

Report No.: FR380908AA





RADIO TEST REPORT

FCC ID : 2AYRA-03795

: Linksys Velop Micro-Mesh 6 Equipment

Brand Name : LINKSYS

Model Name : LN1200, LN1210, LN1215

: Linksys USA, Inc. **Applicant**

121 Theory, Irvine, CA. 92617, USA

Standard : 47 CFR FCC Part 15.247

The product was received on Aug. 09, 2023, and testing was started from Aug. 14, 2023 and completed on Oct. 12, 2023. We, Sporton International Inc. Hsinchu 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. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

TEL: 886-3-656-9065 FAX: 886-3-656-9085

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: 01

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History of this test report

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Report No.	Version	Description	Issued Date
FR380908AA	01	Initial issue of report	Dec. 01, 2023

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Summary of Test Result

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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 Band edge	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	-

Conformity Assessment Condition:

- 1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
- 2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen

Report Producer: Lavender Zeng

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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]

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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

A m4		Port		Brand	Model Name Antenna Type		Connector	Cain (dBi)
Ant.	2.4GHz	5GHz	Bluetooth	Brand	Wiodei Name	Antenna Type	Connector	Gain (GBI)
1	2	1	-	Galtronics	02102140-07935C1	PCB Antenna	U.FL	
2	1	2	-	Galtronics	02102140-07935C2	PCB Antenna	U.FL	Note 1
3	-	-	1	Gemtek	WRTQ-387AX	Printed Antenna	N/A	

Note 1:

	Gain (dBi)						
Ant.	2.4GHz	5GHz UNII 1	5GHz UNII 2A	5GHz UNII 2C	5GHz UNII 3	Bluetooth	
1	3.35	4.90	4.90	4.92	4.92	-	
2	3.72	4.70	4.70	4.79	4.79	-	
3	-	-	-	-	-	2.82	

Note 2: The above information was declared by manufacturer.

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Note 3: Directional gain information

Type	Maximum Output Power	Power Spectral Density
Non-BF	Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4	Directional Gain = $10 \cdot \log \left[\frac{\sum_{j=1}^{N_{BE}} \left[\sum_{k=1}^{N_{ANT}} \mathbf{g}_{j,k} \right]^{2}}{N_{ANT}} \right]$
BF	Directional Gain = $10 \cdot \log \left[\frac{\sum_{j=1}^{N_{all}} \left\{ \sum_{k=1}^{N_{all}} \mathbf{S}_{j,k} \right\}^{2}}{N_{ant}} \right]$	Directional Gain = $10 \cdot \log \left[\frac{\sum_{j=1}^{N_{all}} \left[\sum_{k=1}^{N_{all}} \mathbf{g}_{j,k} \right]^{2}}{N_{ant}} \right]$

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Ex.

Directiona lGain =
$$10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ad}} \left\{ \sum_{k=1}^{N_{ad}} \mathbf{\mathcal{E}}_{j,k} \right\}}{N_{ANT}} \right]$$

$$NSS1(g1,1) = 10^{G1/20}$$
; $NSS1(g1,2) = 10^{G2/20}$;

$$gj,k = (Nss1(g1,1) + Nss1(g1,2))^2$$

$$DG = 10 \log[(Nss1(g1,1) + Nss1(g1,2))^{2} / N_{ANT}] => 10 \log[(10^{G1/20} + 10^{G2/20})^{2} / N_{ANT}]$$

Where:

Note 4: For 2.4GHz function:

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

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

For 5GHz function:

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

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

For Bluetooth function:

For Bluetooth mode (1TX/1RX):

Only Port 1 can be use as transmit and receive antenna.

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1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-BR(1Mbps)	0.741	1.3	2.886m	1k
BT-EDR(2Mbps)	0.742	1.3	2.889m	1k
BT-EDR(3Mbps)	0.785	1.05	2.891m	1k

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Note:

- DC is Duty Cycle.
- DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	From Power Adapter
Test Software Version	QRCT 4.0.210.0

1.1.5 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Description
LN1200	
LN1210	All the models are identical, the difference model served as marketing strategy.
LN1215	

Note 1: From the above models, model: LN1200 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

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1.2 Applicable Standards

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

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47 CFR FCC Part 15.247

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

- FCC KDB 558074 D01 v05r02
- FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location Information

Test Lab.: Sporton International Inc. Hsinchu Laboratory

Hsinchu ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

(TAF: 3787) TEL: 886-3-656-9065 FAX: 886-3-656-9085

Test site Designation No. TW3787 with FCC.

Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date	
RF Conducted	TH03-CB	Nyle Chang	24.2-25.3 / 57-69	Aug. 14, 2023 ~ Sep. 26, 2023	
Radiated (Below 1GHz)	03CH01-CB	Mark Hsu	22.4-23.5 / 55-58	Aug. 15, 2023 ~ Oct. 12, 2023	
Radiated	03CH02-CB		21-22 / 55-58	21-22 / 55-58	Aug. 15, 2023 ~
(Above 1GHz)	03CH06-CB	IVIAIK IISU	22.7-23.8 / 56-59	Oct. 12, 2023	
AC Conduction	CO01-CB	Elvin Yeh	22~23 / 55~56	Sep. 28, 2023	

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
Conducted Emission (150kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.1 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.1 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%
Conducted Emission	3.1 dB	Confidence levels of 95%
Output Power Measurement	0.8 dB	Confidence levels of 95%
Power Density Measurement	3.1 dB	Confidence levels of 95%
Bandwidth Measurement	2.2%	Confidence levels of 95%

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2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	Power Setting
BT-BR(1Mbps)	-
2402MHz	9
2440MHz	9
2480MHz	9
BT-EDR(2Mbps)	-
2402MHz	9
2440MHz	9
2480MHz	9
BT-EDR(3Mbps)	-
2402MHz	9
2440MHz	9
2480MHz	9

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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	Normal Link	
1	EUT + Adapter 1	
2	EUT + Adapter 2	
3	EUT + Adapter 3	
For operating mode 1 is the worst case and it was record in this test report.		

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Th	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		

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Th	e 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
Afrer evaluating, "Z axis" configuration.	generated the worst test result, so the measurement will follow this same test
1	EUT in Z axis + WLAN 2.4GHz + Adapter 1
2	EUT in Z axis + WLAN 2.4GHz + Adapter 2
3	EUT in Z axis + WLAN 2.4GHz + Adapter 3
Mode 1 ha been evaluated to be the worst case between Mode 1~3, thus measurement for Mode 4 follow this same test mode.	
4	EUT in Z axis + WLAN 5GHz + Adapter 1
5	EUT in Z axis + Bluetooth + Adapter 1
For operating mode 1 is th	e worst case and it was record in this test report.
Operating Mode > 1GHz	СТХ
Afrer evaluating, "Z axis" configuration.	generated the worst test result, so the measurement will follow this same test
1	EUT in Z axis

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The Worst Case Mode for Following Conformance Tests		
Tests Item Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation		
Operating Mode		
1	Bluetooth + WLAN 2.4GHz + WLAN 5GHz	
Refer to Sporton Test Report No.: FA380908 for Co-location RF Exposure Evaluation.		

2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

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2.4 Accessories

Accessories			
Power	Brand	Model	Rating
Adapter 1	Ktec	KSA-18W-050300VU	Input: 100-240V ~ 50/60Hz, 0.5A
(Fixed plug)	Riec	KSA-10VV-050500VU	Output: 5.0V, 3.0A
Adapter 2	MOSO	MCA COOODICE O AOD LIC	Input: 100-240V ~ 50/60Hz, 0.7A max.
(Fixed plug)	IVIOSO	MSA-C3000IC5.0-18P-US	Output: 5.0V, 3A
Adapter 3	Ktec	VCA 40\M 050200D5	Input: 100-240V ~ 50/60Hz, 0.5A
(Removable plug)	Kiec	KSA-18W-050300D5	Output: 5.0V, 3.0A, 15.0W
Others			
Plug*1 (for Adapter 3 use)			

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2.5 Support Equipment

For AC Conduction:

	Support Equipment			
No.	No. Equipment Brand Name Model Name FCC ID			
Α	Device AP	LINKSYS	ELM	N/A
В	Device NB	DELL	E6430	N/A
С	2.4G NB	DELL	E6430	N/A
D	5G NB	DELL	E6430	N/A
Е	Smart phone	Samsung	Galaxy J2	N/A

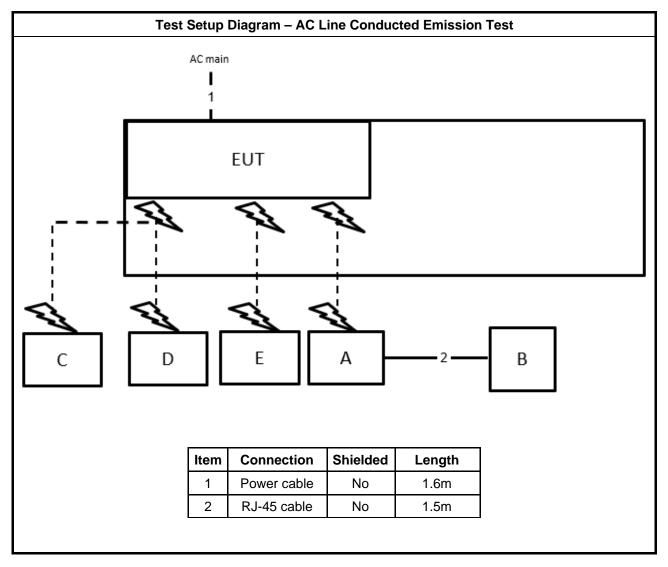
For Radiated and RF Conducted:

	Support Equipment			
No.	Equipment	Brand Name	Model Name	FCC ID
Α	NB	DELL	E4300	N/A
В	Test Fixture	Linksys	ESK-B21-7400R	N/A
С	Test Fixture	Linksys	N/A	N/A

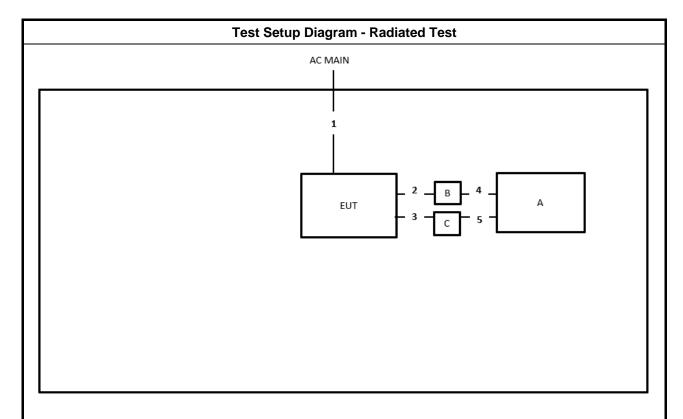
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2.6 Test Setup Diagram



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Item	Connection	Shielded	Length
1	Power cable	No	1.6m
2	Console cable	No	0.03m
3	Console cable	No	0.03m
4	RJ-45 cable	No	1m
5	USB cable	Yes	1m

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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.		

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3.1.2 Measuring Instruments

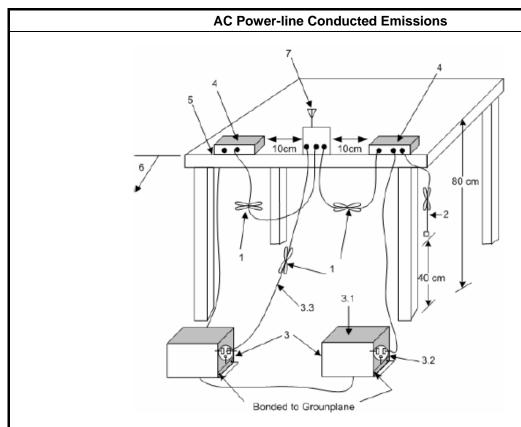
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

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3.1.4 **Test Setup**



-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.

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- 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 50 Ω 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.

- -Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
- -Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground
- 7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

1.1.1. Measurement Results Calculation

The measured Level is calculated using:

- Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- Margin = -Limit + Level

Test Result of AC Power-line Conducted Emissions 3.1.5

Refer as Appendix A

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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								
•	902-928 MHz Band:								
	N ≥50 and ChS ≥ MAX (20 dB bandwidth, 25 kHz); 20 dB bandwidth≤ 250 kHz.								
	■ 50 >N≥25 and ChS ≥ MAX (20 dB bandwidth, 25 kHz); 20 dB bandwidth>250 kHz.								
•	■ 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).								
•	■ 5725-5850 MHz Band:								
	 N ≥ 75 and ChS ≥ MAX (20 dB bandwidth, 25 kHz); 20 dB bandwidth≤ 1 MHz. 								
N:N	umber of Hopping Frequencies; ChS : Hopping Channel Separation								

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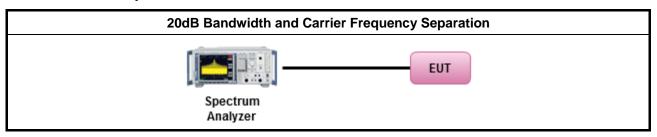
3.2.2 Measuring Instruments

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 6.9.1 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



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

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3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

	Maximum Conducted Output Power Limit							
•	■ 902-928 MHz Band:							
	■ N ≥50; Power 30dBm; EIRP 36dBm							
	■ 50 >N≥ 25; Power 23.98dBm; EIRP 29.98dBm							
•	2400-2483.5 MHz Band:							
	■ N ≥ 75; Power 30dBm; EIRP 36dBm							
	■ 75 >N ≥ 15; Power 21dBm; EIRP 27dBm							
•	■ 5725-5850 MHz Band:							
	■ N ≥ 75; Power 30dBm; EIRP 36dBm							
N:N	lumber of Hopping Frequencies							

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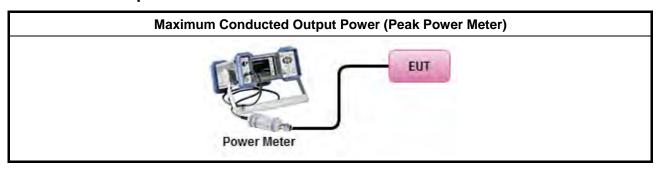
3.3.2 Measuring Instruments

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



3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

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3.4 Number of Hopping Frequencies and Hopping Bandedge

3.4.1 Number of Hopping Frequencies Limit

	Number of Hopping Frequencies Limit						
•	■ 902-928 MHz Band:						
	N ≥50 and ChS ≥ MAX (20 dB bandwidth, 25 kHz); 20 dB bandwidth≤ 250 kHz.						
	■ 50 >N≥ 25 and ChS ≥ MAX (20 dB bandwidth, 25 kHz); 20 dB bandwidth>250 kHz.						
•	• 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). 						
•	■ 5725-5850 MHz Band:						
	N ≥ 75 and ChS ≥ MAX (20 dB bandwidth, 25 kHz); 20 dB bandwidth≤ 1 MHz.						
N:N	Number of Hopping Frequencies; ChS : Hopping Channel Separation						

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3.4.2 Hopping Bandedge Limit

Refer clause 3.6.1 and clause 3.7.1

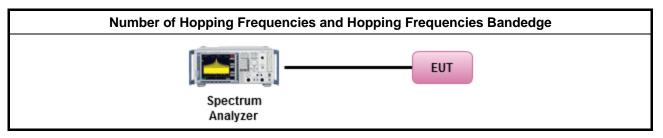
3.4.3 Measuring Instruments

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



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

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3.5 Time of Occupancy (Dwell Time)

3.5.1 Time of Occupancy (Dwell Time) Limit

20dB Bandwidth and Carrier Frequency Separation Limit for Frequency Hopping Systems							
■ 902-928 MHz Band:							
N ≥50; 0.4s in 20s period							
■ 50 >N≥ 25; 0.4s in 10s period							
■ 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							
■ 5725-5850 MHz Band:							
■ N ≥ 75; 0.4s in 30s period							
N:Number of Hopping Frequencies							

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3.5.2 Measuring Instruments

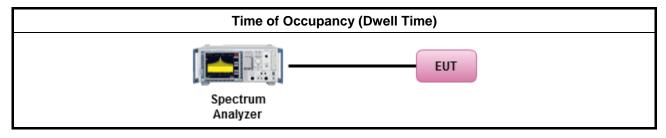
Refer a test equipment and calibration data table in this test report.

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



3.5.5 Test Result of Time of Occupancy (Dwell Time)

Refer as Appendix E

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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 (dBc)				
Peak output power procedure	20			

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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



3.6.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix F

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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	30~88 100		3					
88~216 150		43.5	3					
216~960 200		46	3					
Above 960	500	54	3					

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- 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

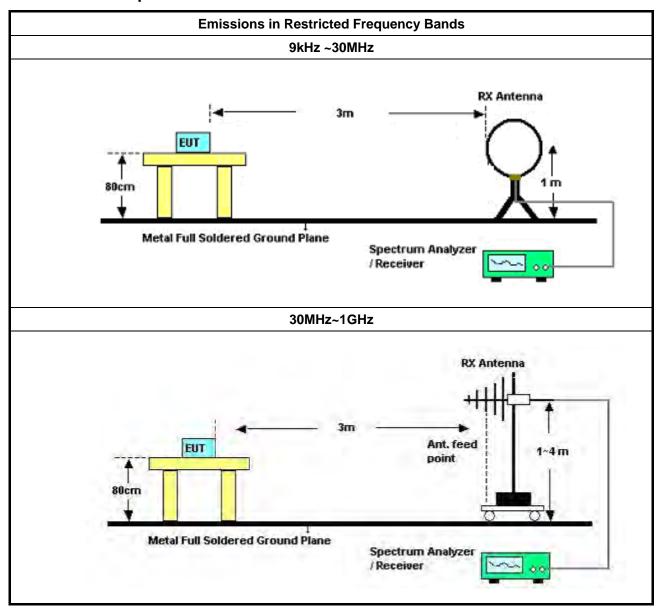
Test Method

- 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.

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3.7.4 Test Setup



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Above 1GHz

SM & 1M

AMAX 30cm

AMAX 30cm

AMAX 30cm

AMAX 30cm

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3.7.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

Spectrum Analyzer

3.7.6 Emissions in Restricted Frequency Bands (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

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

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10th harmonic or 40 GHz, whichever is appropriate.

3.7.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix G

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4 Test Equipment and Calibration Data

							I
Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 20, 2023	Feb. 19, 2024	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50- 16-2	04083	150kHz ~ 100MHz	Feb. 16, 2023	Feb. 15, 2024	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Apr. 27, 2023	Apr. 26, 2024	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Feb. 09, 2023	Feb. 08, 2024	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	Oct. 18, 2022	Oct. 17, 2023	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	31244	9kHz - 30 MHz	Mar. 23, 2023	Mar. 22, 2024	Radiation (03CH01-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH01-CB	30 MHz ~ 1 GHz	Jan. 16, 2023	Jan. 15, 2024	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Feb. 19, 2023	Feb. 18, 2024	Radiation (03CH01-CB)
Pre-Amplifier	SGH	SGH0301	20230109-2	10M~1GHz	Jun. 23, 2023	Jun. 22, 2024	Radiation (03CH01-CB)
Signal Analyzer	R&S	FSV3044	101437	10kHz ~ 44GHz	Nov. 29, 2022	Nov. 29, 2023	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 13, 2023	Jun. 12, 2024	Radiation (03CH01-CB)
RF Cable-low	Woken	RG402	Low Cable-16+17	30 MHz ~ 1 GHz	Oct. 03, 2022	Oct. 02, 2023	Radiation (03CH01-CB)
RF Cable-low	Woken	RG402	Low Cable-16+17	30 MHz ~ 1 GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH01-CB)
3m Semi Anechoic Chamber VSWR	RIKEN	SAC-3M	03CH02-CB	1GHz ~18GHz	Mar. 25, 2023	Mar. 24, 2024	Radiation (03CH02-CB)
Horn Antenna	EMCO	3115	9610-4976	1GHz ~ 18GHz	Apr. 18, 2023	Apr. 17, 2024	Radiation (03CH02-CB)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170507	15GHz ~ 40GHz	Jun. 28, 2023	Jun. 27, 2024	Radiation (03CH02-CB)
Pre-Amplifier	Agilent	83017A	MY39501305	1GHz ~ 26.5GHz	Jun. 30, 2023	Jun. 29, 2024	Radiation (03CH02-CB)
Pre-Amplifier	SGH	SGH184	20221107-3	18GHz ~ 40GHz	Nov. 16, 2022	Nov. 15, 2023	Radiation (03CH02-CB)
Spectrum analyzer	R&S	FSU	100015	9kHz~26GHz	Dec. 05, 2022	Dec. 04, 2023	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-18	1GHz ~ 18GHz	Oct. 03, 2022	Oct. 02, 2023	Radiation (03CH02-CB)
RF Cable-high	Woken	RG402	High Cable-18	1GHz ~ 18GHz	Oct. 02, 2023	Oct. 01, 2024	Radiation (03CH02-CB)

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Calibration Calibration Instrument **Brand** Model No. Serial No. Characteristics Remark **Due Date** Date High Radiation RG402 1GHz ~ 18GHz Oct. 03, 2022 Oct. 02, 2023 RF Cable-high Woken Cable-18+19 (03CH02-CB) High Radiation RF Cable-high Woken RG402 1GHz ~ 18GHz Oct. 02, 2023 Oct. 01, 2024 Cable-18+19 (03CH02-CB) Radiation WCA0929M 40G#5+6 1GHz ~ 40 GHz High Cable Woken Dec. 07, 2022 Dec. 06, 2023 (03CH02-CB) Radiation 1GHz ~ 40 GHz WCA0929M High Cable Woken 40G#5 Dec. 07, 2022 Dec. 06, 2023 (03CH02-CB) Radiation High Cable Woken WCA0929M 40G#6 1GHz ~ 40 GHz Dec. 07, 2022 Dec. 06, 2023 (03CH02-CB) Radiation **Test Software SPORTON SENSE** V5.10 N.C.R. N.C.R. (03CH02-CB) 1GHz ~18GHz 3m Semi Anechoic Radiation **TDK** SAC-3M 03CH01-CB May 05, 2023 May 04, 2024 (03CH06-CB) Chamber VSWR 3m BBHA Radiation BBHA9120D 1GHz~18GHz Horn Antenna SCHWARZBECK Jul. 31, 2023 Jul. 30, 2024 9120D-1292 (03CH06-CB) Radiation Horn Antenna **SCHWARZBECK BBHA 9170** BBHA9170507 15GHz ~ 40GHz Jun. 28, 2023 Jun. 27, 2024 (03CH06-CB) 0.5GHz ~ Radiation MY53270064 Pre-Amplifier Agilent 83017A Aug. 01, 2023 Jul. 31, 2024 26.5GHz (03CH06-CB) Radiation Pre-Amplifier SGH **SGH184** 20221107-3 18GHz ~ 40GHz Nov. 16, 2022 Nov. 15, 2023 (03CH06-CB) Radiation FSP40 9kHz~40GHz Spectrum analyzer R&S 100080 Dec. 21, 2022 Dec. 20, 2023 (03CH06-CB) High Radiation RG402 1GHz~18GHz RF Cable-high Woken Aug. 15, 2023 Aug. 14, 2024 Cable-05+68 (03CH06-CB) Radiation High Cable Woken WCA0929M 40G#5+6 1GHz ~ 40 GHz Dec. 07, 2022 Dec. 06, 2023 (03CH06-CB) Radiation High Cable Woken WCA0929M 40G#5 1GHz ~ 40 GHz Dec. 07, 2022 Dec. 06, 2023 (03CH06-CB) Radiation High Cable Woken WCA0929M 40G#6 1GHz ~ 40 GHz Dec. 07, 2022 Dec. 06, 2023 (03CH06-CB) Radiation **SPORTON** SENSE N.C.R. N.C.R. Test Software V5.10 (03CH06-CB) Conducted Spectrum analyzer R&S FSV40 101028 9kHz~40GHz Dec. 30, 2022 Dec. 29, 2023 (TH03-CB) Conducted Power Sensor Anritsu MA2411B 1531344 300MHz~40GHz Aug. 01, 2023 Jul. 31, 2024 (TH03-CB) Conducted Power Meter Anritsu ML2495A 1728002 300MHz~40GHz Aug. 01, 2023 Jul. 31, 2024 (TH03-CB) Conducted RF Cable RG402 High Cable-11 30MHz -18 GHz Feb. 14, 2023 Feb. 13, 2024 Woken (TH03-CB) Conducted RF Cable Woken RG402 High Cable-12 30MHz -18 GHz Feb. 14, 2023 Feb. 13, 2024 (TH03-CB) Conducted

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RG402

RG402

High Cable-13

High Cable-14

30MHz -18 GHz

1 GHz -18 GHz

Woken

Woken

RF Cable

RF Cable-high

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Feb. 13, 2024

Oct. 02, 2023

(TH03-CB)
Conducted

(TH03-CB)

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Feb. 14, 2023

Oct. 03, 2022

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-15	1 GHz –18 GHz	Oct. 03, 2022	Oct. 02, 2023	Conducted (TH03-CB)
Switch	SPTCB	SP-SWI	SWI-03	1 GHz –26.5 GHz	Oct. 04, 2022	Oct. 03, 2023	Conducted (TH03-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH03-CB)

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Note: Calibration Interval of instruments listed above is one year.

N.C.R means Non-Calibration required.

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Conducted Emissions at Powerline

Appendix A

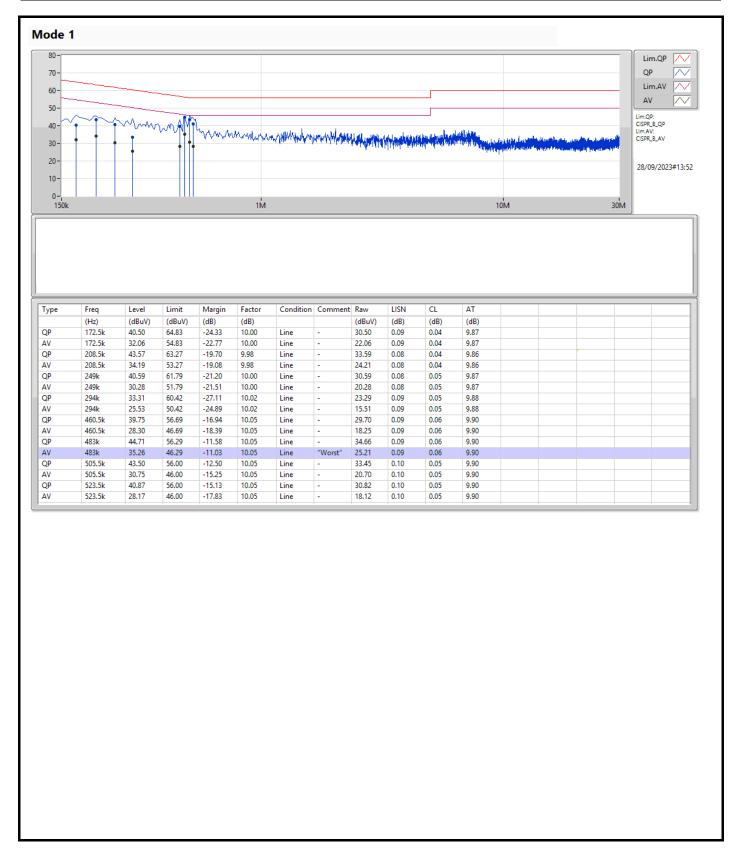
Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	483k	35.30	46.29	-10.99	Neutral

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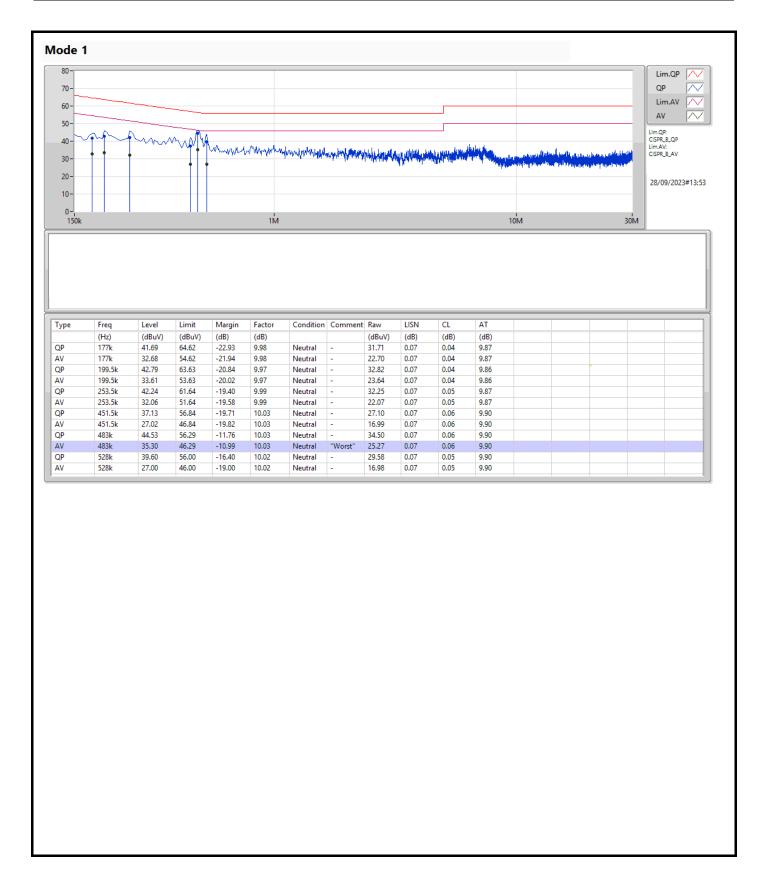
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Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-BR(1Mbps)	918.5k	847.877k	848KF1D	880k	842.238k
BT-EDR(2Mbps)	1.309M	1.19M	1M19G1D	1.298M	1.185M
BT-EDR(3Mbps)	1.29M	1.197M	1M20G1D	1.279M	1.195M

 $\label{eq:max-N} $$ 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; Minimum 99\% occupied b$

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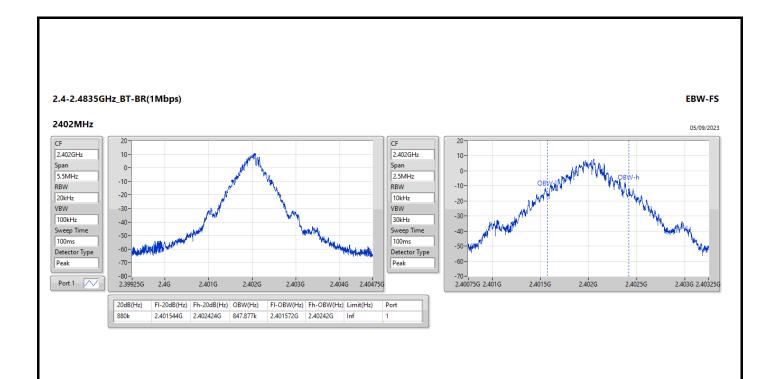
Result

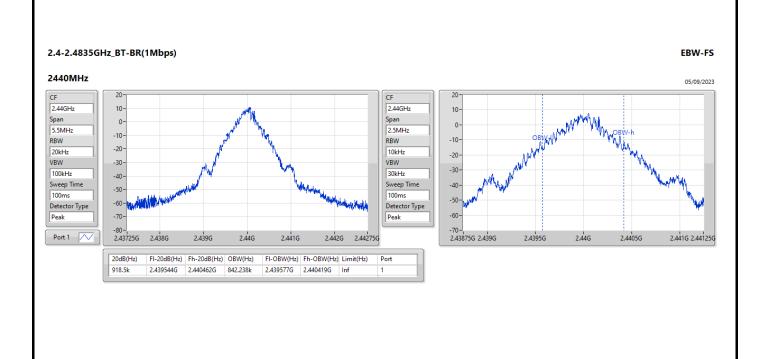
Mode	Result	Limit	Port 1-N dB	Port 1-OBW
		(Hz)	(Hz)	(Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	880k	847.877k
2440MHz	Pass	Inf	918.5k	842.238k
2480MHz	Pass	Inf	913k	845.367k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.306M	1.189M
2440MHz	Pass	Inf	1.298M	1.19M
2480MHz	Pass	Inf	1.309M	1.185M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.279M	1.197M
2440MHz	Pass	Inf	1.279M	1.197M
2480MHz	Pass	Inf	1.29M	1.195M

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

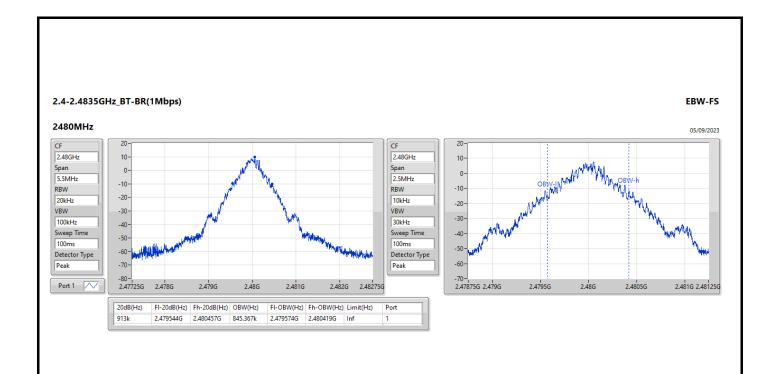
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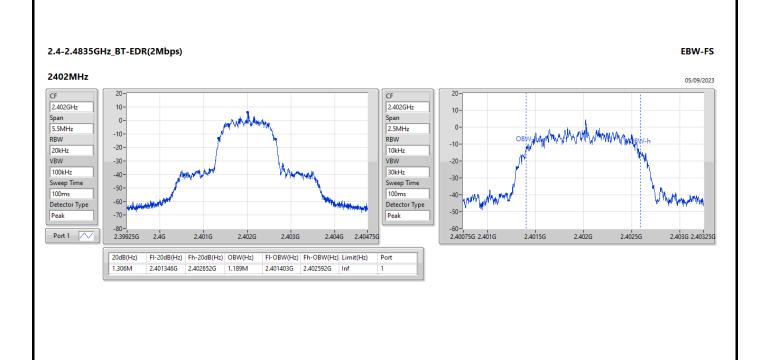
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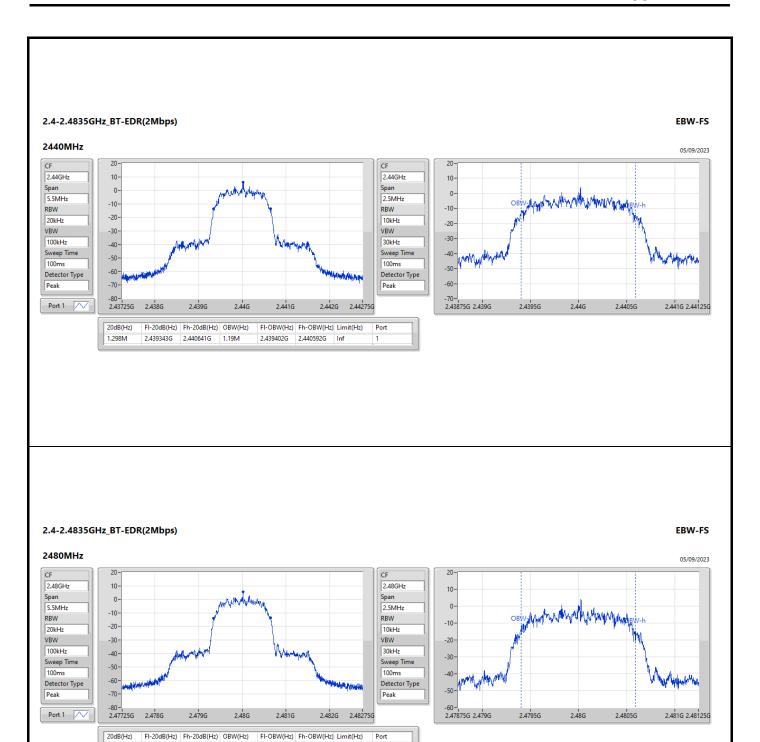


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1.309M

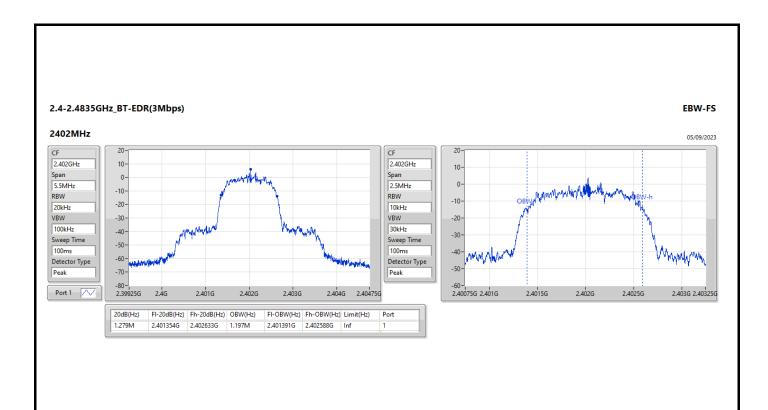
2.47934G

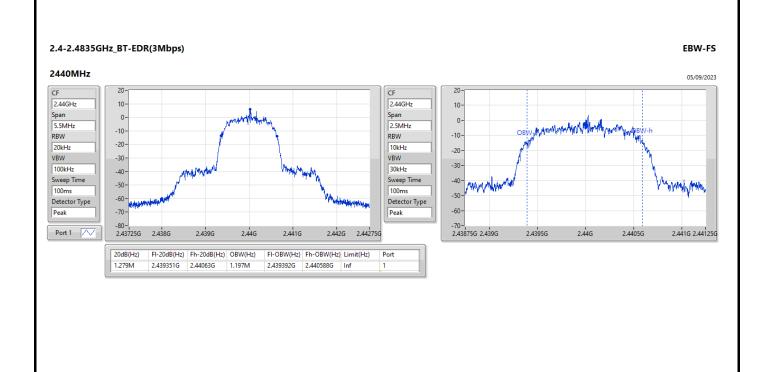
2.480649G

1.185M

2.479404G 2.480589G Inf

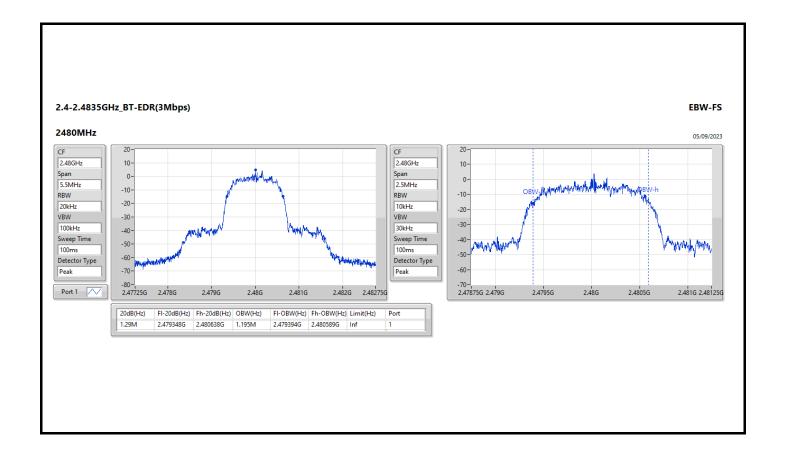
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EBW-FHSS Appendix B.1



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Channel Separation-FHSS

Appendix B.2

Summary

Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1.002M	1.0005M
BT-EDR(2Mbps)	1.002M	1.0005M
BT-EDR(3Mbps)	1.002M	999k

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Channel Separation-FHSS

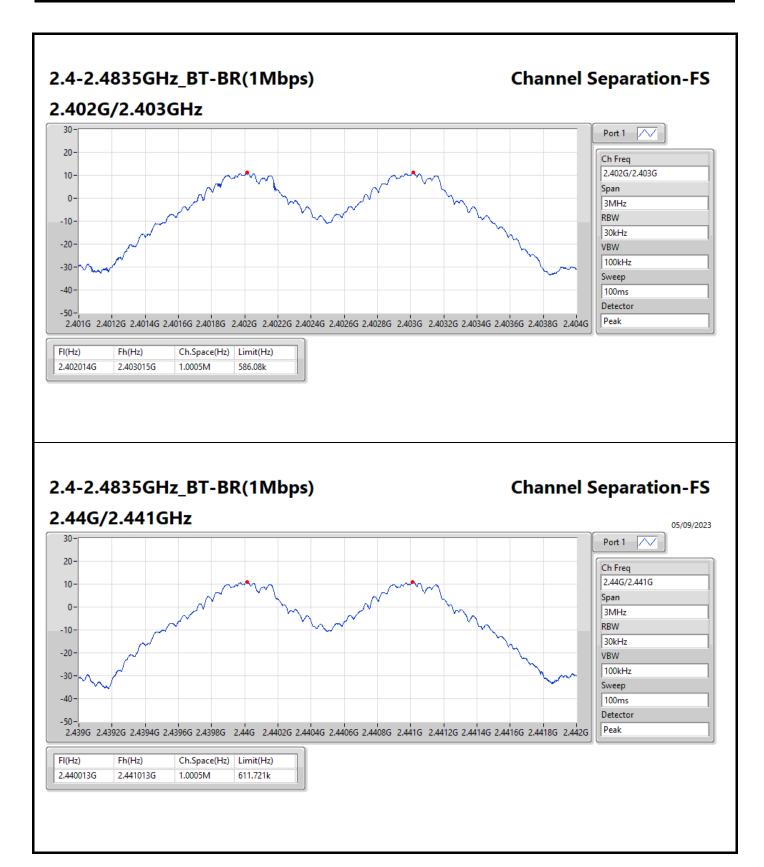
Appendix B.2

Result

Mode	Result	Result FI		Ch.Space	Limit
		(Hz)	(Hz)	(Hz)	(Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.402014G	2.403015G	1.0005M	586.08k
2440MHz	Pass	2.440013G	2.441013G	1.0005M	611.721k
2480MHz	Pass	2.479011G	2.480013G	1.002M	608.058k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.402013G	2.403013G	1.0005M	869.796k
2440MHz	Pass	2.440011G	2.441013G	1.002M	864.468k
2480MHz	Pass	2.479013G	2.480013G	1.0005M	871.794k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.402011G	2.403013G	1.002M	851.814k
2440MHz	Pass	2.440011G	2.441012G	1.0005M	851.814k
2480MHz	Pass	2.479013G	2.480012G	999k	859.14k

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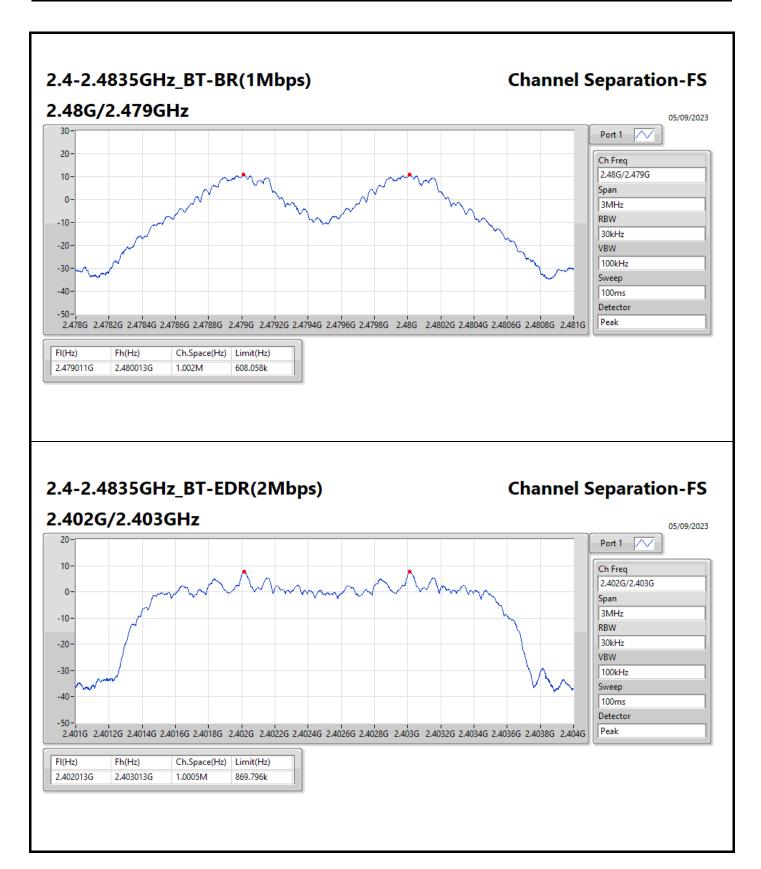




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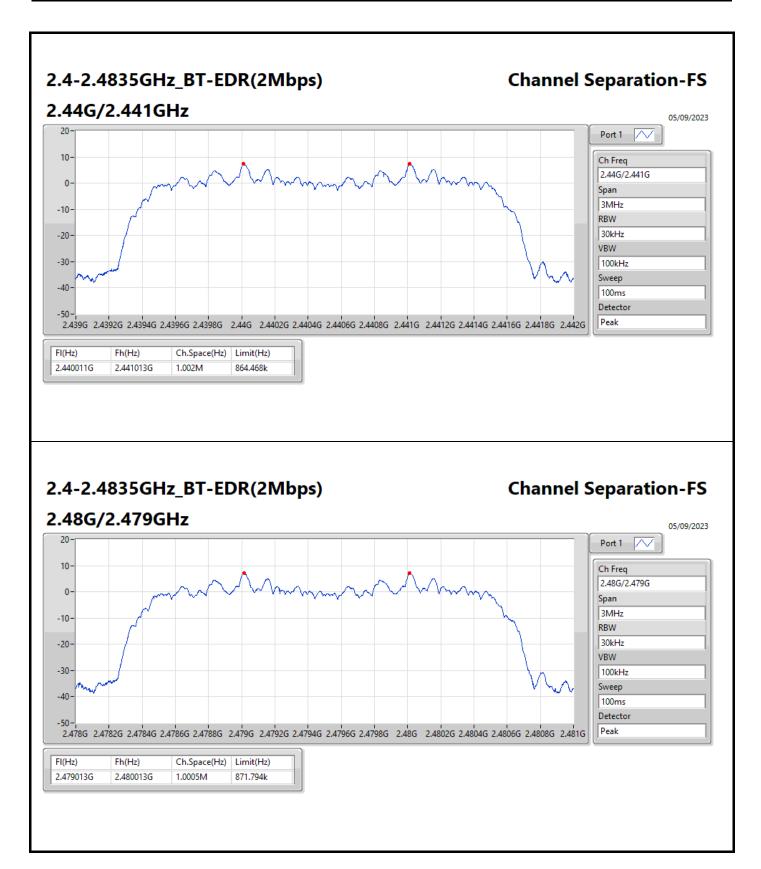




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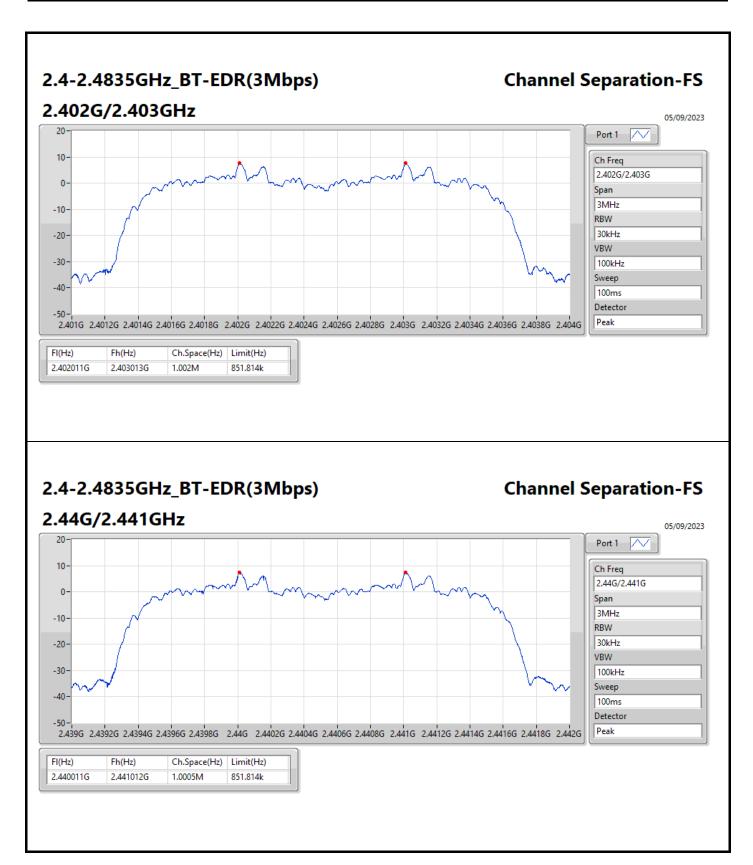




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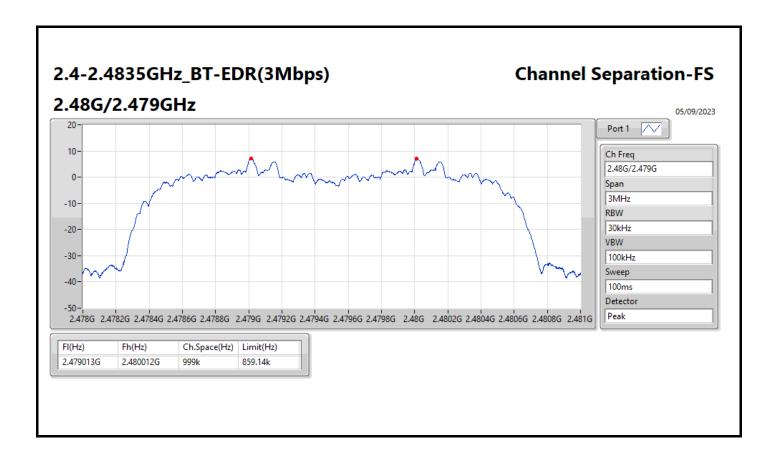




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Peak Power-FHSS Appendix C.1

Summary

Mode	Total Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	13.45	0.02213
BT-EDR(2Mbps)	11.62	0.01452
BT-EDR(3Mbps)	12.12	0.01629

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Peak Power-FHSS Appendix C.1

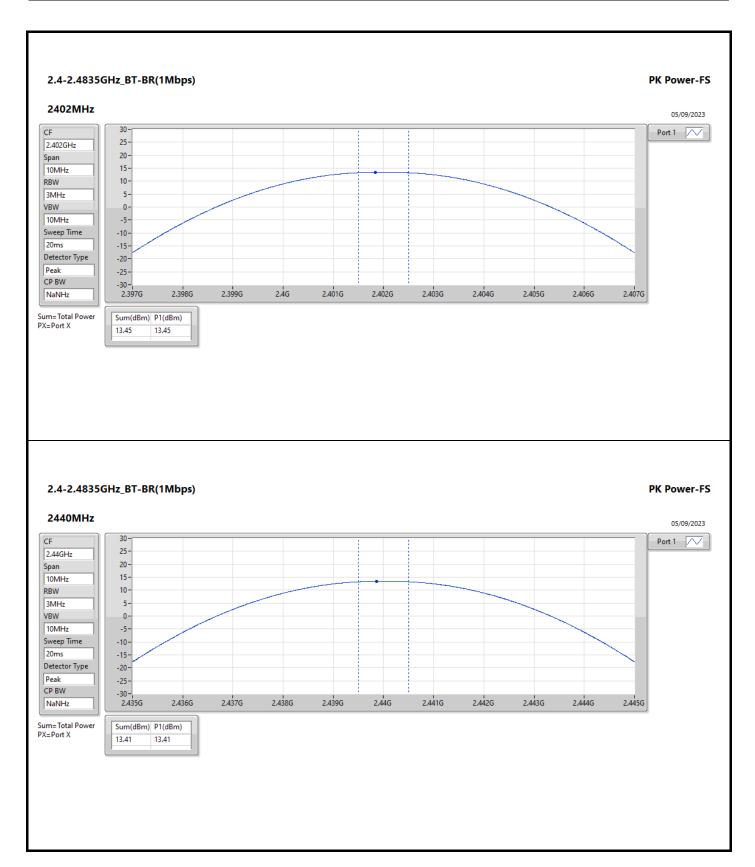
Result

Mode	Result	DG	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	2.82	13.45	21.00
2440MHz	Pass	2.82	13.41	21.00
2480MHz	Pass	2.82	13.24	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	2.82	11.62	21.00
2440MHz	Pass	2.82	11.53	21.00
2480MHz	Pass	2.82	11.31	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	2.82	12.12	21.00
2440MHz	Pass	2.82	12.02	21.00
2480MHz	Pass	2.82	11.83	21.00

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

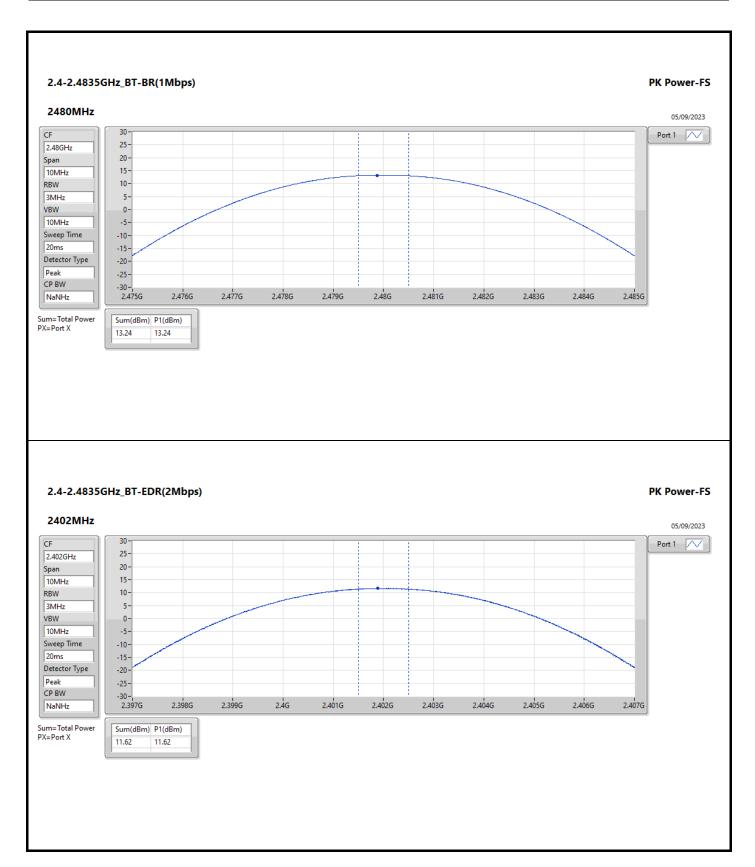
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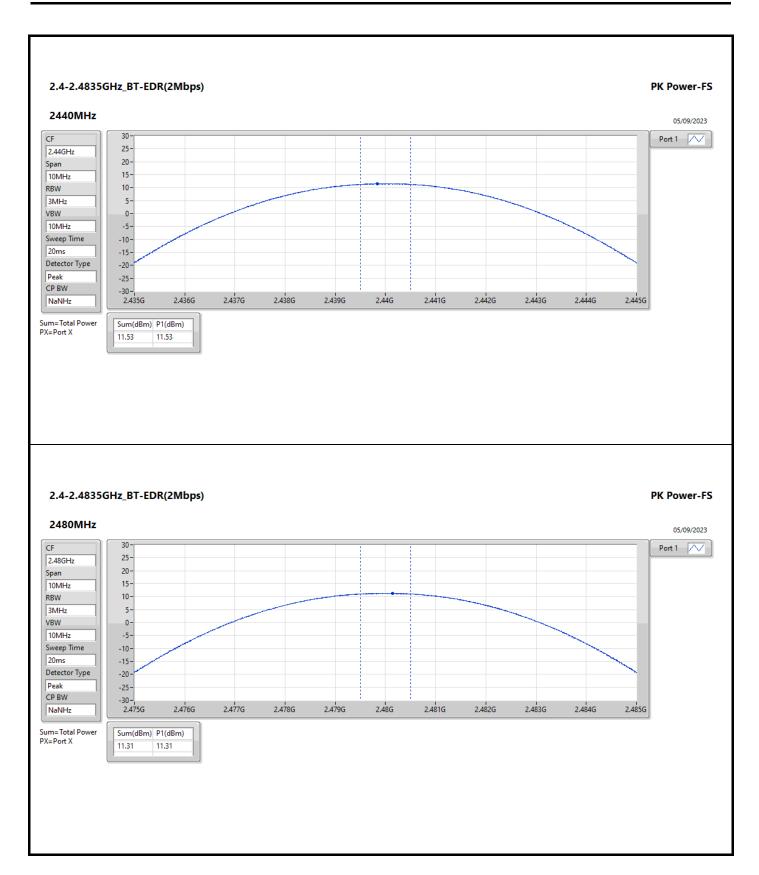
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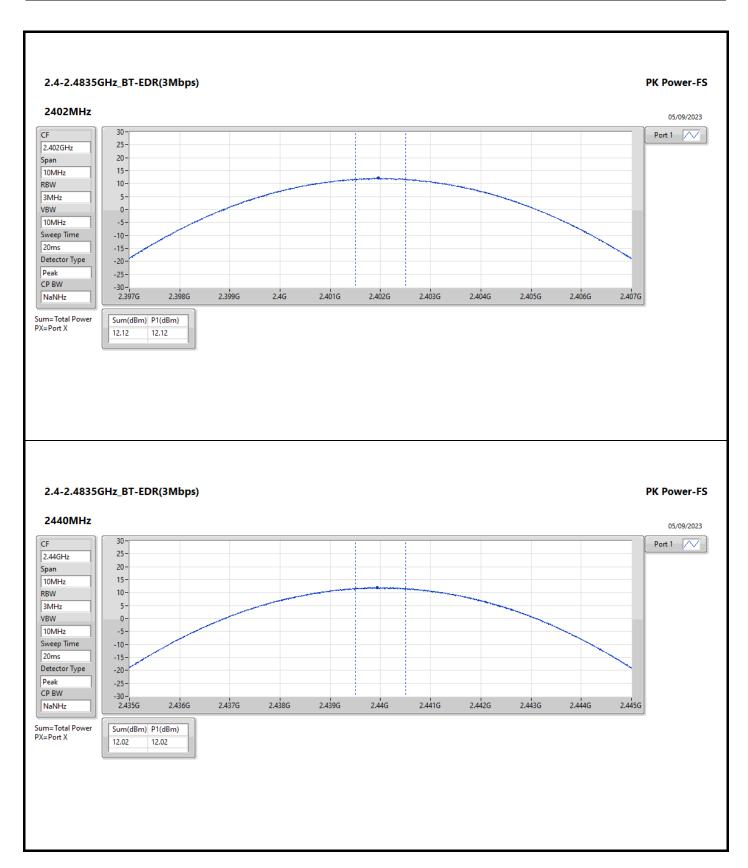
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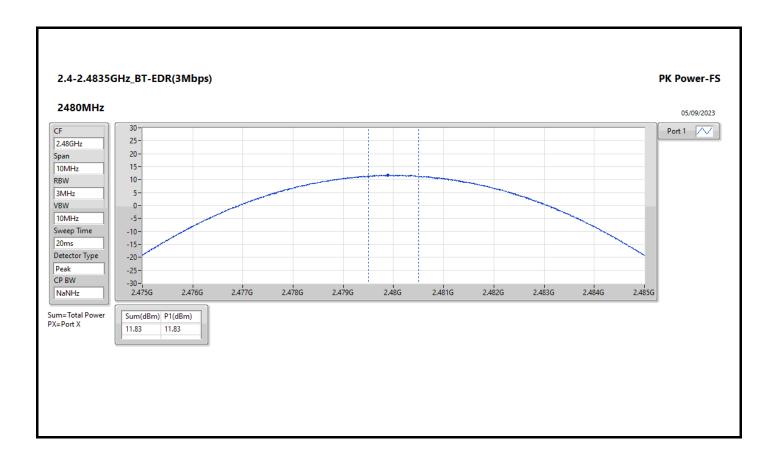


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Average Power-FHSS

Appendix C.2

Summary

Mode	Total Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	13.25	0.02113
BT-EDR(2Mbps)	9.13	0.00818
BT-EDR(3Mbps)	9.20	0.00832

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Result

Mode	Result	DG	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	2.82	13.25	21.00
2440MHz	Pass	2.82	13.11	21.00
2480MHz	Pass	2.82	12.73	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	2.82	9.13	21.00
2440MHz	Pass	2.82	8.96	21.00
2480MHz	Pass	2.82	8.76	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	2.82	9.20	21.00
2440MHz	Pass	2.82	9.03	21.00
2480MHz	Pass	2.82	8.77	21.00

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

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Hopping Channel and Bandedge-FHSS

Appendix D

Summary

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

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Hopping Channel and Bandedge-FHSS

Appendix D

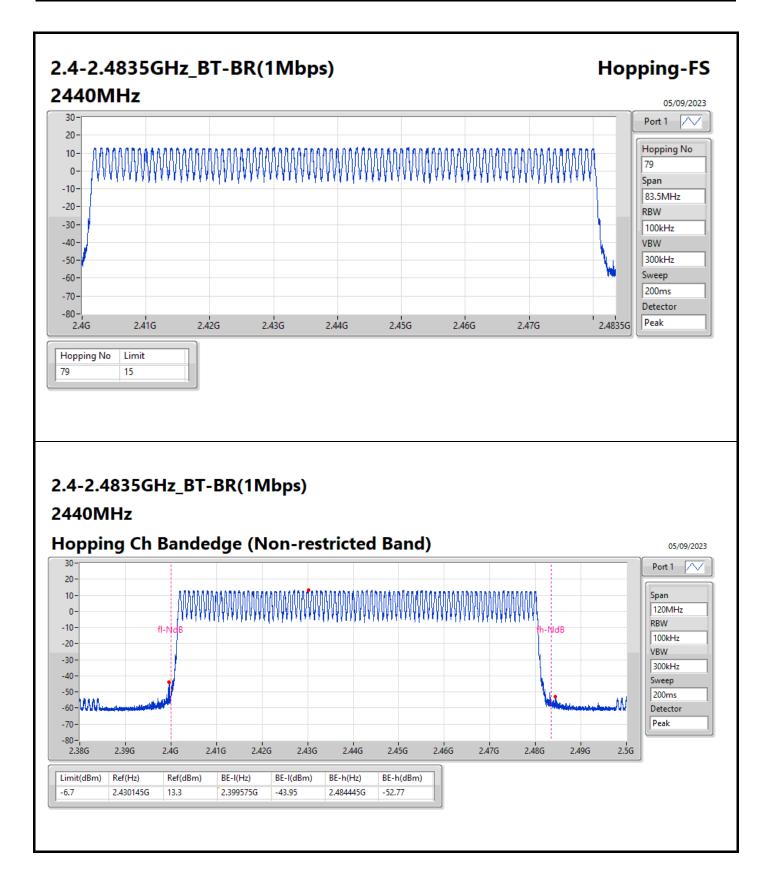
Result

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

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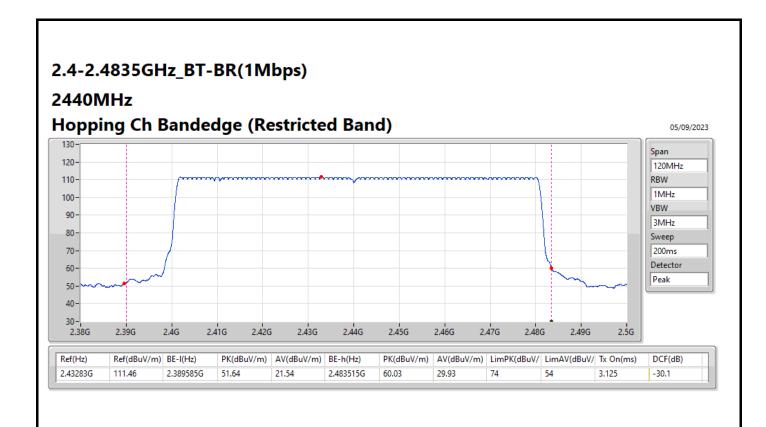


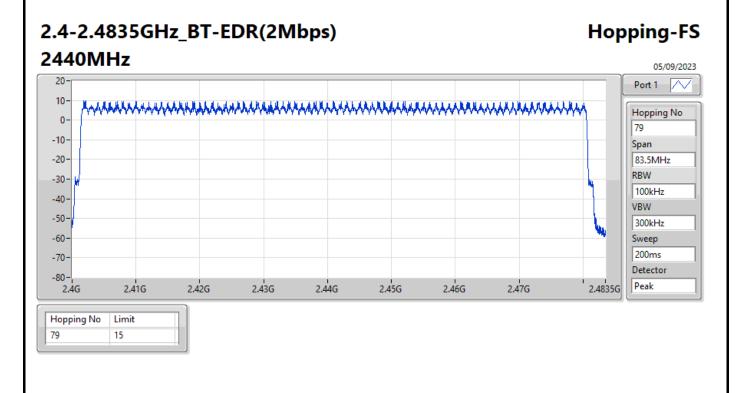


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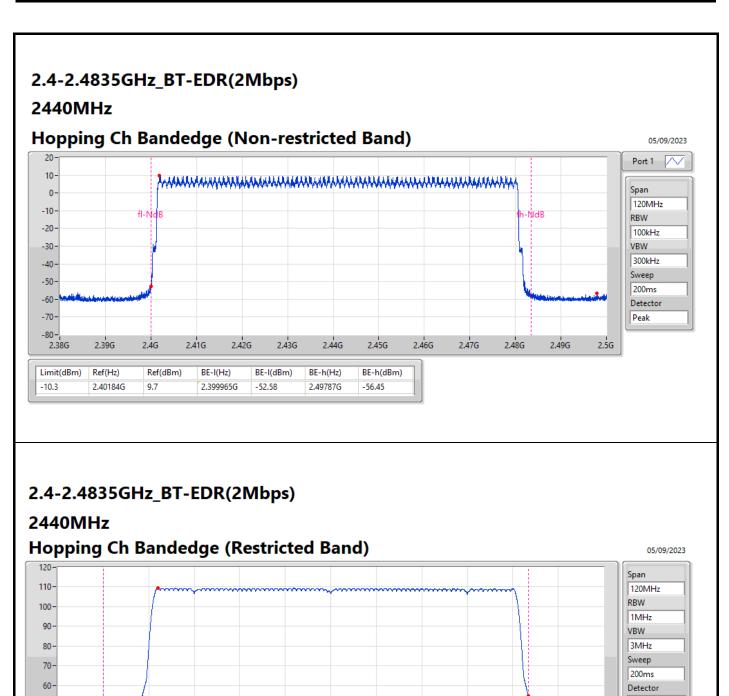




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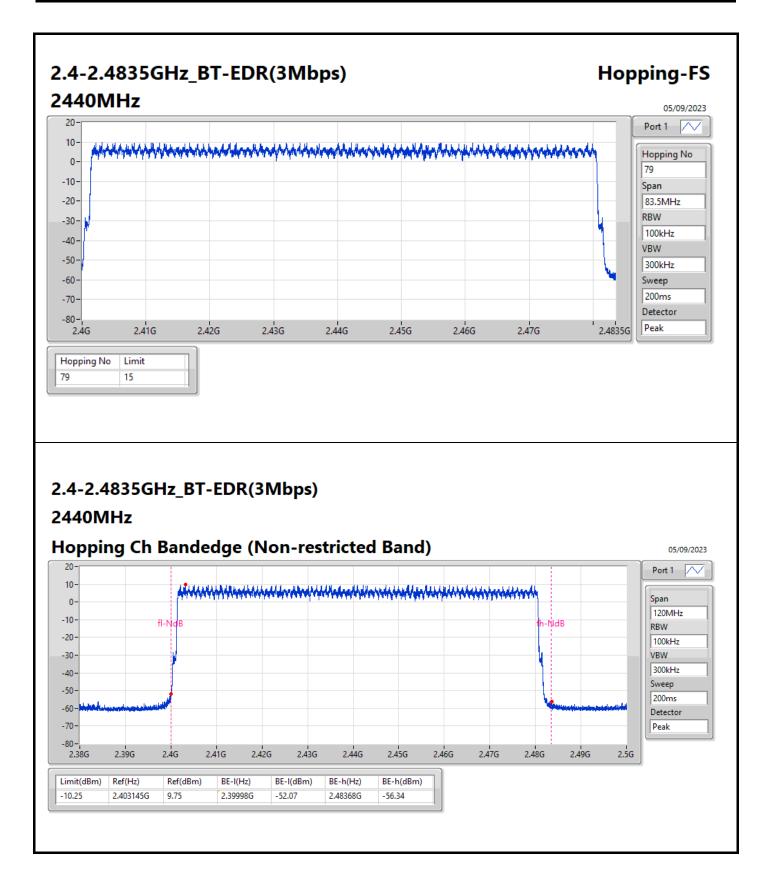




30-10-0												
40-												
2.38G	2.39G	2.4G	2.41G	2.42G	2.43G	2.44G	2.45G	2.46G 2	.47G 2.48	G 2.49G	2.5G	
Ref(Hz)	Ref(dBuV/m)	BE-I(Hz)	PK(dE	BuV/m)	AV(dBuV/m)	BE-h(Hz)	PK(dBuV/m)	AV(dBuV/m)	LimPK(dBuV/	LimAV(dBuV/	Tx On(ms)	DCF(dB)
2.402095G	109.32	2.38366G	50.36		20.26	2.483515G	54.45	24.35	74	54	3.125	-30.1

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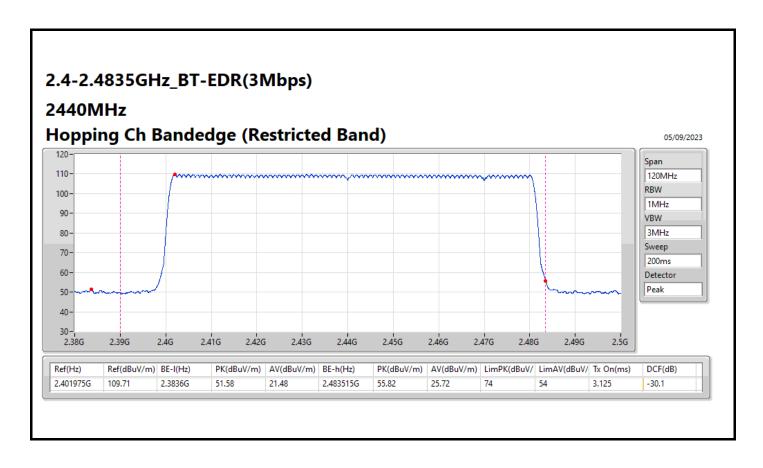




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Dwell Time-FHSS Appendix E

Summary

Cummary					
Mode	Max-Dwell				
	(s)				
2.4-2.4835GHz					
BT-BR(1Mbps)	309.16665m_DH5				
BT-EDR(2Mbps)	308.3405m_DH5				
BT-EDR(3Mbps)	256.3197m_DH5				

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Dwell Time-FHSS Appendix E

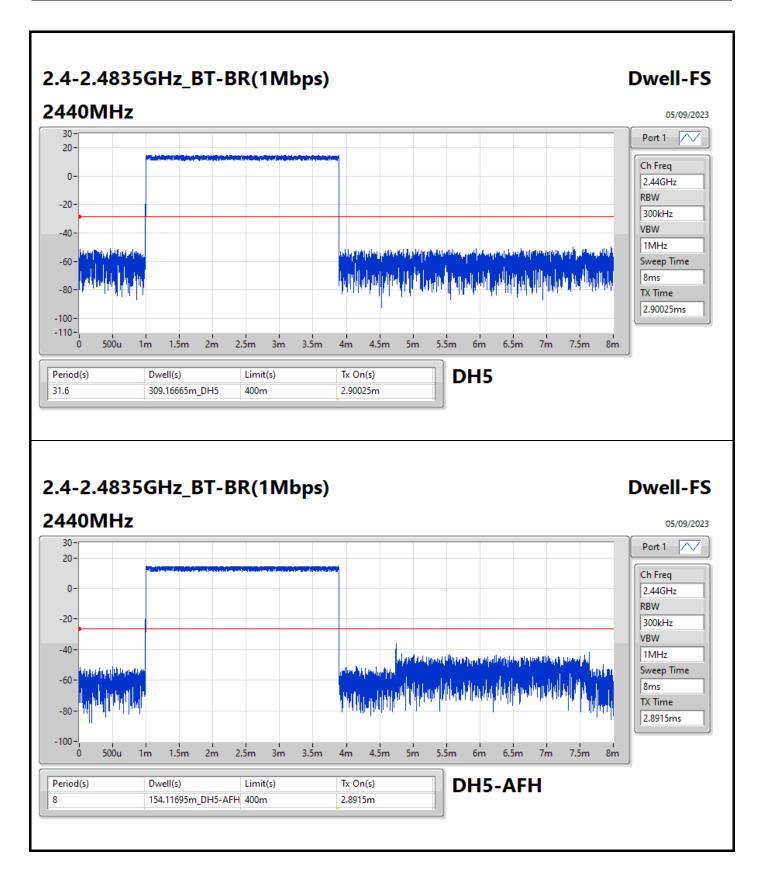
Result

Mode	Result	Period	Dwell	Limit	Tx On
		(s)	(s)	(s)	(s)
BT-BR(1Mbps)	-	-	-	-	-
2440MHz	Pass	31.6	309.16665m_DH5	400m	2.90025m
2440MHz	Pass	8	154.11695m_DH5-AFH	400m	2.8915m
BT-EDR(2Mbps)	-	-	-	-	-
2440MHz	Pass	31.6	308.3405m_DH5	400m	2.8925m
2440MHz	Pass	8	154.183575m_DH5-AFH	400m	2.89275m
BT-EDR(3Mbps)	-	-	-	-	-
2440MHz	Pass	31.6	256.3197m_DH5	400m	2.4045m
2440MHz	Pass	8	154.316825m_DH5-AFH	400m	2.89525m

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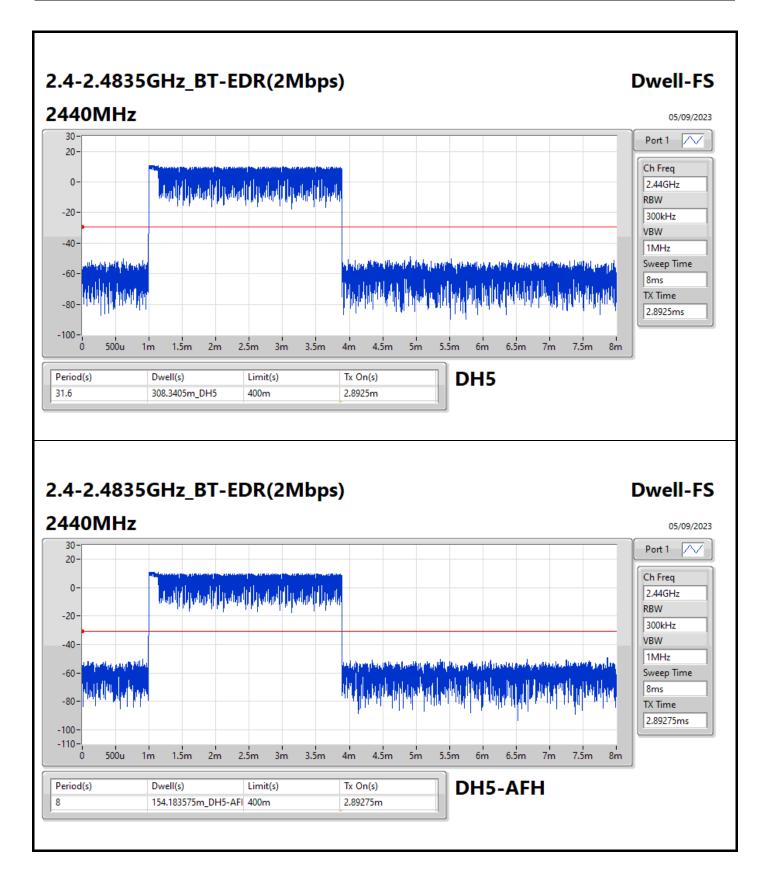
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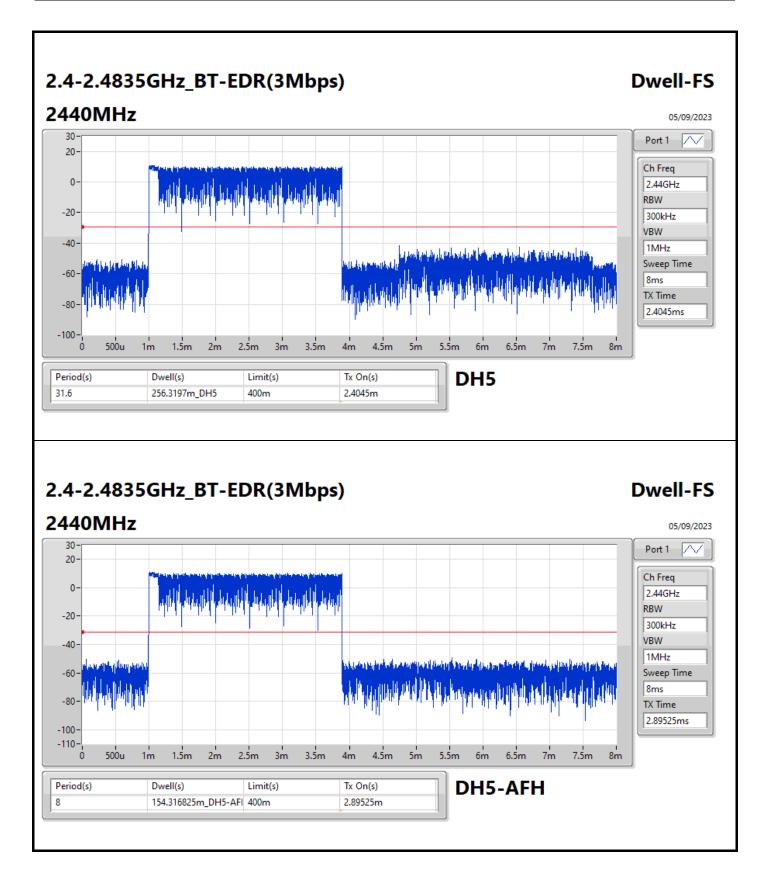




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CSE NdB-FHSS Appendix F

Summary

Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Port								
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-BR(1Mbps)	Pass	2.40184G	12.73	-7.27	1.88298G	-53.62	2.39988G	-41.64	2.4G	-45.28	2.50002G	-51.29	7.20527G	-41.06	1
BT-EDR(2Mbps)	Pass	2.40217G	9.12	-10.88	1.88063G	-54.02	2.4G	-49.50	2.4G	-49.99	2.50022G	-51.74	21.84487G	-47.36	1
BT-EDR(3Mbps)	Pass	2.402G	9.51	-10.49	749.1M	-53.58	2.4G	-49.39	2.4G	-49.91	2.50098G	-50.87	21.79987G	-46.19	1

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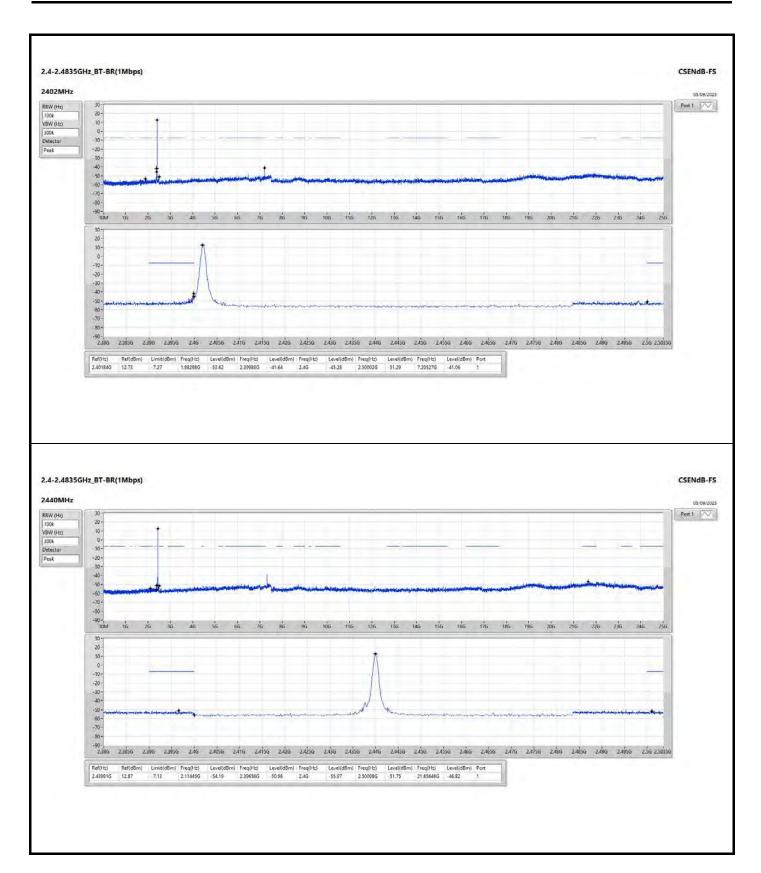
CSE NdB-FHSS Appendix F

Result

Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
BT-BR(1Mbps)	-	-		-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.40184G	12.73	-7.27	1.88298G	-53.62	2.39988G	-41.64	2.4G	-45.28	2.50002G	-51.29	7.20527G	-41.06	1
2440MHz	Pass	2.43991G	12.87	-7.13	2.11445G	-54.19	2.39656G	-50.96	2.4G	-55.97	2.50098G	-51.75	21.65646G	-46.82	1
2480MHz	Pass	2.47999G	12.49	-7.51	1.89825G	-53.39	2.39088G	-50.87	2.4G	-56.61	2.50306G	-51.20	21.49055G	-47.21	1
BT-EDR(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.40217G	9.12	-10.88	1.88063G	-54.02	2.4G	-49.50	2.4G	-49.99	2.50022G	-51.74	21.84487G	-47.36	1
2440MHz	Pass	2.43991G	9.52	-10.48	2.192G	-53.37	2.3948G	-51.64	2.4G	-56.44	2.50298G	-51.86	21.86736G	-46.61	1
2480MHz	Pass	2.48016G	8.82	-11.18	1.85478G	-53.94	2.39056G	-51.21	2.4G	-56.46	2.5031G	-51.40	21.87017G	-47.38	1
BT-EDR(3Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.402G	9.51	-10.49	749.1M	-53.58	2.4G	-49.39	2.4G	-49.91	2.50098G	-50.87	21.79987G	-46.19	1
2440MHz	Pass	2.44008G	9.09	-10.91	2.1168G	-54.05	2.391G	-51.56	2.4G	-57.62	2.50218G	-51.72	21.61146G	-47.26	1
2480MHz	Pass	2.47999G	8.71	-11.29	1.79015G	-53.57	2.3902G	-51.52	2.4G	-56.24	2.50282G	-51.31	21.63677G	-47.59	1

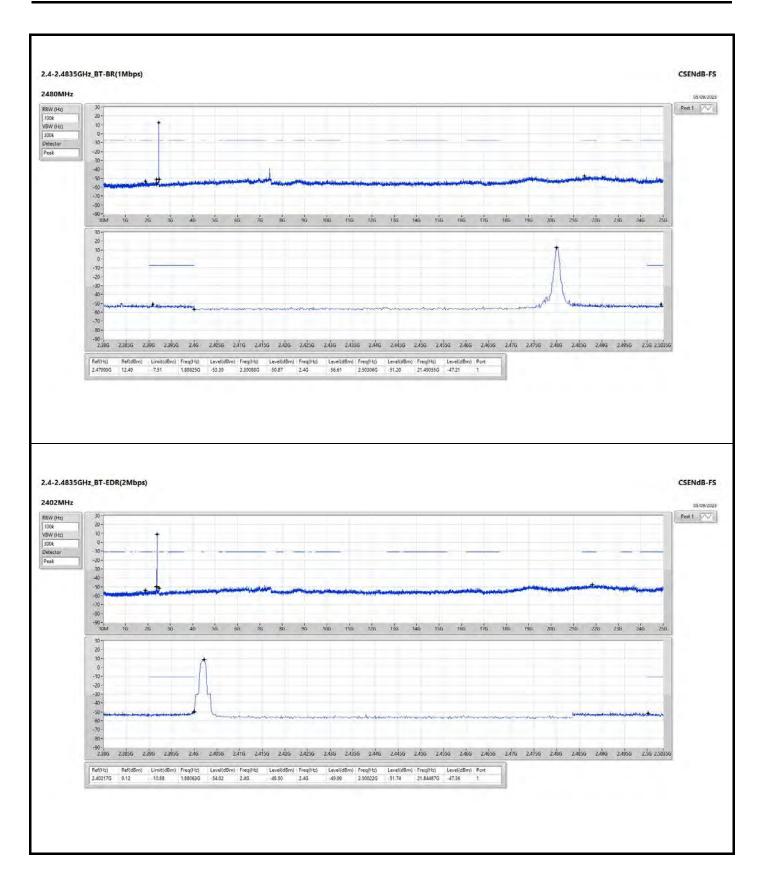
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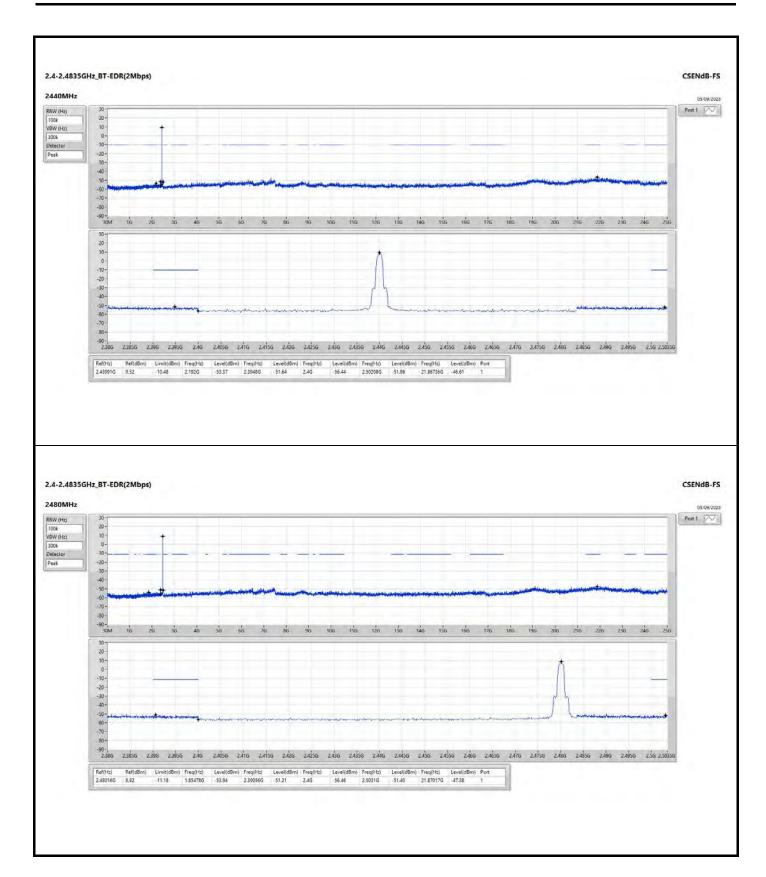
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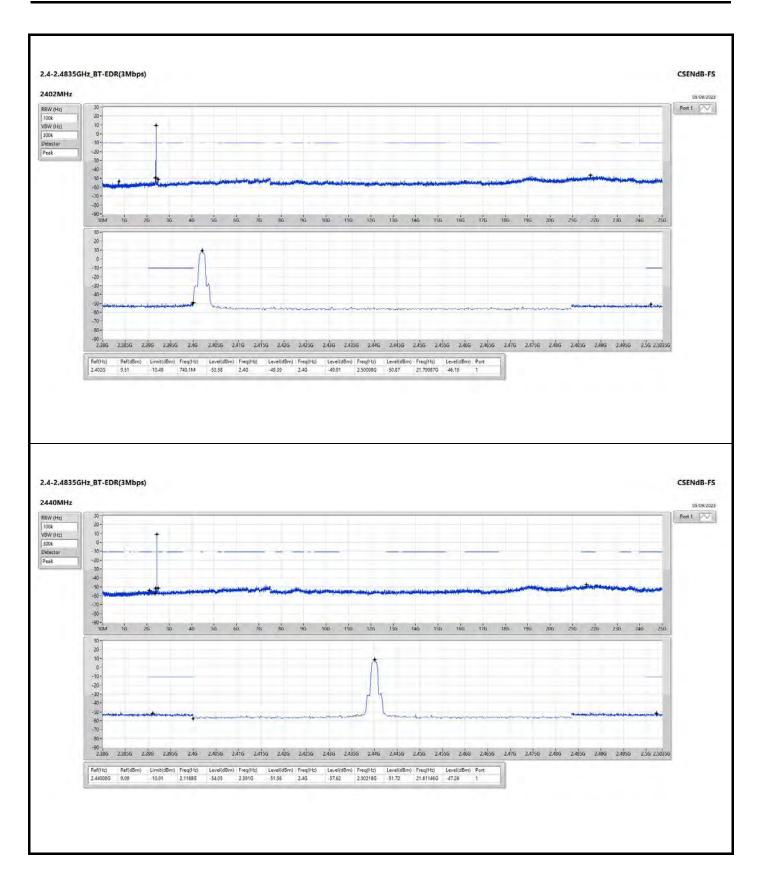


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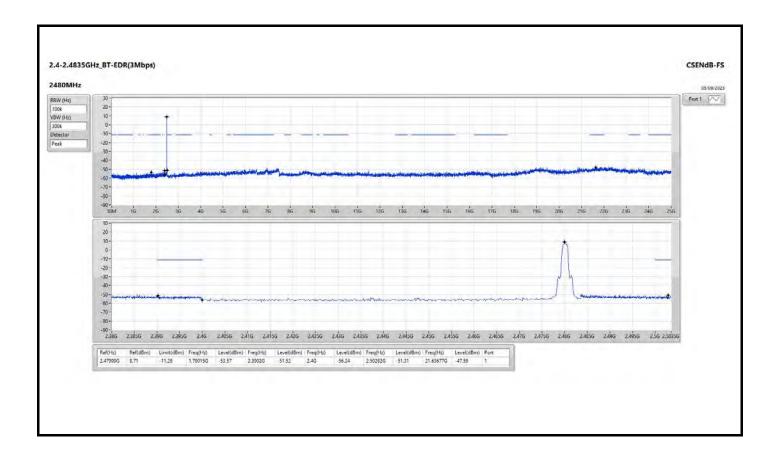
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Radiated Emissions below 1GHz

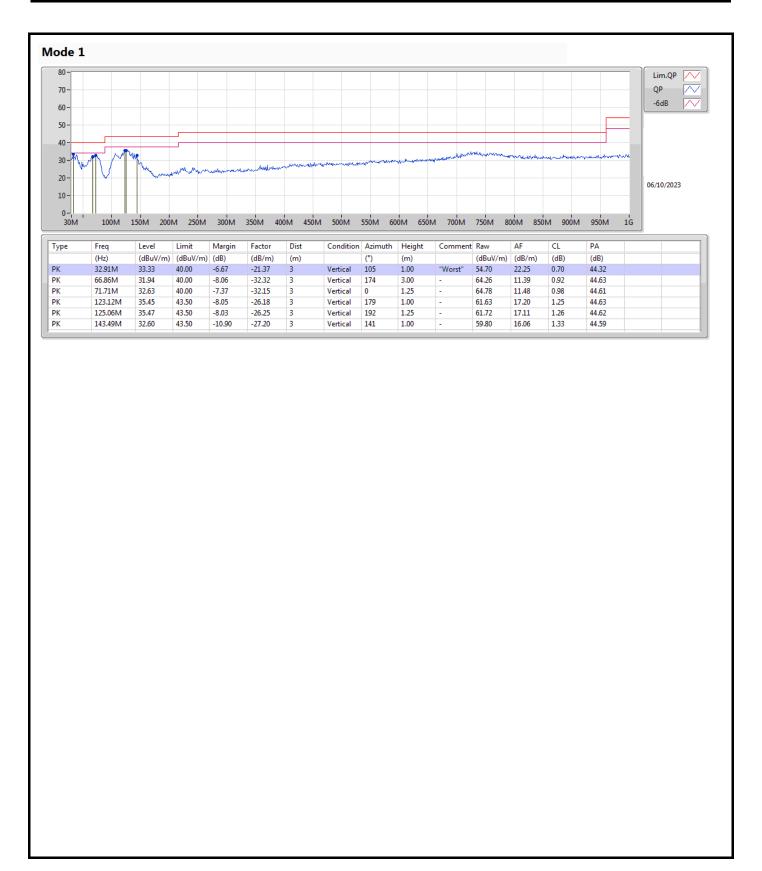
Appendix G.1

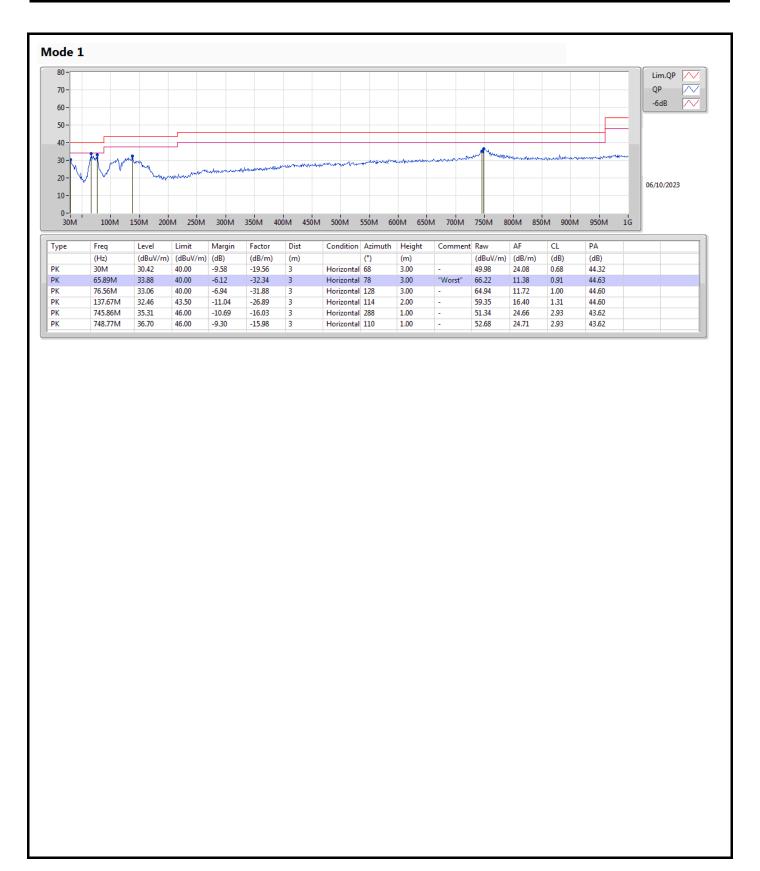
Summary

Mode	Result	Туре	Freq	Level	Limit	Margin	Condition
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	
Mode 1	Pass	PK	65.89M	33.88	40.00	-6.12	Horizontal

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RSE TX above 1GHz

Appendix G.2

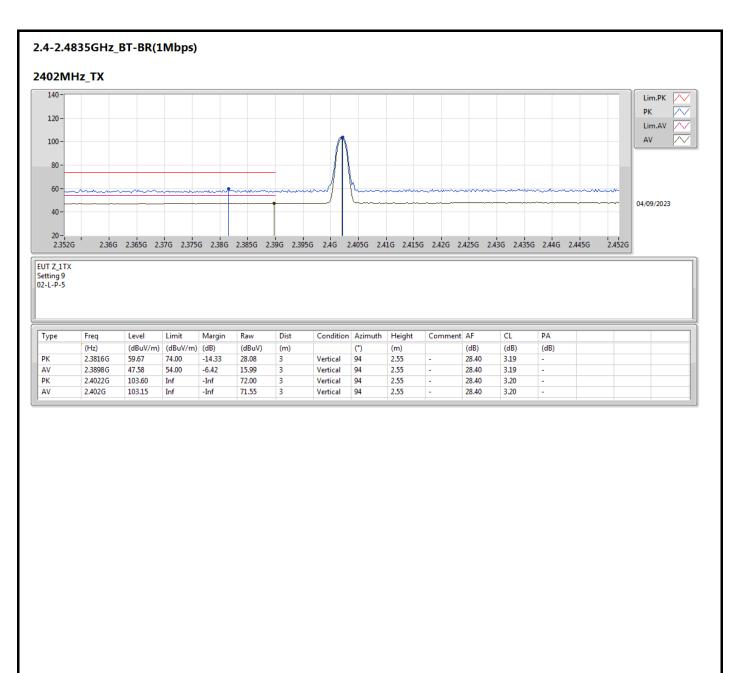
Summary

Mode	Result	Туре	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-
BT-BR(1Mbps)	Pass	AV	4.804G	52.34	54.00	-1.66	3	Vertical	27	2.09	-

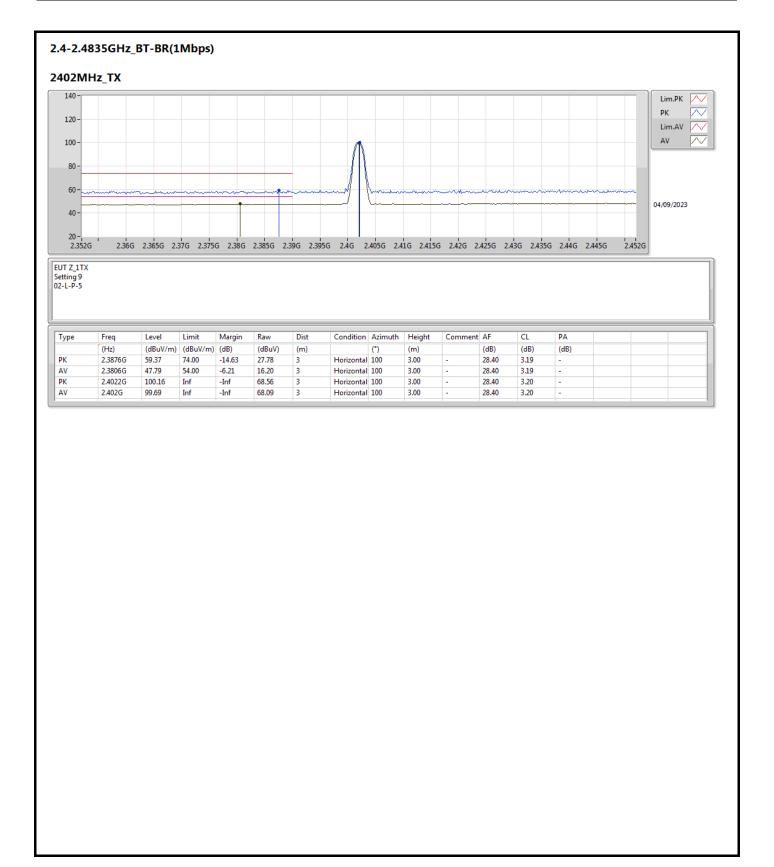
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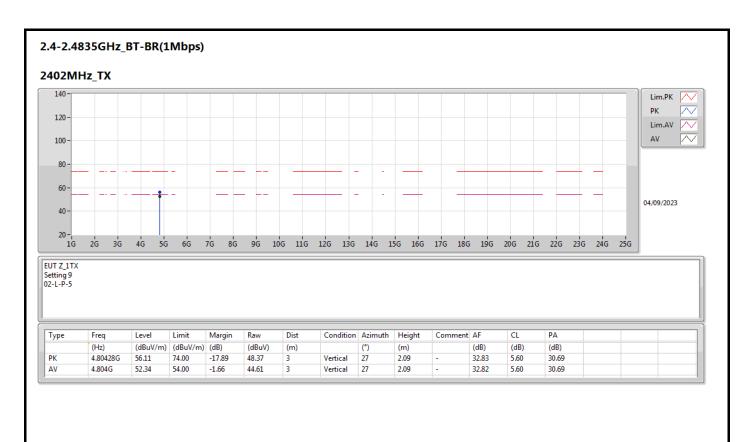




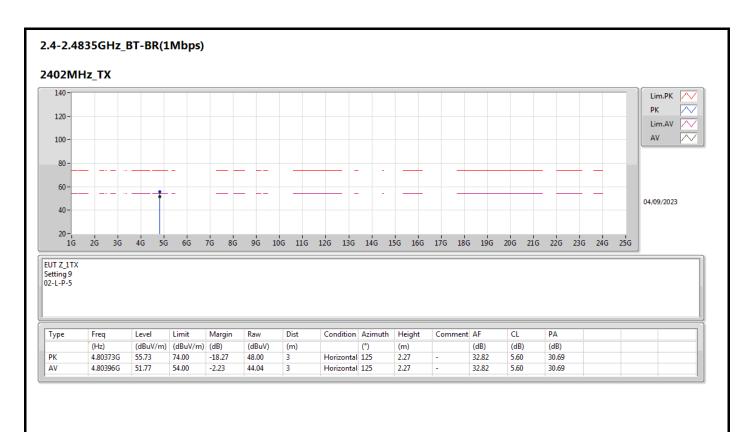




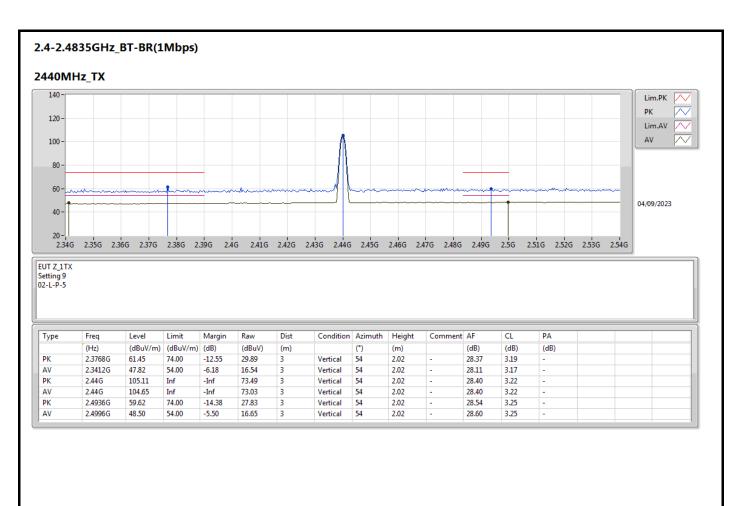




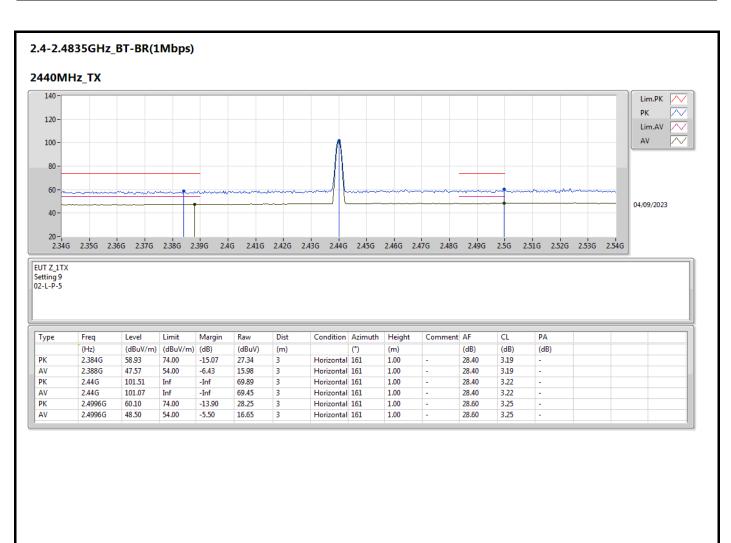










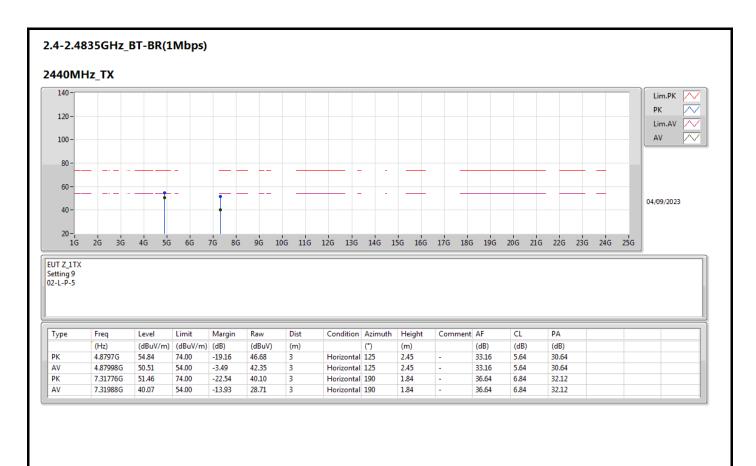






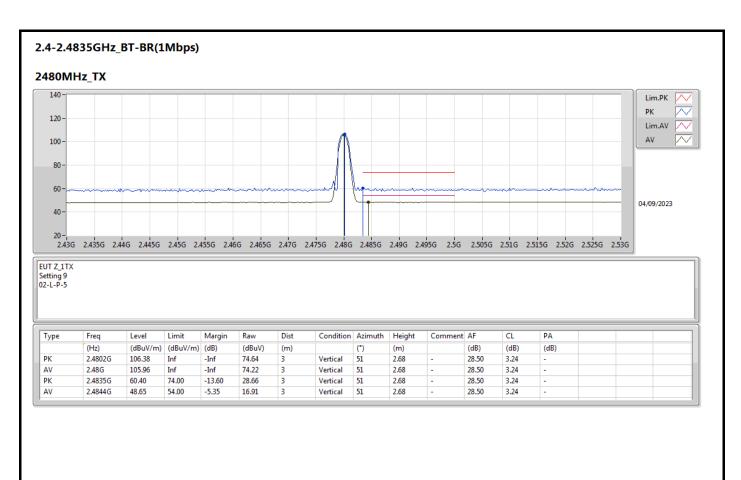
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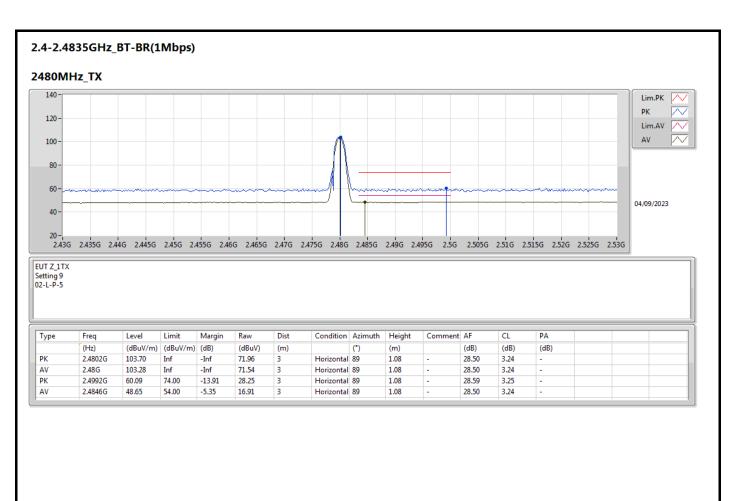
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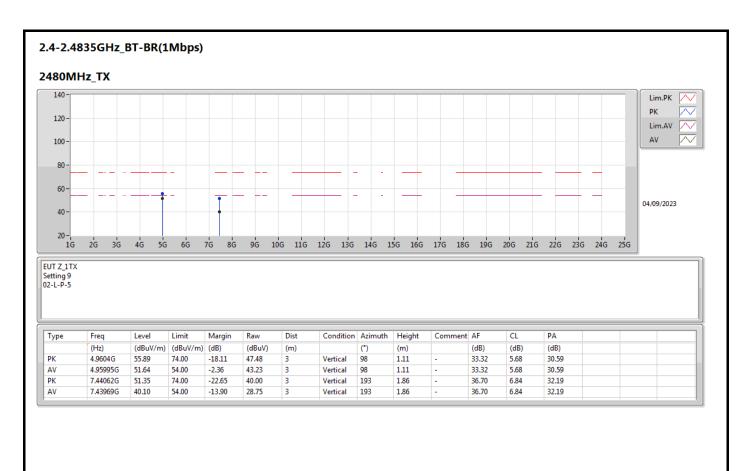




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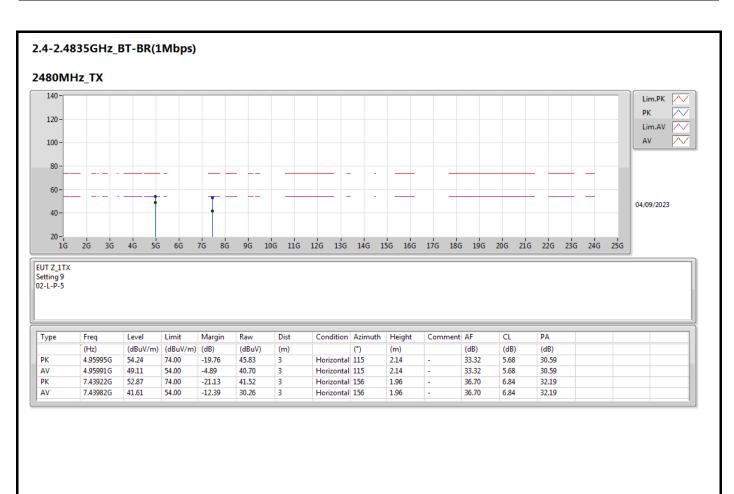
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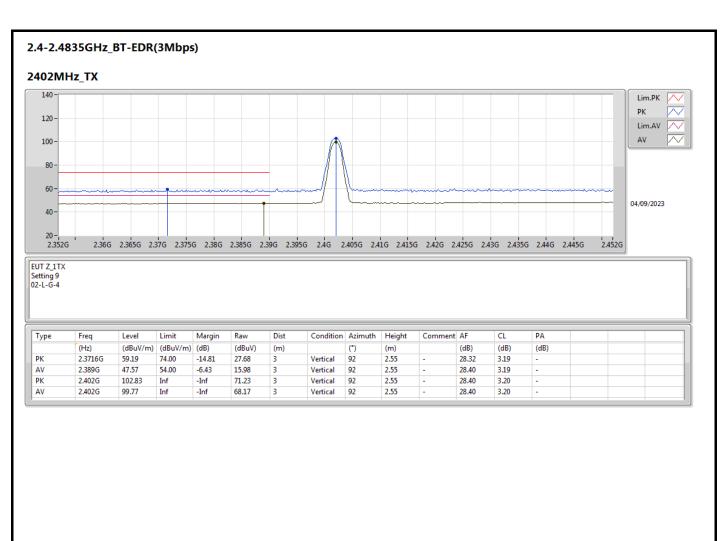


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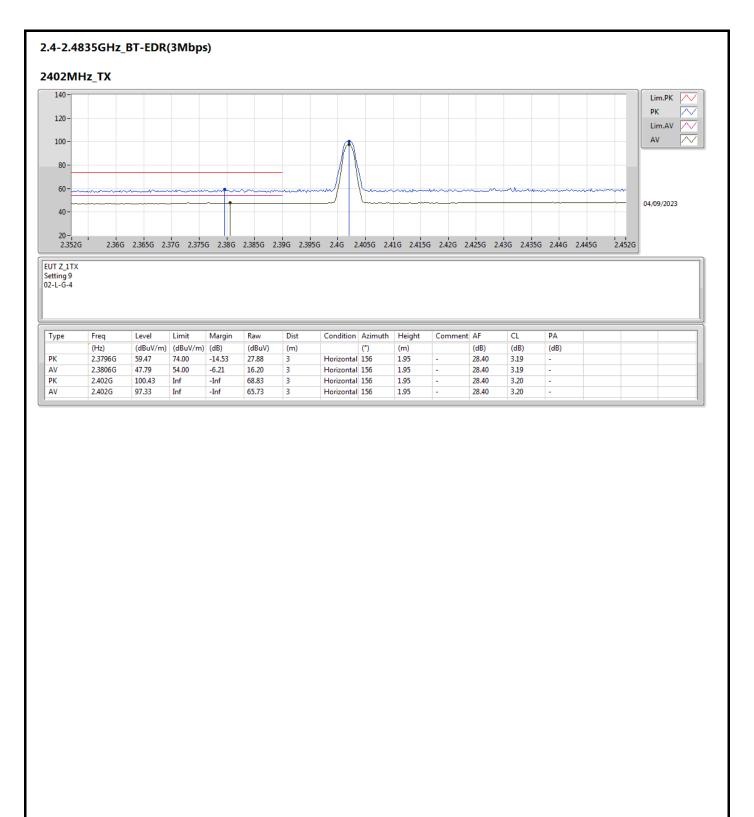




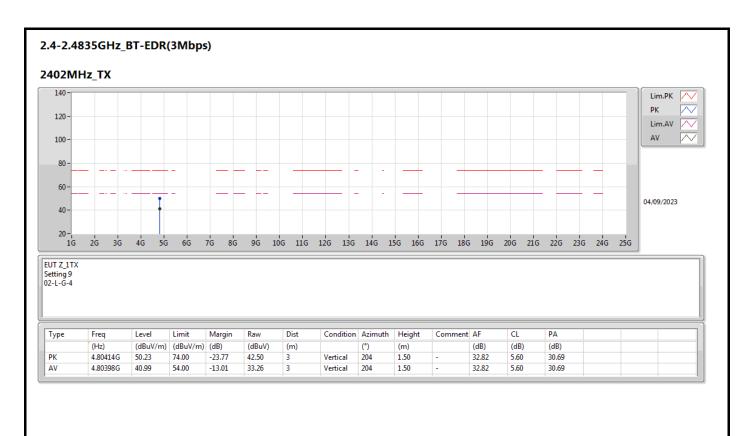






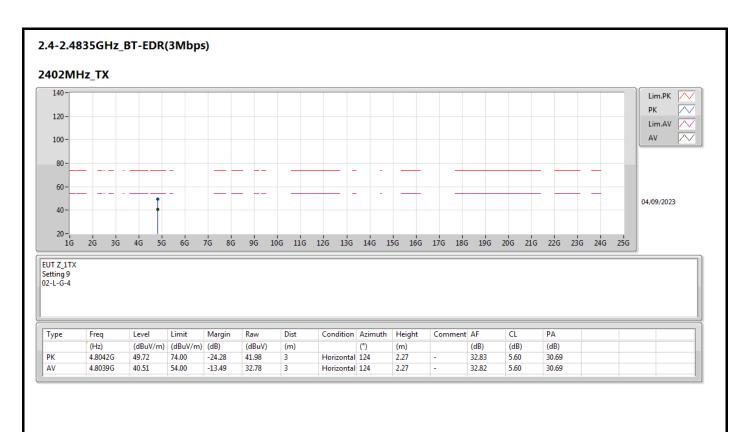






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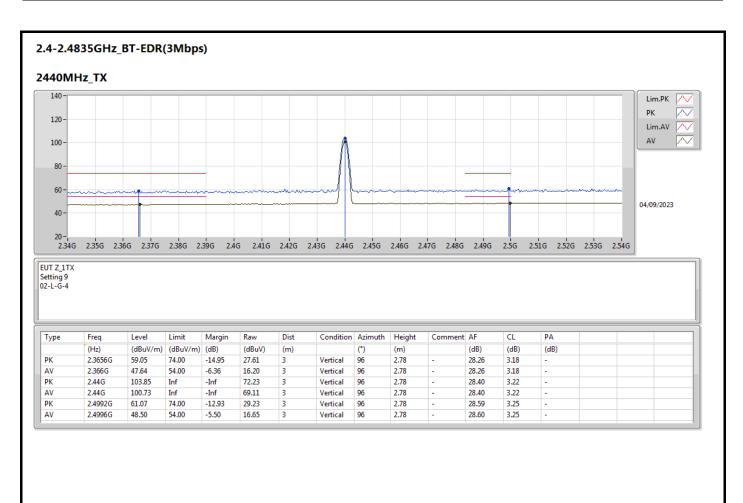




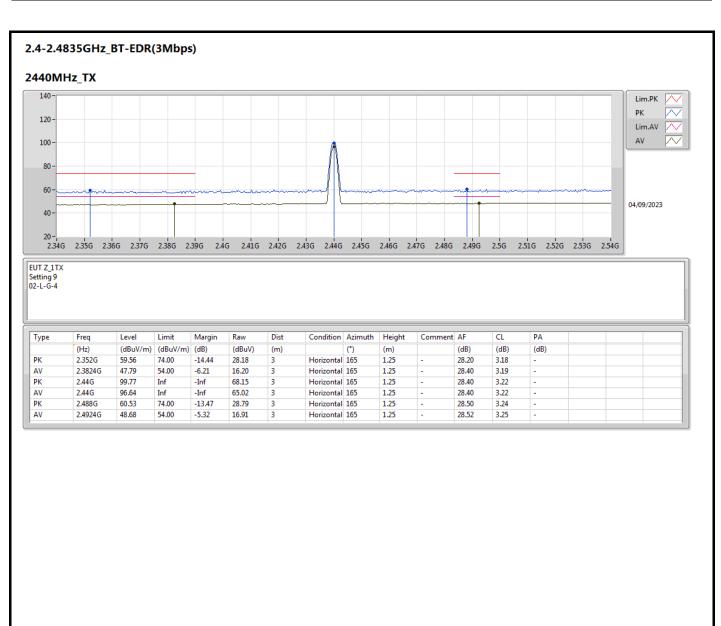
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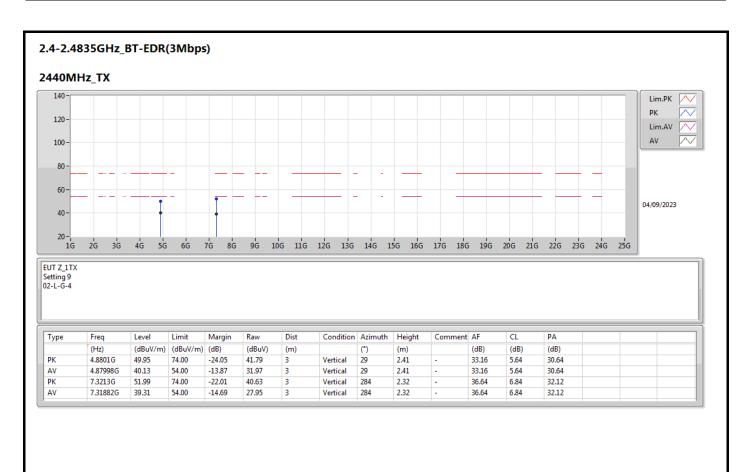








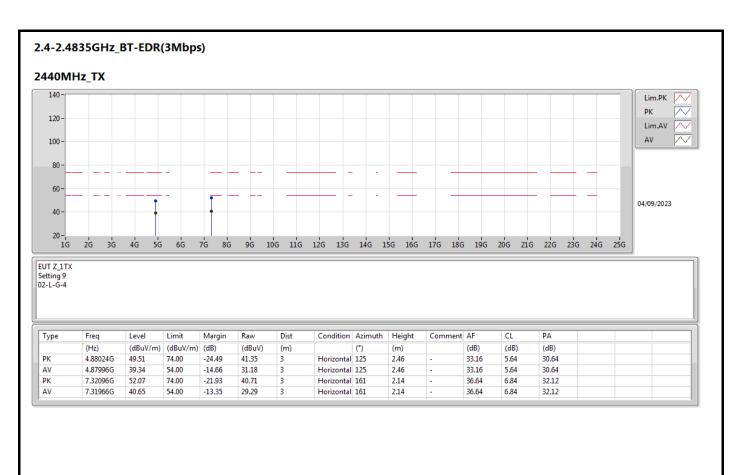




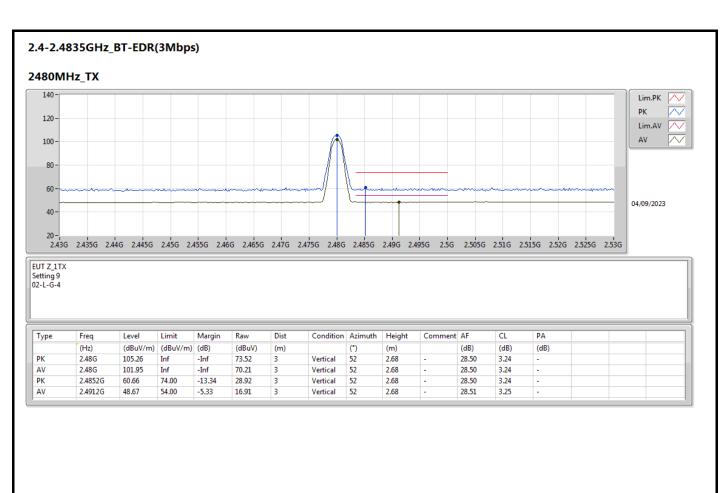
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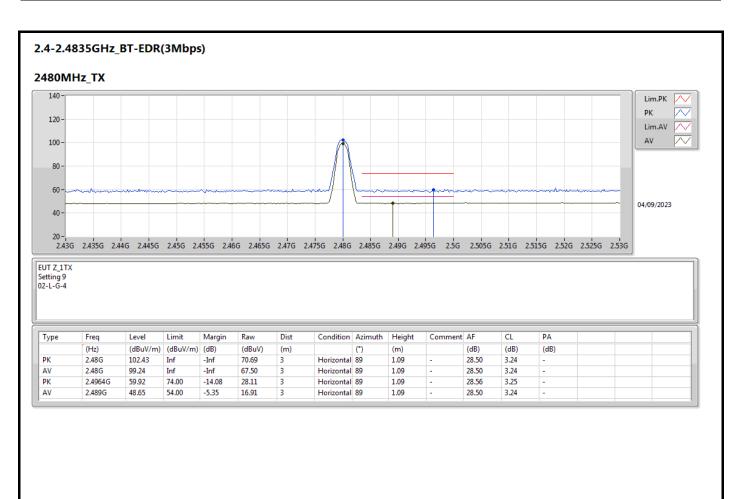




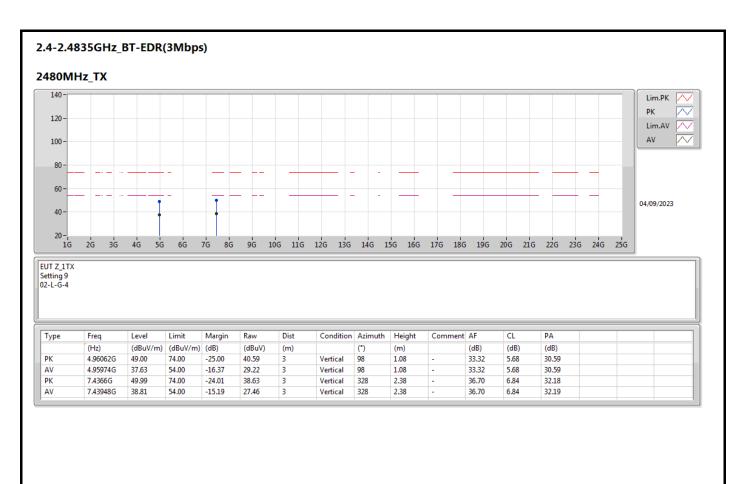


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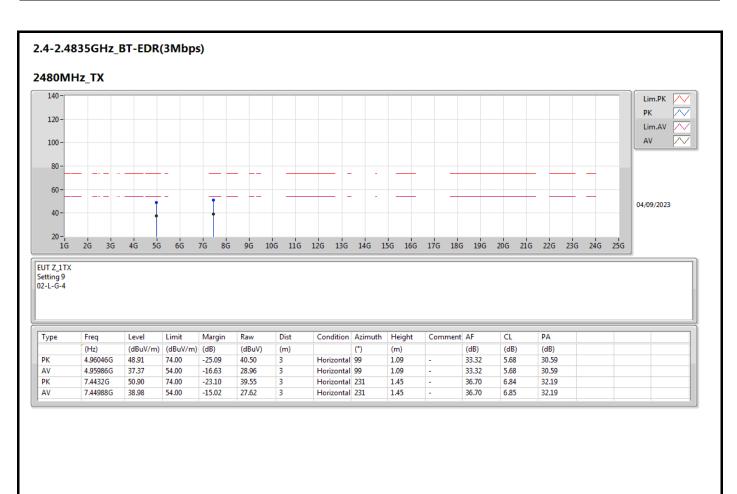












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