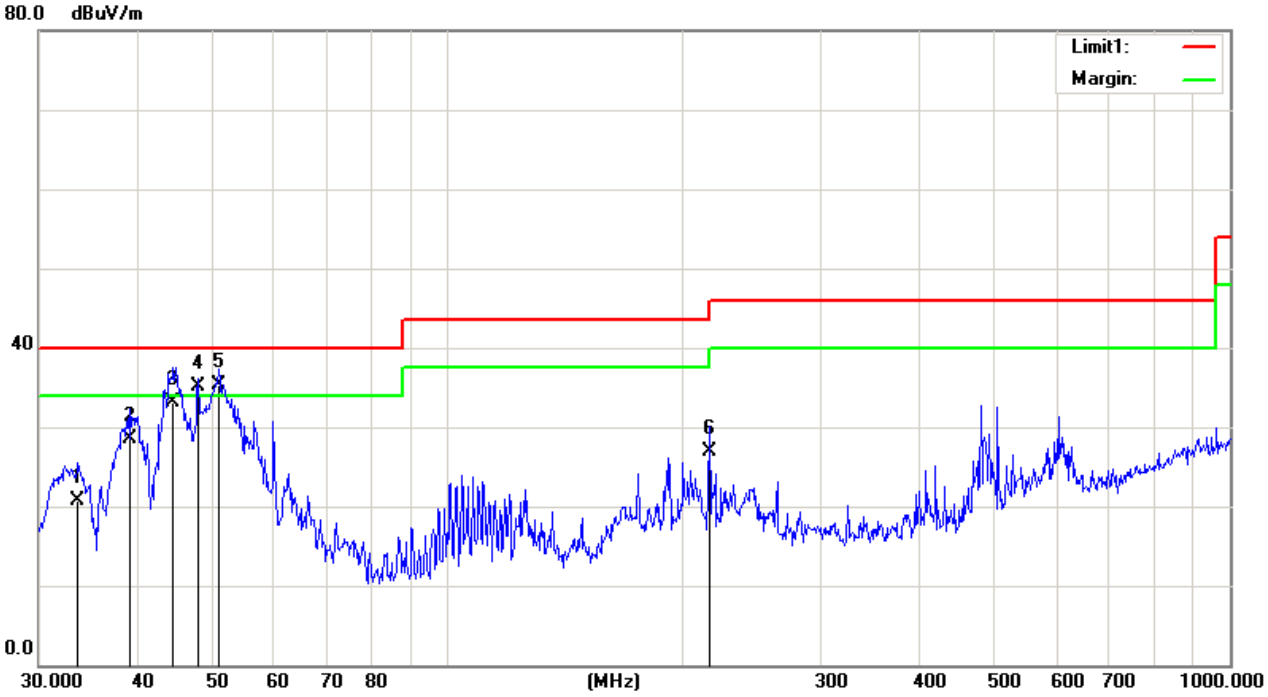
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =20 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor

Between 30M – 1000 MHz

EUT:	CALM. Module	**Model No.:**	SVN-840C
Temperature:	24	**Relative Humidity:**	55%
Distance:	3m	**Test Power:**	DC 3.3V
Polarization:	Vertical	**Test Result:**	Pass
Standard:	(RE)FCC PART 15	**Test By:**	Smile
Test Mode:	Keeping TX mode		

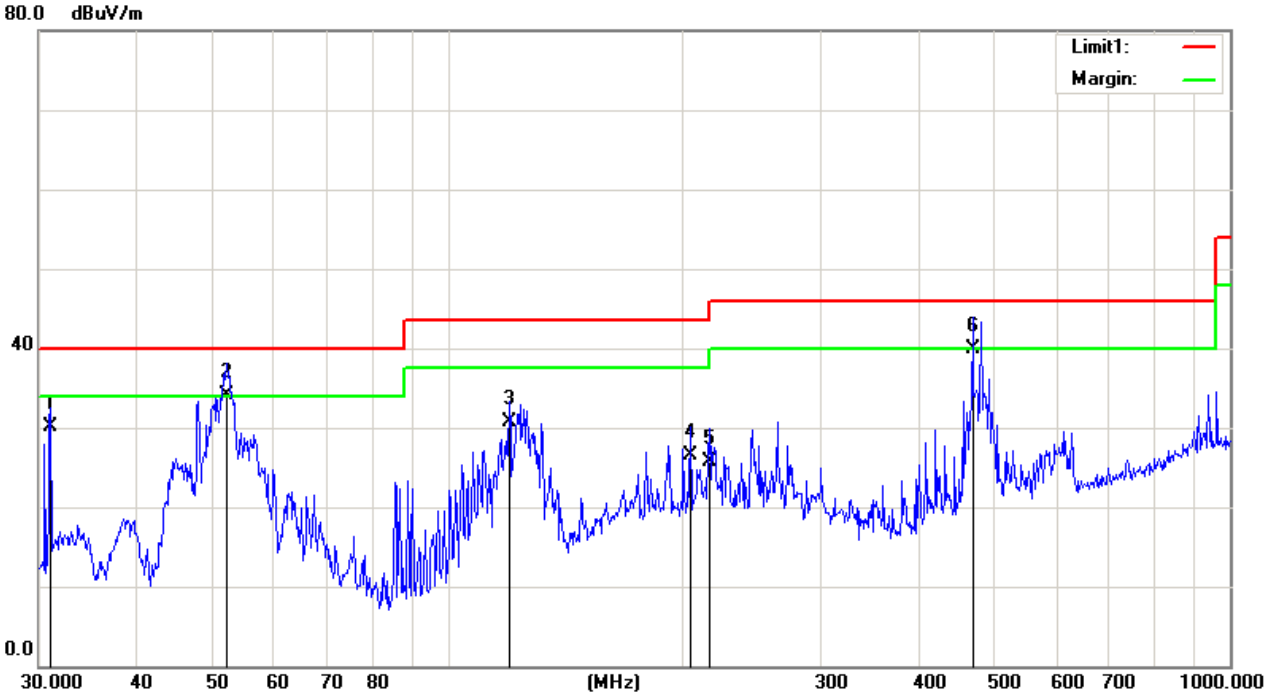


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	33.6802	33.97	-13.31	20.66	40.00	-19.34	QP
2	39.1615	41.86	-13.38	28.48	40.00	-11.52	QP
3	44.5867	47.33	-14.30	33.03	40.00	-6.97	QP
4	47.9939	48.86	-13.85	35.01	40.00	-4.99	QP
5	50.9420	48.64	-13.40	35.24	40.00	-4.76	QP
6	216.0240	38.09	-11.11	26.98	46.00	-19.02	QP

The test result is calculated as the following:

(1) Result = Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 3.7V
Polarization:	Horizontal	Test Result:	Pass
Standard:	(RE)FCC PART 15	Test By:	Smile
Test Mode:	Keeping TX mode		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	31.0705	43.94	-13.92	30.02	40.00	-9.98	QP
2	52.2079	49.87	-15.72	34.15	40.00	-5.85	QP
3	119.8555	45.29	-14.67	30.62	43.50	-12.88	QP
4	204.2376	36.85	-10.40	26.45	43.50	-17.05	QP
5	216.0240	35.52	-9.91	25.61	46.00	-20.39	QP
6	468.8761	47.56	-7.56	40.00	46.00	-6.00	QP

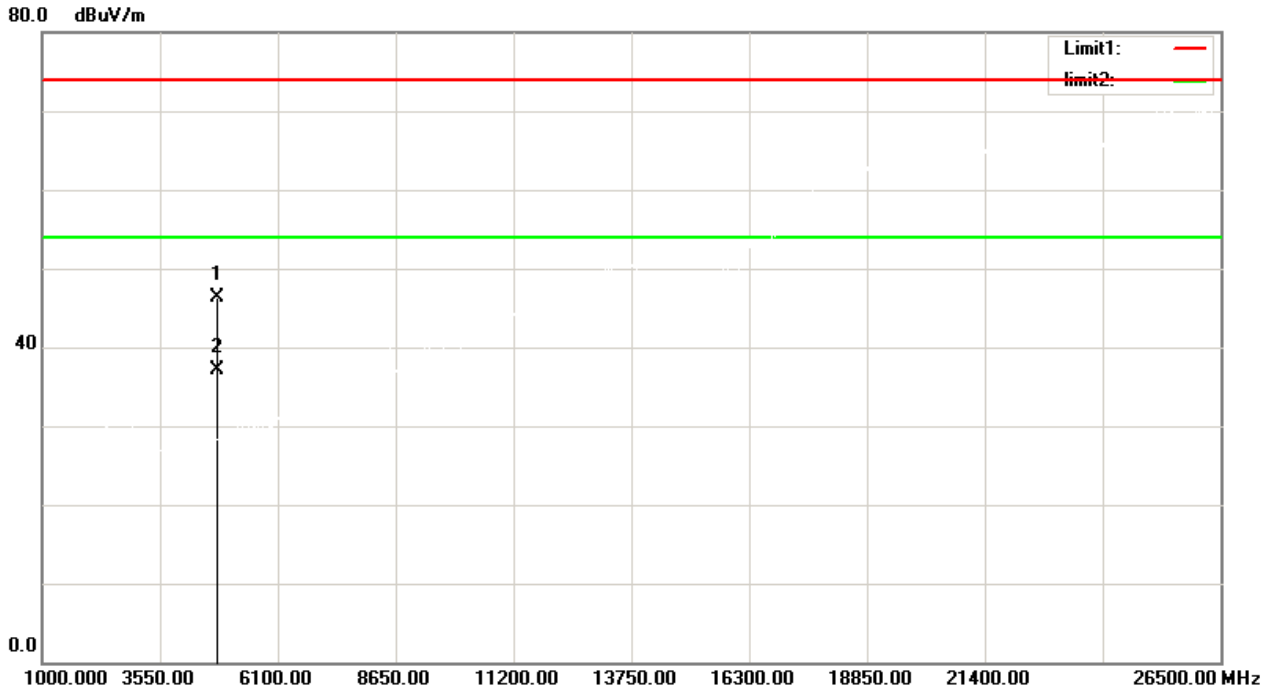
The test result is calculated as the following:

(1) Result = Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
(3) Margin = Result - Limit

Between 1000M – 25000 MHz

Test Site	:	3m Chamber			
EUT	:	CALM. Module	**Tested By**	:	Smile
Power Supply	:	DC 5V	**Model Number**	:	SVN-840C
Condition	:	Temp:24.5'C,Humi:55%, Press:100.1kPa	**Test Mode**	:	Tx mode

EUT:	**CALM. Module**	**Model No.:**	**SVN-840C**
Temperature:	**24**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC5V**
Polarization:	**Horizontal**	**Test Result:**	**Pass**
Test Time:	**2018-11-12**	**Test By:**	**Smile**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**TX**		
Note:	**BLE 2402**		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.000	57.15	-10.79	46.36	74.00	-27.64	peak
2	4804.000	47.84	-10.79	37.05	54.00	-16.95	AVG

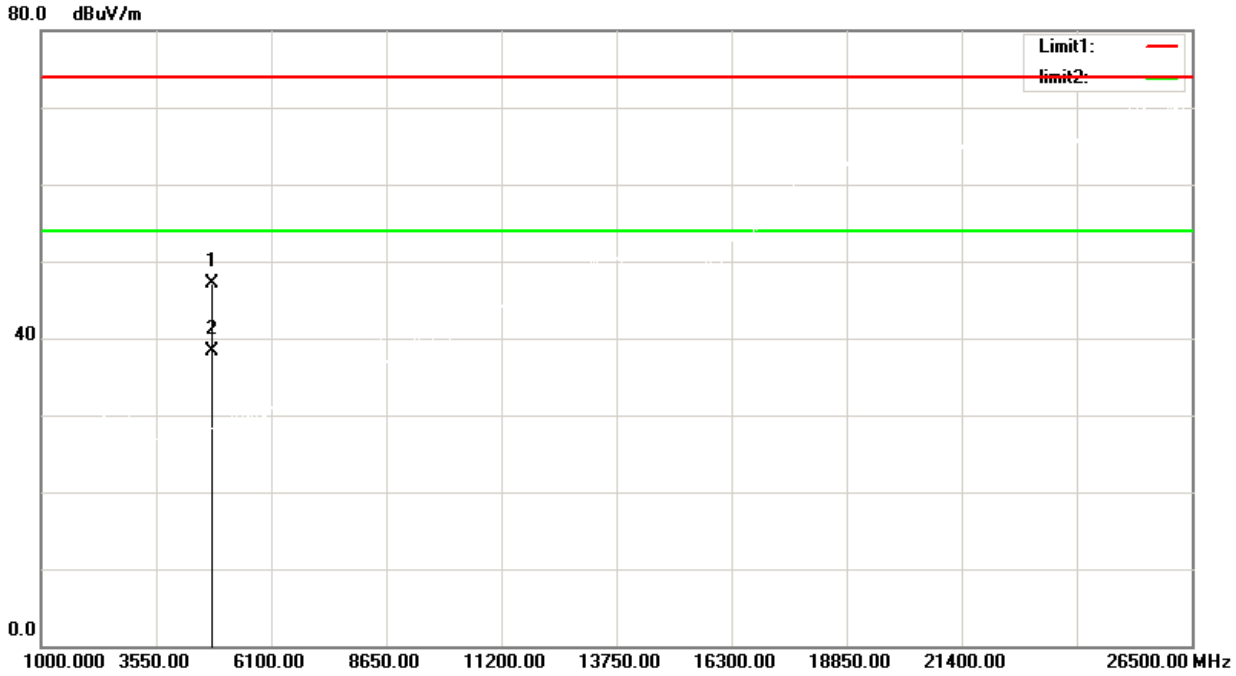
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2402		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.000	57.93	-10.79	47.14	74.00	-26.86	peak
2	4804.000	49.04	-10.79	38.25	54.00	-15.75	AVG

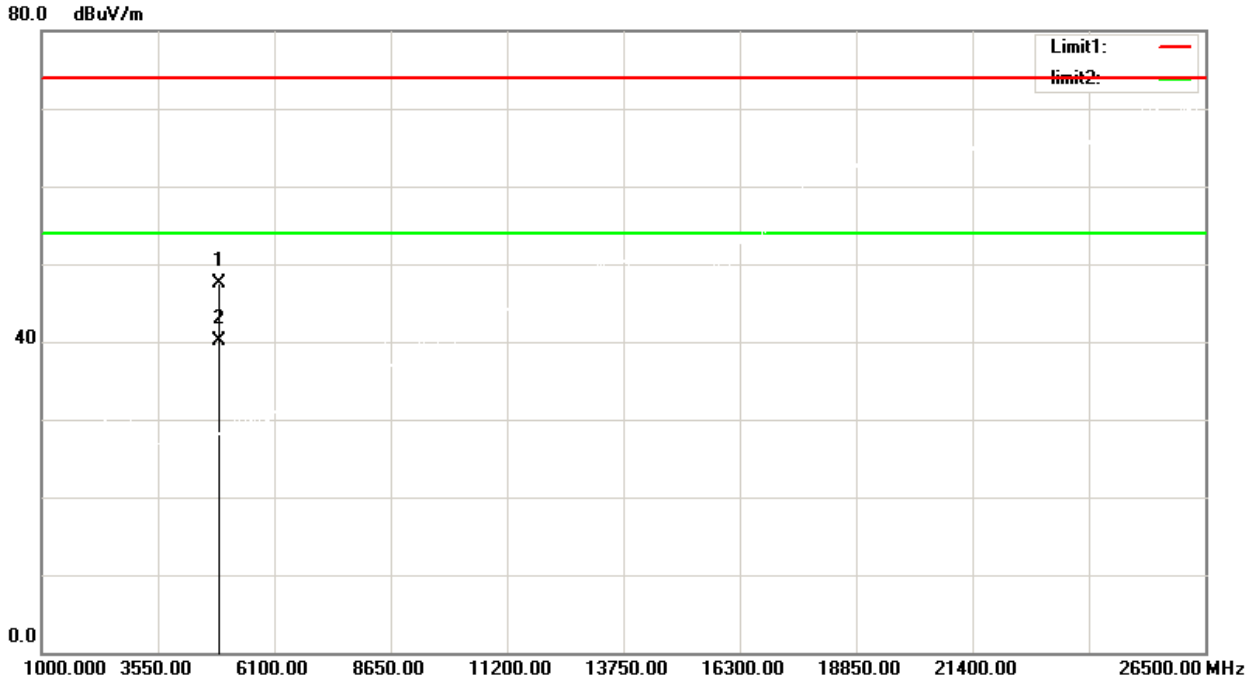
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2440		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	57.98	-10.44	47.54	74.00	-26.46	peak
2	4880.000	50.52	-10.44	40.08	54.00	-13.92	AVG

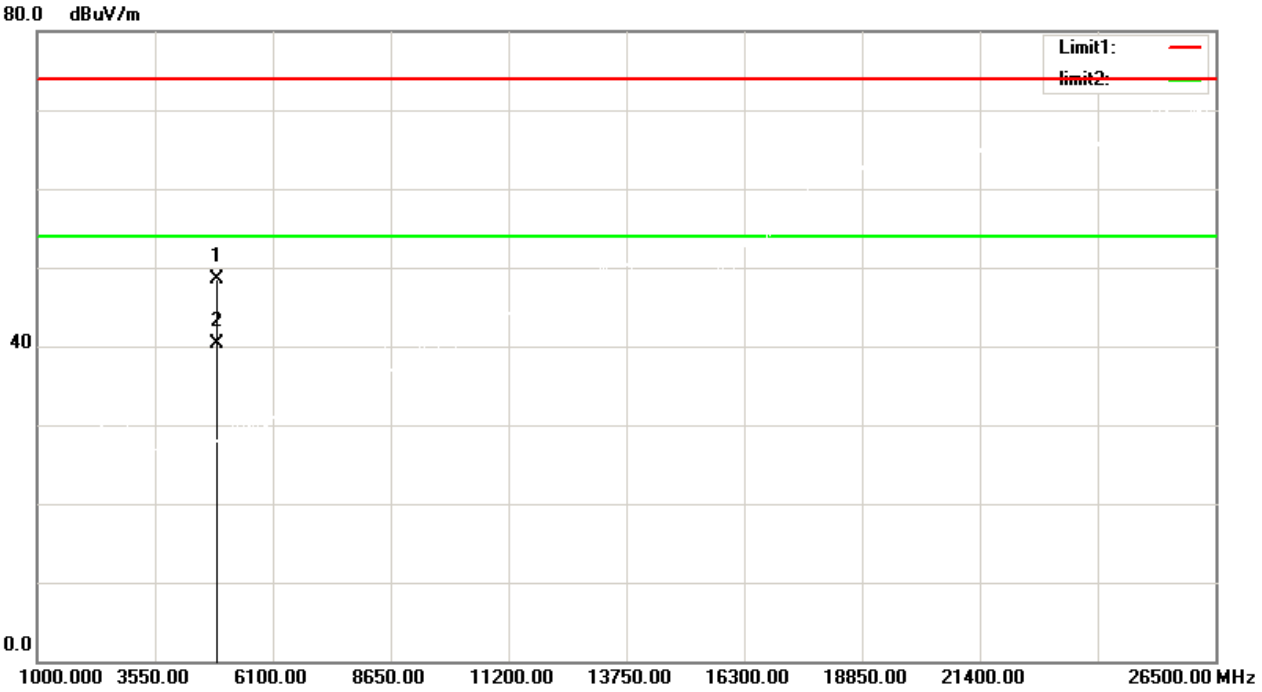
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2440		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	58.85	-10.44	48.41	74.00	-25.59	peak
2	4880.000	50.82	-10.44	40.38	54.00	-13.62	AVG

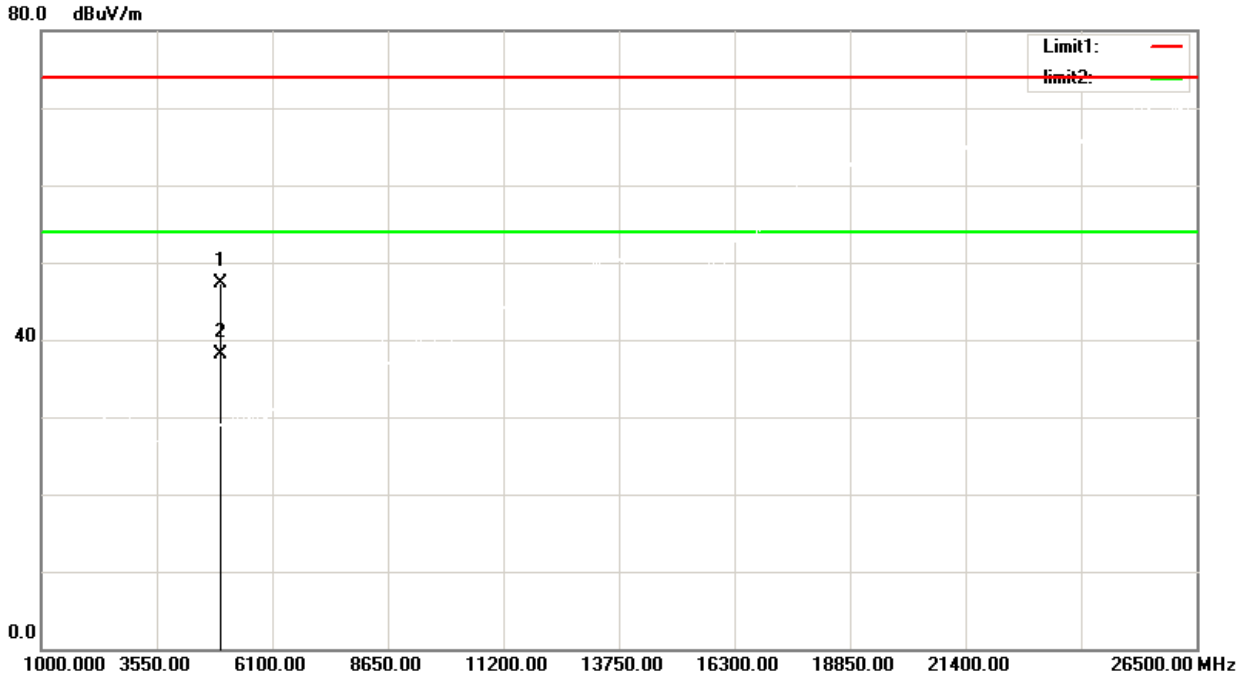
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2480		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	57.42	-10.08	47.34	74.00	-26.66	peak
2	4960.000	48.26	-10.08	38.18	54.00	-15.82	AVG

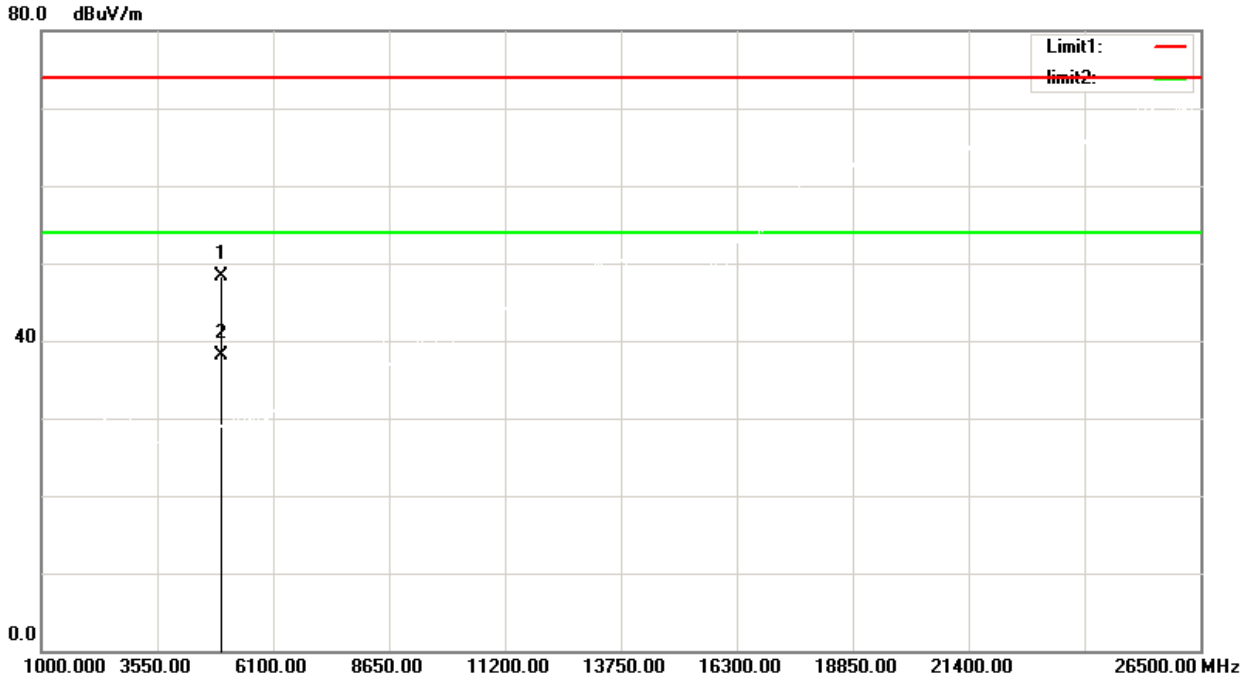
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2480		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	58.45	-10.08	48.37	74.00	-25.63	peak
2	4960.000	48.20	-10.08	38.12	54.00	-15.88	AVG

The test result is calculated as the following:

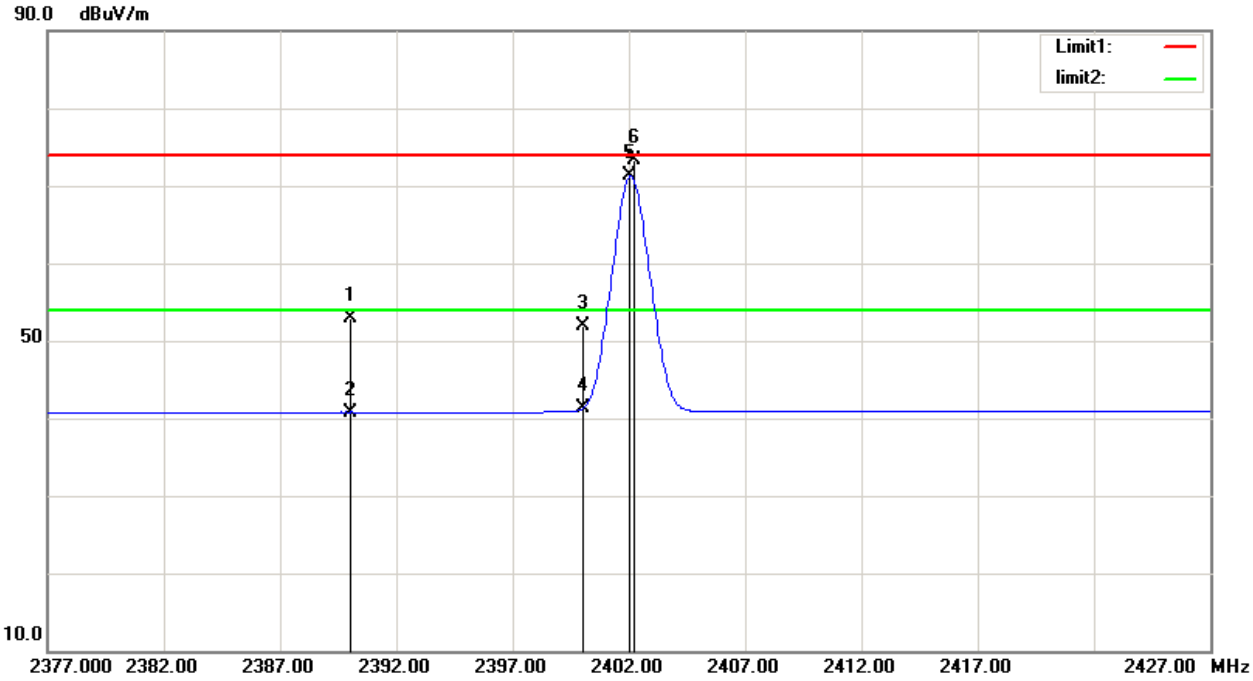
(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

Radiated band edge:

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2402		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	21.96	30.85	52.81	74.00	-21.19	peak
2	2390.000	9.95	30.85	40.80	54.00	-13.20	AVG
3	2400.000	21.12	30.87	51.99	74.00	-22.01	peak
4	2400.000	10.39	30.87	41.26	54.00	-12.74	AVG
5	2402.050	40.34	30.87	71.21	/	/	AVG
6	2402.250	42.43	30.87	73.30	/	/	peak

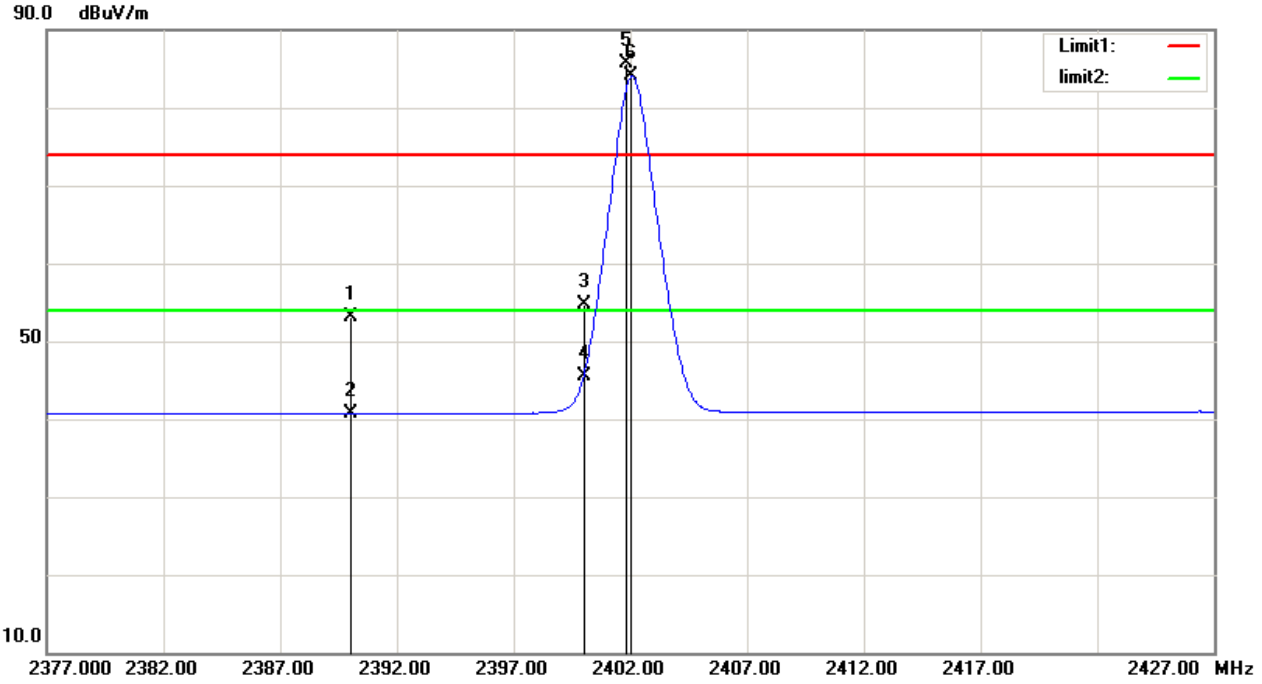
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2402		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	22.17	30.85	53.02	74.00	-20.98	peak
2	2390.000	9.95	30.85	40.80	54.00	-13.20	AVG
3	2400.000	23.91	30.87	54.78	74.00	-19.22	peak
4	2400.000	14.65	30.87	45.52	54.00	-8.48	AVG
5	2401.800	54.91	30.87	85.78	/	/	peak
6	2402.050	53.16	30.87	84.03	/	/	AVG

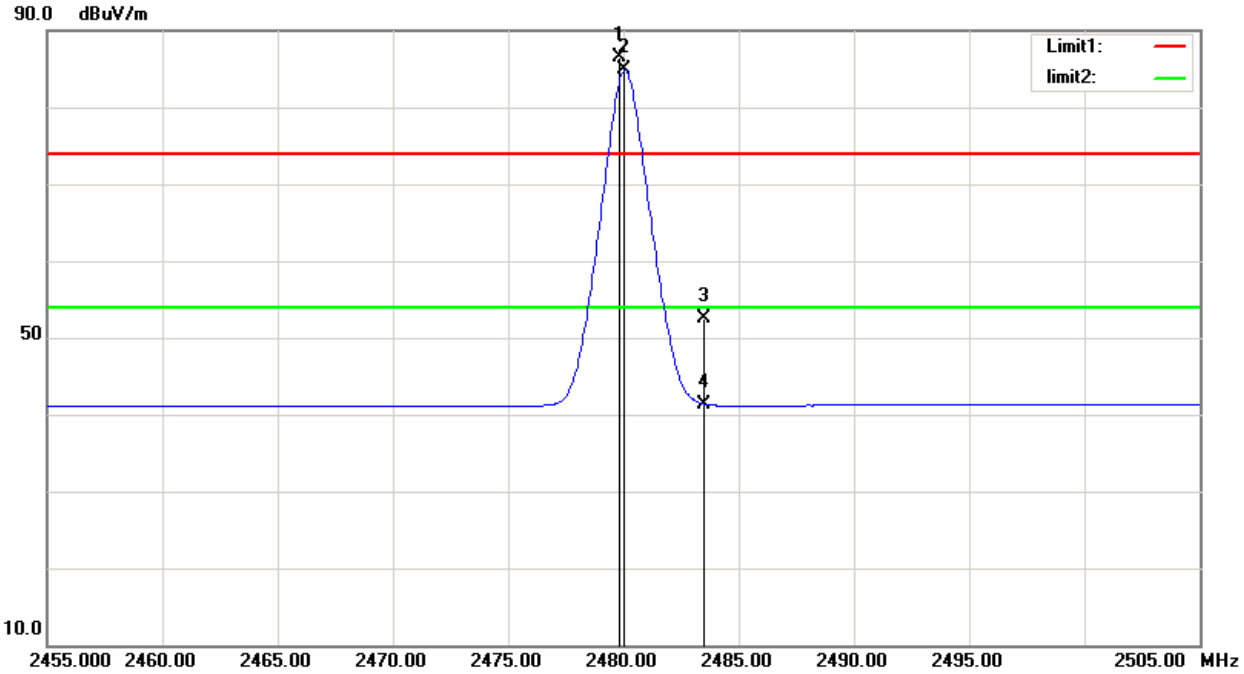
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Horizontal	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2480		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.800	55.52	31.06	86.58	/	/	peak
2	2480.050	53.77	31.06	84.83	/	/	AVG
3	2483.500	21.43	31.07	52.50	74.00	-21.50	peak
4	2483.500	10.31	31.07	41.38	54.00	-12.62	AVG

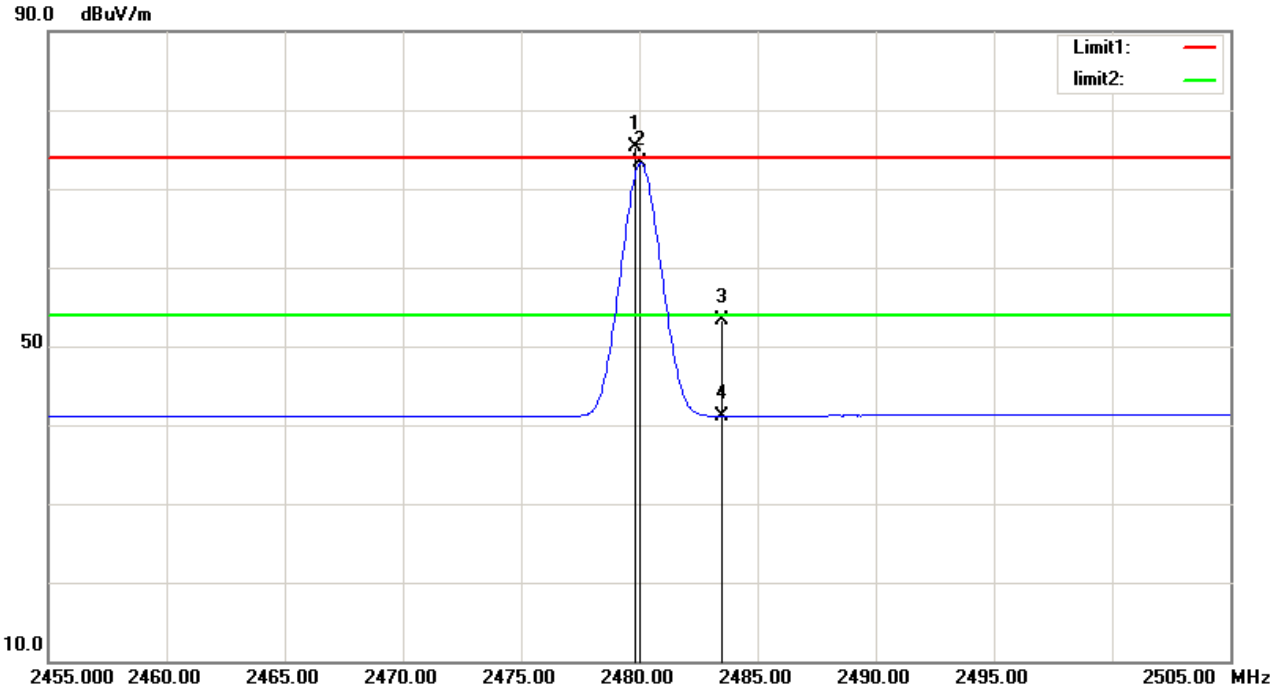
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

(3) Margin = Result - Limit

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	24	Relative Humidity:	55%
Distance:	3m	Test Power:	DC 5V
Polarization:	Vertical	Test Result:	Pass
Test Time:	2018-11-12	Test By:	Smile
Standard:	FCC PART 15 C 1-26.5G PEAK		
Test Mode:	TX		
Note:	BLE 2480		



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.800	44.33	31.06	75.39	/	/	peak
2	2480.050	42.20	31.06	73.26	/	/	AVG
3	2483.500	22.29	31.07	53.36	74.00	-20.64	peak
4	2483.500	10.04	31.07	41.11	54.00	-12.89	AVG

The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

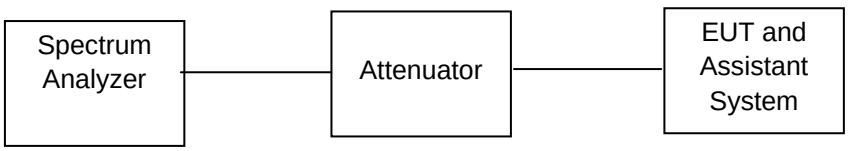
(3) Margin = Result - Limit

7. 100 kHz Bandwidth of Frequency Band Edge

7.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibrated Date
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	05/25/2019	05/26/2018
2	Attenuator	Mini-Circuits	BW-S10W2	101109	12/17/2018	12/18/2017
3	RF Cable	Micable	C10-01-01-1	100309	12/17/2018	12/18/2017

7.2. Block diagram of test setup



7.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

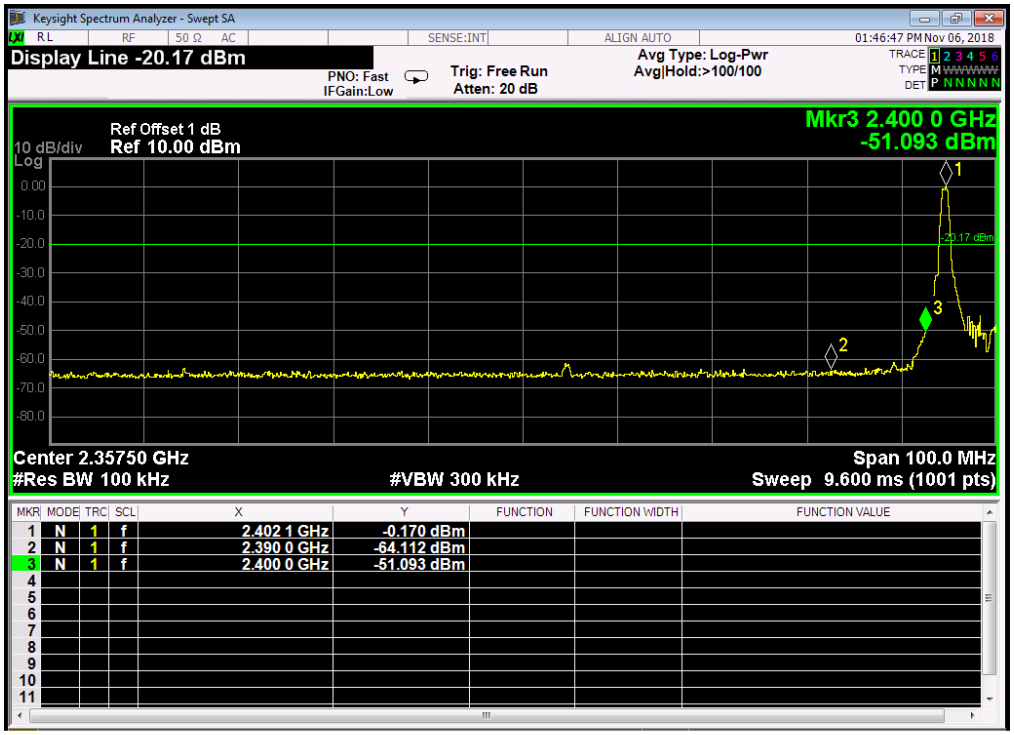
7.4. Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

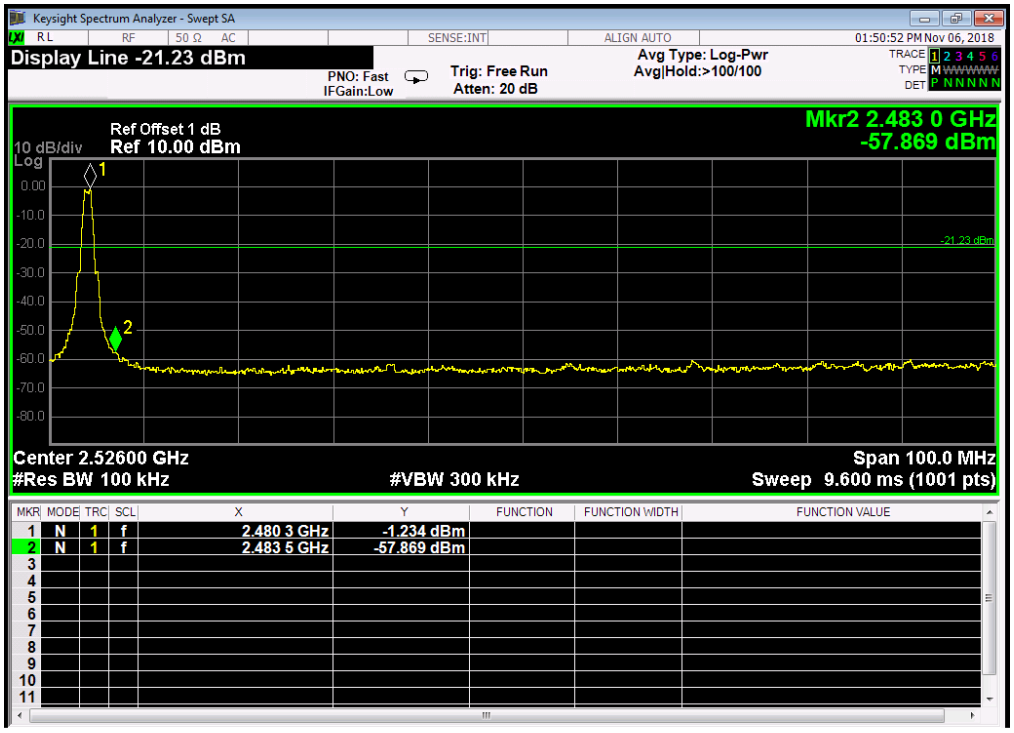
7.5. Test result

Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
BLE			
2400	50.92	20	Pass
2483.5	56.64	20	Pass

CH0

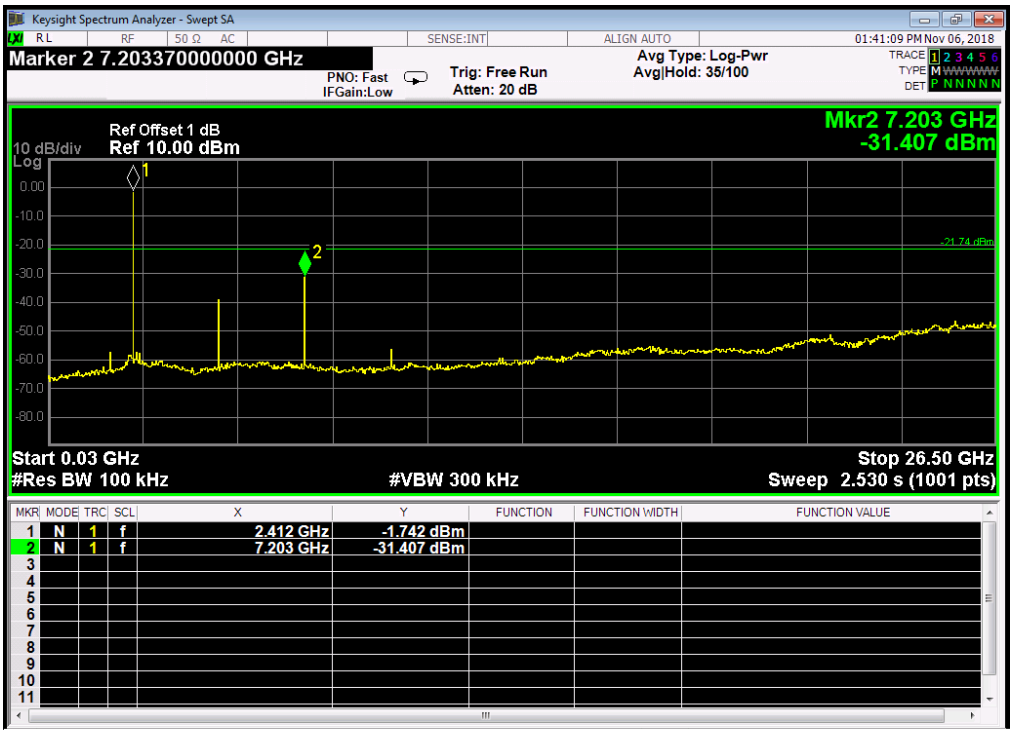


CH 39

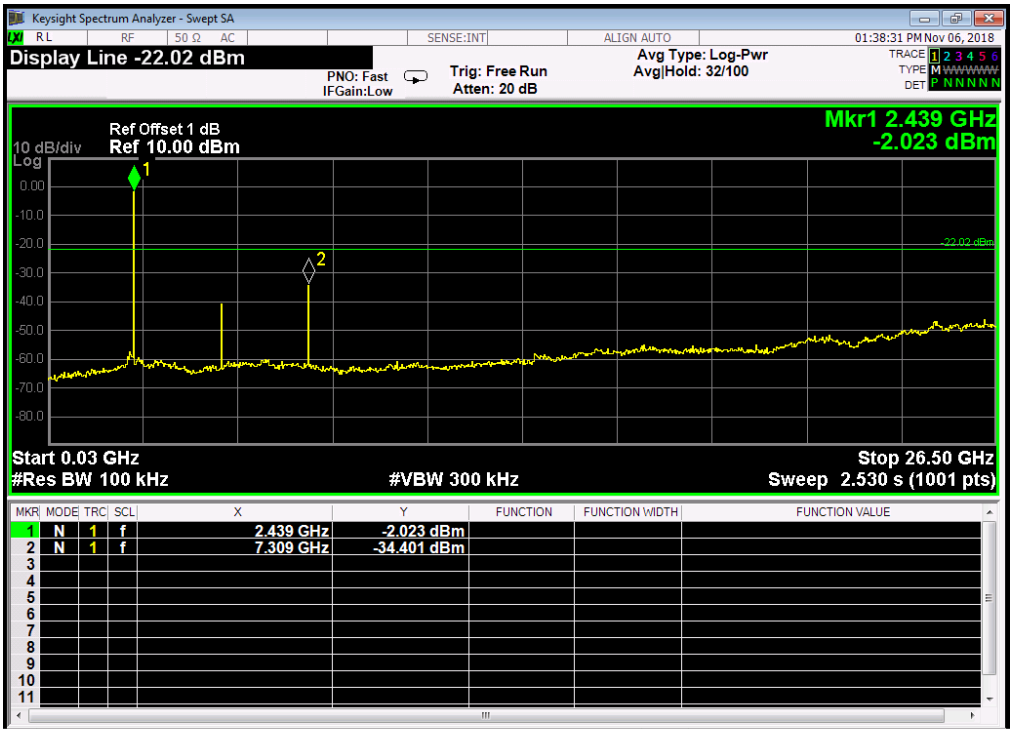

Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:50:52 PM Nov 06, 2018
Display Line -21.23 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr2 2.483 0 GHz
-57.869 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-21.23 dBm
Center 2.52600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.480 3 GHz -1.234 dBm
2 N 1 f 2.483 5 GHz -57.869 dBm
3
4
5
6
7
8
9
10
11

Conducted Emission

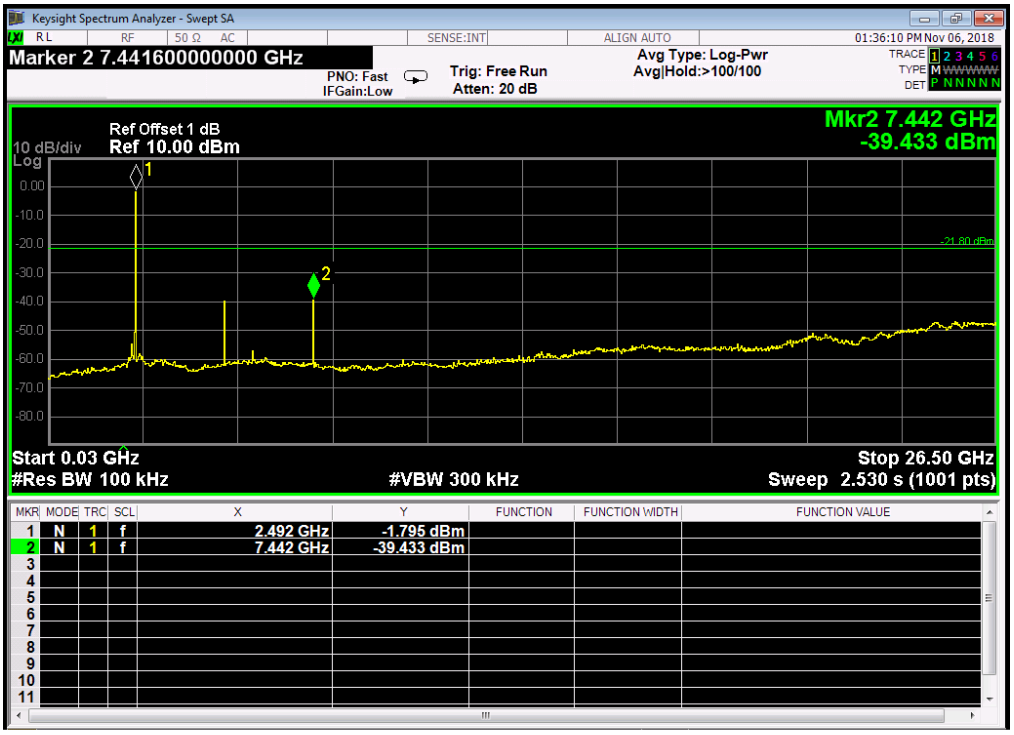
CH0



CH19



CH39

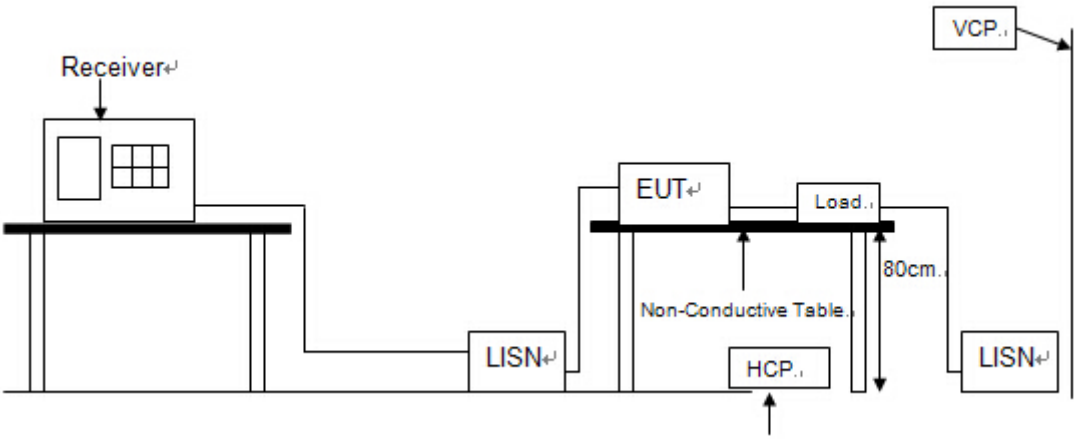

Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
01:36:10 PM Nov 06, 2018
Marker 2 7.441600000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
Ref Offset 1 dB
10 dB/div
Log
Ref 10.00 dBm
Mkr2 7.442 GHz
-39.433 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-21.80 dBm
Start 0.03 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.530 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.492 GHz -1.795 dBm
2 N 1 f 7.442 GHz -39.433 dBm
3
4
5
6
7
8
9
10
11

8 Power Line Conducted Emission

8.1 Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Pulse Limiter	MTS-systemtechnik	MTS-IMP-136	261115-010-0024	12/17/2018
2	EMI Test Receiver	R&S	ESCI	101308	12/17/2018
3	LISN	AFJ	LS16	16011103219	12/17/2018
4	LISN	Schwarzbeck	NSLK 8127	8127-432	12/17/2018
5	Measurement Software	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A
6	MeasurementSoftware	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A

8.2 Block diagram of test setup



8.3 Power Line Conducted Emission Limits(Class B)

Frequency	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

8.4 Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

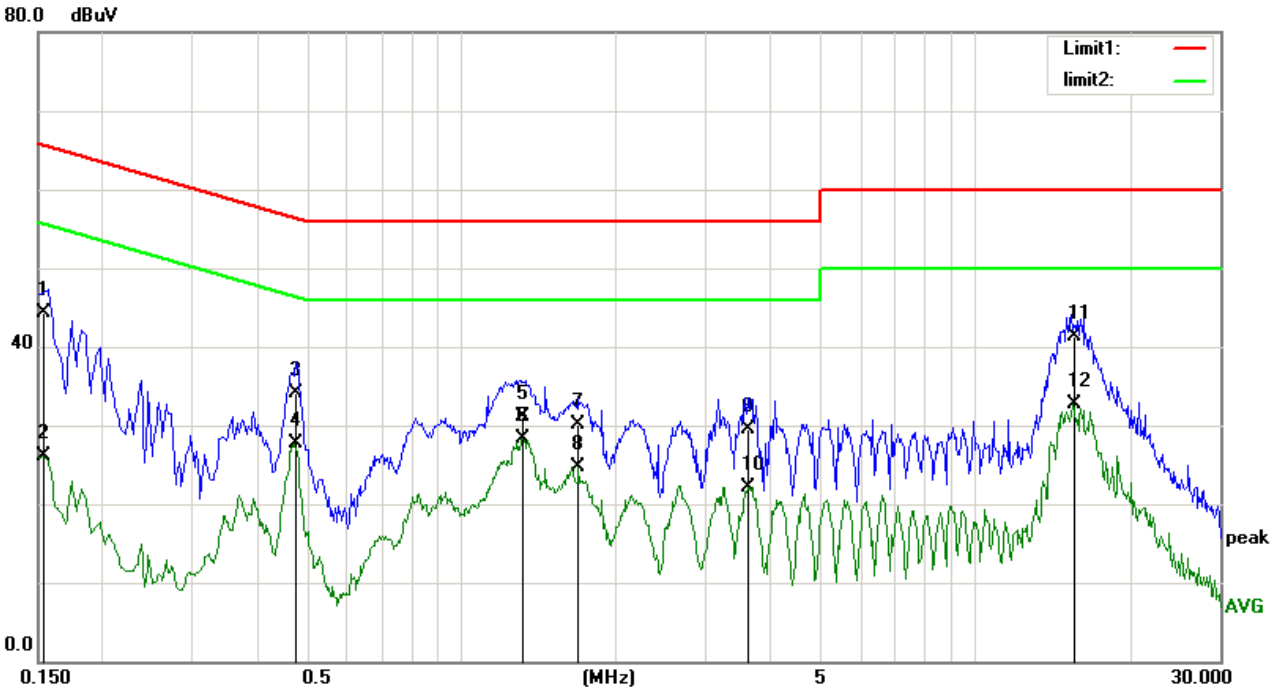
8.5 Test Result

PASS. (See below detailed test result)

Note1: All emissions not reported below are too low against the prescribed limits.

Note2: **"-----"** means peak detection; **"-----"** mans average detection

EUT:	CALM. Module	Model No.:	SVN-840C
Temperature:	23℃	Relative Humidity:	52%
		Test Power:	AC 120V/60Hz
Probe:	N	Test Result:	Pass
Test Time:	2018-11-12	Test By:	
Standard:	(CE)FCC PART 15 class B_QP		
Test Mode:	TX		
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1539	32.91	11.44	44.35	65.78	-21.43	QP
2	0.1539	14.70	11.44	26.14	55.78	-29.64	AVG
3	0.4740	23.84	10.21	34.05	56.44	-22.39	QP
4	0.4740	17.45	10.21	27.66	46.44	-18.78	AVG
5	1.3180	20.98	10.10	31.08	56.00	-24.92	QP
6	1.3180	18.19	10.10	28.29	46.00	-17.71	AVG
7	1.6980	19.97	10.11	30.08	56.00	-25.92	QP
8	1.6980	14.62	10.11	24.73	46.00	-21.27	AVG
9	3.6300	19.31	10.15	29.46	56.00	-26.54	QP
10	3.6300	12.03	10.15	22.18	46.00	-23.82	AVG
11	15.5299	31.22	10.16	41.38	60.00	-18.62	QP
12	15.5299	22.61	10.16	32.77	50.00	-17.23	AVG

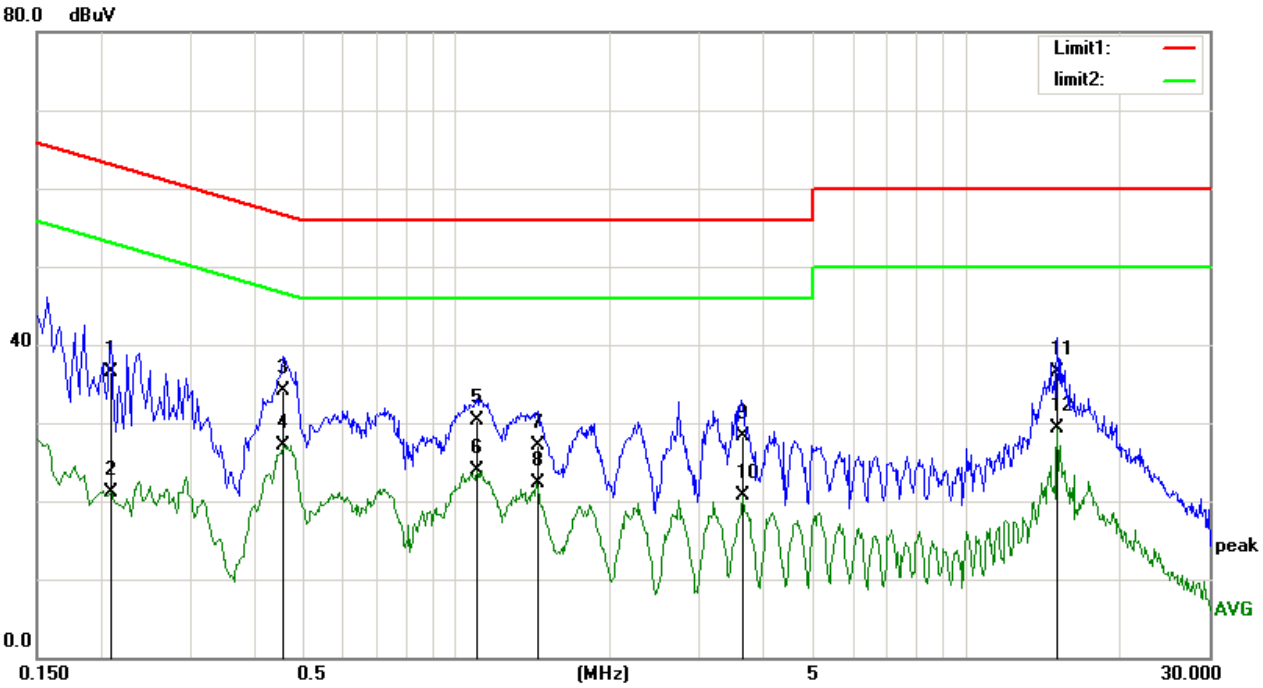
The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = (LISN, ISN, PLC or Current Probe) Factor + Cable Loss +Attenuator

(3) Margin = Result - Limit

EUT:	**CALM. Module**	**Model No.:**	**SVN-840C**
Temperature:	**23℃**	**Relative Humidity:**	**52%**
		Test Power:	**AC 120V/60Hz**
Probe:	**L1**	**Test Result:**	**Pass**
Test Time:	**2018-11-12**	**Test By:**	
Standard:	**(CE)FCC PART 15 class B_QP**		
Test Mode:	**TX**		
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2100	25.46	11.06	36.52	63.20	-26.68	QP
2	0.2100	10.10	11.06	21.16	53.20	-32.04	AVG
3	0.4580	23.89	10.23	34.12	56.73	-22.61	QP
4	0.4580	16.79	10.23	27.02	46.73	-19.71	AVG
5	1.0980	20.18	10.10	30.28	56.00	-25.72	QP
6	1.0980	13.75	10.10	23.85	46.00	-22.15	AVG
7	1.4420	17.05	10.10	27.15	56.00	-28.85	QP
8	1.4420	12.25	10.10	22.35	46.00	-23.65	AVG
9	3.6500	18.19	10.15	28.34	56.00	-27.66	QP
10	3.6500	10.65	10.15	20.80	46.00	-25.20	AVG
11	15.1300	26.40	10.17	36.57	60.00	-23.43	QP
12	15.1300	19.23	10.17	29.40	50.00	-20.60	AVG

The test result is calculated as the following:

(1) Result = Reading + Correct Factor

(2) Correct Factor = (LISN, ISN, PLC or Current Probe) Factor + Cable Loss +Attenuator

(3) Margin = Result - Limit

9. Antenna Requirements

9.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2. Result

See 2.1