# **FCC Test Report**

Report No.: AGC00608150703FE03

FCC ID : 2AFL7BOATRUGBY

**APPLICATION PURPOSE** : Original Equipment

**PRODUCT DESIGNATION**: Stereo Bluetooth Speaker

**BRAND NAME**: boAt

**MODEL NAME** : boAt Rugby, F7

**CLIENT** : Imagine Marketing Pvt Ltd

**DATE OF ISSUE** : Aug.10,2015

STANDARD(S)

TEST PROCEDURE(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.10,2015	Valid	Original Report

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# 1. VERIFICATION OF CONFORMITY

Applicant Imagine Marketing Pvt Ltd			
Address	119 FIRST FLOOR, SHAH AND NAHAR SOCIETY, OFF DR E MOSES ROAD, WORLI,MAHARASHTRA, MUMBAI – 400018 INDIA		
Manufacturer	Imagine Marketing Pvt Ltd		
Address	119 FIRST FLOOR, SHAH AND NAHAR SOCIETY, OFF DR E MOSES ROAD, WORLI,MAHARASHTRA, MUMBAI – 400018 INDIA		
Product Designation	Stereo Bluetooth Speaker		
Brand Name	boAt		
Test Model	boAt Rugby, F7		
Date of test	Aug.03,2015 to Aug.06,2015		
Deviation	None		
Condition of Test Sample	Normal		
Report Template	AGCRT-US-BR/RF		

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 15.249.

Tested By	Trime Huang-			
100.00 2)	Time Huang(Huang Nanhui)	Aug.10,2015		
Reviewed By	Forest ei			
	Forrest Lei(Lei Yonggang)	Aug.10,2015		
Approved By	Solya Hong			
	Solger Zhang(Zhang Hongyi) Authorized Officer	Aug.10,2015		

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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	2.86dBm(Max)	
Bluetooth Version	V2.1+EDR	
Modulation	GFSK, π /4-DQPSK, 8DPSK	
Number of channels	79	
Hardware Version	F1S-V1.0	
Software Version	AL-027_FM_20150610_SP328CEE86.rar	
Antenna Designation PCB Antenna (Met 15.203 Antenna requirement)		
Antenna Gain	2.1dBi	
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 FREQUENCYS

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

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# 3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y  $\pm U$ , 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 %  $\circ$ 

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 GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Low channel π /4-DQPSK
5	Middle channel π /4-DQPSK
6	High channel π /4-DQPSK
7	Low channel 8DPSK
8	Middle channel 8DPSK
9	High channel 8DPSK
10	Normal operation (BT)
NI-4	

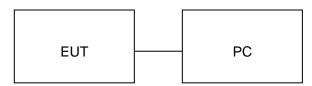
- 1. Only the result of the worst case was recorded in the report, if no other cases.
- 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- 3. The EUT used fully-charged battery when tested.

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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	Model No.	ID or Specification	Remark
1	Stereo Bluetooth Speaker	boAt	2AFL7BOATRUGBY	EUT
2	Control box	N/A	N/A	A.E
3	PC	Dell	INSPIRON	A.E
4	USB Cable	N/A	0.6m, unshielded	A.E
5	Audio Cable	N/A	0.4m, unshielded	A.E
6	Phone	HUAWEI	P7	A.E

## **5.3. SUMMARY OF TEST RESULTS**

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.249	Radiated Emission	Compliant
§15.249	Band Edges	Compliant
§15.207	Conduction Emission	Compliant
N/A	BANDWITH	Compliant

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# **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.

# **7 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&SCHWAR Z	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 / CC	S-SZ-3A2		

	Cond	ducted Emission Te	st Site				
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration		
EMI TEST RECEIVER	ROHDE&SCHWA RZ	ESCI	100783	03/09/2015	03/08/2016		
LISN(EUT)	ROHDE&SCHWA RZ	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							

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# 8. RADIATED EMISSION

## 8.1TEST LIMIT

#### Standard FCC15.249

Fundamental Frequency	Field Strength of Fundamental	Field Strength of Harmonics
	(millivolts/meter)	(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	Distance	Field	l Strengths Limit
(MHz)	Meters	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 dB $\mu$  V = 20 log Emission level  $\mu$  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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#### **8.2. 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, otherwise, 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.

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

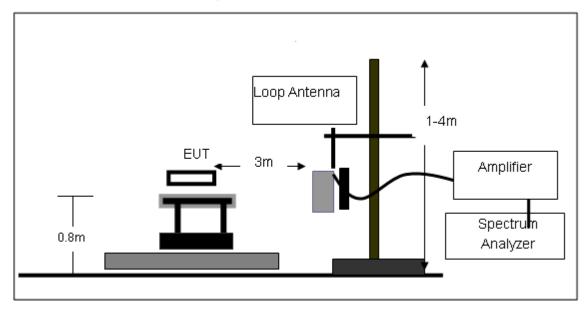
Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1.5MHz/1.5MHz for Peak, 1.5MHz/10Hz for Average

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

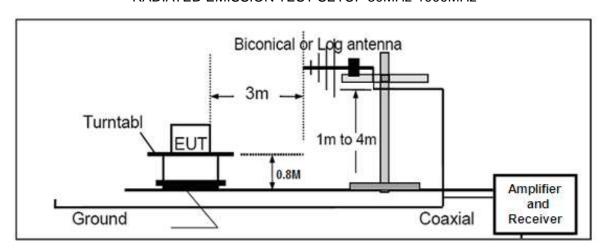
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# 8.3. TEST SETUP

Radiated Emission Test-Setup Frequency Below 30MHz

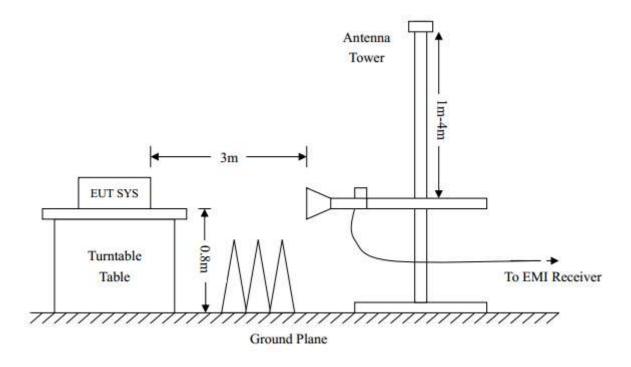


# RADIATED EMISSION TEST SETUP 30MHz-1000MHz



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# RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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#### **8.4. TEST RESULT**

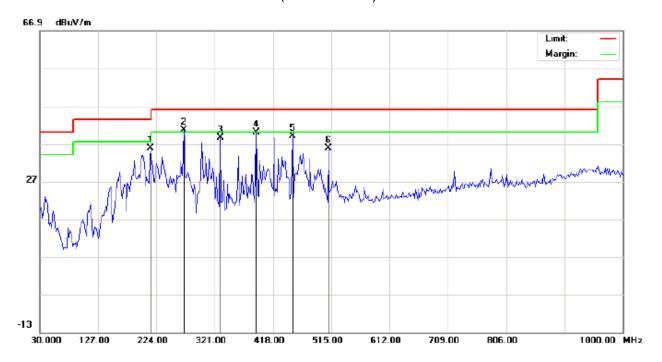
## (Worst modulation:GFSK)

#### **RADIATED EMISSION BELOW 30MHZ**

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

## **RADIATED EMISSION BELOW 1GHZ**

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



Site: site #1 Polarization: Horizontal Temperature: 23.5
Limit: FCC Class B 3M Radiation Power: Humidity: 57.9 %

EUT: Stereo Bluetooth Speaker Distance: 3m

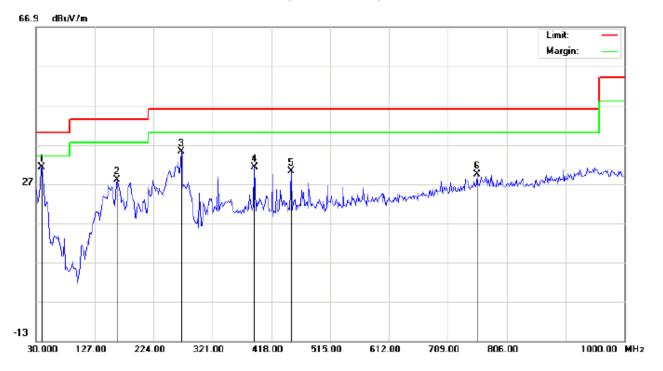
M/N: boAT Rugby Mode: Low Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		214.3000	23.22	12.54	35.76	43.50	-7.74	peak			
2	*	269.2667	26.09	14.48	40.57	46.00	-5.43	peak			
3		330.7000	21.23	17.45	38.68	46.00	-7.32	peak			
4	İ	390.5167	21.04	19.01	40.05	46.00	-5.95	peak			
5		450.3333	18.46	20.59	39.05	46.00	-6.95	peak			
6		510.1500	14.39	21.40	35.79	46.00	-10.21	peak			

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



Site: site #1 Limit: FCC Class B 3M Radiation

EUT: Stereo Bluetooth Speaker

M/N: boAT Rugby Mode: Low Channel TX

Note:

Polarization: Vertical Temperature: 23.5
Power: Humidity: 57.9 %

Distance: 3m

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1	*	39.7000	22.66	8.51	31.17	40.00	-8.83	peak			
2		164.1833	12.92	15.07	27.99	43.50	-15.51	peak			
3		269.2667	20.81	14.48	35.29	46.00	-10.71	peak			
4		390.5167	12.16	19.01	31.17	46.00	-14.83	peak			
5		450.3333	9.60	20.59	30.19	46.00	-15.81	peak			
6		757.5000	2.76	26.73	29.49	46.00	-16.51	peak			

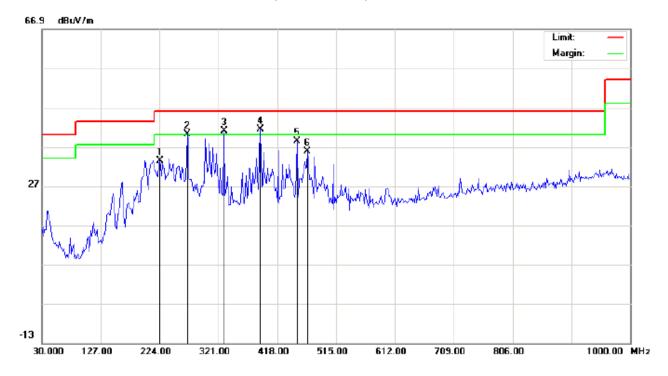
# **RESULT: PASS**

**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: Stereo Bluetooth Speaker

M/N: boAT Rugby

Mode: Middle Channel TX

Note:

Polarization: Horizontal Temperature: 23.5 Power: Humidity: 57.9 %

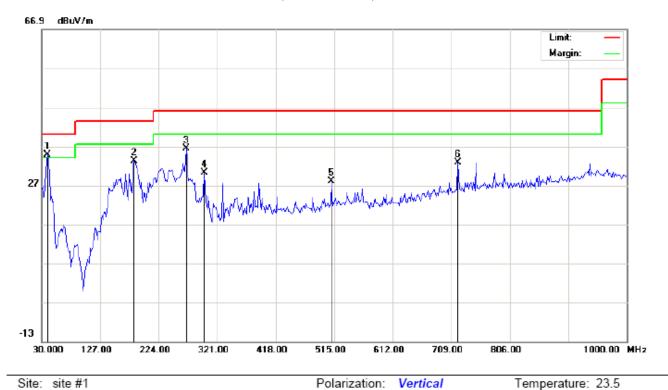
Distance: 3m

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu√/m	dB		cm	degree	
1		224.0000	20.58	12.91	33.49	46.00	-12.51	peak			
2	ļ	269.2667	25.76	14.48	40.24	46.00	-5.76	peak			
3	ļ	330.7000	23.49	17.45	40.94	46.00	-5.06	peak			
4	*	390.5167	22.46	19.01	41.47	46.00	-4.53	peak			
5		450.3333	17.74	20.59	38.33	46.00	-7.67	peak			
6		468.1167	15.04	20.79	35.83	46.00	-10.17	peak	·		

Humidity: 57.9 %

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



Site: site #1

Limit: FCC Class B 3M Radiation

EUT: Stereo Bluetooth Speaker

M/N: boAT Rugby

Mode: Middle Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1	*	39.7000	26.37	8.51	34.88	40.00	-5.12	peak			
2		183.5833	19.97	13.16	33.13	43.50	-10.37	peak			
3		269.2667	21.93	14.48	36.41	46.00	-9.59	peak			
4		299.9833	14.85	15.41	30.26	46.00	-15.74	peak			
5		510.1500	6.60	21.40	28.00	46.00	-18.00	peak			
6		720.3167	7.08	25.78	32.86	46.00	-13.14	peak			

Power:

Distance: 3m

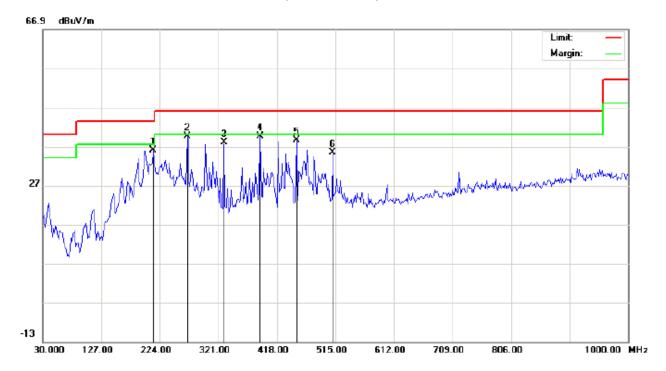
## **RESULT: PASS**

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: Stereo Bluetooth Speaker

M/N: boAT Rugby Mode: High Channel TX

Note:

Polarization: Horizontal Temperature: 23.5
Power: Humidity: 57.9 %

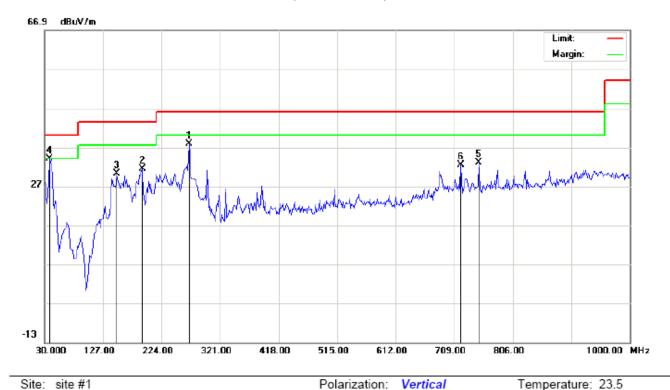
Distance: 3m

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		212.6833	23.60	12.48	36.08	43.50	-7.42	peak			
2		269.2667	25.12	14.48	39.60	46.00	-6.40	peak			
3		330.7000	20.49	17.45	37.94	46.00	-8.06	peak			
4	*	390.5167	20.63	19.01	39.64	46.00	-6.36	peak			
5		450.3333	18.04	20.59	38.63	46.00	-7.37	peak			
6		510.1500	13.96	21.40	35.36	46.00	-10.64	peak			

Humidity: 57.9 %

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



Polarization: Vertical

Site: site #1

Limit: FCC Class B 3M Radiation

EUT: Stereo Bluetooth Speaker

M/N: boAT Rugby Mode: High Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		269.2667	23.26	14.48	37.74	46.00	-8.26	peak			
2		191.6667	20.34	11.11	31.45	43.50	-12.05	peak			
3		149.6333	14.86	15.26	30.12	43.50	-13.38	peak			
4	*	38.0833	27.60	6.39	33.99	40.00	-6.01	peak			
5		749.4167	6.49	26.61	33.10	46.00	-12.90	peak		·	
6		720.3167	6.66	25.78	32.44	46.00	-13.56	peak			

Power:

Distance: 3m

## **RESULT: PASS**

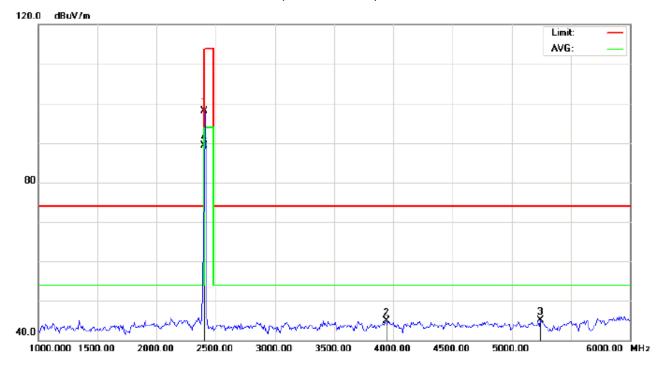
Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

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

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## **RADIATED EMISSION ABOVE 1GHZ**

# RADIATED EMISSION TEST- (ABOVE 1GHZ)-LOW CHANNEL-HORIZONTAL



Site: site #1 Polarization: Horizontal Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)- Power: Humidity: 60 %

EUT: Stereo Bluetooth Speaker Distance: 3m

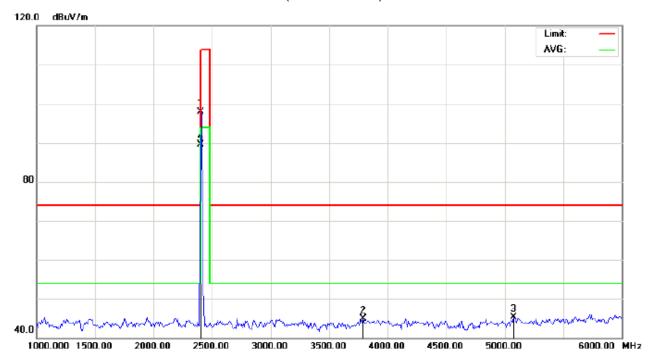
M/N: boAT Rugby Mode: Low Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		2402.000	107.73	-9.68	98.05	114.00	-15.95	peak			
2		3941.667	50.05	-5.17	44.88	74.00	-29.12	peak			
3		5241.667	46.86	-1.80	45.06	74.00	-28.94	peak			
4	*	2402.000	98.97	-9.68	89.29	94.00	-4.71	AVG	150	0	

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# RADIATED EMISSION TEST- (ABOVE 1GHZ)-LOW CHANNEL- VERTICAL



Site: site #1 Polarization: Vertical Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)- Power: Humidity: 60 %

EUT: Stereo Bluetooth Speaker Distance: 3m

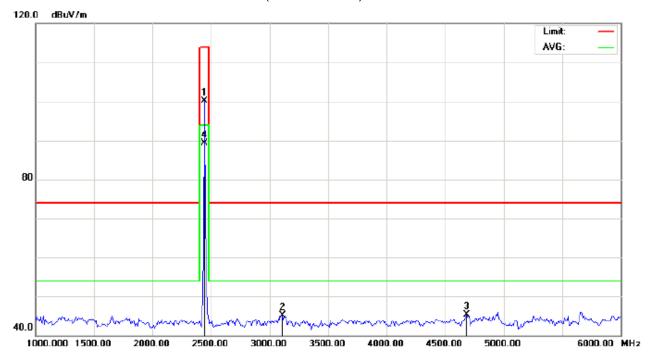
M/N: boAT Rugby Mode: Low Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		2402.000	107.63	-9.68	97.95	114.00	-16.05	peak			
2		3791.667	51.08	-6.09	44.99	74.00	-29.01	peak			
3		5075.000	47.08	-1.80	45.28	74.00	-28.72	peak			
4	*	2402.000	99.11	-9.68	89.43	94.00	-4.57	AVG	150	233	

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# RADIATED EMISSION TEST- (ABOVE 1GHZ)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1 Polarization: Horizontal Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)- Power: Humidity: 60 %

EUT: Stereo Bluetooth Speaker Distance: 3m

M/N: boAT Rugby

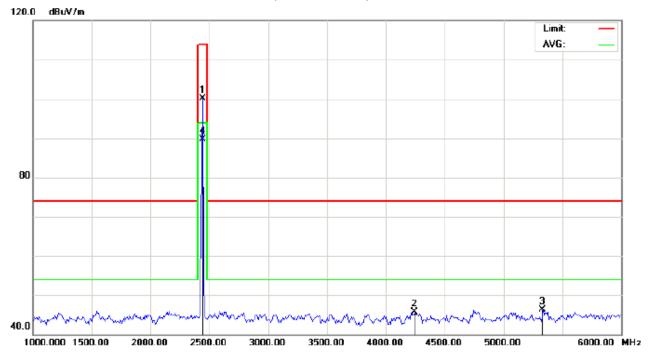
Mode: Middle Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height		Comment
		MHz	dBu∀	dB/m	dBu\//m	dBu∀/m	dB		cm	degree	
1		2441.000	109.82	-9.63	100.19	114.00	-13.81	peak			
2		3108.333	53.45	-8.26	45.19	74.00	-28.81	peak			
3		4683.333	48.03	-2.63	45.40	74.00	-28.60	peak			
4	*	2441.000	98.93	-9.63	89.30	94.00	-4.70	AVG	150	231	

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# RADIATED EMISSION TEST- (ABOVE 1GHZ)-MIDDLE CHANNEL- VERTICAL



Site: site #1 Polarization: Vertical Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)- Power: Humidity: 60 %

EUT: Stereo Bluetooth Speaker Distance: 3m

M/N: boAT Rugby

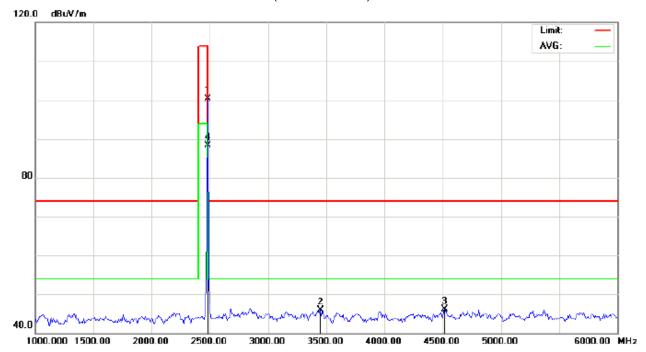
Mode: Middle Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	•	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		2441.000	109.78	-9.63	100.15	114.00	-13.85	peak			
2		4241.667	49.65	-3.99	45.66	74.00	-28.34	peak			
3		5333.333	48.05	-1.81	46.24	74.00	-27.76	peak			
4	*	2441.000	99.27	-9.63	89.64	94.00	-4.36	AVG	150	2	

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# RADIATED EMISSION TEST- (ABOVE 1GHZ)-HIGH CHANNEL-HORIZONTAL



Site: site #1 Polarization: Horizontal Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)- Power: Humidity: 60 %

EUT: Stereo Bluetooth Speaker Distance: 3m

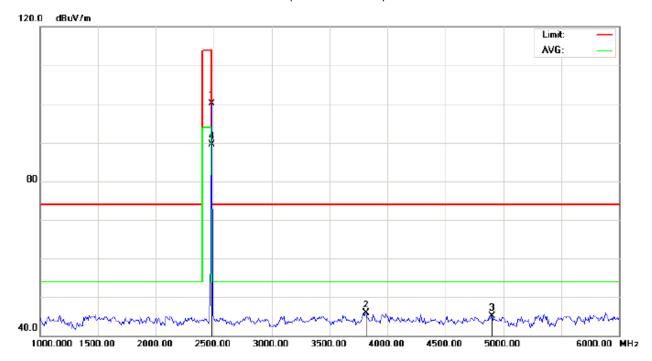
M/N: boAT Rugby Mode: High Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu\//m	dBu∀/m	dB		cm	degree	
1		2480.000	109.80	-9.59	100.21	114.00	-13.79	peak			
2		3450.000	53.94	-7.94	46.00	74.00	-28.00	peak			
3		4516.667	49.11	-3.07	46.04	74.00	-27.96	peak			
4	*	2480.000	97.90	-9.59	88.31	94.00	-5.69	AVG	150	5	

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# RADIATED EMISSION TEST- (ABOVE 1GHZ)-HIGH CHANNEL- VERTICAL



Site: site #1 Polarization: Vertical Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)- Power: Humidity: 60 %

EUT: Stereo Bluetooth Speaker Distance: 3m

M/N: boAT Rugby Mode: High Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height		Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		2480.000	109.74	-9.59	100.15	114.00	-13.85	peak			
2		3816.667	51.88	-5.94	45.94	74.00	-28.06	peak			
3		4900.000	47.18	-2.06	45.12	74.00	-28.88	peak			
4	*	2480.000	99.16	-9.59	89.57	94.00	-4.43	AVG	150	235	

#### **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

# Peak value

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	107.73	-9.68	98.05	114	-15.95	Horizontal
2402	107.63	-9.68	97.95	114	-16.05	Vertical
2441	109.82	-9.63	100.19	114	-13.81	Horizontal
2441	109.78	-9.63	100.15	114	-13.85	Vertical
2480	109.80	-9.59	100.21	114	-13.79	Horizontal
2480	109.74	-9.59	100.15	114	-13.85	Vertical

# Average value

71101490 14140						
Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	98.97	-9.68	89.29	94	-4.71	Horizontal
2402	99.11	-9.68	89.43	94	-4.57	Vertical
2441	98.93	-9.63	89.30	94	-4.70	Horizontal
2441	99.27	-9.63	89.64	94	-4.36	Vertical
2480	97.90	-9.59	88.31	94	-5.69	Horizontal
2480	99.16	-9.59	89.57	94	-4.43	Vertical

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## 9. BAND EDGE EMISSION

## 9.1. MEASUREMENT PROCEDURE

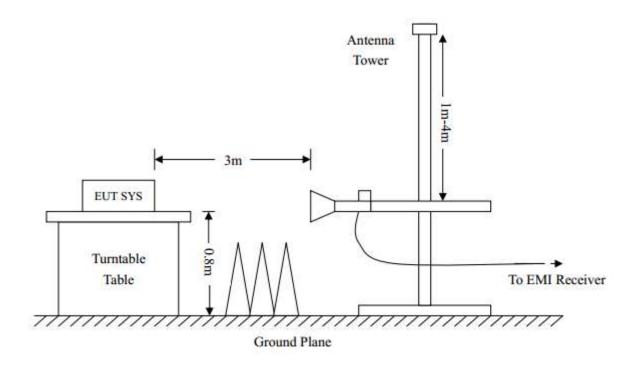
1The EUT operates at hopping-off test mode. The lowest or highest channels are tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.

2Max hold the trace of the setp 1,and the EUT operates at hopping-on test mode to verify the largest spurious emissions power.

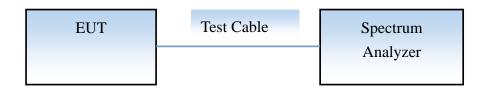
3Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission: (a) PEAK: RBW=VBW=1.5MHz / Sweep=AUTO

#### 9.2 TEST SETUP

## RADIATED EMISSION TEST SETUP



#### CONDUCTED TEST SETUP

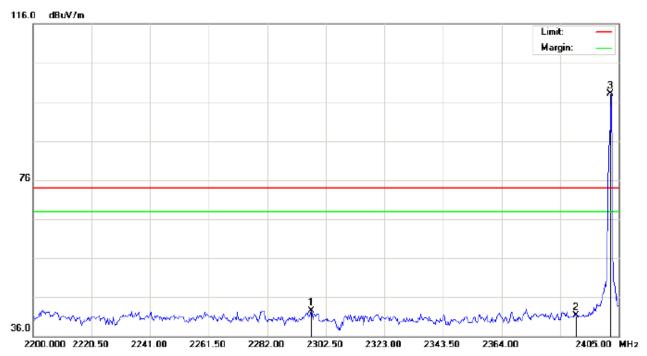


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## 9.3 RADIATED TEST RESULT

# (Worst modulation:GFSK)

## TEST PLOT OF BAND EDGE FOR LOW CHANNEL-Horizontal



Site: site #1 Polarization: Horizontal Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %

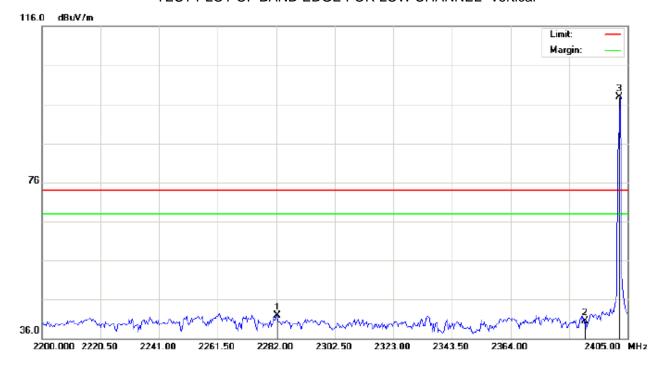
EUT: Stereo Bluetooth Speaker Distance:

M/N: boAT Rugby Mode: Low Channel TX

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu\//m	dBu∀/m	dB		cm	degree	
1		2297.375	32.28	10.21	42.49	74.00	-31.51	peak			
2		2390.000	31.00	10.31	41.31	74.00	-32.69	peak			
3	*	2402.000	87.72	10.32	98.04	74.00	24.04	peak			

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## TEST PLOT OF BAND EDGE FOR LOW CHANNEL -Vertical



Site: site #1 Polarization: Vertical Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %

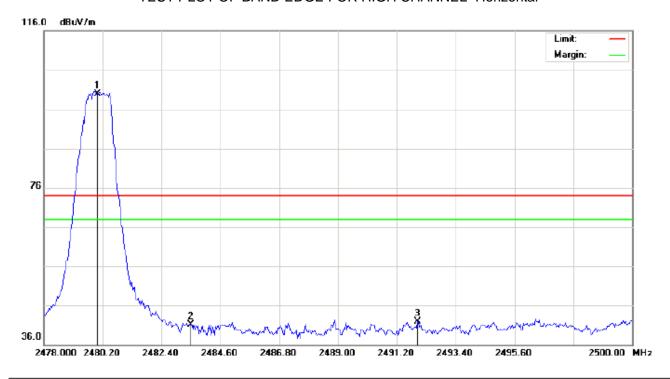
EUT: Stereo Bluetooth Speaker Distance:

M/N: boAT Rugby Mode: Low Channel TX

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1		2282.342	31.70	10.19	41.89	74.00	-32.11	peak			
2		2390.000	30.21	10.31	40.52	74.00	-33.48	peak			
3	*	2402.000	87.59	10.32	97.91	74.00	23.91	peak			

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## TEST PLOT OF BAND EDGE FOR HIGH CHANNEL -Horizontal



Site: site #1 Polarization: Horizontal Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %

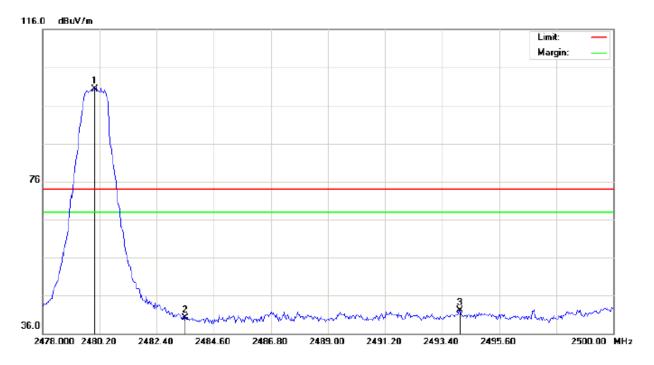
EUT: Stereo Bluetooth Speaker Distance:

M/N: boAT Rugby Mode: High Channel TX

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBu∀/m	dB		cm	degree	
1	*	2480.000	89.55	10.41	99.96	74.00	25.96	peak			
2		2483.500	30.69	10.41	41.10	74.00	-32.90	peak			
3		2491.970	31.48	10.42	41.90	74.00	-32.10	peak			

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## TEST PLOT OF BAND EDGE FOR HIGH CHANNEL-Vertical



Site: site #1 Polarization: Vertical Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK) Power: Humidity: 60 %

EUT: Stereo Bluetooth Speaker Distance:

M/N: boAT Rugby Mode: High Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu\//m	dBu∀/m	dB		cm	degree	
1	*	2480.000	89.82	10.41	100.23	74.00	26.23	peak			
2		2483.500	29.76	10.41	40.17	74.00	-33.83	peak			
3		2494.097	31.67	10.42	42.09	74.00	-31.91	peak			

## **RESULT: PASS**

Note: The other modes radiation emission have enough 20dB margin.

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

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

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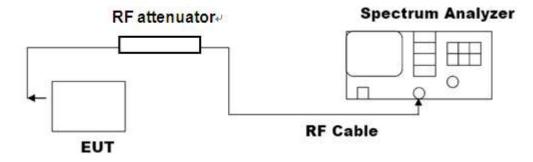
# 10. 20DB BANDWIDTH

## **10.1. 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 hoping 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.

#### 10.2. TEST SET-UP

# (BLOCK DIAGRAM OF CONFIGURATION)



#### 10.3. LIMITS AND MEASUREMENT RESULTS

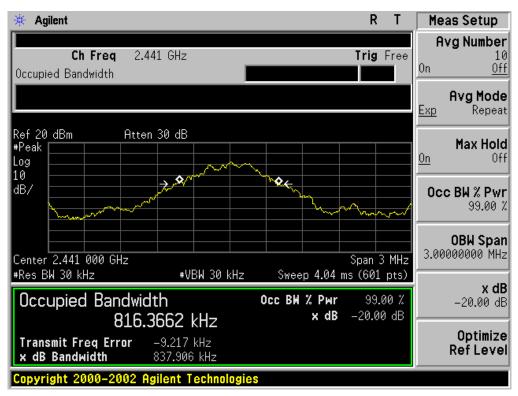
BLUETOOTH	1MBPS LIMITS AND I	MEASUREMENT RESU	JL				
Applicable Limite	Measurement Result						
Applicable Limits	Test Da	ta (MHz)	Criteria				
	Low Channel	0.928	PASS				
N/A	Middle Channel	0.838	PASS				
	High Channel	0.891	PASS				

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#### TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

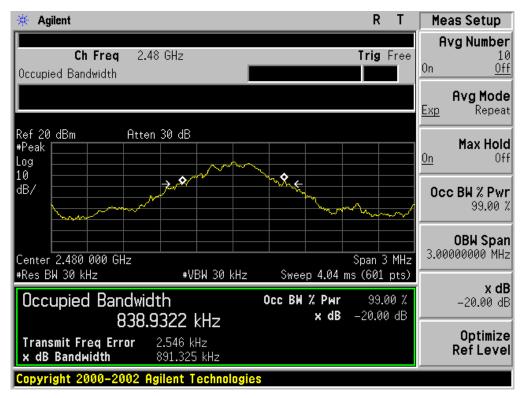


#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



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#### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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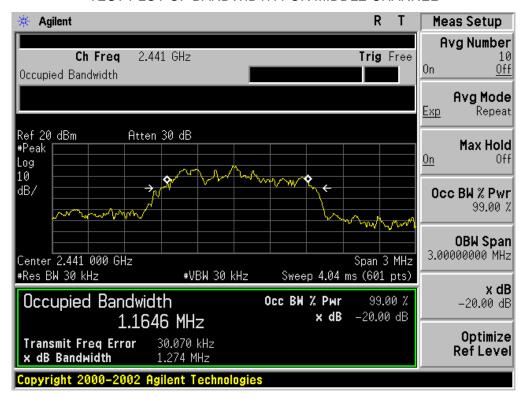
BLUETOOTH 2MBPS LIMITS AND MEASUREMENT RESUL			
Applicable Limits	Measurement Result		
	Test Data (MHz)		Criteria
N/A	Low Channel	1.247	PASS
	Middle Channel	1.274	PASS
	High Channel	1.236	PASS

## TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

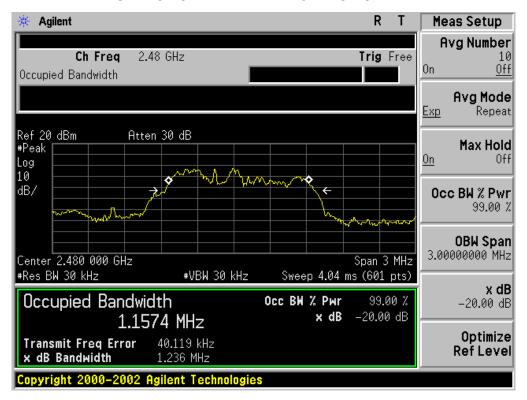


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#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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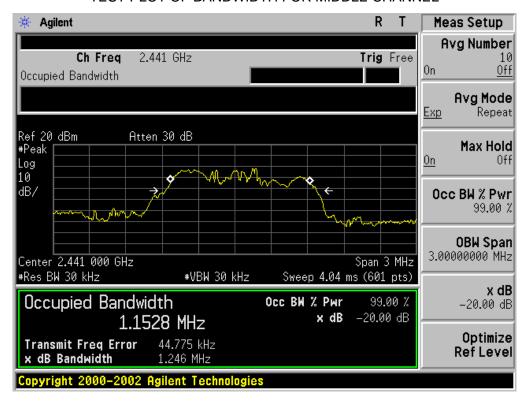
BLUETOOTH 3MBPS LIMITS AND MEASUREMENT RESUL									
Applicable Limite	Measurement Result								
Applicable Limits	Test Da	Criteria							
	Low Channel	1.234	PASS						
N/A	Middle Channel	1.246	PASS						
	High Channel	1.243	PASS						

#### TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

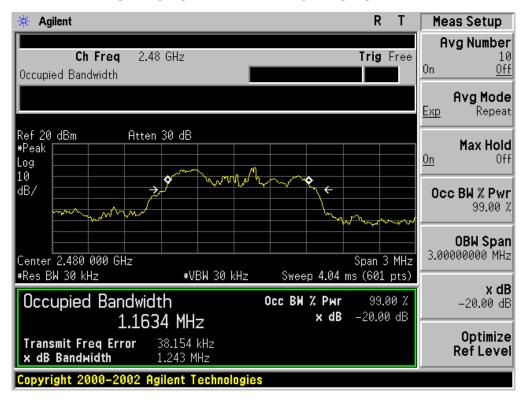


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#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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#### 11. FCC LINE CONDUCTED EMISSION TEST

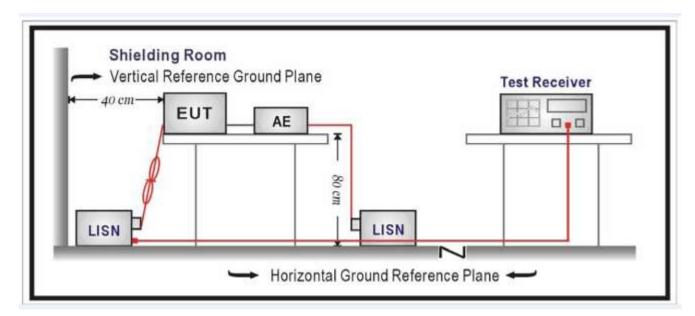
### 11.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Francis	Maximum RF Line Voltage							
Frequency	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.

### 11.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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#### 11.3. 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/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.

### 11.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

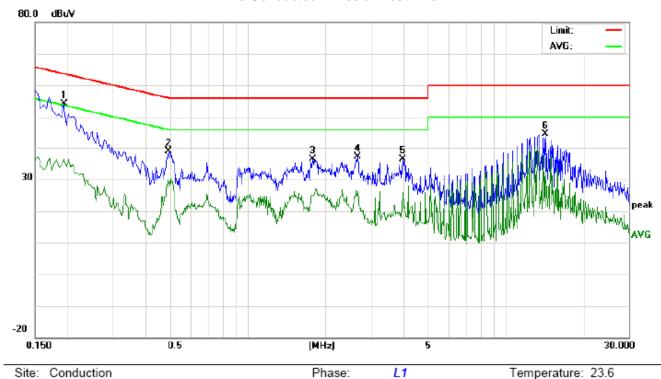
- EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used 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.

Humidity: 51.5 %

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### 11.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



Site: Conduction Limit: FCC Class B Conduction(QP)

EUT: Stereo Bluetooth Speaker

M/N: boAT Rugby

Mode: BT Link with charging

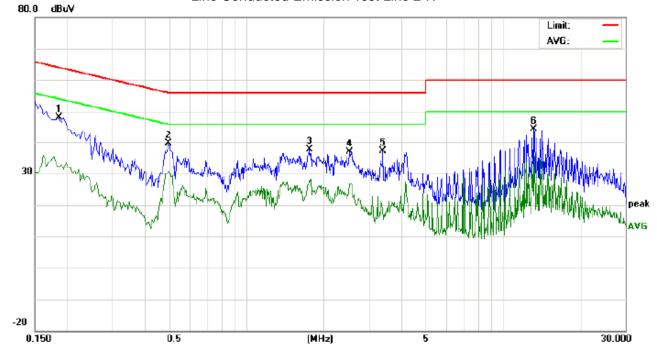
Note:

No. Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment	
	(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1940	44.01		26.15	10.21	54.22		36.36	63.86	53.86	-9.64	-17.50	Р	
2	0.4940	28.36		18.49	10.40	38.76		28.89	56.10	46.10	-17.34	-17.21	Р	
3	1.7860	26.05		14.68	10.29	36.34		24.97	56.00	46.00	-19.66	-21.03	Р	
4	2.6780	26.77		15.57	10.47	37.24		26.04	56.00	46.00	-18.76	-19.96	Р	
5	4.0020	25.87		15.55	10.43	36.30		25.98	56.00	46.00	-19.70	-20.02	Р	
6	14.2220	34.54		26.45	10.12	44.66		36.57	60.00	50.00	-15.34	-13.43	Р	

Power:

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Site: Conduction Phase: N Temperature: 23.6
Limit: FCC Class B Conduction(QP) Power: Humidity: 51.5 %

EUT: Stereo Bluetooth Speaker

M/N: boAT Rugby

Mode: BT Link with charging

Note:

No. Freq.		Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
	(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1860	37.92		21.91	10.20	48.12		32.11	64.21	54.21	-16.09	-22.10	Р	
2	0.4980	29.22		20.46	10.40	39.62		30.86	56.03	46.03	-16.41	-15.17	Р	
3	1.7700	27.42		16.80	10.29	37.71		27.09	56.00	46.00	-18.29	-18.91	Р	
4	2.5380	26.48		16.14	10.44	36.92		26.58	56.00	46.00	-19.08	-19.42	Р	
5	3.4100	26.51		8.14	10.52	37.03		18.66	56.00	46.00	-18.97	-27.34	Р	
6	13.2580	34.31		19.05	10.13	44.44		29.18	60.00	50.00	-15.56	-20.82	Р	

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# **APPENDIX A: PHOTOGRAPHS OF TEST SETUP**

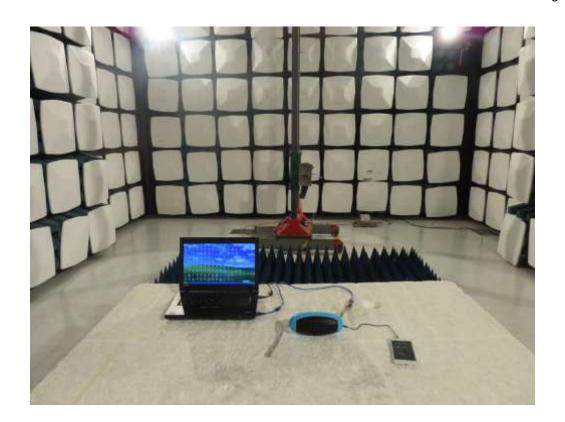
FCC LINE CONDUCTED EMISSION TEST SETUP



FCC RADIATED EMISSION TEST SETUP



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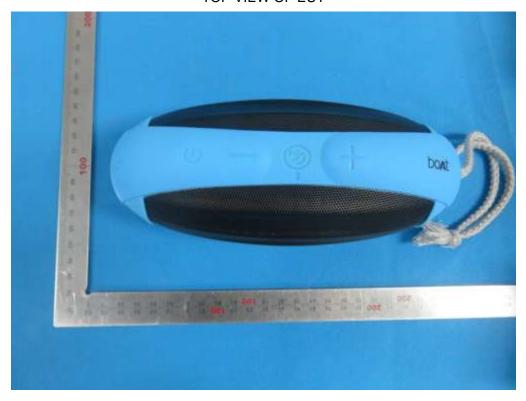
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## **APPENDIX B: PHOTOGRAPHS OF EUT**

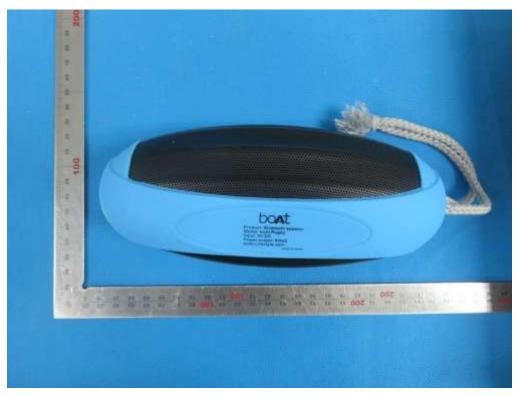
TOTAL VIEW OF EUT



TOP VIEW OF EUT



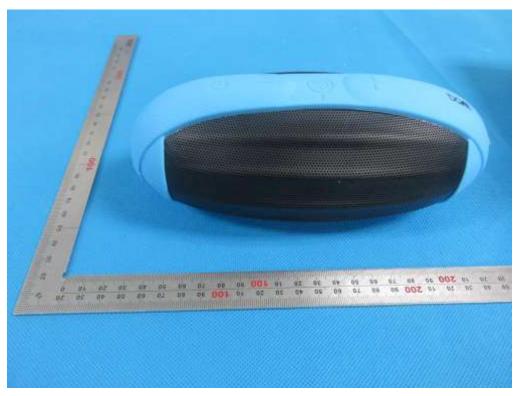
## **BOTTOM VIEW OF EUT**



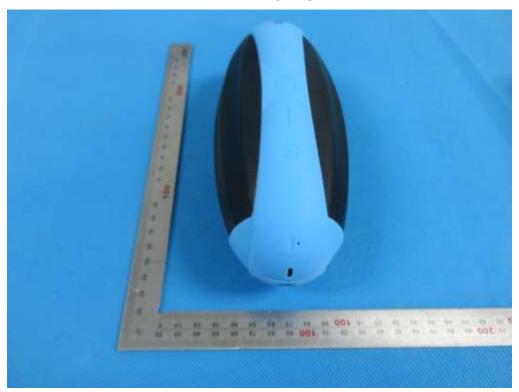
FRONT VIEW OF EUT



**BACK VIEW OF EUT** 



LEFT VIEW OF EUT



RIGHT VIEW OF EUT



VIEW OF EUT (PORT)

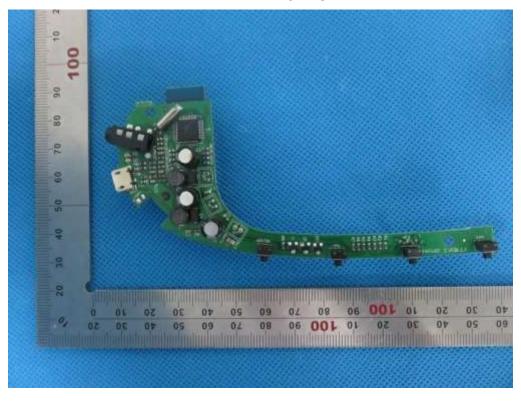


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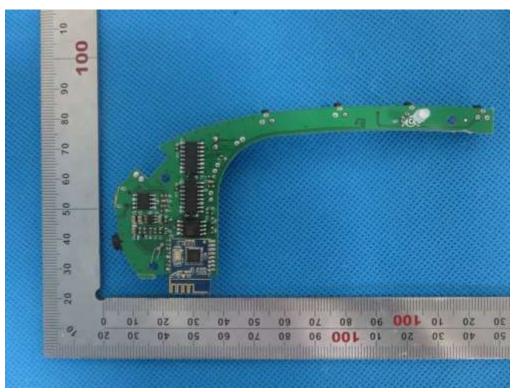
**OPEN VIEW OF EUT** 



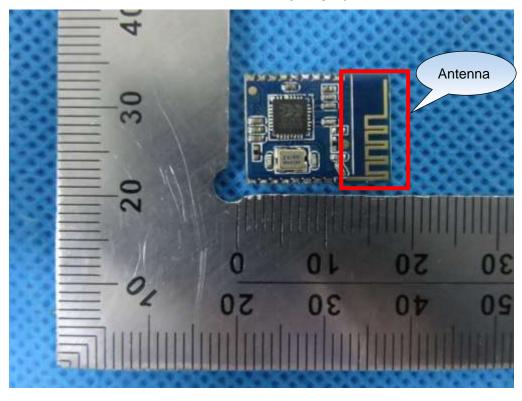
**INTERNAL VIEW OF EUT-1** 



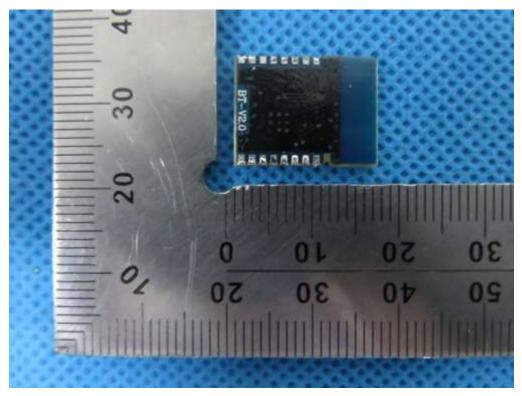
**INTERNAL VIEW OF EUT-2** 



**INTERNAL VIEW OF EUT-3** 



## **INTERNAL VIEW OF EUT-4**



----END OF REPORT----