

# FCC Test Report

Report No.: AGC00302140802FE03

FCC ID	: 2AB22T16
APPLICATION PURPOSE	: Original Equipment
PRODUCT DESIGNATION	: wireless mobile speaker
BRAND NAME	: ETEKCITY
MODEL NAME	: T16
CLIENT	: Etekcity Corporation
DATE OF ISSUE	: Aug.26, 2014
STANDARD(S)	: FCC Part 15 Rules
REPORT VERSION	: V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

omplianc

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# **Report Revise Record**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	1	Aug.26, 2014	Valid	Original Report

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Applicant	Etekcity Corporation	
Address	2310 SE DELAWARE AVE SUITE G #243, ANKENY, IA 50021, United States	
Manufacturer	Zhongshan Coox Electron Technology Co.,Ltd.	
Address	NO.8, Zhongsheng Street, Shiqi District, Zhongshan, Guangdong, China.	
Product Designation	<i>v</i> ireless mobile speaker	
Brand Name	ETEKCITY	
Test Model	T16	
Date of test	Aug.20, 2014 to Aug.22, 2014	
Deviation	None	
Condition of Test Sample	Normal	
Report Template	AGCRT-US-BR/RF (2013-03-01)	

# **1. VERIFICATION OF CONFORMITY**

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. 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 (2003) 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.

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# 2. GENERAL INFORMATION

# 2.1. PRODUCT DESCRIPTION

The EUT is "wireless mobile 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 EOT is described as following			
<b>Operation Frequency</b>	2.402 GHz to 2.480GHz		
RF Output Power	1.77dBm(Max)		
Bluetooth Version	V2.1 with EDR		
Modulation	GFSK, π /4-DQPSK, 8DPSK		
Number of channels	79		
Hardware Version	QD0075		
Software Version T3ProV1.1			
Antenna Designation PCB Antenna			
Antenna Gain	0dBi		
Power Supply	Power Supply DC3.7V by Battery		
Note: The USB port only used for charging and can't be used to transfer data with PC.			

A major technical description of EUT is described as following

# 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency		
	0	2402MHZ		
	1	2403MHZ		
		:		
	38	2440 MHZ		
2402~2480MHZ	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 of multislot 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 send on the same frequency, it is send on the next frequency of the hopping sequence.

# 2.4. EXAMPLE OF A HOPPING SEQUENCY 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 24MSB's of the 48BD\_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 ehavior zation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us.The clock has a cycle of about one day(23h30).In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire. LAP(24 bits),4LSB's(4bits)(Input 1) and the 27MSB's of the clock(Input 2) are used. With this input values different mathematical procedures(permutations, additions, XOR-operations)are performed to generate te Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following ehavior:

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 transmission is longer(and it Cannot be shorter) than the minimum resolution of the clock(312.5us). 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: 2AB22T16** 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 (2003). 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:

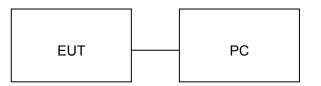
1. Only the result of the worst case was recorded in the report, if no other cases.

2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

# **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	wireless mobile speaker	ETEKCITY	T16	EUT
2	PC	Dell	INSPIRON	A.E
3	Control box	N/A	N/A	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	Attestation of Global Compliance (Shenzhen) Co., Ltd		
	2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China		
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2003.		

# ALL TEST EQUIPMENT LIST

Description	Manufacturer	Model	S/N	Cal. Date	Cal. Due
Power Probe	R&S	NRP-Z23	100323	07/16/2014	07/15/2015
RF attenuator	N/A	RFA20db	68	N/A	N/A
Spectrum Analyzer	Agilent	E4440A	US41421290	07/16/2014	07/15/2015
EXA Signal Analyzer	Agilent	N9010A		02/28/2014	02/27/2015
Amplifier	EM	EM30180	0607030	02/28/2014	02/27/2015
Horn Antenna	EM	EM-AH-10180	67	04/19/2014	04/18/2015
Horn Antenna	A.H. Systems Inc.	SAS-574		07/16/2014	07/15/2015
EMI Test Receiver	Rohde & Schwarz	ESCI	100694	07/16/2014	07/15/2015
Bilogical Antenna	A.H. Systems Inc.	SAS-521-4	26	06/06/2014	06/05/2015
LISN	R&S	ESH3-Z5	8389791009	07/16/2014	07/15/2015
Loop Antenna	Daze	ZN30900N	SEL0097	07/16/2014	07/15/2015
Isolation Transformer	LETEAC	LTBK		07/16/2014	07/15/2015
Radiation Cable 1	Sat	RE1	R003	06/04/2014	06/03/2015
Radiation Cable 2	Sat	RE2	R002	06/04/2014	06/03/2015
Conduction Cable	Sat	CE1	C001	06/04/2014	06/03/2015

# 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 > the 20 dB bandwidth of the emission being measured, VBW  $\ge$  RBW.
- 4. Record the maximum power from the Spectrum Analyzer.

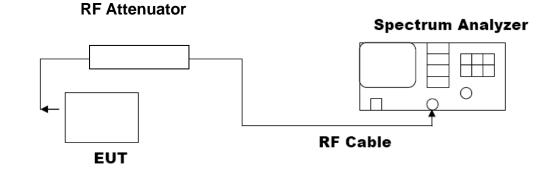
For average power test:

- 1. Connect EUT RF output port to power probe through an RF attenuator.
- 2. Connect the power probe to the PC.
- 3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 4. Record the maximum power from the software.
- 5. The maximum peak power shall be less 125mW (21dBm).

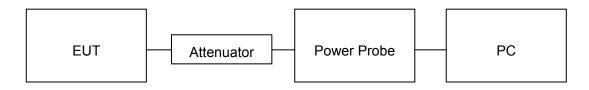
Note : The EUT was tested according to DA000705 for compliance to FCC 47CFR 15.247 requirements.

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

# PEAK POWER TEST SETUP

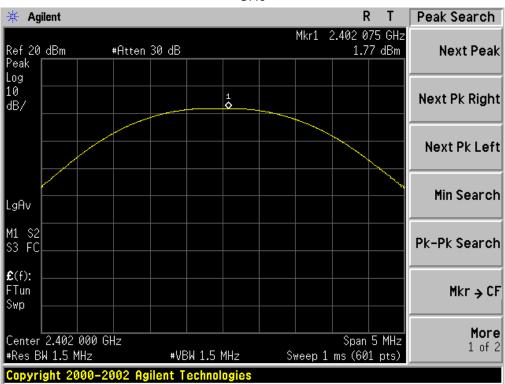


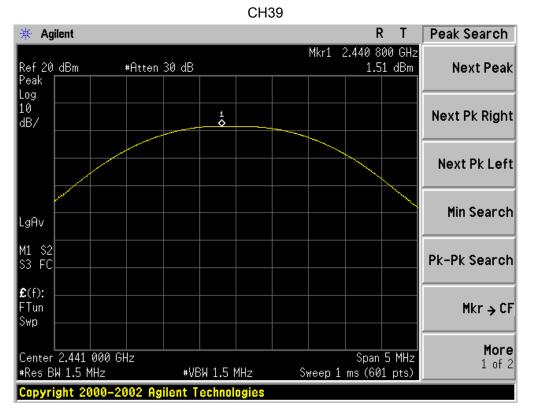
#### AVERAGE POWER SETUP



73 LIMITS AND	MEASUREMENT RESULT
1.3. LINITS AND	

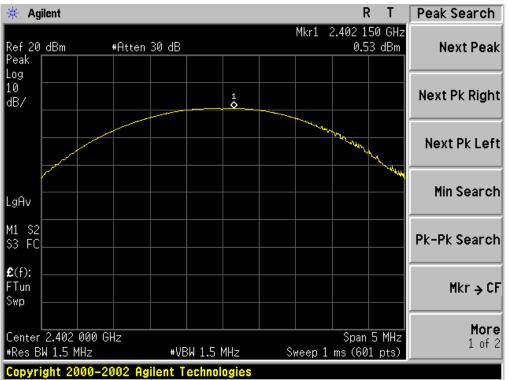
PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION					
Frequency (GHz)Average Power (dBm)Peak Power (dBm)Applicable Limits 					
2.402	-0.15	1.77	21	Pass	
2.441	-0.44	1.51	21	Pass	
2.480	-0.35	1.61	21	Pass	

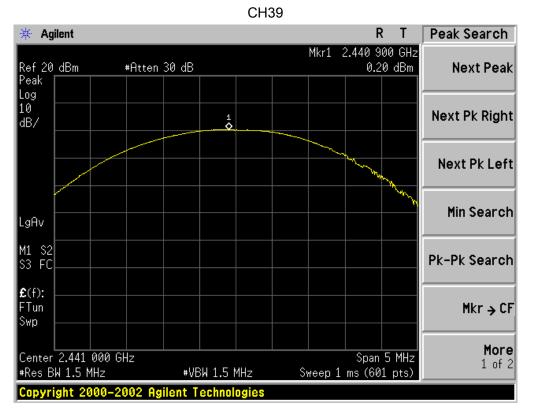




🔆 Agilent							R	t S	Peak Search
Ref 20 dBm Peak	#Atten	30 dB				Mkr1 :	2.479 8 1.6	50 GHz 1 dBm	Next Peak
Log 10 dB/			1 \$						Next Pk Right
									Next Pk Left
LgAv									Min Search
M1 S2 S3 FC									Pk-Pk Search
£(f): FTun Swp									Mkr → CF
Center 2.480 #Res BW 1.5	Iz	#VE	3W 1.5 I	MHz	Sı	veep 1	Span ms (60	5 MHz 1 pts)	<b>More</b> 1 of 2
Copyright 2	)02 Ag								

PEAK OUTPUT POWER MEASUREMENT RESULT FOR $II$ /4-DQPSK MODULATION					
Frequency (GHz)Average Power (dBm)Peak Power (dBm)Applicable Limits 					
2.402	-1.32	0.53	21	Pass	
2.441	-1.74	0.2	21	Pass	
2.480	-1.93	0.03	21	Pass	

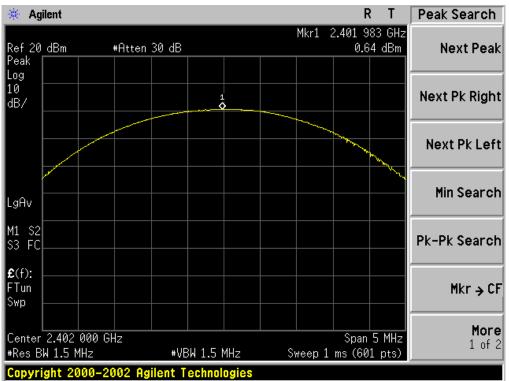


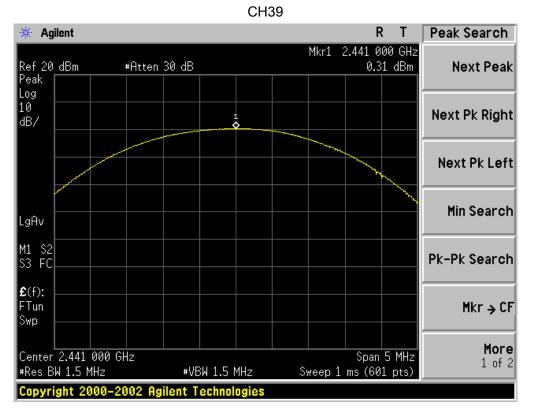


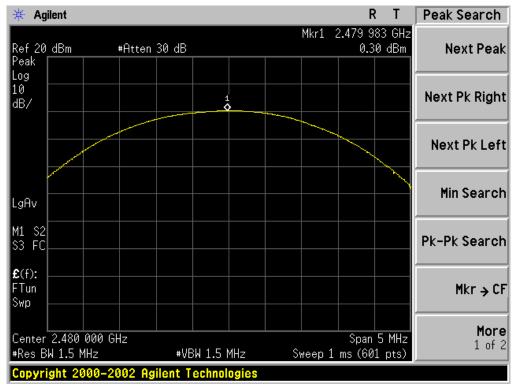
CH78

🔆 Agilent		RT	Peak Search
Ref 20 dBm #An Peak	tten 30 dB	Mkr1 2.480 033 GHz 0.03 dBm	Next Peak
Log 10 dB/	1		Next Pk Right
			Next Pk Left
LgAv		·····	Min Search
M1 S2 S3 FC			Pk-Pk Search
£(f): FTun Swp			Mkr→CF
Center 2.480 000 GHz #Res BW 1.5 MHz	#VBW 1.5 MHz	Span 5 MHz Sweep 1 ms (601 pts)	More 1 of 2
Copyright 2000-2002	2 Agilent Technologies		

PEAK OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MODULATION					
Frequency (GHz)	Average Power (dBm)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail	
2.402	-1.31	0.64	21	Pass	
2.441	-1.53	0.31	21	Pass	
2.480	-1.61	0.3	21	Pass	





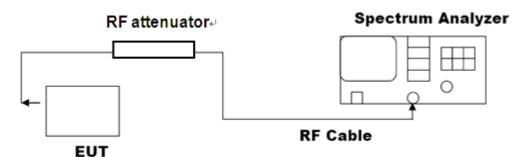


# 8. 20DB BANDWIDTH

# 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 hoping channel RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

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



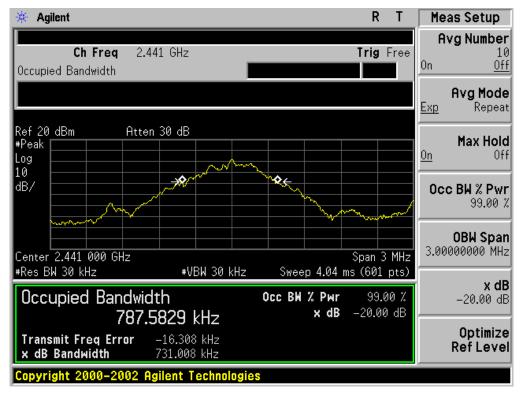
## 8.3. LIMITS AND MEASUREMENT RESULTS

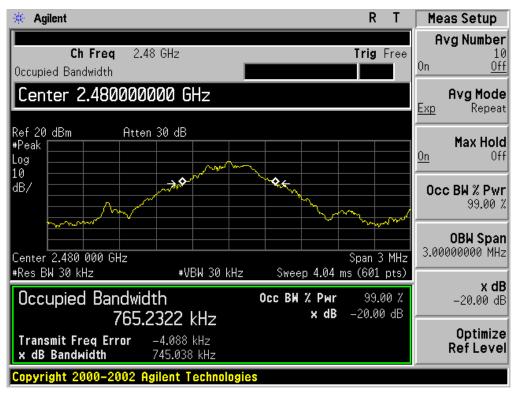
BLUETOOTH 1MBPS LIMITS AND MEASUREMENT RESUL				
	Measurement Result			
Applicable Limits	Test Data (MHz)		Criteria	
	Low Channel	0.774	PASS	
N/A	Middle Channel	0.731	PASS	
	High Channel	0.745	PASS	



## TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

#### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



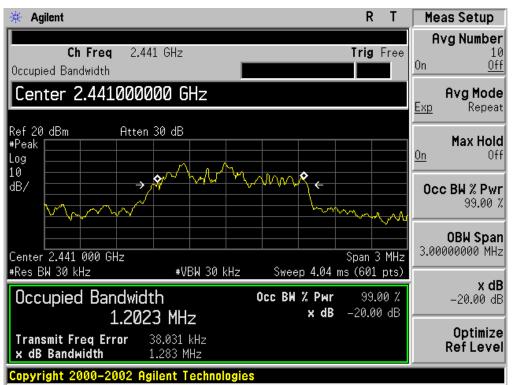


# TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

BLUETOOTH 2MBPS LIMITS AND MEASUREMENT RESUL				
Applicable Limite	Measurement Result			
Applicable Limits	Test Data (MHz)		Criteria	
	Low Channel	1.291	PASS	
N/A	Middle Channel	1.283	PASS	
	High Channel	1.291	PASS	

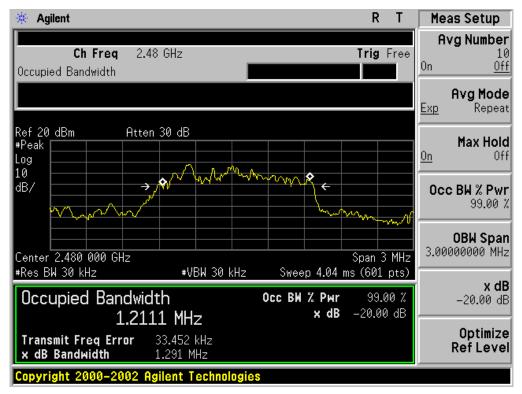


#### TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



# TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

#### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



BLUETOOTH 3MBPS LIMITS AND MEASUREMENT RESUL				
Appliechie Limite	Measurement Result			
Applicable Limits	Test Da	ita (MHz)	Criteria	
	Low Channel	1.227	PASS	
N/A	Middle Channel	1.225	PASS	
	High Channel	1.292	PASS	

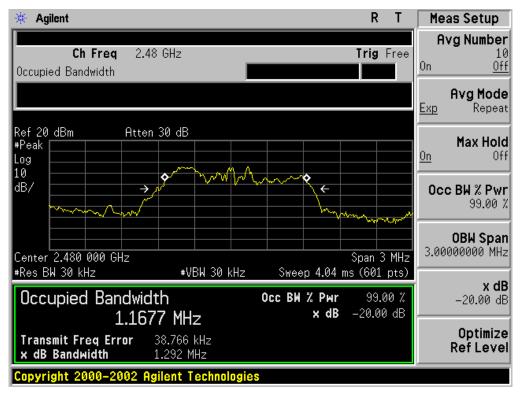
* Agilent R T	Meas Setup
Ch Freq 2.402 GHz Trig Free Occupied Bandwidth	Avg Number 10 0n <u>Off</u>
VBW 30.00000000 kHz	Avg Mode Exp Repeat
Ref 20 dBm Atten 30 dB #Peak Log 10	Max Hold On Off
dB/	Occ BW % Pwr 99.00 %
Center 2.402 000 GHz Span 3 MH	
#Res BW 30 kHz #VBW 30 kHz Sweep 4.04 ms (601 pts   Occupied Bandwidth Occ BW % Pwr 99.00 %   1.1595 MHz × dB -20.00 dB	<b>x dB</b> –20.00 dB
Transmit Freq Error 41.937 kHz x dB Bandwidth 1.227 MHz	Optimize RefLevel
Copyright 2000–2002 Agilent Technologies	

## 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.
- 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 ≥ RBW; Sweep = auto; Detector function = peak.
- 4. Set SPA Trace 1 Max hold, then View.

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

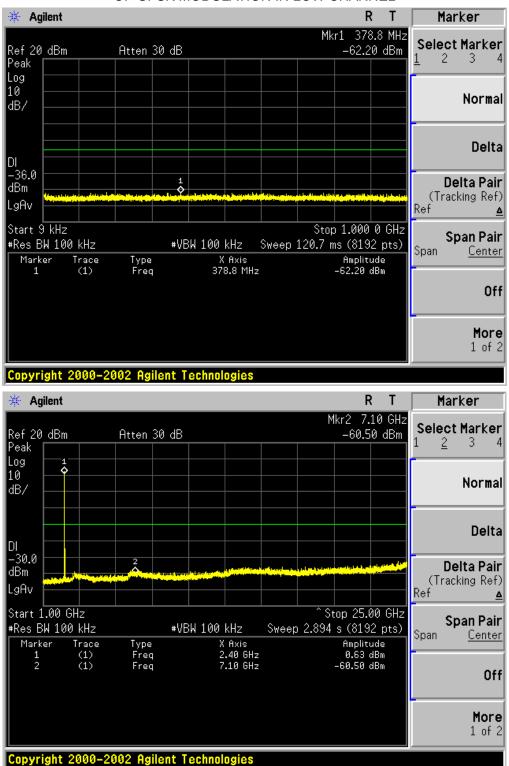
The same as described in section 8.2

## 9.3. MEASUREMENT EQUIPMENT USED

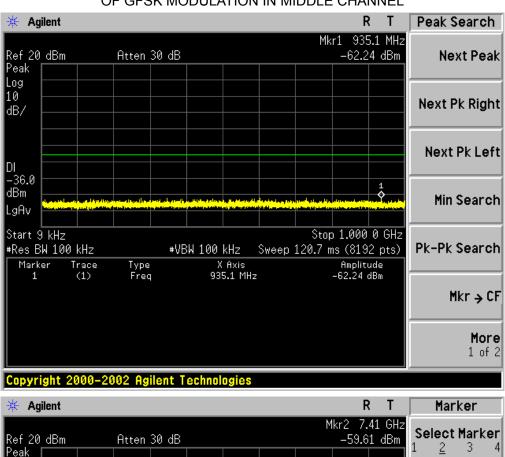
The same as described in section 6

## 9.4. LIMITS AND MEASUREMENT RESULT

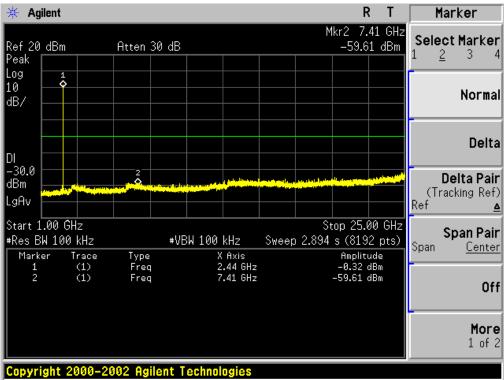
LIMITS AND MEASUREMENT RESULT					
Angliaghta Limita	Measurement Result				
Applicable Limits	Test Data	Criteria			
In any 100 KHz Bandwidth Outside the	At least -20dBc than the limit				
frequency band in which the spread spectrum	Specified on the BOTTOM	PASS			
intentional radiator is operating, the radio frequency	Channel				
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 TOP Channel	PASS			

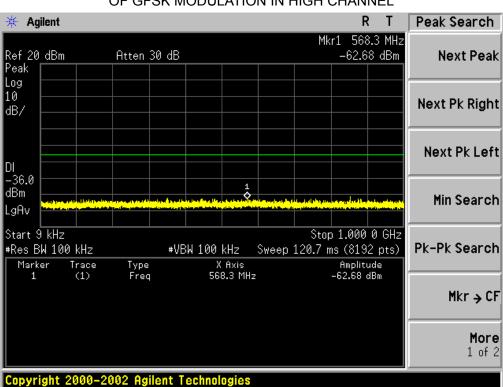


# TEST PLOT OF OUT OF BAND EMISSIONS WITH THE WORST CASE OF GFSK MODULATION IN LOW CHANNEL

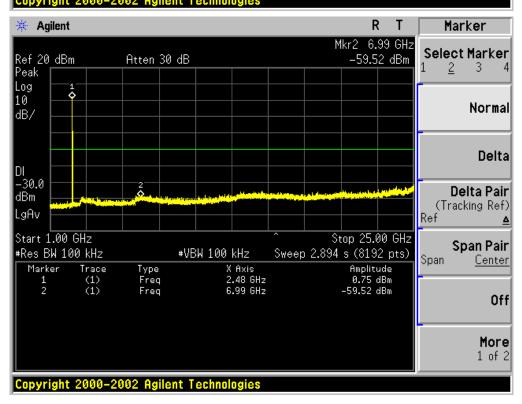


#### TEST PLOT OF OUT OF BAND EMISSIONS OF GFSK MODULATION IN MIDDLE CHANNEL





## 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 1MHz VBW and RBW for peak reading. Then 1MHz 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.

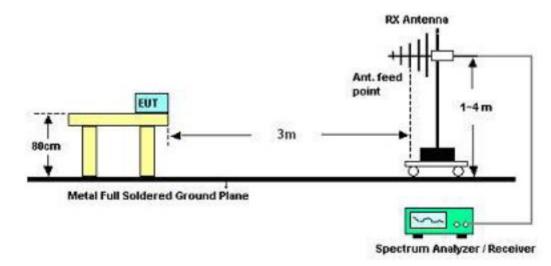
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

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
	1MHz/1MHz for Peak, 1MHz/10Hz for Average

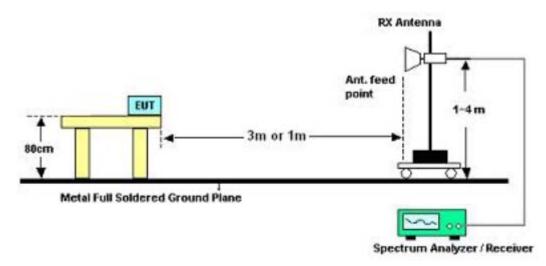
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

#### 10.2. TEST SETUP



## RADIATED EMISSION TEST SETUP 30MHz-1000MHz

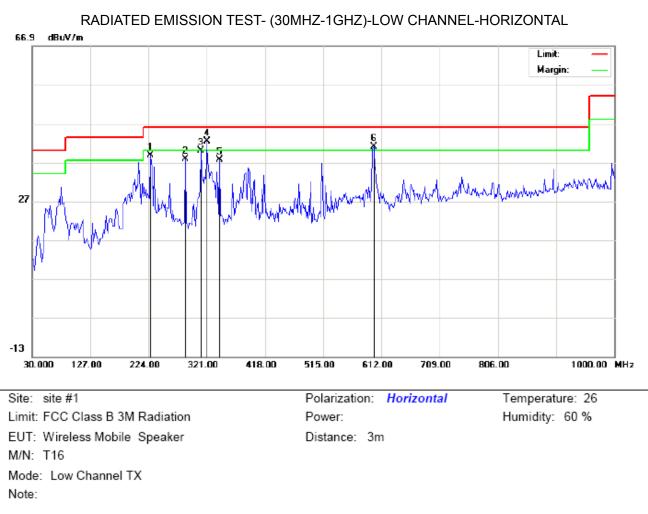
# RADIATED EMISSION TEST SETUP ABOVE 1000MHz



## 10.3. TEST RESULT (Worst Modulation: GFSK)

## **RADIATED EMISSION BELOW 30MHZ**

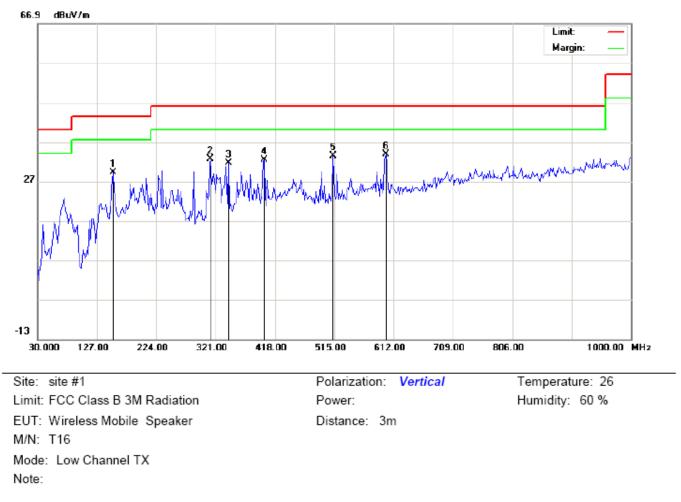
No emission found between lowest internal used/generated frequencies to 30MHz.



#### **RADIATED EMISSION BELOW 1GHZ**

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	•	MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		227.2333	25.83	13.03	38.86	46.00	-7.14	peak			
2		285.4333	22.83	14.97	37.80	46.00	-8.20	peak			
3		311.3000	23.83	16.16	39.99	46.00	-6.01	peak			
4	*	321.0000	25.57	16.81	42.38	46.00	-3.62	peak			
5		342.0167	19.45	18.21	37.66	46.00	-8.34	peak			
6	İ	599.0667	17.35	23.71	41.06	46.00	-4.94	peak			

**RESULT: PASS** 



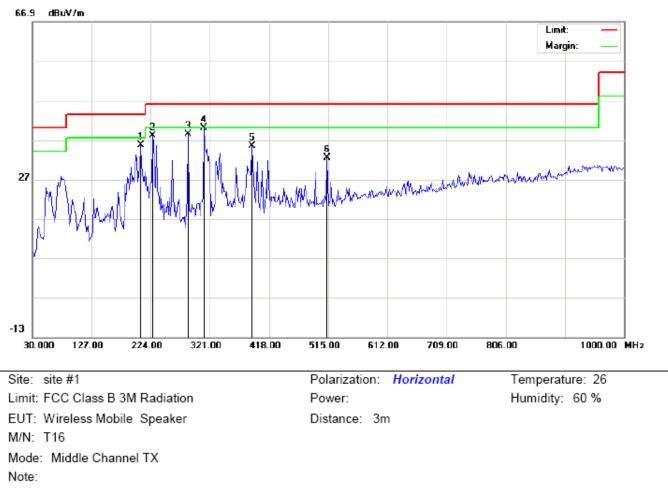
#### RADIATED EMISSION TEST- (30MHZ-1GHZ)-LOW CHANNEL -VERTICAL

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBuV/m	dB		cm	degree	
1		152.8667	13.94	15.28	29.22	43.50	-14.28	peak			
2		312.9167	16.34	16.27	32.61	46.00	-13.39	peak			
3		342.0167	13.43	18.21	31.64	46.00	-14.36	peak			
4		400.2167	13.36	19.08	32.44	46.00	-13.56	peak			
5		513.3833	11.86	21.49	33.35	46.00	-12.65	peak			
6	*	599.0667	11.03	22.73	33.76	46.00	-12.24	peak			

# **RESULT: PASS**

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

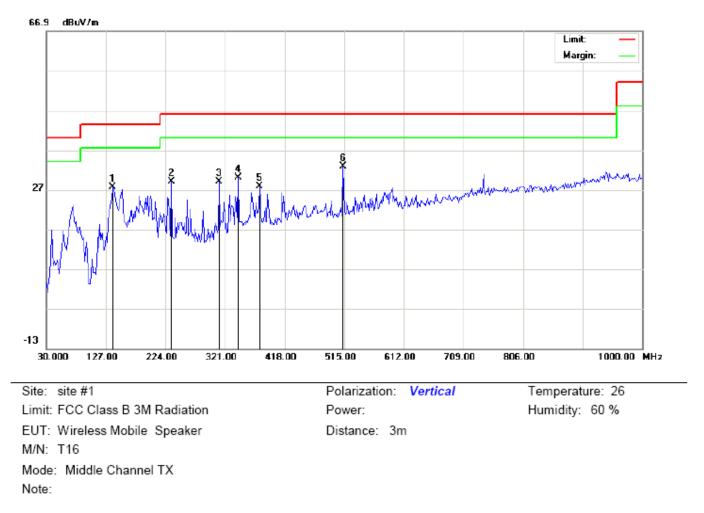
2. The "Factor" value can be calculated automatically by software of measurement system.



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

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		207.8333	23.27	12.30	35.57	43.50	-7.93	peak			
2		227.2333	24.98	13.03	38.01	46.00	-7.99	peak			
3		285.4333	23.53	14.97	38.50	46.00	-7.50	peak			
4	*	311.3000	23.78	16.16	39.94	46.00	-6.06	peak			
5		390.5167	16.33	19.01	35.34	46.00	-10.66	peak			
6		513.3833	10.90	21.49	32.39	46.00	-13.61	peak			

#### **RESULT: PASS**



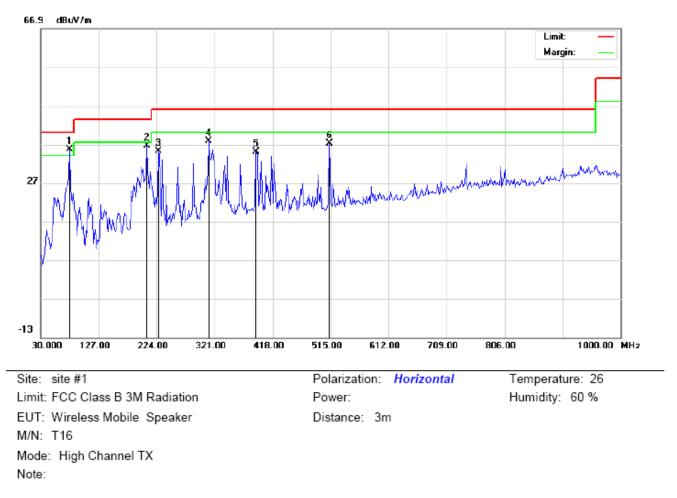
# RADIATED EMISSION TEST- (30MHZ-1GHZ)- MIDDLE CHANNEL -VERTICAL

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		138.3167	13.02	14.50	27.52	43.50	-15.98	peak			
2		233.7000	16.79	12.30	29.09	46.00	-16.91	peak			
3		311.3000	12.80	16.16	28.96	46.00	-17.04	peak			
4		342.0167	11.86	18.21	30.07	46.00	-15.93	peak			
5		377.5833	8.83	18.92	27.75	46.00	-18.25	peak			
6	*	513.3833	11.38	21.49	32.87	46.00	-13.13	peak			

# **RESULT: PASS**

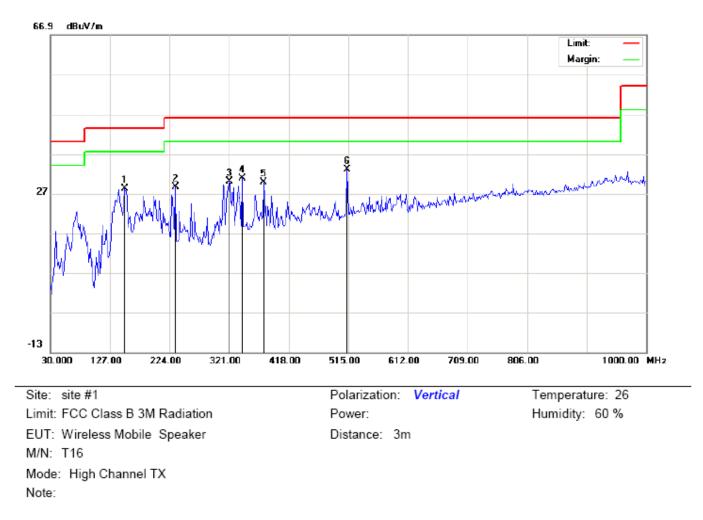
Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

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



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

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height		Comment
	-	MHz	dBu∨	dB/m	dBu\//m	dBuV/m	dB		cm	degree	
1	*	78.5000	25.83	9.87	35.70	40.00	-4.30	peak			
2		207.8333	24.38	12.30	36.68	43.50	-6.82	peak			
3		227.2333	22.18	13.03	35.21	46.00	-10.79	peak			
4		311.3000	21.72	16.16	37.88	46.00	-8.12	peak			
5		390.5167	16.00	19.01	35.01	46.00	-10.99	peak			
6		513.3833	15.65	21.49	37.14	46.00	-8.86	peak			



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

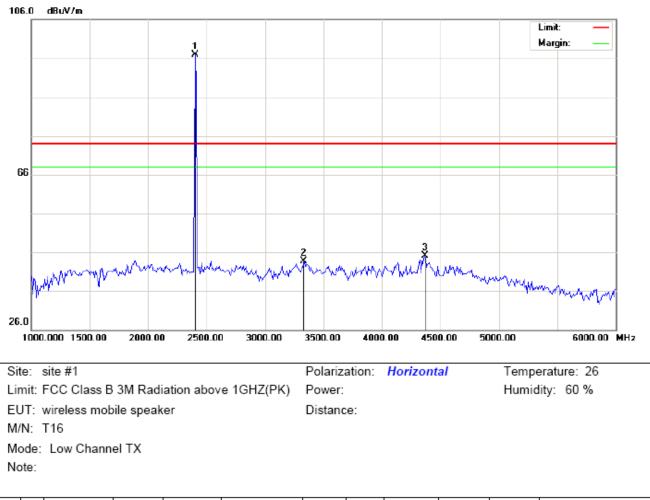
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∨	dB/m	dBu∨/m	dBuV/m	dB		cm	degree	
1		151.2500	12.96	15.27	28.23	43.50	-15.27	peak			
2		233.7000	16.40	12.30	28.70	46.00	-17.30	peak			
3		321.0000	13.27	16.81	30.08	46.00	-15.92	peak			
4		342.0167	12.64	18.21	30.85	46.00	-15.15	peak			
5		377.5833	10.89	18.92	29.81	46.00	-16.19	peak			
6	*	513.3833	11.48	21.49	32.97	46.00	-13.03	peak			

#### **RESULT: PASS**

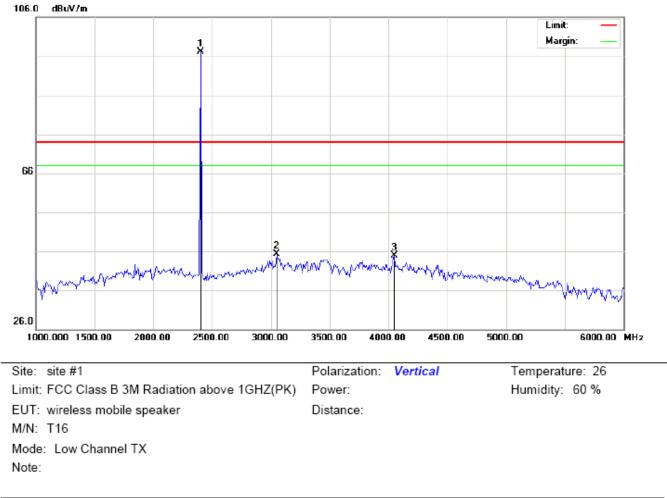
Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

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

# RADIATED EMISSION ABOVE 1GHZ RADIATED EMISSION ABOVE 1GHZ (1-10<sup>th</sup> Harmonics)-LOW CHANNEL-HORIZONTAL

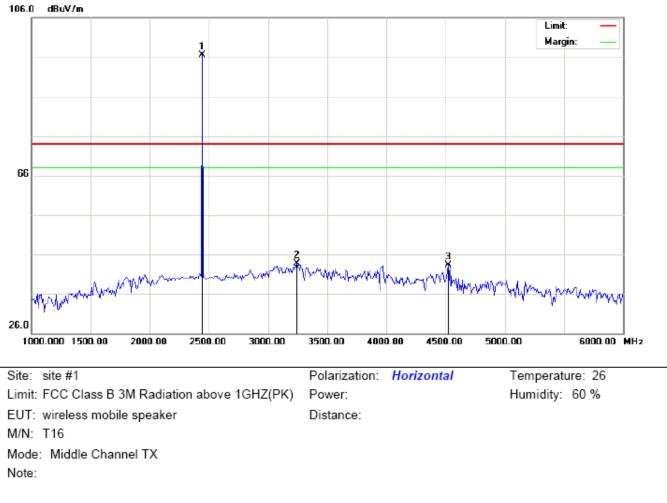


No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	•	MHz	dBu∨	dB/m	dBu\//m	dBuV/m	dB		cm	degree	
1	*	2402.000	86.57	10.32	96.89	74.00	22.89	peak			
2		3333.333	31.80	11.95	43.75	74.00	-30.25	peak			
3		4366.667	35.97	9.10	45.07	74.00	-28.93	peak			



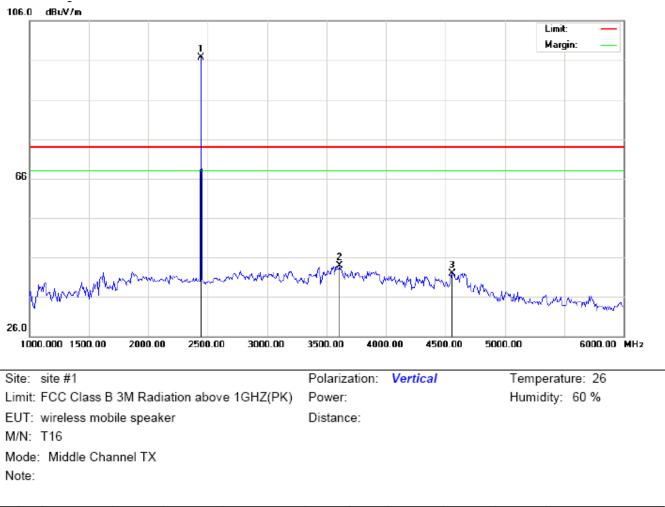
# RADIATED EMISSION ABOVE 1GHZ (1-10<sup>th</sup> Harmonics)-LOW CHANNEL -VERTICAL

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu\//m	dBuV/m	dB		cm	degree	
1	*	2402.000	86.70	10.32	97.02	74.00	23.02	peak			
2		3050.000	33.71	11.69	45.40	74.00	-28.60	peak			
3		4050.000	30.58	14.36	44.94	74.00	-29.06	peak			



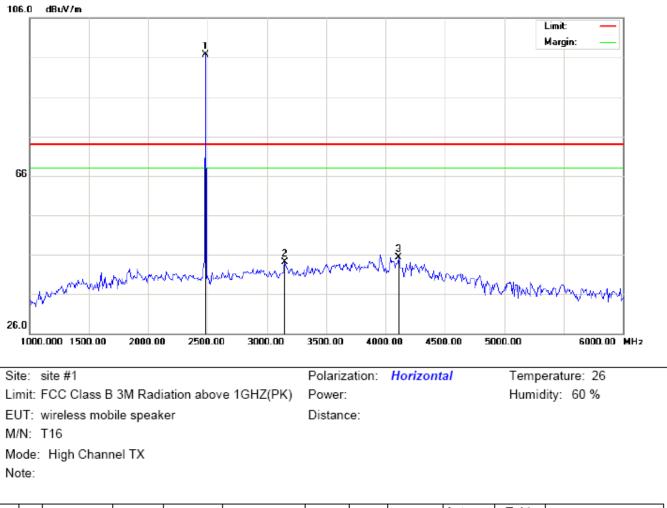
# RADIATED EMISSION ABOVE 1GHZ (1-10<sup>th</sup> Harmonics)-MIDDLE CHANNEL-HORIZONTAL

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	86.11	10.36	96.47	74.00	22.47	peak			
2		3241.667	31.86	11.87	43.73	74.00	-30.27	peak			
3		4525.000	36.35	6.96	43.31	74.00	-30.69	peak			



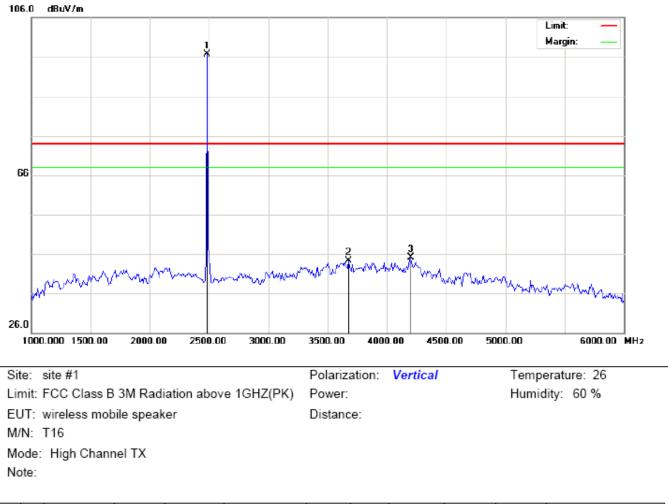
# RADIATED EMISSION ABOVE 1GHZ (1-10<sup>th</sup> Harmonics) - MIDDLE CHANNEL -VERTICAL

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2441.000	86.41	10.36	96.77	74.00	22.77	peak			
2		3608.333	31.08	12.78	43.86	74.00	-30.14	peak			
3		4558.333	34.92	7.04	41.96	74.00	-32.04	peak			



# RADIATED EMISSION ABOVE 1GHZ (1-10<sup>th</sup> Harmonics)-HIGH CHANNEL-HORIZONTAL

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	•	MHz	dBu∀	dB/m	dBu\//m	dBuV/m	dB		cm	degree	
1	*	2480.000	86.39	10.41	96.80	74.00	22.80	peak			
2		3150.000	32.24	11.78	44.02	74.00	-29.98	peak			
3		4108.333	31.94	13.39	45.33	74.00	-28.67	peak			



# RADIATED EMISSION ABOVE 1GHZ (1-10<sup>th</sup> Harmonics)-HIGH CHANNEL –VERTICAL

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	86.26	10.41	96.67	74.00	22.67	peak			
2		3675.000	31.21	13.19	44.40	74.00	-29.60	peak			
3		4200.000	33.14	11.87	45.01	74.00	-28.99	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>=100kHz, VBW>=3\*RBW, Center frequency =Operation frequency
- 3. The band edges was measured and recorded.

# 11.2. TEST SET-UP

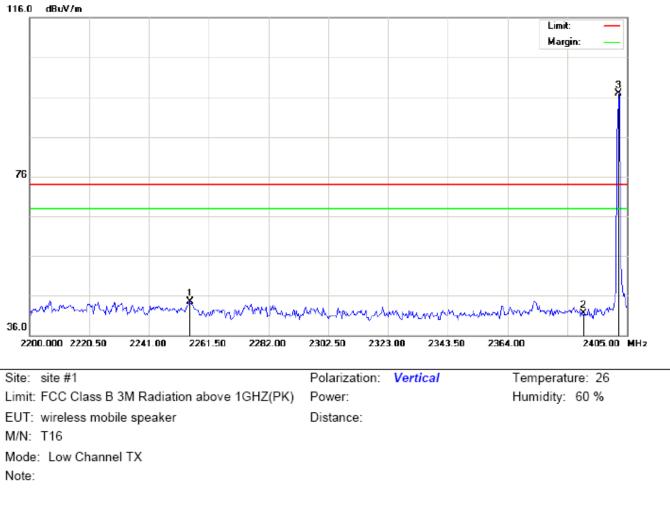
Radiated same as 10.2

# 116.0 dBuV/m Limit: Margin: 76 36.0 2343.50 2200.000 2220.50 2241.00 2261.50 2282.00 2302.50 2323.00 2364.00 2405.00 MHz Temperature: 26 Site: site #1 Polarization: Horizontal Limit: FCC Class B 3M Radiation above 1GHZ(PK) Humidity: 60 % Power: EUT: wireless mobile speaker Distance: M/N: T16 Mode: Low Channel TX Note:

# 11.3. TEST RESULT (Worst Modulation: GFSK)

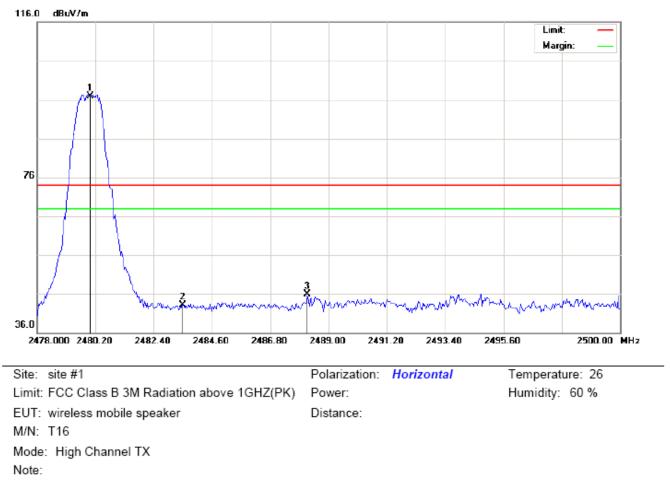
TEST PLOT OF BAND EDGE FOR LOW CHANNEL (1Mbps)-Horizontal

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∀	dB/m	dBu∀/m	dBuV/m	dB		cm	degree	
1		2284.733	34.61	10.19	44.80	74.00	-29.20	peak			
2		2390.000	30.50	10.31	40.81	74.00	-33.19	peak			
3	*	2402.000	86.72	10.32	97.04	74.00	23.04	peak			



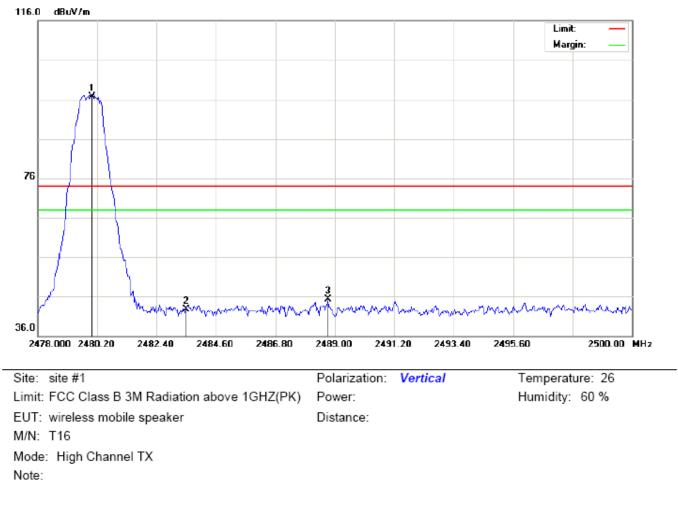
# TEST PLOT OF BAND EDGE FOR LOW CHANNEL (1Mbps)-Vertical

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2255.008	34.36	10.16	44.52	74.00	-29.48	peak			
2		2390.000	31.21	10.31	41.52	74.00	-32.48	peak			
3	*	2402.000	86.59	10.32	96.91	74.00	22.91	peak			



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

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	•	MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	86.55	10.41	96.96	74.00	22.96	peak			
2		2483.500	32.69	10.41	43.10	74.00	-30.90	peak			
3		2488.193	35.48	10.42	45.90	74.00	-28.10	peak			



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

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
	-	MHz	dBu∨	dB/m	dBu∀/m	dBuV/m	dB		cm	degree	
1	*	2480.000	86.32	10.41	96.73	74.00	22.73	peak			
2		2483.500	32.26	10.41	42.67	74.00	-31.33	peak			
3		2488.743	34.97	10.42	45.39	74.00	-28.61	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>=1%span, VBW>=RBW.

#### 12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

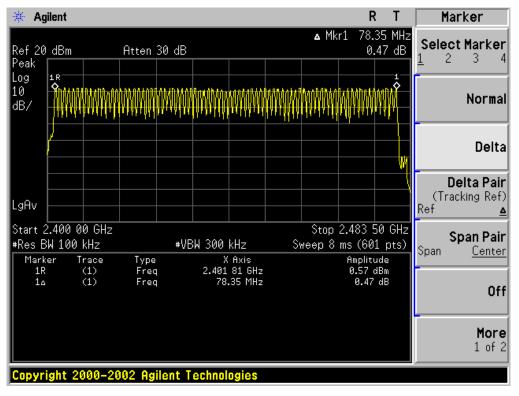
Same as described in section 8.2

#### 12.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

#### **12.4. LIMITS AND MEASUREMENT RESULT**

TOTAL NO. OF	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
HOPPING CHANNEL	>=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 hoping 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**

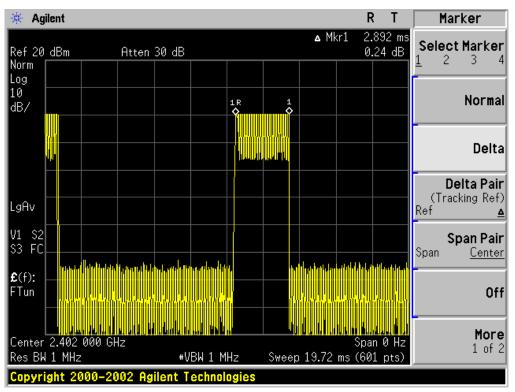
The same as described in section 6

#### **13.4. LIMITS AND MEASUREMENT RESULT**

Channel	Time of Pulse for DH5 (ms)	Period Time (s)	Sweep Time (ms)	Limit (ms)
Low	2.892	31.6	308.48	400
Middle	2.925	31.6	312.00	400
High	2.958	31.6	315.52	400

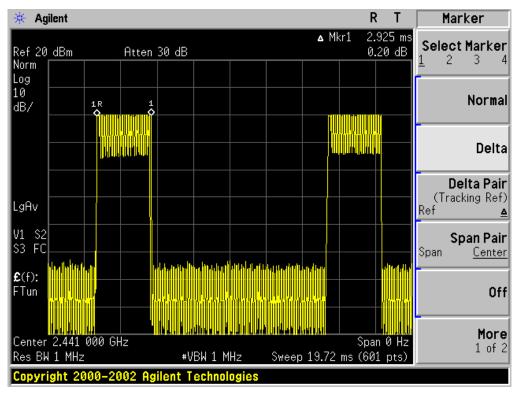
The Worst Case (3Mbps)

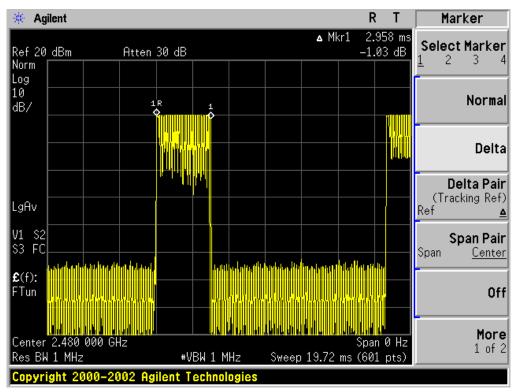
Low Channel Time 2.892\*(1600/6)/79\*31.6=308.48ms Middle Channel Time 2.925\*(1600/6)/79\*31.6=312.00ms High Channel Time 2.958\*(1600/6)/79\*31.6=315.52ms



# 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
- Set Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span Video (or Average) Bandwidth (VBW) ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold

#### 14.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

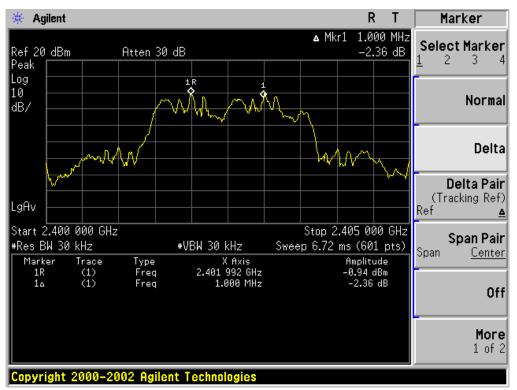
Same as described in section 6.2

#### 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	Daga
CH00-CH01	1000	>=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**

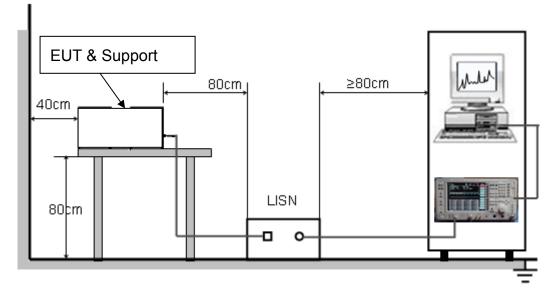
Frequency	Maximum RF	Line Voltage			
Frequency	Q.P.( dBuV)	Average( dBuV)			
150kHz~500kHz	66-56	56-46			
500kHz~5MHz	56	46			
5MHz~30MHz	60	50			

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.

# 15.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



### 15.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

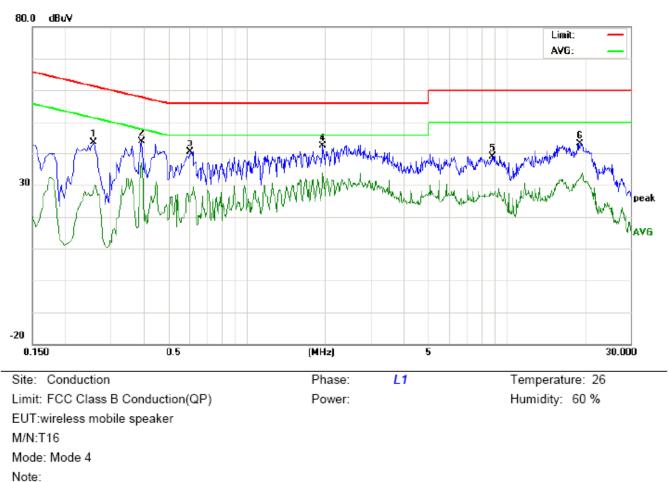
- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground 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/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.

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

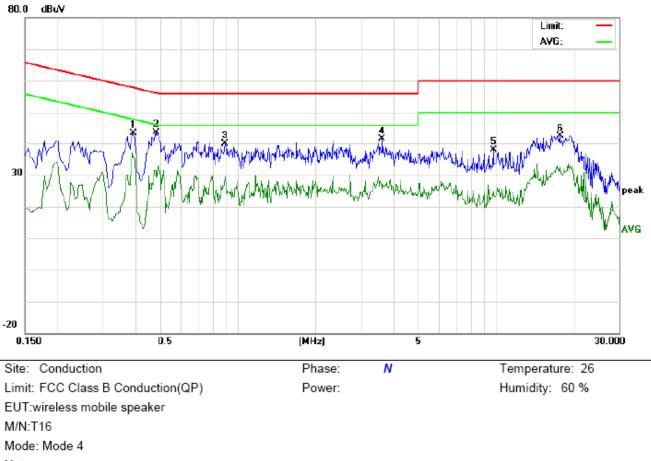
- 1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used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

No.	Freq. (d		ding_L (dBuV)		Correct Factor		asuren (dBuV)			nit uV)		rgin IB)	P/F	Comment
	(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.2580	33.34		18.57	10.27	43.61		28.84	61.49	51.49	-17.88	-22.65	Р	
2	0.3940	33.52		26.43	10.33	43.85		36.76	57.98	47.98	-14.13	-11.22	Р	
3	0.6060	30.16		14.33	10.31	40.47		24.64	56.00	46.00	-15.53	-21.36	Р	
4	1.9660	32.23		23.55	10.23	42.46		33.78	56.00	46.00	-13.54	-12.22	Р	
5	8.7780	28.70		17.07	10.27	38.97		27.34	60.00	50.00	-21.03	-22.66	Р	
6	19.1820	33.08		22.59	10.12	43.20		32.71	60.00	50.00	-16.80	-17.29	Р	



#### Line Conducted Emission Test Line 2-N

Note:

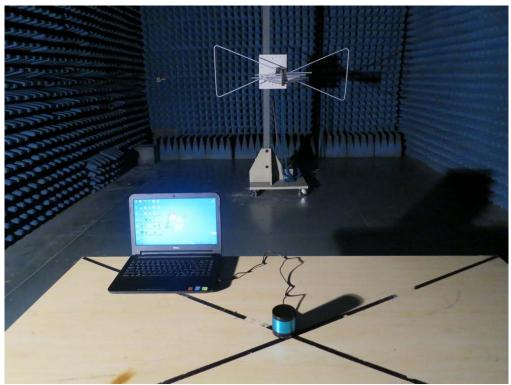
No.	No. Freq.		ading_L (dBuV)		Correct Factor	Me	easuren (dBuV)		1	nit uV)	Mai (c	rgin IB)	P/F	Comment
	(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.3940	33.00		25.91	10.33	43.33		36.24	57.98	47.98	-14.65	-11.74	Р	
2	0.4820	33.34		21.08	10.39	43.73		31.47	56.30	46.30	-12.57	-14.83	Р	
3	0.8900	29.49		18.91	10.40	39.89		29.31	56.00	46.00	-16.11	-16.69	Р	
4	3.6300	30.97		15.24	10.49	41.46		25.73	56.00	46.00	-14.54	-20.27	Р	
5	9.7739	27.54		14.73	10.22	37.76		24.95	60.00	50.00	-22.24	-25.05	Р	
6	17.7180	32.27		22.28	10.12	42.39		32.40	60.00	50.00	-17.61	-17.60	Р	

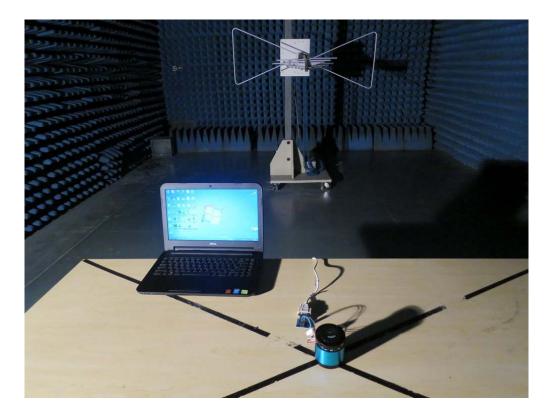
# APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC LINE CONDUCTED EMISSION TEST SETUP



FCC RADIATED EMISSION TEST SETUP



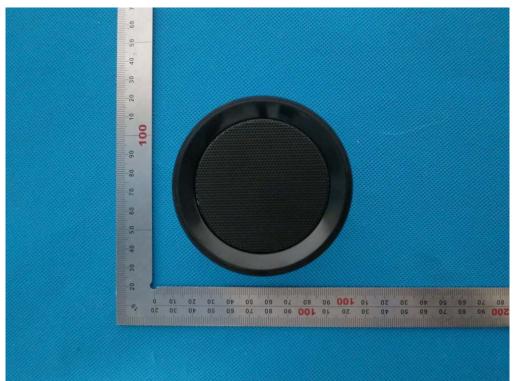


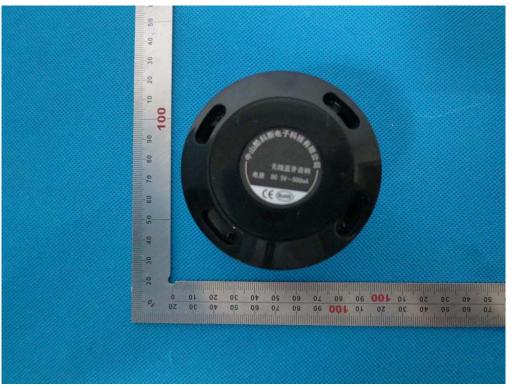


**APPENDIX B: PHOTOGRAPHS OF EUT** 

All VIEW OF EUT

TOP VIEW OF EUT





BOTTOM VIEW OF EUT

FRONT VIEW OF EUT

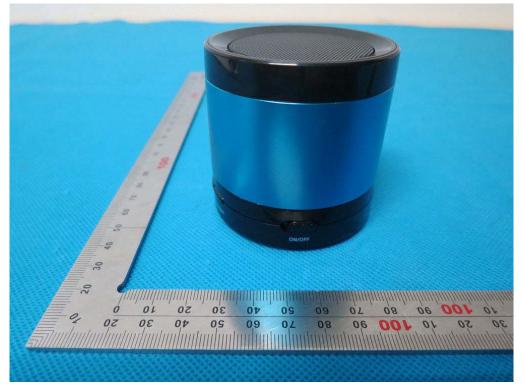




BACK VIEW OF EUT

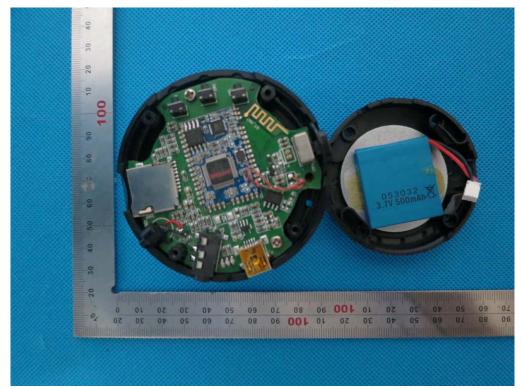
LEFT VIEW OF EUT

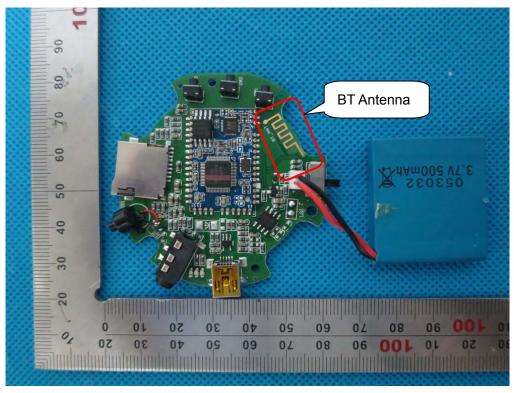




RIGHT VIEW OF EUT

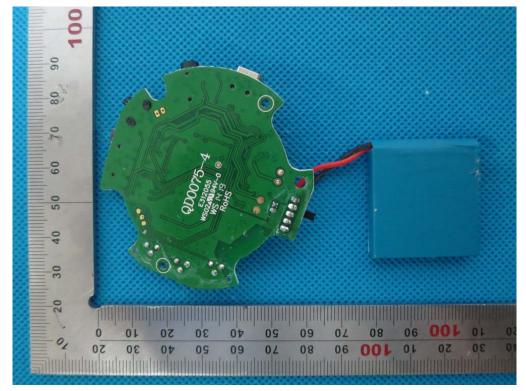
OPEN VIEW OF EUT



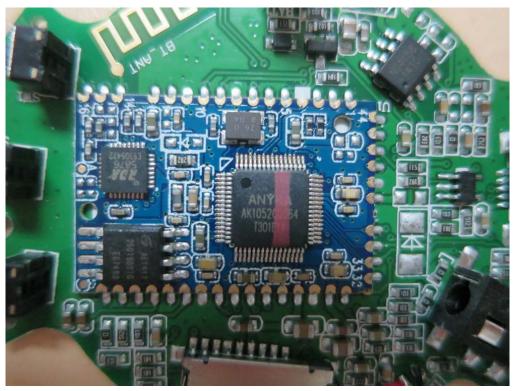


**INTERNAL VIEW OF EUT-1** 

**INTERNAL VIEW OF EUT-2** 



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**INTERNAL VIEW OF EUT-3** 

----END OF REPORT----