Prüfbericht-Nr.: *Test Report No.:*	**50046619 001**	**Auftrags-Nr.:** *Order No.:*	**154169393**	**Seite 1 von 27** *Page 1 of 27*
Kunden-Referenz-Nr.: *Client Reference No.:*	**52158935**	**Auftragsdatum:** *Order date:*	**2016.05.23**	

Auftraggeber: *Client:*	**GENERAL TOOLS & INSTRUMENTS COMPANY LLC** 75 Seaview Drive Secaucus New Jersey United States 07094
Prüfgegenstand: *Test item:*	**ToolSmart Infrared Thermometer**
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	**TS05** **FCC ID: YRKTS05**
Auftrags-Inhalt: *Order content:*	**Complete test**
Prüfgrundlage: *Test specification:*	**FCC CFR47 Part 15, Subpart C Section 15.247** **ANSI C63.10: 2013** **KDB 558074 D01 DTS Meas Guidance v03r05**
Wareneingangsdatum: *Date of receipt:*	**2016.05.13**
Prüfmuster-Nr.: *Test sample No.:*	**A000359887-001**
Prüfzeitraum: *Testing period:*	**2016.05.24 to 2016.05.27**
Ort der Prüfung: *Place of testing:*	**MRT Technology(Suzhou) Co., Ltd.**
Prüflaboratorium: *Testing laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.**
Prüfergebnis*: *Test result*:*	**Pass**

geprüft von / *tested by*:			**kontrolliert von** / *reviewed by*:		
2016.06.16	Elliot Zhang / Senior Project Engineer	Elliot Zhang	2016.06.16	Shi Li / Section Manager	SL
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 PEAK OUTPUT POWER
RESULT: Pass

5.1.3 6DB BANDWIDTH
RESULT: Pass

5.1.4 CONDUCTED SPURIOUS EMISSIONS
RESULT: Pass

5.1.5 POWER SPECTRAL DENSITY
RESULT: Pass

5.1.6 RADIATED SPURIOUS EMISSION
RESULT: Pass

Contents

1. General Remarks

1.1 Complementary Materials

Null.

2. Test Sites

2.1 Test Facilities

MRT Technology (Suzhou) Co., Ltd.

D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The Federal Communications Commission has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance with the requirements of section 2.948 of the FCC rules. The description of the test facility is listed under FCC registration number 809388.

The Industry Canada has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance. The description of the test facility is listed under chambers filing number 11384A.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Conducted Emissions

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	2016.11.03
Two-Line V-Network	R&S	ENV216	101683	2016.11.03
Two-Line V-Network	R&S	ENV216	101684	2016.11.03
Temperature/Humidity Meter	Yuhuaze	N/A	N/A	2016.12.20

Radiated Emission

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	2016.12.08
EMI Test Receiver	R&S	ESR7	101209	2016.11.03
Preamplifier	Schwarzbeck	BBV 9721	9721-008	2017.04.16
Preamplifier	Agilent	83017A	MY53270040	2017.03.29
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	2016.12.14
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	2016.11.07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	2016.11.07
Broadband Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170549	2017.01.04
Digital Thermometer & Hygrometer	Minggao	N/A	N/A	2016.11.30

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	2017.05.08
USB Wideband Power Sensor	Boonton	55006	8911	2017.05.08
Temperature/Humidity Meter	Yuhuaze	N/A	N/A	2016.12.20

Software	Version	Function
e3	V8.3.5	EMI Test Software

2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

Table 2: Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.39dB
	> 1GHz	±0.68dB
Radiated Emission	30MHz - 1GHz	±5.34dB
	> 1GHz	±5.40dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a Infrared thermometer which use the technic of Bluetooth 4.0 Low Energy Only.

For details refer to the User Manual and Circuit Diagram.

3.2 Ratings and System Details

Kind of Equipment	ToolSmart Infrared Thermometer
Type Designation	TS05
Operating Frequency band	2402 – 2480MHz
Modulation	GFSK
Operation Voltage	DC 9V (by Battery: 6F22/6LR61)
Antenna	Chip Antenna, Max gain 3.19dBi

3.3 Independent Operation Modes

The basic operation modes are:

A. Transmitting
    1. Low Channel
    2. Middle Channel
    3. High Channel
B. Receiving
C. Standby
D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material
- PCB Layout
- Photo Document
- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

4.3 Special Accessories and Auxiliary Equipment

Null.

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Pass**

According to the manufacturer declared, the EUT has one chip antenna, the directional gain of antenna is 3.19dBi and the antenna is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Table 3: Antenna Requirement

FCC 15.203 – Antenna Requirement 1		
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	Aennta type:	Chip Antenna
Verdict:	PASS	

FCC 15.204 – Antenna Requirement 2	
Requirement:	An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.
Results:	Only one integral antenna can be used
Verdict:	PASS

5.1.2 Peak Output Power

RESULT: **Pass**

Date of testing	:	2016.05.26
Test standard	:	FCC Part 15.247(b)(3)
Test procedure	:	ANSI C63.10: 2013 Clause 9.1 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(b)(3)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1; A.2; A.3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Table 4: Peak Output Power

Mode	Freq. [MHz]	Maximum Peak Conducted Output Power [dBm]	Limit [dBm]
BLE	**2402**	**-2.33**	**30**
	2440	-4.01	30
	2480	-4.70	30

5.1.3 6dB Bandwidth

RESULT: **Pass**

Date of testing	:	2016.05.26
Test standard	:	FCC Part 15.247(a)(2)
Test procedure	:	ANSI C63.10: 2013 Clause 8 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(a)(2)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1; A.2; A.3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Table 5: 6dB Bandwidth

Mode	Frequency [MHz]	6dB Bandwidht [kHz]	Limit [kHz]
BLE	2402	685.1	500
	2440	695.9	500
	2480	689.2	500

Figure 1: 6dB Bandwidth, 2402MHz

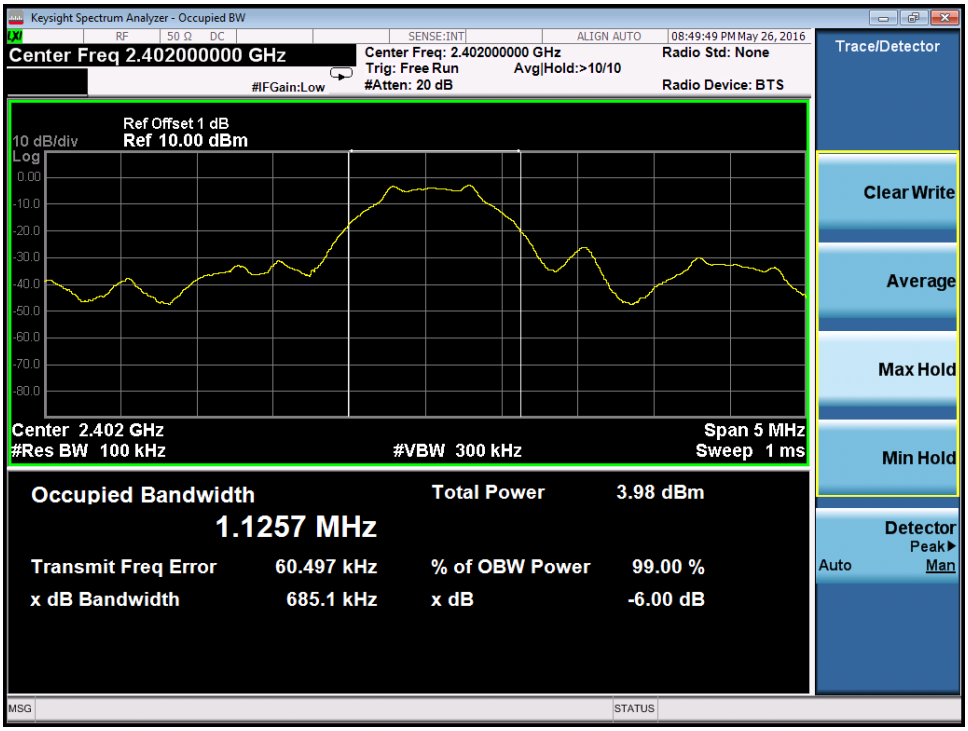


Figure 2: 6dB Bandwidth, 2440MHz

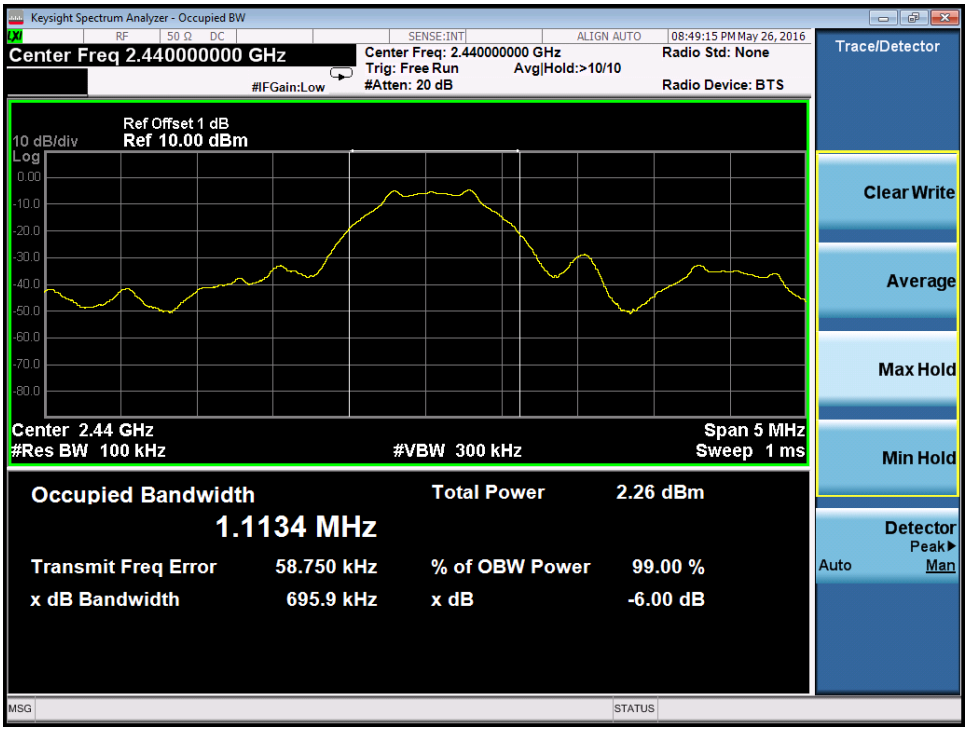
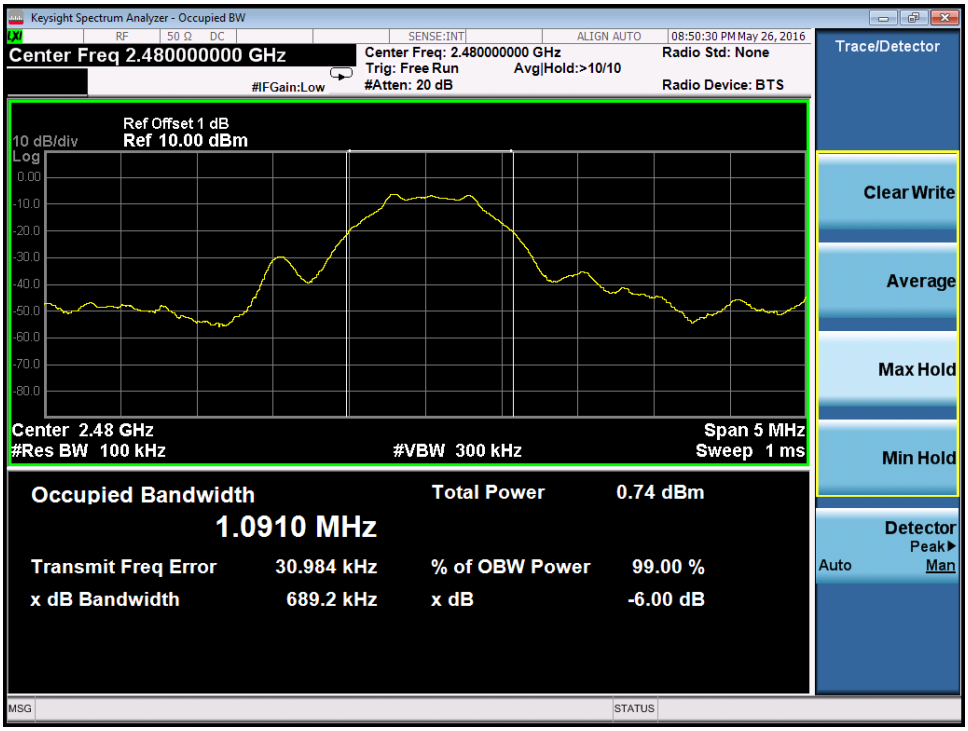


Figure 3: 6dB Bandwidth, 2480MHz



5.1.4 Conducted Spurious Emissions

RESULT: **Pass**

Date of testing	:	2016.05.27
Test standard	:	FCC Part 15.247(d)
Test procedure	:	ANSI C63.10: 2013
Limit	:	FCC Part 15.247(d)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1; A.2; A.3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Figure 4: Conducted Spurious Emission, 2402MHz

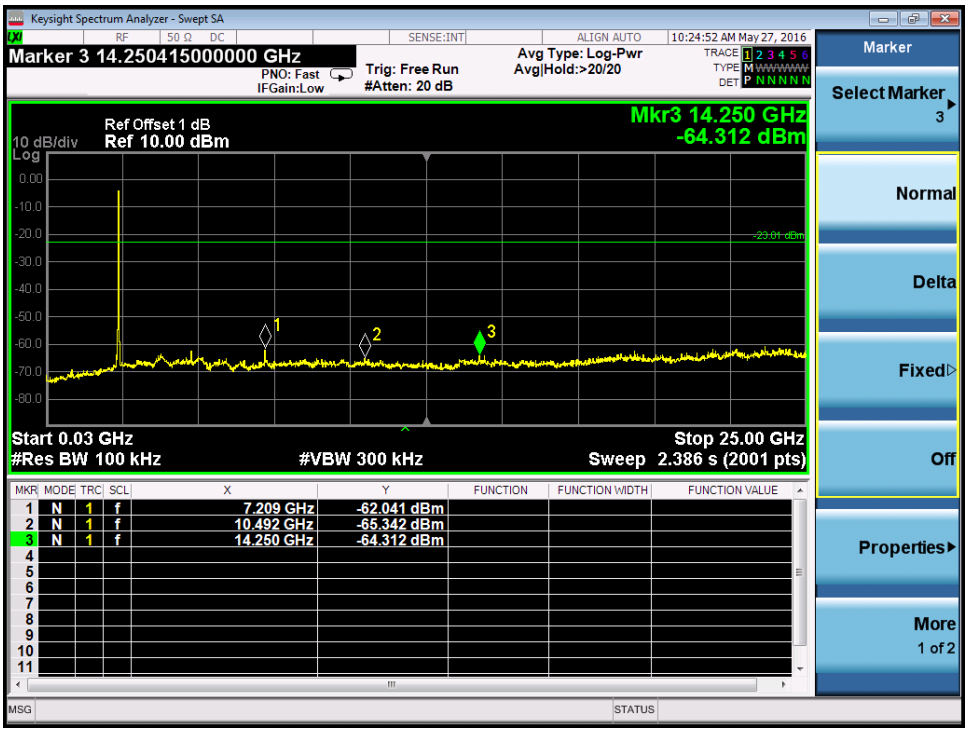


Figure 5: Conducted Spurious Emission, 2440MHz

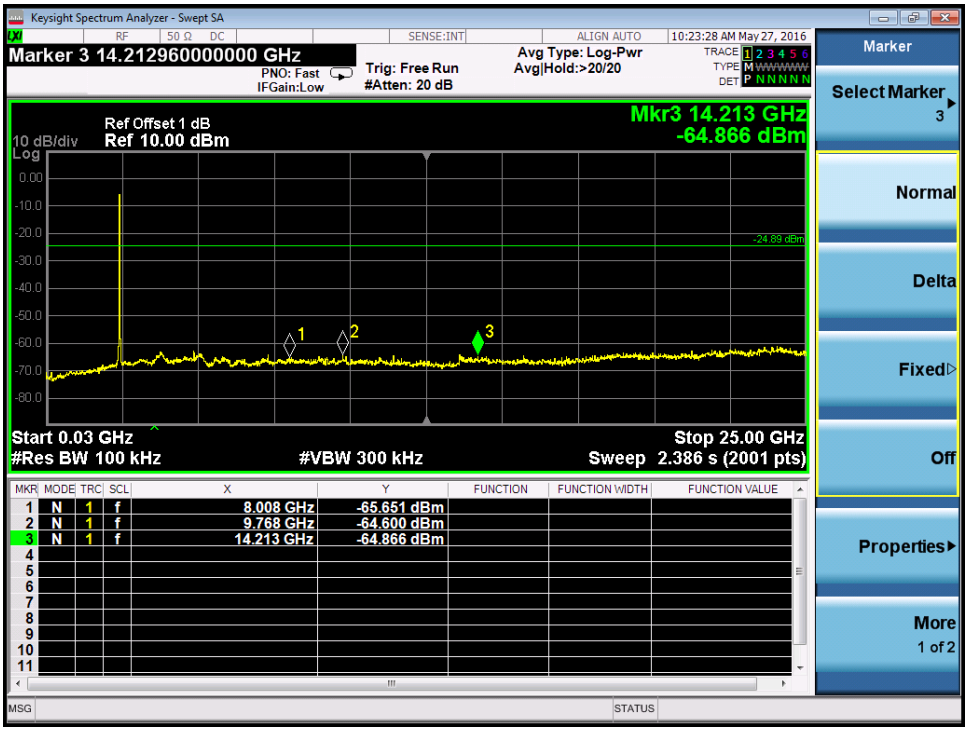


Figure 6: Conducted Spurious Emission, 2480MHz

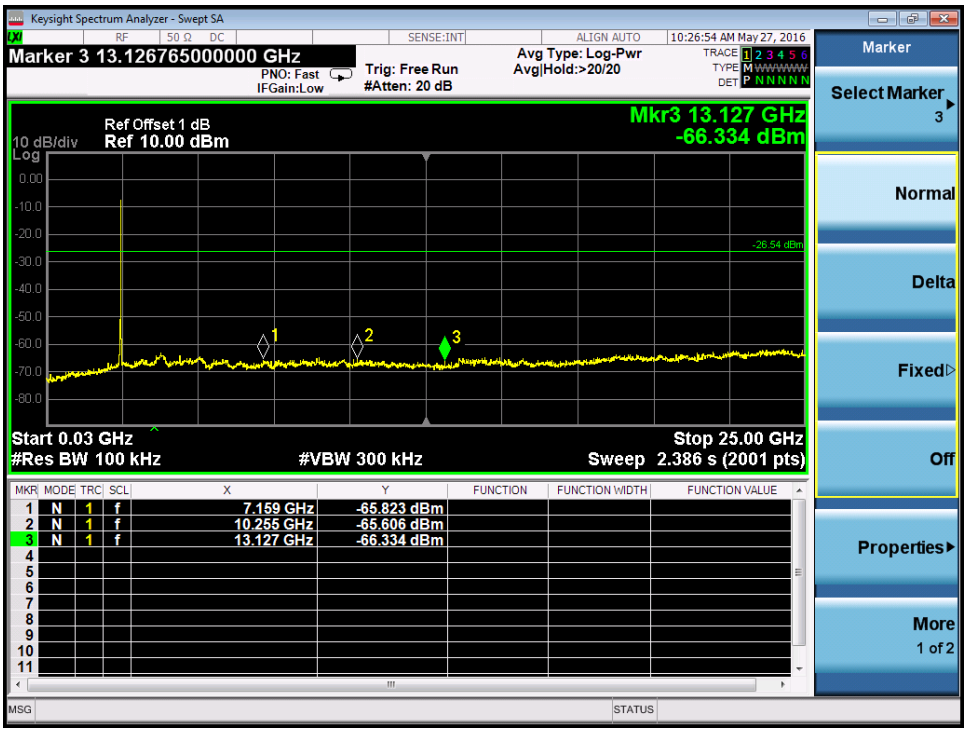


Figure 7: Conducted Bandedge, 2402MHz

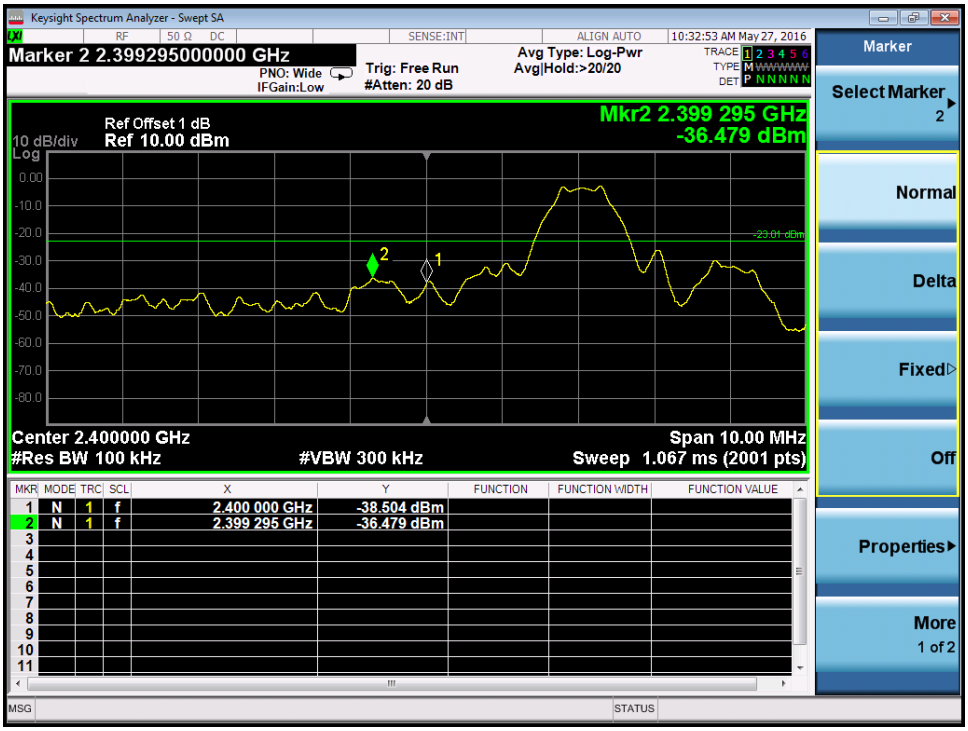
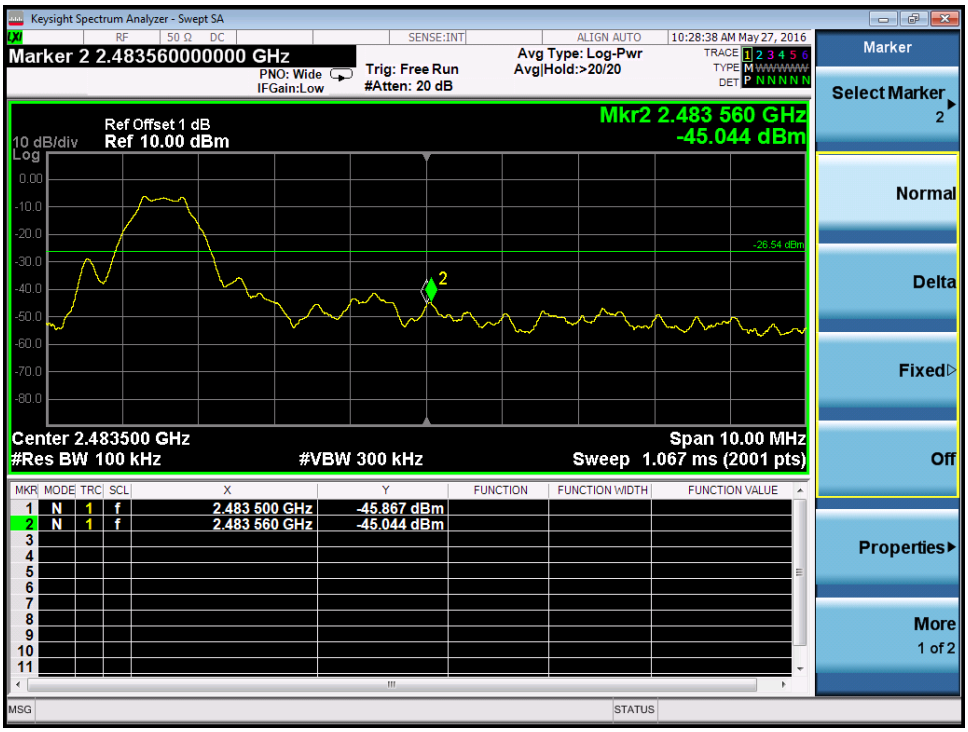


Figure 8: Conducted Bandedge, 2480MHz



5.1.5 Power Spectral Density

RESULT: **Pass**

Date of testing	:	2016.05.26
Test standard	:	FCC Part 15.247(e)
Test procedure	:	ANSI C63.10: 2013 Clause 10 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(e)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1; A.2; A.3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Table 6: Power Spectral Density

Mode	Frequency [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]
BLE	2402	-14.349	8
	2440	-16.365	8
	2480	-17.689	8

Figure 9: Power Spectral Density, 2402MHz

Figure 10: Power Spectral Density, 2440MHz

Figure 11: Power Spectral Density, 2480MHz

5.1.6 Radiated Spurious Emission

RESULT: **Pass**

Date of testing	:	2016.05.24
Test standard	:	FCC Part 15.247(d)
Test procedure	:	ANSI C63.10: 2013 Clause 11&12 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(d) FCC Part 15.209(a)
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A.1; A.2; A.3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Table 7: Radiated Spurious Emission, below 1GHz

Channel	Freq. [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type	Ant. Pol.
Low	49.840	14.242	-0.710	-25.758	40.000	14.953	QP	H
	103.680	12.886	-0.260	-30.614	43.500	13.146	QP	H
	239.180	13.993	0.600	-32.007	46.000	13.394	QP	H
	352.030	17.804	1.920	-28.196	46.000	15.884	QP	H
	707.310	21.901	0.180	-24.099	46.000	21.721	QP	H
	844.920	23.241	-0.320	-22.759	46.000	23.562	QP	H
	45.520	15.086	0.150	-24.914	40.000	14.936	QP	V
	106.350	13.185	0.120	-30.315	43.500	13.066	QP	V
	235.140	12.421	-0.840	-33.579	46.000	13.261	QP	V
	416.030	17.293	0.310	-28.707	46.000	16.983	QP	V
	608.140	19.552	-0.640	-26.448	46.000	20.192	QP	V
	822.060	22.374	-0.870	-23.626	46.000	23.244	QP	V

Note:
All the three channels have been evaluated, only the worst case was shown on the table above.

Table 8: Radiated Spurious Emission, above 1GHz

Channel	Freq. [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type	Ant. Pol.
Low	3881.500	38.686	38.554	-35.314	74.000	0.132	PK	H
	4808.000	47.171	44.477	-26.829	74.000	2.694	PK	H
	6712.000	42.538	36.748	-31.462	74.000	5.790	PK	H
	9661.500	46.790	35.839	-27.210	74.000	10.951	PK	H
	3915.500	38.605	38.371	-35.395	74.000	0.234	PK	V
	4808.000	43.441	40.747	-30.559	74.000	2.694	PK	V
	6627.000	43.212	37.193	-30.788	74.000	6.019	PK	V
	9755.000	46.989	35.599	-27.011	74.000	11.390	PK	V
Middle	3958.000	38.712	38.409	-35.288	74.000	0.303	PK	H
	4876.000	43.910	41.235	-30.090	74.000	2.675	PK	H
	6567.500	42.363	36.379	-31.637	74.000	5.984	PK	H
	9644.500	46.389	35.412	-27.611	74.000	10.976	PK	H
	3907.000	37.940	37.726	-36.060	74.000	0.214	PK	V
	4884.500	41.657	38.972	-32.343	74.000	2.684	PK	V
	6933.000	43.330	36.710	-30.670	74.000	6.620	PK	V
	9814.500	46.537	34.963	-27.463	74.000	11.573	PK	V
High	3949.500	38.247	37.961	-35.753	74.000	0.286	PK	H
	4961.000	42.831	39.919	-31.169	74.000	2.912	PK	H
	6474.000	43.077	37.264	-30.923	74.000	5.813	PK	H
	9755.000	46.061	34.671	-27.939	74.000	11.390	PK	H
	3839.000	37.872	37.882	-36.128	74.000	-0.010	PK	V
	4961.000	41.259	38.347	-32.741	74.000	2.912	PK	V
	6610.000	42.329	36.324	-31.671	74.000	6.005	PK	V
	9933.500	46.262	34.765	-27.738	74.000	11.497	PK	V

Note:
The measurements using an average detector for the frequency above 1GHz were not performed since the results measured with a Peak detector are totally meet the average limit.

Figure 12: Radiated Restricted Band Edge, 2402MHz, Horizontal, PK

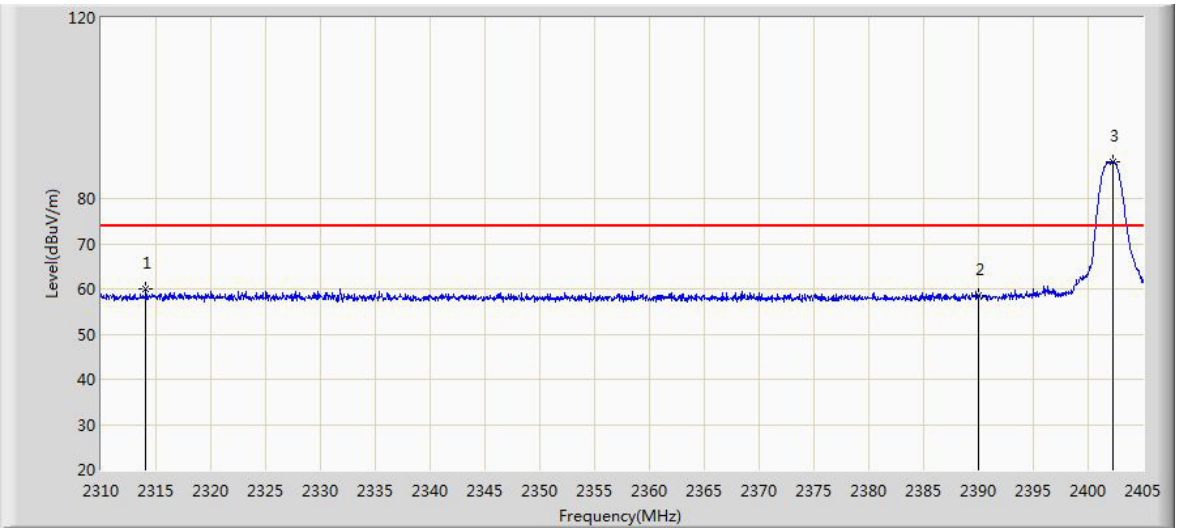


Table 9: Radiated Restricted Band Edge, 2402MHz, Horizontal, PK

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2314.085	59.925	28.481	-14.075	74.000	31.444	PK
2390.000	58.569	27.366	-15.431	74.000	31.203	PK
2402.292	88.210	57.026	N/A	N/A	31.184	PK

Figure 13: Radiated Restricted Band Edge, 2402MHz, Horizontal, AV

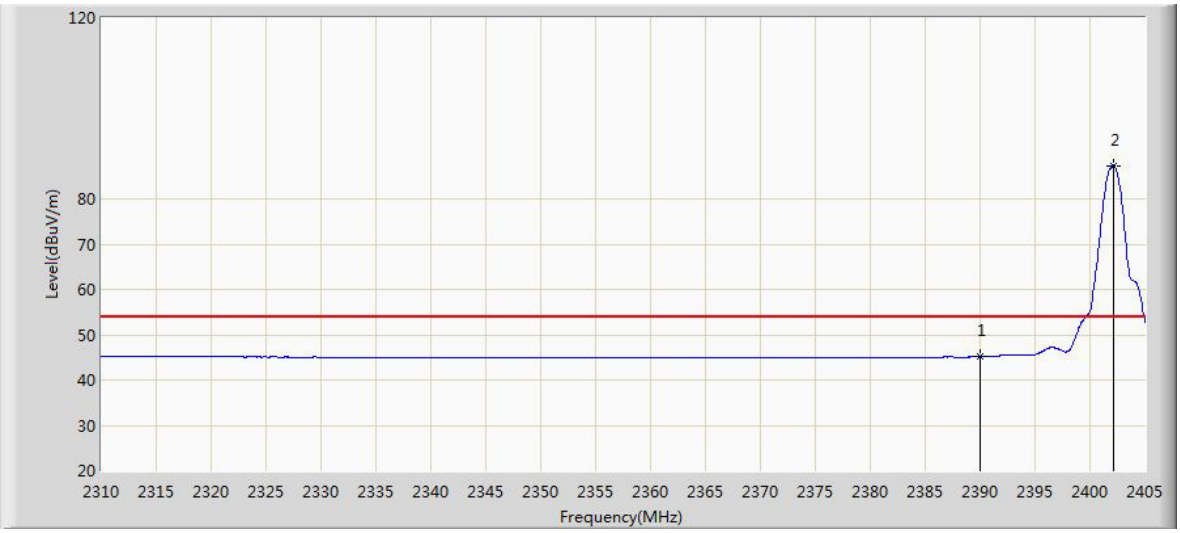


Table 10: Radiated Restricted Band Edge, 2402MHz, Horizontal, AV

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2390.000	45.205	14.002	-8.795	54.000	31.203	AV
2402.150	87.376	56.192	N/A	N/A	31.184	AV

Figure 14: Radiated Restricted Band Edge, 2402MHz, Vertical, PK

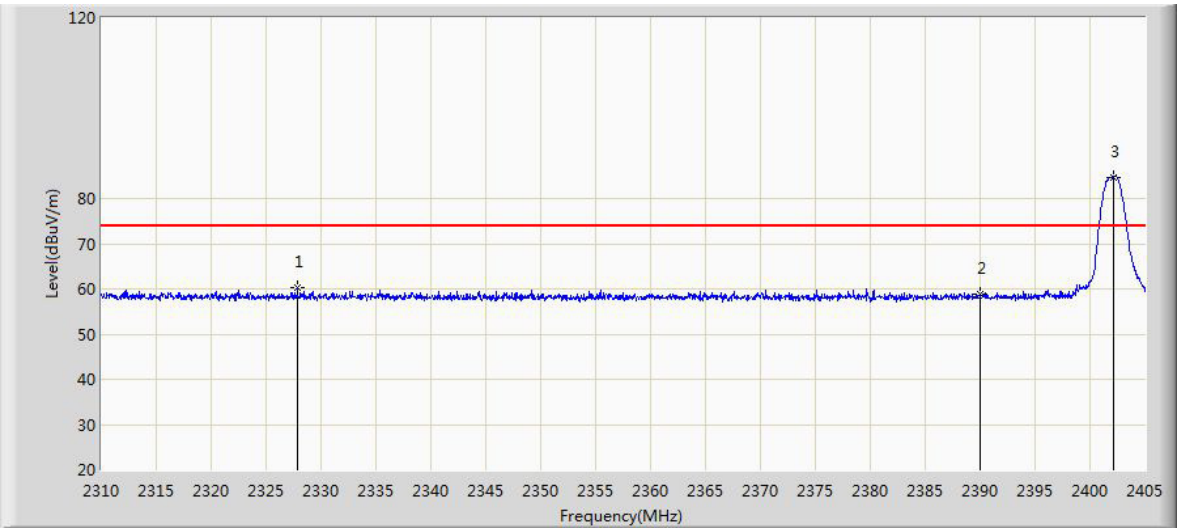


Table 11: Radiated Restricted Band Edge, 2402MHz, Vertical, PK

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2327.860	60.182	28.796	-13.818	74.000	31.386	PK
2390.000	58.734	27.531	-15.266	74.000	31.203	PK
2402.150	84.769	53.585	N/A	N/A	31.184	PK

Figure 15: Radiated Restricted Band Edge, 2402MHz, Vertical, AV

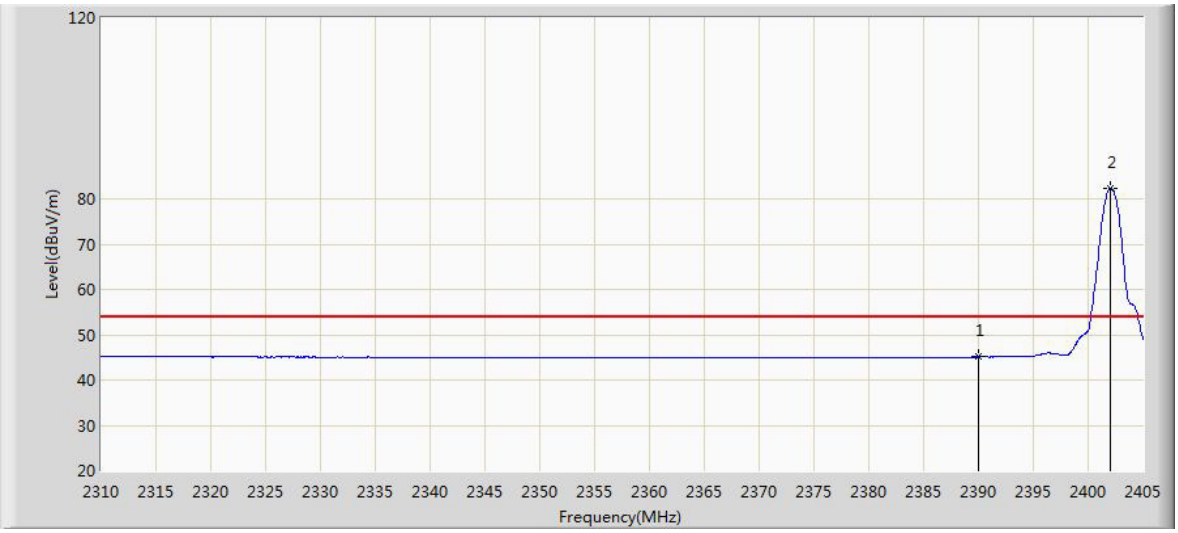


Table 12: Radiated Restricted Band Edge, 2402MHz, Vertical, AV

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2390.000	45.102	13.899	-8.898	54.000	31.203	AV
2402.008	82.322	51.138	N/A	N/A	31.184	AV

Figure 16: Radiated Restricted Band Edge, 2480MHz, Horizontal, PK

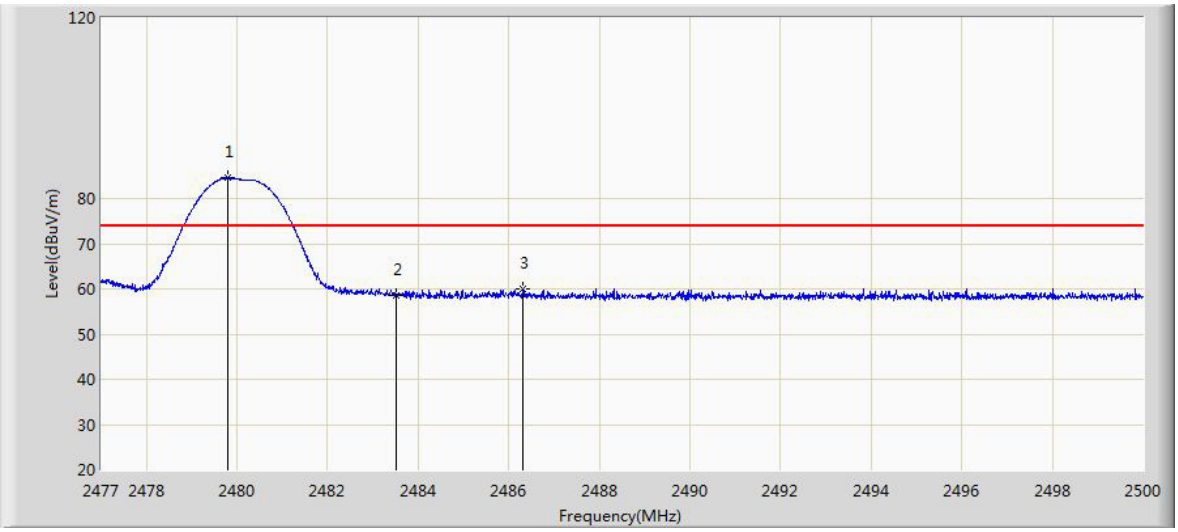


Table 13: Radiated Restricted Band Edge, 2480MHz, Horizontal, PK

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2479.783	84.509	53.325	N/A	N/A	31.184	PK
2483.500	58.448	27.255	-15.552	74.000	31.194	PK
2486.303	60.131	28.930	-13.869	74.000	31.201	PK

Figure 17: Radiated Restricted Band Edge, 2480MHz, Horizontal, AV

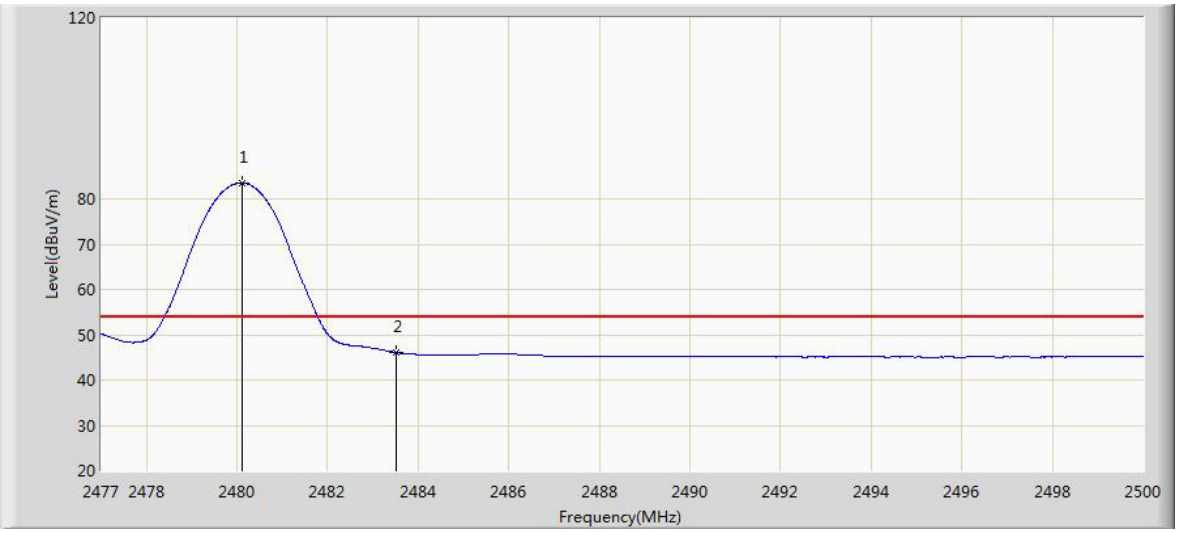


Table 14: Radiated Restricted Band Edge, 2480MHz, Horizontal, AV

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2480.105	83.509	52.325	N/A	N/A	31.184	AV
2483.500	46.135	14.942	-7.865	54.000	31.194	AV

Figure 18: Radiated Restricted Band Edge, 2480MHz, Vertical, PK

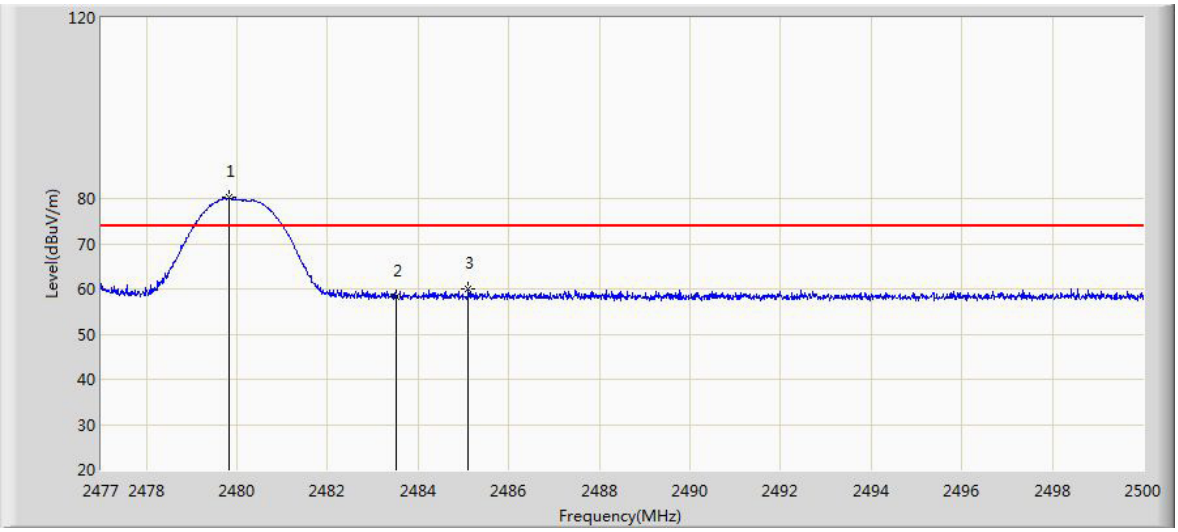


Table 15: Radiated Restricted Band Edge, 2480MHz, Vertical, PK

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2479.817	80.153	48.969	N/A	N/A	31.184	PK
2483.500	58.322	27.129	-15.678	74.000	31.194	PK
2485.107	60.097	28.899	-13.903	74.000	31.198	PK

Figure 19: Radiated Restricted Band Edge, 2480MHz, Vertical, AV

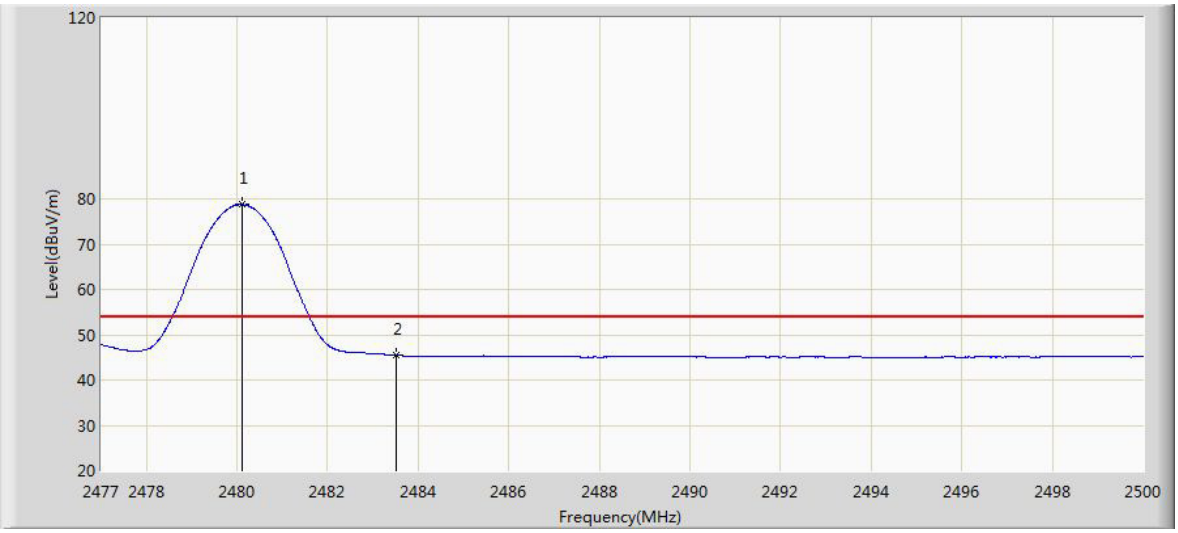


Table 16: Radiated Restricted Band Edge, 2480MHz, Vertical, AV

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2480.105	78.731	47.547	N/A	N/A	31.184	AV
2483.500	45.436	14.243	-8.564	54.000	31.194	AV

6. List of Tables

7. List of Figures