

**FCC 15.249
2.4 GHz Report**

for

INVENTEC BESTA CO.,LTD

**10FL.,No.36,Lane513,Rui Guang Road,Nei Hu Dist., Taipei
114,Taiwan,R.O.C**

**Product Name : Ancall Smart Tracker
Model Name : AC-GS11
FCC ID : U6OACGS11**

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



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TEST REPORT CERTIFICATION

Applicant : INVENTEC BESTA CO.,LTD
Product Name : Ancall Smart Tracker
Model No. : AC-GS11
Serial No. : N/A
Power Supply : DC 3V (via Battery)

Rules of Compliance and Measurement Standards:

FCC CFR 47 Part 15 Subpart C:2015

ANSI C63.10:2013

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. 11. 22 ~ 23

Date of Report: 2016. 11. 28

Producer: Eva Chen
(Eva Chen/Assistant Administrator)

Signatory: Ben Cheng
(Ben Cheng/Manager)

1. REPORT HISTORY

Revision	Date	Revision Summary	Report Number
0	2016. 11. 28	Original Report.	EM-F160789

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	N/A, Note
15.205/ 15.209/ 15.249(a)	Radiated Band Edge and Radiated Spurious Emission Fundamental Frequency	PASS
----	Occupied Bandwidth 99% Power	Reference only
15.203	Antenna Requirement	PASS
Note: The EUT only employs battery power for operation, so it is unnecessary to test.		

3. GENERAL INFORMATION

3.1. Description of EUT

Product	Ancall Smart Tracker
Model Number	AC-GS11
Serial Number	N/A
Applicant	INVENTEC BESTA CO.,LTD 10FL.,No.36,Lane513,Rui Guang Road,Nei Hu Dist., Taipei 114,Taiwan,R.O.C
RF Features	Bluetooth Low Energy (BLE)
Transmit Type	1T1R
Date of Receipt of Sample	2016. 11. 02

3.2. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (Mbps)
BLE	2402-2480	40	GFSK	0.3

Channel List			
BLE			
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)
---	---	PCB Antenna	2.4GHz	-1.24

3.4. Test Configuration

Mode	Duty Cycle (x)	T (ms)	Duty Cycle Factor (dB)
BLE	0.67	N/A	N/A

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

Item		Mode	Data Rate	Test Channel
Radiated Test Case	Radiated Band Edge ^{Note1}	BLE	1Mbps	37/39
	Radiated Spurious Emission (30MHz-1GHz) ^{Note1}	BLE	1Mbps	37
	Radiated Spurious Emission (Above 1GHz) ^{Note1}	BLE	1Mbps	37/17/39
	Fundamental Frequency	BLE	1Mbps	37/17/39
	Occupied Bandwidth 99% Power	BLE	1Mbps	37/17/39

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.

3.5. Setup Configuration



3.6. Operating Condition of EUT

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

3.7. 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 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

3.8. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark : Uncertainty = $k_{uc}(y)$

Test Item	Uncertainty
Occupied Bandwidth 99% Power	± 1kHz

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	7NSL10-244 1.5E130.5-00	1	2016. 07. 27	1 Year
5.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.1.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2016. 04. 20	1 Year

5. CONDUCTED EMISSION MEASUREMENT

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

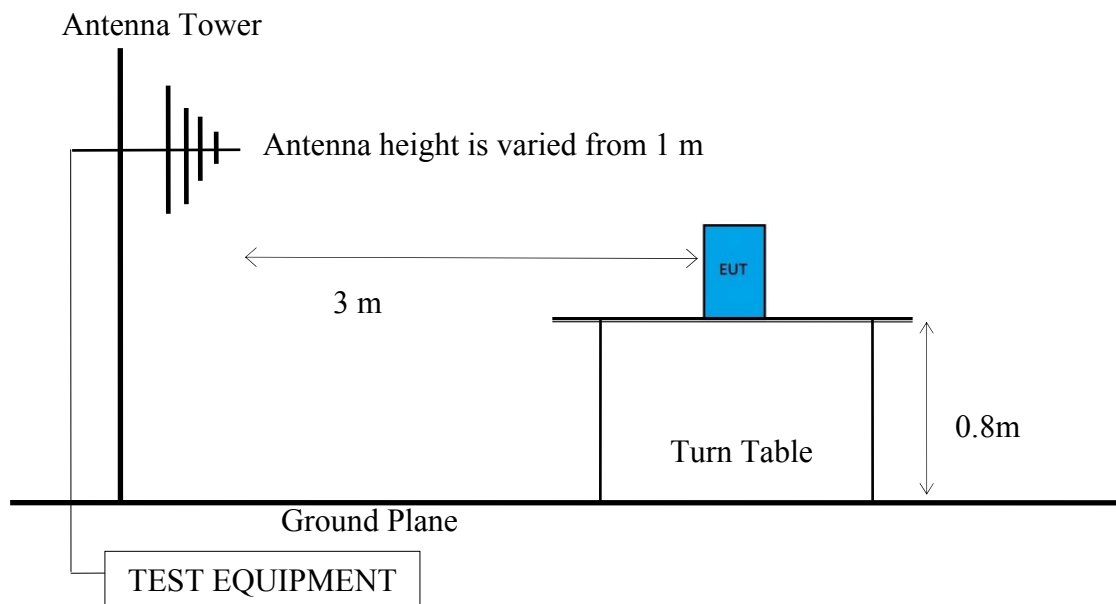
6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup

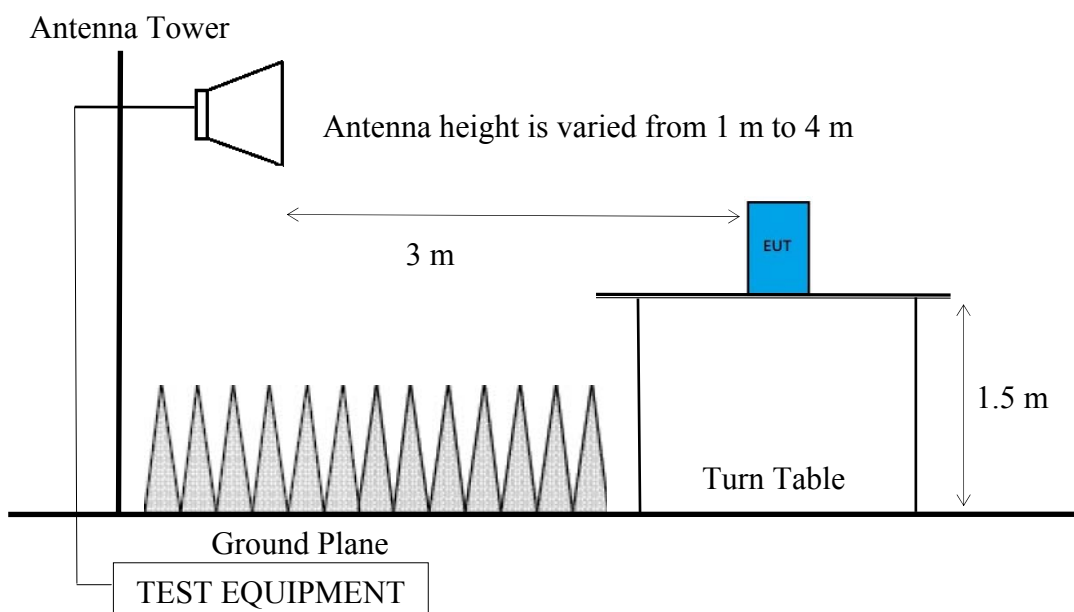
6.1.1. Block Diagram of EUT

Indicated as section 3.6

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



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



6.2. Radiated Emission Limits

6.2.1. General Limit

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with section 6.2.2. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Distance (m)	Field Strengths Limits	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (Average)	

Remark : (1) $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$

- (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.

6.2.2. Limite for Fundamental & Harmonics Frequency

Fundamental Frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	$\text{dB}\mu\text{V/m}$	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
902-928MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
2400-2483.5MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
5725-5875MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
24.0-24.25GHz	250	128 (Peak)	2500	88 (Peak)
		108 (Average)		68 (Average)

Remark: $\text{mV/m} = 1000 \mu\text{V/m}$; $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$

6.3. Test Procedure

The EUT setup on the turn table which has 1.5 m 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 $\geq 3 \times$ 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.

Frequency above 1GHz to 10th harmonic:

Peak Detector:

- (1) RBW = 1MHz
- (2) VBW $\geq 3 \times$ 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 Measurement:

☒ **Option 1:**

- (1) RBW = 1 MHz
- (2) VBW = 1/T or 10Hz when duty cycle >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) = $20\log(TX_{on}/TX_{on+off})$ presented in section 3.4

6.5. Test Results

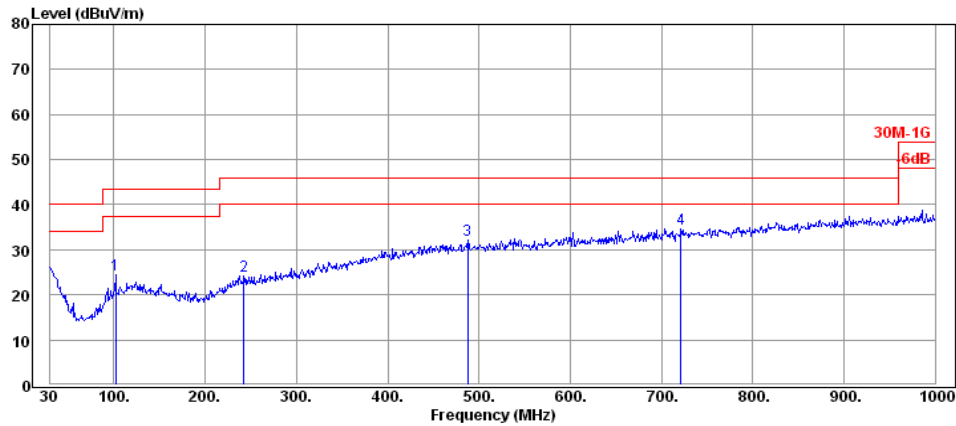
PASSED.

Test Date	2016/11/22	Temp./Hum.	23°C/53%
Test Voltage	DC 3V (via Battery)		

6.5.1. Emissions within Restricted Frequency Bands

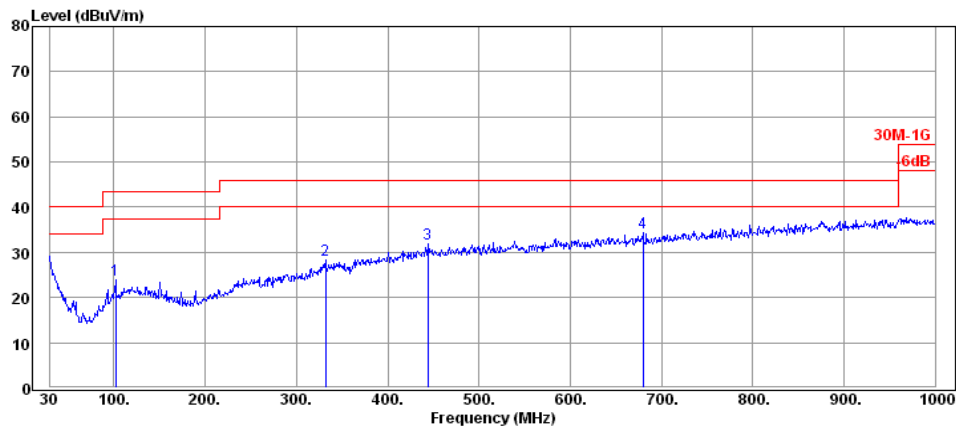
6.5.1.1. Frequency Below 1 GHz

Mode	BLE	Frequency	TX 2402MHz
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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	17.38	2.29	4.81	24.48	43.50	19.02	Peak
242.43	18.47	3.74	2.03	24.24	46.00	21.76	Peak
487.84	23.64	6.32	2.10	32.06	46.00	13.94	Peak
721.61	25.87	7.20	1.51	34.58	46.00	11.42	Peak



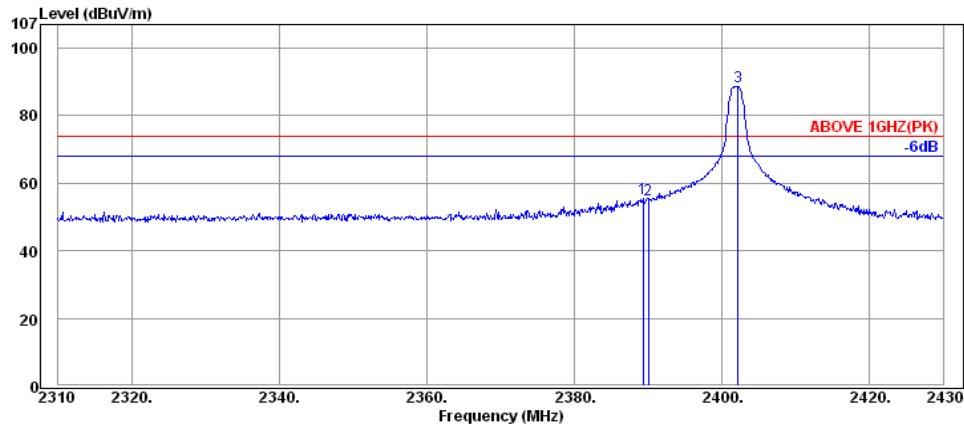
Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
101.78	17.38	2.29	4.32	23.99	43.50	19.51	Peak
331.67	20.80	4.74	2.87	28.41	46.00	17.59	Peak
444.19	23.23	5.97	2.61	31.81	46.00	14.19	Peak
679.90	25.50	7.02	1.81	34.33	46.00	11.67	Peak

6.5.1.2. Frequency Above 1 GHz to 10th harmonics

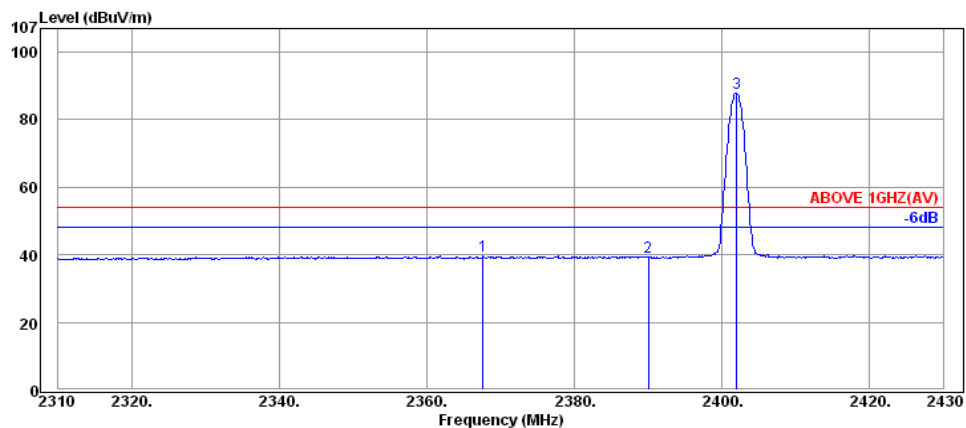
Band Edge:

Mode	BLE	Frequency	TX 2402MHz
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Antenna at Horizontal Polarization

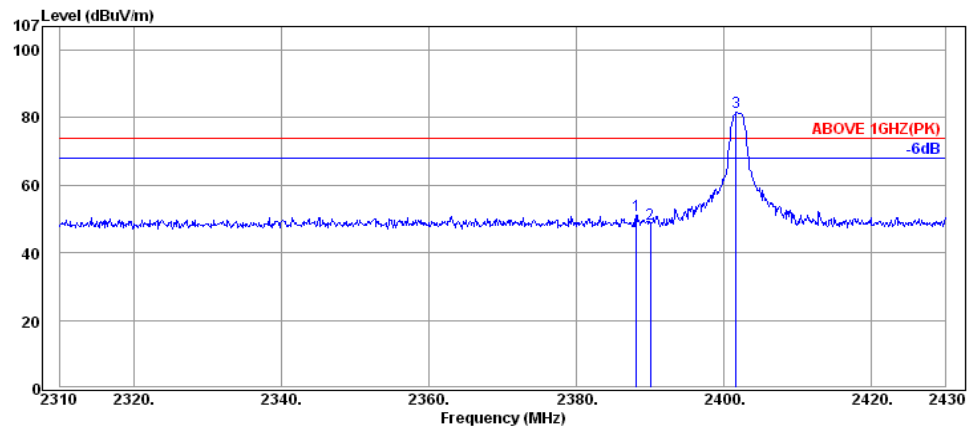
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.32	32.16	5.72	17.59	55.47	74.00	18.53	Peak
2390.04	32.16	5.72	17.27	55.15	74.00	18.85	Peak
2402.16	32.16	5.72	50.60	88.48	---	---	Peak



Antenna at Horizontal Polarization

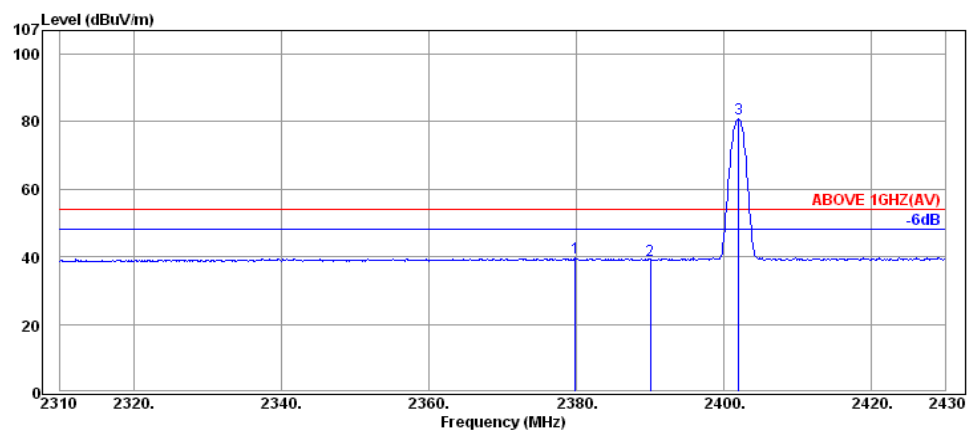
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2367.60	32.11	5.69	1.82	39.62	54.00	14.38	Average
2390.04	32.16	5.72	1.31	39.19	54.00	14.81	Average
2402.04	32.16	5.72	50.00	87.88	---	---	Average

Mode	BLE	Frequency	TX 2402MHz
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Antenna at Vertical Polarization

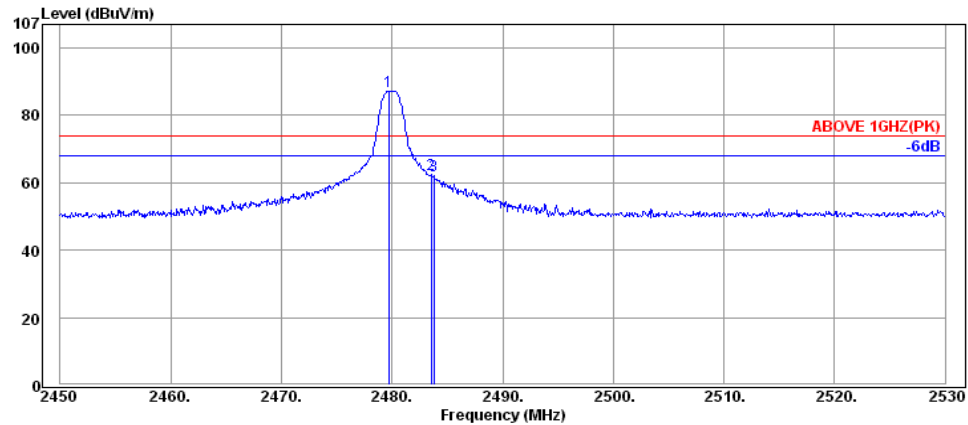
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2388.12	32.16	5.72	13.10	50.98	74.00	23.02	Peak
2390.04	32.16	5.72	10.73	48.61	74.00	25.39	Peak
2401.68	32.16	5.72	43.62	81.50	---	---	Peak



Antenna at Vertical Polarization

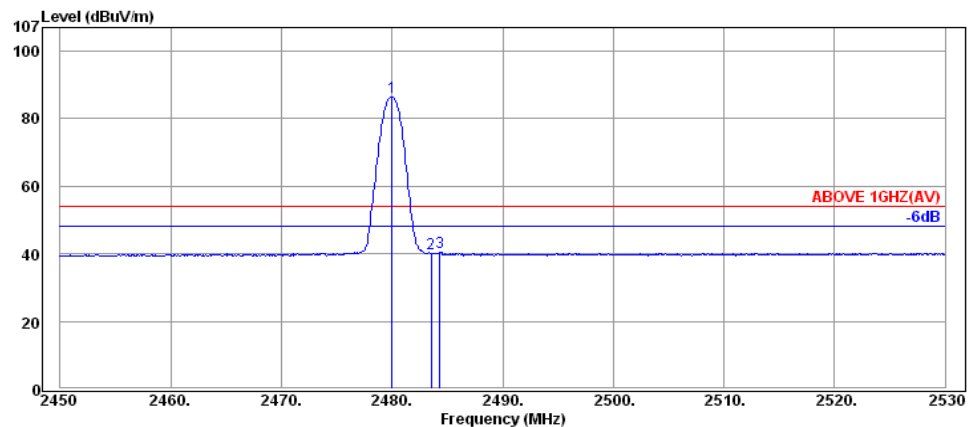
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2379.84	32.13	5.71	1.77	39.61	54.00	14.39	Average
2390.04	32.16	5.72	1.10	38.98	54.00	15.02	Average
2402.04	32.16	5.72	42.97	80.85	---	---	Average

Mode	BLE	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

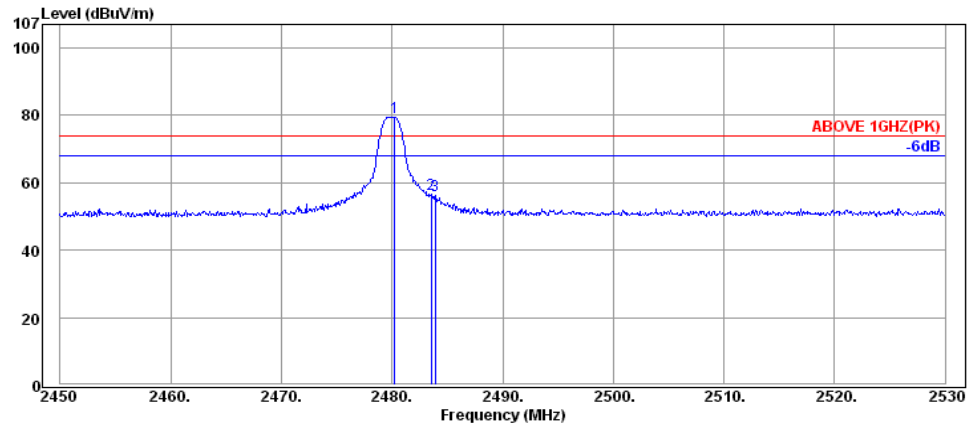
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2479.68	32.28	5.82	49.03	87.13	---	---	Peak
2483.52	32.28	5.82	24.30	62.40	74.00	11.60	Peak
2483.76	32.28	5.82	23.88	61.98	74.00	12.02	Peak



Antenna at Horizontal Polarization

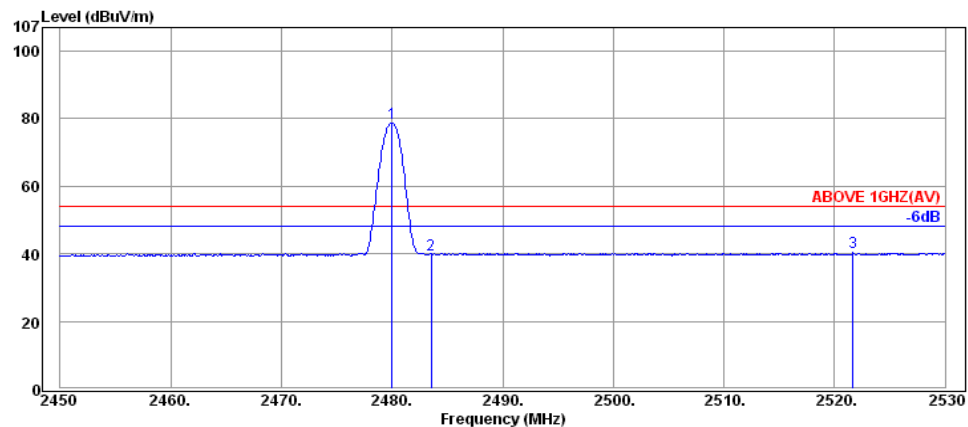
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2480.00	32.28	5.82	48.44	86.54	---	---	Average
2483.52	32.28	5.82	1.93	40.03	54.00	13.97	Average
2484.32	32.28	5.82	2.42	40.52	54.00	13.48	Average

Mode	BLE	Frequency	TX 2480MHz
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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	41.34	79.44	---	---	Peak
2483.52	32.28	5.82	18.36	56.46	74.00	17.54	Peak
2483.92	32.28	5.82	18.04	56.14	74.00	17.86	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
2480.00	32.28	5.82	40.64	78.74	---	---	Average
2483.52	32.28	5.82	1.78	39.88	54.00	14.12	Average
2521.68	32.34	5.89	2.06	40.29	54.00	13.71	Average

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
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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	5.08	47.16	54.00	6.84	Peak
7205.00	35.80	9.22	0.89	45.91	54.00	8.09	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	3.12	45.20	54.00	8.80	Peak
7205.00	35.80	9.22	-1.54	43.48	54.00	10.52	Peak

Mode	BLE	Frequency	TX 2440MHz
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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	4.55	47.15	54.00	6.85	Peak
7320.00	35.80	9.89	-2.23	43.46	54.00	10.54	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	3.10	45.70	54.00	8.30	Peak
7320.00	35.80	9.89	-2.47	43.22	54.00	10.78	Peak

Mode	BLE	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

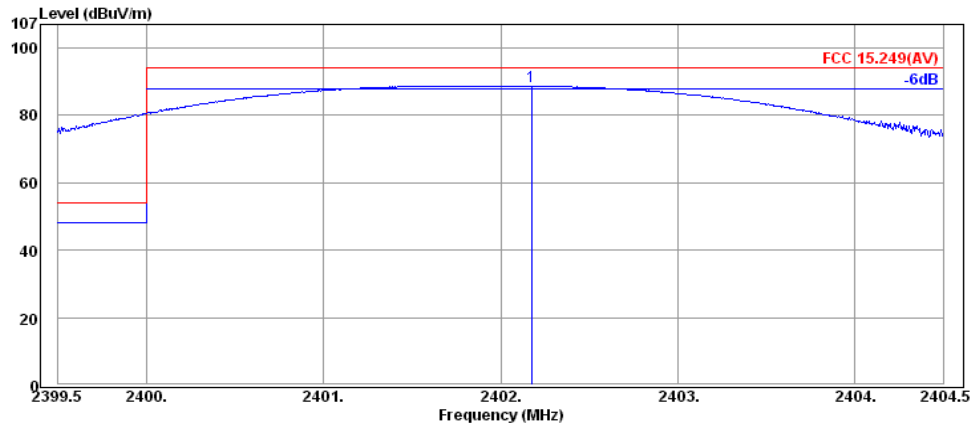
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4960.00	34.29	8.68	4.49	47.46	54.00	6.54	Peak
7440.00	35.80	10.40	-2.14	44.06	54.00	9.94	Peak

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	8.68	0.14	43.11	54.00	10.89	Peak
7440.00	35.80	10.40	-2.60	43.60	54.00	10.40	Peak

6.5.3. Fundamental Frequency:

Mode	BLE	Frequency	TX 2402MHz
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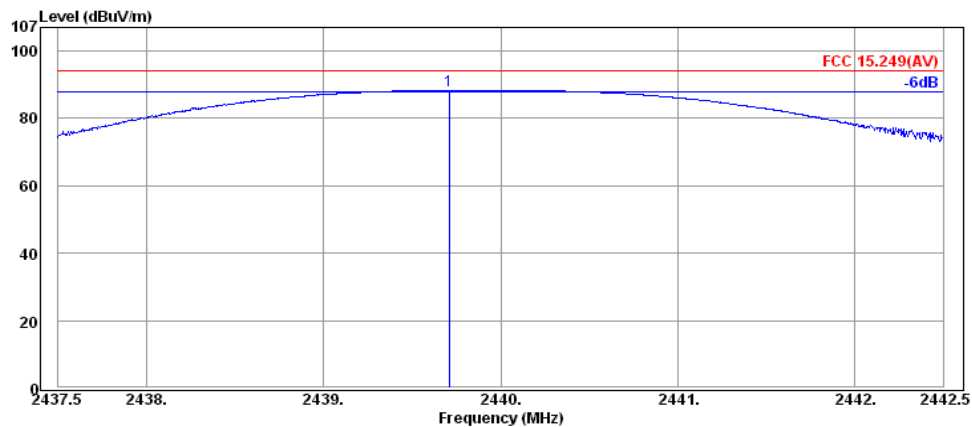


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2402.18	32.16	5.72	50.80	88.68	94.00	5.32	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

Mode	BLE	Frequency	TX 2440MHz
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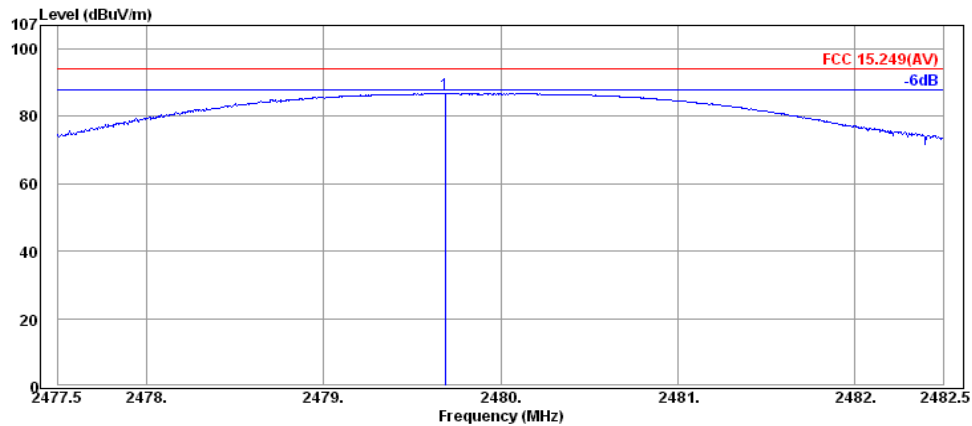


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2439.71	32.23	5.78	50.27	88.28	94.00	5.72	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

Mode	BLE	Frequency	TX 2480MHz
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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
2479.69	32.28	5.82	48.59	86.69	94.00	7.31	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with limit, so vertical won't be listed in test report.

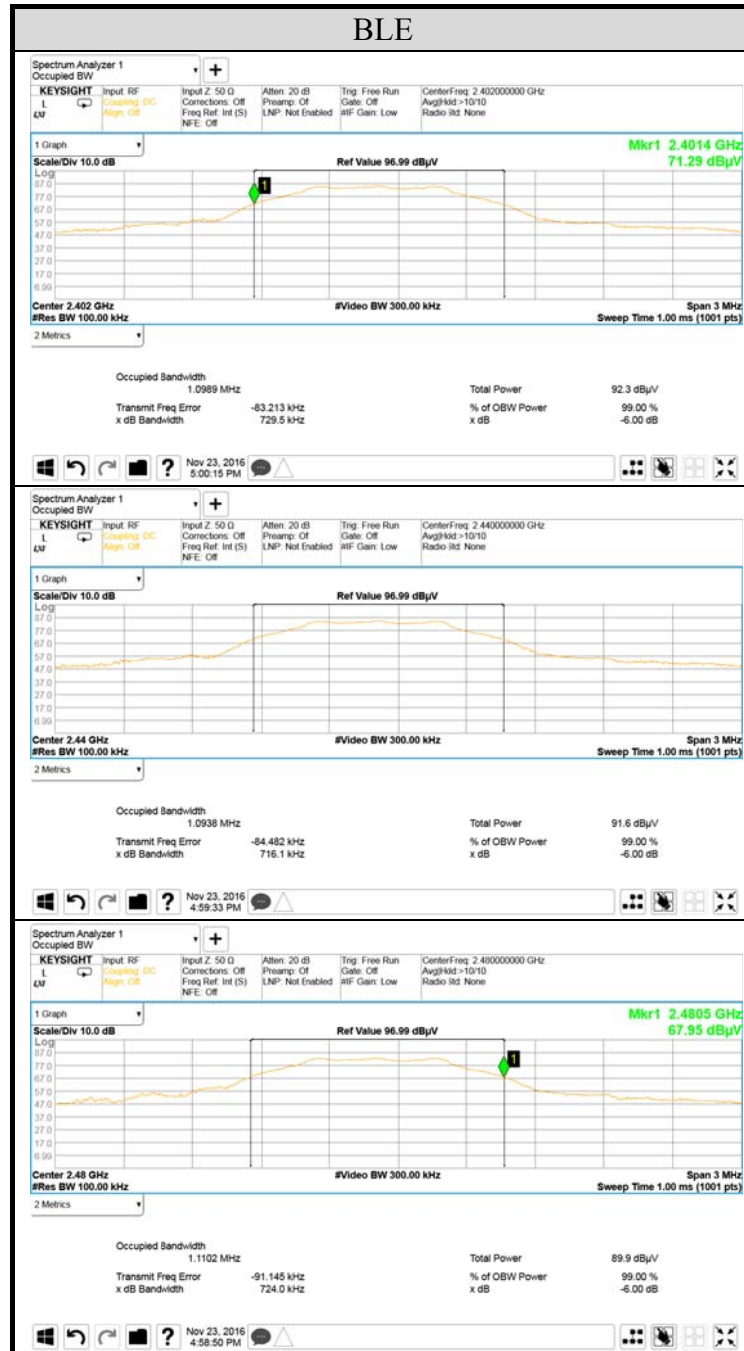
7. OCCUPIED BANDWIDTH 99% POWER MEASUREMENT

Test Date	2016/11/23	Temp./Hum.	23°C/52%
Cable Loss	---	Test Voltage	DC 3V (via Battery)

7.1.1. Occupied Bandwidth 99% Power Result

Modulation Type	Centre Frequency (MHz)	Occupied Bandwidth 99% Power (MHz)
BLE	2402	1.0989
	2440	1.0938
	2480	1.1102

7.1.2. Measurement Plots



8. DEVIATION TO TEST SPECIFICATIONS

【NONE】