FCC Radio Test Report

FCC ID	:	**2BE5ALIVAX3A**
Equipment	:	**Box PC**
Brand Name	:	**LIVA**
Model Name	:	**LIVA X3A**
Applicant	:	**ECS Industrial Computer Co., Ltd. 9F, No. 22,Sec. 3, Zhongshan N. Rd., Zhongshan Dist., Taipei City 104427 , Taiwan (R.O.C)**
Manufacturer	:	**ECS Industrial Computer Co., Ltd. 9F, No. 22,Sec. 3, Zhongshan N. Rd., Zhongshan Dist., Taipei City 104427 , Taiwan (R.O.C)**
Standard	:	**47 CFR FCC Part 15.247**

The product was received on Jan. 30, 2024, and testing was started from Mar. 02, 2024 and completed on Mar. 10, 2024. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Hsinhua Laboratory, the test report shall not be reproduced except in full.

Approved by: Jackson Tsai

SPORTON INTERNATIONAL INC. Hsinhua Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)

Table of Contents

HISTORY OF THIS TEST REPORT 3

SUMMARY OF TEST RESULT 4

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Testing Applied Standards 7
1.3 Testing Location Information 7
1.4 Measurement Uncertainty 7

2 TEST CONFIGURATION OF EUT 8

2.1 Test Channel Mode 8
2.2 The Worst Case Measurement Configuration 9
2.3 Accessories 10
2.4 Support Equipment 10
2.5 Test Setup Diagram 11

3 TRANSMITTER TEST RESULT 12

3.1 AC Power-line Conducted Emissions 12
3.2 20dB Bandwidth and Carrier Frequency Separation 14
3.3 Maximum Conducted Output Power 15
3.4 Number of Hopping Frequencies and Hopping Bandedge 16
3.5 Time of Occupancy (Dwell Time) 17
3.6 Emissions in Non-restricted Frequency Bands 18
3.7 Emissions in Restricted Frequency Bands 19

4 TEST EQUIPMENT AND CALIBRATION DATA 22

APPENDIX A. TEST RESULTS OF AC POWER-LINE CONDUCTED EMISSIONS

APPENDIX B. TEST RESULTS OF 20DB BANDWIDTH AND CARRIER FREQUENCY SEPARATION

APPENDIX C. TEST RESULTS OF MAXIMUM CONDUCTED OUTPUT POWER

APPENDIX D. TEST RESULTS OF NUMBER OF HOPPING FREQUENCIES AND HOPPING BANDEDGE

APPENDIX E. TEST RESULTS OF TIME OF OCCUPANCY (DWELL TIME)

APPENDIX F. TEST RESULTS OF EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS

APPENDIX G. TEST RESULTS OF EMISSIONS IN RESTRICTED FREQUENCY BANDS

APPENDIX H. TEST PHOTOS

PHOTOGRAPHS OF EUT V01

History of this test report

Report No.	Version	Description	Issued Date
FR412914AD	01	Initial issue of report	Apr. 19, 2024

Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.247(a)	20dB Bandwidth	PASS	-
3.2	15.247(a)	Carrier Frequency Separation	PASS	-
3.3	15.247(b)	Maximum Conducted Output Power	PASS	-
3.4	15.247(a)	Number of Hopping Frequencies and Hopping Bandedge	PASS	-
3.5	15.247(a)	Time of Occupancy (Dwell Time)	PASS	-
3.6	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	-
3.7	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and explanations:
None

Reviewed by: Barry Hsiao

Report Producer: Ann Hou

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Bluetooth Version	Ch. Frequency (MHz)	Channel Number
2400-2483.5	BR / EDR	2402-2480	0-78 [79]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	BT-BR(1Mbps)	1	1TX
2.4-2.4835GHz	BT-EDR(2Mbps)	1	1TX
2.4-2.4835GHz	BT-EDR(3Mbps)	1	1TX

Note:
- Bluetooth BR uses a GFSK (1Mbps).
- Bluetooth EDR uses a combination of π/4-DQPSK (2Mbps) and 8DPSK (3Mbps).
- Bluetooth BR/EDR uses as a system using FHSS modulation.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	VSO	JC1Q02078	Dipole	SMA FEMALE
2	VSO	JC1Q02078	Dipole	SMA FEMALE

Ant.	Port	Gain (dBi)					
		2.4G	UNII-1	UNII-2A	UNII-2C	UNII-3	BT
1	1	2	3.4	3.6	4.1	4.4	2
2	2	2	3.4	3.6	4.1	4.4	-

Note 1: The EUT has two antennas.

For 2.4GHz function:

For IEEE 802.11 b/g/n/VHT/ax mode (2TX/2RX)

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

For BT function:

For IEEE 802.15.1 Bluetooth mode (1TX/1RX)

Ant. 1 (port 1) could transmit/receive.

For 5GHz function:

For IEEE 802.11 a/n/ac/ax mode (2TX/2RX)

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

1.1.3 EUT Information

Operational Condition				
EUT Power Type	From AC Adapter			
EUT Function	☒	Point-to-multipoint	☐	Point-to-point

Type of EUT		
☒	Stand-alone	
☐	Combined (EUT where the radio part is fully integrated within another device)	
	Combined Equipment - Brand Name / Model No.:	…
☐	Plug-in radio (EUT intended for a variety of host systems)	
	Host System - Brand Name / Model No.:	…
☐	Other:	

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF (dB)	T (s)	VBW (Hz)_1/T
BT-BR(1Mbps)	0.766	1.16	2.874m	1k
BT-EDR(2Mbps)	0.767	1.15	2.877m	1k
BT-EDR(3Mbps)	0.768	1.15	2.879m	1k

Note. If DC < 0.98, the DCF was added while measuring Output power and PSD.

1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF:

- KDB 558074 D01 v05r02
- KDB 414788 D01 v01r01

1.3 Testing Location Information

Test Lab.：Sporton International Inc. Hsinhua Laboratory				
☒ Hsinhua (**TAF:** 3785)	**ADD:** No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)			
	TEL: 886-3-327-3456		**FAX:** 886-3-327-0973	
Test site Designation No. TW3785 with FCC.				
Test Condition	**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**
AC Conduction	CO04-HY	Edward Wang	19.5~23.4°C / 50~54%	10/Mar/2024
RF Conducted	TH07-HY	Raven Chien	22.2~23.4°C / 50~57%	07/Mar/2024
Radiated	03CH03-HY	Edward Wang	19.5~23.4°C / 50~54%	02/Mar/2024~10/Mar/2024
☐ Wen 33rd.St. (**TAF:** 3785)	**ADD:** No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)			
	TEL: 886-3-318-0787		**FAX:** 886-3-318-0287	
Test site Designation No. TW0008 with FCC.				

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	**Uncertainty**	**Remark**
AC Power-line Conducted Emissions	4.53 dB	Confidence levels of 95%
Bandwidth	3 MHz	Confidence levels of 95%
Maximum Conducted Output Power	2 dB	Confidence levels of 95%
Emissions in Non-restricted Frequency Bands	0.14 dB	Confidence levels of 95%
Emissions in Restricted Frequency Bands	4.8 dB	Confidence levels of 95%
Temperature	0.41 °C	Confidence levels of 95%
Humidity	3.4 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Test Software Version	Microsoft Windows V6.1

Mode	Power Setting
BT-BR(1Mbps)	-
2402MHz	Default
2440MHz	Default
2480MHz	Default
BT-EDR(2Mbps)	-
2402MHz	Default
2440MHz	Default
2480MHz	Default
BT-EDR(3Mbps)	-
2402MHz	Default
2440MHz	Default
2480MHz	Default

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	CTX
1	Adapter mode

The Worst Case Mode for Following Conformance Tests	
Tests Item	20dB Bandwidth Carrier Frequency Separation Maximum Conducted Output Power Number of Hopping Frequencies Hopping Bandedge Time of Occupancy (Dwell Time) Emissions in Non-restricted Frequency Bands
Test Condition	Conducted measurement at transmit chains ☒ Non-adaptive frequency hopping systems (Non-AFH) ☒ adaptive frequency hopping systems (AFH)
Non-AFH Mode configuration was found to be the worst case and measured during the test.	

The Worst Case Mode for Following Conformance Tests			
Tests Item	Emissions in Restricted Frequency Bands		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
Operating Mode < 1GHz	CTX		
1	Adapter mode		
Operating Mode > 1GHz	CTX		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
Worst Planes of EUT			V

2.3 Accessories

Accessories				
AC Adapter	**Brand Name**	FSP	**Model Name**	FSP045-RBBN3
	Power Rating	I/P: 100 - 240Vac, 1.5A, O/P: 19Vdc, 2.37A		
	DC Power Cord	1.2 meter, shielded cable, with ferrite core		
	AC Power cord	1.8 meter, non-shielded cable, w/o ferrite core		
mounting bracket	**Brand Name**	LIVA	**Model Name**	20-060-XR1031
DIN rail clip	**Brand Name**	LIVA	**Model Name**	20-060PXR1011
Optional Box 1 (PoE function)	**Brand Name**	LIVA	**Model Name**	RT7670
Optional Box 2 (LTE function) (without module)	**Brand Name**	LIVA	**Model Name**	LTE BOX

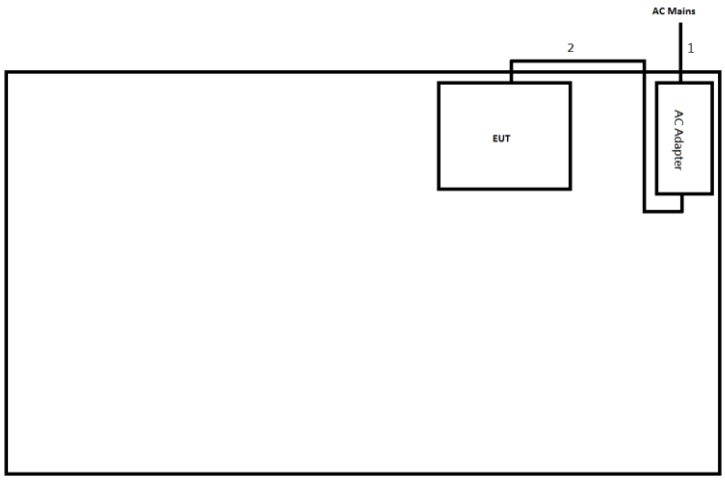
Reminder: Regarding to more detail and other information, please refer to user manual.

2.4 Support Equipment

Support Equipment – Conducted					
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**	**Remark**
1	Notebook	DELL	E5410	-	-
2	Adapter for NB	DELL	HA65NM130	-	-

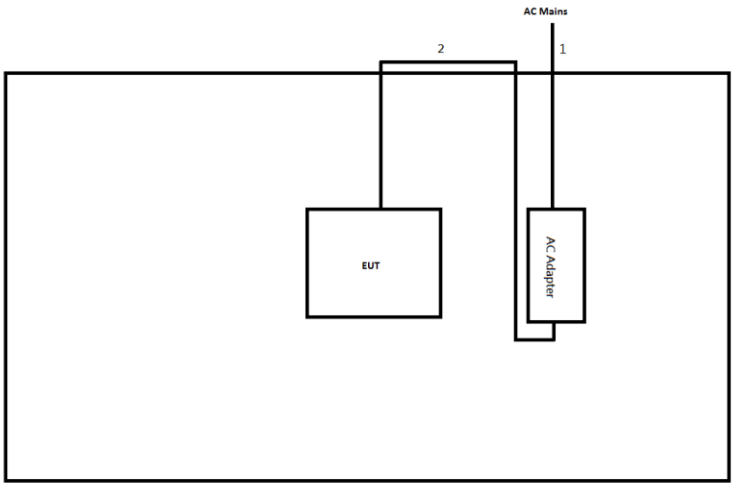
2.5 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)
1	Power cord	No	1.8
2	DC Power Cable	Yes	1.2

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)
1	Power cord	No	1.8
2	DC Power Cable	Yes	1.2

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

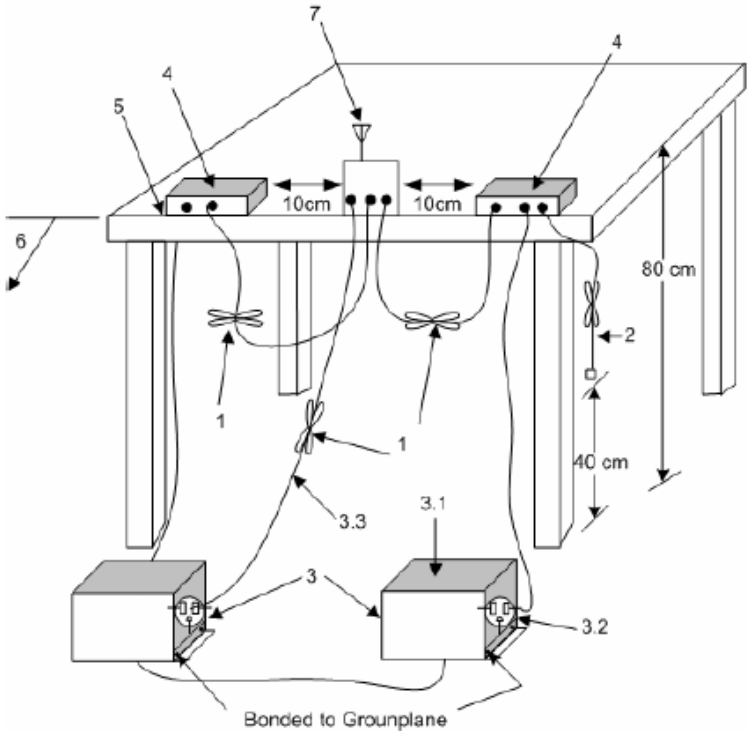
Test Method
▪ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Raw(Read Level) +LISN(LISN Factor) + CL(Cable Loss) + AT(Attenuator).

3.1.5 Test Setup

AC Power-line Conducted Emissions



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

3.1.6 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

3.2 20dB Bandwidth and Carrier Frequency Separation

3.2.1 20dB Bandwidth and Carrier Frequency Separation Limit

20dB Bandwidth and Carrier Frequency Separation Limit for Frequency Hopping Systems	
▪ 2400-2483.5 MHz Band:	
	▪ N ≥75 and ChS ≥ MAX (20 dB bandwidth, 25 kHz).
	▪ 75>N ≥ 15 and ChS ≥ MAX (20 dB bandwidth 2/3,25 kHz).
N:Number of Hopping Frequencies; **ChS**: Hopping Channel Separation	

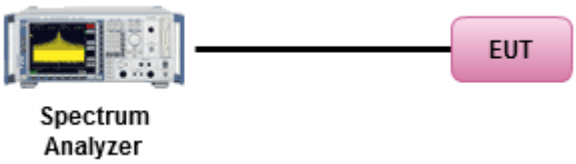
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method
▪ Refer as ANSI C63.10-2013, clause 6.9.2 for 20 dB bandwidth measurement.
▪ Refer as ANSI C63.10-2013, clause 7.8.2 for carrier frequency separation measurement.

3.2.4 Test Setup

20dB Bandwidth and Carrier Frequency Separation


3.2.5 Test Result of 20dB Bandwidth

Refer as Appendix B

3.2.6 Test Result of Carrier Frequency Separation

Refer as Appendix B

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit	
▪ 2400-2483.5 MHz Band:	
	▪ N ≥ 75; Power 30dBm; EIRP 36dBm
	▪ 75 >N ≥ 15; Power 21dBm; EIRP 27dBm
N:Number of Hopping Frequencies	

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method
▪ Refer as ANSI C63.10-2013, clause 7.8.5 for output power measurement.

3.3.4 Test Setup

Maximum Conducted Output Power (Peak Power Meter)

3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

3.4 Number of Hopping Frequencies and Hopping Bandedge

3.4.1 Number of Hopping Frequencies Limit

Number of Hopping Frequencies Limit	
▪ 2400-2483.5 MHz Band:	
	▪ N ≥ 75 and ChS ≥ MAX (20 dB bandwidth, 25 kHz).
	▪ 75 >N ≥ 15 and ChS ≥ MAX (20 dB bandwidth 2/3,25 kHz).
N:Number of Hopping Frequencies; **ChS** : Hopping Channel Separation	

3.4.2 Hopping Bandedge Limit

Refer clause 3.6.1 and clause 3.7.1

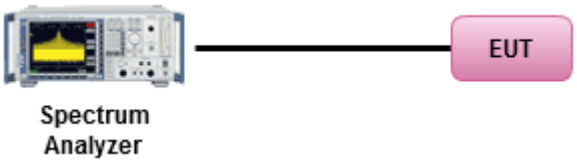
3.4.3 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.4 Test Procedures

Test Method
▪ Refer as ANSI C63.10-2013, clause 7.8.3 for number of hopping frequencies measurement.
▪ Refer as ANSI C63.10-2013, clause 7.8.6 for hopping frequencies Bandedge measurement.

3.4.5 Test Setup

Number of Hopping Frequencies and Hopping Frequencies Bandedge


3.4.6 Test Result of Number of Hopping Frequencies

Refer as Appendix D

3.4.7 Test Result of Number of Hopping Frequencies Bandedge

Refer as Appendix D

3.5 Time of Occupancy (Dwell Time)

3.5.1 Time of Occupancy (Dwell Time) Limit

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems	
▪ 2400-2483.5 MHz Band:	
	▪ N ≥ 75; 0.4s in N x 0.4 period
	▪ 75 >N ≥ 15; 0.4s in N x 0.4 period
N:Number of Hopping Frequencies	

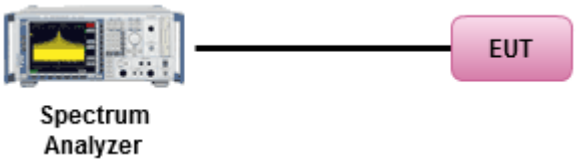
3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method	
▪ Refer as ANSI C63.10-2013, clause 7.8.4 for dwell time measurement.	
▪ Bluetooth ACL packets can be 1, 3, or 5 time slots. Following as dwell time. Operate DH5 at maximum dwell time and maximum duty cycle.	
	▪ The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms.DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel.

3.5.4 Test Setup

Time of Occupancy (Dwell Time)


3.5.5 Test Result of Time of Occupancy (Dwell Time)

Refer as Appendix E

3.6 Emissions in Non-restricted Frequency Bands

3.6.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit	
RF output power procedure	**Limit (dB)**
Peak output power procedure	20
Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.	

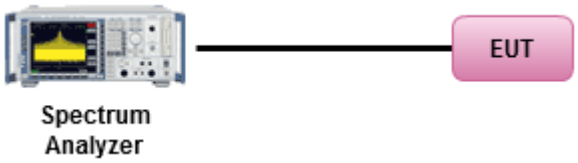
3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method
▪ Refer as ANSI C63.10-2013, clause 7.8.8 for unwanted emissions into non-restricted bands.

3.6.4 Test Setup

Emissions in Non-restricted Frequency Bands


3.6.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix F

3.7 Emissions in Restricted Frequency Bands

3.7.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB / decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.7.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

Test Method	
▪ The average emission levels shall be measured in [hopping duty factor].	
▪ Refer as ANSI C63.10; clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.	
▪ For the transmitter unwanted emissions shall be measured using following options below:	
	▪ Refer as ANSI C63.10, clause 4.1.4.2.1 QP value.
	▪ Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak.
	▪ Refer as ANSI C63.10, clause 4.1.4.2.4 average value of hopping pulsed emissions.
▪	KDB 414788 Open-Field Test Sites and Chamber Correlation Justification.
	▪ Based on FCC 15.31(f)(2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
	▪ Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

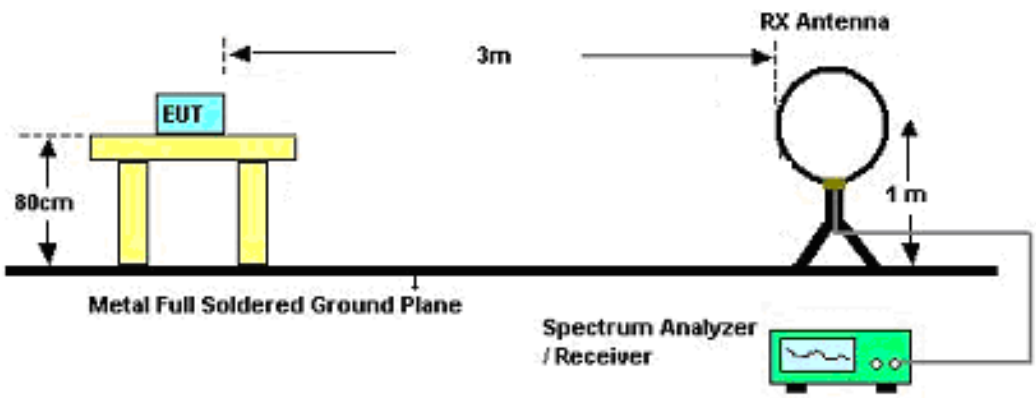
3.7.4 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA(Preamp Factor)

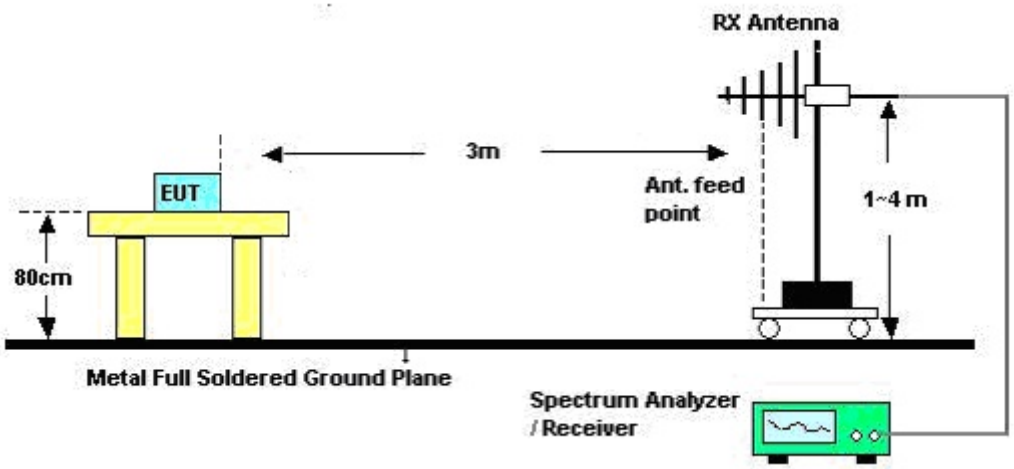
3.7.5 Test Setup

Emissions in Restricted Frequency Bands

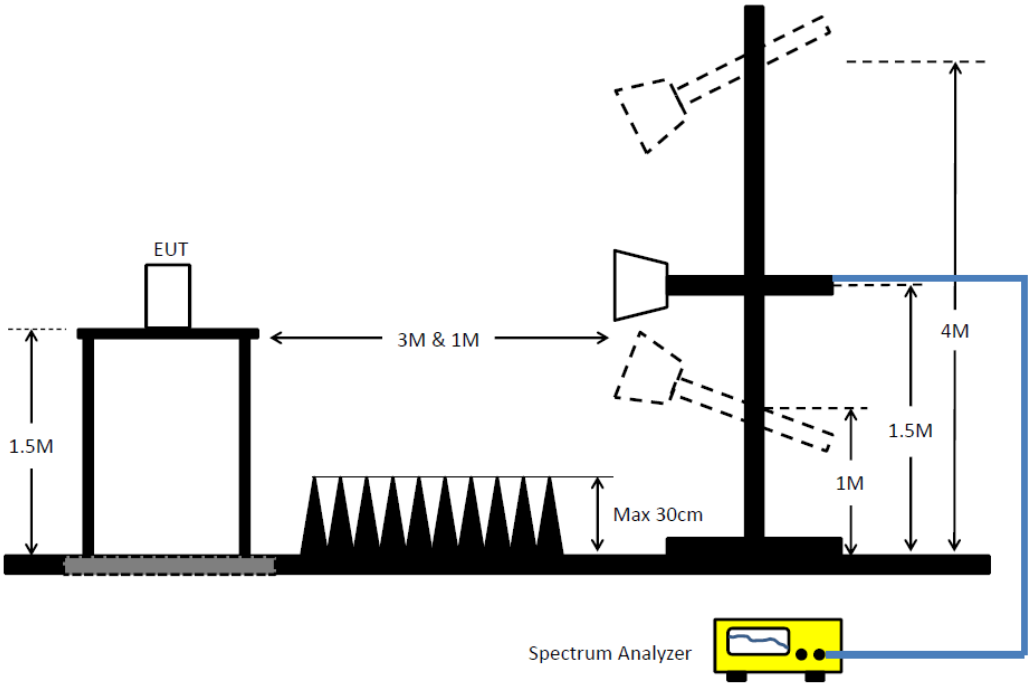
9kHz ~30MHz



30MHz~1GHz



Above 1GHz



3.7.6 Test Result of Emissions in Restricted Frequency Bands (Below 30MHz)

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

3.7.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix G

4 Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR	102051	9kHz ~ 3.6GHz	16/May/2023	15/May/2024
Two-Line V-Network	R&S	ENV 216	101295	9kHz ~ 30MHz	05/Feb/2024	04/Feb/2025
RF Cable 5m	TITAN	TITAN	CO04-cable-01	9kHz ~ 200MHz	27/Feb/2024	26/Feb/2025
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9kHz ~ 30MHz	18/Oct/2023	17/Oct/2024
Sporton	SENSE-EMI	V5.11.3	NA	NA	NA	NA

NCR: No Calibration Required

Instrument for Conducted Test

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101515	9kHz~40GHz	02/Feb/2024	01/Feb/2025
SMB100A Signal Generator	R&S	SMB100A	181147	100kHz~40GHz	20/Oct/2023	19/Oct/2024
Power Meter	Anritsu	ML2495A	1517010	300MHz~40GHz	15/Dec/2023	14/Dec/2024
Pulse Sensor	Anritsu	MA2411B	1339407	300MHz~40GHz	15/Dec/2023	14/Dec/2024
SENSE-15247_FS	Sporton	V5.11.16	N/A	N/A	N/A	N/A

Instrument for Radiated Test

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz~18GHz 3m	28/Jul/2023	27/Jul/2024
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	30/Jul/2023	29/Jul/2024
EMI Test Receiver	R&S	ESR3	102051	9kHz~3.6GHz	16/May/2023	15/May/2024
Signal Analyzer	R&S	FSV40	101500	10Hz~40GHz	26/Oct/2023	25/Oct/2024
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	23/Mar/2023	22/Mar/2024
Bilog Antenna & 6dB Attenuator	SCHAFFNER / EMCI	CBL6112B / N-6-05	22237 / AT-N-0603	30MHz~1GHz	15/Oct/2023	14/Oct/2024
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	02267	1GHz~18GHz	04/Oct/2023	03/Oct/2024
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	01248	18GHz ~ 40GHz	21/Aug/2023	20/Aug/2024
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz~30MHz	13/Jun/2023	12/Jun/2024
RF Cable-R03m	Jye Bao	RG142	03CH03-cable-02	30MHz~1GHz	13/Jun/2023	12/Jun/2024
RF CABLE 5+8 m	HUBER+SUHNER	SUOFLEX 104	03CH03-cable-03	1GHz~40GHz	20/Feb/2024	19/Feb/2025
Amplifier	Aglient	8447D	2944A08033	100kHz~1.3GHz	14/Sep/2023	13/Sep/2024
Microwave Preamplifier	Agilent	8449B	3008A02326	1GHz~26.5GHz	26/Jul/2023	25/Jul/2024
Microwave Preamplifier	EMC INSTRUMENTS	EM18G40G	060604	18GHz ~ 40GHz	16/Mar/2023	15/Mar/2024
SENSE-15247_FS	Sporton	V5.11.16	N/A	N/A	N/A	N/A

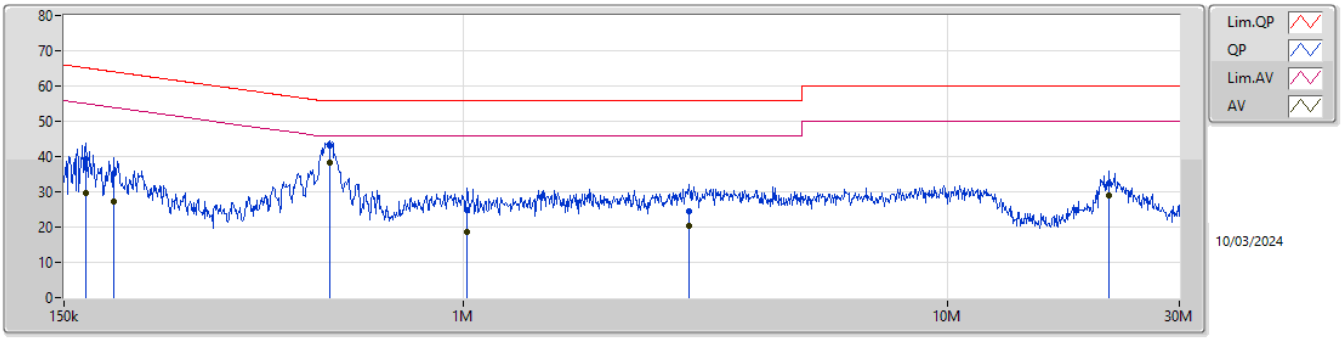
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	529.596k	38.24	46.00	-7.76	Line

Result

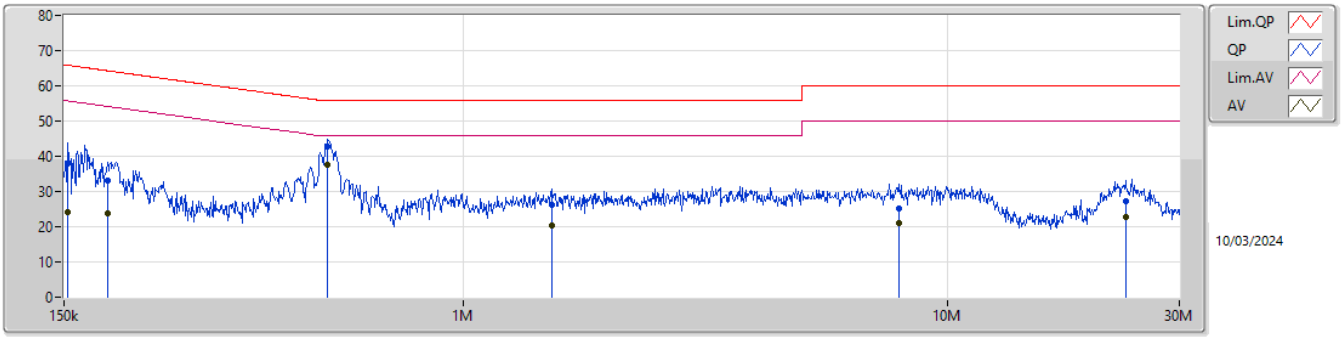
Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	QP	166.406k	39.47	65.14	-25.67	Line
Mode 1	Pass	AV	166.406k	29.75	55.14	-25.39	Line
Mode 1	Pass	QP	189.837k	35.17	64.05	-28.88	Line
Mode 1	Pass	AV	189.837k	27.33	54.05	-26.72	Line
Mode 1	Pass	QP	529.596k	42.99	56.00	-13.01	Line
Mode 1	Pass	AV	529.596k	38.24	46.00	-7.76	Line
Mode 1	Pass	QP	1.019M	24.71	56.00	-31.29	Line
Mode 1	Pass	AV	1.019M	18.61	46.00	-27.39	Line
Mode 1	Pass	QP	2.924M	24.58	56.00	-31.42	Line
Mode 1	Pass	AV	2.924M	20.34	46.00	-25.66	Line
Mode 1	Pass	QP	21.519M	32.47	60.00	-27.53	Line
Mode 1	Pass	AV	21.519M	28.81	50.00	-21.19	Line
Mode 1	Pass	QP	153.024k	37.82	65.83	-28.01	Neutral
Mode 1	Pass	AV	153.024k	24.13	55.83	-31.70	Neutral
Mode 1	Pass	QP	184.605k	33.18	64.28	-31.10	Neutral
Mode 1	Pass	AV	184.605k	23.81	54.28	-30.47	Neutral
Mode 1	Pass	QP	525.384k	42.62	56.00	-13.38	Neutral
Mode 1	Pass	AV	525.384k	37.44	46.00	-8.56	Neutral
Mode 1	Pass	QP	1.519M	26.33	56.00	-29.67	Neutral
Mode 1	Pass	AV	1.519M	20.42	46.00	-25.58	Neutral
Mode 1	Pass	QP	7.901M	25.19	60.00	-34.81	Neutral
Mode 1	Pass	AV	7.901M	21.16	50.00	-28.84	Neutral
Mode 1	Pass	QP	23.215M	27.31	60.00	-32.69	Neutral
Mode 1	Pass	AV	23.215M	22.78	50.00	-27.22	Neutral

Conducted Emissions at Powerline_Mode 1



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	166.406k	39.47	65.14	-25.67	19.41	Line	-	20.06	9.61	0.07	9.73
AV	166.406k	29.75	55.14	-25.39	19.41	Line	-	10.34	9.61	0.07	9.73
QP	189.837k	35.17	64.05	-28.88	19.39	Line	-	15.78	9.61	0.09	9.69
AV	189.837k	27.33	54.05	-26.72	19.39	Line	-	7.94	9.61	0.09	9.69
QP	529.596k	42.99	56.00	-13.01	19.49	Line	-	23.50	9.61	0.11	9.77
AV	529.596k	38.24	46.00	-7.76	19.49	Line	-	18.75	9.61	0.11	9.77
QP	1.019M	24.71	56.00	-31.29	19.50	Line	-	5.21	9.61	0.09	9.80
AV	1.019M	18.61	46.00	-27.39	19.50	Line	-	-0.89	9.61	0.09	9.80
QP	2.924M	24.58	56.00	-31.42	19.51	Line	-	5.07	9.63	0.09	9.79
AV	2.924M	20.34	46.00	-25.66	19.51	Line	-	0.83	9.63	0.09	9.79
QP	21.519M	32.47	60.00	-27.53	19.53	Line	-	12.94	9.57	0.12	9.84
AV	21.519M	28.81	50.00	-21.19	19.53	Line	-	9.28	9.57	0.12	9.84

Conducted Emissions at Powerline_Mode 1



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	153.024k	37.82	65.83	-28.01	19.44	Neutral	-	18.38	9.62	0.07	9.75
AV	153.024k	24.13	55.83	-31.70	19.44	Neutral	-	4.69	9.62	0.07	9.75
QP	184.605k	33.18	64.28	-31.10	19.39	Neutral	-	13.79	9.61	0.08	9.70
AV	184.605k	23.81	54.28	-30.47	19.39	Neutral	-	4.42	9.61	0.08	9.70
QP	525.384k	42.62	56.00	-13.38	19.49	Neutral	-	23.13	9.61	0.11	9.77
AV	525.384k	37.44	46.00	-8.56	19.49	Neutral	-	17.95	9.61	0.11	9.77
QP	1.519M	26.33	56.00	-29.67	19.52	Neutral	-	6.81	9.62	0.10	9.80
AV	1.519M	20.42	46.00	-25.58	19.52	Neutral	-	0.90	9.62	0.10	9.80
QP	7.901M	25.19	60.00	-34.81	19.53	Neutral	-	5.66	9.68	0.06	9.79
AV	7.901M	21.16	50.00	-28.84	19.53	Neutral	-	1.63	9.68	0.06	9.79
QP	23.215M	27.31	60.00	-32.69	19.66	Neutral	-	7.65	9.69	0.13	9.84
AV	23.215M	22.78	50.00	-27.22	19.66	Neutral	-	3.12	9.69	0.13	9.84

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-BR(1Mbps)	970.75k	887.426k	887KF1D	921.25k	872.057k
BT-EDR(2Mbps)	1.345M	1.228M	1M23G1D	1.326M	1.214M
BT-EDR(3Mbps)	1.383M	1.226M	1M23G1D	1.348M	1.219M

Max-N dB = Maximum 20dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 20dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

Result

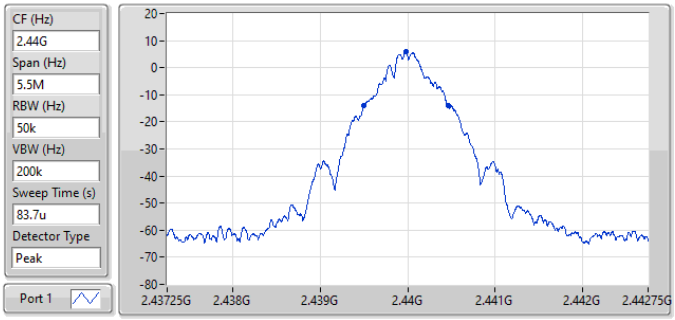
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	932.25k	879.406k
2440MHz	Pass	Inf	970.75k	872.057k
2480MHz	Pass	Inf	921.25k	887.426k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.326M	1.222M
2440MHz	Pass	Inf	1.345M	1.214M
2480MHz	Pass	Inf	1.331M	1.228M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.35M	1.226M
2440MHz	Pass	Inf	1.348M	1.224M
2480MHz	Pass	Inf	1.383M	1.219M

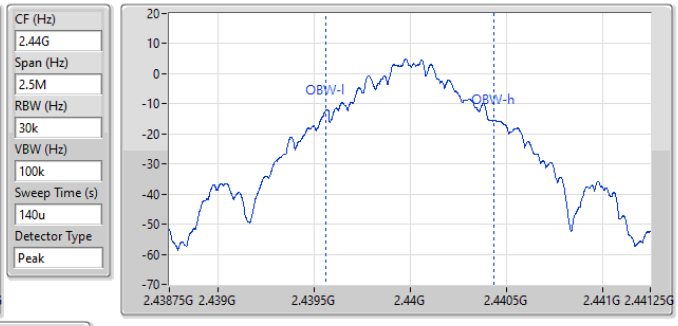
Port X-N dB = Port X 20dB down bandwidth;
Port X-OBW = Port X 99% occupied bandwidth

2.4-2.4835GHz_BT-BR(1Mbps) **EBW-FS**

2440MHz

07/03/2024



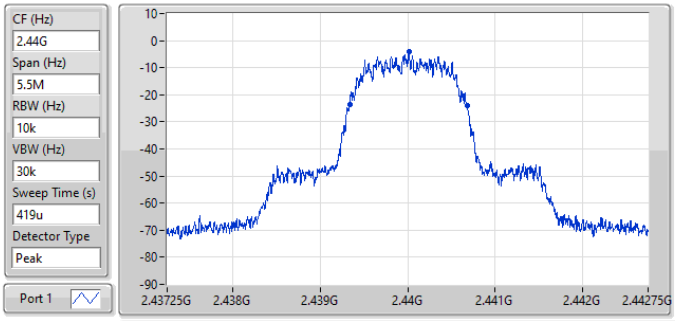


20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
970.75k	2.439497G	2.440468G	872.057k	2.439563G	2.440435G	Inf	1

2.4-2.4835GHz_BT-EDR(2Mbps) **EBW-FS**

2440MHz

07/03/2024

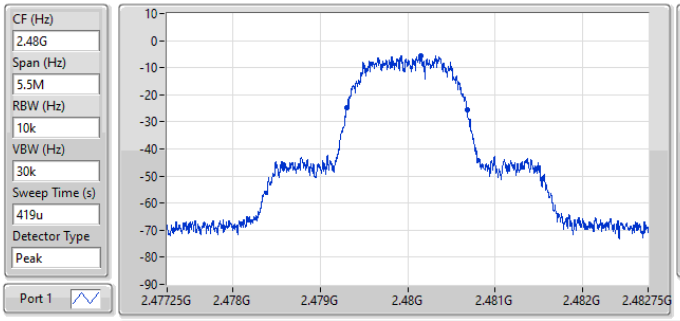


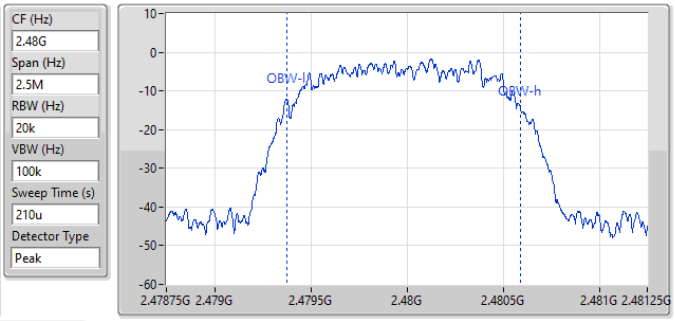
20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.345M	2.439337G	2.440682G	1.214M	2.4394G	2.440614G	Inf	1

2.4-2.4835GHz_BT-EDR(3Mbps) **EBW-FS**

2480MHz

07/03/2024





20dB(Hz)	Fl-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.383M	2.479302G	2.480685G	1.219M	2.479375G	2.480593G	Inf	1

Summary

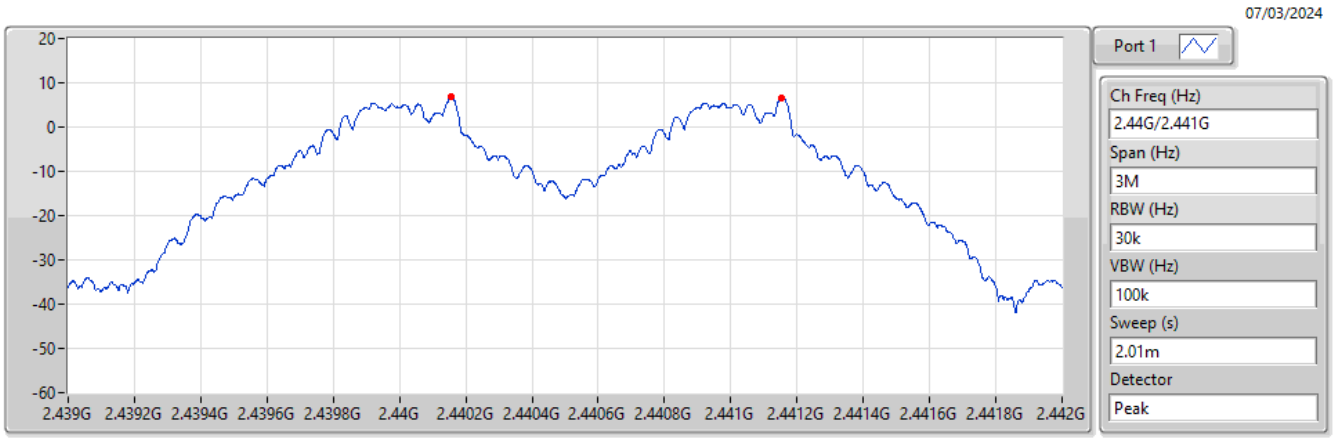
Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1.0035M	997.5k
BT-EDR(2Mbps)	1.0035M	999k
BT-EDR(3Mbps)	1.0035M	987k

Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.402167G	2.403169G	1.002M	620.8785k
2440MHz	Pass	2.440155G	2.441153G	997.5k	646.5195k
2480MHz	Pass	2.479145G	2.480148G	1.0035M	613.5525k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.401927G	2.402928G	1.0005M	883.116k
2440MHz	Pass	2.439921G	2.440925G	1.0035M	895.77k
2480MHz	Pass	2.478914G	2.479913G	999k	886.446k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.40217G	2.403157G	987k	899.1k
2440MHz	Pass	2.440155G	2.441159G	1.0035M	897.768k
2480MHz	Pass	2.479149G	2.480147G	997.5k	921.078k

2.4-2.4835GHz_BT-BR(1Mbps) **Channel Separation-FS**

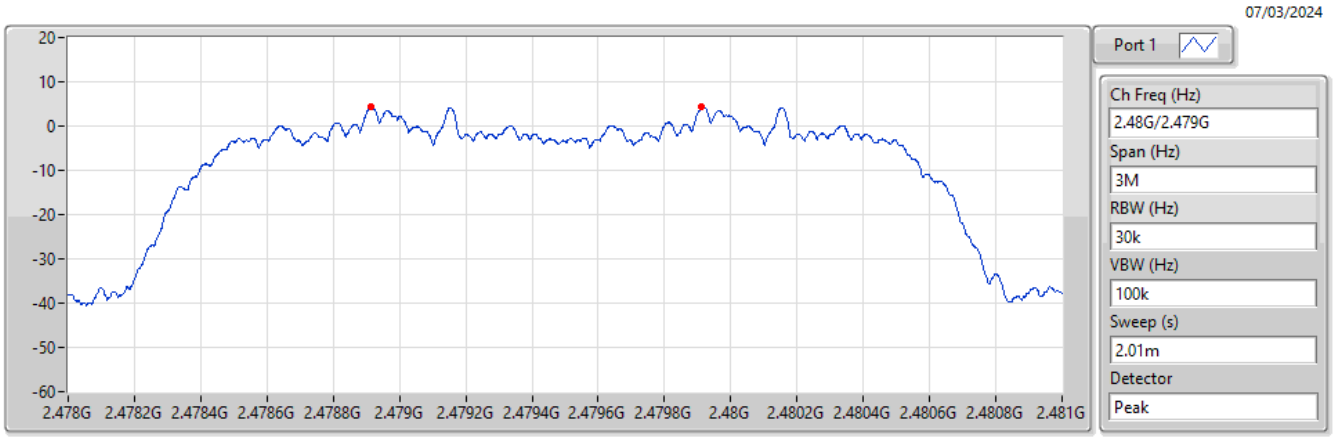
2.44G/2.441GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.440155G	2.441153G	997.5k	646.5195k

2.4-2.4835GHz_BT-EDR(2Mbps) **Channel Separation-FS**

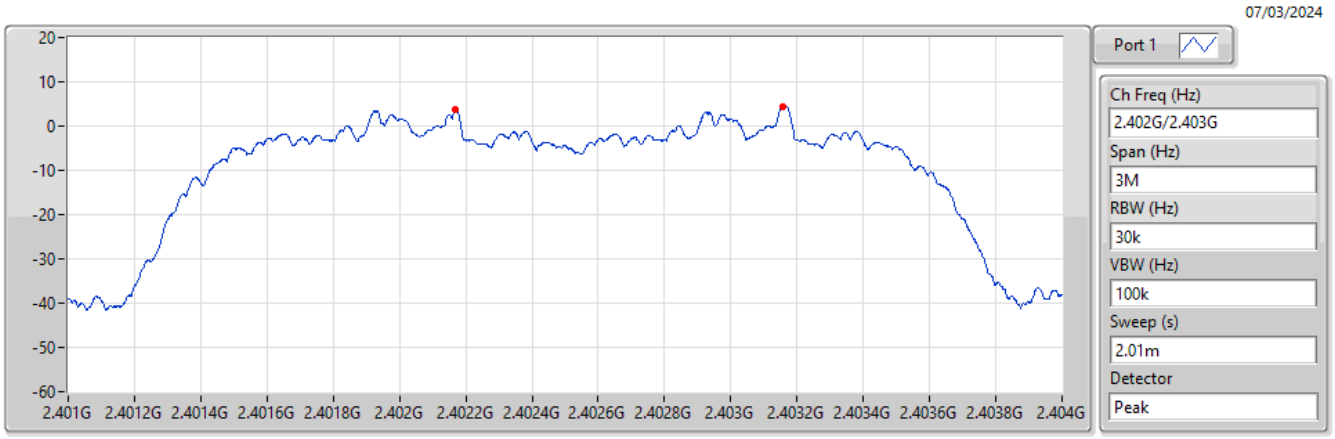
2.48G/2.479GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.478914G	2.479913G	999k	886.446k

2.4-2.4835GHz_BT-EDR(3Mbps) **Channel Separation-FS**

2.402G/2.403GHz



Fl(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.40217G	2.403157G	987k	899.1k

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	9.13	0.00818
BT-EDR(2Mbps)	9.49	0.00889
BT-EDR(3Mbps)	9.85	0.00966

Result

Mode	Result	DG (dBi)	Total Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	2.00	8.76	21.00
2440MHz	Pass	2.00	8.66	21.00
2480MHz	Pass	2.00	9.13	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	2.00	8.69	21.00
2440MHz	Pass	2.00	8.67	21.00
2480MHz	Pass	2.00	9.49	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	2.00	9.02	21.00
2440MHz	Pass	2.00	9.00	21.00
2480MHz	Pass	2.00	9.85	21.00

DG = Directional Gain; Port X = Port X output power

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	8.67	0.00736
BT-EDR(2Mbps)	7.12	0.00515
BT-EDR(3Mbps)	7.14	0.00518

Result

Mode	Result	DG (dBi)	Total Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	2.00	8.37	21.00
2440MHz	Pass	2.00	8.07	21.00
2480MHz	Pass	2.00	8.67	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	2.00	6.36	21.00
2440MHz	Pass	2.00	6.23	21.00
2480MHz	Pass	2.00	7.12	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	2.00	6.36	21.00
2440MHz	Pass	2.00	6.21	21.00
2480MHz	Pass	2.00	7.14	21.00

DG = Directional Gain; Port X = Port X output power

Summary

Mode 2.4-2.4835GHz	Max-Hop No -
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79
BT-EDR(3Mbps)	79

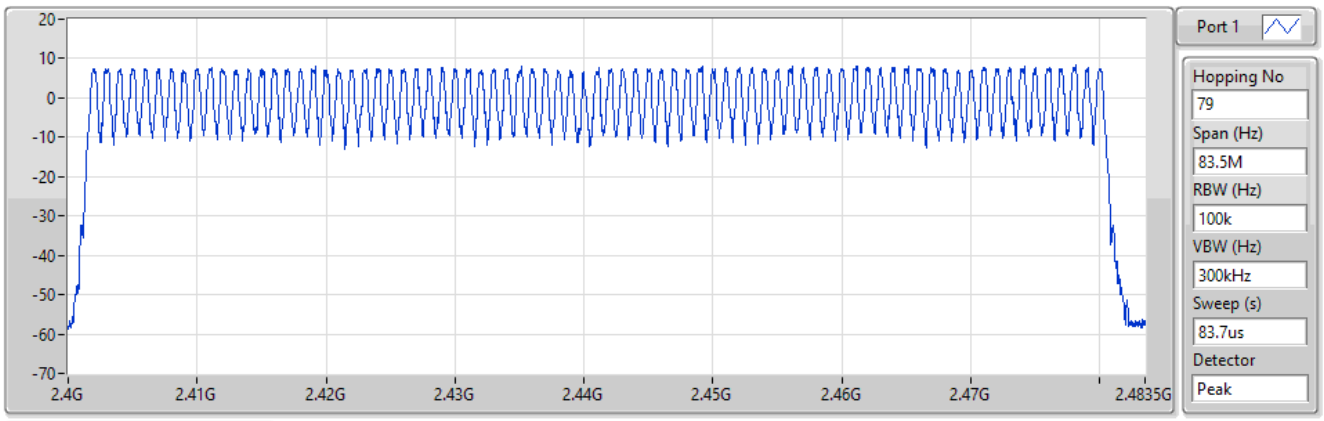
Result

Mode BT-BR(1Mbps)	Result -	Hopping No -	Limit -
2440MHz	Pass	79	15
BT-EDR(2Mbps)	-	-	-
2440MHz	Pass	79	15
BT-EDR(3Mbps)	-	-	-
2440MHz	Pass	79	15

2.4-2.4835GHz_BT-BR(1Mbps) **Hopping-FS**

2440MHz

07/03/2024



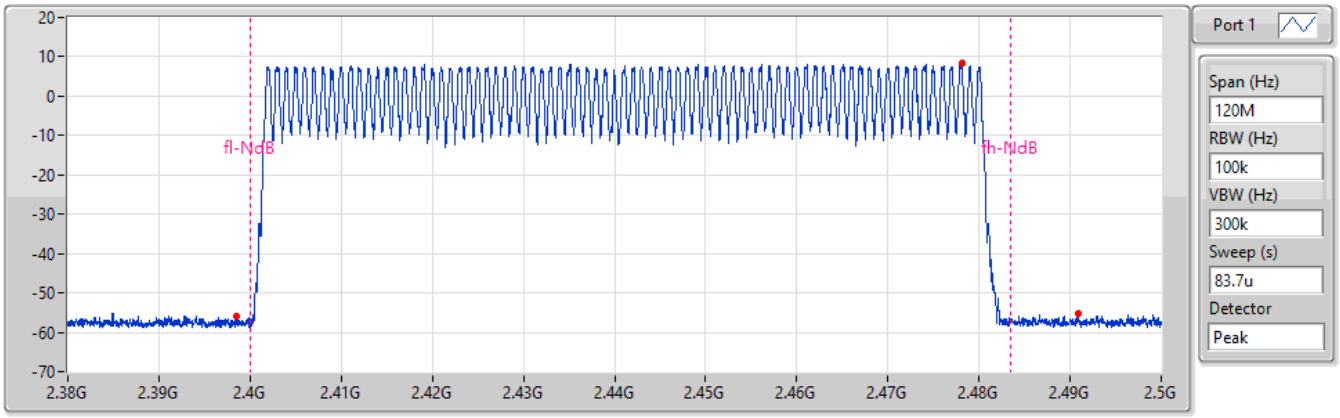
Hopping No	Limit
79	15

2.4-2.4835GHz_BT-BR(1Mbps)

2440MHz

Hopping Ch Bandedge (Non-restricted Band)

07/03/2024



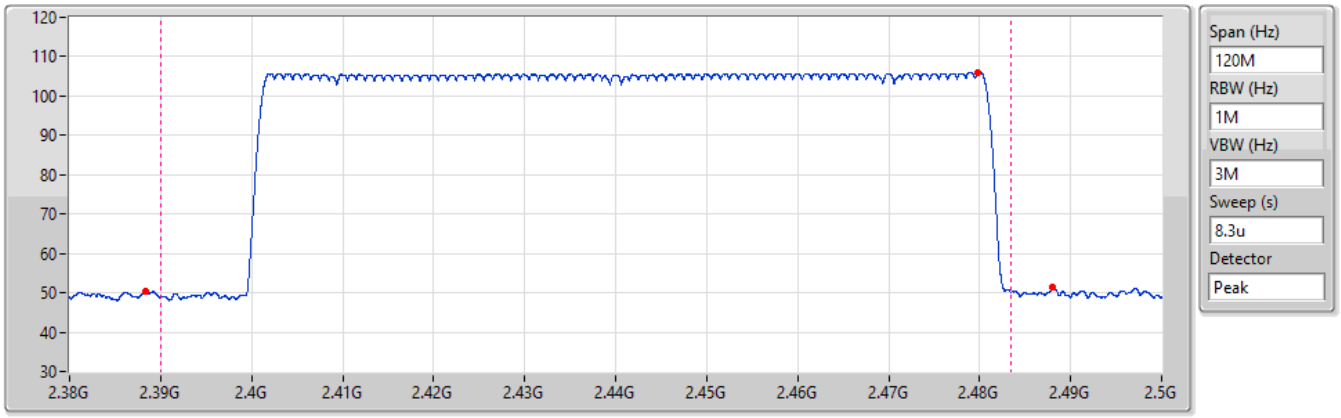
Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-11.64	2.47816G	8.36	2.398435G	-55.84	2.490925G	-55.14

2.4-2.4835GHz_BT-BR(1Mbps)

2440MHz

Hopping Ch Bandedge (Restricted Band)

07/03/2024

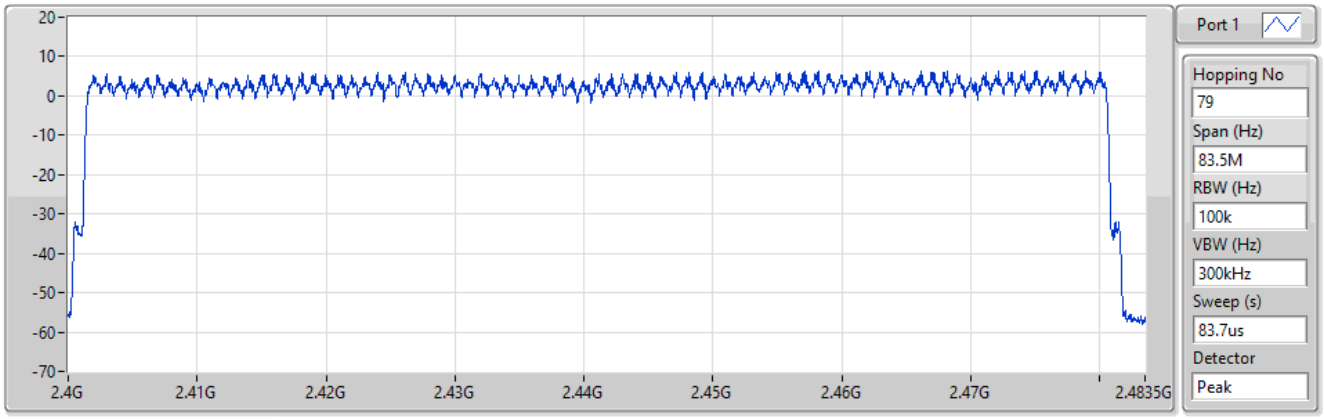


Ref(Hz)	Ref(dBuV/m)	BE-l(Hz)	PK(dBuV/m)	AV(dBuV/m)	BE-h(Hz)	PK(dBuV/m)	AV(dBuV/m)	LimPK(dBuV/	LimAV(dBuV/	Tx On(ms)	DCF(dB)
2.47984G	105.92	2.388355G	50.37	20.27	2.488075G	51.42	21.32	74	54	3.125	-30.1

2.4-2.4835GHz_BT-EDR(2Mbps) **Hopping-FS**

2440MHz

07/03/2024

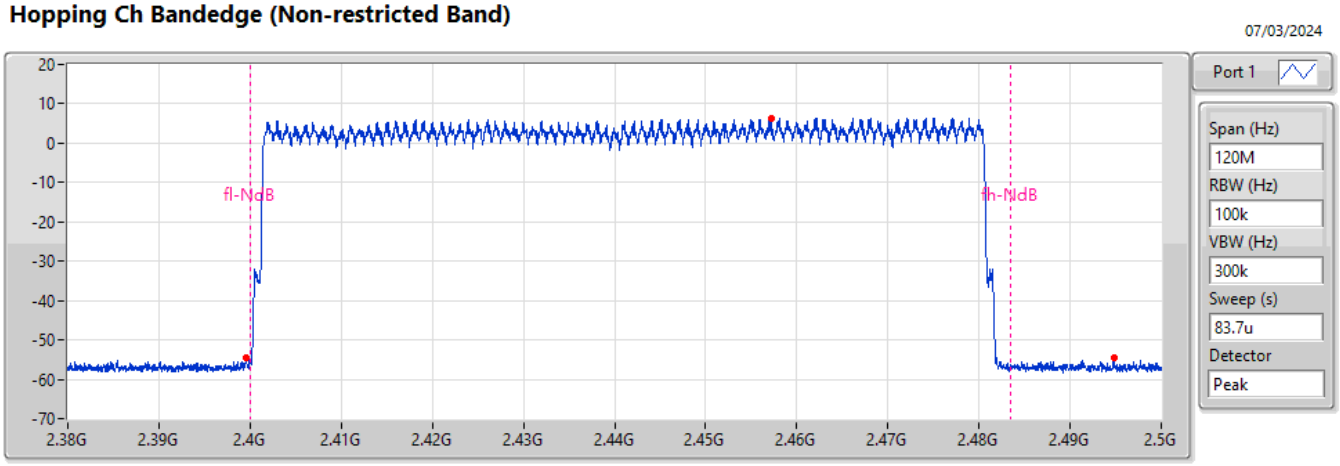


Hopping No	Limit
79	15

2.4-2.4835GHz_BT-EDR(2Mbps)

2440MHz

Hopping Ch Bandedge (Non-restricted Band)

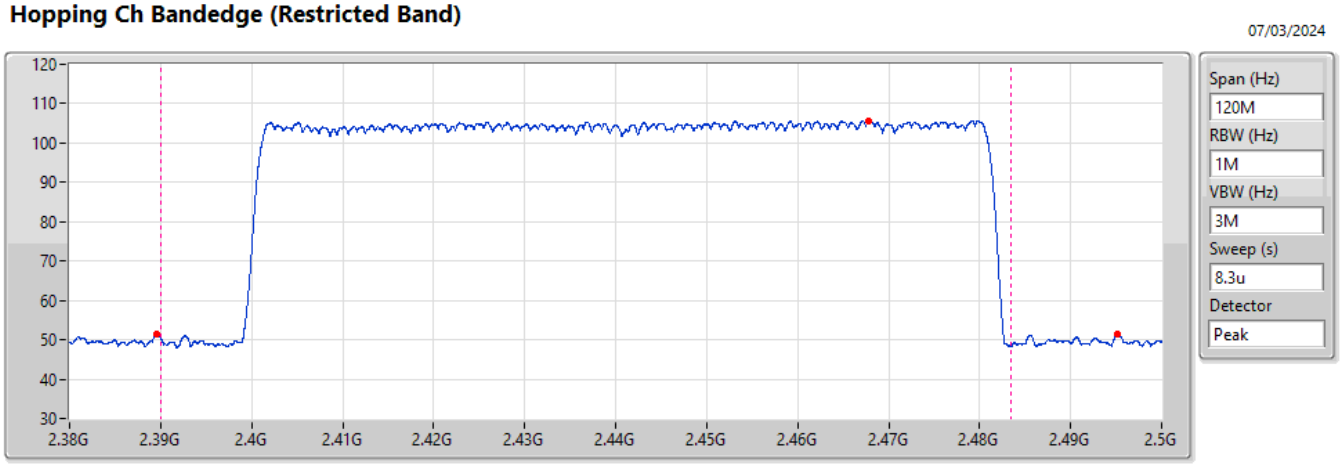


Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-13.58	2.45716G	6.42	2.39959G	-54.6	2.49478G	-54.49

2.4-2.4835GHz_BT-EDR(2Mbps)

2440MHz

Hopping Ch Bandedge (Restricted Band)

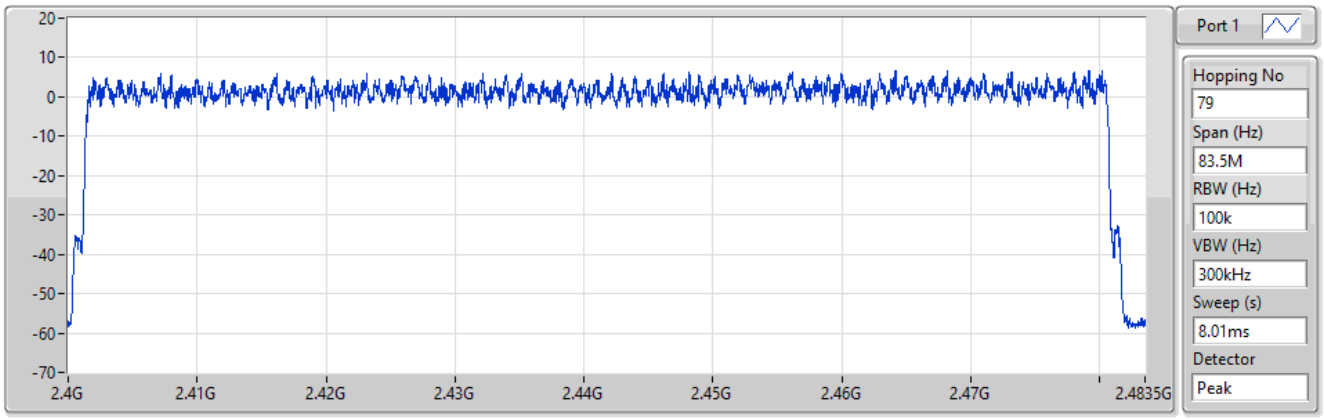


Ref(Hz)	Ref(dBuV/m)	BE-l(Hz)	PK(dBuV/m)	AV(dBuV/m)	BE-h(Hz)	PK(dBuV/m)	AV(dBuV/m)	LimPK(dBuV/	LimAV(dBuV/	Tx On(ms)	DCF(dB)
2.46784G	105.64	2.389585G	51.53	21.43	2.495185G	51.35	21.25	74	54	3.125	-30.1

2.4-2.4835GHz_BT-EDR(3Mbps) **Hopping-FS**

2440MHz

07/03/2024



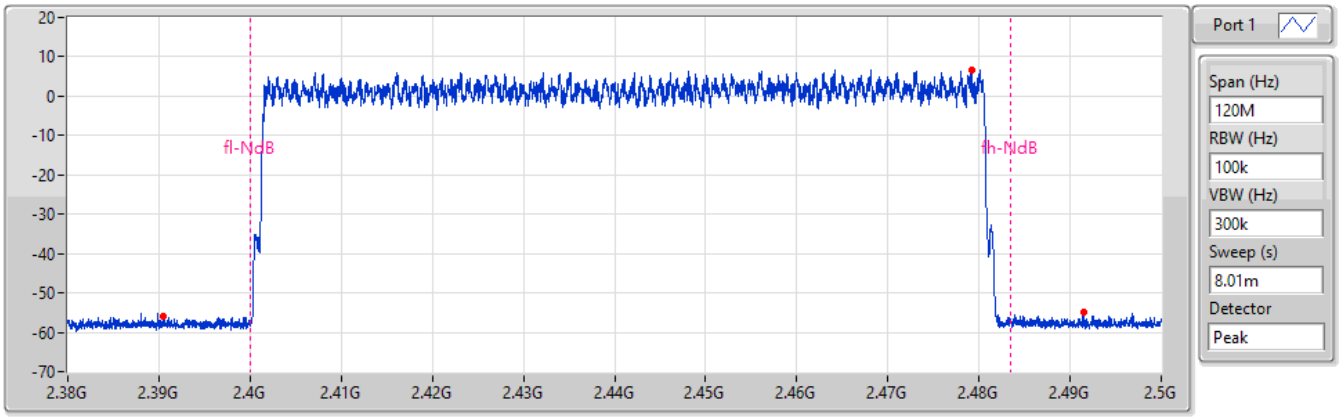
Hopping No	Limit
79	15

2.4-2.4835GHz_BT-EDR(3Mbps)

2440MHz

Hopping Ch Bandedge (Non-restricted Band)

07/03/2024



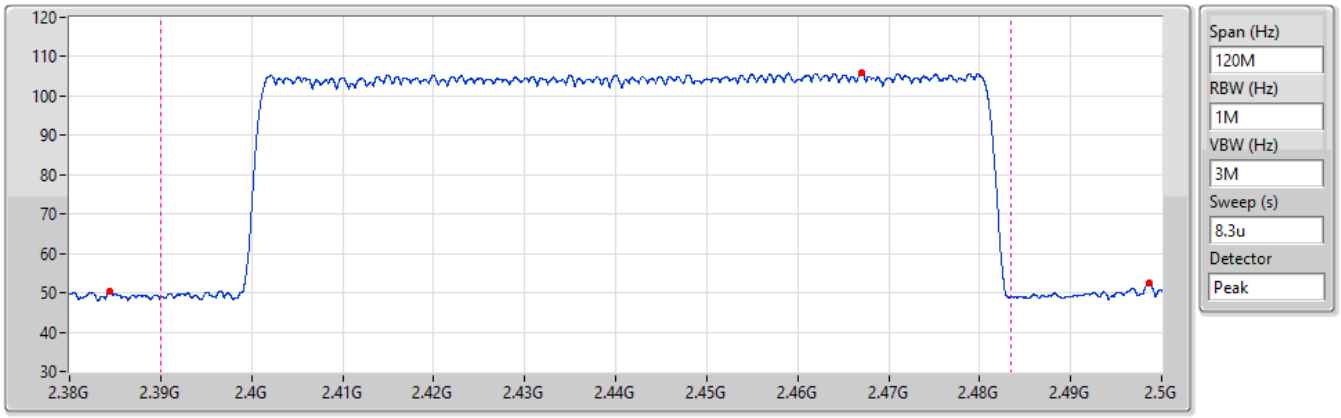
Limit(dBm)	Ref(Hz)	Ref(dBm)	BE-l(Hz)	BE-l(dBm)	BE-h(Hz)	BE-h(dBm)
-13.19	2.479165G	6.81	2.390455G	-55.94	2.491435G	-55

2.4-2.4835GHz_BT-EDR(3Mbps)

2440MHz

Hopping Ch Bandedge (Restricted Band)

07/03/2024



Ref(Hz)	Ref(dBuV/m)	BE-l(Hz)	PK(dBuV/m)	AV(dBuV/m)	BE-h(Hz)	PK(dBuV/m)	AV(dBuV/m)	LimPK(dBuV/	LimAV(dBuV/	Tx On(ms)	DCF(dB)
2.466985G	105.86	2.38444G	50.29	20.19	2.498575G	52.36	22.26	74	54	3.125	-30.1

Summary

2.4-2.4835GHz	-
BT-BR(1Mbps)	307.08795m_DH5
BT-EDR(2Mbps)	307.19455m_DH5
BT-EDR(3Mbps)	307.08795m_DH5

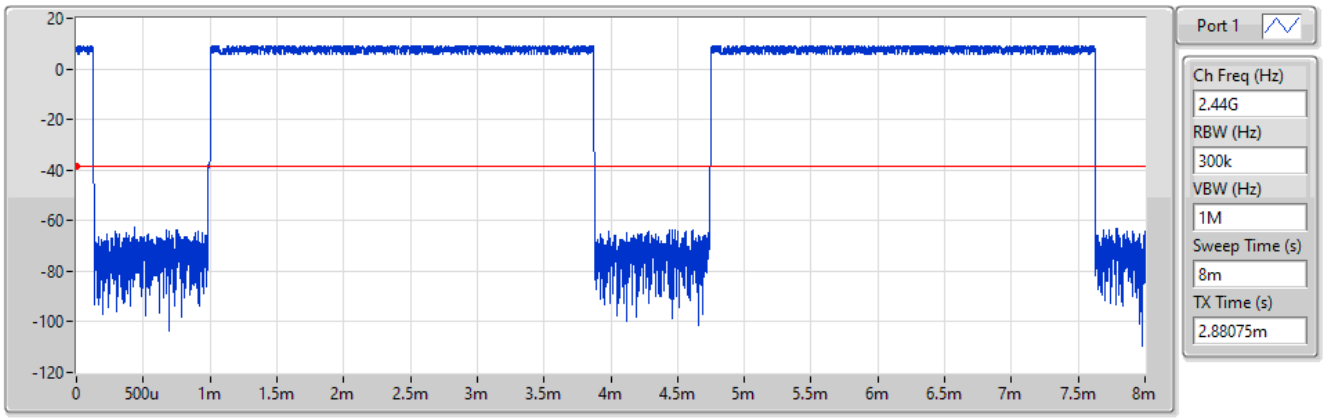
Result

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
BT-BR(1Mbps)	-	-	-	-	-
2440MHz	Pass	31.6	307.08795m_DH5	400m	2.88075m
2440MHz	Pass	8	153.3441m_DH5-AFH	400m	2.877m
BT-EDR(2Mbps)	-	-	-	-	-
2440MHz	Pass	31.6	307.19455m_DH5	400m	2.88175m
2440MHz	Pass	8	153.490675m_DH5-AFH	400m	2.87975m
BT-EDR(3Mbps)	-	-	-	-	-
2440MHz	Pass	31.6	307.08795m_DH5	400m	2.88075m
2440MHz	Pass	8	153.543975m_DH5-AFH	400m	2.88075m

2.4-2.4835GHz_BT-BR(1Mbps) **Dwell-FS**

2440MHz

07/03/2024



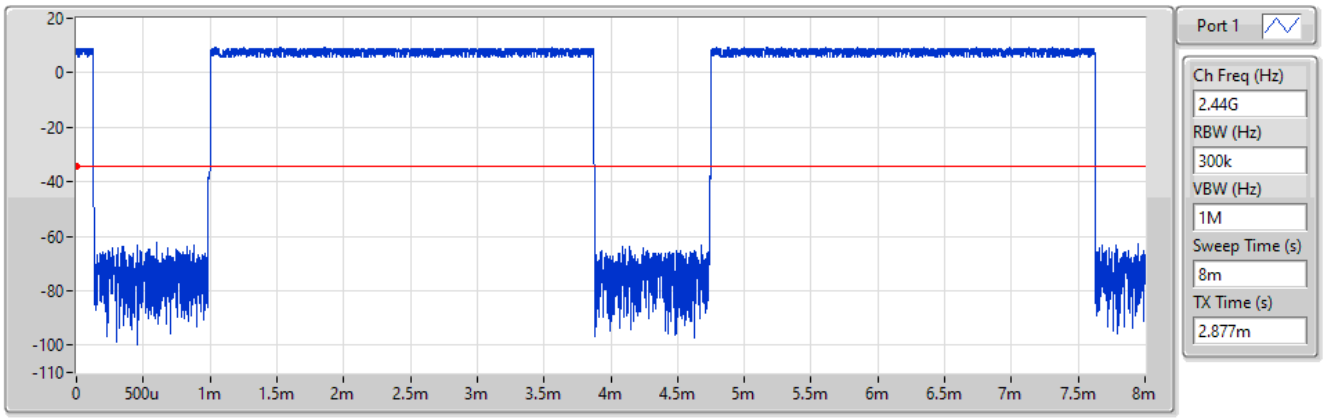
Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	307.08795m_DH5	400m	2.88075m

DH5

2.4-2.4835GHz_BT-BR(1Mbps) **Dwell-FS**

2440MHz

07/03/2024



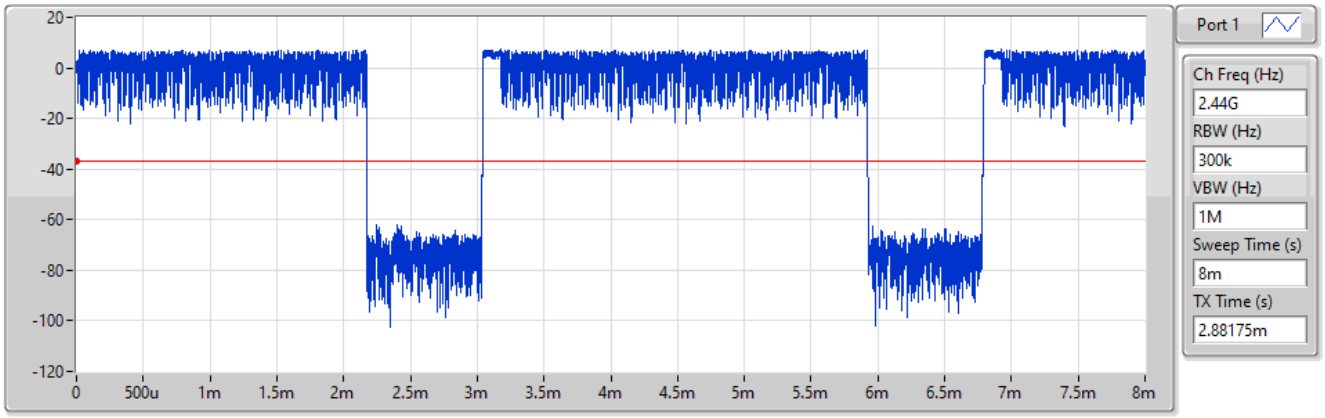
Period(s)	Dwell(s)	Limit(s)	Tx On(s)
8	153.3441m_DH5-AFH	400m	2.877m

DH5-AFH

2.4-2.4835GHz_BT-EDR(2Mbps) **Dwell-FS**

2440MHz

07/03/2024



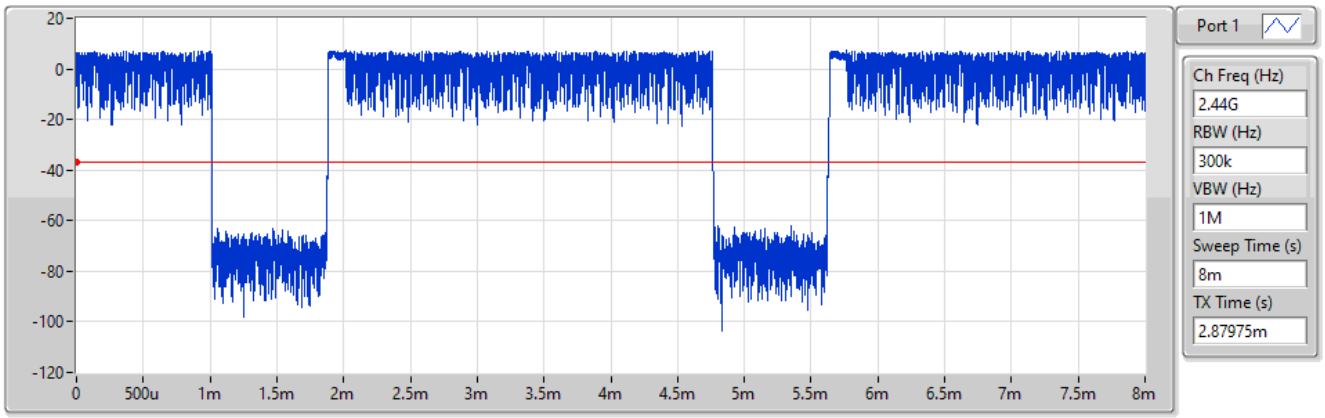
Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	307.19455m_DH5	400m	2.88175m

DH5

2.4-2.4835GHz_BT-EDR(2Mbps) **Dwell-FS**

2440MHz

07/03/2024



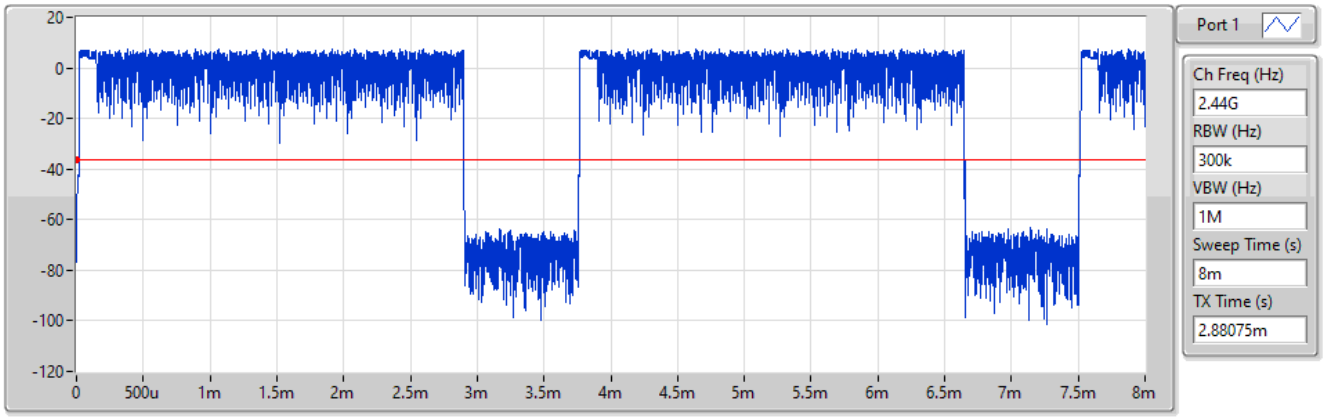
Period(s)	Dwell(s)	Limit(s)	Tx On(s)
8	153.490675m_DH5-AFI	400m	2.87975m

DH5-AFH

2.4-2.4835GHz_BT-EDR(3Mbps) **Dwell-FS**

2440MHz

07/03/2024



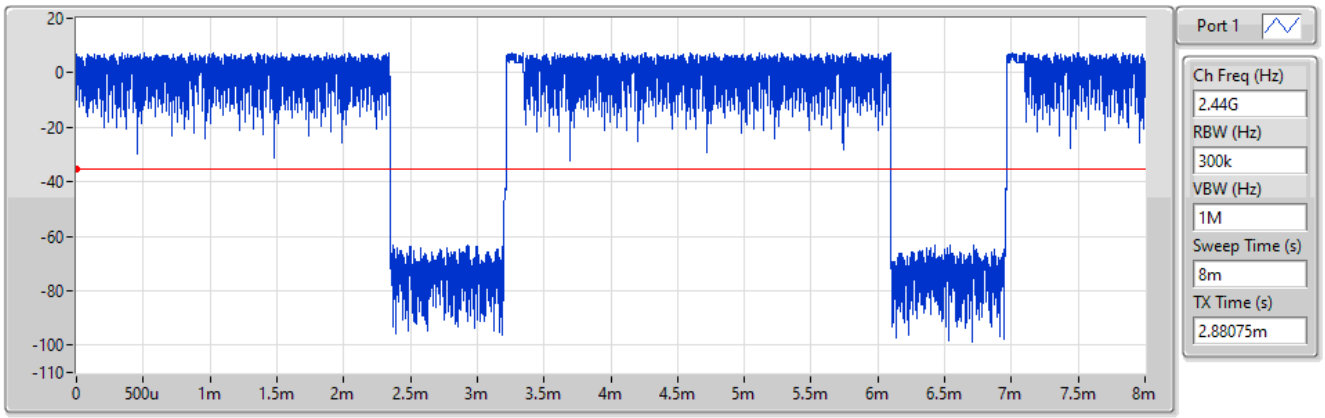
Period(s)	Dwell(s)	Limit(s)	Tx On(s)
31.6	307.08795m_DH5	400m	2.88075m

DH5

2.4-2.4835GHz_BT-EDR(3Mbps) **Dwell-FS**

2440MHz

07/03/2024



Period(s)	Dwell(s)	Limit(s)	Tx On(s)
8	153.543975m_DH5-AFI	400m	2.88075m

DH5-AFH

Summary

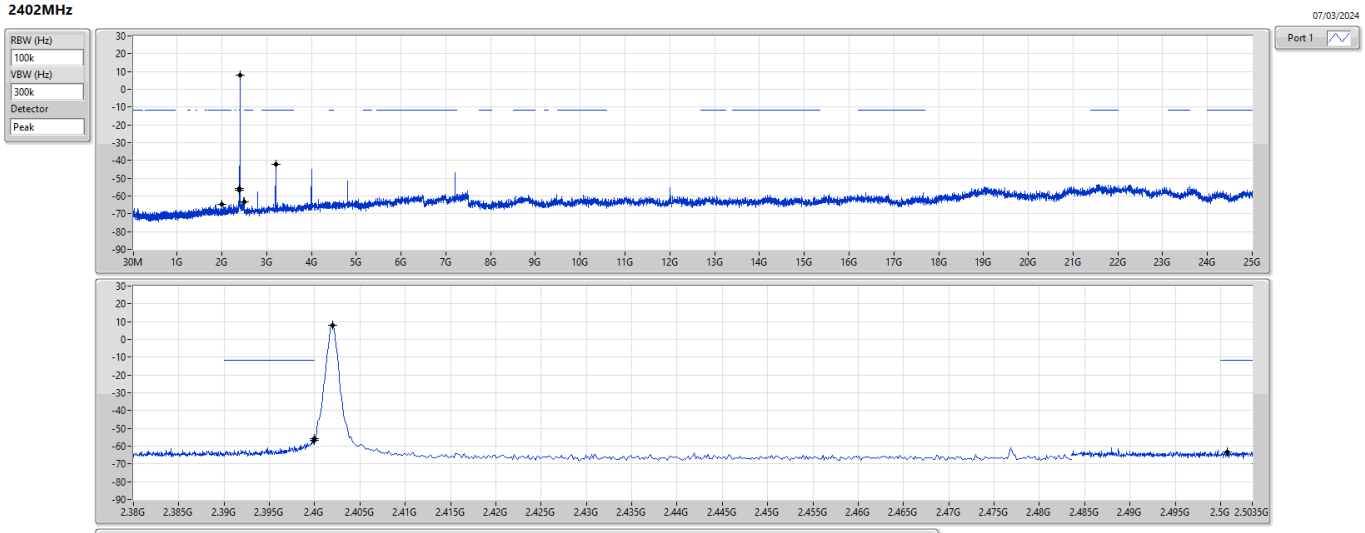
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-BR(1Mbps)	Pass	2.402G	8.15	-11.85	2.00165G	-64.66	2.39996G	-56.64	2.4G	-55.65	2.50078G	-63.41	3.20089G	-42.09	1
BT-EDR(2Mbps)	Pass	2.40184G	5.40	-14.60	2.00165G	-65.40	2.39952G	-53.00	2.4G	-56.36	2.50258G	-62.23	3.20089G	-42.10	1
BT-EDR(3Mbps)	Pass	2.40184G	5.69	-14.31	1.92058G	-64.49	2.39956G	-55.13	2.4G	-54.52	2.50222G	-62.58	3.20089G	-41.97	1

Result

Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
BT-BR(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.402G	8.15	-11.85	2.00165G	-64.66	2.39996G	-56.64	2.4G	-55.65	2.50078G	-63.41	3.20089G	-42.09	1
2440MHz	Pass	2.44025G	7.58	-12.42	2.30363G	-63.63	2.39024G	-61.81	2.4G	-66.88	2.50338G	-62.45	3.25151G	-44.10	1
2480MHz	Pass	2.47999G	7.94	-12.06	2.06745G	-63.74	2.39148G	-61.39	2.4G	-65.33	2.50194G	-61.93	3.30494G	-47.01	1
BT-EDR(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.40184G	5.40	-14.60	2.00165G	-65.40	2.39952G	-53.00	2.4G	-56.36	2.50258G	-62.23	3.20089G	-42.10	1
2440MHz	Pass	2.44008G	5.54	-14.46	2.03338G	-64.85	2.39904G	-62.89	2.4G	-66.18	2.50038G	-62.71	3.25151G	-44.15	1
2480MHz	Pass	2.48016G	6.46	-13.54	2.06745G	-60.86	2.4G	-62.67	2.4G	-66.56	2.50218G	-62.15	3.30494G	-45.58	1
BT-EDR(3Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.40184G	5.69	-14.31	1.92058G	-64.49	2.39956G	-55.13	2.4G	-54.52	2.50222G	-62.58	3.20089G	-41.97	1
2440MHz	Pass	2.44008G	5.23	-14.77	2.19083G	-65.56	2.39132G	-62.76	2.4G	-65.27	2.50346G	-62.92	3.25151G	-44.31	1
2480MHz	Pass	2.48016G	6.95	-13.05	2.06745G	-61.65	2.39044G	-61.87	2.4G	-67.21	2.50174G	-62.08	3.30494G	-45.43	1

2.4-2.4835GHz_BT-BR(1Mbps) **CSENdB-FS**

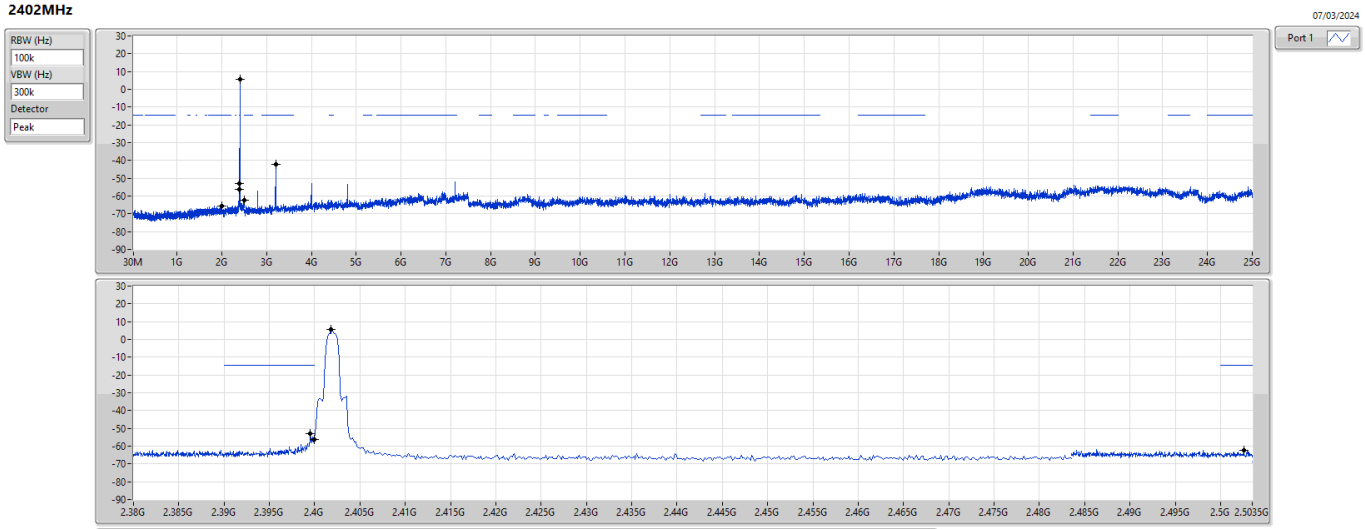
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.402G	8.15	-11.85	2.00165G	-64.66	2.39996G	-56.64	2.4G	-55.65	2.50078G	-63.41	3.20089G	-42.09	1

2.4-2.4835GHz_BT-EDR(2Mbps) **CSENdB-FS**

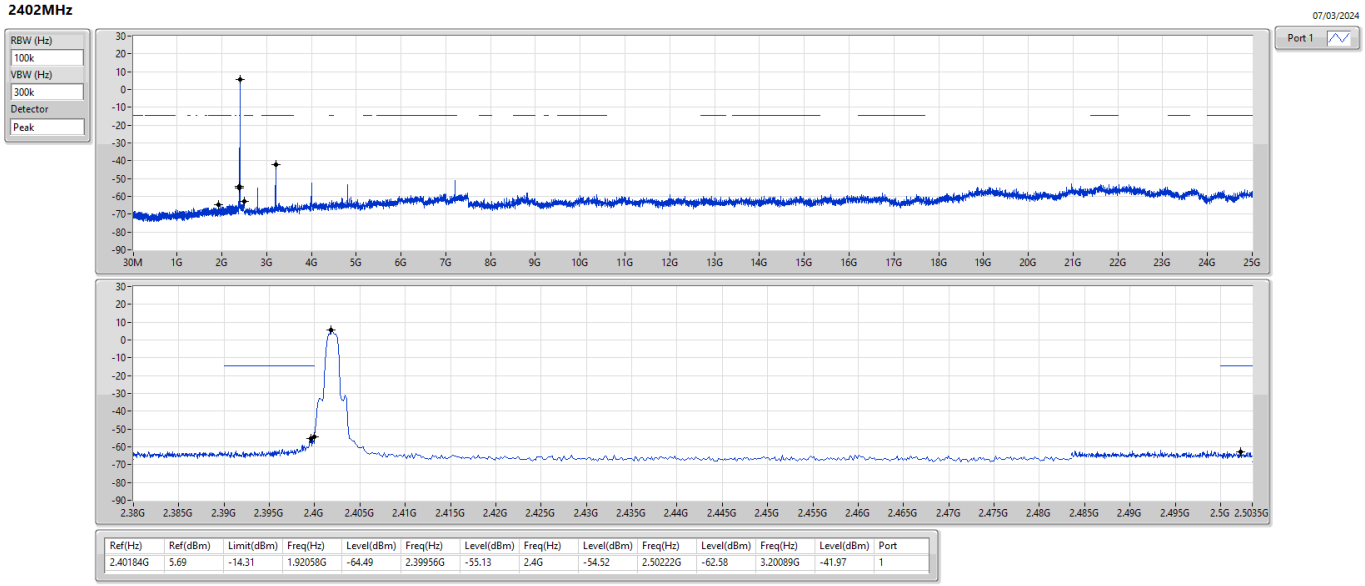
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40184G	5.40	-14.60	2.00165G	-65.40	2.39952G	-53.00	2.4G	-56.36	2.50258G	-62.23	3.20089G	-42.10	1

2.4-2.4835GHz_BT-EDR(3Mbps) CSENdB-FS

2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40184G	5.69	-14.31	1.92058G	-64.49	2.39956G	-55.13	2.4G	-54.52	2.50222G	-62.58	3.20089G	-41.97	1

Summary

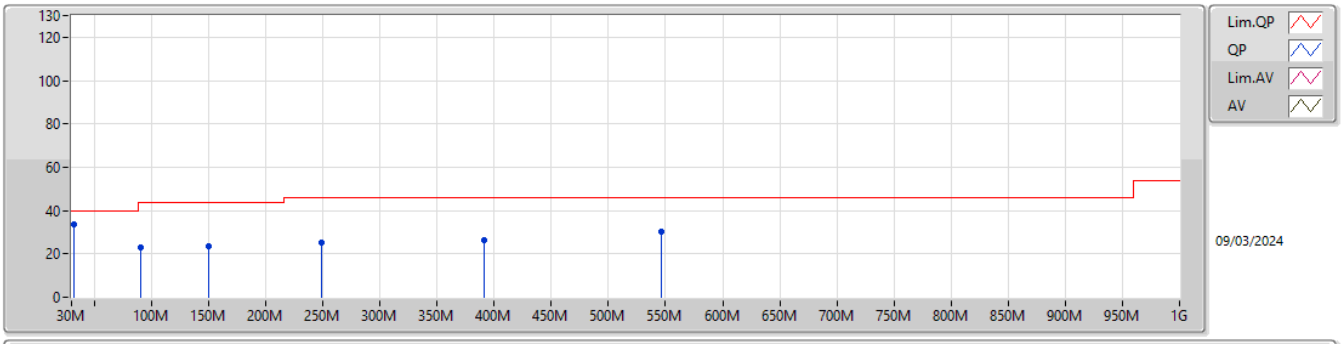
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-
BT-BR(1Mbps)	Pass	PK	31.94M	33.55	40.00	-6.45	3	Vertical	0	1.00

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
BT-BR(1Mbps)	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	31.94M	33.55	40.00	-6.45	3	Vertical	0	1.00
2440MHz	Pass	PK	90.14M	22.90	43.50	-20.60	3	Vertical	0	1.00
2440MHz	Pass	PK	150.28M	23.72	43.50	-19.78	3	Vertical	0	1.00
2440MHz	Pass	PK	249.22M	25.23	46.00	-20.77	3	Vertical	0	1.00
2440MHz	Pass	PK	390.84M	26.61	46.00	-19.39	3	Vertical	0	1.00
2440MHz	Pass	PK	546.04M	30.06	46.00	-15.94	3	Vertical	0	1.00
2440MHz	Pass	PK	30M	23.72	40.00	-16.28	3	Horizontal	360	1.00
2440MHz	Pass	PK	154.16M	20.64	43.50	-22.86	3	Horizontal	360	1.00
2440MHz	Pass	PK	224M	30.66	46.00	-15.34	3	Horizontal	360	1.00
2440MHz	Pass	PK	326.82M	30.07	46.00	-15.93	3	Horizontal	360	1.00
2440MHz	Pass	PK	392.78M	29.65	46.00	-16.35	3	Horizontal	360	1.00
2440MHz	Pass	PK	549.92M	29.63	46.00	-16.37	3	Horizontal	360	1.00

2.4-2.4835GHz_BT-BR(1Mbps)

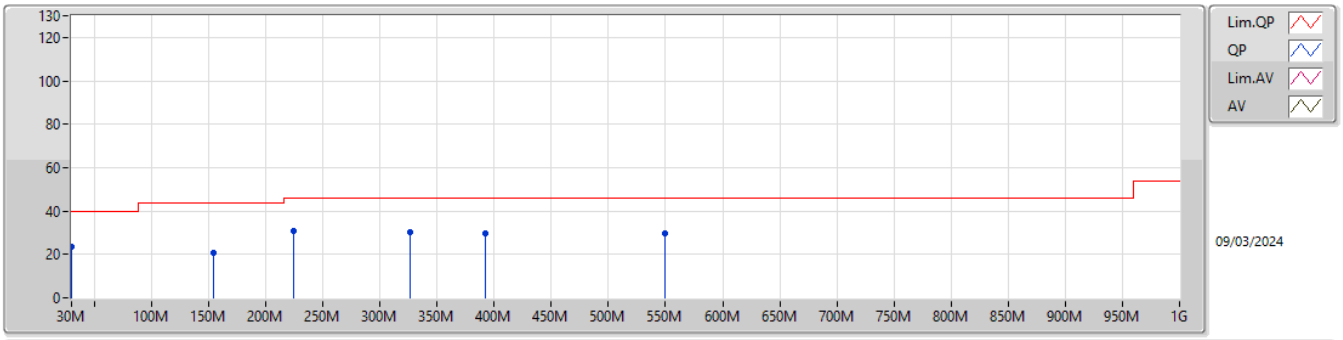
2440MHz_Adapter



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
PK	31.94M	33.55	40.00	-6.45	-4.03	3	Vertical	0	1.00	37.58	22.60	0.95	27.58
PK	90.14M	22.90	43.50	-20.60	-11.54	3	Vertical	0	1.00	34.44	14.35	1.56	27.45
PK	150.28M	23.72	43.50	-19.78	-9.66	3	Vertical	0	1.00	33.38	15.58	2.02	27.26
PK	249.22M	25.23	46.00	-20.77	-6.91	3	Vertical	0	1.00	32.14	17.51	2.63	27.05
PK	390.84M	26.61	46.00	-19.39	-3.49	3	Vertical	0	1.00	30.10	20.52	3.33	27.34
PK	546.04M	30.06	46.00	-15.94	0.45	3	Vertical	0	1.00	29.61	24.71	3.98	28.24

2.4-2.4835GHz_BT-BR(1Mbps)

2440MHz_Adapter



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
PK	30M	23.72	40.00	-16.28	-3.18	3	Horizontal	360	1.00	26.90	23.49	0.92	27.59
PK	154.16M	20.64	43.50	-22.86	-9.95	3	Horizontal	360	1.00	30.59	15.24	2.05	27.24
PK	224M	30.66	46.00	-15.34	-9.91	3	Horizontal	360	1.00	40.57	14.68	2.49	27.08
PK	326.82M	30.07	46.00	-15.93	-5.12	3	Horizontal	360	1.00	35.19	18.86	3.05	27.03
PK	392.78M	29.65	46.00	-16.35	-3.40	3	Horizontal	360	1.00	33.05	20.62	3.34	27.36
PK	549.92M	29.63	46.00	-16.37	0.33	3	Horizontal	360	1.00	29.30	24.60	3.99	28.26

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-
BT-BR(1Mbps)	Pass	PK	2.357G	59.15	74.00	-14.85	3	Vertical	104	1.28
BT-EDR(3Mbps)	Pass	PK	2.497G	59.01	74.00	-14.99	3	Vertical	107	1.28

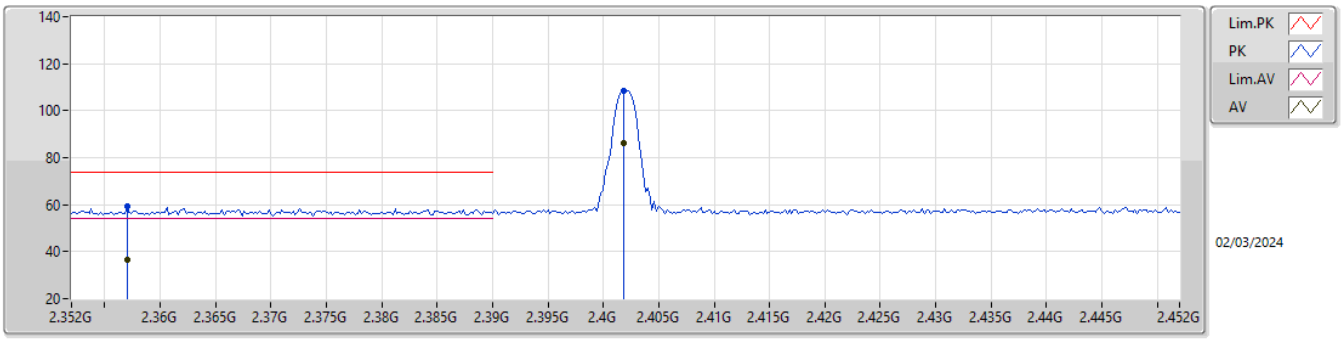
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
BT-BR(1Mbps)	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.357G	36.65	54.00	-17.35	3	Vertical	104	1.28
2402MHz	Pass	AV	2.4018G	86.19	Inf	-Inf	3	Vertical	104	1.28
2402MHz	Pass	PK	2.357G	59.15	74.00	-14.85	3	Vertical	104	1.28
2402MHz	Pass	PK	2.4018G	108.69	Inf	-Inf	3	Vertical	104	1.28
2402MHz	Pass	AV	2.3686G	36.19	54.00	-17.81	3	Horizontal	43	1.09
2402MHz	Pass	AV	2.4018G	77.05	Inf	-Inf	3	Horizontal	43	1.09
2402MHz	Pass	PK	2.3686G	58.69	74.00	-15.31	3	Horizontal	43	1.09
2402MHz	Pass	PK	2.4018G	99.55	Inf	-Inf	3	Horizontal	43	1.09
2402MHz	Pass	AV	4.80356G	28.96	54.00	-25.04	3	Vertical	161	2.46
2402MHz	Pass	PK	4.80356G	51.46	74.00	-22.54	3	Vertical	161	2.46
2402MHz	Pass	AV	4.80186G	24.24	54.00	-29.76	3	Horizontal	89	1.21
2402MHz	Pass	PK	4.80186G	46.74	74.00	-27.26	3	Horizontal	89	1.21
2440MHz	Pass	AV	2.3776G	35.68	54.00	-18.32	3	Vertical	105	1.31
2440MHz	Pass	AV	2.44G	86.02	Inf	-Inf	3	Vertical	105	1.31
2440MHz	Pass	AV	2.4948G	36.26	54.00	-17.74	3	Vertical	105	1.31
2440MHz	Pass	PK	2.3776G	58.18	74.00	-15.82	3	Vertical	105	1.31
2440MHz	Pass	PK	2.44G	108.52	Inf	-Inf	3	Vertical	105	1.31
2440MHz	Pass	PK	2.4948G	58.76	74.00	-15.24	3	Vertical	105	1.31
2440MHz	Pass	AV	2.3748G	35.70	54.00	-18.30	3	Horizontal	12	1.24
2440MHz	Pass	AV	2.44G	76.84	Inf	-Inf	3	Horizontal	12	1.24
2440MHz	Pass	AV	2.492G	36.52	54.00	-17.48	3	Horizontal	12	1.24
2440MHz	Pass	PK	2.3748G	58.20	74.00	-15.80	3	Horizontal	12	1.24
2440MHz	Pass	PK	2.44G	99.34	Inf	-Inf	3	Horizontal	12	1.24
2440MHz	Pass	PK	2.492G	59.02	74.00	-14.98	3	Horizontal	12	1.24
2440MHz	Pass	AV	4.88053G	26.86	54.00	-27.14	3	Vertical	171	2.02
2440MHz	Pass	AV	7.32031G	29.96	54.00	-24.04	3	Vertical	206	2.14
2440MHz	Pass	PK	4.88053G	49.36	74.00	-24.64	3	Vertical	171	2.02
2440MHz	Pass	PK	7.32031G	52.46	74.00	-21.54	3	Vertical	206	2.14
2440MHz	Pass	AV	4.88205G	24.58	54.00	-29.42	3	Horizontal	275	1.90
2440MHz	Pass	AV	7.32122G	29.86	54.00	-24.14	3	Horizontal	214	2.54
2440MHz	Pass	PK	4.88205G	47.08	74.00	-26.92	3	Horizontal	275	1.90
2440MHz	Pass	PK	7.32122G	52.36	74.00	-21.64	3	Horizontal	214	2.54
2480MHz	Pass	AV	2.4798G	86.19	Inf	-Inf	3	Vertical	107	1.30
2480MHz	Pass	AV	2.4882G	36.22	54.00	-17.78	3	Vertical	107	1.30
2480MHz	Pass	PK	2.4798G	108.69	Inf	-Inf	3	Vertical	107	1.30
2480MHz	Pass	PK	2.4882G	58.72	74.00	-15.28	3	Vertical	107	1.30
2480MHz	Pass	AV	2.48G	74.74	Inf	-Inf	3	Horizontal	329	1.48
2480MHz	Pass	AV	2.498G	36.40	54.00	-17.60	3	Horizontal	329	1.48
2480MHz	Pass	PK	2.48G	97.24	Inf	-Inf	3	Horizontal	329	1.48
2480MHz	Pass	PK	2.498G	58.90	74.00	-15.10	3	Horizontal	329	1.48
2480MHz	Pass	AV	4.9598G	26.74	54.00	-27.26	3	Vertical	141	2.25
2480MHz	Pass	AV	7.43819G	29.14	54.00	-24.86	3	Vertical	139	1.41
2480MHz	Pass	PK	4.9598G	49.24	74.00	-24.76	3	Vertical	141	2.25
2480MHz	Pass	PK	7.43819G	51.64	74.00	-22.36	3	Vertical	139	1.41
2480MHz	Pass	AV	4.96226G	24.75	54.00	-29.25	3	Horizontal	21	2.28
2480MHz	Pass	AV	7.4393G	29.03	54.00	-24.97	3	Horizontal	231	1.52
2480MHz	Pass	PK	4.96226G	47.25	74.00	-26.75	3	Horizontal	21	2.28
2480MHz	Pass	PK	7.4393G	51.53	74.00	-22.47	3	Horizontal	231	1.52
BT-EDR(3Mbps)	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.3532G	36.19	54.00	-17.81	3	Vertical	103	1.01
2402MHz	Pass	AV	2.402G	84.65	Inf	-Inf	3	Vertical	103	1.01
2402MHz	Pass	PK	2.3532G	58.69	74.00	-15.31	3	Vertical	103	1.01
2402MHz	Pass	PK	2.402G	107.15	Inf	-Inf	3	Vertical	103	1.01
2402MHz	Pass	AV	2.3896G	35.86	54.00	-18.14	3	Horizontal	43	1.09
2402MHz	Pass	AV	2.402G	75.37	Inf	-Inf	3	Horizontal	43	1.09
2402MHz	Pass	PK	2.3896G	58.36	74.00	-15.64	3	Horizontal	43	1.09
2402MHz	Pass	PK	2.402G	97.87	Inf	-Inf	3	Horizontal	43	1.09
2402MHz	Pass	AV	4.80409G	29.96	54.00	-24.04	3	Vertical	155	2.17
2402MHz	Pass	PK	4.80409G	52.46	74.00	-21.54	3	Vertical	155	2.17
2402MHz	Pass	AV	4.80466G	24.50	54.00	-29.50	3	Horizontal	155	2.50

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2402MHz	Pass	PK	4.80466G	47.00	74.00	-27.00	3	Horizontal	155	2.50
2440MHz	Pass	AV	2.356G	35.15	54.00	-18.85	3	Vertical	106	1.30
2440MHz	Pass	AV	2.44G	85.23	Inf	-Inf	3	Vertical	106	1.30
2440MHz	Pass	AV	2.4868G	36.32	54.00	-17.68	3	Vertical	106	1.30
2440MHz	Pass	PK	2.356G	57.65	74.00	-16.35	3	Vertical	106	1.30
2440MHz	Pass	PK	2.44G	107.73	Inf	-Inf	3	Vertical	106	1.30
2440MHz	Pass	PK	2.4868G	58.82	74.00	-15.18	3	Vertical	106	1.30
2440MHz	Pass	AV	2.366G	35.50	54.00	-18.50	3	Horizontal	0	1.95
2440MHz	Pass	AV	2.44G	75.34	Inf	-Inf	3	Horizontal	0	1.95
2440MHz	Pass	AV	2.4992G	36.40	54.00	-17.60	3	Horizontal	0	1.95
2440MHz	Pass	PK	2.366G	58.00	74.00	-16.00	3	Horizontal	0	1.95
2440MHz	Pass	PK	2.44G	97.84	Inf	-Inf	3	Horizontal	0	1.95
2440MHz	Pass	PK	2.4992G	58.90	74.00	-15.10	3	Horizontal	0	1.95
2440MHz	Pass	AV	4.88015G	28.59	54.00	-25.41	3	Vertical	171	1.94
2440MHz	Pass	AV	7.32121G	29.57	54.00	-24.43	3	Vertical	312	1.64
2440MHz	Pass	PK	4.88015G	51.09	74.00	-22.91	3	Vertical	171	1.94
2440MHz	Pass	PK	7.32121G	52.07	74.00	-21.93	3	Vertical	312	1.64
2440MHz	Pass	AV	4.87868G	24.55	54.00	-29.45	3	Horizontal	323	2.13
2440MHz	Pass	AV	7.31864G	29.70	54.00	-24.30	3	Horizontal	245	2.71
2440MHz	Pass	PK	4.87868G	47.05	74.00	-26.95	3	Horizontal	323	2.13
2440MHz	Pass	PK	7.31864G	52.20	74.00	-21.80	3	Horizontal	245	2.71
2480MHz	Pass	AV	2.48G	85.99	Inf	-Inf	3	Vertical	107	1.28
2480MHz	Pass	AV	2.497G	36.51	54.00	-17.49	3	Vertical	107	1.28
2480MHz	Pass	PK	2.48G	108.49	Inf	-Inf	3	Vertical	107	1.28
2480MHz	Pass	PK	2.497G	59.01	74.00	-14.99	3	Vertical	107	1.28
2480MHz	Pass	AV	2.48G	74.47	Inf	-Inf	3	Horizontal	329	1.48
2480MHz	Pass	AV	2.4944G	36.17	54.00	-17.83	3	Horizontal	329	1.48
2480MHz	Pass	PK	2.48G	96.97	Inf	-Inf	3	Horizontal	329	1.48
2480MHz	Pass	PK	2.4944G	58.67	74.00	-15.33	3	Horizontal	329	1.48
2480MHz	Pass	AV	4.96004G	28.87	54.00	-25.13	3	Vertical	141	2.25
2480MHz	Pass	AV	7.44237G	29.14	54.00	-24.86	3	Vertical	334	1.83
2480MHz	Pass	PK	4.96004G	51.37	74.00	-22.63	3	Vertical	141	2.25
2480MHz	Pass	PK	7.44237G	51.64	74.00	-22.36	3	Vertical	334	1.83
2480MHz	Pass	AV	4.95904G	24.45	54.00	-29.55	3	Horizontal	181	1.09
2480MHz	Pass	AV	7.43849G	28.94	54.00	-25.06	3	Horizontal	176	1.73
2480MHz	Pass	PK	4.95904G	46.95	74.00	-27.05	3	Horizontal	181	1.09
2480MHz	Pass	PK	7.43849G	51.44	74.00	-22.56	3	Horizontal	176	1.73

2.4-2.4835GHz_BT-BR(1Mbps)

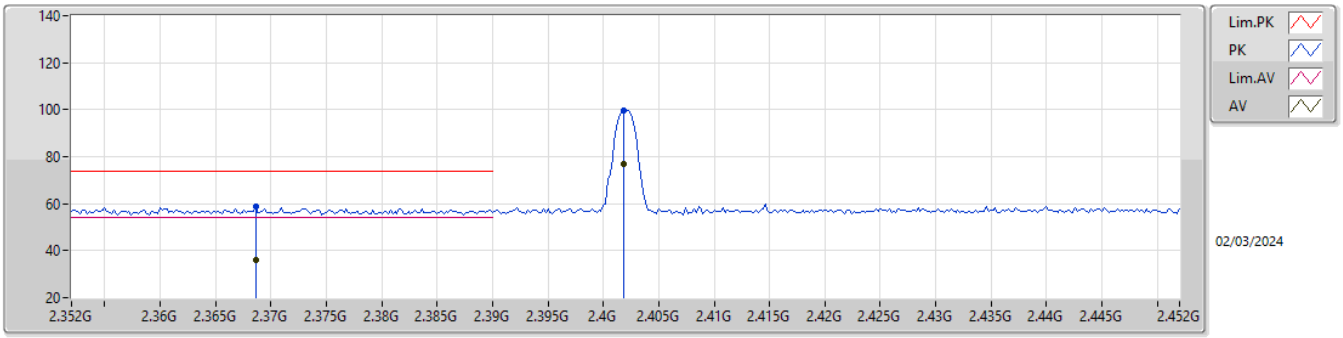
2402MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	2.357G	36.65	54.00	-17.35	32.54	3	Vertical	104	1.28	4.11	27.17	5.37	-
AV	2.4018G	86.19	Inf	-Inf	32.81	3	Vertical	104	1.28	53.38	27.40	5.41	-
PK	2.357G	59.15	74.00	-14.85	32.54	3	Vertical	104	1.28	26.61	27.17	5.37	-
PK	2.4018G	108.69	Inf	-Inf	32.81	3	Vertical	104	1.28	75.88	27.40	5.41	-

2.4-2.4835GHz_BT-BR(1Mbps)

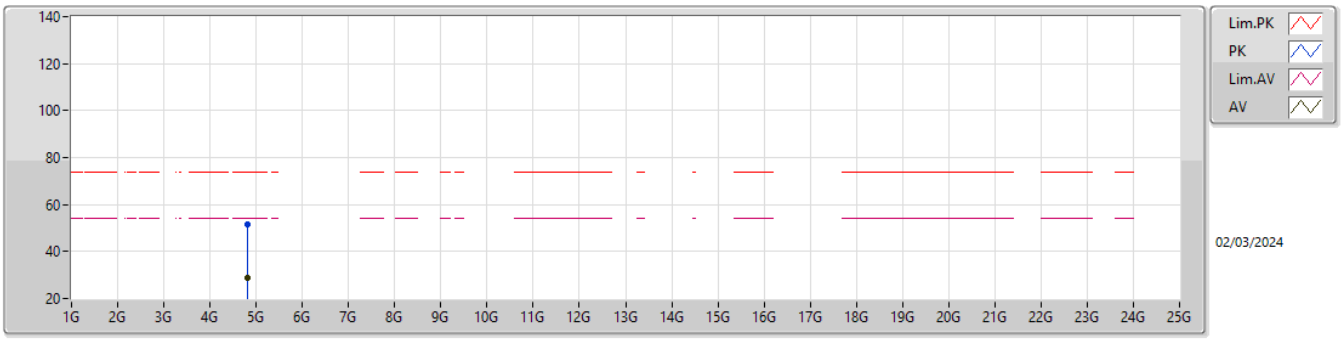
2402MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	2.3686G	36.19	54.00	-17.81	32.58	3	Horizontal	43	1.09	3.61	27.20	5.38	-
AV	2.4018G	77.05	Inf	-Inf	32.81	3	Horizontal	43	1.09	44.24	27.40	5.41	-
PK	2.3686G	58.69	74.00	-15.31	32.58	3	Horizontal	43	1.09	26.11	27.20	5.38	-
PK	2.4018G	99.55	Inf	-Inf	32.81	3	Horizontal	43	1.09	66.74	27.40	5.41	-

2.4-2.4835GHz_BT-BR(1Mbps)

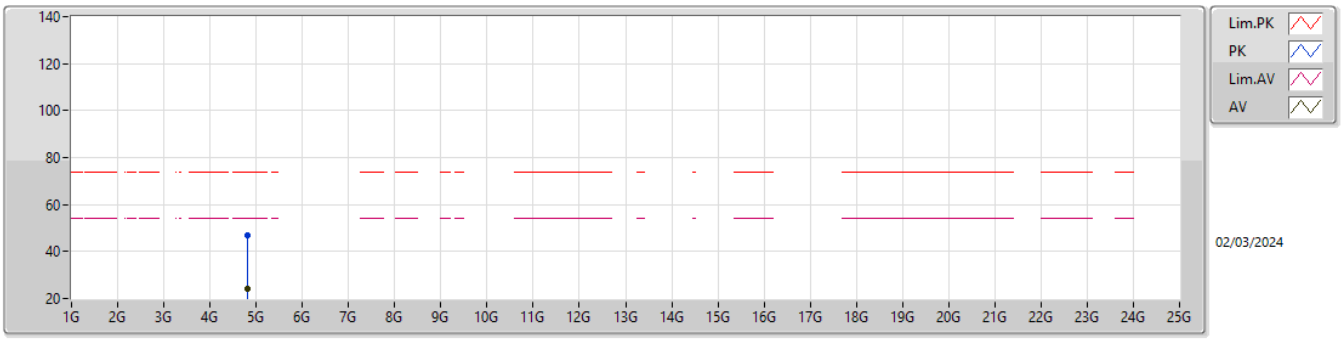
2402MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	4.80356G	28.96	54.00	-25.04	5.97	3	Vertical	161	2.46	22.99	32.02	7.96	34.01
PK	4.80356G	51.46	74.00	-22.54	5.97	3	Vertical	161	2.46	45.49	32.02	7.96	34.01

2.4-2.4835GHz_BT-BR(1Mbps)

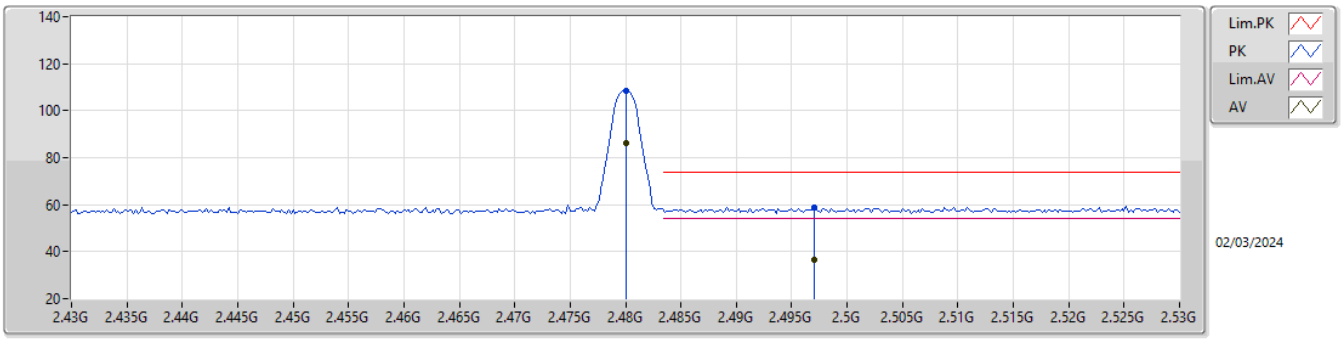
2402MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	4.80186G	24.24	54.00	-29.76	5.96	3	Horizontal	89	1.21	18.28	32.01	7.96	34.01
PK	4.80186G	46.74	74.00	-27.26	5.96	3	Horizontal	89	1.21	40.78	32.01	7.96	34.01

2.4-2.4835GHz_BT-EDR(3Mbps)

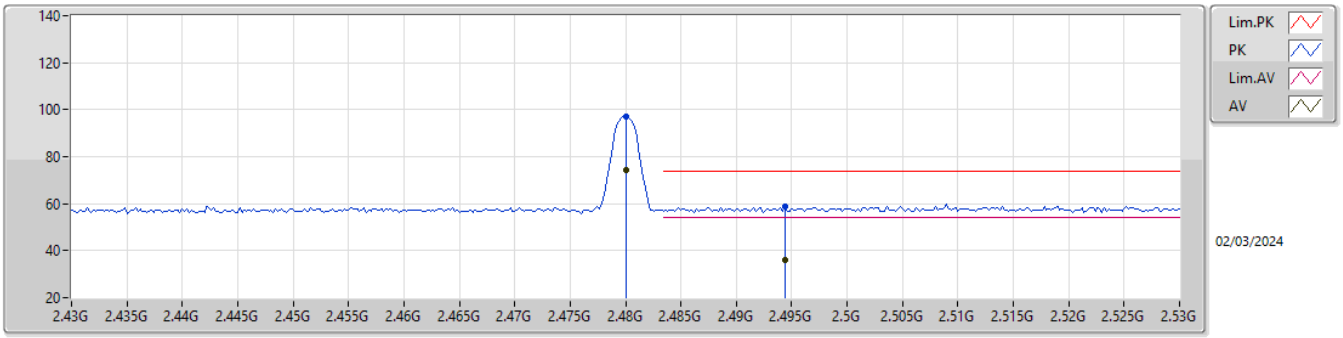
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	2.48G	85.99	Inf	-Inf	33.21	3	Vertical	107	1.28	52.78	27.70	5.51	-
AV	2.497G	36.51	54.00	-17.49	33.33	3	Vertical	107	1.28	3.18	27.80	5.53	-
PK	2.48G	108.49	Inf	-Inf	33.21	3	Vertical	107	1.28	75.28	27.70	5.51	-
PK	2.497G	59.01	74.00	-14.99	33.33	3	Vertical	107	1.28	25.68	27.80	5.53	-

2.4-2.4835GHz_BT-EDR(3Mbps)

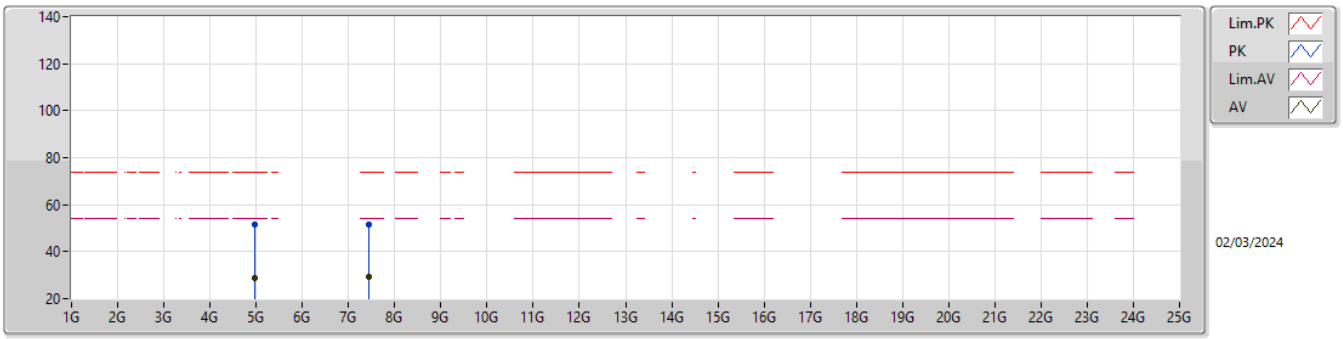
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	2.48G	74.47	Inf	-Inf	33.21	3	Horizontal	329	1.48	41.26	27.70	5.51	-
AV	2.4944G	36.17	54.00	-17.83	33.33	3	Horizontal	329	1.48	2.84	27.80	5.53	-
PK	2.48G	96.97	Inf	-Inf	33.21	3	Horizontal	329	1.48	63.76	27.70	5.51	-
PK	2.4944G	58.67	74.00	-15.33	33.33	3	Horizontal	329	1.48	25.34	27.80	5.53	-

2.4-2.4835GHz_BT-EDR(3Mbps)

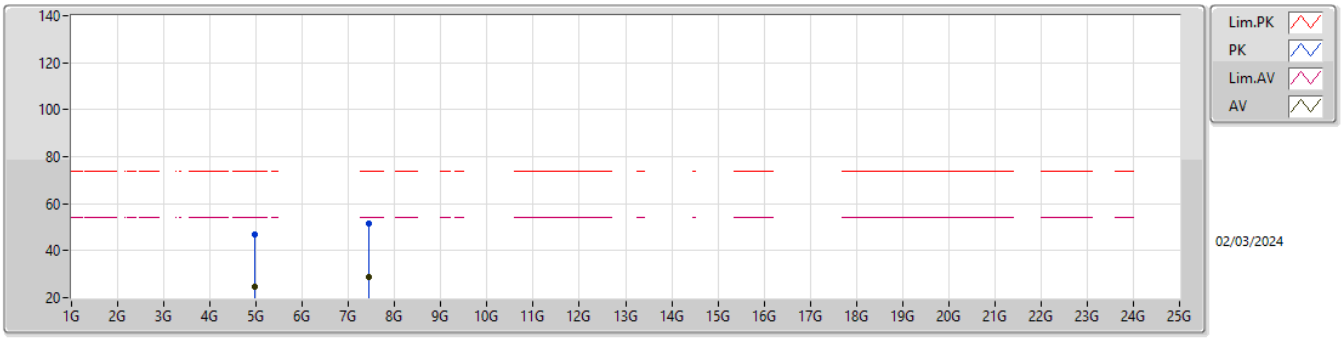
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	4.96004G	28.87	54.00	-25.13	6.85	3	Vertical	141	2.25	22.02	32.86	7.98	33.99
AV	7.44237G	29.14	54.00	-24.86	11.54	3	Vertical	334	1.83	17.60	36.32	9.57	34.35
PK	4.96004G	51.37	74.00	-22.63	6.85	3	Vertical	141	2.25	44.52	32.86	7.98	33.99
PK	7.44237G	51.64	74.00	-22.36	11.54	3	Vertical	334	1.83	40.10	36.32	9.57	34.35

2.4-2.4835GHz_BT-EDR(3Mbps)

2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	4.95904G	24.45	54.00	-29.55	6.84	3	Horizontal	181	1.09	17.61	32.85	7.98	33.99
AV	7.43849G	28.94	54.00	-25.06	11.53	3	Horizontal	176	1.73	17.41	36.32	9.56	34.35
PK	4.95904G	46.95	74.00	-27.05	6.84	3	Horizontal	181	1.09	40.11	32.85	7.98	33.99
PK	7.43849G	51.44	74.00	-22.56	11.53	3	Horizontal	176	1.73	39.91	36.32	9.56	34.35