

Report No: File reference No:	FCC 1509077 2015-09-22
Applicant:	ADDON Technology.
Product:	Portable speaker
Model No:	TS217 WeariT, Brionvega WeariT, BV3320-I
Trademark:	Brionvega
Test Standards:	FCC Part 15.247
Test result:	It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15 Subpart C, Paragraph 15.247 regulations for the evaluation of

electromagnetic compatibility

Approved By

Jack Chung

Jack Chung

Manager

Dated:

September 22, 2015

Results appearing herein relate only to the sample tested The technical reports is issued errors and omissions exempt and is subject to withdrawal at

# SHENZHEN TIMEWAY TESTING LABORATORIES

Room 512-519, 5/F., East Tower, Building 4, Anhua Industrial Zone, Futian District, Shenzhen, Guangdong, China Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timewaytech.com



## **Special Statement**:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

## CNAS-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of testing Laboratories.

## FCC-Registration No.: 899988

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.:899988.

## IC- Registration No.: IC5205A-02

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration No.: IC 5205A-02.

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## 1.0 General Details

### 1.1 Test Lab Details

Name :SHENZHEN TIMEWAY TESTING LABORATORIES.Address:Room 512-519,5/F., East Tower,Building 4, Anhua Industrial Zone, Futian District,Shenzhen,<br/>Guangdong ChinaTelephone:(755) 83448688Fax:(755) 83442996Site on File with the Federal Communications Commission – United SatesRegistration Number: 899988For 3m & 10 m OATSSite Listed with Industry Canada of Ottawa, CanadaRegistration Number: IC: 5205A-02For 3m & 10 m OATS

## 1.2 Applicant Details

Applicant:	ADDON Technology
Address:	1F., No.11, Lane 206, Sec. 1, Da An Road, Taipei City 10684, Taiwan
Telephone:	+886 (2) 2325-3569
Fax:	+886 (2) 2706-9692

## 1.3 Description of EUT

Product:	Portable speaker
Manufacturer:	ADDON Technology
Address:	1F., No.11, Lane 206, Sec. 1, Da An Road, Taipei City 10684, Taiwan
Brand Name:	Brionvega
Model Number:	TS217 WeariT
Additional Model Nurr	aber: Brionvega WeariT, BV3320-I
Type of Modulation	GFSK, 刀/4DQPSK, 8DPSK for Bluetooth
Frequency range	2402-2480MHz for Bluetooth
Channel Spacing	1MHz for Bluetooth
Frequency Selection	By software
Channel Number	79 channel for Bluetooth
Antenna:	PCB Antenna and the maximum Gain of this antenna is 1.13dBi

### 1.4 Submitted Sample: 2 Samples

#### 1.5 Test Duration

2015-09-17 to 2015-09-21

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1.6 Test Uncertainty Conducted Emissions Uncertainty =3.6dB Radiated Emissions Uncertainty =4.7dB

1.7 Test Engineer

Terry Tang

The sample tested by

Print Name: Terry Tang

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2.0 Test Equipments					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2015-08-22	2016-08-21
TWO Line-V-NETW	R&S	EZH3-Z5	100294	2015-08-22	2016-08-21
TWO Line-V-NETW	R&S	EZH3-Z5	100253	2015-08-22	2016-08-21
Ultra Broadband ANT	R&S	HL562	100157	2015-08-23	2016-08-22
ESDV Test Receiver	R&S	ESDV	100008	2015-08-22	2016-08-21
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2015-08-22	2016-08-21
System Controller	СТ	SC100	-		
Printer	EPSON	РНОТО ЕХЗ	CFNH234850		
Computer	IBM	8434	1S8434KCE99BLXLO*	-	-
Loop Antenna	EMCO	6502	00042960	2015-08-23	2016-08-22
ESPI Test Receiver	R&S	ESI26	838786/013	2015-08-22	2016-08-23
3m OATS			N/A	2015-08-24	2016-08-23
Horn Antenna	R&S	BBHA 9170	BBHA9170265	2015-08-24	2016-08-23
Horn Antenna	R&S	BBHA 9120D	9120D-631	2015-08-24	2016-08-23
Power meter	Anritsu	ML2487A	6K00003613	2015-08-22	2016-08-21
Power sensor	Anritsu	MA2491A	32263	2015-08-22	2016-08-21
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2015-08-23	2016-08-21
LISN	AFJ	LS16C	10010947251	2015-08-22	2016-08-21
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2015-08-23	2016-08-22
9*6*6 Anechoic			N/A	2015-08-24	2016-08-23
EMI Test Receiver	RS	ESCS30	100139	2015-08-22	2016-08-21

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## 3.0 Technical Details

## 3.1 Summary of test results

The EUT has been tested according to the following specifications:						
Requirement	CFR 47 Section	Result	Notes			
Antenna Requirement	15.203, 15.247(b)(4)	PASS	Complies			
Maximum Peak Out Power	15.247 (b)(1), (4)	PASS	Complies			
Carrier Frequency Separation	15.247(a)(1)	PASS	Complies			
20dB Channel Bandwidth	15.247 (a)(1)	PASS	Complies			
Number of Hopping Channels	15.247(a)(iii), 15.247(b)(1)	PASS	Complies			
Time of Occupancy (Dwell Time)	15.247(a)(iii)	PASS	Complies			
Spurious Emission, Band Edge, and Restricted bands	15.247(d),15.205(a), 15.209 (a),15.109	PASS	Complies			
Conducted Emissions	15.207(a), 15.107	PASS	Complies			
<b>RF</b> Exposure	15.247(i), 1.1307(b)(1)	PASS	Complies			

## 3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247, ANSI C63.4:2014 and ANSI C63.10:2013

### 4.0 EUT Modification

No modification by Shenzhen Timeway Technology Consulting Co., Ltd

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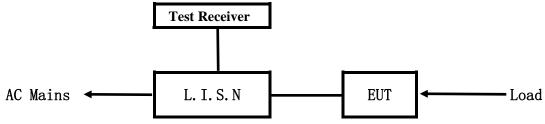
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## 5. Power Line Conducted Emission Test

5.1 Schematics of the test

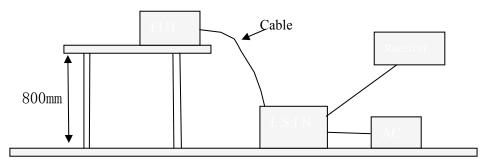


EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10 –2013. Test Voltage: 120V~60Hz

Block diagram of Test setup



5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

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A. EUT

Device	Manufacturer	Model	FCC ID
Portable speaker	ADDON Technology	TS217 WeariT, Brionvega WeariT, BV3320-I	Z2HBV3320I

### B. Internal Device

Device	Manufacturer	Model	Rating

### C. Peripherals

Device	Manufacturer	Model	Cable		
Power	Ruiheng	RH-050100US	Input: 100-240V~, 0.2A, 50/60Hz,		
Supply			Output: DC5V, 1A		

## 5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

### 5.5 Power line conducted Emission Limit according to Paragraph 15.107, 15.207

Frequency	Class A Lim	nits (dB µ V)	Class B Limits (dB µ V)			
(MHz)	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level		
$0.15 \sim 0.50$	79.0	66.0	66.0~56.0*	56.0~46.0*		
$0.50~\sim~5.00$	73.0	60.0	56.0	46.0		
$5.00 \sim 30.00$	73.0	60.0	60.0	50.0		

Notes: 1. \*Decreasing linearly with logarithm of frequency.

2. The tighter limit shall apply at the transition frequencies

## 5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

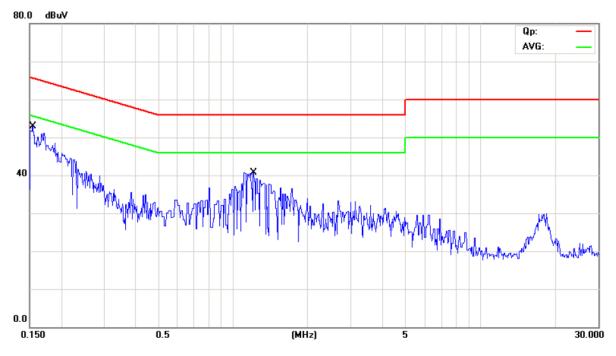
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A: Conducted Emission on Live Terminal (150kHz to 30MHz) **EUT Operating Environment** Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa **EUT set Condition: Keep Bluetooth Transmitting Equipment Level: Class B Results: PASS** Please refer to following diagram for individual



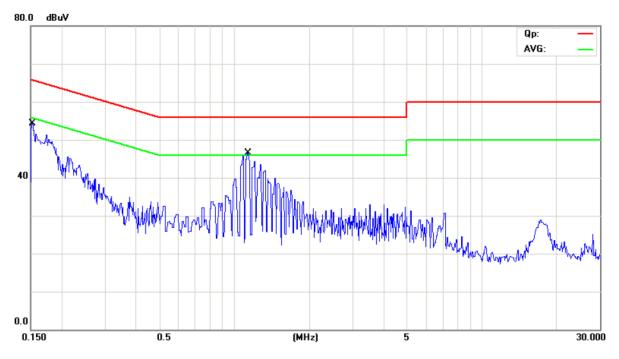
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1543	33.40	11.00	44.40	65.77	-21.37	QP	
2	0.1543	-1.60	11.00	9.40	55.77	-46.37	AVG	
3	1.2118	18.50	11.98	30.48	56.00	-25.52	QP	
4	1.2118	-0.30	11.98	11.68	46.00	-34.32	AVG	

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B: Conducted Emission on Neutral Terminal (150kHz to 30MHz) **EUT Operating Environment** Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa **EUT set Condition: Keep Bluetooth Transmitting Equipment Level: Class B Results: Pass** Please refer to following diagram for individual



No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1524	31.70	11.00	42.70	65.87	-23.17	QP	
2	0.1524	0.90	11.00	11.90	55.87	-43.97	AVG	
3 *	1.1341	24.00	11.95	35.95	56.00	-20.05	QP	
4	1.1341	-6.70	11.95	5.25	46.00	-40.75	AVG	

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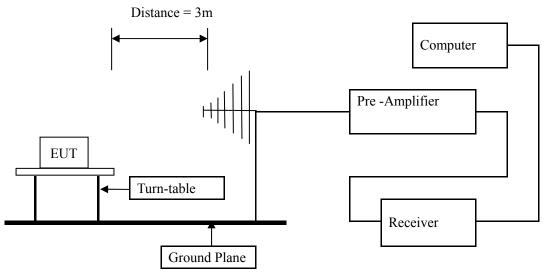


## 6 Radiated Emission Test

## 6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.899988
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.
- (3) The frequency spectrum from 30 MHz to 25GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "**QP**" in the data table.
- (6) The antenna polarization : Vertical polarization and Horizontal polarization.

### Block diagram of Test setup



- 6.2 Configuration of The EUT Same as section 5.3 of this report
- 6.3 EUT Operating Condition

Same as section 5.4 of this report.

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## 6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

Frequencies in restricted band are	complied to limit or	Paragraph 15 200 and	15 100 and PSS_210
riequencies in restricted band are	complied to milit of	1 Falagiaph 15.209 anu	15.109 and KSS-210

<b>_</b>		
Frequency Range (MHz)	Distance (m)	Field strength (dB $\mu$ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1. RF Voltage (dBuV) =  $20 \log RF$  Voltage (uV)

2. In the Above Table, the higher limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

4. This is a handhold device. The radiated emissions should be tested under 3-axes position (Lying, Side,

and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.

5. All modulation have been tested ,GFSK was found as the worst case and only reported

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## **Test result** General Radiated Emission Data and Harmonics Radiated Emission Data

## Radiated Emission In Horizontal/Vertical (30MHz----1000MHz)

EUT set Condition: Keep Bluetooth Transmitting

**Results:** 

Pass

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB µ V/m)
30.800	31.13	Н	40.00
958.200	40.42	Н	46.00
256.120	34.24	Н	46.00
78.360	32.30	V	40.00
958.280	41.90	V	46.00
30.680	36.44	V	40.00

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Η MARKER 3 RBW 120 kHz Marker 3 [T1 ] 31.13 dBµV/m 30.8 MHz МΤ 50 µs Att 10 dB PREAMP ON 30.80000000 MHz dBµV 80 100 MHz 1 GHz Marker 1 [T1 /m dBµV/m 42 40 200000000 958 MHz 70 Ma rkei 1 1 РК МАХН 34 24 dB ιV m 256 120000000 M Hz 60 TDF -50 1 FCC15 BF Ţ ٨ 6DB 1.1 Malahata 0 M munerwhelp -20 W wh. -10 0 1 GHz

30 MHz

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Test Figure:

Test Figure:



V RBW 120 kHz Marker 3 [T1 ] 32.30 dBµV/m MТ 50 µs Att 10 dB PREAMP ON 78.36000000 MHz dBµV 80 100 MHz 1 GHz Marker 1 [T1 /m 90 dBµV/m 41 280000000 958 MHz 70 Ma ckei Ι 1 РК МАХН 36 44 dB ιV 'n 30 680000000 M Hz 60 TDF -50 1 FCC15 ਤਸ when whe Nu muhum 6DB when he a the when when when the -20 10 0

30 MHz

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1 GHz



Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB µ V/m)
	Н	74(Peak)/ 54(AV)
	V	74(Peak)/ 54(AV)
	H/V	74(Peak)/ 54(AV)
		H    V    H/V    H/V

## **Operation Mode: Transmitting under Low Channel (2402MHz)**

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured

## **Operation Mode: Transmitting g under Middle Channel (2441MHz)**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB µ V/m)
4882		Н	74(Peak)/ 54(AV)
4882		V	74(Peak)/ 54(AV)
7323		H/V	74(Peak)/ 54(AV)
9764		H/V	74(Peak)/ 54(AV)
12205		H/V	74(Peak)/ 54(AV)
14646		H/V	74(Peak)/ 54(AV)
17087		H/V	74(Peak)/ 54(AV)
19528		H/V	74(Peak)/ 54(AV)
21969		H/V	74(Peak)/ 54(AV)
24410		H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured

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Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB µ V/m)
4960		Н	74(Peak)/ 54(AV)
4960		V	74(Peak)/ 54(AV)
7440		H/V	74(Peak)/ 54(AV)
9920		H/V	74(Peak)/ 54(AV)
12400		H/V	74(Peak)/ 54(AV)
14880		H/V	74(Peak)/ 54(AV)
17360		H/V	74(Peak)/ 54(AV)
19840		H/V	74(Peak)/ 54(AV)
22320		H/V	74(Peak)/ 54(AV)
24800		H/V	74(Peak)/ 54(AV)

## **Operation Mode: Transmitting under High Channel (2480MHz)**

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured

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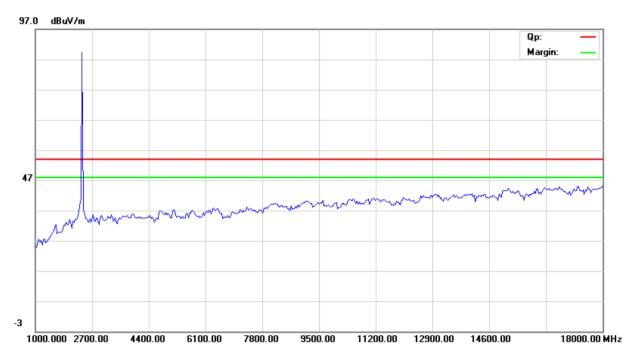
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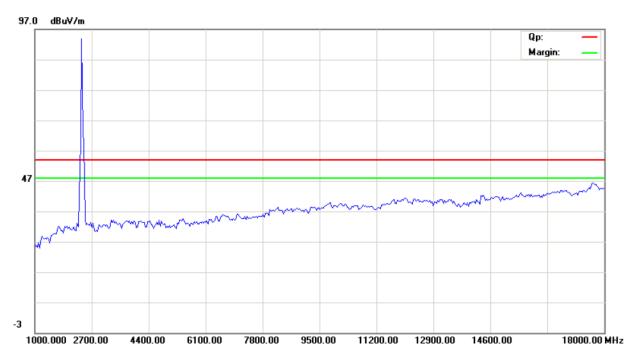


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Please refer to the following test plots for details: Low Channel: Horizontal



#### Low Channel : Vertical

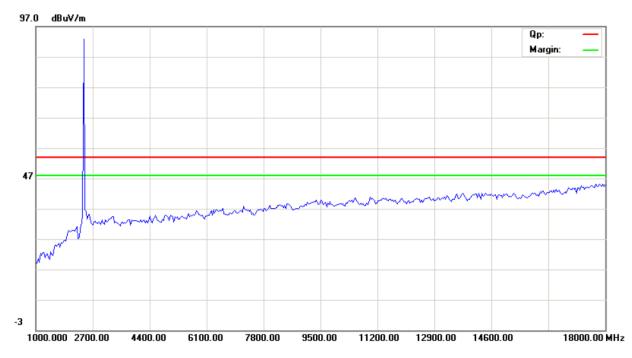


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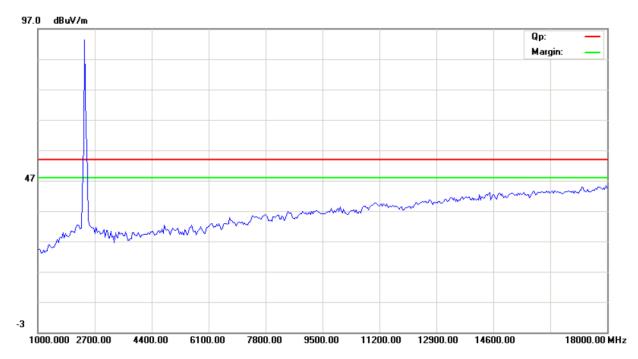
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## **Middle Channel : Horizontal**

#### **Middle Channel : Vertical**



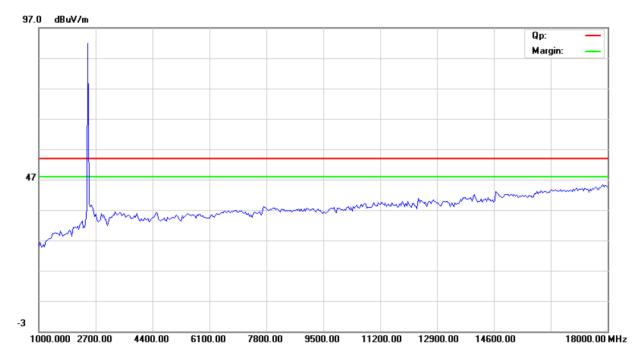
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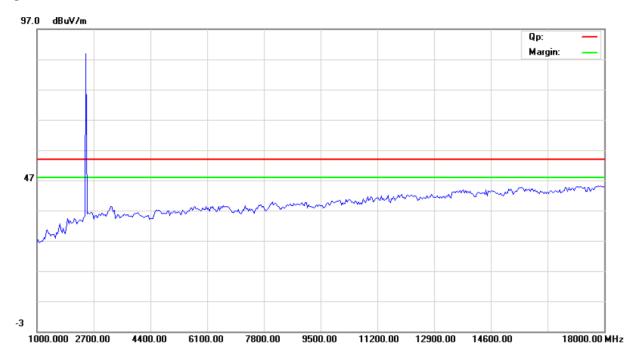
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#### **High Channel : Horizontal**



#### **High Channel : Vertical**



## Note: for the radiated emissions above 18G, it is the floor noise.

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## 7.0 20dB Bandwidth Measurement

## 7.1 Regulation

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

## 7.2 Limits of 20dB Bandwidth Measurement

N/A

## 7.3 Test Procedure.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.

2. Set the spectrum analyzer as follows: Span =3MHz, RBW =30 kHz, VBW=100 kHz, Sweep = auto Detector function = peak, Trace = max hold

3. Measure the highest amplitude appearing on spectral display and record the level to calculate results. 6. Repeat above procedures until all frequencies measured were complete.

## 7.4 Test Result

EUT	Po	Portable speaker		TS217 WeariT
Mode	Ke	Keep Transmitting		DC3.7V
Temperate	ure	24 deg. C,		56% RH
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
Low	2402	878		Pass
Middle	2441	878		Pass
High	2480	866		Pass

### **Type of Modulation: GFSK**

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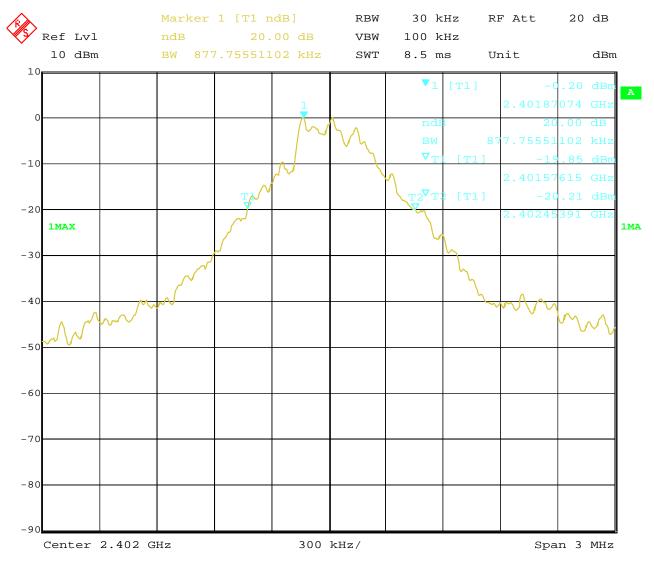
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### Test Figure:

#### 1. Condition: Low Channel



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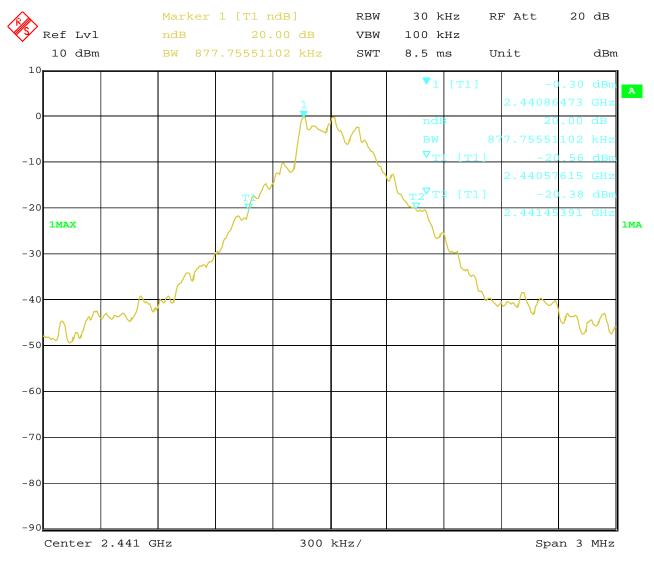
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## 2. Condition: Middle Channel



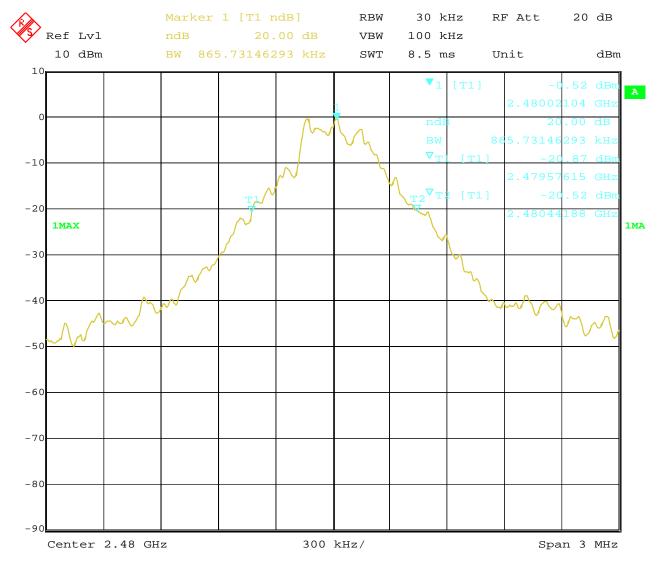
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## 3. High Channel



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## **Test Result Type of Modulation:** Л/4DQPSK

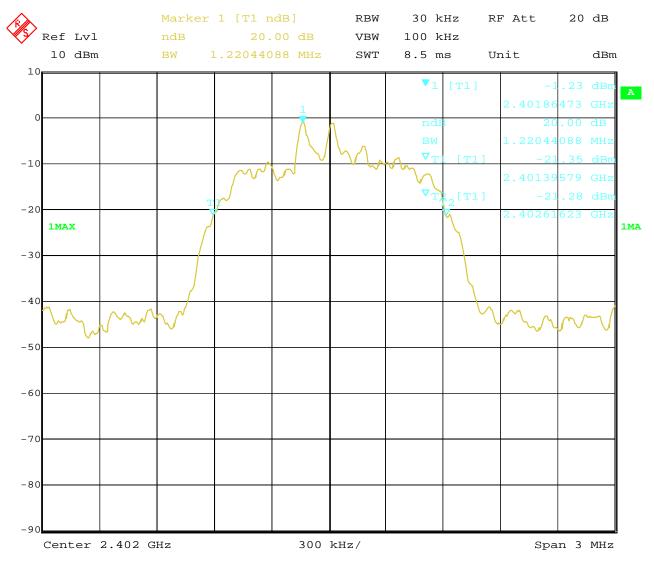
EUT	F	Portable speaker		TS217 WeariT
Mode	K	Keep Transmitting		DC3.7V
Temperat	ure	24 deg. C,		56% RH
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
Low	2402	1220		Pass
Middle	2441	1220		Pass
High	2480	1220		Pass

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## Test Figure:

#### 1. Condition: Low Channel

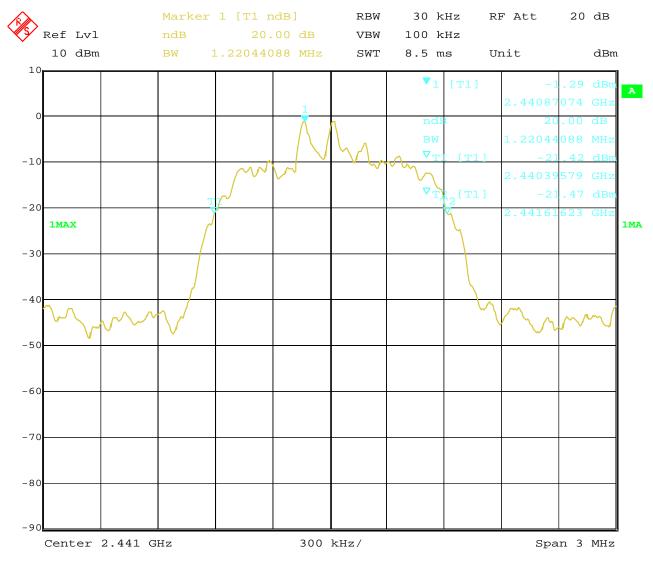


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## 2. Condition: Middle Channel



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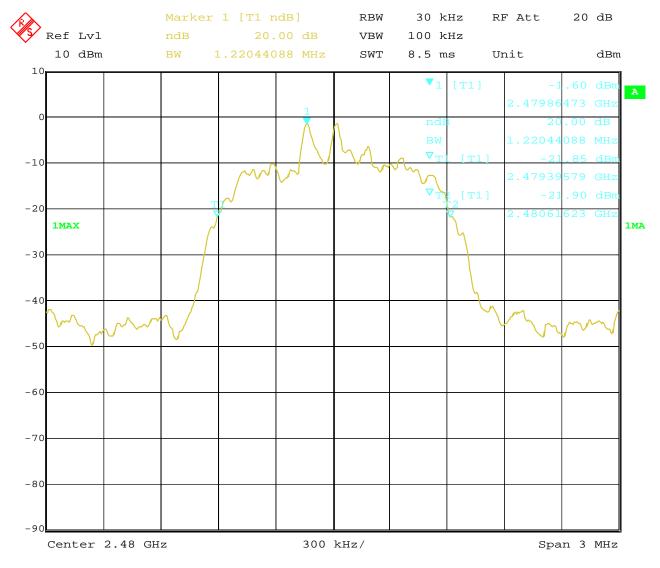
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## 3. High Channel



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## **Test Result Type of Modulation: 8DPSK**

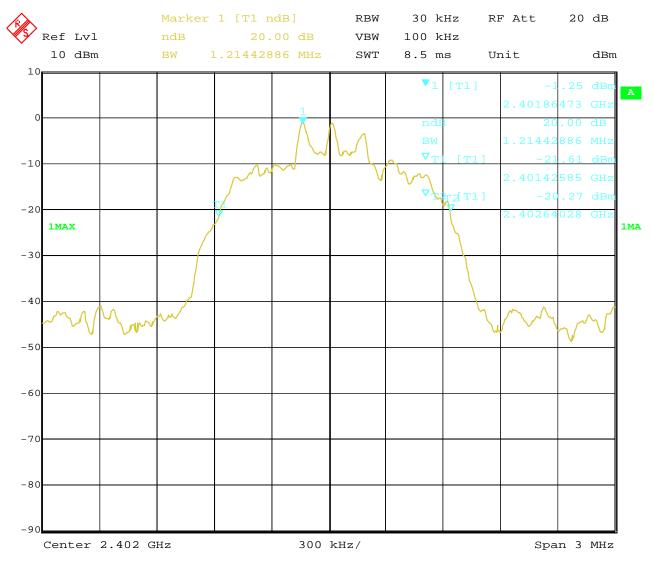
EUT	Ро	Portable speaker		TS217 WeariT
Mode	Кес	ep Transmitting	Input Voltage	DC3.7V
Temperat	ıre	24 deg. C,		56% RH
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
Low	2402	1214		Pass
Middle	2441	1220		Pass
High	2480	1214		Pass

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## Test Figure:

#### 1. Condition: Low Channel

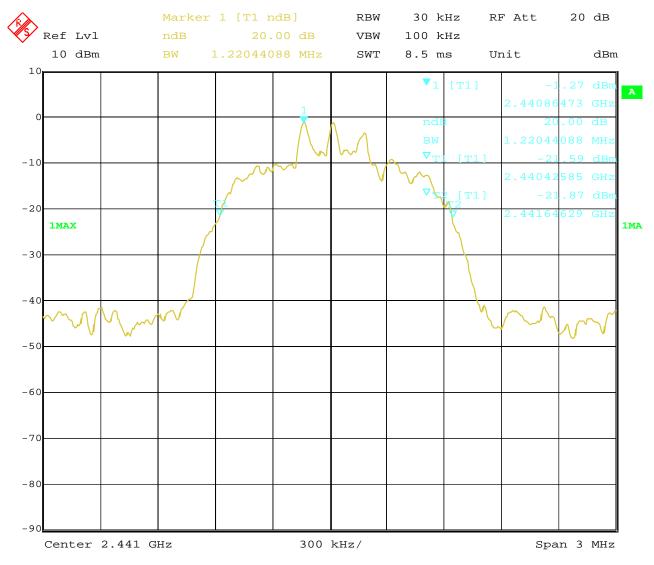


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## 2. Condition: Middle Channel



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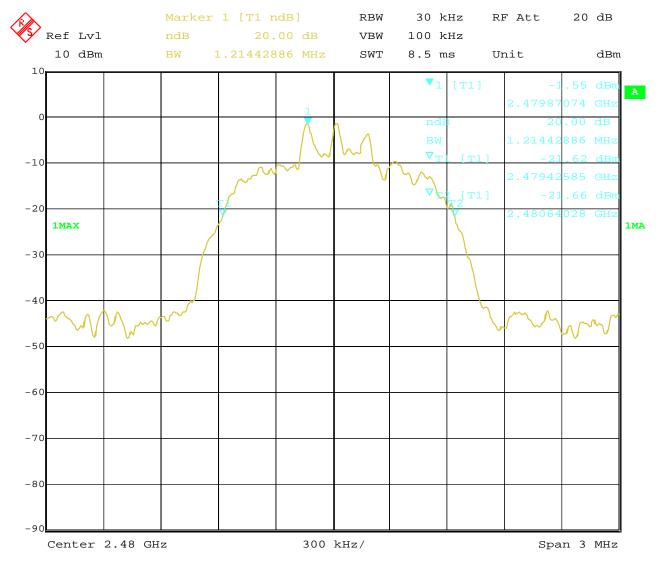
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## 3. High Channel



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## 8. Maximum Output Power

## 8.1 Regulation

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band:0.125 watts. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

## **8.3 Test Procedure**

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.

2. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel; RBW > the 20 dB bandwidth of the emission being measured; VBW = 10MHz, RBW=3MHz; Sweep = auto; Detector function = peak; Trace = max hold

3. Measure the highest amplitude appearing on spectral display and record the level to calculate results.

4. Repeat above procedures until all frequencies measured were complete.

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## **8.4Test Results Type of Modulation: GFSK**

EUT	F	Portable speaker		TS217 WeariT
Mode	K	Keep Transmitting		DC3.7V
Temperature	e	24 deg. C,		56% RH
Channel	Channel Frequency (MHz)	Max. Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	1.33	30	Pass
Middle	2441	1.45	30	Pass
High	2480	1.06	30	Pass

Note: 1. the result basic equation calculation as follow:

Max. Power Output = Power Reading + Cable loss + Attenuator

2. The worse case was recorded

### **Type of Modulation:** Л/4DOPSK

EUT	Pe	Portable speaker		TS217 WeariT
Mode	Ke	Keep Transmitting		DC3.7V
Temperatur	e	24 deg. C,		56% RH
Channel	Channel Frequency (MHz)	Max. Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	0.38	30	Pass
Middle	2441	0.25	30	Pass
High	2480	-0.10	30	Pass

Note: 1. the result basic equation calculation as follow:

Max. Power Output = Power Reading + Cable loss + Attenuator

2. The worse case was recorded

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adopt any other remedies which may be appropriate.



### **Type of Modulation: 8DPSK**

EUT		Portable speaker		Model	TS217 WeariT
Mode		Ke	ep Transmitting	Input Voltage	DC3.7V
Temperature	e	24 deg. C,		Humidity	56% RH
Channel	Cha	annel Frequency (MHz)	Max. Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
Low		2402	0.52	30	Pass
Middle		2441	0.52	30	Pass
High		2480	0.25	30	Pass

Note: 1. the result basic equation calculation as follow:

Max. Power Output = Power Reading + Cable loss + Attenuator

2. The worse case was recorded

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## 9. Carrier Frequency Separation

#### 9.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

## 9.2 Limits of Carrier Frequency Separation

The Maximum Power Spectral Density Measurement is 25kHz or two-thirds of the 20dB bandwidth of the hopping Channel which is great.

## 9.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Set the spectrum analyzer as follows: 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

3. Measure the separation between the peaks of the adjacent channels using the marker-delta function.

4. Repeat above procedures until all frequencies measured were complete.

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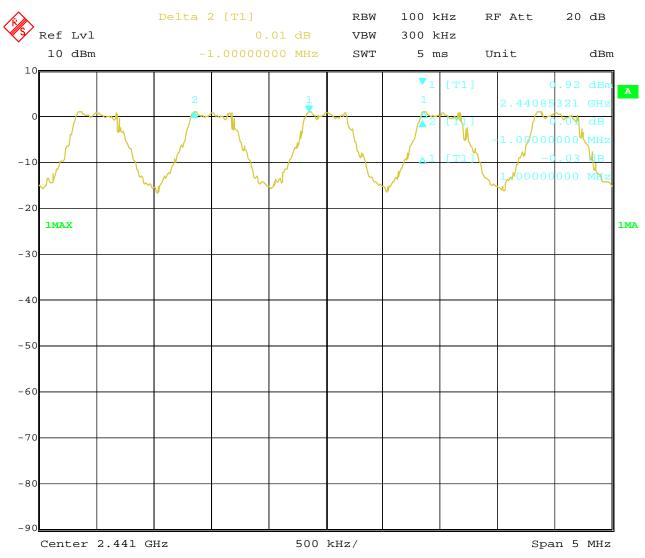


#### 9.4Test Result

#### **Type of Modulation: GFSK**

EUT	Portable speaker		Model	TS	217 WeariT
Mode	Hopping On I		Input Voltage	DC3.7V	
Temperature	24 deg. C,		Humidity		56% RH
Carrier Frequency Separation			Limit		Pass/ Fail
1.000MHz		$\geq$ 25 kHz or 2/3	of the 20 dB ban	dwidth	Pass

## **Test Plots**



The report refers only to the sample tested and does not apply to the bulk.

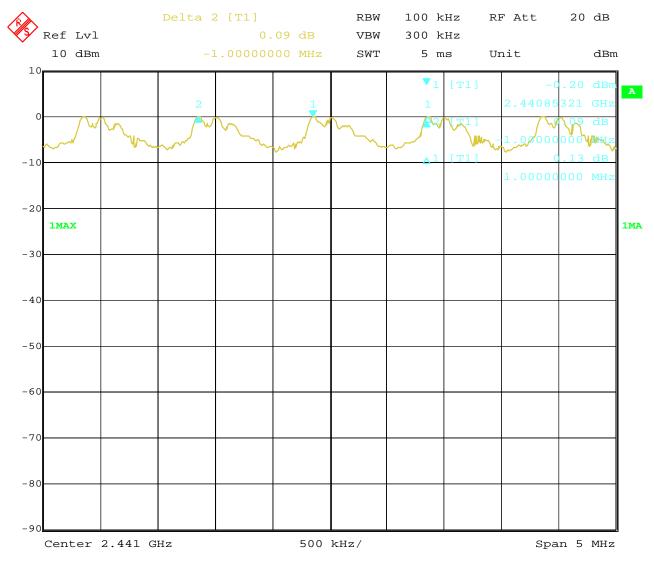
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#### **Type of Modulation:** Л/4DQPSK

EUT	Portable speaker		Model	TS	217 WeariT
Mode	Hopping On		Input Voltage	DC3.7V	
Temperature	24 deg. C,		Humidity	56% RH	
Carrier I	Carrier Frequency Separation		Limit		Pass/ Fail
	1.000MHz	$\geq 25$ kHz or 2	2/3 of 20 dB bandy	width	Pass

#### **Test Plots**



The report refers only to the sample tested and does not apply to the bulk.

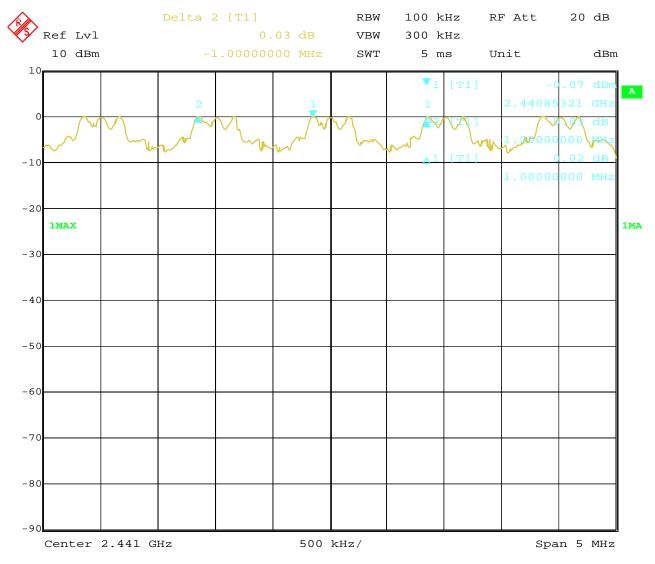
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#### **Type of Modulation: 8DPSK**

EUT	Portable speaker		Model	TS	217 WeariT
Mode	Hopping On		Input Voltage	DC3.7V	
Temperature	24 deg. C,		Humidity	56% RH	
Carrier I	Carrier Frequency Separation		Limit		Pass/ Fail
	1.000MHz	$\geq 25$ kHz or 2	2/3 of 20 dB bandy	width	Pass

#### **Test Plots**



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## **10. Number of Hopping Channels**

#### 10.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

## **10.2 Limits of Number of Hopping Channels**

The frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

#### **10.3 Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW=100 kHz, VBW=300 kHz; Sweep = auto; Detector function = peak; Trace = max hold

3. Record the number of hopping channels.

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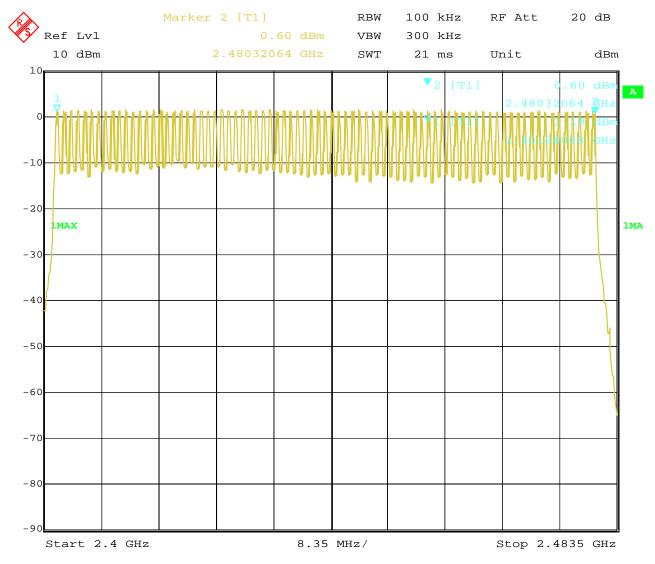
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## **10.4Test Result Type of Modulation: GFSK**

EUT	Portable speaker		Model	TS	217 WeariT
Mode	Hopping On		Input Voltage	DC3.7V	
Temperature		24 deg. C,	Humidity	56% RH	
Operating Frequency Num		Number of hopp	ping channels	Limit	Pass/ Fail
2402-2480MHz	2402-2480MHz 79			≥15	Pass

## **Test Plot**



The report refers only to the sample tested and does not apply to the bulk.

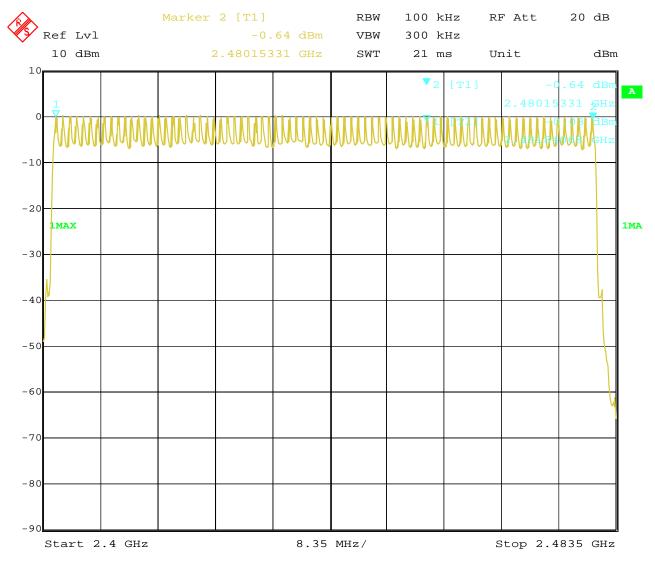
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## Type of Modulation: JI/4DQPSK

EUT	Portable speaker		Model		TS217 WeariT	
Mode	Hopping On		Input Voltage		DC3.7V	
Temperature	24 deg. C,		Humidity		56% RH	
Operating Frequer	Number of hopp channels		oing	Lir	nit	Pass/ Fail
2402-2480MHz		79		2	15	Pass

#### **Test Plot**



The report refers only to the sample tested and does not apply to the bulk.

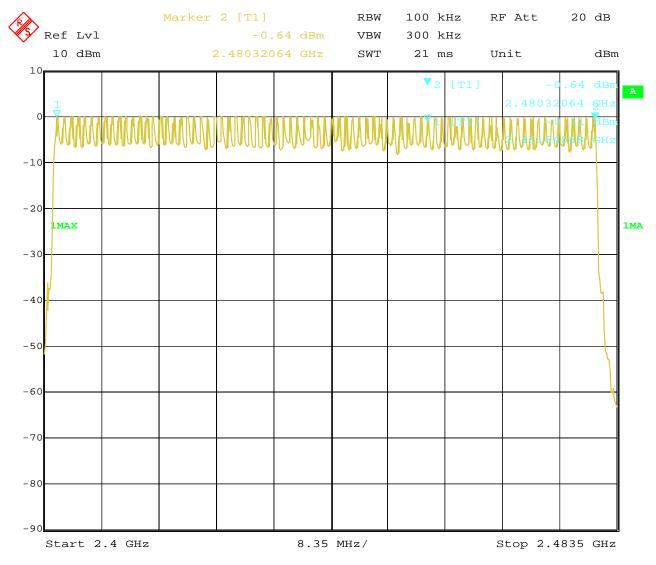
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#### **Type of Modulation: 8DPSK**

EUT	Portable speaker		Model		TS217 WeariT	
Mode	Hopping On		Input V	oltage		DC3.7V
Temperature	24 deg. C,		Humidi	dity		56% RH
Operating Frequer	ncy	cy Number of hopp channels		Liı	nit	Pass/ Fail
2402-2480MHz		79		$\geq$	15	Pass

#### **Test Plot**



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## 11. Time of Occupancy (Dwell Time)

## 11.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

## 11.2 Limits of Carrier Frequency Separation

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

## **11.3 Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW

RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold

3. Measure the dwell time using the marker-delta function.

4. Repeat above procedures until all frequencies measured were complete.

5. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

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# 11.4 Test Result

#### **Type of Modulation: GFSK**

EUT	Portabl	e speaker	Model	TS2	217 WeariT
Mode	Keep Tra	ansmitting	Input Voltage	]	DC3.7V
Temperatur	re 24 d	leg. C, Humidity		56% RH	
Channel	Reading	Hoping	g Rate	Actual	Limit
High	2.97ms	266.66	7 hop/s	0.317s	0.4s
Middle	2.97ms	266.66	7 hop/s	0.317s	0.4s
Low	2.99ms	266.667 hop/s		0.319s	0.4s

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period, Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels.

#### Note: DH5 was the wore case

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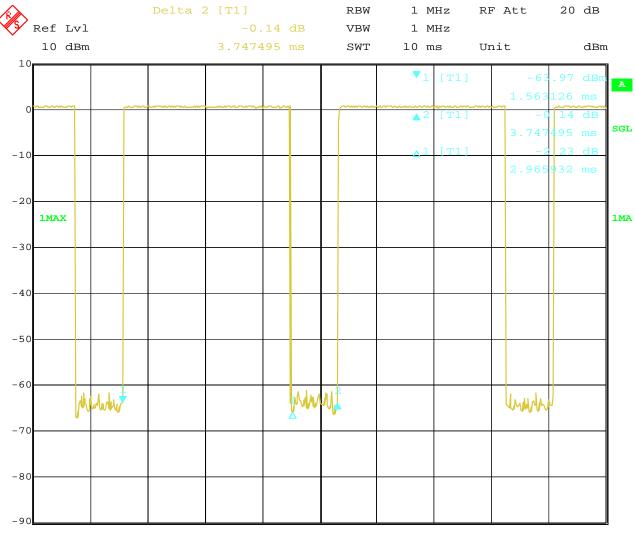
adopt any other remedies which may be appropriate.



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Test Plots: DH5

High Channel:



Center 2.48 GHz

1 ms/

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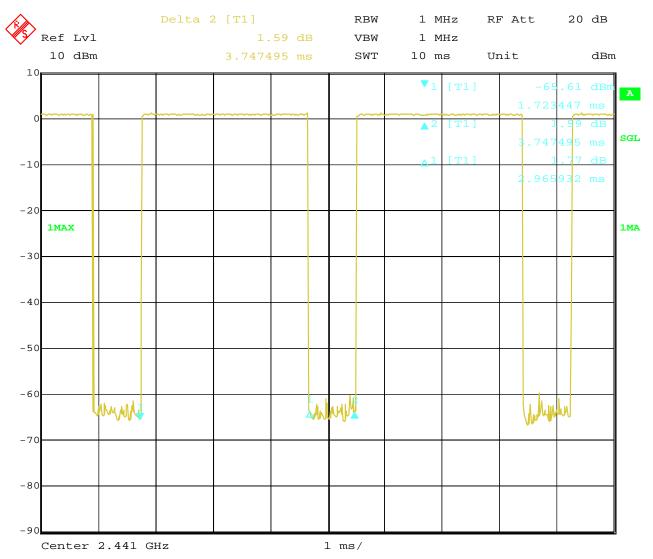
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## DH5

Middle Channel



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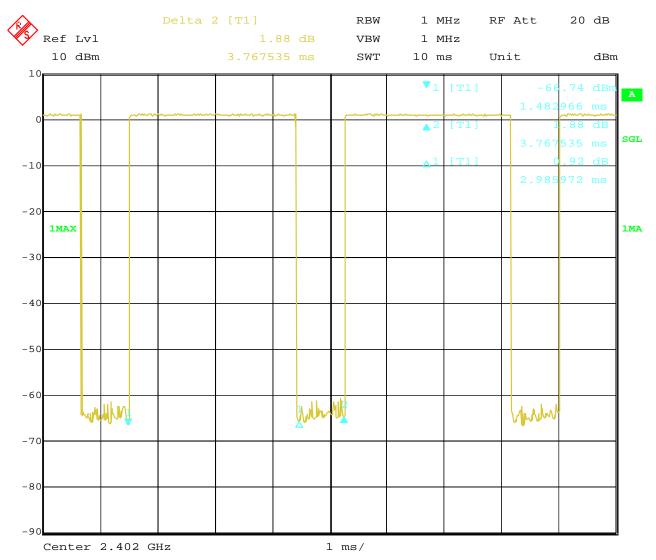
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#### DH5

Low Channel



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#### **Test Result Type of Modulation:** Л/4DOPSK

LJPC OF HIG					
EUT	Portabl	e speaker	Model	TS217 WeariT	
Mode	Keep Tr	ansmitting	Input Voltage	Ι	DC3.7V
Temperatur	re 24 c	eg. C, Humidity		56% RH	
Channel	Reading	Hoping	g Rate	Actual	Limit
High	2.99ms	266.66	7 hop/s	0.319s	0.4s
Middle	2.97ms	266.66	7 hop/s	0.317s	0.4s
Low	2.99ms	266.667 hop/s		0.319s	0.4s

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period, Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels.

Note: DH5 was the worse case.

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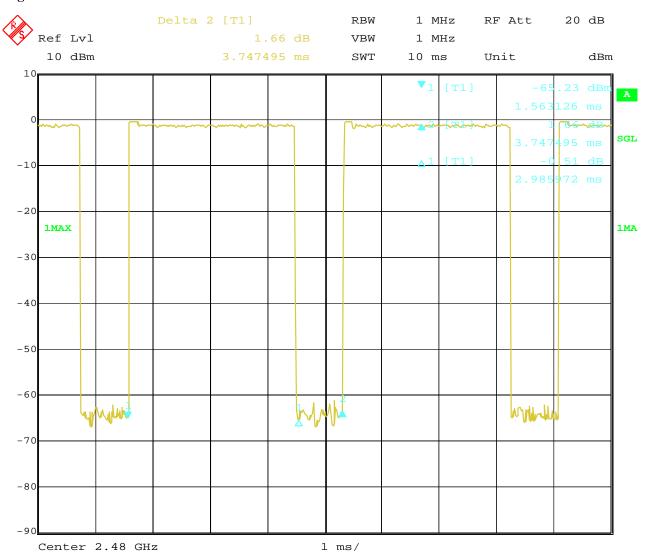
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## Test Plots: **2DH5 High Channel**

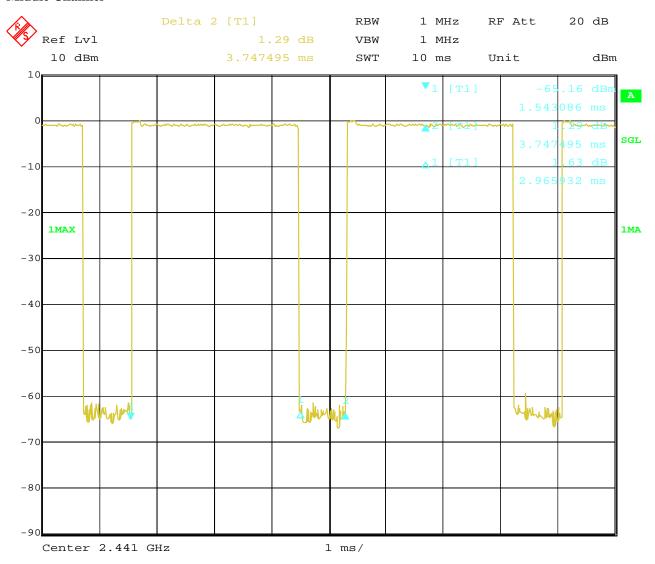


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## **2DH5 Middle Channel**



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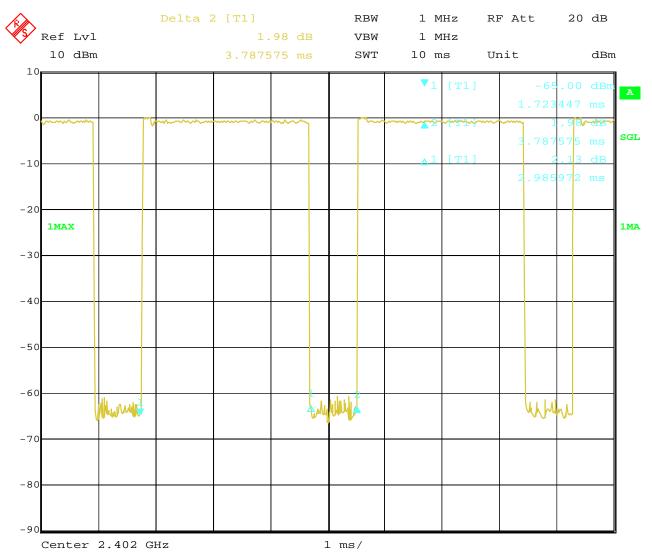
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#### **2DH5**

Low Channel



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#### **Type of Modulation: 8DPSK**

EUT	Portabl	e speaker	aker Model		TS217 WeariT	
Mode	Keep Tra	ansmitting	Input Voltage	I	DC3.7V	
Temperatur	re 24 d	eg. C, Humidity		56% RH		
Channel	Reading	Hoping	g Rate	Actual	Limit	
High	2.99ms	266.66	7 hop/s	0.319s	0.4s	
Middle	2.99ms	266.66	7 hop/s	0.319s	0.4s	
Low	2.97ms	266.66	7 hop/s	0.317s	0.4s	

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period, Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels.

#### Note: DH5 was the worse case.

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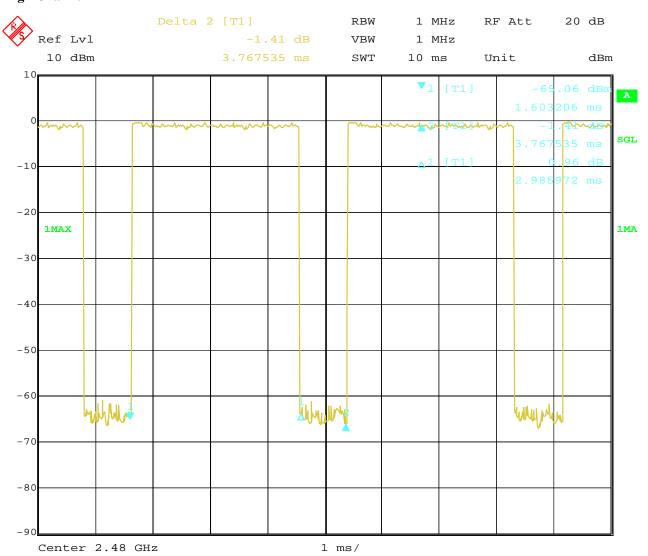
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## Test Plots: **3DH5 High Channel**



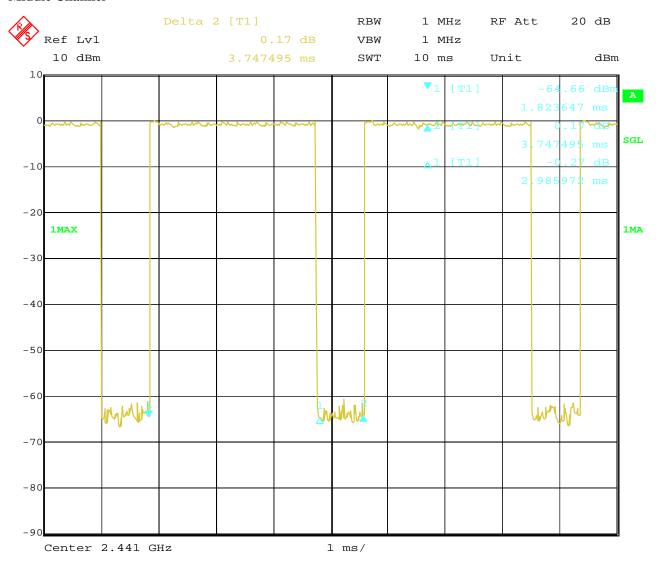
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## 3DH5 **Middle Channel**



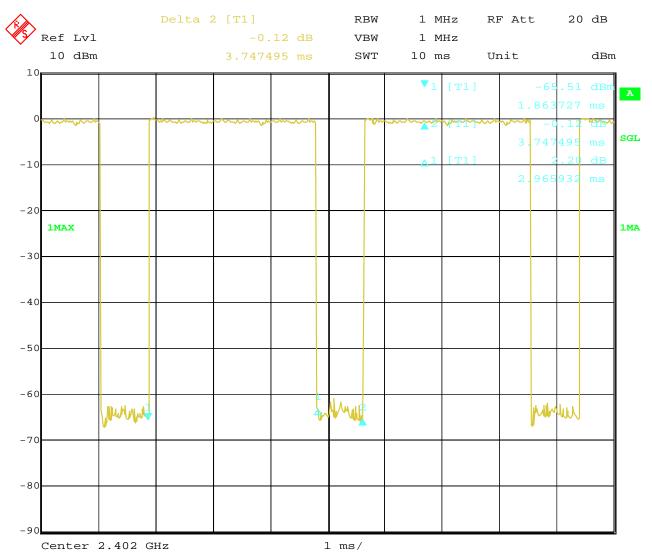
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#### 3DH5

Low Channel



The report refers only to the sample tested and does not apply to the bulk.

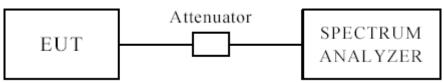
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## 12 Out of Band Measurement

12.1 Test Setup



## The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

## 12.2 Limits of Out of Band Emissions Measurement

- 1. Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
- 2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

#### **12.3 Test Procedure**

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. Peak values with RBW=VBW=1MHz and PK detector. For bandage test, the spectrum set as follows: RBW=100kHz, VBW=300 kHz. A conducted measurement used

Note: 1. For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

2. This is a handhold device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.

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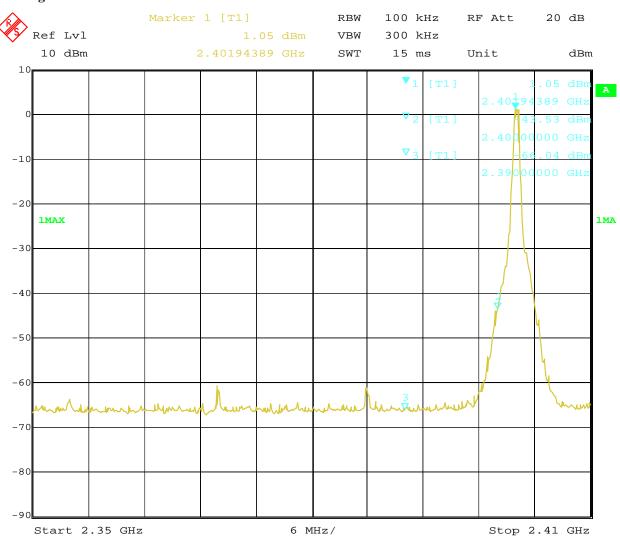


## **Type of Modulation: GFSK**

#### 12.4 Out of Band Test Result

Product:	Portable speaker		Test Mode:	Low Channel
Mode	Keep	ing Transmitting	Input Voltage	DC3.7V
Temperature		24 deg. C		56% RH
Test Result:		Pass	Detector	РК
The Max. FS in	PK (dBµV/m)	46.5		74(dBµV/m)
Restrict Band	$AV(dB\mu V/m)$		Limit	54(dBµV/m)
2390MHz				

**Test Figure:** 



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#### **Type of Modulation: GFSK**

#### 12.4 Out of Band Test Result

Product:	F	ortable speaker		Test N	Iode:	I	High Chan	nel
Mode	Kee	ping Transmitting		Input V	/oltage		DC3.7V	
Temperature		24 deg. C,		Hum	Humidity 56% RH		[	
Test Result:		Pass		Dete	ctor		РК	
The Max. FS in	PK (dBµV/m)	43.1					74(dBµV/1	m)
Restrict Band	AV(dBµV/m)			Lin	nit		54(dBµV/1	m)
2483.5MHz								
Test Figure:								
<b>B</b>		er 1 [T1]	RBW			'Att	20 dB	
Ref Lv		0.64 dBm	VBW				10	
10 dB 10	m	2.47985972 GHz	SWT	7.5 m	s Ur	nit	dBm	L .
				<b>V</b> 1	[T1]		.64 dBm	A
0				_		2.47985	972 GHz	_
0				<b>v</b> <sub>2</sub>	[T1]	-61	.13 dBm	
						2.48350	000 GHz	
-10								
-20								
1MAX								1MA
-30								
-40								
		4						
-50	<u>/</u>	<u> </u>						
2.0								
60		2						
-60	. N	No.				N		
	windown	i in	mylila	manhan	mantum	Mun VI	Hermony	
-70								
- 8 0								
-90								
Start	2.47 GHz	3 M	1Hz/			Stop	2.5 GHz	

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## **Type of Modulation: GFSK**

#### Out of Band Test Result 12.4

Product:	Р	ortable speaker		Tes	t Mode:	Hopping mode	
Mode		Hopping On		Inpu	t Voltage	DC3.7V	
Temperature		24 deg. C,		Hı	umidity	56% RH	
Test Result:		Pass		D	etector	PK	
The Max. FS in	PK (dBµV/m)	44.7	,			74(dBµV/m)	
Restrict Band	AV(dBµV/m)			]	Limit	54(dBµV/m)	
2390MHz	,					、 <b>·</b> · ·	
Test Figure:				1			
	Marker 1	[T1]	RBW	100 kH	z RFAt	t 20 dB	
Ref Lvl		1.04 dBm	VBW	300 kH	Z		
10 dBm	2.	40494990 GHz	SWT	15 ms	Unit	dBm	
10				▼1 [	T1]	1.04 dBm	
						.0494990 GHz	
0				₹2[	T1]	-44.44 (digin	
					2.4	ODOOD00 GHZ	
-10				<mark>₹</mark>	T1]	<u>-62.82.dm</u>	
					2.3	90000000	
-20							
1MAX						1M	
-30							
-40					2		
-50							
					A		
-60				3			
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### **Type of Modulation: GFSK**

#### Out of Band Test Result 12.4

Product:	Po	Test M	ode:	Hopping mode			
Mode		Hopping On		Input Voltage		DC3.7V	
Temperature		24 deg. C,		Humic	lity	56% RH	
Test Result:		Pass		Detec	tor	РК	
The Max. FS in	PK (dBµV/m)	43.1				74(dBµV/m)	)
Restrict Band	$AV(dB\mu V/m)$			Lim	it	54(dBµV/m)	)
2483.5MHz							
<b>Fest Figure:</b>							
Real Contractions	Marker 1	[T1]	RBW	100 kHz	RF A	tt 20 dB	
🛛 🕹 Ref Lvl		0.71 dBm		300 kHz			
10 dBm	2.	47288577 GHz	SWT	7.5 ms	Unit	dBm	
10				▼1 [T1	]	0.71 dBm	A
		le .			2.4	47288577 GHz	
				¥2 [T1		-64.38 dBm	
					2.4	48350000 GHz	
-10							
V V V	4 4 4 4 4 6						
-20							<b>1MA</b>
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-80							
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Stop 2.41 GHz

## **Type of Modulation:** Л/4DQPSK

Out of Band Test Result 12 4

Product:	Pe	Portable speaker			Low	Channel
Mode	Keej	ping Transmitting		Input Voltage	DC	C3.7V
Temperature		24 deg. C		Humidity	56	% RH
Test Result:		Pass		Detector		РК
The Max. FS in	PK (dBµV/m)	45.1			74(d	BµV/m)
Restrict Band	$AV(dB\mu V/m)$			Limit	54(d	BµV/m)
2390MHz						
Test Figure:						
Real Contractions		1 [T1]			r Att 20	dB
Ref Lvl		0.05 dBm		300 kHz	• .	1-
10 dBm 10 <b></b>	n	2.40194389 GHz	SWT	15 ms Un	nit	dBm
				▼1 [T1]	0.05	dBm
0					2.40194389	GHz
0				▼2 [T1]	48.67	dBm Gu
				<b>▽</b> 3 [T1]		dBm
-10						GHz
-20						1MA
						1
-30						
					NY	
-40					`	
					2	
-50						
					4	
-60					<u></u>	
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The report refers only to the sample tested and does not apply to the bulk.

-80

-90

Start 2.35 GHz

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## **Type of Modulation:** Л/4DQPSK

#### Out of Band Test Result 12.4

Product:	Portable speaker				Tes	st Mode:	H	High Channel		
Mode	Kee	ping Trans	smitting		Inpu	Input Voltage		DC3.7V		
Temperature		24 deg.	С,		H	umidity		56% RH		
Test Result:		Pass			D	etector		РК		
The Max. FS in	PK (dBµV/m)		42.6				7	/4(dBµV/m)	)	
Restrict Band	$AV(dB\mu V/m)$					Limit	5	54(dBµV/m)	)	
2483.5MHz										
est Figure:										
$\hat{\mathbf{A}}$	Marker	1 [T1]		RBW	100 k	Hz RF	Att	20 dB		
🛛 Ref Lvl		-0.	36 dBm	VBW	300 k					
10 dBm	2	.479859	72 GHz	SWT	7.5 m	ns Un	it	dBm		
10					<b>v</b> 1	[T1]	- (	1.36 dBm	A	
		1				2	2.47985	972 GHz	A	
0		K			₹2	[T1]	-63	.85 dBm		
		$\mathcal{N}$				2	2.48350	000 GHz		
-10										
-20										
1MAX									1M	
-30										
- 30										
	٨	И								
-40										
	J	l								
-50										
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## **Type of Modulation:** Л/4DQPSK

#### Out of Band Test Result 12.4

Product:	Portable speaker				est Mode	:	Hopping mod	
Mode		Hopping On		In	put Voltag	ge	DC3.7V	
Temperature		24 deg. C,		]	Humidity		56%	% RH
Test Result:		Pass			Detector		]	PK
The Max. FS in	PK (dBµV/m)	43.9					74(dI	BμV/m)
Restrict Band	$AV(dB\mu V/m)$				Limit		54(dI	BμV/m)
2390MHz								
est Figure:								
	Marker 1	[T1]	RBW	100 k	Hz R	F Att	t 20	dB
Ref Lvl		0.01 dBm	VBW	300 k				
10 dBm 10	2.	40795591 GHz	SWT	15 m	is U	nit		dBm
				<b>▼</b> 1	[T1]		0.01	dBm
0				_		2.40	795591	⊈Hz ▼
0				₹2	[T1]	2.40		dBm
				<b>∇</b> <sub>3</sub>	[T1]	2.40	-63.14	dBm
-10						2.39	000000	GHz
-20								1M
INAA								
-30								
						A		
-40								
- 5 0								
-60				3		<b>⊢</b> /─		
more lundon	manutin	haddrahah	unpulsed by	mili	aluha	N		
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-90	5 GHz	6 M	Hz/		I	Sto	p 2.41	GHZ

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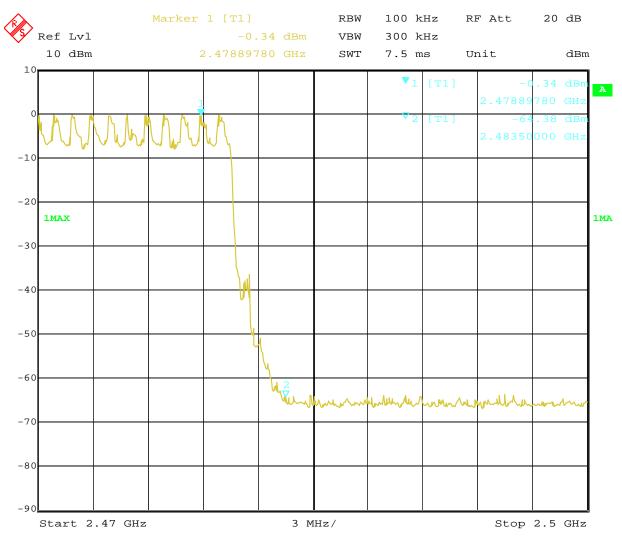


## **Type of Modulation:** Л/4DQPSK

#### **12.4** Out of Band Test Result

Product:	Ро	ortable speaker	Test Mode:	Hopping mode
Mode		Hopping On	Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	РК
The Max. FS in	PK (dBµV/m)	42.3		74(dBµV/m)
Restrict Band	$AV(dB\mu V/m)$		Limit	54(dBµV/m)
2483.5MHz				

**Test Figure:** 



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Stop 2.41 GHz

#### **Type of Modulation: 8DPSK**

Out of Band Test Result 12 4

-80

-90

Start 2.35 GHz

Product:	Pe	ortable speaker	Test Mode:	Low Chan	nel	
Mode	Keej	ping Transmitting		Input Voltage	DC3.7V	7
Temperature		24 deg. C		Humidity	56% RH	I
Test Result:		Pass		Detector	РК	
The Max. FS in	PK (dBµV/m)	44.1			74(dBµV/1	m)
Restrict Band 2390MHz	$AV(dB\mu V/m)$			Limit	54(dBµV/i	m)
Test Figure:				1		
Ref Lv]		1 [T1] 0.04 dBm	RBW VBW	100 kHz RF 300 kHz	Att 20 dB	
10 dBr	n	2.40194389 GHz	SWT	15 ms Un	it dBm	
10				▼1 [T1]	0.04 dBm	
					2.40 <u>1</u> 94389 GHz	A
0				▼2 [T1]	50.18 dBm	
					2.4000000 GHz	
-10				5 1 1 1 1	- <mark>65.97 dBm</mark> 2.3900000 GHz	
					2.39000000 GHZ	
-20						
1MAX						1MA
- 3 0						
-40						
-50						
					1	
-60					<u>/</u>	
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#### **Type of Modulation: 8DPSK**

#### 12.4 Out of Band Test Result

Product:	Р	ortable speaker		Test Mode:	]	High Channel
Mode	Kee	ping Transmitting		Input Voltage		DC3.7V
Temperature		24 deg. C,		Humidity		56% RH
Test Result:		Pass		Detector		РК
The Max. FS in	PK (dBµV/m)	41.9				74(dBµV/m)
Restrict Band	$AV(dB\mu V/m)$			Limit		54(dBµV/m)
2483.5MHz						
Test Figure:						
Sin a		er 1 [T1]	RBW		RF Att	20 dB
Ref Lv 10 dB		-0.35 dBm 2.47985972 GHz	VBW SWT		Unit	dBm
10 dB		2.4/9039/2 GH2	SWI			
				▼1 [T1]	- 0	.35 dBm
0		1			2.47985	
U U		$\Lambda$		2 [T1]	-63	.15 dBm 000 GHz
1.0					2.40550	000 GHZ
-10						
-20						1MA
IMAX						IMA
-30						
-40		V				
-50		/				
-60						
	meanment	V.	hunn		Mu	
-70		~	minun	monun	Man w	linnun
0.0						
- 80						
-90 Start	2.47 GHz	<u> </u>	IHz/		Stop	2.5 GHz
Start	2.47 GHz	3 M	IHz/		Stop	2.5 GHz

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## **Type of Modulation: 8DPSK**

#### Out of Band Test Result 12.4

Product:		Portable speaker				Hopping mode	
Mode		Input	Voltage	DC3.7V			
Temperature		24 deg. C,		Hum	nidity	56% RH	-
Test Result:		Pass		Dete	ector	РК	
The Max. FS in	PK (dBµV/m)	42.9				74(dBµV/1	n)
Restrict Band	AV(dBµV/m)			Li	mit	54(dBµV/1	n)
2390MHz							
<b>Fest Figure:</b>				•			
Ŕ	Marker 1	[T1]	RBW	100 kHz	RF At	t 20 dB	
Ref Lvl		0.06 dBm	VBW	300 kHz			
10 dBm	2.	40290581 GHz	SWT	15 ms	Unit	dBr	n
10				▼1 [T]	1]	0.06 dBm	
						02 <b>9</b> 0581 GHz	A
0				▼2 [T	1]	A N A PRA A HIM	1
					2.4	ob/ogfad/ (ette	
-10				▼ <sub>3</sub> [T		<u>-63.98 dBn</u>	
					2.3	9000000 GHz	
-20							
1MAX							<b>1M</b>
3.0							
-30							
						N N	
-40						U	
- 5 0							
-60							
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-70							
- 8 0							-
-90							

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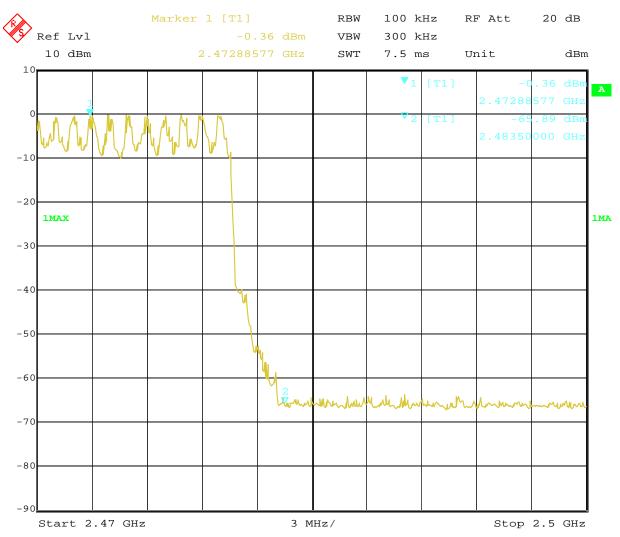


## **Type of Modulation: 8DPSK**

#### Out of Band Test Result 12.4

Product:	Ро	ortable speaker	Test Mode:	Hopping mode
Mode		Hopping On	Input Voltage	DC3.7V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	РК
The Max. FS in	PK (dBµV/m)	42.0		74(dBµV/m)
Restrict Band	AV(dBµV/m)		Limit	54(dBµV/m)
2483.5MHz				

**Test Figure:** 



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## 13.0 Antenna Requirement

13.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the mount in dB that the directional gain of the antenna exceeds 6 dBi.

13.2 Antenna Connected constructionsPCB Antenna and the maximum Gain of this antenna is 1.13dBi

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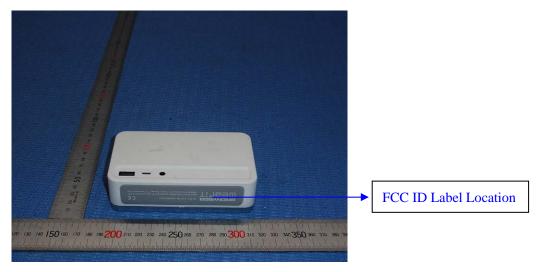
#### 14.0 FCC ID Label

## FCC ID: Z2HBV3320I

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

### Mark Location:



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#### 15.0 Photo of testing

Conducted Emission Test Setup:



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Radiated Emission Test Setup:



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## **Photographs – EUT**

Outside view





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Outside view



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Inside view

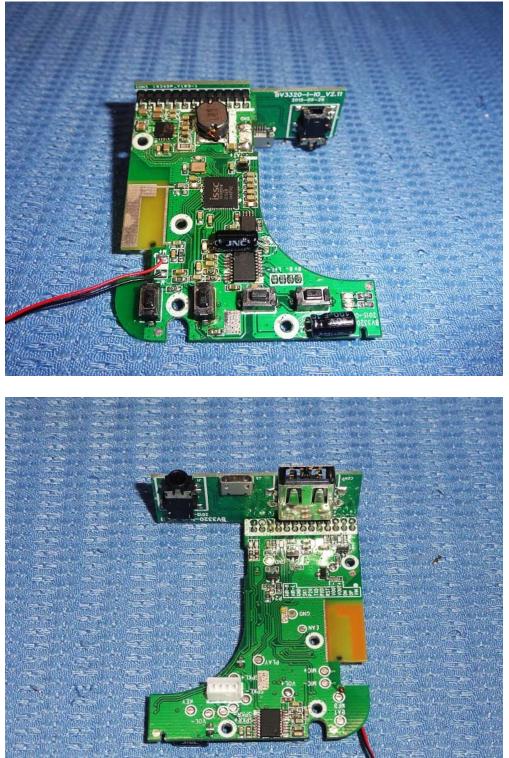


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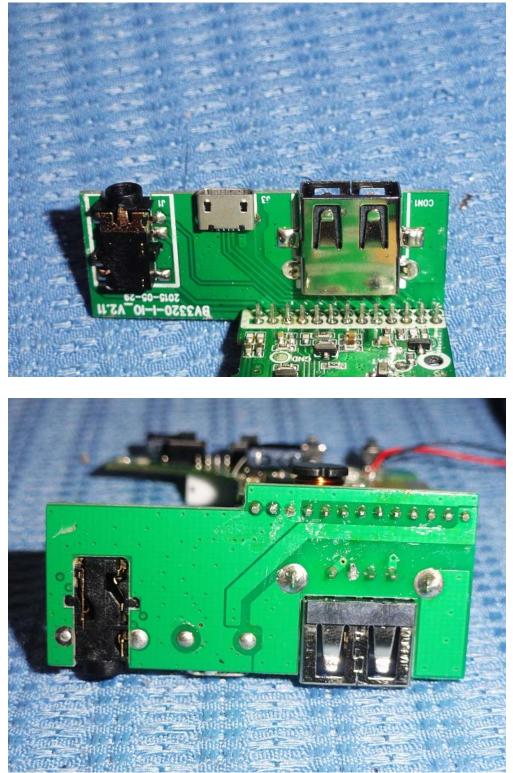
Inside view



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Inside view



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Inside view





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Inside view



End of the report

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