

Project No.: TM-2308000057P
 Report No.: TMWK2308002698KR

FCC ID: VPYLBEE6XX1UR
 IC: 772C-LBEE6XX1UR

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 Rev.: 00

RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-247

Test Standard	FCC Part 15.247 IC RSS-247 issue 2 and IC RSS-GEN issue 5
Product name	Communication module
Brand Name	muRata
Model No.	LBEE6XX1UR
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 22, 2023	Initial Issue	ALL	Allison Chen

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APPENDIX 1 - PHOTOGRAPHS OF EUT		

1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Murata manufacturing co., ltd. 1-10-1, Higashikotari, Nagaokakyou-shi, Kyoto 617-8555 Japan
Manufacturer	Murata manufacturing co., ltd. 1-10-1, Higashikotari, Nagaokakyou-shi, Kyoto 617-8555 Japan
Equipment	Communication module
Model Name	LBEE6XX1UR
Model Discrepancy	N/A
Brand Name	muRata
Received Date	August 7, 2023
Date of Test	August 10 ~ September 1, 2023
Power Supply	Powered from power supply: DC 3.3V
HW Version	1.0
SW Version	1.0

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

15.247(a)(1) that the Rx input bandwidths shift frequencies in synchronization with the transmitted signals.

15.247(g): In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.

15.247(h): 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 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
<input type="checkbox"/> 1 MHz or less	1	Middle
<input type="checkbox"/> 1 MHz to 10 MHz	2	1 near top and 1 near bottom
<input checked="" type="checkbox"/> More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.4 ANTENNA INFORMATION

Antenna Specification	<input checked="" type="checkbox"/> PCB <input type="checkbox"/> PIFA <input type="checkbox"/> Dipole <input type="checkbox"/> Coils
Antenna Gain	Gain: 1 dBi
Brand / Model	Forvia / BT_IFA
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 and RSS-Gen §6.8.

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	± 3.115 dB
Radiated Emission_30MHz-200MHz	± 4.071 dB
Radiated Emission_200MHz-1GHz	± 4.419 dB
Radiated Emission_1GHz-6GHz	± 5.023 dB
Radiated Emission_6GHz-18GHz	± 5.068 dB
Radiated Emission_18GHz-26GHz	± 3.349 dB
Radiated Emission_26GHz-40GHz	± 3.229 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.

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1.6 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

AC Powerline Conducted Emission and Conducted:

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

Radiated emission 9kHz to 40GHz:

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	-	Not applicable, because EUT doesn't connect to AC Main Source direct.
Radiation	Tony Chao, Ray Li	-
RF Conducted	Marco Chan	-

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

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1.7 INSTRUMENT CALIBRATION

Conducted_FCC/IC/NCC (All)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Sensor	Anritsu	MA2411B	1911386	2023-07-25	2024-07-24
Power Sensor	Anritsu	MA2411B	1911387	2023-07-25	2024-07-24
Power Meter	Anritsu	ML2496A	2136002	2022-11-24	2023-11-23
Bluetooth Test Set	Anritsu	MT8852B	750013	2023-04-27	2024-04-06
EXA Signal Analyzer	Keysight	N9010B	MY60242460	2023-02-02	2024-02-01
Software	Radio Test Software Ver. 21				

966A_Radiated Wi-Fi 2.4GHz					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Loop Antenna	COM-POWER	AL-130	121051	2023-05-23	2024-05-22
Preamplifier	EMEC	EM330	060609	2023-02-22	2024-02-21
Thermo-Hygro Meter	WISEWIND	1206	D07	2022-12-19	2023-12-18
PXA Signal Analyzer	Keysight Technologies	N9030B	MY62291089	2022-10-14	2023-10-13
Preamplifier	HP	8449B	3008A00965	2022-12-23	2023-12-22
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2023-08-08	2024-08-07
Cable	Huber+Suhner	104PEA	20995+21000+182330	2023-02-22	2024-02-21
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-01-12	2024-01-11
High Pass Filters	Titan Microwave	T04H30001800070501	22011402-4	2023-06-17	2024-06-16
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2022-12-30	2023-12-29
Pre-Amplifier	EMCI	EMC184045SE	980860	2022-12-27	2023-12-26
Cable	EMCI	EMC101G	211010+211011+211012	2022-12-12	2023-12-11
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
Software	e3 V9-210616c				

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

Support Unit List (Client)				
N0	Kind/ Brand/ Model(S/N)	Core(Qty)	Length	Remark
A	TypeA to TypeB Cable/NA/NA	N/A	N/A	N/A
B	Power Cable/NA/NA	N/A	N/A	N/A
C	TypeA to RS232 Cable/NA/NA	N/A	N/A	N/A
D	Power Cable/NA/NA	N/A	N/A	N/A
E	Power Cable/NA/NA	N/A	N/A	N/A
Support Unit List				
N0	Kind/ Brand/ Model(S/N)	Core(Qty)	Length	Remark
1	Power Supply/ABM/9603D-D011314	N/A	N/A	N/A
2	NB(D)/Lenovo/ThinkPad X260	N/A	N/A	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, KDB 558074, 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	-	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

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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	<p>GFSK for BDR-1Mbps: 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz</p> <p>$\pi/4$-DQPSK for 2Mbps: 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz</p> <p>8DPSK for EDR-3Mbps: 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz</p>

Remark:

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

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	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Worst Position	<input type="checkbox"/> Placed in fixed position. <input type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input checked="" type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input type="checkbox"/> 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	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

3.3 EUT DUTY CYCLE

Temperature: 24.6~25.8°C

Test date: August 10~14, 2023

Humidity: 51~54%RH

Tested by: Marco Chan

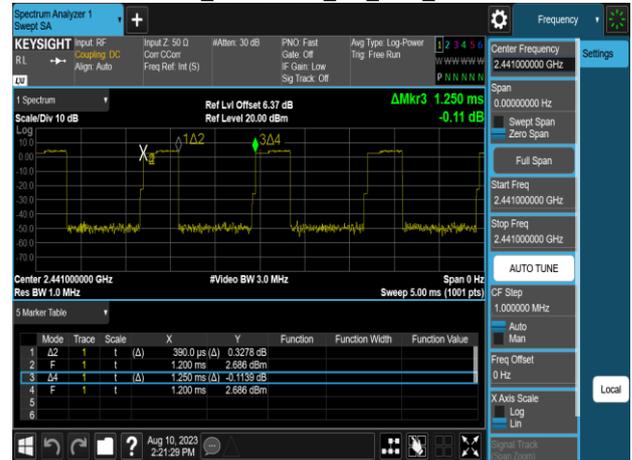
Duty Cycle				
Configuration	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
DH1	30.80	5.11	2.60	3.00
DH3	65.60	1.83	0.61	1.00
DH5	76.80	1.15	0.35	1.00
2DH1	31.20	5.06	2.56	3.00
2DH3	66.00	1.80	0.61	1.00
2DH5	77.20	1.12	0.35	1.00
3DH1	31.20	5.06	2.56	3.00
3DH3	65.60	1.83	0.61	1.00
3DH5	77.20	1.12	0.35	1.00

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Dwell Time_GFSK_1M_DH1_2441MHz



Dwell Time_π/4DQPSK_2M_DH1_2441MHz



Dwell Time_GFSK_1M_DH3_2441MHz



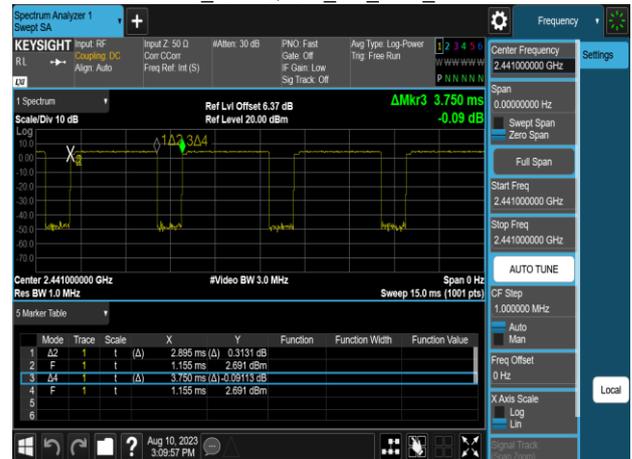
Dwell Time_π/4DQPSK_2M_DH3_2441MHz



Dwell Time_GFSK_1M_DH5_2441MHz

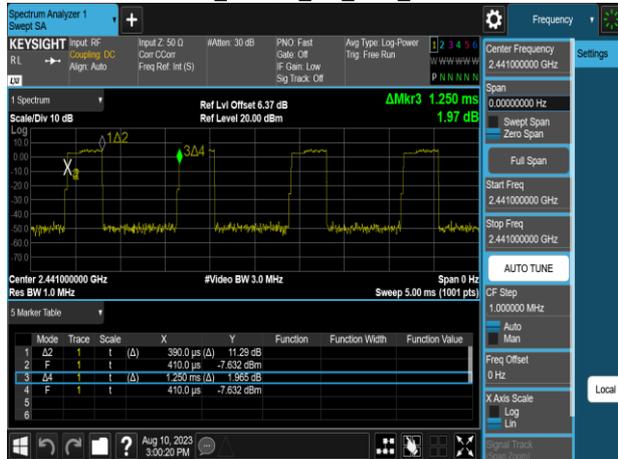


Dwell Time_π/4DQPSK_2M_DH5_2441MHz

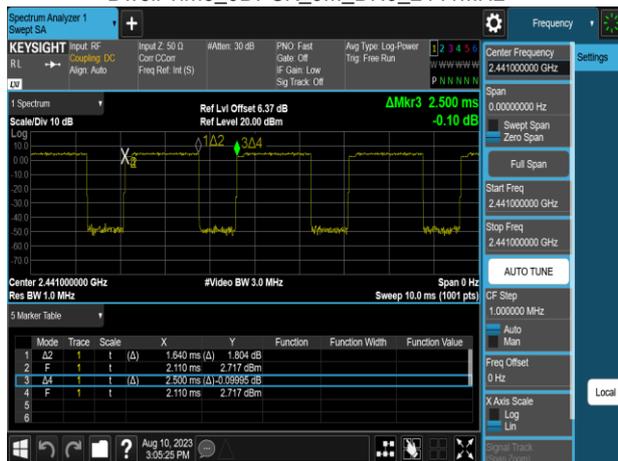


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Dwell Time_8DPSK_3M_DH1_2441MHz



Dwell Time_8DPSK_3M_DH3_2441MHz



Dwell Time_8DPSK_3M_DH5_2441MHz



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4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a)(2), RSS-GEN section 8.8,

Frequency Range (MHz)	Limits(dB μ V)	
	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

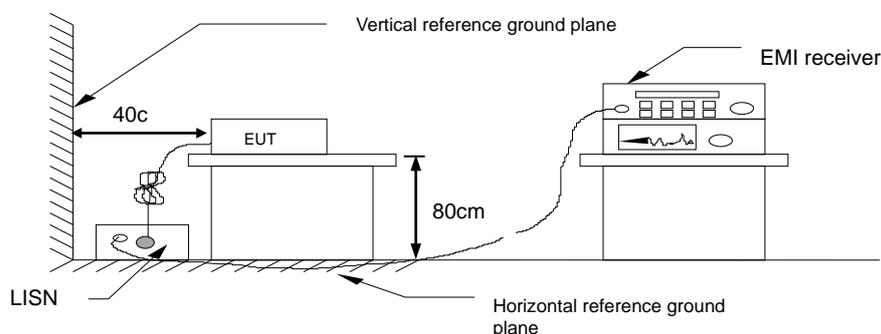
* Decreases with the logarithm of the frequency.

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(5.1)(a) and RSS-GEN 6.7

20 dB Bandwidth : For reporting purposes only.

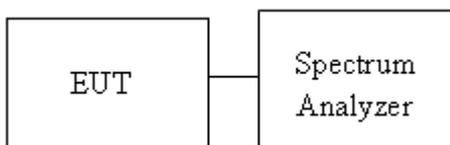
Occupied Bandwidth(99%) : For reporting purposes only.

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: 24.6~25.8°C

Test date: August 10~14, 2023

Humidity: 51~54%RH

Tested by: Marco Chan

GFSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.041	0.69
Mid	1.043	0.70
High	1.043	0.70

$\pi/4$ -DQPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.359	0.91
Mid	1.358	0.91
High	1.357	0.90

8-DPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.335	0.89
Mid	1.335	0.89
High	1.334	0.89

GFSK

CH	99% BW (MHz)
Low	0.92140
Mid	0.92053
High	0.92420

 $\pi/4$ -DQPSK

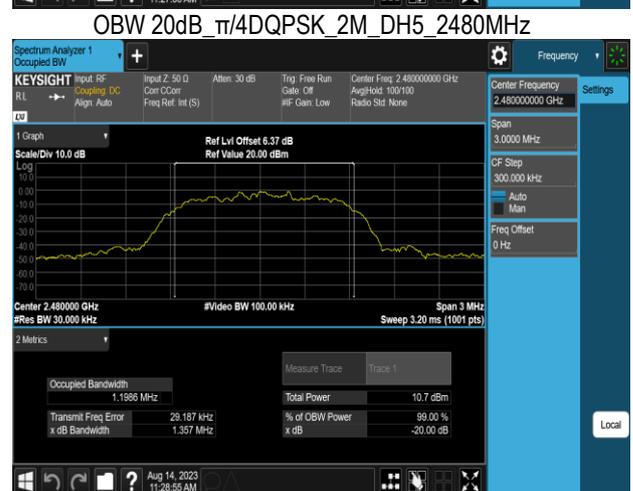
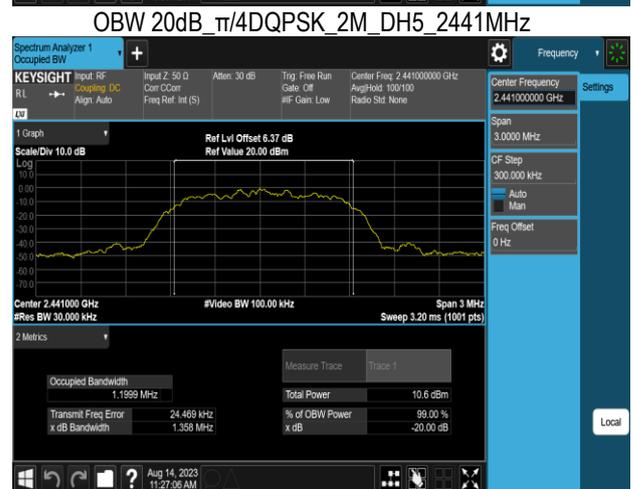
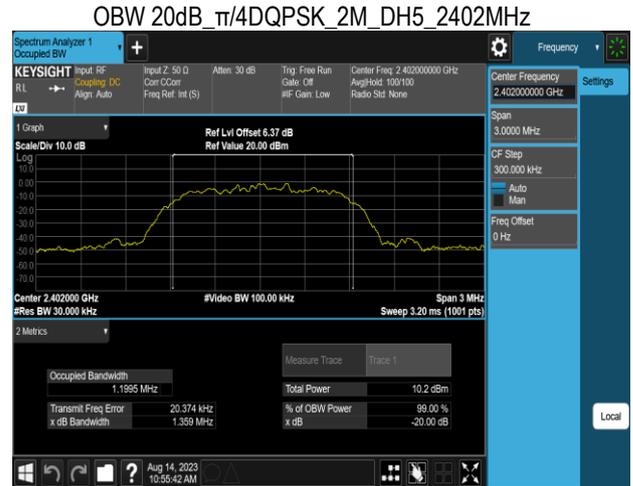
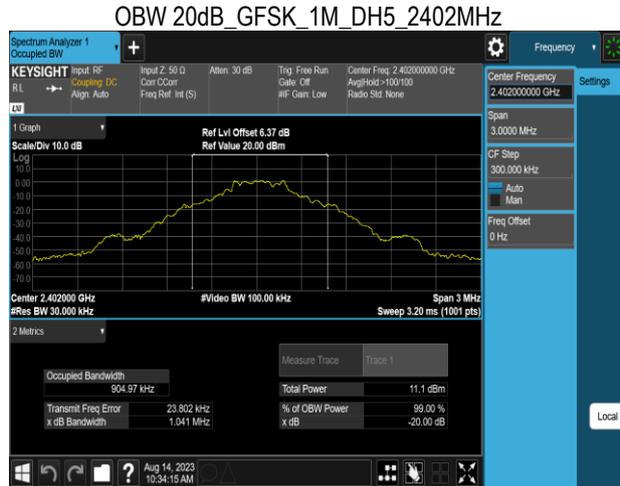
CH	99% BW (MHz)
Low	1.1982
Mid	1.1964
High	1.1958

8-DPSK

CH	99% BW (MHz)
Low	1.2063
Mid	1.2059
High	1.2065

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Test Data (20dB BANDWIDTH)



Report No.: TMWK2308002698KR

OBW 20dB_8DPSK_3M_DH5_2402MHz



OBW 20dB_8DPSK_3M_DH5_2441MHz

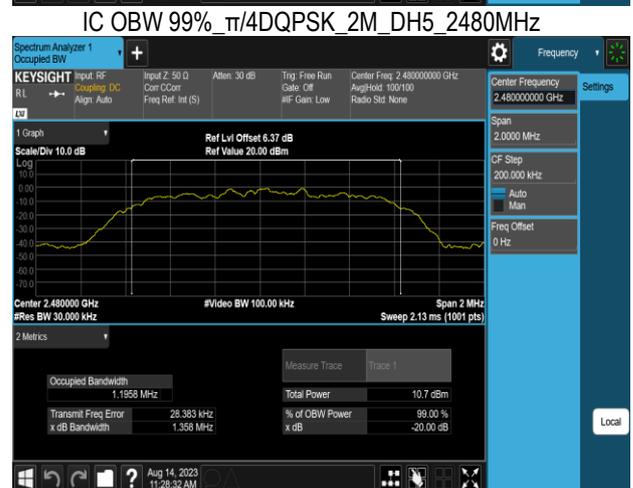
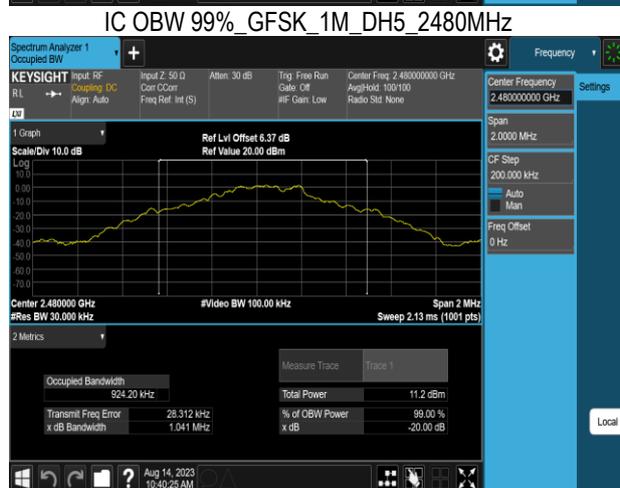
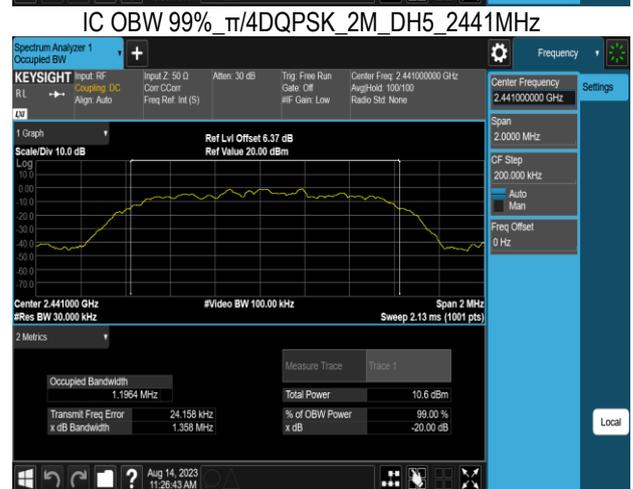
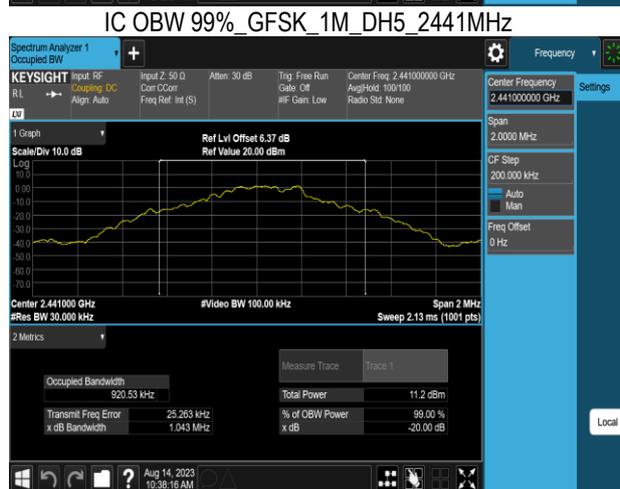
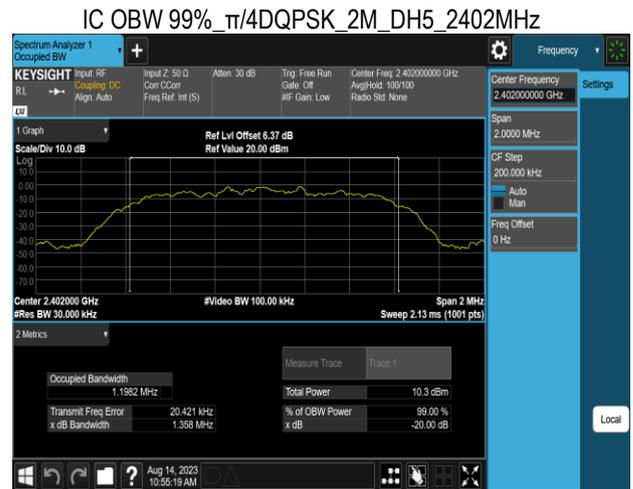
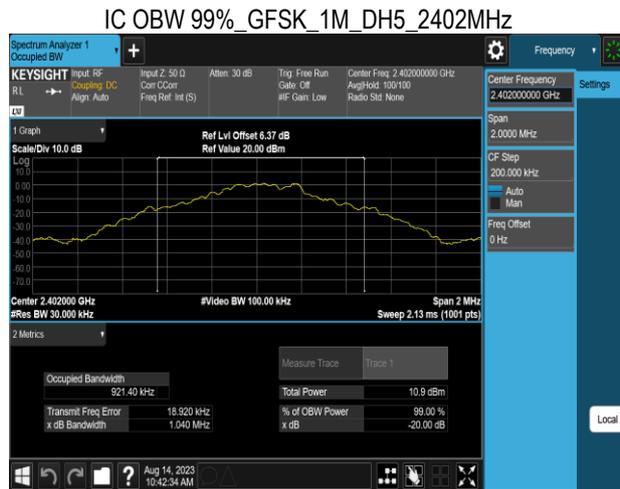


OBW 20dB_8DPSK_3M_DH5_2480MHz



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Test Data (BANDWIDTH 99%)



Report No.: TMWK2308002698KR

IC OBW 99%_8DPSK_3M_DH5_2402MHz



IC OBW 99%_8DPSK_3M_DH5_2441MHz



IC OBW 99%_8DPSK_3M_DH5_2480MHz



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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).

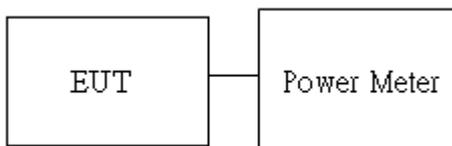
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 21dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : 21dBm [Limit = 30 – (DG – 6)]
-------	--

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



4.3.4 Test Result

Temperature: 24.6~25.8°C

Test date: August 10~14, 2023

Humidity: 51~54%RH

Tested by: Marco Chan

Peak & Average output power :

1M BR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	3.82	2.410	125
Mid	2441	default	4.01	2.518	125
High	2480	default	4.22	2.642	125

1M BR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	3.39	2.181	125
Mid	2441	default	3.46	2.216	125
High	2480	default	3.49	2.232	125

2M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	5.59	3.622	125
Mid	2441	default	5.54	3.581	125
High	2480	default	5.49	3.540	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	3.10	2.044	125
Mid	2441	default	3.11	2.048	125
High	2480	default	3.09	2.039	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	5.95	3.936	125
Mid	2441	default	5.96	3.945	125
High	2480	default	5.91	3.899	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	3.12	2.053	125
Mid	2441	default	3.13	2.058	125
High	2480	default	3.10	2.044	125

**Note: Max. Output include tune up tolerance Power measured by using average detector.*

1M BR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	default	3.39	1.00	2.746	4000
Mid	2441	default	3.46	1.00	2.790	4000
High	2480	default	3.49	1.00	2.810	4000

2M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	default	3.10	1.00	2.573	4000
Mid	2441	default	3.11	1.00	2.579	4000
High	2480	default	3.09	1.00	2.567	4000

3M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	default	3.12	1.00	2.585	4000
Mid	2441	default	3.13	1.00	2.590	4000
High	2480	default	3.10	1.00	2.573	4000

* **Note:** EIRP = Average Power + Gain

Report No.: TMWK2308002698KR

4.4 FREQUENCY SEPARATION

4.4.1 Test Limit

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

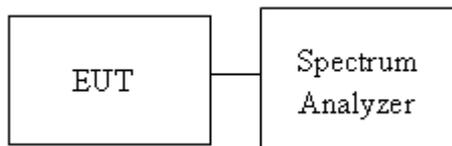
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 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 = 100kHz, VBW = 300kHz, 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: 24.6~25.8°C

Test date: August 10~14, 2023

Humidity: 51~54%RH

Tested by: Marco Chan

Report No.: TMWK2308002698KR

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



Report No.: TMWK2308002698KR

8DPSK_3M_DH5_CH0CH1CH2



8DPSK_3M_DH5_CH38CH39CH40



8DPSK_3M_DH5_CH76CH77CH78



Note: We selected worst case to performed ref test in middle channel, The results can be meet other channel.

Report No.: TMWK2308002698KR

4.5 NUMBER OF HOPPING

4.5.1 Test Limit

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

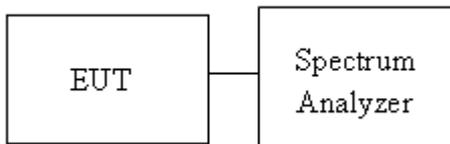
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

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. = 2483.5 MHz, RBW = 100KHz, VBW = 300KHz.
4. Max hold, view and count how many channel in the band.

4.5.3 Test Setup



4.5.4 Test Result

Temperature: 24.6~25.8°C

Test date: August 10~14, 2023

Humidity: 51~54%RH

Tested by: Marco Chan

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	



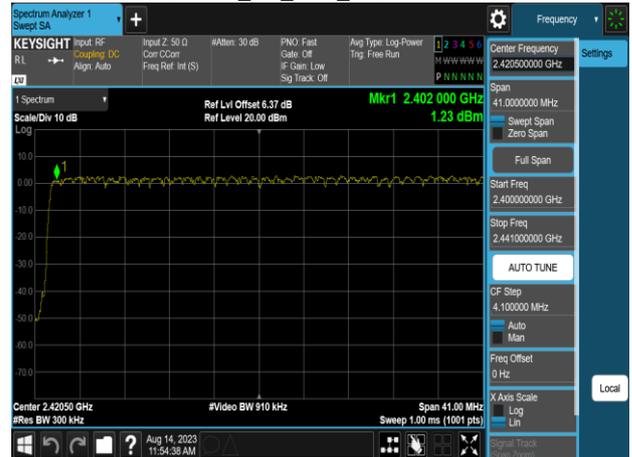
Report No.: TMWK2308002698KR

Test Data

GFSK_1M_DH5_2400-2441



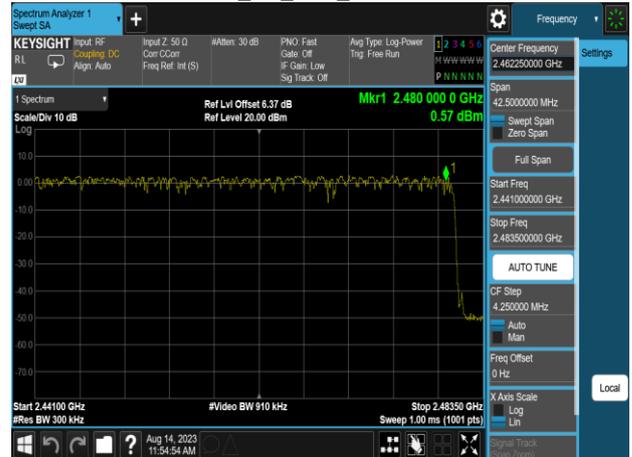
8DPSK_3M_DH5_2400-2441



GFSK_1M_DH5_2441-2480



8DPSK_3M_DH5_2441-2480



Report No.: TMWK2308002698KR

4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

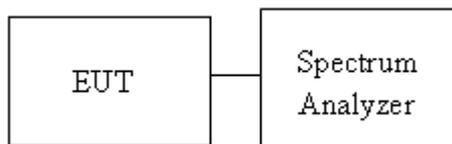
According to §15.247(d) and RSS-247 section 5.5

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



4.6.4 Test Result

Temperature: 24.6~25.8°C

Test date: August 10~14, 2023

Humidity: 51~54%RH

Tested by: Marco Chan

Report No.: TMWK2308002698KR

Test Data

Band Edge_GFSK_1M_DH5_2402MHz



Band Edge_8DPSK_3M_DH5_2402MHz



Band Edge_GFSK_1M_DH5_2480MHz



Band Edge_8DPSK_3M_DH5_2480MHz



Report No.: TMWK2308002698KR

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



Report No.: TMWK2308002698KR

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



Report No.: TMWK2308002698KR

Spurious Emission_8DPSK_3M_DH5_2402MHz



Spurious Emission_8DPSK_3M_DH5_2441MHz



Spurious Emission_8DPSK_3M_DH5_2480MHz



Report No.: TMWK2308002698KR

4.7 TIME OF OCCUPANCY (DWEELL 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: 24.6~25.8°C

Test date: August 10~14, 2023

Humidity: 51~54%RH

Tested by: Marco Chan

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	124.80	400
	2DH3	264.00	400
	2DH5	308.80	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	=	0.390	*	(1600/2/79)	*	31.6	=	124.80	(ms)
	2DH3 time slot	=	1.650	*	(1600/4/79)	*	31.6	=	264.00	(ms)
	2DH5 time slot	=	2.895	*	(1600/6/79)	*	31.6	=	308.80	(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_GFSK_1M_DH1_2441MHz



Dwell Time π/4DQPSK 2M_DH1_2441MHz



Dwell Time_GFSK_1M_DH3_2441MHz



Dwell Time π/4DQPSK 2M_DH3_2441MHz



Dwell Time_GFSK_1M_DH5_2441MHz



Dwell Time π/4DQPSK 2M_DH5_2441MHz

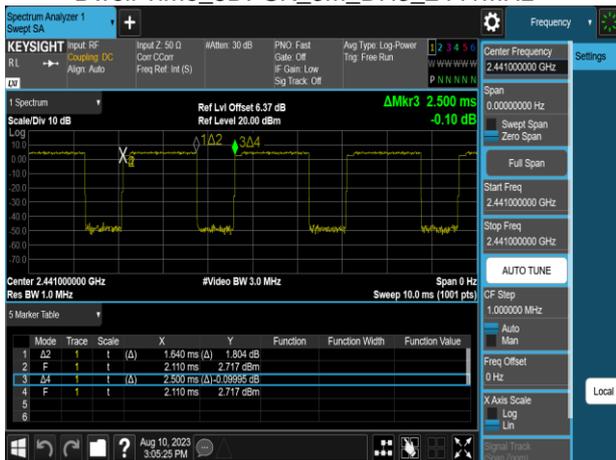


Report No.: TMWK2308002698KR

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,

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

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.

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.

Report No.: TMWK2308002698KR

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.

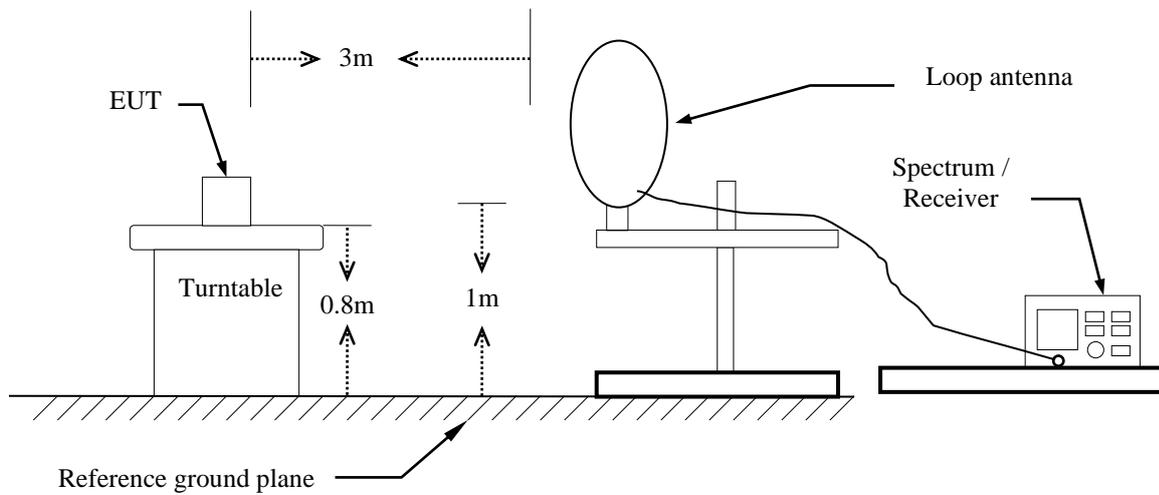
5. Data result

Actual FS=Spectrum Reading Level + Factor

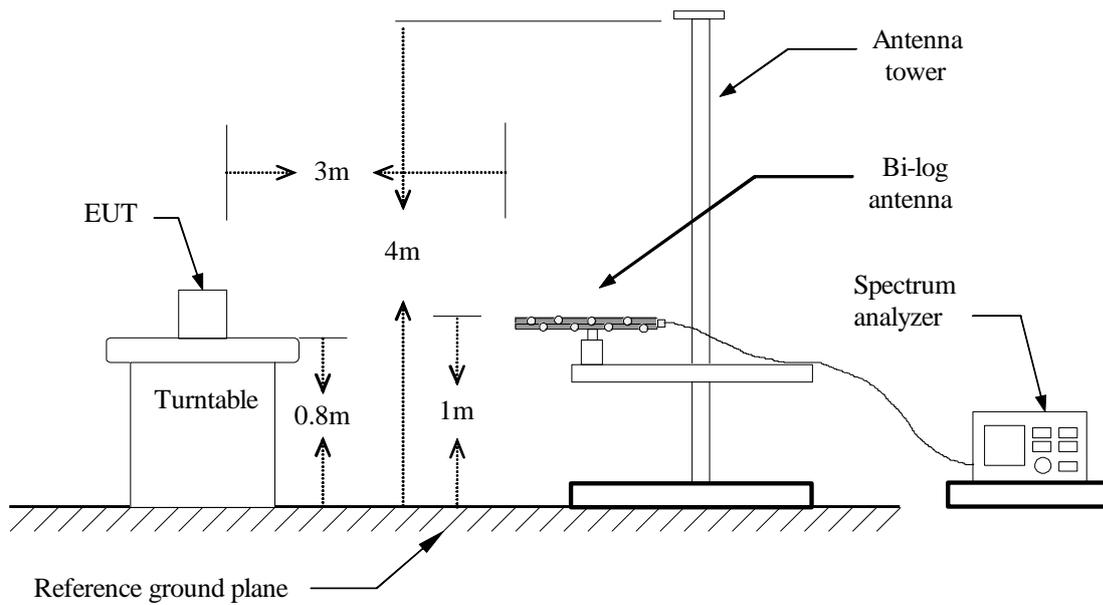
Margin=Actual FS- Limit

4.8.3 Test Setup

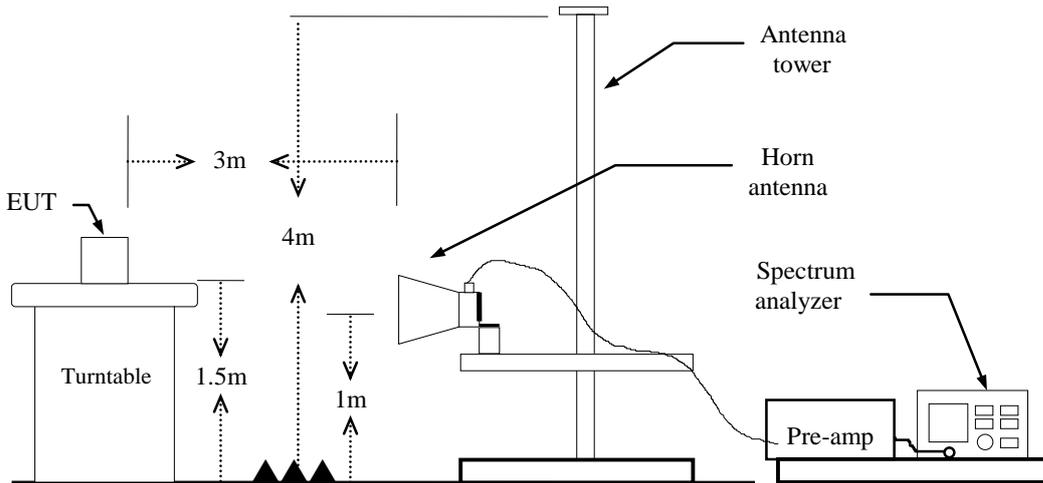
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz

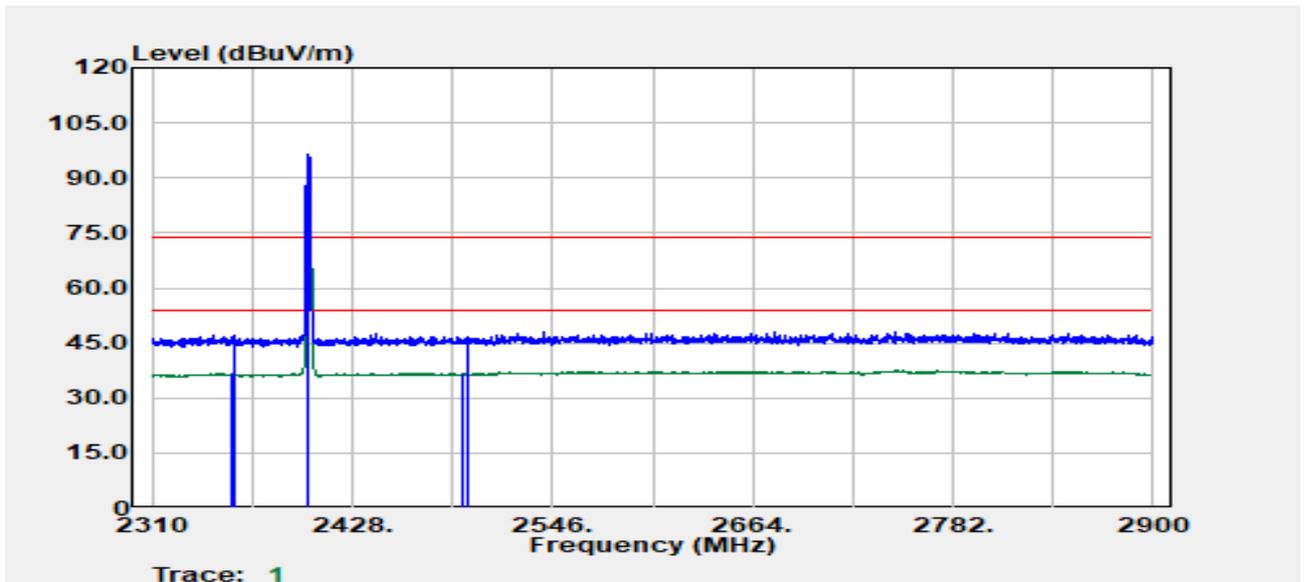


Report No.: TMWK2308002698KR

4.8.4 Test Result

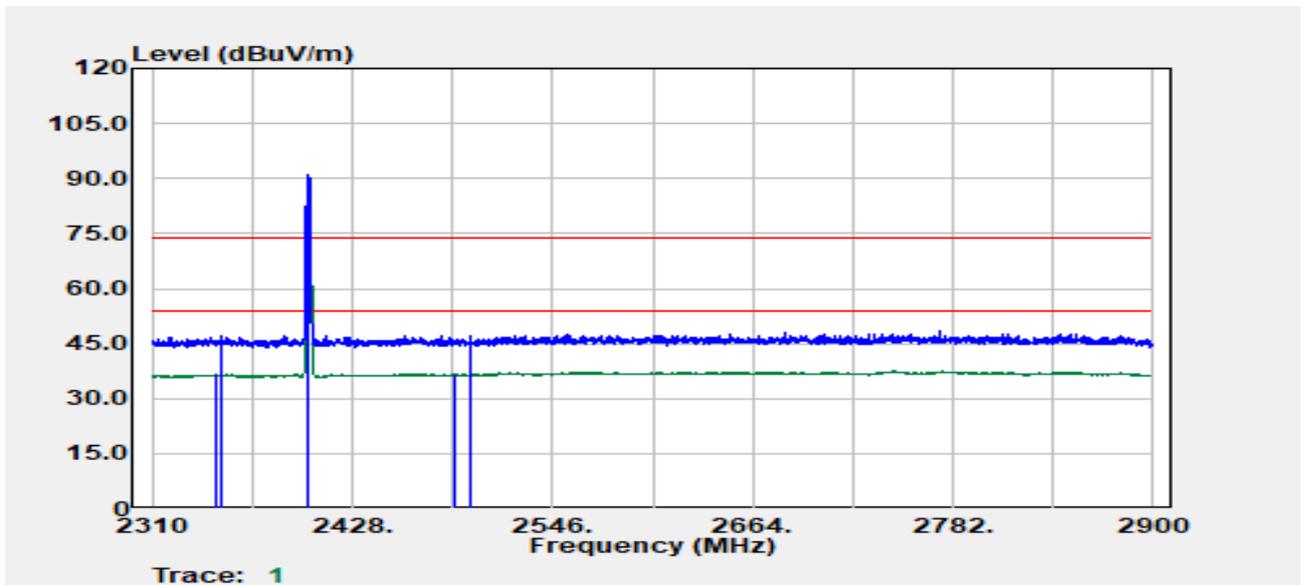
Band Edge Test Data

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



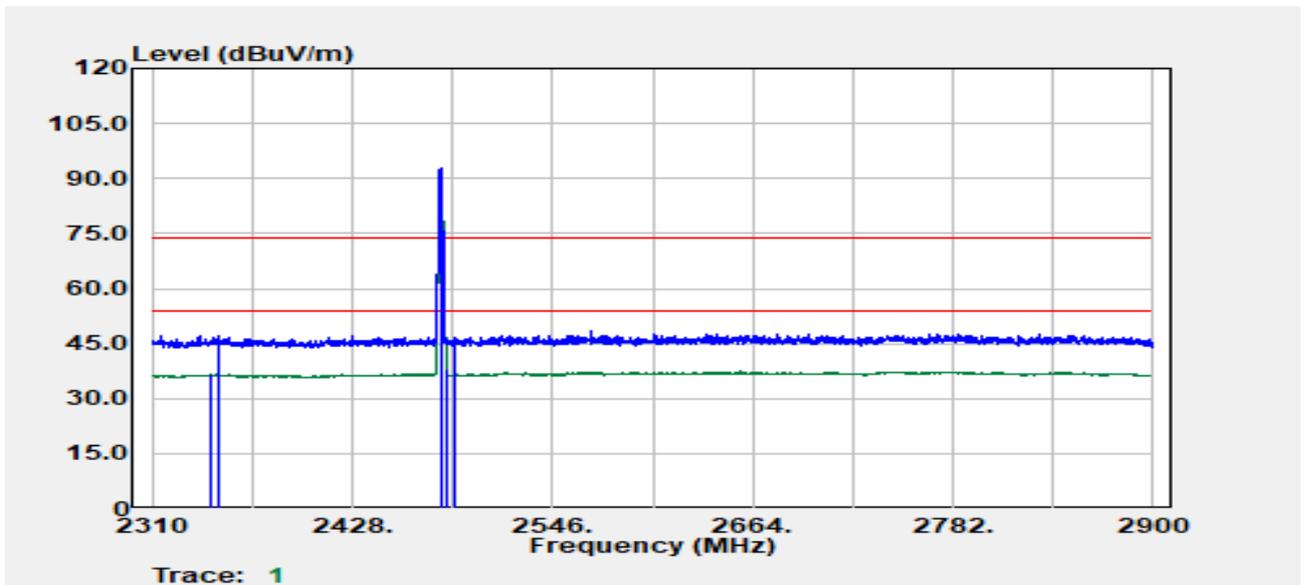
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
2356.520	Average	31.72	4.90	36.62	54.00	-17.38
2357.770	Peak	42.25	4.89	47.14	74.00	-26.86
2402.000	Peak	91.60	4.79	96.39	--	--
2402.000	Average	90.43	4.79	95.22	--	--
2493.328	Average	31.31	5.27	36.59	54.00	-17.41
2495.329	Peak	41.45	5.28	46.72	74.00	-27.28

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:HORIZONTAL
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
2347.266	Average	31.63	4.93	36.57	54.00	-17.43
2351.518	Peak	42.00	4.95	46.95	74.00	-27.05
2402.000	Peak	86.17	4.79	90.95	--	--
2402.000	Average	86.02	4.79	90.81	--	--
2488.326	Average	31.30	5.27	36.57	54.00	-17.43
2497.329	Peak	41.60	5.28	46.88	74.00	-27.12

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

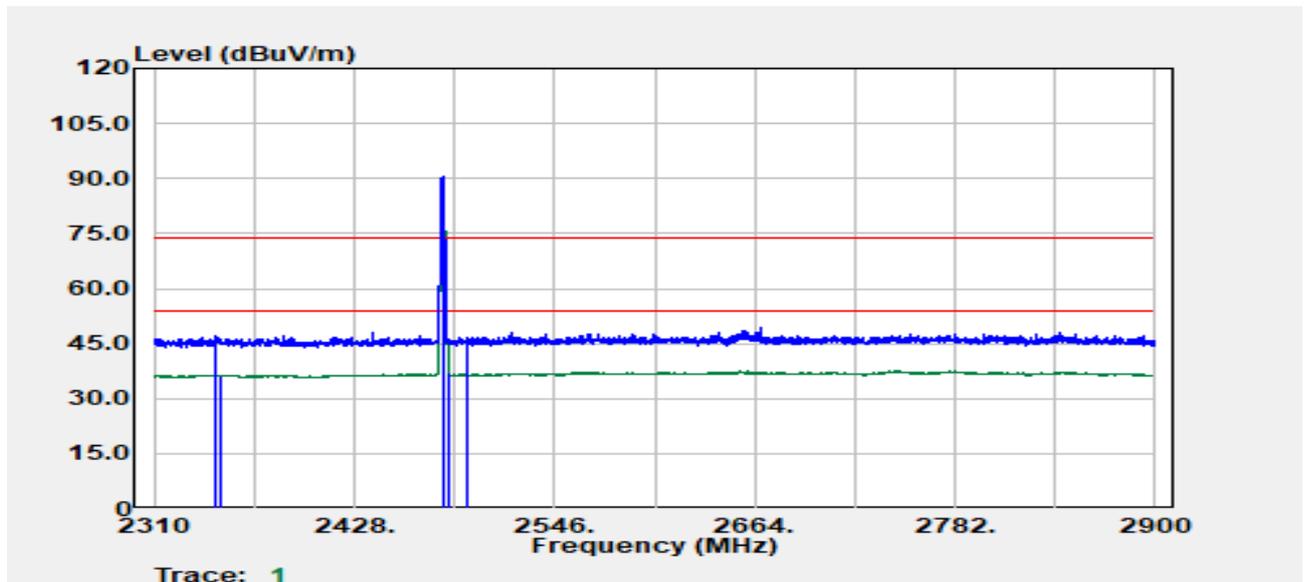


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
2345.265	Average	31.63	4.91	36.54	54.00	-17.46
2348.516	Peak	42.18	4.95	47.13	74.00	-26.87
2480.000	Peak	87.55	5.26	92.81	--	--
2480.000	Average	87.38	5.26	92.64	--	--
2483.573	Average	32.55	5.26	37.82	54.00	-16.18
2489.076	Peak	41.54	5.27	46.80	74.00	-27.20

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:HORIZONTAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

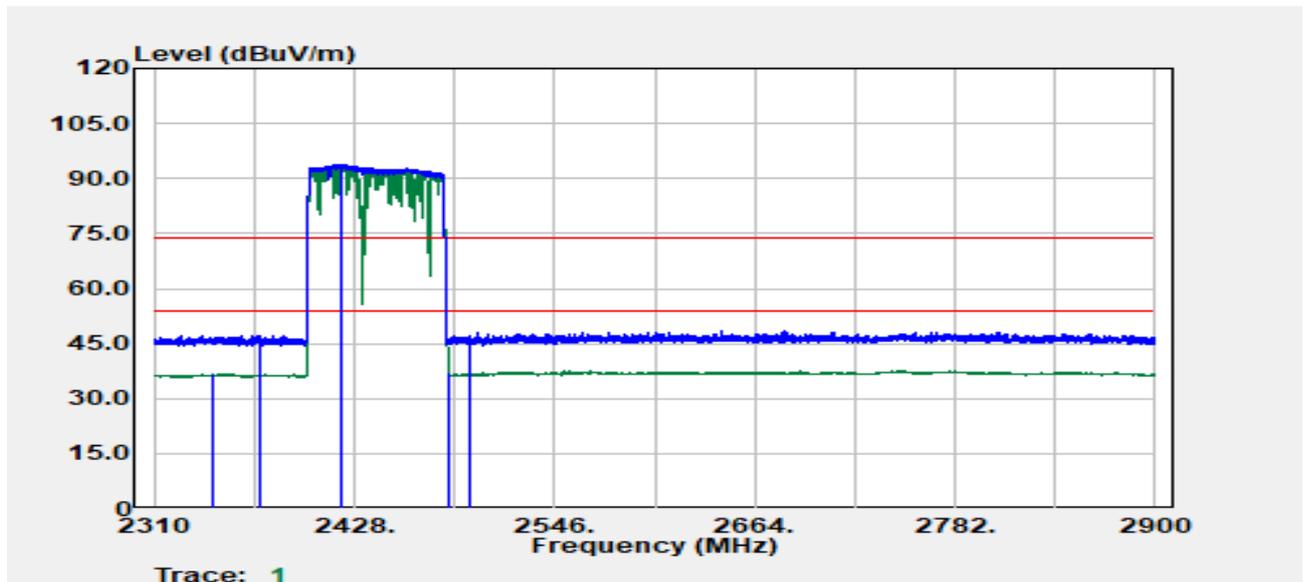


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2345.765	Peak	42.14	4.92	47.06	74.00	-26.94
2349.267	Average	31.47	4.96	36.42	54.00	-17.58
2480.000	Peak	85.16	5.26	90.42	--	--
2480.000	Average	84.94	5.26	90.20	--	--
2483.573	Average	31.68	5.26	36.95	54.00	-17.05
2494.328	Peak	41.53	5.27	46.81	74.00	-27.19

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2402~2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Hopping	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

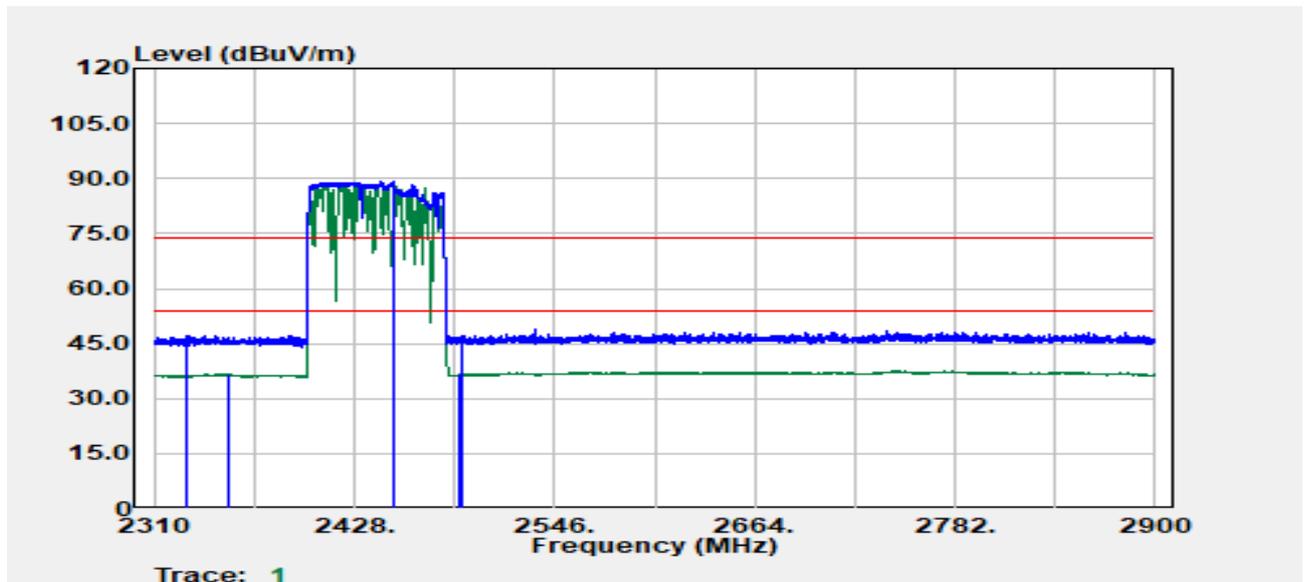


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level d μ V	Factor dB	Actual FS d μ V/m	Limit d μ V/m	Margin dB
2345.282	Average	31.70	4.91	36.61	54.00	-17.39
2373.012	Peak	42.35	4.80	47.15	74.00	-26.85
2420.094	Peak	88.80	4.94	93.74	--	--
2420.094	Average	88.64	4.94	93.58	--	--
2483.500	Average	31.90	5.26	37.16	54.00	-16.84
2496.204	Peak	41.85	5.28	47.13	74.00	-26.87

Report No.: TMWK2308002698KR

Rev.: 00

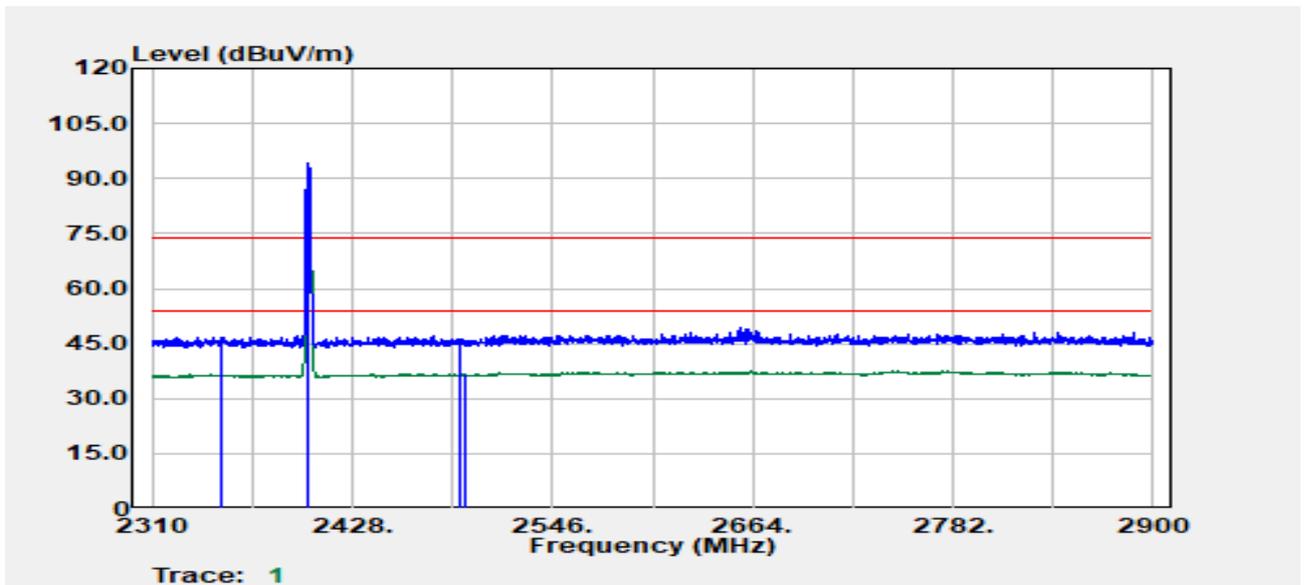
Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2402~2480 MHz	Antenna Pol.	:HORIZONTAL
Operation Mode	:Hopping	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2329.588	Peak	42.52	4.73	47.25	74.00	-26.75
2354.368	Average	31.67	4.92	36.59	54.00	-17.41
2451.128	Peak	84.19	5.04	89.23	--	--
2451.128	Average	83.58	5.04	88.63	--	--
2489.360	Average	31.32	5.27	36.59	54.00	-17.41
2492.074	Peak	41.83	5.27	47.10	74.00	-26.90

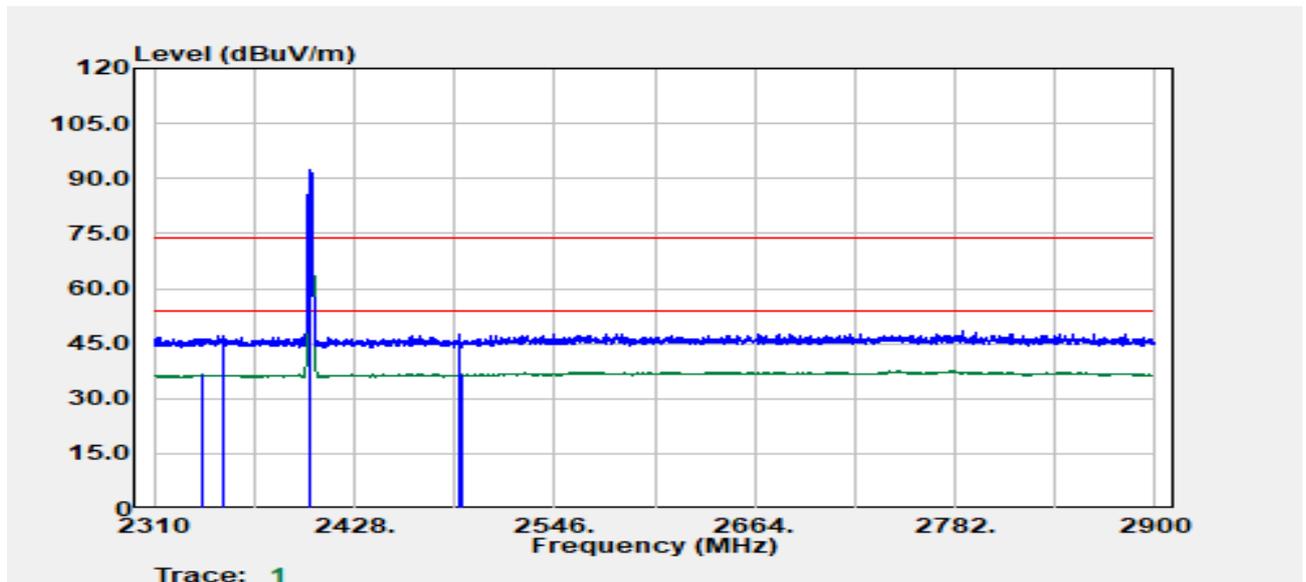
Report No.: TMWK2308002698KR

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



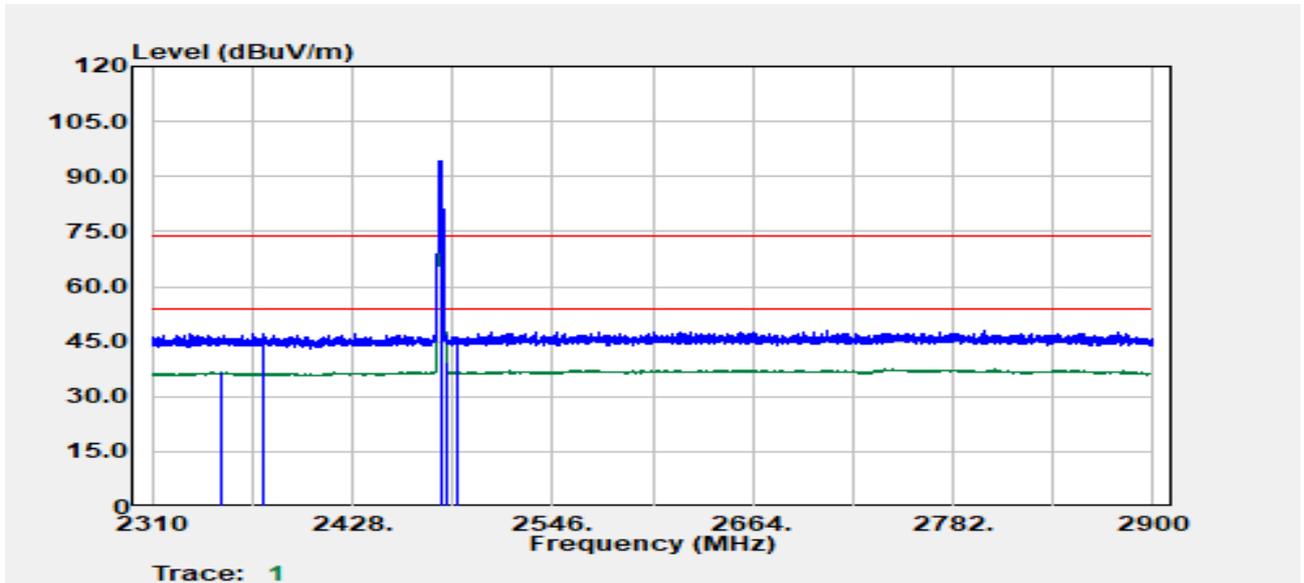
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
2351.268	Peak	41.84	4.95	46.79	74.00	-27.21
2351.518	Average	31.55	4.95	36.50	54.00	-17.50
2402.000	Peak	89.24	4.79	94.03	--	--
2402.000	Average	86.14	4.79	90.93	--	--
2490.827	Peak	41.13	5.27	46.40	74.00	-27.60
2493.828	Average	31.23	5.27	36.50	54.00	-17.50

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:HORIZONTAL
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
2338.512	Average	31.65	4.83	36.49	54.00	-17.51
2350.517	Peak	42.34	4.96	47.30	74.00	-26.70
2402.000	Peak	87.81	4.79	92.59	--	--
2402.000	Average	84.64	4.79	89.43	--	--
2490.326	Peak	42.17	5.27	47.44	74.00	-26.56
2491.827	Average	31.25	5.27	36.52	54.00	-17.48

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

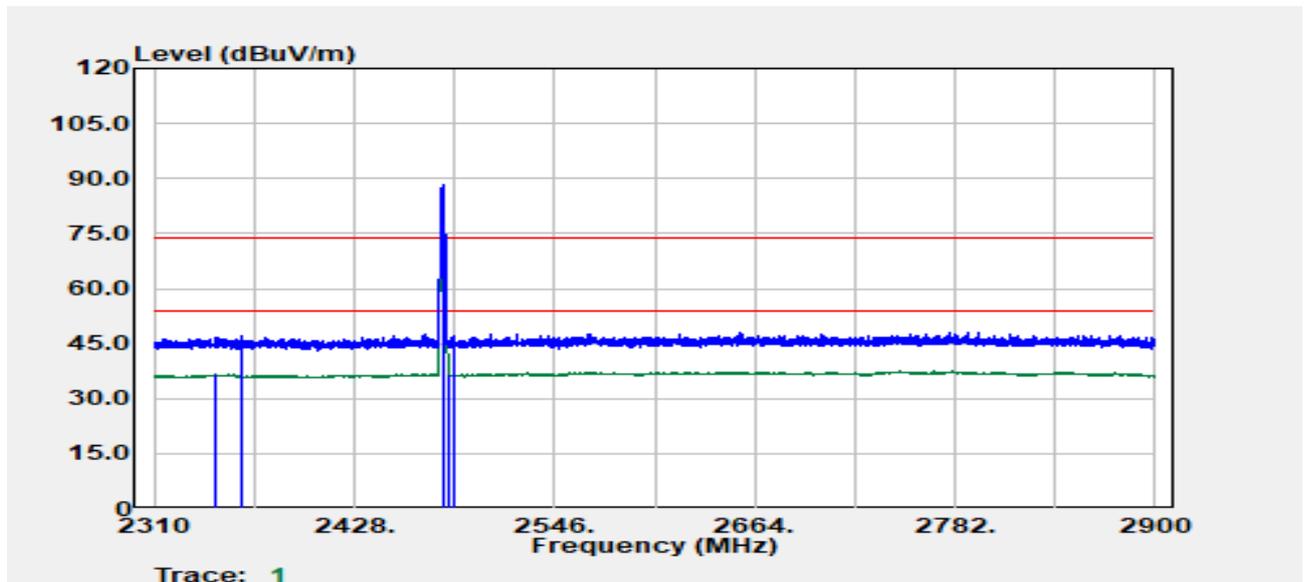


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
2350.120	Average	31.73	4.96	36.69	54.00	-17.31
2374.782	Peak	42.43	4.82	47.25	74.00	-26.75
2480.000	Peak	89.10	5.26	94.36	--	--
2480.000	Average	86.02	5.26	91.28	--	--
2483.500	Average	33.91	5.26	39.18	54.00	-14.82
2490.068	Peak	41.12	5.27	46.39	74.00	-27.61

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:HORIZONTAL
Operation Mode	:Bandedge	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

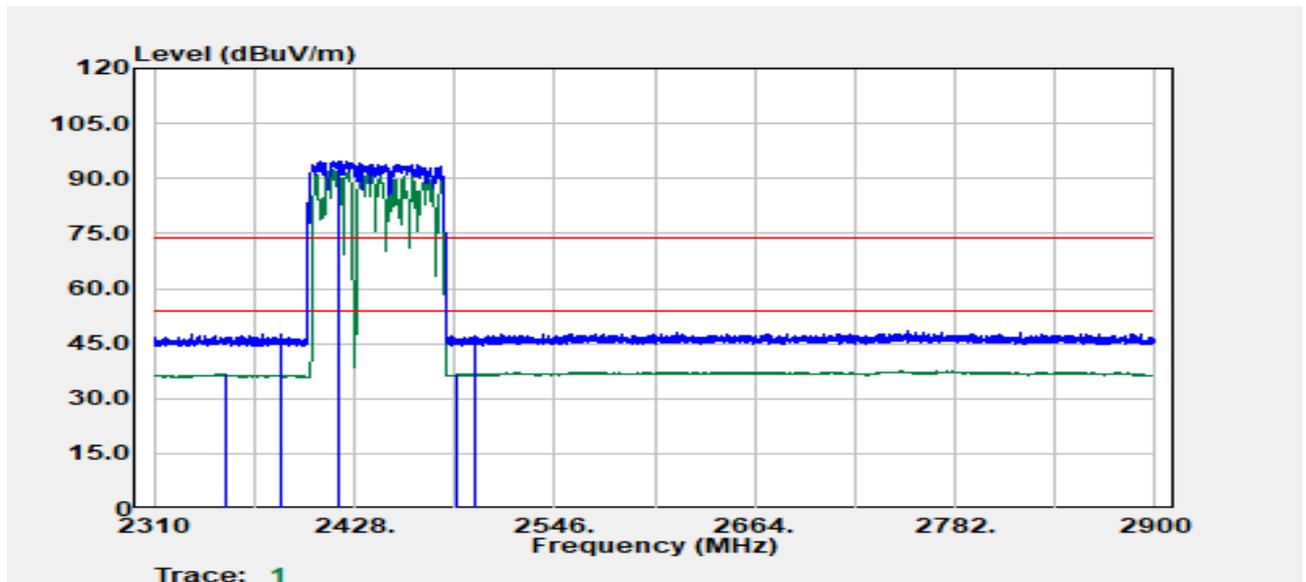


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
2346.580	Average	31.62	4.93	36.55	54.00	-17.45
2362.038	Peak	42.26	4.85	47.10	74.00	-26.90
2480.000	Peak	82.86	5.26	88.12	--	--
2480.000	Average	79.66	5.26	84.92	--	--
2483.500	Average	31.59	5.26	36.85	54.00	-17.15
2486.646	Peak	41.71	5.27	46.98	74.00	-27.02

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2402~2480 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Hopping	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

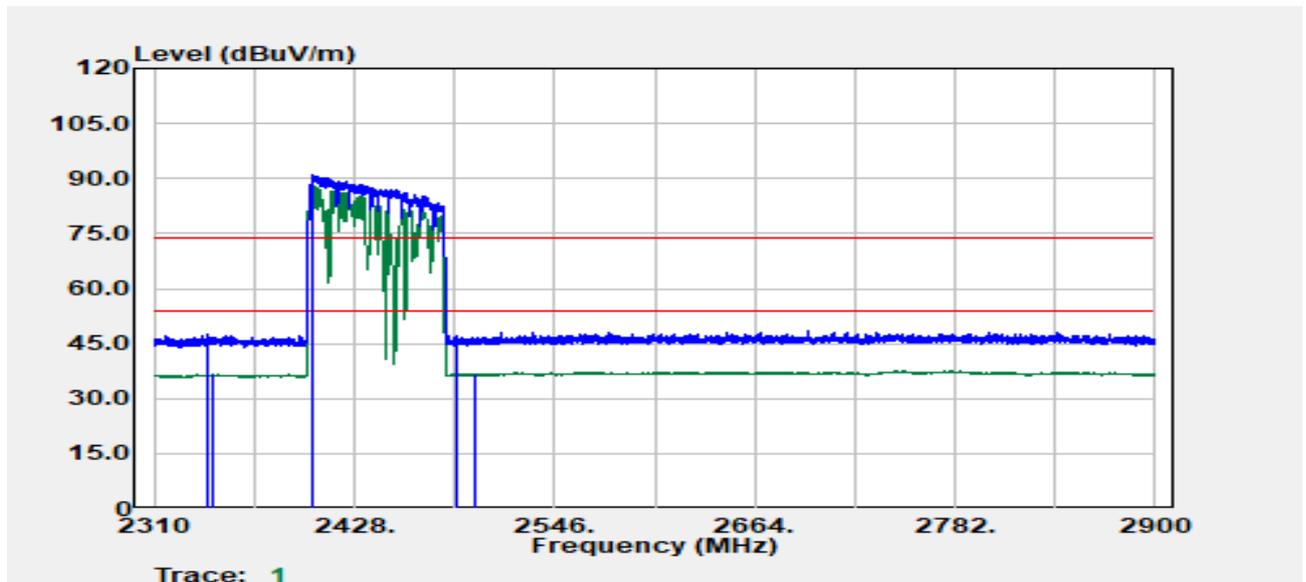


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2351.772	Average	31.68	4.95	36.63	54.00	-17.37
2384.812	Peak	42.81	4.92	47.73	74.00	-26.27
2418.088	Peak	89.91	4.92	94.82	--	--
2418.088	Average	87.33	4.92	92.24	--	--
2488.416	Average	31.41	5.27	36.68	54.00	-17.32
2499.390	Peak	41.91	5.28	47.19	74.00	-26.81

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2402~2480 MHz	Antenna Pol.	:HORIZONTAL
Operation Mode	:Hopping	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

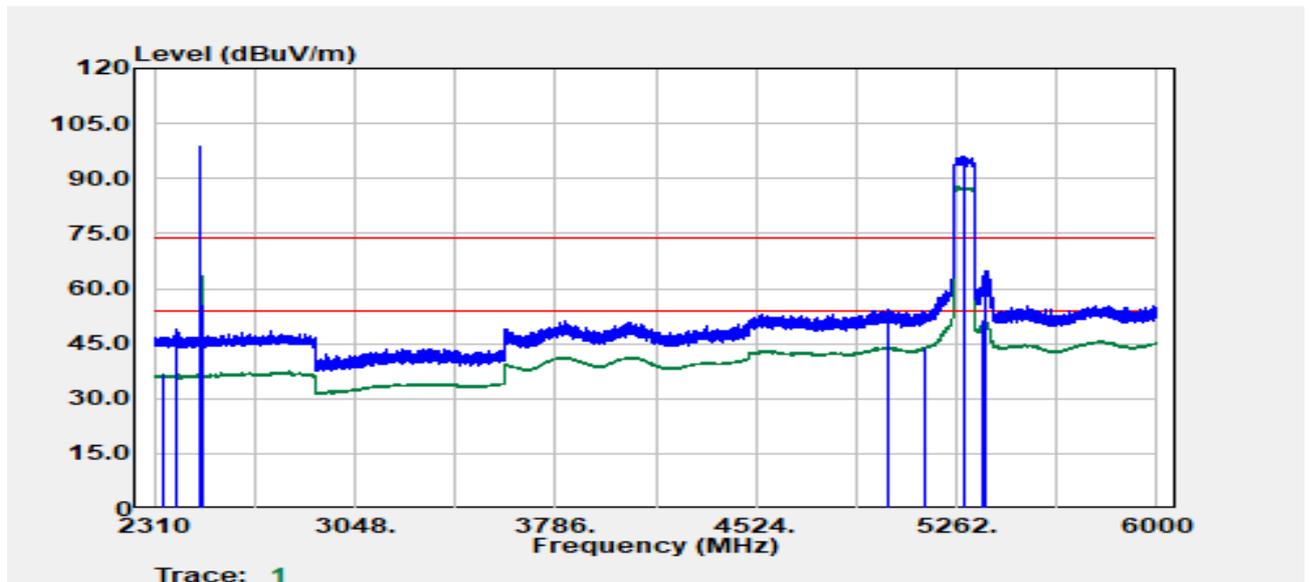


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2341.860	Peak	42.78	4.87	47.66	74.00	-26.34
2344.692	Average	31.65	4.90	36.56	54.00	-17.44
2403.928	Peak	86.23	4.79	91.02	--	--
2403.928	Average	83.38	4.79	88.17	--	--
2489.006	Peak	41.83	5.27	47.10	74.00	-26.90
2499.272	Average	31.35	5.28	36.63	54.00	-17.37

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11ac80/Band2	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5290 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

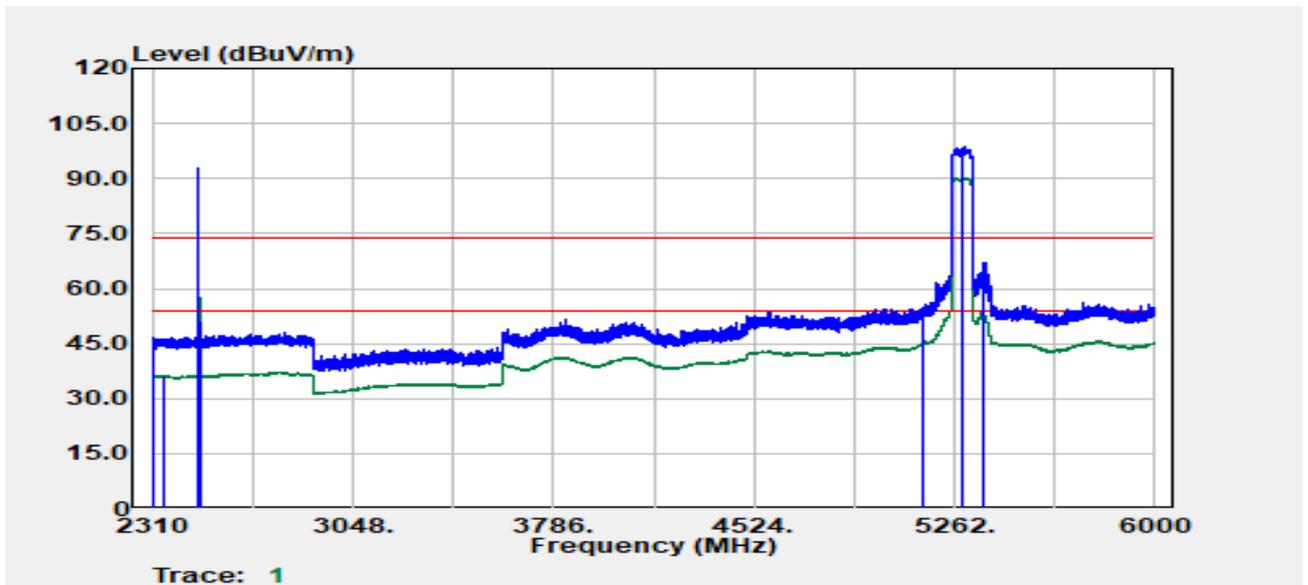


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2345.015	Average	31.57	4.91	36.48	54.00	-17.52
2389.284	Peak	43.47	4.97	48.44	74.00	-25.56
2480.000	Peak	93.59	5.26	98.85	--	--
2480.000	Average	90.46	5.26	95.72	--	--
2483.573	Peak	45.23	5.26	50.49	74.00	-23.51
2483.573	Average	35.83	5.26	41.10	54.00	-12.90
5008.585	Peak	42.75	11.67	54.42	74.00	-19.58
5147.858	Average	31.92	12.16	44.08	54.00	-9.92
5290.000	Peak	83.90	12.13	96.03	--	--
5290.000	Average	75.72	12.13	87.85	--	--
5360.144	Average	39.17	12.17	51.34	54.00	-2.66
5370.645	Peak	52.70	12.21	64.91	74.00	-9.09

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11ac80/Band2	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5290 MHz	Antenna Pol.	:HORIZONTAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

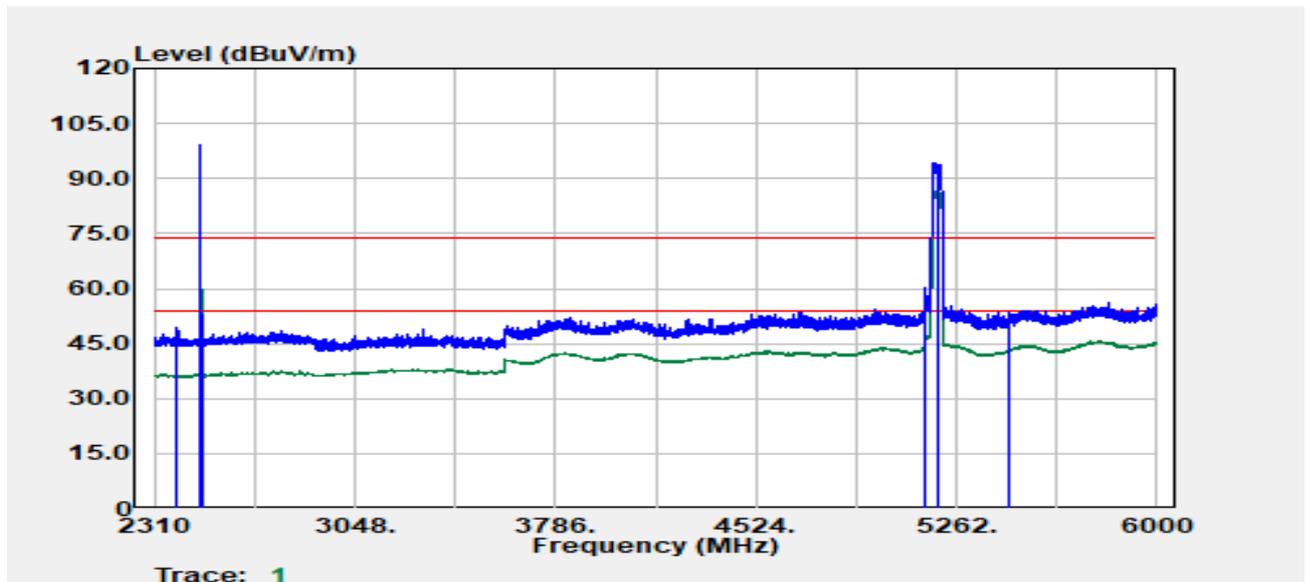


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2311.501	Peak	41.62	4.88	46.50	74.00	-27.50
2350.267	Average	31.39	4.96	36.35	54.00	-17.65
2480.000	Peak	87.78	5.26	93.04	--	--
2480.000	Average	84.64	5.26	89.90	--	--
2483.573	Average	32.68	5.26	37.94	54.00	-16.06
2484.074	Peak	41.42	5.26	46.68	74.00	-27.32
5148.108	Peak	42.41	12.16	54.57	74.00	-19.43
5149.858	Average	33.11	12.16	45.27	54.00	-8.73
5290.000	Peak	86.68	12.13	98.81	--	--
5290.000	Average	78.17	12.13	90.30	--	--
5364.644	Peak	54.99	12.19	67.18	74.00	-6.82
5368.645	Average	41.33	12.20	53.53	54.00	-0.47

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11n40/Band1	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5190 MHz	Antenna Pol.	:VERTICAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

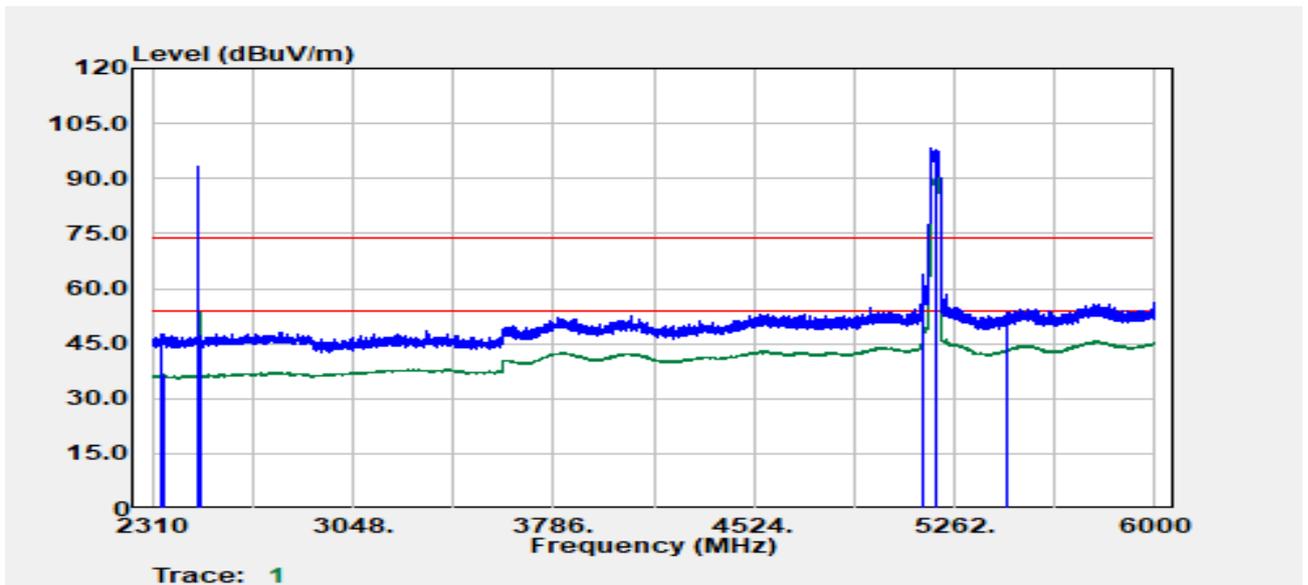


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2389.033	Peak	42.86	4.97	47.83	74.00	-26.17
2389.784	Average	31.71	4.97	36.69	54.00	-17.31
2480.000	Peak	93.97	5.26	99.23	--	--
2480.000	Average	90.90	5.26	96.16	--	--
2483.573	Peak	44.45	5.26	49.71	74.00	-24.29
2483.573	Average	36.34	5.26	41.61	54.00	-12.39
5144.607	Peak	48.18	12.15	60.33	74.00	-13.67
5149.108	Average	34.10	12.16	46.26	54.00	-7.74
5190.000	Peak	82.31	12.08	94.39	--	--
5190.000	Average	74.75	12.08	86.83	--	--
5453.909	Average	30.94	12.39	43.32	54.00	-10.68
5458.660	Peak	40.86	12.41	53.26	74.00	-20.74

Report No.: TMWK2308002698KR

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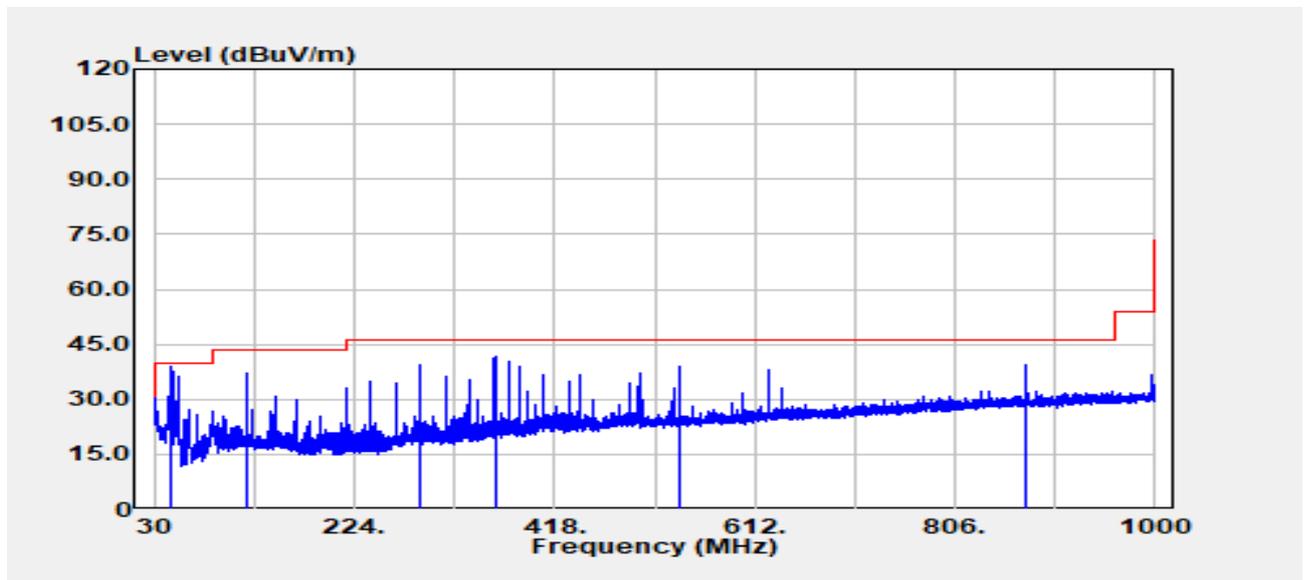
Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11n40/Band1	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5190 MHz	Antenna Pol.	:HORIZONTAL
Operation Mode	:Bandedge	Engineer	:Tony.Chao
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
2343.014	Peak	42.47	4.88	47.36	74.00	-26.64
2349.017	Average	31.63	4.95	36.59	54.00	-17.41
2480.000	Peak	87.93	5.26	93.19	--	--
2480.000	Average	84.77	5.26	90.03	--	--
2483.573	Average	32.51	5.26	37.77	54.00	-16.23
2484.074	Peak	40.75	5.26	46.01	74.00	-27.99
5149.358	Peak	51.68	12.16	63.84	74.00	-10.16
5150.108	Average	36.18	12.16	48.34	54.00	-5.66
5190.000	Peak	86.17	12.08	98.25	--	--
5190.000	Average	78.00	12.08	90.08	--	--
5454.159	Peak	41.16	12.39	53.55	74.00	-20.45
5459.910	Average	31.02	12.41	43.43	54.00	-10.57

TX Test Data

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

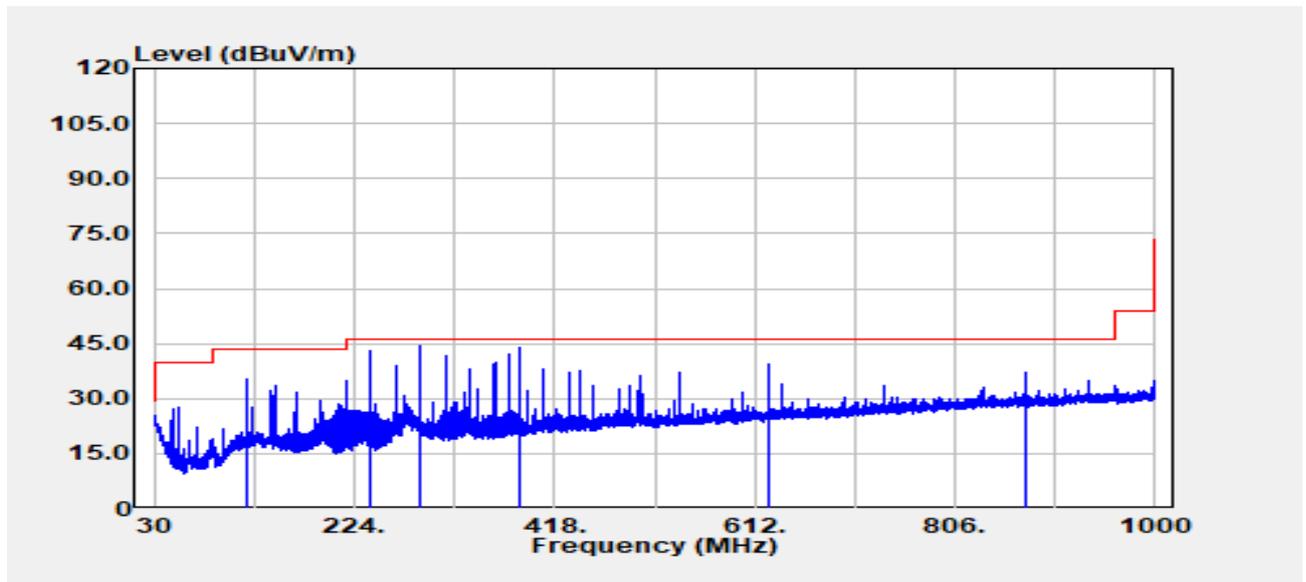


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
46.490	Peak	53.02	-14.14	38.88	40.00	-1.12
119.968	Peak	46.37	-9.21	37.16	43.50	-6.34
288.020	Peak	48.20	-8.79	39.42	46.00	-6.58
360.043	Peak	48.79	-7.18	41.62	46.00	-4.38
539.978	Peak	41.84	-2.85	38.99	46.00	-7.01
874.991	Peak	36.78	2.57	39.35	46.00	-6.65

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

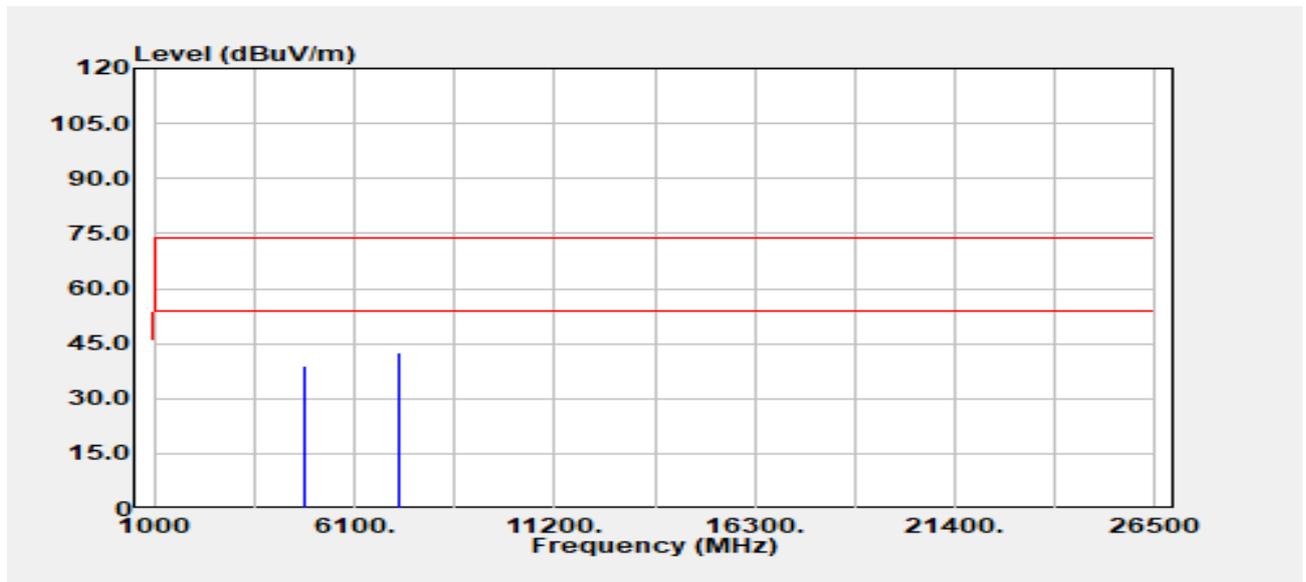


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
119.968	Peak	44.63	-9.21	35.42	43.50	-8.08
240.005	Peak	53.63	-10.75	42.88	46.00	-3.12
288.020	Peak	53.06	-8.79	44.27	46.00	-1.73
384.050	Peak	50.35	-6.48	43.87	46.00	-2.13
624.974	Peak	40.77	-1.16	39.61	46.00	-6.39
874.991	Peak	34.69	2.57	37.26	46.00	-8.74

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

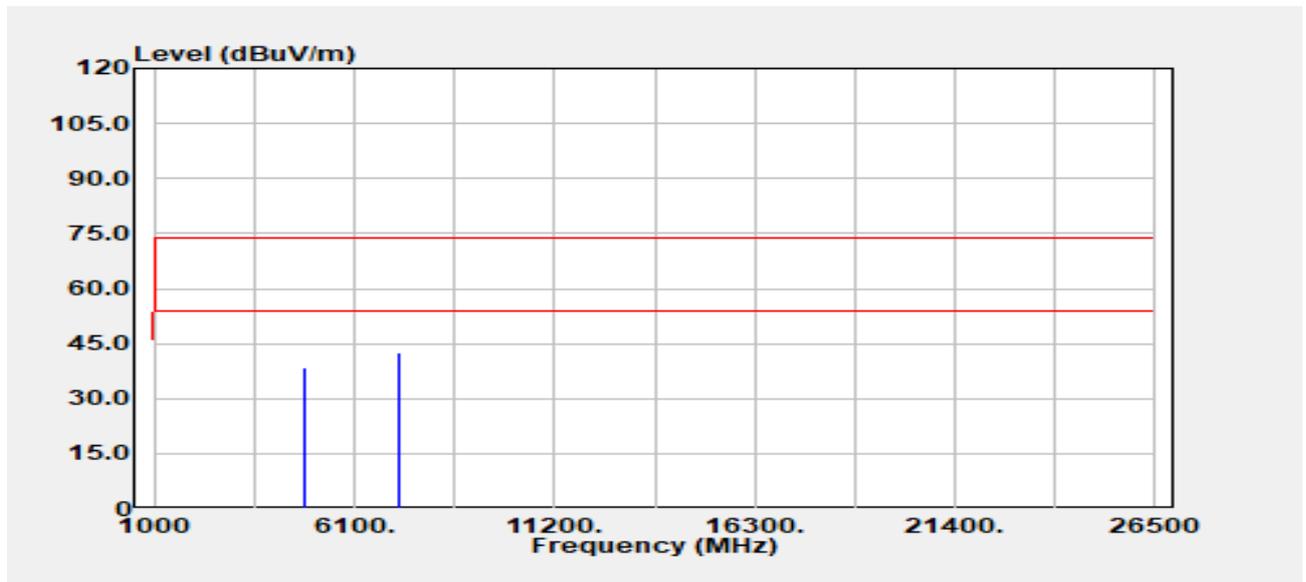


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.000	Peak	37.90	1.22	39.12	74.00	-34.88
4804.000	Average	28.05	1.22	29.27	54.00	-24.73
7206.000	Peak	34.65	7.75	42.40	74.00	-31.60
7206.000	Average	25.45	7.75	33.20	54.00	-20.80

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

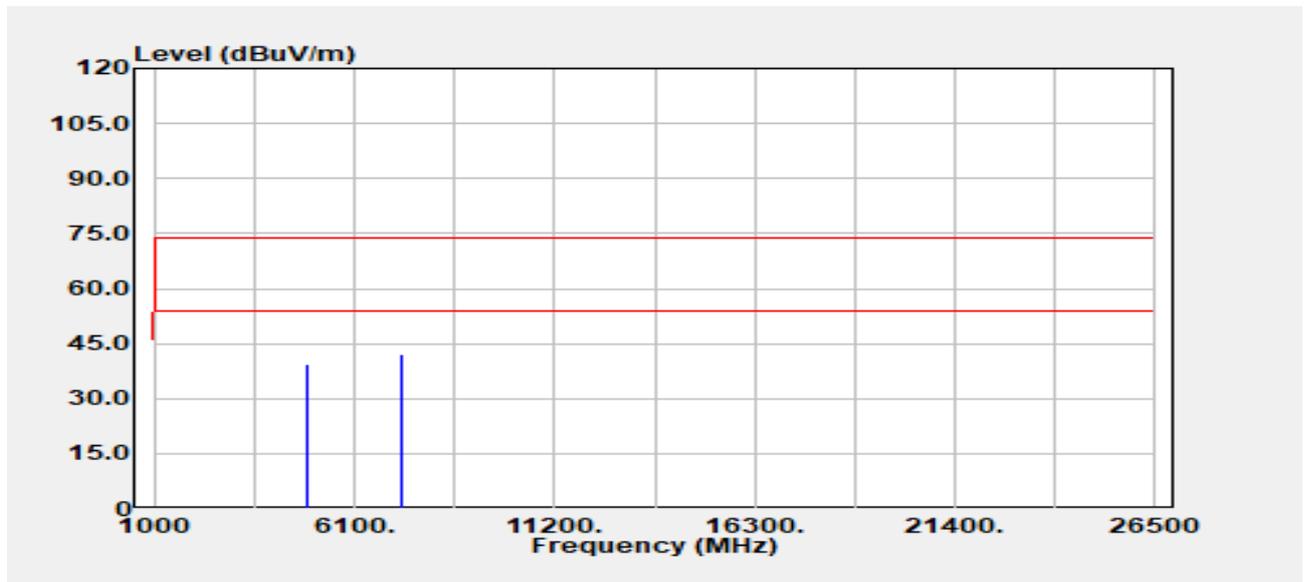


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.000	Peak	37.16	1.22	38.38	74.00	-35.62
4804.000	Average	28.17	1.22	29.40	54.00	-24.60
7206.000	Peak	34.75	7.75	42.50	74.00	-31.50
7206.000	Average	25.56	7.75	33.31	54.00	-20.69

Report No.: TMWK2308002698KR

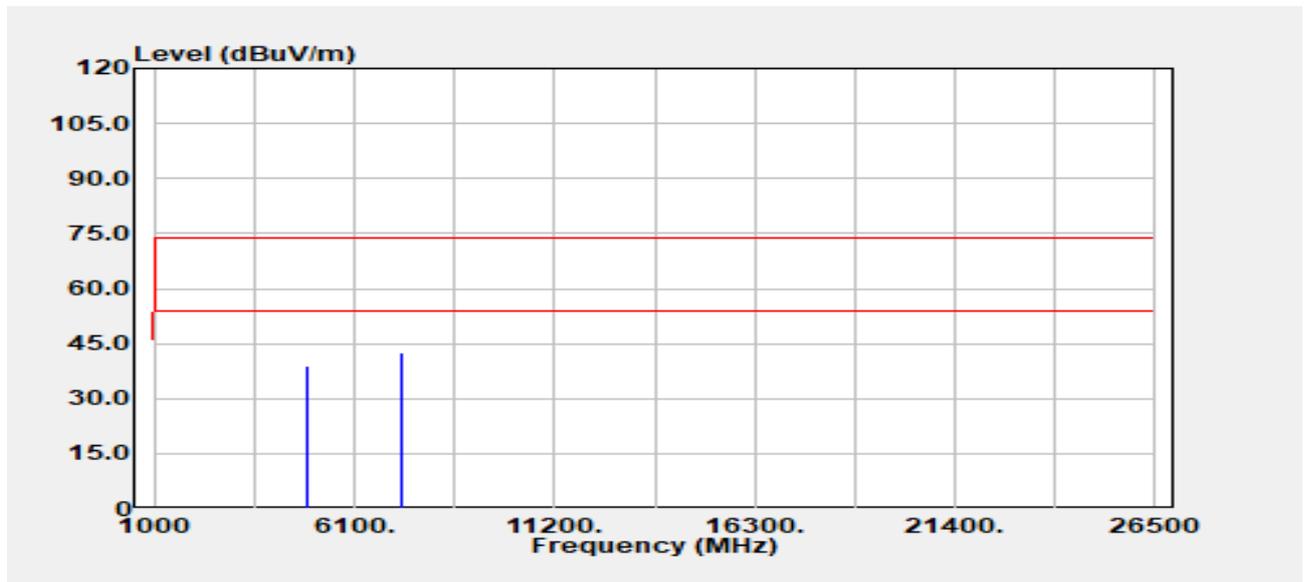
Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2441 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



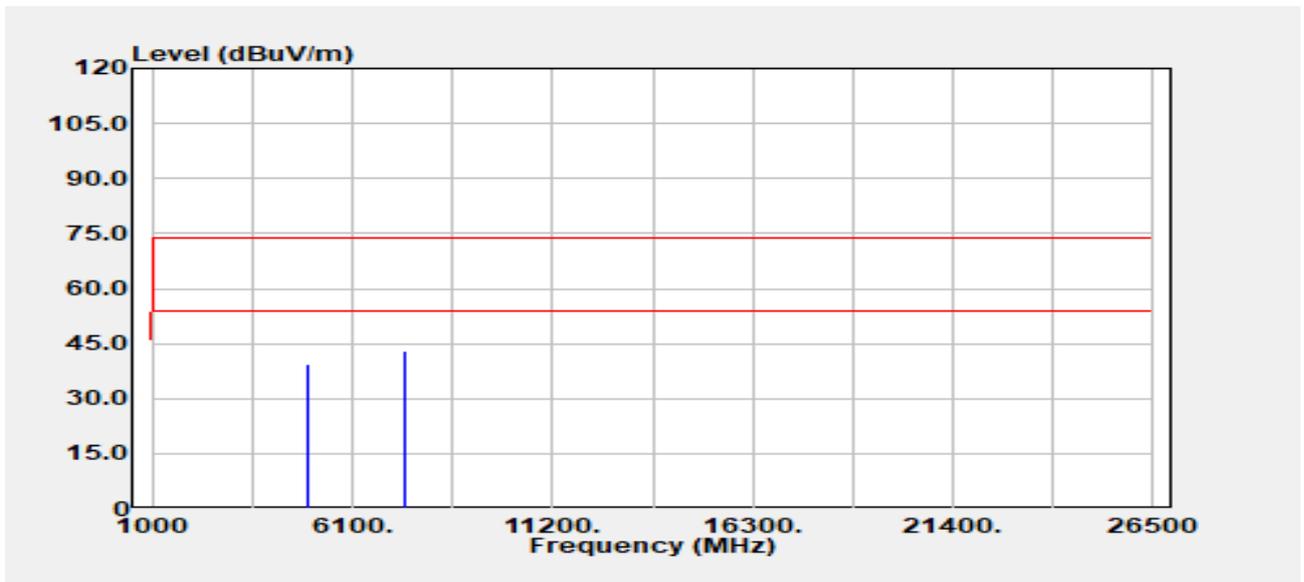
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4882.000	Peak	37.72	1.63	39.36	74.00	-34.64
4882.000	Average	27.79	1.63	29.42	54.00	-24.58
7323.000	Peak	34.20	7.71	41.91	74.00	-32.09
7323.000	Average	25.51	7.71	33.21	54.00	-20.79

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2441 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
4882.000	Peak	37.51	1.63	39.14	74.00	-34.86
4882.000	Average	27.83	1.63	29.47	54.00	-24.53
7323.000	Peak	34.63	7.71	42.34	74.00	-31.66
7323.000	Average	25.61	7.71	33.32	54.00	-20.68

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

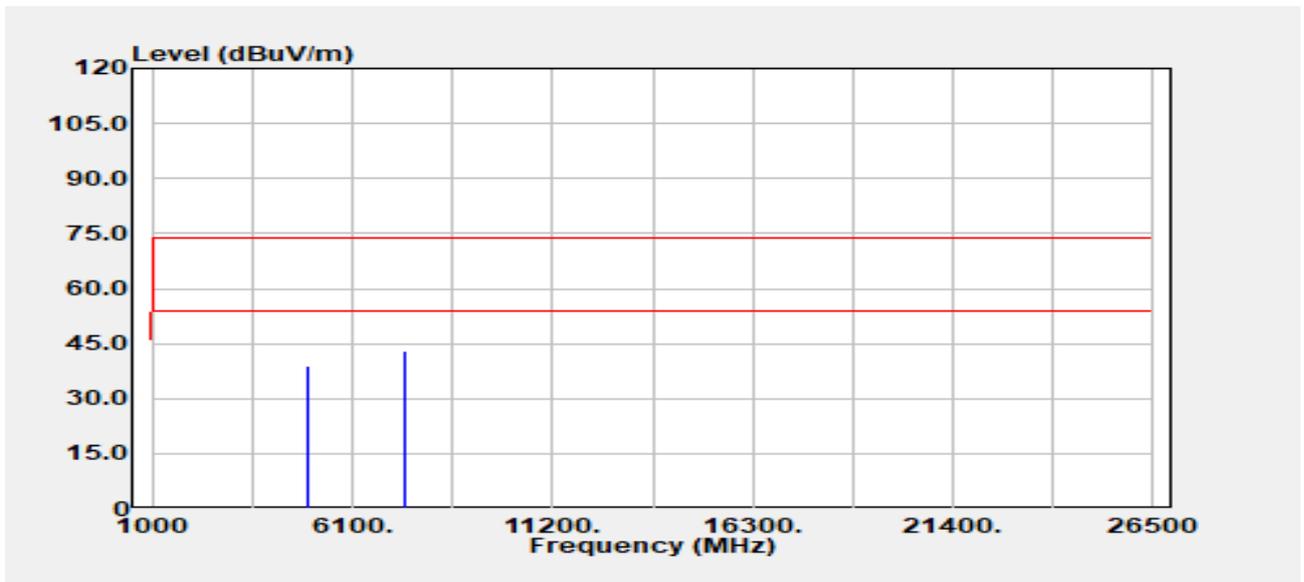


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.000	Peak	36.95	2.25	39.19	74.00	-34.81
4960.000	Average	27.55	2.25	29.80	54.00	-24.20
7440.000	Peak	35.44	7.64	43.08	74.00	-30.92
7440.000	Average	25.57	7.64	33.20	54.00	-20.80

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT BR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

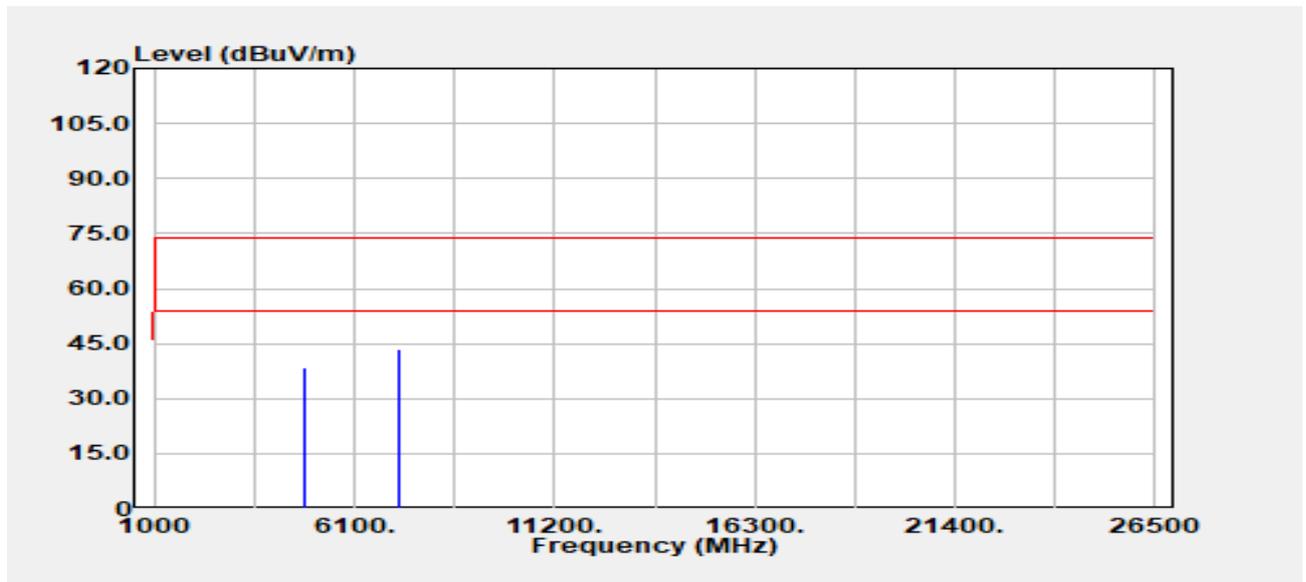


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.000	Peak	36.83	2.25	39.07	74.00	-34.93
4960.000	Average	28.11	2.25	30.36	54.00	-23.64
7440.000	Peak	35.41	7.64	43.05	74.00	-30.95
7440.000	Average	25.62	7.64	33.26	54.00	-20.74

Report No.: TMWK2308002698KR

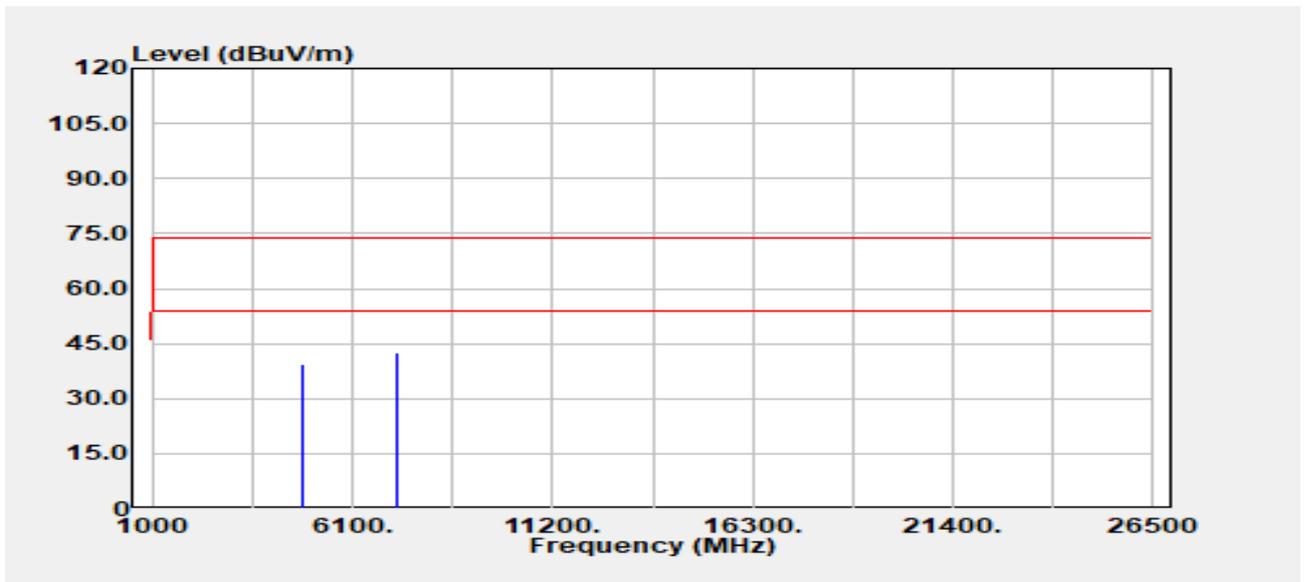
Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



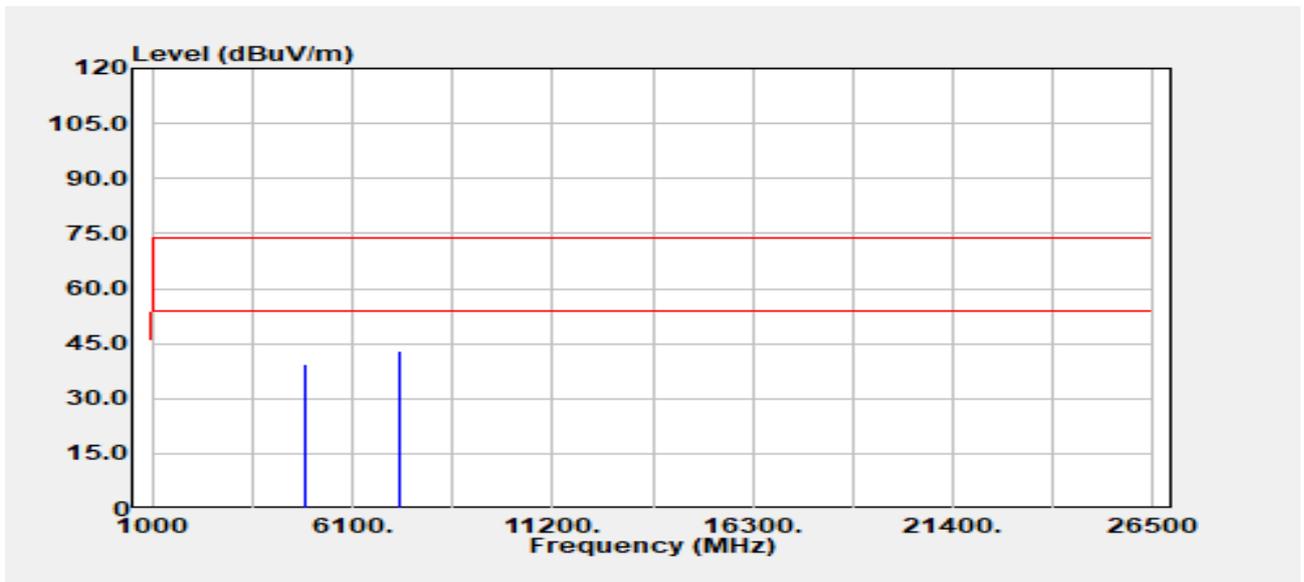
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
4804.000	Peak	37.26	1.22	38.48	74.00	-35.52
4804.000	Average	28.29	1.22	29.51	54.00	-24.49
7206.000	Peak	35.51	7.75	43.26	74.00	-30.74
7206.000	Average	25.61	7.75	33.36	54.00	-20.64

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2402 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



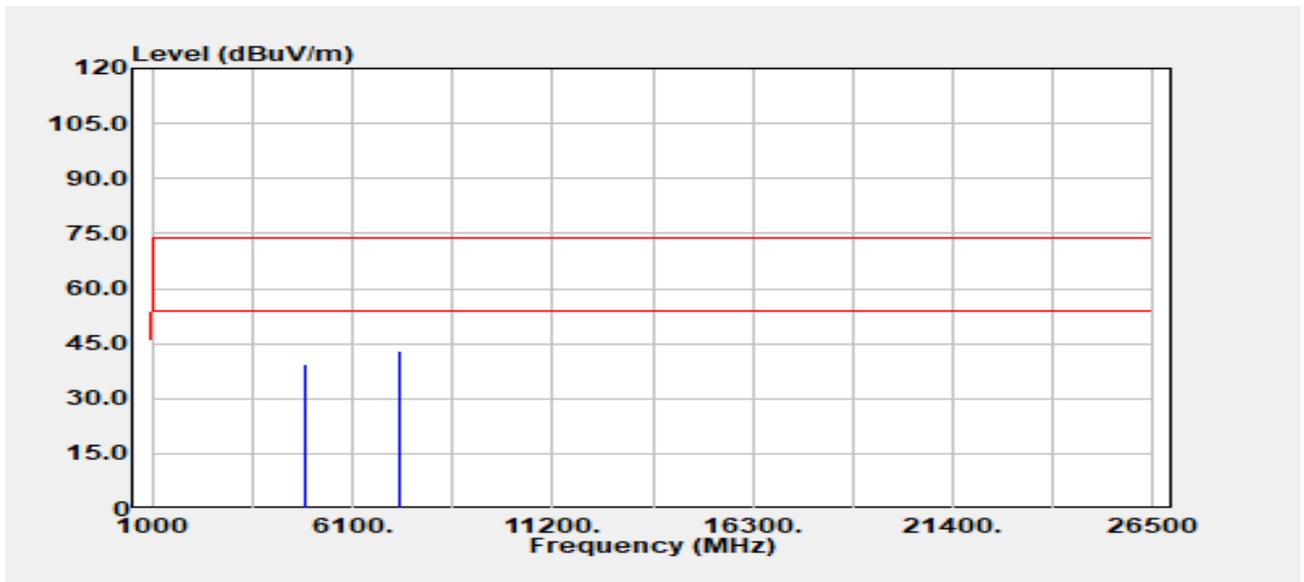
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4804.000	Peak	38.04	1.22	39.26	74.00	-34.74
4804.000	Average	28.11	1.22	29.34	54.00	-24.66
7206.000	Peak	34.76	7.75	42.52	74.00	-31.48
7206.000	Average	25.74	7.75	33.49	54.00	-20.51

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2441 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



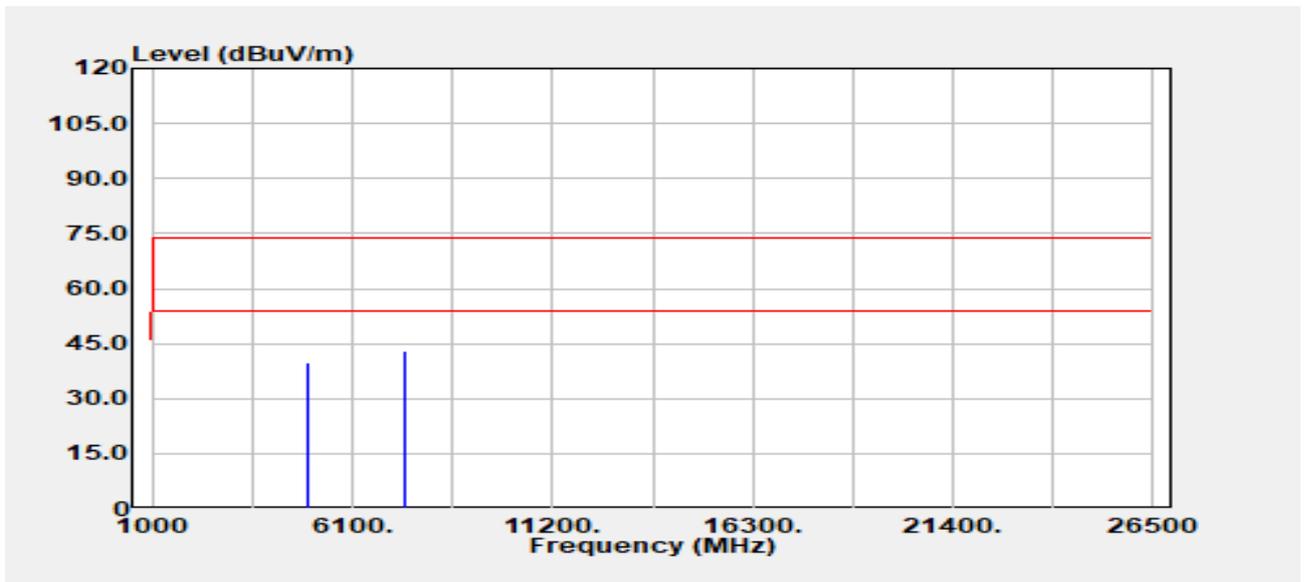
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4882.000	Peak	37.92	1.63	39.55	74.00	-34.45
4882.000	Average	27.75	1.63	29.38	54.00	-24.62
7323.000	Peak	35.26	7.71	42.97	74.00	-31.03
7323.000	Average	25.55	7.71	33.25	54.00	-20.75

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2441 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



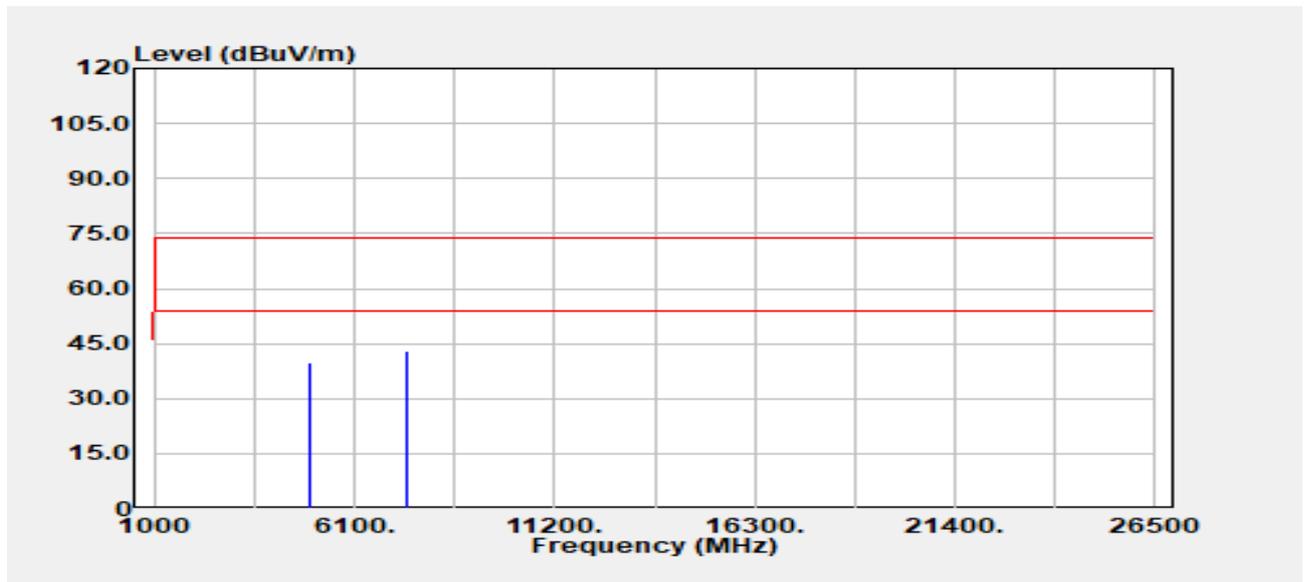
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4882.000	Peak	37.93	1.63	39.56	74.00	-34.44
4882.000	Average	27.74	1.63	29.38	54.00	-24.62
7323.000	Peak	35.44	7.71	43.14	74.00	-30.86
7323.000	Average	25.51	7.71	33.21	54.00	-20.79

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2480 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		



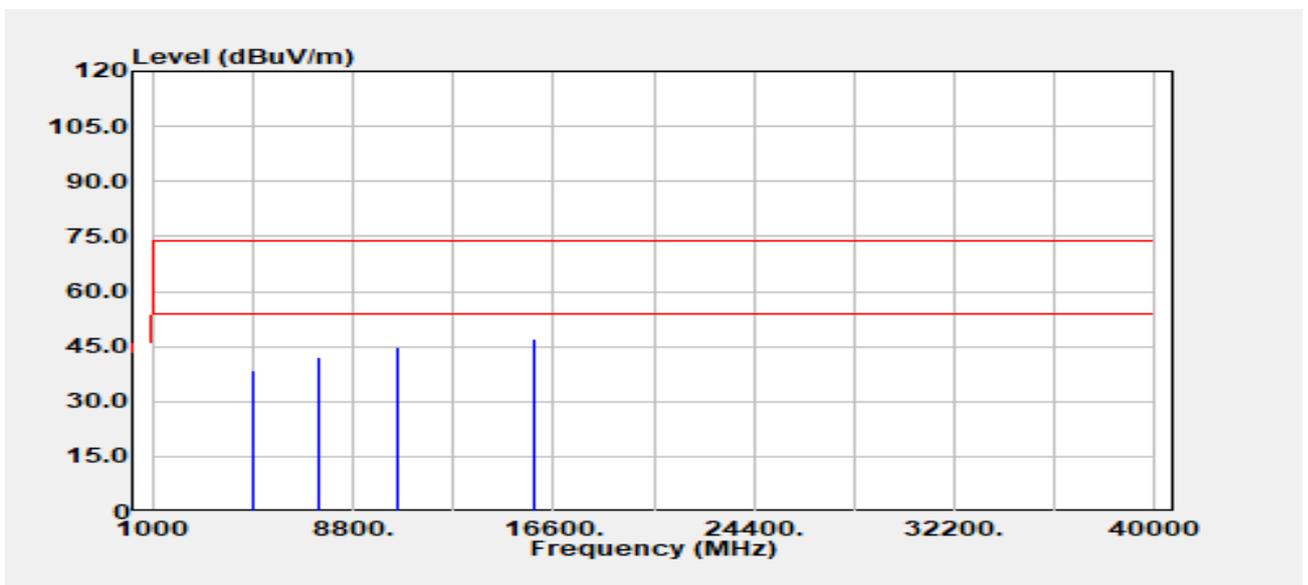
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.000	Peak	37.69	2.25	39.93	74.00	-34.07
4960.000	Average	27.55	2.25	29.80	54.00	-24.20
7440.000	Peak	35.17	7.64	42.81	74.00	-31.19
7440.000	Average	25.54	7.64	33.18	54.00	-20.82

Report Number	:TM-2308000057P	Test Date	:2023-08-18
Operation Band	:BT EDR	Temp./Humi.	:24.6/59
Frequency	:2480 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 dB μ V	Factor dB	Actual FS dB μ V/m	Limit dB μ V/m	Margin dB
4960.000	Peak	37.45	2.25	39.70	74.00	-34.30
4960.000	Average	27.50	2.25	29.74	54.00	-24.26
7440.000	Peak	35.55	7.64	43.19	74.00	-30.81
7440.000	Average	25.55	7.64	33.19	54.00	-20.81

Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11ac80/Band2	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5290 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

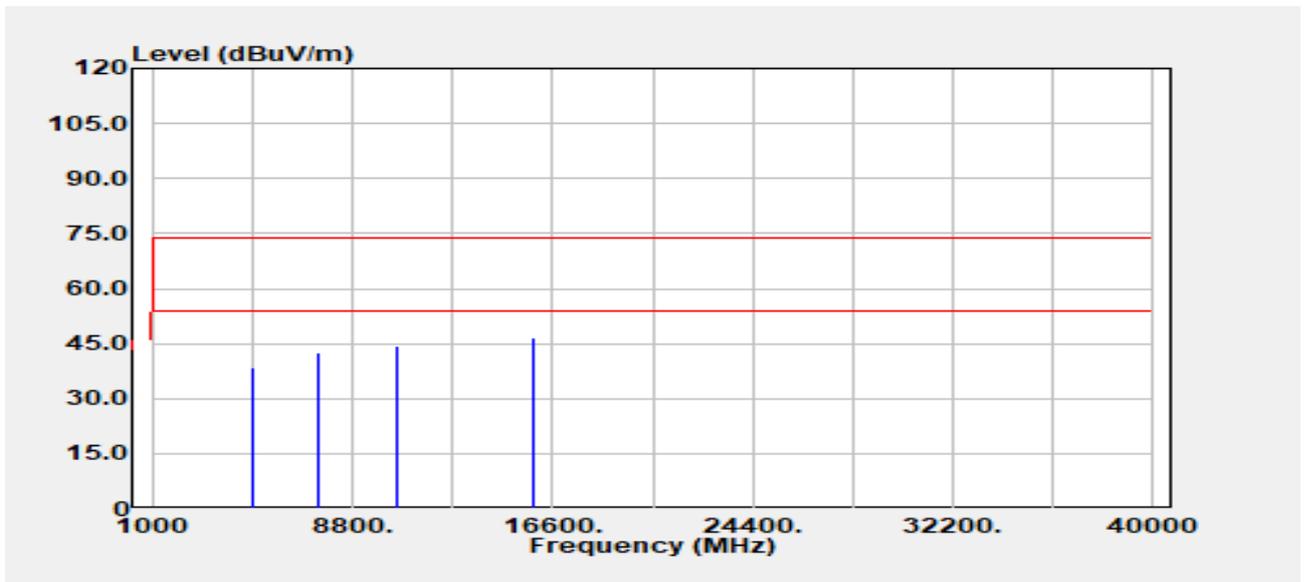


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.000	Peak	36.06	2.25	38.31	74.00	-35.69
4960.000	Average	29.08	2.25	31.32	54.00	-22.68
7440.000	Peak	34.60	7.64	42.24	74.00	-31.76
7440.000	Average	25.24	7.64	32.88	54.00	-21.12
10580.000	Peak	33.40	11.48	44.88	78.85	-33.97
15870.000	Peak	32.63	14.34	46.98	74.00	-27.02
15870.000	Average	23.49	14.34	37.83	54.00	-16.17

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Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11ac80/Band2	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5290 MHz	Antenna Pol.	:Horizontal
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

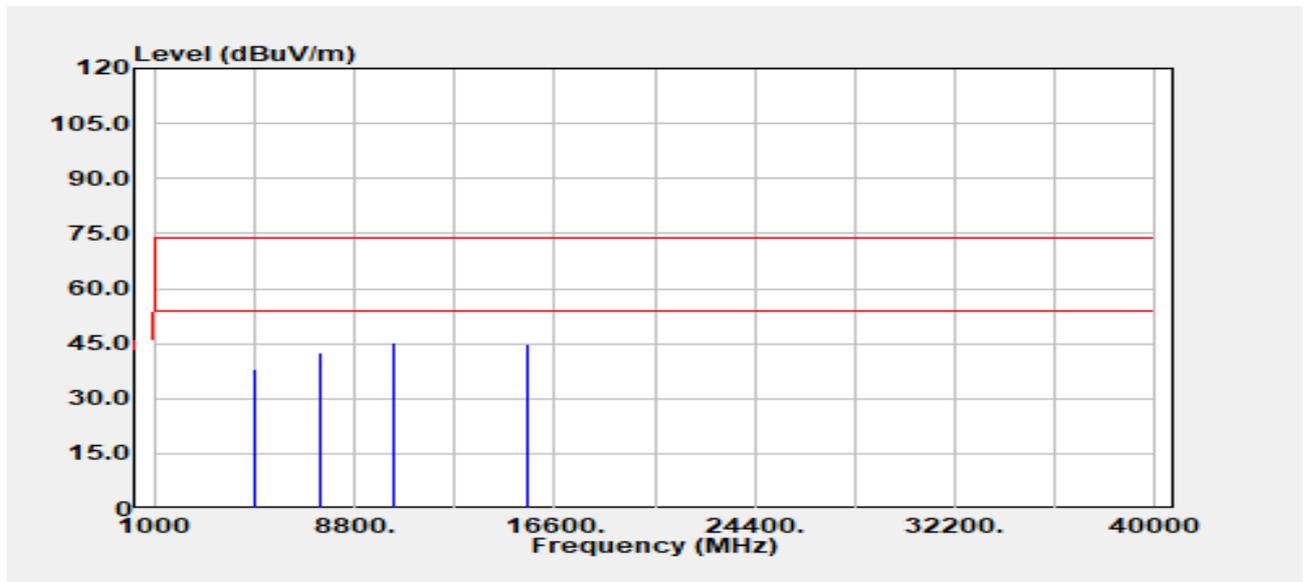


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.000	Peak	36.34	2.25	38.59	74.00	-35.41
4960.000	Average	29.08	2.25	31.32	54.00	-22.68
7440.000	Peak	34.91	7.64	42.54	74.00	-31.46
7440.000	Average	24.90	7.64	32.53	54.00	-21.47
10580.000	Peak	32.99	11.48	44.48	73.04	-28.56
15870.000	Peak	32.11	14.34	46.45	74.00	-27.55
15870.000	Average	23.21	14.34	37.55	54.00	-16.45

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Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11n40/Band1	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5190 MHz	Antenna Pol.	:Vertical
Operation Mode	:TX	Engineer	:Ray.Li
EUT Pol	:E1	Test Chamber	: 966A
Setting	:		

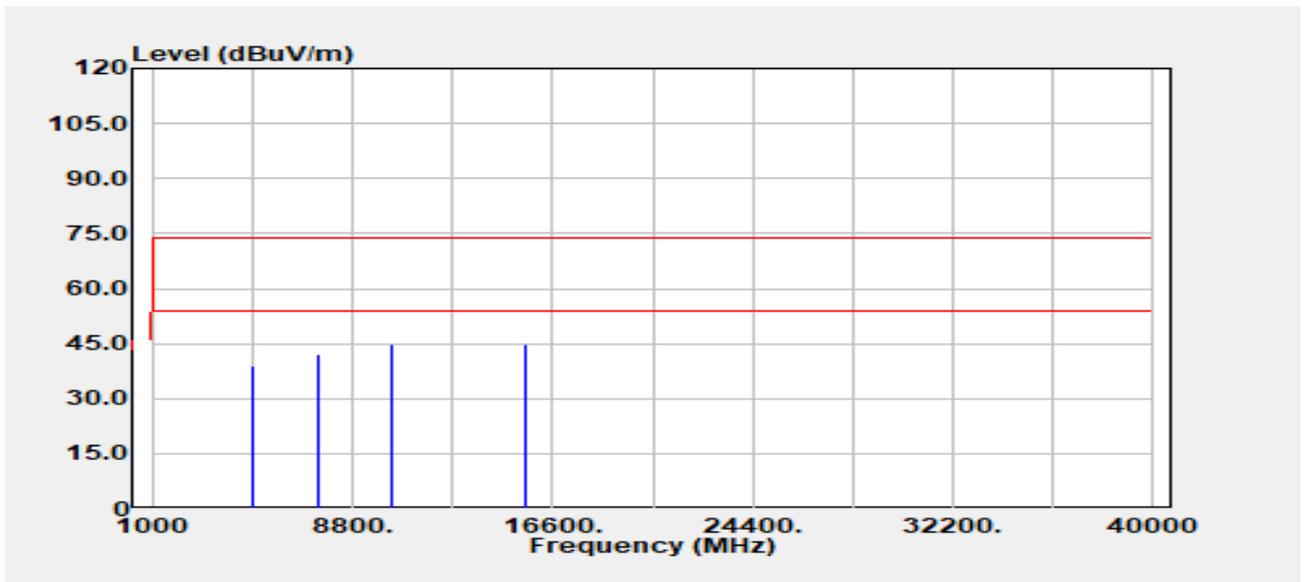


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Read Level dBμV	Factor dB	Actual FS dBμV/m	Limit dBμV/m	Margin dB
4960.000	Peak	35.81	2.25	38.05	74.00	-35.95
4960.000	Average	27.59	2.25	29.84	54.00	-24.16
7440.000	Peak	35.14	7.64	42.78	74.00	-31.22
7440.000	Average	24.94	7.64	32.58	54.00	-21.42
10380.000	Peak	34.02	11.22	45.24	79.23	-33.99
15570.000	Peak	32.20	12.41	44.61	74.00	-29.39
15570.000	Average	22.57	12.41	34.98	54.00	-19.02

Report No.: TMWK2308002698KR

Rev.: 00

Report Number	:TM-2308000057P	Test Date	:2023-09-01
Operation Band	:BT EDR_802.11n40/Band1	Temp./Humi.	:24.6/58
Frequency	:2480 MHz_5190 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
4960.000	Peak	36.81	2.25	39.05	74.00	-34.95
4960.000	Average	27.83	2.25	30.08	54.00	-23.92
7440.000	Peak	34.53	7.64	42.16	74.00	-31.84
7440.000	Average	24.70	7.64	32.34	54.00	-21.66
10380.000	Peak	33.66	11.22	44.88	73.19	-28.31
15570.000	Peak	32.38	12.41	44.80	74.00	-29.20
15570.000	Average	23.32	12.41	35.74	54.00	-18.27

- End of Test Report -