
FCC Test Report

Report No.: AGC04096150701FE03

FCC ID : 2AEDMSC-21A
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : Bluetooth Speaker
BRAND NAME : ESOTICA
MODEL NAME : SC-21
CLIENT : Shenzhen Caijiixin Technology Co., Ltd.
DATE OF ISSUE : Aug.04,2015
STANDARD(S) : FCC Part 15 Rules
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	/	Aug.04,2015	Valid	Original Report

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1. VERIFICATION OF CONFORMITY

Applicant	Shenzhen Caijiaxin Technology Co., Ltd.
Address	4th Floor, Building 51, Bantian 3rd Industrial Zone, Longgang District, Shenzhen, Guangdong, China
Manufacturer	Shenzhen Caijiaxin Technology Co., Ltd.
Address	4th Floor, Building 51, Bantian 3rd Industrial Zone, Longgang District, Shenzhen, Guangdong, China
Product Designation	Bluetooth Speaker
Brand Name	ESOTICA
Test Model	SC-21
Date of test	July 29,2015 to July 30,2015
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-US-BR/RF (2013-03-01)

We hereby certify that:

The above equipment was tested by Compliance Certification Service(Shenzhen) Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Tested By 
Jerry Xiao(Xiao Wang) Aug.04,2015

Reviewed By 
Forrest Lei(Lei Yonggang) Aug.04,2015

Approved By 
Solger Zhang(Zhang Hongyi) Aug.04,2015
Authorized Officer

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is “Bluetooth Speaker” designed as a “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz
RF Output Power	6.99dBm(Max)
Bluetooth Version	V 3.0
Modulation	GFSK, $\pi/4$ -DQPSK, 8DPSK
Number of channels	79
Hardware Version	V1.2
Software Version	V1.0
Antenna Designation	PCB Antenna
Antenna Gain	0dBi
Power Supply	DC3.7V by Battery
Note: The USB port only used for charging and can't be used to transfer data with PC.	

2.2. TABLE OF CARRIER FREQUENCIES

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

2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHz. In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multislotted packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be sent on the same frequency, it is sent on the next frequency of the hopping sequence.

2.4. EXAMPLE OF A HOPPING SEQUENCE IN DATA MODE

Example of a 79 hopping sequence in data mode:

40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67
56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59
72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75
09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06
01, 51, 03, 55, 05, 04

2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection.
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units only offsets are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30). In most cases it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With these input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmissions is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

2.6. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2AEDMSC-21A** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (2009).

Radiated testing was performed at an antenna to EUT distance 3 meters.

Test has been referenced to the DA 00-705

2.8. SPECIAL ACCESSORIES

Refer to section 5.2.

2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. MEASUREMENT UNCERTAINTY

Conducted measurement: +/- 2.75dB

Radiated measurement: +/- 3.2dB

4. DESCRIPTION OF TEST MODES

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

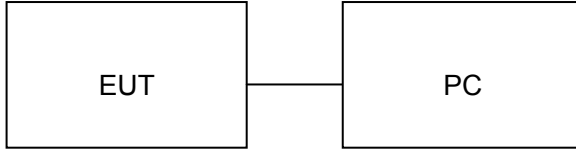
Note:

1. 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.

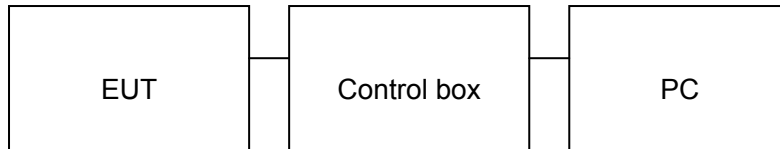
5. SYSTEM TEST CONFIGURATION

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 Speaker	ESOTICA	SC-21	EUT
2	PC	Dell	INSPIRON	A.E
3	Control box	N/A	N/A	A.E
4	USB Cable	N/A	0.5m, unshielded	A.E
5	Audio Cable	N/A	0.6m, unshielded	A.E
6	IPOD	APPLE	A1367	A.E

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Peak Output Power	Compliant
§15.247	20 dB Bandwidth	Compliant
§15.247	Spurious Emission	Compliant
§15.209	Radiated Emission	Compliant
§15.247	Band Edges	Compliant
§15.207	Conduction Emission	Compliant
§15.247	Number of Hopping Frequency	Compliant
§15.247	Time of Occupancy	Compliant
§15.247	Frequency Separation	Compliant

6. TEST FACILITY

Site	Compliance Certification Service(Shenzhen) Inc.
Location	No.10-1 Mingkeda Logistics Park, No.18 Huanguan South RD. Guan lan Town,Baoan Distr
FCC Registration No.	441872
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009.

ALL TEST EQUIPMENT LIST

Radiated Emission Test Site 966(2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	03/01/2015	03/01/2016
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	03/09/2015	03/08/2016
Amplifier	MITEQ	AM-1604-3000	1123808	03/18/2015	03/17/2016
High Noise Amplifier	Agilent	8449B	3008A01838	03/18/2015	03/17/2016
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	07/10/2015	07/09/2016
Bilog Antenna	SCHAFFNER	CBL6143	5082	03/01/2015	03/01/2016
Horn Antenna	SCHWARZBECK	BBHA9120	D286	03/01/2015	03/01/2016
Loop Antenna	COM-POWER	AL-130	121044	09/27/2014	09/26/2015
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/28/2015	02/27/2016
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	03/09/2015	03/08/2016
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	03/09/2015	03/08/2016
LISN	EMCO	3825/2	8901-1459	03/09/2015	03/08/2016
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	03/04/2015	03/03/2016
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

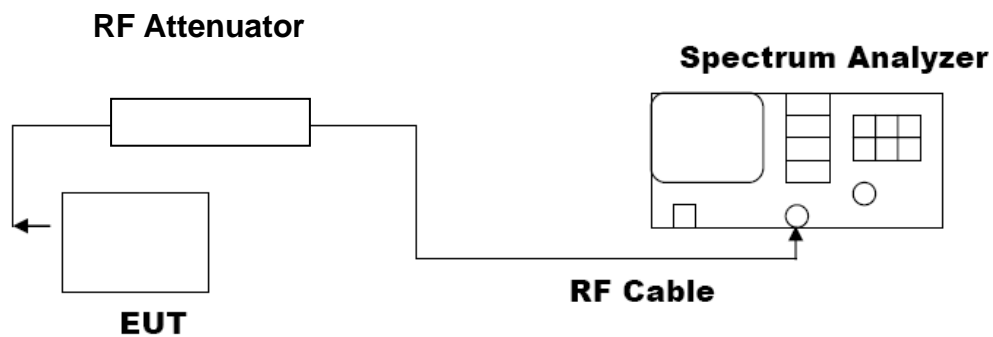
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, middle and the bottom operation frequency individually.
3. $RBW > \text{the 20 dB bandwidth of the emission being measured}$, $VBW \geq RBW$.
4. Record the maximum power from the Spectrum Analyzer.

Note : The EUT was tested according to DA000705 for compliance to FCC 47CFR 15.247 requirements.

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

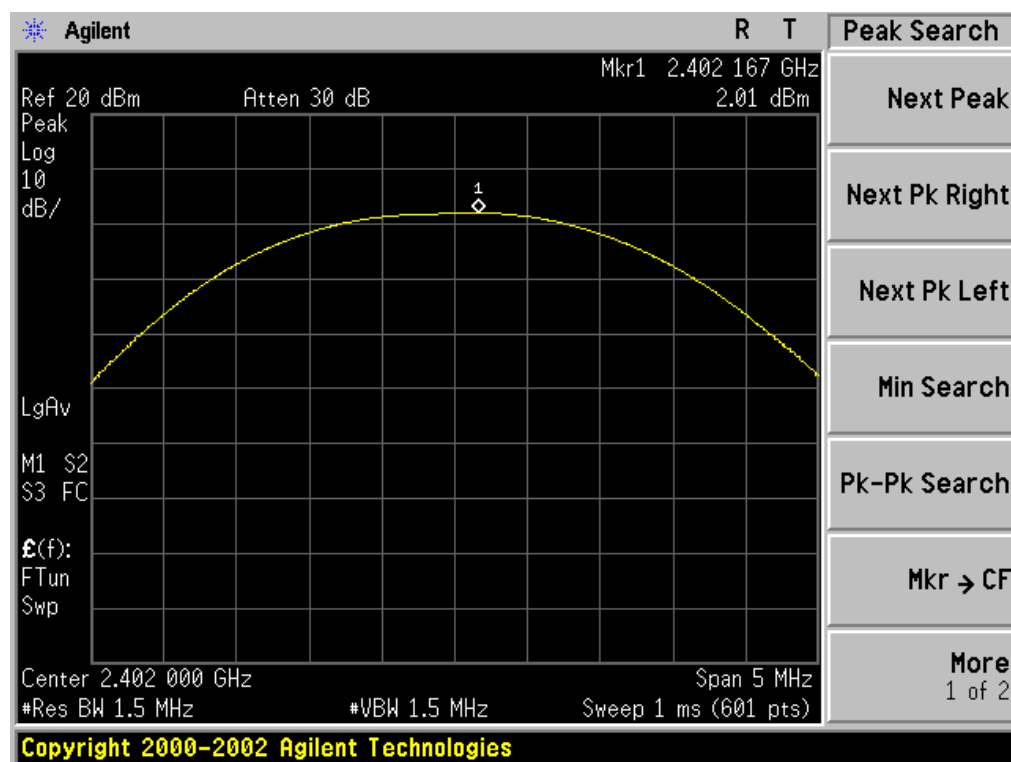
PEAK POWER TEST SETUP



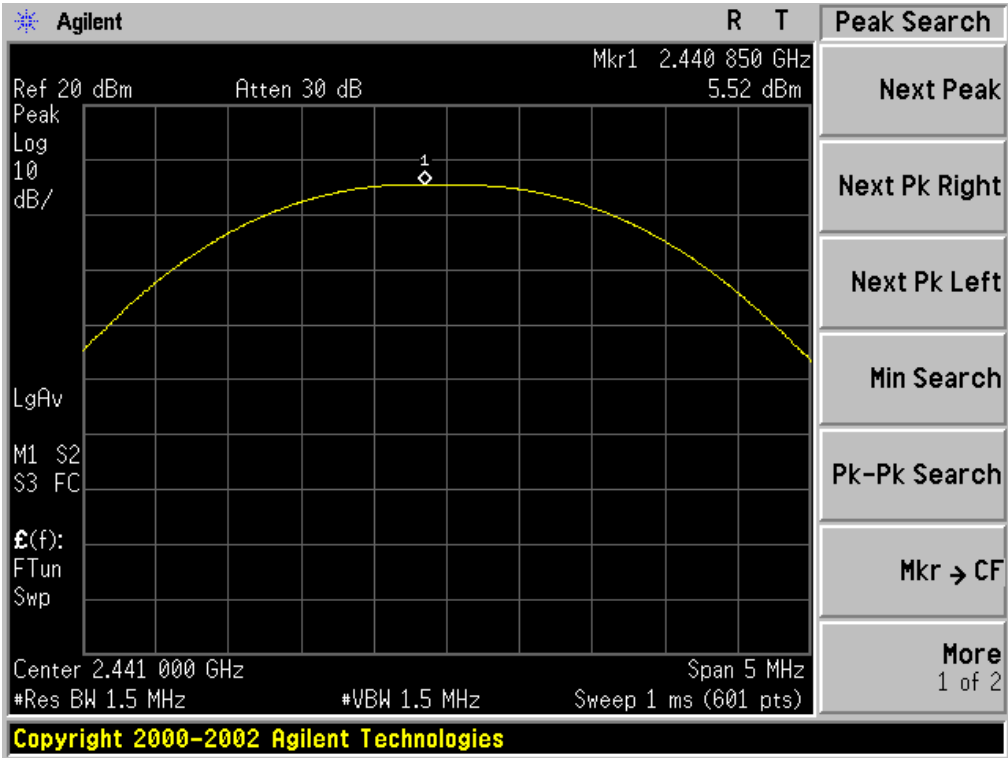
7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	2.01	30	Pass
2.441	5.52	30	Pass
2.480	6.99	30	Pass

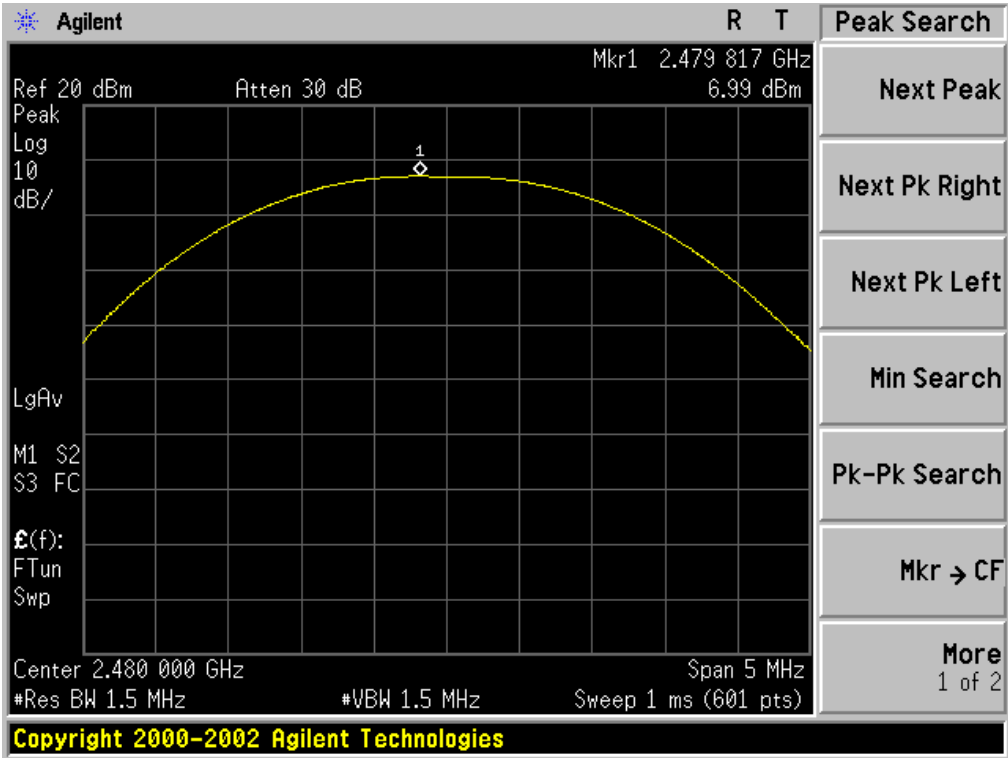
CH0



CH39

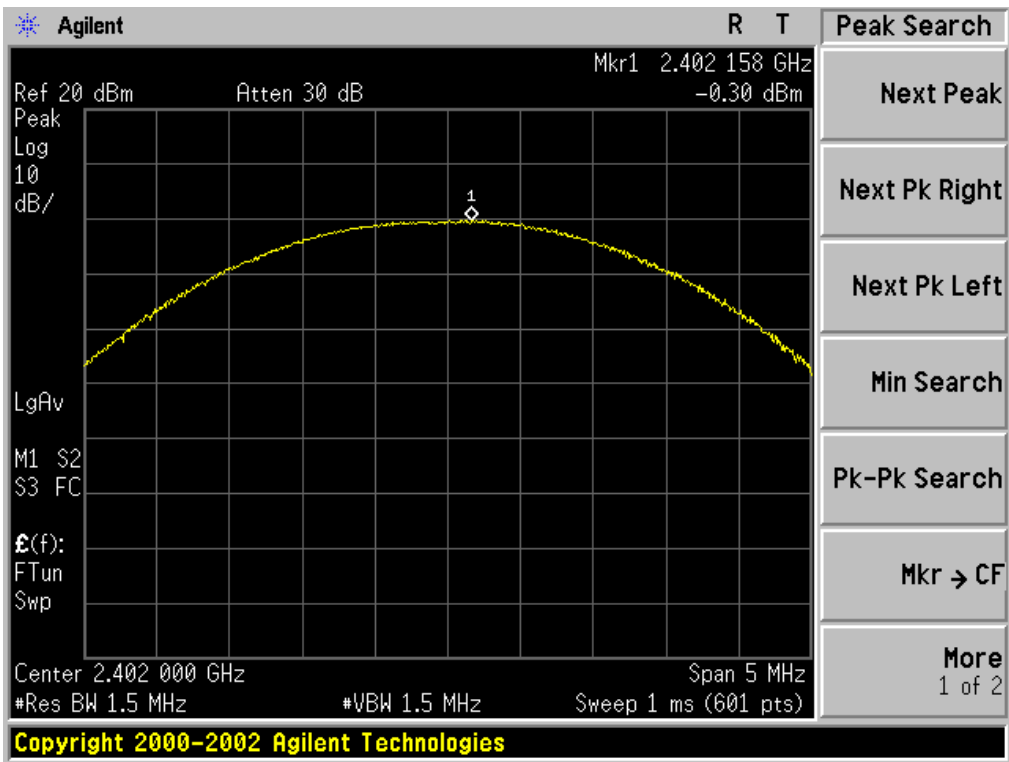


CH78

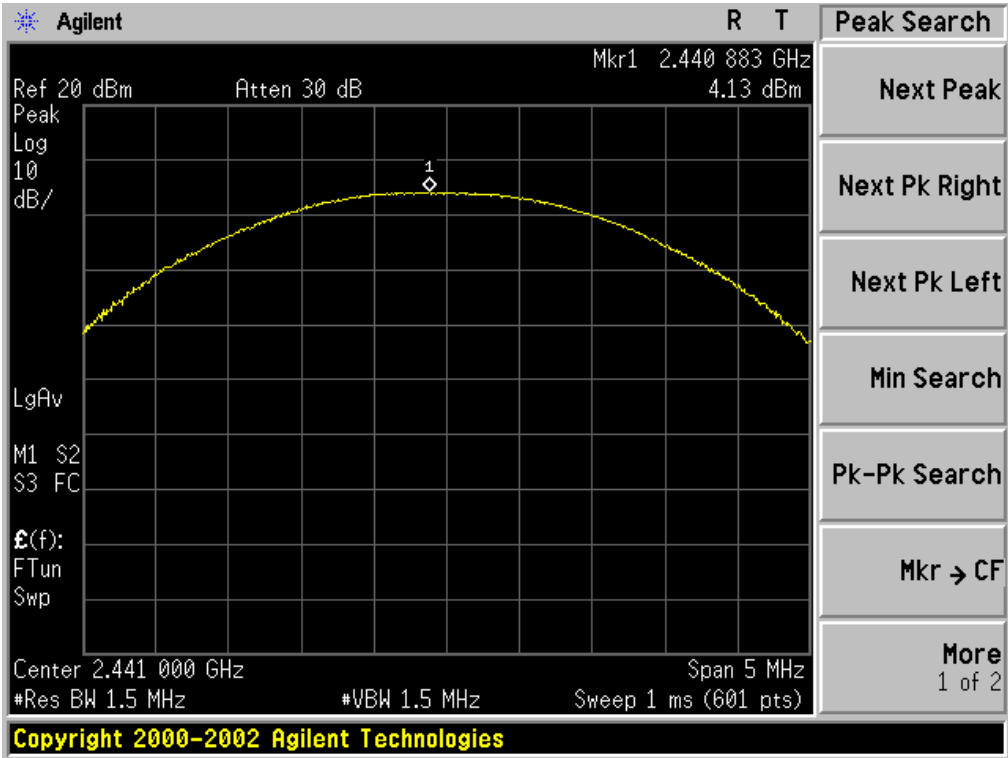


PEAK OUTPUT POWER MEASUREMENT RESULT FOR Π /4-DQPSK MODULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	-0.30	30	Pass
2.441	4.13	30	Pass
2.480	5.62	30	Pass

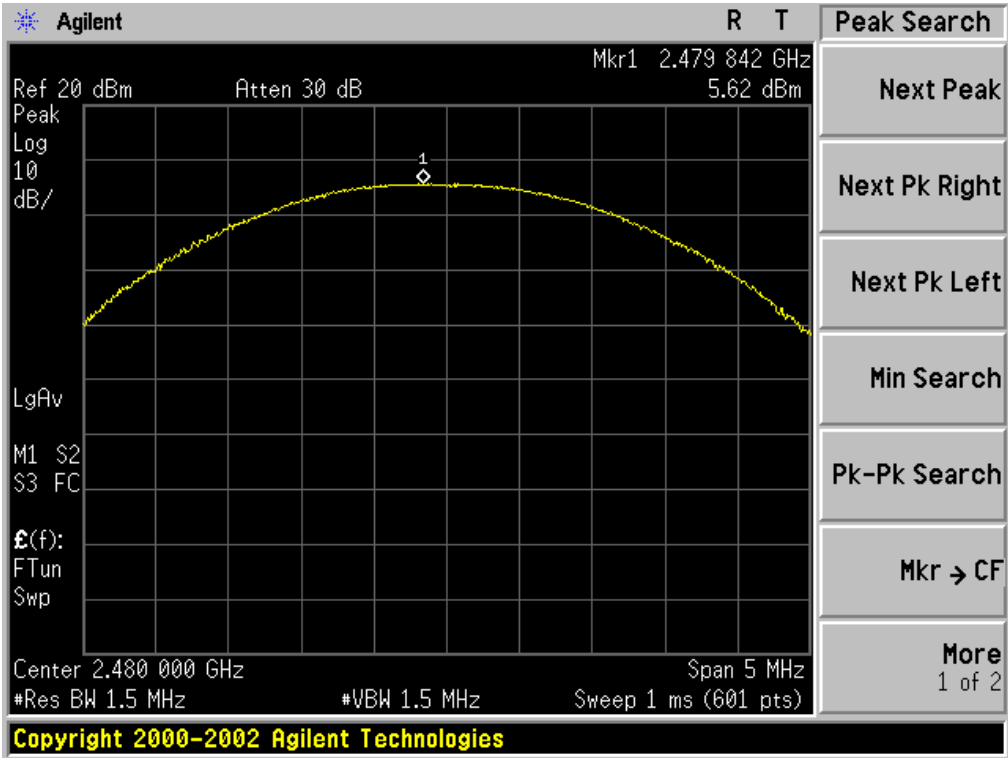
CH0



CH39

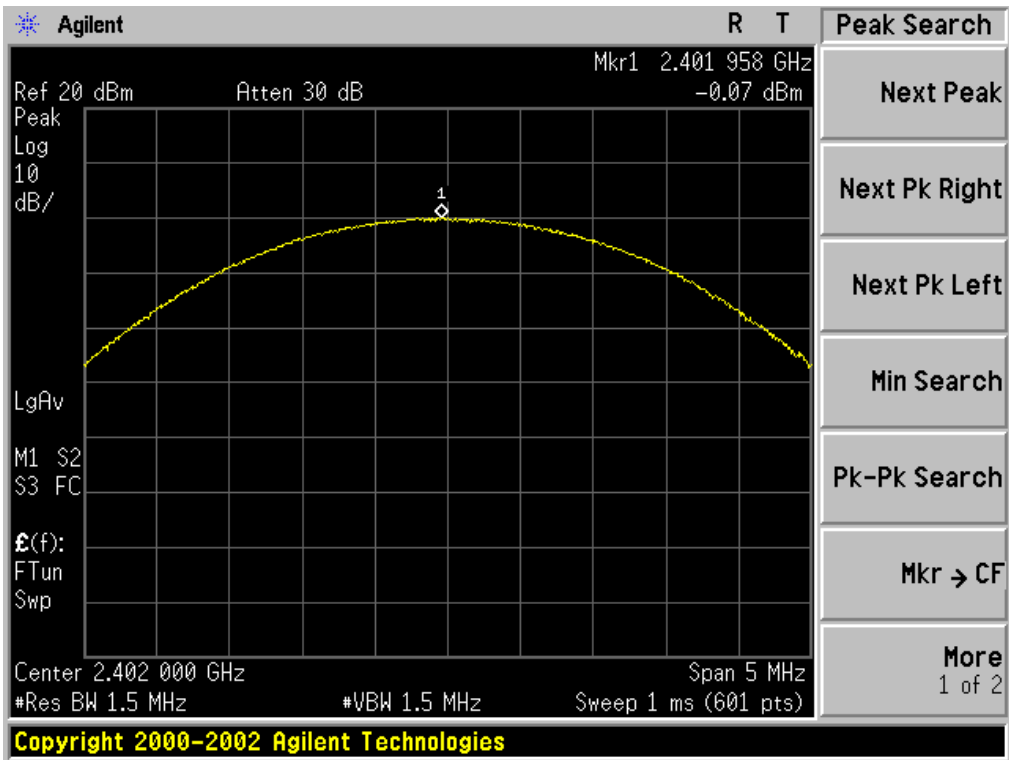


CH78

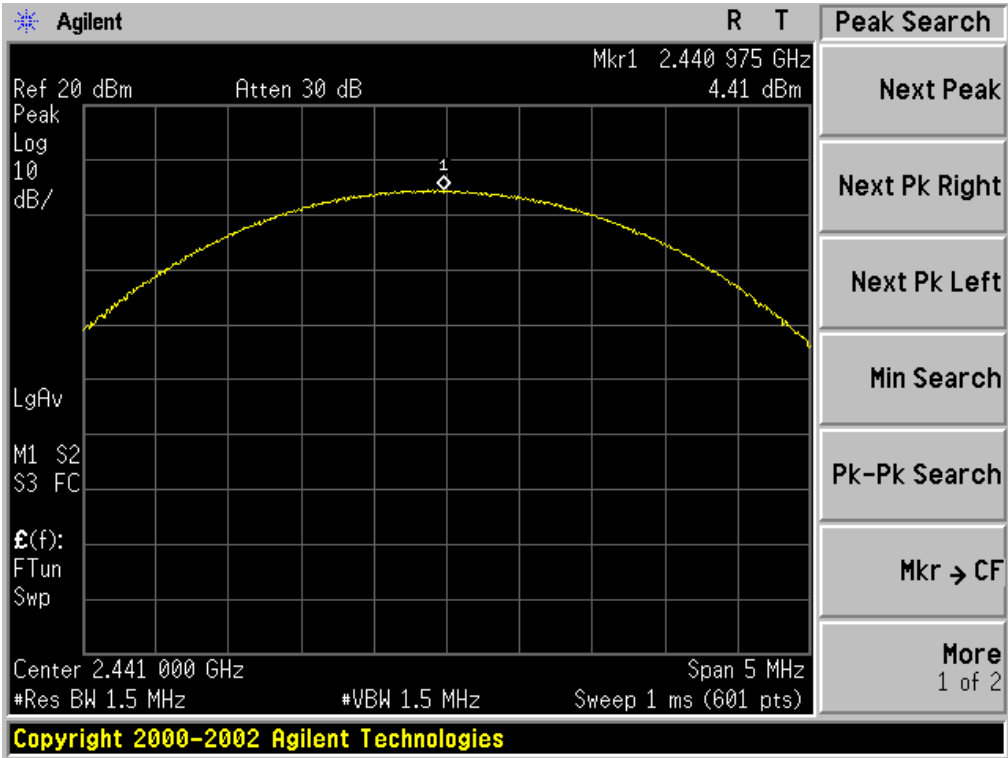


PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MODULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	-0.07	30	Pass
2.441	4.41	30	Pass
2.480	5.87	30	Pass

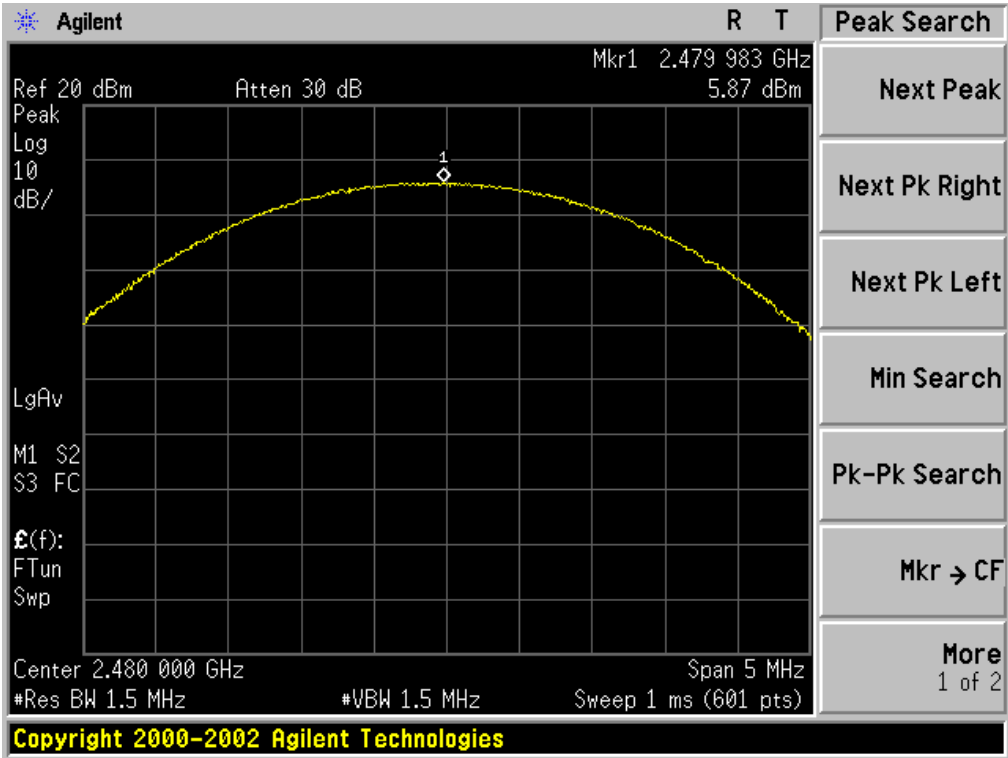
CH0



CH39



CH78

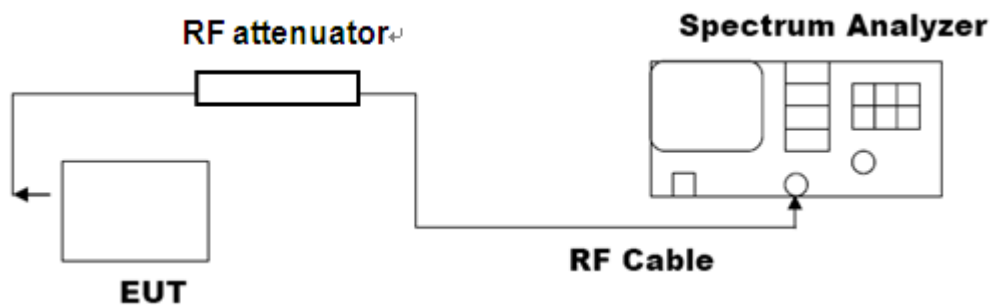


8. 20DB BANDWIDTH

8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set 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 RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

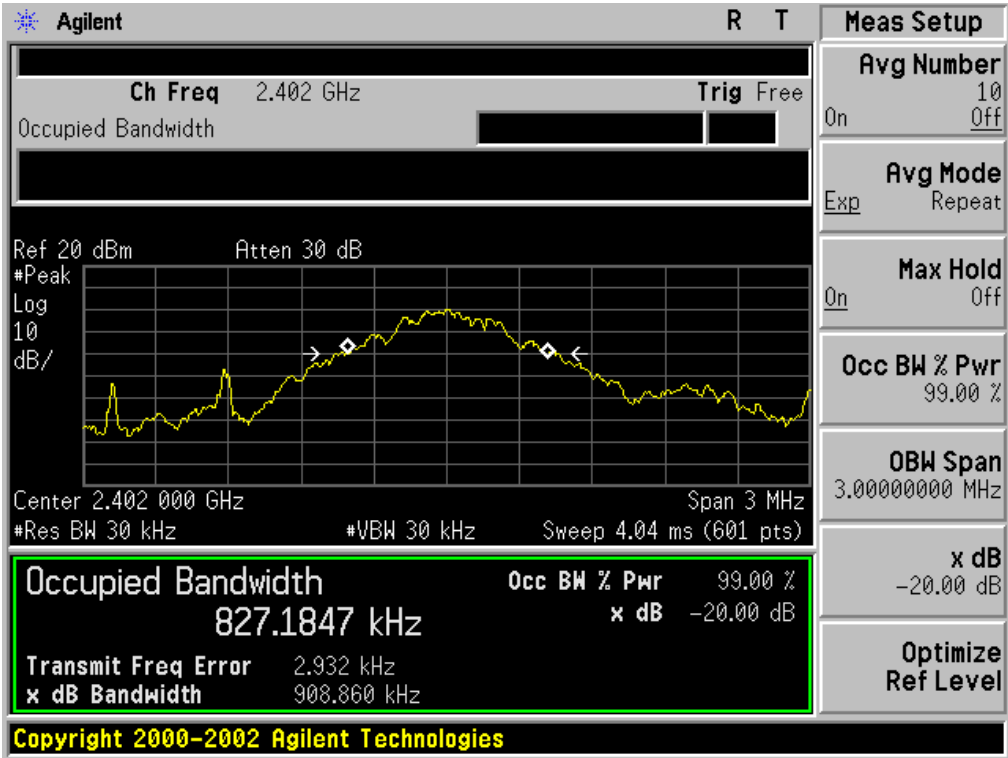
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



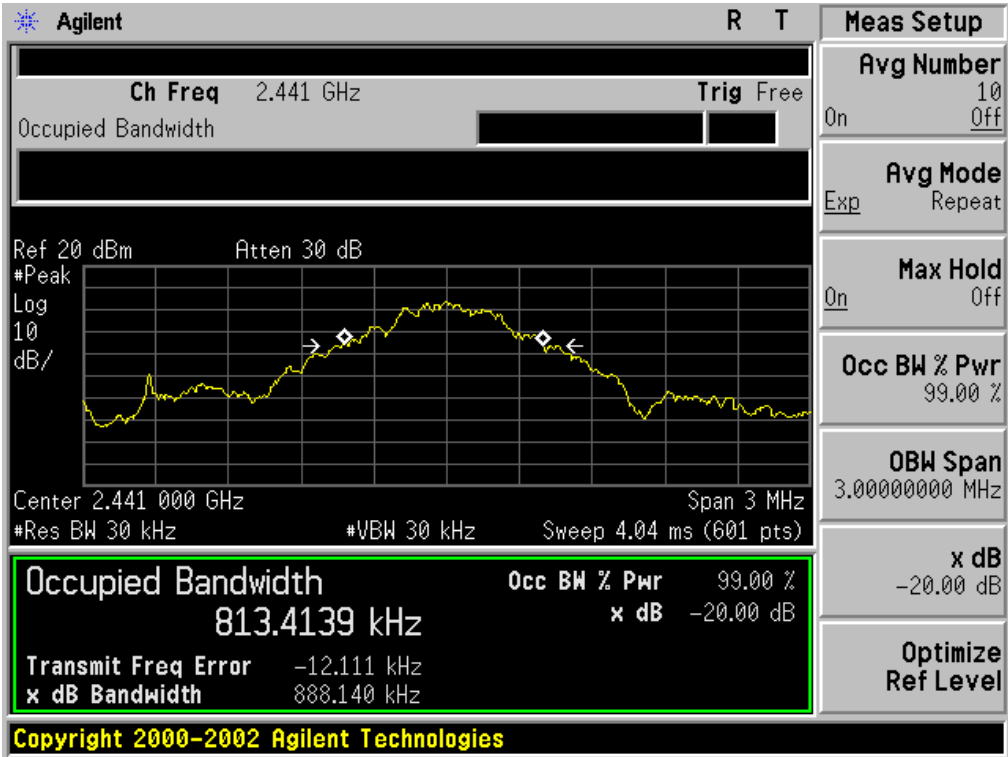
8.3. LIMITS AND MEASUREMENT RESULTS

BLUETOOTH 1MBPS LIMITS AND MEASUREMENT RESUL			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
N/A	Low Channel	0.909	PASS
	Middle Channel	0.888	PASS
	High Channel	0.908	PASS

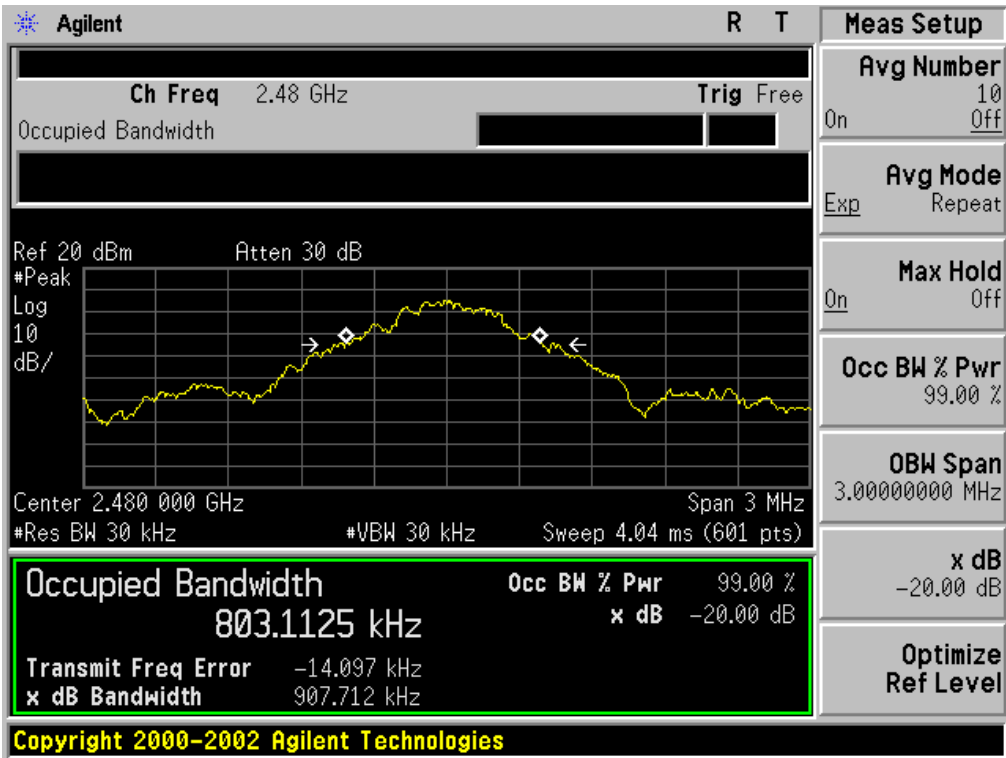
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

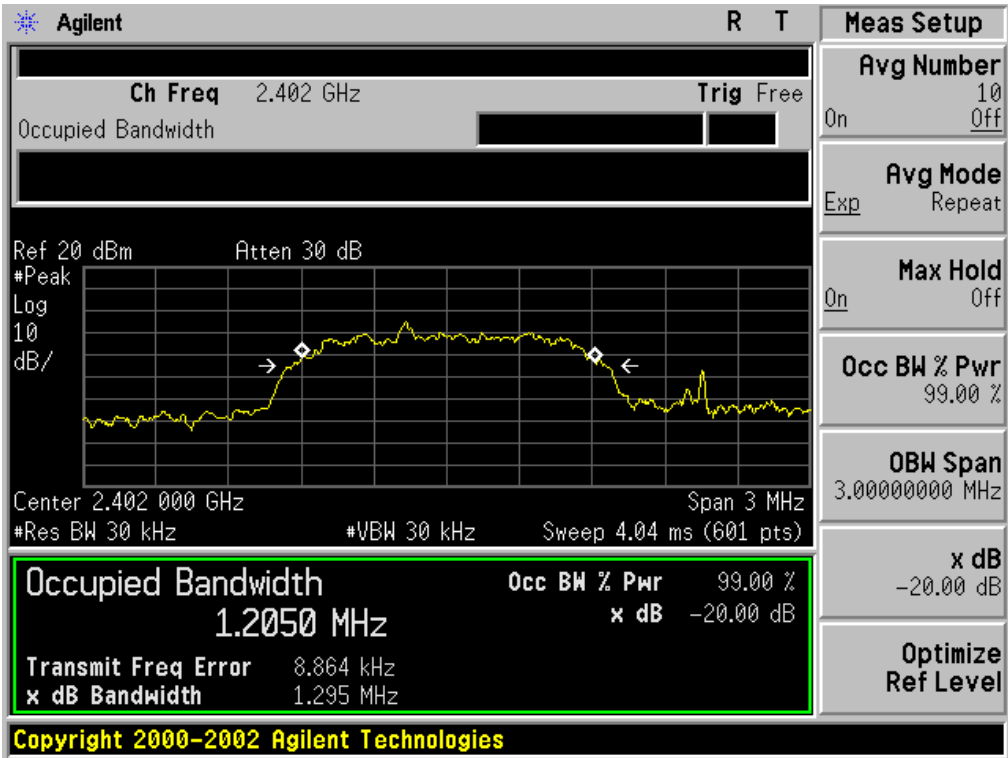


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

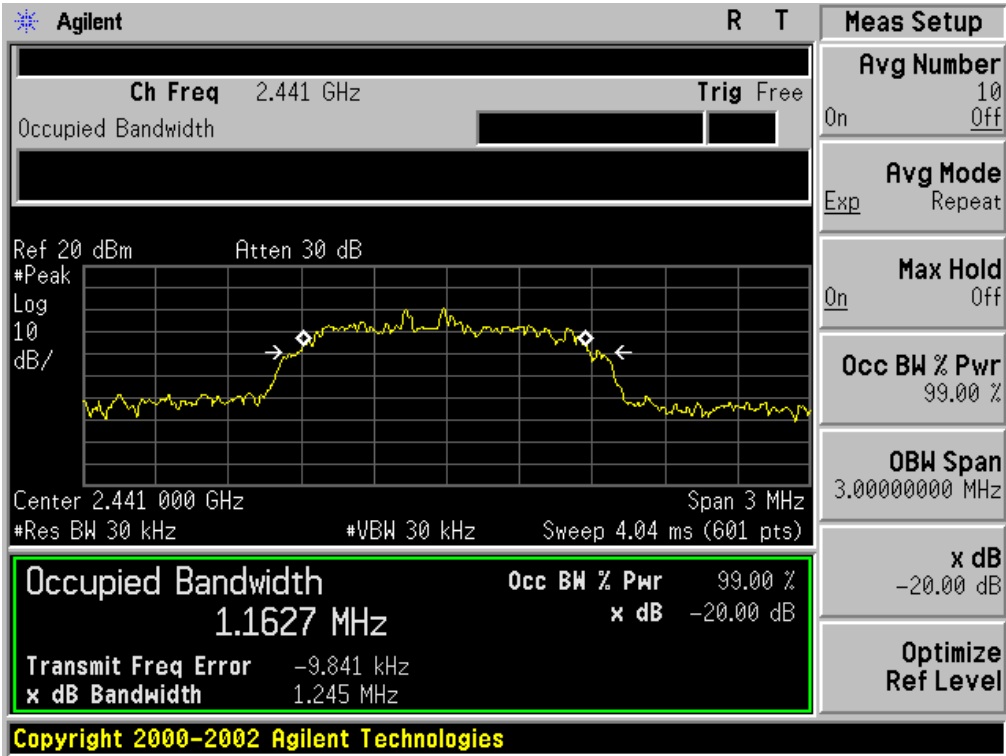


BLUETOOTH 2Mbps LIMITS AND MEASUREMENT RESUL			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
N/A	Low Channel	1.295	PASS
	Middle Channel	1.245	PASS
	High Channel	1.262	PASS

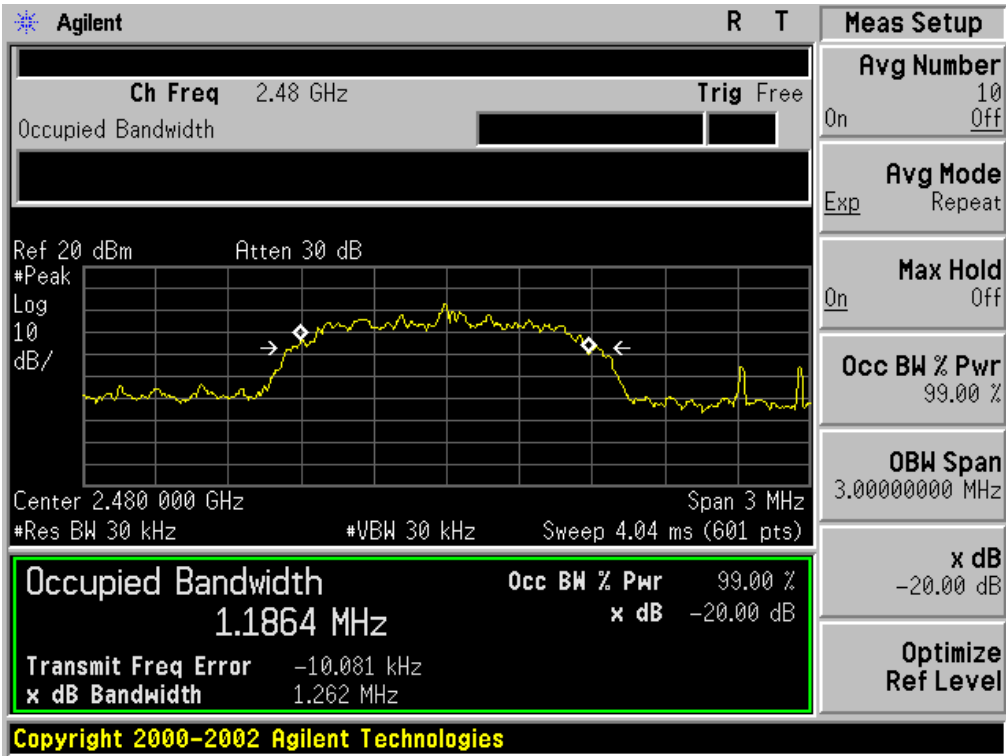
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

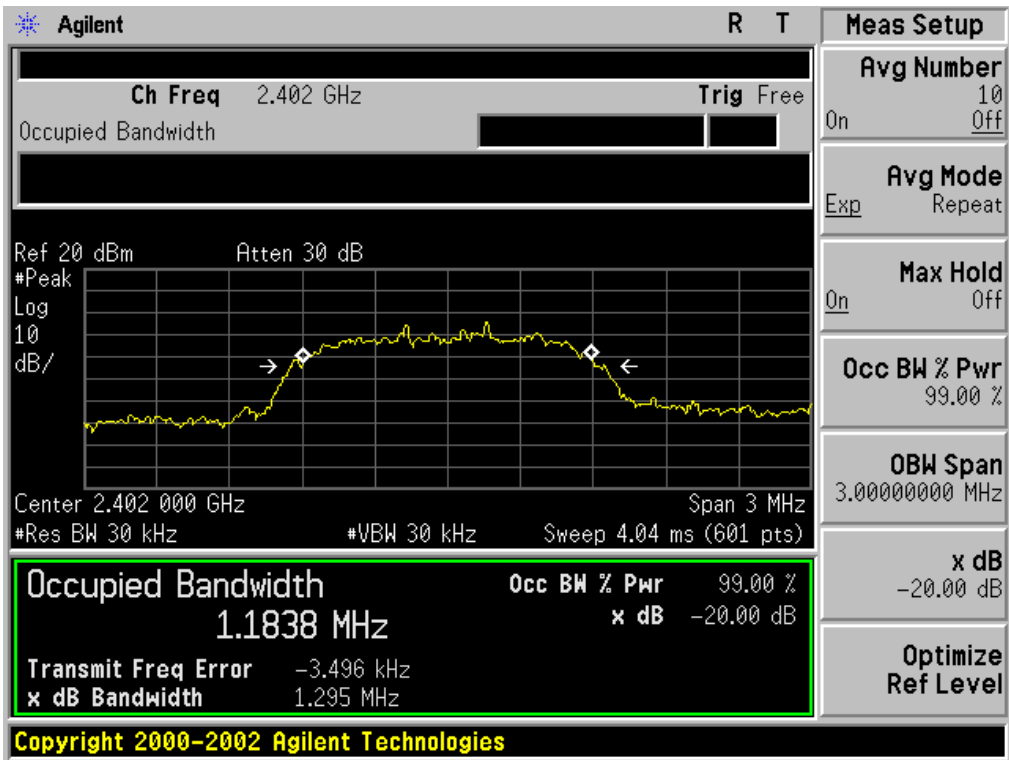


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

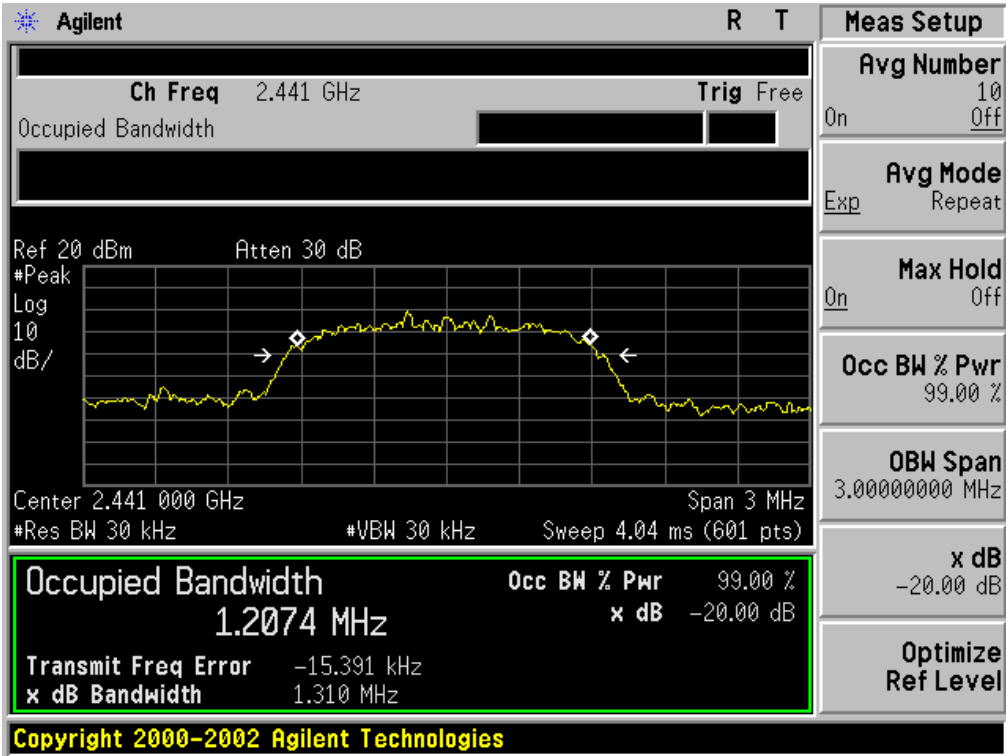


BLUETOOTH 3Mbps LIMITS AND MEASUREMENT RESUL			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
N/A	Low Channel	1.295	PASS
	Middle Channel	1.310	PASS
	High Channel	1.292	PASS

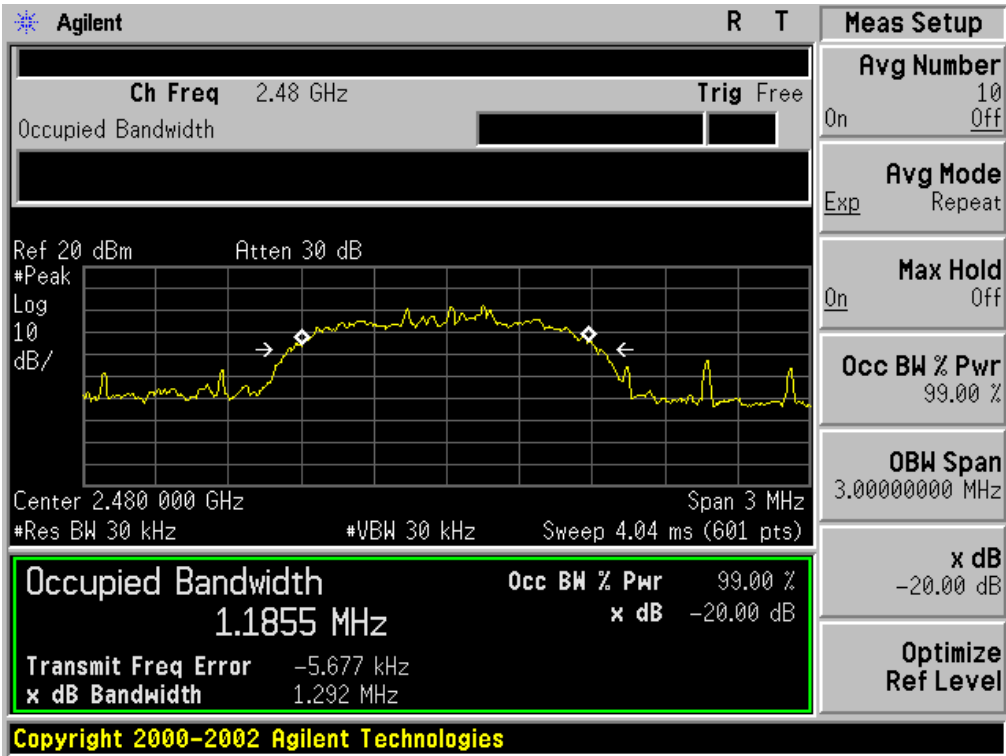
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

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

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

The same as described in section 8.2

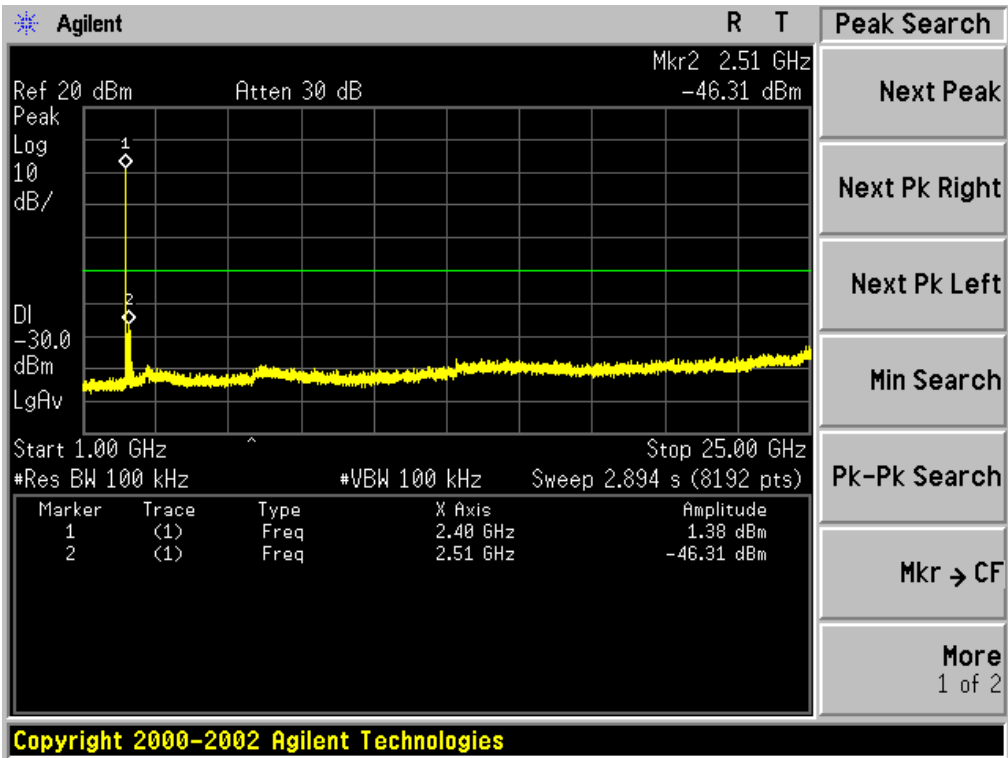
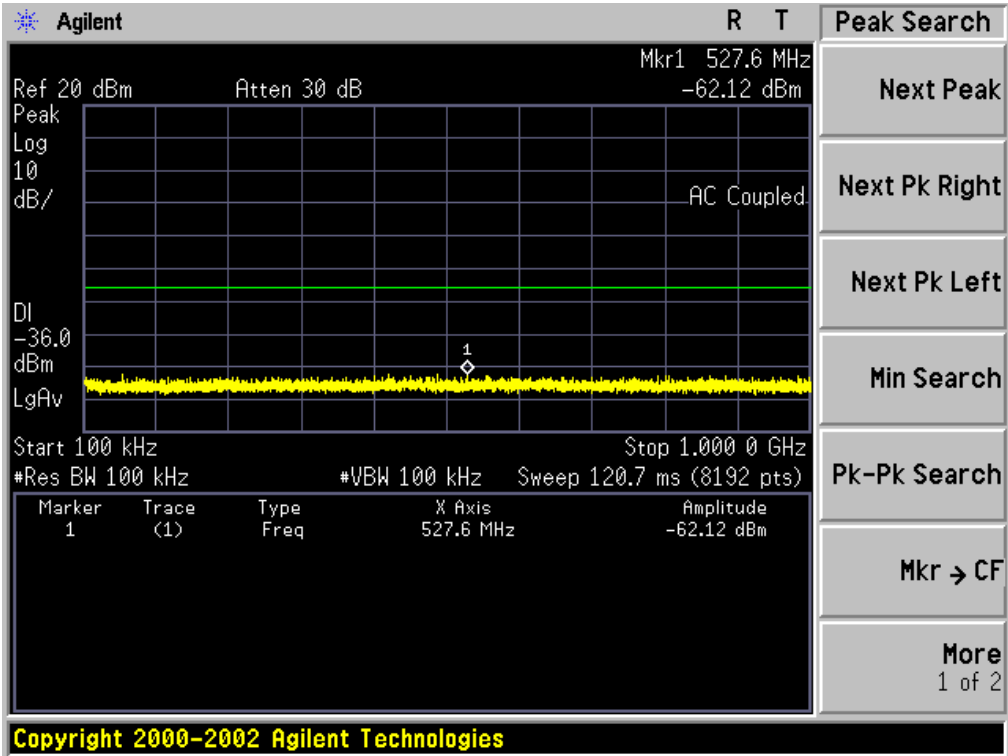
9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

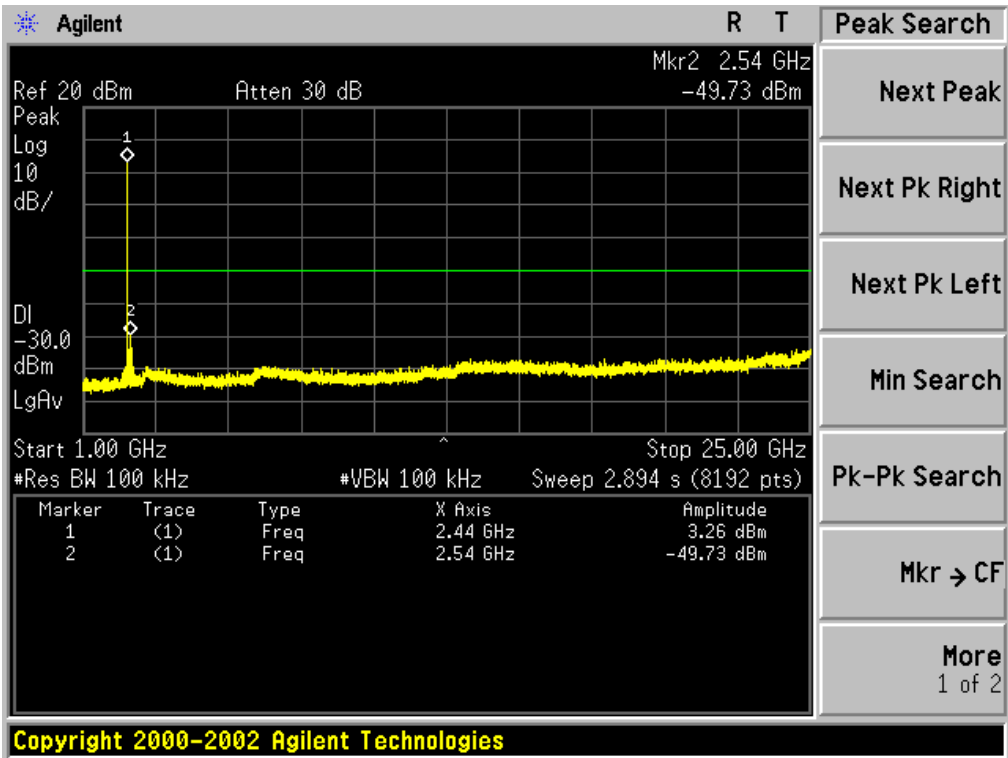
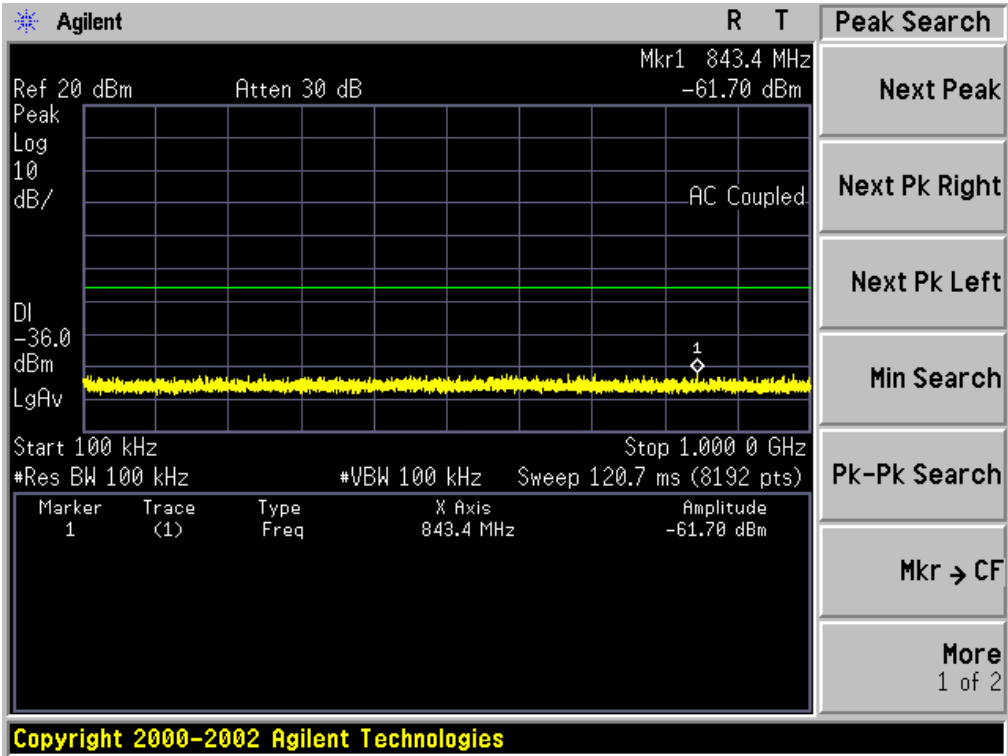
9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
	At least -20dBc than the limit Specified on the TOP Channel	PASS

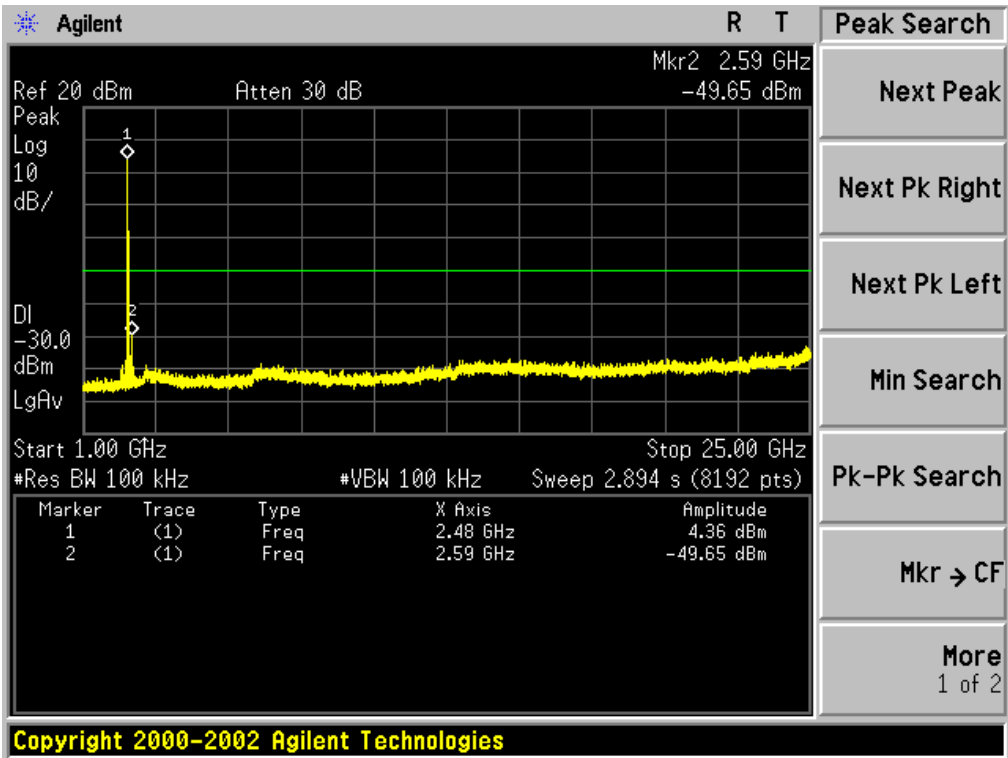
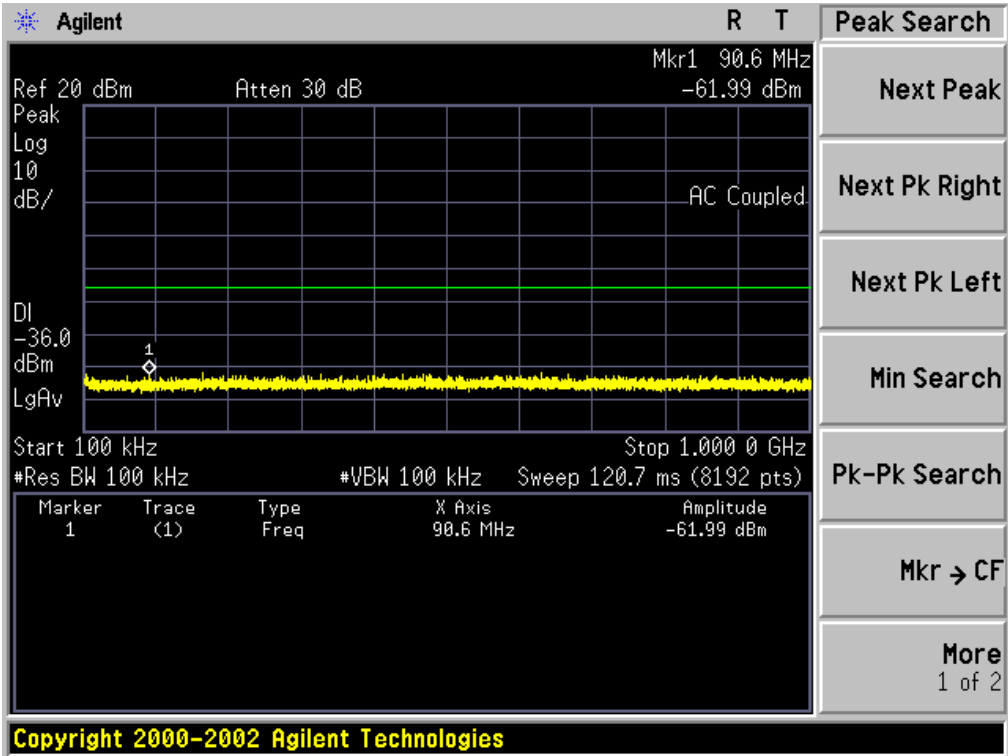
TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE
OF GFSK MODULATION IN LOW CHANNEL



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



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



10. RADIATED EMISSION

10.1. MEASUREMENT PROCEDURE

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1.5MHz VBW and RBW for peak reading. Then 1.5MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported for above 1GHz, and the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

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 1.5MHz/1.5MHz for Peak, 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

10.2. TEST SETUP

RADIATED EMISSION TEST SETUP 30MHz-1000MHz



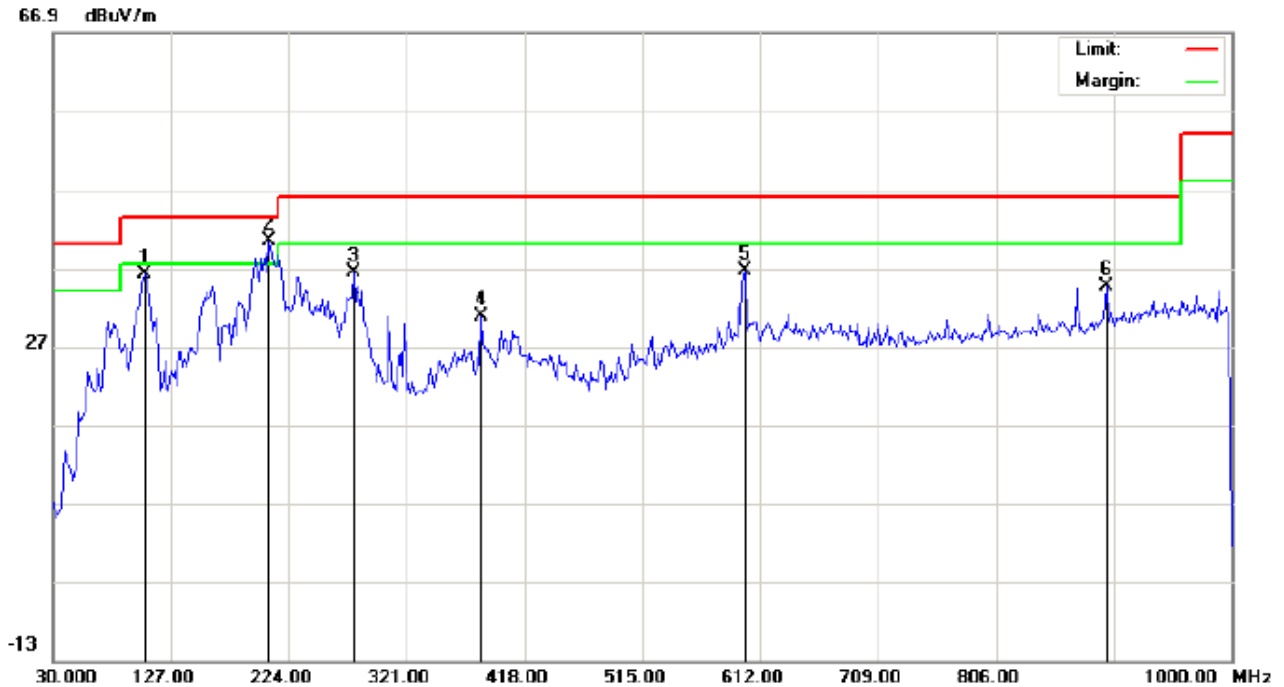
RADIATED EMISSION TEST SETUP ABOVE 1000MHz



10.3. TEST RESULT (Worst Modulation: GFSK)

RADIATED EMISSION BELOW 30MHZ

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

RADIATED EMISSION BELOW 1GHZ**RADIATED EMISSION TEST- (30MHZ-1GHZ)-LOW CHANNEL-HORIZONTAL**

Site: site #1

Limit: FCC Class B 3M Radiation

EUT: Bluetooth Speaker

M/N: SC-21

Mode: Low Channel TX

Note:

Polarization: *Horizontal*

Power:

Distance: 3m

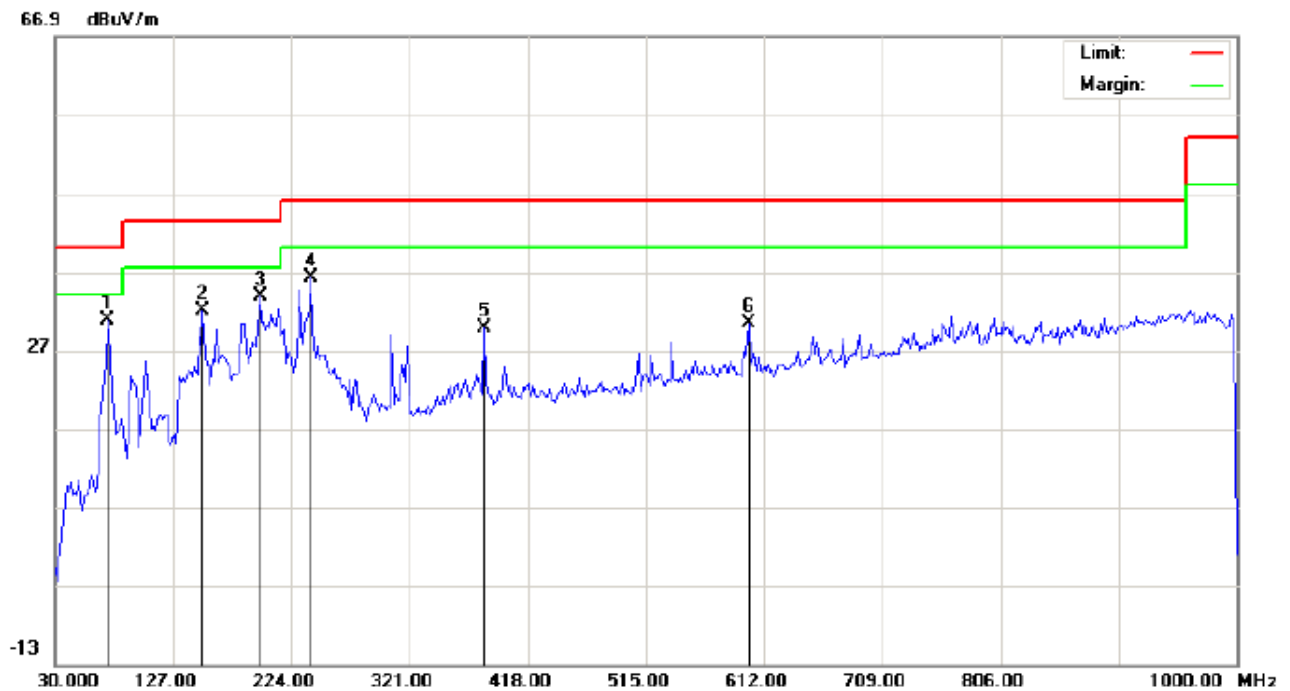
Temperature: 24.6

Humidity: 57.5 %

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		105.9833	25.38	10.89	36.27	43.50	-7.23	peak			
2	*	207.8333	28.17	12.30	40.47	43.50	-3.03	peak			
3		277.3500	21.63	14.73	36.36	46.00	-9.64	peak			
4		382.4332	11.86	18.95	30.81	46.00	-15.19	peak			
5		599.0667	12.87	23.71	36.58	46.00	-9.42	peak			
6		896.5333	6.06	28.52	34.58	46.00	-11.42	peak			

RESULT: PASS

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



Site: site #1

Polarization: **Vertical**

Temperature: 24.6

Limit: FCC Class B 3M Radiation

Power:

Humidity: 57.5 %

EUT: Bluetooth Speaker

Distance: 3m

M/N: SC-21

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	*	73.6500	27.37	3.36	30.73	40.00	-9.27	peak			
2		151.2500	16.65	15.27	31.92	43.50	-11.58	peak			
3		198.1333	24.30	9.47	33.77	43.50	-9.73	peak			
4		240.1667	23.23	12.94	36.17	46.00	-9.83	peak			
5		382.4333	10.88	18.95	29.83	46.00	-16.17	peak			
6		599.0667	7.60	22.73	30.33	46.00	-15.67	peak			

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

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

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



Site: site #1

Polarization: *Horizontal*

Temperature: 23.8

Limit: FCC Class B 3M Radiation

Power:

Humidity: 57.5 %

EUT: Bluetooth Speaker

Distance: 3m

M/N: SC-21

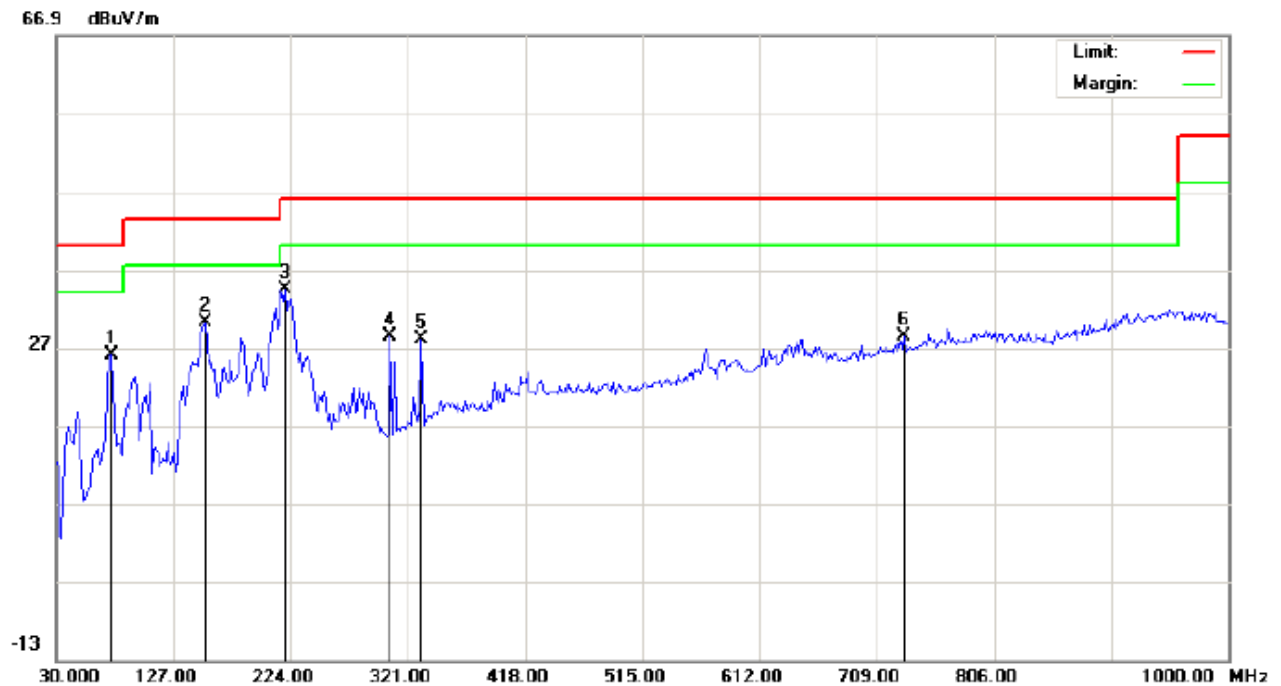
Mode: Middle Channel TX

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		101.1333	24.46	10.56	35.02	43.50	-8.48	peak			
2		160.9500	18.59	15.13	33.72	43.50	-9.78	peak			
3	*	215.9167	26.22	12.60	38.82	43.50	-4.68	peak			
4		395.3667	9.92	19.04	28.96	46.00	-17.04	peak			
5		631.4000	6.93	23.81	30.74	46.00	-15.26	peak			
6		794.6833	2.91	27.25	30.16	46.00	-15.84	peak			

RESULT: PASS

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



Site: site #1

Polarization: *Vertical*

Temperature: 23.8

Limit: FCC Class B 3M Radiation

Power:

Humidity: 57.5 %

EUT: Bluetooth Speaker

Distance: 3m

M/N: SC-21

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		75.2667	22.99	2.96	25.95	40.00	-14.05	peak			
2		152.8667	15.01	15.28	30.29	43.50	-13.21	peak			
3	*	219.1500	23.60	10.88	34.48	46.00	-11.52	peak			
4		306.4500	12.48	15.84	28.32	46.00	-17.68	peak			
5		332.3167	10.51	17.56	28.07	46.00	-17.93	peak			
6		731.6333	2.32	26.10	28.42	46.00	-17.58	peak			

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

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

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



Site: site #1

Polarization: *Horizontal*

Temperature: 23.8

Limit: FCC Class B 3M Radiation

Power:

Humidity: 57.5 %

EUT: Bluetooth Speaker

Distance: 3m

M/N: SC-21

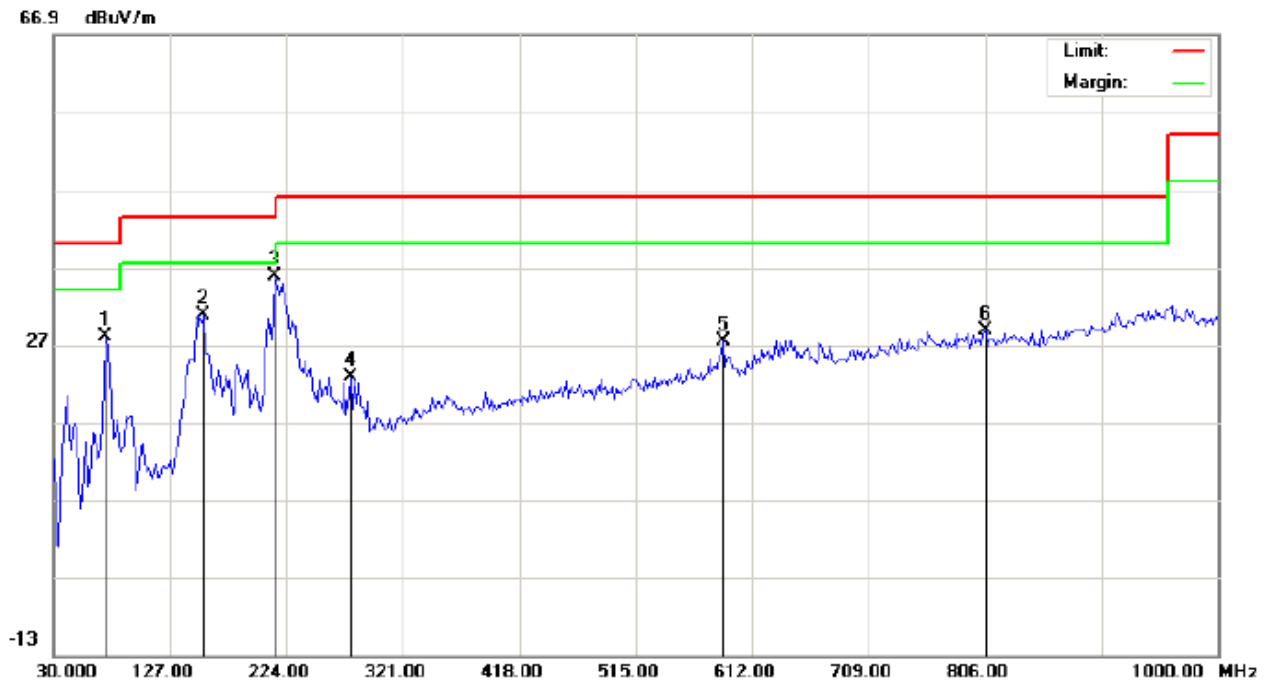
Mode: High Channel TX

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		105.9833	17.91	10.89	28.80	43.50	-14.70	peak			
2		160.9500	13.98	15.13	29.11	43.50	-14.39	peak			
3	*	215.9167	22.51	12.60	35.11	43.50	-8.39	peak			
4		280.5833	15.91	14.82	30.73	46.00	-15.27	peak			
5		406.6832	7.68	19.27	26.95	46.00	-19.05	peak			
6		600.6833	4.60	23.73	28.33	46.00	-17.67	peak			

RESULT: PASS

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



Site: site #1
Limit: FCC Class B 3M Radiation
EUT: Bluetooth Speaker
M/N: SC-21
Mode: High Channel TX
Note:

Polarization: **Vertical**
Power:
Distance: 3m

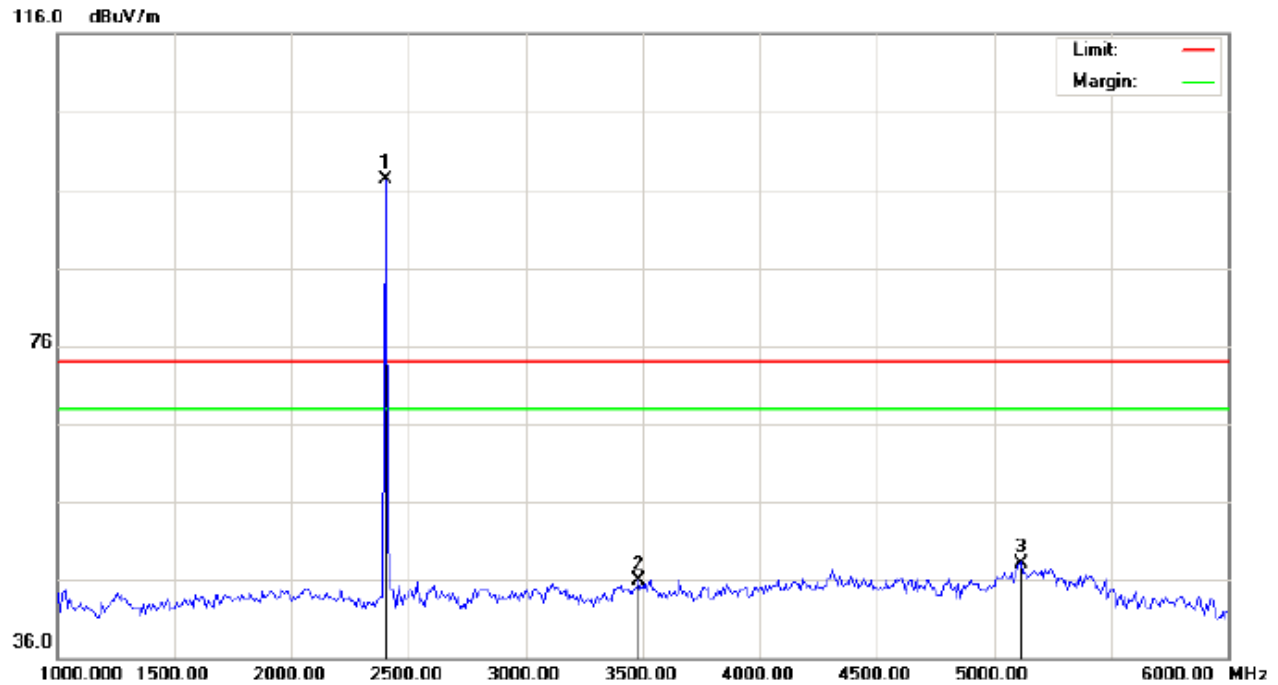
Temperature: 23.8
Humidity: 57.5 %

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		73.6500	24.65	3.36	28.01	40.00	-11.99	peak			
2		154.4833	15.46	15.29	30.75	43.50	-12.75	peak			
3	*	214.3000	25.34	10.40	35.74	43.50	-7.76	peak			
4		277.3500	8.14	14.73	22.87	46.00	-23.13	peak			
5		587.7500	4.75	22.67	27.42	46.00	-18.58	peak			
6		806.0000	1.47	27.32	28.79	46.00	-17.21	peak			

RESULT: PASS

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

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

RADIATED EMISSION ABOVE 1GHZ**RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics)-LOW CHANNEL-HORIZONTAL**

Site: site #1

Polarization: *Horizontal*

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)

Power:

Humidity: 60 %

EUT: Bluetooth Speaker

Distance:

M/N: SC-21

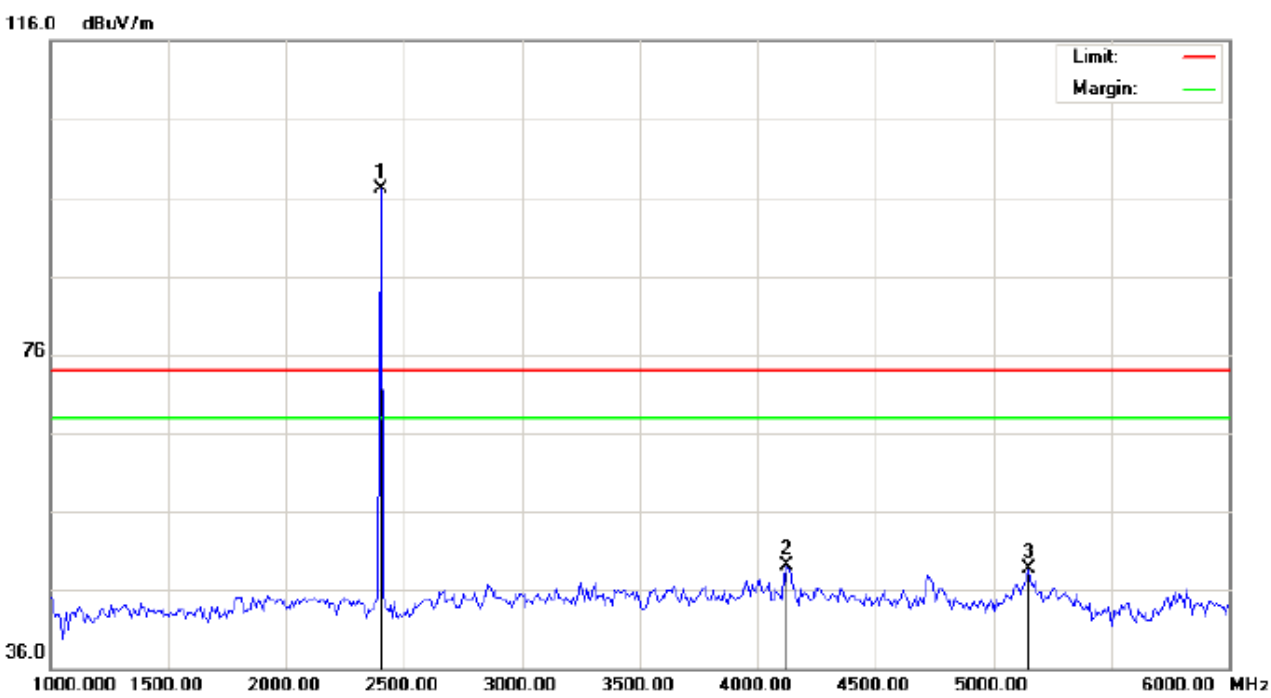
Mode: Low Channel TX

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	87.07	10.32	97.39	74.00	23.39	peak			
2		3483.333	33.90	12.09	45.99	74.00	-28.01	peak			
3		5116.667	42.34	5.86	48.20	74.00	-25.80	peak			

RESULT: PASS

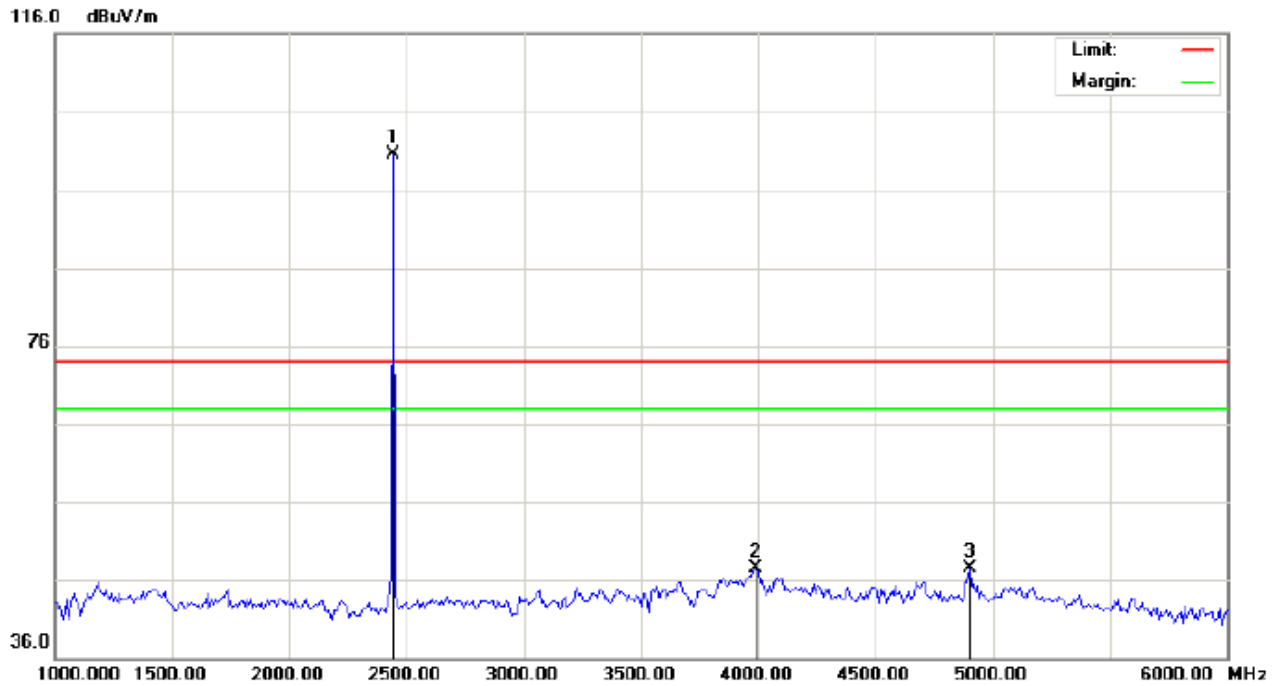
RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics)-LOW CHANNEL –VERTICAL



Site: site #1	Polarization: Vertical	Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)	Power:	Humidity: 60 %
EUT: Bluetooth Speaker	Distance:	
M/N: SC-21		
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	86.70	10.32	97.02	74.00	23.02	peak			
2		4125.000	36.07	13.11	49.18	74.00	-24.82	peak			
3		5150.000	43.51	5.20	48.71	74.00	-25.29	peak			

RESULT: PASS

RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics)-MIDDLE CHANNEL-HORIZONTAL

Site: site #1

Polarization: *Horizontal*

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)

Power:

Humidity: 60 %

EUT: Bluetooth Speaker

Distance:

M/N: SC-21

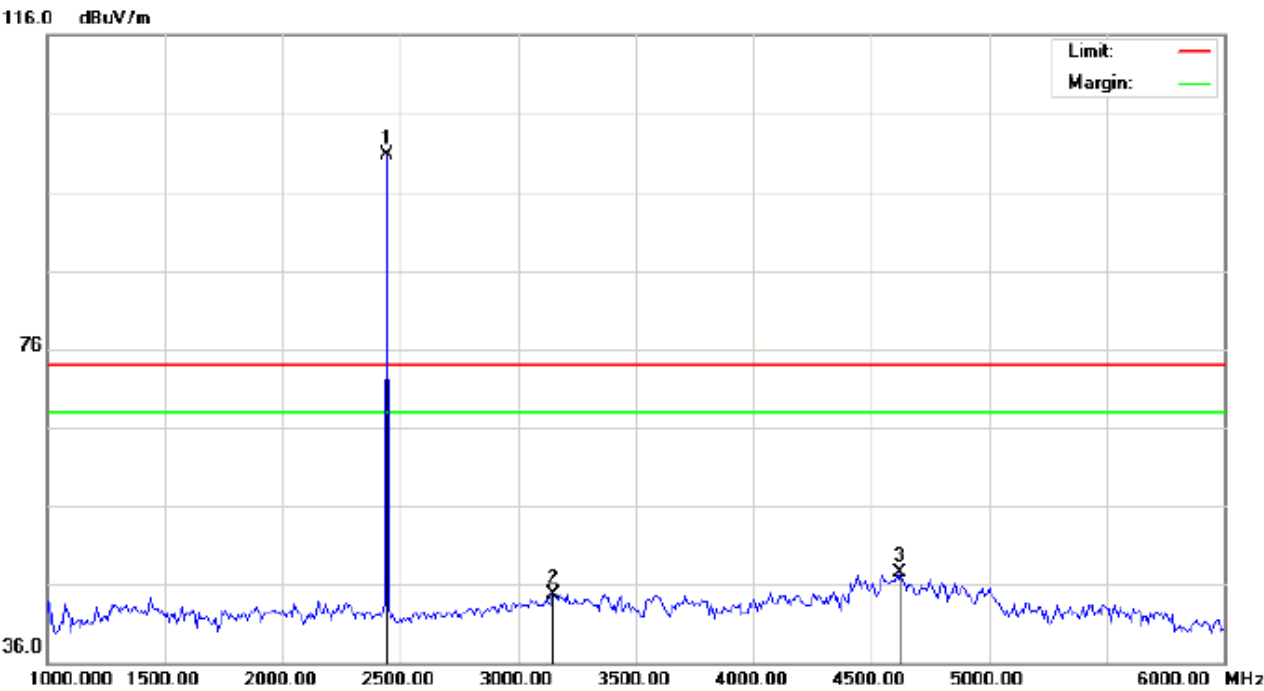
Mode: Middle Channel TX

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	*	2441.000	90.11	10.36	100.47	74.00	26.47	peak			
2		3991.667	32.29	15.14	47.43	74.00	-26.57	peak			
3		4900.000	39.52	7.94	47.46	74.00	-26.54	peak			

RESULT: PASS

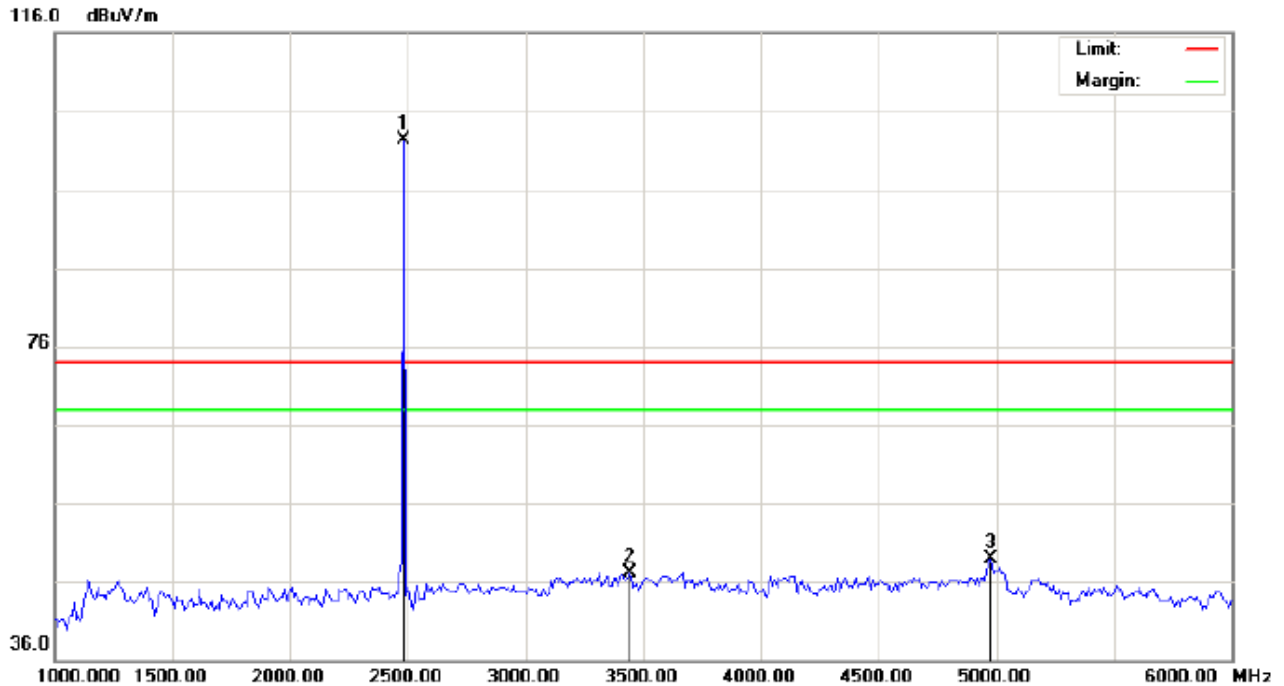
RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics) - MIDDLE CHANNEL –VERTICAL



Site: site #1	Polarization: Vertical	Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)	Power:	Humidity: 60 %
EUT: Bluetooth Speaker	Distance:	
M/N: SC-21		
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	*	2441.000	90.41	10.36	100.77	74.00	26.77	peak			
2		3150.000	32.95	11.78	44.73	74.00	-29.27	peak			
3		4625.000	40.19	7.22	47.41	74.00	-26.59	peak			

RESULT: PASS

RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics)-HIGH CHANNEL-HORIZONTAL

Site: site #1

Polarization: *Horizontal*

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)

Power:

Humidity: 60 %

EUT: Bluetooth Speaker

Distance:

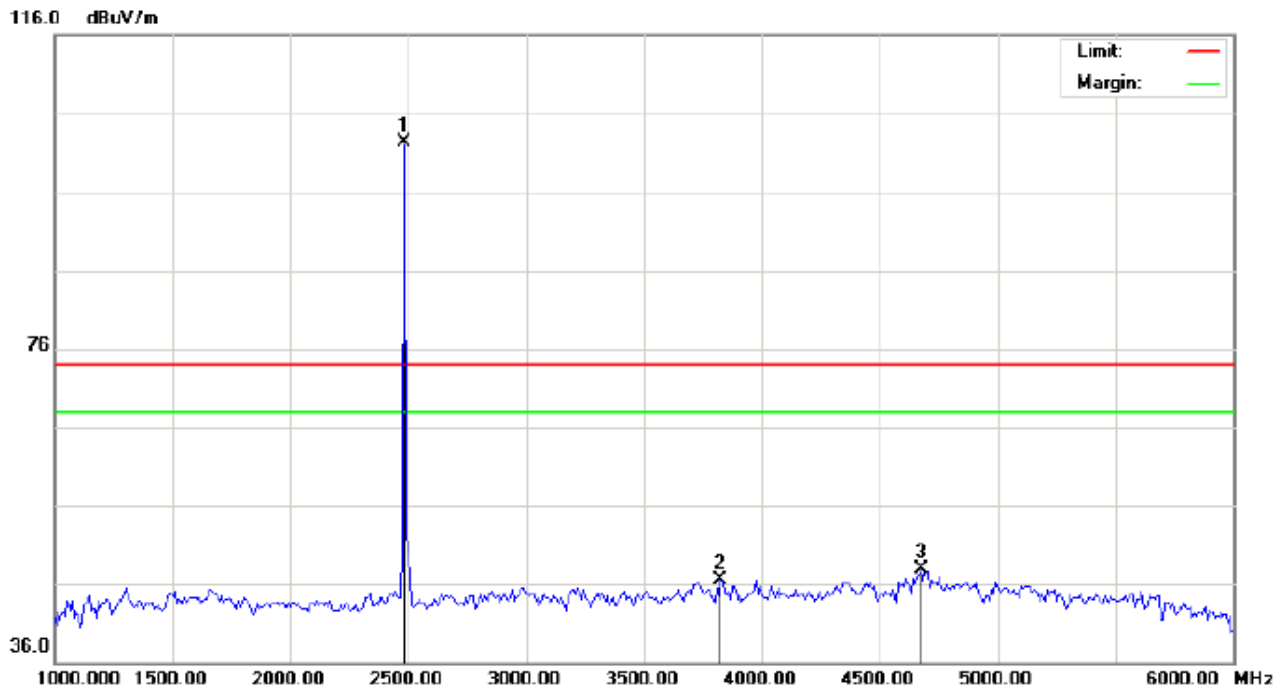
M/N: SC-21

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	91.89	10.41	102.30	74.00	28.30	peak			
2		3441.667	35.10	12.05	47.15	74.00	-26.85	peak			
3		4975.000	40.78	8.13	48.91	74.00	-25.09	peak			

RESULT: PASS

RADIATED EMISSION ABOVE 1GHZ (1-10th Harmonics)-HIGH CHANNEL –VERTICAL

Site: site #1

Polarization: *Vertical*

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)

Power:

Humidity: 60 %

EUT: Bluetooth Speaker

Distance:

M/N: SC-21

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	91.80	10.41	102.21	74.00	28.21	peak			
2		3825.000	32.39	14.11	46.50	74.00	-27.50	peak			
3		4675.000	40.46	7.35	47.81	74.00	-26.19	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.

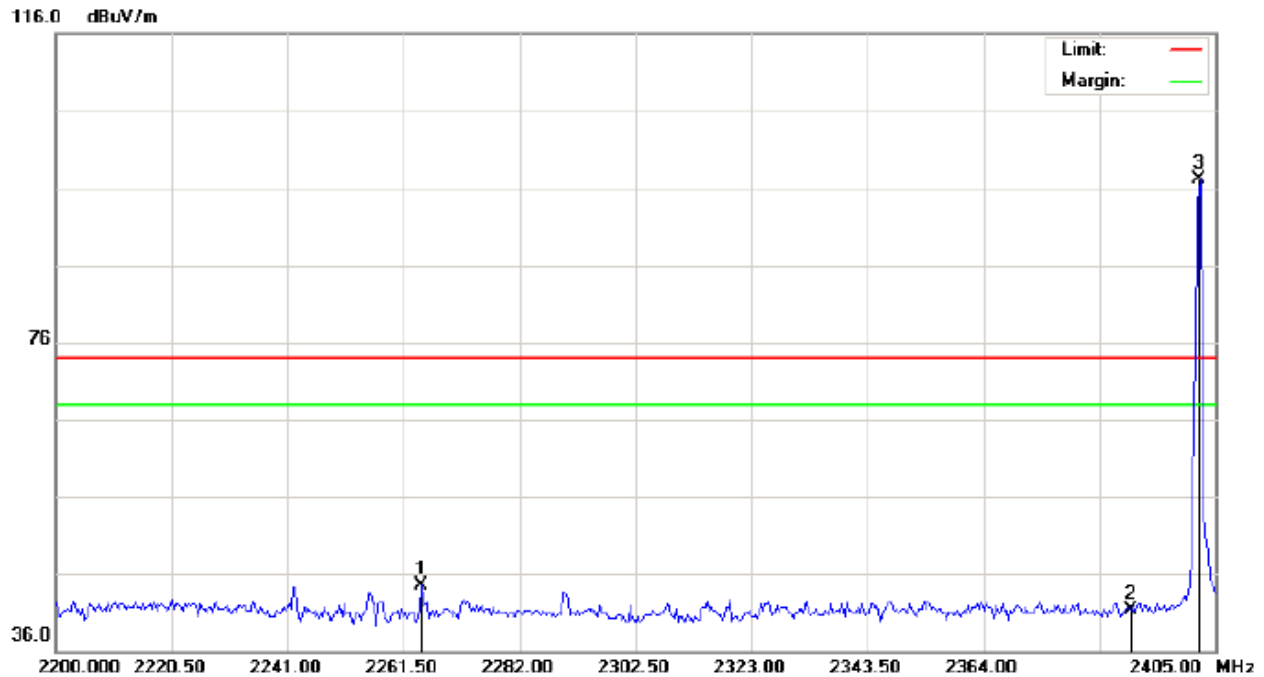
11. BAND EDGE EMISSION

11.1. MEASUREMENT PROCEDURE

1. Set the EUT Work on the top, the bottom operation frequency individually.
2. Set SPA Start or Stop Frequency=Operation Frequency, $RBW \geq 100\text{kHz}$, $VBW \geq 3 \cdot RBW$,
Center frequency =Operation frequency
3. The band edges was measured and recorded.

11.2. TEST SET-UP

Radiated same as 10.2

11.3. TEST RESULT (Worst Modulation: GFSK)**TEST PLOT OF BAND EDGE FOR LOW CHANNEL (1Mbps)-Horizontal**

Site: site #1

Polarization: *Horizontal*

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)

Power:

Humidity: 60 %

EUT: Bluetooth Speaker

Distance:

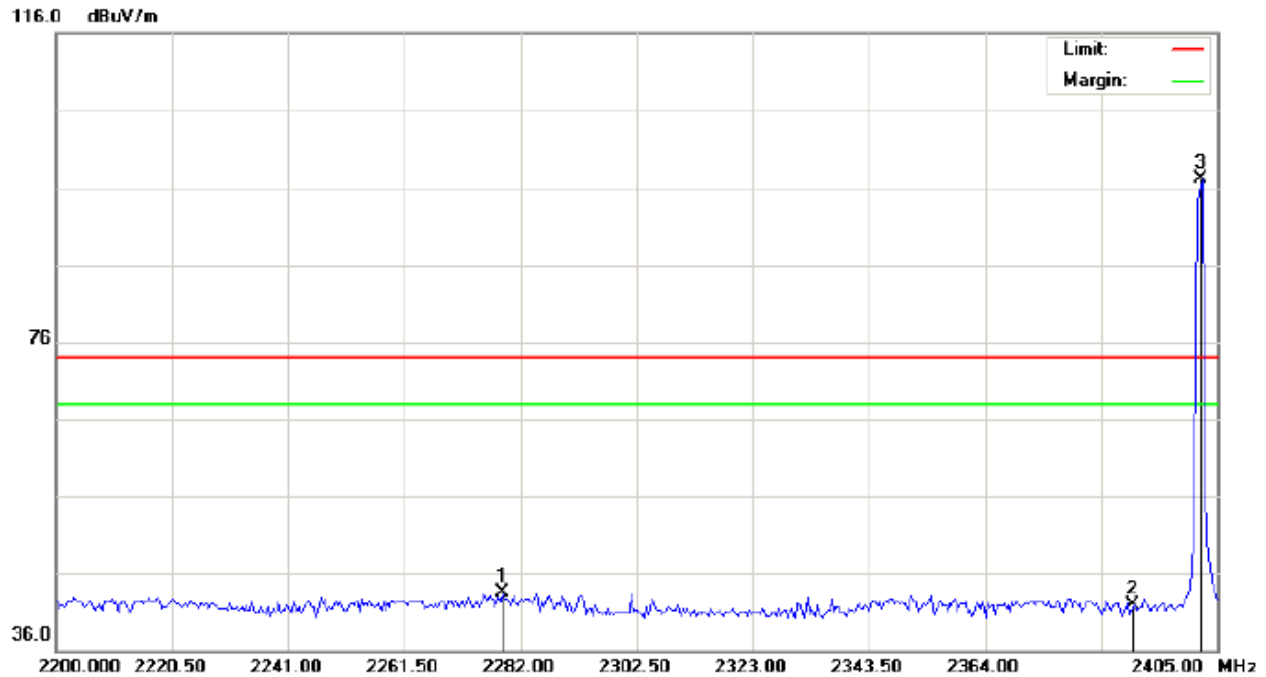
M/N: SC-21

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		2264.575	34.25	10.17	44.42	74.00	-29.58	peak			
2		2390.000	31.00	10.31	41.31	74.00	-32.69	peak			
3	*	2402.000	86.72	10.32	97.04	74.00	23.04	peak			

TEST PLOT OF BAND EDGE FOR LOW CHANNEL (1Mbps)-Vertical



Site: site #1

Polarization: *Vertical*

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)

Power:

Humidity: 60 %

EUT: Bluetooth Speaker

Distance:

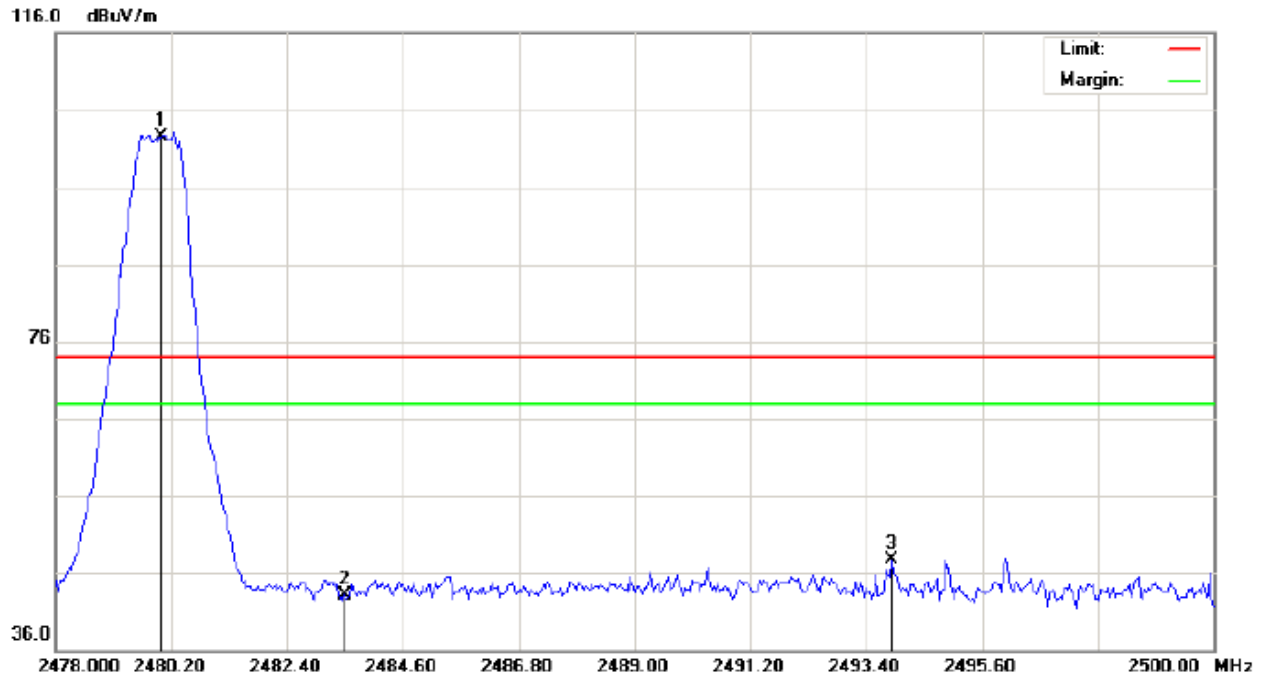
M/N: SC-21

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		2278.925	33.33	10.19	43.52	74.00	-30.48	peak			
2		2390.000	31.50	10.31	41.81	74.00	-32.19	peak			
3	*	2402.000	86.76	10.32	97.08	74.00	23.08	peak			

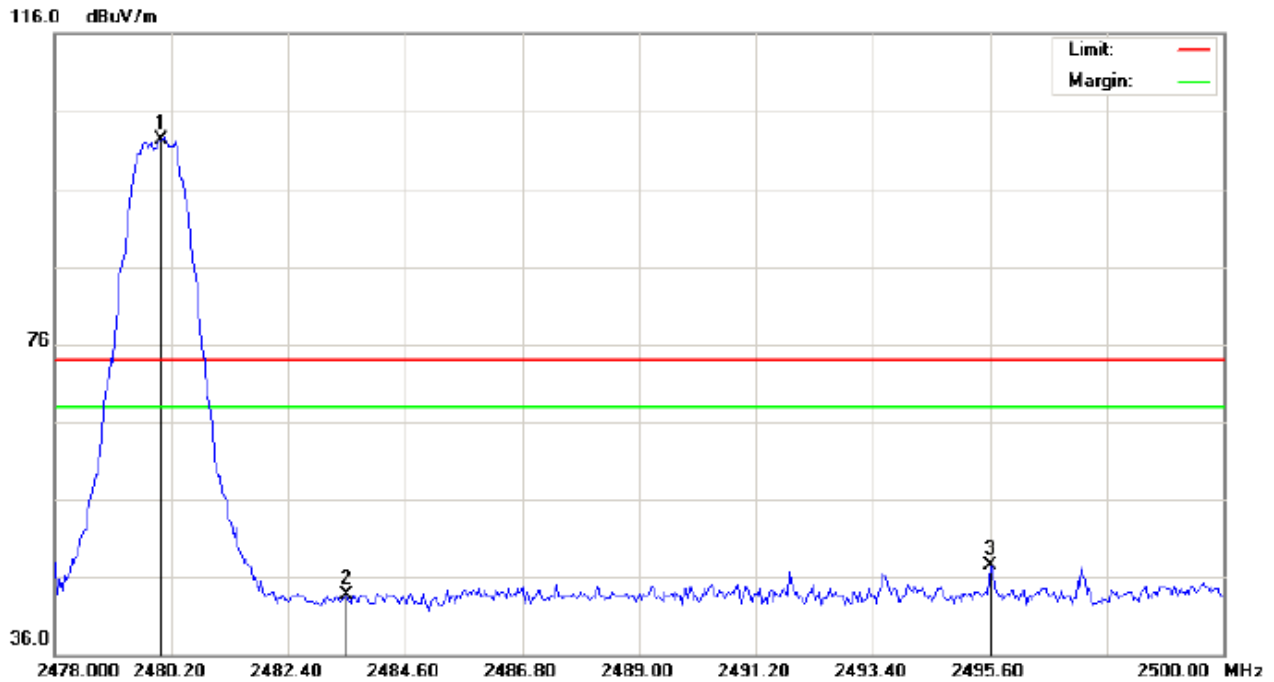
TEST PLOT OF BAND EDGE FOR HIGH CHANNEL (1Mbps)-Horizontal



Site: site #1 Polarization: **Horizontal** Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %
EUT: Bluetooth Speaker Distance:
M/N: SC-21
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	92.05	10.41	102.46	74.00	28.46	peak			
2		2483.500	32.69	10.41	43.10	74.00	-30.90	peak			
3		2493.877	37.31	10.42	47.73	74.00	-26.27	peak			

TEST PLOT OF BAND EDGE FOR HIGH CHANNEL (1Mbps)-Vertical



Site: site #1

Polarization: **Vertical**

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHZ(PK)

Power:

Humidity: 60 %

EUT: Bluetooth Speaker

Distance:

M/N: SC-21

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	91.82	10.41	102.23	74.00	28.23	peak			
2		2483.500	33.26	10.41	43.67	74.00	-30.33	peak			
3		2495.600	37.10	10.42	47.52	74.00	-26.48	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.

3. Hopping off and Hopping on have been tested and only worst case recorded

12. NUMBER OF HOPPING FREQUENCY

12.1. MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer Start = 2.4GHz Stop = 2.4835GHz
4. Set the Spectrum Analyzer as RBW \geq 1%span, VBW \geq RBW.

12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

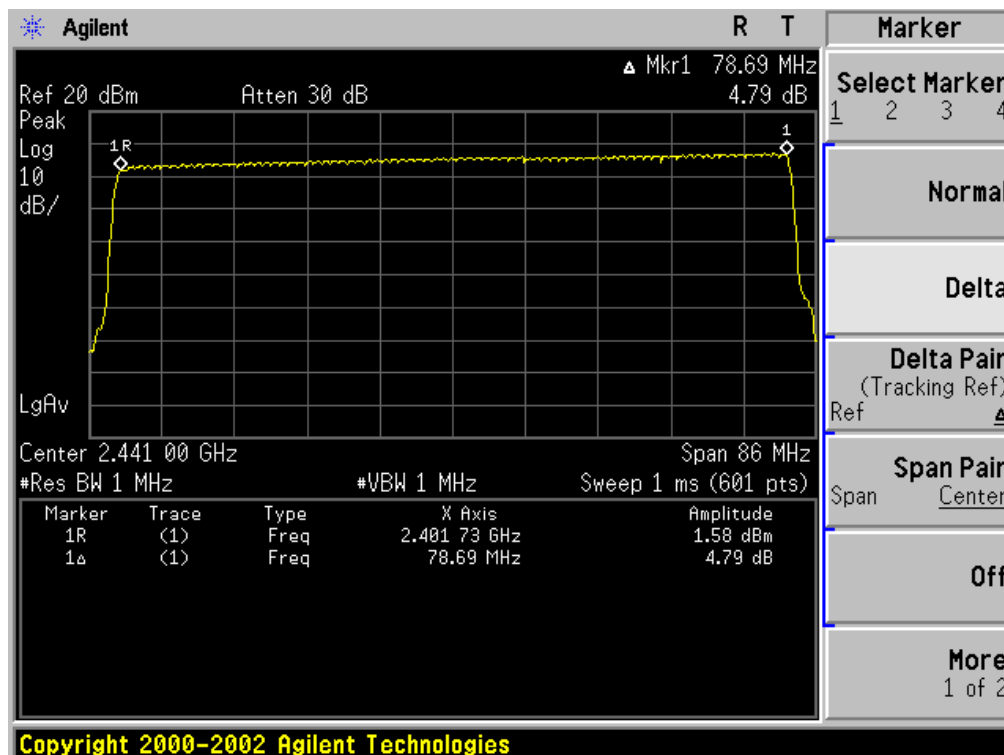
12.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

12.4. LIMITS AND MEASUREMENT RESULT

TOTAL NO. OF HOPPING CHANNEL	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
	≥ 15	79	PASS

TEST PLOT FOR NO. OF TOTAL CHANNELS



13. TIME OF OCCUPANCY (DWELL TIME)

13.1. MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set Span = zero span, centered on a hopping channel
4. Set the spectrum analyzer as RBW=1MHz, VBW>=RBW, Span = 0 Hz

13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

13.4. LIMITS AND MEASUREMENT RESULT

The Worst Case (3Mbps)

Channel	Time of Pulse for DH5 (ms)	Period Time (s)	Sweep Time (ms)	Limit (ms)
Low	2.875	31.6	306.67	400
Middle	2.875	31.6	306.67	400
High	2.875	31.6	306.67	400

Low Channel Time

$$2.875 \times (1600/6) / 79 \times 31.6 = 306.67 \text{ms}$$

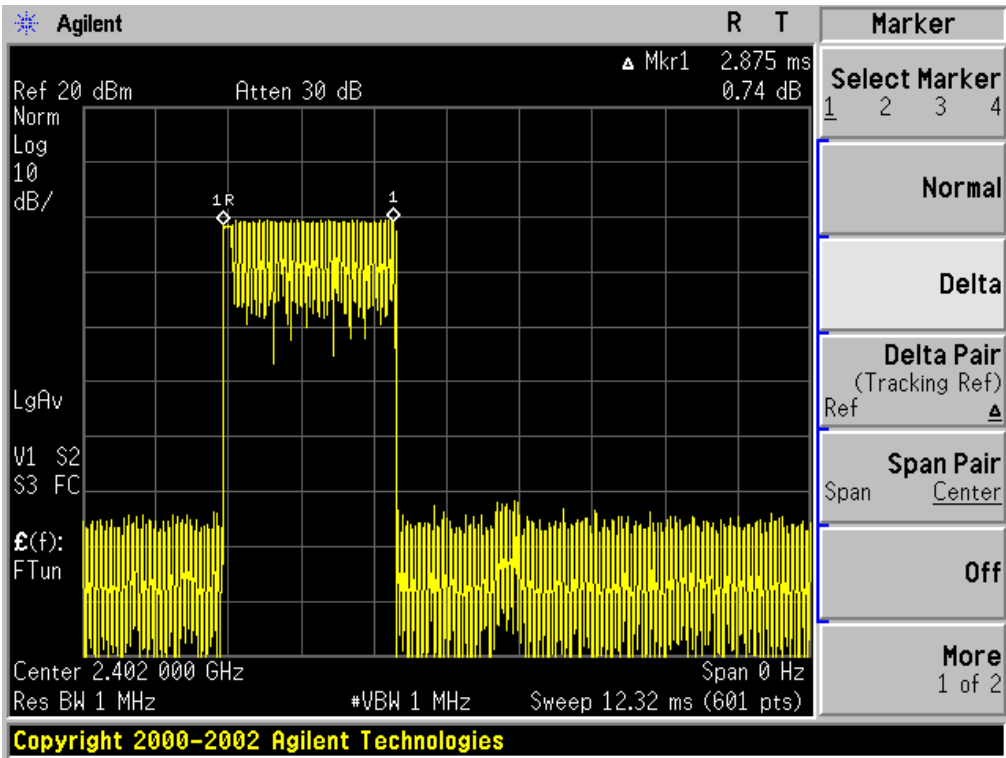
Middle Channel Time

$$2.875 \times (1600/6) / 79 \times 31.6 = 306.67 \text{ms}$$

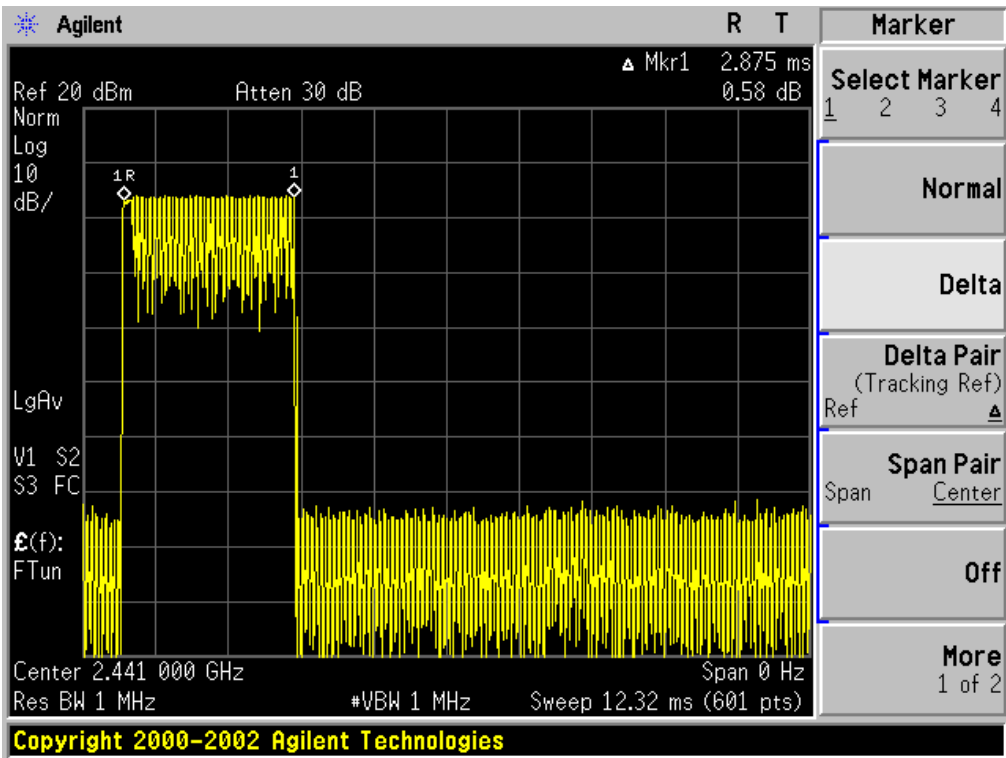
High Channel Time

$$2.875 \times (1600/6) / 79 \times 31.6 = 306.67 \text{ms}$$

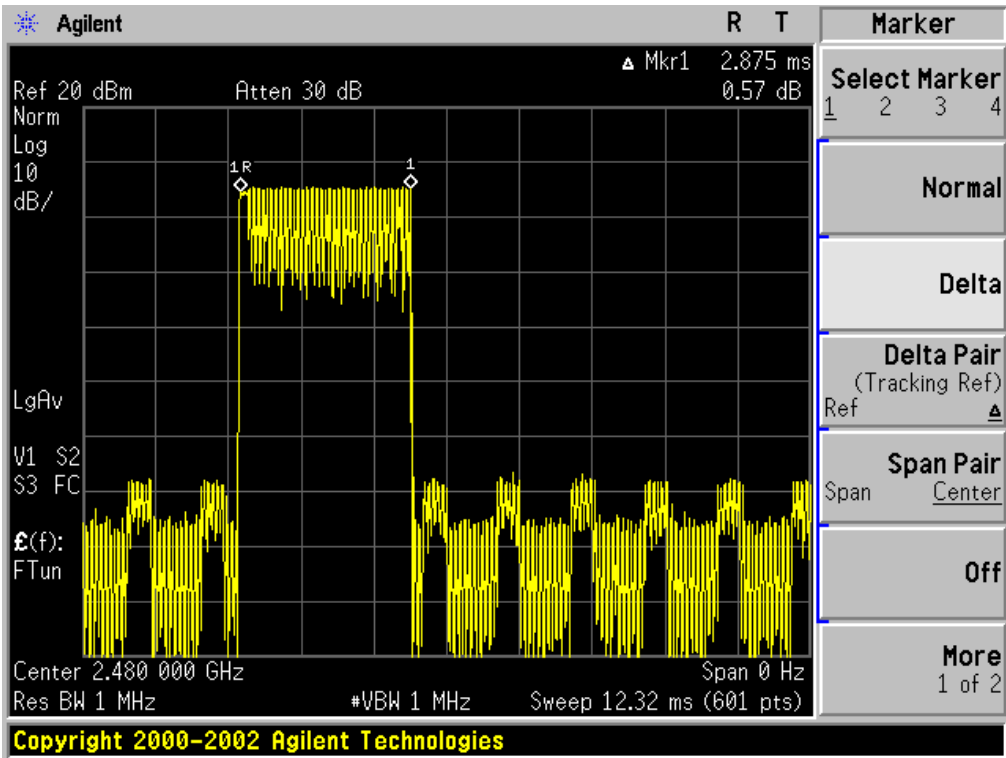
TEST PLOT OF LOW CHANNEL



TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL



14. FREQUENCY SEPARATION

14.1. MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span Video (or Average) Bandwidth (VBW) \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold

14.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

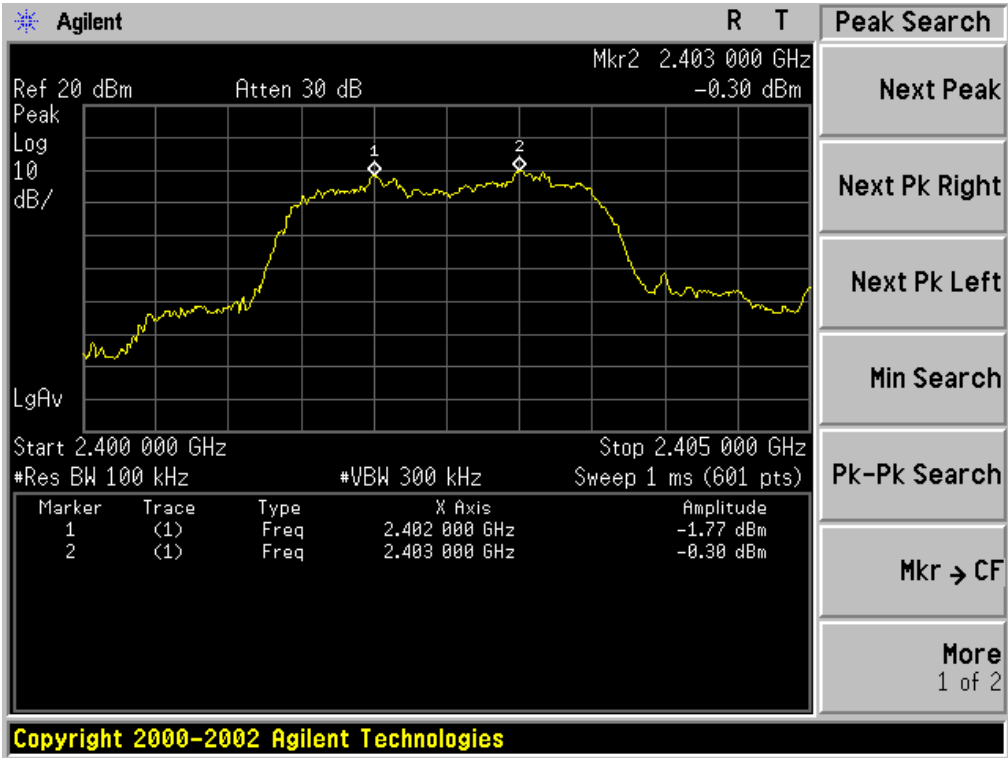
14.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

14.4. LIMITS AND MEASUREMENT RESULT

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	
CH00-CH01	853	≥ 25 KHz or 2/3 20 dB BW	Pass

TEST PLOT FOR FREQUENCY SEPARATION (3Mbps)



15. FCC LINE CONDUCTED EMISSION TEST

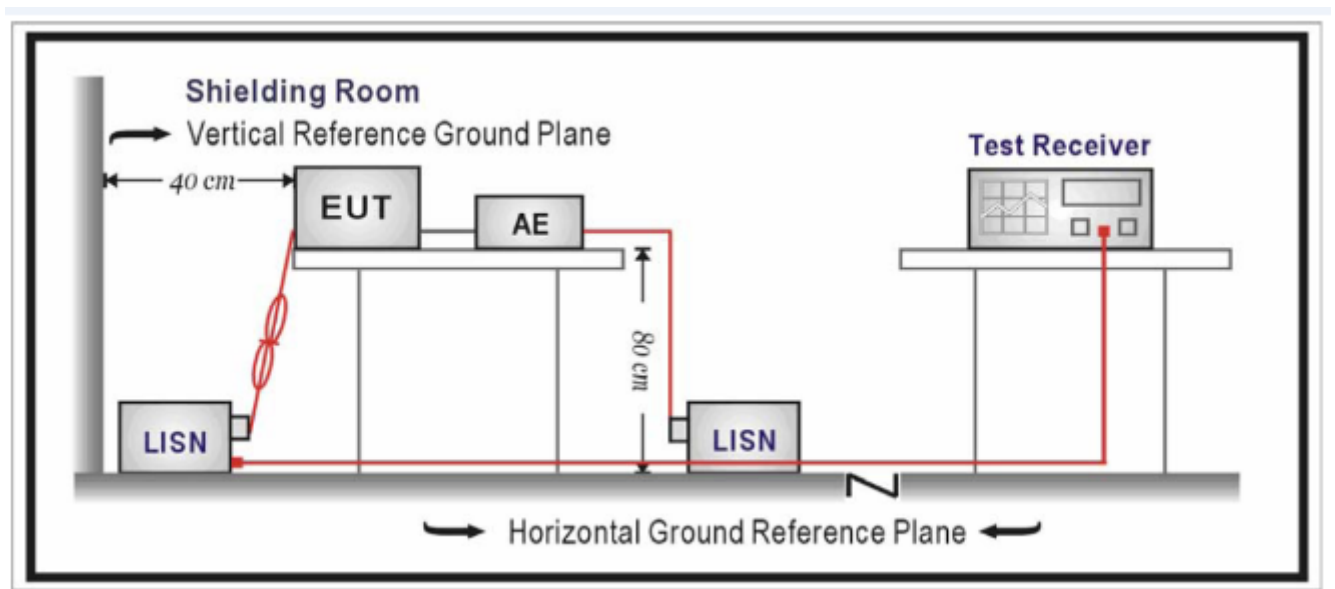
15.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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.

15.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



15.3. 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 C63.4 (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 C63.4.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC charging voltage by 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.

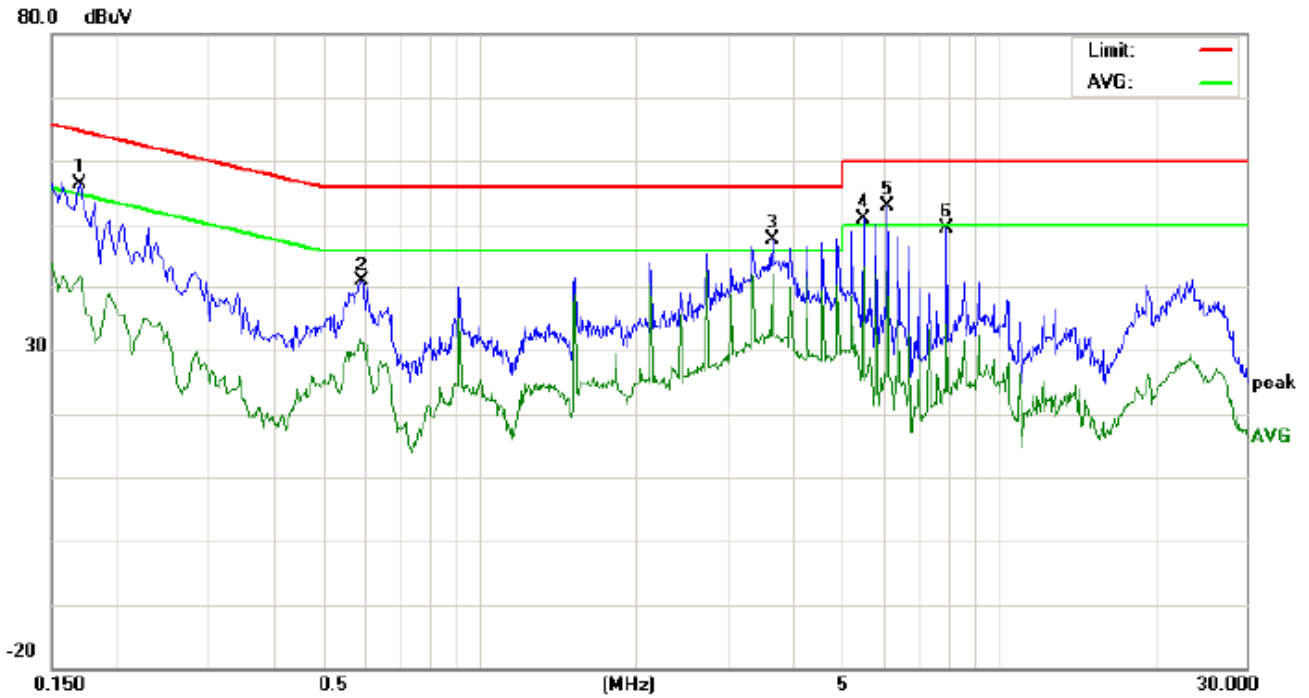
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

15.4. 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.

15.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

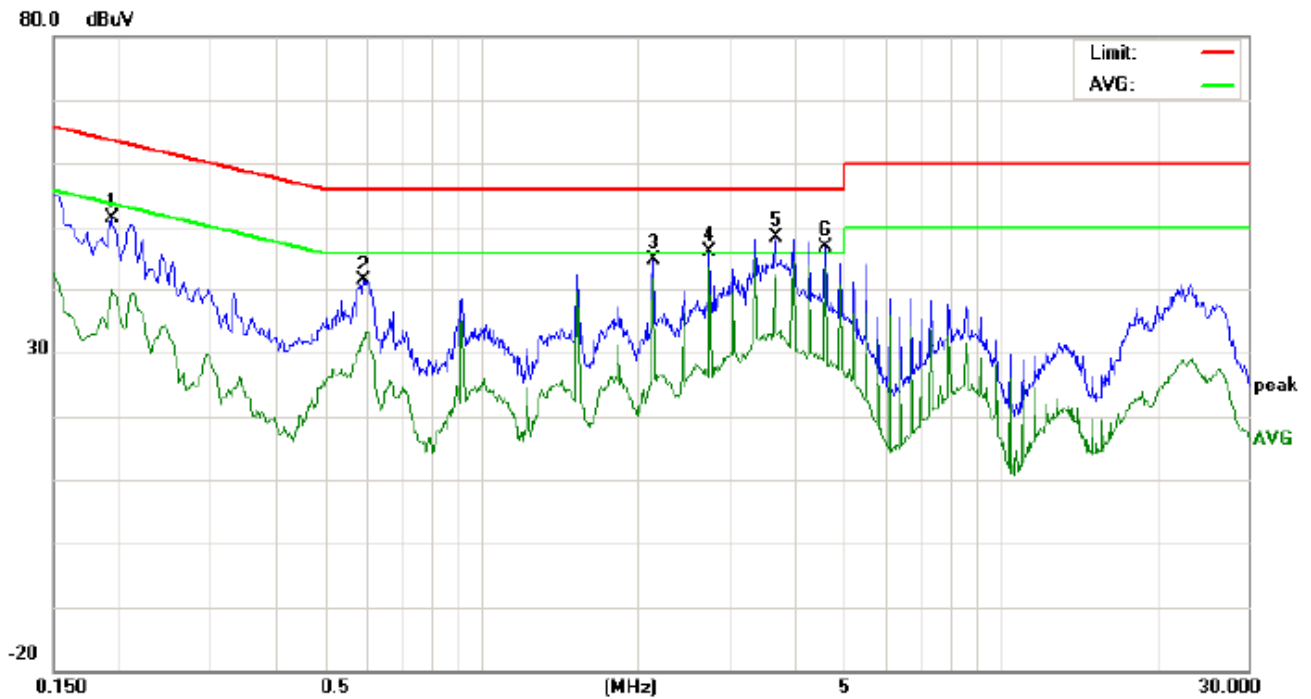
Line Conducted Emission Test Line 1-L



Site: Conduction Phase: **L1** Temperature: 23.3
Limit: FCC Class B Conduction(QP) Power: Humidity: 54.1 %
EUT: Bluetooth Speaker
M/N: SC-21
Mode: BT Link with charging
Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1700	46.12		31.52	10.18	56.30		41.70	64.96	54.96	-8.66	-13.26	P	
2	0.5940	30.46		20.69	10.32	40.78		31.01	56.00	46.00	-15.22	-14.99	P	
3	3.6700	37.24		31.39	10.48	47.72		41.87	56.00	46.00	-8.28	-4.13	P	
4	5.5019	40.72		32.77	10.25	50.97		43.02	60.00	50.00	-9.03	-6.98	P	
5	6.1139	42.60		32.14	10.28	52.88		42.42	60.00	50.00	-7.12	-7.58	P	
6	7.9499	38.99		23.78	10.35	49.34		34.13	60.00	50.00	-10.66	-15.87	P	

Line Conducted Emission Test Line 2-N



Site: Conduction Phase: **N** Temperature: 23.3
Limit: FCC Class B Conduction(QP) Power: Humidity: 54.1 %
EUT: Bluetooth Speaker
M/N: SC-21
Mode: BT Link with charging
Note:

No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1940	41.29		29.55	10.21	51.50		39.76	63.86	53.86	-12.36	-14.10	P	
2	0.5940	31.10		21.95	10.32	41.42		32.27	56.00	46.00	-14.58	-13.73	P	
3	2.1460	34.59		31.30	10.28	44.87		41.58	56.00	46.00	-11.13	-4.42	P	
4	2.7620	35.60		33.10	10.49	46.09		43.59	56.00	46.00	-9.91	-2.41	P	
5	3.6820	37.82		31.55	10.48	48.30		42.03	56.00	46.00	-7.70	-3.97	P	
6	4.6020	36.61		33.43	10.22	46.83		43.65	56.00	46.00	-9.17	-2.35	P	

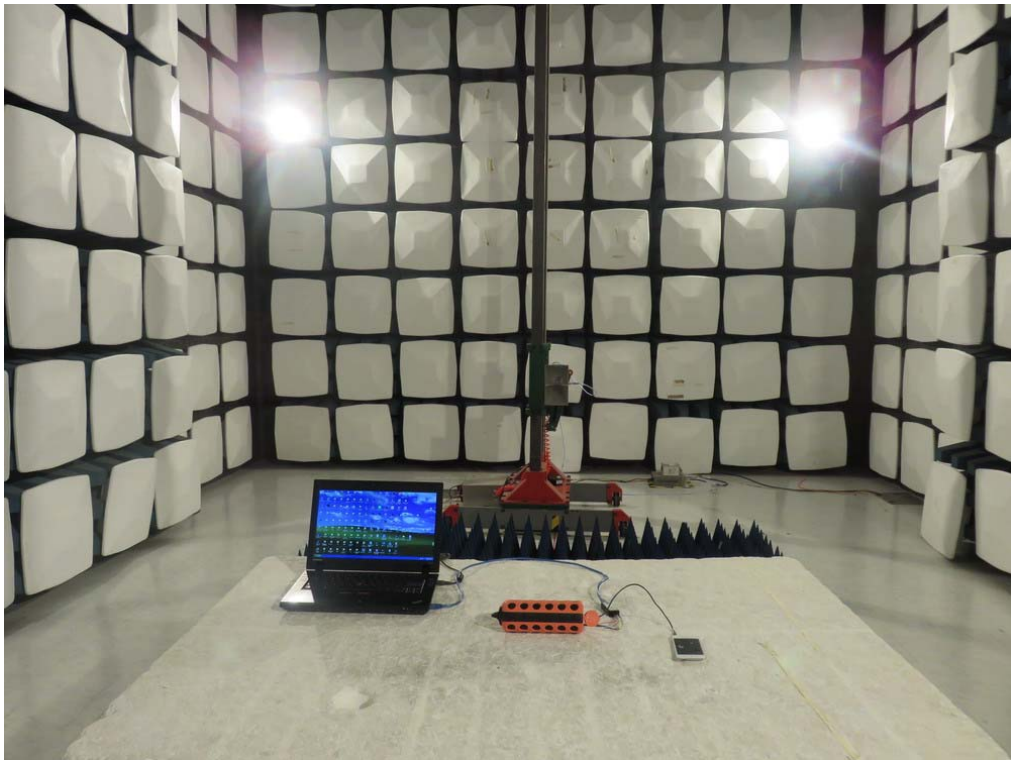
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC LINE CONDUCTED EMISSION TEST SETUP



FCC RADIATED EMISSION TEST SETUP





APPENDIX B: PHOTOGRAPHS OF EUT

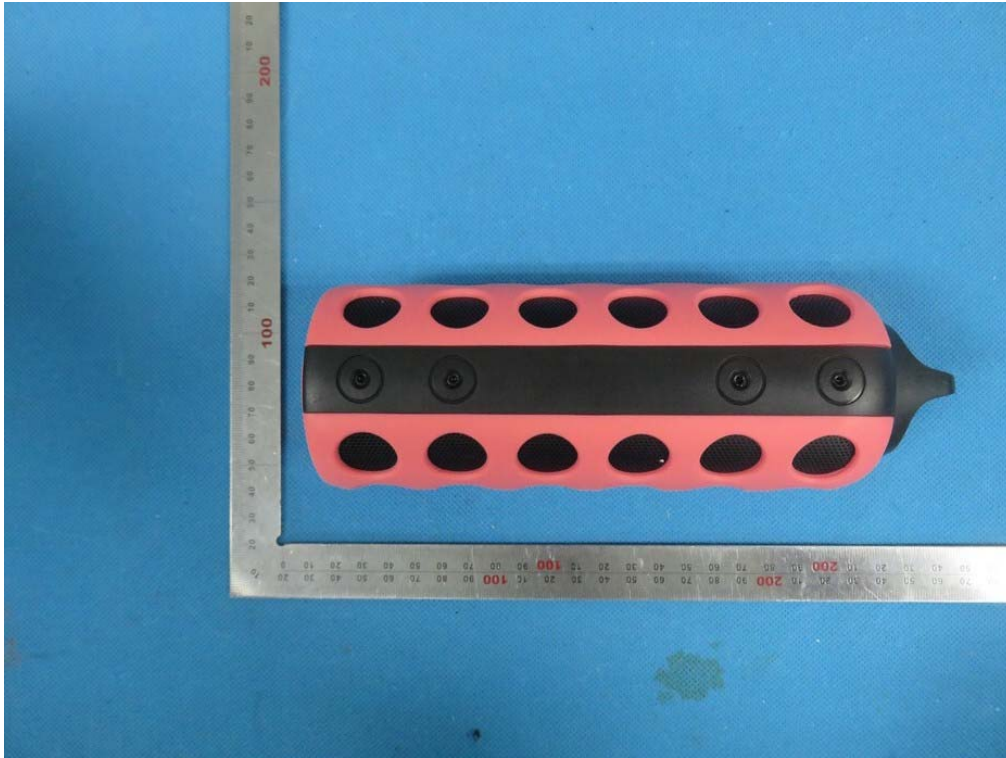
TOTAL VIEW OF EUT



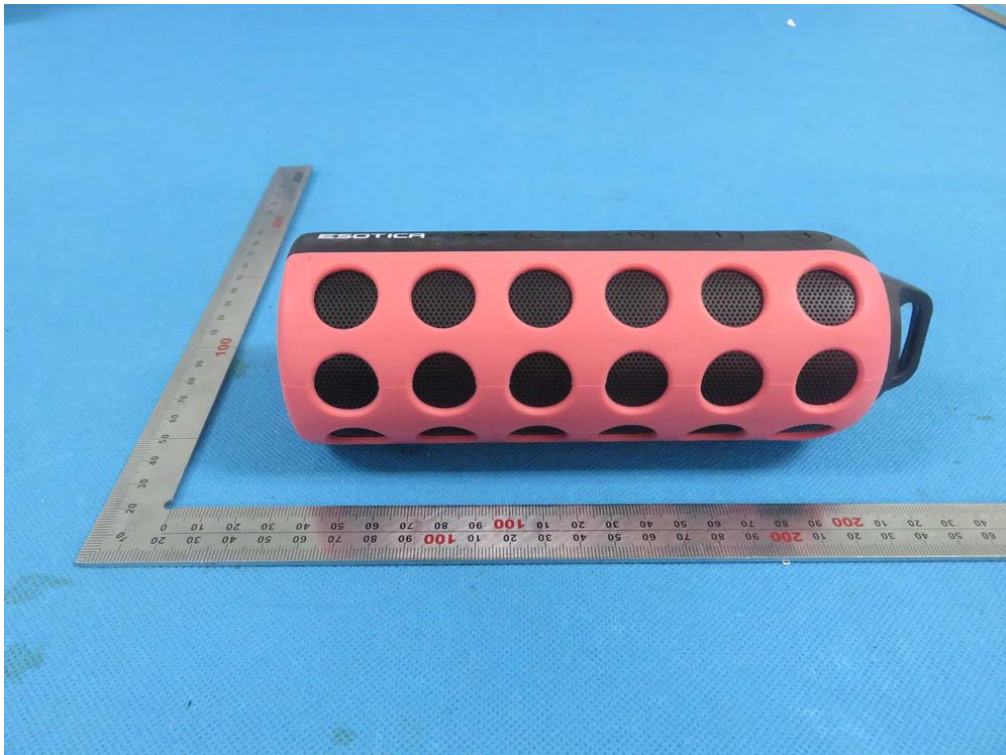
TOP VIEW OF EUT



BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



BACK VIEW OF EUT



LEFT VIEW OF EUT



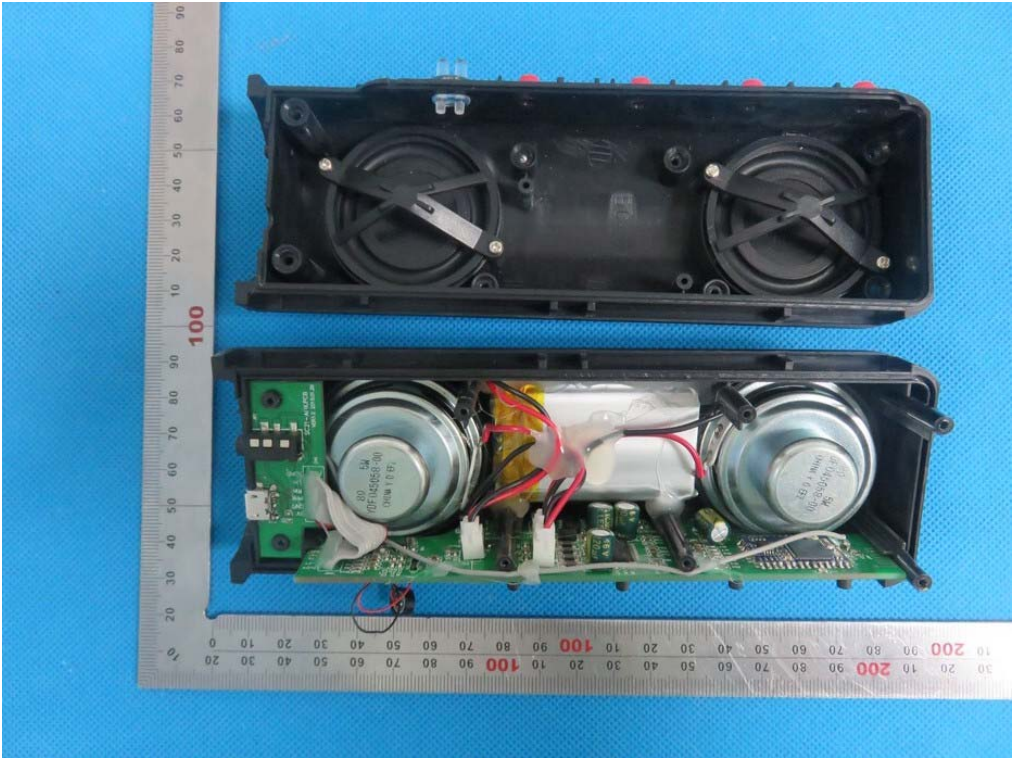
RIGHT VIEW OF EUT



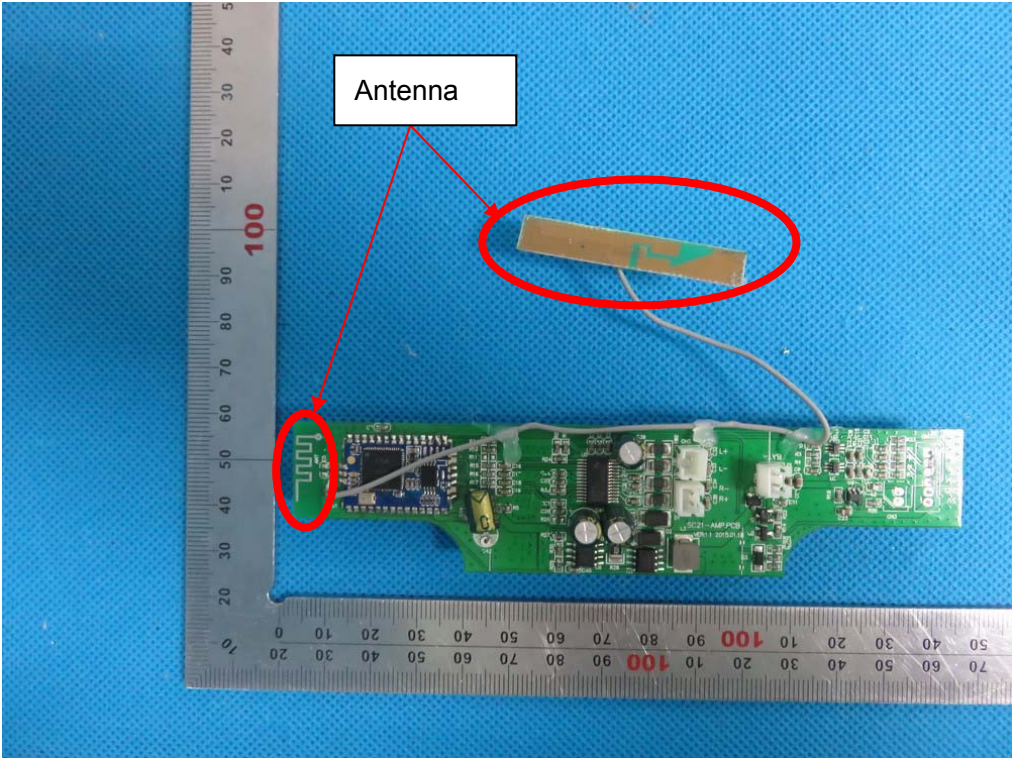
VIEW OF EUT(Port)



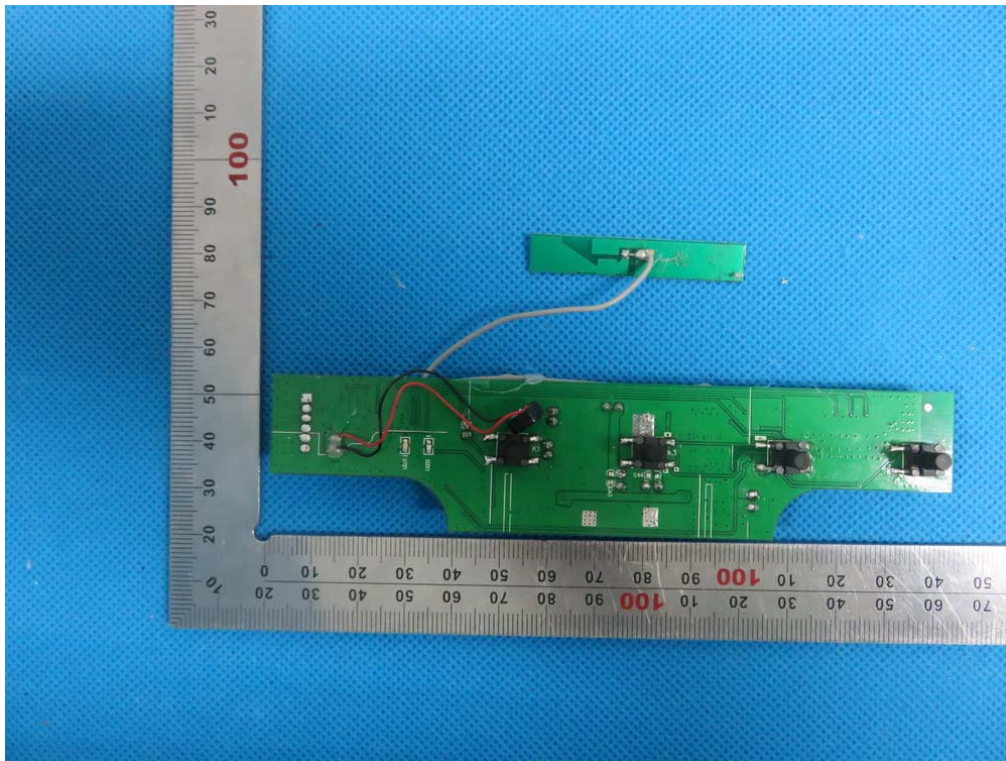
OPEN VIEW OF EUT



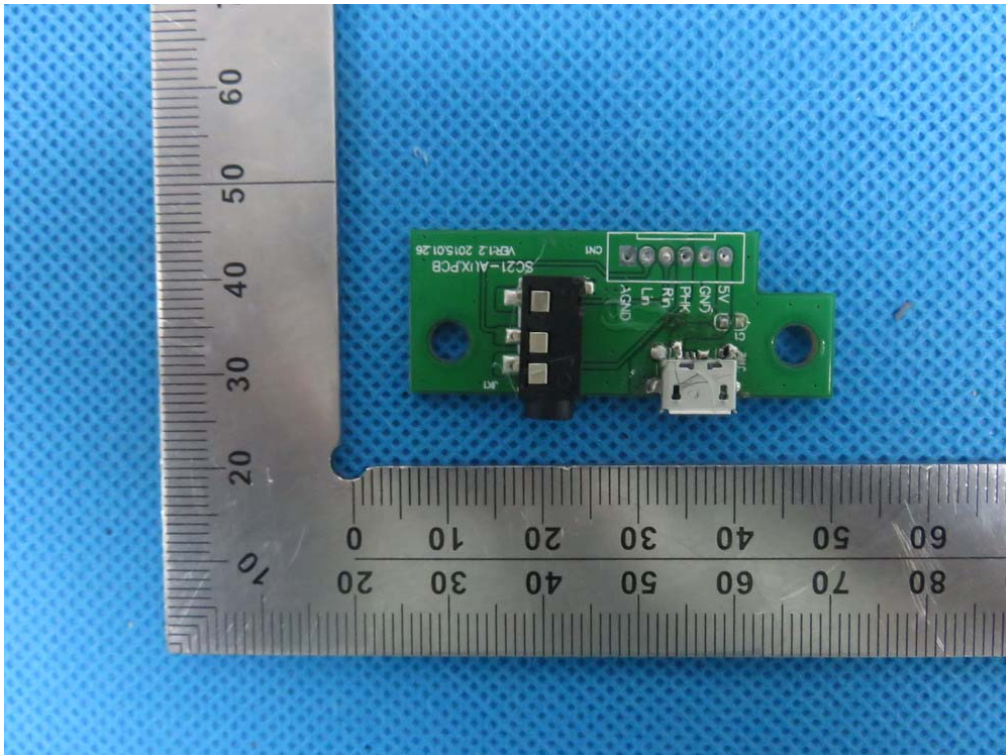
INTERNAL VIEW OF EUT-1



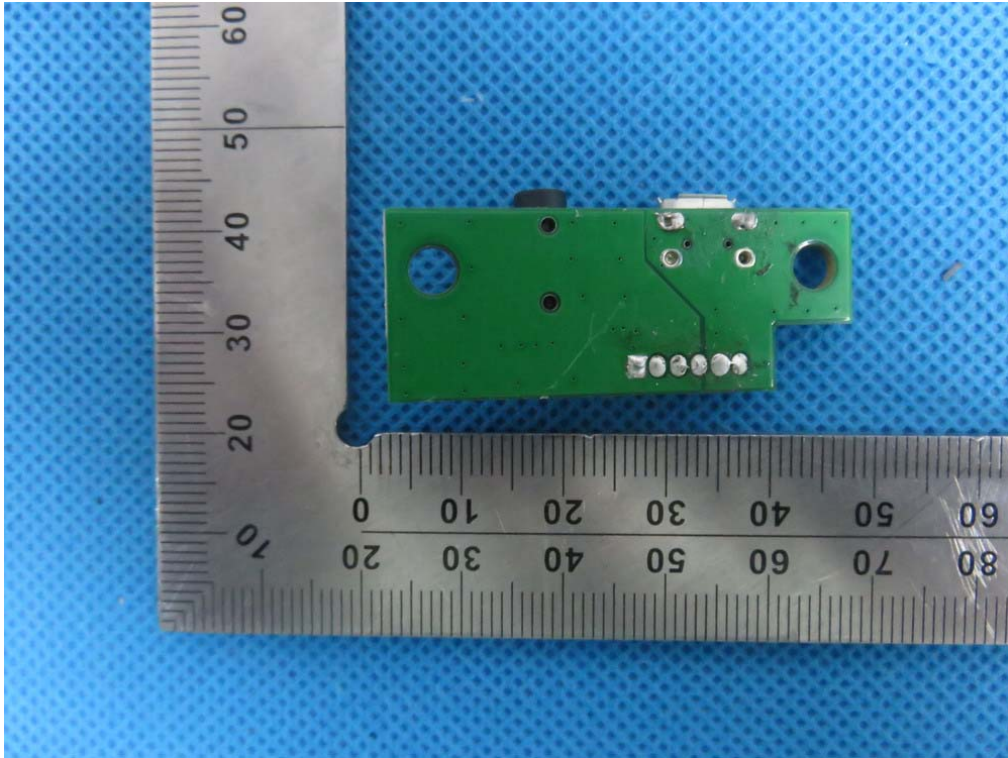
INTERNAL VIEW OF EUT-2



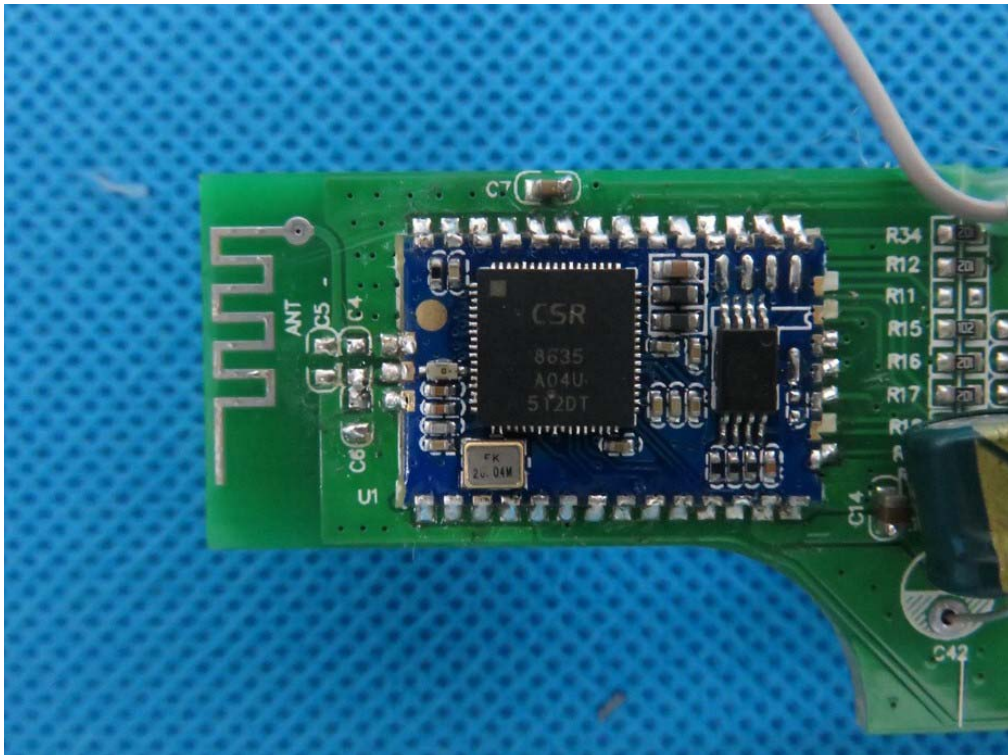
INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5



----END OF REPORT----