

TEST REPORT

100, Jangjateo-ro, Hobeop-myeon, Icheon-si, Gyeonggi-do, 17396, Korea Tel: 031-637-8898 / Fax: 0505-116-8895

1. Client					
• Name	: Sena Technologies Co., Ltd.				
 Address. 	: 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea				
2. Use of Rep	ort: FCC Approval				
3. Sample Des	scription				
• Product	Name: SC2 Standard				
Model Na	ame: SP170				
4. Date of Rec	ceipt:: 2024-06-04				
5. Date of Tes	st: 2024-06-20 ~ 2024-07-04				
6. Test Metho	d FCC Part 15 Subpart C 15.247				
7. Test Result	7. Test Results : Refer to the test results				
 The results shown in this test report are the results of testing the samples provided. This test report is prepared according to the requirements of ISO / IEC 17025. 					
Affirmation	Tested byTechnical ManagerJoonyoung, Jeon(Sign)Jong-Myoung, Shin(Sign)				
	July 11, 2024 EMC Labs Co., Ltd.				

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<u>Version</u>

TEST REPORT NO.	DATE	DESCRIPTION
KR0140-RF2407-001	July 11, 2024	Initial Issue

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1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant Information

Applicant	Sena Technologies Co., Ltd.
Applicant Address 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea	
Contact Person	Seunghyun Kim
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1.2. Manufacturer Information

Manufacturer	Sena Technologies Co., Ltd.
Manufacturer Address	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, Korea

1.3 Test Laboratory Information

Laboratory	EMC Labs Co., Ltd.
Laboratory Address	100, Jangjateo-ro, Hobeop-myeon, Icheon-si, Gyeonggi-do, Republic of
	Korea
Contact Person	Jong-Myoung, Shin
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FCC Designation No.	KR0140
FCC Registration No.	580000
IC Site Registration No.	28751



2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	SC2 Standard
Model Name	SP170
FCC ID	S7A-SP170
Rated Voltage	DC 3.8 V

2.2 Additional Information

Operating Frequency	2 402 MHz ~ 2 480 MHz	
Number of channel	79	
Modulation Type	BDR Mode(GFSK), EDR Mode(Pi/4 DQPSK, 8DPSK)	
Antenna Type	PCB Antenna	
Antenna Gain	Max. Gain 0.56 dBi	
Firmware Version	1.0	
Hardware Version	1.0	
Test software	BlueTest3 v3.3.5	

2.3 Test Frequency

Test mode	Test Frequency (MHz)			
	Low Frequency	Middle Frequency	High Frequency	
GFSK	2 402	2 441	2 480	
Pi/4 DQPSK	2 402	2 441	2 480	
8DPSK	2 402 2 441 2 4		2 480	

2.4 Worst-Case

BDR	GFSK (DH5)
EDR	8DPSK (3-DH5)

Note: The power measurement has been conducted to determine the worst-case mode from all possible Combinations between available modulations, data rates.

2.5 Mode of operation during the test

- The EUT continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel. To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

2.6 Modifications of EUT

- None

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3. Test Summary

Applied	FCC Rule	IC Rule	Test Items	Test Condition	Result
\boxtimes	15.203	_	Antenna Requirement		С
\square	15.247(a)	-	20 dB Bandwidth		С
\square	_	RSS GEN (6.7)	Occupied Bandwidth (99%)		С
\square	15.247(a)	RSS-247 (5.1)	Number of Hopping Frequencies	O a ra du a tra d	С
\square	15.247(a)	RSS-247 (5.1)	Time of Occupancy (Dwell Time)	Conducted	С
\square	15.247(a)	RSS-247 (5.1)	Carrier Frequencies Separation		С
\square	15.247(b)	RSS-247 (5.4)	Peak Output Power		С
\square	15.247(d)	RSS-247 (5.5)	Conducted Spurious Emission		С
\square	15.247(d) 15.205 & 15.209	RSS-247 (5.5) RSS-GEN (8.9 & 8.10)	Radiated Spurious Emission	Radiated	С
Note 1: C=0	15.207	RSS-GEN (8.8) Complies NT=No	Conducted Emissions AC I Condu		С

<u>Note 1</u>: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

The sample was tested according to the following specification: ANSI C63.10:2013.

Compliance was determined by specification limits of the applicable standard according to customer requirements.



4. Used equipment on test

Description	Manufacturer	Model Name	Serial Name	Next Cal.
TEMP & HUMID CHAMBER	JFM	JFMA-001	20200929-01	2024.12.07
CONTROLLER	AMWON TECHNOLOGY	TEMI2500	S7800VK191 0707	2024.12.07
PSA SERIES SPECTRUM ANALYZER	AGILENT	E4440A	MY45304057	2024.12.08
MXG ANALOG SIGNAL GENERATOR	AGILENT	N5183A	MY50141890	2024.12.08
SYSTEM DC POWER SUPPLY	AGILENT	6674A	MY53000118	2024.12.11
VECTOR SIGNAL GENERATOR	ROHDE & SCHWARZ	SMBV100A	257524	2024.12.08
DIRECTIONAL COUPLER	AGILENT	773D	2839A01855	2024.12.08
ATTENUATOR	AGILENT	8493C	73193	2024.12.08
TERMINATIOM	HEWLETT PACKARD	909D	07492	2024.12.08
POWER DIVIDER	HEWLETT PACKARD	11636A	06916	2024.12.08
SLIDE-AC	DAEKWANG TECH	SV-1023	NONE	2024.11.10
DIGITAL MULTIMETER	HUMANTECHSTORE	15B+	50561541WS	2024.12.08
ATTENUATOR	ACE RF COMM	ATT SMA 20W 20dB 8GHz	A-0820.SM20.2	2025.04.04
DC POWER SUPPLY	AGILENT	E3634A	MY40012120	2025.02.22
USB Peak Power Sensor	Anritsu	MA24408A	12321	2024.11.09
High Pass Filter	WT Microwave INC.	WT-A3314-HS	WT22111804-1	2024.12.08
High Pass Filter	WT Microwave INC.	WT-A1935-HS	WT22111804-2	2024.12.08
SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSU26	200444	2025.02.22
ATTENUATOR	Mini-Circuits	BW-K3-2W44+	2318-1	2025.06.28
ATTENUATOR	Mini-Circuits	BW-K3-2W44+	2318-2	2025.06.28
Balanced Temperature and Humidity Control System	ESPEC CORP.	SH-241	92004650	2025.06.13
ACTIVE LOOP ANTENNA	TESEQ	HLA 6121	55685	2024.12.22
Biconilog ANT	Schwarzbeck	VULB 9160	3260	2026.04.01
Biconilog ANT	Schwarzbeck	VULB9168	902	2024.11.30
Horn ANT	Schwarzbeck	BBHA9120D	974	2024.11.30
Horn ANT	Schwarzbeck	BBHA9120D	1497	2025.01.04
Amplifier	TESTEK	TK-PA18H	200104-L	2025.03.14
Horn ANT	Schwarzbeck	BBHA9170	01188	2025.03.19
Horn ANT	Schwarzbeck	BBHA9170	01189	2025.03.19
AMPLIFIER	TESTEK	TK-PA1840H	220105-L	2025.03.14
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW44	101952	2025.03.14
Test Receiver	ROHDE & SCHWARZ	ESR7	101616	2025.06.27
LISN	ROHDE & SCHWARZ	ENV216	100409	2025.01.04
PULSE LIMITER	lignex1	EPL-30	NONE	2025.01.04

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5. Antenna Requirement

According to §15.203 An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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.

According to §15.247(b)(4) e 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.

5.1 Result

Complies

(The transmitter has a PCB Antenna. The directional peak gain of the antenna is 0.56 dBi.)



6. 20 dB Bandwidth & Occupied Bandwidth (99%)

6.1 Test Setup

Refer to the APPENDIX I.

6.2 Limit

Limit : Not Applicable

6.3 Test Procedure

- 1. The 20 dB bandwidth & Occupied bandwidth were measured with a spectrum analyzer connected to RF antenna Connector (conducted measurement) while EUT was operating in transmit mode. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer.
- 2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using below setting:

 $\begin{array}{l} \mathsf{RBW} = 1\% \text{ to } 5\% \text{ of the 20 dB Bandwidth \& Occupied Bandwidth} \\ \mathsf{VBW} \geq 3 \ \times \ \mathsf{RBW} \\ \mathsf{Span} = \mathsf{between two times and five times the 20 dB Bandwidth \& Occupied Bandwidth} \\ \mathsf{Sweep} = \mathsf{Auto} \\ \mathsf{Detector function} = \mathsf{Peak} \\ \mathsf{Trace} = \mathsf{Max Hold} \end{array}$

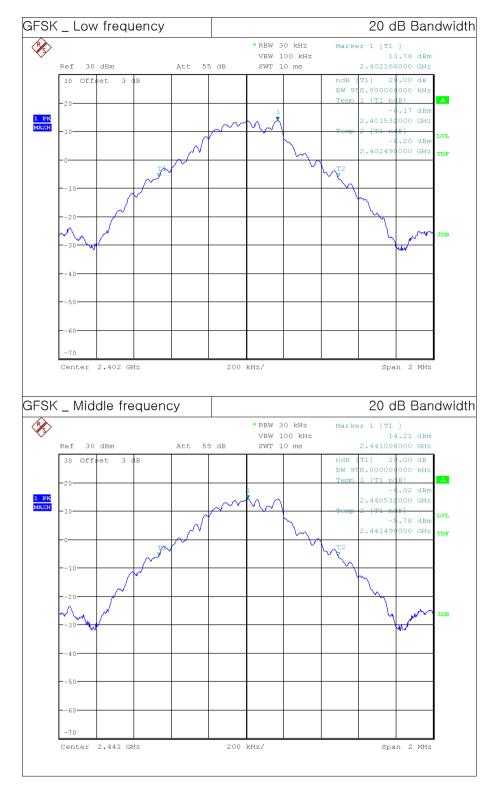
6.4 Test Result

Test Mode	Test Frequency	20 dB Bandwidth (MHz)	Occupied Bandwidth (MHz)		
	Low	0.958	0.870		
GFSK	Middle	0.958	0.868		
	High	0.958	0.866		
	Low	1.312	1.188		
8DPSK	Middle	1.308	1.188		
	High	1.308	1.188		

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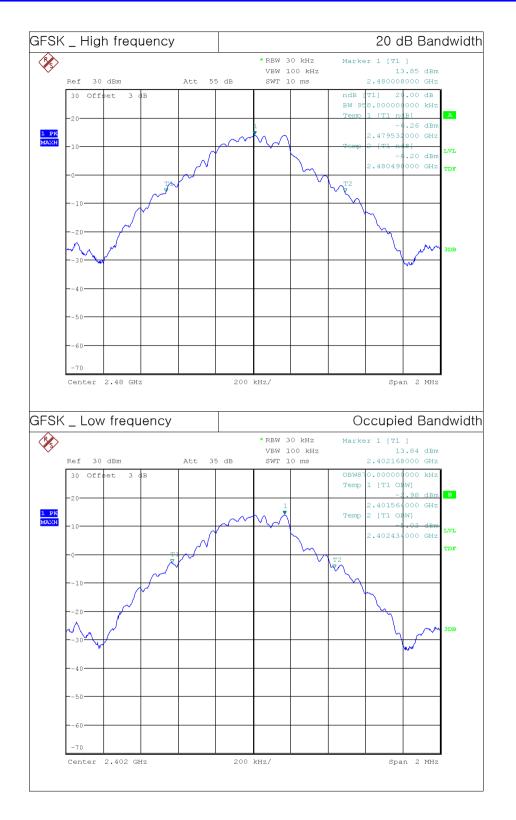


6.5 Test Plot



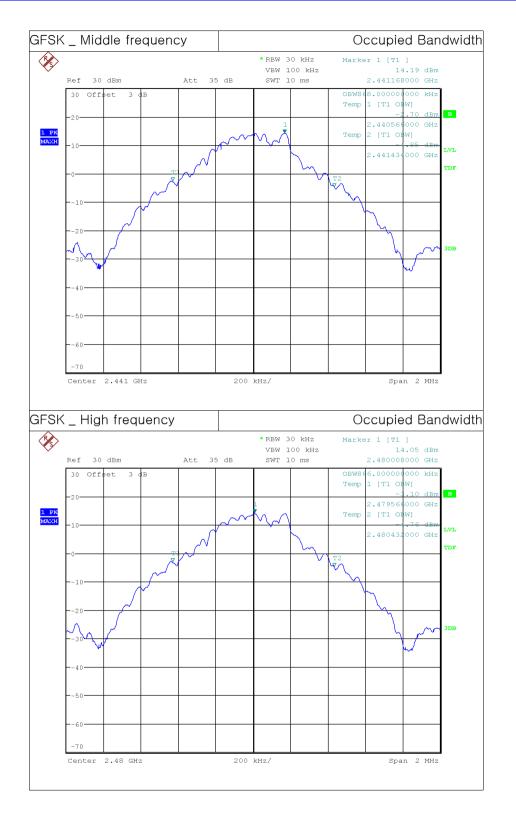
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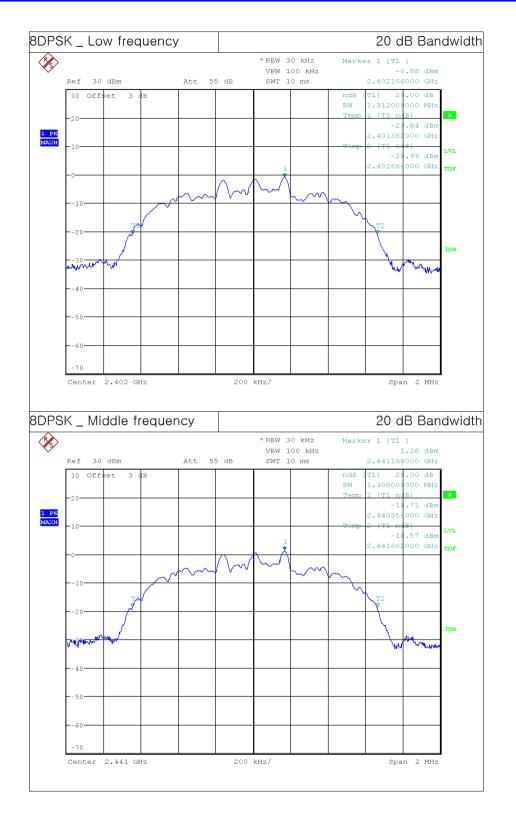
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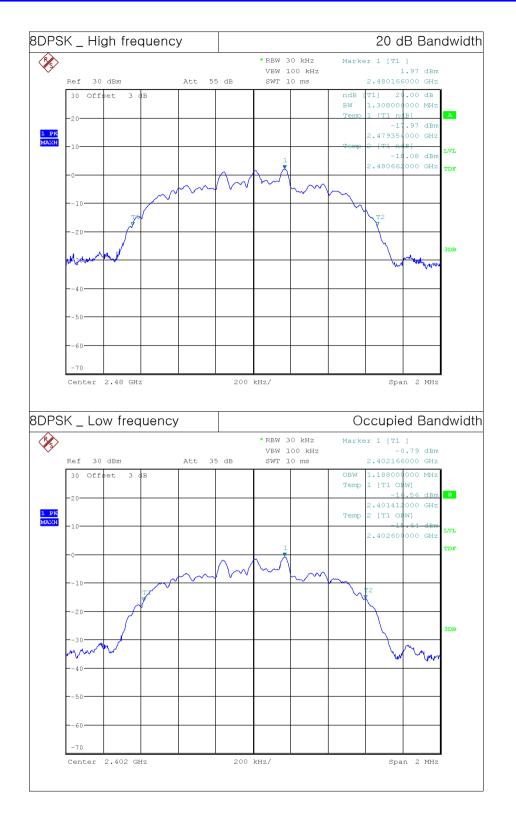
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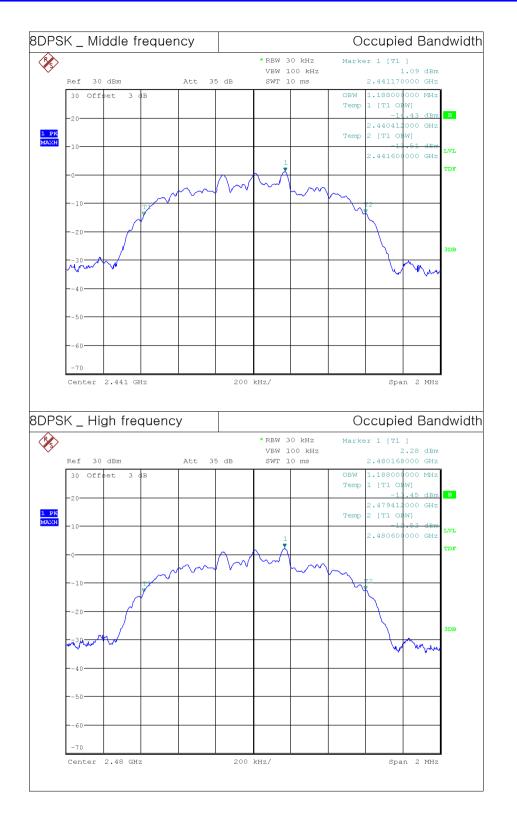
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7. Number of Hopping Frequencies

7.1 Test Setup

Refer to the APPENDIX I.

7.2 Limit

Limit : >= 15 hops

7.3 Test Procedure

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, two frequency ranges for FH mode within the 2400 \sim 2483.5 MHz were examined.

The spectrum analyzer is set to:

 Span = 50 MHz

 RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

 VBW ≥ RBW
 Sweep = Auto

 Detector = Peak
 Trace = Max hold

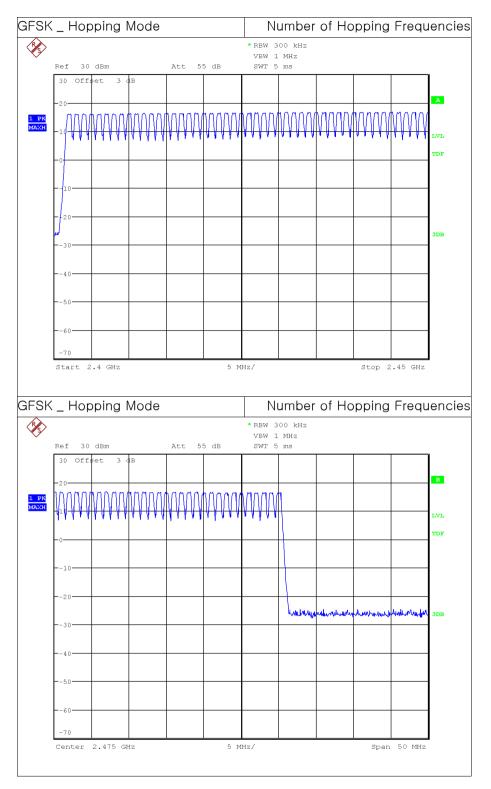
7.4 Test Result

Test Mode	Number of Hopping Channels
GFSK	79
8DPSK	79

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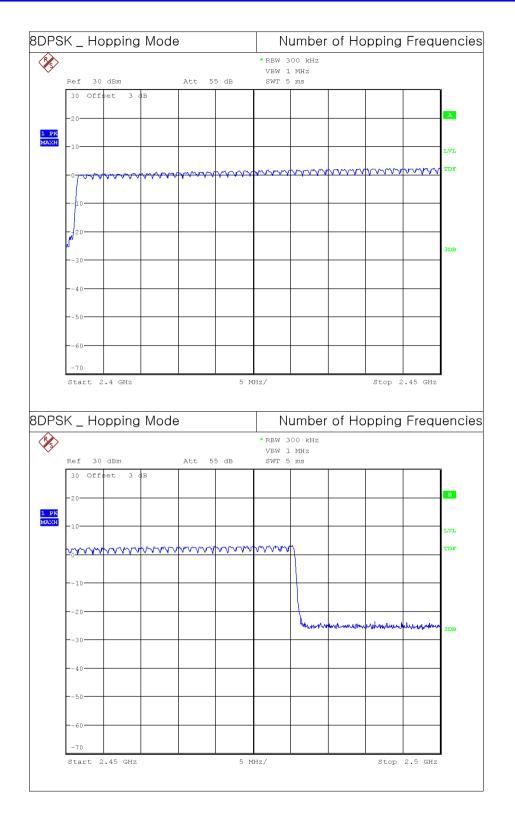


7.5 Test Plot



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8. Time of Occupancy (Dwell Time)

8.1 Test Setup

Refer to the APPENDIX I.

8.2 Limit

The maximum permissible time of occupancy is 400 ms within a period of 400 ms multiplied by the number of hopping channels employed.

8.3 Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

```
Center frequency = 2441 MHz Span = Zero

RBW = 1 MHz (RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T,

where T is the expected dwell time per channel)

VBW ≥ RBW Detector = Peak

Trace = Max hold
```

8.4 Test Result

Test Mode	Number of Hopping Channels	Burst On Time (ms)	Result (sec)	Limit (sec)
GFSK (non-AFH)	79	2.905	0.31	0.40
GFSK (AFH)	20	2.905	0.15	0.40
8DPSK (non-AFH)	79	2.905	0.31	0.40
8DPSK (AFH)	20	2.905	0.15	0.40

Note: Dwell Time = 0.4 x Hopping channel x Burst On Time x ((Hopping rate / Time slots) / Hopping channel)

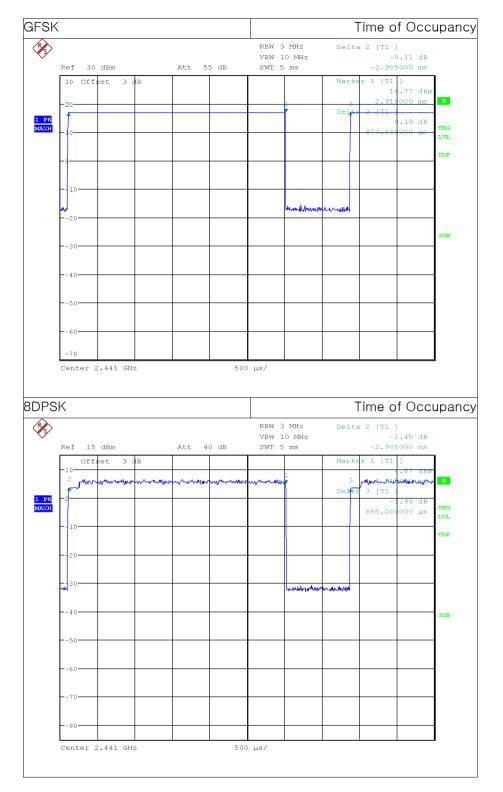
- Time slots for DH5 = 6 slots (TX = 5 slot / RX = 1 slot)

- Hopping Rate = 1600 for FH mode & 800 for AFH mode

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8.5 Test Plot



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9. Carrier Frequencies Separation

9.1 Test Setup

Refer to the APPENDIX I.

9.2 Limit

Limit : \geq 25 kHz or \geq Two-Thirds of the 20 dB Bandwidth whichever is greater.

9.3 Test Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = wide enough to capture the peaks of two adjacent channelsRBW = Start with the RBW set to approximately 30% of the channel spacing; adjust asnecessary to best identify the center of each individual channel. $VBW \ge RBW$ Sweep = AutoDetector = PeakTrace = Max hold

Test Mode	Test Frequency	Carrier Frequencies Separation (MHz)	Min. Limit (MHz)		
	Low	1.002	0.639		
GFSK	Middle	0.996	0.639		
	High	0.999	0.639		
	Low	1.005	0.875		
8DPSK	Middle	1.005	0.872		
	High	1.008	0.872		

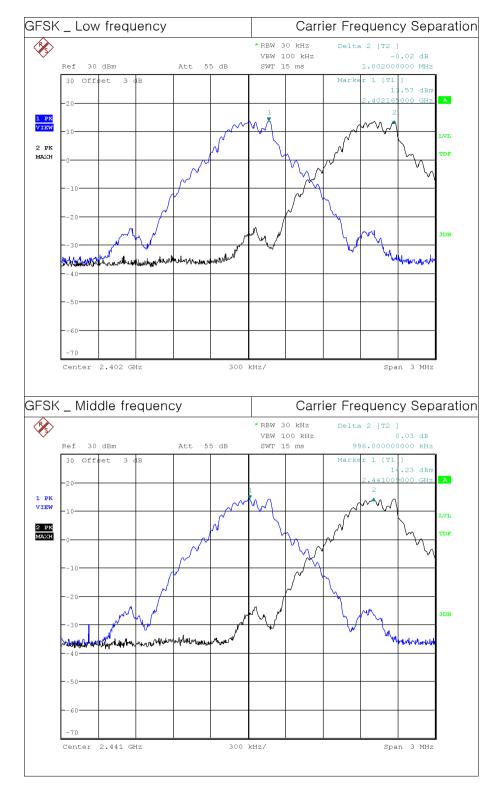
9.4 Test Result

Note: Limit(kHz) = Test Result of 20 dB BW * 2/3



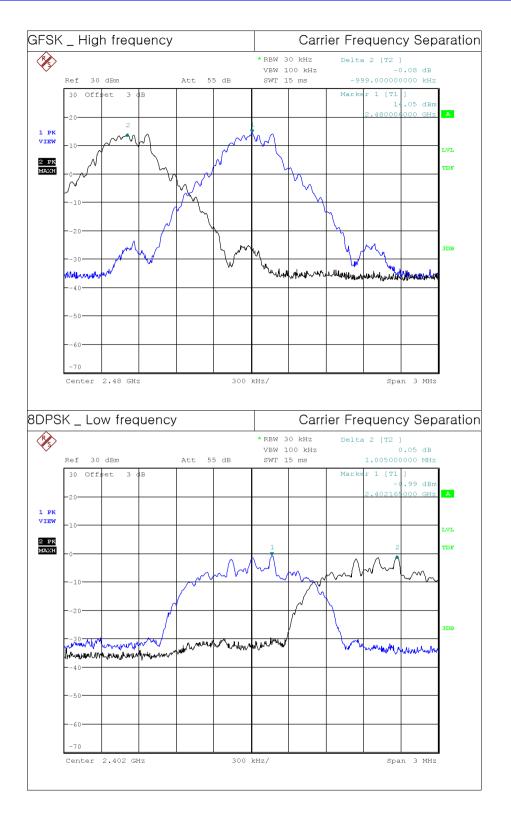


9.5 Test Plot



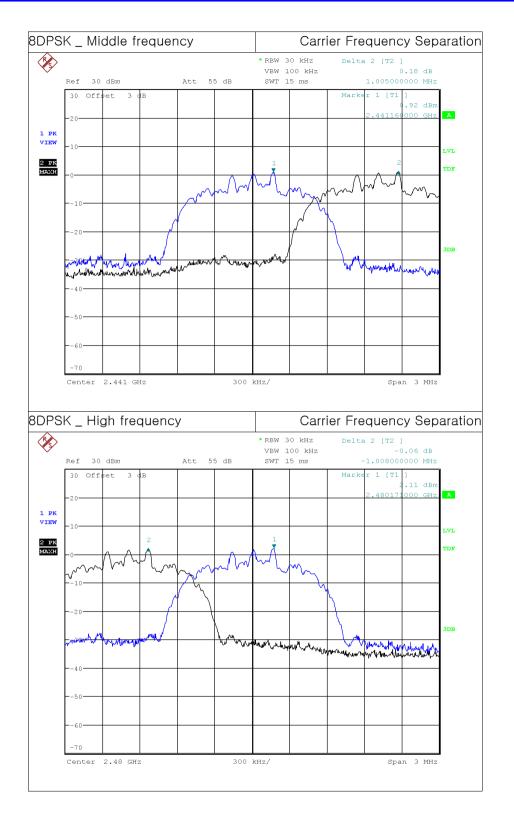
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10. Peak Output Power

10.1 Test Setup

Refer to the APPENDIX I.

10.2 Limit

■ FCC Requirements

The maximum peak output power of the intentional radiator shall not exceed the following:

- §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
- §15.247(b)(1), For frequency hopping systems operating in the 2400 2483.5 MHz employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725 5805 MHz band: 1 Watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
- IC Requirements
- RSS-247(5.4) (b), For FHSS operating in the band 2400 2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels, the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p shall not exceed 4 W, except as provided in section 5.4(e)

10.3 Test Procedure

- 1. The RF output power was measured with a spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, a spectrum analyzer was used to record the shape of the transmit signal.
- 2. The peak output power of the fundamental frequency was measured with the spectrum analyzer using;

Span = approximately 5 times of the 20 dB bandwidth, centered on a hopping channel

RBW ≥ 20 dB Bandwidth VBW ≥ RBW Sweep = Auto Detector function = Peak Trace = Max Hold

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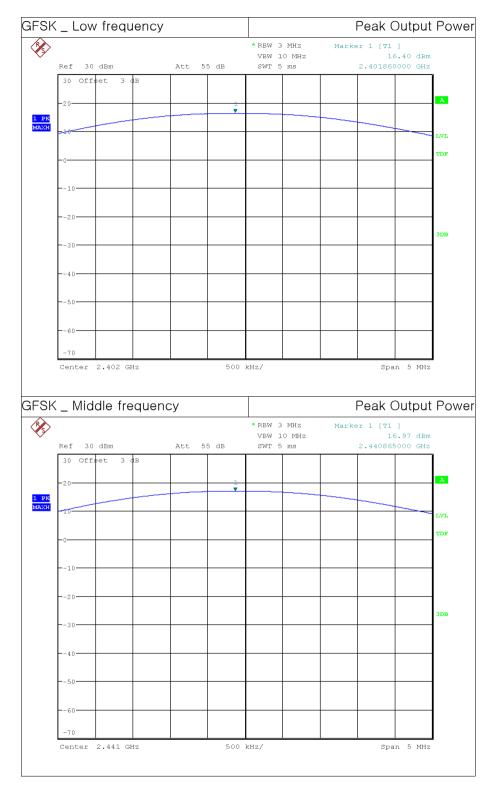


10.4 Test Result

Test Mode	Toot Fraguanay	Peak Output Power				
Test Mode	Test Frequency	dBm	mW			
	Low	16.40	43.65			
GFSK	Middle	16.97	49.77			
	High	16.69	46.67			
	Low	3.20	2.09			
Pi/4 DQPSK	Middle	4.95	3.13			
	High	5.98	3.96			
	Low	3.64	2.31			
8DPSK	Middle	5.48	3.53			
	High	6.59	4.56			

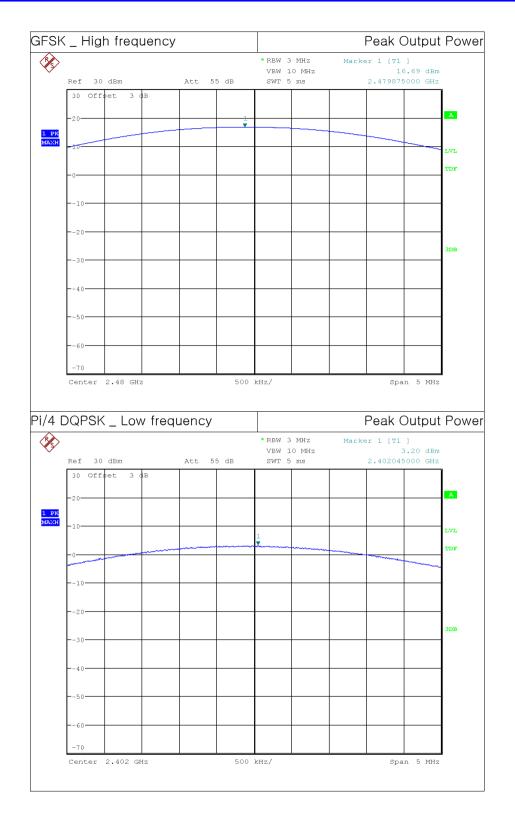


10.5 Test Plot



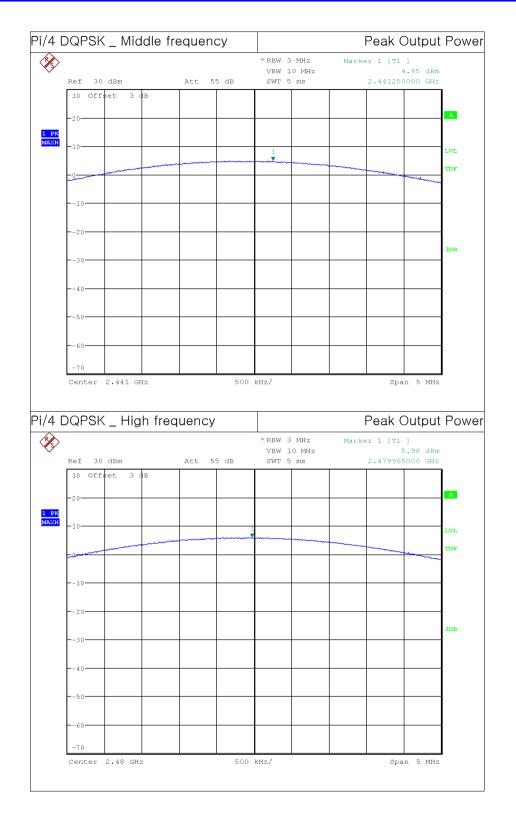
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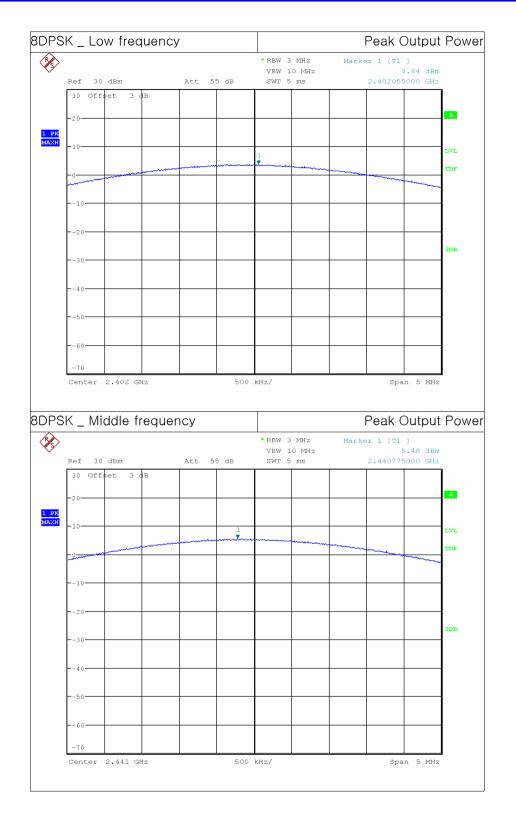
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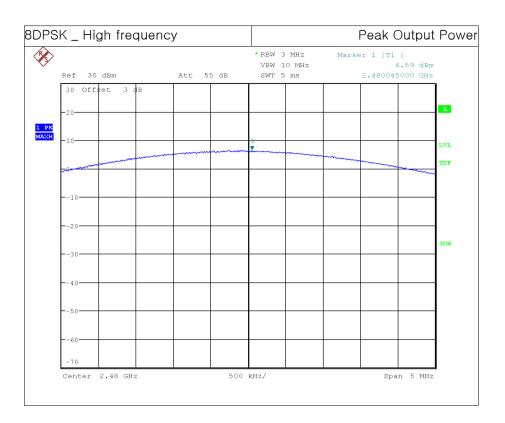
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11. TX Radiated Spurious Emission and Conducted Spurious Emission

11.1 Test Setup

Refer to the APPENDIX I.

11.2 Limit

According to §15.247(d), 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 section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional

radiator shall not exceed the new strength levels speemed in the following table									
Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)							
0.009 ~ 0.490	2400/F (kHz)	300							
0.490 ~ 1705	24000/F (kHz)	30							
1705 ~ 30.0	30	30							
30 ~ 88	100 **	3							
88 ~ 216	150 **	3							
216 ~ 960	200 **	3							
Above 960	500	3							

radiator shall not exceed the field strength levels specified in the following table

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

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According to § 15.205(a) and (b), only spurious emissions are permitted in any of
The frequency bands listed below:

The frequency bands listed below.										
MHz	MHz	MHz	GHz							
0.009 ~ 0.110	16.42 ~ 16.423	399.90 ~ 410	4.5 ~ 5.15							
0.495 ~ 0.505	16.69475 ~ 16.69525	608 ~ 614	5.35 ~ 5.46							
2.1735 ~ 2.1905	16.80425 ~ 16.80475	960 ~ 1240	7.25 ~ 7.75							
4.125 ~ 4.128	25.5 ~ 25.67	1300 ~ 1427	8.025 ~ 8.5							
4.17725 ~ 4.17775	37.5 ~ 38.	1435 ~ 1626.5	9.0 ~ 9.2							
4.20725 ~ 4.20775	25 73 ~ 74.6	1645.5 ~ 1646.5	9.3 ~ 9.5							
4.17725 ~ 4.17775	74.8 ~ 75.2	1660 ~ 1710	10.6 ~ 12.7							
6.215 ~ 6.218	108 ~ 121.94	1718.8 ~ 1722.2	13.25 ~ 13.4							
6.26775 ~ 6.26825	149.9 ~ 150.05	2200 ~ 2300	14.47 ~ 14.5							
6.31175 ~ 6.31225	156.52475 ~ 156.52525	2310 ~ 2390	15.35 ~ 16.2							
8.291 ~ 8.294	156.7 ~ 156.9	2483.5 ~ 2500	17.7 ~ 21.4							
8.362 ~ 8.366	162.0125 ~ 167.17	2690 ~ 2900	22.01 ~ 23.12							
8.37625 ~ 8.38675	3345.8 ~ 3358	3260 ~ 3267	23.6 ~ 24.0							
8.41425 ~ 8.41475	3600 ~ 4400	3332 ~ 3339	31.2 ~ 31.8							
12.51975 ~ 12.52025	3345.8 ~ 3358	240 ~ 285	36.43 ~ 36.5							
12.57675 ~ 12.57725	3600 ~ 4400	322 ~ 335.4	Above 38.6							
13.36 ~ 13.41										

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.



11.3 Test Procedure for Radiated Spurious Emission

- 1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3.75 meter away from the interference-receiving antenna.
- 3. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.
- 4. The antenna is a broadband antenna, and its 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.
- 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 table was turned from 0 degrees to 360 degrees to find the maximum reading. (The EUT was pre-tested with three axes (X, Y, Z) and the final test was performed at the worst case.)
- 6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 7. If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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Measurement Instrument Setting

- Frequency Range: Below 1 GHz RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak
- Frequency Range: Above 1 GHz
 Peak Measurement
 RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes

Average Measurement RBW = 1MHz, VBW ≥ 1/T, Detector = Peak, Sweep Time = Auto, Trace Mode = Max Hold until the trace stabilizes

11.4 Test Procedure for Conducted Spurious Emission

- 1. The transmitter output was connected to the spectrum analyzer.
- The reference level of the fundamental frequency was measured with the spectrum analyzer using RBW = 100 kHz, VBW = 300 kHz.
- The conducted spurious emission was tested each ranges were set as below. Frequency range: 30 MHz ~ 26.5 GHz RBW = 100 kHz, VBW = 300 kHz, Sweep Time = Auto, Detector = Peak, Trace = Max Hold

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)



11.5 Test Result

9 kHz ~ 25 GHz Data (Modulation: GFSK)

• Low frequency

Fraguanay	Rea	ding	Pol. T.F (dB)		Pol		Limits		Result		Margin				
Frequency	(dBu	V/m)					Pol		Pol		DCCF (dB)	(dBuV/m)		(dBuV/m)	
(MHz)	AV ,	/ Peak			(00)	AV / Peak		AV / Peak		AV / Peak		AV / Peak AV / Pe		AV /	Peak
2 389.96	N/A	48.70	V	9.04	-24.72	54.0	74.0	33.0	57.7	21.0	16.3				
4 804.42	N/A	50.44	V	-1.11	-24.72	54.0	74.0	24.6	49.3	29.4	24.7				
7 205.49	N/A	49.80	Н	8.47	-24.72	54.0	74.0	33.6	58.3	20.4	15.7				
9 608.77	N/A	43.50	V	10.75	-24.72	54.0	74.0	29.5	54.3	24.5	19.8				
12 010.68	N/A	41.44	V	15.82	-24.72	54.0	74.0	32.5	57.3	21.5	16.7				

Middle frequency

	Rea	ding				Lin	nits	Re	sult	Mar	rgin										
Frequency	(dBu	V/m)	Pol. T.F		Pol. (dB)		Pol		Pol		Pol		Pol		DCCF (dB)	(dBu	V/m)	(dBuV/m)		(dB)	
(MHz)	AV ,	/ Peak		(00)	(00)	AV / Peak		AV / Peak AV / Peak		AV / Peak											
4 881.73	N/A	50.87	V	-1.14	-24.72	54.0	74.0	25.0	49.7	29.0	24.3										
7 323.49	N/A	50.25	V	8.63	-24.72	54.0	74.0	34.2	58.9	19.8	15.1										
9 764.73	N/A	42.57	V	11.24	-24.72	54.0	74.0	29.1	53.8	24.9	20.2										
12 205.73	N/A	39.80	V	15.95	-24.72	54.0	74.0	31.0	55.8	23.0	18.3										

• High frequency

Fraguanay	Rea	ding	Pol. T.F (dB)		7.5 0.005		2.2.25	Limits		Result		Margin					
Frequency	(dBu	V/m)			Pol	Pol		Pol		Pol		Pol		(dBuV/m)		(dBuV/m)	
(MHz)	AV /	[/] Peak		AV / Peak AV / Peak		AV / Peak		AV / Peak		AV /	Peak						
2 484.25	N/A	56.13	V	9.87	-24.72	54.0	74.0	41.3	66.0	12.7	8.0						
4 959.65	N/A	55.05	V	-0.94	-24.72	54.0	74.0	29.4	54.1	24.6	19.9						
7 440.43	N/A	50.66	V	8.76	-24.72	54.0	74.0	34.7	59.4	19.3	14.6						
9 919.39	N/A	50.42	V	11.32	-24.72	54.0	74.0	37.0	61.7	17.0	12.3						
12 400.90	N/A	38.99	V	15.42	-24.72	54.0	74.0	29.7	54.4	24.3	19.6						

Note 1: The radiated emissions were inverstigated 9 kHz to 25 GHz. And no other spurious and harmonic emissions were found above listed frequencies.

Note 2: DCCF(Duty Cycle Correction Factor)

- Time to cycle through all channels = Δt = T [ms] X 20 minimum hopping channels, where T = pulse width = 2.905 ms

- 100 ms / $\Delta t \text{ [ms]}$ = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.905 X 20) = 1.72 = 2

- The Worst Case Dwell Time = T [ms] x H' = 2.905 ms X 2 = 5.81 ms

- DCCF = 20 x log(The Worst Case Dwell Time / 100 ms) dB = 20 x log(5.81 / 100) = -24.72 dB

Note 3: Sample Calculation.

Margin = Limit - Result / Peak Result = Peak Reading + TF / Average Result = Peak Reading + TF + DCCF TF = Ant factor + Cable Loss + Filter Loss - Amp Gain + Distance Factor

Distance Factor = 20log(applied distance/required distance) = 20log(3.75m/3m) = 1.94



9 kHz ~ 25 GHz Data (Modulation: 8DPSK)

• Low frequency

Frequency	Rea	ding			2225	Lin	nits	Re	sult	Mai	rgin
Frequency	(dBu	V/m)	Pol.	T.F (dB)	DCCF (dB)	(dBu	V/m)	(dBu	ıV/m)	(d	B)
(MHz)	AV ,	/ Peak		(48)	(02)	AV /	Peak	AV /	Peak	AV /	Peak
2 389.40	N/A	50.41	V	9.04	-24.72	54.0	74.0	34.7	59.5	19.3	14.6
4 804.44	N/A	44.62	V	-1.11	-24.72	54.0	74.0	18.8	43.5	35.2	30.5

• Middle frequency

	Rea	ding				Lin	nits	Re	sult	Mai	rgin
Frequency	(dBu	V/m)	Pol.	T.F (dB)	DCCF (dB)	(dBu	IV/m)	(dBu	V/m)	(d	B)
(MHz)	AV ,	/ Peak		(42)	(42)	AV /	Peak	AV /	Peak	AV /	Peak
4 881.66	N/A	43.62	V	-1.14	-24.72	54.0	74.0	17.8	42.5	36.2	31.5

High frequency

	Rea	ding				Lin	nits	Re	sult	Mai	rgin
Frequency	(dBu	V/m)	Pol.	T.F (dB)	DCCF (dB)	(dBu	V/m)	(dBu	V/m)	(d	B)
(MHz)	AV ,	/ Peak		(00)	(00)	AV /	Peak	AV /	Peak	AV /	Peak
2 484.42	N/A	57.66	V	9.87	-24.72	54.0	74.0	42.8	67.5	11.2	6.5
4 959.92	N/A	43.25	V	-0.94	-24.72	54.0	74.0	17.6	42.3	36.4	31.7

Note 1: The radiated emissions were inverstigated 9 kHz to 25 GHz.

Note 2: DCCF(Duty Cycle Correction Factor)

- Time to cycle through all channels = Δt = T [ms] X 20 minimum hopping channels, where T = pulse width = 2.905 ms - 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.905 X 20) = 1.72 ≈ 2

- The Worst Case Dwell Time = T [ms] x H' = 2.905 ms X 2 = 5.81 ms

- DCCF = 20 x log(The Worst Case Dwell Time / 100 ms) dB = 20 x log(5.81 / 100) = -24.72 dB Note 3: Sample Calculation.

Margin = Limit - Result / Peak Result = Peak Reading + TF / Average Result = Peak Reading + TF + DCCF

TF = Ant factor + Cable Loss + Filter Loss - Amp Gain + Distance Factor

Distance Factor = 20log(applied distance/required distance) = 20log(3.75m/3m) = 1.94



11.6 Test Plot for Radiated Spurious Emission

• GFSK _ Low frequency

	Spectrum	Spectrun		Spectrum 3	Spectru	ım 4 🛛 🕱			~
Ref Level 97 Att Input	0 dBµV 0 dB SWT 1 AC PS	■ RBW 1.01 ms = VBW On Note	1 MHz 3 MHz Mod h Off	e Auto Sweep			Fr	equency 2.3	500000 GH
Frequency S								M1[1]	1Pk Max 48.70 dBµ ¹
) dBµV									2.3899600 GH
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dBµ∨			1001 pt						2.39 GH:
								Spuriou	ıs – Pea
lultiView			ectrum 2	X				Spuriou	ıs – Pea
Ref Level 80.0 Att Input	0 dBµV 0 dB SWT 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	Auto Sweep					Ÿ
Ref Level 80.1 Att Input Frequency S	0 dBµV 0 dB SWT 1 AC PS		1 MHz 3 MHz Mode					equency 4.8	• 1Pk Max 50.44 dBp
Ref Level 80.4 Att nput Frequency S	0 dBµV 0 dB SWT 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode					equency 4.8	• 1Pk Max 50.44 dBp
Ref Level 80.0 Att input Frequency S I dBµV	0 dBµV 0 dB SWT 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode					equency 4.8	• 1Pk Max 50.44 dBp
Ref Level 80.0 Att nput Frequency S 0 dBµV	0 dBµV 0 dB SWT 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	Auto Sweep	MI			equency 4.8	• 1Pk Max 50.44 dBp
Ref Level 80.0 Att nput Frequency S 0 dBµV	0 dBµV 0 dB SWT 1 AC PS	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode		NS Y			equency 4.8	040000 GH
Ref Level 80.4 Att Input Arequency S I dBµV I dBµV I dBµV	00 dBµV 0 dB SWT 1 AC PS weep	● RBW 1.01 ms ● VBW	1 MHz 3 MHz Mode	Auto Sweep	103 T		Fr	equency 4.8	v 040000 GH 1Pk Max 50.44 8b/ s0442000 GH
Ref Level 80.1 Att input Bull idBull idBull	00 dBµV 0 dB SWT 1 AC PS weep	RBW Off Note	1 MHz 3 MHz Mode	Auto Sweep	MI		Fr	equency 4.8	v 040000 GH 1Pk Max 50.44 8b/ s0442000 GH
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kef Level 80.1 ttt приt indeproved by a second by a s	00 dBµV 0 dB SWT 1 AC PS weep	RBW Off Note	1 MHz 3 MHz Mode	Auto Sweep	MI		Fr	equency 4.8	• 1Pk Max 50.44 dBp
tef Level 80.1 при при вари вари вари вари вари вари вари ва	00 dBµV 0 dB SWT 1 AC PS weep	RBW Off Note	1 MHz 3 MHz Mode	Auto Sweep	H3		Fr	equency 4.8	v 040000 GH 1Pk Max 50.44 8b/ s0442000 GH
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tet f evel 80.1 tt mput Frequency S dBµv	00 dBµV 0 dB SWT 1 AC PS weep	RBW Off Note	1 MHz 3 MHz Mode	Auto Sweep	M1		Fr	equency 4.8	v 040000 GH 1Pk Max 50.44 8b/ s0442000 GH
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ultiView 🗄 Spectrum	X Spectrum 2	X					
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of Level 80.00 dBµV t 0 dB SWT 1.2 ms 1.2 ms requency sweep 18µV	BBW 1 MHz	\sim				requency 9.6(
of Level 80.00 dBy// t 0 dB SWT 1.2 ms. put 1.4C PS off requency Sweep	BBW 1 MHz	\sim				requency 9.6(080000 G 1Pk Ma 43.50 db
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If Level 80.00 #Bµ/ t 0.48 SWT 1.2 ms i put 1.4C PS Off requency Sweep	Rew 1 MHz WeW 3 MHz Notch Off	\sim				requency 9.6(080000 G 1Pk Ma 43.50 db
If Level 80.00 #Bµ/ t 0.48 SWT 1.2 ms i put 1.4C PS Off requency Sweep	BBW 1 MHz	\sim	M1 ¥		Fr	requency 9.6(080000 G 1Pk Ma 43.50 db
ון ער אין	Rew 1 MHz WeW 3 MHz Notch Off	\sim	MI		Fr	requency 9.6(080000 G 1Pk Ma 43.50 db
If Level 80.00 dBy/v t 0 dB SWT 1.2 ms : put 1.AC PS Off requency Sweep off Image: Sweep Image: Sweep dBy/v image: Sweep image: Sweep Image: Sweep Image: Sweep dBy/v image: Sweep Image: Sweep <td>Rew 1 MHz WeW 3 MHz Notch Off</td> <td>\sim</td> <td>ME T</td> <td></td> <td>Fr</td> <td>requency 9.6(</td> <td>080000 G 1Pk Ma 43.50 db</td>	Rew 1 MHz WeW 3 MHz Notch Off	\sim	ME T		Fr	requency 9.6(080000 G 1Pk Ma 43.50 db
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ef Level 80.00 dBµV tt 0 dB SWT 1.2 ms pput 1.4C PS Off requency Sweep dBµV dBµV dBµV dBµV	Rew 1 MHz WeW 3 MHz Notch Off	\sim		0 MHz/	Fr	equency 9.60	080000 G 1Pk Ma 43.50 db

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ultiView Spectrum Spectrum 2 X ef Level 80.00 dBuV • RBW 1 MHz		
tt 0 dB SWT 1.2 ms ⊕ VBW 3 MHz Mode Auto Sweep nput 1 AC PS Off Notch Off	Frequency 12.	0100000 GI
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• GFSK _ Middle frequency

IultiView Ref Level 80.0		■ RB 1.01 ms ● VB	pectrum 2 W 1 MHz	X					
tt nput	1 AC PS	1.01 ms = VBV Off Not	W 3 MHz Mode tch Off	Auto Sweep			F	requency 4.8	• 1Pk Max
requency S	weep							M1[1]	50.87 dBµ .88173000 Gł
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ef Level 80.0			pectrum 2 ₩ 1MHz	×					4
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af Level 80.0 it put requency S dBµV	0 dBµV 0 dB SWT 1 AC PS	● RB 1.01 ms ● VB	W 1 MHz W 3 MHz Mode					requency 7.3	230000 GH 1Pk Max 50.25 dBg
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af Level 80.0 tt put requency S dBµV dBµV	0 dBµV 0 dB SWT 1 AC PS	● RB 1.01 ms ● VB	W 1 MHz W 3 MHz Mode		MI			requency 7.3	230000 GH 1Pk Max 50.25 dBg
ef Level 80.0 it put requency S iвµv iвµv iвµv iвµv iвµv	0 dBµV 0 dB SWT 1 AC PS	Off Not	W 1 MHz W 3 MHz Mode		MI V		F	MI[1] 7	v 230000 Gł • 1Pk M33 - 32349000 Gł - 32349000 Gł
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9f Level 80. ск t t t t gguency S J8µV 	0 dBµV 0 dB SWT 1 AC PS	Off Not	W 1 MHz W 3 MHz Mode		M3		F	MI[1] 7	v 230000 Gł • 1Pk M33 - 32349000 Gł - 32349000 Gł
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ultiView ef Level 80.0 tt dBµV	0 dBµV 0 dB SWT 1 AC PS	Off Not	W 1 MHz W 3 MHz Mode				F	MI[1] 7	v 230000 Gł • 1Pk M33 - 32349000 Gł - 32349000 Gł

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					Spuriou	
ultiView 🛛 Spectrum	Spectrum 2	X				
ef Level 80.00 dBµV tt 0 dB SWT put 1 AC PS	● RBW 1 MHz 1.2 ms ● VBW 3 MHz Mode A Off Notch Off	Auto Sweep		F	Frequency 9.76	40000 GI
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						s – Pe
	Spectrum 2					s – Pe
f Level 80.00 dBµV t 0 dB SWT put 1 AC PS	Spectrum 2					550000 G
f Level 80.00 dBµV t 0 dB SWT put 1 AC PS	Spectrum 2	X			Spuriou: equency 12.20	950000 GI • 1Pk Ma 39.80 dB
f Level 80.00 dBµV t 0 dB SWT put 1 AC PS requency Sweep	Spectrum 2	X			Spuriou: equency 12.20	950000 GI • 1Pk Ma 39.80 dB
f Level 80.00 dBµV t 0 dB SWT I AC PS requency Sweep	Spectrum 2	X			Spuriou: equency 12.20	950000 G • 1Pk Ma 39.80 dB
f Level 80.00 dBμ/ o dB SWT put 1AC PS requency Sweep isμ/	Spectrum 2	X			Spuriou: equency 12.20	950000 GI • 1Pk Ma 39.80 dB
ft Level 30.00 dBj/V 0 dB SWT put 1.6C PS requency Sweep	Spectrum 2	X			Spuriou: equency 12.20	950000 GI • 1Pk Ma 39.80 dB
f Level 30.00 dBµ/ν put 0 dB squency Sweep //sµ/ν //sµ/ν //sµ/ν //sµ/ν	Spectrum 2 RBW 1MHz 1.2 ms = VBW 1MHz Off Notch Off Mode A	X		Fn	equency 12.20	550000 GI ● 1PE MB 39,80 dB 20572900 G
f Level 30.00 dBµ/ν put 0 dB squency Sweep //sµ/ν //sµ/ν //sµ/ν //sµ/ν	Spectrum 2 RBW 1MHz 1.2 ms = VBW 1MHz Off Notch Off Mode A	X		Fn	Spuriou: equency 12.20	550000 GI ● 1PE MB 39,80 dB 20572900 G
I Level 30.00 dBµ/ν put 0.dB SwT put 1.AC PS cequency Sweep ////////////////////////////////////	Spectrum 2 RBW 1MHz 1.2 ms = VBW 1MHz Off Notch Off Mode A	X		Fn	equency 12.20	550000 GI ● 1PE MB 39,80 dB 20572900 G
I Level 30.00 dBµ/ put 0.d5 SwT 1.4C PS 2000000000000000000000000000000000000	Spectrum 2 RBW 1MHz 1.2 ms = VBW 1MHz Off Notch Off Mode A	X		Fn	equency 12.20	550000 GI ● 1PE MB 39,80 dB 20572900 G
I Level 30.00 dBµ/ν put 0 dB SwT put 1 AC PS requency Sweep ////////////////////////////////////	Spectrum 2 RBW 1MHz 1.2 ms = VBW 1MHz Off Notch Off Mode A	X		Fn	equency 12.20	550000 GI ● 1PE MB 39,80 dB 20572900 G
I Level 30.00 dBju/ put 0.dB SwT put IAC PS cquency Sweep ////////////////////////////////////	Spectrum 2 RBW 1MHz 1.2 ms = VBW 1MHz Off Notch Off Mode A	X		Fn	equency 12.20	550000 GI ● 1PE MB 39,80 dB 20572900 G
	Spectrum 2 RBW 1MHz 1.2 ms = VBW 1MHz Off Notch Off Mode A	X		Fn	equency 12.20	550000 GI ● 1PE MB 39,80 dB 20572900 G

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• GFSK _ High frequency

Υ		(and can be					1		
ItiView EE ef Level 97. tt nput	Spectrum 00 dBµV 0 dB SWT 1 AC PS	Spectrur BBV 1.01 ms VBW On Note	V 1 MHz V 3 MHz Mode	Auto Sweep	X Spectru	ım 4 🛛 🕱	Fre	equency 2.4	
requency S							M	1[1]	• 1Pk Max 56,13 dB
iBμV									2.4842500 GI
IBµV									
вµ∨									
вну									
<u>Muluu</u>	Janata	Al Washler							
	a de artefer	an an Pa	unprestruitans	my how have	and my mar	MANAMENI	in ladebach dennet		
ІВµ∨							l Aver is relation Mr	anthe high star	MMW WWW V
IBµV									
IBµV									
ВРА									
μν									
1835 GHz			1001 pts	1	1.	65 MHz/			2.5 GF
								Spuriou	s – Pe
								Spuriou	s – Pe
litition	Castrum		ectrum 2					Spuriou	
f Level 80.0 t	Spectrum	RBW 1.01 ms = VBW	ectrum 2 1 MHz 3 MHz Mode	I Auto Sweep				Spuriou equency 4.9	4
altiView St Level 80.0 put put requency S	0 dBµV 0 dB SWT 1 AC PS	Sp RBW 1.01 ms = VBW Off Note	ectrum 2 1 MHz 3 MHz Mode h Off						4
f Level 80.0 t put requency S	0 dBµV 0 dB SWT 1 AC PS	Sp RBW Off Note	ectrum 2 1 MHz 3 MHz Mode h Off					equency 4.9	500000 GH
f Level 80.0 t put requency S IBµV	0 dBµV 0 dB SWT 1 AC PS	E BW 1.01 ms = VBW Off Note	ectrum 2 ¹ 1 MHz 3 MHz Mode h Off	Auto Sweep				equency 4.9	500000 GF 1Pk Max 55.05 dBj
if Level 80.0 t put equency S IBpV IBpV	0 dBµV 0 dB SWT 1 AC PS	Sp RBW 1.01 ms = VBW Off = Netc	ectrum 2 1 MHz 3 MHz Mode h Off					equency 4.9	500000 GF 1Pk Max 55.05 dBj
if Level 80.0 t put equency S IBpV IBpV	0 dBµV 0 dB SWT 1 AC PS	X Sp RBW 1.01 ms = VBW Off Note	ectrum 2 ¹ IMHz 3 MHz Mode h Off Mode	Auto Sweep				equency 4.9	500000 GF 1Pk Max 55.05 dBj
f Level 80.0 t put requency S IBµV IBµV IBµV	00 dBµV 0 dB SWT I AC PS weep	Sp BBW 1.01 ms VBW Off Note VBW Note	1 MHz Mode	Auto Sweep				M1[1] 4	₹ 500000 Gł 1 Pic Mar 55.05 dły 2565000 Gł
f Level 80.0 t put еquency S івµv івµv івµv івµv івµv	00 dBµV 0 dB SWT I AC PS weep	PBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep			Fr	M1[1] 4	₹ 500000 Gł 1 Pic Mar 55.05 dły 2565000 Gł
If Level 80.0 t t еquency S Iвµv Iвµv Iвµv Iвµv Iвµv Iвµv Iвµv Iвµv	00 dBµV 0 dB SWT I AC PS weep	PBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep			Fr	M1[1] 4	₹ 500000 Gł 1 Pic Mar 55.05 dły 2565000 Gł
f Level 80. с с requency S вµV	00 dBµV 0 dB SWT I AC PS weep	PBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep			Fr	M1[1] 4	₹ 500000 Gł 1 Pic Mar 55.05 dły 2565000 Gł
ff Level 80 put ?equency S ////////////////////////////////////	00 dBµV 0 dB SWT I AC PS weep	PBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep			Fr	M1[1] 4	₹ 500000 Gł 1 Pic Mar 55.05 dły 2565000 Gł
f Level 80 f Level 80 put cquency S i8µ∨ i8µ∨	00 dBµV 0 dB SWT I AC PS weep	PBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep			Fr	M1[1] 4	₹ 500000 Gł 1 Pic Mar 55.05 dły 2565000 Gł
8f Level 80.0 t put requency S i8µv i8µv i8µv	00 dBµV 0 dB SWT I AC PS weep	PBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep			Fr	M1[1] 4	₹ 500000 Gł 1 Pic Mar 55.05 dły 2565000 Gł

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			Spurious – Pe
	Spectrum 2		V
tef Level 80.00 dBμV tt 0 dB SWT 1.01 ms nput 1 AC PS Off	RBW 1 MHz VBW 3 MHz Notch Off		Frequency 7.4400000 GH
requency Sweep	Noten		• 1Pk Max M1[1] 50.66 dBµ
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dBµV-			
		M1	
d8μV			
d8μV			
upuntente to the state and the state of the	ertendet/wer		wasansanontan mananana ana ana ana ana ana ana ana
чан			
авµv			
вµv			
dBµV			
7.44 GHz	1001 pts	1.0 MHz/	Span 10.0 Mł
			Spurious - Pe
			Spurious – Pe
ultiView 🕄 Spectrum 👔	x Spectrum 2 x		Spurious – Pe
ef Level 80.00 dBμV t 0 dB SWT 1.2 ms =	RBW 1 MHz VBW 3 MHz Mode Auto Sweep		_ v
af Level 80.00 dBµV t 0 dB SWT 1.2 ms € put 1 AC PS Off			Frequency 9.9200000 G
ef Level 80.00 dBµV t 0 dB SWT 1.2 ms = put 1 AC PS Off requency Sweep	RBW 1 MHz VBW 3 MHz Mode Auto Sweep		Frequency 9.9200000 G
ef Level 80.00 dBµV t 0 dB SWT 1.2 ms = put 1AC PS Off requency Sweep	RBW 1 MHz VBW 3 MHz Mode Auto Sweep		Frequency 9.9200000 G
of Level 80.00 dBj/V dB SWT 1.2 ms put 1.4C PS Off requency Sweep	RBW 1 MHz VBW 3 MHz Mode Auto Sweep		Frequency 9.9200000 G
of Level 80.00 dBj/V dB SWT 1.2 ms put 1.4C PS Off requency Sweep	BQW 1 MHz WBW 3 MHz Mode Auto Sweep Notch Off		Frequency 9.9200000 G
fLevel 80.00 dBµ/ dB SWT 1.2 ms put 1.4C PS off requency Sweep off ////////////////////////////////////	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off		Frequency 9.9200000 G
ft Level 30.00 dBj/V 0 dB SWT 1.2 ms # put 1 AC PS Off requency Sweep	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off		Frequency 9.9200000 G
f Level 80.00 dB/V	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off		Frequency 9.9200000 G
ft Level 80.00 dBµ/ t dB put dB put 1.4C pst 1.4C pst 1.4C requency Sweep Off JBµ/ JBµ/ JBµ/ JBµ/ JBµ/ JBµ/	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off		Frequency 9.9200000 G
f Level 30.00 dBj/V 0.03 ByWT 1.2 ms # put 1.4C PS Off requency Sweep	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off		Frequency 9.9200000 G
f Level 30.00 dBj/V 0.03 ByWT 1.2 ms # put 1.4C PS Off requency Sweep	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off		Frequency 9.9200000 G
f Level 80.00 dB, WT 1.2 ms put 0 dB iAC PS off Off requency sweep 0 dBµV 0	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off		Frequency 9.9200000 G
ef Level 90.00 48,0/ tt 0 48 SWT 1.2 ms # pput 1.4C PS Off requency Sweep d8µV d8µV d8µV d8µV d8µV	BBW 1 MHz WeW 3 MHz Mode Auto Sweep Off	1.0 MHz/	Spurious – Pe

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		Spuri	ous - Pe
			_
ef Level 80.00 dBµV	Spectrum 2 RBW 1 MHz		~
tt 0 dB SWT 1.2 nput 1 AC PS requency Sweep	2 ms ● VBW 3 MHz Mode Auto Sweep Off Notch Off	Frequency 1	2.4000000 GH
requency sweep		MI	
dBµV-			
d8µV			
lBμV			
dBµV	and the second sec	N1	
IBUV-	North Address and the second	The second secon	marine Manufactures
Vuat			
Івµ∨			
3μν			
dBµV			
12.4 GHz	1001 pts	1.0 MHz/	Span 10.0 MH

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• 8DPSK _ Low frequency

						lestricte		
ultiView ⊞ Spects Ref Level 97.00 dBµ Att 0 d			Spectrum 3	X Spectro	um 4 🛛 🕱	En	equency 2.3	
Input 1 A Frequency Sweep	C PS On	Notch Off					_	.01Pk Max
dBµV							M1[1]	50.41 dBµ\ 2.3894010 GH:
dBµV								
dBµV								
dBµV								
dBµV								Arman
dBµV								and a second and a second a s
					and mark and for	when the warden	Carl and	
dBUV-	and an and the second second	My any marker	hannaha	manantahan				
dBµV								
dBµV								
ush v								
івµv		1001 pts			.0 MHz/			2.39 GHz
							Spuriou	ıs - Pea
							Spuriou	
ef Level 80.00 dBµ\ tt 0 dE	/ • F 3 SWT 1.01 ms • V	Spectrum 2 RBW 1 MHz VEW 3 MHz Mode Notch Off	III Auto Sweep					V
ef Level 80.00 dBµ\ tt 0 dE nput 1 A0	/ • F 3 SWT 1.01 ms • V	RBW 1 MHz VBW 3 MHz Mode					equency 4.8	▼ 040000 GH ●1Pk Max 44.62 dBp
ef Level 80.00 dBµ\ tt 0 dE nput 1 AC requency Sweep	/ • F 3 SWT 1.01 ms • V	RBW 1 MHz VBW 3 MHz Mode					equency 4.8	▼ 040000 GH ●1Pk Max 44.62 dBp
ef Level 80.00 dBµX tt 0 dđ nput 1 AC requency Sweep dBµV	/ • F 3 SWT 1.01 ms • V	RBW 1 MHz VBW 3 MHz Mode					equency 4.8	▼ 040000 GH ●1Pk Max 44.62 dBp
ef Level 80.00 dBµN tt 0 db прut 1 AC requency Sweep dBµV dBµV	/ • F 3 SWT 1.01 ms • V	RBW 1 MHz VBW 3 MHz Mode					equency 4.8	▼ 040000 GH ●1Pk Max 44.62 dBp
ef Level 80.00 dBµN tt 0 db прut 1 AC requency Sweep dBµV dBµV	/ • F 3 SWT 1.01 ms • V	RBW 1 MHz VBW 3 MHz Mode	Auto Sweep				equency 4.8	▼ 040000 GH: ●1Pk Max 44.62 dBp
ef Level 80.00 dBy, tevel 80.00 dBy, yput 1.40 requency Sweep dBµV dBµV dBµV dBµV dBµV	/ • F 3 SWT 1.01 ms • V	RBW 1 MHz VBW 3 MHz Mode Notch Off		Ma		Fr	MI[1]	▼ 040000 GH: ●1Pk Max 44.62 dBp
ef Level 30.00 dbj. trequency Sweep dbj.v	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep	. T		Fr	MI[1]	▼ 040000 GH ● 1 Pk Max 44.62 dep/ 30444000 GH
of Level 30.00 dbp/ put 0.4 pput 1.4 pput 1.4 requency sweep dbp/ dbp/ dbp/ dbp/ dbp/ dbp/ dbp/ dbp	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep	. T		Fr	MI[1]	▼ 040000 GH ● 1 Pk Max 44.62 dep/ 30444000 GH
of Level 30.00 dbp/ put 0.4 pput 1.4 pput 1.4 requency sweep dbp/ dbp/ dbp/ dbp/ dbp/ dbp/ dbp/ dbp	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep	. T		Fr	MI[1]	040000 GH: 1Pk Max 44.62 dBph 44.62 dBph 44.62 dBph
ef Lavel 80.00 dbµ hyput 0.40 урит 0.40 гесциелсу Swatep dbµv dbµv dbµv dbµv dbµv dbµv dbµv dbµv	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep	. T		Fr	MI[1]	▼ 040000 GH ● 1 Pk Max 44.62 dep/ 30444000 GH
ef Level 80.00 dbµ hyput 0.4 pput 0.4 pput 0.4 pput 0.4 dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep	. T		Fr	MI[1]	▼ 040000 GH ● 1 Pk Max 44.62 dep/ 30444000 GH
ef Level 80.00 dbµ hyput 0.4 pput 0.4 pput 0.4 pput 0.4 dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV dbµV	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep	. T		Fr	MI[1]	▼ 040000 GH ● 1 Pk Max 44.62 dep/ 30444000 GH
of Level 30.00 dbp/ to 1 4 pput 0 db pput 1 4 requency sweep dbp/	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep	. T		Fr	MI[1]	▼ 040000 GH ● 1 Pk Max 44.62 dep/ 30444000 GH
при 1 АС Frequency Sweep dBµv dBµv dBµv dBµv dBµv	/ ************************************	RBW 1 MHz VBW 3 MHz Mode Notch Off	Auto Sweep			Fr	equency 4.8	▼ 040000 GH ● 1 Pk Max 44.62 dep/ 30444000 GH

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• 8DPSK _ Middle frequency

							ç	Spuriou	is – Pea
MultiView	Spectrum	x Sp	ectrum 2	X					v
Ref Level 80.0 Att Input	0 dBµV 0 dB SWT 1 AC PS	● RBW 1.01 ms ● VBW Off Note	/ 1 MHz / 3 MHz Mode sh Off	Auto Sweep			Fre	equency 4.8	820000 GH
Frequency Sv	weep							M1[1]	 1Pk Max 43.62 dBµ .88166000 GH
0 dBµV									
∣ dBµV									
dBµV				M1	and an and and a second				
dBµV	mandulante	numer	enterester and	and and the second and the	and the second second second	and the second of the second o	a Makalan pohonoo	talan nanananan	mburners
dBµV									
dBµV									
dBµV									
Вµ∨									
u dBµV									
4.882 GHz			1001 pt	s	1	.0 MHz/			Span 10.0 MH

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• 8DPSK _ High frequency

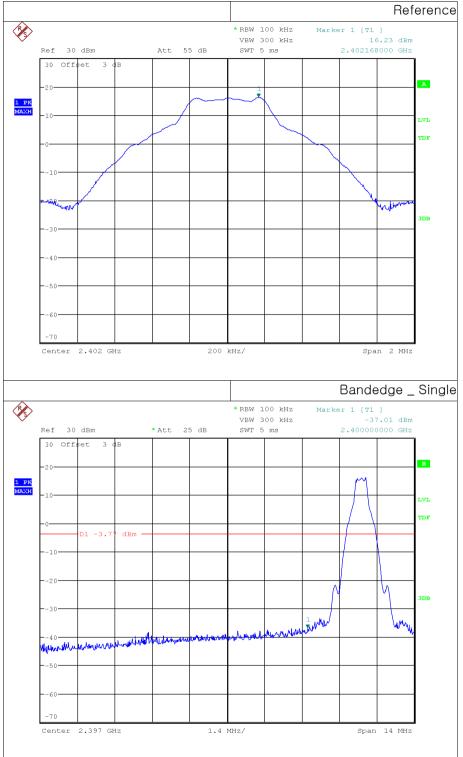
/ultiView 🖽	Spectrum	Spectrur	n 2 🕱 :	Spectrum 3	X Spectru	ım 4 🕅 🕱			~
Ref Level 97 Att	7.00 dBµV 0 dB SWT	= RBW 1.01 ms = VBW	V 1 MHz V 3 MHz Mode	e Auto Sweep	(a) opecut		Fr	equency 2.4	917500 GH
Input Frequency (1 AC PS Sweep	On Note	ch Off					M1[1]	1Pk Max 57.66 dBµV
0 dBµV									2.4844150 GHz
0 dBµV									
0 dBµV									
o deuv Maria									
0 dBµV	unanna	mand grand you	m. A. marken and and and and and and and and and an	whether a second second					
) dBµV				mphanerworkd	Mar Mar Marker	Managert	mentante	Murlagenter	half and a
									and the second second
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2.4835 GHz			1001 pts	6	1.	65 MHz/			2.5 GHz
								Spuriou	s – Pea
fulkitions.	1 Construm	Su	ectrum 2					Spuriou	
Ref Level 80. Att	.00 dBµV 0 dB SWT	RBW 1.01 ms = VBW	ectrum 2 1 MHz 3 MHz Mode 0 Off	<u>س</u> Auto Sweep				Spuriou equency 4.9 0	~
Ref Level 80 Att Input	.00 dBµV 0 dB SWT 1 AC PS	= RBW	1 MHz 3 MHz Mode					equency 4.9	▼ 500000 GH: 1Pk Max 43:25 dBµV
Ref Level 80 Att Input Frequency S	.00 dBµV 0 dB SWT 1 AC PS	RBW 1.01 ms = VBW	1 MHz 3 MHz Mode					equency 4.9	500000 GH:
Ref Level 80 Att Input Frequency 9 0 dBµV	.00 dBµV 0 dB SWT 1 AC PS	RBW 1.01 ms = VBW	1 MHz 3 MHz Mode					equency 4.9	▼ 500000 GH: 1Pk Max 43:25 dBµV
MultiView RefLevel 80 Att Input Frequencys 0 dbµV 0 dbµV 0 dbµV	.00 dBµV 0 dB SWT 1 AC PS	RBW 1.01 ms = VBW	1 MHz 3 MHz Mode					equency 4.9	▼ 500000 GH: 1Pk Max 43:25 dBµV
Ref Level 80 Att Input Frequency \$ 0 d8μV 0 d8μV 0 d8μV	.00 dBµV 0 dB SWT 1 AC PS	RBW 1.01 ms = VBW	1 MHz 3 MHz Mode					equency 4.9	▼ 500000 GH: 1Pk Max 43:25 dBµV
Ref Level 80 Att Input Hrequency \$ 0 dBμV 0 dBμV 0 dBμV	.00 dBµV 0 dB SWT 1 AC PS	BBW 1.01 ms = VBW Off Note	1 MHz 3 MHz Mode	Auto Sweep	Anna and a start and a start a sta		Fr	equency 4.9	▼ 500000 GH: 1Pk Max 43:25 dBµV
Ref Level 80 Att Input Frequency 5 0 dBµV 0 dBµV 0 dBµV 0 dBµV	.00 dBµV 0 dB swT 1 AC PS sweep	BBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep	Marrison and States		Fr	M1[1] 4	▼ 500000 GH: 43.25 dB _M 95992000 GH;
Ref Level 80 Att Input Frequency 5 0 d8µV	.00 dBµV 0 dB swT 1 AC PS sweep	BBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep	Aug 1044000 - 6444000		Fr	M1[1] 4	▼ 500000 GH: 43.25 dB _M 95992000 GH;
Ref Level 80 Att Input IFRQUENCYS 0 d8µV	.00 dBµV 0 dB swT 1 AC PS sweep	BBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep			Fr	M1[1] 4	▼ 500000 GH: 43.25 dB _M 95992000 GH;
Ref Level 800 Att Input Input Input I day 0 day	.00 dBµV 0 dB swT 1 AC PS sweep	BBW 1.01 ms = VBW Off Note	1 MHz Mode	Auto Sweep	~#//\healthetic-readers		Fr	M1[1] 4	▼ 500000 GH: 43.25 dB _M 95992000 GH;
Ref Level 80 Att Att Input Input If Requency 4 0 dsµv 0 dsµv	.00 dBµV 0 dB swT 1 AC PS sweep	BBW 1.01 ms = VBW Off Note	1 MHz 3 MHz Mode h Off	Auto Sweep			Fr	M1[1] 4	▼ 500000 GH: 43.25 dB _M 95992000 GH;
Ref Level 800 Att Input Input Input 0 dsµv	.00 dBµV 0 dB swT 1 AC PS sweep	BBW 1.01 ms = VBW Off Note	1 MHz 3 MHz Mode h Off	Auto Sweep	~m~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Fr	M1[1] 4	▼ 500000 GH: 43.25 dB _M 95992000 GH;

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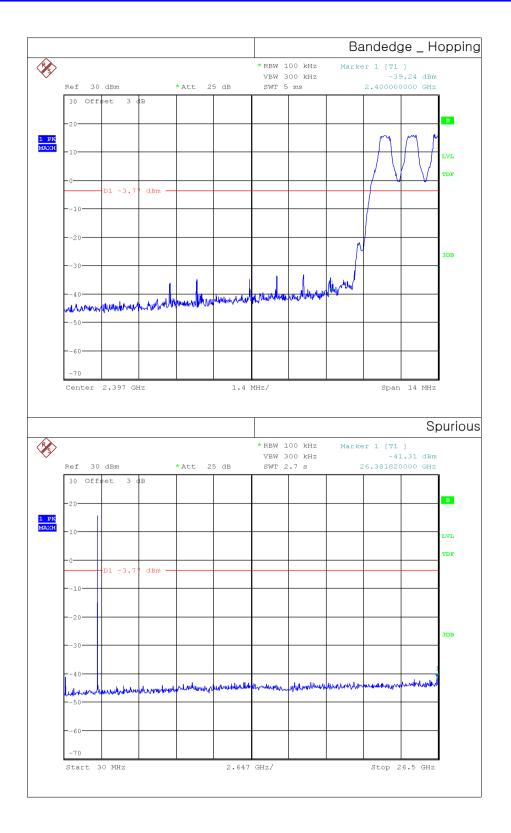
11.7 Test Plot for Conducted Spurious Emission

• GFSK _ Low frequency

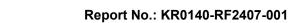


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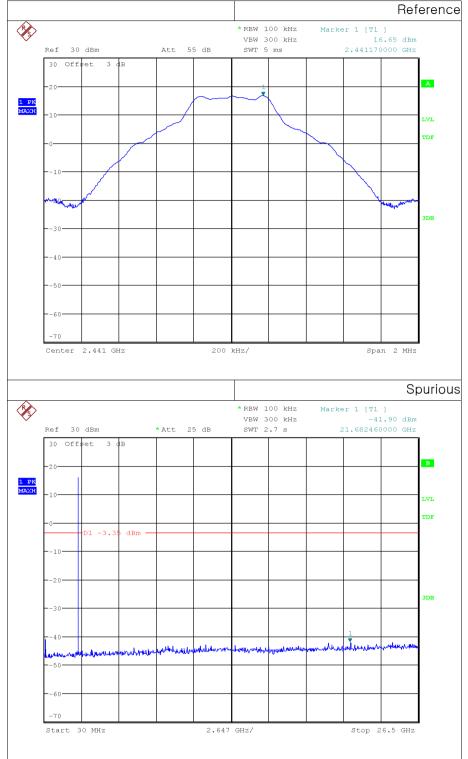


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• GFSK _ Middle frequency

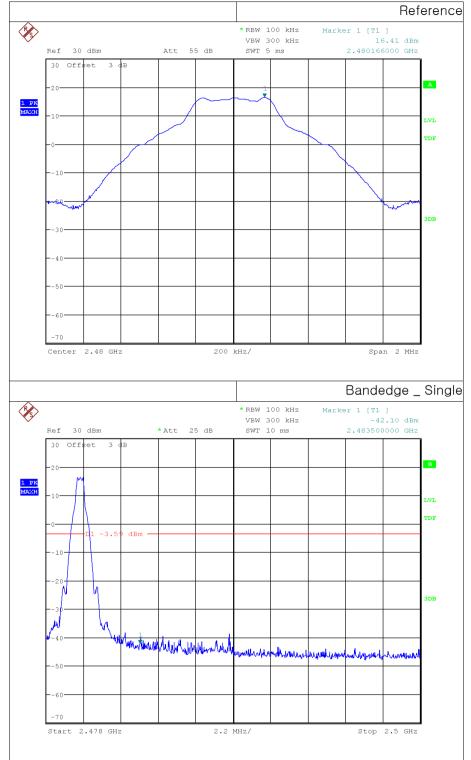


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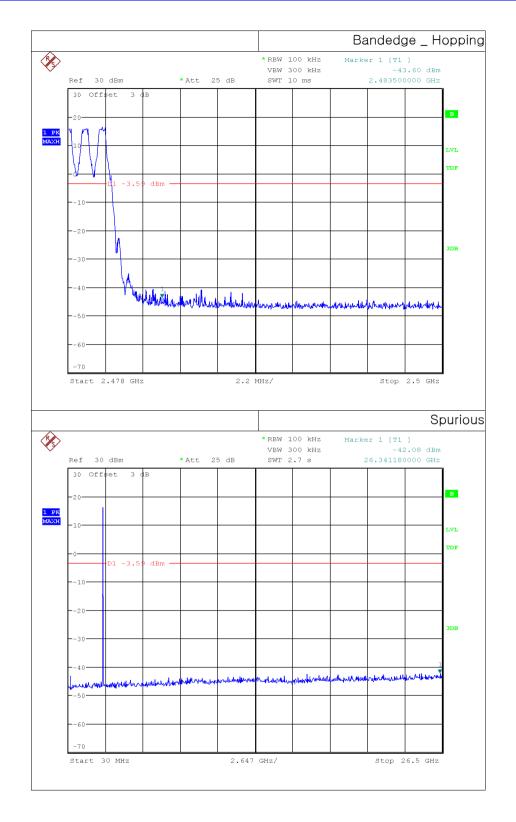


GFSK _ High frequency



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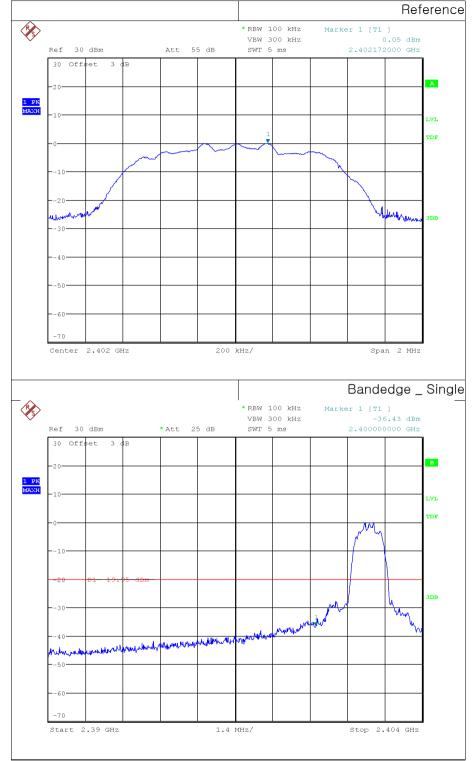


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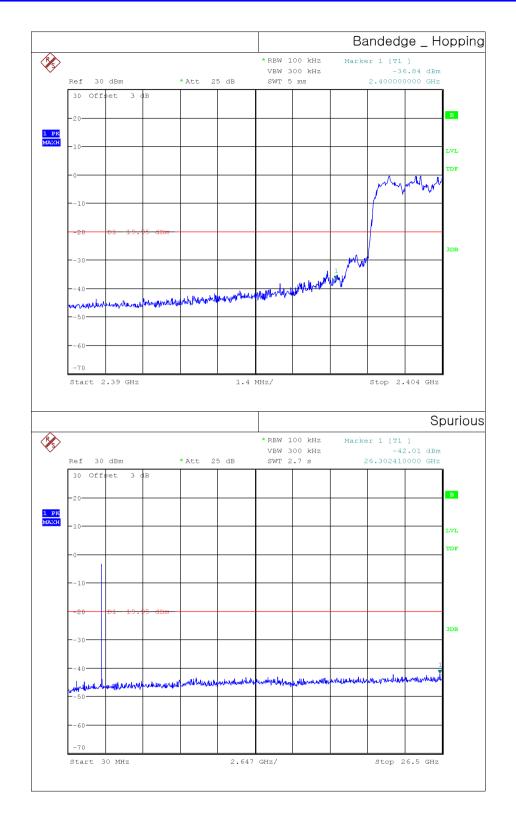


• 8DPSK _ Low frequency



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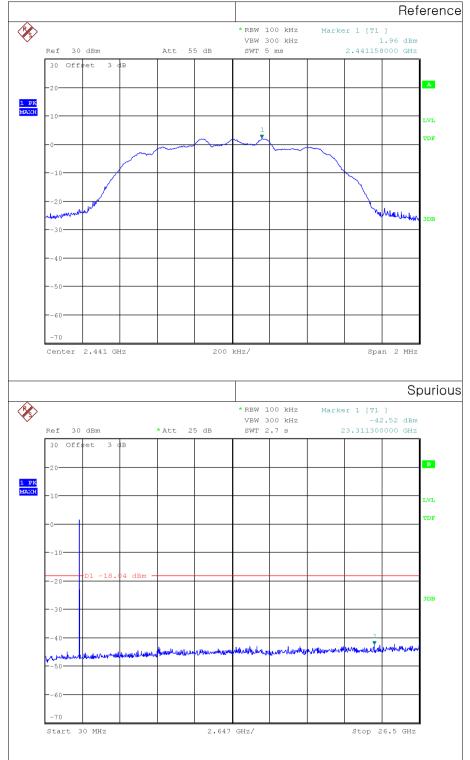


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• 8DPSK _ Middle frequency

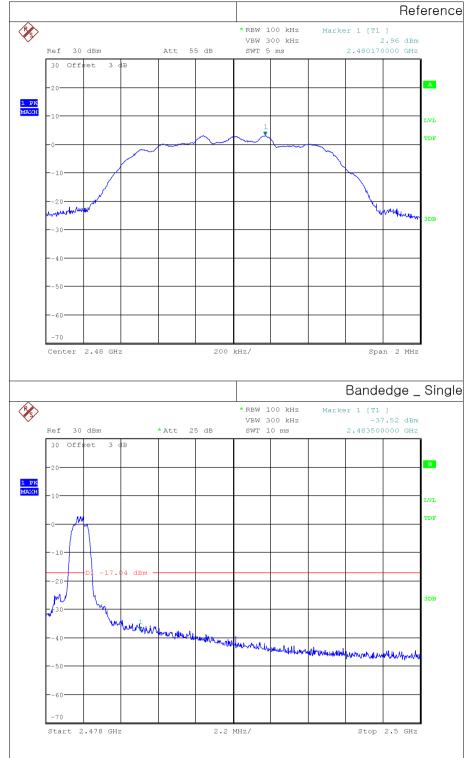


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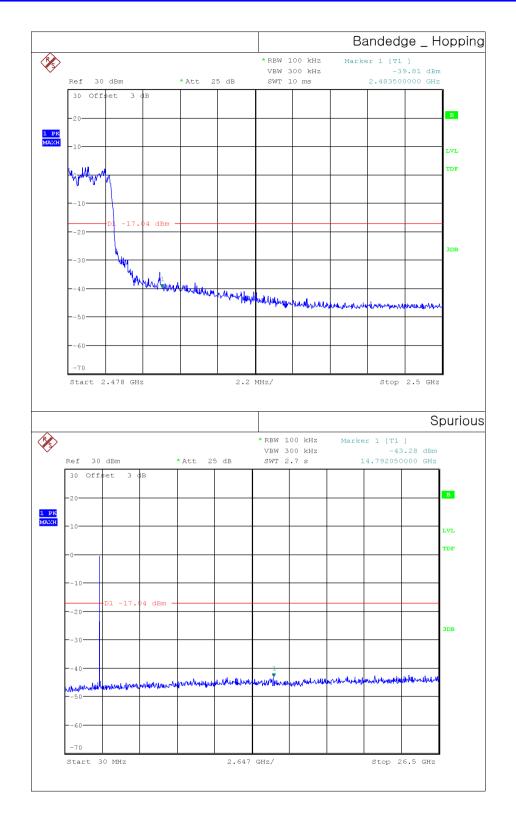


• 8DPSK _ High frequency



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12. Conducted Emission

12.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

12.2 Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Fraguaday Badaa (MHz)	Conducted Limit (dBuV)				
Frequency Range (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

12.3 Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

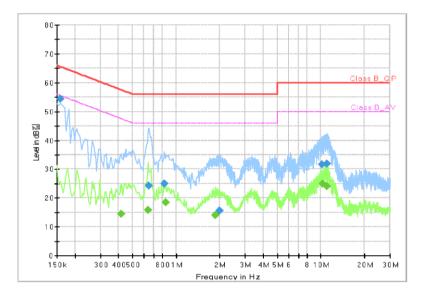
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12.4 Test Result

• AC Line Conducted Emission (Graph)

SP170_Charging Mode_L1



Conducted Emission

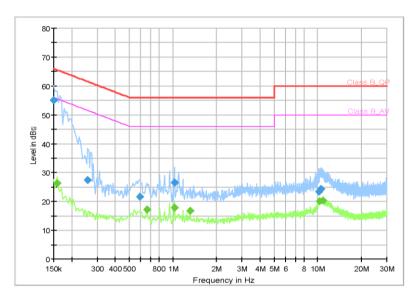
Final_Resu	ult						
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
		(ubµv)					
0.158	54.30		65.57	11.27	9	L1	20.7
0.418		14.38	47.49	33.11	9	L1	20.7
0.640		15.90	46.00	30.10	9	L1	20.4
0.650	24.28		56.00	31.72	9	L1	20.3
0.830	24.92		56.00	31.08	9	L1	20.0
0.850		18.56	46.00	27.44	9	L1	20.0
1.860		14.11	46.00	31.89	9	L1	19.9
2.000	15.49		56.00	40.51	9	L1	19.9
10.150	31.63		60.00	28.37	9	L1	20.0
10.330		25.05	50.00	24.95	9	L1	20.0
10.970		24.11	50.00	25.89	9	L1	20.0
11.030	31.84		60.00	28.16	9	L1	20.0

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SP170_Charging Mode_N



Conducted Emission

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.150	55.02		66.00	10.98	9	N	20.6
0.158		26.38	55.57	29.19	9	N	20.7
0.258	27.48		61.50	34.01	9	N	20.5
0.590	21.63		56.00	34.37	9	N	20.7
0.660		17.26	46.00	28.74	9	N	20.3
1.030		17.90	46.00	28.10	9	N	20.0
1.030	26.54		56.00	29.46	9	N	20.0
1.320		16.82	46.00	29.18	9	N	19.9
10.240	23.45		60.00	36.55	9	N	20.0
10.340		20.07	50.00	29.93	9	N	20.0
10.530	24.37		60.00	35.63	9	N	20.0
10.850		20.27	50.00	29.73	9	N	20.0

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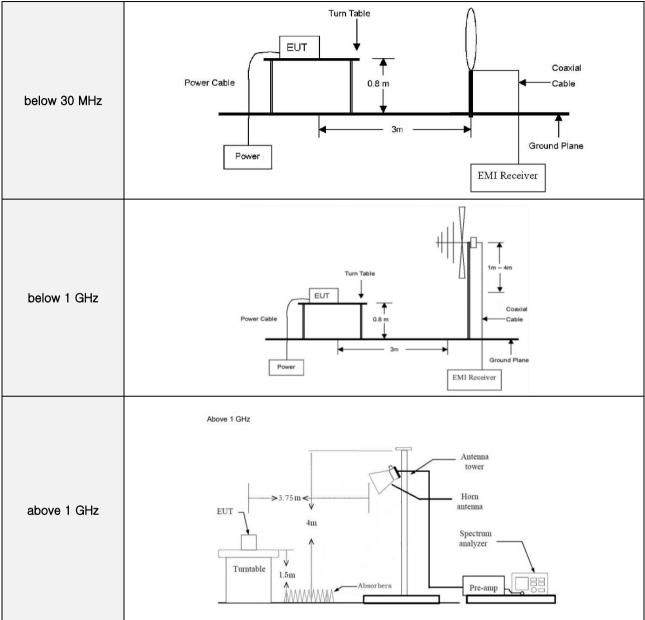
APPENDIX I

TEST SETUP

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Radiated Measurement



• Conducted Measurement

Conducted	EUT	Attenuator	Spectrum Analyzer	

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APPENDIX II

UNCERTAINTY

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Measurement Item	Expanded Uncertainty U = <i>k</i> Uc (<i>k</i> =2)	
Conducted RF power	0.34 dB	
Conducted Spurious Emissions	0.34 dB	
Radiated Spurious Emissions	6.34 dB	
Conducted Emissions	1.74 dB	