

Report on the FCC Testing of the Monica Healthcare Ltd Interface unit. Model: Novii System Interface Unit In accordance with FCC 47 CFR Part 15C

Prepared for: Monica Healthcare Ltd
Interchange 25 business Park
Unit 8
Bostocks lane
Nottingham
NG10 5QG
United Kingdom

FCC ID: YOM-6961-MON



Product Service

**Choose certainty.
Add value.**

COMMERCIAL-IN-CONFIDENCE

Date: December 2017

Document Number: 75941097-04 | Issue: 02

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Clare Wright	14 December 2017	
Authorised Signatory	Matthew Russell	14 December 2017	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Graeme Lawler	14 December 2017	
Testing	Jack Tuckwell	14 December 2017	

FCC Accreditation

90987 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C: 2016.



DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD Product Service with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD Product Service. No part of this document may be reproduced without the prior written approval of TÜV SÜD Product Service. © 2017 TÜV SÜD Product Service.

ACCREDITATION

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation. Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

TÜV SÜD Product Service
is a trading name of TÜV SÜD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TÜV SÜD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuv-sud.co.uk

TÜV SÜD Product Service
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom



Contents

1 Report Summary2

1.1 Report Modification Record.....2

1.2 Introduction.....2

1.3 Brief Summary of Results3

1.4 Application Form4

1.5 Product Information6

1.6 Deviations from the Standard.....6

1.7 EUT Modification Record6

1.8 Test Location.....6

2 Test Details7

2.1 Peak EIRP7

2.2 Spurious Radiated Emissions9

2.3 Restricted Band Edges23

2.4 Authorised Band Edges37

3 Measurement Uncertainty45



1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	13 December 2017
2	Further details were added to section 2.1.4 to explain how the conducted limit was interpreted to the radiated measurement that was made.	13 December 2017

Table 1

1.2 Introduction

Applicant	Monica Healthcare Ltd
Manufacturer	Monica Healthcare Ltd
Model Number(s)	Interface
Serial Number(s)	TA1772
Hardware Version(s)	Rev L
Software Version(s)	Rev 2.71
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2016
Order Number	Issue 2 501559
Date	30-November-2017
Date of Receipt of EUT	02-December-2017
Start of Test	02-December-2017
Finish of Test	05-December-2017
Name of Engineer(s)	Graeme Lawler and Jack Tuckwell
Related Document(s)	ANSI C63.10 (2013)



Product Service

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Bluetooth (BR + EDR)				
2.1	15.247 (b)	Peak EIRP	Pass	ANSI C63.10
2.2	15.247 (d) and 15.205	Spurious Radiated Emissions	Pass	ANSI C63.10
2.3	15.205	Restricted Band Edges	Pass	ANSI C63.10
2.4	15.247 (d)	Authorised Band Edges	Pass	ANSI C63.10

Table 2



1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	Novii System Interface Unit
Part Number	107-PT-001
Hardware Version	Rev L
Software Version	Rev 2.71
FCC ID (if applicable)	YOM-6961_MON
Industry Canada ID (if applicable)	
Technical Description (Please provide a brief description of the intended use of the equipment)	The Novii System Interface Unit is part of the Novii Wireless Patch System: a Maternal/Fetal monitor that records Fetal heart rate, Maternal Heart Rate and Uterine Contractions from a pregnant subject.

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
Bluetooth (Left side)	2402-2480	10	1.18	1MHz / channel	V2.1 + EDR	1M00F1D	2402	2440	2480
Bluetooth (Right side)	2402-2480	10	3.24	1MHz / channel	V2.1 + EDR	1M00F1D	2402	2440	2480
Qi Wireless Charger transmitter	0.110 to 0.205	37		0.095	Frequency Modulation				

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	26MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	0Hz

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
	x		100-240
External DC	Nominal Voltage	Maximum Current	
	5V	2.5A	
Battery	Nominal Voltage	Battery Operating End Point Voltage	
	N/A		
Can EUT transmit whilst being charged?			Yes ☒ No ☐



EXTREME CONDITIONS					
Maximum temperature	30	°C	Minimum temperature	10	°C
Ancillaries					
Please list all ancillaries which will be used with the device.					
Novii System Pod					
ANTENNA CHARACTERISTICS					
☐	Antenna connector		State impedance	Ohm	
☐	Temporary antenna connector		State impedance	Ohm	
☒	Integral antenna	Type	Ceramic (Antenova SRCW004)		
☐	External antenna	Type			

I hereby declare that the information supplied is correct and complete.

Name: Jean-Francois Pieri
Position held: CTO

Date: 12th December 2017



1.5 Product Information

1.5.1 Technical Description

The Novii Interface is an accessory to the Novii POD which provides a means of interfacing the wireless output of the Novii POD to the transducer inputs of a Maternal/Fetal Monitor. The Novii Interface enables signals collected by the Novii POD to be printed and displayed on a Maternal/Fetal Monitor and sent on to a central network, if connected.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: TA1772			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Bluetooth (BR + EDR)		
Peak EIRP	Graeme Lawler	UKAS
Spurious Radiated Emissions	Jack Tuckwell	UKAS
Restricted Band Edges	Jack Tuckwell	UKAS
Authorised Band Edges	Jack Tuckwell	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom



2 Test Details

2.1 Peak EIRP

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)

2.1.2 Equipment Under Test and Modification State

Interface, S/N: TA1772 - Modification State 0

2.1.3 Date of Test

04-December-2017 to 05-December-2017

2.1.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 7.8.5.

The test was performed radiated in an emissions chamber with the EUT antenna connected. The measurement antenna in the chamber was varied in elevation and azimuth and the EUT was placed in the orientation and rotation that resulted in the highest EIRP.

NOTE: The limit specified in clause 15.247 (b) is based on maximum peak conducted output power. The evidence of compliance shown is based on radiated power taking into account the integral antenna used with the product. The radiated limit based on the table below is 4 W (1W+6 dBi = 4 W) the test results shown in table 5 provide evidence of compliance to this limit.

2.1.5 Environmental Conditions

Ambient Temperature 18.5 °C
Relative Humidity 36.0 %

2.1.6 Test Results

Bluetooth (BR + EDR)

Frequency	Output Power	
	dBm	mW
2402 MHz	13.34	21.58
2440 MHz	13.73	23.60
2480 MHz	14.27	26.73

Table 5

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(1)(4)

For frequency hopping systems operating in the 2400-2483.5 MHz and 5725-5850 MHz band:

Number of Hopping Channels	Maximum Conducted Power (W)	Maximum Antenna Gain (dBi)
At least 75	1	6
Less than 75	0.125	6



Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	20-Oct-2018
Test Receiver	Rohde & Schwarz	ESIB40	1006	12	28-Jun-2018
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	24-Oct-2018
Antenna (DRG Horn)	ETS-Lindgren	3115	3125	12	21-Jul-2018
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	4143	12	03-Nov-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 6

TU - Traceability Unscheduled



2.2 Spurious Radiated Emissions

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d) and 15.205

2.2.2 Equipment Under Test and Modification State

Interface, S/N: TA1772 - Modification State 0

2.2.3 Date of Test

02-December-2017 to 05-December-2017

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10-2013 clause 6.3, 6.5 and 6.6.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.2.

The plots shown are the characterization of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBμV/m to μV/m:
 $10^{(\text{Field Strength in dB}\mu\text{V/m}/20)}$

For frequencies > 18 GHz, the measurement distance was reduced to 1 meter and the limit line was increased by $20 \cdot \text{LOG}(3/1) = 9.54$ dB.

2.2.5 Environmental Conditions

Ambient Temperature	18.1 °C
Relative Humidity	37.0 %

2.2.6 Test Results

Bluetooth (BR + EDR)

Testing was performed on the modulation and packet type which resulted in the highest conducted output power. The Modulation/Packet type was GFSK/DH5.

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
34.067	29.3	40.0	-10.7	360	1.00	Vertical
163.044	40.4	43.5	-3.1	253	1.58	Vertical
296.036	35.7	46.0	-10.3	7	1.39	Horizontal
493.343	45.5	46.0	-0.5	164	1.00	Vertical
690.762*	49.4			171	1.71	Horizontal
888.042*	48.8			292	1.09	Vertical

Table 7 - 2402 MHz - 30 MHz to 1 GHz Emissions Results

*Emission is above -6 dB of the limit in the restricted band of 46 dB μ V/m (Quasi-Peak) however the frequency does not fall in a restricted band and therefore the limit is -20 dBc of which there is more than 6 dB margin hence the emission was not further investigated.

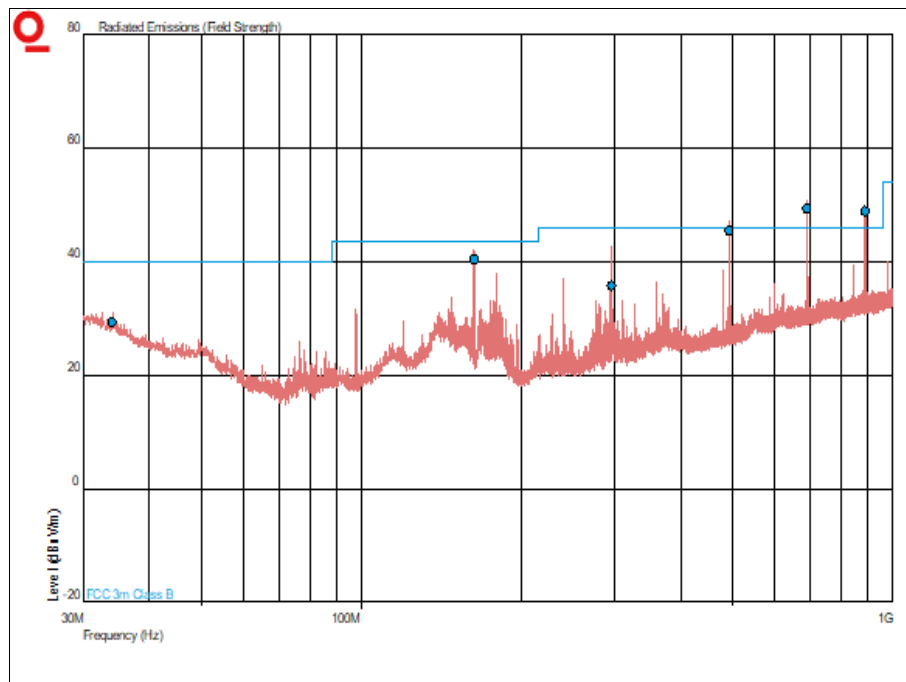


Figure 1 - 2402 MHz - 30 MHz to 1 GHz - Horizontal and Vertical



Frequency (GHz)	Result (dBμV/m)		Limit (dBμV/m)		Margin (dBμV/m)	
	Peak	Average	Peak	Average	Peak	Average
1.085	53.90	50.34	74.0	54.0	20.10	3.66
4.804	57.79	49.02	74.0	54.0	16.31	4.98
19.216	64.80	45.20	84.0	64.0	19.20	18.8

Table 8 - 2402 MHz - 1 GHz to 25 Emissions Results

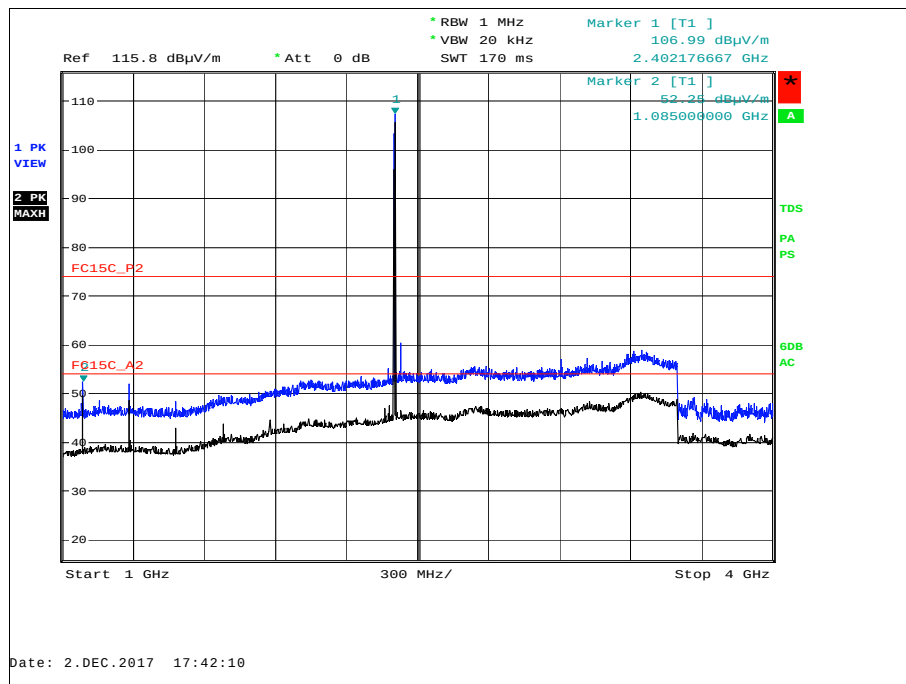


Figure 2 - 2402 MHz - 1 GHz to 4 GHz - Horizontal and Vertical



Product Service

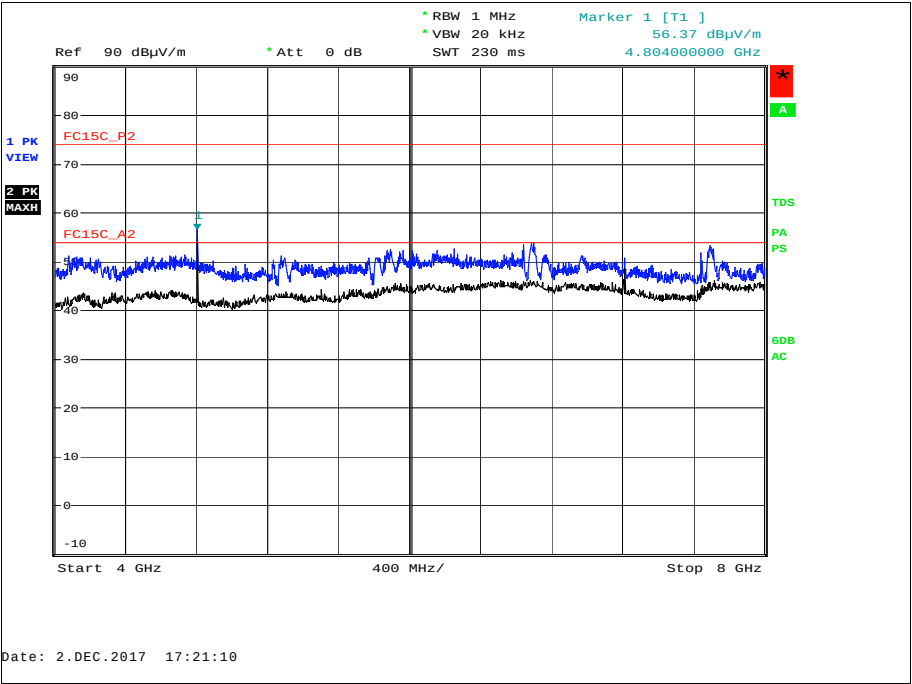


Figure 3 - 2402 MHz - 4 GHz to 8 GHz - Horizontal and Vertical

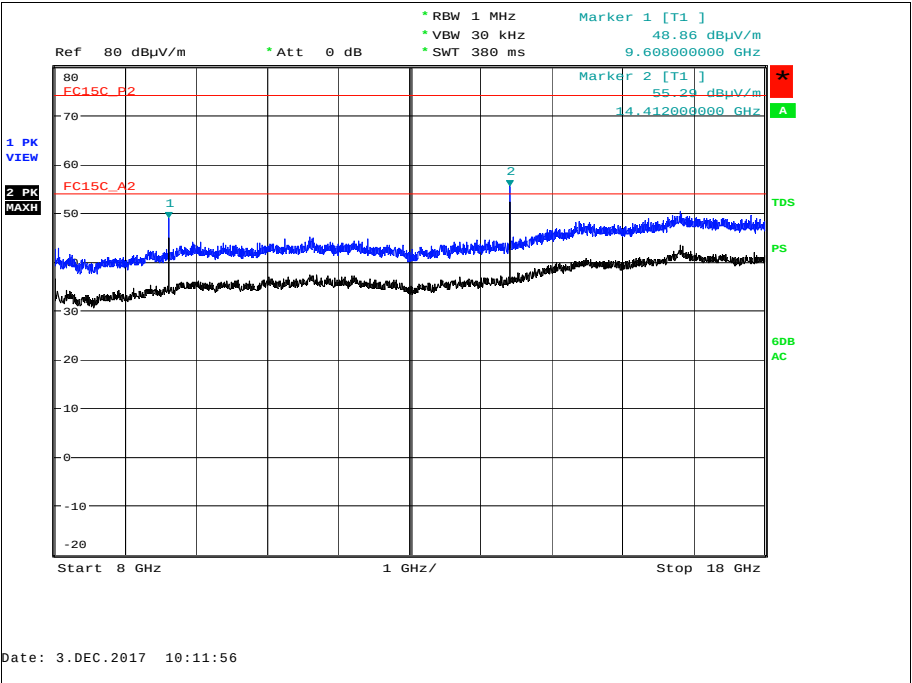


Figure 4 - 2402 MHz - 8 GHz to 18 GHz - Horizontal and Vertical



Product Service

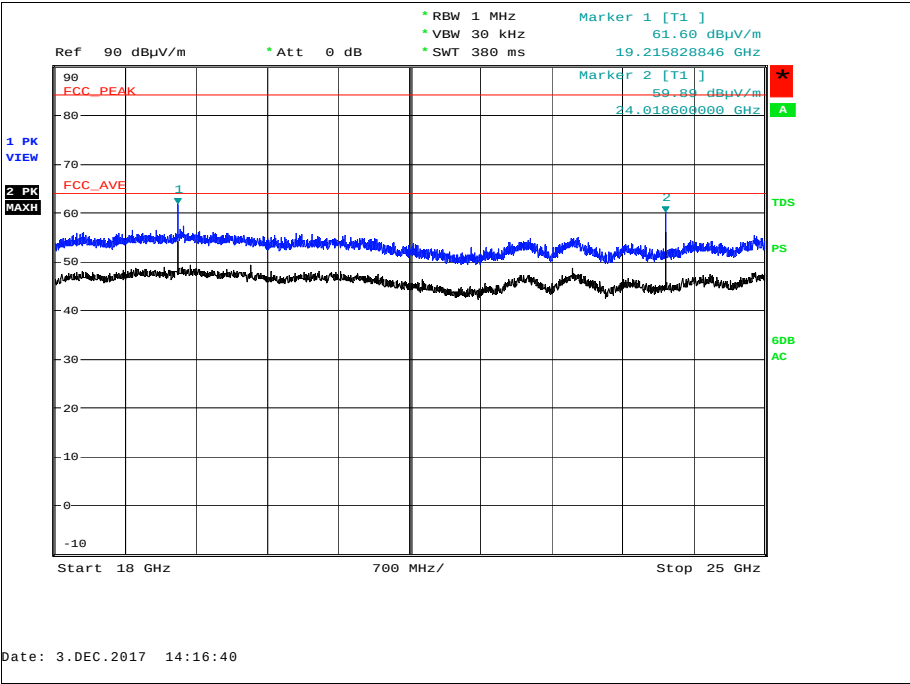


Figure 5 - 2402 MHz - 18 GHz to 25 GHz - Horizontal and Vertical

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
31.274	31.0	40.0	-9.0	66	3.93	Vertical
163.102	41.5	43.5	-2.0	213	1.00	Vertical
295.999	35.9	46.0	-10.1	28	1.95	Horizontal
493.360	45.7	46.0	-0.3	186	1.00	Vertical
690.771*	51.0			211	1.18	Horizontal
888.105*	49.4			236	1.09	Vertical

Table 9 - 2440 MHz - 30 MHz to 1 GHz Emissions Results

*Emission is above -6 dB of the limit in the restricted band of 46 dBuV/m (Quasi-Peak) however the frequency does not fall in a restricted band and therefore the limit is -20 dBc of which there is more than 6 dB margin hence the emission was not further investigated.

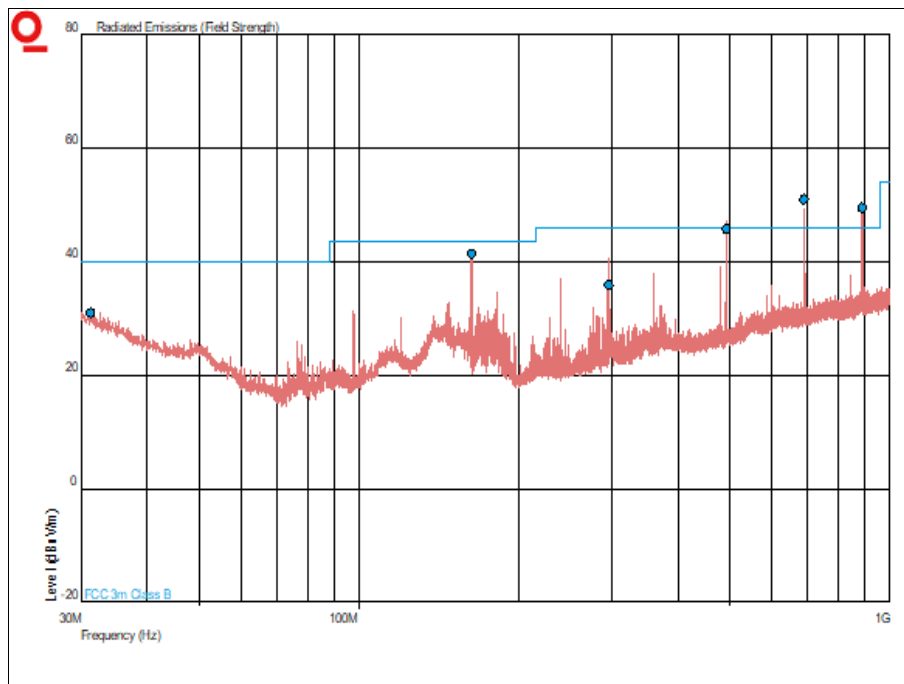


Figure 6 - 2440 MHz - 30 MHz to 1 GHz - Horizontal and Vertical



Frequency (GHz)	Result (dBμV/m)		Limit (dBμV/m)		Margin (dBμV/m)	
	Peak	Average	Peak	Average	Peak	Average
1.085	54.64	51.04	74.0	54.0	19.46	2.96
1.282*						
4.880	56.88	47.65	74.0	54.0	17.12	6.35
19.518	62.80	43.08	84.0	64.0	21.2	20.92

Table 10 - 2440 MHz - 1 GHz to 25 Emissions Results

*Emission is above -6 dB of the limit in the restricted band of 74 dBμV/m (Peak) or 54 dBμV/m (Average) however the frequency does not fall in a restricted band and therefore the limit is -20 dBc of which there is more than 6 dB margin hence the emission was not further investigated.

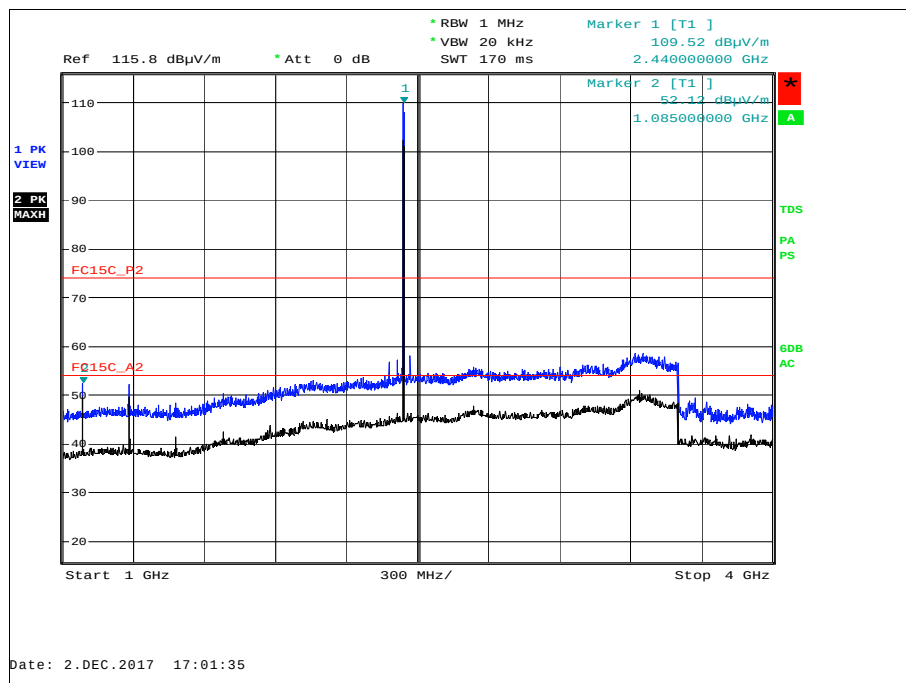


Figure 7 - 2440 MHz - 1 GHz to 4 GHz - Horizontal and Vertical



Product Service

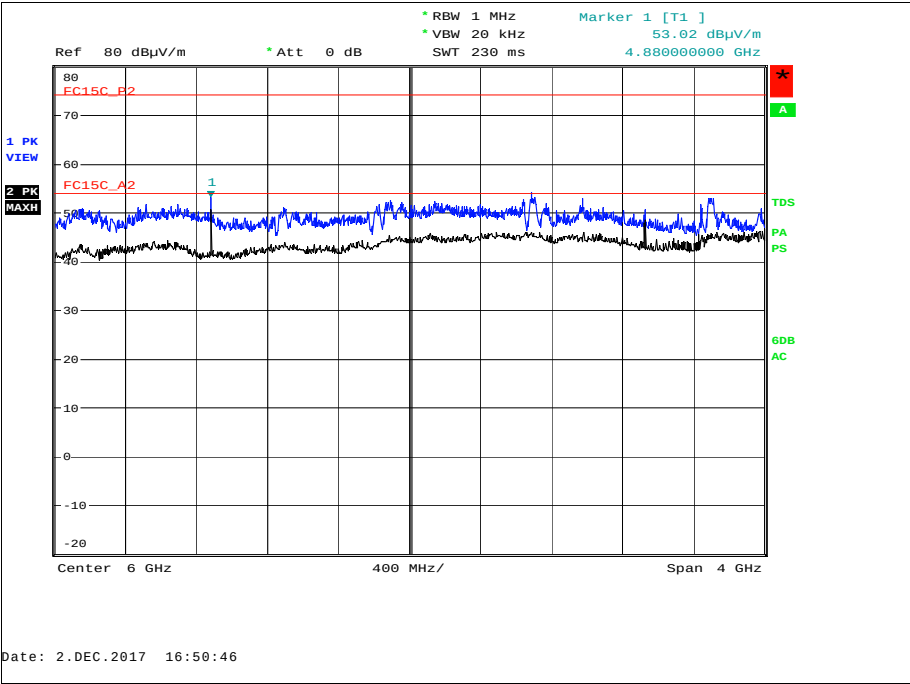


Figure 8 - 2440 MHz - 4 GHz to 8 GHz - Horizontal and Vertical

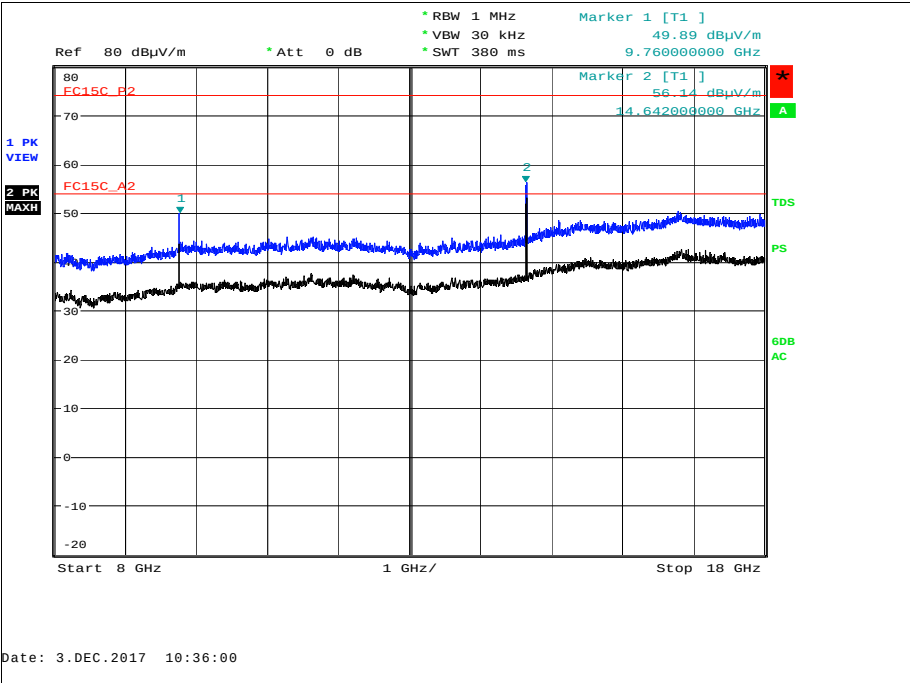


Figure 9 - 2440 MHz - 8 GHz to 18 GHz - Horizontal and Vertical



Product Service

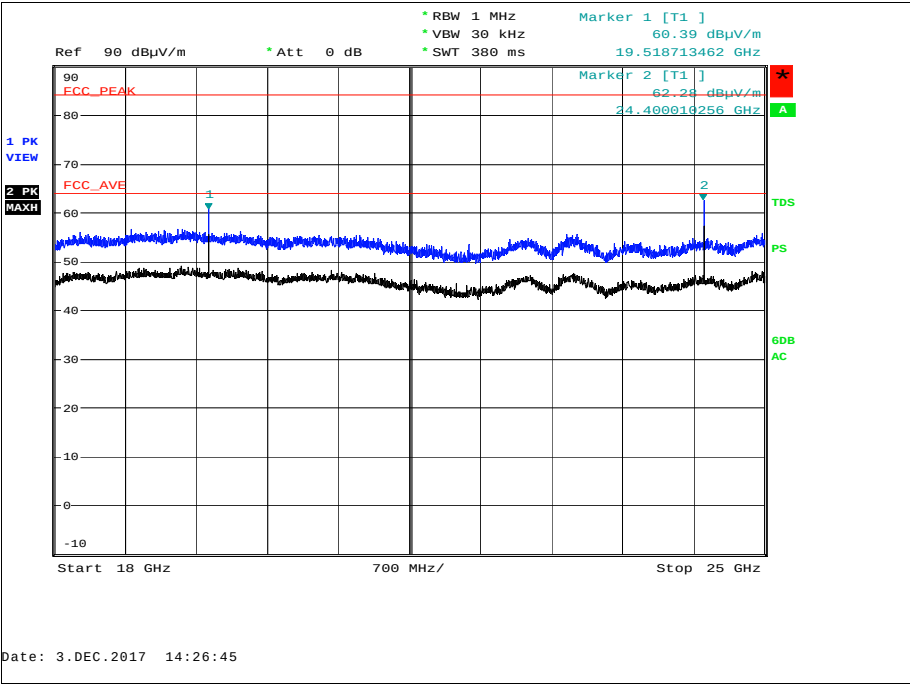


Figure 10 - 2440 MHz - 18 GHz to 25 GHz - Horizontal and Vertical

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
32.628	33.5	40.0	-6.5	81	3.38	Vertical
163.096	41.4	43.5	-2.1	214	1.00	Vertical
296.091	41.1	46.0	-4.9	249	1.00	Horizontal
493.467	45.6	46.0	-0.4	169	1.00	Vertical
690.907*	50.2			228	1.00	Horizontal
888.251*	49.1			287	1.18	Vertical

Table 11 - 2480 MHz - 30 MHz to 1 GHz Emissions Results

*Emission is above -6 dB of the limit in the restricted band of 46 dB μ V/m (Quasi-Peak) however the frequency does not fall in a restricted band and therefore the limit is -20 dBc of which there is more than 6 dB margin hence the emission was not further investigated.

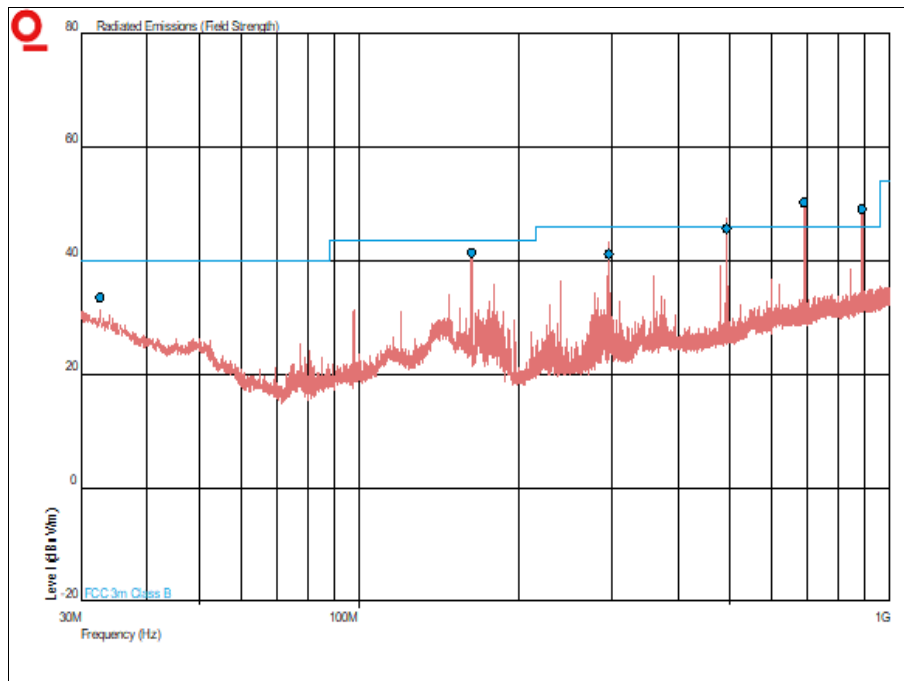


Figure 11 - 2480 MHz - 30 MHz to 1 GHz - Horizontal and Vertical



Frequency (GHz)	Result (dBμV/m)		Limit (dBμV/m)		Margin (dBμV/m)	
	Peak	Average	Peak	Average	Peak	Average
1.085	54.16	50.46	74.0	54.0	19.84	3.54
4.958	53.88	45.99	74.0	54.0	20.12	8.01
19.830	64.05	42.47	84.0	64.0	19.95	21.53

Table 12 - 2480 MHz - 1 GHz to 25 Emissions Results

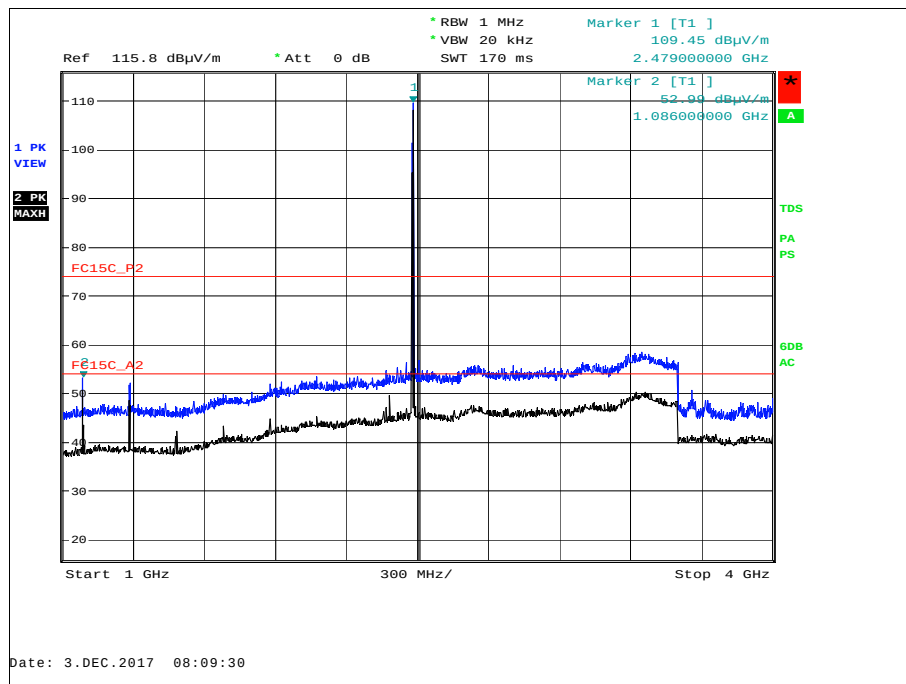


Figure 12 - 2480 MHz - 1 GHz to 4 GHz - Horizontal and Vertical

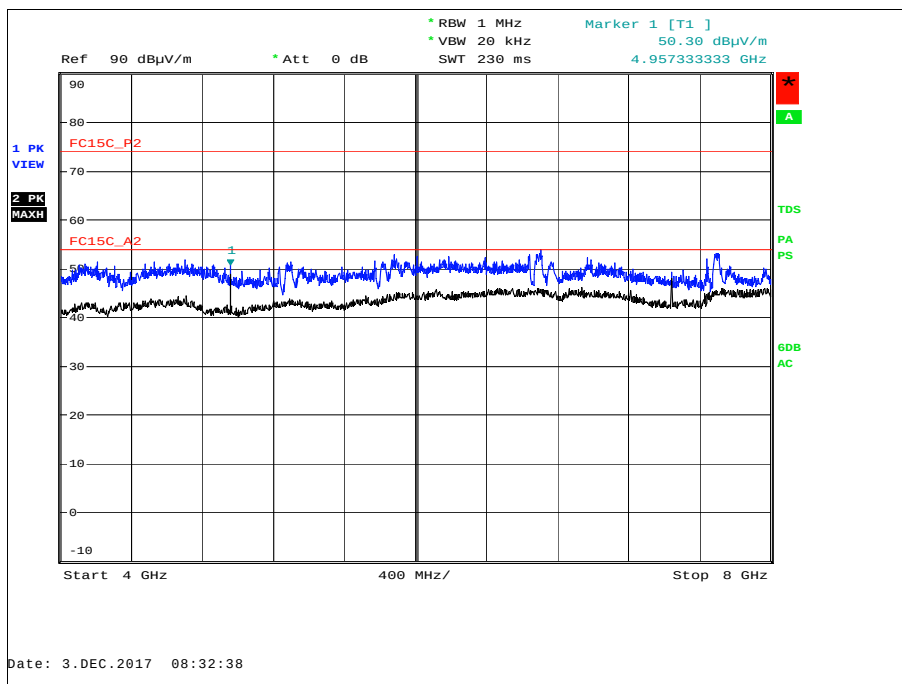


Figure 13 - 2480 MHz - 4 GHz to 8 GHz - Horizontal and Vertical

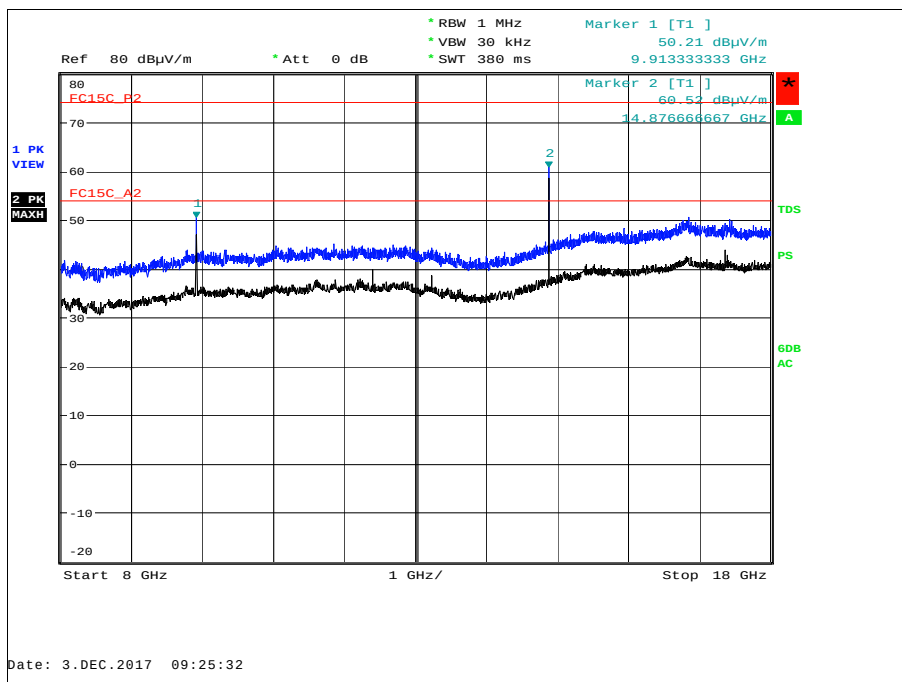


Figure 14 - 2480 MHz - 8 GHz to 18 GHz - Horizontal and Vertical

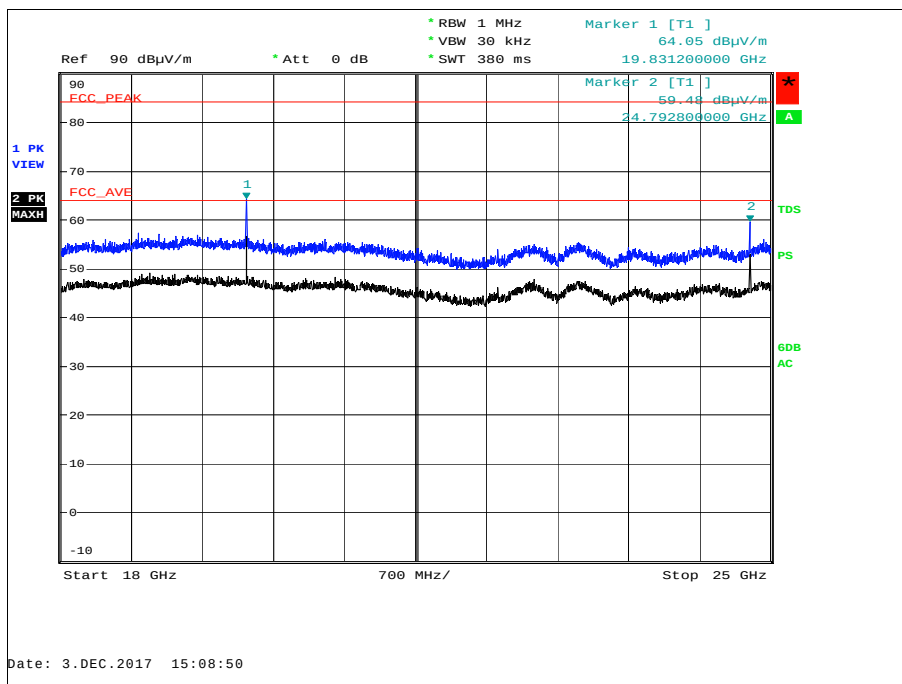


Figure 15 - 2480 MHz - 18 GHz to 25 GHz - Horizontal and Vertical

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).



2.2.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Apr-2018
Pre-Amplifier	Phase One	PS04-0086	1533	12	31-Jul-2018
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	24-Oct-2018
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Cable (Rx, SMAm-SMAm 0.5m)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	03-Feb-2017
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	17-Feb-2018
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 13

TU - Traceability Unscheduled



2.3 Restricted Band Edges

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.205

2.3.2 Equipment Under Test and Modification State

Interface, S/N: TA1772 - Modification State 0

2.3.3 Date of Test

07-December-2017

2.3.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.10.5.

Plots for average measurements were taken in accordance with ANSI C63.10 clause 4.1.4.2.3. These are shown for information purposes and were used to determine the worst case measurement point. Final average measurements were then taken in accordance with ANSI C63.10 clause 4.1.4.2.2. to obtain the measurement result recorded in the test results tables.

The following conversion can be applied to convert from dBμV/m to μV/m:
 $10^{(\text{Field Strength in dB}\mu\text{V/m}/20)}$

2.3.5 Environmental Conditions

Ambient Temperature 18.4 °C
Relative Humidity 41.0 %

2.3.6 Test Results

Bluetooth (BR + EDR)

Mode	Modulation	Frequency (MHz)	Measured Frequency (MHz)	Peak Level (dBμV/m)	Average Level (dBμV/m)
Static	GFSK	2402	2390.0	60.30	45.30
Static	GFSK	2480	2483.5	57.60	46.16
Hopping	GFSK	2402	2390.0	59.04	45.20
Hopping	GFSK	2480	2483.5	60.96	45.78
Static	π/4 DQPSK	2402	2390.0	58.02	45.42
Static	π/4 DQPSK	2480	2483.5	60.89	48.00
Hopping	π/4 DQPSK	2402	2390.0	58.98	45.25
Hopping	π/4 DQPSK	2480	2483.5	58.40	45.52
Static	8-DPSK	2402	2390.0	58.27	45.54
Static	8-DPSK	2480	2483.5	62.68	48.04
Hopping	8-DPSK	2402	2390.0	59.55	45.28
Hopping	8-DPSK	2480	2483.5	59.69	45.68

Table 14 - Restricted Band Edge Results



Product Service

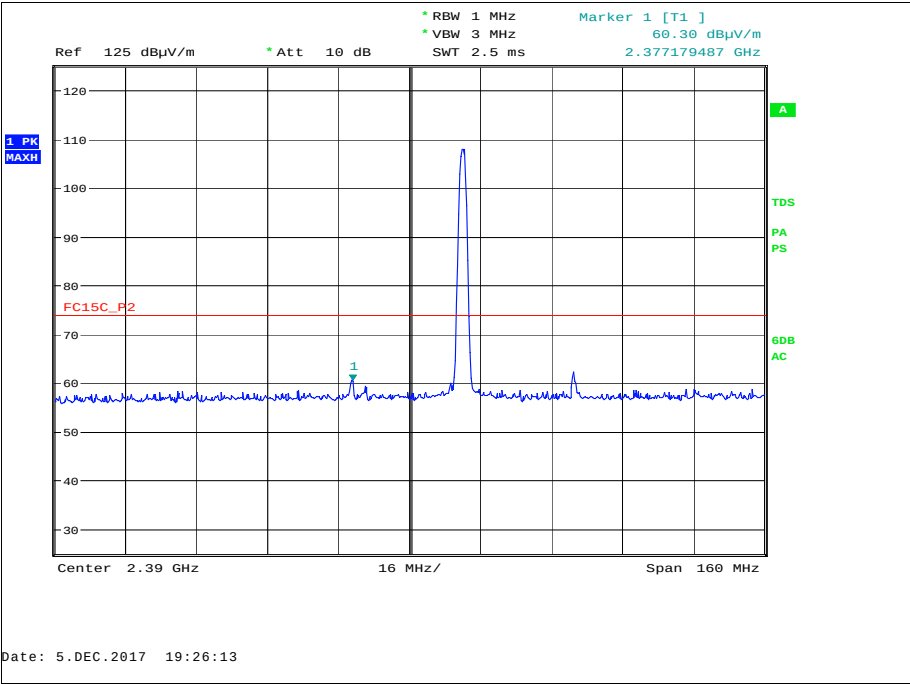


Figure 16 - Static - GFSK - 2402 MHz - Measured Frequency 2390.0 MHz - Peak

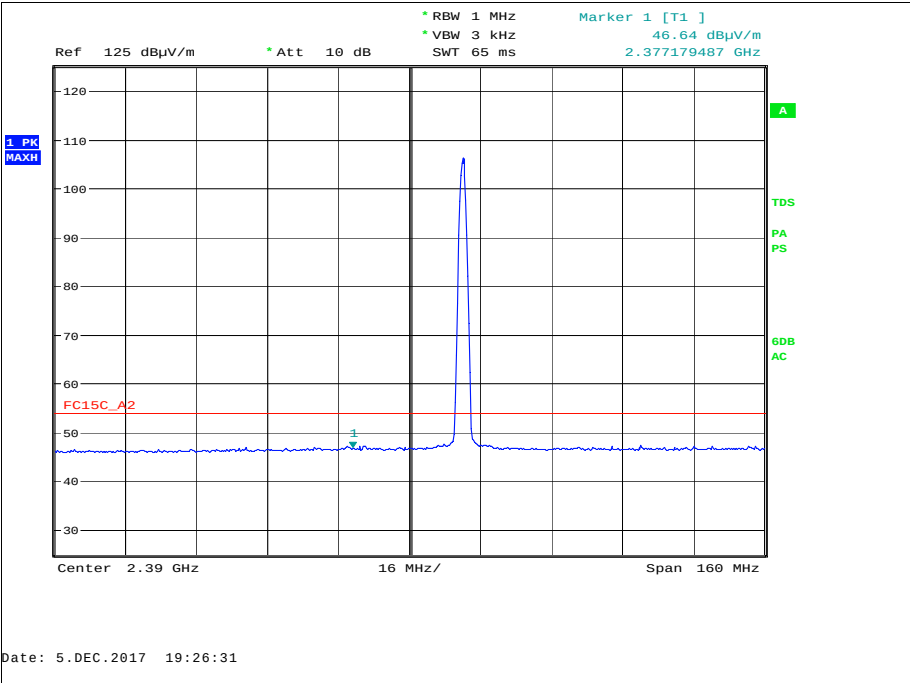


Figure 17 - Static - GFSK - 2402 MHz - Measured Frequency 2390.0 MHz - Average

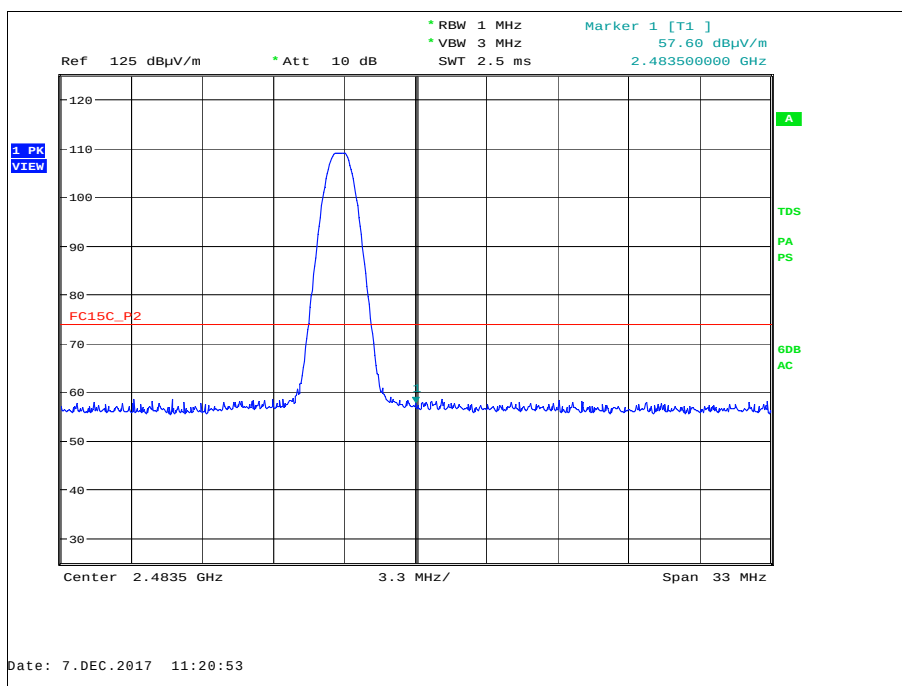


Figure 18 - Static - GFSK - 2480 MHz - Measured Frequency 2483.5 MHz - Peak

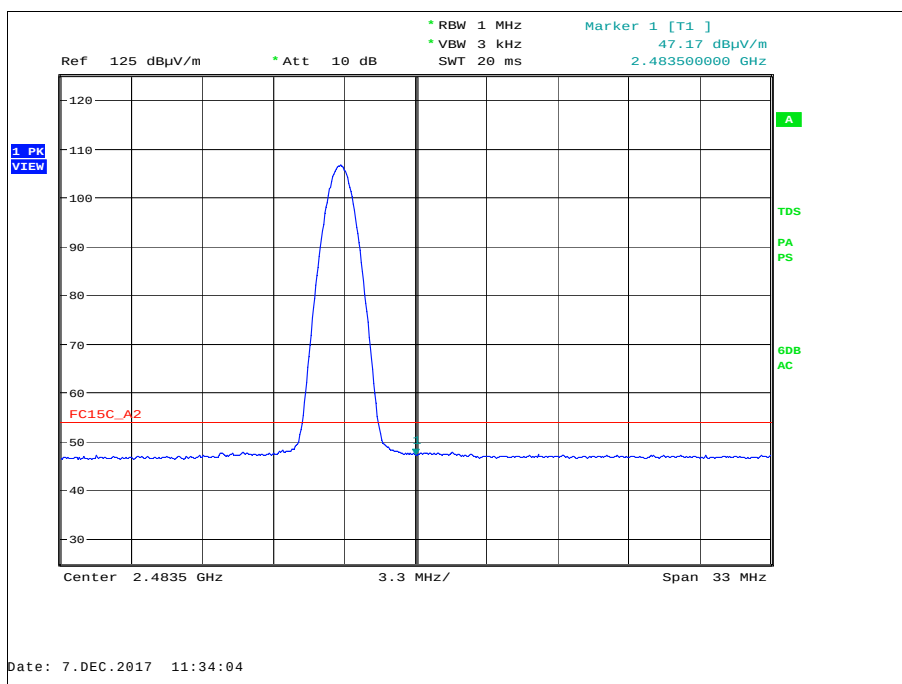


Figure 19 - Static - GFSK - 2480 MHz - Measured Frequency 2483.5 MHz - Average

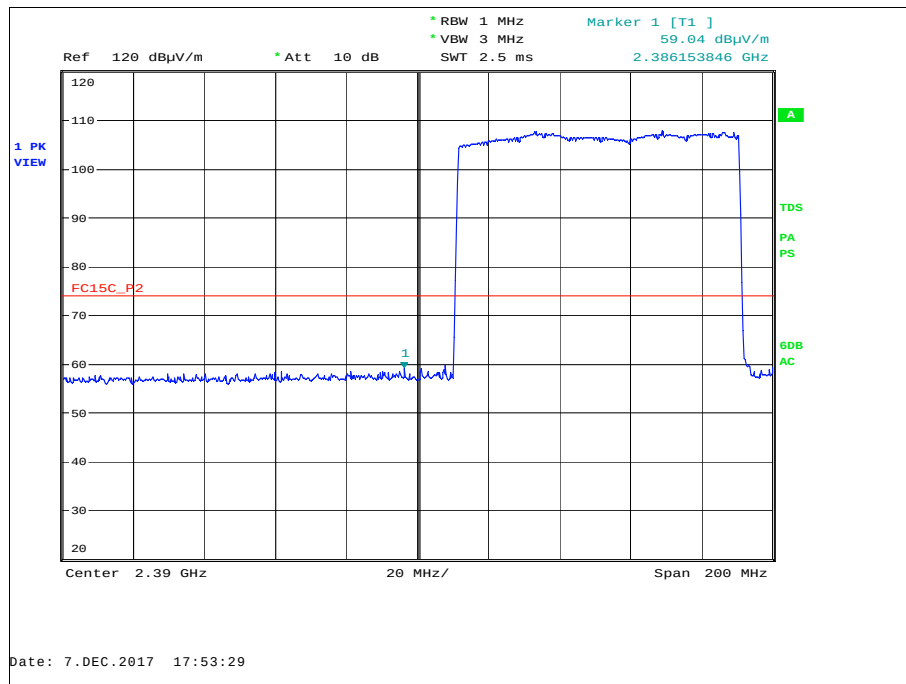


Figure 20 - Hopping - GFSK - 2402 MHz - Measured Frequency 2390.0 MHz - Peak

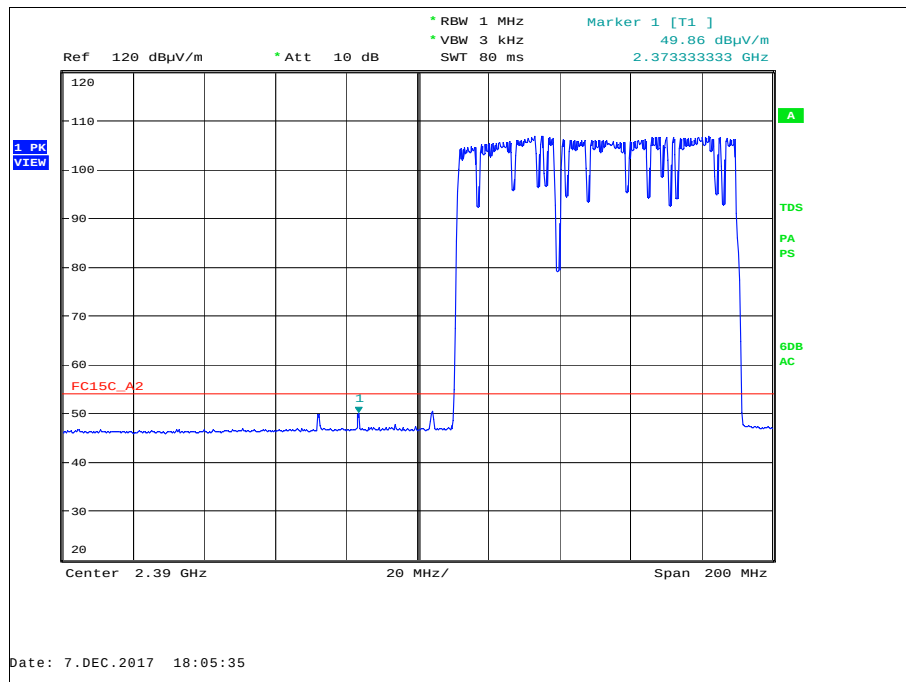


Figure 21 - Hopping - GFSK - 2402 MHz - Measured Frequency 2390.0 MHz - Average

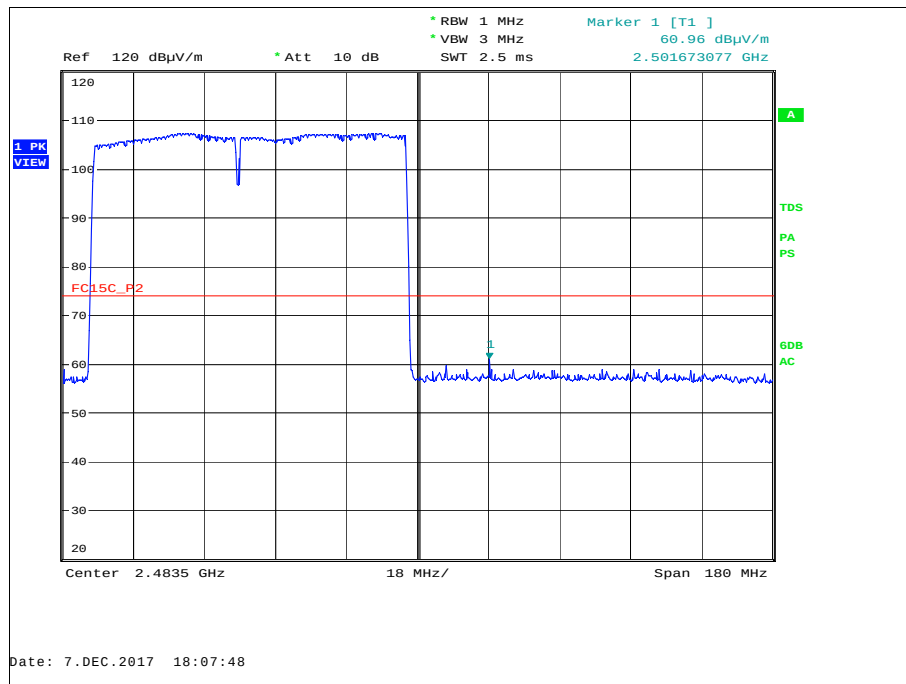


Figure 22 - Hopping - GFSK - 2480 MHz - Measured Frequency 2483.5 MHz - Peak

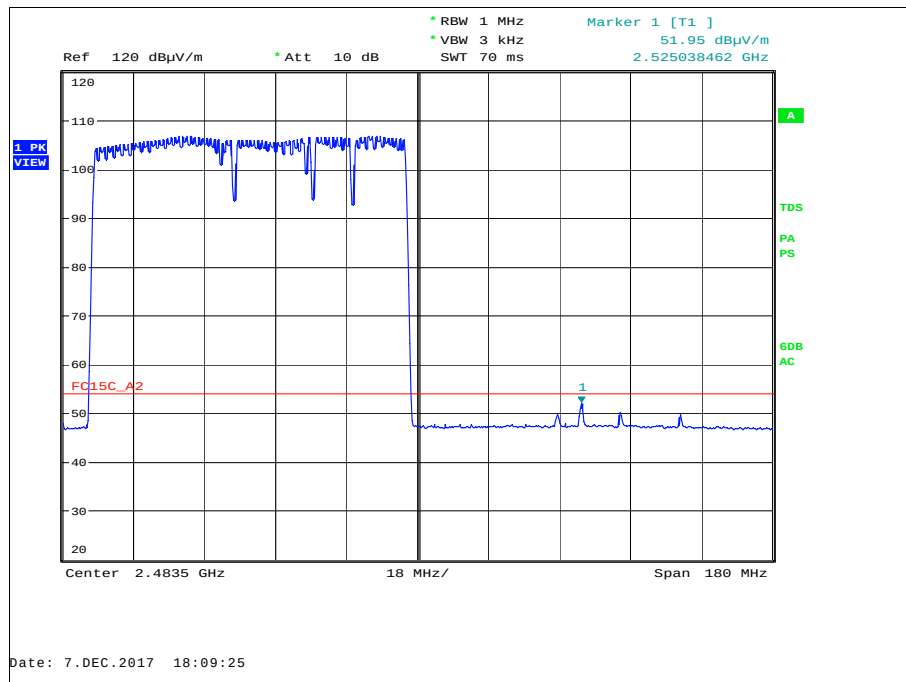


Figure 23 - Hopping - GFSK - 2480 MHz - Measured Frequency 2483.5 MHz - Average



Product Service

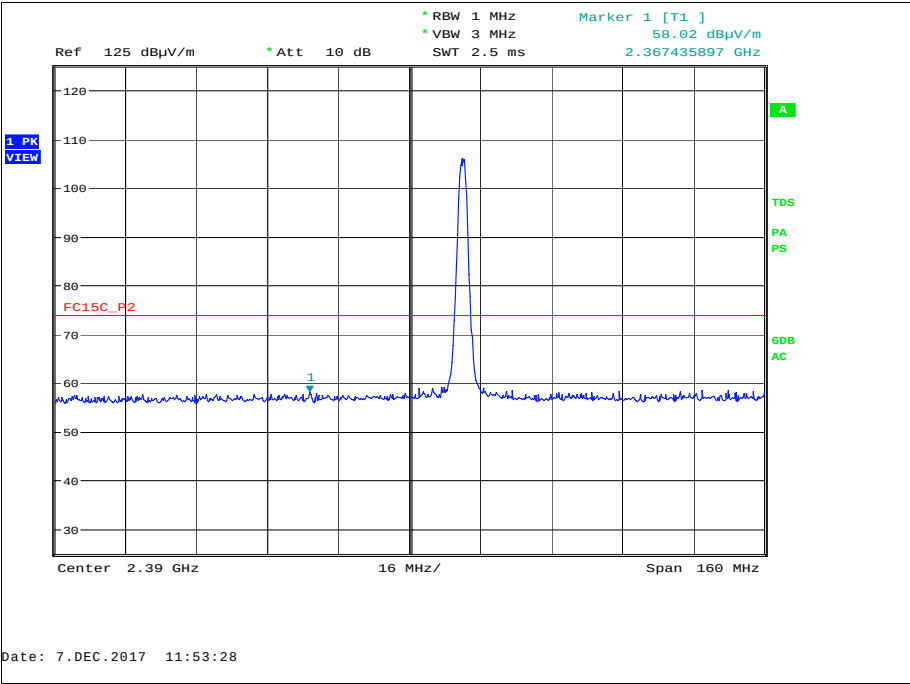


Figure 24 - Static - $\pi/4$ DQPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Peak

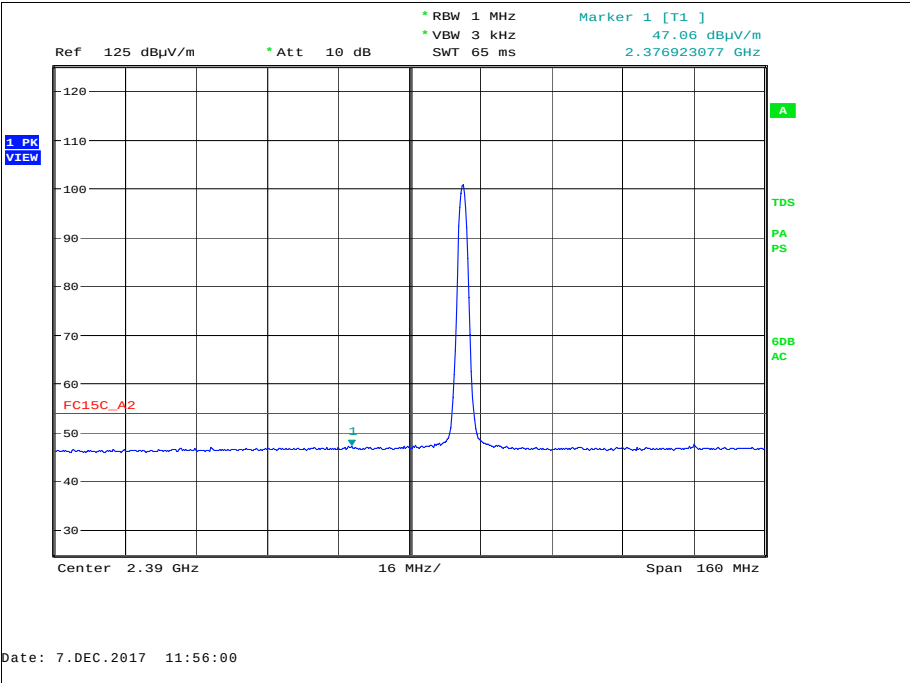


Figure 25 - Static - $\pi/4$ DQPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Average



Product Service

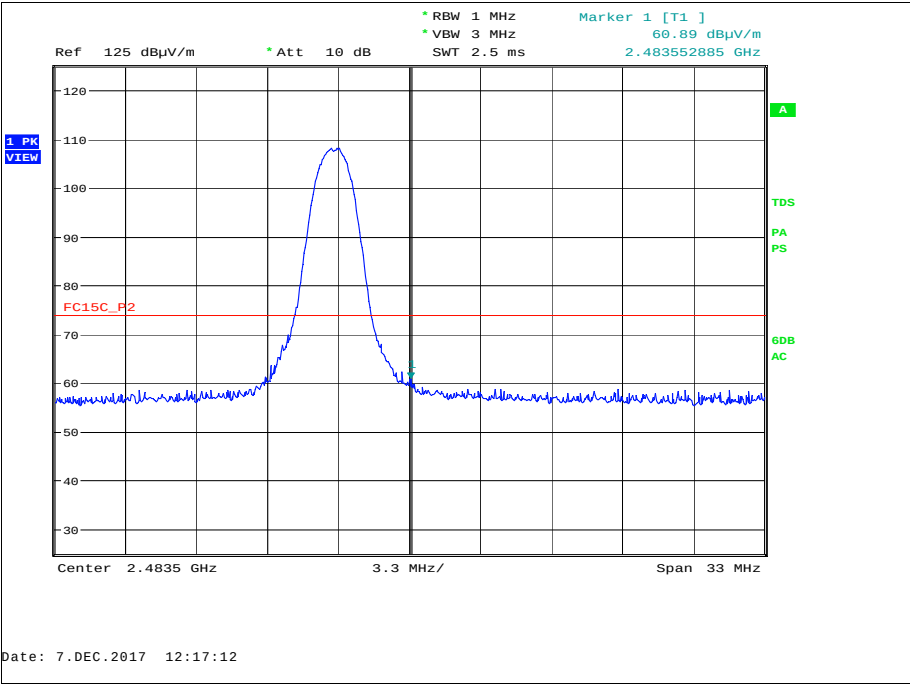


Figure 26 - Static - $\pi/4$ DQPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Peak

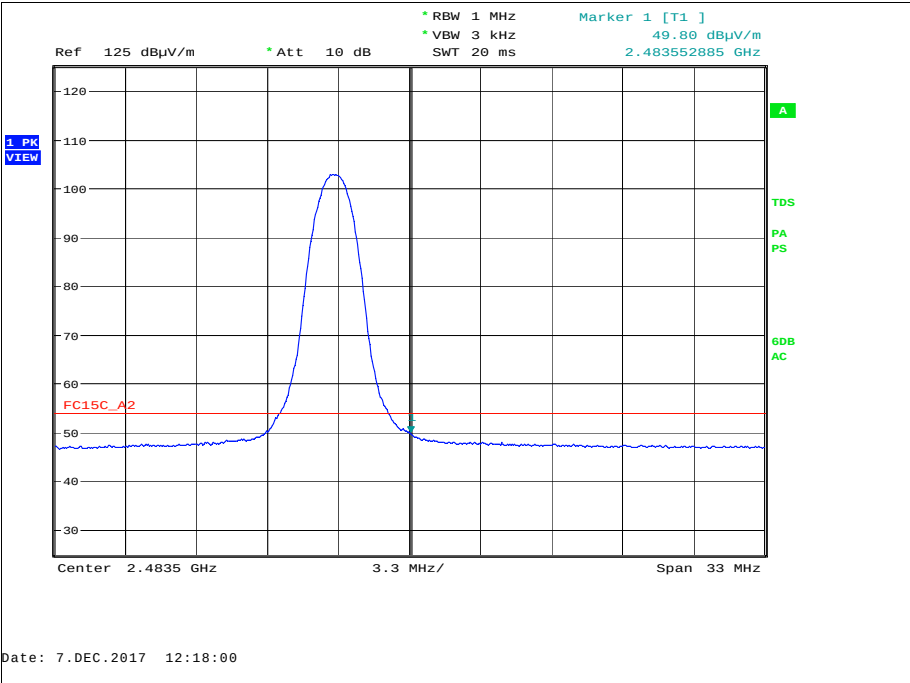


Figure 27 - Static - $\pi/4$ DQPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Average



Product Service

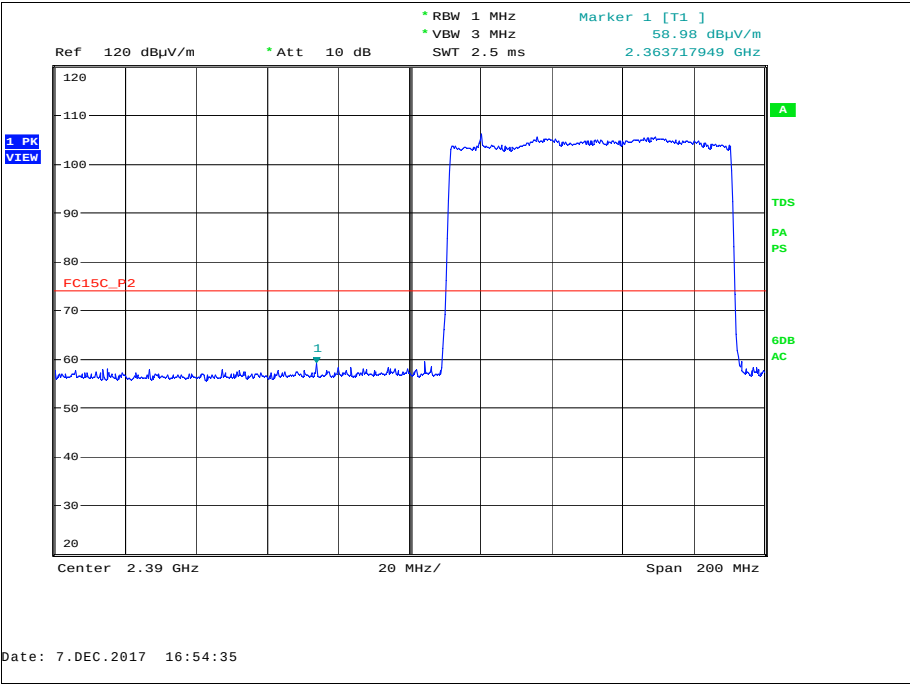


Figure 28 - Hopping - $\pi/4$ DQPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Peak

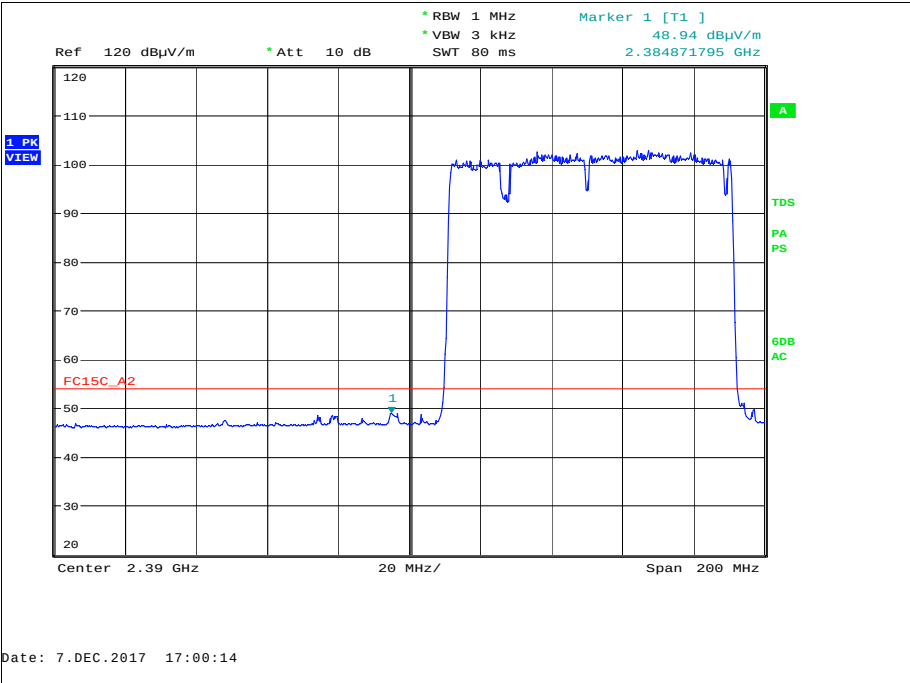


Figure 29 - Hopping - $\pi/4$ DQPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Average



Product Service

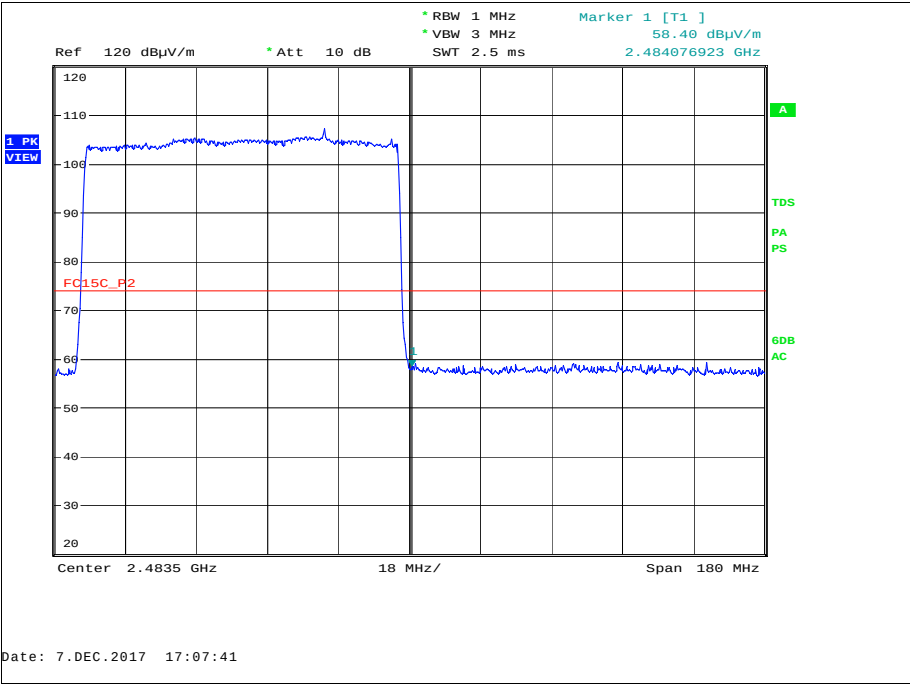


Figure 30 - Hopping - $\pi/4$ DQPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Peak

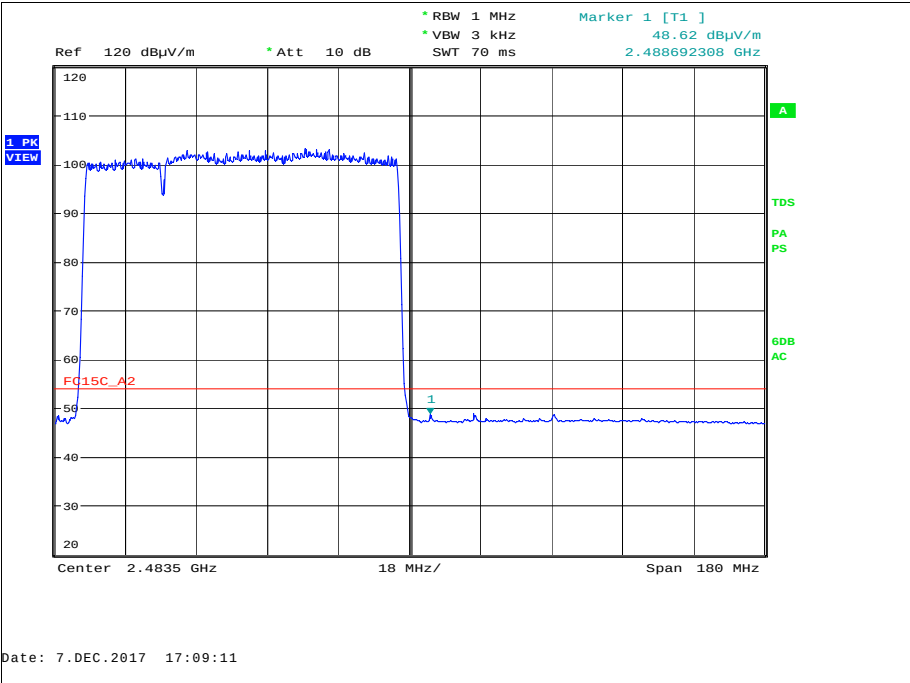


Figure 31 - Hopping - $\pi/4$ DQPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Average

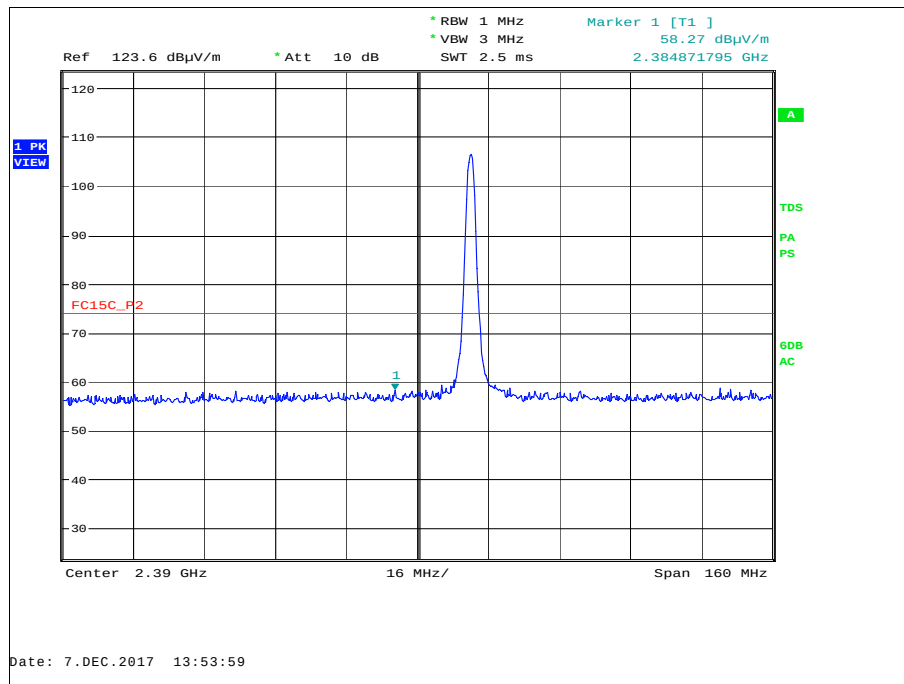


Figure 32 - Static - 8-DPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Peak

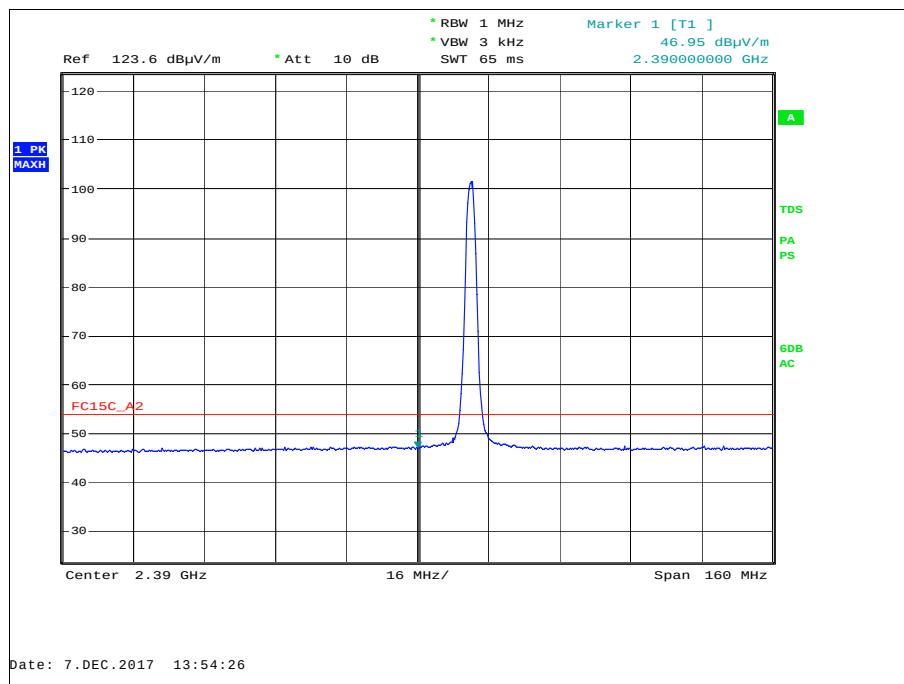


Figure 33 - Static - 8-DPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Average

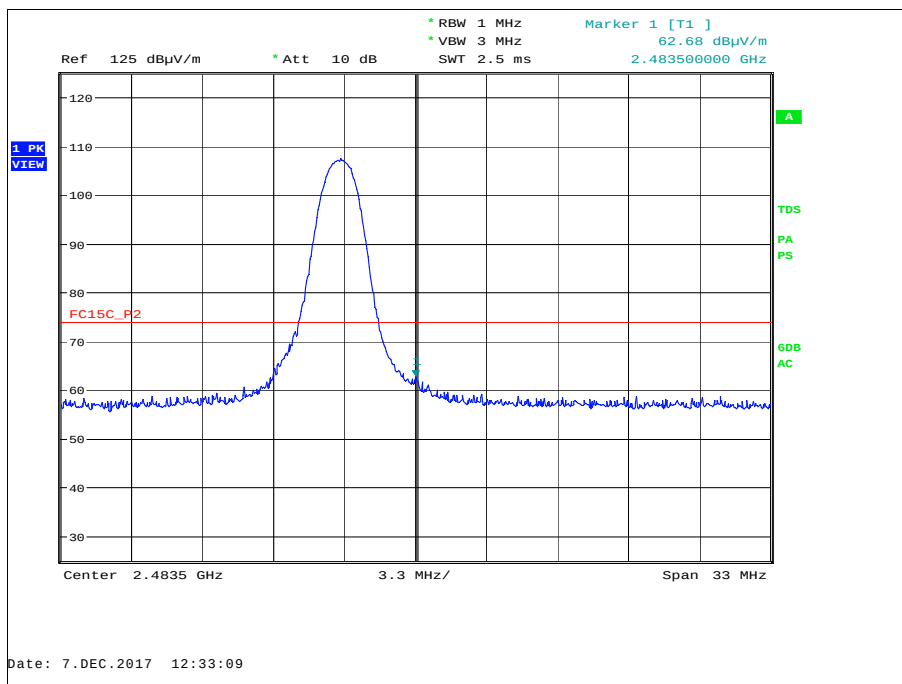


Figure 34 - Static - 8-DPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Peak

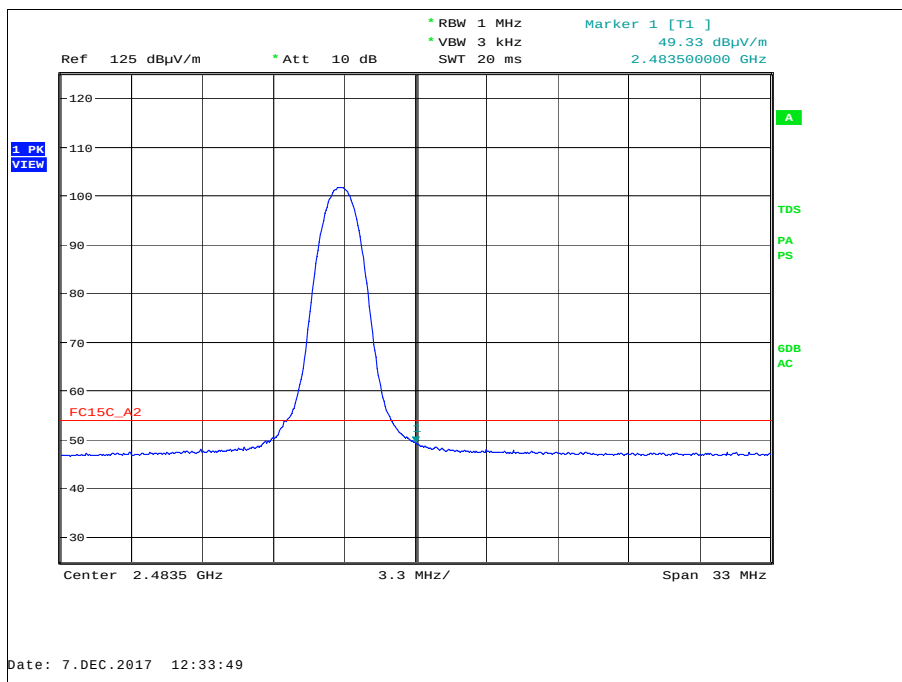


Figure 35 - Static - 8-DPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Average



Product Service

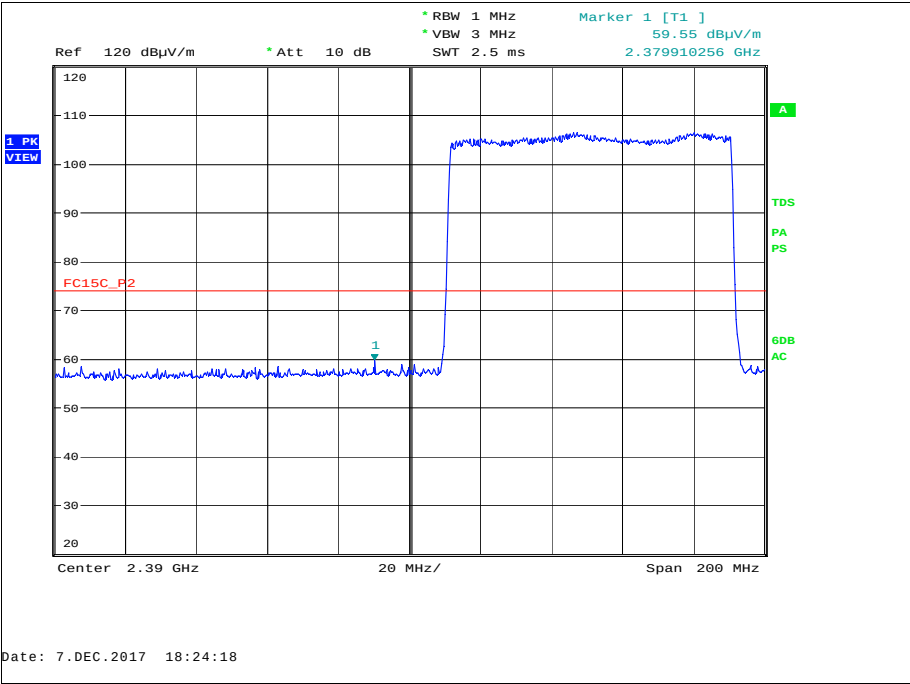


Figure 36 - Hopping - 8-DPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Peak

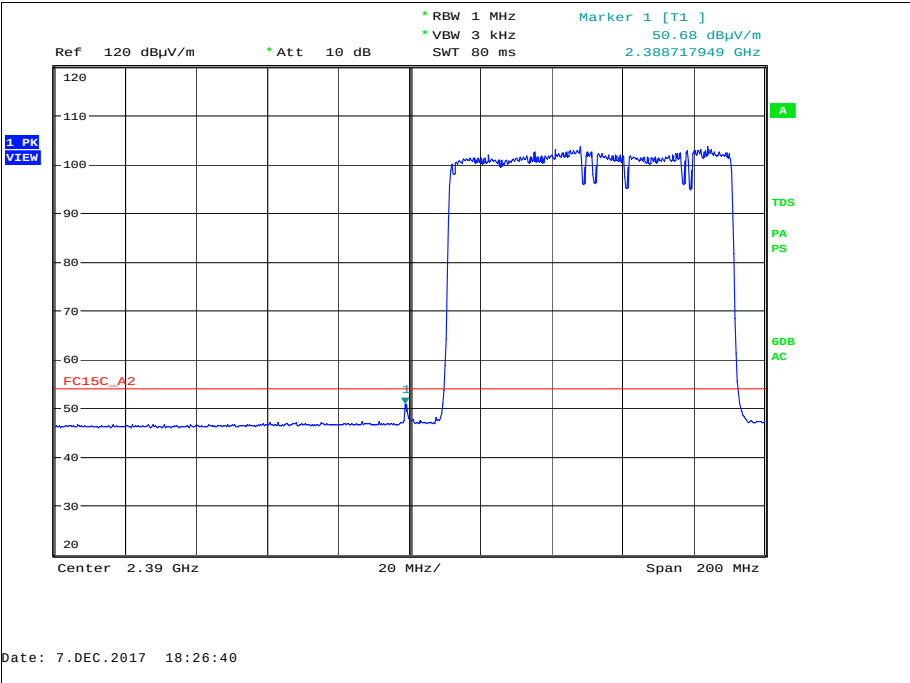


Figure 37 - Hopping - 8-DPSK - 2402 MHz - Measured Frequency 2390.0 MHz - Average



Product Service

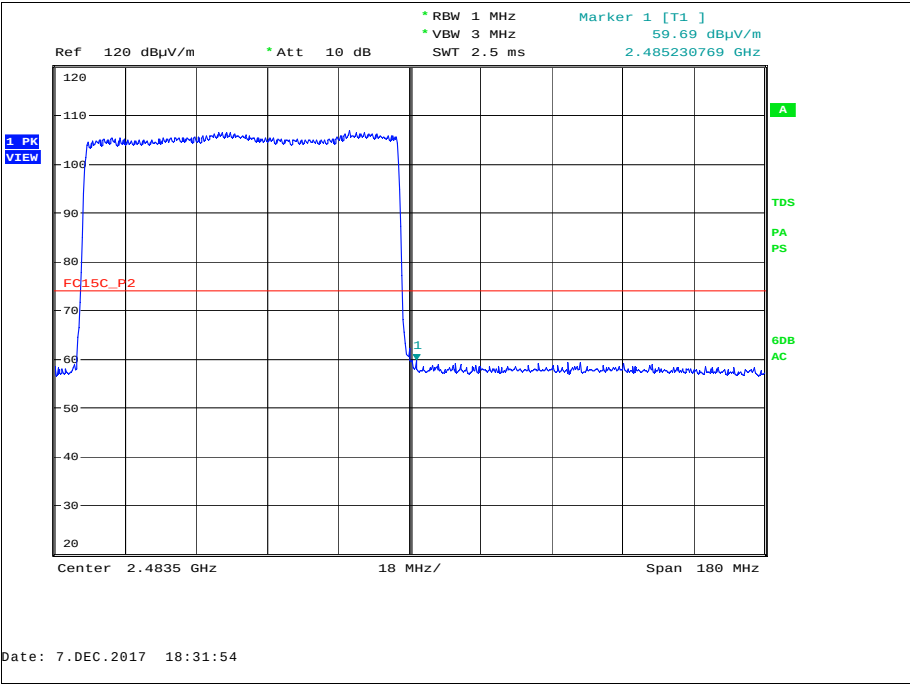


Figure 38 - Hopping - 8-DPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Peak

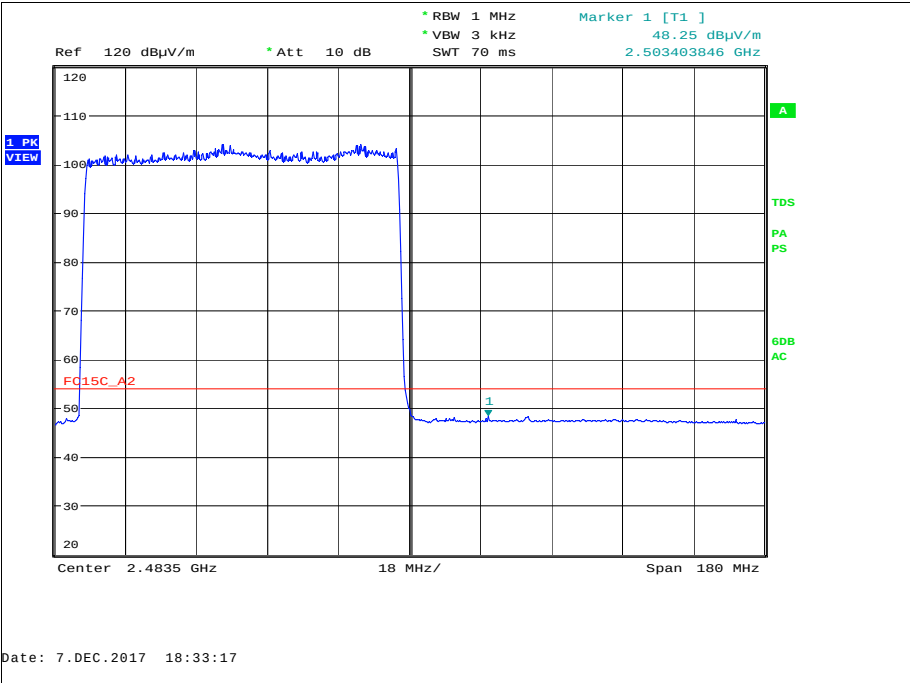


Figure 39 - Hopping - 8-DPSK - 2480 MHz - Measured Frequency 2483.5 MHz - Average



FCC 47 CFR Part 15, Limit Clause 15.205

	Peak (dBμV/m)	Average (dBμV/m)
Restricted Bands of Operation	74	54

Table 15

2.3.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	24-Oct-2018
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 16

TU - Traceability Unscheduled



2.4 Authorised Band Edges

2.4.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d)

2.4.2 Equipment Under Test and Modification State

Interface, S/N: TA1772 - Modification State 0

2.4.3 Date of Test

07-December-2017

2.4.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.10.4.

2.4.5 Environmental Conditions

Ambient Temperature 18.4 °C

Relative Humidity 41.0 %

2.4.6 Test Results

Bluetooth (BR + EDR)

Mode	Modulation	Frequency (MHz)	Measured Frequency (MHz)	Level (dBc)
Static	GFSK	2402	2400.0	56.37
Static	GFSK	2480	2483.5	58.38
Hopping	GFSK	2402	2400.0	56.74
Hopping	GFSK	2480	2483.5	52.86
Static	$\pi/4$ DQPSK	2402	2400.0	45.37
Static	$\pi/4$ DQPSK	2480	2483.5	53.41
Hopping	$\pi/4$ DQPSK	2402	2400.0	50.00
Hopping	$\pi/4$ DQPSK	2480	2483.5	54.55
Static	8-DPSK	2402	2400.0	44.79
Static	8-DPSK	2480	2483.5	52.28
Hopping	8-DPSK	2402	2400.0	51.36
Hopping	8-DPSK	2402	2483.5	49.39

Table 17



Product Service

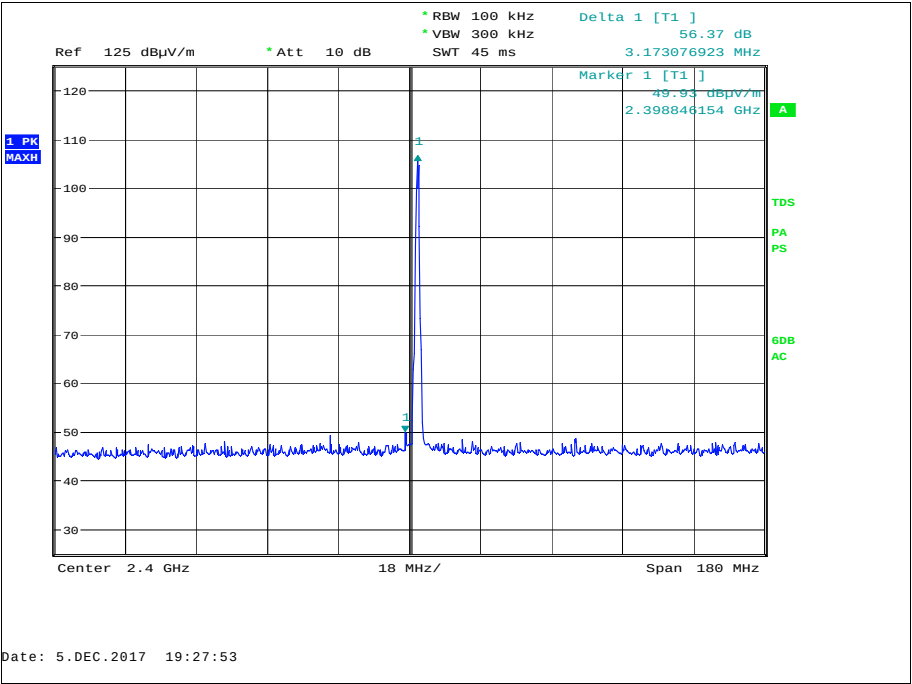


Figure 40 - Static - GFSK - 2402 MHz - Measured Frequency 2400.0 MHz

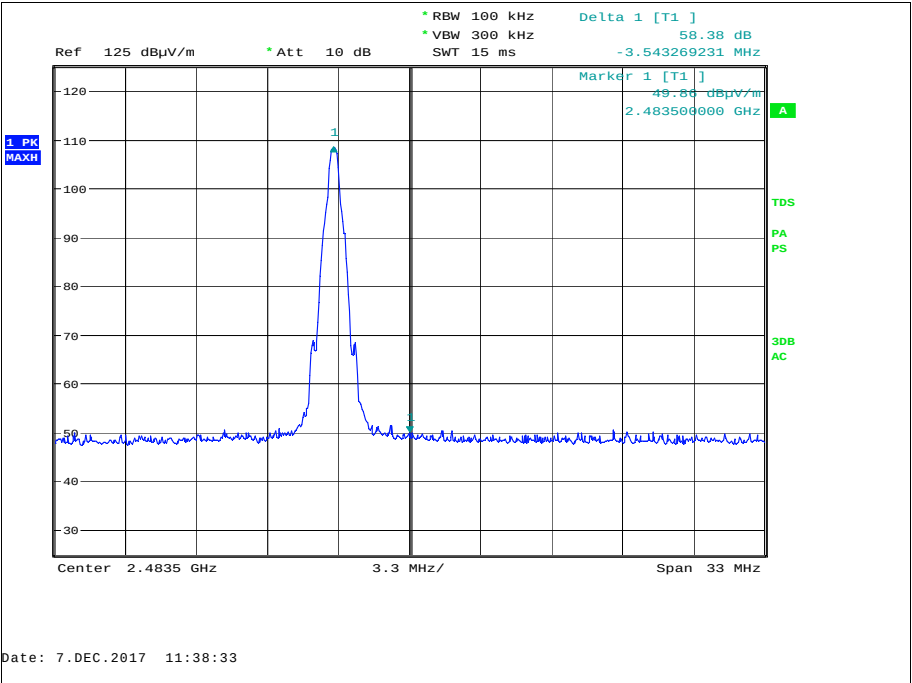


Figure 41 - Static - GFSK - 2480 MHz - Measured Frequency 2483.5 MHz



Product Service

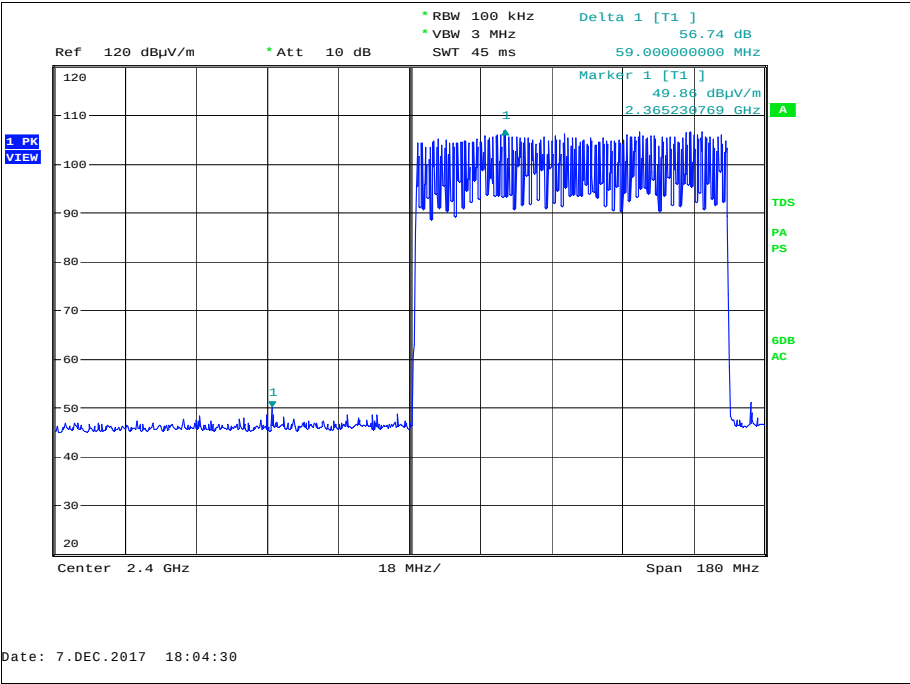


Figure 42 - Hopping - GFSK - 2402 MHz - Measured Frequency 2400.0 MHz

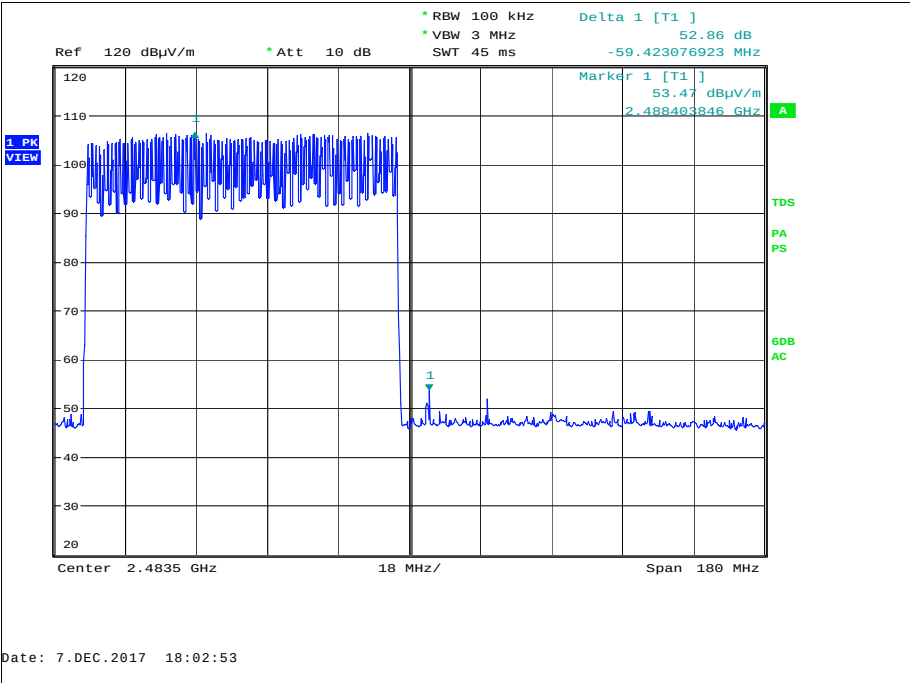


Figure 43 - Hopping - GFSK - 2480 MHz - Measured Frequency 2483.5 MHz

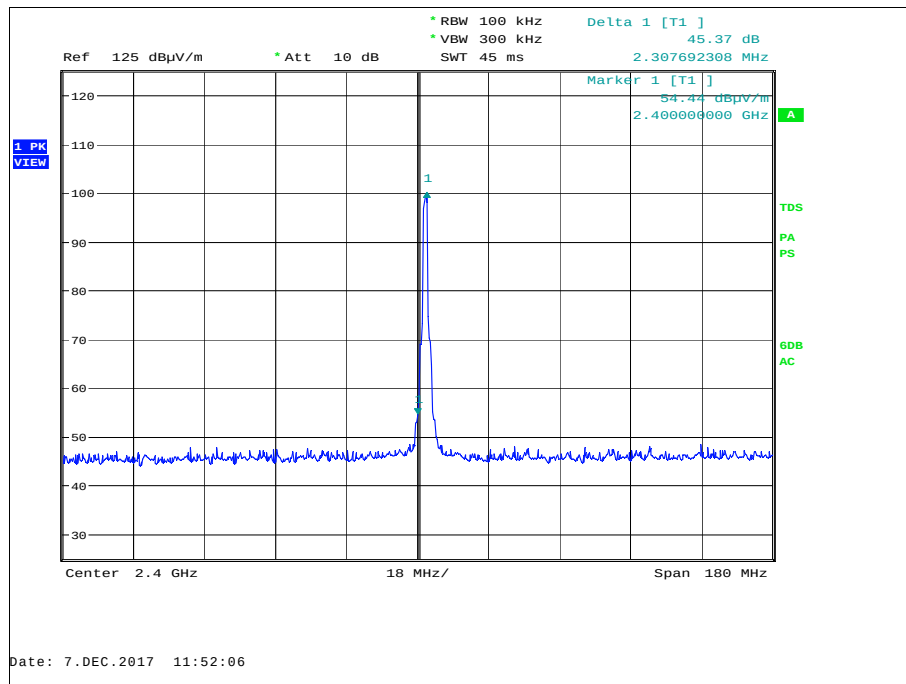


Figure 44 - Static - $\pi/4$ DQPSK - 2402 MHz - Measured Frequency 2400.0 MHz

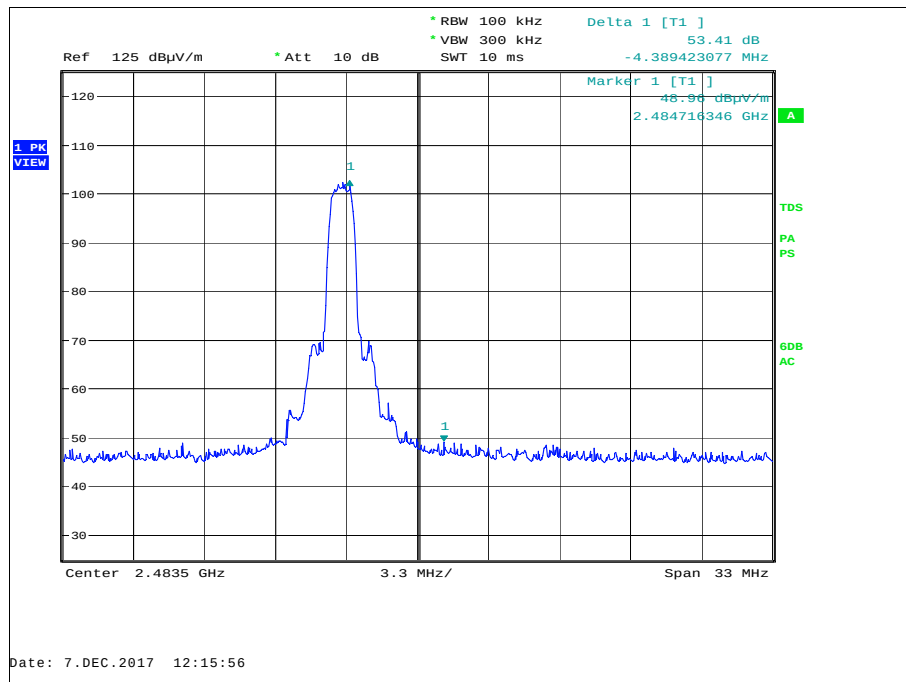


Figure 45 - Static - $\pi/4$ DQPSK - 2480 MHz - Measured Frequency 2483.5 MHz

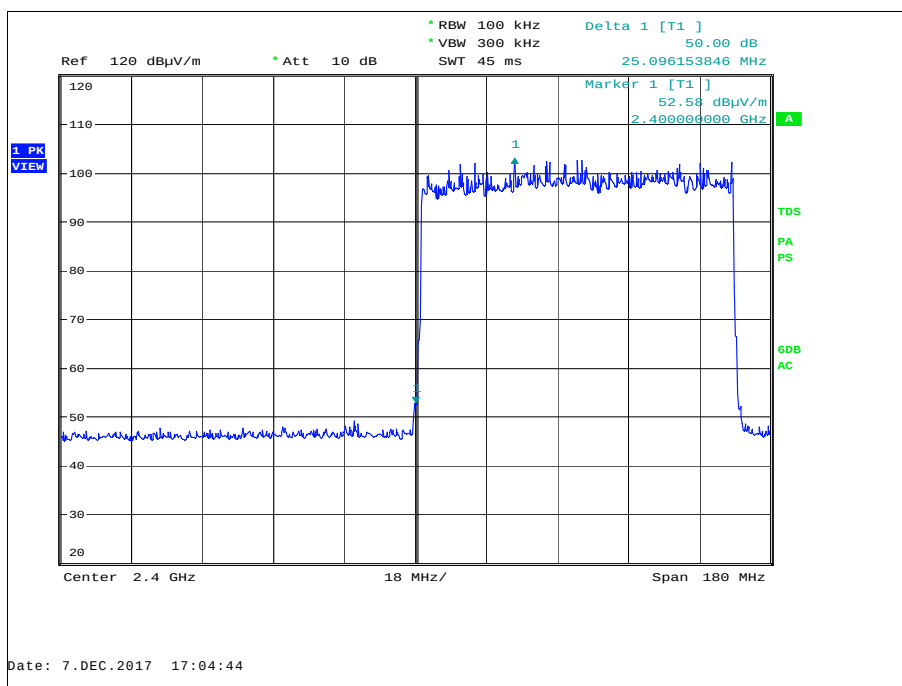


Figure 46 - Hopping - $\pi/4$ DQPSK - 2402 MHz - Measured Frequency 2400.0 MHz

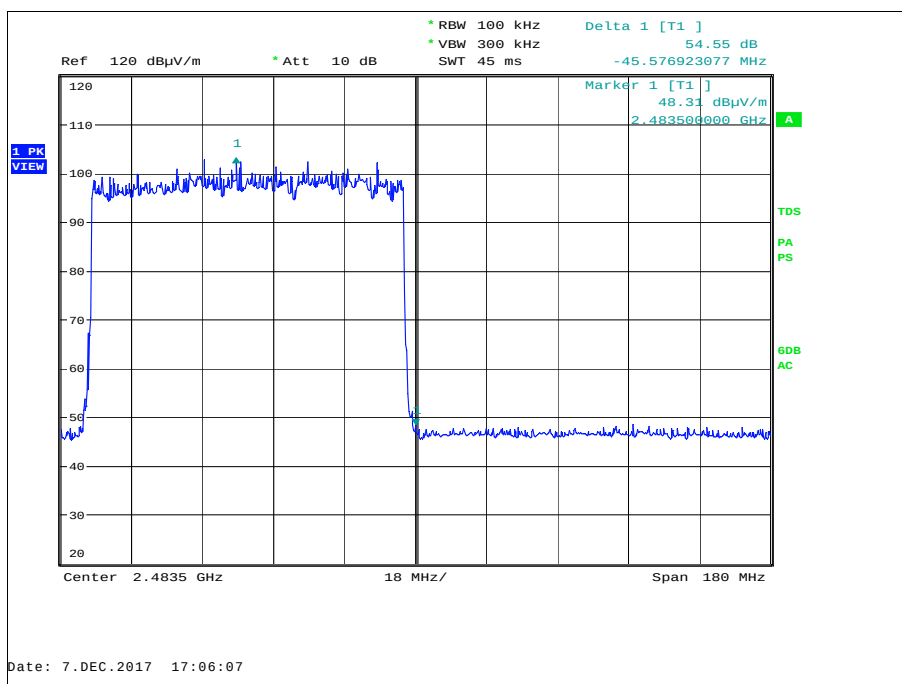


Figure 47 - Hopping - $\pi/4$ DQPSK - 2480 MHz - Measured Frequency 2483.5 MHz



Product Service

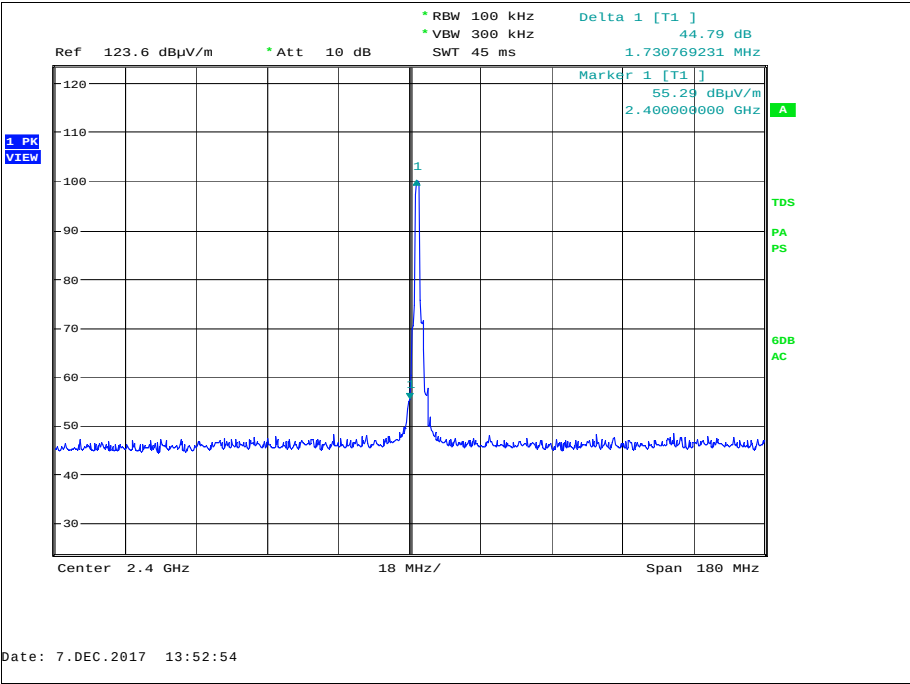


Figure 48 - Static - 8-DPSK - 2402 MHz - Measured Frequency 2400.0 MHz

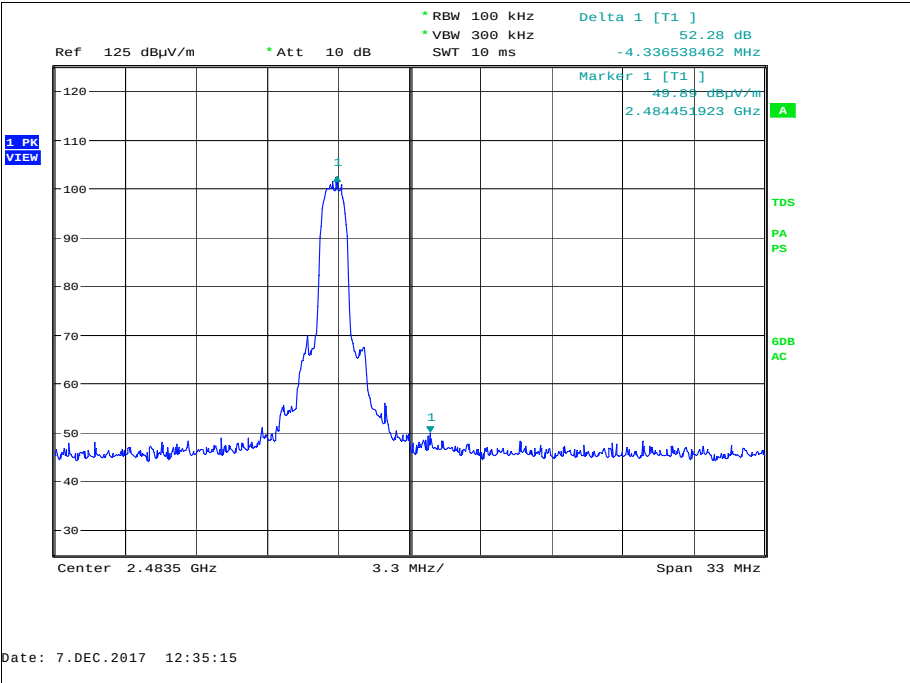


Figure 49 - Static - 8-DPSK - 2480 MHz - Measured Frequency 2483.5 MHz



Product Service

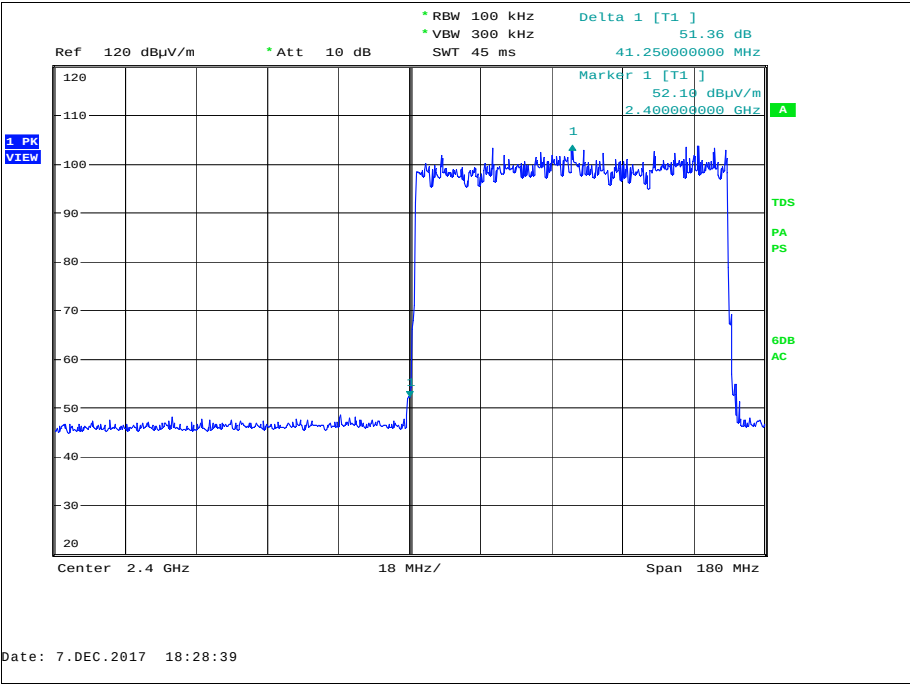


Figure 50 - Hopping - 8-DPSK - 2402 MHz - Measured Frequency 2400.0 MHz

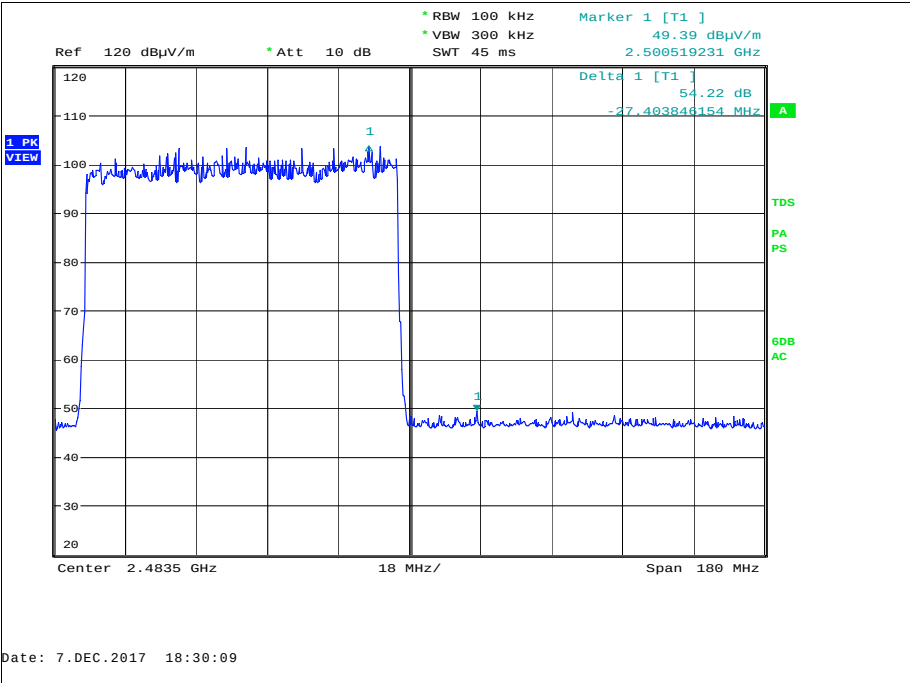


Figure 51 - Hopping - 8-DPSK - 2402 MHz - Measured Frequency 2483.5 MHz



FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

2.4.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	24-Oct-2018
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 18

TU - Traceability Unscheduled



3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Peak EIRP	Radiated: 1 GHz to 40 GHz: ± 6.3 dB
Spurious Radiated Emissions	Radiated: 30 MHz to 1 GHz: ± 5.2 dB Radiated: 1 GHz to 40 GHz: ± 6.3 dB
Restricted Band Edges	Radiated: 30 MHz to 1 GHz: ± 5.2 dB Radiated: 1 GHz to 40 GHz: ± 6.3 dB
Authorised Band Edges	Radiated: 30 MHz to 1 GHz: ± 5.2 dB Radiated: 1 GHz to 40 GHz: ± 6.3 dB

Table 19