

Report No.: GZEM200701378102

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## TEST REPORT

GZEM2007013781CR **Application No.:** 

Applicant: Dongguan Siyoto Electronics Co.,Ltd

NO.12,15,16,17, Seve street of north, Qiaodong Road, Dongjiang Village, Address of Applicant:

Qiaotou Town

Manufacturer: The same as applicant Address of Manufacturer: The same as applicant Factory: The same as applicant Address of Factory: The same as applicant

**Equipment Under Test (EUT):** 

FCC ID: 2ADZH-A50T

**EUT Name:** Wireless Headphones

Model No.: HA-A50T **Trade Mark:** JVC Serial No.: HA-A50T

Standard(s): 47 CFR Part 15, Subpart C 15.247

Date of Receipt: 2020-07-17

**Date of Test:** 2020-08-13 to 2020-08-27

Date of Issue: 2020-09-18

**Test Result:** Pass\*

Kobe Jian **EMC Laboratory Manager** 



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<sup>\*</sup> In the configuration tested, the EUT complied with the standards specified above.



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Revision Record					
Version	Chapter	Date	Modifier	Remark	
01		2020-09-18		Original	

Authorized for issue by:			
Tested By	Curry Wu	2020-08-13 to 2020-08-27	
	Curry_Wu /Project Engineer	Date	
Checked By	Ricky_Liu /Reviewer	2020-09-18  Date	



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## 2 Test Summary

Radio Spectrum Tecl	Radio Spectrum Technical Requirement						
Item	Standard	Method	Requirement	Result			
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass			
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass			

Radio Spectrum Matter Part							
Item	Standard	Method	Requirement	Result			
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass			
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass			
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass			
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass			
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass			
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass			
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass			
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			

Remark: All the tests were performed at left/right earbuds separately due to the two earbuds SCH are totally same but different in PCB layout and antenna.



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### 4 General Information

### 4.1 Details of E.U.T.

Power Supply: DC 5V for battery charging by box

DC 3.7V for normal working

Test voltage DC 3.7V

Antenna Gain
-0.24dBi for left earbud
(declared by manufacture):
-0.1dBi for right earbud
Integrated antenna

Channel Spacing: 1MHz

Modulation Type: GFSK, π/4DQPSK, 8DPSK

Number of Channels: 79

Operation Frequency: 2402MHz to 2480MHz

Spectrum Spread Technology: Frequency Hopping Spread Spectrum(FHSS)

Sample NO. A1 for Left earbud

A2 for right earbud

Bluetooth version Bluetooth 5.0 classic only

Hardware HA-A5CT-R\_V1.2 for right earbud

HA-A5CT-L\_V1.2 for left earbud

Firmware SV01

Test Software EMI Tools.exe

Power Setting Default

### 4.2 Description of Support Units

The EUT has been tested as an independent unit.



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### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
4	Conducted Disturbance Voltage at	±3.63dB (9kHz to 150kHz)
1	Mains Terminals	±3.22dB (150kHz to 30MHz)
2	Disturbance Power	±3.78dB
3	Radiated Emissions	±5.0dB (30MHz-1GHz)
3	Radiated Emissions	±5.0dB (1GHz-6GHz)
4	Radiated Immunity	±2.18dB(80MHz-3GHz)
5	Conducted Immunity	±3.5dB(150kHz-230MHz)
6	Electrostatic Discharge	±6 %
7	EFT (Electrical Fast Transients)	±4 %
8	Surge Immunity	±6%
9	Voltage Dips and Interruptions	±4 %
10	CISPR 20 Immunity	±1.5dB
11	Temperature	±0.4℃
12	Humidity	±1.3%
13	DC power	±0.5 %

#### 4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.



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### 4.5 Test Facility

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

● NVLAP (Lab Code: 200611-0)

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

#### ACMA

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

### SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

● CNAS (Lab Code: L0167)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to

ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

### ◆FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)

SGS-CSTC Standards Technical Services Co., Ltd., 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 282399, May 31, 2002.

#### ◆FCC Recognized Accredited Test Firm(Registration No.: 486818)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

#### ●Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

#### ● VCCI (Registration No.: R-12460, C-12584, G-10449 and T-11179)

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-10449 and T-11179 respectively.

#### ● CBTL (Lab Code: TL129)

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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## 5 Equipment List

Conducted Peak Output Power						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01	
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01	

20dB Bandwidth					
Equipment	Manufacturer	Model No	<b>Inventory No</b>	Cal Date	Cal Due Date
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	M8.0	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	M8.0	EMC2137	2019-11-02	2021-11-01

Carrier Frequencies Separation						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01	
MI CABLE	SGS-EMC	M8.0	EMC2137	2019-11-02	2021-11-01	

Hopping Channel Number						
Equipment	Manufacturer	Model No	<b>Inventory No</b>	Cal Date	Cal Due Date	
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	M8.0	EMC2136	2019-11-02	2021-11-01	
MI CABLE	SGS-EMC	M8.0	EMC2137	2019-11-02	2021-11-01	



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Dwell Time						
Equipment	Manufacturer	Model No	<b>Inventory No</b>	Cal Date	Cal Due Date	
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	M8.0	EMC2136	2019-11-02	2021-11-01	
MI CABLE	SGS-EMC	M8.0	EMC2137	2019-11-02	2021-11-01	

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	<b>Inventory No</b>	Cal Date	Cal Due Date
MXA Signal Analyzer	AgilentTechnologies	N9020A	SEM004-10	2020-03-02	2021-03-01
ESG Vector Signal Generator	Keysight	E4438C	SEM006-03	2020-03-31	2021-03-30
EXG Analog Signal Generator	AgilentTechnologies	N5171B	SEM006-04	2020-07-15	2021-07-14
Power Meter	AgilentTechnologies	U2021XA_Ch2	SEM009-02	2020-05-26	2021-05-25
Power Meter	AgilentTechnologies	U2021XA_Ch3	SEM009-03	2020-05-26	2021-05-25
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	<b>Inventory No</b>	Cal Date	Cal Due Date
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	M8.0	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	M8.0	EMC2137	2019-11-02	2021-11-01



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Radiated Emissions which fall in the restricted bands					T
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2020-01-10	2021-01-09
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2020-01-10	2021-01-09
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 25MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	EMC2174	2018-09-06	2021-09-05
Bi-log Type Antenna	Schaffner Chase	CBL6143	EMC0519	2020-06-08	2023-06-07
Horn Antenna	SCHWARZBECKME SS-ELEKTRONIK	BBHA 9120D	EMC2016	2019-09-25	2022-09-24
Horn Antenna 1GHz-18GHz	Rohde & Schwarz	HF906	EMC0518	2018-09-02	2021-09-01
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2020-01-10	2021-01-09
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2019-11-18	2020-11-17
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2021-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2020-01-10	2021-01-09
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2020-01-10	2021-01-09
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2020-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2019-11-18	2020-11-17
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2019-11-18	2020-11-17
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A



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Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2020-01-10	2021-01-09
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2020-01-10	2021-01-09
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 25MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	EMC2174	2018-09-06	2021-09-05
Bi-log Type Antenna	Schaffner Chase	CBL6143	EMC0519	2020-06-08	2023-06-07
Horn Antenna	SCHWARZBECKME SS-ELEKTRONIK	BBHA 9120D	EMC2016	2019-09-25	2022-09-24
Horn Antenna 1GHz-18GHz	Rohde & Schwarz	HF906	EMC0518	2018-09-02	2021-09-01
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2020-01-10	2021-01-09
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2019-11-18	2020-11-17
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2021-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2020-01-10	2021-01-09
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2020-01-10	2021-01-09
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2017-12-19	2020-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2019-11-18	2020-11-17
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2019-11-18	2020-11-17
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKME SS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

General used equipment					
Equipment	Manufacturer	Model No	<b>Inventory No</b>	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2020-07-09	2021-07-08
DMM	Fluke	73	EMC0007	2020-07-09	2021-07-08



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## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

#### 6.1.2 Conclusion

#### Standard Requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### 15.247(b) (4) requirement:

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.

#### EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The max antenna gain for the EUT is -0.24dBi for left earbud and -0.1dBi for right earbud.

Antenna photo please refer to product internal photo.



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## 6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

#### 6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

#### 6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- > Number of shift register stages: 9
- > Length of pseudo-random sequence: 29 -1 = 511 bits
- > Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum bands



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## 7 Radio Spectrum Matter Test Results

### 7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.5

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)	
	1 for ≥50 hopping channels	
902-928	0.25 for 25≤ hopping channels <50	
	1 for digital modulation	
	1 for ≥75 non-overlapping hopping channels	
2400-2483.5	0.125 for all other frequency hopping systems	
	1 for digital modulation	
5725-5850	1 for frequency hopping systems and digital modulation	



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#### 7.1.1 E.U.T. Operation

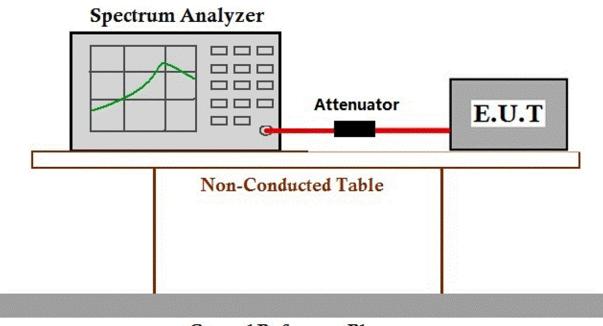
Operating Environment:

Temperature: 25.6 °C Humidity: 66.1 % RH Atmospheric Pressure: 1020 mbar Test Mode: c:TX non-Hop mode Keep the EUT in continuously transmitting mode with GFSK

modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been

tested and only the data of worst case is recorded in the report.

#### 7.1.2 Test Setup Diagram



### Ground Reference Plane

#### 7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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#### 7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.7

#### 7.2.1 E.U.T. Operation

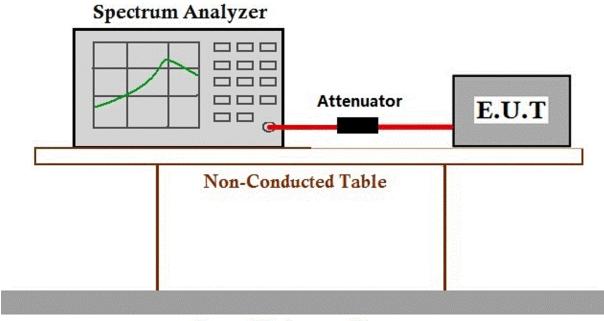
Operating Environment:

Temperature: 25.6 °C Humidity: 66.2 % RH Atmospheric Pressure: 1020 mbar Test Mode: c:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK

modulation,  $\pi/4\text{DQPSK}$  modulation, 8DPSK modulation. All modes have been

tested and only the data of worst case is recorded in the report.

#### 7.2.2 Test Setup Diagram



### **Ground Reference Plane**

#### 7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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### 7.3 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)
Test Method: ANSI C63.10 (2013) Section 7.8.2

Limit: 2/3 of the 20dB bandwidth base on the transmission power is less than

0.125W

#### 7.3.1 E.U.T. Operation

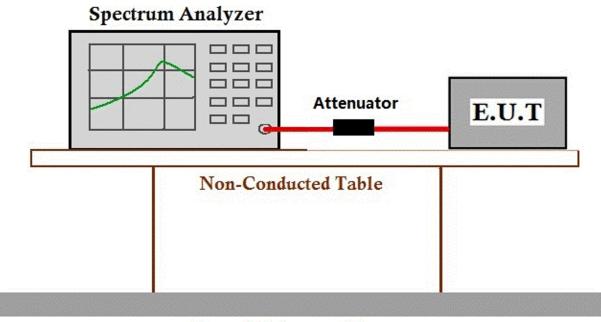
Operating Environment:

Temperature: 25.6 °C Humidity: 66.1 % RH Atmospheric Pressure: 1020 mbar Test Mode: b:TX Hop mode Keep the EUT in frequency hopping mode with GFSK modulation.

π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only

the data of worst case is recorded in the report.

#### 7.3.2 Test Setup Diagram



### Ground Reference Plane

#### 7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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### 7.4 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.3

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)		
000 000	50 for 20dB bandwidth <250kHz		
902-928	25 for 20dB bandwidth ≥250kHz		
2400-2483.5	15		
5725-5850	75		

#### 7.4.1 E.U.T. Operation

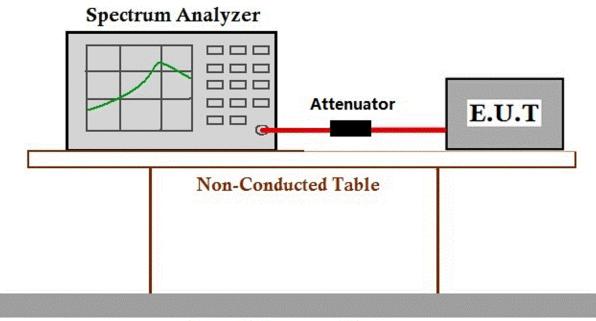
Operating Environment:

Temperature: 25.6 °C Humidity: 66.1 % RH Atmospheric Pressure: 1020 mbar Test Mode: b:TX Hop mode Keep the EUT in frequency hopping mode with GFSK modulation,

π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only

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#### 7.4.2 Test Setup Diagram



### Ground Reference Plane

### 7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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### 7.5 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

Frequency(MHz)	Limit		
002 029	0.4S within a 20S period(20dB bandwidth<250kHz)		
902-928	0.4S within a 10S period(20dB bandwidth≥250kHz)		
0400 0400 5	0.4S within a period of 0.4S multiplied by the number		
2400-2483.5	of hopping channels		
5725-5850	0.4S within a 30S period		

#### 7.5.1 E.U.T. Operation

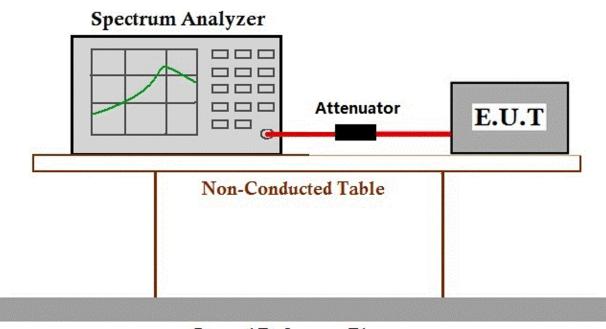
Operating Environment:

Temperature: 25.6 °C Humidity: 65.2 % RH Atmospheric Pressure: 1020 mbar Test Mode: b:TX Hop mode Keep the EUT in frequency hopping mode with GFSK modulation,

π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only

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#### 7.5.2 Test Setup Diagram



### Ground Reference Plane

#### 7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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### 7.6 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 7.8.6

Limit: In any 100 kHz bai

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated 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) (see §15.205(c)



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### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.6 °C Humidity: 65.1 % RH Atmospheric Pressure: 1020 Test Mode: b:TX Hop mode Keep the EUT in frequency hopping mode with GFSK modulation,

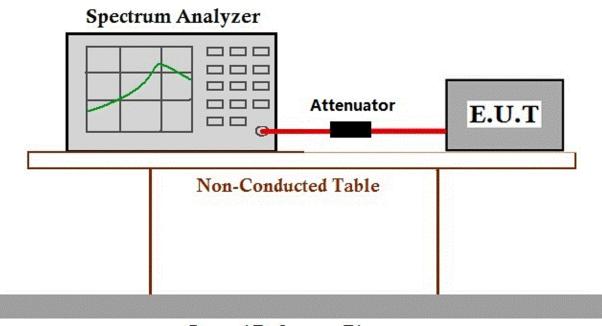
 $\pi$ /4DQPSK modulation, 8DPSK modulation. All modes have been tested and only

the data of worst case is recorded in the report.

c:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been

tested and only the data of worst case is recorded in the report.

### 7.6.2 Test Setup Diagram



#### Ground Reference Plane

#### 7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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### 7.7 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 7.8.8

Limit: In any 100 kHz bandwidth outside the frequency band in which the spread

spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated 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) (see §15.205(c)

#### 7.7.1 E.U.T. Operation

Operating Environment:

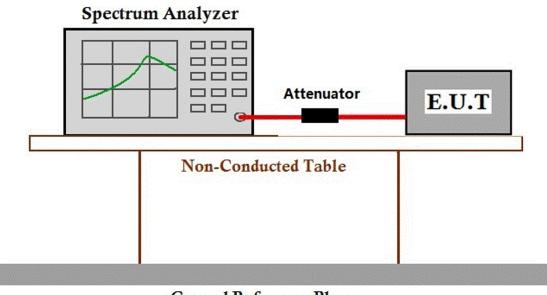
Temperature: 25.6 °C Humidity: 65.1 % RH Atmospheric Pressure: 1020 mbar

Test Mode: c:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK

modulation,  $\pi/\text{4DQPSK}$  modulation, 8DPSK modulation. All modes have been

tested and only the data of worst case is recorded in the report.

#### 7.7.2 Test Setup Diagram



### Ground Reference Plane

#### 7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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#### 7.8 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

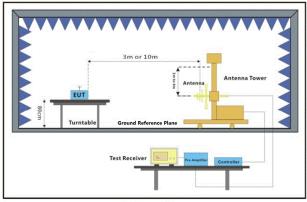
### 7.8.1 E.U.T. Operation

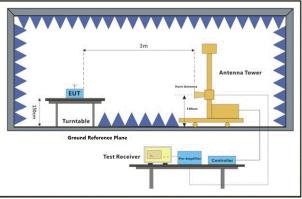
Operating Environment:

Temperature: 25.9 °C Humidity: 63.4 % RH Atmospheric Pressure: 1020 mbar Test Mode: c:TX non-Hop mode Keep the EUT in continuously transmitting mode with GFSK

modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case 8DPSK modulation is recorded in the report.

#### 7.8.2 Test Setup Diagram





30MHz-1GHz Above 1GHz

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#### 7.8.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor



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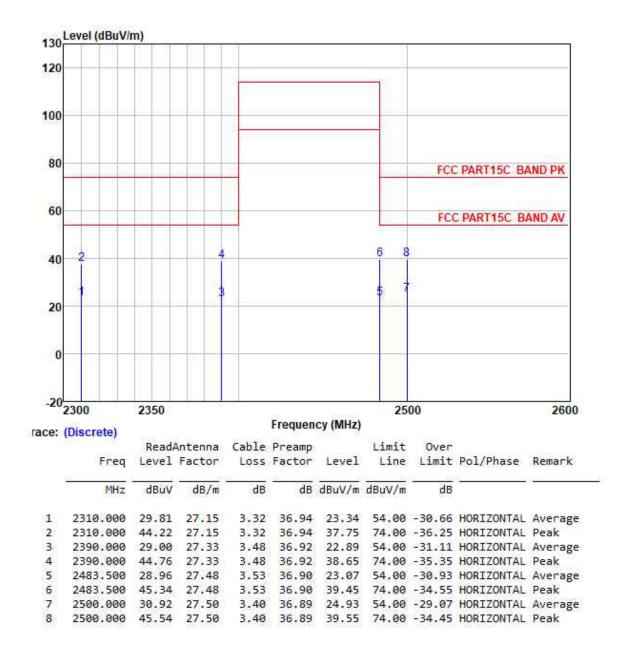
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Mode: c; left earbud, low channel





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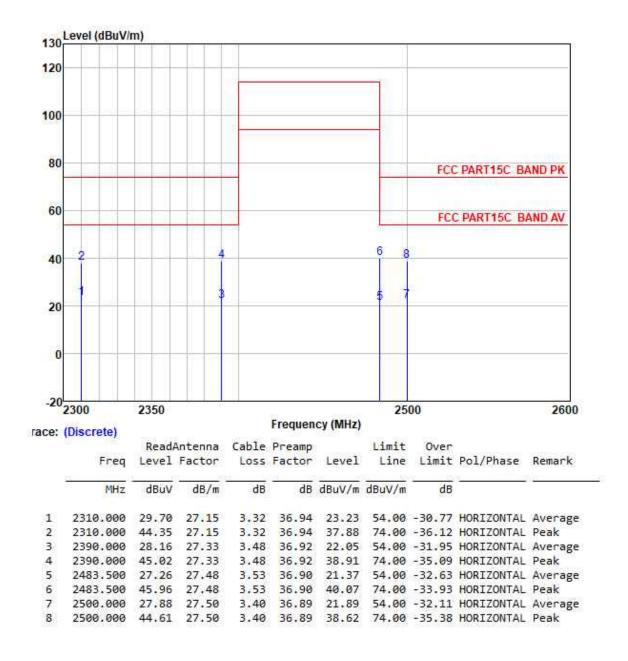
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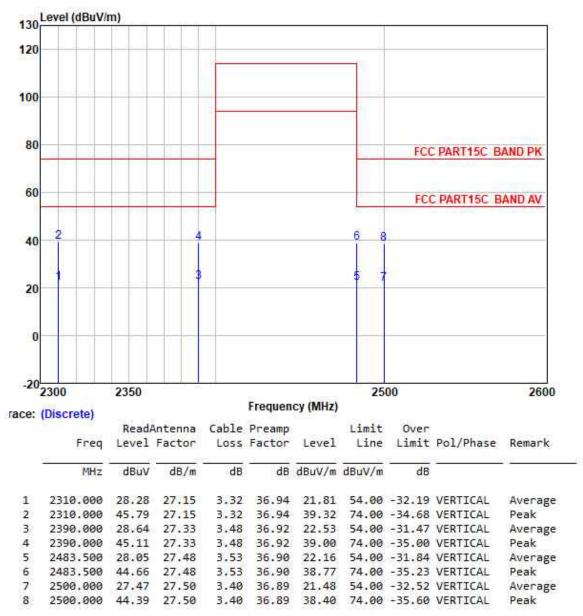
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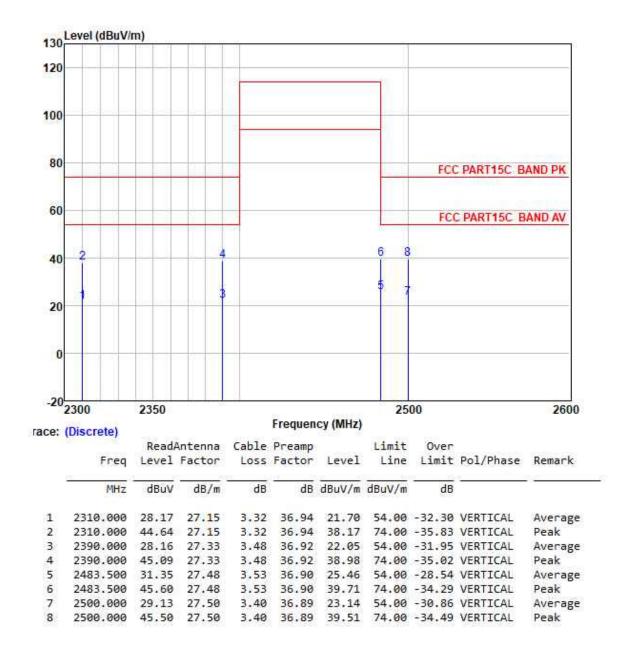
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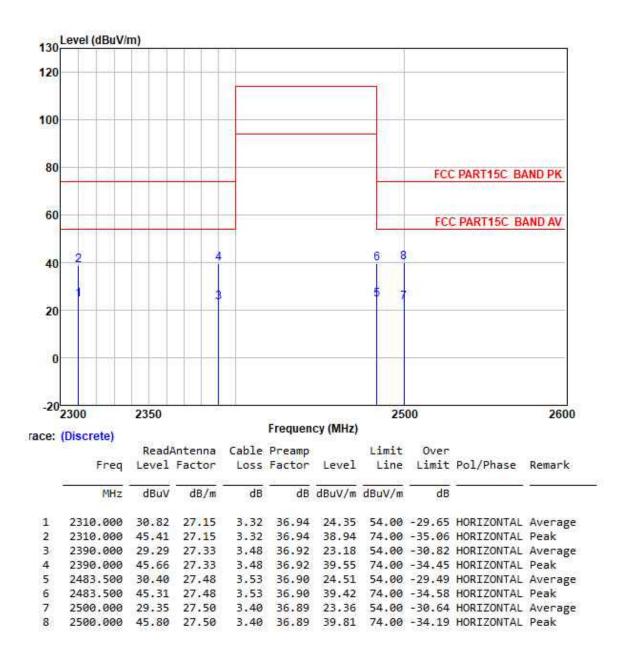
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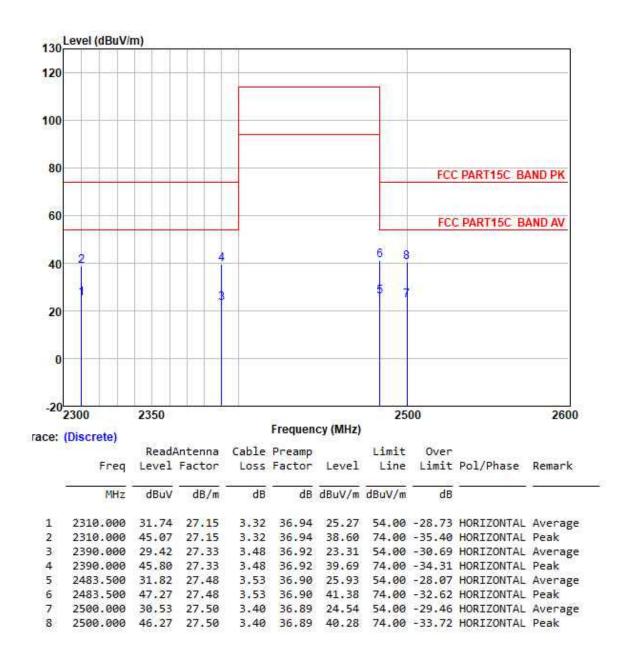
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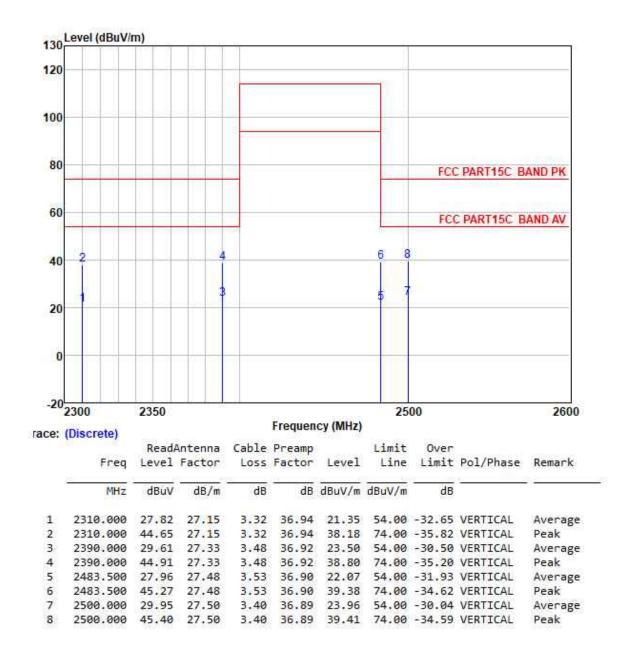
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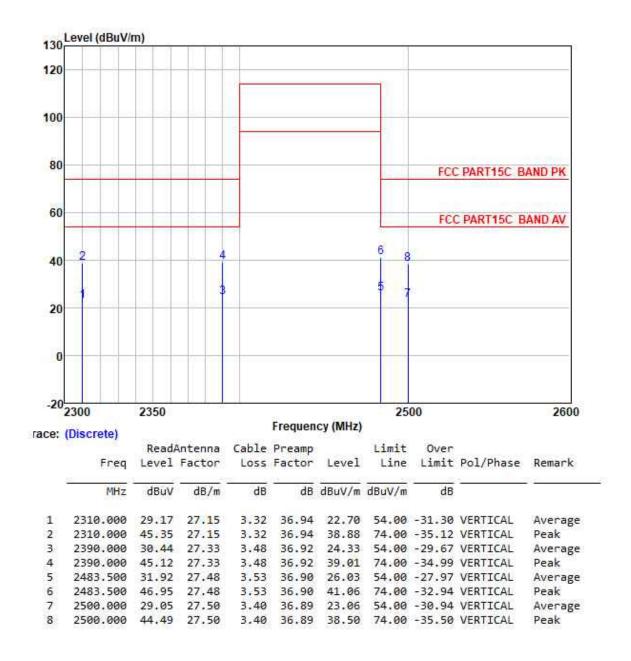
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### 7.9 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 25.9 °C Humidity: 63.3 % RH Atmospheric Pressure: 1020 mbar Test Mode: c:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK

modulation,  $\pi/4DQPSK$  modulation, 8DPSK modulation. All modes have been tested and only the data of worst case 8DPSK modulation is recorded in the report.



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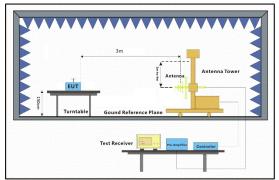
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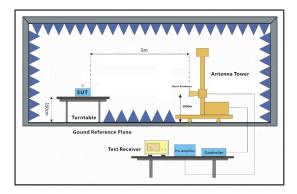


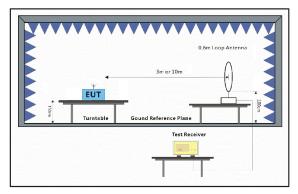
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### 7.9.2 Test Setup Diagram









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#### 7.9.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

#### Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown.
- 5) The emission below 1Ghz for both left earbud and right earbud are tested at low/middle /high channel. Only the worst case emission data at low channel is record in the report.



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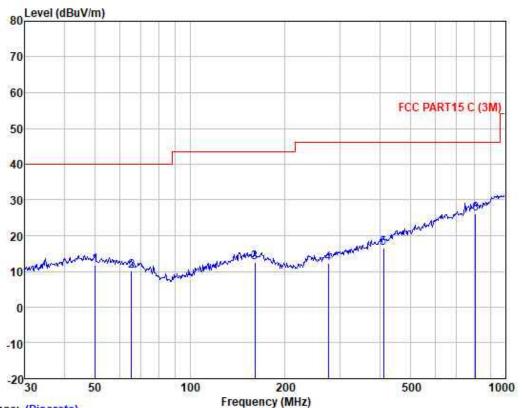
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Trace: (Discrete)

Site : SGS

Condition: FCC PART15 C (3M) 3m HORIZONTAL

Job : Model : Power : Test Mode: L

	Freq		Antenna Factor		FU +503 FL 12 (14)				Pol/Phase	Remark
-	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	-	-
1	50.057	23.70	13.90	1.19	27.17	11.62	40.00	-28.38	HORIZONTAL	QP
2	65.343	23.39	12.68	1.28	27.15	10.20	40.00	-29.80	HORIZONTAL	QP
3	160.909	23.74	13.60	2.15	26.85	12.64	43.50	-30.86	HORIZONTAL	QP
4	274.194	23.51	12.93	2.76	27.04	12.16	46.00	-33.84	HORIZONTAL	QP
5	411.824	24.72	15.97	3.68	27.93	16.44	46.00	-29.56	HORIZONTAL	QP
6	804.603	25.65	22.65	5.99	28.12	26.17	46.00	-19.83	HORIZONTAL	OP



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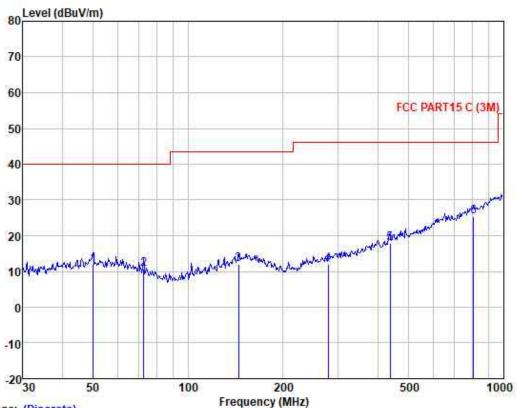
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Mode: c; right earbud, low channel



Trace: (Discrete)

Site : SGS

Condition: FCC PART15 C (3M) 3m HORIZONTAL

Model Power Test Mode: R

		ReadAntenna		Cable	Preamp		Limit	0ver		
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
-	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	-	-
1	50.057	24.20	13.90	1.19	27.17	12.12	40.00	-27.88	HORIZONTAL	QP
2	72.338	25.02	11.43	1.42	27.13	10.74	40.00	-29.26	HORIZONTAL	QP
3	144.842	23.35	13.65	2.02	26.91	12.11	43.50	-31.39	HORIZONTAL	QP
4	278.067	23.07	13.14	2.79	27.06	11.94	46.00	-34.06	HORIZONTAL	QP
5	437.120	25.05	16.93	3.89	27.97	17.90	46.00	-28.10	HORIZONTAL	QP
6	804.603	24.87	22.65	5.99	28.12	25.39	46.00	-20.61	HORIZONTAL	QP



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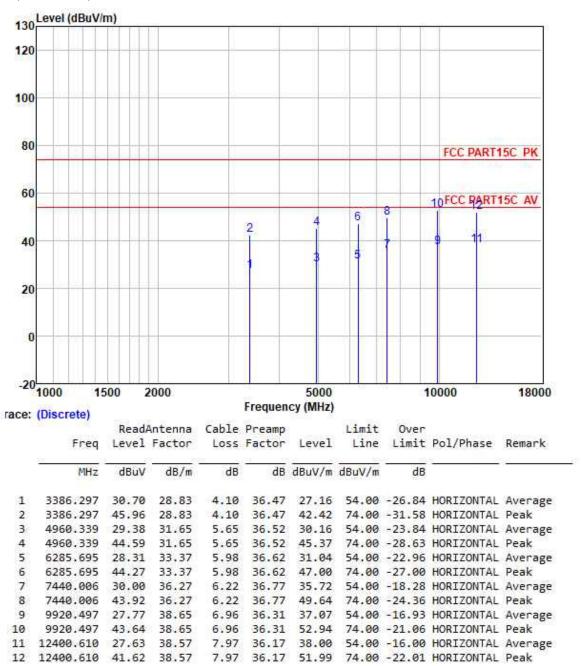
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Mode: c; left earbud, low channel





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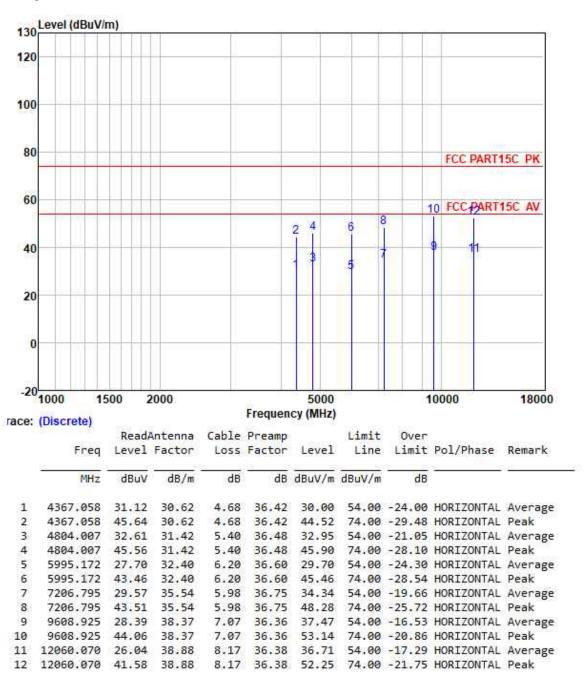
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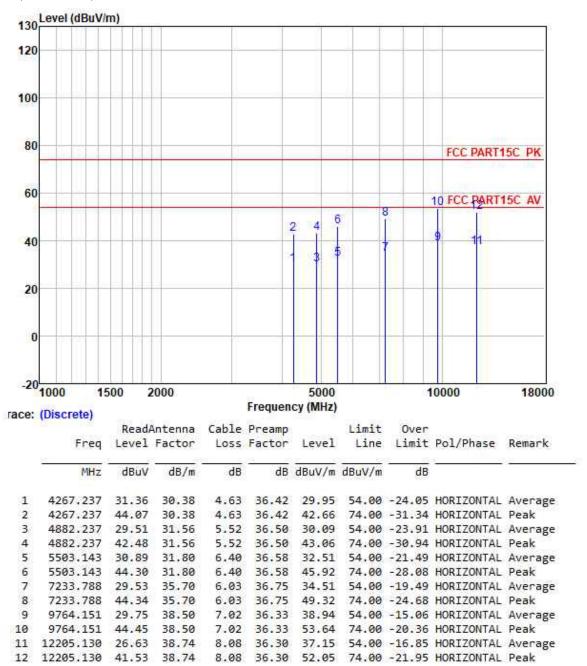
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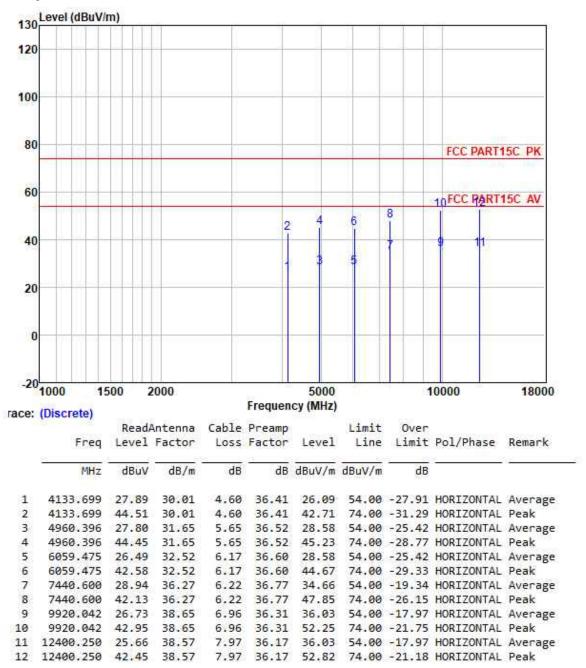
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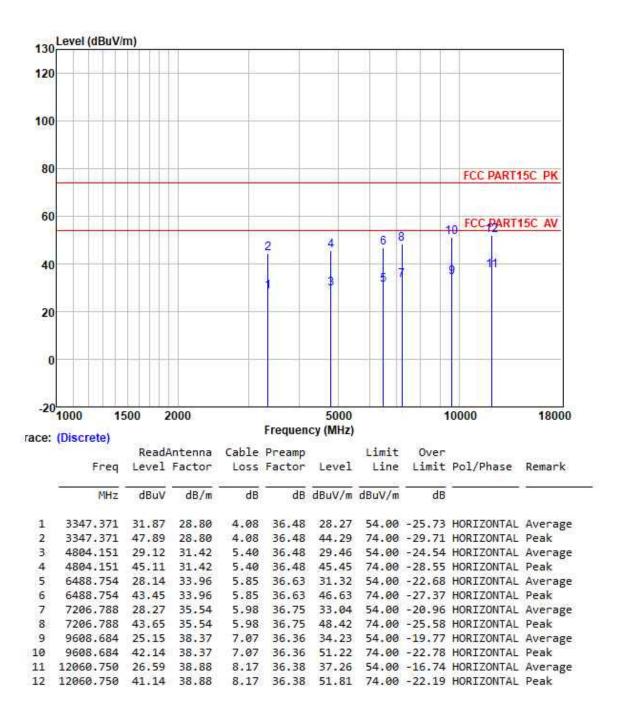
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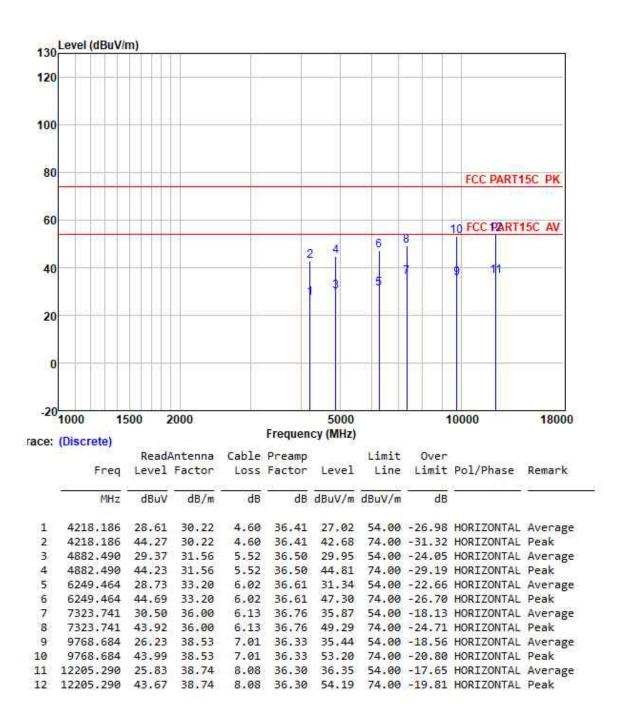
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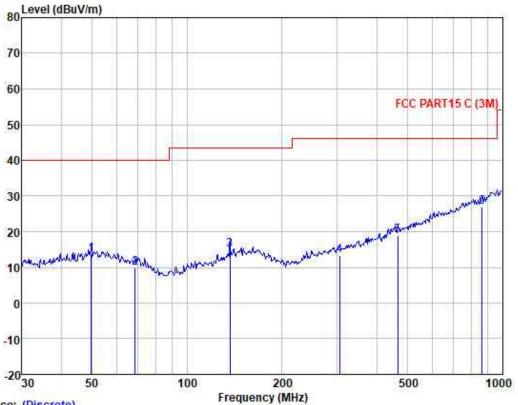
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Mode: c; left earbud, low channel



Trace: (Discrete)

Site : SGS

Condition: FCC PART15 C (3M) 3m VERTICAL

Job : Model : Power : Test Mode: L

	Freq		Antenna Factor		FU + 035 L 107 L 107				Pol/Phase	Remark
9	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		5
1	49.707	25.78	13.91	1.19	27.17	13.71	40.00	-26.29	VERTICAL	QP
2	68.631								VERTICAL	QP
3	136.939	27.16	12.90	1.94	26.98	15.02	43.50	-28.48	VERTICAL	QP
4	304.610	23.89	13.70	2.98	27.25	13.32	46.00	-32.68	VERTICAL	QP
5	465.599	25.47	17.40	4.16	28.01	19.02	46.00	-26.98	VERTICAL	QP
6	863.056	26.24	22.97	5.87	28.04	27.04	46.00	-18.96	VERTICAL	QP



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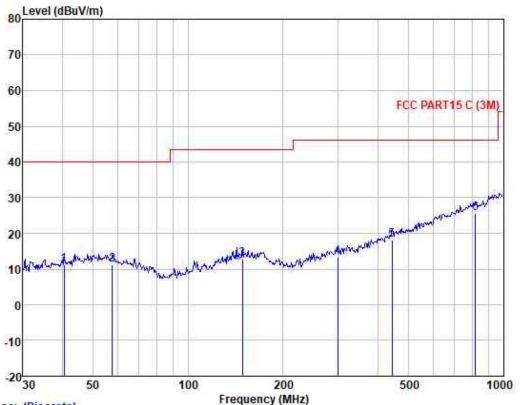
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Mode: c; right earbud, low channel



Trace: (Discrete)

Site : SGS

Condition: FCC PART15 C (3M) 3m VERTICAL

Job : Model : Power : Test Mode: R

<b>5</b>	noue. A	ReadAntenna		Cable	Preamp		Limit	Over		
	Freq	Level Factor			PU + 0.00 = 10.00 = 0.00					Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	•	5=
1	40.559	23.76	13.55	1.07	27.18	11.20	40.00	-28.80	VERTICAL	QP
2	57.594	23.40	13.62	1.30	27.16	11.16	40.00	-28.84	VERTICAL	QP
3	148.963	24.01	13.75	2.05	26.89	12.92	43.50	-30.58	VERTICAL	OP
4	298.268	23.97	13.57	2.97	27.19	13.32	46.00	-32.68	VERTICAL	QP
5	443.294	25.10	17.13	3.97	27.98	18.22	46.00	-27.78	VERTICAL	QP
6	815.968	25.16	22.77	5.90	28.10	25.73	46.00	-20.27	VERTICAL	QP



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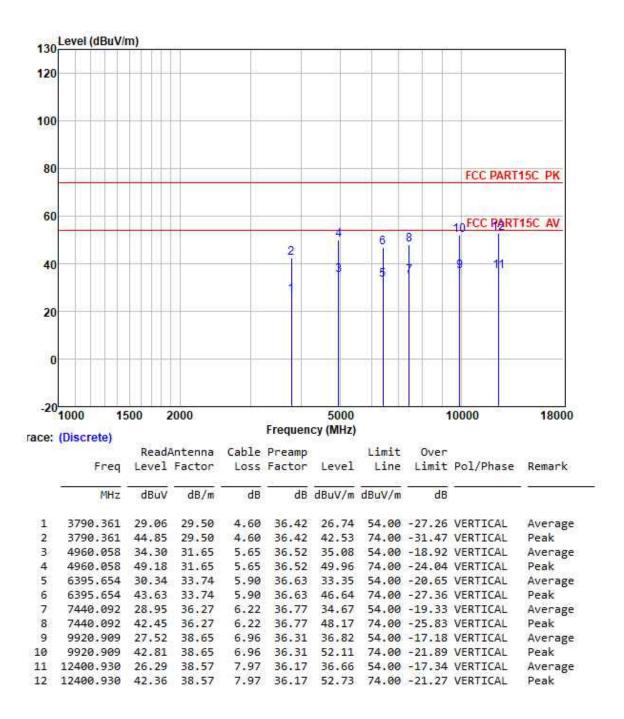
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Mode: c; left earbud, low channel





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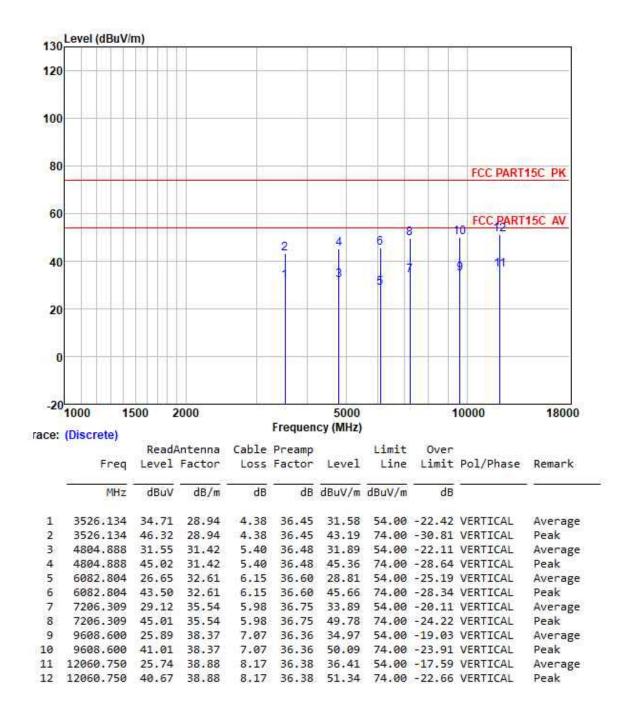
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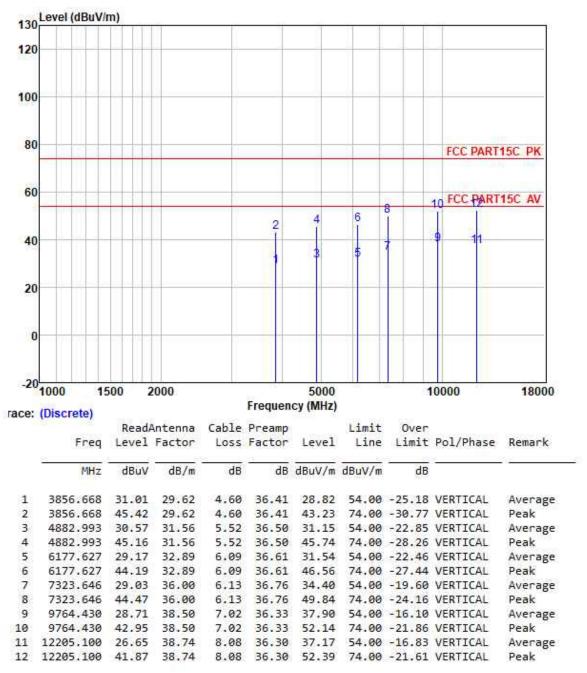
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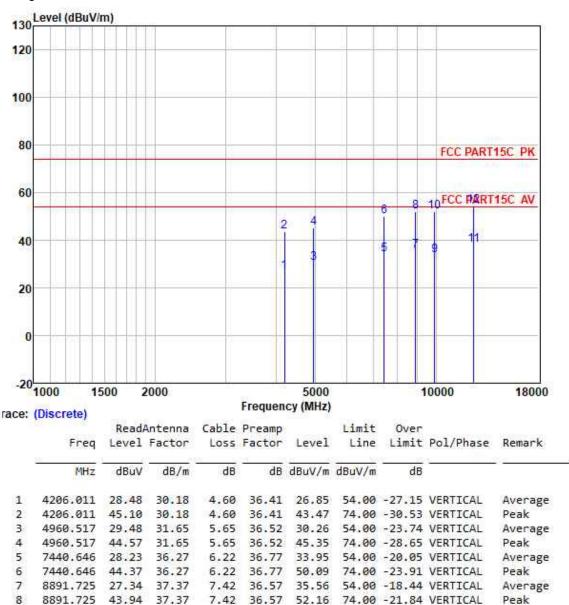
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9

10

9920.740 24.11 38.65

9920.740 42.57 38.65

11 12400.600 27.46 38.57

12 12400.600 44.17 38.57

6.96

36.31 33.41

6.96 36.31 51.87

54.00 -20.59 VERTICAL

74.00 -22.13 VERTICAL

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7.97 36.17 37.83 54.00 -16.17 VERTICAL

7.97 36.17 54.54 74.00 -19.46 VERTICAL

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Average

Peak Average

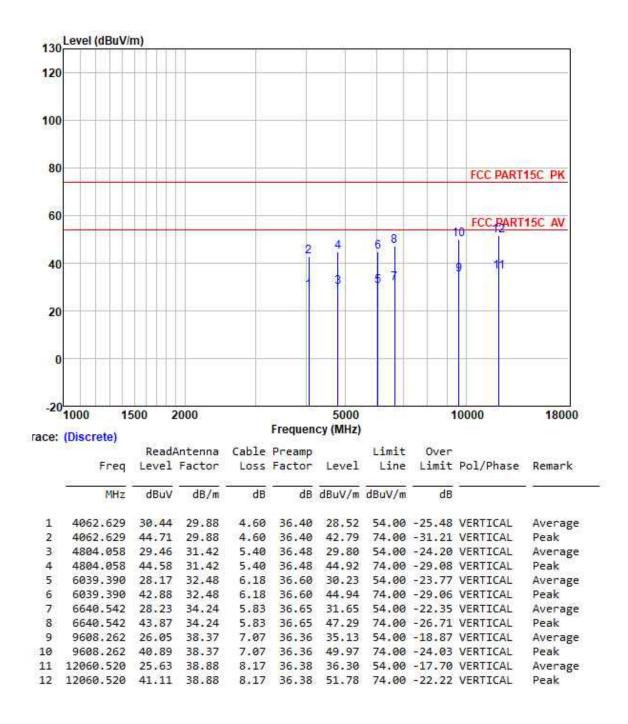
Peak



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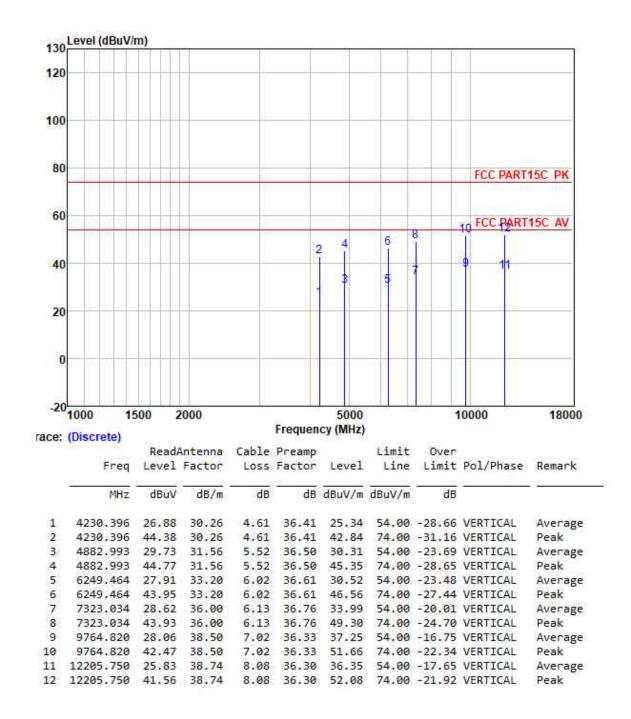
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