FCC Test Report

Report No.: AGC01629170901FE03

FCC ID	:	2ADXE-HY-40R201PC
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Bluetooth BLE 5.0 Module
BRAND NAME	:	N/A
MODEL NAME	:	See page 4
CLIENT	:	Shenzhen Sheng Run Technology Co., Ltd
DATE OF ISSUE	:	Jun. 03, 2017
STANDARD(S) **TEST PROCEDURE(S)**	:	FCC Part 15 Subpart C Section 15.249
REPORT VERSION	:	V1.0

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 03, 2017	Valid	Initial release

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TABLE OF CONTENTS

1. VERIFICATION OF CONFORMITY 4
2. GENERAL INFORMATION 5
2.1. PRODUCT DESCRIPTION 5
2.2. TABLE OF CARRIER FREQUENCYS 5
3. MEASUREMENT UNCERTAINTY 6
4. DESCRIPTION OF TEST MODES 6
5. SYSTEM TEST CONFIGURATION 7
5.1. CONFIGURATION OF EUT SYSTEM 7
5.2. EQUIPMENT USED IN EUT SYSTEM 7
5.3. SUMMARY OF TEST RESULTS 7
6. TEST FACILITY 8
7. TEST METHOD 8
8. ALL TEST EQUIPMENT LIST 8
9. RADIATED EMISSION 10
9.1TEST LIMIT 10
9.2. MEASUREMENT PROCEDURE 11
9.3. TEST SETUP 13
9.4. TEST RESULT 15
10. BAND EDGE EMISSION 28
10.1. MEASUREMENT PROCEDURE 28
10.2 TEST SETUP 28
10.3 RADIATED TEST RESULT 29
11. 20DB BANDWIDTH 33
11.1. MEASUREMENT PROCEDURE 33
11.2. TEST SET-UP 33
11.3. LIMITS AND MEASUREMENT RESULTS 33
12. FCC LINE CONDUCTED EMISSION TEST 36
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST 36
12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST 36
12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST 37
12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST 37
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST 38
APPENDIX A: PHOTOGRAPHS OF TEST SETUP 40
APPENDIX B: PHOTOGRAPHS OF EUT 43

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1. VERIFICATION OF CONFORMITY

Applicant	Shenzhen Sheng Run Technology Co., Ltd
Address	Room 602 6/F, B Block of Longjing Jingu Hi-tech Pioneer Park, Longzhu 4th Road, Xili Town, Nanshan District, Shenzhen, China
Manufacturer	Shenzhen Sheng Run Technology Co., Ltd
Address	Room 602 6/F, B Block of Longjing Jingu Hi-tech Pioneer Park, Longzhu 4th Road, Xili Town, Nanshan District, Shenzhen, China
Product Designation	Bluetooth BLE 5.0 Module
Brand Name	N/A
Test Model	HY-40R201PC
Series Model	HY-40R201P, HY-40R201I, HY-40R201W, HY-40R201C, HY-40R201IC, HY-40R201WC, HY-40R201CC
Difference description	All the same except for the model name
Date of test	May 09, 2017 to May 16, 2017
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BR/RF

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 15.249.

Tested By Henry Zhang

Henry Zhang(Zhang Zhuorui) May 16, 2017

Reviewed By Forrest Lei

Forrest Lei(Lei Yonggang) Jun. 03, 2017

Approved By Solger Zhang

Solger Zhang(Zhang Hongyi)
Authorized Officer
Jun. 03, 2017

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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	3.40dBm(Max EIRP Power=Max radiation field-95.2)
Bluetooth Version	V5.0
Modulation	GFSK
Number of channels	40
Hardware Version	HY-40R201P
Software Version	simple_peripheral_cc2640r2lp_app_PTM.hex
Antenna Designation	PCB IFA Antenna
Antenna Gain	3.42dBi
Power Supply	DC 3.3V
Note: The EUT didn't support BR/EDR.	

2.2. TABLE OF CARRIER FREQUENCYS

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

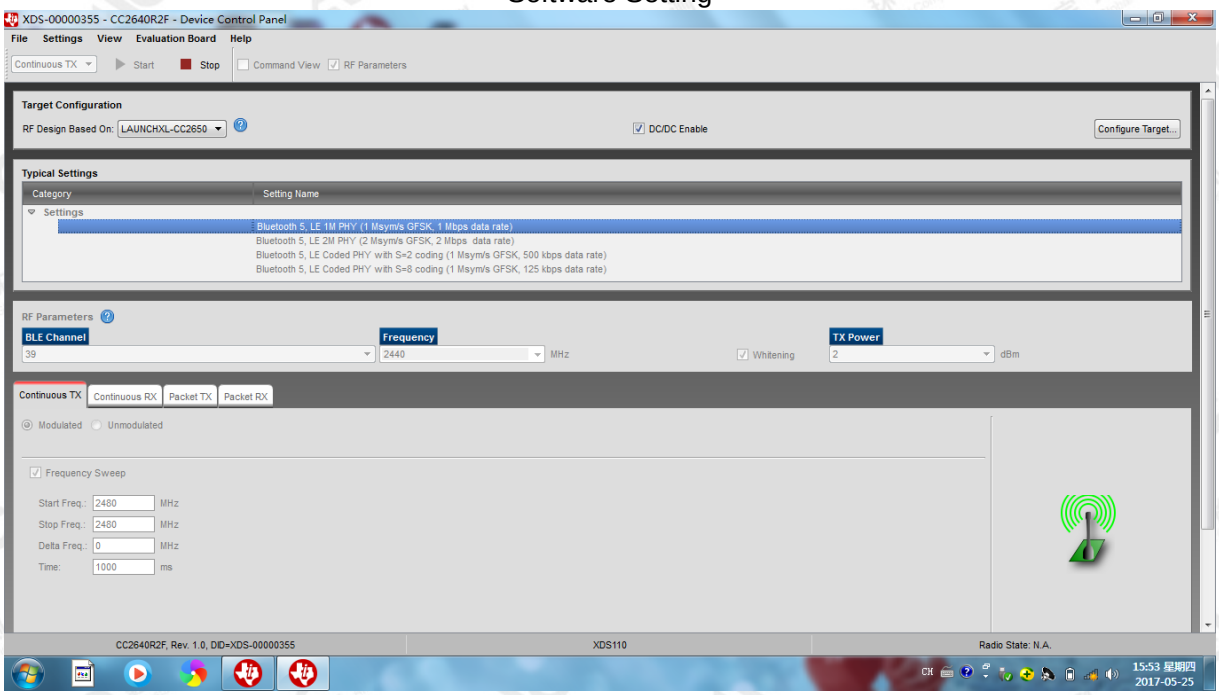
The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	±3.18dB
2	All emissions, radiated	±3.91dB
3	Temperature	±0.5°C
4	Humidity	±2%

4. DESCRIPTION OF TEST MODES

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

Software Setting



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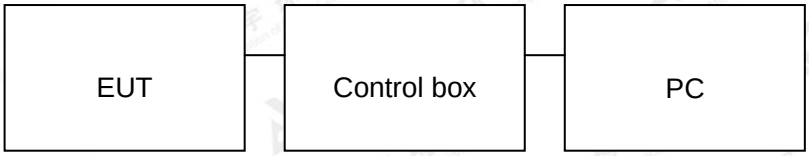
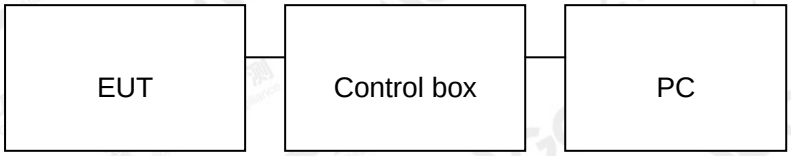
5. SYSTEM TEST CONFIGURATION

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	Bluetooth BLE 5.0 Module	Sheng Run	HY-40R201PC	EUT
2	PC	Sony	E1412AYCW	A.E
3	PC Adapter	Sony	VGP-AC19V36	A.E
4	Control box	CCDEBUGGER	N/A	A.E
5	USB Cable	N/A	1.0m Unshielded	A.E

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	Compliant
§15.215	Bandwidth	Compliant

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6. 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.

7. TEST METHOD

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

8. ALL TEST EQUIPMENT LIST

FOR RADIATED EMISSION TEST (BELOW 1GHz)

Radiated Emission Test Site					
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
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
Radiation Cable 1	MXT	RS1	R005	June 6, 2016	June 5, 2017
Radiation Cable 2	MXT	RS1	R006	June 6, 2016	June 5, 2017
temporary antenna connector	N/A	S100	--	July 4, 2016	July 3, 2017

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FOR RADIATED EMISSION TEST (1GHz ABOVE)

Radiated Emission Test Site					
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
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 7, 2016	July 6, 2017
RF Cable	SCHWARZBECK	AK9515H	96220	July 8, 2016	July 7, 2017
MULTI-DEVICE Positioning Controller	MAX-FULL	MF-7802	MF780208339	N/A	N/A
Horn Ant (18G-40GHz)	SCHWARZBECK	BBHA 9170	9170-181	June 6, 2016	June 5, 2017
Radiation Cable 1	MXT	RS1	R005	June 6, 2016	June 5, 2017
Radiation Cable 2	MXT	RS1	R006	June 6, 2016	June 5, 2017

Conducted Emission Test Site					
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
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

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9. RADIATED EMISSION

9.1TEST 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(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.

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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	1GHz~26.5GHz RBW 2MHz/VBW 6MHz for Peak, RBW 1.5MHz/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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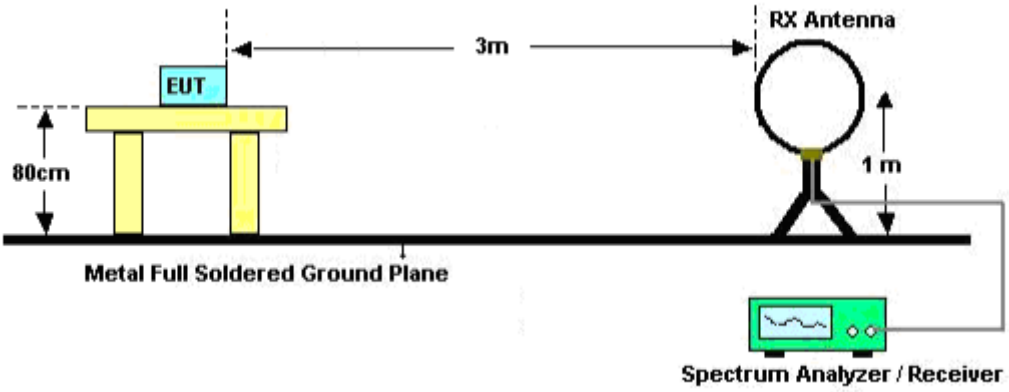
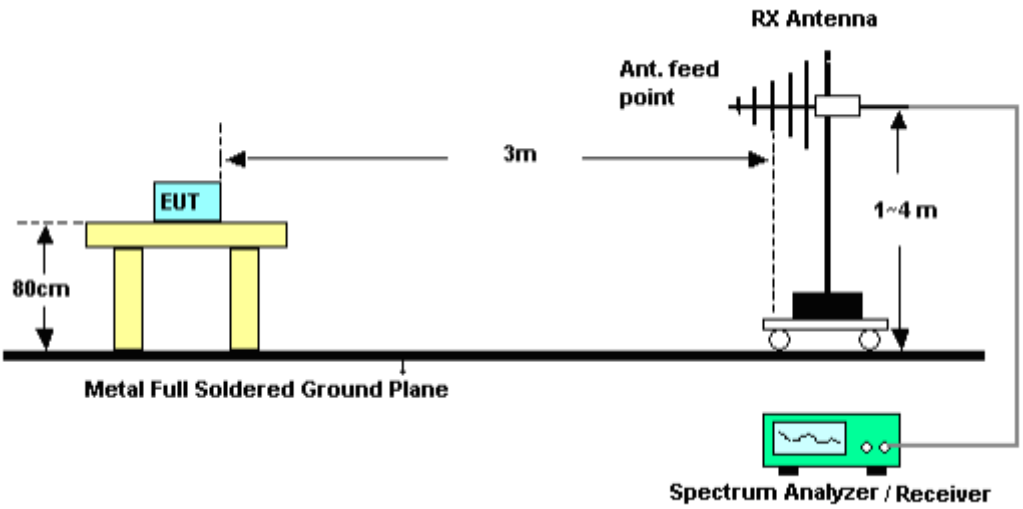
9.3. TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



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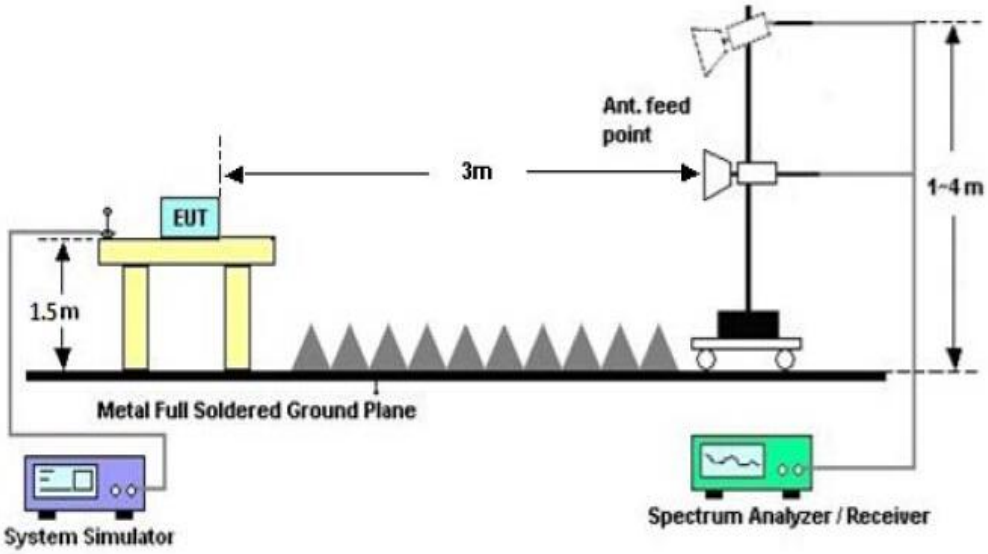
RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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9.4. TEST RESULT

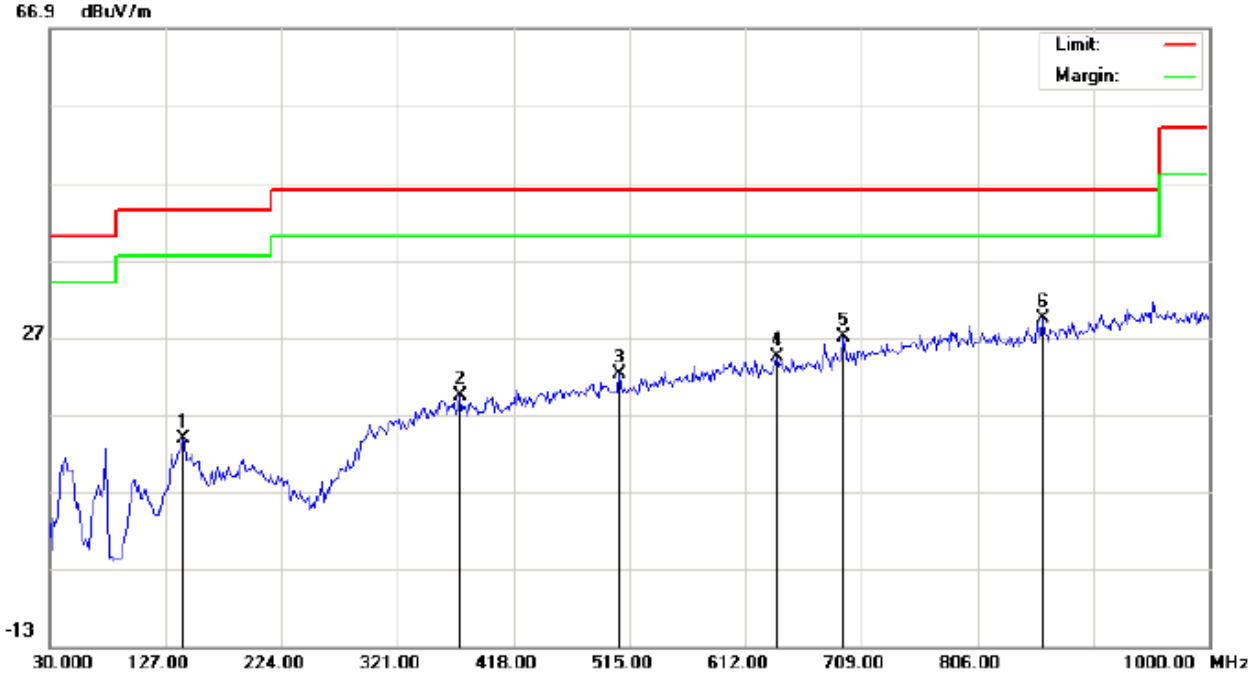
FOR BLE

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: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: Low Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

Temperature: 22.4
Humidity: 52.5 %

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		141.5500	-1.06	14.82	13.76	43.50	-29.74	peak			
2		372.7333	0.47	18.89	19.36	46.00	-26.64	peak			
3		506.9167	0.88	21.32	22.20	46.00	-23.80	peak			
4		637.8667	0.60	23.82	24.42	46.00	-21.58	peak			
5		694.4500	1.95	25.04	26.99	46.00	-19.01	peak			
6	*	860.9667	1.84	27.59	29.43	46.00	-16.57	peak			

RESULT: PASS

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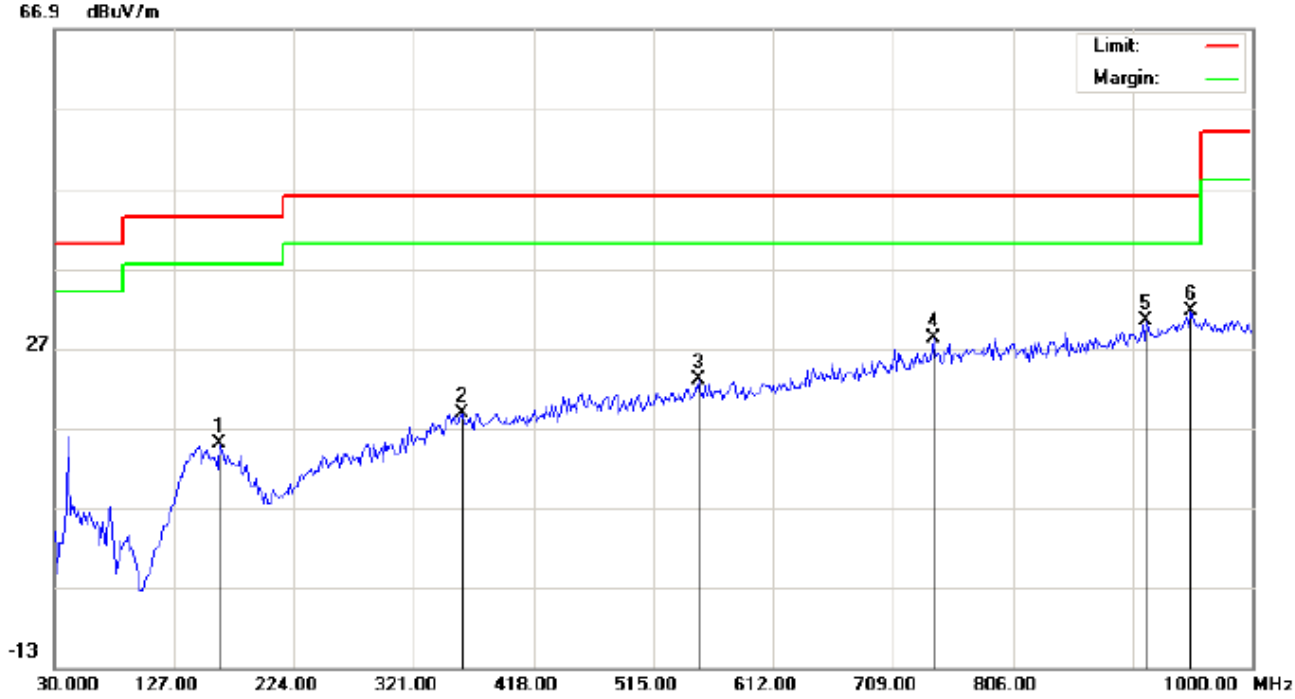
RADIATED EMISSION TEST- (30MHz-1GHz)-LOW CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: Low Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 22.4
Humidity: 52.5 %

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		164.1833	-0.06	15.07	15.01	43.50	-28.49	peak			
2		359.8000	0.09	18.80	18.89	46.00	-27.11	peak			
3		552.1833	0.56	22.49	23.05	46.00	-22.95	peak			
4		741.3333	1.75	26.38	28.13	46.00	-17.87	peak			
5		914.3167	1.32	29.01	30.33	46.00	-15.67	peak			
6	*	949.8833	1.70	30.00	31.70	46.00	-14.30	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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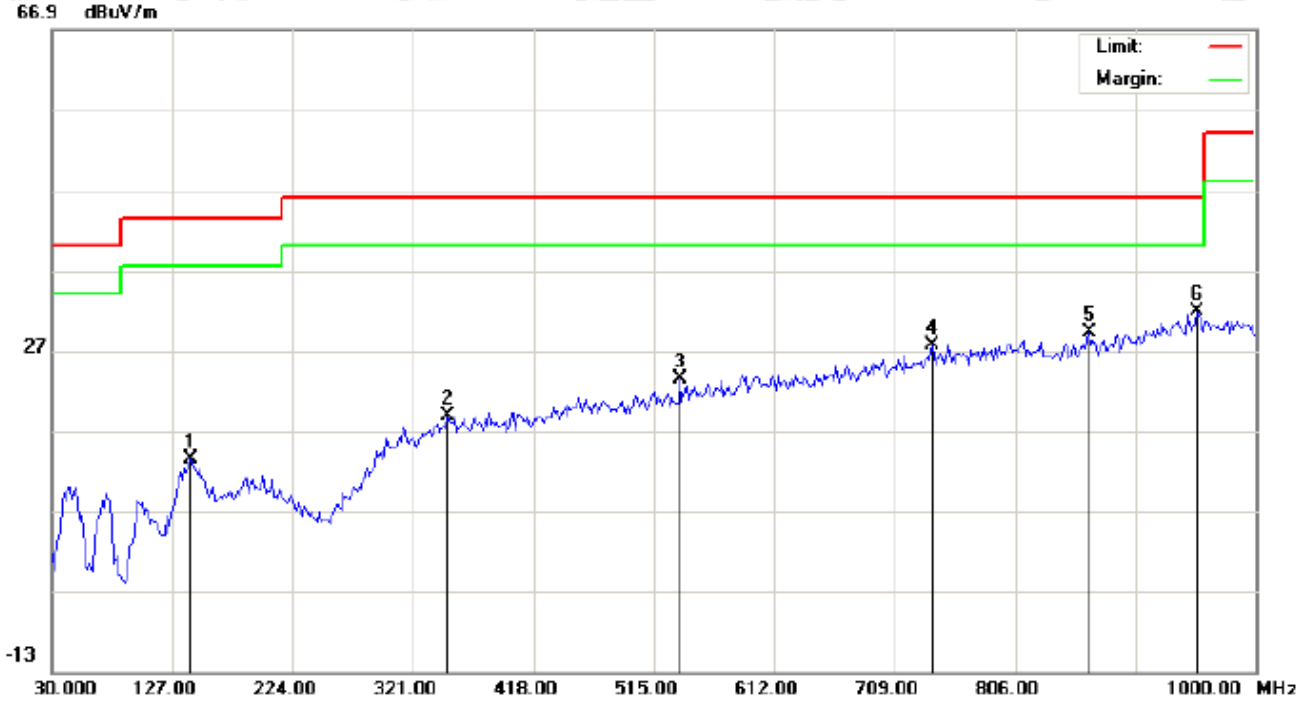
RADIATED EMISSION TEST- (30MHz-1GHz)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: Middle Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

Temperature: 22.4
Humidity: 52.5 %

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		141.5500	-1.39	14.82	13.43	43.50	-30.07	peak			
2		348.4833	0.16	18.64	18.80	46.00	-27.20	peak			
3		536.0167	1.26	22.10	23.36	46.00	-22.64	peak			
4		739.7167	1.32	26.33	27.65	46.00	-18.35	peak			
5		865.8167	1.45	27.72	29.17	46.00	-16.83	peak			
6	*	953.1167	1.81	29.97	31.78	46.00	-14.22	peak			

RESULT: PASS

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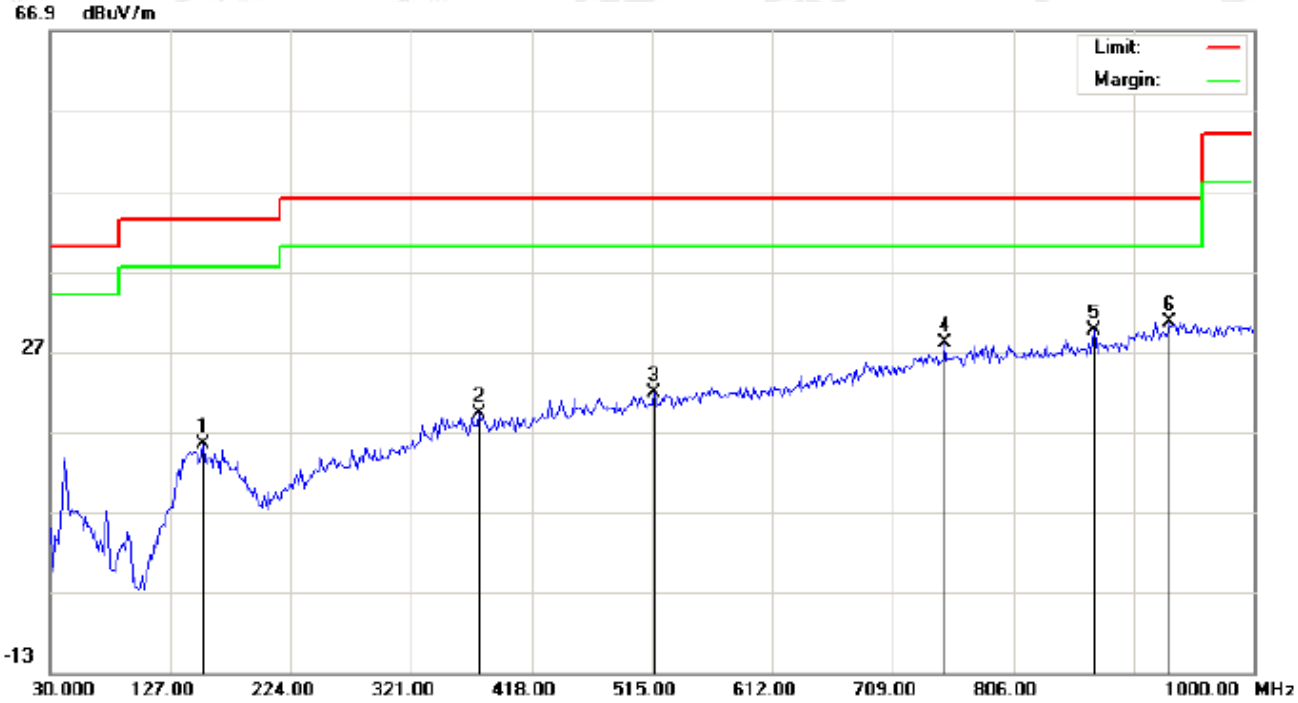
RADIATED EMISSION TEST- (30MHz-1GHz)- MIDDLE CHANNEL -VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: Middle Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 22.4
Humidity: 52.5 %

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		152.8667	0.18	15.28	15.46	43.50	-28.04	peak			
2		375.9667	0.27	18.91	19.18	46.00	-26.82	peak			
3		516.6167	0.16	21.58	21.74	46.00	-24.26	peak			
4		751.0333	1.39	26.64	28.03	46.00	-17.97	peak			
5		870.6667	1.76	27.85	29.61	46.00	-16.39	peak			
6	*	932.1000	1.11	29.50	30.61	46.00	-15.39	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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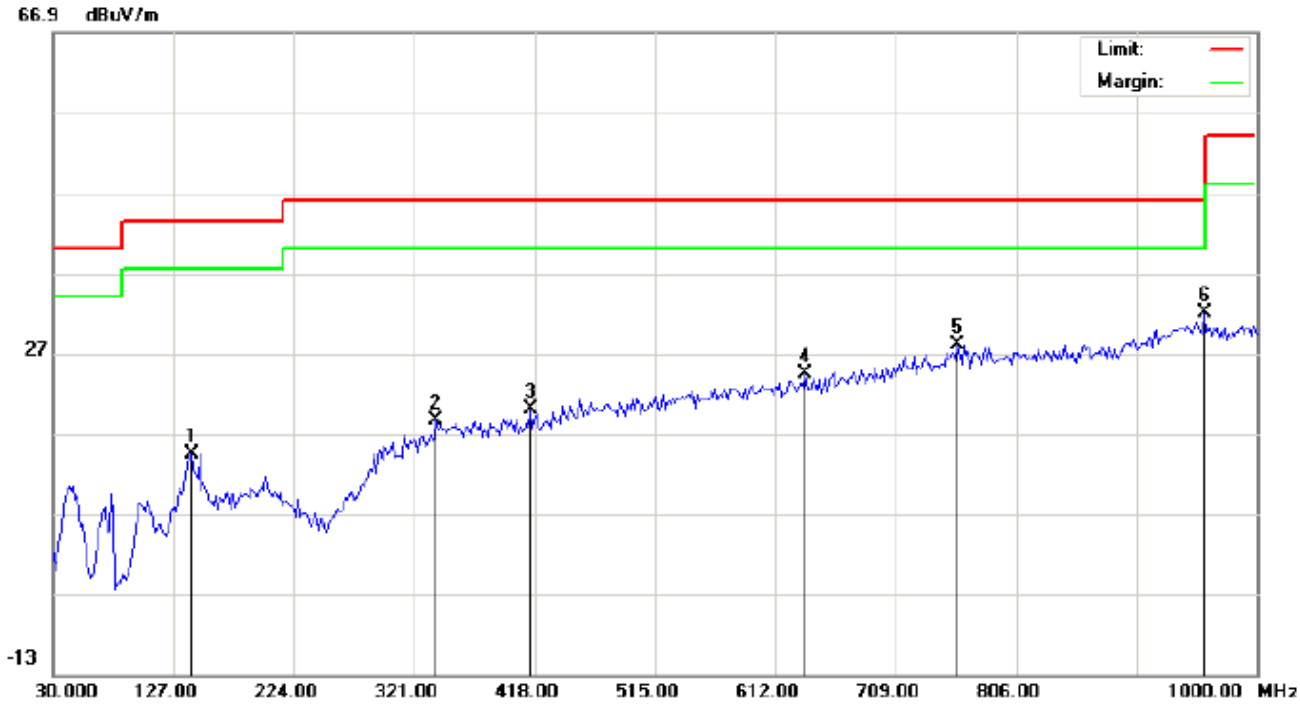
RADIATED EMISSION TEST- (30MHz-1GHz)-HIGH CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: High Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

Temperature: 22.4
Humidity: 52.5 %

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		141.5500	-0.41	14.82	14.41	43.50	-29.09	peak			
2		338.7833	0.71	17.99	18.70	46.00	-27.30	peak			
3		414.7667	0.39	19.52	19.91	46.00	-26.09	peak			
4		636.2500	0.49	23.82	24.31	46.00	-21.69	peak			
5		759.1167	1.31	26.76	28.07	46.00	-17.93	peak			
6	*	957.9667	2.11	29.92	32.03	46.00	-13.97	peak			

RESULT: PASS

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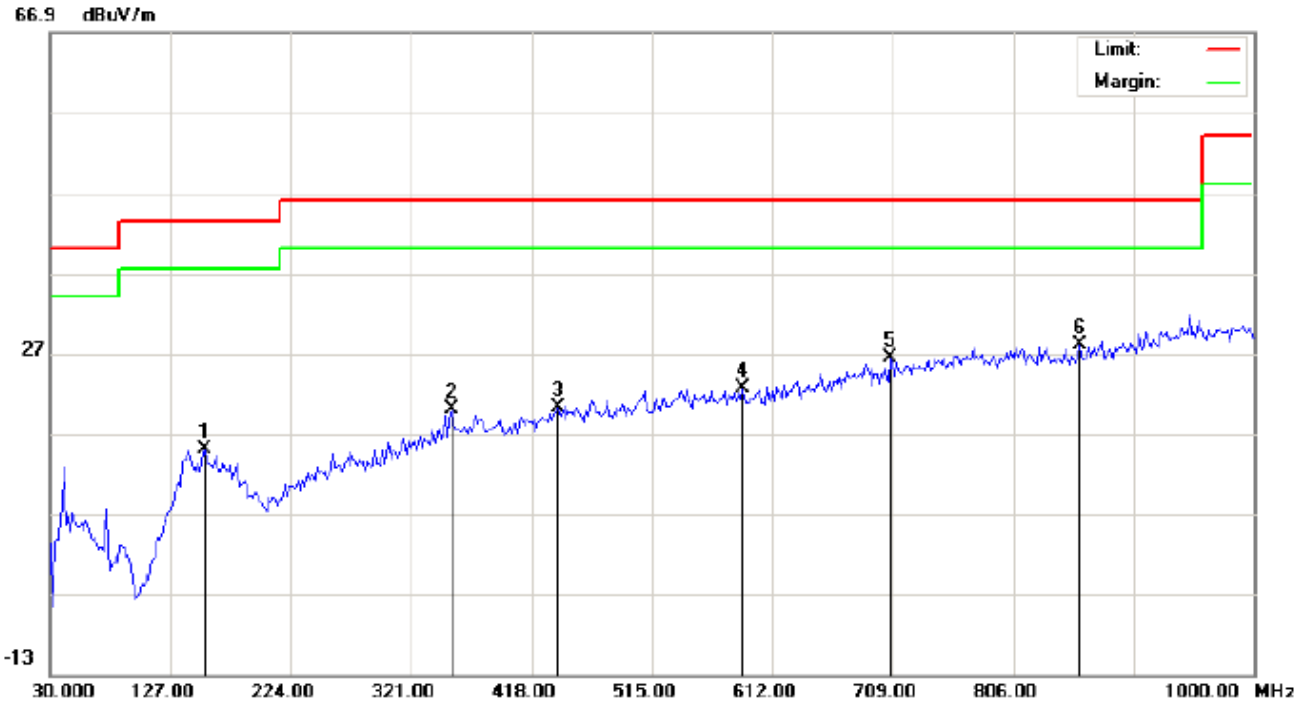
RADIATED EMISSION TEST- (30MHz-1GHz)-HIGH CHANNEL –VERTICAL



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: High Channel TX
Note:

Polarization: *Vertical*
Power:
Distance:

Temperature: 22.4
Humidity: 52.5 %

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		154.4832	-0.21	15.29	15.08	43.50	-28.42	peak			
2		353.3333	1.16	18.76	19.92	46.00	-26.08	peak			
3		439.0167	-0.11	20.26	20.15	46.00	-25.85	peak			
4		587.7500	0.02	22.67	22.69	46.00	-23.31	peak			
5		707.3832	1.06	25.40	26.46	46.00	-19.54	peak			
6	*	859.3500	0.51	27.55	28.06	46.00	-17.94	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.

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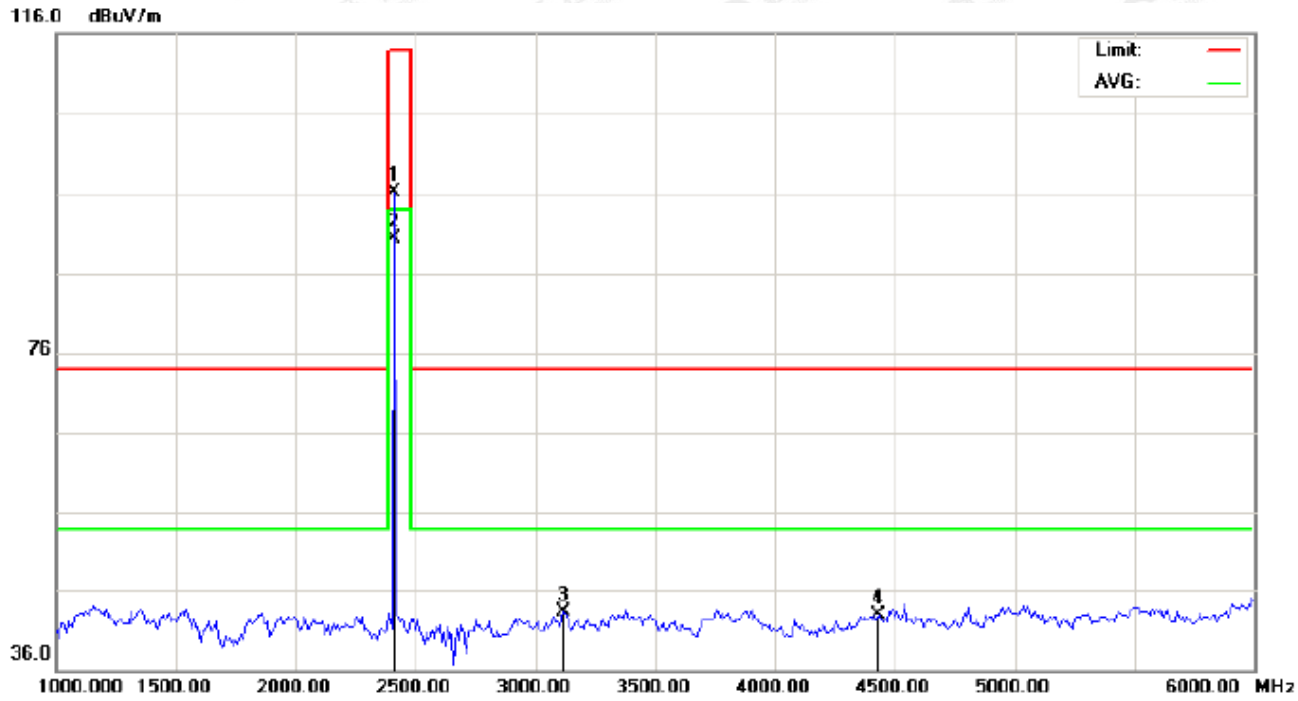
RADIATED EMISSION ABOVE 1GHz

FOR BLE

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



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)-
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: Low Channel TX
Note:

Polarization: ***Horizontal***
Power:
Distance:

Temperature: 22.7
Humidity: 53.6 %

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	85.70	10.33	96.03	114.00	-17.97	peak			
2	*	2402.000	79.93	10.33	90.26	94.00	-3.74	AVG			
3		3116.667	31.47	11.75	43.22	74.00	-30.78	peak			
4		4433.333	34.88	8.00	42.88	74.00	-31.12	peak			

RESULT: PASS

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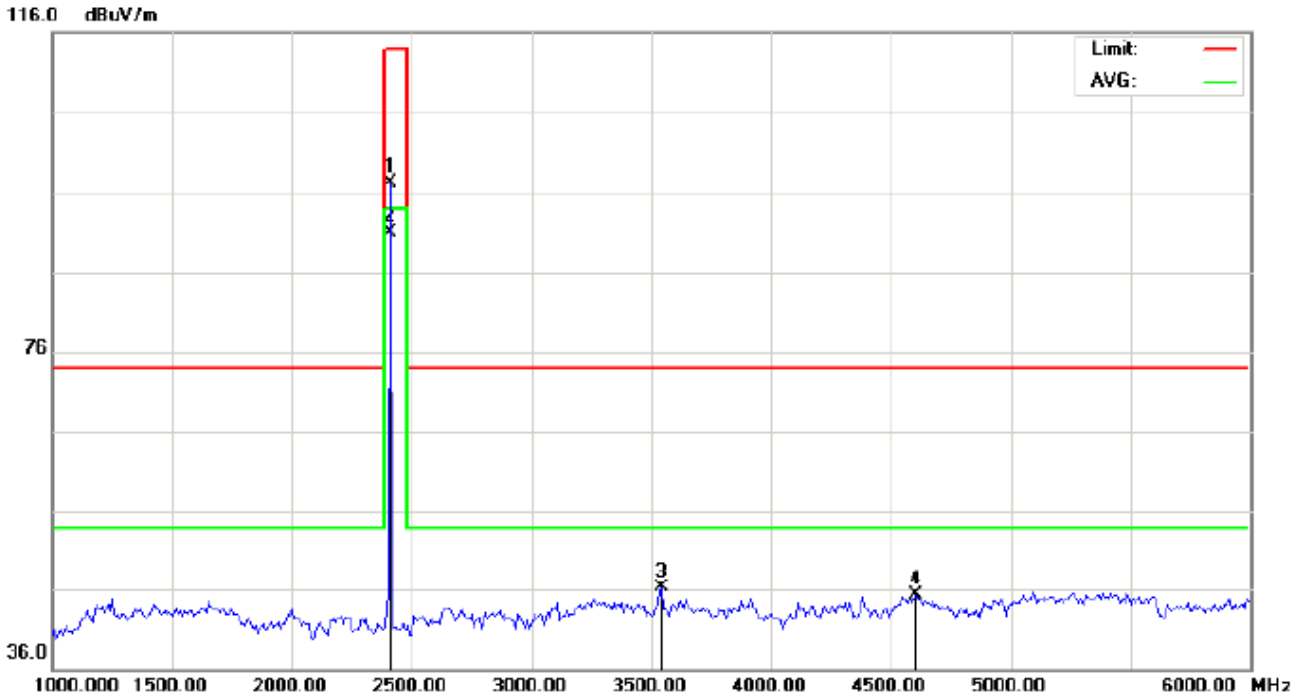
RADIATED EMISSION TEST- (ABOVE 1GHz)-LOW CHANNEL- VERTICAL



Site: site #1 Polarization: *Vertical* Temperature: 22.7
Limit: FCC Class B 3M Radiation above 1GHz(PK)- Power: Humidity: 53.6 %
EUT: Bluetooth 5.0 BLE Module Distance:
M/N: HY-40R201PC
Mode: Low Channel TX
Note:

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	86.81	10.33	97.14	114.00	-16.86	peak			
2	*	2402.000	80.57	10.33	90.90	94.00	-3.10	AVG			
3		3541.667	33.97	12.37	46.34	74.00	-27.66	peak			
4		4600.000	38.21	7.15	45.36	74.00	-28.64	peak			

RESULT: PASS

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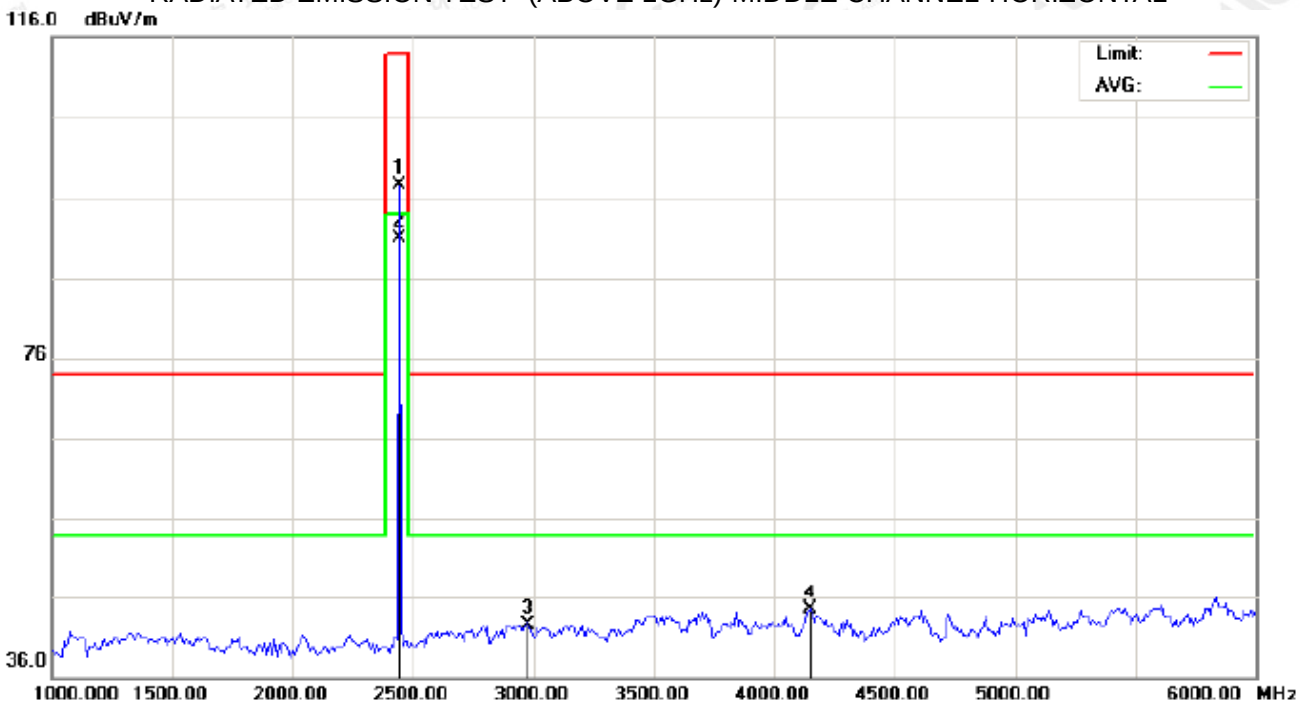
RADIATED EMISSION TEST- (ABOVE 1GHz)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)-
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: Middle Channel TX
Note:

Polarization: ***Horizontal***
Power:
Distance:

Temperature: 22.7
Humidity: 53.6 %

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	87.23	10.37	97.60	114.00	-16.40	peak			
2	*	2440.000	80.63	10.37	91.00	94.00	-3.00	AVG			
3		2975.000	30.91	11.58	42.49	74.00	-31.51	peak			
4		4150.000	31.78	12.70	44.48	74.00	-29.52	peak			

RESULT: PASS

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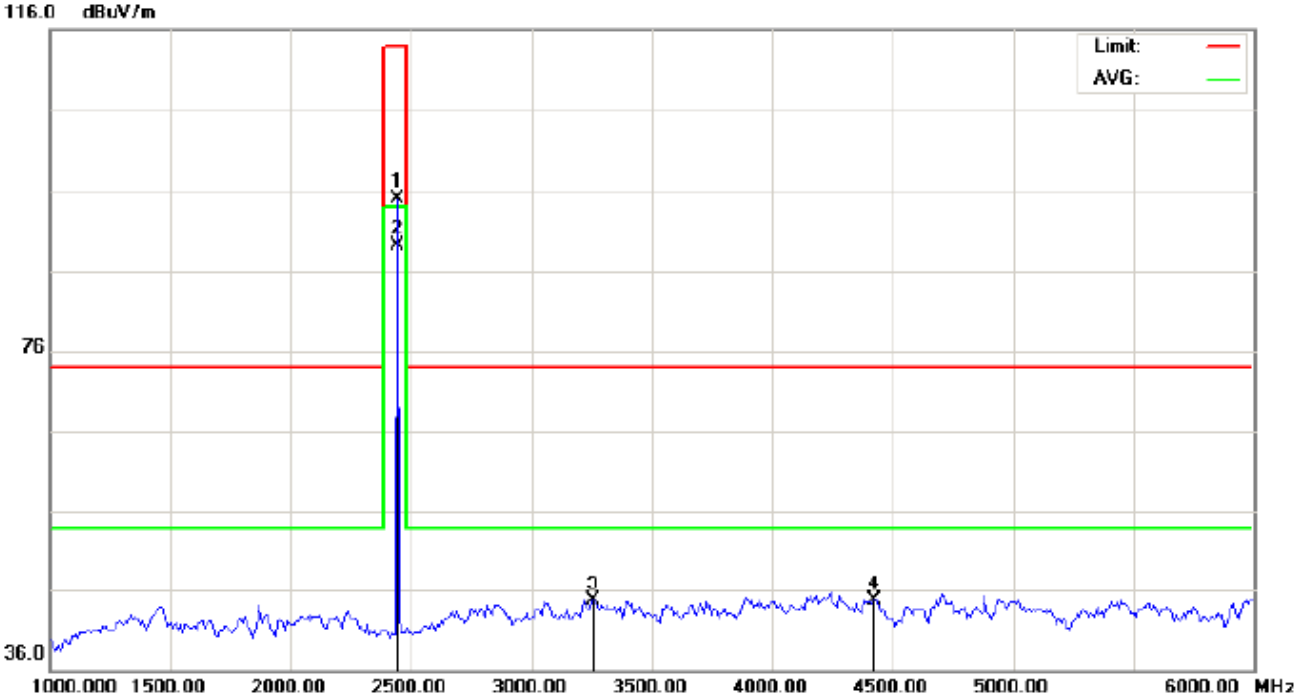
RADIATED EMISSION TEST- (ABOVE 1GHz)-MIDDLE CHANNEL- VERTICAL



Site: site #1	Polarization: *Vertical*	Temperature: 22.7
Limit: FCC Class B 3M Radiation above 1GHz(PK)-	Power:	Humidity: 53.6 %
EUT: Bluetooth 5.0 BLE Module	Distance:	
M/N: HY-40R201PC		
Mode: Middle Channel TX		
Note:		

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	84.48	10.37	94.85	114.00	-19.15	peak			
2	*	2440.000	78.69	10.37	89.06	94.00	-4.94	AVG			
3		3258.333	32.89	11.88	44.77	74.00	-29.23	peak			
4		4425.000	36.65	8.13	44.78	74.00	-29.22	peak			

RESULT: PASS

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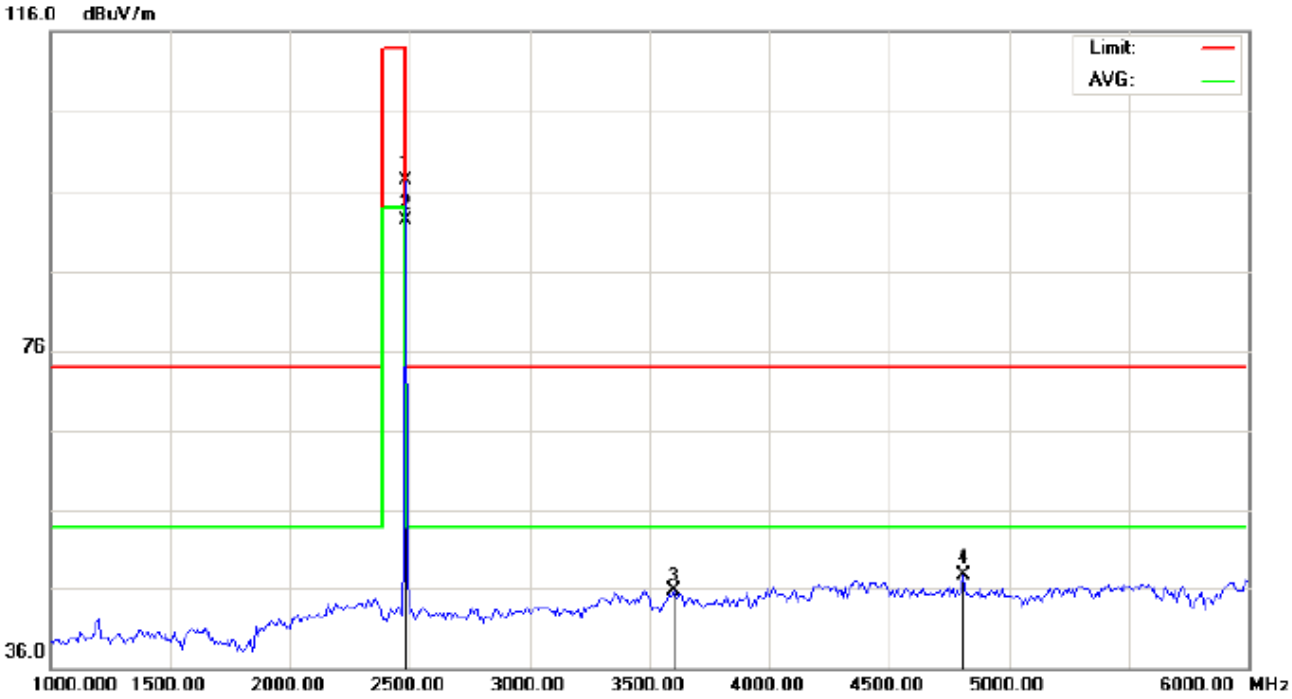
RADIATED EMISSION TEST- (ABOVE 1GHz)-HIGH CHANNEL-HORIZONTAL



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)-
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
Mode: High Channel TX
Note:

Polarization: *Horizontal*
Power:
Distance:

Temperature: 22.7
Humidity: 53.6 %

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	86.97	10.41	97.38	114.00	-16.62	peak			
2	*	2480.000	81.92	10.41	92.33	94.00	-1.67	AVG			
3		3600.000	33.07	12.73	45.80	74.00	-28.20	peak			
4		4808.333	40.22	7.70	47.92	74.00	-26.08	peak			

RESULT: PASS

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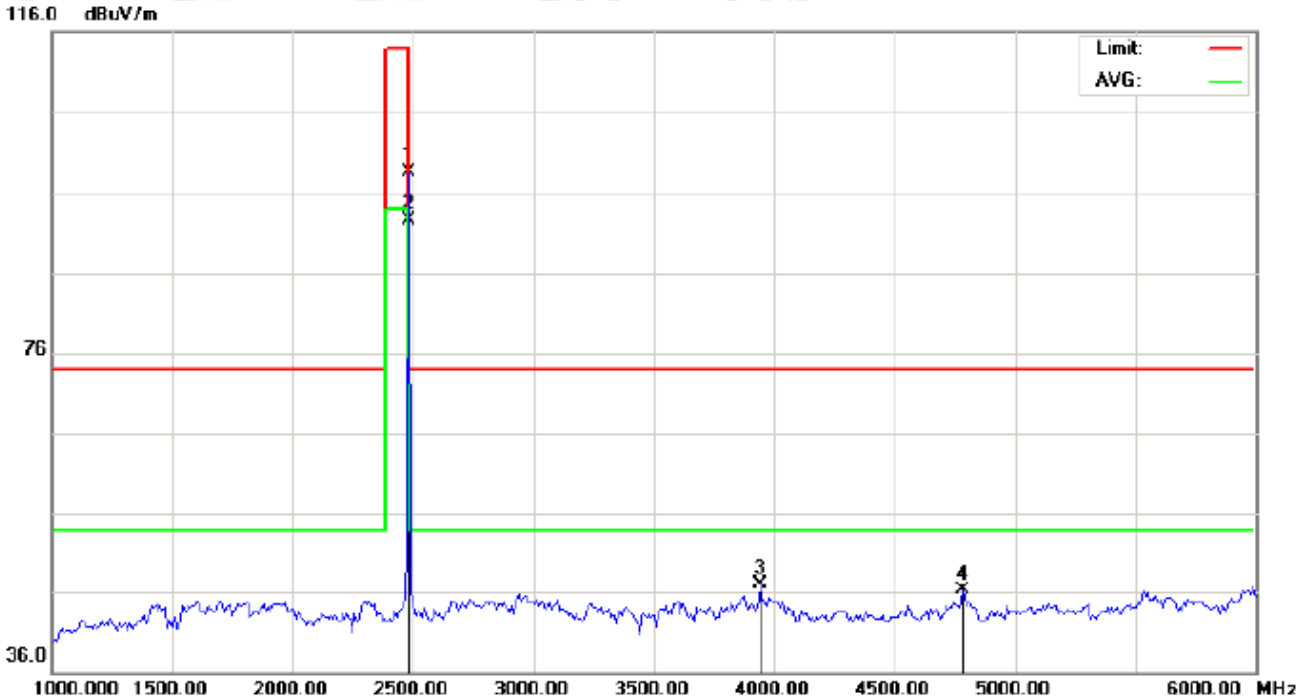
RADIATED EMISSION TEST- (ABOVE 1GHz)-HIGH CHANNEL- VERTICAL



Site: site #1 | Polarization: *Vertical* | Temperature: 22.7
Limit: FCC Class B 3M Radiation above 1GHz(PK)- | Power: | Humidity: 53.6 %
EUT: Bluetooth 5.0 BLE Module | Distance:
M/N: HY-40R201PC
Mode: High Channel TX
Note:

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	88.19	10.41	98.60	114.00	-15.40	peak			
2	*	2480.000	82.04	10.41	92.45	94.00	-1.55	AVG			
3		3941.667	32.28	14.83	47.11	74.00	-26.89	peak			
4		4783.333	38.57	7.63	46.20	74.00	-27.80	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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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	85.70	10.33	96.03	114	-17.97	Horizontal
2402	86.81	10.33	97.14	114	-16.86	Vertical
2440	87.23	10.37	97.60	114	-16.40	Horizontal
2440	84.48	10.37	94.85	114	-19.15	Vertical
2480	86.97	10.41	97.38	114	-16.62	Horizontal
2480	88.19	10.41	98.60	114	-15.40	Vertical

Average value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	79.93	10.33	90.26	94	-3.74	Horizontal
2402	80.57	10.33	90.90	94	-3.10	Vertical
2440	80.63	10.37	91.00	94	-3.00	Horizontal
2440	78.69	10.37	89.06	94	-4.94	Vertical
2480	81.92	10.41	92.33	94	-1.67	Horizontal
2480	82.04	10.41	92.45	94	-1.55	Vertical

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10. BAND EDGE EMISSION

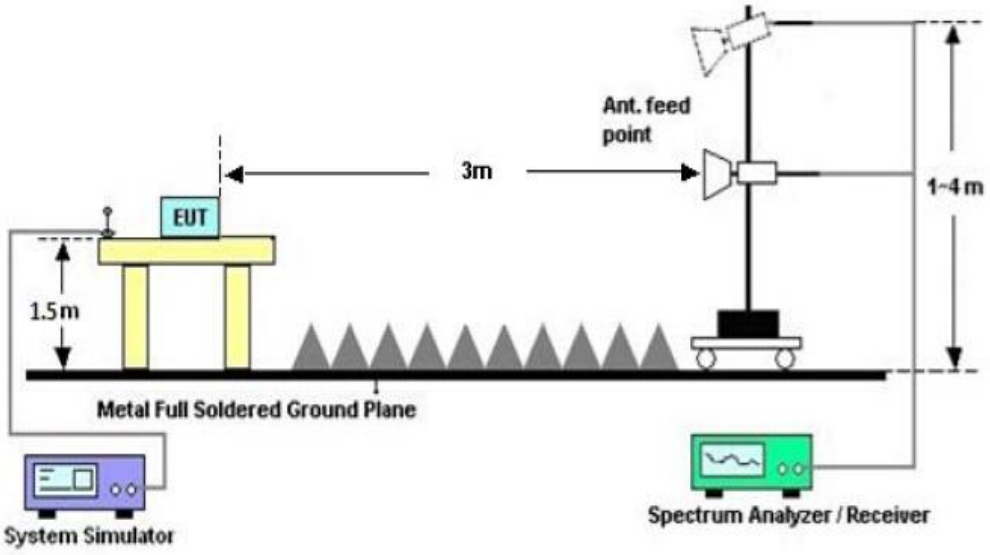
10.1. MEASUREMENT PROCEDURE

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 setup1, 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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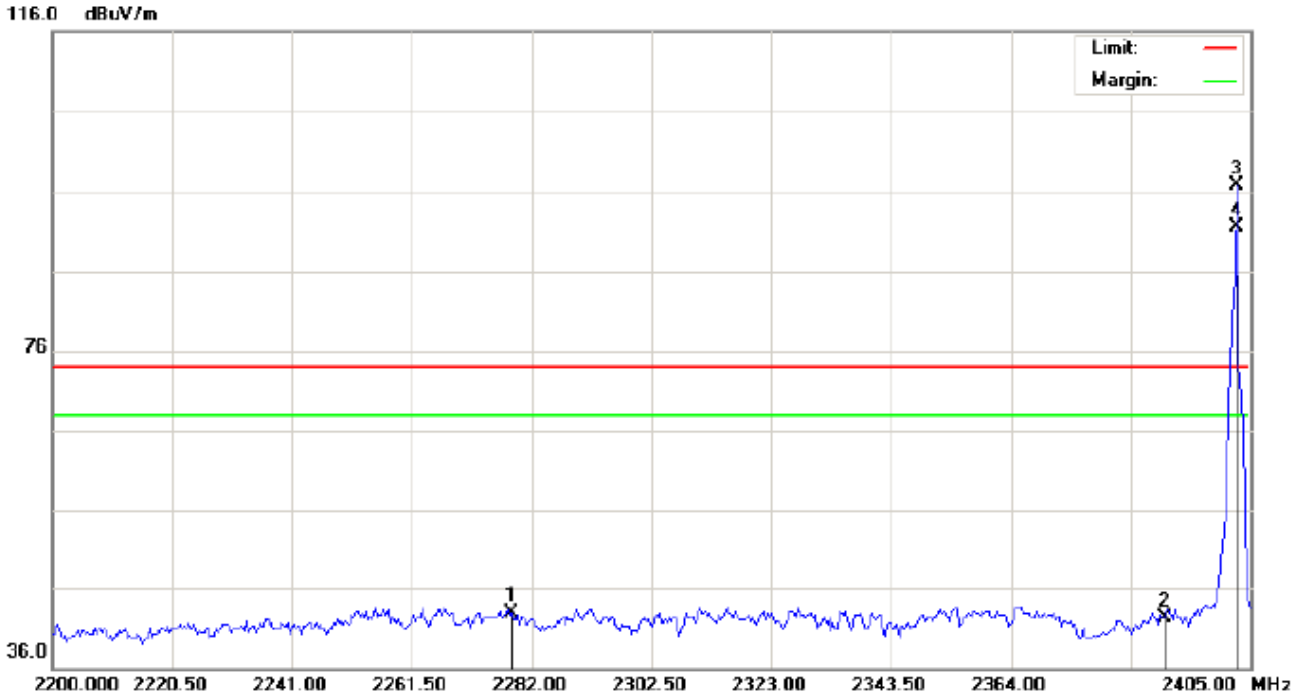
10.3 RADIATED TEST RESULT

FOR BLE

TEST PLOT OF BAND EDGE FOR LOW CHANNEL-Horizontal



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
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		2278.583	32.66	10.19	42.85	74.00	-31.15	peak			
2		2390.308	32.00	10.31	42.31	74.00	-31.69	peak			
3	*	2402.000	86.47	10.33	96.80	74.00	22.80	peak			
4	X	2402.000	81.23	10.33	91.56	74.00	17.56	AVG			

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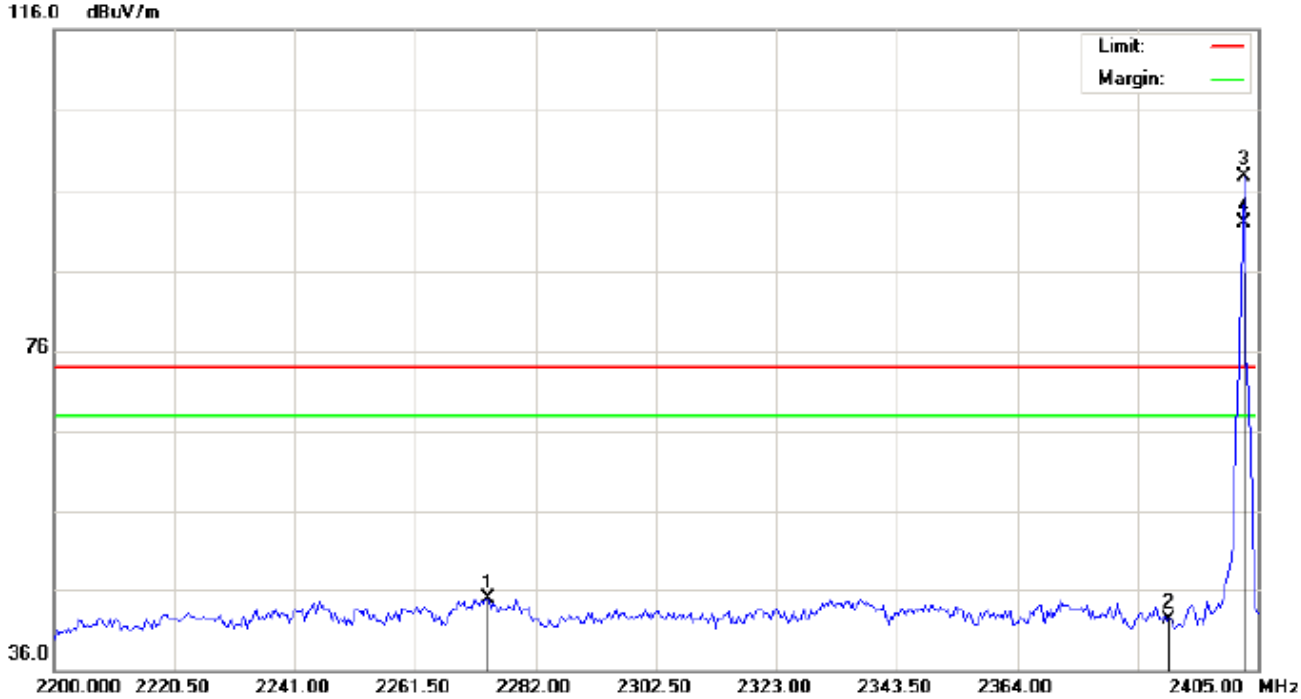
TEST PLOT OF BAND EDGE FOR LOW CHANNEL -Vertical



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
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		2273.800	34.72	10.18	44.90	74.00	-29.10	peak			
2		2389.966	31.96	10.31	42.27	74.00	-31.73	peak			
3	*	2402.000	87.29	10.33	97.62	74.00	23.62	peak			
4	X	2402.000	81.51	10.33	91.84	74.00	17.84	AVG			

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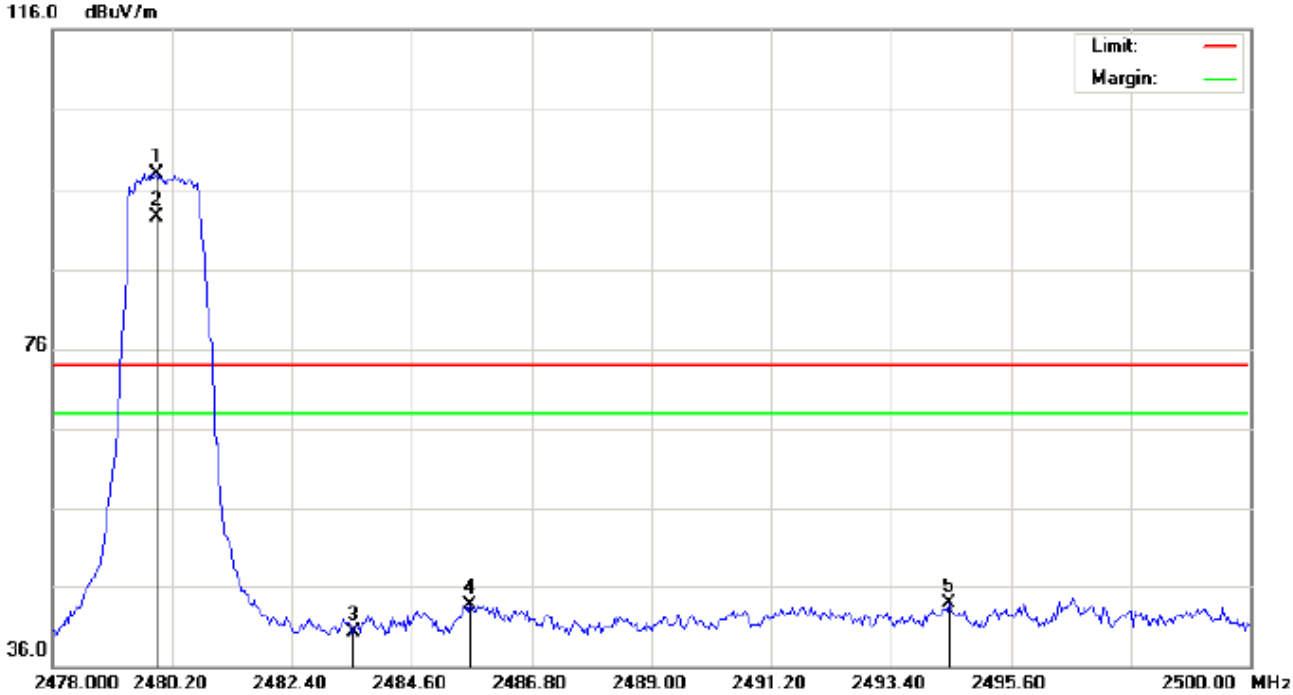
TEST PLOT OF BAND EDGE FOR HIGH CHANNEL -Horizontal



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
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	87.51	10.41	97.92	74.00	23.92	peak			
2	X	2480.000	82.05	10.41	92.46	74.00	18.46	AVG			
3		2483.537	29.82	10.41	40.23	74.00	-33.77	peak			
4		2485.663	33.19	10.41	43.60	74.00	-30.40	peak			
5		2494.463	33.46	10.42	43.88	74.00	-30.12	peak			

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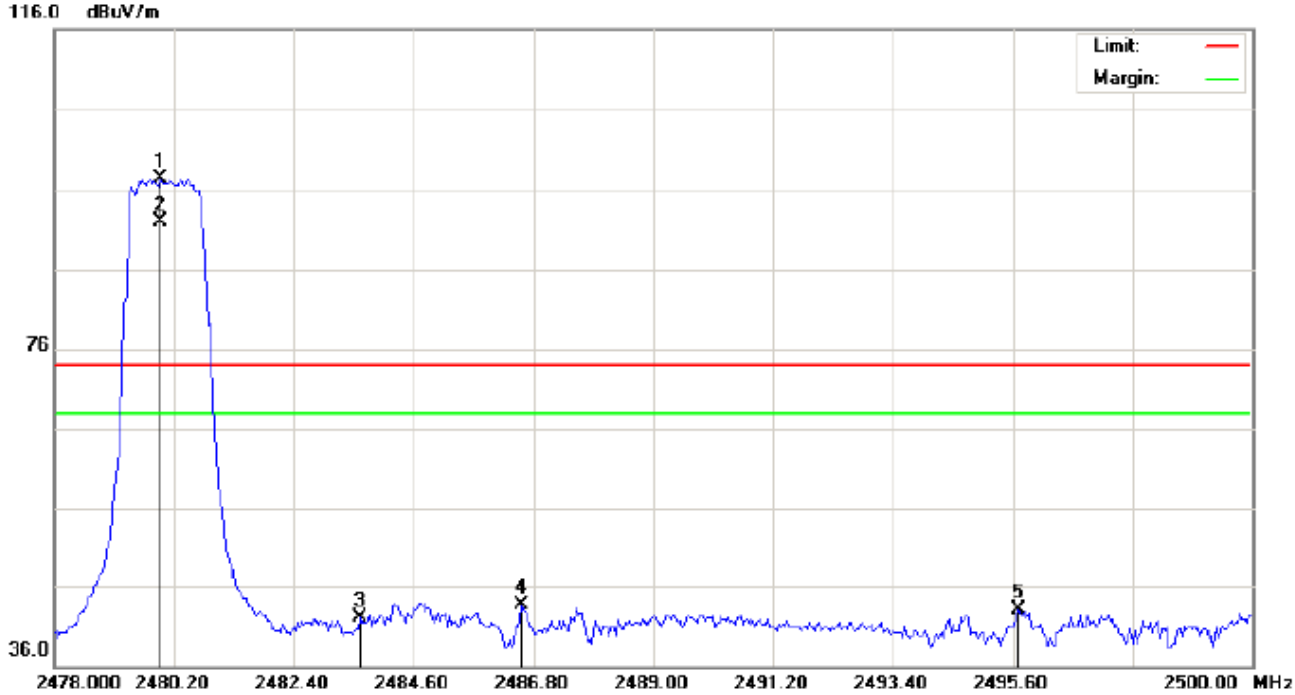
TEST PLOT OF BAND EDGE FOR HIGH CHANNEL-Vertical



Site: site #1
Limit: FCC Class B 3M Radiation above 1GHz(PK)
EUT: Bluetooth 5.0 BLE Module
M/N: HY-40R201PC
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	86.95	10.41	97.36	74.00	23.36	peak			
2	X	2480.000	81.48	10.41	91.89	74.00	17.89	AVG			
3		2483.610	31.77	10.41	42.18	74.00	-31.82	peak			
4		2486.580	33.30	10.42	43.72	74.00	-30.28	peak			
5		2495.710	32.65	10.43	43.08	74.00	-30.92	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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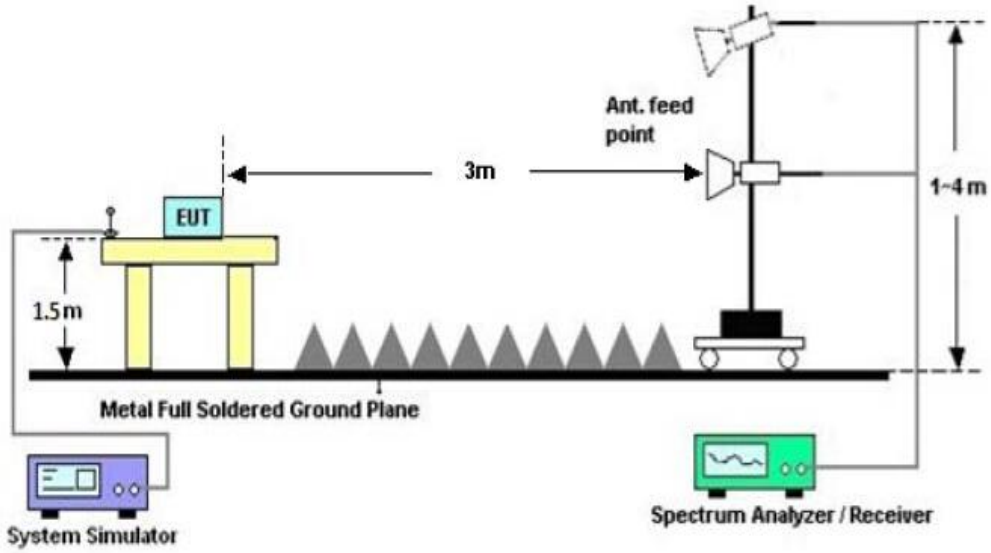
11. 20DB BANDWIDTH

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 hoping channel RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW; 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 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	1.066	1.243	PASS
	Middle Channel	1.068	1.238	PASS
	High Channel	1.080	1.238	PASS

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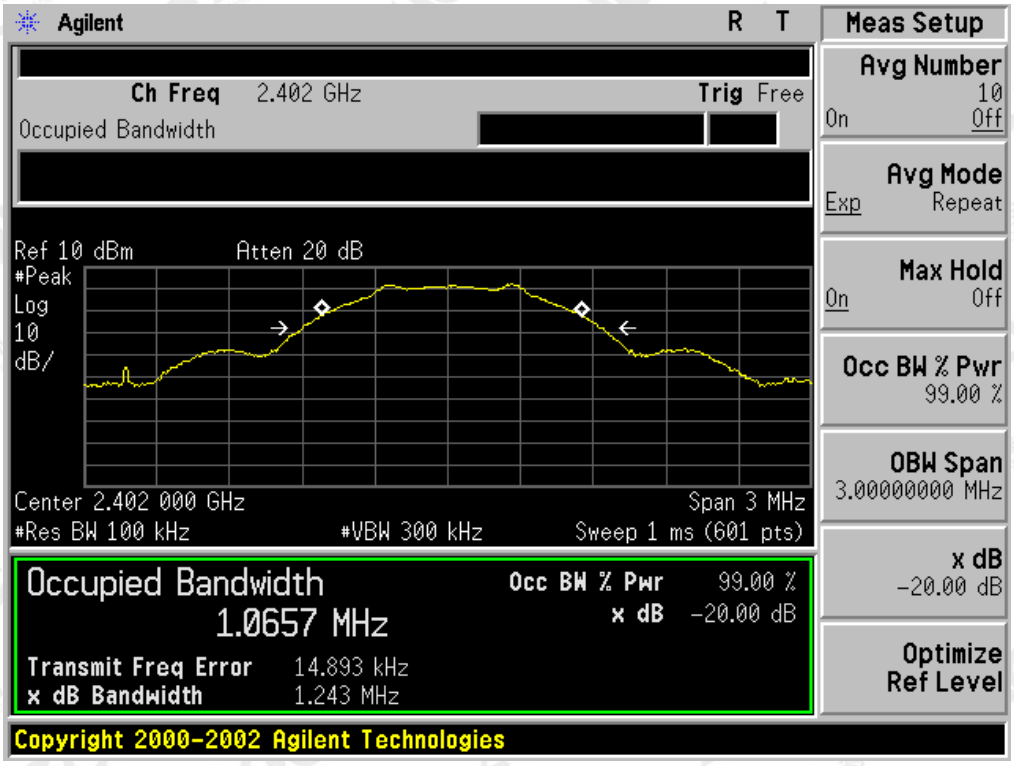
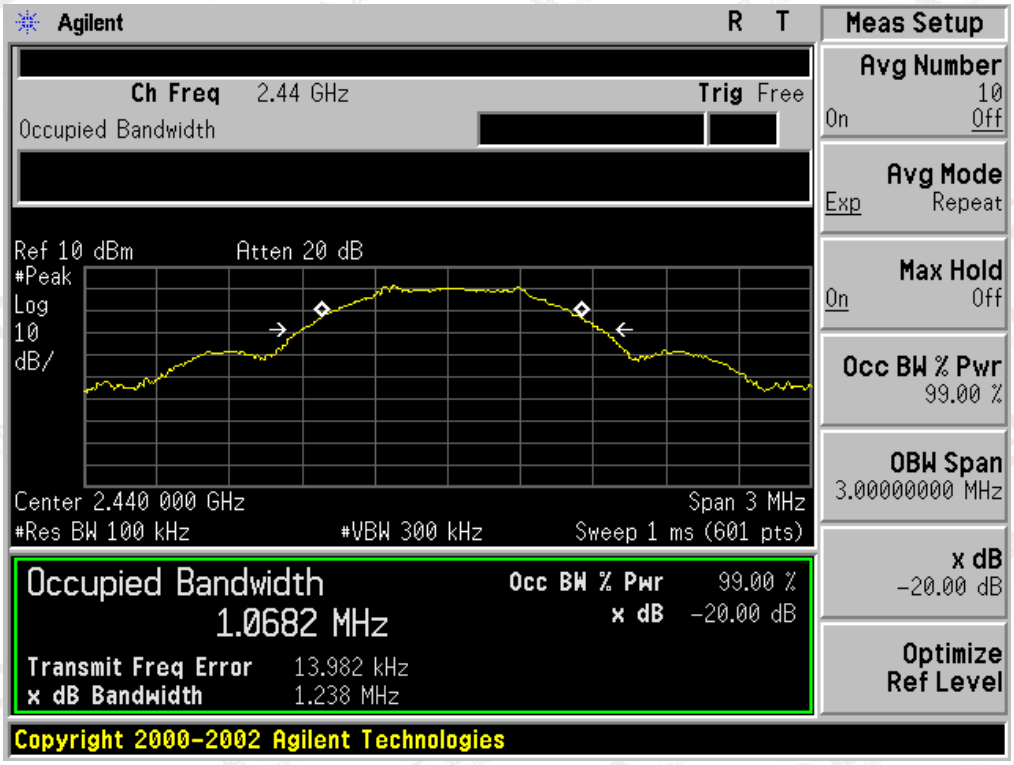
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



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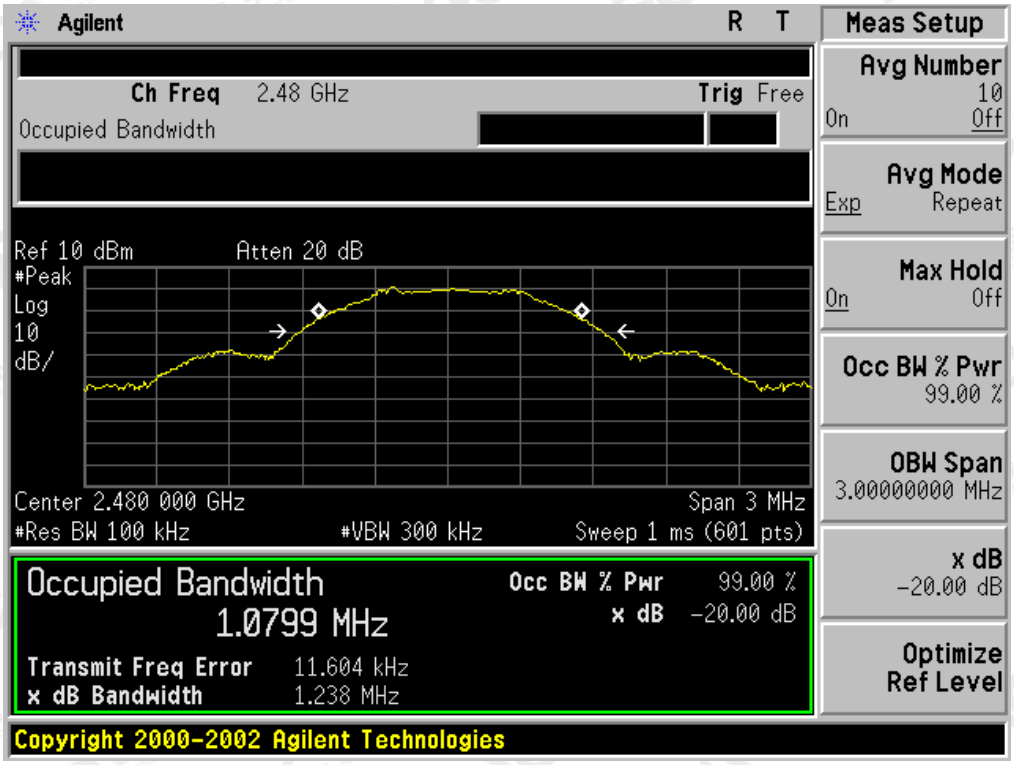
TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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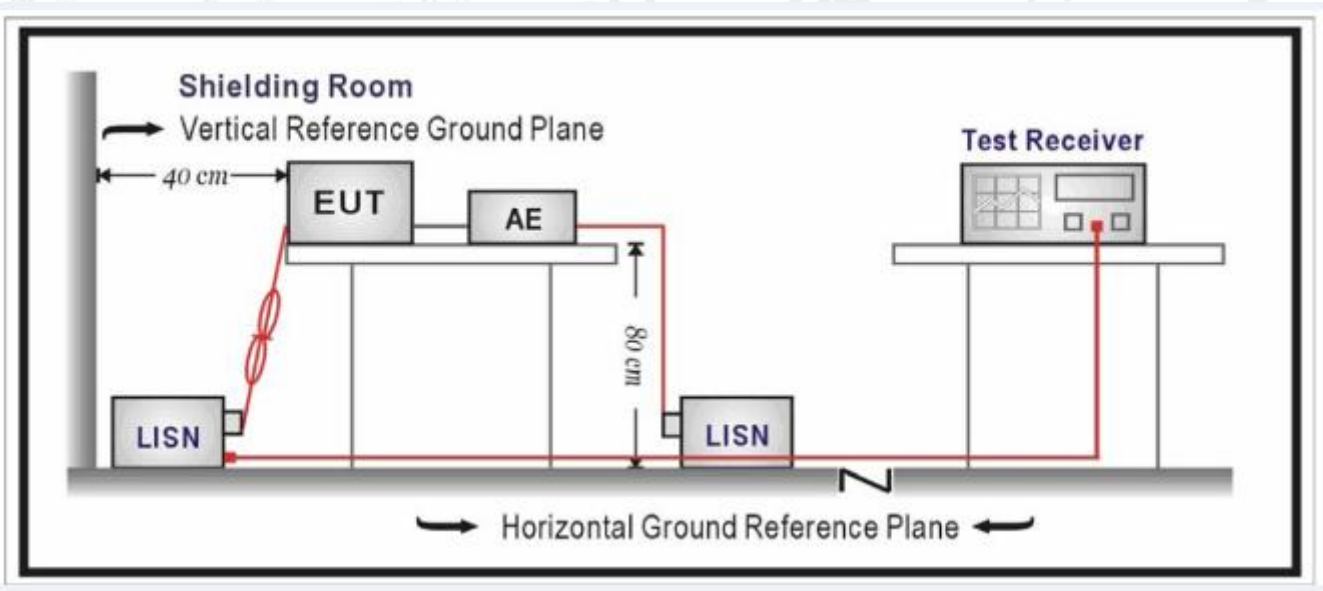
12. FCC LINE CONDUCTED EMISSION TEST

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 voltage by PC 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 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.

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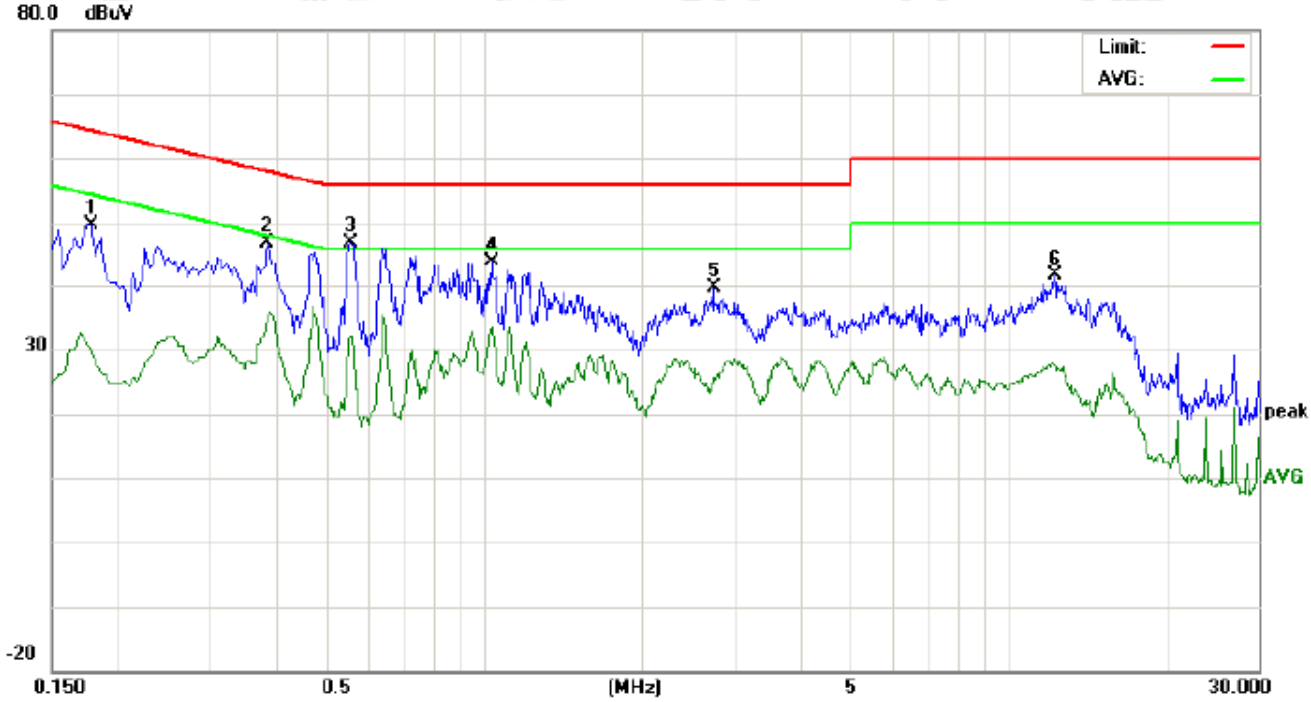
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

FOR BLE

Line Conducted Emission Test Line 1-L



Site: Conduction | Phase: *L1* | Temperature: 26
Limit: FCC Class B Conduction(QP) | Power: | Humidity: 60 %
EUT: Bluetooth BLE 5.0 Module
M/N: HY-40R201PC
Mode: BT Link
Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1780	39.42		19.77	10.19	49.61		29.96	64.57	54.57	-14.96	-24.61	P	
2	0.3860	36.60		24.59	10.32	46.92		34.91	58.15	48.15	-11.23	-13.24	P	
3	0.5580	36.44		21.68	10.35	46.79		32.03	56.00	46.00	-9.21	-13.97	P	
4	1.0339	33.44		22.85	10.37	43.81		33.22	56.00	46.00	-12.19	-12.78	P	
5	2.7500	29.23		15.16	10.49	39.72		25.65	56.00	46.00	-16.28	-20.35	P	
6	12.2858	31.39		17.40	10.14	41.53		27.54	60.00	50.00	-18.47	-22.46	P	

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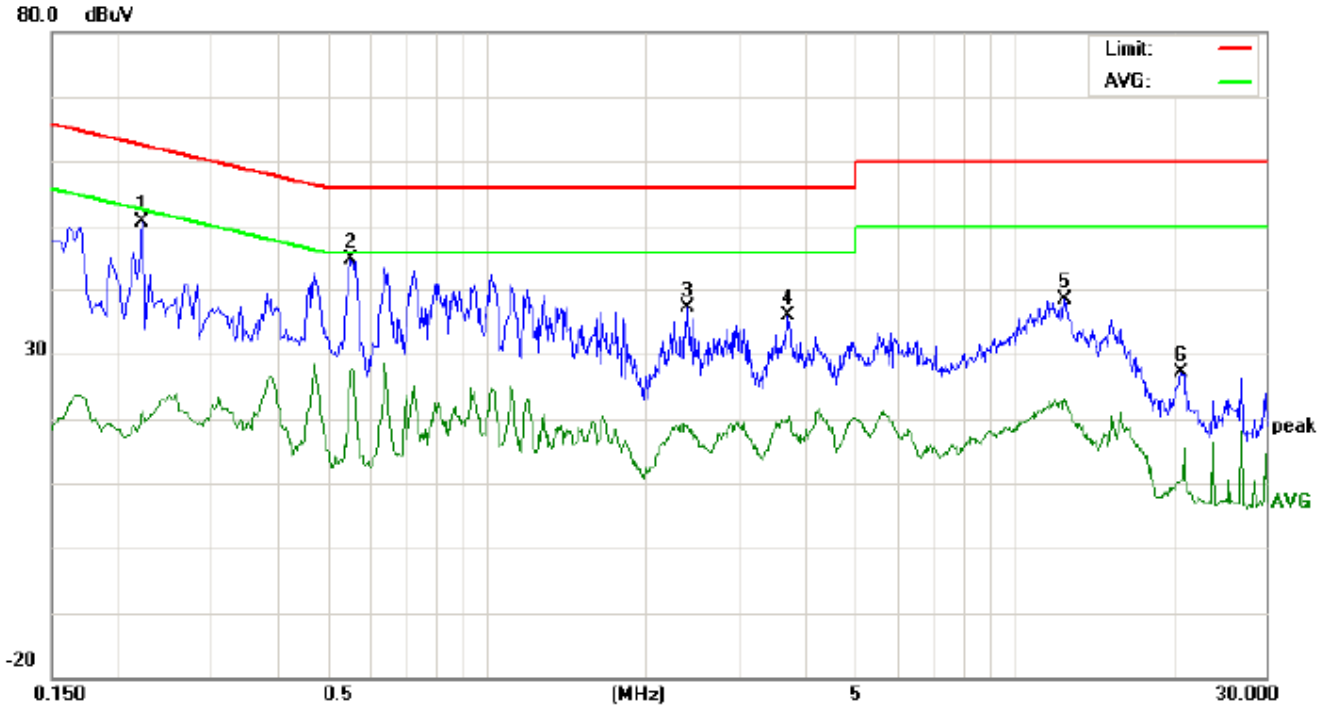
Line Conducted Emission Test Line 2-N



Site: Conduction
Phase: N
Temperature: 26
Limit: FCC Class B Conduction(QP)
Power:
Humidity: 60 %
EUT: Bluetooth BLE 5.0 Module
M/N: HY-40R201PC
Mode: BT Link
Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2220	40.46		10.84	10.24	50.70		21.08	62.74	52.74	-12.04	-31.66	P	
2	0.5540	34.62		16.78	10.35	44.97		27.13	56.00	46.00	-11.03	-18.87	P	
3	2.4060	26.76		8.53	10.39	37.15		18.92	56.00	46.00	-18.85	-27.08	P	
4	3.7260	25.49		8.99	10.47	35.96		19.46	56.00	46.00	-20.04	-26.54	P	
5	12.4579	28.35		12.93	10.14	38.49		23.07	60.00	50.00	-21.51	-26.93	P	
6	20.7220	17.08		0.29	10.12	27.20		10.41	60.00	50.00	-32.80	-39.59	P	

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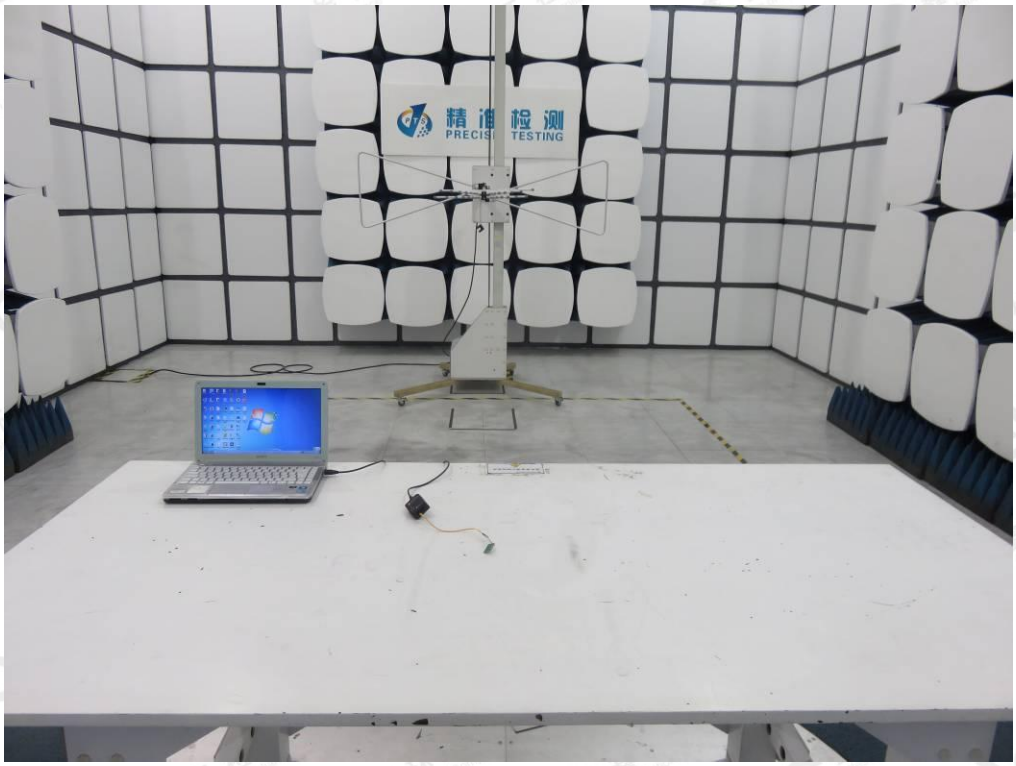
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC LINE CONDUCTED EMISSION TEST SETUP

FCC RADIATED EMISSION TEST SETUP



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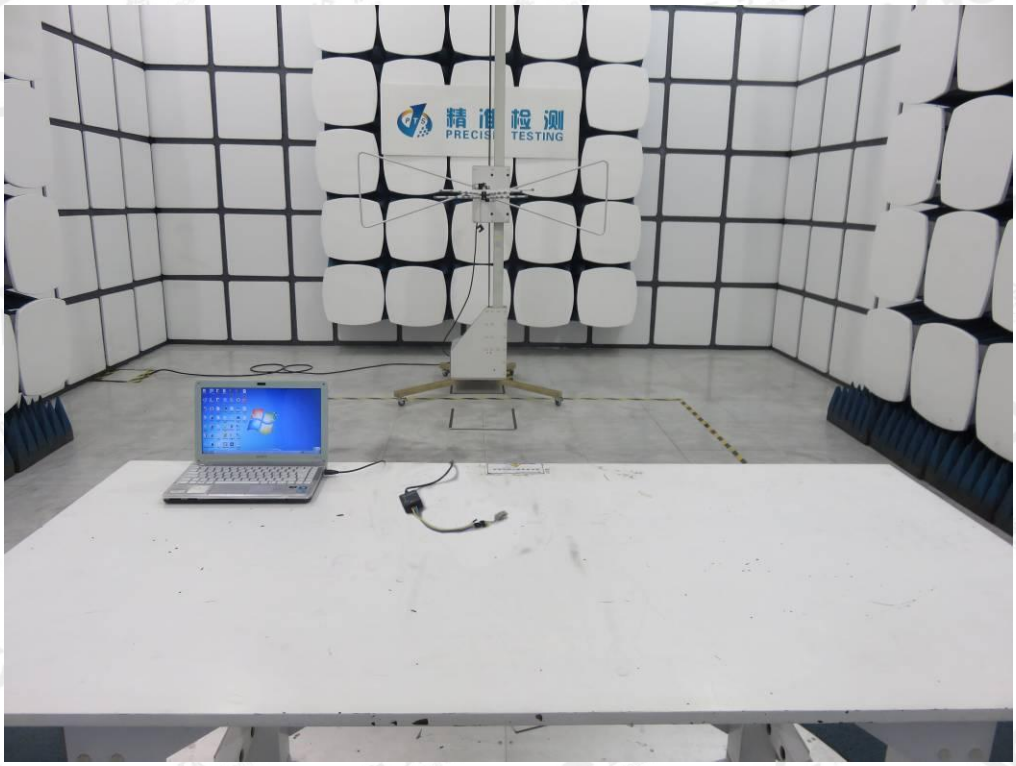

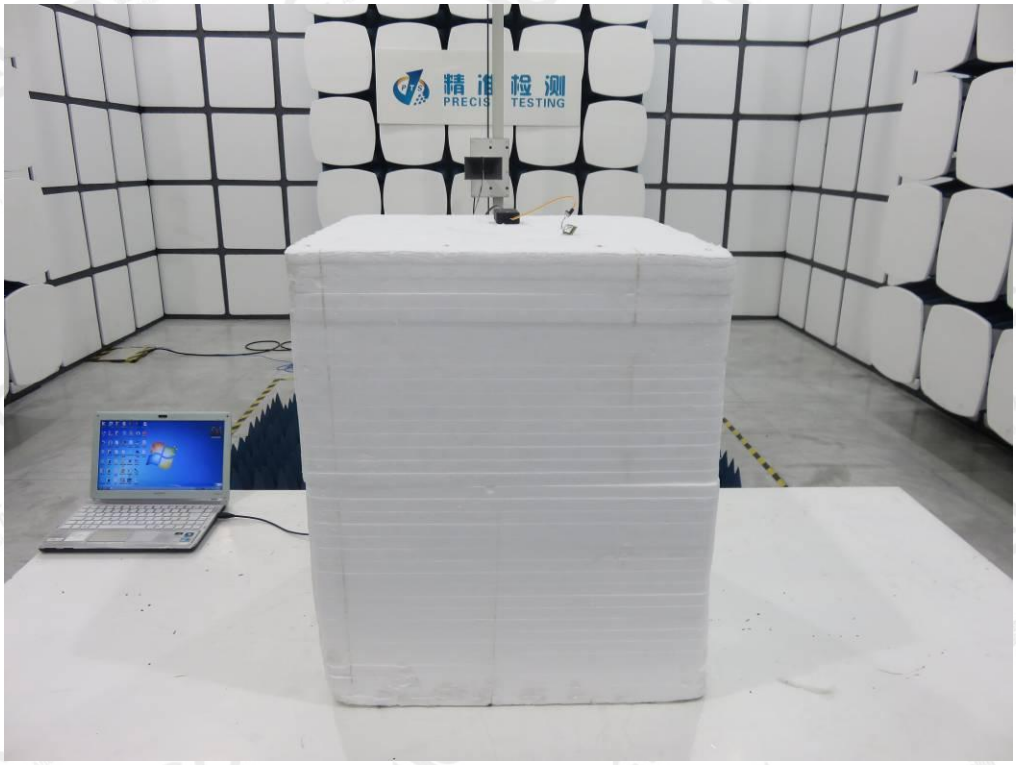

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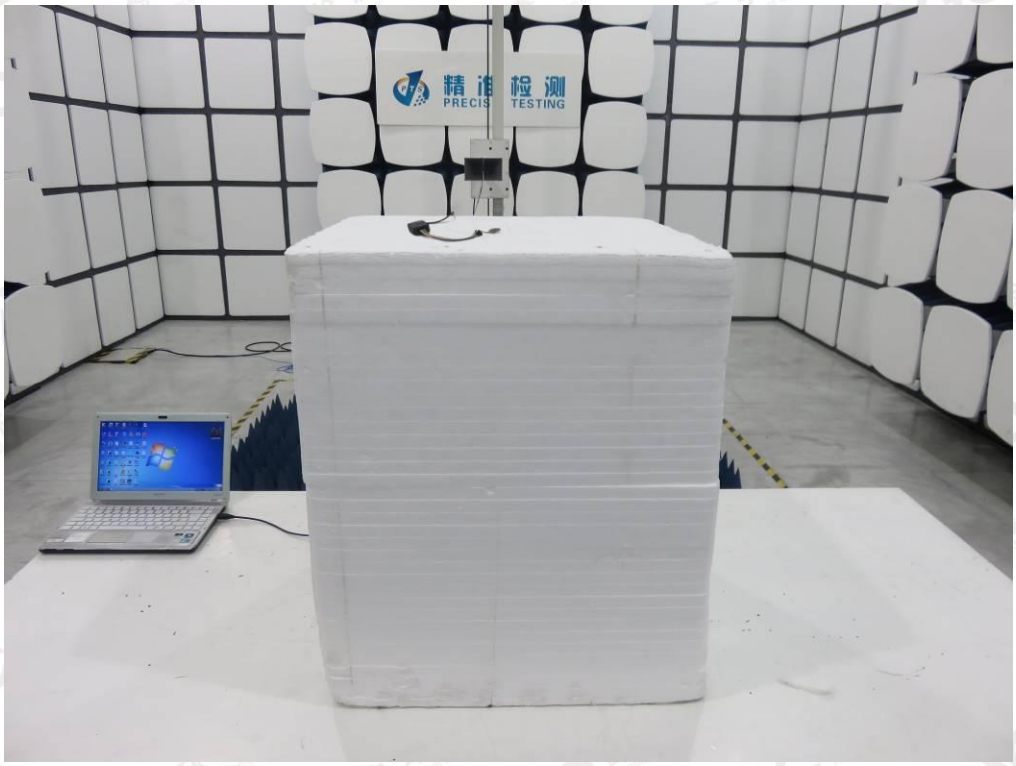

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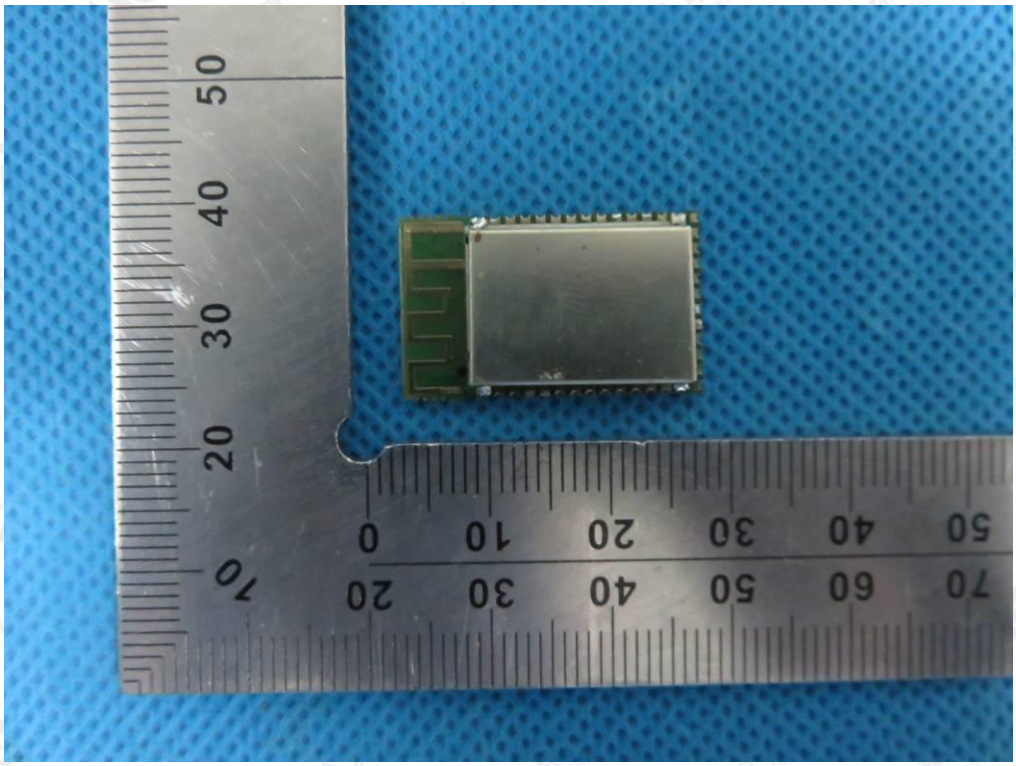
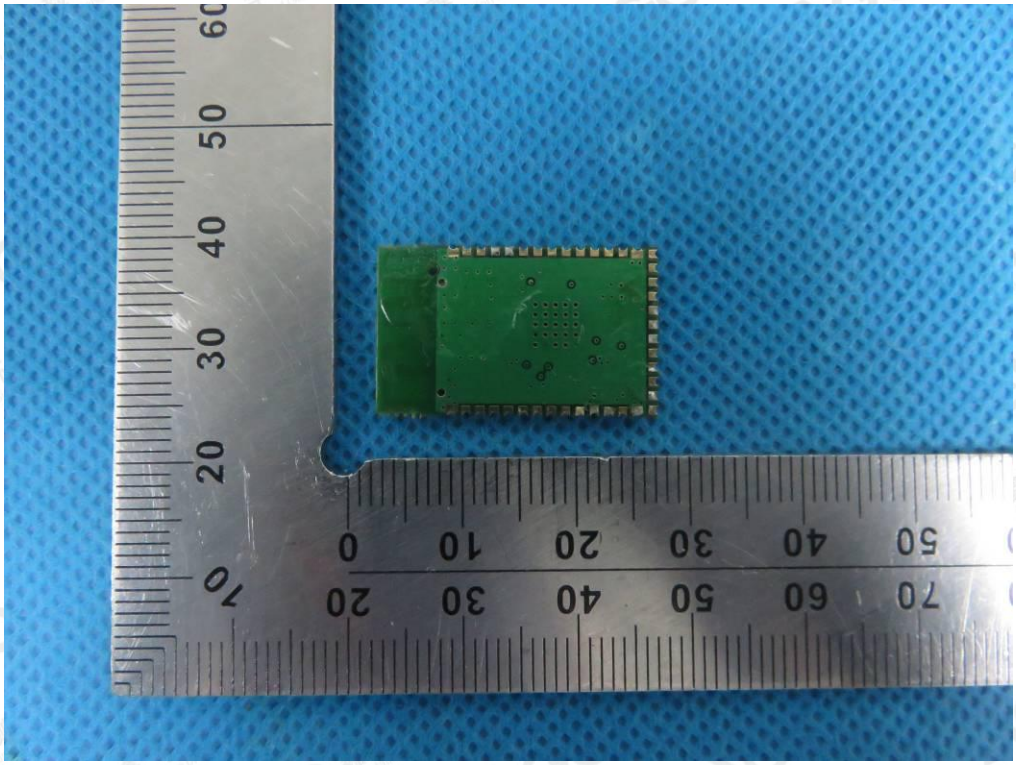
APPENDIX B: PHOTOGRAPHS OF EUT

VIEW OF EUT-1



VIEW OF EUT-2



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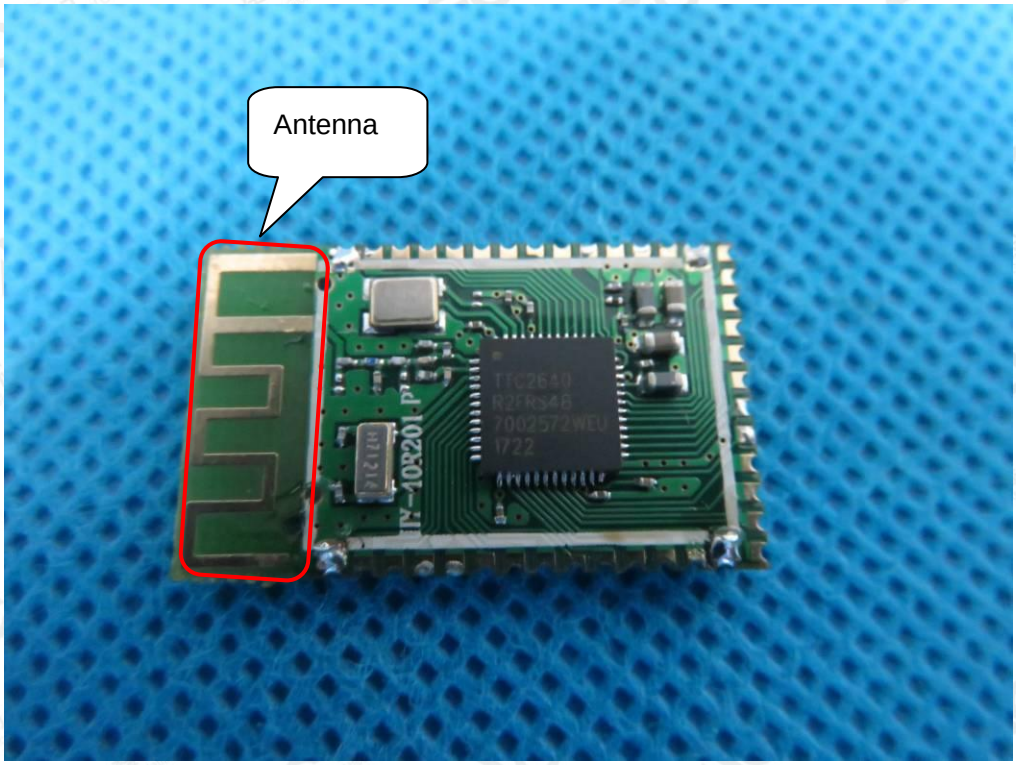
VIEW OF EUT-3



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