

Report No.: GZCR220400041901

Page: 1 of 157

FCC ID: APIJBLENPEAK3

TEST REPORT

Application No.: GZCR2204000419AT

Applicant: Harman International Industries, Inc.

Address of Applicant: 8500 Balboa Boulevard, Northridge, California, 91329, United States

Manufacturer: Harman International Industries, Inc.

Address of Manufacturer: 8500 Balboa Boulevard, Northridge, California, 91329, United States

Factory: Concord Intelligent Technology (Huizhou) Ltd.

Address of Factory: 25, Ping An Rd, Shuikou Street, Hui Cheng District, Huizhou City,

Guangdong Province, China

Equipment Under Test (EUT):

EUT Name: Model No.:BLUETOOTH HEADSET
ENDURANCE PEAK 3

Trade Mark: JBL

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

Date of Receipt: 2022-04-02

Date of Test: 2022-04-07 to 2022-04-14

Date of Issue: 2022-05-10

Test Result: Pass*

Kobe Jian EMC Laboratory Manager



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^{*} In the configuration tested, the EUT complied with the standards specified above.



Report No.: GZCR220400041901

Page: 2 of 157

Revision Record						
Version Chapter Date Modifier Remark						
	2022-05-10		Original			
	Chapter	Chapter Date	Chapter Date Modifier			

Authorized for issue by		
	Cof Vhu	
	Curry Wu/Project Engineer	
	Riday Liu	
	Ricky Liu/Reviewer	



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Report No.: GZCR220400041901

Page: 3 of 157

2 Test Summary

Radio Spectrum Technical Requirement						
Item	Standard	Method	Requirement	Result		
Antenna Requirement		N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	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							
ltem	Standard	Method	Requirement	Result			
Conducted Peak Output Power		ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass			
20dB Bandwidth		ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass			
Carrier Frequencies Separation		ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass			
Hopping Channel Number		ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass			
Dwell Time		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	- Caspan C 10.2 11	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		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			
Radiated Spurious Emissions (Below 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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Report No.: GZCR220400041901

Page: 4 of 157

3 Contents

			Page
1	Cove	er Page	1
2	Test	Summary	3
3	Cont	ents	
J			
4	Gene	eral Information	6
	4.1	Details of E.U.T.	
	4.2	Description of Support Units	
	4.3	Measurement Uncertainty	
	4.4	Test Location	
	4.5 4.6	Test Facility Deviation from Standards	
	4.0 4.7	Abnormalities from Standard Conditions	
5	Equi	pment List	10
6	Radi	o Spectrum Technical Requirement	1/
•			
		Antenna Requirement	
	6.1.1 6.1.2	Test Requirement:	
	-	Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	
	6.2.1	Test Requirement:	
	6.2.2	·	
7	_	o Spectrum Matter Test Results	
7		·	
	7.1	Conducted Peak Output Power	
	7.1.1	E.U.T. Operation	
	7.1.2	·	
	7.1.3 7.1.4	1 0	
	7.1.4	20dB Bandwidth	
	7.2.1		
	7.2.2	·	
	7.2.3		
	7.2.4		20
	7.3	Carrier Frequencies Separation	
	7.3.1	E.U.T. Operation	
	7.3.2	Test Mode Description	21
	7.3.3		
	7.3.4		
	7.4	Hopping Channel Number	
	7.4.1	E.U.T. Operation	
	7.4.2	The state of the s	
	7.4.3	1 0	
	7.4.4		
	7.5	Dwell Time	
	7.5.1	E.U.T. Operation	24



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Report No.: GZCR220400041901

Page: 5 of 157

	5.2 Test Mode Description5.3 Test Setup Diagram	
	5.4 Measurement Procedure and Data	
7.6		
	6.1 E.U.T. Operation	
	6.2 Test Mode Description	
	6.3 Test Setup Diagram	
	6.4 Measurement Procedure and Data	
7.7		
	7.1 E.U.T. Operation	
	7.2 Test Mode Description	
7.	7.3 Test Setup Diagram	
7.	7.4 Measurement Procedure and Data	
7.8		
7.8	8.1 E.U.T. Operation	30
7.8	8.2 Test Mode Description	
7.8	8.3 Test Setup Diagram	31
7.8	8.4 Measurement Procedure and Data	
7.9	Radiated Spurious Emissions (Below 1GHz)	40
7.9	9.1 E.U.T. Operation	40
7.9	9.2 Test Mode Description	40
7.9	9.3 Test Setup Diagram	41
7.9	9.4 Measurement Procedure and Data	42
7.10	Radiated Spurious Emissions (Above 1GHz)	49
7.	10.1 E.U.T. Operation	
	10.2 Test Mode Description	49
7.	10.3 Test Setup Diagram	
7.	10.4 Measurement Procedure and Data	51
8 Te	est Setup Photo	64
9 El	JT Constructional Details (EUT Photos)	65
10 Aı	opendix	66



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Report No.: GZCR220400041901

Page: 6 of 157

4 **General Information**

Details of E.U.T. 4.1

Power supply: Left earbuds: Li-Ion Polymer Battery DC3.85V 70mAh (Charged by travel

Right earbuds: Li-Ion Polymer Battery DC3.85V 70mAh(Charged by travel

case)

travel case with backup battery: Li-Ion Polymer Battery DC3.7V 950mAh

(Charged by USB port)

Cable(s): Type-C cable: 21cm unshielded

Operation Frequency: 2402MHz to 2480MHz

Bluetooth Version: V5.2 Dual mode

Spectrum Spread

Frequency Hopping Spread Spectrum(FHSS) Technology:

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

Number of Channels: 79 **Channel Spacing:** 1MHz

Antenna Type: Integral Antenna

Antenna Gain: Left earbuds: 0.41dBi; Right earbuds: -0.52dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
The EUT has been tested	as an independent unit.		





Report No.: GZCR220400041901

Page: 7 of 157

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty	
Conducted Peak Output Power	± 0.75dB	
20dB Bandwidth	± 3%	
Carrier Frequencies Separation	± 7.25 x 10-8	
Hopping Channel Number	± 7.25 x 10-8	
Dwell Time	± 0.37%	
Conducted Band Edges Measurement	± 0.75dB	
Conducted Spurious Emissions	± 0.75dB	
Radiated Emissions which fall in the restricted bands	±5.08dB (1GHz-6GHz); ±5.14Db	
Radiated Emissions which fall in the restricted bands	(above 6GHz)	
Radiated Spurious Emissions (Below 1GHz)	±5.06dB (3m);±4.46dB (10m)	
Padiated Courieus Emissions (Abous 10Uz)	±5.08dB (1GHz-6GHz); ±5.14dB	
Radiated Spurious Emissions (Above 1GHz)	(above 6GHz)	

Remark:

The Ulab (lab Uncertainty) is less than Ucispr (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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Report No.: GZCR220400041901

Page: 8 of 157

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory, 198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

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/New Zealand Regulatory Compliance Mark (RCM).

• 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 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.

• ISED (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-20107 and T-11179)

The 10m Semi-anechoic chamber, 966 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-20107 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 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



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Report No.: GZCR220400041901

Page: 9 of 157

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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Report No.: GZCR220400041901

Page: 10 of 157

5 Equipment List

Conducted Peak Output Power						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
MI CABLE	SGS-EMC	M8.0	EMC2136	2021-11-01	2023-11-01	
Test Software	TST	V2.0	GZE100-78	N/A	N/A	

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Carrier Frequencies Separation						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01	
Test Software	TST	V2.0	GZE100-78	N/A	N/A	

Hopping Channel Number							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15		
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14		
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01		
Test Software	TST	V2.0	GZE100-78	N/A	N/A		

Dwell Time					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01



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Report No.: GZCR220400041901

Page: 11 of 157

Test Software	TST	V2.0	GZE100-78	N/A	N/A
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Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-12-17	2022-12-16
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-16	2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2021-07-29	2022-07-28
Horn Antenna(14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2021-08-30	2022-08-29



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Report No.: GZCR220400041901

Page: 12 of 157

Radiated Spurious Emissions (Below 1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(10Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Active Loop Antenna- RED	ETS-Lindgren	6502	EMC2190	2022-04-06	2024-04-05
Trilog Broadband Antenna(25MHz-1GHz)- Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22 2022-02-21	2022-02-22 2024-02-20
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
High Pass Filter (915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2021-12-17	2022-12-16
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
EMI Test Receiver(1Hz- 8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25

Radiated Spurious Emissions (Above 1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-12-17	2022-12-16
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-16	2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2021-07-29	2022-07-28
Horn Antenna(14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27



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Report No.: GZCR220400041901

Page: 13 of 157

Microwave Broadband Preamplifier	SCHWARZBECK	BBV 9721	EMC2172	2021-08-30	2022-08-29
(18-40GHz)					

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2021-07-05	2022-07-05
DMM	Fluke	73	EMC0007	2021-07-05	2022-07-05



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Report No.: GZCR220400041901

Page: 14 of 157

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

15.203 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of 15.211, 15.213, 15.217, 15.219, 15.221, or 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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 best case gain of the antenna is Left earbuds: 0.41dBi; Right earbuds: -0.52dBi.

Antenna location: Refer to internal photo.



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Report No.: GZCR220400041901

Page: 15 of 157

6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

Limit:

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:



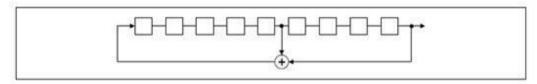
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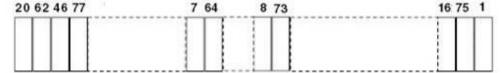
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Page: 16 of 157



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 band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

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



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Report No.: GZCR220400041901

Page: 17 of 157

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

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 band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.



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Report No.: GZCR220400041901

Page: 18 of 157

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

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX_non-Hop mode(Left earbuds)_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.
Final test	06	TX_non-Hop mode(Right earbuds)_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.



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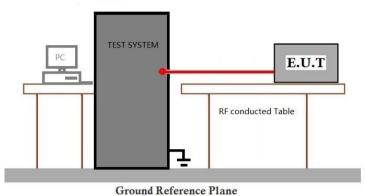
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Report No.: GZCR220400041901

Page: 19 of 157

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR220400041901

Page: 20 of 157

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: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.2.2 Test Mode Description

Pre-scan / Mode Final test Code Description

06

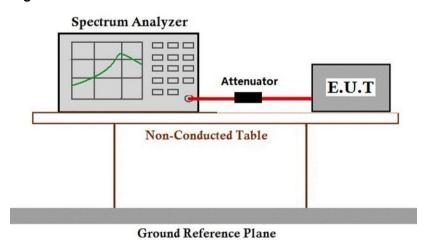
TX_non-Hop mode(Left earbuds)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is

recorded in the report.

TX_non-Hop mode(Right earbuds)_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.

7.2.3 Test Setup Diagram

Final test



7.2.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR220400041901

Page: 21 of 157

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

Final test

Final test

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.3.2 Test Mode Description

Pre-scan / Mode Final test Code Description

03

05

TX_Hop mode(Left earbuds)_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

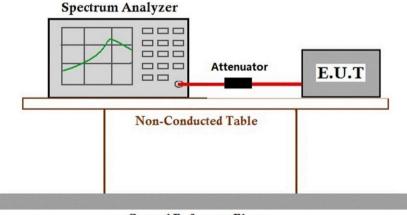
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TX_Hop mode(Right earbuds)_Keep the EUT in frequency hopping mode with GFSK modulation, pi/4DQPSK modulation, 8DPSK modulation. All

modes have been tested and only the data of worst case is recorded in the

report.

7.3.3 Test Setup Diagram



Ground Reference Plane

7.3.4 Measurement Procedure and Data

cable loss=0.9dB

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Report No.: GZCR220400041901

Page: 22 of 157

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)
002.028	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: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.4.2 Test Mode Description

Pre-scan /	Mode	Description
Final test	Code	Description

TX_Hop mode(Left earbuds)_Keep the EUT in frequency hopping mode with GFSK modulation, pi/4DQPSK modulation, 8DPSK modulation. All Final test 03

modes have been tested and only the data of worst case is recorded in the

report.

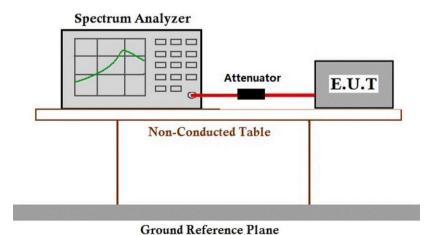
TX_Hop mode(Right earbuds)_Keep the EUT in frequency hopping mode

with GFSK modulation, pi/4DQPSK modulation, 8DPSK modulation. All **Final test** 05 modes have been tested and only the data of worst case is recorded in the

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7.4.3 Test Setup Diagram

检验检测专用章



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Report No.: GZCR220400041901

Page: 23 of 157

7.4.4 Measurement Procedure and Data

cable loss=0.9dB

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Report No.: GZCR220400041901

Page: 24 of 157

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
000.000	0.4s within a 20s period(20dB bandwidth<250kHz)
902-928	0.4s within a 10s period(20dB bandwidth≥250kHz)
2400 2402 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

Final test

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.5.2 Test Mode Description

Pre-scan / Mode Final test Code Description

TX_Hop mode(Left earbuds)_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

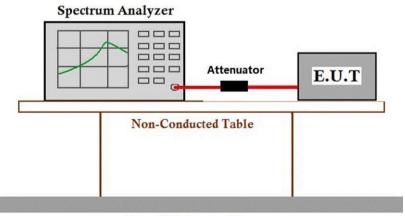
report.

TX_Hop mode(Right earbuds)_Keep the EUT in frequency hopping mode with GFSK modulation, pi/4DQPSK modulation, 8DPSK modulation. All

Final test 05 with GFSK modulation, ph/4DQFSK modulation, All modes have been tested and only the data of worst case is recorded in the

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7.5.3 Test Setup Diagram



Ground Reference Plane



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7.5.4 Measurement Procedure and Data

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Report No.: GZCR220400041901

Page: 26 of 157

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 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).

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	03	TX_Hop mode(Left earbuds)_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.
Final test	04	TX_non-Hop mode(Left earbuds)_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.
Final test	05	TX_Hop mode(Right earbuds)_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.
Final test	06	TX_non-Hop mode(Right earbuds)_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.



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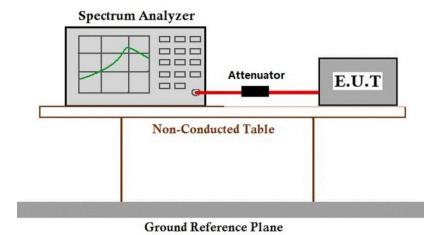
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Page: 27 of 157

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

cable loss=0.9dB

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Page: 28 of 157

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:

23 °C Humidity: Atmospheric Pressure: 1003 mbar Temperature: 54 % RH

7.7.2 Test Mode Description

Mode Pre-scan / Description Final test Code

TX_non-Hop mode(Left earbuds)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation, 8DPSK **Final test** 04 modulation. All modes have been tested and only the data of worst case is

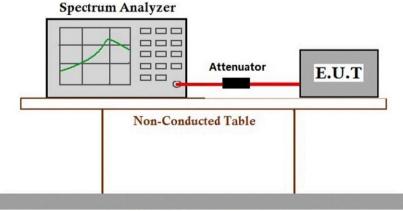
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TX non-Hop mode(Right earbuds) Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation, 8DPSK Final test 06

modulation. All modes have been tested and only the data of worst case is

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7.7.3 Test Setup Diagram



Ground Reference Plane



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Page: 29 of 157

7.7.4 Measurement Procedure and Data

cable loss=0.9dB

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Report No.: GZCR220400041901

Page: 30 of 157

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: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX_non-Hop mode(Left earbuds)_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.
Final test	06	TX_non-Hop mode(Right earbuds)_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.



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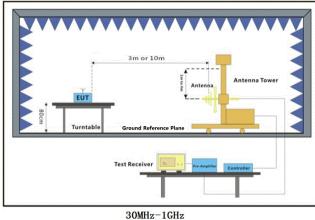
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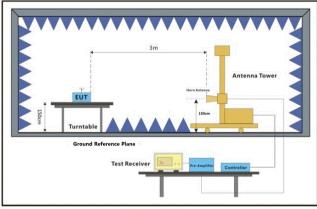


Report No.: GZCR220400041901

Page: 31 of 157

7.8.3 Test Setup Diagram





Above 1GHz

7.8.4 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 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.



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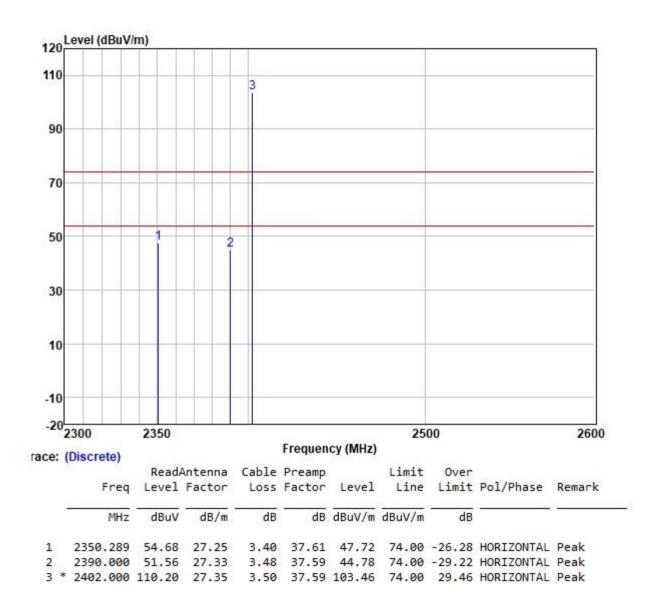
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Page: 32 of 157

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low





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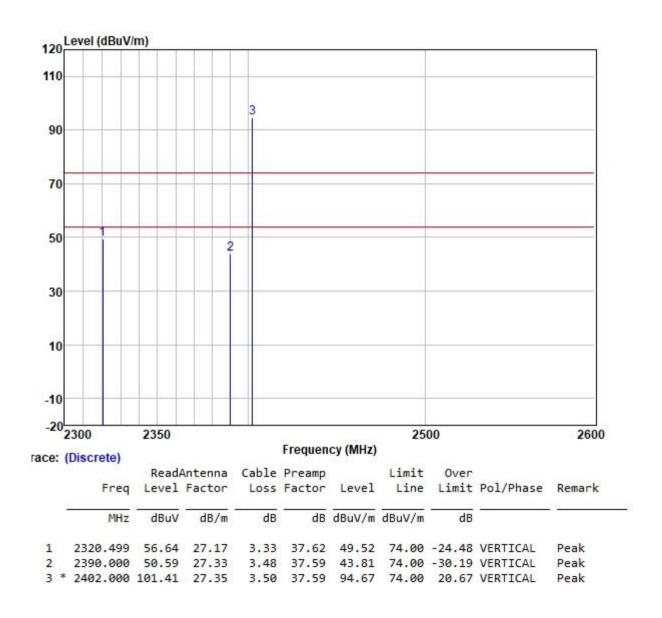
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Page: 33 of 157

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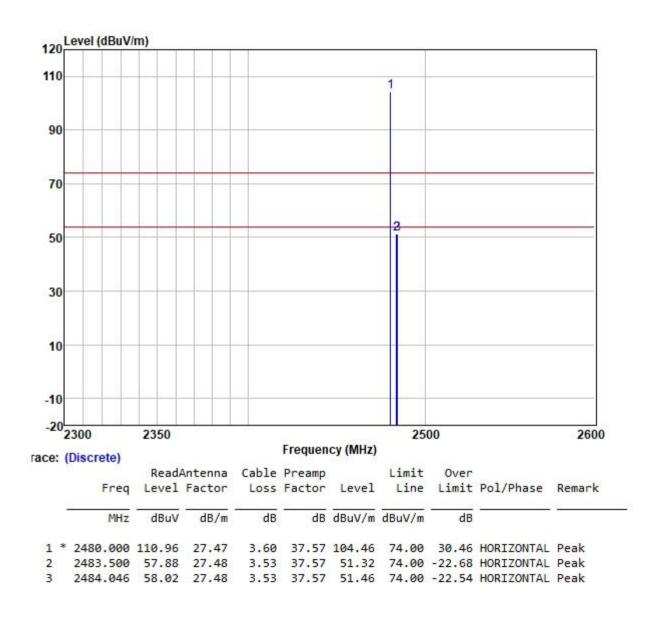
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Page: 34 of 157

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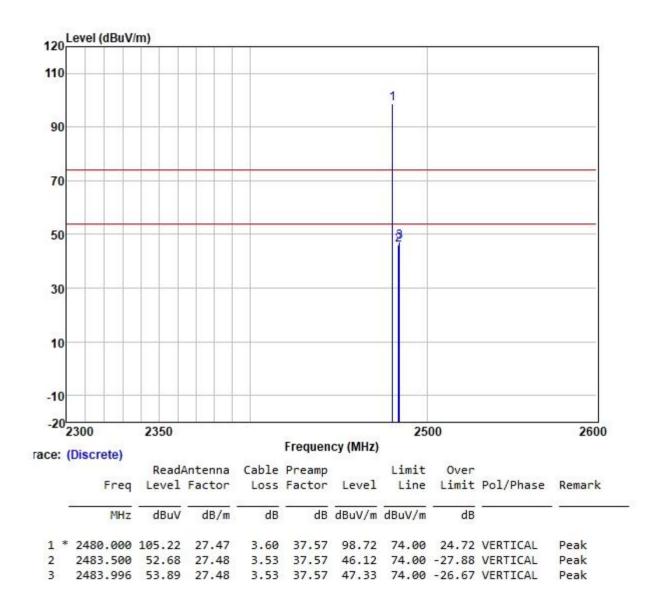
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Page: 35 of 157

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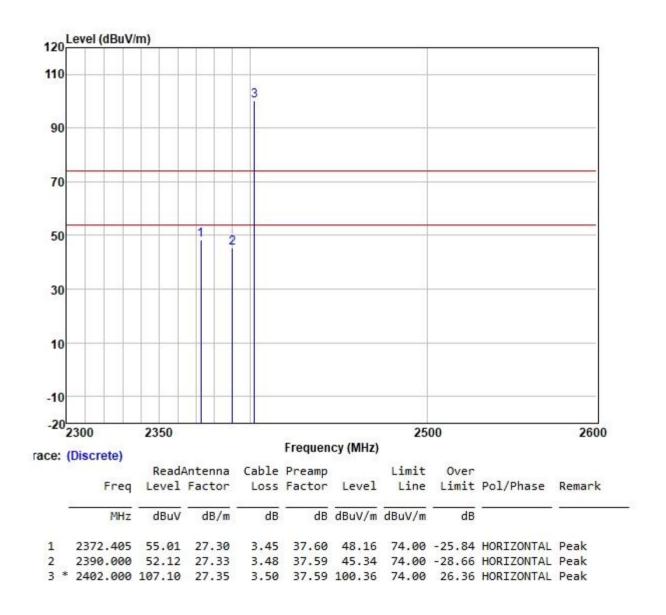
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Page: 36 of 157

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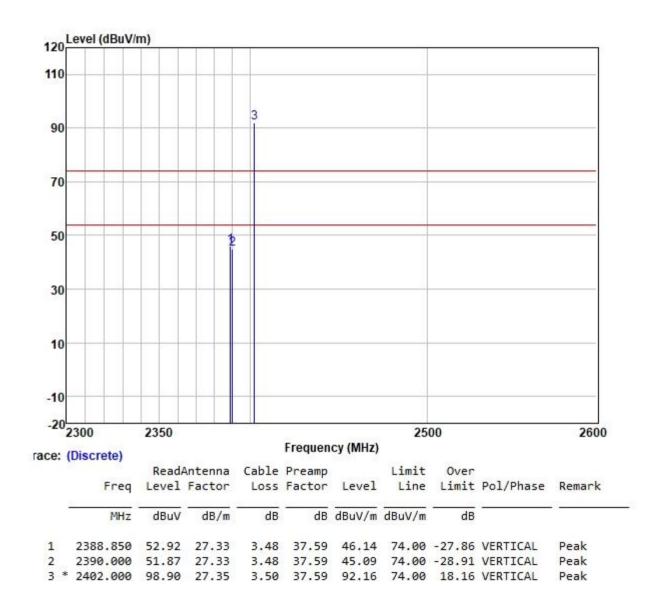
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Page: 37 of 157

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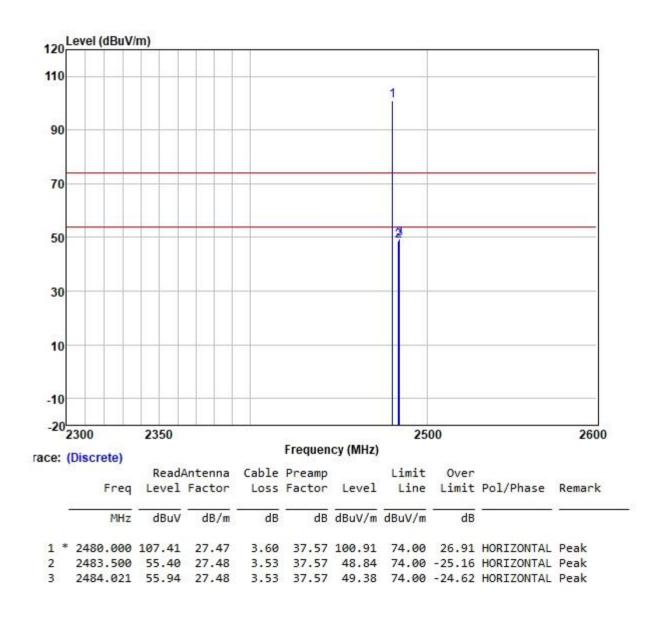
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Report No.: GZCR220400041901

Page: 38 of 157

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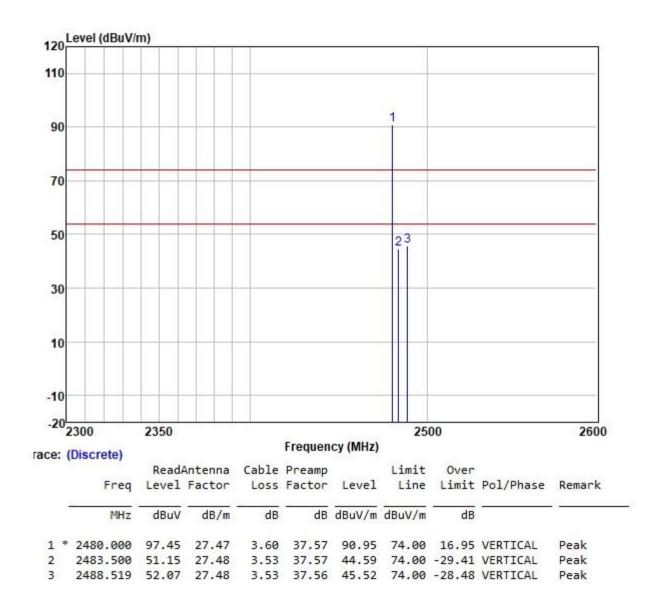
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Page: 39 of 157

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Report No.: GZCR220400041901

Page: 40 of 157

7.9 Radiated Spurious Emissions (Below 1GHz)

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

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: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX_non-Hop mode(Left earbuds)_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.
Final test	06	TX_non-Hop mode(Right earbuds)_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.



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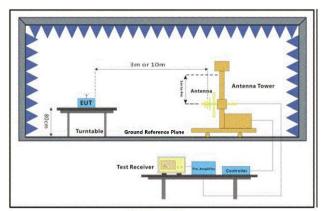
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Report No.: GZCR220400041901

Page: 41 of 157

7.9.3 Test Setup Diagram



30MHz-1GHz



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Report No.: GZCR220400041901

Page: 42 of 157

7.9.4 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. 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.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) 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 1 GHz, the disturbance 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.



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Report No.: GZCR220400041901

Page: 43 of 157

The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

 $L_3 / L_{10} = D_{10} / D_3$

Note:

L₃: Level @ 3m distance. Unit: uV/m; L₁₀: Level @ 10m distance. Unit: uV/m;

D₃: 3m distance. Unit: m D₁₀: 10m distance. Unit: m

The level at 3m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
39.437	9.77	3.08	10.27	20.23	40.00	-19.77	Н
52.025	10.77	3.46	11.52	21.23	40.00	-18.77	Н
139.361	12.23	4.09	13.63	22.69	43.50	-20.81	Н
408.946	16.20	6.46	21.52	26.66	46.00	-19.34	Н
556.774	21.87	12.40	41.34	32.33	46.00	-13.67	Н
813.112	25.26	18.32	61.08	35.72	46.00	-10.28	Н
43.506	10.91	3.51	11.71	21.37	40.00	-18.63	V
47.994	10.82	3.48	11.58	21.28	40.00	-18.72	V
142.324	11.53	3.77	12.57	21.99	43.50	-21.51	V
460.727	18.02	7.96	26.54	28.48	46.00	-17.52	V
810.265	26.41	20.92	69.72	36.87	46.00	-9.13	V
993.011	28.78	27.48	91.60	39.24	54.00	-14.76	V



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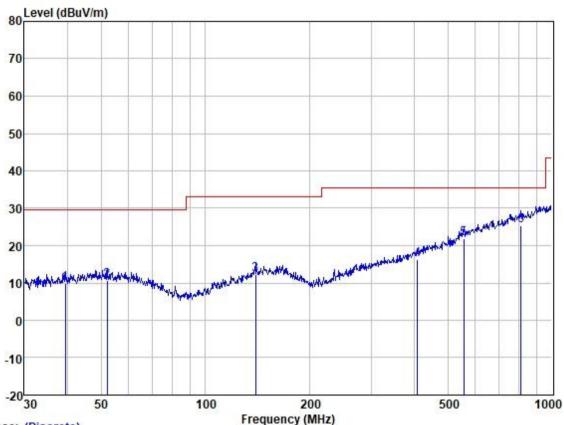
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Report No.: GZCR220400041901

Page: 44 of 157

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS Job : Model : Power : Test Mode : 04

	Freq					Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	***	
1	39.437	22.87	12.98	1.10	27.18	9.77	29.50	-19.73	HORIZONTAL	QP
2	52.025	23.21	13.57	1.16	27.17	10.77	29.50	-18.73	HORIZONTAL	QP
3	139.361	24.28	12.81	2.07	26.93	12.23	33.10	-20.87	HORIZONTAL	QP
4	408.946	24.03	15.56	3.97	27.36	16.20	35.60	-19.40	HORIZONTAL	QP
5	556.774	26.71	18.41	4.88	28.13	21.87	35.60	-13.73	HORIZONTAL	QP
6	813.112	24.61	22.43	6.23	28.01	25.26	35.60	-10.34	HORIZONTAL	QP



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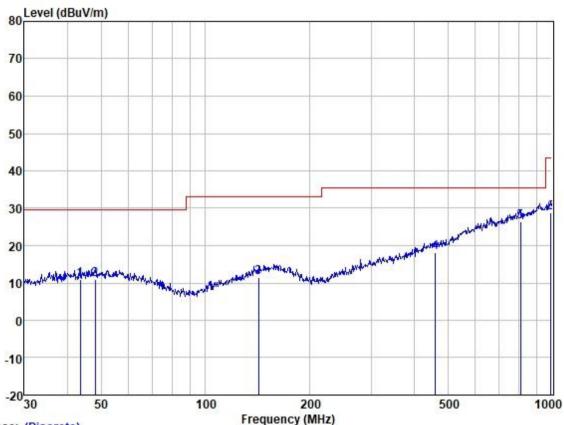
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Report No.: GZCR220400041901

Page: 45 of 157

Test Mode: 04; Polarity: Vertical; Modulation: GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS Job : Model : Power : Test Mode : 04

	Freq				- C	Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		-
1	43.506	23.60	13.36				29.50	-18.59	VERTICAL	QP
2	47.994	23.31	13.55	1.13	27.17	10.82	29.50	-18.68	VERTICAL	QP
3	142.324	23.32	12.98	2.12	26.89	11.53	33.10	-21.57	VERTICAL	QP
4	460.727	24.57	17.00	4.25	27.80	18.02	35.60	-17.58	VERTICAL	QP
5	810.265	25.63	22.57	6.23	28.02	26.41	35.60	-9.19	VERTICAL	QP
6	993.011	24.99	24.09	7.37	27.67	28.78	43.50	-14.72	VERTICAL	QP



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Report No.: GZCR220400041901

Page: 46 of 157

The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

 $L_3 / L_{10} = D_{10} / D_3$

Note:

L₃: Level @ 3m distance. Unit: uV/m; L₁₀: Level @ 10m distance. Unit: uV/m;

D₃: 3m distance. Unit: m D₁₀: 10m distance. Unit: m

The level at 3m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
42.302	10.45	3.33	11.10	20.91	40.00	-19.09	Н
56.001	10.68	3.42	11.40	21.14	40.00	-18.86	Н
150.538	12.49	4.21	14.04	22.95	43.50	-20.55	Н
334.859	13.35	4.65	15.50	23.81	46.00	-22.19	Н
554.825	21.25	11.55	38.49	31.71	46.00	-14.29	Н
830.400	25.55	18.95	63.15	36.01	46.00	-9.99	Н
39.715	10.42	3.32	11.06	20.88	40.00	-19.12	V
57.999	10.59	3.38	11.28	21.05	40.00	-18.95	V
148.963	11.75	3.87	12.89	22.21	43.50	-21.29	V
326.985	14.36	5.22	17.41	24.82	46.00	-21.18	V
576.644	21.55	11.95	39.85	32.01	46.00	-13.99	V
869.130	26.59	21.36	71.18	37.05	46.00	-8.95	V



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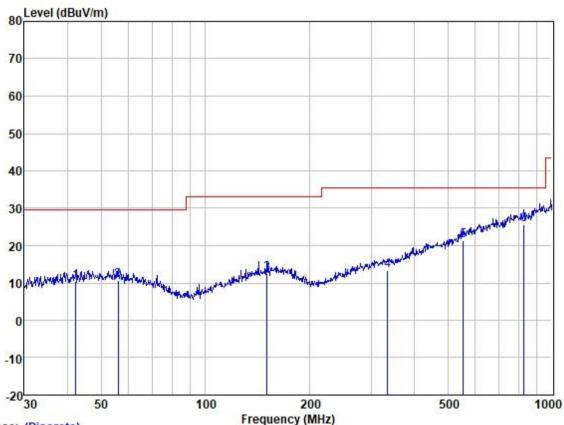
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Report No.: GZCR220400041901

Page: 47 of 157

Test Mode: 06; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS Job : Model : Power : Test Mode : 06

	Freq					Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	42.302	23.23	13.28	1.11	27.17	10.45	29.50	-19.05	HORIZONTAL	QP
2	56.001	23.37	13.27	1.20	27.16	10.68	29.50	-18.82	HORIZONTAL	QP
3	150.538	23.74	13.34	2.24	26.83	12.49	33.10	-20.61	HORIZONTAL	QP
4	334.859	22.48	14.19	3.46	26.78	13.35	35.60	-22.25	HORIZONTAL	QP
5	554.825	26.23	18.31	4.83	28.12	21.25	35.60	-14.35	HORIZONTAL	QP
6	830.400	24.68	22.48	6.38	27.99	25.55	35.60	-10.05	HORIZONTAL	QP



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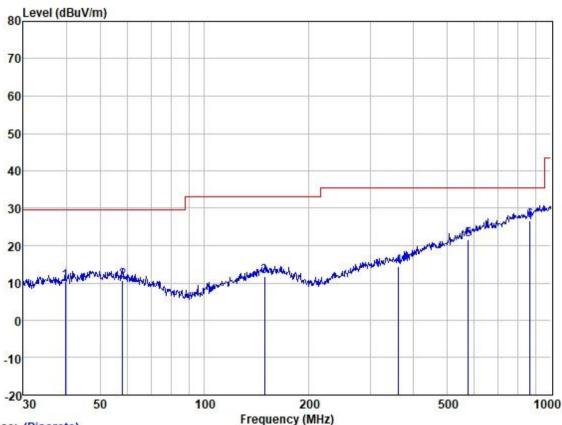
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Report No.: GZCR220400041901

Page: 48 of 157

Test Mode: 06; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

Site : SGS Job : Model : Power : Test Mode : 06

	Freq				- C	Measured Level			Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	39.715	23.51	12.99			10.42	29.50	-19.08	VERTICAL	QP
2	57.999	23.43	13.09	1.23	27.16	10.59	29.50	-18.91	VERTICAL	QP
3	148.963	23.05	13.32	2.22	26.84	11.75	33.10	-21.35	VERTICAL	QP
4	362.985	23.26	14.51	3.73	27.14	14.36	35.60	-21.24	VERTICAL	QP
5	576.644	25.63	19.08	5.02	28.18	21.55	35.60	-14.05	VERTICAL	QP
6	869.130	25.47	22.30	6.71	27.89	26.59	35.60	-9.01	VERTICAL	QP



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Report No.: GZCR220400041901

Page: 49 of 157

7.10 Radiated Spurious Emissions (Above 1GHz)

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.

7.10.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1003 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX_non-Hop mode(Left earbuds)_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.
Final test	06	TX_non-Hop mode(Right earbuds)_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.



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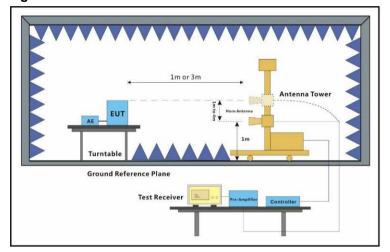
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Report No.: GZCR220400041901

Page: 50 of 157

7.10.3 Test Setup Diagram





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Report No.: GZCR220400041901

Page: 51 of 157

7.10.4 Measurement Procedure and Data

- a. 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.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1) 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

- 2) Scan from 1GHz to 25GHz, the disturbance above 18GHz 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.
- 3) 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.



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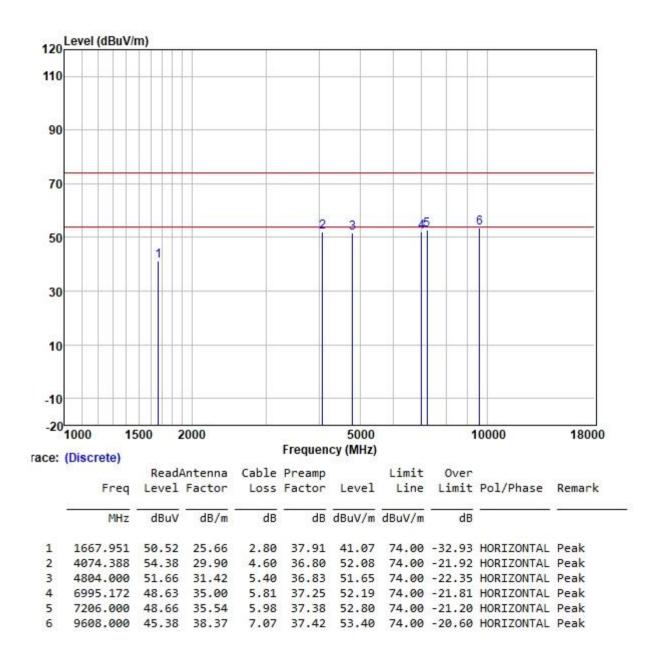
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Report No.: GZCR220400041901

Page: 52 of 157

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low





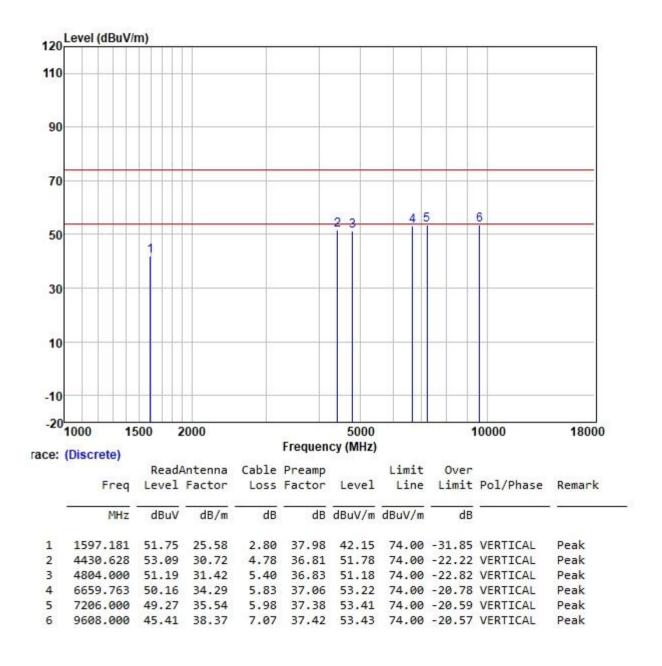
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Page: 53 of 157

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:Low





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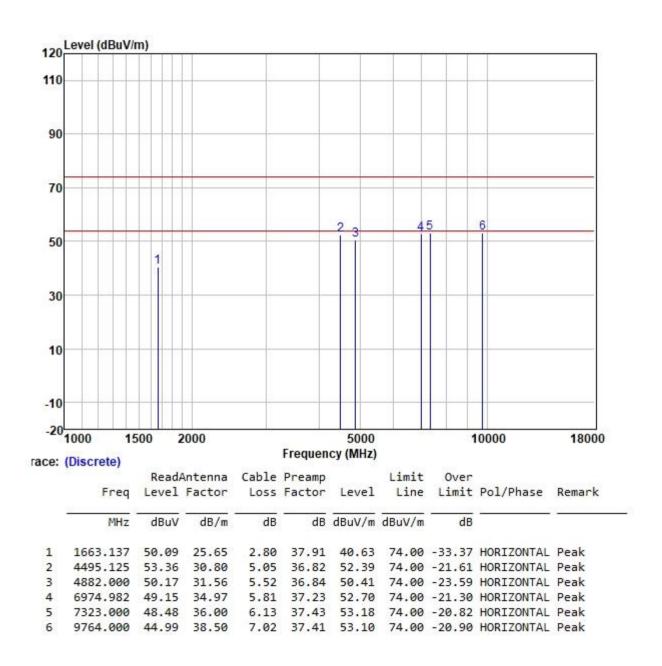
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Report No.: GZCR220400041901

Page: 54 of 157

Test Mode: 04; Polarity: Horizontal; Modulation: GFSK; ; Channel: middle





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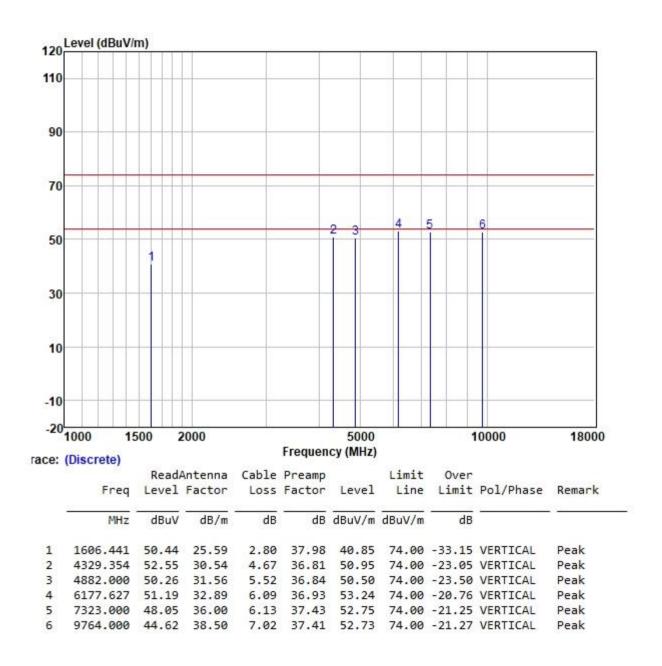
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Report No.: GZCR220400041901

Page: 55 of 157

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:middle





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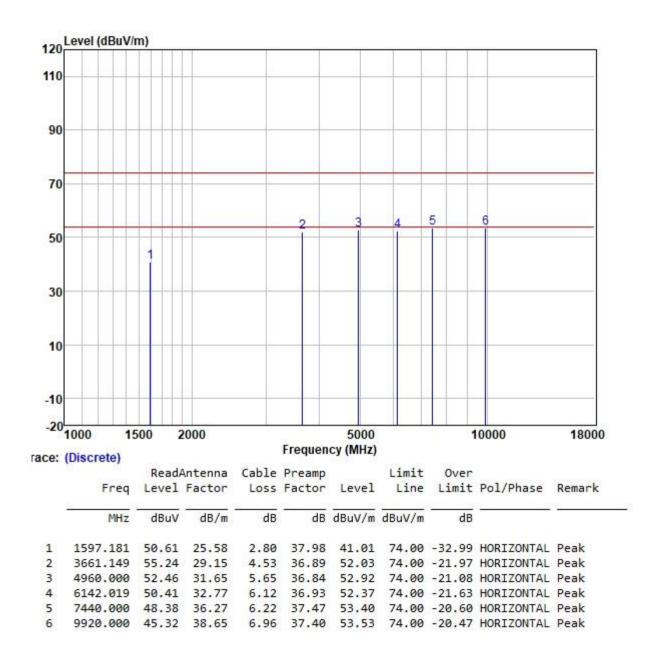
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Report No.: GZCR220400041901

Page: 56 of 157

Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:High





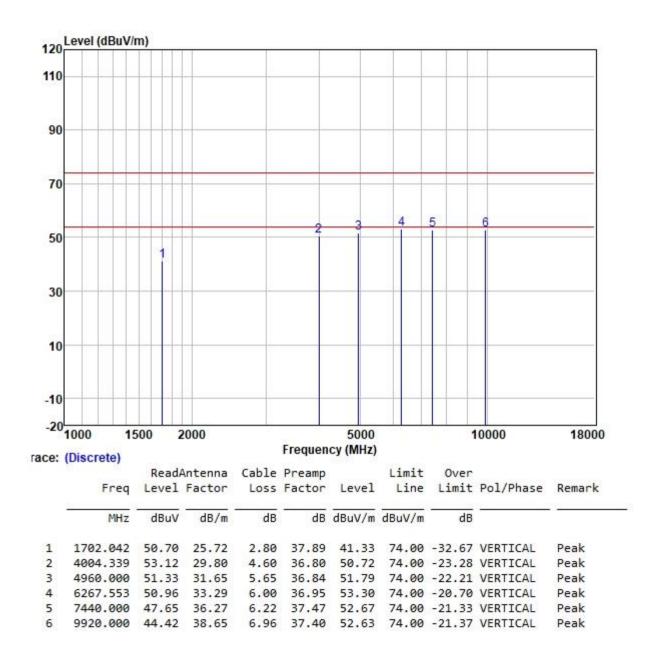
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Report No.: GZCR220400041901

Page: 57 of 157

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:High





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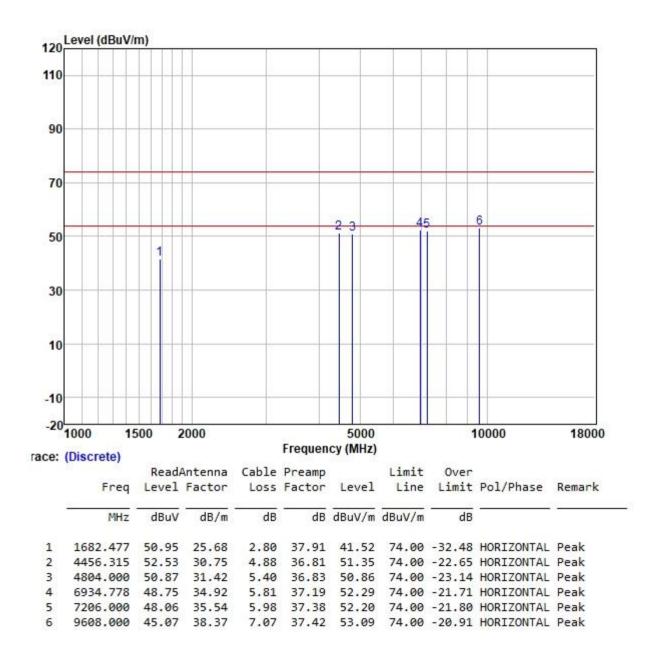
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Report No.: GZCR220400041901

Page: 58 of 157

Test Mode: 06; Polarity: Horizontal; Modulation: GFSK; ; Channel:Low





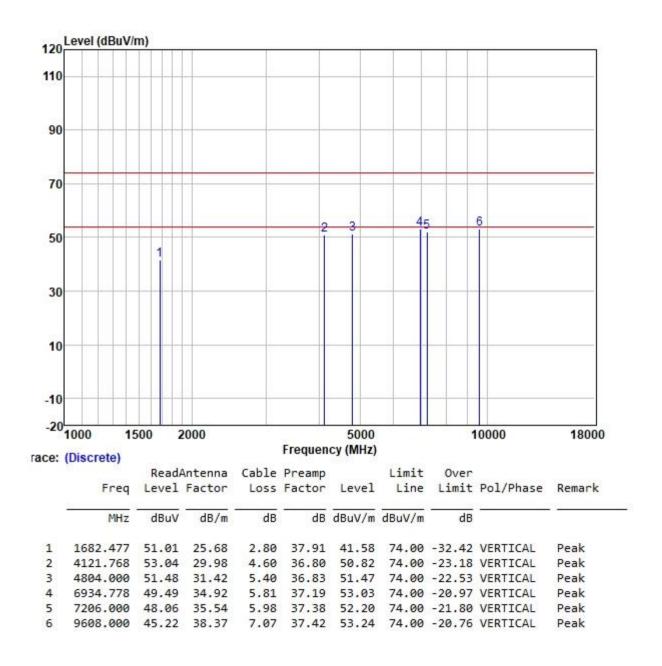
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Page: 59 of 157

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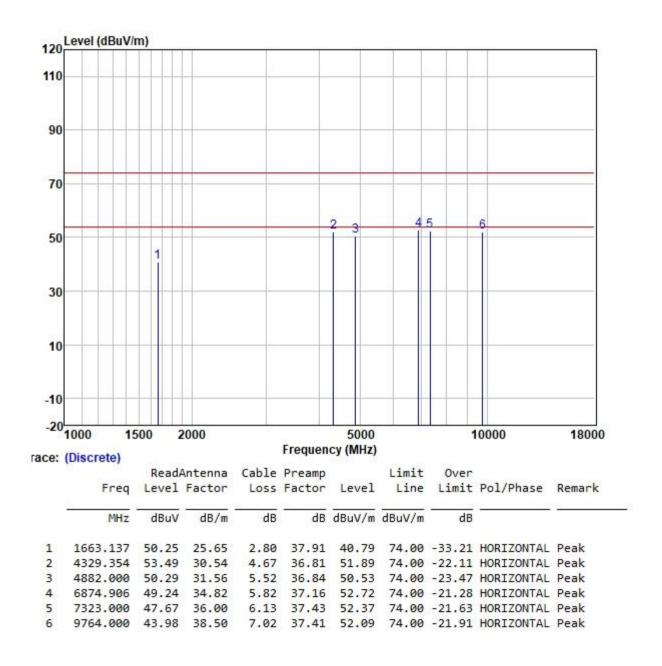
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Report No.: GZCR220400041901

Page: 60 of 157

Test Mode: 06; Polarity: Horizontal; Modulation: GFSK; ; Channel: middle





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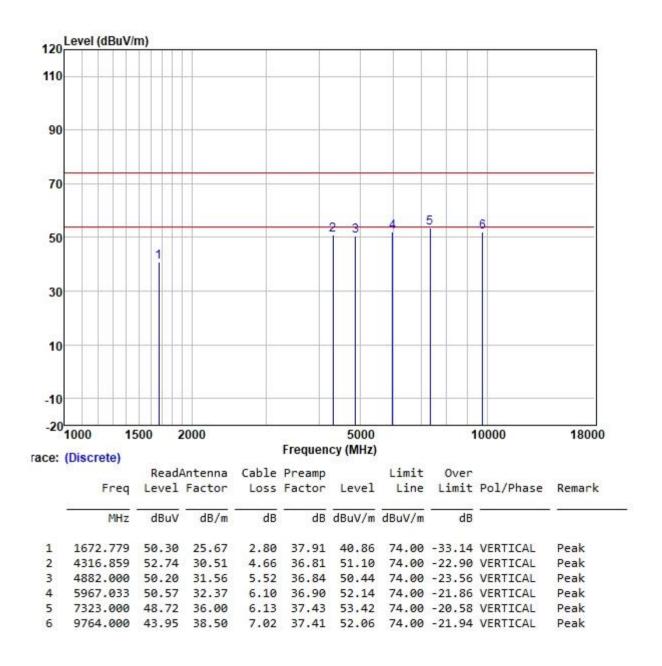
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Report No.: GZCR220400041901

Page: 61 of 157

Test Mode: 06; Polarity: Vertical; Modulation:GFSK; ; Channel:middle





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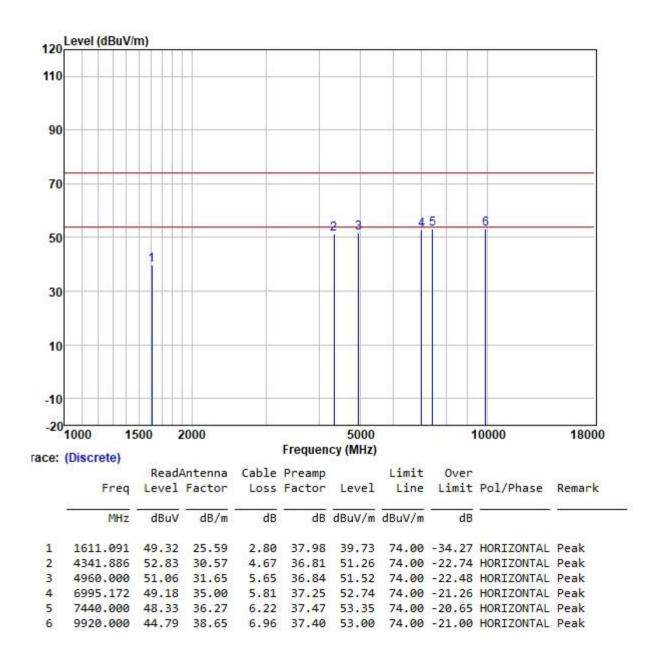
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Report No.: GZCR220400041901

Page: 62 of 157

Test Mode: 06; Polarity: Horizontal; Modulation:GFSK; ; Channel:High





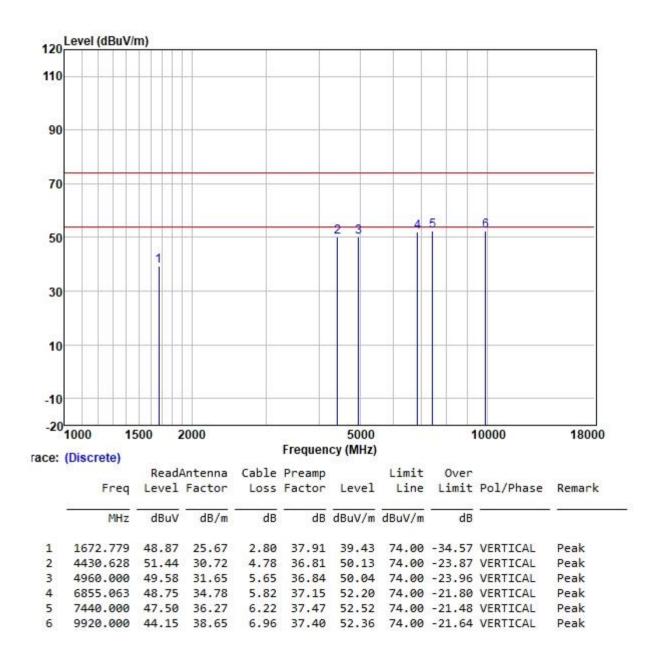
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Test Mode: 06; Polarity: Vertical; Modulation:GFSK; ; Channel:High





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Report No.: GZCR220400041901

Page: 64 of 157

8 Test Setup Photo

Refer to Appendix - SetupPhoto for GZCR2204000419AT



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Report No.: GZCR220400041901

Page: 65 of 157

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for GZCR2204000419AT



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Report No.: GZCR220400041901

Page: 66 of 157

10 Appendix

For right earbud:

1. Bandwidth

1.1 OBW

1.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)	Verdict	
	Турс	` ′			Result		
		2402	DH5	1	0.937	Pass	
GFSK	SISO	2441	DH5	1	0.915	Pass	
		2480	DH5	1	0.929	Pass	
		2402	2DH5	1	1.128	Pass	
Pi/4DQPSK	SISO	2441	2DH5	1	1.128	Pass	
		2480	2DH5	1	1.128	Pass	
		2402	3DH5	1	1.140	Pass	
8DPSK	SISO	2441	3DH5	1	1.140	Pass	
		2480	3DH5	1	1.138	Pass	

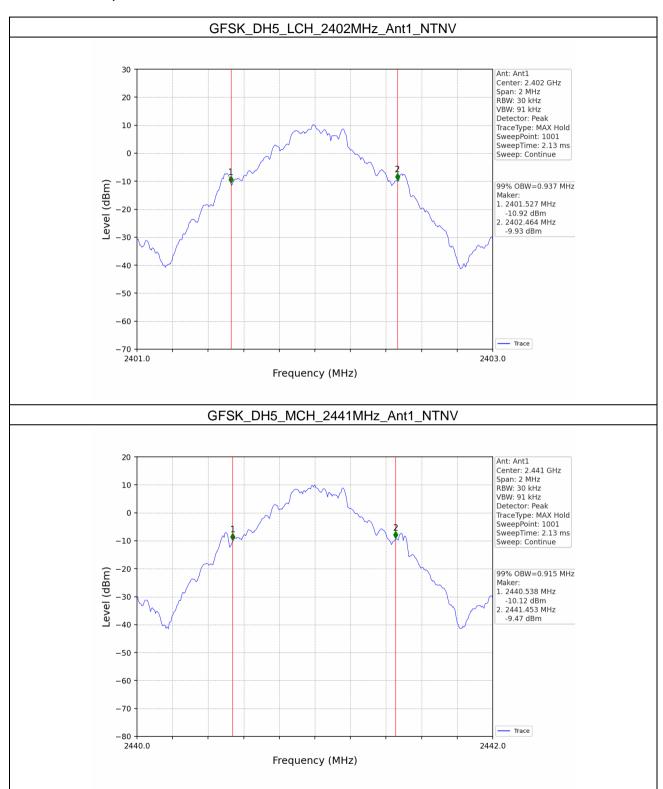




Report No.: GZCR220400041901

Page: 67 of 157

1.1.2 Test Graph



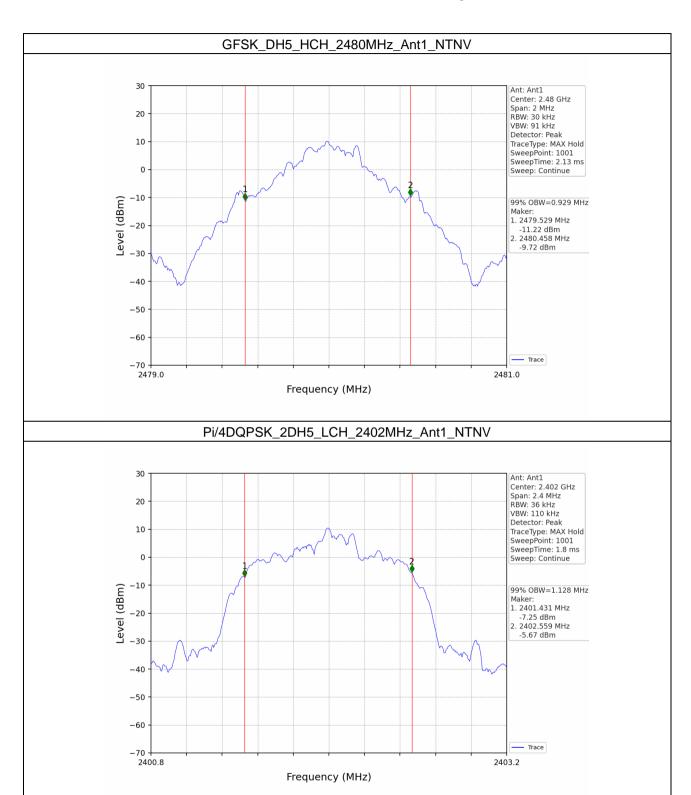


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Page: 68 of 157



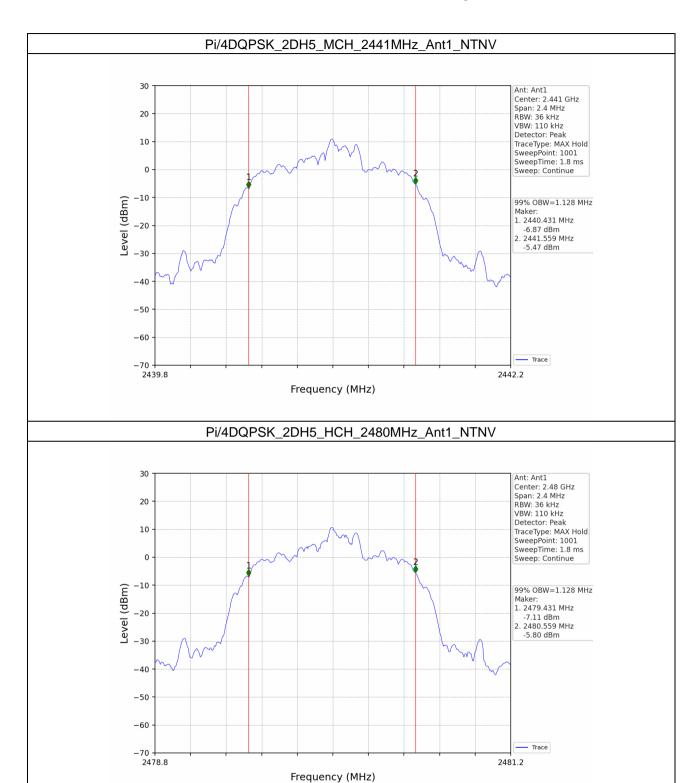


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Page: 69 of 157





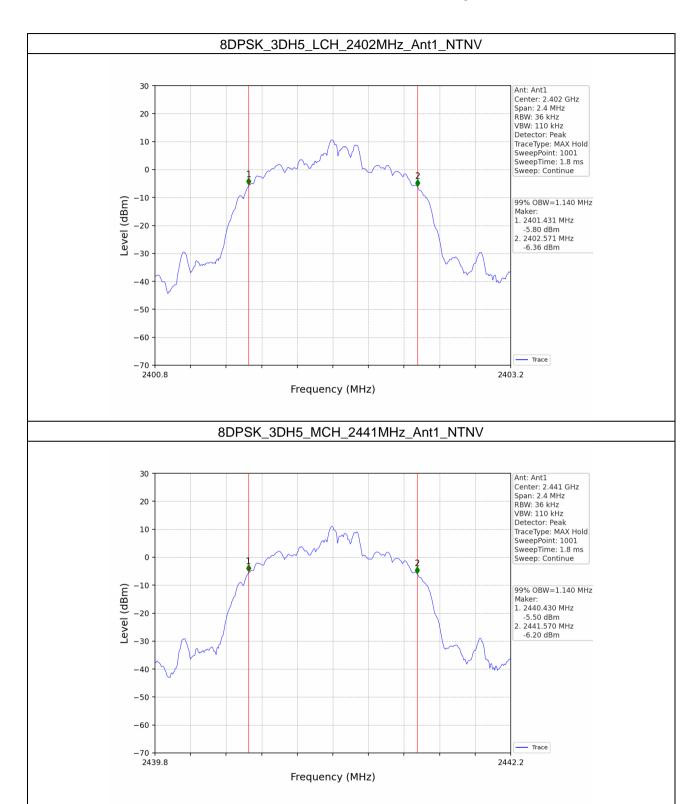
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Report No.: GZCR220400041901

Page: 70 of 157



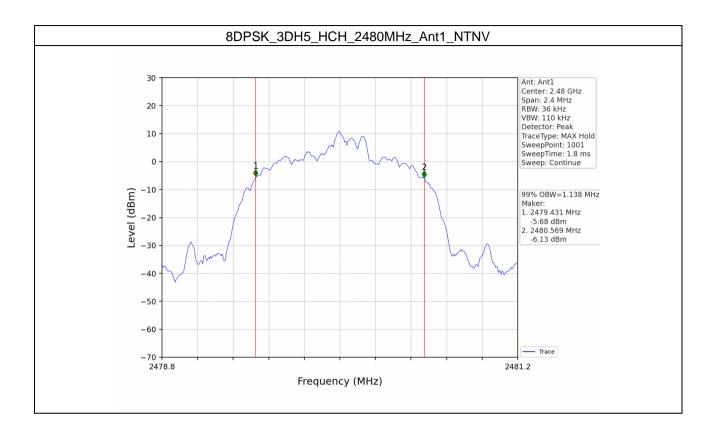


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Report No.: GZCR220400041901

Page: 72 of 157

1.2 20dB BW

1.2.1 Test Result

Mode	TX	Frequency	Packet	ANT	20dB Bandwidth (MHz)	Verdict	
Mode	Type	(MHz)	Type	AINT	Result	verdict	
		2402	DH5	1	1.022	Pass	
GFSK	SISO	2441	DH5	1	1.041	Pass	
		2480	DH5	1	1.041	Pass	
		2402	2DH5	1	1.206	Pass	
Pi/4DQPSK	SISO	2441	2DH5	1	1.204	Pass	
		2480	2DH5	1	1.202	Pass	
	SISO	2402	3DH5	1	1.213	Pass	
8DPSK		2441	3DH5	1	1.213	Pass	
		2480	3DH5	1	1.208	Pass	



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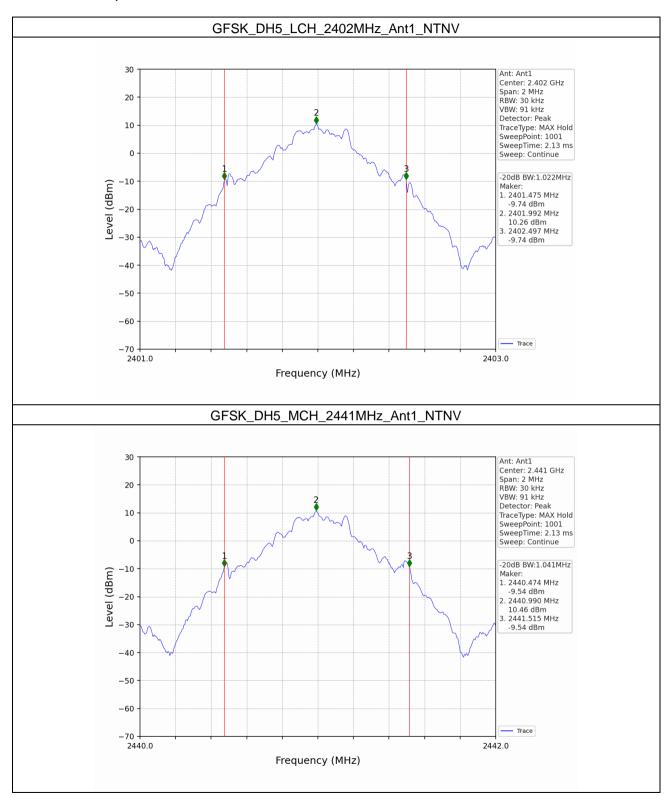
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Page: 73 of 157

1.2.2 Test Graph





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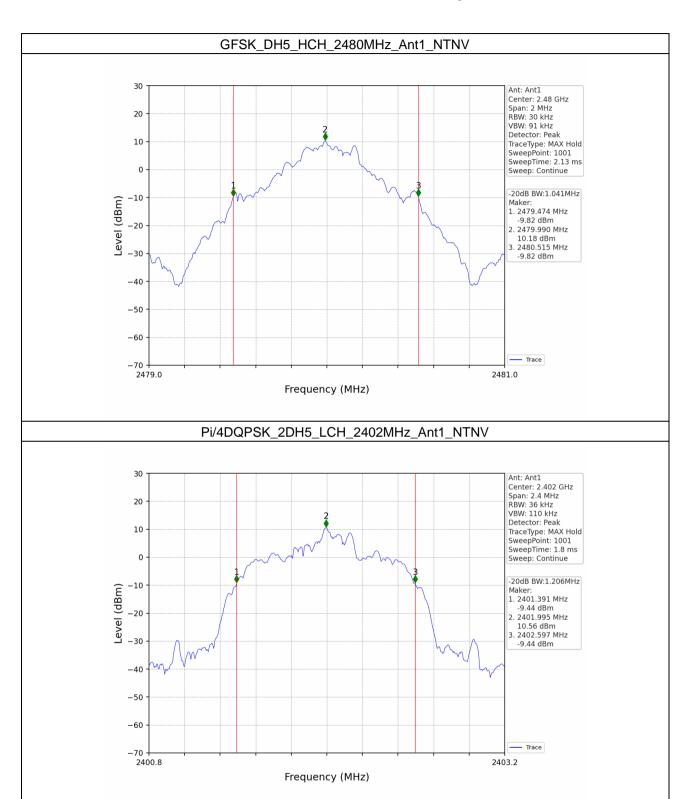
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Page: 74 of 157

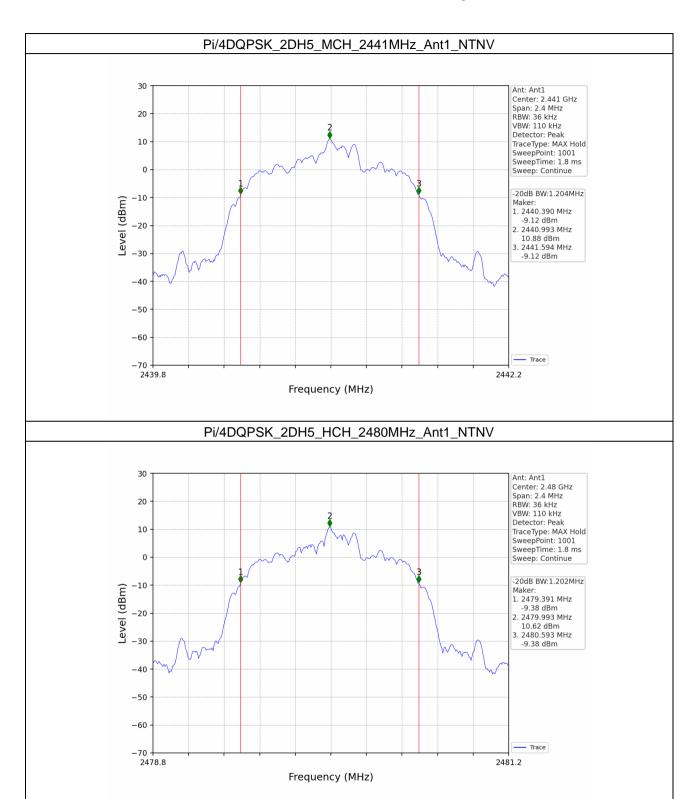






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Page: 75 of 157

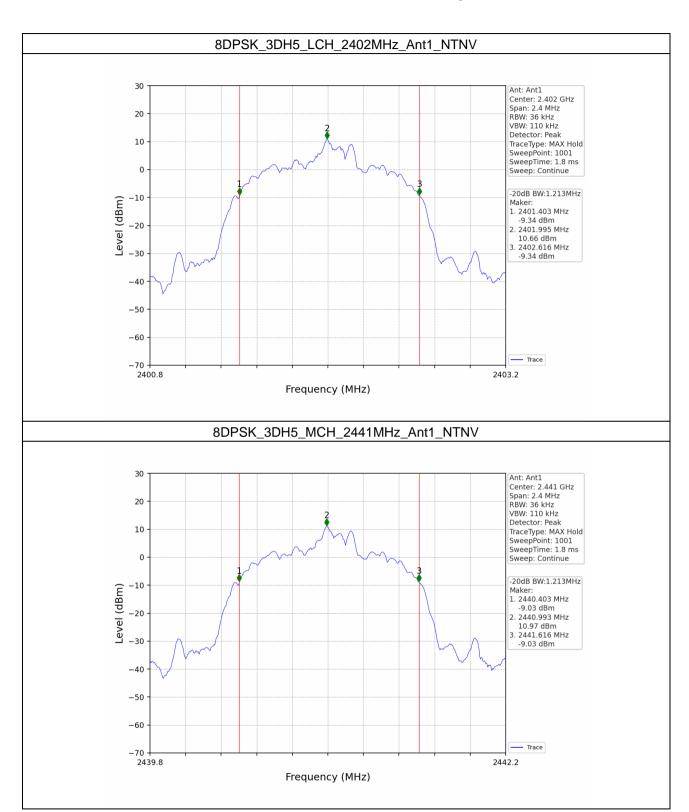






Report No.: GZCR220400041901

Page: 76 of 157

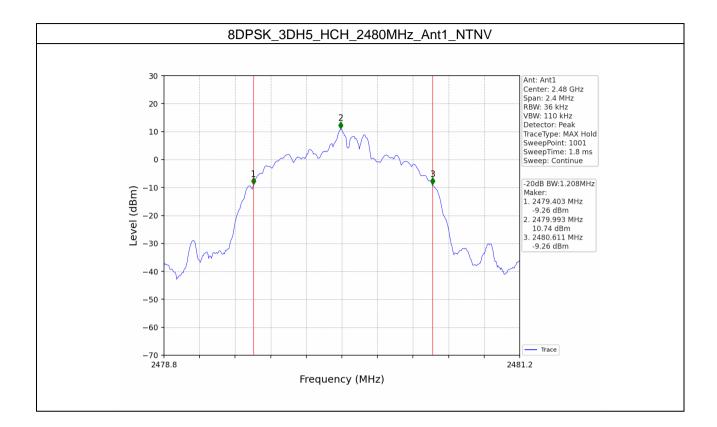






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Report No.: GZCR220400041901

Page: 78 of 157

2. Maximum Conducted Output Power

2.1 Power

2.1.1 Test Result

Mode	TX	Frequency (MHz)	Packet Type	Maximum Peak Conduc	Mandiat					
Mode	Type			ANT1	Limit	Verdict				
	SISO	2402	DH5	11.23	<=20.97	Pass				
GFSK		2441	DH5	11.46	<=20.97	Pass				
		2480	DH5	11.18	<=20.97	Pass				
Pi/4DQPSK	SISO	2402	2DH5	11.16	<=20.97	Pass				
		2441	2DH5	11.46	<=20.97	Pass				
		2480	2DH5	11.22	<=20.97	Pass				
8DPSK	SISO					2402	3DH5	11.25	<=20.97	Pass
		2441	3DH5	11.54	<=20.97	Pass				
		2480	3DH5	11.30	<=20.97	Pass				

3. Carrier Frequency Separation

3.1 Ant1

3.1.1 Test Result

Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict		
GFSK	SISO	HOPP	DH5	0.998	1.041	>=0.694	Pass		
Pi/4DQPSK	SISO	HOPP	2DH5	0.989	1.206	>=0.804	Pass		
8DPSK	SISO	HOPP	3DH5	1.003	1.213	>=0.809	Pass		



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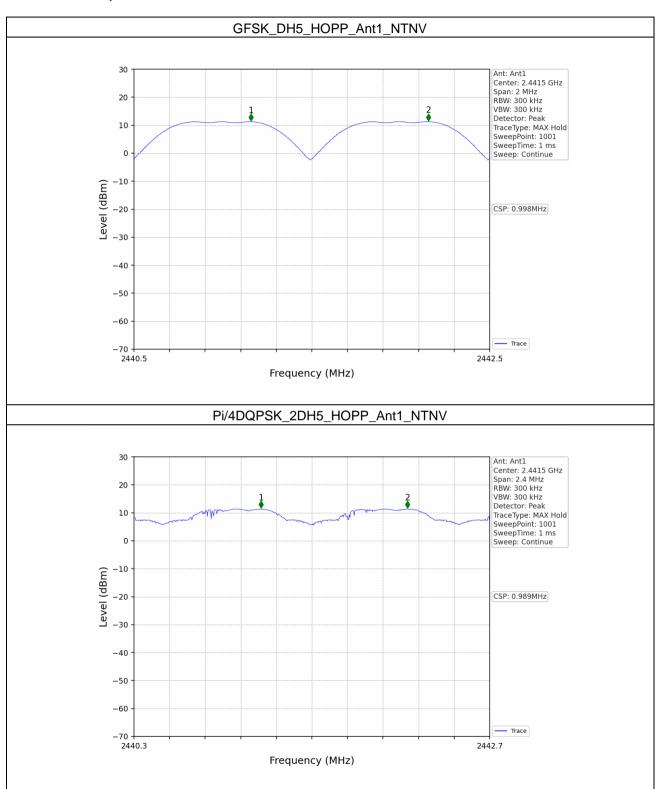
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Report No.: GZCR220400041901

Page: 79 of 157

3.1.2 Test Graph





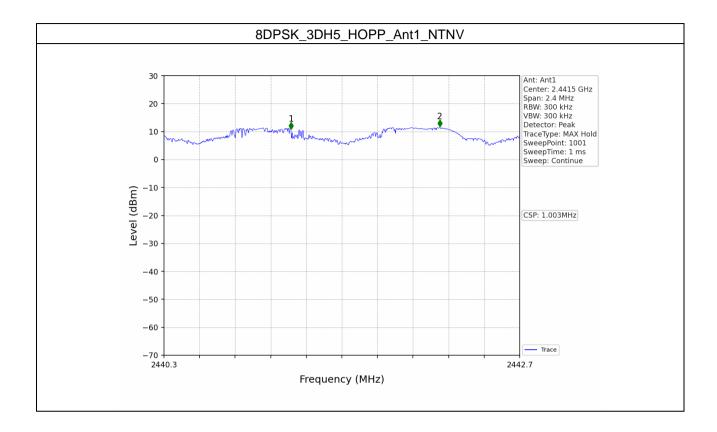
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Report No.: GZCR220400041901

Page: 81 of 157

4. Number of Hopping Frequencies

4.1 HoppNum

4.1.1 Test Result

Mode	_TX	Frequency	Packet Type	Num of Hoppir	Verdict	
Wiede	Туре	(MHz)		ANT1	Limit	roraiot
GFSK	SISO	HOPP	DH5	79	>=15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass
8DPSK	SISO	HOPP	3DH5	79	>=15	Pass



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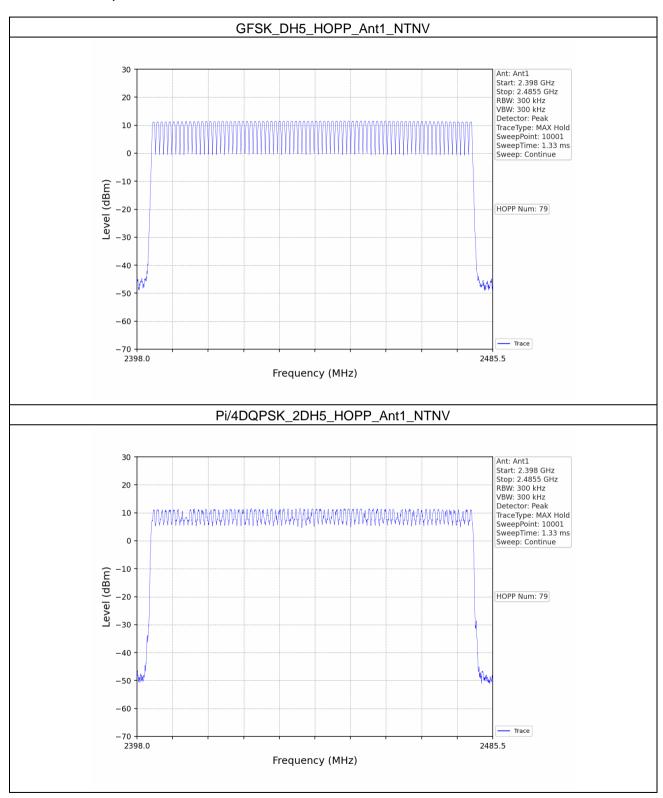
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Report No.: GZCR220400041901

Page: 82 of 157

4.1.2 Test Graph





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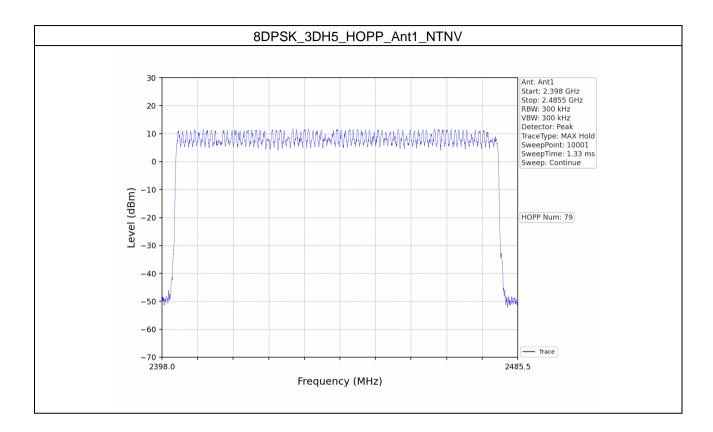
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Report No.: GZCR220400041901

Page: 83 of 157







Report No.: GZCR220400041901

Page: 84 of 157

5. Time of Occupancy (Dwell Time)

5.1 Ant1

5.1.1 Test Result

Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
		HOPP	DH1	0.410	31.600	150	61.500	<=400	Pass
GFSK	SISO		DH3	1.668	31.600	96	160.128	<=400	Pass
			DH5	2.916	31.600	77	224.532	<=400	Pass
		О НОРР	2DH1	0.404	31.600	167	67.468	<=400	Pass
Pi/4DQPSK	SISO		2DH3	1.674	31.600	96	160.704	<=400	Pass
			2DH5	2.922	31.600	80	233.760	<=400	Pass
8DPSK S	SISO	HOPP	3DH1	0.424	31.600	169	71.656	<=400	Pass
			3DH3	1.672	31.600	111	185.592	<=400	Pass
			3DH5	2.904	31.600	82	238.128	<=400	Pass

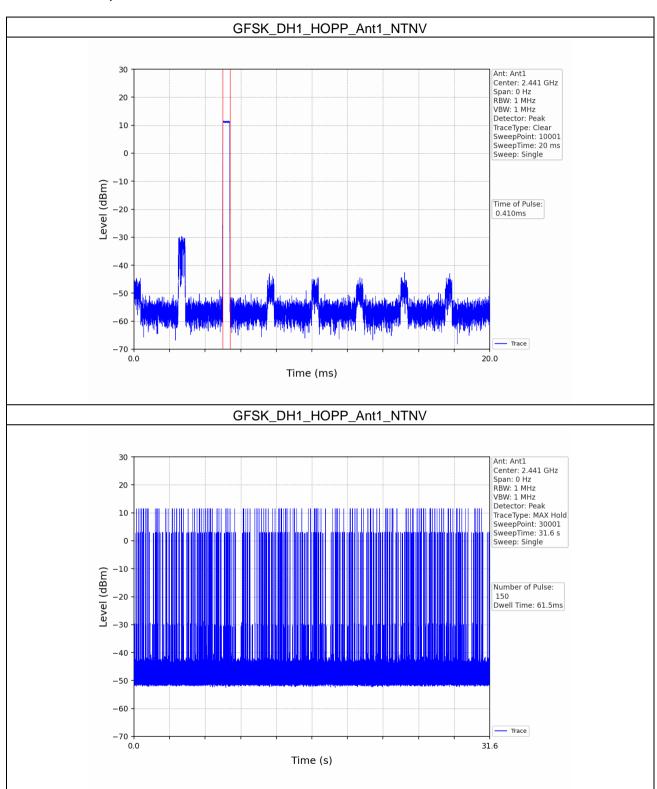




Report No.: GZCR220400041901

Page: 85 of 157

5.1.2 Test Graph





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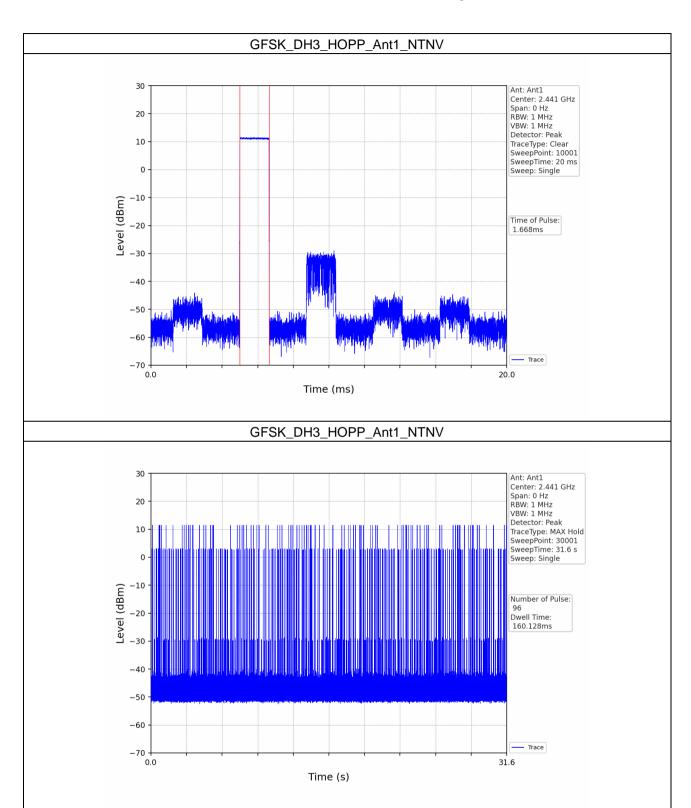
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Report No.: GZCR220400041901

Page: 86 of 157





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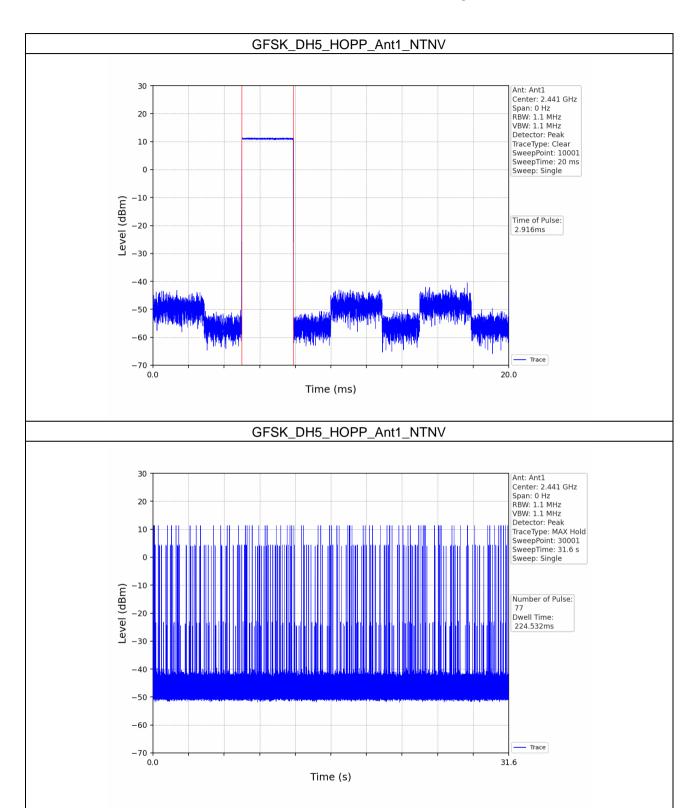
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Report No.: GZCR220400041901

Page: 87 of 157





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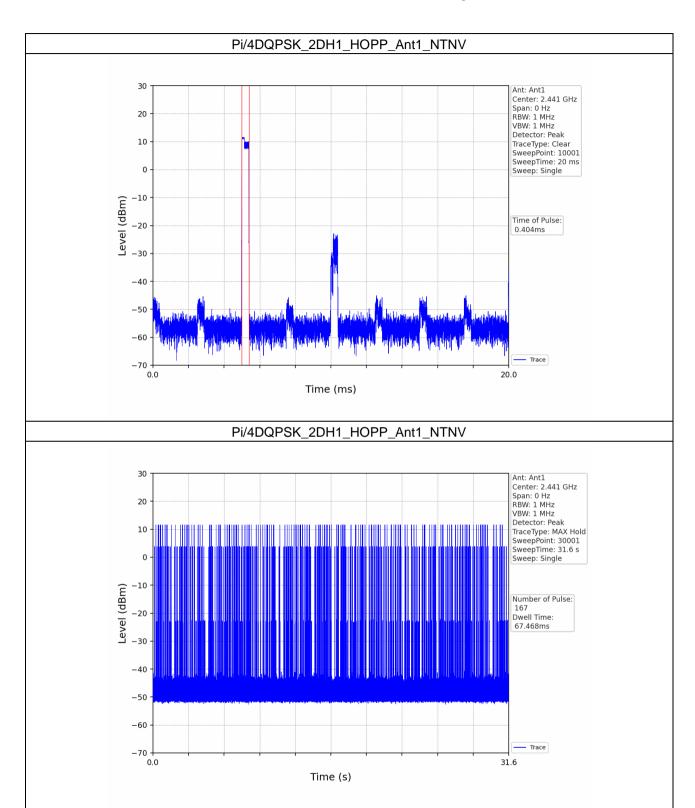
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Page: 88 of 157





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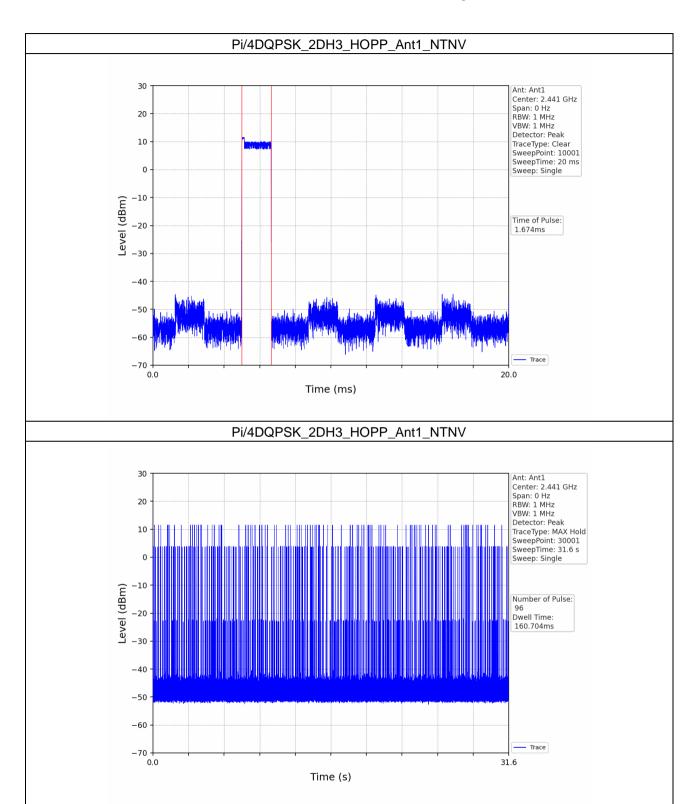
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Page: 89 of 157





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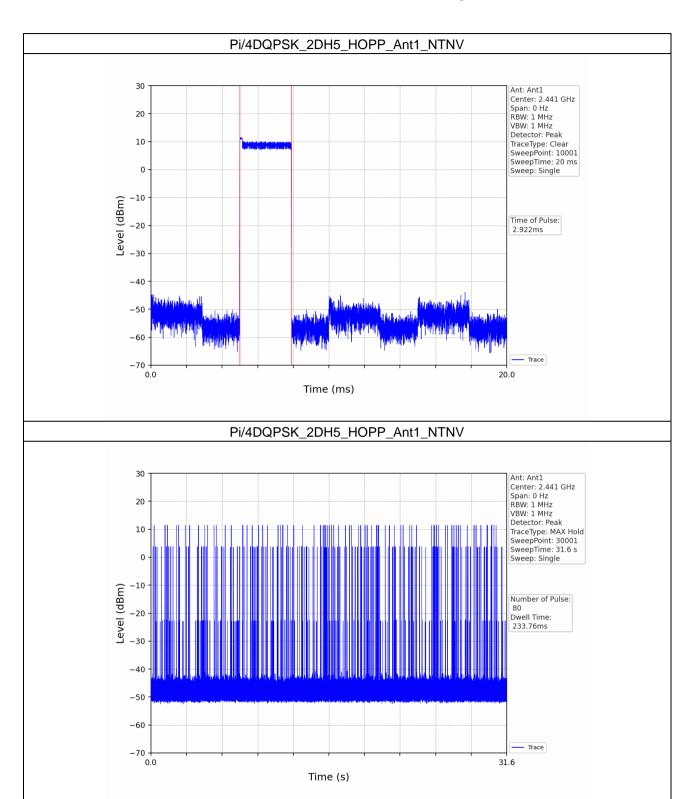
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Page: 90 of 157





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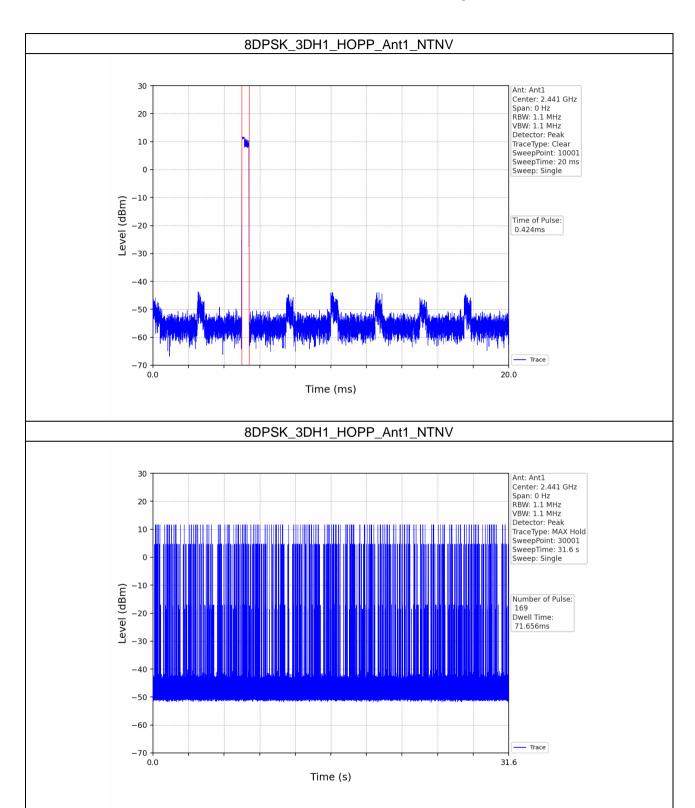
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Page: 91 of 157





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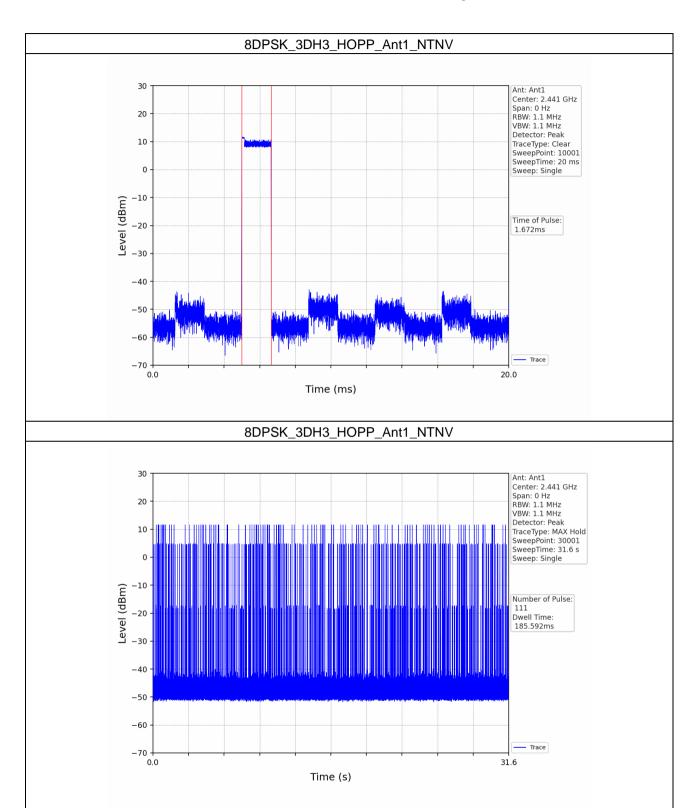
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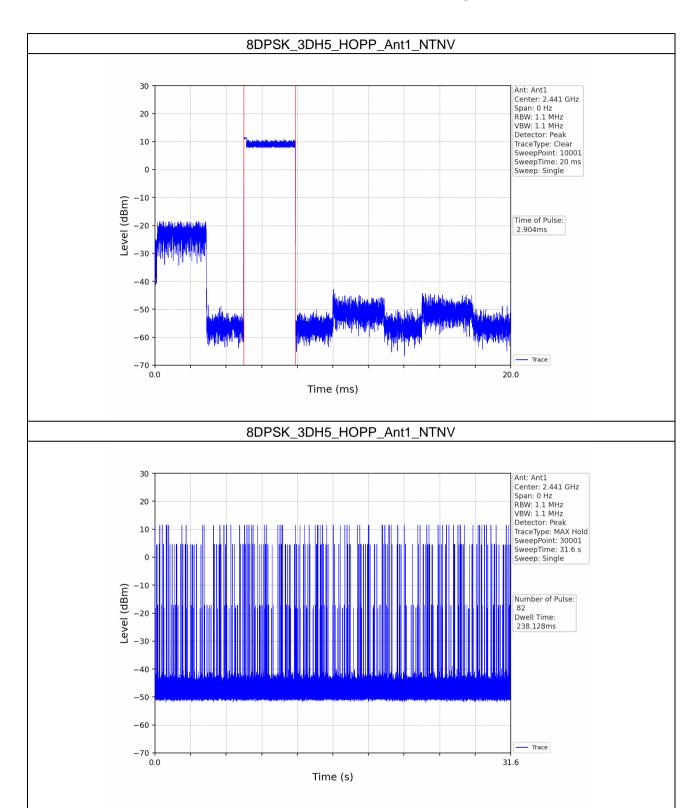
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Report No.: GZCR220400041901

Page: 94 of 157

6. Unwanted Emissions In Non-restricted Frequency Bands

6.1 Ref

6.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
		2402	DH5	1	11.04
GFSK	SISO	2441	DH5	1	11.25
		2480	DH5	1	10.93
Pi/4DQPSK	SISO	2402	2DH5	1	10.98
		2441	2DH5	1	11.30
		2480	2DH5	1	11.07
8DPSK		2402	3DH5	1	11.01
	SISO	2441	3DH5	1	11.40
		2480	3DH5	1	11.15



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