FCC Test Report

Report No.: AGC07628170101FE08

FCC ID	:	2AG4NWISE1230
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	WiSe 1230 BLE Module
BRAND NAME	:	WiSilica
MODEL NAME	:	WiSe1230
CLIENT	:	WiSilica, Inc.
DATE OF ISSUE	:	Jun.12, 2017
STANDARD(S)	:	FCC Part 15 Subpart C Section 15.247
REPORT VERSION	:	V1.0

*A*ttestation of *G*lobal *C*ompliance (Shenzhen) Co., Ltd

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun.12, 2017	Valid	Original Report

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1. VERIFICATION OF COMPLIANCE

Applicant	WiSilica, Inc.
Address	23282 Mill Creek Dr #340, Laguna Hills, CA 92653, USA
Manufacturer	HISWILL
Address	Rm.1806,18th Floor,Shekou Building, Shekou Xin Street, Shekou, NanShan District, Shenzhen, China
Product Designation	WiSe 1230 BLE Module
Brand Name	WiSilica
Test Model	WiSe1230
Date of test	Jan.13, 2017 to Jan.17, 2017
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BLE/RF (2013-03-01)

We hereby certify that:
The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.247.

Tested By	Strive Liang	
	Strive Liang(Liang Faqiang)	Jan.17, 2017
Reviewed By	Forrest Lei	
	Forrest Lei(Lei Yonggang)	Jun.12, 2017
Approved By	Solger Zhang	
	Solger Zhang(Zhang Hongyi) Authorized Officer	Jun.12, 2017

2.GENERAL INFORMATION

2.1PRODUCT DESCRIPTION

The EUT is designed as a “WiSe 1230 BLE Module”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz
Bluetooth Version	V4.1
Modulation	GFSK for BLE
Number of channels	40 Channel(37 Hopping Channel,3 advertising Channel)
Antenna Designation	external antenna with U-FL connector
Antenna Gain	1dBi
Hardware Version	1.0
Software Version	V2.1.41
Power Supply	DC 3.3V
Note: 1. The EUT didn't support BR/EDR. 2. The Module will only use external antenna with U-FL connector, without PCB Antenna.	

2.2 RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: 2AG4NWISE1230 ,** filing to comply with Section 15.247of the FCC Part 15, Subpart C Rules.

2.3TEST METHOD

All measurements contained in this report were conducted with ANSI C63.10-2013.

2.4 TEST FACILITY

All measurement facilities used to collect the measurement data are located at
Dongguan Precise Testing Service Co., Ltd.

Building D,Baoding Technology Park,Guangming Road2,Dongcheng District, Dongguan, Guangdong, China,

2.5 SPECIAL ACCESSORIES

Refer to section 3.2.

2.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.7 MEASUREMENT UNCERTAINTY

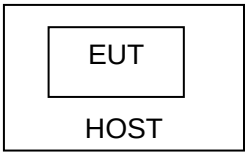
Radiation Emission:+/-3.2

Conduction Emission:+/-2.5

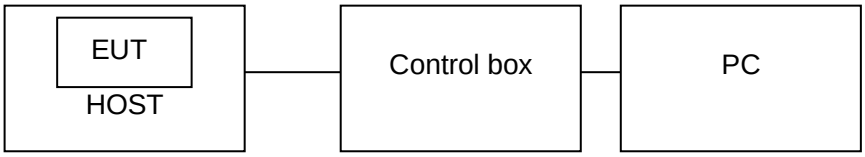
3. SYSTEM TEST CONFIGURATION

3.1 CONFIGURATION OF TESTED SYSTEM

Configure 1: (Normal hopping)



Configure 2: (Control continuous TX)



3.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	WiSe 1230 BLE Module	WiSilica	WiSe1230	EUT
2	PC	Sony	E1412AYCW	A.E
3	Control box	DOFLY	LY-UXB-TTL	A.E
4	PC Adapter	Sony	AC-L100	A.E
5	Temporary Antenna	T10	N/A	A.E
6	Host	WiSilica	A12	A.E

3.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.209 §15.247(d)	Radiated Emission	Compliant
§15.247(d)	Band Edges	Compliant
§15.247(a) (2)	6 dB Bandwidth	Compliant
§15.247(b)	Conducted Output Power	Compliant
§15.247(d)	Conducted Spurious Emission	Compliant
§15.247(e)	Conducted Power Spectral Density	Compliant
§15.207	Line Conduction Emission	N/A

Note: N/A means it's not applicable to this item.

4. DESCRIPTION OF TEST MODES

The EUT has been operated in one modulation: GFSK.

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	BT Link

5. TEST FACILITY

Site	Dongguan Precise Testing Service Co., Ltd.
Location	Building D,Baoding Technology Park,Guangming Road2,Dongcheng District, Dongguan, Guangdong, China,
FCC Registration No.	371540
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014

6. TEST EQUIPMENT LIST

TEST EQUIPMENT LIST					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
EMI Test Receiver	ROHDE & SCHWARZBECK	ESCI	101417	July 4, 2016	July 3, 2017
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 4, 2016	July 3, 2017
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 4, 2016	July 3, 2017
RF Cable	SCHWARZBECK	AK9515E	96221	July 4, 2016	July 3, 2017
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 6, 2016	June 5, 2017
MULTI-DEVICE Positioning Controller	MAX-FULL	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	SCHWARZBECK	FMZB1519	1519-038	June 6, 2016	June 5, 2017
Spectrum analyzer	AGILENT	E4407B	MY46185649	June 6, 2016	June 5, 2017
Horn Antenna (1G-18GHz)	SCHWARZBECK	BBHA9120D	9120D-1246	July 11, 2016	July 10, 2017
Spectrum Analyzer	AGILENT	E4411B	MY4511453	July 4, 2016	July 3, 2017
Signal Amplifier	SCHWARZBECK	BBV 9718	9718-269	July 4, 2016	July 3, 2017
RF Cable	SCHWARZBECK	AK9515H	96220	July 4, 2016	July 3, 2017
Horn Ant (18G-40GHz)	SCHWARZBECK	BBHA 9170	9170-181	June 6, 2016	June 5, 2017
Artificial Mains Network	NARDA	L2-16B	000WX31025	July 8, 2016	July 7, 2017
Artificial Mains Network (AUX)	NARDA	L2-16B	000WX31026	July 8, 2016	July 7, 2017
RF Cable	SCHWARZBECK	AK9515E	96222	July 4, 2016	July 3, 2017
Shielded Room	CHENGYU	843	PTS-002	June 6, 2016	June 5, 2017
Conduction Cable	MXT	SE1	S003	June 6, 2016	June 5, 2017

7. ANTENNA REQUIREMENT

7.1. STANDARD APPLICABLE

According to FCC 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

7.2. TEST RESULT

This product has a permanent antenna, fulfill the requirement of this section.

8. RADIATED EMISSION

8.1 LIMITS

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		μ V/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	---
1.705 ~ 30	30	30	---
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	Other:74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Remark： (1) Emission level dBμ V = 20 log Emission level μ V/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

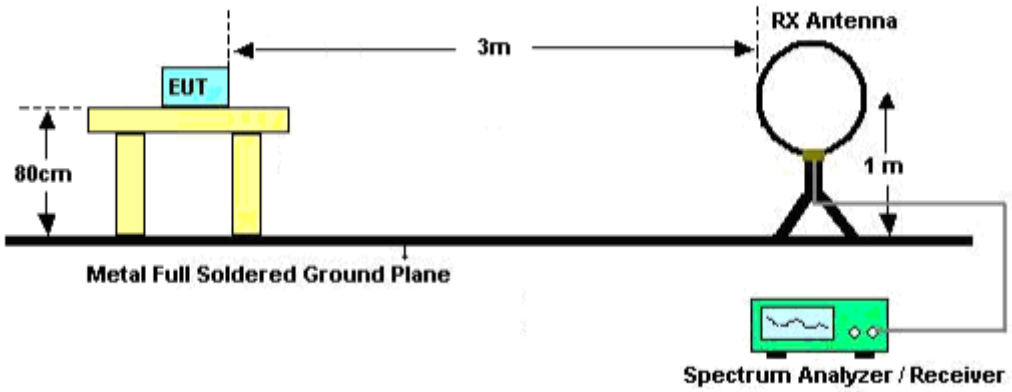
(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

8.2 MEASUREMENT PROCEDURE

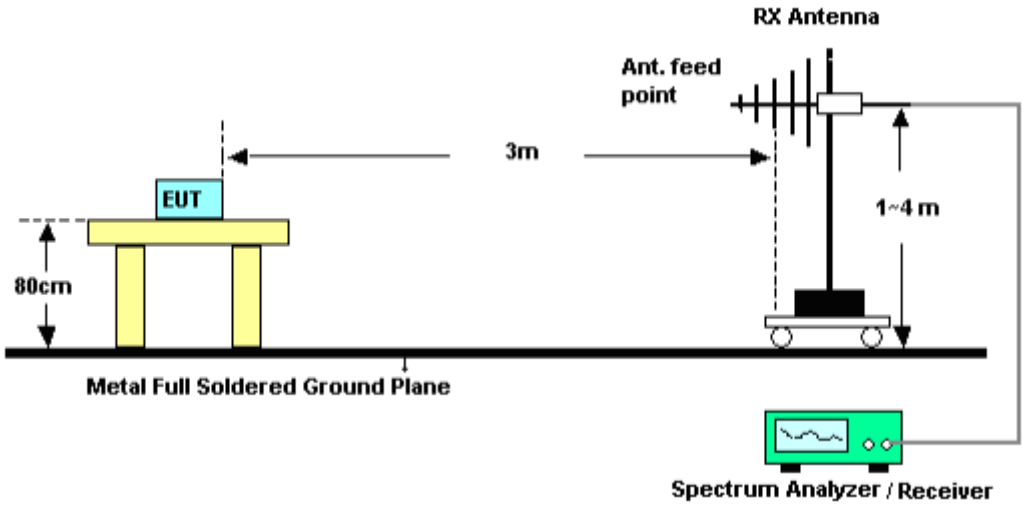
1. The measuring distance of 3m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Below 1GHz)
2. The measuring distance of 3m shall used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Above 1GHz)
3. The height of the test antenna shall vary between 1m to 4m.Both horizontal and vertical polarization Of the antenna are set to make the measurement.
4. The initial step in collecting radiated emission data is a receive peak detector mode. Pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
5. All readings are peak unless otherwise stated QP in column of Note. Peak denoted that the Peak reading compliance with the QP limits and then QP Mode measurement didn't perform(Below 1GHz)
6. All readings are Peak mode value unless otherwise stated AVG in column of Note. If the Peak mode measured value compliance with the Peak limits and lower than AVG Limits, the EUT shall be deemed to meet Peak&AVG limits and then only Peak mode was measured, but AVG mode didn't perform.(Above 1GHz)

8.3 TEST SETUP

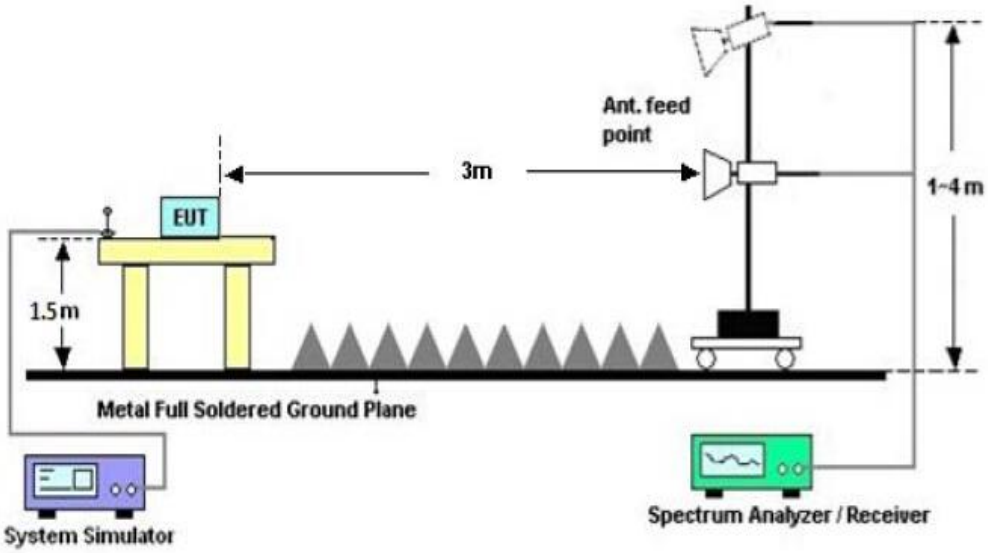
RADIATED EMISSION TEST SETUP BELOW 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



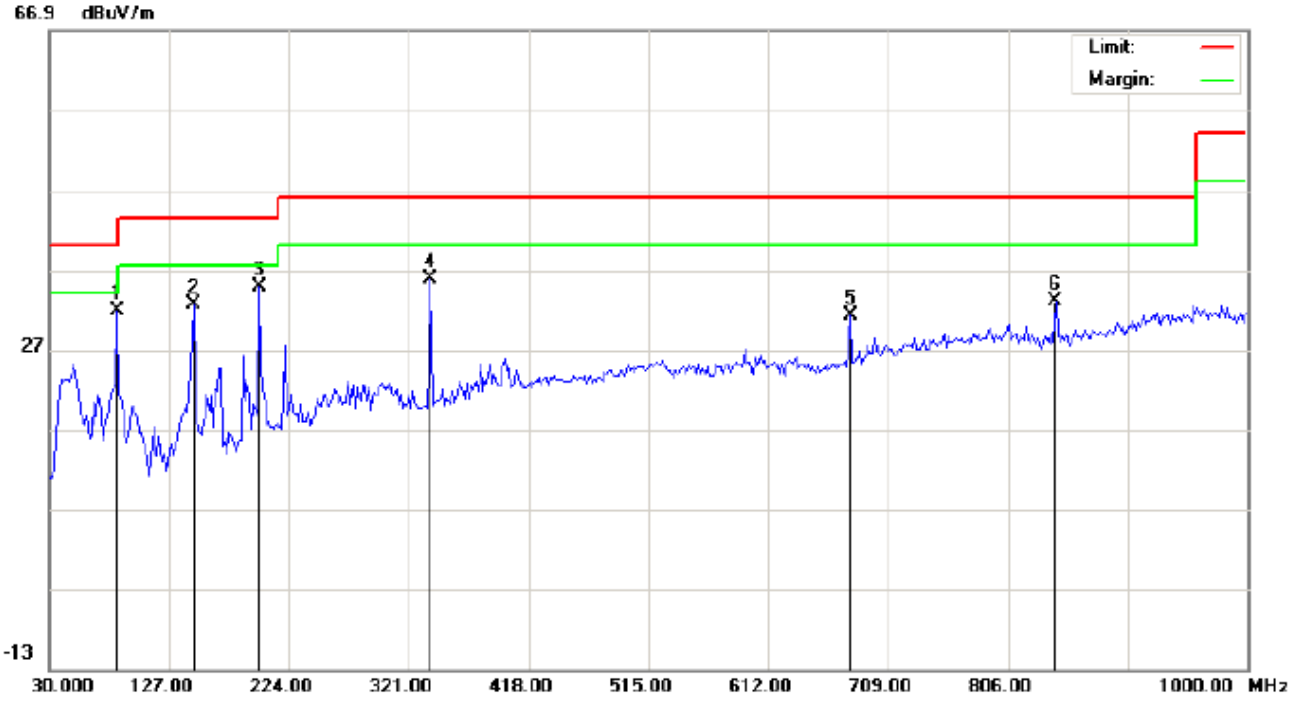
8.4 TEST RESULT (Worst Modulation: GFSK)

RADIATED EMISSION BELOW 30MHz

No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION BELOW 1GHz

RADIATED EMISSION TEST- (30MHz-1GHz)-LOW CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Low Channel TX
Note:

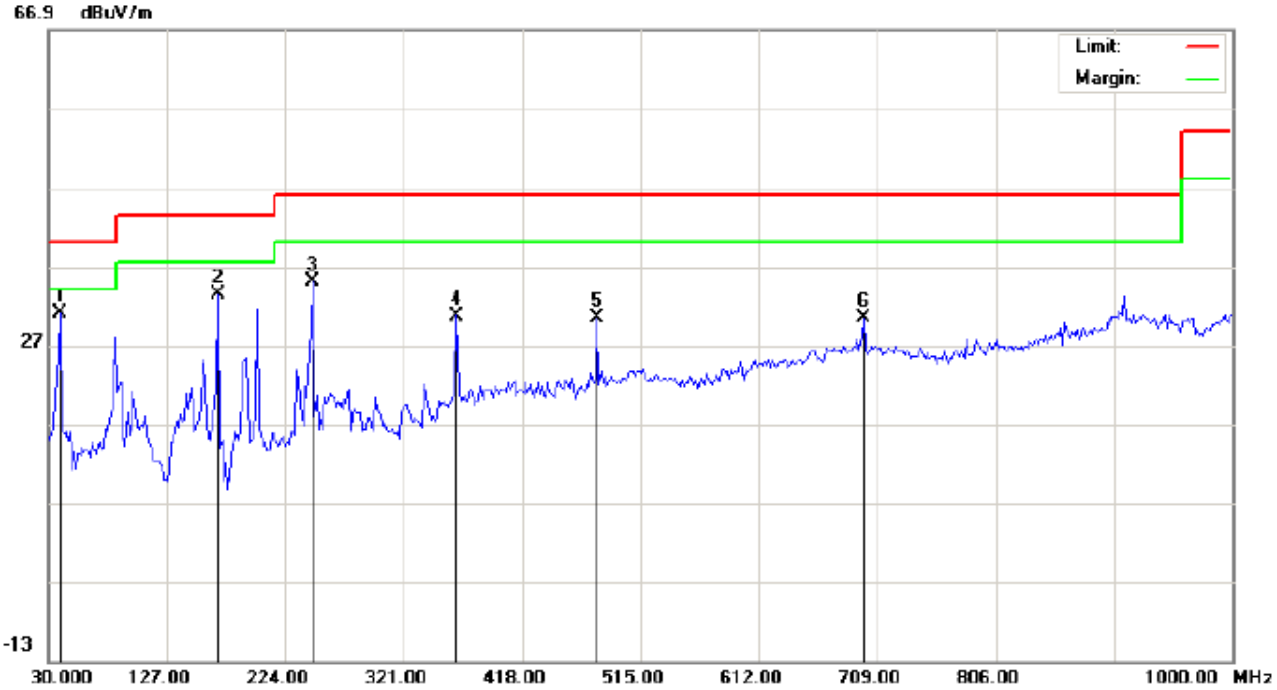
Polarization: *Horizontal*
Power:
Distance:

Temperature: 21.1
Humidity: 53.5 %

No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	84.9666	31.31	0.50	31.81	40.00	-8.19	peak			
2		146.4000	19.05	13.64	32.69	43.50	-10.81	peak			
3		199.7500	22.76	11.99	34.75	43.50	-8.75	peak			
4		338.7832	17.73	17.99	35.72	46.00	-10.28	peak			
5		678.2833	6.66	24.61	31.27	46.00	-14.73	peak			
6		844.7999	5.70	27.31	33.01	46.00	-12.99	peak			

RESULT: PASS

RADIATED EMISSION TEST- (30MHz-1GHz)-LOW CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Low Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 21.1
Humidity: 53.5 %

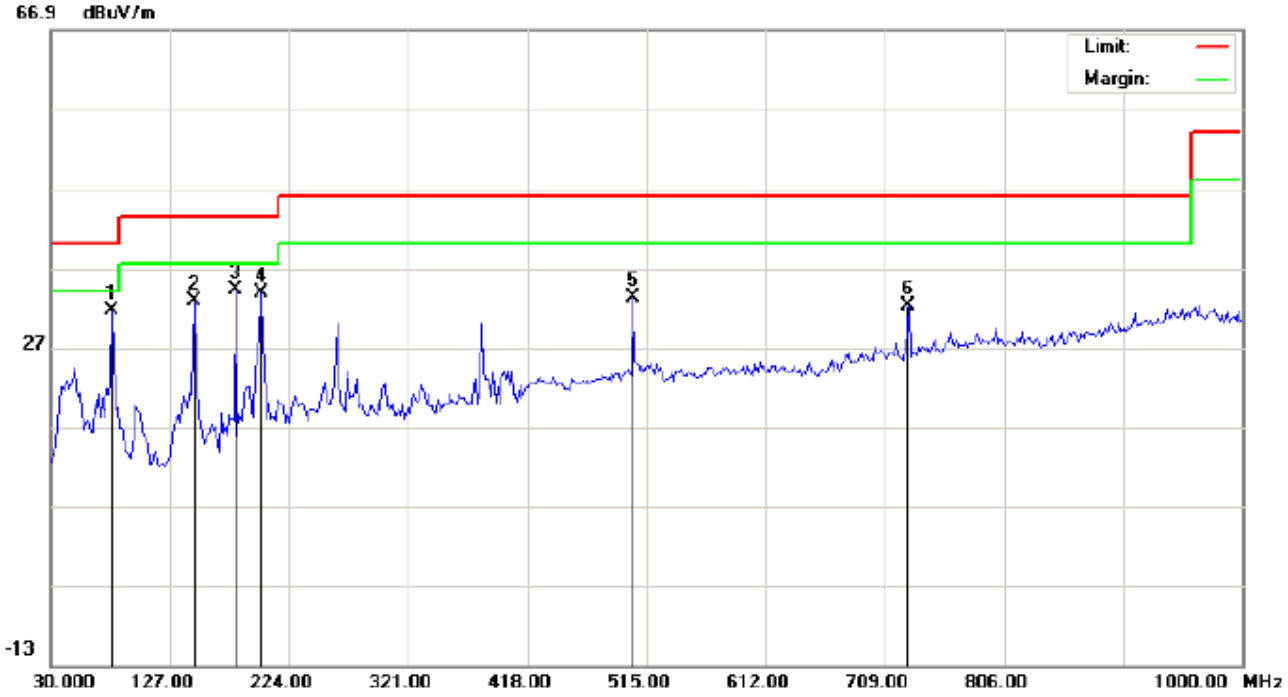
No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	39.7000	22.45	8.51	30.96	40.00	-9.04	peak			
2		169.0331	18.59	14.76	33.35	43.50	-10.15	peak			
3		246.6332	21.35	13.57	34.92	46.00	-11.08	peak			
4		364.6499	11.86	18.84	30.70	46.00	-15.30	peak			
5		479.4332	9.51	20.91	30.42	46.00	-15.58	peak			
6		697.6833	5.31	25.13	30.44	46.00	-15.56	peak			

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

RADIATED EMISSION TEST- (30MHz-1GHz)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Middle Channel TX
Note:

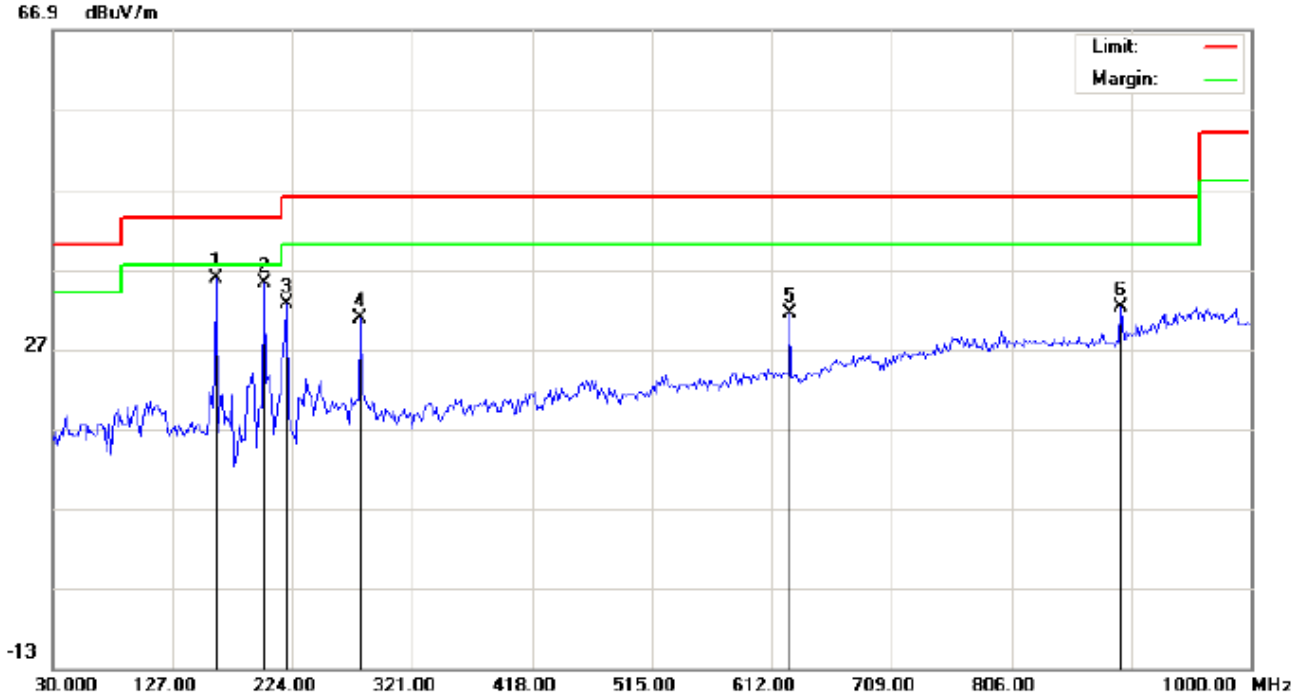
Polarization: *Horizontal*
Power:
Distance:

Temperature: 21.1
Humidity: 53.5 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	80.1166	31.03	0.50	31.53	40.00	-8.47	peak			
2		146.4000	19.17	13.64	32.81	43.50	-10.69	peak			
3		180.3499	23.18	11.09	34.27	43.50	-9.23	peak			
4		201.3667	21.97	11.86	33.83	43.50	-9.67	peak			
5		503.6832	11.95	21.23	33.18	46.00	-12.82	peak			
6		728.3999	6.23	26.01	32.24	46.00	-13.76	peak			

RESULT: PASS

RADIATED EMISSION TEST- (30MHz-1GHz)- MIDDLE CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Middle Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 21.1
Humidity: 53.5 %

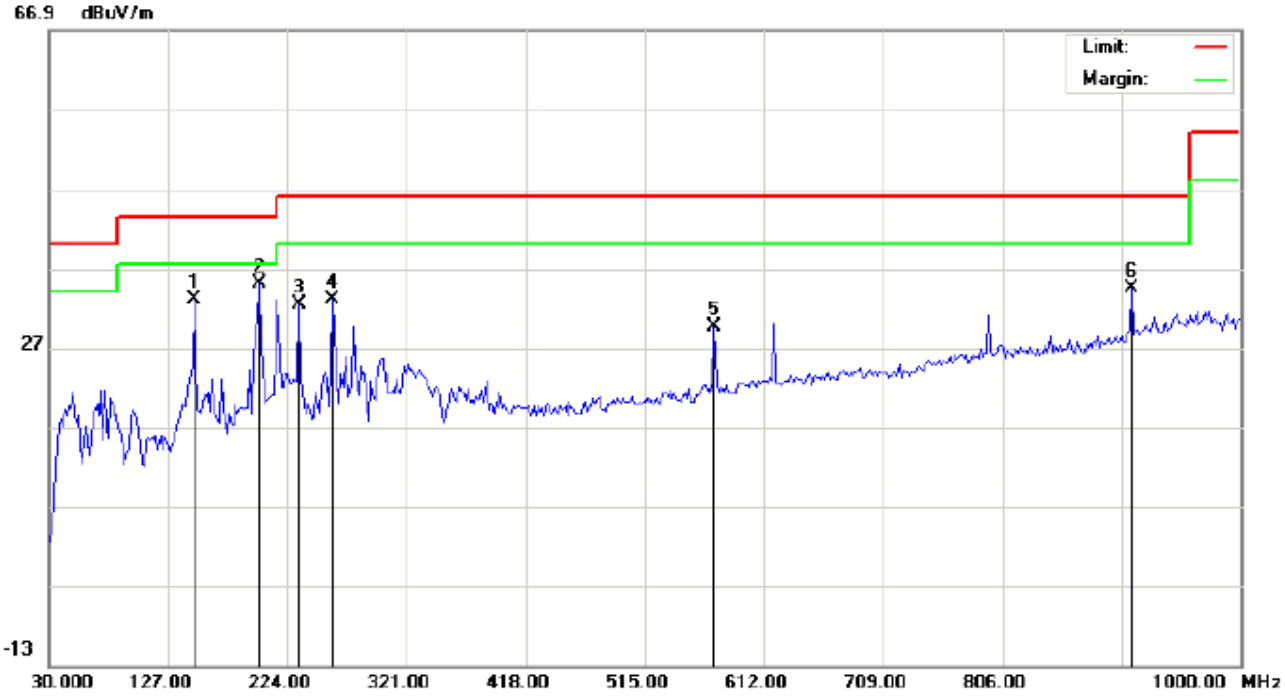
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	162.5666	20.54	15.17	35.71	43.50	-7.79	peak			
2		201.3667	26.04	9.13	35.17	43.50	-8.33	peak			
3		219.1500	21.80	10.88	32.68	46.00	-13.32	peak			
4		278.9667	16.04	14.77	30.81	46.00	-15.19	peak			
5		626.5499	8.07	23.32	31.39	46.00	-14.61	peak			
6		894.9166	3.71	28.48	32.19	46.00	-13.81	peak			

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

RADIATED EMISSION TEST- (30MHz-1GHz)-HIGH CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: WiSe1230 BLE Module
M/N: WiSe1230
Mode: High Channel TX
Note:

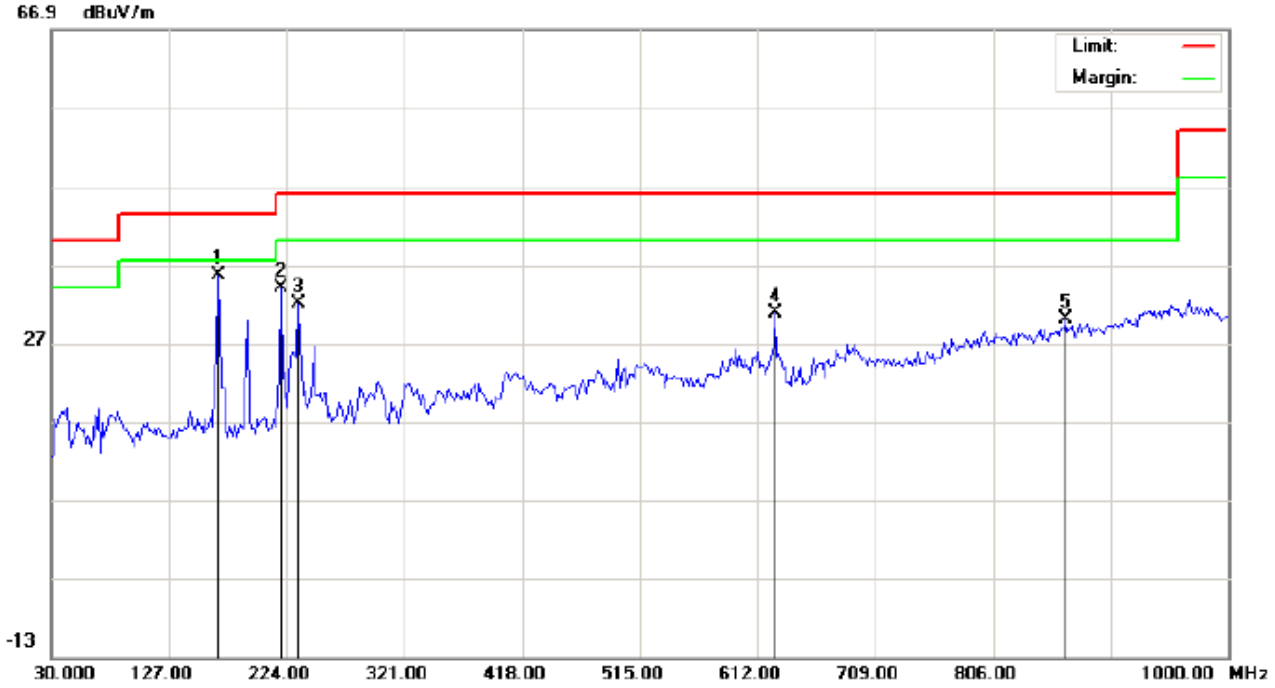
Polarization: *Horizontal*
Power:
Distance:

Temperature: 21.1
Humidity: 53.5 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		148.0166	19.78	13.25	33.03	43.50	-10.47	peak			
2	*	201.3667	23.09	11.86	34.95	43.50	-8.55	peak			
3		233.6999	23.79	8.56	32.35	46.00	-13.65	peak			
4		261.1831	24.30	8.80	33.10	46.00	-12.90	peak			
5		571.5833	6.68	23.02	29.70	46.00	-16.30	peak			
6		911.0833	5.42	28.92	34.34	46.00	-11.66	peak			

RESULT: PASS

RADIATED EMISSION TEST- (30MHz-1GHz)-HIGH CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: WiSe1230 BLE Module
M/N: WiSe1230
Mode: High Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 21.1
Humidity: 53.5 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	167.4166	20.67	14.86	35.53	43.50	-7.97	peak			
2		219.1500	23.19	10.88	34.07	46.00	-11.93	peak			
3		233.6999	19.65	12.30	31.95	46.00	-14.05	peak			
4		626.5499	7.53	23.32	30.85	46.00	-15.15	peak			
5		865.8166	2.30	27.72	30.02	46.00	-15.98	peak			

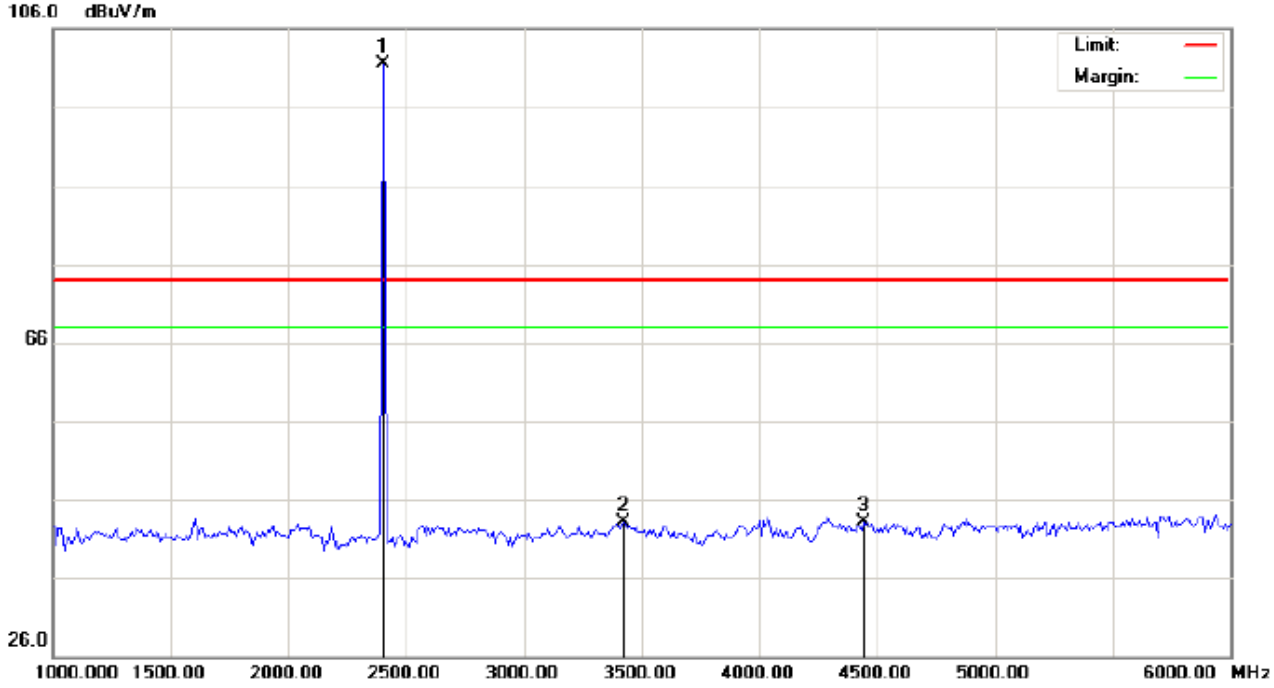
RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

RADIATED EMISSION ABOVE 1GHz

RADIATED EMISSION TEST- (ABOVE 1GHz)-LOW CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Low Channel TX
Note:

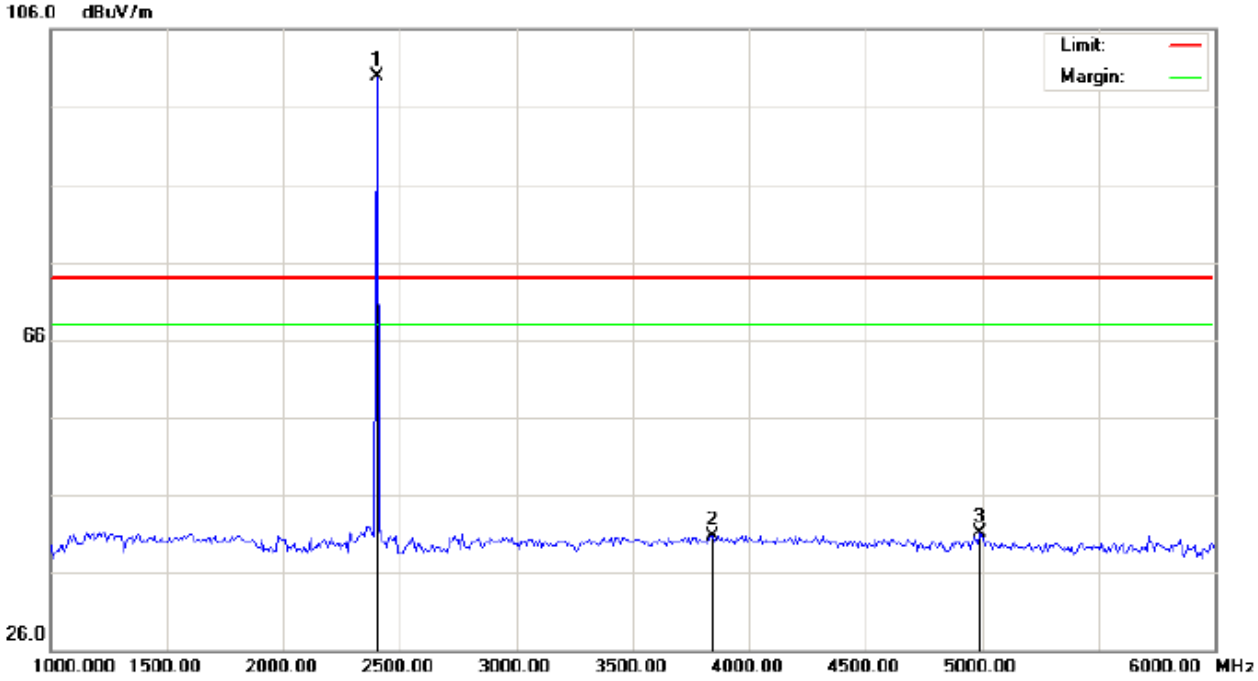
Polarization: *Horizontal*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2402.000	91.11	10.32	101.43	74.00	27.43	peak			
2		3425.000	31.02	12.04	43.06	74.00	-30.94	peak			
3		4441.667	35.25	7.86	43.11	74.00	-30.89	peak			

RESULT: PASS

RADIATED EMISSION TEST-(ABOVE 1GHz)-LOW CHANNEL-VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Low channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 26
Humidity: 60 %

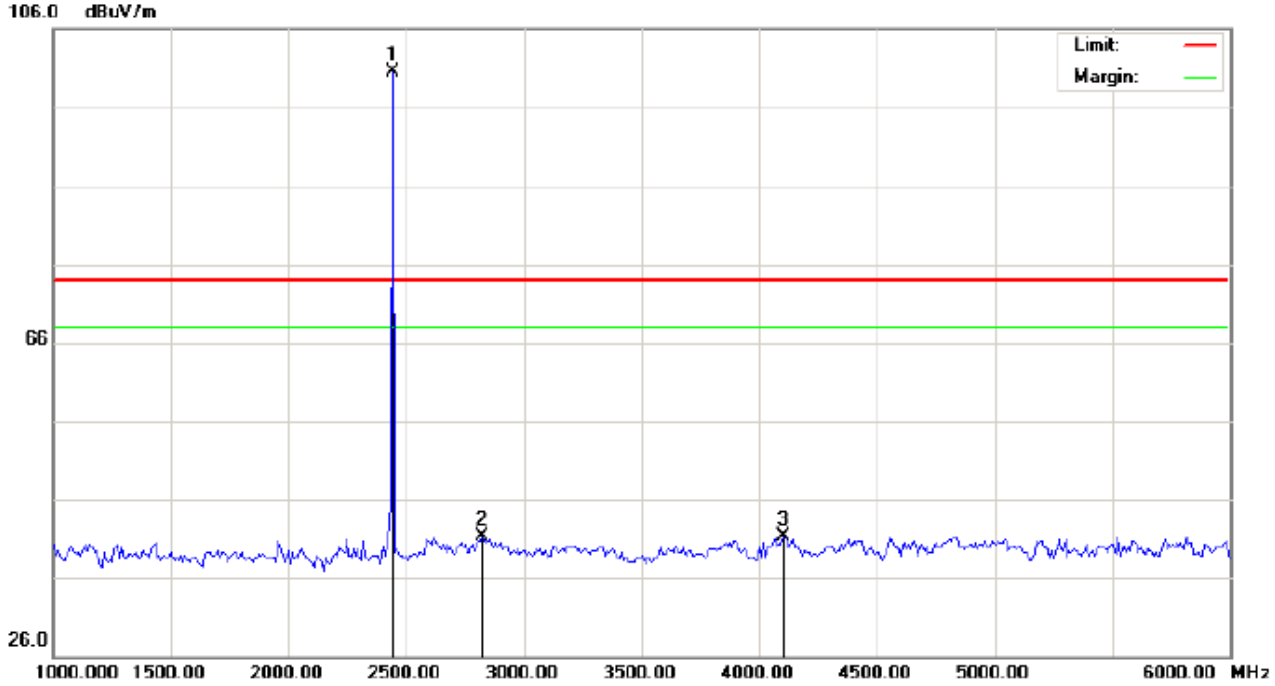
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2402.000	89.67	10.32	99.99	74.00	25.99	peak			
2		3841.667	26.48	14.21	40.69	74.00	-33.31	peak			
3		4991.667	32.88	8.18	41.06	74.00	-32.94	peak			

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

RADIATED EMISSION TEST-(ABOVE 1GHz)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Middle Channel TX
Note:

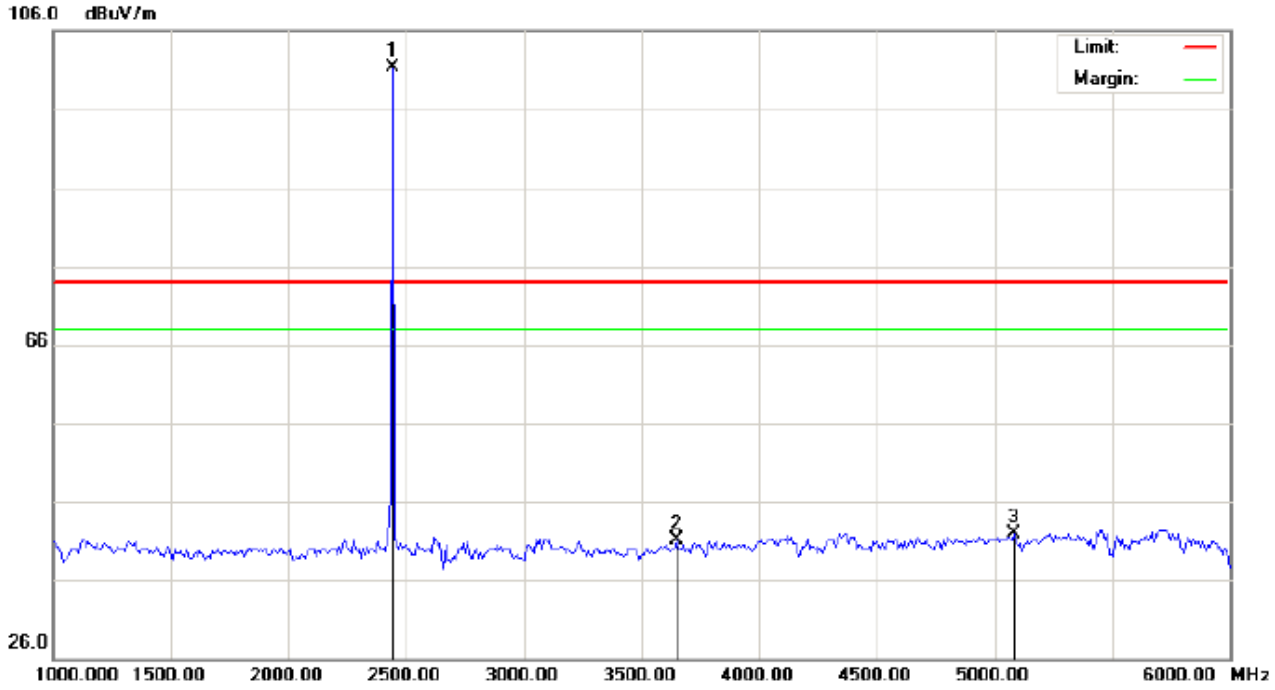
Polarization: *Horizontal*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2440.000	90.22	10.36	100.58	74.00	26.58	peak			
2		2825.000	30.07	11.22	41.29	74.00	-32.71	peak			
3		4100.000	27.84	13.53	41.37	74.00	-32.63	peak			

RESULT: PASS

RADIATED EMISSION TEST-(ABOVE 1GHz)-MIDDLE CHANNEL-VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Middle Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 26
Humidity: 60 %

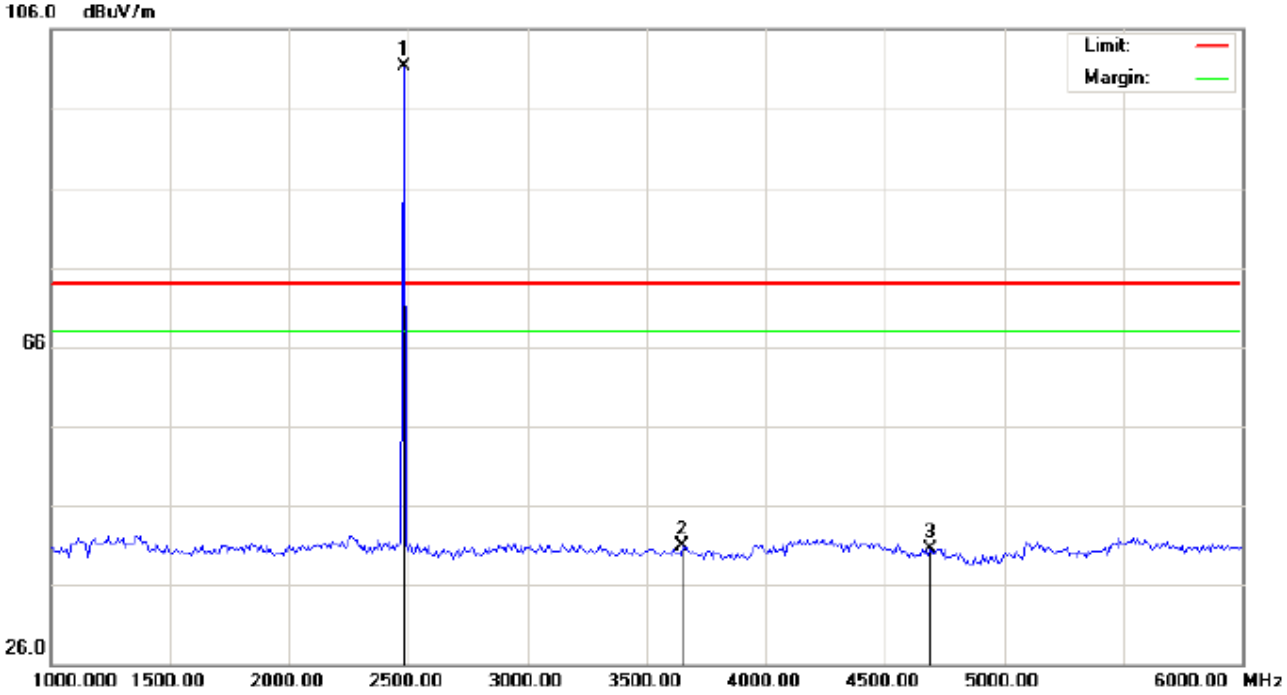
No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2440.000	90.88	10.36	101.24	74.00	27.24	peak			
2		3650.000	28.06	13.03	41.09	74.00	-32.91	peak			
3		5083.333	35.39	6.53	41.92	74.00	-32.08	peak			

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The “Factor” value can be calculated automatically by software of measurement system.

RADIATED EMISSION TEST-(ABOVE 1GHz)-HIGH CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: High channel TX
Note:

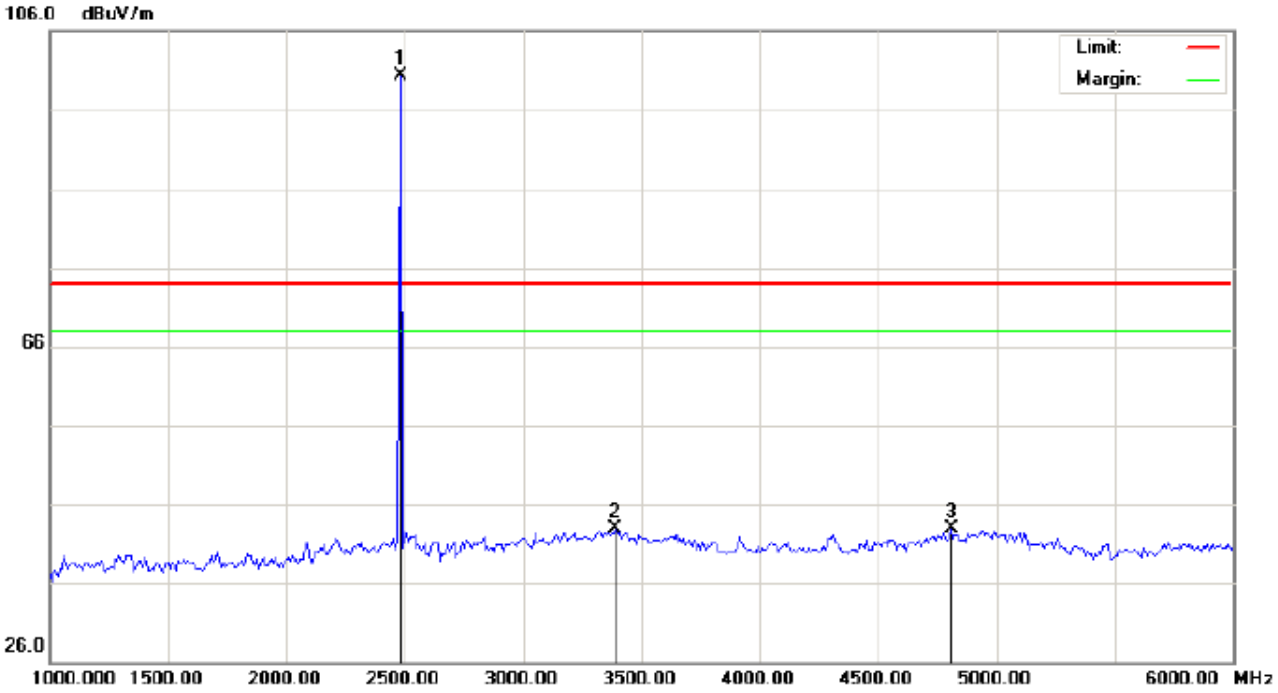
Polarization: *Horizontal*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	90.93	10.41	101.34	74.00	27.34	peak			
2		3650.000	27.78	13.03	40.81	74.00	-33.19	peak			
3		4691.667	33.13	7.39	40.52	74.00	-33.48	peak			

RESULT: PASS

RADIATED EMISSION TEST-(ABOVE 1GHz)-HIGH CHANNEL-VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: High Channe TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	89.97	10.41	100.38	74.00	26.38	peak			
2		3391.667	30.96	12.01	42.97	74.00	-31.03	peak			
3		4808.333	35.15	7.70	42.85	74.00	-31.15	peak			

RESULT: PASS

Note: 6~25GHz at least have 20dB margin. No recording in the test report.

Factor=Antenna Factor+ Cable loss-Amplifier gain,

Margin=Measurement-Limit.

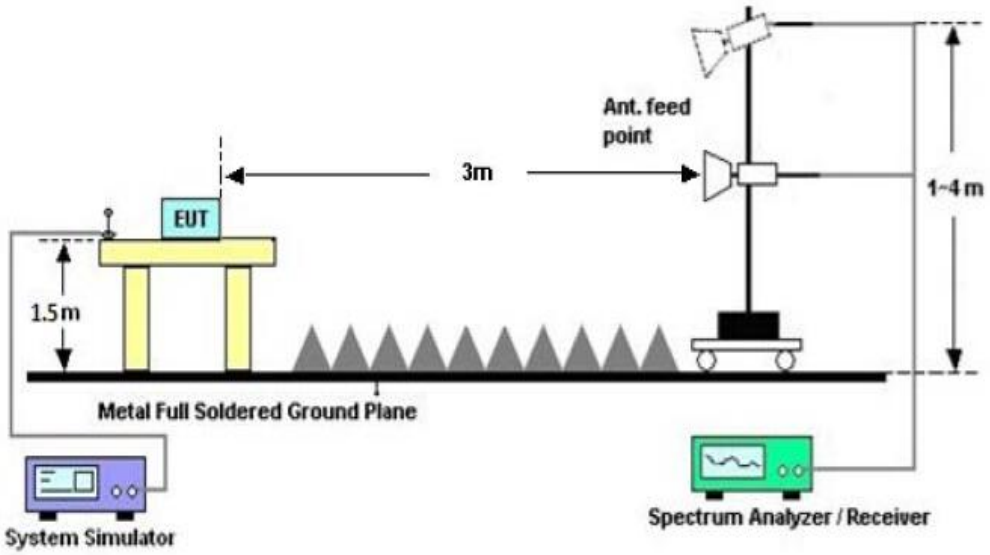
The “Factor” value can be calculated automatically by software of measurement system.

9. BAND EDGE EMISSION

9.1. MEASUREMENT PROCEDURE

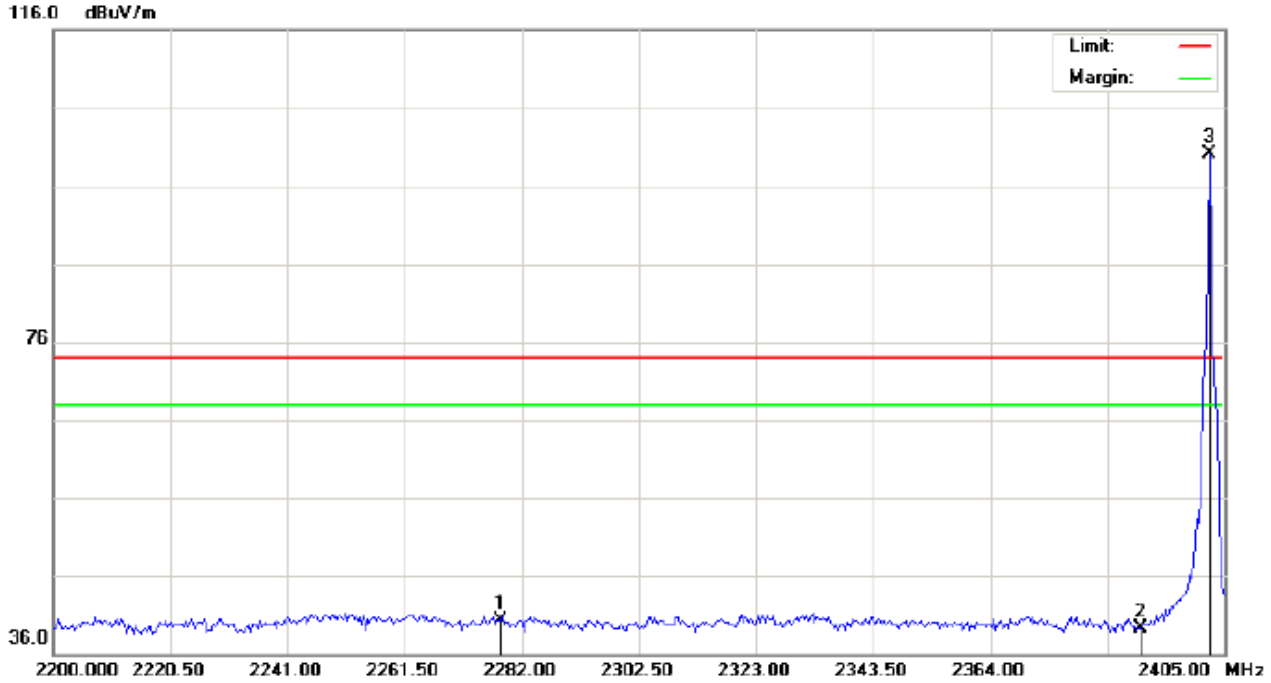
1. Set the EUT Work on the top, the bottom operation frequency individually.
2. Set SPA Start or Stop Frequency=Operation Frequency, RBW>=100kHz, VBW>=3*RBW, Center frequency =Operation frequency
3. The band edges was measured and recorded.

9.2. TEST SET-UP



9.3. TEST RESULT

TEST PLOT OF BAND EDGE FOR LOW CHANNEL -Horizontal



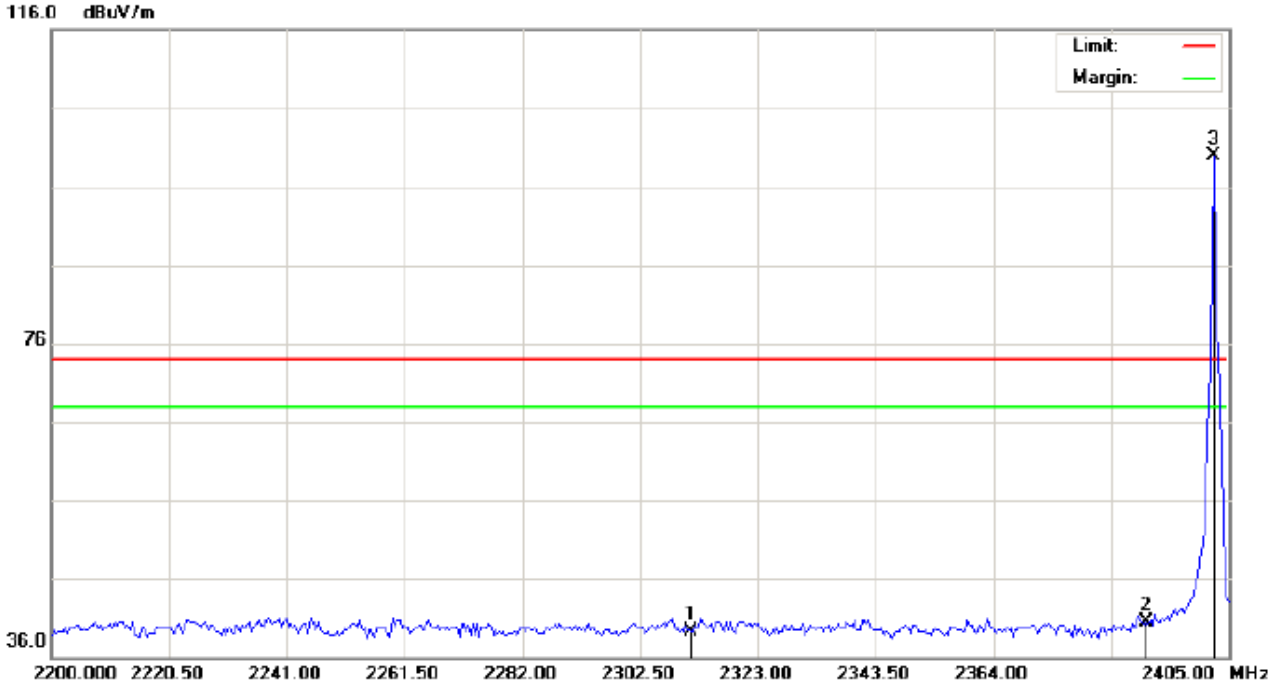
Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Low Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2278.241	30.03	10.19	40.22	74.00	-33.78	peak			
2		2390.308	29.00	10.31	39.31	74.00	-34.69	peak			
3	*	2402.000	89.72	10.32	100.04	74.00	26.04	peak			

TEST PLOT OF BAND EDGE FOR LOW CHANNEL - Vertical



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: Low Channel TX
Note:

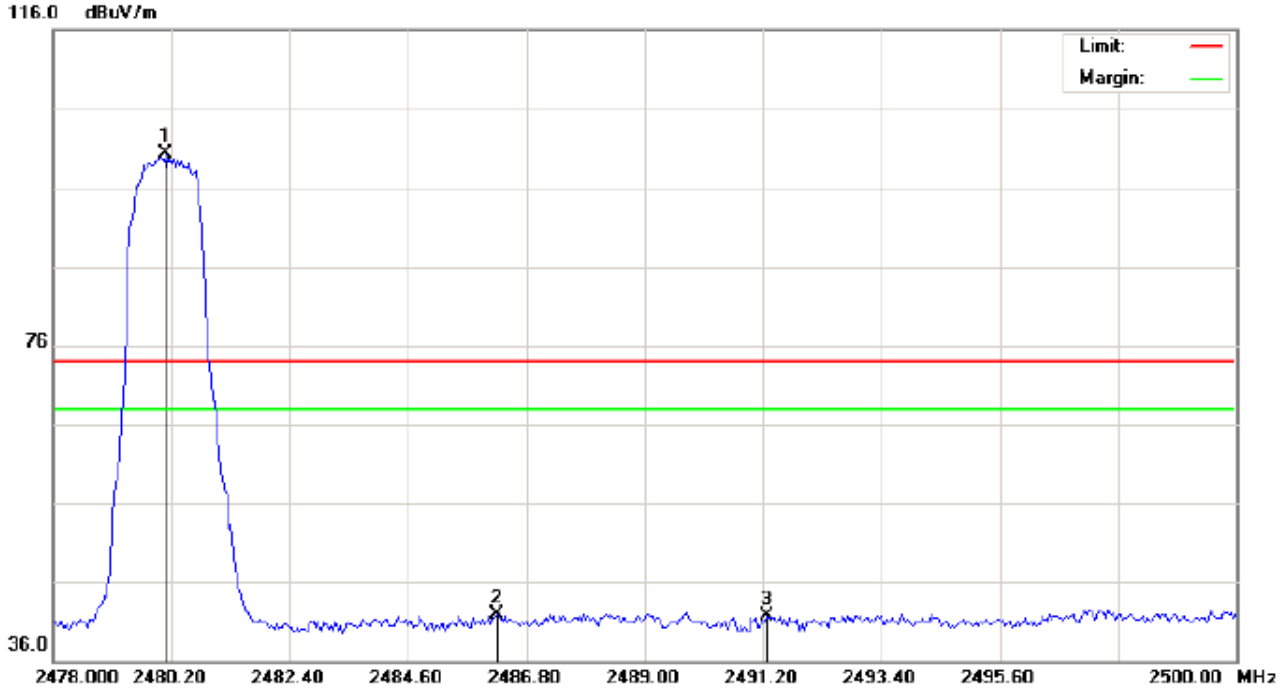
Polarization: *Vertical*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2311.383	29.15	10.22	39.37	74.00	-34.63	peak			
2		2390.650	30.10	10.31	40.41	74.00	-33.59	peak			
3	*	2402.000	89.59	10.32	99.91	74.00	25.91	peak			

RESULT: PASS

TEST PLOT OF BAND EDGE FOR HIGH CHANNEL –Horizontal



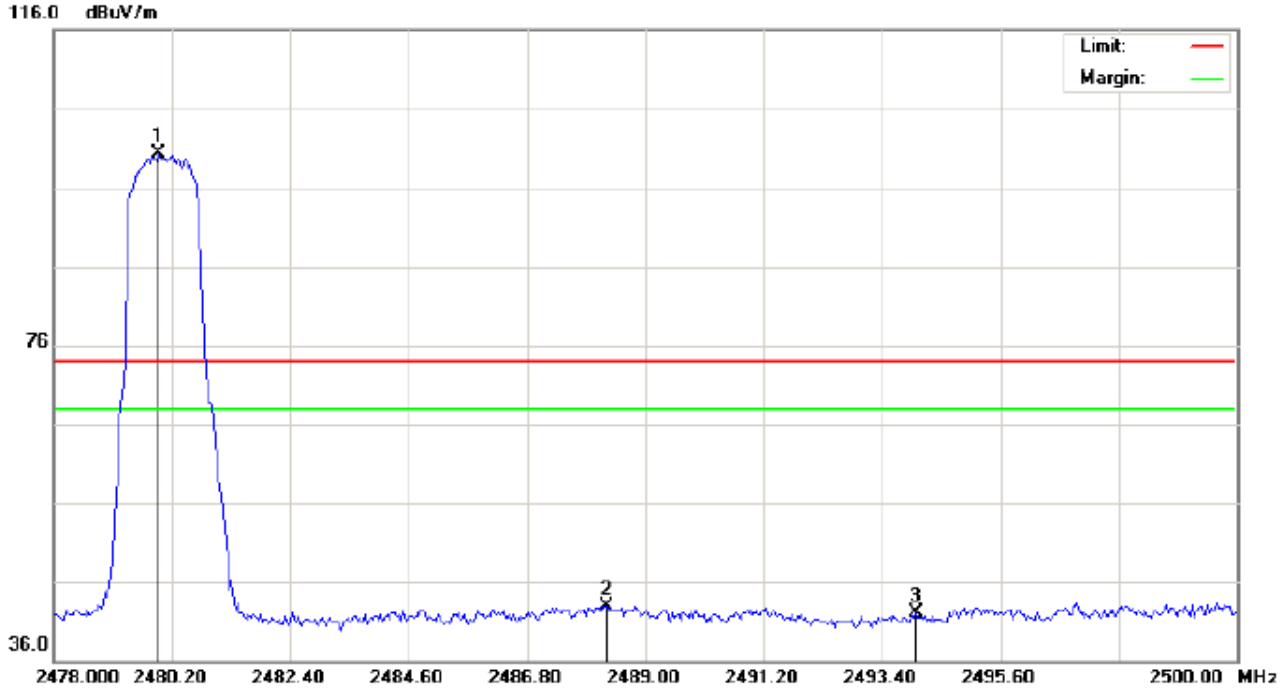
Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: High Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	89.84	10.41	100.25	74.00	26.25	peak			
2		2486.250	31.51	10.41	41.92	74.00	-32.08	peak			
3		2491.273	31.24	10.42	41.66	74.00	-32.34	peak			

TEST PLOT OF BAND EDGE FOR HIGH CHANNEL -Vertical



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: WiSe 1230 BLE Module
M/N: WiSe1230
Mode: High Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 26
Humidity: 60 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	89.95	10.41	100.36	74.00	26.36	peak			
2		2488.267	32.56	10.42	42.98	74.00	-31.02	peak			
3		2494.023	31.62	10.42	42.04	74.00	-31.96	peak			

RESULT: PASS

10. 6DB BANDWIDTH

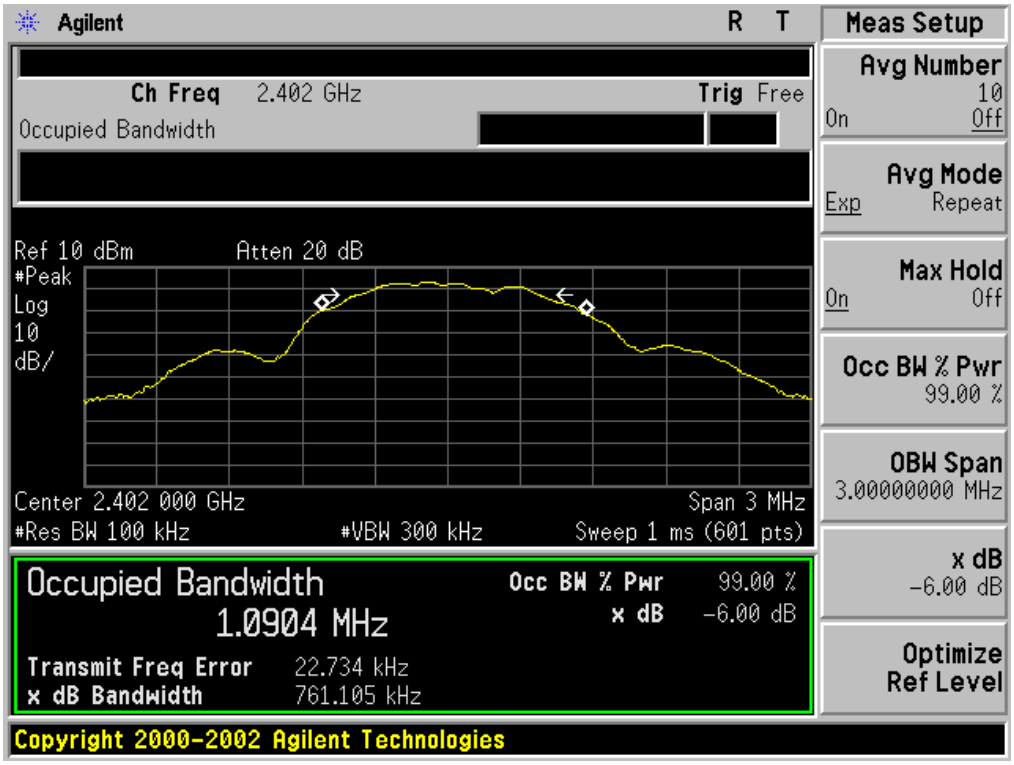
10.1. TEST PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW⩾3*RBW.
4. Set SPA Trace 1 Max hold, then View.

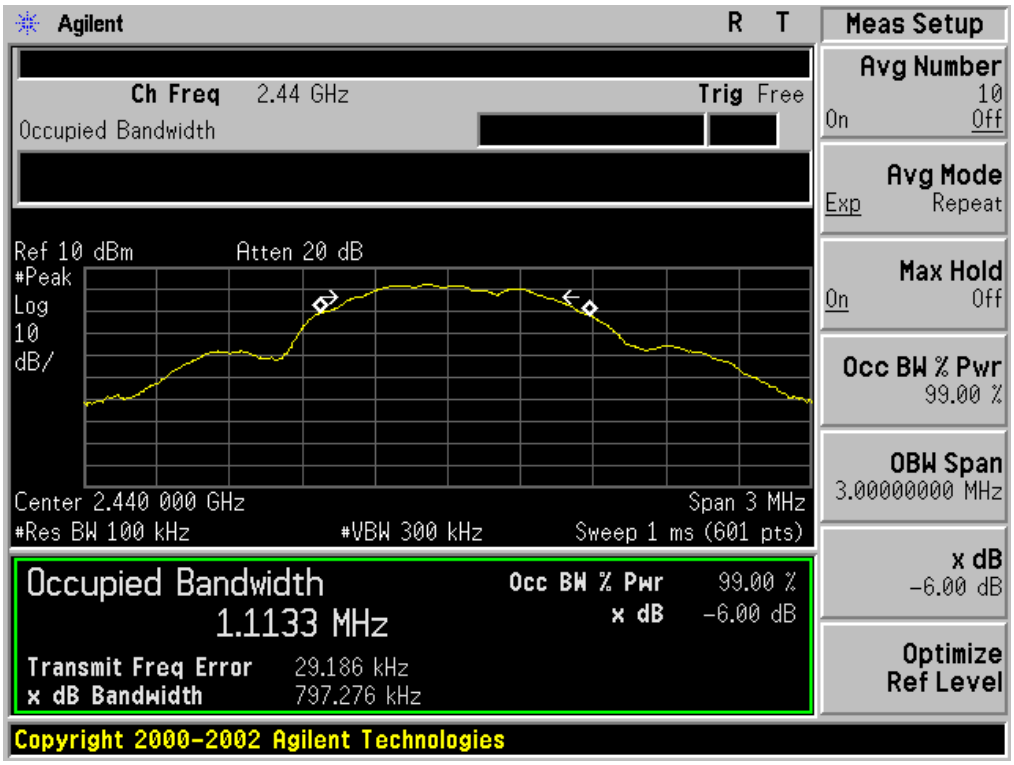
10.2. SUMMARY OF TEST RESULTS/PLOTS

Channel	6dB Bandwidth (KHz)	Minimum Limit (KHz)	Pass/Fail
Low	0.761	500KHz	Pass
Middle	0.797		Pass
High	0.784		Pass

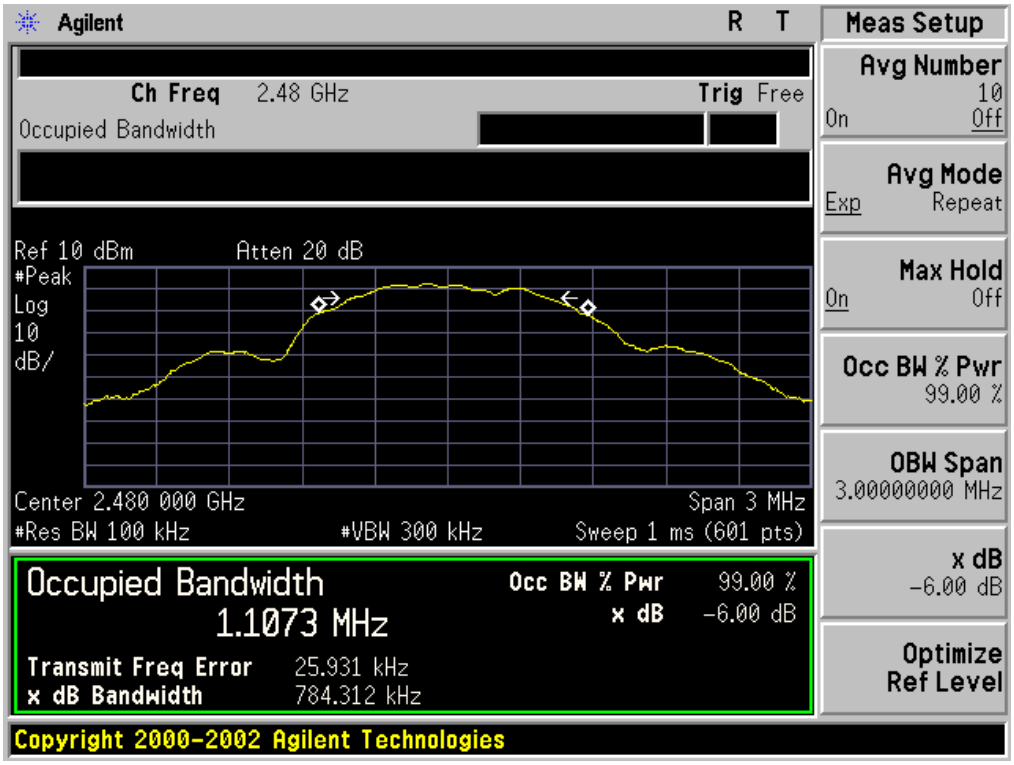
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

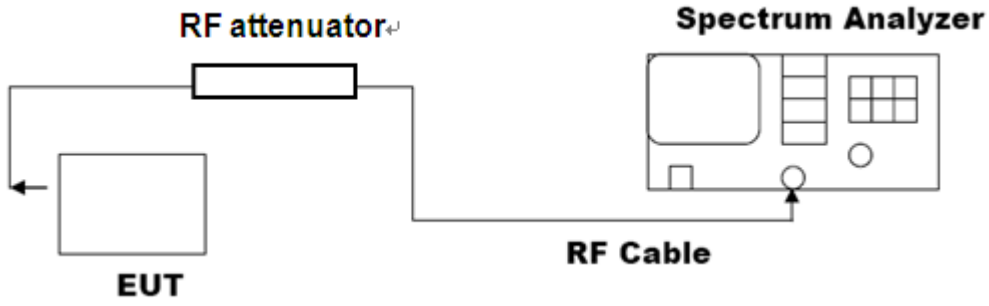


11. CONDUCTED OUTPUT POWER

11.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, middle and the bottom operation frequency individually.
3. Use the following spectrum analyzer settings:
   a) Set the RBW ≥ DTS bandwidth.
   b) Set VBW ≥ 3 □ RBW.
   c) Set span ≥ 3 x RBW
   d) Sweep time = auto couple.
   e) Detector = peak.
   f) Trace mode = max hold.
   g) Allow trace to fully stabilize.
   h) Use peak marker function to determine the peak amplitude level.
4. Allow the trace to stabilize.
5. Record the result form the Spectrum Analyzer.

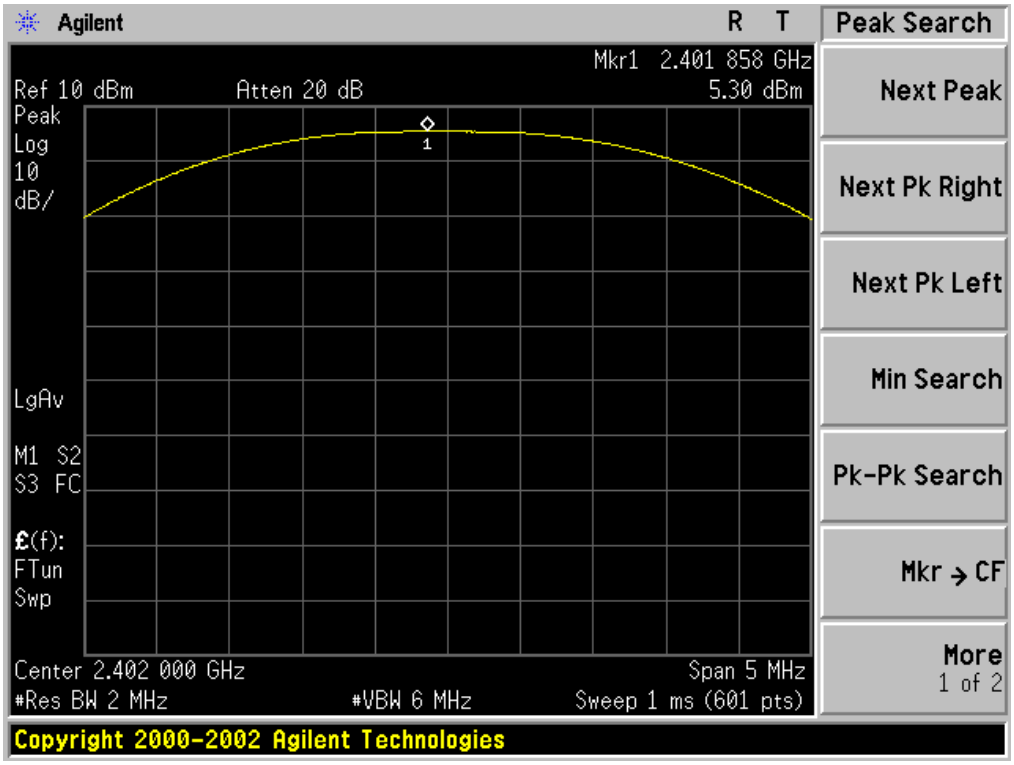
11.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



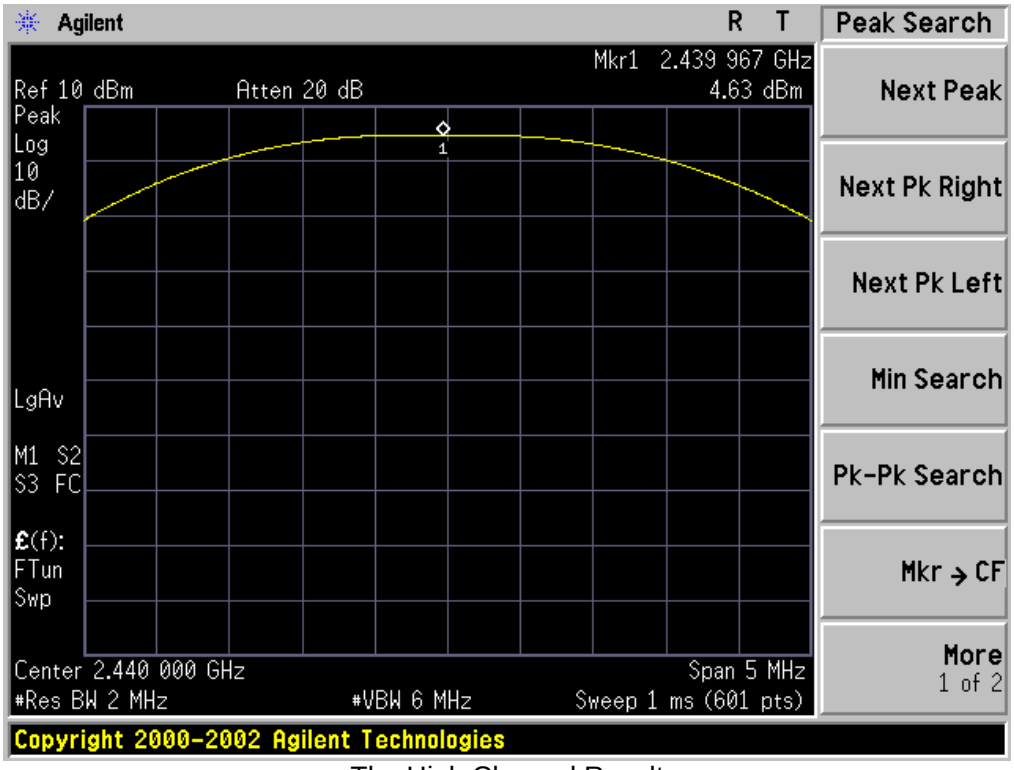
11.3. LIMITS AND MEASUREMENT RESULT

Channel	Peak Power (dBm)	Applicable Limits (dBm)	Pass/Fail
Low Channel	5.30	30	Pass
Middle Channel	4.63	30	Pass
High Channel	4.53	30	Pass

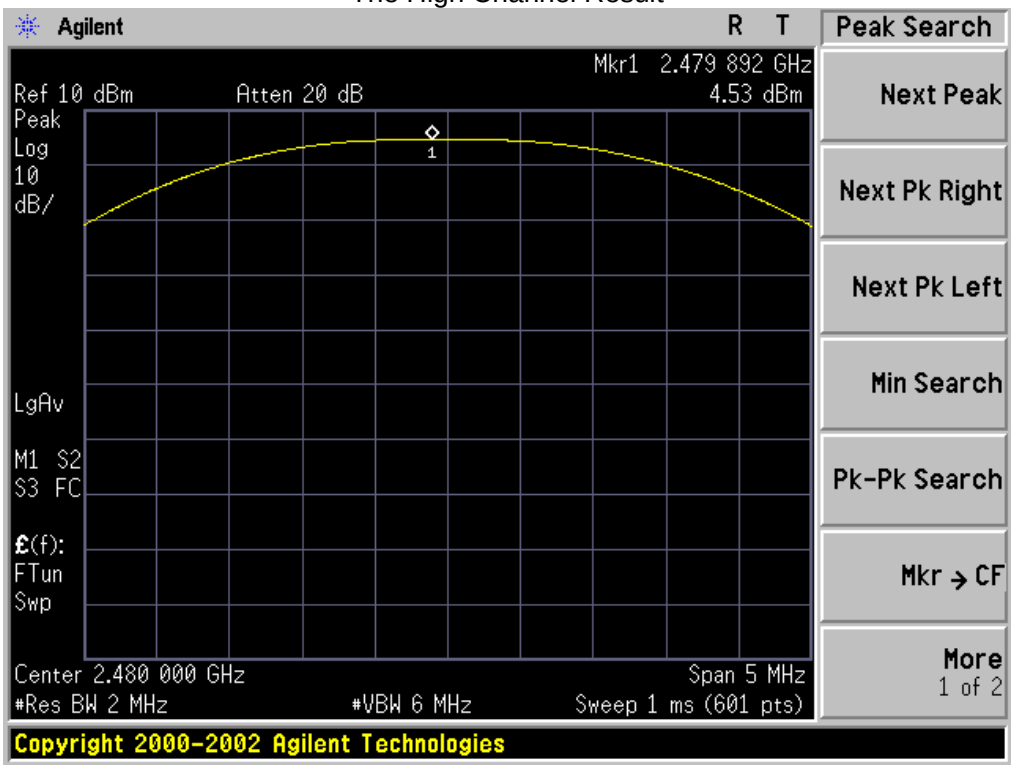
The Low Channel Result



The Middle Channel Result



The High Channel Result

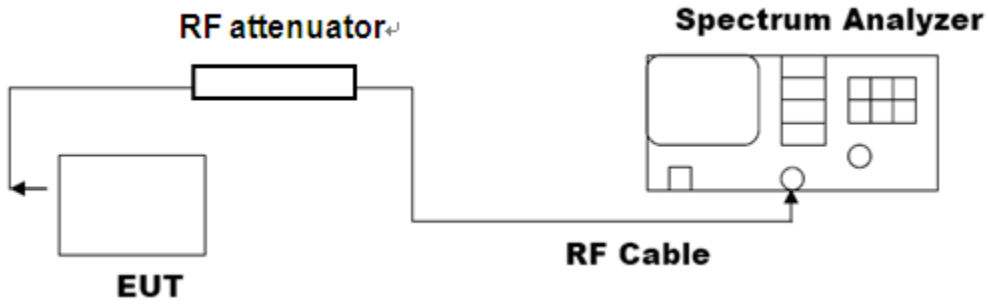


12. CONDUCTED SPURIOUS EMISSION

12.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
   1. RBW = 100 kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

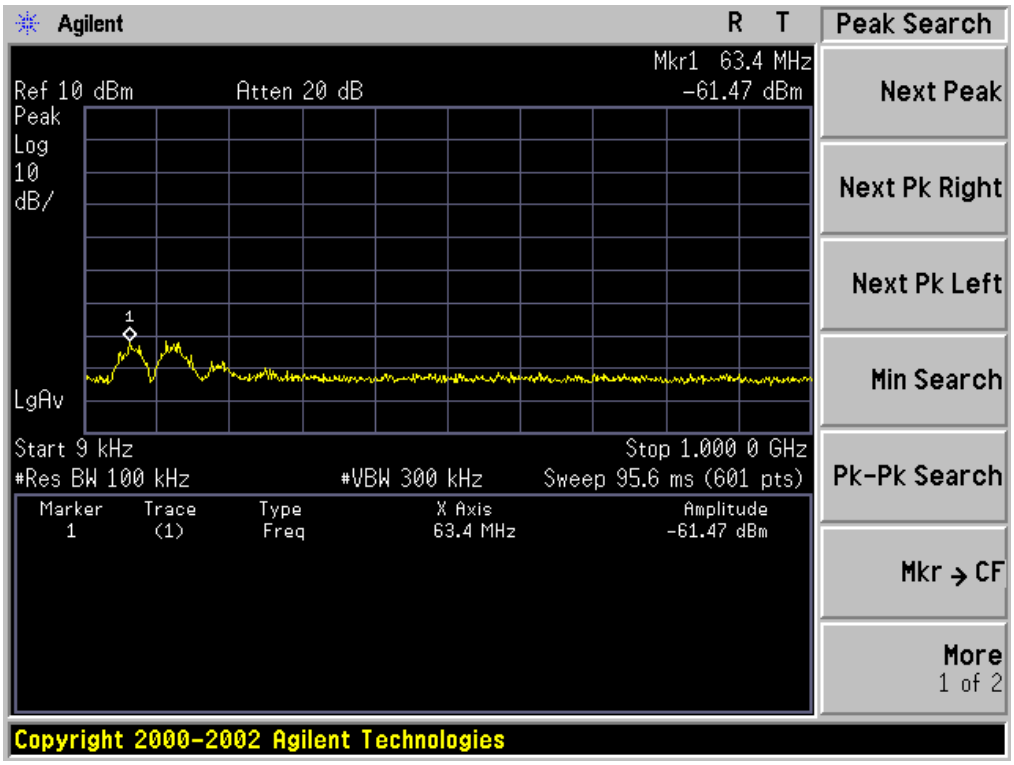
12.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

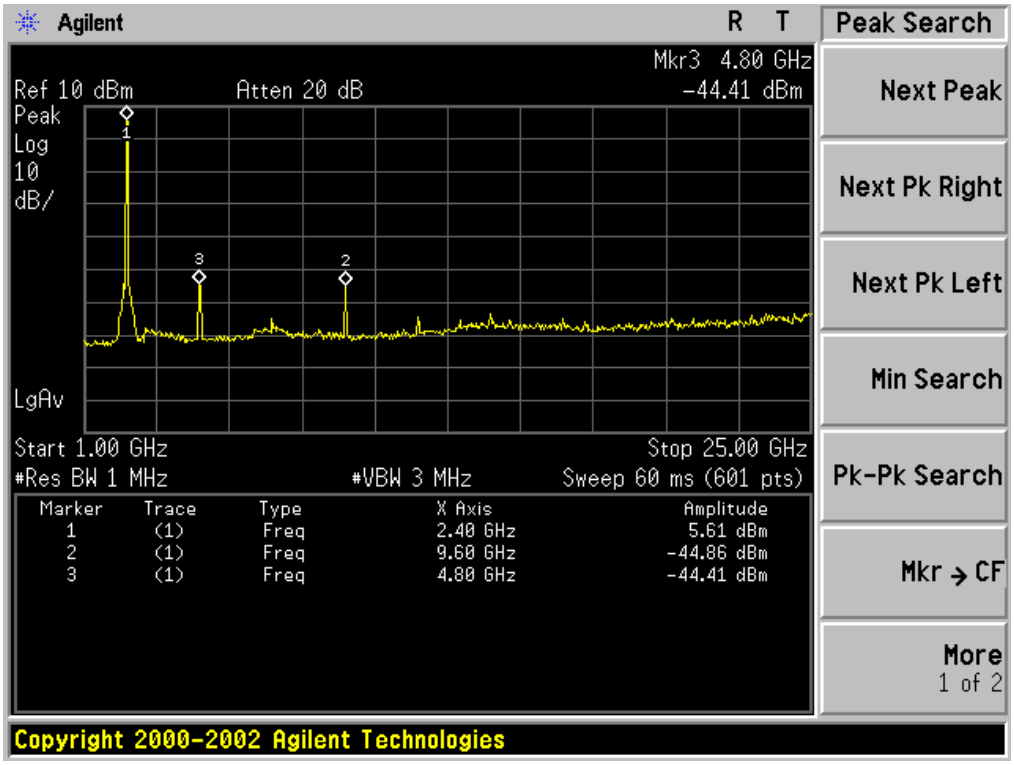


12.3. LIMITS AND MEASUREMENT RESULT

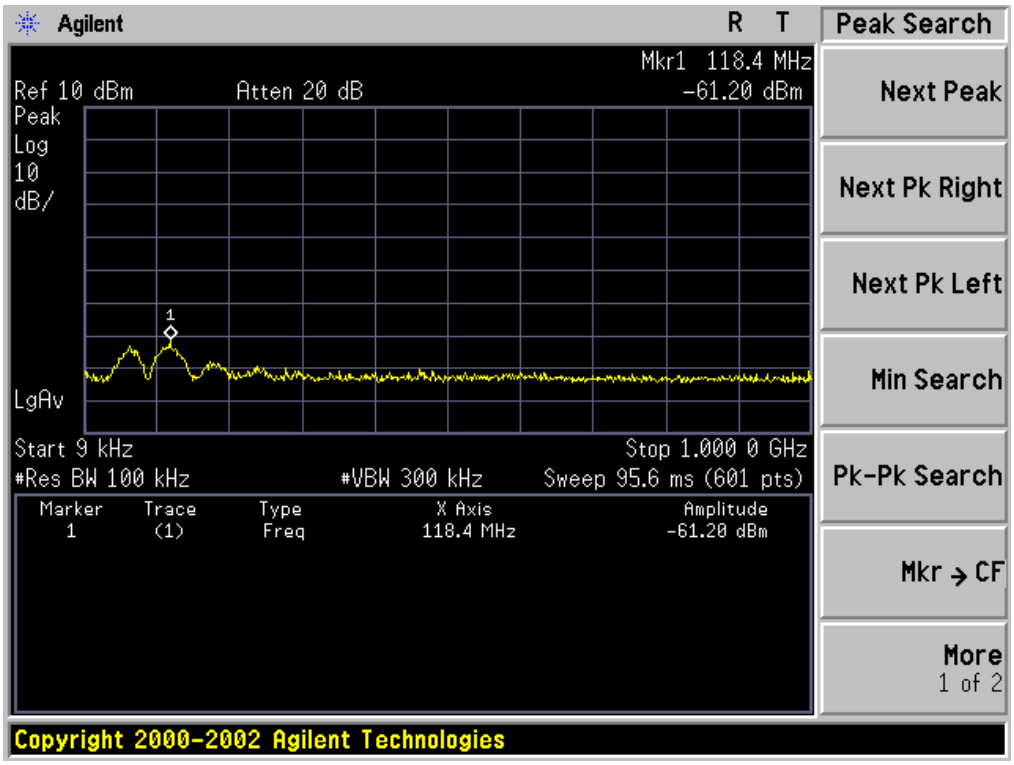
LIMITS AND MEASUREMENT RESULT		
Applicable Limits	**Measurement Result**	
	Test Data	**Result**
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation 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))	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
	At least -20dBc than the limit Specified on the TOP Channel	PASS

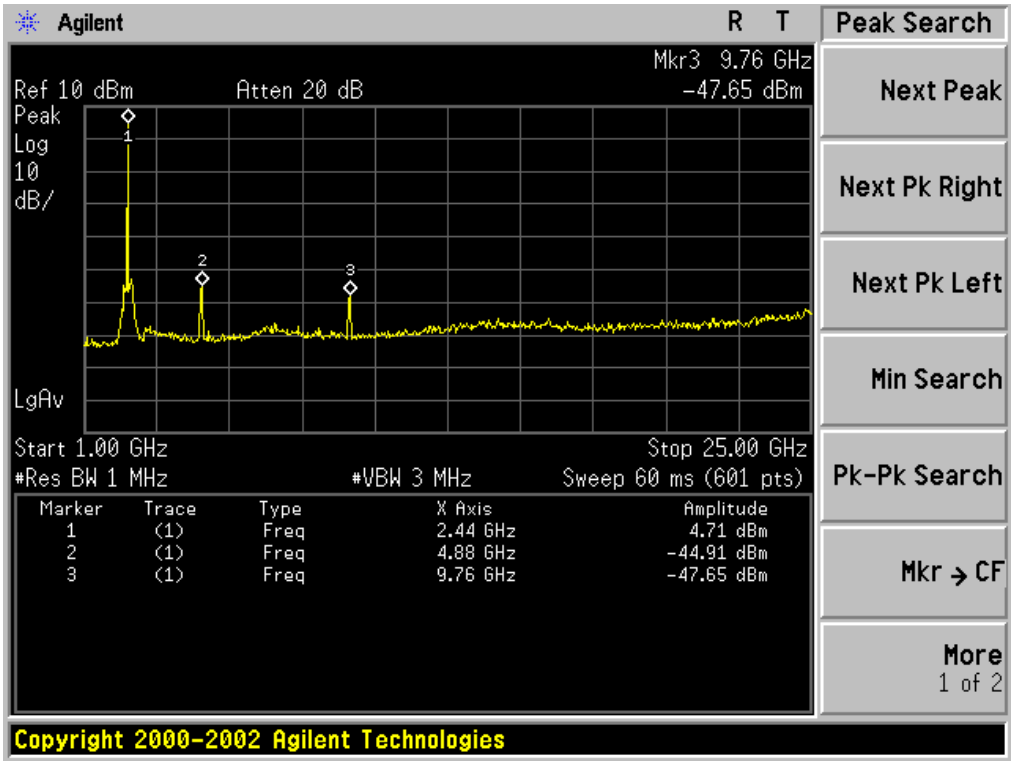
TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE
OF GFSK MODULATION IN LOW CHANNEL



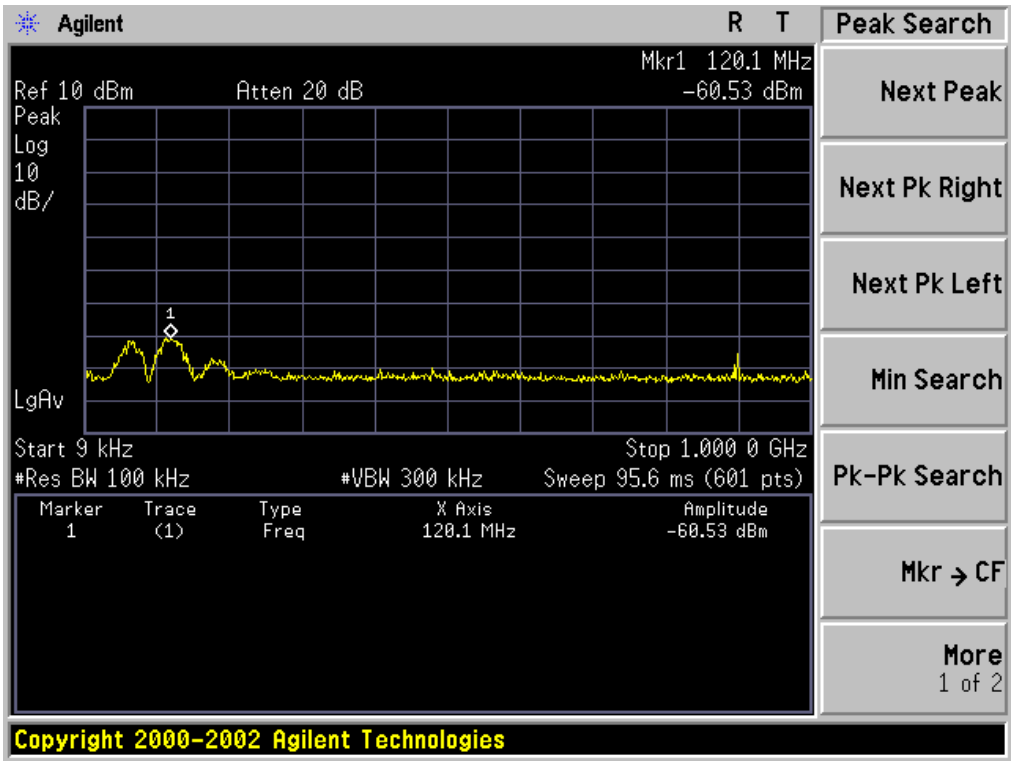


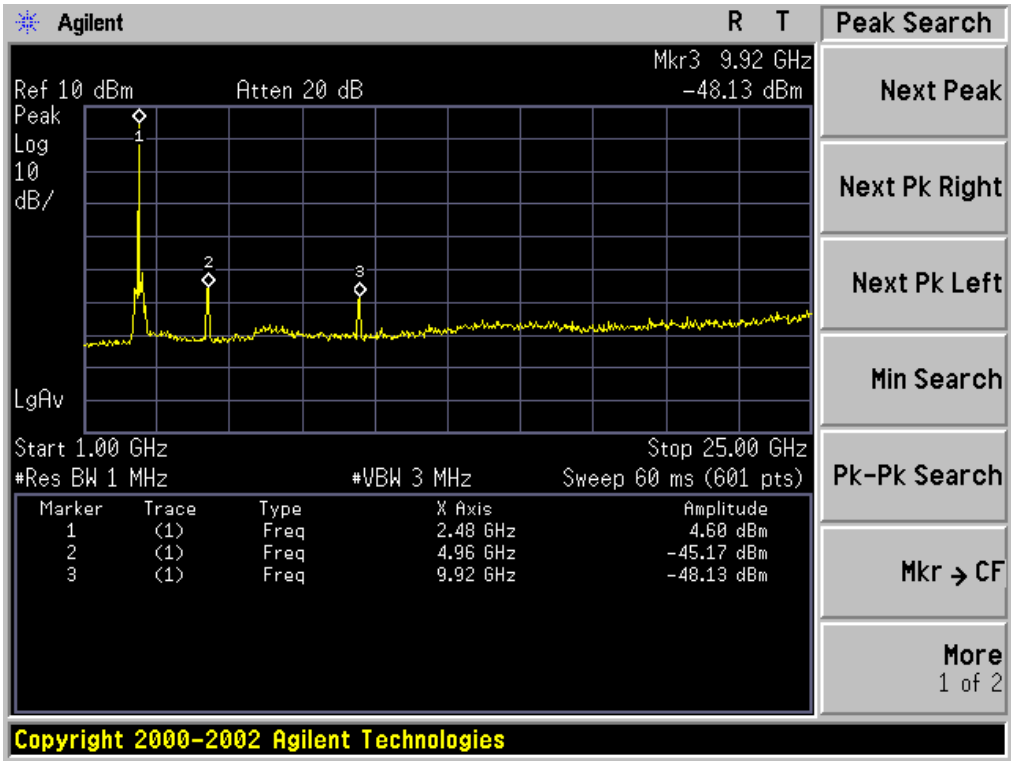
TEST PLOT OF OUT OF BAND EMISSIONS
OF GFSK MODULATION IN MIDDLE CHANNEL





TEST PLOT OF OUT OF BAND EMISSIONS
OF GFSK MODULATION IN HIGH CHANNEL





13. CONDUCTED OUTPUT POWER SPECTRAL DENSITY

13.1 MEASUREMENT PROCEDURE

(1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator

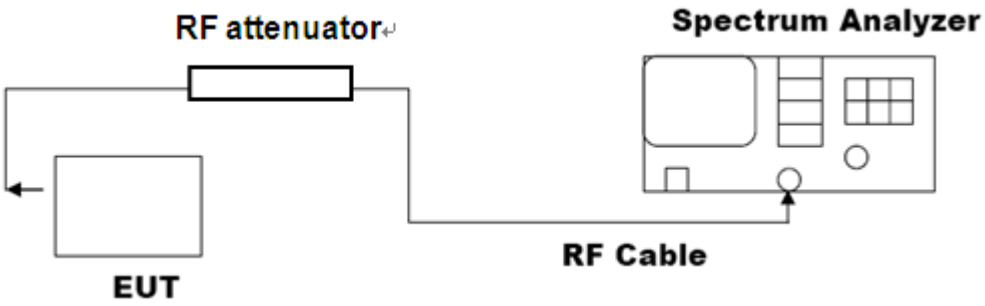
(2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.

(3). Set the span to 1.5times the DTS bandwidth, RBW: 3kHz<=RBW<=100KHz, VBW>=3*RBW

(4). Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

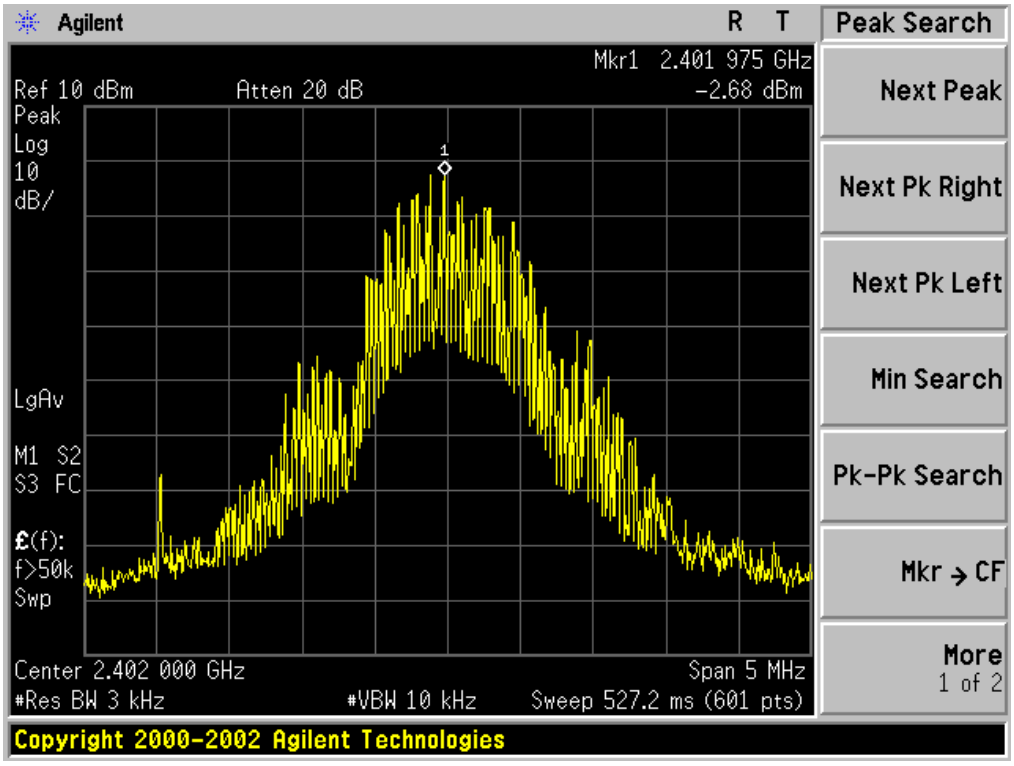
13.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



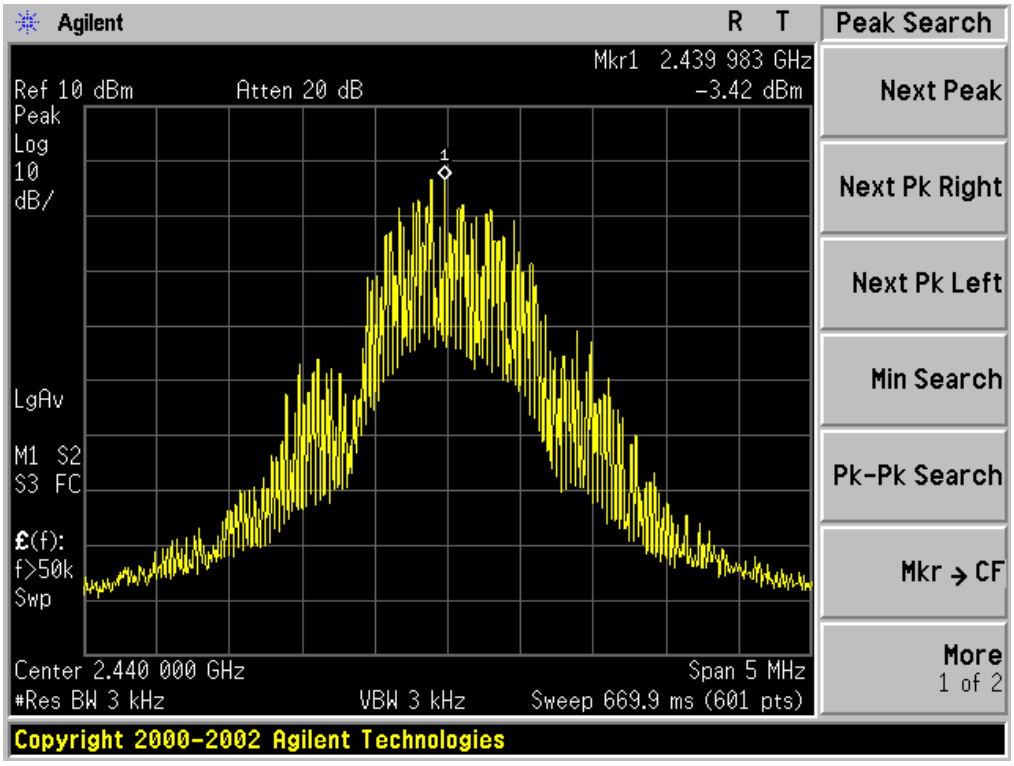
13.3 LIMITS AND MEASUREMENT RESULT

Channel No.	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
Low Channel	-2.68	8	Pass
Middle Channel	-3.42	8	Pass
High Channel	-3.52	8	Pass

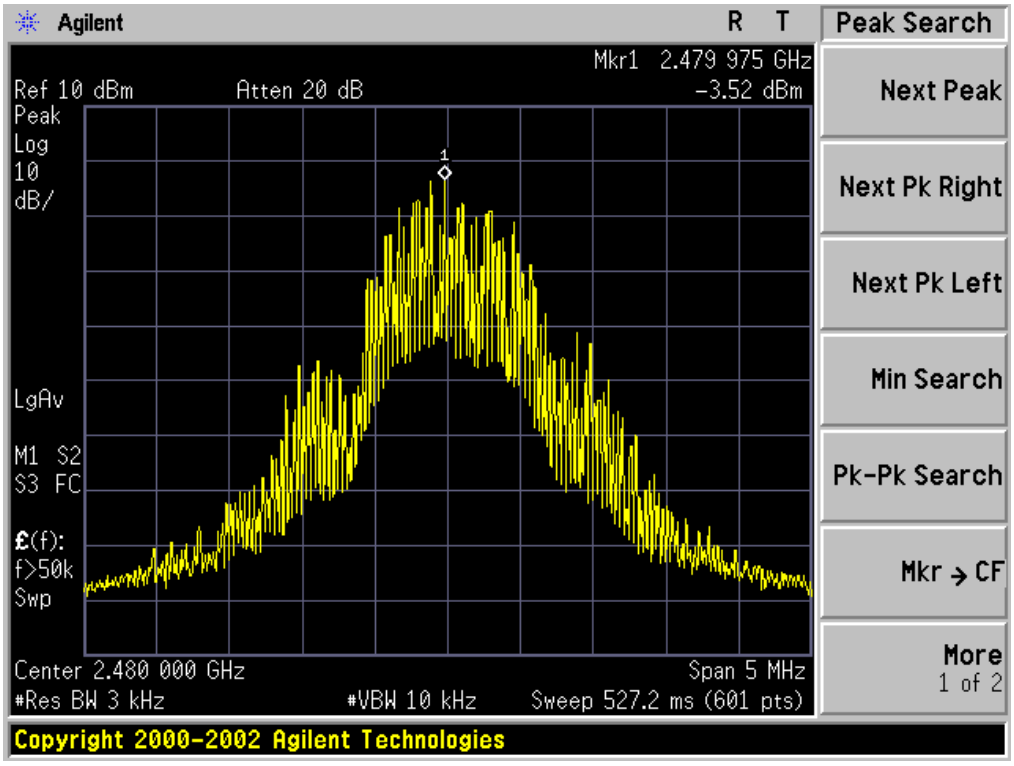
TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL



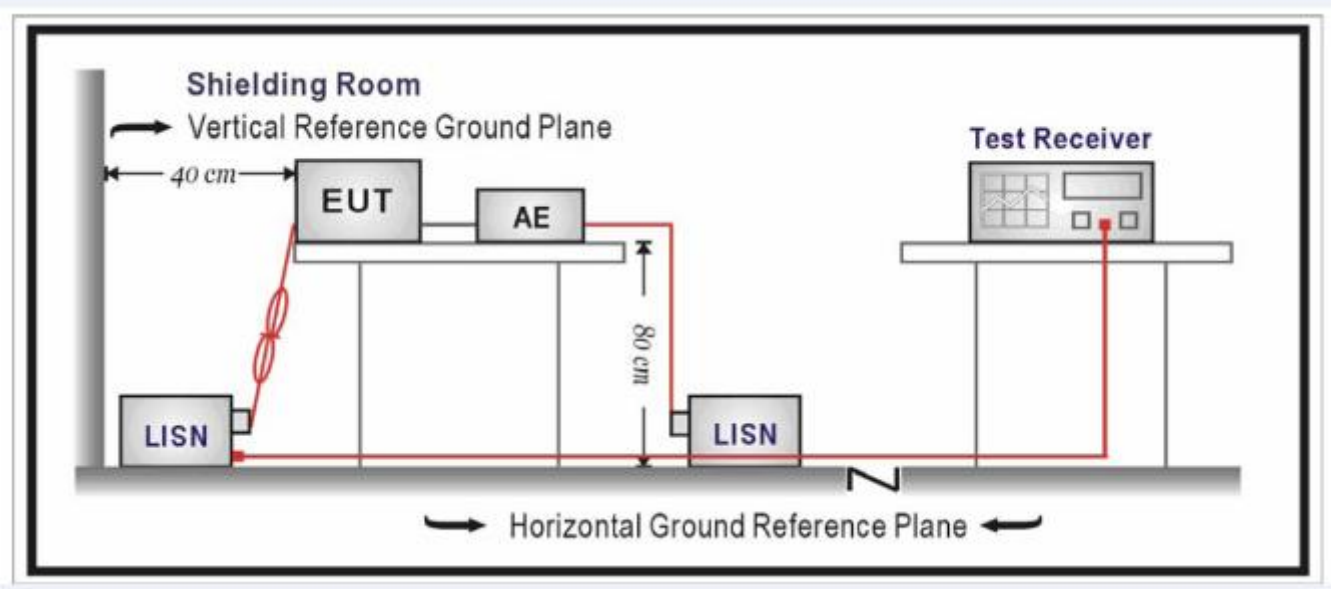
14. LINE CONDUCTED EMISSION TEST

14.1 LIMITS

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

***Note:** 1. The lower limit shall apply at the transition frequency.*
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

14.2 TEST SETUP



14.3 PRELIMINARY PROCEDURE

1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2) Support equipment, if needed, was placed as per ANSI C63.10.
3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4) All support equipments received AC120V/60Hz power from a LISN, if any.
5) The EUT received DC charging voltage by adapter which received 120V/60Hzpower by a LISN.
6) The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7) Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8) During the above scans, the emissions were maximized by cable manipulation.
9) The following test mode(s) were scanned during the preliminary test.
   Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

14.4 FINAL TEST PROCEDURE

1) EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3) The test data of the worst case condition(s) was reported on the Summary Data page.

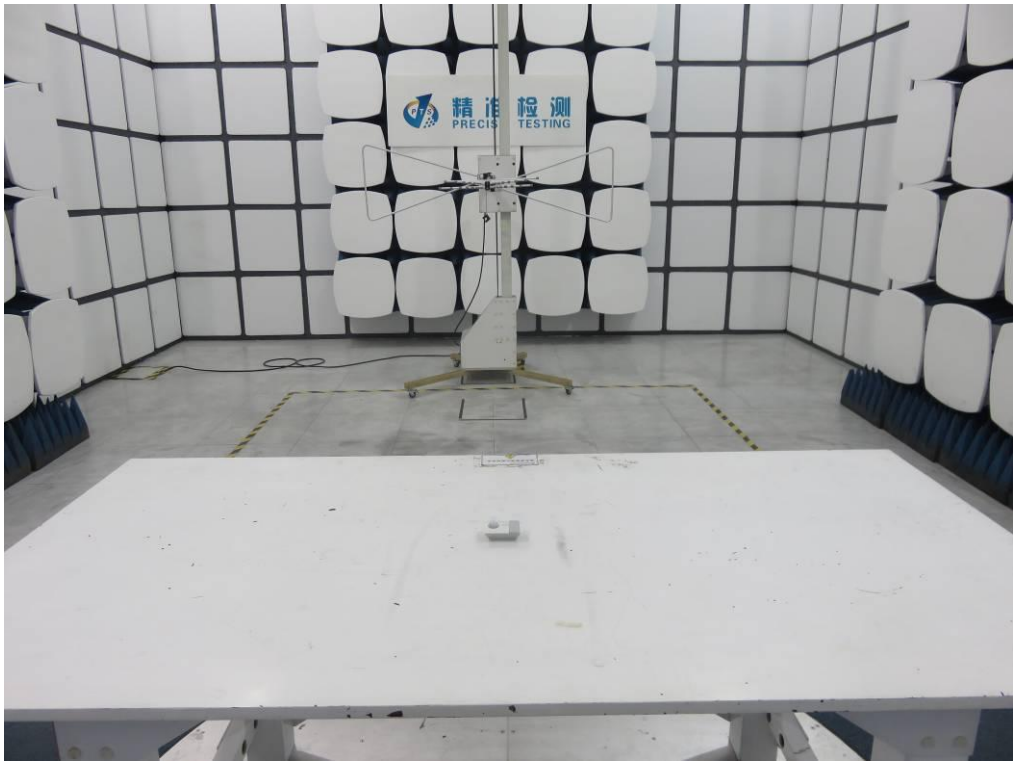
14.5 TEST RESULT OF POWER LINE

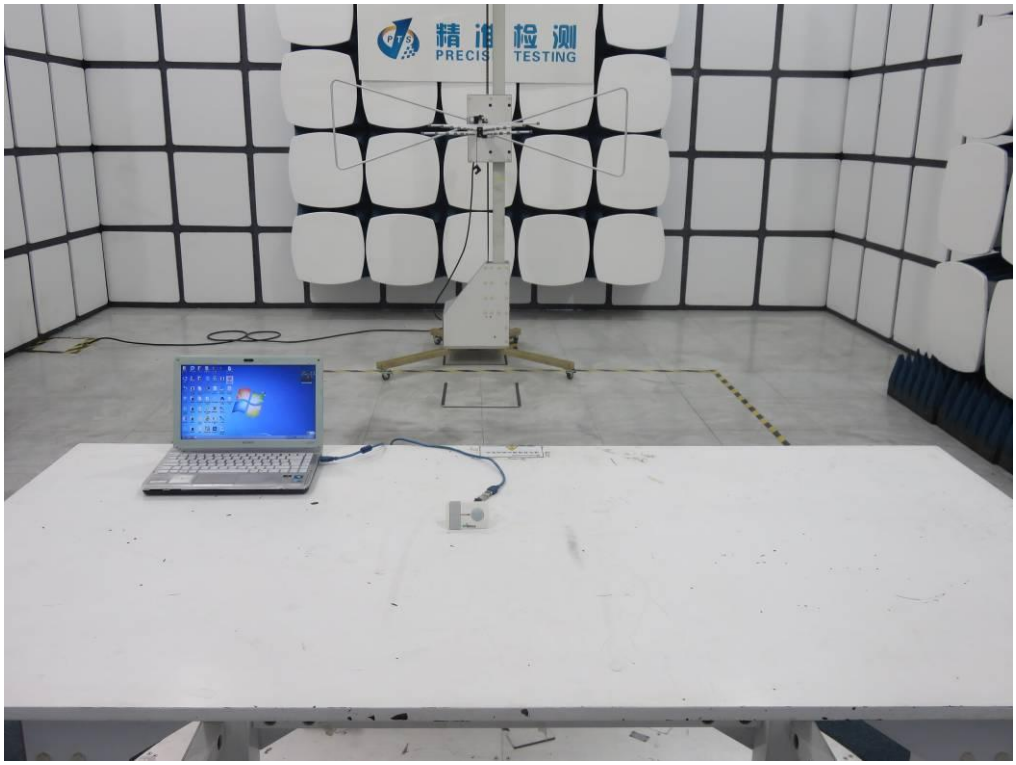
N/A

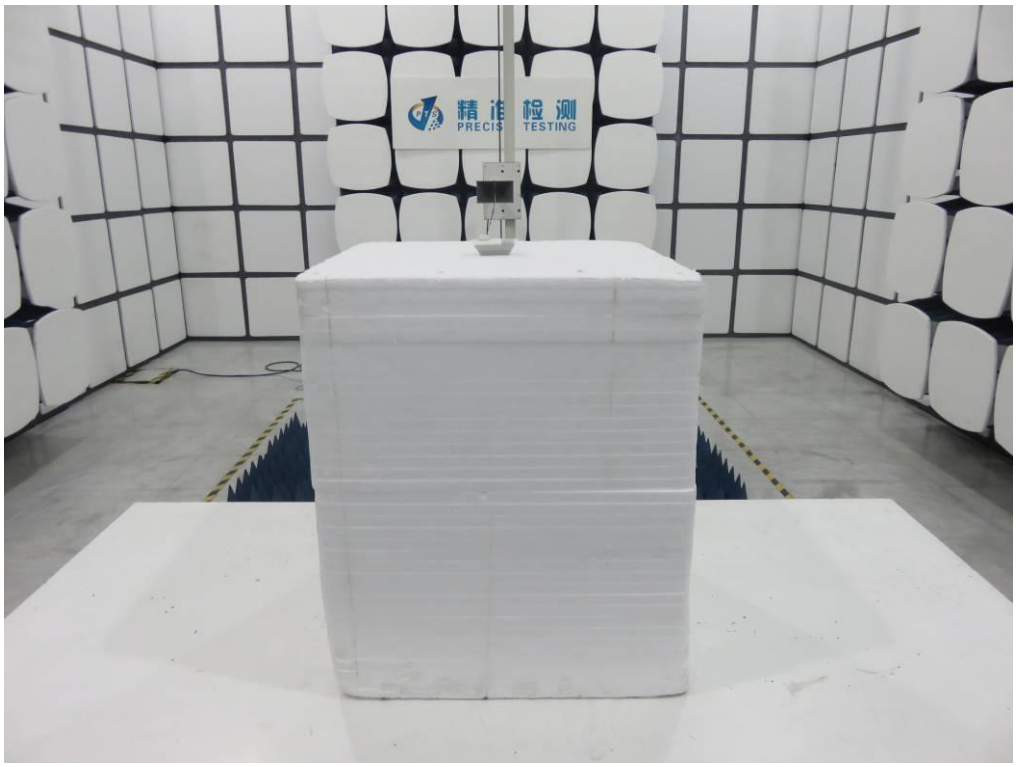
Note: Owing to the EUT supplied by battery, the test item is not applicable.

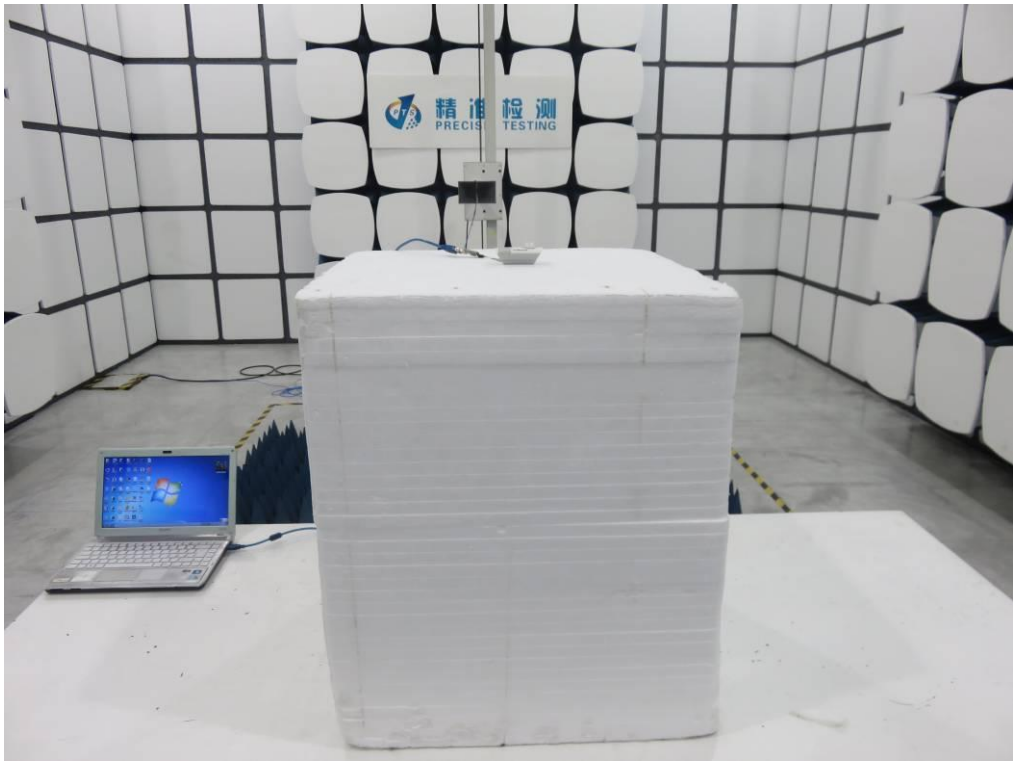
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC RADIATED EMISSION TEST SETUP



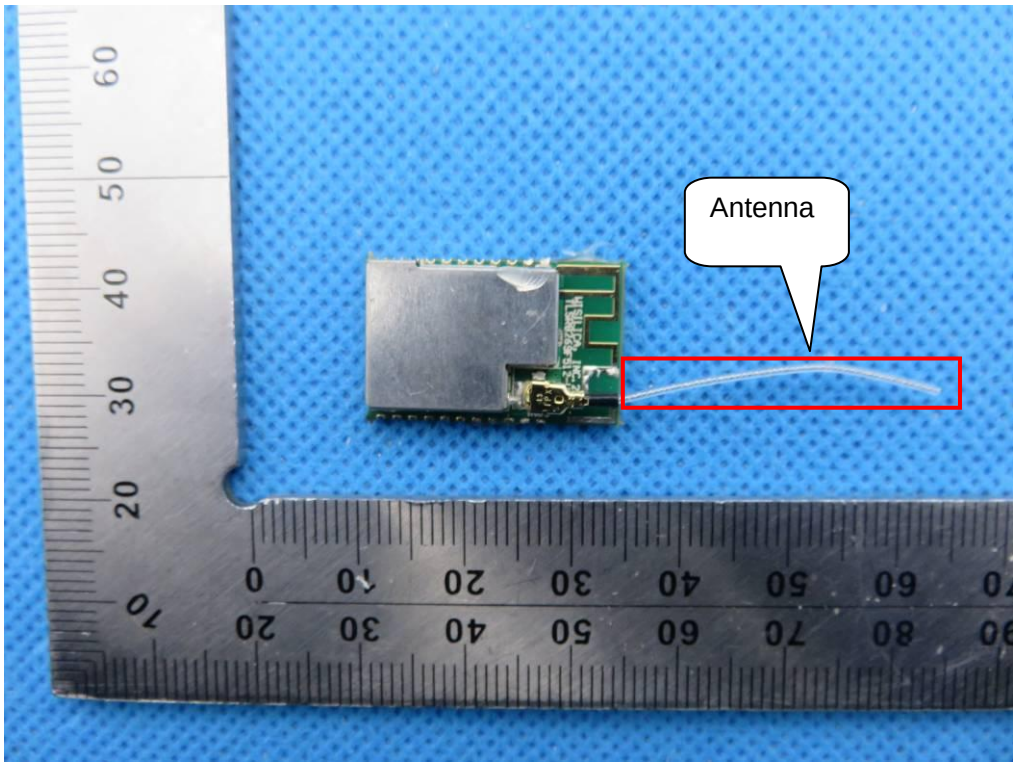




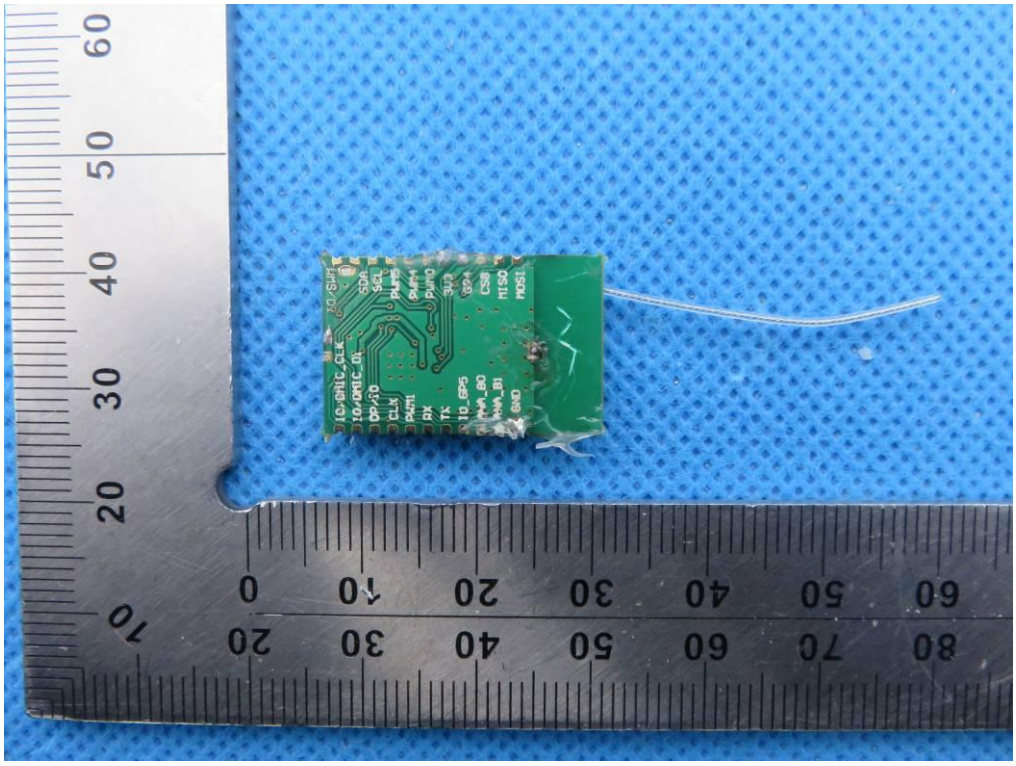


APPENDIX B: PHOTOGRAPHS OF EUT

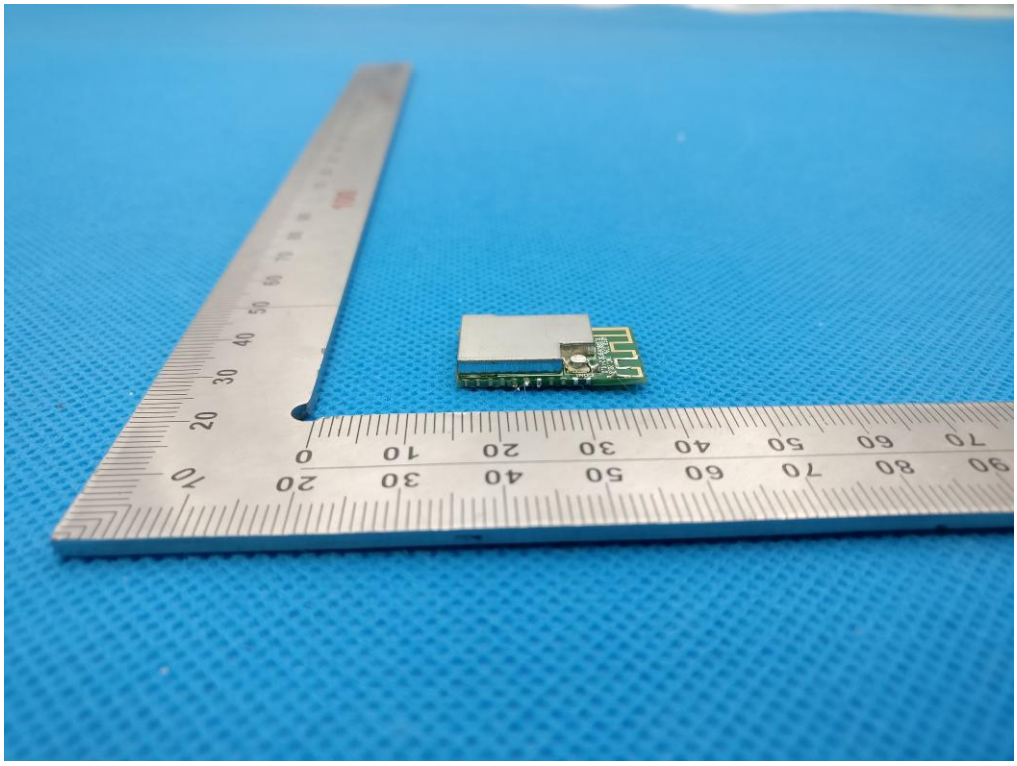
VIEW OF EUT-1



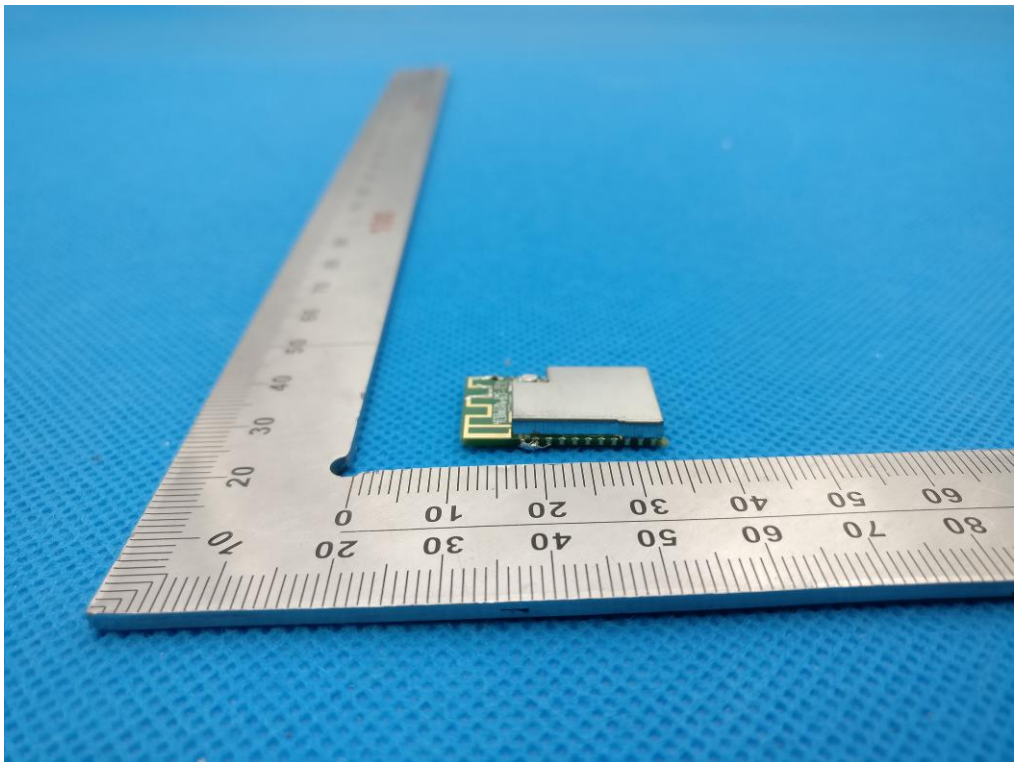
VIEW OF EUT-2



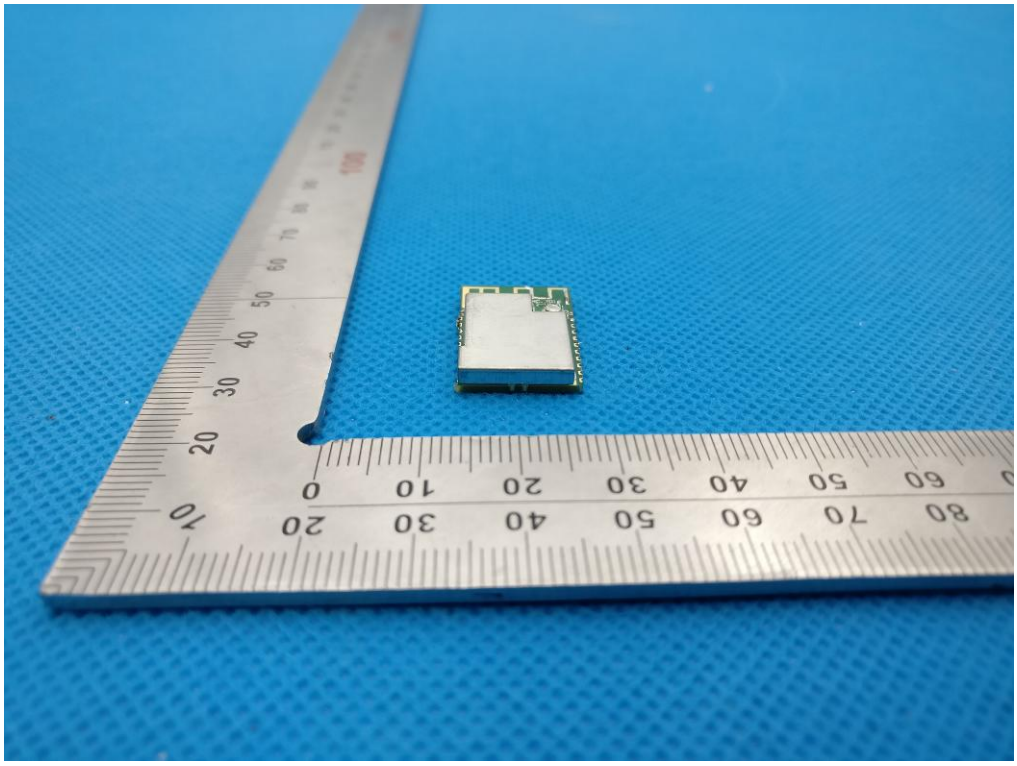
VIEW OF EUT-3



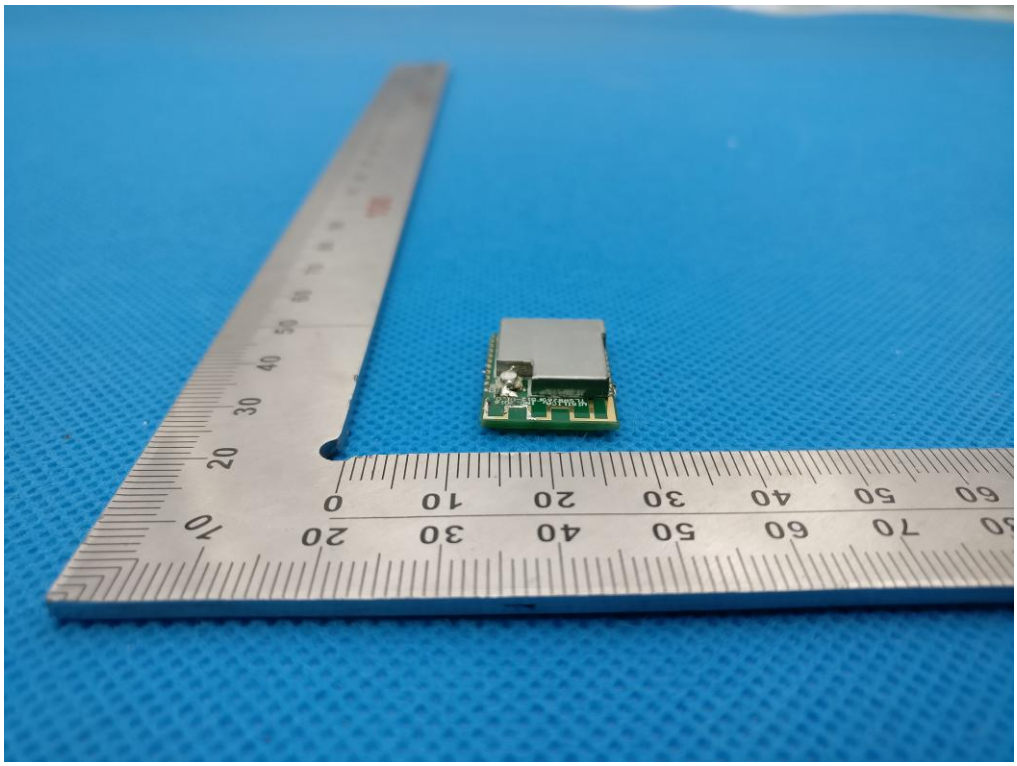
VIEW OF EUT-4



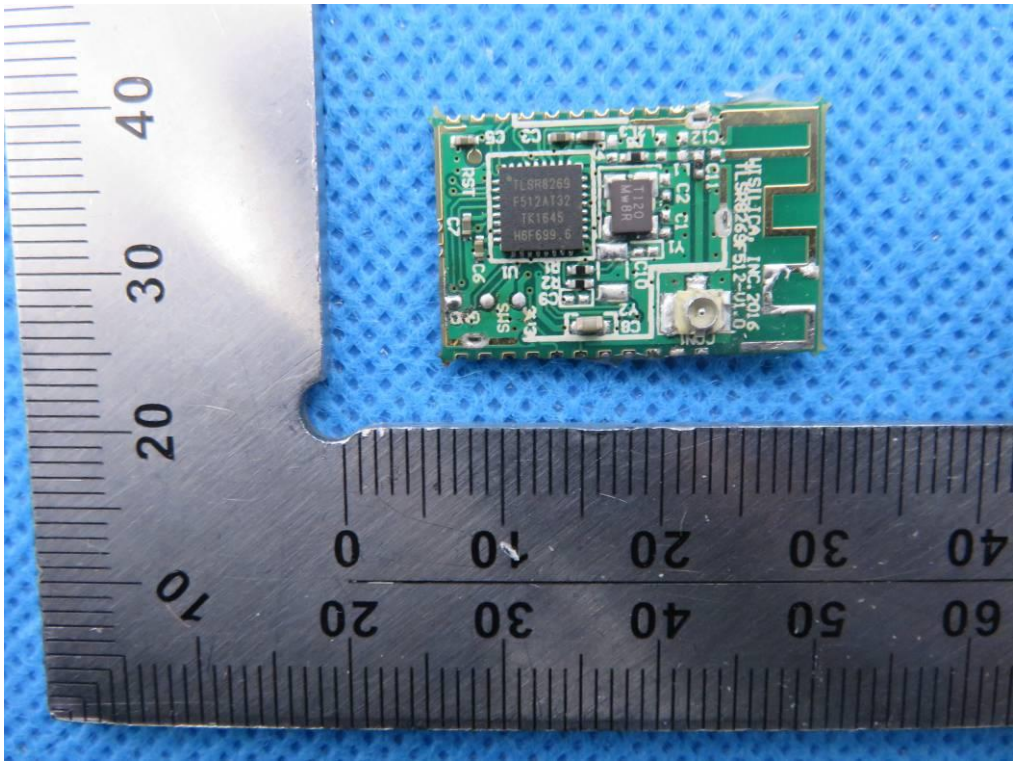
VIEW OF EUT-5



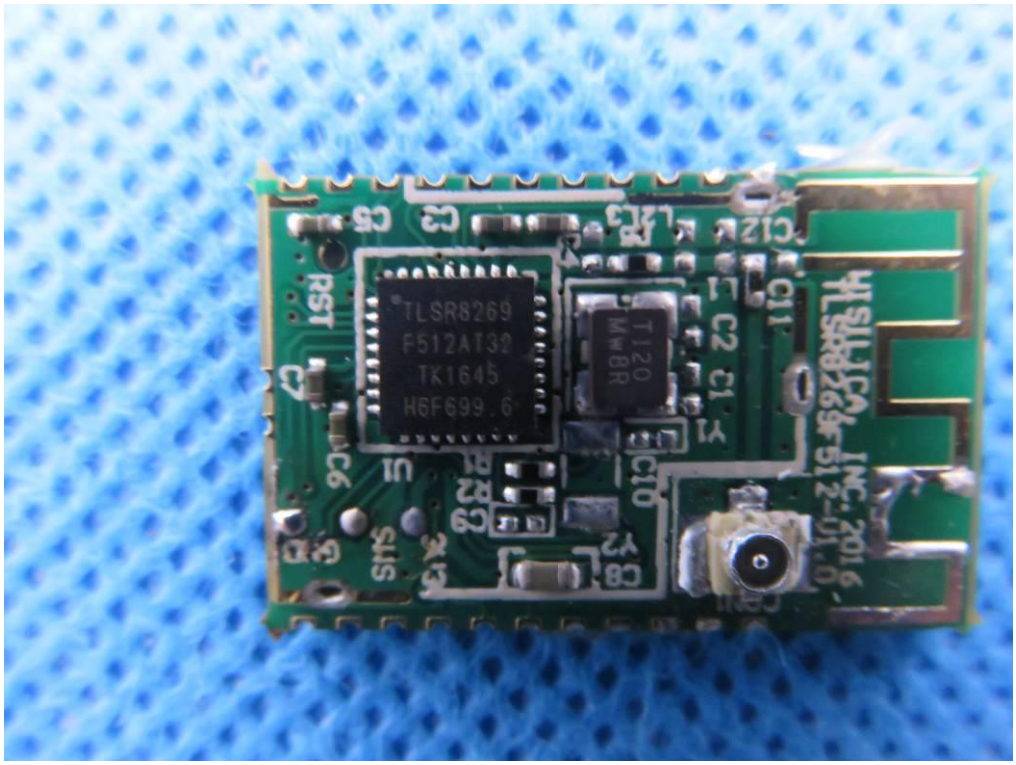
VIEW OF EUT-6



VIEW OF EUT-7



VIEW OF EUT-8



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