



Project No: TM-2402000257P
Report No.: TMWK2402000545KR

FCC ID: JNF-BTS-319XP

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Rev.: 04

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
Product name	Wireless Handheld Barcode Scanner
Brand Name	ZEBEX
Model No.	Z-3190BT Plus, Z-3192BT Plus
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	June 7, 2024	Initial Issue	ALL	Peggy Tsai
01	July 3, 2024	See the following Note Rev. (01)	P.4, 6, 9, 11, 12, 33, 35,36	Peggy Tsai
02	July 9, 2024	See the following Note Rev. (02)	P. 1, 4, 9, 16, 25, 32, 34, 37, 39, 45, 65, 66	Peggy Tsai
03	July 15, 2024	See the following Note Rev. (03)	P. A-3	Peggy Tsai
04	July 18, 2024	See the following Note Rev. (04)	P. 4	Peggy Tsai

Note:

Rev. (01)

1. Added EUT Serial #: P90PH000001.
2. Modify antenna gain.
3. Modify instrument calibration in section 1.7.
4. Modify support and EUT accessories equipment in section 1.8.
5. Modify test set up diagram in section 1.9.
6. Modify test procedure in section 4.4.2.
7. Modify test data in section 4.4.4.

Rev. (02)

1. Modify model to Z-3190BT Plus, Z-3192BT Plus.
2. Modify HW Version in section 1.1.
3. Modify date of test in section 1.1.
4. Modify instrument calibration in section 1.7.
5. Modify TX test data in section 4.8.4.
6. Modify date of RF Conducted test.

Rev. (03)

1. Modify conducted emission set up photo.

Rev. (04)

1. Modify SW version.

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	ZEBEX INDUSTRIES INC. B1F.-1, No. 207, Sec. 3, Beixin Rd, Xindian Dist, New Taipei City 23143, Taiwan
Manufacturer	ZEBEX INDUSTRIES INC. B1F.-1, No. 207, Sec. 3, Beixin Rd, Xindian Dist, New Taipei City 23143, Taiwan
Equipment	Wireless Handheld Barcode Scanner
Model	Z-3190BT Plus, Z-3192BT Plus
Model Discrepancy	Z-3190BT Plus: CCD Wireless Handheld Barcode Scanner Z-3192BT Plus: 2D Image Wireless Handheld Barcode Scanner
Brand Name	ZEBEX
Received Date	February 22, 2024
Date of Test	March 15 ~ June 20, 2024
Power Supply	Power from Adapter. BILLION / BA018-050200HXX I/P: 100-240VAC, 0.5A, 50/60Hz O/P: 5.0VDC, 2.0A
EUT Serial #	P90PH000001
HW Version	023-190BP1-034 & 023-190BP2-034 & 023-190BP3-034
SW Version	Z-3190BT Plus: Z-3190BT+(H02.x0) 09:27:50 Date:11/28/2023 Z-3192BT Plus: Z-3192BT+(M01.03) Ver:01.00 Jul 11 2024 SN:20240319 BT Controller(H02.B2) BT0103 Jul 12 2024

Remark:

- For more details, please refer to the User's manual of the EUT.
- Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
- Disclaimer: Variant information between/among model numbers / trademarks are provided by the applicant, test results of this report are applicable to the sample EUT received of main test model name.)

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

The Rx input bandwidths shift frequencies in synchronization with the transmitted signals.

In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in standard when the transmitter is presented with a continuous data (or information) system.

In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

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 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	☐ PIFA ☐ PCB ☐ Dipole ☒ Chip
Antenna Gain	Gain: 2.13 dBi
Antenna Connector	N/A

Notes:

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.

1.5 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.213 dB
Channel Bandwidth	± 2.7 %
RF output power (Power Meter + Power sensor)	± 0.243 dB
Power Spectral density	± 2.739 dB
Conducted Bandedge	± 2.739 dB
Conducted Spurious Emission	± 2.742 dB
Radiated Emission_9kHz-30MHz	± 3.761 dB
Radiated Emission_30MHz-200MHz	± 3.473 dB
Radiated Emission_200MHz-1GHz	± 3.946 dB
Radiated Emission_1GHz-6GHz	± 4.797 dB
Radiated Emission_6GHz-18GHz	± 4.803 dB
Radiated Emission_18GHz-26GHz	± 3.459 dB
Radiated Emission_26GHz-40GHz	± 3.297 dB

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.

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.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan 24803

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Czerny Lin	-
Radiation	Tony Chao 、 Ray Li	-
RF Conducted	Jerry Chang	-

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

Conducted_FCC/IC/NCC (All)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Sensor	Anritsu	MA2411B	1911387	2023-07-25	2024-07-24
Power Meter	Anritsu	ML2496A	2136002	2023-11-16	2024-11-15
EXA Signal Analyzer	Keysight	N9010A	MY54200716	2023-10-13	2024-10-12
EXA Signal Analyzer	Keysight	N9030B	MY62291089	2023-10-13	2024-10-12
Software	Radio Test Software Ver. 21 & E3-Ver: 6.11-20180413				

966A_Radiated					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Signal Analyzer	KEYSIGHT	N9010A	MY54200716	2023-10-13	2024-10-12
Thermo-Hygro Meter	WISEWIND	1206	D07	2023-12-08	2024-12-07
Loop Antenna	COM-POWER	AL-130	121051	2023-05-23	2024-05-22
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2023-08-08	2024-08-07
Preamplifier	EMEC	EM330	060609	2024-02-21	2025-02-20
Cable	Huber+Suhner	104PEA	20995+21000+182330	2024-02-21	2025-02-20
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-12-28	2024-12-27
Preamplifier	HP	8449B	3008A00965	2023-12-22	2024-12-21
Cable	EMCI	EMC101G	221213+221011+221012	2023-10-17	2024-10-16
Attenuator	Mini-Circuits	BW-S9W5	BWS9W5-09-966A-01	2024-02-07	2025-02-06
High Pass Filters	Titan Microwave	T04H30001800070S01	22011402-4	2023-06-17	2024-06-16
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2023-12-13	2024-12-12
Pre-Amplifier	EMCI	EMC184045SE	980860	2023-12-12	2024-12-11
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Site Validation	CCS	966A	N/A	2023-07-10	2024-07-09
Software	e3 V9-210616c				

Remark:

- Each piece of equipment is scheduled for calibration once a year.
- N.C.R. = No Calibration Required.

AC Mains Conduction					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI	100064	2023-06-07	2024-06-06
LISN	TESEQ	LN2-16N	22012	2024-02-29	2025-02-27
Cable	EMCI	CFD300-NL	CERF	2023-06-27	2024-06-26
Software	e3 V6-110812				

Remark:

1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

1.8 SUPPORT AND EUT ACCESSORIES EQUIPMENT

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

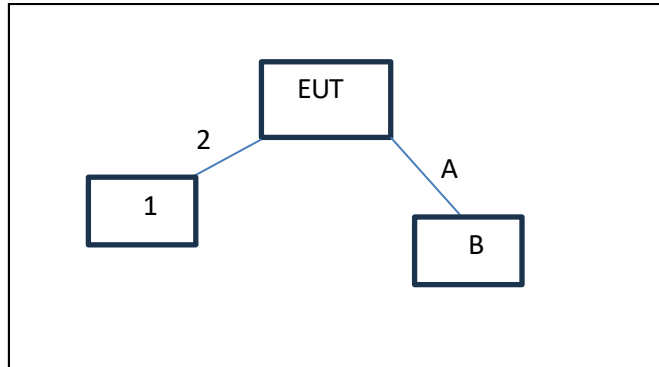
Support Equipment (Conducted)					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	NB(L)	Lenovo	X260	N/A	N/A
2	Micro to USB Cable	Pro-Best	MK-USB-MIN5MBM-100	N/A	N/A
A	USB to Type C Cable	WHALETURN	USB A/M TO Type C/M L=1.5M	N/A	N/A
B	Adapter	BILLION	BA018-050200HXX	N/A	N/A

Support Equipment (Conduction)					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
2	Adapter	BILLION	BA018-050200HXX	N/A	N/A
3	Micro to USB Cable	Pro-Best	MK-USB-MIN5MBM-100	N/A	N/A
A	Type C Cable	WHALETURN	USB A/M TO Type C/M L=1.5M	N/A	N/A

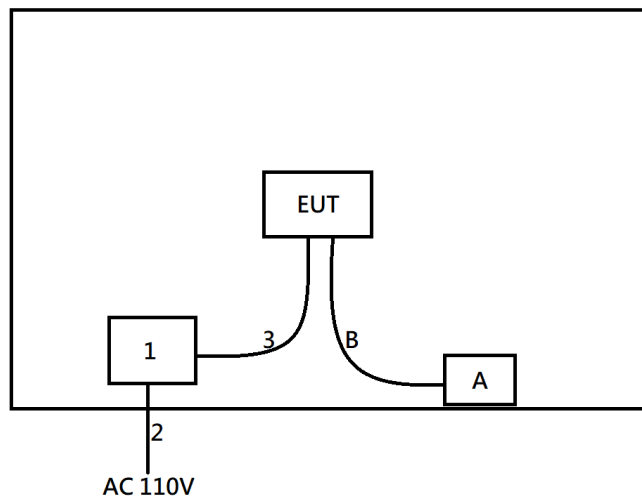
Support Equipment (RSE)					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
2	Adapter	Lenovo	ADLX45DLC3A	N/A	N/A
3	Micro to USB Cable	Smays	SMAYS-6FT	N/A	N/A
A	Adapter	BILLION	BA018-050200HXX	N/A	N/A
B	Type C Cable	WHALETURN	USB A/M TO Type C/M L=1.5M	N/A	N/A

1.9 TEST SET UP DIAGRAM

Conducted:



RSE:



1.10 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, KDB 558074.

2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	Pass
15.247(a)(1)	4.2	20 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(1)	4.3	Output Power Measurement	Pass
15.247(a)(1)	4.4	Frequency Separation	Pass
15.247(a)(1)(iii)	4.5	Number of Hopping	Pass
15.247(d)	4.6	Conducted Band Edge	Pass
15.247(d)	4.6	Conducted Spurious Emission	Pass
15.247(a)(1)(iii)	4.7	Time of Occupancy	Pass
15.247(d) 15.205, 15.209	4.8	Radiation Band Edge	Pass
15.247(d) 15.205, 15.209	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 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 2Mbps: 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.The system support GFSK , $\pi/4$ DQPSK ,8DPSK , the $\pi/4$ DQPSK were reduced since the identical parameters with 8dpsk. In the following test items, frequency hopping, Conducted band edge, radiated band edge and spurious emissions.

3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1: EUT Power by Adapter
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

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

Remark:

1. The worst mode was record in this test report.
2. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.
3. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(Y-Plane) were recorded in this report

3.3 EUT DUTY CYCLE

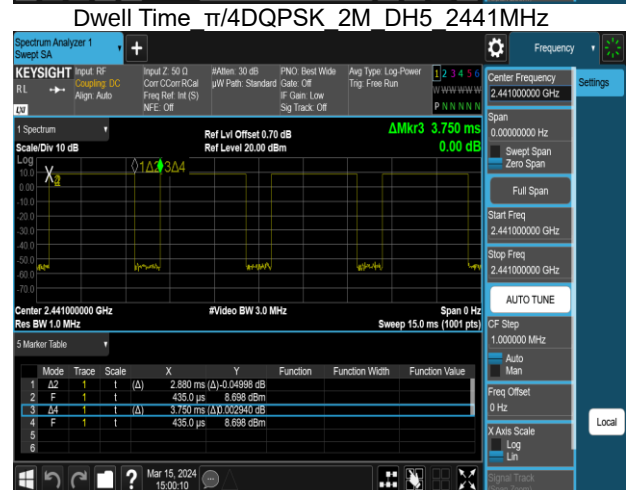
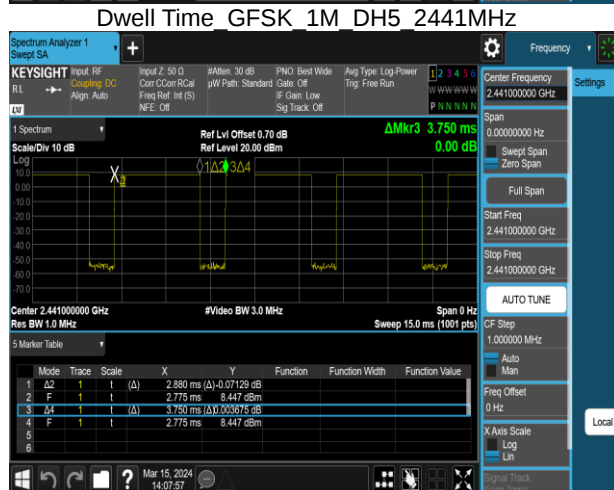
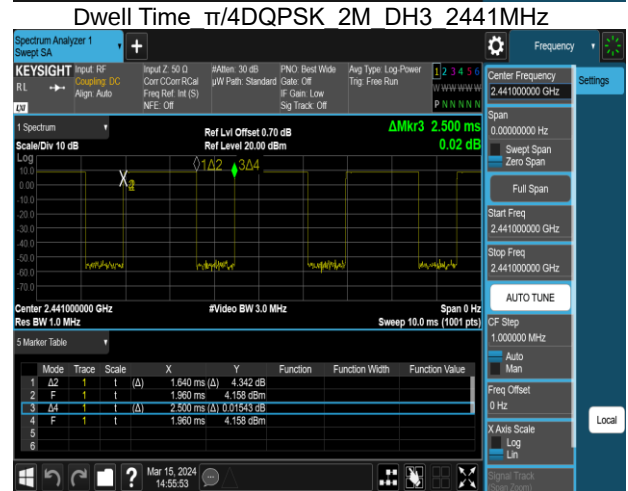
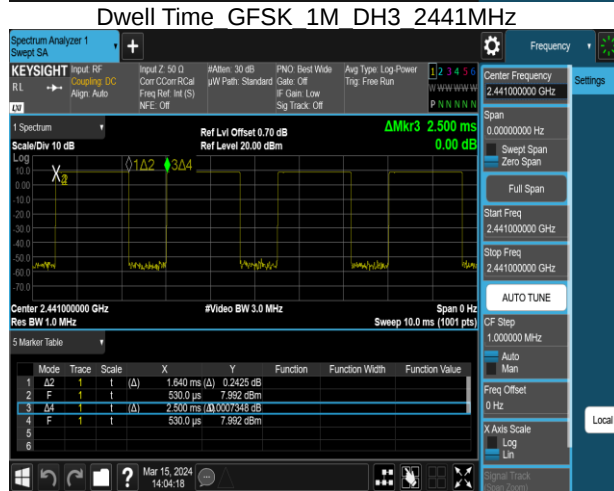
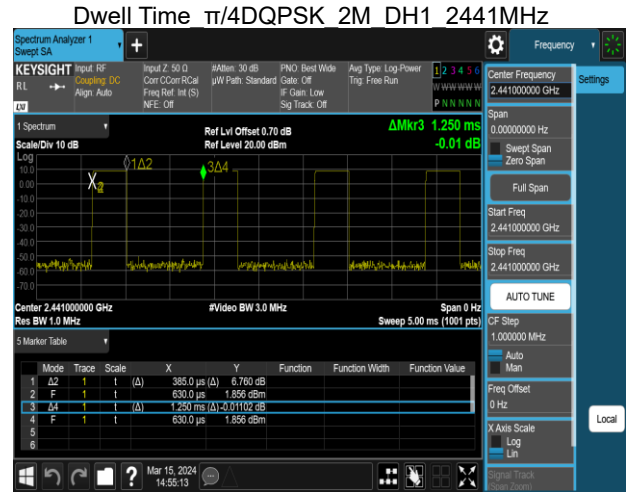
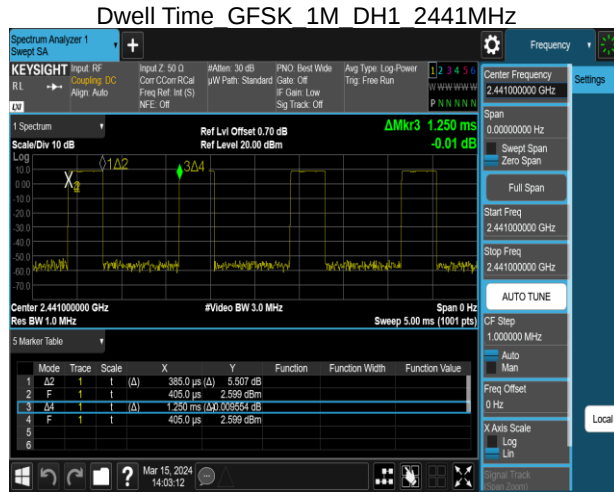
Temperature: 20.4 ~ 22.1℃

Test date: March 15 ~ June 20, 2024

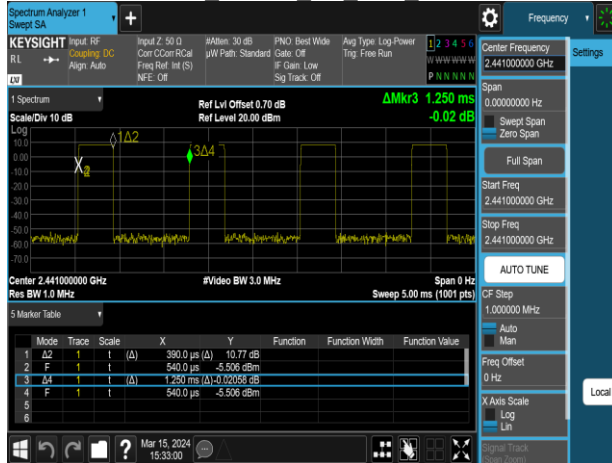
Humidity: 57 ~ 59% RH

Tested by: Jerry Chang

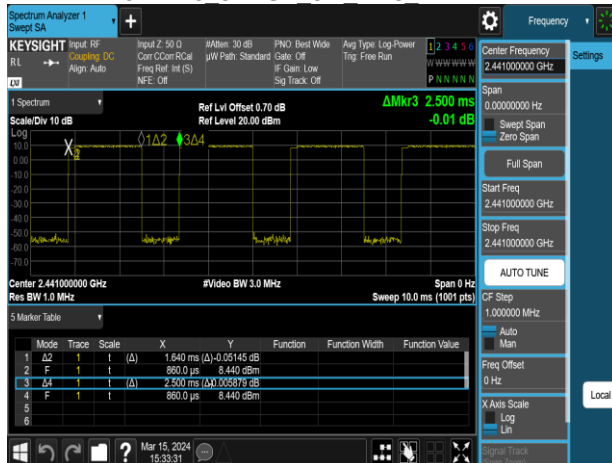
	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
DH1	30.80	5.11	2.60	3.00
DH3	65.60	1.83	0.61	1.00
DH5	76.80	1.15	0.35	1.00
2DH1	30.80	5.11	2.60	3.00
2DH3	65.60	1.83	0.61	1.00
2DH5	76.80	1.15	0.35	1.00
3DH1	31.20	5.06	2.56	3.00
3DH3	65.60	1.83	0.61	1.00
3DH5	77.20	1.12	0.35	1.00



Dwell Time 8DPSK 3M DH1 2441MHz



Dwell Time 8DPSK 3M DH3 2441MHz



Dwell Time 8DPSK 3M DH5 2441MHz



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

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

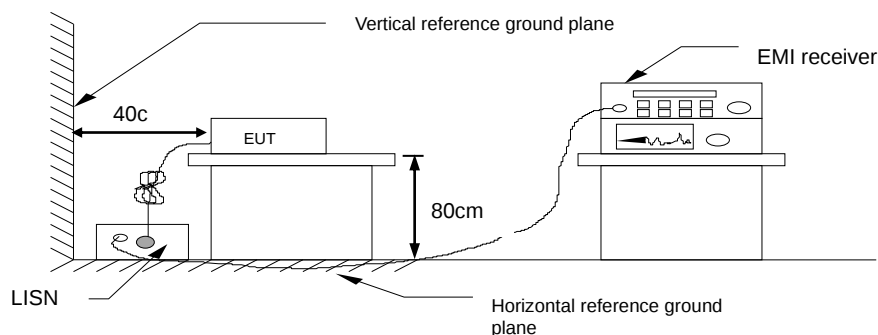
* Decreases with the logarithm of the frequency.

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



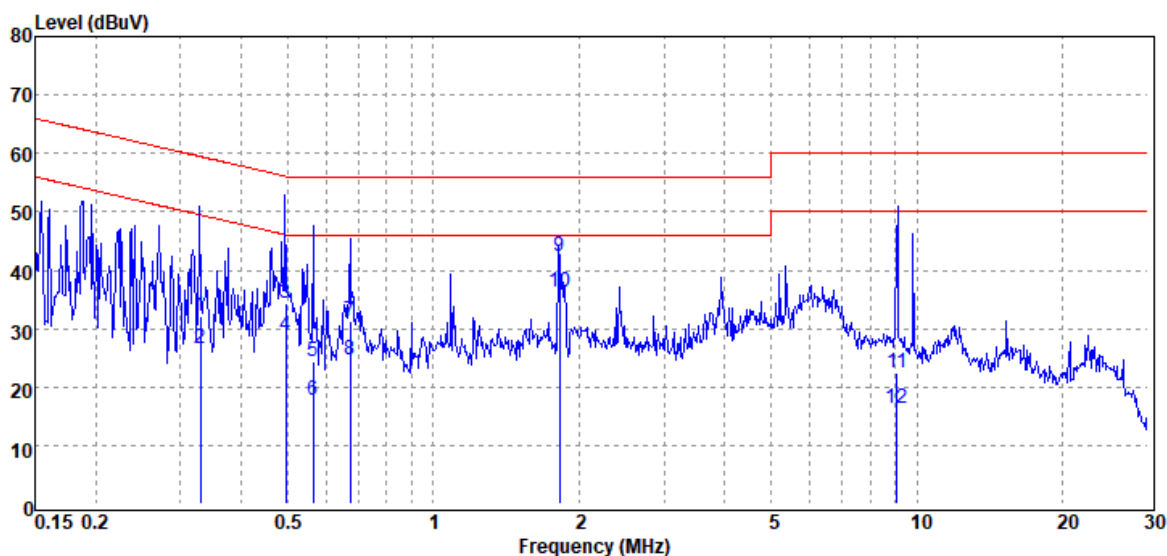
4.1.4 Test Result

PASS

Test Data

Project No : TM-2403000257P
Operation Mode : BT
Test Chamber : Conduction
Probe : LINE
Note :

Test Date : 2024-03-20
Temp./Humi. : 24.6°C / 54%
Engineer : Czerny Lin
Test Voltage : AC 120V/60Hz



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.330	QP	31.98	0.15	32.13	59.46	-27.33
0.330	Average	26.32	0.15	26.47	49.46	-22.99
0.496	QP	34.14	0.15	34.29	56.07	-21.78
0.496	Average	28.75	0.15	28.90	46.07	-17.17
0.565	QP	24.20	0.15	24.35	56.00	-31.65
0.565	Average	17.60	0.15	17.75	46.00	-28.25
0.673	QP	31.20	0.16	31.36	56.00	-24.64
0.673	Average	24.44	0.16	24.60	46.00	-21.40
1.821	QP	42.24	0.21	42.45	56.00	-13.55
1.821	Average	36.05	0.21	36.26	46.00	-9.74
9.080	QP	22.01	0.35	22.36	60.00	-37.64
9.080	Average	15.98	0.35	16.33	50.00	-33.67

Note: 1. Actual FS= Spectrum Read Level + Factor

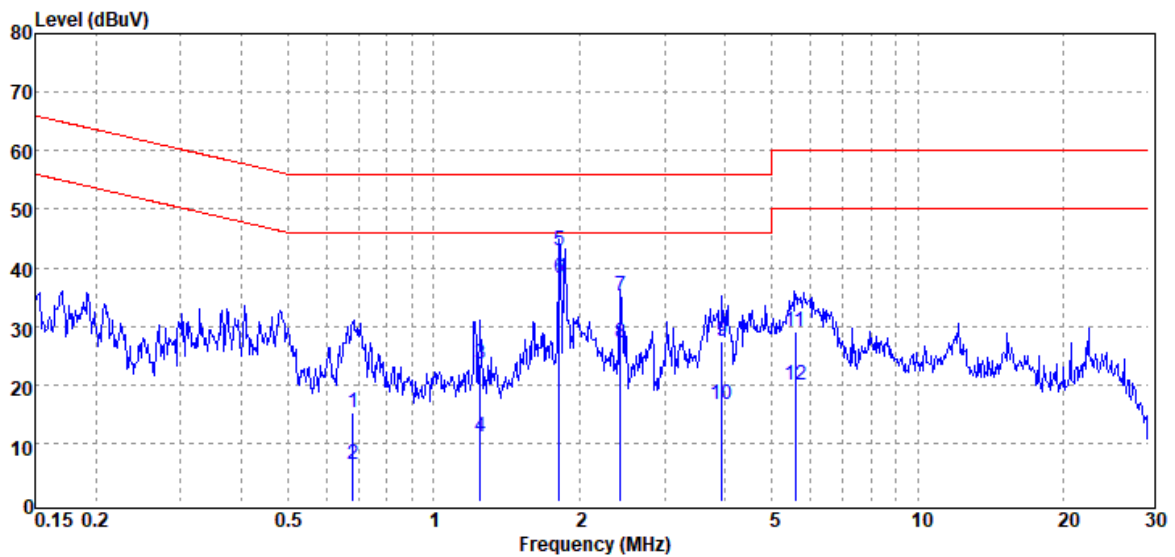
Note: 2. Margin= Actual FS – Limit

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Project No : TM-2403000257P
Operation Mode : BT
Test Chamber : Conduction
Probe : NEUTRAL
Note :

Test Date : 2024-03-20
Temp./Humi. : 24.6°C / 54%
Engineer : Czerny Lin
Test Voltage : AC 120V/60Hz



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.680	QP	14.91	0.21	15.12	56.00	-40.88
0.680	Average	6.03	0.21	6.24	46.00	-39.76
1.247	QP	23.23	0.22	23.45	56.00	-32.55
1.247	Average	10.90	0.22	11.12	46.00	-34.88
1.819	QP	42.65	0.25	42.90	56.00	-13.10
1.819	Average	37.96	0.25	38.21	46.00	-7.79
2.429	QP	34.97	0.28	35.25	56.00	-20.75
2.429	Average	26.72	0.28	27.00	46.00	-19.00
3.940	QP	27.02	0.31	27.33	56.00	-28.67
3.940	Average	16.38	0.31	16.69	46.00	-29.31
5.575	QP	28.67	0.34	29.01	60.00	-30.99
5.575	Average	19.70	0.34	20.04	50.00	-29.96

Note: 1. Actual FS= Spectrum Read Level + Factor

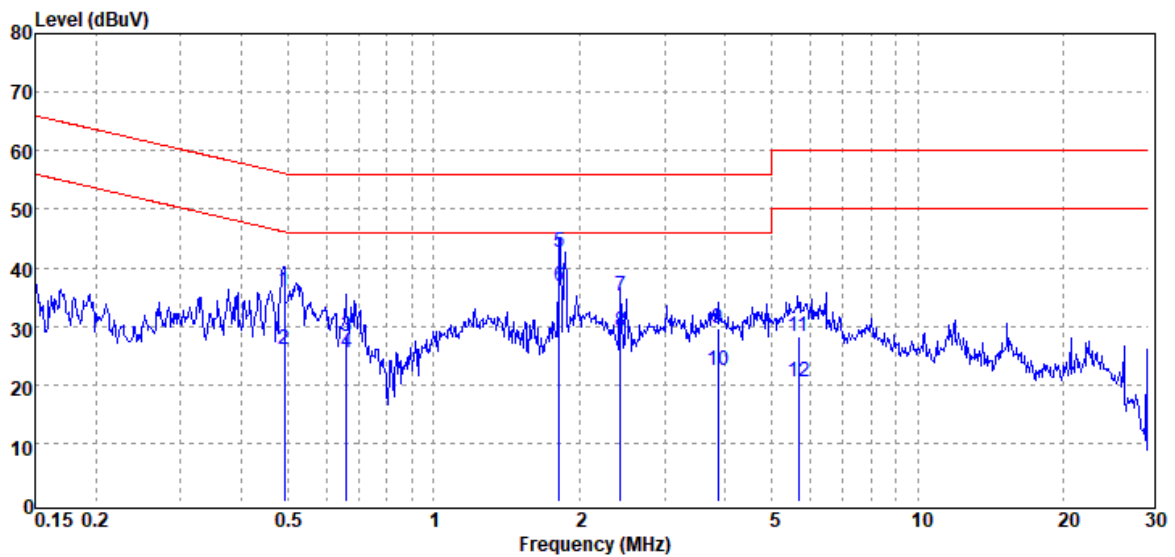
Note: 2. Margin= Actual FS – Limit

Report No.: TMWK2402000545KR

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Rev.: 04

Project No : TM-2403000257P
Operation Mode : BT
Test Chamber : Conduction
Probe : LINE
Note :

Test Date : 2024-03-20
Temp./Humi. : 24.6°C / 54%
Engineer : Czerny Lin
Test Voltage : AC 240V/60Hz



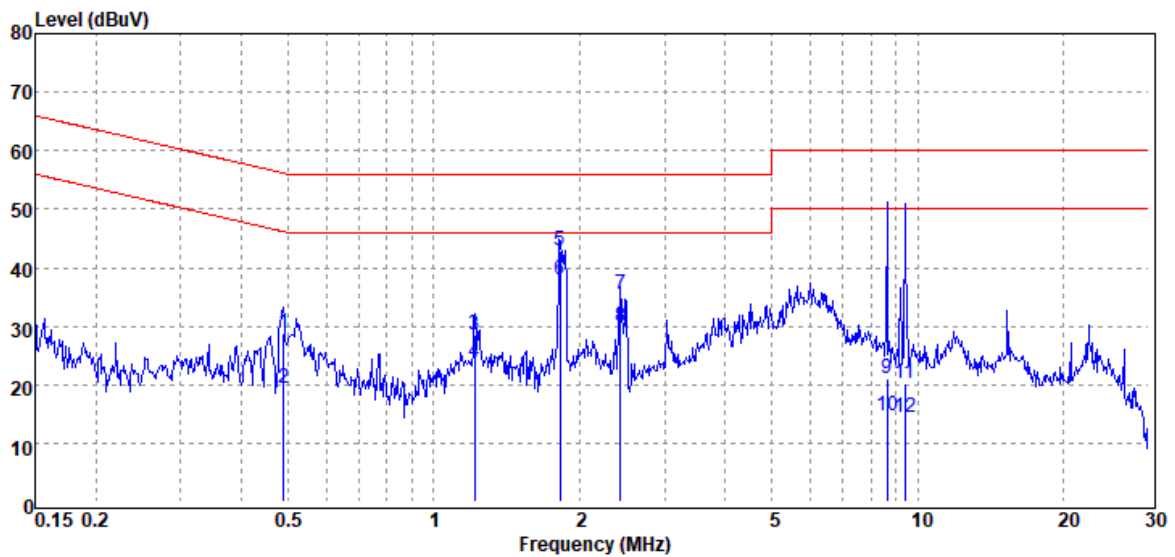
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.491	QP	35.70	0.15	35.85	56.16	-20.31
0.491	Average	25.94	0.15	26.09	46.16	-20.07
0.660	QP	28.17	0.16	28.33	56.00	-27.67
0.660	Average	25.31	0.16	25.47	46.00	-20.53
1.819	QP	42.46	0.21	42.67	56.00	-13.33
1.819	Average	36.48	0.21	36.69	46.00	-9.31
2.426	QP	34.96	0.24	35.20	56.00	-20.80
2.426	Average	28.78	0.24	29.02	46.00	-16.98
3.861	QP	29.45	0.26	29.71	56.00	-26.29
3.861	Average	22.10	0.26	22.36	46.00	-23.64
5.661	QP	27.84	0.30	28.14	60.00	-31.86
5.661	Average	20.18	0.30	20.48	50.00	-29.52

Note: 1. Actual FS= Spectrum Read Level + Factor

Note: 2. Margin= Actual FS – Limit

Project No : TM-2403000257P
Operation Mode : BT
Test Chamber : Conduction
Probe : NEUTRAL
Note :

Test Date : 2024-03-20
Temp./Humi. : 24.6°C / 54%
Engineer : Czerny Lin
Test Voltage : AC 240V/60Hz



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.489	QP	28.54	0.19	28.73	56.18	-27.45
0.489	Average	19.28	0.19	19.47	46.18	-26.71
1.213	QP	28.20	0.22	28.42	56.00	-27.58
1.213	Average	23.58	0.22	23.80	46.00	-22.20
1.822	QP	42.74	0.25	42.99	56.00	-13.01
1.822	Average	37.60	0.25	37.85	46.00	-8.15
2.426	QP	35.06	0.28	35.34	56.00	-20.66
2.426	Average	29.62	0.28	29.90	46.00	-16.10
8.651	QP	20.69	0.38	21.07	60.00	-38.93
8.651	Average	14.33	0.38	14.71	50.00	-35.29
9.413	QP	19.86	0.39	20.25	60.00	-39.75
9.413	Average	14.07	0.39	14.46	50.00	-35.54

Note: 1. Actual FS= Spectrum Read Level + Factor

Note: 2. Margin= Actual FS – Limit

4.2 20dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

4.2.1 Test Limit

According to §15.247(a) (1),

20 dB Bandwidth : For reporting purposes only.

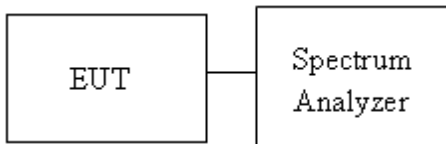
Occupied Bandwidth(99%) : For reporting purposes only.

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 = 30kHz, VBW = 100kHz and Detector = Peak, to measurement 20 dB Bandwidth and 99% Bandwidth.
4. 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: 20.4 ~ 22.1°C

Test date: March 15 ~ June 20, 2024

Humidity: 57 ~ 59% RH

Tested by: Jerry Chang

20dB BANDWIDTH

GFSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	0.9567	0.64
Mid	0.9562	0.64
High	0.9562	0.64

$\pi/4$ -DQPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	0.688	0.46
Mid	0.689	0.46
High	0.684	0.46

8-DPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	0.690	0.46
Mid	0.694	0.46
High	0.692	0.46

BANDWIDTH 99%

GFSK

CH	99% BW (MHz)
Low	0.86862
Mid	0.872
High	0.86767

$\pi/4$ -DQPSK

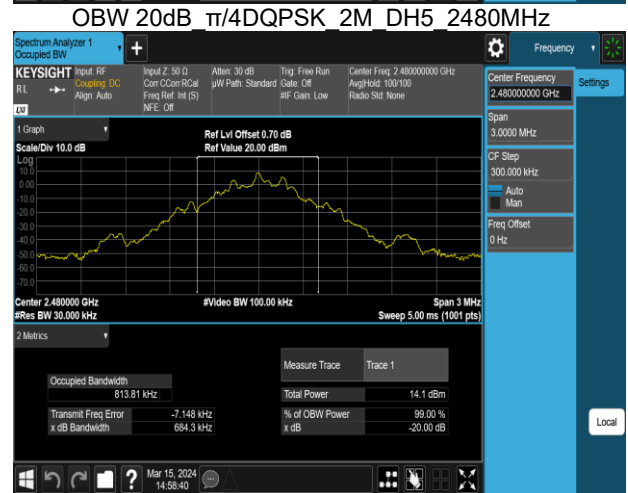
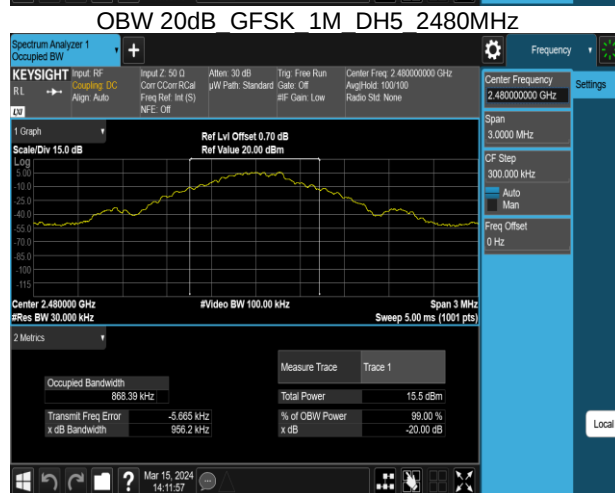
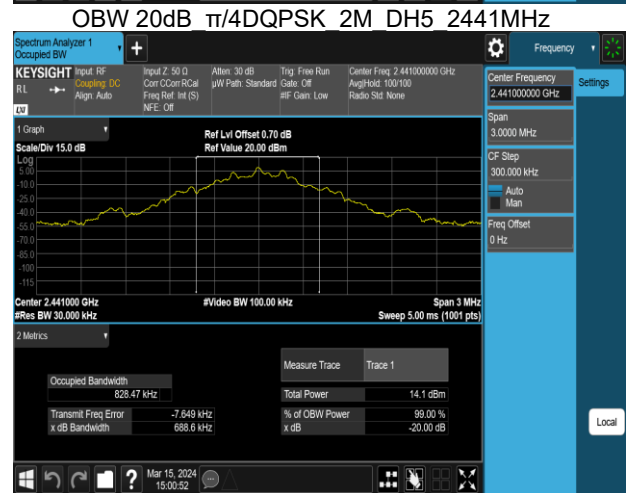
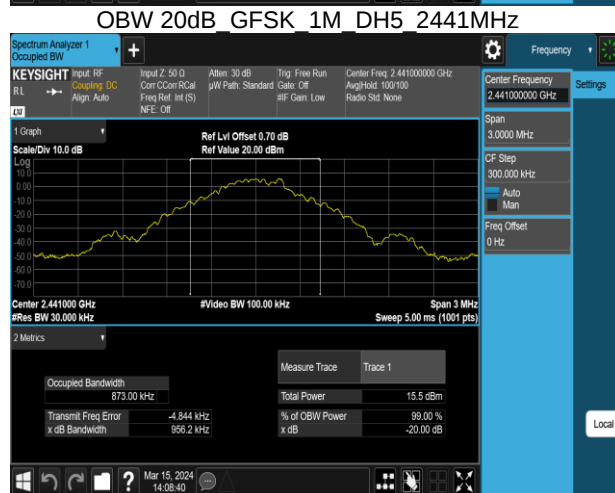
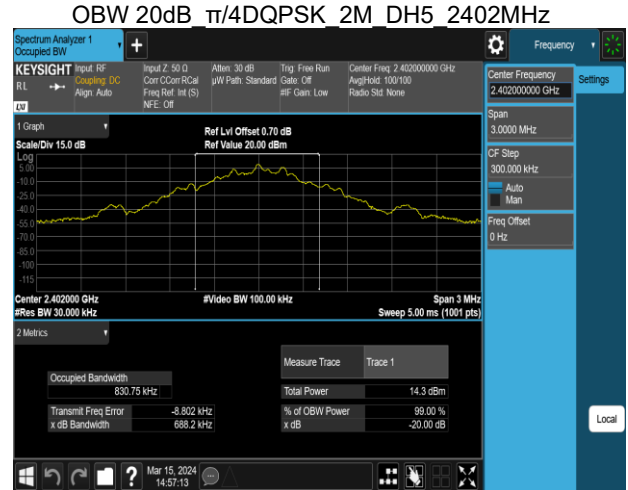
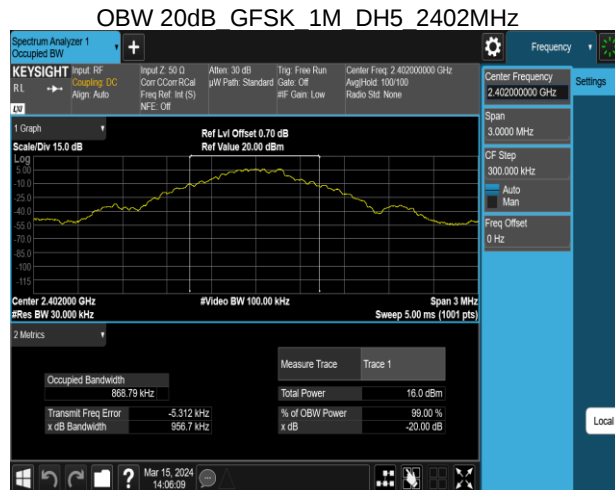
CH	99% BW (MHz)
Low	0.8190
Mid	0.8306
High	0.8251

8-DPSK

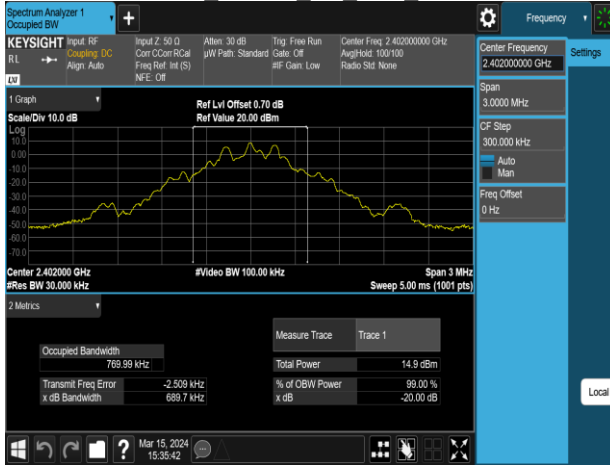
CH	99% BW (MHz)
Low	0.7719
Mid	0.7795
High	0.7726

Test Data

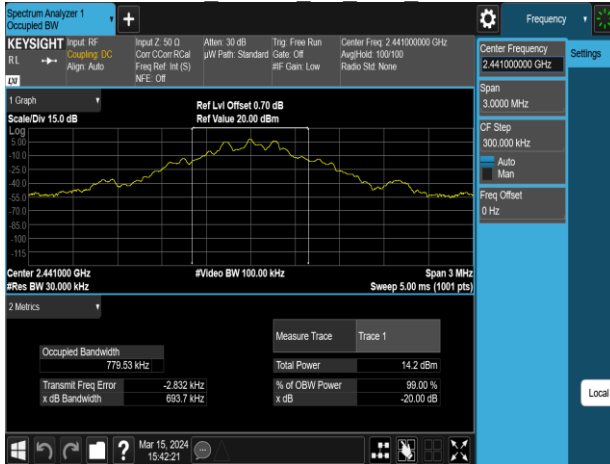
20dB BANDWIDTH



OBW 20dB 8DPSK 3M DH5 2402MHz



OBW 20dB 8DPSK 3M DH5 2441MHz

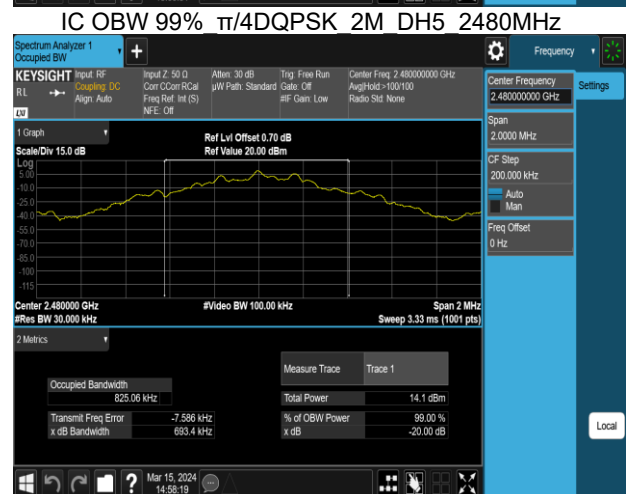
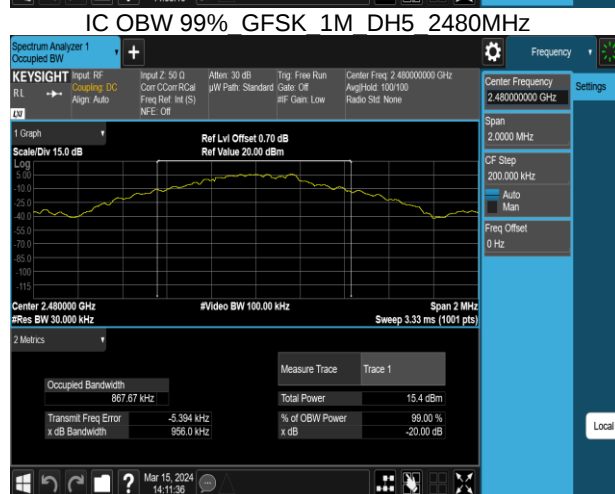
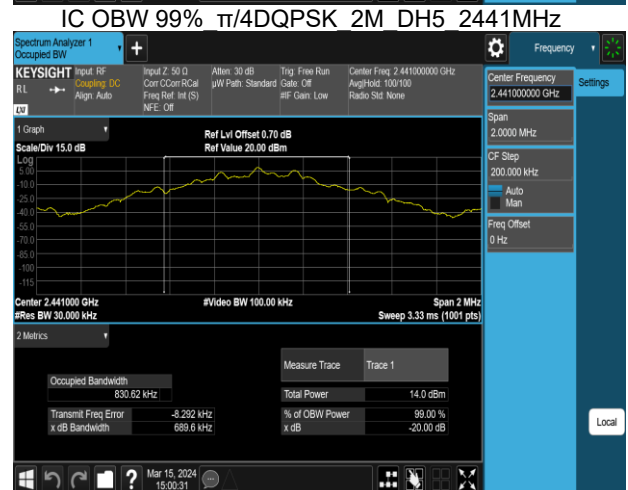
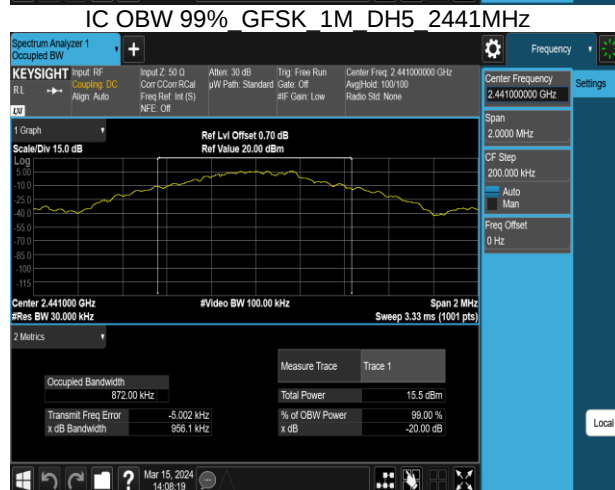
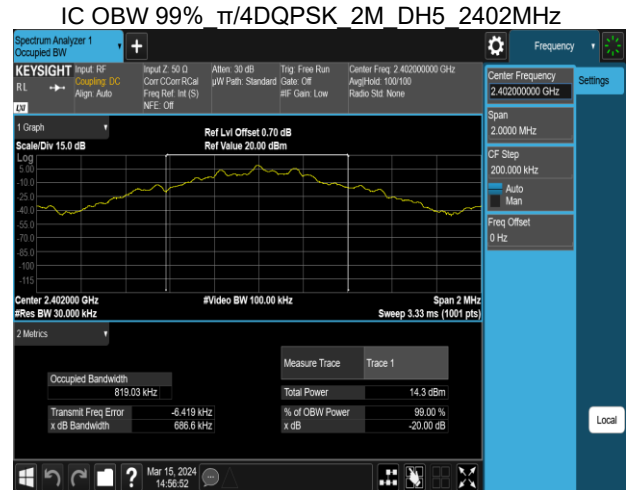
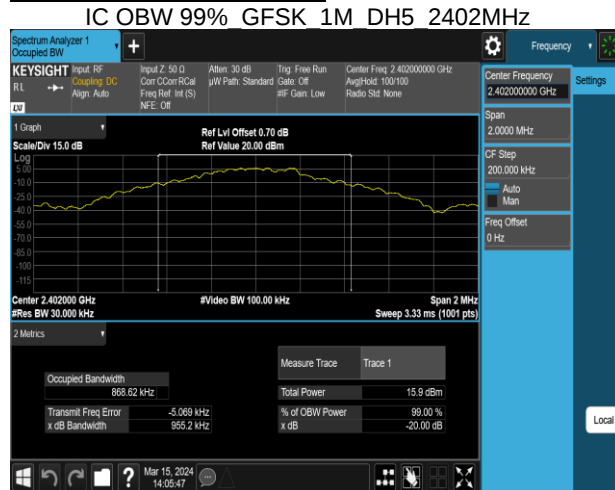


OBW 20dB 8DPSK 3M DH5 2480MHz



Test Data

BANDWIDTH 99%



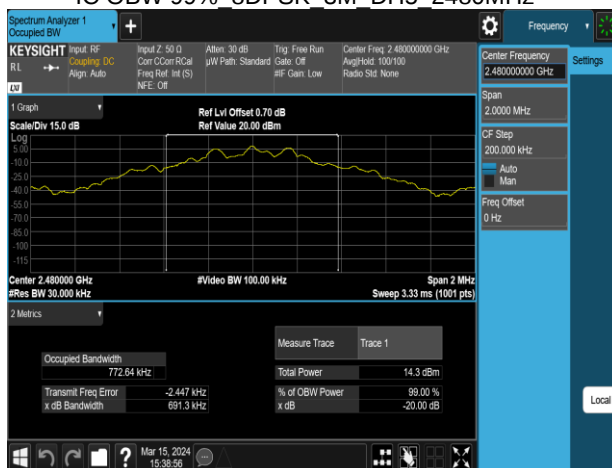
IC OBW 99% 8DPSK 3M DH5 2402MHz



IC OBW 99% 8DPSK 3M DH5 2441MHz



IC OBW 99% 8DPSK 3M DH5 2480MHz



4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(a)(1),

Peak output power :

FCC

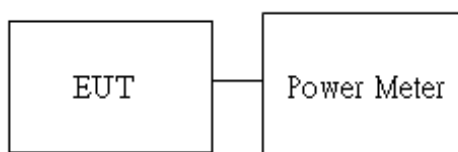
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

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



4.3.4 Test Result

Temperature: 20.4 ~ 22.1℃

Test date: March 15 ~ June 20, 2024

Humidity: 57 ~ 59% RH

Tested by: Jerry Chang

Peak & Average output power :

1M BR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	8.08	6.427	1000
Mid	2441	default	7.86	6.109	1000
High	2480	default	7.88	6.138	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	7.69	5.870	1000
Mid	2441	default	7.81	6.034	1000
High	2480	default	7.83	6.062	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	8.38	6.887	125
Mid	2441	default	7.87	6.124	125
High	2480	default	7.78	5.998	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	7.98	6.275	125
Mid	2441	default	7.83	6.062	125
High	2480	default	7.73	5.924	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	8.54	7.145	125
Mid	2441	default	7.91	6.180	125
High	2480	default	7.87	6.124	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	7.97	6.272	125
Mid	2441	default	7.85	6.101	125
High	2480	default	7.83	6.073	125

Note: Measured by power meter, cable loss + Duty cycle factor has been offsetted to the power meter for Avg. power and cable loss has been offsetted for Peak power measurement.

4.4 FREQUENCY SEPARATION

4.4.1 Test Limit

According to §15.247(a)(1),

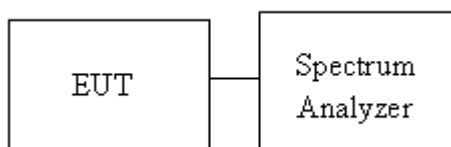
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 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: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
 - VBW $\geq$ RBW, Sweep = auto.
 - Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency.

4.4.3 Test Setup



4.4.4 Test Result

Temperature: 20.4 ~ 22.1℃

Test date: March 15 ~ June 20, 2024

Humidity: 57 ~ 59% RH

Tested by: Jerry Chang

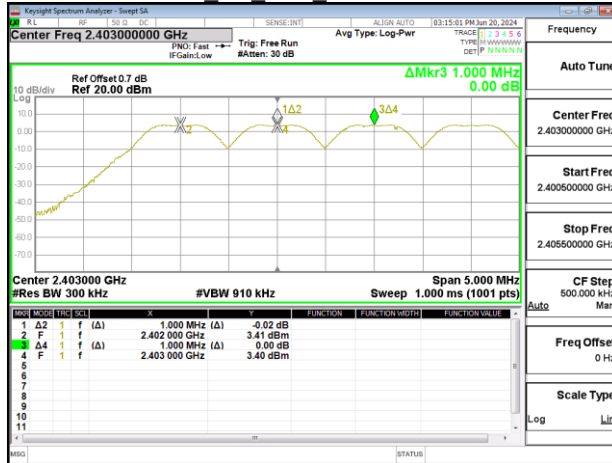
Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.64	PASS
Mid	2441	1.000	0.64	PASS
High	2480	1.000	0.64	PASS

Test mode: $\pi/4$ -DQPSK_2Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.46	PASS
Mid	2441	1.000	0.46	PASS
High	2480	1.000	0.46	PASS

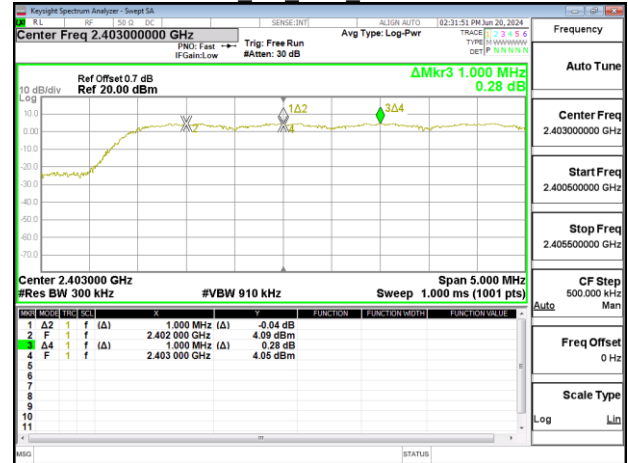
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.46	PASS
Mid	2441	1.000	0.46	PASS
High	2480	1.000	0.46	PASS

Test Data

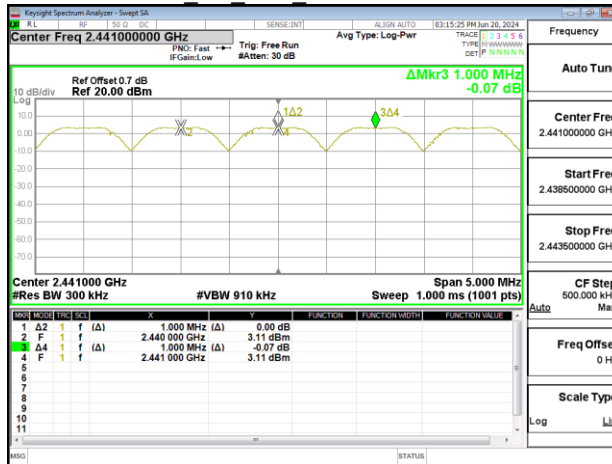
GFSK 1M DH5 CH0CH1CH2



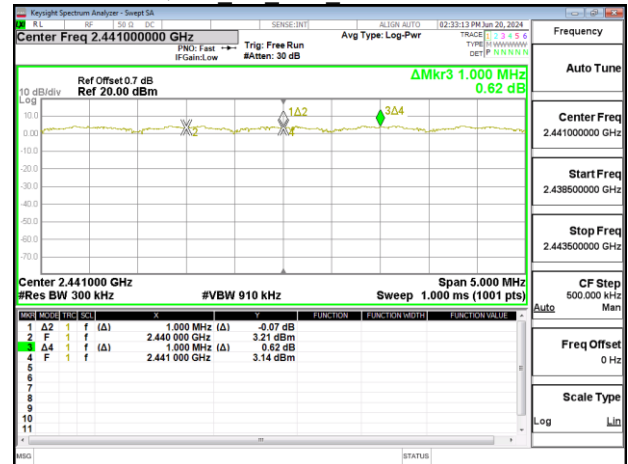
π/4DQPSK 2M DH5 CH0CH1CH2



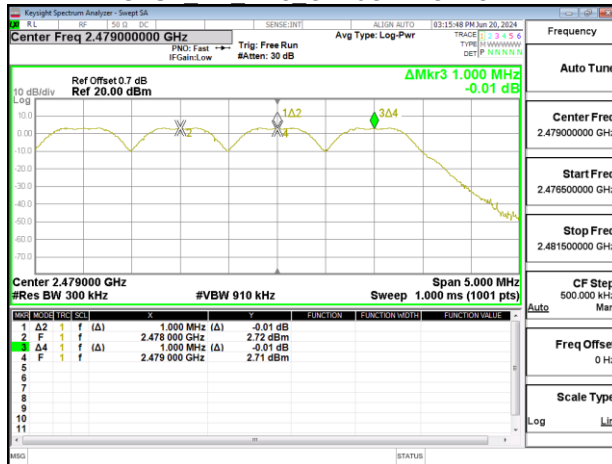
GFSK 1M DH5 CH38CH39CH40



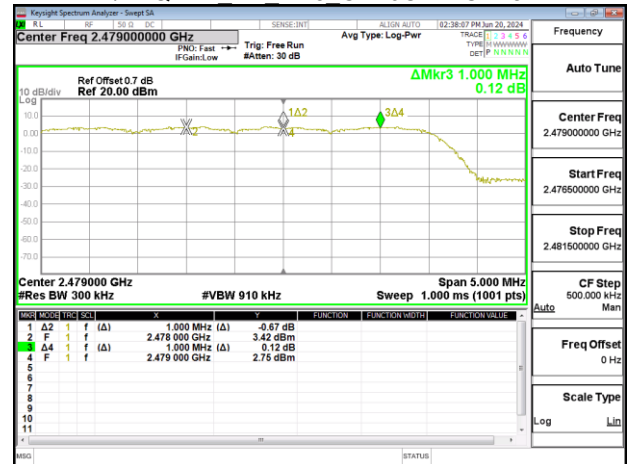
π/4DQPSK 2M DH5 CH38CH39CH40



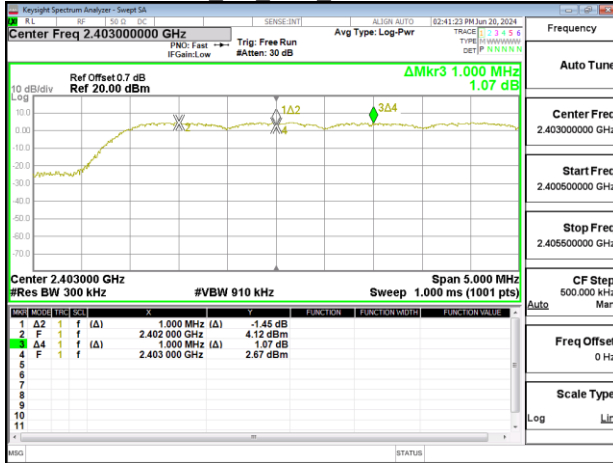
GFSK 1M DH5 CH76CH77CH78



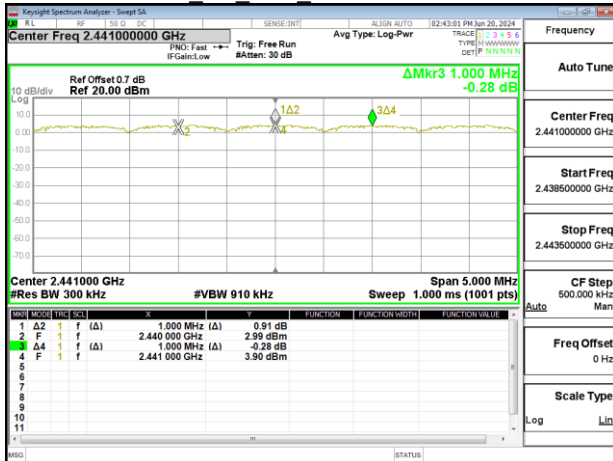
π/4DQPSK 2M DH5 CH76CH77CH78



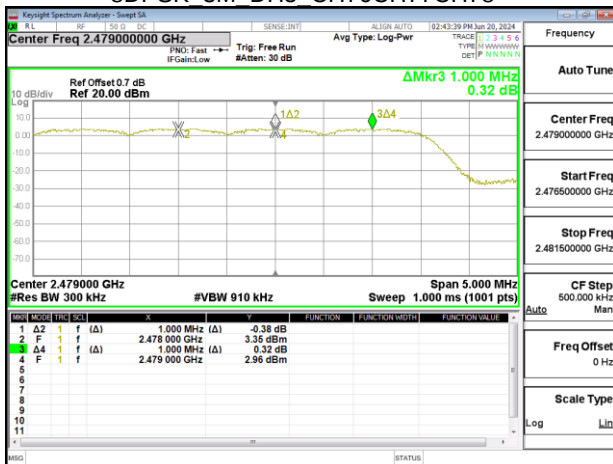
8DPSK 3M DH5 CH0CH1CH2



8DPSK 3M DH5 CH38CH39CH40



8DPSK 3M DH5 CH76CH77CH78



4.5 NUMBER OF HOPPING

4.5.1 Test Limit

According to §15.247(a)(1)(iii),

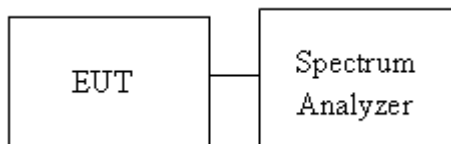
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

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, RBW=300KHz, VBW =910kHz for left half.
4. Set spectrum analyzer Start Freq. = 2441 MHz, Stop Freq. = 2483.5 MHz, RBW=300KHz, VBW =910kHz for right half.
5. Max hold, view and count how many channel in the band.

4.5.3 Test Setup



4.5.4 Test Result

Temperature: 20.4 ~ 22.1℃

Test date: March 15 ~ June 20, 2024

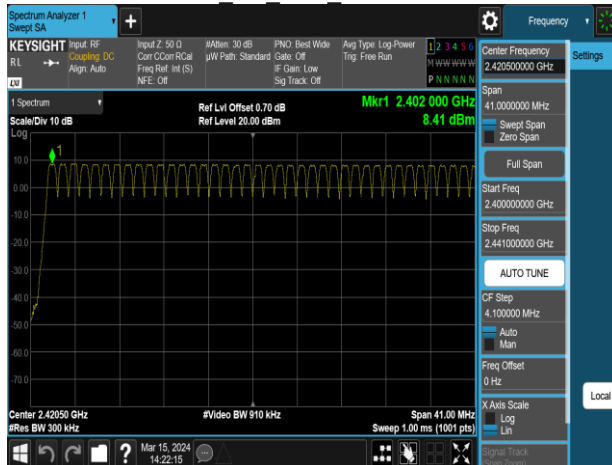
Humidity: 57 ~ 59% RH

Tested by: Jerry Chang

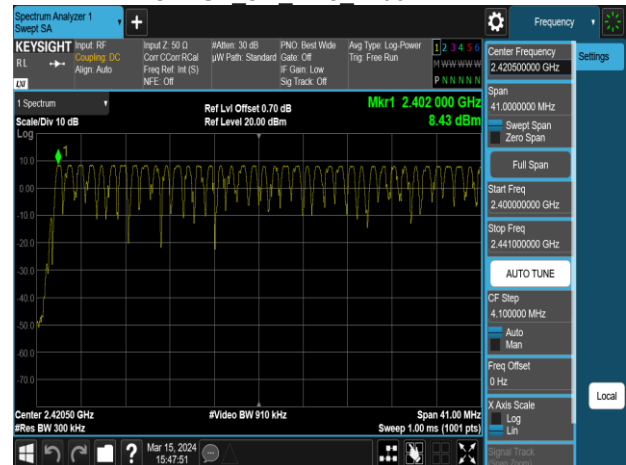
Number of Hopping				
Mode	Frequency (MHz)	Hopping Channel Number	Hopping Channel Number Limits	Result
BDR-1Mbps	2402-2480	79	15	Pass
EDR-3Mbps	2402-2480	79	15	

Test Data

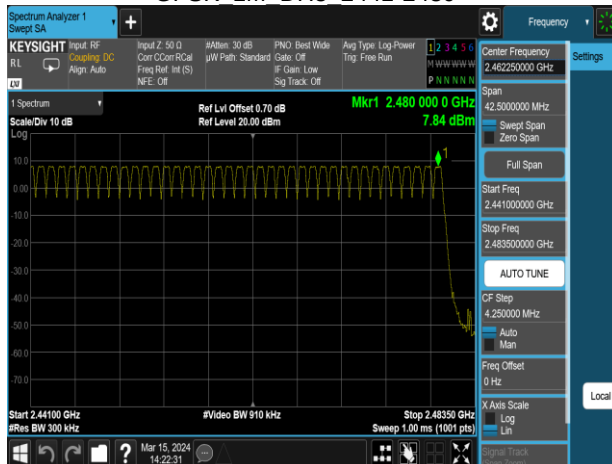
GFSK 1M DH5 2400-2441



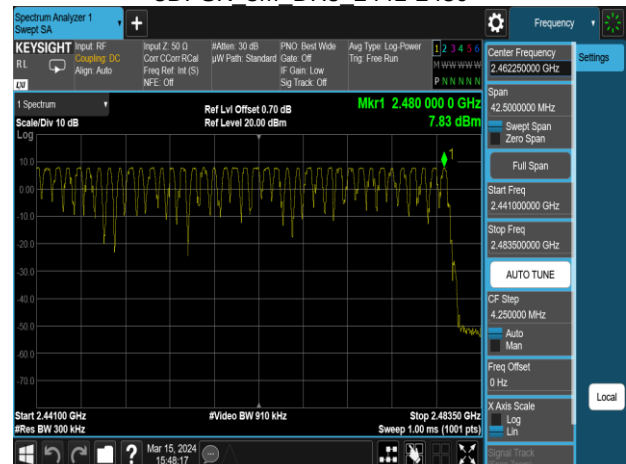
8DPSK 3M DH5 2400-2441



GFSK 1M DH5 2441-2480



8DPSK 3M DH5 2441-2480



4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

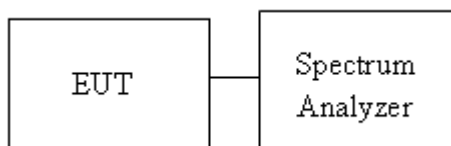
According to §15.247(d),

Limit	-20 dBc
-------	---------

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



4.6.4 Test Result

Temperature: 20.4 ~ 22.1℃

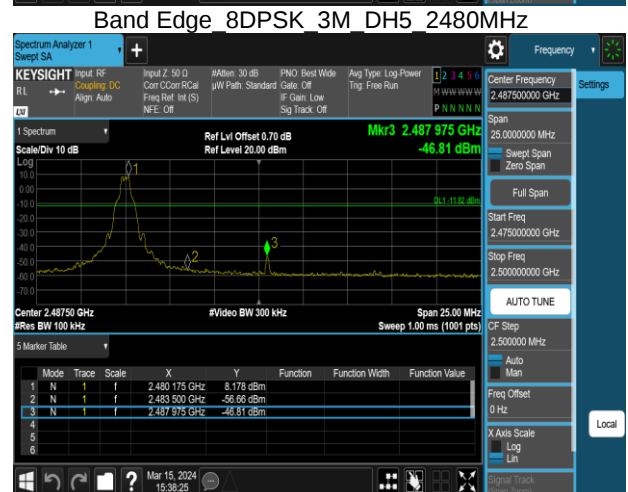
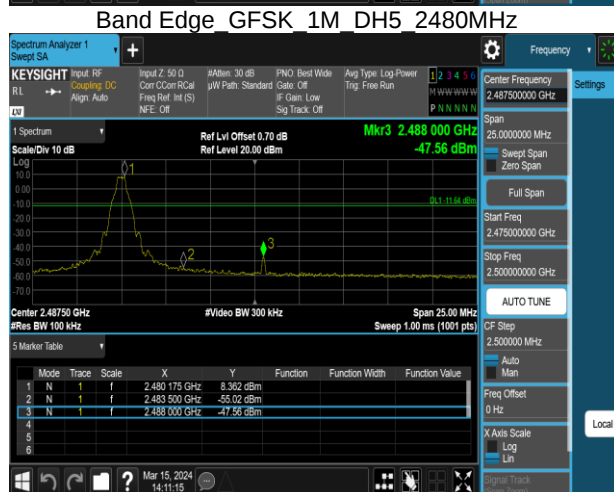
Humidity: 57 ~ 59% RH

Test date: March 15 ~ June 20, 2024

Tested by: Jerry Chang

Test Data

Band Edge

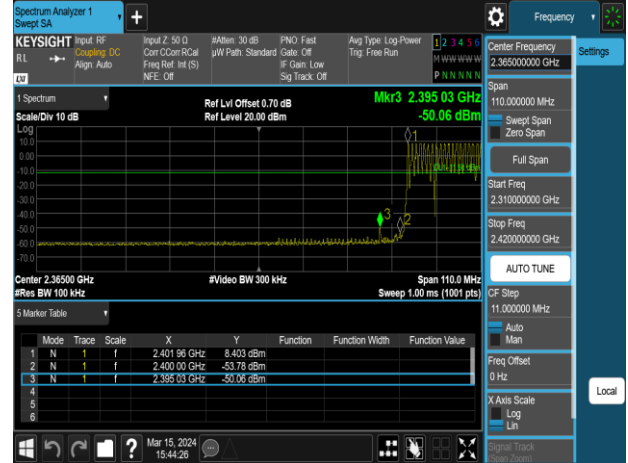


Hopping mode

Hopping Band Edge GFSK 1M DH5 2402MHz



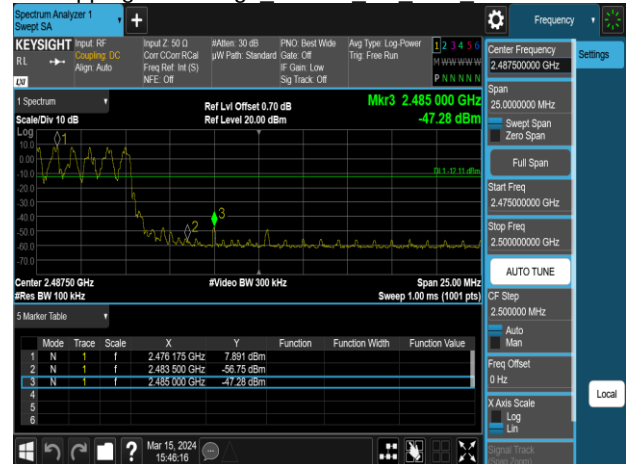
Hopping Band Edge 8DPSK 3M DH5 2402MHz



Hopping Band Edge GFSK 1M DH5 2480MHz



Hopping Band Edge 8DPSK 3M DH5 2480MHz



Spurious Emission

Spurious Emission GFSK 1M DH5 2402MHz



Spurious Emission $\pi/4$ DQPSK 2M DH5 2402MHz



Spurious Emission GFSK 1M DH5 2441MHz



Spurious Emission $\pi/4$ DQPSK 2M DH5 2441MHz



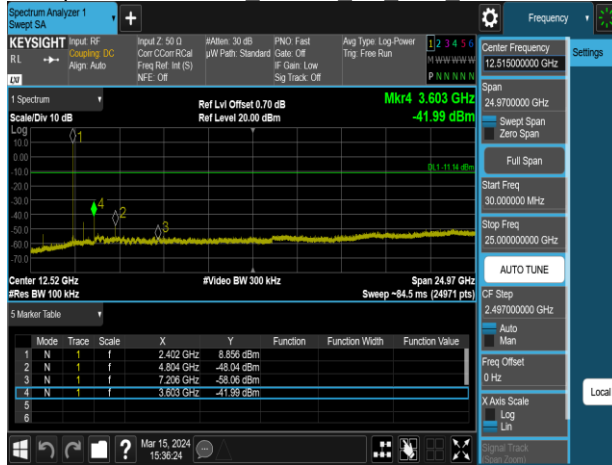
Spurious Emission GFSK 1M DH5 2480MHz



Spurious Emission $\pi/4$ DQPSK 2M DH5 2480MHz



Spurious Emission 8DPSK 3M DH5 2402MHz



Spurious Emission 8DPSK 3M DH5 2441MHz



Spurious Emission 8DPSK 3M DH5 2480MHz



4.7 TIME OF OCCUPANCY (DWELL TIME)

4.7.1 Test Limit

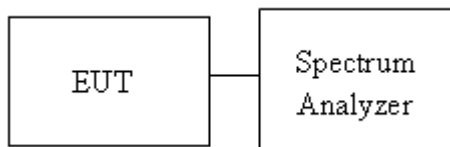
According to §15.247(a)(1)(iii)

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=1MHz, VBW=3MHz, Sweep = 5 ms ~15ms(Depends on signal characteristics)

4.7.3 Test Setup



4.7.4 Test Result

Temperature: 20.4 ~ 22.1℃

Test date: March 15 ~ June 20, 2024

Humidity: 57 ~ 59% RH

Tested by: Jerry Chang

GFSK (1Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	DH1	123.20	400
	DH3	262.40	400
	DH5	307.20	400

$\pi/4$ DQPSK (2Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	2DH1	123.20	400
	2DH3	262.40	400
	2DH5	307.20	400

8-DPSK (3Mbps)

Channel	PACKET TYPE	Measurement Result (ms)	Limit (ms)
Mid	3DH1	124.80	400
	3DH3	262.40	400
	3DH5	308.80	400

GFSK (1Mbps):

CH Mid	DH1 time slot	=	0.385	*	(1600/2/79)	*	31.6	=	123.20 (ms)
	DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	DH5 time slot	=	2.880	*	(1600/6/79)	*	31.6	=	307.20 (ms)

$\pi/4$ -DQPSK (2Mbps):

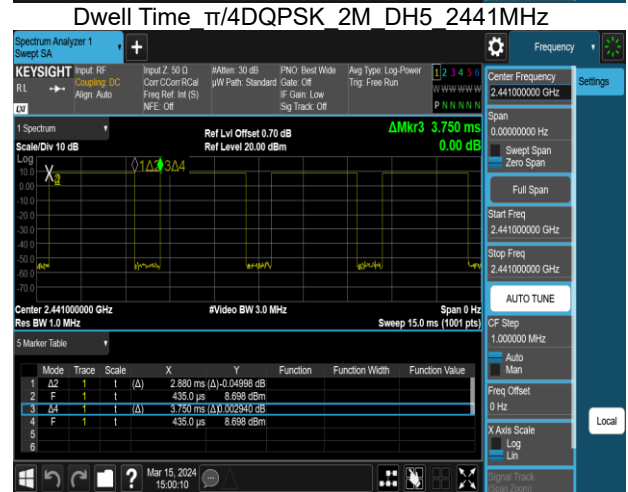
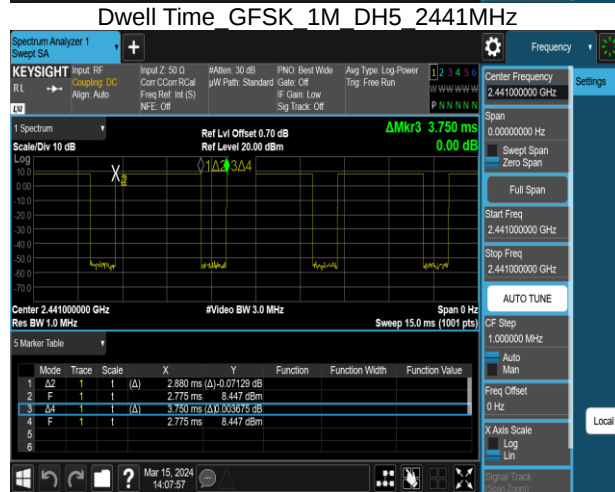
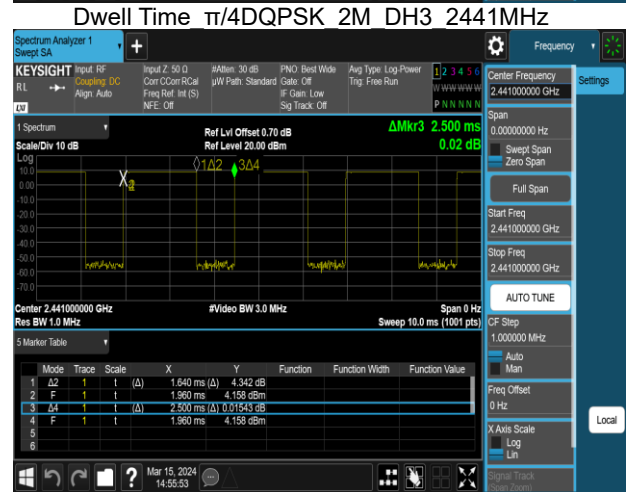
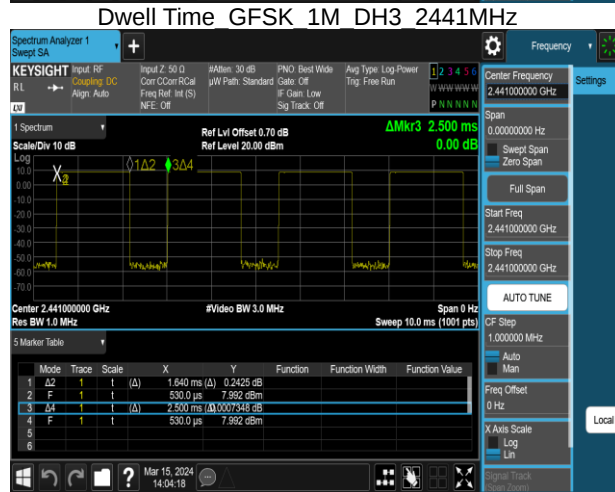
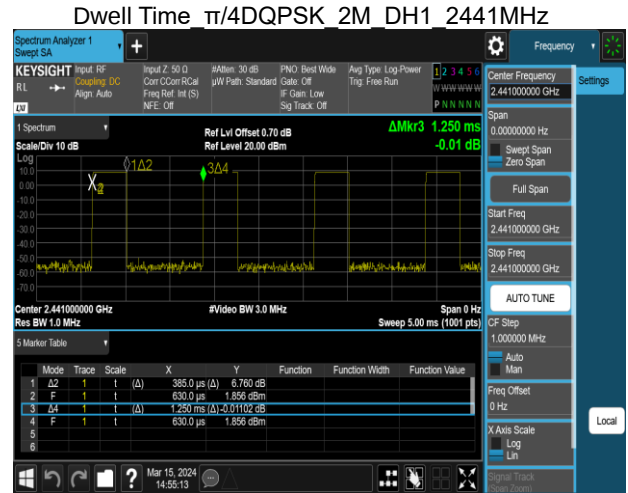
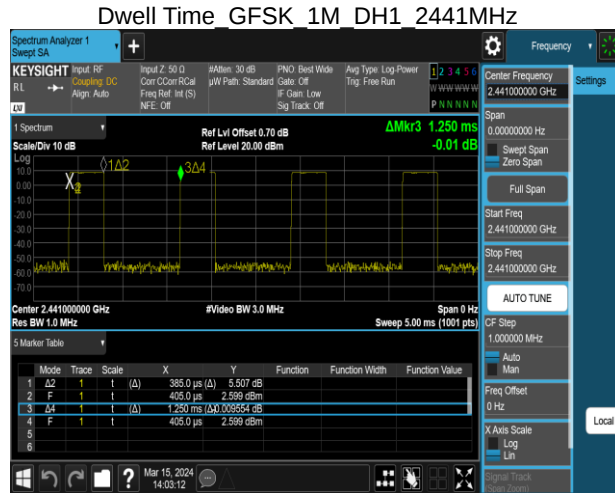
CH Mid	2DH1 time slot	=	0.385	*	(1600/2/79)	*	31.6	=	123.20 (ms)
	2DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	2DH5 time slot	=	2.880	*	(1600/6/79)	*	31.6	=	307.20 (ms)

8-DPSK (3Mbps):

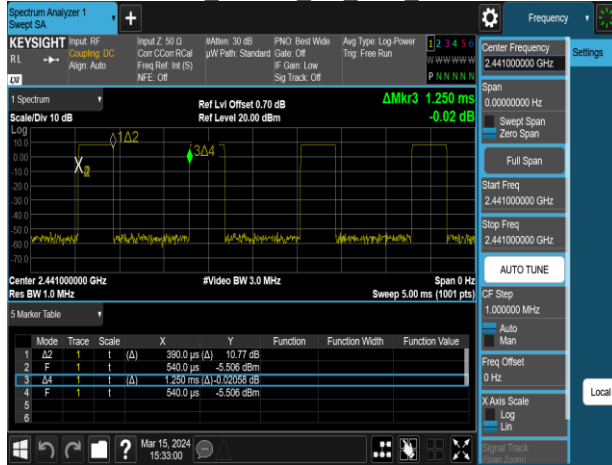
CH Mid	3DH1 time slot	=	0.390	*	(1600/2/79)	*	31.6	=	124.80 (ms)
	3DH3 time slot	=	1.640	*	(1600/4/79)	*	31.6	=	262.40 (ms)
	3DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80 (ms)

A period time = 0.4 (s) * 79 = 31.6 (s)

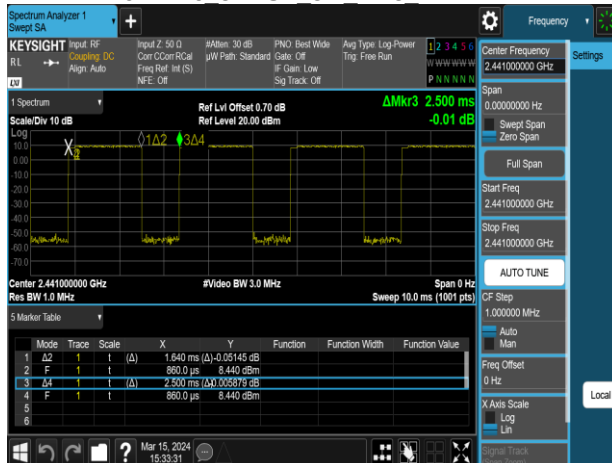
Test Data



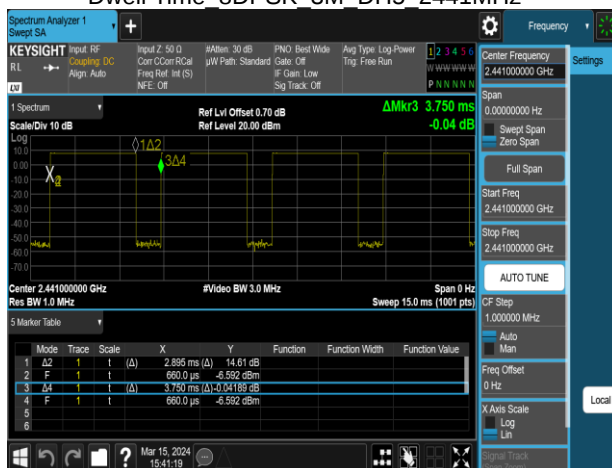
Dwell Time 8DPSK 3M DH1 2441MHz



Dwell Time 8DPSK 3M DH3 2441MHz



Dwell Time 8DPSK 3M DH5 2441MHz



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.

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. 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.

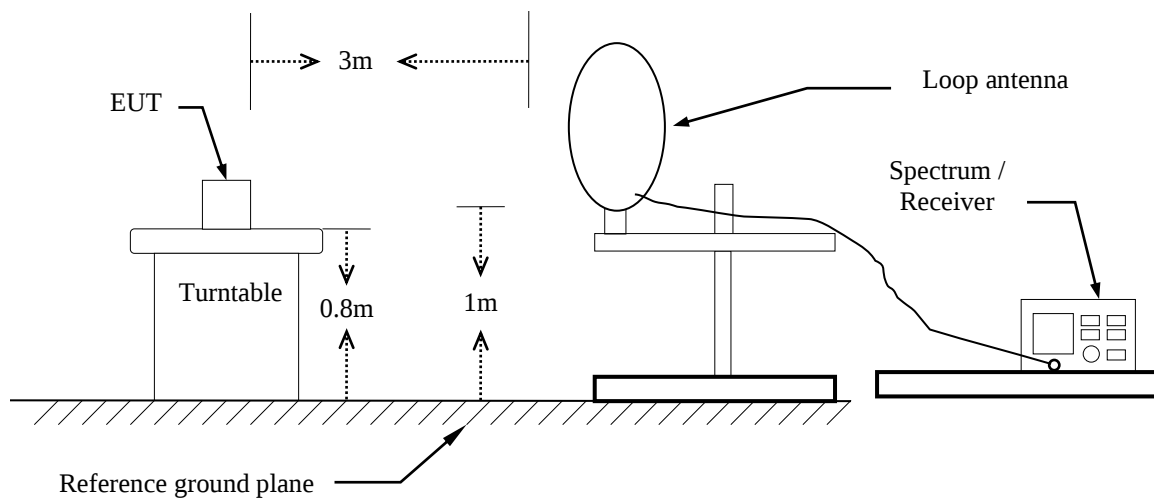
5. Data result

Actual FS=Spectrum Reading Level + Factor

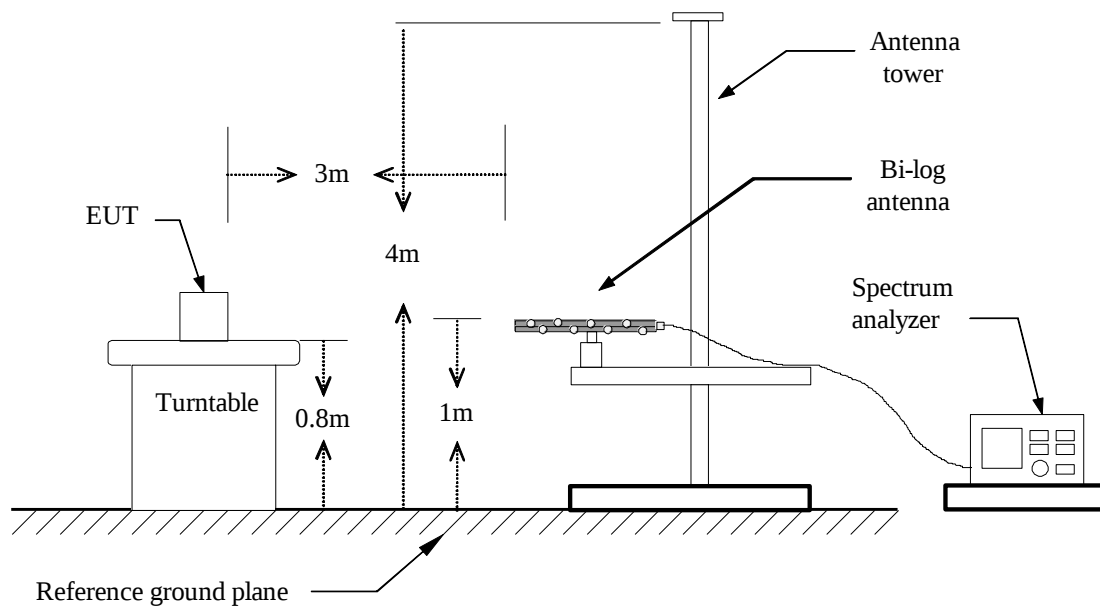
Margin=Actual FS- Limit

4.8.3 Test Setup

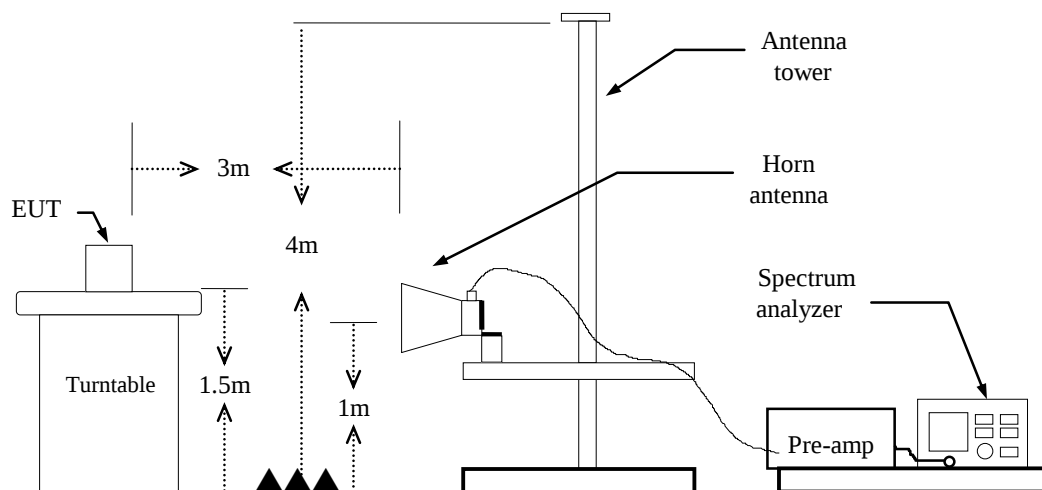
9kHz ~ 30MHz



30MHz ~ 1GHz



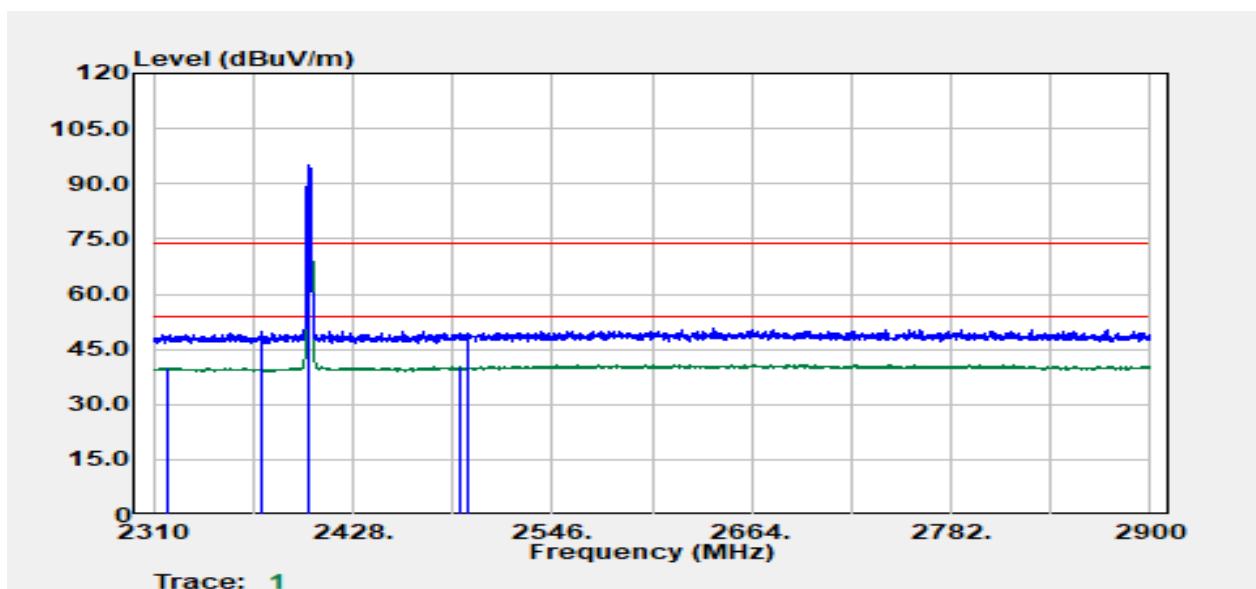
Above 1 GHz



4.8.4 Test Result

Band Edge Test Data

Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



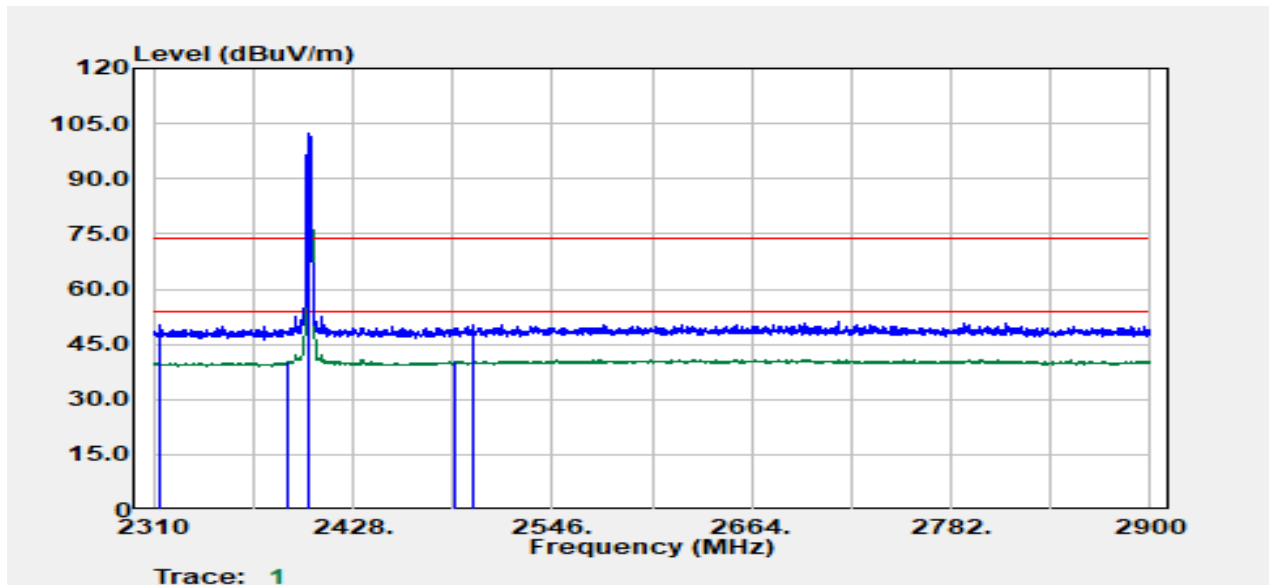
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2317.74	Average	33.71	6.15	39.86	54.00	-14.14
2373.92	Peak	43.56	6.12	49.68	74.00	-24.32
2402.00	Peak	88.93	6.29	95.22	--	--
2402.00	Average	88.90	6.29	95.19	--	--
2491.52	Average	33.38	6.81	40.19	54.00	-13.81
2496.01	Peak	42.74	6.83	49.56	74.00	-24.44

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Project No :TM-2402000257P
Operation Band :BT_BR
Frequency :2402 MHz
Operation Mode :Bandedge
EUT Pol :E1
Setting :

Test Date :2024-03-20
Temp./Humi. :24.5/58
Antenna Pol. :HORIZONTAL
Engineer :Tony Chao
Test Chamber : 966A

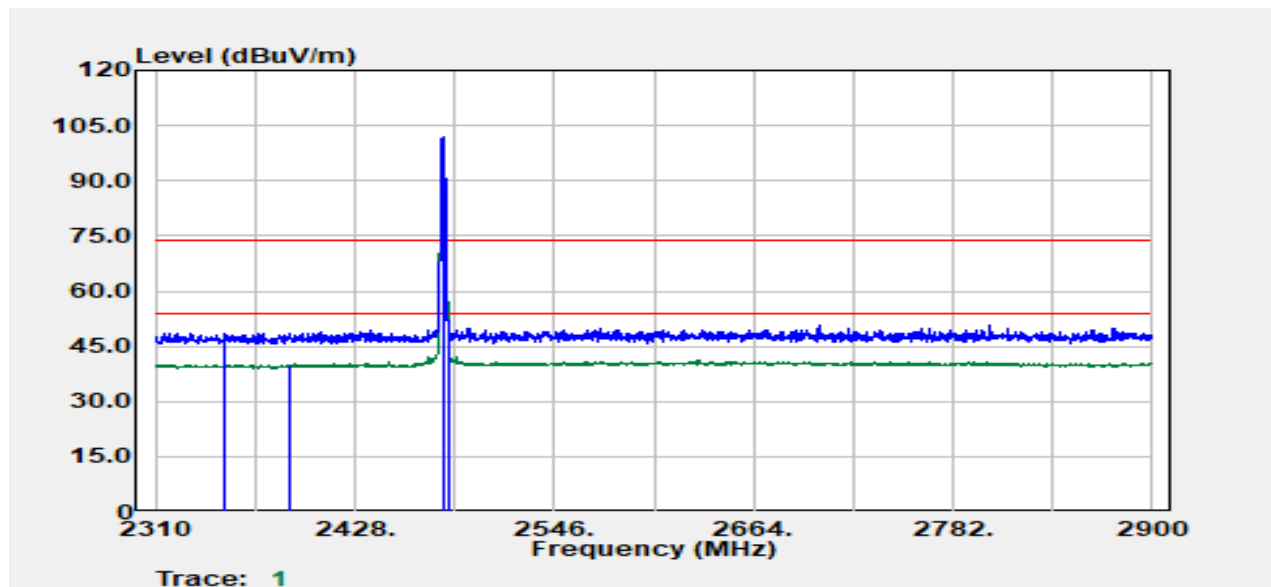


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2313.25	Peak	44.01	6.14	50.15	74.00	-23.85
2389.90	Average	33.91	6.28	40.19	54.00	-13.81
2402.00	Peak	96.04	6.29	102.34	--	--
2402.00	Average	96.00	6.29	102.30	--	--
2488.52	Average	33.42	6.78	40.20	54.00	-13.80
2499.26	Peak	43.26	6.84	50.10	74.00	-23.90

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



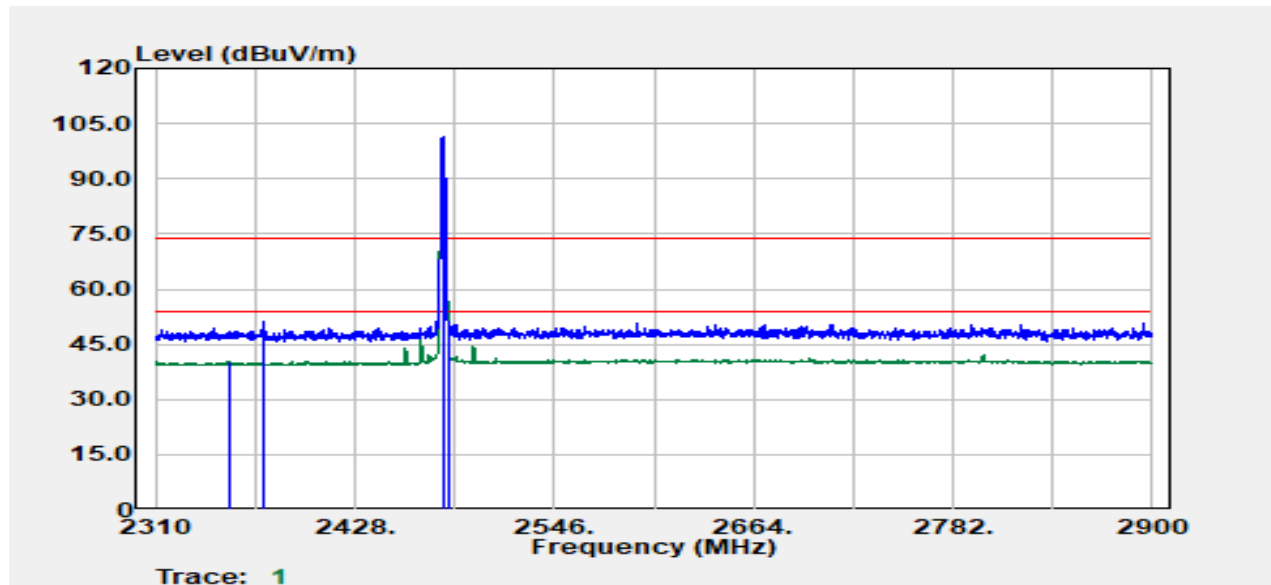
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2351.45	Peak	42.43	6.24	48.67	74.00	-25.33
2389.40	Average	33.71	6.27	39.97	54.00	-14.03
2480.00	Peak	93.04	6.67	99.71	--	--
2480.00	Average	92.84	6.67	99.51	--	--
2483.50	Peak	43.17	6.71	49.89	74.00	-24.11
2483.53	Average	39.53	6.71	46.25	54.00	-7.75

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Project No :TM-2402000257P
Operation Band :BT_BR
Frequency :2480 MHz
Operation Mode :Bandedge
EUT Pol :E1
Setting :

Test Date :2024-03-20
Temp./Humi. :24.5/58
Antenna Pol. :HORIZONTAL
Engineer :Tony Chao
Test Chamber : 966A

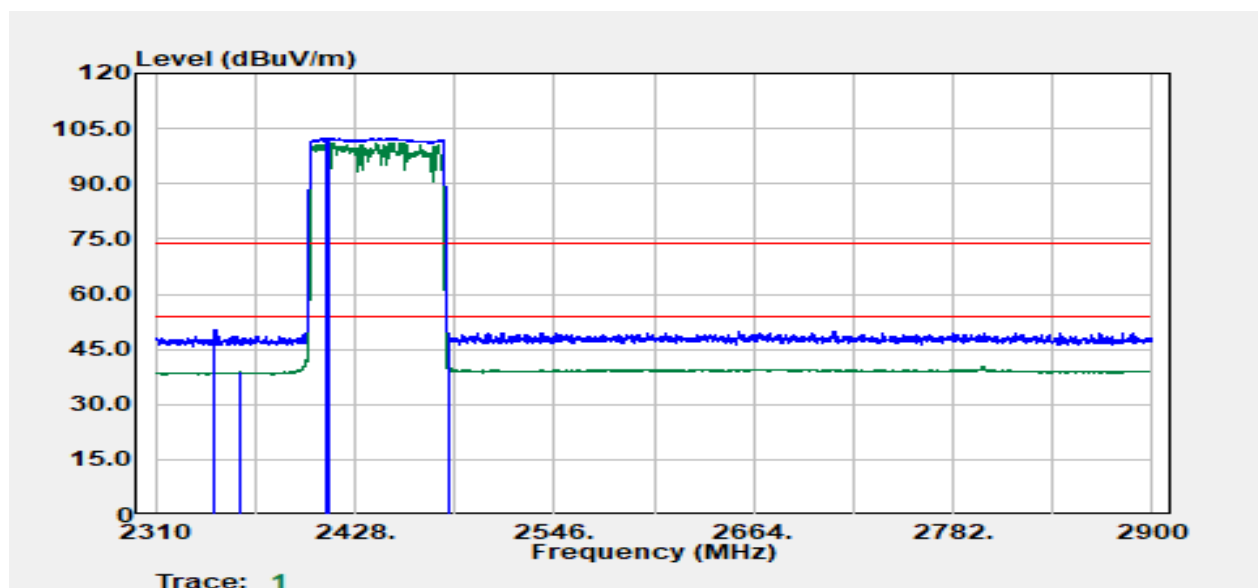


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2354.19	Average	33.98	6.24	40.23	54.00	-13.77
2374.67	Peak	45.19	6.12	51.31	74.00	-22.69
2480.00	Peak	94.67	6.67	101.34	--	--
2480.00	Average	94.58	6.67	101.25	--	--
2483.50	Peak	43.58	6.71	50.29	74.00	-23.71
2483.53	Average	38.21	6.71	44.93	54.00	-9.07

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2402~2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Hopping	Engineer	:Ray Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



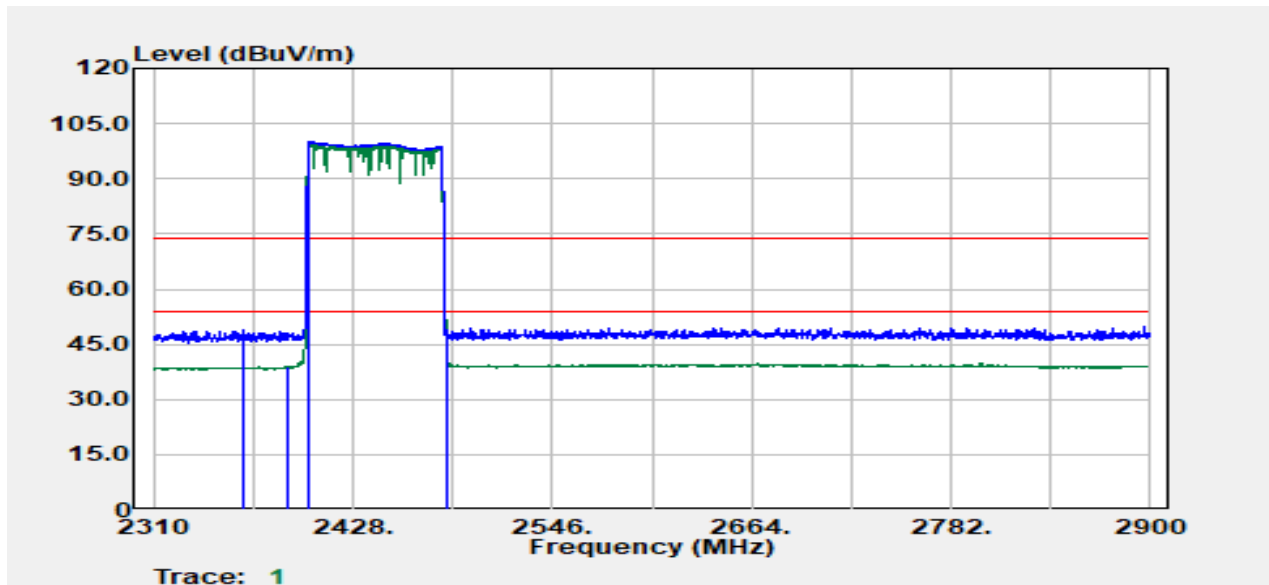
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2345.27	Peak	44.91	5.41	50.32	74.00	-23.68
2360.02	Average	33.47	5.48	38.95	54.00	-15.05
2411.04	Peak	96.40	5.53	101.93	--	--
2413.04	Average	96.13	5.53	101.66	--	--
2483.50	Peak	43.37	5.94	49.31	74.00	-24.69
2484.07	Average	33.88	5.95	39.83	54.00	-14.17

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Project No :TM-2402000257P
Operation Band :BT_BR
Frequency :2402~2480 MHz
Operation Mode :Hopping
EUT Pol :E1
Setting :

Test Date :2024-03-20
Temp./Humi. :24.5/58
Antenna Pol. :HORIZONTAL
Engineer :Ray Li
Test Chamber : 966A

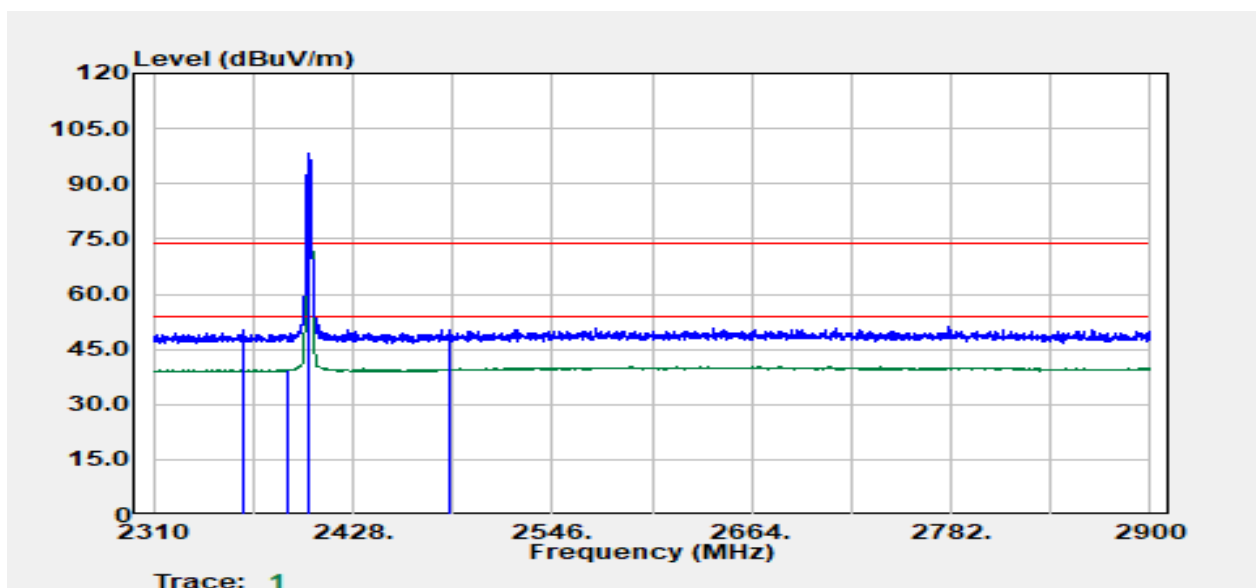


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2362.77	Peak	43.41	5.46	48.87	74.00	-25.13
2389.78	Average	33.24	5.51	38.74	54.00	-15.26
2402.04	Peak	94.51	5.52	100.03	--	--
2402.04	Average	94.43	5.52	99.95	--	--
2483.50	Peak	43.21	5.94	49.15	74.00	-24.85
2483.57	Average	35.15	5.94	41.10	54.00	-12.90

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



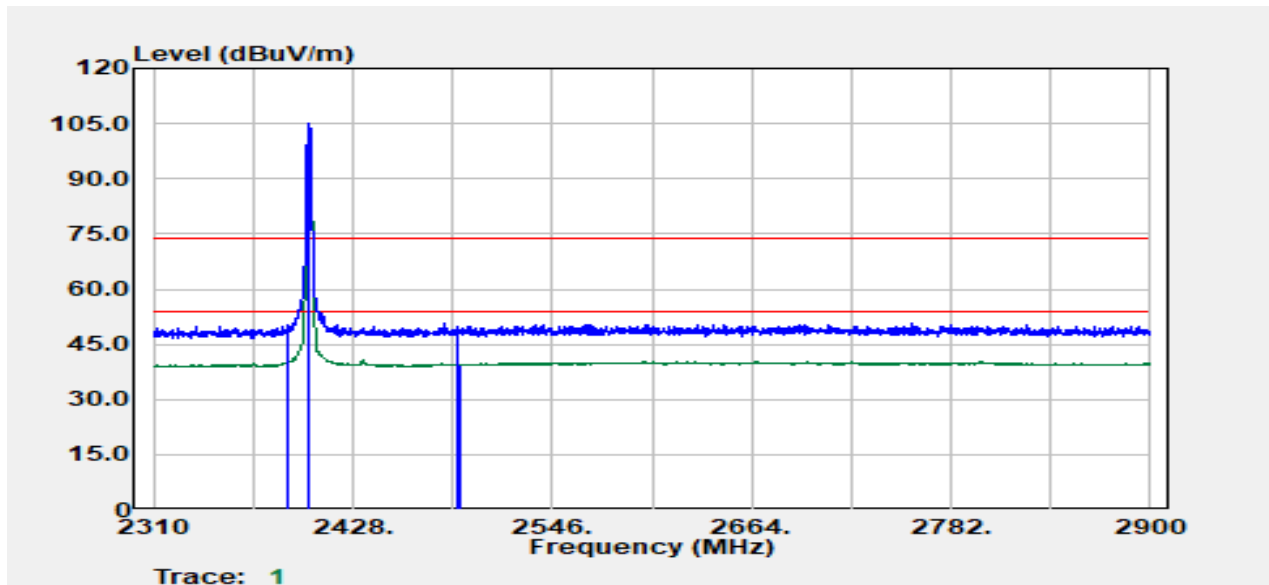
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2363.18	Peak	43.90	6.22	50.12	74.00	-23.88
2389.40	Average	33.14	6.27	39.40	54.00	-14.60
2402.00	Peak	91.88	6.29	98.18	--	--
2402.00	Average	88.56	6.29	94.86	--	--
2484.53	Peak	43.45	6.73	50.18	74.00	-23.82
2485.78	Average	32.97	6.75	39.71	54.00	-14.29

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Project No :TM-2402000257P
Operation Band :BT_EDR
Frequency :2402 MHz
Operation Mode :Bandedge
EUT Pol :E1
Setting :

Test Date :2024-03-20
Temp./Humi. :24.5/58
Antenna Pol. :HORIZONTAL
Engineer :Tony Chao
Test Chamber : 966A

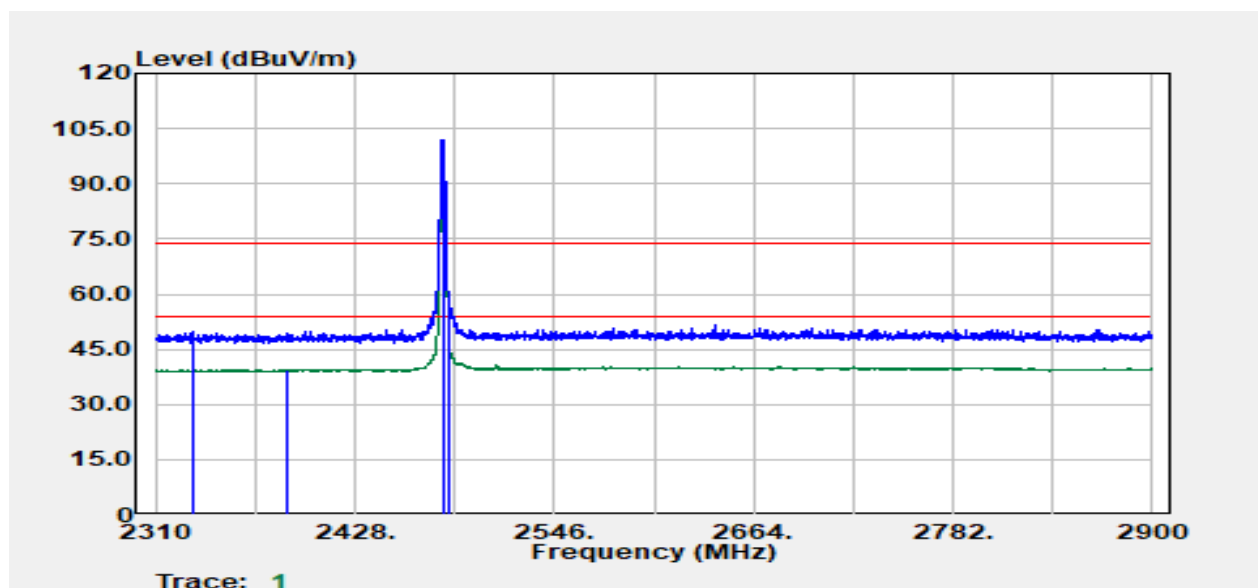


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2388.90	Peak	43.97	6.26	50.23	74.00	-23.77
2389.40	Average	33.89	6.27	40.16	54.00	-13.84
2402.00	Peak	98.75	6.29	105.04	--	--
2402.00	Average	95.44	6.29	101.73	--	--
2490.02	Peak	43.04	6.80	49.84	74.00	-24.16
2491.27	Average	32.80	6.81	39.60	54.00	-14.40

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



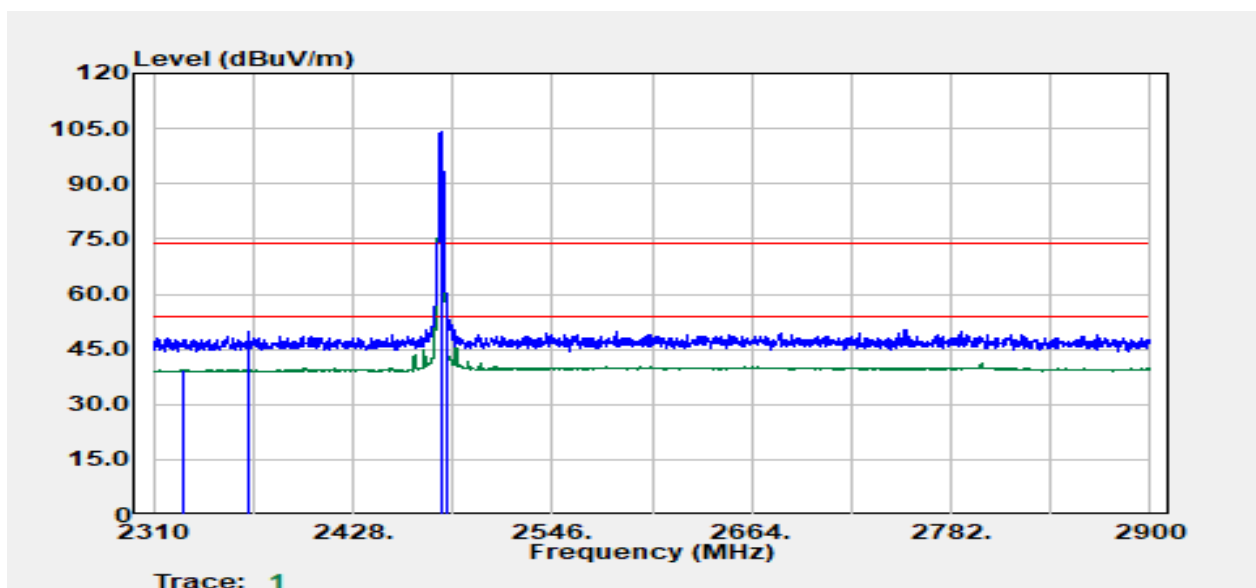
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2331.72	Peak	43.75	6.17	49.92	74.00	-24.08
2388.40	Average	33.17	6.25	39.42	54.00	-14.58
2480.00	Peak	95.26	6.67	101.93	--	--
2480.00	Average	92.16	6.67	98.83	--	--
2483.53	Peak	51.58	6.71	58.29	74.00	-15.71
2483.53	Average	41.94	6.71	48.65	54.00	-5.35

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Project No :TM-2402000257P
Operation Band :BT_EDR
Frequency :2480 MHz
Operation Mode :Bandedge
EUT Pol :E1
Setting :

Test Date :2024-03-20
Temp./Humi. :24.5/58
Antenna Pol. :HORIZONTAL
Engineer :Tony Chao
Test Chamber : 966A

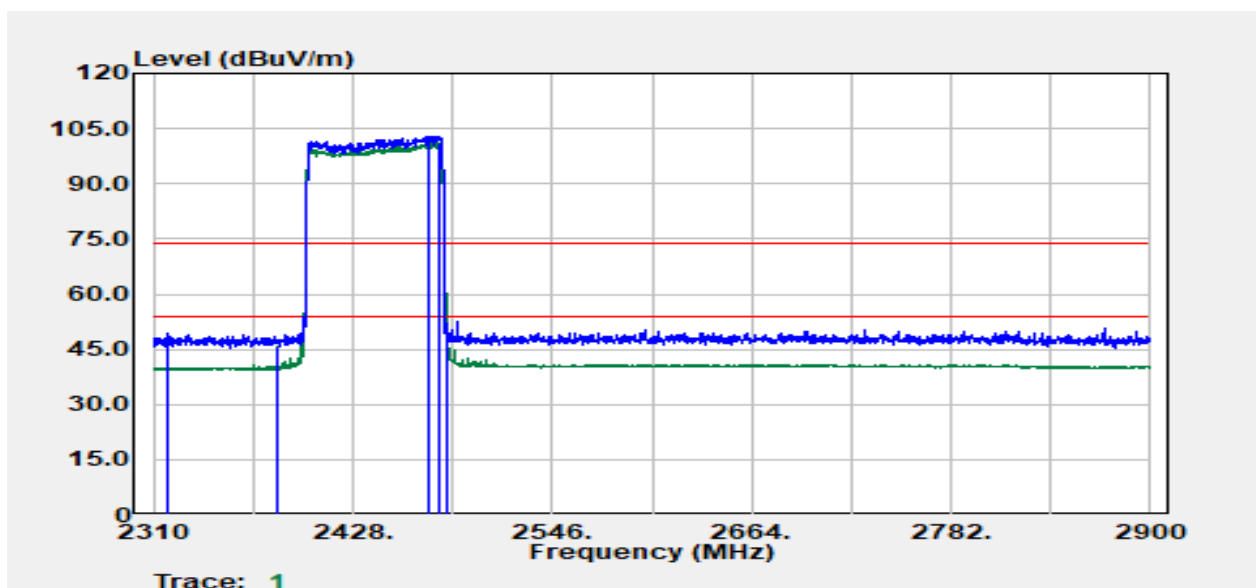


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2328.23	Average	33.22	6.18	39.40	54.00	-14.60
2366.68	Peak	44.19	6.19	50.38	74.00	-23.62
2480.00	Peak	97.97	6.67	104.64	--	--
2480.00	Average	94.80	6.67	101.47	--	--
2483.53	Peak	50.74	6.71	57.46	74.00	-16.54
2483.53	Average	40.78	6.71	47.49	54.00	-6.51

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2402~2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Hopping	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



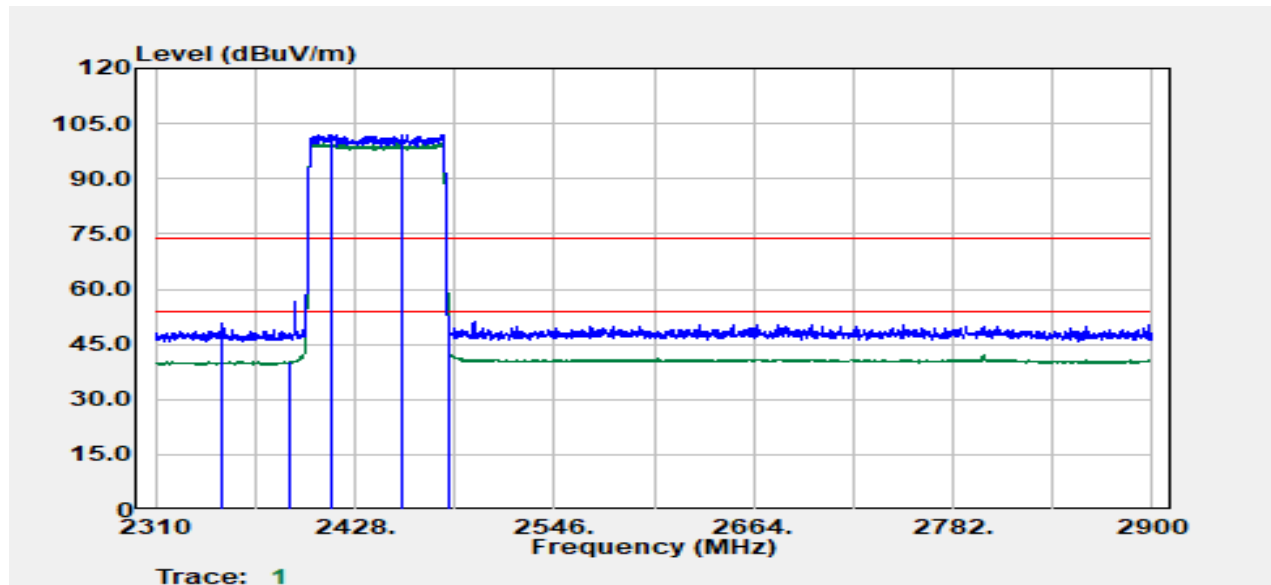
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2318.24	Peak	42.99	6.15	49.15	74.00	-24.85
2383.41	Average	39.46	6.14	45.60	54.00	-8.40
2472.29	Peak	96.51	6.48	102.99	--	--
2479.04	Average	94.47	6.64	101.12	--	--
2483.50	Peak	45.98	6.71	52.69	74.00	-21.31
2483.53	Average	42.13	6.71	48.84	54.00	-5.16

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Project No :TM-2402000257P
Operation Band :BT_EDR
Frequency :2402~2480 MHz
Operation Mode :Hopping
EUT Pol :E1
Setting :

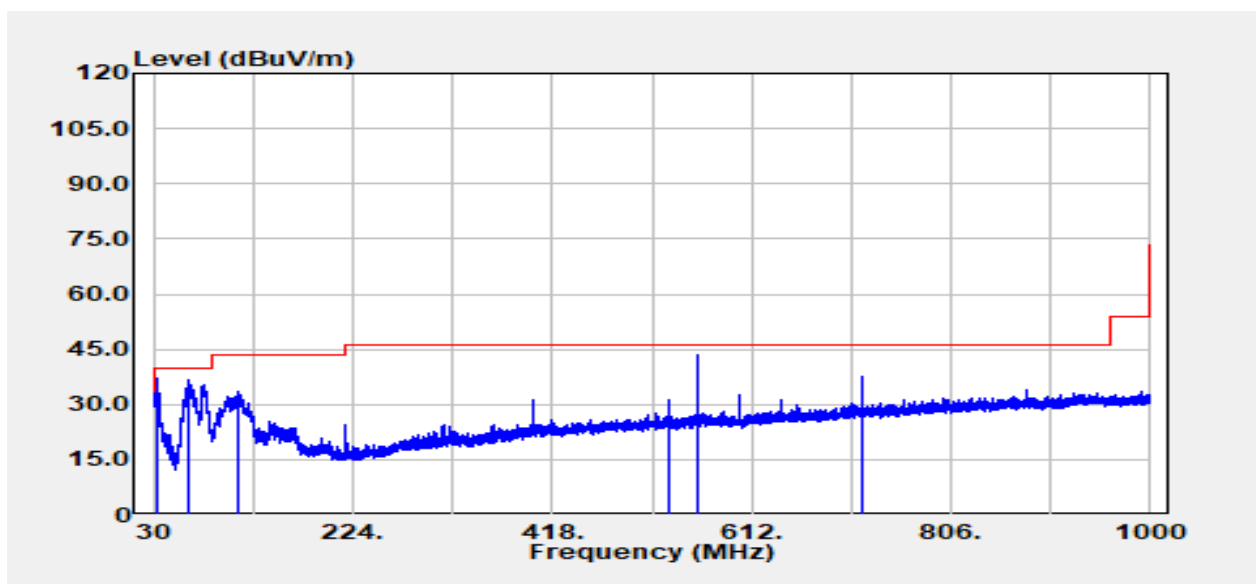
Test Date :2024-03-20
Temp./Humi. :24.5/58
Antenna Pol. :HORIZONTAL
Engineer :Tony Chao
Test Chamber : 966A



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2348.70	Peak	44.47	6.22	50.69	74.00	-23.31
2389.15	Average	34.09	6.26	40.35	54.00	-13.65
2414.12	Average	93.31	6.31	99.62	--	--
2456.31	Peak	95.69	6.32	102.01	--	--
2483.50	Peak	45.10	6.71	51.81	74.00	-22.19
2483.53	Average	41.01	6.71	47.72	54.00	-6.28

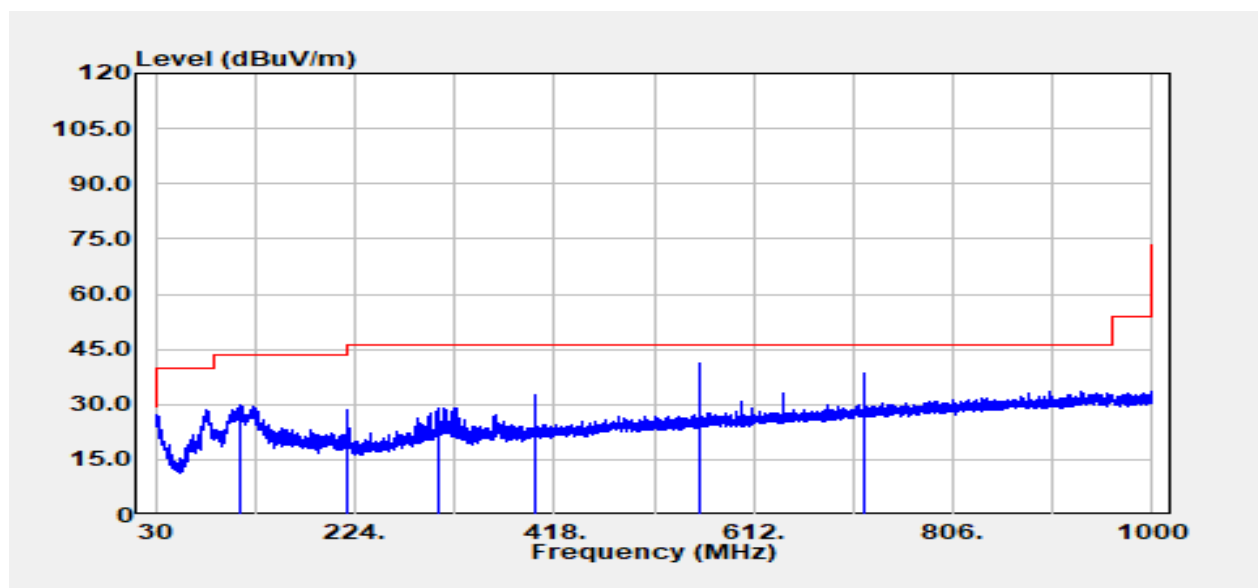
TX Test Data

Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBUV	Factor dB	Actual FS dBUV/m	Limit dBUV/m	Margin dB
33.88	Peak	42.37	-5.04	37.34	40.00	-2.66
65.16	Peak	51.93	-15.30	36.63	40.00	-3.37
112.81	Peak	43.18	-9.79	33.38	43.50	-10.12
531.01	Peak	34.40	-2.96	31.44	46.00	-14.56
559.98	Peak	45.91	-2.44	43.47	46.00	-2.53
720.03	Peak	37.26	0.36	37.62	46.00	-8.38

Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

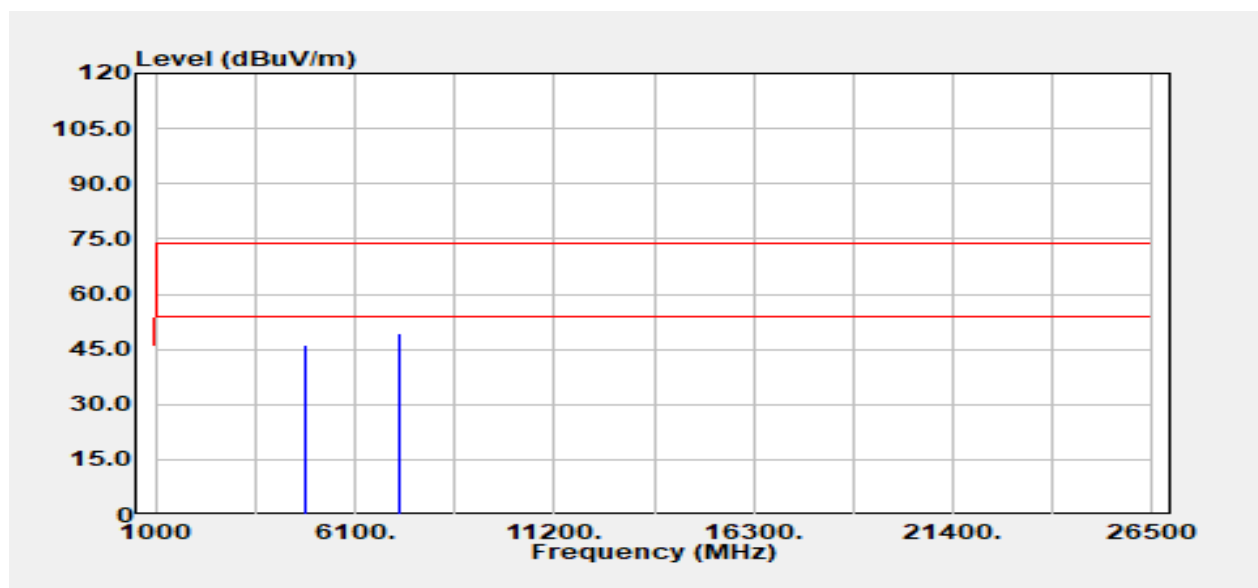


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
112.09	Peak	39.48	-9.74	29.75	43.50	-13.75
216.00	Peak	40.46	-11.79	28.67	43.50	-14.83
305.97	Peak	37.63	-8.44	29.19	46.00	-16.81
400.06	Peak	38.20	-5.80	32.41	46.00	-13.59
559.98	Peak	43.71	-2.44	41.27	46.00	-4.73
720.03	Peak	37.94	0.36	38.30	46.00	-7.70

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

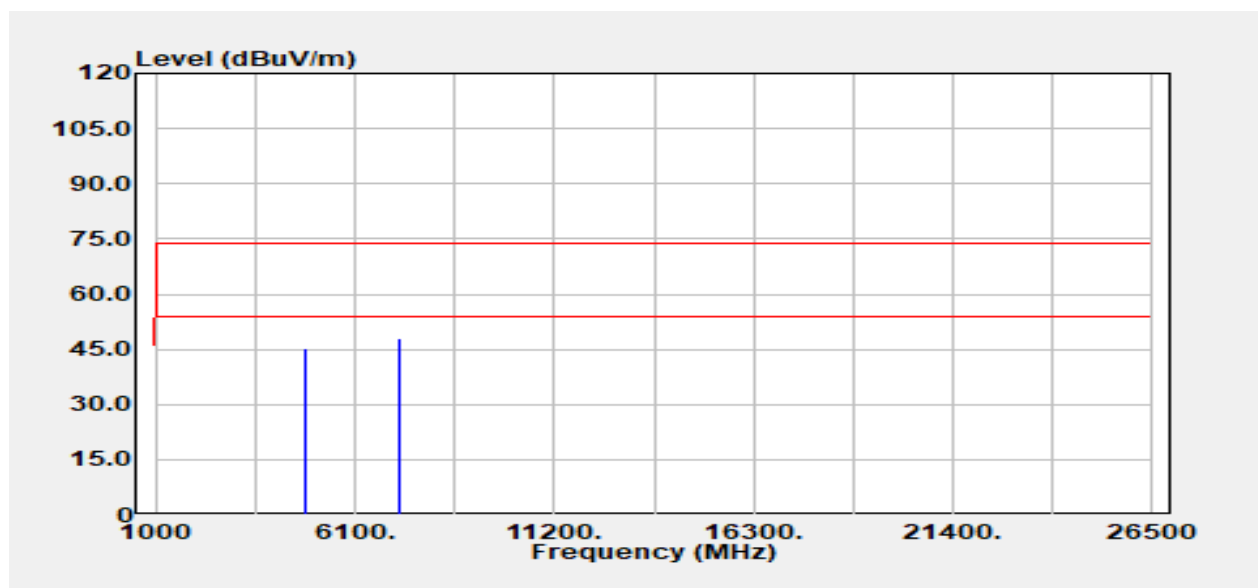


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.00	Peak	43.93	2.23	46.16	74.00	-27.84
4804.00	Average	39.93	2.23	42.15	54.00	-11.85
7206.00	Peak	40.23	9.01	49.24	74.00	-24.76
7206.00	Average	35.38	9.01	44.39	54.00	-9.61

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

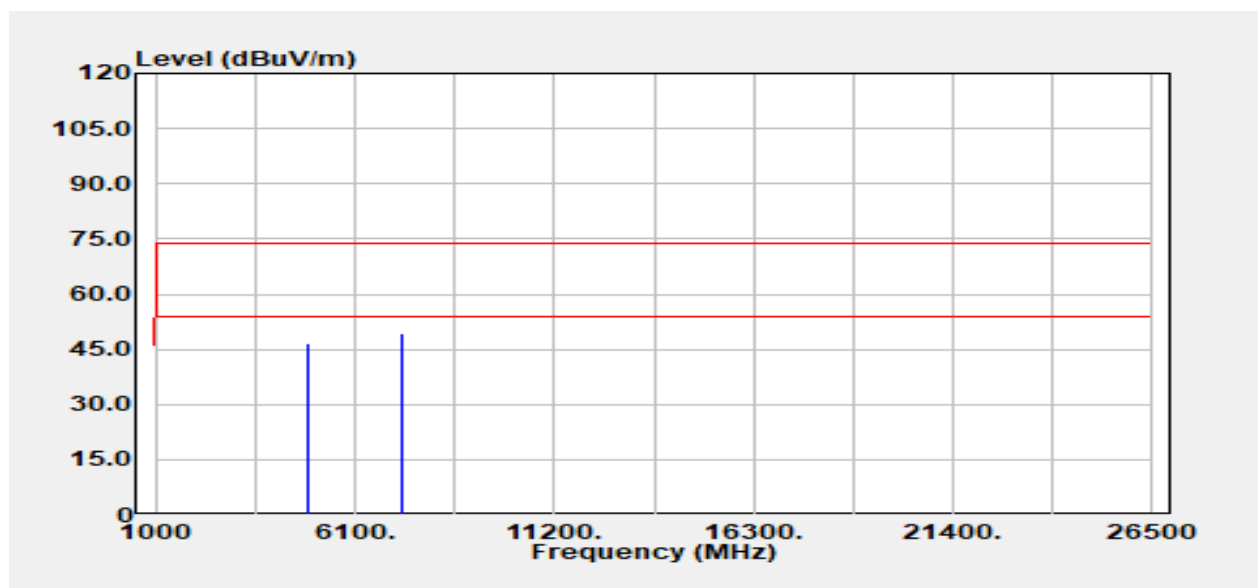


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.00	Peak	43.22	2.23	45.44	74.00	-28.56
4804.00	Average	39.74	2.23	41.97	54.00	-12.03
7206.00	Peak	39.01	9.01	48.02	74.00	-25.98
7206.00	Average	35.33	9.01	44.34	54.00	-9.66

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2441 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

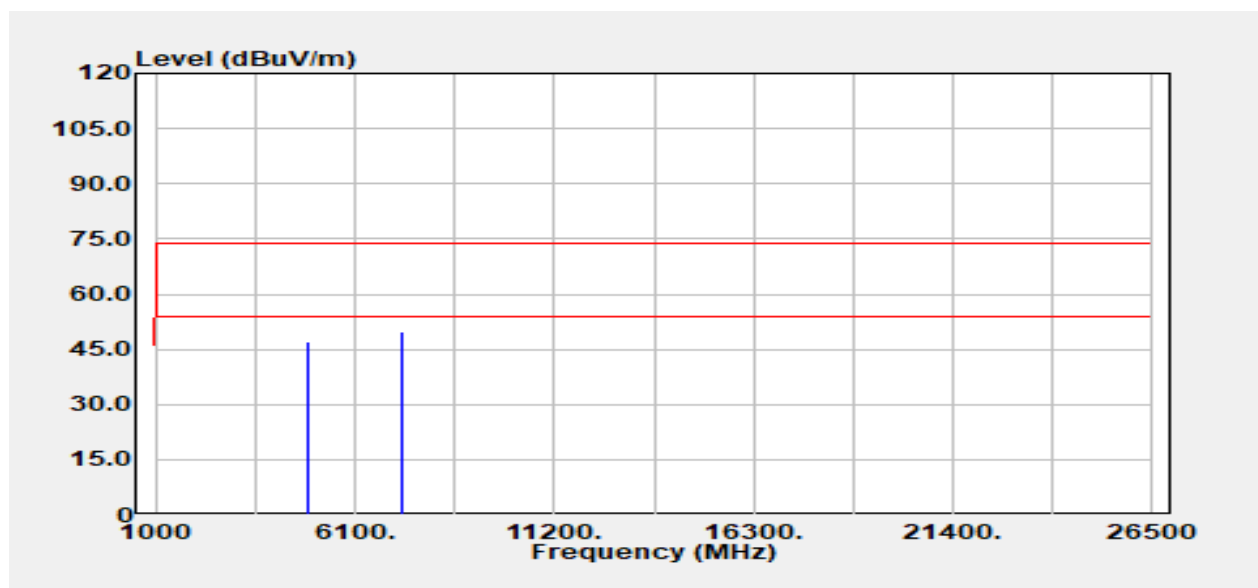


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4882.00	Peak	44.01	2.56	46.57	74.00	-27.43
4882.00	Average	40.99	2.56	43.55	54.00	-10.45
7323.00	Peak	40.20	8.96	49.16	74.00	-24.84
7323.00	Average	36.61	8.96	45.57	54.00	-8.43

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2441 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

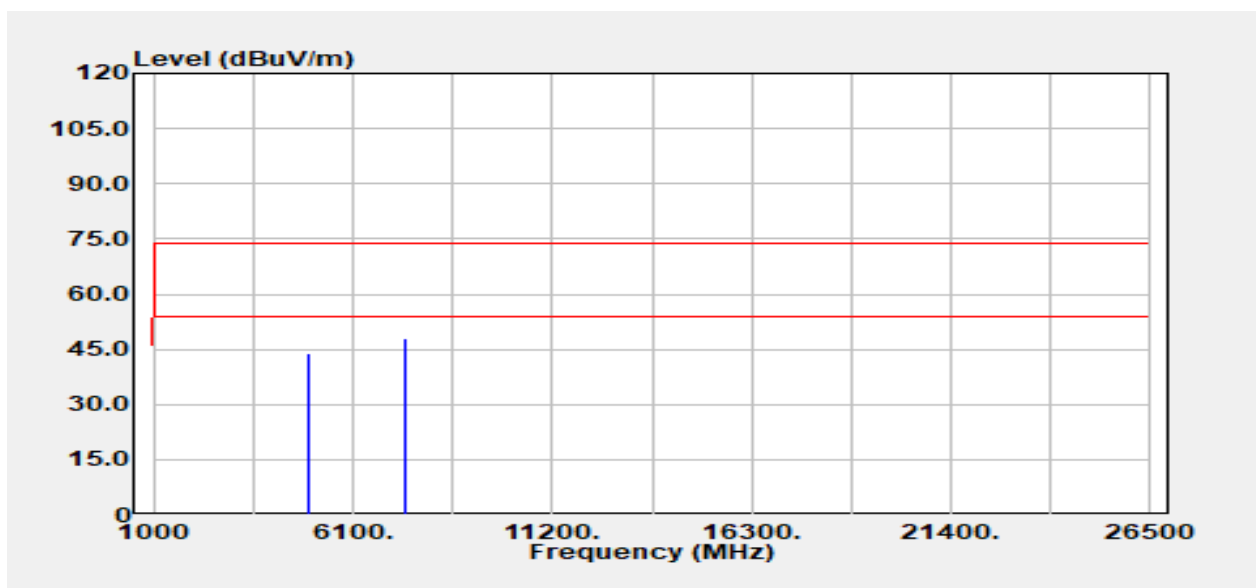


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4882.00	Peak	44.62	2.56	47.18	74.00	-26.82
4882.00	Average	42.51	2.56	45.08	54.00	-8.92
7323.00	Peak	40.99	8.96	49.95	74.00	-24.05
7323.00	Average	36.22	8.96	45.18	54.00	-8.82

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2480 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

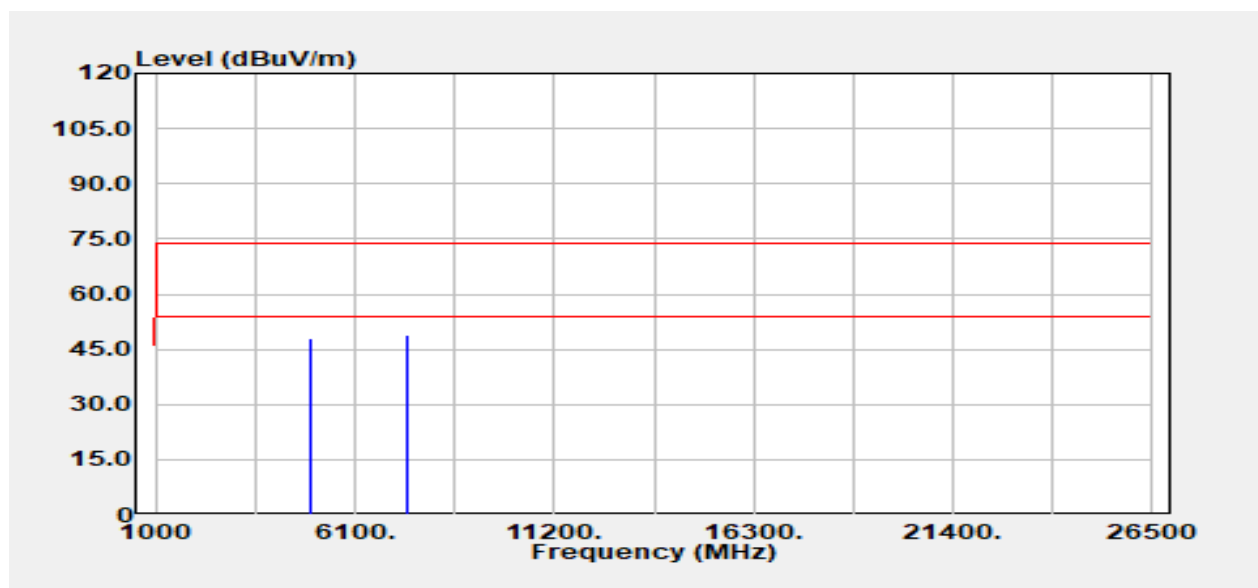


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.00	Peak	40.54	3.21	43.75	74.00	-30.25
4960.00	Average	35.76	3.21	38.97	54.00	-15.03
7440.00	Peak	38.89	8.92	47.81	74.00	-26.19
7440.00	Average	36.32	8.92	45.24	54.00	-8.76

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_BR	Temp./Humi.	:24.5/58
Frequency	:2480 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

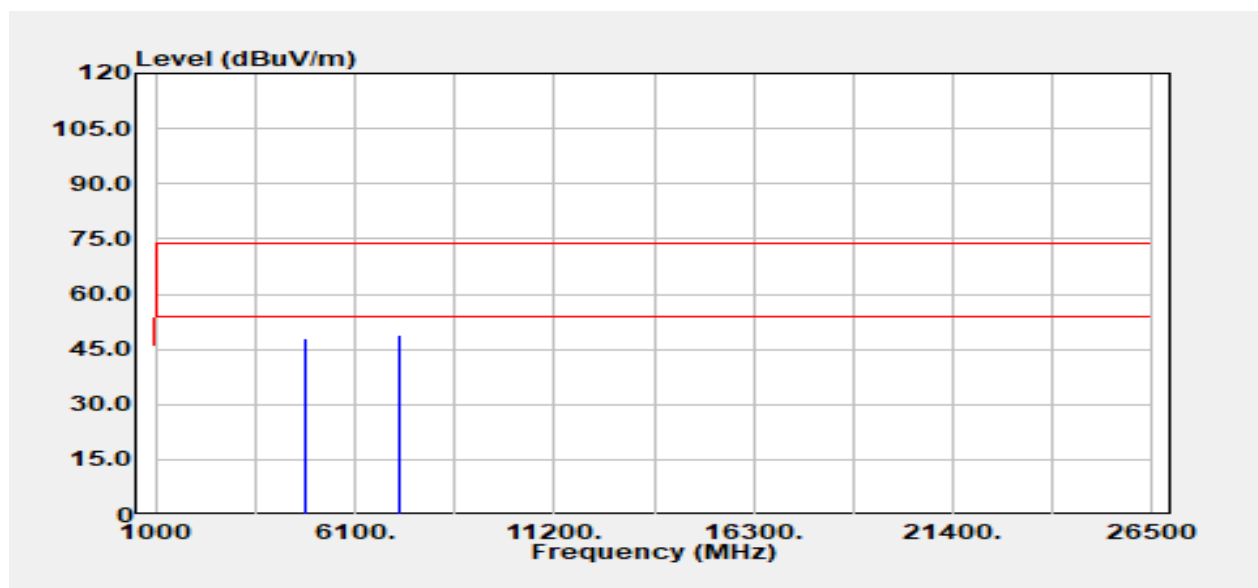


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.00	Peak	44.90	3.21	48.12	74.00	-25.88
4960.00	Average	41.15	3.21	44.36	54.00	-9.64
7440.00	Peak	39.84	8.92	48.76	74.00	-25.24
7440.00	Average	35.26	8.92	44.18	54.00	-9.82

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

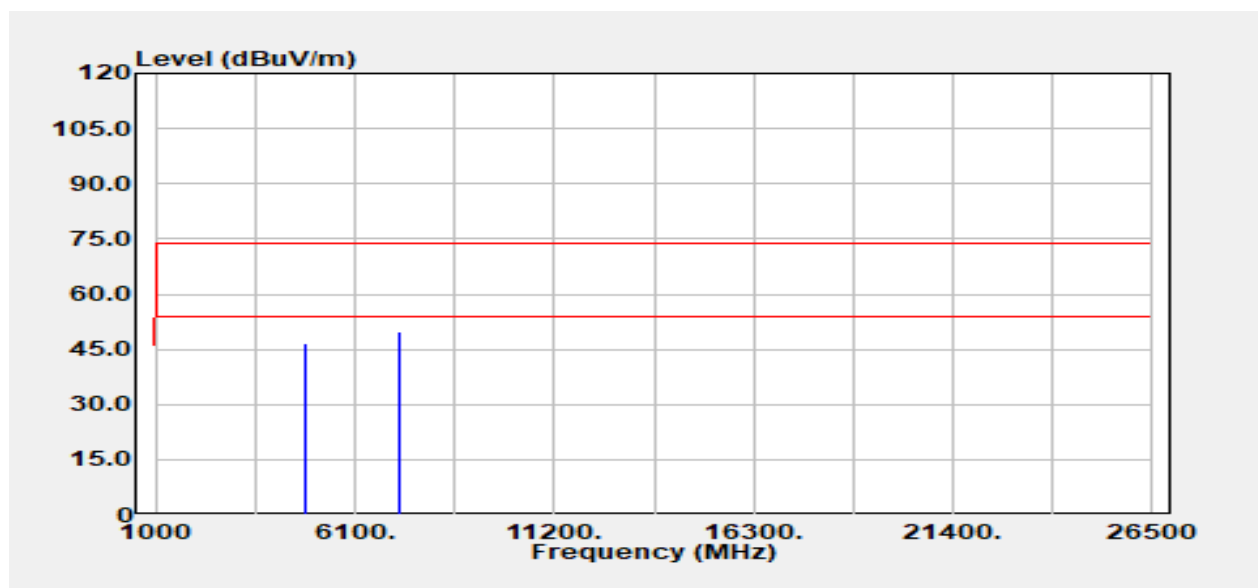


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.00	Peak	45.64	2.23	47.87	74.00	-26.13
4804.00	Average	39.41	2.23	41.64	54.00	-12.36
7206.00	Peak	39.78	9.01	48.79	74.00	-25.21
7206.00	Average	34.05	9.01	43.06	54.00	-10.94

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2402 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

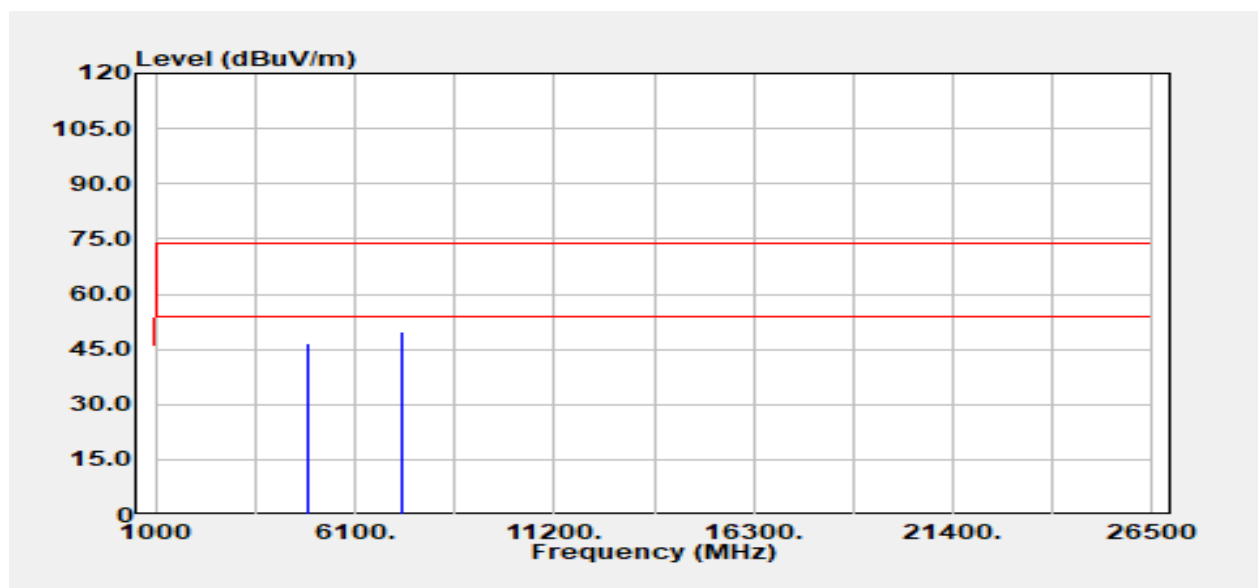


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.00	Peak	44.50	2.23	46.72	74.00	-27.28
4804.00	Average	37.99	2.23	40.21	54.00	-13.79
7206.00	Peak	40.79	9.01	49.80	74.00	-24.20
7206.00	Average	35.36	9.01	44.37	54.00	-9.63

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2441 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

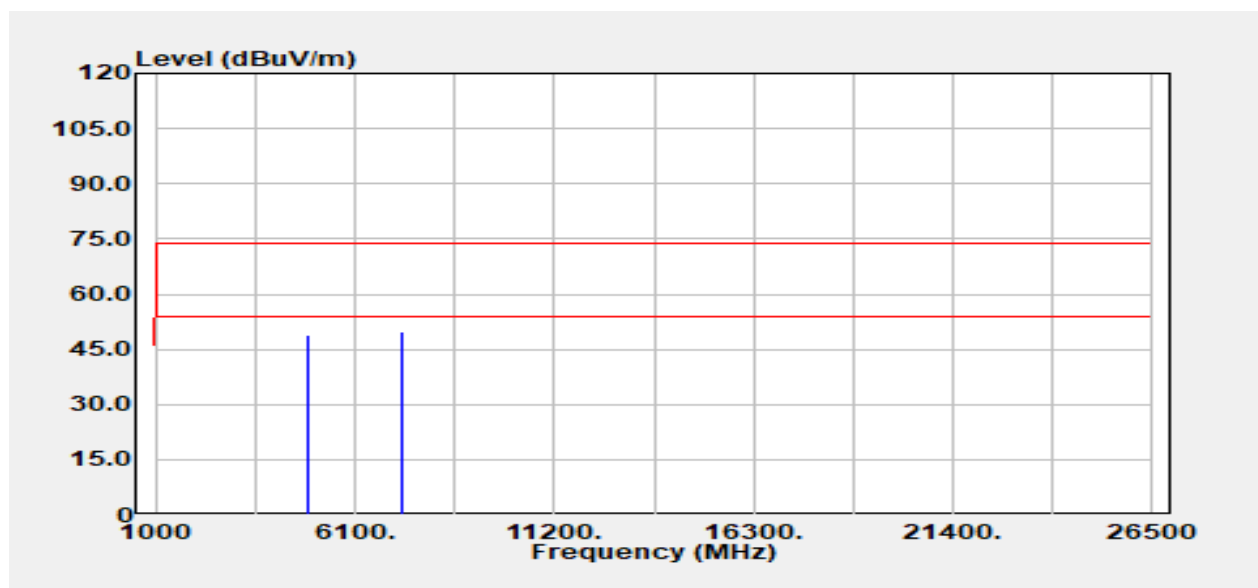


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4882.00	Peak	43.96	2.56	46.53	74.00	-27.47
4882.00	Average	40.00	2.56	42.56	54.00	-11.44
7323.00	Peak	41.03	8.96	49.98	74.00	-24.02
7323.00	Average	34.99	8.96	43.95	54.00	-10.05

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2441 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

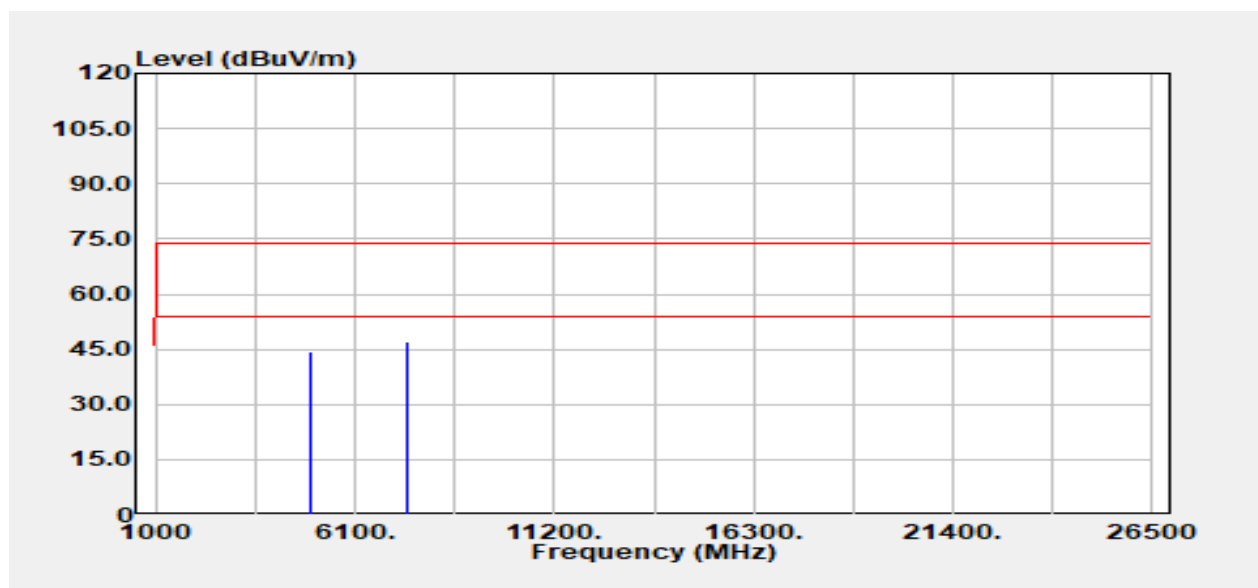


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4882.00	Peak	46.46	2.56	49.03	74.00	-24.97
4882.00	Average	40.82	2.56	43.38	54.00	-10.62
7323.00	Peak	40.98	8.96	49.94	74.00	-24.06
7323.00	Average	35.45	8.96	44.41	54.00	-9.59

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2480 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

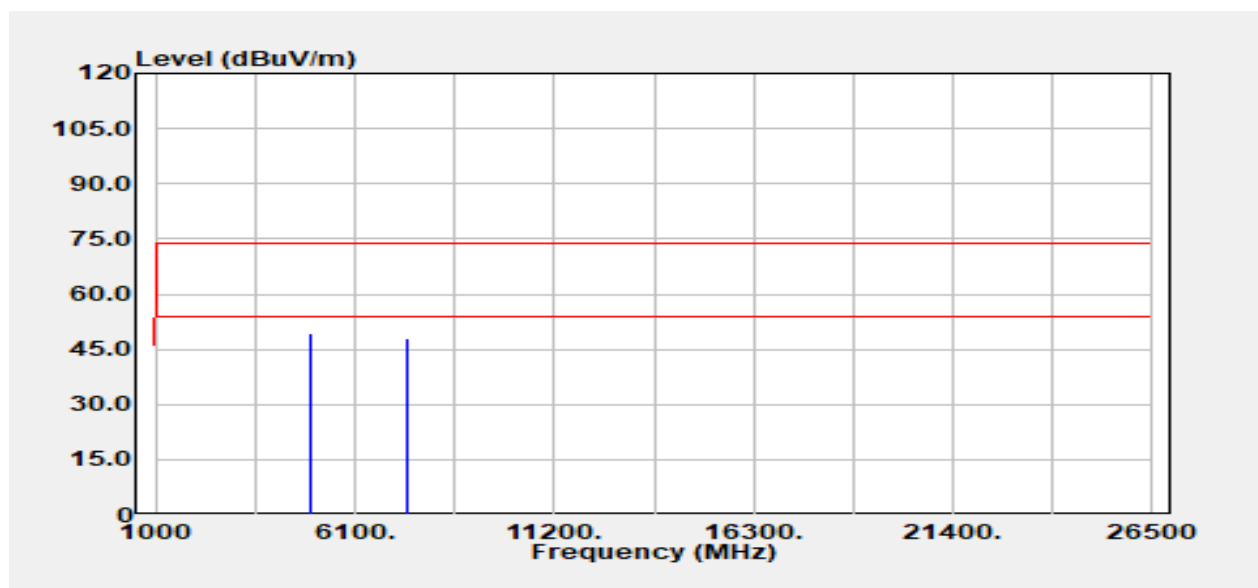


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.00	Peak	40.95	3.21	44.17	74.00	-29.83
4960.00	Average	34.53	3.21	37.74	54.00	-16.26
7440.00	Peak	38.18	8.92	47.10	74.00	-26.90
7440.00	Average	34.68	8.92	43.60	54.00	-10.40

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Project No	:TM-2402000257P	Test Date	:2024-03-20
Operation Band	:BT_EDR	Temp./Humi.	:24.5/58
Frequency	:2480 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Tony Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.00	Peak	46.36	3.21	49.57	74.00	-24.43
4960.00	Average	41.37	3.21	44.58	54.00	-9.42
7440.00	Peak	39.10	8.92	48.02	74.00	-25.98
7440.00	Average	34.23	8.92	43.15	54.00	-10.85

- End of Test Report -