TUV Rheinland

Job # 234112604

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Report# 31964808.001

Emissions
Test Report

EUT Name: VERASENSE for Exactech Equinoxe

Model No.: EXC-EQRV42, EXC-EQRV38

CFR47 part 15.247:2019

FCC ID: XNL-ORTHOSNSR8

Prepared for:

OrthoSensor, Inc.
1855 Griffin Road Suite A-310
Dania FL 33004

Prepared by:

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Revisions

Revision No.	Date	Reason for Change	Author
0	10/24/ 2019	Original Document	D. Foster
1	10/25/2019	Reviewer Requests	D. Foster
2	10/29/2019	Reviewer Requests	D. Foster

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	OrthoSensor, Inc. 1855 Griffin Road Suite A-310 Dania FL 33004
Requester / Applicant:	Joshua Gardner
Name of Equipment:	VERASENSE for Exactech Equinoxe
Model No.	EXC-EQRV42, EXC-EQRV38
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR47 part 15.247: 2019
Test Dates:	October 16, 2019 to October 24, 2019

Guidance Documents:

CFR47 part 15.247

Test Methods:

ANSI C63.10

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Donn Foster		Josie Sabado	
Test Engineer	Date October 29, 2019	Lab Signatory	Date October 29, 2019

Testing Cert #3331.02 **US1131** **2932M-1**

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1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR47 part15.247:2019 based on the results of testing performed on October 16-25, 2019 on the VERASENSE for Exactech Equinoxe Model EXC-EQRV42, EXC-EQRV38 manufactured by OrthoSense. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the radio performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

Laboratory Information

1.3 Accreditations & Endorsements

1.3.1 US Federal Communications Commission

TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 is recognized by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US1131). The laboratory scope of accreditation includes Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

1.3.2 NIST / A2LA

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2017. The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

1.3.3 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

1.4 Test Facilities

The primary test facility is located at 1279 Quarry Lane, Pleasanton, California 94566, USA. The 5015 Brandin Court, Fremont, CA 94538, USA location is considered a Pleasanton annex.

1.4.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

1.5 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

1.5.1 Measurement Uncertainty

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

1.6 Calibration Traceability

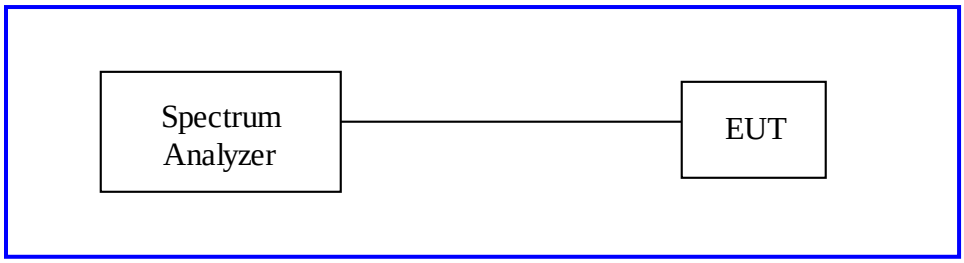
All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2017. Equipment calibration records are kept on file at the test facility.

1.7 Conducted Antenna Port Testing

1.7.1 Test Method

The measurement equipment is directly connected to the antenna port of the EUT's antenna port using an RF coaxial cable. The path loss between the measurement equipment and EUT is accounted for as a measurement offset. Measurement plots will include the path loss unless otherwise stated.

1.7.2 Block Diagram



1.8 Radiated Emissions Testing

1.8.1 Test Method

1.8.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emissions test procedure. The frequency range of interest was divided into sub-ranges. For each sub-range peak emission data was recorded and plotted while the turntable was rotated 360° and the measurement antenna was rotated in horizontal and vertical antenna polarization.

Preliminary emission profile testing was performed inside a semi-anechoic chamber. The EUT was placed on a non-conductive table 80 cm above the floor for emissions less than 1 GHz and 150cm above the floor for emissions greater than 1 GHz. The EUT was positioned as shown in the setup photographs. The measurement antenna was placed at a distance of 3m.

1.8.1.2 Final Test

Final testing was performed on an NSA compliant test site.

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation.

For spurious emissions, preliminary emissions within 10 dB of the limit were measured.

The final scans were performed on the worst EUT axis for three operating channels in the operating mode with the highest power.

1.8.2 Sample Calculation – Radiated Emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBµV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBµV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

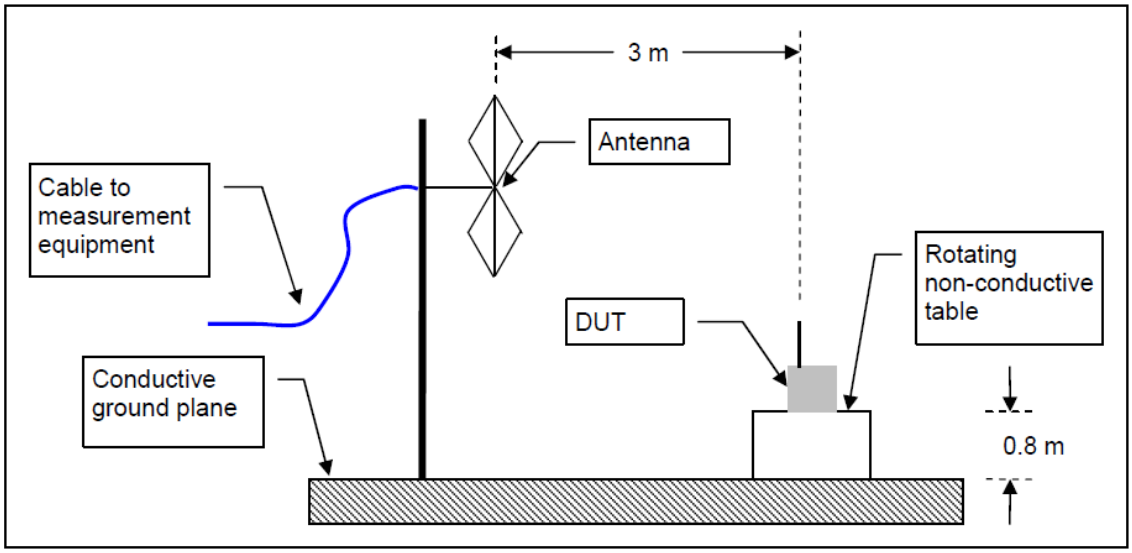
$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement + Antenna Factor – Amplifier Gain + Cable loss = Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

1.8.3 Block Diagram



Where h = 80cm for <1GHz and 150cm for >1GHz

Support Equipment

Support equipment is used for testing purposes only. The user manual of the EUT should be consulted to determine if the support equipment is used under normal operating conditions.

Equipment	Manufacturer	Model	Serial	Used for
Tablet	Zebra Technologies	VSA-S	17029	Control the radio power/channel etc.

Description of Sample used for Testing

Device	Serial	RF Connection	Comment
VERASENSE for Exactech Equinoxe	Proto 1	Direct to the antenna port	

2 Measurement Results

2.1 Occupied Bandwidth

The 20db bandwidth is the bandwidth in which the signal 6 db down from the peak of the transmitted power is measured. The 99% and 6db bandwidth will be measured with the OBW measurement function.

2.1.1 Test Method

Set RBW = 100 kHz.

Set the VBW = 300 kHz

Detector = peak.

Trace mode = max hold.

Sweep = auto couple.

Allow the trace to stabilize.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

2.1.2 Results

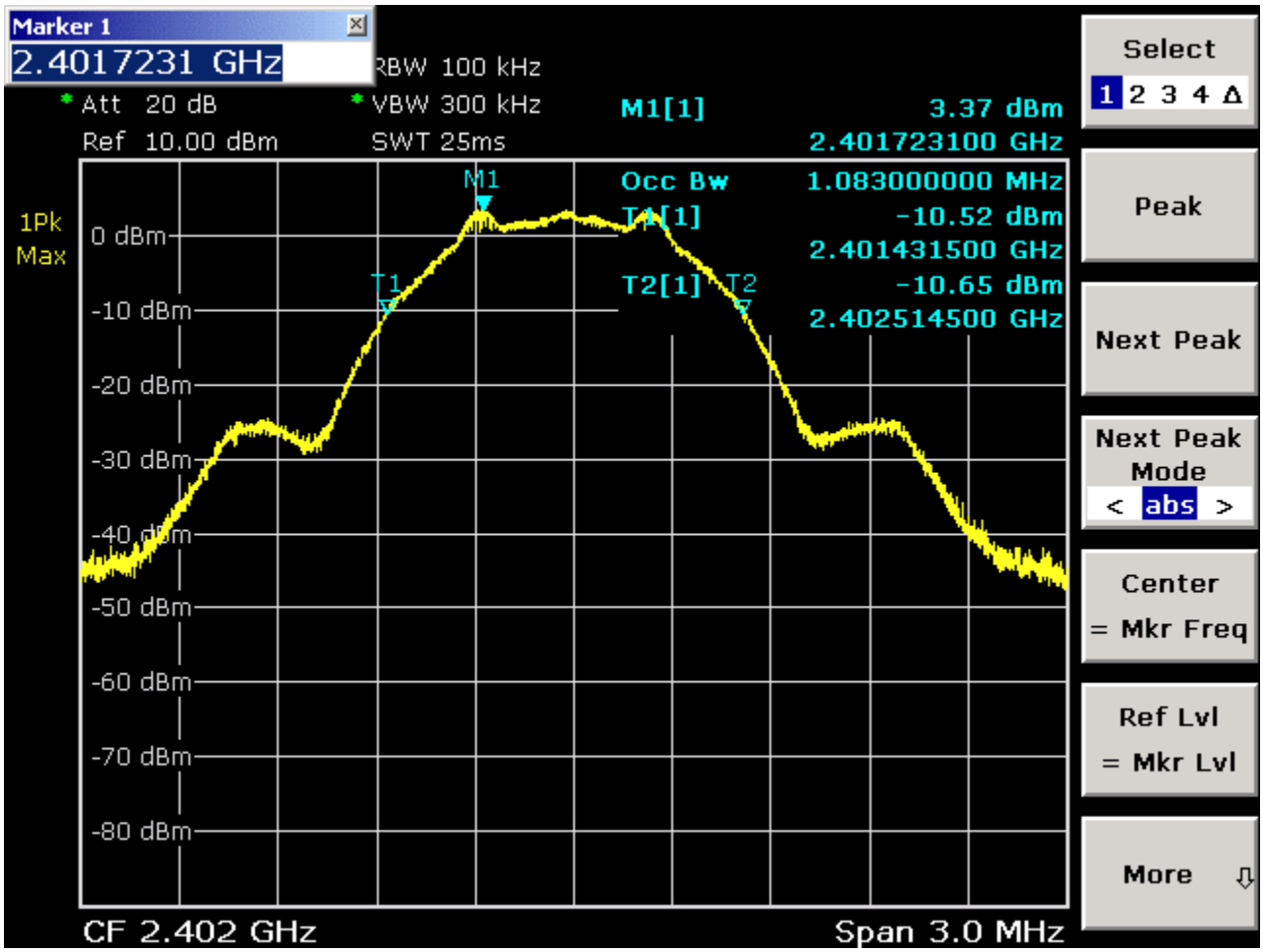
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Reference Standard: CFR 47 part 15.247:2018		
Test Conditions: Conducted Measurement, Normal Temperature		
Power Setting: 4dbm		
Signal State: Modulated Continuous Tx, Single Antenna, 100% Duty Cycle		
Configuration: mode 1		
Ambient Temp.: 19° C	**Relative Humidity:** 41%	**Barometric pressure:** 1002 mbar

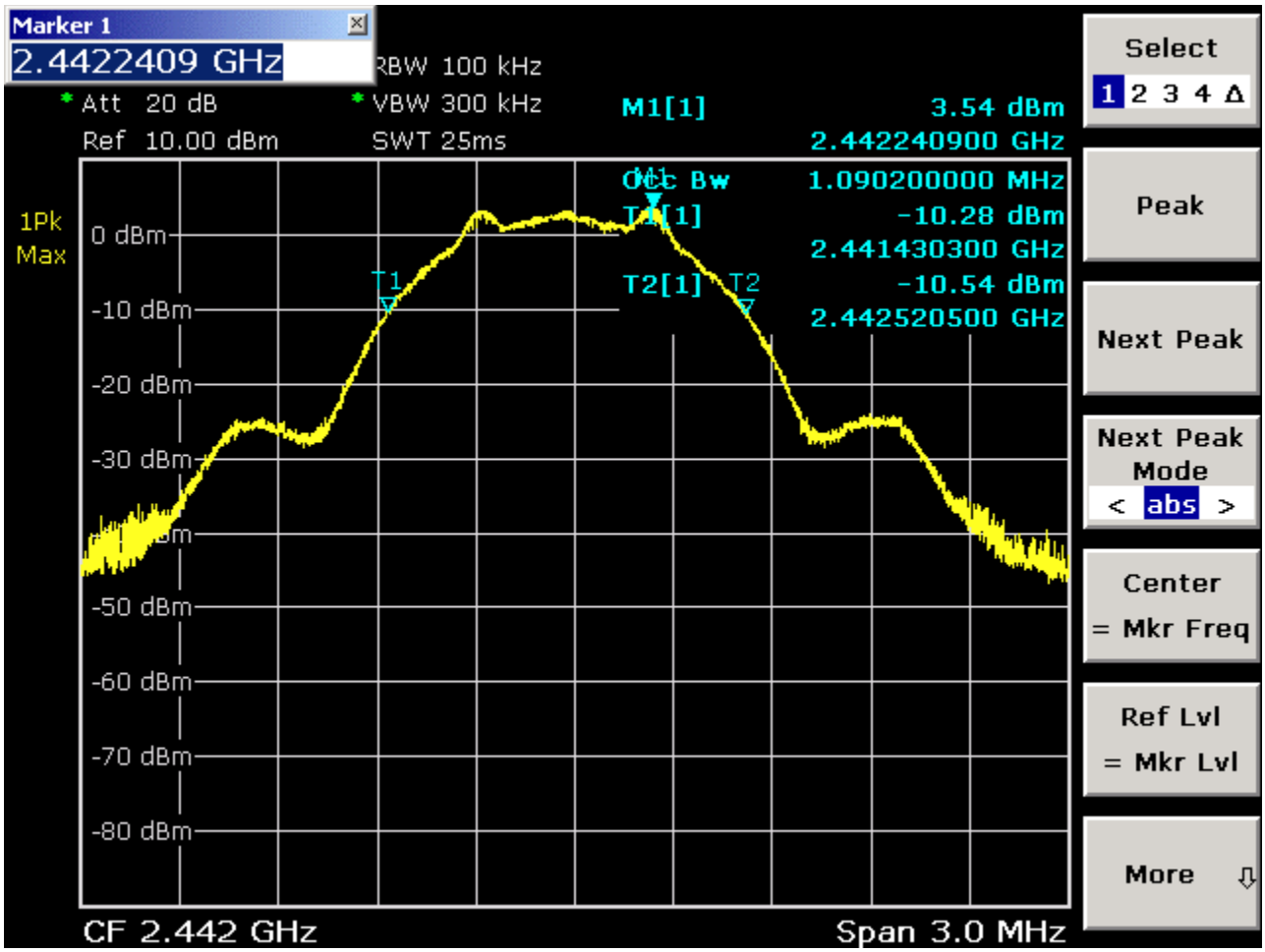
Operating Frequency (MHz)	6db Bandwidth (kHz)
2402	706
2442	741
2480	699

Operating Frequency (MHz)	99% Bandwidth (MHz)
2402	1.08
2442	1.09
2480	1.08

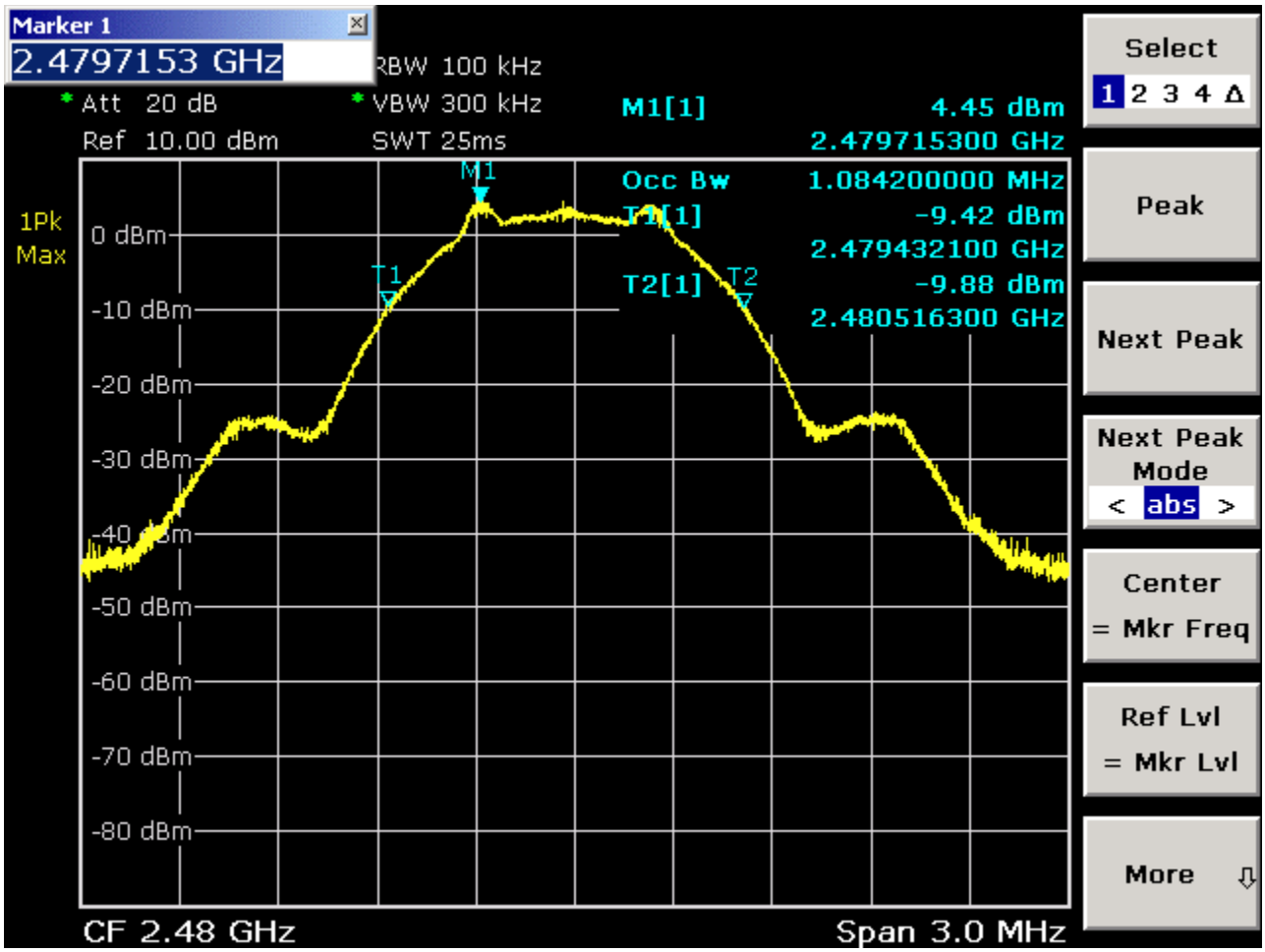
2.1.3 Measurement Plots



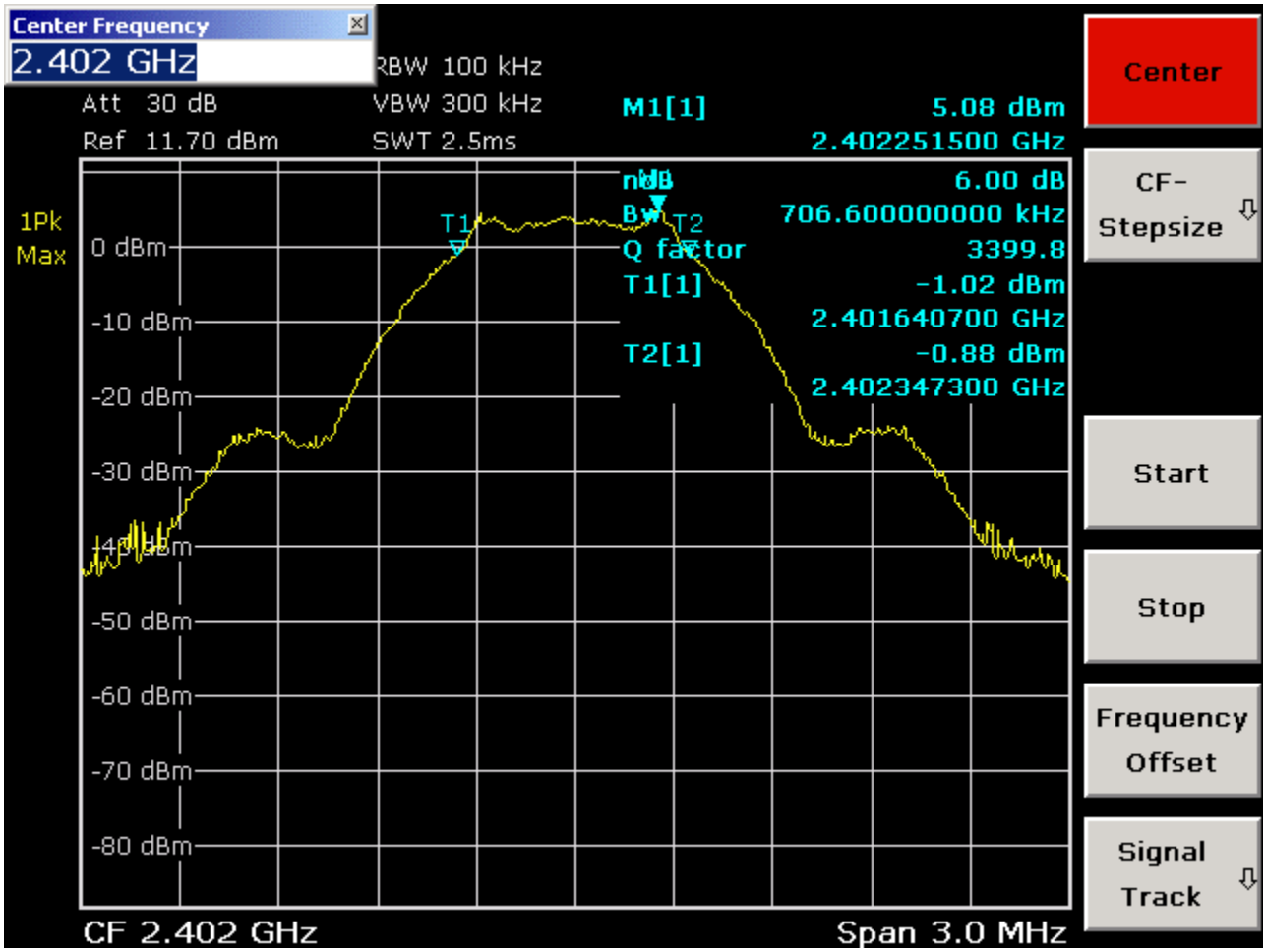
99% Bandwidth for channel 2402



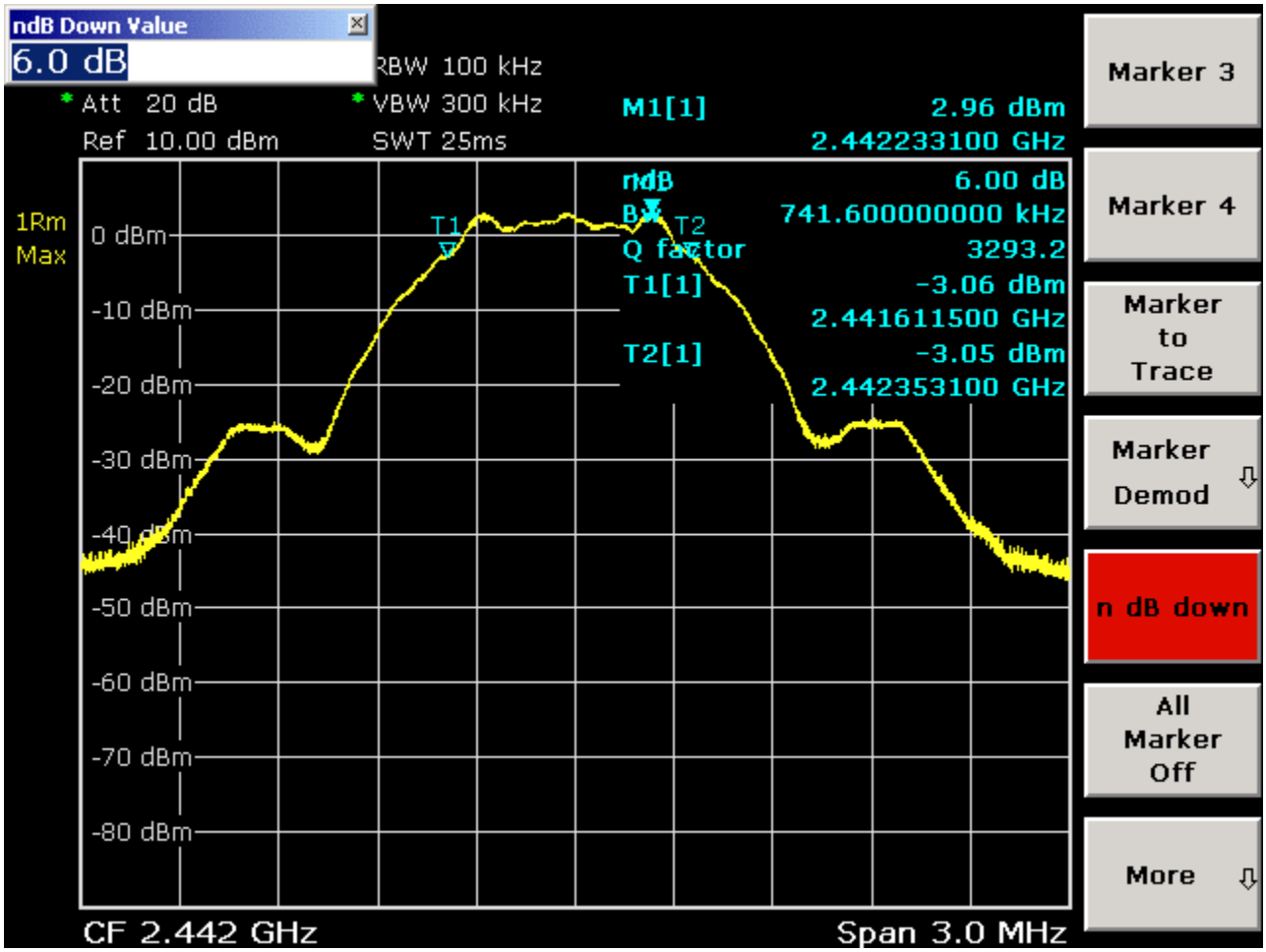
99% Bandwidth for channel 2442



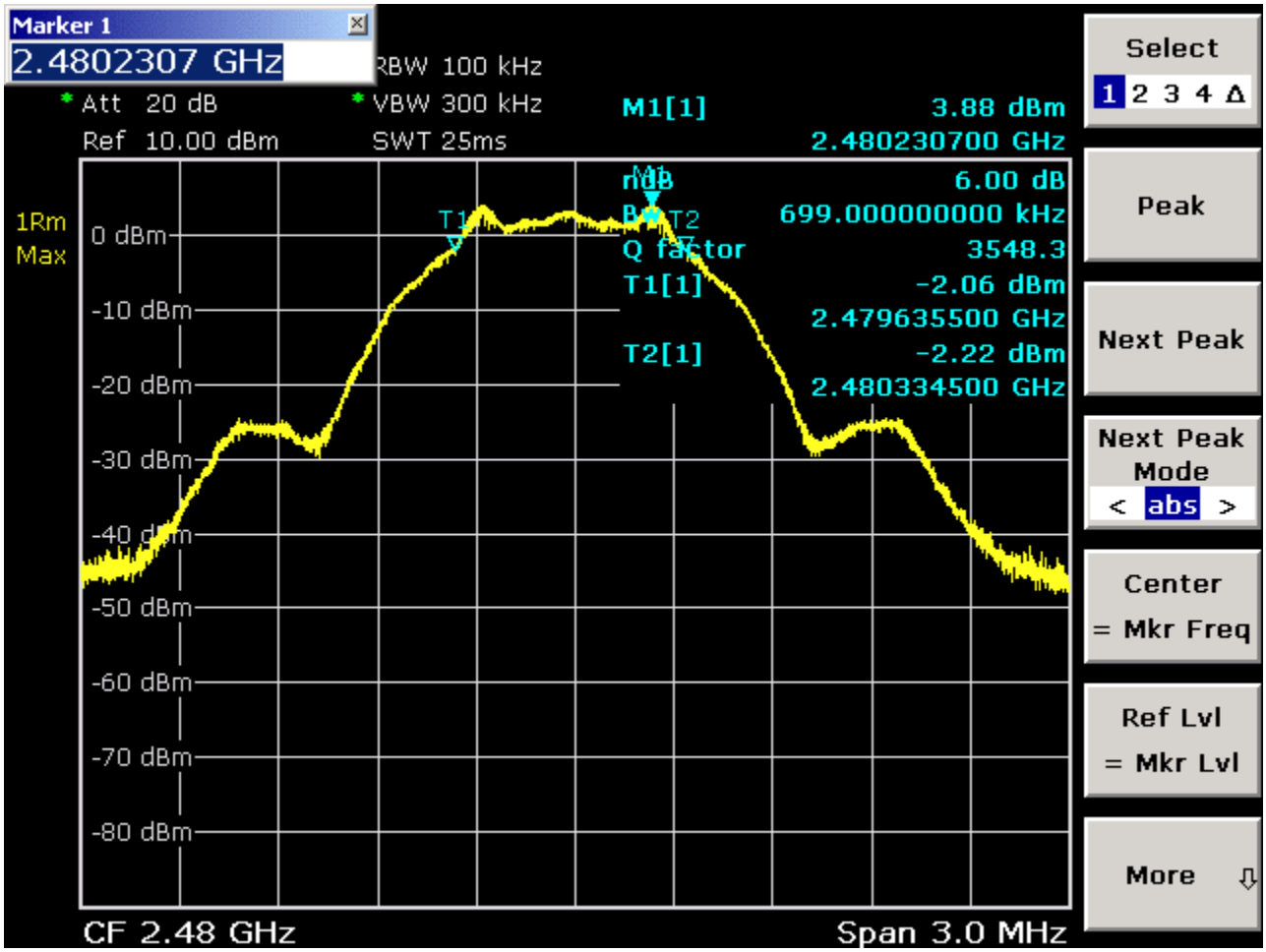
99% Bandwidth for channel 2480



6db Bandwidth for channel 2402

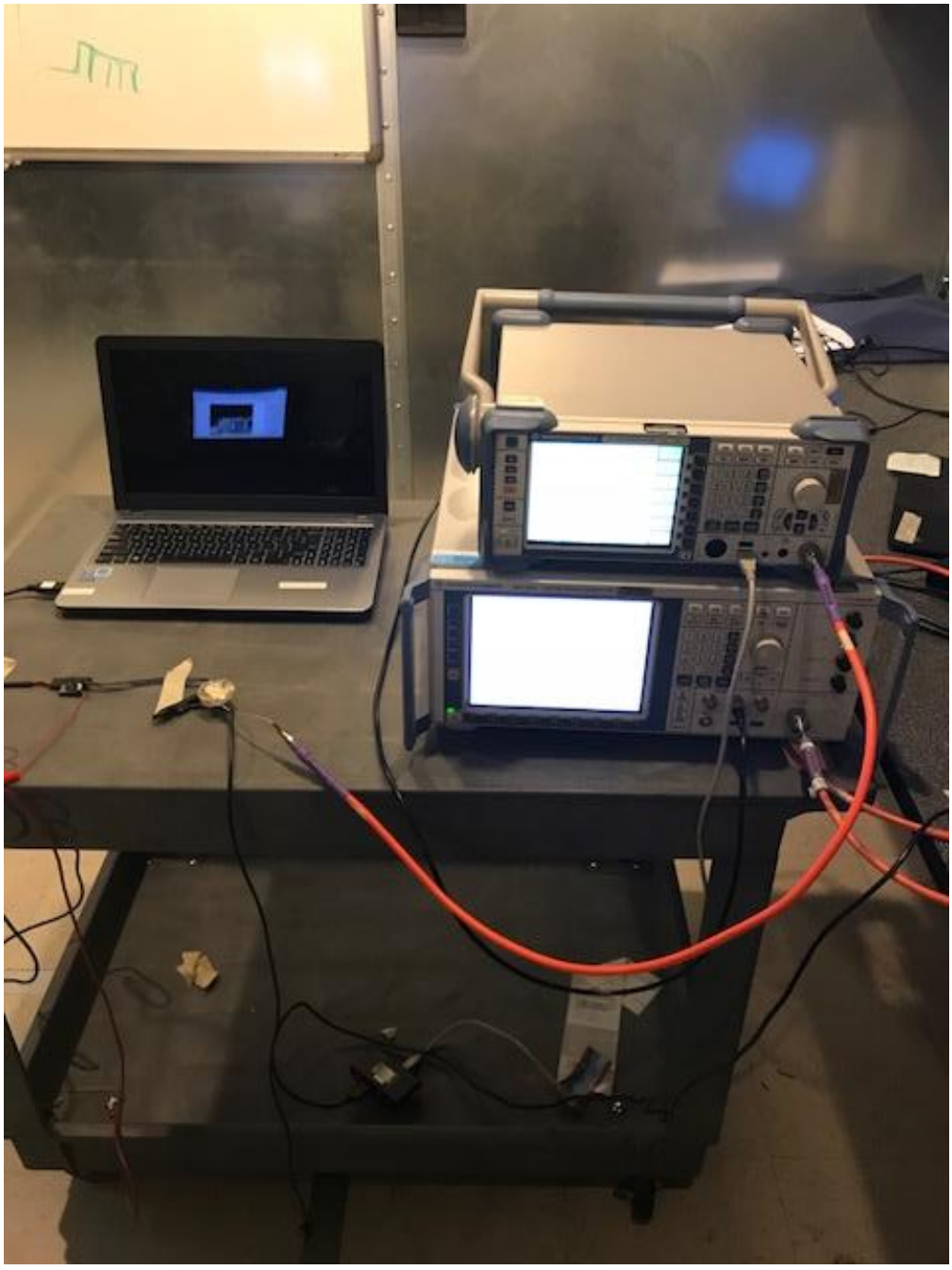


6db Bandwidth for channel 2442



6db Bandwidth for channel 2480

2.1.4 Photos



Bandwidth Test Setup

2.2 RF Peak output power

The RF output power is the power in the DTS bandwidth of the fundamental emission.

2.2.1 Test Method

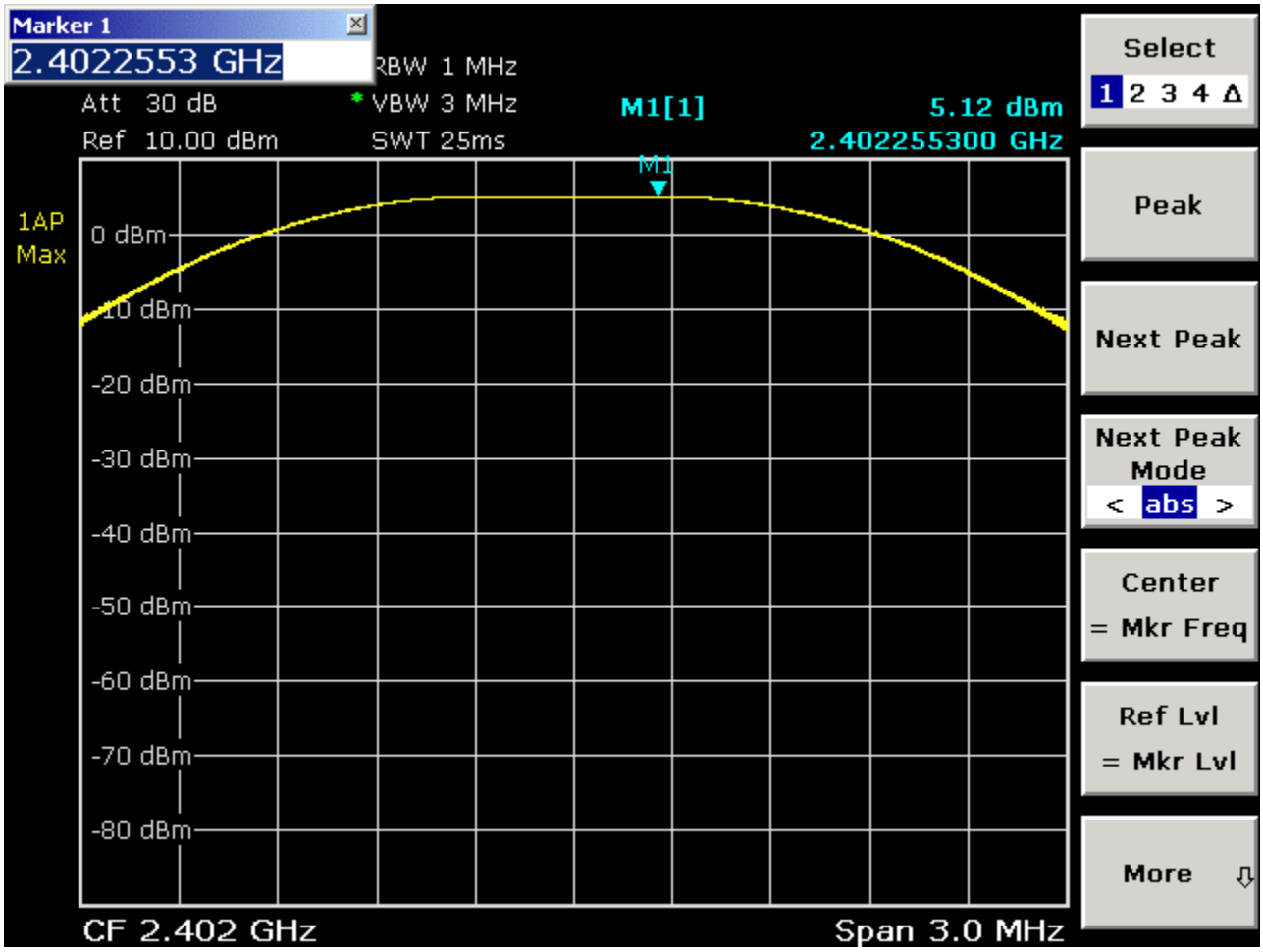
RBW = 1 MHz
VBW ≥ [3 × RBW].
Detector = peak.
Sweep time = auto.
Trace mode = max hold.
Allow sweeps to continue until the trace stabilizes

Reference Standard: CFR 47 part 15.247		
Test Conditions: Conducted Measurement, Normal Temperature		
Power Setting: 4dbm		
Signal State: Modulated Continuous Tx, Single Antenna, 100% Duty Cycle		
Configuration: mode 1		
Ambient Temp.: 22° C	**Relative Humidity:** 35%	**Barometric pressure:** 1004 mbar

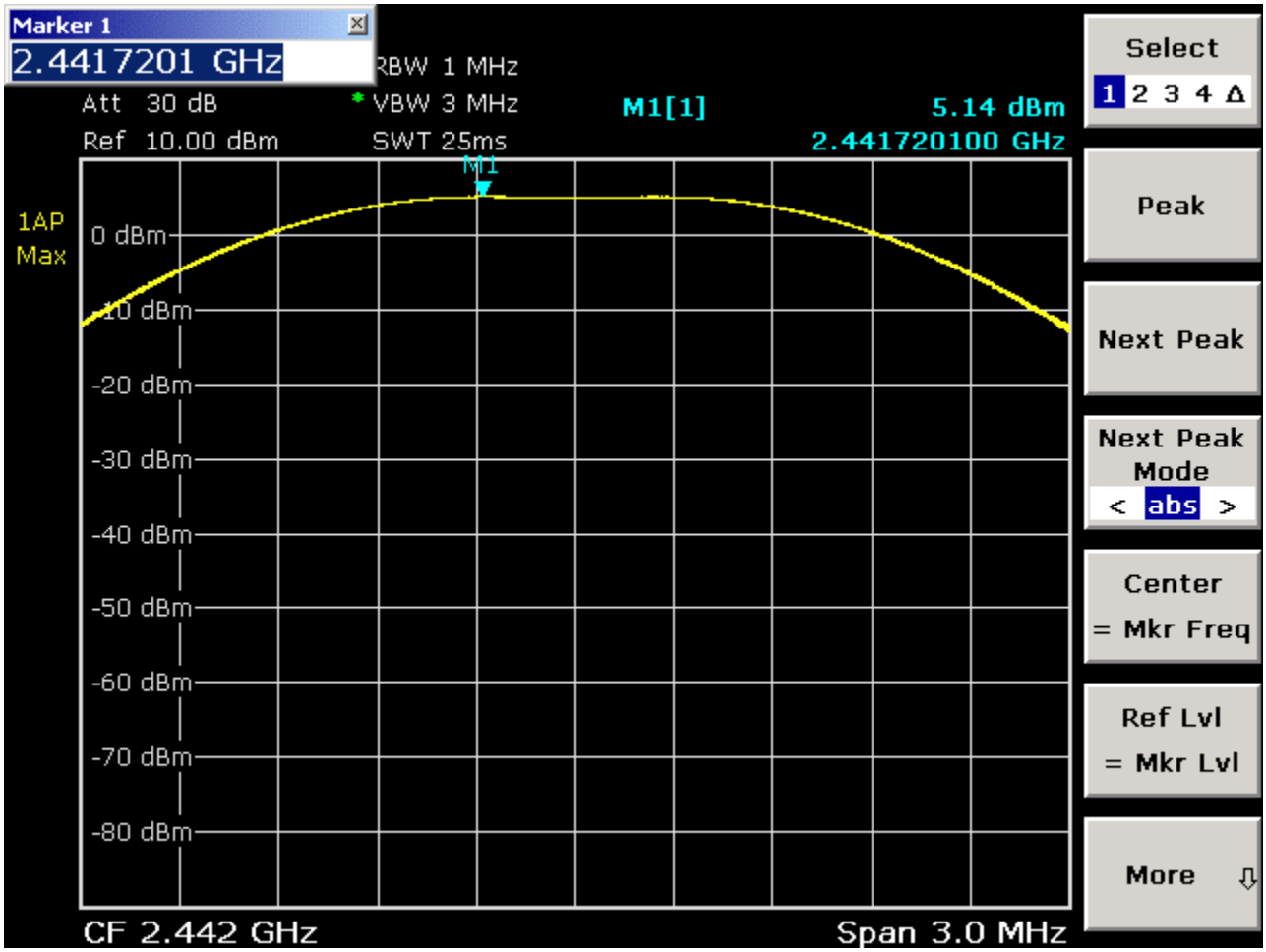
2.2.2 RF Output power

Output Power (dbm)	Limit Max (dBm)	Margin (dbm)	Result
5.12	30.0	24.88	PASS
5.14	30.0	24.86	PASS
5.79	30.0	24.21	PASS

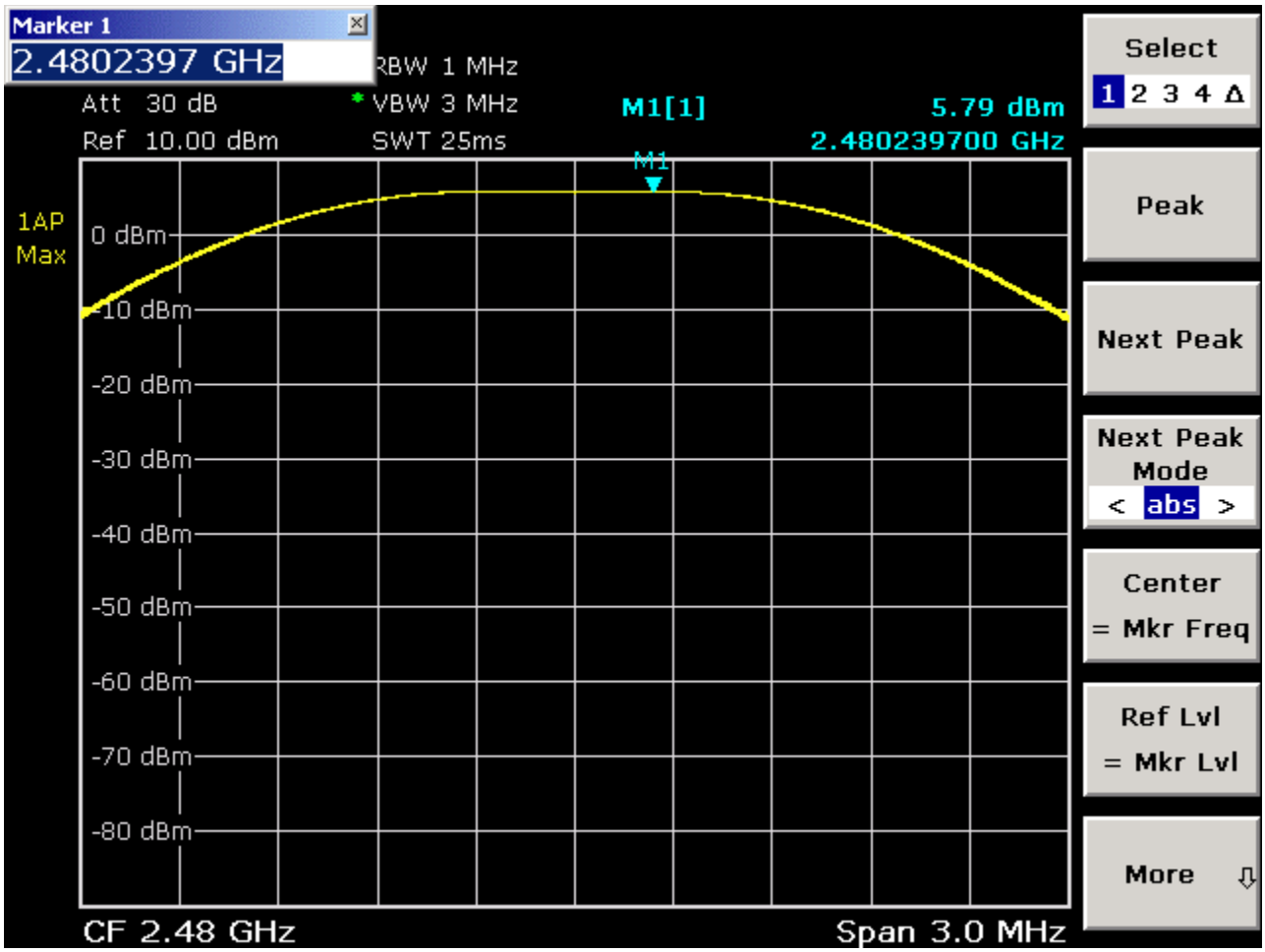
2.2.3 Plots



RF Output Power channel 2402

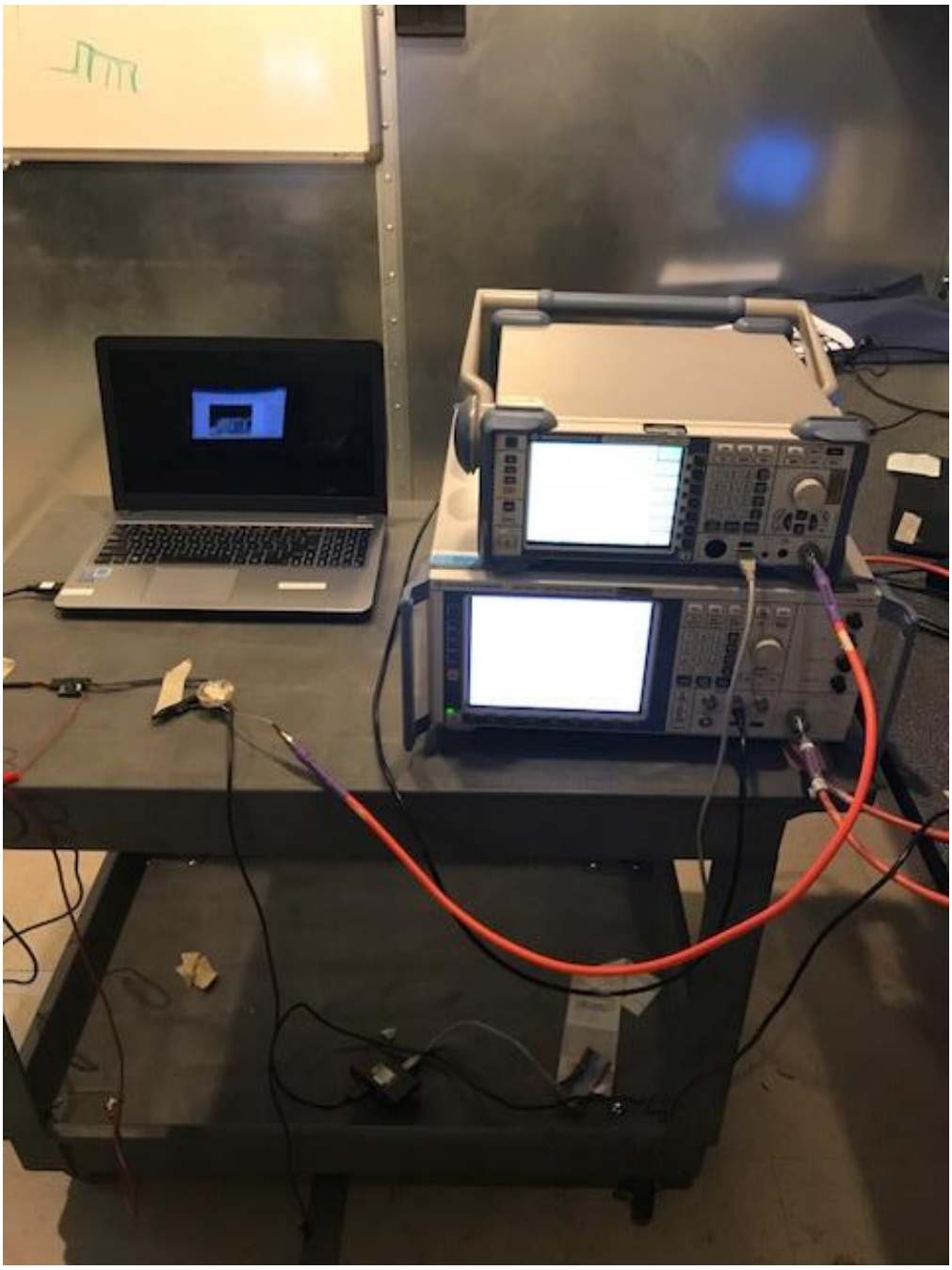


RF output Power Channel 2442



RF Output Power Channel 2480

2.2.4 Photos



RF Power Test Setup

2.3 Peak Power Spectral Density

Notwithstanding that some regulatory requirements refer to peak power spectral density (PPSD), in some cases the intent is to measure the maximum value of the time average of the power spectral density during a period of continuous transmission. The procedure for this method is as follows:

2.3.1 Test Method

Set analyzer center frequency to DTS channel center frequency. Set the span to 1.5 times the DTS bandwidth.

Set the RBW to 3 kHz $\geq$ RBW $\leq$ 100 kHz.

Set the VBW $\geq$ [3 × RBW].

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold. Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

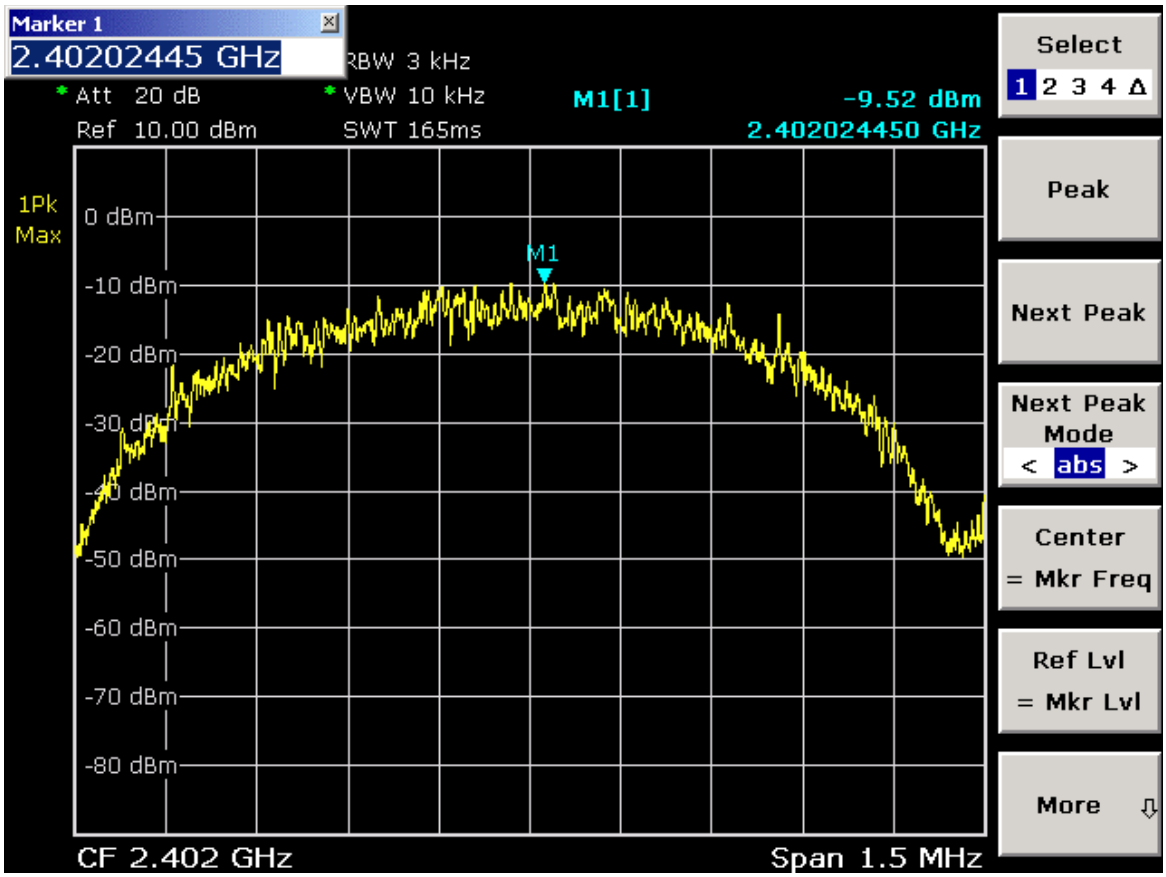
If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

Reference Standard: CFR 47 part 15.247		
Test Conditions: Conducted Measurement, Normal Temperature		
Power Setting: 4dbm		
Signal State: Modulated Continuous Tx, Single Antenna, 100% Duty Cycle		
Configuration: mode 1		
Ambient Temp.: 22° C	**Relative Humidity:** 35%	**Barometric pressure:** 1004 mbar

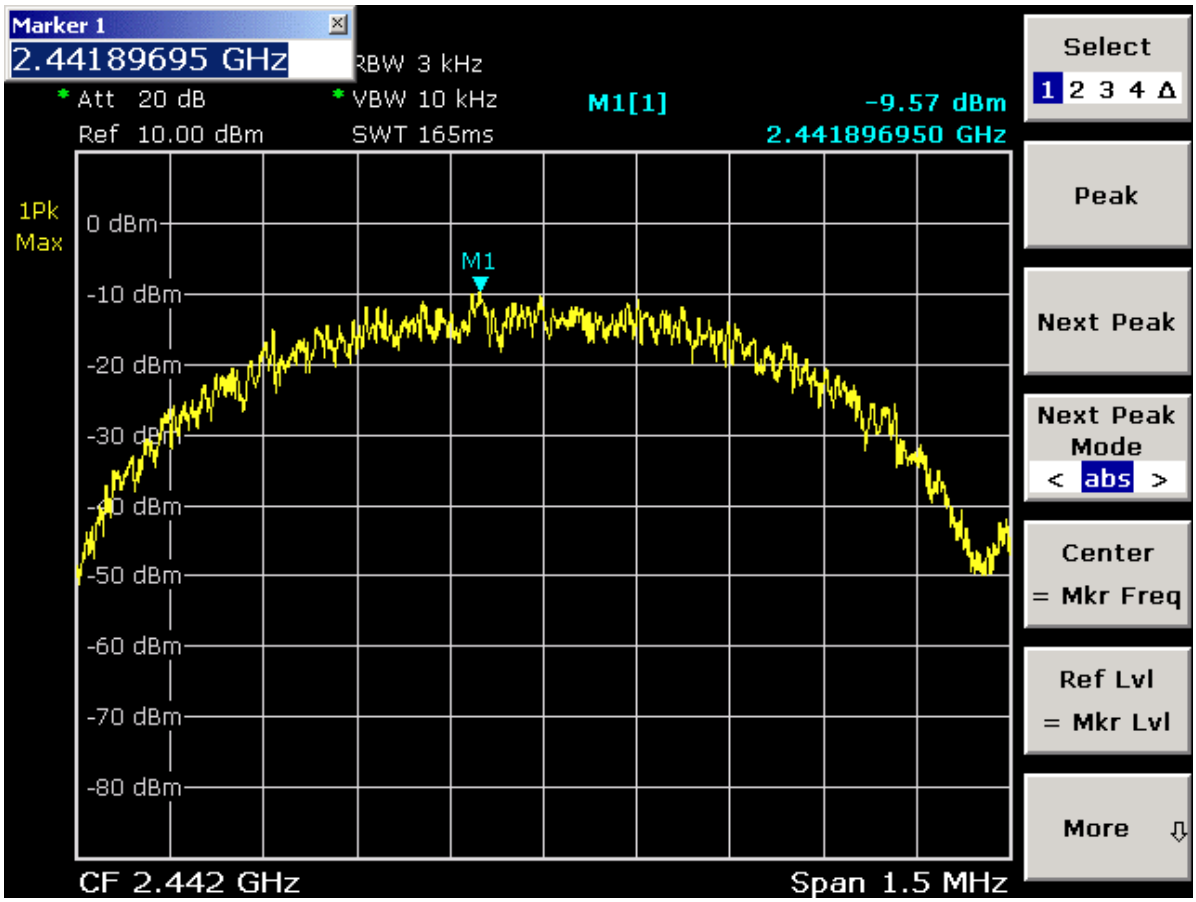
2.3.2 PPSD

PPSD (dbm)	Limit Max (dBm)	Margin (dbm)	Result
-9.5	8	17.5	PASS
-9.5	8	17.5	PASS
-8.5	8	16.5	PASS

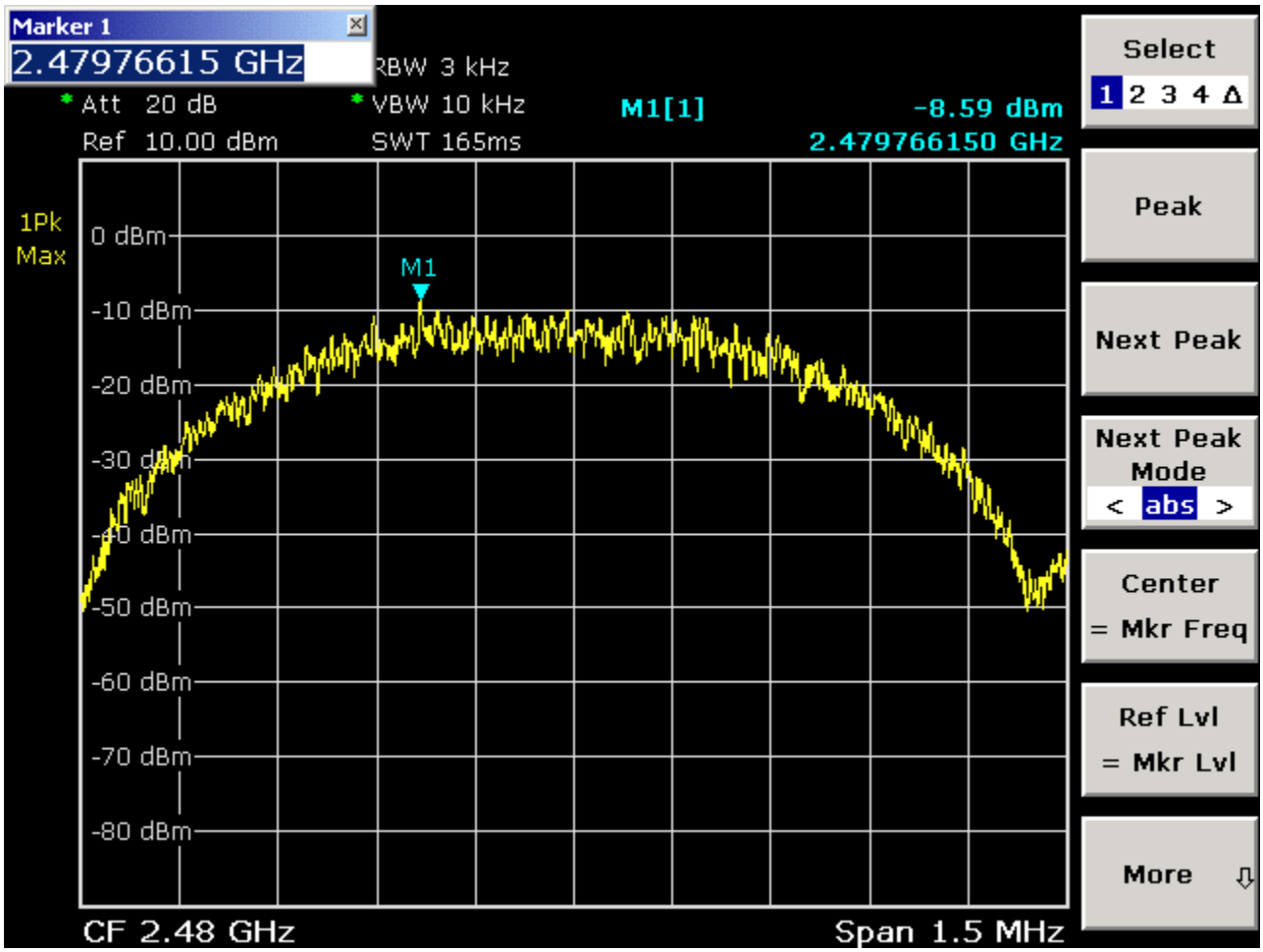
2.3.3 Measurement Plots



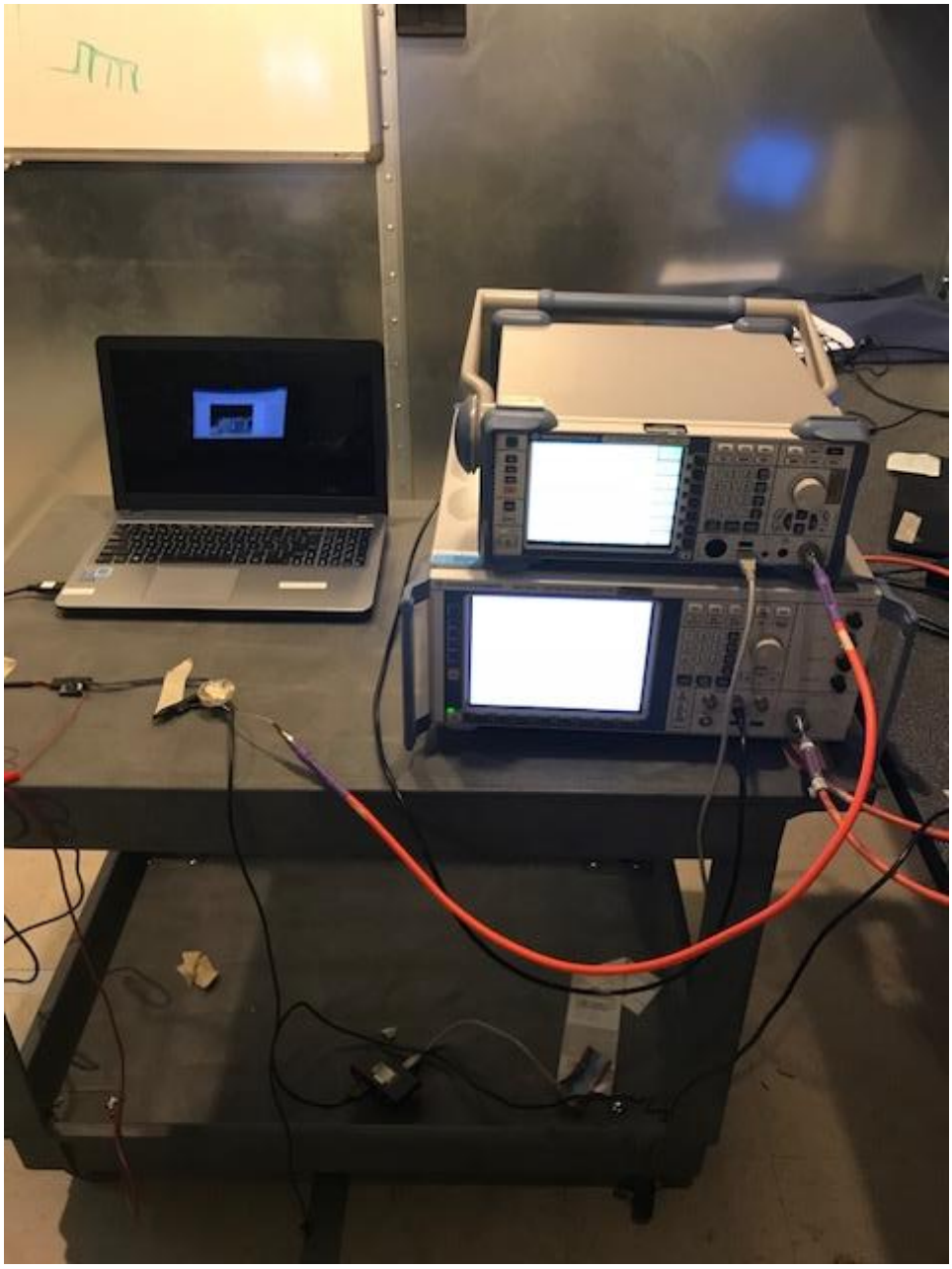
2402 PPSD


Marker 1
2.44189695 GHz
RBW 3 kHz
Att 20 dB
VBW 10 kHz
M1[1]
-9.57 dBm
Ref 10.00 dBm
SWT 165ms
2.441896950 GHz
1Pk
Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
CF 2.442 GHz
Span 1.5 MHz
Select
1 2 3 4 Δ
Peak
Next Peak
Next Peak Mode
< abs >
Center = Mkr Freq
Ref Lvl = Mkr Lvl
More

2442 PPSD


Marker 1
2.47976615 GHz
RBW 3 kHz
Att 20 dB
VBW 10 kHz
M1[1]
-8.59 dBm
Ref 10.00 dBm
SWT 165ms
2.479766150 GHz
1Pk
Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
CF 2.48 GHz
Span 1.5 MHz
Select
1 2 3 4 Δ
Peak
Next Peak
Next Peak Mode
< abs >
Center = Mkr Freq
Ref Lvl = Mkr Lvl
More

2480 PPSD



PPSD Test Setup

2.4 Radiated Spurious Emissions

Measurements are performed with the EUT rotated from 0° to 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Variations in cable or wire placement shall be explored to maximize the measured emissions.

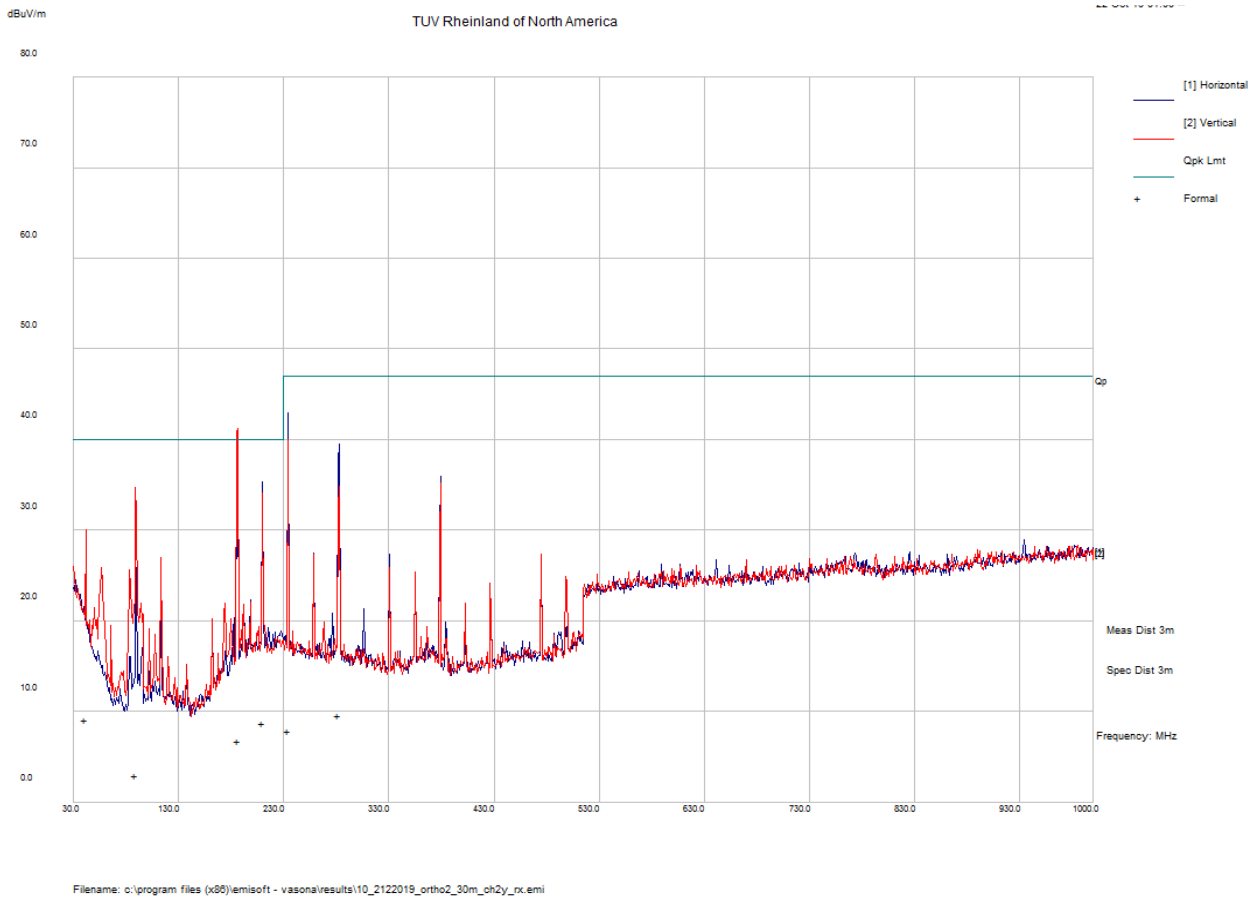
2.4.1 Test method

Res BW: 100kHz below 1GHz and 1MHz above 1GHz
Video BW 3 times Res BW
Detectors: QP and Average
Follow procedures in sec. 6.3,6.5,6.6

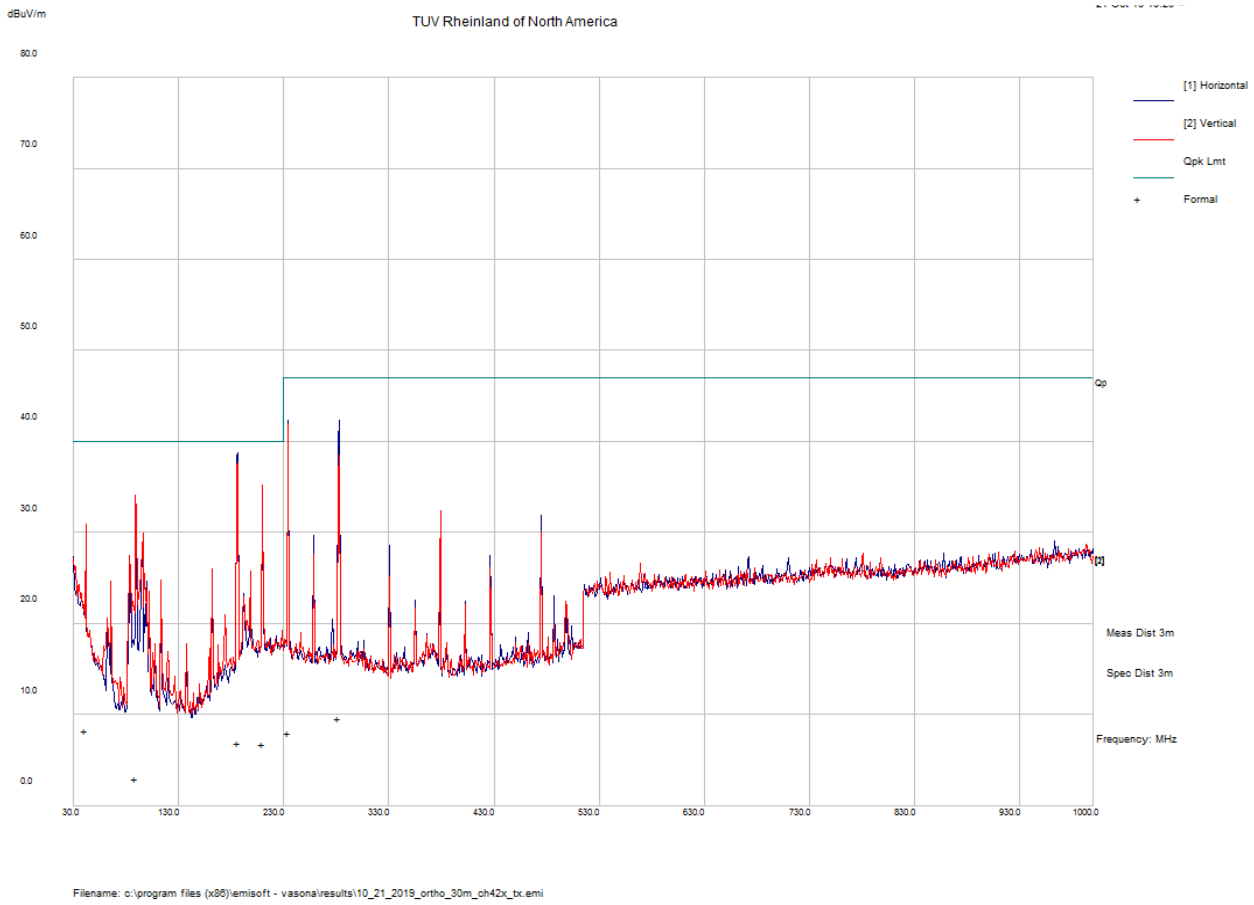
2.4.2 Results

Reference Standard: CFR 47 part 15.247:2018		
Test Conditions: Continuous Transmit under Normal Conditions		
Power Setting: 4dbm		
Signal State: Modulated Continuous Tx, Single Antenna, 100% Duty Cycle		
Configuration: mode 1		
Ambient Temp.: 21° C	**Relative Humidity:** 34%	**Barometric pressure:** 1009 mbar

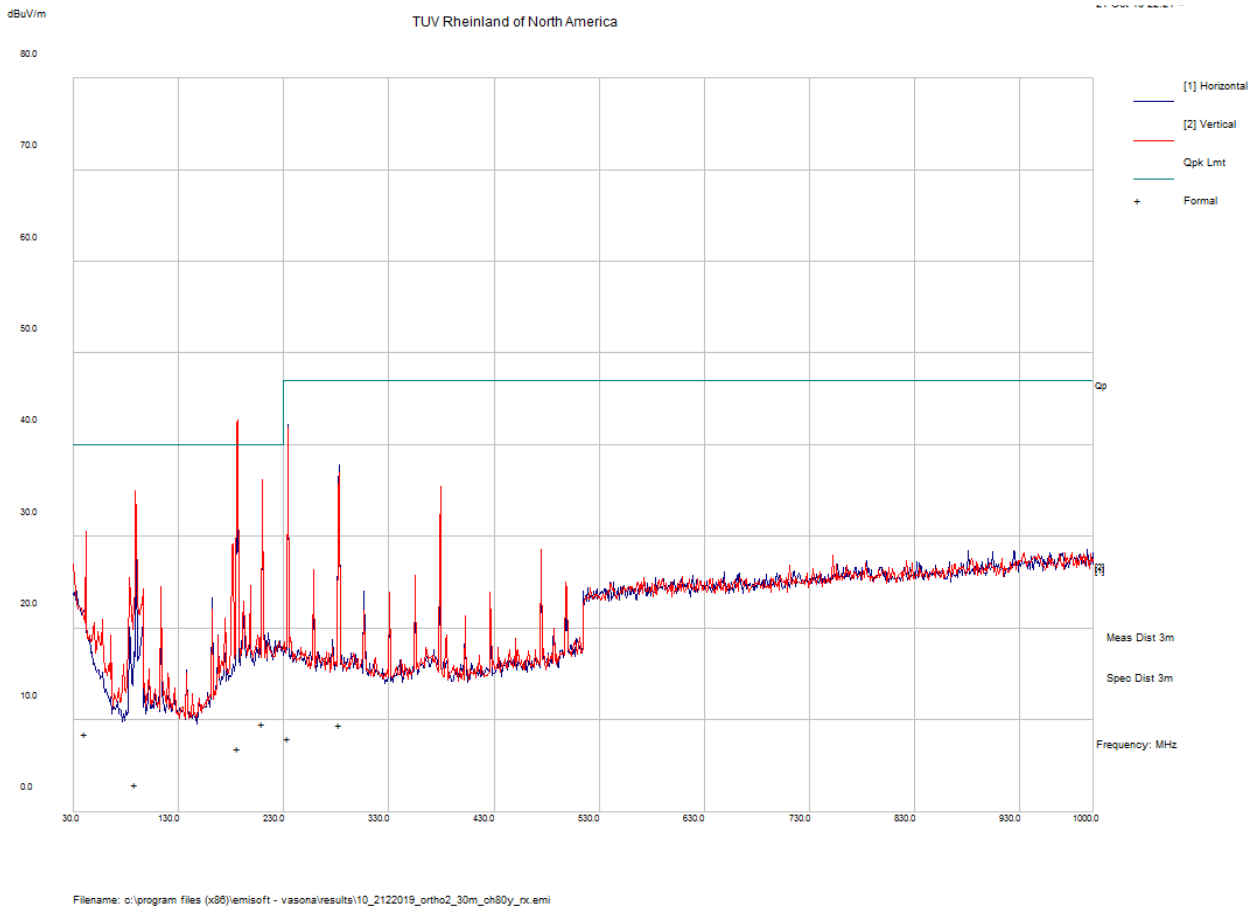
Note1: The tabular data denotes the worst case axis. Results are stored on the TUV client server.
Note2: The sensor runs a single oscillator at 32MHz it has no function in the 9k-30M range. No emissions will be tested in this range.



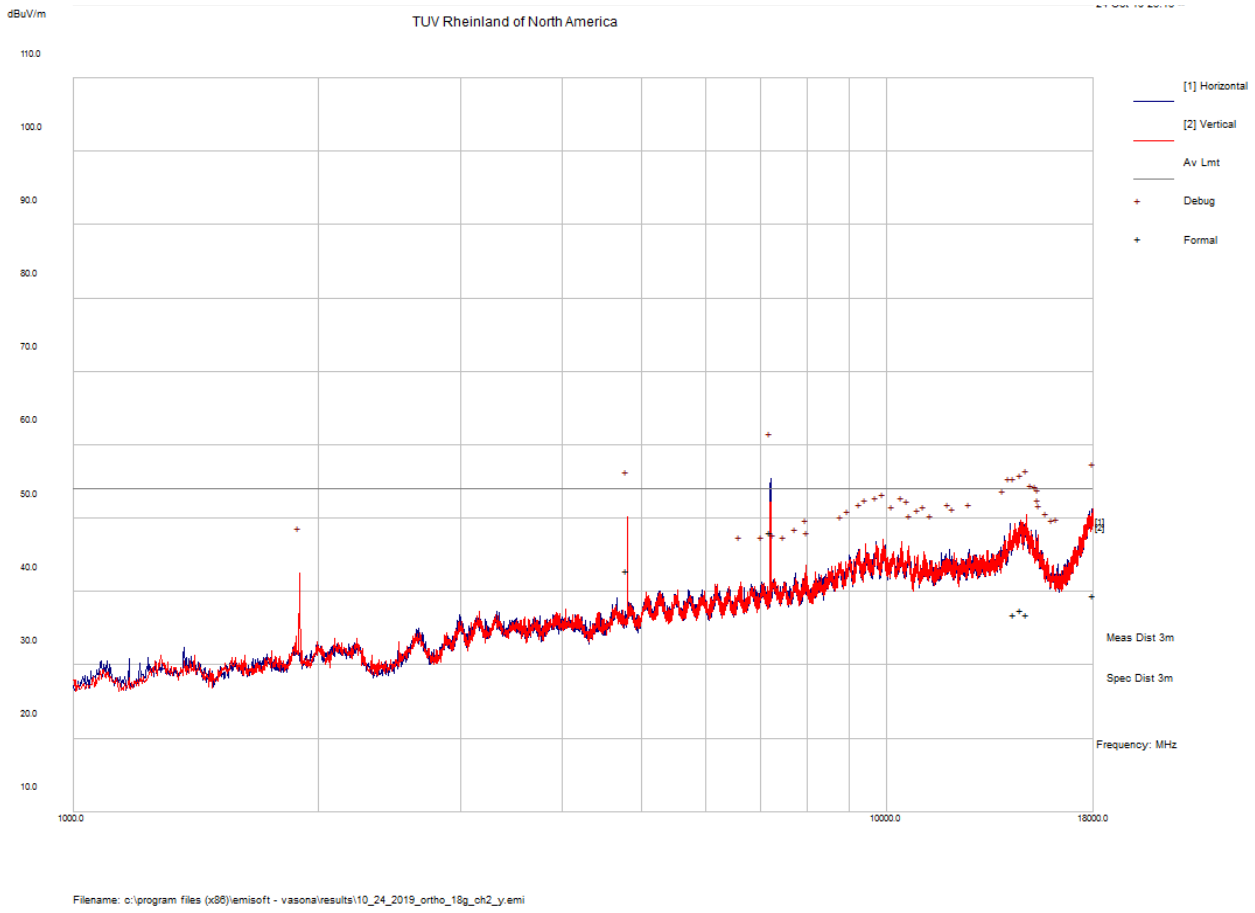
30-1000 MHz. Channel 2402



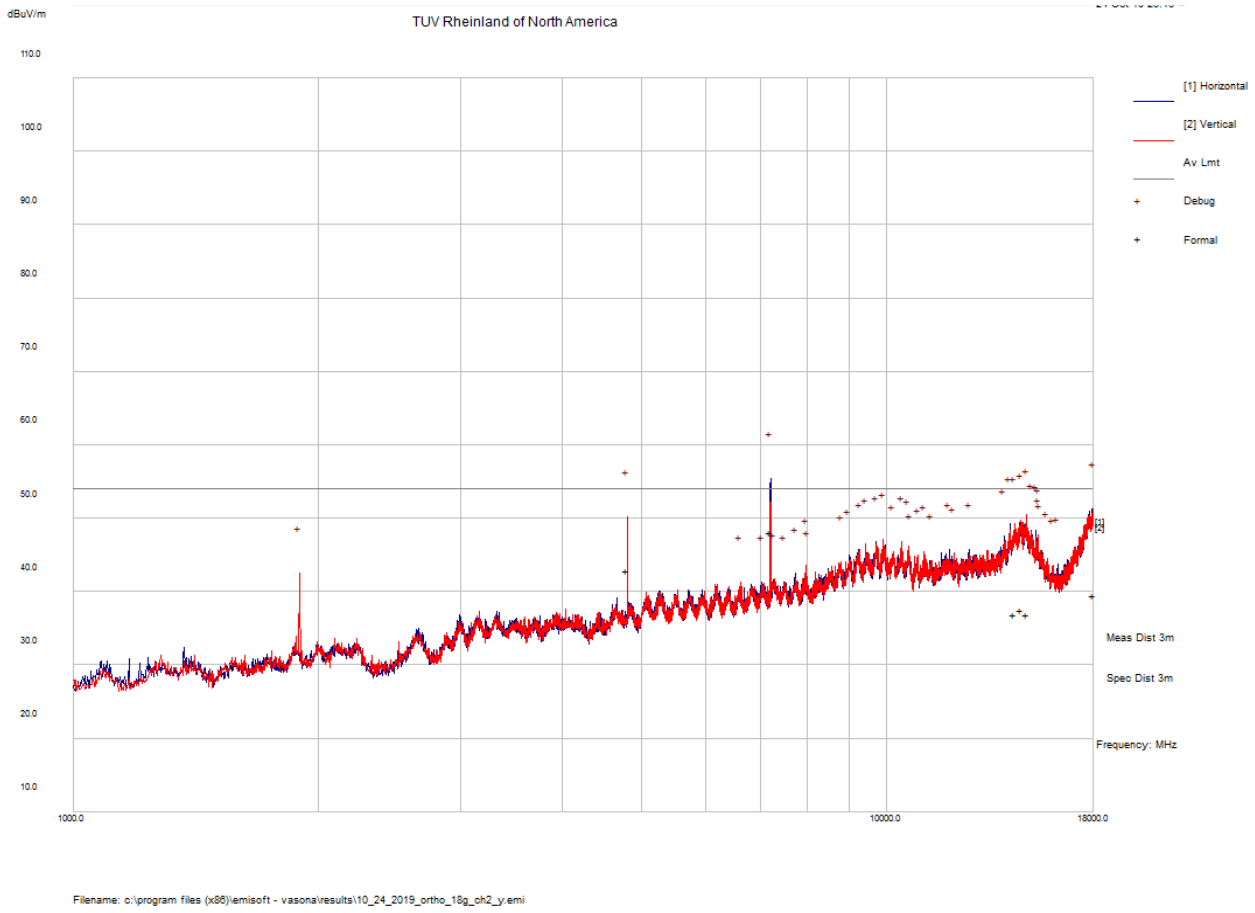
30-1000 MHz Channel 2442



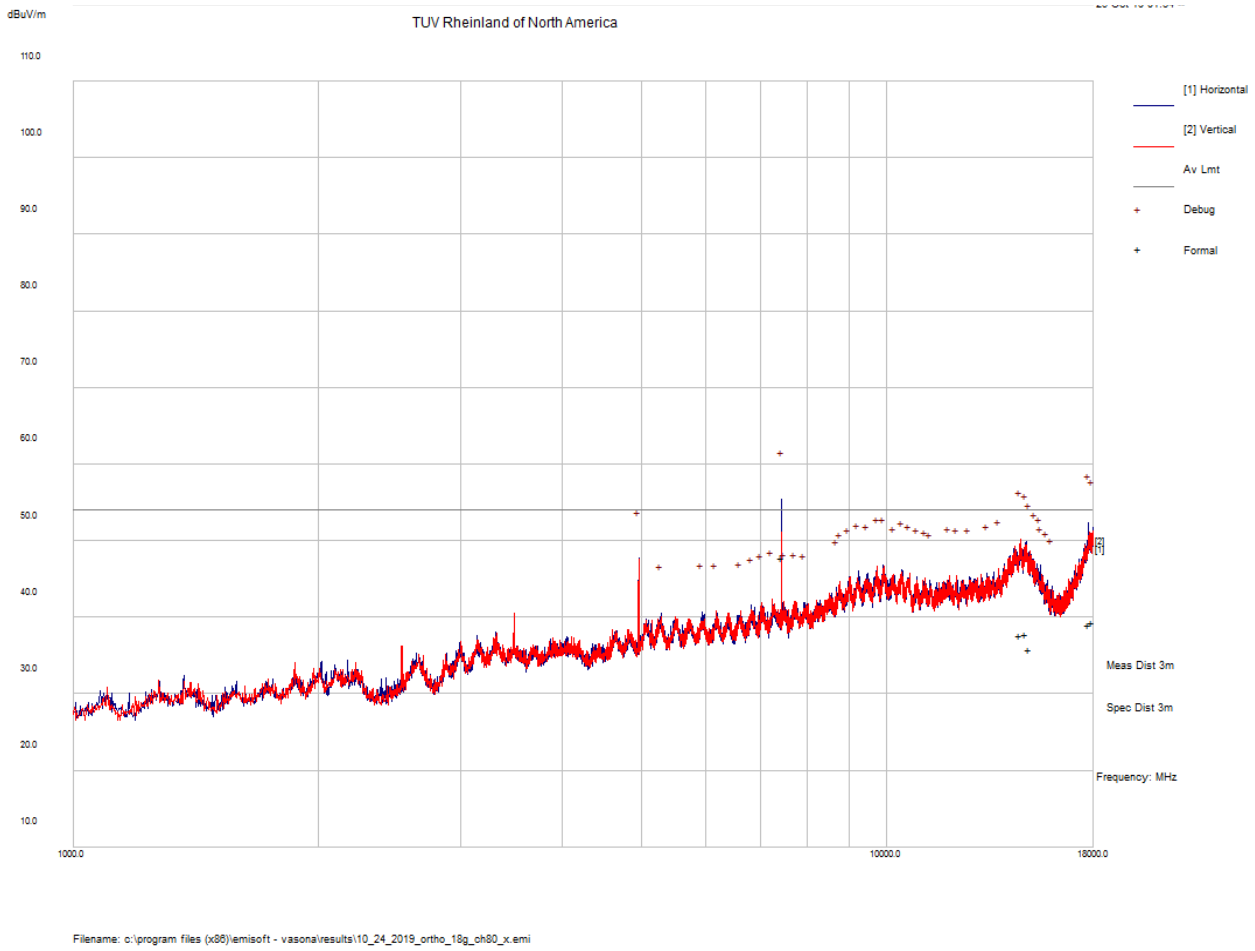
30-1000 MHz Channel 2479



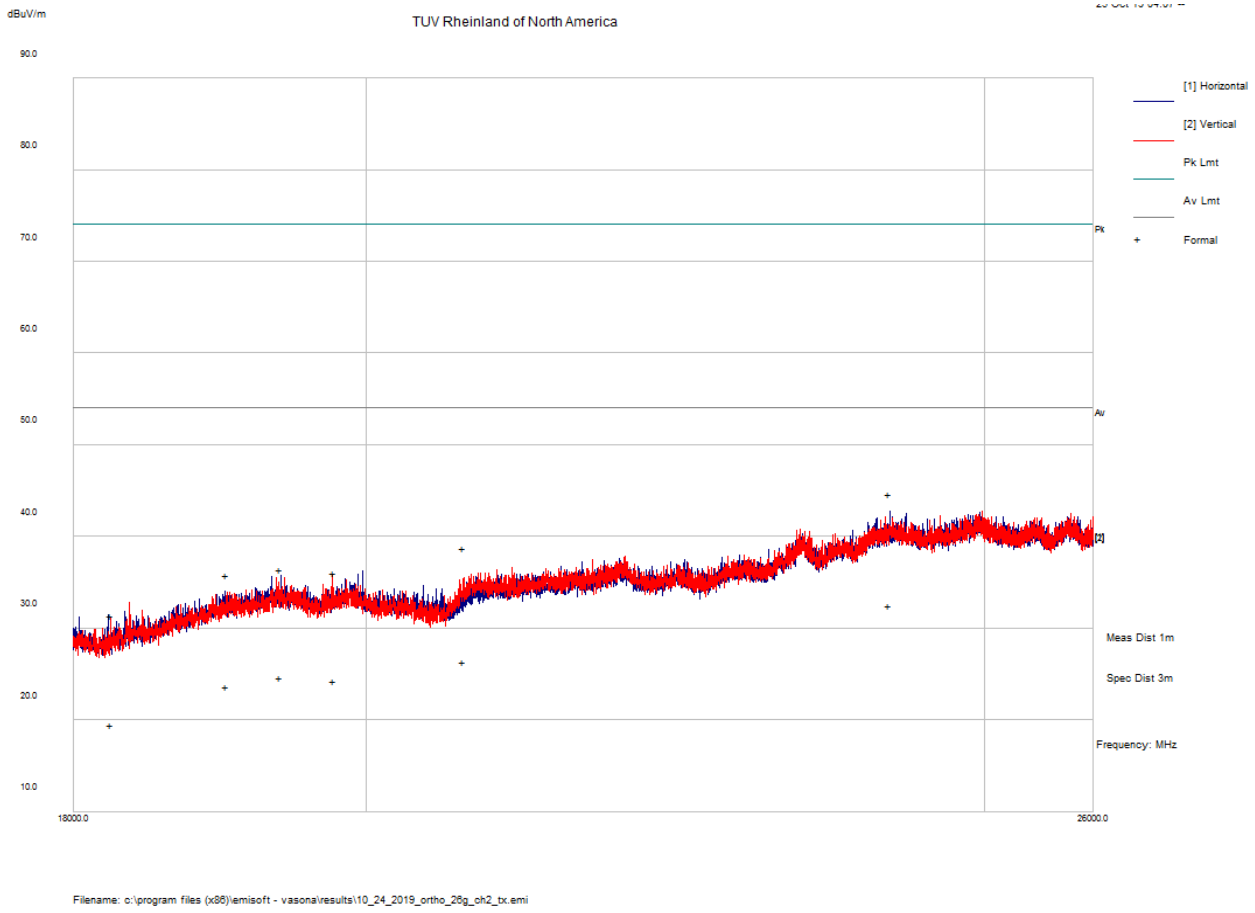
1-18 GHz Channel 2402



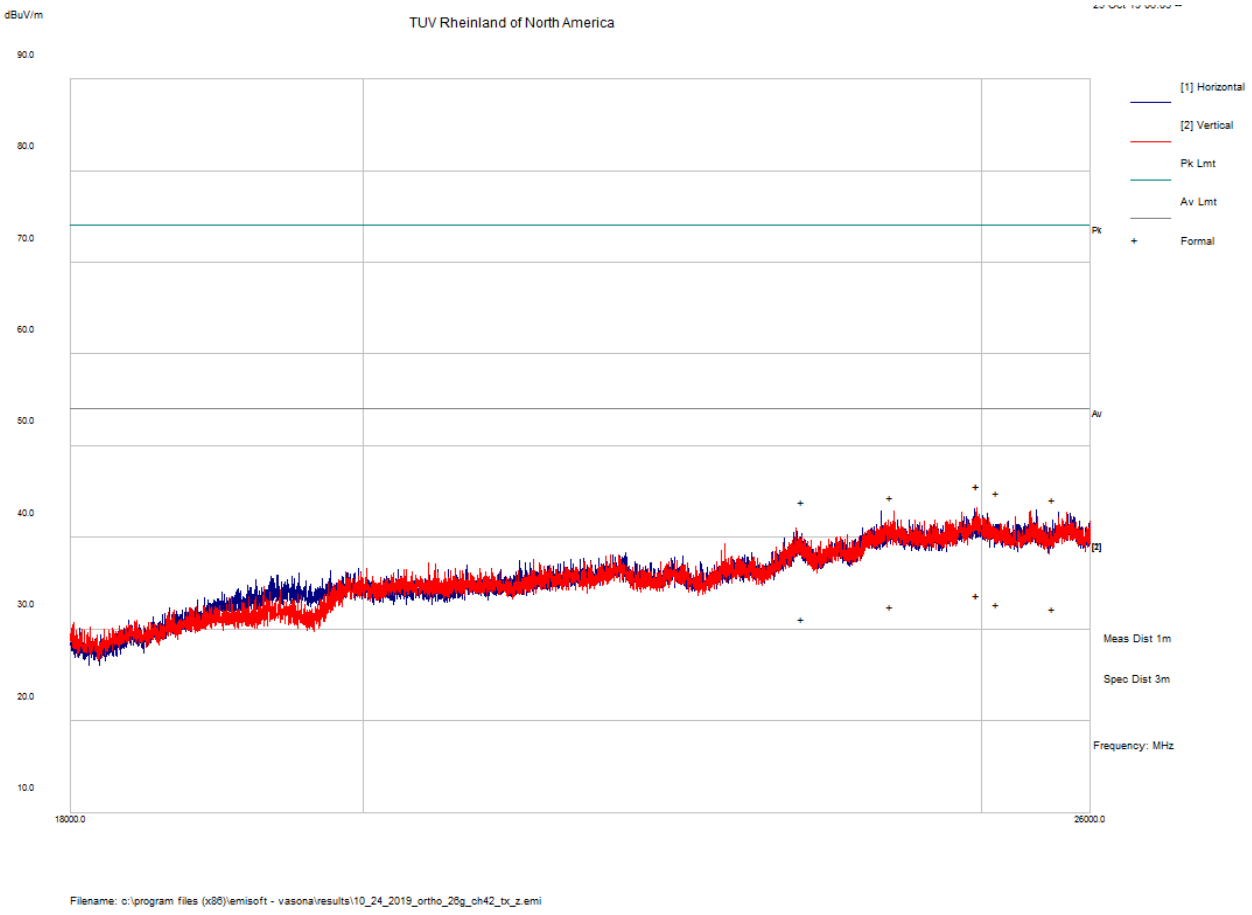
1-18 GHz Channel 2442



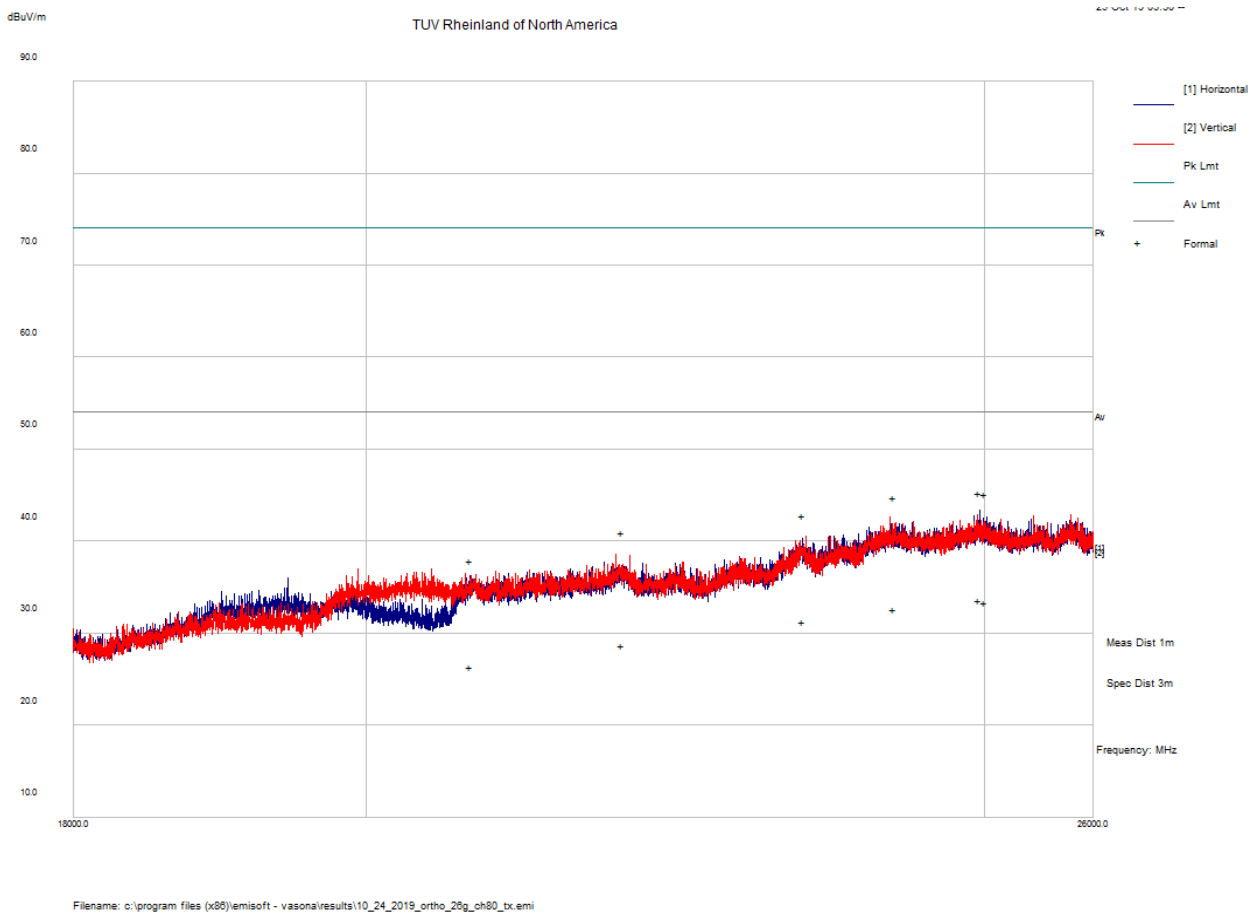
1-18 GHz Channel 2480



18-26 GHz channel 2402



18-26 GHz channel 2442



18-26 GHz channel 2480

Tabular Data 30-1000 MHz Channel 2402 Y Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
234.12	20.68	3.40	-16.12	7.96	QP	H	148	64	47.00	-39.04	Pass
282.59	20.31	3.55	-14.38	9.48	QP	H	275	25	47.00	-37.52	Pass
41.43	21.70	2.58	-15.11	9.17	QP	V	154	244	40.00	-30.83	Pass
89.46	20.76	2.84	-20.52	3.08	QP	V	110	0	40.00	-36.92	Pass
186.48	20.18	3.24	-16.62	6.80	QP	V	267	321	40.00	-33.20	Pass
209.94	22.55	3.32	-16.95	8.92	QP	V	207	0	40.00	-31.08	Pass

Tabular Data 30-1000 MHz Channel 2442 X Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
209.92	20.61	3.32	-16.95	6.98	QP	H	135	298	40.00	-33.02	Pass
234.30	20.69	3.40	-16.10	7.98	QP	H	272	303	47.00	-39.02	Pass
282.84	20.60	3.55	-14.38	9.78	QP	H	122	95	47.00	-37.22	Pass
41.47	21.29	2.58	-15.14	8.74	QP	V	198	238	40.00	-31.26	Pass
89.35	20.89	2.84	-20.54	3.19	QP	V	209	185	40.00	-36.81	Pass
186.23	20.20	3.24	-16.65	6.79	QP	V	262	360	40.00	-33.21	Pass

Tabular Data 30-1000 MHz Channel 2480 Z Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
234.11	20.70	3.40	-16.12	7.98	QP	H	243	2	47.00	-39.02	Pass
282.82	20.35	3.55	-14.38	9.52	QP	H	330	180	47.00	-37.48	Pass
41.58	21.19	2.58	-15.22	8.56	QP	V	185	197	40.00	-31.44	Pass
89.26	20.68	2.84	-20.54	2.97	QP	V	261	328	40.00	-37.03	Pass
186.52	20.22	3.24	-16.62	6.85	QP	V	187	143	40.00	-33.15	Pass
209.98	23.19	3.32	-16.95	9.56	QP	V	233	0	40.00	-30.44	Pass

Tabular Data 1-18 GHz Channel 2402 X Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
4804.44	63.93	3.50	-23.59	43.84	verage Ma	H	125	52	54.00	-10.16	Pass
7206.83	65.17	4.21	-20.04	49.34	verage Ma	H	112	130	54.00	-4.66	Pass
14657.67	44.10	6.18	-12.76	37.53	verage Ma	H	239	0	54.00	-16.47	Pass
14707.97	42.78	6.13	-12.61	36.30	verage Ma	V	242	12	54.00	-17.70	Pass
14883.53	44.08	6.40	-12.89	37.58	verage Ma	V	222	110	54.00	-16.42	Pass
17971.97	40.29	6.96	-7.70	39.55	verage Ma	V	245	60	54.00	-14.45	Pass

Tabular Data 1-18 GHz Channel 2442 X Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
14954.41	42.97	6.39	-13.10	36.26	verage Ma	H	112	154	54.00	-17.74	Pass
15107.64	43.84	6.33	-13.72	36.45	verage Ma	H	190	130	54.00	-17.55	Pass
17292.05	40.69	6.80	-11.96	35.53	verage Ma	H	231	38	54.00	-18.47	Pass
14600.89	44.46	6.10	-13.01	37.55	verage Ma	V	121	108	54.00	-16.45	Pass
14874.99	44.15	6.40	-12.84	37.71	verage Ma	V	159	198	54.00	-16.29	Pass
17958.30	40.27	6.98	-7.78	39.47	verage Ma	V	137	286	54.00	-14.53	Pass

Tabular Data 1-18 GHz Channel 2480 Z Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
7439.31	63.07	4.30	-19.54	47.83	verage Ma	H	228	120	54.00	-6.17	Pass
14865.57	44.11	6.40	-12.77	37.75	verage Ma	H	193	124	54.00	-16.25	Pass
17733.01	40.82	6.73	-8.54	39.01	verage Ma	H	159	0	54.00	-14.99	Pass
17956.91	40.21	6.99	-7.79	39.41	verage Ma	H	156	184	54.00	-14.59	Pass
14619.74	44.50	6.14	-12.95	37.70	verage Ma	V	147	40	54.00	-16.31	Pass
15020.75	43.09	6.22	-13.43	35.88	verage Ma	V	201	160	54.00	-18.12	Pass

Tabular Data 18-26 GHz Channel 2402 X Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
24158.60	43.36	8.10	-6.83	44.63	Peak Max	H	115	360	74.00	-29.37	Pass
24158.60	31.24	8.10	-6.83	32.51	verage Ma	H	115	360	54.00	-21.49	Pass
18244.75	37.82	6.99	-13.43	31.39	Peak Max	V	131	128	74.00	-42.61	Pass
18244.75	25.87	6.99	-13.43	19.43	verage Ma	V	131	128	54.00	-34.57	Pass
19022.29	38.54	7.20	-9.97	35.78	Peak Max	V	127	288	74.00	-38.23	Pass
19022.29	26.39	7.20	-9.97	23.63	verage Ma	V	127	288	54.00	-30.37	Pass
19392.05	38.02	7.30	-8.87	36.46	Peak Max	V	158	86	74.00	-37.54	Pass
19392.05	26.17	7.30	-8.87	24.60	verage Ma	V	158	86	54.00	-29.40	Pass
19775.39	37.38	7.30	-8.68	36.00	Peak Max	V	173	317	74.00	-38.00	Pass
19775.39	25.69	7.30	-8.68	24.30	verage Ma	V	173	317	54.00	-29.70	Pass
20714.42	40.23	7.60	-9.13	38.70	Peak Max	V	162	82	74.00	-35.30	Pass
20714.42	27.84	7.60	-9.13	26.32	verage Ma	V	162	82	54.00	-27.68	Pass

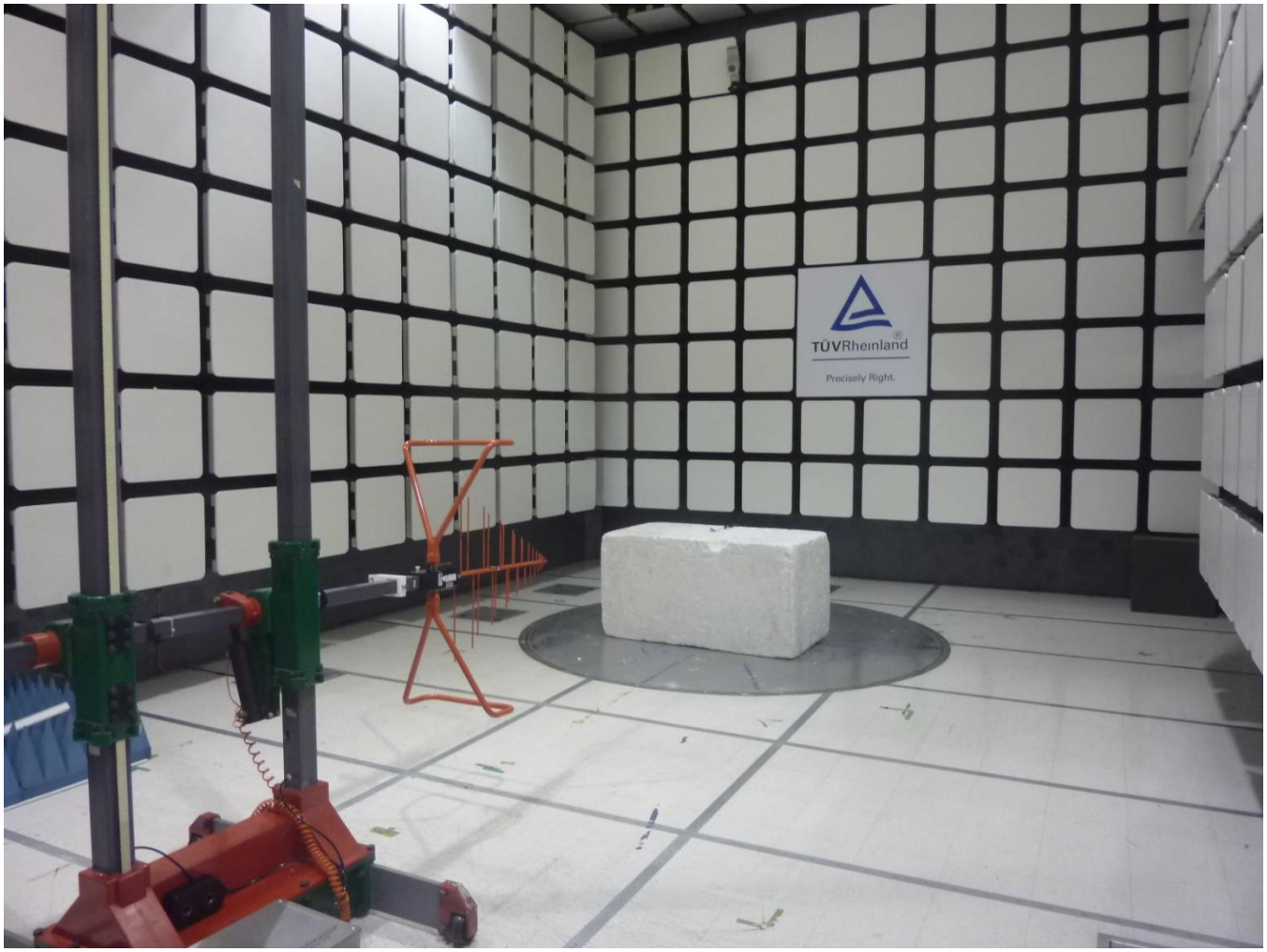
Tabular Data 18-26 GHz Channel 2442 X Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
24932.79	44.79	8.17	-7.22	45.74	Peak Max	H	140	256	74.00	-28.27	Pass
24932.79	32.63	8.17	-7.22	33.57	verage Ma	H	140	256	54.00	-20.43	Pass
18082.59	37.05	6.93	-13.09	30.89	Peak Max	V	197	134	74.00	-43.11	Pass
18082.59	25.72	6.93	-13.09	19.57	verage Ma	V	197	134	54.00	-34.43	Pass
19653.64	37.19	7.30	-8.78	35.70	Peak Max	V	194	360	74.00	-38.30	Pass
19653.64	25.40	7.30	-8.78	23.92	verage Ma	V	194	360	54.00	-30.08	Pass
19986.26	38.61	7.40	-8.55	37.46	Peak Max	V	181	74	74.00	-36.54	Pass
19986.26	25.12	7.40	-8.55	23.97	verage Ma	V	181	74	54.00	-30.03	Pass
20166.28	38.42	7.40	-9.01	36.82	Peak Max	V	174	254	74.00	-37.18	Pass
20166.28	26.07	7.40	-9.01	24.47	verage Ma	V	174	254	54.00	-29.54	Pass
20626.74	37.99	7.50	-9.42	36.07	Peak Max	V	194	256	74.00	-37.93	Pass
20626.74	26.18	7.50	-9.42	24.26	verage Ma	V	194	256	54.00	-29.74	Pass

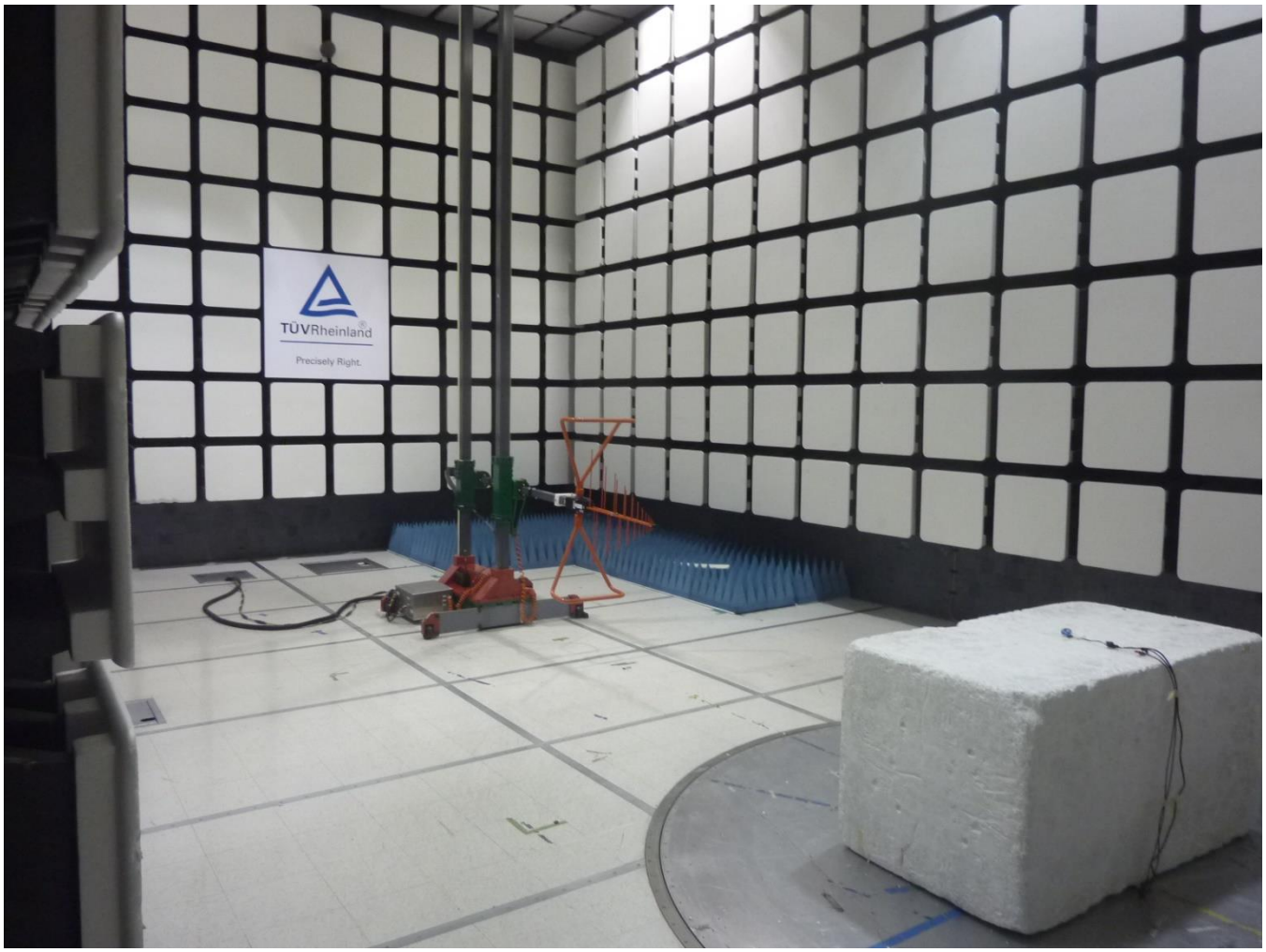
Tabular Data 18-26 GHz Channel 2480 X Axis

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
24951.15	44.23	8.17	-7.18	45.23	Peak Max	H	190	268	74.00	-28.77	Pass
24951.15	32.62	8.17	-7.18	33.62	Average Max	H	190	268	54.00	-20.38	Pass
20768.09	39.40	7.60	-9.05	37.95	Peak Max	V	160	184	74.00	-36.05	Pass
20768.09	27.81	7.60	-9.05	26.36	Average Max	V	160	184	54.00	-27.64	Pass
21933.44	42.14	7.70	-8.81	41.03	Peak Max	V	123	348	74.00	-32.97	Pass
21933.44	29.83	7.70	-8.81	28.72	Average Max	V	123	348	54.00	-25.28	Pass
23414.77	42.52	7.80	-7.47	42.86	Peak Max	V	104	336	74.00	-31.15	Pass
23414.77	30.98	7.80	-7.47	31.31	Average Max	V	104	336	54.00	-22.69	Pass
24193.21	43.55	8.10	-6.82	44.83	Peak Max	V	167	204	74.00	-29.17	Pass
24193.21	31.32	8.10	-6.82	32.60	Average Max	V	167	204	54.00	-21.40	Pass
24998.53	44.07	8.18	-7.06	45.19	Peak Max	V	170	208	74.00	-28.82	Pass
24998.53	32.27	8.18	-7.06	33.39	Average Max	V	170	208	54.00	-20.61	Pass

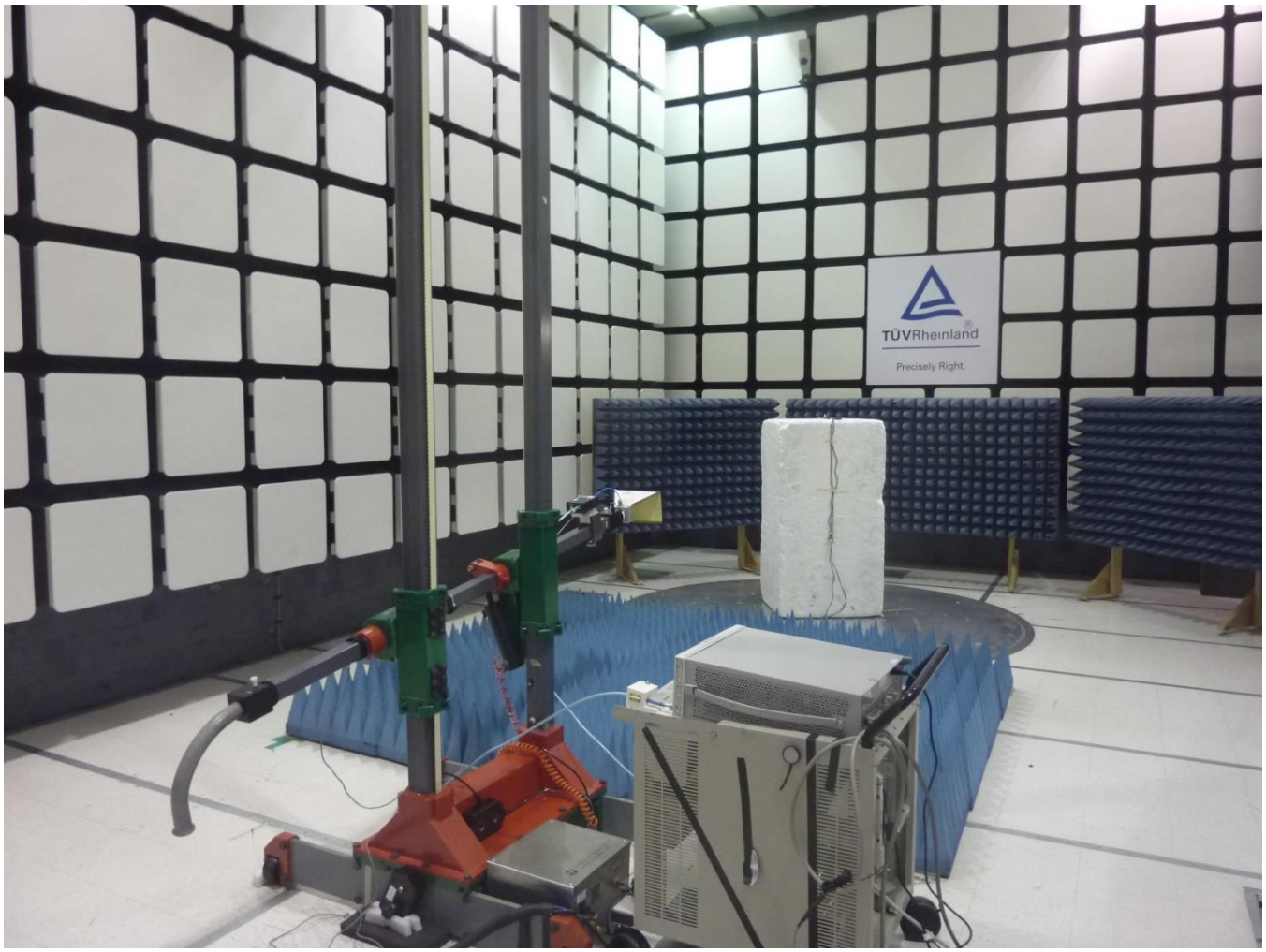
2.4.4 Photos



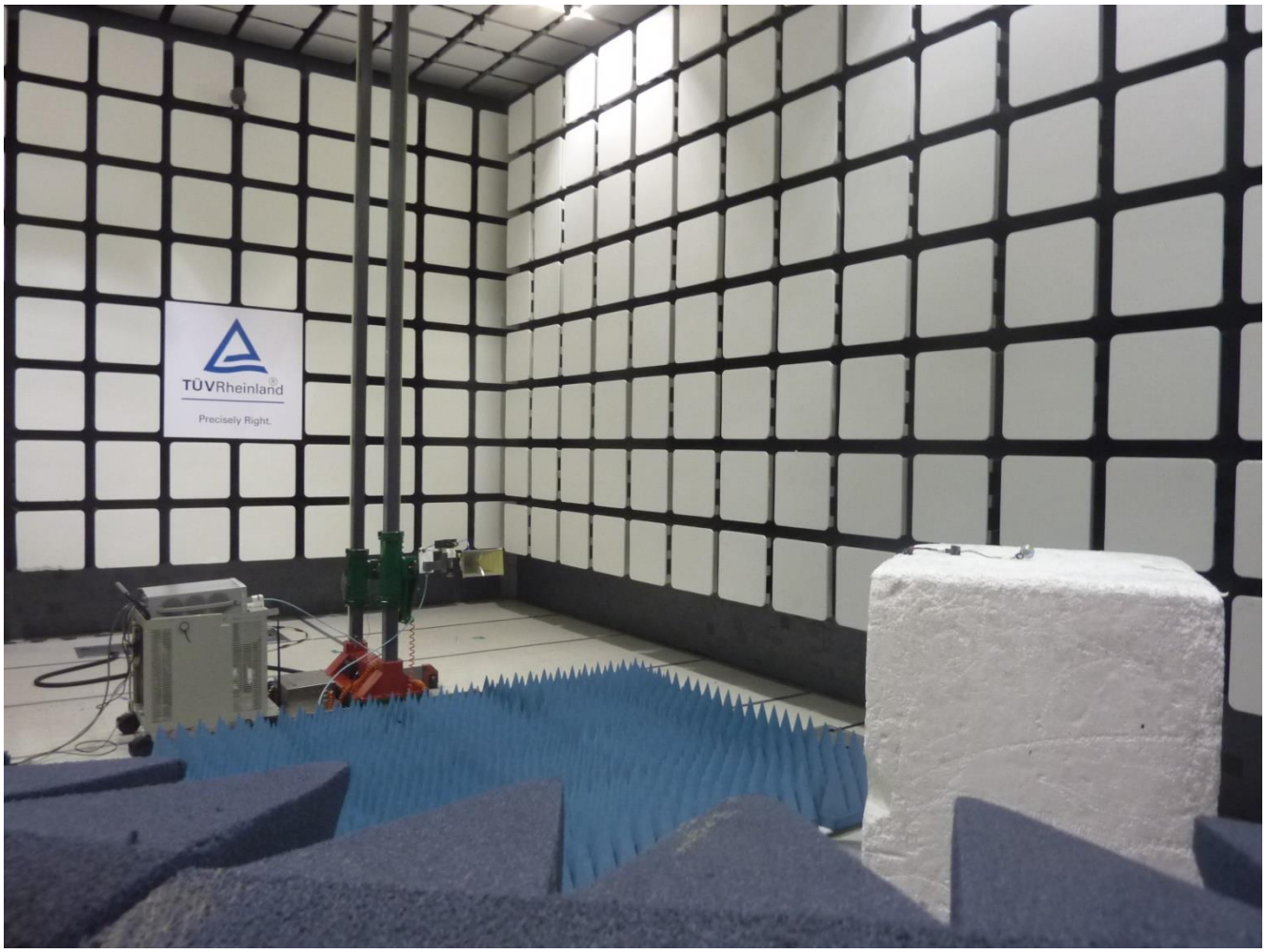
Test Setup 30-1000 MHz Front



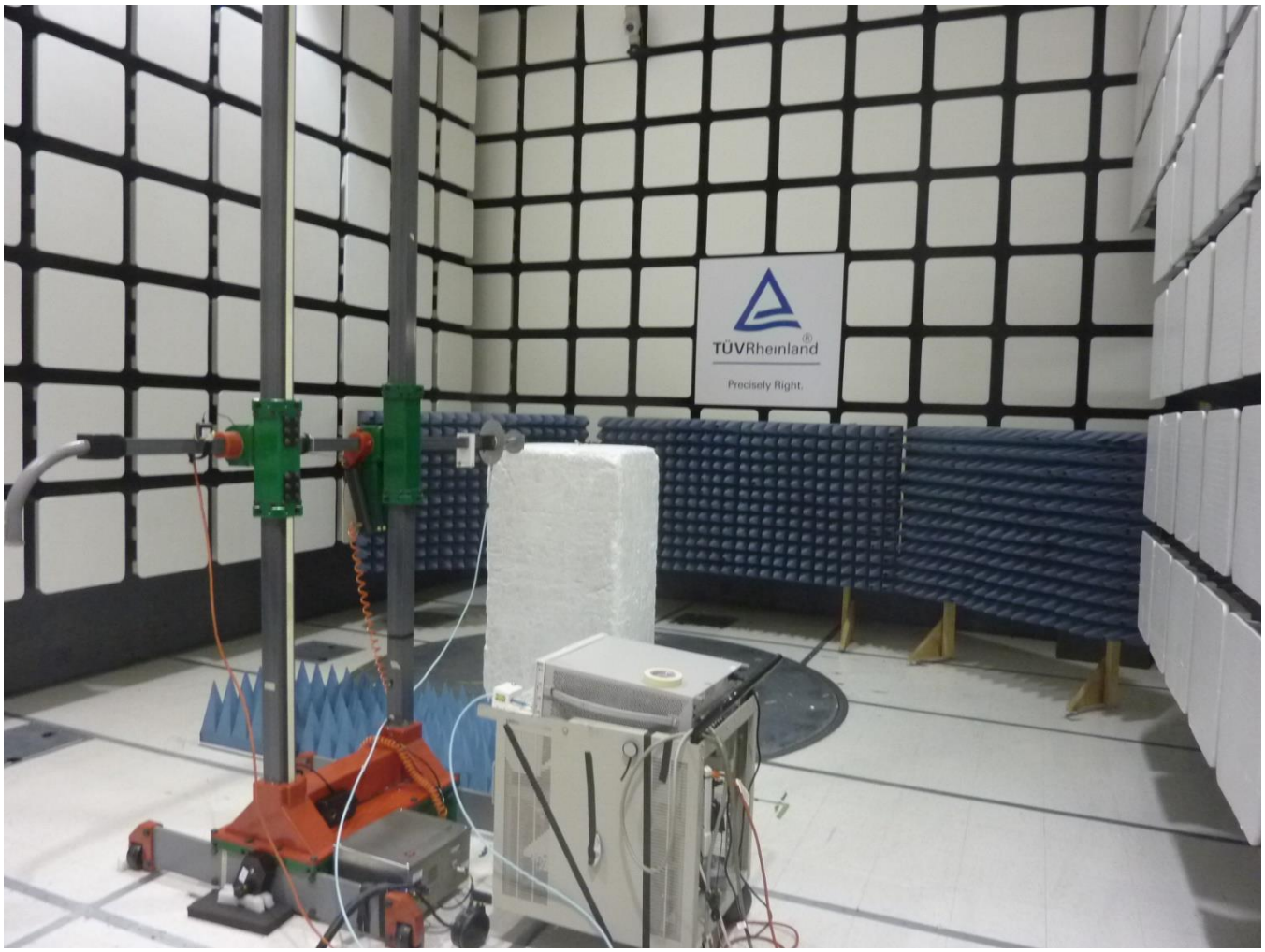
Test Setup 30-1000 MHz Rear



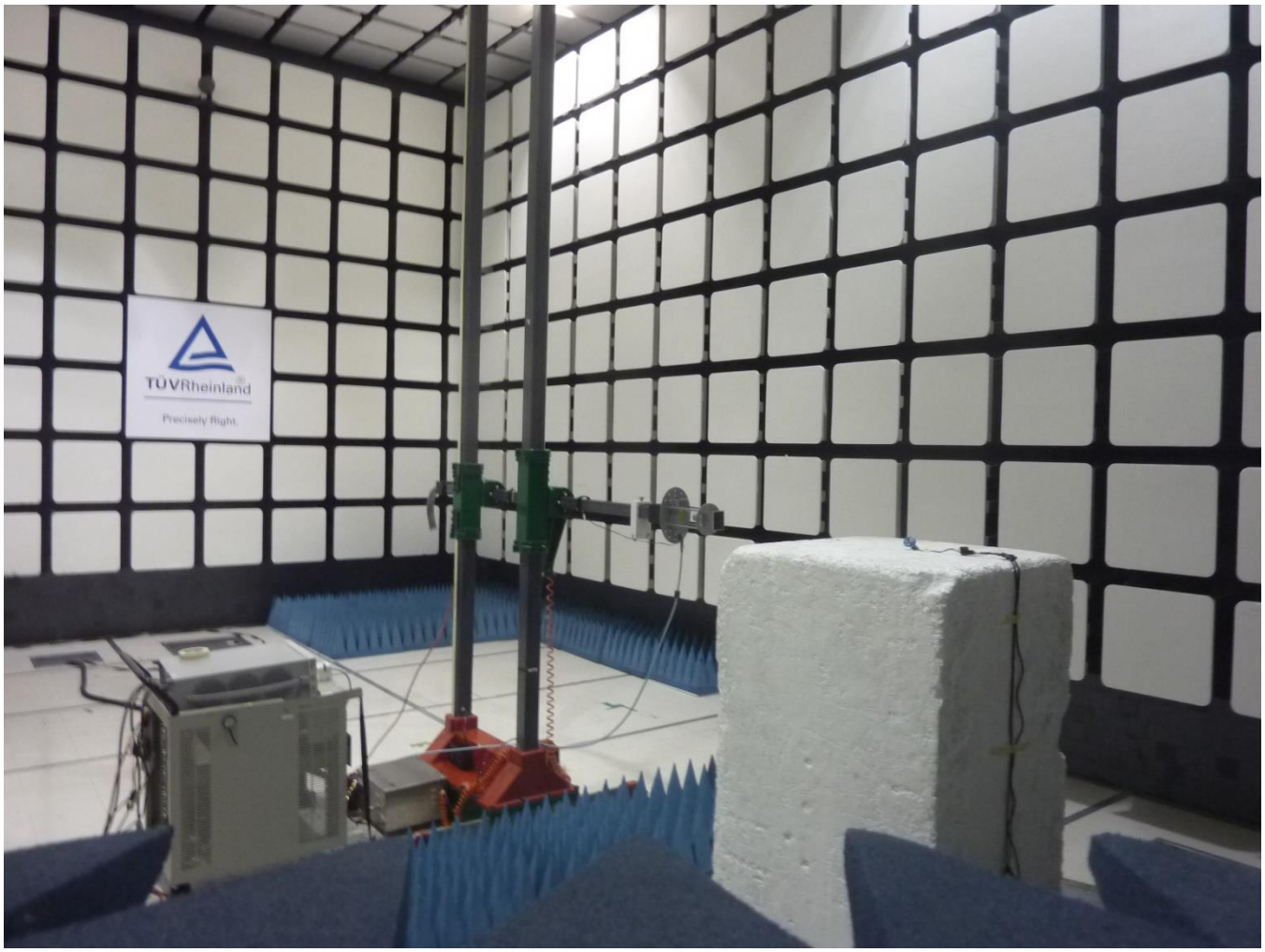
Test Setup 1-18 GHz Front



Test Setup 1-18 GHz Rear



Test Setup 18-26 GHz front



Test Setup 18-26 GHz

2.5 Emissions in nonrestricted frequency bands

The maximum peak conducted output power procedure was used to determine compliance as described in 11.9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum

in-band peak PSD level in 100 kHz

2.5.1 Test Method

Set the center frequency and span to encompass frequency range to be measured.

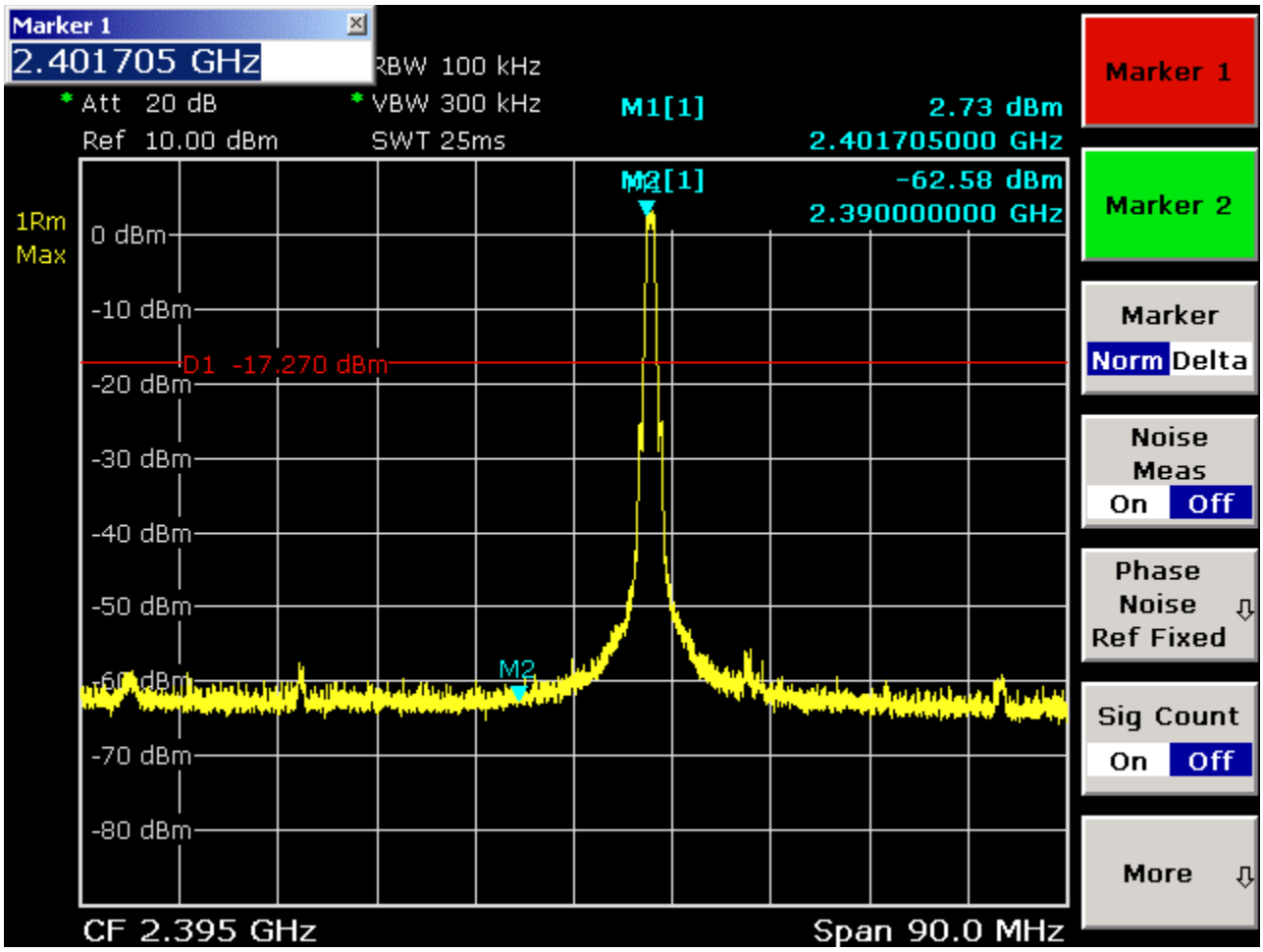
Set the RBW = 100 kHz.
Set the VBW [3 · RBW].
Detector = peak.
Sweep time = auto couple.
Trace mode = max hold.
Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum amplitude level.

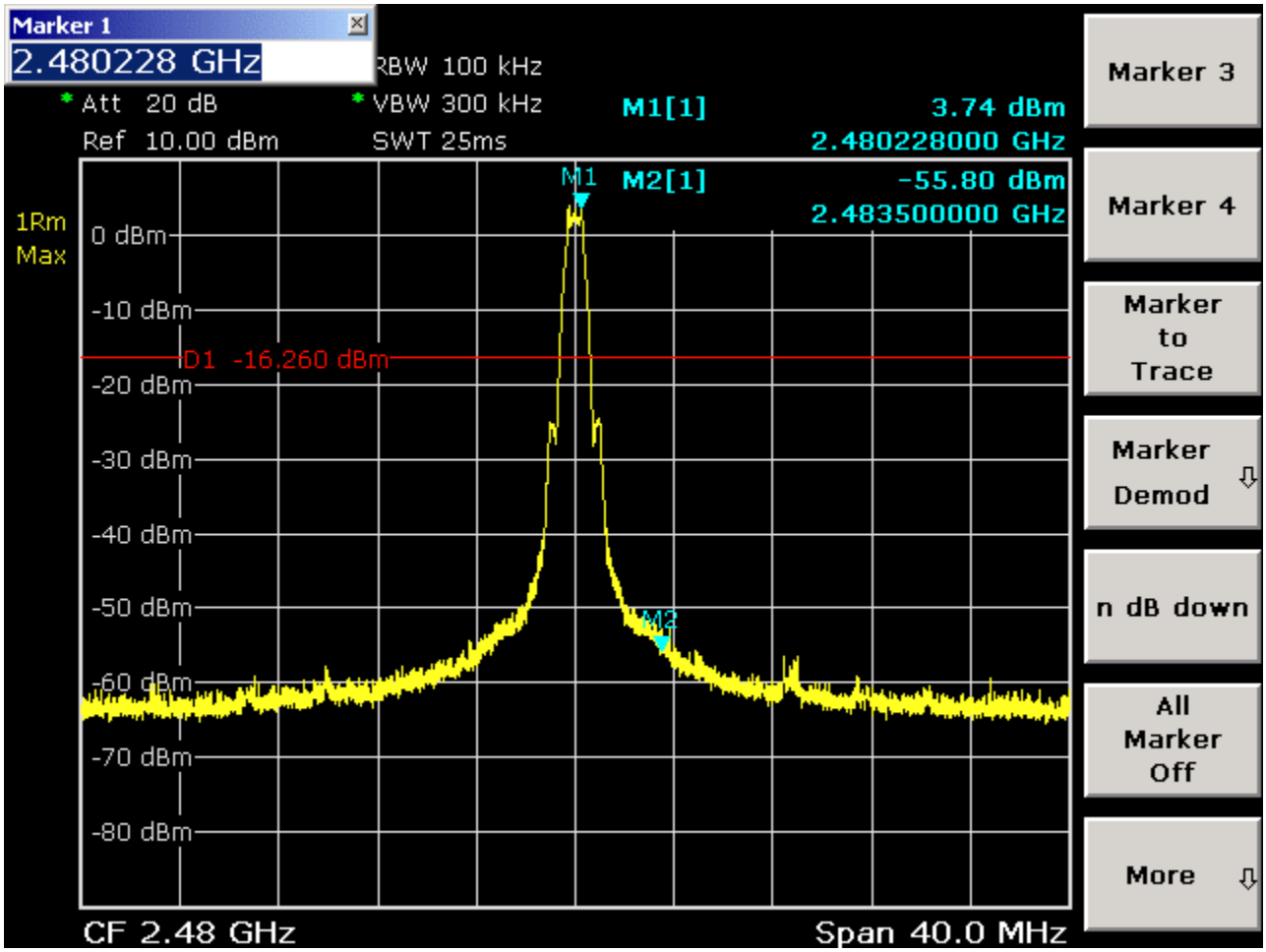
2.5.2 Results

Reference Standard: CFR 47 part 15.247:2018		
Test Conditions: Continuous Transmit under Normal Conditions		
Power Setting: 4dbm		
Signal State: Modulated Continuous Tx, Single Antenna, 100% Duty Cycle		
Configuration: mode 1		
Antenna Gain: -1.2		
Ambient Temp.: 21° C	**Relative Humidity:** 34%	**Barometric pressure:** 1009 mbar

Frequency	Measured (dbm)	Limit (dbm)
2402	-62.5	-17.5
2408	-55.8	-16.2



2402 Nonrestricted Band Emissions



2480 Nonrestricted Band Emissions

2.6 Restricted Bandedges

Any emissions outside of the authorized band and falling into the restricted band.

2.6.1 Test Method

Attenuation= auto

Reference level= to encompass the entire power of the channel

Res BW= 1 Mhz

Video BW= 3x Res BW

Trace= Max hold

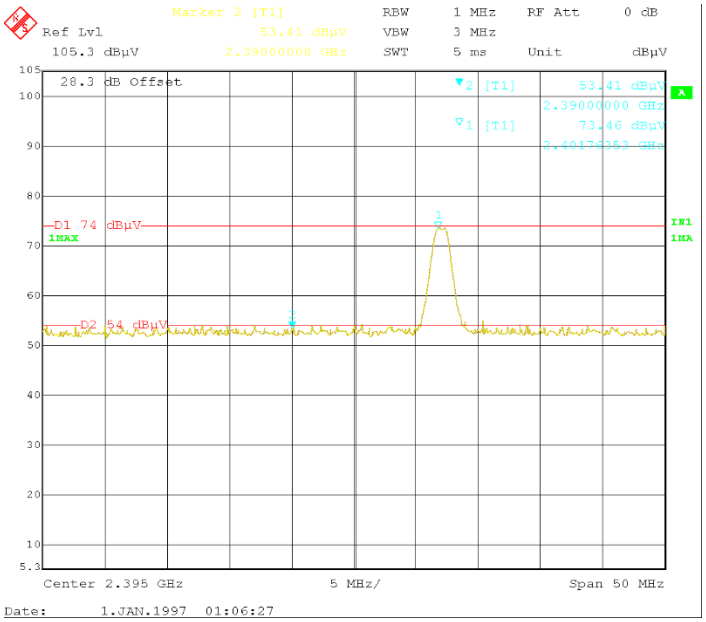
2.6.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

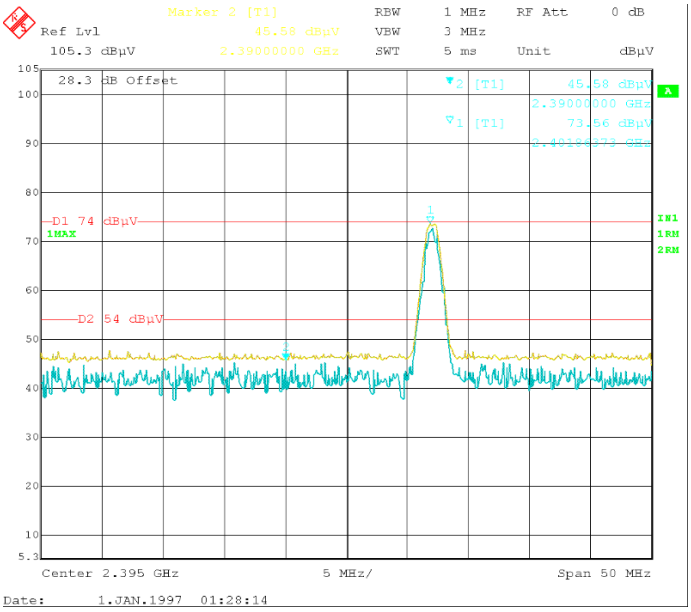
Reference Standard: CFR 47 part 15.247:2018		
Test Conditions: Radiated Measurement, Normal Temperature		
Power Setting: 4 dbm		
Signal State: Modulated Continuous Tx, Single Antenna, 100% Duty Cycle		
Configuration: mode 1		
Ambient Temp.: 19° C	**Relative Humidity:** 41%	**Barometric pressure:** 1002 mbar
Operating Frequency (MHz)	**Restricted band emission (dbuV)**	
2402 (peak vertical)	53.4	
2402 (peak horizontal)	52.8	

2402 (ave vertical)	46.3
2402 (ave horizontal)	45.5
2480 (peak vertical)	53.6
2480 (peak horizontal)	53.6
2480 (average vertical)	46.1
2480 (average horizontal)	45.9

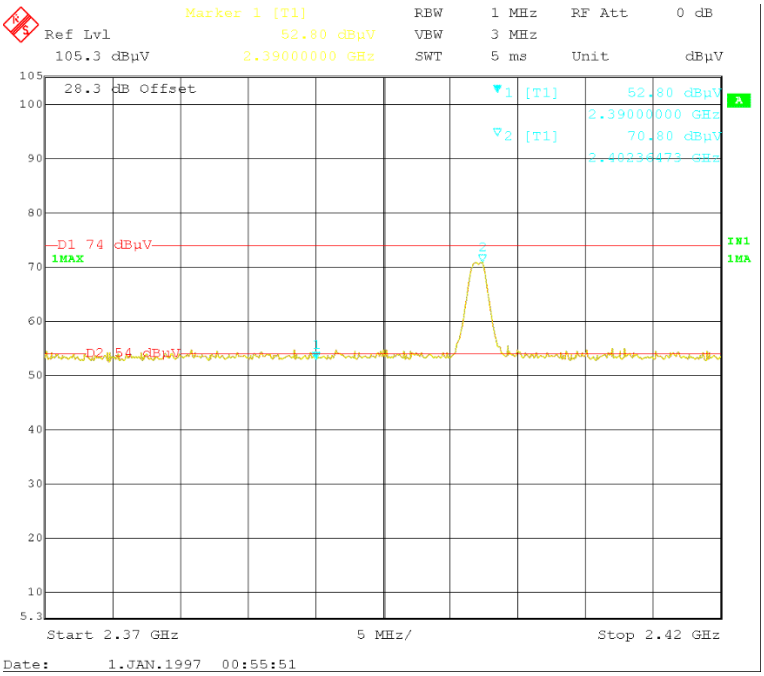
2402 Peak Horizontal BE



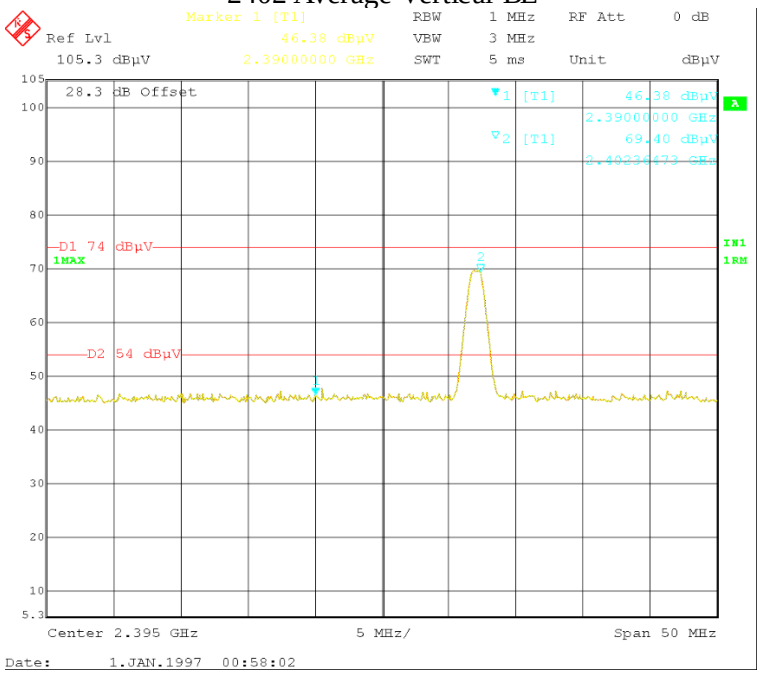
2402 Average Horizontal BE



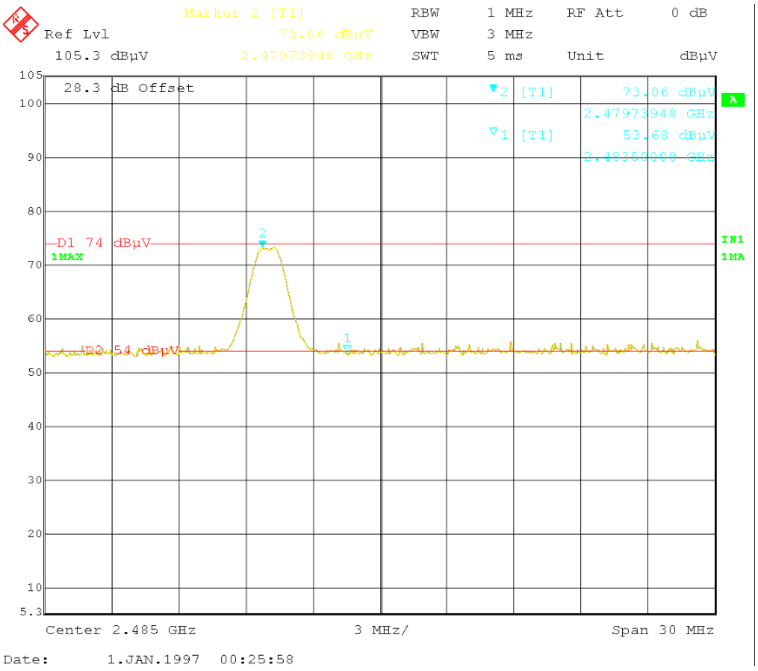
2402 Peak Vertical BE



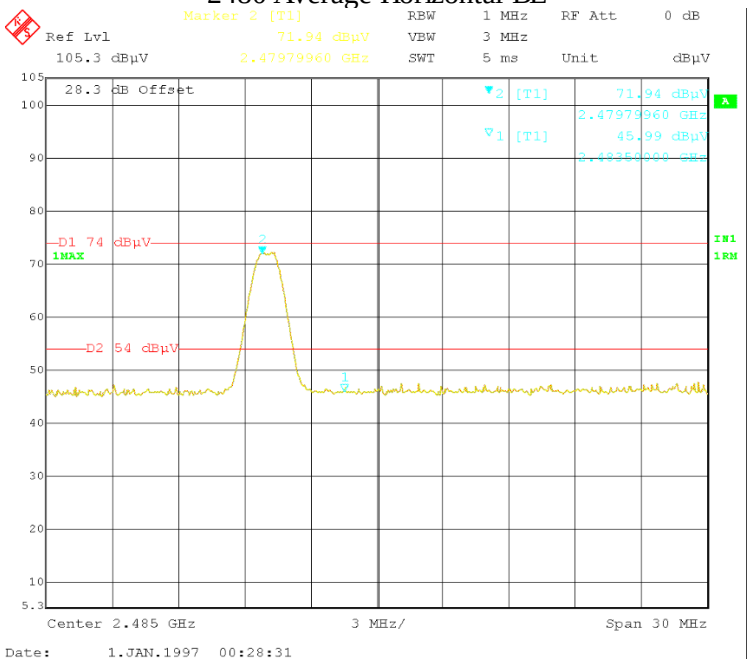
2402 Average Vertical BE



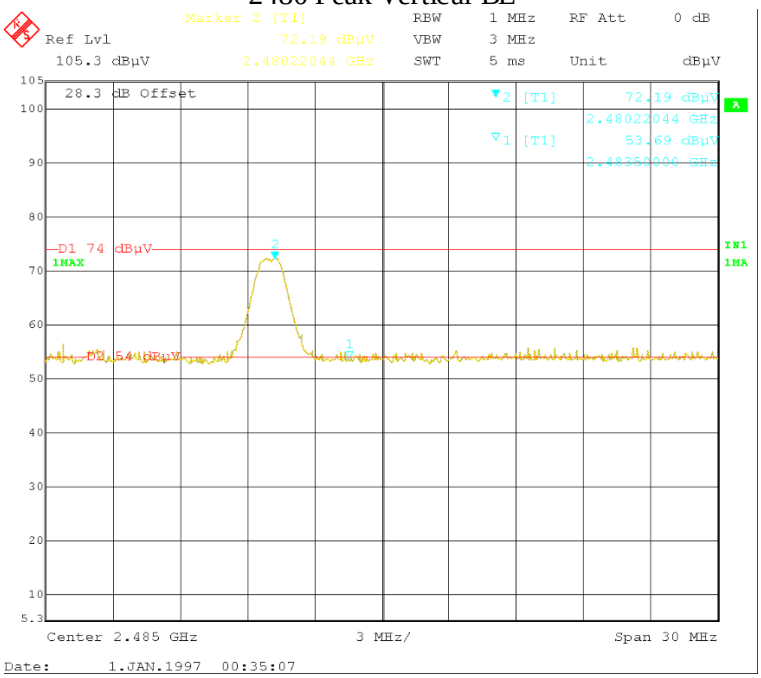
2480 Peak Horizontal BE



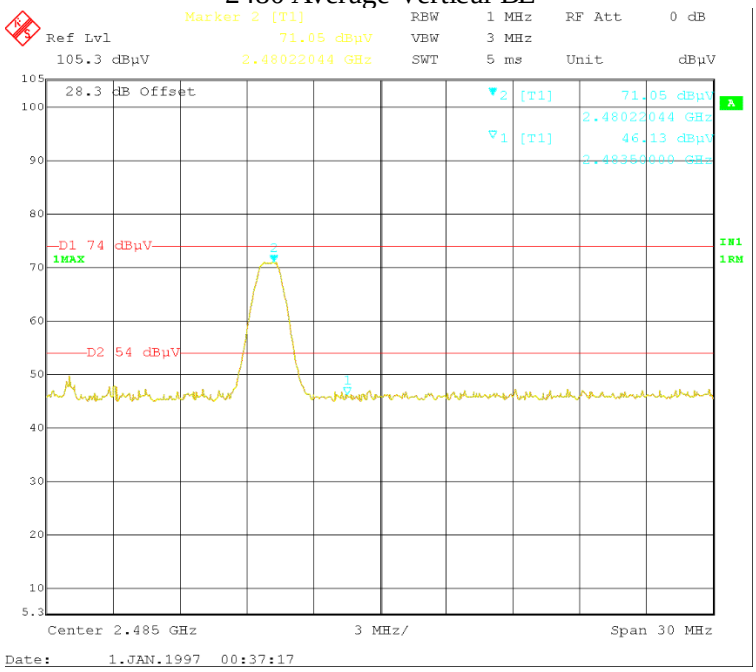
2480 Average Horizontal BE



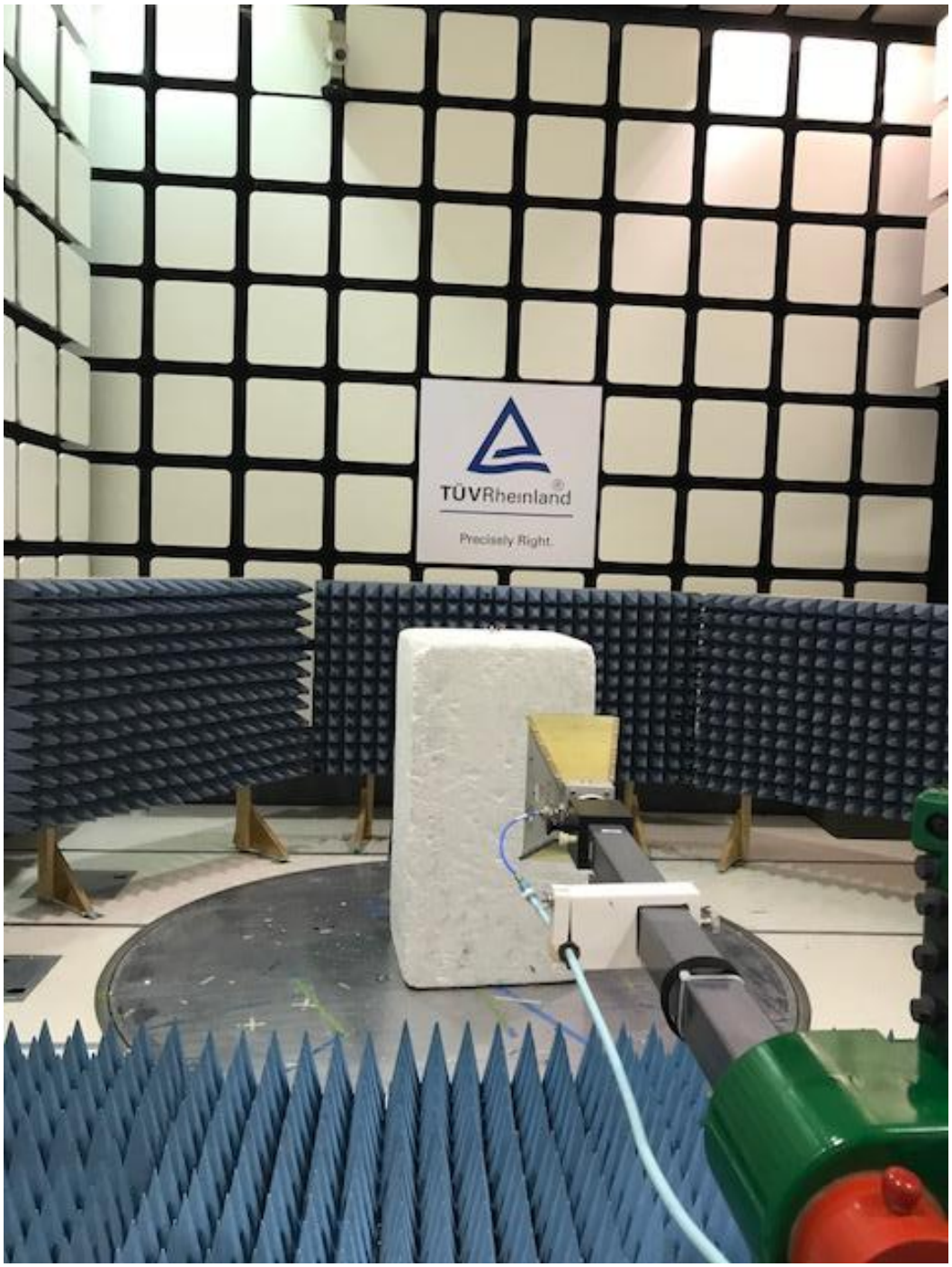
2480 Peak Vertical BE



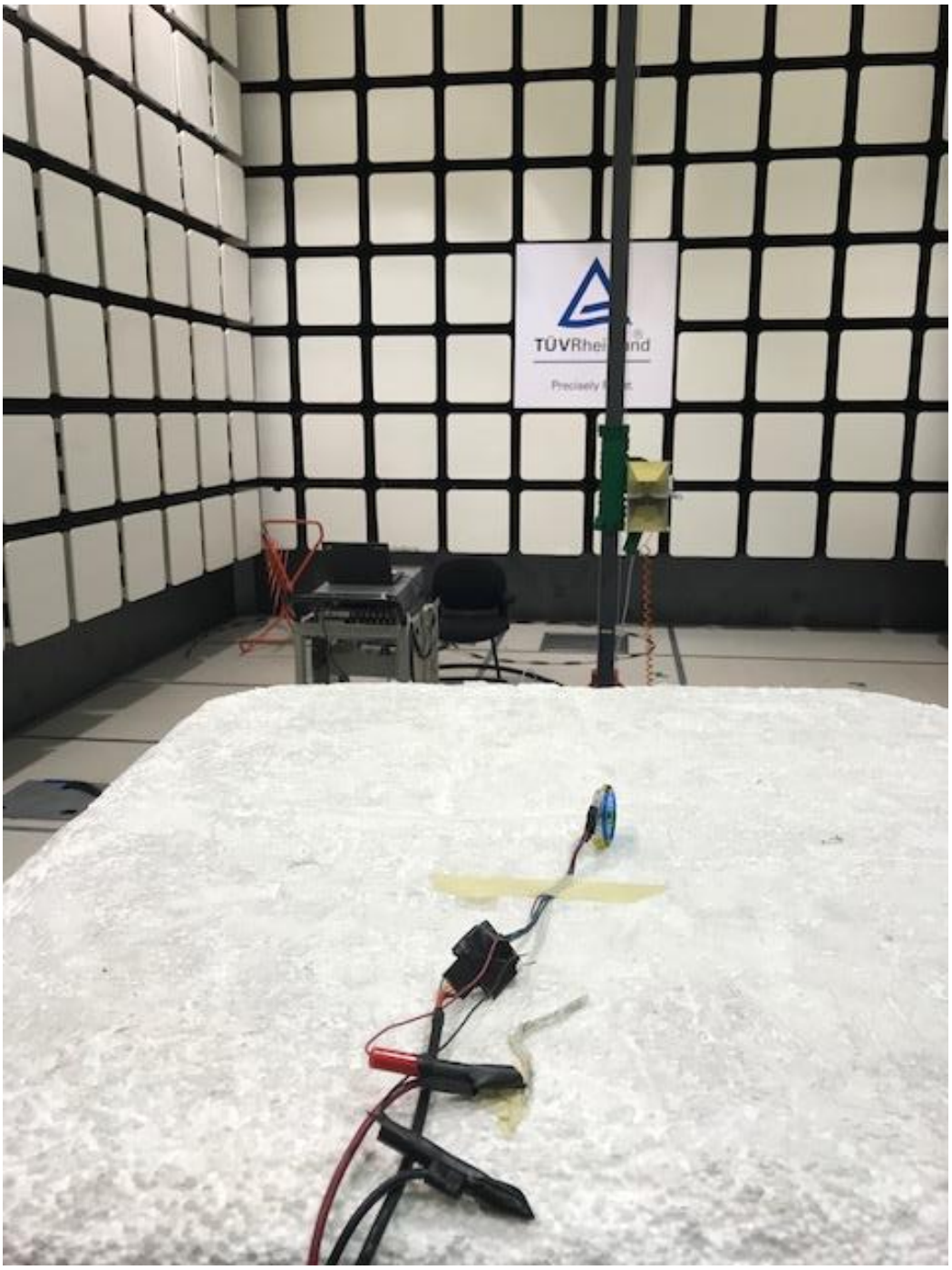
2480 Average Vertical BE



Photos



Bandedge setup front



Bandedge setup rear

3 Test Equipment List

3.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Bilog Antenna	Sunol Sciences	JB3	A102606	11/20/2017	11/20/2019
Amplifier	Sonoma Instruments	310	165516	01/23/2019	01/23/2020
Spectrum Analyzer	Agilent	N9038A	MY51210195	01/22/2019	01/22/2020
Rigid Horn antenna	Emco	3115	9602-4676	05/03/19	05/03/20
1-18GHz preamp	Miteq	TTA1800-30-HG	1842452	01/15/2019	01/15/2020
Spectrum Analyzer	Rhode&Schwarz	FSV	5000-309088910	11/21/18	11/21/19
Spectrum Analyzer	Agilent	N9030A	US51350291	01/15/19	01/15/20
Horn antenna	Emco	AH840	105005	9/3/2019	9/3/2021

Note: Equipment is characterized before use.

Appendix A

4 Test Plan

This test report is intended to follow this test plan outlined here in unless otherwise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

4.1.1 General Information

Client	OrthoSensor, Inc.
Address	1855 Griffin Road Suite A-310
	Dania FL 33004
Contact Person	Joshua Gardner
Telephone	Tel: (954) 577-7770
e-mail	E-Mail: Joshua.gardner@orthosensor.com

4.1.2 EUT Designation

Model Name	VERASENSE for Exactech Equinoxe
Model Number(s)	EXC-EQRV42, EXC-EQRV38

4.1.3 Equipment Under Test (EUT) Description

The EUT is a location monitoring Tag that runs in a closed loop proprietary system.

4.1.4 Product Environment(s)

☐	**Domestic/Residential**	☒	**Hospital**
☐	**Light Industrial/Commercial**	☐	**Small Clinic**
☐	**Industrial**	☐	**Doctor's office**
☐	**Telecommunications Center**	☐	**Other than Telecommunications Center**
☐	**Other**		

*Check all that apply

Applicable Documents

Standards	Description
CFR 47 part 15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

4.1.5 EUT specifications

AC Input	N/A
Number of Antenna Feeds:	1
RF Test Software Version	Uart-cli
Radio Evaluated	Bluetooth LE
Transmit Frequency Band	2400-2483.5 MHz
Max. Power Output for Technology	4 dBm RMS (Declared, Conducted)
Antenna Gain	-1.2 dBi
Antenna Type	chip
Modulation Type	GFSK
Type of Equipment	☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other: Body worn

4.1.6 EUT Electrical Power Information

Name	# of Phases	Type	Input Voltage		AC Voltage Frequency		
			Min	Max			
Equinoxe Sensor	1 ☐ 3 ☐ None ☒	AC ☐ DC ☐ Host ☐ Batteries ☒	3.3	3.3	n/a		
Notes							

4.1.7 EUT Clock/Oscillator Frequencies

Reference Designation	Speed (MHz)	Type
DTS	2400	☐ Oscillator ☒ Transmitter
ISM	900	☐ Oscillator ☒ Transmitter
		☐ Oscillator ☐ Microprocessor

4.1.8 Electrical Support Equipment

Reference Designation	Manufacturer	Model	Serial Number

4.1.9 Non - Electrical Support Equipment

Reference Designation	Manufacturer	Model	Serial Number or Description (e.g., Type of Gas or Liquid)

4.1.10 EUT Equipment/Cabling Information

EUT Port	Connected To	Cable Type				
		Length (Meters)	Shielded Yes / No		Bead Yes / No	
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐
			☐	☐	☐	☐

4.1.11 EUT Test Program

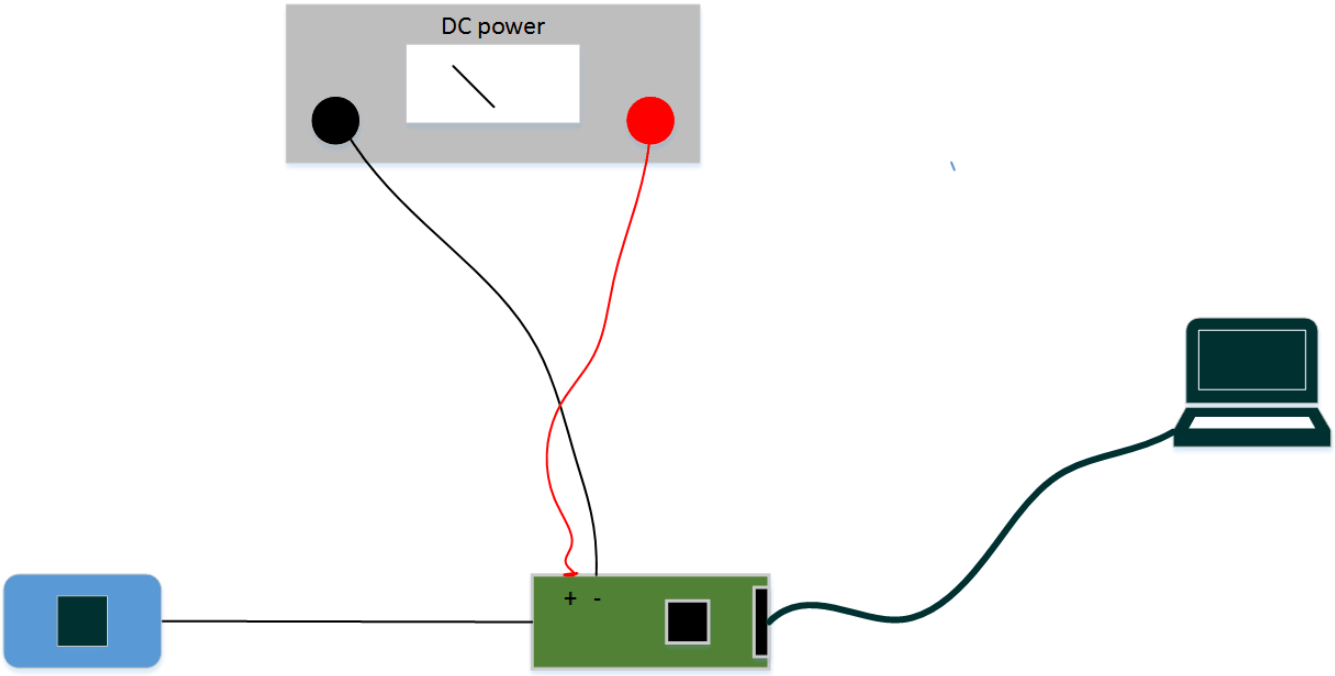
4.1.12 Monitoring of EUT during Testing

No monitoring needed

4.1.13 EUT Configuration

Configuration	Description
Mode 1	The Shoulder Sensor is running in continuous Tx mode.
Notes	

4.1.14 Block Diagram



4.1.15 Final Radiated Emissions Test Setup

Standard	CFR 47 part 15.247			**Procedure**	ANSI C63.10
Antenna Gain		**Emissions Verification**		Emissions Under Limit	
Frequency Range	Scans were done with the unit on Channels 2402, 2442, and 2480				
Scan #1	30-1000 MHz	**Antenna Distance**	3m	**Detector**	Quasi peak
Scan #2	1-18 GHz	**Antenna Distance**	3m	**Detector**	Average
Scan #3	18-26 GHz	**Antenna Distance**	3m	**Detector**	Average
Configuration	See 5.1.13				
Notes	The sensor runs a single oscillator at 32MHz it has no function in the 9k-30M range. No emissions will be tested in this range.				

4.1.16 Radiated Transmitter Tests

Test procedures for essential radio test suites Clause Corresponding test site -	**Clause**
Transmitter unwanted emissions in the spurious domain	11.12.2.2
Bandedge	11.13.1

Standard	CFR 47 part 15.247			**Procedure**	ANSI C63.10
Antenna Gain		**Emissions Verification**		Meets limits	
Frequency Range	Measurements were done with the unit on Channels 2402, 2442, and 2480				

4.1.17 Conducted Transmitter Tests

Test	Clause	Test Method
Emissions in nonrestricted frequency bands	11.11	ANSI C 63.10
PPSD	11.10	ANSI C 63.10
Duty Cycle	11.6	ANSI C 63.10
Occupied Bandwidth	11.8	ANSI C 63.10
RF Output power	11.9.1.1	ANSI C 63.10
Transmitter Spurious Emissions	11.12	ANSI C 63.10
Bandedges	11.13	ANSI C 63.10

END of REPORT