

Report No.: KSCR220800154901

Page: 1 of 115

TEST REPORT

Application No.: KSCR2208001549AT

FCC ID: 2AXNA-TTCSL

Applicant: AGM Global Vision LLC

Address of Applicant: 173 West Main Street, #962, Springerville, AZ 85938 USA

Manufacturer: AGM Global Vision LLC

Address of Manufacturer: 173 West Main Street, #962, Springerville, AZ 85938 USA

Equipment Under Test (EUT):

EUT Name: Thermal Imaging Rifle Scope

Model No.: AGM Adder LRF TS50-640.AGM Adder LRF TS19-256.AGM Adder LRF

TS25-256,AGM Adder LRF TS35-384,AGM Adder LRF TS50-384,AGM Adder LRF TS35-640,AGM Adder LRF TS19-256 G2,AGM Adder LRF TS25-256 G2,AGM Adder LRF TS35-384 G2,AGM Adder LRF TS50-384 G2,AGM Adder LRF TS35-640 G2,AGM Adder LRF TS50-640 G2,AGM Adder-X LRF TS19-256,AGM Adder-X LRF TS25-256,AGM Adder-X LRF TS35-384,AGM Adder-X LRF TS50-384,AGM Adder-X LRF TS35-640,AGM

Adder-X LRF TS50-640

Please refer to section 2 of this report which indicates which model was

actually tested and which were electrically identical.

Trade Mark:

☆≦

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

 Date of Receipt:
 2022-08-29

 Date of Test:
 2022-09-04

 Date of Issue:
 2022-09-05

Test Result: Pass*

Eric Lin Laboratory Manager

Fra Lin



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



Report No.: KSCR220800154901

Page: 2 of 115

Revision Record			
Version	Description	Date	Remark
00	Original	2022-09-05	/

Authorized for issue by:		
	Damon zhou	
	Damon Zhou/Project Engineer	-
	Ena Li	
	Eric Lin /Reviewer	-



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Report No.: KSCR220800154901

Page: 3 of 115

2 Test Summary

Item	Standard	Method	Requirement	Result
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
Antenna Requirement		N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	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	47 CFR Part 15, Subpart C 15.205 & 15.209	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
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Band Edges Measurement	47 CFR Part 15,	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Dwell Time	Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Hopping Channel Number		ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)		ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass

Declaration of EUT Family Grouping:

There are series models mentioned in this report and they are the Identical in electrical and electronic characters. Only the model AGM Adder LRF TS50-640 was tested since their differences were the model number, trade name, Color and appearance.



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Report No.: KSCR220800154901

Page: 4 of 115

3 Contents

		Page
1	COVER PAGE	1
2	TEST SUMMARY	3
3	CONTENTS	4
4	GENERAL INFORMATION	6
	4.1 DETAILS OF E.U.T	6
	4.2 DESCRIPTION OF SUPPORT UNITS	
	4.3 MEASUREMENT UNCERTAINTY	
	4.4 TEST LOCATION	
	4.5 TEST FACILITY	
	4.6 DEVIATION FROM STANDARDS	7
	4.7 ABNORMALITIES FROM STANDARD CONDITIONS	7
5	EQUIPMENT LIST	g
•		
6	RADIO SPECTRUM TECHNICAL REQUIREMENT	9
	6.1 OTHER REQUIREMENTS FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM HOPPING SEQUENCE	
	6.1.1 Test Requirement:	
	6.1.2 Conclusion	
	6.2 Antenna Requirement	_
	6.2.1 Test Requirement:	
	6.2.2 Conclusion	
7	RADIO SPECTRUM MATTER TEST RESULTS	12
-	7.1 RADIATED SPURIOUS EMISSIONS ABOVE 1GHz	
	7.1 RADIATED SPURIOUS EMISSIONS ABOVE 1GHZ	
	7.1.1 E.O.1. Operation	
	7.1.2 Test Mode Description	
	7.1.4 Measurement Procedure and Data	
	7.2 RADIATED SPURIOUS EMISSIONS BELOW 1GHz	
	7.2.1 E.U.T. Operation	
	7.2.2 Test Mode Description	
	7.2.3 Test Setup Diagram	
	7.2.4 Measurement Procedure and Data	33
	7.3 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	36
	7.3.1 E.U.T. Operation	36
	7.3.2 Test Mode Description	
	7.3.3 Test Setup Diagram	
	7.3.4 Measurement Procedure and Data	
	7.4 CONDUCTED SPURIOUS EMISSIONS	
	7.4.1 E.U.T. Operation	
	7.4.2 Test Mode Description	51



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Report No.: KSCR220800154901

Page: 5 of 115

7.4.3	Test Setup Diagram	51
7.4.4	Measurement Procedure and Data	51
7.5 Co	ONDUCTED BAND EDGES MEASUREMENT	52
7.5.1	E.U.T. Operation	52
7.5.2	Test Mode Description	52
7.5.3	Test Setup Diagram	53
7.5.4	Measurement Procedure and Data	53
7.6 D	NELL TIME	54
7.6.1	E.U.T. Operation	54
7.6.2	Test Mode Description	54
7.6.3	Test Setup Diagram	
7.6.4	Measurement Procedure and Data	
7.7 Ho	OPPING CHANNEL NUMBER	55
7.7.1	E.U.T. Operation	55
7.7.2	Test Mode Description	55
7.7.3	Test Setup Diagram	55
7.7.4	Measurement Procedure and Data	55
7.8 C	ARRIER FREQUENCIES SEPARATION	56
7.8.1	E.U.T. Operation	
7.8.2	Test Mode Description	
7.8.3	Test Setup Diagram	
7.8.4	Measurement Procedure and Data	56
7.9 20	DB BANDWIDTH	57
7.9.1	E.U.T. Operation	57
7.9.2	Test Mode Description	57
7.9.3	Test Setup Diagram	
7.9.4	Measurement Procedure and Data	
	ONDUCTED PEAK OUTPUT POWER	
7.10.1	E.U.T. Operation	
7.10.2	Test Mode Description	
7.10.3	Test Setup Diagram	
7.10.4	Measurement Procedure and Data	
7.11 Co	ONDUCTED EMISSIONS AT AC POWER LINE (150kHz-30MHz)	
7.11.1	E.U.T. Operation	
7.11.2	Test Mode Description	
7.11.3	Test Setup Diagram	
7.11.4	Measurement Procedure and Data	60
TEST S	ETUP PHOTO	63
EUT C	DNSTRUCTIONAL DETAILS (EUT PHOTOS)	63
) APPEN		64



8

9

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Report No.: KSCR220800154901

Page: 6 of 115

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 5V, 9V, 12V by Adapter or DC 3.6V by battery
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 Classic
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PCB Antenna
Antenna Gain:	-17.47dBi(Provided by the manufacturer)

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	Lenovo	1	1

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4 x 10 ⁻⁸
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz)
0	Kr Kadiated Fower	5.9dB (Above 1GHz)
		4.2dB (Below 30MHz)
9	Padiated Spurious Emission Test	4.5dB (30MHz-1GHz)
9	Radiated Spurious Emission Test	5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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Report No.: KSCR220800154901

Page: 7 of 115

4.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

- 1. SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).
- 2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).

4.5 Test Facility

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

CNAS

Compliance Certification Services (Kunshan) Inc. is accredited by the China National Accreditation Service for Conformity Assessment (CNAS). Registration No. CNAS L4354

A2LA

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

VCCI

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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Report No.: KSCR220800154901

Page: 8 of 115

5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
Condu	Conducted Emission at Mains Terminals (150kHz-30MHz)					
1	EMI Test Receive	R&S	ESCI	KS301101	01/22/2022	01/21/2023
2	LISN	R&S	ENV216	KS301197	01/22/2022	01/21/2023
3	LISN	Schwarzbeck	NNLK 8129	KS301091	01/22/2022	01/21/2023
4	Pulse Limiter	R&S	ESH3-Z2	KUS1902E001	01/22/2022	01/21/2023
5	CE test Cable	Thermax	1	CZ301102	11/14/2021	11/13/2022
6	Test Software	Farad	EZ-EMC	1	N.C.R	N.C.R
RF Co	nducted Test					
1	Spectrum Analyzer	Keysight	N9020A	KUS1911E004-2	08/22/2022	08/21/2023
2	Spectrum Analyzer	Keysight	N9020A	KUS2001M001-2	08/22/2022	08/21/2023
3	Spectrum Analyzer	Keysight	N9030B	KSEM021-1	01/22/2022	01/21/2023
4	Signal Generator	R&S	SMW200A	KSEM020-1	08/22/2022	08/21/2023
5	Signal Generator	Agilent	N5182A	KUS2001M001-1	08/22/2022	08/21/2023
6	Radio Communication Test Station	Anritsu	MT8000A	KSEM001-1	08/22/2022	08/21/2023
7	Radio Communication Analyzer	Anritsu	MT8821C	KSEM002-1	04/01/2022	03/31/2023
8	Universal Radio Communication Tester	R&S	CMW500	KUS1911E004-1	08/22/2022	08/21/2023
9	Switcher	CCSRF	FY562	KUS2001M001-3	08/22/2022	08/21/2023
10	AC Power Source	EXTECH	6605	KS301178	N.C.R	N.C.R
11	DC Power Supply	Aglient	E3632A	KS301180	N.C.R	N.C.R
12	Conducted Test Cable	Thermax	RF01-RF04	CZ301111- CZ301120	01/16/2022	01/15/2023
13	Temp. / Humidity Chamber	TERCHY	MHK-120AK	KS301190	04/01/2021	03/31/2023
14	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-5	04/14/2022	04/13/2023
15	Software	BST	TST-PASS	1	N/A	N/A
RF Ra	diated Test					
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	08/22/2022	08/21/2023
2	Universal Radio Communication Tester	R&S	CMW500	KSEM009-1	04/01/2022	03/31/2023
3	Signal Generator	Agilent	E8257C	KS301066	08/22/2022	08/21/2023
4	Loop Antenna	COM-POWER	AL-130R	KUS1806E001	04/13/2021	04/12/2023
5	Bilog Antenna	TESEQ	CBL 6112D	KUS1806E005	06/29/2021	06/28/2023
6	Bilog Antenna	SCHWARZBECK	VULB9160	CZ301016	04/13/2021	04/12/2024
7	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	KS301079	04/02/2022	04/01/2024
8	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	KS301186	02/22/2021	02/21/2023
9	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	CZ301058	03/17/2022	03/16/2023
10	Amplifier(30MHz~18GHz)	PANSHAN TECHNOLOGY	LNA:1~18G	KSEM010-1	01/22/2022	01/21/2023
11	Amplifier(18~40GHz)	COM-POWER	PAM-840A	KUS1710E001	01/22/2022	01/21/2023
12	RE Test Cable	REBES MICROWAVE	1	CZ301097	11/14/2021	11/13/2022
13	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	01/04/2022	31/03/2023
14	Software	Faratronic	EZ_EMC-v 3A1	/	N/A	N/A



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Report No.: KSCR220800154901

Page: 9 of 115

6 Radio Spectrum Technical Requirement

6.1 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.1.1 Test Requirement:

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

6.1.2 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



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Report No.: KSCR220800154901

Page: 10 of 115

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.: KSCR220800154901

Page: 11 of 115

6.2 Antenna Requirement

6.2.1 Test Requirement:

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

6.2.2 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 best case gain of the antenna is -17.47 dBi.

Antenna location: Refer to internal photo.



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Report No.: KSCR220800154901

Page: 12 of 115

7 Radio Spectrum Matter Test Results

7.1 Radiated Spurious Emissions Above 1GHz

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

Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.1.1 E.U.T. Operation

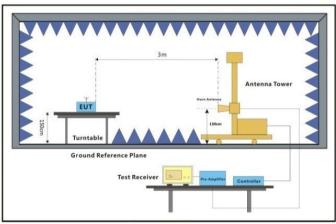
Operating Environment:

Temperature: 22 °C Humidity: 57.5 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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.

7.1.3 Test Setup Diagram



Above 1GHz



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Report No.: KSCR220800154901

Page: 13 of 115

7.1.4 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 (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 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. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp 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. As shown in this section, 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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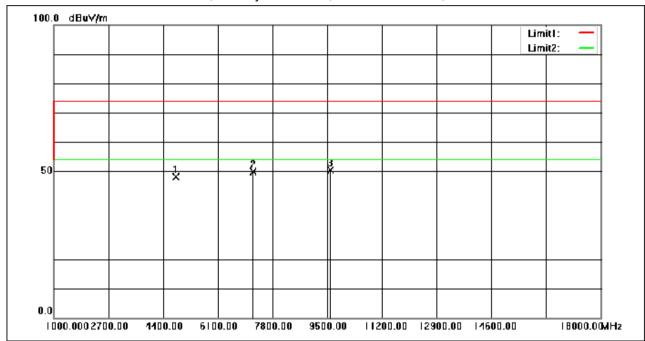
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Report No.: KSCR220800154901

Page: 14 of 115

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	56.90	-8.86	48.04	74.00	-25.96	peak
2	7206.000	55.66	-5.89	49.77	74.00	-24.23	peak
3	9608.000	51.66	-1.26	50.40	74.00	-23.60	peak



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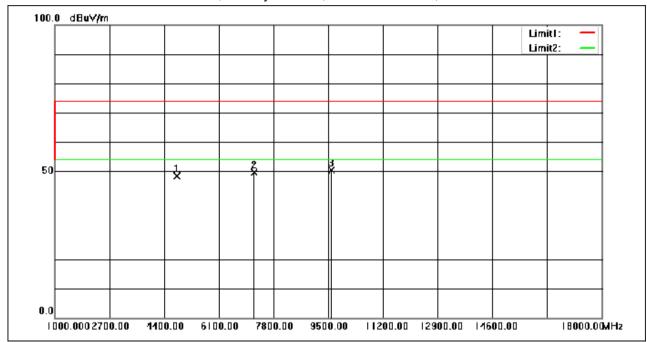
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Report No.: KSCR220800154901

Page: 15 of 115

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.000	57.25	-8.86	48.39	74.00	-25.61	peak
2	7206.000	55.44	-5.89	49.55	74.00	-24.45	peak
3	9608.000	51.58	-1.26	50.32	74.00	-23.68	peak



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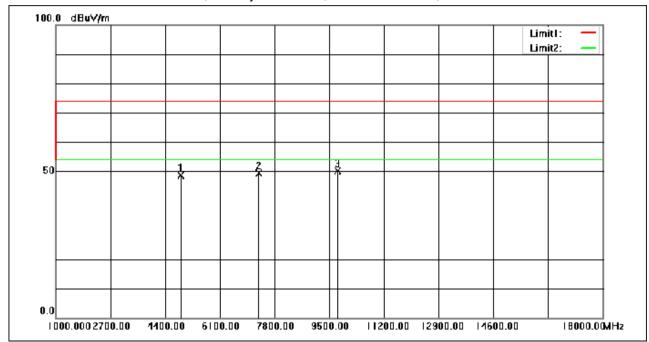
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Report No.: KSCR220800154901

Page: 16 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4882.000	57.25	-8.58	48.67	74.00	-25.33	peak
							<u>'</u>
2	7323.000	55.15	-5.77	49.38	74.00	-24.62	peak
3	9764.000	51.64	-1.46	50.18	74.00	-23.82	peak



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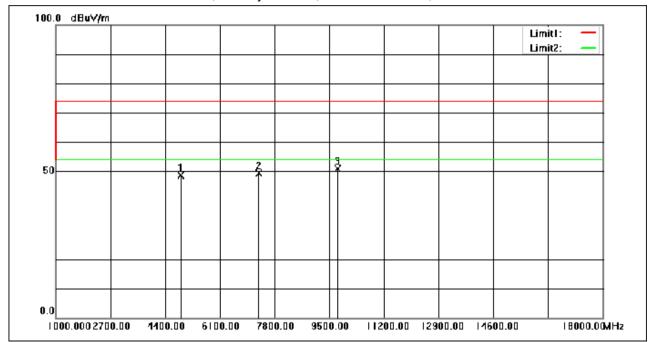
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Report No.: KSCR220800154901

Page: 17 of 115

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:middle



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	57.14	-8.58	48.56	74.00	-25.44	peak
2	7323.000	55.14	-5.77	49.37	74.00	-24.63	peak
3	9764.000	52.28	-1.46	50.82	74.00	-23.18	peak



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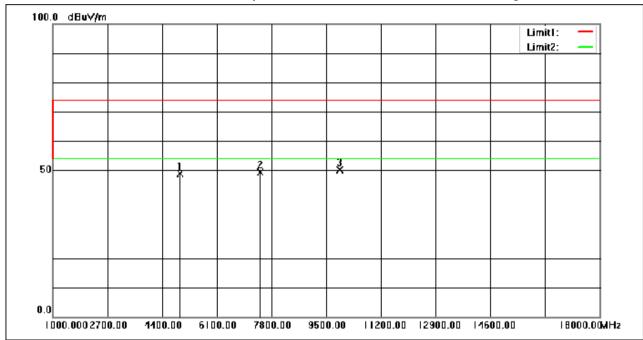
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Report No.: KSCR220800154901

Page: 18 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4960.000	57.29	-8.32	48.97	74.00	-25.03	peak
2	7440.000	54.98	-5.63	49.35	74.00	-24.65	peak
3	9920.000	50.99	-0.94	50.05	74.00	-23.95	peak



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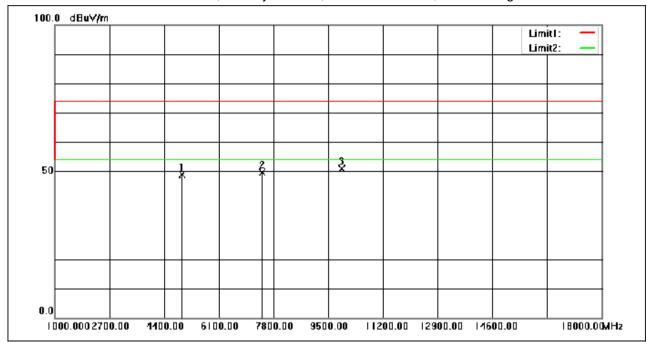
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Report No.: KSCR220800154901

Page: 19 of 115

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4960.000	57.10	-8.32	48.78	74.00	-25.22	peak
2	7440.000	55.14	-5.63	49.51	74.00	-24.49	peak
3	9920.000	51.85	-0.94	50.91	74.00	-23.09	peak



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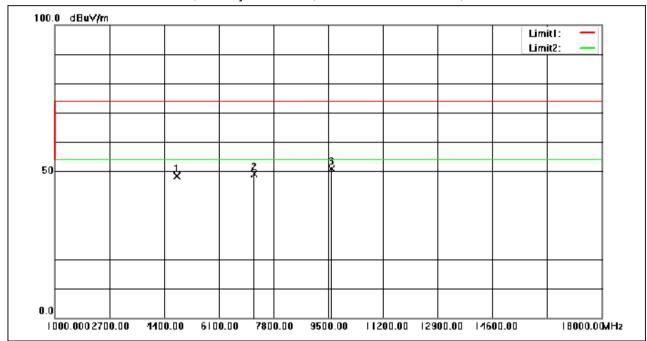
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Report No.: KSCR220800154901

Page: 20 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	57.25	-8.86	48.39	74.00	-25.61	peak
2	7206.000	54.97	-5.89	49.08	74.00	-24.92	peak
3	9608.000	52.14	-1.26	50.88	74.00	-23.12	peak



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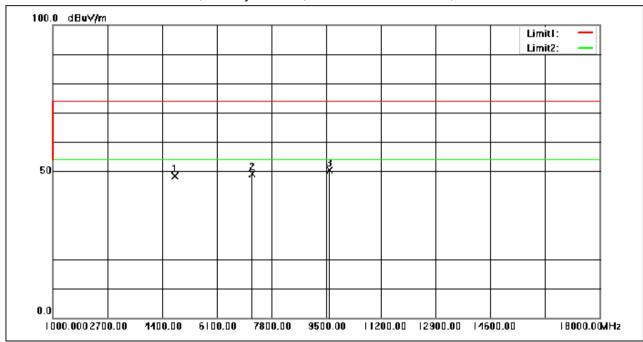
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Report No.: KSCR220800154901

Page: 21 of 115

Test Mode: 01; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	57.31	-8.86	48.45	74.00	-25.55	peak
2	7206.000	55.02	-5.89	49.13	74.00	-24.87	peak
3	9608.000	51.73	-1.26	50.47	74.00	-23.53	peak



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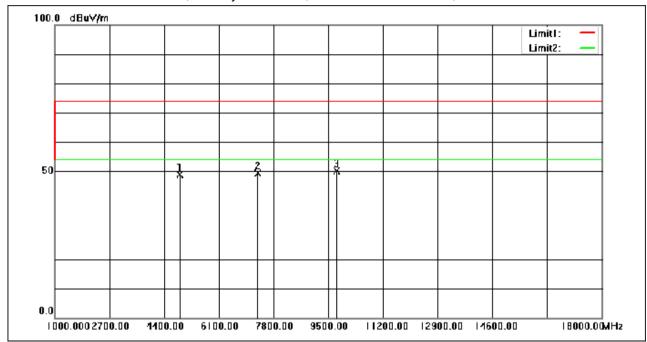
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Report No.: KSCR220800154901

Page: 22 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:middle



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	57.50	-8.58	48.92	74.00	-25.08	peak
2	7323.000	55.22	-5.77	49.45	74.00	-24.55	peak
3	9764.000	51.68	-1.46	50.22	74.00	-23.78	peak



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Report No.: KSCR220800154901

Page: 23 of 115

Test Mode: 01; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:middle



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	57.16	-8.58	48.58	74.00	-25.42	peak
2	7323.000	55.27	-5.77	49.50	74.00	-24.50	peak
3	9764.000	51.90	-1.46	50.44	74.00	-23.56	peak



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Report No.: KSCR220800154901

Page: 24 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4960.000	56.87	-8.32	48.55	74.00	-25.45	peak
2	7440.000	54.64	-5.63	49.01	74.00	-24.99	peak
3	9920.000	51.19	-0.94	50.25	74.00	-23.75	peak



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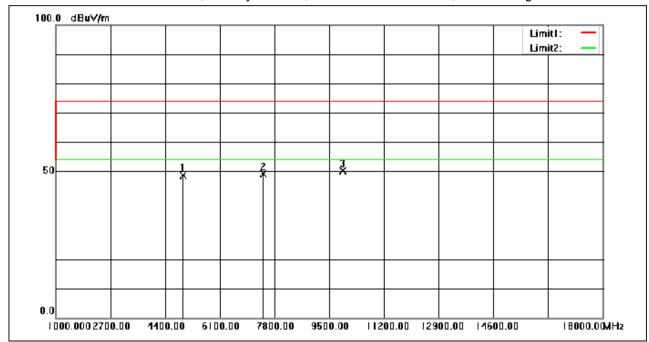
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Report No.: KSCR220800154901

Page: 25 of 115

Test Mode: 01; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	56.98	-8.32	48.66	74.00	-25.34	peak
2	7440.000	54.87	-5.63	49.24	74.00	-24.76	peak
2							
3	9920.000	50.96	-0.94	50.02	74.00	-23.98	peak



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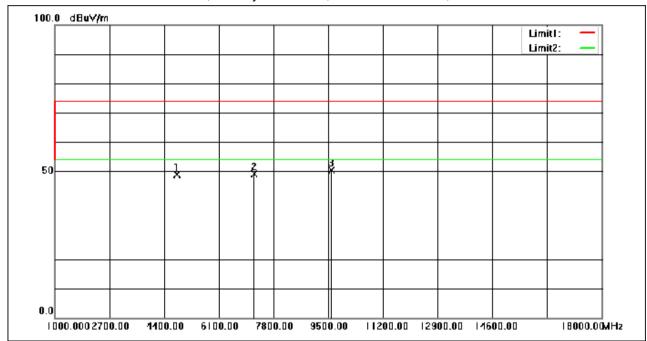
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Report No.: KSCR220800154901

Page: 26 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:8DPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	57.79	-8.86	48.93	74.00	-25.07	peak
2	7206.000	54.94	-5.89	49.05	74.00	-24.95	peak
3	9608.000	51.52	-1.26	50.26	74.00	-23.74	peak



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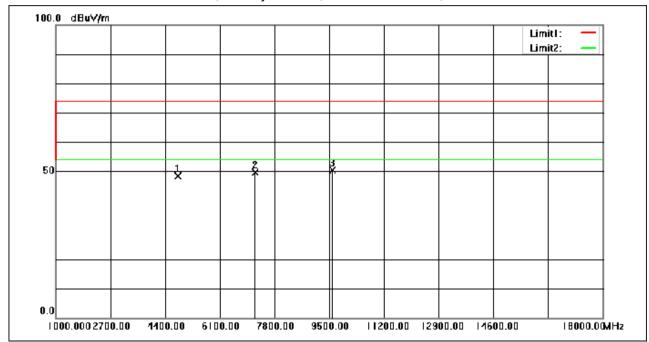
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Report No.: KSCR220800154901

Page: 27 of 115

Test Mode: 01; Polarity: Vertical; Modulation:8DPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4804.000	57.33	-8.86	48.47	74.00	-25.53	peak
2	7206.000	55.51	-5.89	49.62	74.00	-24.38	peak
3	9608.000	51.53	-1.26	50.27	74.00	-23.73	peak



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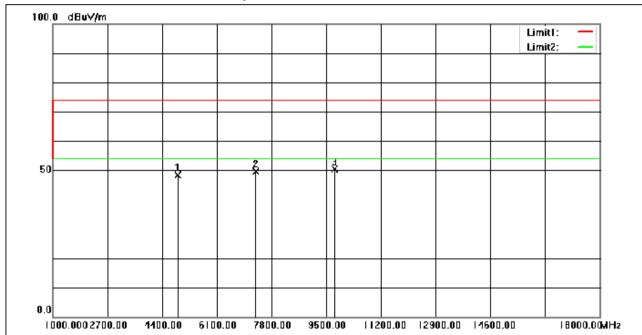
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Report No.: KSCR220800154901

Page: 28 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:8DPSK; Channel:middle



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4882.000	56.98	-8.58	48.40	74.00	-25.60	peak
2	7323.000	55.46	-5.77	49.69	74.00	-24.31	peak
3	9764.000	51.85	-1.46	50.39	74.00	-23.61	peak



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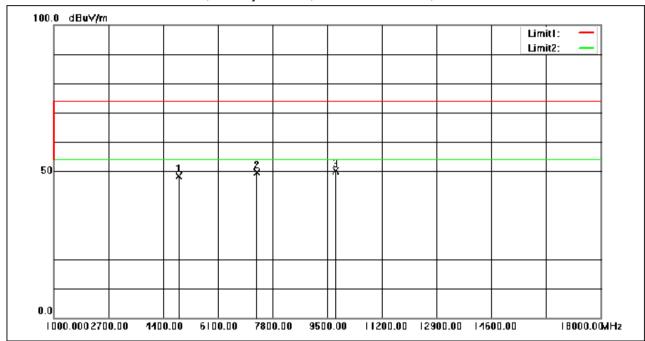
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Report No.: KSCR220800154901

Page: 29 of 115

Test Mode: 01; Polarity: Vertical; Modulation:8DPSK; Channel:middle



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4882.000	57.01	-8.58	48.43	74.00	-25.57	peak
2	7323.000	55.38	-5.77	49.61	74.00	-24.39	peak
2	9764.000	51.53	-1.46	50.07	74.00	-23.93	
3	9704.000	51.53	-1.40	50.07	74.00	-23.93	peak



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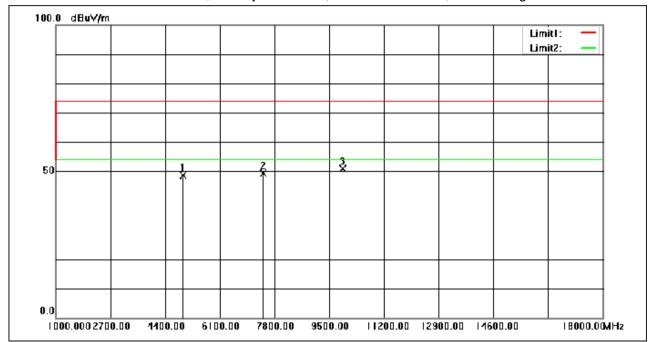
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Report No.: KSCR220800154901

Page: 30 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:8DPSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	56.85	-8.32	48.53	74.00	-25.47	peak
2	7440.000	54.89	-5.63	49.26	74.00	-24.74	peak
3	9920.000	51.82	-0.94	50.88	74.00	-23.12	peak



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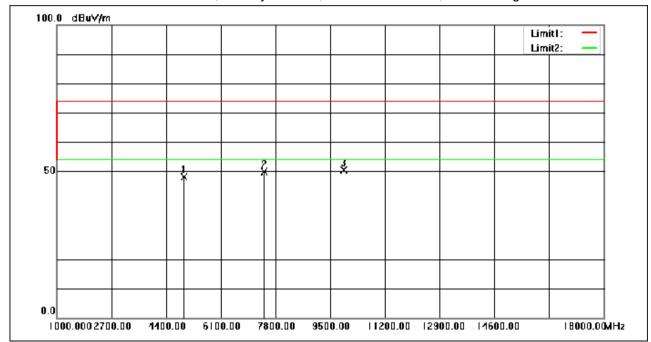
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Report No.: KSCR220800154901

Page: 31 of 115

Test Mode: 01; Polarity: Vertical; Modulation:8DPSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	56.44	-8.32	48.12	74.00	-25.88	peak
2	7440.000	55.53	-5.63	49.90	74.00	-24.10	peak
3	9920.000	51.21	-0.94	50.27	74.00	-23.73	peak



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Report No.: KSCR220800154901

Page: 32 of 115

7.2 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

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
960-1000	500	3

7.2.1 E.U.T. Operation

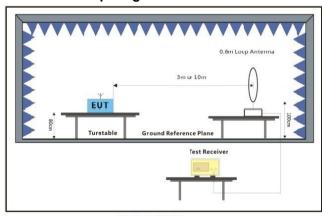
Operating Environment:

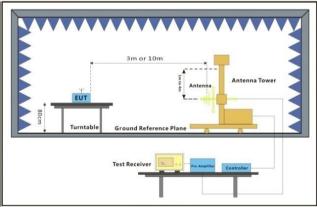
Temperature: 22 °C Humidity: 58.2 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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.

7.2.3 Test Setup Diagram





Below 30MHz 30MHz-1GHz



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Report No.: KSCR220800154901

Page: 33 of 115

7.2.4 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 quasi-peak 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. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- 2. Scan from 9kHz to 30MHz, 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.
- 3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



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Report No.: KSCR220800154901

Page: 34 of 115

Test Mode: 01 Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	32.6340	1.45	25.07	26.52	40.00	-13.48	100	135	QP
2	52.2079	8.84	17.04	25.88	40.00	-14.12	100	360	QP
3	67.4382	10.73	15.41	26.14	40.00	-13.86	100	248	QP
4	83.2298	11.80	14.05	25.85	40.00	-14.15	100	302	QP
5	133.1511	9.41	19.23	28.64	43.50	-14.86	100	31	QP
6	225.3080	13.10	17.07	30.17	46.00	-15.83	100	285	QP



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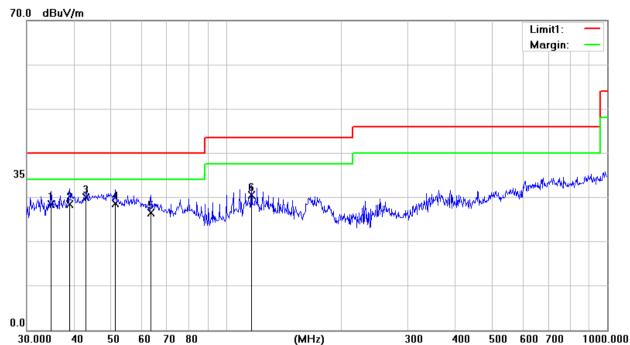
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Report No.: KSCR220800154901

Page: 35 of 115

Test Mode: 01 Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	34.7602	3.71	24.70	28.41	40.00	-11.59	100	333	QP
2	38.8879	5.64	22.72	28.36	40.00	-11.64	100	44	QP
3	42.8998	9.29	20.76	30.05	40.00	-9.95	100	55	QP
4	51.1209	11.28	17.36	28.64	40.00	-11.36	100	70	QP
5	63.5356	11.81	14.74	26.55	40.00	-13.45	100	89	QP
6	116.5401	11.45	19.16	30.61	43.50	-12.89	200	360	QP



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Report No.: KSCR220800154901

Page: 36 of 115

7.3 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

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.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 57.6 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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.



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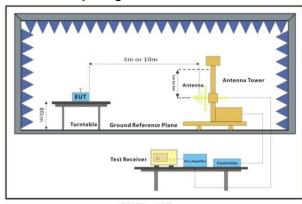
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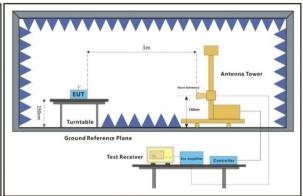


Report No.: KSCR220800154901

Page: 37 of 115

7.3.3 Test Setup Diagram





30MHz-1GHz





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Report No.: KSCR220800154901

Page: 38 of 115

7.3.4 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 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.



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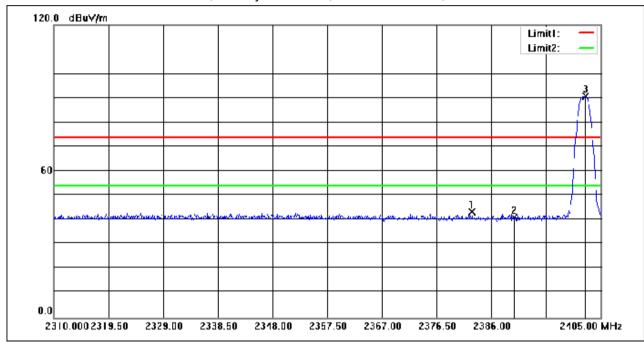
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Report No.: KSCR220800154901

Page: 39 of 115

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2382.675	62.05	-18.76	43.29	74.00	-30.71	peak
2	2390.000	59.65	-18.75	40.90	74.00	-33.10	peak
3	2402.340	109.47	-18.74	90.73	74.00	16.73	peak



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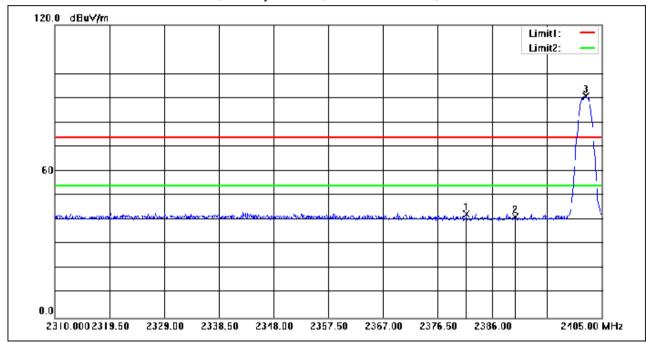
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Report No.: KSCR220800154901

Page: 40 of 115

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2381.440	61.10	-18.75	42.35	74.00	-31.65	peak
2	2390.000	60.11	-18.75	41.36	74.00	-32.64	peak
3	2402.245	109.50	-18.74	90.76	74.00	16.76	peak



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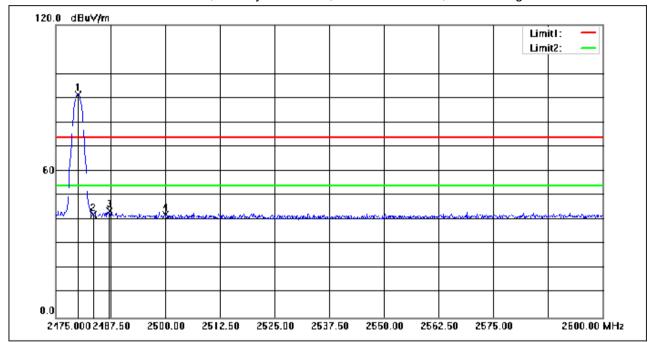
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Report No.: KSCR220800154901

Page: 41 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2480.000	109.70	-18.46	91.24	74.00	17.24	peak
2	2483.500	60.63	-18.45	42.18	74.00	-31.82	peak
3	2487.250	62.10	-18.44	43.66	74.00	-30.34	peak
4	2500.000	60.48	-18.38	42.10	74.00	-31.90	peak



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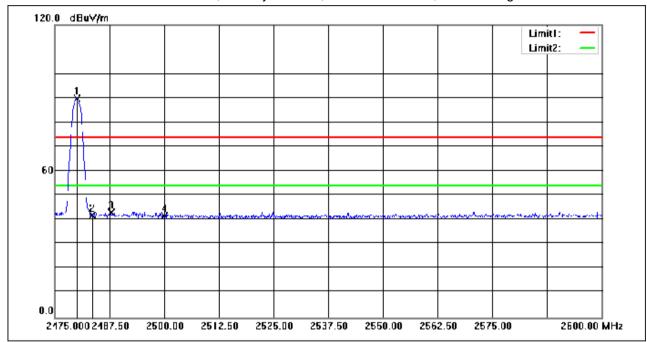
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Report No.: KSCR220800154901

Page: 42 of 115

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2480.125	108.20	-18.46	89.74	74.00	15.74	peak
2	2483.500	60.38	-18.45	41.93	74.00	-32.07	peak
3	2487.875	61.48	-18.43	43.05	74.00	-30.95	peak
4	2500.000	59.83	-18.38	41.45	74.00	-32.55	peak



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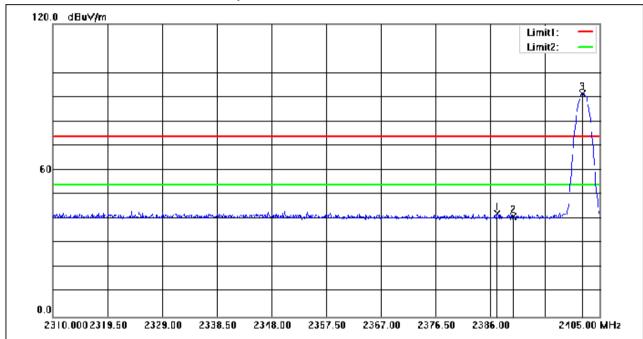
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Report No.: KSCR220800154901

Page: 43 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2387.235	60.94	-18.76	42.18	74.00	-31.82	peak
2	2390.000	59.67	-18.75	40.92	74.00	-33.08	peak
3	2401.960	109.99	-18.74	91.25	74.00	17.25	peak



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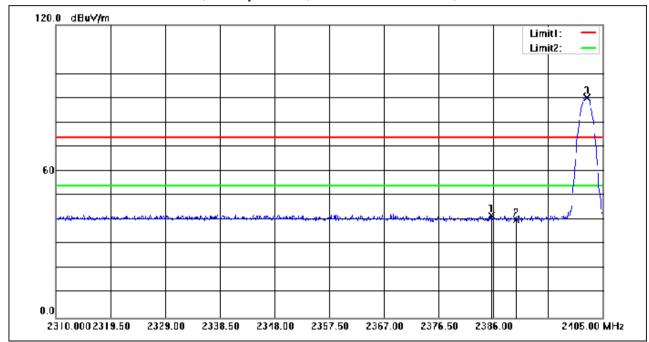
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Report No.: KSCR220800154901

Page: 44 of 115

Test Mode: 01; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2385.620	60.68	-18.76	41.92	74.00	-32.08	peak
2	2390.000	58.86	-18.75	40.11	74.00	-33.89	peak
3	2402.245	109.00	-18.74	90.26	74.00	16.26	peak



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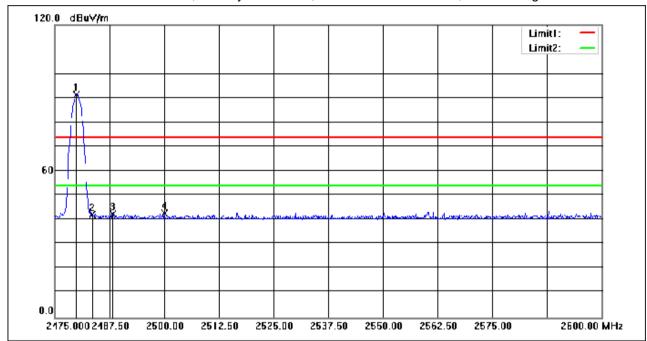
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Report No.: KSCR220800154901

Page: 45 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:π/4 DQPSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.875	109.67	-18.46	91.21	74.00	17.21	peak
2	2483.500	60.73	-18.45	42.28	74.00	-31.72	peak
3	2488.250	60.98	-18.42	42.56	74.00	-31.44	peak
4	2500.000	61.00	-18.38	42.62	74.00	-31.38	peak



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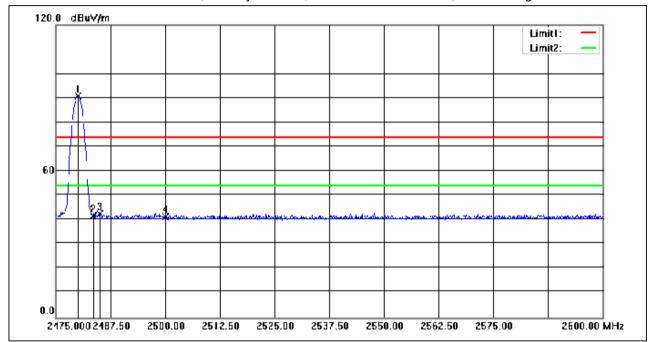
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Report No.: KSCR220800154901

Page: 46 of 115

Test Mode: 01; Polarity: Vertical; Modulation:π/4 DQPSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2480.125	109.17	-18.46	90.71	74.00	16.71	peak
2	2483.500	59.94	-18.45	41.49	74.00	-32.51	peak
3	2485.125	60.91	-18.44	42.47	74.00	-31.53	peak
4	2500.000	59.64	-18.38	41.26	74.00	-32.74	peak



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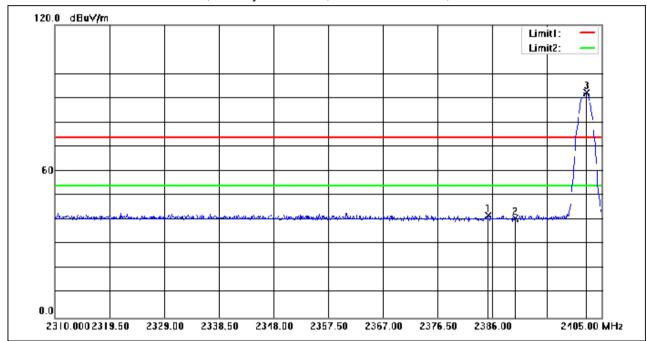
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Report No.: KSCR220800154901

Page: 47 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:8DPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2385.240	60.65	-18.76	41.89	74.00	-32.11	peak
2	2390.000	59.28	-18.75	40.53	74.00	-33.47	peak
3	2402.340	110.99	-18.74	92.25	74.00	18.25	peak



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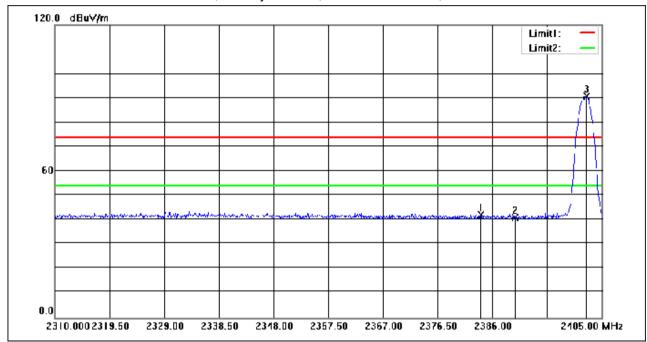
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Report No.: KSCR220800154901

Page: 48 of 115

Test Mode: 01; Polarity: Vertical; Modulation:8DPSK; Channel:Low



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2384.005	61.00	-18.76	42.24	74.00	-31.76	peak
2	2390.000	59.71	-18.75	40.96	74.00	-33.04	peak
3	2402.340	109.50	-18.74	90.76	74.00	16.76	peak



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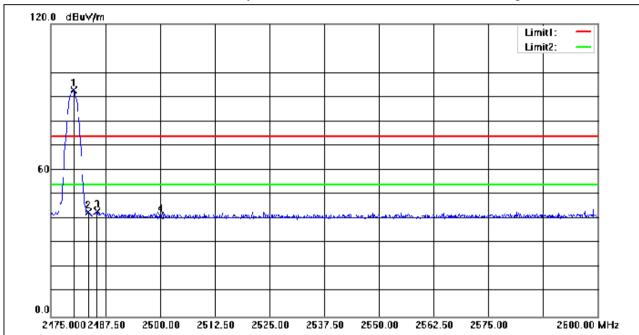
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Report No.: KSCR220800154901

Page: 49 of 115

Test Mode: 01; Polarity: Horizontal; Modulation:8DPSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2480.250	111.18	-18.46	92.72	74.00	18.72	peak
2	2483.500	61.30	-18.45	42.85	74.00	-31.15	peak
3	2485.625	61.49	-18.44	43.05	74.00	-30.95	peak
4	2500.000	59.60	-18.38	41.22	74.00	-32.78	peak



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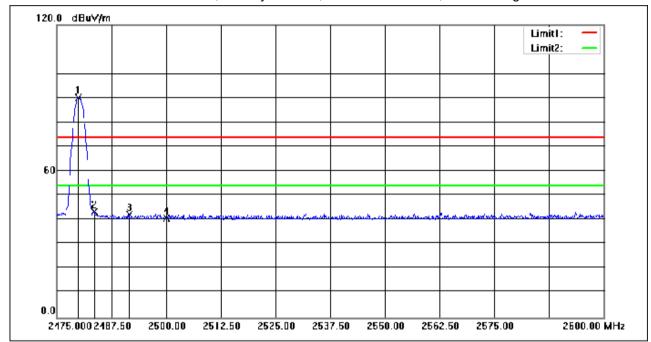
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Report No.: KSCR220800154901

Page: 50 of 115

Test Mode: 01; Polarity: Vertical; Modulation:8DPSK; Channel:High



No.	Frequency	Reading	Correction	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.875	108.68	-18.46	90.22	74.00	16.22	peak
2	2483.500	61.68	-18.45	43.23	74.00	-30.77	peak
3	2491.500	60.69	-18.41	42.28	74.00	-31.72	peak
4	2500.000	58.97	-18.38	40.59	74.00	-33.41	peak



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Report No.: KSCR220800154901

Page: 51 of 115

7.4 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).

7.4.1 E.U.T. Operation

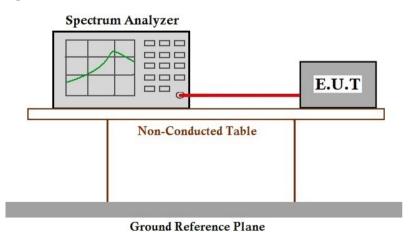
Operating Environment:

Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

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Report No.: KSCR220800154901

Page: 52 of 115

7.5 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).

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

7.5.2 Test mode bescription		
Pre-scan / Final test	Mode Code	Description
Final test	01	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.
Final test	02	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.



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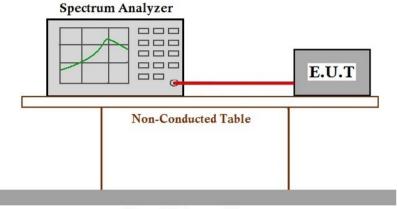
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Report No.: KSCR220800154901

Page: 53 of 115

7.5.3 Test Setup Diagram



Ground Reference Plane

7.5.4 Measurement Procedure and Data

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Report No.: KSCR220800154901

Page: 54 of 115

7.6 Dwell Time

Test Method:

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii) ANSI C63.10 (2013) Section 7.8.4

Limit:

Frequency(MHz)	Limit	
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)	
902-926	0.4S within a 10S period(20dB bandwidth≥250kHz)	
2400-2483.5	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	

7.6.1 E.U.T. Operation

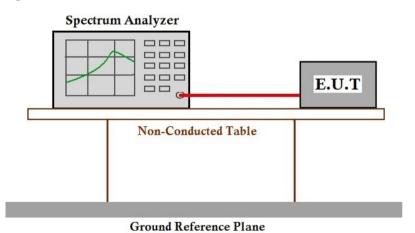
Operating Environment:

Temperature: 24 °C Humidity: % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

	· · · · · · · · · · · · · · · · · · ·		
Pre-scan / Final test	Mode Code	Description	
Final test	02	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.	

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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Report No.: KSCR220800154901

Page: 55 of 115

7.7 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)	
902-928	50 for 20dB bandwidth <250kHz	
902-926	25 for 20dB bandwidth ≥250kHz	
2400-2483.5	15	
5725-5850	75	

7.7.1 E.U.T. Operation

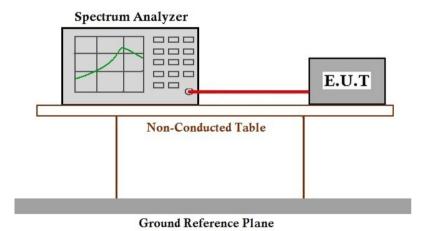
Operating Environment:

Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

the state of the s		
Pre-scan / Final test	Mode Code	Description
Final test	02	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.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

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Report No.: KSCR220800154901

Page: 56 of 115

7.8 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:

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

7.8.1 E.U.T. Operation

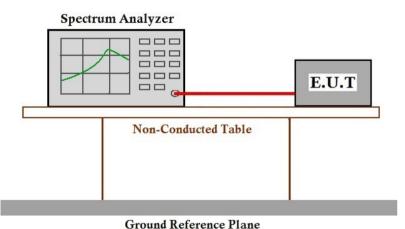
Operating Environment:

Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	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.

7.8.3 Test Setup Diagram



Ground Reference F18

7.8.4 Measurement Procedure and Data

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Report No.: KSCR220800154901

Page: 57 of 115

7.9 20dB Bandwidth

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

Limit:

20 dB bandwidth of the hopping channel	Hopping frequencies	Average time of occupancy
less than 250 kHz	least 50 hopping frequencies	shall not be greater than 0.4 seconds within a 20 second period
250 kHz to 500kHz	least 25 hopping frequencies	shall not be greater than 0.4 seconds within a 10 second period.

7.9.1 E.U.T. Operation

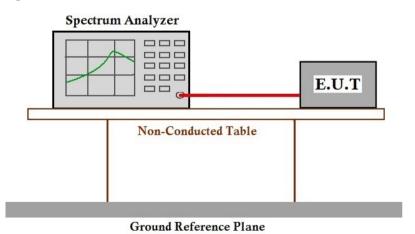
Operating Environment:

Temperature: Atmospheric Pressure: 1010 mbar Humidity: 48 % RH

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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.

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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Report No.: KSCR220800154901

Page: 58 of 115

7.10 Conducted Peak Output Power

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

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	

7.10.1 E.U.T. Operation

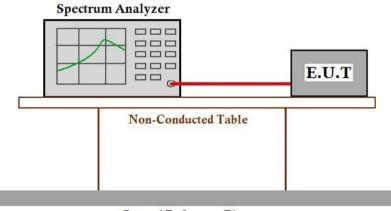
Operating Environment:

24 °C Temperature: Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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.

7.10.3 Test Setup Diagram



Ground Reference Plane

7.10.4 Measurement Procedure and Data

Note: Since the verify power the same operating range bandwidth and smaller power can be covered by the higher power.

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Report No.: KSCR220800154901

Page: 59 of 115

7.11 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207 Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of	Conducted limit(dBµV)			
emission(MHz)	Quasi-peak	Average		
0.15-0.5	66 to 56*	56 to 46*		
0.5-5	56	46		
5-30	60	50		
*Decreases with the logarithm of the frequency.				
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz				

7.11.1 E.U.T. Operation

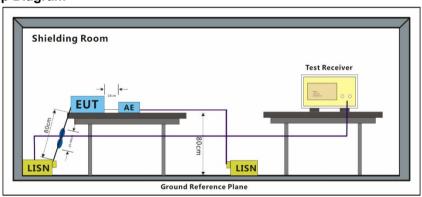
Operating Environment:

Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

7.11.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	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.

7.11.3 Test Setup Diagram





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Report No.: KSCR220800154901

Page: 60 of 115

7.11.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50 \text{ohm}/50 \mu\text{H} + 5 \text{ohm}$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: Level=Read Level+ Cable Loss+ LISN Factor



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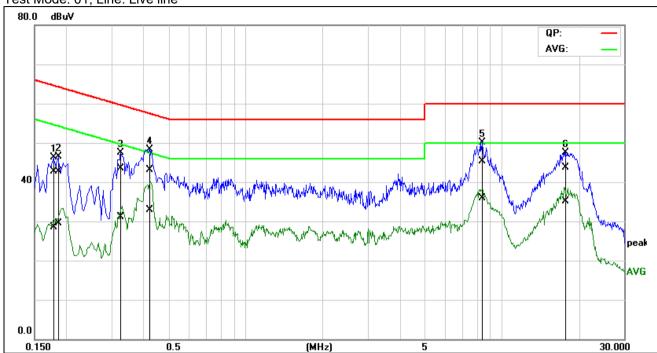
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Report No.: KSCR220800154901

Page: 61 of 115

Test Mode: 01; Line: Live line



No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark
		reading	reading	factor	result	result	limit	limit	margin	margin	
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1780	23.28	8.91	19.50	42.78	28.41	64.58	54.58	-21.80	-26.17	Pass
2	0.1860	23.28	9.98	19.50	42.78	29.48	64.21	54.21	-21.43	-24.73	Pass
3	0.3260	24.06	11.54	19.52	43.58	31.06	59.55	49.55	-15.97	-18.49	Pass
4	0.4220	23.64	13.34	19.54	43.18	32.88	57.41	47.41	-14.23	-14.53	Pass
5*	8.3780	25.25	15.86	20.00	45.25	35.86	60.00	50.00	-14.75	-14.14	Pass
6	17.7940	23.32	14.82	20.30	43.62	35.12	60.00	50.00	-16.38	-14.88	Pass



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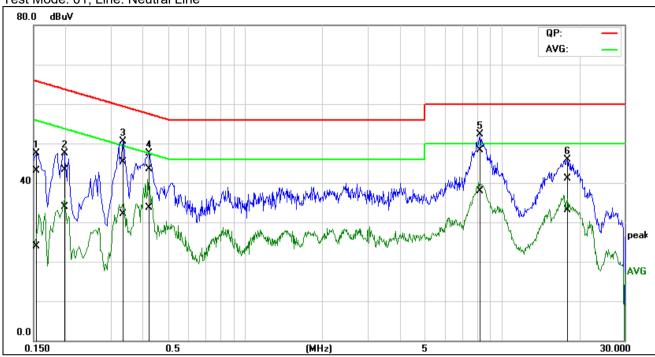
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Report No.: KSCR220800154901

Page: 62 of 115

Test Mode: 01; Line: Neutral Line



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1540	23.70	4.39	19.48	43.18	23.87	65.78	55.78	-22.60	-31.91	Pass
2	0.1980	23.83	14.40	19.49	43.32	33.89	63.69	53.69	-20.37	-19.80	Pass
3	0.3340	25.74	12.54	19.51	45.25	32.05	59.35	49.35	-14.10	-17.30	Pass
4	0.4220	24.04	14.21	19.54	43.58	33.75	57.41	47.41	-13.83	-13.66	Pass
5*	8.1980	28.34	17.90	19.98	48.32	37.88	60.00	50.00	-11.68	-12.12	Pass
6	18.0340	20.72	12.75	20.30	41.02	33.05	60.00	50.00	-18.98	-16.95	Pass



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Report No.: KSCR220800154901

Page: 63 of 115

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2208001549AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for KSCR2208001549AT



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Report No.: KSCR220800154901

Page: 64 of 115

10 Appendix

Appendix for KSCR220800154901-BT

Power level setting using in test:

Channel	DH5	2DH5	3DH5	
0	Default	Default	Default	
39	Default	Default	Default	
78	Default	Default	Default	

1. Bandwidth

1.1 OBW

1.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz) Result	Verdict
		2402	DH5	1	0.885	Pass
GFSK	SISO	2441	DH5	1	0.886	Pass
		2480	DH5	1	0.887	Pass
	SISO	2402	2DH5	1	1.203	Pass
Pi/4DQPSK		2441	2DH5	1	1.203	Pass
		2480	2DH5	1	1.203	Pass
8DPSK		2402	3DH5	1	1.200	Pass
	SISO	2441	3DH5	1	1.203	Pass
		2480	3DH5	1	1.204	Pass



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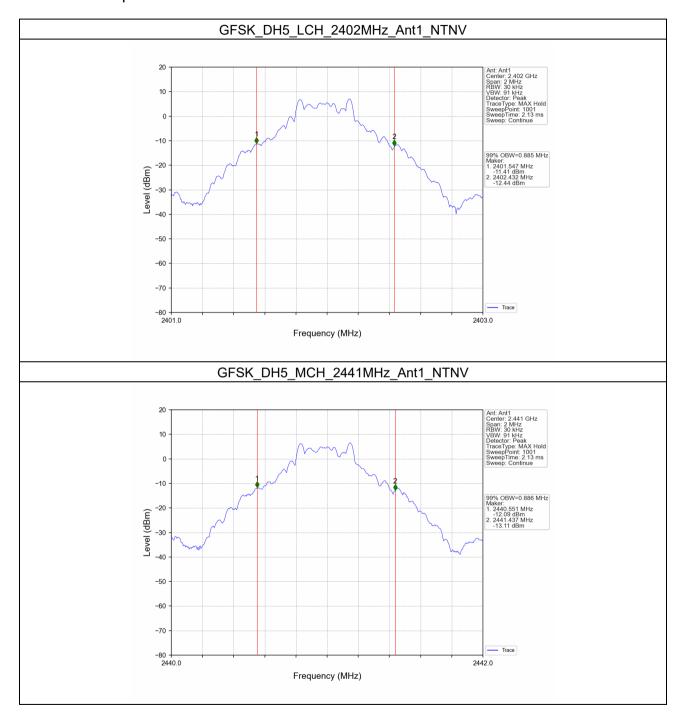
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Report No.: KSCR220800154901

Page: 65 of 115

1.1.2 Test Graph





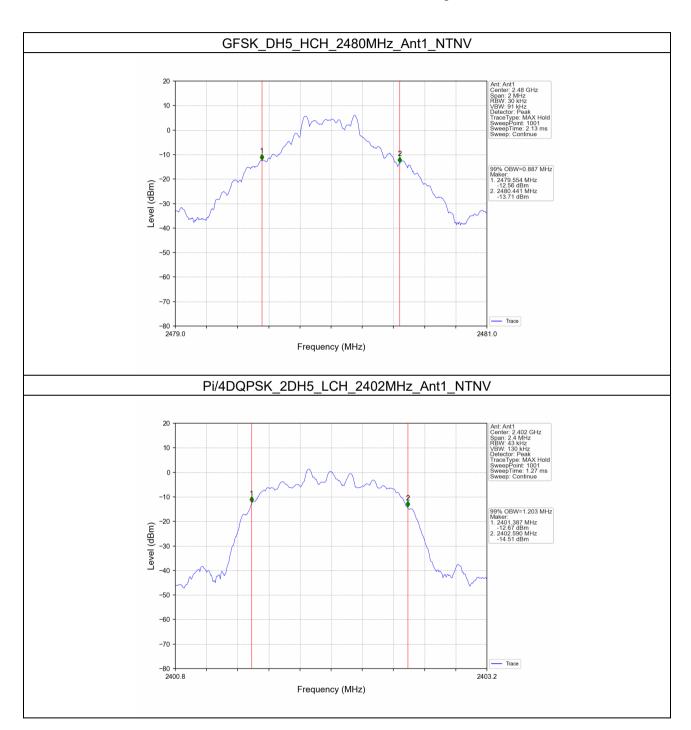
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Report No.: KSCR220800154901

Page: 66 of 115





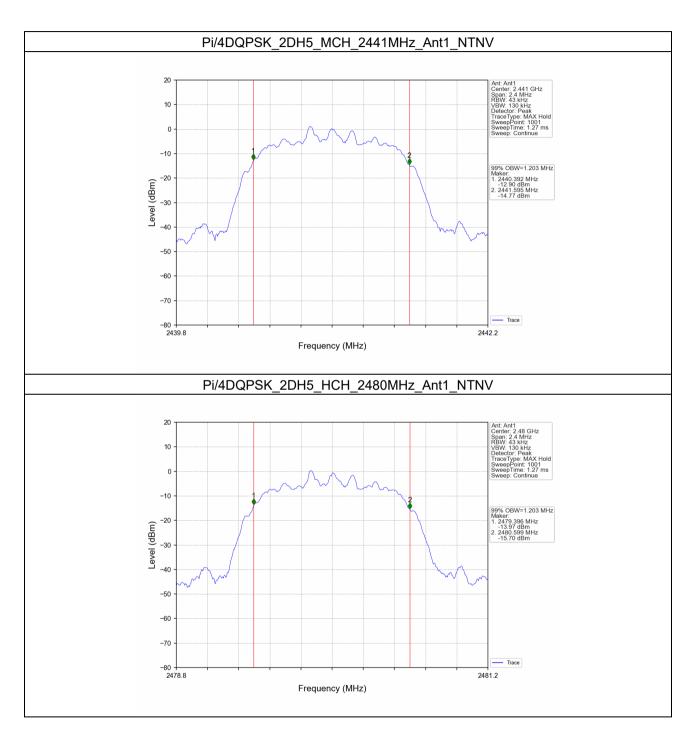
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Report No.: KSCR220800154901

Page: 67 of 115





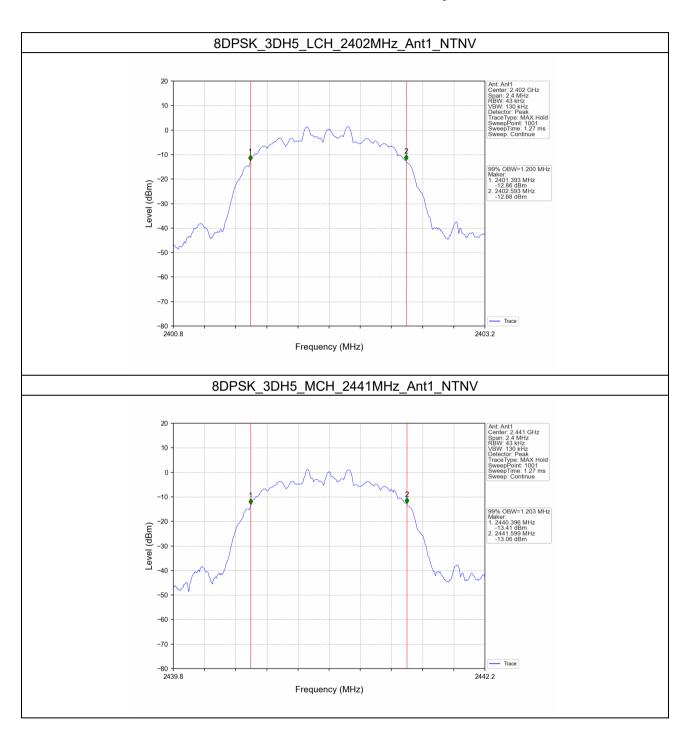
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Report No.: KSCR220800154901

Page: 68 of 115





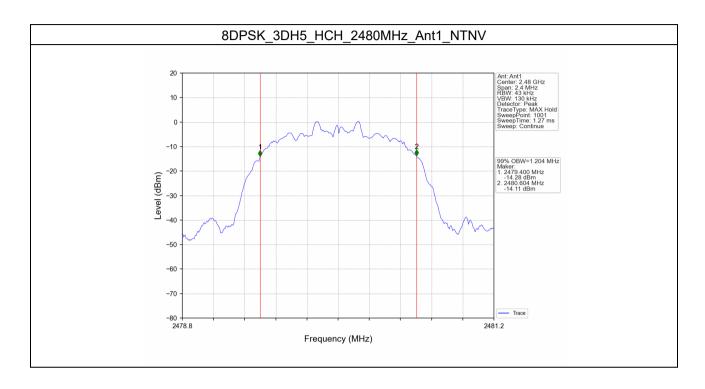
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Report No.: KSCR220800154901

Page: 69 of 115





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Report No.: KSCR220800154901

Page: 70 of 115

1.2 20dB BW

1.2.1 Test Result

Mode	TX	Frequency	Packet	ANT	20dB Bandwidth (MHz)	Verdict	
iviode	Type	(MHz) Type		Result	verdict		
		2402	DH5	1	0.947	Pass	
GFSK	SISO	2441	DH5	1	0.947	Pass	
		2480	DH5	1	0.946	Pass	
	SISO	2402	2DH5	1	1.346	Pass	
Pi/4DQPSK		2441	2DH5	1	1.347	Pass	
		2480	2DH5	1	1.349	Pass	
8DPSK		2402	3DH5	1	1.328	Pass	
	SISO	2441	3DH5	1	1.330	Pass	
		2480	3DH5	1	1.326	Pass	



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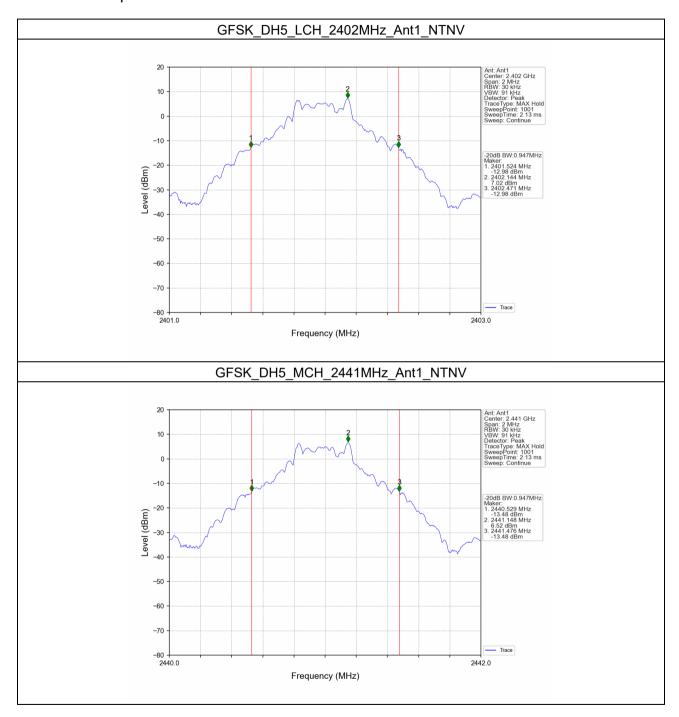
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Report No.: KSCR220800154901

Page: 71 of 115

1.2.2 Test Graph





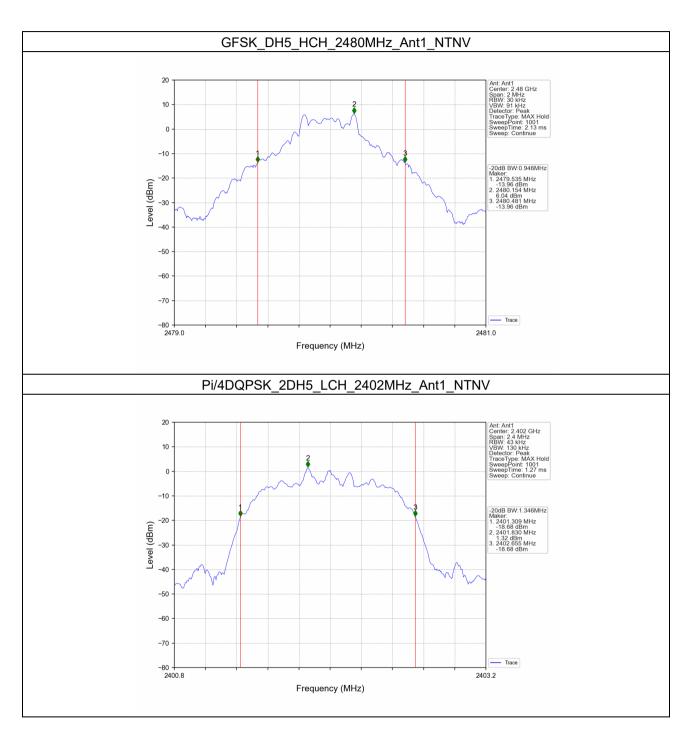
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Report No.: KSCR220800154901

Page: 72 of 115





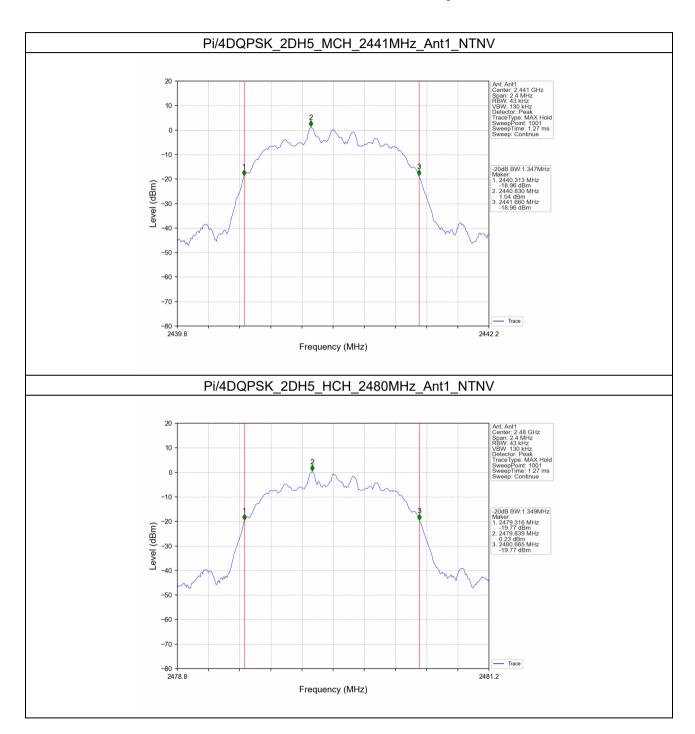
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Page: 73 of 115





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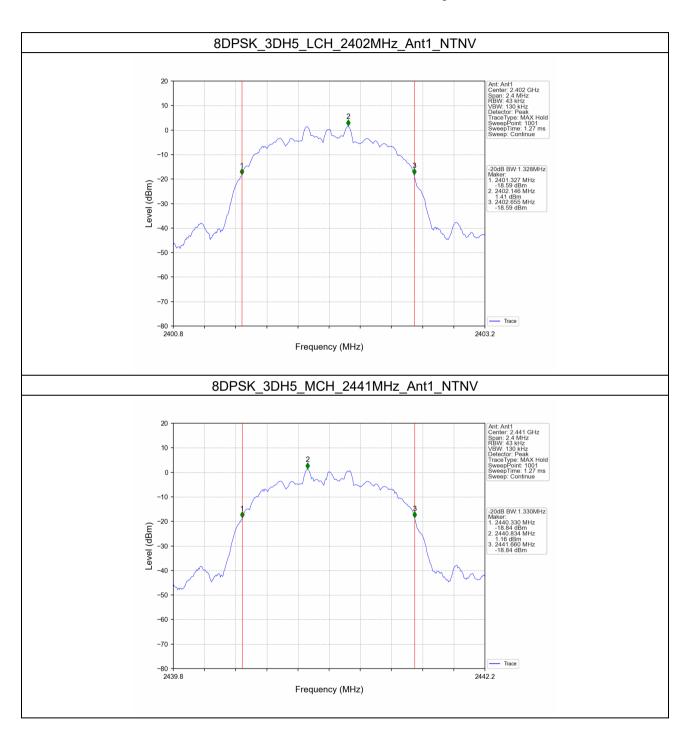
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Report No.: KSCR220800154901

Page: 74 of 115





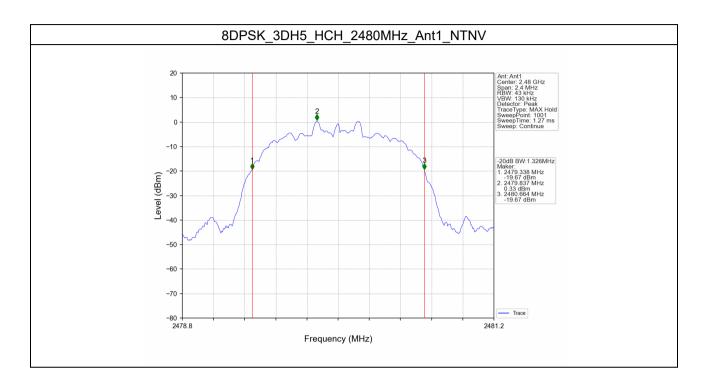
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Page: 75 of 115





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Report No.: KSCR220800154901

Page: 76 of 115

2. Maximum Conducted Output Power

2.1 Power

2.1.1 Test Result

Mode	TX	Frequency	Packet	Maximum Peak Conduc	Vardiet			
	Type	(MHz)	Type	ANT1	Limit	Verdict		
		2402	DH5	3.97	<=30	Pass		
GFSK	SISO	2441	DH5	3.45	<=30	Pass		
		2480	DH5	2.99	<=30	Pass		
	SISO	2402	2DH5	3.96	<=20.97	Pass		
Pi/4DQPSK		2441	2DH5	3.71	<=20.97	Pass		
		2480	2DH5	2.87	<=20.97	Pass		
	SISO		2402	3DH5	4.46	<=20.97	Pass	
8DPSK		2441	3DH5	4.23	<=20.97	Pass		
		2480	3DH5	3.38	<=20.97	Pass		
Note1: Antenna Gain: Ant1: -17.47dBi;								



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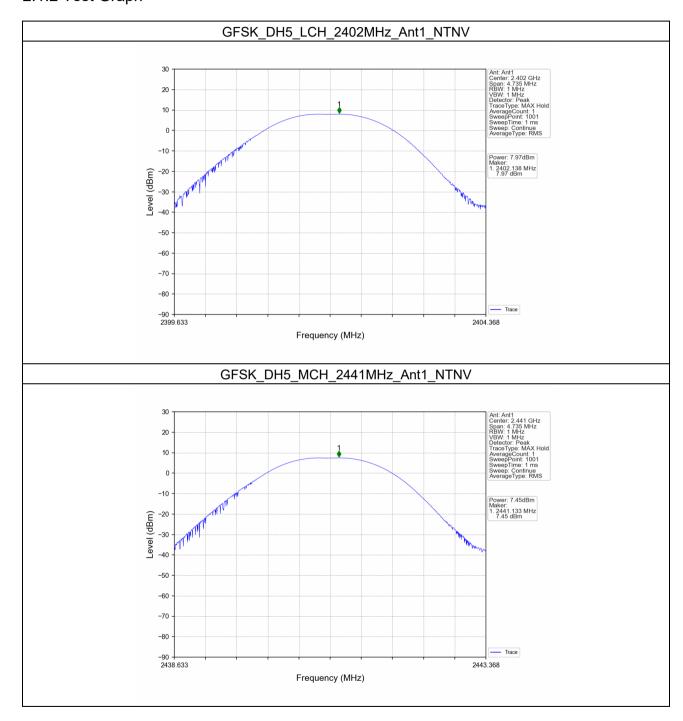
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Page: 77 of 115

2.1.2 Test Graph





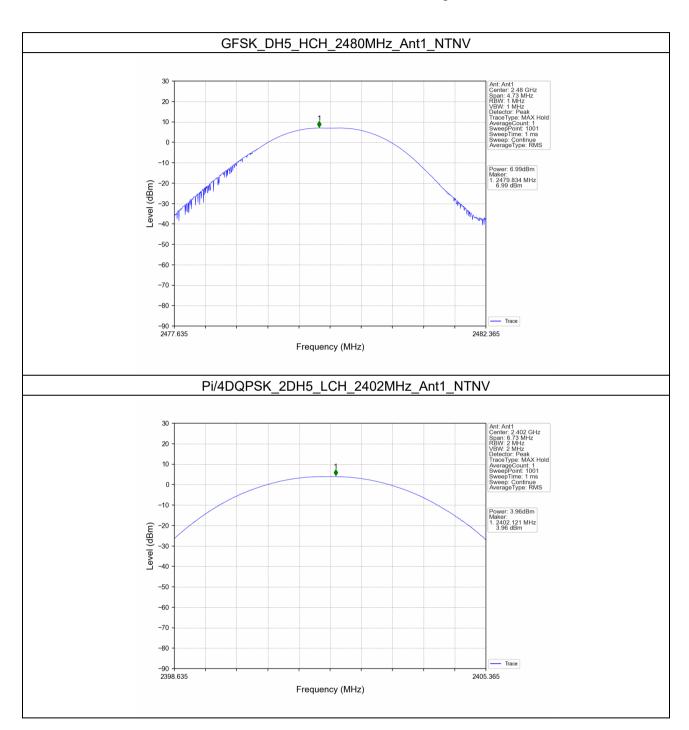
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Report No.: KSCR220800154901

Page: 78 of 115





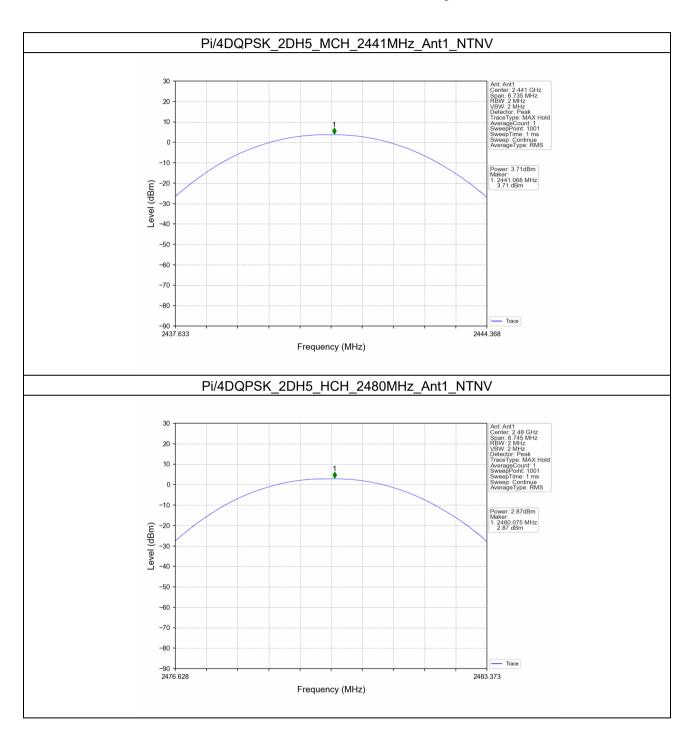
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Report No.: KSCR220800154901

Page: 79 of 115





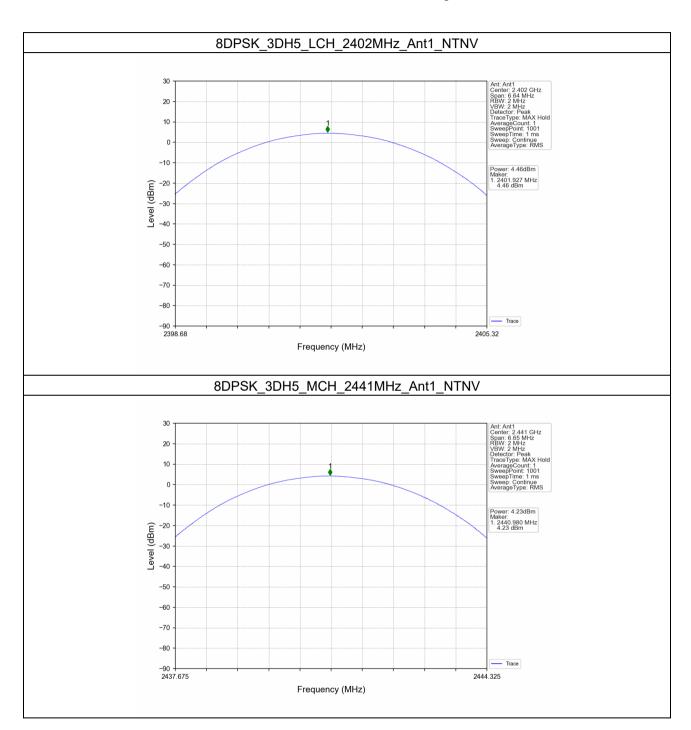
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Report No.: KSCR220800154901

Page: 80 of 115





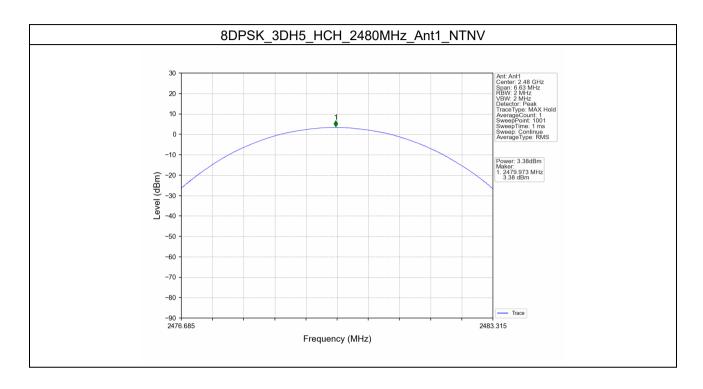
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Page: 82 of 115

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	0.994	0.947	>=0.947	Pass		
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.349	>=0.899	Pass		
8DPSK	SISO	HOPP	3DH5	1.030	1.330	>=0.887	Pass		



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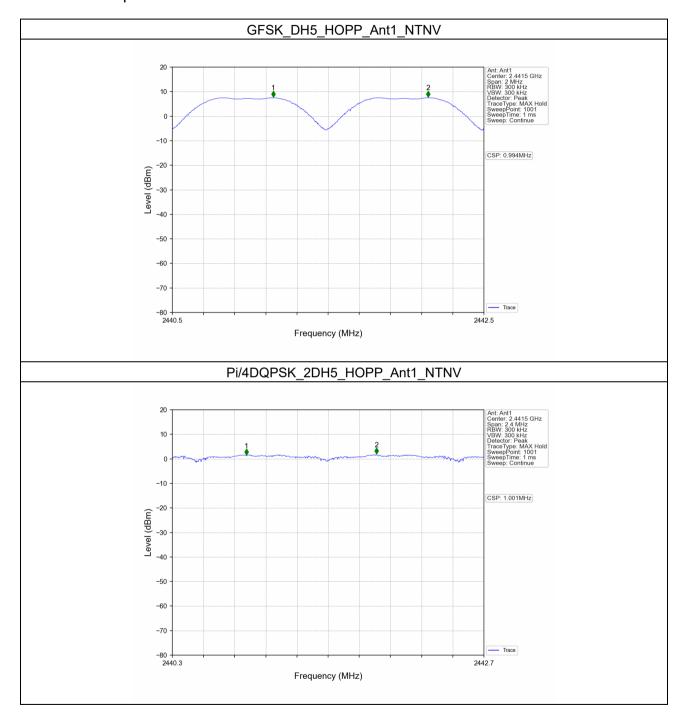
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Page: 83 of 115

3.1.2 Test Graph





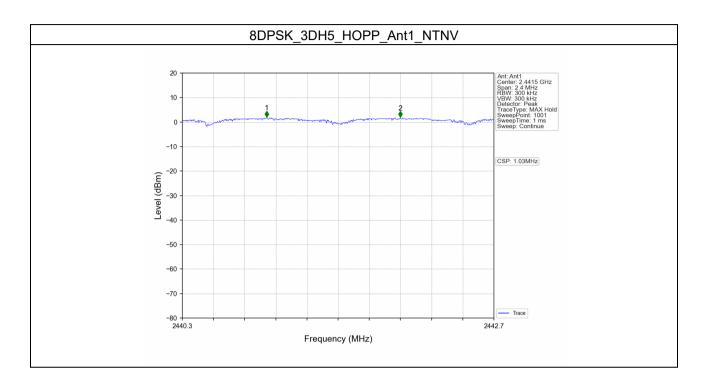
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Report No.: KSCR220800154901

Page: 85 of 115

4. Number of Hopping Frequencies

4.1 HoppNum

4.1.1 Test Result

Mode	TX	Frequency	Packet	Num of Hopping Frequencies		Vardiat
	Type	(MHz)	Туре	ANT1	Limit	Verdict
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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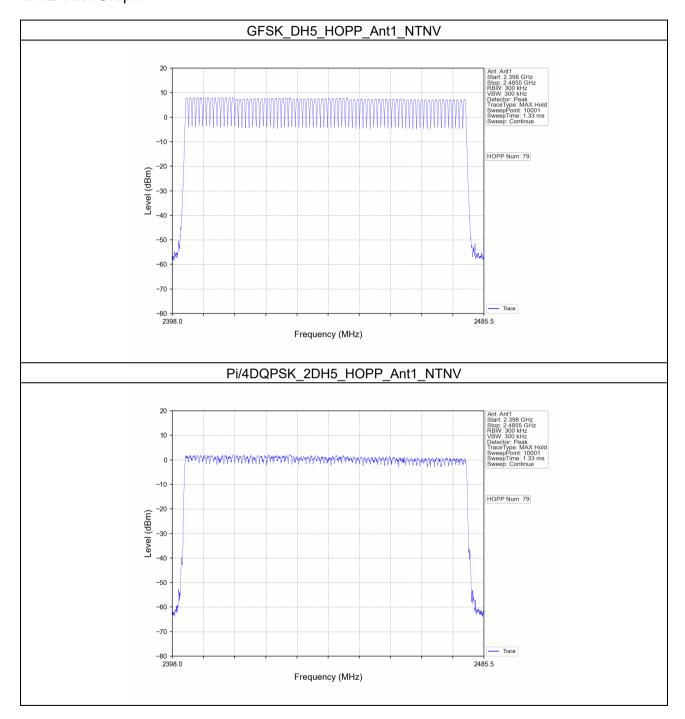
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Page: 86 of 115

4.1.2 Test Graph





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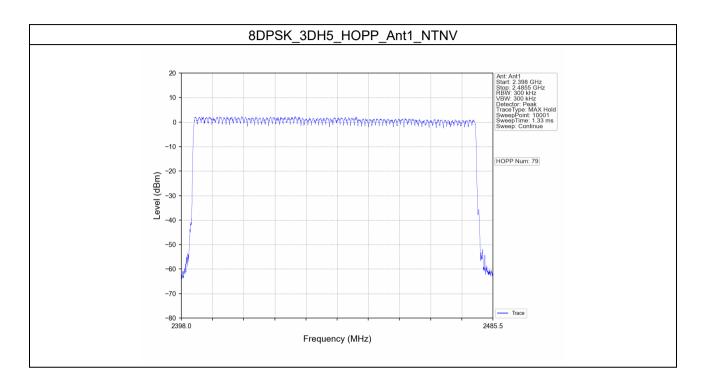
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Report No.: KSCR220800154901

Page: 88 of 115

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	
			DH1	0.422	31.600	320	135.040	<=400	Pass	
GFSK	SISO	HOPP	DH3	1.678	31.600	153	256.734	<=400	Pass	
			DH5	2.928	31.600	113	330.864	<=400	Pass	
	SISO	SO HOPP	2DH1	0.392	31.600	320	125.440	<=400	Pass	
Pi/4DQPSK			2DH3	1.680	31.600	158	265.440	<=400	Pass	
			2DH5	2.928	31.600	100	292.800	<=400	Pass	
		SISO HOPP	3DH1	0.428	31.600	320	136.960	<=400	Pass	
8DPSK	SISO		3DH3	1.680	31.600	165	277.200	<=400	Pass	
			3DH5	2.932	31.600	113	331.316	<=400	Pass	



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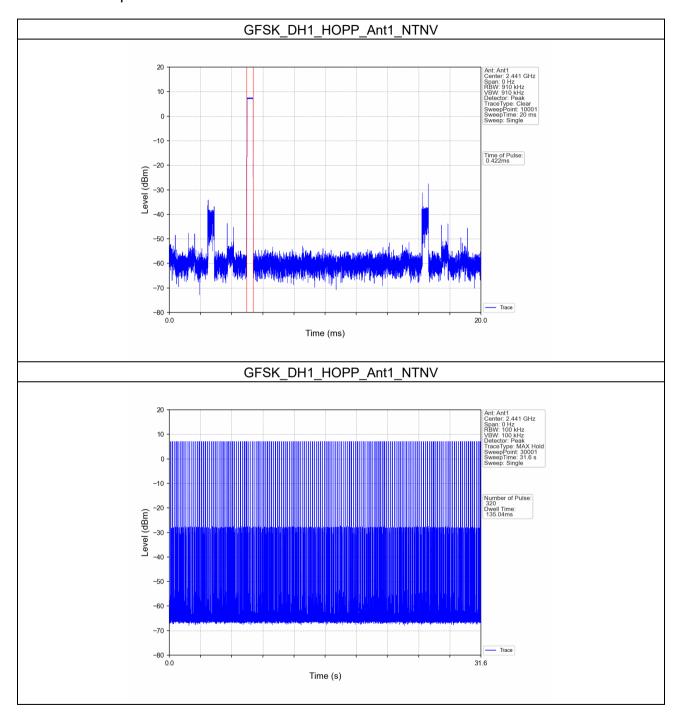
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Report No.: KSCR220800154901

Page: 89 of 115

5.1.2 Test Graph





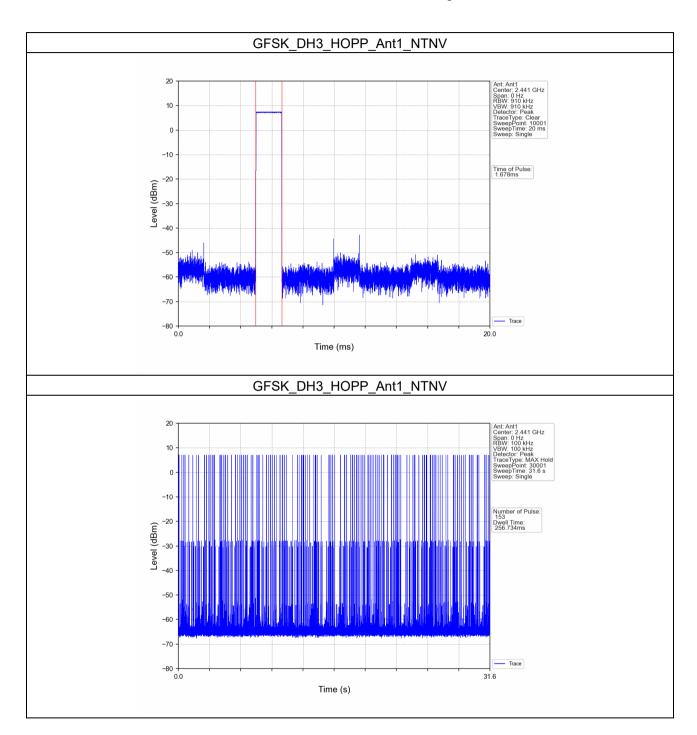
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Report No.: KSCR220800154901

Page: 90 of 115





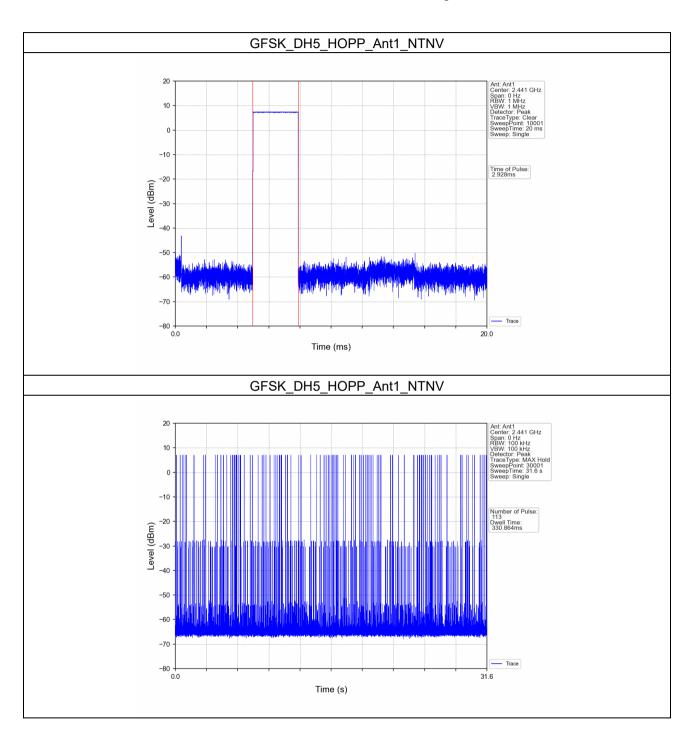
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Report No.: KSCR220800154901

Page: 91 of 115





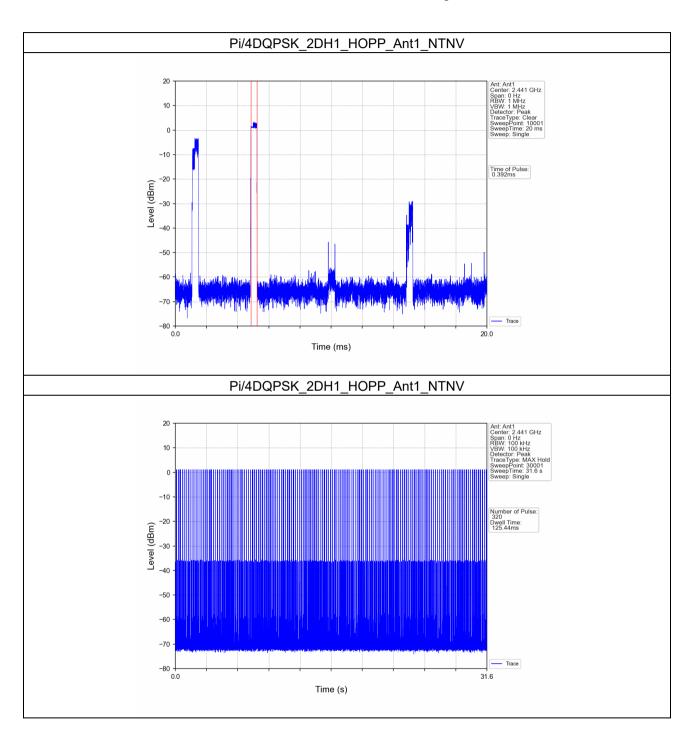
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Report No.: KSCR220800154901

Page: 92 of 115





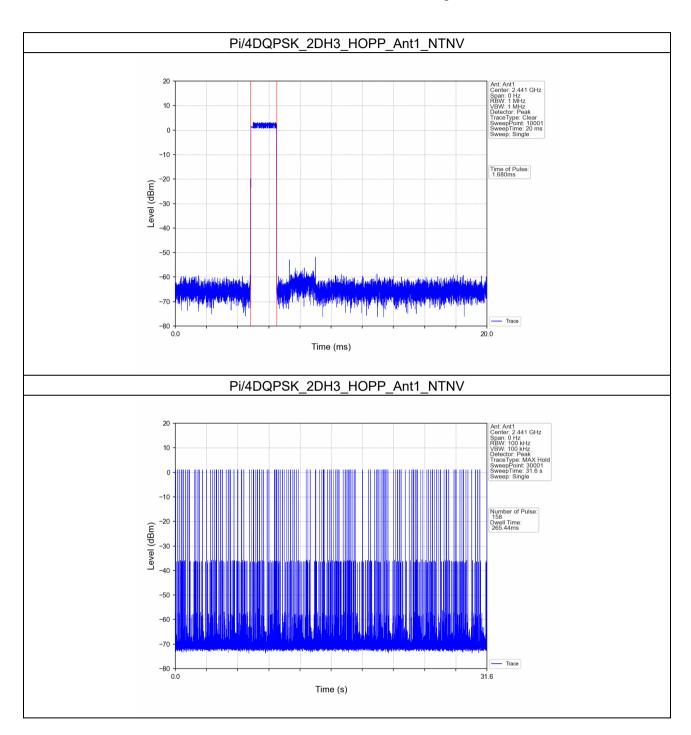
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Report No.: KSCR220800154901

Page: 93 of 115





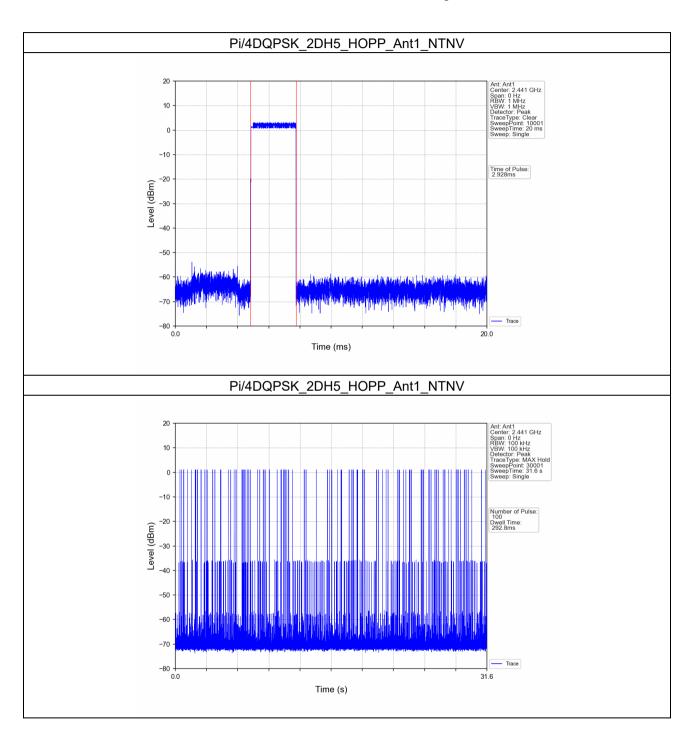
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Report No.: KSCR220800154901

Page: 94 of 115





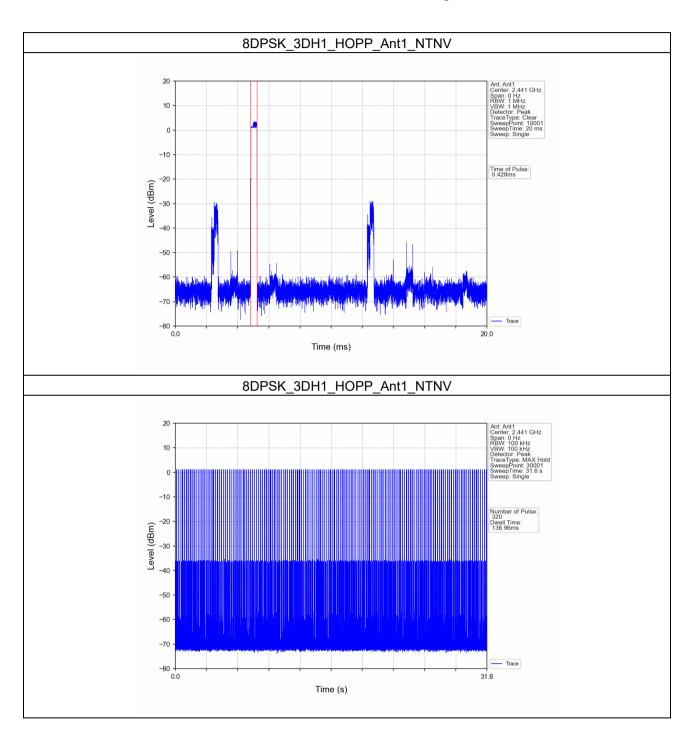
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Report No.: KSCR220800154901

Page: 95 of 115





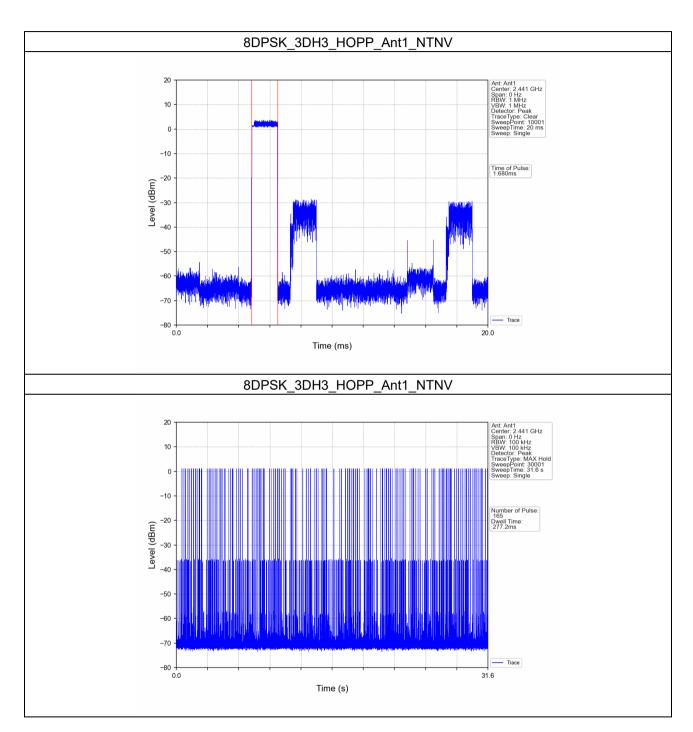
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Report No.: KSCR220800154901

Page: 96 of 115





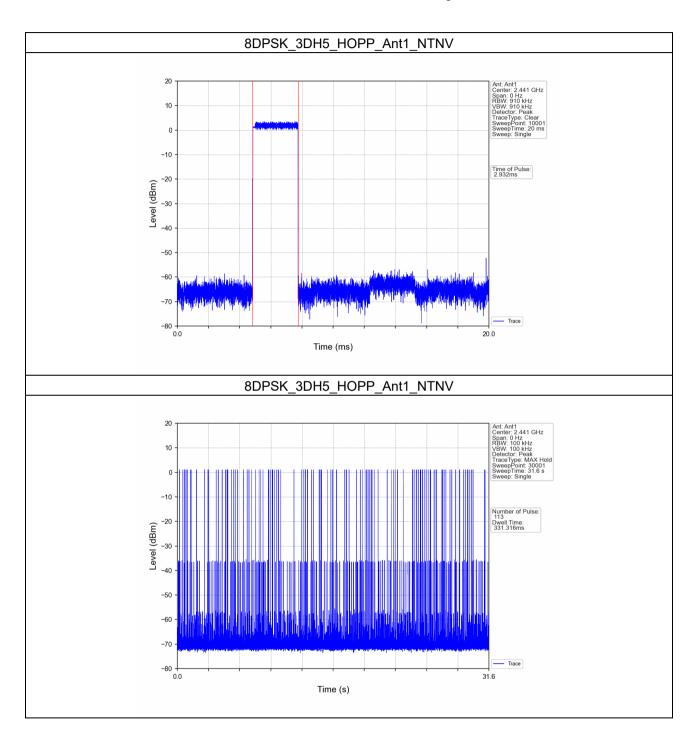
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Report No.: KSCR220800154901

Page: 97 of 115





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Report No.: KSCR220800154901

Page: 98 of 115

6. Unwanted Emissions InStandard Non-restricted Frequency Bands

6.1 Ref

6.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
	010.0	2402	DH5	1	7.87
GFSK	SISO	2441	DH5	1	7.35
		2480	DH5	1	6.88
	SISO	2402	2DH5	1	1.48
Pi/4DQPSK		2441	2DH5	1	1.28
		2480	2DH5	1	0.46
8DPSK	0100	2402	3DH5	1	1.54
	SISO	2441	3DH5	1	1.34
		2480	3DH5	1	0.52

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.



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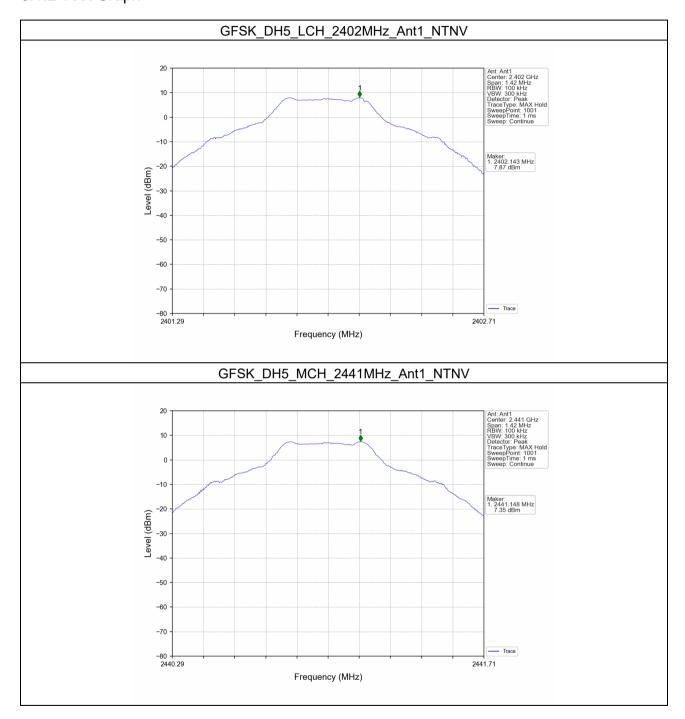
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Report No.: KSCR220800154901

Page: 99 of 115

6.1.2 Test Graph





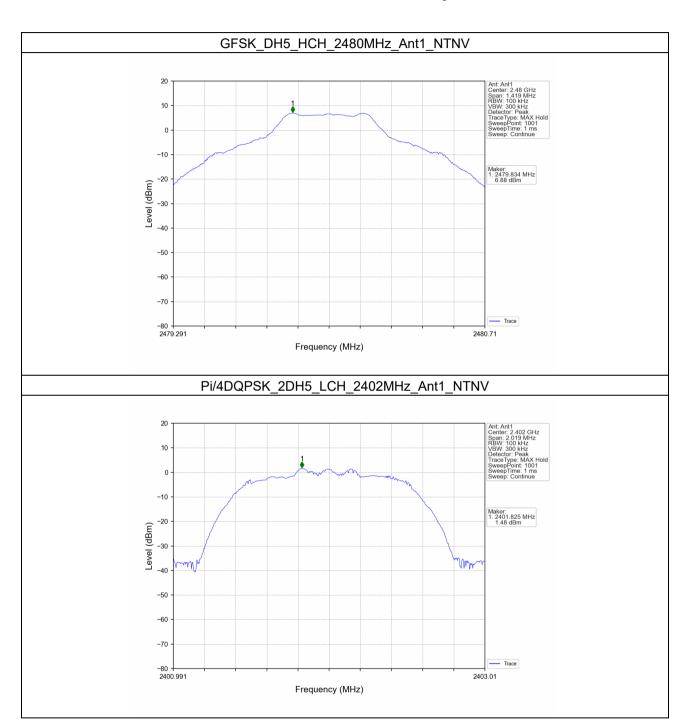
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Report No.: KSCR220800154901

Page: 100 of 115





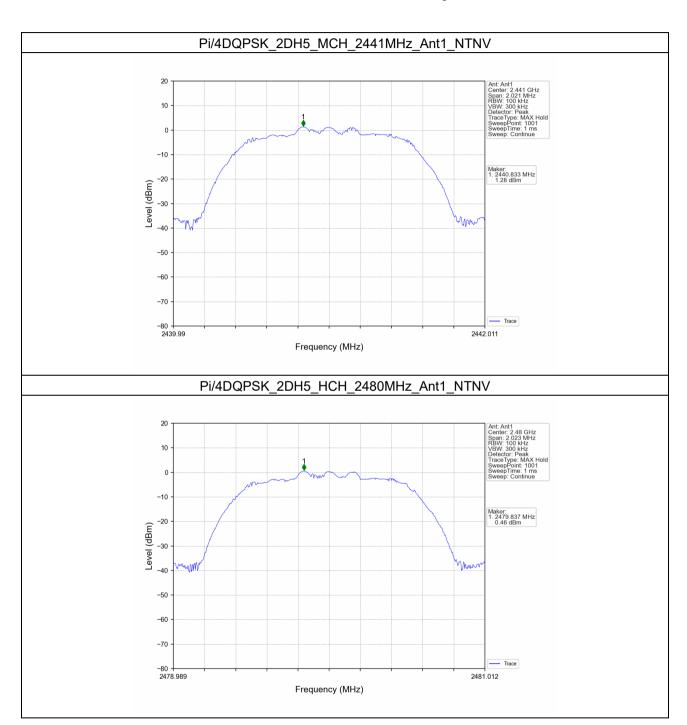
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Report No.: KSCR220800154901

Page: 101 of 115





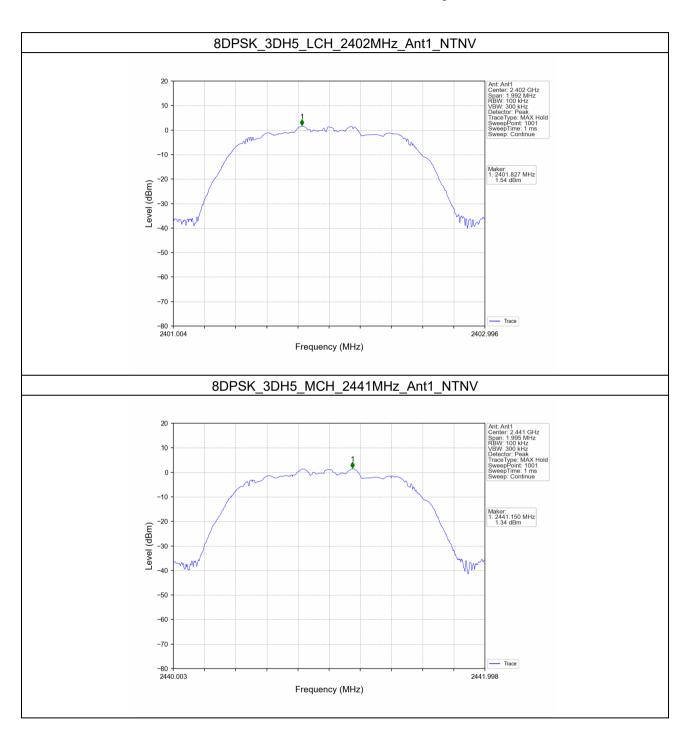
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Report No.: KSCR220800154901

Page: 102 of 115





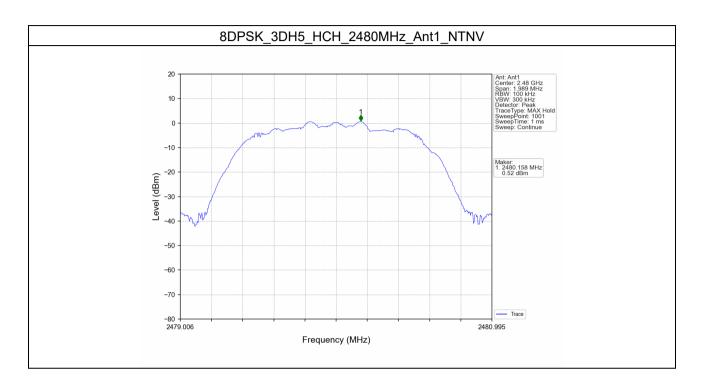
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Report No.: KSCR220800154901

Page: 103 of 115





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Report No.: KSCR220800154901

Page: 104 of 115

6.2 CSE

6.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
	SISO	2402	DH5	1	7.87	-12.13	Pass
OFOK		2441	DH5	1	7.87	-12.13	Pass
GFSK		2480	DH5	1	7.87	-12.13	Pass
		HOPP	DH5	1	7.87	-12.13	Pass
	SISO	2402	2DH5	1	1.48	-18.52	Pass
D:/ADODCK		2441	2DH5	1	1.48	-18.52	Pass
Pi/4DQPSK		2480	2DH5	1	1.48	-18.52	Pass
		HOPP	2DH5	1	1.48	-18.52	Pass
	SISO	2402	3DH5	1	1.54	-18.46	Pass
8DPSK		2441	3DH5	1	1.54	-18.46	Pass
		2480	3DH5	1	1.54	-18.46	Pass
		HOPP	3DH5	1	1.54	-18.46	Pass

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.



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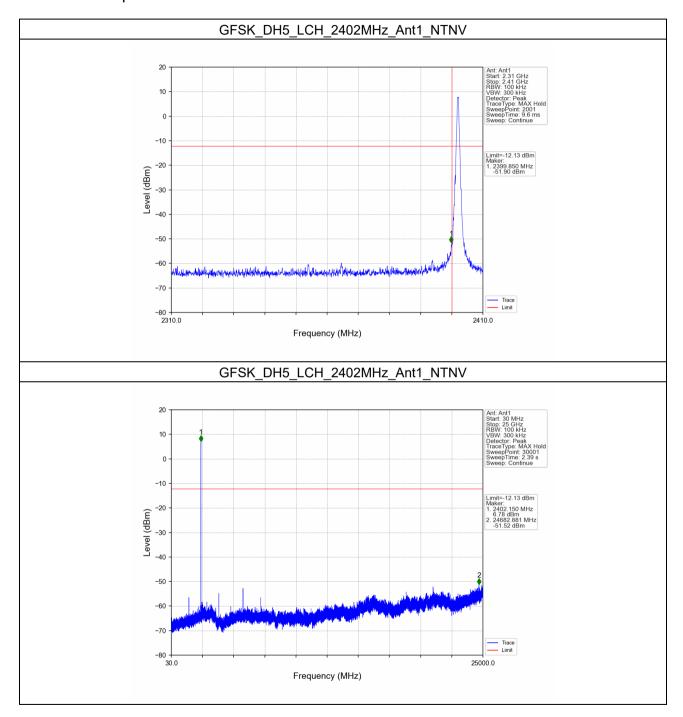
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Report No.: KSCR220800154901

Page: 105 of 115

6.2.2 Test Graph





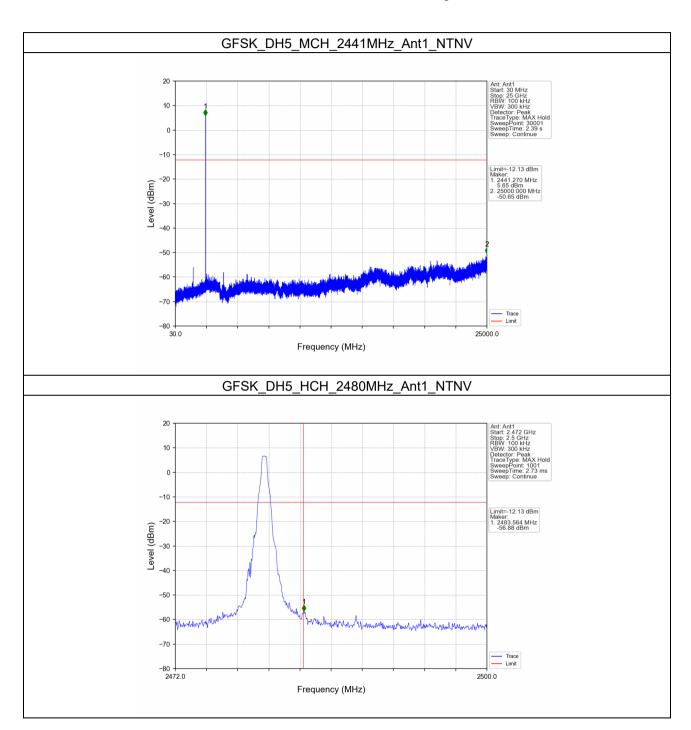
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Page: 106 of 115





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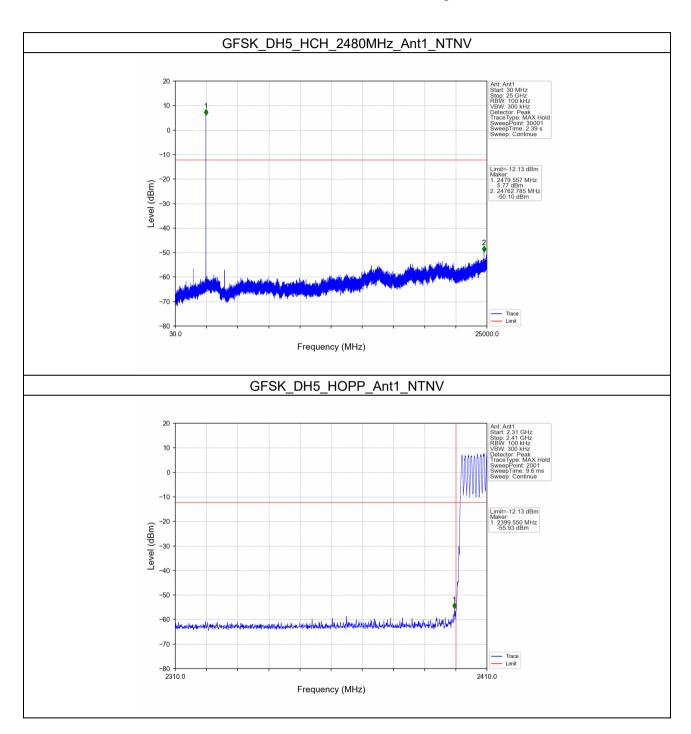
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Report No.: KSCR220800154901

Page: 107 of 115





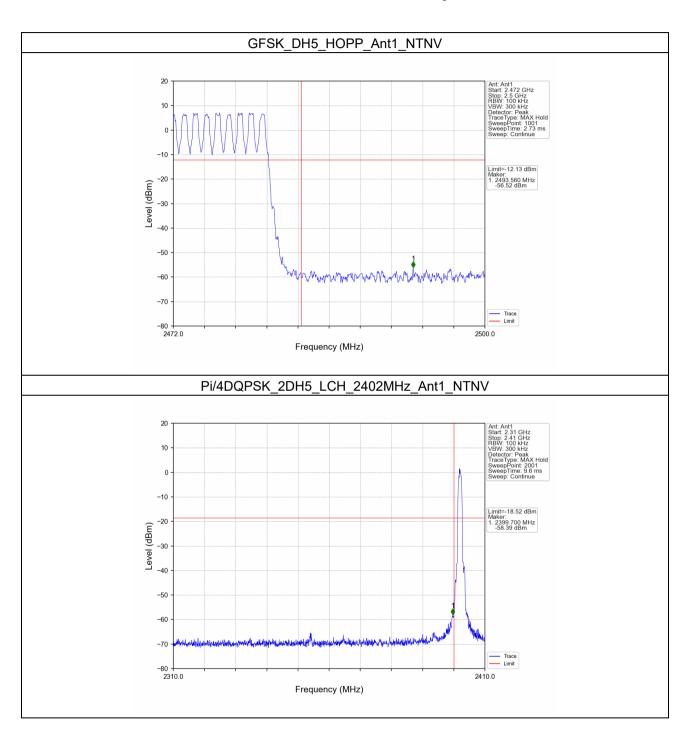
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Page: 108 of 115





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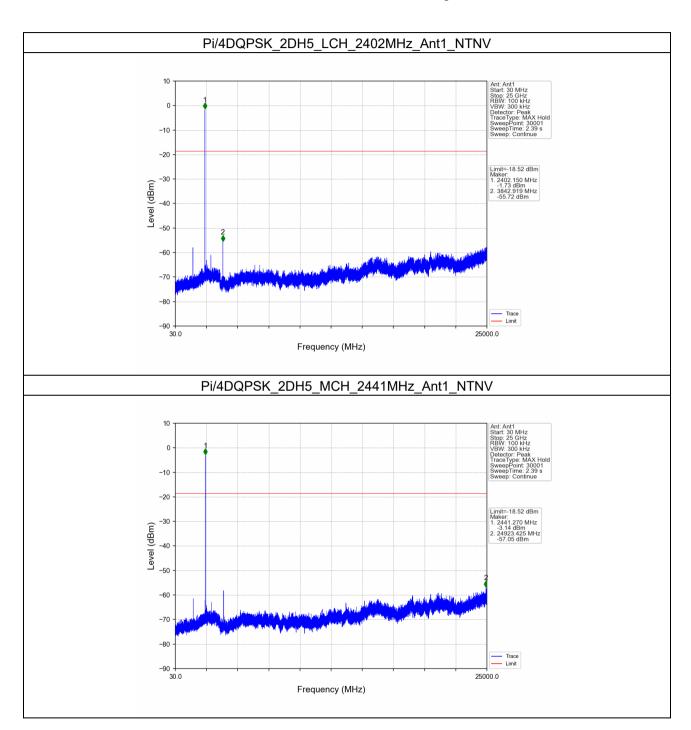
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Report No.: KSCR220800154901

Page: 109 of 115





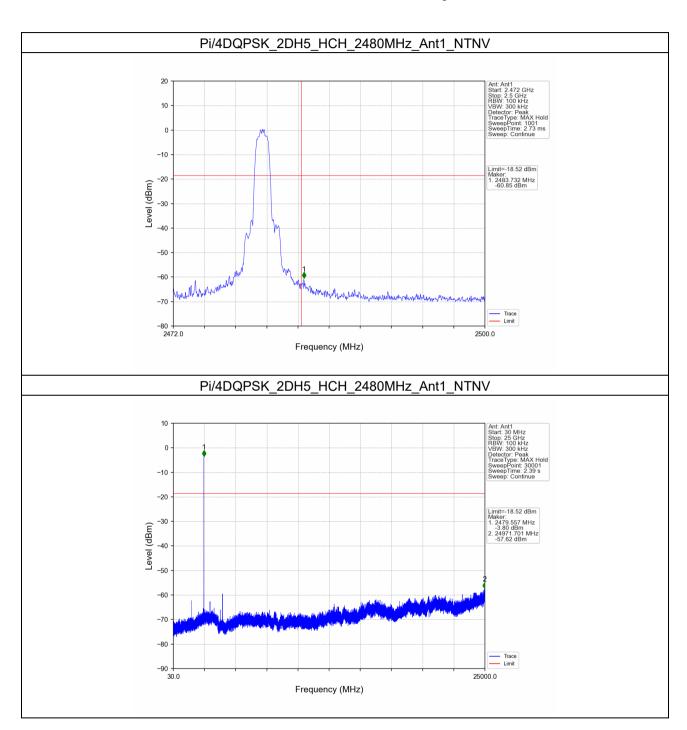
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Page: 110 of 115





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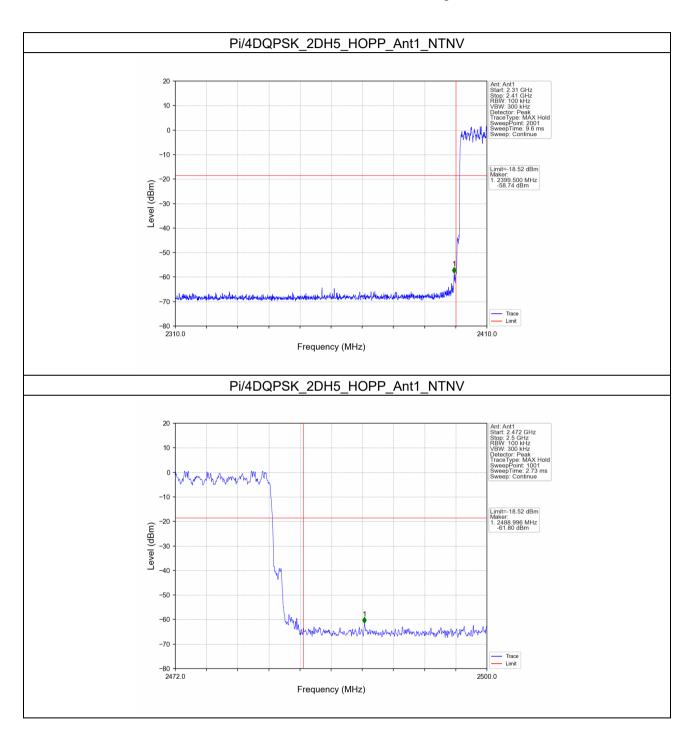
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Report No.: KSCR220800154901

Page: 111 of 115





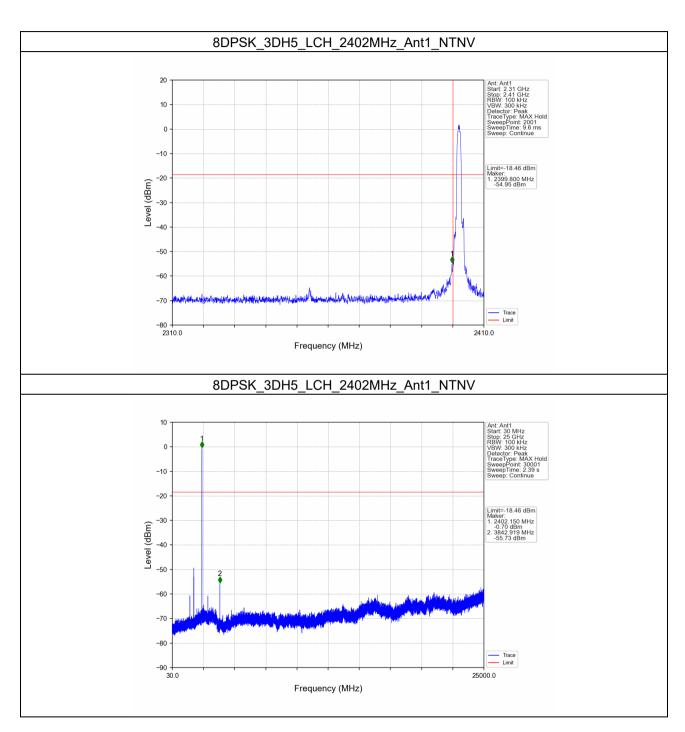
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Report No.: KSCR220800154901

Page: 112 of 115





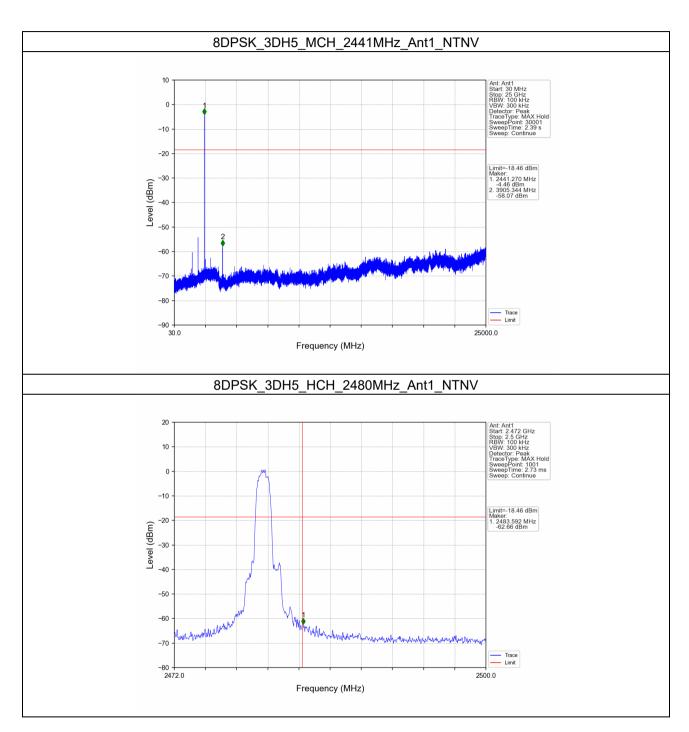
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Report No.: KSCR220800154901

Page: 113 of 115





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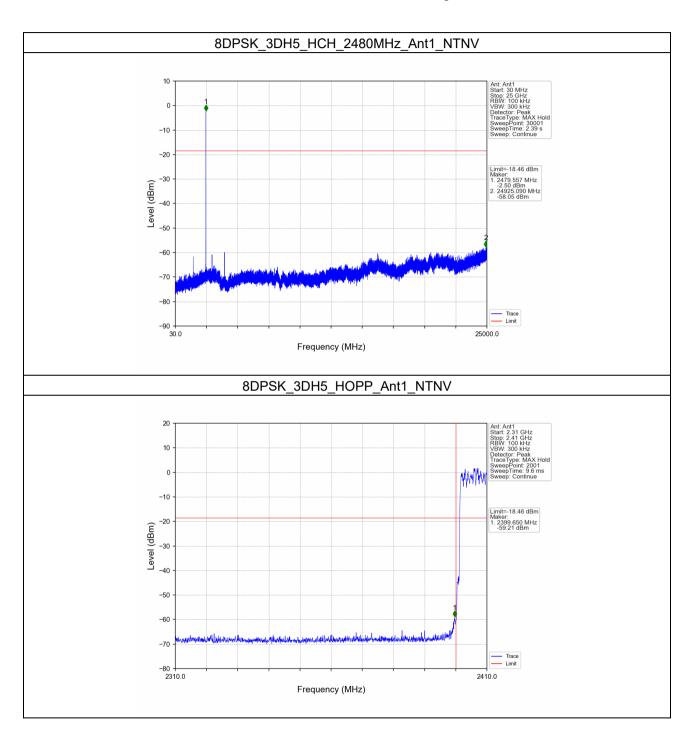
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Report No.: KSCR220800154901

Page: 114 of 115





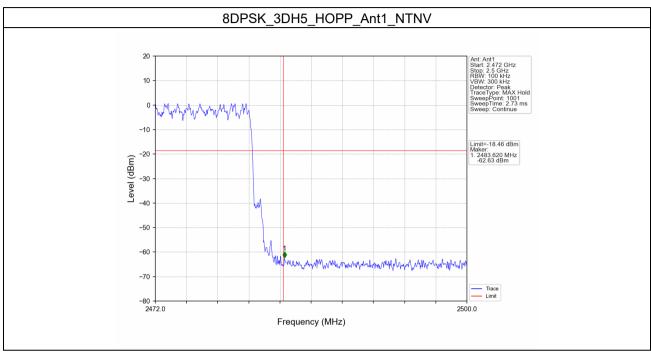
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Report No.: KSCR220800154901

Page: 115 of 115



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