AUDIX Technology Corp.
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FCC 15.247
2.4 GHz Report

for

LIVAN TECHNOLOGY CO., LTD.

3F., No.3, Ln.113, Baozhong Rd., Xindian Dist., New Taipei City 23144, Taiwan

Brand	**:**	**Livan**
Product Name	**:**	**Bluetooth thermometer**
Model Name	**:**	**BT1219**
FCC ID	**:**	**2AHQNBT1219**

Prepared by: **:** **AUDIX Technology Corporation, EMC Department**

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TEST REPORT CERTIFICATION

Applicant	:	LIVAN TECHNOLOGY CO., LTD.
Manufacture	:	LIVAN TECHNOLOGY CO., LTD.
Product Name	:	Bluetooth thermometer
Model No.	:	BT1219
Serial No.	:	N/A
Brand	:	Livan
Power Supply	:	DC 3V

Rules of Compliance and Measurement Standards:
47 CFR FCC Part 15 Subpart C: 2015
ANSI C63.10:2013
KDB 558074 D01 DTS Meas Guidance v03r05

AUDIX Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report. ***AUDIX Technology Corp.*** does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Test: 2016. 10. 14 ~ 18 Date of Report: 2016. 10. 21

Producer: Eva Chen
(Eva Chen/Assistant Administrator)

Signatory: Ben Cheng
(Ben Cheng/Manager)

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1. REPORT HISTORY

Revision	Date	Revision Summary	Report Number
0	2016. 10. 21	Original Report.	EM-F160688

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2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	**N/A, Note**
15.247(d)/15.205	Radiated Band Edge and Radiated Spurious Emission	**PASS**
15.247(a)(2)	6dB Bandwidth	**PASS**
15.247(b)(3)	Maximum Peak Output	**PASS**
15.247(d)	Conducted Band Edges and Conducted Spurious Emission	**PASS**
15.247 (e)	Power Spectral Density	**PASS**
15.203	Antenna Requirement	**PASS**
Note: The EUT only employs battery power for operation, so it is unnecessary to test.		

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3. GENERAL INFORMATION

3.1. Description of EUT

Product	Bluetooth thermometer
Model Number	BT1219
Serial Number	N/A
Brand Name	Livan
Applicant	LIVAN TECHNOLOGY CO., LTD. 3F., No.3, Ln.113, Baozhong Rd., Xindian Dist., New Taipei City 23144, Taiwan
Manufacture	LIVAN TECHNOLOGY CO., LTD. 3F., No.3, Ln.113, Baozhong Rd., Xindian Dist., New Taipei City 23144, Taiwan
RF Features	Bluetooth Low Energy (BLE)
Transmit Type	1T1R
Date of Receipt of Sample	2016. 10. 03

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3.2. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (Mbps)
BLE	2402-2480	40	GFSK	1

Channel List			
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
37	2402	18	2442
00	2404	19	2444
01	2406	20	2446
02	2408	21	2448
03	2410	22	2450
04	2412	23	2452
05	2414	24	2454
06	2416	25	2456
07	2418	26	2458
08	2420	27	2460
09	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

3.3. Antenna Information

Antenna Part Number	Manufacture	Antenna Type	Frequency	Max Gain (dBi)
AT3216	ACX	Multilayer Chip Antenna	2400~2500MHz	0.5

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3.4. Test Configuration

Mode	Duty Cycle (x)	T (ms)	Duty Cycle Factor (dB)
BLE	0.263	0.165	5.3
TX_{on}/TX_{on+off}=0.165/0.628=0.263			

Note: When duty cycle is less than 98% (0.98) that duty cycle factor 10log(1/x) is needed to add in conducted test items measured in average detector.

Item		Test Channel
Radiated Test Case	Radiated Band Edge Note1	37/39
	Radiated Spurious Emission (30MHz-1GHz) Note1	37/19/39
	Radiated Spurious Emission (Above 1GHz) Note1	37/19/39
Conducted Test Case	6dB Bandwidth	37/19/39
	Peak Power Spectral Density	37/19/39
	Peak Output Power	37/19/39
	Band Edge	37/39
	Spurious Emission	37/19/39

Note 1:
☐Mobile Device
■Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow:
■ Lie
☐ Side
☐ Stand
Note 2: We performed testing of the highest and lowest data rate.

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3.5. Tested Supporting System List

3.5.1. Support Peripheral Unit

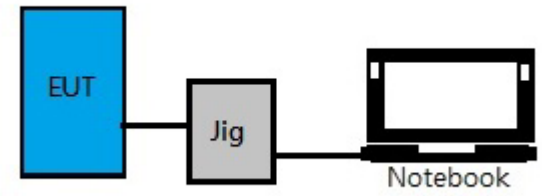
No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook PC	ASUS	ASUS N20A	N/A	TLZ-BT253
2.	Test Jig	N/A	N/A	N/A	N/A

3.5.2. Cable Lists

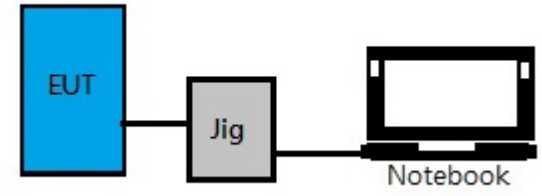
No.	Cable Description Of The Above Support Units
1.	LAN Cable: Shielded, Detachable, 0.9m USB Cable: Shielded, Detachable, 1.8m Adapter: ACBEL, M/N AA90PM111, DC Cord: Shielded, Undetachable, 1.8m, Bonded a ferrite core AC Power Cord: Unshielded, Detachable, 1.8m
2.	USB Cable: Unshielded, Detachable, 0.15m

3.6. Setup Configuration

3.6.1. EUT Configuration for Radiated Emission



3.6.2. EUT Configuration for Conducted Test Items



3.7. Operating Condition of EUT

Test program “nRFgo Studio” is used for enabling EUT RF function under continues transmitting and choosing data rate/ channel.

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3.8. Description of Test Facility

Test Firm Name	:	**AUDIX Technology Corporation** **EMC Department** No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
Test Location & Facility	:	**Semi-Anechoic Chamber &** **Fully Semi-Anechoic Chamber** No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724
FCC OET Designation	:	TW1004 & TW1090

3.9. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark：Uncertainty = $ku_c(y)$

Test Item	Uncertainty
6dB Bandwidth	± 0.05kHz
Maximum peak output power	± 0.33dB
Power spectral density	± 0.13dB
Conducted Emission Limitations	± 0.13dB

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4. MEASUREMENT EQUIPMENT LIST

4.1. Radiated Emission Measurement

4.1.1. Frequency Range 30MHz~1000MHz (Semi-Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2016. 09. 19	1 Year
2.	Test Receiver	R & S	ESCS30	100338	2016. 06. 22	1 Year
3.	Amplifier	HP	8447D	2944A06305	2016. 02. 23	1 Year
4.	Bilog Antenna	TESEQ	CBL6112D	33821	2016. 01. 30	1 Year
5.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.1.2. Frequency Range Above 1GHz (Fully Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	2016. 08. 19	1 Year
2.	Pre-Amplifier	HP	8449B	3008A02678	2016. 03. 04	1 Year
3.	Horn Antenna	ETS-Lindgren	3117	00135902	2016. 03. 09	1 Year
4.	2.4GHz Notch Filter	K&L	7NSL10-2441.5E130.5-00	1	2016. 07. 27	1 Year
5.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.
6.	Spectrum Analyzer	Agilent	E4446A	US44300366	2016. 08. 19	1 Year

4.2. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2015. 11. 28	1 Year

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5. CONDUCTED EMISSION MEASUREMET

【The EUT only employs battery power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207】

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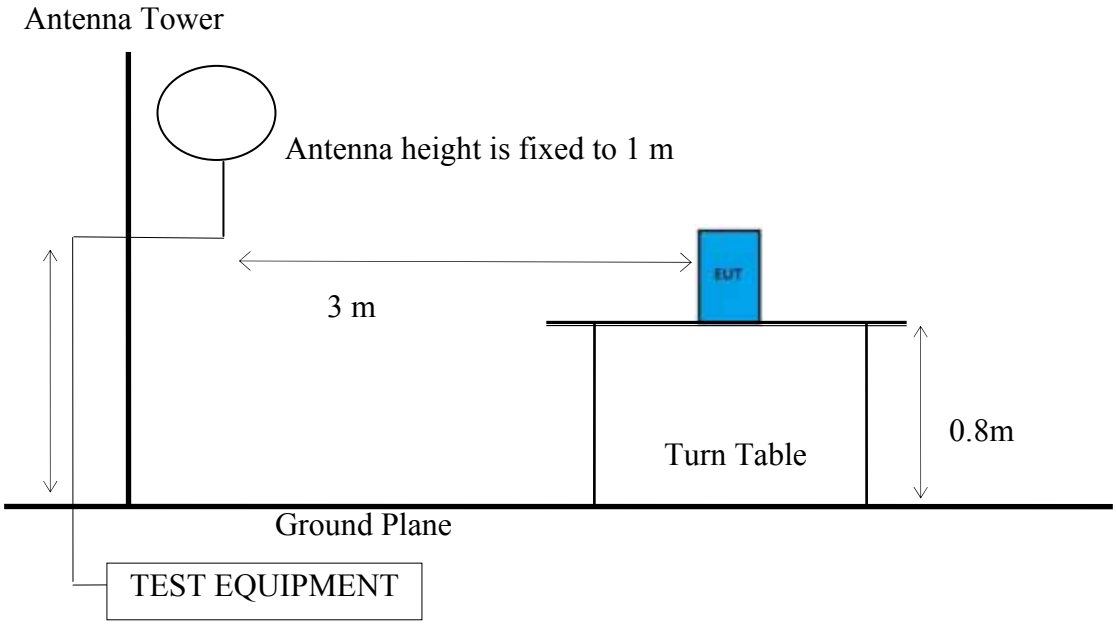
6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup

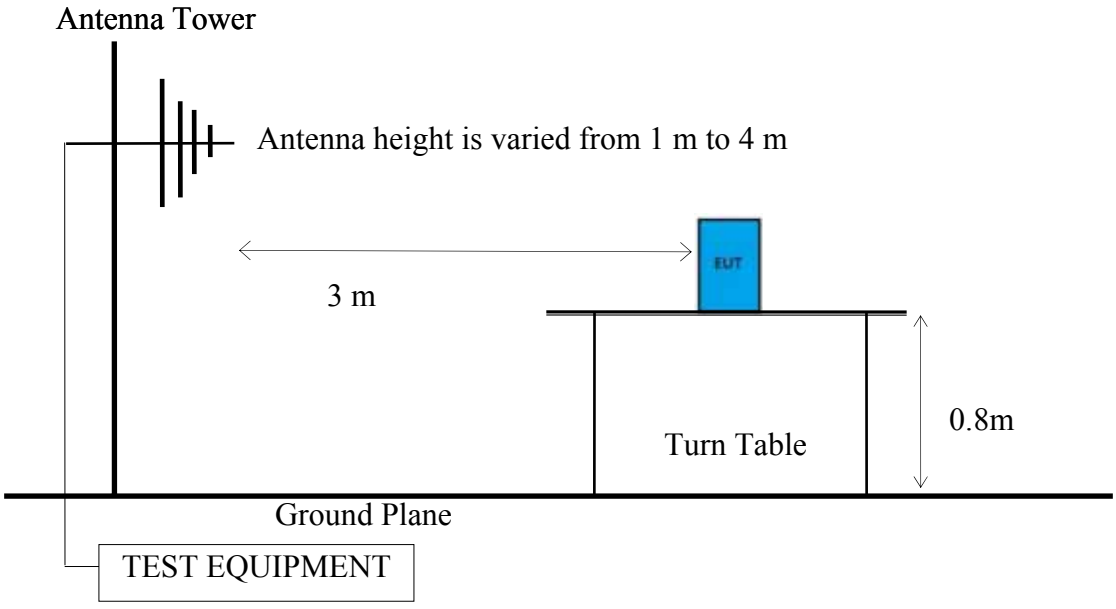
6.1.1. Block Diagram of EUT

Indicated as section 3.6

6.1.2. Semi Anechoic Chamber (3m) Setup Diagram for 9kHz-30MHz



6.1.3. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000 MHz



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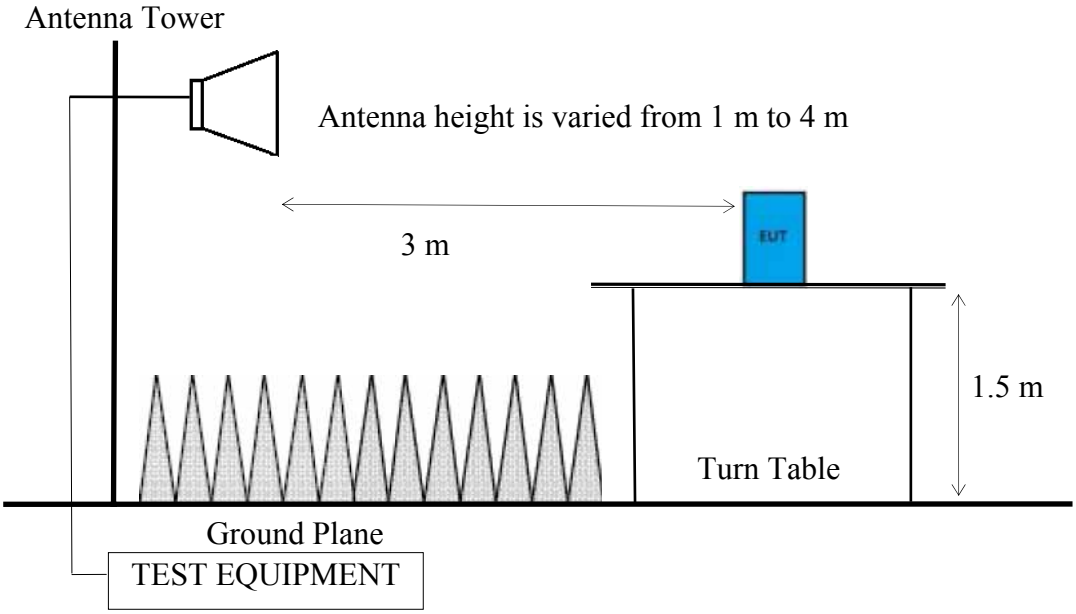
6.1.4. Fully Anechoic Chamber (3m) Setup Diagram for above 1GHz



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6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dBμV/m	μV/m
0.009 - 0.490	300	67.6	2400/kHz
0.490 - 1.705	30	87.6	24000/kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark：(1) dBμV/m = 20 log (μV/m)
(2) The tighter limit applies to the edge between two frequency bands.
(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
(4) Fundamental and emission fall within operation band are exempted from this section.
(5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

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6.3. Test Procedure

Frequency Range 9kHz~30MHz:
The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

(1) RBW = 9kHz with peak and average detector.
(2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 40GHz:
The EUT setup on the turn find table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1 GHz:
Spectrum Analyzer is used for pre-testing with following setting:

(1) RBW = 120KHz
(2) VBW ≥ 3 x RBW.
(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.
(7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required. Otherwise using Q.P. for finally measurement.

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Frequency above 1GHz to 10th harmonic:

Peak Detector:

(1) RBW = 1MHz
(2) VBW ≥ 3 x RBW.
(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.
(7) When peak-detected value is lower than limit that the measurement using the average detector is not required. Otherwise using average for finally measurement.

Average Detector:

■**Option 1:**

(1) RBW = 1MHz
(2) VBW ≥ 1/ T.

Modulation Type	T (ms)	1/ T (kHz)	VBW Setting (kHz)
BLE	0.165	6.06	6.06

N/A: 1/ T is not implemented when duty cycle presented in section 3.5 is ≥98 %.

(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.

☐**Option 2:**

Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation

■Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading
■Average Emission Level =Antenna Factor + Cable Loss + Meter Reading
☐Average Emission Level= Peak Emission Level+ DCCF
Duty Cycle Correction Factor (DCCF)= 20log (TX_{on}/TX_{on+off}) presented in section 3.4
☐EPR= Peak Emission Level-95.2dB-2.14dBi

6.5. Test Results

PASSED.

Test Date	2016/10/18	Temp./Hum.	23℃/53%
Test Voltage	DC 3V (Via Test Jig)		

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6.5.1. Emissions within Restricted Frequency Bands

6.5.1.1. Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

6.5.1.2. Frequency Below 1 GHz

Mode	BLE	Frequency	TX 2402MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
144.46	12.06	2.77	19.65	34.48	43.50	9.02	Peak
275.41	13.28	4.07	22.17	39.52	46.00	6.48	Peak
692.51	18.50	7.06	4.36	29.92	46.00	16.08	Peak
829.28	19.87	7.78	7.37	35.02	46.00	10.98	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
134.76	12.60	2.66	16.10	31.36	43.50	12.14	Peak
325.85	14.39	4.66	16.31	35.36	46.00	10.64	Peak
555.74	17.87	6.61	14.22	38.70	46.00	7.30	Peak
827.34	19.85	7.77	7.46	35.08	46.00	10.92	Peak

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Mode	BLE	Frequency	TX 2440MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
101.78	12.04	2.29	8.49	22.82	43.50	20.68	Peak
252.13	12.79	3.83	27.12	43.74	46.00	2.26	Peak
690.57	18.50	7.05	6.12	31.67	46.00	14.33	Peak
829.28	19.87	7.78	6.32	33.97	46.00	12.03	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
136.70	12.54	2.69	17.39	32.62	43.50	10.88	Peak
263.77	13.05	3.95	22.24	39.24	46.00	6.76	Peak
515.97	17.35	6.48	11.77	35.60	46.00	10.40	Peak
828.31	19.85	7.77	7.76	35.38	46.00	10.62	Peak

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Mode	BLE	Frequency	TX 2480MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
101.78	12.04	2.29	8.64	22.97	43.50	20.53	Peak
156.10	11.07	2.89	21.32	35.28	43.50	8.22	Peak
332.64	14.55	4.75	22.63	41.93	46.00	4.07	Peak
828.31	19.85	7.77	6.54	34.16	46.00	11.84	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
126.03	12.85	2.57	10.63	26.05	43.50	17.45	Peak
252.13	12.79	3.83	18.18	34.80	46.00	11.20	Peak
468.44	16.79	6.17	11.88	34.84	46.00	11.16	Peak
828.31	19.85	7.77	7.02	34.64	46.00	11.36	Peak

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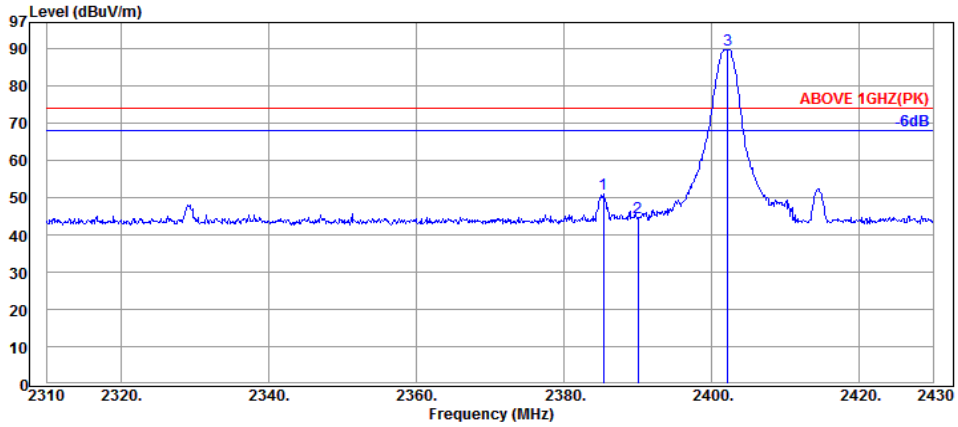
6.5.1.3. Frequency Above 1 GHz to 10th harmonics

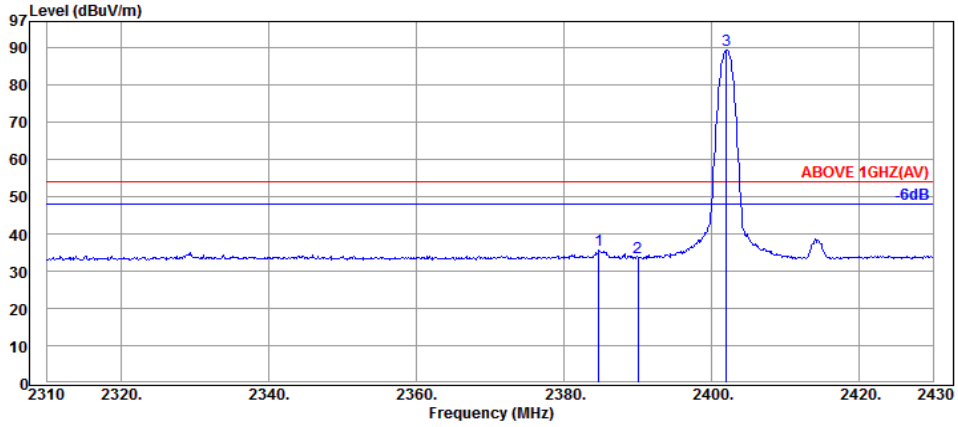
Band Edge:

Mode	BLE	Frequency	TX 2402MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2385.36	32.13	5.71	13.11	50.95	74.00	23.05	Peak
2390.04	32.16	5.72	6.93	44.81	74.00	29.19	Peak
2402.16	32.16	5.72	51.95	89.83	---	---	Peak



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2384.76	32.13	5.71	-2.34	35.50	54.00	18.50	Average
2390.04	32.16	5.72	-4.33	33.55	54.00	20.45	Average
2402.04	32.16	5.72	51.40	89.28	---	---	Average

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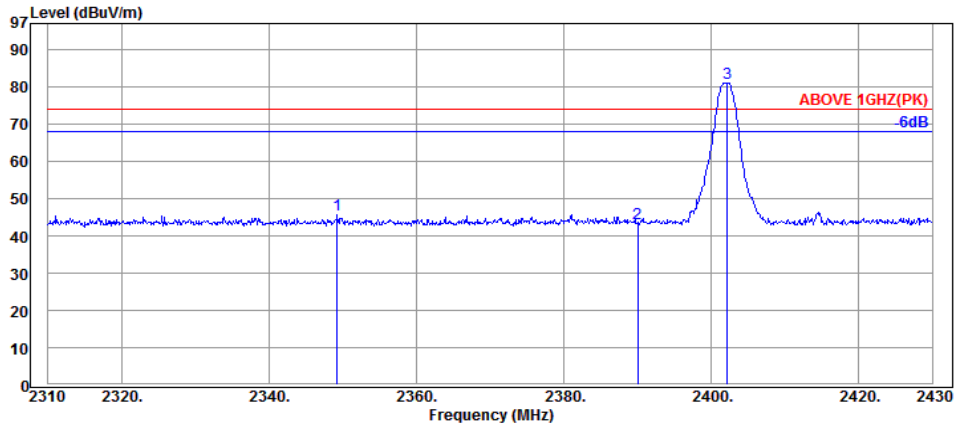
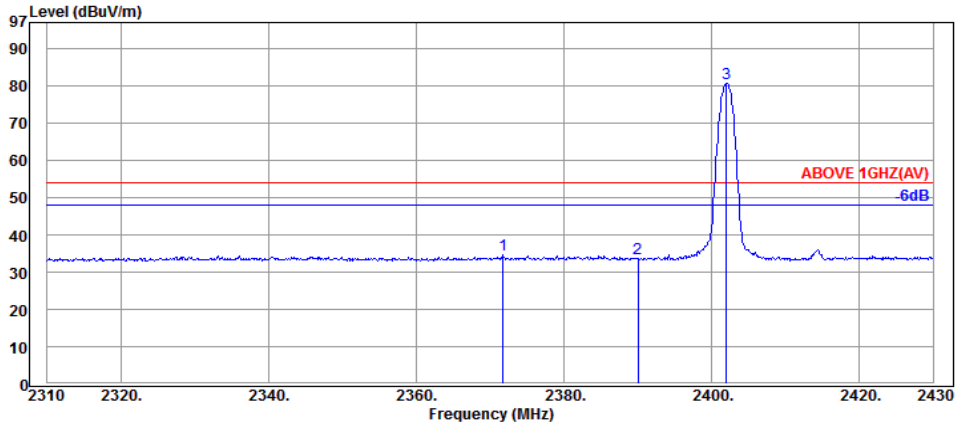
Mode	BLE	Frequency	TX 2402MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2349.24	32.08	5.68	7.84	45.60	74.00	28.40	Peak
2390.04	32.16	5.72	5.52	43.40	74.00	30.60	Peak
2402.16	32.16	5.72	43.27	81.15	---	---	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2371.80	32.13	5.71	-3.31	34.53	54.00	19.47	Average
2390.04	32.16	5.72	-4.31	33.57	54.00	20.43	Average
2402.04	32.16	5.72	42.72	80.60	---	---	Average

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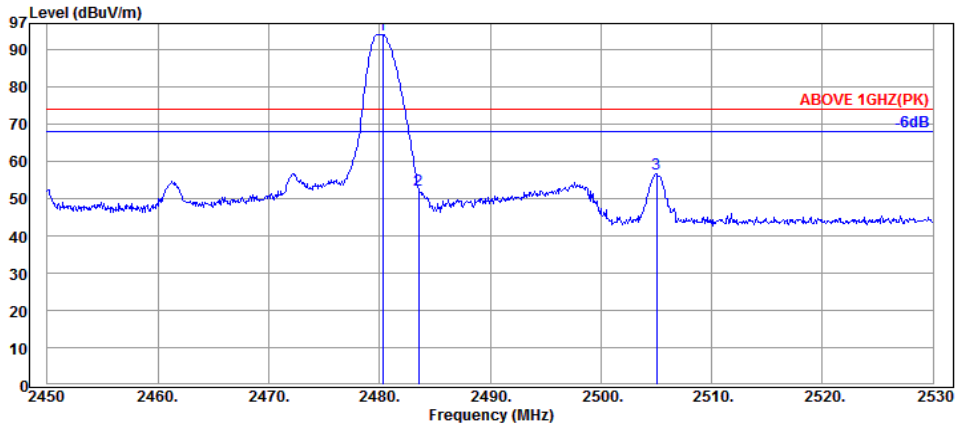
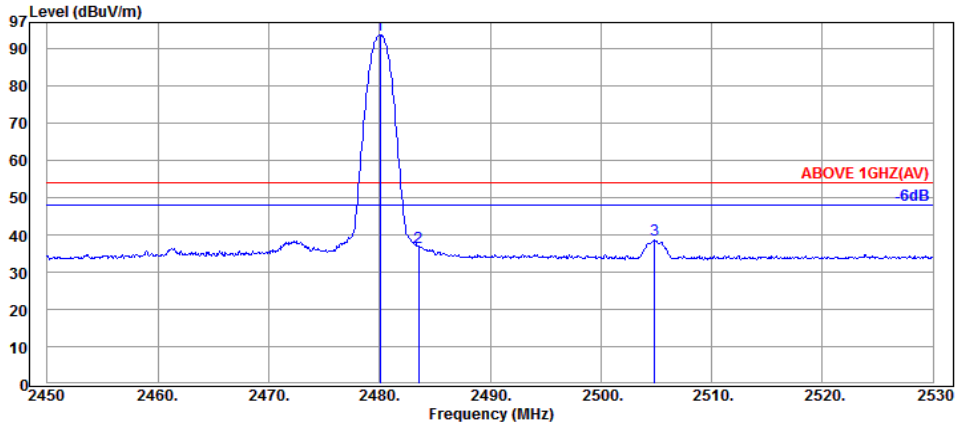
Mode	BLE	Frequency	TX 2480MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.32	32.28	5.82	55.94	94.04	---	---	Peak
2483.52	32.28	5.82	14.34	52.44	74.00	21.56	Peak
2505.04	32.32	5.87	18.64	56.83	74.00	17.17	Peak



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.08	32.28	5.82	55.58	93.68	---	---	Average
2483.52	32.28	5.82	-1.37	36.73	54.00	17.27	Average
2504.88	32.32	5.87	0.48	38.67	54.00	15.33	Average

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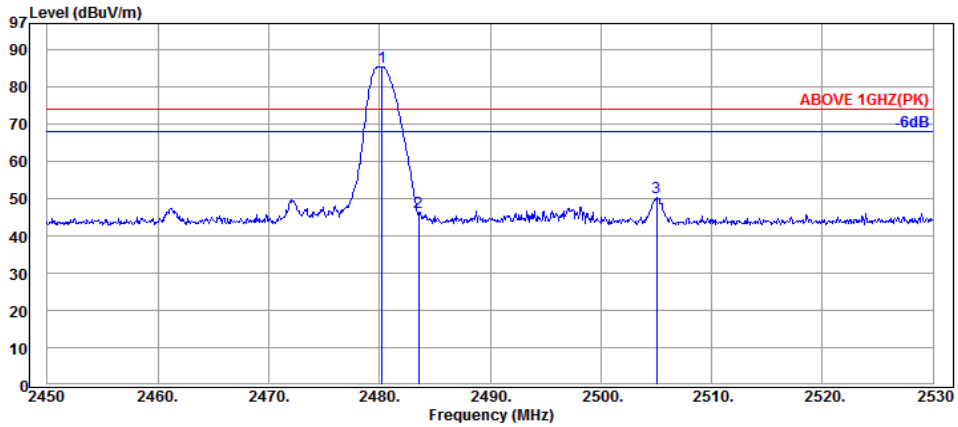
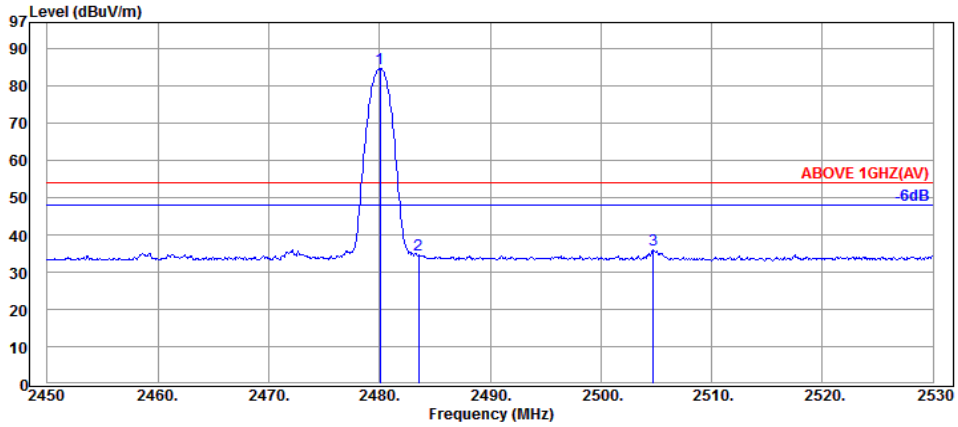
Mode	BLE	Frequency	TX 2480MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.24	32.28	5.82	47.27	85.37	---	---	Peak
2483.52	32.28	5.82	8.38	46.48	74.00	27.52	Peak
2505.04	32.32	5.87	12.02	50.21	74.00	23.79	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.08	32.28	5.82	46.50	84.60	---	---	Average
2483.52	32.28	5.82	-3.59	34.51	54.00	19.49	Average
2504.72	32.32	5.87	-2.07	36.12	54.00	17.88	Average

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6.5.2. Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Mode	BLE	Frequency	TX 2402MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4805.00	34.22	7.86	7.06	49.14	54.00	4.86	Peak
7205.00	35.80	9.22	-1.65	43.37	54.00	10.63	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4805.00	34.22	7.86	3.95	46.03	54.00	7.97	Peak
7205.00	35.80	9.22	-0.51	44.51	54.00	9.49	Peak

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Mode	BLE	Frequency	TX 2440MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4880.00	34.25	8.35	5.42	48.02	54.00	5.98	Peak
7320.00	35.80	9.89	-2.76	42.93	54.00	11.07	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4880.00	34.25	8.35	0.11	42.71	54.00	11.29	Peak
7320.00	35.80	9.89	-1.95	43.74	54.00	10.26	Peak

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Mode	BLE	Frequency	TX 2480MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4960.00	34.29	9.40	3.66	47.35	54.00	6.65	Peak
7440.00	35.80	12.56	-2.47	45.89	54.00	8.11	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4960.00	34.29	9.40	1.00	44.69	54.00	9.31	Peak
7440.00	35.80	12.56	-1.89	46.47	54.00	7.53	Peak

6.5.3. Emissions in Non-restricted Frequency Bands

Pursuant to KDB 558074 D01 DTS Meas Guidance v03r05 that emission levels below the 15.209 general radiated emissions limits is not required.

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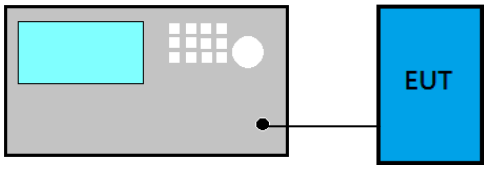
7. 6dB BANDWIDTH MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Specification Limits

The minimum 6dB bandwidth shall be at least 500kHz.

7.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v03r05:

■ Option 2

(1) Set RBW = 100 kHz.
(2) Set the video bandwidth (VBW) ≥ 3 × RBW.
(3) Detector = Peak.
(4) Trace mode = max hold.
(5) Sweep = auto couple.
(6) Allow the trace to stabilize.
(7) Setting channel bandwidth function x dB to -6 dB to record the final bandwidth.

7.4. Test Results

Test Date	2016/10/14	Temp./Hum.	25℃/51%
Cable Loss	2dB	Test Voltage	DC 3V (Via Test Jig)

7.4.1. 6dB Bandwidth Result

Mode	Centre Frequency (MHz)	6 dB Bandwidth (MHz)
BLE	2402	0.6535
	2440	0.6656
	2480	0.6645

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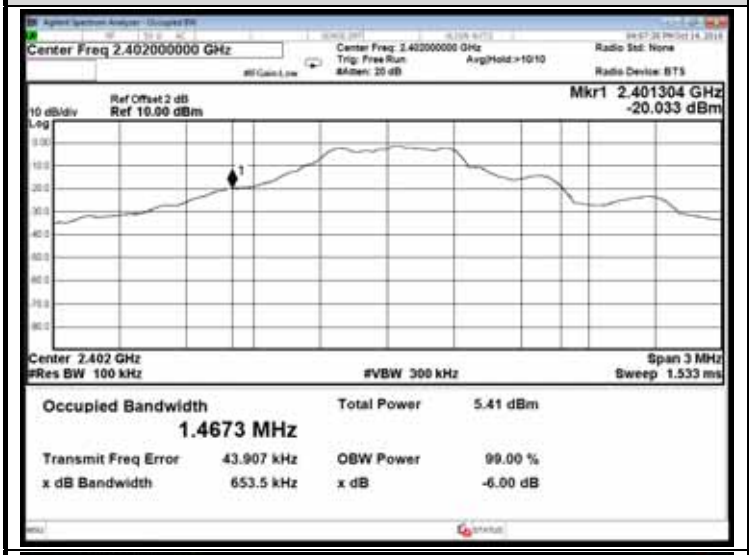
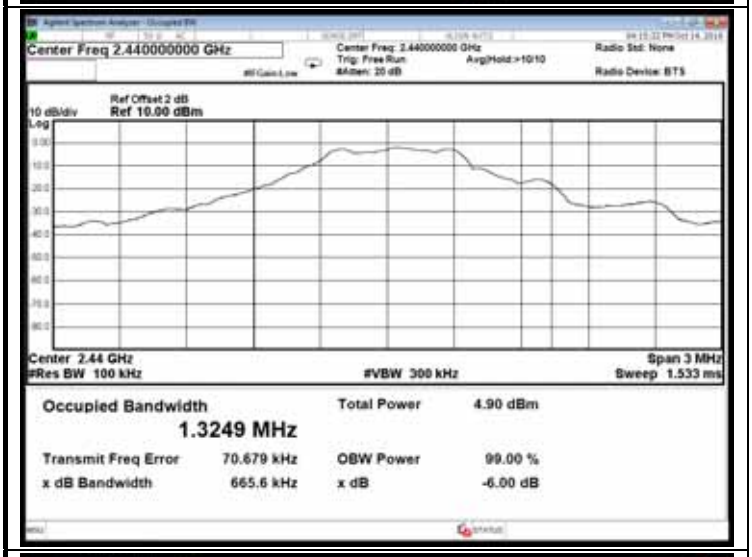
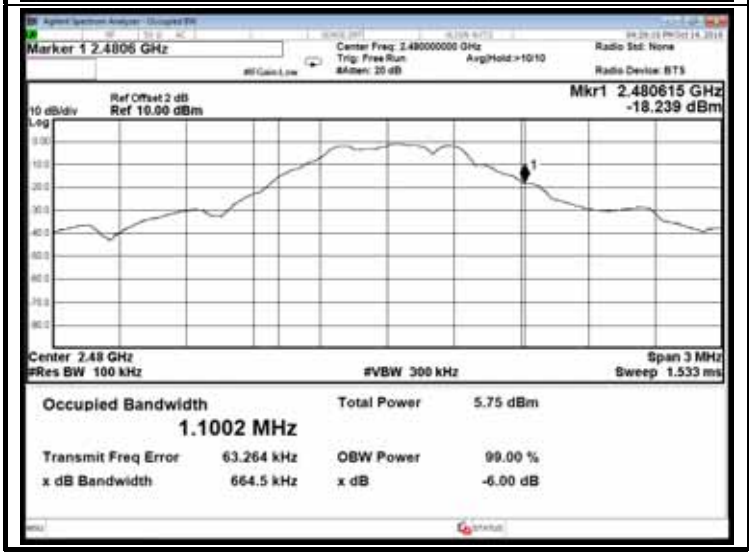
7.4.2. Measurement Plots

BLE







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8. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

8.1. Block Diagram of Test Setup

8.2. Specification Limits

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5MHz is : 1Watt. (30dBm)

8.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v03r05:

■**PKPM1 Peak power meter method:**

EUT is connected to power sensor and record the maximum output power.

□**Method AVGPM (Measurement using an RF average power meter):**

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.5.1 is < 98%.

□**RBW≥DTS bandwidth**

(1) Set span to at least 3 times the OBW
(2) Set RBW ≥ OBW
(3) Set the video bandwidth (VBW) ≥ 3 × RBW.
(4) Detector = Peak
(5) Trace mode = max hold
(6) Sweep = auto couple.
(7) To find the peak amplitude level.

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8.4. Test Results

Test Date	2016/10/14	Temp./Hum.	25℃/51%
Cable Loss	2dB	Test Voltage	DC 3V (Via Test Jig)

8.4.1. Peak Output Power

Mode	Centre Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(W)	
BLE	2402	-1.488	0.000710	< 30 dBm (1 W)
	2440	-2.008	0.000630	
	2480	-0.970	0.000800	

Note: The results have been included cable loss.

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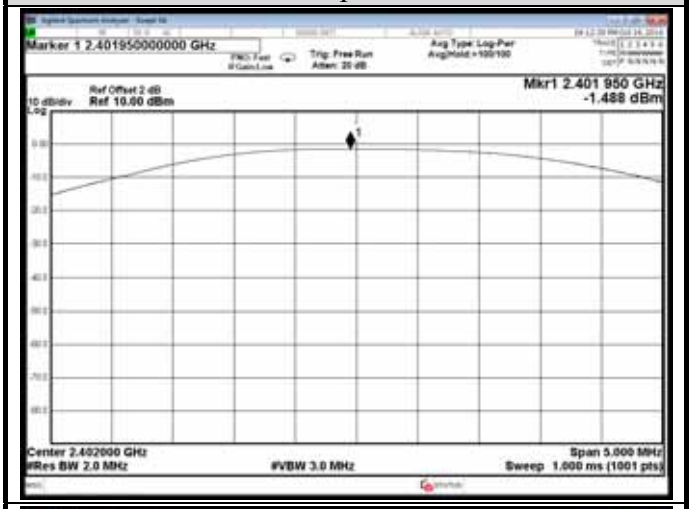
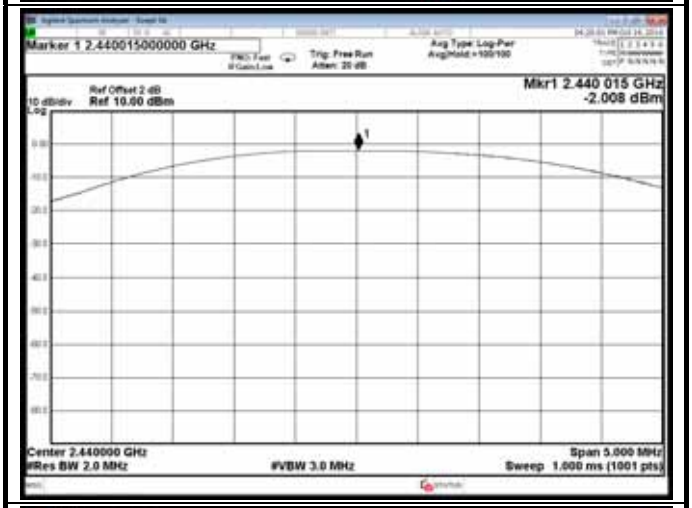
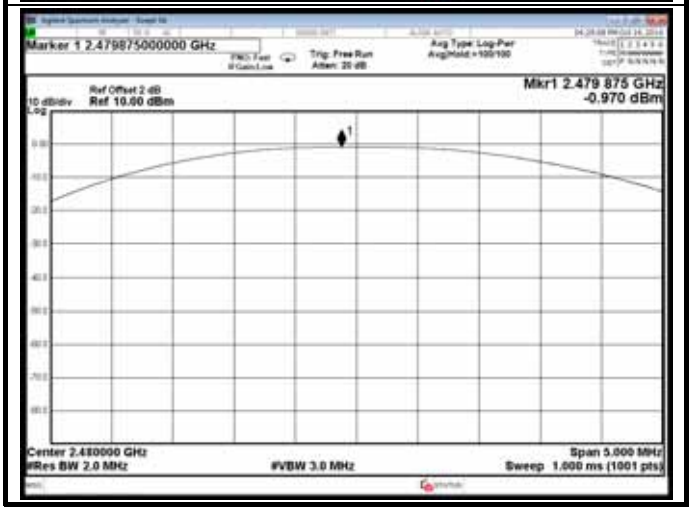
8.4.2. Peak Measurement Plots

ZigBee
Peak Output Power




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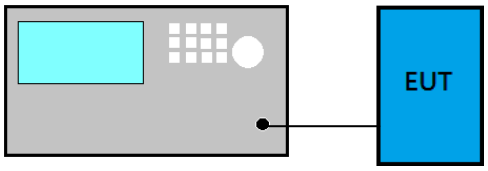
9. EMISSION LIMITATIONS MEASUREMENT

9.1. Block Diagram of Test Setup



9.2. Specification Limits

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).

9.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v03r05:

■Reference Level

(1) Set analyzer center frequency to DTS channel center frequency.
(2) Set the span to 1.5 times the DTS bandwidth.
(3) Set the RBW to: 100 kHz.
(4) Set the VBW ≥ 3 × RBW.
(5) Detector = peak.
(6) Sweep time = auto couple.
(7) Trace mode = max hold.
(8) Allow trace to fully stabilize to find the max PSD as reference level.

■Emission Level Measurement

(1) Set analyzer center frequency to DTS channel center frequency.
(2) Set the span to 1.5 times the DTS bandwidth.
(3) Set the RBW to: 100 kHz.
(4) Set the VBW ≥ 3 × RBW.
(5) Detector = peak.
(6) Sweep time = auto couple.
(7) Trace mode = max hold.
(8) Allow trace to fully stabilize to find the max level.

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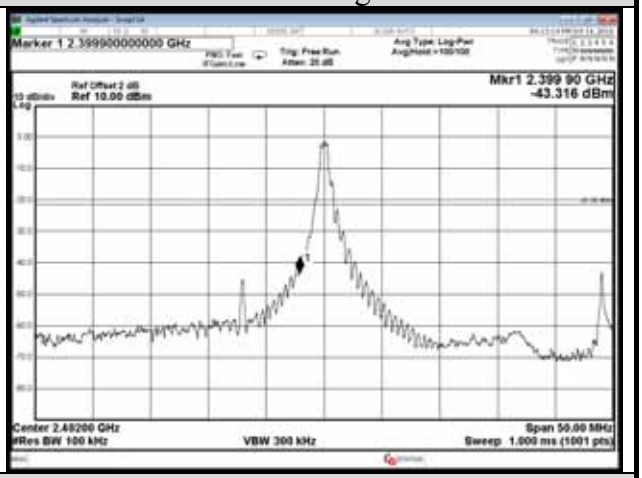
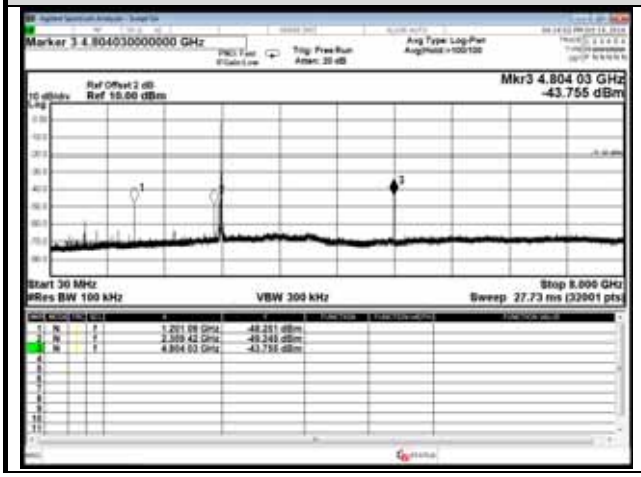
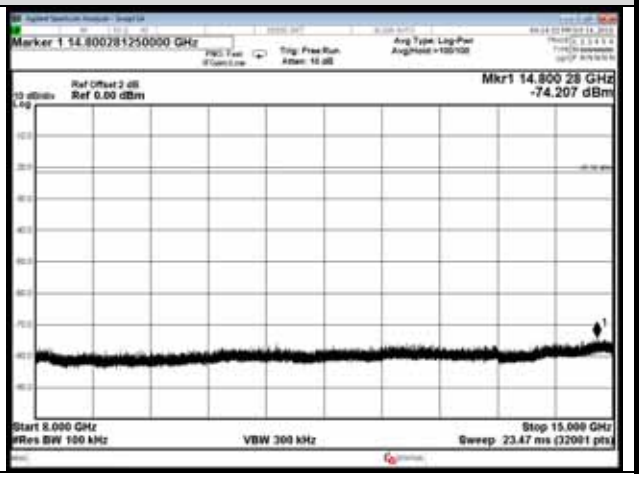
9.4. Test Results

Test Date	2016/10/14	Temp./Hum.	25℃/51%
Mode	BLE	Frequency	TX 2402MHz
Cable Loss	2dB	Test Voltage	DC 3V (Via Test Jig)

Reference Level	Band Edge
	
30MHz – 8GHz	**8GHz – 15GHz**
	

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15GHz – 25GHz

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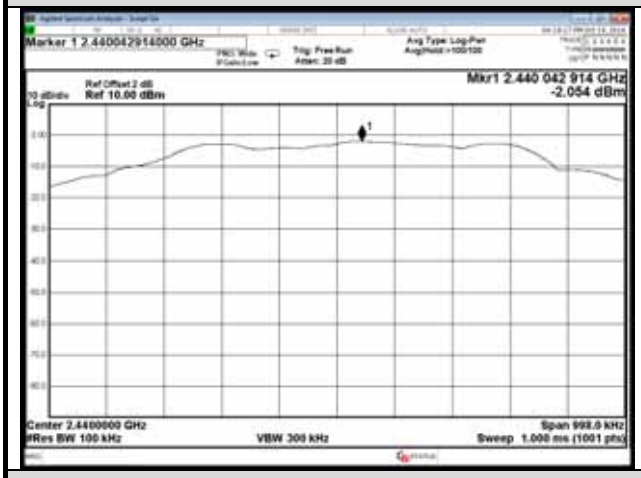
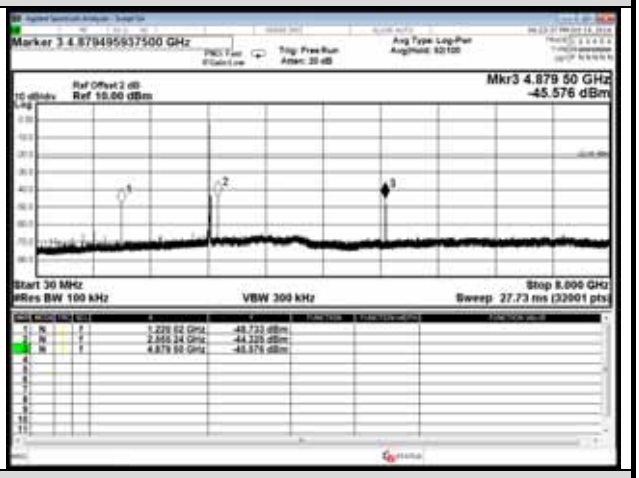
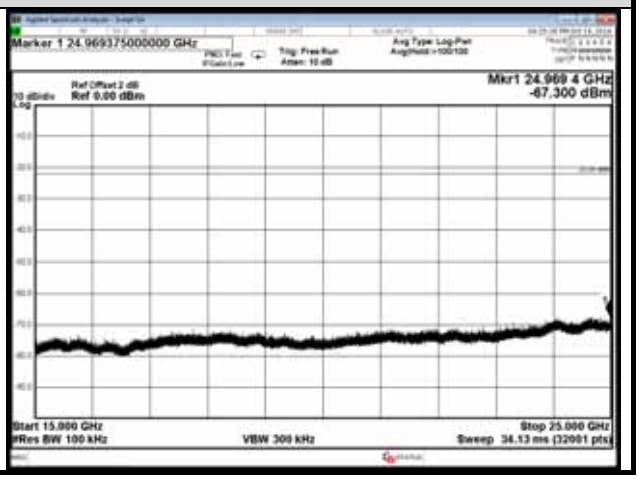
Test Date	2016/10/14	Temp./Hum.	25℃/51%
Mode	BLE	Frequency	TX 2440MHz
Cable Loss	2dB	Test Voltage	DC 3V (Via Test Jig)

Reference Level	30MHz – 8GHz
	
8GHz – 15GHz	**15GHz – 25GHz**
	

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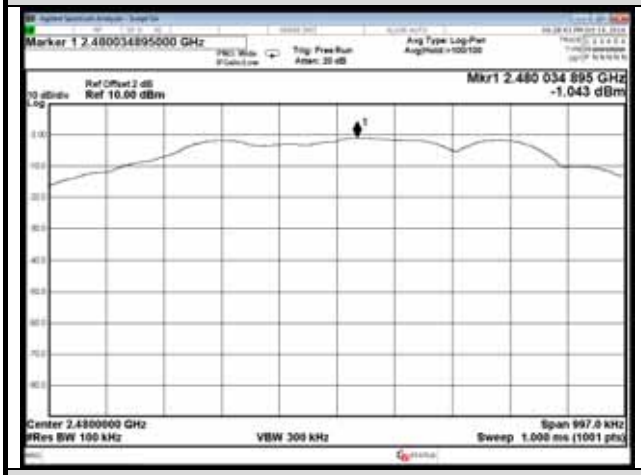
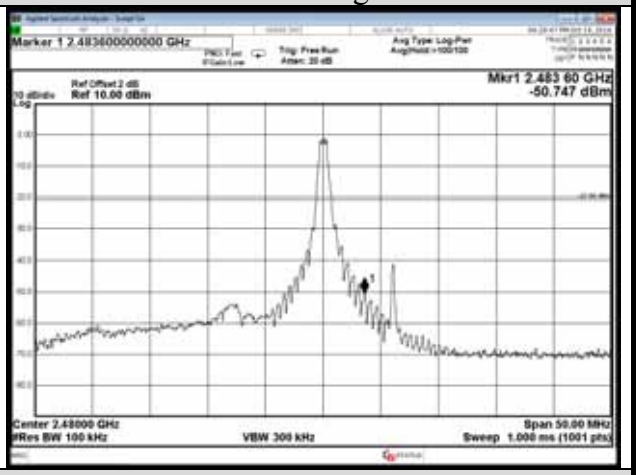
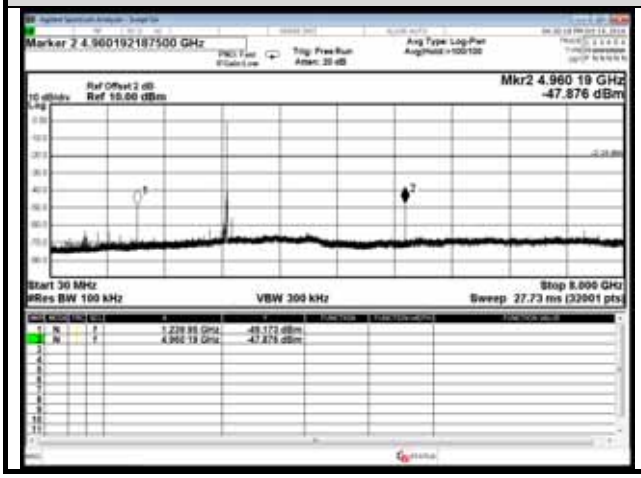
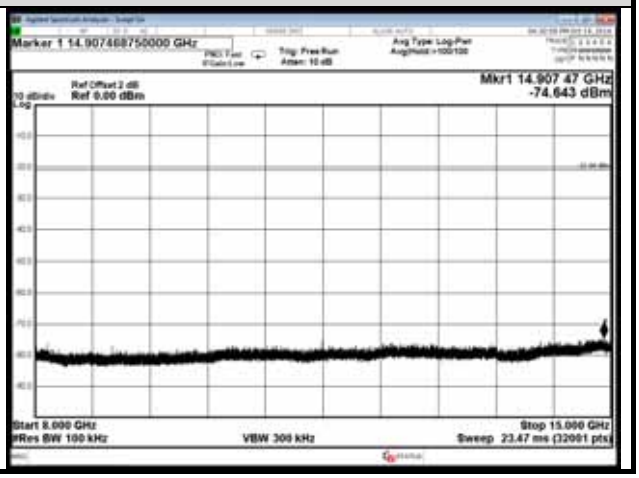
Test Date	2016/10/14	Temp./Hum.	25℃/51%
Mode	BLE	Frequency	TX 2480MHz
Cable Loss	2dB	Test Voltage	DC 3V (Via Test Jig)

Reference Level	Band Edge
	
30MHz – 8GHz	**8GHz – 15GHz**
	

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15GHz – 25GHz

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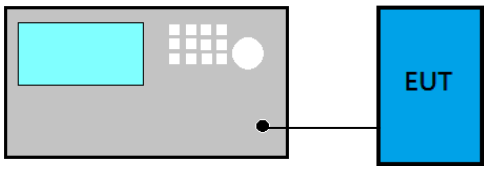
10. POWER SPECTRAL DENSITY

10.1. Block Diagram of Test Setup



10.2. Specification Limits

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

10.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v03r05:

■Method PKPSD (peak PSD)

(1) Set analyzer center frequency to DTS channel center frequency.
(2) Set the span to 1.5 times the DTS bandwidth.
(3) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
(4) Set the VBW ≥ 3 × RBW.
(5) Detector = peak.
(6) Sweep time = auto couple.
(7) Trace mode = max hold.
(8) Allow trace to fully stabilize.
(9) Use the peak marker function to determine the maximum amplitude level.
(10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

□Method AVGPSD-2

(1) Using peak PSD procedure step 1 to step 4.
(2) Detector= RMS detector
(3) Sweep time = auto couple
(4) Trace mode = trace averaging over a minimum of 100 traces
(5) Use the peak marker function to determine the maximum amplitude level.
(6) Duty cycle factor is added when duty cycle presented in section 3.5.1. < 98%.
(7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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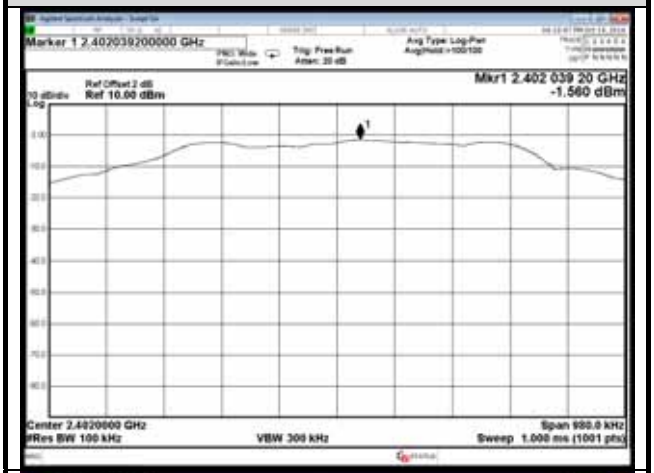
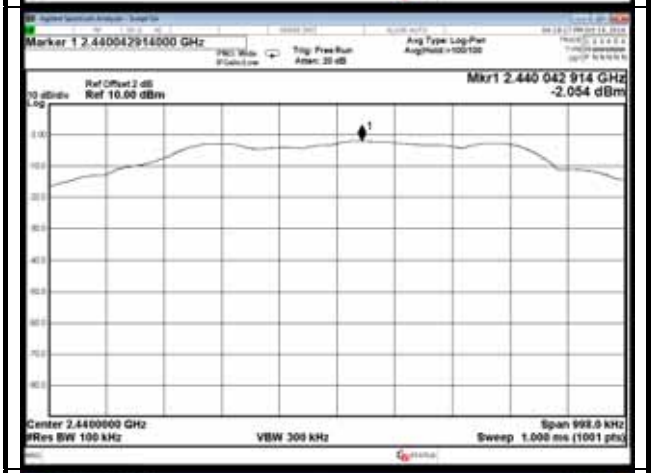
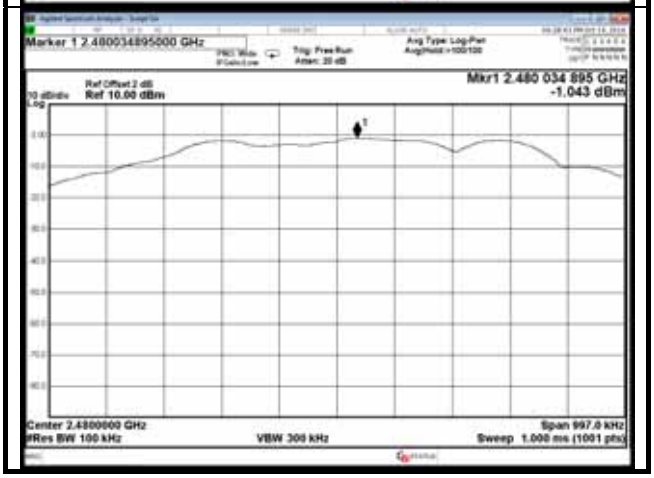
10.4. Test Results

Test Date	2016/10/14	Temp./Hum.	25℃/51%
Cable Loss	2dB	Test Voltage	DC 3V (Via Test Jig)

BLE







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11. DEVIATION TO TEST SPECIFICATIONS

【NONE】