



F2 Labs
16740 Peters Road
Middlefield, Ohio 44062
United States of America
www.f2labs.com

CERTIFICATION TEST REPORT

Manufacturer: **BREGGZ Innovations B.V.**
Keizersgracht 165
Amsterdam, NETHERLANDS 1016DP

Applicant: **Same as Above**

Product Name: **Zohn-1**

Product Description: In-ear monitor with Bluetooth connectivity and induction charging case

Operating Voltage/Freq. of EUT During Testing: Battery-Operated (5VDC)

Model(s): **Zohn-1**

FCC ID: **2BLGWZOHN-1**

Testing Commenced: 2024-10-07

Testing Ended: 2024-10-25

Summary of Test Results: **In Compliance**

The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Standards:

- ❖ **FCC Part 15 Subpart C, Section 15.249**
- ❖ **FCC Part 15 Subpart C, Section 15.215(c) – Additional provisions to the general radiated emission limitations**
- ❖ **FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards**



Order No(s): F2P32249B

Applicant: BREGGZ Innovations B.V.
Model(s): Zohn-1

Evaluation Conducted by:

Erik Tobin, EMC Engineer

Julius Chiller, Senior Wireless Project Engineer

Report Reviewed by:

Ken Littell, Vice President of Operations

F2 Labs
26501 Ridge Road
Damascus, MD 20872
Ph 301.253.4500

F2 Labs
16740 Peters Road
Middlefield, OH 44062
Ph 440.632.5541

F2 Labs
8583 Zionsville Road
Indianapolis, IN 46268
Ph 317.610.0611

This test report may be reproduced in full; partial reproduction only may be made with the written consent of F2 Labs. The results in this report apply only to the equipment tested.



TABLE OF CONTENTS

1	<u>ADMINISTRATIVE INFORMATION</u>
2	<u>SUMMARY OF TEST RESULTS/MODIFICATIONS</u>
3	<u>TABLE OF MEASURED RESULTS</u>
4	<u>ENGINEERING STATEMENT</u>
5	<u>EUT INFORMATION AND DATA</u>
6	<u>LIST OF MEASUREMENT INSTRUMENTATION</u>
7	<u>OCCUPIED BANDWIDTH</u>
8	<u>FIELD STRENGTH OF EMISSIONS</u>
9	<u>PHOTOGRAPHS - TEST SETUPS</u>



1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to the 2013 version of ANSI C63.10 and recommended FCC procedure of measurement of DXX operating under Section 15.249. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of $k=2$. The Uncertainty for a laboratory is referred to as U_{lab} . For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the U_{cispr} values to determine if a specific margin is required to deem compliance.

U_{lab}

Measurement Range	Combined Uncertainty	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54dB	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55dB	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81dB	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55dB	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38dB	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66dB	3.32dB

U_{cispr}

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If U_{lab} is less than or equal to U_{cispr} , then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} in table 1, then:

- compliance is deemed to occur if no measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.



Order No(s): F2P32249B

Applicant: BREGGZ Innovations B.V.
Model(s): Zohn-1

1.4 Document History:

Document Number	Description	Issue Date	Approved By
F2P32249B-01E	First Issue	2024-10-26	K. Littell

**2 SUMMARY OF TEST RESULTS**

Test Name	Standard(s)	Results
99% Occupied Bandwidth	CFR 47 Part 15.215(c)	Complies
-20dB Occupied Bandwidth	CFR 47 Part 15.215(c)	Complies
Field Strength of Emissions	CFR 47 Part 15.249(a)(d)	Complies
Variation of the Input Power	CFR 47 Part 15.31(e)	N/A*
Conducted Emissions	CFR 47 Part 15.207(a)	N/A

**Requirements of FCC 15.31(e) were met by using new or fully charged non-removable batteries.*

Modifications Made to the Equipment
None

3 TABLE OF MEASURED RESULTS

Test		Low Channel 2402 MHz	Mid Channel 2440 MHz	High Channel 2480 MHz
Field Strength of Fundamental	BLE 1M	87.8dB μ V/m, 24.5mV/m	86.4dB μ V/m, 20.9mV/m	83.2dB μ V/m, 14.5mV/m
	BLE 2M	79.3dB μ V/m, 9.3mV/m	78.3dB μ V/m, 8.2mV/m	79.6dB μ V/m, 9.5mV/m
	2DH5 TT/4 DQPSK 2Mb/s	84.6dB μ V/m, 17.0mV/m	83.6dB μ V/m, 15.1mV/m	80.6dB μ V/m, 10.7mV/m
	3DH5 8DPSK 3Mb/s	85.7dB μ V/m, 19.3mV/m	87.5dB μ V/m, 23.7mV/m	85.6dB μ V/m, 19.1mV/m
	DH5 GFSK 1Mb/s	88dB μ V/m, 25.1mV/m	87.3dB μ V/m, 23.1mV/m	87.1dB μ V/m, 22.6mV/m
Limit for Fundamental		50 millivolts/meter (93.97 dB μ V/m)	50 millivolts/meter (93.97 dB μ V/m)	50 millivolts/meter (93.97 dB μ V/m)
-20dB Occupied Bandwidth	BLE 1M	1.174 MHz	1.162 MHz	1.174 MHz
	BLE 2M	2.283 MHz	2.273 MHz	2.268 MHz
	2DH5 TT/4 DQPSK 2Mb/s	1.269 MHz	1.254 MHz	1.254 MHz
	3DH5 8DPSK 3Mb/s	1.273 MHz	1.244 MHz	1.277 MHz
	DH5 GFSK 1Mb/s	1.019 MHz	1.022 MHz	10.28 MHz
99% Occupied Bandwidth (MHz)	BLE 1M	1.059 MHz	1.051 MHz	1.047 MHz
	BLE 2M	2.098 MHz	2.098 MHz	2.082 MHz
	2DH5 TT/4 DQPSK 2Mb/s	1.169 MHz	1.175 MHz	1.173 MHz
	3DH5 8DPSK 3Mb/s	1.181 MHz	1.180 MHz	1.175 MHz
	DH5 GFSK 1Mb/s	0.896 MHz	0.899 MHz	0.897 MHz

The -20dB bandwidth of the emission shall be contained within the frequency band designated in the rule section under which the equipment is operated.



4 ENGINEERING STATEMENT

This report has been prepared on behalf of BREGGZ Innovations B.V. to provide documentation for the testing described herein. This equipment has been tested and found to comply with part 15.249 of the FCC Rules using ANSI C63.10 2013 standard. The test results found in this test report relate only to the items tested.



5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: In-ear Monitor

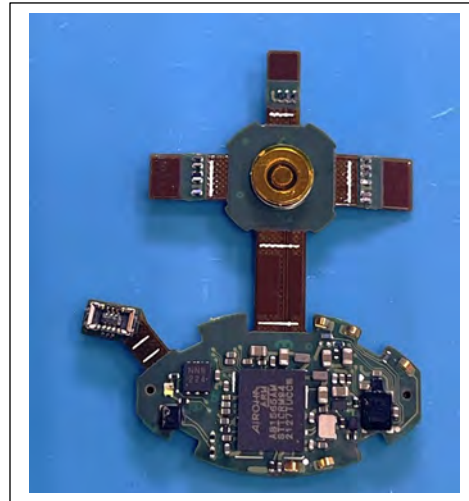
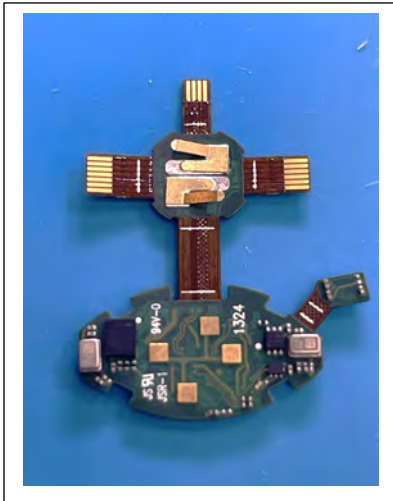
Model: Zohn-1

Serial Nos.: 991001, 991002, 991003

Firmware: V5.0.5

Hardware: V1.0

FCC ID: 2BLGWZOHN-1



5.2 Trade Name:

Breggz

5.3 Power Supply:

5V DC input

5.4 Applicable Rules:

CFR 47, Part 15.249, subpart C

5.5 Antenna:

Integral Antenna (LDS Trace with spring contact to feed and ground launch points on PCB)

5.6 Accessories:

Device	Manufacturer	Model Number	Serial Number
Laptop	Hewlett Packard	14-fq0013dx	5CD030L0P2



5.7 Test Item Condition:

The equipment to be tested was received in good condition.

5.8 Testing Algorithm:

EUT was set up in the direct test mode. Device was set to transmit on the low, mid and high channels in the 2.4 GHz band (2402, 2440 & 2480 MHz); BLE 1 MHz, 2 MHz and BT Classic DH5, 2DH5 and 3DH5 modulations and data rates were used for testing.

**6 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	2024-11-15
Shielded Chamber 2018	CL251-E-3m	AlbatrossProjects	US170028	B83117-FG639-T261	2024-11-08
Spectrum Analyzer	CL138	Agilent Technologies	E4407B	US41192779	2025-04-11
Receiver	CL151	Rohde & Schwarz	ESU40	100319	2025-04-09
Receiver	CL204	Rohde & Schwarz	ESR7	101714	2025-04-10
Low Loss Cable Set	CL315 / CL318	Fairview Microwave	FMC0202914-72/FMC0202914-	None Spec.	2025-04-09
Pre-Amplifier	CL201	Com-Power	PAM-103	441148	2025-04-11
Pre-Amplifier	CL250	Com-Power	PAM-118A	18040011	2025-04-11
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	2025-09-18
Amplifier w/Monopole & 18" Loop	CL163-Mono	A.H. Systems, Inc.	EHA-52B	100	2024-12-14
Horn Antenna	CL098	Emco	3115	9809-5580	2025-01-02
Horn Antenna 18-26.5 GHz	CL114	A.H. Systems, Inc.	SAS-572	237	2026-01-09
Software:	Tile Version 3.4.B.3		Software Verified: 2024-10-07 to 2024-10-18		
Software:	EMC 32, Version 8.53.0		Software Verified: 2024-10-07 to 2024-10-18		
Software:	EMC 32, Version 10.60.20		Software Verified: 2024-10-07 to 2024-10-18		
Temp/Hum Rec	CL119	Extech	RH520	H005869	2025-05-19



7 OCCUPIED BANDWIDTH

7.1 Requirements:

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the -20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

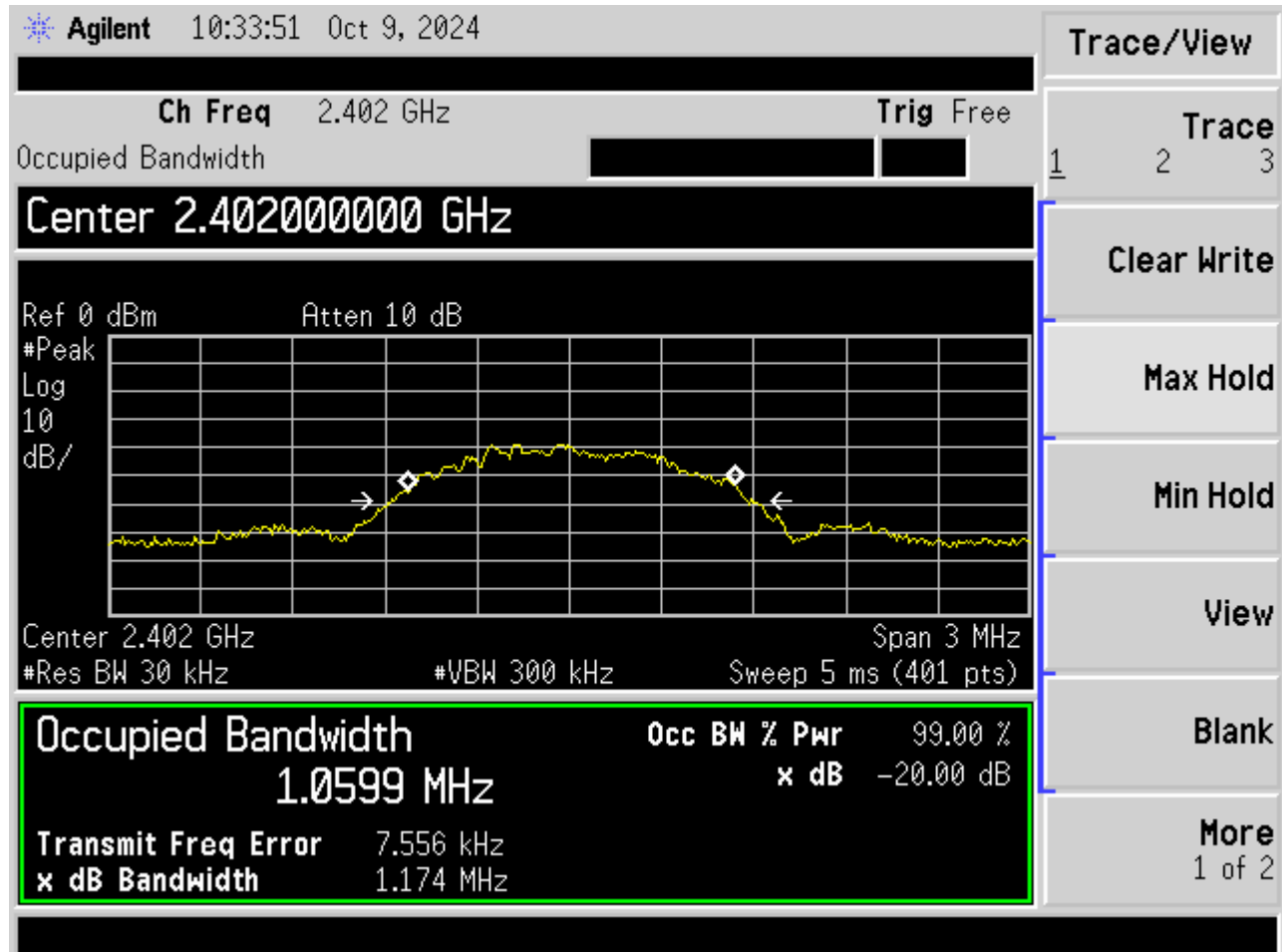
Bandwidth measurements were made at the low (2.402 GHz), mid (2.440 GHz) and upper (2.480 GHz) frequencies.



7.2 Occupied Bandwidth Test Data

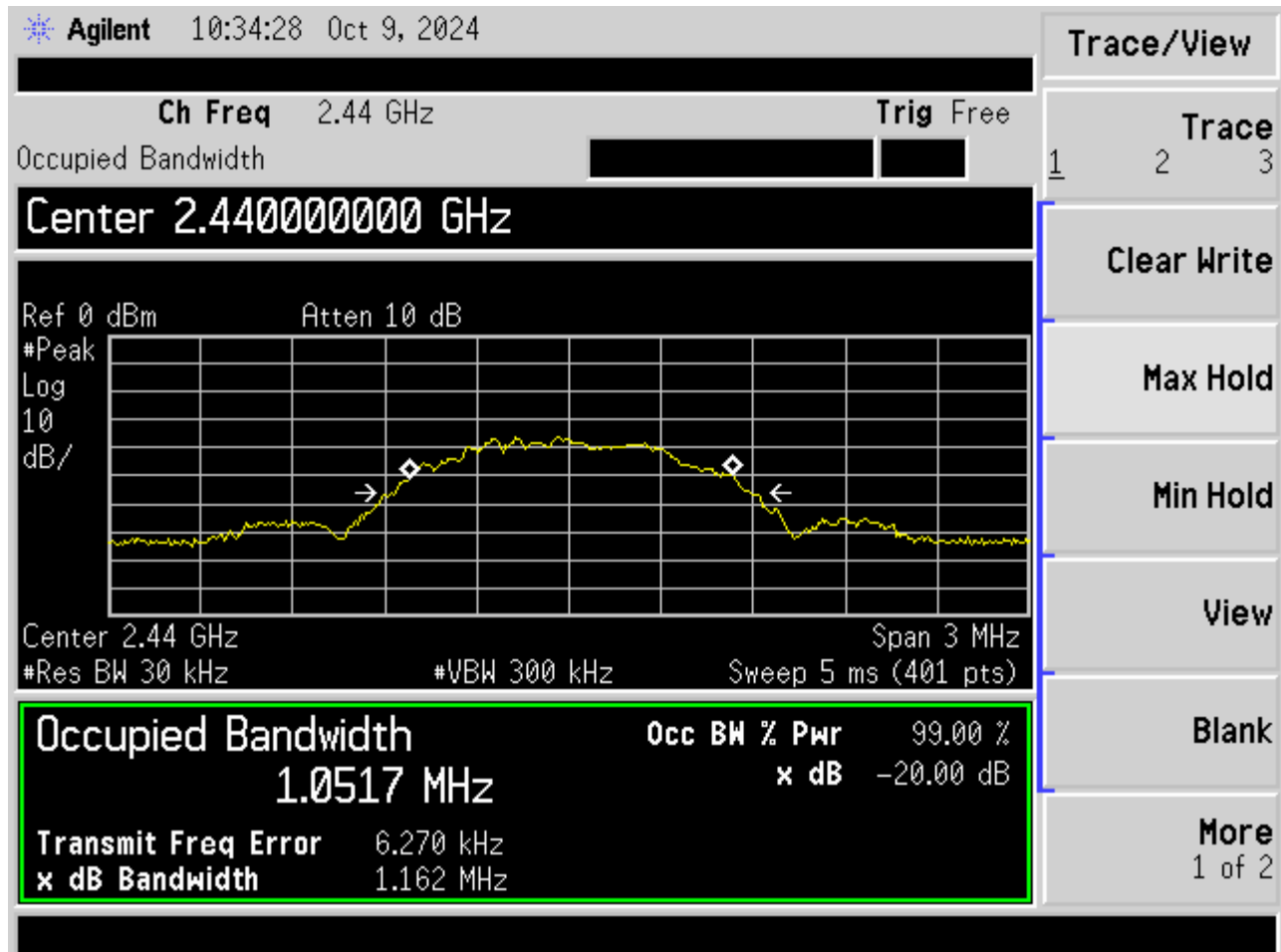
Test Date(s):	2024-10-16	Test Engineer(s):	J. Chiller
Standard(s):	CFR 47 Part 15.215(c)	Air Temperature:	21.3°C
Test Results:	Complies	Relative Humidity:	42%

BLE 1M, Low Channel



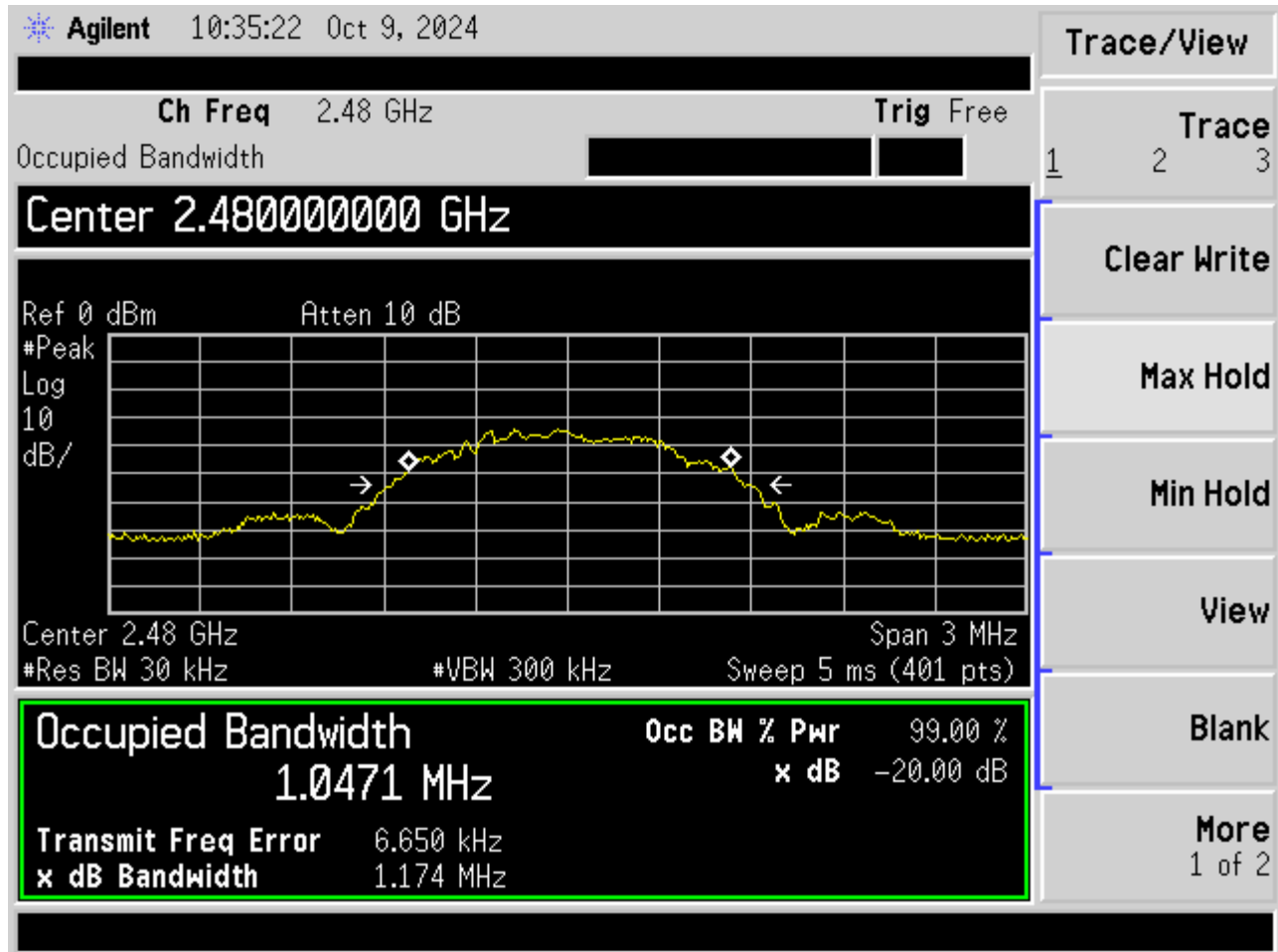


BLE 1M, Mid Channel



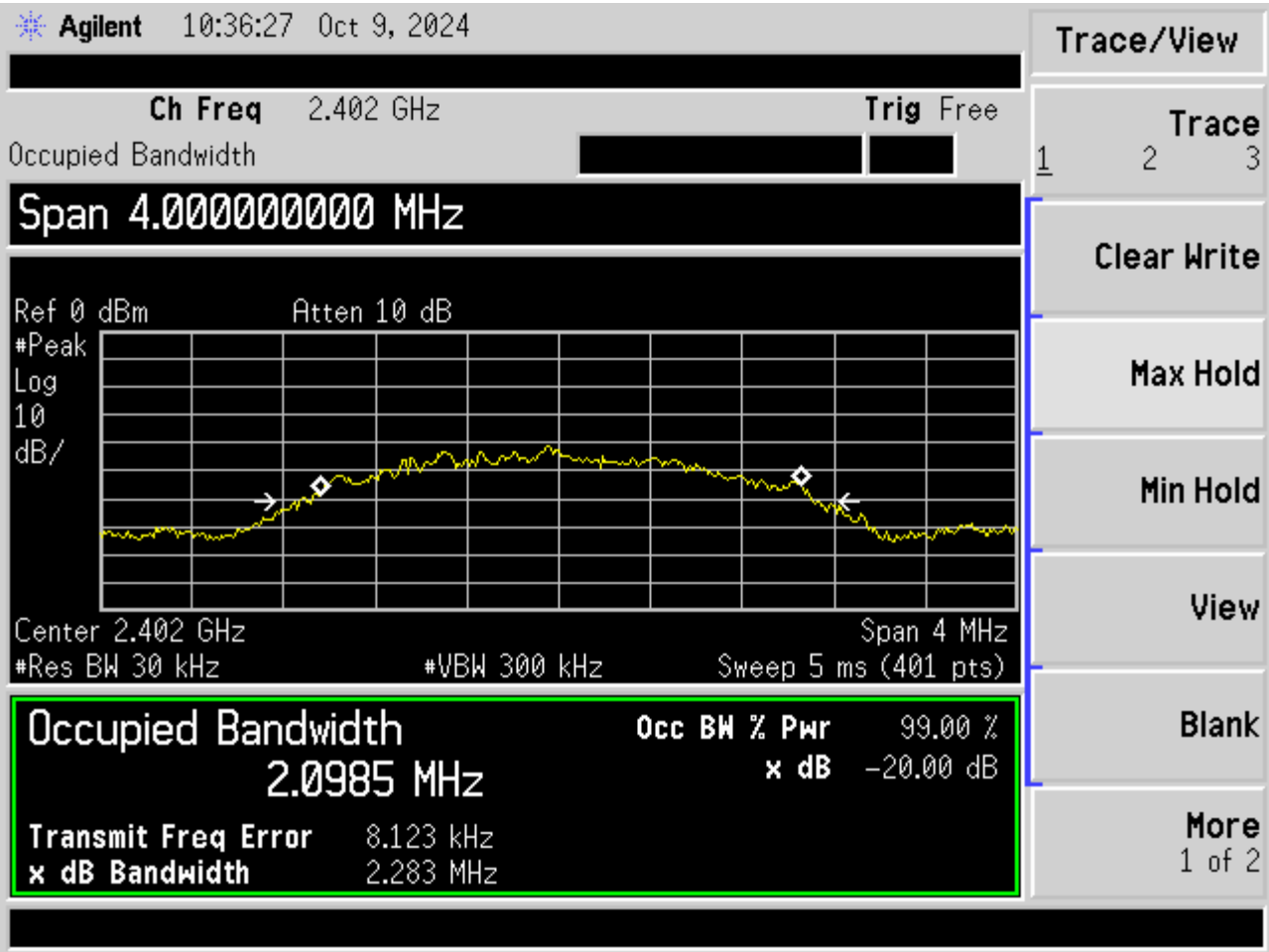


BLE 1M, High Channel



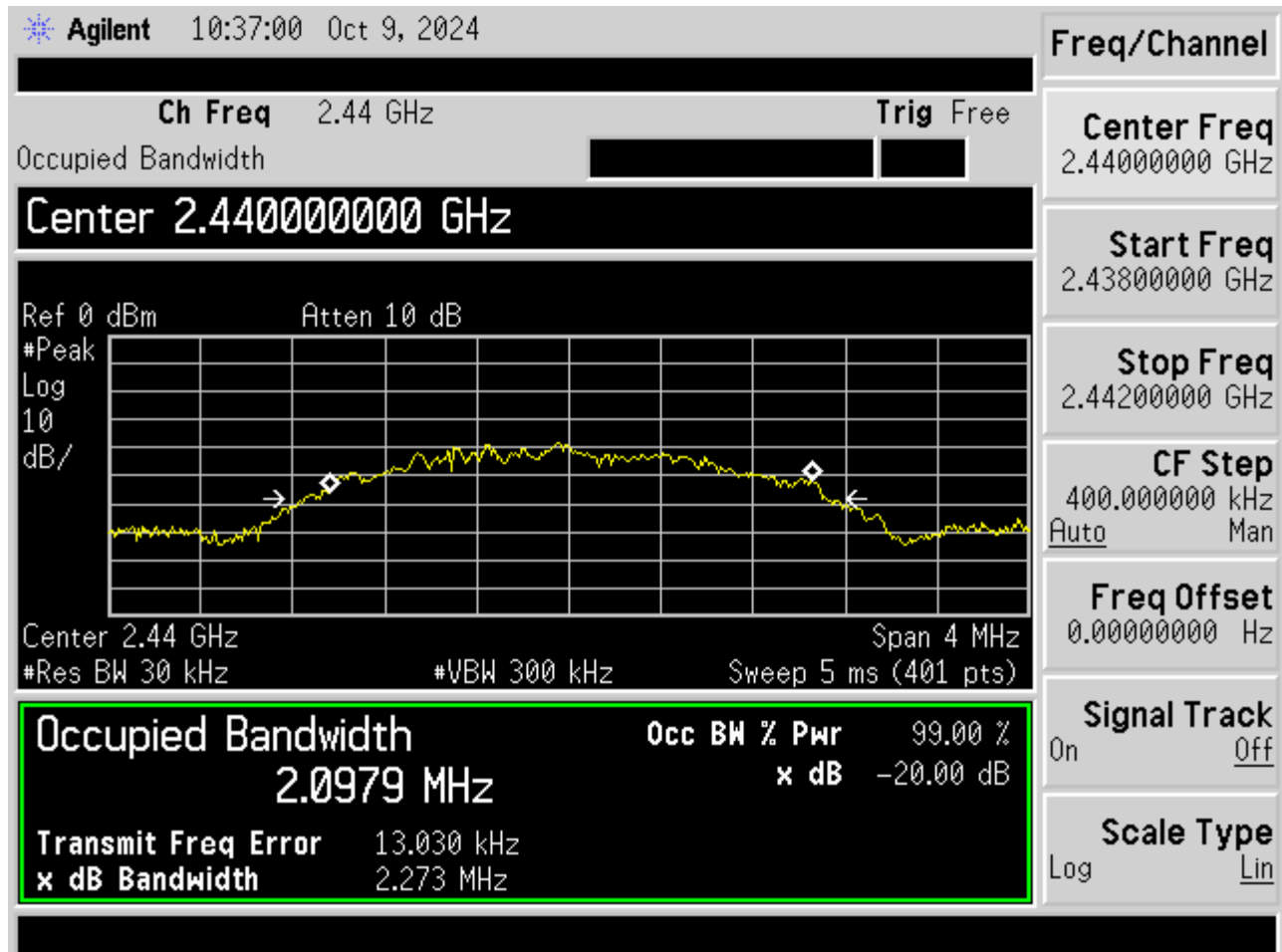


BLE 2M, Low Channel



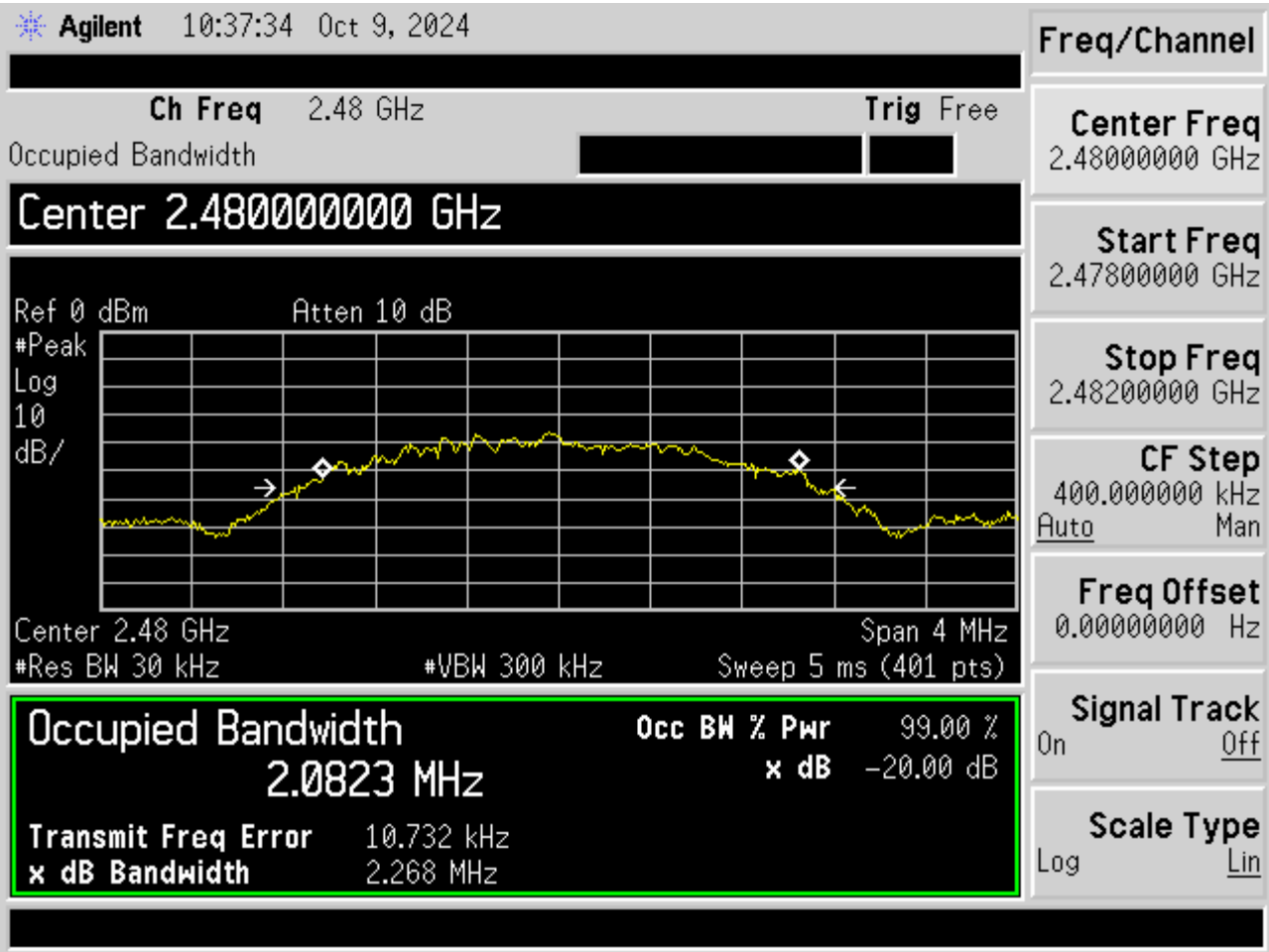


BLE 2M, Mid Channel





BLE 2M, High Channel





Order No(s): F2P32249B

Applicant: BREGGZ Innovations B.V.

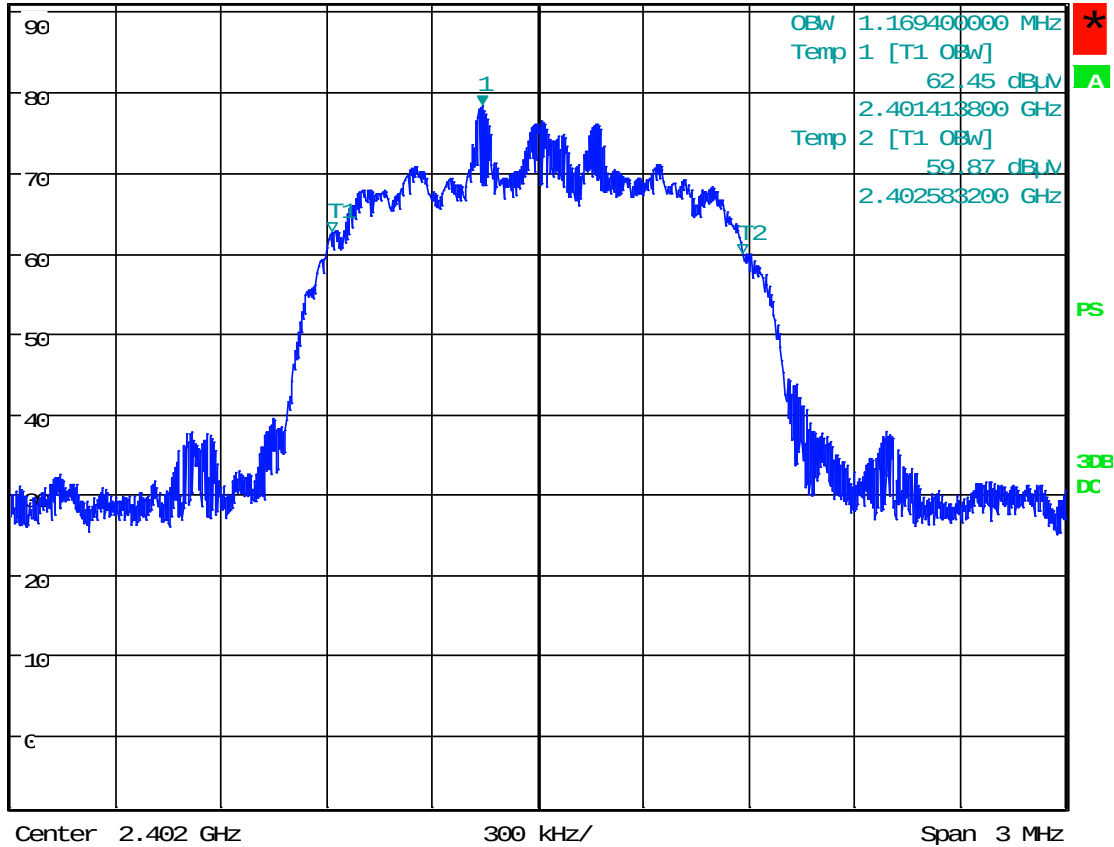
Model(s): Zohn-1

2DH5: 99%, Low Channel



Ref 91 dBμV *Att 10 dB *RBW 30 kHz *VBW 100 kHz Marker 1 [T1] 78.19 dBμV
SWT 45 ms 2.401841300 GHz

1 Fx
VIEW



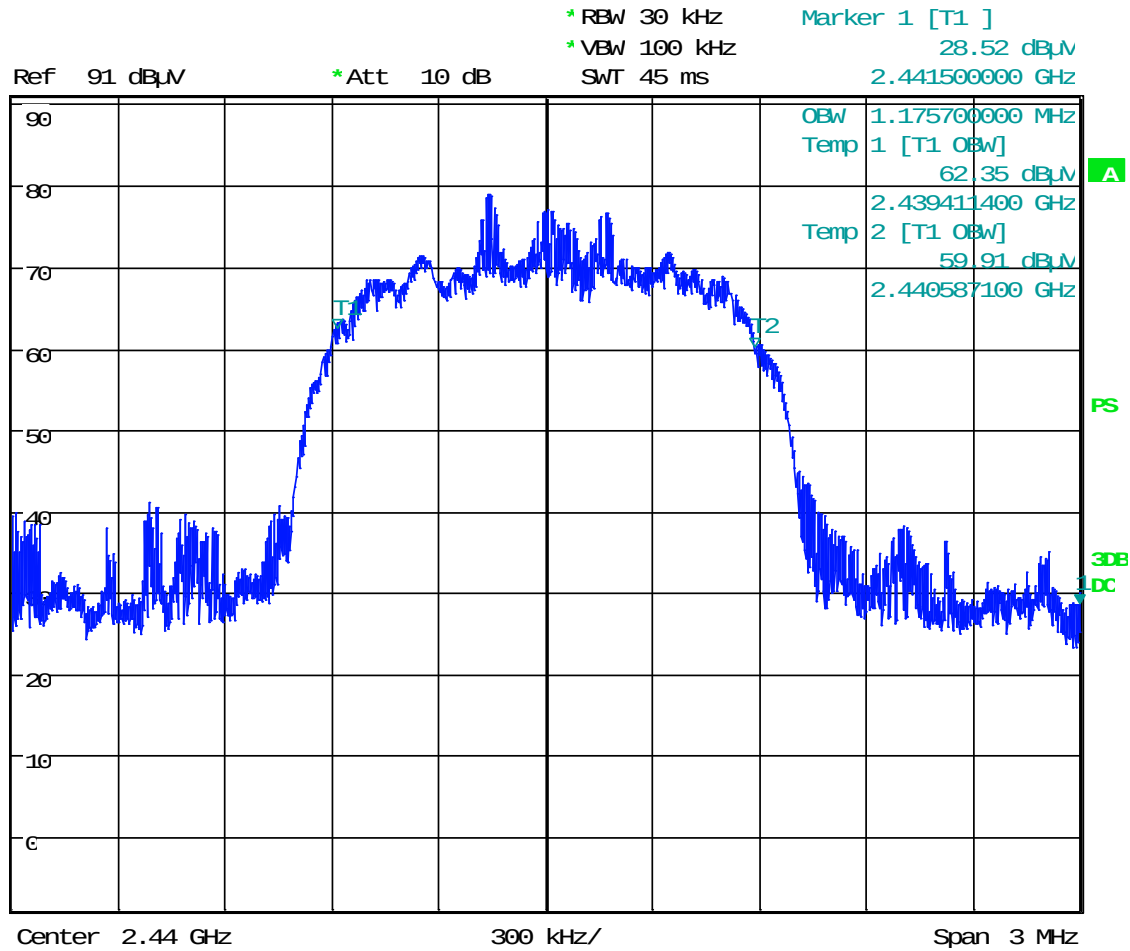
Date: 17.OCT.2024 15:24:46



2DH5: 99%, Mid Channel



1 PK
VIB



Date: 17.OCT.2024 15:22:24



Order No(s): F2P32249B

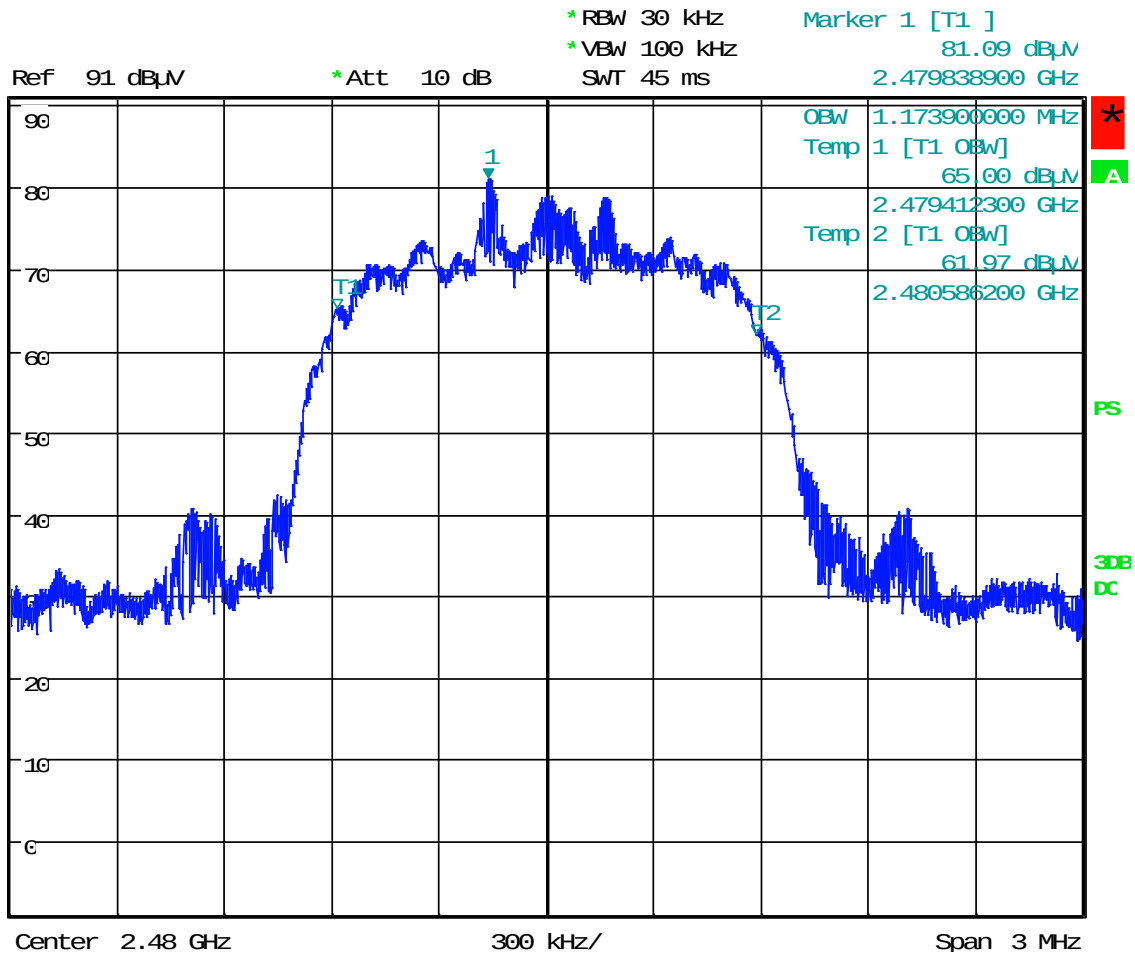
Applicant: BREGGZ Innovations B.V.

Model(s): Zohn-1

2DH5: 99%, High Channel



1 PK
VIEW



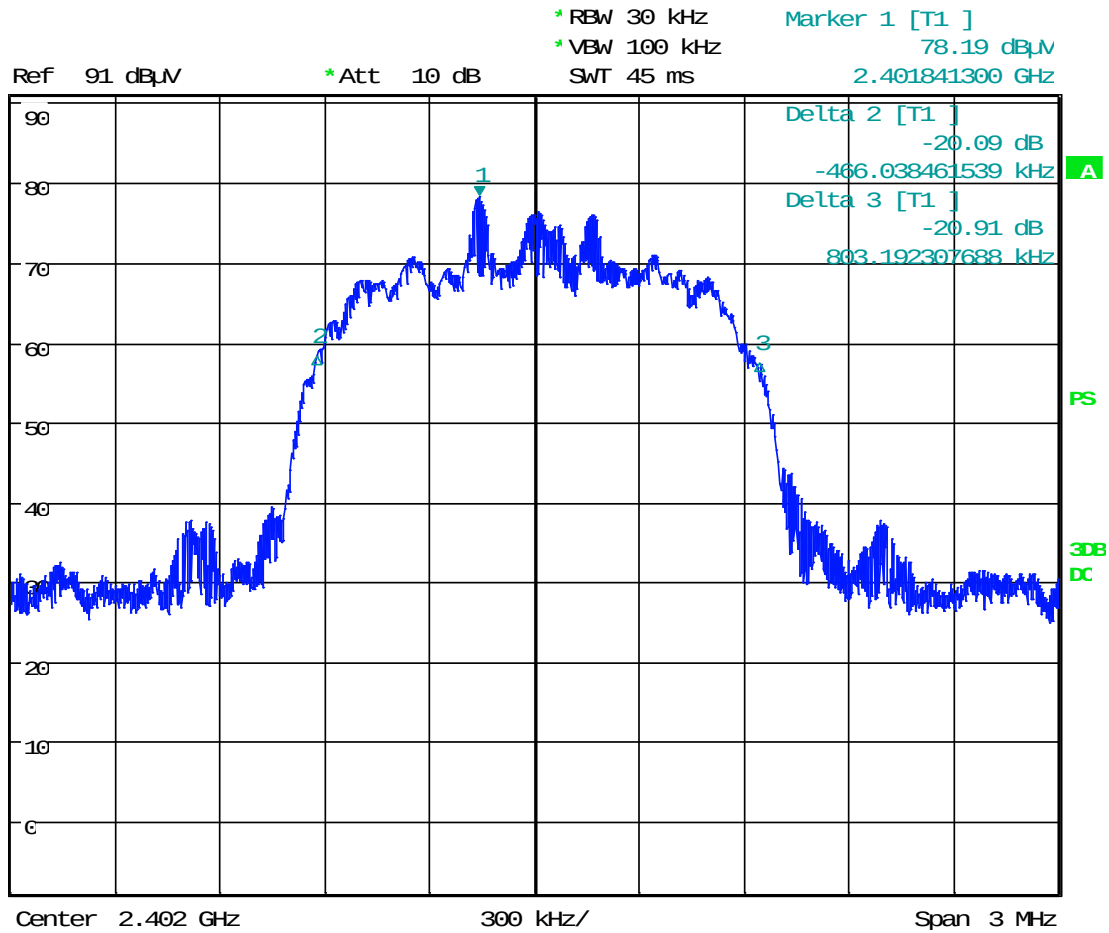
Date: 17.OCT.2024 15:21:30



2DH5: 20dB, Low Channel



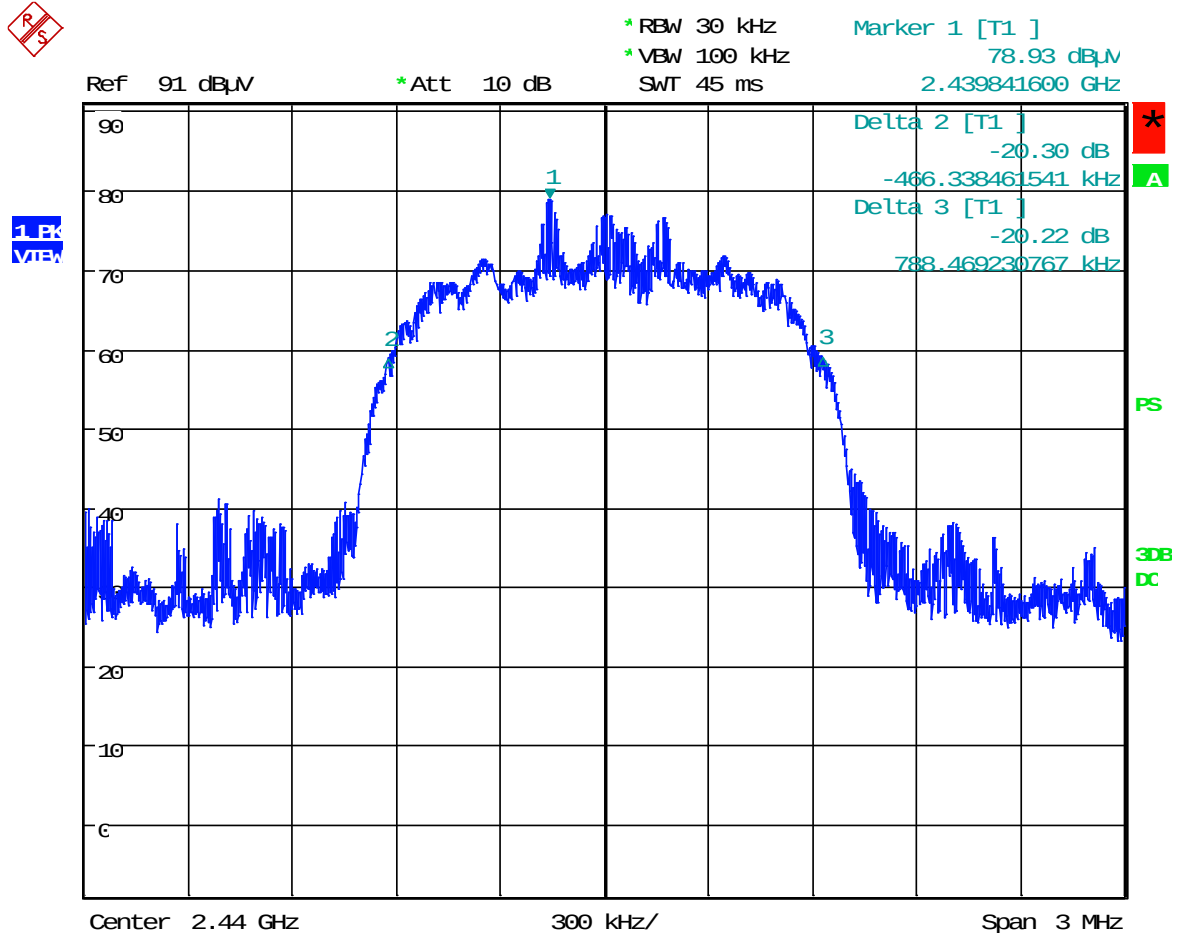
1 Fk
VIB



Date: 17.OCT.2024 15:24:35



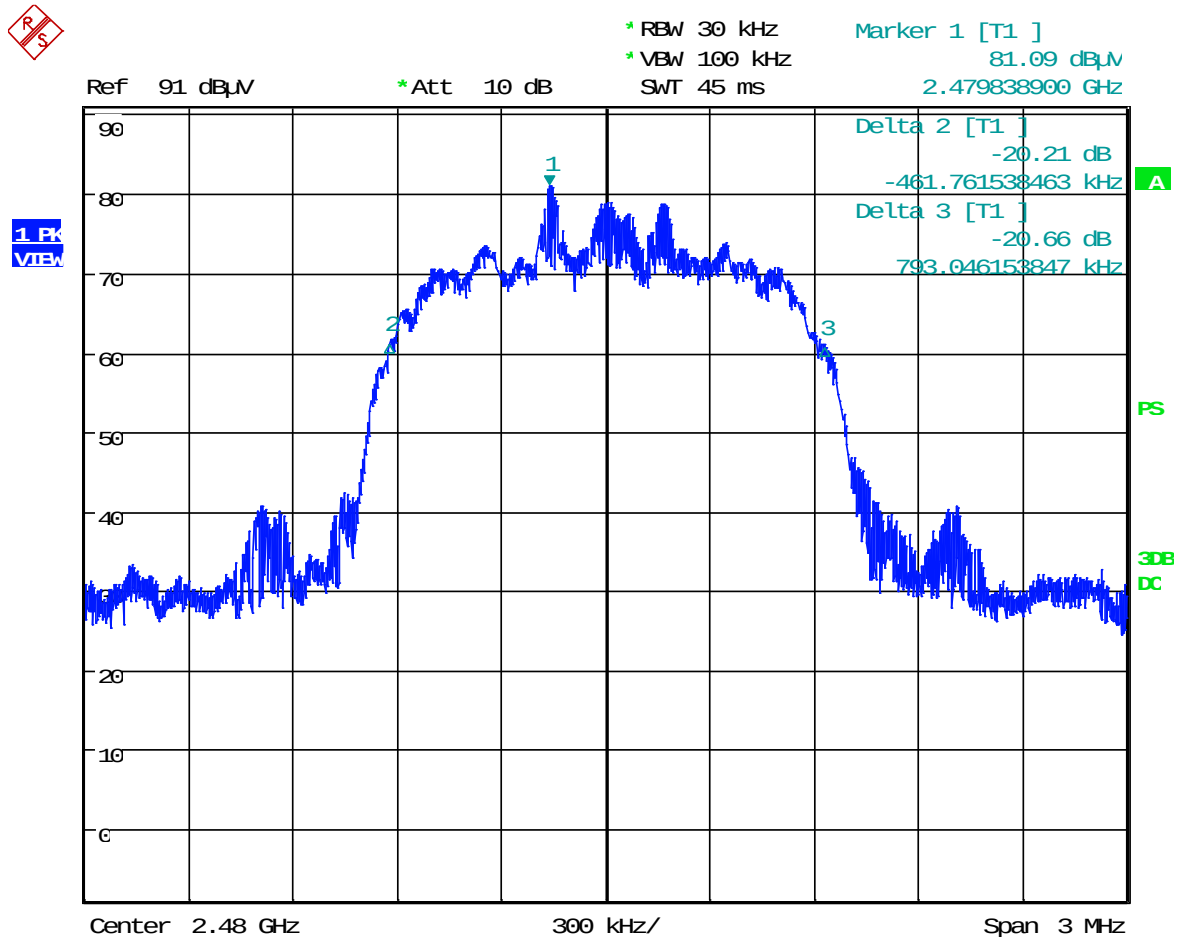
2DH5: 20dB, Mid Channel



Date: 17.OCT.2024 15:23:07



2DH5: 20dB, High Channel



Date: 17.OCT.2024 15:20:52



Order No(s): F2P32249B

Applicant: BREGGZ Innovations B.V.

Model(s): Zohn-1

3DH5: 99%, Low Channel



* RBW 30 kHz

Marker 1 [T1]

* VBW 100 kHz

77.61 dBμV

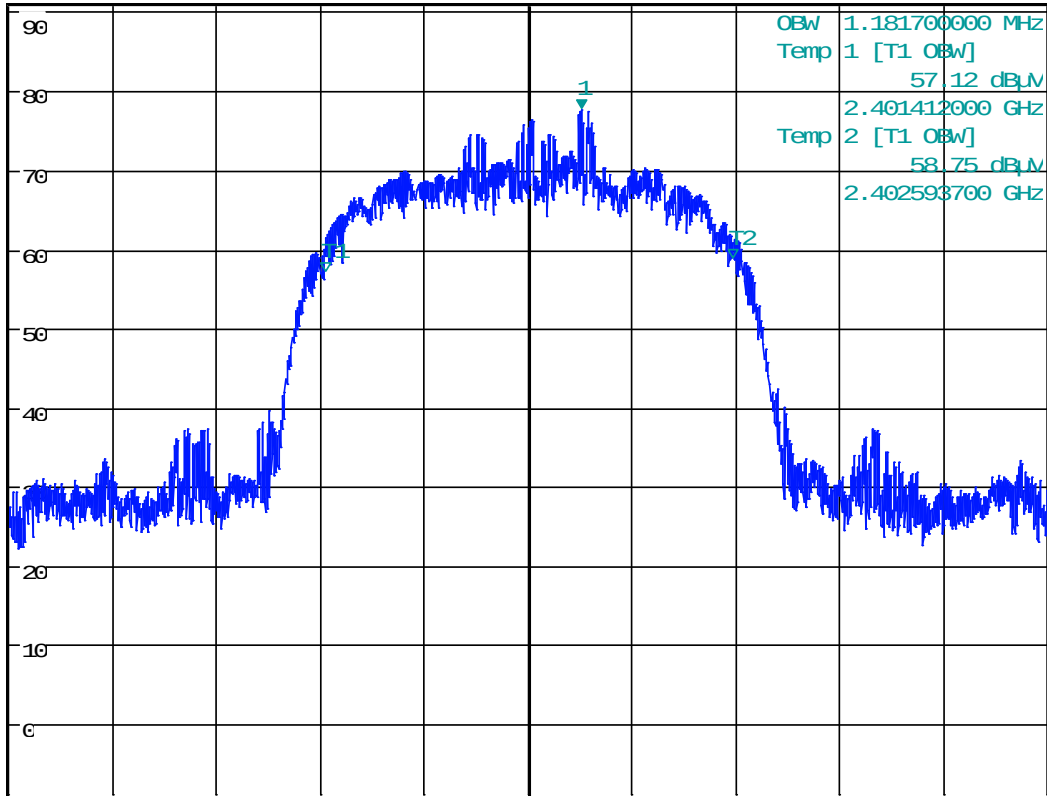
Ref 91 dBμV

* Att 10 dB

SWT 45 ms

2.402154500 GHz

1 PK
VIEW



*
A

PS

3DB
DC

Center 2.402 GHz

300 kHz/

Span 3 MHz

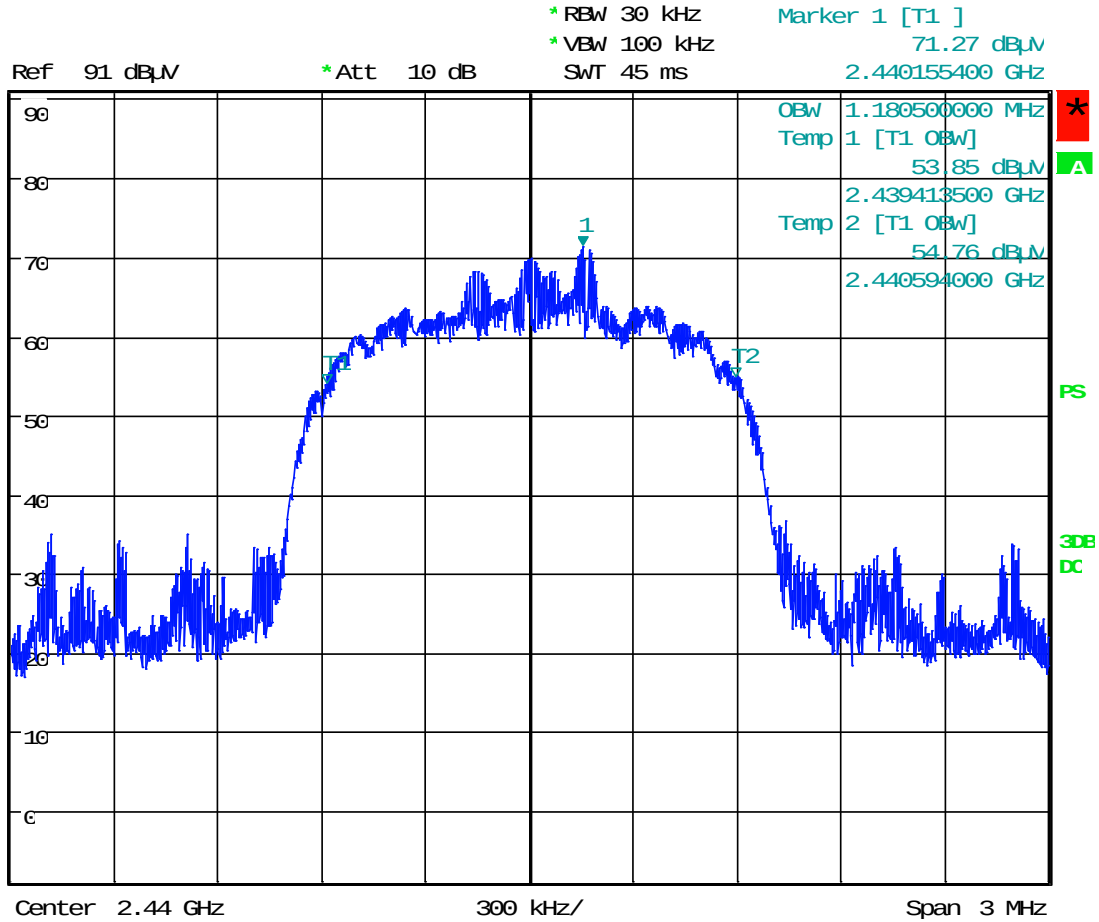
Date: 17.OCT.2024 15:25:40



3DH5: 99%, Mid Channel



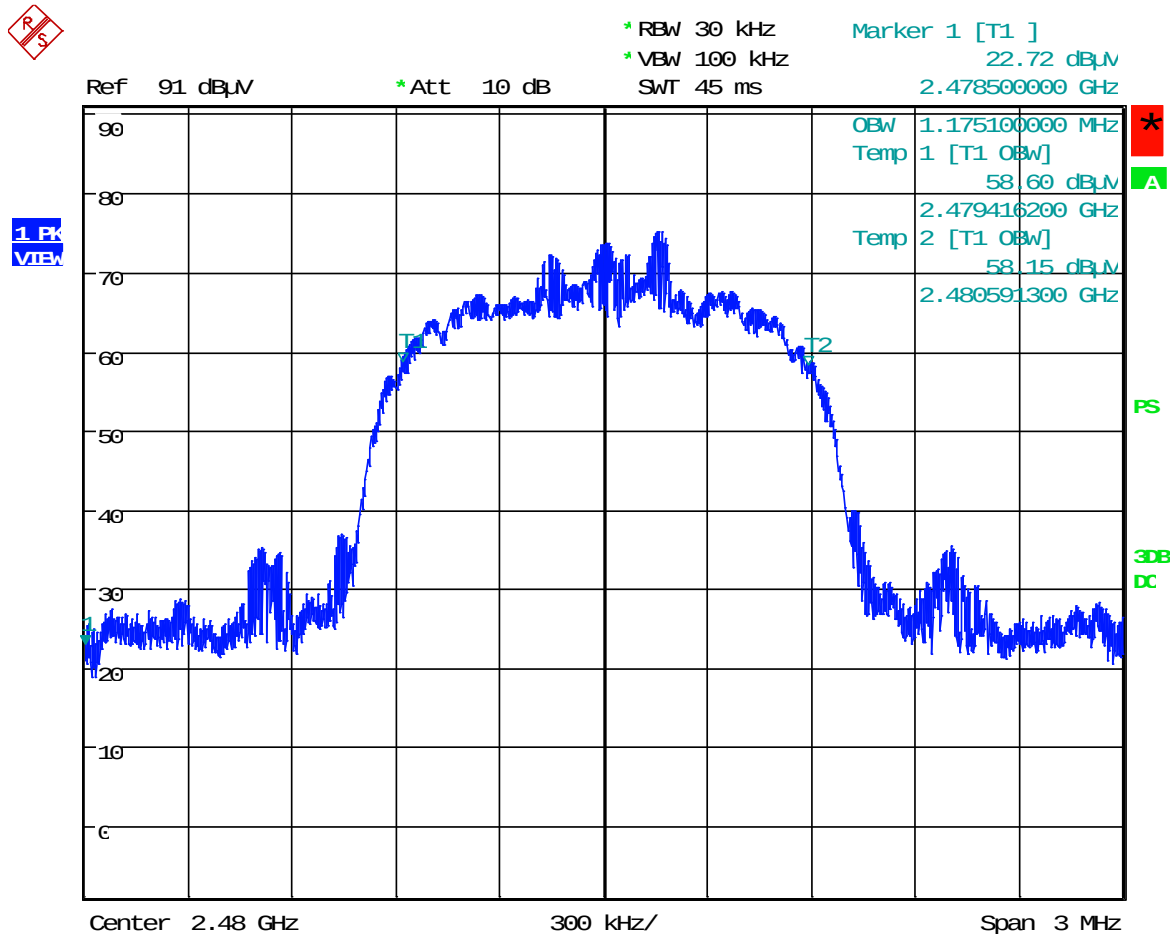
1 PK
VIBW



Date: 17.OCT.2024 15:28:33



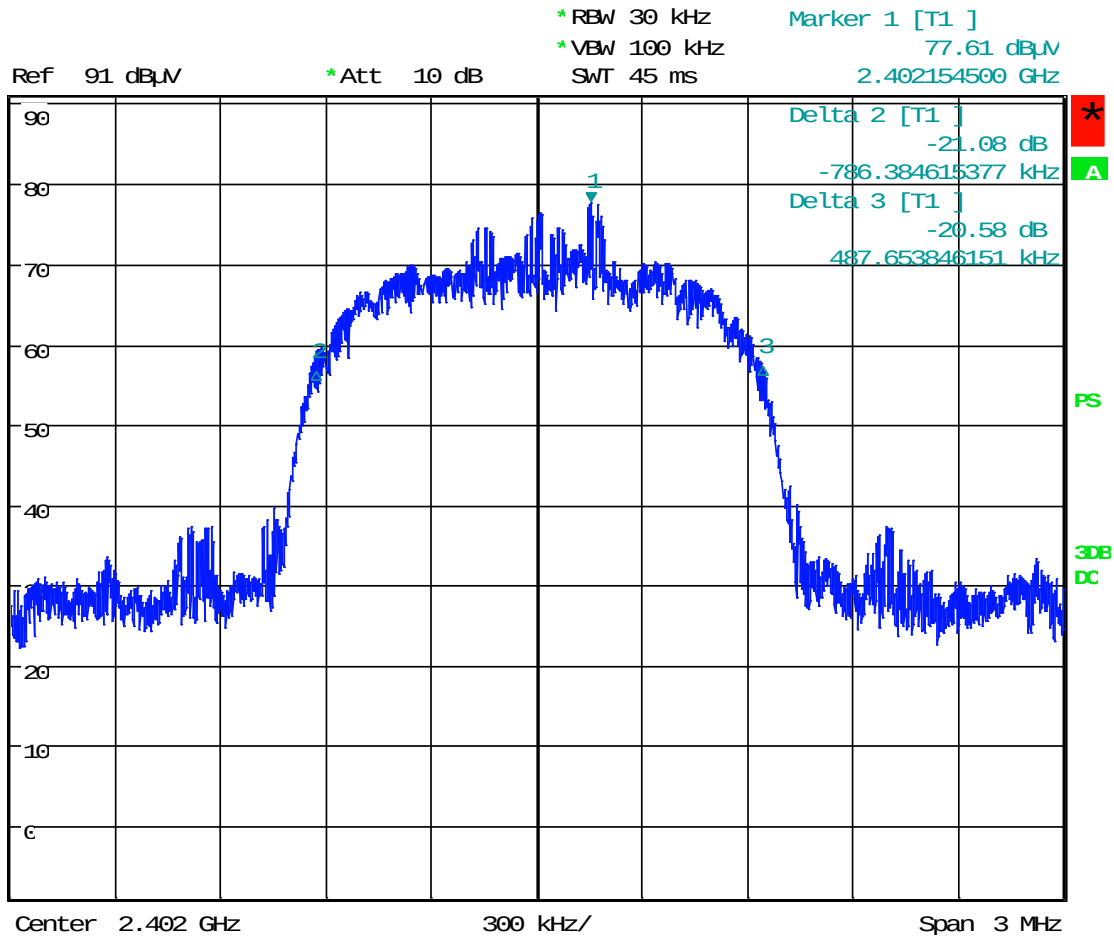
3DH5: 99%, High Channel



Date: 17.OCT.2024 15:29:39



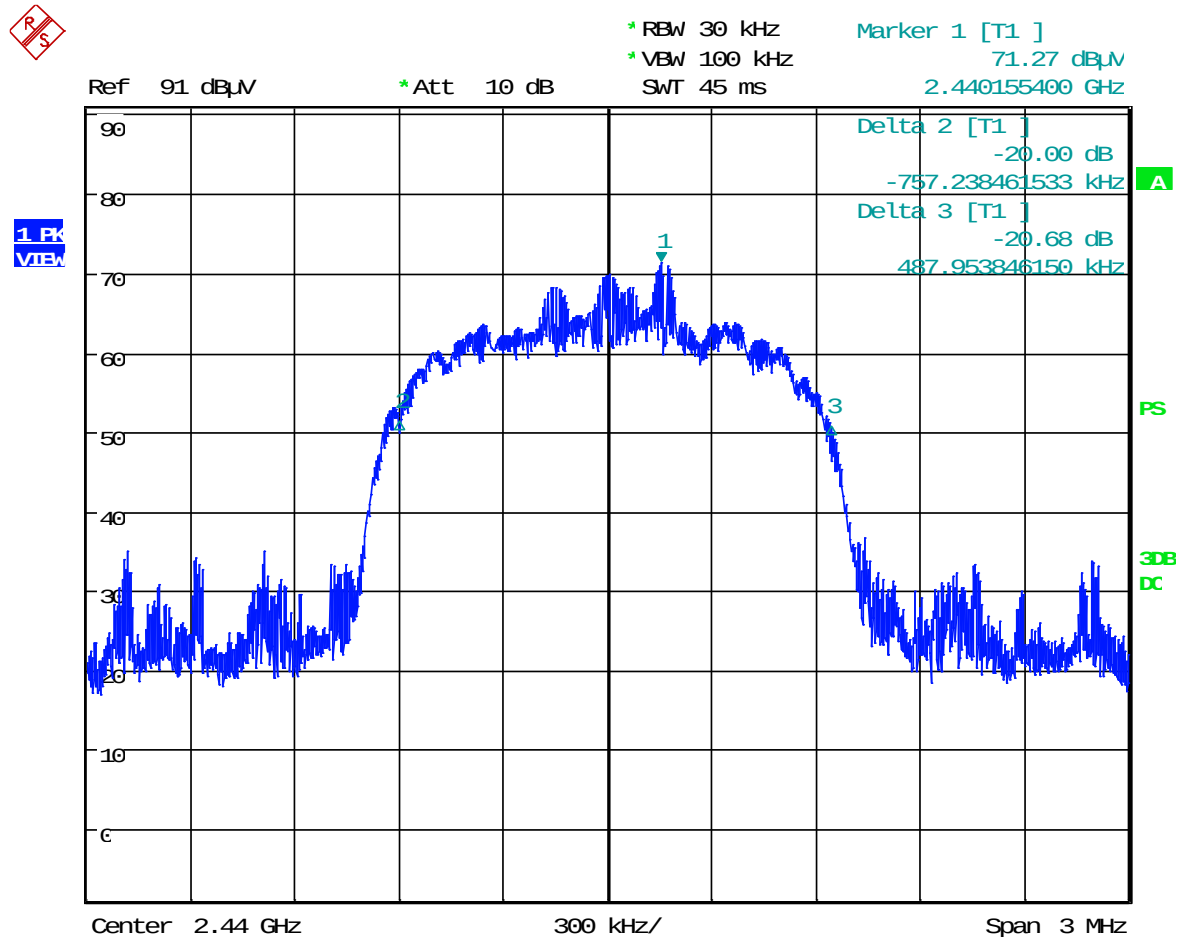
3DH5: 20dB, Low Channel



Date: 17.OCT.2024 15:26:21



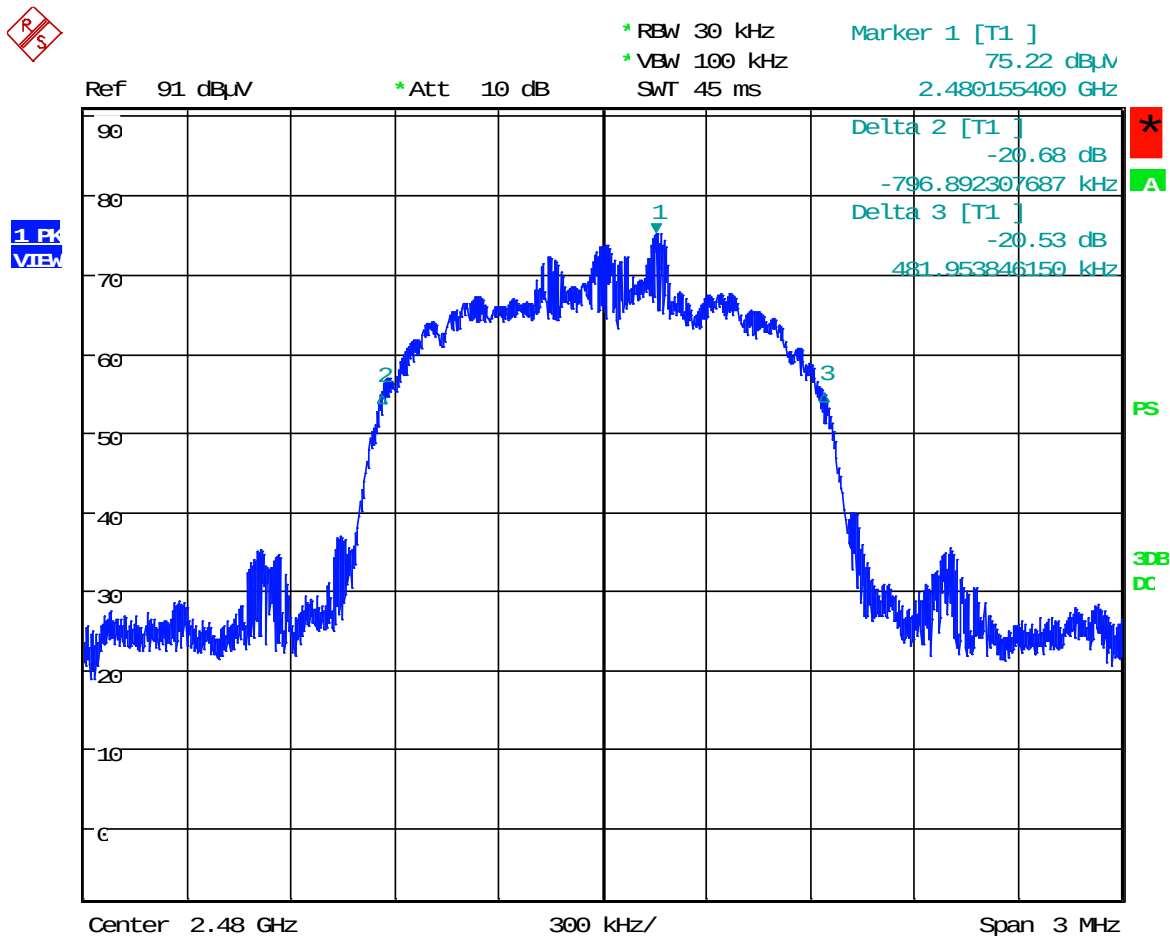
3DH5: 20dB, Mid Channel



Date: 17.OCT.2024 15:28:20



3DH5: 20dB, High Channel



Date: 17.OCT.2024 15:30:10



Order No(s): F2P32249B

Applicant: BREGGZ Innovations B.V.

Model(s): Zohn-1

DH5: 99%, Low Channel



* RBW 30 kHz

Marker 1 [T1]

* VBW 100 kHz

77.89 dBμV

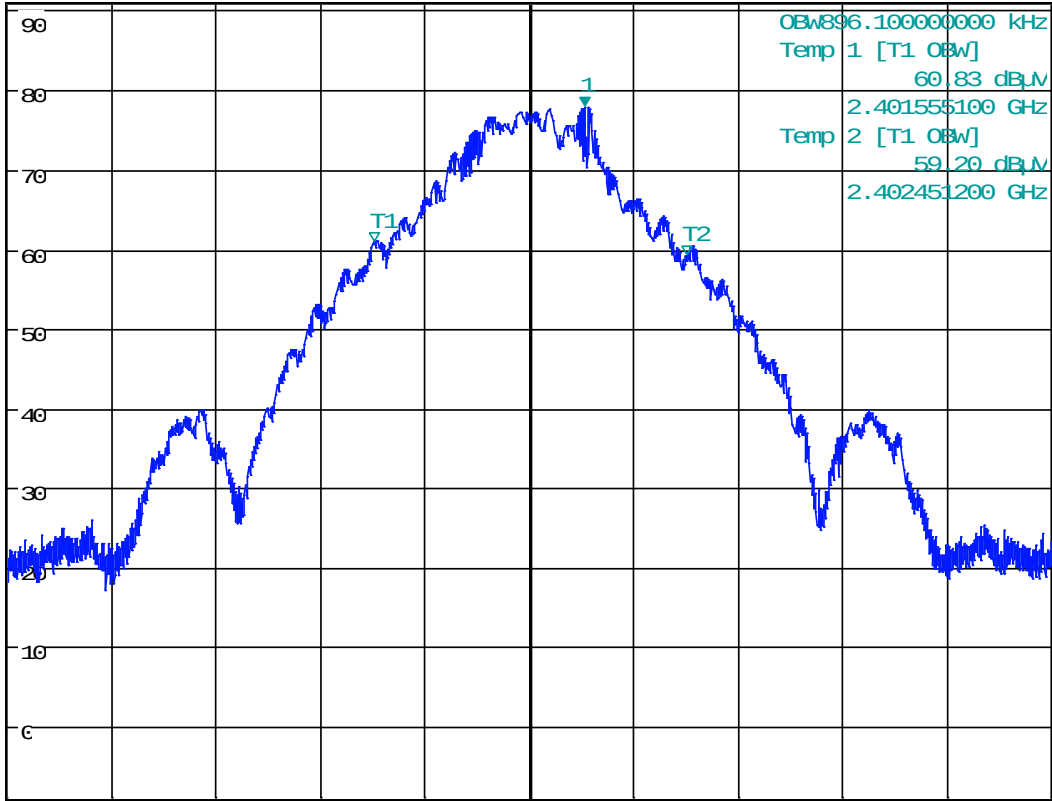
SWT 45 ms

2.402156900 GHz

Ref 91 dBμV

* Att 10 dB

1.8k
VITW



Center 2.402 GHz

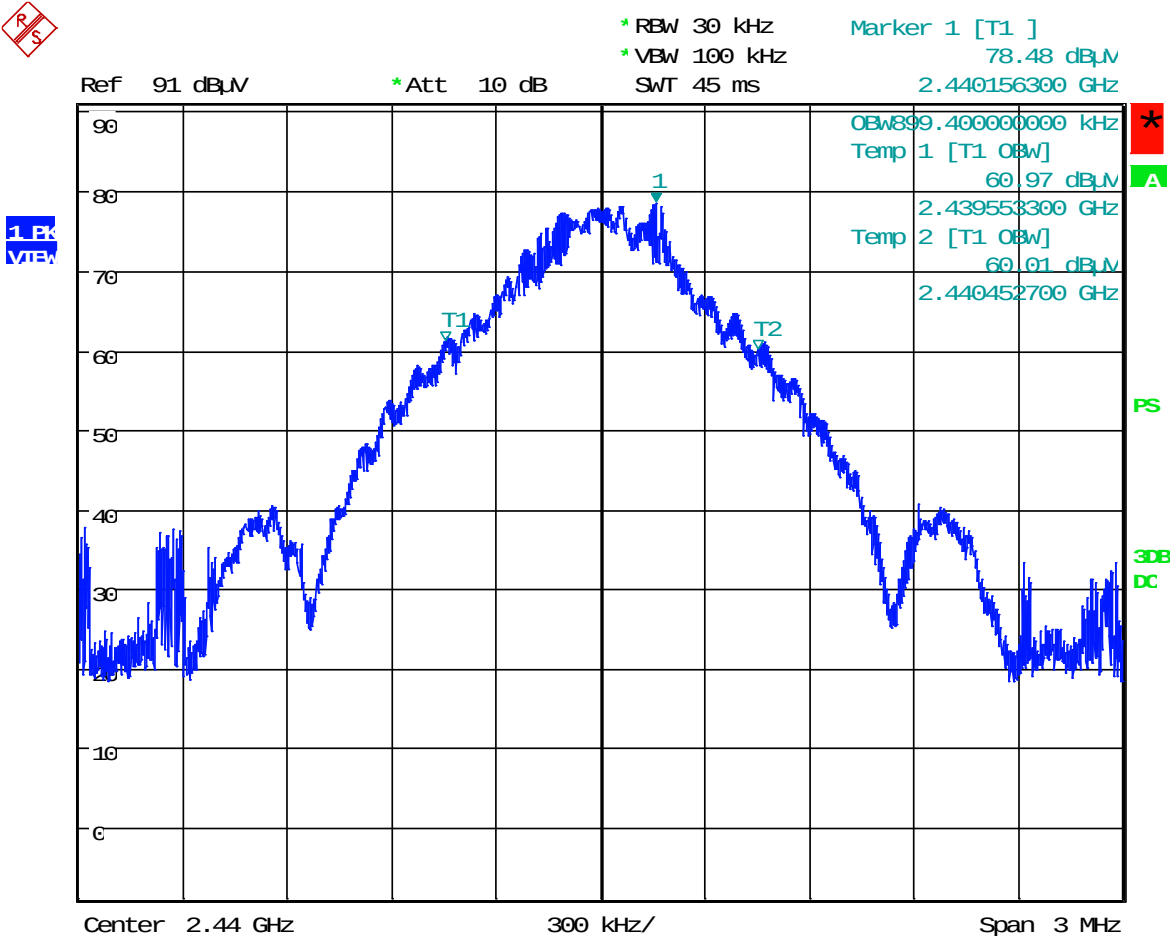
300 kHz/

Span 3 MHz

Date: 17.OCT.2024 15:14:27



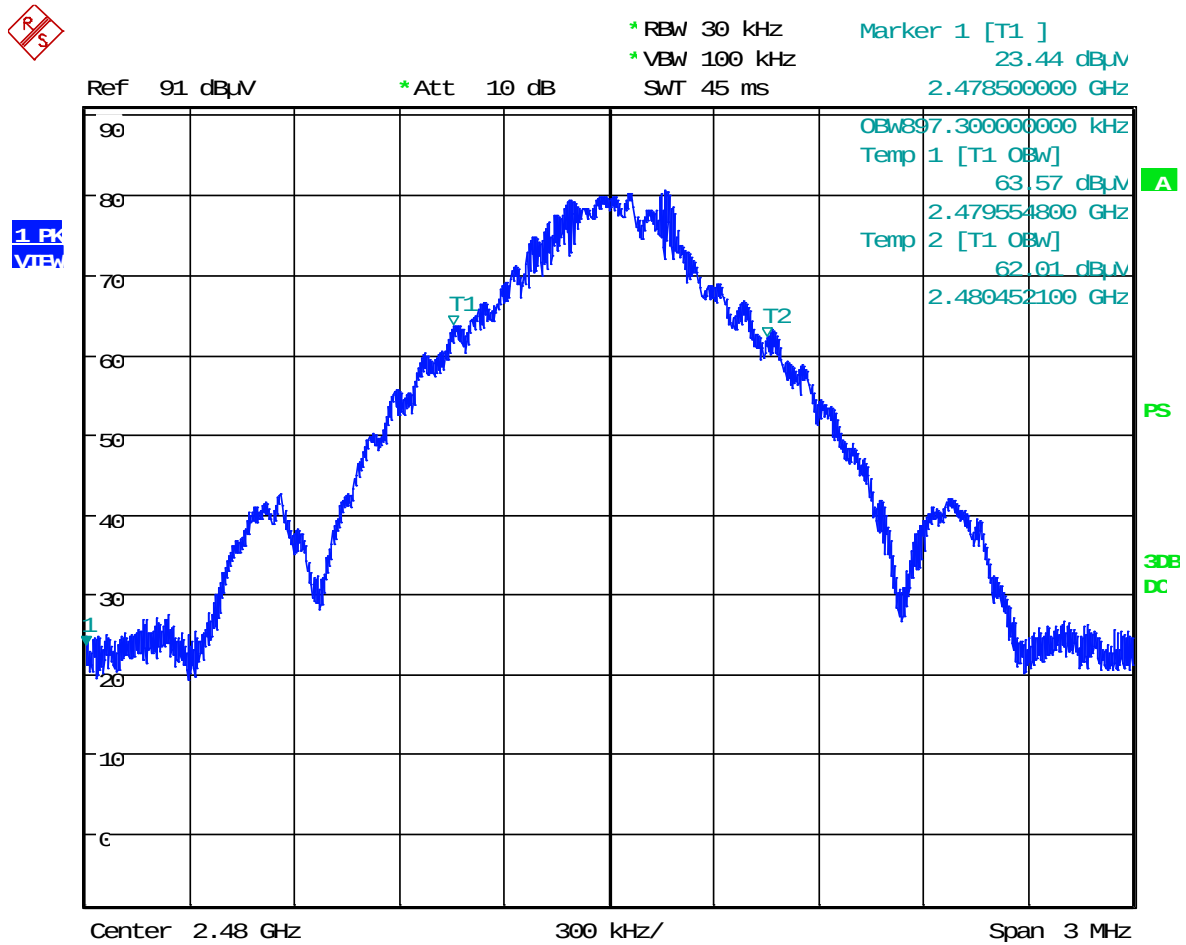
DH5: 99%, Mid Channel



Date: 17.OCT.2024 15:17:42



DH5: 99%, High Channel



Date: 17.OCT.2024 15:18:48

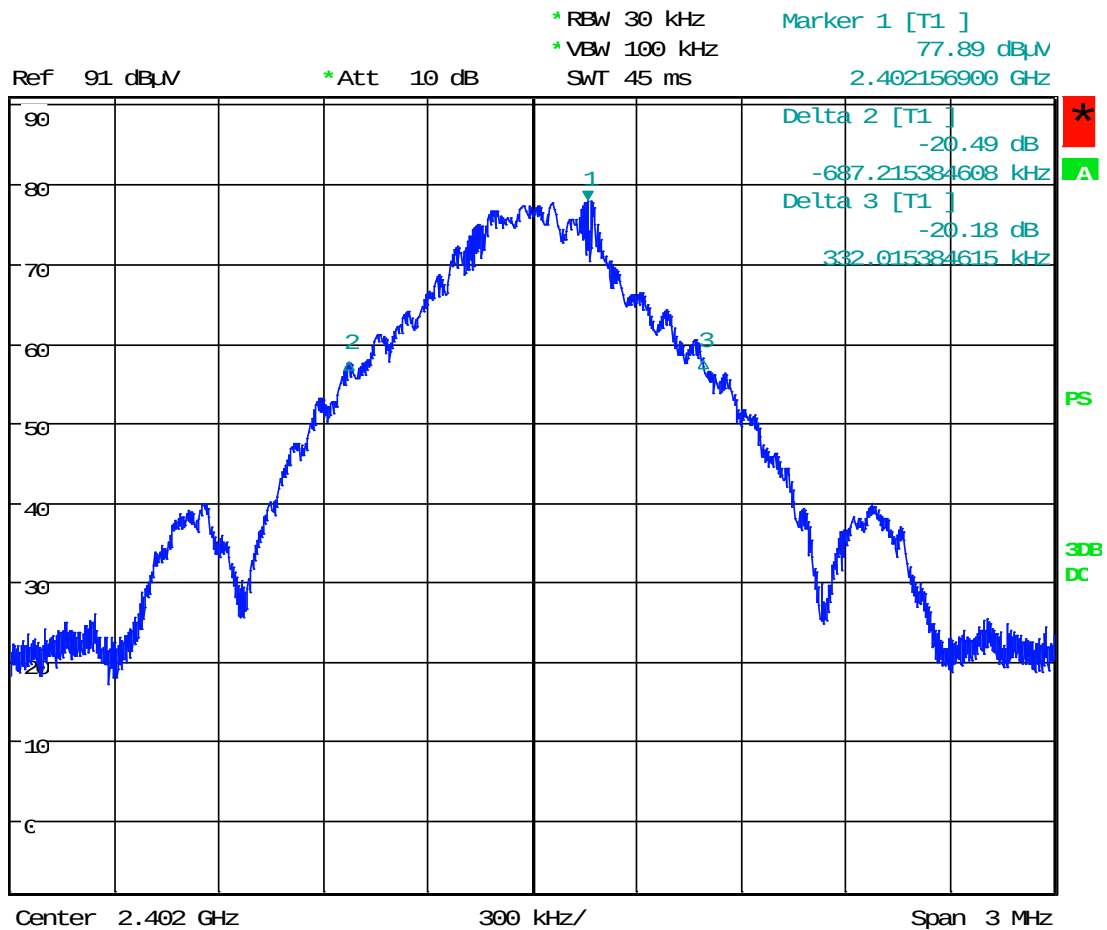


Order No(s): F2P32249B

Applicant: BREGGZ Innovations B.V.

Model(s): Zohn-1

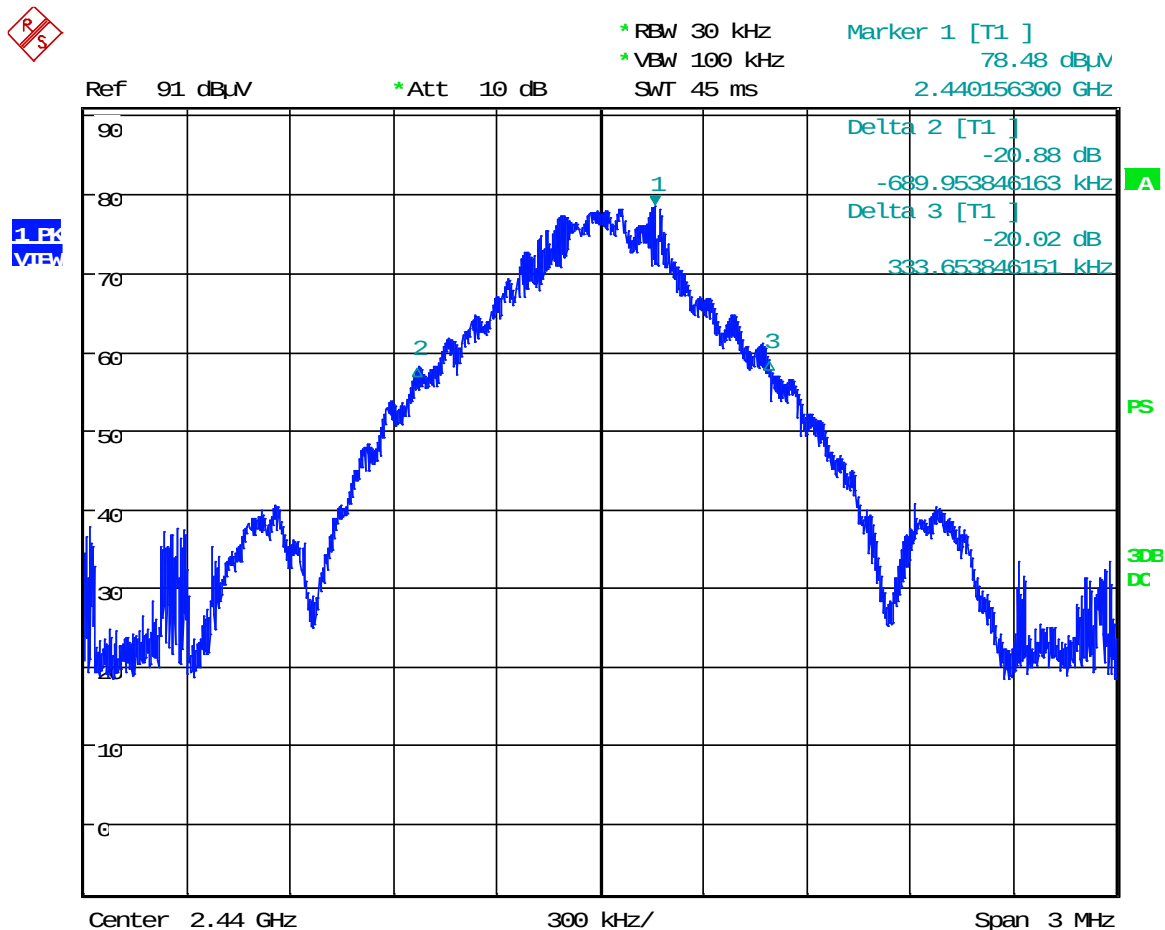
DH5: 20dB, Low Channel



Date: 17.OCT.2024 15:15:23



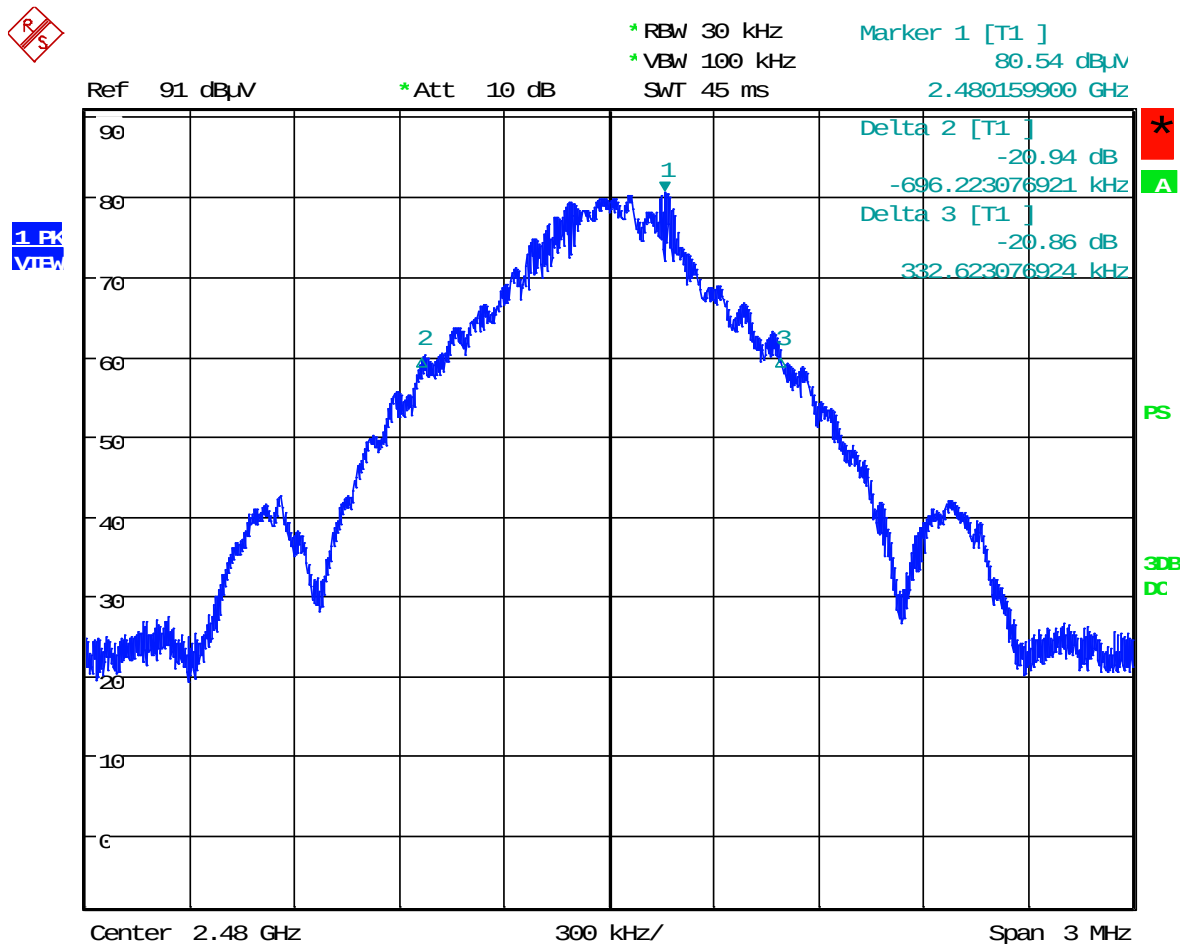
DH5: 20dB, Mid Channel



Date: 17.OCT.2024 15:17:18



DH5: 20dB, High Channel



Date: 17.OCT.2024 15:19:29



8 FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

NOTE: During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. The measuring antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions.



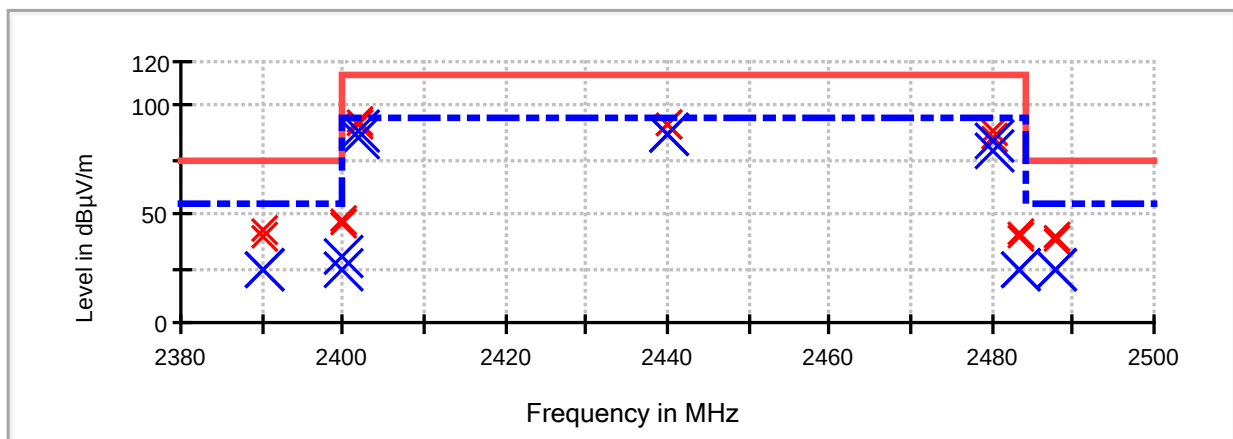
8.1 Test Data - Field Strength of Emissions from Intentional Radiators

Test Date(s):	2024-10-08	Test Engineer(s):	J. Chiller, E. Tobin
Standard(s):	CFR 47 Part 15.249(a)	Air Temperature:	21.1°C
Test Results:	Complies	Relative Humidity:	46%

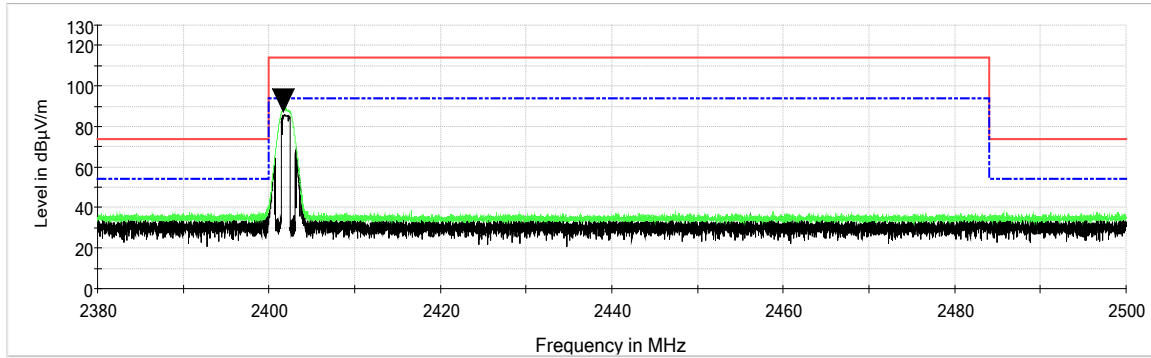
Measurements, Field Strength of the Fundamentals

BLE 1M

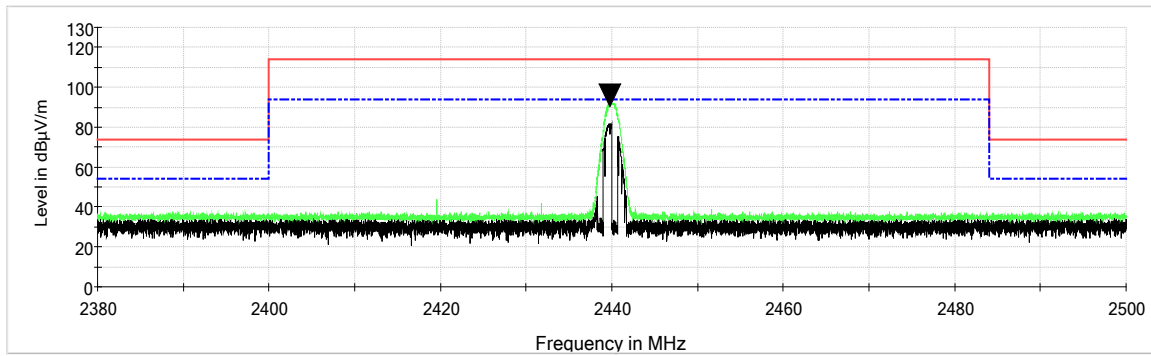
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2390.000000	38.8	25.0	1000.0	1000.000	246.0	V	0.0	-7.3	29.0	54.0
2390.000000	42.2	25.0	1000.0	1000.000	150.0	H	0.0	-7.3	29.0	54.0
2400.000000	47.3	24.7	1000.0	1000.000	150.0	H	357.0	-7.3	29.3	54.0
2400.000000	45.4	30.7	1000.0	1000.000	130.0	V	80.0	-7.3	23.3	54.0
2402.000000	90.7	85.6	1000.0	1000.000	150.0	V	358.0	-7.3	8.4	94.0
2402.000000	93.0	87.8	1000.0	1000.000	150.0	H	4.0	-7.3	6.2	94.0
2440.000000	91.8	86.4	1000.0	1000.000	100.0	H	358.0	-7.4	7.6	94.0
2440.000000	91.7	86.2	1000.0	1000.000	150.0	V	2.0	-7.4	7.8	94.0
2480.000000	84.3	78.6	1000.0	1000.000	100.0	H	4.0	-7.4	15.4	94.0
2480.000000	88.7	83.2	1000.0	1000.000	159.0	V	357.0	-7.4	10.8	94.0
2483.500000	39.3	24.7	1000.0	1000.000	300.0	V	352.0	-7.4	29.3	54.0
2483.500000	40.4	24.9	1000.0	1000.000	300.0	H	5.0	-7.4	29.1	54.0
2488.000000	38.2	24.7	1000.0	1000.000	100.0	H	0.0	-7.4	29.3	54.0
2488.000000	39.2	24.7	1000.0	1000.000	100.0	V	0.0	-7.4	29.3	54.0



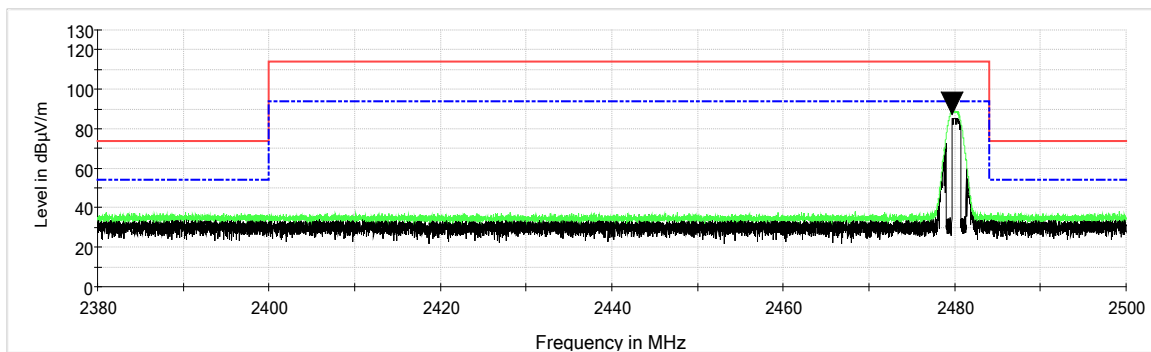
Band Edges: BLE 1M, Low Channel - Vertical



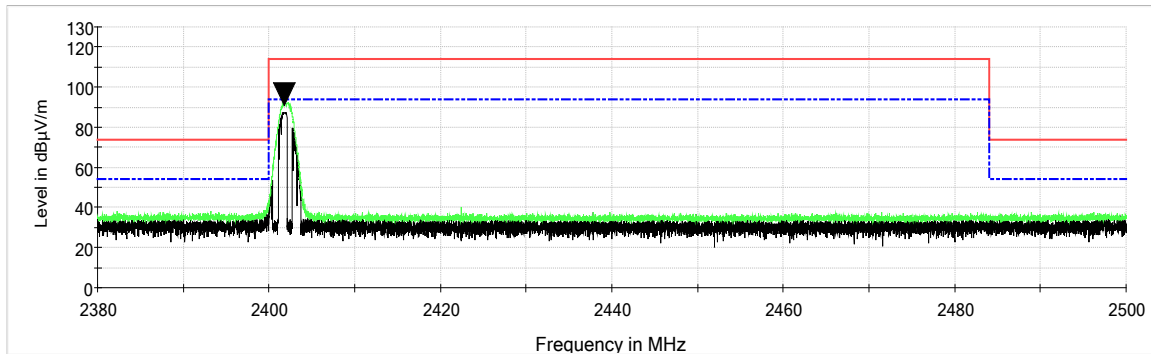
Band Edges: BLE 1M, Mid Channel - Vertical



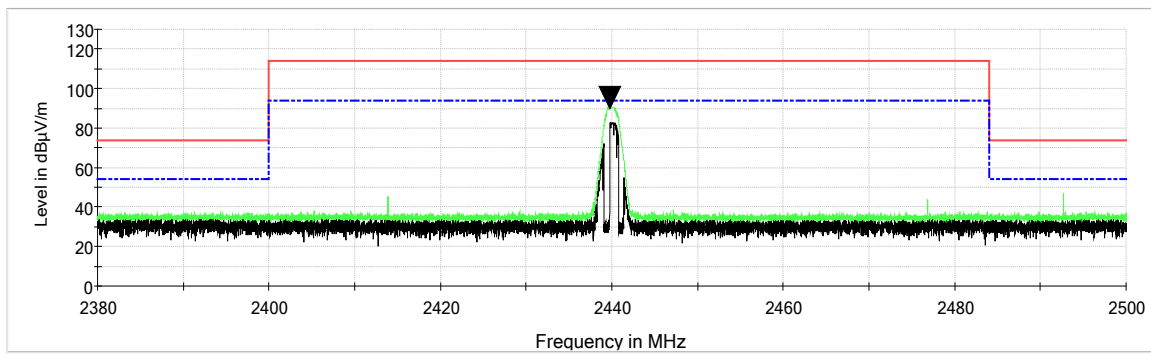
Band Edges: BLE 1M, High Channel - Vertical



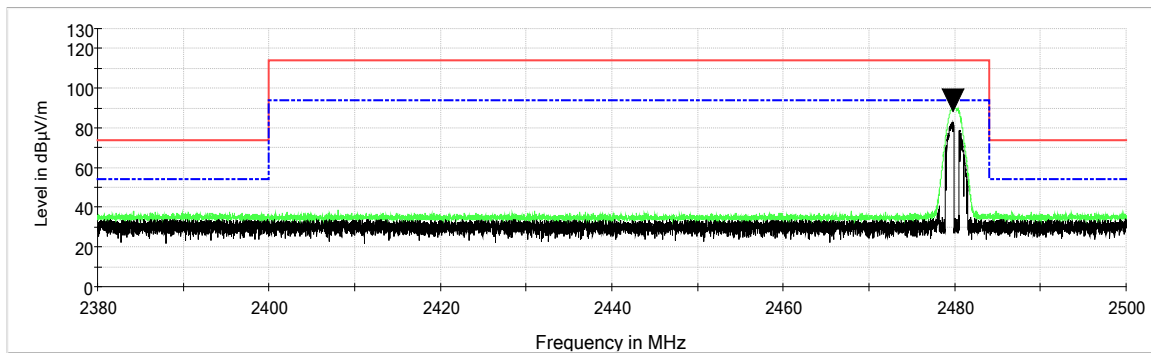
Band Edges: BLE 1M, Low Channel - Horizontal



Band Edges: BLE 1M, Mid Channel - Horizontal



Band Edges: BLE 1M, High Channel - Horizontal

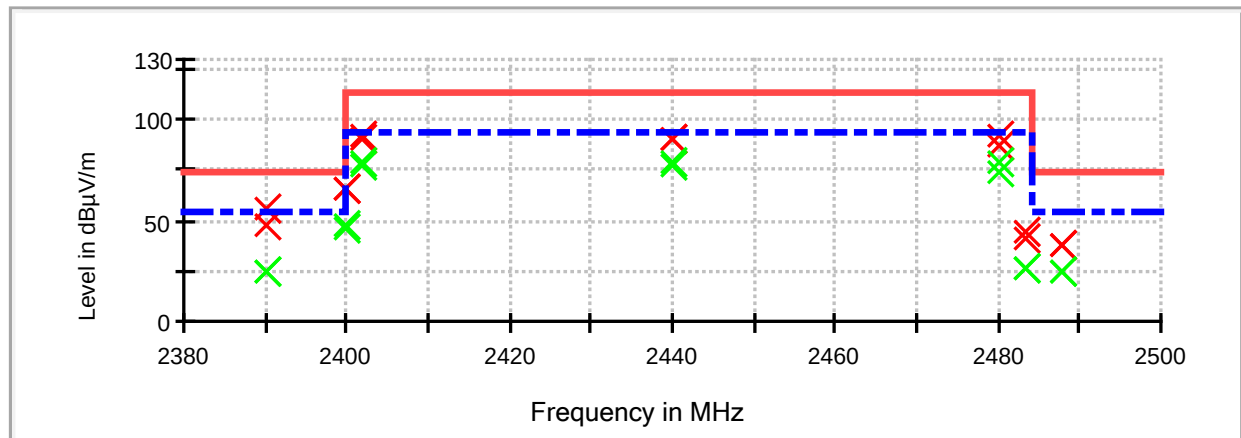




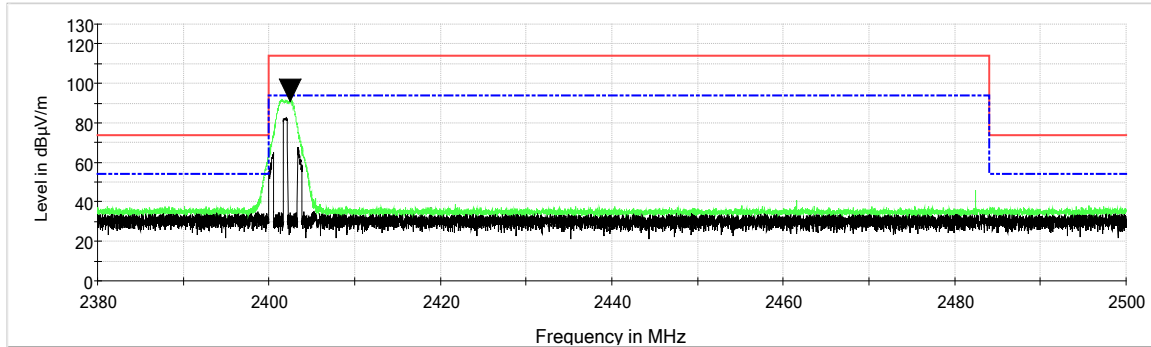
Measurements, Field Strength of the Fundamentals

BLE 2M

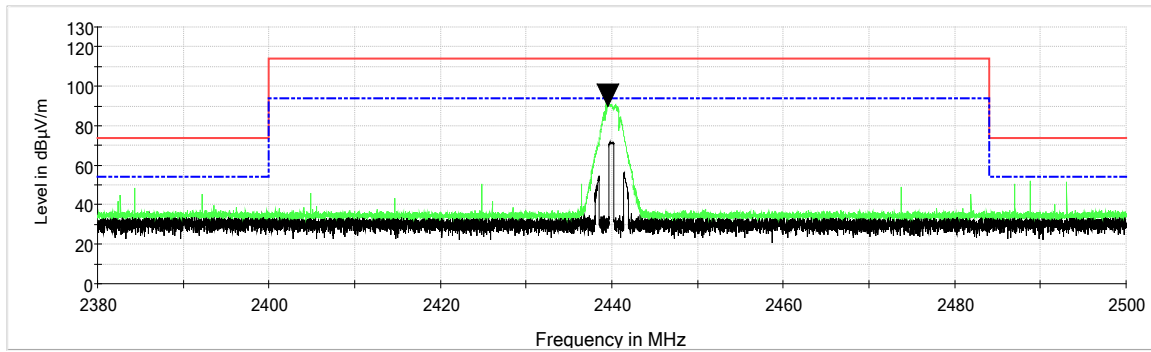
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2390.000000	55.8	25.0	1000.0	1000.000	150.0	V	0.0	-7.3	29.0	54.0
2390.000000	47.0	24.9	1000.0	1000.000	200.0	H	205.0	-7.3	29.1	54.0
2400.000000	65.8	47.0	1000.0	1000.000	167.0	V	111.0	-7.3	7.0	54.0
2400.000000	65.1	46.4	1000.0	1000.000	113.0	H	178.0	-7.3	7.6	54.0
2402.000000	91.8	79.3	1000.0	1000.000	150.0	V	2.0	-7.3	14.7	94.0
2402.000000	90.7	78.0	1000.0	1000.000	150.0	H	0.0	-7.3	16.0	94.0
2440.000000	90.7	78.0	1000.0	1000.000	134.0	H	330.0	-7.4	16.0	94.0
2440.000000	90.8	78.3	1000.0	1000.000	105.0	V	156.0	-7.4	15.7	94.0
2480.000000	92.4	79.6	1000.0	1000.000	137.0	H	124.0	-7.4	14.4	94.0
2480.000000	87.0	73.7	1000.0	1000.000	150.0	V	233.0	-7.4	20.3	94.0
2483.500000	41.1	25.9	1000.0	1000.000	138.0	V	192.0	-7.4	28.1	54.0
2483.500000	44.3	26.4	1000.0	1000.000	100.0	H	190.0	-7.4	27.6	54.0
2488.000000	38.5	24.7	1000.0	1000.000	100.0	V	4.0	-7.4	29.3	54.0
2488.000000	38.2	24.7	1000.0	1000.000	212.0	H	89.0	-7.4	29.3	54.0



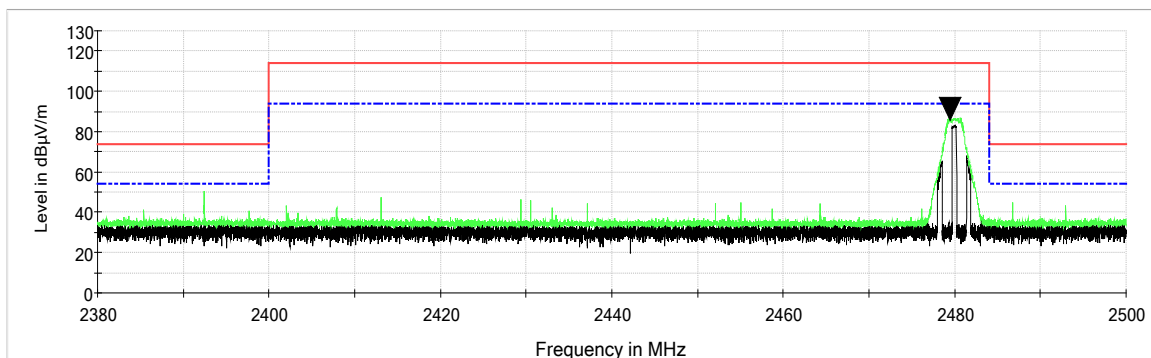
Band Edges: BLE 2M, Low Channel - Vertical



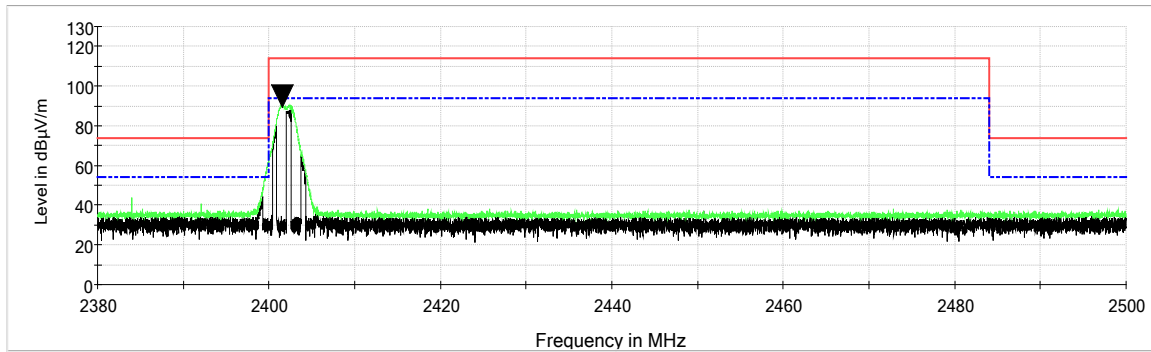
Band Edges: BLE 2M, Mid Channel - Vertical



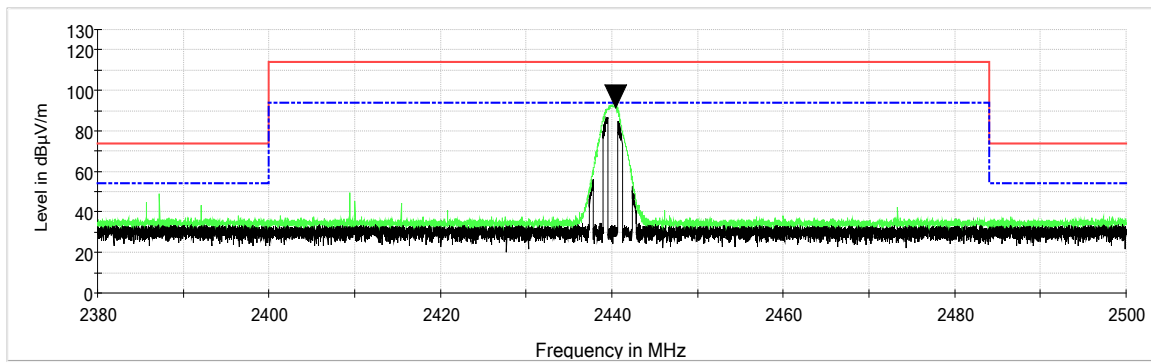
Band Edges: BLE 2M, High Channel - Vertical



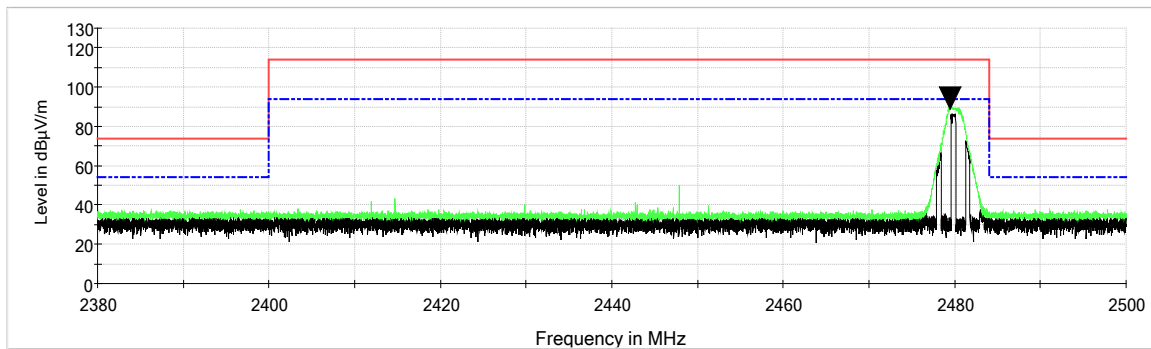
Band Edges: BLE 2M, Low Channel - Horizontal



Band Edges: BLE 2M, Mid Channel - Horizontal



Band Edges: BLE 2M, High Channel - Horizontal





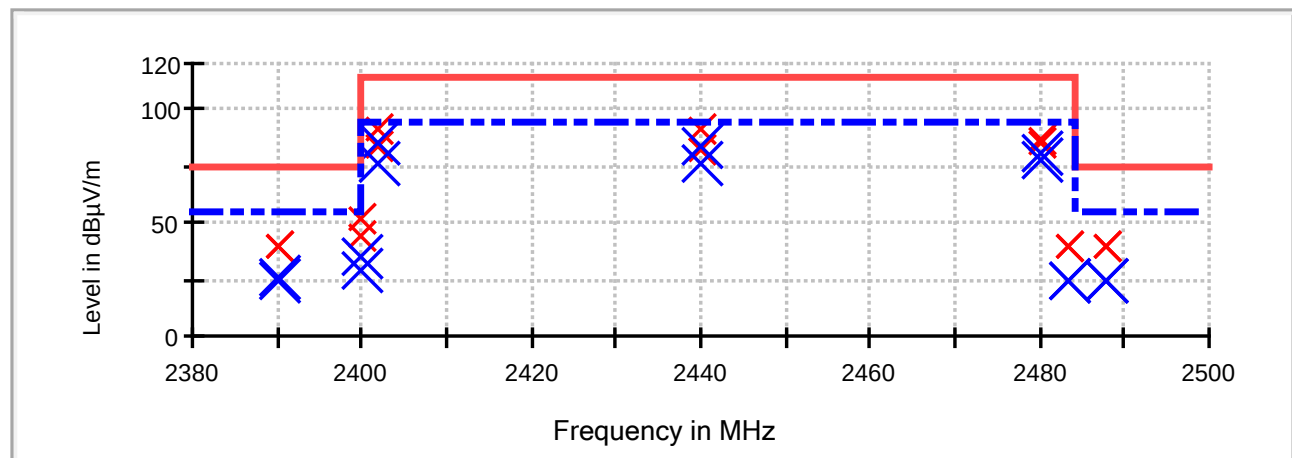
Test Date(s):	2024-10-17	Test Engineer(s):	J. Chiller, E. Tobin
Standard(s):	CFR 47 Part 15.249(a)	Air Temperature:	21.0°C
Test Results:	Complies	Relative Humidity:	45%

Measurements, Field Strength of the Fundamentals

2DH5

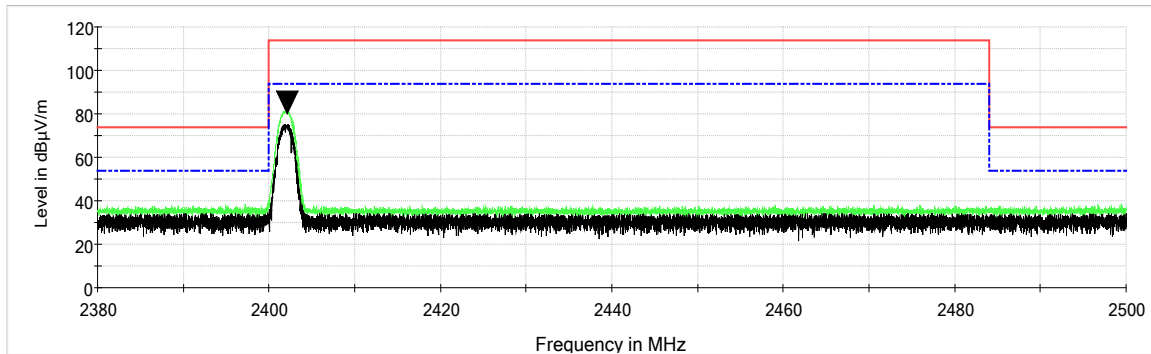
Note: Chart below includes data from all three channels.

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Meas Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2390.000000	39.2	25.1	1000.	1000.000	150.0	H	20.0	-7.3	28.9	54.0
2390.000000	38.8	25.0	1000.	1000.000	150.0	V	334.0	-7.3	29.0	54.0
2400.000000	51.9	34.9	1000.	1000.000	115.0	H	91.0	-7.3	19.1	54.0
2400.000000	43.7	28.2	1000.	1000.000	138.0	V	91.0	-7.3	25.8	54.0
2402.000000	91.4	84.6	1000.	1000.000	150.0	H	154.0	-7.3	9.4	94.0
2402.000000	82.9	75.9	1000.	1000.000	187.0	V	305.0	-7.3	18.1	94.0
2440.000000	82.2	75.2	1000.	1000.000	139.0	V	0.0	-7.4	18.8	94.0
2440.000000	90.7	83.6	1000.	1000.000	105.0	H	78.0	-7.4	10.4	94.0
2480.000000	84.4	77.0	1000.	1000.000	211.0	V	130.0	-7.4	17.0	94.0
2480.000000	87.3	80.6	1000.	1000.000	150.0	H	269.0	-7.4	13.4	94.0
2483.500000	39.0	25.0	1000.	1000.000	150.0	V	266.0	-7.4	29.0	54.0
2483.500000	39.0	25.1	1000.	1000.000	150.0	H	25.0	-7.4	28.9	54.0
2488.000000	38.9	24.9	1000.	1000.000	150.0	H	120.0	-7.4	29.1	54.0
2488.000000	39.3	24.9	1000.	1000.000	150.0	V	162.0	-7.4	29.1	54.0

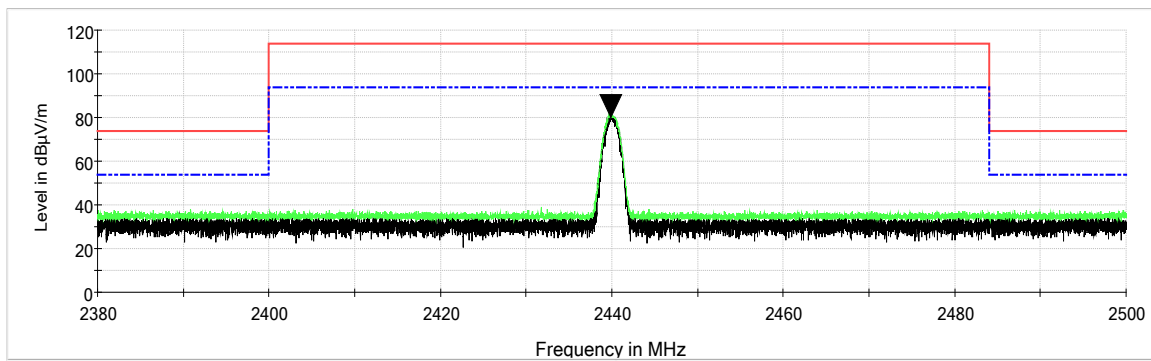




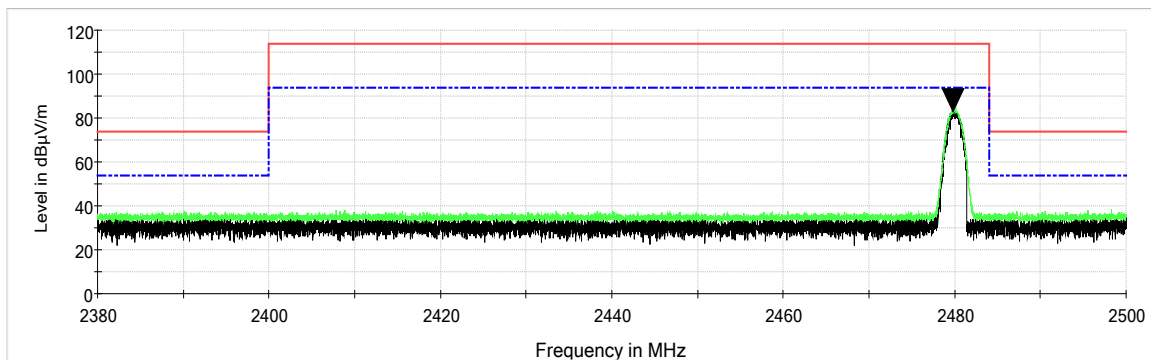
Band Edges: 2DH5: Low Channel - Vertical



Band Edges: 2DH5: Mid Channel - Vertical

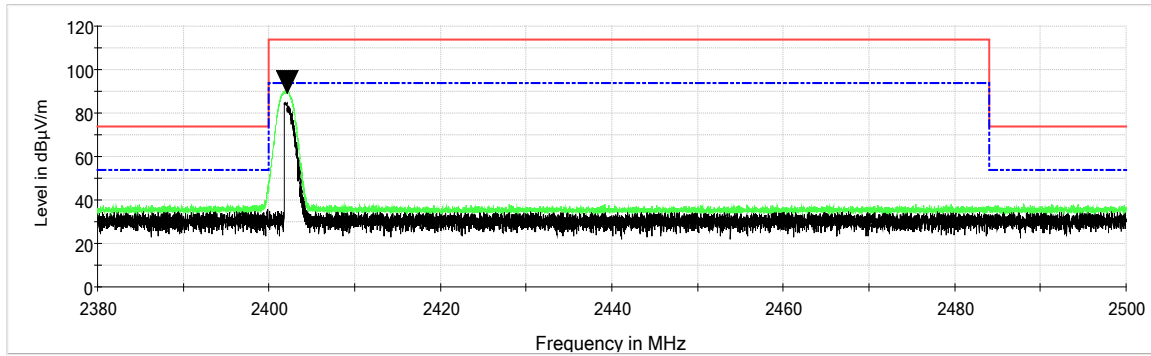


Band Edges: 2DH5: High Channel - Vertical

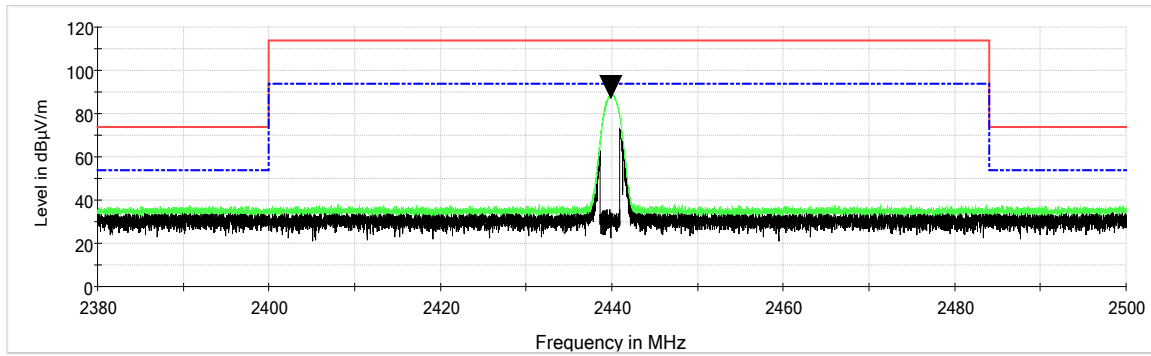




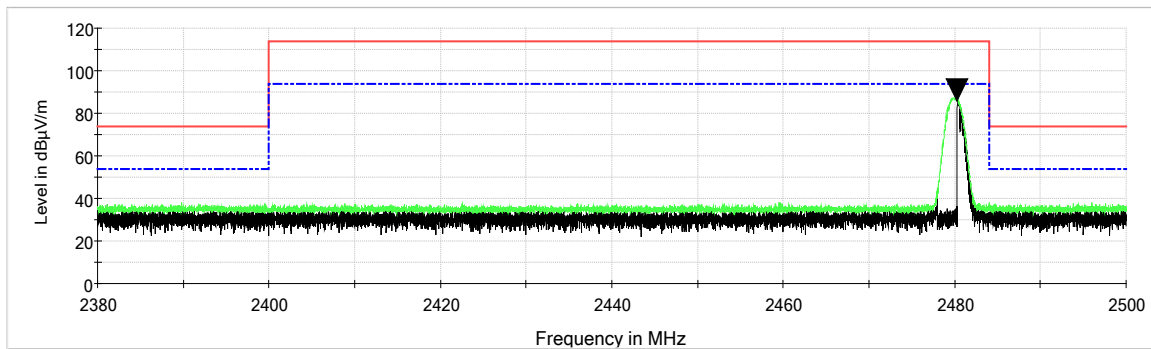
Band Edges: 2DH5: Low Channel - Horizontal



Band Edges: 2DH5: Mid Channel - Horizontal



Band Edges: 2DH5: High Channel - Horizontal

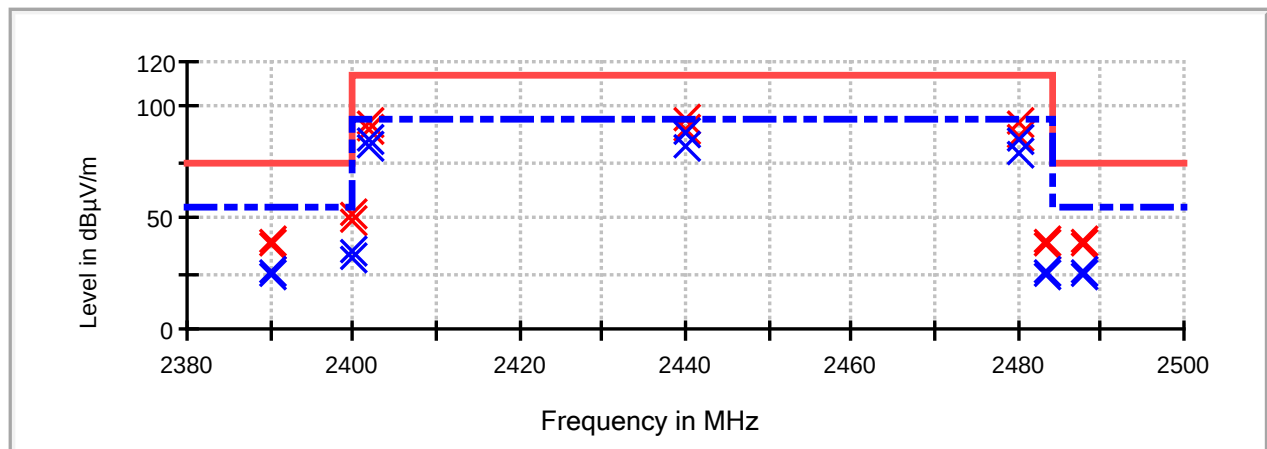




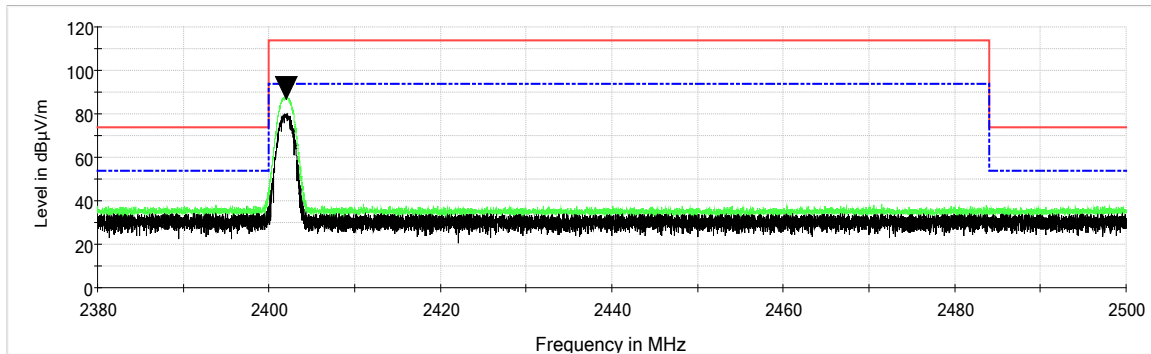
Measurements, Field Strength of the Fundamentals

3DH5

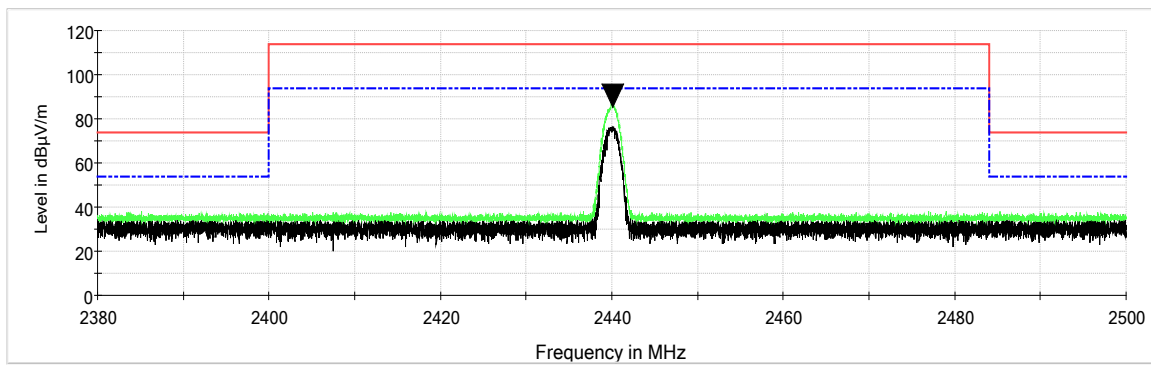
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2390.000000	39.0	25.0	1000.0	1000.000	150.0	V	0.0	-7.3	29.0	54.0
2390.000000	38.7	25.1	1000.0	1000.000	150.0	H	224.0	-7.3	28.9	54.0
2400.000000	48.6	32.2	1000.0	1000.000	212.0	V	90.0	-7.3	21.8	54.0
2400.000000	51.5	35.2	1000.0	1000.000	100.0	H	210.0	-7.3	18.8	54.0
2402.000000	89.4	82.5	1000.0	1000.000	163.0	V	61.0	-7.3	11.5	94.0
2402.000000	92.3	85.7	1000.0	1000.000	138.0	H	214.0	-7.3	8.3	94.0
2440.000000	94.2	87.5	1000.0	1000.000	188.0	H	175.0	-7.4	6.5	94.0
2440.000000	89.2	81.7	1000.0	1000.000	216.0	V	85.0	-7.4	12.3	94.0
2480.000000	92.5	85.6	1000.0	1000.000	163.0	H	180.0	-7.4	8.4	94.0
2480.000000	85.8	78.6	1000.0	1000.000	187.0	V	60.0	-7.4	15.4	94.0
2483.500000	39.3	25.2	1000.0	1000.000	169.0	V	51.0	-7.4	28.8	54.0
2483.500000	38.1	25.0	1000.0	1000.000	150.0	H	107.0	-7.4	29.0	54.0
2488.000000	39.2	25.1	1000.0	1000.000	150.0	H	112.0	-7.4	28.9	54.0
2488.000000	38.6	24.9	1000.0	1000.000	150.0	V	121.0	-7.4	29.1	54.0



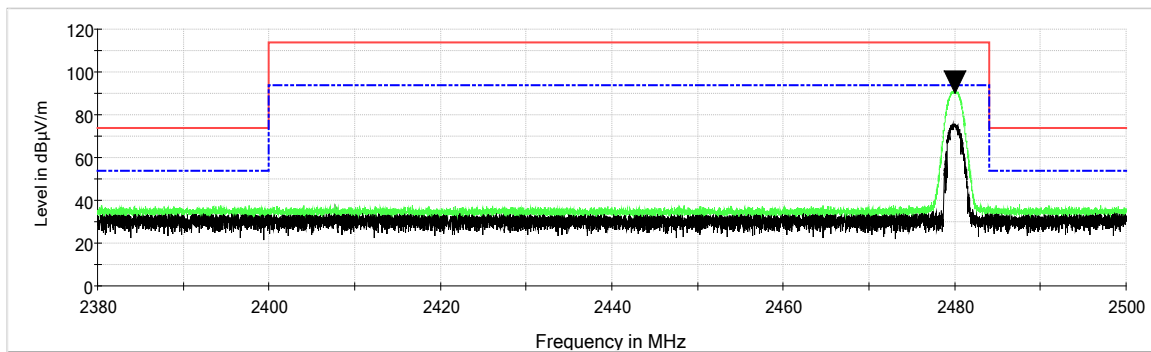
Band Edges: 3DH5: Low Channel - Vertical



Band Edges: 3DH5: Mid Channel - Vertical

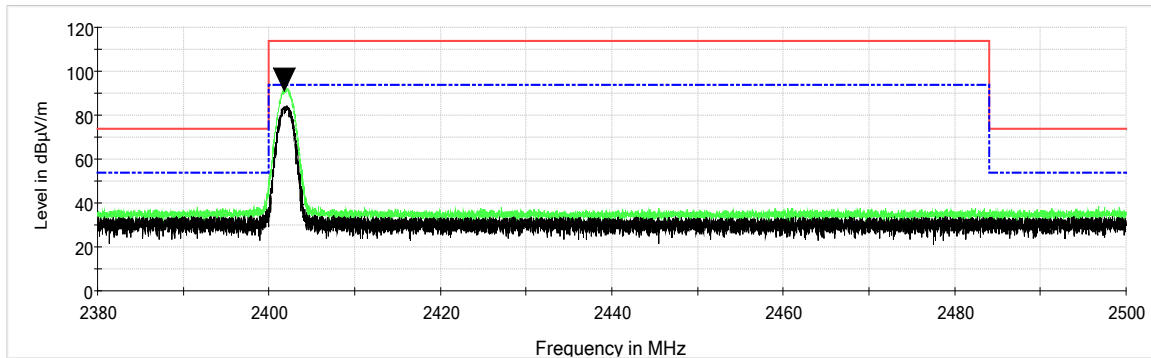


Band Edges: 3DH5: High Channel - Vertical

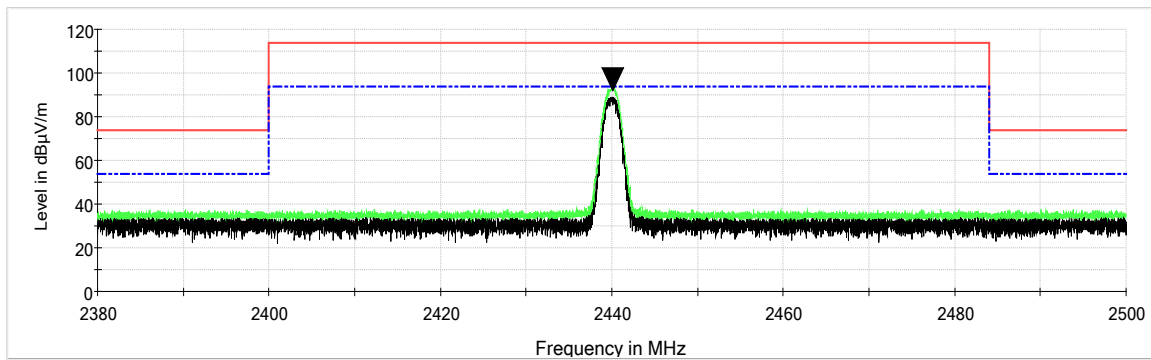




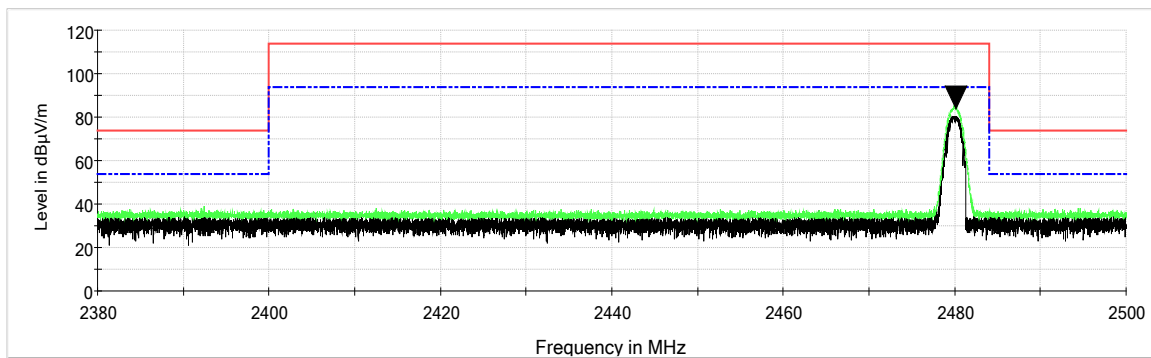
Band Edges: 3DH5: Low Channel - Horizontal



Band Edges: 3DH5: Mid Channel - Horizontal



Band Edges: 3DH5: High Channel - Horizontal

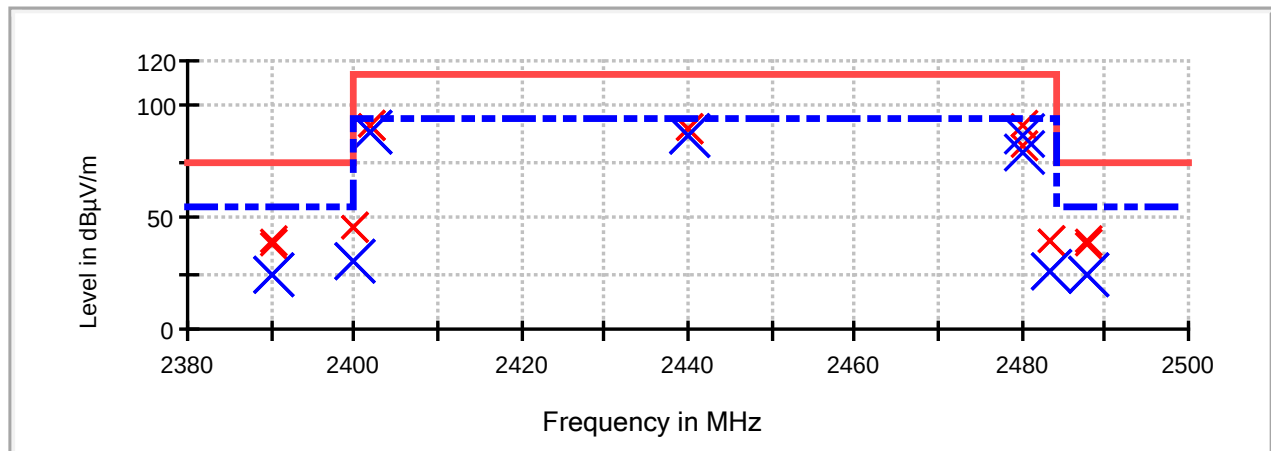




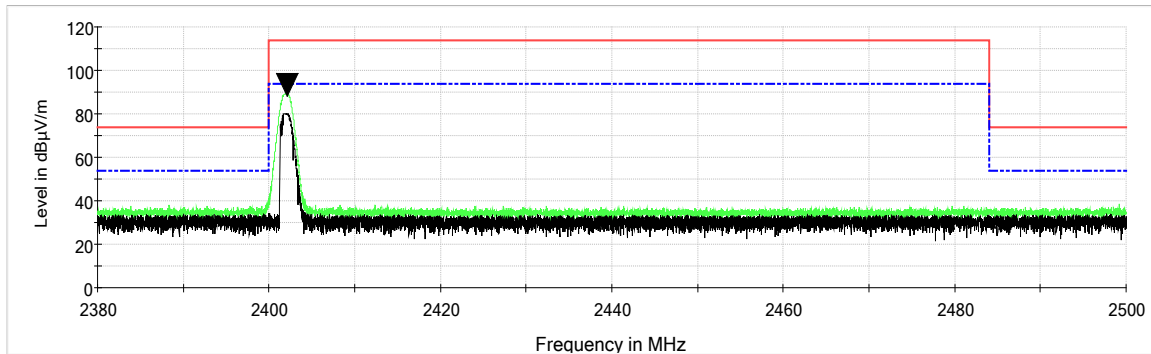
Measurements, Field Strength of the Fundamentals

DH5

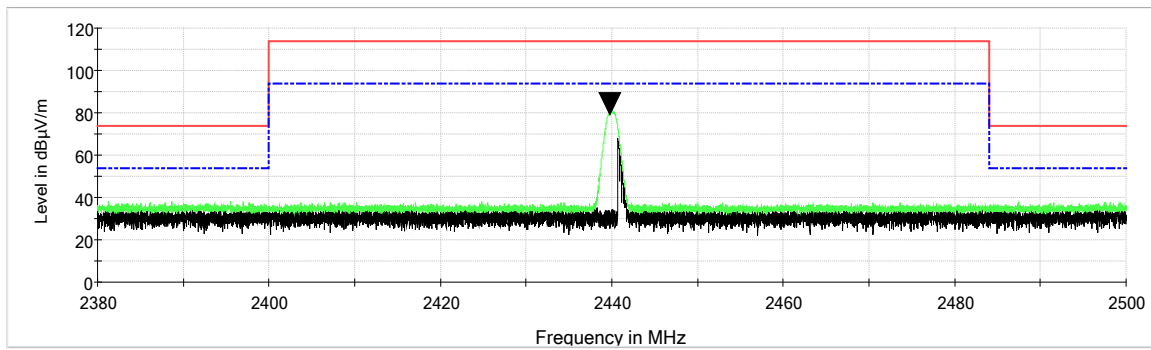
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
2390.000000	39.0	25.0	1000.0	1000.000	150.0	V	126.0	-7.3	29.0	54.0
2390.000000	38.3	25.0	1000.0	1000.000	150.0	H	94.0	-7.3	29.0	54.0
2400.000000	45.8	30.4	1000.0	1000.000	134.0	H	150.0	-7.3	23.6	54.0
2400.000000	45.2	30.0	1000.0	1000.000	150.0	V	126.0	-7.3	24.0	54.0
2402.000000	90.5	87.3	1000.0	1000.000	162.0	V	116.0	-7.3	6.7	94.0
2402.000000	91.1	88.0	1000.0	1000.000	104.0	H	95.0	-7.3	6.0	94.0
2440.000000	89.6	86.8	1000.0	1000.000	150.0	V	179.0	-7.4	7.2	94.0
2440.000000	90.1	87.3	1000.0	1000.000	134.0	H	200.0	-7.4	6.7	94.0
2480.000000	90.5	87.1	1000.0	1000.000	114.0	H	83.0	-7.4	6.9	94.0
2480.000000	81.9	79.1	1000.0	1000.000	150.0	V	14.0	-7.4	14.9	94.0
2483.500000	39.1	25.1	1000.0	1000.000	105.0	V	15.0	-7.4	28.9	54.0
2483.500000	40.1	25.8	1000.0	1000.000	234.0	H	114.0	-7.4	28.2	54.0
2488.000000	39.1	25.1	1000.0	1000.000	150.0	H	113.0	-7.4	28.9	54.0
2488.000000	38.6	24.9	1000.0	1000.000	150.0	V	65.0	-7.4	29.1	54.0



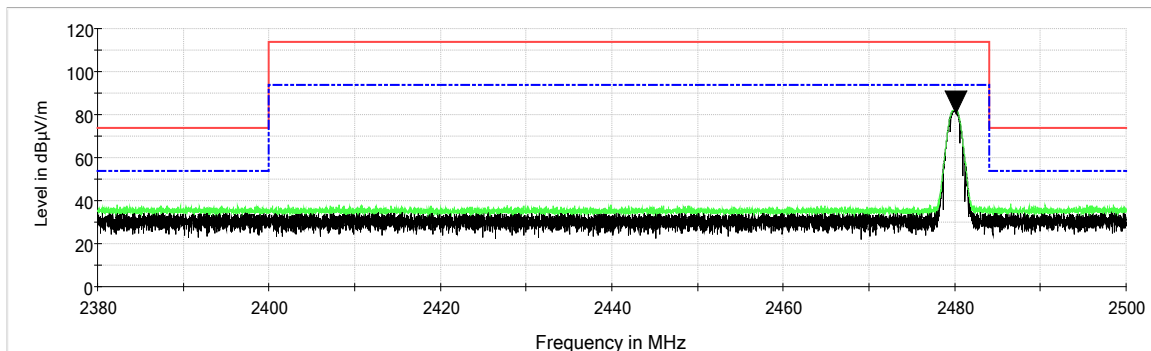
Band Edges: DH5: Low Channel - Vertical



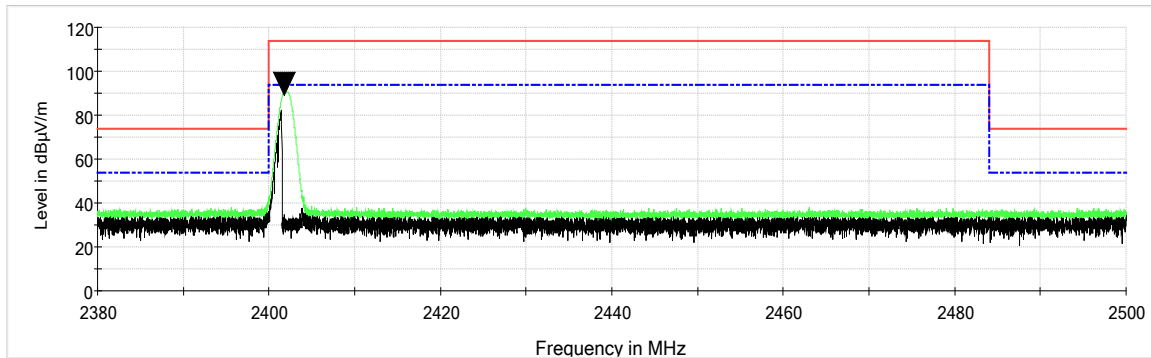
Band Edges: DH5: Mid Channel - Vertical



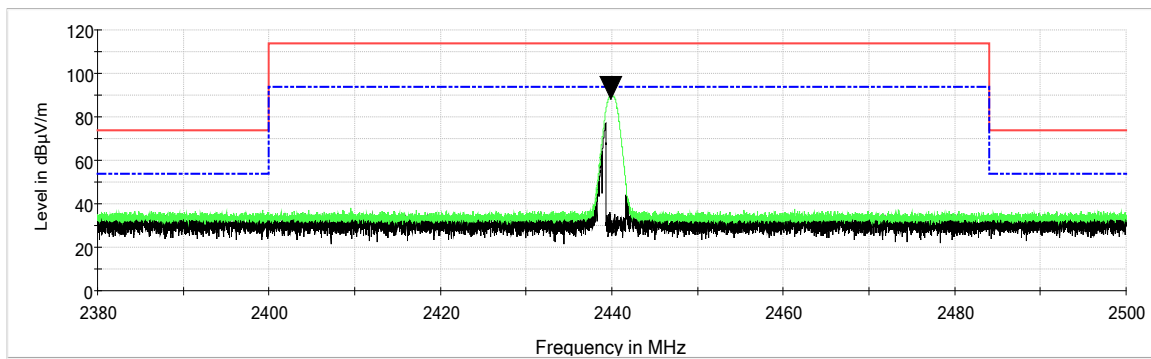
Band Edges: DH5: High Channel - Vertical



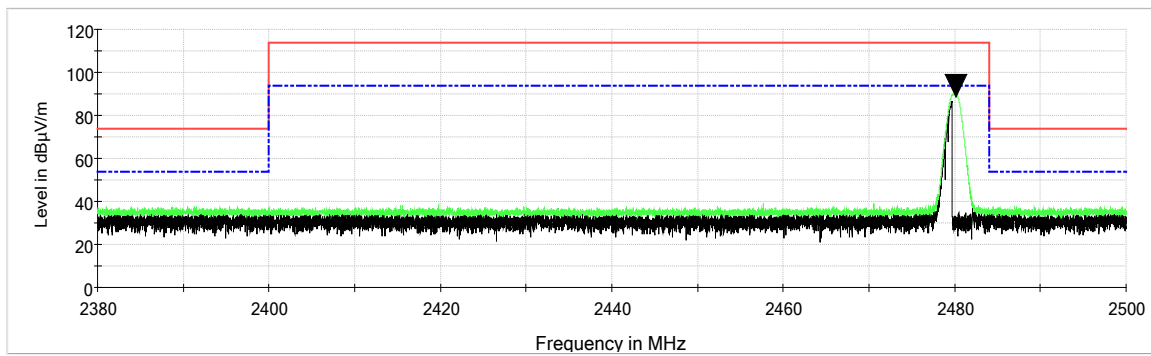
Band Edges: DH5: Low Channel - Horizontal



Band Edges: DH5: Mid Channel - Horizontal



Band Edges: DH5: High Channel - Horizontal





8.2 Test Data – Spurious Emissions

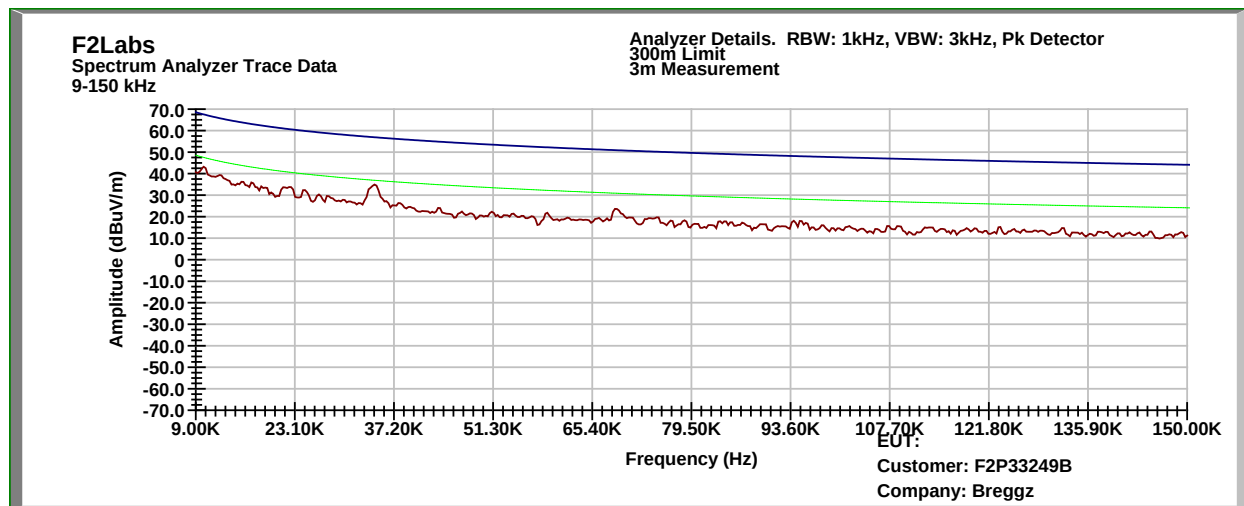
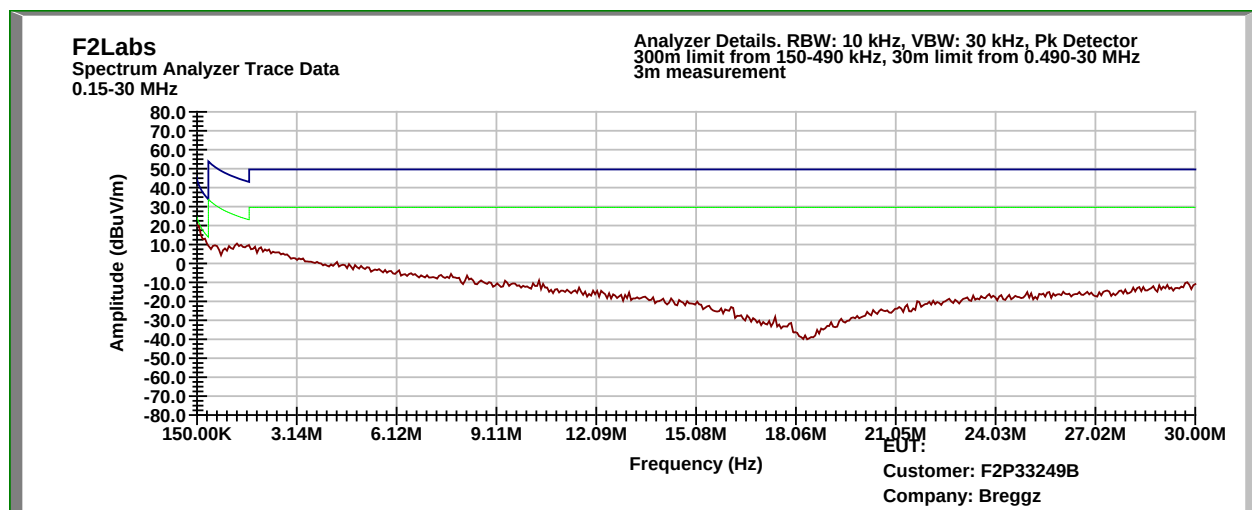
Notes: The Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

At least 6 of the highest frequencies were measured per ANSI 63.4 in a 3-meter anechoic chamber. Frequencies below 1 GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit. Frequencies were scanned from 9kHz to 26 GHz and the highest emissions are listed below.

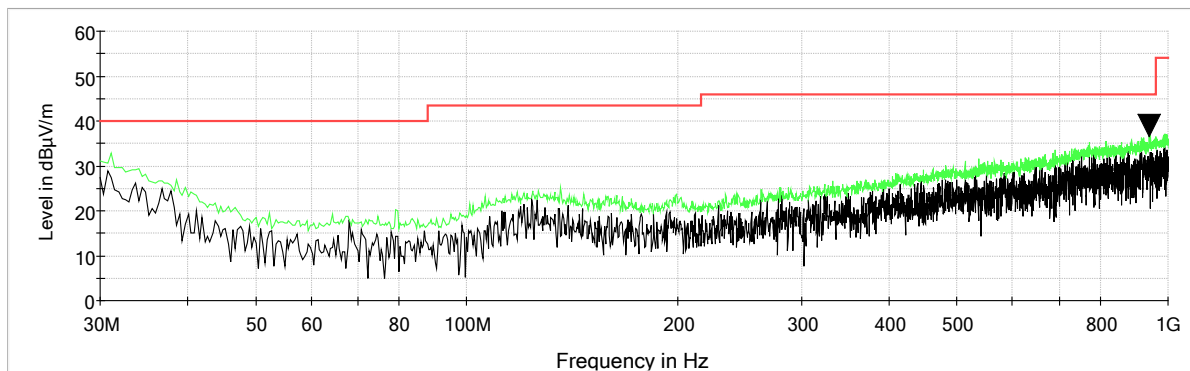
Scans were performed on the BLE 1Mbps and 2Mbps modes, and the 1Mbps results are shown to be worst-case. Of the Bluetooth Classic, the scans were performed and the DH5 was shown to be worst-case, and those results are included below.



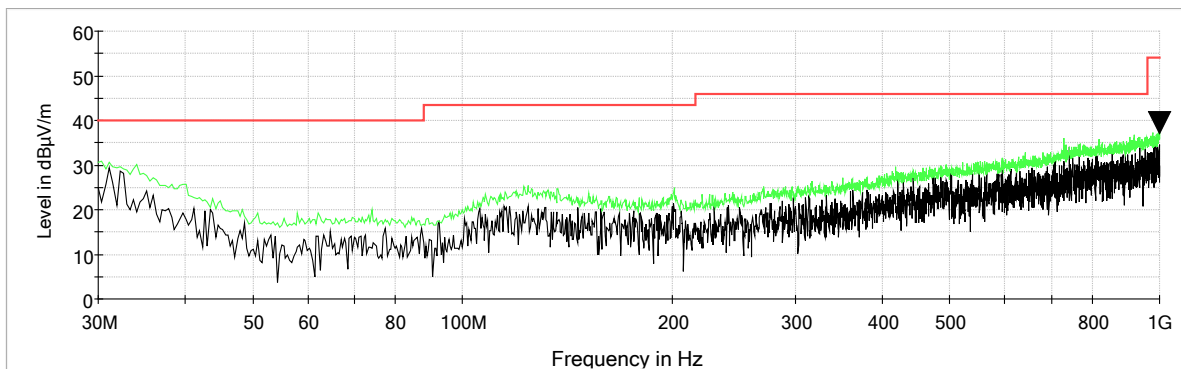
Test Date(s):	2024-10-09, 2024-10-18	Test Engineer(s):	E. Tobin
Standard(s):	CFR 47 Part 15.249(d) / Part 15.209	Air Temperature:	21.9°C
Test Results:	Complies	Relative Humidity:	46%

BLE, 1 MHz: Characterization Scan, 9 kHz to 150 kHz**BLE, 1 MHz: Characterization Scan, 150 kHz to 30 MHz**

BLE, 1 MHz: Low Channel, 30 MHz to 1000 MHz, Vertical



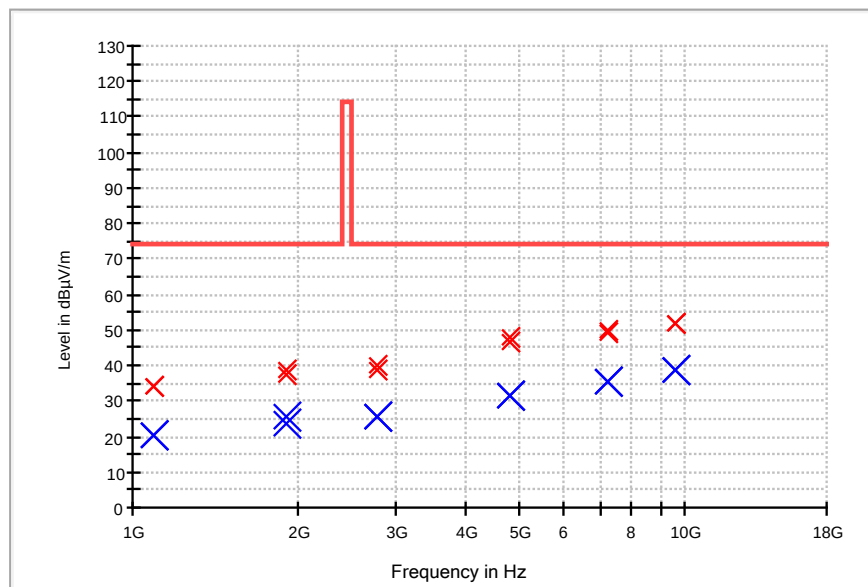
BLE, 1 MHz: Low Channel, 30 MHz to 1000 MHz, Horizontal



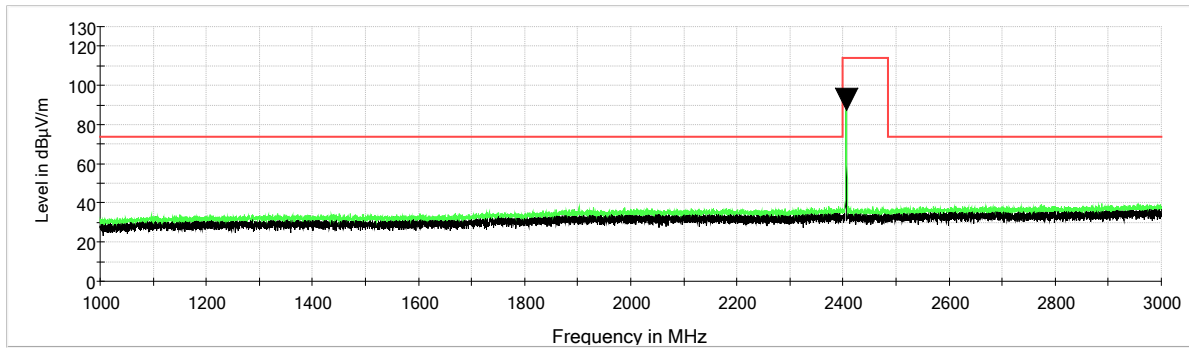


BLE, 1 MHz: Measurements, 1 GHz to 18 GHz

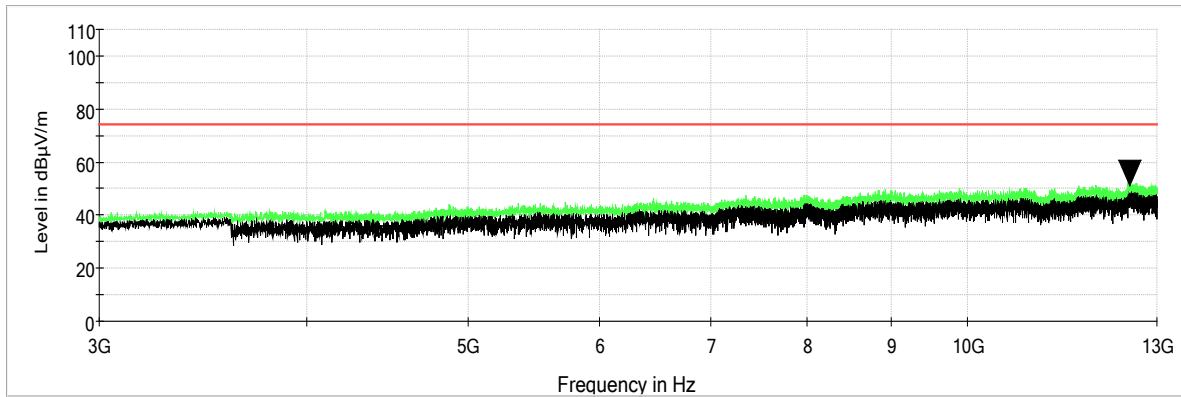
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1096.200000	34.1	20.5	1000.0	1000.000	150.0	H	66.0	-10.8	33.5	54.0
1096.200000	34.1	20.5	1000.0	1000.000	150.0	V	330.0	-10.8	33.5	54.0
1902.200000	39.0	25.7	1000.0	1000.000	150.0	H	146.0	-6.7	28.3	54.0
1902.200000	37.6	23.6	1000.0	1000.000	150.0	V	36.0	-8.1	30.4	54.0
2773.800000	39.8	25.7	1000.0	1000.000	150.0	V	327.0	-6.7	28.3	54.0
2773.800000	38.6	25.7	1000.0	1000.000	150.0	H	186.0	-6.7	28.3	54.0
4804.000000	48.1	31.6	1000.0	1000.000	150.0	H	144.0	-0.4	22.4	54.0
4804.000000	46.5	31.6	1000.0	1000.000	150.0	V	281.0	-0.4	22.4	54.0
7206.000000	50.2	35.4	1000.0	1000.000	150.0	H	113.0	5.1	18.6	54.0
7206.000000	49.1	35.3	1000.0	1000.000	150.0	V	142.0	5.1	18.7	54.0
9608.000000	52.1	38.7	1000.0	1000.000	150.0	V	223.0	8.9	15.3	54.0
9608.000000	52.1	38.7	1000.0	1000.000	150.0	H	265.0	8.9	15.3	54.0



BLE, 1 MHz: Low Channel, 1 GHz to 3 GHz, Vertical

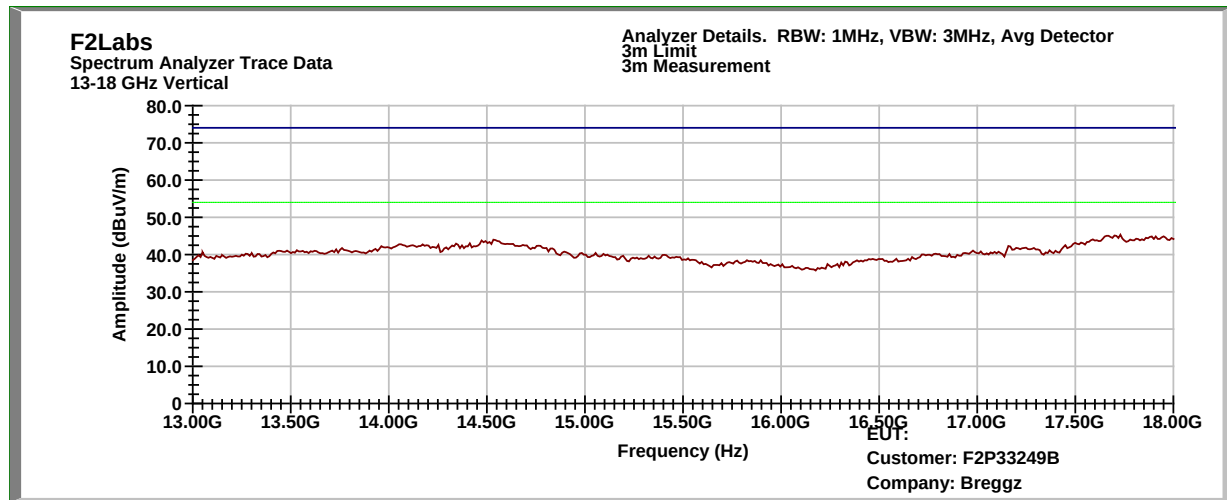


BLE, 1 MHz: Low Channel, 3 GHz to 13 GHz, Vertical

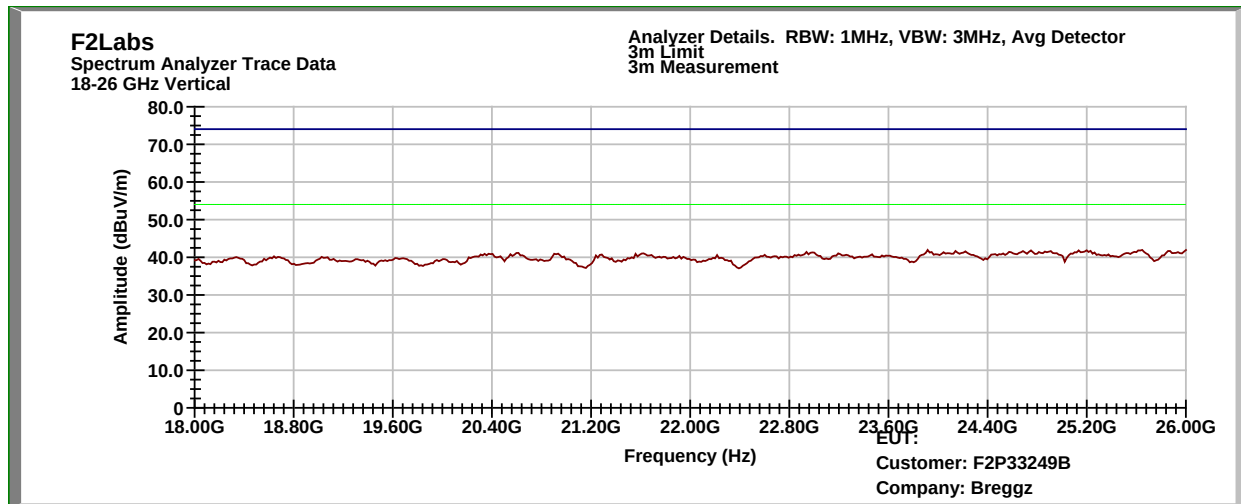




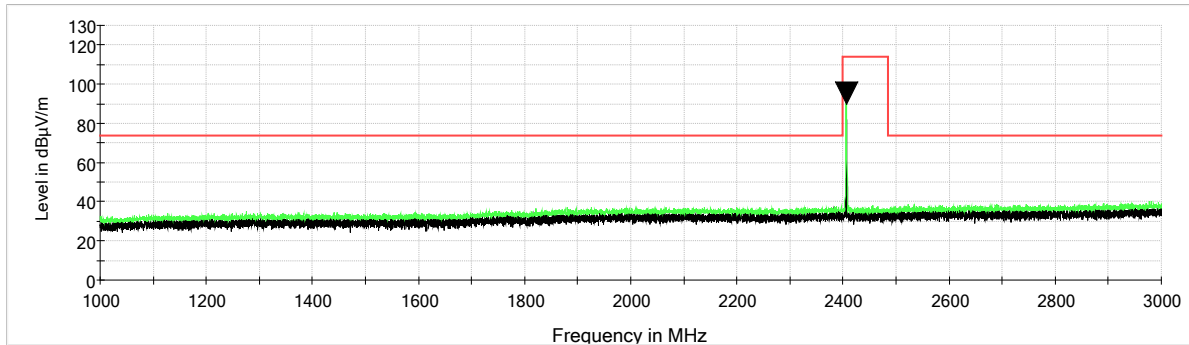
BLE, 1 MHz: Low Channel, 13 GHz to 18 GHz, Vertical



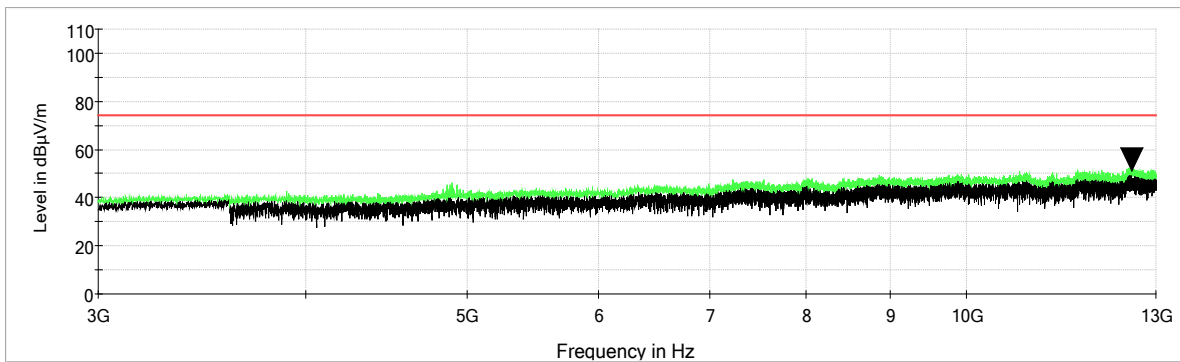
BLE, 1 MHz: Low Channel, 18 GHz to 26 GHz, Vertical



BLE, 1 MHz: Low Channel, 1 GHz to 3 GHz, Horizontal

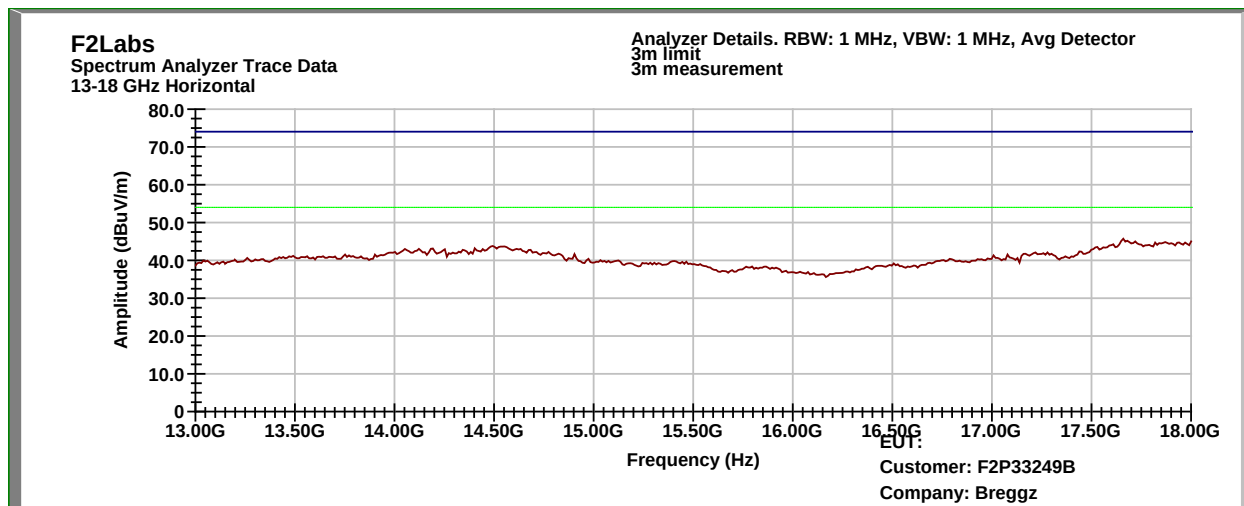


BLE, 1 MHz: Low Channel, 3 GHz to 13 GHz, Horizontal

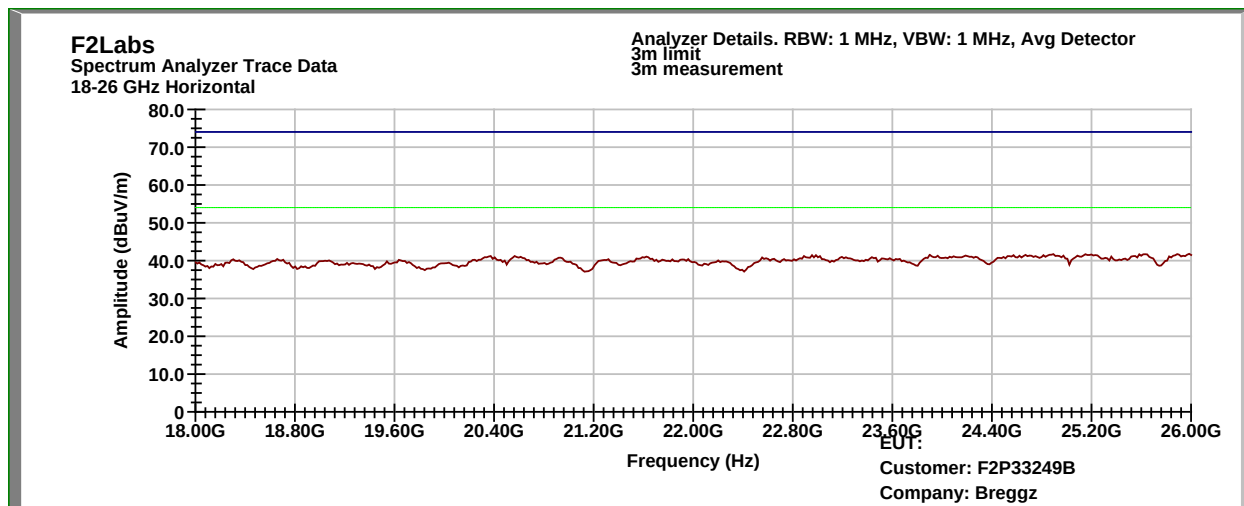


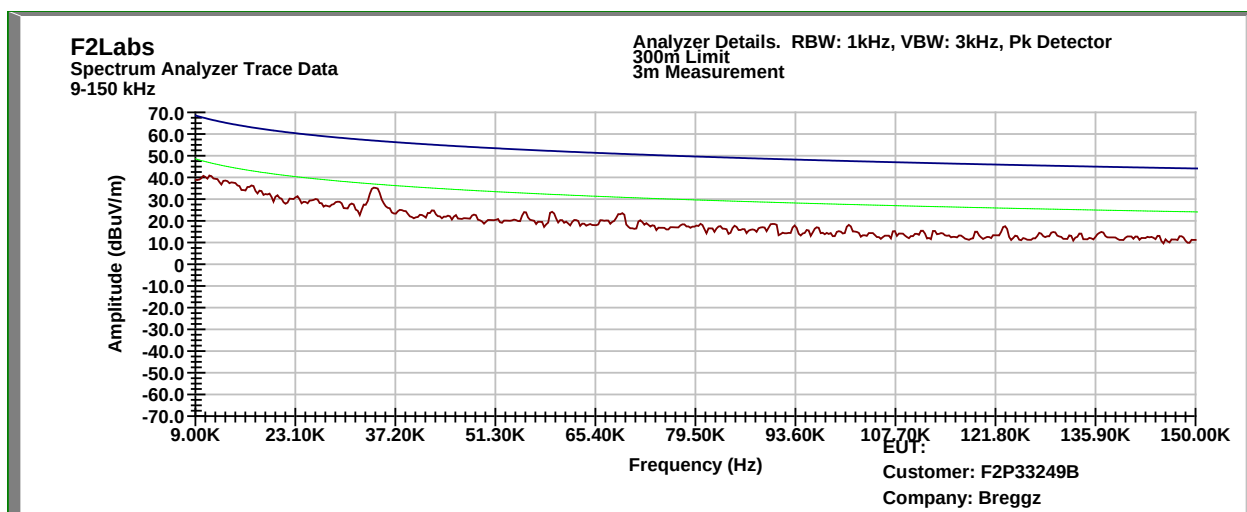
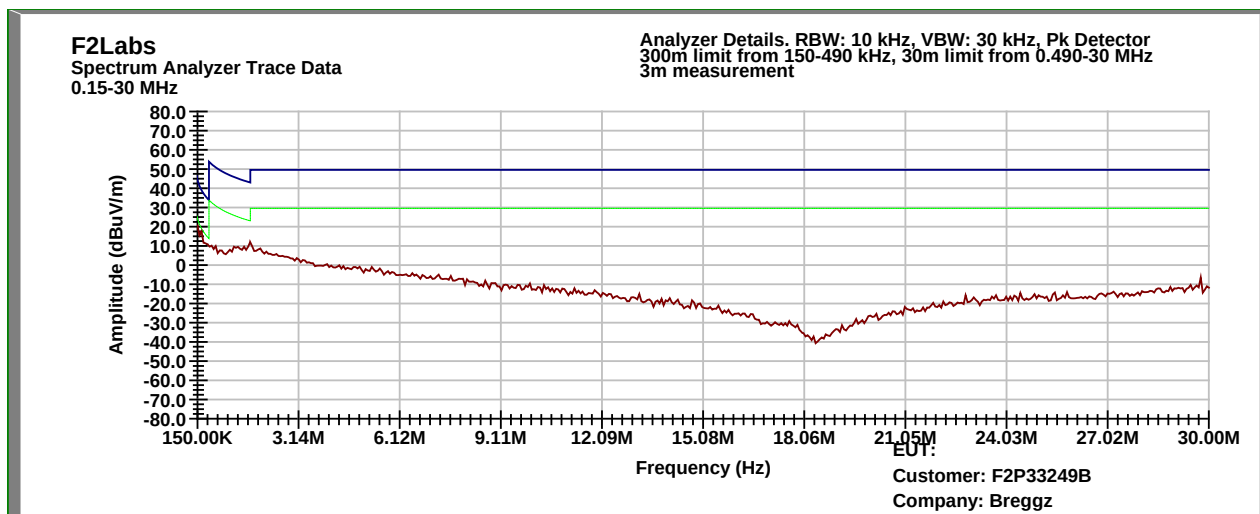


BLE, 1 MHz: Low Channel, 13 GHz to 18 GHz, Horizontal

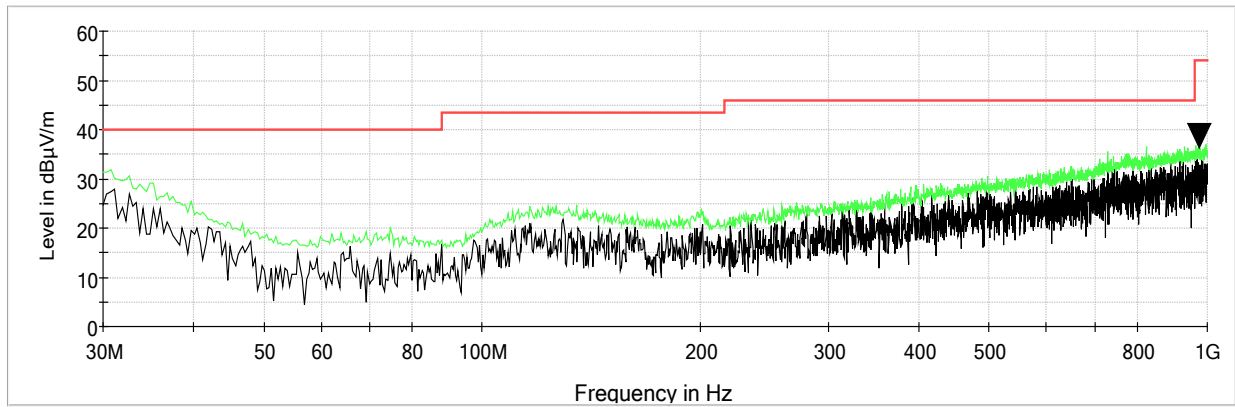


BLE, 1 MHz: Low Channel, 18 GHz to 26 GHz, Horizontal

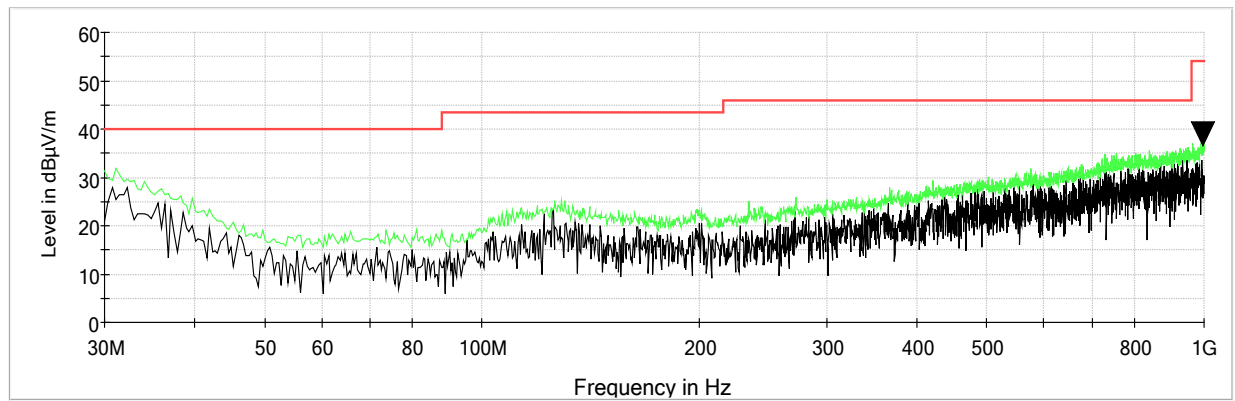


**BT Classic DH5: Characterization Scan, Low Channel, 9 kHz to 150 kHz****BT Classic DH5: Characterization Scan, Low Channel, 150 kHz to 30 MHz**

BT Classic DH5: Low Channel, 30 MHz to 1000 MHz, Vertical



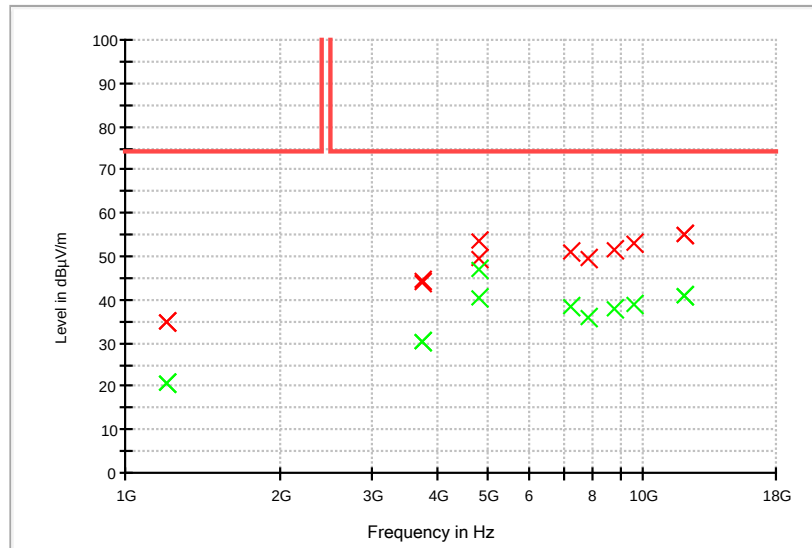
BT Classic DH5: Low Channel, 30 MHz to 1000 MHz, Horizontal



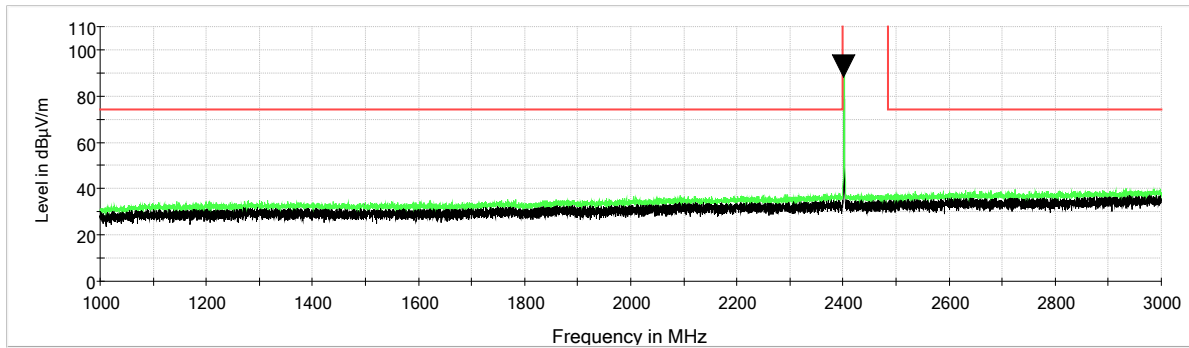


BT Classic DH5: Measurements, 1 GHz to 18 GHz

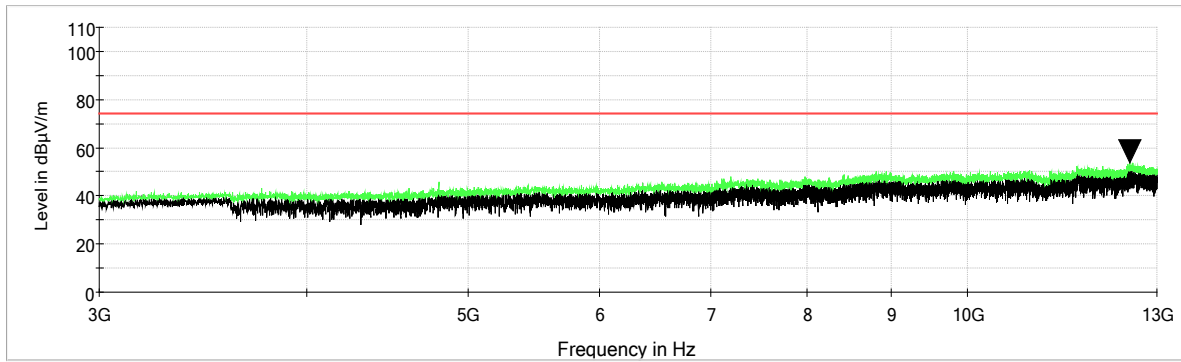
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1201.000000	34.7	21.0	1000.0	1000.000	150.0	H	0.0	-10.4	33.0	54.0
1201.000000	34.7	20.9	1000.0	1000.000	150.0	V	0.0	-10.4	33.1	54.0
3757.000000	44.4	30.2	1000.0	1000.000	150.0	H	2.0	-2.8	23.8	54.0
3757.000000	44.2	30.3	1000.0	1000.000	150.0	V	20.0	-2.8	23.7	54.0
4804.000000	53.7	46.9	1000.0	1000.000	150.0	H	321.0	-0.4	7.1	54.0
4804.000000	49.6	40.2	1000.0	1000.000	150.0	V	358.0	-0.4	13.8	54.0
7206.000000	50.9	38.6	1000.0	1000.000	150.0	V	17.0	5.1	15.4	54.0
7804.000000	49.4	35.9	1000.0	1000.000	150.0	H	337.0	6.1	18.1	54.0
8804.000000	51.6	37.9	1000.0	1000.000	150.0	H	0.0	8.5	16.1	54.0
9608.000000	52.9	38.9	1000.0	1000.000	150.0	V	346.0	8.9	15.1	54.0
12010.000000	55.1	41.0	1000.0	1000.000	150.0	V	20.0	12.3	13.0	54.0
12010.000000	55.3	41.0	1000.0	1000.000	150.0	H	0.0	12.3	13.0	54.0



BT Classic DH5: Low Channel, 1 GHz to 3 GHz, Vertical

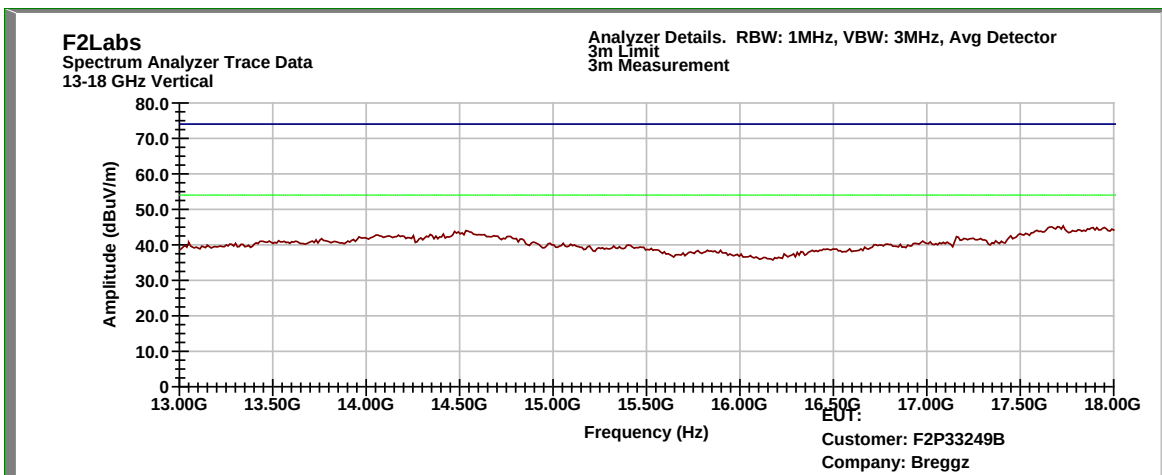


BT Classic DH5: Low Channel, 3 GHz to 13 GHz, Vertical

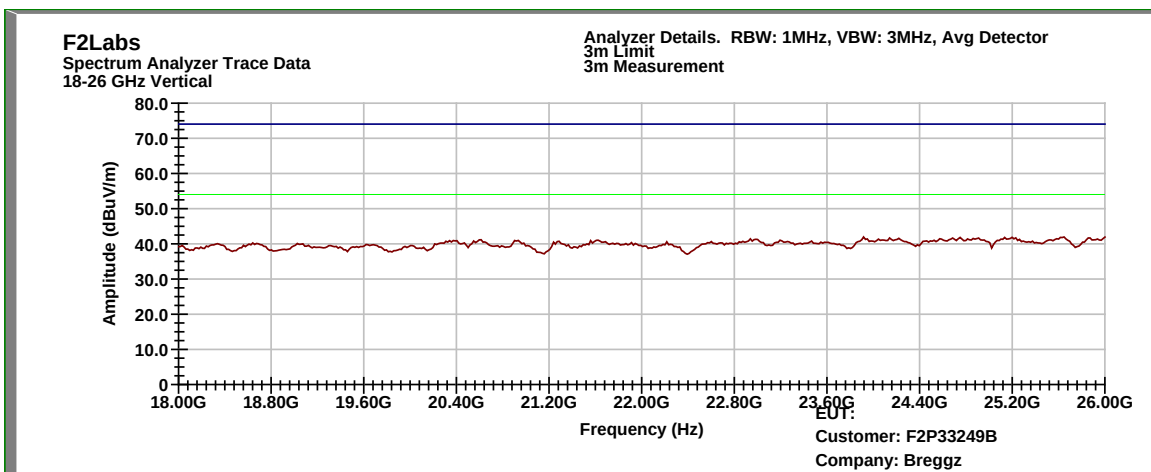




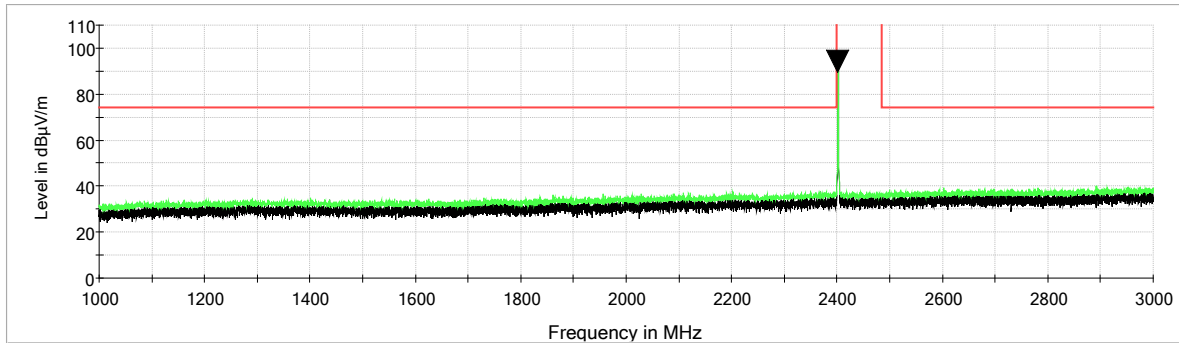
BT Classic DH5: Low Channel, 13 GHz to 18 GHz, Vertical



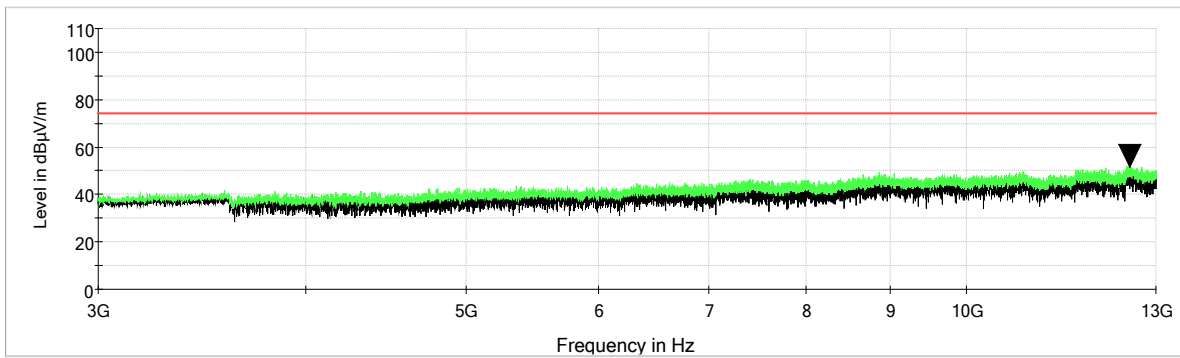
BT Classic DH5: Low Channel, 18 GHz to 26 GHz, Vertical



BT Classic DH5: Low Channel, 1 GHz to 3 GHz, Horizontal

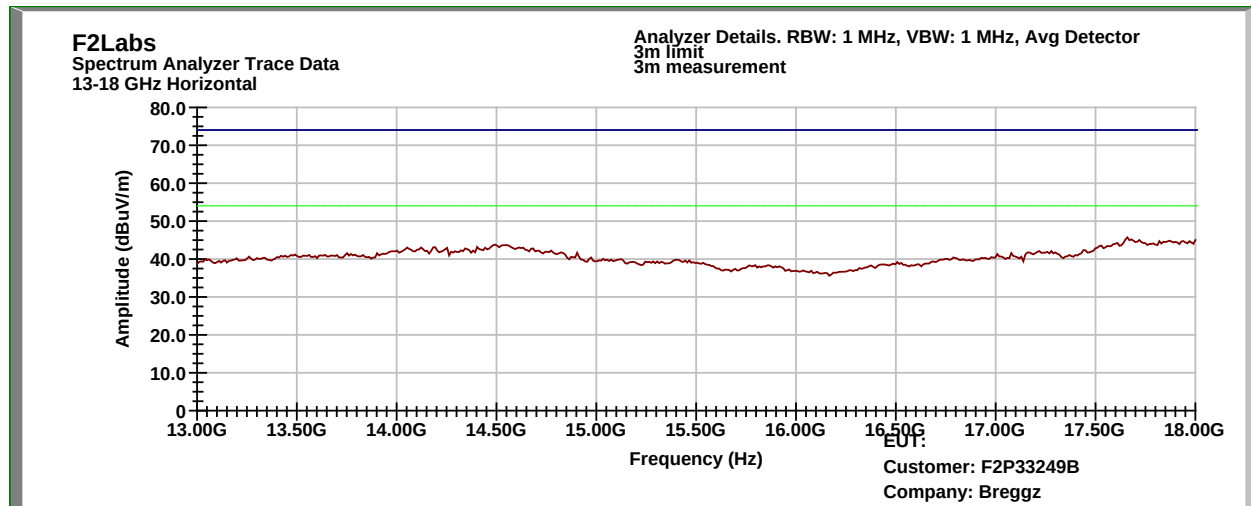


BT Classic DH5: Low Channel, 3 GHz to 13 GHz, Horizontal

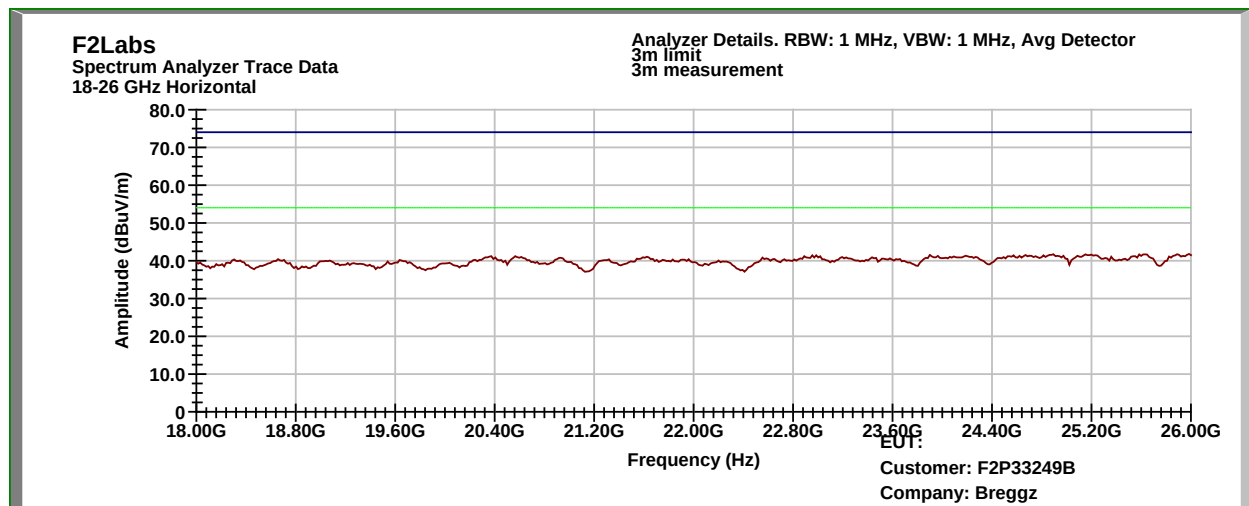




BT Classic DH5: Low Channel, 13 GHz to 18 GHz, Horizontal

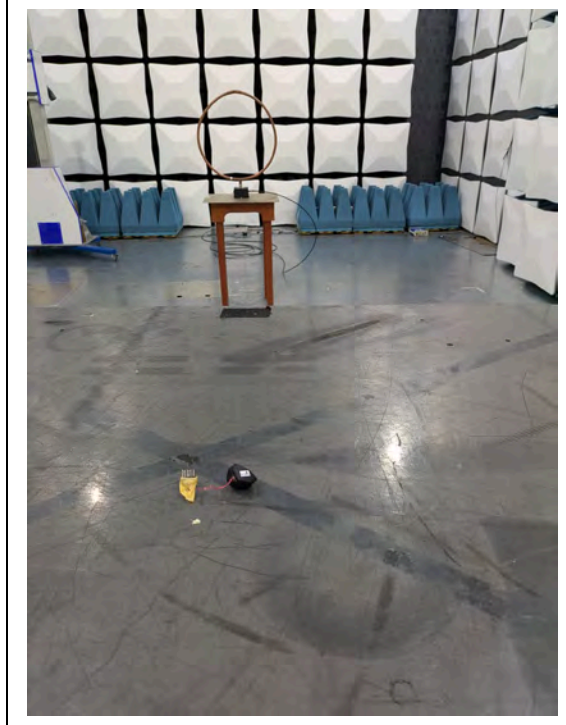


BT Classic DH5: Low Channel, 18 GHz to 26 GHz, Horizontal

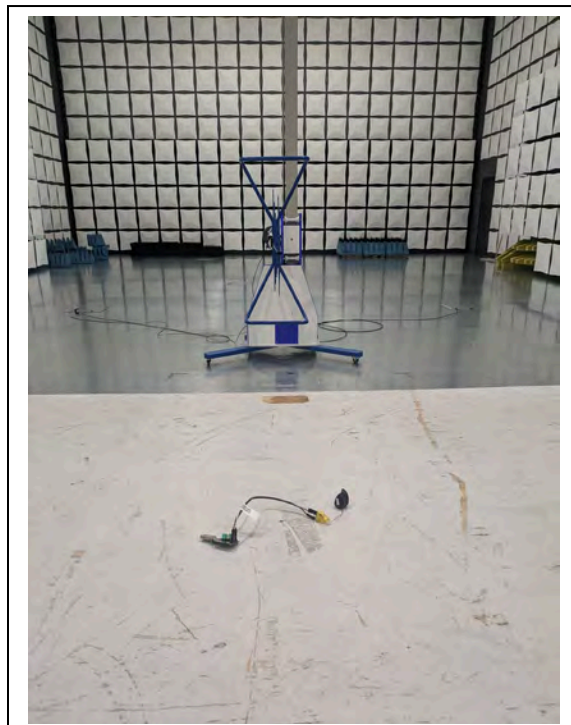


9 PHOTOGRAPHS - TEST SETUPS

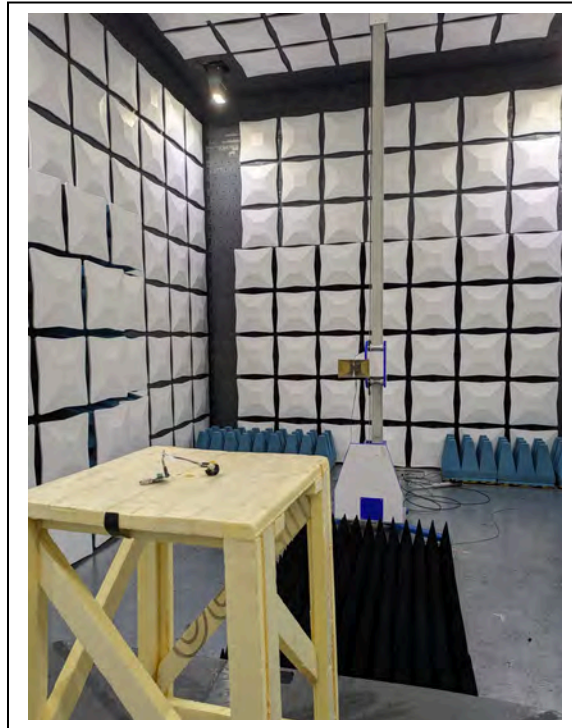
Radiated Spurious Emissions, 9kHz to 30 MHz



Spurious Emissions, 30 MHz to 1000 MHz; Occupied Bandwidth



Spurious Emissions, 1 GHz to 18 GHz



Spurious Emissions, 18 GHz to 26 GHz

