

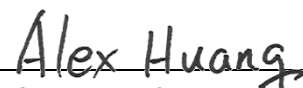
CE Test Report

Equipment : Bluetooth BT5.4 Dual Model Module
Model No. : Vela IF820
Brand Name : Laird Connectivity
Applicant : Laird Connectivity LLC
Address : W66N220 Commerce Court, Cedarburg, WI
53012 United States Of America
Standard : EN 300 328 V2.2.2 (2019-07)
Received Date : Apr. 18, 2023
Tested Date : Aug. 08 ~ Sep. 05, 2023

We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

Approved by:


Alex Huang / Supervisor

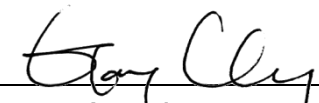

Gary Chang / Manager

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Appendix A. RF Output Power

Appendix B. Accumulated Transmit Time, Minimum Frequency Occupation And Hopping Sequence

Appendix C. Hopping Frequency Separation

Appendix D. Occupied Channel Bandwidth

Appendix E. Transmitter Unwanted Emissions in the Out-Of-Band Domain

Appendix F. Transmitter Spurious Emissions

Appendix G. Receiver Spurious Emissions

Appendix H. Receiver Blocking

Release Record

Report No.	Version	Description	Issued Date
ER341801AD	Rev. 01	Initial issue	Sep. 19, 2023

Summary of Test Results

Ref. Std. Clause	Test Items	Measured	Result
4.3.1.2	RF Output Power	EIRP (dBm): 9.18	Pass
4.3.1.3	Duty cycle, Tx-Sequence, Tx-gap	Only for non-adaptive equipment	N/A
4.3.1.4	Dwell time, Minimum Frequency Occupation & Hopping Sequence	Meet the requirement of limit.	Pass
4.3.1.5	Hopping Frequency Separation	Meet the requirement of limit.	Pass
4.3.1.6	Medium Utilisation (MU) factor	Only for non-adaptive equipment	N/A
4.3.1.7	Adaptivity	The RF Output power is less than 10 dBm e.i.r.p. This item is not applicable	N/A
4.3.1.8	Occupied Channel Bandwidth	Meet the requirement of limit.	Pass
4.3.1.9	Transmitter unwanted emissions in the out of band domain	Meet the requirement of limit.	Pass
4.3.1.10	Transmitter unwanted emissions in the spurious domain	Meet the requirement of limit.	Pass
4.3.1.11	Receiver spurious emissions	Meet the requirement of limit.	Pass
4.3.1.12	Receiver Blocking	Meet the requirement of limit.	Pass
4.3.1.13	Geo-location capability	The device has no geo-location capability.	N/A

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:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Product Details

The EUT is available in SA module (integrated antenna) and SC module (IPEX MHF4 connector) variants.

Model Name	Part No.	Module
Vela IF820	453-00171	SA Module, Vela IF820, Integrated Antenna
	453-00172	SC Module, Vela IF820, MHF4

1.1.2 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number	Data Rate
2400-2483.5	BR	2402-2480	0-78 [79]	1 Mbps
2400-2483.5	EDR	2402-2480	0-78 [79]	2 Mbps
2400-2483.5	EDR	2402-2480	0-78 [79]	3 Mbps
Note 1: Bluetooth BR uses a GFSK modulation.				
Note 2: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK and 8DPSK modulation.				

1.1.3 Antenna Details

Ant. No.	Manufacturer	Model	Laird Part Number	Type	Connector	Gain	Cable loss (dB)
1	Laird	NanoBlue	EBL2400A1-10M H4L	PCB Dipole	IPEX MHF4	2dBi	N/A
2	Laird	FlexPIFA	001-0022	PCB Dipole	IPEX MHF4	2dBi	N/A
3	Mag.Layers	EDA-8709-2G4C1-B27-CY	0600-00057	Dipole	IPEX MHF4	2.32dBi	0.7
4	Laird	mFlexPIFA	EFA2400A3S-10 MH4L	PIFA	IPEX MHF4	2dBi	N/A
5	ACX	AD1608	AD1608-A2455A AT/LF	Chip Antenna	N/A	1dBi	N/A

1.1.4 EUT Operational Condition

Power Supply Type	3Vdc from host		
SW Version	CYW20820A1_001.002.012.0271.0000_Generic_btle_20820FCBGA62.cgr		
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (85°C)	☒ Tmin (-40°C)

1.1.5 Accessories

N/A

1.1.6 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	--	--

1.1.7 Test Tool and Duty Cycle

SC module

Test Tool	CyBluetool 1.0	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
BR-1Mbps	77.03%	1.13
EDR-3Mbps	74.32%	1.29

SA module

Test Tool	CyBluetool 1.0	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
BR-1Mbps	77.03%	1.13
EDR-3Mbps	79.56%	0.99

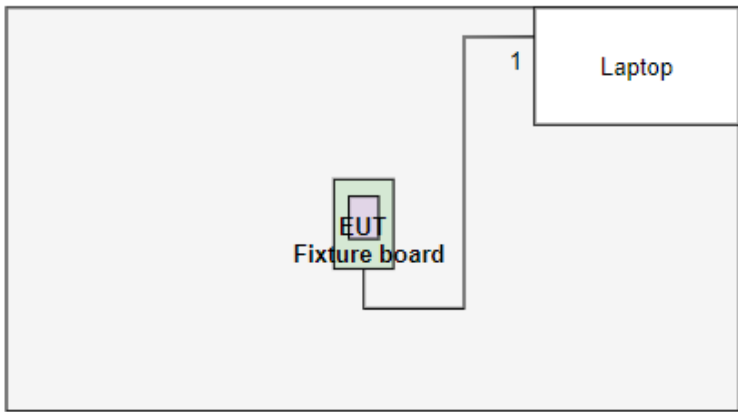
1.1.8 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2441	2480
BR-1Mbps	Default	Default	Default
EDR-3Mbps	Default	Default	Default

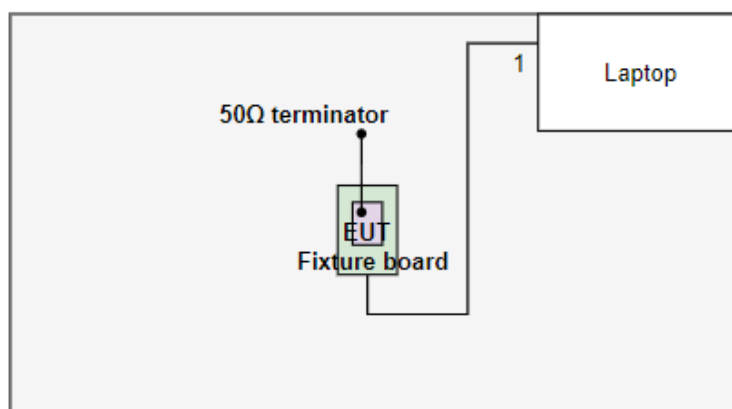
1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	S/N	Remarks
1	Laptop	DELL	Latitude 3400	GKZLWZ2	---
2	50 Ω terminator	woken	WTER-18S2	---	---
3	Fixture	---	---	---	Provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram (Conducted Emission – SC module)	
 The diagram shows a large rectangular area representing the test setup. Inside this area, there is a smaller rectangle labeled 'Fixture board'. Within the 'Fixture board', there is a small square labeled 'EUT'. A signal cable, labeled '1', connects the 'EUT' to a 'Laptop' box located outside the main test area to the right.	
No.	Signal cable / Length (m)
1	USB, 1m shielded.

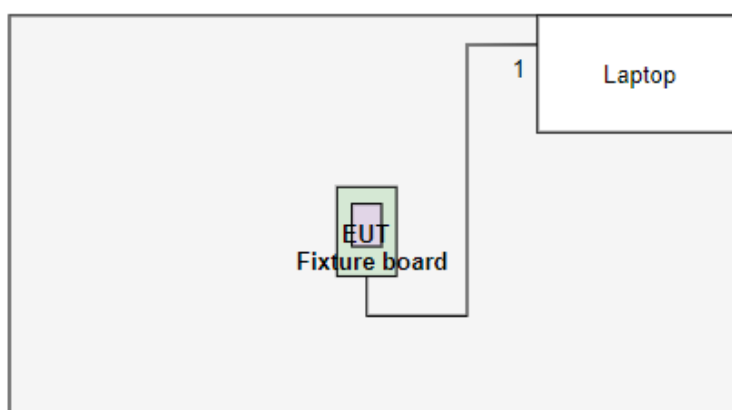
Test Setup Diagram (Radiated Emission – SC module)



No.	Signal cable / Length (m)
-----	---------------------------

1	USB, 1m shielded.
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Test Setup Diagram (Radiated Emission – SA module)



No.	Signal cable / Length (m)
-----	---------------------------

1	USB, 1m shielded.
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1.4 Test Equipment List and Calibration Data

Test Item	Radiated Emissions				
Test Site	Fully-anechoic chamber 2 / (05CH02-WS)				
Test Date	Aug. 01 ~ Aug. 24, 2023				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY52221474	Nov. 07, 2022	Nov. 06, 2023
Bilog Antenna 30-1000MHz	SCHWARZBECK	VULB9168	9168-563	Mar. 10, 2023	Mar. 09, 2024
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	9120D-1205	Feb. 03, 2023	Feb. 02, 2024
Preamplifier	Agilent	83017A	MY53270013	Feb. 04, 2023	Feb. 03, 2024
Preamplifier	EMC	EMC02325	980188	Oct. 26, 2022	Oct. 25, 2023
RF cable-1M	EMC	EMC104-35M-35M-1000	S/N:210926	Oct. 12, 2022	Oct. 11, 2023
RF cable-1M	EMC	EMC104-35M-35M-1000	S/N:210927	Oct. 12, 2022	Oct. 11, 2023
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22621/4	Oct. 12, 2022	Oct. 11, 2023
RF cable-4M	HUBER+SUHNER	SUCOFLEX104	MY32489/4	Oct. 12, 2022	Oct. 11, 2023
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-002	Oct. 12, 2022	Oct. 11, 2023
LF cable-3M	EMC	EMC8D-NM-NM-3000	131102	Oct. 12, 2022	Oct. 11, 2023
LF cable-10M	EMC	EMC8D-NM-NM-10000	131101	Oct. 12, 2022	Oct. 11, 2023
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Test Date	Aug. 08 ~ Sep. 05, 2023				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101910	Apr. 14, 2023	Apr. 13, 2024
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Jun. 21, 2023	Jun. 20, 2024
Power Sensor	Agilent	U2021XA	MY53480019	Mar. 07, 2023	Mar. 06, 2024
Power Sensor	Agilent	U2021XA	MY53510003	Mar. 07, 2023	Mar. 06, 2024
Power Sensor	Agilent	U2021XA	MY54070003	Mar. 27, 2023	Mar. 26, 2024
Power Sensor	Agilent	U2021XA	MY54060013	Mar. 27, 2023	Mar. 26, 2024
RF cable	EMC	EMC104-35M-35M-1000	210928	Oct. 14, 2022	Oct. 13, 2023
RF Cable	EMC	EMC104-35M-35M-1000	210929	Oct. 14, 2022	Oct. 13, 2023
RF Cable	EMC	EMC104-35M-35M-1000	210930	Oct. 14, 2022	Oct. 13, 2023
RF Cable	EMC	EMC104-35M-35M-1000	210931	Oct. 14, 2022	Oct. 13, 2023
Measurement Software	Sporton	SENSE	5.10.7	NA	NA
Measurement Software	Agilent	EN RF test	1.1501125	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Receiver Blocking				
Test Site	05CH02-WS				
Test Date	Aug. 14, 2023				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Wireless Connectivity Test Set	R&S	CMW270	100856	Nov. 16, 2022	Nov. 15, 2023
Vector Signal Generator	R&S	SMB100A	175727	May 26, 2023	May 25, 2024
RF Cable	HUBER+SUHNER	SUCOFLEX_104	500202/4	Oct. 13, 2022	Oct. 12, 2023
RF Cable	HUBER+SUHNER	SUCOFLEX_104	296088/4	Oct. 13, 2022	Oct. 12, 2023
RF Cable	HUBER+SUHNER	SUCOFLEX_104	329023/4	Oct. 13, 2022	Oct. 12, 2023
Combiner(1X2)	WOKEN	2WAYDIV	12101200003	Oct. 13, 2022	Oct. 12, 2023
Note: Calibration Interval of instruments listed above is one year.					

1.5 Testing Applied Standards

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

EN 300 328 V2.2.2 (2019-07)

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$)).

Measurement Uncertainty		
Parameters	Uncertainty	Limit
Occupied Channel Bandwidth	$\pm 0.0034 \%$	$\pm 5 \%$
RF output power, conducted	$\pm 0.592 \text{ dB}$	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 0.583 \text{ dB}$	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 2.715 \text{ dB}$	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 3.14 \text{ dB}$	$\pm 6 \text{ dB}$
Temperature	$\pm 0.4 \text{ }^{\circ}\text{C}$	$\pm 3 \text{ }^{\circ}\text{C}$
Supply voltages	$\pm 0.15 \%$	$\pm 3 \%$
Time	$\pm 0.1 \%$	$\pm 5 \%$

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)
Test Site	05CH02-WS
Address of Test Site	No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test method	Mode	Test Configuration
RF Output Power	GFSK 8DPSK	Hopping Hopping	1 Mbps 3 Mbps	Conducted	TX	1
				Radiated		2
Accumulated Transmit Time Minimum Frequency Occupation Hopping Sequence Transmitter unwanted emissions in the OOB domain	GFSK 8DPSK	Hopping Hopping	1 Mbps 3 Mbps	Conducted	TX	1
				Radiated		2
Hopping Frequency Separation	GFSK 8DPSK	2441 2441	1 Mbps 3 Mbps	Conducted	TX	1
				Radiated		2
Occupied Channel Bandwidth	GFSK 8DPSK	2402 / 2441 / 2480 2402 / 2441 / 2480	1 Mbps 3 Mbps	Conducted	TX	1
				Radiated		2
Transmitter Spurious Emissions	GFSK 8DPSK	2402 / 2480 2402 / 2480	1 Mbps 3 Mbps	Conducted	TX	1 Note2
				Radiated		2
Receiver Spurious Emissions	GFSK 8DPSK	2402 / 2480 2402 / 2480	1 Mbps 3 Mbps	Conducted	RX	1 Note2
				Radiated		2
Receiver Blocking	GFSK	Hopping	1 Mbps	Conducted	RX	1
				Radiated		2

NOTE:

- The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** result was found as the worst case and was shown in this report.
- The 50Ω terminator is connected to antenna port of EUT for radiated emission measurement.
- Test configurations are listed as below:
Configuration 1: Laird part number: 453-00172 (SC module)
Configuration 2: Laird part number: 453-00171 (SA module)

3 Transmitter Test Results

3.1 RF Output Power

3.1.1 Limit of RF Output Power

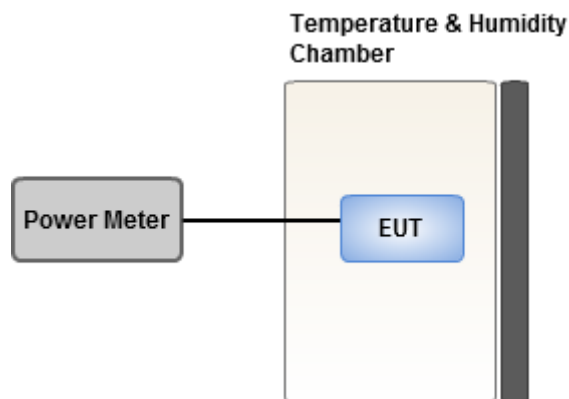
The maximum RF output power shall be equal to or less than 20 dBm

3.1.2 Test Procedures

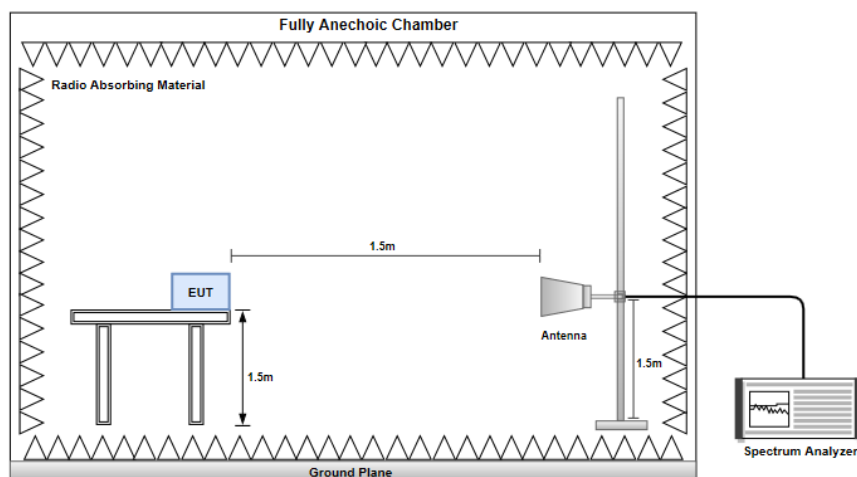
Reference to clause 5.4.2.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.1.3 Test Setup

Conducted method



Radiated method



3.1.4 Test Results

Ambient Condition	26°C / 63% 25°C / 65%	Tested By	Alan Tang Jack Li
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Refer to Appendix A.

3.2 Accumulated Transmit Time, Minimum Frequency Occupation and Hopping Sequence

3.2.1 Limit of Accumulated Transmit Time, Minimum Frequency Occupation and Hopping Sequence

Adaptive mode

Adaptive Frequency Hopping equipment shall be capable of operating over a minimum of 70 % of the band 2.4GHz to 2.4835GHz. The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used. In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Option 2: The occupation probability for each frequency shall be between $((1 / U) \times 25 \%)$ and 77 % where U is the number of hopping frequencies in use. The hopping sequence(s) shall contain at least N hopping frequencies at all times, where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

Non-Adaptive mode

The Accumulated Transmit Time on any hopping frequency shall not be greater than 15 ms within any observation period of 15 ms multiplied by the minimum number of hopping frequencies (N) that have to be used. Non-adaptive medical devices requiring reverse compatibility with other medical devices placed on the market that are compliant with version 1.7.1 or earlier versions of ETSI EN 300 328, are allowed to have an operating mode in which the maximum Accumulated Transmit Time is 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used, only when communicating to these legacy devices already placed on the market. In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:

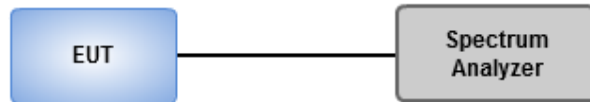
Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.

Option 2: The occupation probability for each frequency shall be between $((1 / U) \times 25 \%)$ and 77 % where U is the number of hopping frequencies in use. The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

3.2.2 Test Procedures

Reference to clause 5.4.4.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.2.3 Test Setup



3.2.4 Test Results

Ambient Condition	26°C / 63% 25°C / 65%	Tested By	Alan Tang Jack Li
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Refer to Appendix B.

3.3 Hopping Frequency Separation

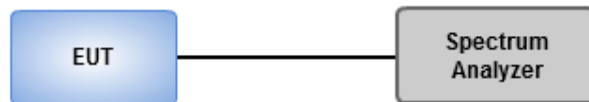
3.3.1 Limit of Hopping Frequency Separation

For adaptive Frequency Hopping equipment, the minimum Hopping Frequency Separation shall be 100 kHz.
For non-adaptive Frequency Hopping equipment, the Hopping Frequency Separation shall be equal or greater than the Occupied Channel Bandwidth, with a minimum separation of 100 kHz.

3.3.2 Test Procedures

Reference to clause 5.4.5.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.3.3 Test Setup



3.3.4 Test Results

Ambient Condition	26°C / 63% 25°C / 65%	Tested By	Alan Tang Jack Li
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Refer to Appendix C.

3.4 Occupied Channel Bandwidth

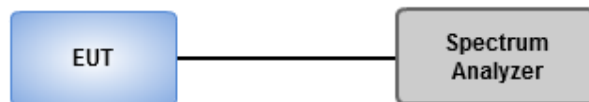
3.4.1 Limit of Occupied Channel Bandwidth

The Occupied Channel Bandwidth for each hopping frequency shall fall completely within 2.4~2.4835 GHz. For non-adaptive Frequency Hopping equipment with e.i.r.p greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than the value declared by the supplier. This declared value shall not be greater than 5 MHz.

3.4.2 Test Procedures

Reference to clause 5.4.7.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.4.3 Test Setup



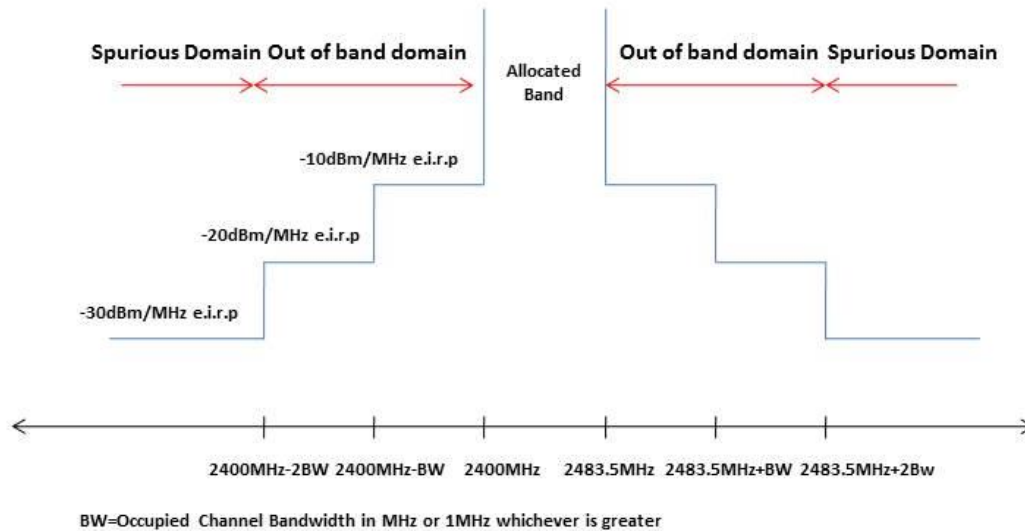
3.4.4 Test Results

Ambient Condition	26°C / 63% 25°C / 65%	Tested By	Alan Tang Jack Li
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Refer to Appendix D.

3.5 Transmitter Unwanted Emissions in the Out-Of-Band Domain

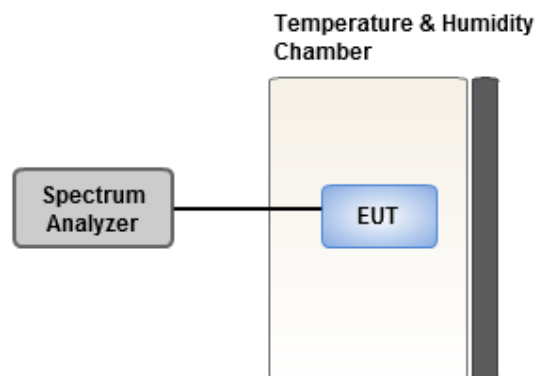
3.5.1 Limit of Transmitter Unwanted Emissions in the Out-Of-Band Domain



3.5.2 Test Procedures

Reference to clause 5.4.8.2 of ETSI EN 300 328 V2.2.2 (2019-07).

3.5.3 Test Setup



3.5.4 Test Results

Ambient Condition	26°C / 63% 25°C / 65%	Tested By	Alan Tang Jack Li
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Refer to Appendix E.

3.6 Transmitter Unwanted Emissions in the Spurious Domain

3.6.1 Limit of Transmitter Unwanted Emissions in the Spurious Domain

Frequency Range (MHz)	Maximum power (dBm)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87,5	-36	100
87,5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 694	-54	100
694 to 1000	-36	100
1000 to 12750	-30	1000

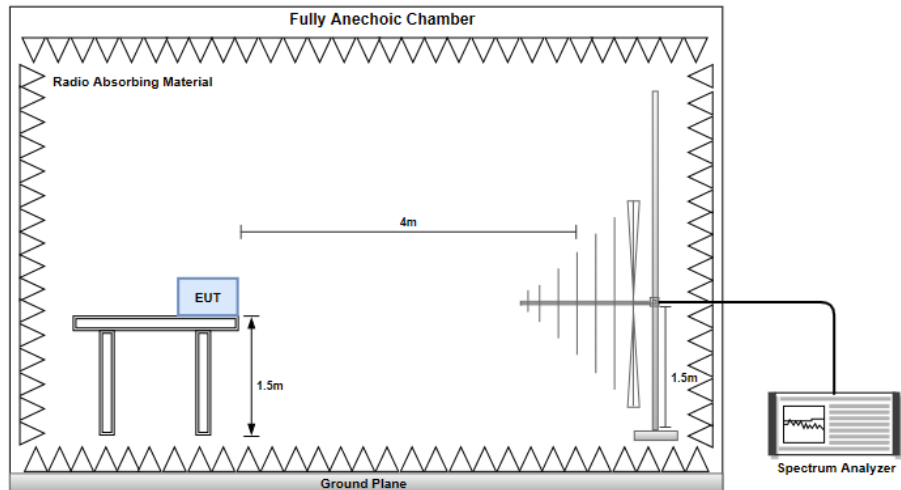
3.6.2 Test Procedures

Reference to clause 5.4.9.2 of ETSI EN 300 328 V2.2.2 (2019-07).

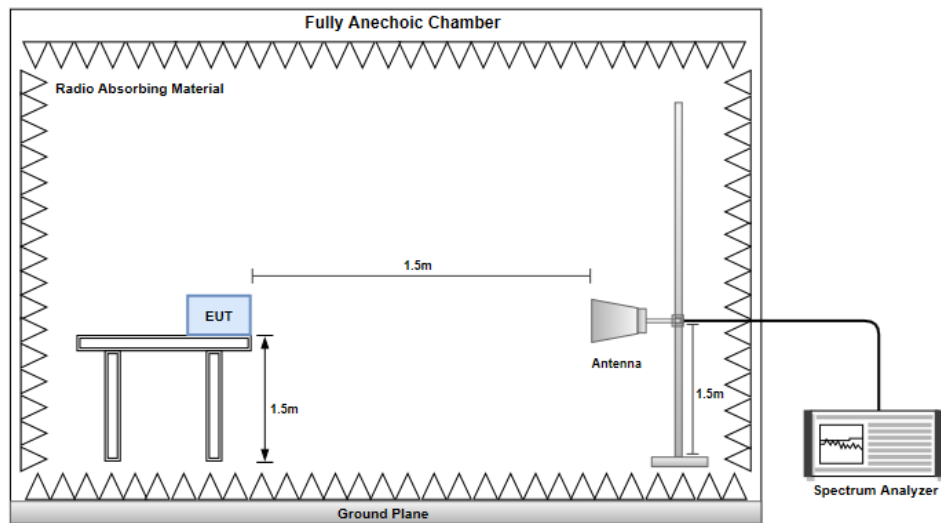
3.6.3 Test Setup

Radiated Emission

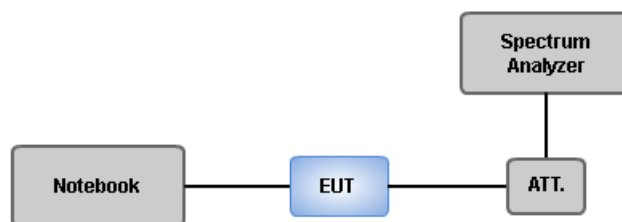
Below 1GHz



Above 1 GHz



Conducted Emission



3.6.4 Test Results

Refer to Appendix F.

4 Receiver Test Results

4.1 Receiver Spurious Emissions

4.1.1 Limit of Receiver Spurious Emissions

Frequency Range	Maximum power (dBm)	Measurement bandwidth(kHz)
30 MHz to 1 GHz	-57	100
Above 1 GHz to 12,75 GHz	-47	1000

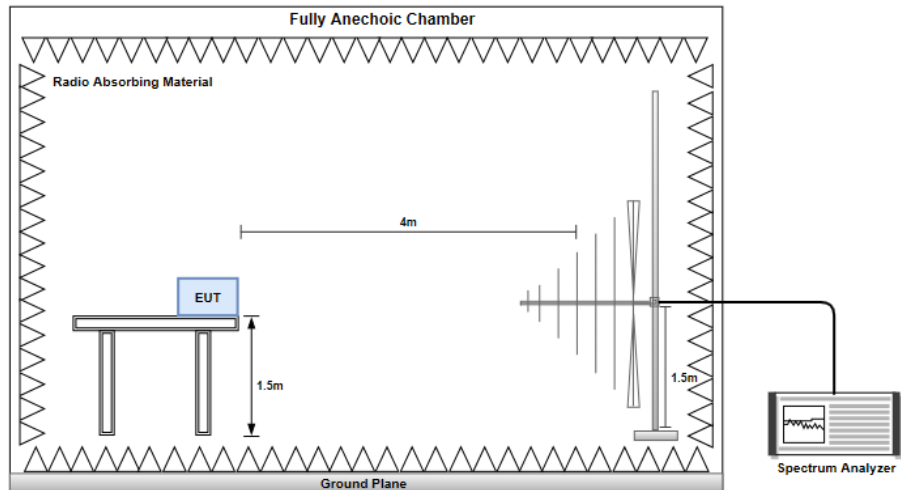
4.1.2 Test Procedures

Reference to clause 5.4.10.2 of ETSI EN 300 328 V2.2.2 (2019-07).

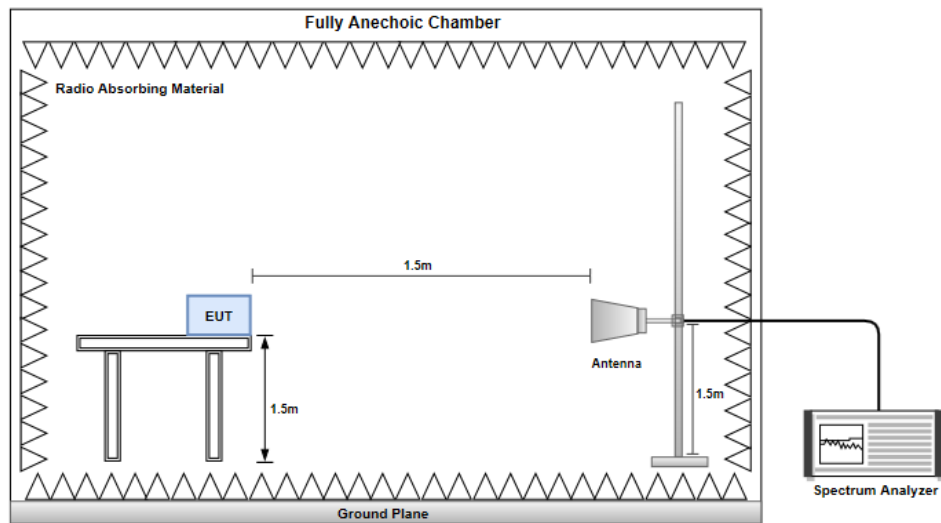
4.1.3 Test Setup

Radiated Emission

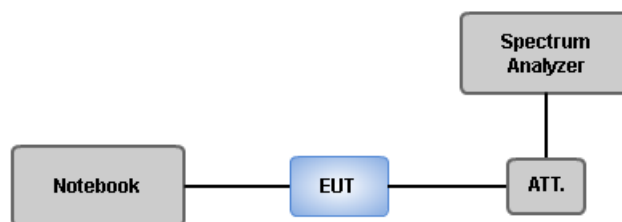
Below 1GHz



Above 1 GHz



Conducted Emission



4.1.4 Test Results

Refer to Appendix G.

5 Receiver Blocking Test Results

5.1 Receiver Blocking

5.1.1 Limit of Receiver Blocking

Receiver Blocking Parameters for Receiver Category 1 Equipment Limit					
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 4)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 4)	Type of Blocking Signal		
(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW		
(-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674				
Note 1: OCBW is in Hz.					
Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P _{min} + 26 dB where P _{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.					
Note 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P _{min} + 20 dB where P _{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.					
Note 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.					

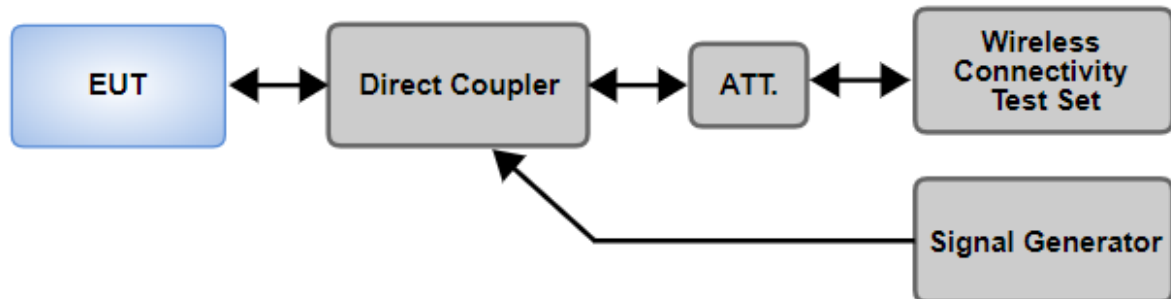
Receiver Blocking Parameters for Receiver Category 2 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 3)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 3)	Type of Blocking Signal
$(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 10 \text{ dB})$ or $(-74 \text{ dBm} + 10 \text{ dB})$ whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
Note 1: OCBW is in Hz. Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to $P_{\min} + 26 \text{ dB}$ where $P_{\min}$ is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. Note 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.			

Receiver Blocking Parameters for Receiver Category 3 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 3)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 3)	Type of Blocking Signal
$(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 20 \text{ dB})$ or $(-74 \text{ dBm} + 20 \text{ dB})$ whichever is less	2 380 2 504 2 300 2 584	-34	CW
Note 1: OCBW is in Hz. Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative the test may be performed using a wanted signal up to $P_{\min} + 30 \text{ dB}$ where $P_{\min}$ is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. Note 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.			

5.1.2 Test Procedures

Reference to clause 5.4.11.2 of ETSI EN 300 328 V2.2.2 (2019-07).

5.1.3 Test Setup



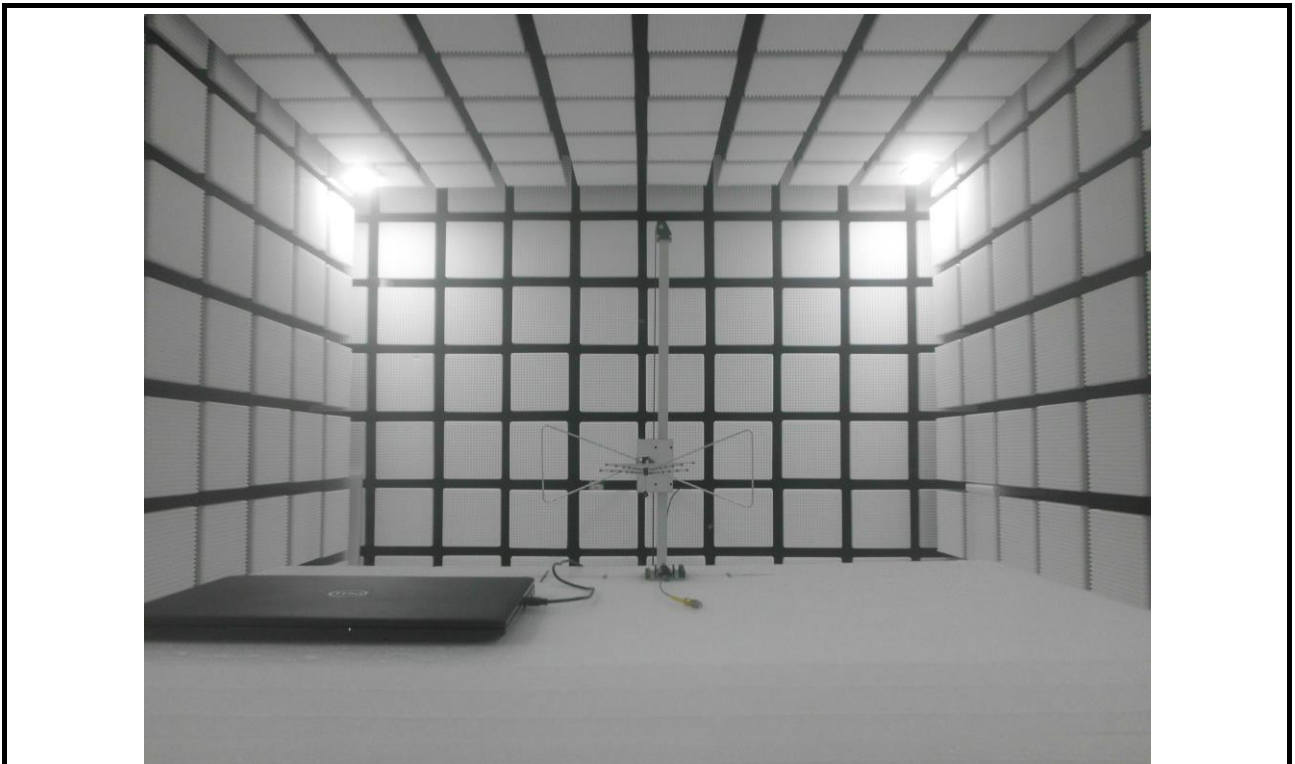
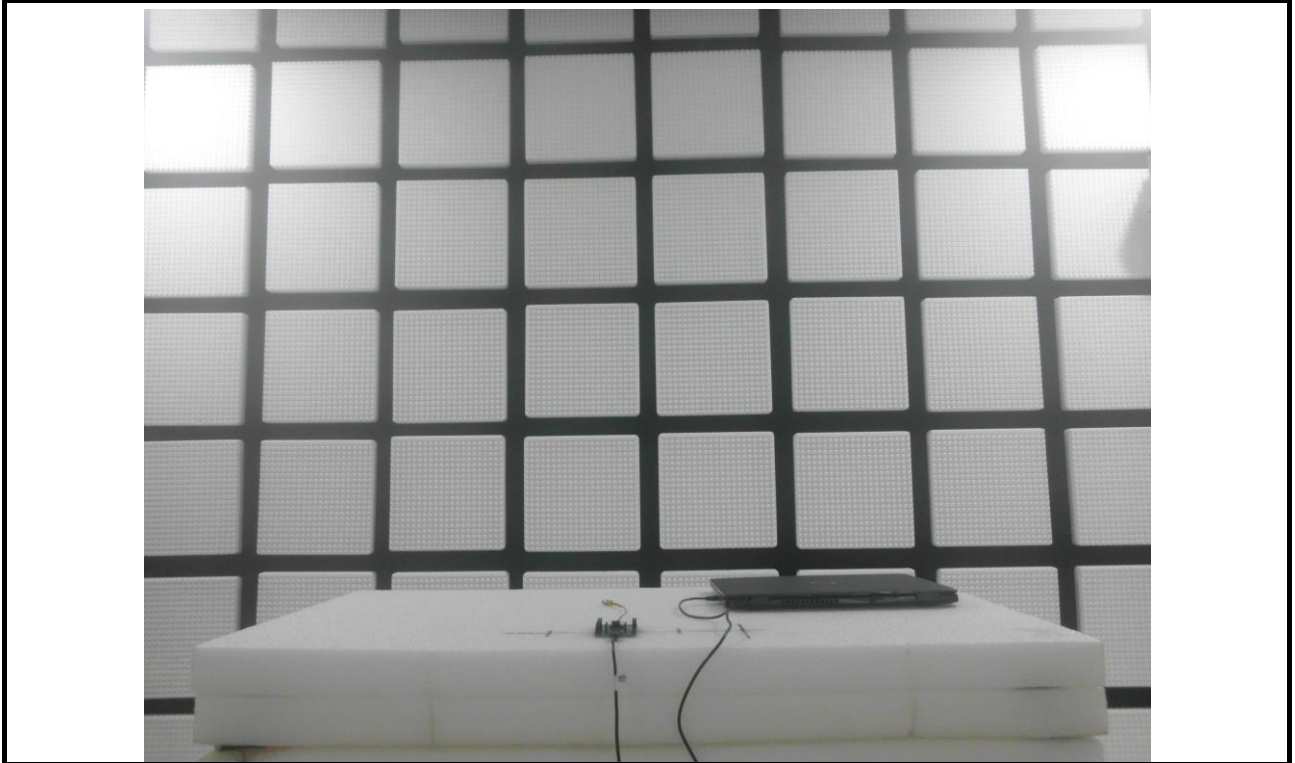
5.1.4 Test Results

Ambient Condition	25°C / 65%	Tested By	Hugo Zhen
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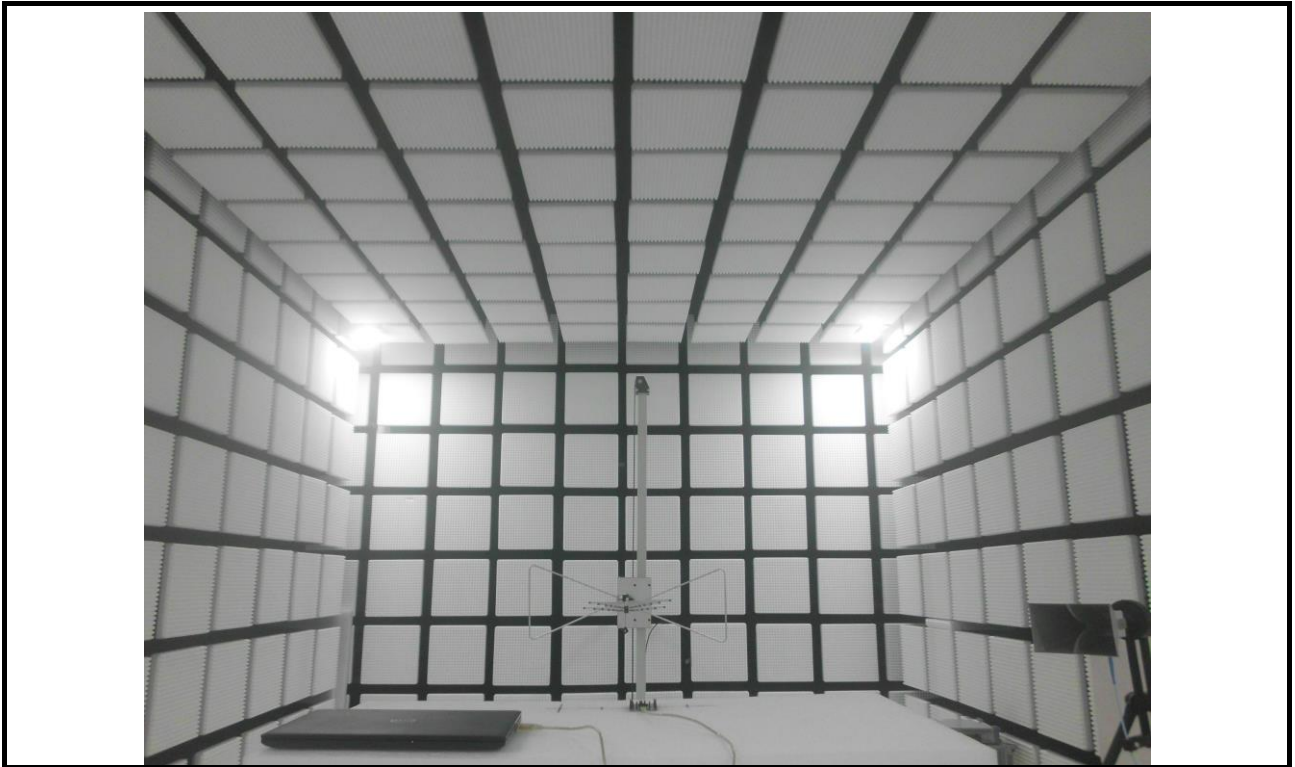
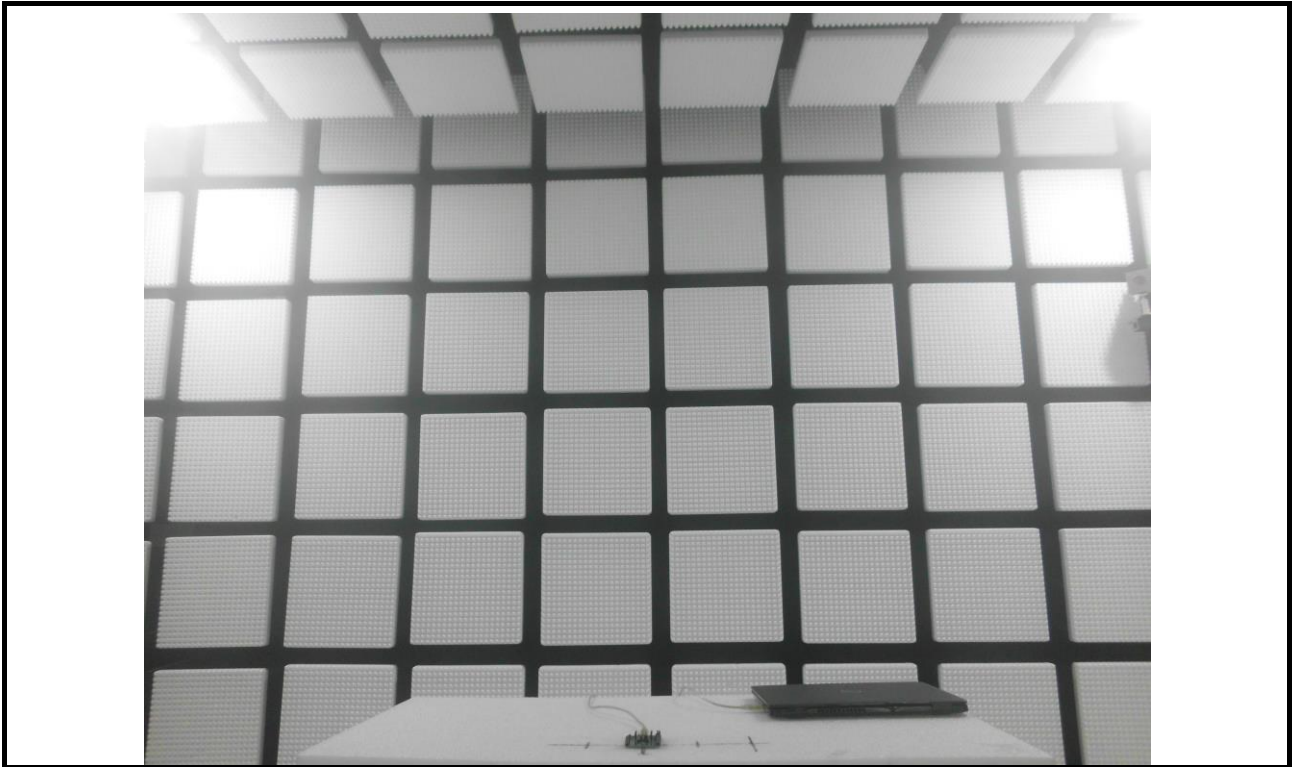
Refer to Appendix H.

6 Photographs of the Test Configuration

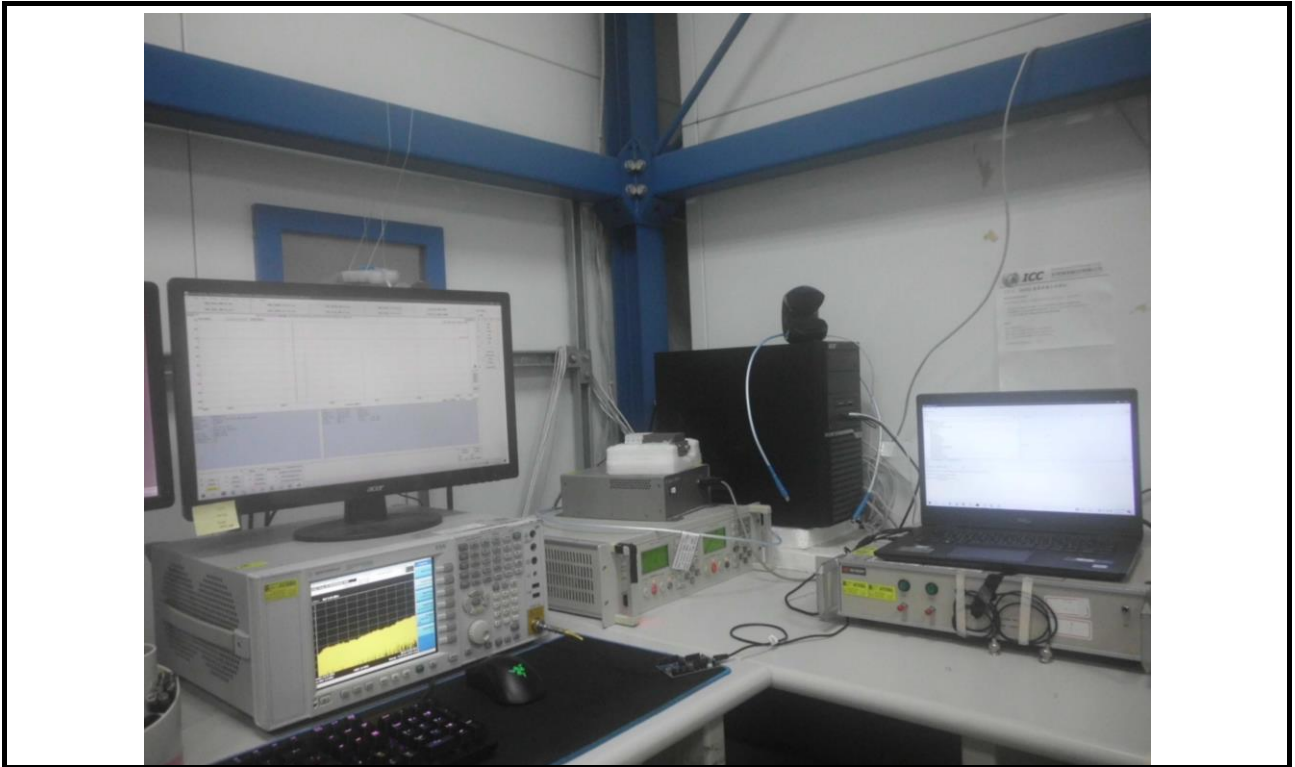
Spurious Emission Test (SC Module, RSE)



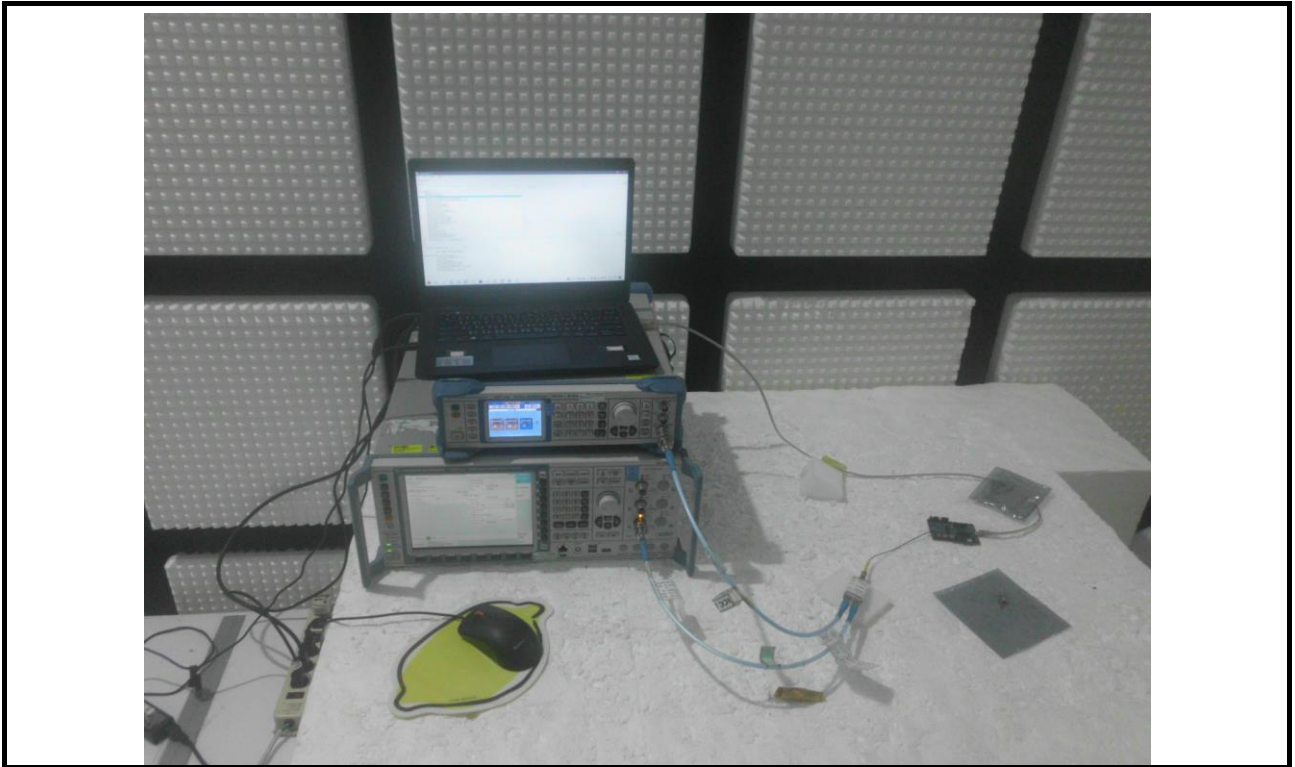
Spurious Emission Test (SA Module, RSE)



Spurious Emission Test (SC Module, CSE)



Receiver Blocking Test (SC Module)



Receiver Blocking Test (SA Module)



7 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corporation (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No.30-2, Ding Fwu Tsuen, Lin Kou
District, New Taipei City, Taiwan
(R.O.C.)

Kwei Shan

Tel: 886-3-271-8666

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666

Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==

**Configuration 1: Laird part number: 453-00171 (SC module)**

Condition	Modulation Mode	Freq. (MHz)	EIRP Power(dBm)	Limit (dBm)
TnomVnom	BR-1Mbps	Hopping	9.11	20
TminVnom	BR-1Mbps	Hopping	9.18	20
TmaxVnom	BR-1Mbps	Hopping	8.52	20
TnomVnom	EDR-3Mbps	Hopping	2.75	20
TminVnom	EDR-3Mbps	Hopping	2.80	20
TmaxVnom	EDR-3Mbps	Hopping	1.97	20

Note:

- 1) Test method is conducted.
- 2) EIRP = Measured conducted power + Antenna gain. (2dBi)

**Configuration 2: Laird part number: 453-00172 (SA module)**

Condition	Modulation Mode	Freq. (MHz)	EIRP Power(dBm)	Limit (dBm)
TnomVnom	BR-1Mbps	Hopping	7.66	20
TminVnom	BR-1Mbps	Hopping	7.54	20
TmaxVnom	BR-1Mbps	Hopping	7.16	20
TnomVnom	EDR-3Mbps	Hopping	1.38	20
TminVnom	EDR-3Mbps	Hopping	1.33	20
TmaxVnom	EDR-3Mbps	Hopping	0.81	20

Note:

- 1) Test method is radiated.

Configuration 1: Laird part number: 453-00171 (SC module)
Summary

Mode	Max-Dwell (s)
2.4-2.4835GHz	-
BT-BR(1Mbps)	157.416827m
BT-EDR(3Mbps)	135.364872m

Result

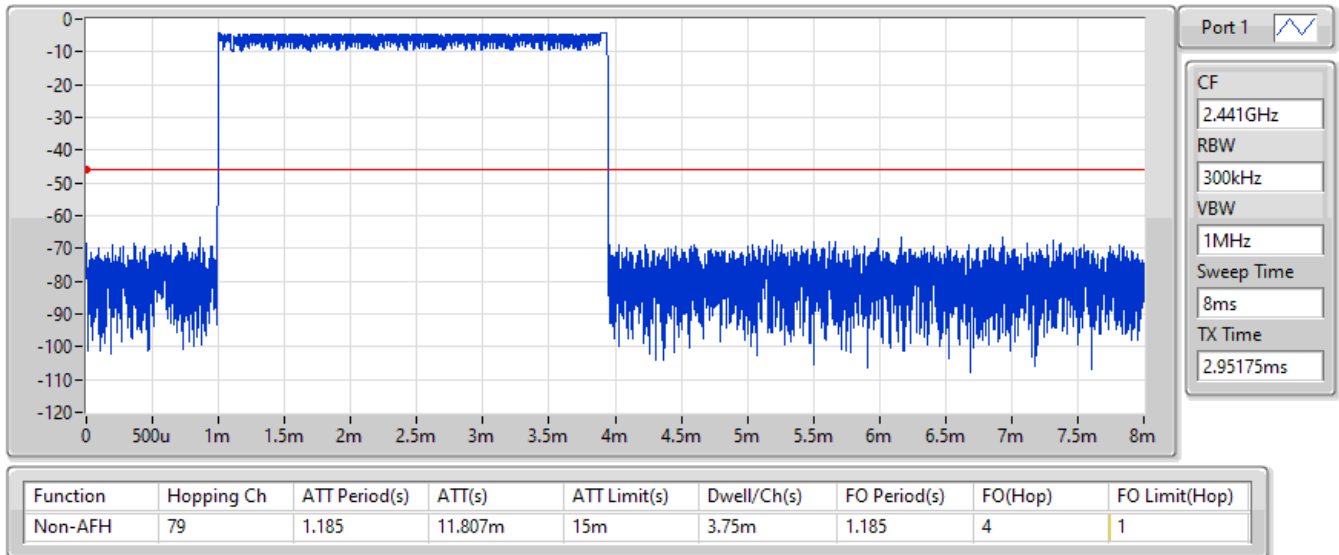
Mode	Result	Function	Hopping Ch	ATT Period (s)	ATT (s)	ATT Limit (s)	Dwell/Ch (s)	FO Period (s)	FO (Hop)	FO Limit (Hop)
BT-BR(1Mbps)	-	-	-	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	Non-AFH	79	1.185	11.807m	15m	3.75m	1.185	4	1
Hopping Mode_Tnom	Pass	AFH	20	8	157.416827m	400m	7.5m	600m	4	1
BT-EDR(3Mbps)	-	-	-	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	Non-AFH	79	1.185	11.582m	15m	3.75m	1.185	4	1
Hopping Mode_Tnom	Pass	AFH	20	8	135.364872m	400m	7.5m	600m	4	1

BT-BR(1Mbps)

ATT-FS Non-AFH

Hopping Mode_TnomVnom

08/08/2023

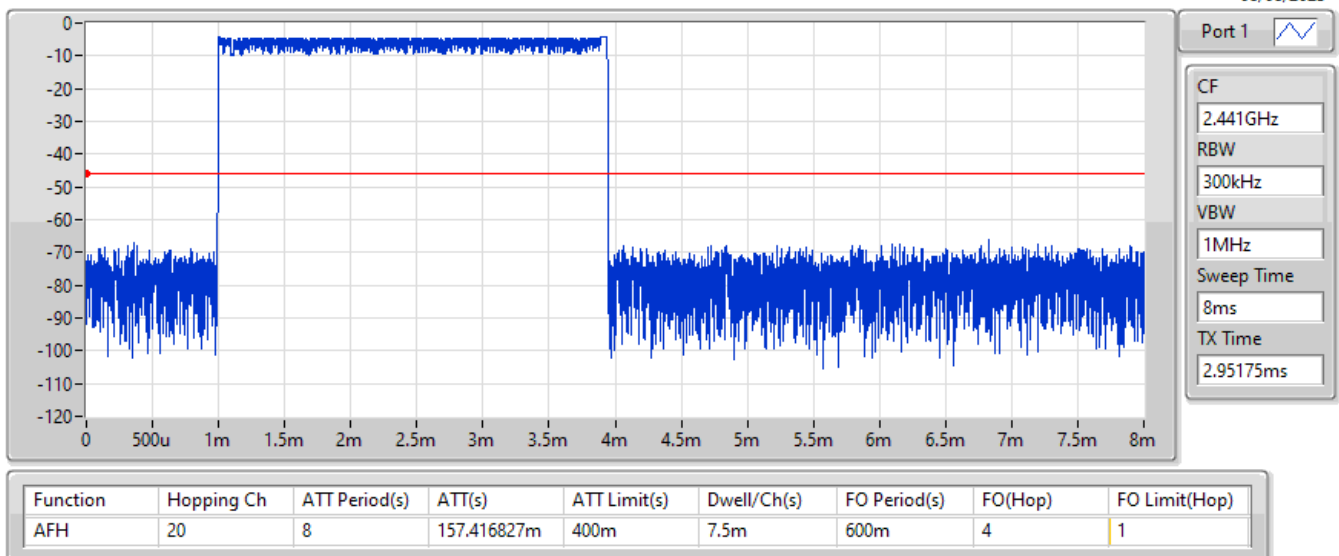


BT-BR(1Mbps)

ATT-FS AFH

Hopping Mode_TnomVnom

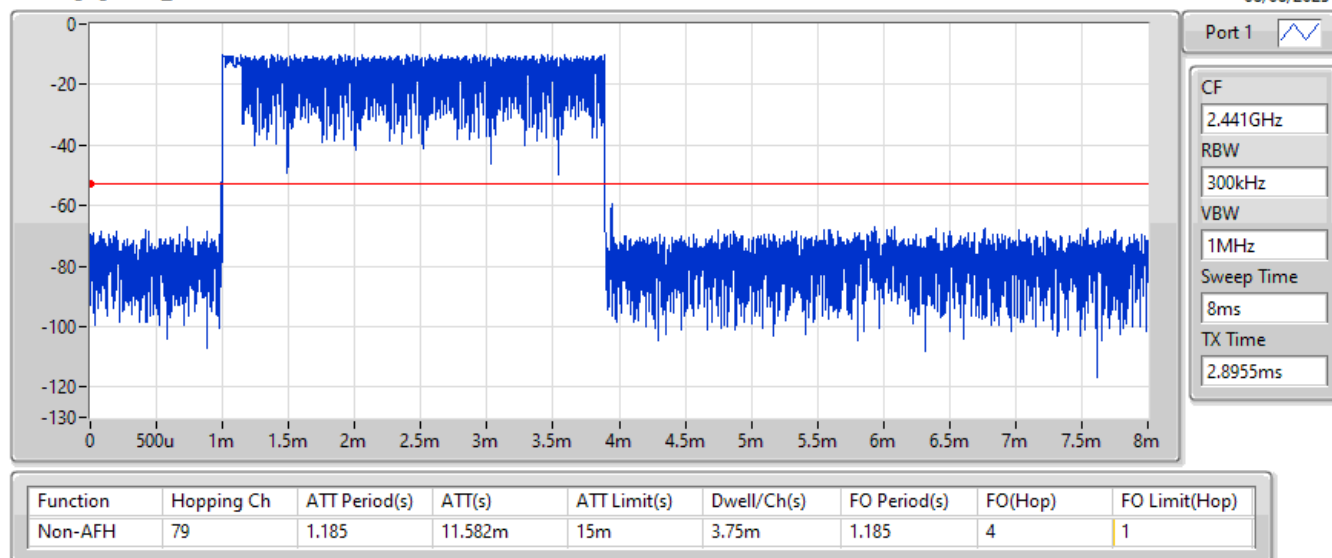
08/08/2023



BT-EDR(3Mbps)

ATT-FS Non-AFH

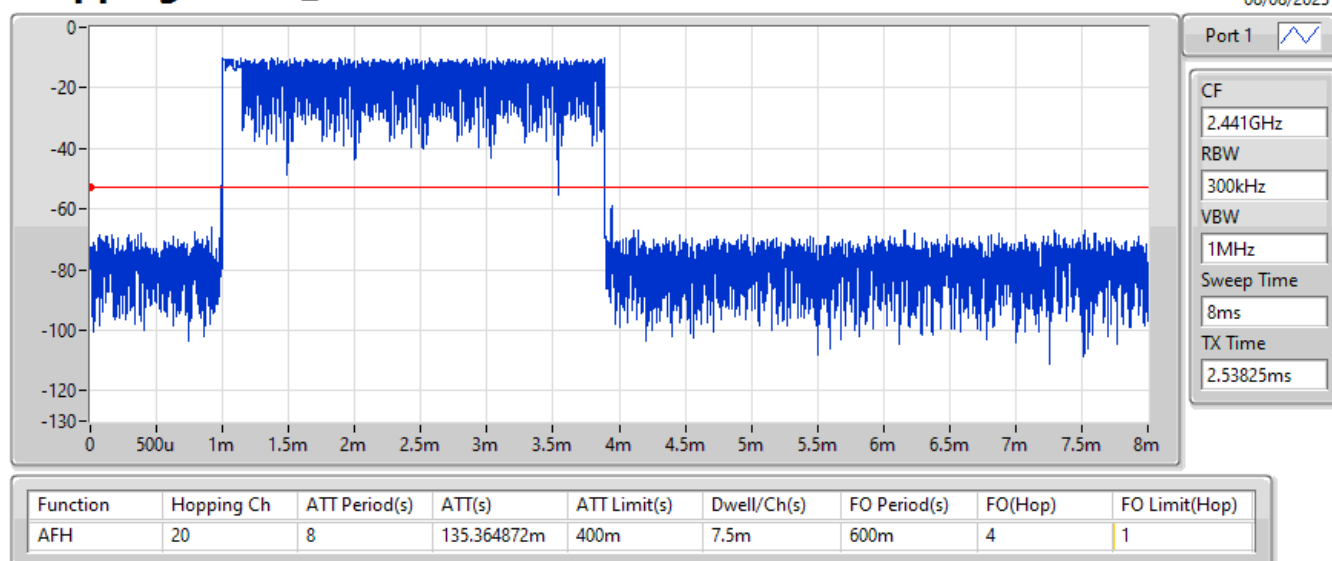
Hopping Mode_TnomVnom



BT-EDR(3Mbps)

ATT-FS AFH

Hopping Mode_TnomVnom



**Configuration 1: Laird part number: 453-00171 (SC module)****Summary**

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

Result

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

**Configuration 2: Laird part number: 453-00172 (SA module)****Summary**

Mode	Max-Dwell (s)
2.4-2.4835GHz	-
BT-BR(1Mbps)	157.43016m
BT-EDR(3Mbps)	109.00652m

Result

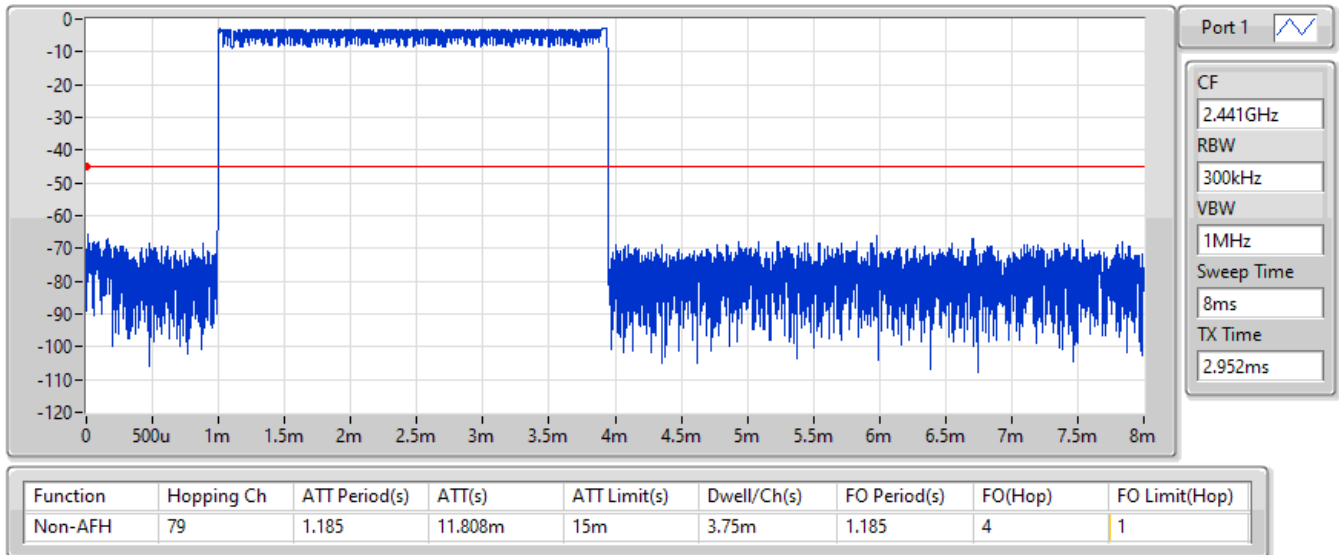
Mode	Result	Function	Hopping Ch	ATT Period (s)	ATT (s)	ATT Limit (s)	Dwell/Ch (s)	FO Period (s)	FO (Hop)	FO Limit (Hop)
BT-BR(1Mbps)	-	-	-	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	Non-AFH	79	1.185	11.808m	15m	3.75m	1.185	4	1
Hopping Mode_Tnom	Pass	AFH	20	8	157.43016m	400m	7.5m	600m	4	1
BT-EDR(3Mbps)	-	-	-	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	Non-AFH	79	1.185	8.175m	15m	3.75m	1.185	4	1
Hopping Mode_Tnom	Pass	AFH	20	8	109.00652m	400m	7.5m	600m	4	1

BT-BR(1Mbps)

ATT-FS Non-AFH

Hopping Mode_TnomVnom

08/08/2023

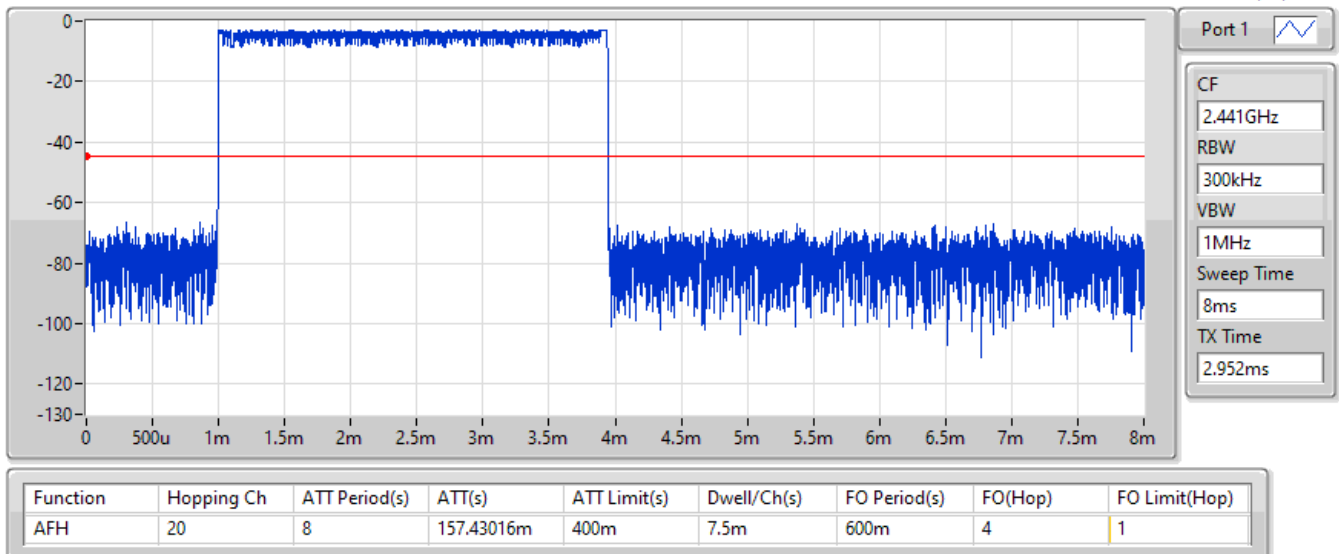


BT-BR(1Mbps)

ATT-FS AFH

Hopping Mode_TnomVnom

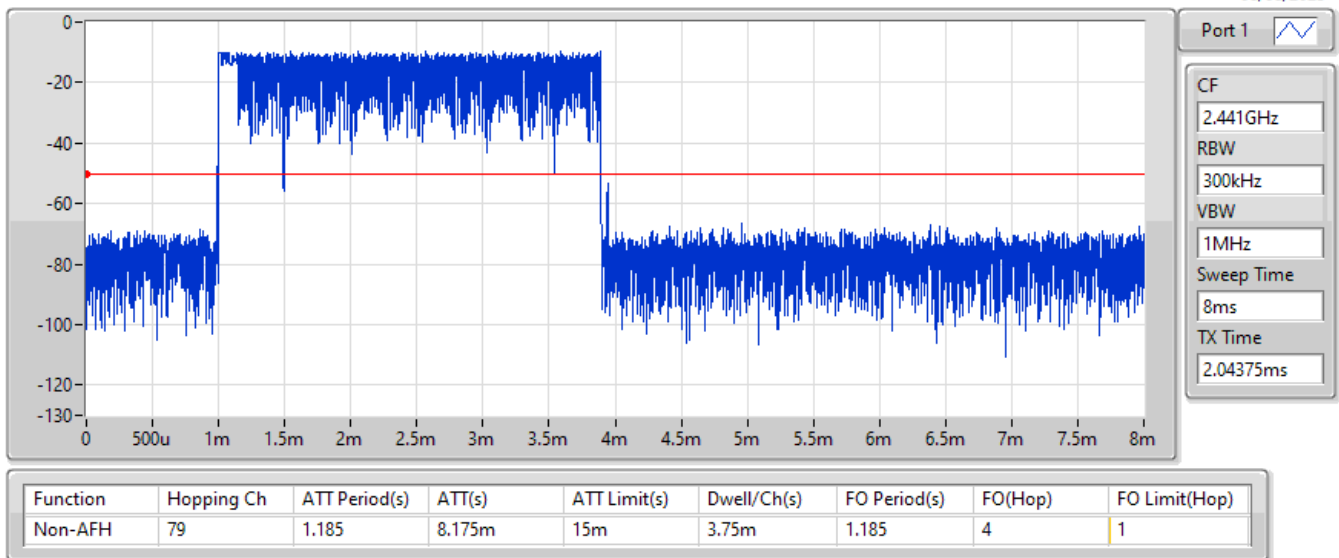
08/08/2023



BT-EDR(3Mbps)

ATT-FS Non-AFH

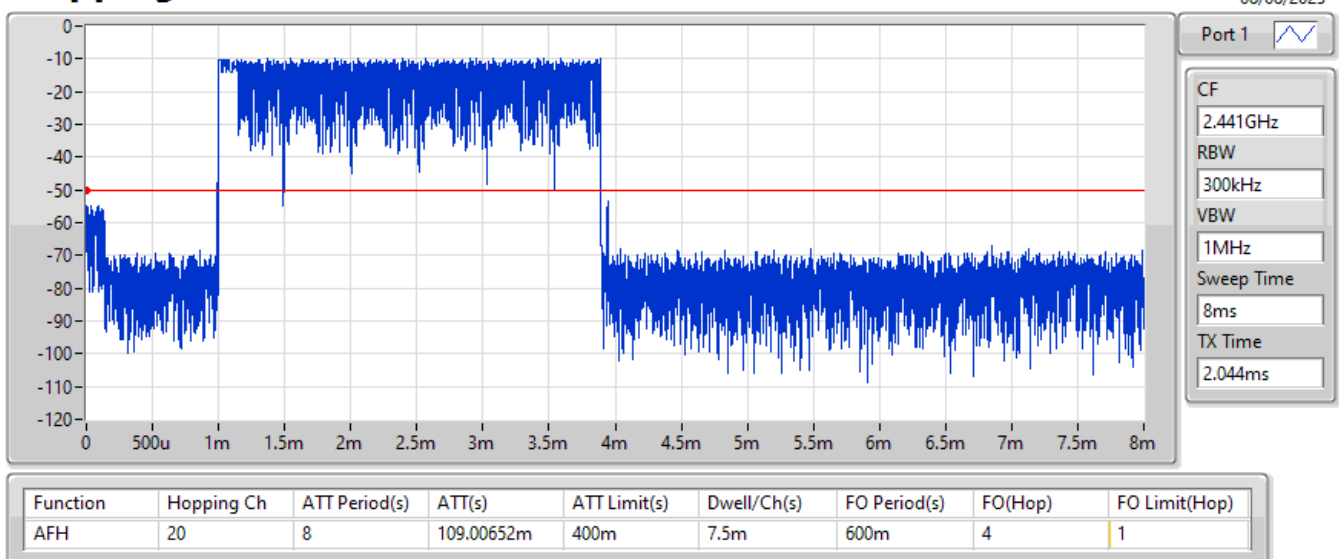
Hopping Mode_TnomVnom



BT-EDR(3Mbps)

ATT-FS AFH

Hopping Mode_TnomVnom



**Configuration 2: Laird part number: 453-00172 (SA module)****Summary**

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

Result

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

**Configuration 1: Laird part number: 453-00171 (SC module)****Summary**

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

Result

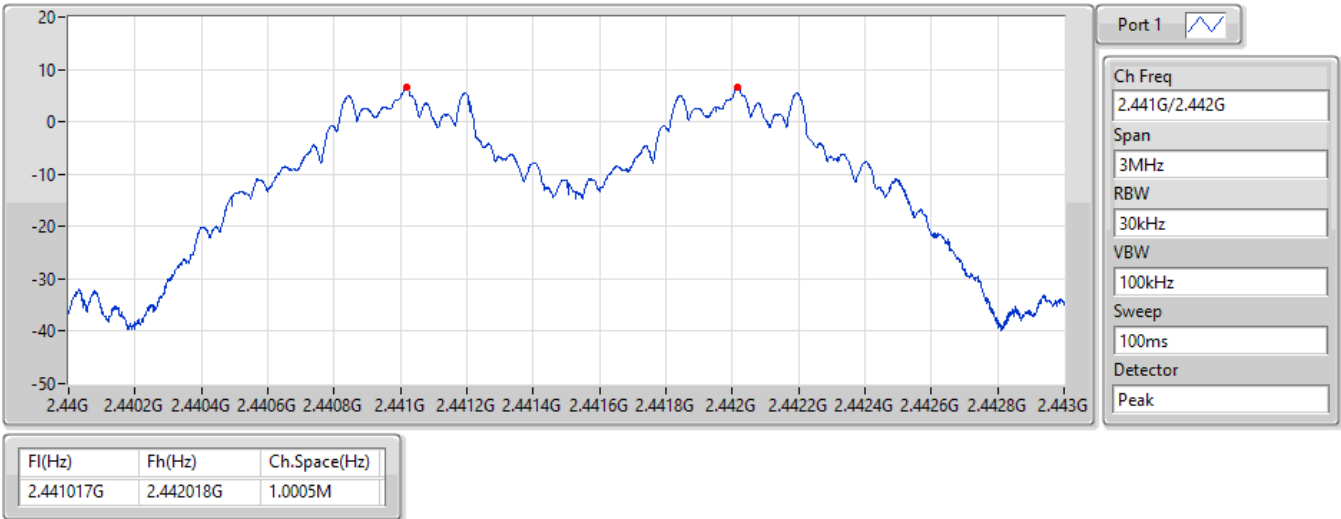
Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz_Tnom	Pass	2.441017G	2.442018G	1.0005M	100k
BT-EDR(3Mbps)	-	-	-	-	-
2441MHz_Tnom	Pass	2.44117G	2.442169G	999k	100k

BT-BR(1Mbps)

2.441G/2.442GHz

Channel Separation-FS

08/08/2023

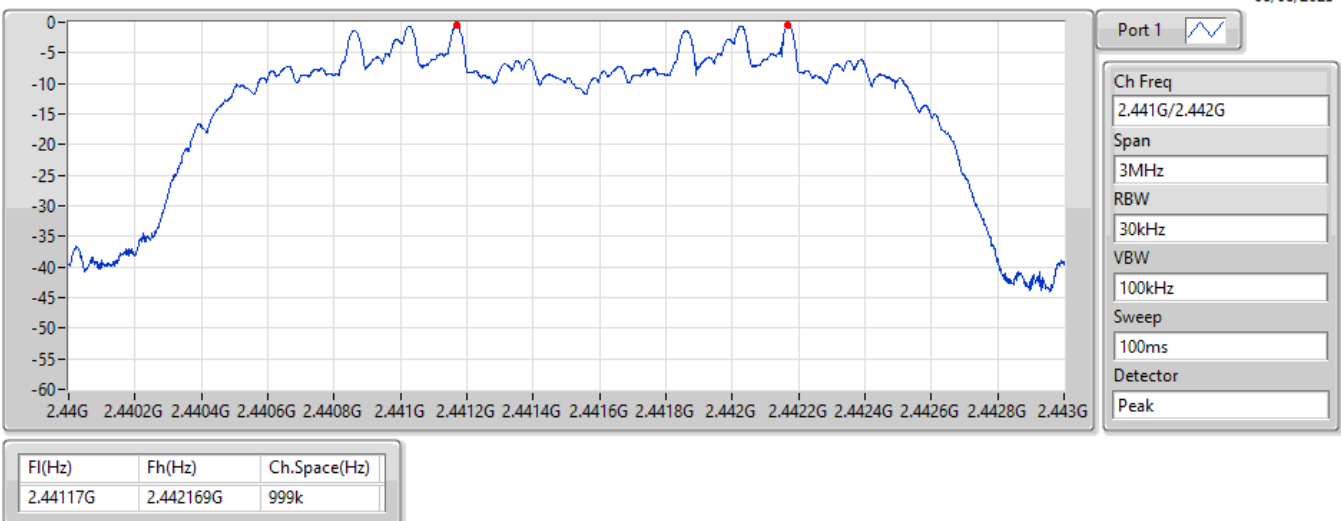


BT-EDR(3Mbps)

2.441G/2.442GHz

Channel Separation-FS

08/08/2023



**Configuration 2: Laird part number: 453-00172 (SA module)****Summary**

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

Result

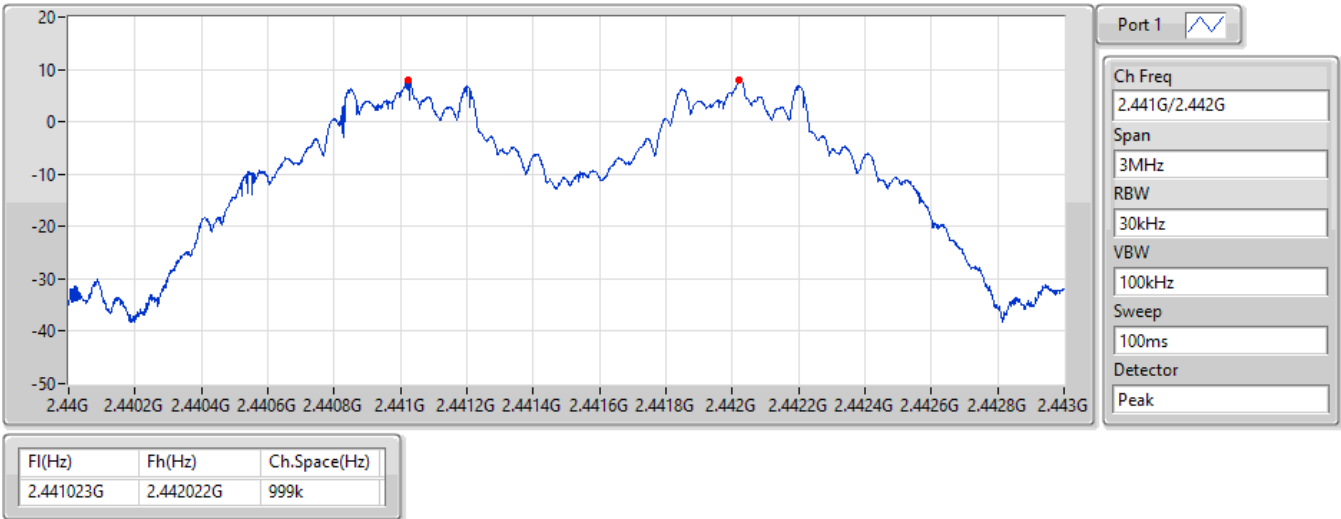
Mode	Result	Fi (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2441MHz_Tnom	Pass	2.441023G	2.442022G	999k	100k
BT-EDR(3Mbps)	-	-	-	-	-
2441MHz_Tnom	Pass	2.441176G	2.442175G	999k	100k

BT-BR(1Mbps)

2.441G/2.442GHz

Channel Separation-FS

08/08/2023



BT-EDR(3Mbps)

2.441G/2.442GHz

Channel Separation-FS

08/08/2023



**Configuration 1: Laird part number: 453-00171 (SC module)****Summary**

Mode	OBW (Hz)	ITU-Code
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	920.175k	920KF1D
BT-EDR(3Mbps)	1.228M	1M23G1D

OBW = 99% occupied bandwidth

Result

Mode	Result	Limit (Hz)	fl-OBW (Hz)	fh-OBW (Hz)	OBW (Hz)	N dB (Hz)
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz_Tnom	Pass	2.4-2.4835G	2.401565G	2.402482G	916.434k	953k
2441MHz_Tnom	Pass	2.4-2.4835G	2.440561G	2.44148G	918.36k	949k
2480MHz_Tnom	Pass	2.4-2.4835G	2.479559G	2.480479G	920.175k	954k
BT-EDR(3Mbps)	-	-	-	-	-	-
2402MHz_Tnom	Pass	2.4-2.4835G	2.401402G	2.402629G	1.227M	1.368M
2441MHz_Tnom	Pass	2.4-2.4835G	2.440399G	2.441626G	1.227M	1.366M
2480MHz_Tnom	Pass	2.4-2.4835G	2.479396G	2.480624G	1.228M	1.366M

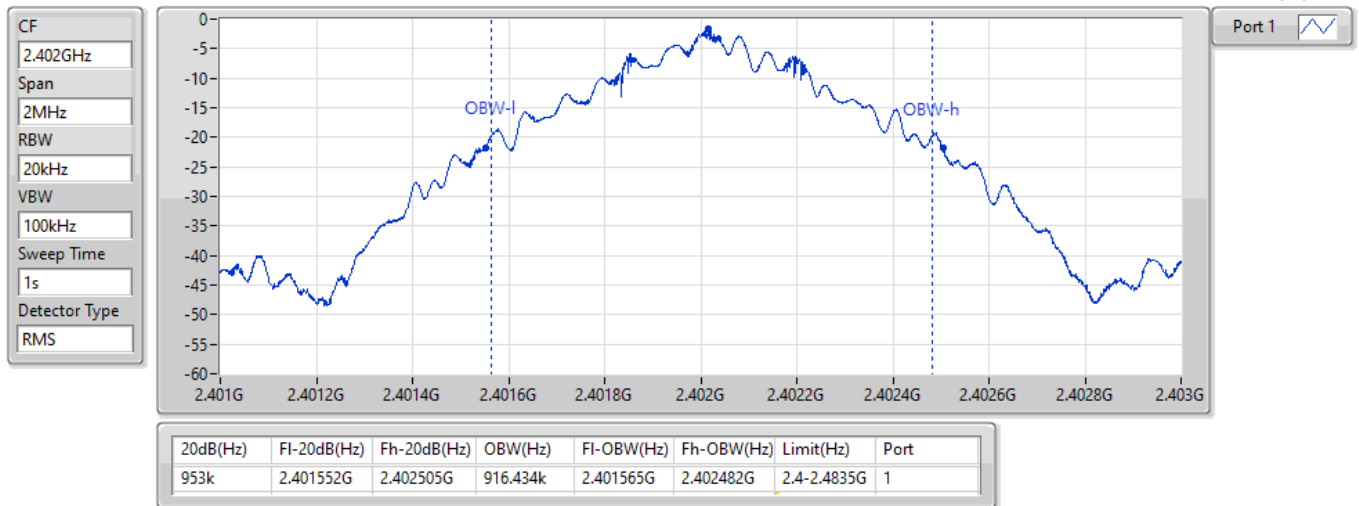
fl-OBW = fl lower edge 99% occupied bandwidth; fh-OBW = fh higher edge 99% occupied bandwidth; OBW = 99% occupied bandwidth;

N dB = 20dB down bandwidth

BT-BR(1Mbps)

EBW-FS

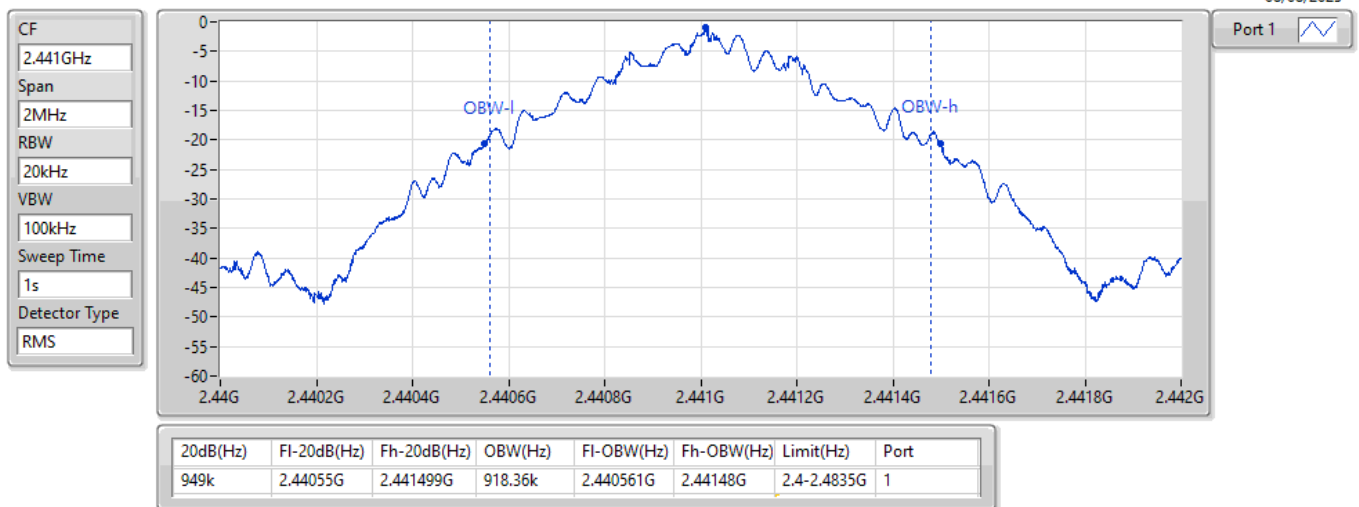
2402MHz



BT-BR(1Mbps)

EBW-FS

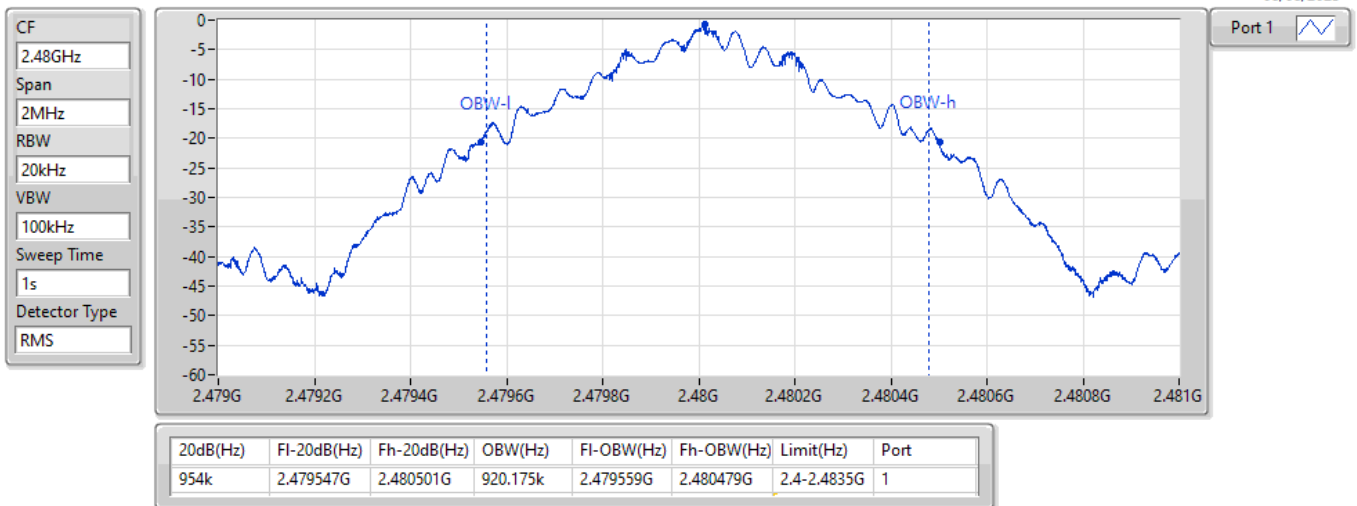
2441MHz



BT-BR(1Mbps)

EBW-FS

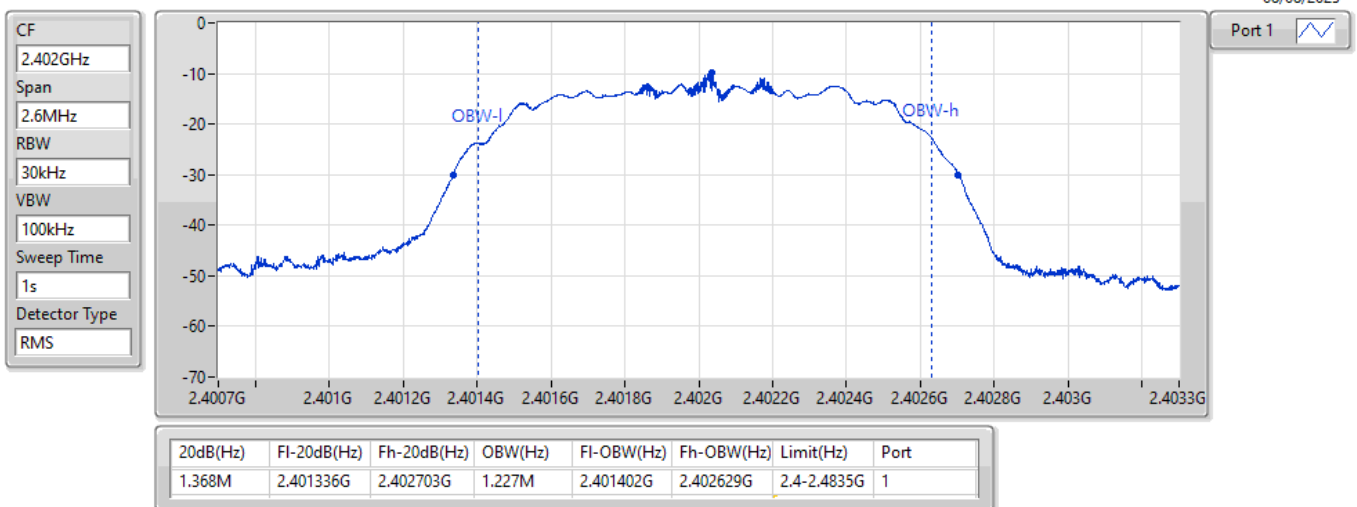
2480MHz



BT-EDR(3Mbps)

EBW-FS

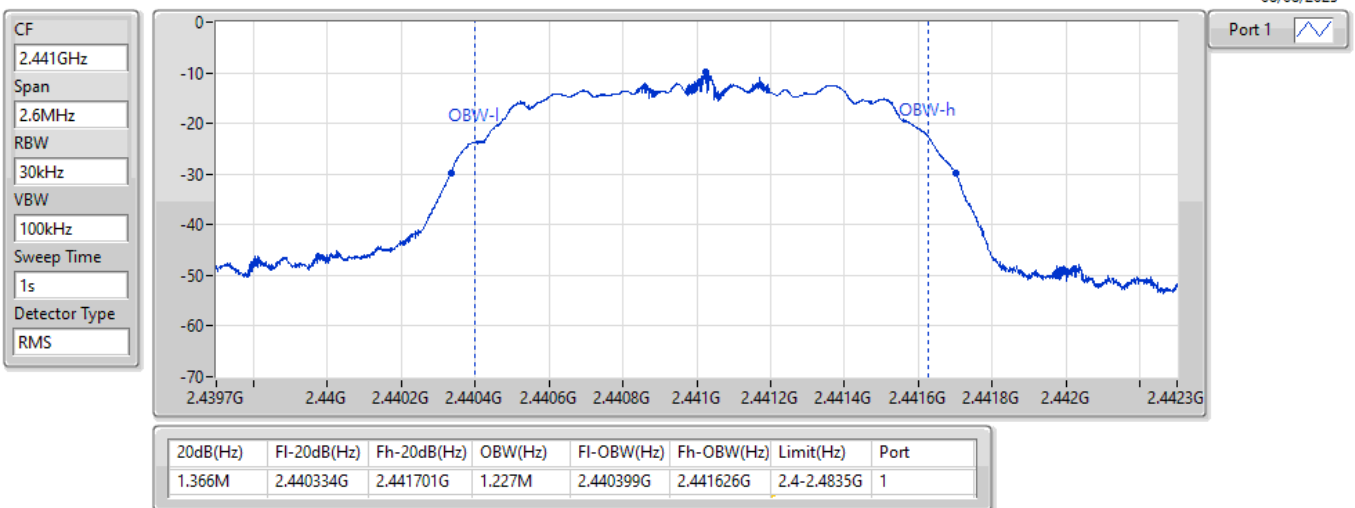
2402MHz



BT-EDR(3Mbps)

EBW-FS

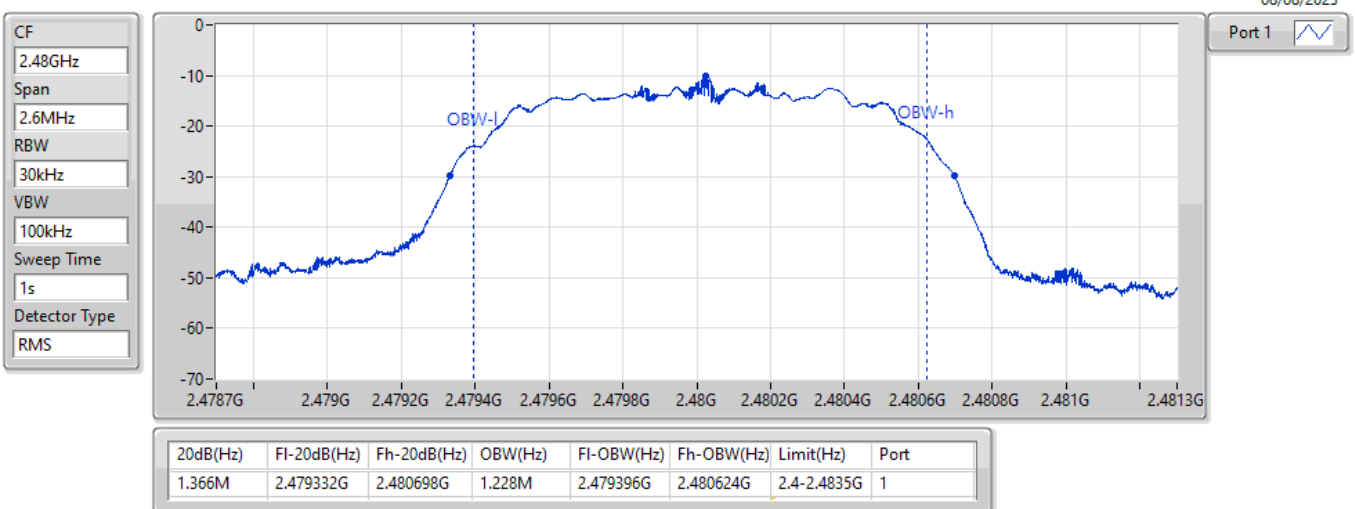
2441MHz



BT-EDR(3Mbps)

EBW-FS

2480MHz



Configuration 2: Laird part number: 453-00172 (SA module)

Summary

Mode	OBW (Hz)	ITU-Code
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	938.494k	938KF1D
BT-EDR(3Mbps)	1.228M	1M23G1D

OBW = 99% occupied bandwidth

Result

Mode	Result	Limit (Hz)	fl-OBW (Hz)	fh-OBW (Hz)	OBW (Hz)	N dB (Hz)
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz_Tnom	Pass	2.4-2.4835G	2.401564G	2.402493G	929.2k	974k
2441MHz_Tnom	Pass	2.4-2.4835G	2.440559G	2.441493G	933.264k	969k
2480MHz_Tnom	Pass	2.4-2.4835G	2.479554G	2.480493G	938.494k	972k
BT-EDR(3Mbps)	-	-	-	-	-	-
2402MHz_Tnom	Pass	2.4-2.4835G	2.401409G	2.402635G	1.226M	1.379M
2441MHz_Tnom	Pass	2.4-2.4835G	2.440406G	2.441633G	1.228M	1.379M
2480MHz_Tnom	Pass	2.4-2.4835G	2.479403G	2.480631G	1.228M	1.379M

fl-OBW = fl lower edge 99% occupied bandwidth; fh-OBW = fh higher edge 99% occupied bandwidth; OBW = 99% occupied bandwidth;

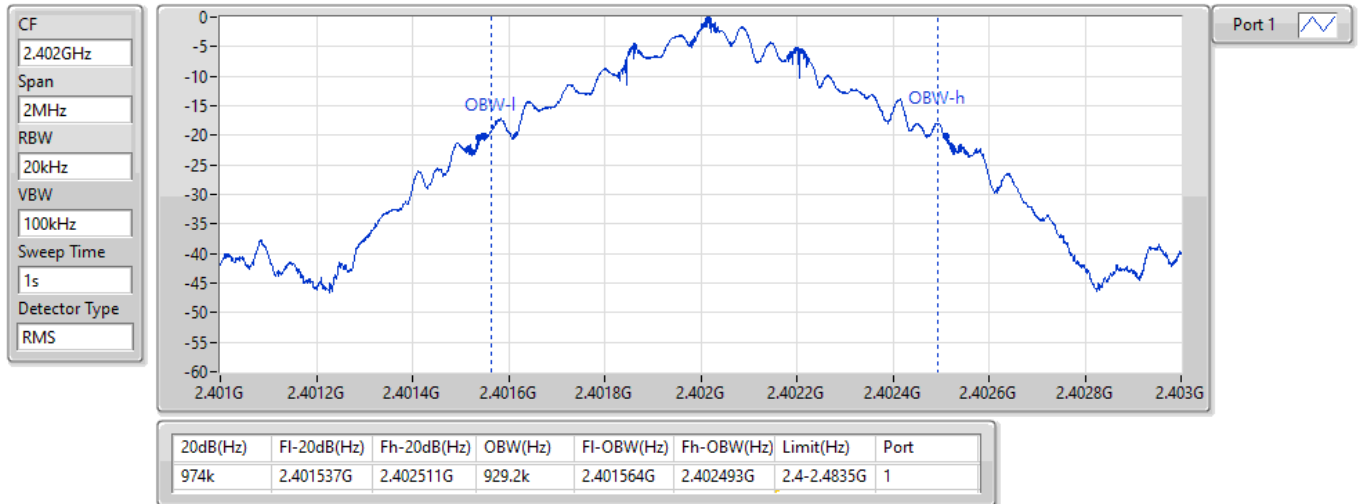
N dB = 20dB down bandwidth

BT-BR(1Mbps)

EBW-FS

2402MHz

08/08/2023



BT-BR(1Mbps)

EBW-FS

2441MHz

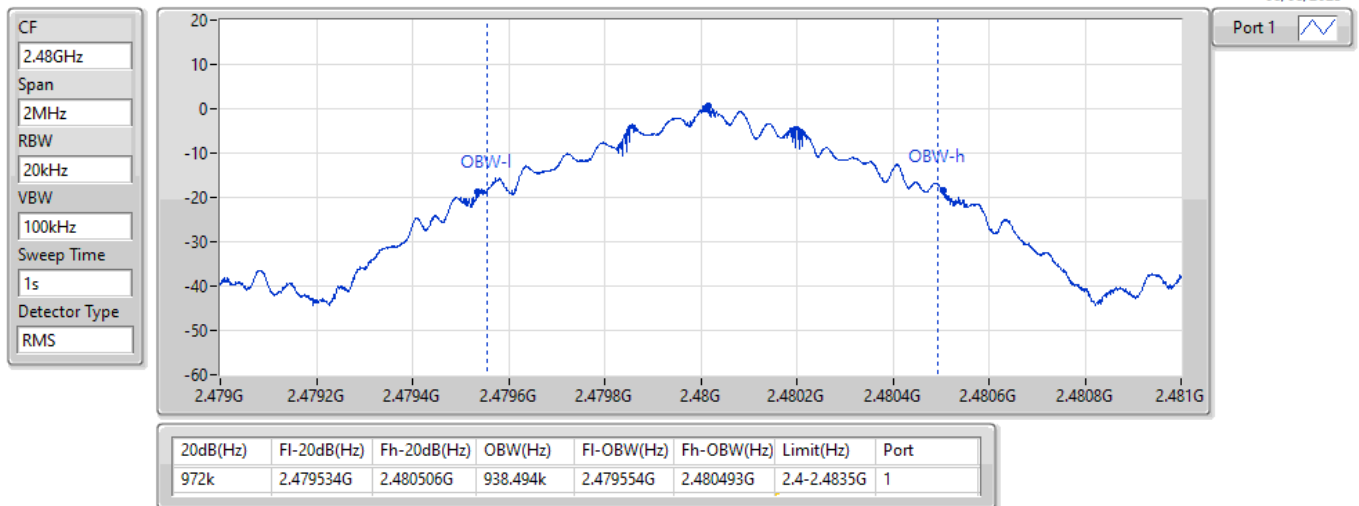
08/08/2023



BT-BR(1Mbps)

EBW-FS

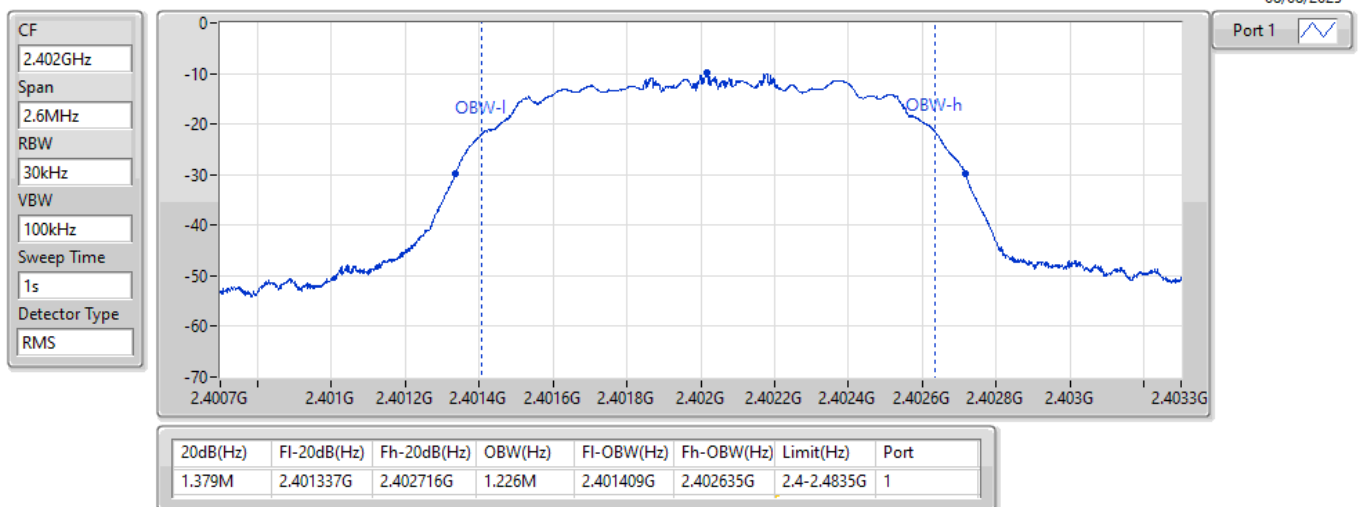
2480MHz



BT-EDR(3Mbps)

EBW-FS

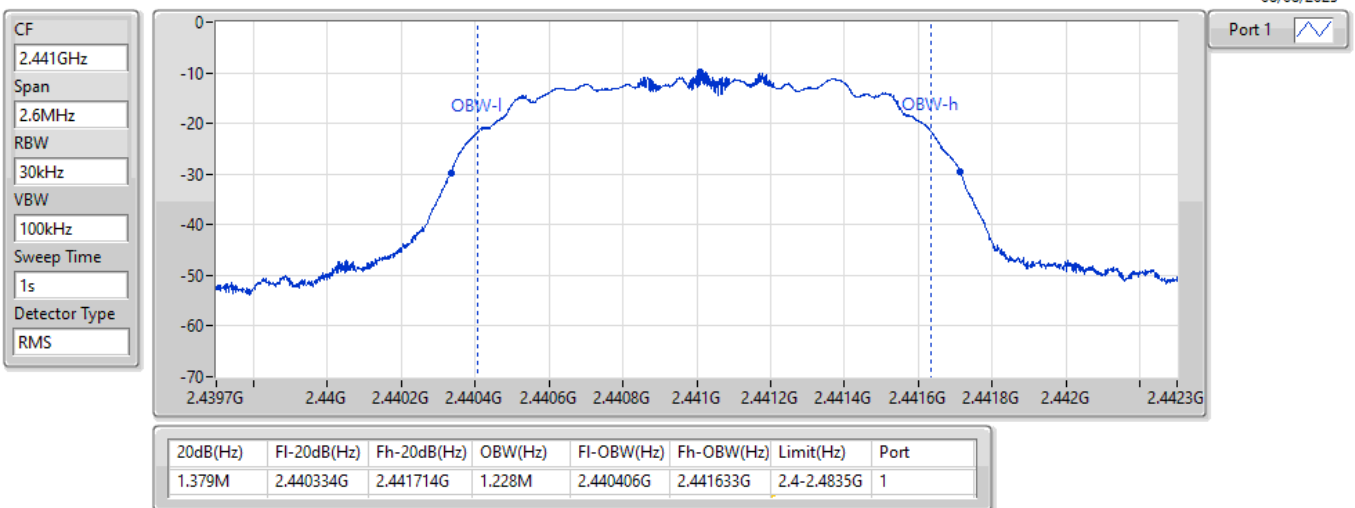
2402MHz



BT-EDR(3Mbps)

EBW-FS

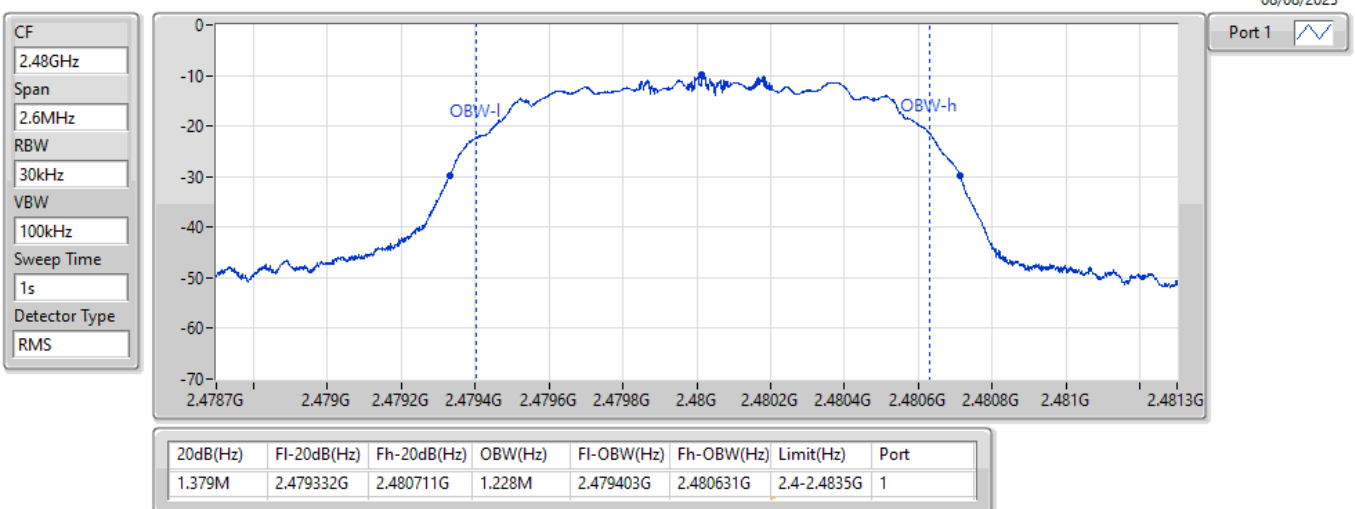
2441MHz



BT-EDR(3Mbps)

EBW-FS

2480MHz



Configuration 1: Laird part number: 453-00171 (SC module)
Summary

Mode	EIRP-A (dBm)	Limit-A (dBm)	EIRP-B (dBm)	Limit-B (dBm)
2.4-2.4835GHz	-	-	-	-
BT-BR(1Mbps)	-46.6	-10	-46.59	-20
BT-EDR(3Mbps)	-41.08	-10	-46.75	-20

Result

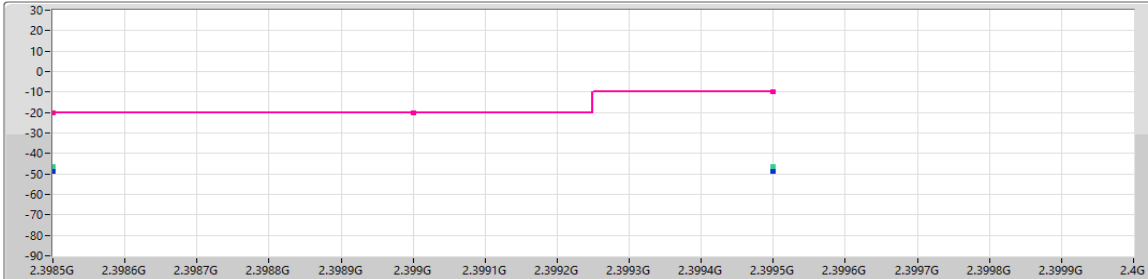
Mode	Result	Freq (Hz)	EIRP (dBm)	Limit (dBm)	Freq (Hz)	EIRP (dBm)	Limit (dBm)
BT-BR(1Mbps)	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	2.3985G	-46.59	-20	2.3995G	-46.60	-10
Hopping Mode_Tnom	Pass	2.485G	-48.36	-20	2.484G	-46.76	-10
BT-EDR(3Mbps)	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	2.398273G	-47.32	-20	2.3995G	-41.08	-10
Hopping Mode_Tnom	Pass	2.485454G	-46.75	-20	2.484G	-48.05	-10

BT-BR(1Mbps)

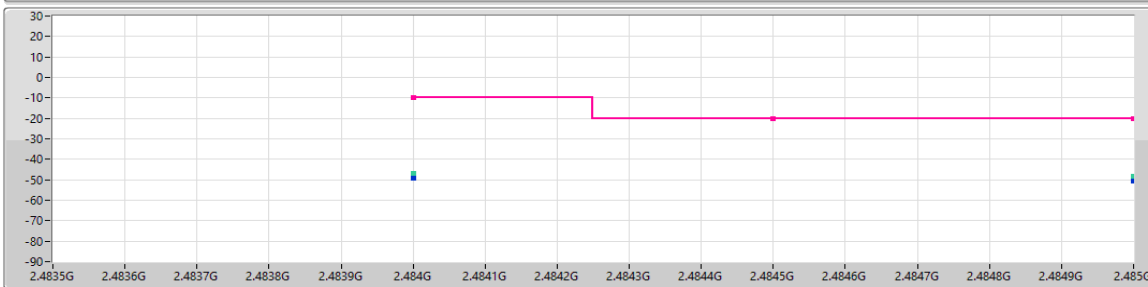
MASK-FS

Hopping Mode_TnomVnom

08/08/2023



Limit
EIRP
Port 1



Limit
EIRP
Port 1

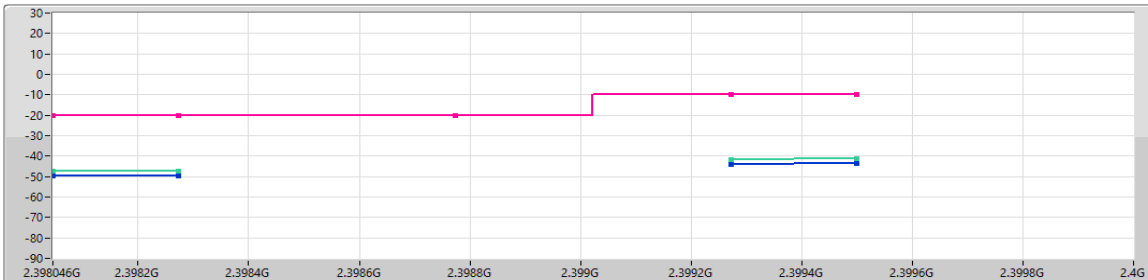
Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3985G	-46.59	-20	2.3995G	-46.60	-10	2.484G	-46.76	-10	2.485G	-48.36	-20

BT-EDR(3Mbps)

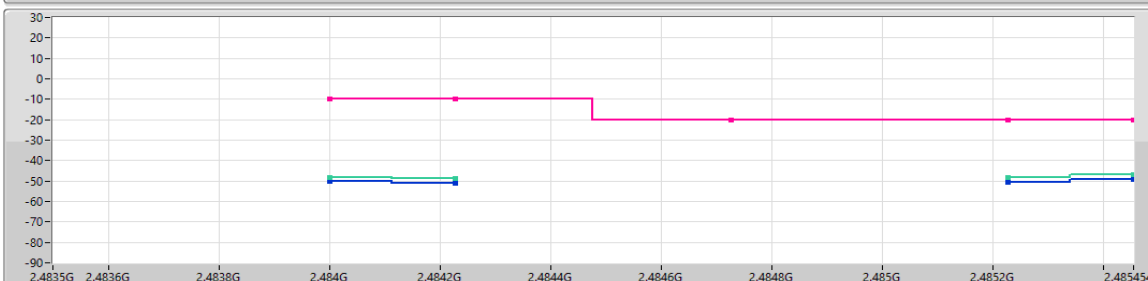
MASK-FS

Hopping Mode_TnomVnom

08/08/2023



Limit
EIRP
Port 1



Limit
EIRP
Port 1

Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398273G	-47.32	-20	2.3995G	-41.08	-10	2.484G	-48.05	-10	2.485454G	-46.75	-20

Configuration 2: Laird part number: 453-00172 (SA module)
Summary

Mode	EIRP-A (dBm)	Limit-A (dBm)	EIRP-B (dBm)	Limit-B (dBm)
2.4-2.4835GHz	-	-	-	-
BT-BR(1Mbps)	-45.31	-10	-47.53	-20
BT-EDR(3Mbps)	-40.19	-10	-48.24	-20

Result

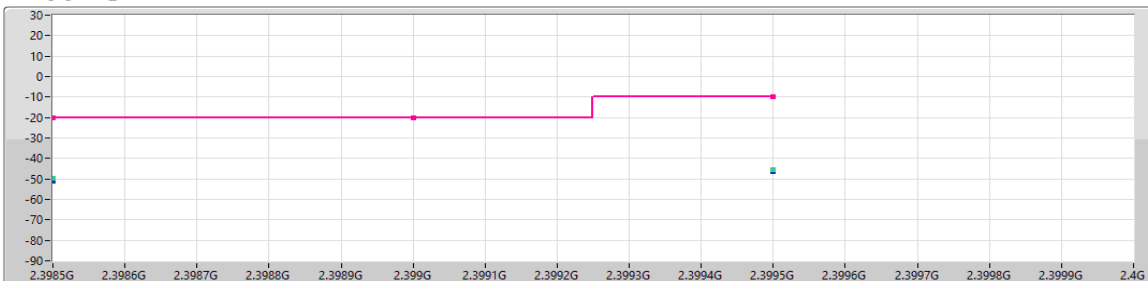
Mode	Result	Freq (Hz)	EIRP (dBm)	Limit (dBm)	Freq (Hz)	EIRP (dBm)	Limit (dBm)
BT-BR(1Mbps)	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	2.3985G	-49.92	-20	2.3995G	-45.31	-10
Hopping Mode_Tnom	Pass	2.485G	-47.53	-20	2.484G	-45.95	-10
BT-EDR(3Mbps)	-	-	-	-	-	-	-
Hopping Mode_Tnom	Pass	2.398272G	-48.24	-20	2.3995G	-40.19	-10
Hopping Mode_Tnom	Pass	2.485228G	-48.27	-20	2.484G	-48.53	-10

BT-BR(1Mbps)

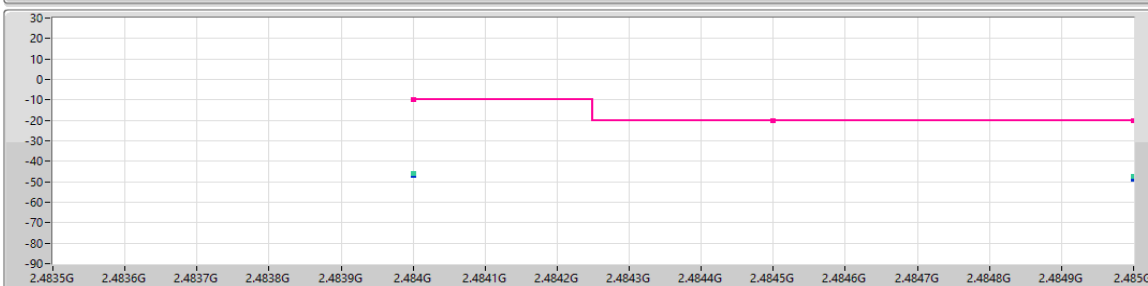
MASK-FS

Hopping Mode_TnomVnom

08/08/2023



Limit
EIRP
Port 1



Limit
EIRP
Port 1

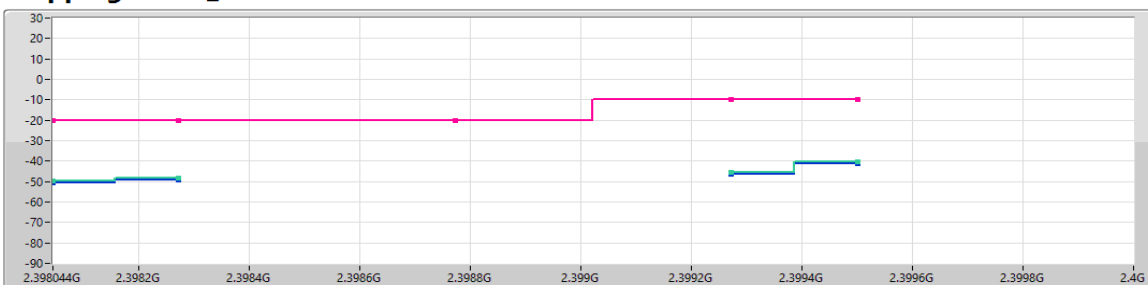
Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.3985G	-49.92	-20	2.3995G	-45.31	-10	2.484G	-45.95	-10	2.485G	-47.53	-20

BT-EDR(3Mbps)

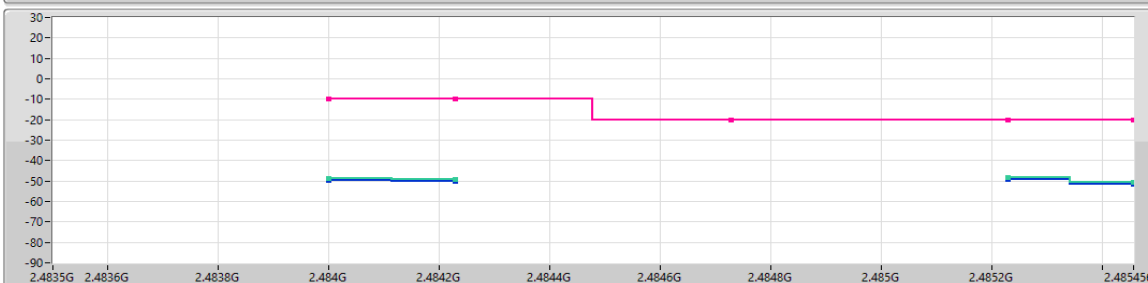
MASK-FS

Hopping Mode_TnomVnom

08/08/2023



Limit
EIRP
Port 1



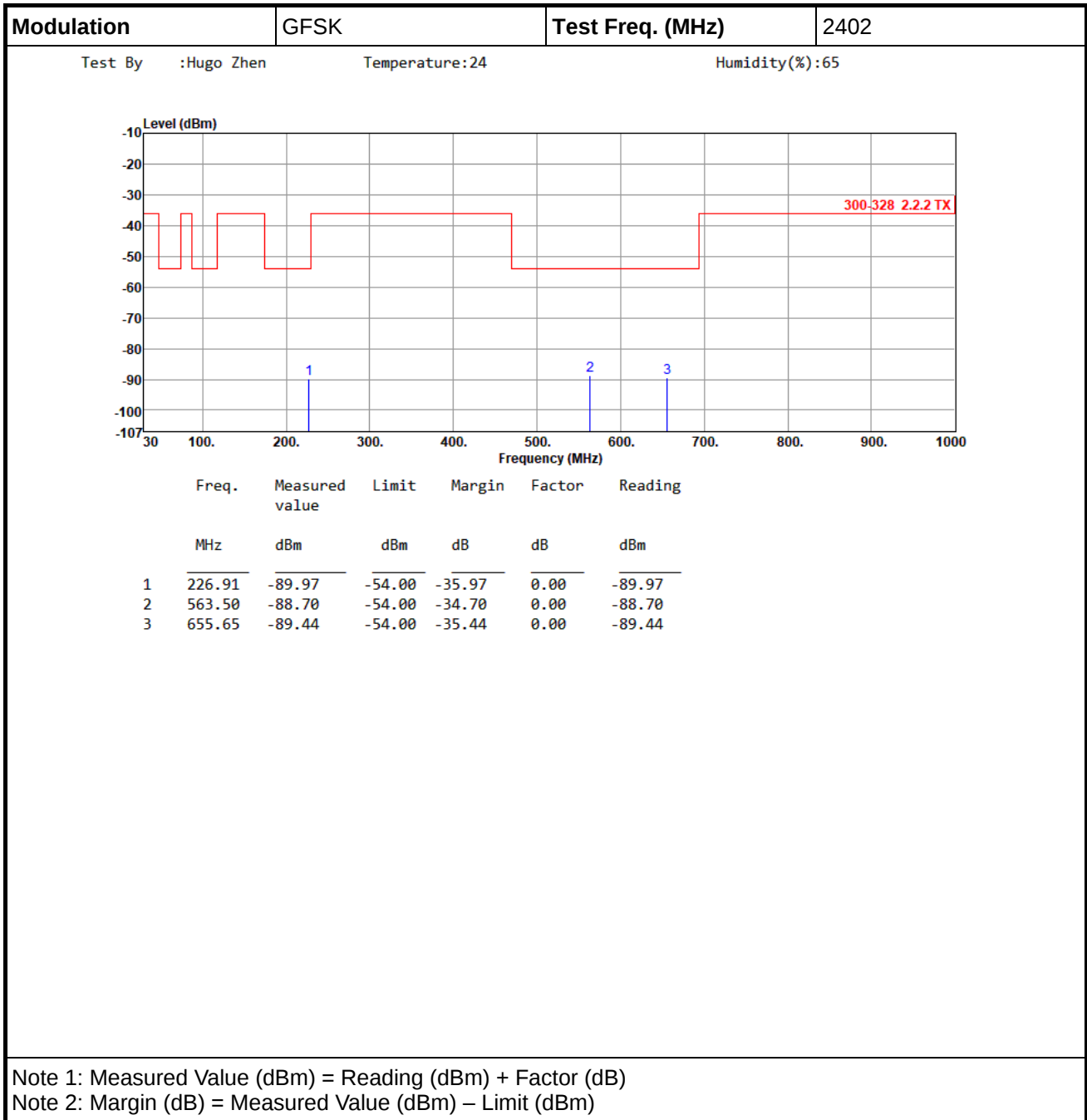
Limit
EIRP
Port 1

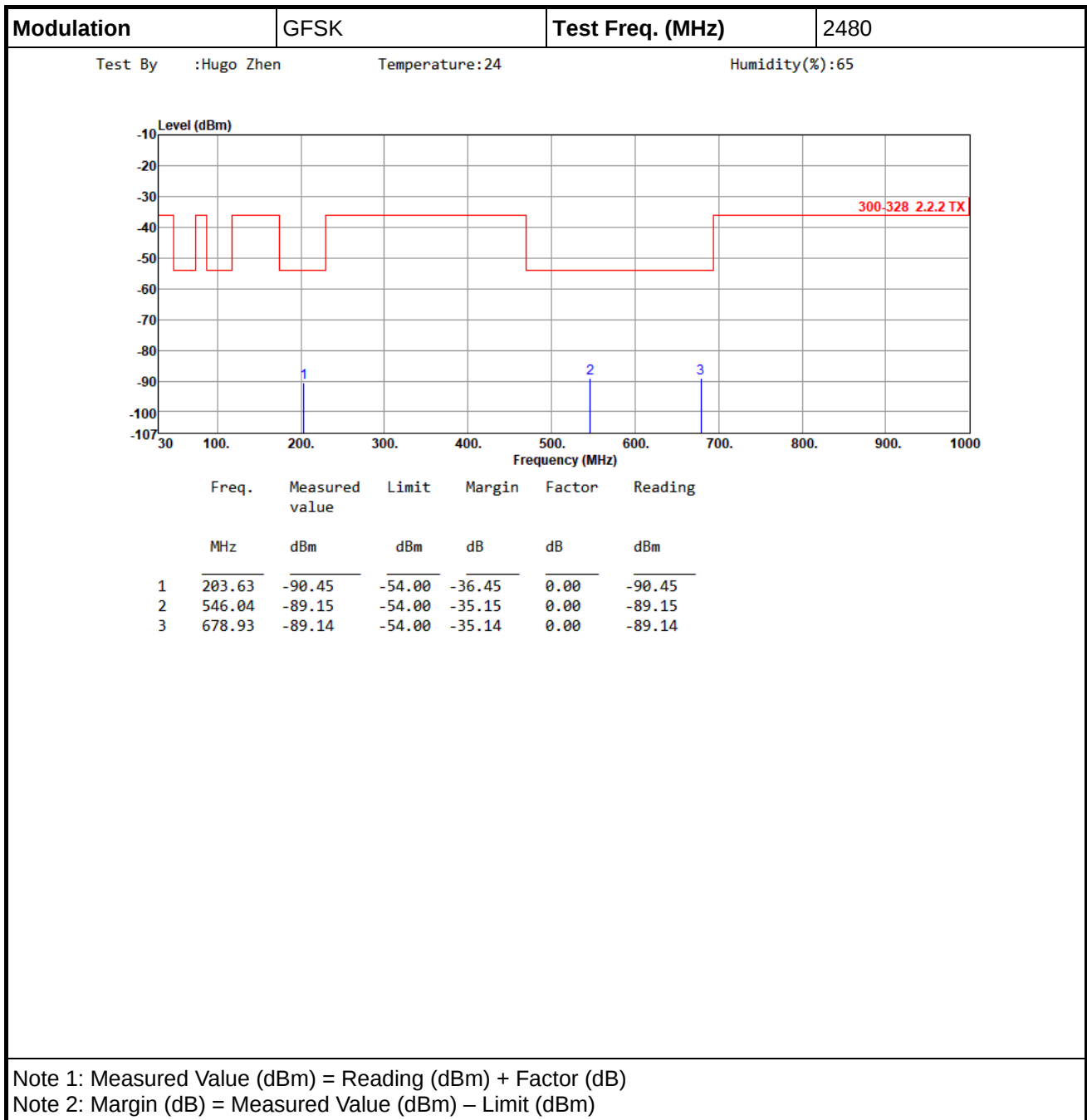
Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398272G	-48.24	-20	2.3995G	-40.19	-10	2.484G	-48.53	-10	2.485228G	-48.27	-20

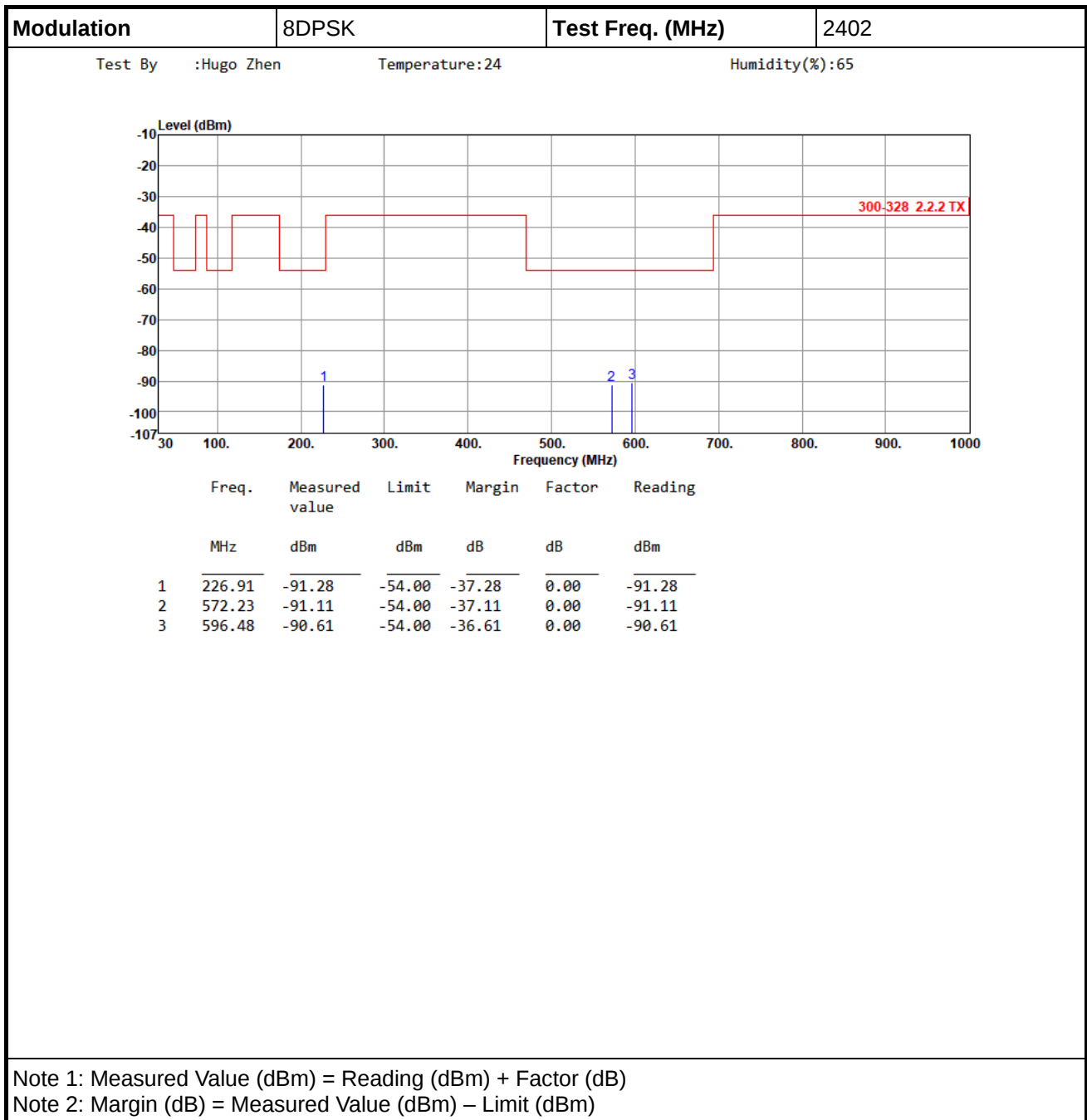


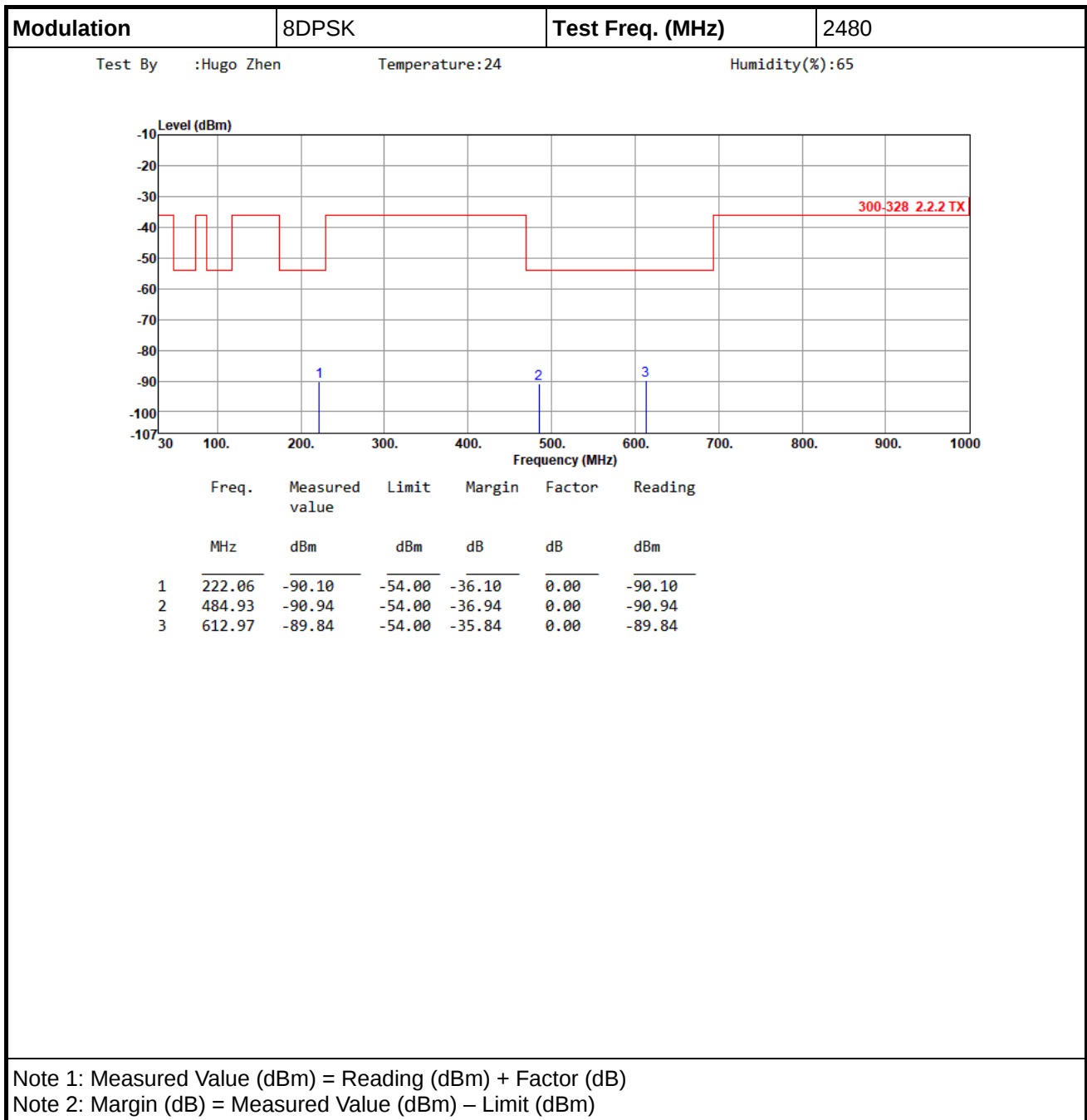
Configuration 1: Laird part number: 453-00171 (SC module)

Conducted Unwanted Emissions (Below 1GHz)



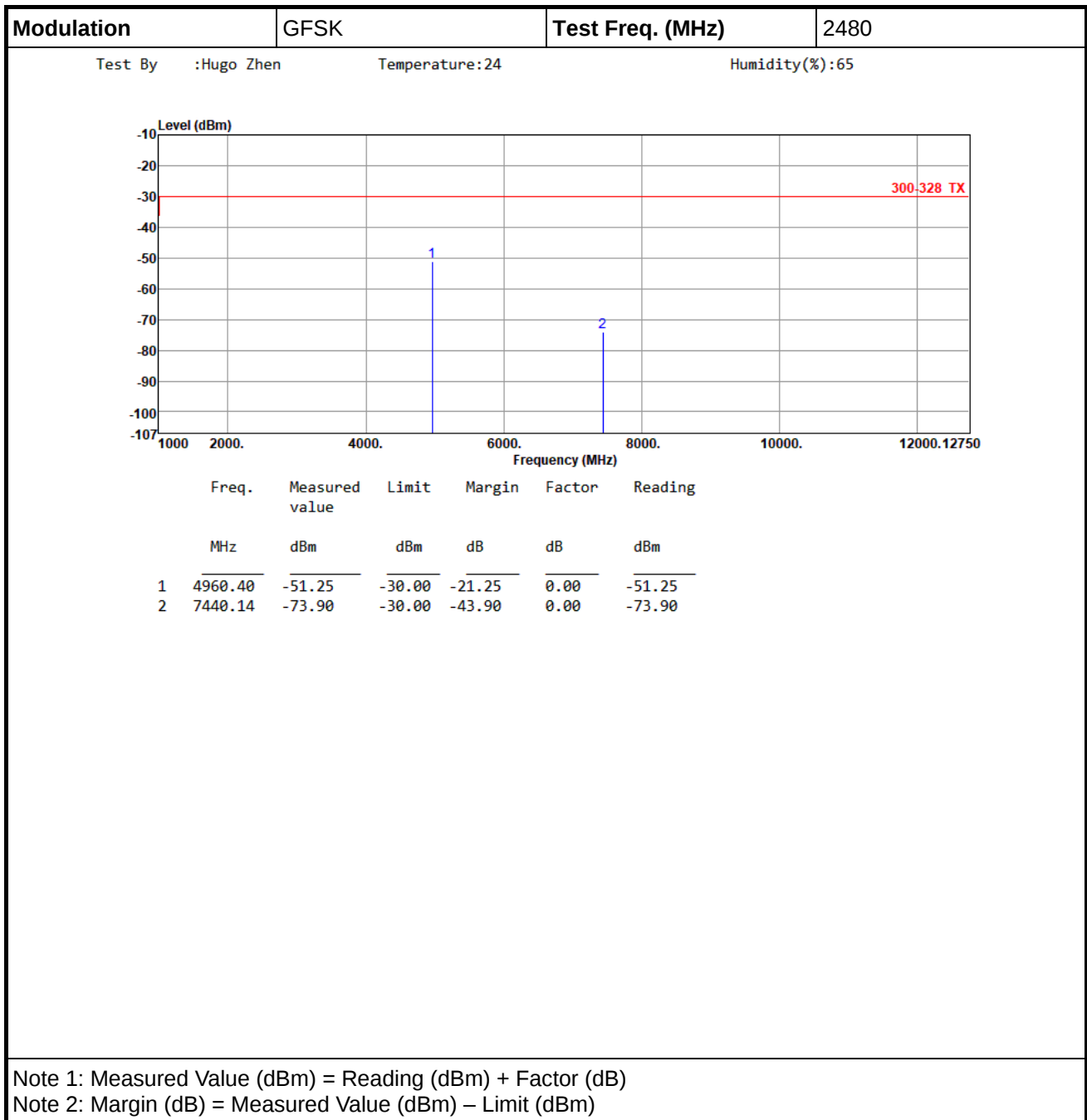


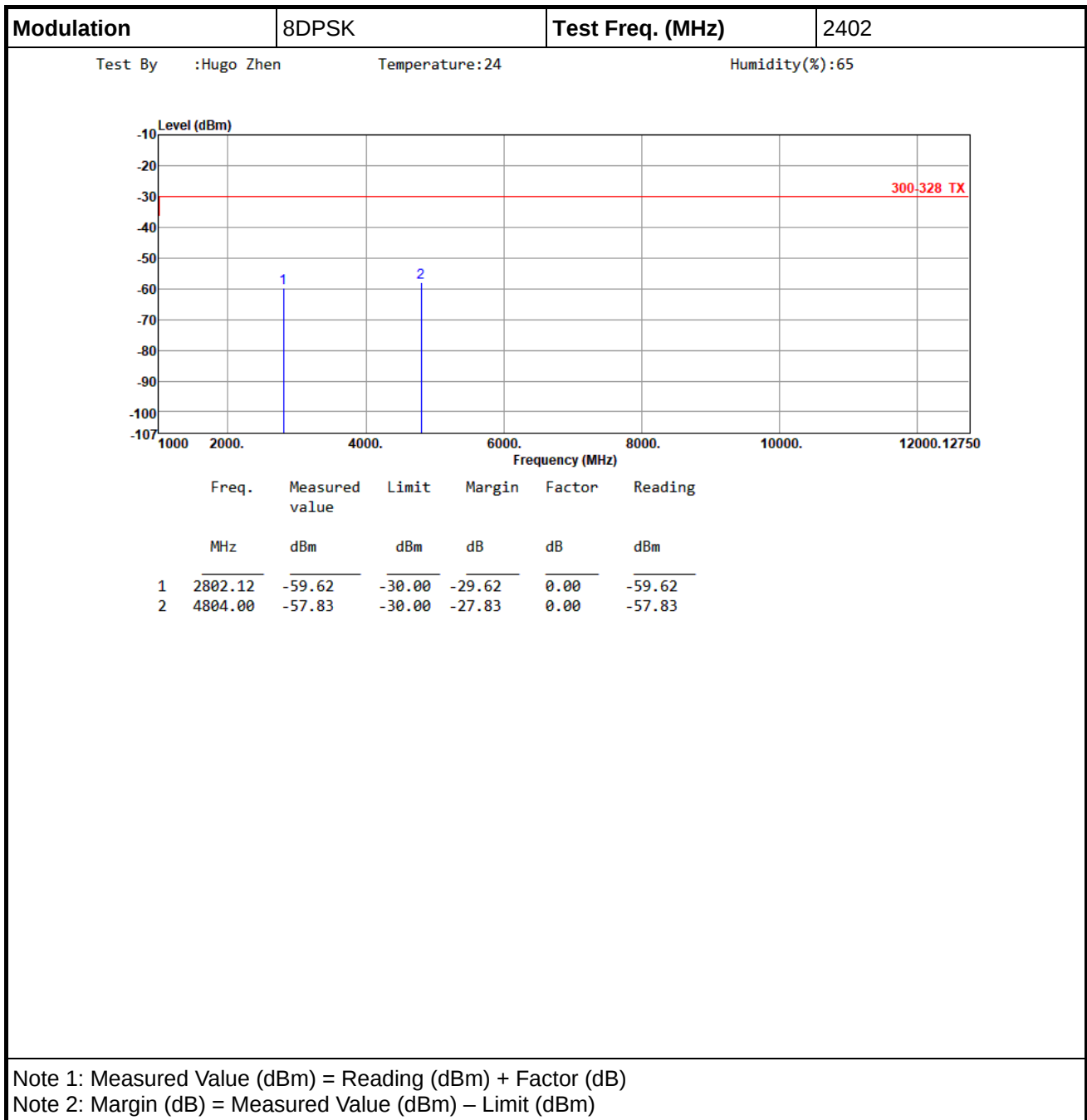


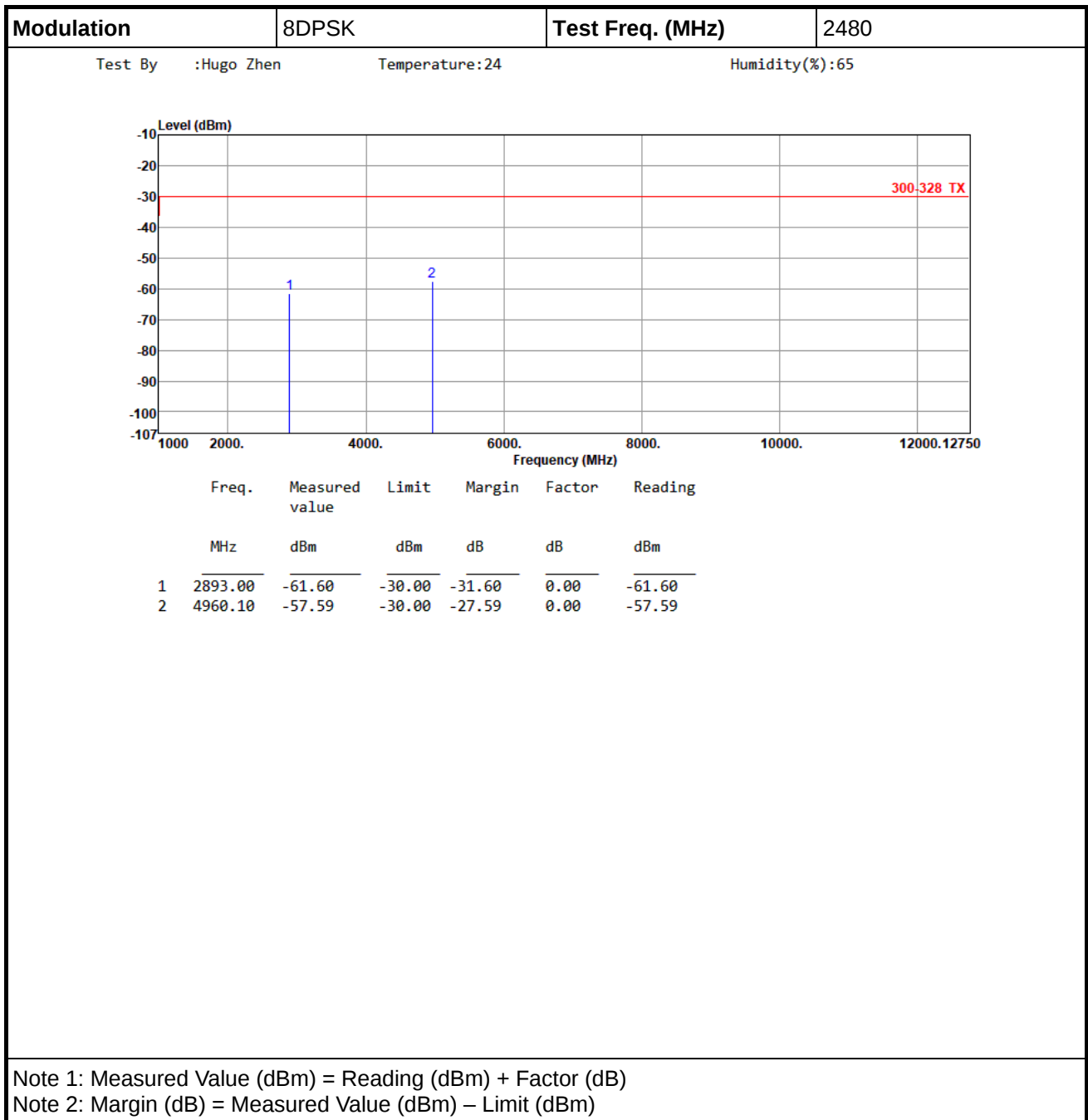


Conducted Unwanted Emissions (Above 1GHz)

Modulation		GFSK		Test Freq. (MHz)		2402	
Test By		:Hugo Zhen		Temperature:24		Humidity(%):65	
Level (dBm)							



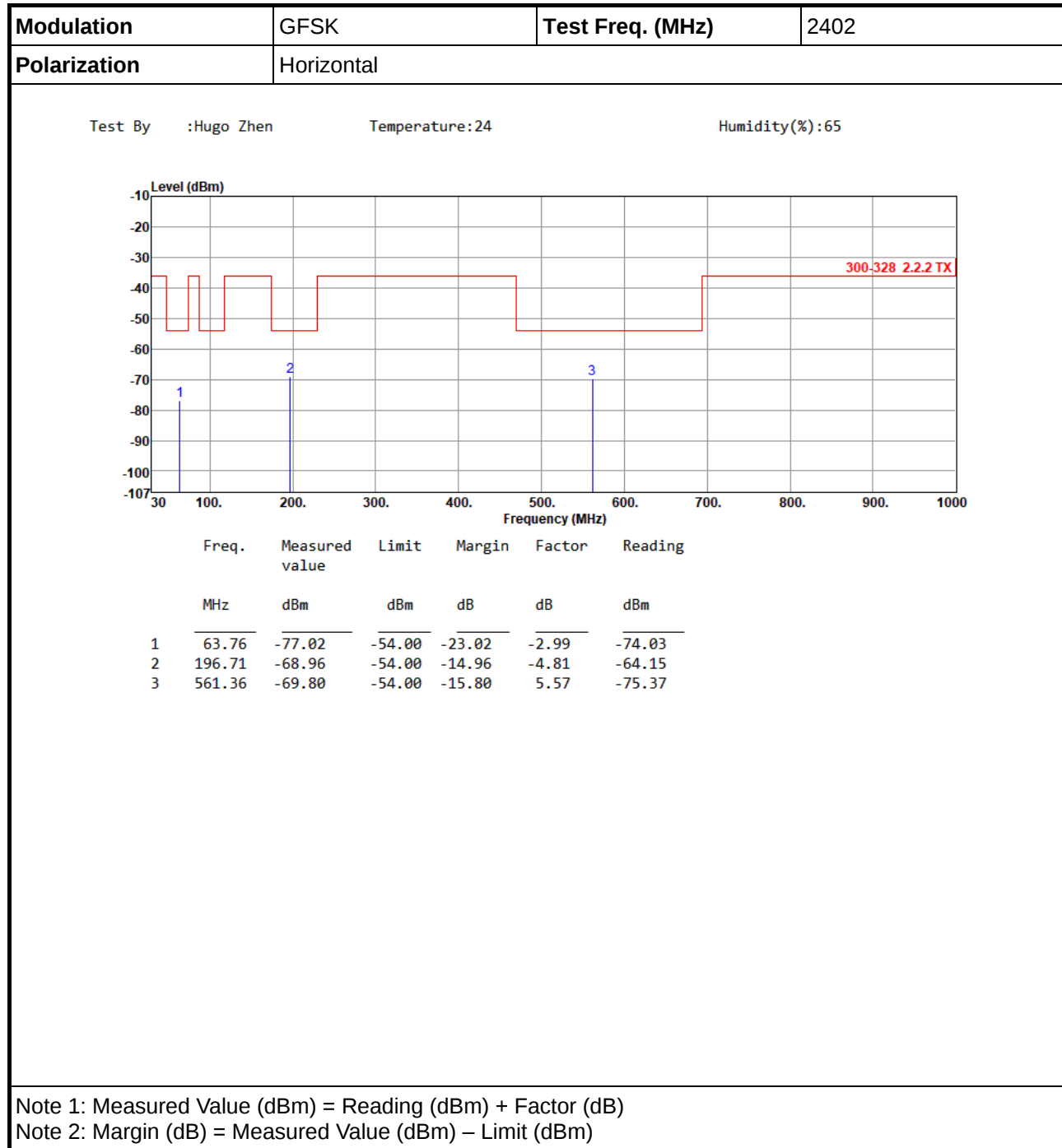






Configuration 1: Laird part number: 453-00171 (SC module)

Radiated Unwanted Emissions (Below 1GHz)





Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Radiated Unwanted Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Transmitter Spurious Emissions

Appendix F

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Transmitter Spurious Emissions

Appendix F

Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
<			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Transmitter Spurious Emissions

Appendix F

Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
</			

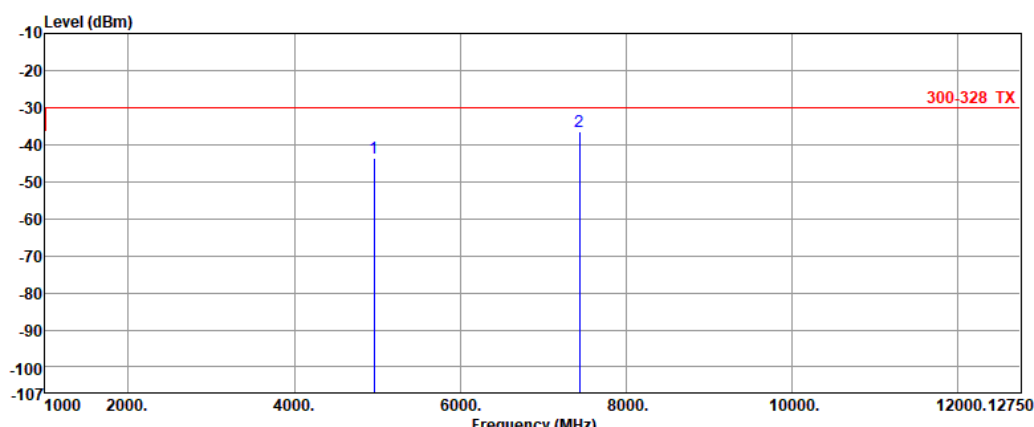


Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By :Hugo Zhen

Temperature:24

Humidity(%):65



Freq.	Measured value	Limit	Margin	Factor	Reading
MHz	dBm	dBm	dB	dB	dBm
1 4960.18	-43.76	-30.00	-13.76	13.27	-57.03
2 7439.77	-36.48	-30.00	-6.48	19.48	-55.96

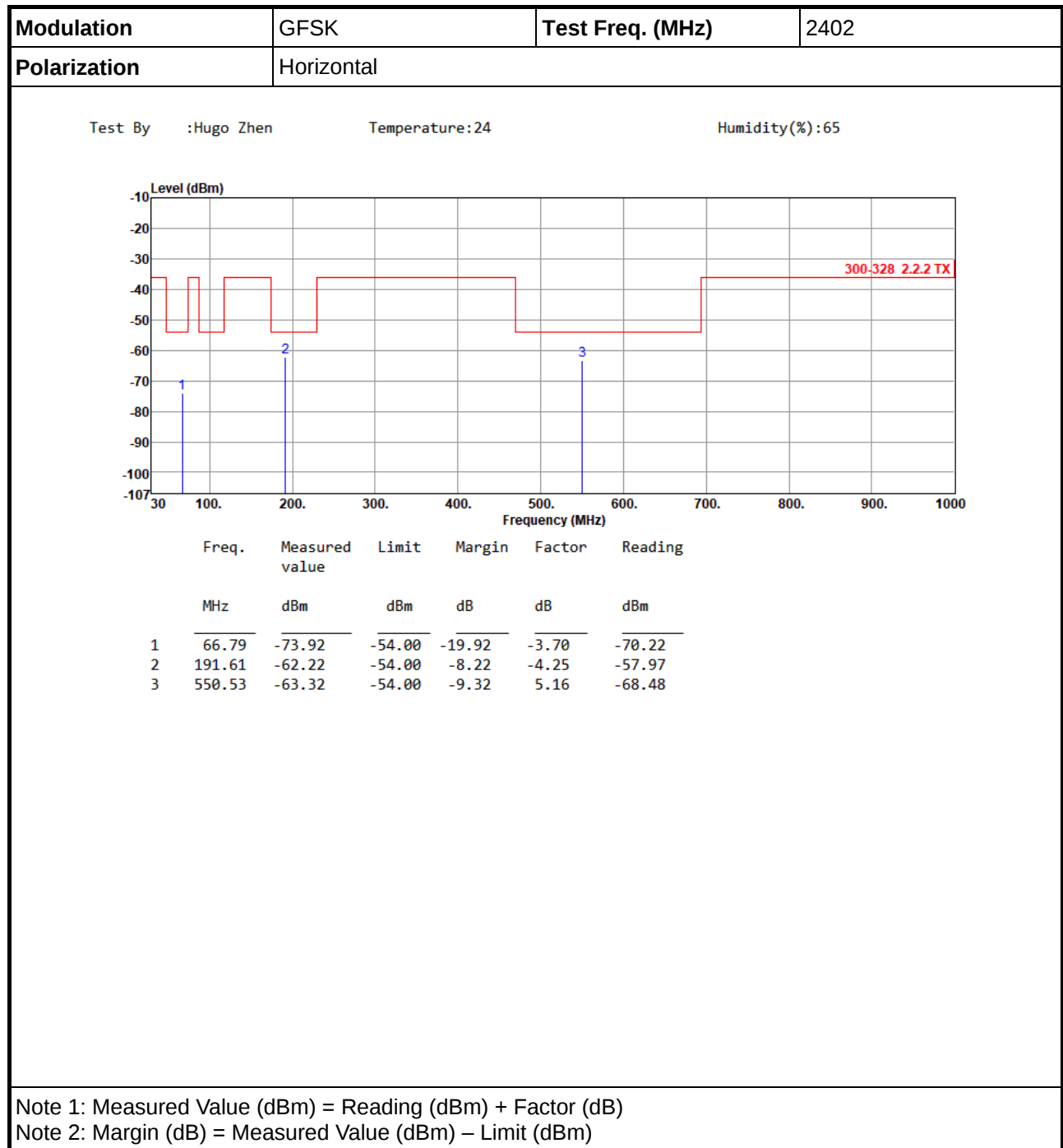
Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)



Configuration 2: Laird part number: 453-00172 (SA module)

Radiated Unwanted Emissions (Below 1GHz)





Transmitter Spurious Emissions

Appendix F

Modulation	GFSK	Test Freq. (MHz)	2402																																	
Polarization	Vertical																																			
Test By :Hugo Zhen Temperature:24 Humidity(%):65																																				
Level (dBm) Frequency (MHz) <table><tr><th>Freq.</th><th>Measured value</th><th>Limit</th><th>Margin</th><th>Factor</th><th>Reading</th></tr><tr><th>MHz</th><th>dBm</th><th>dBm</th><th>dB</th><th>dB</th><th>dBm</th></tr><tr><td>1</td><td>66.68</td><td>-60.23</td><td>-54.00</td><td>-6.23</td><td>-3.84</td><td>-56.39</td></tr><tr><td>2</td><td>522.07</td><td>-68.66</td><td>-54.00</td><td>-14.66</td><td>4.32</td><td>-72.98</td></tr><tr><td>3</td><td>588.75</td><td>-67.84</td><td>-54.00</td><td>-13.84</td><td>6.19</td><td>-74.03</td></tr></table>				Freq.	Measured value	Limit	Margin	Factor	Reading	MHz	dBm	dBm	dB	dB	dBm	1	66.68	-60.23	-54.00	-6.23	-3.84	-56.39	2	522.07	-68.66	-54.00	-14.66	4.32	-72.98	3	588.75	-67.84	-54.00	-13.84	6.19	-74.03
Freq.	Measured value	Limit	Margin	Factor	Reading																															
MHz	dBm	dBm	dB	dB	dBm																															
1	66.68	-60.23	-54.00	-6.23	-3.84	-56.39																														
2	522.07	-68.66	-54.00	-14.66	4.32	-72.98																														
3	588.75	-67.84	-54.00	-13.84	6.19	-74.03																														
Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB) Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)																																				



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			

Radiated Unwanted Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			

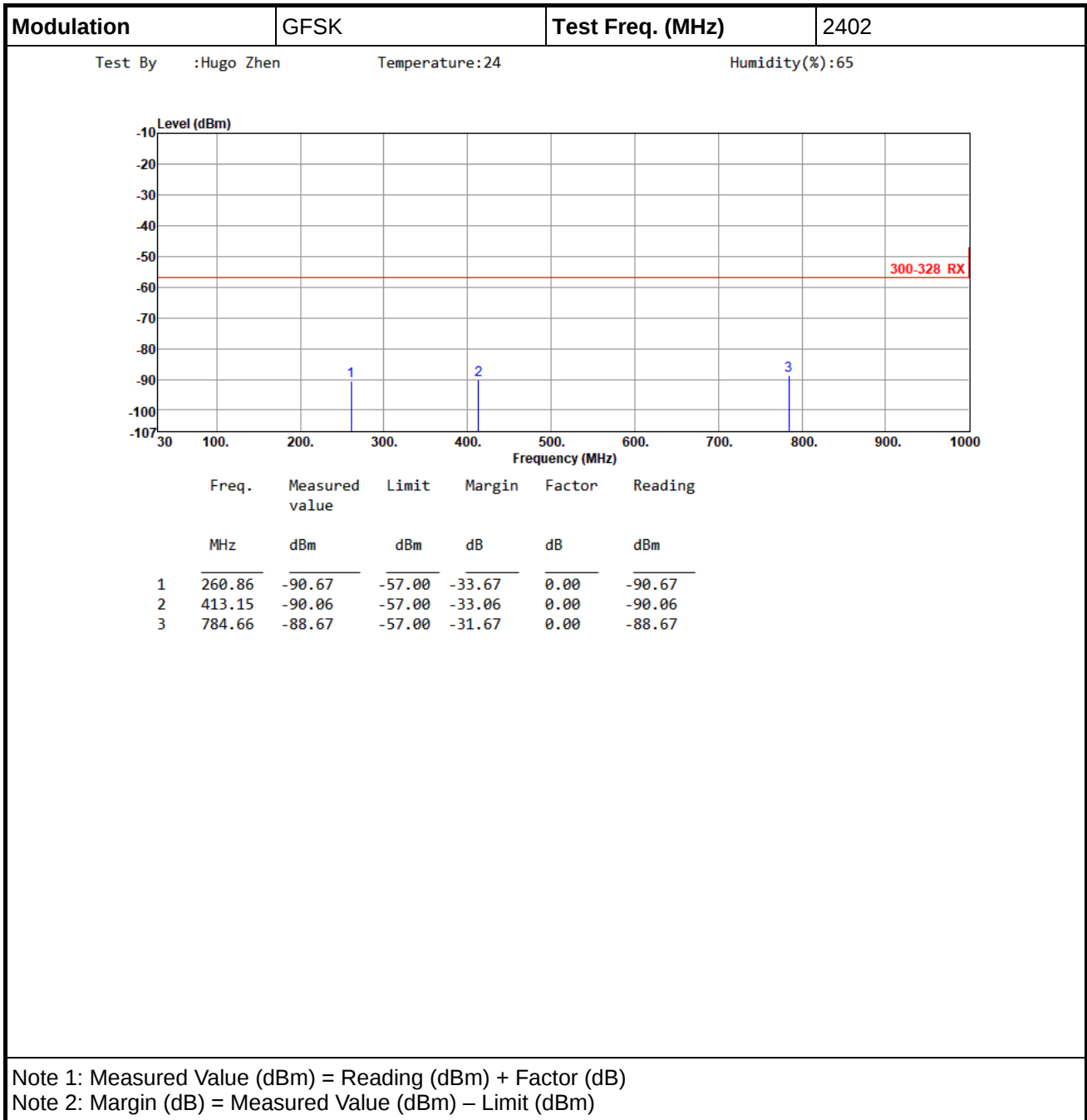


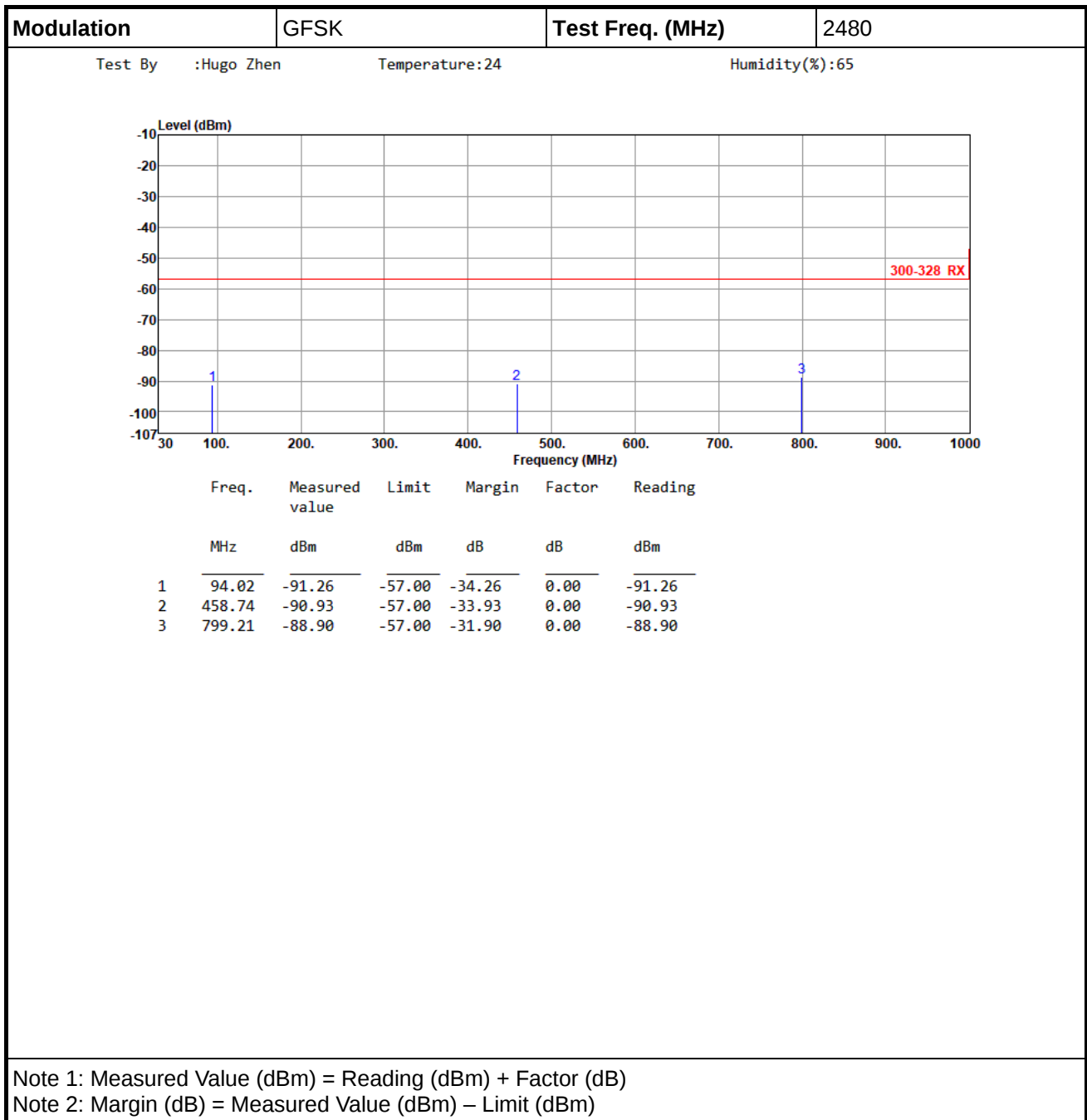
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			

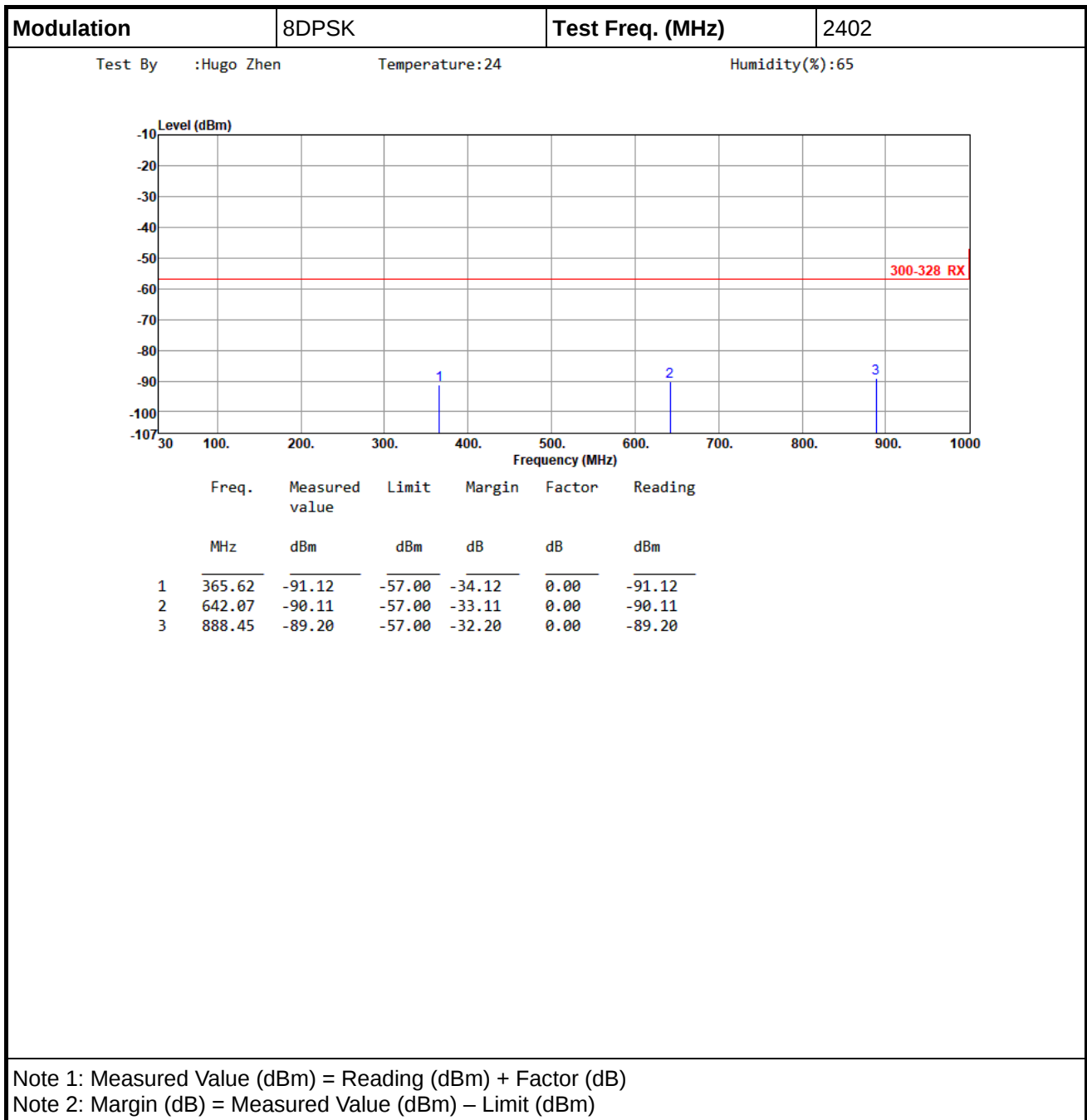


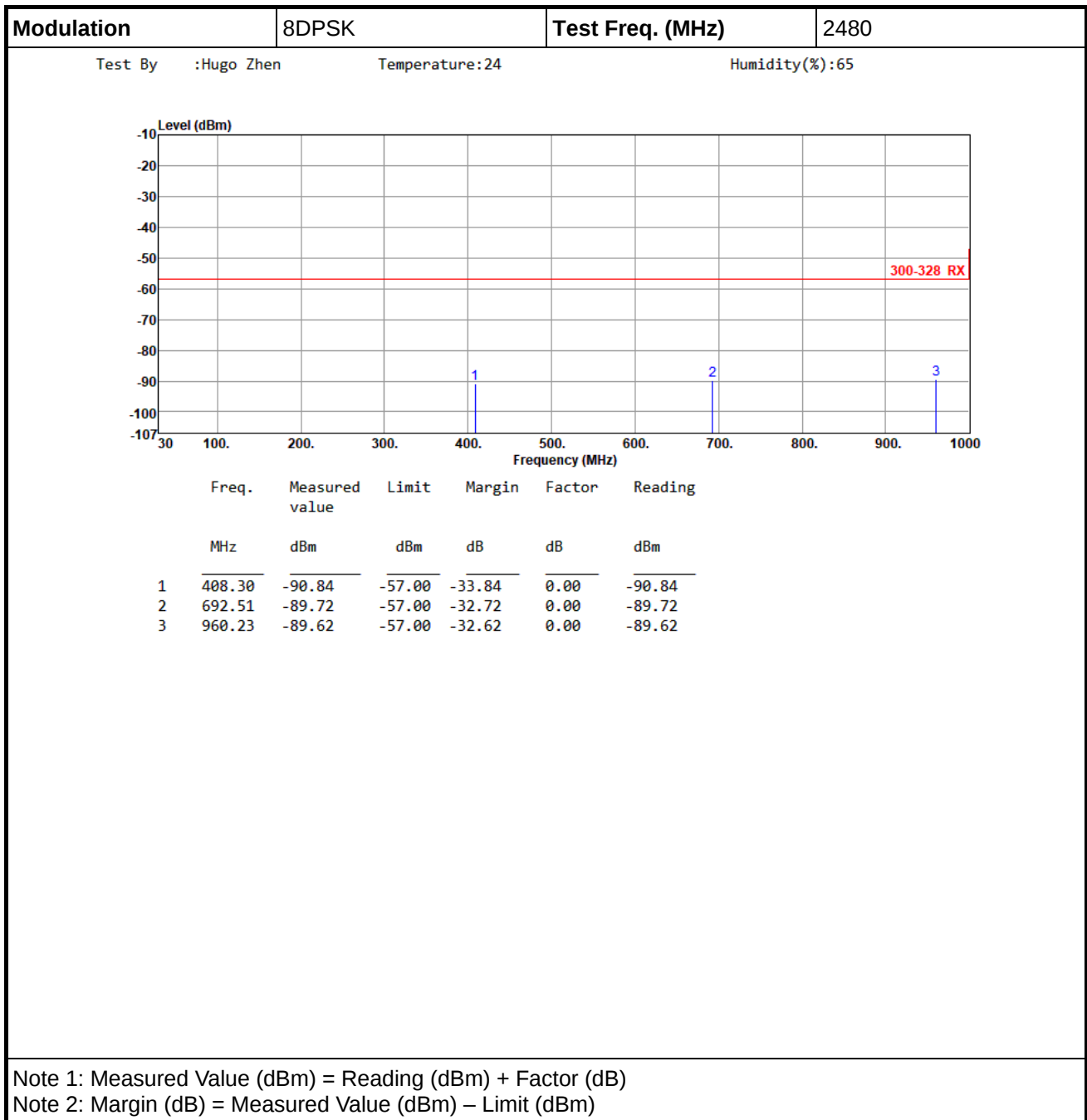
Configuration 1: Laird part number: 453-00171 (SC module)

Conducted Unwanted Emissions (Below 1GHz)





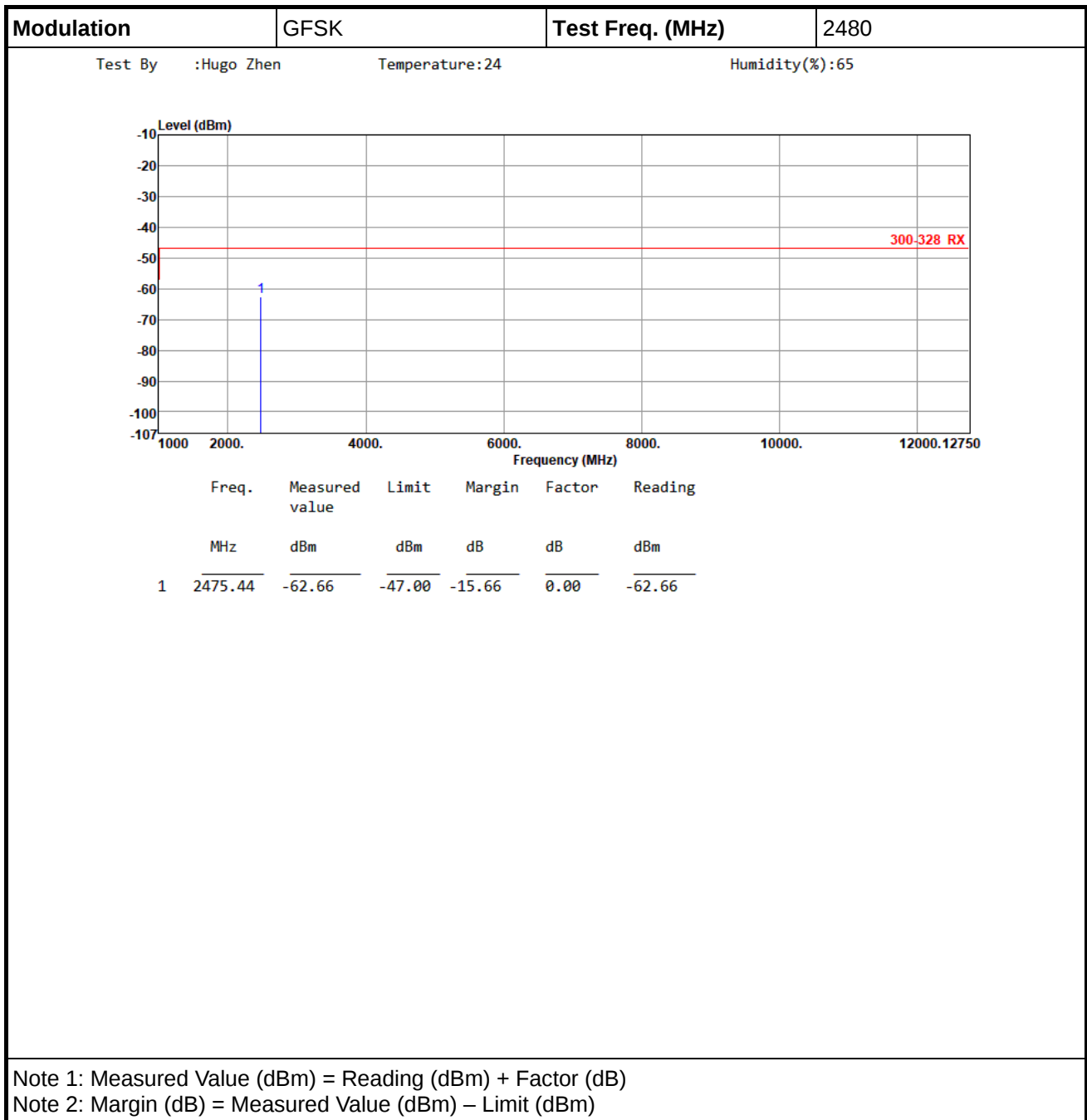


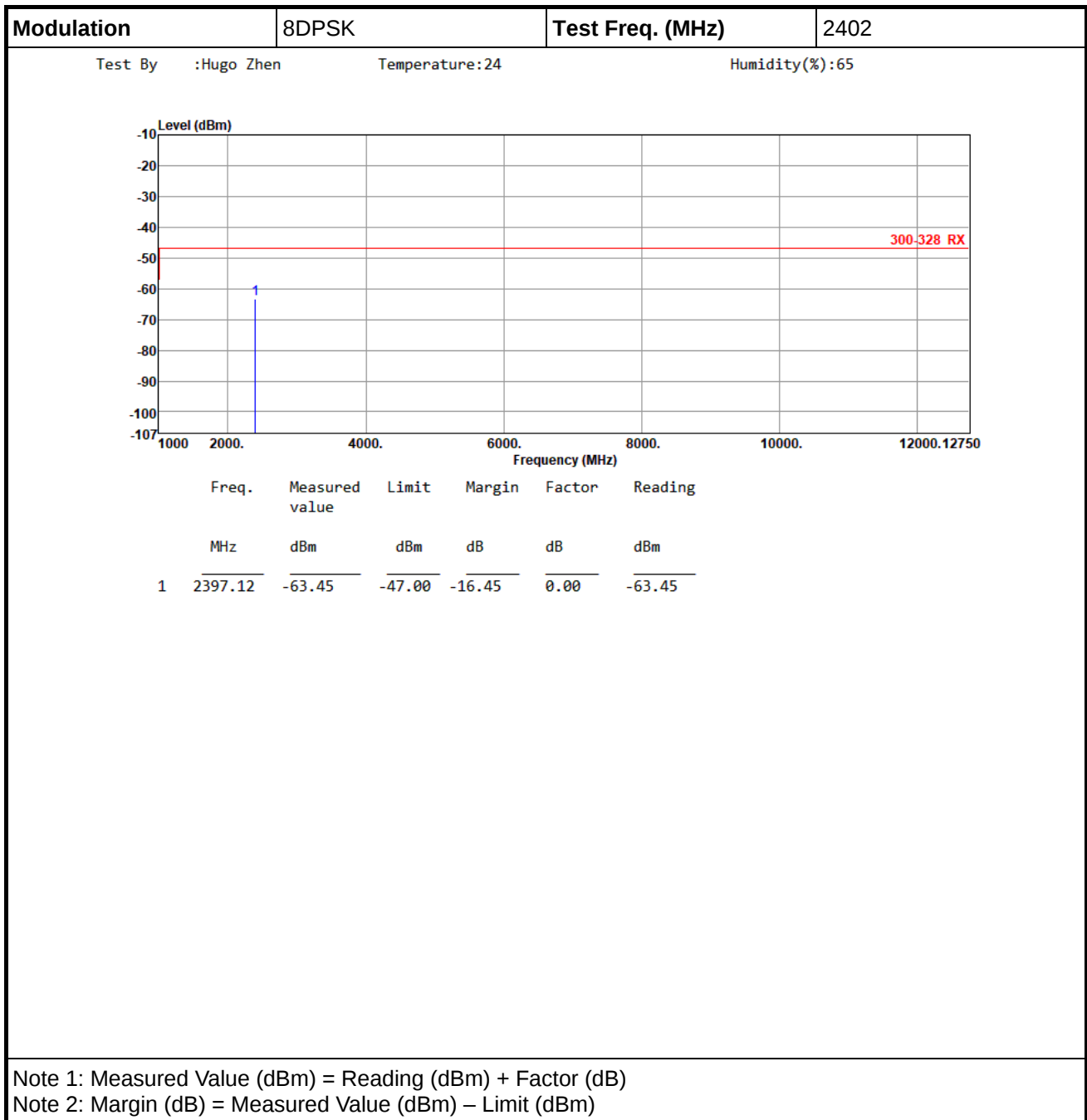


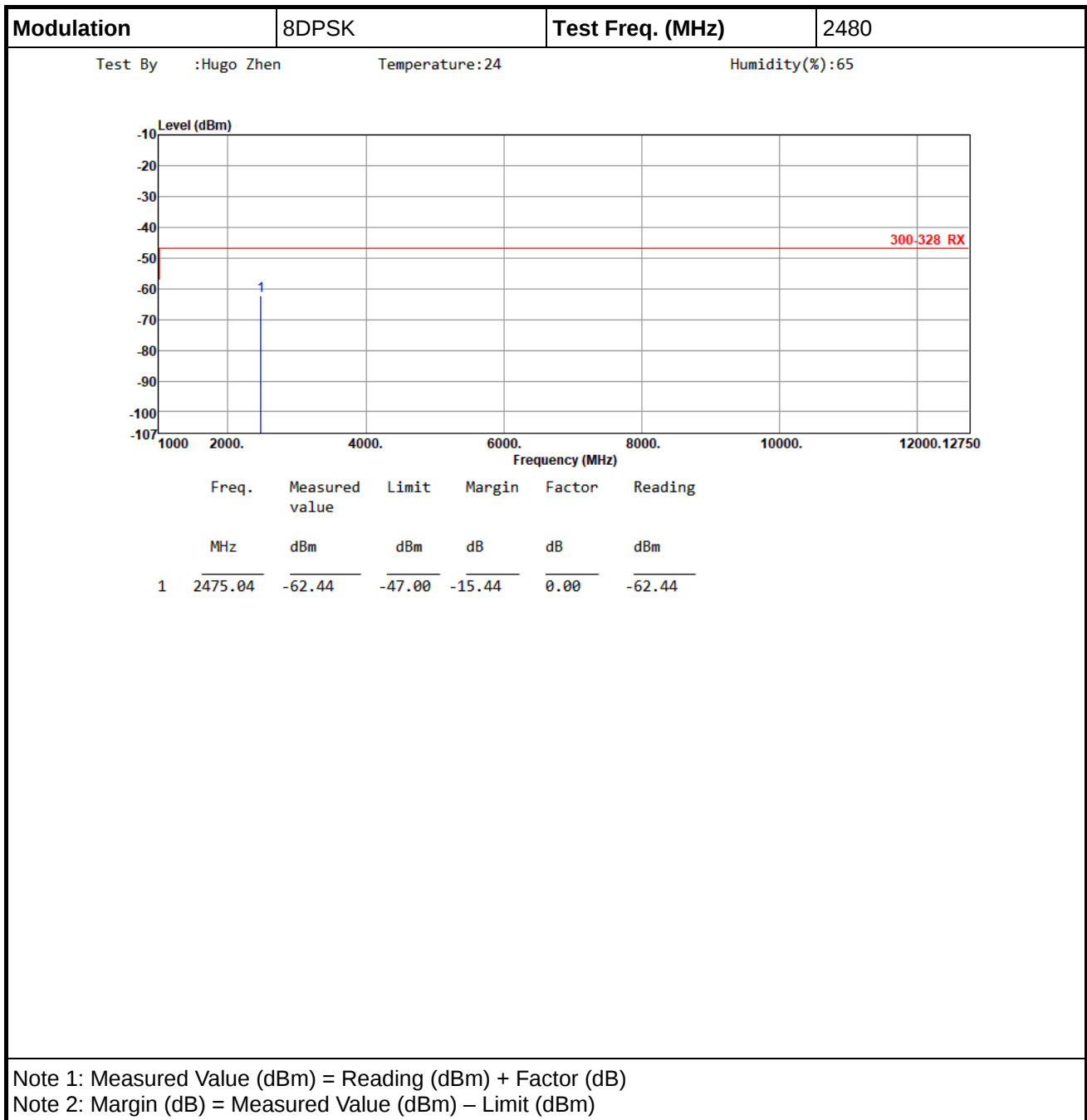


Conducted Unwanted Emissions (Above 1GHz)

Modulation		GFSK		Test Freq. (MHz)		2402	
Test By		:Hugo Zhen		Temperature:24		Humidity(%):65	
Level (dBm)							



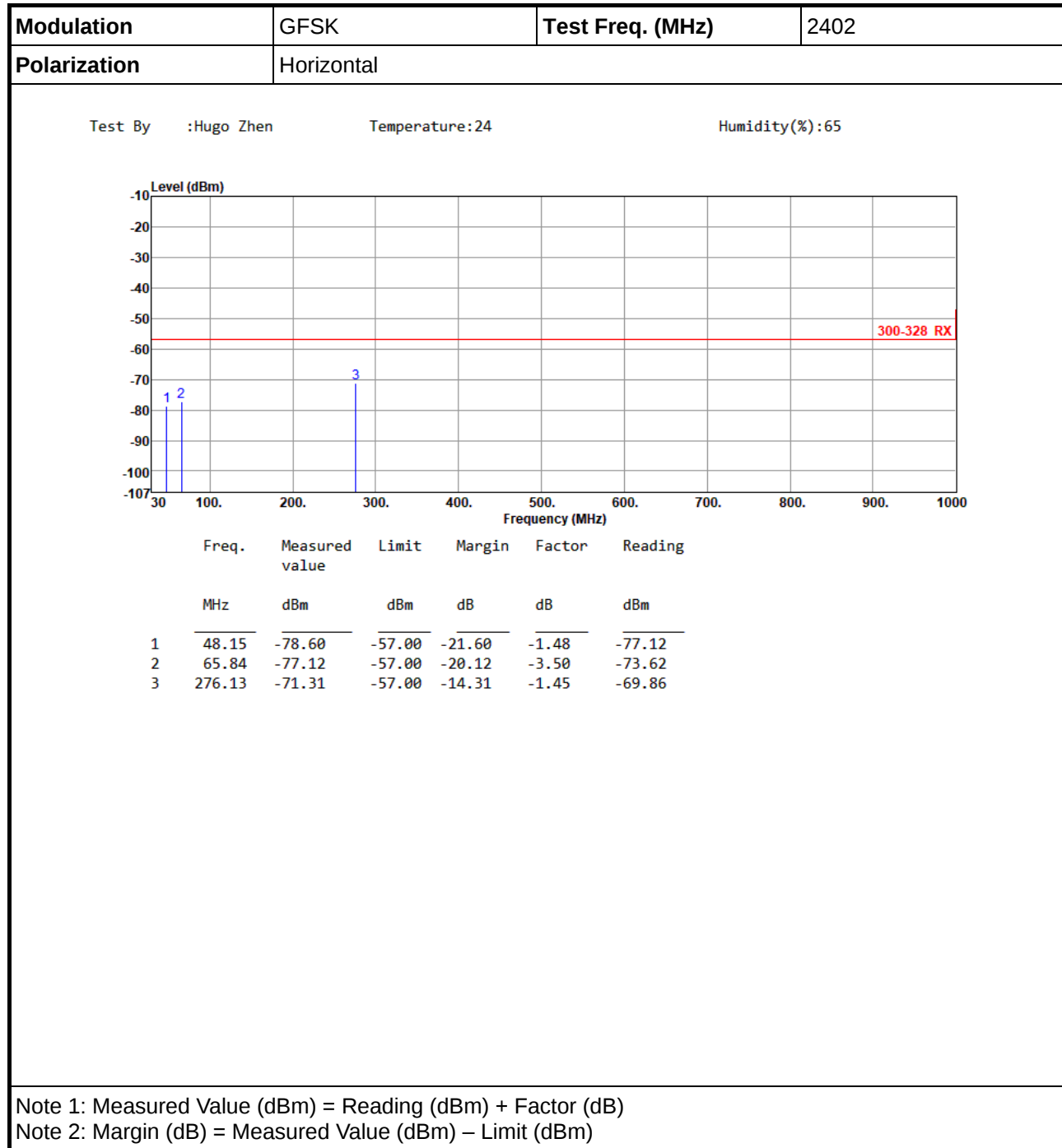






Configuration 1: Laird part number: 453-00171 (SC module)

Radiated Unwanted Emissions (Below 1GHz)





Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Receiver Spurious Emissions

Appendix G

Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



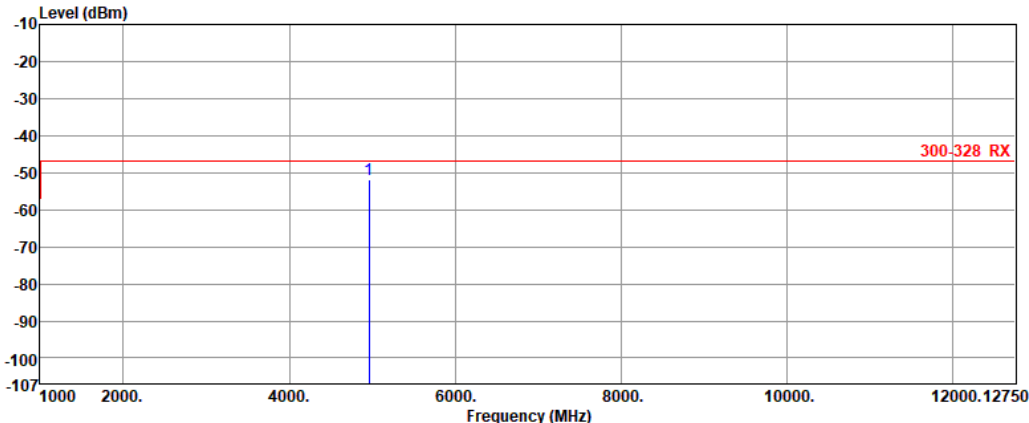
Radiated Unwanted Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480																					
Polarization	Horizontal																							
Test By :Hugo Zhen Temperature:24 Humidity(%):65																								
 <table><tr><th></th><th>Freq.</th><th>Measured value</th><th>Limit</th><th>Margin</th><th>Factor</th><th>Reading</th></tr><tr><th></th><th>MHz</th><th>dBm</th><th>dBm</th><th>dB</th><th>dB</th><th>dBm</th></tr><tr><td>1</td><td>4959.98</td><td>-52.06</td><td>-47.00</td><td>-5.06</td><td>13.79</td><td>-65.85</td></tr></table>					Freq.	Measured value	Limit	Margin	Factor	Reading		MHz	dBm	dBm	dB	dB	dBm	1	4959.98	-52.06	-47.00	-5.06	13.79	-65.85
	Freq.	Measured value	Limit	Margin	Factor	Reading																		
	MHz	dBm	dBm	dB	dB	dBm																		
1	4959.98	-52.06	-47.00	-5.06	13.79	-65.85																		
Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB) Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)																								



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Configuration 2: Laird part number: 453-00172 (SA module)

Radiated Unwanted Emissions (Below 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402																																	
Polarization	Horizontal																																			
Test By :Hugo Zhen Temperature:24 Humidity(%):65																																				
Level (dBm) Frequency (MHz) <table><tr><th>Freq.</th><th>Measured value</th><th>Limit</th><th>Margin</th><th>Factor</th><th>Reading</th></tr><tr><th>MHz</th><th>dBm</th><th>dBm</th><th>dB</th><th>dB</th><th>dBm</th></tr><tr><td>1</td><td>65.30</td><td>-72.65</td><td>-57.00</td><td>-15.65</td><td>-3.38</td><td>-69.27</td></tr><tr><td>2</td><td>191.91</td><td>-64.41</td><td>-57.00</td><td>-7.41</td><td>-4.30</td><td>-60.11</td></tr><tr><td>3</td><td>558.71</td><td>-66.28</td><td>-57.00</td><td>-9.28</td><td>5.41</td><td>-71.69</td></tr></table>				Freq.	Measured value	Limit	Margin	Factor	Reading	MHz	dBm	dBm	dB	dB	dBm	1	65.30	-72.65	-57.00	-15.65	-3.38	-69.27	2	191.91	-64.41	-57.00	-7.41	-4.30	-60.11	3	558.71	-66.28	-57.00	-9.28	5.41	-71.69
Freq.	Measured value	Limit	Margin	Factor	Reading																															
MHz	dBm	dBm	dB	dB	dBm																															
1	65.30	-72.65	-57.00	-15.65	-3.38	-69.27																														
2	191.91	-64.41	-57.00	-7.41	-4.30	-60.11																														
3	558.71	-66.28	-57.00	-9.28	5.41	-71.69																														
Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB) Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)																																				



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Radiated Unwanted Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm)			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) <			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



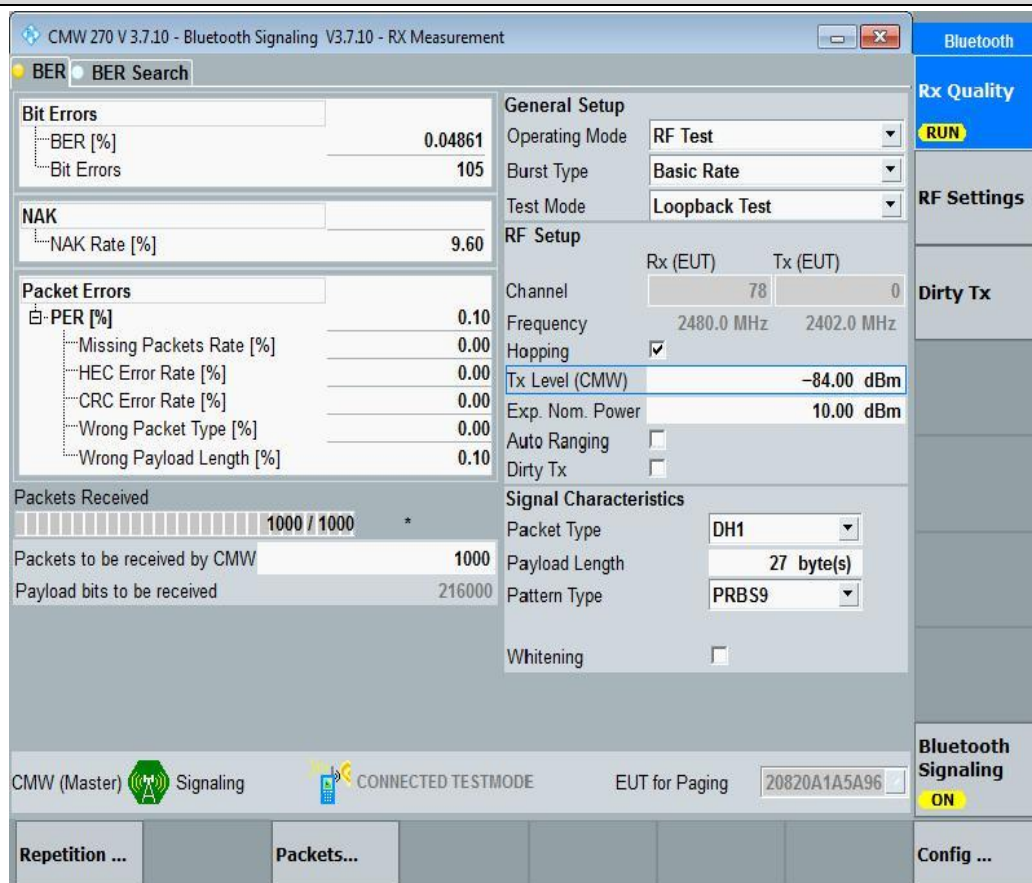
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Test By :Hugo Zhen Temperature:24 Humidity(%):65			
Level (dBm) </			

Configuration 1: Laird part number: 453-00171 (SC module)

Hopping mode



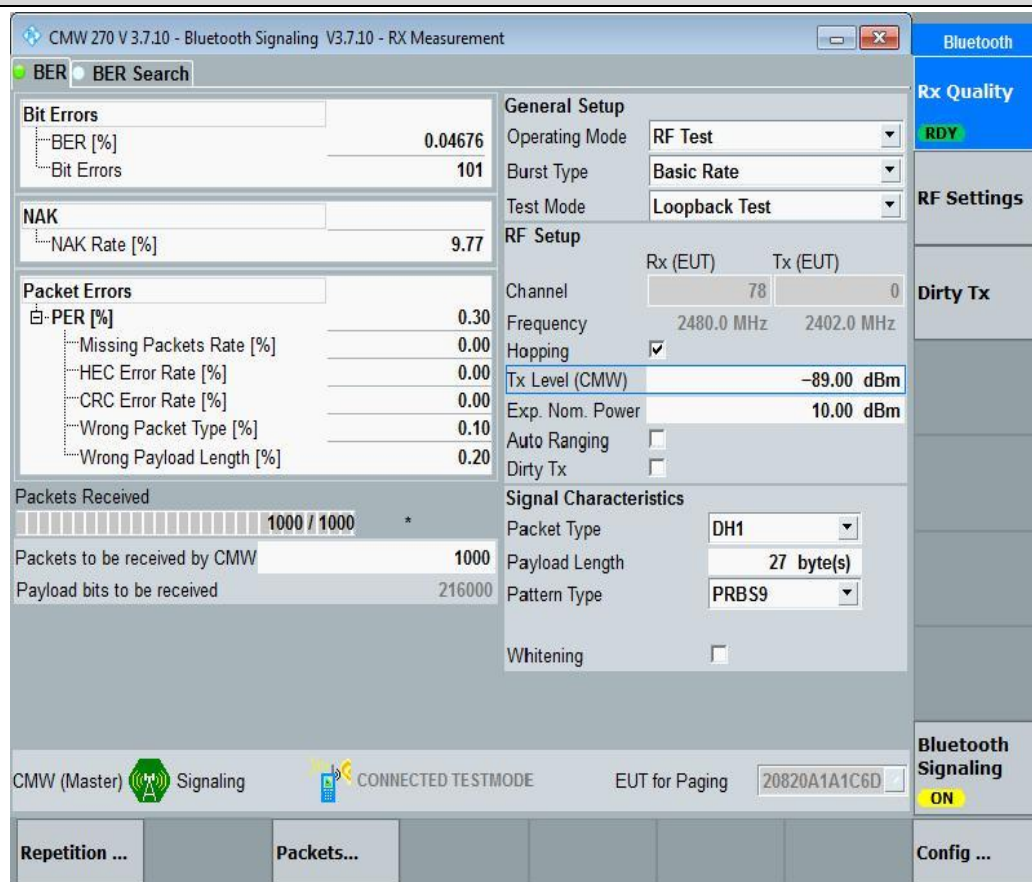
The screenshot shows the CMW 270 V3.7.10 - Bluetooth Signaling V3.7.10 - RX Measurement interface. The interface is divided into several sections:

- Bit Errors:** BER [%] 0.04861, Bit Errors 105.
- NAK:** NAK Rate [%] 9.60.
- Packet Errors:** PER [%] 0.10, Missing Packets Rate [%] 0.00, HEC Error Rate [%] 0.00, CRC Error Rate [%] 0.00, Wrong Packet Type [%] 0.00, Wrong Payload Length [%] 0.10.
- Packets Received:** 1000 / 1000.
- Packets to be received by CMW:** 1000.
- Payload bits to be received:** 216000.
- General Setup:** Operating Mode RF Test, Burst Type Basic Rate, Test Mode Loopback Test.
- RF Setup:** Rx (EUT) 78, Tx (EUT) 0, Channel 2480.0 MHz, Frequency 2402.0 MHz, Hopping checked, Tx Level (CMW) -84.00 dBm, Exp. Nom. Power 10.00 dBm, Auto Ranging unchecked, Dirty Tx unchecked.
- Signal Characteristics:** Packet Type DH1, Payload Length 27 byte(s), Pattern Type PRBS9, Whitening unchecked.
- Bluetooth Signaling:** ON.
- Buttons:** Repetition..., Packets..., Config...

Receiver Category	2		
Performance Criteria Limit	PER ≤ 10 %		
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-67.38	2380	-32	Pass
-67.38	2504	-32	Pass
-67.38	2300	-32	Pass
-67.38	2584	-32	Pass

Configuration 2: Laird part number: 453-00172 (SA module)

Hopping mode



The screenshot shows the CMW 270 V3.7.10 - Bluetooth Signaling V3.7.10 - RX Measurement interface. The interface is divided into several sections:

- Bit Errors:** BER [%] 0.04676, Bit Errors 101.
- NAK:** NAK Rate [%] 9.77.
- Packet Errors:**
 - PER [%] 0.30
 - Missing Packets Rate [%] 0.00
 - HEC Error Rate [%] 0.00
 - CRC Error Rate [%] 0.00
 - Wrong Packet Type [%] 0.10
 - Wrong Payload Length [%] 0.20
- Packets Received:** 1000 / 1000.
- Packets to be received by CMW:** 1000.
- Payload bits to be received:** 216000.
- General Setup:**
 - Operating Mode: RF Test
 - Burst Type: Basic Rate
 - Test Mode: Loopback Test
- RF Setup:**
 - Channel: 78
 - Frequency: 2480.0 MHz
 - Hopping: ☒
 - Tx Level (CMW): -89.00 dBm
 - Exp. Nom. Power: 10.00 dBm
 - Auto Ranging: ☐
 - Dirty Tx: ☐
- Signal Characteristics:**
 - Packet Type: DH1
 - Payload Length: 27 byte(s)
 - Pattern Type: PRBS9
 - Whitening: ☐
- Bluetooth Signaling:** ON
- EUT for Paging:** 20820A1A1C6D
- Repetition ...** and **Packets...** buttons are visible at the bottom.

Receiver Category	2		
Performance Criteria Limit	PER ≤ 10 %		
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-68.28	2380	-33	Pass
-68.28	2504	-33	Pass
-68.28	2300	-33	Pass
-68.28	2584	-33	Pass