

Project No:
Report No.:

TM-2203000244P
TMWK2203000958KR

FCC ID: VPYLB2FJ
IC: 772C-LB2FJ

Page: 1 / 82
Rev.: 02

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

INDUSTRY CANADA RSS-247

Test Standard	FCC Part 15.247 RSS-247 issue 2 and RSS-GEN issue 5
Product name	Communication Module
Brand Name	muRata
Model No.	Type2FJ
Test Result	Pass
Statements of Conformity	Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory)

Approved by:



Shawn Wu
Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 21, 2022	Initial Issue	ALL	Allison Chen
01	September 29, 2022	See the following Note Rev.(01)	P.4	Allison Chen
02	September 29, 2022	See the following Note Rev.(02)	P.4	Allison Chen

Note:

Rev.(01)

1. Modify IC applicant information.

Rev.(02)

1. Modify FCC applicant information.

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

FCC Applicant / Manufacturer	Murata Manufacturing Co., Ltd. 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555 Japan
IC Applicant / Manufacturer	MURATA MANUFACTURING CO., LTD. 10-1, Higashikotari 1-chome, Nagaokakyo-shi Kyoto 617-8555 Japan
Equipment	Communication Module
Model No.	Type2FJ
Model Discrepancy	N/A
Trade Name	muRata
Received Date	March 9, 2022
Date of Test	March 16~28, 2022
Power Supply	EUT power by Power Supply
HW Version	1
SW Version	CYW43439A2_Runtime_26MHz.btp
EUT Serial #	C1, C13, C16

Remark:

1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

1.2 INFORMATION ABOUT THE FHSS CHARACTERISTICS

1.2.1 Pseudorandom Frequency Hopping Sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1 600 hops/s.

1.2.2 Equal Hopping Frequency Use

The channels of this system will be used equally over the long-term distribution of the hopsets.

1.2.3 Example of a 79 hopping sequence in data mode:

02, 05, 31, 24, 20, 10, 43, 36, 30, 23, 40, 06, 21, 50, 44, 09, 71, 78, 01, 13, 73, 07, 70, 72, 35, 62, 42, 11, 41, 08, 16, 29, 60, 15, 34, 61, 58, 04, 67, 12, 22, 53, 57, 18, 27, 76, 39, 32, 17, 77, 52, 33, 56, 46, 37, 47, 64, 49, 45, 38, 69, 14, 51, 26, 79, 19, 28, 65, 75, 54, 48, 03, 25, 66, 05, 16, 68, 74, 59, 63, 55

1.2.4 System Receiver Input Bandwidth

Each channel bandwidth is 1MHz.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.2.5 Equipment Description

RSS-247, 5.1 (a): The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. 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.

1.3 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	1. GFSK for BDR-1Mbps 2. $\pi/4$ -DQPSK for EDR-2Mbps 3. 8DPSK for EDR-3Mbps
Number of channel	79 Channels

Remark:

Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 and RSS-GEN Table 1 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.4 ANTENNA INFORMATION

Antenna Type	☒ Monopole Pattern ☐ PCB ☐ Dipole ☐ Coils
Antenna Gain	Gain :1.33 dBi
Brand/Model	Murata / Type2FJ_Antenna

Remark:

1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203 and RSS-Gen 6.8.

1.5 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~1G (Horizontally)	+/- 3.91
3M Semi Anechoic Chamber / 30M~1G (Vertically)	+/- 4.57
3M Semi Anechoic Chamber / 1G~6G	+/- 5.20
3M Semi Anechoic Chamber / 6G~18G	+/- 5.18
3M Semi Anechoic Chamber / 18G~40G	+/- 3.68

Remark:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

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1.6 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)
CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	-	Not applicable, because EUT doesn't connect to AC Main Source direct.
Radiation	Ray Li, Tony Chao	-
RF Conducted	Allen Shen	-

Remark: The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC public Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309”

1.7 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Signal Analyzer	KEYSIGHT	N9010B	MY55460167	09/07/2021	09/06/2022
Power Meter	Anritsu	ML2496A	2136002	12/06/2021	12/05/2022
Power Seneor	Anritsu	MA2411B	1911386	08/19/2021	08/18/2022
Power Seneor	Anritsu	MA2411B	1911387	08/19/2021	08/18/2022
Software	Radio Test Software Ver. 21				

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal Due
Band Reject Filters	MICRO TRONICS	BRM 50702	112	11/23/2021	11/22/2022
Bilog Antenna	Sunol Sciences	JB3	A030105	07/19/2021	07/18/2022
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/23/2022	02/22/2023
Coaxial Cable	EMCI	EMC105	190914+1111	09/17/2021	09/16/2022
Coaxial Cable	Woken	J-1099	201709090004	12/23/2021	12/22/2022
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	12/28/2021	12/27/2022
Horn Antenna	ETS LINDGREN	3116	00026370	11/30/2021	11/29/2022
Horn Antenna	ETS LINDGREN	3117	00055165	07/29/2021	07/28/2022
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	12/05/2021	12/04/2022
Loop Ant	COM-POWER	AL-130	121051	04/07/2021	04/06/2022
Pre-Amplifier	EMEC	EM330	060609	02/23/2022	02/22/2023
Pre-Amplifier	HP	8449B	3008A00965	12/24/2021	12/23/2022
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	12/06/2021	12/05/2022
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 210616				

Remark: Each piece of equipment is scheduled for calibration once a year.

1.8 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

Support Equipment						
No.	Equipment	Brand	Model	Series No.	FCC ID	IC
1	NB(L)	Toshiba	PORTEGE R30-A	N/A	PD97260H	N/A
2	DC Power Source	GWINSTEK	SPS-3610	N/A	N/A	N/A
3	DC Power Source	Agilent	E3640A	N/A	N/A	N/A
4	NB(J)	TOSHIBA	PT345T-00L002	N/A	PD97260H	N/A

1.9 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, RSS-247 Issue 2 and RSS-GEN Issue 5.

2. TEST SUMMARY

FCC Standard Section	IC Standard Section	Report Section	Test Item	Result
15.203	RSS-Gen 6.8	1.3	Antenna Requirement	Pass
15.207(a)	RSS-GEN 8.8	4.1	AC Conducted Emission	N/A
15.247(a)(1)	RSS-247(5.1)(a)	4.2	20 dB Bandwidth	Pass
-	RSS-GEN 6.7	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(1)	RSS-247(5.4)(b)	4.3	Output Power Measurement	Pass
15.247(a)(1)	RSS-247(5.1)(b)	4.4	Frequency Separation	Pass
15.247(a)(1)(iii)	RSS-247(5.1)(d)	4.5	Number of Hopping	Pass
15.247(d)	RSS-247(5.5)	4.6	Conducted Band Edge	Pass
15.247(d)	RSS-247(5.5)	4.6	Conducted Spurious Emission	Pass
15.247(a)(1)(iii)	RSS-247(5.1)(d)	4.7	Time of Occupancy	Pass
15.247(d)	RSS-GEN 8.9, 8.10	4.8	Radiation Band Edge	Pass
15.247(d)	RSS-GEN 8.9, 8.10	4.8	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	GFSK for BDR-1Mbps (DH5) $\pi/4$ -DQPSK for EDR-2Mbps (2DH5) 8DPSK for EDR-3Mbps (3DH5)
Test Channel Frequencies	GFSK for BDR-1Mbps: 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz $\pi/4$-DQPSK for EDR-2Mbps (2DH5) 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz 8DPSK for EDR-3Mbps: 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz

Remark:

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.
2. For EDR-2/3Mbps, because the characteristics are the same, so choose the high power as a hopping test.

3.2 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement Above 1G	
Test Condition	Radiated Emission Above 1G
Power supply Mode	Mode 1: EUT power by Power Supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4
Worst Position	☐ Placed in fixed position. ☒ Placed in fixed position at X-Plane (E2-Plane) ☐ Placed in fixed position at Y-Plane (E1-Plane) ☐ Placed in fixed position at Z-Plane (H-Plane)

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT power by Power Supply
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

3.3 EUT DUTY CYCLE

Temperature: 19.8~24.5°C

Test date: March 16~28, 2022

Humidity: 50~67% RH

Tested by: Allen Shen

For GFSK (1Mbps)

PACKET TYPE	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
DH1	30.40	5.17	2.63	3.00
DH3	65.60	1.83	0.61	1.00
DH5	77.20	1.12	0.35	1.00

For $\pi/4$ DQPSK (2Mbps)

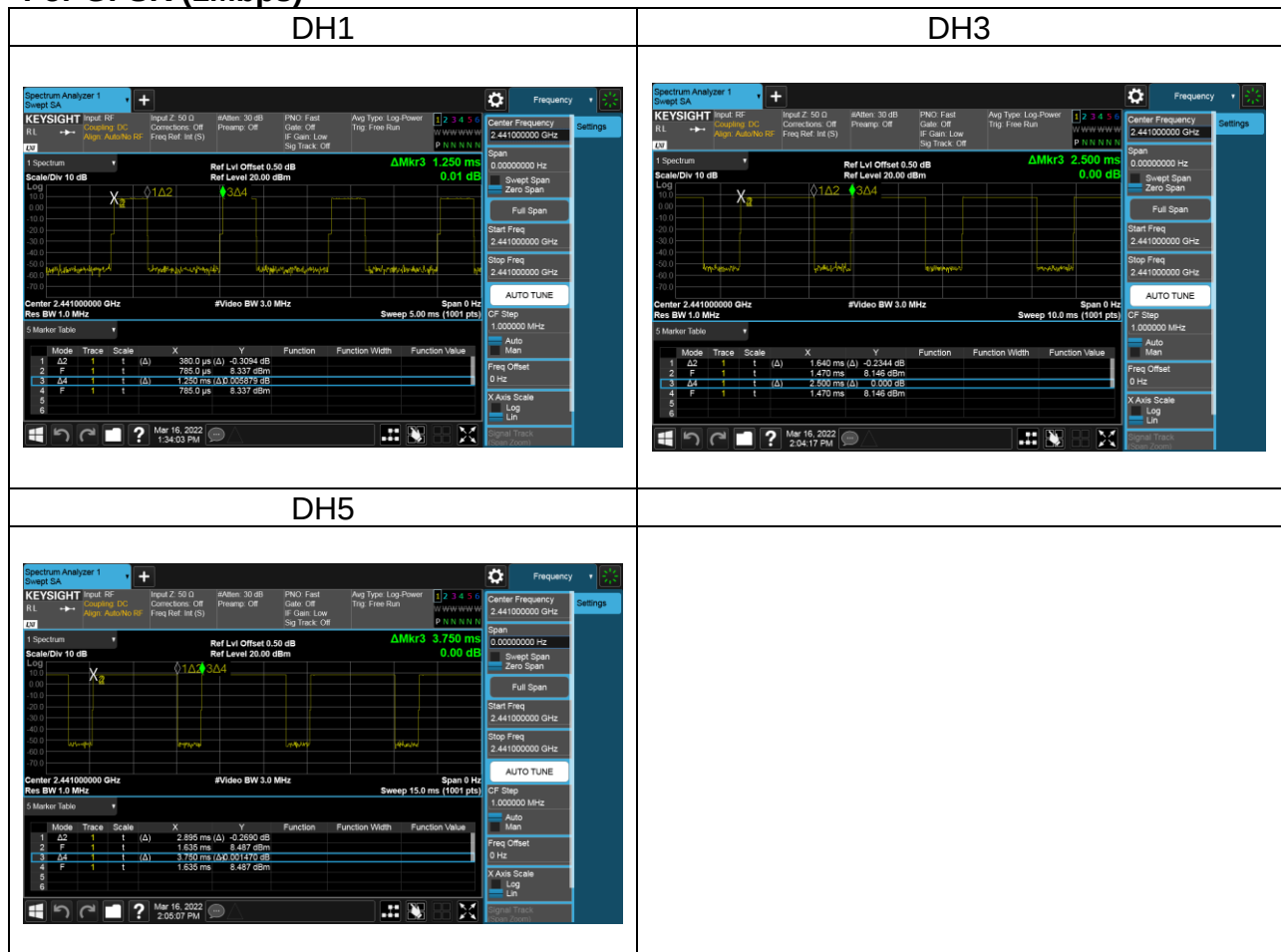
PACKET TYPE	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
2DH1	31.20	5.06	2.56	3.00
2DH3	65.60	1.83	0.61	1.00
2DH5	76.80	1.15	0.35	1.00

For 8-DPSK (3Mbps)

PACKET TYPE	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
3DH1	31.20	5.06	2.56	3.00
3DH3	65.60	1.83	0.61	1.00
3DH5	77.20	1.12	0.35	1.00

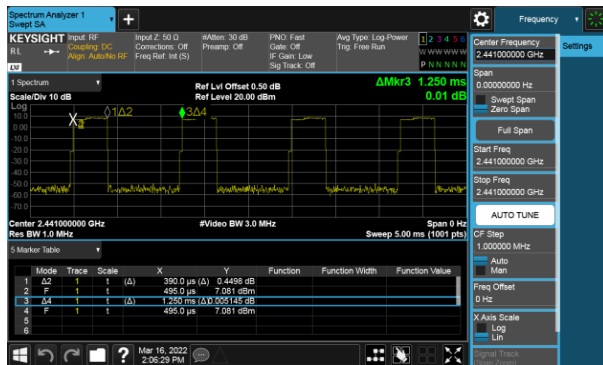
Report No.: TMWK2203000958KR

For GFSK (1Mbps)

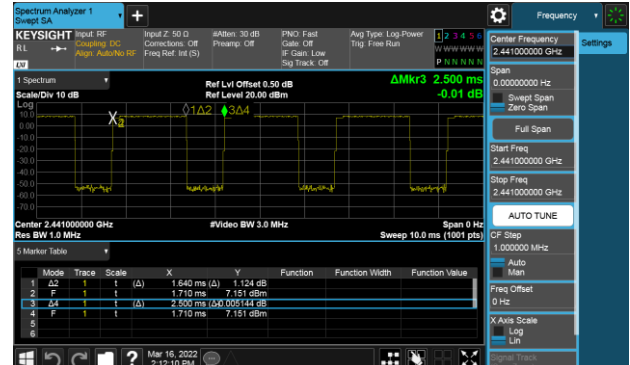


For $\pi/4$ DQPSK (2Mbps)

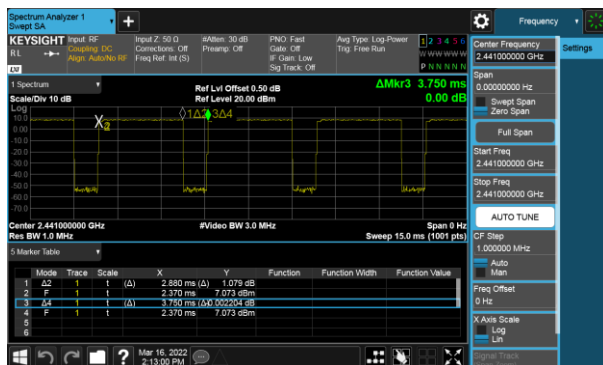
2DH1



2DH3



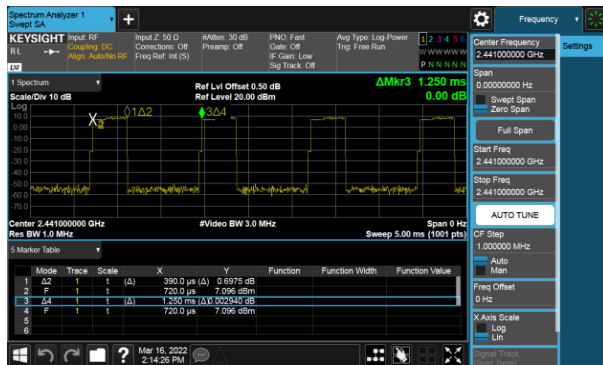
2DH5



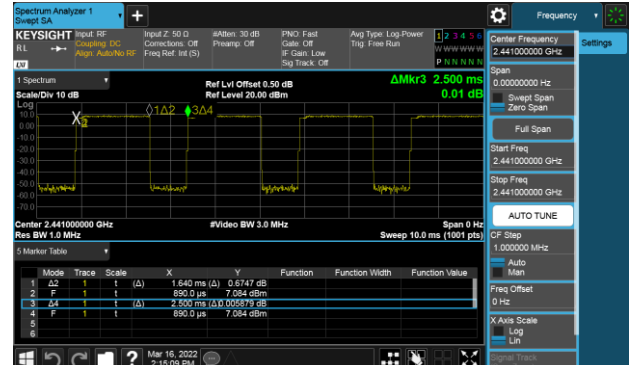
Report No.: TMWK2203000958KR

For 8-DPSK (3Mbps)

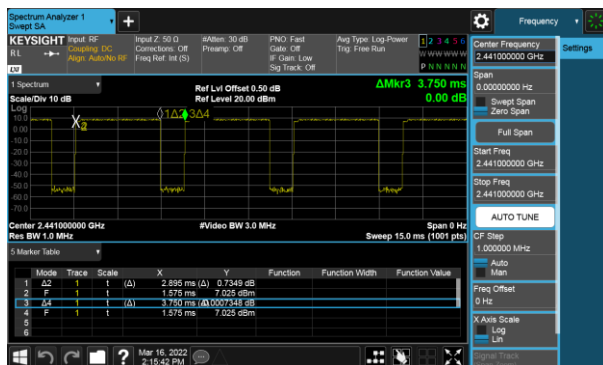
3DH1



3DH3



3DH5



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a) and RSS-GEN section 8.8,

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

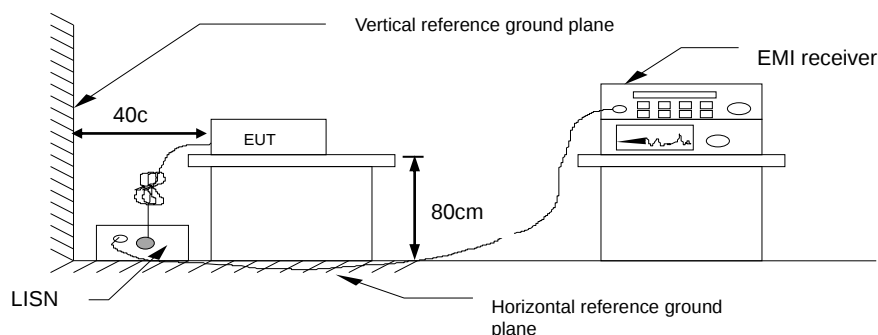
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

4.1.3 Test Setup



4.1.4 Test Result

Not applicable, because EUT doesn't connect to AC Main Source direct.

4.2 20dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

4.2.1 Test Limit

According to §15.247(a) (1), RSS-247 section 5.1(a) and RSS-GEN 6.7,

20 dB Bandwidth : For reporting purposes only.

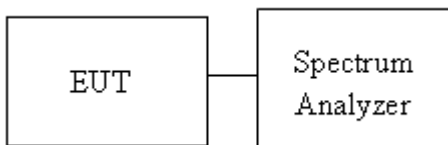
Occupied Bandwidth(99%) : For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 7.8.7,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 1% ~ 5% OBW, VBW $\geq 3 \times$ RBW and Detector = Peak, to measurement 20 dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW $\geq$ three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 20 dB Bandwidth and 99% Bandwidth. In the test report.

4.2.3 Test Setup



4.2.4 Test Result

Temperature: 19.8~24.5°C

Test date: March 16~28, 2022

Humidity: 50~67% RH

Tested by: Allen Shen

Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	0.89522	0.9943
Mid	2441	0.89449	0.9883
High	2480	0.89616	0.9947

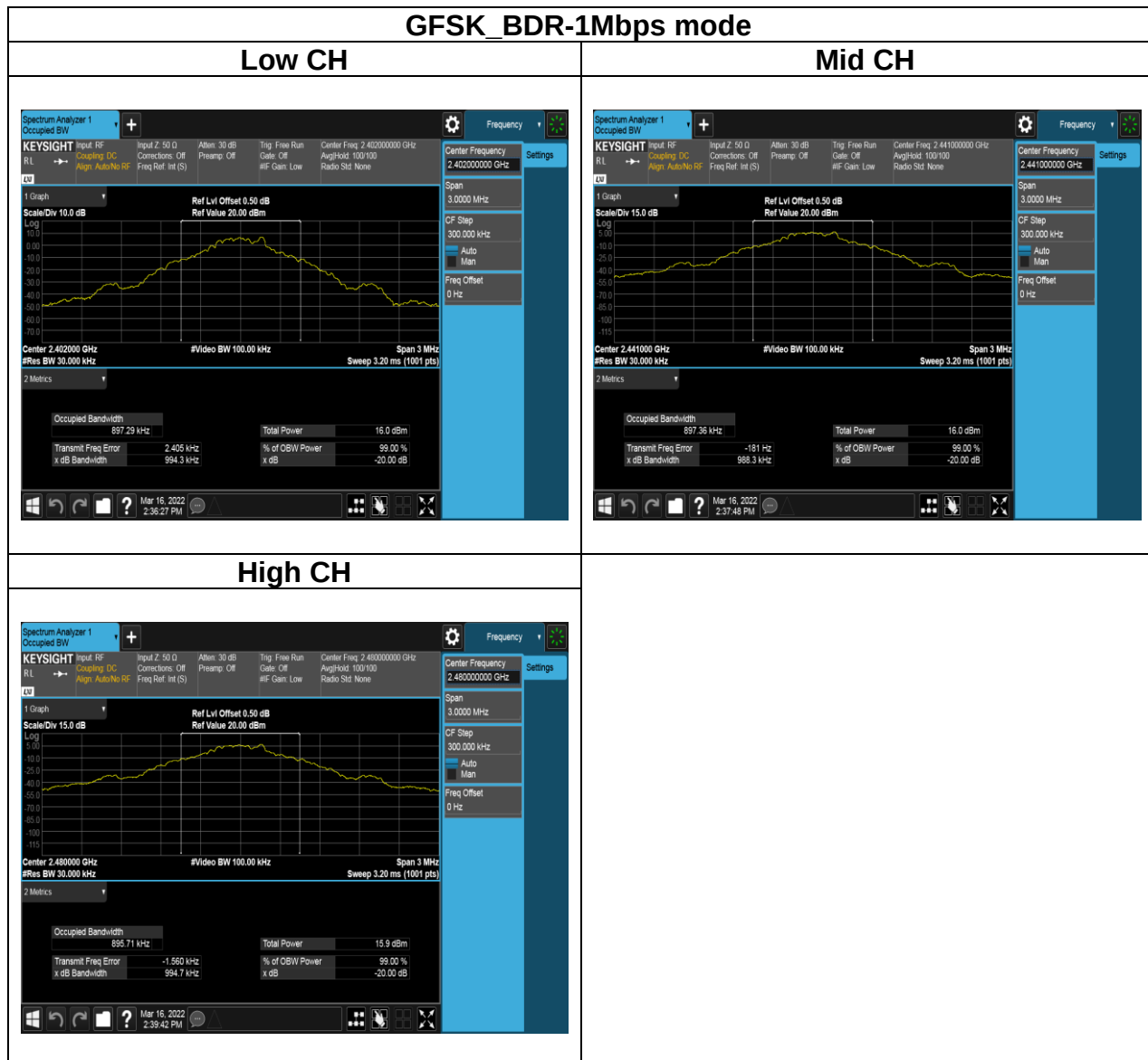
Test mode: $\pi/4$ -DQPSK_EDR -2Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	1.2091	1.349
Mid	2441	1.2133	1.348
High	2480	1.2199	1.351

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz			
Channel	Frequency (MHz)	OBW(99%) (MHz)	20dB BW (MHz)
Low	2402	1.2117	1.317
Mid	2441	1.2152	1.316
High	2480	1.2186	1.322

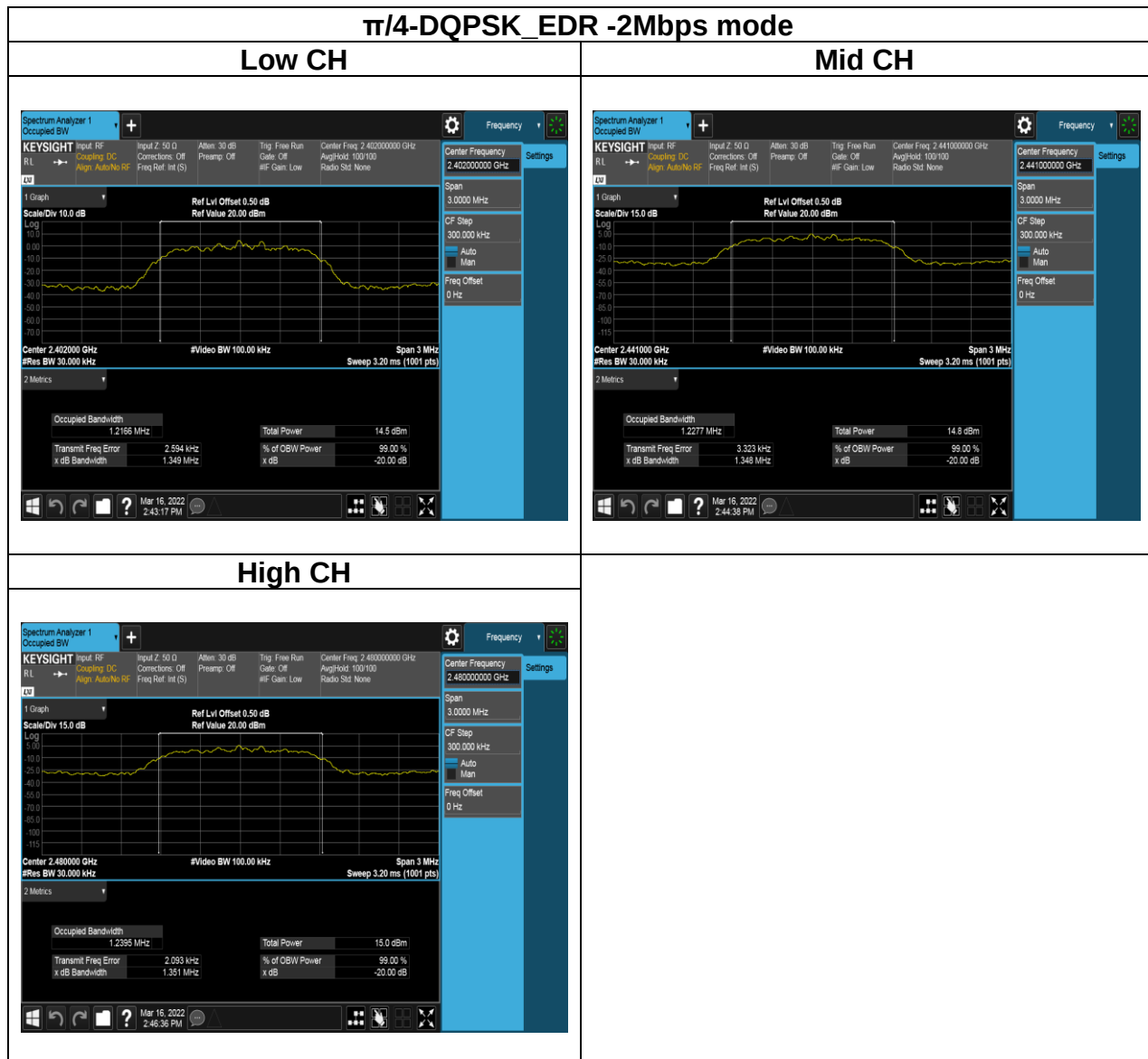
Report No.: TMWK2203000958KR

Test Data

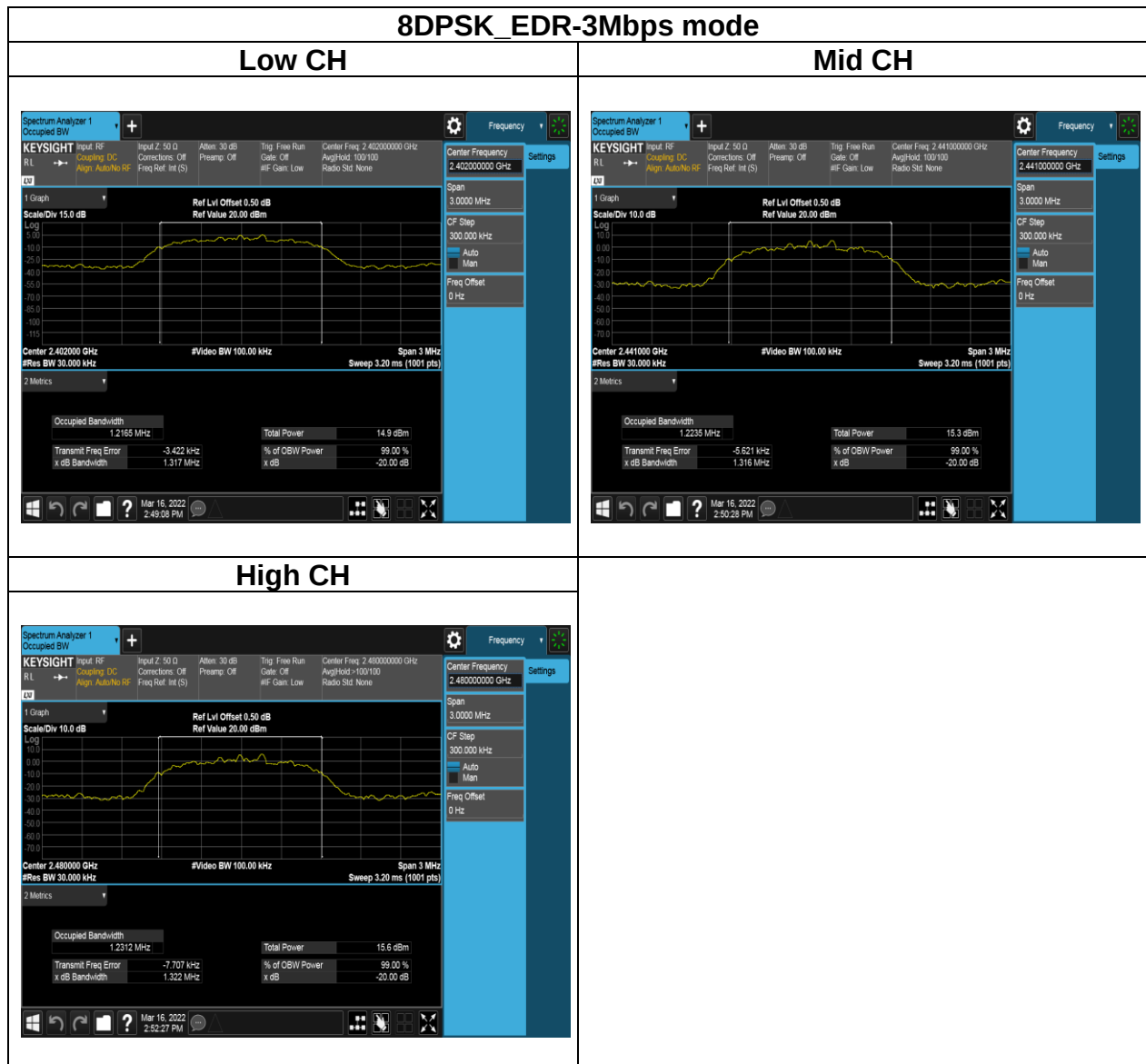
20dB BANDWIDTH



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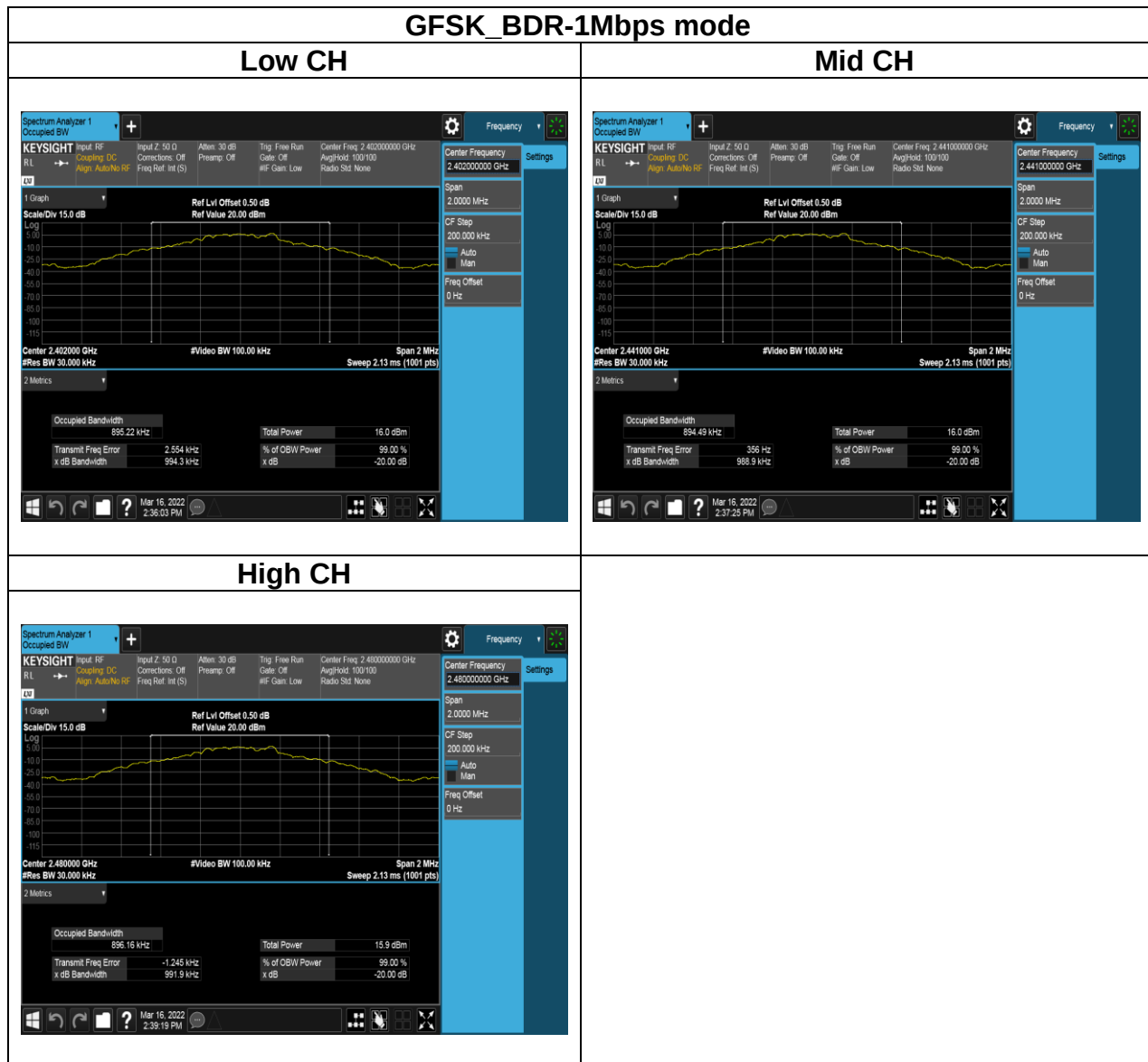
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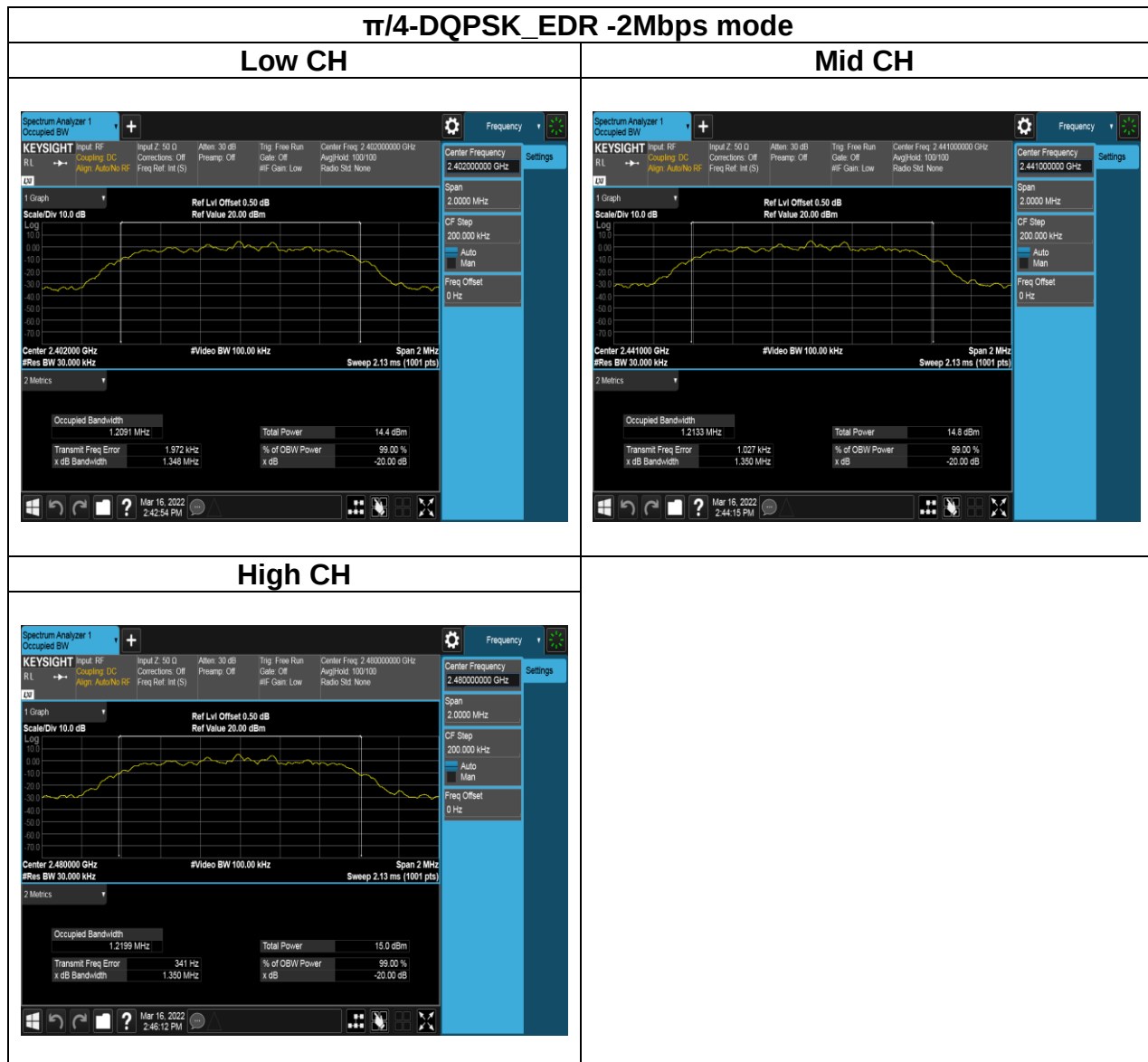


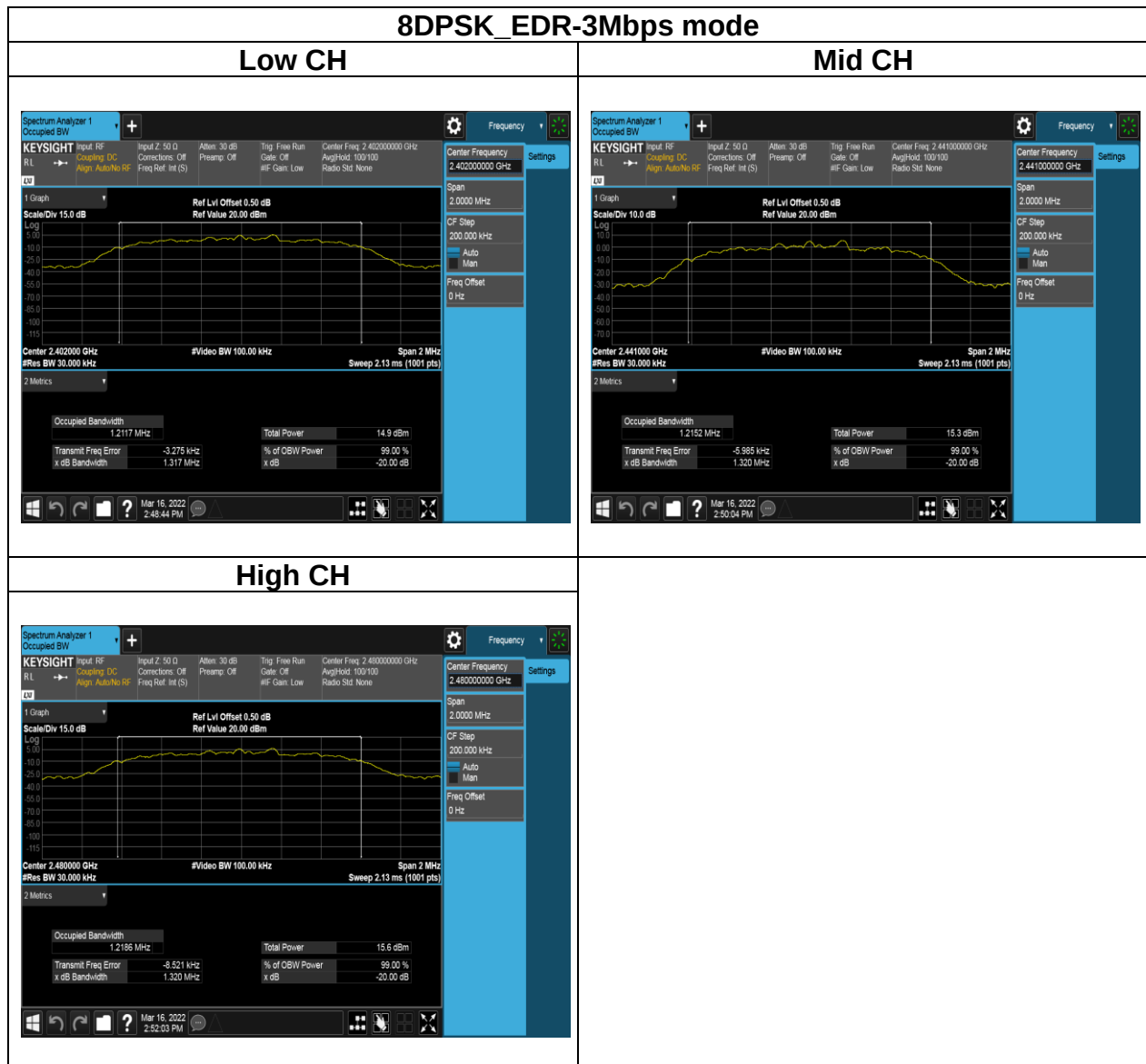
Report No.: TMWK2203000958KR

Test Data

BANDWIDTH 99%







4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(a)(1) and RSS-247 section 5.4(b)

Peak output power :

FCC

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.

IC

According to RSS-247 section 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).

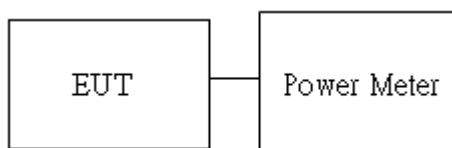
Limit	☒ Antenna not exceed 6 dBi : 21dBm ☐ Antenna with DG greater than 6 dBi : 21dBm [Limit = 30 – (DG – 6)]
-------	--

Average output power : For reporting purposes only.

4.3.2 Test Procedure

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

4.3.3 Test Setup



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4.3.4 Test Result

Temperature: 19.8~24.5°C

Test date: March 16~28, 2022

Humidity: 50~67% RH

Tested by: Allen Shen

Peak output power :

1M BR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	8.23	6.653	125
Mid	2441	default	8.30	6.761	125
High	2480	default	8.43	6.966	125

2M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	8.99	7.925	125
Mid	2441	default	9.10	8.128	125
High	2480	default	9.12	8.166	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	9.07	8.072	125
Mid	2441	default	9.16	8.241	125
High	2480	default	9.19	8.299	125

Average output power :

1M BR mode (Average):

CH	Freq. (MHz)	Power set	Max. Avg.Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	8.18	6.582	125
Mid	2441	default	8.21	6.628	125
High	2480	default	8.27	6.720	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power set	Max. Avg.Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	6.74	4.717	125
Mid	2441	default	7.02	5.031	125
High	2480	default	7.26	5.317	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power set	Max. Avg.Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	6.70	4.681	125
Mid	2441	default	7.08	5.110	125
High	2480	default	7.24	5.301	125

EIRP power :

1M BR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg.Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	10	8.18	1.33	8.941	4000
Mid	2441	10	8.21	1.33	9.003	4000
High	2480	10	8.27	1.33	9.128	4000

2M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg.Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	10	6.74	1.33	6.407	4000
Mid	2441	10	7.02	1.33	6.833	4000
High	2480	10	7.26	1.33	7.222	4000

3M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Max. Avg.Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	10	6.70	1.33	6.359	4000
Mid	2441	10	7.08	1.33	6.940	4000
High	2480	10	7.24	1.33	7.201	4000

4.4 FREQUENCY SEPARATION

4.4.1 Test Limit

According to §15.247(a)(1) and RSS-247 section 5.1(b)

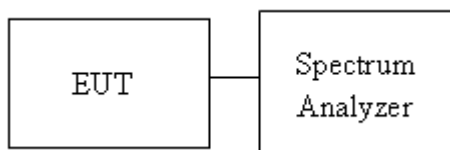
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

Limit	> two-thirds of the 20 dB bandwidth
-------	-------------------------------------

4.4.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set the spectrum analyzer as RBW = 300kHz, VBW = 300kHz, Sweep = auto.
Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency

4.4.3 Test Setup



Report No.: TMWK2203000958KR

4.4.4 Test Result

Temperature: 19.8~24.5°C

Test date: March 16~28, 2022

Humidity: 50~67% RH

Tested by: Allen Shen

Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.66	PASS
Mid	2441	1.000	0.66	PASS
High	2480	1.000	0.66	PASS

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.88	PASS
Mid	2441	1.000	0.88	PASS
High	2480	1.000	0.88	PASS

Report No.: TMWK2203000958KR

Test Data

GFSK_BDR-1Mbps mode

CH Low



CH Mid



CH High

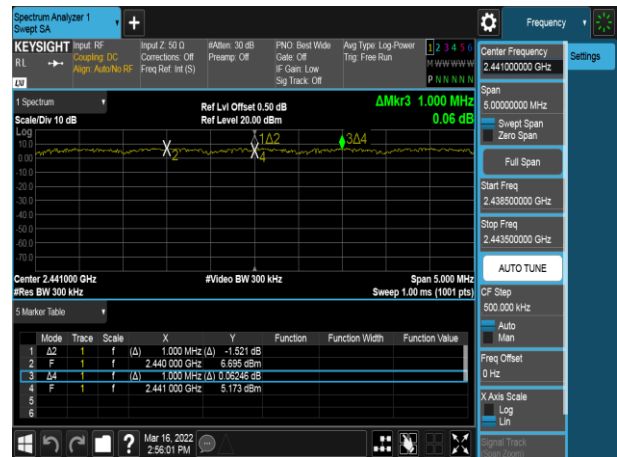


8DPSK_EDR-3Mbps mode

CH Low



CH Mid



CH High



4.5 NUMBER OF HOPPING

4.5.1 Test Limit

According to §15.247(a)(1)(iii) and RSS-247 section 5.1(d)

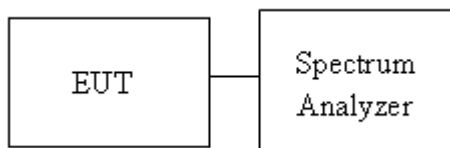
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

4.5.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 7.8.3

1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set spectrum analyzer Start Freq. = 2400 MHz, Stop Freq. = 2441 MHz for Low range, Start Freq. = 2441 MHz, Stop Freq. = 2483.5 MHz for High range ; RBW=430KHz, VBW = 1.5MHz.
4. Max hold, view and count how many channel in the band.

4.5.3 Test Setup



4.5.4 Test Result

Temperature: 19.8~24.5°C

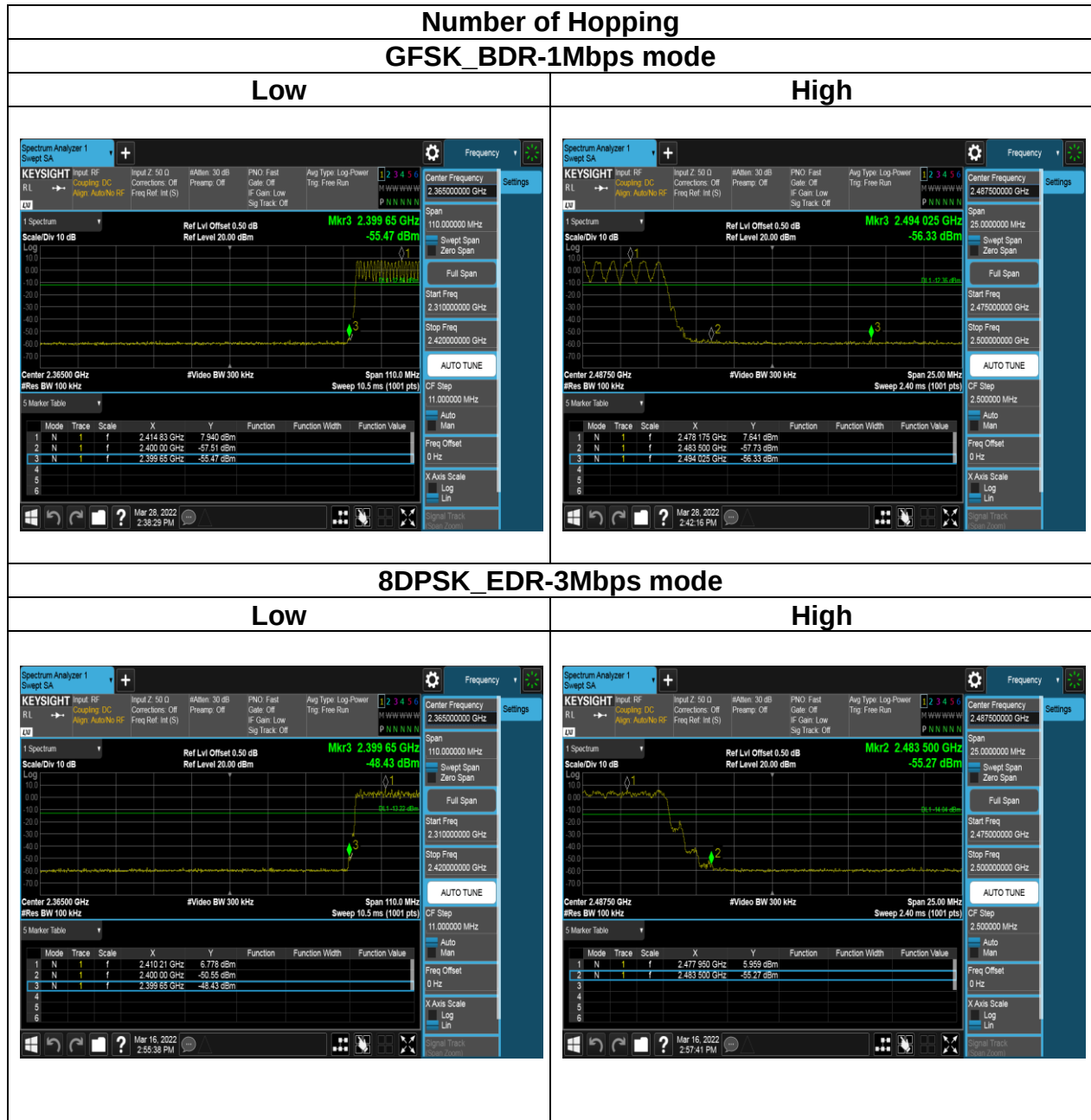
Test date: March 16~28, 2022

Humidity: 50~67% RH

Tested by: Allen Shen

Number of Hopping				
Mode	Frequency (MHz)	Hopping Channel Number	Hopping Channel Number Limits	Result
BDR-1Mbps	2402-2480	79	15	Pass
EDR-3Mbps	2402-2480	79	15	

Test Data



Report No.: TMWK2203000958KR

4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

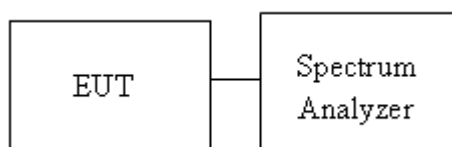
According to §15.247(d) and RSS-247 section 5.5

Limit	-20 dBc
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4.6.2 Test Procedure

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.
2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.
3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with both hopping "ON" and "OFF" modes ".

4.6.3 Test Setup



Report No.: TMWK2203000958KR

4.6.4 Test Result

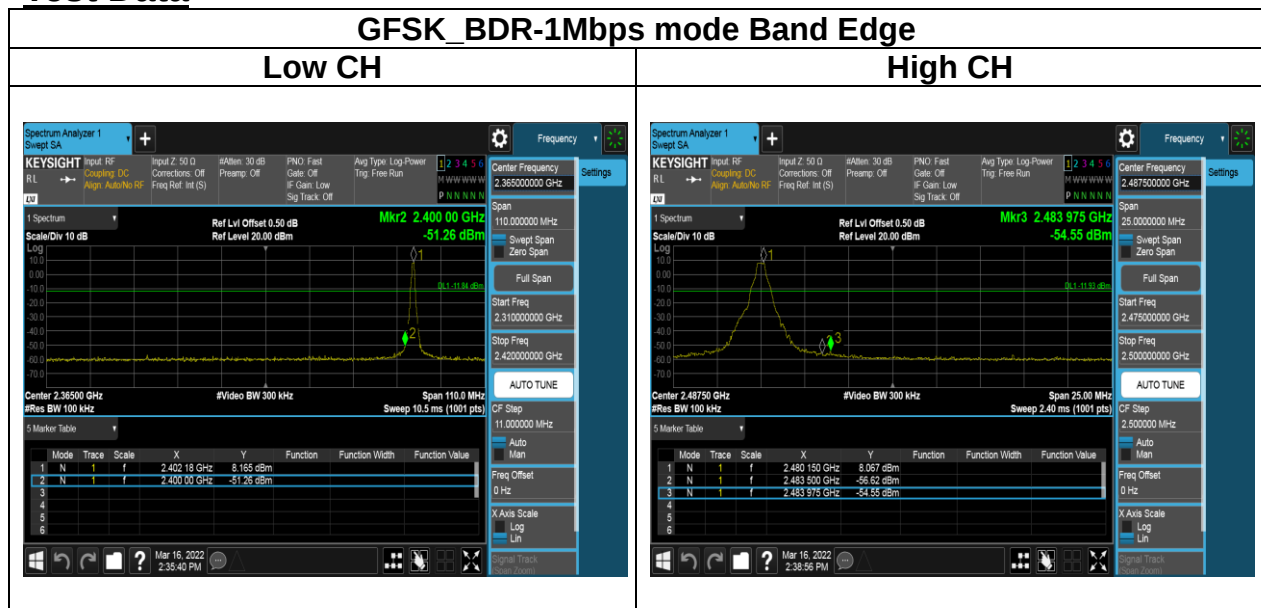
Temperature: 19.8~24.5°C

Test date: March 16~28, 2022

Humidity: 50~67% RH

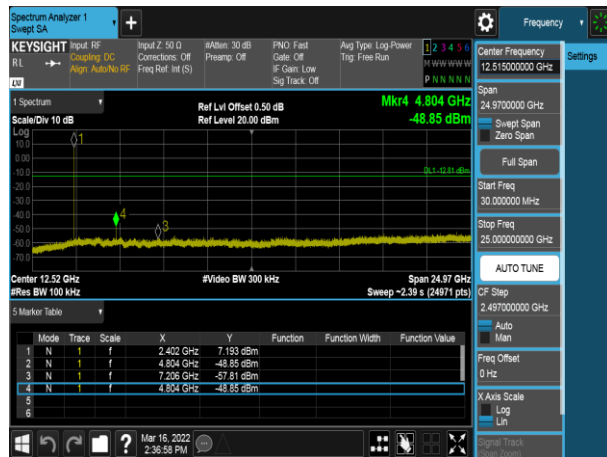
Tested by: Allen Shen

Test Data

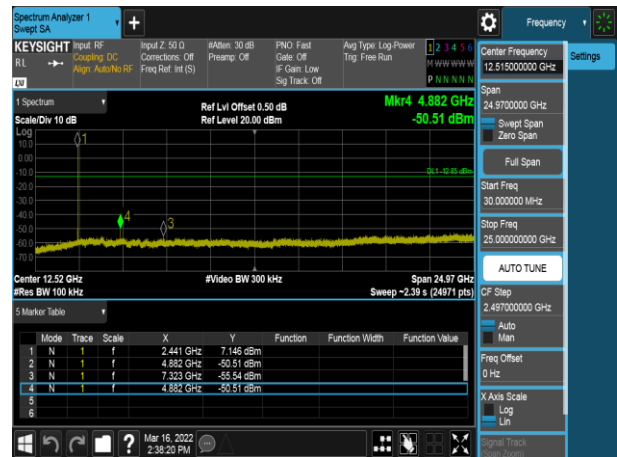


GFSK_BDR-1Mbps mode Spurious Emission 30MHz-25GHz

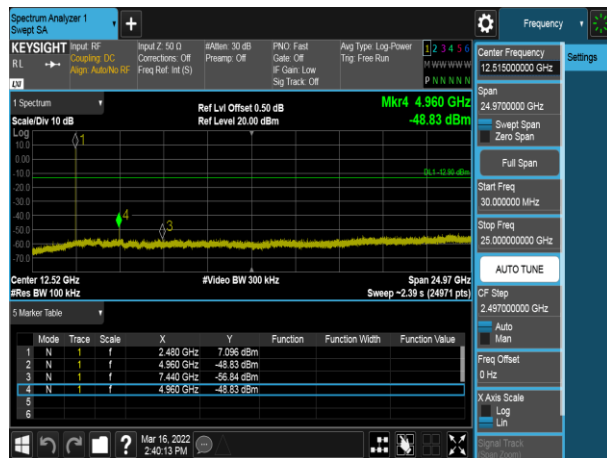
Low CH

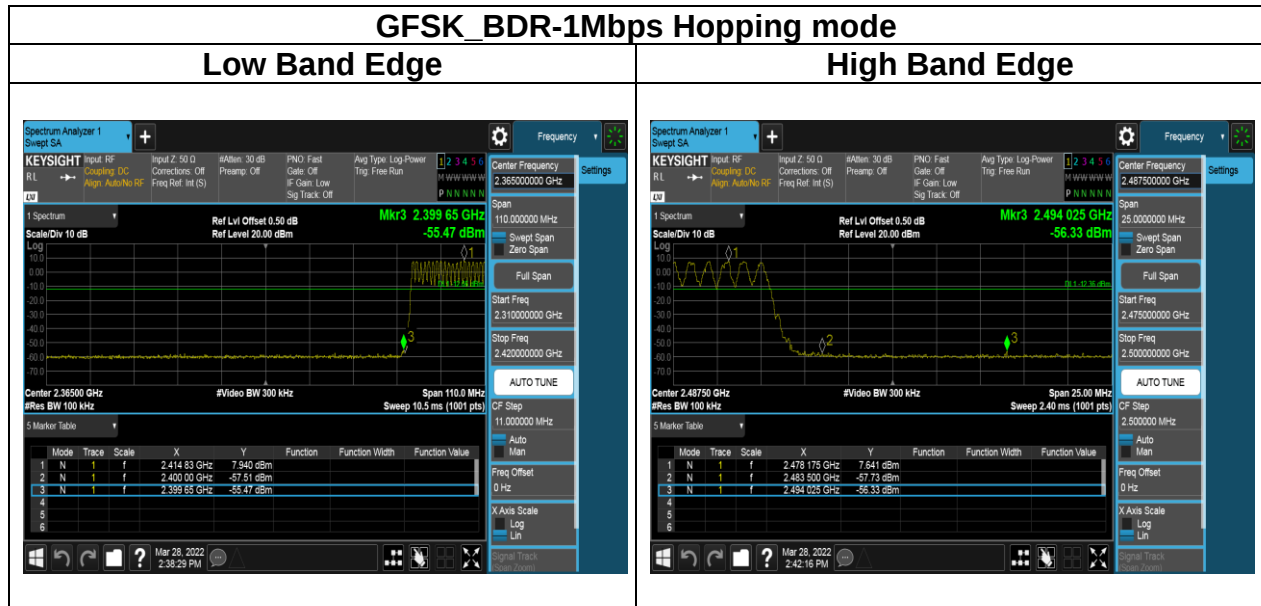


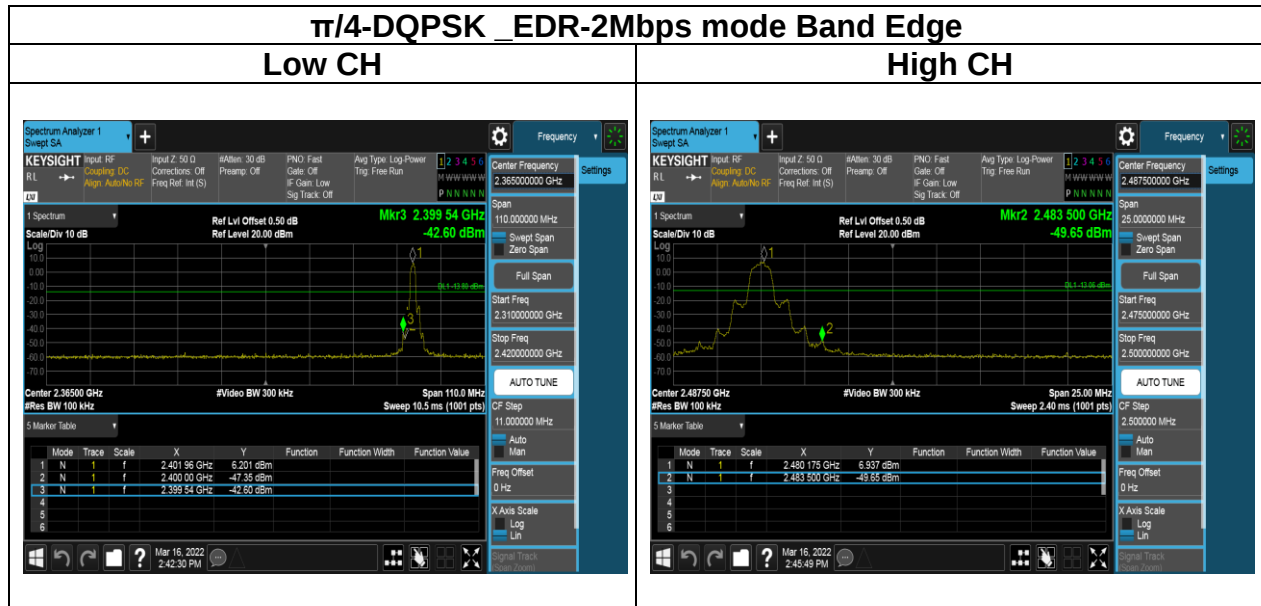
Mid CH



High CH





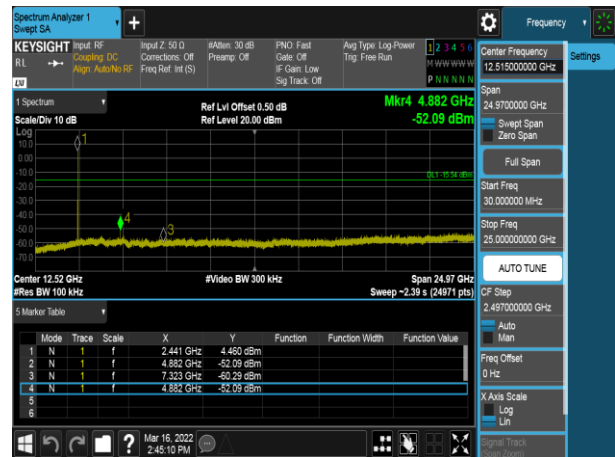


$\pi/4$ -DQPSK_EDR-2Mbps mode Spurious Emission 30MHz-25GHz

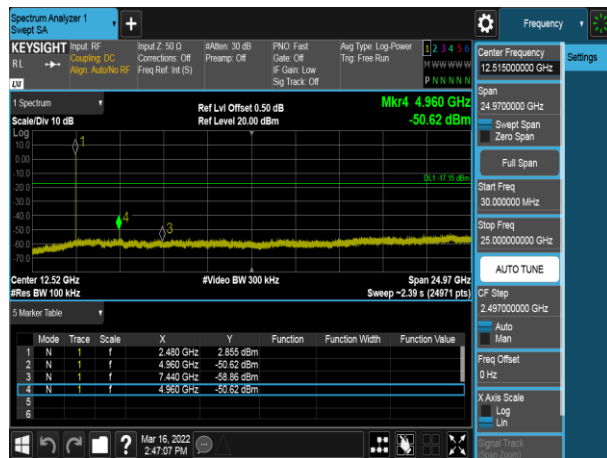
Low CH

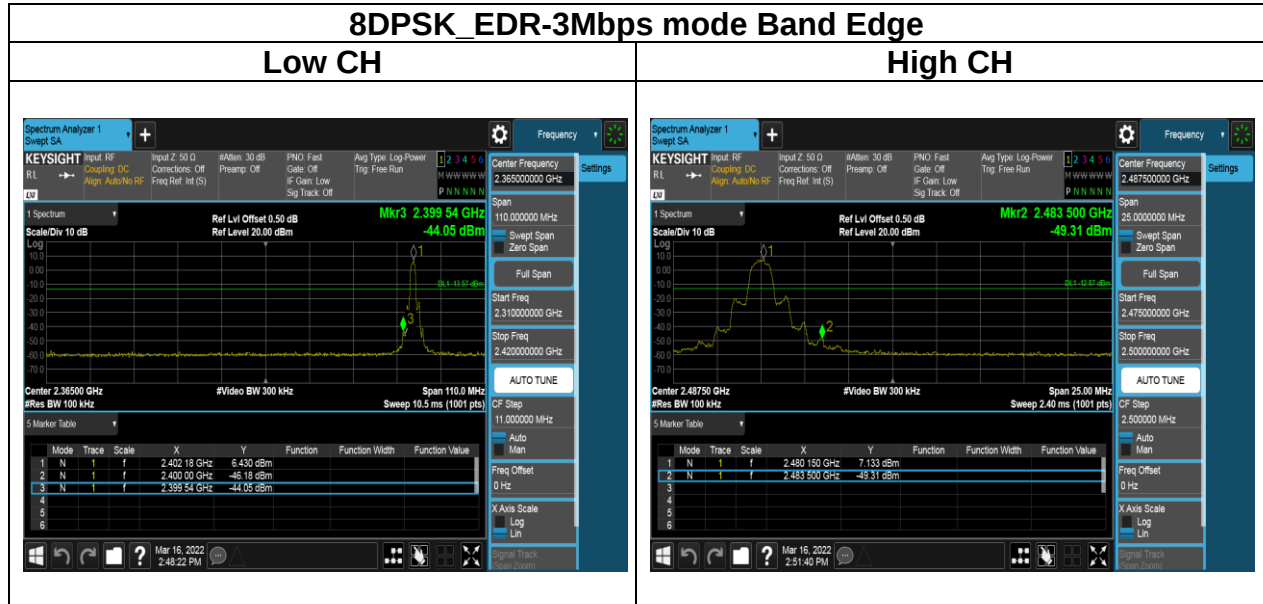


Mid CH



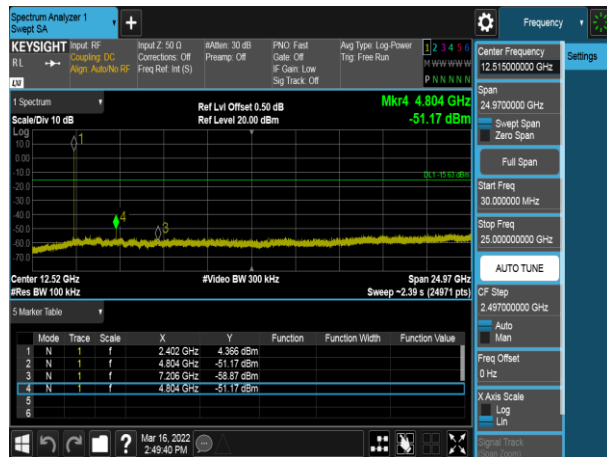
High CH



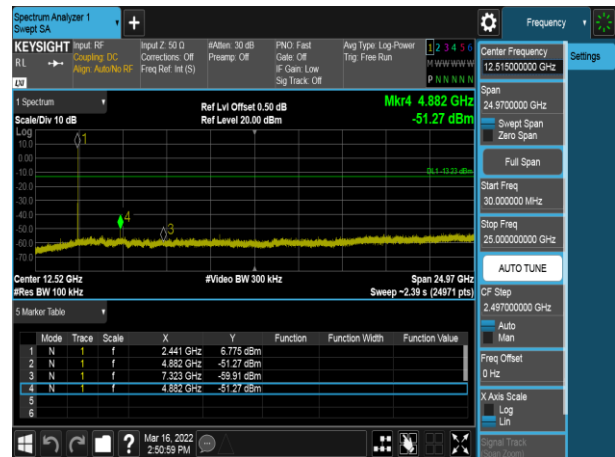


8DPSK_EDR-3Mbps mode Spurious Emission 30MHz-25GHz

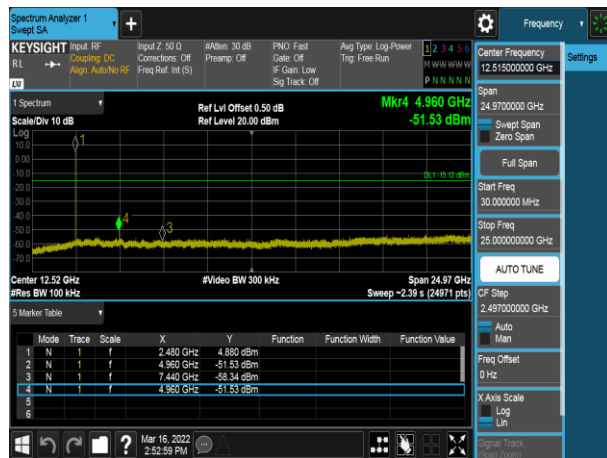
Low CH



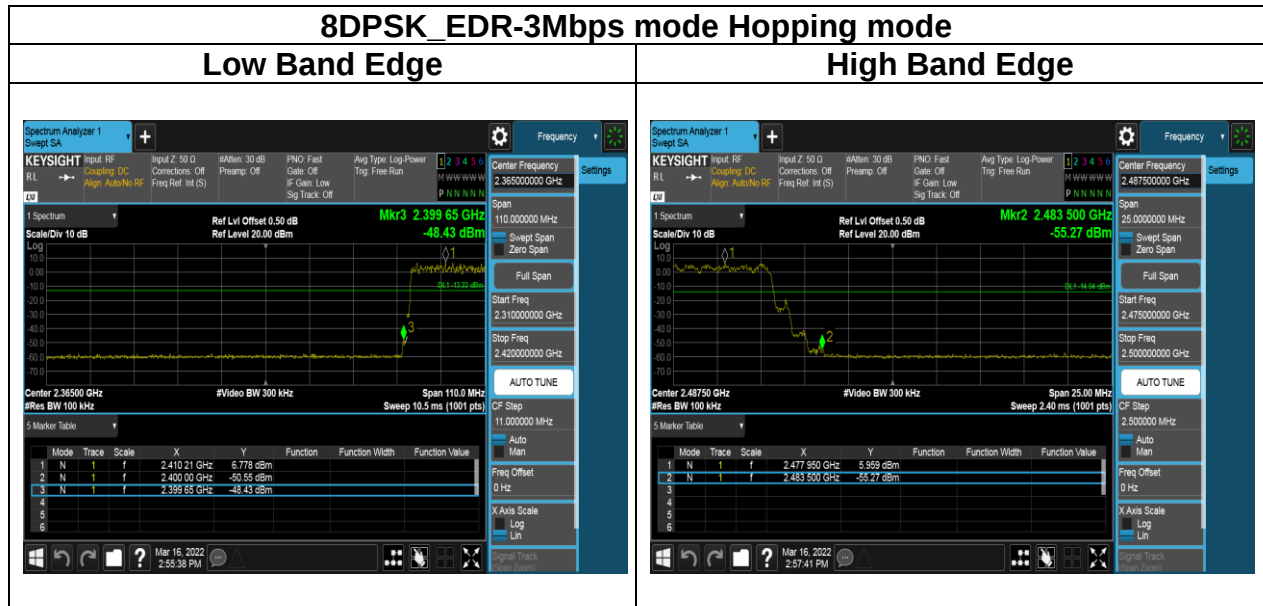
Mid CH



High CH



Report No.: TMWK2203000958KR



4.7 TIME OF OCCUPANCY (DWELL TIME)

4.7.1 Test Limit

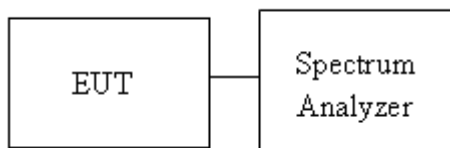
According to §15.247(a)(1)(iii) and RSS-247 section 5.1(d)

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

4.7.2 Test Procedure

1. EUT RF output port connected to the SA by RF cable.
2. Set center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW, VBW=1MHz, Sweep = 1 ms

4.7.3 Test Setup



4.7.4 Test Result

Temperature: 19.8~24.5°C

Test date: March 16~28, 2022

Humidity: 50~67% RH

Tested by: Allen Shen

For GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	VBW setting (kHz)
Mid	DH1	121.60	400ms	3.00
	DH3	262.40	400ms	1.00
	DH5	308.80	400ms	1.00

CH Mid DH1 time slot = 0.380 * (1600/2/79) * 31.6 = 121.60 (ms)
 DH3 time slot = 1.640 * (1600/4/79) * 31.6 = 262.40 (ms)
 DH5 time slot = 2.895 * (1600/6/79) * 31.6 = 308.80 (ms)

For $\pi/4$ DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	VBW setting (kHz)
Mid	2DH1	124.80	400ms	3.00
	2DH3	262.40	400ms	1.00
	2DH5	307.20	400ms	1.00

CH Mid 2DH1 time slot = 0.390 * (1600/2/79) * 31.6 = 124.80 (ms)
 2DH3 time slot = 1.640 * (1600/4/79) * 31.6 = 262.40 (ms)
 2DH5 time slot = 2.880 * (1600/6/79) * 31.6 = 307.20 (ms)

For 8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)	VBW setting (kHz)
Mid	3DH1	124.80	400ms	3.00
	3DH3	262.40	400ms	1.00
	3DH5	308.80	400ms	1.00

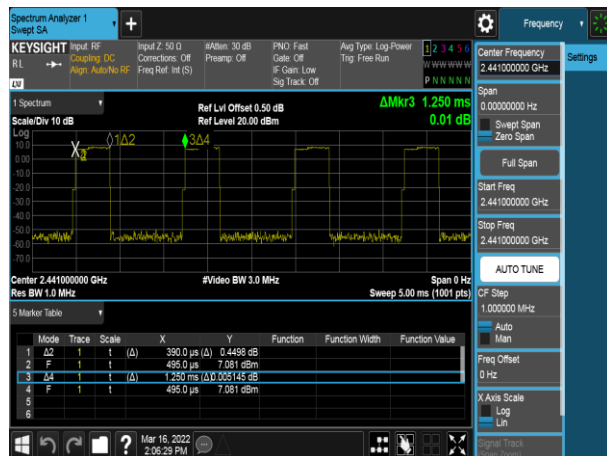
CH Mid 3DH1 time slot = 0.390 * (1600/2/79) * 31.6 = 124.80 (ms)
 3DH3 time slot = 1.640 * (1600/4/79) * 31.6 = 262.40 (ms)
 3DH5 time slot = 2.895 * (1600/6/79) * 31.6 = 308.80 (ms)

For GFSK (1Mbps)

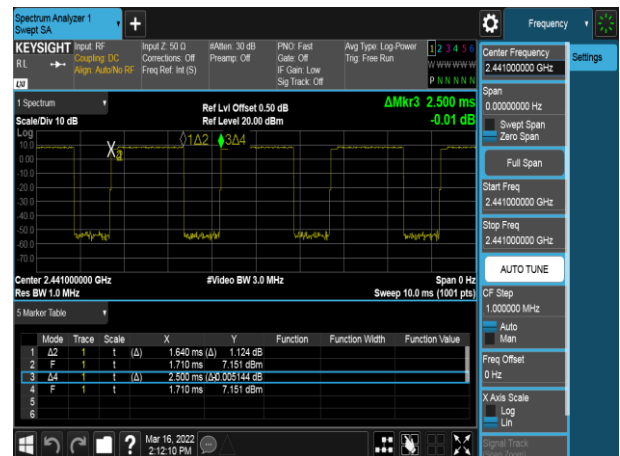


For $\pi/4$ DQPSK (2Mbps)

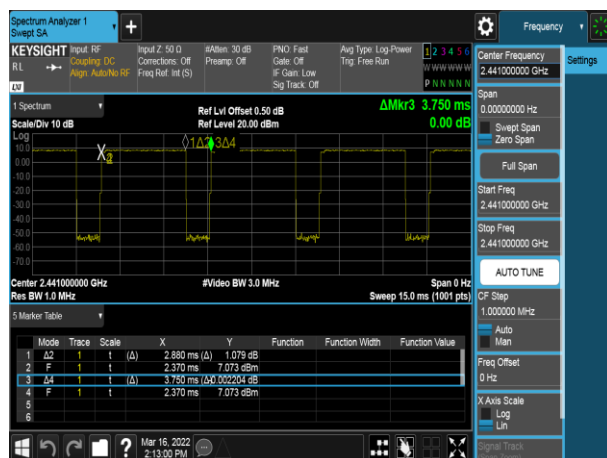
2DH1



2DH3

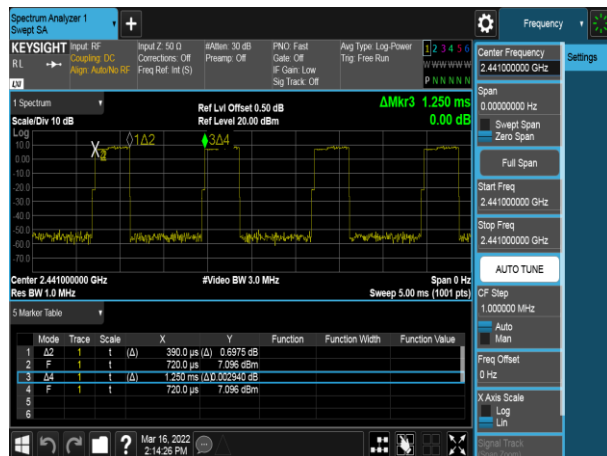


2DH5

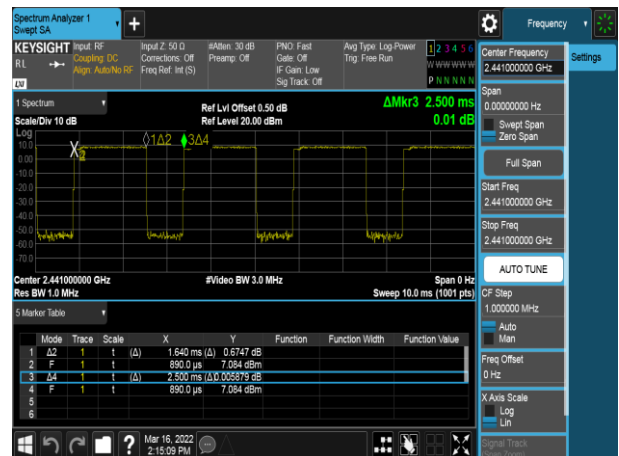


For 8-DPSK (3Mbps)

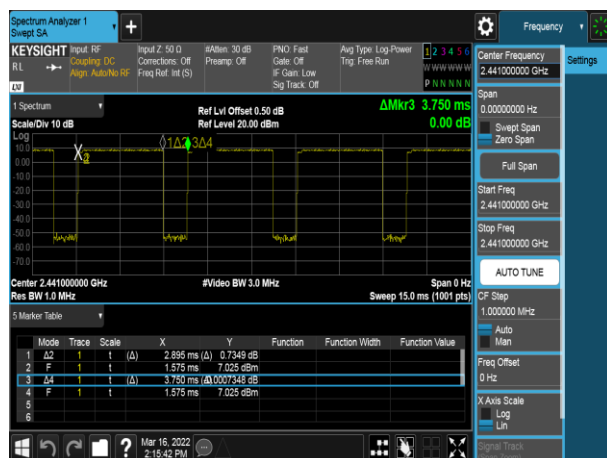
3DH1



3DH3



3DH5



4.8 RADIATION BANDEDGE AND SPURIOUS EMISSION

4.8.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

IC according to RSS-247 section 5.5, RSS-Gen, Section 8.9 and 8.10

RSS-Gen Table 3 and Table 5 – General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz ^(Note)

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Note: Measurements for compliance with the limits in table 3 may be performed at distances other than 3 metres, in accordance with Section 6.6.

RSS-Gen Table 6: General Field Strength Limits for Transmitters at Frequencies Below 30 MHz (Transmit)

Frequency	Magnetic field strength (H-Field) ($\mu\text{A/m}$)	Measurement Distance (m)
9-490 kHz ^{Note}	6.37/F (F in kHz)	300
490-1,705 kHz	63.7/F (F in kHz)	30
1.705-30 MHz	0.08	30

Note: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

4.8.2 Test Procedure

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9kHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

4. For harmonic, the worst case of output power was BDR-1Mbps. Therefore only BDR-1Mbps record in the report.

5. The SA setting following :

(1) Below 1G : RBW = 100kHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G :

(2.1) For Peak measurement : RBW = 1MHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement : RBW = 1MHz, VBW

·If Duty Cycle $\geq$ 98%, VBW=10Hz.

·If Duty Cycle < 98%, VBW $\geq$ 1/T.

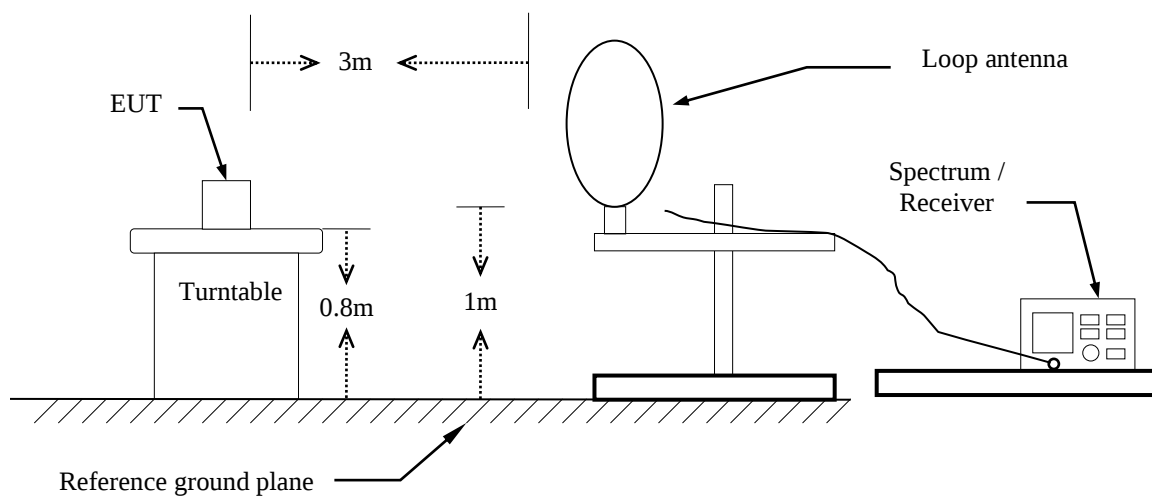
6. Data result

Actual FS=Spectrum Reading Level + Factor

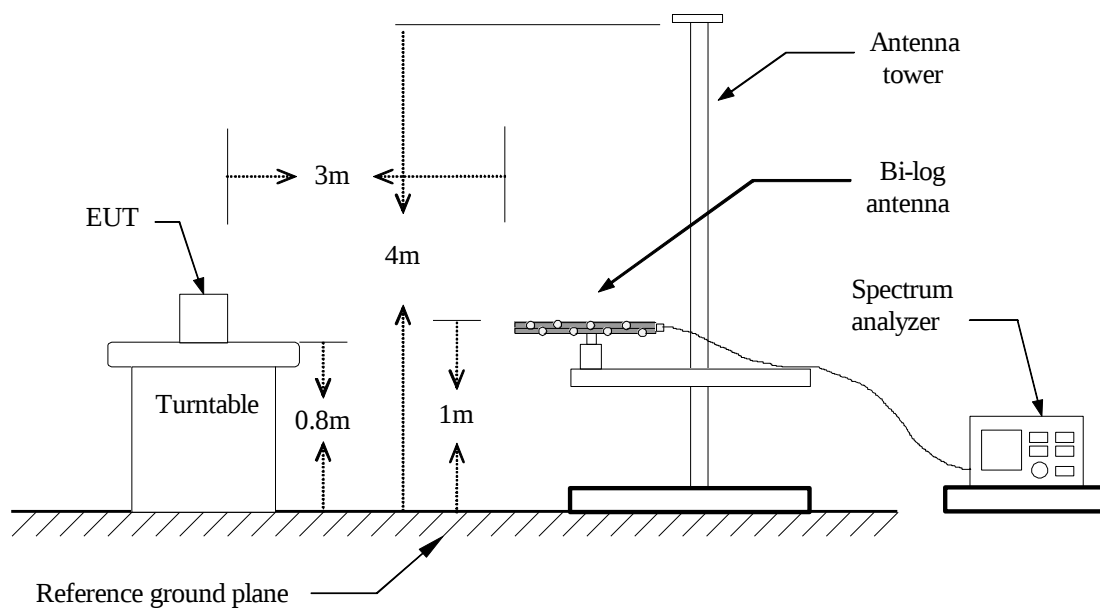
Margin=Actual FS- Limit

4.8.3 Test Setup

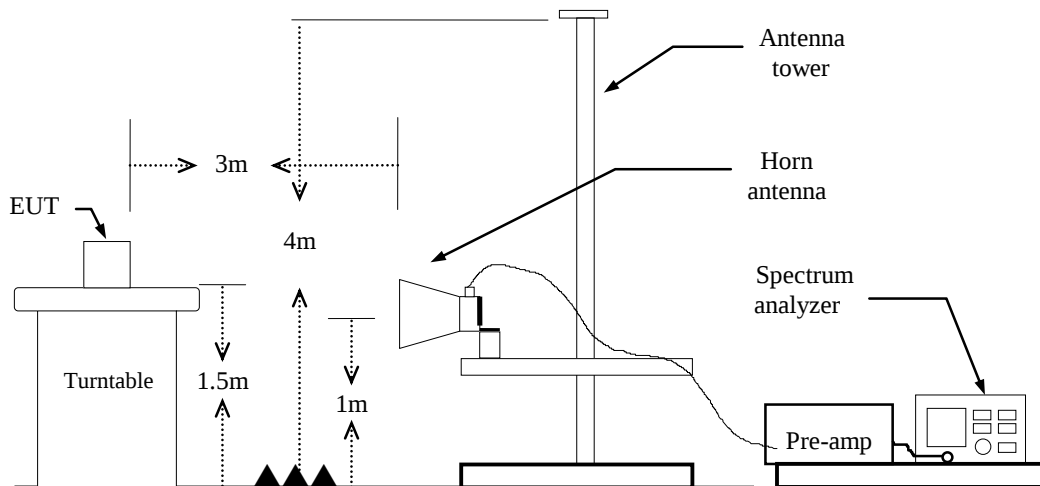
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz

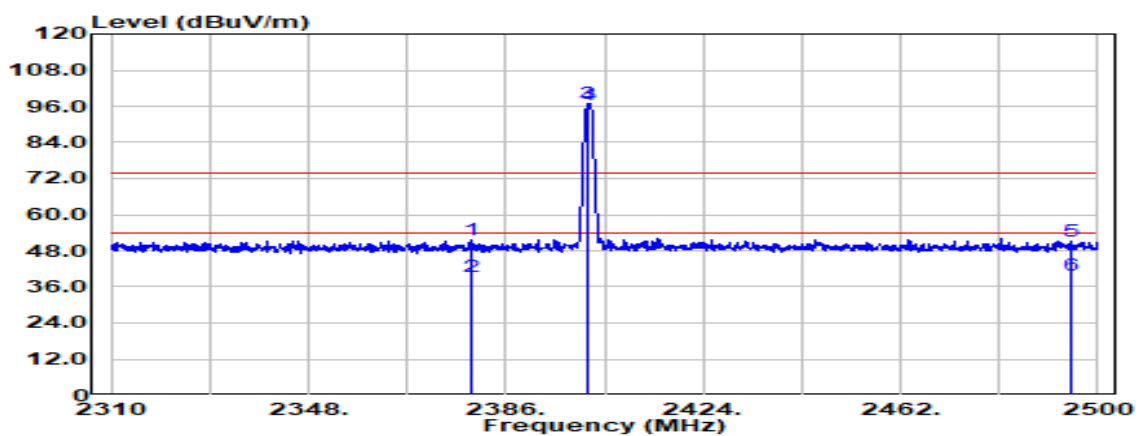


Report No.: TMWK2203000958KR

4.8.4 Test Result

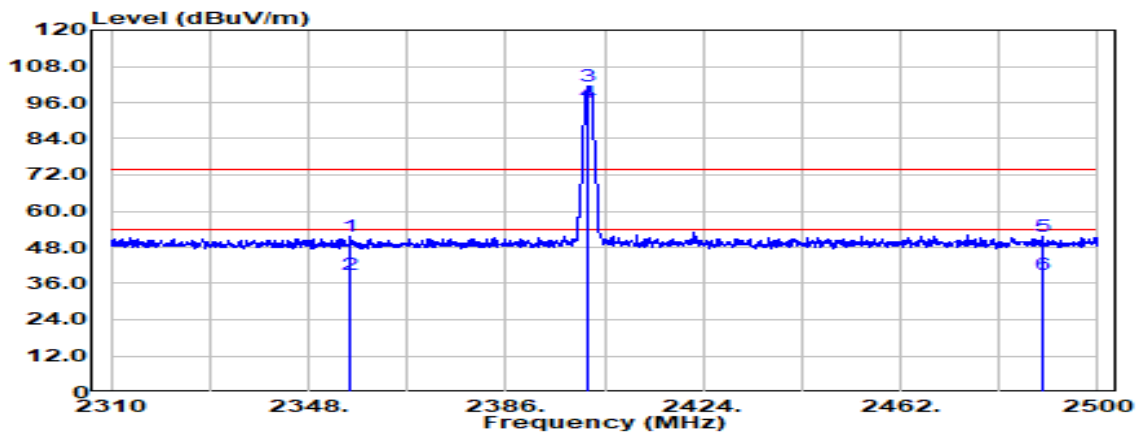
Band Edge Test Data

Test Mode:	GFSK_BDR-1Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak / Average		



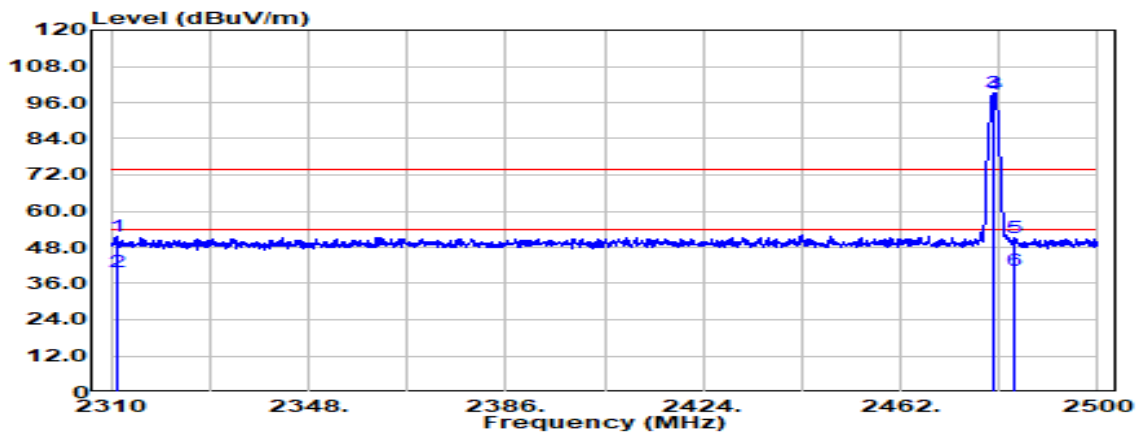
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2379.160	Peak	39.02	12.43	51.44	74.00	-22.56
2379.160	Average	27.18	12.43	39.61	54.00	-14.39
2402.000	Peak	84.25	12.54	96.79	-	-
2402.000	Average	83.80	12.54	96.34	-	-
2494.680	Peak	37.99	13.15	51.14	74.00	-22.86
2494.680	Average	26.51	13.15	39.66	54.00	-14.34

Test Mode:	GFSK_BDR-1Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak / Average		



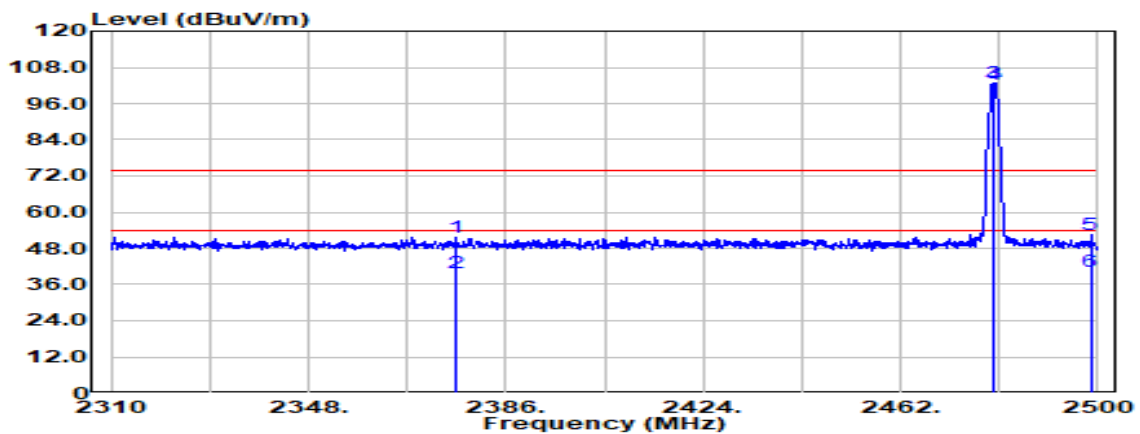
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
2356.075	Peak	39.47	12.31	51.78	74.00	-22.22
2356.075	Average	26.59	12.31	38.90	54.00	-15.10
2402.000	Peak	88.79	12.54	101.34	-	-
2402.000	Average	83.68	12.54	96.22	-	-
2489.455	Peak	38.37	13.12	51.49	74.00	-22.51
2489.455	Average	25.96	13.12	39.08	54.00	-14.92

Test Mode:	GFSK_BDR-1Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2311.045	Peak	39.31	12.22	51.53	74.00	-22.47
2311.045	Average	27.60	12.22	39.81	54.00	-14.19
2480.000	Peak	86.14	13.05	99.19	-	-
2480.000	Average	85.58	13.05	98.63	-	-
2483.945	Peak	37.91	13.08	50.99	74.00	-23.01
2483.945	Average	27.00	13.08	40.08	54.00	-13.92

Test Mode:	GFSK_BDR-1Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak / Average		



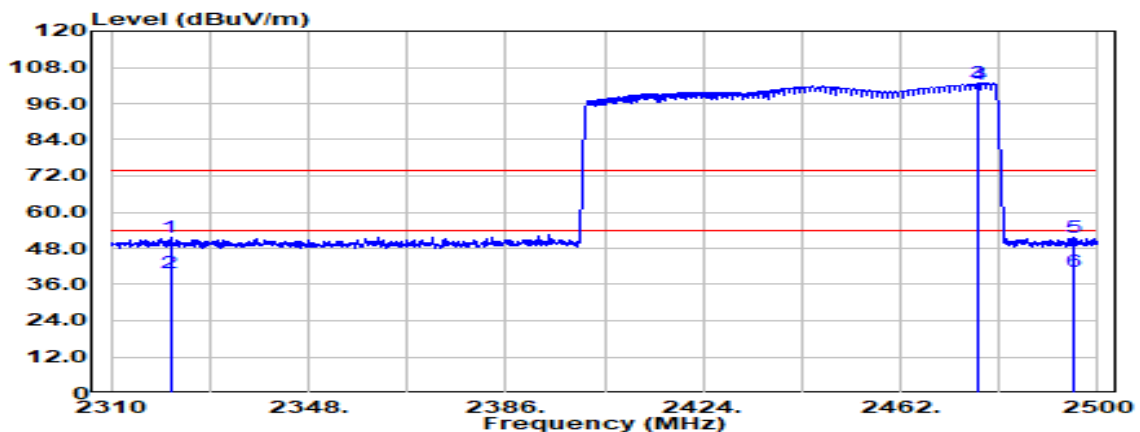
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2376.405	Peak	39.40	12.41	51.81	74.00	-22.19
2376.405	Average	27.32	12.41	39.73	54.00	-14.27
2480.000	Peak	89.93	13.05	102.98	-	-
2480.000	Average	89.49	13.05	102.54	-	-
2498.575	Peak	39.13	13.18	52.31	74.00	-21.69
2498.575	Average	27.19	13.18	40.37	54.00	-13.63

Test Mode:	GFSK_BDR-1Mbps Hopping	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak / Average		



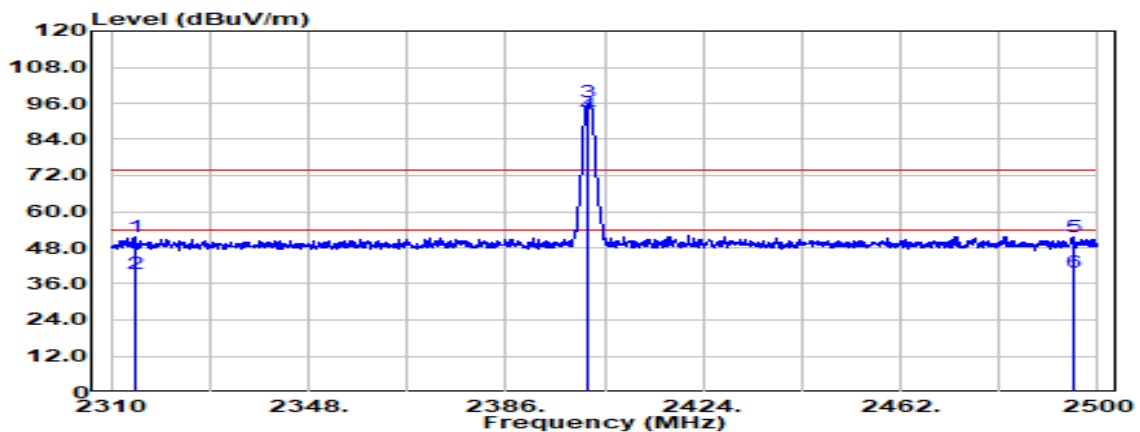
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2378.400	Peak	40.10	12.42	52.52	74.00	-21.48
2378.400	Average	27.41	12.42	39.84	54.00	-14.16
2480.145	Peak	85.48	13.05	98.54	-	-
2480.145	Average	85.10	13.05	98.16	-	-
2486.890	Peak	38.70	13.10	51.80	74.00	-22.20
2486.890	Average	26.88	13.10	39.98	54.00	-14.02

Test Mode:	GFSK_BDR-1Mbps Hopping	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak / Average		



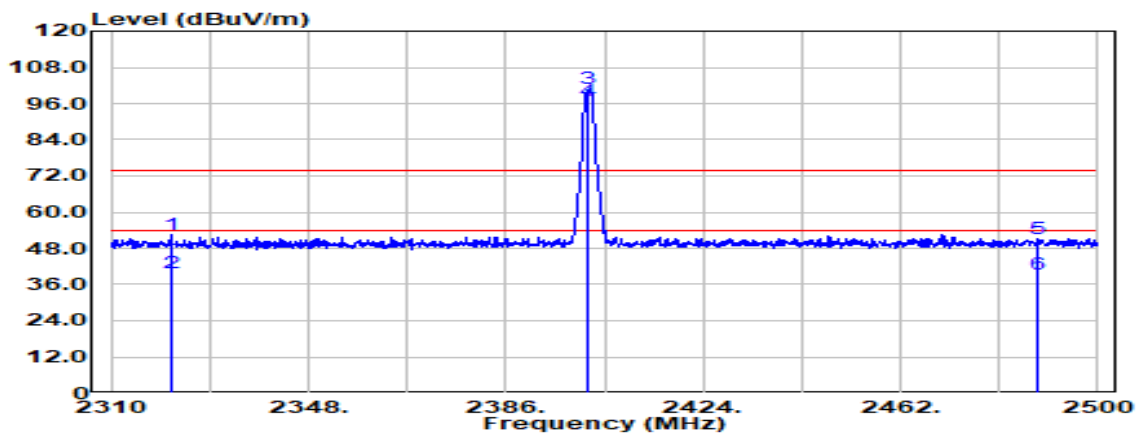
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2321.400	Peak	39.47	12.23	51.70	74.00	-22.30
2321.400	Average	27.66	12.23	39.90	54.00	-14.10
2477.010	Peak	89.80	13.03	102.83	-	-
2477.010	Average	89.23	13.03	102.27	-	-
2495.155	Peak	38.46	13.16	51.61	74.00	-22.39
2495.155	Average	27.01	13.16	40.16	54.00	-13.84

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak / Average		



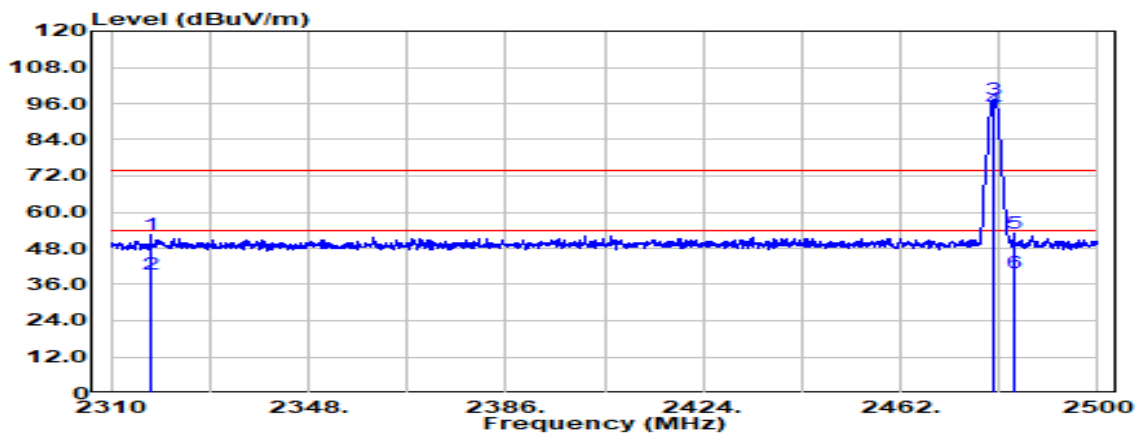
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2314.465	Peak	39.20	12.22	51.42	74.00	-22.58
2314.465	Average	27.34	12.22	39.56	54.00	-14.44
2402.000	Peak	83.70	12.54	96.24	-	-
2402.000	Average	79.87	12.54	92.41	-	-
2495.155	Peak	38.26	13.16	51.42	74.00	-22.58
2495.155	Average	26.50	13.16	39.66	54.00	-14.34

Test Mode:	8DPSK_EDR-3Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak / Average		



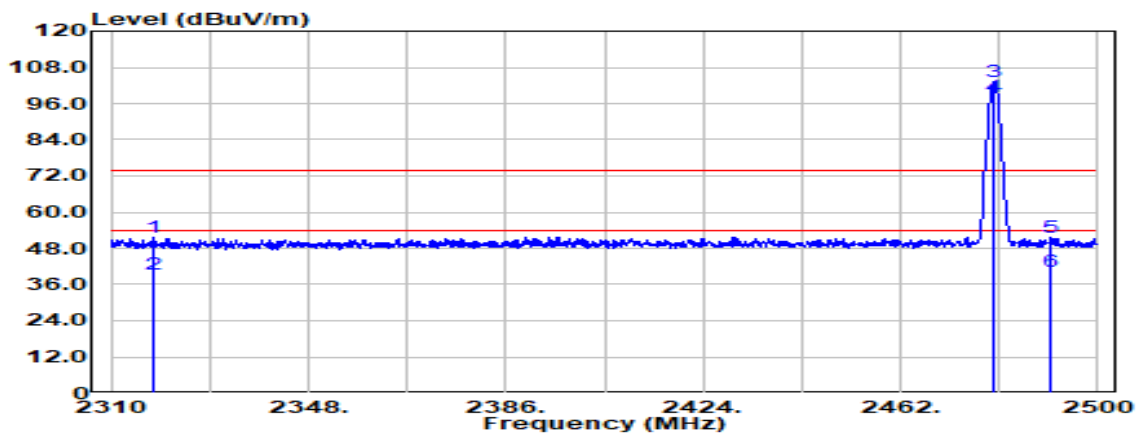
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2321.495	Peak	40.12	12.23	52.35	74.00	-21.65
2321.495	Average	27.43	12.23	39.66	54.00	-14.34
2402.000	Peak	88.24	12.54	100.79	-	-
2402.000	Average	84.34	12.54	96.88	-	-
2488.505	Peak	38.24	13.11	51.35	74.00	-22.65
2488.505	Average	26.42	13.11	39.53	54.00	-14.47

Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak / Average		



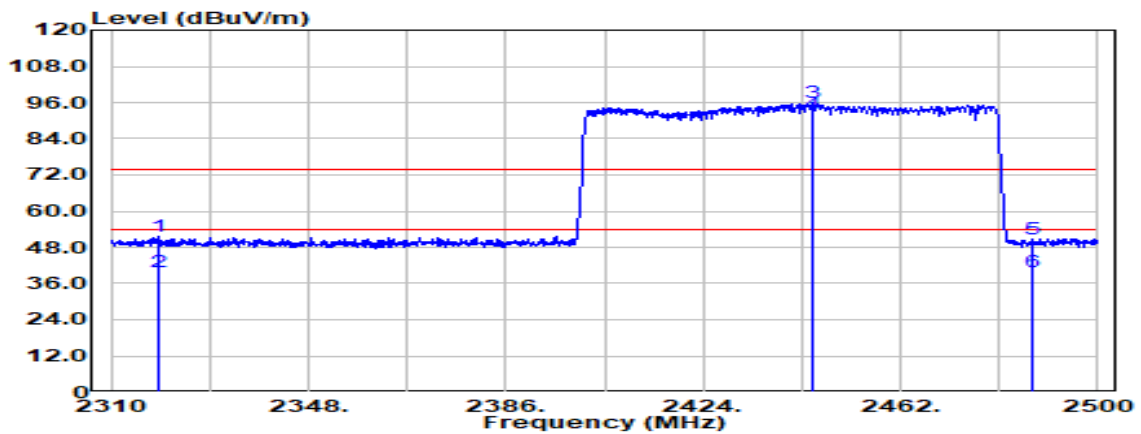
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2317.695	Peak	40.14	12.23	52.37	74.00	-21.63
2317.695	Average	27.38	12.23	39.60	54.00	-14.40
2480.000	Peak	84.43	13.05	97.49	-	-
2480.000	Average	80.96	13.05	94.02	-	-
2484.040	Peak	39.95	13.08	53.03	74.00	-20.97
2484.040	Average	26.61	13.08	39.69	54.00	-14.31

Test Mode:	8DPSK_EDR-3Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak / Average		



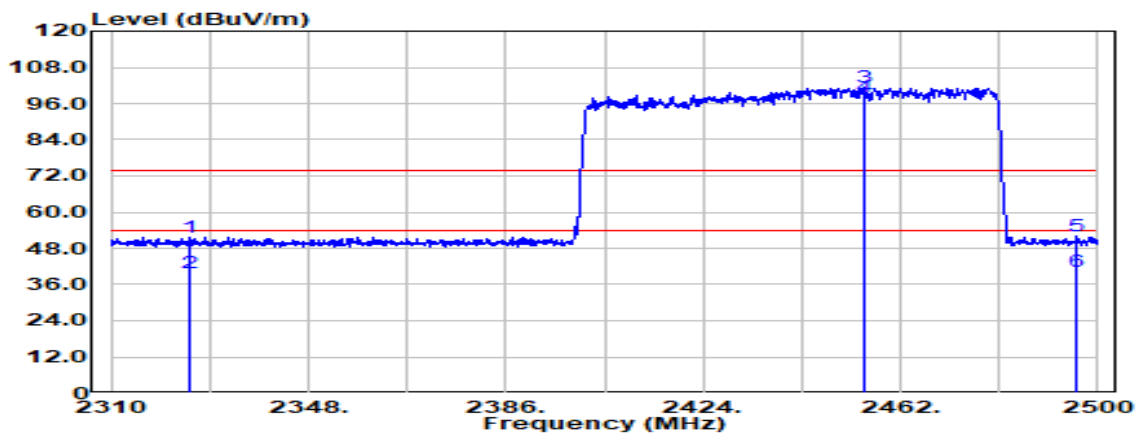
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2318.075	Peak	39.36	12.23	51.59	74.00	-22.41
2318.075	Average	27.30	12.23	39.53	54.00	-14.47
2480.000	Peak	90.00	13.05	103.05	-	-
2480.000	Average	85.28	13.05	98.34	-	-
2490.785	Peak	38.41	13.13	51.54	74.00	-22.46
2490.785	Average	27.13	13.13	40.25	54.00	-13.75

Test Mode:	8DPSK_EDR-3Mbps Hopping	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
2319.120	Peak	39.17	12.23	51.40	74.00	-22.60
2319.120	Average	27.40	12.23	39.63	54.00	-14.37
2444.995	Peak	82.98	12.82	95.80	-	-
2444.995	Average	79.40	12.82	92.22	-	-
2487.270	Peak	37.83	13.10	50.94	74.00	-23.06
2487.270	Average	26.63	13.10	39.73	54.00	-14.27

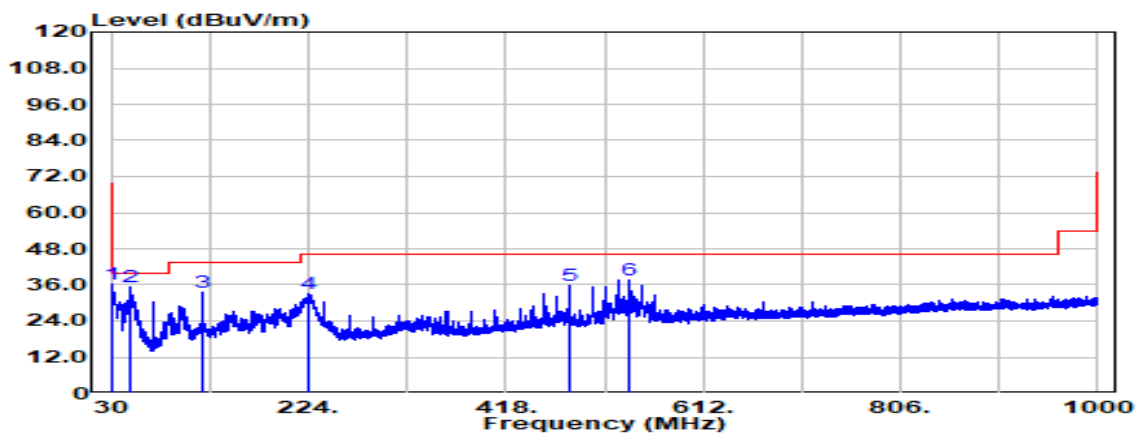
Test Mode:	8DPSK_EDR-3Mbps Hopping	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Band Edge	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak / Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
2325.200	Peak	39.48	12.24	51.72	74.00	-22.28
2325.200	Average	27.42	12.24	39.66	54.00	-14.34
2454.970	Peak	88.33	12.88	101.21	-	-
2454.970	Average	85.38	12.88	98.26	-	-
2496.010	Peak	38.97	13.16	52.14	74.00	-21.86
2496.010	Average	27.18	13.16	40.34	54.00	-13.66

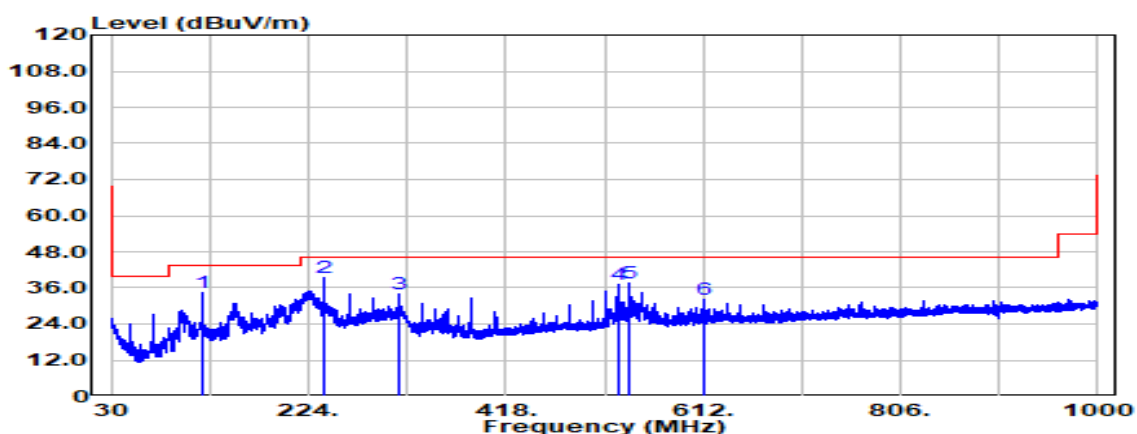
Below 1G Test Data

Test Mode:	GFSK_BDR-1Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	30MHz-1GHz	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
30.243	Peak	39.27	-2.86	36.41	40.00	-3.59
48.066	Peak	50.25	-14.81	35.44	40.00	-4.56
119.968	Peak	42.85	-9.39	33.46	43.50	-10.04
223.515	Peak	45.13	-11.92	33.21	46.00	-12.79
479.959	Peak	39.38	-3.60	35.78	46.00	-10.22
539.978	Peak	40.54	-2.90	37.64	46.00	-8.36

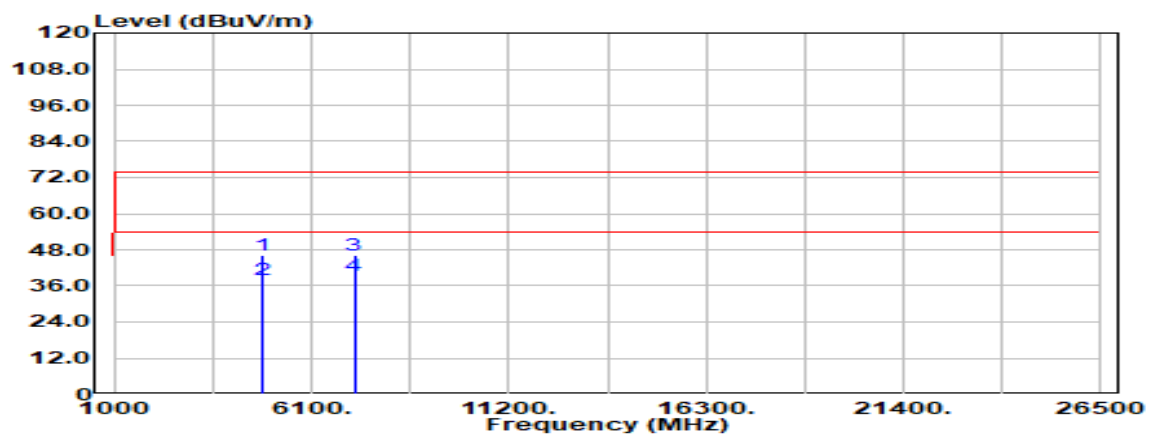
Test Mode:	GFSK_BDR-1Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	30MHz-1GHz	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
119.968	Peak	43.84	-9.39	34.45	43.50	-9.05
240.005	Peak	50.13	-10.86	39.26	46.00	-6.74
312.028	Peak	42.75	-8.63	34.13	46.00	-11.87
527.974	Peak	40.36	-3.19	37.17	46.00	-8.83
540.099	Peak	40.34	-2.90	37.43	46.00	-8.57
612.000	Peak	33.96	-1.76	32.19	46.00	-13.81

Above 1G Test Data

Test Mode:	GFSK_BDR-1Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak & Average		

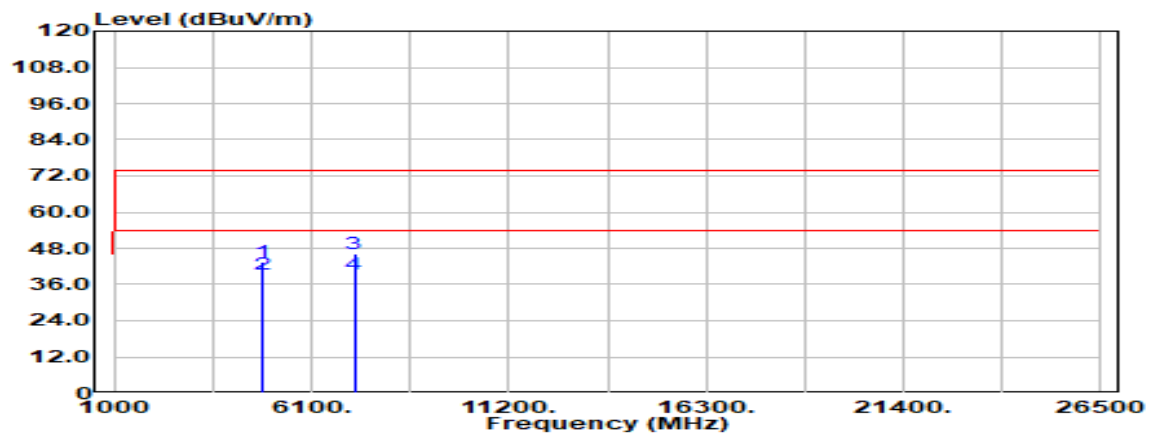


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4804.000	Peak	36.74	9.46	46.20	74.00	-27.80
4804.000	Average	28.65	9.46	38.11	54.00	-15.89
7206.000	Peak	32.62	13.51	46.13	74.00	-27.87
7206.000	Average	25.88	13.51	39.39	54.00	-14.61

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode:	GFSK_BDR-1Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak & Average		

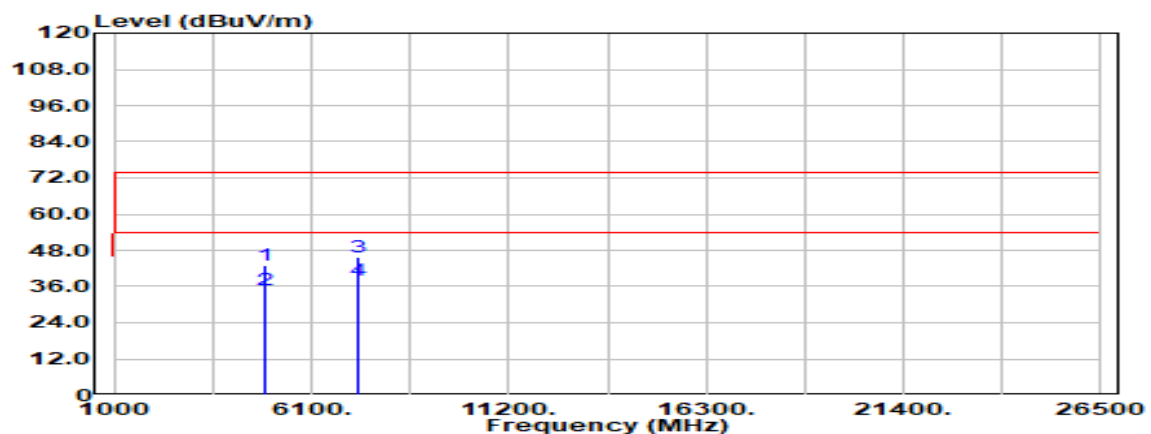


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4804.000	Peak	34.04	9.46	43.50	74.00	-30.50
4804.000	Average	29.80	9.46	39.26	54.00	-14.74
7206.000	Peak	32.55	13.51	46.06	74.00	-27.94
7206.000	Average	25.78	13.51	39.29	54.00	-14.71

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode:	GFSK_BDR-1Mbps Mid CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak & Average		

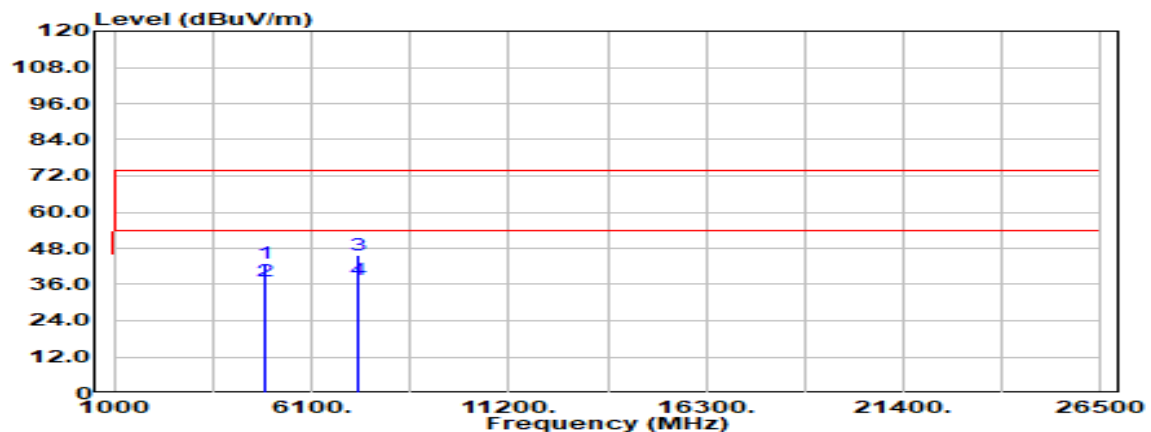


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4882.000	Peak	33.47	9.59	43.06	74.00	-30.94
4882.000	Average	25.24	9.59	34.83	54.00	-19.17
7323.000	Peak	32.45	13.24	45.69	74.00	-28.31
7323.000	Average	24.63	13.24	37.87	54.00	-16.13

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode:	GFSK_BDR-1Mbps Mid CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Tony Chao
Detector	Peak & Average		

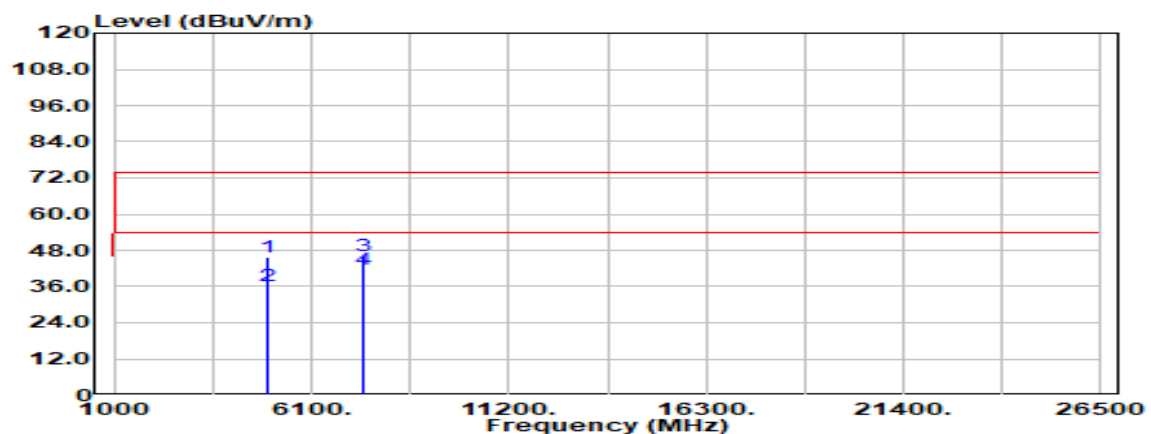


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4882.000	Peak	33.35	9.59	42.94	74.00	-31.06
4882.000	Average	27.54	9.59	37.13	54.00	-16.87
7323.000	Peak	32.34	13.24	45.58	74.00	-28.42
7323.000	Average	24.51	13.24	37.75	54.00	-16.25

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode:	GFSK_BDR-1Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Tony Chao
Detector	Peak & Average		

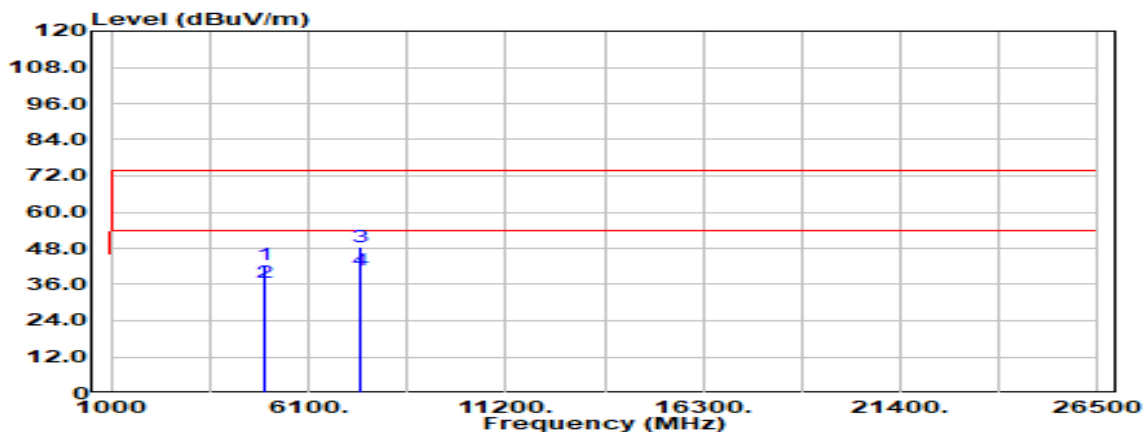


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4960.000	Peak	35.83	9.71	45.54	74.00	-28.46
4960.000	Average	26.60	9.71	36.31	54.00	-17.69
7440.000	Peak	32.70	13.54	46.24	74.00	-27.76
7440.000	Average	27.95	13.54	41.49	54.00	-12.51

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode:	GFSK_BDR-1Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak & Average		

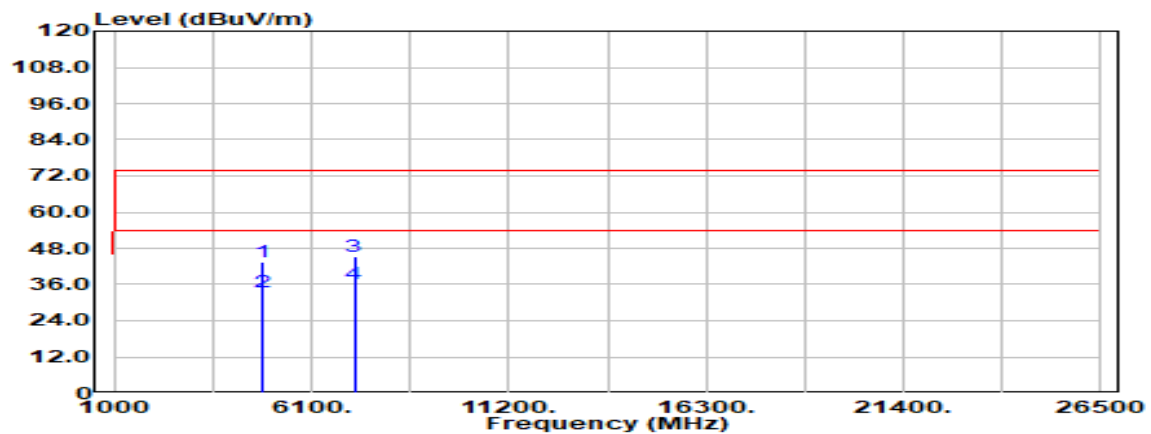


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4960.000	Peak	33.02	9.71	42.73	74.00	-31.27
4960.000	Average	26.95	9.71	36.66	54.00	-17.34
7440.000	Peak	35.05	13.54	48.59	74.00	-25.41
7440.000	Average	27.05	13.54	40.59	54.00	-13.41

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	8DPSK_EDR-3Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak & Average		

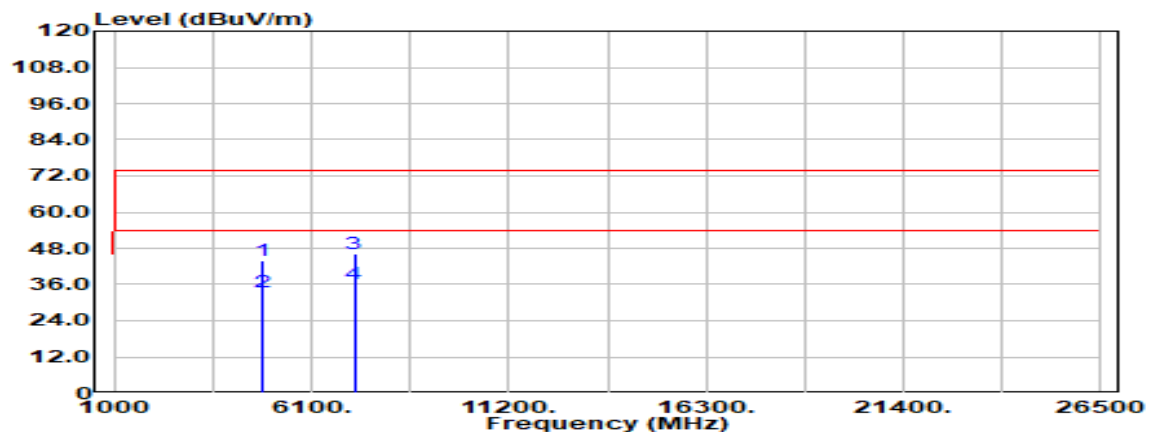


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
4804.000	Peak	33.91	9.46	43.38	74.00	-30.62
4804.000	Average	24.01	9.46	33.48	54.00	-20.52
7206.000	Peak	31.65	13.51	45.16	74.00	-28.84
7206.000	Average	22.69	13.51	36.20	54.00	-17.80

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	8DPSK_EDR-3Mbps Low CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak & Average		

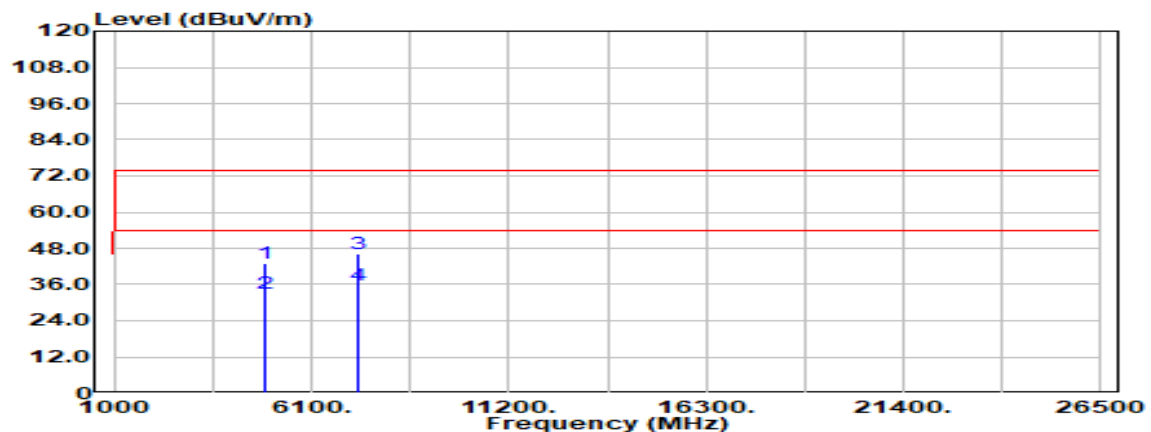


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
4804.000	Peak	34.56	9.46	44.02	74.00	-29.98
4804.000	Average	24.09	9.46	33.56	54.00	-20.44
7206.000	Peak	32.49	13.51	46.00	74.00	-28.00
7206.000	Average	22.72	13.51	36.23	54.00	-17.77

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	8DPSK_EDR-3Mbps Mid CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak & Average		

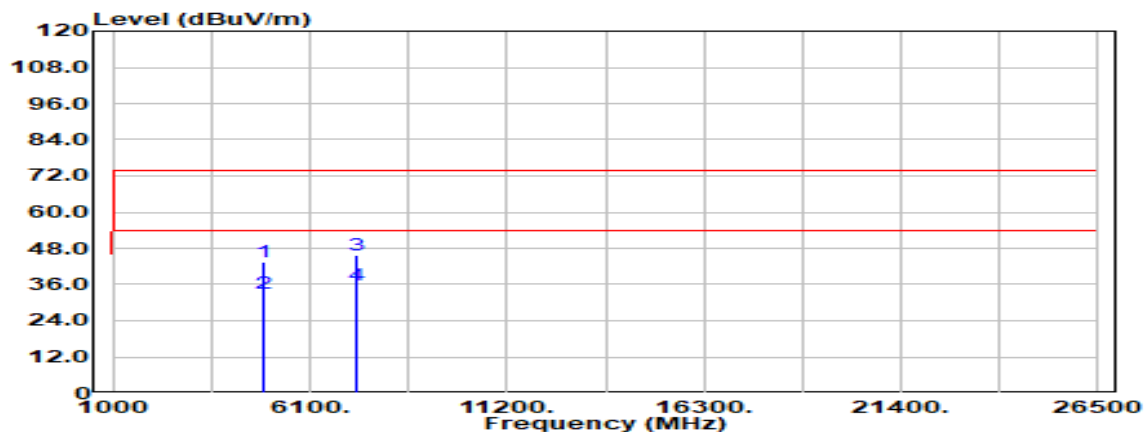


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
4882.000	Peak	33.37	9.59	42.97	74.00	-31.03
4882.000	Average	23.67	9.59	33.26	54.00	-20.74
7323.000	Peak	32.78	13.24	46.02	74.00	-27.98
7323.000	Average	22.54	13.24	35.78	54.00	-18.22

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	8DPSK_EDR-3Mbps Mid CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak & Average		

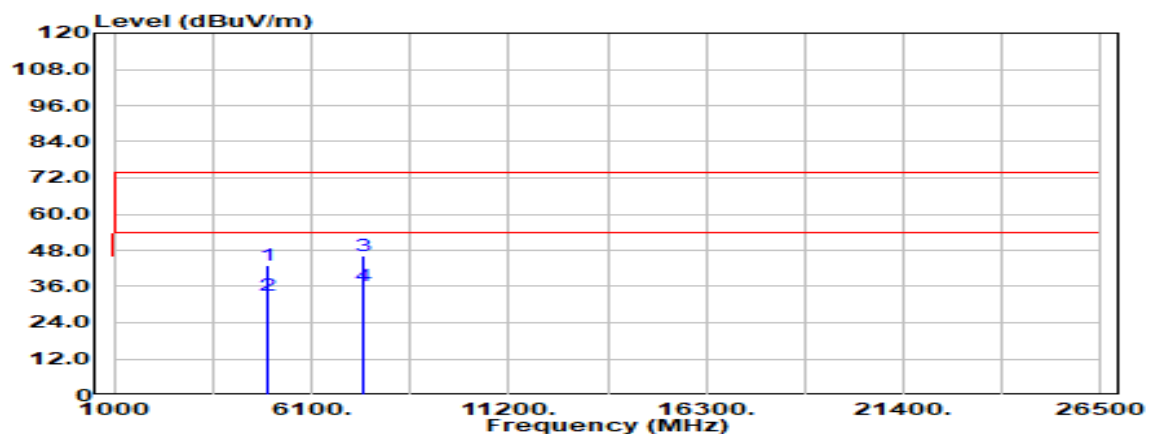


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit @3m (dBUV/m)	Margin (dB)
4882.000	Peak	33.78	9.59	43.37	74.00	-30.63
4882.000	Average	23.68	9.59	33.27	54.00	-20.73
7323.000	Peak	32.69	13.24	45.93	74.00	-28.07
7323.000	Average	22.71	13.24	35.95	54.00	-18.05

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	8DPSK_EDR-3Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Vertical	Test Engineer	Ray Li
Detector	Peak & Average		

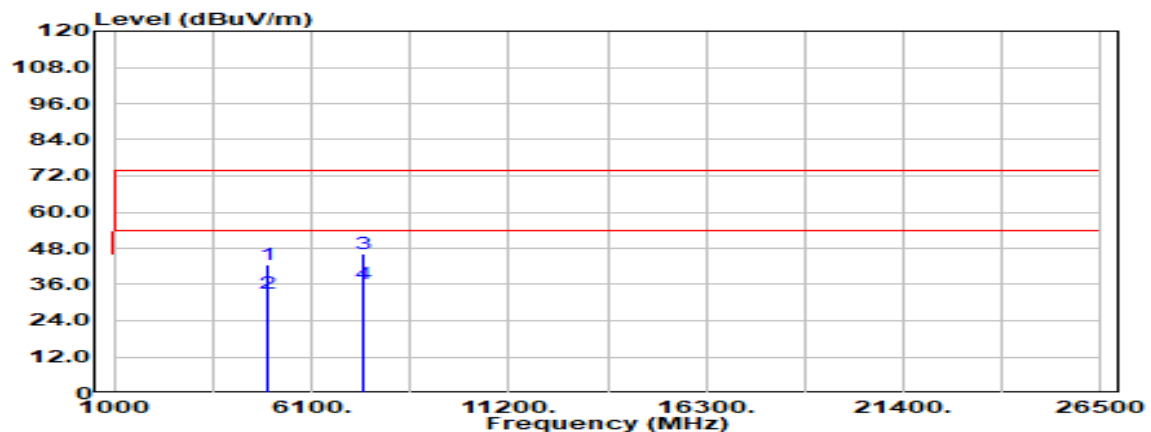


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4960.000	Peak	33.23	9.71	42.94	74.00	-31.06
4960.000	Average	23.40	9.71	33.10	54.00	-20.90
7440.000	Peak	32.74	13.54	46.28	74.00	-27.72
7440.000	Average	22.87	13.54	36.41	54.00	-17.59

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

Test Mode	8DPSK_EDR-3Mbps High CH	Temp/Hum	19.9(°C)/ 62%RH
Test Item	Harmonic	Test Date	March 25, 2022
Polarize	Horizontal	Test Engineer	Ray Li
Detector	Peak & Average		



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBμV)	Factor (dB)	Actual FS (dBμV/m)	Limit @3m (dBμV/m)	Margin (dB)
4960.000	Peak	32.81	9.71	42.52	74.00	-31.48
4960.000	Average	23.47	9.71	33.18	54.00	-20.82
7440.000	Peak	32.67	13.54	46.21	74.00	-27.79
7440.000	Average	22.81	13.54	36.35	54.00	-17.65

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

- End of Test Report -