FCC CERTIFICATION TEST REPORT

For

FCC ID:2AP8SK16

IC: 24032-K16

Report Reference No. ..... :	19EFCS05008 2211
FCC Registration Number..... :	171688
IC Registration Number..... :	11033A
Date of issue ..... :	2019-10-07
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……..:	SIG SAUER INC.
Address……..:	27100 SW Parkway Avenue Wilsonville US 97070 USA.
Manufacturer……:	SIG SAUER INC.

Test specification:

Test item description ..... :	Laser range finder
Trade Mark ..... :	N/A
Model/Type reference ..... :	KILO1600BDX
Ratings ..... :	I/P: DC 3V

Responsible Engineer :

Blue Qiu

Authorized Signatory:

King Wang

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TEST REPORT DECLARE

Applicant	:	SIG SAUER INC.
Address	:	27100 SW Parkway Avenue Wilsonville US 97070 USA.
Equipment under Test	:	Laser range finder
Test Model No	:	KILO1600BDX
Manufacturer	:	SIG SAUER INC.
Address	:	27100 SW Parkway Avenue Wilsonville US 97070 USA.

Test Standard Used: FCC:FCC Rules and Regulations Part 15 Subpart C (15.247)
IC: RSS-Gen Issue 5,March 2019. RSS-247 Issue 2, February 2017

Test procedure used: ANSI C63.10:2013, KDB558074 D01 DTS Meas Guidance v05r02

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:	19EFCS05008 2211		
Date of Test:	2019-09-07 To 2019-09-30	**Date of Report**:	2019-10-07

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:15.247(a)(2) IC:RSS-247 5.2(a)	PASS
Peak Output Power	FCC:15.247(b)(3) IC:RSS-247 5.4(d)	PASS
Power Spectral Density	FCC:15.247(e) IC:RSS-247 5.2(b)	PASS
Spurious Emissions at Antenna Port	FCC:15.247(d) IC:RSS-247 5.5	PASS
Spurious Emissions	FCC:15.205,15.209,15.247(d) IC:RSS-247 5.5	PASS
100 kHz Bandwidth of Frequency Band Edge	FCC:15.247(d) IC:RSS-247 5.5	PASS
AC Line Conducted Emissions	FCC:15.207 IC:RSS-GEN 8.8	N/A
Antenna requirement	FCC:15.203	PASS
Frequency Stability	IC:RSS-GEN 6.11	PASS

2. GENERAL TEST INFORMATION

2.1. Accresitations

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

FCC Registration 171688 and IC Registration Number: 11033A

2.2. Description of EUT

EUT* Name	:	Laser range finder
Model Number	:	KILO1600BDX
Trade Mark	:	N/A
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 3V
Radio Specification	:	BLE
Operation frequency	:	2402 MHz -2480MHz
Modulation	:	GFSK
Antenna Type	:	Integrated Antenna, Maximum PK gain: 1 dBi
Date of Receipt	:	2019/09/07
Sample Type	:	Series production
Software version	:	24141
Hardware version	:	RSSAB0319_MAIN_V1_2_20190708

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

Channle information:							
CH	Frequency	CH	Frequency	CH	Frequency	CH	Frequency
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

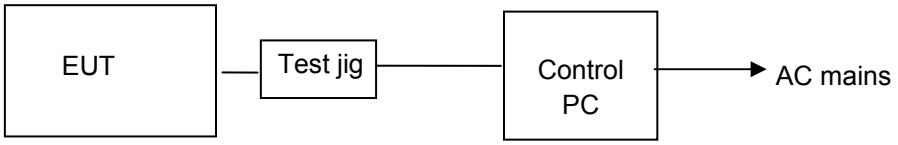
2.3. Accessories of EUT

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

2.4. Assistant equipment used for test

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	Notebook	ACER	MS2367	32807810766	/
Test jig	jig	Modules	CP2102	/	/

2.5. Block diagram of EUT configuration for test



EUT was connected to control to a special test jig provided by manufacturer which has a USB connector to Notebook, and the Notebook will run a special test software to control EUT work in Continuous TX mode, and select test channel, wireless mode and data rate. New battery is used during all test.
"BLE" provided by manufacturer to control EUT work in test mode as blow table.

Mode	Channel	Frequency (MHz)
BLE	Low :CH1	2402
	Middle: CH19	2440
	High: CH39	2480

2.6. 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

2.7. 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.

2.8.Table Of Parameters Of Test Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

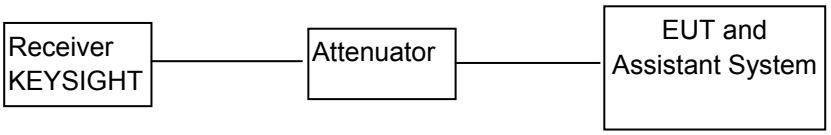
Test Software Version	nRFgo		
Frequency (MHz)	2402	2440	2480
Power Parameters (GFSK)	Default	Default	Default

3. 6DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

3.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

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.

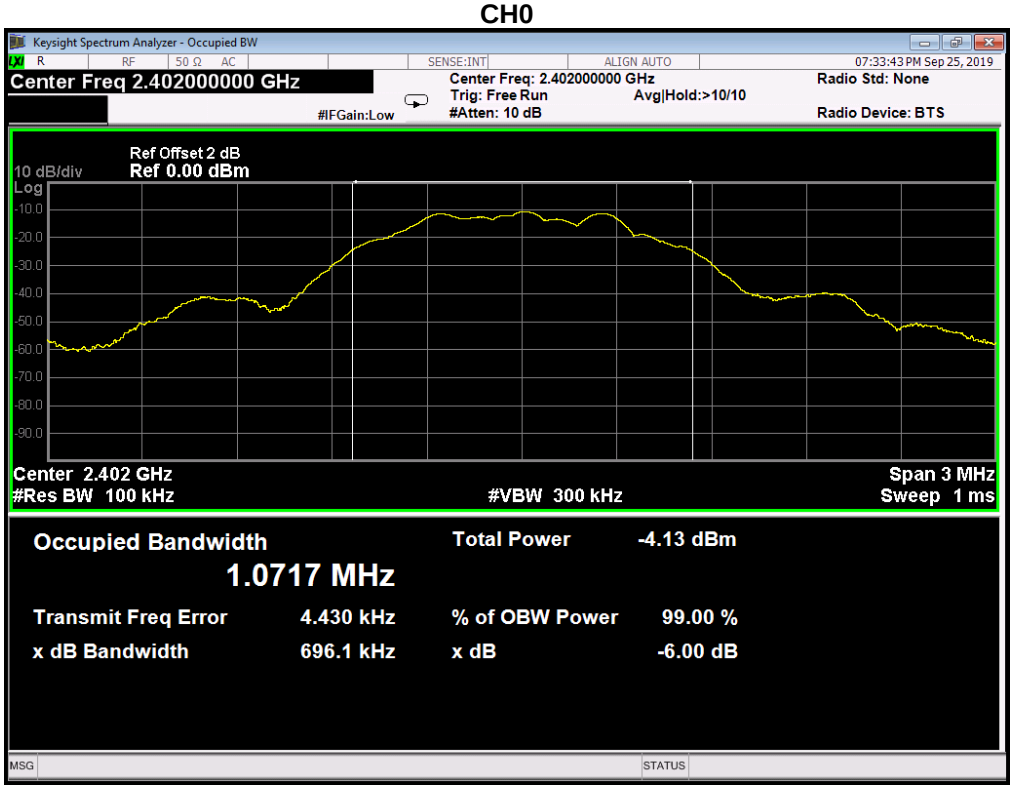
3.5. Test Result

EUT Set Mode	CH or Frequency	6 dB bandwidth	99% dB bandwidth	Limt	Conclusion
		Result (MHz)	Result (MHz)		
BLE					
	CH0	0.696	/	>500KHz	PASS
	CH19	0.694	/	>500KHz	PASS
	CH39	0.697	/	>500KHz	PASS
	CH0	/	1.0284	>500KHz	PASS
	CH19	/	1.0283	>500KHz	PASS
	CH39	/	1.0285	>500KHz	PASS

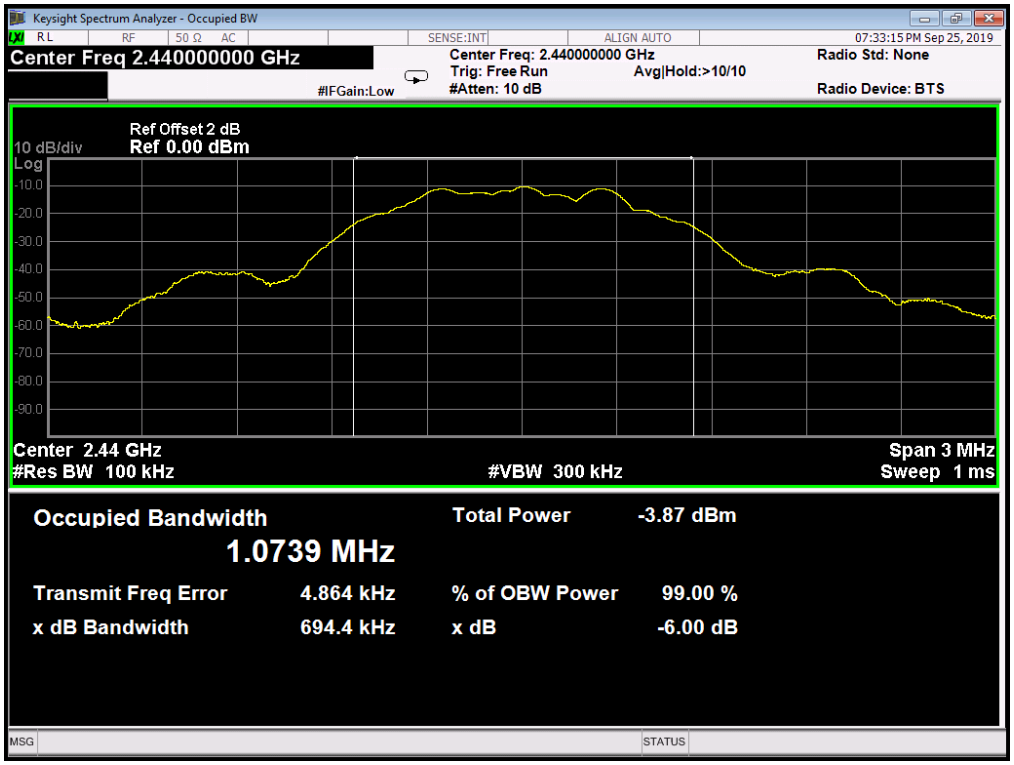
3.6. Original test data

FCC DATA

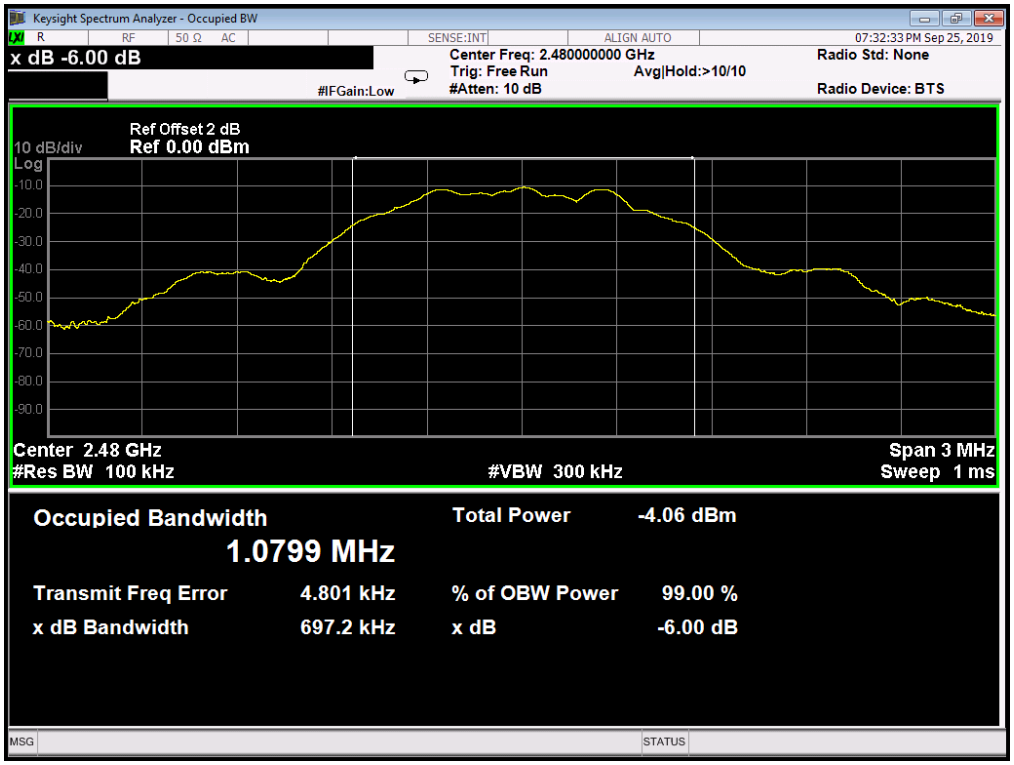
CH0



CH19

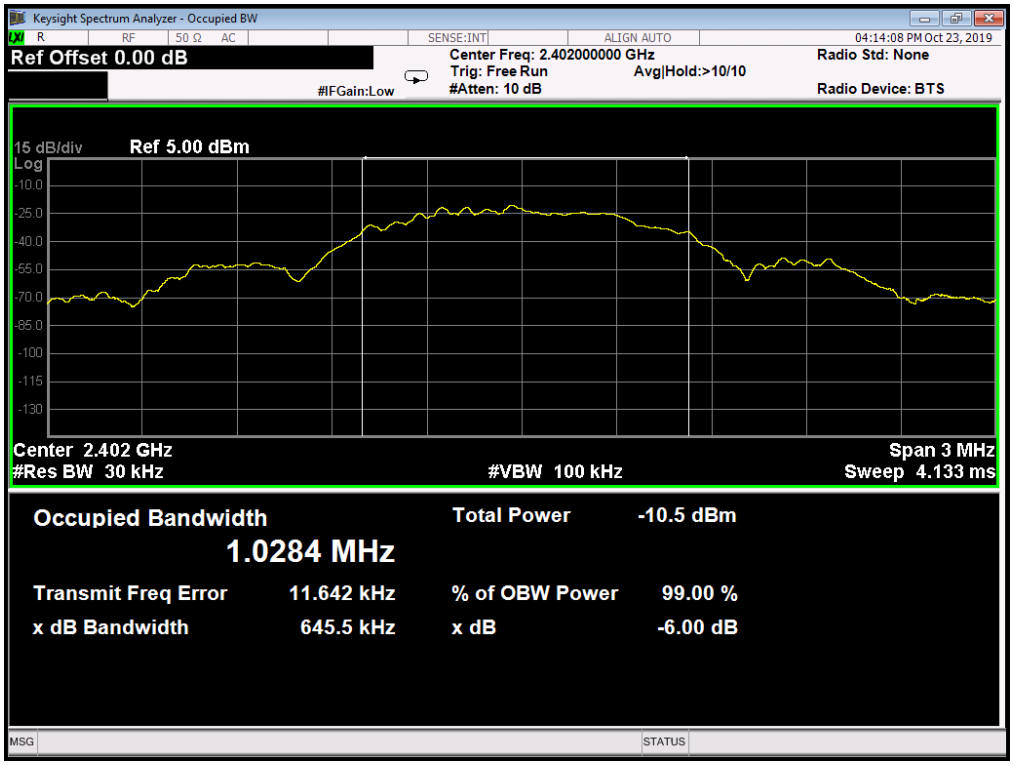


CH39

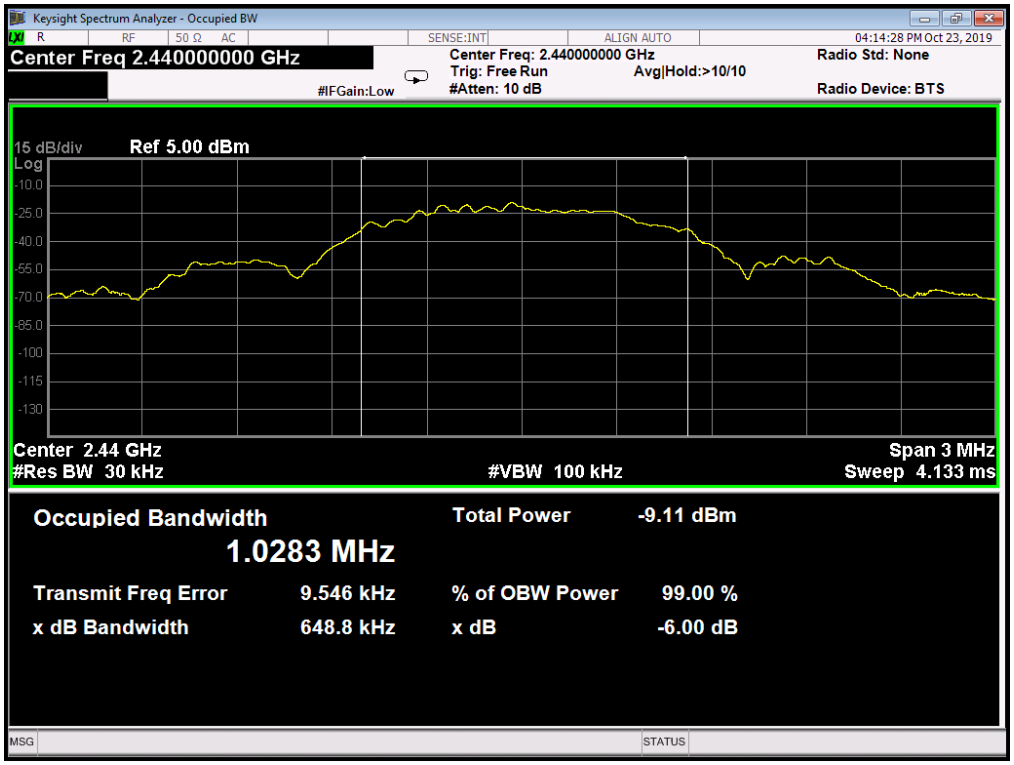


IC DATA

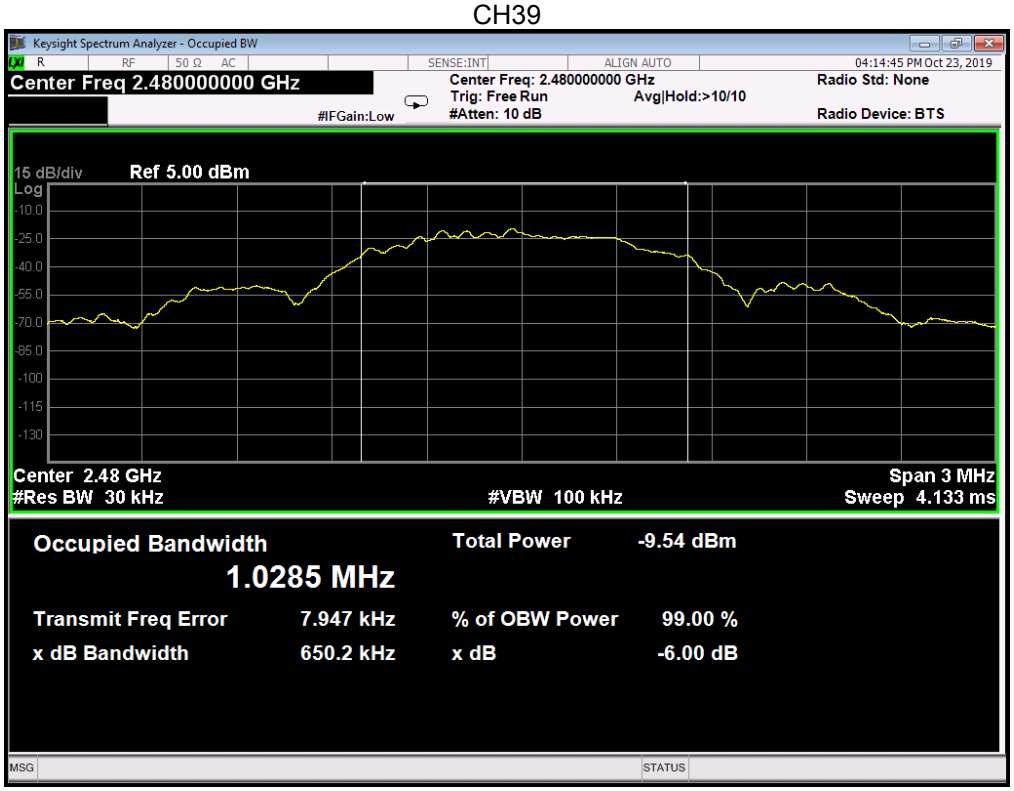
CH0



CH19


Keysight Spectrum Analyzer - Occupied BW
R RF 50 Ω AC SENSE:INT ALIGN AUTO 04:14:28 PM Oct 23, 2019
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
15 dB/div Ref 5.00 dBm
Log
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
-130
Center 2.44 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.0283 MHz
Total Power -9.11 dBm
Transmit Freq Error 9.546 kHz
% of OBW Power 99.00 %
x dB Bandwidth 648.8 kHz
x dB -6.00 dB
MSG
STATUS

CH39

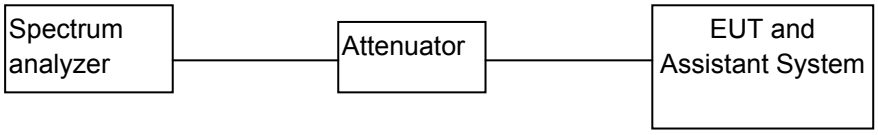

Keysight Spectrum Analyzer - Occupied BW
R RF 50 Ω AC SENSE:INT ALIGN AUTO 04:14:45 PM Oct 23, 2019
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
15 dB/div Ref 5.00 dBm
Log
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
-130
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.0285 MHz
Total Power -9.54 dBm
Transmit Freq Error 7.947 kHz
% of OBW Power 99.00 %
x dB Bandwidth 650.2 kHz
x dB -6.00 dB
MSG
STATUS

4. MAXIMUM PEAK OUTPUT POWER

4.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

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) Configure EUT and assistant system according clause 2.4 and 3.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable.

(3) Configure EUT work in test mode as stated in clause 2.4.

(4) Set the spectrum analyzer as follows:

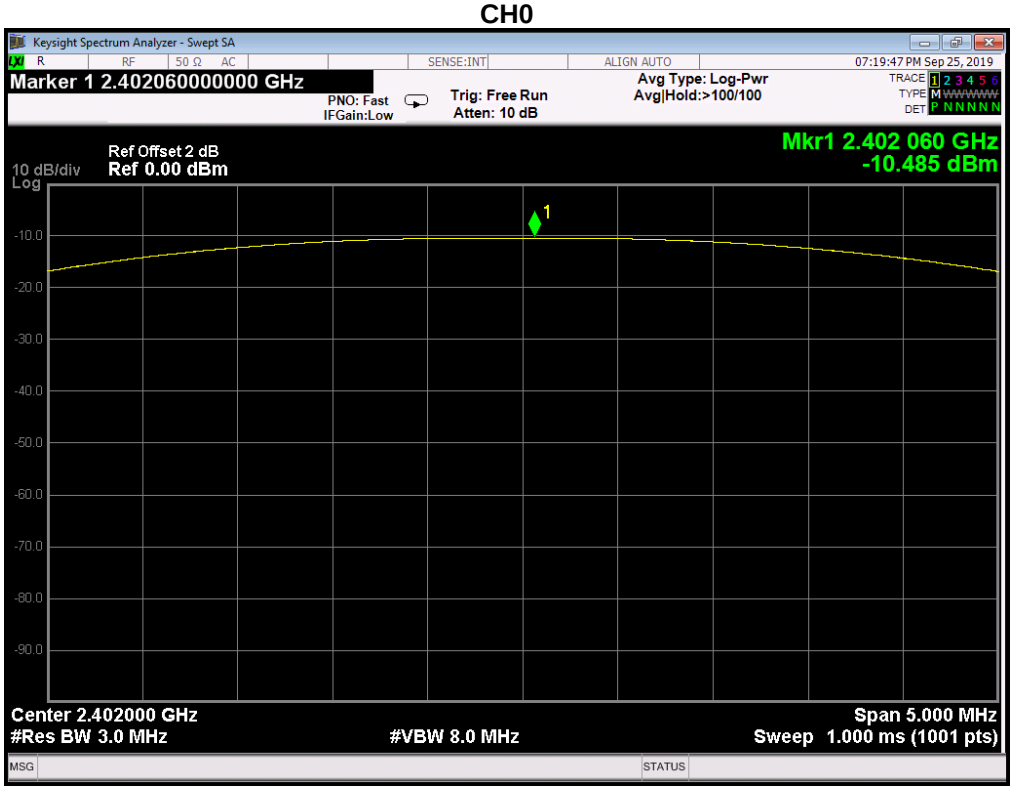
GFSK	RBW:	3MHz
	VBW:	8MHz
Span		≥ 3 x DTS bandwidth
Detector Mode:		Peak
Sweep time:		auto
Trace mode		Max hold

4.5. Test Result

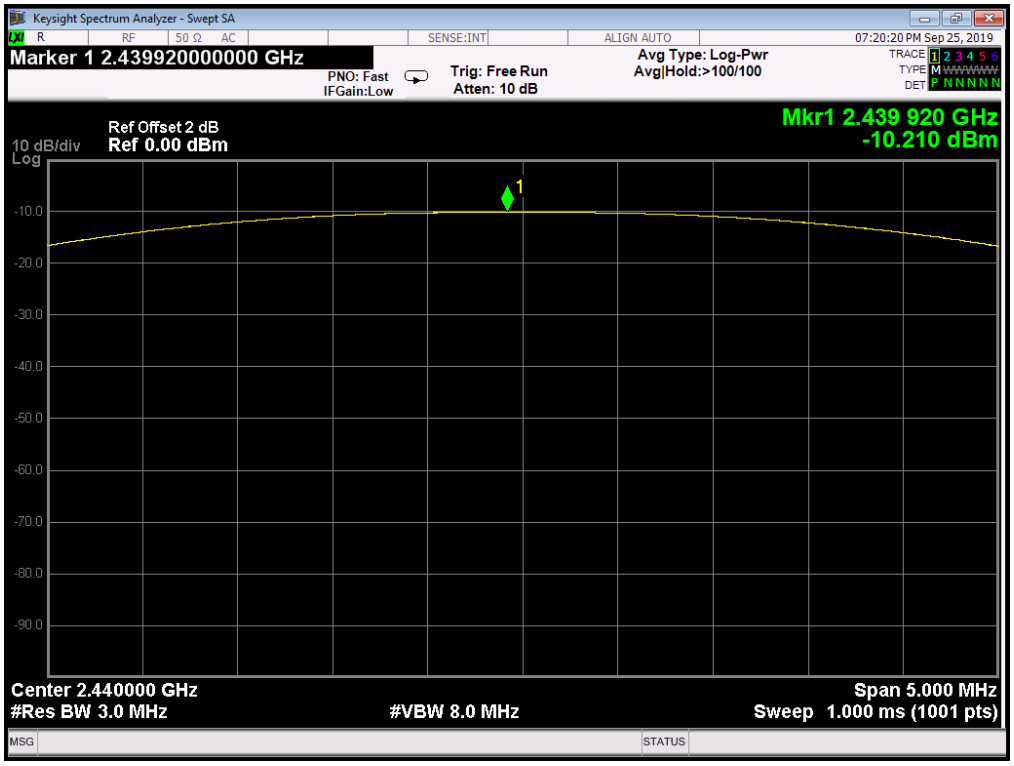
EUT Set Mode	Limit(Peak)	Conclusion	CH	Result(dBm)
				Peak
BLE	30dBm	PASS	CH0	-10.485
			CH19	-10.210
			CH39	-10.468

4.6 Original test data

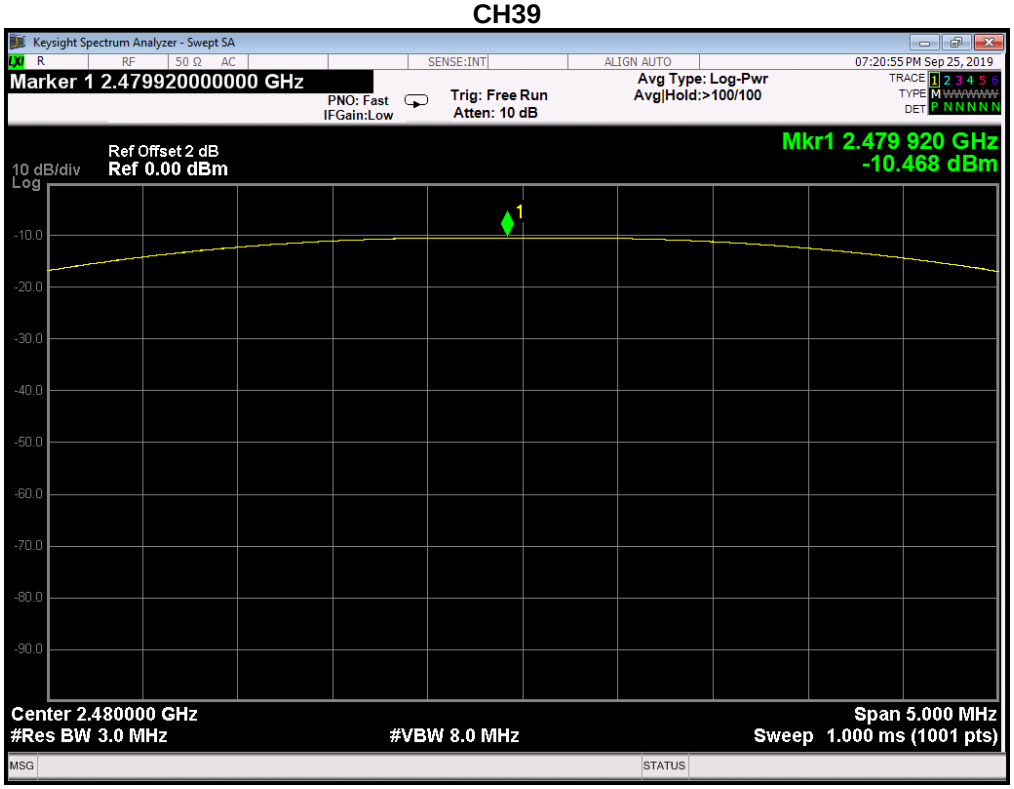
CH0



CH19



CH39

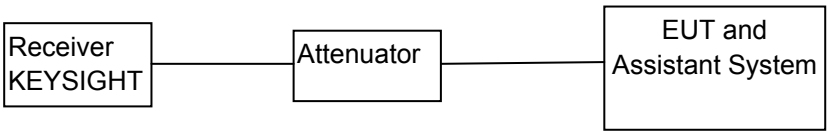

Keysight Spectrum Analyzer - Swept SA
R
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
07:20:55 PM Sep 25, 2019
Marker 1 2.479920000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Log
Mkr1 2.479 920 GHz
-10.468 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 5.000 MHz
Sweep 1.000 ms (1001 pts)
MSG
STATUS

5. POWER SPECTRAL DENSITY

5.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

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

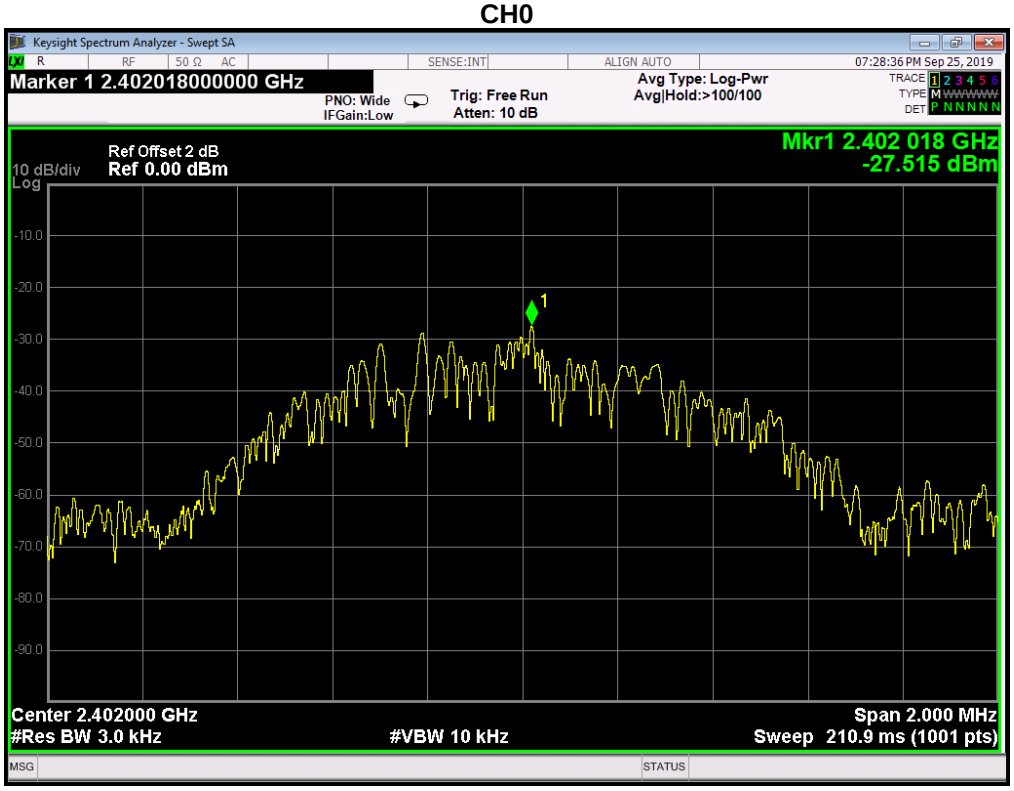
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generatorl.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. 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 v05r02, set the RBW = 3 kHz, VBW = 10 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

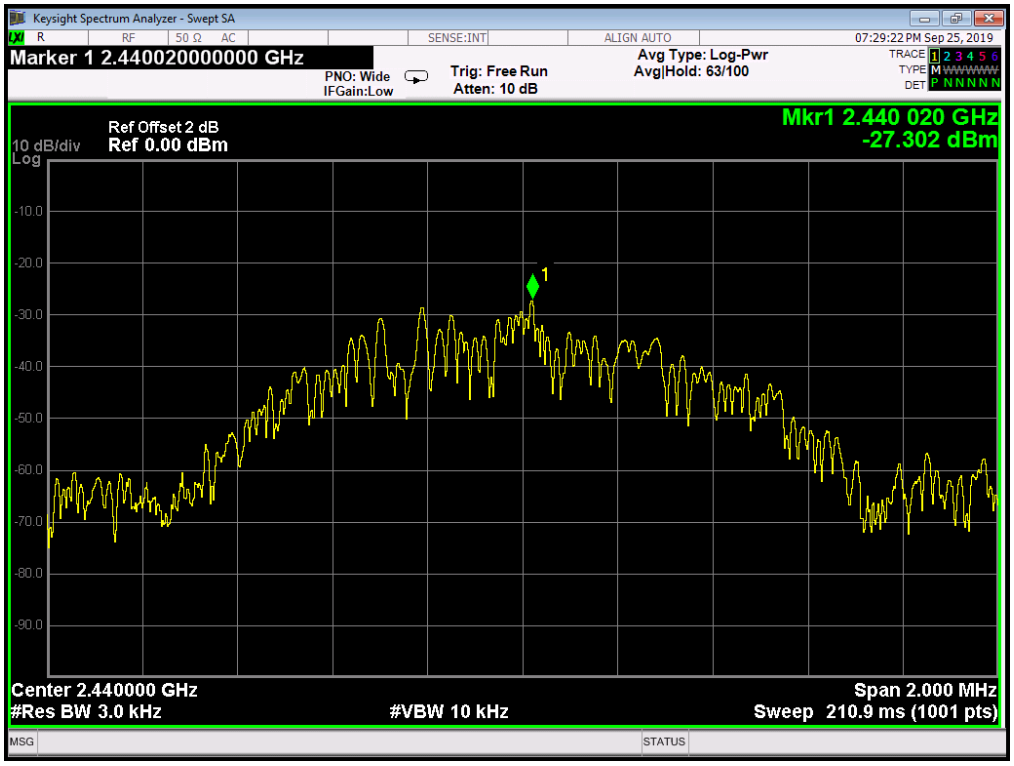
EUT Set Mode	CH or Frequency	Result	Limit: <dBm/3KHz	Conclusion
BLE	CH0	-27.515	8	PASS
	CH19	-27.302	8	PASS
	CH39	-27.661	8	PASS

5.6. Original test data

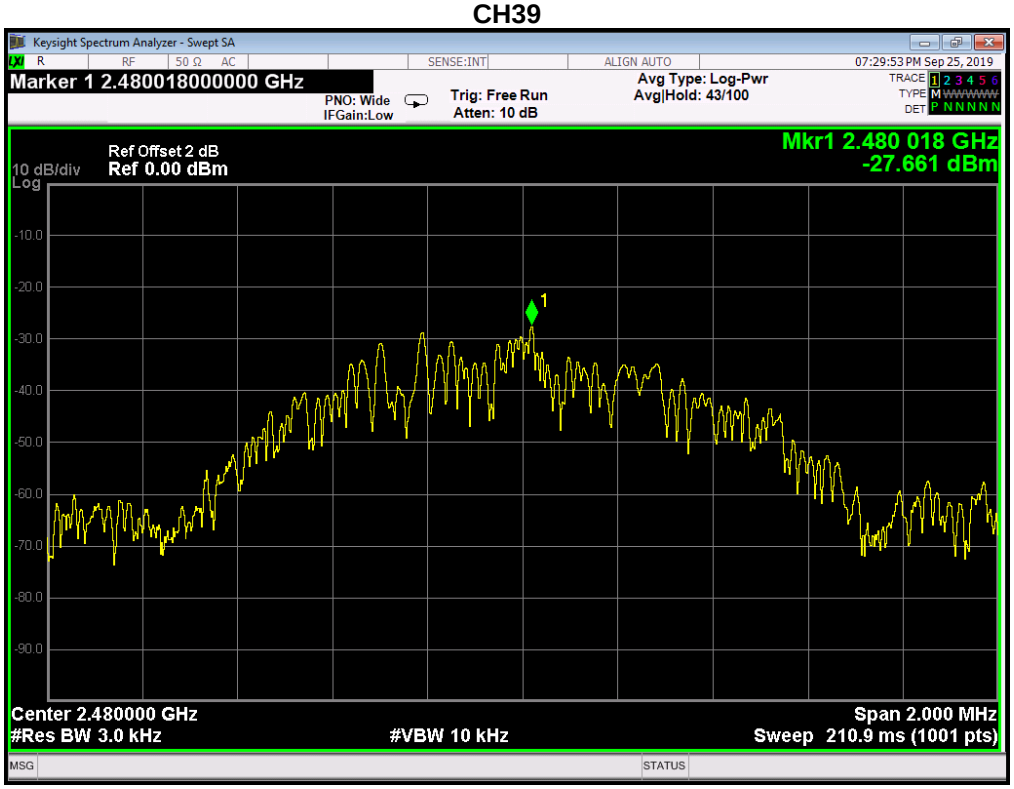
CH0



CH19



CH39


Keysight Spectrum Analyzer - Swept SA
R
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
07:29:53 PM Sep 25, 2019
Marker 1 2.480018000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 43/100
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Log
Mkr1 2.480 018 GHz
-27.661 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
1
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)
MSG
STATUS

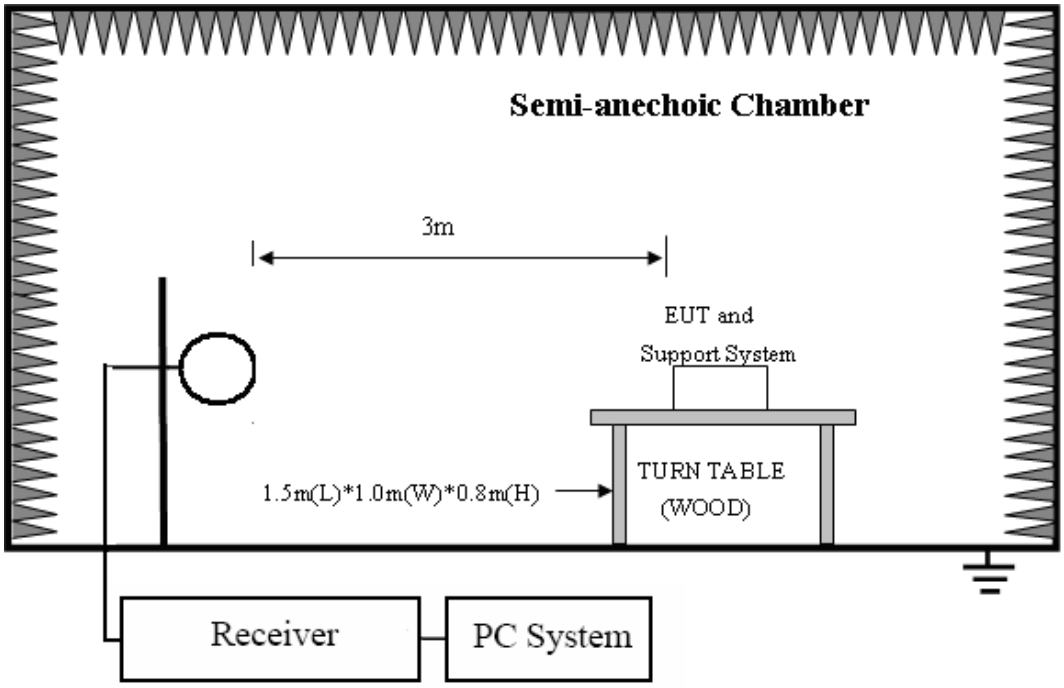
6. SPURIOUS EMISSIONS

6.1. Test equipment

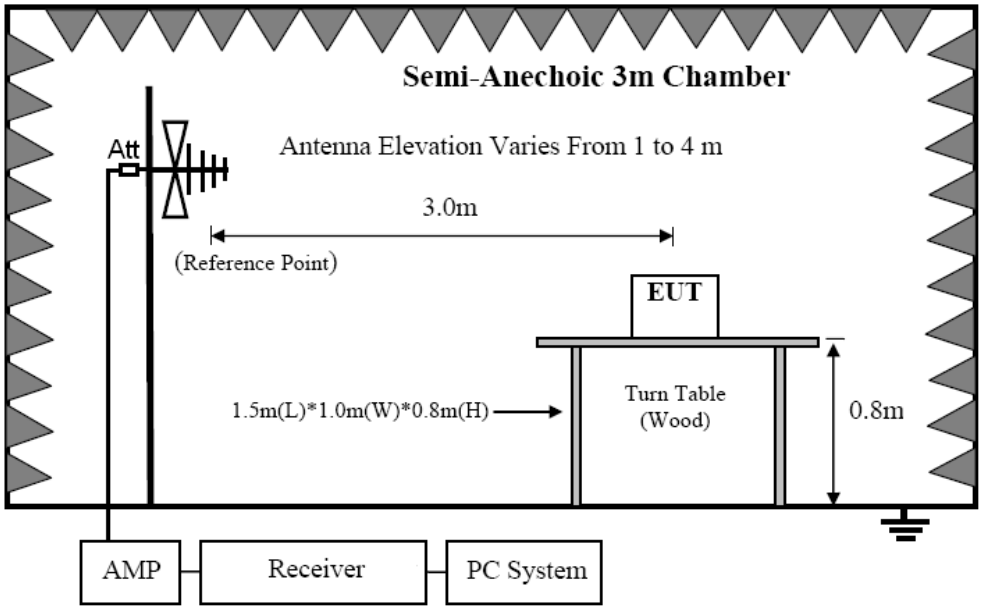
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2019/12/16	1 Year
2	Spectrum Analyzer	Agilent	E4407B	US40240708	2019/11/20	1 Year
3	Spectrum analyzer	R&S	FSU	1166.1660.26	2019/12/16	1 Year
4	Loop antenna	TESEQ	HLA6120	20129	2019/12/16	1 Year
5	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2019/12/16	1 Year
6	Double Ridged Horn Antenna	Schwarzbeck	BBHA9120D	9120D 1065	2020/04/22	1 Year
7	Horn Antenna	Schwarzbeck	BBHA 9170	9170 1248	2019/12/16	1 Year
8	Pre-amplifier	A.H.	PAM-1840VH	562	2019/12/16	1 Year
9	Pre-amplifier	R&S	AFS33-18002 650-30-8P-44	SEL0080	2019/12/16	1 Year
10	Pre-Amplifier	HP	8449B	3274A06298	2019/12/16	1 Year
11	RF Cable	R&S	R01	10403	2019/12/16	1 Year
12	RF Cable	R&S	R02	10512	2019/12/16	1 Year
13	Measurement Software	Farad	EZ-EMC (Ver.ATT-03A)	N/A	N/A	N/A

6.2. Block diagram of test setup

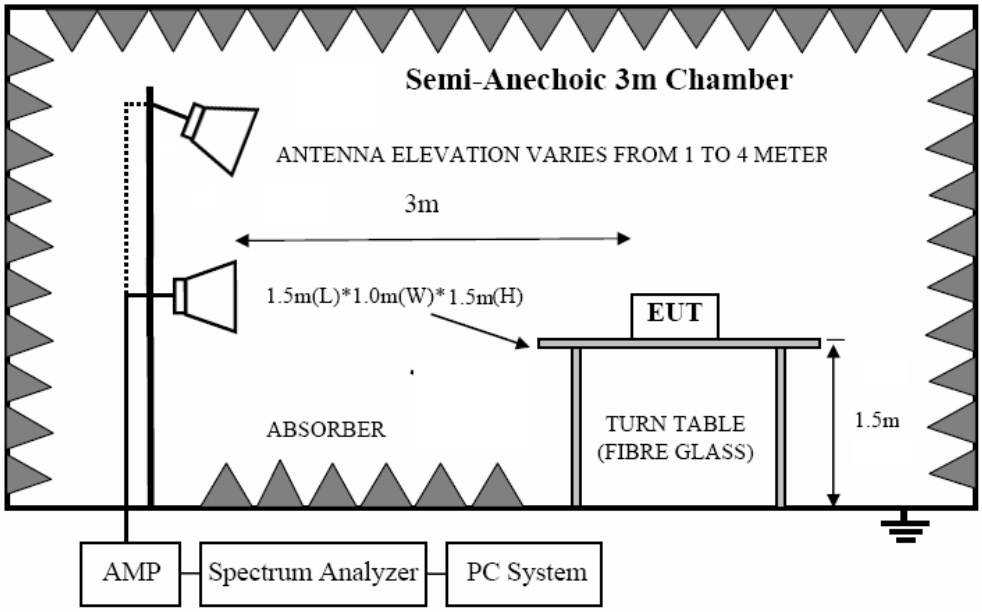
In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-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 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) New battery is used

(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:	Laser range finder	**Model No.:**	KILO1600BDX
Temperature:	24℃	**Relative Humidity:**	55%
Distance:	3m	**Test Power:**	DC 3V
Polarization:	--	**Test Result:**	Pass
Test Mode:	Keeping TX mode	**Test By:**	Blue

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

Note:

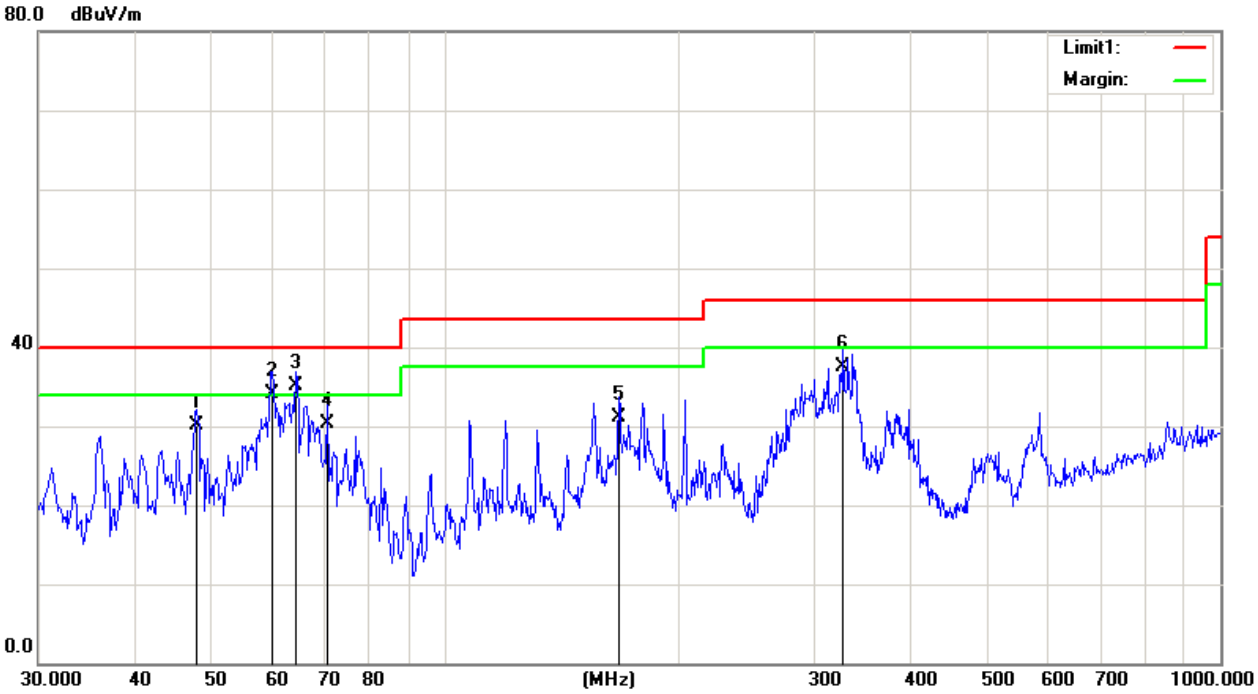
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

Between 30MHz – 1000 MHz

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Vertical**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**(RE)FCC PART 15 class B 3m**		
Test Mode:	**Keeping TX Mdoe**		
Note:			

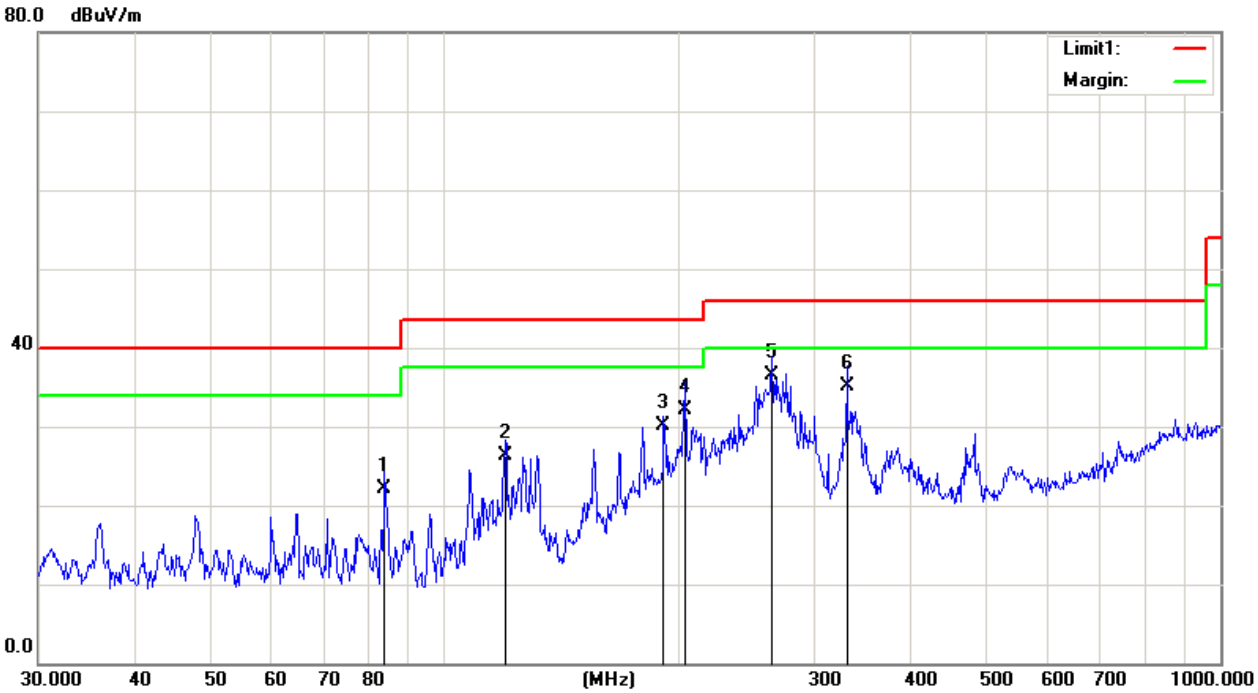


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	47.9938	43.67	-13.47	30.20	40.00	-9.80	QP
2	60.0690	47.14	-12.99	34.15	40.00	-5.85	QP
3	64.4330	47.55	-12.49	35.06	40.00	-4.94	QP
4	70.8315	45.06	-14.84	30.22	40.00	-9.78	QP
5	167.8240	41.53	-10.48	31.05	43.50	-12.45	QP
6	326.7395	45.72	-8.24	37.48	46.00	-8.52	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:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Horizontal**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**(RE)FCC PART 15 class B 3m**		
Test Mode:	**Keeping TX Mdoe**		
Note:			



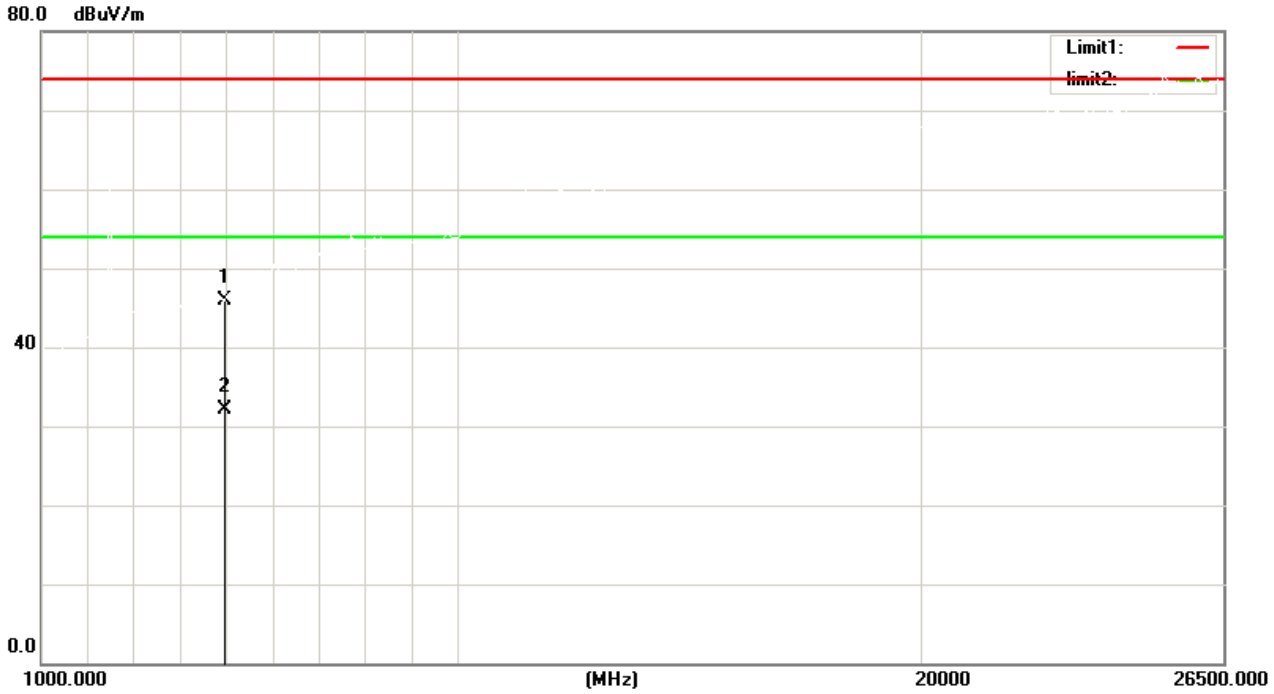
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	83.8156	39.54	-17.41	22.13	40.00	-17.87	QP
2	119.8555	40.23	-13.89	26.34	43.50	-17.16	QP
3	191.7450	39.51	-9.49	30.02	43.50	-13.48	QP
4	204.2376	41.87	-9.76	32.11	43.50	-11.39	QP
5	263.8190	41.21	-4.76	36.45	46.00	-9.55	QP
6	330.1949	43.26	-8.21	35.05	46.00	-10.95	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 1000MHz – 26500 MHz

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Vertical**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2480MHz**		
Note:			

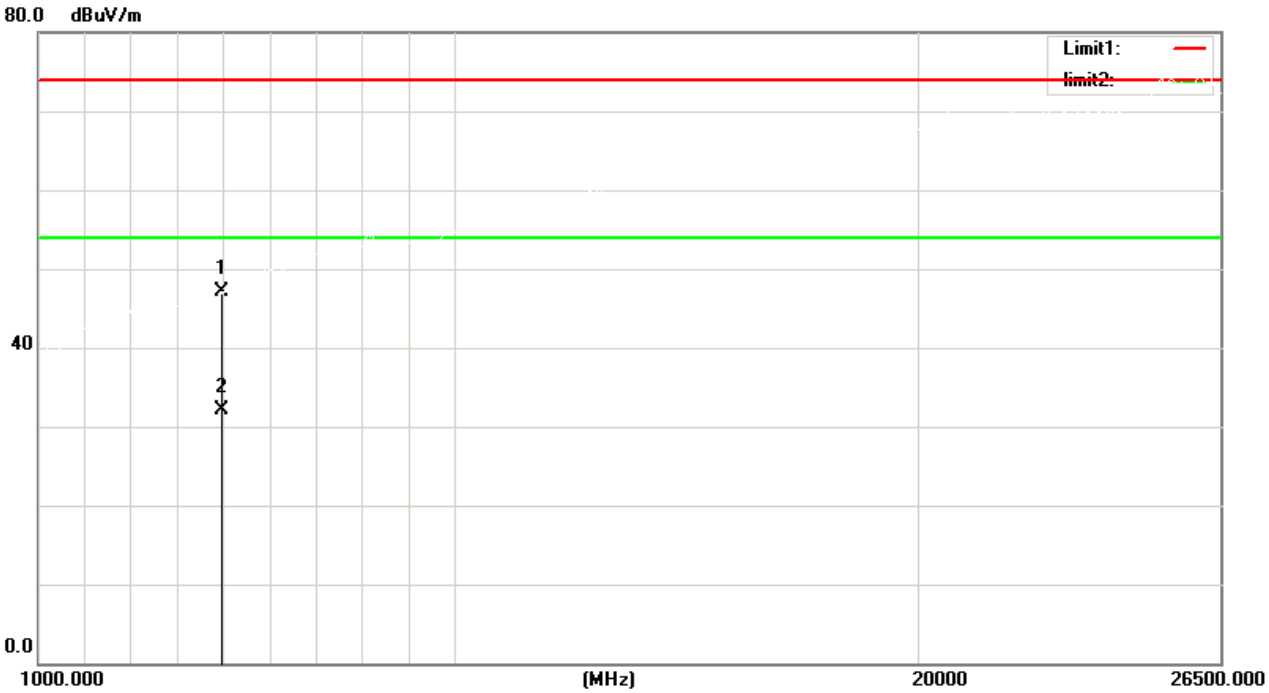


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.300	48.56	-2.74	45.82	74.00	-28.18	peak
2	4960.300	34.90	-2.74	32.16	54.00	-21.84	AVG

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Horizontal**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2480MHz**		
Note:			

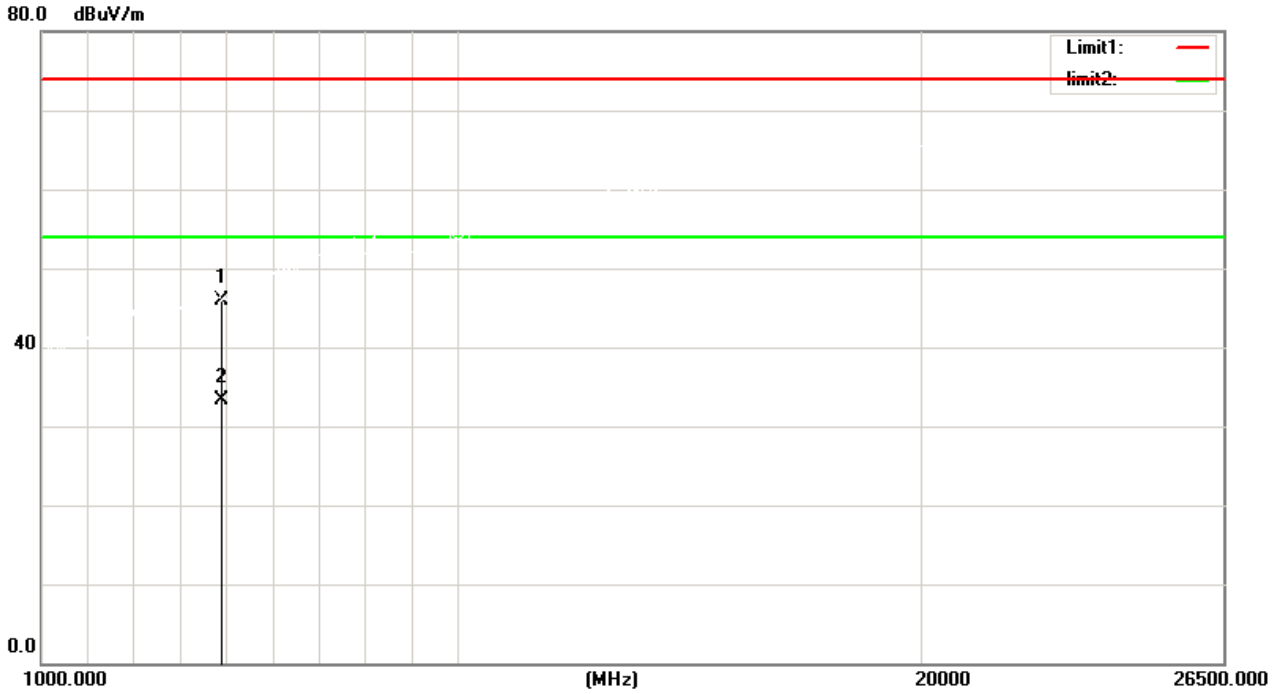


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.150	49.81	-2.74	47.07	74.00	-26.93	peak
2	4960.150	34.78	-2.74	32.04	54.00	-21.96	AVG

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Horizontal**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2440MHz**		
Note:			

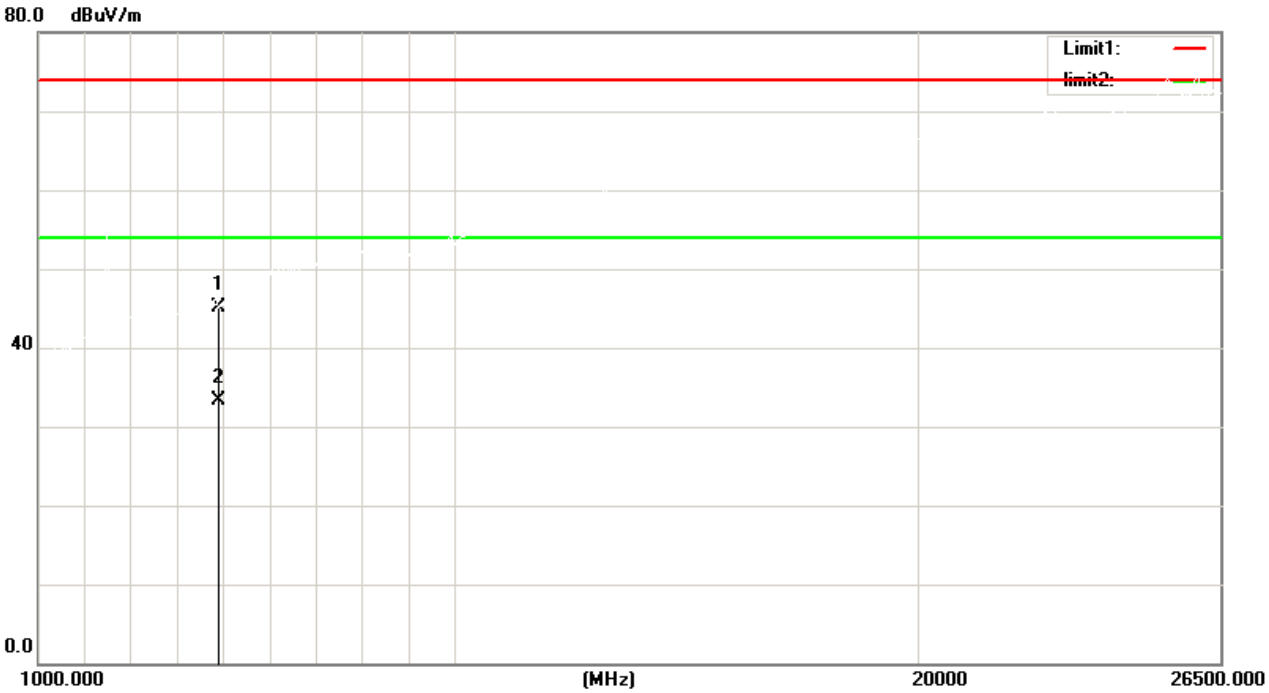


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.100	48.94	-3.05	45.89	74.00	-28.11	peak
2	4880.100	36.32	-3.05	33.27	54.00	-20.73	AVG

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Vertical**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2440MHz**		
Note:			

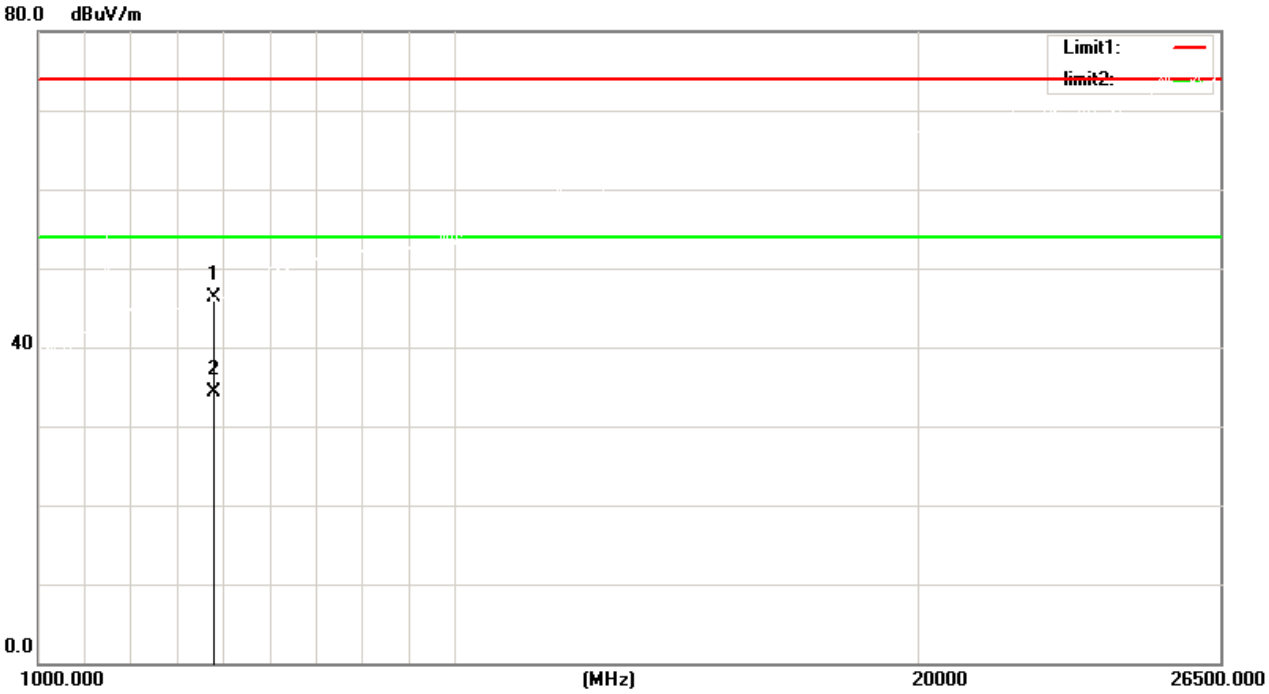


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.100	48.07	-3.05	45.02	74.00	-28.98	peak
2	4880.100	36.33	-3.05	33.28	54.00	-20.72	AVG

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Vertical**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2402MHz**		
Note:			

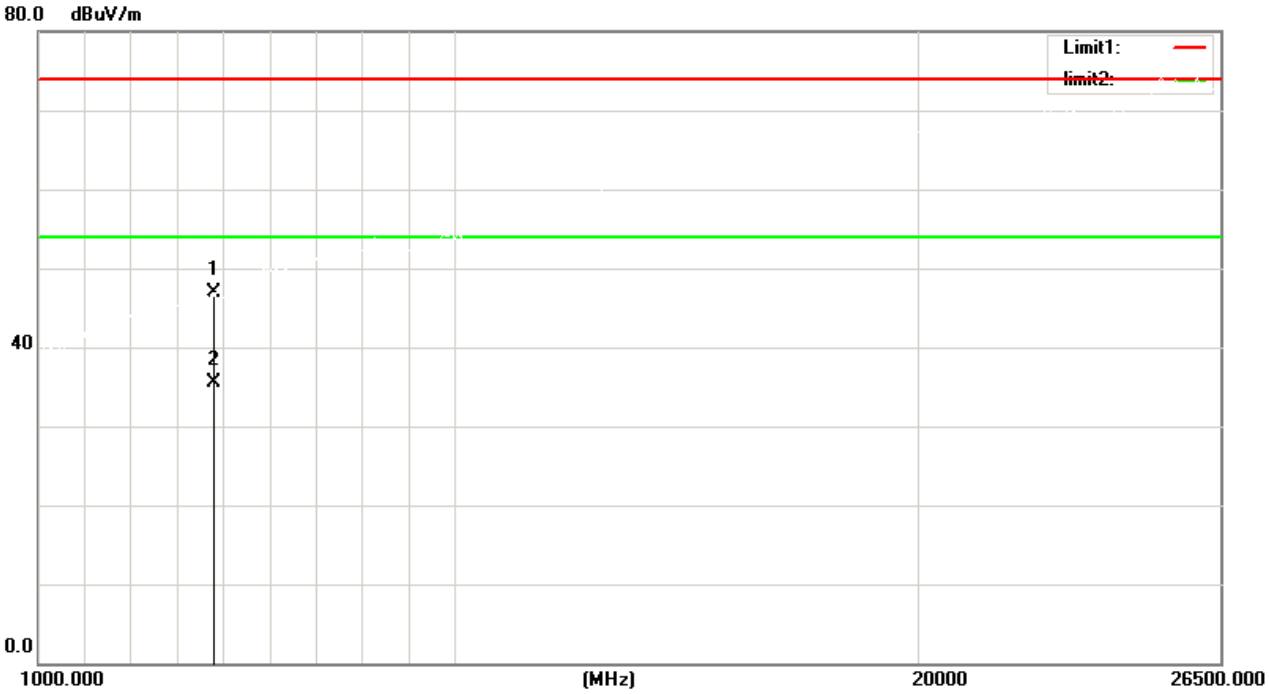


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.010	49.72	-3.33	46.39	74.00	-27.61	peak
2	4804.010	37.57	-3.33	34.24	54.00	-19.76	AVG

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Horizontal**	**Test Result:**	**Pass**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2402MHz**		
Note:			



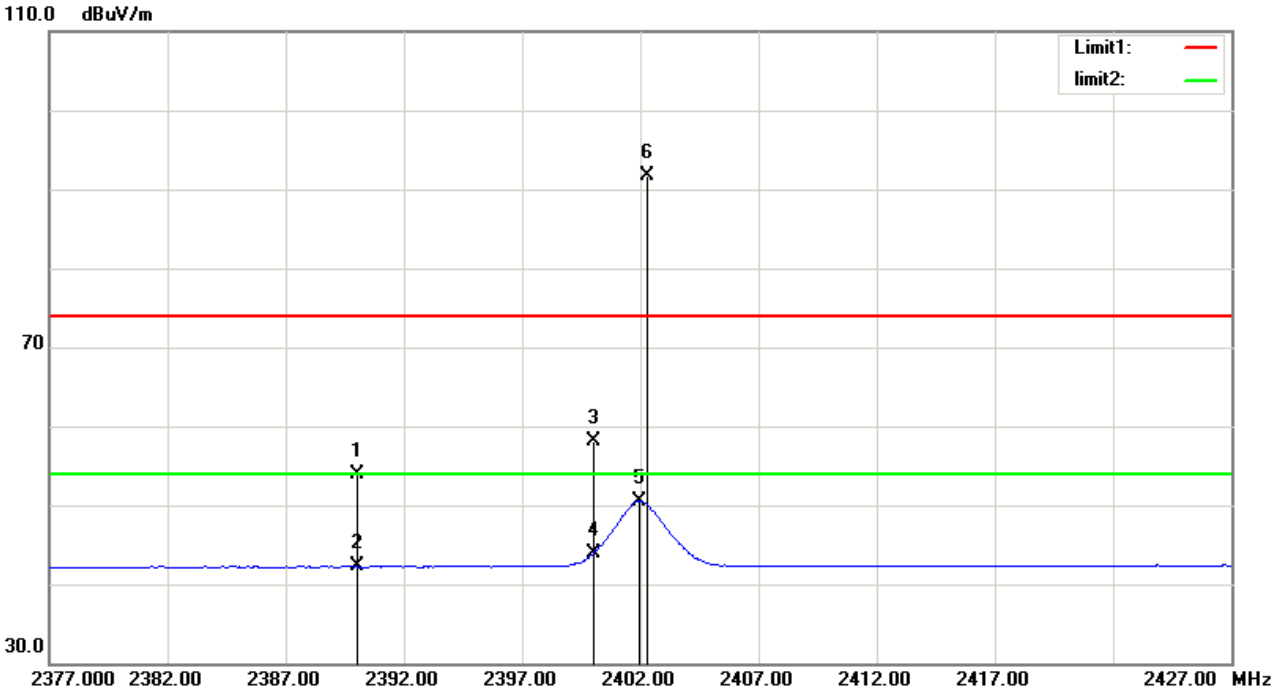
No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.010	50.22	-3.33	46.89	74.00	-27.11	peak
2	4804.010	38.74	-3.33	35.41	54.00	-18.59	AVG

The test result is calculated as the following:

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

Radiated band edge:

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Vertical**	**Test Result:**	**PASS**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2402MHz**		
Note:			

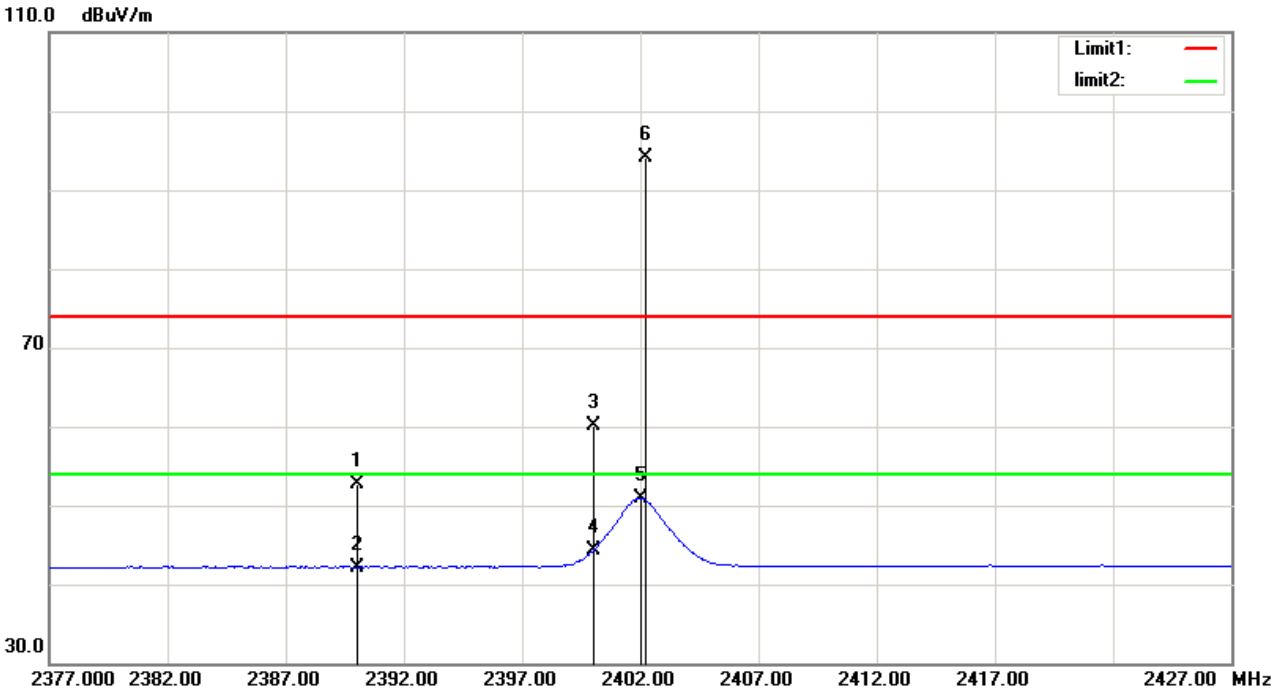


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	22.25	31.62	53.87	74.00	-20.13	peak
2	2390.000	10.58	31.62	42.20	54.00	-11.80	AVG
3	2400.000	26.48	31.64	58.12	74.00	-15.88	peak
4	2400.000	12.26	31.64	43.90	54.00	-10.10	AVG
5	2401.950	18.90	31.64	50.54	/	/	AVG
6	2402.300	60.02	31.65	91.67	/	/	peak

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Horizontal**	**Test Result:**	**PASS**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2402MHz**		
Note:			

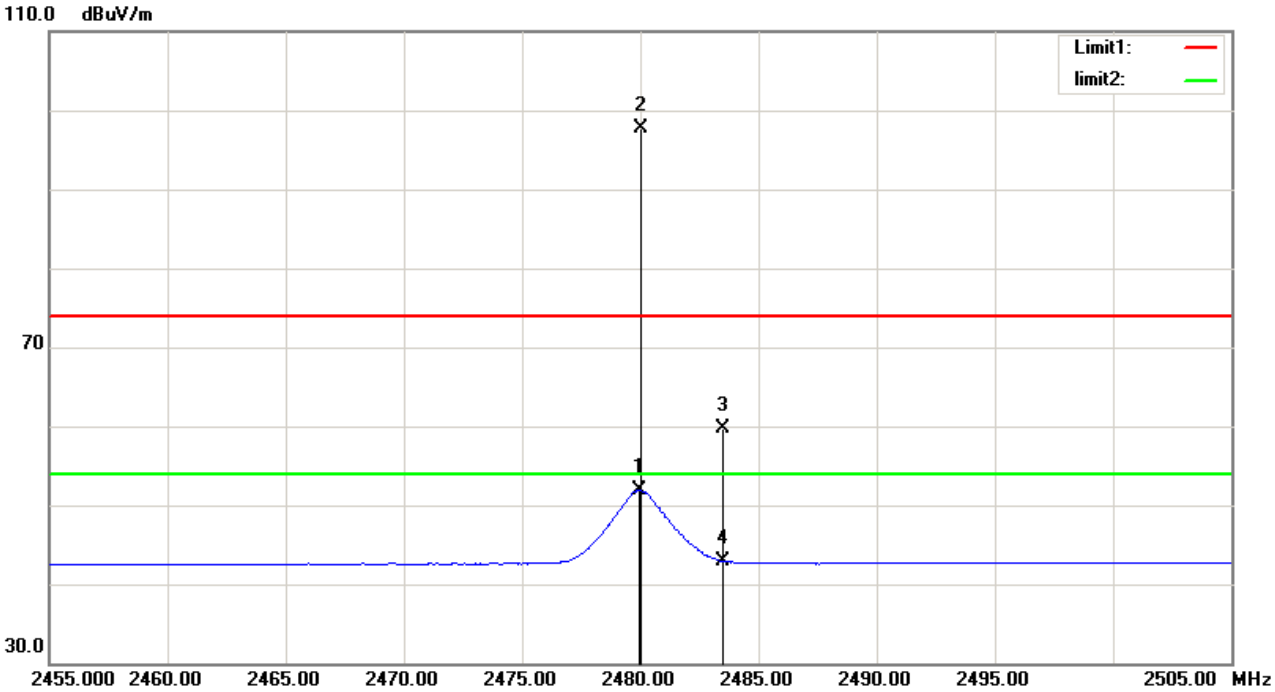


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2390.000	21.14	31.62	52.76	74.00	-21.24	peak
2	2390.000	10.57	31.62	42.19	54.00	-11.81	AVG
3	2400.000	28.46	31.64	60.10	74.00	-13.90	peak
4	2400.000	12.61	31.64	44.25	54.00	-9.75	AVG
5	2402.000	19.30	31.64	50.94	/	/	AVG
6	2402.250	62.49	31.65	94.14	/	/	peak

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Horizontal**	**Test Result:**	**PASS**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2480MHz**		
Note:			

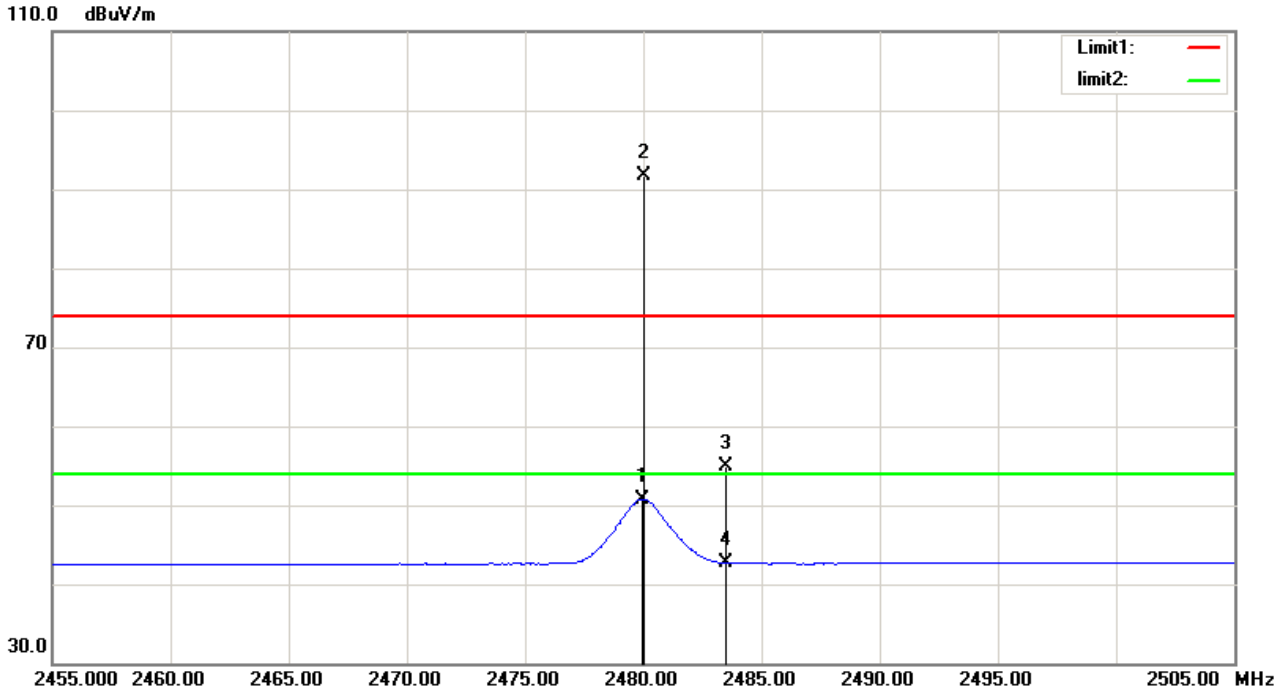


No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.950	19.97	31.88	51.85	/	/	AVG
2	2480.050	65.83	31.88	97.71	/	/	peak
3	2483.500	27.80	31.89	59.69	74.00	-14.31	peak
4	2483.500	11.03	31.89	42.92	54.00	-11.08	AVG

The test result is calculated as the following:

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

EUT:	**Laser range finder**	**Model No.:**	**KILO1600BDX**
Temperature:	**24℃**	**Relative Humidity:**	**55%**
Distance:	**3m**	**Test Power:**	**DC 3V**
Polarization:	**Vertical**	**Test Result:**	**PASS**
Test Time:	**2019-9-20**	**Test By:**	**Blue**
Standard:	**FCC PART 15 C 1-26.5G PEAK**		
Test Mode:	**BLE TX-2480MHz**		
Note:			



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.950	18.89	31.88	50.77	/	/	AVG
2	2480.000	59.79	31.88	91.67	/	/	peak
3	2483.500	22.92	31.89	54.81	74.00	-19.19	peak
4	2483.500	10.82	31.89	42.71	54.00	-11.29	AVG

The test result is calculated as the following:

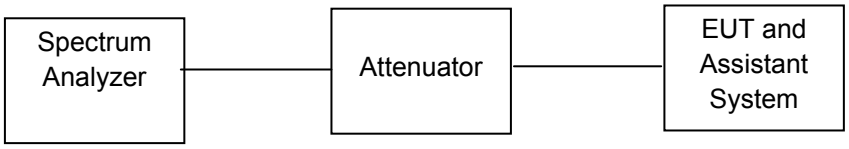
(1) Result = Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss
(3) Margin = Result - Limit

7. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

7.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year

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)).

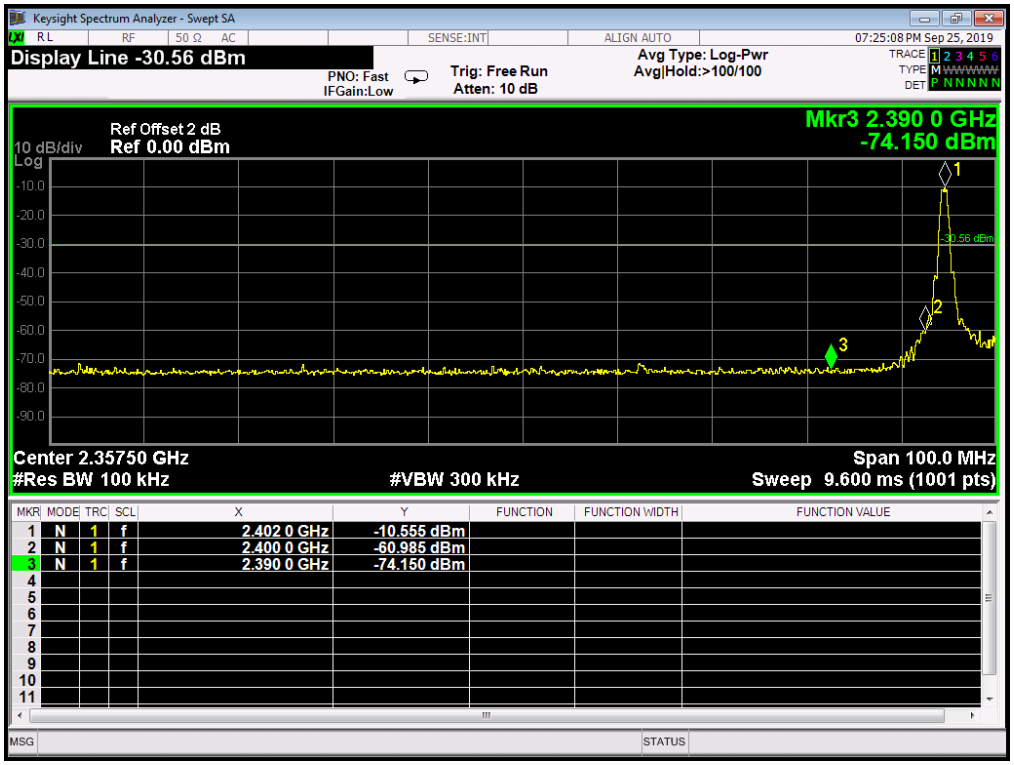
7.4. Test Procedure

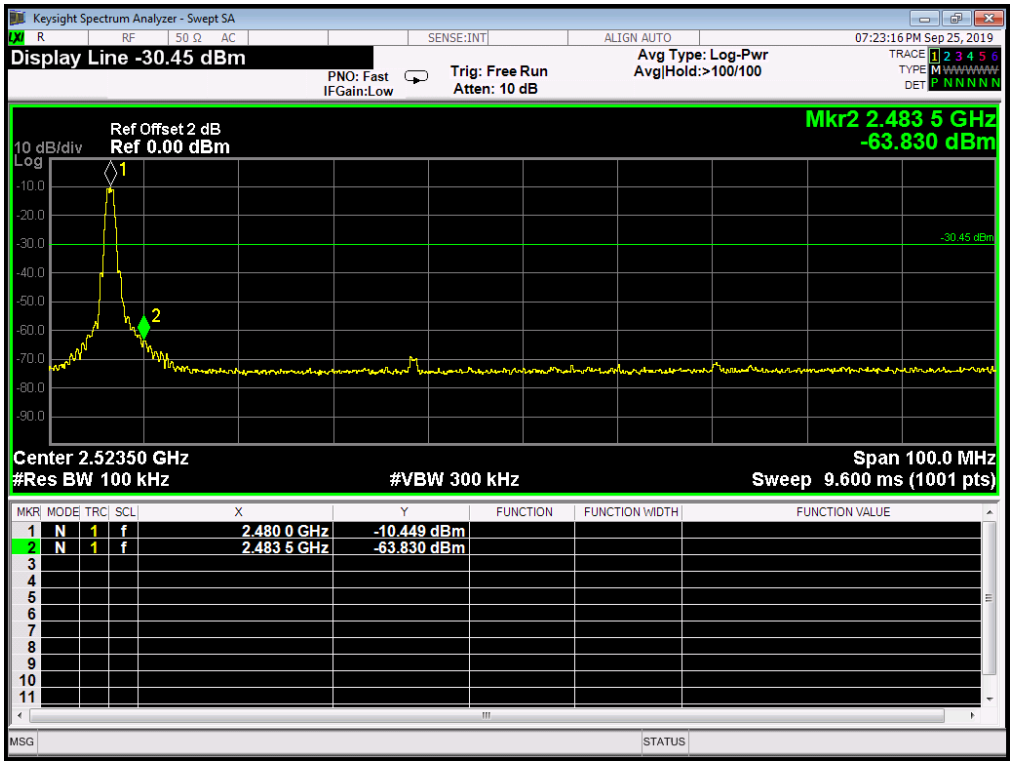
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting 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 Mode			
2400	50.430	20	Pass
2483.5	53.381	20	Pass

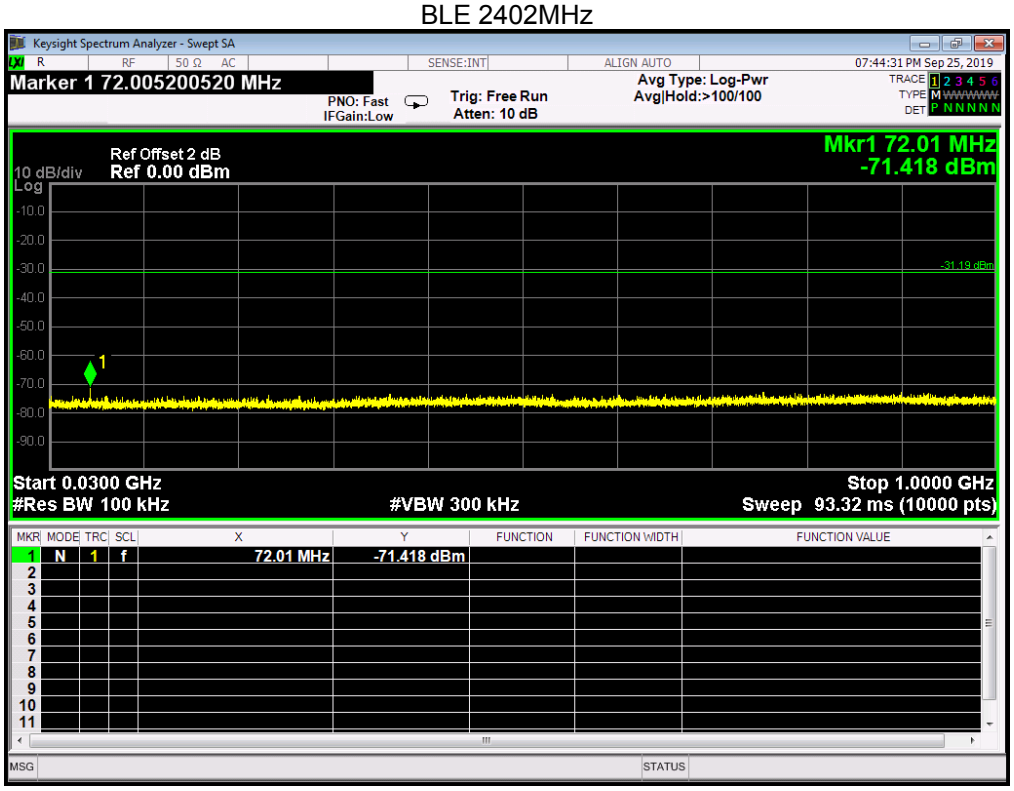
BLE

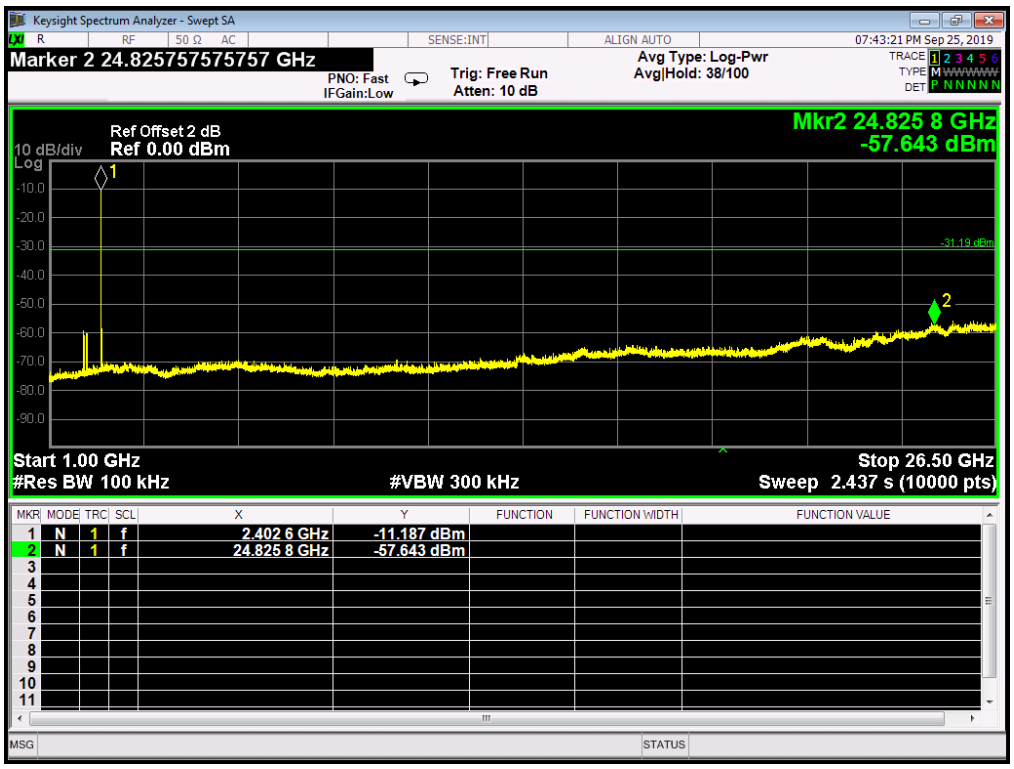

Keysight Spectrum Analyzer - Swept SA
Display Line -30.56 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:25:08 PM Sep 25, 2019
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Log
Mkr3 2.390 0 GHz
-74.150 dBm
Center 2.35750 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.402 0 GHz -10.555 dBm
2 N 1 f 2.400 0 GHz -60.985 dBm
3 N 1 f 2.390 0 GHz -74.150 dBm


Keysight Spectrum Analyzer - Swept SA
Display Line -30.45 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:23:16 PM Sep 25, 2019
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Log
Mkr2 2.483 5 GHz
-63.830 dBm
Center 2.52350 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 100.0 MHz
Sweep 9.600 ms (1001 pts)
1 N 1 f 2.480 0 GHz -10.449 dBm
2 N 1 f 2.483 5 GHz -63.830 dBm

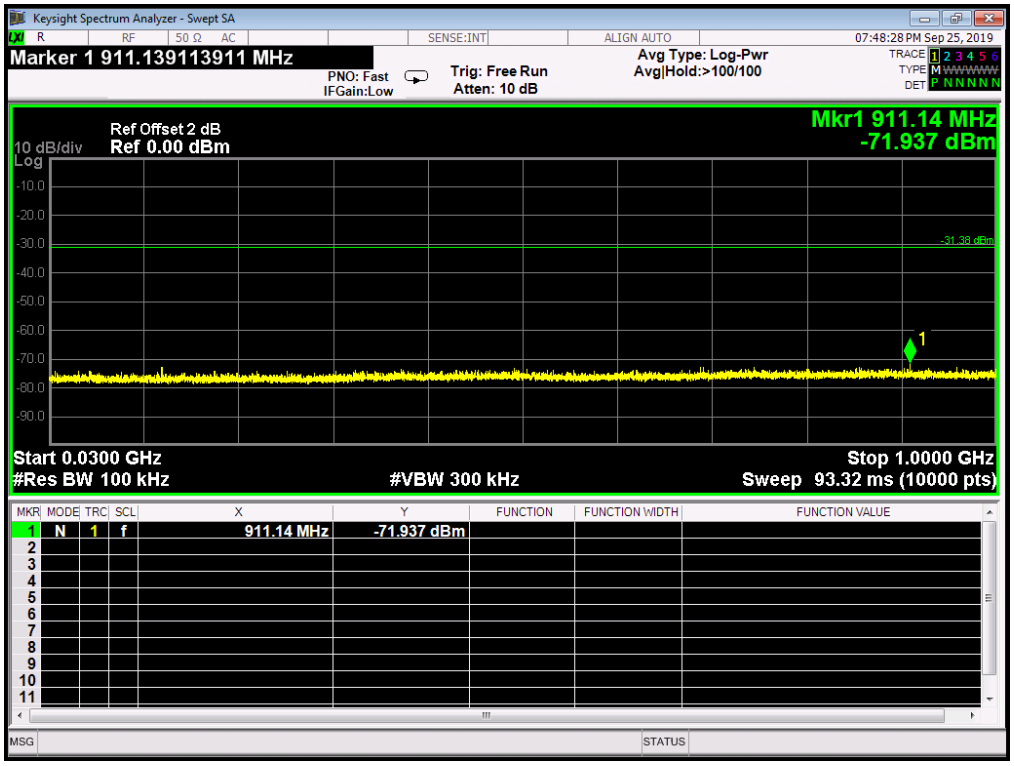
Conducted Emission

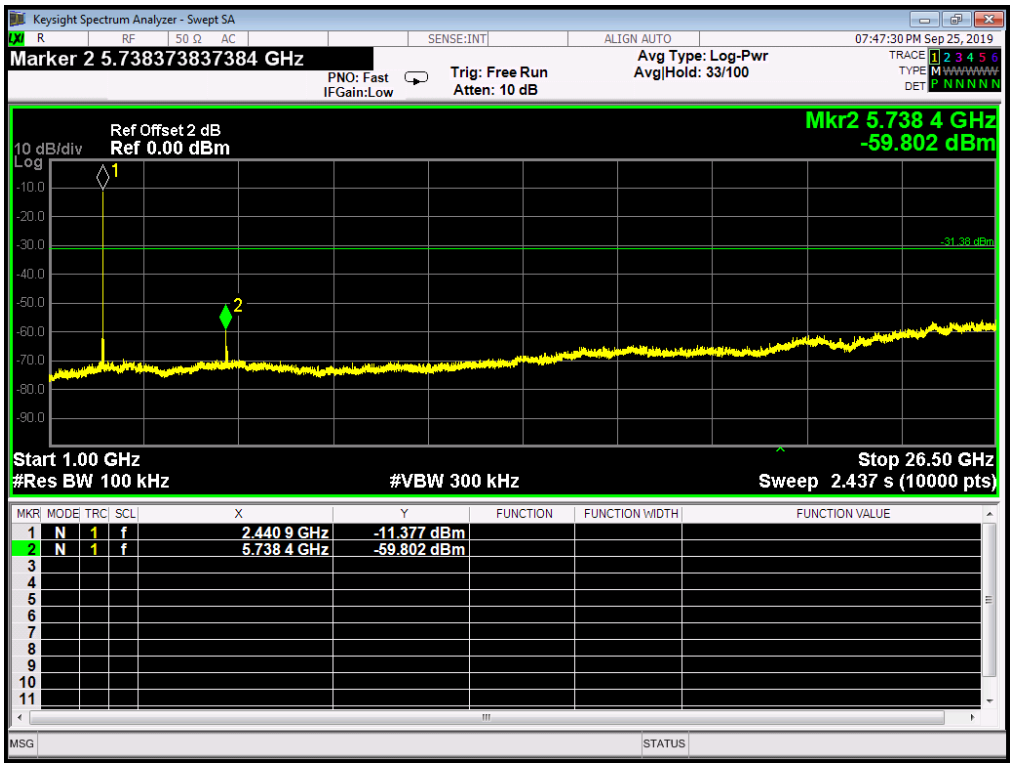
BLE 2402MHz



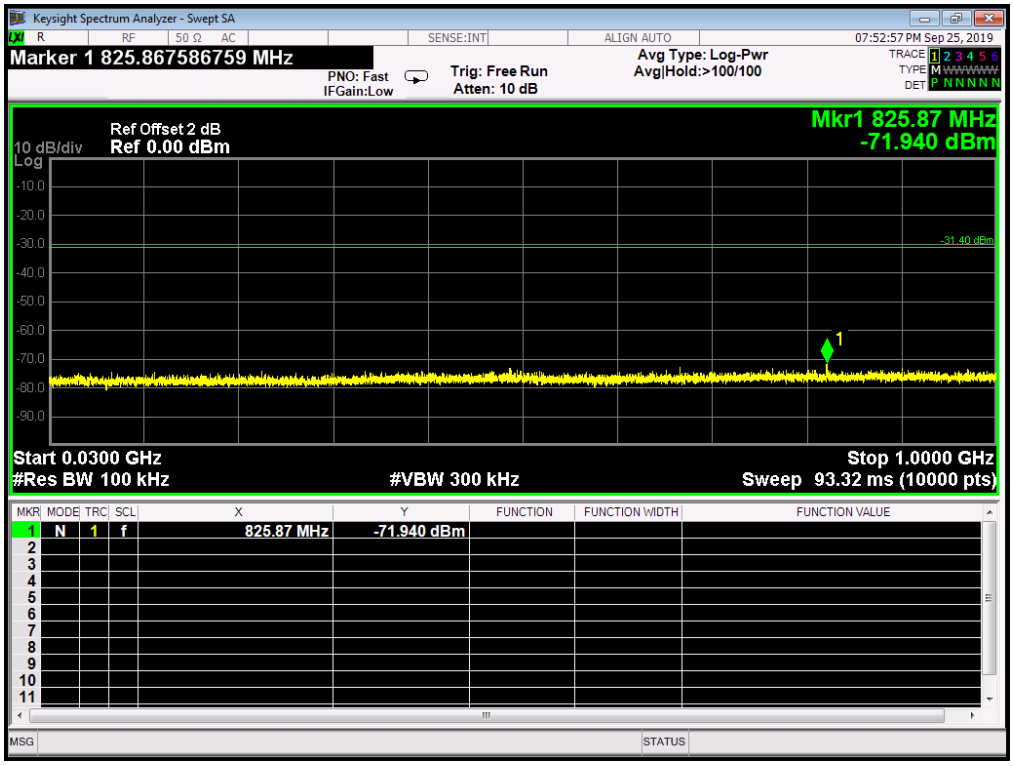


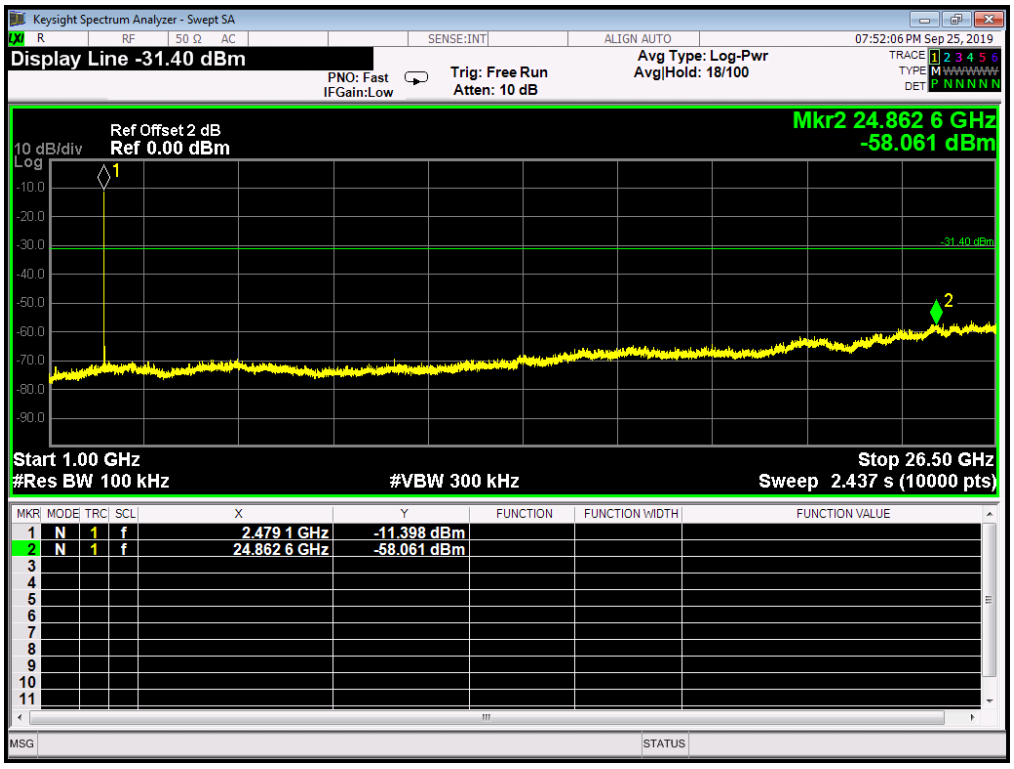
BLE 2440MHz


Keysight Spectrum Analyzer - Swept SA
Marker 1 911.139113911 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:48:28 PM Sep 25, 2019
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Mkr1 911.14 MHz
-71.937 dBm
Start 0.0300 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 93.32 ms (10000 pts)
1 N 1 f 911.14 MHz -71.937 dBm


Keysight Spectrum Analyzer - Swept SA
Marker 2 5.738373837384 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 33/100
07:47:30 PM Sep 25, 2019
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Mkr2 5.738 4 GHz
-59.802 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.437 s (10000 pts)
1 N 1 f 2.440 9 GHz -11.377 dBm
2 N 1 f 5.738 4 GHz -59.802 dBm

BLE 2480MHz


Keysight Spectrum Analyzer - Swept SA
Marker 1 825.867586759 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
07:52:57 PM Sep 25, 2019
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Mkr1 825.87 MHz
-71.940 dBm
-31.40 dBm
Start 0.0300 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1.0000 GHz
Sweep 93.32 ms (10000 pts)
1 N 1 f 825.87 MHz -71.940 dBm

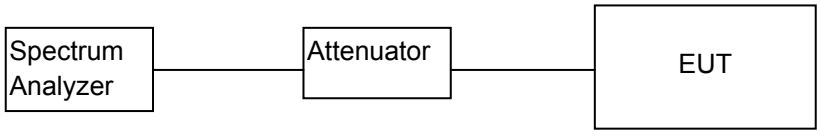

Keysight Spectrum Analyzer - Swept SA
Display Line -31.40 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 18/100
07:52:06 PM Sep 25, 2019
Ref Offset 2 dB
10 dB/div
Ref 0.00 dBm
Mkr2 24.862 6 GHz
-58.061 dBm
-31.40 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.437 s (10000 pts)
1 N 1 f 2.479 1 GHz -11.398 dBm
2 N 1 f 24.862 6 GHz -58.061 dBm

8.TRANSMITTER FREQUENCY STABILITY

8.1.Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Due.	Cal. Interval
1	Spectrum analyzer	KEYSIGHT	N9010A	MY55150427	2020/05/27	1 Year
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2019/12/16	1 Year
3	RF Cable	Micable	C10-01-01-1	100309	2019/12/16	1 Year
4	Temperature conditioning	Guan Jian.HTH1000	-20-130℃	GJ1000-10D 001	2019/12/16	1.Year
5	DC Power Supply	G.KE	IPR-10010D	010931954	2019/12/16	1.Year

8.2.Block diagram of test setup



8.3.Test Result

	Temperature vs. Frequency Stability	
Voltage	**Temperature**	**Measurement Frequency (MHz)**
3V	**(℃)**	**2402**
	-20	2402.062
	20	2402.063
	50	2402.063
1.7V	**20**	2402.061
	Max. Deviation (MHz)	**0.063**
	Max. Deviation (ppm)	**26.23**

Voltage	**Temperature**	**Measurement Frequency (MHz)**
3V	**(℃)**	**2440**
	-20	2440.063
	20	2440.065
	50	2440.064
1.7V	**20**	2440.064
	Max. Deviation (MHz)	**0.065**
	Max. Deviation (ppm)	**26.64**

Voltage	**Temperature**	**Measurement Frequency (MHz)**
3V	**(℃)**	**2480**
	-20	2480.061
	20	2480.061
	50	2480.062
1.7V	**20**	2480.062
	Max. Deviation (MHz)	**0.062**
	Max. Deviation (ppm)	**25.00**

Note: 1.7V is the end point voltage, and products below 1.7V will cease working.

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

The EUT antenna is permanent attached antenna. It comply with the standard requirement.

END OF REPORT