

FCC Test Report

Report No.: AGC01993180305FE03

FCC ID : 2AEKFMTX
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : Bling Helmet
BRAND NAME : LIVALL, Smart4u
MODEL NAME : See Page 4
CLIENT : LIVALL Tech Co., Ltd
DATE OF ISSUE : Apr. 02, 2018
STANDARD(S) : FCC Part 15 Subpart C Section 15.249
TEST PROCEDURE(S)
REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Apr. 02, 2018	Valid	Initial release

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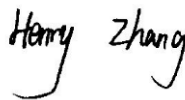
1. VERIFICATION OF CONFORMITY

Applicant	LIVALL Tech Co., Ltd.
Address	Room 904, 9F., R&D Building, Shenzhen Tsinghua Hi-Tech Park, Nanshan District, Shenzhen, China
Manufacturer	LIVALL Tech Co., Ltd.
Address	Room 904, 9F., R&D Building, Shenzhen Tsinghua Hi-Tech Park, Nanshan District, Shenzhen, China
Product Designation	Bling Helmet
Brand Name	LIVALL, Smart4u
Test Model	MT1
Series Model	MTL, BH60SE, BH62, BH61S, SH55M
Difference description	All the same except for the brand name, model name, appearance color and structure. 1. The first brand name is applicable for the model MT1, MTL, BH60SE, BH62, BH61S, SH55M, and the second brand name is applicable for SH55M. 2. The model MT1, BH60SE, BH62, BH61S, SH55M have microphone and loudspeaker, while MTL without loudspeaker.
Date of test	Mar. 12, 2018 to Mar. 20, 2018
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BR/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) 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 15.249. The test results of this report relate only to the tested sample identified in this report.

Tested By



Henry Zhang(Zhang Zhuorui)

Mar. 20, 2018

Reviewed By



Forrest Lei(Lei Yonggang)

Apr. 02, 2018

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz	
RF Output Power (for AB1512)	-5.10dBm(Max EIRP Power=Max radiation field-95.2)	
RF Output Power (for NRF51822)	-6.83dBm(Max EIRP Power=Max radiation field-95.2)	
Bluetooth module	AB1512	NRF51822
Bluetooth Version	V4.1	V4.0
Modulation	BR ☒ GFSK, EDR ☒ π /4-DQPSK, ☒ 8DPSK BLE ☐ GFSK	BR ☐ GFSK, EDR ☐ π /4-DQPSK, ☐ 8DPSK BLE ☒ GFSK
Number of channels	79 for BR/EDR, 40 for BLE	
Hardware Version	V1.0	
Software Version	V1.0	
Antenna Designation	PCB Antenna	
Antenna Gain	0dBi for AB1512, 0dBi for NRF51822	
Power Supply	DC 3.7V by battery	
Note:1. The BT function of two modules didn't work when charging. 2. The EUT has two Bluetooth modules. One is for Bluetooth speaker (AB1512), the other one is for LED light(NRF51822). Both have been assessed and the test data were recorded in the test report.		

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2.2. TABLE OF CARRIER FREQUENCIES

BR/EDR channel List

Frequency Band	Channel Number	Frequency
2400~2483.5MHz	0	2402MHz
	1	2403MHz
	:	:
	38	2440 MHz
	39	2441 MHz
	40	2442 MHz
	:	:
	77	2479 MHz
	78	2480 MHz

BLE Channel List

Frequency Band	Channel Number	Frequency
2400~2483.5MHz	0	2402MHz
	1	2404MHz
	:	:
	38	2478 MHz
	39	2480 MHz

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3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

- Uncertainty of Conducted Emission, $U_c = \pm 3.2$ dB
- Uncertainty of Radiated Emission below 1GHz, $U_c = \pm 3.9$ dB
- Uncertainty of Radiated Emission above 1GHz, $U_c = \pm 4.8$ dB

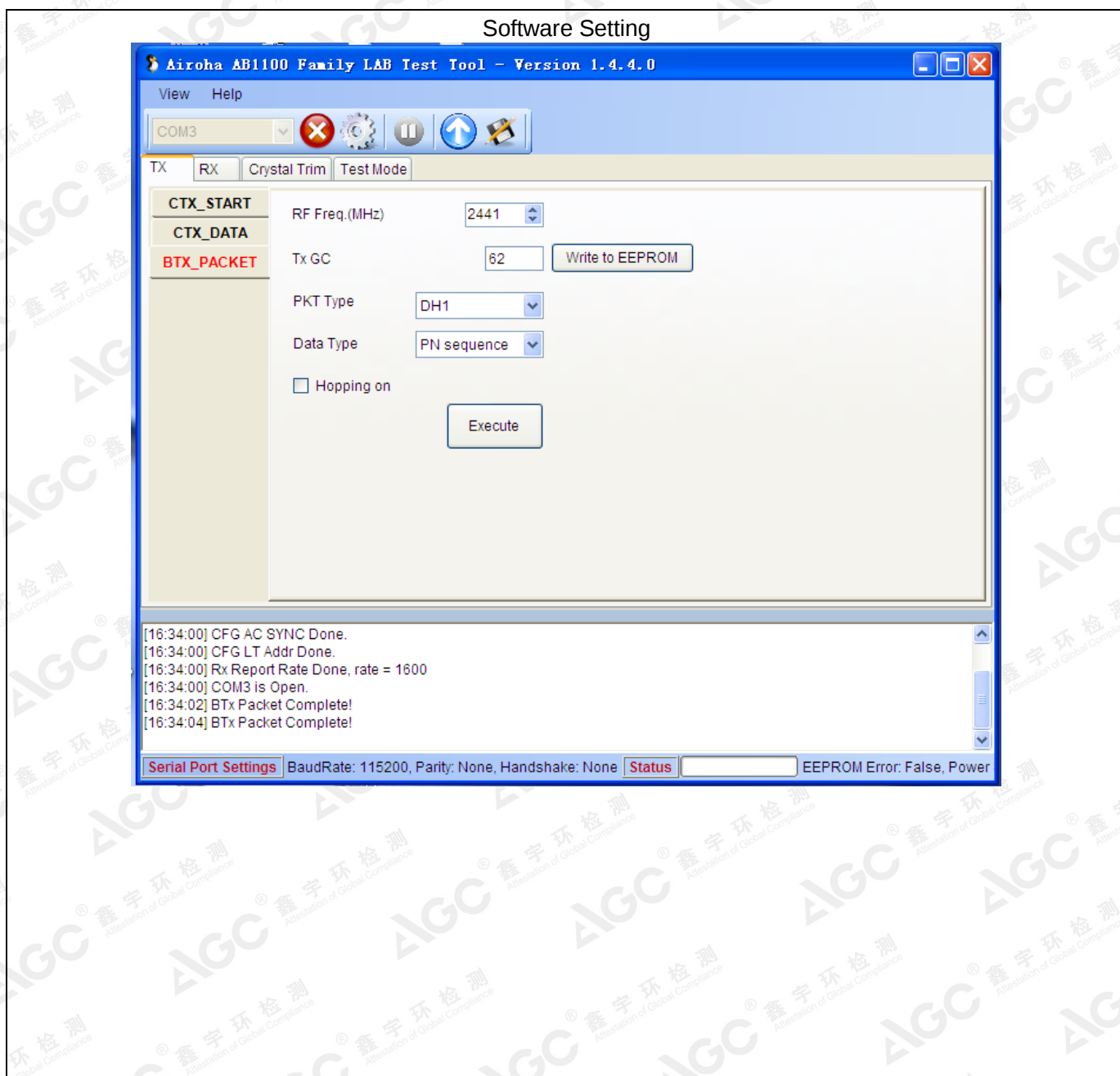
4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Low channel $\pi/4$ -DQPSK
5	Middle channel $\pi/4$ -DQPSK
6	High channel $\pi/4$ -DQPSK
7	Low channel 8DPSK
8	Middle channel 8DPSK
9	High channel 8DPSK
10	BT Link

Note:

1. All the test modes can be supply by battery, only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. The EUT used fully-charged battery when tested.

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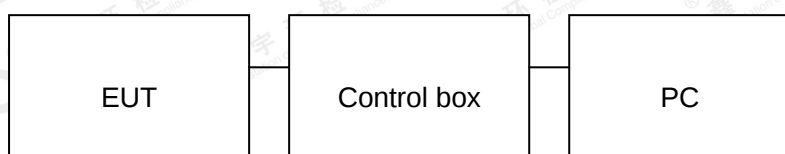
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure 1: (Normal hopping)



Configure 2: (Control continuous TX)



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	Bling Helmet	LIVALL	MTL	EUT
2	Battery	ZWD	651448	Accessory
3	PC	APPLE	A1465	A.E
4	Control box	AIROHA	N/A	A.E
5	Control box	SERIAL	N/A	A.E
6	USB Cable	N/A	1m unshielded	A.E
7	Mobile Phone	APPLE	6PLUS	A.E

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5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.249(a) §15.209	Radiated Emission	Compliant
§15.249(d)	Band Edges	Compliant
§15.207	Conduction Emission	N/A
§15.215	Bandwidth	Compliant

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

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6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2F., Bldg.2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Bldg.12, Baoan Bldg Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen 518012
NVLAP Lab Code	600153-0
Designation Number	CN5028
Test Firm Registration Number	682566
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0

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7. TEST METHOD

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

8. TEST EQUIPMENT LIST

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun.20, 2017	Jun.19, 2018
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec.08, 2017	Dec.07, 2018
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep.20, 2017	Sep.19, 2018
preamplifier	ChengYi	EMC184045SE	980508	Sep.15, 2017	Sep.14, 2018
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 18, 2017	May 17, 2019
Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-205	Jun.20, 2017	Jun.19, 2018
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep.28, 2017	Sep.27, 2018
Loop Antenna	A.H.Systems,Inc	SAS-562B	--	Mar. 01, 2018	Feb. 28, 2020

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9. RADIATED EMISSION

9.1 TEST LIMIT

Standard FCC15.249

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
900-928MHz	50	500
2400-2483.5MHz	50	500
5725-5875MHz	50	500
24.0-24.25GHz	250	2500

Standard FCC 15.209

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		μ V/m	dB(μ V)/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(μ V)/m (Peak) 54.0 dB(μ V)/m (Average)	

Remark:

- (1) Emission level $\text{dB}\mu$ 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.

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9.2. 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)

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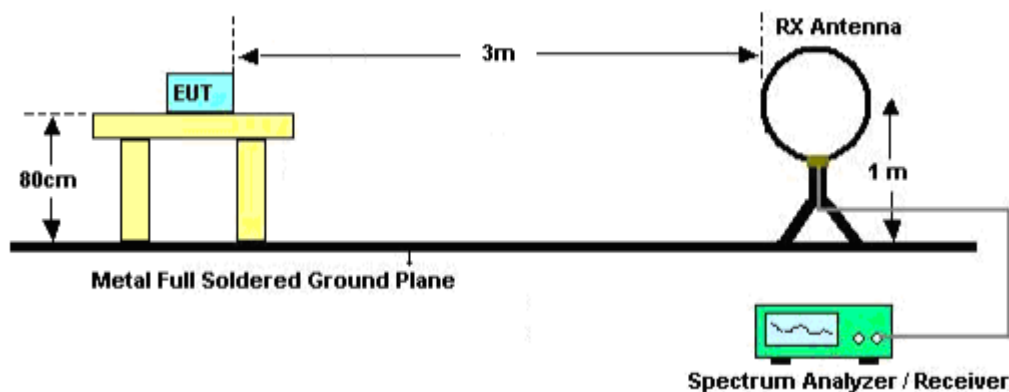
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	Fundamental: 2.4~2.483GHz RBW 2MHz/ VBW 6MHz for Peak, RBW 2MHz/ VBW 10Hz for Average Harmonics: 1GHz~25GHz RBW 1MHz/ VBW 3MHz for Peak, RBW 1MHz/ VBW 10Hz for Average
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

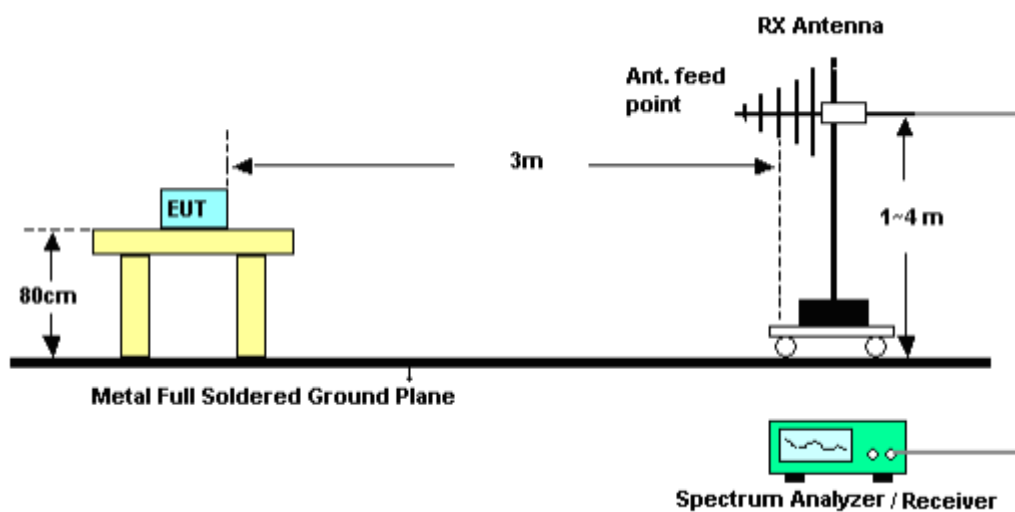
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9.3. TEST SETUP

Radiated Emission Test-Setup Frequency Below 30MHz

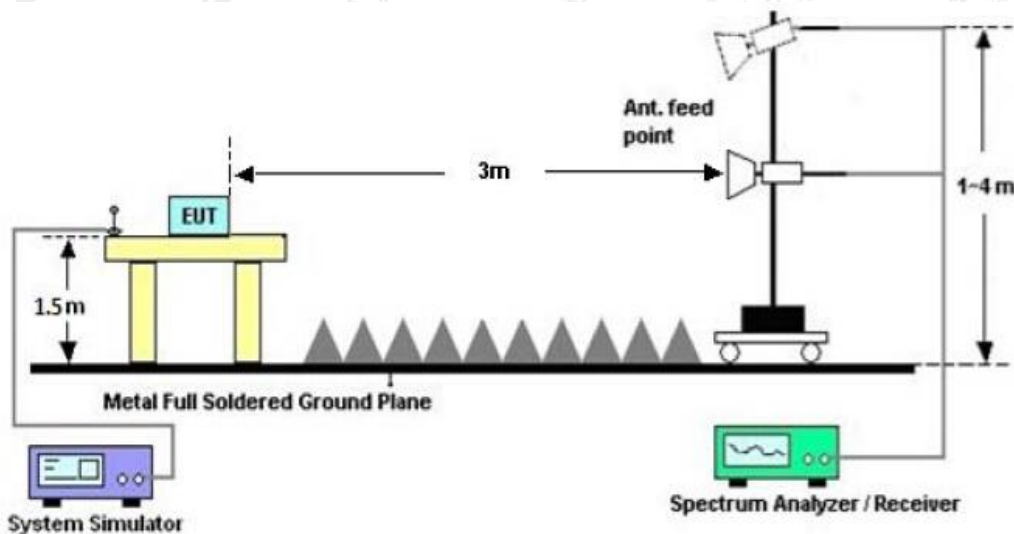


RADIATED EMISSION TEST SETUP 30MHz-1000MHz



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RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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9.4. TEST RESULT

For AB1512

FOR BR/EDR

(Worst modulation: 8DPSK)

RADIATED EMISSION BELOW 30MHz

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

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RADIATED EMISSION BELOW 1GHz

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

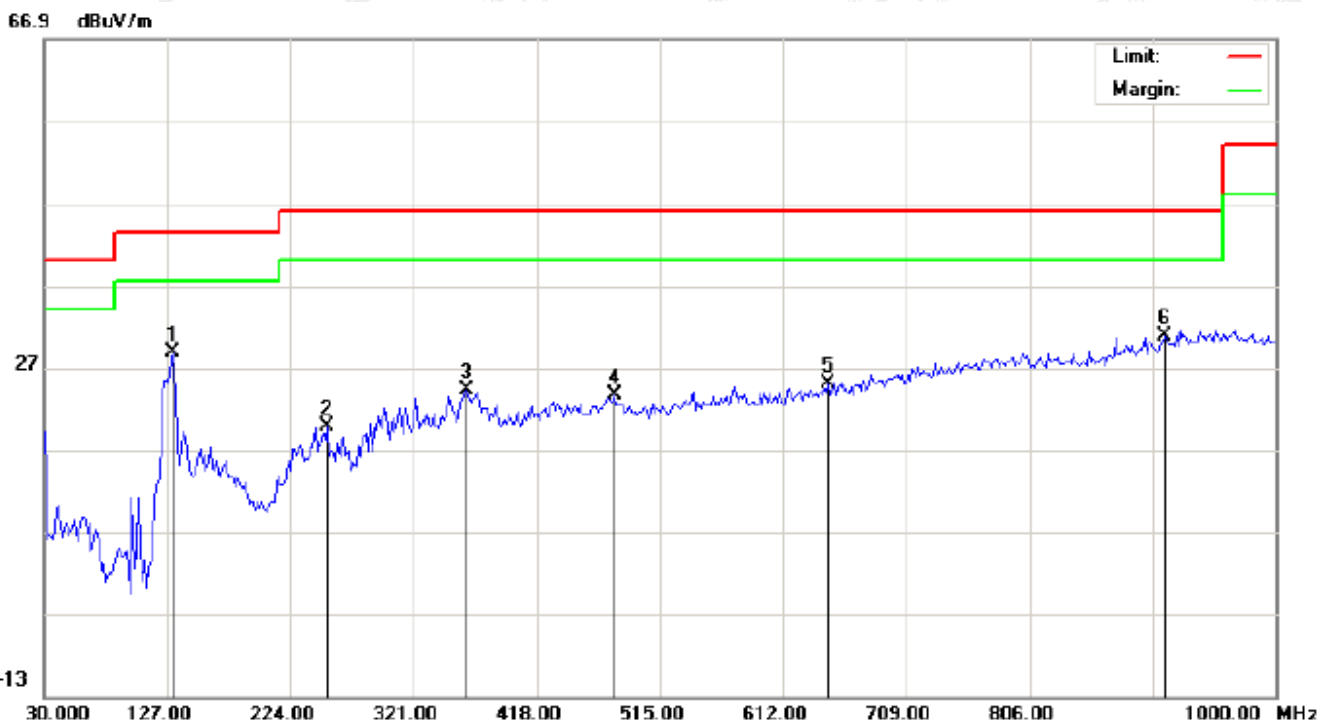


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		96.2833	11.48	6.77	18.25	43.50	-25.25	peak			
2		346.8667	11.22	18.53	29.75	46.00	-16.25	peak			
3		476.2000	7.65	20.87	28.52	46.00	-17.48	peak			
4		605.5333	1.16	23.74	24.90	46.00	-21.10	peak			
5		765.5833	1.57	26.85	28.42	46.00	-17.58	peak			
6	*	941.8000	2.92	29.77	32.69	46.00	-13.31	peak			

RESULT: PASS

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RADIATED EMISSION TEST- (30MHZ-1GHZ)-LOW CHANNEL -VERTICAL



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	*	131.8500	17.00	11.80	28.80	43.50	-14.70	peak			
2		253.1000	5.87	13.99	19.86	46.00	-26.14	peak			
3		363.0333	5.39	18.83	24.22	46.00	-21.78	peak			
4		479.4333	2.75	20.91	23.66	46.00	-22.34	peak			
5		647.5667	1.29	23.80	25.09	46.00	-20.91	peak			
6		912.7000	1.77	28.96	30.73	46.00	-15.27	peak			

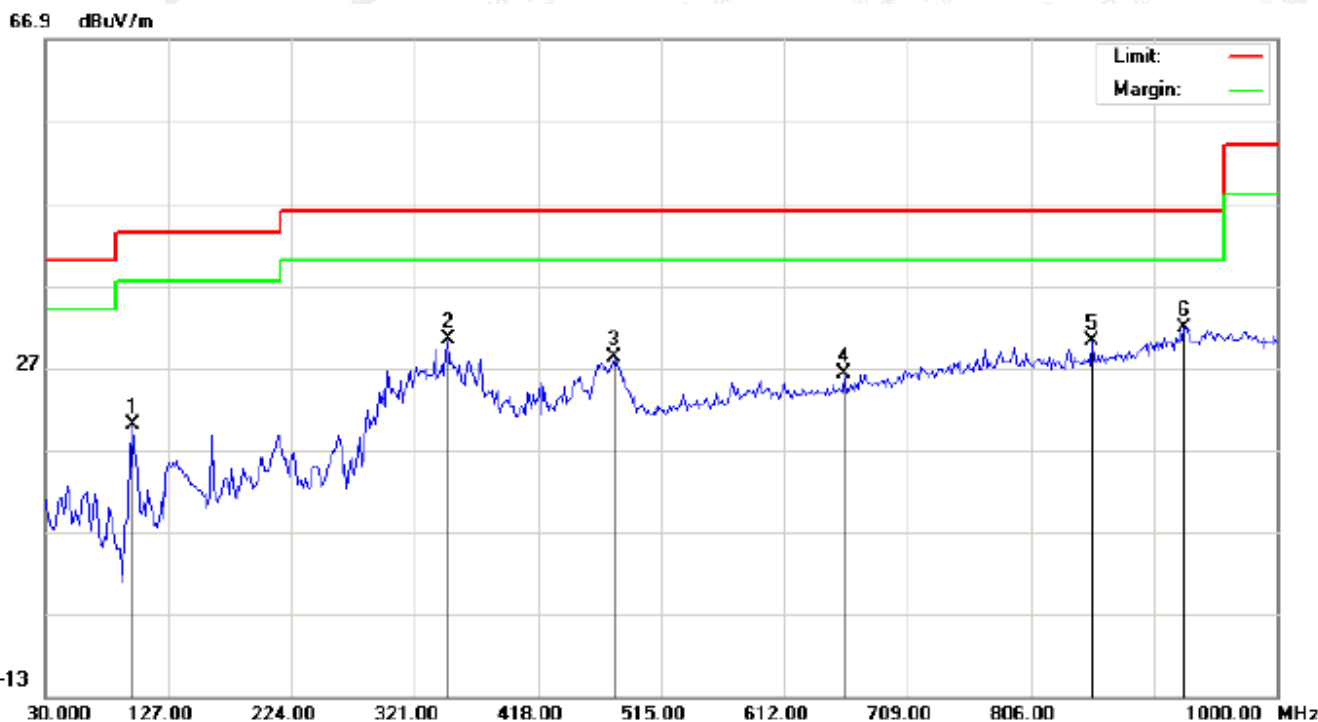
RESULT: PASS

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

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

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RADIATED EMISSION TEST- (30MHZ-1GHZ)-MIDDLE CHANNEL-HORIZONTAL



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		99.5167	9.95	10.00	19.95	43.50	-23.55	peak			
2		346.8667	11.92	18.53	30.45	46.00	-15.55	peak			
3		477.8167	7.29	20.89	28.18	46.00	-17.82	peak			
4		658.8833	2.04	24.09	26.13	46.00	-19.87	peak			
5		854.5000	2.70	27.43	30.13	46.00	-15.87	peak			
6	*	927.2500	2.38	29.37	31.75	46.00	-14.25	peak			

RESULT: PASS

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



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	*	130.2333	19.96	11.13	31.09	43.50	-12.41	peak			
2		243.4000	6.73	13.25	19.98	46.00	-26.02	peak			
3		361.4167	7.52	18.82	26.34	46.00	-19.66	peak			
4		479.4333	3.19	20.91	24.10	46.00	-21.90	peak			
5		726.7833	1.15	25.96	27.11	46.00	-18.89	peak			
6		919.1667	1.72	29.14	30.86	46.00	-15.14	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.

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

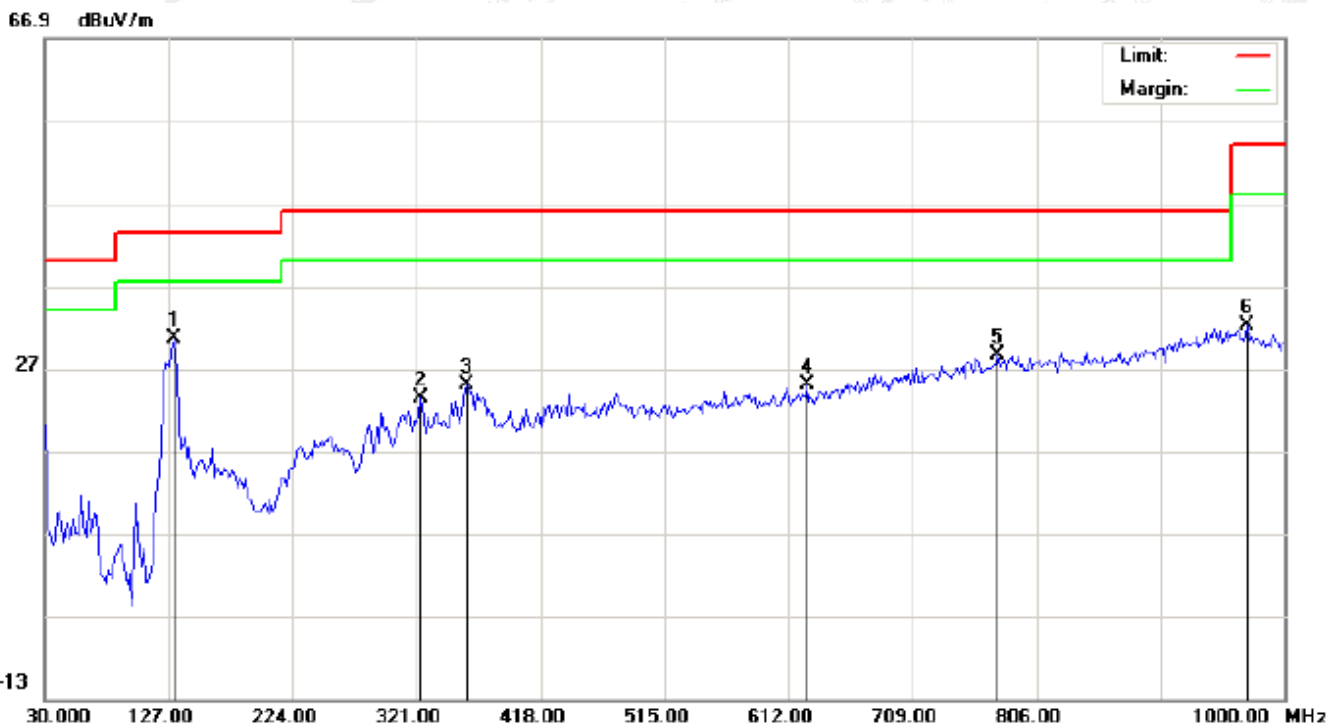


No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		125.3833	13.94	8.37	22.31	43.50	-21.19	peak			
2		324.2333	12.28	17.02	29.30	46.00	-16.70	peak			
3		474.5833	7.11	20.86	27.97	46.00	-18.03	peak			
4		726.7833	1.20	25.98	27.18	46.00	-18.82	peak			
5		915.9333	1.50	29.05	30.55	46.00	-15.45	peak			
6	*	941.8000	2.60	29.77	32.37	46.00	-13.63	peak			

RESULT: PASS

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



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	*	131.8500	18.76	11.80	30.56	43.50	-12.94	peak			
2		324.2333	6.32	17.02	23.34	46.00	-22.66	peak			
3		359.8000	6.21	18.80	25.01	46.00	-20.99	peak			
4		626.5500	1.73	23.32	25.05	46.00	-20.95	peak			
5		775.2833	1.62	26.98	28.60	46.00	-17.40	peak			
6		970.9000	2.34	29.80	32.14	54.00	-21.86	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.

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For NRF51822

(Worst modulation: GFSK)

FOR BLE

RADIATED EMISSION BELOW 30MHz

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

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Attestation of Global Compliance

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Add: 2/F, Building 2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Baoan District, Shenzhen, Guangdong China

RADIATED EMISSION BELOW 1GHz

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



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		60.7167	17.26	1.20	18.46	40.00	-21.54	peak			
2		96.2833	10.98	6.77	17.75	43.50	-25.75	peak			
3		346.8667	6.22	18.53	24.75	46.00	-21.25	peak			
4		466.5000	2.51	20.77	23.28	46.00	-22.72	peak			
5	*	765.5833	0.58	26.84	27.42	46.00	-18.58	peak			
6		967.6667	0.98	29.83	30.81	54.00	-23.19	peak			

RESULT: PASS

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RADIATED EMISSION TEST- (30MHZ-1GHZ)-LOW CHANNEL -VERTICAL



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		94.6667	11.22	1.42	12.64	43.50	-30.86	peak			
2		130.2332	4.96	11.13	16.09	43.50	-27.41	peak			
3		359.8000	3.61	18.80	22.41	46.00	-23.59	peak			
4		540.8667	-2.15	22.23	20.08	46.00	-25.92	peak			
5	*	731.6332	-0.67	26.10	25.43	46.00	-20.57	peak			
6		967.6667	0.12	29.83	29.95	54.00	-24.05	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.

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RADIATED EMISSION TEST- (30MHZ-1GHZ)-MIDDLE CHANNEL-HORIZONTAL

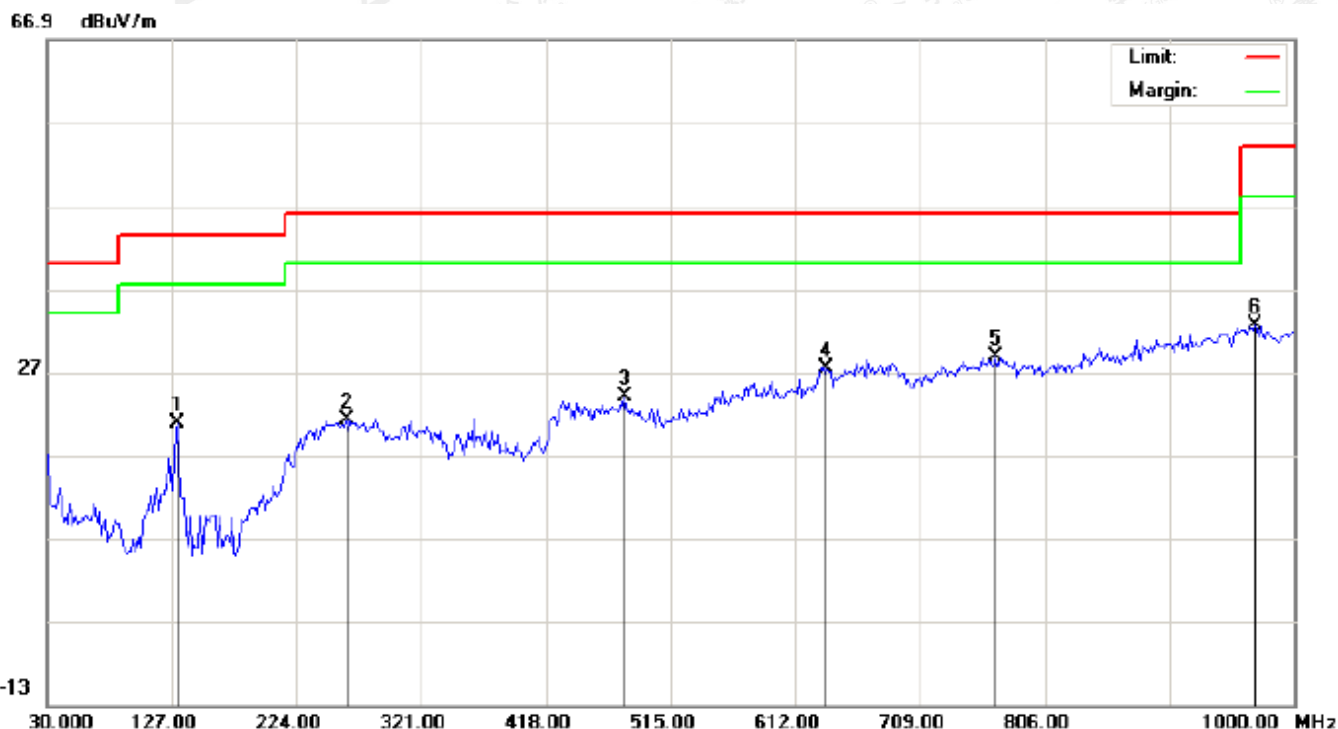


No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		99.5167	7.95	10.00	17.95	43.50	-25.55	peak			
2		212.6833	9.07	10.71	19.78	43.50	-23.72	peak			
3		346.8667	5.92	18.53	24.45	46.00	-21.55	peak			
4	*	477.8167	4.79	20.89	25.68	46.00	-20.32	peak			
5		658.8832	1.04	24.09	25.13	46.00	-20.87	peak			
6		975.7500	0.91	29.75	30.66	54.00	-23.34	peak			

RESULT: PASS

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



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		131.8500	8.95	11.80	20.75	43.50	-22.75	peak			
2		262.8000	6.88	14.29	21.17	46.00	-24.83	peak			
3		479.4333	3.19	20.91	24.10	46.00	-21.90	peak			
4		636.2500	3.95	23.54	27.49	46.00	-18.51	peak			
5	*	767.2000	1.86	26.87	28.73	46.00	-17.27	peak			
6		969.2833	2.85	29.81	32.66	54.00	-21.34	peak			

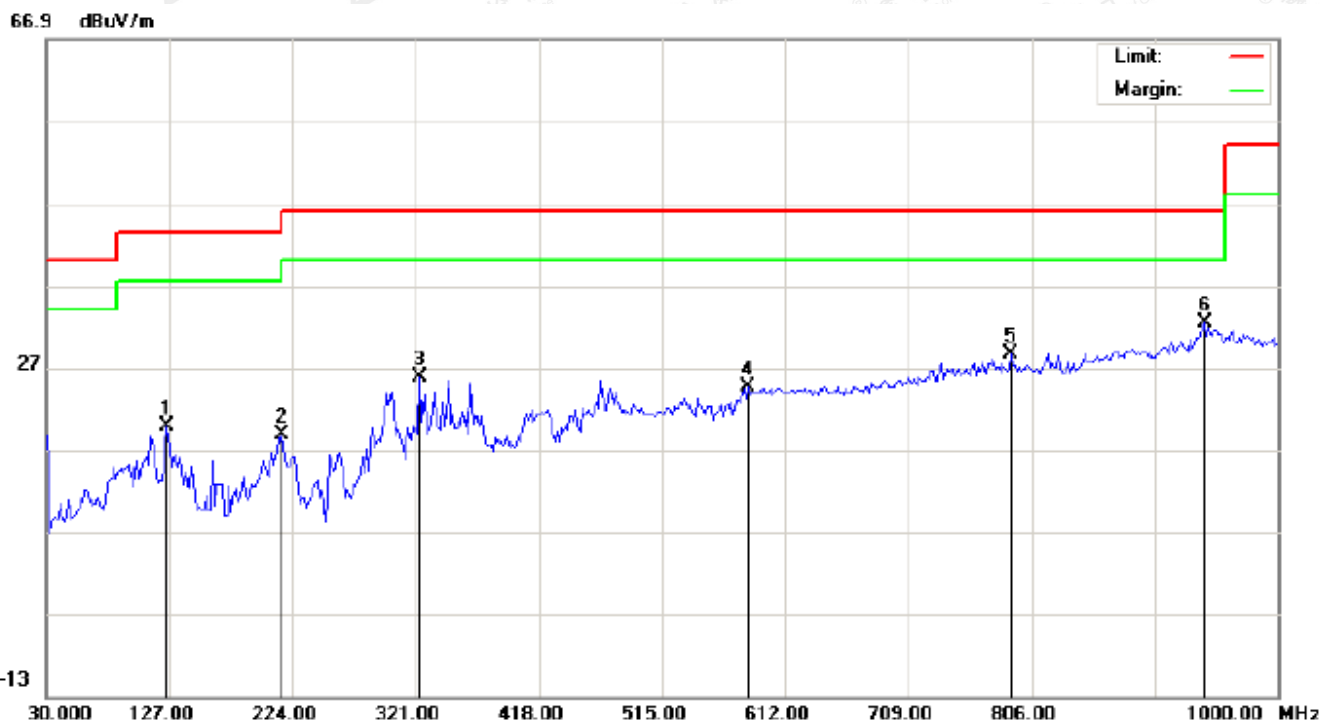
RESULT: PASS

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

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

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

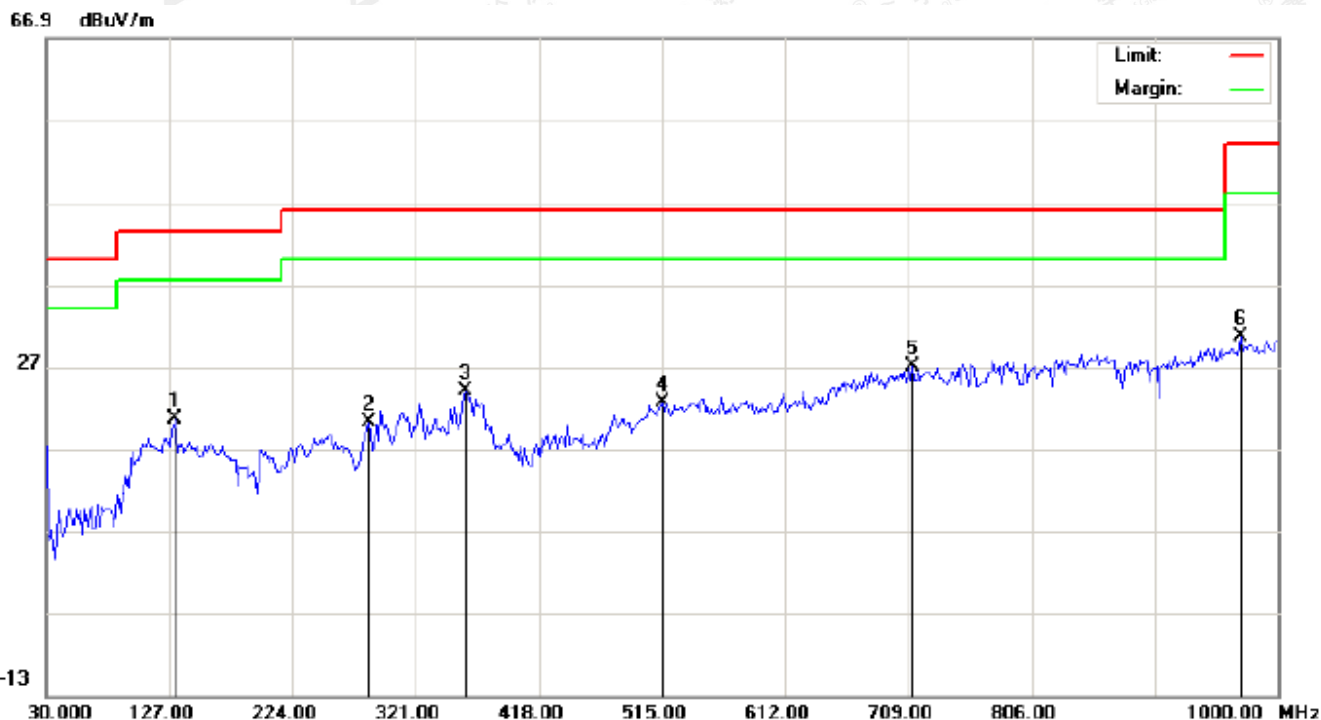


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		125.3833	11.44	8.37	19.81	43.50	-23.69	peak			
2		215.9167	8.39	10.38	18.77	43.50	-24.73	peak			
3		324.2333	8.78	17.02	25.80	46.00	-20.20	peak			
4		582.9000	1.22	23.30	24.52	46.00	-21.48	peak			
5		789.8333	1.39	27.18	28.57	46.00	-17.43	peak			
6	*	941.8000	2.60	29.77	32.37	46.00	-13.63	peak			

RESULT: PASS

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RADIATED EMISSION TEST- (30MHZ-1GHZ)-HIGH CHANNEL -VERTICAL



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		131.8500	8.76	11.80	20.56	43.50	-22.94	peak			
2		283.8167	5.28	14.92	20.20	46.00	-25.80	peak			
3		359.8000	5.21	18.80	24.01	46.00	-21.99	peak			
4		515.0000	1.09	21.53	22.62	46.00	-23.38	peak			
5	*	712.2333	1.46	25.54	27.00	46.00	-19.00	peak			
6		970.9000	0.84	29.80	30.64	54.00	-23.36	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.

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RADIATED EMISSION ABOVE 1GHz

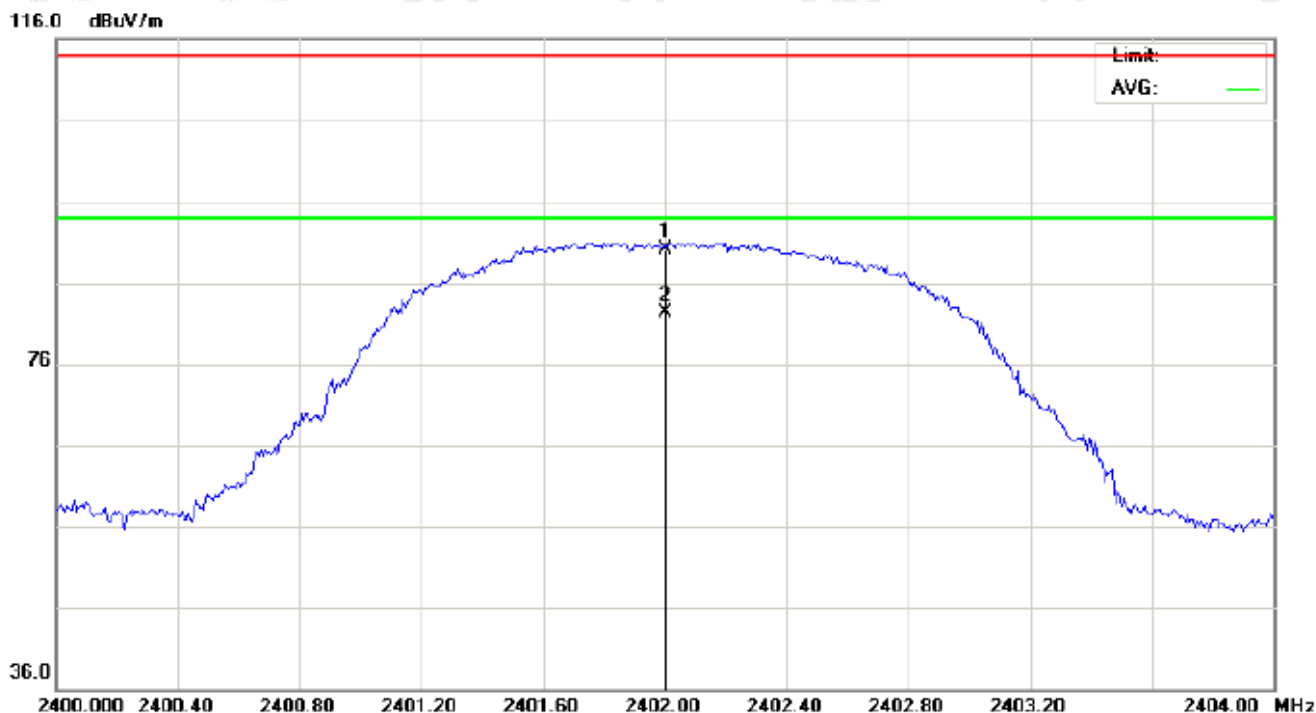
For AB1512

FOR BR/EDR

(Worst modulation: 8DPSK)

For Fundamental

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

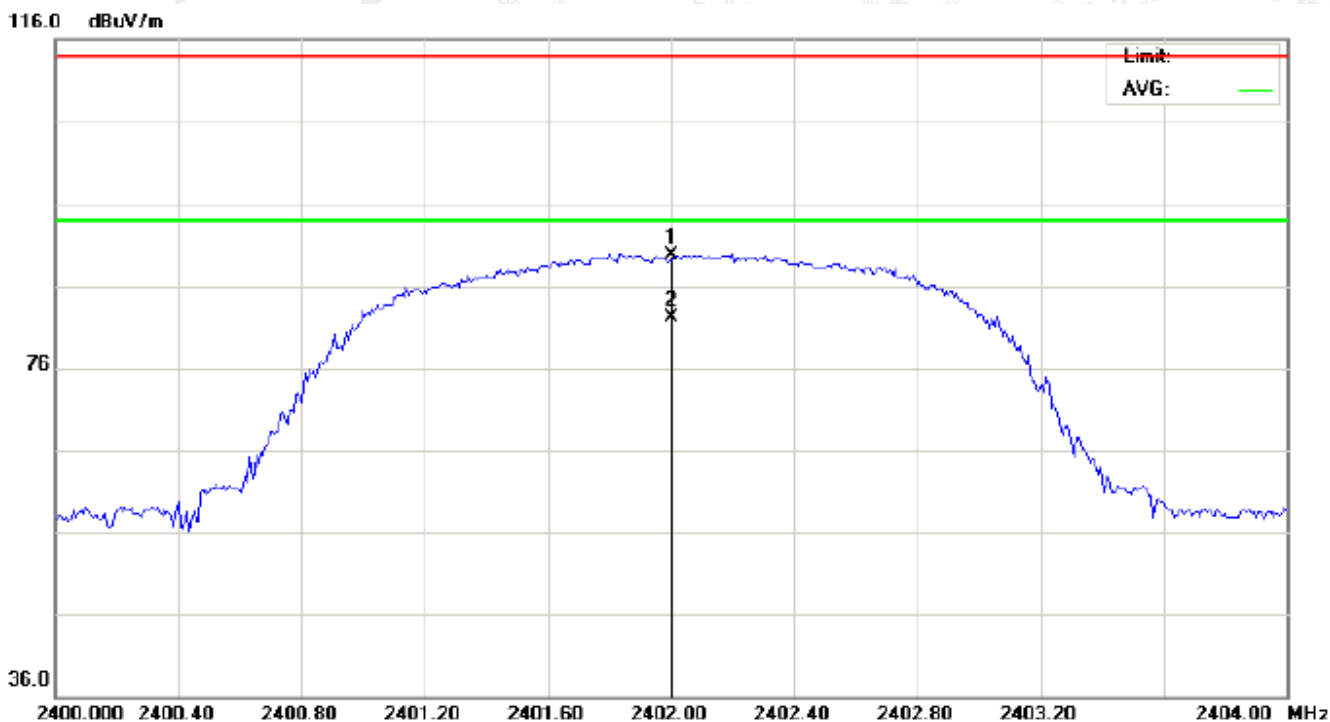


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2402.000	79.78	10.32	90.10	114.00	-23.90	peak			
2	*	2402.000	71.98	10.32	82.30	94.00	-11.70	AVG	100	301	

RESULT: PASS

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

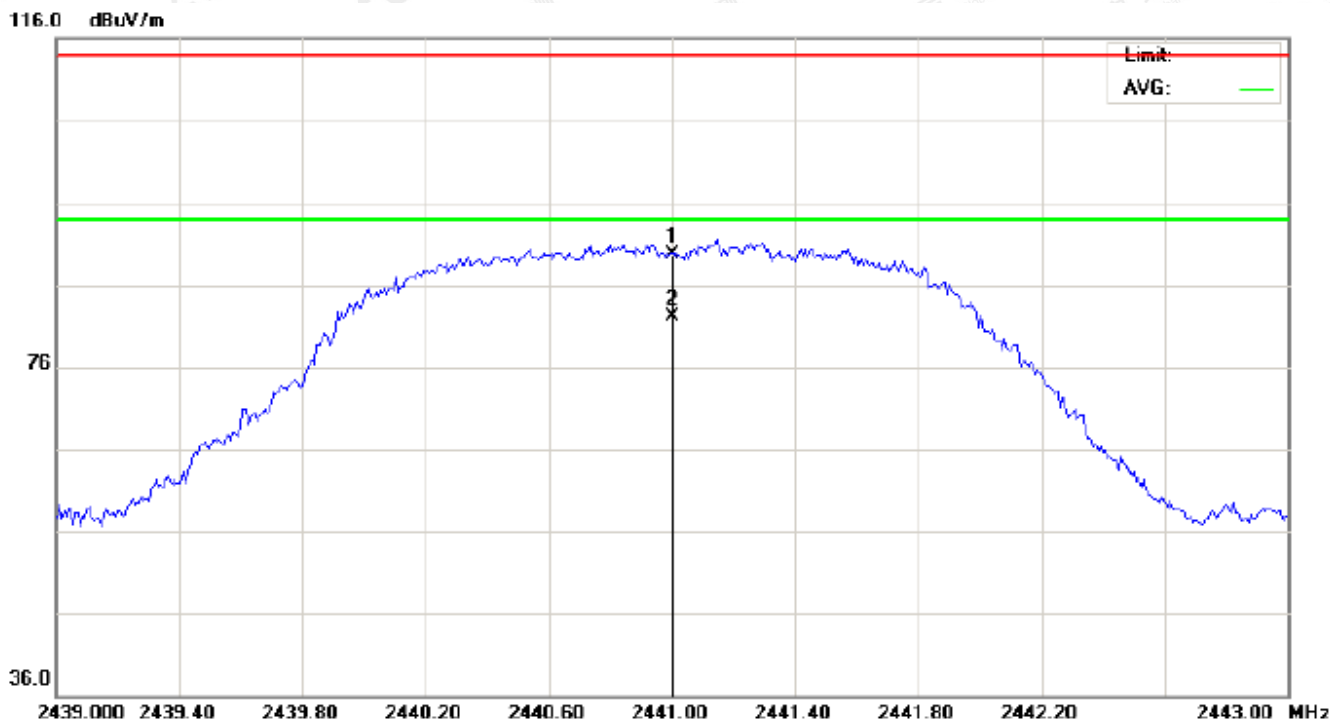


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2402.000	79.37	10.32	89.69	114.00	-24.31	peak			
2	*	2402.000	71.74	10.32	82.06	94.00	-11.94	AVG	100	126	

RESULT: PASS

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

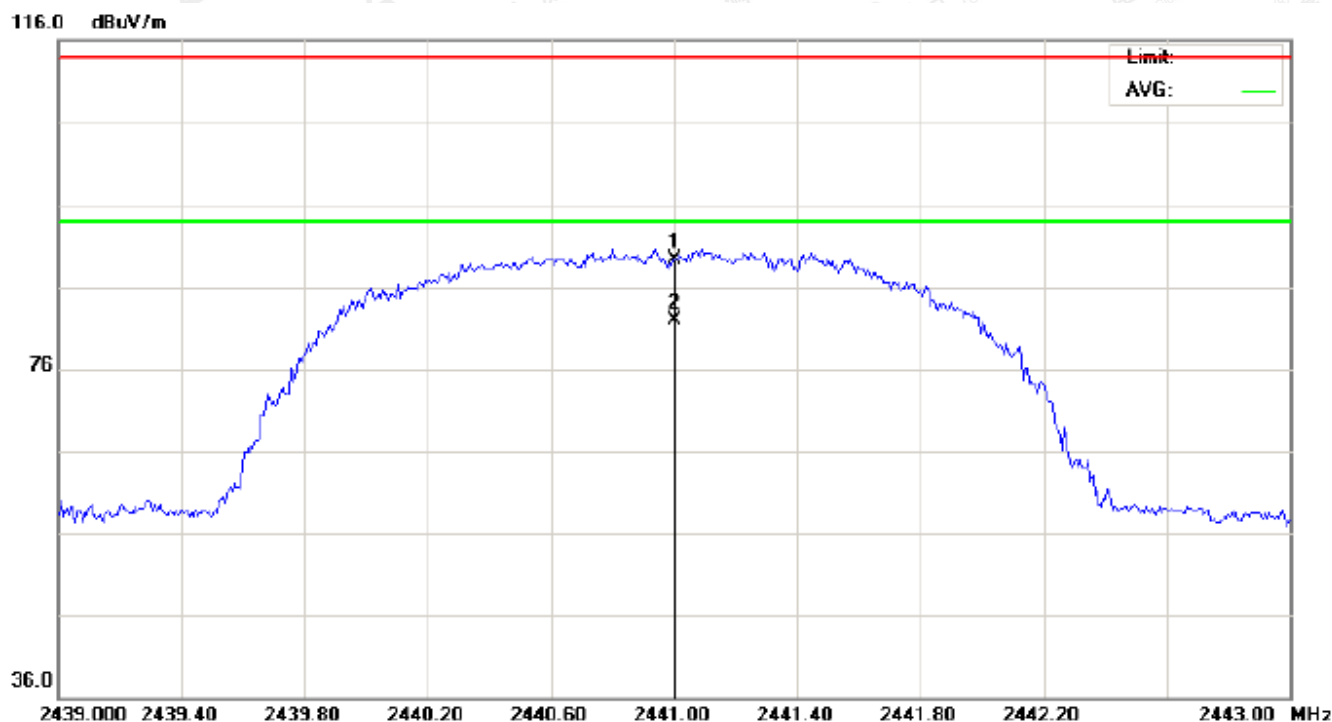


No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		2441.000	79.34	10.36	89.70	114.00	-24.30	peak			
2	*	2441.000	71.84	10.36	82.20	94.00	-11.80	AVG	100	321	

RESULT: PASS

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

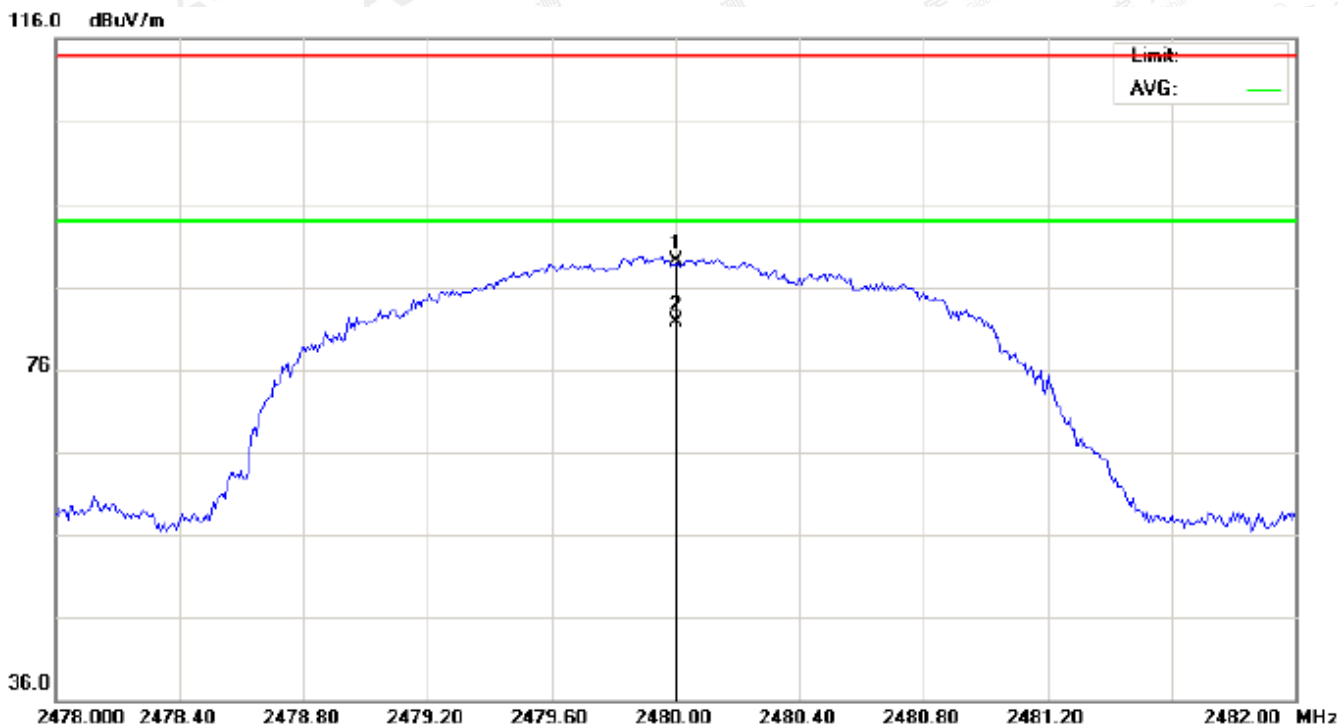


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2441.000	79.02	10.36	89.38	114.00	-24.62	peak			
2	*	2441.000	71.53	10.36	81.89	94.00	-12.11	AVG	100	124	

RESULT: PASS

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

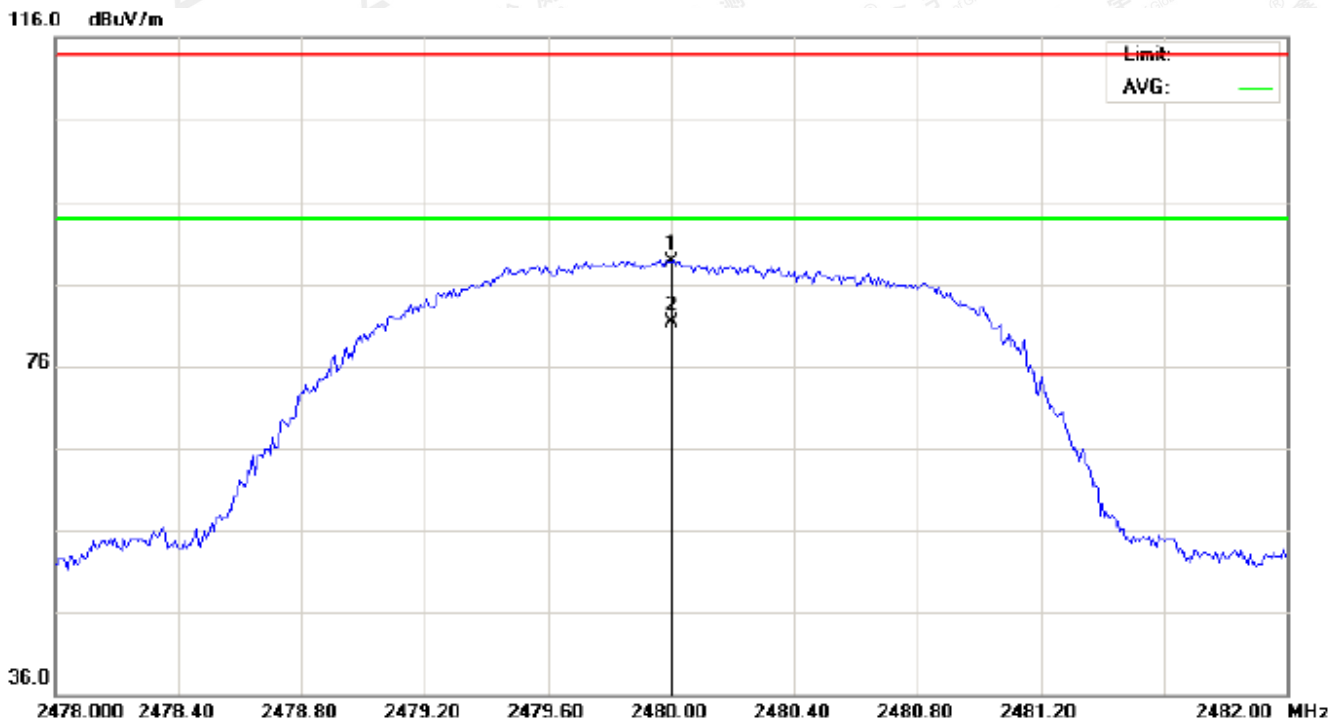


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2480.000	78.75	10.41	89.16	114.00	-24.84	peak			
2	*	2480.000	71.25	10.41	81.66	94.00	-12.34	AVG	100	345	

RESULT: PASS

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



No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		2480.000	78.32	10.41	88.73	114.00	-25.27	peak			
2	*	2480.000	70.96	10.41	81.37	94.00	-12.63	AVG	100	147	

RESULT: PASS

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

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

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Field strength of the fundamental signal
3Mbps Result:
Peak value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	79.78	10.32	90.10	114	-23.90	Horizontal
2402	79.37	10.32	89.69	114	-24.31	Vertical
2441	79.34	10.36	89.70	114	-24.30	Horizontal
2441	79.02	10.36	89.38	114	-24.62	Vertical
2480	78.75	10.41	89.16	114	-24.84	Horizontal
2480	78.32	10.41	88.73	114	-25.27	Vertical

Average value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	71.98	10.32	82.30	94	-11.70	Horizontal
2402	71.74	10.32	82.06	94	-11.94	Vertical
2441	71.84	10.36	82.20	94	-11.80	Horizontal
2441	71.53	10.36	81.89	94	-12.11	Vertical
2480	71.25	10.41	81.66	94	-12.34	Horizontal
2480	70.96	10.41	81.37	94	-12.63	Vertical

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2Mbps Result:
Peak value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	79.35	10.32	89.67	114	-24.33	Horizontal
2402	78.90	10.32	89.22	114	-24.78	Vertical
2441	78.97	10.36	89.33	114	-24.67	Horizontal
2441	78.62	10.36	88.98	114	-25.02	Vertical
2480	78.30	10.41	88.71	114	-25.29	Horizontal
2480	77.93	10.41	88.34	114	-25.66	Vertical

Average value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	71.62	10.32	81.94	94	-12.06	Horizontal
2402	71.40	10.32	81.72	94	-12.28	Vertical
2441	71.48	10.36	81.84	94	-12.16	Horizontal
2441	71.07	10.36	81.43	94	-12.57	Vertical
2480	70.77	10.41	81.18	94	-12.82	Horizontal
2480	70.51	10.41	80.92	94	-13.08	Vertical

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1Mbps Result:
Peak value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	79.01	10.32	89.33	114	-24.67	Horizontal
2402	78.58	10.32	88.90	114	-25.10	Vertical
2441	78.64	10.36	89.00	114	-25.00	Horizontal
2441	78.22	10.36	88.58	114	-25.42	Vertical
2480	77.86	10.41	88.27	114	-25.73	Horizontal
2480	77.62	10.41	88.03	114	-25.97	Vertical

Average value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	71.13	10.32	81.45	94	-12.55	Horizontal
2402	70.92	10.32	81.24	94	-12.76	Vertical
2441	71.02	10.36	81.38	94	-12.62	Horizontal
2441	70.66	10.36	81.02	94	-12.98	Vertical
2480	70.27	10.41	80.68	94	-13.32	Horizontal
2480	70.11	10.41	80.52	94	-13.48	Vertical

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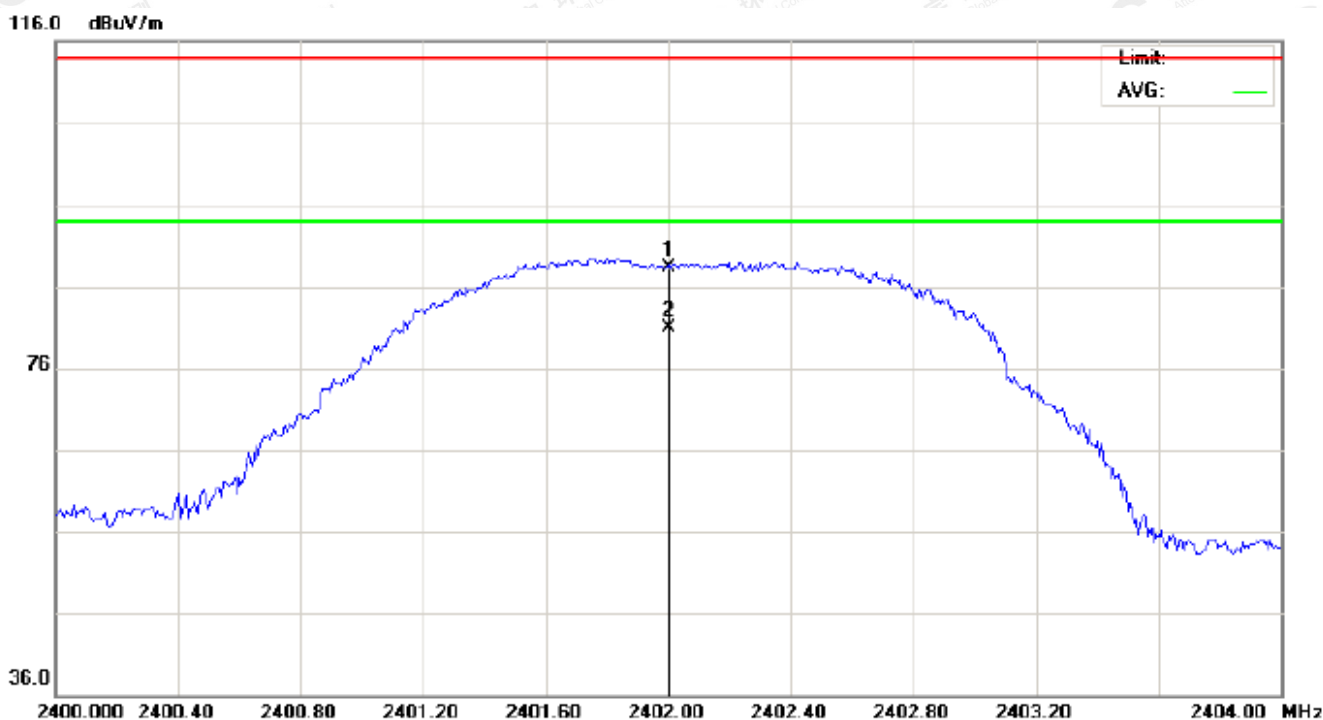
For NRF51822

(Worst modulation: GFSK)

FOR BLE

For Fundamental

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

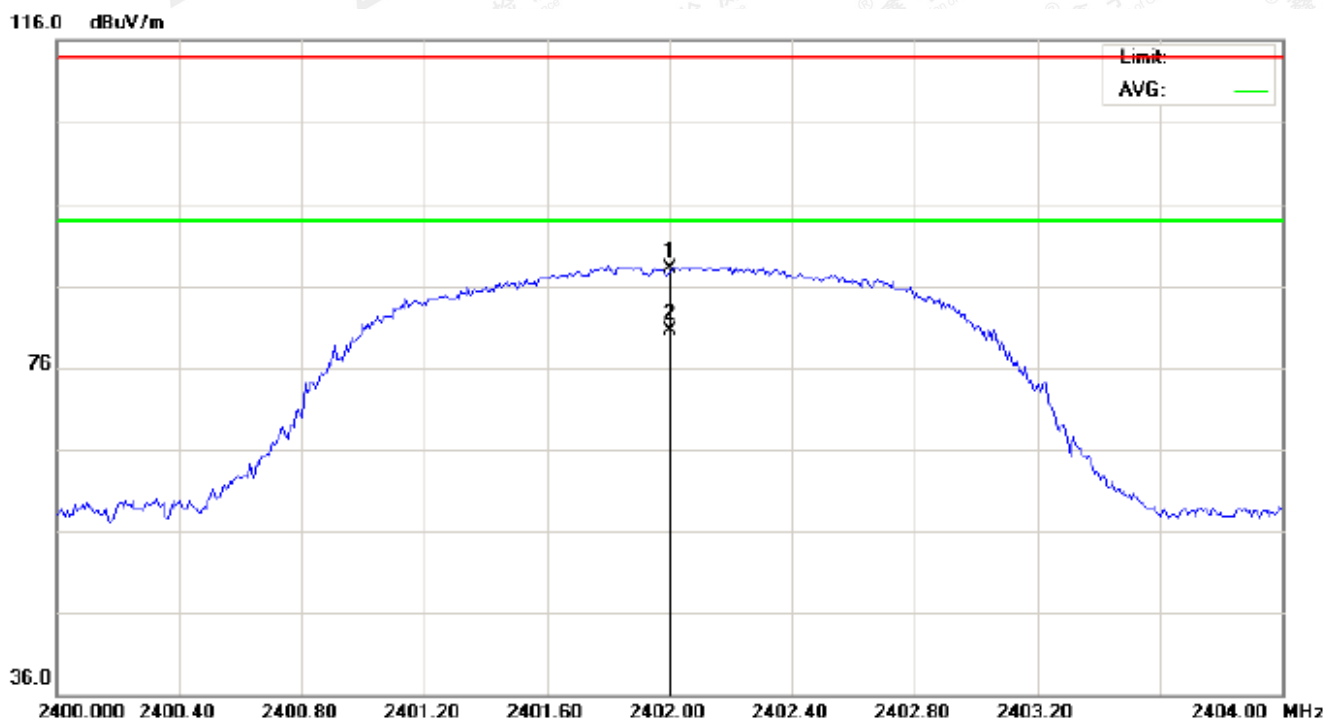


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2402.000	78.05	10.32	88.37	114.00	-25.63	peak			
2	*	2402.000	70.55	10.32	80.87	94.00	-13.13	AVG	100	312	

RESULT: PASS

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

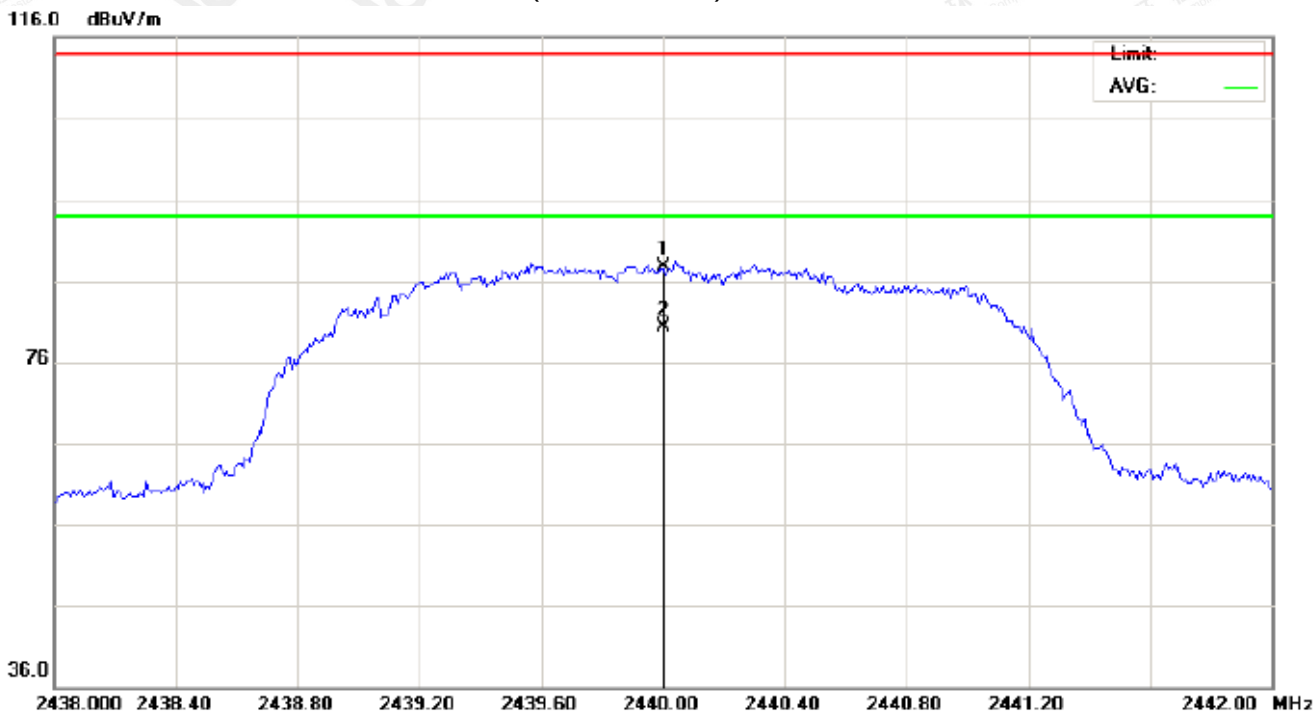


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2402.000	77.73	10.32	88.05	114.00	-25.95	peak			
2	*	2402.000	70.21	10.32	80.53	94.00	-13.47	AVG	100	124	

RESULT: PASS

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

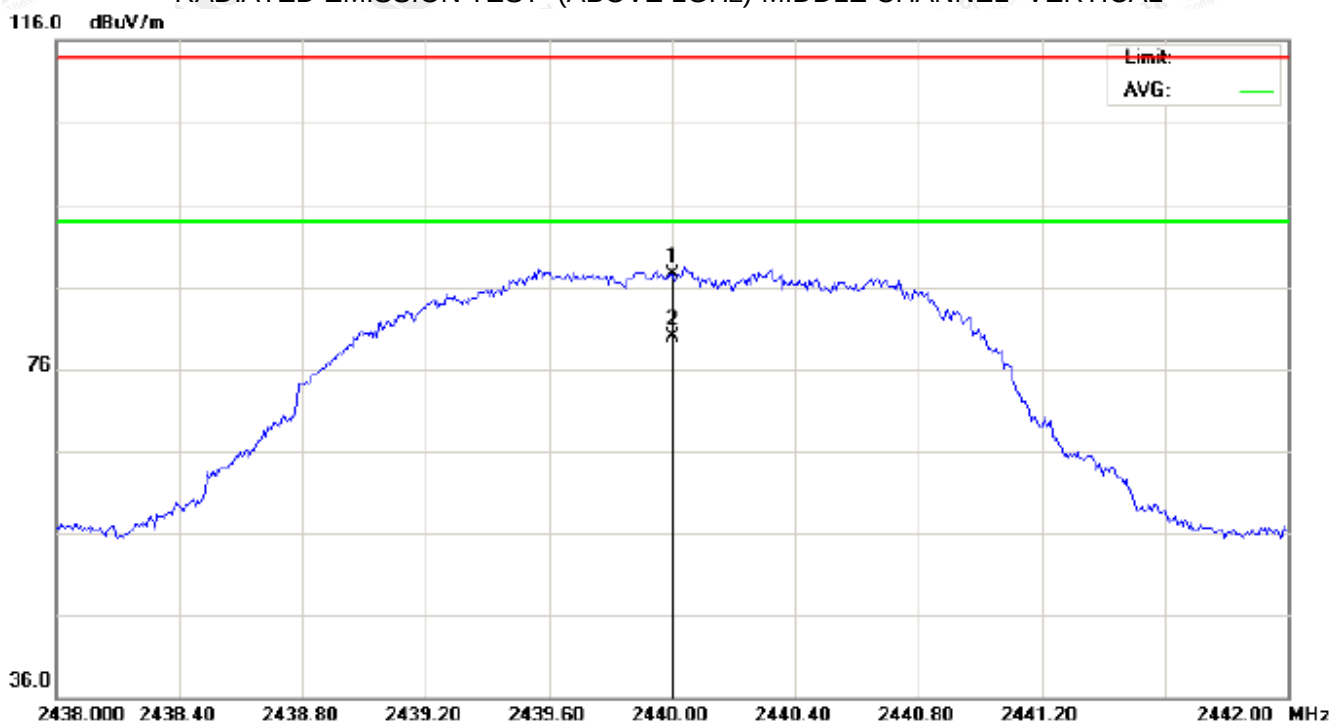


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2440.000	77.36	10.36	87.72	114.00	-26.28	peak			
2	*	2440.000	69.86	10.36	80.22	94.00	-13.78	AVG	100	341	

RESULT: PASS

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

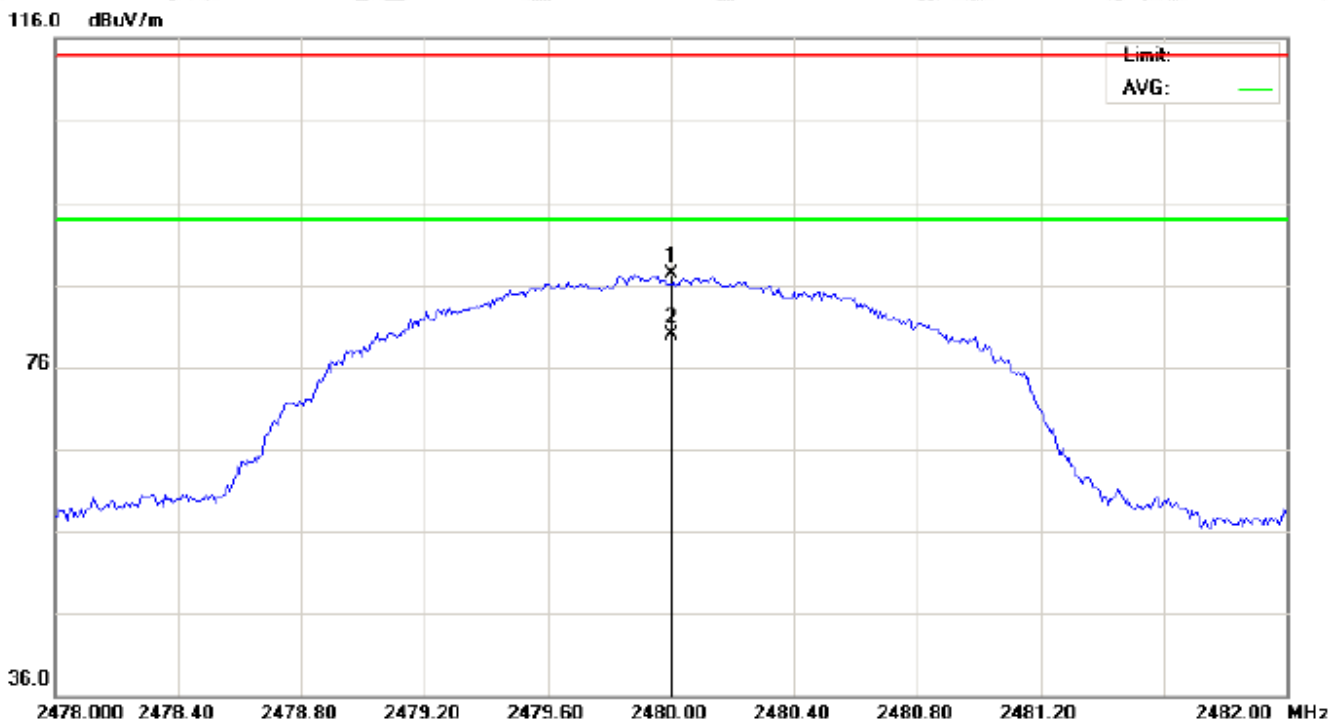


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2440.000	77.07	10.36	87.43	114.00	-26.57	peak			
2	*	2440.000	69.53	10.36	79.89	94.00	-14.11	AVG	100	145	

RESULT: PASS

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

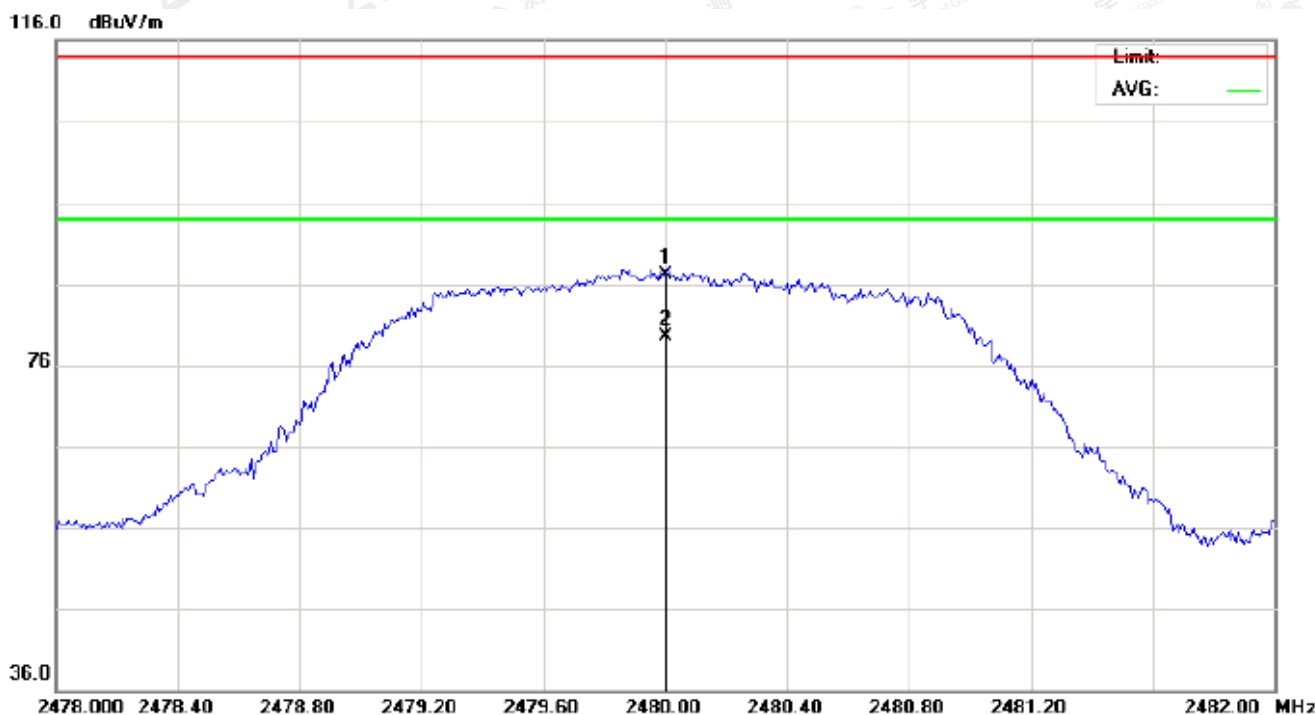


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2480.000	76.90	10.41	87.31	114.00	-26.69	peak			
2	*	2480.000	69.40	10.41	79.81	94.00	-14.19	AVG	100	341	

RESULT: PASS

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



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	76.60	10.41	87.01	114.00	-26.99	peak			
2	*	2480.000	69.09	10.41	79.50	94.00	-14.50	AVG	100		

RESULT: PASS

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

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

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Field strength of the fundamental signal
1Mbps Result:
Peak value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	78.05	10.32	88.37	114	-25.63	Horizontal
2402	77.73	10.32	88.05	114	-25.95	Vertical
2440	77.36	10.36	87.72	114	-26.28	Horizontal
2440	77.07	10.36	87.43	114	-26.57	Vertical
2480	76.90	10.41	87.31	114	-26.69	Horizontal
2480	76.60	10.41	87.01	114	-26.99	Vertical

Average value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	70.55	10.32	80.87	94	-13.13	Horizontal
2402	70.21	10.32	80.53	94	-13.47	Vertical
2440	69.86	10.36	80.22	94	-13.78	Horizontal
2440	69.53	10.36	79.89	94	-14.11	Vertical
2480	69.40	10.41	79.81	94	-14.19	Horizontal
2480	69.09	10.41	79.50	94	-14.50	Vertical

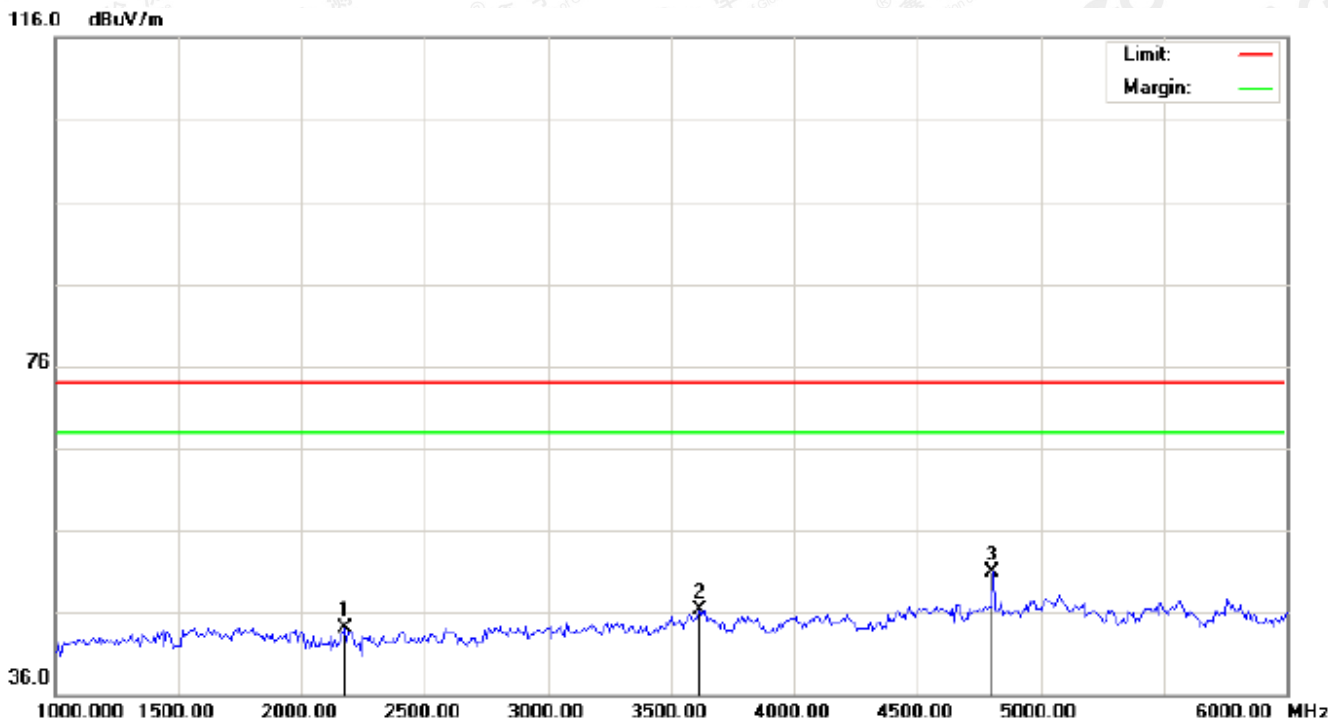
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

For AB1512

FOR BR/EDR
(Worst modulation: 8DPSK)

For Harmonics

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



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		2175.000	34.00	10.07	44.07	74.00	-29.93	peak			
2		3616.667	33.55	12.83	46.38	74.00	-27.62	peak			
3	*	4804.000	43.21	7.69	50.90	74.00	-23.10	peak			

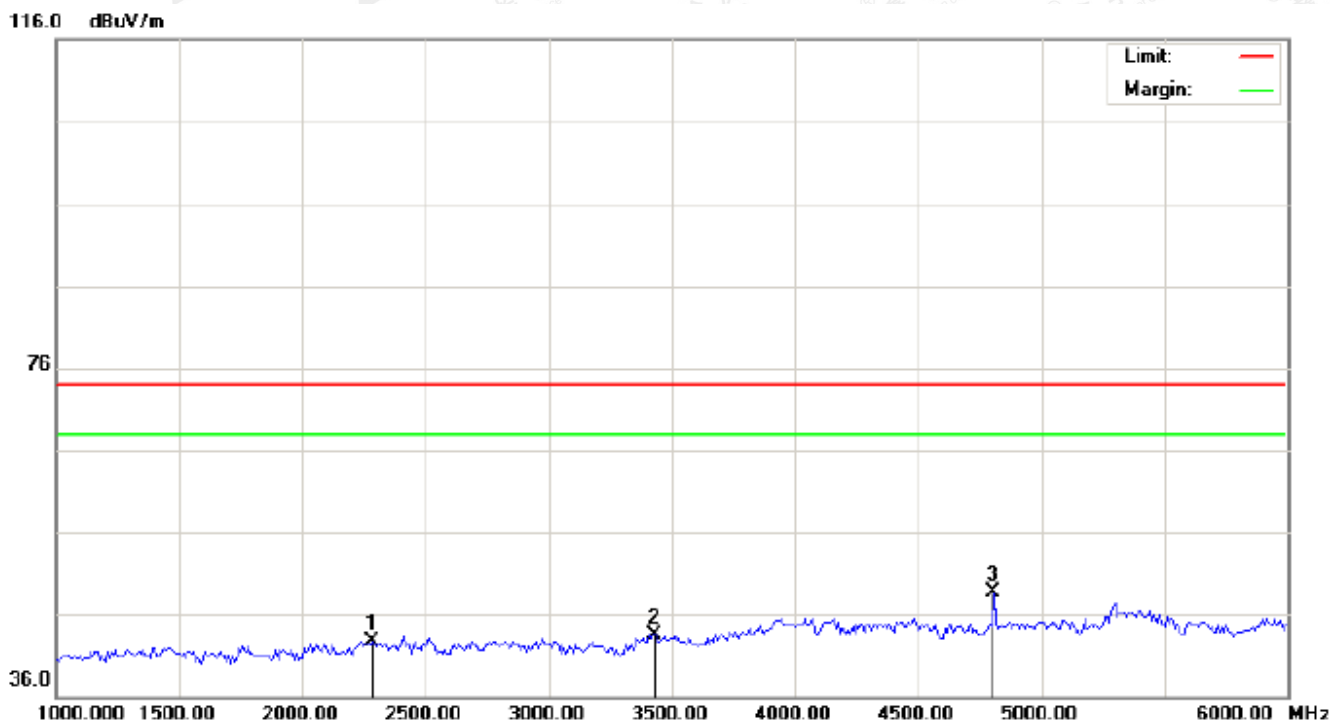
RESULT: PASS

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Attestation of Global Compliance

Tel: +86-755 2908 1955 Fax: +86-755 2600 8484 E-mail: agc@agc-cert.com 400 089 2118
Add: 2/F, Building 2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Baoan District, Shenzhen, Guangdong China

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

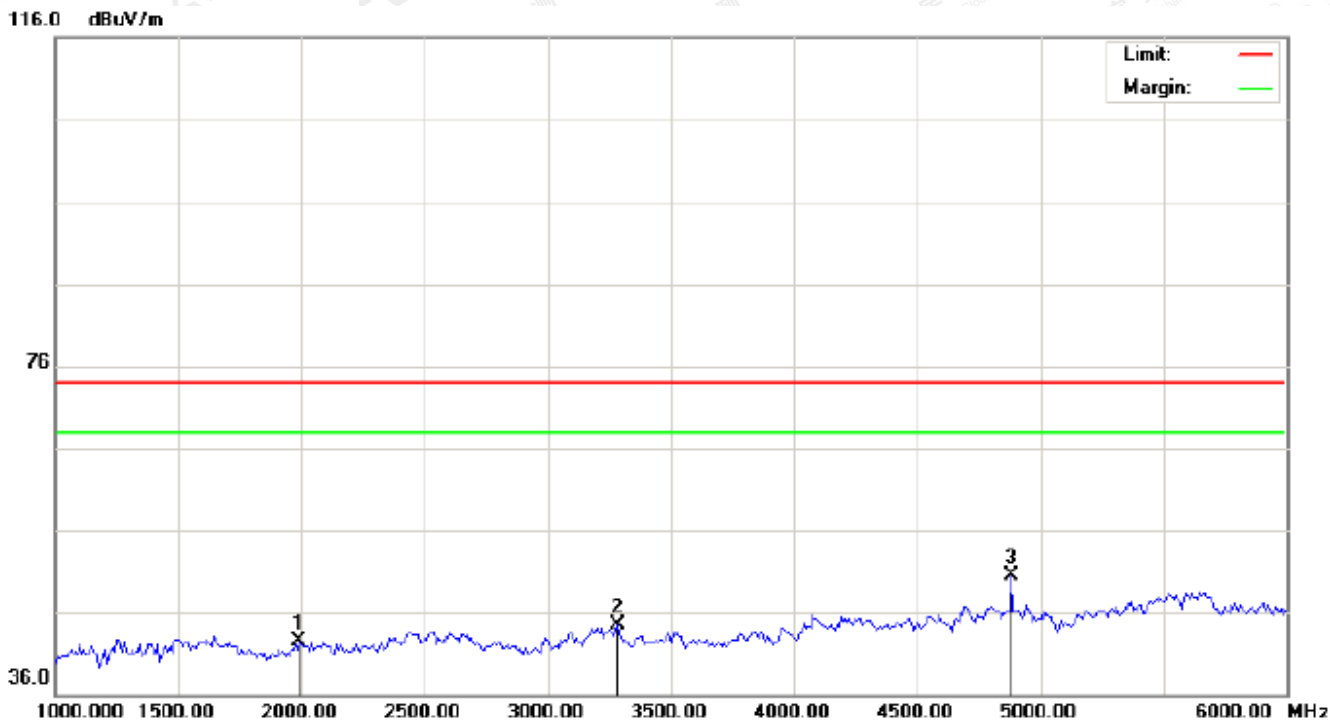


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2283.333	32.41	10.19	42.60	74.00	-31.40	peak			
2		3433.333	31.54	12.05	43.59	74.00	-30.41	peak			
3	*	4804.000	41.05	7.69	48.74	74.00	-25.26	peak			

RESULT: PASS

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

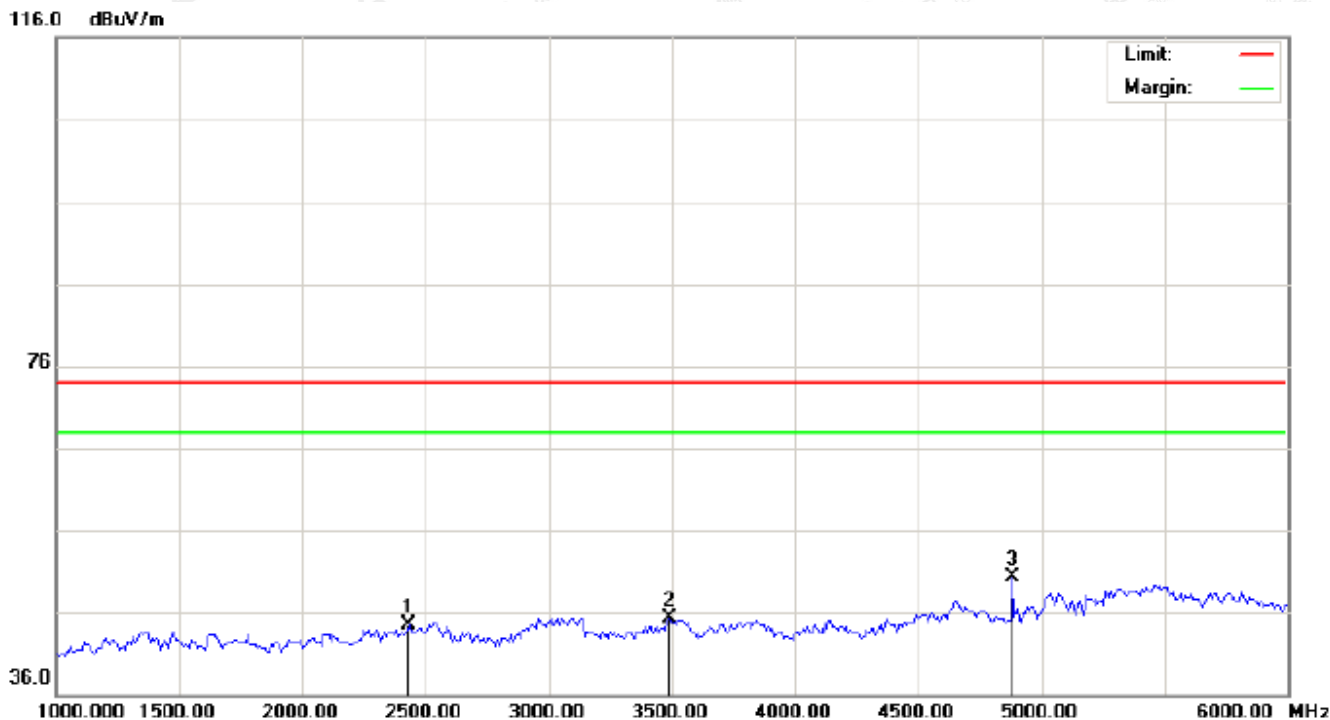


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		1991.667	32.70	9.79	42.49	74.00	-31.51	peak			
2		3283.333	32.67	11.91	44.58	74.00	-29.42	peak			
3	*	4882.000	42.66	7.89	50.55	74.00	-23.45	peak			

RESULT: PASS

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

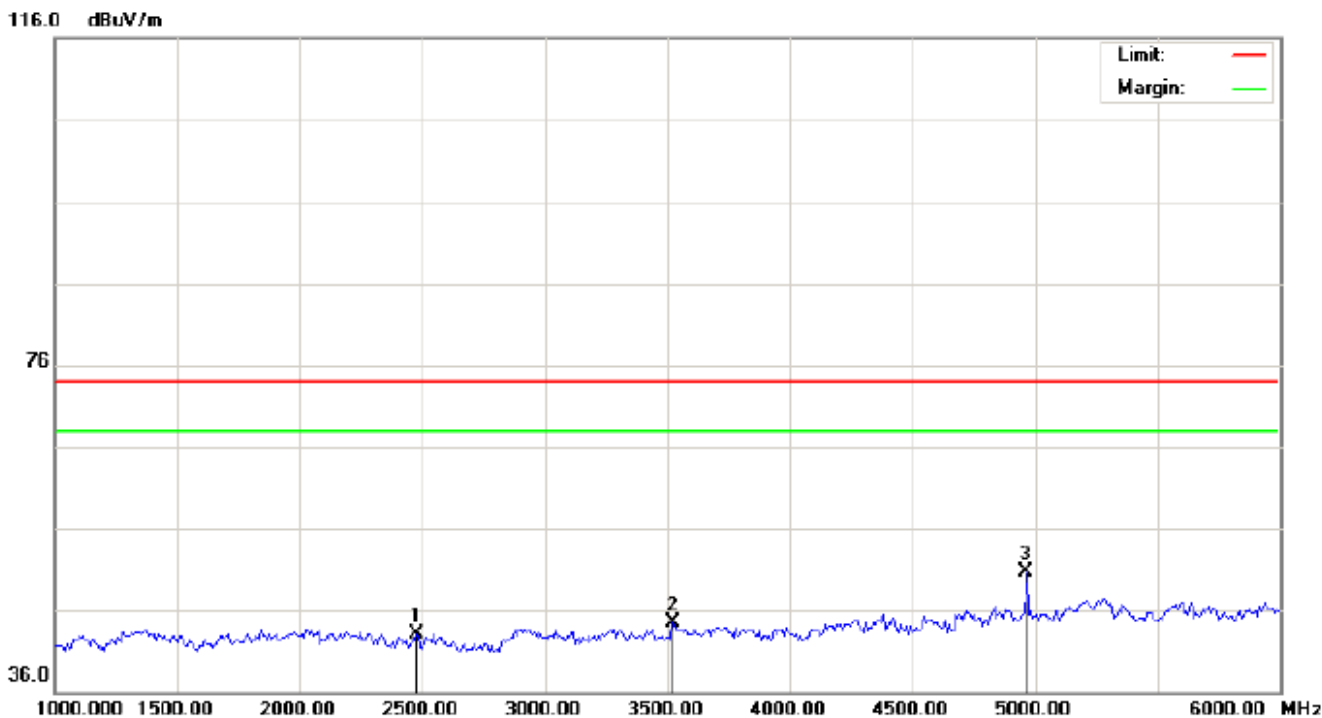


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2433.333	34.05	10.36	44.41	74.00	-29.59	peak			
2		3491.667	33.15	12.10	45.25	74.00	-28.75	peak			
3	*	4882.000	42.39	7.89	50.28	74.00	-23.72	peak			

RESULT: PASS

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

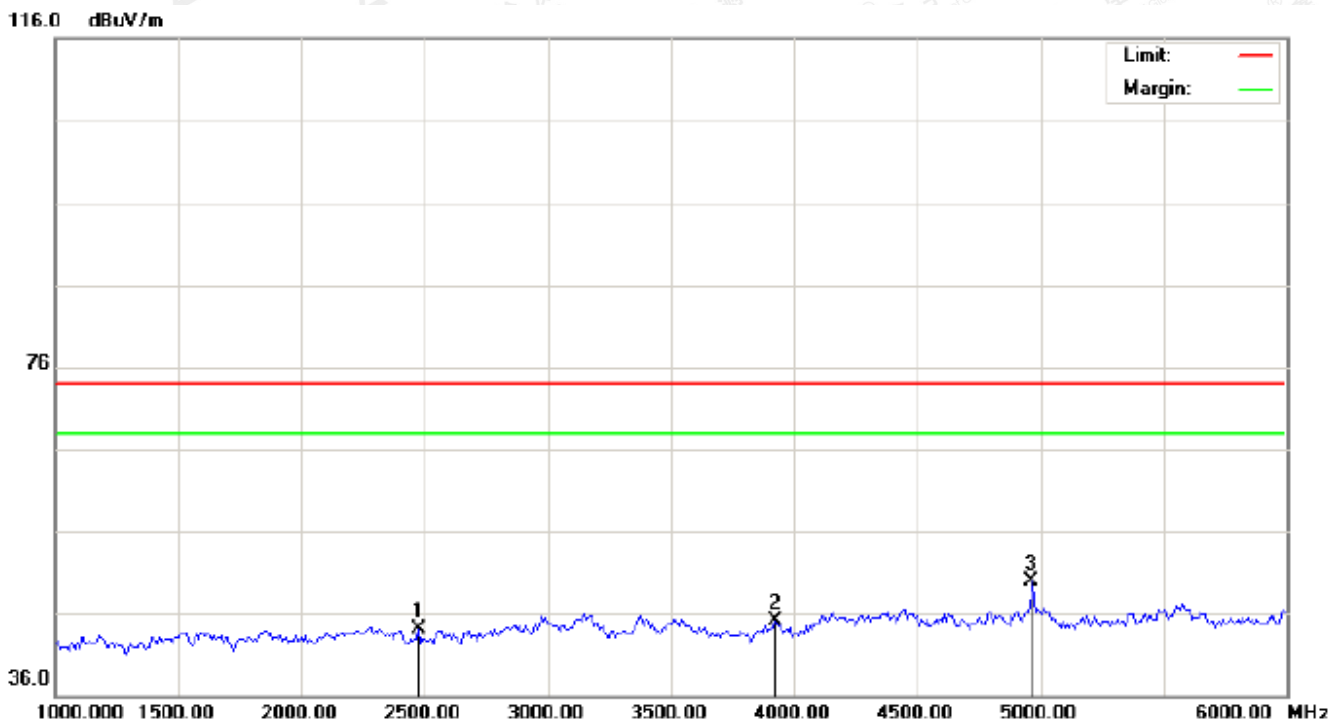


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2475.000	32.73	10.40	43.13	74.00	-30.87	peak			
2		3525.000	32.29	12.26	44.55	74.00	-29.45	peak			
3	*	4960.000	42.60	8.09	50.69	74.00	-23.31	peak			

RESULT: PASS

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



No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		2475.000	33.61	10.40	44.01	74.00	-29.99	peak			
2		3925.000	30.33	14.73	45.06	74.00	-28.94	peak			
3	*	4960.000	41.91	8.09	50.00	74.00	-24.00	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.

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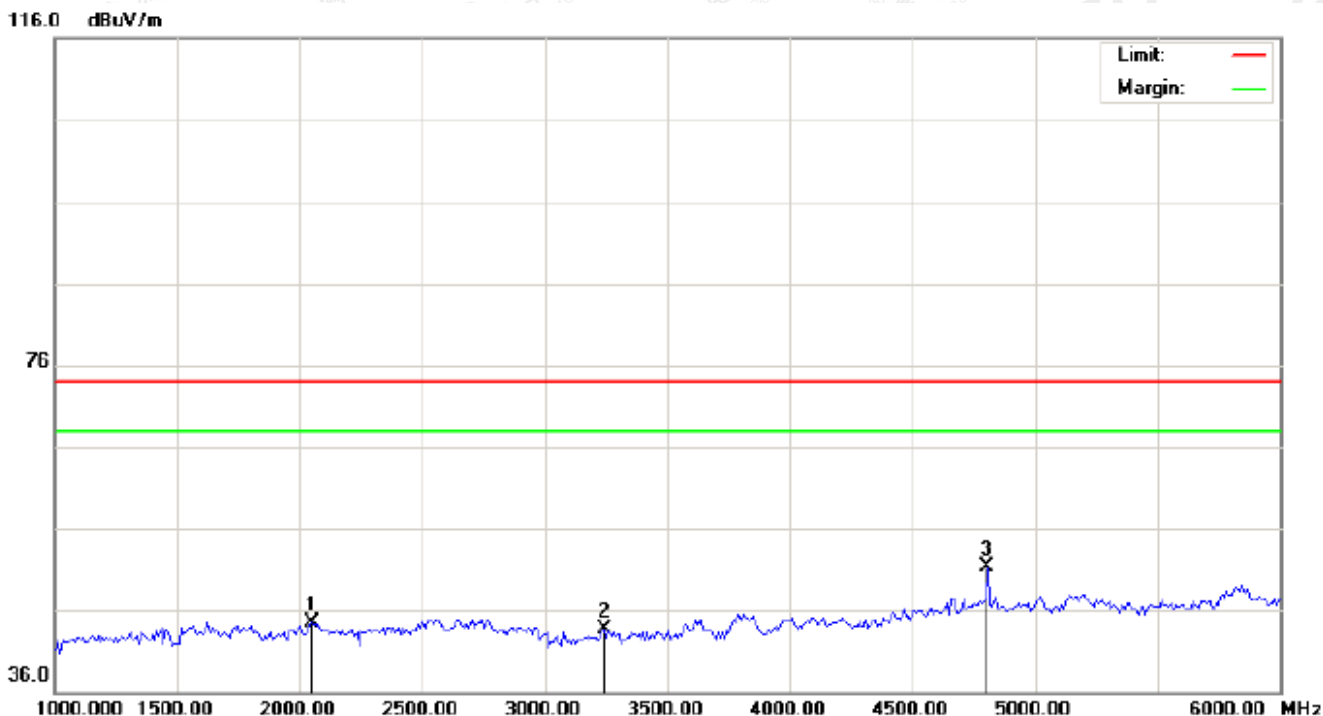
For NRF51822

For BLE

(Worst modulation:GFSK)

For Harmonics

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

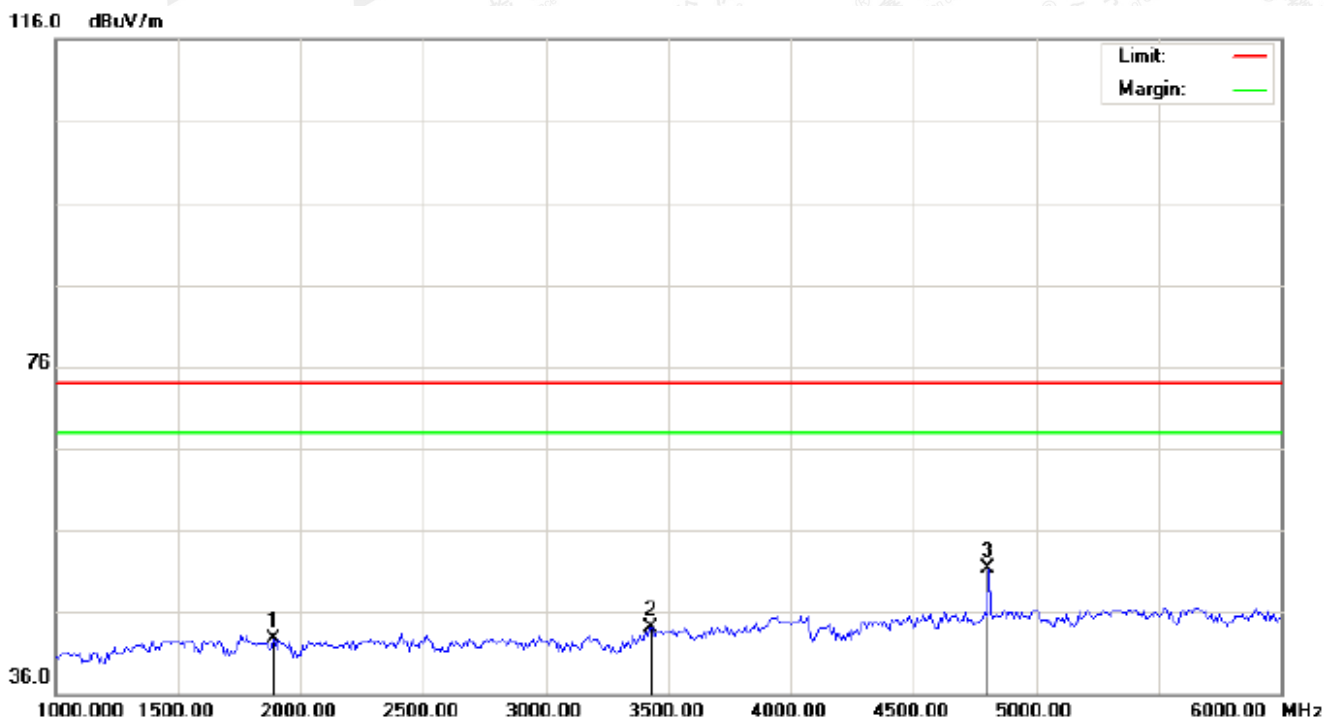


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2050.000	34.65	9.93	44.58	74.00	-29.42	peak			
2		3241.667	31.80	11.87	43.67	74.00	-30.33	peak			
3	*	4804.000	43.71	7.69	51.40	74.00	-22.60	peak			

RESULT: PASS

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

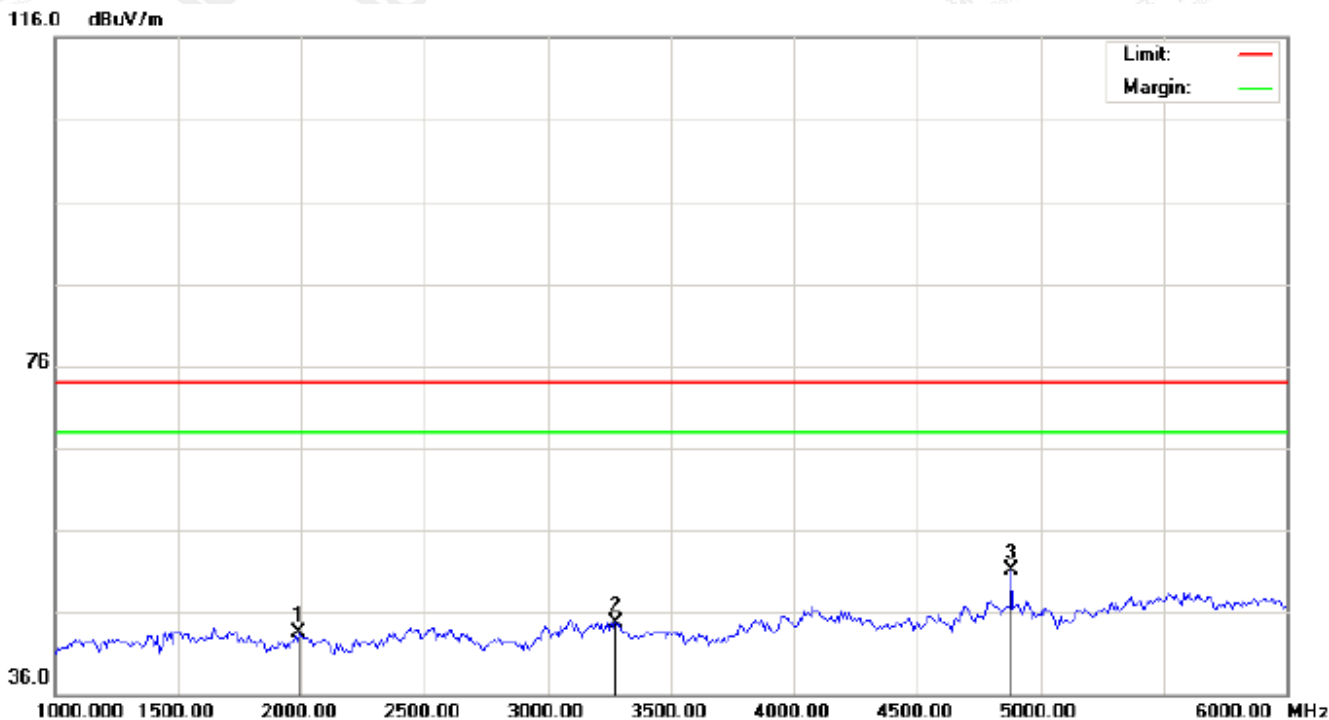


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		1891.667	34.01	8.74	42.75	74.00	-31.25	peak			
2		3433.333	32.04	12.05	44.09	74.00	-29.91	peak			
3	*	4804.000	43.55	7.69	51.24	74.00	-22.76	peak			

RESULT: PASS

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

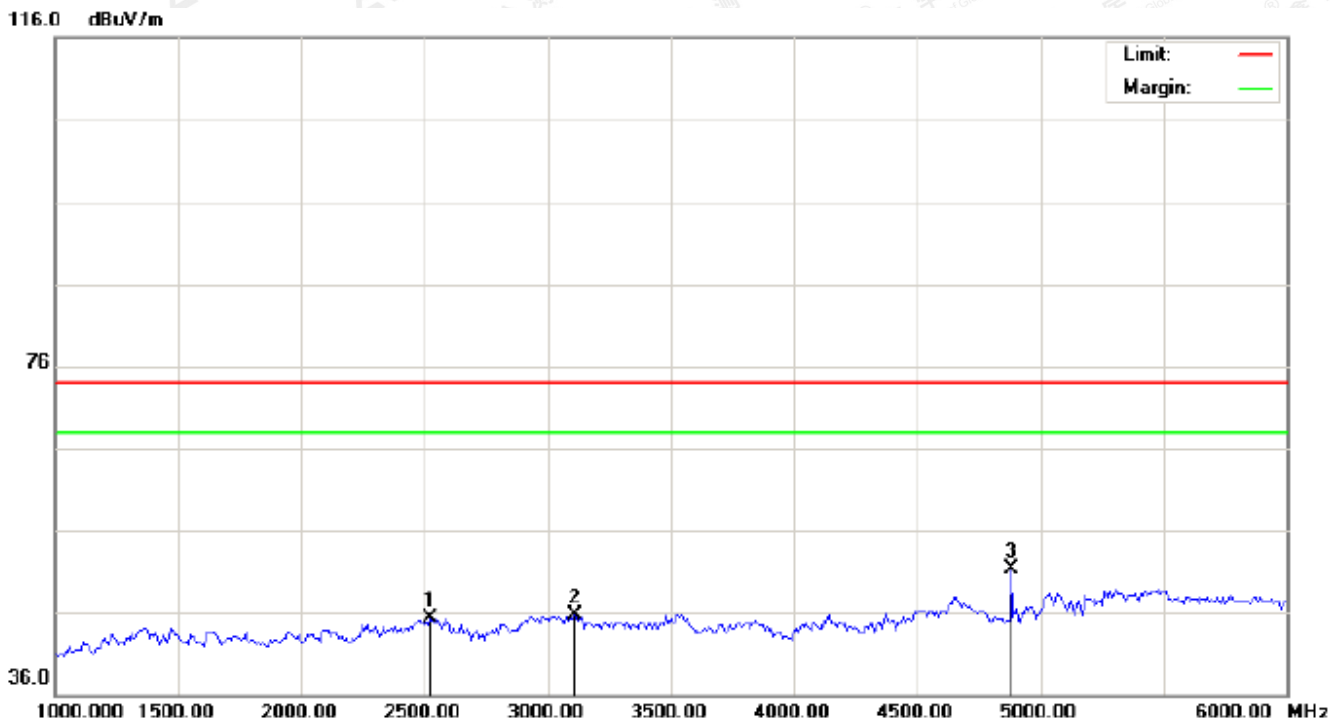


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		1991.667	33.70	9.79	43.49	74.00	-30.51	peak			
2		3275.000	32.90	11.90	44.80	74.00	-29.20	peak			
3	*	4882.000	43.16	7.89	51.05	74.00	-22.95	peak			

RESULT: PASS

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

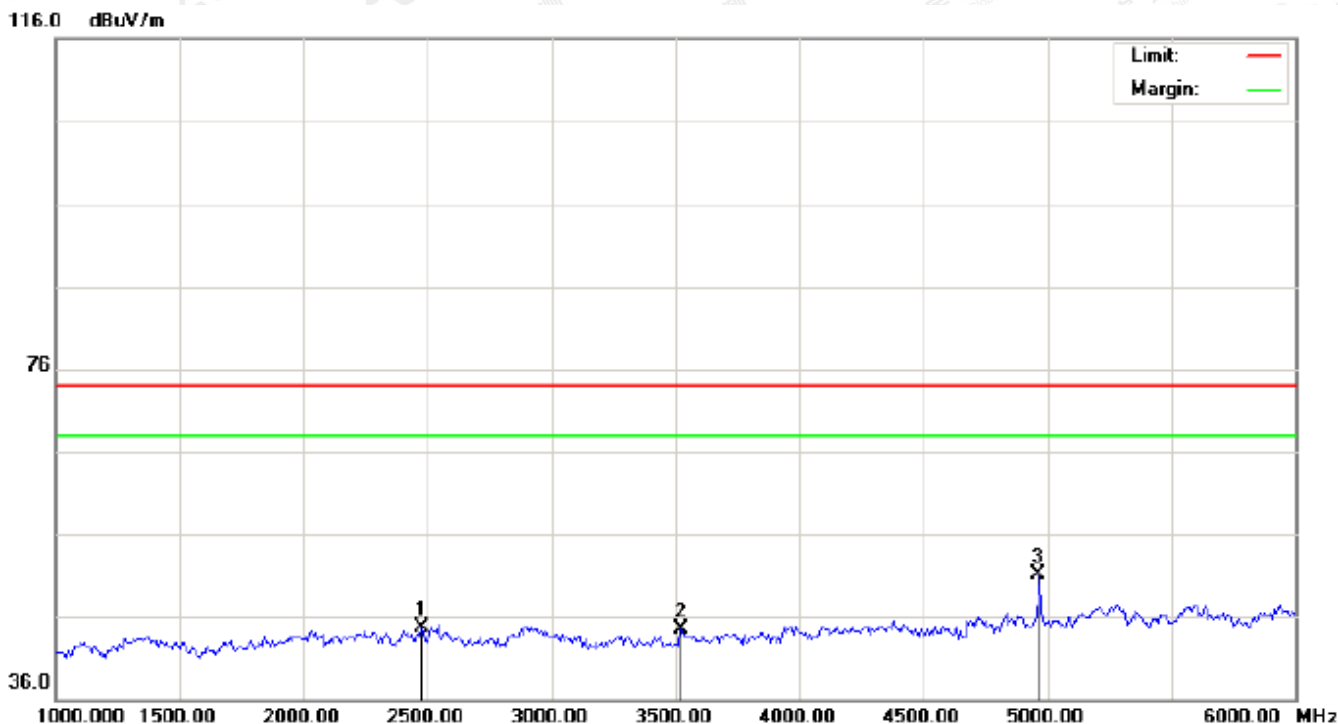


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2525.000	34.89	10.49	45.38	74.00	-28.62	peak			
2		3108.333	33.92	11.74	45.66	74.00	-28.34	peak			
3	*	4882.000	43.39	7.89	51.28	74.00	-22.72	peak			

RESULT: PASS

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

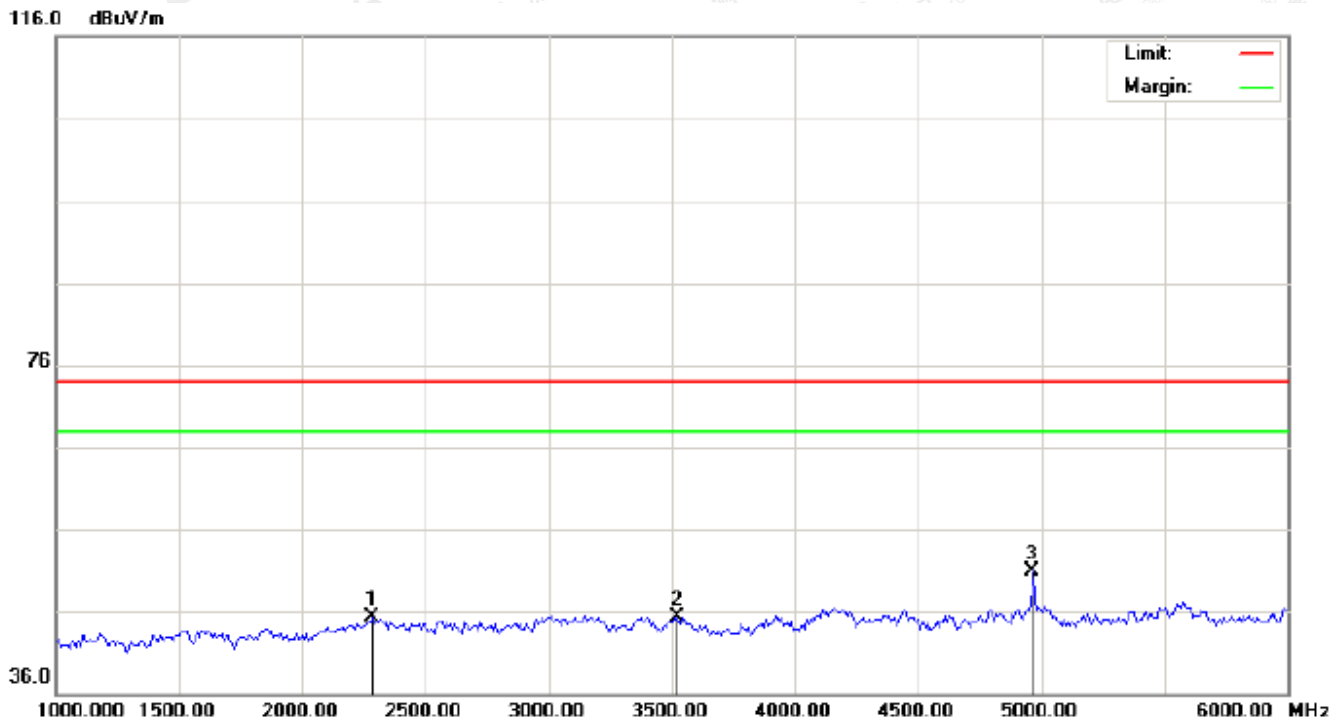


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2475.000	34.23	10.40	44.63	74.00	-29.37	peak			
2		3525.000	32.29	12.26	44.55	74.00	-29.45	peak			
3	*	4960.000	43.10	8.09	51.19	74.00	-22.81	peak			

RESULT: PASS

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



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		2283.333	35.05	10.19	45.24	74.00	-28.76	peak			
2		3525.000	33.02	12.26	45.28	74.00	-28.72	peak			
3	*	4960.000	42.91	8.09	51.00	74.00	-23.00	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.

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10. BAND EDGE EMISSION

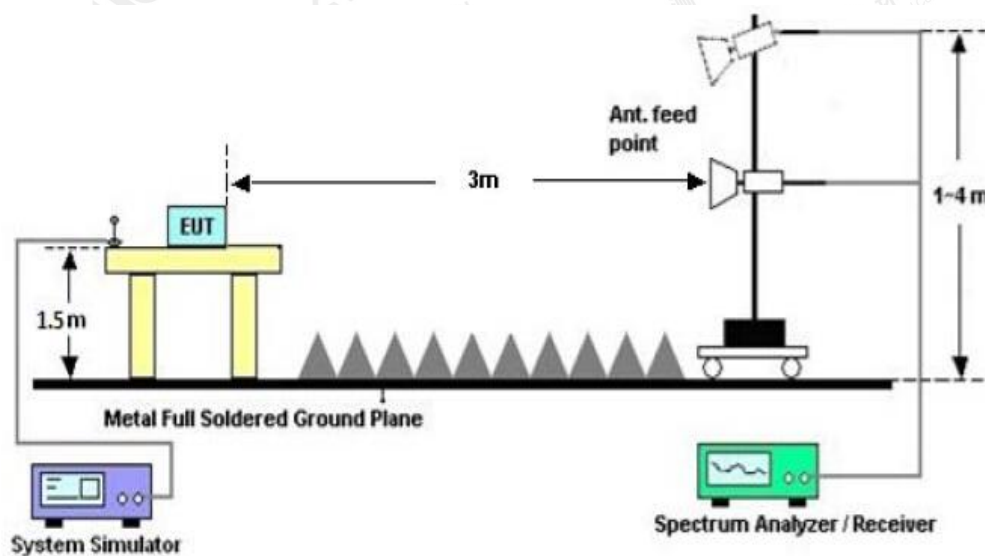
10.1. MEASUREMENT PROCEDURE

1. The EUT operates at hopping-off test mode. The lowest or highest channels are tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.
2. Max hold the trace of the setup 1, and the EUT operates at hopping-on test mode to verify the largest spurious emissions power.
3. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission.

Start frequency(MHz)	Stop frequency(MHz)
2200	2405
2478	2500

10.2 TEST SETUP

RADIATED EMISSION TEST SETUP



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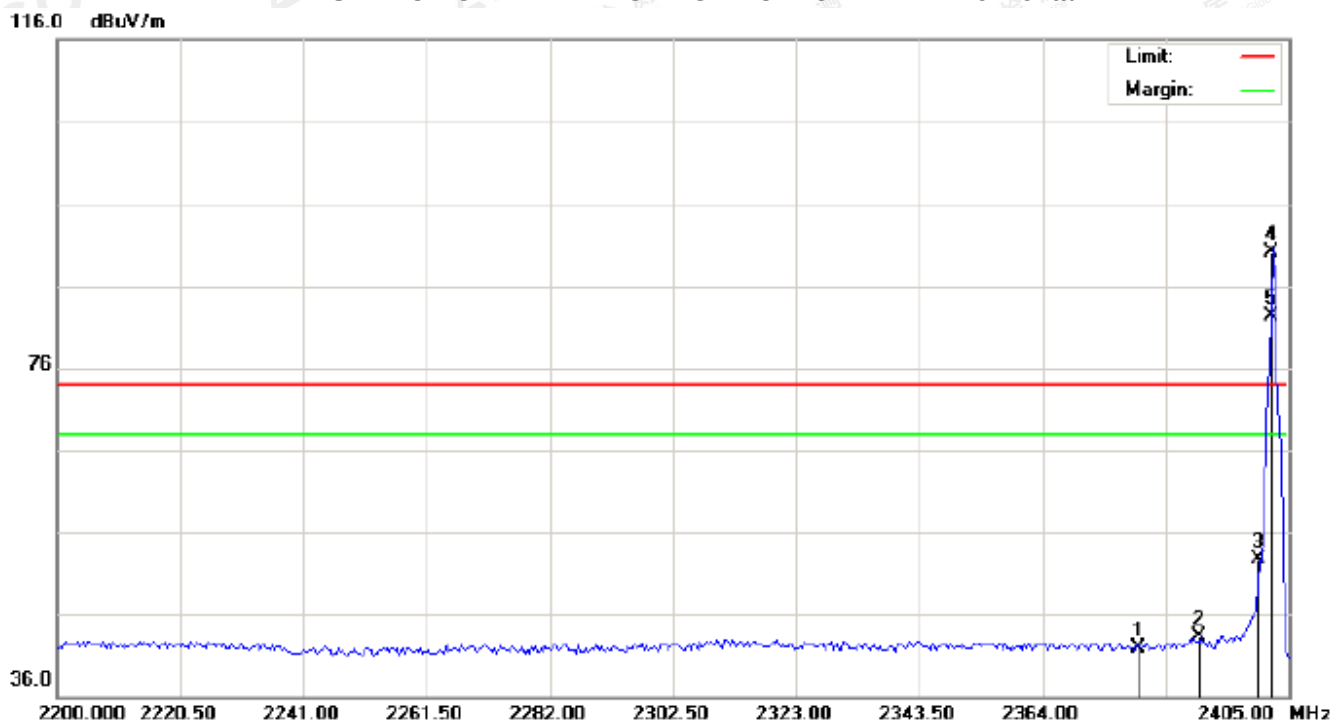
10.3 RADIATED TEST RESULT

For AB1512

FOR BR/EDR

(Worst modulation: 8DPSK)

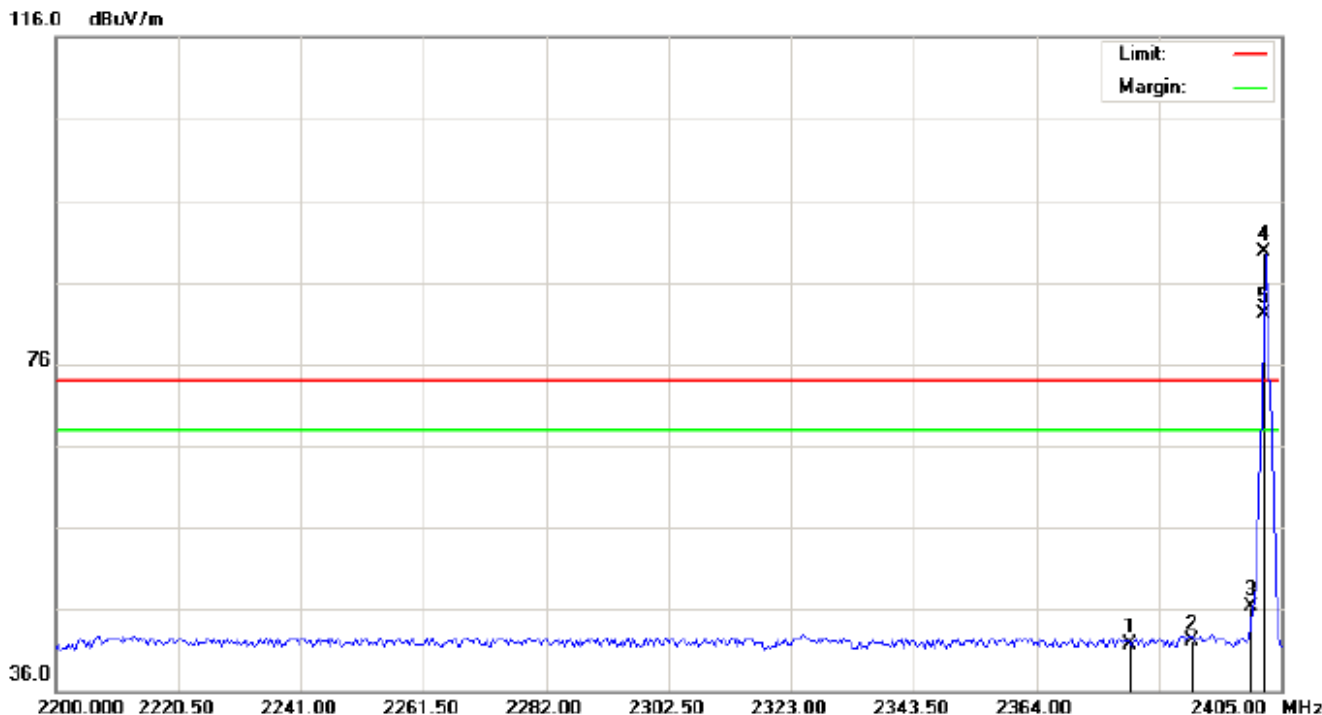
TEST PLOT OF BAND EDGE FOR LOW CHANNEL-Horizontal



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		2380.058	31.56	10.30	41.86	74.00	-32.14	peak			
2		2390.000	33.00	10.31	43.31	74.00	-30.69	peak			
3		2400.000	42.47	10.32	52.79	74.00	-21.21	peak			
4	*	2402.000	79.80	10.32	90.12	74.00	16.12	peak			
5	X	2402.000	71.99	10.32	82.31	74.00	8.31	AVG	100	333	

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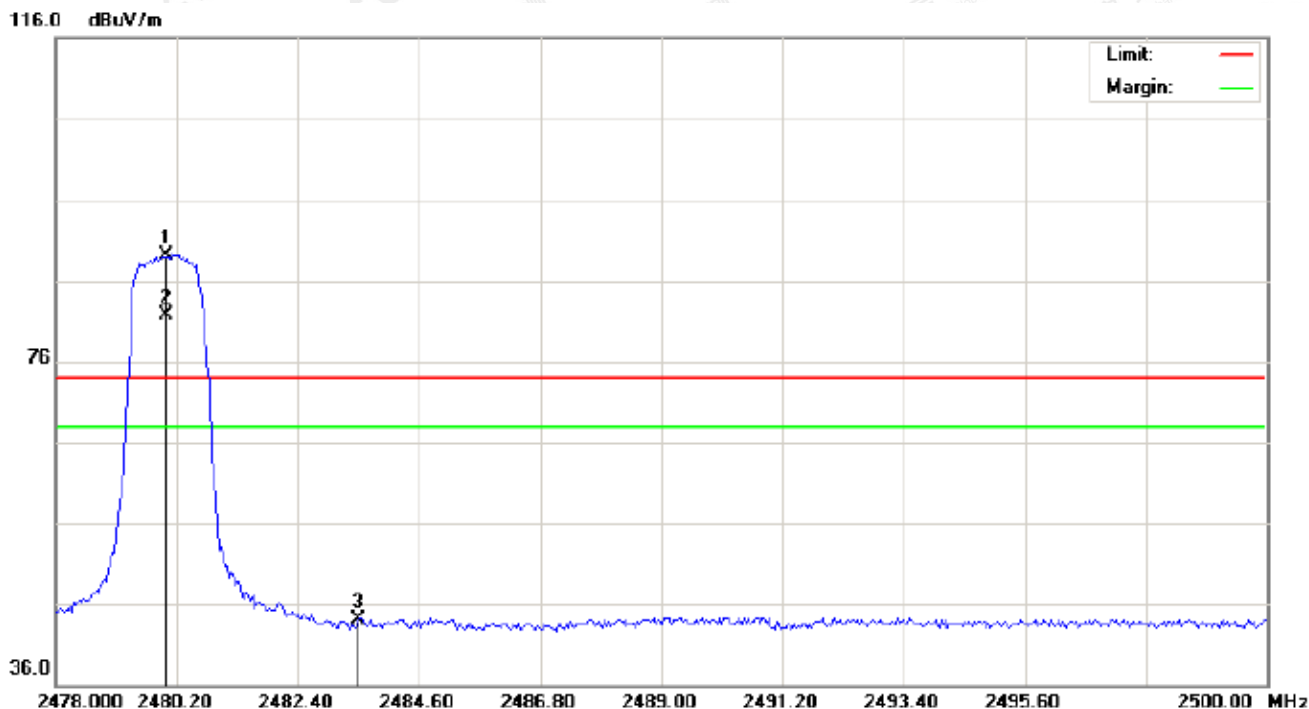
TEST PLOT OF BAND EDGE FOR LOW CHANNEL -Vertical



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		2379.716	31.50	10.30	41.80	74.00	-32.20	peak			
2		2390.000	31.71	10.31	42.02	74.00	-31.98	peak			
3		2400.000	36.06	10.32	46.38	74.00	-27.62	peak			
4	*	2402.000	79.36	10.32	89.68	74.00	15.68	peak			
5	X	2402.000	71.72	10.32	82.04	74.00	8.04	AVG	100	110	

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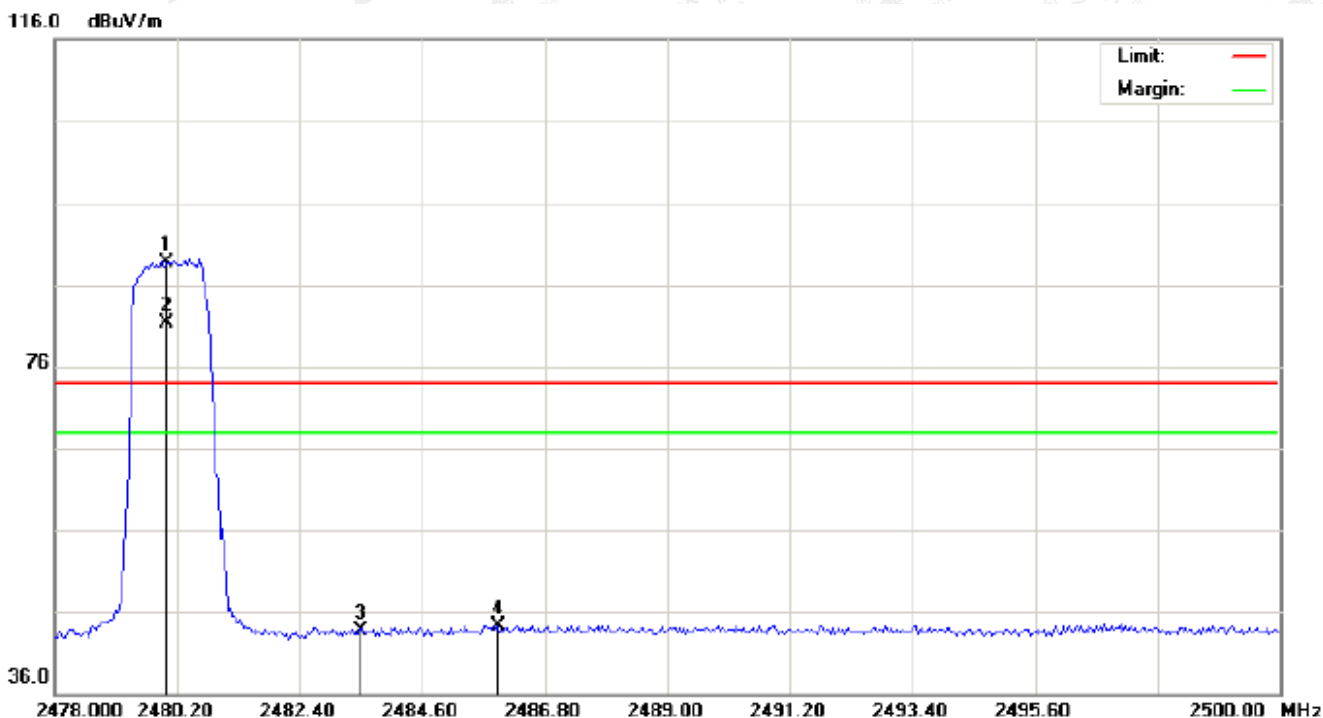
TEST PLOT OF BAND EDGE FOR HIGH CHANNEL -Horizontal



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	78.74	10.41	89.15	74.00	15.15	peak			
2	X	2480.000	71.24	10.41	81.65	74.00	7.65	AVG	100	310	
3		2483.500	33.69	10.41	44.10	74.00	-29.90	peak			

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TEST PLOT OF BAND EDGE FOR HIGH CHANNEL-Vertical



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	78.31	10.41	88.72	74.00	14.72	peak			
2	X	2480.000	70.95	10.41	81.36	74.00	7.36	AVG	100	124	
3		2483.500	33.26	10.41	43.67	74.00	-30.33	peak			
4		2485.957	33.98	10.41	44.39	74.00	-29.61	peak			

RESULT: PASS

Note: Factor=Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

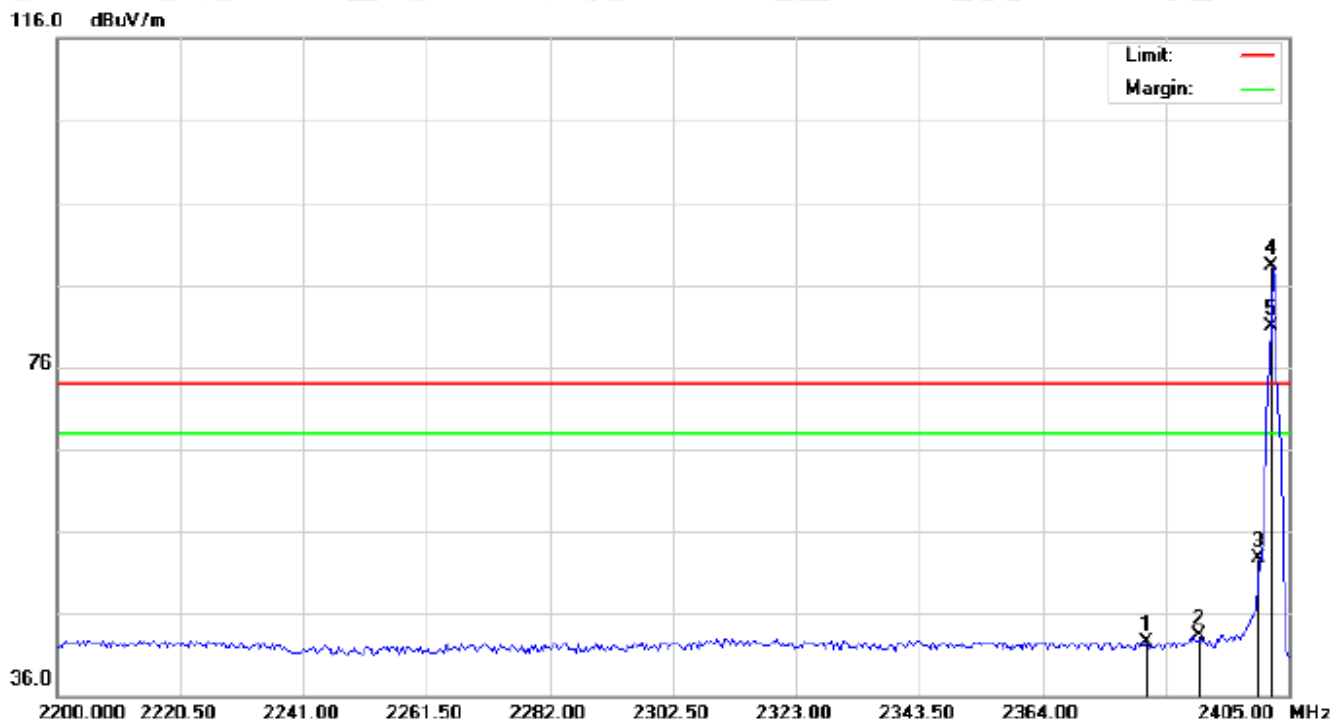
The "Factor" value can be calculated automatically by software of measurement system.

Hopping on mode and Hopping off mode have been tested, but only worst case reported.

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For NRF51822
FOR BLE

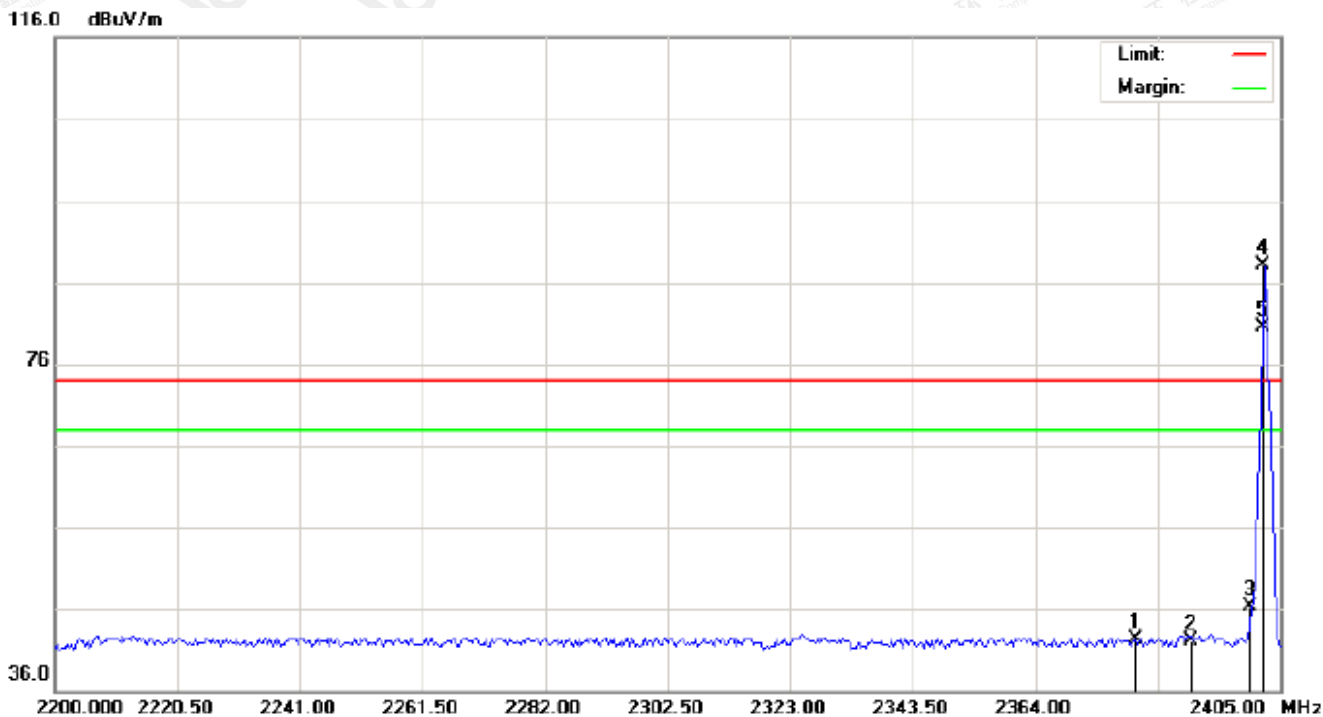
TEST PLOT OF BAND EDGE FOR LOW CHANNEL-Horizontal



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		2381.425	32.17	10.30	42.47	74.00	-31.53	peak			
2		2390.000	33.00	10.31	43.31	74.00	-30.69	peak			
3		2400.000	42.47	10.32	52.79	74.00	-21.21	peak			
4	*	2402.000	78.00	10.32	88.32	74.00	14.32	peak			
5	X	2402.000	70.54	10.32	80.86	74.00	6.86	AVG	100	341	

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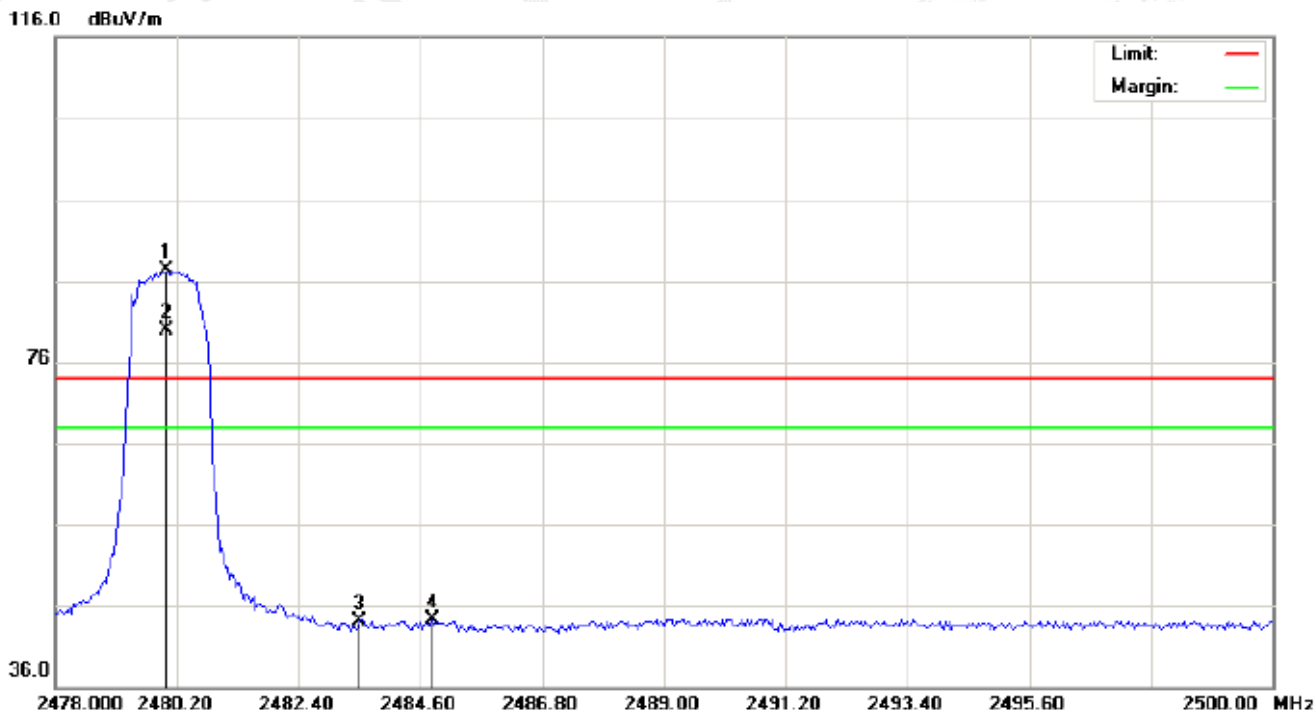
TEST PLOT OF BAND EDGE FOR LOW CHANNEL -Vertical



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		2380.741	32.03	10.30	42.33	74.00	-31.67	peak			
2		2390.000	31.71	10.31	42.02	74.00	-31.98	peak			
3		2400.000	36.06	10.32	46.38	74.00	-27.62	peak			
4	*	2402.000	77.72	10.32	88.04	74.00	14.04	peak			
5	X	2402.000	70.20	10.32	80.52	74.00	6.52	AVG	100	147	

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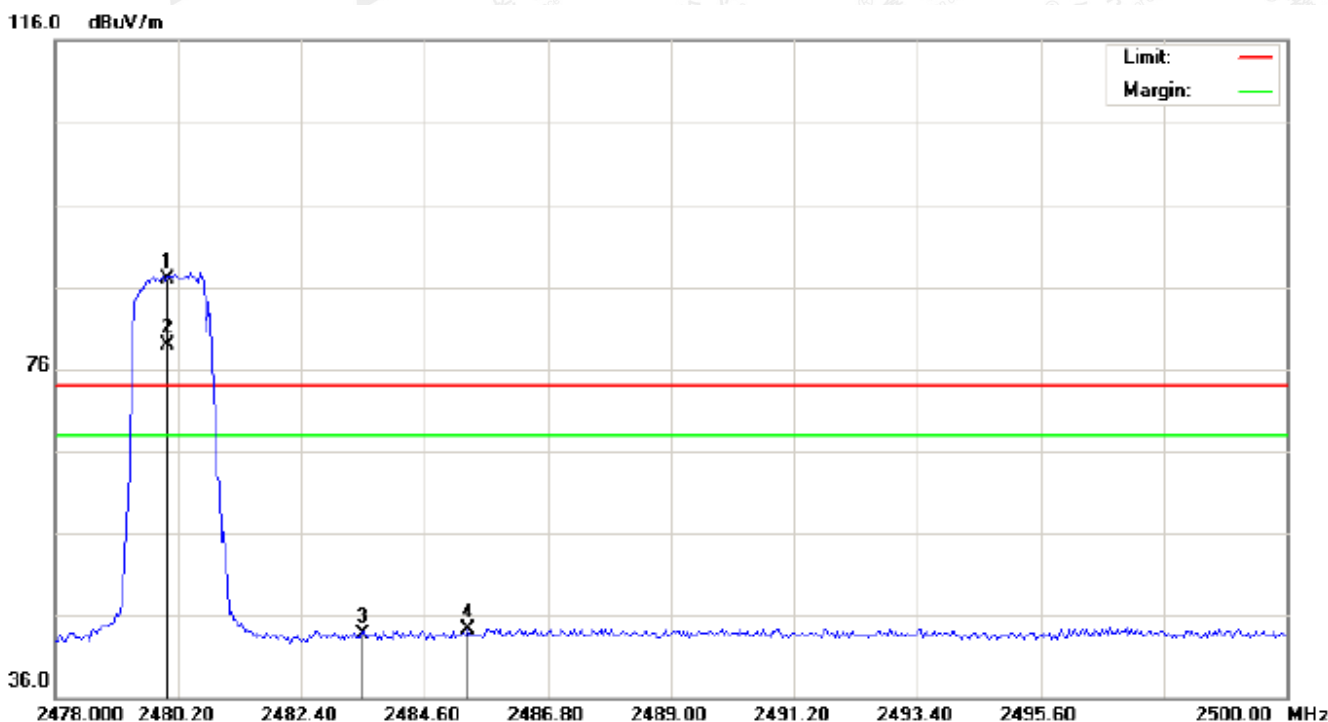
TEST PLOT OF BAND EDGE FOR HIGH CHANNEL -Horizontal



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	76.89	10.41	87.30	74.00	13.30	peak			
2	X	2480.000	69.41	10.41	79.82	74.00	5.82	AVG	100	344	
3		2483.500	33.69	10.41	44.10	74.00	-29.90	peak			
4		2484.820	33.86	10.41	44.27	74.00	-29.73	peak			

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TEST PLOT OF BAND EDGE FOR HIGH CHANNEL-Vertical



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	76.59	10.41	87.00	74.00	13.00	peak			
2	X	2480.000	68.41	10.41	78.82	74.00	4.82	AVG	100	124	
3		2483.500	33.26	10.41	43.67	74.00	-30.33	peak			
4		2485.370	33.89	10.41	44.30	74.00	-29.70	peak			

RESULT: PASS

Note: Factor=Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

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

Hopping on mode and Hopping off mode have been tested, but only worst case reported.

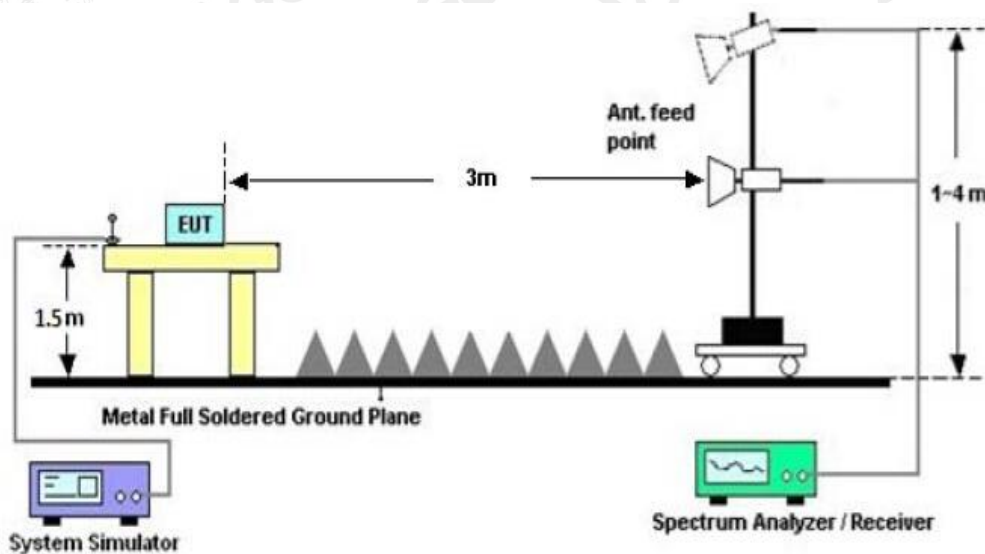
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11. 20DB BANDWIDTH

11.1. MEASUREMENT PROCEDURE

1. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
2. Set Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW $\geq$ 1% of the 20 dB bandwidth, VBW $\geq$ 3RBW; Sweep = auto; Detector function = peak
3. Set SPA Trace 1 Max hold, then View.

11.2. TEST SET-UP



11.3. LIMITS AND MEASUREMENT RESULTS

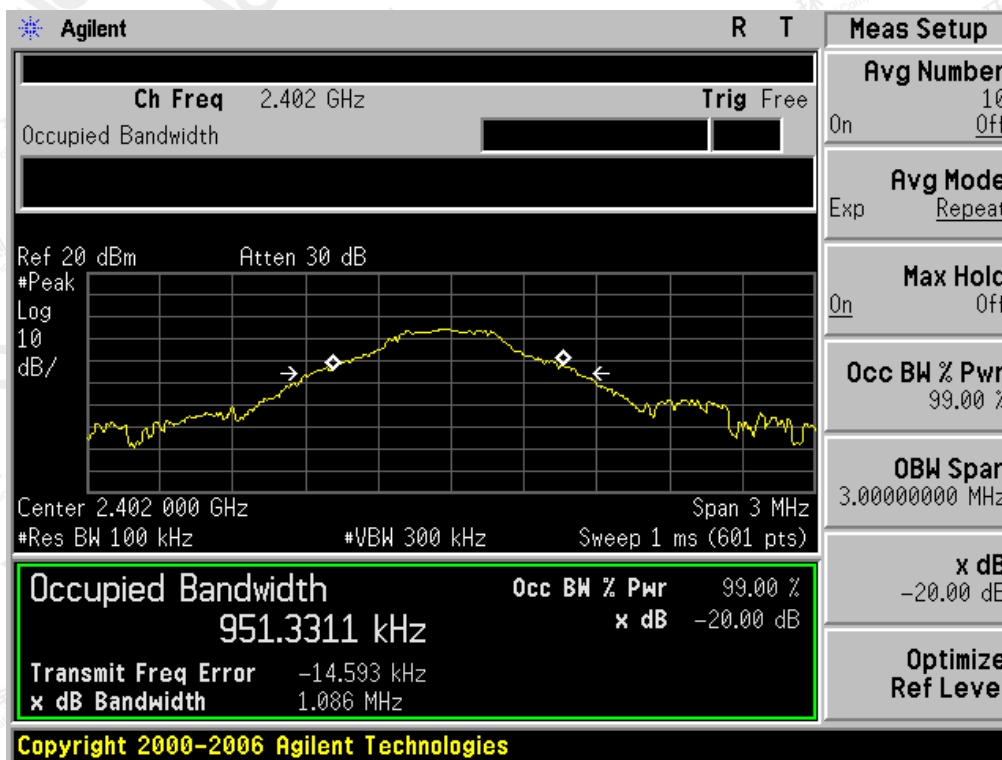
For AB1512

FOR BR/EDR

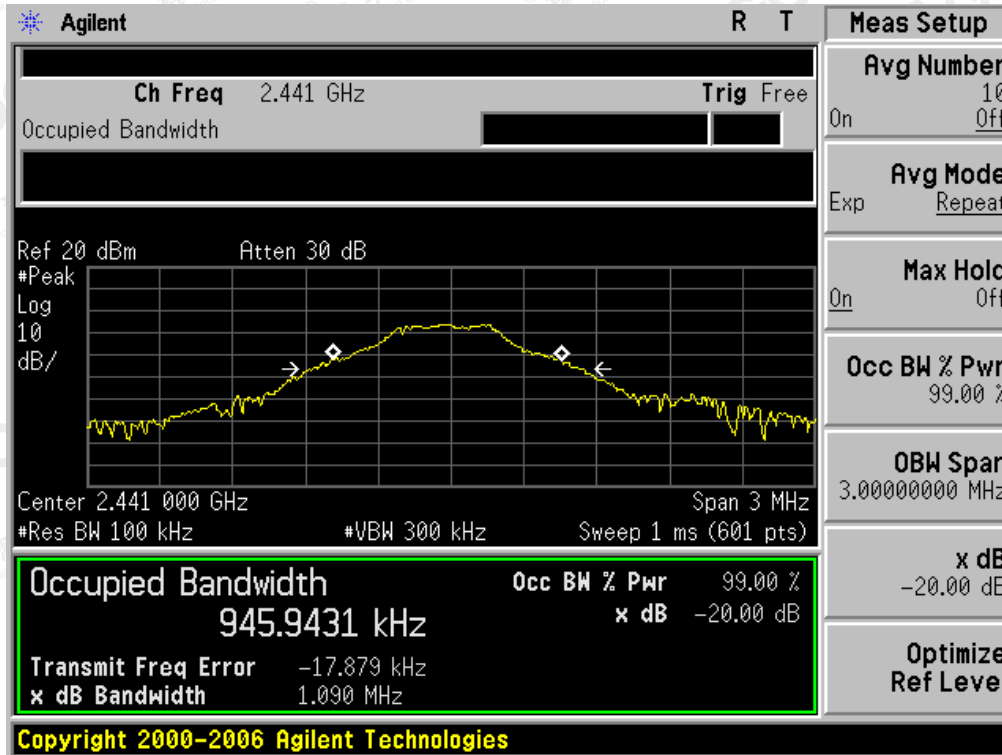
BLUETOOTH 1MBPS LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Measurement Result			
	Test Data (MHz)			Result
		99%OBW (MHz)	-20dB BW(MHz)	
N/A	Low Channel	0.951	1.086	PASS
	Middle Channel	0.946	1.090	PASS
	High Channel	0.959	1.104	PASS

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TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

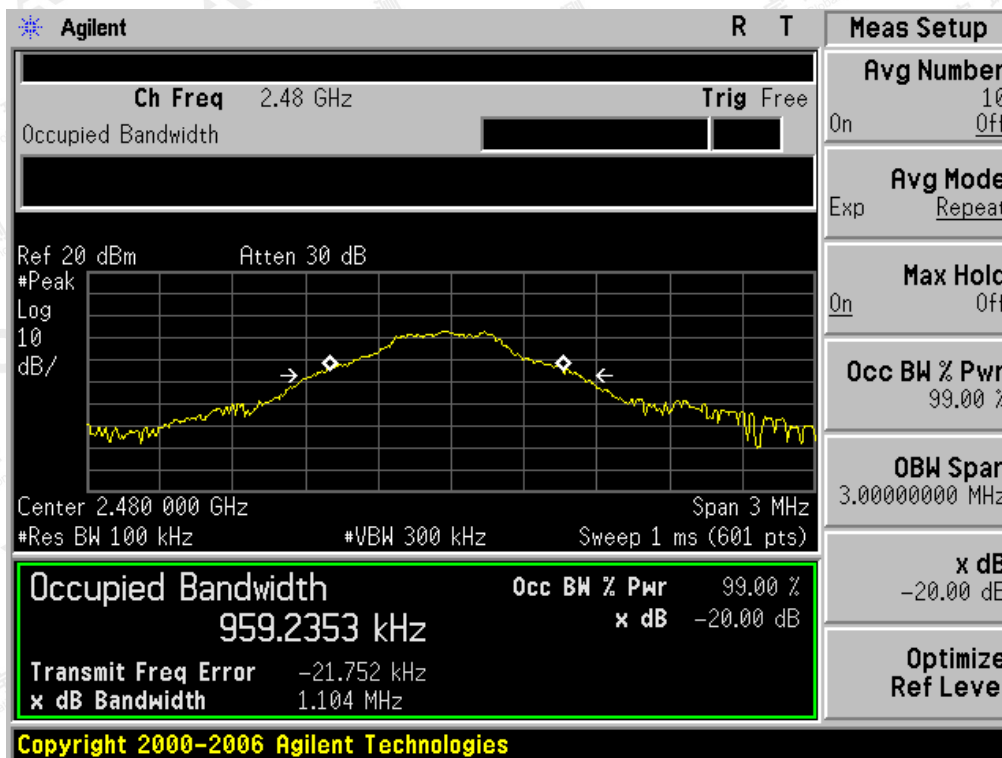


TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



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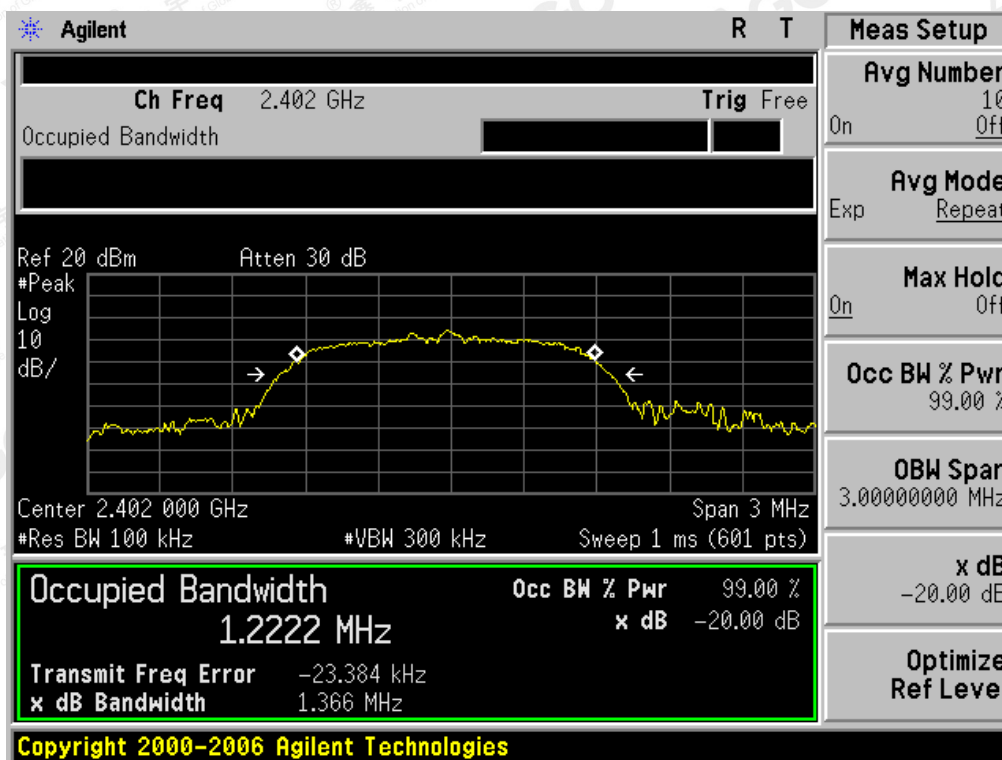
TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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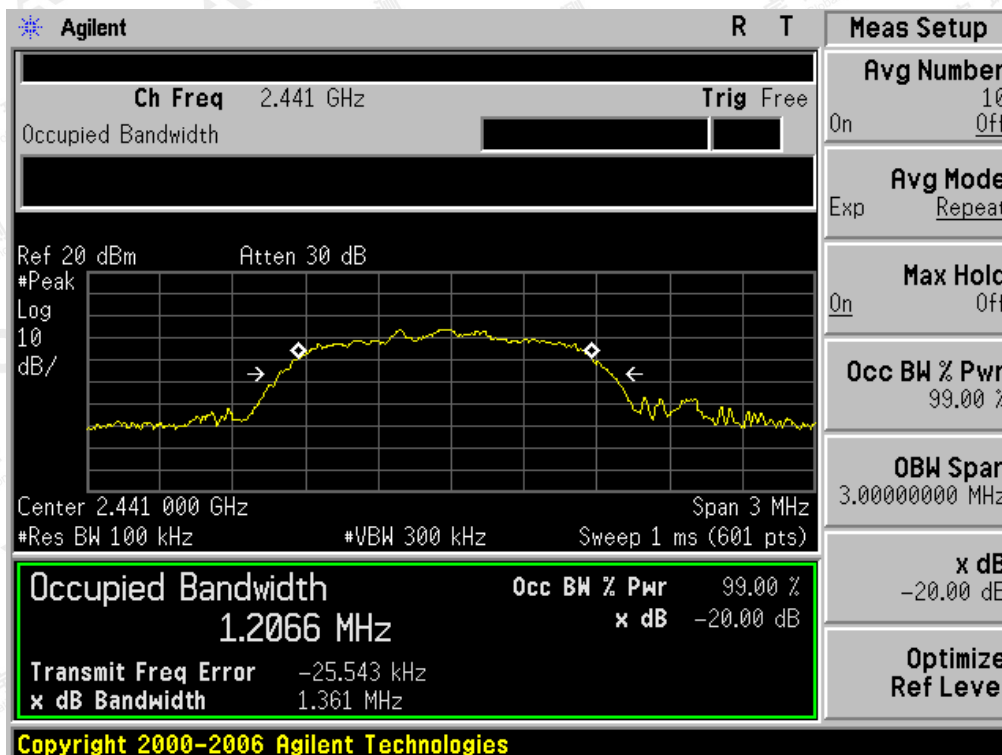
BLUETOOTH 2MBPS LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Measurement Result			
	Test Data (MHz)			Result
		99%OBW (MHz)	-20dB BW(MHz)	
N/A	Low Channel	1.222	1.366	PASS
	Middle Channel	1.207	1.361	PASS
	High Channel	1.212	1.361	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

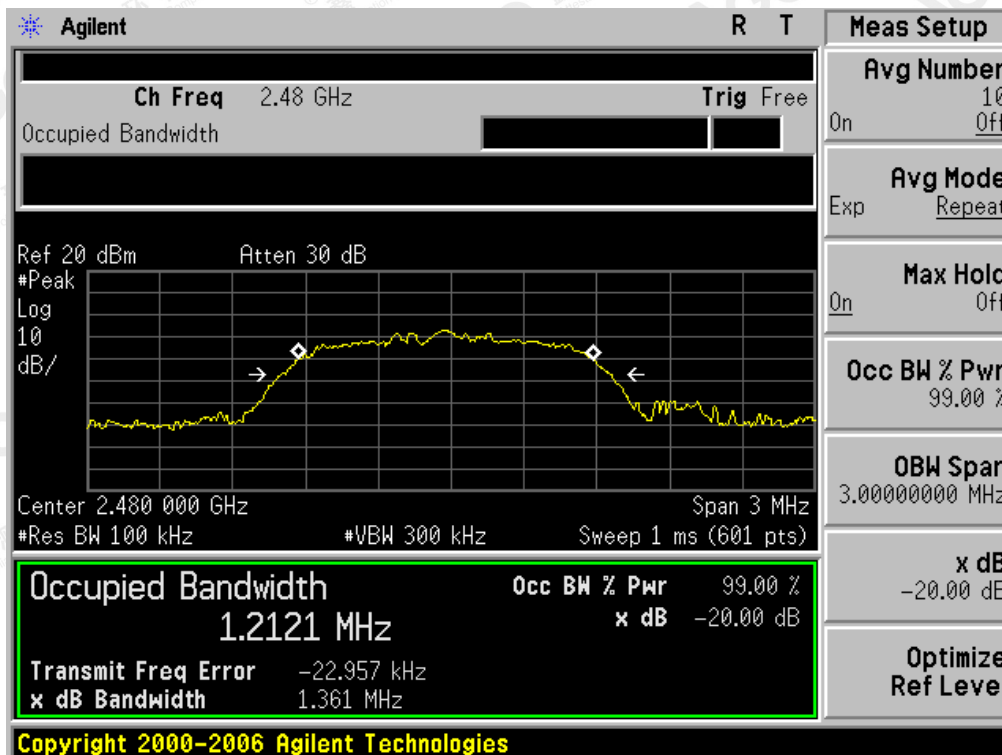


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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



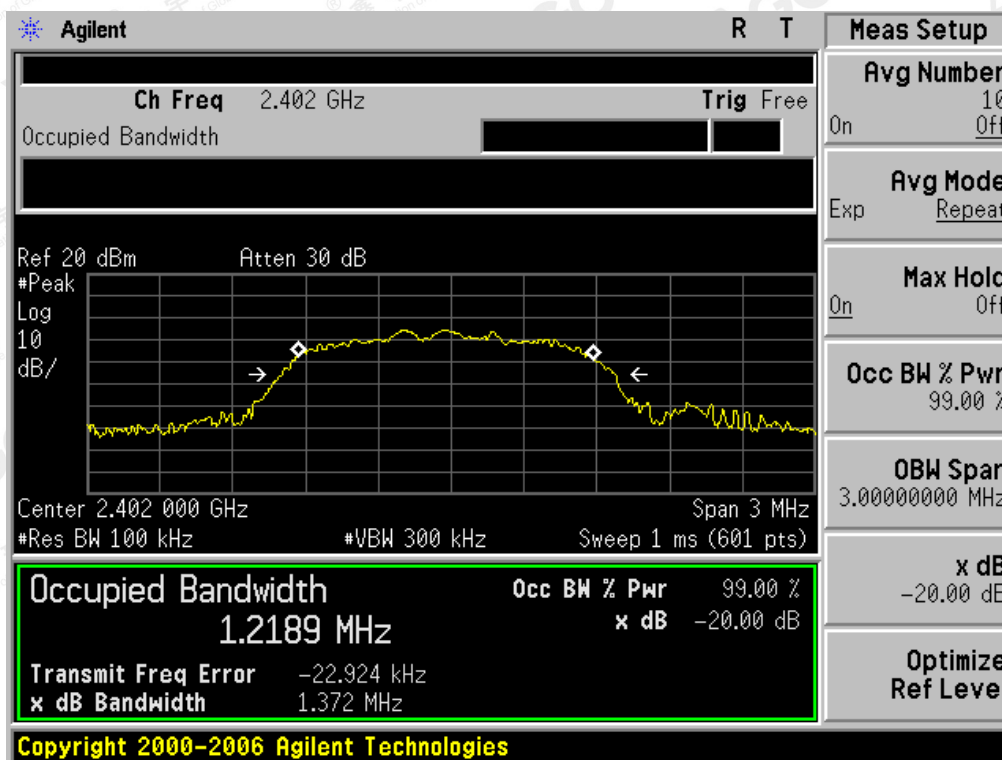
TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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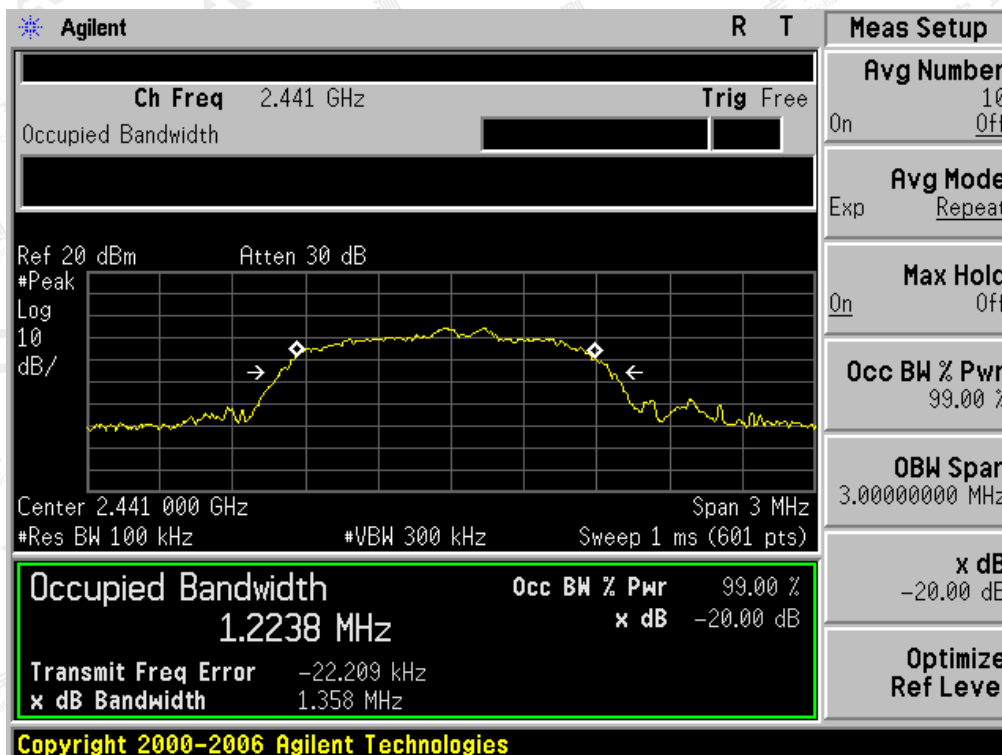
BLUETOOTH 3MBPS LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Measurement Result			
	Test Data (MHz)			Result
		99%OBW (MHz)	-20dB BW(MHz)	
N/A	Low Channel	1.219	1.372	PASS
	Middle Channel	1.224	1.358	PASS
	High Channel	1.226	1.374	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

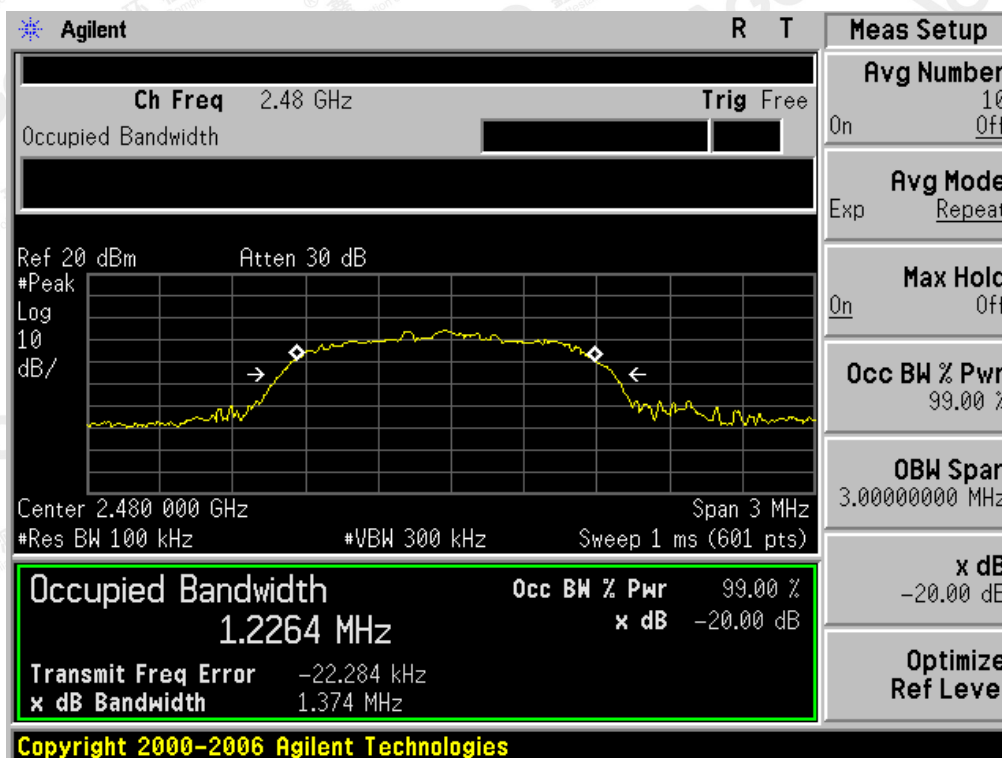


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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



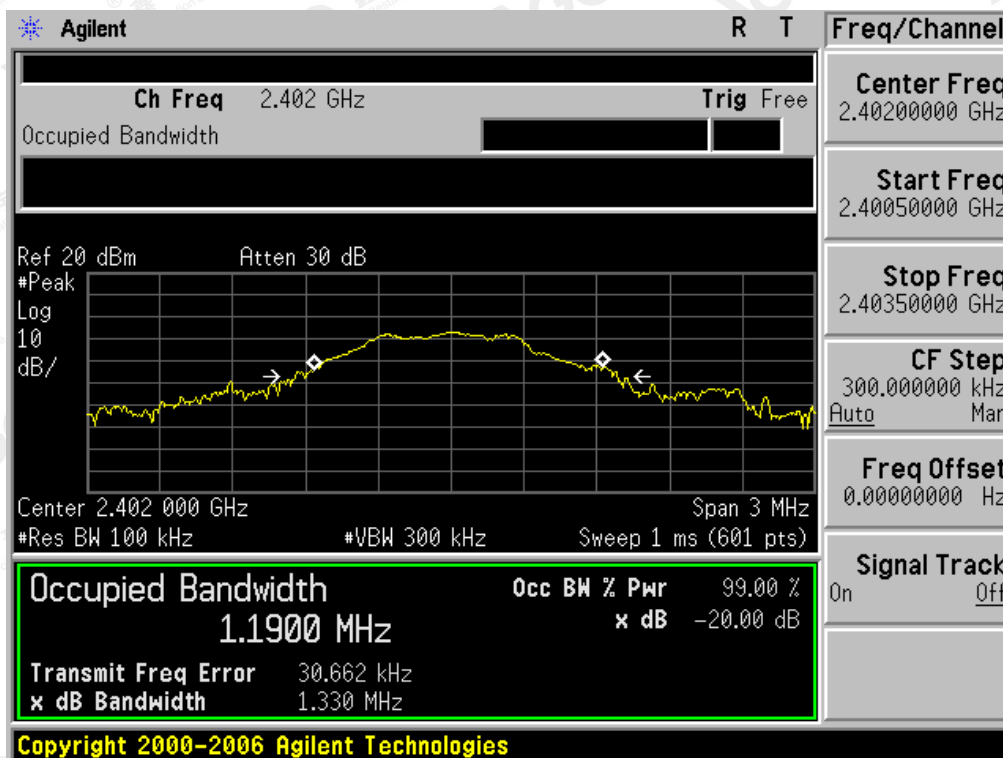
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For NRF51822

FOR BLE

BLUETOOTH 1MBPS LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Measurement Result			
	Test Data (MHz)			Result
		99%OBW (MHz)	-20dB BW(MHz)	
N/A	Low Channel	1.190	1.330	PASS
	Middle Channel	1.082	1.264	PASS
	High Channel	1.051	1.220	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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12. FCC LINE CONDUCTED EMISSION TEST

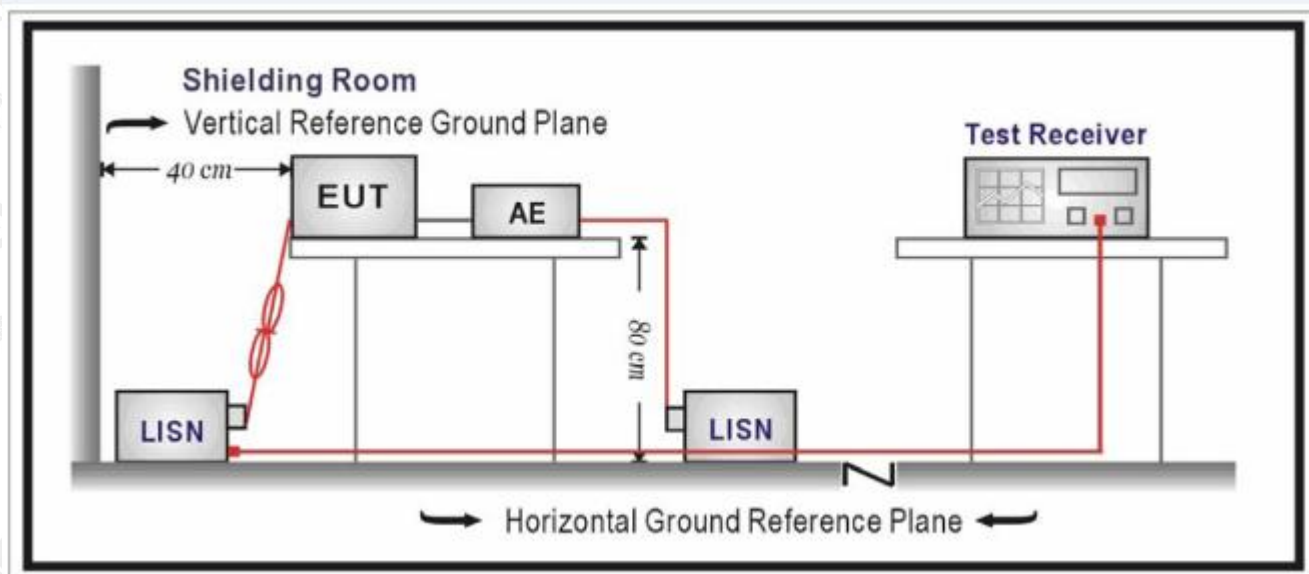
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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.

12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

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 or PC which received 120V/60Hz power 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 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.

12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

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.

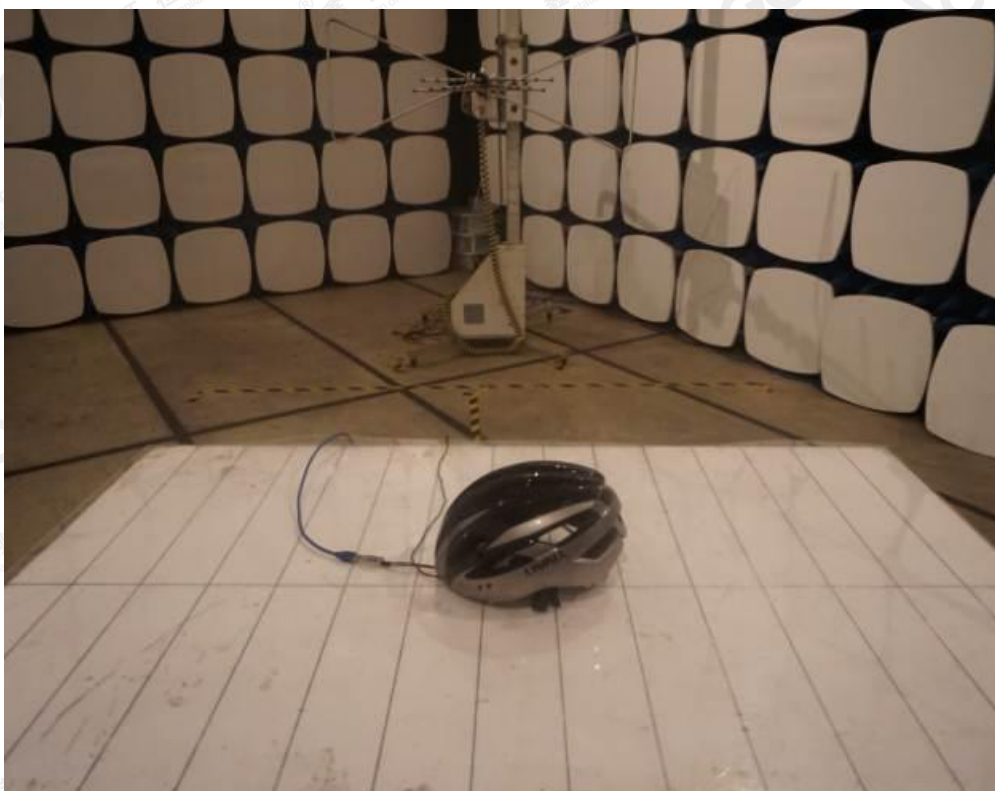
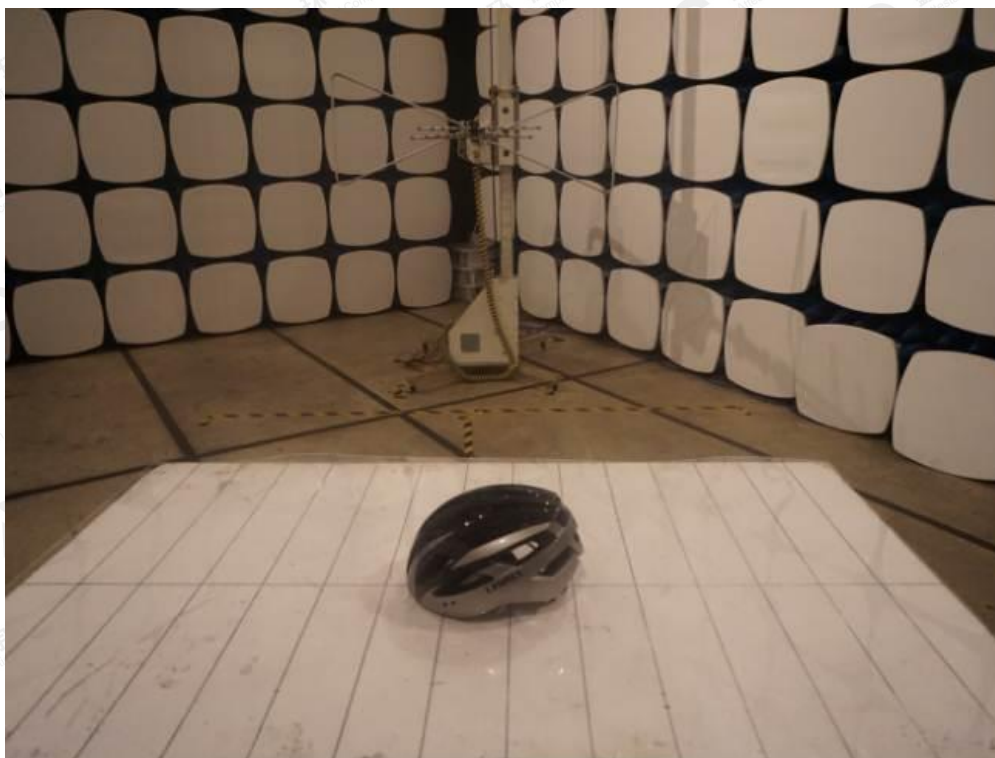
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

N/A

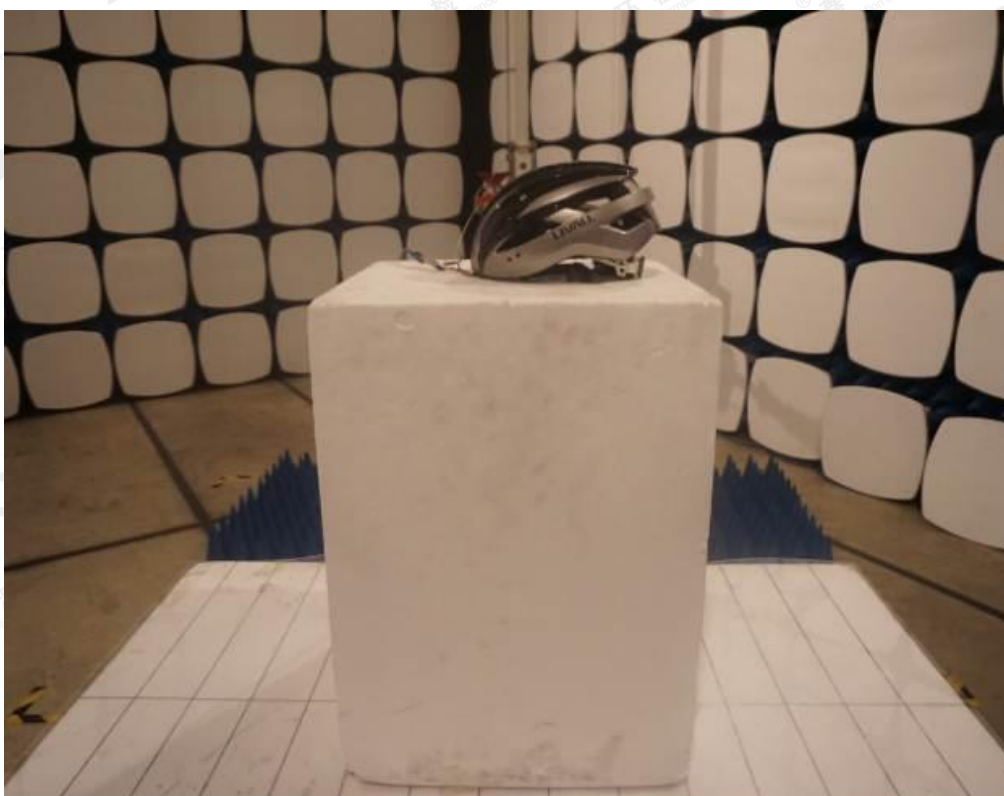
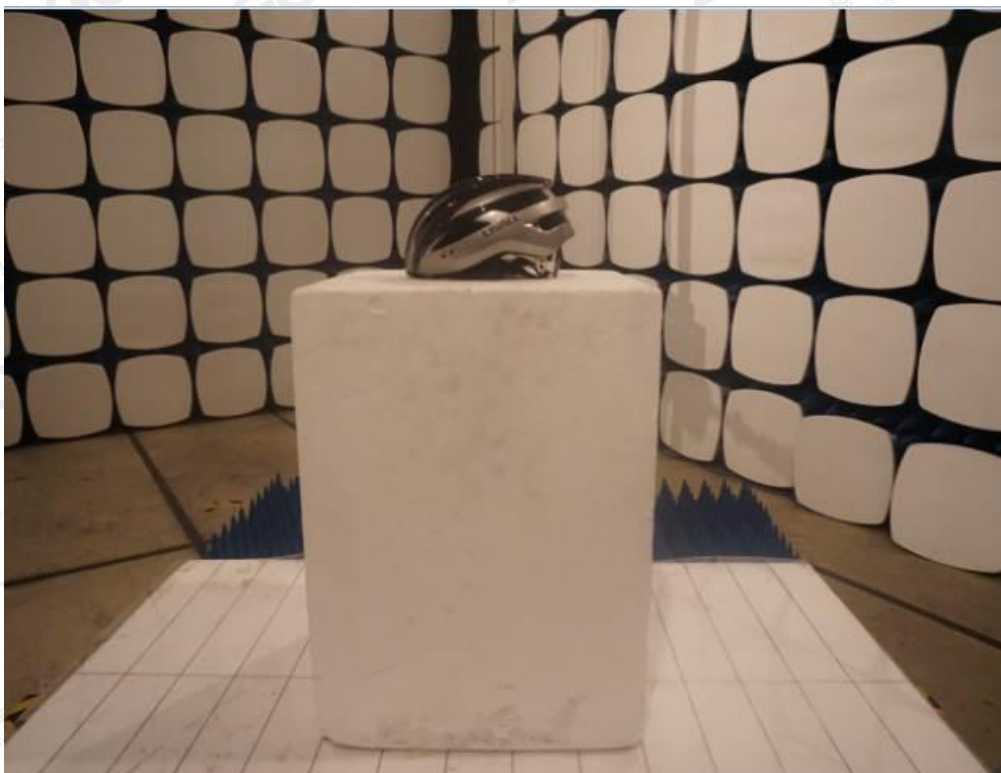
Note: The BT function of two modules didn't work when charging.

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APPENDIX A: PHOTOGRAPHS OF TEST SETUP
FCC RADIATED EMISSION TEST SETUP



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APPENDIX B: PHOTOGRAPHS OF EUT
ALL VIEW OF EUT



TOP VIEW OF EUT



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BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



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BACK VIEW OF EUT



LEFT VIEW OF EUT



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RIGHT VIEW OF EUT

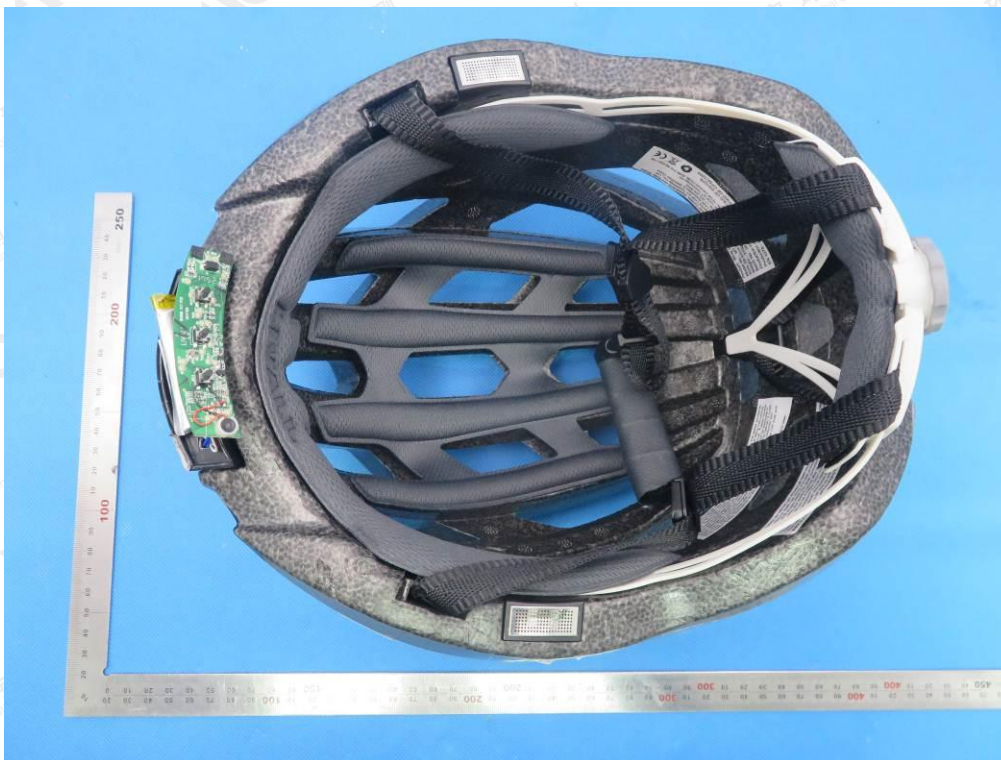


VIEW OF EUT (PORT)

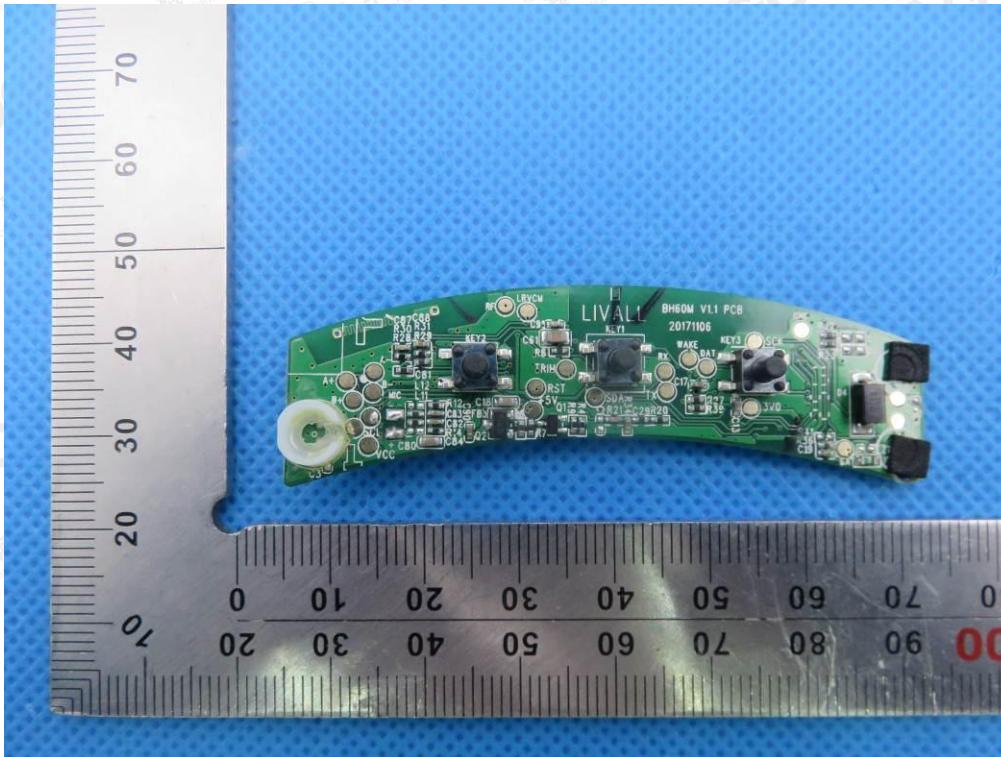


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OPEN VIEW OF EUT

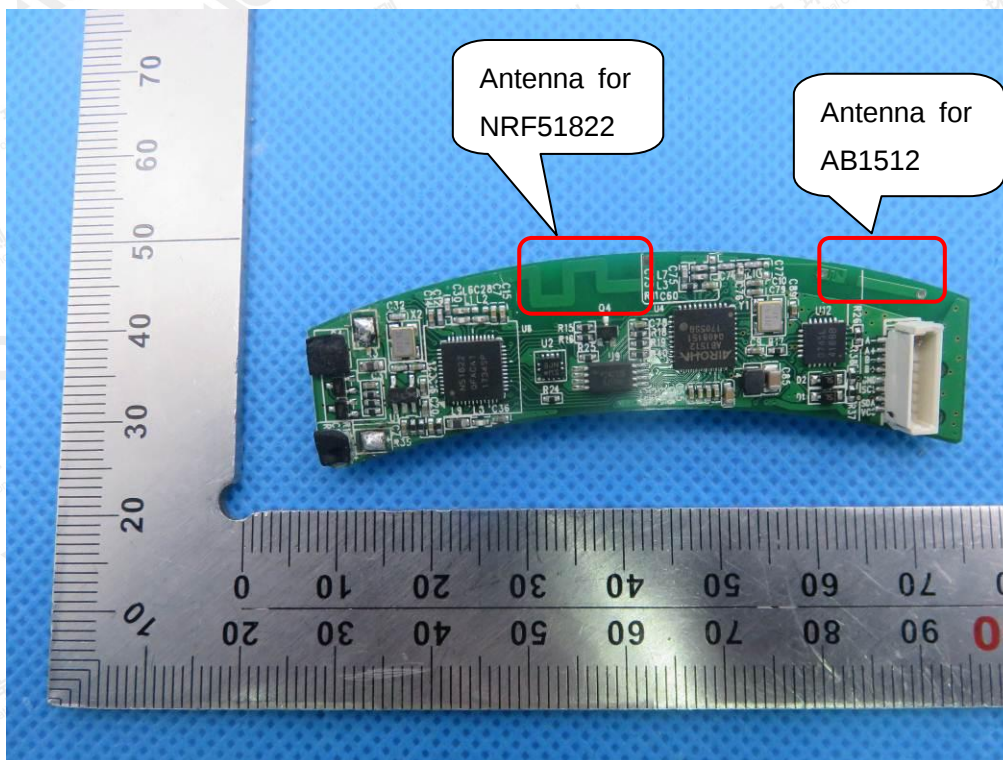


INTERNAL VIEW OF EUT-1

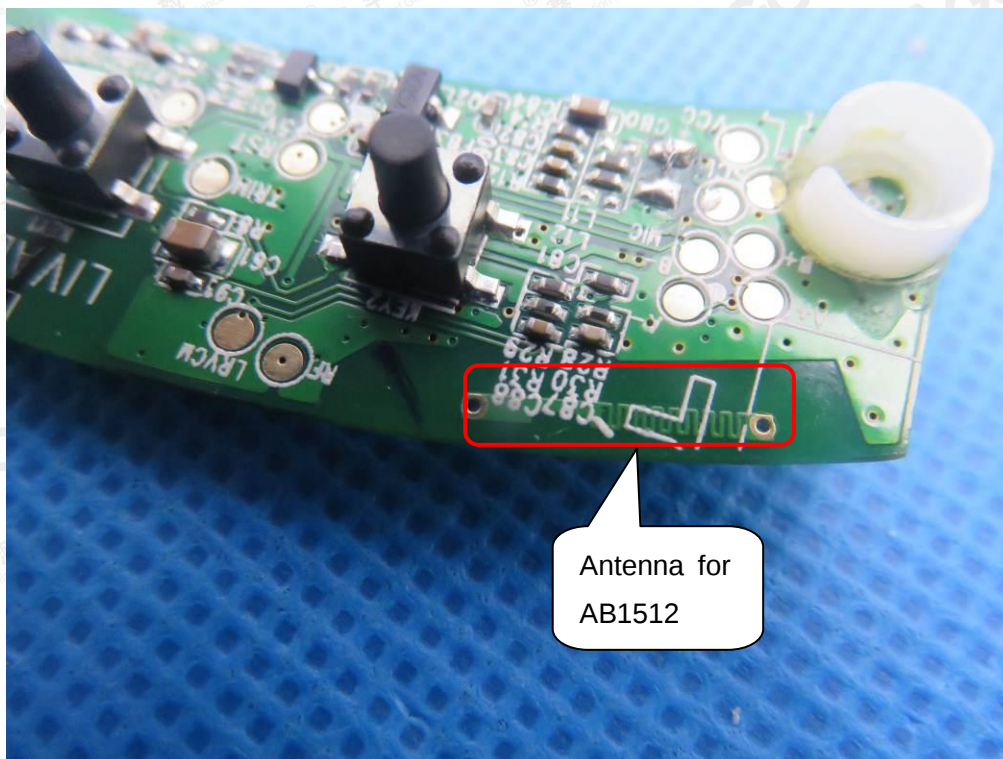


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INTERNAL VIEW OF EUT-2

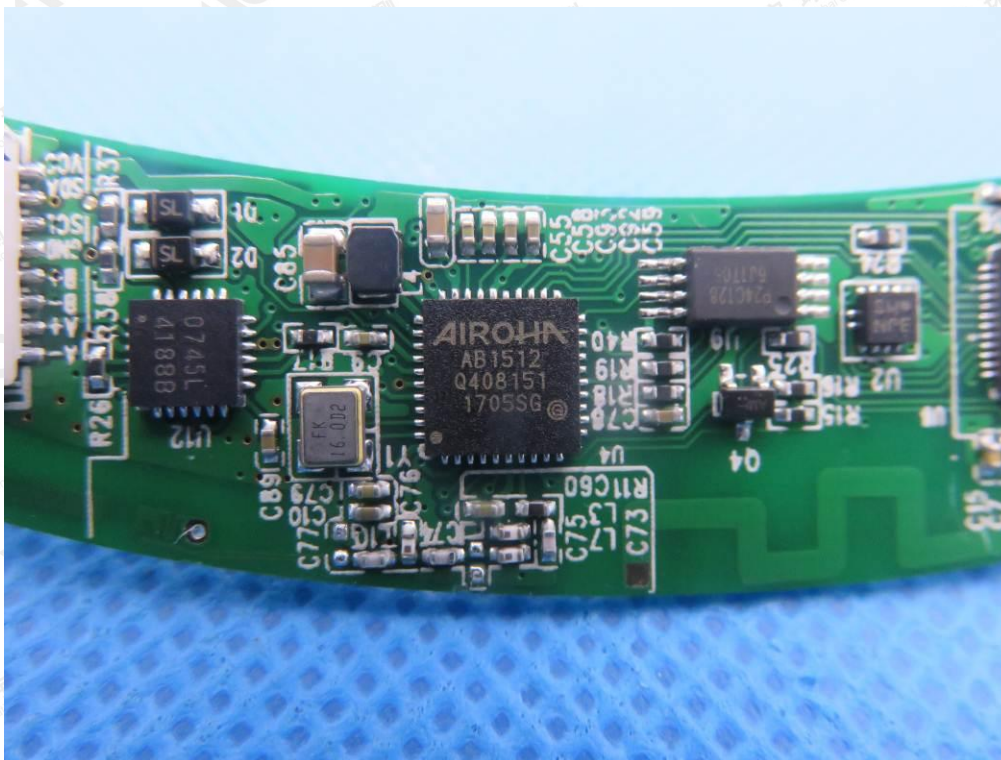


INTERNAL VIEW OF EUT-3

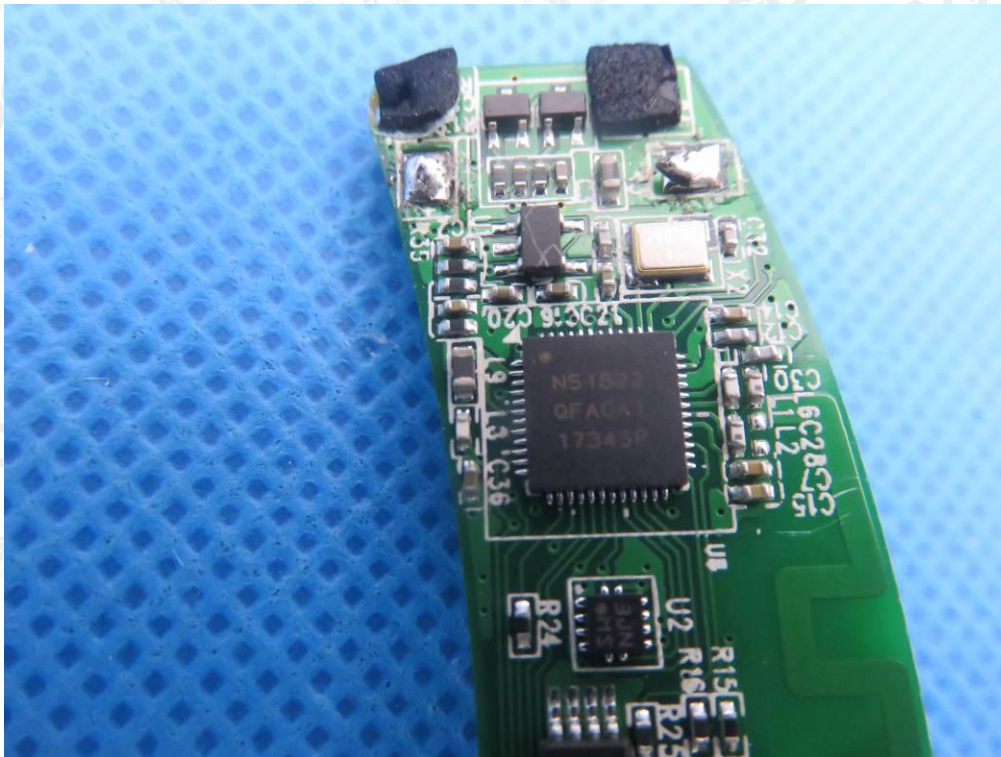


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INTERNAL VIEW OF EUT-4 (AB1512)



INTERNAL VIEW OF EUT-5 (NRF51822)



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Series Model
MTL
ALL VIEW OF EUT



TOP VIEW OF EUT



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BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



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BACK VIEW OF EUT



LEFT VIEW OF EUT



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RIGHT VIEW OF EUT



VIEW OF EUT (PORT)

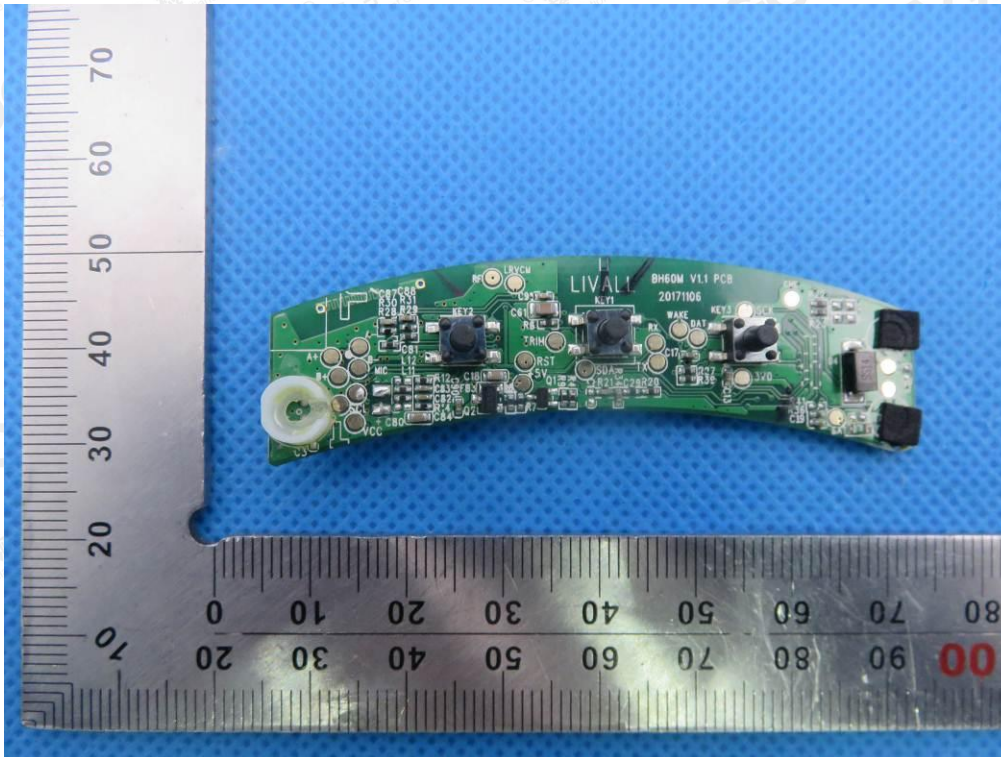


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OPEN VIEW OF EUT

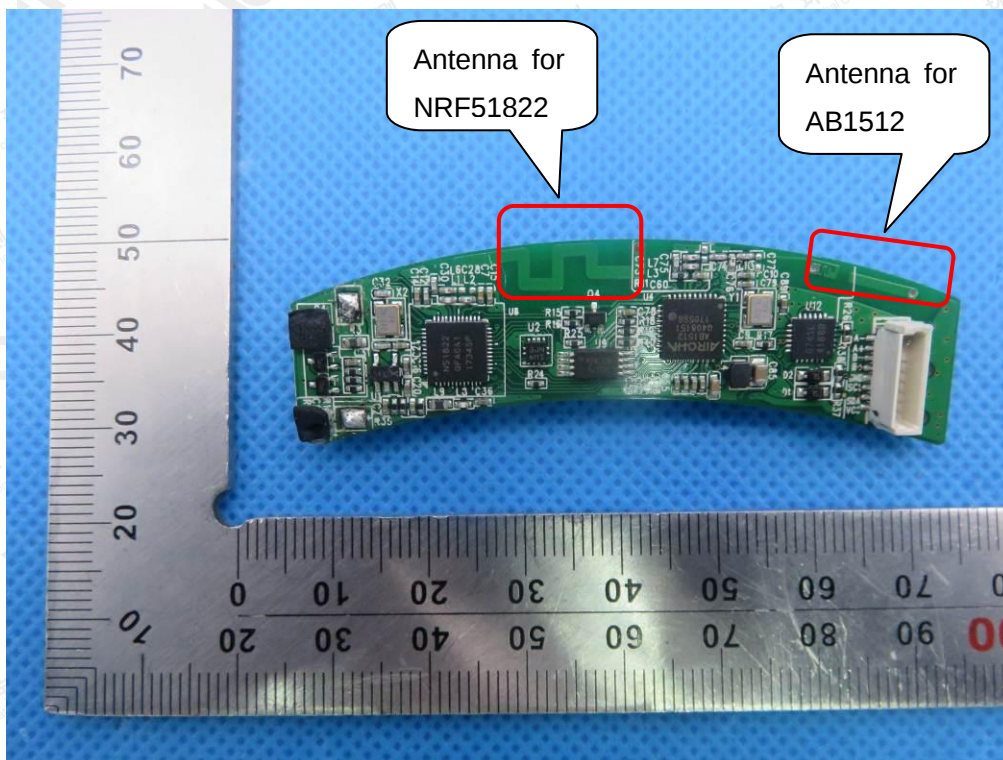


INTERNAL VIEW OF EUT-1

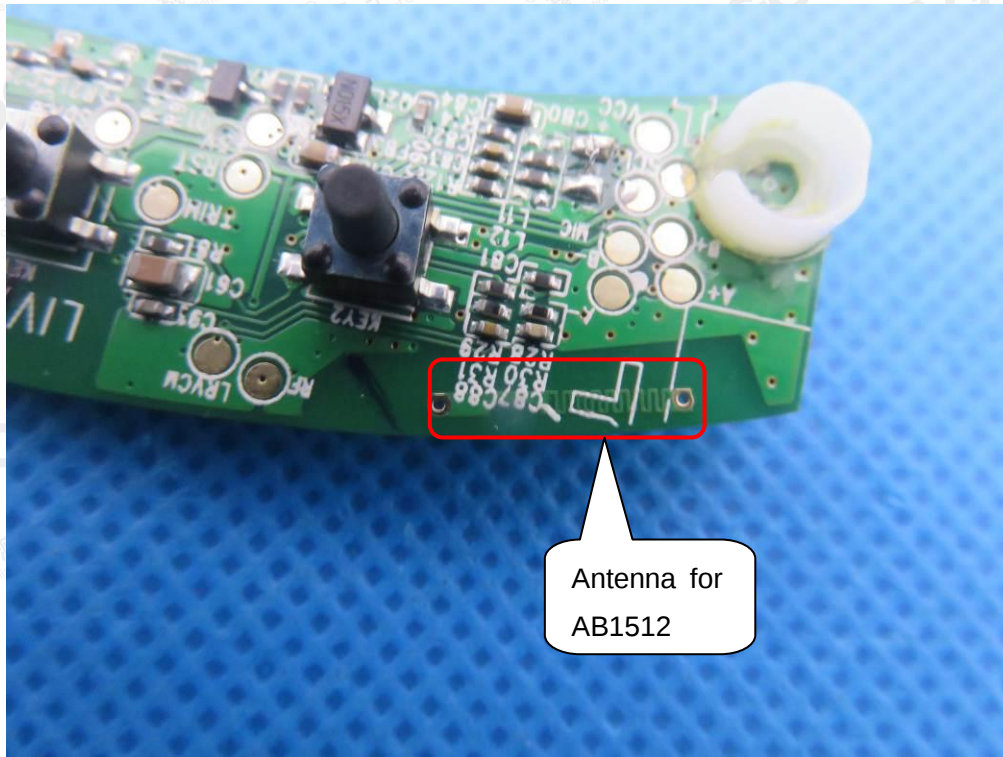


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INTERNAL VIEW OF EUT-2

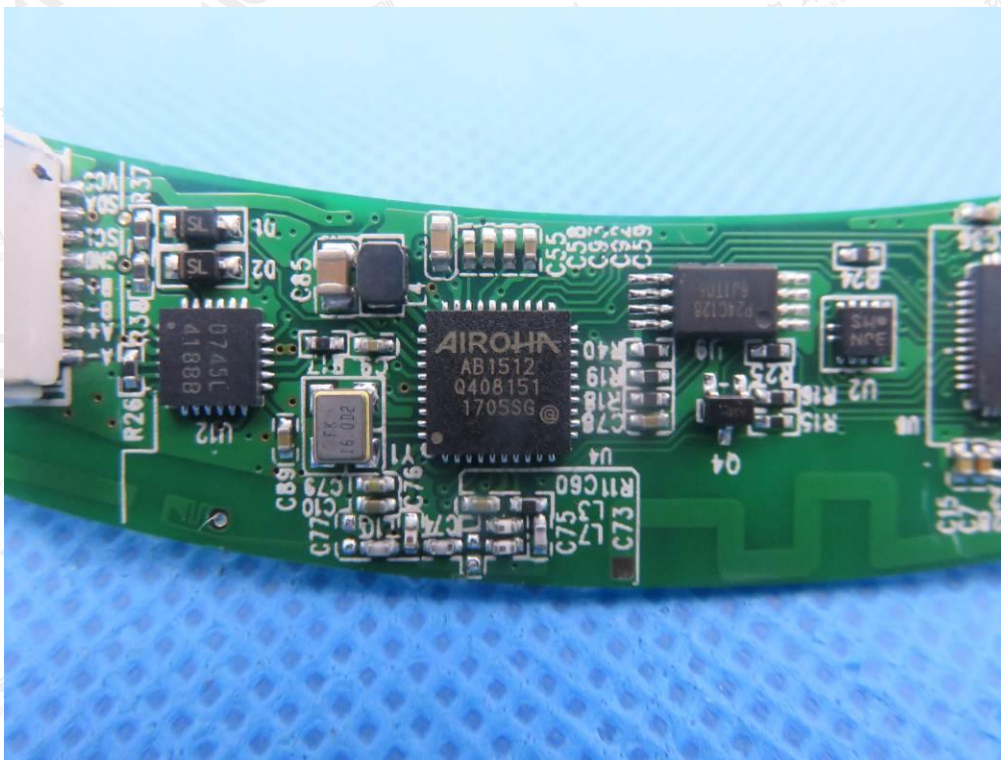


INTERNAL VIEW OF EUT-3



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INTERNAL VIEW OF EUT-4(AB1512)



INTERNAL VIEW OF EUT-5(NRF51822)



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