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Report On

Radio Testing of the
Delphi Deutschland GmbH
B3TR Short Range Radar

FCC Part 15 Subpart C §15.253
IC RSS-251 Issue 1 November 2014

Report No. SD72129496-0717B

August 2017



America

TÜV SÜD America Inc., 10040 Mesa Rim Road, San Diego, CA 92121
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REPORT ON Radio Testing of the
Delphi Deutschland GmbH
B3TR Short Range Radar

TEST REPORT NUMBER SD72129496-0717B

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DATED August 08, 2017



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Revision History

SD72129496-0717B Delphi Deutschland GmbH B3TR Short Range Radar					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
08/08/17	Initial Release				Juan M. Gonzalez

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SECTION 1

REPORT SUMMARY

Radio Testing of the
Delphi Deutschland GmbH
B3TR Short Range Radar



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Delphi Deutschland GmbH Third-Generation Short Range Radar to the requirements of FCC Part 15 Subpart C §15.253 and IC RSS-251 Issue 1 November 2014.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Delphi Deutschland GmbH
Product Name	B3TR Short Range Radar
Model Number(s)	B3TR
FCC ID Number	LTQB3TR
IC Number	3659A-B3TR
Serial Number(s)	N/A
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.253 (October 1, 2016). • RSS-251 – Field Disturbance Sensors in the Bands 46.7-46.9 GHz (Vehicular Radar) and 76-77 GHz (Vehicular and Airport Fixed Radar) (Issue 1, November 2014). • RSS-Gen - General Requirements and Information for the Certification of Radio Apparatus (Issue 4, November 2014).
Start of Test	July 19, 2017
Finish of Test	August 2, 2017
Name of Engineer(s)	Nikolay Shtin
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

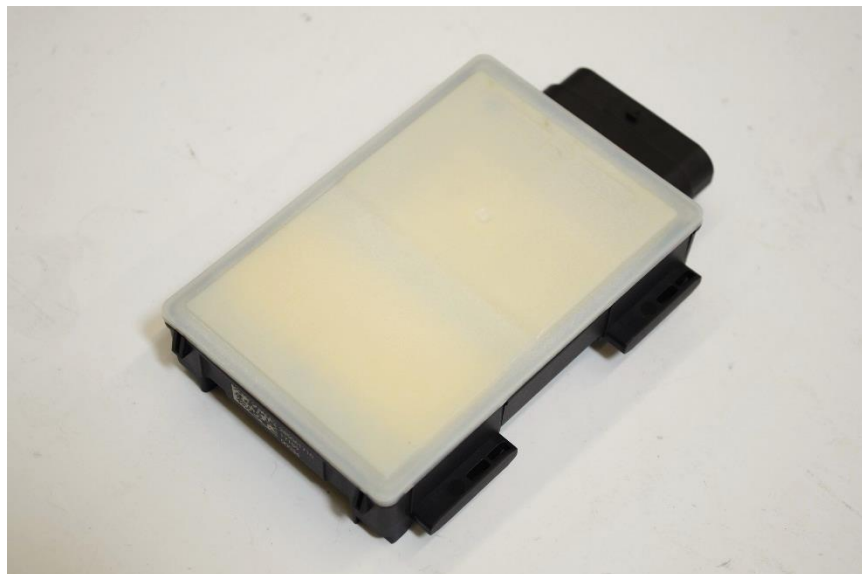
A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.253 with cross-reference to the corresponding ISED RSS standard is shown below.

Section	FCC Spec Clause	RSS	Test Description	Result	Comments/Base Standard
2.1	§15.253(d)(1)(2)	RSS-251 5.2.2	Power Density Limits	Compliant	
2.2	§2.1049	RSS-GEN	99% Emission Bandwidth	Compliant	
2.3	§15.253(e)(1)(2)(3) and (4)	RSS-251 5.3	Spurious Emissions	Compliant	
2.4	§15.253(f)	RSS-251 5.4	Frequency stability	Compliant	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Delphi Deutschland GmbH B3TR Short Range Radar. The EUT is a Third-Generation Short Range Radar. The EUT operates in the 76-77 GHz band. The device employs a dynamic chirp modulated transmit array. Multiple receive antennas are used to determine target angular resolution through digital beam forming. The device is intended to be mounted at the front and rear corners of a vehicle. The EUT nominal operating voltage is 12.0 VDC.



Equipment Under Test



1.3.2 EUT General Description

EUT Description	Third-Generation Short Range Radar
Product Name	B3TR Short Range Radar
Model Number(s)	B3TR
Rated Voltage	12.0 VDC
Output Power	25.98 dBm Peak EIRP
Frequency Range	76.00286 GHz to 76.99987 GHz in the 76.0 GHz to 77.0 GHz Band
Number of Operating Frequencies	7
Channels Verified	Low, Mid and High
Antenna Type (used during evaluation)	Integral (Complies with Part 15.203 requirements)

1.3.3 Antenna Details

Manufacturer	Delphi Deutschland GmbH
Antenna Type	Planar array antenna
Antenna Gain	14 dBi
EUT Antenna Connector	N/A
Maximum Dimensions	96.5 mm x 73.9 mm x 23.0 mm

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configurations	Description
Default	Radiated configuration. EUT transmitting modulated signal continuously through the integral antenna.

1.4.2 EUT Exercise Software

Before each test, the EUT is configured using CalFlasher tool version 2.00. The tool allows configuration of operating channel and modulation bandwidth.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Dell	Support Laptop	Latitude D630 (Delphi Wireless Test configuration Support Laptop)
Dell	PA-10 AC Adapter	M/N: LA90PS1-00
Vector	Single channel CAN HW	Used for communication between EUT and Support Laptop
	Harness with pins for power supply and CAN connector.	Connects the EUT to a 12 VDC power supply and to the CAN HW

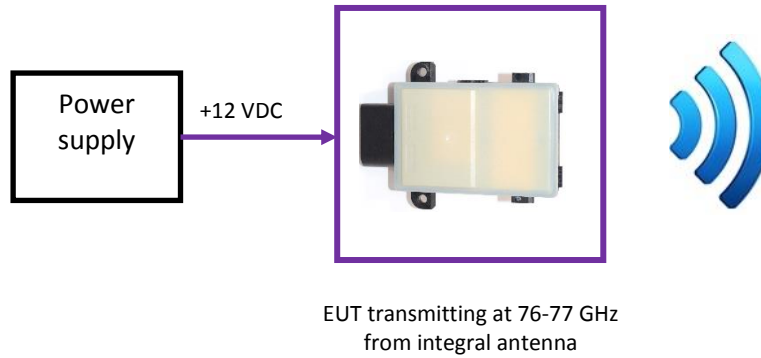
1.4.4 Worst Case Configuration

Worst-case configuration used in this test report based from Peak Power Density measurement:

Channel	Modulation BW
Low Channel	175 MHz
Mid Channel	175 MHz
High Channel	175 MHz

EUT is mobile device designed to be installed on a vehicular, for radiated spurious measurement only default configuration was evaluated (See test setup picture exhibit).

1.4.5 Simplified Test Configuration Diagram



For Illustration Purpose Only
Image presented may not represent the
actual EUT or support equipment



1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: N/A		
N/A	-	-

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.10-2013. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678-1400 Fax: 858 546 0364.



1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.

1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.



SECTION 2

TEST DETAILS

Radio Testing of the
Delphi Deutschland GmbH
B3TR Short Range Radar



2.1 POWER DENSITY LIMITS

2.1.1 Specification Reference

Part 15 Subpart C §15.253(d)(1),(2) and RSS-251 Issue 1 Sec. 5.2.2

2.1.2 Standard Applicable

(d) The radiated emission limits within the band 76.0-77.0 GHz are as follows:

(1) The average power density of any emission within the bands specified in this section shall not exceed $88 \mu\text{W}/\text{cm}^2$ at a distance of 3 meters from the exterior surface of the radiating structure (average EIRP of 50 dBm).

(2) The peak power density of any emission within the band 76-77 GHz shall not exceed $279 \mu\text{W}/\text{cm}^2$ at a distance of 3 meters from the exterior surface of the radiating structure (peak EIRP of 55 dBm).

2.1.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.1.4 Date of Test/Initial of test personnel who performed the test

July 19, 2017/NS

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	26.2°C
Relative Humidity	44.8%
ATM Pressure	99.8 kPa

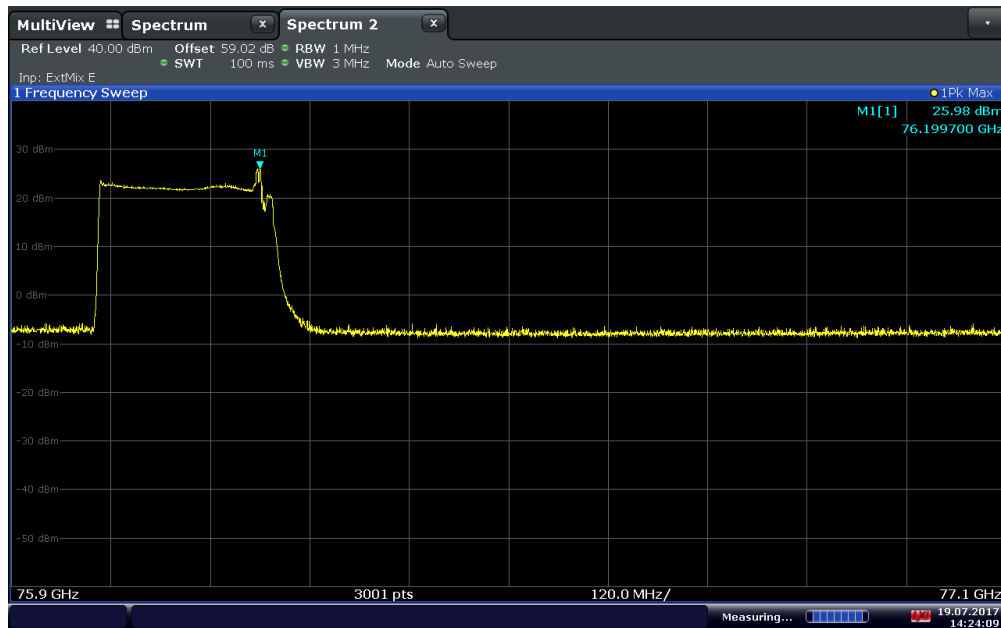
2.1.7 Additional Observations

- This is a radiated test.
- Test distance of 3 m was used for the fundamental emissions measurement.
- A correction factor of 59.02-59.09 dB dB and mixer conversion loss table were used to account for the test antenna gain, free-space loss and external mixer loss.

2.1.8 Test Results

Peak EIRP			
Modulation BW	Channel	Measured EIRP (dBm)	Limit (dBm)
175 MHz	Low (76.0925 GHz)	25.98	55
	Mid (76.5000 GHz)	25.34	
	High (76.8625 GHz)	25.45	
300 MHz	Low (76.155 GHz)	25.44	
	Mid (76.500 GHz)	25.31	
	High (76.740 GHz)	25.35	
425 MHz	Low (76.2175 GHz)	25.53	
	Mid (76.500 GHz)	25.25	
	High (76.7125 GHz)	25.36	
Average EIRP			
Modulation BW	Channel	Measured EIRP (dBm)	Limit (dBm)
175 MHz	Low (76.0925 GHz)	7.90	50
	Mid (76.5000 GHz)	6.38	
	High (76.8625 GHz)	7.32	
300 MHz	Low (76.155 GHz)	6.02	
	Mid (76.500 GHz)	5.26	
	High (76.740 GHz)	5.49	
425 MHz	Low (76.2175 GHz)	5.15	
	Mid (76.500 GHz)	4.12	
	High (76.7125 GHz)	4.53	
EUT complies			

2.1.9 Test plots



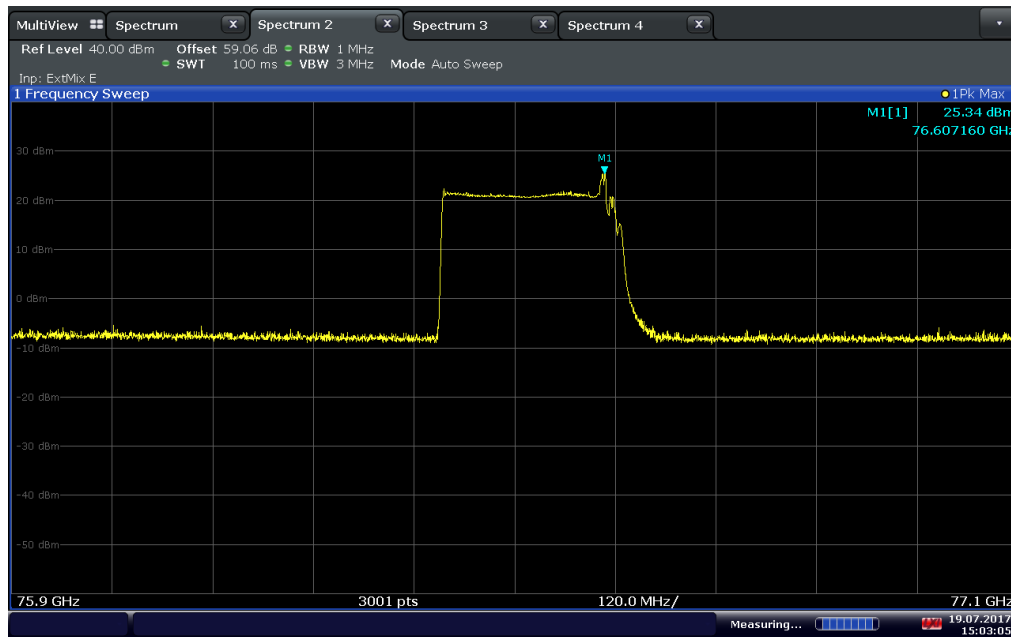
14:24:09 19.07.2017

Low Channel 175 MHz BW (Peak detector)



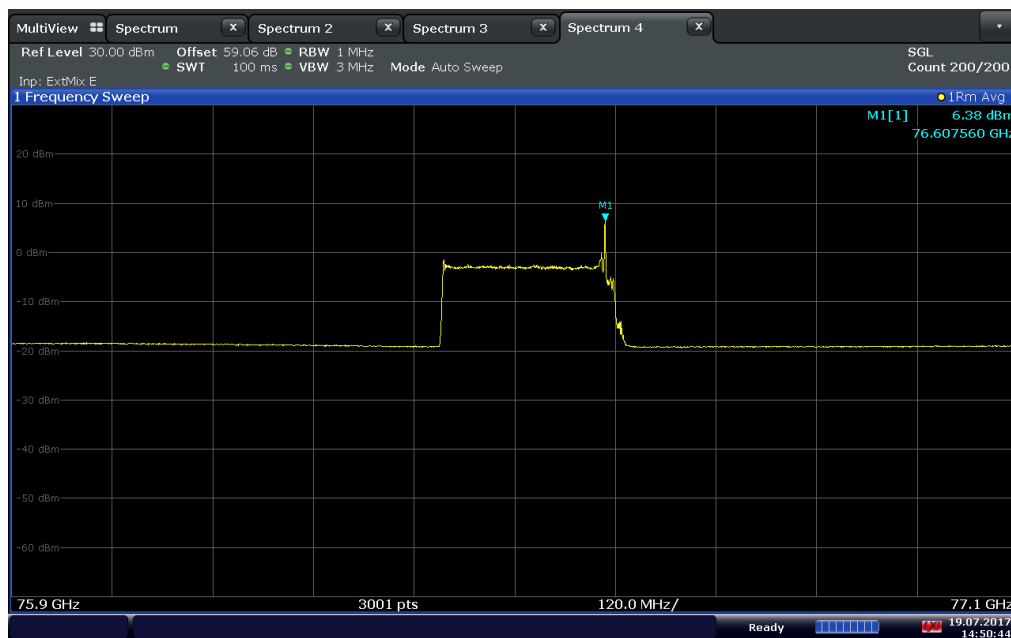
14:54:31 19.07.2017

Low Channel 175 MHz BW (RMS detector)



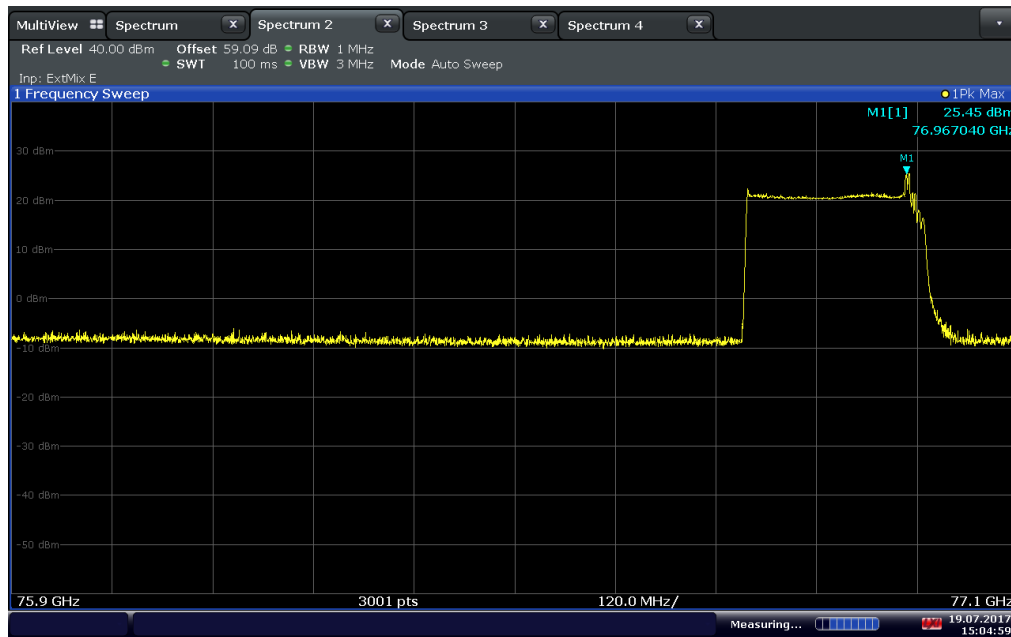
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Mid Channel 175 MHz BW (Peak detector)

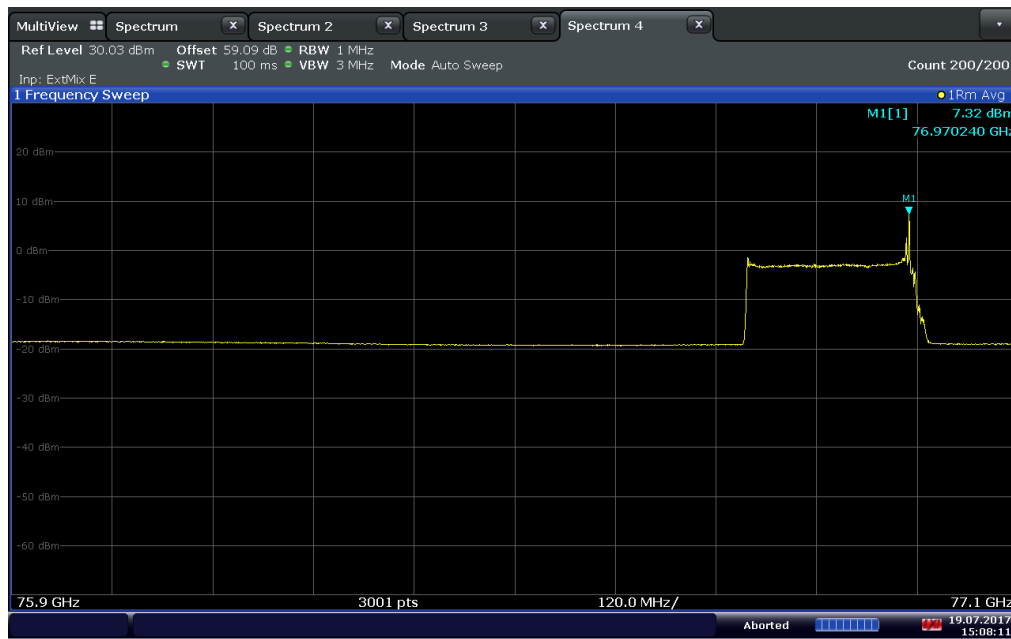


14:50:44 19.07.2017

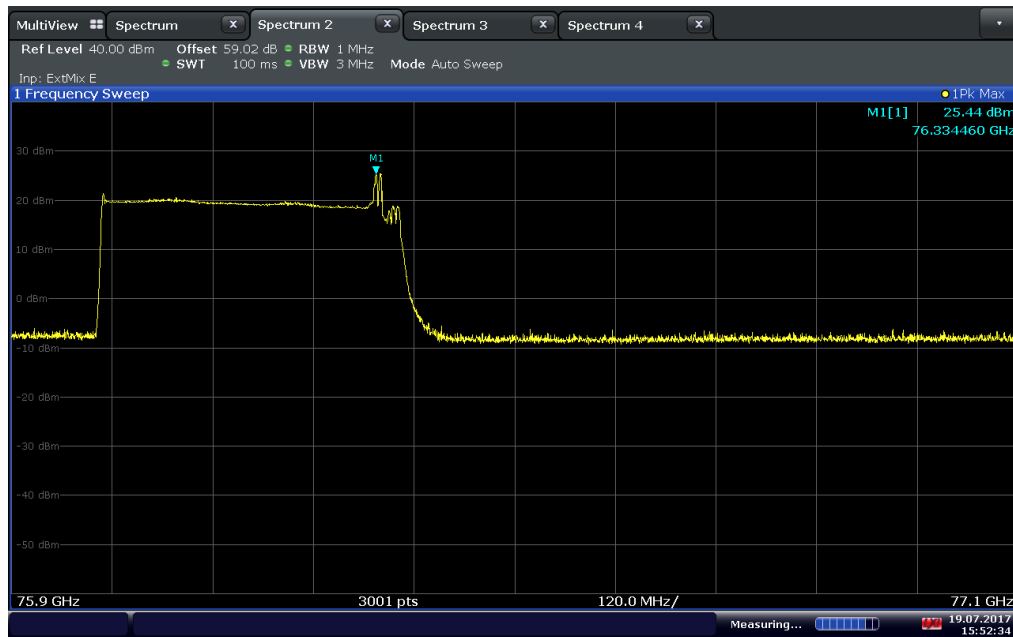
Mid Channel 175 MHz BW (RMS detector)



High Channel 175 MHz BW (Peak detector)



High Channel 175 MHz BW (RMS detector)



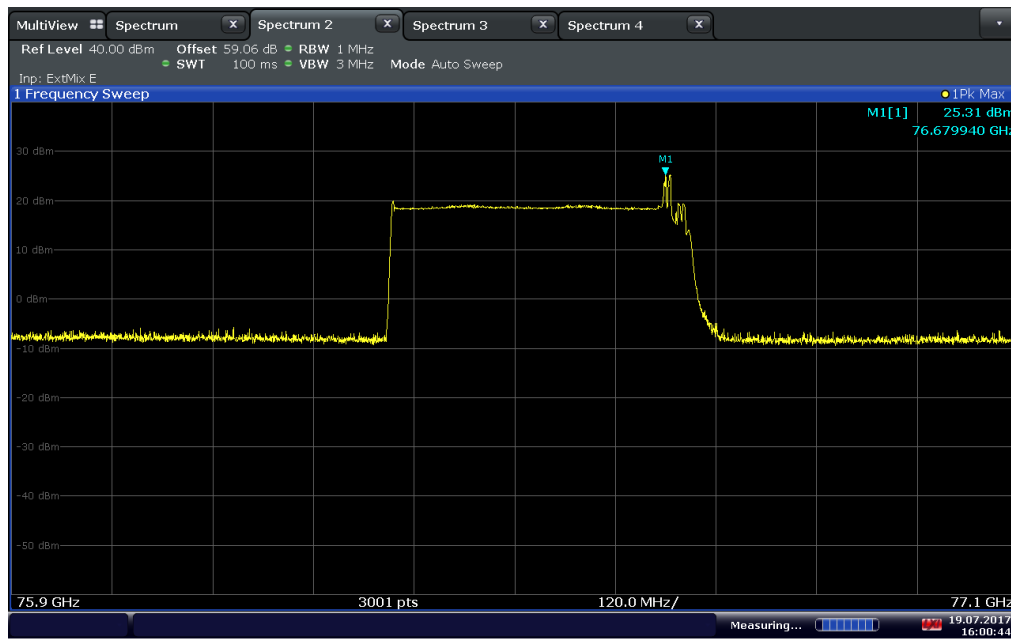
15:52:34 19.07.2017

Low Channel 300 MHz BW (Peak detector)



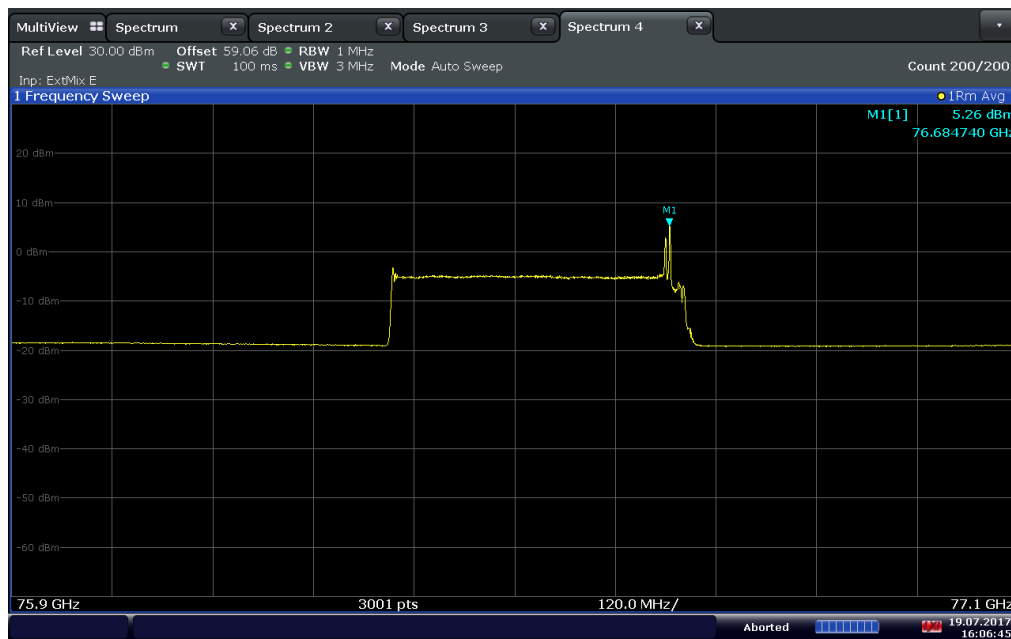
15:58:36 19.07.2017

Low Channel 300 MHz BW (RMS detector)



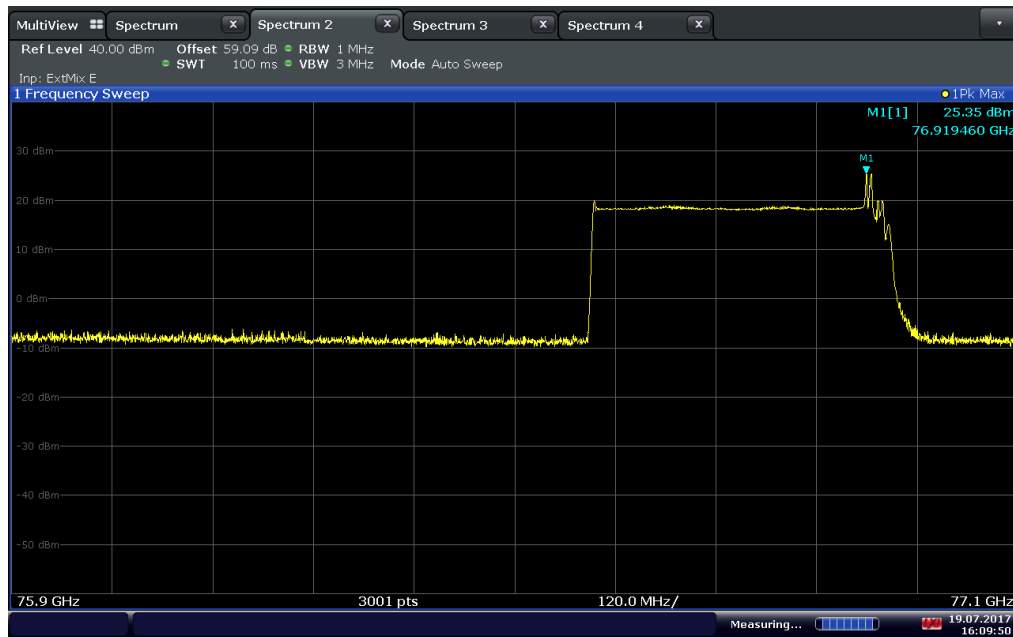
16:00:44 19.07.2017

Mid Channel 300 MHz BW (Peak detector)



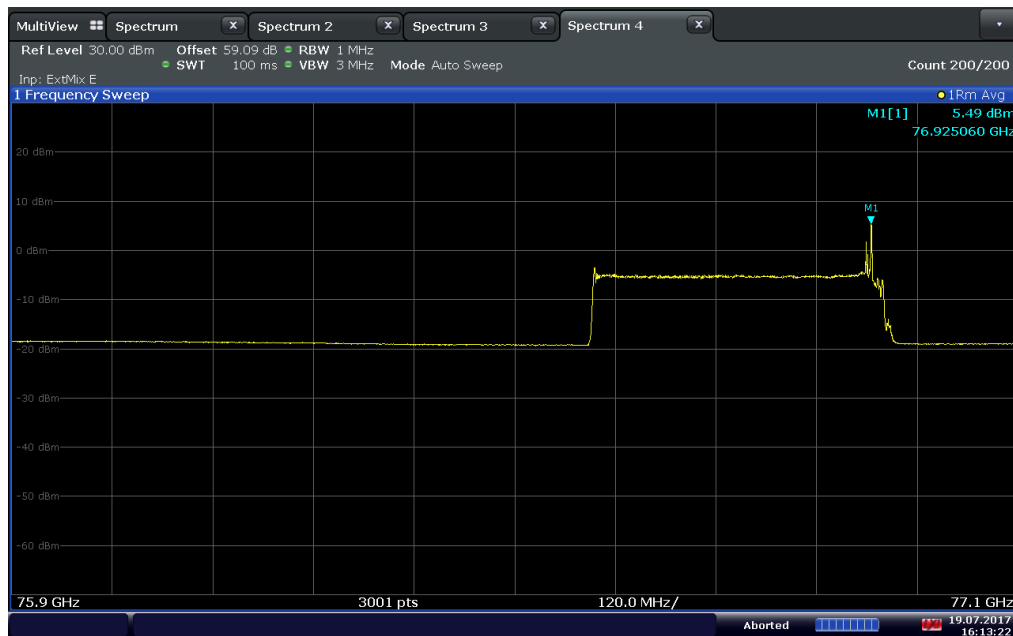
16:06:46 19.07.2017

Mid Channel 300 MHz BW (RMS detector)



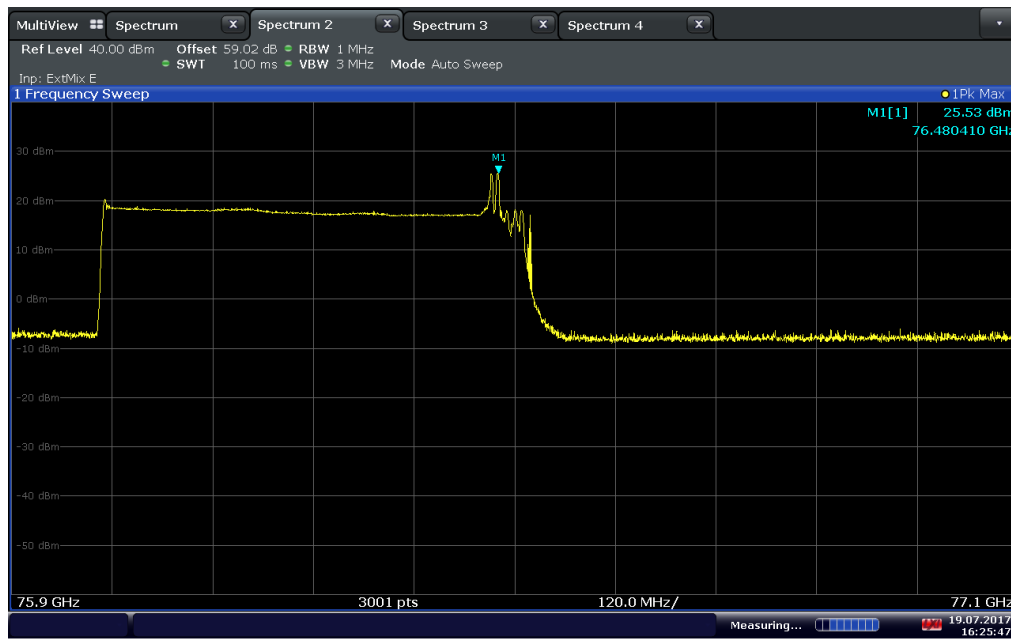
16:09:50 19.07.2017

High Channel 300 MHz BW (Peak detector)



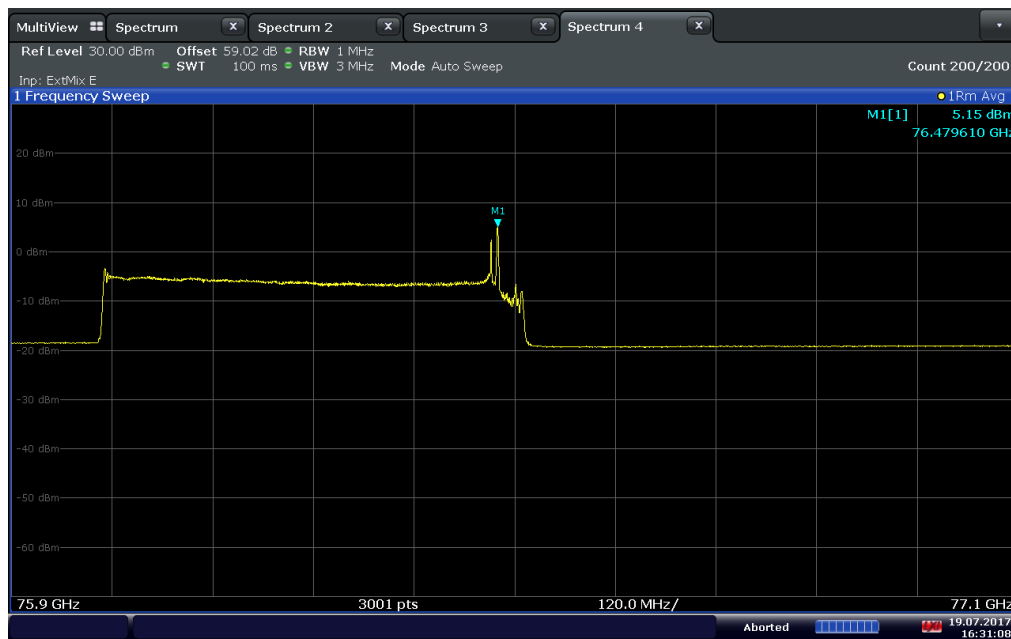
16:13:23 19.07.2017

High Channel 300 MHz BW (RMS detector)



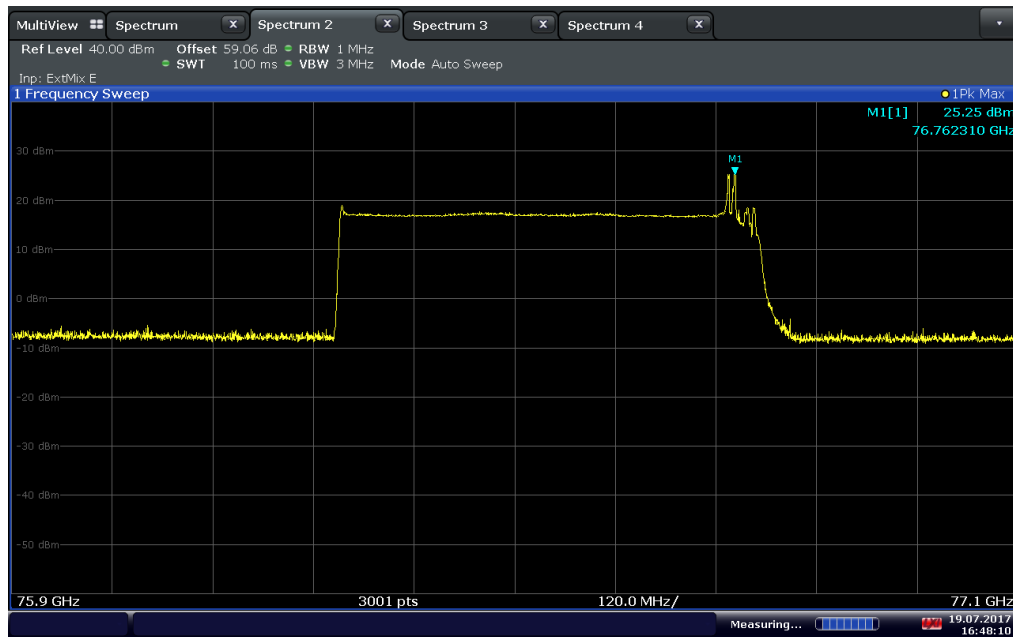
16:25:48 19.07.2017

Low Channel 425 MHz BW (Peak detector)



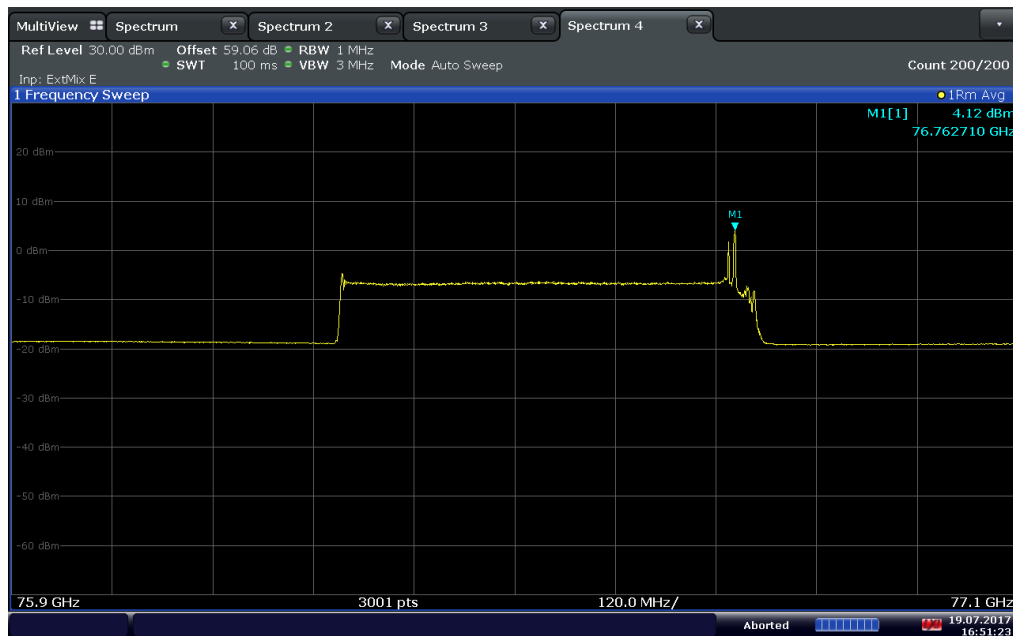
16:31:09 19.07.2017

Low Channel 425 MHz BW (RMS detector)



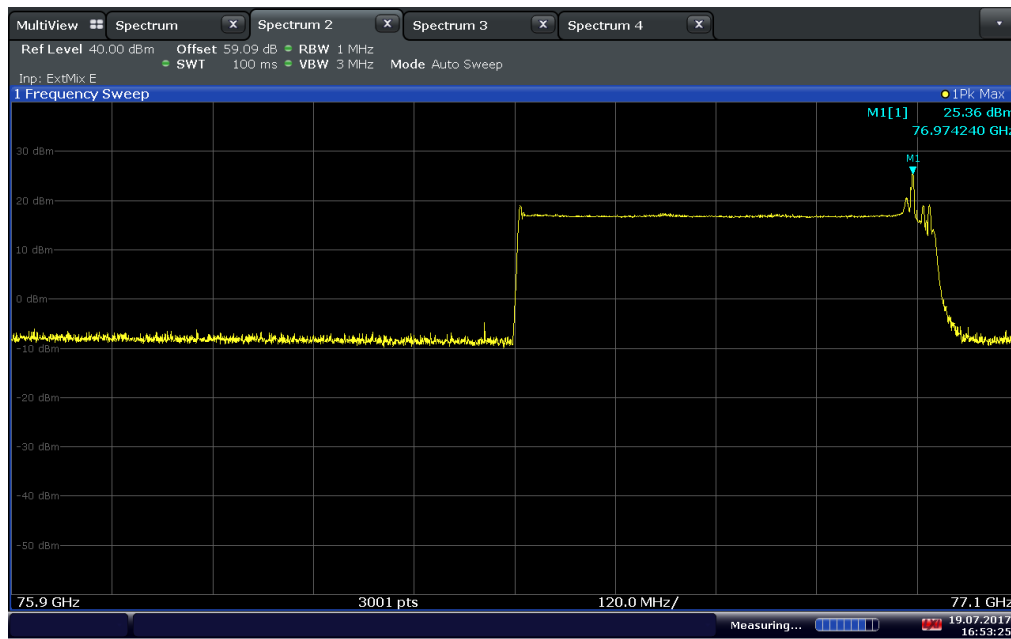
16:48:11 19.07.2017

Mid Channel 425 MHz BW (Peak detector)



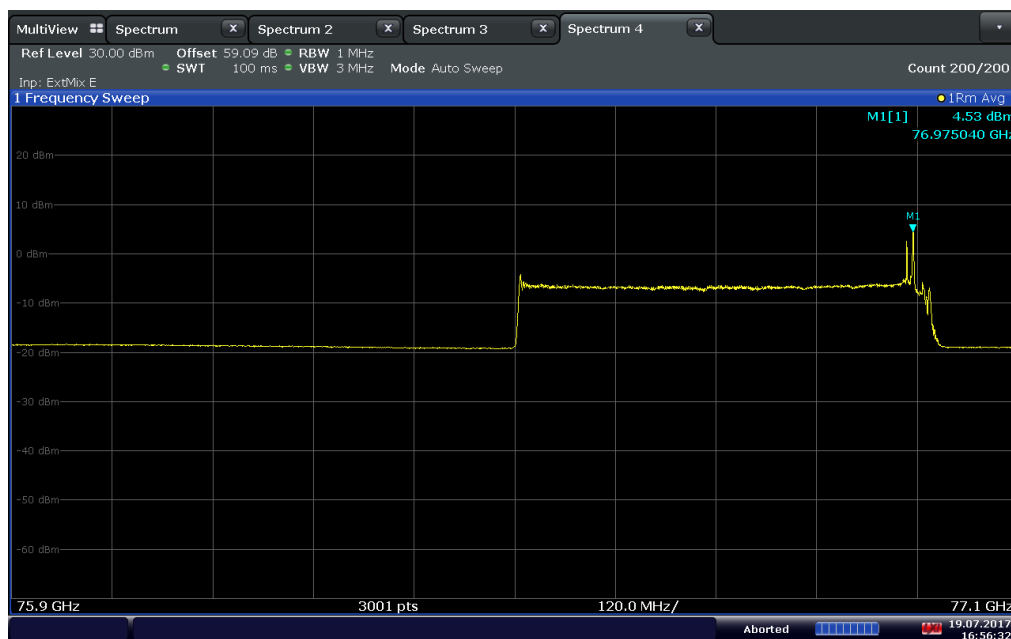
16:51:23 19.07.2017

Mid Channel 425 MHz BW (RMS detector)



16:53:26 19.07.2017

High Channel 425 MHz BW (Peak detector)



16:56:33 19.07.2017

High Channel 425 MHz BW (RMS detector)



2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049 and 2.202(a)
RSS-GEN Issue 4 Section 6.6

2.2.2 Standard Applicable

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

2.2.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.2.4 Date of Test/Initial of test personnel who performed the test

July 19, 2017/NS

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	26.5°C
Relative Humidity	45.3%
ATM Pressure	99.2 kPa

2.2.7 Additional Observations

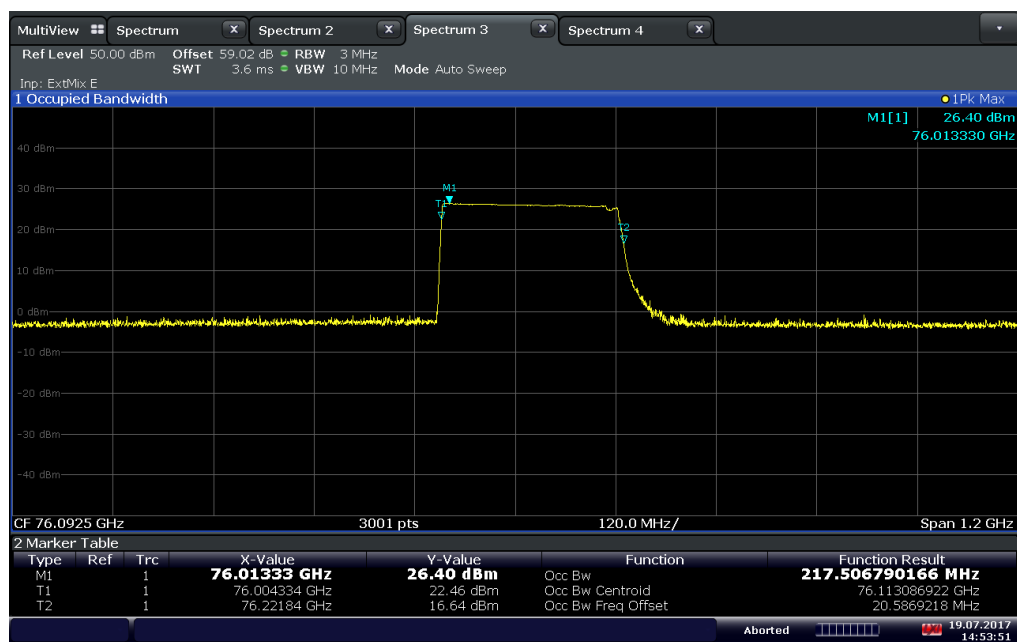
- This is a radiated test.
- A correction factor of 59.02-59.09 dB and mixer conversion loss table were used to account for the test antenna gain, free-space loss and external mixer loss.
- Span is wide enough to capture the channel transmission.
- RBW is 1% initially set approx. to 1% of anticipated EBW.
- VBW > RBW.
- Trace is max hold.
- Detector is peak.

- Sweep time is set to Auto.
- 99% OBW measurement function of the spectrum analyzer was used for this test.
- RBW adjusted until RBW/EBW ratio is approximately 1% or as the SA setting permits (i.e next setting after 3 MHz RBW is limited to 5 MHz).

2.2.8 Summary Test Results (as reported)

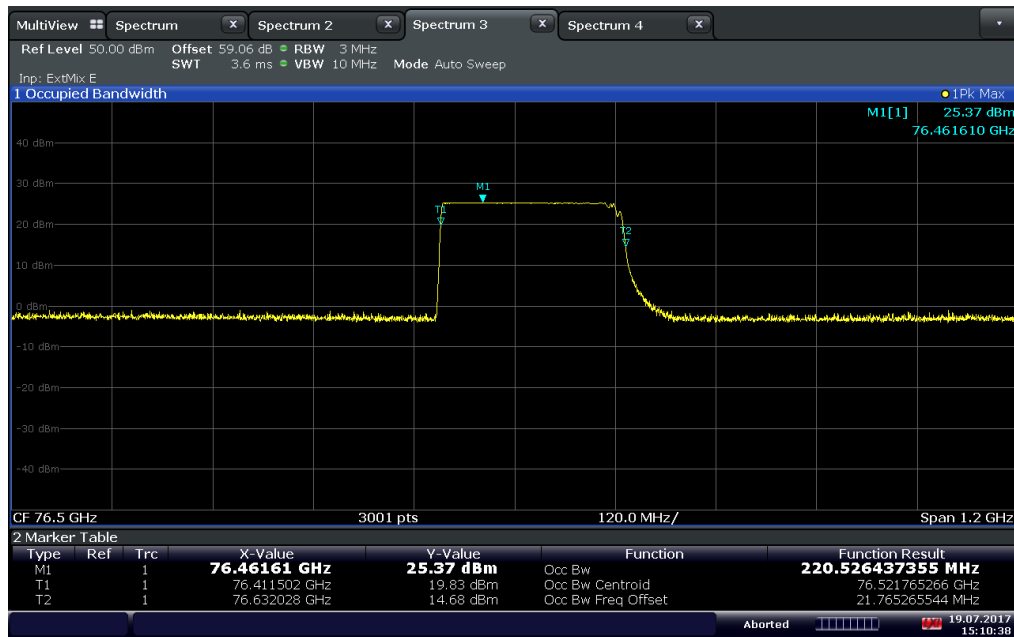
Occupied Bandwidth			
Modulation BW	Low Channel	Mid Channel	High Channel
175 MHz	217.51 MHz	220.53 MHz	218.77 MHz
300 MHz	365.11 MHz	365.22 MHz	363.62 MHz
425 MHz	505.64 MHz	504.16 MHz	501.31 MHz

2.2.9 Test Plots



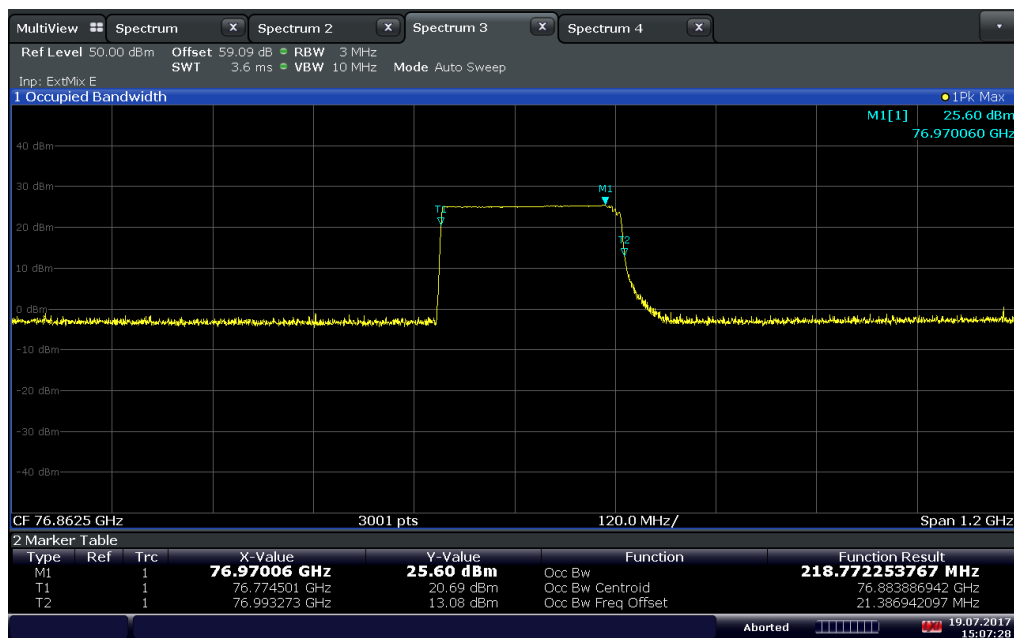
14:53:52 19.07.2017

Low channel 175 MHz BW



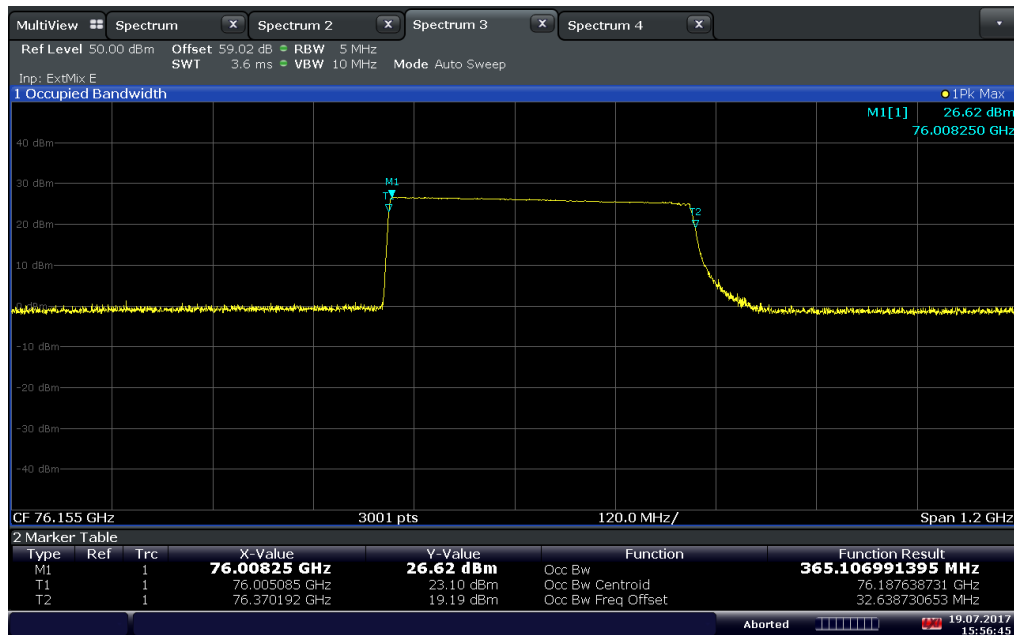
15:10:39 19.07.2017

Mid channel 175 MHz BW



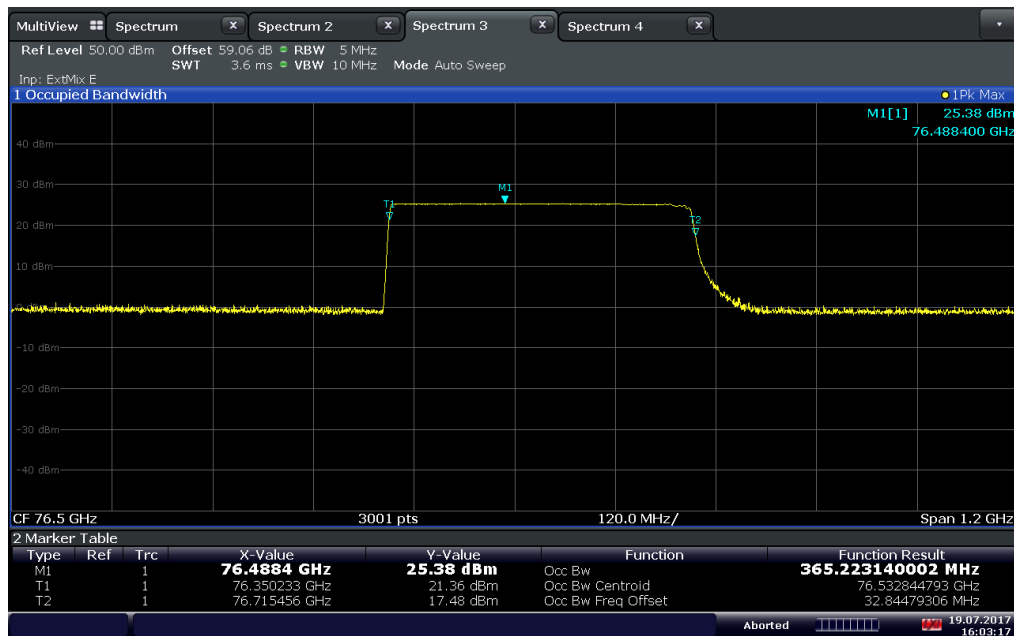
15:07:29 19.07.2017

High channel 175 MHz BW



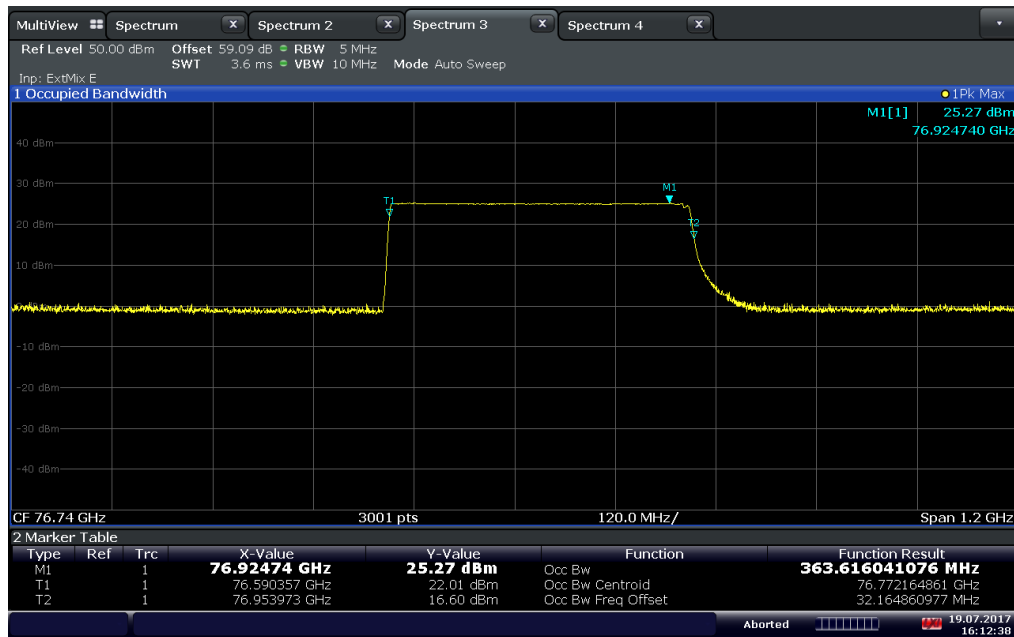
15:56:46 19.07.2017

Low channel 300 MHz BW



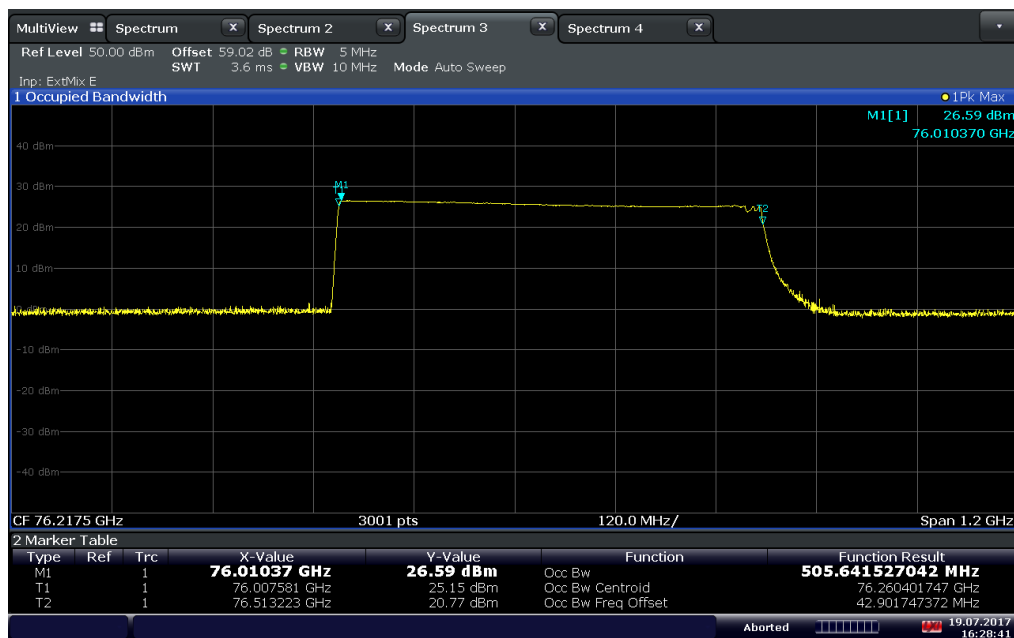
16:03:17 19.07.2017

Mid channel 300 MHz BW



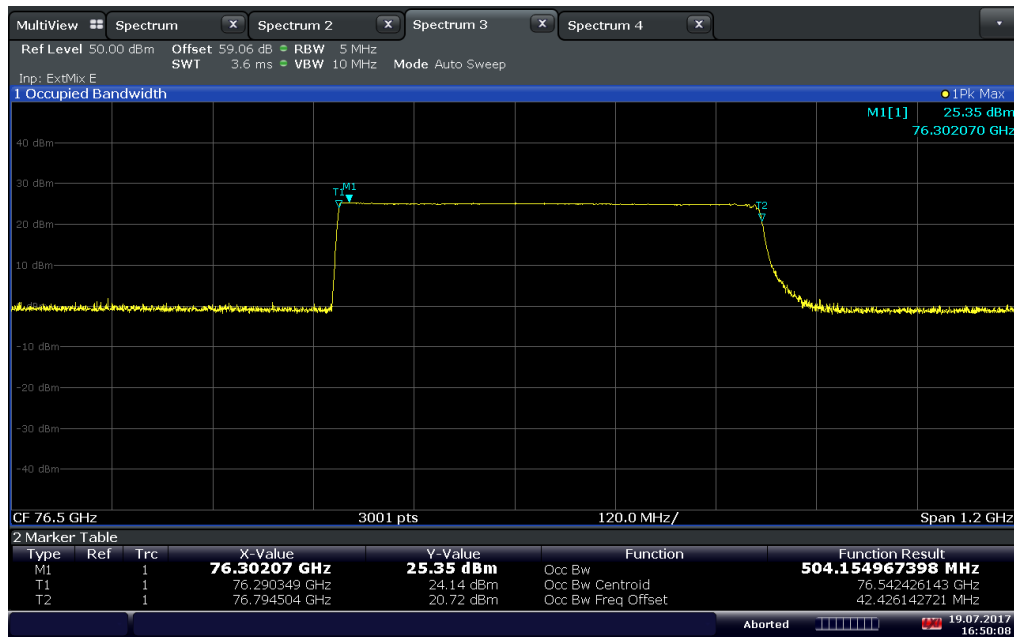
16:12:39 19.07.2017

High channel 300 MHz BW



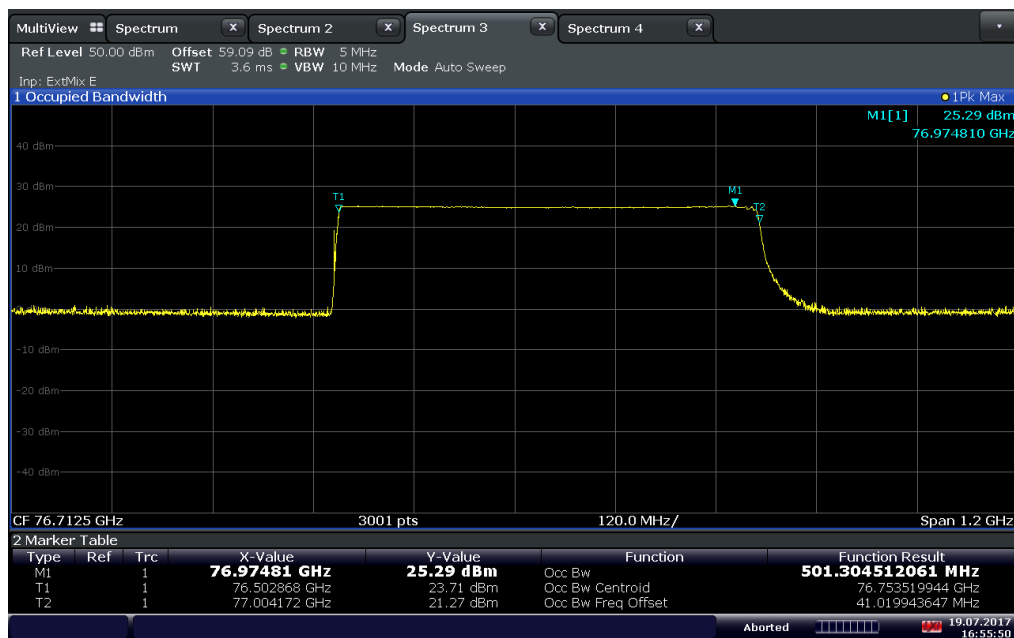
16:28:41 19.07.2017

Low channel 425 MHz BW



16:50:08 19.07.2017

Mid channel 425 MHz BW



16:55:51 19.07.2017

High channel 425 MHz BW



2.3 SPURIOUS RADIATED EMISSIONS

2.3.1 Specification Reference

FCC Part 15 Subpart C §15.253(e) and RSS-251 Issue 1 Sec. 5.3

2.3.2 Standard Applicable

(e) The power density of any emissions outside the operating band shall consist solely of spurious emissions and shall not exceed the following:

- (1)** Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.
- (2)** Radiated emissions outside the operating band and between 40 GHz and 200 GHz shall not exceed the following:
 - (i)** For field disturbance sensors operating in the band 46.7-46.9 GHz: 2 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.
 - (ii)** For field disturbance sensors operating in the band 76-77 GHz: 600 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.
- (3)** For radiated emissions above 200 GHz from field disturbance sensors operating in the 76-77 GHz band: the power density of any emission shall not exceed 1000 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.
- (4)** For field disturbance sensors operating in the 76-77 GHz band, the spectrum shall be investigated up to 231 GHz.

2.3.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.3.4 Date of Test/Initial of test personnel who performed the test

July 21, July 26-27, July 31 and August 01, 2017/NS

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.9-27.2°C
Relative Humidity	44.7-48.2%
ATM Pressure	98.7-99.1 kPa

2.3.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30 MHz to 300 GHz. There are no significant spurious emissions observed.
- Test distance of 3 m was used for the spurious emissions measurement below 75 GHz. The emissions in the range from 75 GHz to 160 GHz were evaluated at 1.0 m distance. For the measurements in the ranges from 160 GHz to 220 GHz and 220 GHz to 300 GHz, the test distance was respectively reduced to 0.5 m and 0.2 m to assure that the noise floor is at least 10 dB below the applicable limit.
- Corrections factors of 9.54 dB, 15.56 dB and 23.52 dB were used to extrapolate the field strengths measured at 1.0 metres, 0.5 meters and 0.2 meters to the 3 meters distance as specified in § 15.31.
- All the emissions below 40 GHz comply with the general radiated emission limits of §15.209.
- Measurements below 40 GHz were done using EMC32 V8.53 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.3.8 for sample computation.

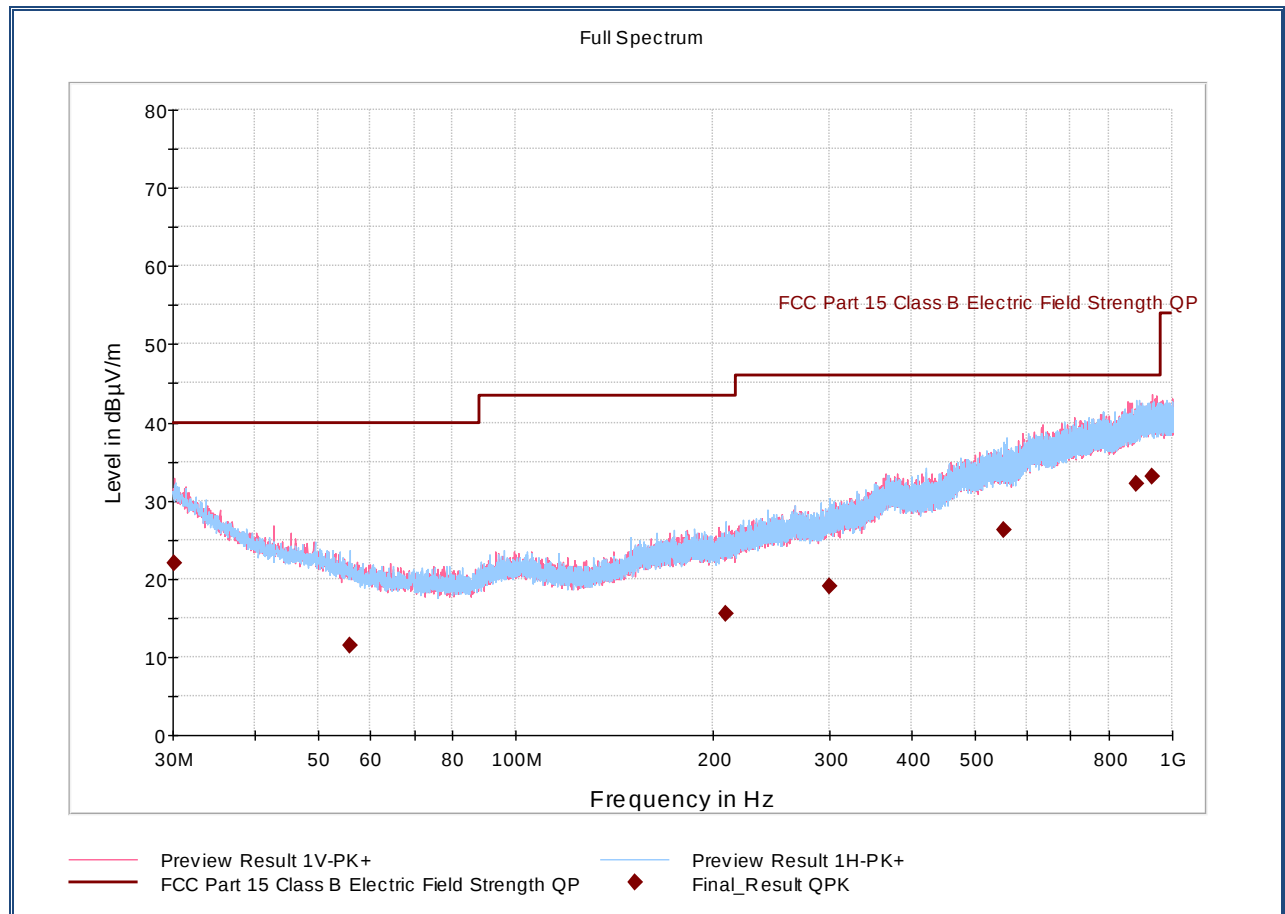
2.3.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (db μ V) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (db μ V/m) @ 30MHz			11.8

2.3.9 Test Results

See attached plots.

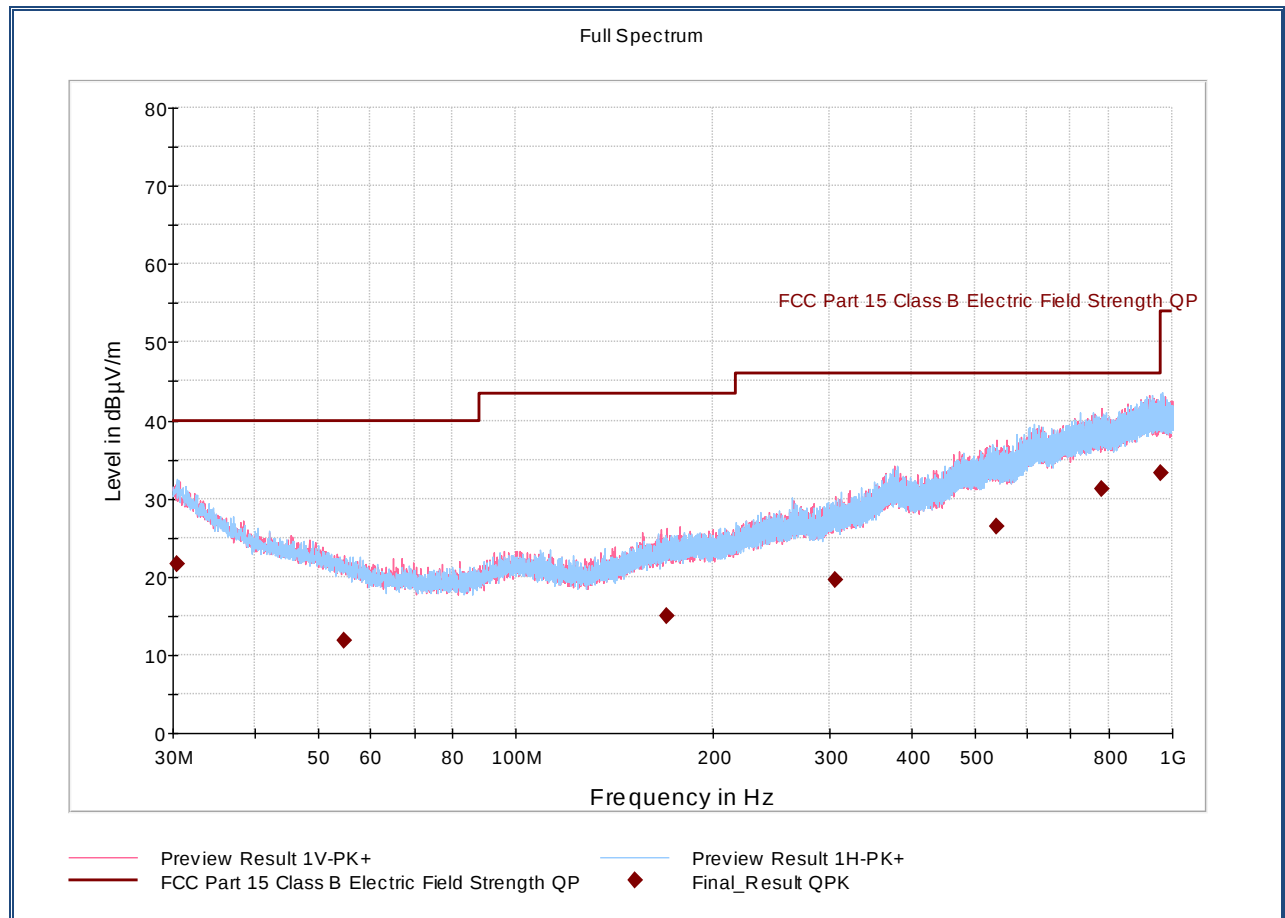
2.3.10 Test Results Below 1GHz Low Channel 175 MHz BW (worst case configuration)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.109333	21.94	1000.0	120.000	166.2	V	171.0	24.0	18.06	40.00
55.894333	11.45	1000.0	120.000	191.8	H	328.0	14.2	28.55	40.00
208.960333	15.53	1000.0	120.000	368.6	H	186.0	17.8	27.97	43.50
301.087333	19.12	1000.0	120.000	324.9	H	243.0	21.2	26.88	46.00
552.640667	26.18	1000.0	120.000	149.6	H	348.0	27.9	19.82	46.00
880.959333	32.17	1000.0	120.000	124.3	H	266.0	33.0	13.83	46.00
929.929000	33.08	1000.0	120.000	410.3	V	336.0	33.8	12.92	46.00

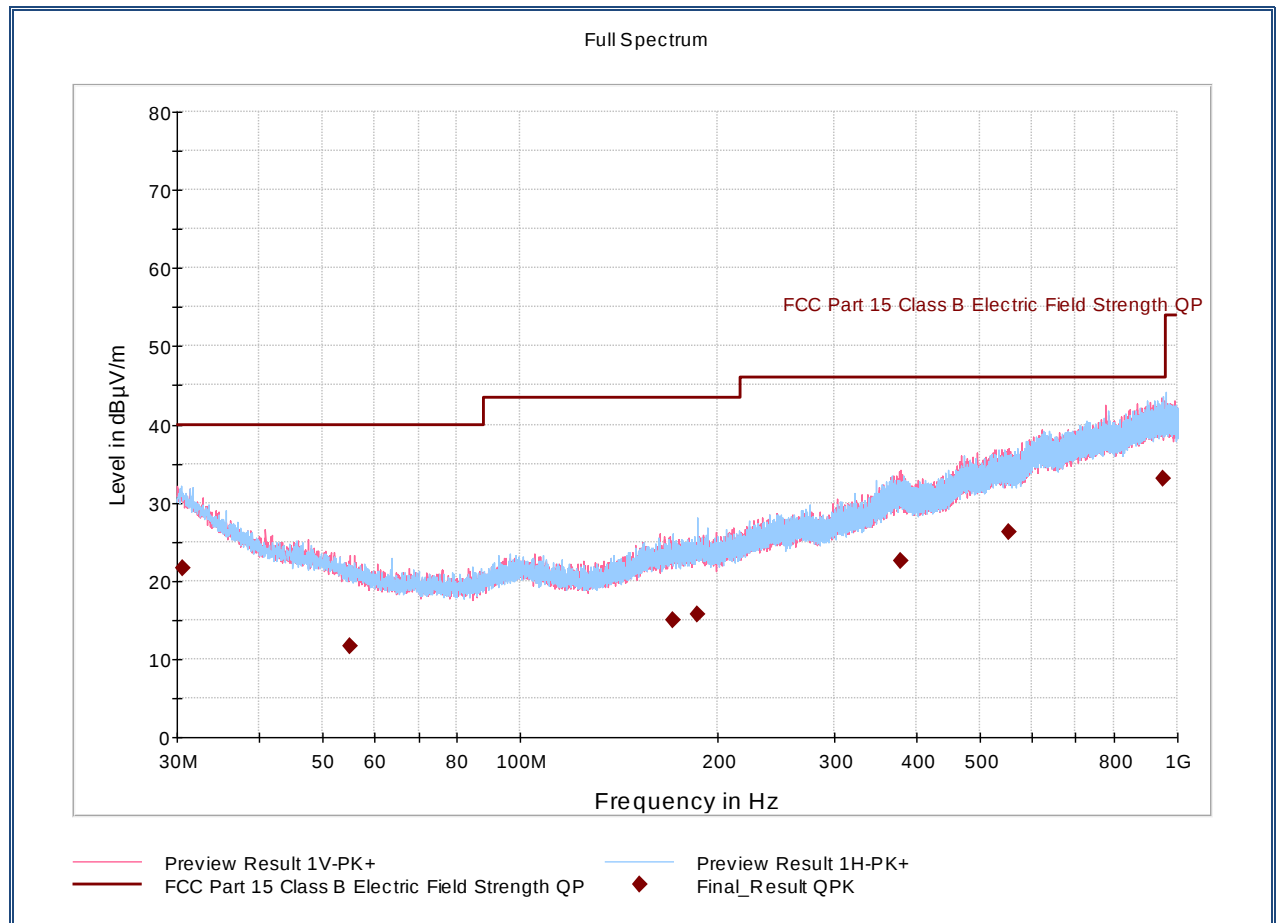
2.3.11 Test Results Below 1GHz Mid Channel 175 MHz BW (worst case configuration)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.448000	21.65	1000.0	120.000	214.9	H	351.0	23.8	18.35	40.00
54.762667	11.74	1000.0	120.000	112.6	V	334.0	14.4	28.26	40.00
169.384333	14.91	1000.0	120.000	410.2	V	182.0	17.2	28.59	43.50
306.778000	19.53	1000.0	120.000	119.9	V	287.0	21.7	26.47	46.00
540.660333	26.36	1000.0	120.000	378.4	V	346.0	28.1	19.64	46.00
778.972333	31.24	1000.0	120.000	388.1	V	6.0	31.8	14.76	46.00
960.031333	33.17	1000.0	120.000	107.4	H	260.0	33.9	20.73	53.90

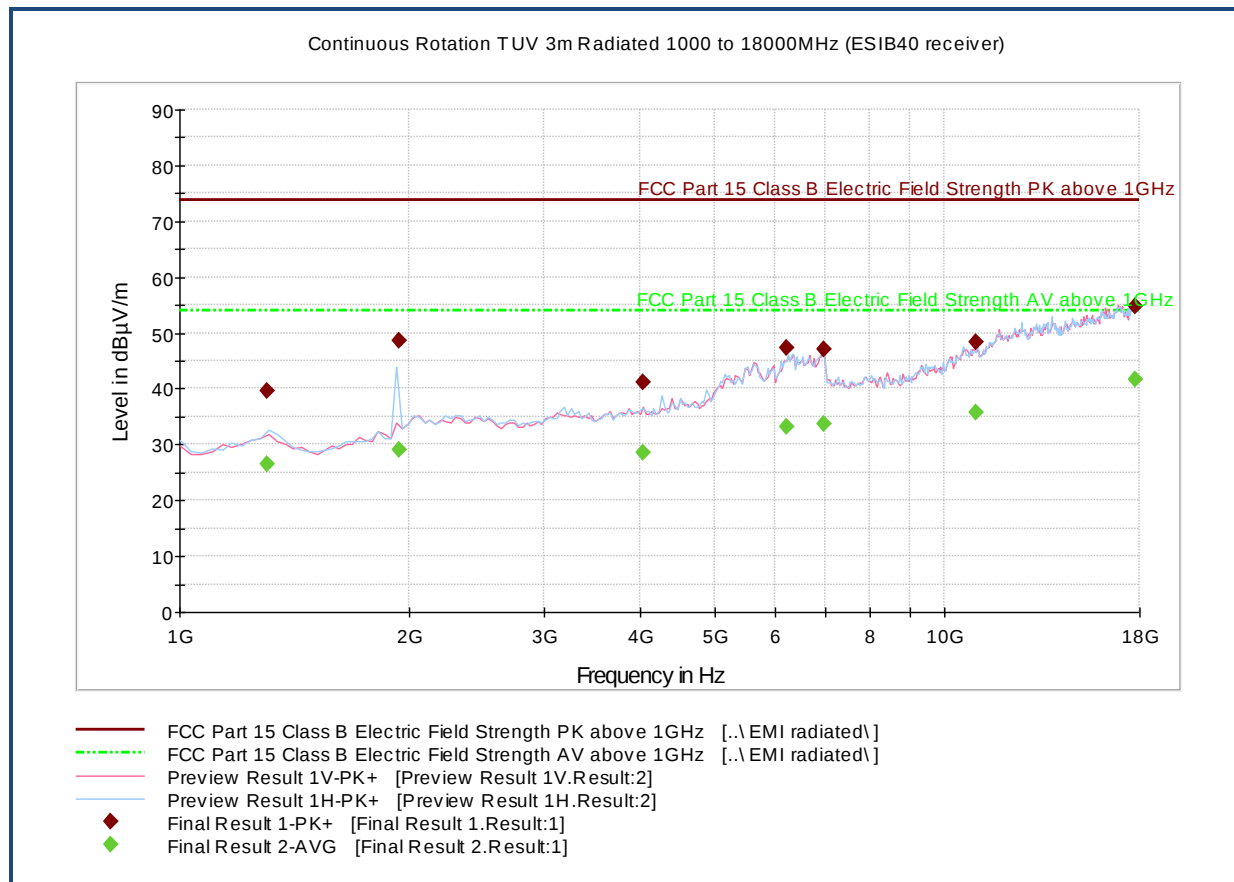
2.3.12 Test Results Below 1GHz High Channel 175 MHz BW (worst case configuration)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.545000	21.58	1000.0	120.000	320.6	H	247.0	23.7	18.42	40.00
55.126000	11.60	1000.0	120.000	223.7	V	117.0	14.3	28.40	40.00
170.603667	15.01	1000.0	120.000	127.1	H	241.0	17.2	28.49	43.50
186.222333	15.65	1000.0	120.000	386.4	H	255.0	17.4	27.85	43.50
379.809667	22.56	1000.0	120.000	364.8	V	273.0	25.0	23.44	46.00
553.344333	26.23	1000.0	120.000	221.9	V	192.0	27.9	19.77	46.00
948.408333	33.06	1000.0	120.000	410.1	H	12.0	33.8	12.94	46.00

2.3.13 Test Results 1 GHz to 18 GHz Low Channel 175 MHz BW (worst case configuration)



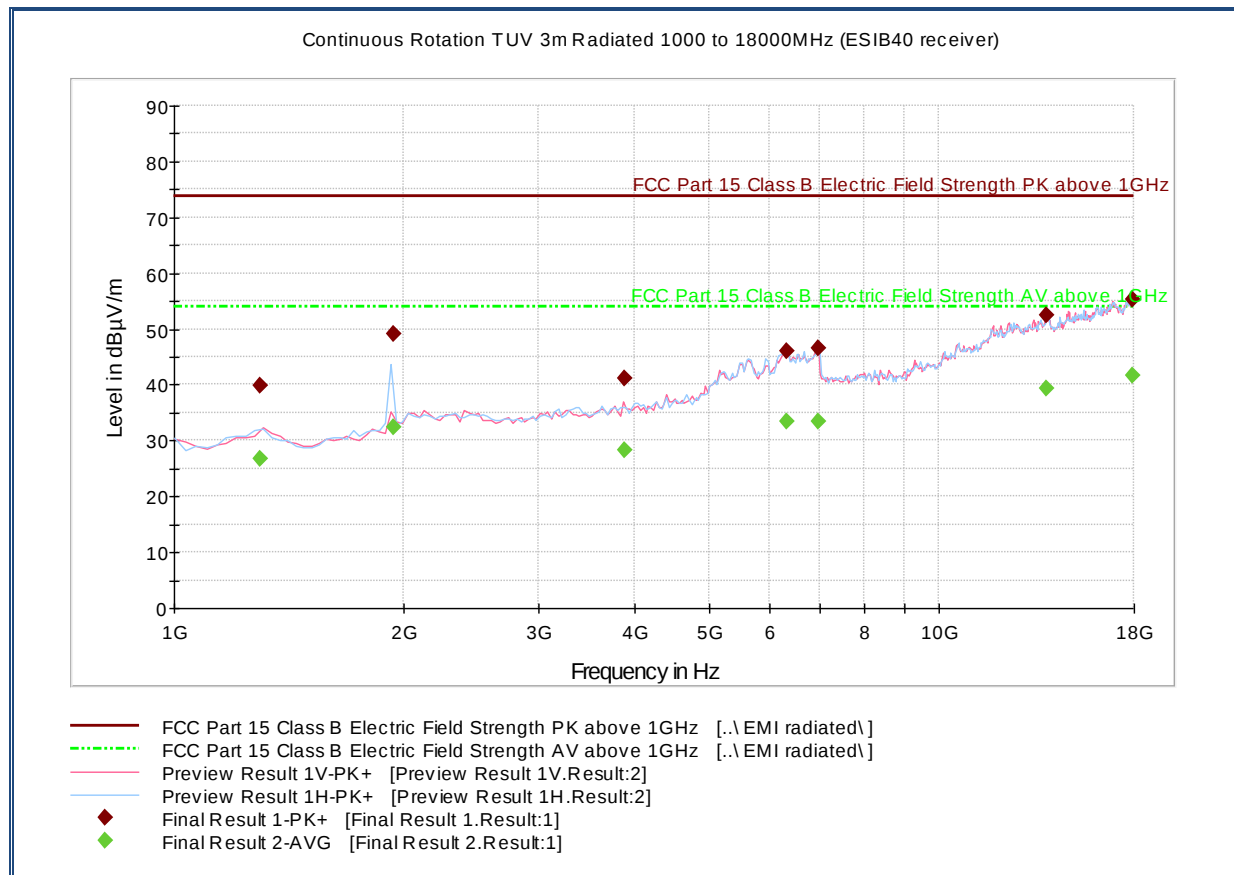
Peak Data

Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1303.41322	39.5	1000.0	1000.000	124.0	H	226.0	-4.4	34.4	73.9
1938.23967	48.5	1000.0	1000.000	410.0	H	239.0	-2.3	25.4	73.9
4042.46412	41.1	1000.0	1000.000	124.0	V	10.0	3.1	32.8	73.9
6229.29298	47.3	1000.0	1000.000	138.0	H	282.0	6.7	26.6	73.9
6968.72384	47.0	1000.0	1000.000	315.0	V	-3.0	7.8	26.9	73.9
10980.0320	48.4	1000.0	1000.000	350.0	H	118.0	13.8	25.5	73.9
17786.7230	54.9	1000.0	1000.000	350.0	V	3.0	23.0	19.0	73.9

Average Data

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1303.41322	26.6	1000.0	1000.000	124.0	H	226.0	-4.4	27.3	53.9
1938.23967	29.2	1000.0	1000.000	410.0	H	239.0	-2.3	24.7	53.9
4042.46412	28.6	1000.0	1000.000	124.0	V	10.0	3.1	25.3	53.9
6229.29298	33.3	1000.0	1000.000	138.0	H	282.0	6.7	20.6	53.9
6968.72384	33.6	1000.0	1000.000	315.0	V	-3.0	7.8	20.3	53.9
10980.0320	35.8	1000.0	1000.000	350.0	H	118.0	13.8	18.1	53.9
17786.7230	41.6	1000.0	1000.000	350.0	V	3.0	23.0	12.3	53.9

2.3.14 Test Results 1 GHz to 18 GHz Mid Channel 175 MHz BW (worst case configuration)



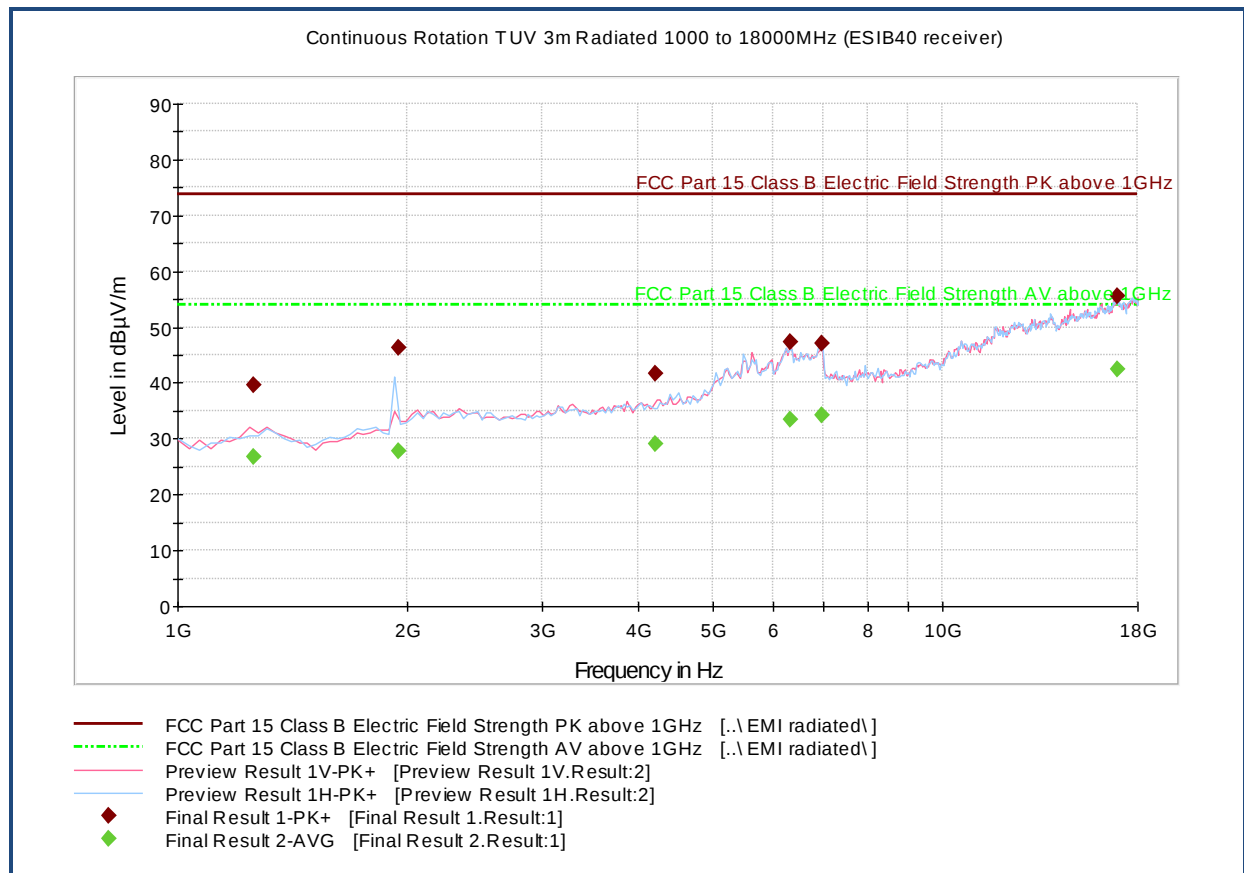
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1295.81322	39.9	1000.0	1000.000	188.0	V	-16.0	-5.3	34.0	73.9
1938.23967	49.0	1000.0	1000.000	410.0	H	0.0	-2.3	24.9	73.9
3880.52344	41.2	1000.0	1000.000	406.9	V	166.0	2.4	32.7	73.9
6325.82925	46.1	1000.0	1000.000	228.0	H	19.0	7.0	27.8	73.9
6968.32384	46.5	1000.0	1000.000	150.0	H	-9.0	7.8	27.4	73.9
13833.2873	52.3	1000.0	1000.000	150.0	H	338.0	18.3	21.6	73.9
17907.3955	55.4	1000.0	1000.000	250.0	H	120.0	23.2	18.5	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1295.81322	26.8	1000.0	1000.000	188.0	V	-16.0	-5.3	27.1	53.9
1938.23967	32.5	1000.0	1000.000	410.0	H	0.0	-2.3	21.4	53.9
3880.52344	28.4	1000.0	1000.000	406.9	V	166.0	2.4	25.5	53.9
6325.82925	33.4	1000.0	1000.000	228.0	H	19.0	7.0	20.5	53.9
6968.32384	33.4	1000.0	1000.000	150.0	H	-9.0	7.8	20.5	53.9
13833.2873	39.4	1000.0	1000.000	150.0	H	338.0	18.3	14.5	53.9
17907.3955	41.7	1000.0	1000.000	250.0	H	120.0	23.2	12.2	53.9

2.3.15 Test Results 1 GHz to 18 GHz High Channel 175 MHz BW (worst case configuration)



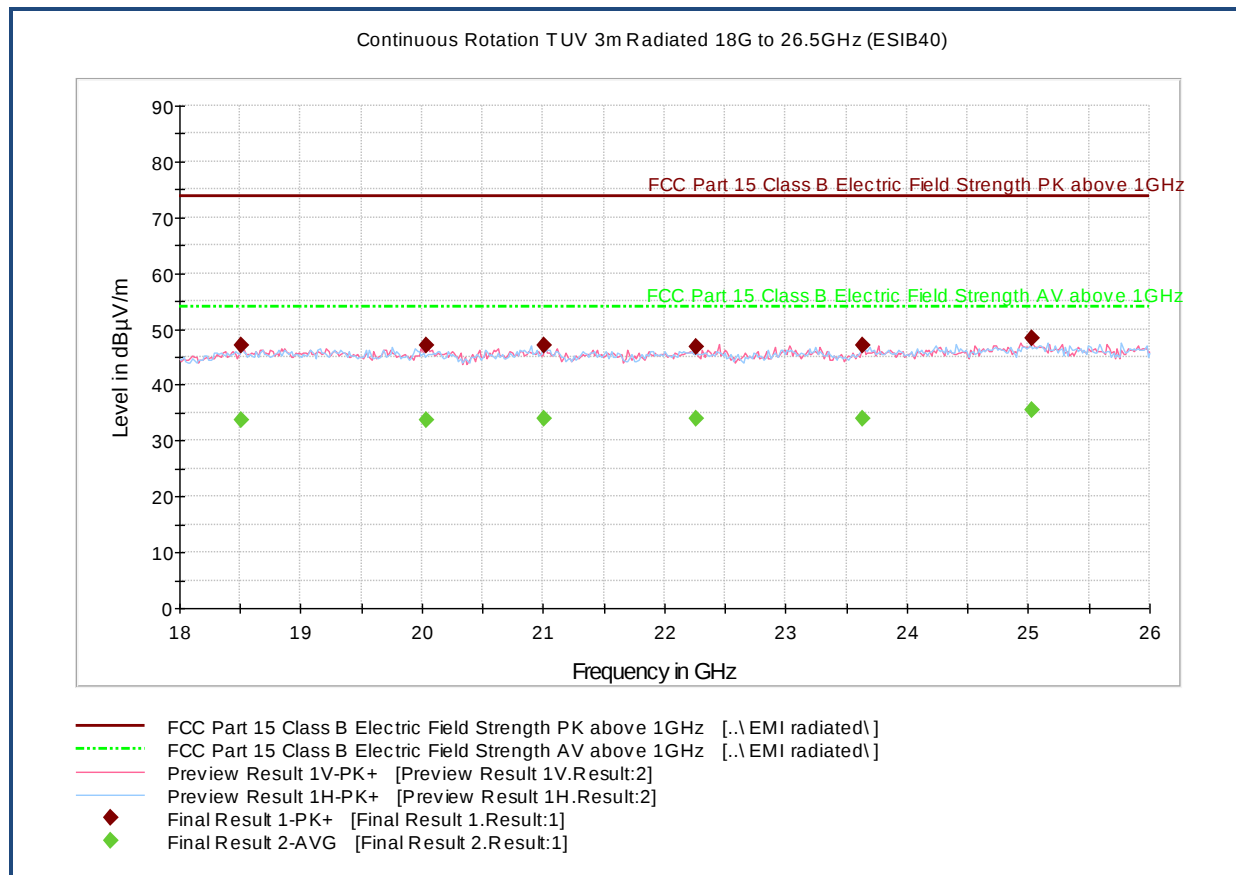
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1259.67695	39.5	1000.0	1000.000	200.0	V	20.0	-5.1	34.4	73.9
1943.83967	46.4	1000.0	1000.000	328.0	H	20.0	-2.2	27.5	73.9
4211.67294	41.5	1000.0	1000.000	138.0	V	123.0	3.0	32.4	73.9
6318.62925	47.3	1000.0	1000.000	350.0	V	341.0	6.9	26.6	73.9
6952.32384	46.9	1000.0	1000.000	350.0	V	281.0	7.8	27.0	73.9
16909.0196	55.6	1000.0	1000.000	350.0	V	143.0	23.1	18.3	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1259.67695	26.7	1000.0	1000.000	200.0	V	20.0	-5.1	27.2	53.9
1943.83967	27.7	1000.0	1000.000	328.0	H	20.0	-2.2	26.2	53.9
4211.67294	28.9	1000.0	1000.000	138.0	V	123.0	3.0	25.0	53.9
6318.62925	33.3	1000.0	1000.000	350.0	V	341.0	6.9	20.6	53.9
6952.32384	34.2	1000.0	1000.000	350.0	V	281.0	7.8	19.7	53.9
16909.0196	42.3	1000.0	1000.000	350.0	V	143.0	23.1	11.6	53.9

2.3.16 Test Results from 18 GHz to 26 GHz Low Channel 175 MHz BW (worst case configuration)



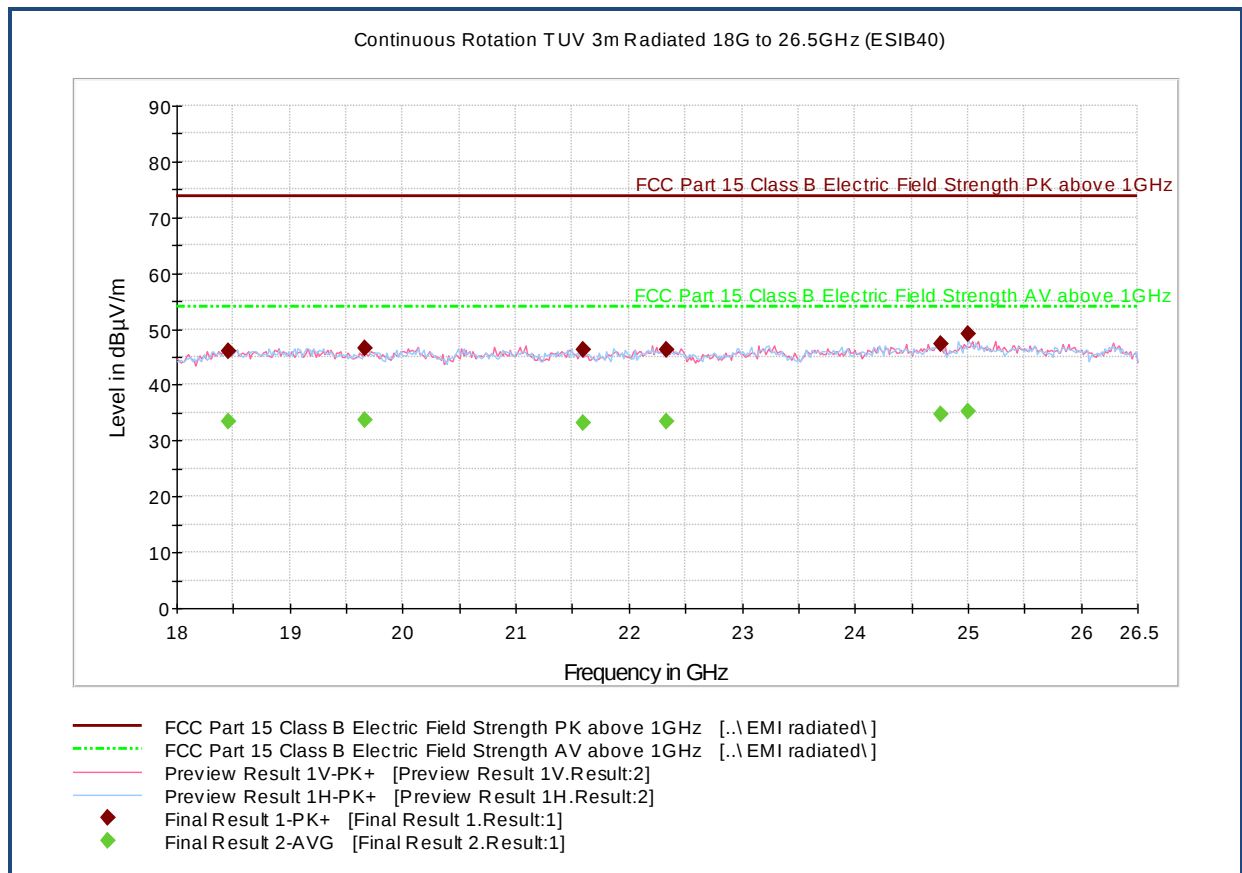
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
18513.6220	47.0	1000.0	1000.000	149.0	H	120.0	-0.5	26.9	73.9
20033.8881	47.2	1000.0	1000.000	149.0	V	167.0	-0.7	26.7	73.9
21004.8300	47.1	1000.0	1000.000	125.0	V	-6.0	-0.3	26.8	73.9
22255.1170	46.9	1000.0	1000.000	175.0	V	74.0	0.6	27.0	73.9
23634.4765	47.1	1000.0	1000.000	150.0	V	119.0	0.8	26.8	73.9
25027.6701	48.5	1000.0	1000.000	175.0	V	286.0	1.8	25.4	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
18513.6220	33.7	1000.0	1000.000	149.0	H	120.0	-0.5	20.2	53.9
20033.8881	33.8	1000.0	1000.000	149.0	V	167.0	-0.7	20.1	53.9
21004.8300	33.9	1000.0	1000.000	125.0	V	-6.0	-0.3	20.0	53.9
22255.1170	34.0	1000.0	1000.000	175.0	V	74.0	0.6	19.9	53.9
23634.4765	33.9	1000.0	1000.000	150.0	V	119.0	0.8	20.0	53.9
25027.6701	35.4	1000.0	1000.000	175.0	V	286.0	1.8	18.5	53.9

2.3.17 Test Results from 18 GHz to 26 GHz Mid Channel 175 MHz BW (worst case configuration)



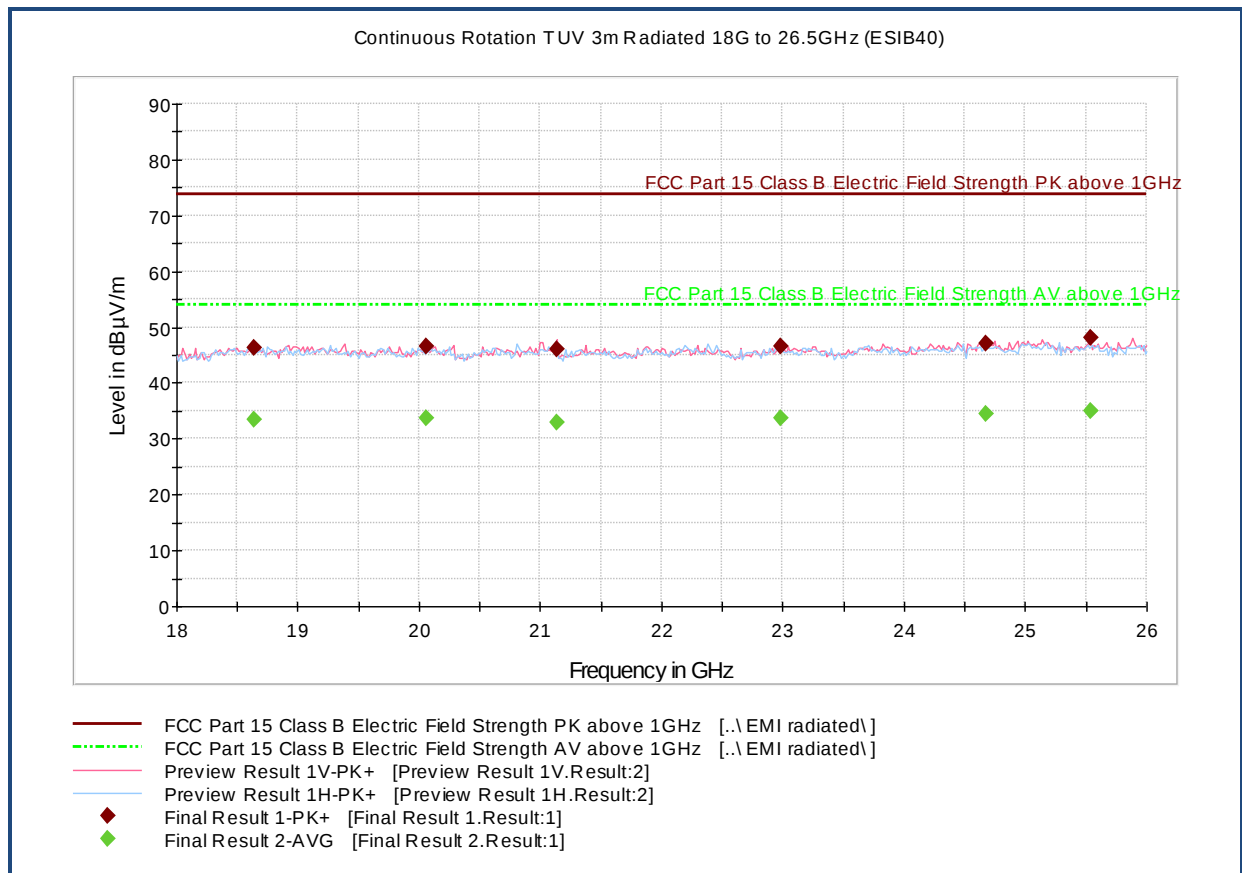
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
18458.9198	46.1	1000.0	1000.000	175.0	H	239.0	-0.6	27.8	73.9
19659.7046	46.6	1000.0	1000.000	175.0	V	237.0	-1.0	27.3	73.9
21599.5883	46.4	1000.0	1000.000	163.0	H	272.0	-0.2	27.5	73.9
22336.6873	46.2	1000.0	1000.000	150.0	V	89.0	0.6	27.7	73.9
24762.7250	47.4	1000.0	1000.000	175.0	H	10.0	1.6	26.5	73.9
25006.4020	49.0	1000.0	1000.000	125.0	H	254.0	1.8	24.9	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
18458.9198	33.4	1000.0	1000.000	175.0	H	239.0	-0.6	20.5	53.9
19659.7046	33.8	1000.0	1000.000	175.0	V	237.0	-1.0	20.1	53.9
21599.5883	33.3	1000.0	1000.000	163.0	H	272.0	-0.2	20.6	53.9
22336.6873	33.3	1000.0	1000.000	150.0	V	89.0	0.6	20.6	53.9
24762.7250	34.6	1000.0	1000.000	175.0	H	10.0	1.6	19.3	53.9
25006.4020	35.3	1000.0	1000.000	125.0	H	254.0	1.8	18.6	53.9

2.3.18 Test Results from 18 GHz to 26 GHz High Channel 175 MHz BW (worst case configuration)



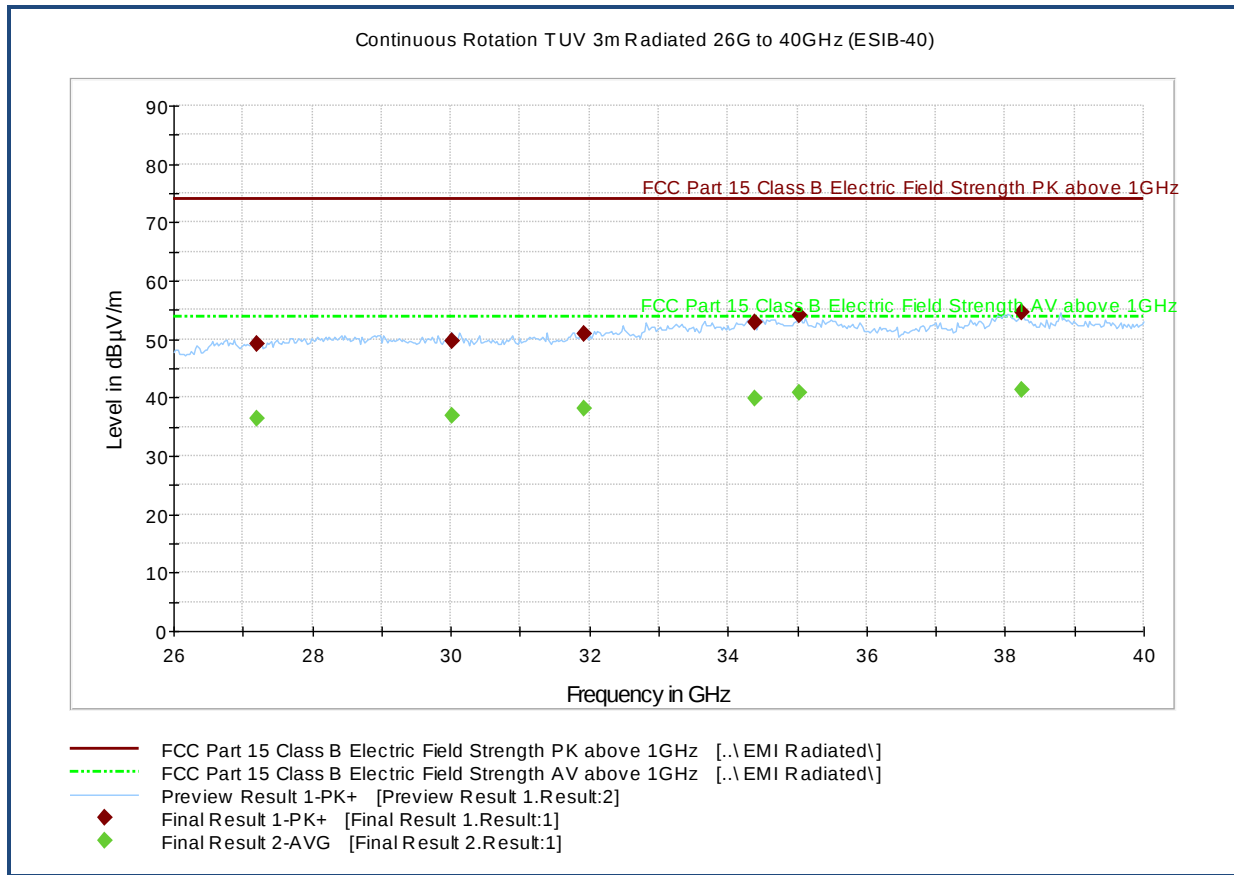
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
18638.6945	46.3	1000.0	1000.000	175.0	V	351.0	-0.7	27.6	73.9
20064.5222	46.6	1000.0	1000.000	175.0	V	94.0	-0.8	27.3	73.9
21141.2685	46.0	1000.0	1000.000	175.0	V	3.0	-0.3	27.9	73.9
22978.1478	46.6	1000.0	1000.000	162.0	H	283.0	0.7	27.3	73.9
24671.7206	47.1	1000.0	1000.000	175.0	V	21.0	1.6	26.8	73.9
25539.6581	48.0	1000.0	1000.000	175.0	V	193.0	1.5	25.9	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
18638.6945	33.4	1000.0	1000.000	175.0	V	351.0	-0.7	20.5	53.9
20064.5222	33.8	1000.0	1000.000	175.0	V	94.0	-0.8	20.1	53.9
21141.2685	33.0	1000.0	1000.000	175.0	V	3.0	-0.3	20.9	53.9
22978.1478	33.7	1000.0	1000.000	162.0	H	283.0	0.7	20.2	53.9
24671.7206	34.5	1000.0	1000.000	175.0	V	21.0	1.6	19.4	53.9
25539.6581	34.8	1000.0	1000.000	175.0	V	193.0	1.5	19.1	53.9

2.3.19 Test Results from 26 GHz to 40 GHz Low Channel 175 MHz BW (worst case configuration)



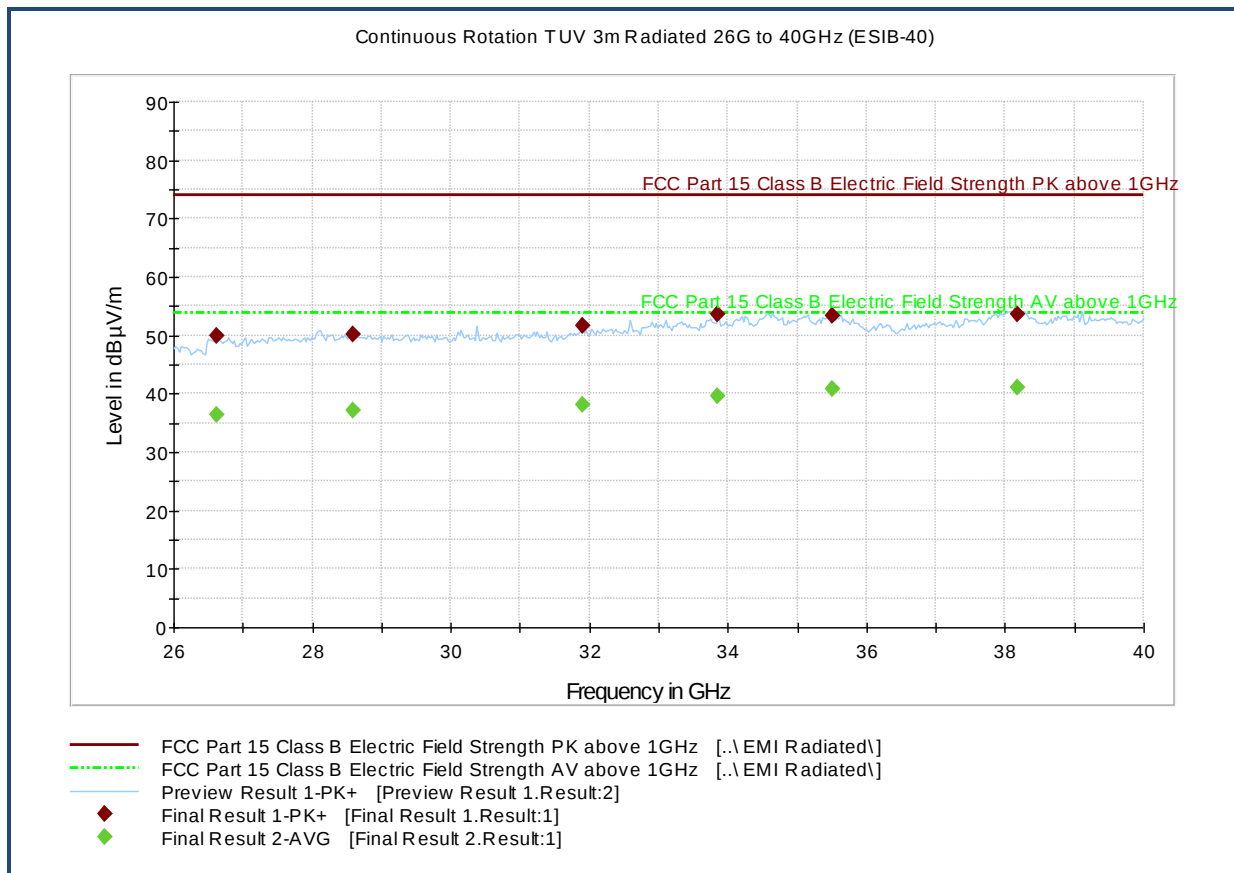
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
27204.2128	49.1	1000.0	1000.000	152.0	V	329.0	2.5	24.8	73.9
30017.4240	49.6	1000.0	1000.000	147.0	H	203.0	3.6	24.3	73.9
31925.2396	50.9	1000.0	1000.000	177.0	V	57.0	4.4	23.0	73.9
34380.9775	53.0	1000.0	1000.000	140.0	H	170.0	5.9	20.9	73.9
35028.6681	54.2	1000.0	1000.000	152.0	V	346.0	6.2	19.7	73.9
38244.6649	54.5	1000.0	1000.000	127.0	H	286.0	8.1	19.4	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
27204.2128	36.5	1000.0	1000.000	152.0	V	329.0	2.5	17.4	53.9
30017.4240	36.9	1000.0	1000.000	147.0	H	203.0	3.6	17.0	53.9
31925.2396	38.1	1000.0	1000.000	177.0	V	57.0	4.4	15.8	53.9
34380.9775	39.7	1000.0	1000.000	140.0	H	170.0	5.9	14.2	53.9
35028.6681	40.9	1000.0	1000.000	152.0	V	346.0	6.2	13.0	53.9
38244.6649	41.4	1000.0	1000.000	127.0	H	286.0	8.1	12.5	53.9

2.3.20 Test Results from 26 GHz to 40 GHz Mid Channel 175 MHz BW (worst case configuration)



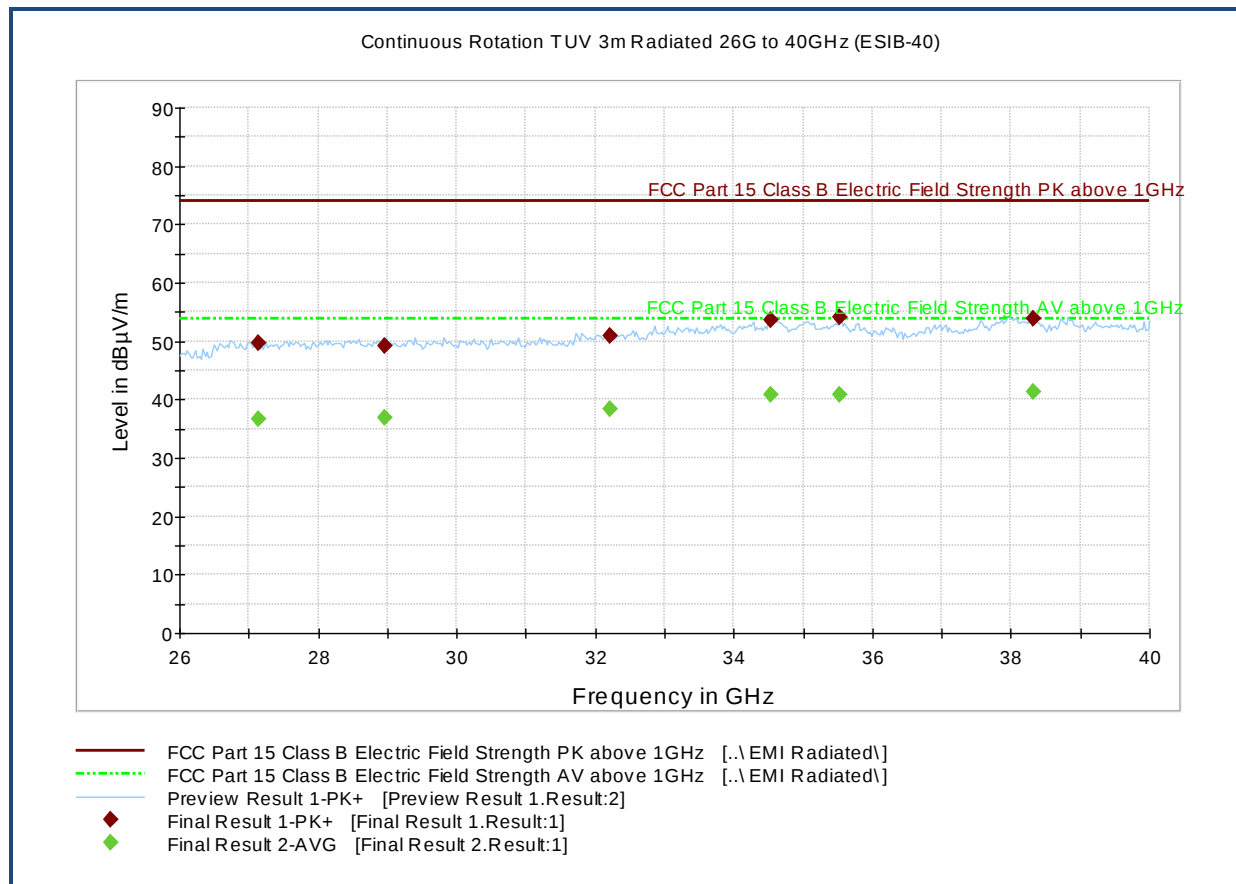
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
26624.6344	50.0	1000.0	1000.000	177.0	V	3.0	2.2	23.9	73.9
28584.1623	50.2	1000.0	1000.000	152.0	V	74.0	3.5	23.7	73.9
31892.7835	51.6	1000.0	1000.000	127.0	H	154.0	4.3	22.3	73.9
33851.5114	53.6	1000.0	1000.000	147.0	H	70.0	5.7	20.3	73.9
35505.6220	53.3	1000.0	1000.000	147.0	H	355.0	6.6	20.6	73.9
38182.9527	53.7	1000.0	1000.000	152.0	V	20.0	8.0	20.2	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
26624.6344	36.5	1000.0	1000.000	177.0	V	3.0	2.2	17.4	53.9
28584.1623	37.1	1000.0	1000.000	152.0	V	74.0	3.5	16.8	53.9
31892.7835	38.1	1000.0	1000.000	127.0	H	154.0	4.3	15.8	53.9
33851.5114	39.5	1000.0	1000.000	147.0	H	70.0	5.7	14.4	53.9
35505.6220	40.8	1000.0	1000.000	147.0	H	355.0	6.6	13.1	53.9
38182.9527	41.0	1000.0	1000.000	152.0	V	20.0	8.0	12.9	53.9

2.3.21 Test Results from 26 GHz to 40 GHz High Channel 175 MHz BW (worst case configuration)



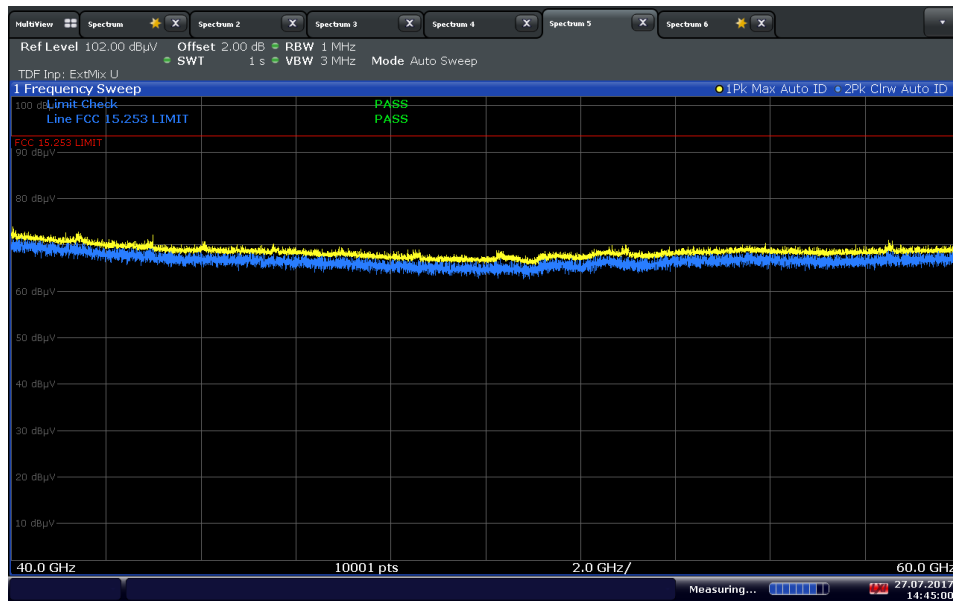
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
27130.8444	49.7	1000.0	1000.000	154.0	H	278.0	2.5	24.2	73.9
28971.3478	49.3	1000.0	1000.000	173.9	H	229.0	3.5	24.6	73.9
32220.2569	51.0	1000.0	1000.000	124.0	V	268.0	4.5	22.9	73.9
34537.2581	53.7	1000.0	1000.000	134.0	V	187.0	6.0	20.2	73.9
35533.2781	54.0	1000.0	1000.000	124.0	V	271.0	6.6	19.9	73.9
38321.6332	53.9	1000.0	1000.000	144.0	H	91.0	8.1	20.0	73.9

Average Data

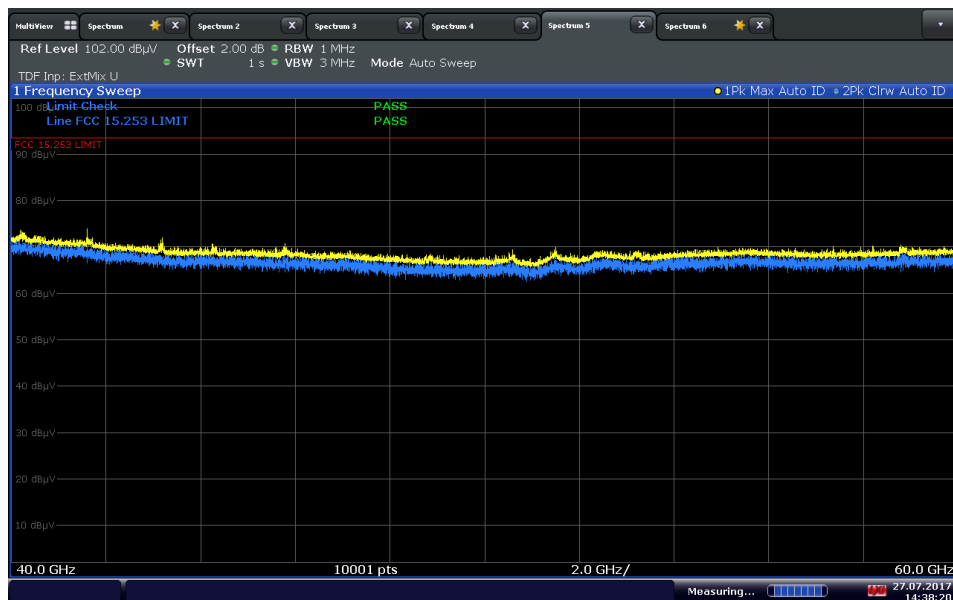
Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
27130.8444	36.7	1000.0	1000.000	154.0	H	278.0	2.5	17.2	53.9
28971.3478	36.9	1000.0	1000.000	173.9	H	229.0	3.5	17.0	53.9
32220.2569	38.3	1000.0	1000.000	124.0	V	268.0	4.5	15.6	53.9
34537.2581	40.7	1000.0	1000.000	134.0	V	187.0	6.0	13.2	53.9
35533.2781	40.8	1000.0	1000.000	124.0	V	271.0	6.6	13.1	53.9
38321.6332	41.4	1000.0	1000.000	144.0	H	91.0	8.1	12.5	53.9

2.3.22 Test Results 40 GHz to 300 GHz



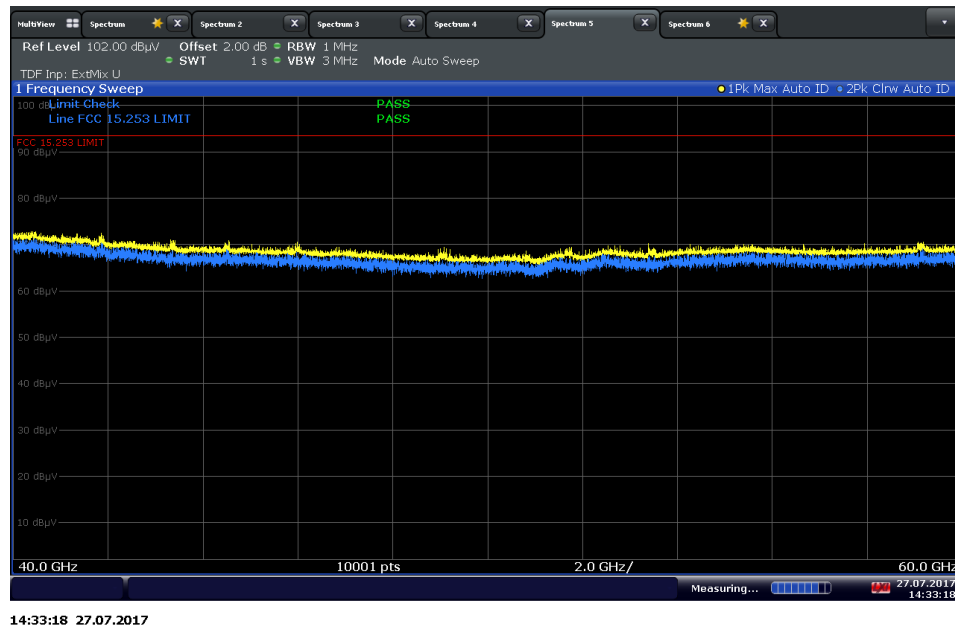
14:45:01 27.07.2017

40 to 60 GHz Low Channel 175 MHz BW

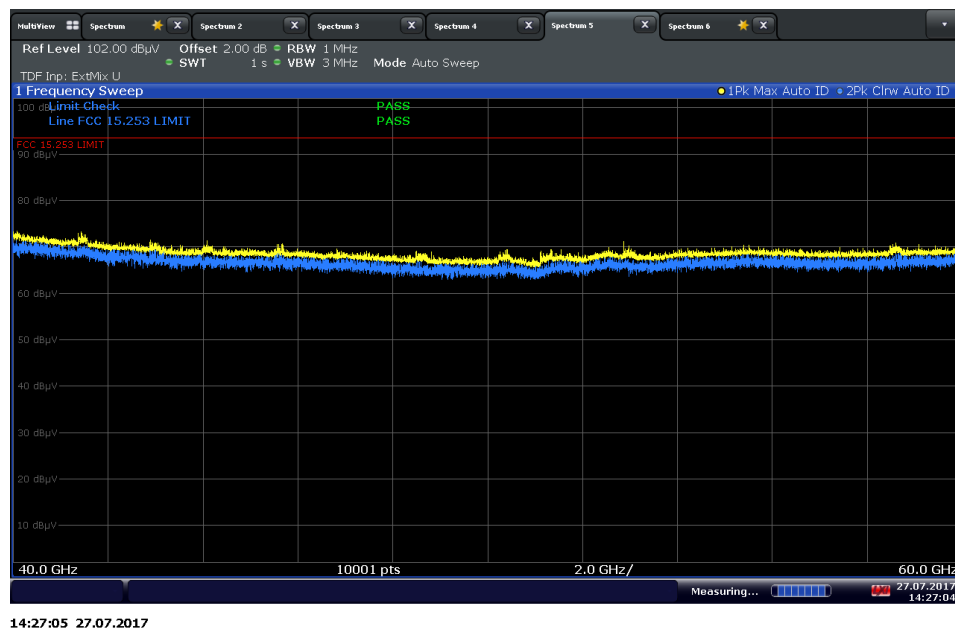


14:38:21 27.07.2017

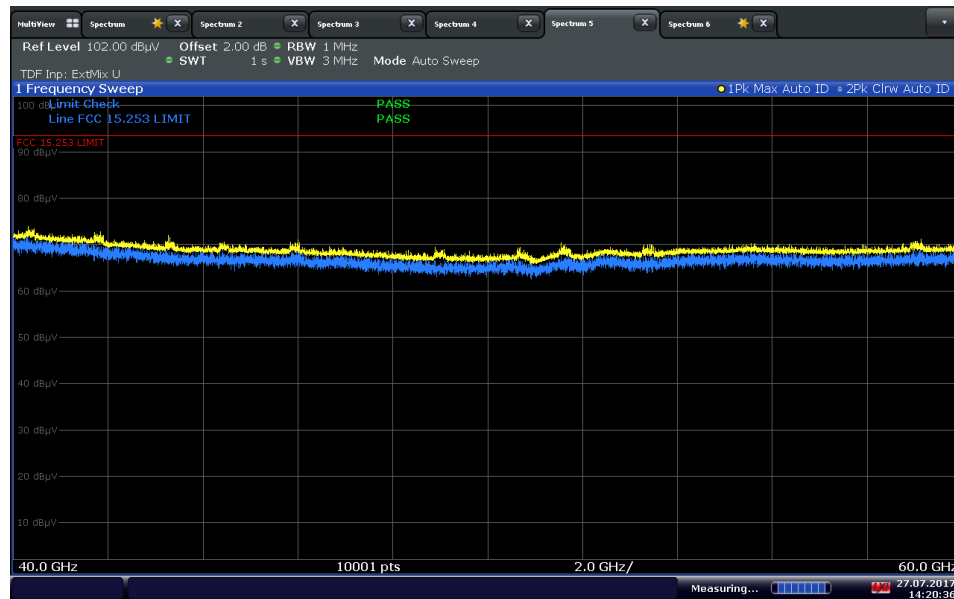
40 to 60 GHz Mid Channel 175 MHz BW



40 to 60 GHz High Channel 175 MHz BW

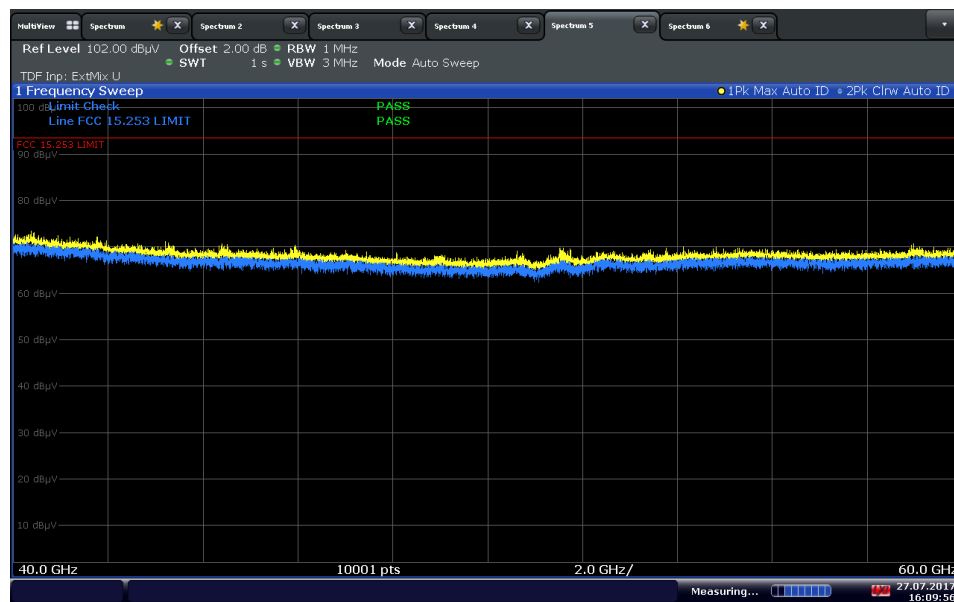


40 to 60 GHz Low Channel 300 MHz BW



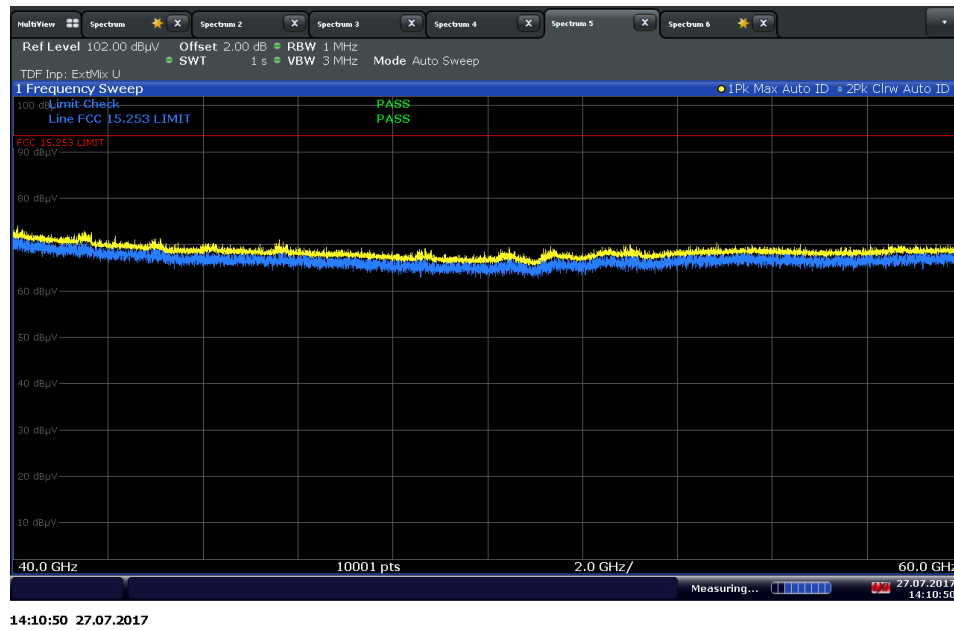
14:20:37 27.07.2017

40 to 60 GHz Mid Channel 300 MHz BW

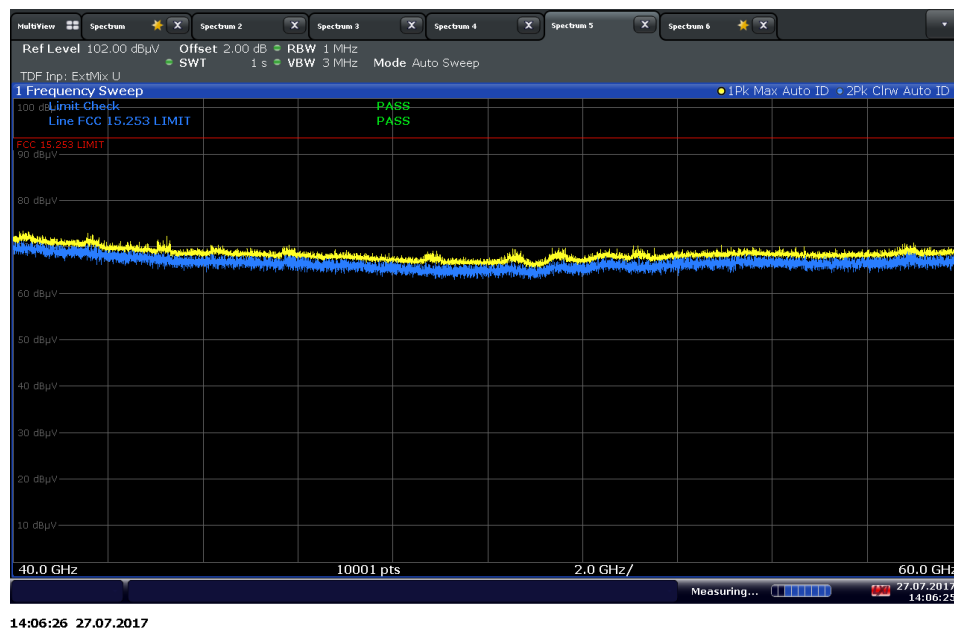


16:09:57 27.07.2017

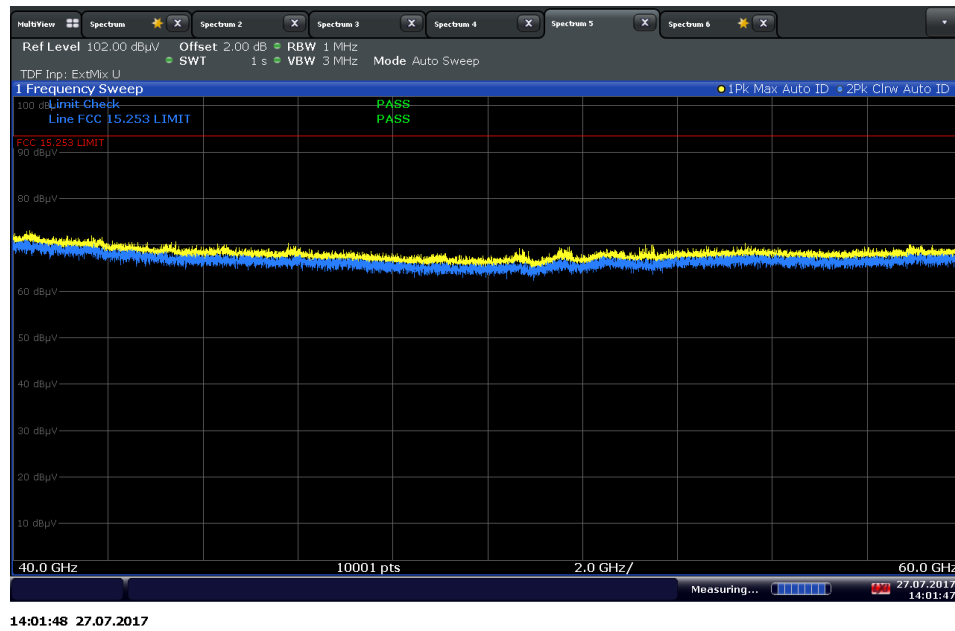
40 to 60 GHz High Channel 300 MHz BW



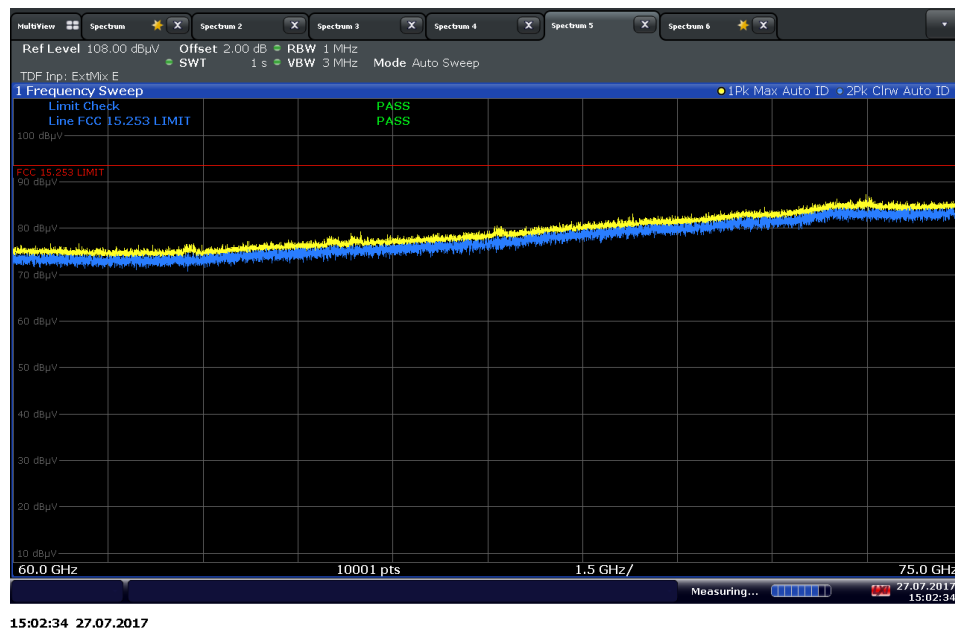
40 to 60 GHz Low Channel 425 MHz BW



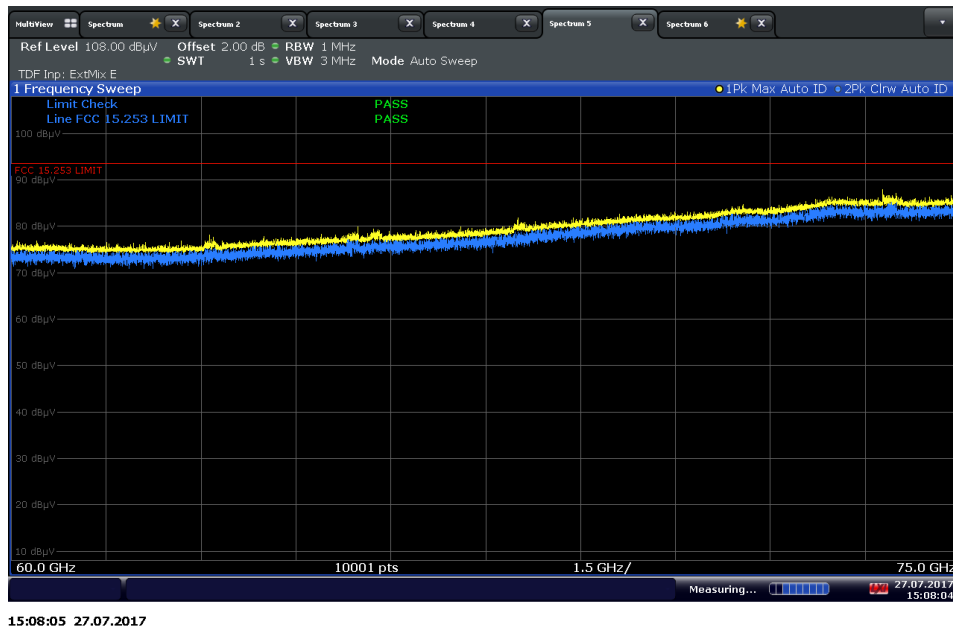
40 to 60 GHz Mid Channel 425 MHz BW



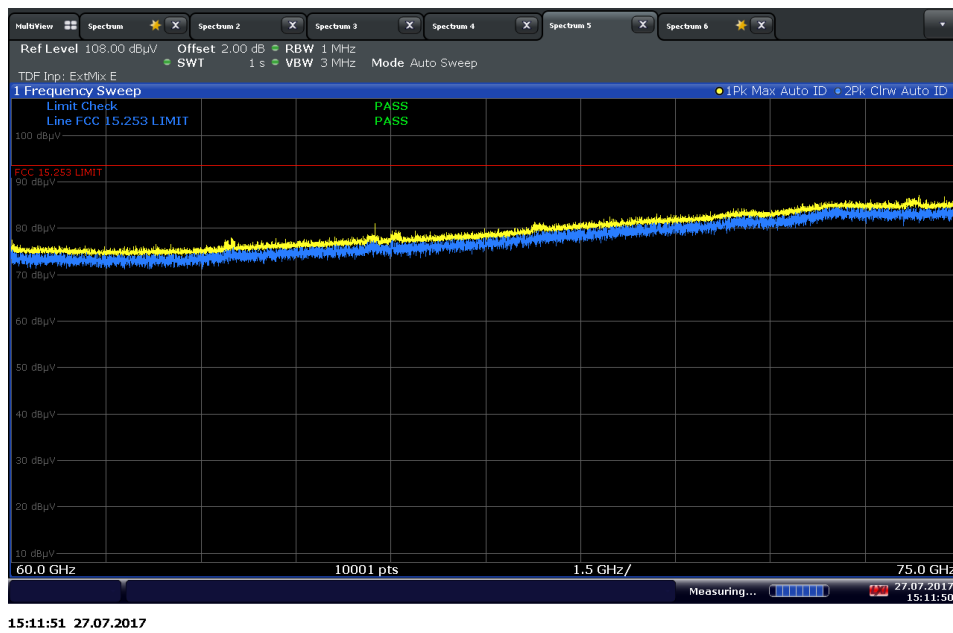
40 to 60 GHz High Channel 425 MHz BW



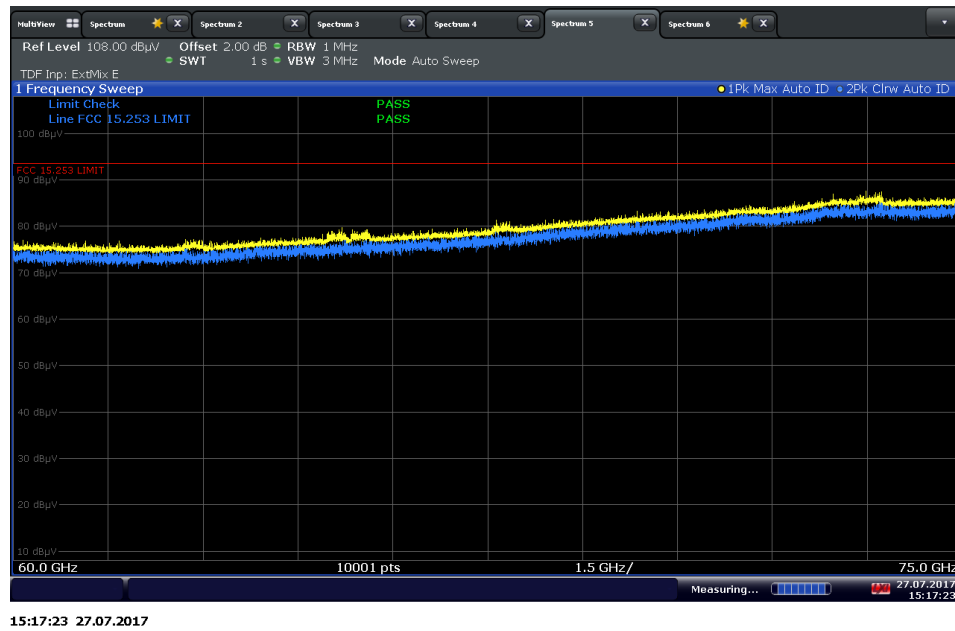
60 to 75 GHz Low Channel 175 MHz BW



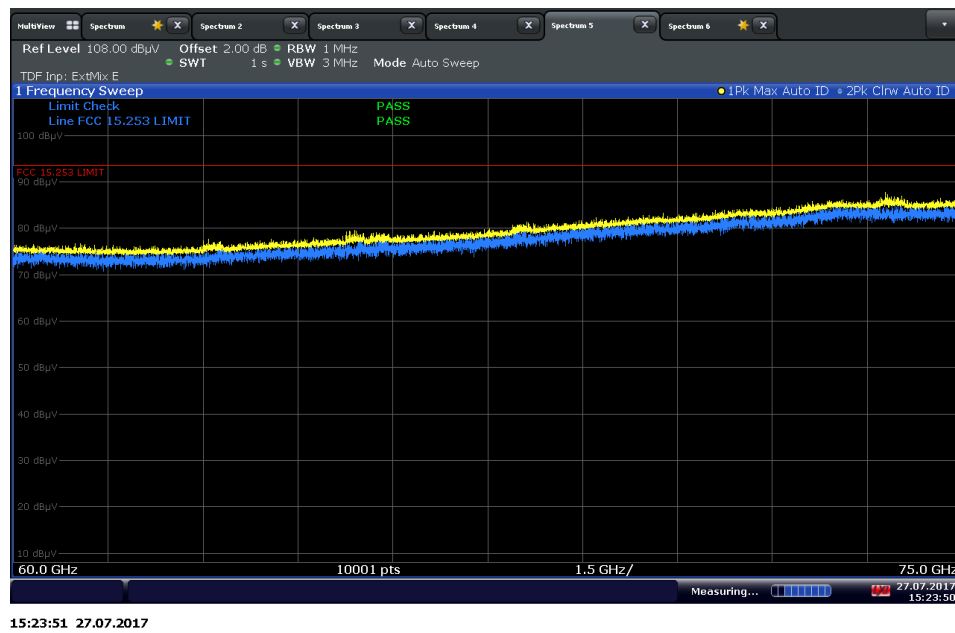
60 to 75 GHz Mid Channel 175 MHz BW



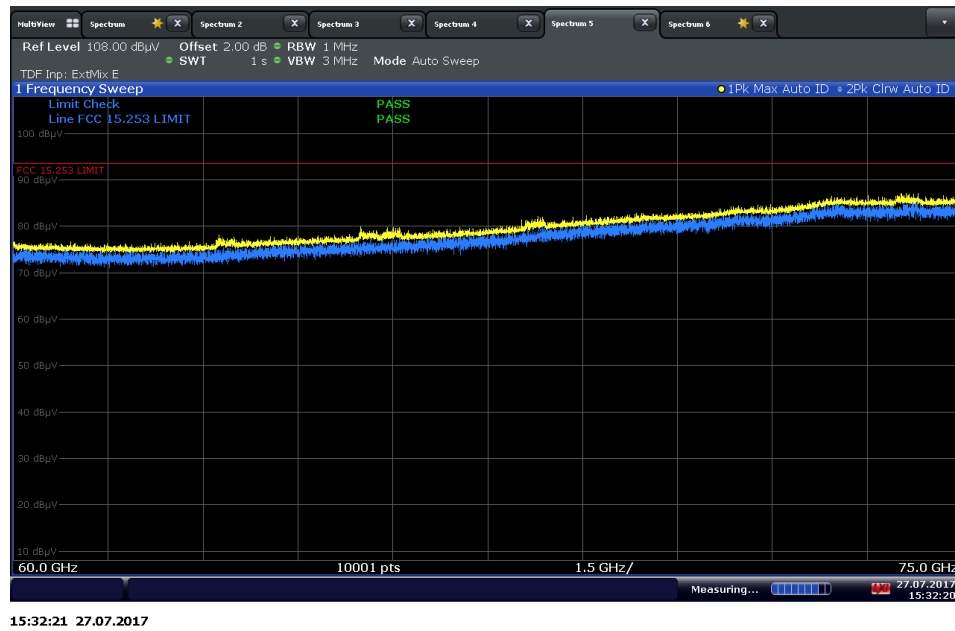
60 to 75 GHz High Channel 175 MHz BW



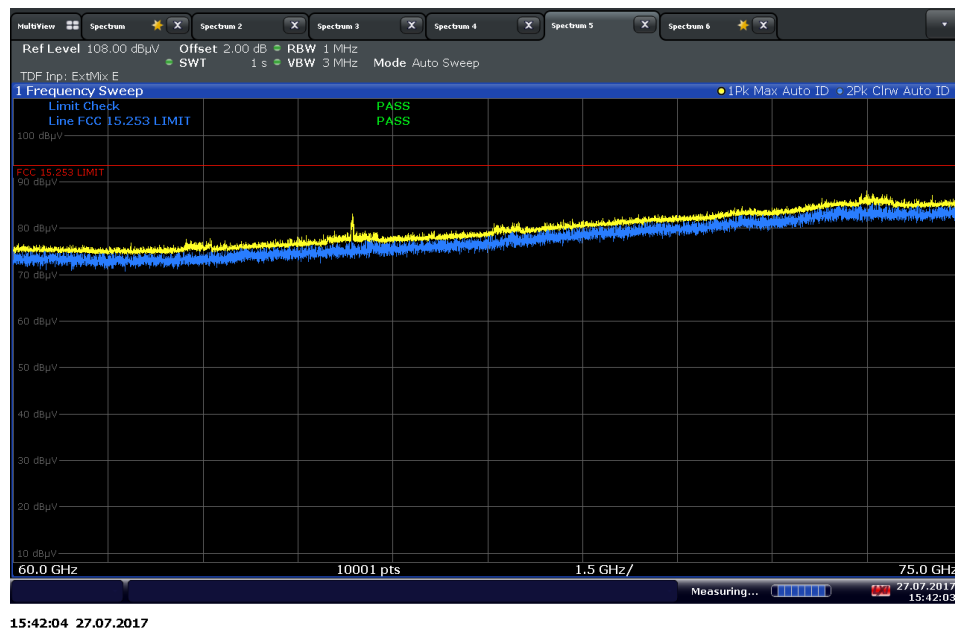
60 to 75 GHz Low Channel 300 MHz BW



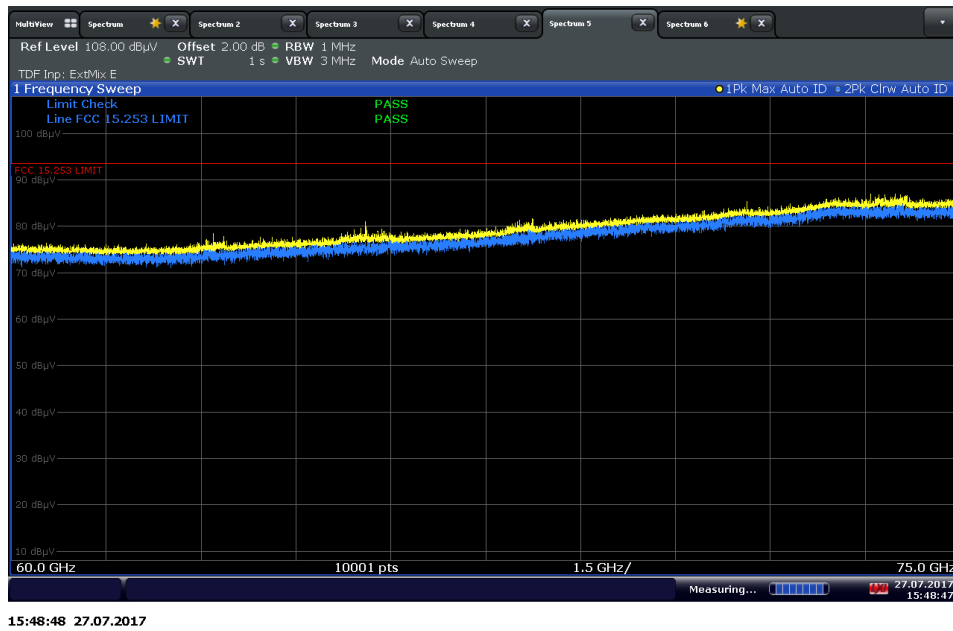
60 to 75 GHz Mid Channel 300 MHz BW



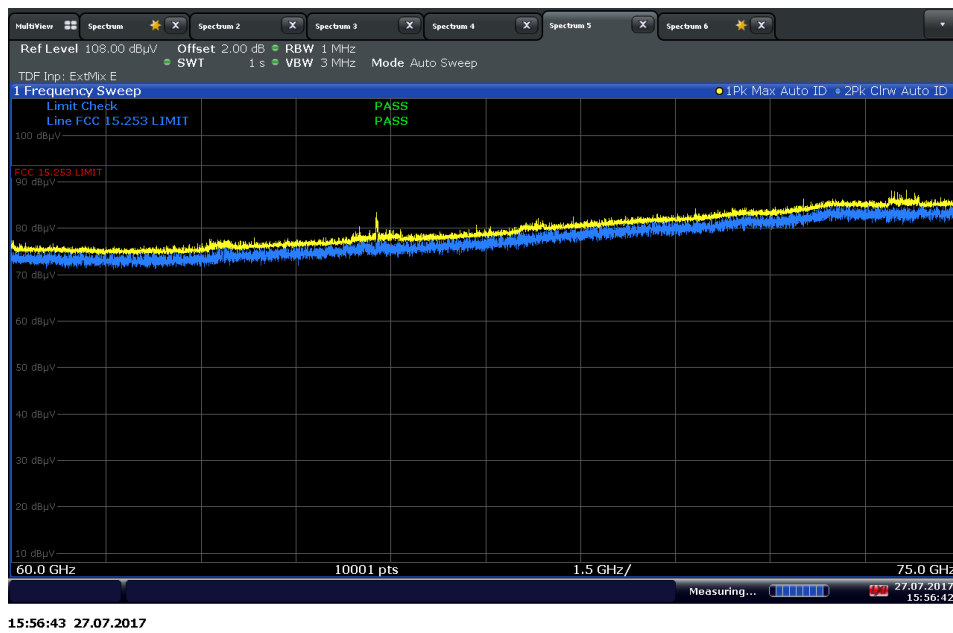
60 to 75 GHz High Channel 300 MHz BW



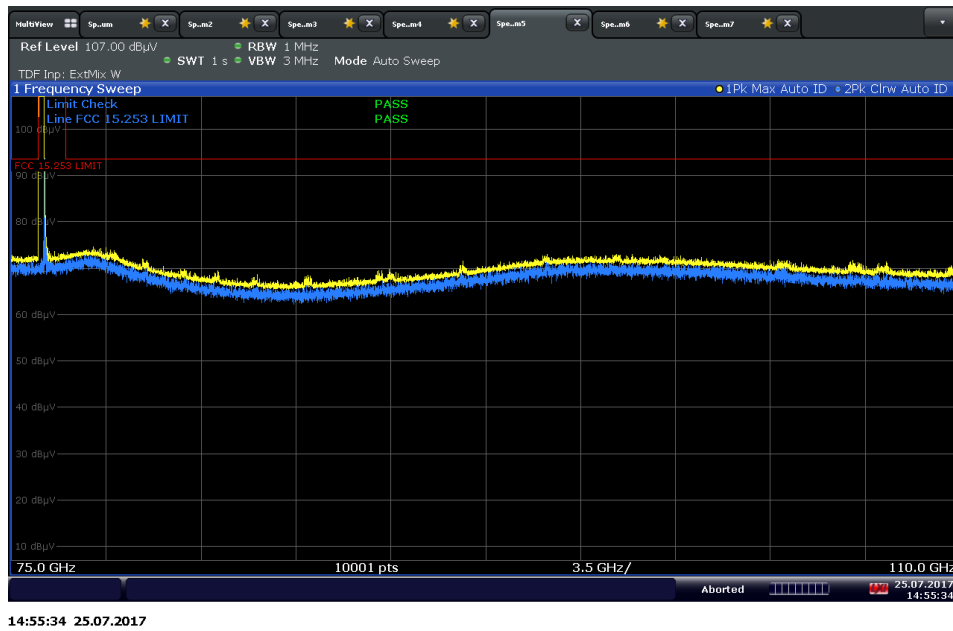
60 to 75 GHz Low Channel 425 MHz BW



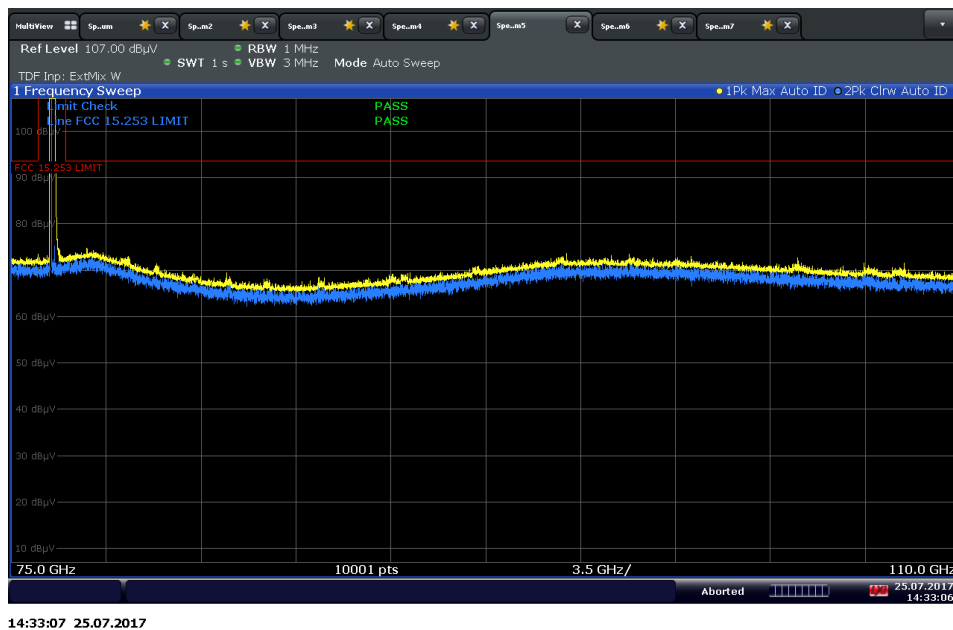
60 to 75 GHz Mid Channel 425 MHz BW



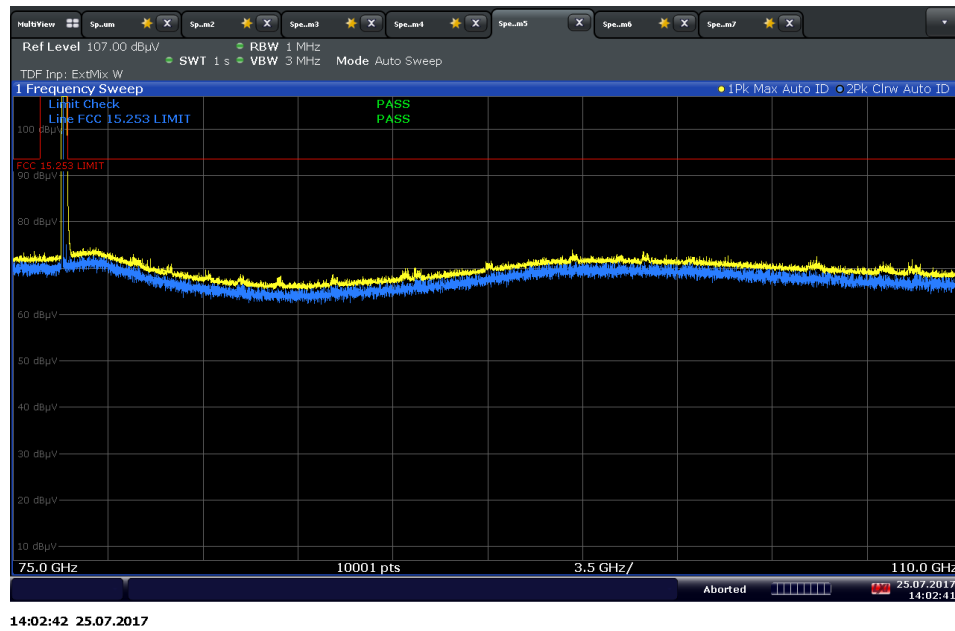
60 to 75 GHz High Channel 425 MHz BW



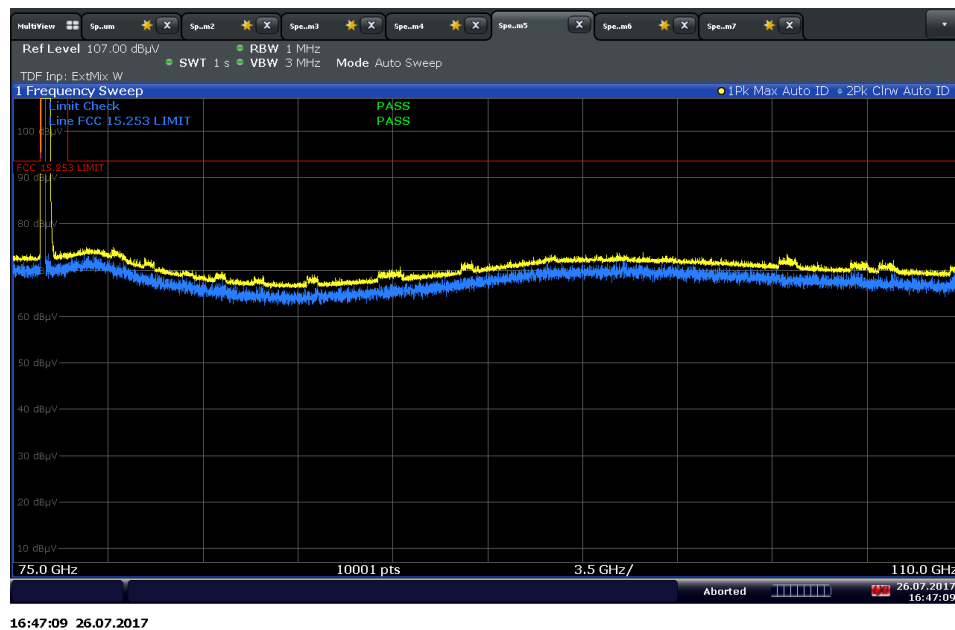
75 to 110 GHz Low Channel 175 MHz BW



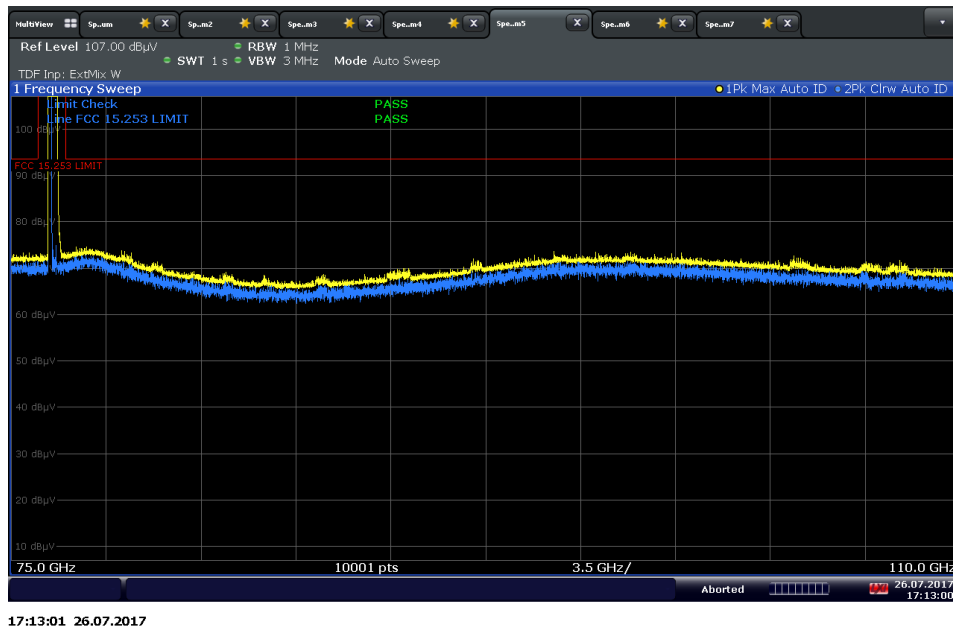
75 to 110 GHz Mid Channel 175 MHz BW



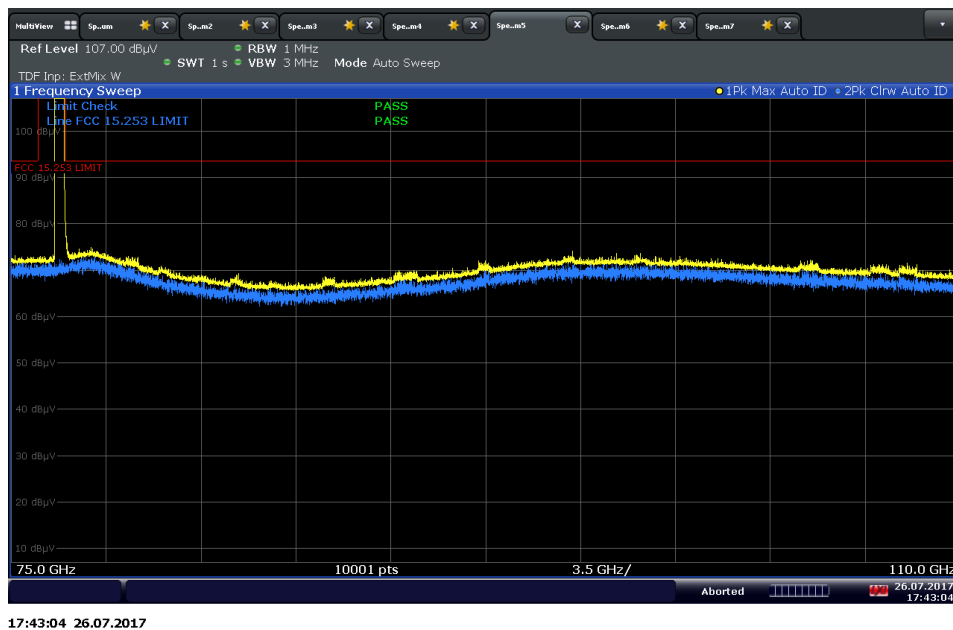
75 to 110 GHz High Channel 175 MHz BW



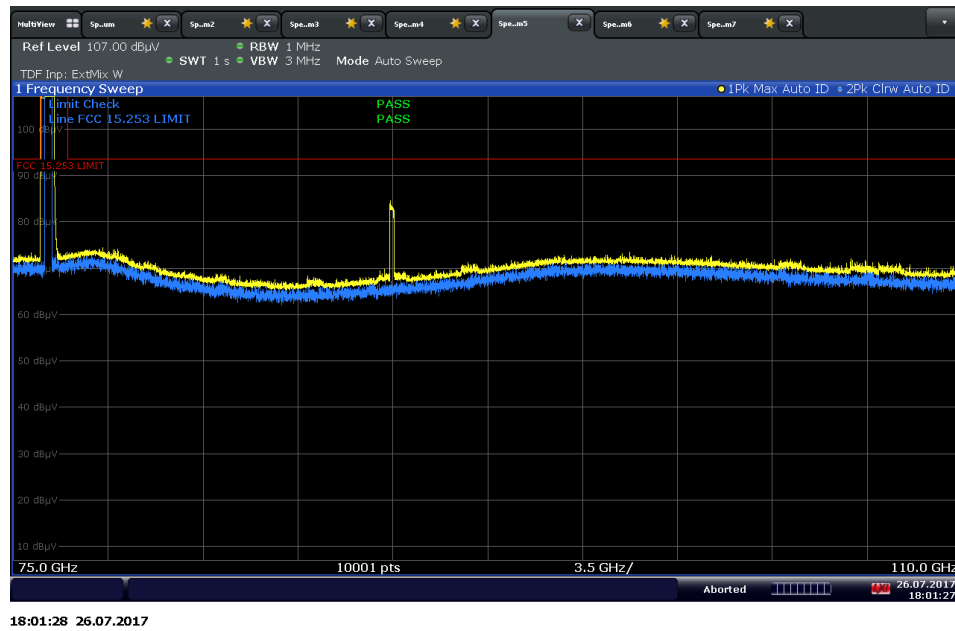
75 to 110 GHz Low Channel 300 MHz BW



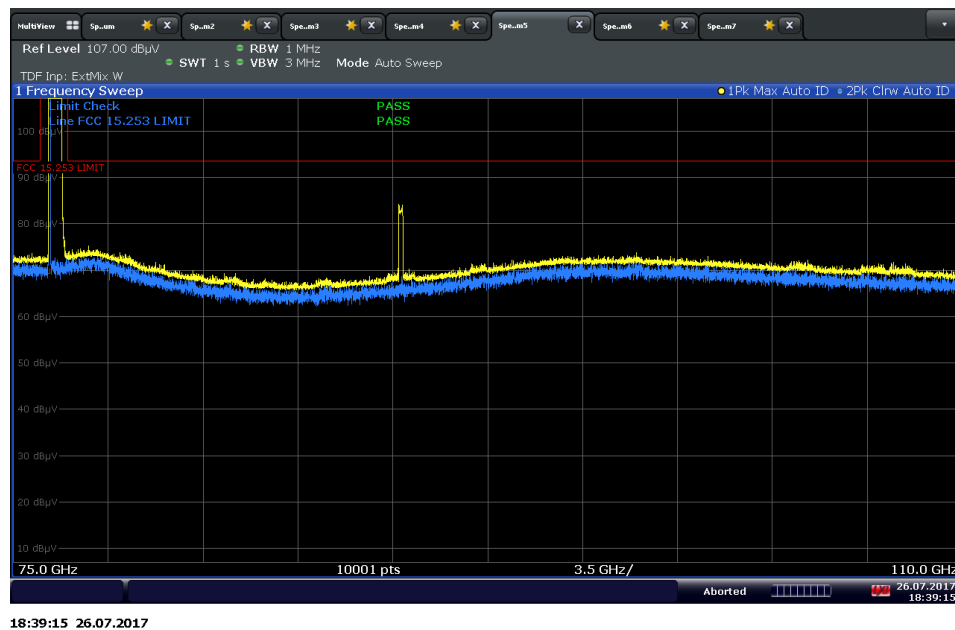
75 to 110 GHz Mid Channel 300 MHz BW



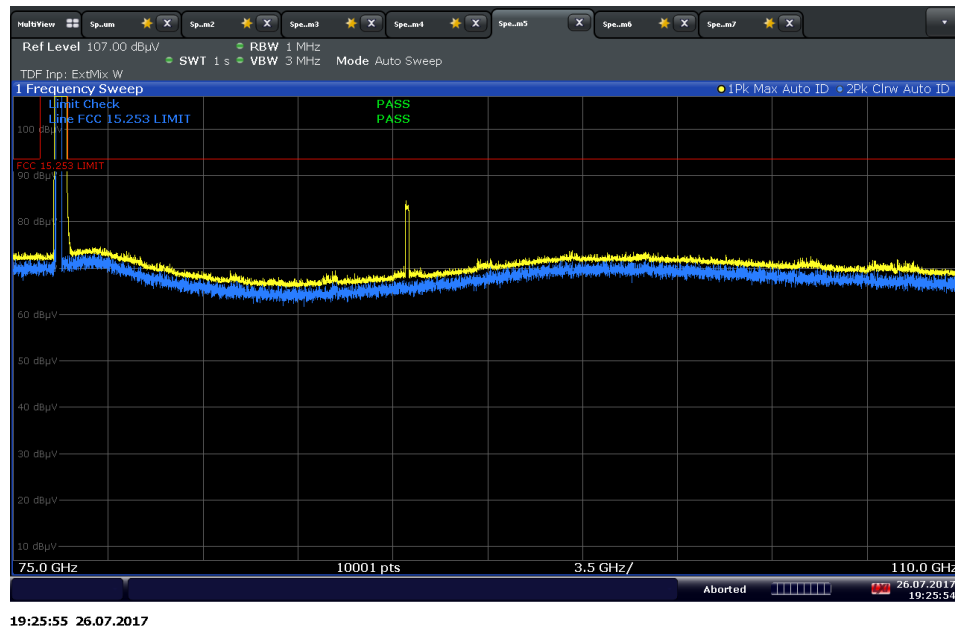
75 to 110 GHz High Channel 300 MHz BW



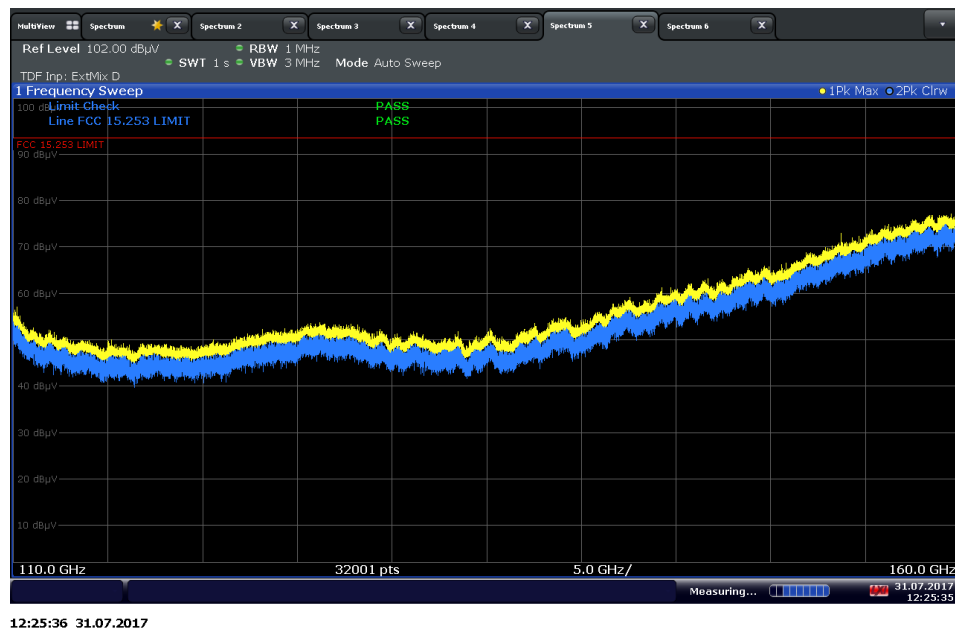
75 to 110 GHz Low Channel 425 MHz BW



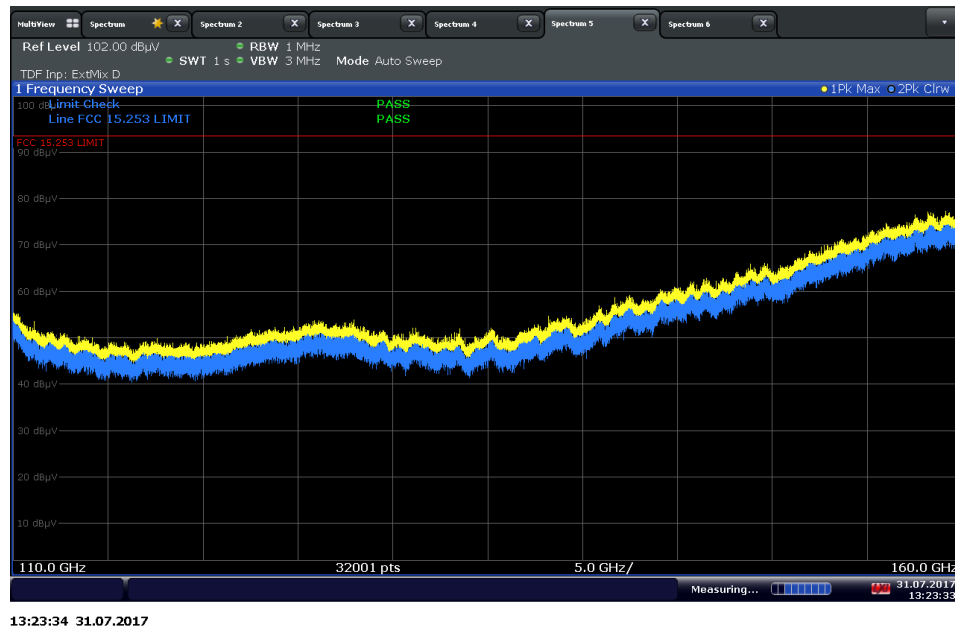
75 to 110 GHz Mid Channel 425 MHz BW



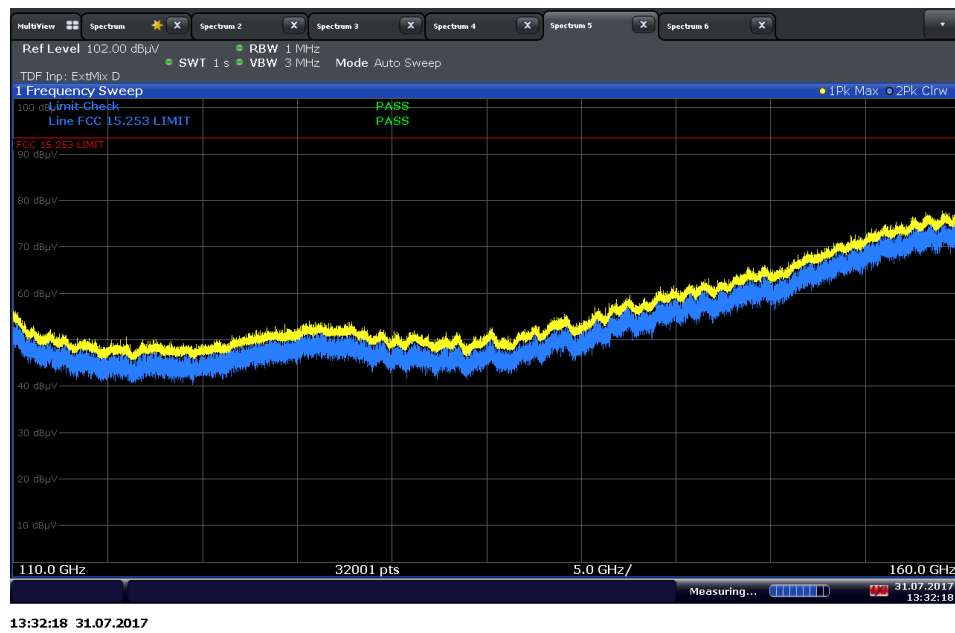
75 to 110 GHz High Channel 425 MHz BW



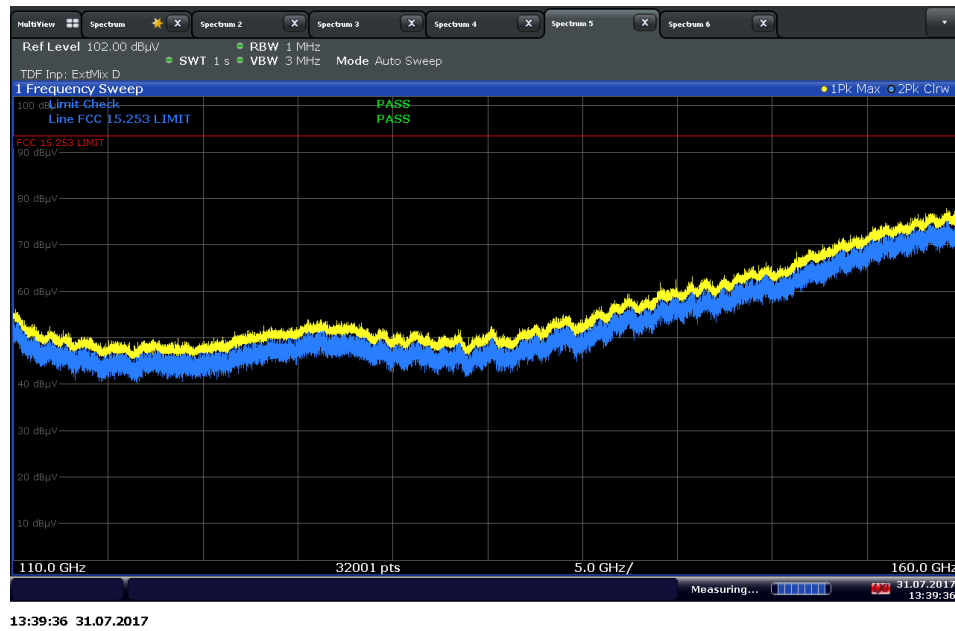
110 to 160 GHz Low Channel 175 MHz BW



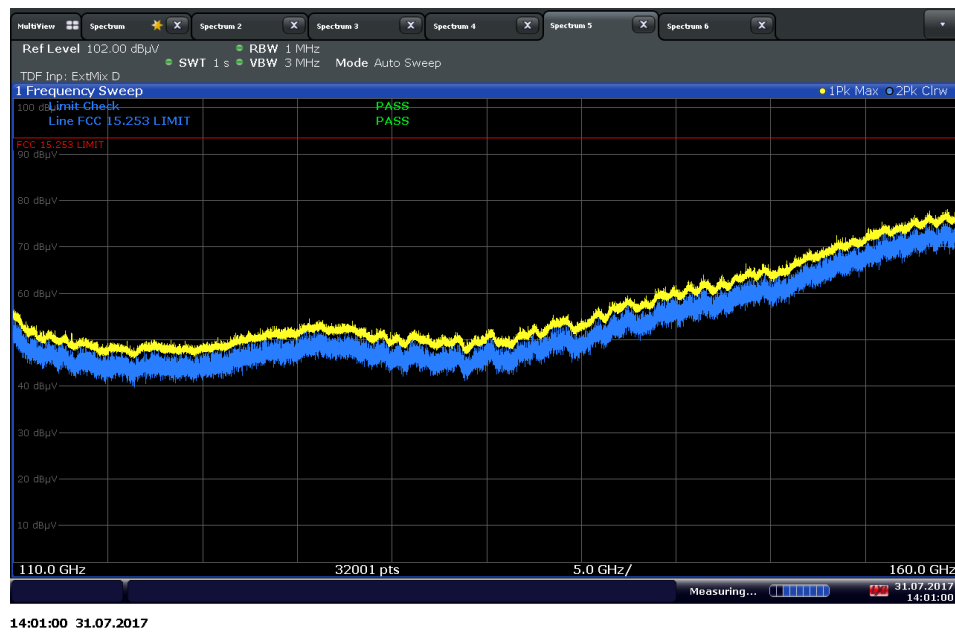
110 to 160 GHz Mid Channel 175 MHz BW



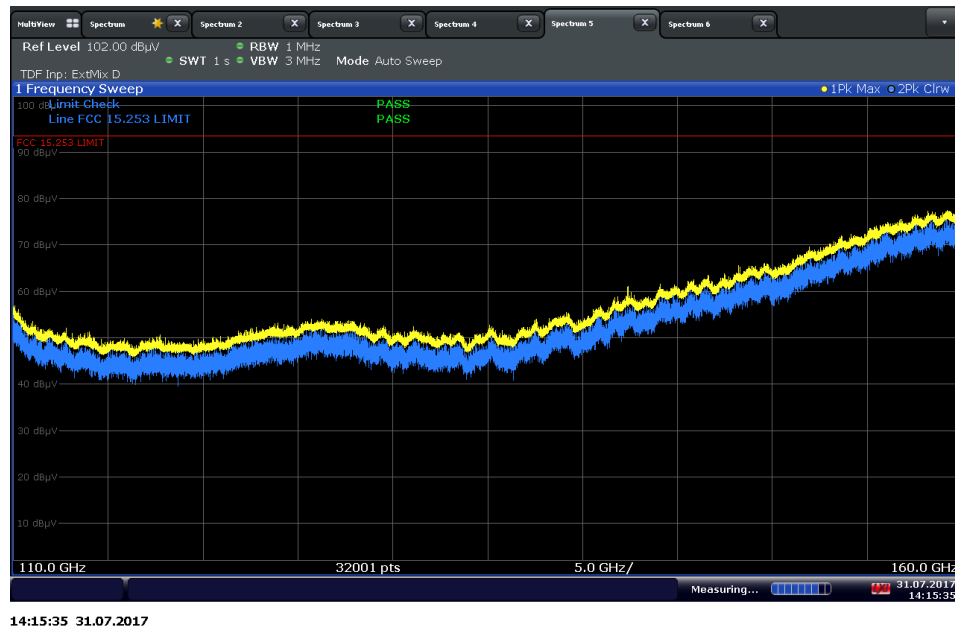
110 to 160 GHz High Channel 175 MHz BW



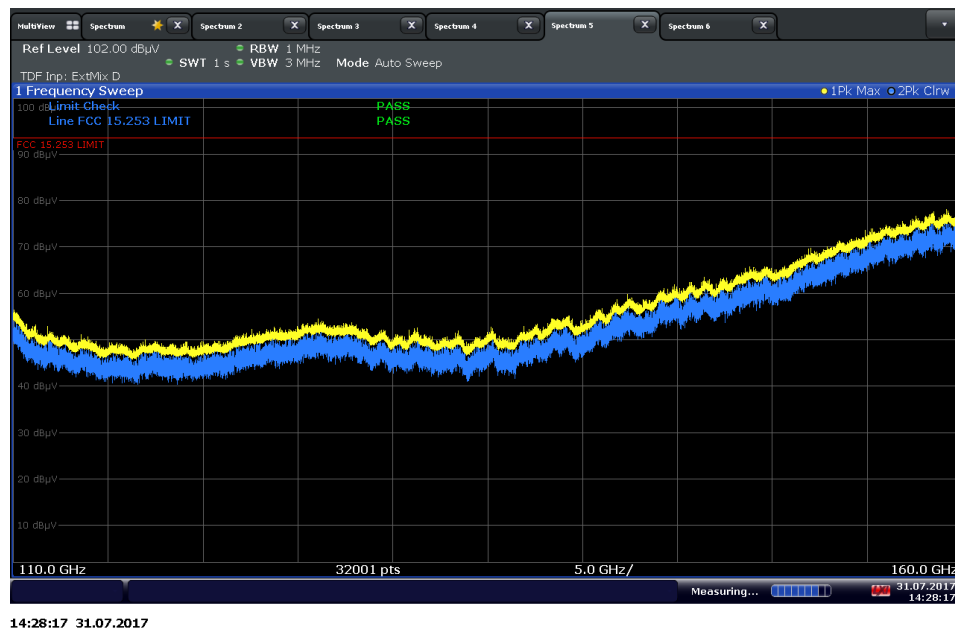
110 to 160 GHz Low Channel 300 MHz BW



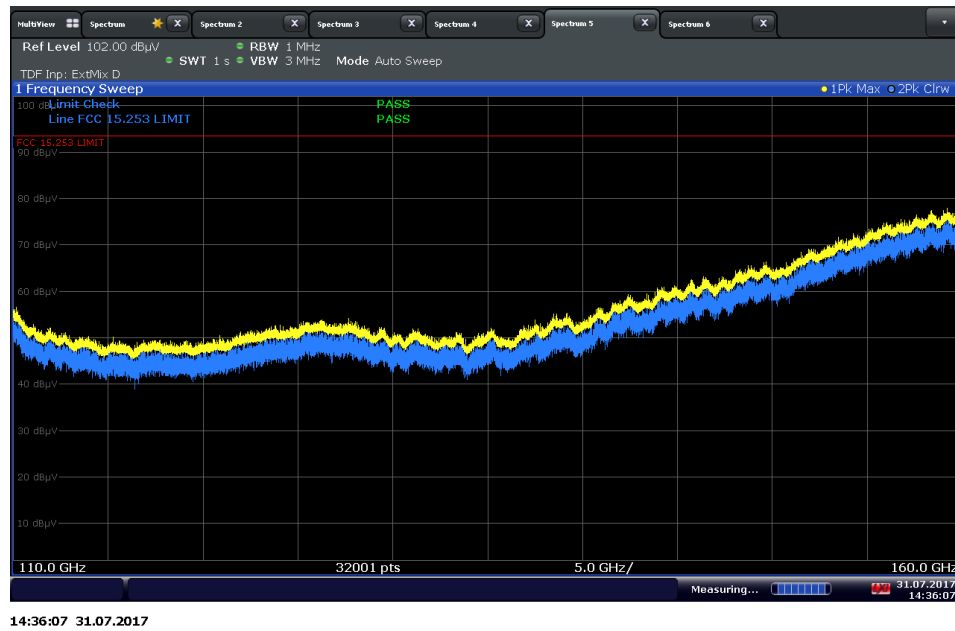
110 to 160 GHz Mid Channel 300 MHz BW



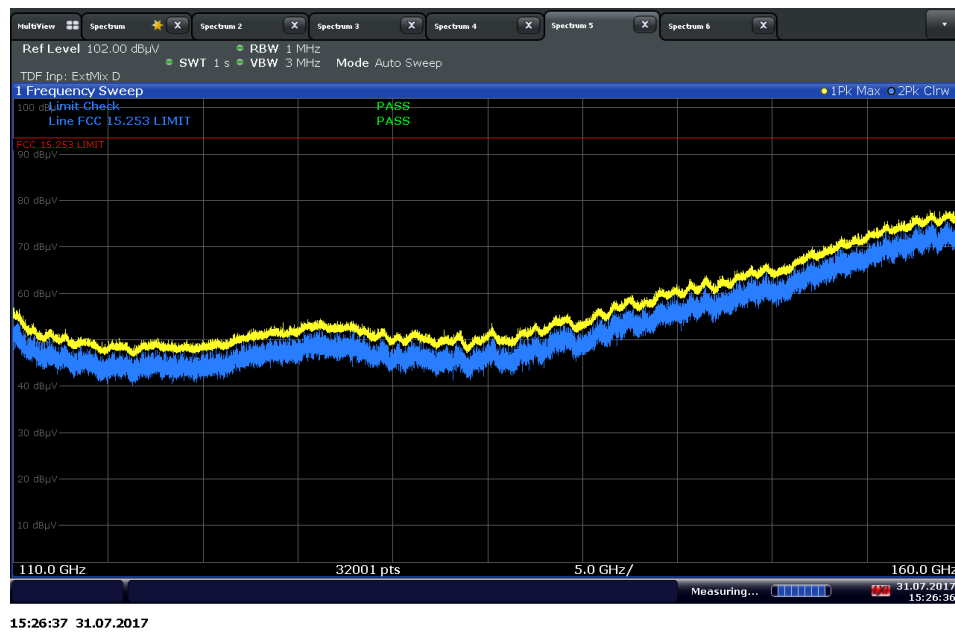
110 to 160 GHz High Channel 300 MHz BW



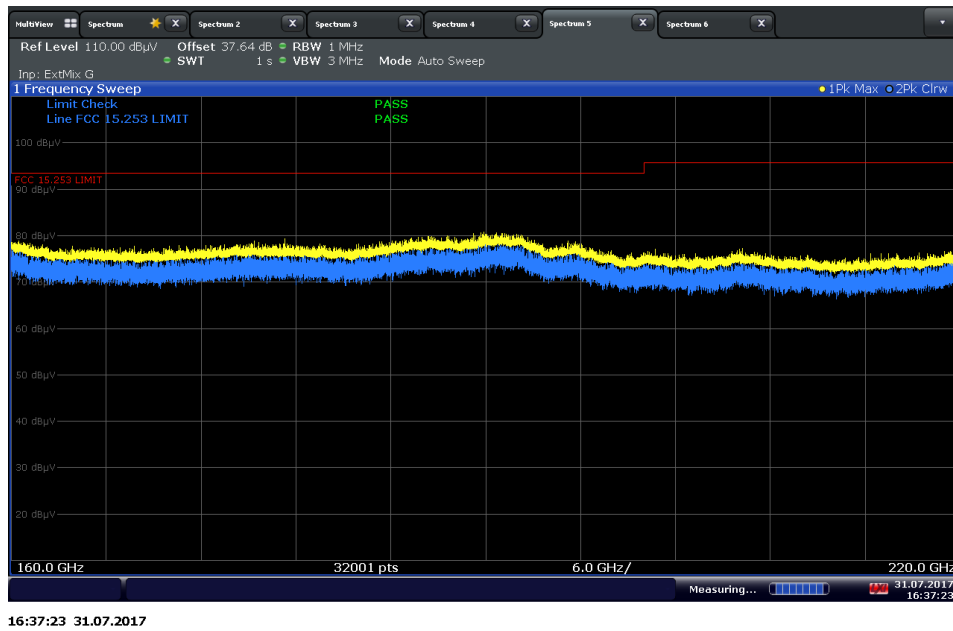
110 to 160 GHz Low Channel 425 MHz BW



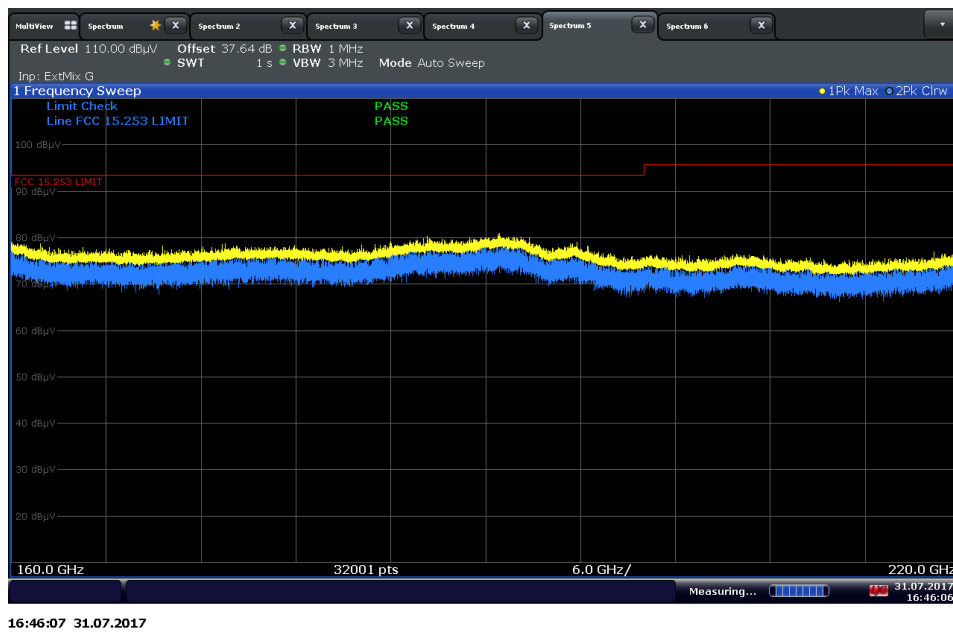
110 to 160 GHz Mid Channel 425 MHz BW



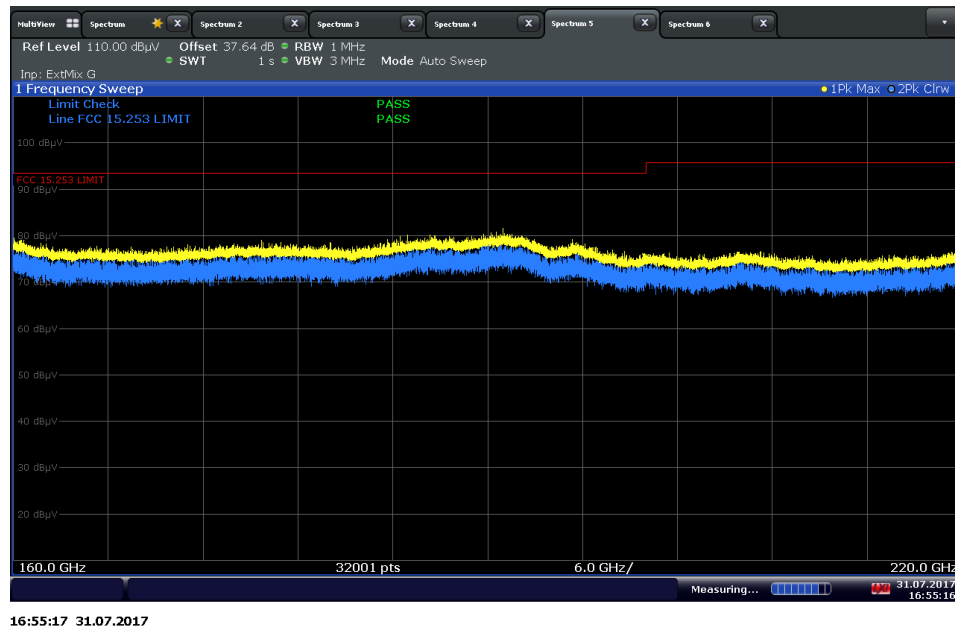
110 to 160 GHz High Channel 425 MHz BW



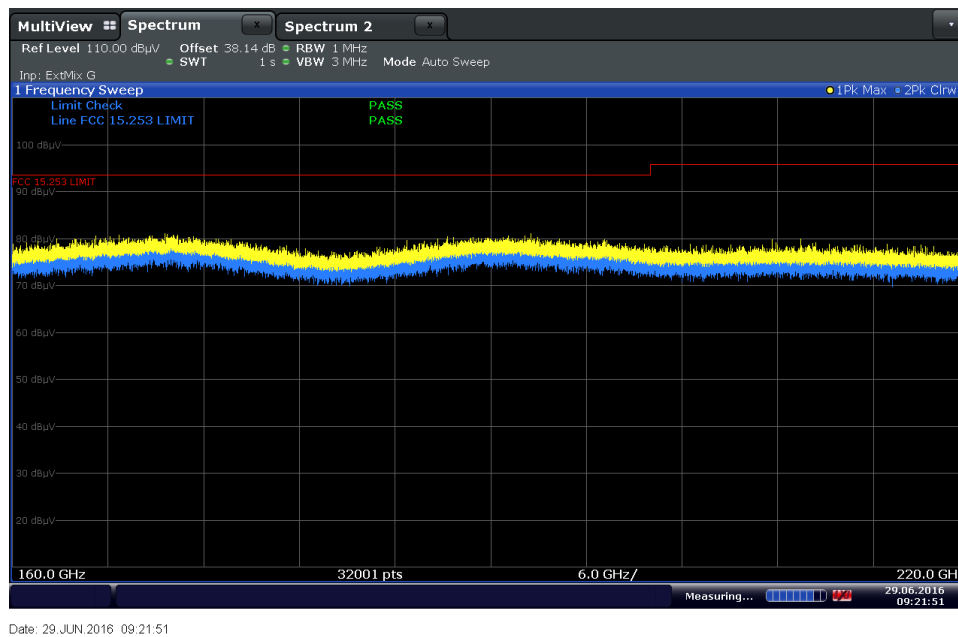
160 to 220 GHz Low Channel 175 MHz BW



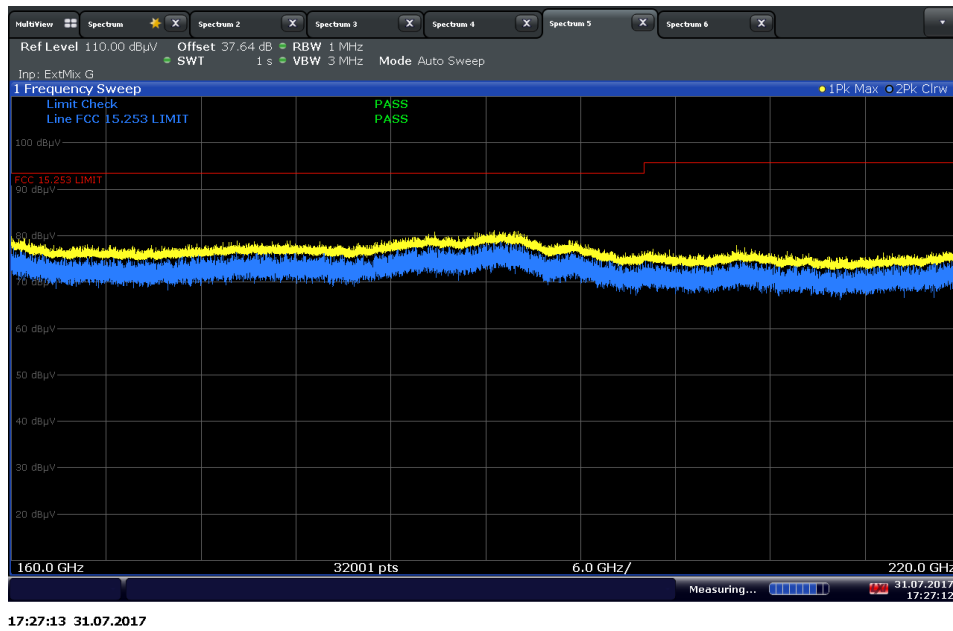
160 to 220 GHz Mid Channel 175 MHz BW



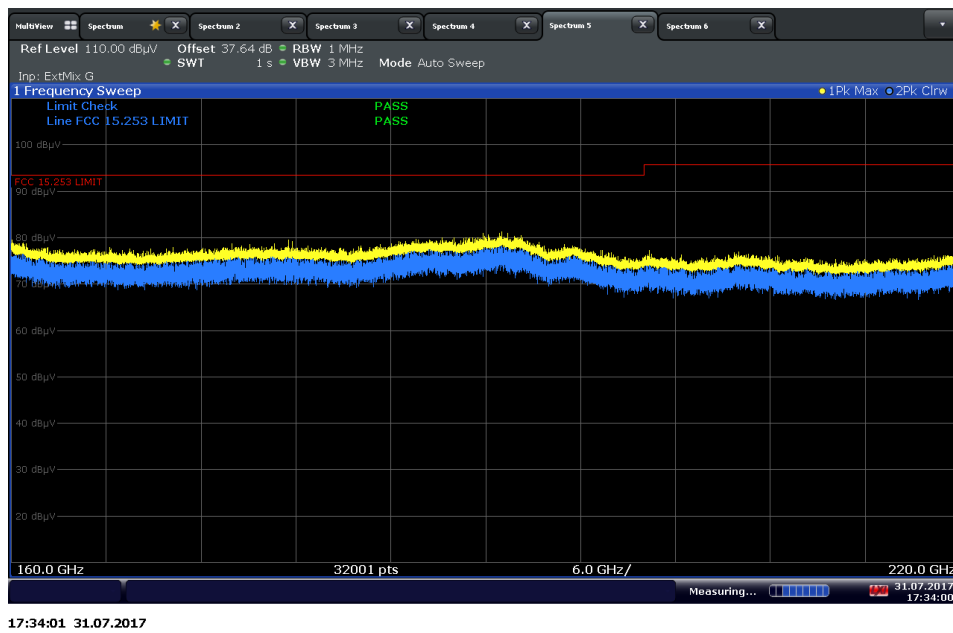
160 to 220 GHz High Channel 175 MHz BW



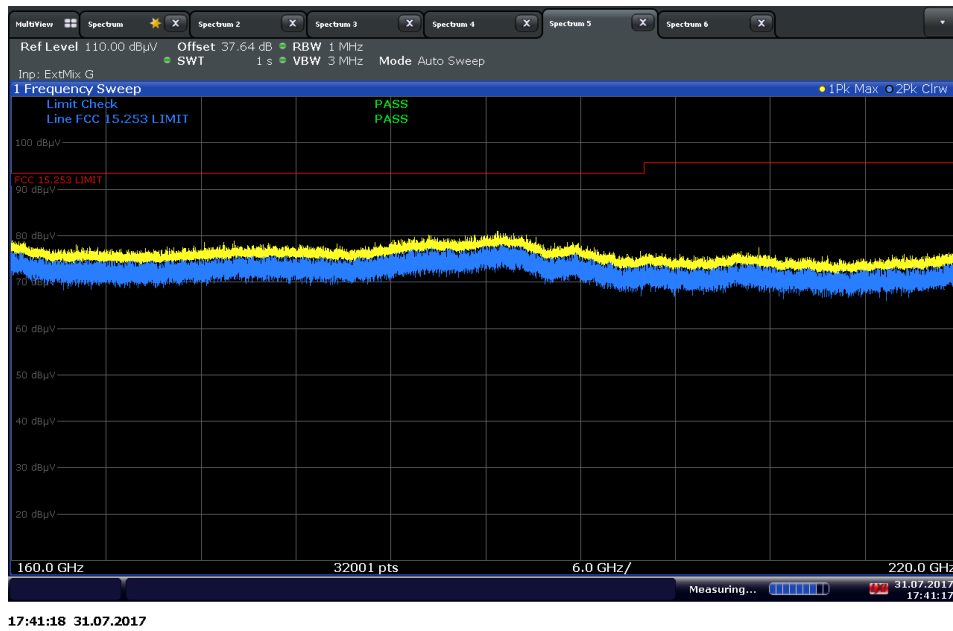
160 to 220 GHz Low Channel 300 MHz BW



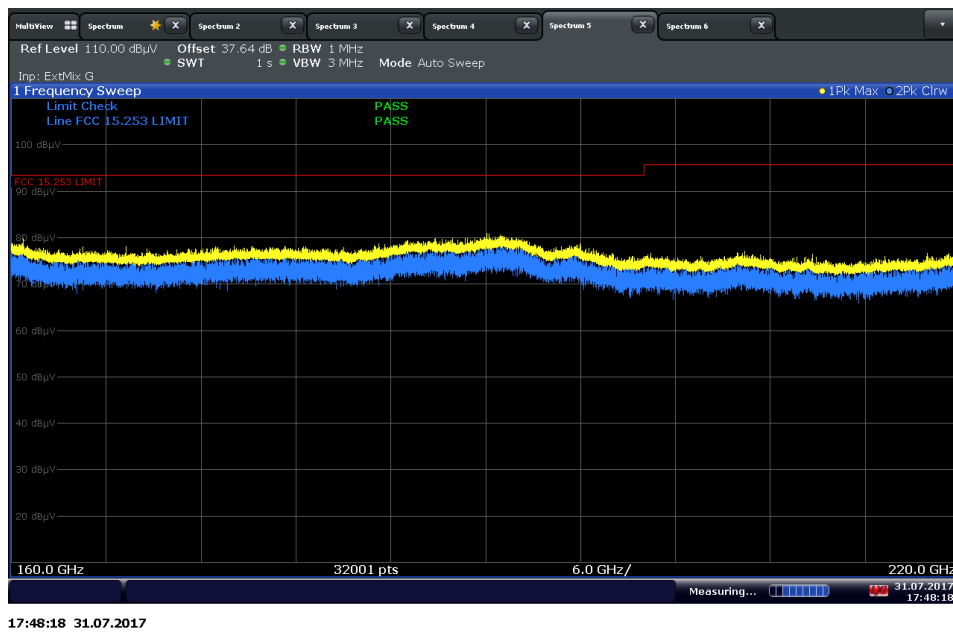
160 to 220 GHz Mid Channel 300 MHz BW



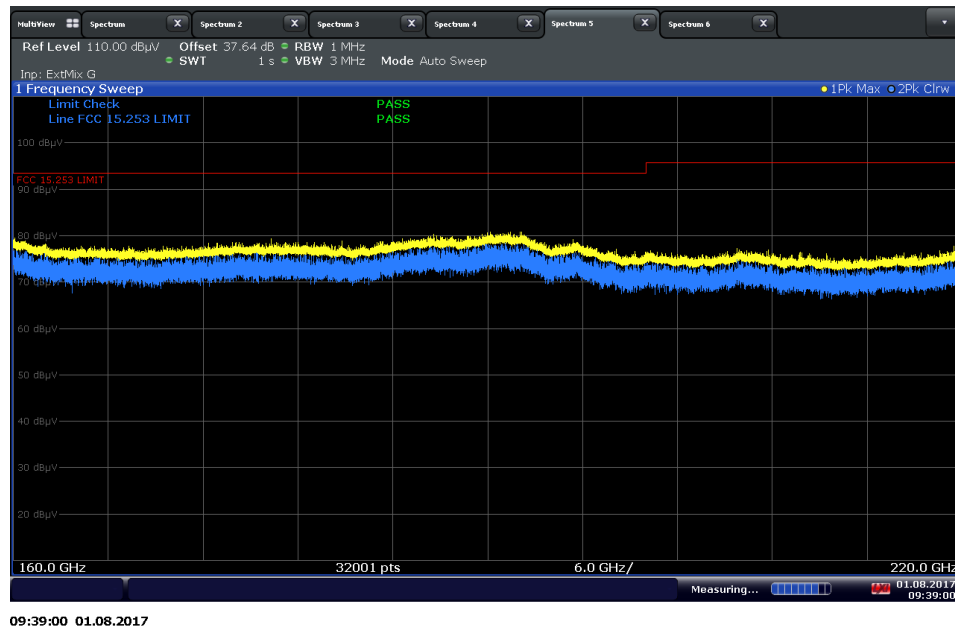
160 to 220 GHz High Channel 300 MHz BW



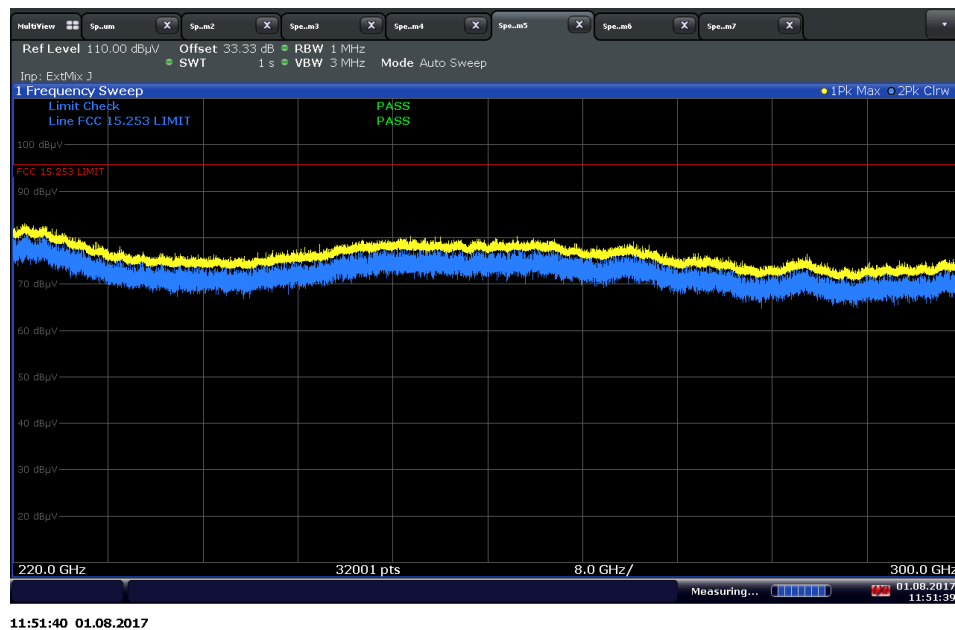
160 to 220 GHz Low Channel 425 MHz BW



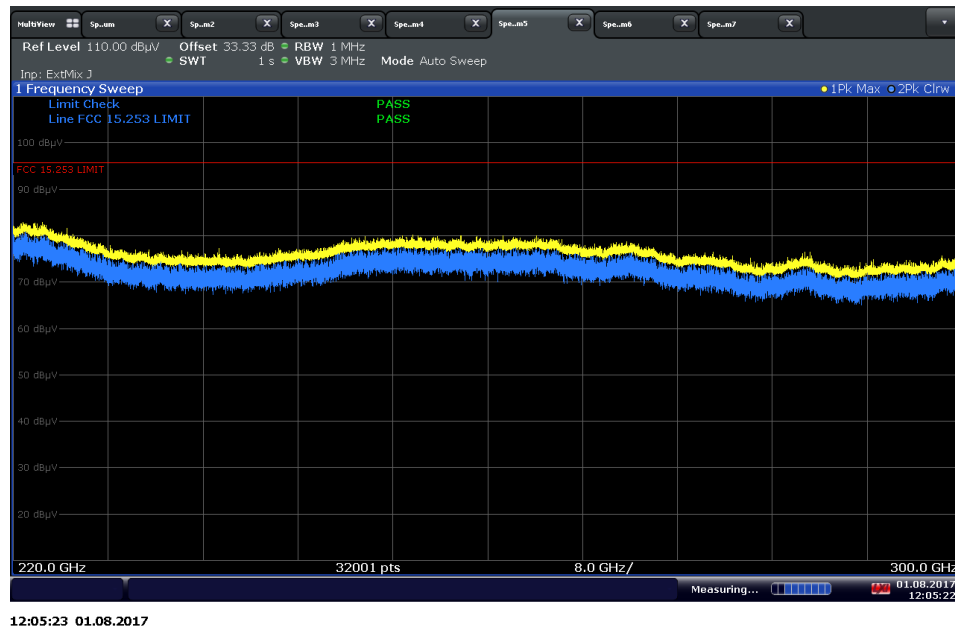
160 to 220 GHz Mid Channel 425 MHz BW



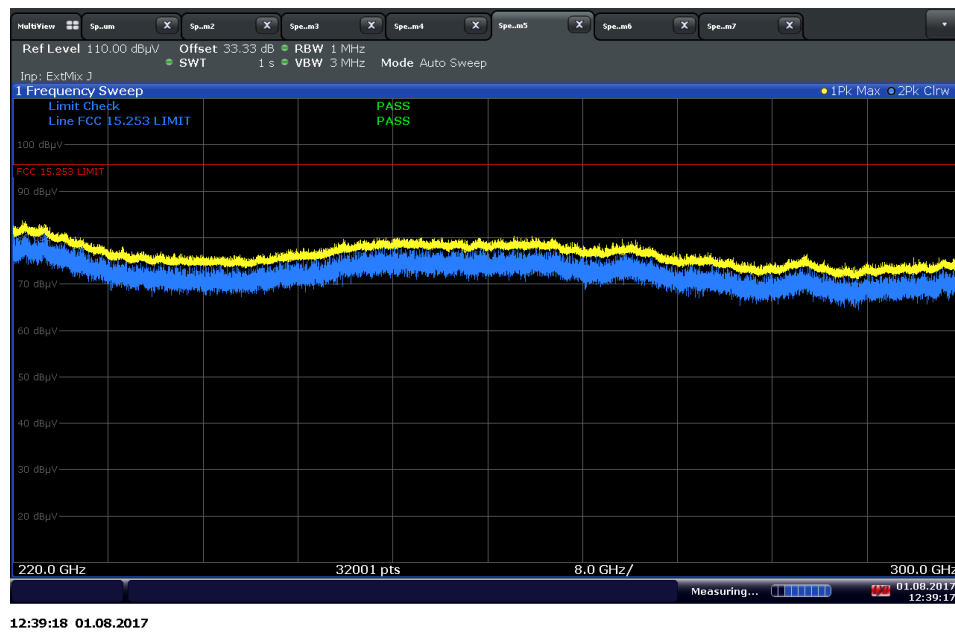
160 to 220 GHz High Channel 425 MHz BW



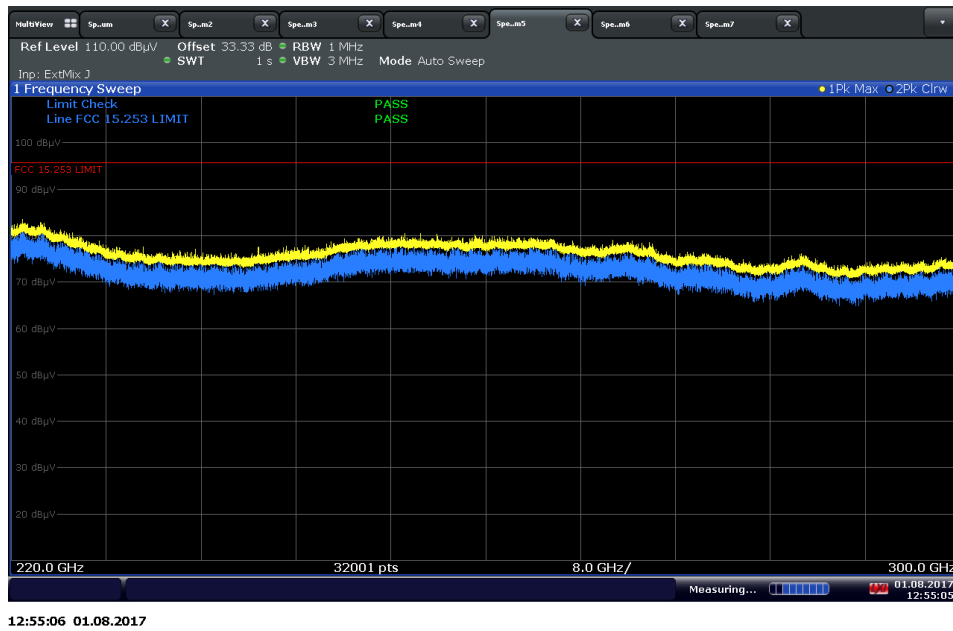
220 to 300 GHz Low Channel 175 MHz BW



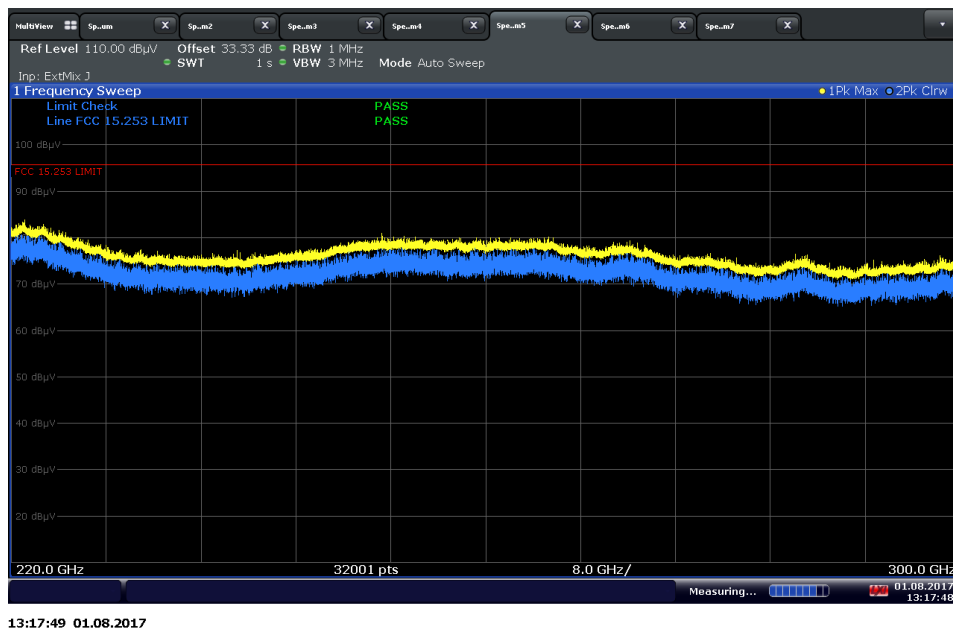
220 to 300 GHz Mid Channel 175 MHz BW



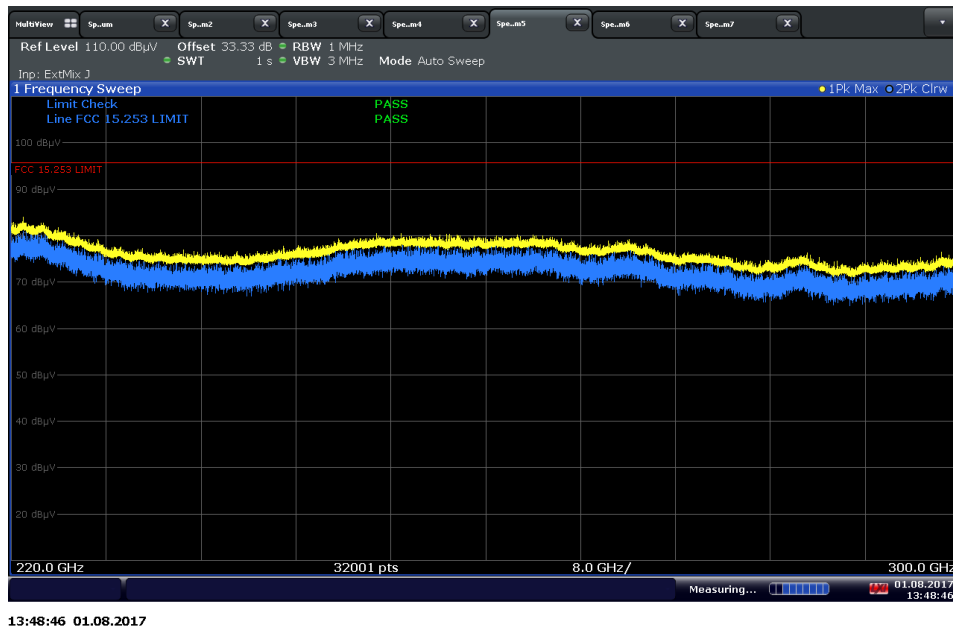
220 to 300 GHz High Channel 175 MHz BW



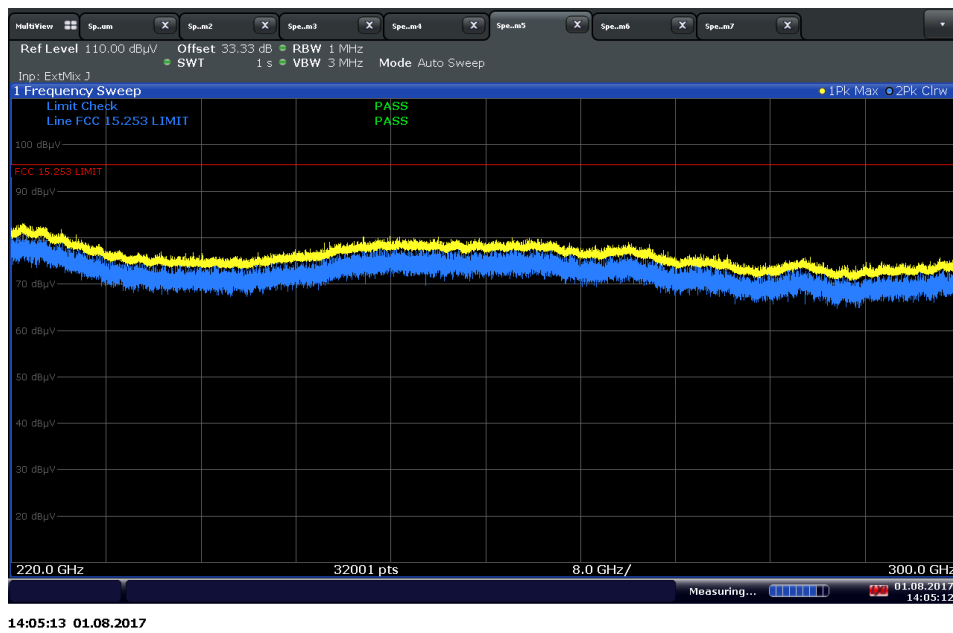
220 to 300 GHz Low Channel 300 MHz BW



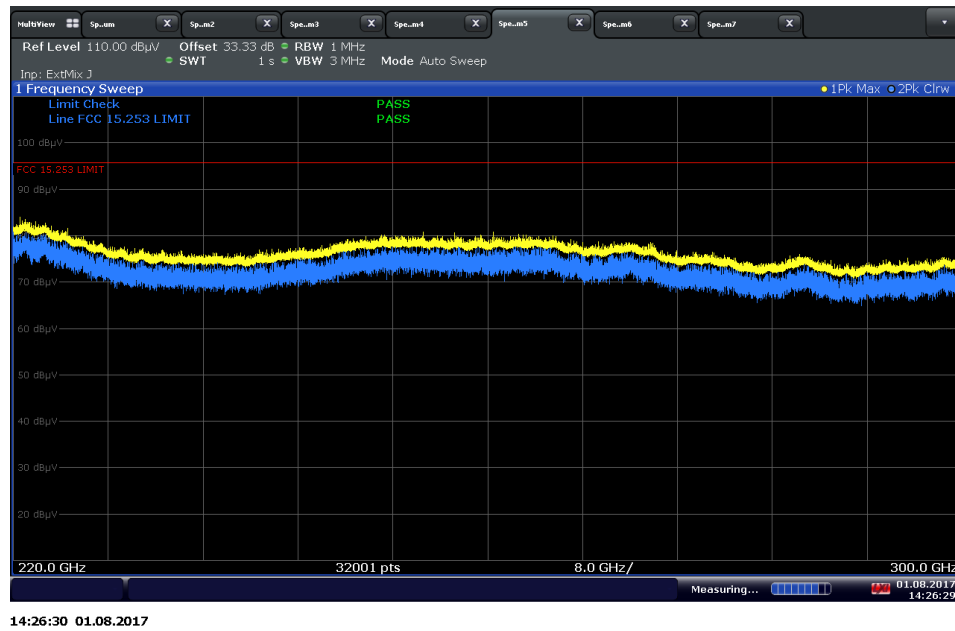
220 to 300 GHz Mid Channel 300 MHz BW



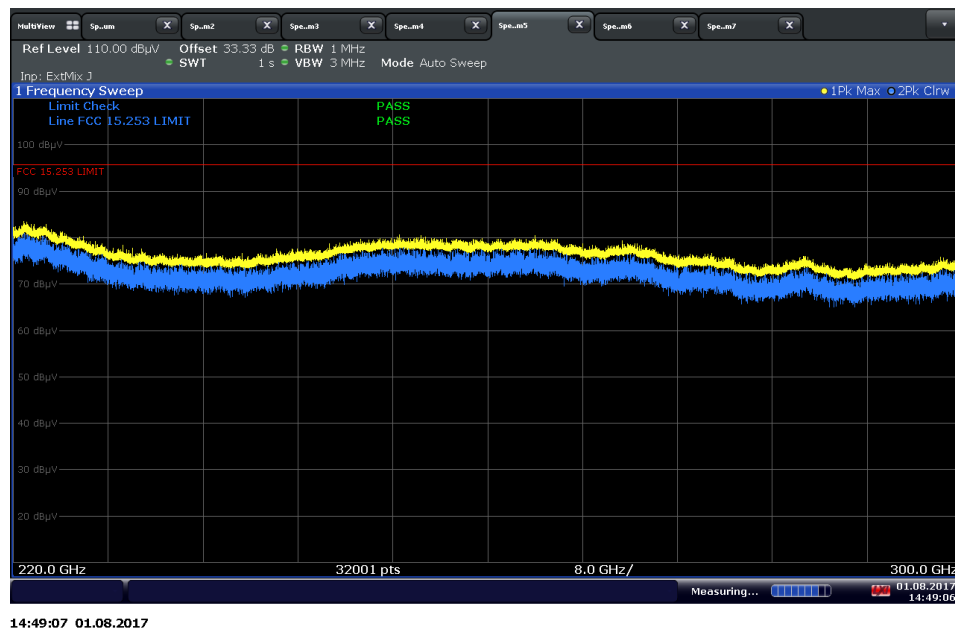
220 to 300 GHz High Channel 300 MHz BW



220 to 300 GHz Low Channel 425 MHz BW



220 to 300 GHz Mid Channel 425 MHz BW



220 to 300 GHz High Channel 425 MHz BW



2.4 FREQUENCY STABILITY

2.4.1 Specification Reference

FCC Part 15 Subpart C §15.253(f) and RSS-251 Issue 1 Sec. 5.4

2.4.2 Standard Applicable

(f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

2.4.3 Equipment Under Test and Modification State

Serial No: N/A / Default Test Configuration

2.4.4 Date of Test/Initial of test personnel who performed the test

July 25 and July 26, 2016/NS

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions

Ambient Temperature	26.9-27.1°C
Relative Humidity	43.7-49.2%
ATM Pressure	99.1-99.3 kPa

2.4.7 Additional Observations

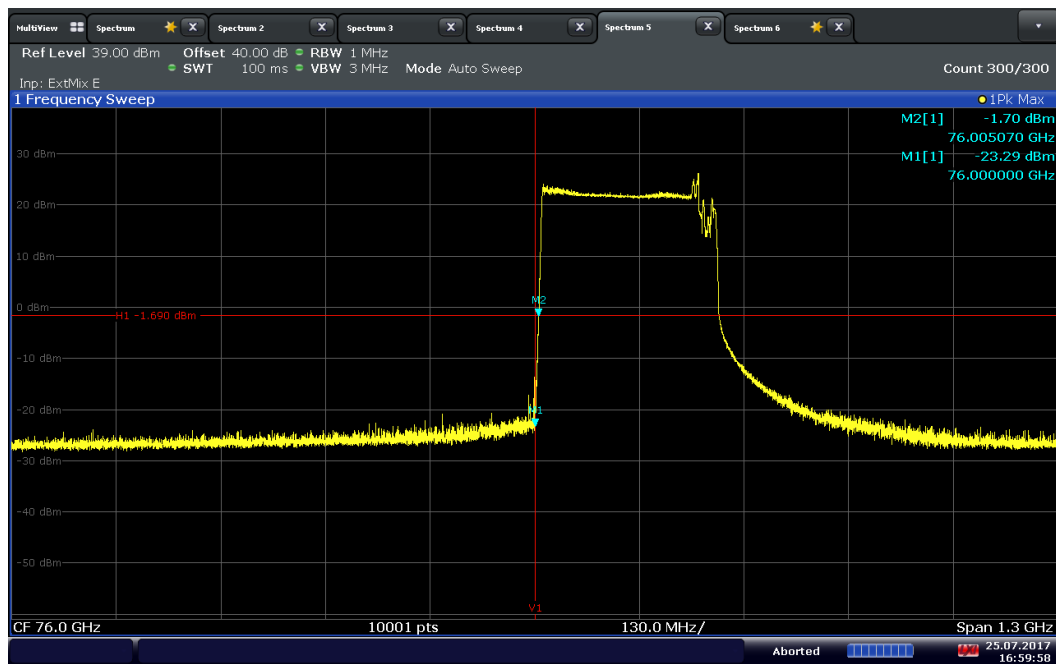
- EUT has no antenna port available. The measurements under this section were performed using radiated measurement method.
- Extreme temperature range used is -30°C to +85°C. During test the EUT spectrum was monitored in the entire temperature range but only the data obtained at extreme temperatures is presented as worst case results.
- Extreme test source voltage used is 10.2 VDC and 13.8 VDC (85 % and 115 % of nominal voltage). No considerable frequency variations were observed at extreme supply voltages.
- An offset of 40.0 dB was added to account for the test setup loss.
- RBW is 1 MHz while VBW is 3 MHz
- Detector is Peak
- Trace is Max Hold
- During the test low and high frequencies (f_L and f_H) of the signal spectrum were monitored. The applicable spurious emissions limit was used to define f_L and f_H .

2.4.8 Test Results

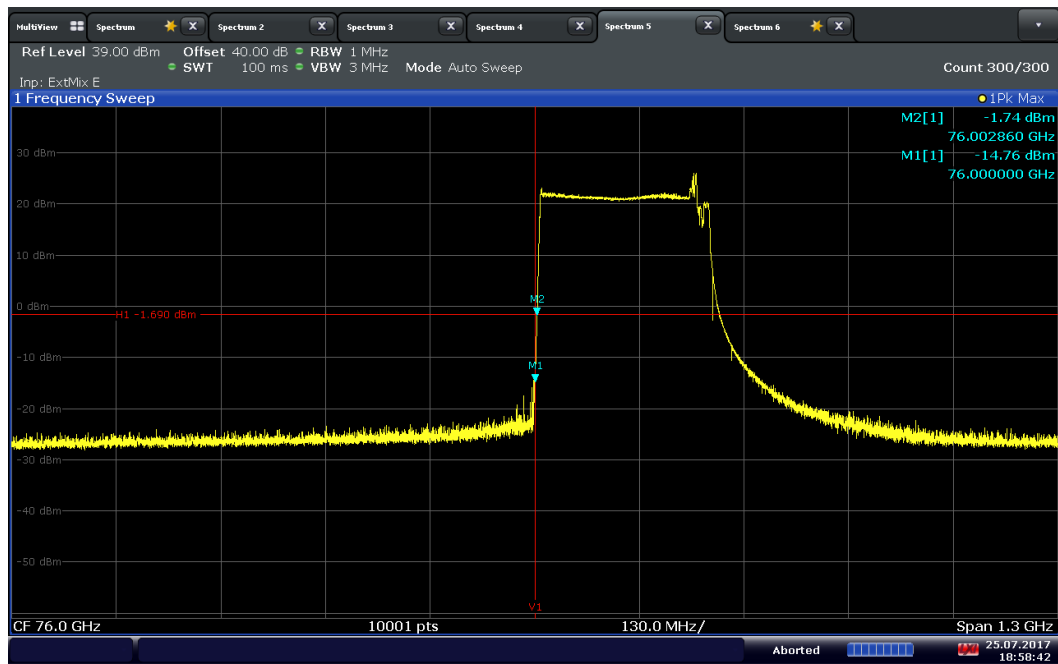
Temperature variation

Modulation BW	Temperature	Frequency Low f_L (GHz)	Frequency High f_H (GHz)
175 MHz	85°C	76.003120	76.983100
	20°C	76.002860	76.999480
	-30°C	76.005070	76.998180
300 MHz	85°C	76.004420	76.937610
	20°C	76.004160	76.959310
	-30°C	76.005980	76.959180
425 MHz	85°C	76.005850	76.972050
	20°C	76.005330	76.985570
	-30°C	76.006890	76.999870
$f_L = 76.002860 \text{ GHz} > 76.0 \text{ GHz}$ $f_H = 76.999870 \text{ GHz} < 77.0 \text{ GHz}$ EUT Complies			

2.4.9 Test Plots

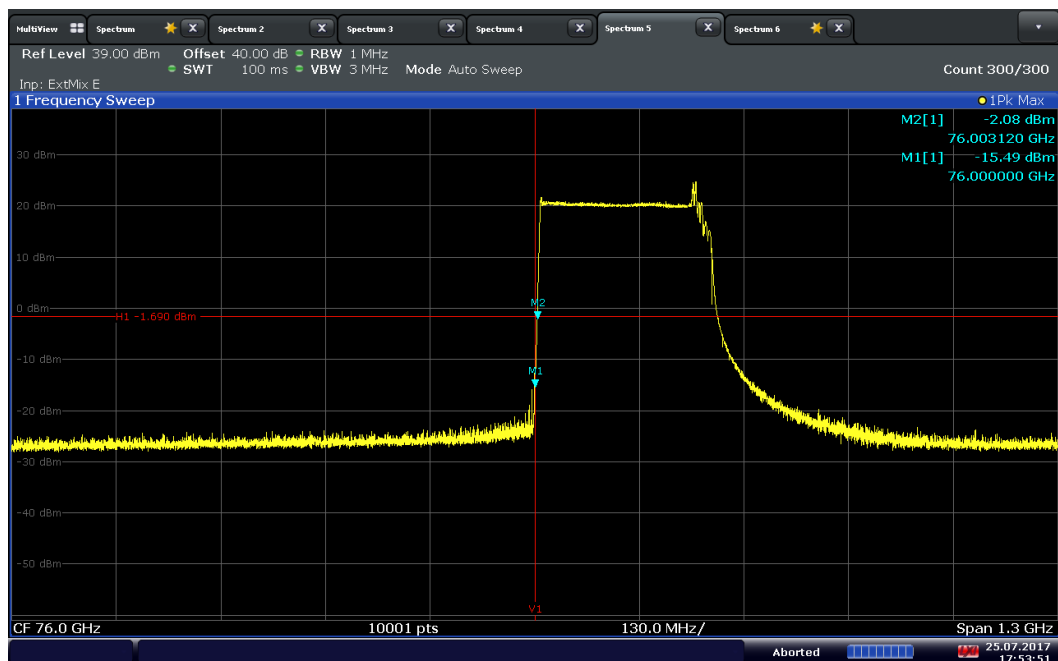


-30 DEG 12.0 VDC Low channel 175 MHz BW



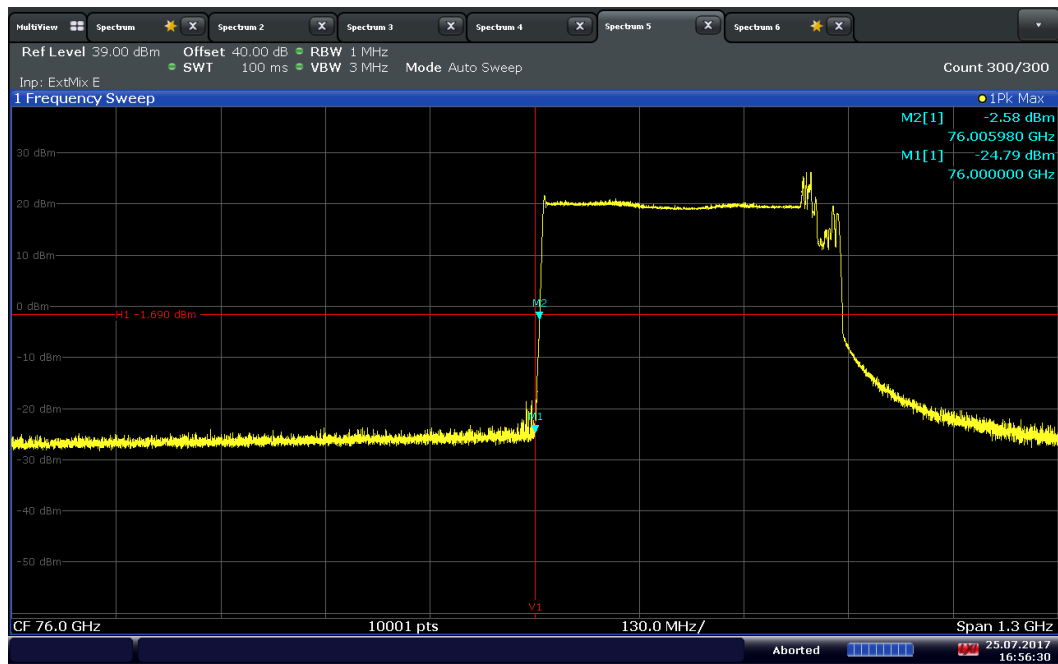
18:58:42 25.07.2017

20 DEG 10.2/12.0/13.8 VDC Low channel 175 MHz BW



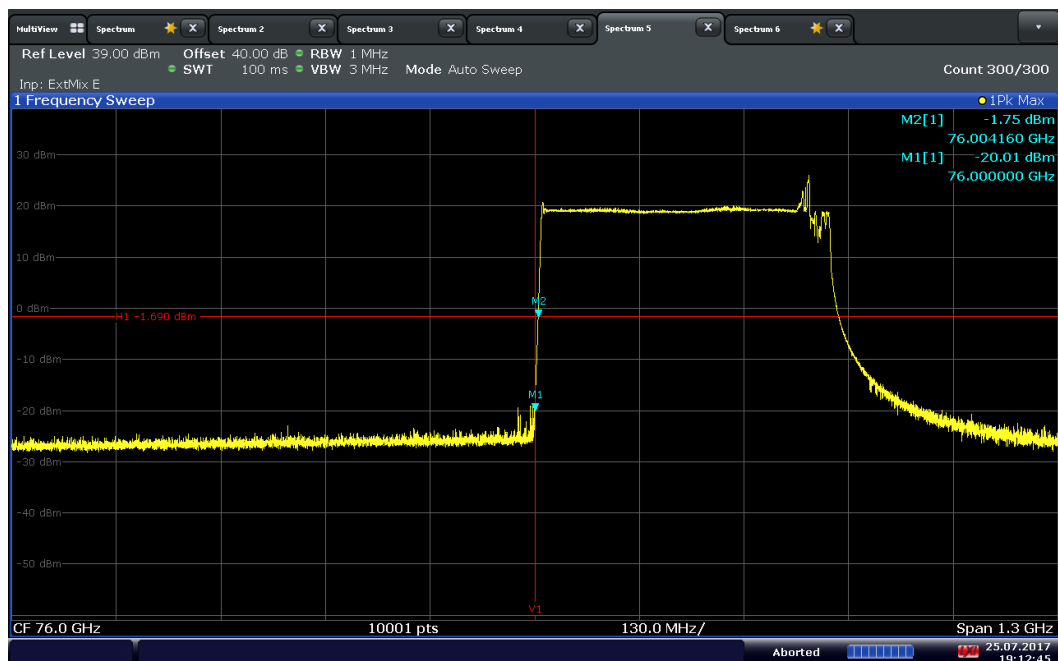
17:53:52 25.07.2017

85 DEG 12.0 VDC Low channel 175 MHz BW



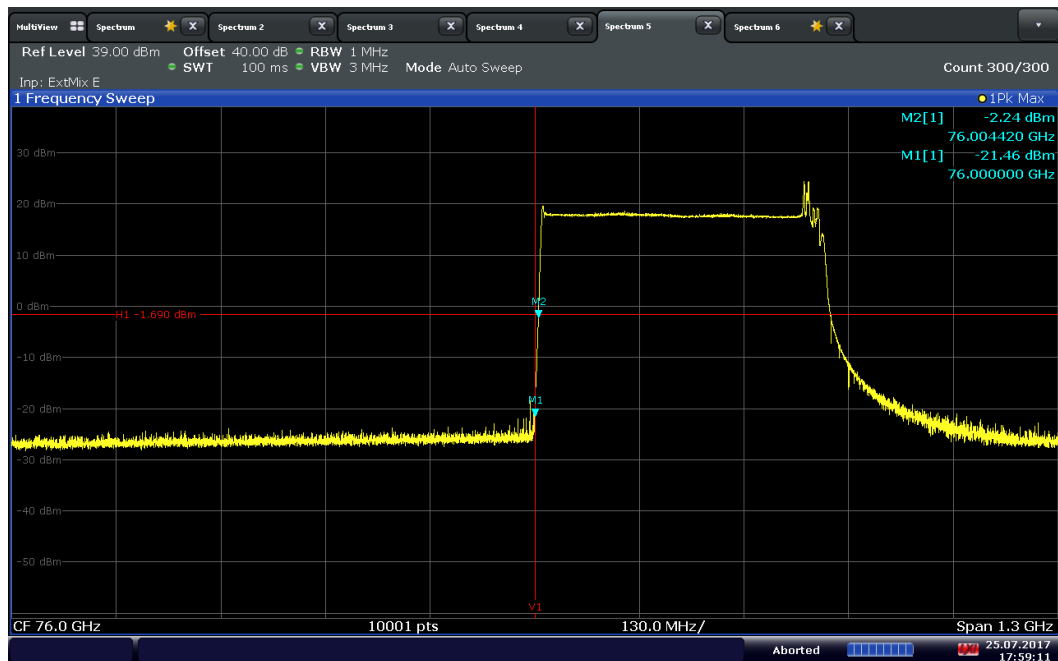
16:56:31 25.07.2017

-30 DEG 12 VDC Low channel 300 MHz BW



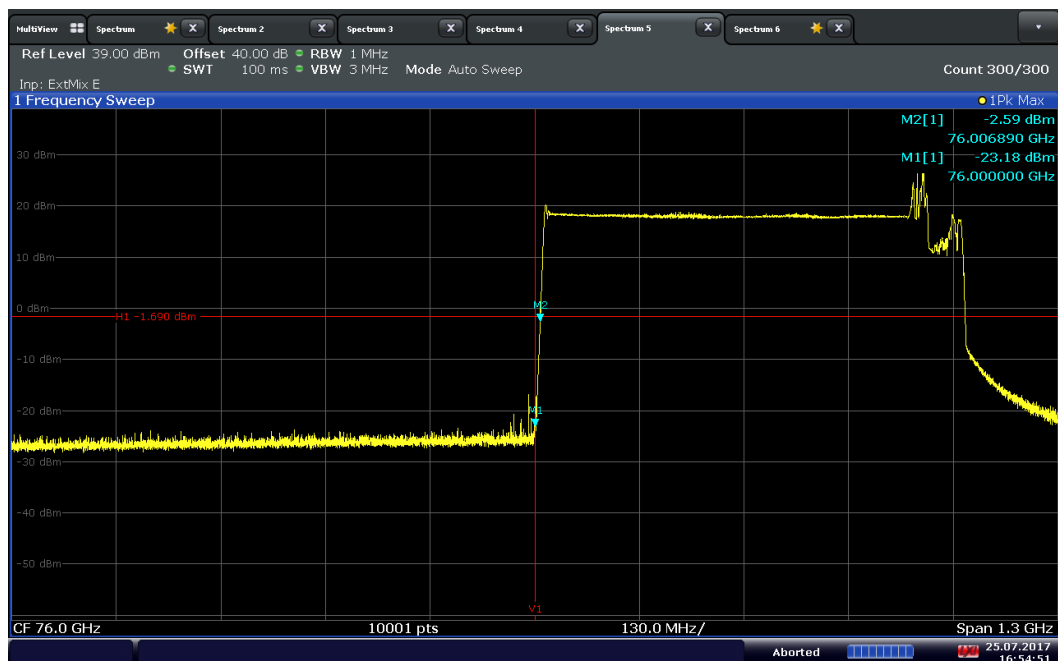
19:12:46 25.07.2017

20 DEG 10.2/12.0/13.8 VDC Low channel 300 MHz BW



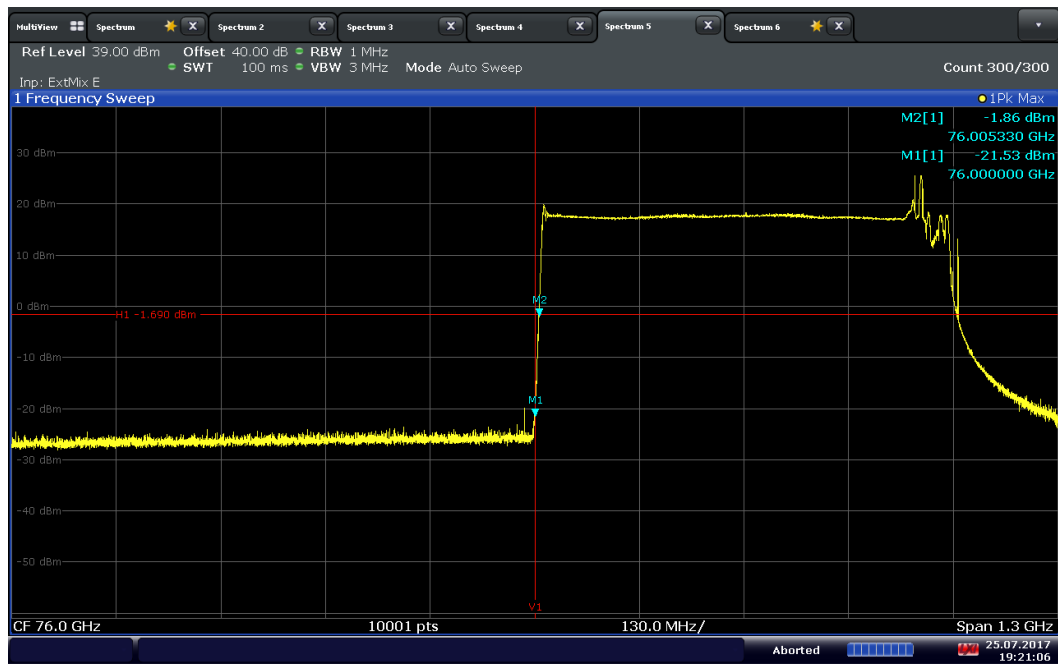
17:59:12 25.07.2017

85 DEG 12.0 VDC Low channel 300 MHz BW



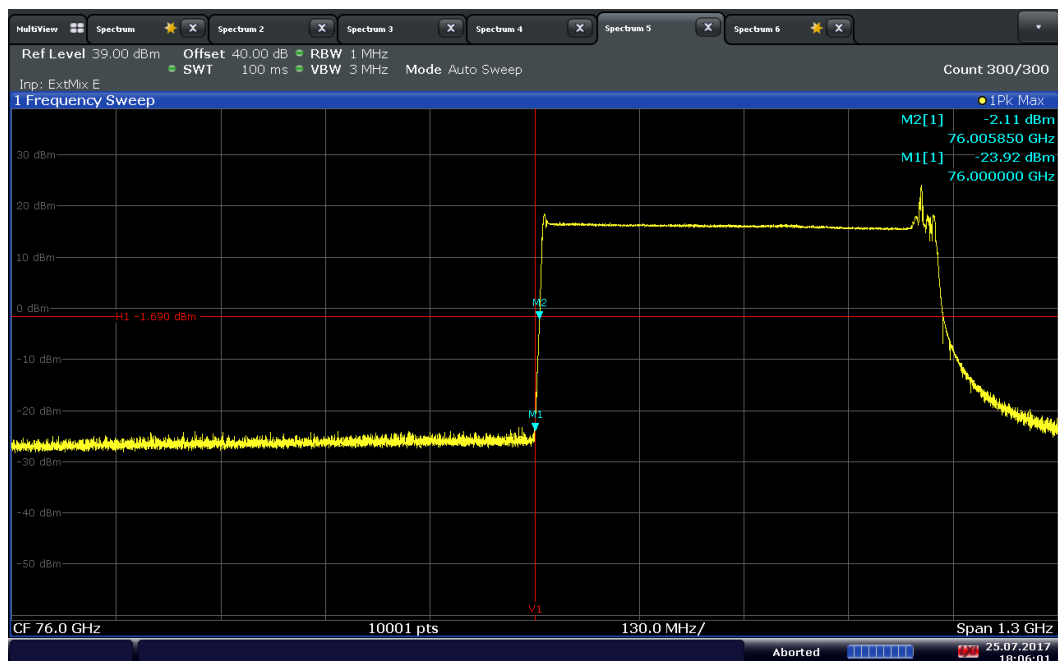
16:54:52 25.07.2017

-30 DEG 12.0 VDC Low channel 425 MHz BW



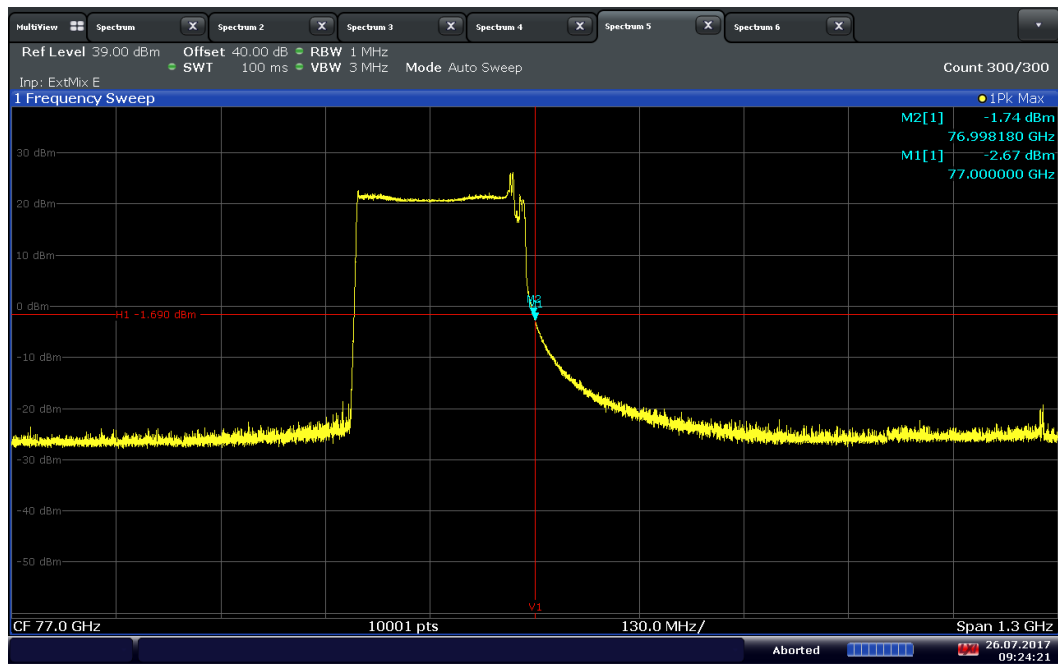
19:21:06 25.07.2017

20 DEG 10.2/12.0/13.8 VDC Low channel 425 MHz BW



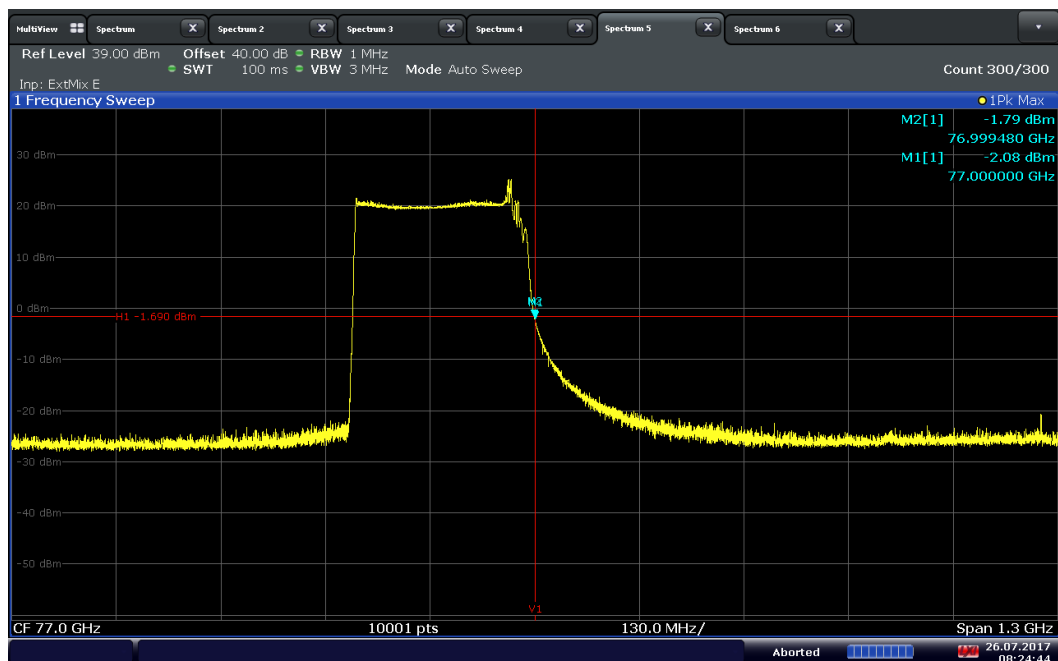
18:06:02 25.07.2017

85 DEG 12.0 VDC Low channel 425 MHz BW



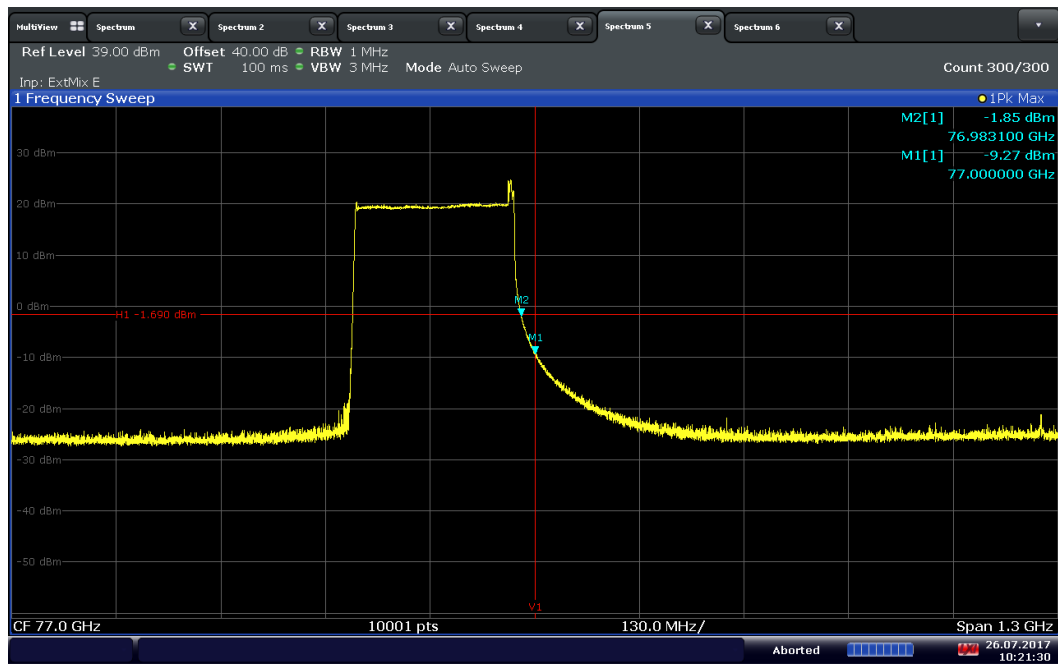
09:24:21 26.07.2017

-30 DEG 12.0 VDC High channel 175 MHz BW



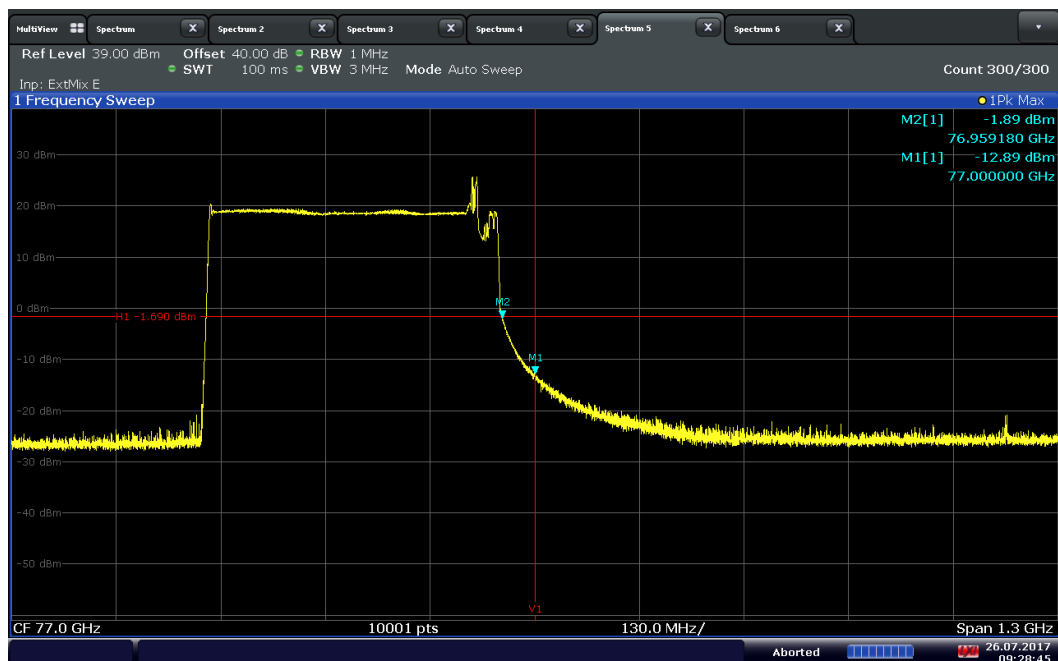
08:24:45 26.07.2017

20 DEG 10.2/ 12.0/13.8 VDC High channel 175 MHz BW



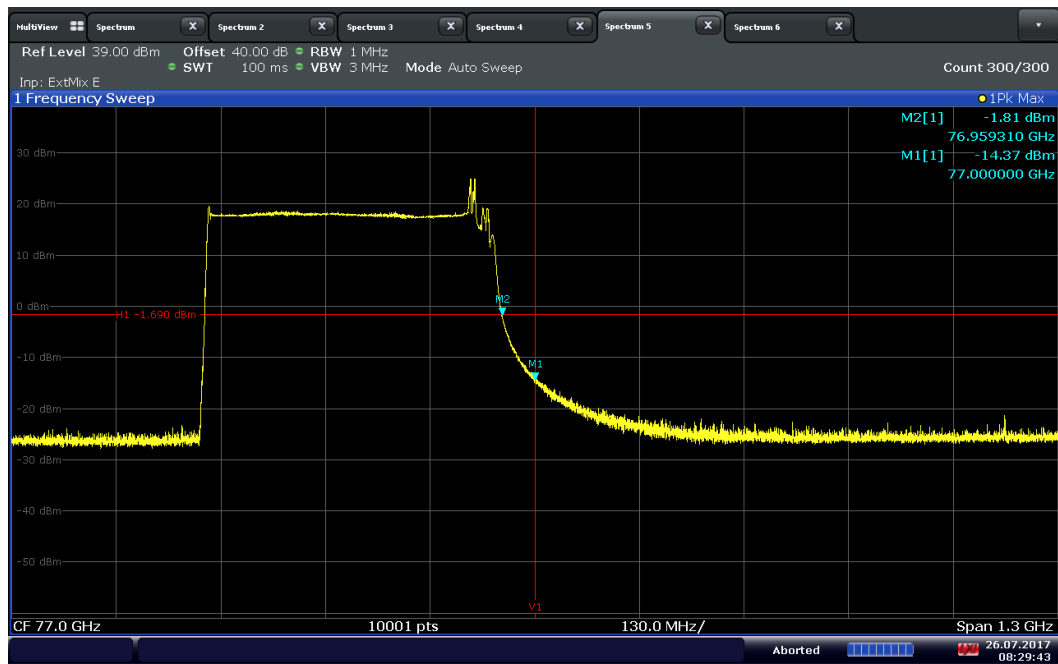
10:21:30 26.07.2017

85 DEG 12.0 VDC High channel 175 MHz BW



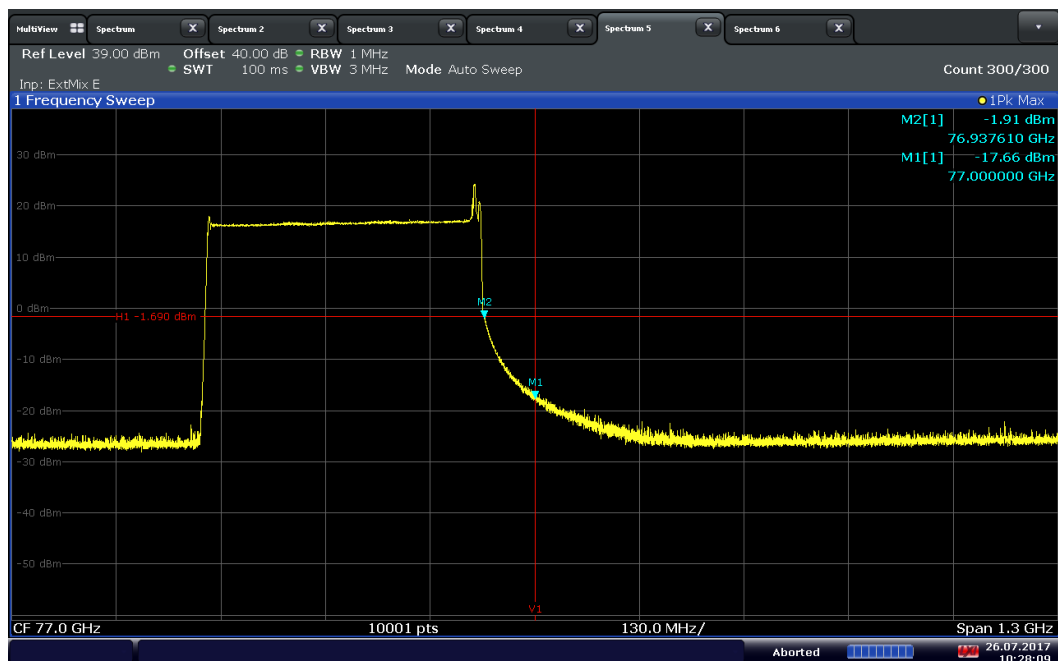
09:28:46 26.07.2017

-30 DEG 12.0 VDC High channel 300 MHz BW



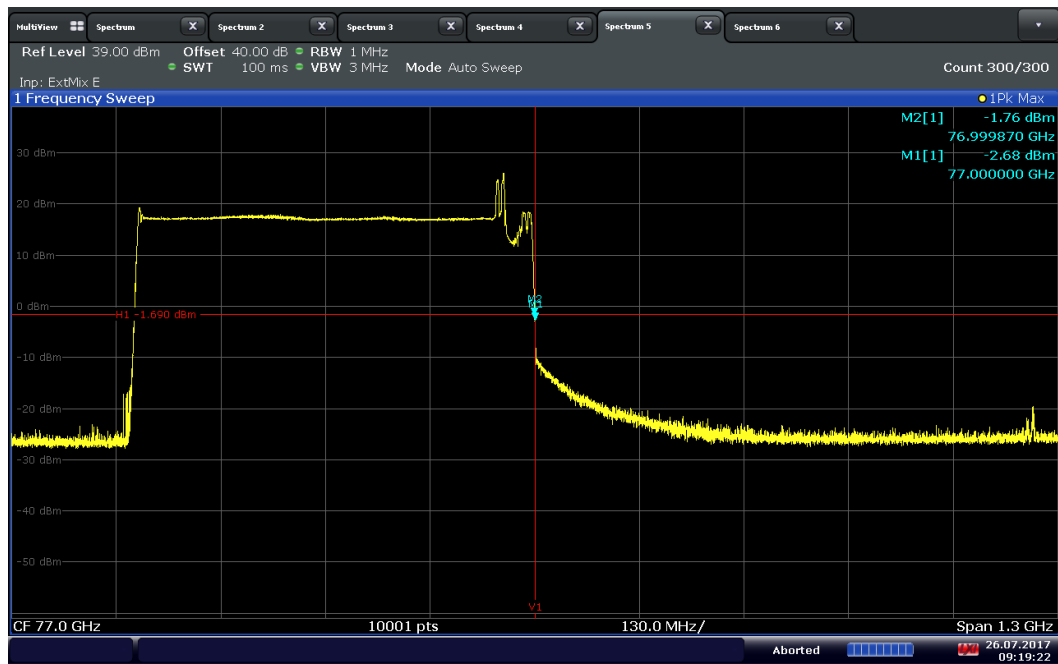
08:29:44 26.07.2017

20 DEG 10.2/12.0/13.8 VDC High channel 300 MHz BW



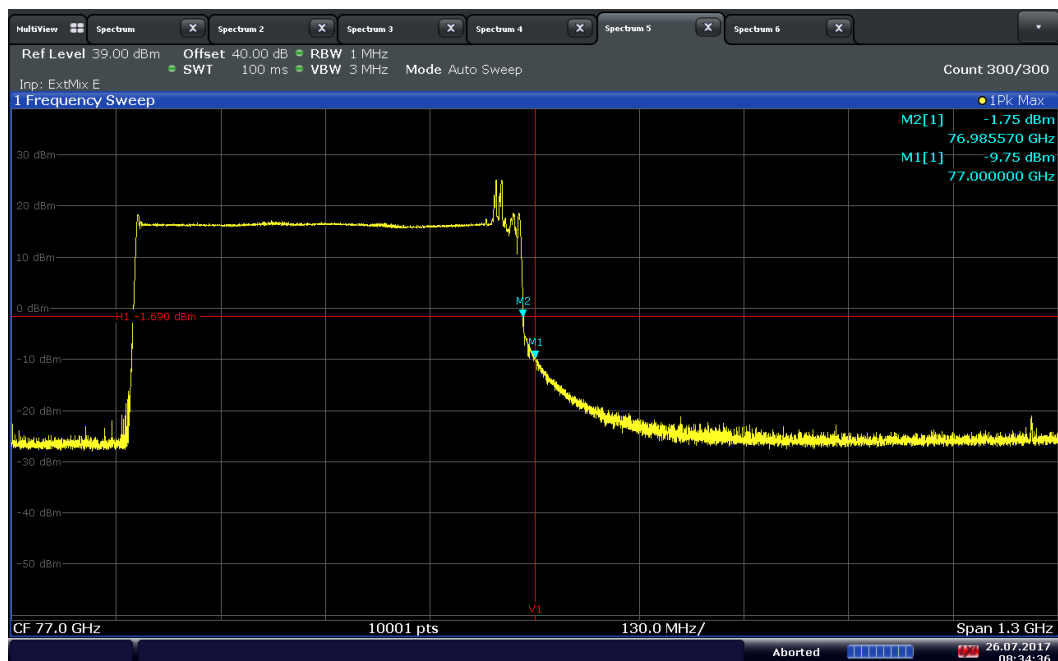
10:28:09 26.07.2017

85 DEG 12.0 VDC High channel 300 MHz BW



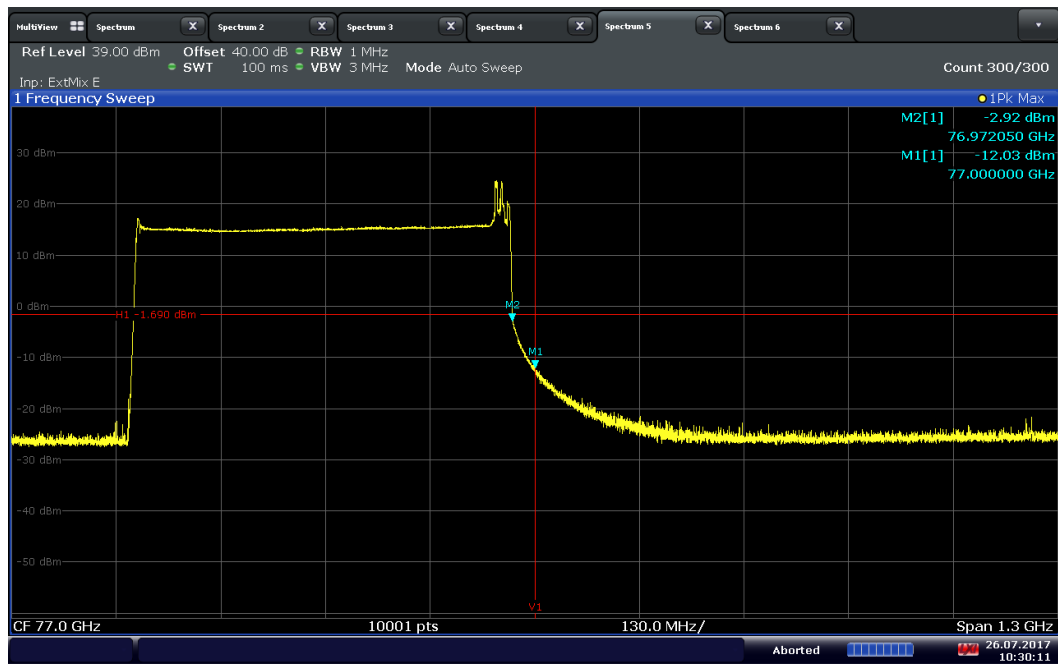
09:19:23 26.07.2017

-30 DEG 12.0 VDC High channel 425 MHz BW



08:34:37 26.07.2017

20 DEG 10.2/12.0/13.8 VDC High channel 425 MHz BW



10:30:12 26.07.2017

85 DEG 12.0 VDC High channel 425 MHz BW



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Radiated Test Setup						
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	05/16/17	05/16/18
7611	Signal/Spectrum Analyzer	FSW26	102017	Rhode & Schwarz	04/25/17	04/25/18
1033	Bilog Antenna	3142C	00044556	EMCO	10/11/16	10/11/18
1016	Pre-amplifier	PAM-0202	187	PAM	10/17/16	10/17/17
7575	Double-ridged waveguide horn antenna	3117	155511	EMCO	06/01/17	06/01/18
9001	Horn antenna (18-26 GHz)	HO42S	101	Custom Microwaves	07/23/16	07/23/17
9002	Horn antenna (26-40 GHz)	HO28S	102	Custom Microwaves	07/14/17	07/14/19
9003	Horn antenna (40-60 GHz)	HO19R	103	Custom Microwaves	07/19/17	07/19/19
9004	Horn antenna (50-75 GHz)	HO15R	104	Custom Microwaves	07/19/17	07/19/19
9005	Horn antenna (75-110 GHz)	HO10R	105	Custom Microwaves	04/27/16	07/26/17
9081	Horn antenna (110-170 GHz)	HO6R	N/A	Custom Microwaves	Verified	
9082	Horn antenna (140-220 GHz)	HO5R	N/A	Custom Microwaves	Verified	
9080	Horn antenna (220-325 GHz)	HO3R	N/A	Custom Microwaves	Verified	
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	10/07/16	10/07/17
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	02/09/17	02/09/18
8893	Pre-amplifier (18-40 GHz)	SLKka-30-6	15G27	Spacek Labs	Verified by 1003 and 7611	
7637	Harmonics mixer (40-60 GHz)	FS-Z60	100009	Rhode & Schwarz	01/26/16	01/26/18
7636	Harmonics mixer (60-90 GHz)	FS-Z90	100092	Rhode & Schwarz	10/26/15	10/26/17
7633	Harmonics mixer (75-110 GHz)	HM-110-7	101000	Radiometer Physics	Verified	
7634	Harmonics mixer (110-170 GHz)	HM-170	0062	Radiometer Physics	05/10/16	05/10/18
7635	Harmonics mixer (170-220 GHz)	HM-220	020022	Radiometer Physics	06/10/16	06/10/18
7632	Harmonics mixer (220-325 GHz)	HM-325	020075	Radiometer Physics	06/14/16	06/14/18
8872	Direct Reading Attenuator	STA-60-19-D1	11875-01	Sage Millimeter, Inc.	Verified	
8860	Direct Reading Attenuator	STA-60-15-D1	11466-01	Sage Millimeter, Inc.	Verified	
8861	Direct Reading Attenuator	STA-60-10-D1	11466-01	Sage Millimeter, Inc.	Verified	
8873	Active Multiplier (40-60 GHz)	AMC-19-RFH00	124	Millitech, Inc.	Verified	
8914	Active Multiplier (50-75 GHz)	AMC-15-RFH00	283	Millitech, Inc.	Verified	
8915	Active Multiplier (75-110 GHz)	AMC-10-RFH00	606	Millitech, Inc.	Verified	
8922	High-frequency cable	R90-088-200	N/A	Teledyne	02/10/17	02/10/18
1026	High-frequency cable	3M-7/C2	N/A	MicroCoax	04/26/17	04/26/18
8849	High-frequency cable (1-18 GHz)	SAC-26G-6.1	363	A.H.Systems	04/23/17	04/23/18
8771	6dB attenuator	606-06-1F4/DR	N/A	MECA	10/11/17	10/11/18
Miscellaneous						
6792	Multimeter	3478A	2911A70964	Hewlett Packard	08/29/16	08/29/17
7554	Barometer/Temperature/Humidity Transmitter	iBTHX-W	15250268	Omega	01/17/17	01/17/18
7579	Temperature Chamber	115	151617	TestEquity	08/25/16	08/25/17
118208	DC Power Supply	Pad 250-4.5L	29051058	Kikusui Electronics Corp.	Verified by 6792	

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IC: 3659A-B3TR
Report No. SD72129496-0717B Model: B3TR



9076	DC Power Supply	18020M	P802039	Protek	Verified by 6792
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A

3.2 MEASUREMENT UNCERTAINTY

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

3.2.1 Radiated Emission Measurements (Below 1 GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.78
Coverage Factor (k):					2
Expanded Uncertainty:					3.57

3.2.2 Radiated Emission Measurements (1 GHz to 40 GHz)

Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.00	0.58	0.33
Combined Uncertainty (u_c):					1.78
Coverage Factor (k):					2
Expanded Uncertainty:					3.57

3.2.3 Radiated Emission Measurements (Above 40 GHz)

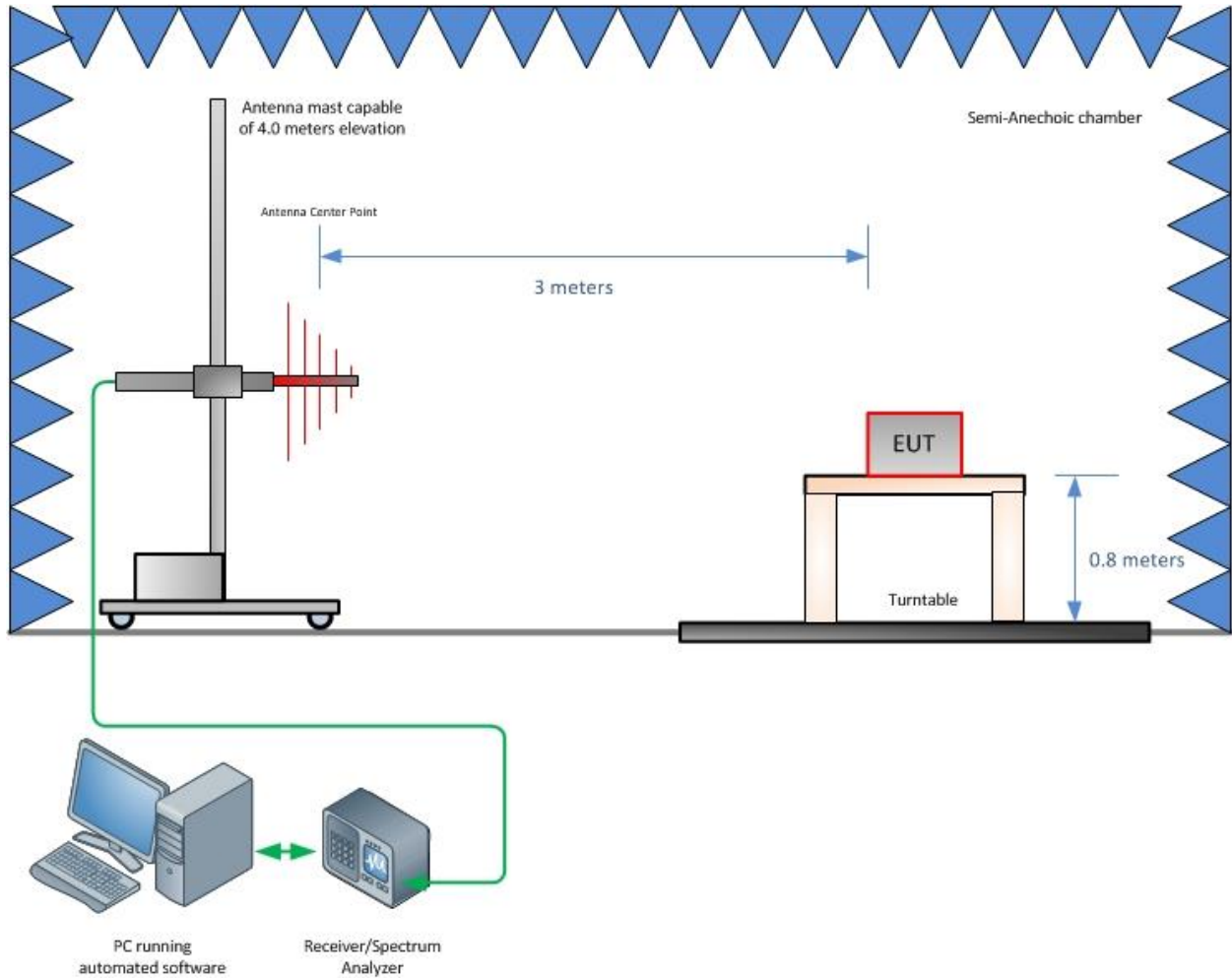
Contribution		Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Spectrum Analyzer/External Mixer	Rectangular	3.34	1.93	3.72
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	2.70	1.56	2.43
6	EUT Setup	Rectangular	1.50	0.87	0.75
Combined Uncertainty (u_c):					2.67
Coverage Factor (k):					2
Expanded Uncertainty:					5.35



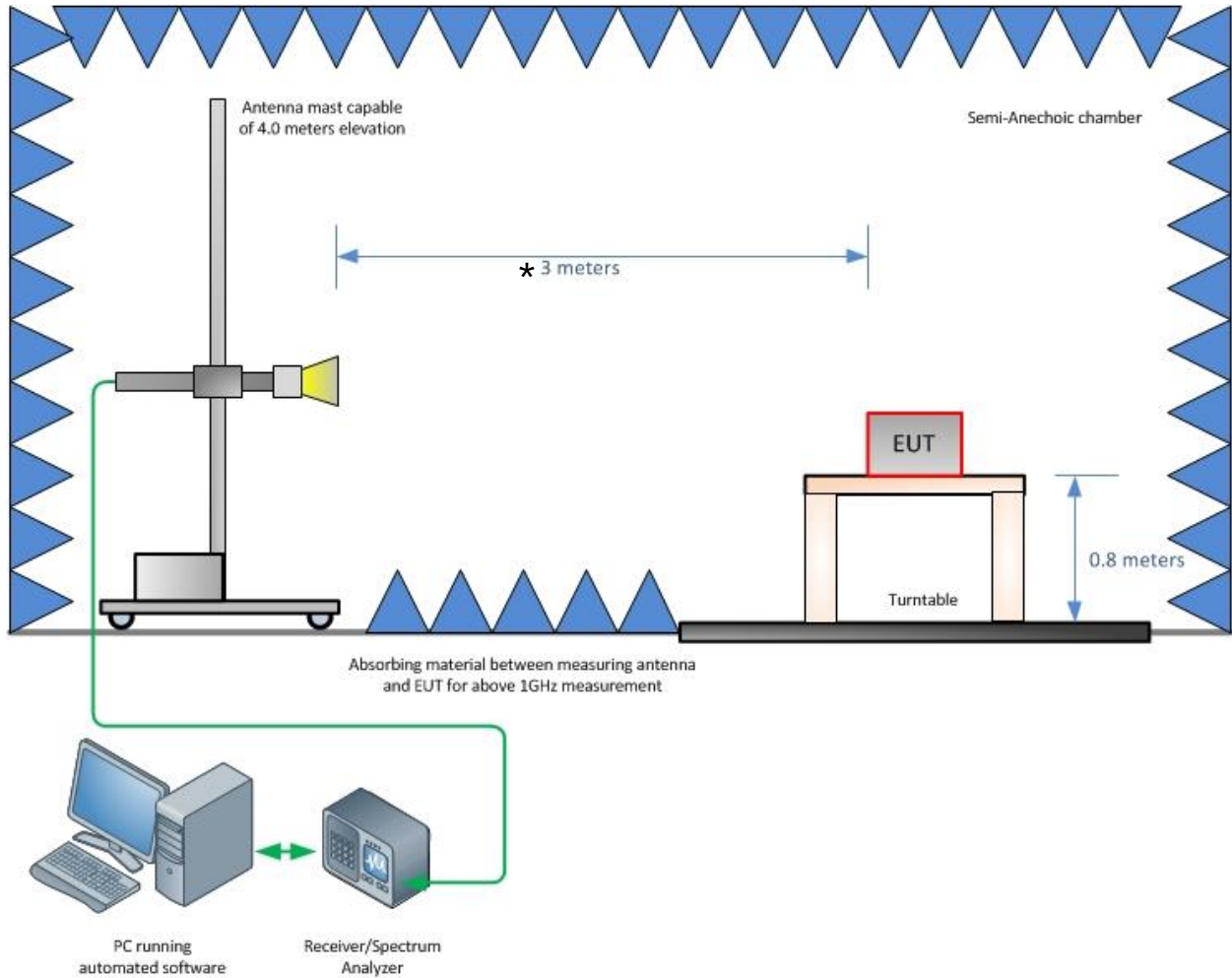
SECTION 4

DIAGRAM OF TEST SETUP

4.1 RADIATED EMISSION TEST SETUP (BELOW 1 GHZ)



4.2 RADIATED EMISSION TEST SETUP (ABOVE 1 GHz)



*A test distance of 3 m was used for measurements below 75 GHz. The emissions in the range from 75 GHz to 160 GHz were evaluated at 1.0 m distance. For the measurements from 160 GHz to 220 GHz, the test distance was reduced to 0.5 m to assure that the noise floor is at least 10 dB below the applicable limit. Measurements above 220 GHz were taken at 0.2 m distance.



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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