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25 September 2019

Page 1 of 87

Prüfbericht / Test Report

Nr. / No. TR-00237-48147-10 (Edition 2)

Auftraggeber <i>Applicant</i>	APTIV Services Deutschland GmbH
Geräteart <i>Type of equipment</i>	Automotive Radar Sensors
Typenbezeichnung <i>Type designation</i>	SRR4.0b
Seriennummer / <i>Serial number</i>	Test Samples: 005
Auftragsnummer / <i>Order No.</i>	N/A
Prüfgrundlage <i>Test standards</i>	CFR 47, Part 95, Subpart M ISED RSS-251, Issue 2

Summary

Prüfergebnisse / <i>Test Results</i>		Auftragsnummer / <i>Order No.</i> N/A			
Die Prüfungen wurden nach folgenden Vorschriften durchgeführt: <i>Tests were performed according to:</i> CFR 47, Part 95, Subpart M ISED RSS-251, Issue 2					
Durchgeführte Prüfung <i>Test performed</i>		Prüfergebnis <i>Test result</i>			
		Erfüllt <i>Passed</i>	Nicht erfüllt <i>Not Passed</i>	Nicht zutreffend <i>Not applicable</i>	Nicht durchgeführt <i>Not performed</i>
Power Density		☒	☐	☐	☐
Occupied Bandwidth		☒	☐	☐	☐
Spurious Radiated Emissions		☒	☐	☐	☐
Frequency Stability		☒	☐	☐	☐

Bemerkungen / Remarks:

Die Prüfergebnisse beziehen sich ausschließlich auf das zur Prüfung vorgestellte Prüfmuster. Ohne schriftliche Genehmigung des Prüflabors darf der Prüfbericht auszugsweise nicht vervielfältigt werden. *The test results relate only to the individual item which has been tested. Without the written approval of the test laboratory this report may not be reproduced in extracts.*

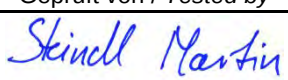
Datum / Date	Geprüft von / Tested by	Freigabe durch / Checked by	Prüfergebnis / Test Result	
2019-09-25	 Martin Steindl Responsible for testing	 Matthias Stumpe Reviewer	☒ Erfüllt / Passed	☐ Nicht erfüllt / Not passed

Table of Contents

1	Administrative Data	4
2	Details about the Test Laboratory.....	5
3	Description of the Equipment Under Test	6
4	Operation Mode and Configuration of EUT	8
5	Test Setups	9
6	Photographs Taken During Testing	12
7	Referenced Regulations	13
8	Measurement Uncertainty Values.....	14
9	Test Equipment used.....	17
10	Test Results	18
10.1	Radiated Power	20
10.2	Occupied Bandwidth.....	27
10.3	Spurious Radiated Emissions.....	34
10.4	Frequency Stability	70
10.5	SAR Evaluation	86
11	Revision History	87

Annex I: 3 pages

1 Administrative Data

Application details	
Applicant:	APTIV Services Deutschland GmbH Am Technologiepark 1 42119 Wuppertal Germany
Contact person:	Ms. Ljiljana Trivic
Intercompany contact:	TÜV SÜD Product Service GmbH GMA Straubing Mr. Thomas Ring
Order number:	N/A
Receipt of EUT:	2019-03-19
Return of EUT:	N/A
Date(s) of test:	2019-03-19 to 2019-04-10
Note(s):	Mr. Stawikowski, representing the applicant attended all tests.
Responsible for testing:	Mr. Martin Steindl
Responsible for test report:	Mr. Martin Steindl
Test report checked by:	Mr. Matthias Stumpe

Report details	
Report number:	TR-00237-48147-10
Edition:	2
Issue date:	2019-09-25

2 Details about the Test Laboratory

Details about the Test Laboratory	
Company name:	TÜV SÜD Product Service GmbH
Address:	Äußere Frühlingstraße 45 D-94315 Straubing Germany
Laboratory accreditation:	DAkKS Registration No. D-PL-11321-11-02 DAkKS Registration No. D-PL-11321-11-03
Laboratory recognition:	Registration No. BNetzA-CAB-16/21-15
Industry Canada test site registration:	3050A-2
Contact:	Mr. Markus Biberger
	Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

3 Description of the Equipment Under Test

Equipment characteristics	
Type designation:	SRR4.0b
Parts of the system:	
Options and accessories:	
Type of equipment:	Automotive Radar Sensors
Serial number:	Test Samples: 005
Manufacturer:	APTIV Services Deutschland GmbH
Power supply:	Battery supply (regulated lead-acid) Nominal: 13.2 V Minimum: 10.8 V Maximum: 15.6 V Nominal frequency: 0 Hz (DC supply)
FCC-ID:	LTQSRR4
IC:	3659A-SRR4
Highest internal frequency:	77 GHz
Version of EUT:	Hardware Version: 28674298AA Software Version: 002.001.20

Marking Plate



4 Operation Mode and Configuration of EUT

Operation Mode(s)

Transmitting continuously on lowest, middle and highest frequency with modulation 175 MHz, 300 MHz and 425 MHz.

List of ports and cables

No.	Description	Classification ¹	Cable type	Cable length used	maximum ²
D1	DC 12 V supply	dc power	Unshielded	3 m	≥ 3 m
S1	CAN interface	signal/control port	Shielded	3 m	≥ 3 m

List of devices connected to EUT

No.	Description	Type designation	Serial no. or ID	Manufacturer

List of support devices

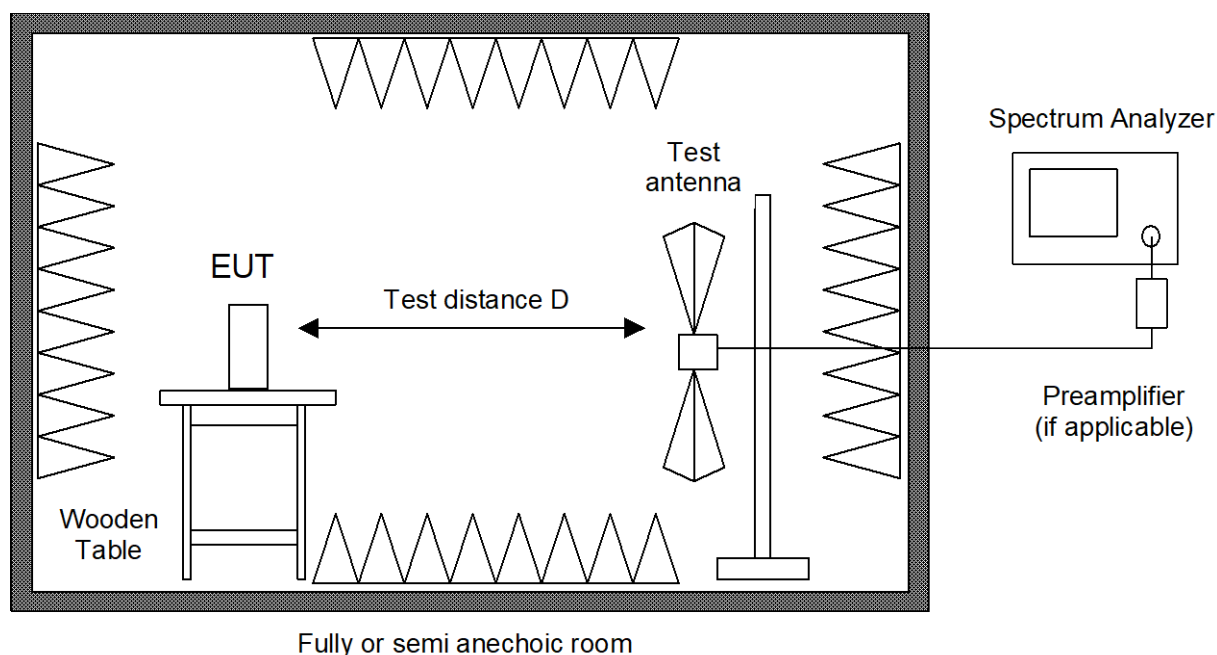
No.	Description	Type designation	Serial no. or ID	Manufacturer
1	CAN/LIN-Interface	VN1640A	---	Vector
2	Laptop PC	Latitude E5520	---	DELL

¹ Ports shall be classified as ac power, dc power or signal/control port.

² As specified by applicant

5 Test Setups

Radiated Emission in Fully or Semi Anechoic Room



Radiated emission in fully or semi anechoic room is measured in the frequency range from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.

Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set to 100 kHz (below 1 GHz) or 1 MHz (above 1 GHz).

Testing up to 1 GHz is performed with a linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna"). For testing above 1 GHz horn antennas are used.

All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.4 for alternative test sites is used (see 0). If prescans are recorded in fully anechoic room they are indicated appropriately.

According to section 13 of KDB558074 the requirement for radiated emissions on the band edges was performed with a reduced bandwidth of 100 kHz instead of 1 MHz.

Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

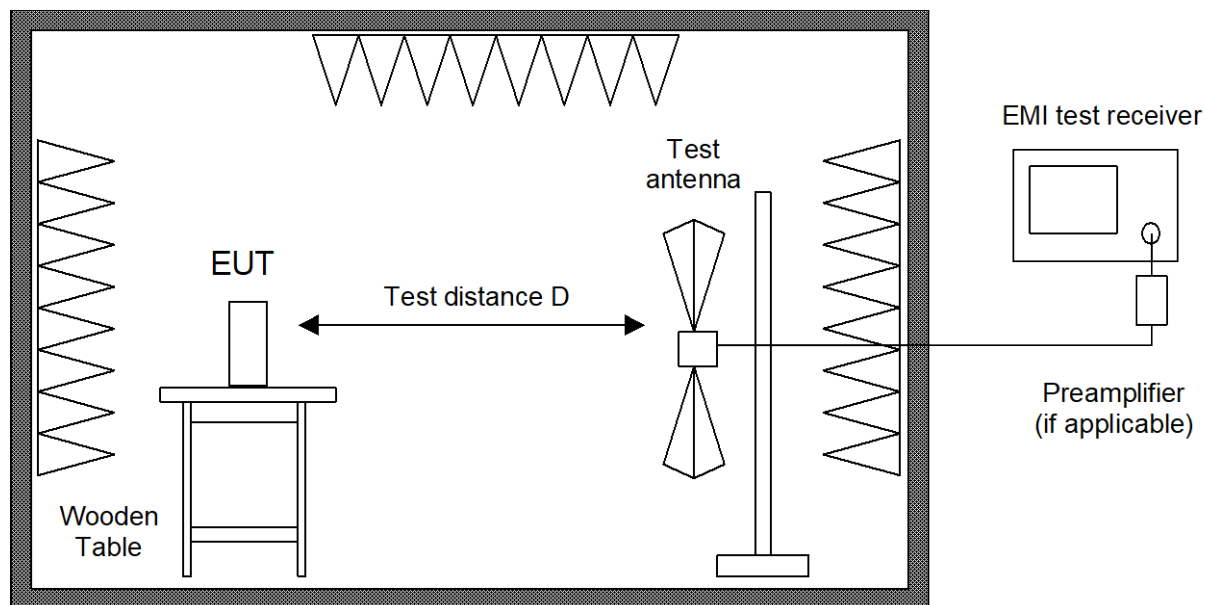
EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where, for non-pulsed operation, average detector is employed.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Radiated Emission at Alternative Test Site



Alternate test site (semi anechoic room)

Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.

Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.

With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.

Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is discharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission.

Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.

6 Photographs Taken During Testing

Please refer to Annex I of his test report

7 Referenced Regulations

<i>Publication</i>	<i>Title</i>
CFR 47, Part 2	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communications Commission (FCC)
CFR 47, Part 95, Subpart M	Code of Federal Regulations Part 95 (Personal Radio Services), Subpart M (76 – 77 GHz Band Radar Service) of the Federal Communications Commission (FCC)
RSS-251, Issue 2	Vehicular Radar and Airport Fixed or Mobile Radar in the 76 – 81 GHz Frequency band
ANSI C63.4-2014	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
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

8 Measurement Uncertainty Values

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

Radio Testing			
Test Name	kp	Expanded Uncertainty	Note
Occupied Bandwidth	2.0	±1.14 %	2
RF-Frequency error	1.96	±1 · 10 ⁻⁷	7
RF-Power, conducted carrier	2	±0.079 dB	2
RF-Power uncertainty for given BER	1.96	+0.94 dB / -1.05	7
RF power, conducted, spurious emissions	1.96	+1.4 dB / -1.6 dB	7
RF power, radiated			
25 MHz – 4 GHz	1.96	+3.6 dB / -5.2 dB	8
1 GHz – 18 GHz	1.96	+3.8 dB / -5.6 dB	8
18 GHz – 26.5 GHz	1.96	+3.4 dB / -4.5 dB	8
40 GHz – 170 GHz	1.96	+4.2 dB / -7.1 dB	8
Spectral Power Density, conducted	2.0	±0.53 dB	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	±2,89 %	2
6 kHz – 25 kHz	2	±0.2 dB	2
Maximum frequency deviation for FM	2	±2,89 %	2
Adjacent channel power 25 MHz – 1 GHz	2	±2.31 %	2
Temperature	2	±0.39 K	4
(Relative) Humidity	2	±2.28 %	2
DC- and low frequency AC voltage			
DC voltage	2	±0.01 %	2
AC voltage up to 1 kHz	2	±1.2 %	2
Time	2	±0.6 %	2

Radio Interference Emission Testing			
Test Name	kp	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5μH AMN)	2	± 3.6 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 200 MHz	2	± 3.5 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.5 dB	1
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4

Immunity Testing			
Test Name	kp	Expanded Uncertainty	Note
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances, induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips, Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Note 1:

The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 2:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 3:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2.05$, providing a level of confidence of $p = 95.45\%$

Note 4:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence.

Note 5:

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 6:

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 7:

The expanded uncertainty reported according ETSI TR 100 028 V1.4.1 (all parts) to is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$

Note 8:

The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$

9 Test Equipment used

<i>T-ID</i>	<i>Designation</i>	<i>Type</i>	<i>Last Cal.</i>	<i>Next Cal.</i>
18874	Horn antenna	3160-07	Verified	
18875	Horn antenna	3160-08	Verified	
19125	Horn antenna	3160-09	Verified	
19383	Double ridged waveguide horn antenna	3115	2017-02	2020-02
19442	Horn antenna	3160-10	Verified	
19533	Spectrum analyser	FSP30	2019-02	2020-02
19933	Double ridged horn antenna	HF907	2017-02	2019-06
19946	Horn antenna	24240-20	Verified	
20219	Signal and Spectrum Analysator	FSV40 for TS8997	2019-01	2020-01
22553	Waveguide mixer	FS-Z170	2016-08	2019-08
25849	Waveguide mixer	FS-Z60	2017-04	2020-04
25850	Waveguide mixer	FS-Z90	2016-12	2019-12
25851	Waveguide mixer	FS-Z110	2016-11	2019-11
27898	Horn antenna	26240-20	Verified	
27899	Horn antenna	27240-20	Verified	
28268	EMI test receiver	ESW26	2018-05	2019-05
39897	EMI test receiver	ESW44	2019-02	2020-02
36954	Harmonic Mixer	FS-Z220	2018-03	2021-03
36955	Harmonic Mixer	FS-Z325	2018-02	2021-02
37863	Horn antenna	30240-20 WG30	Verified	
37864	Horn antenna	32240-20 WG32	Verified	
38401	ULTRALOG Antenna	HL562E	2018-05	2021-05

Test software for: EMC32 V10.

10 Test Results

CFR 47, Part 2			
Section(s)	Test performed	Page	Test Result
§ 2.202 (a); § 2.1049	Occupied Bandwidth	27	Test passed

CFR 47, Part 95, Subpart M,			
Section(s)	Test performed	Page	Test Result
§ 95.3367 (a)	Radiated Power – Average	20	Test passed
§ 95.3367 (b)	Radiated Power – Peak	20	Test passed
§ 95.3379 (a)	Spurious Emissions	34	Test passed
§95.3379 (b)	Frequency Stability	70	Test passed

ISED RSS-GEN, Issue 5

Section(s)	Test performed	Page	Test Result
6.7	Occupied Bandwidth	27	Test passed

ISED RSS-251, Issue 2

Section(s)	Test performed	Page	Test Result
7	Occupied Bandwidth	27	Test passed
8	Average equivalent isotropically radiated power (e.i.r.p.)	20	Test passed
9	Peak (e.i.r.p.)	20	Test passed
10	Unwanted Emissions	34	Test passed
11	Frequency Stability	70	Test passed

10.1 Radiated Power

Date of Test	2019-04-19
Operator	Martin Steindl
Test Site	Fully anechoic room, cabin no. 2

Test Result	
☒	Passed
☐	Not Passed

Barometric pressure:	981 hPa
Relative humidity:	33 %
Ambient temperature:	22 °C

Specifications:	CFR 47, Part 95, Subpart M, § 95.3367(a) and (b) RSS-251 Issue 2, Sections 8 and 9
Description:	The fundamental radiated emission limits within the 76 – 81 GHz band are expressed in terms of Equivalent Isotropically Radiated Power (EIRP) and are as follows: a) The maximum power (EIRP) within the 76 – 81 GHz band shall not exceed 50 dBm based on measurements employing a power averaging detector with a 1 MHz Resolution Bandwidth (RBW). b) The maximum peak power (EIRP) within the 76 – 81 GHz band shall not exceed 55 dBm based on measurements employing a peak detector with a 1 MHz RBW
Operation mode:	Transmitting continuously on frequency with modulation bandwidth as stated in table below
Comment :	Test was performed as radiated test. The test distance was 3 m. A correction factor of 59.67 dB and mixer conversion loss table were used to account for the test antenna gain, free-space loss and external mixer loss.

Modulation	Detector	Lowest Channel	Middle Channel	Highest Channel	Limit	Note
175 MHz	Average	8.3 dBm	8.7 dBm	9.0 dBm	50 dBm	
	Peak	23.6 dBm	24.3 dBm	24.2 dBm	55 dBm	
300 MHz	Average	5.9 dBm	6.5 dBm	5.9 dBm	50 dBm	
	Peak	21.6 dBm	22.2 dBm	21.6 dBm	55 dBm	
425 MHz	Average	4.6 dBm	4.9 dBm	5.0 dBm	50 dBm	
	Peak	20.2 dBm	20.5 dBm	20.7 dBm	55 dBm	

Note(s):

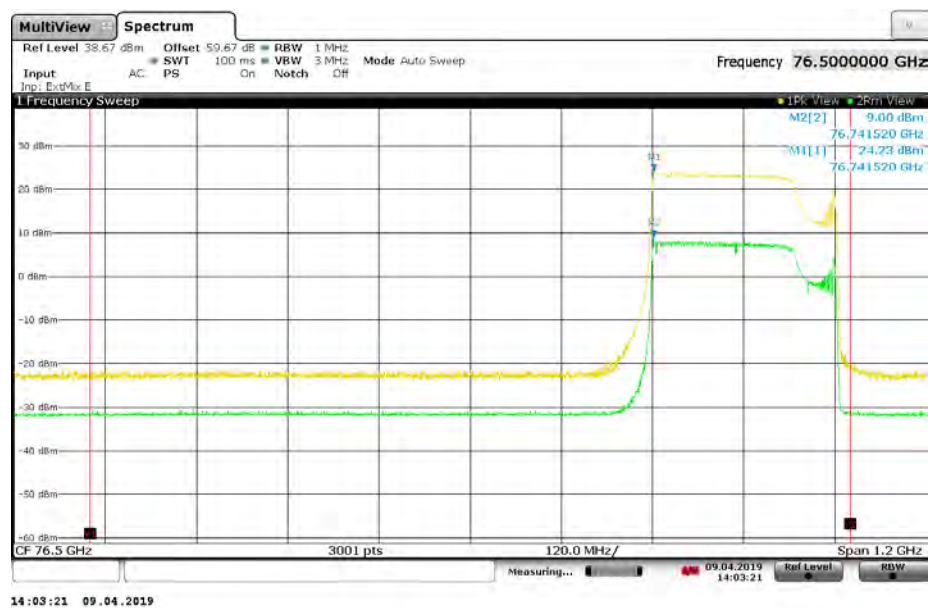
Plots taken during test



175 MHz, Lowest Channel



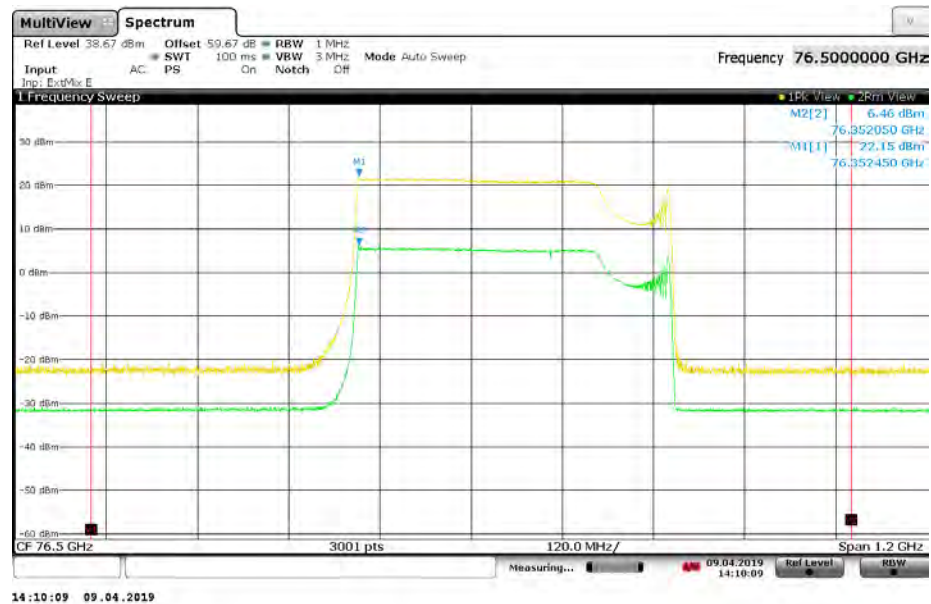
175 MHz, Middle Channel



175 MHz, Highest Channel



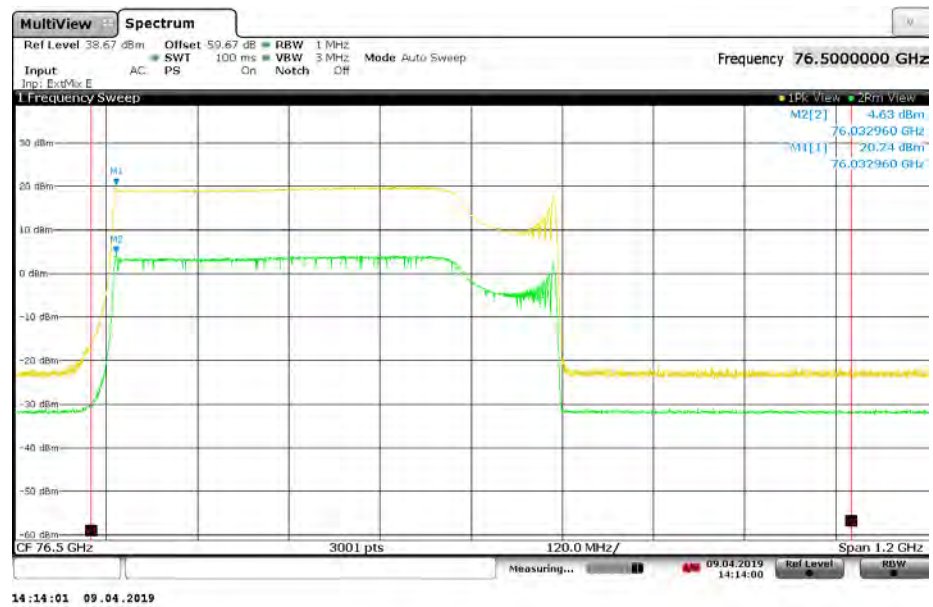
300 MHz, Lowest Channel



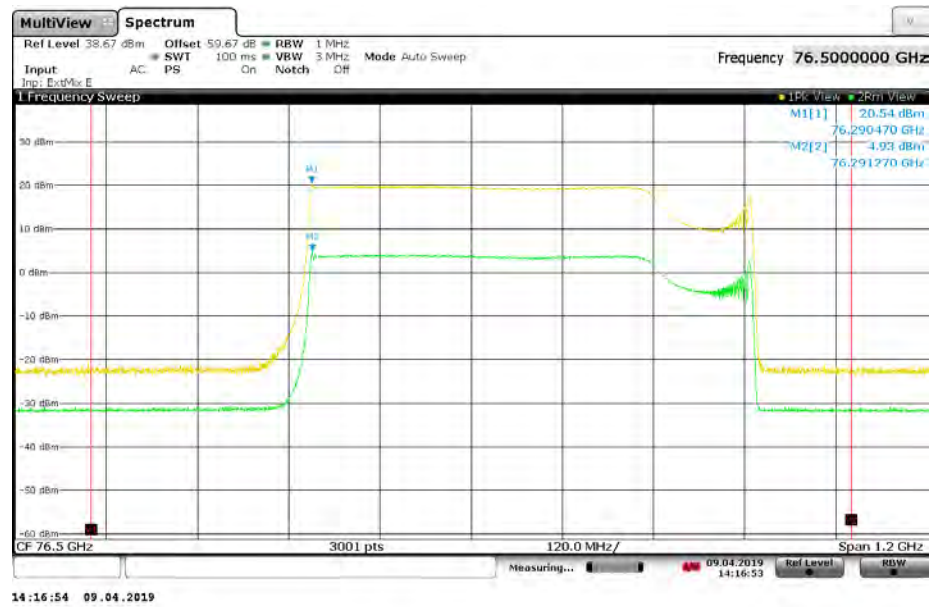
300 MHz, Middle Channel



300 MHz, Highest Channel



425 MHz, Lowest Channel



425 MHz, Middle Channel



425 MHz, Highest Channel

10.2 Occupied Bandwidth

Date of Test	2019-03-19
Operator	Martin Steindl
Test Site	Fully anechoic room, cabin no. 2

Test Result	
☒	Passed
☐	Not Passed

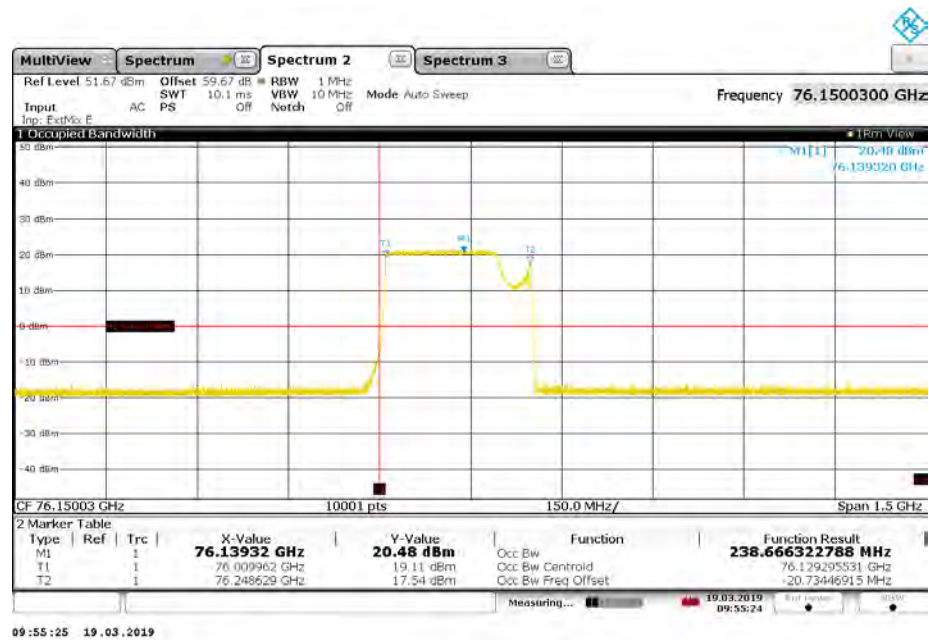
Barometric pressure:	994 hPa
Relative humidity:	33 %
Ambient temperature:	22 °C

Specifications:	CFR 47, Part 2, Clause 2.1049 and 2.202(a) RSS-GEN Issue 5, Section 6.7 RSS-251, Issue 2, Section 7
Description:	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.
Operation mode:	Transmitting continuously on frequency with modulation bandwidth as stated in table below
Comment :	

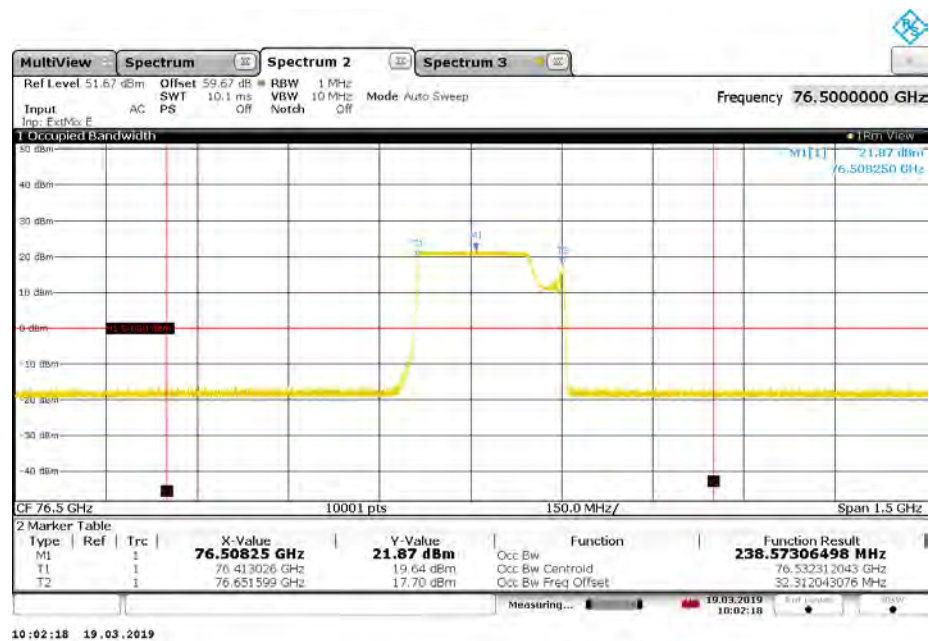
Modulation		Lowest Channel	Middle Channel	Highest Channel	Limit	Note
175 MHz	f _L	76.009962 GHz	76.413026 GHz	76.740004 GHz	≥ 76 GHz	
	f _H	76.248629 GHz	76.651599 GHz	76.978223 GHz	≤ 77 GHz	
300 MHz	f _L	76.031019 GHz	76.350833 GHz	76.575738 GHz	≥ 76 GHz	
	f _H	76.438867 GHz	76.758355 GHz	76.983183 GHz	≤ 77 GHz	
425 MHz	f _L	76.031833 GHz	76.289755 GHz	76.406489 GHz	≥ 76 GHz	
	f _H	76.607466 GHz	76.865533 GHz	76.982343 GHz	≤ 77 GHz	

Note(s):

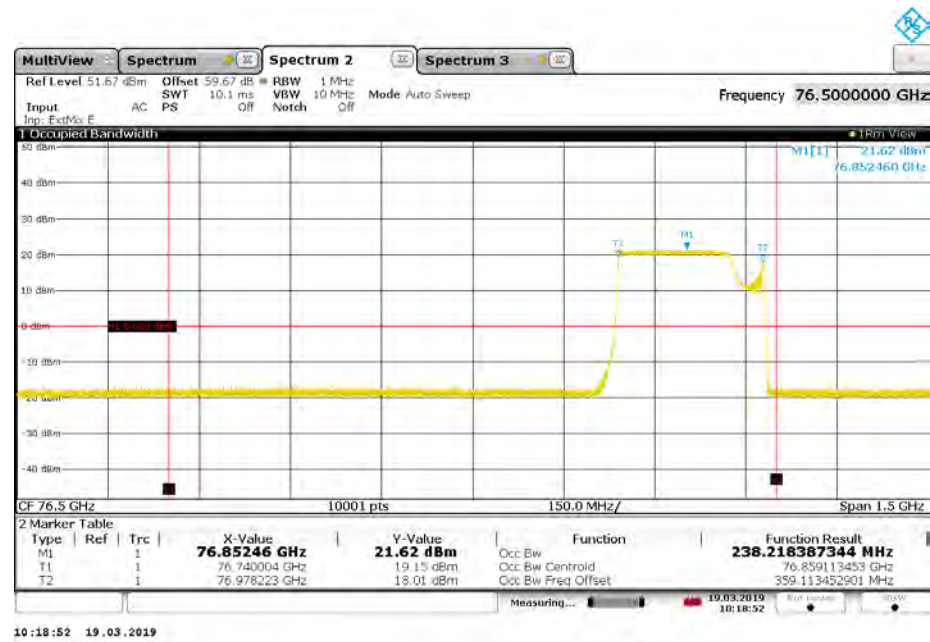
Plots taken during test



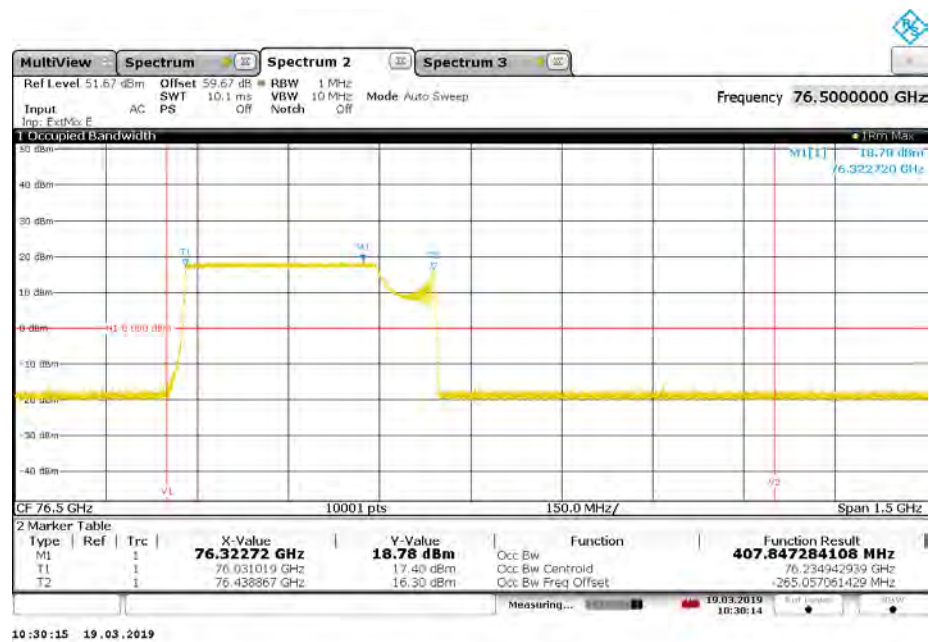
175 MHz, Lowest Channel



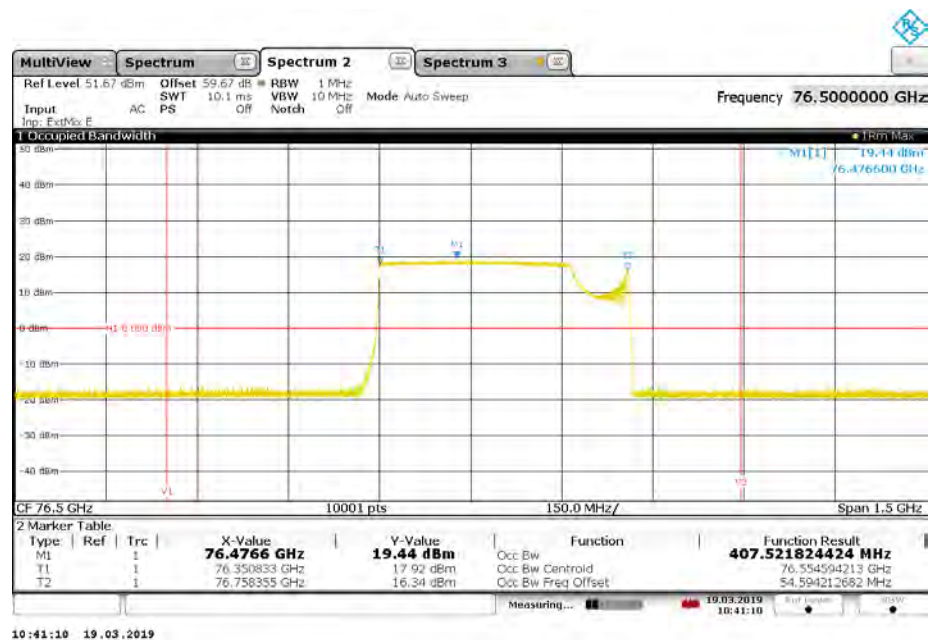
175 MHz, Middle Channel



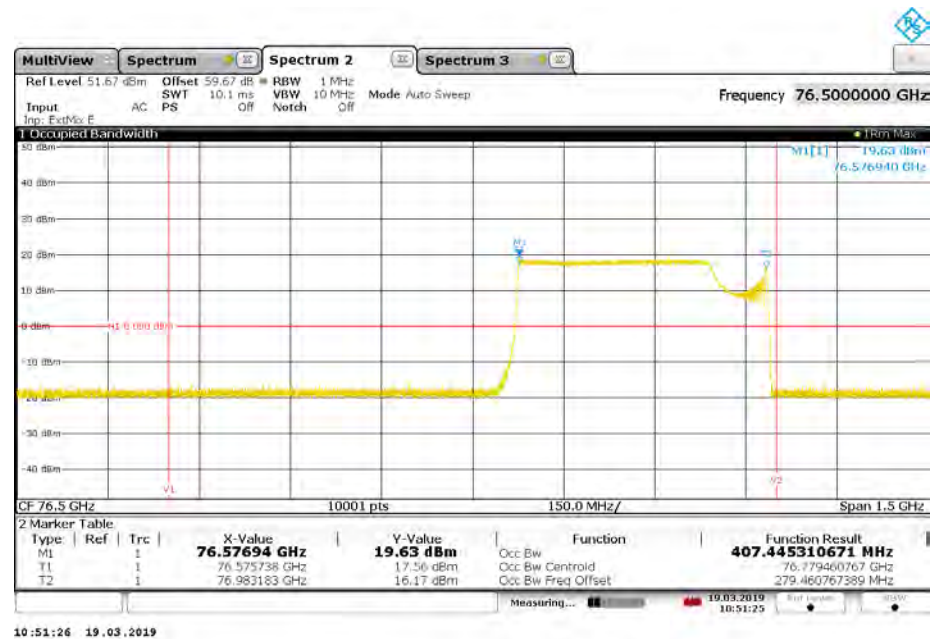
175 MHz, Highest Channel



300 MHz, Lowest Channel



300 MHz, Middle Channel



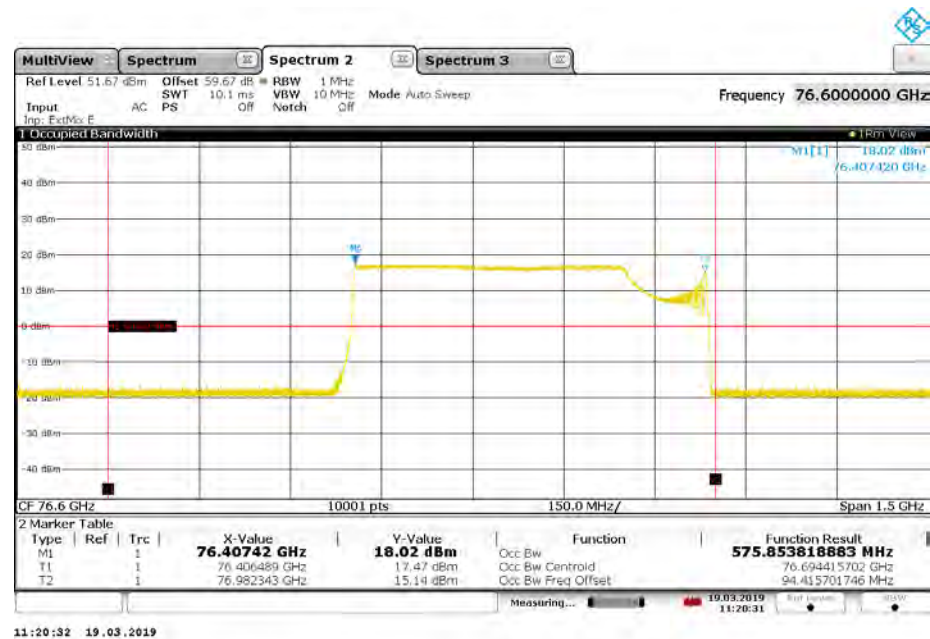
300 MHz, Highest Channel



425 MHz, Lowest Channel



425 MHz, Middle Channel



425 MHz, Highest Channel

10.3 Spurious Radiated Emissions

Date of Test	2019-04-9 to 2019-04-16	Test Result ☒ Passed ☐ Not Passed
Operator	Martin Steindl	
Test Site	Shielded room, cabin no. 1	

Barometric pressure:	981 hPa
Relative humidity:	33 %
Ambient temperature:	22 °C

Specifications:	CFR 47, Part 95, Subpart M, § 95.3379(a) ISED RSS-251 Issue 2, Section 10
Description:	The power density of any emissions outside the 76 – 81 GHz band shall consist solely of spurious emissions and shall not exceed the following: Radiated emissions below 40 GHz shall not exceed the field strength as shown in the Table 1. The power density of radiated emissions outside the 76 – 81 GHz band above 40 GHz shall not exceed the power density as shown in tables on next page.
Operation mode: Comment :	Test was performed as radiated test.

Radiated emission limits 9 kHz – 40 GHz		
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/f(kHz)	300
0.490 – 1.705	24000/f(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
960 – 40000	500	3

Note(s):

- 1 In the emissions table the tighter limit applies at the band edges.
- 2 The limits are based on the frequency of the unwanted emissions and not the fundamental frequency. However, the level of any unwanted emission shall not exceed the level of the fundamental frequency.
- 3 The emissions limits shown in the table are based on measurement employing CISPR quasi-peak detector except for the frequency bands 9.0 – 90 kHz, 110.0 – 490 kHz, and above 1 GHz. Radiated emissions limits in these three bands are based on measurements employing an average detector with 1 MHz RBW.

Table 1: FCC and ISED Radiated emission limits 9 kHz – 40 GHz

<i>Radiated emission limits 40 GHz – 231 GHz</i>		
<i>Frequency (GHz)</i>	<i>Power Density (pW/cm²)</i>	<i>Measurement distance (m)</i>
40 – 200	600	3
above	1000	3

Note(s):

- 1 According to 47 CFR, Part 95, § 95.3379(a)(3) the spectrum shall be investigated up to 231 GHz.
- 2 The power density of 600 pW/cm² corresponds to a field strength of 93.5 dBµV/m for 3 m distance and 103.1 dBµV/m for 1 m distance
- 3 The power density of 1000 pW/cm² corresponds to a field strength of 95.8 dBµV/m for 3 m distance, 105.3 dBµV/m for 1 m distance and 111.3 dBµV/m for 0.5 m distance.

Table 2: FCC Radiated emission limits above 40 GHz

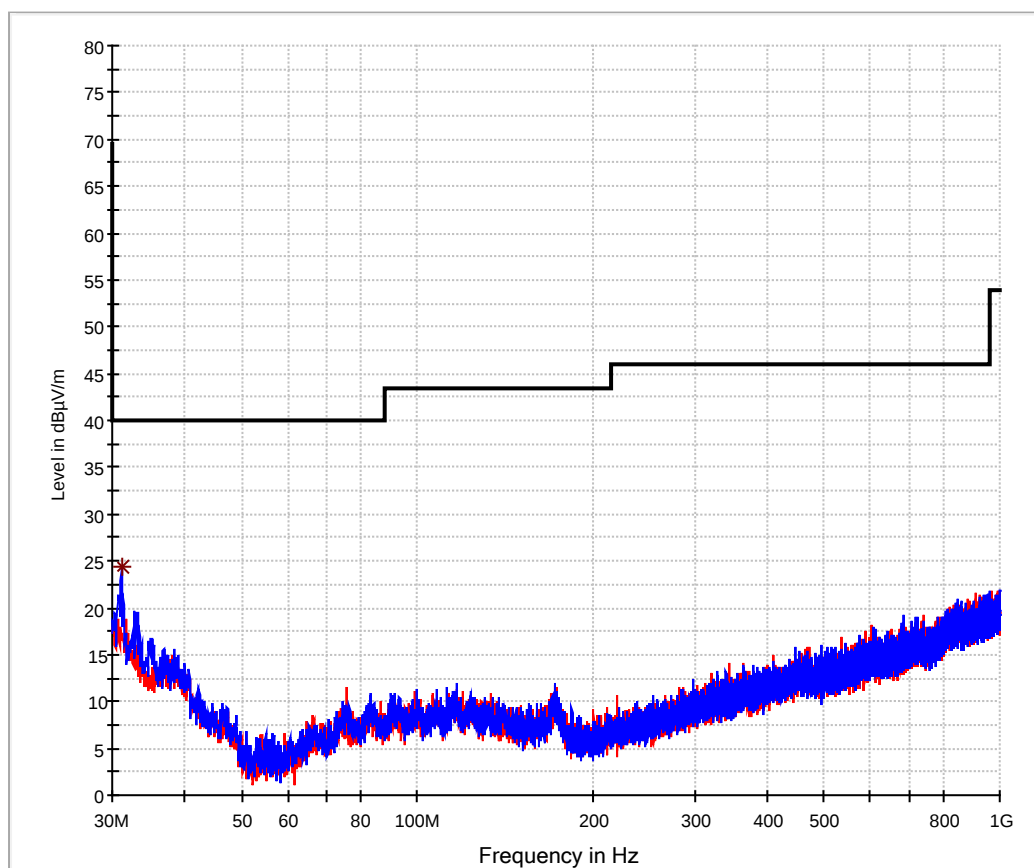
<i>Radiated emission limits 40 GHz –162 GHz</i>		
<i>Frequency (GHz)</i>	<i>Limit (dBm/MHz e.i.r.p.)</i>	<i>Detector</i>
40 – 162	-30	RMS

Note(s):

- 1 For radar devices that operate solely in the 76 – 76 GHz Band (i.e. the occupied bandwidth is entirely contained in the 76 – 77 GHz band), an unwanted emissions limit of 0 dBm/MHz shall apply for the unwanted emission that fall in the 73.5 – 76 GHz band. Outside the 73.5 – 76 GHz band, the unwanted emission limits prescribed above shall apply.

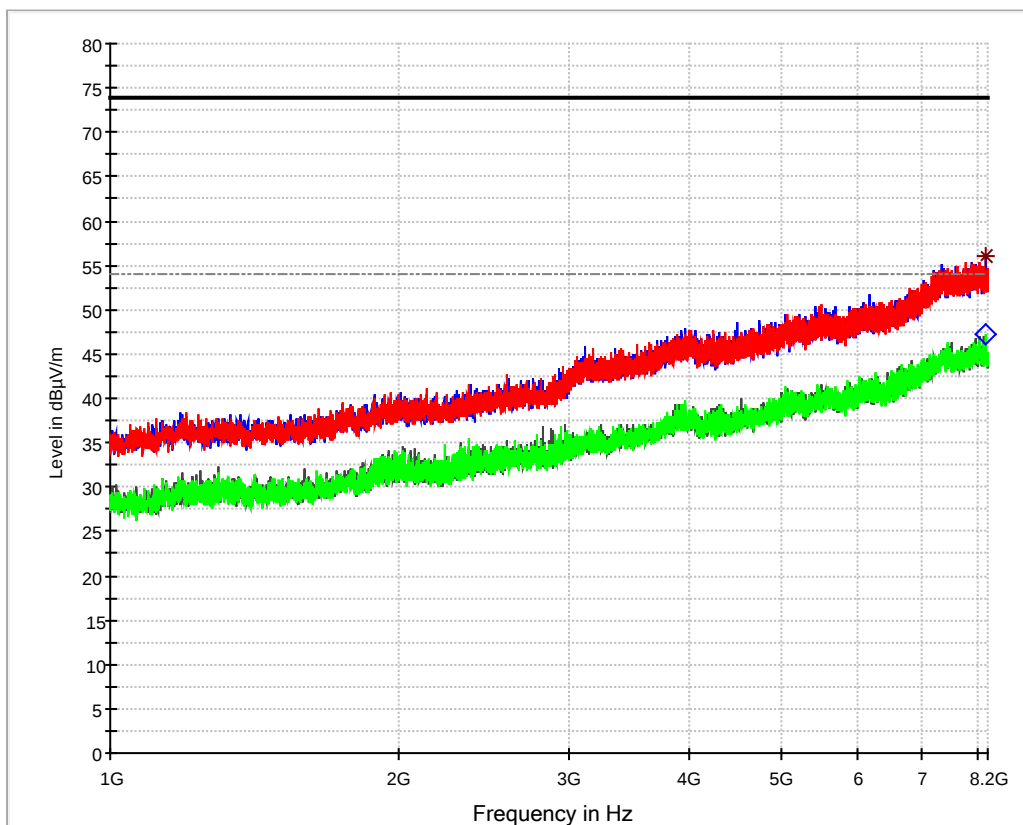
Table 3: ISSED Radiated emission limits above 40 GHz

Plots for lowest channel



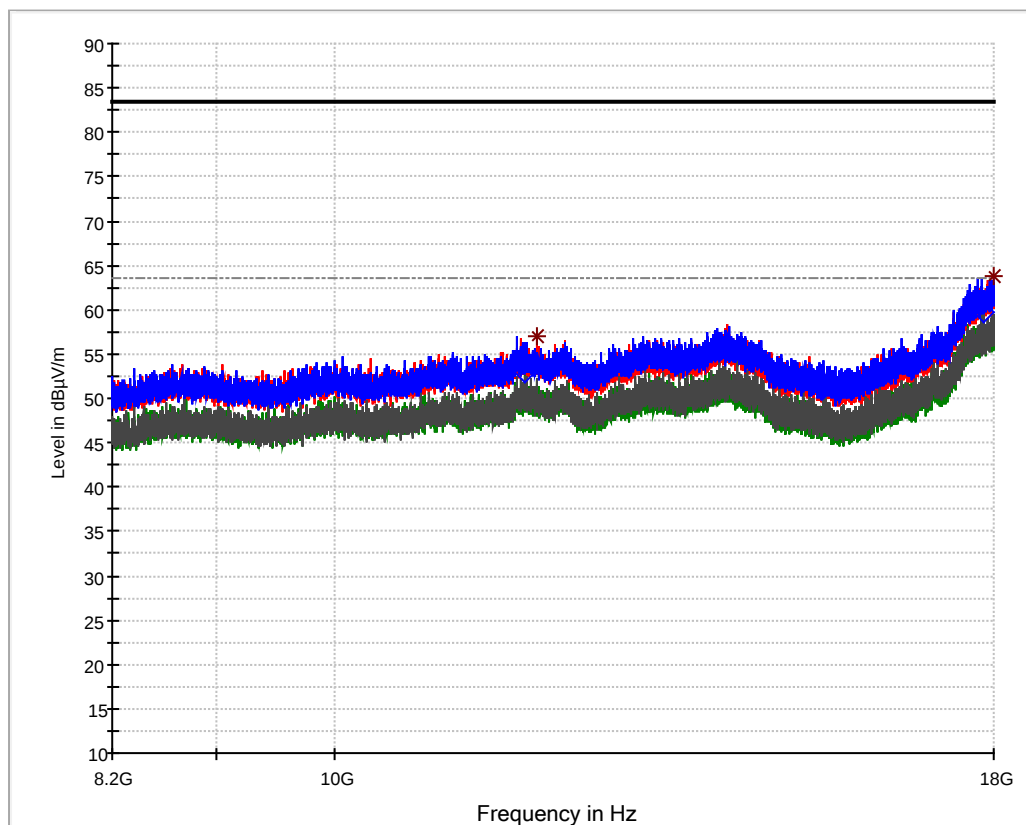
— Preview Result 1H-PK+ — Preview Result 1V-PK+ — FCC 15.209 * Final_Result PK

Frequency MHz	MaxPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Pol	Azimuth deg	Corr. dB/m
31.115500	24.49	40.00	15.51	2.5	100.000	V	226.0	-11



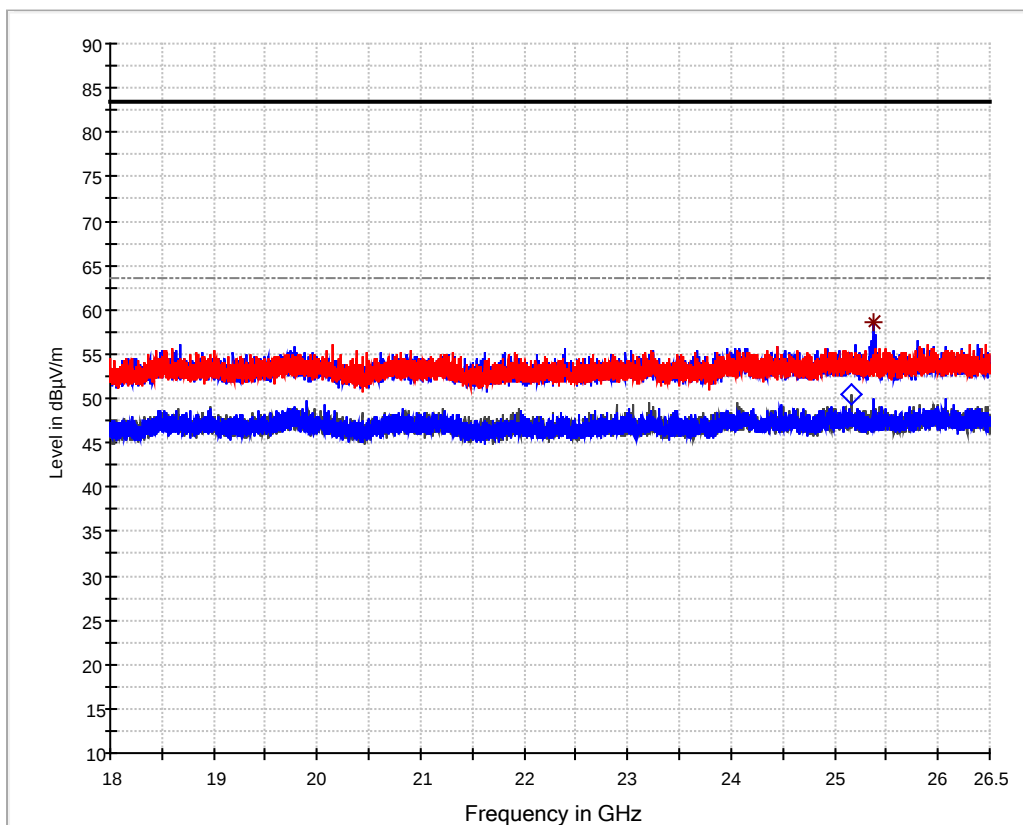
— Preview Result 2V-AVG — Preview Result 1V-PK+ — Preview Result 2H-AVG
 — Preview Result 1H-PK+ — FCC 15.209 PK - - - - - FCC 15.209 AV
 * Final_Result PK+ ◇ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
8149.000000		47.21	54.00	6.79	2.5	1000.000	150.0	H	329.0	13.6
8173.000000	55.97		74.00	18.03	2.5	1000.000	150.0	V	201.0	13.6



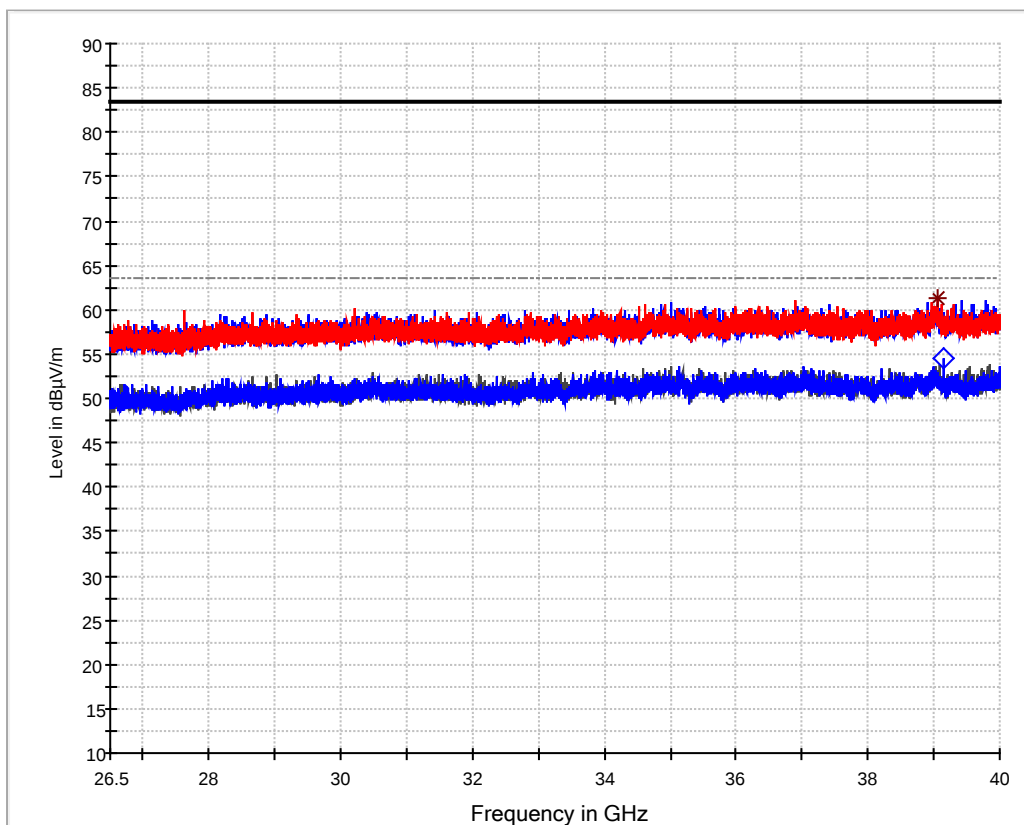
— Preview Result 2H-AVG — Preview Result 1H-PK+ — Preview Result 2V-AVG
— Preview Result 1V-PK+ — FCC 15.209 (1m) PK - - - FCC 15.209 (1m) AV
* Final_Result PK+ ◇ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB/m
11858.200000		52.87	63.50	10.63	2.5	1000.000	150.0	H	23.0	40
11981.866667	57.09		83.50	26.41	2.5	1000.000	150.0	H	219.0	40
17844.600000		59.73	63.50	3.77	2.5	1000.000	150.0	V	98.0	48
18000.000000	63.89		83.50	19.61	2.5	1000.000	150.0	V	194.0	48



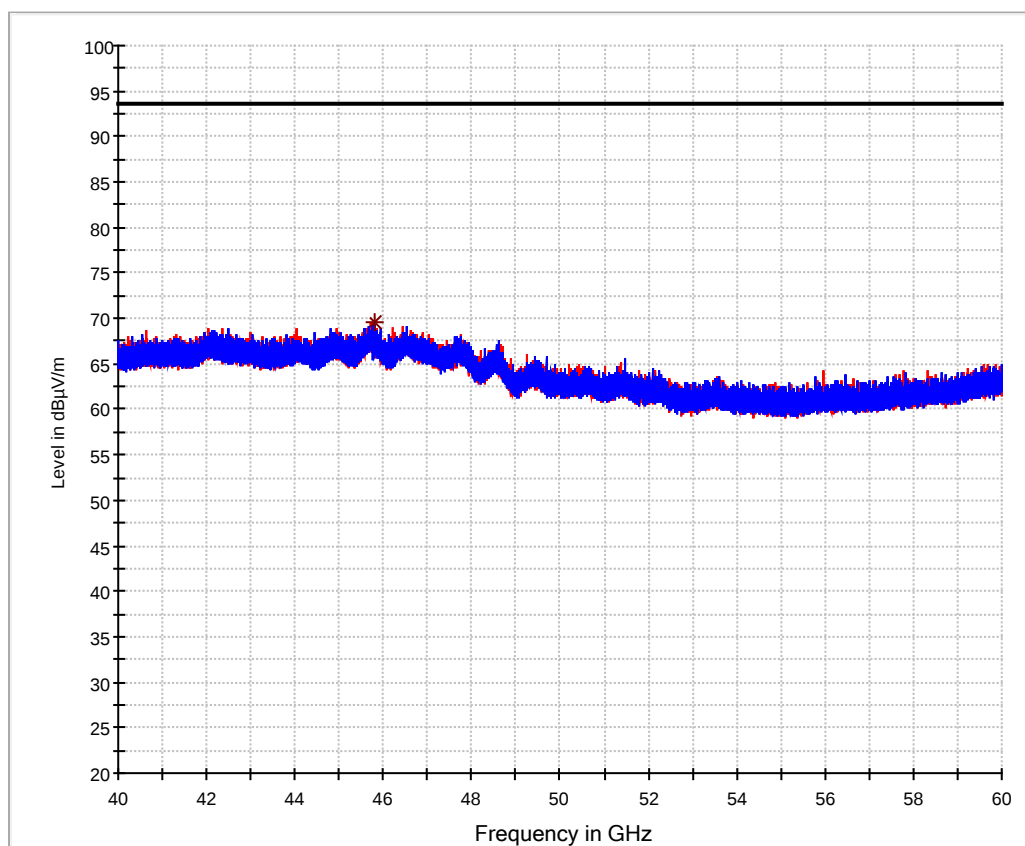
— Preview Result 2V-AVG — Preview Result 1V-PK+ — Preview Result 2H-AVG
 — Preview Result 1H-PK+ — FCC 15.209 (1m) PK — FCC 15.209 (1m) AV
 * Final_Result PK+ ◇ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
25161.250000		50.52	63.50	12.98	2.5	1000.000	150.0	V	153.0	40.4
25379.062500	58.55		83.50	24.95	2.5	1000.000	150.0	V	0.0	40.5



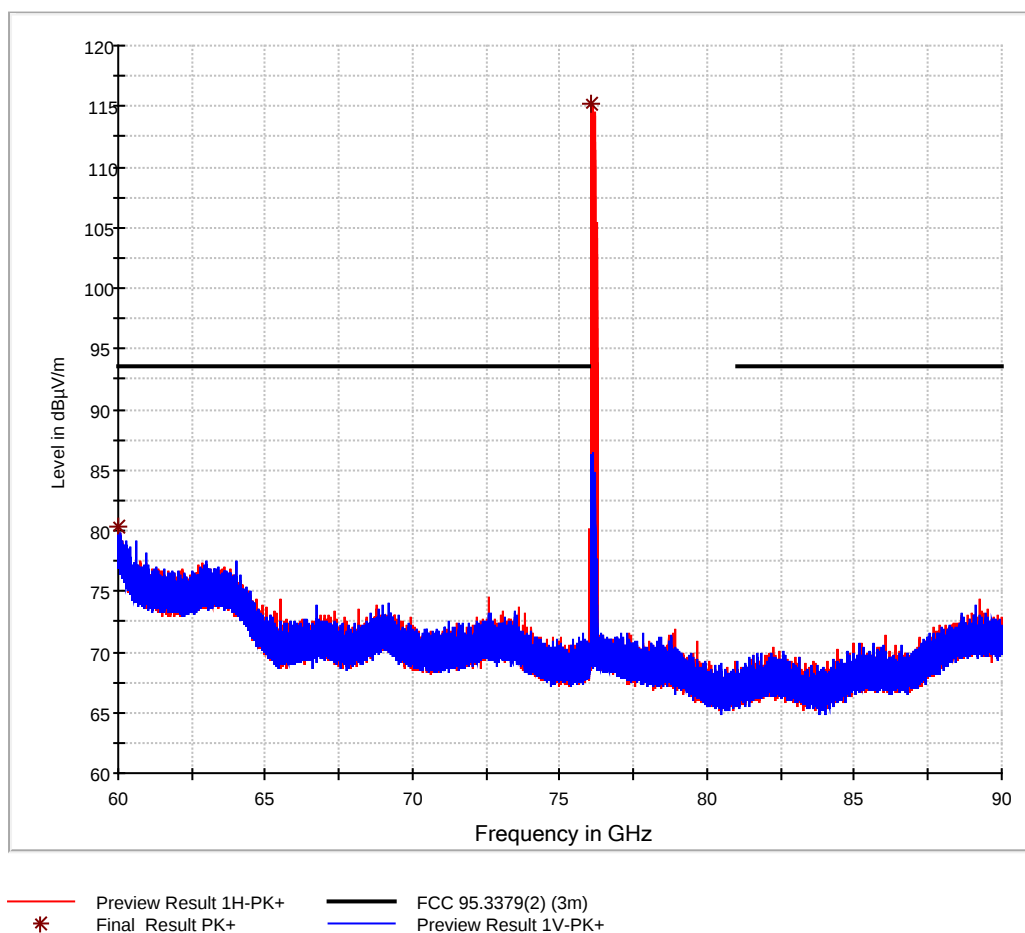
— Preview Result 2V-AVG — Preview Result 1V-PK+ — Preview Result 2H-AVG
 — Preview Result 1H-PK+ — FCC 15.209 (1m) PK - - - - - FCC 15.209 (1m) AV
 * Final_Result PK+ ◇ Final_Result AVG

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
39046.900000	61.27		83.50	22.23	2.5	1000.000	150.0	H	37.0	44
39138.700000		54.50	63.50	9.00	2.5	1000.000	150.0	H	33.0	44

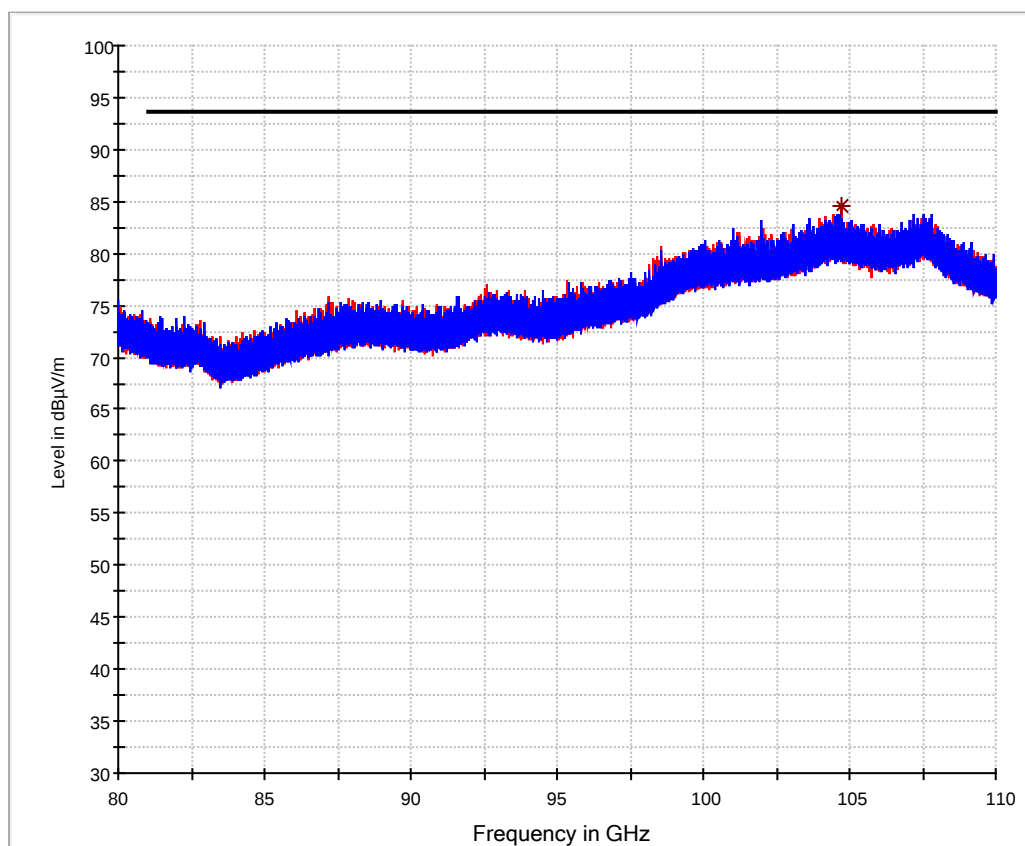


— Preview Result 1H-PK+ — Preview Result 1V-PK+
— FCC 95.3379(2) (3m) * Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
45792.500000	69.64	93.55	23.91	2.5	1000.000	150.0	V	168.0	44.2

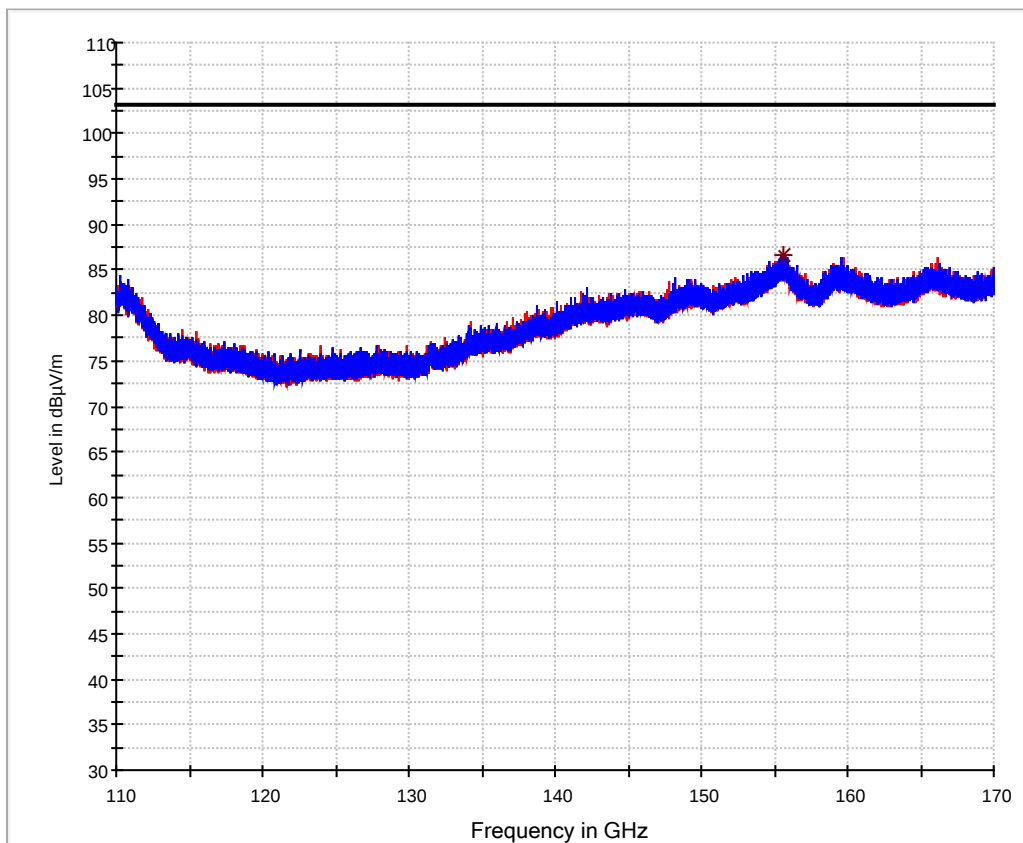


Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
60004.500000	80.41	93.55	13.14	2.5	1000.000	150.0	H	104.0	48
76031.111111	115.26			2.5	1000.000	150.0	H	187.0	48



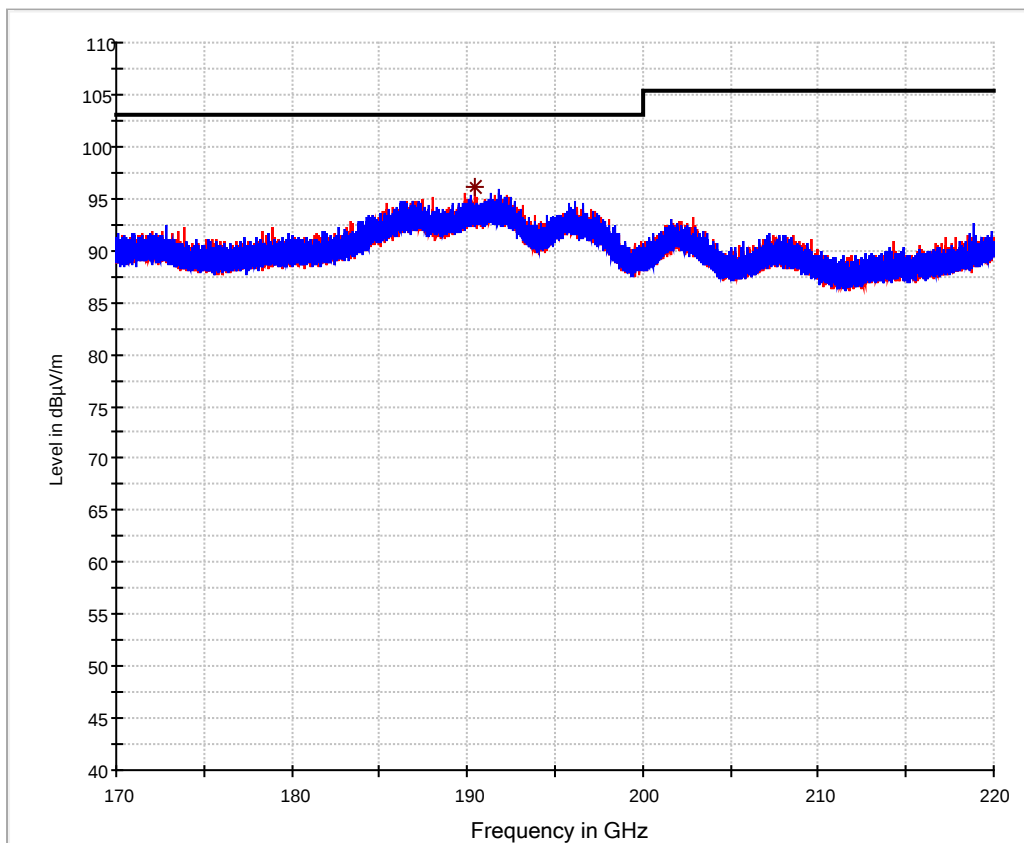
— Preview Result 1H-PK+ — Preview Result 1V-PK+
 — FCC 95.3379(2) (3m) * Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
104707.142857	84.62	93.55	8.93	2.5	1000.000	150.0	H	167.0	49.7



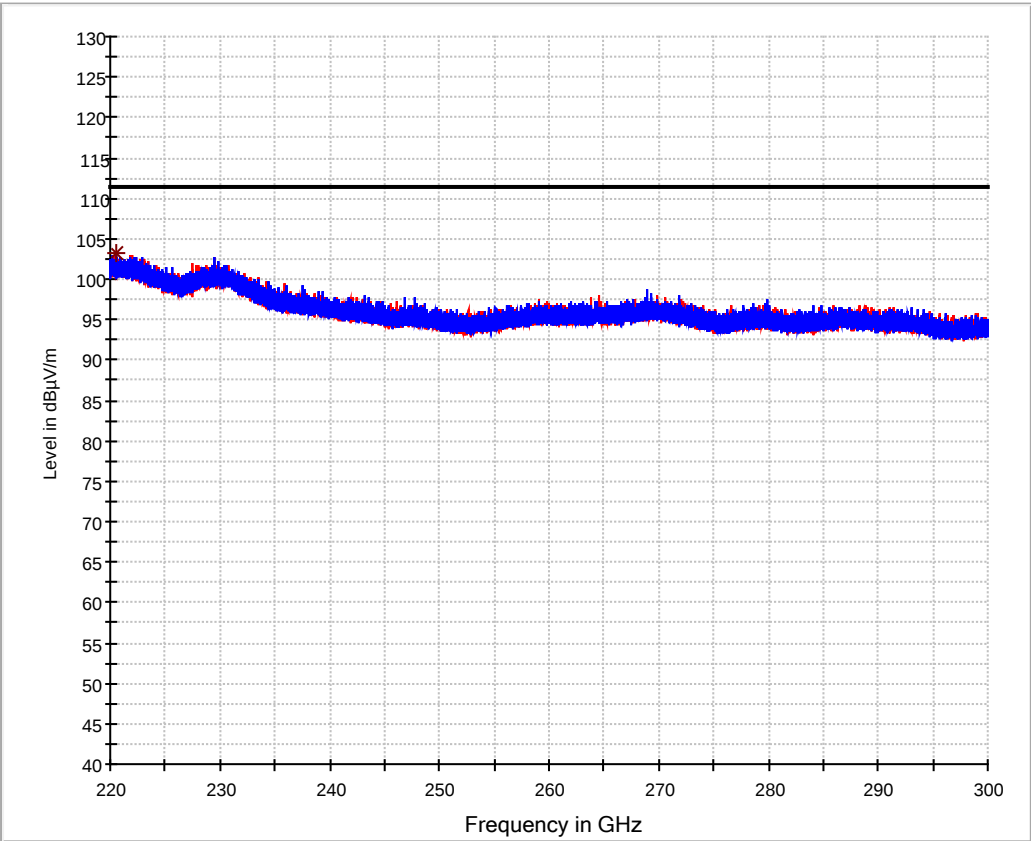
— Preview Result 1H-PK+ — Preview Result 1V-PK+
 — FCC 95.3379(2) (1m) * Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
155600.000000	86.74	103.09	16.35	2.5	1000.000	150.0	H	50.0	50



— Preview Result 1H-PK+ — Preview Result 1V-PK+
— FCC 95.3379(2) (1m) * Final_Result PK+

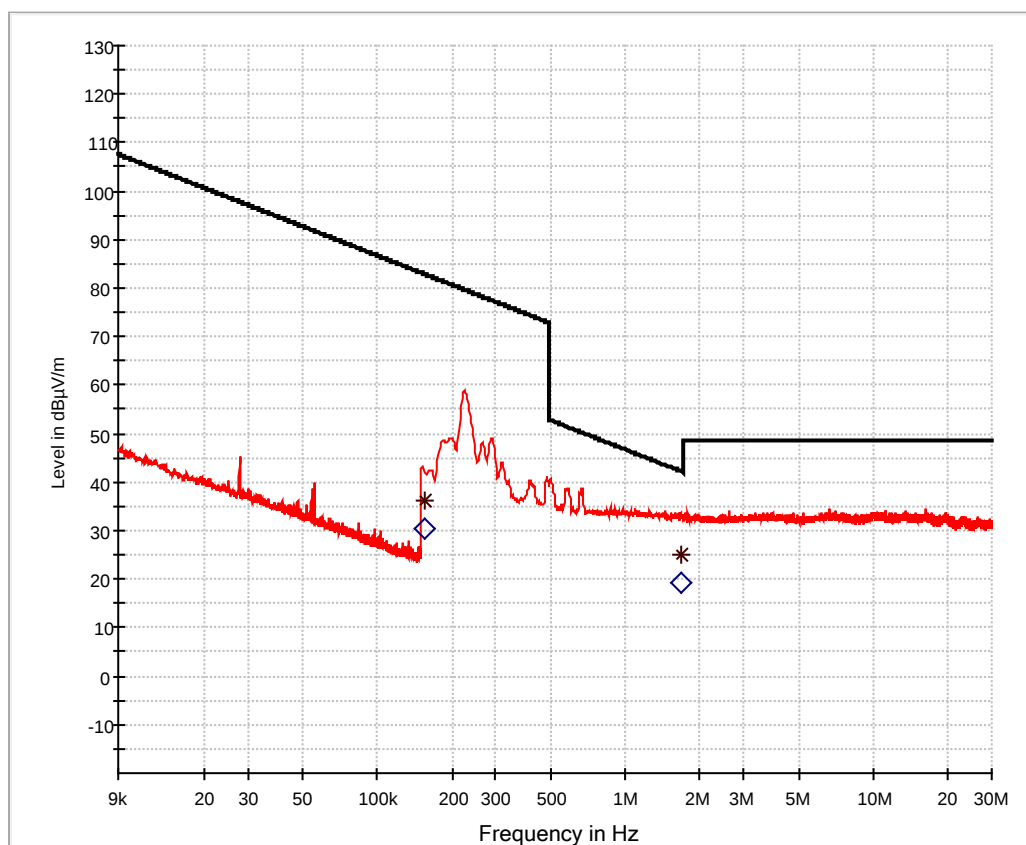
Frequency MHz	MaxPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB	Trd Corr. dB	Raw Rec dBµV
190418.750000	96.12	103.09	6.97	2.5	1000.000	150.0	H	208.0	54.9	55	41



— Preview Result 1H-PK+ — Preview Result 1V-PK+
— FCC 95.3379(2) (0.5m) * Final_Result PK+

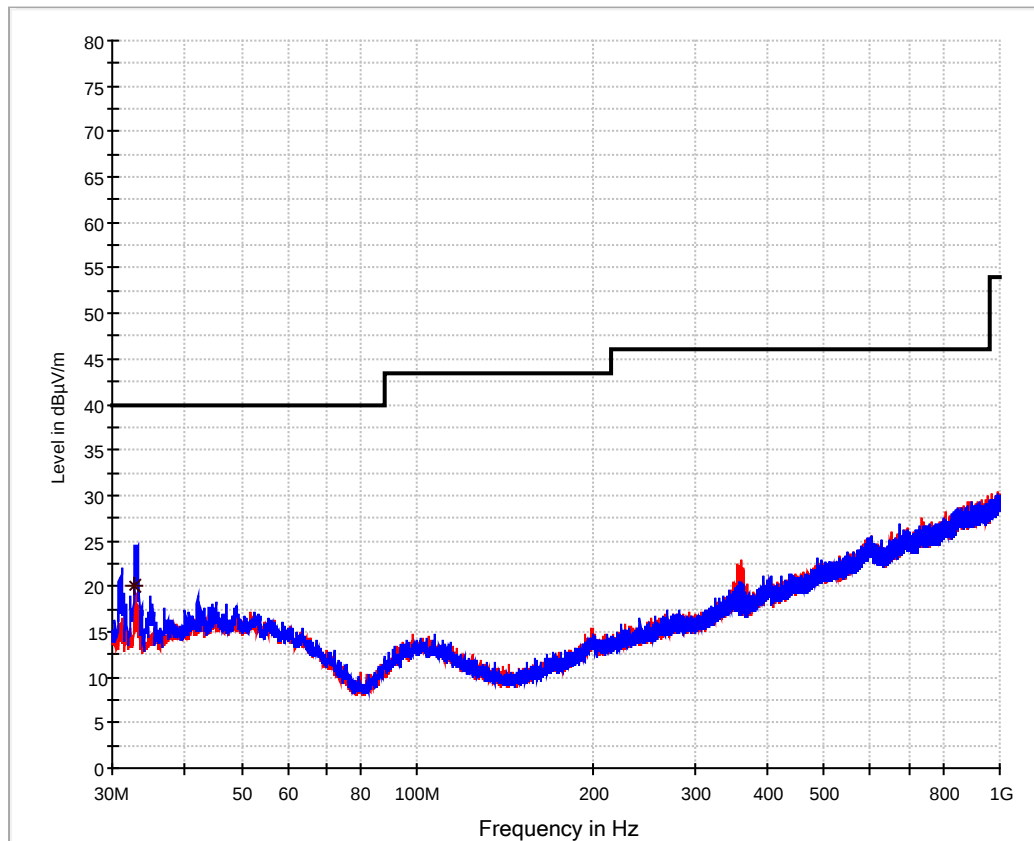
Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.	Trd Corr.	Raw Rec
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m	dB/m	dBµV
220477.500000	103.28	111.33	8.05	2.5	1000.000	150.0	H	350.0	59	59	44

Plots for middle channel



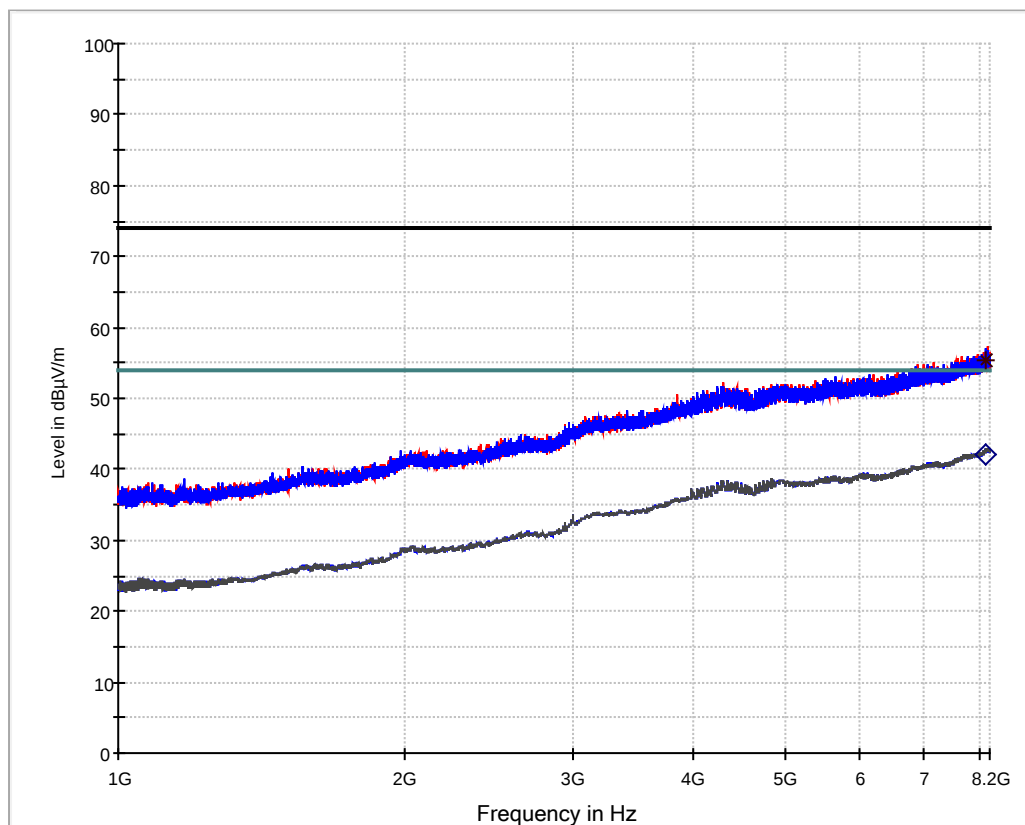
— Preview Result 1-PK+
* Final_Result QPK
 — FCC 15.209 mag (10 m)
◆ Final_Result CAV

Frequency	QuasiPeak	CAverage	Limit	Margin	Meas. Time	Bandwidth	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz		deg	dB
0.154500	36.29		82.92	46.63	1000.0	9.000	V	113.0	20.0
0.154500		30.29	82.92	52.63	1000.0	9.000	V	113.0	20.0
1.691250	25.17		42.17	17.00	1000.0	9.000	V	51.0	20.0
1.691250		19.35	42.17	22.82	1000.0	9.000	V	51.0	20.0



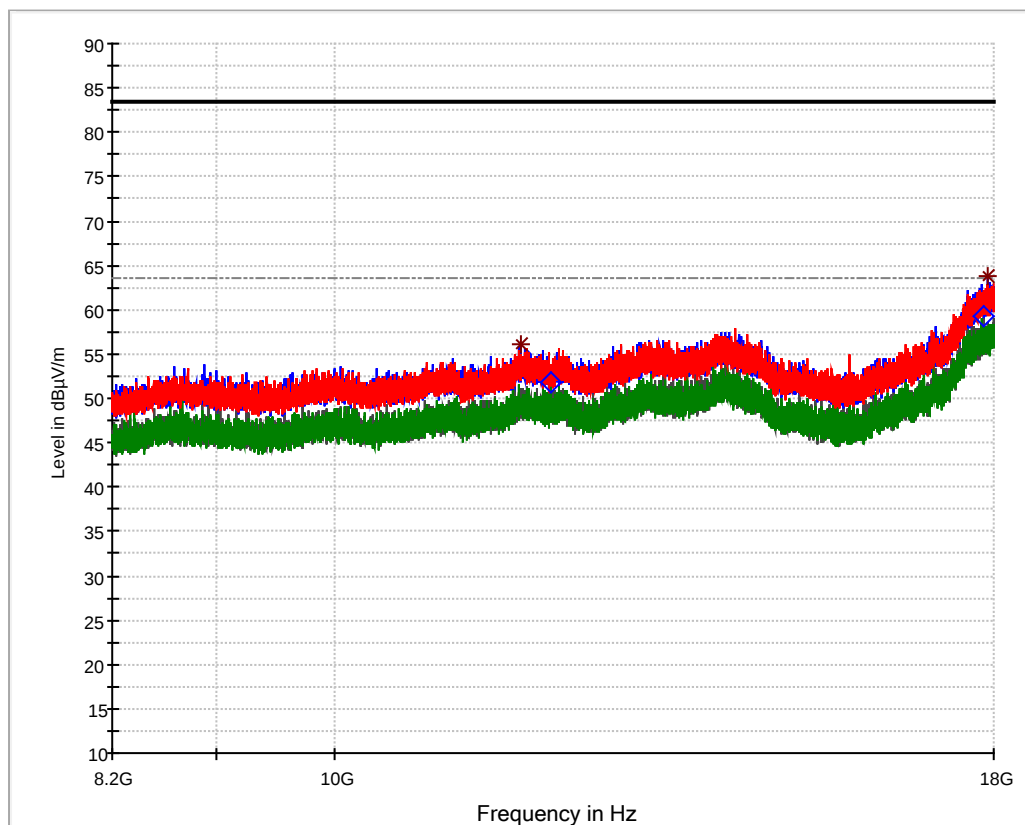
— Preview Result 1H-PK+ — Preview Result 1V-PK+
 — FCC 15.109 Class B 3 m QP * Final_Result QPK

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
32.850000	19.98	40.00	20.02	1000.0	120.000	104.0	V	-95.0	10.4



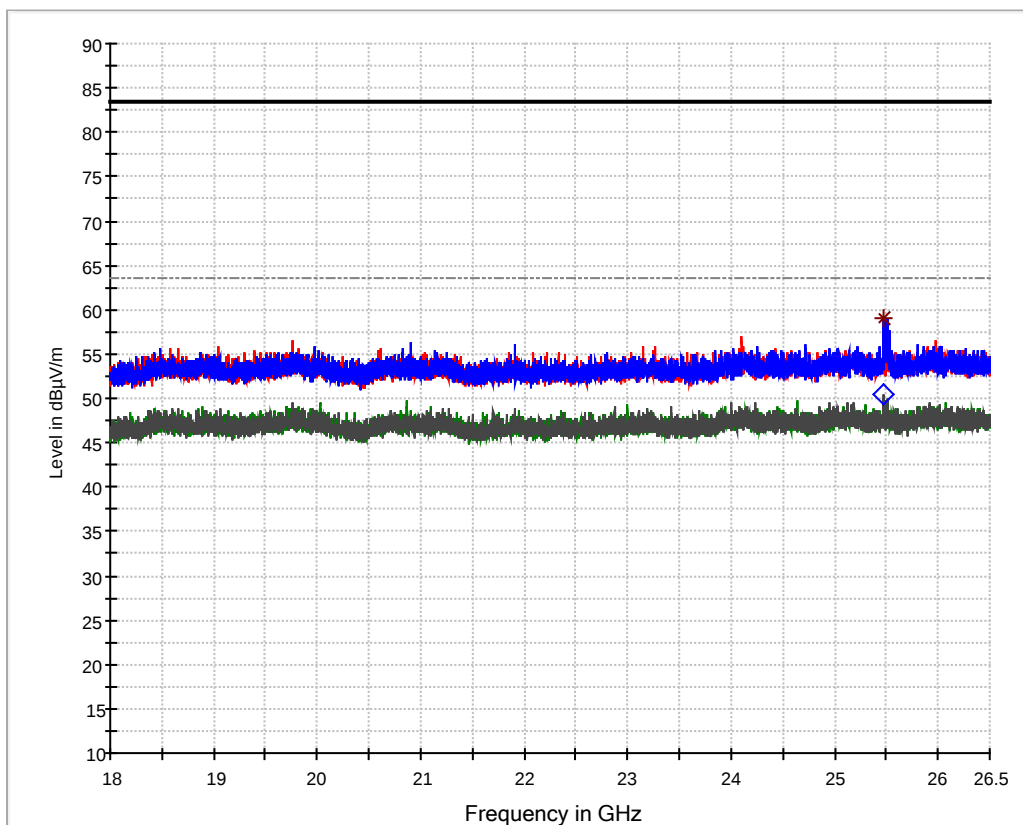
— Preview Result 2H-AVG — Preview Result 1H-PK+ — Preview Result 2V-AVG
— Preview Result 1V-PK+ — FCC 15.209 3 m PK — FCC 15.209 3 m AV
* Final_Result PK+ ◇ Final_Result CAV

Frequency MHz	MaxPeak dBµV/m	CAverage dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
8105.250000		42.19	53.98	11.79	1000.0	1000.000	280.0	V	48.0	46.2
8105.250000	55.43		73.97	18.54	1000.0	1000.000	280.0	V	48.0	46.2



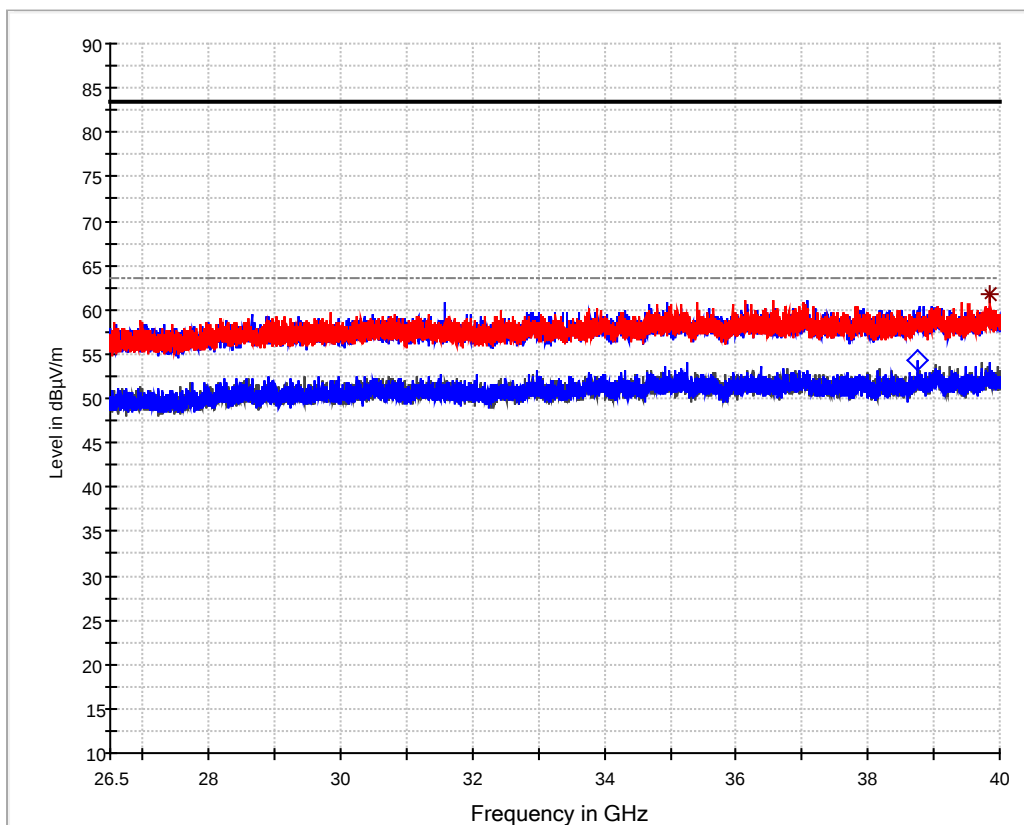
— Preview Result 2V-AVG — Preview Result 1V-PK+ — Preview Result 2H-AVG
 — Preview Result 1H-PK+ — FCC 15.209 (1m) PK - - - - - FCC 15.209 (1m) AV
 * Final_Result PK+ ♦ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
11808.733333	56.04		83.50	27.46	2.5	1000.000	150.0	V	277.0	40.1
12125.133333		51.78	63.50	11.72	2.5	1000.000	150.0	H	301.0	39.6
17854.866667		59.23	63.50	4.27	2.5	1000.000	150.0	V	11.0	48.0
17905.733333	63.79		83.50	19.71	2.5	1000.000	150.0	V	175.0	48.1



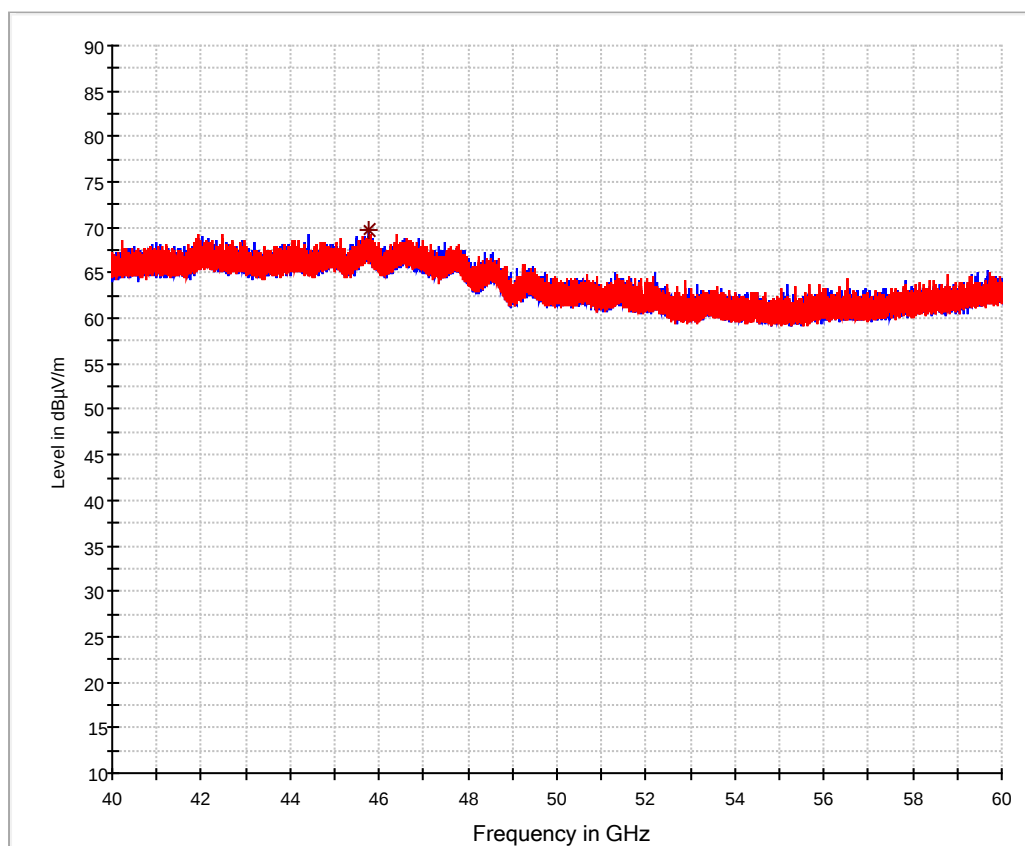
— Preview Result 2H-AVG — Preview Result 1H-PK+ — Preview Result 2V-AVG
— Preview Result 1V-PK+ — FCC 15.209 (1m) PK - - - FCC 15.209 (1m) AV
* Final_Result PK+ ◇ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
25474.687500	59.13		83.50	24.37	2.5	1000.000	150.0	V	359.0	40.5
25475.750000		50.37	63.50	13.13	2.5	1000.000	150.0	V	0.0	40.5



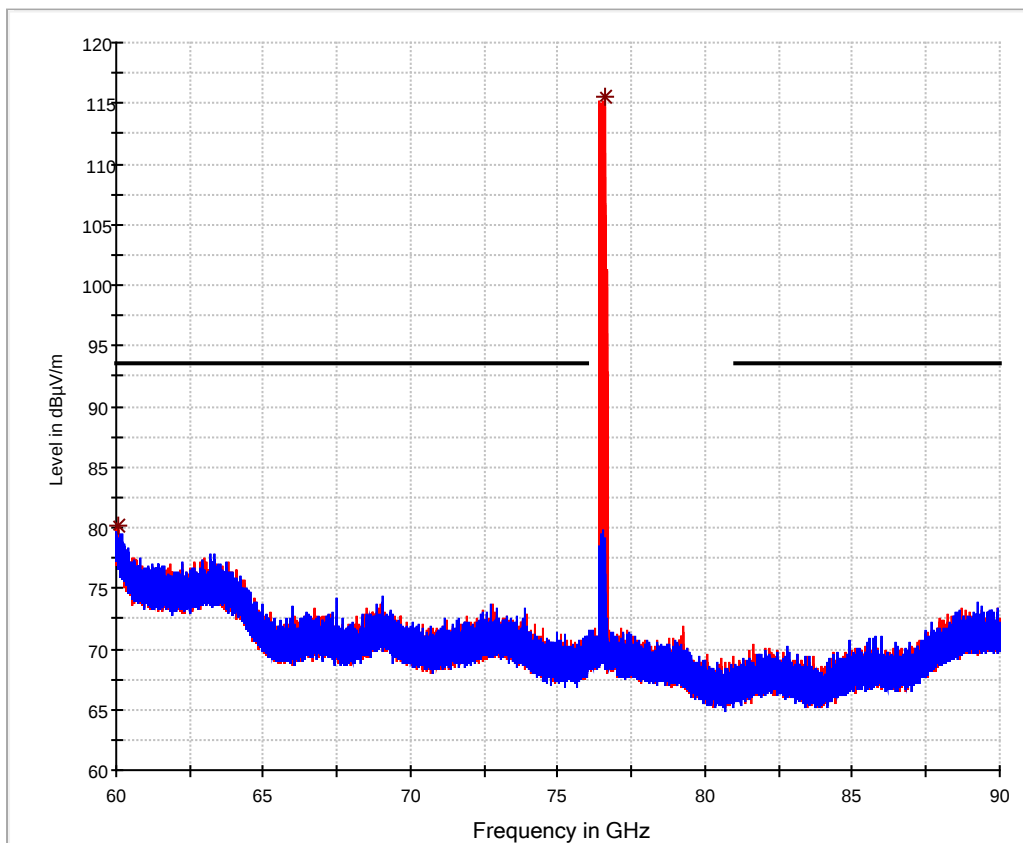
— Preview Result 2V-AVG — Preview Result 1V-PK+ — Preview Result 2H-AVG
 — Preview Result 1H-PK+ — FCC 15.209 (1m) PK — FCC 15.209 (1m) AV
 * Final_Result PK+ ◇ Final_Result AVG

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
38759.350000		54.37	63.50	9.13	2.5	1000.000	150.0	H	352.0	43.7
39842.050000	61.70		83.50	21.80	2.5	1000.000	150.0	H	180.0	43.8



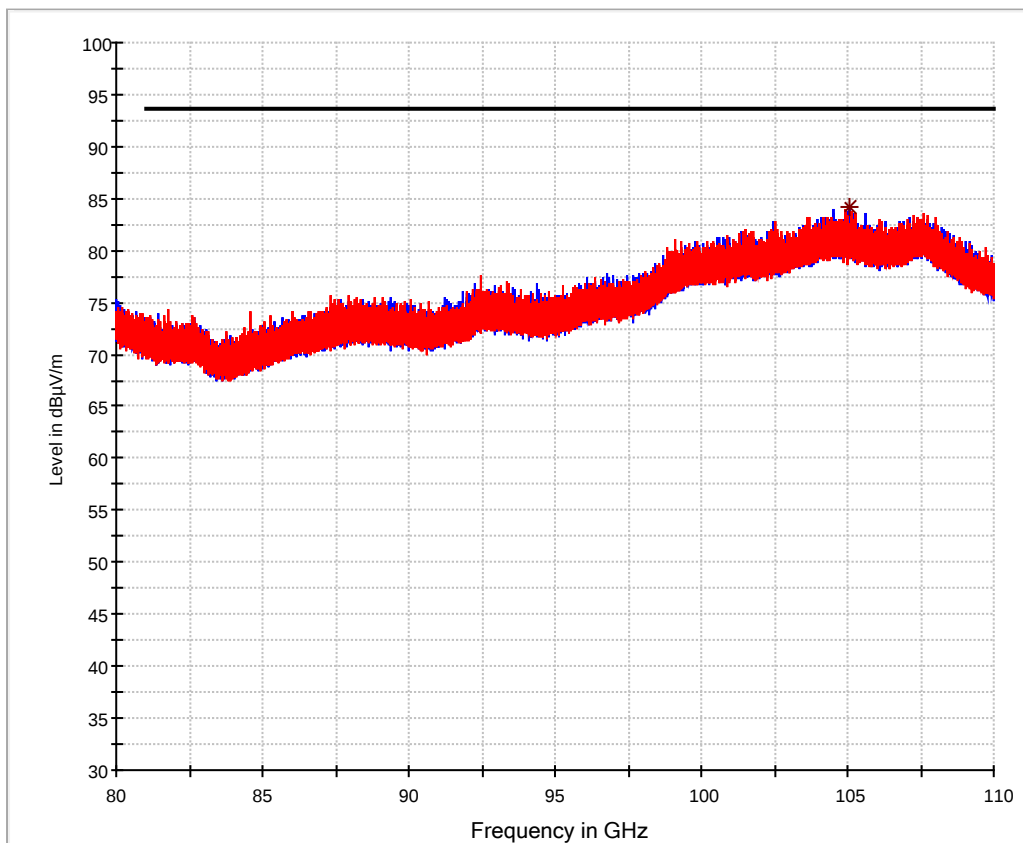
— Preview Result 1V-PK+ — Preview Result 1H-PK+
 — FCC 95.3379(2) (3m) * Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
45751.250000	69.68	93.55	23.86	2.5	1000.000	150.0	V	304.0	44.2



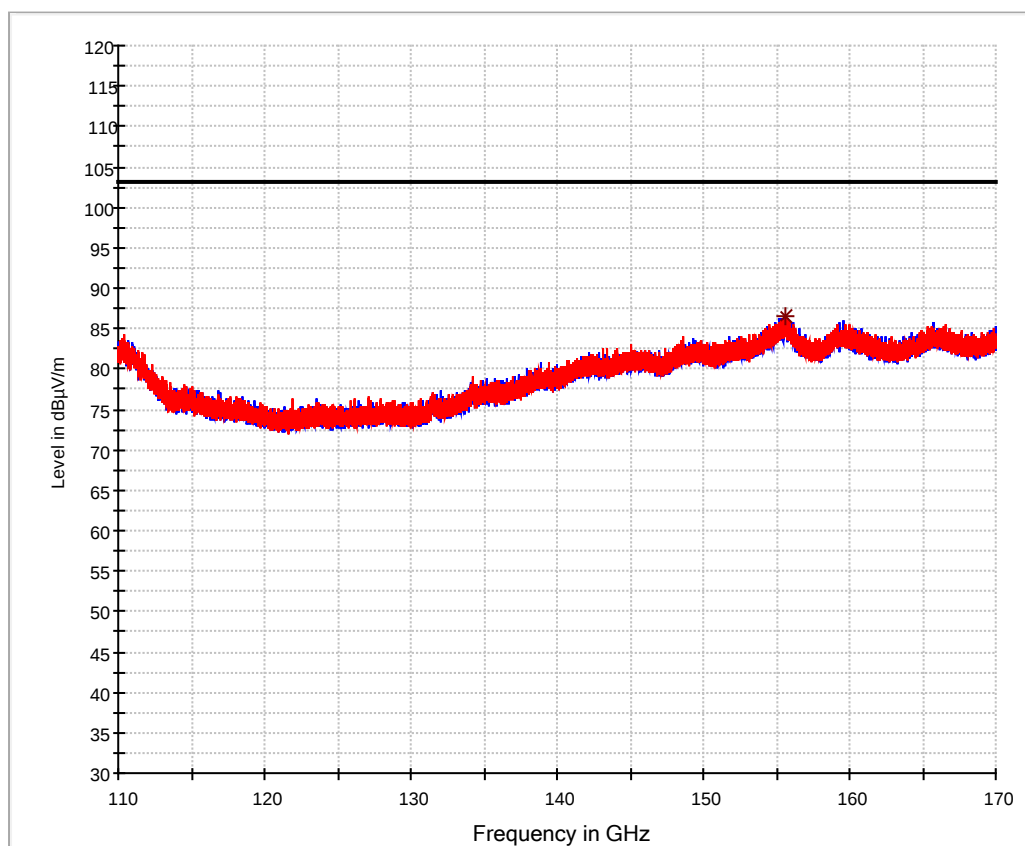
— Preview Result 1H-PK+ — Preview Result 1V-PK+
 — FCC 95.3379(2) (3m) * Final_Result PK+

Frequency MHz	MaxPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
60038.000000	80.19	93.55	13.36	2.5	1000.000	150.0	H	272.0	47.8
76584.444445	115.54			2.5	1000.000	150.0	H	161.0	47.9



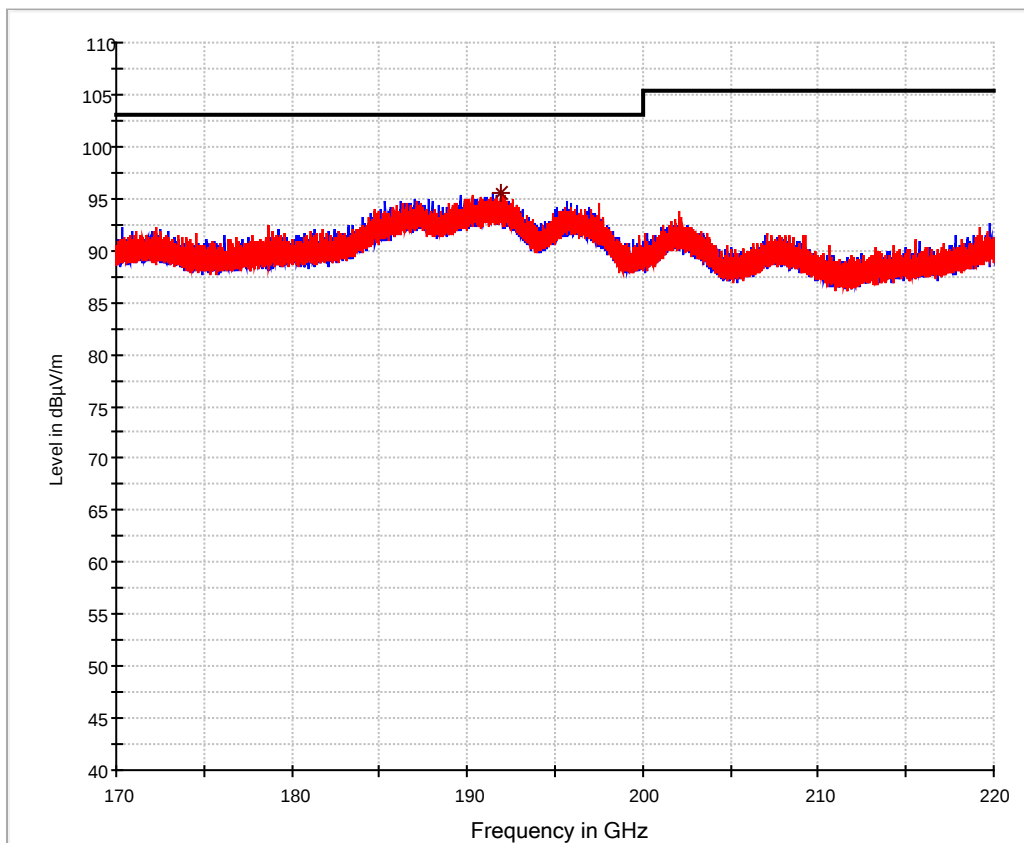
— Preview Result 1V-PK+ — Preview Result 1H-PK+
— FCC 95.3379(2) (3m) * Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
105052.571429	84.20	93.55	9.35	2.5	1000.000	150.0	V	171.0	49.7



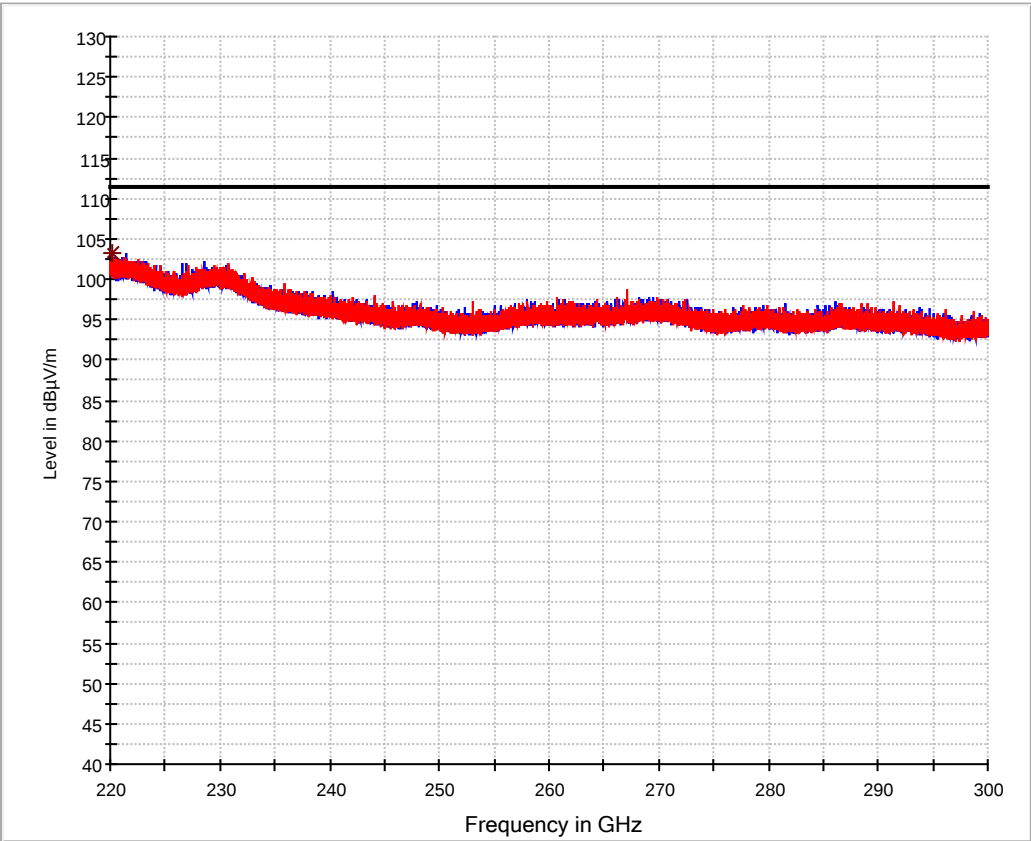
— Preview Result 1V-PK+
— FCC 95.3379(2) (1m)
— Preview Result 1H-PK+
* Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
155579.375000	86.49	103.09	16.59	2.5	1000.000	150.0	H	175.0	50.1



— Preview Result 1V-PK+ — Preview Result 1H-PK+
— FCC 95.3379(2) (1m) * Final_Result PK+

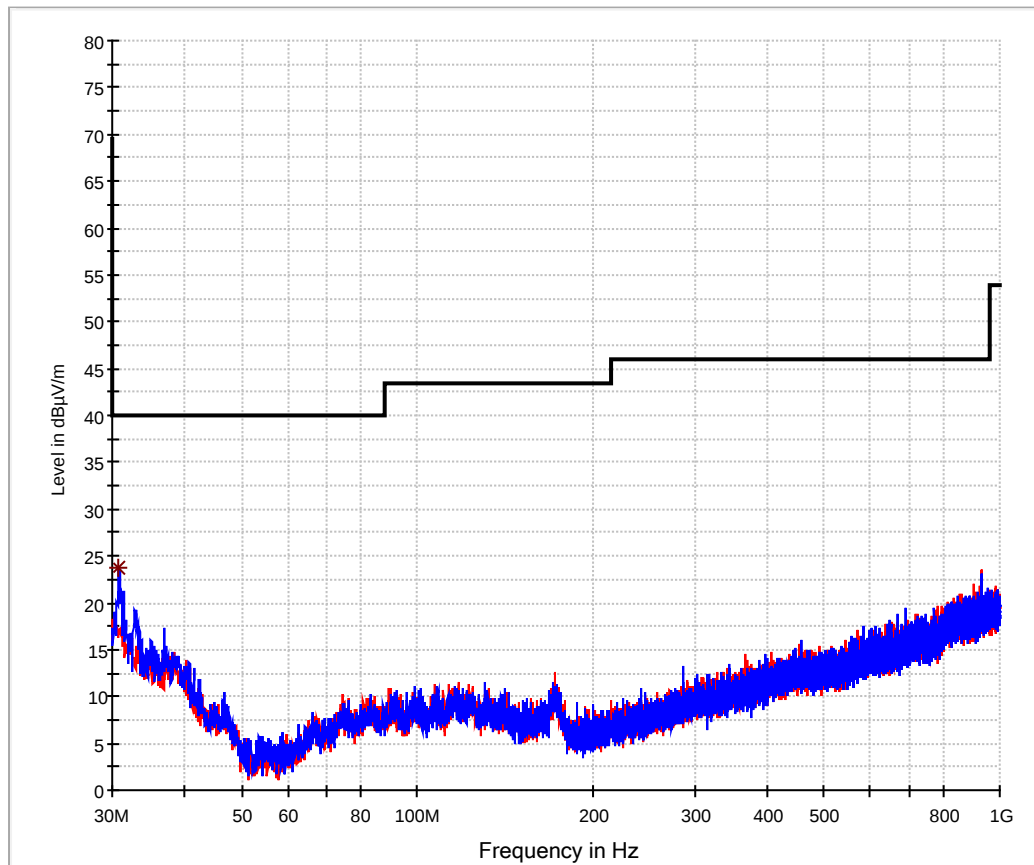
Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.	Trd Corr.	Raw Rec
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB	dB	dBµV
191943.750000	95.57	103.09	7.52	2.5	1000.000	150.0	H	282.0	54.9	55	41



— Preview Result 1V-PK+ — Preview Result 1H-PK+
— FCC 95.3379(2) (0.5m) * Final_Result PK+

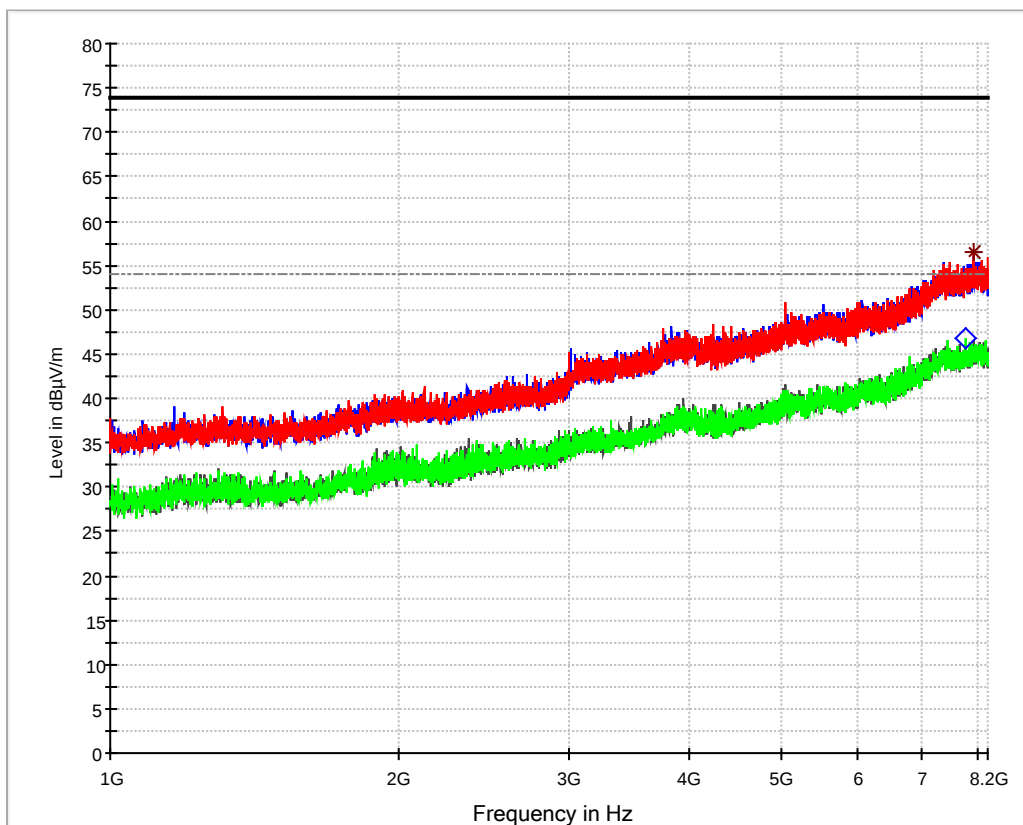
Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.	Trd Corr.	Raw Rec
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB	dB	dBµV
220095.000000	103.28	111.33	8.05	2.5	1000.000	150.0	H	141.0	59.0	59	44

Plots for highest channel



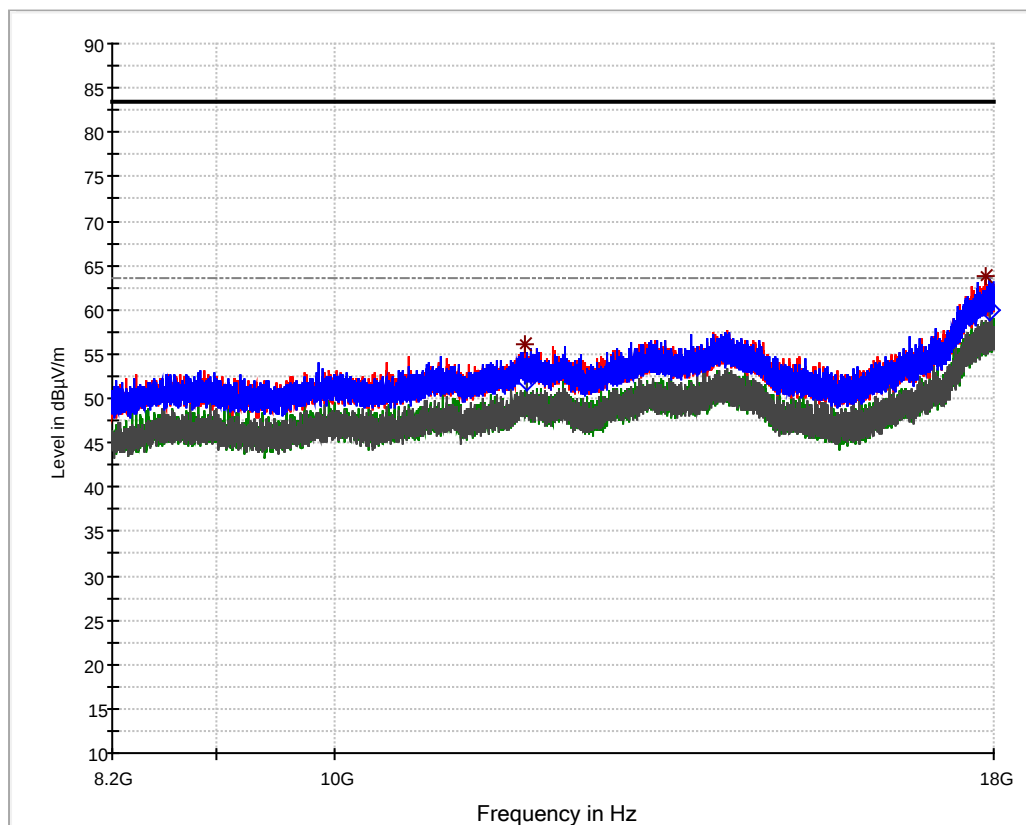
— Preview Result 1H-PK+ — Preview Result 1V-PK+ — FCC 15.209 * Final_Result PK

Frequency MHz	MaxPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Pol	Azimuth deg	Corr. dB
30.824500	23.79	40.00	16.21	2.5	100.000	V	182.0	-10.6



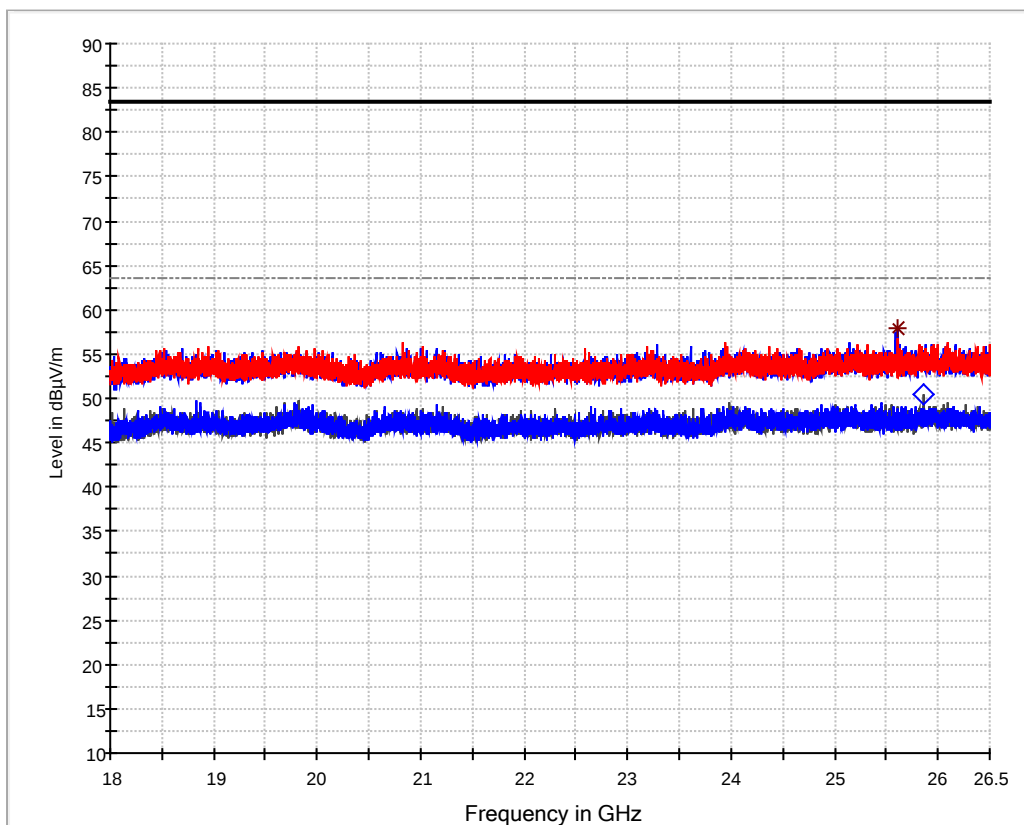
— Preview Result 2V-AVG — Preview Result 1V-PK+ — Preview Result 2H-AVG
 — Preview Result 1H-PK+ — FCC 15.209 PK - - - - - FCC 15.209 AV
 * Final_Result PK+ ◇ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB/m
7769.800000		46.83	54.00	7.17	2.5	1000.000	150.0	H	240.0	13
7935.400000	56.44		74.00	17.56	2.5	1000.000	150.0	H	338.0	13



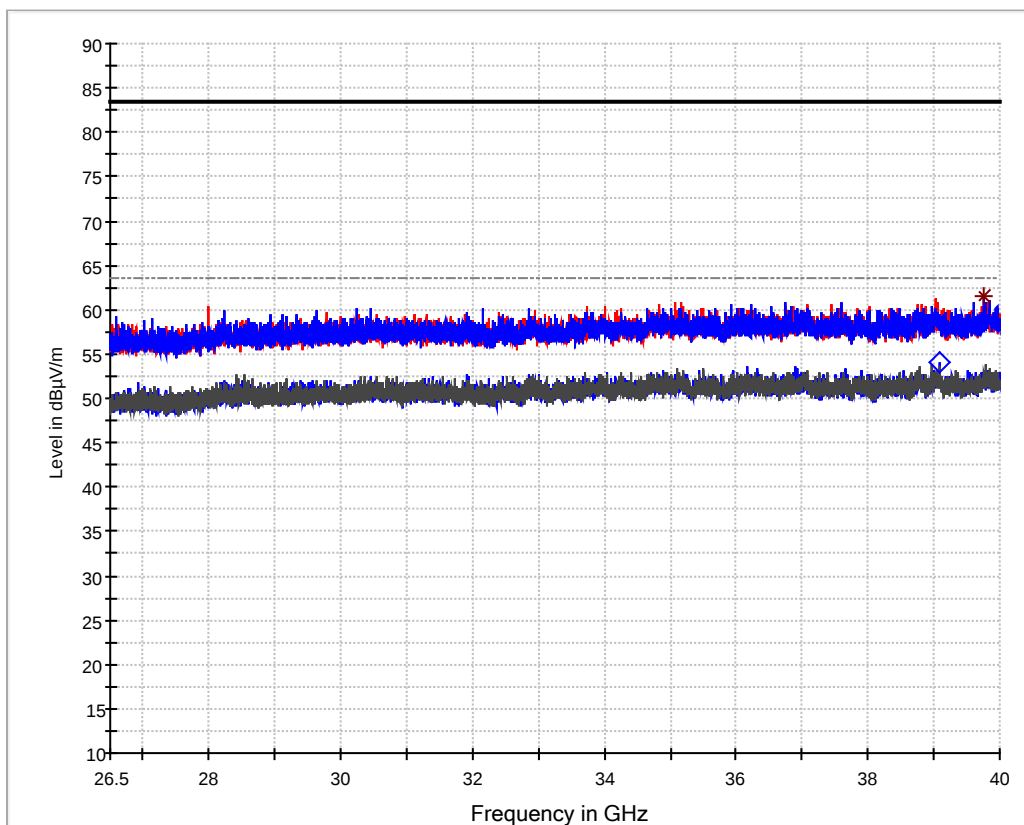
— Preview Result 2H-AVG — Preview Result 1H-PK+ — Preview Result 2V-AVG
— Preview Result 1V-PK+ — FCC 15.209 (1m) PK - - - FCC 15.209 (1m) AV
* Final_Result PK+ ◇ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
11850.266667	56.09		83.50	27.41	2.5	1000.000	150.0	H	278.0	40.0
11879.666667		52.07	63.50	11.43	2.5	1000.000	150.0	V	330.0	40.0
17866.533333	63.88		83.50	19.62	2.5	1000.000	150.0	H	275.0	48.0
17947.733333		59.91	63.50	3.59	2.5	1000.000	150.0	V	347.0	48.3



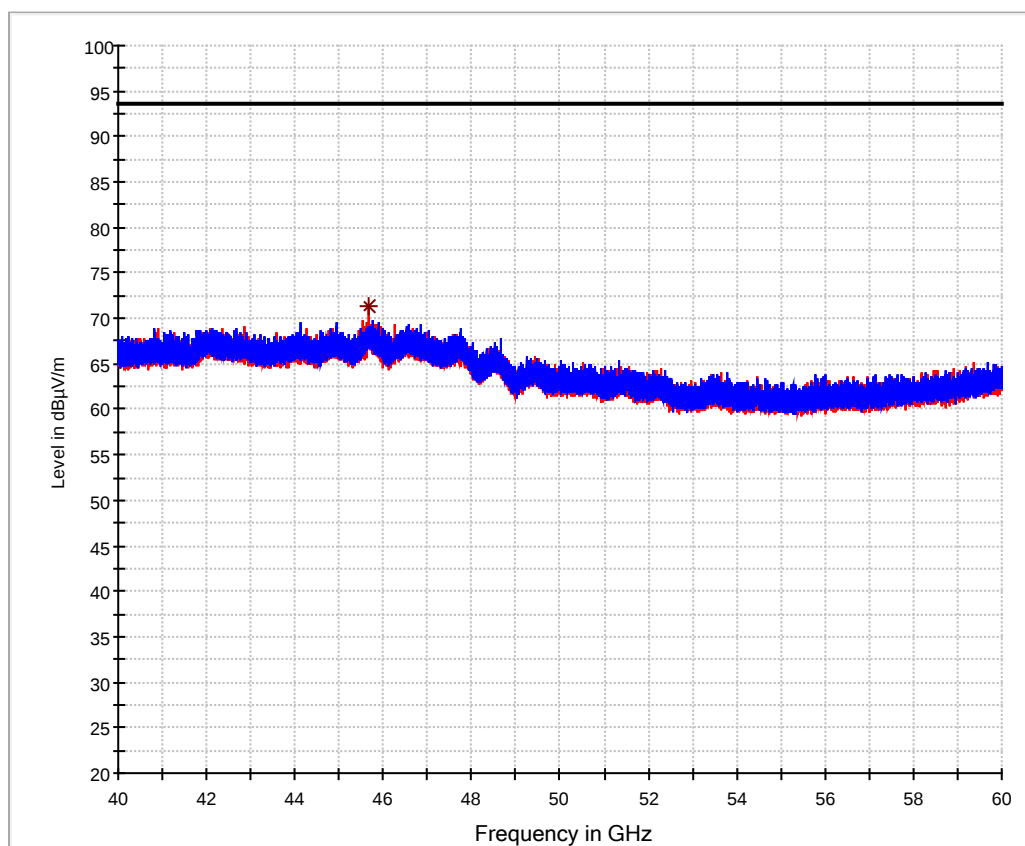
— Preview Result 2V-AVG — Preview Result 1V-PK+ — Preview Result 2H-AVG
 — Preview Result 1H-PK+ — FCC 15.209 (1m) PK — FCC 15.209 (1m) AV
 * Final_Result PK+ ◇ Final_Result AVG

Frequency MHz	MaxPeak dBµV/m	Average dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB/m
25604.312500	57.89		83.50	25.61	2.5	1000.000	150.0	V	0.0	41
25860.375000		50.42	63.50	13.08	2.5	1000.000	150.0	V	83.0	41



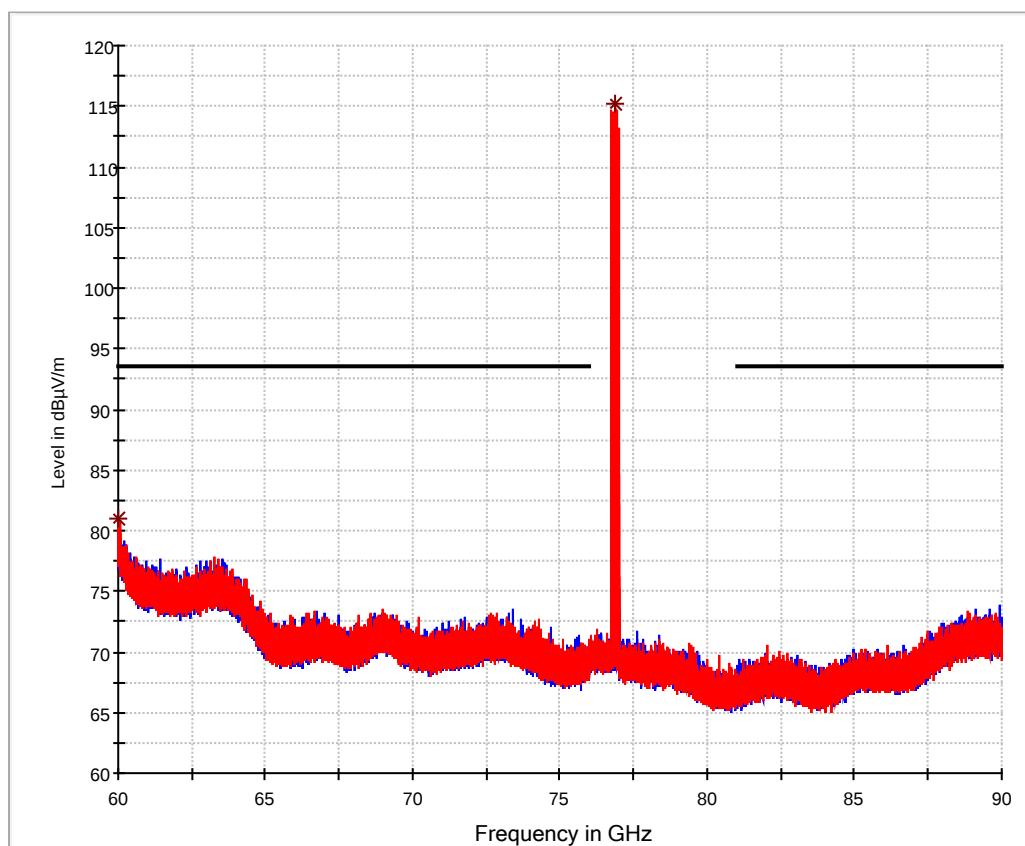
— Preview Result 2H-AVG — Preview Result 1H-PK+ — Preview Result 2V-AVG
— Preview Result 1V-PK+ — FCC 15.209 (1m) PK - - - FCC 15.209 (1m) AV
* Final_Result PK+ ◇ Final_Result AVG

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
39080.650000		53.96	63.50	9.54	2.5	1000.000	150.0	H	78.0	43.7
39758.350000	61.49		83.50	22.01	2.5	1000.000	150.0	V	139.0	43.8



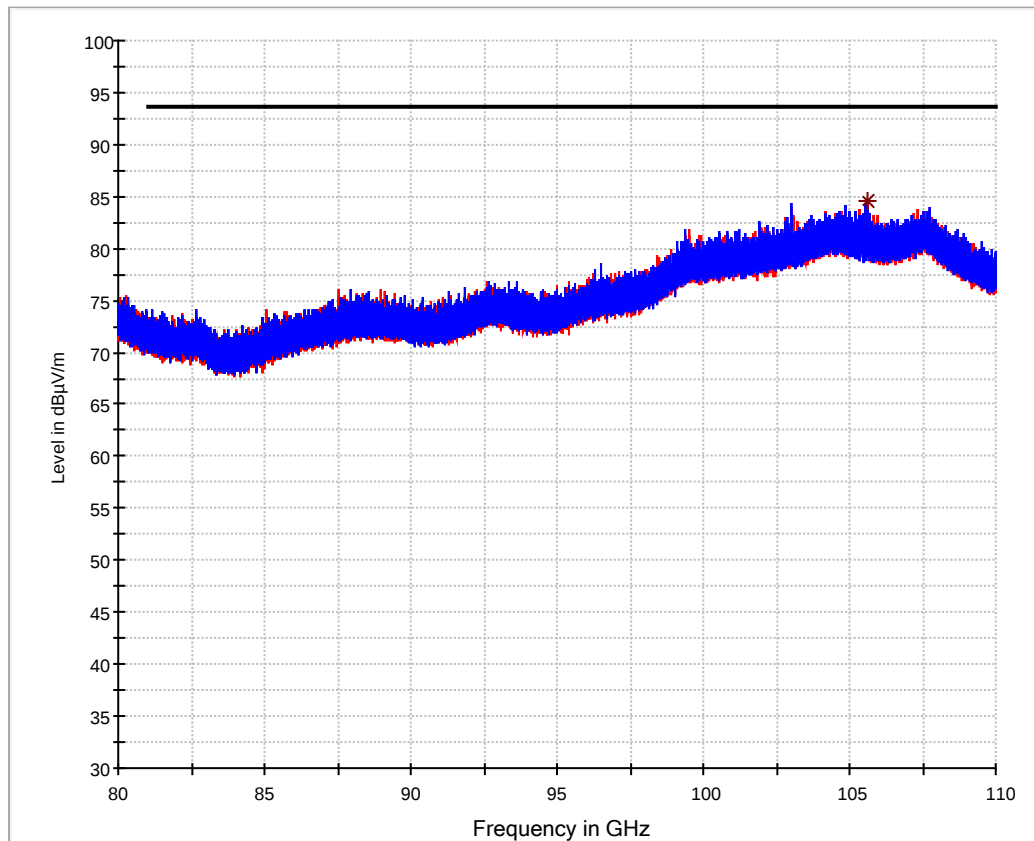
— Preview Result 1H-PK+ — Preview Result 1V-PK+
— FCC 95.3379(2) (3m) * Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
45663.750000	71.33	93.55	22.22	2.5	1000.000	150.0	H	218.0	44



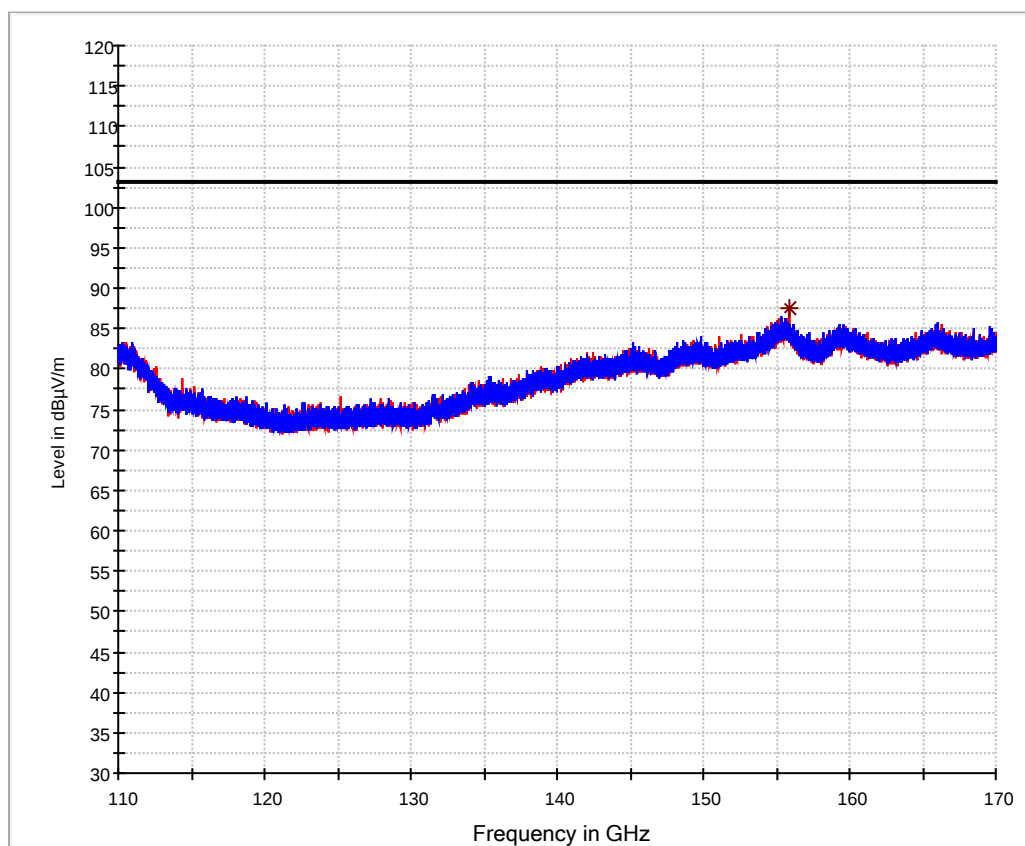
— Preview Result 1V-PK+
— FCC 95.3379(2) (3m)
— Preview Result 1H-PK+
* Final_Result PK+

Frequency MHz	MaxPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
60024.500000	81.02	93.55	12.53	2.5	1000.000	150.0	H	116.0	47.8
76875.555556	115.20			2.5	1000.000	150.0	H	161.0	47.9



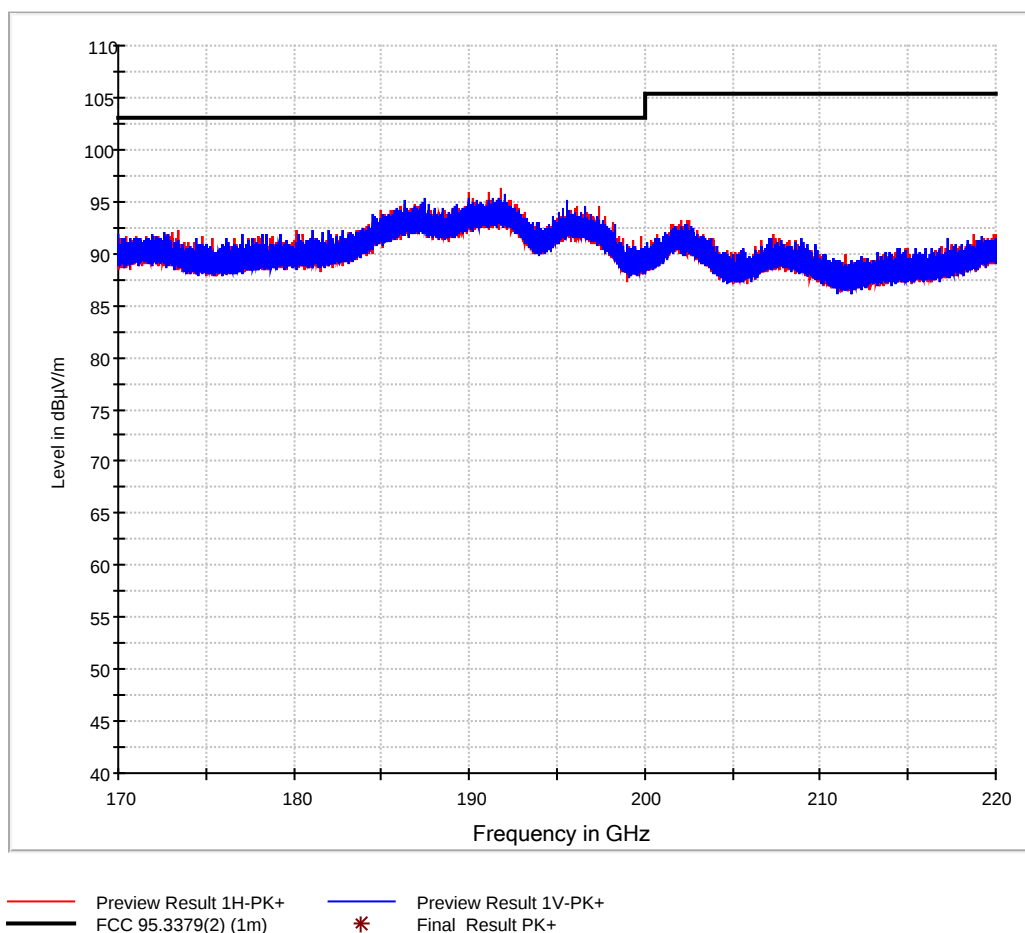
— Preview Result 1H-PK+ — Preview Result 1V-PK+
— FCC 95.3379(2) (3m) * Final_Result PK+

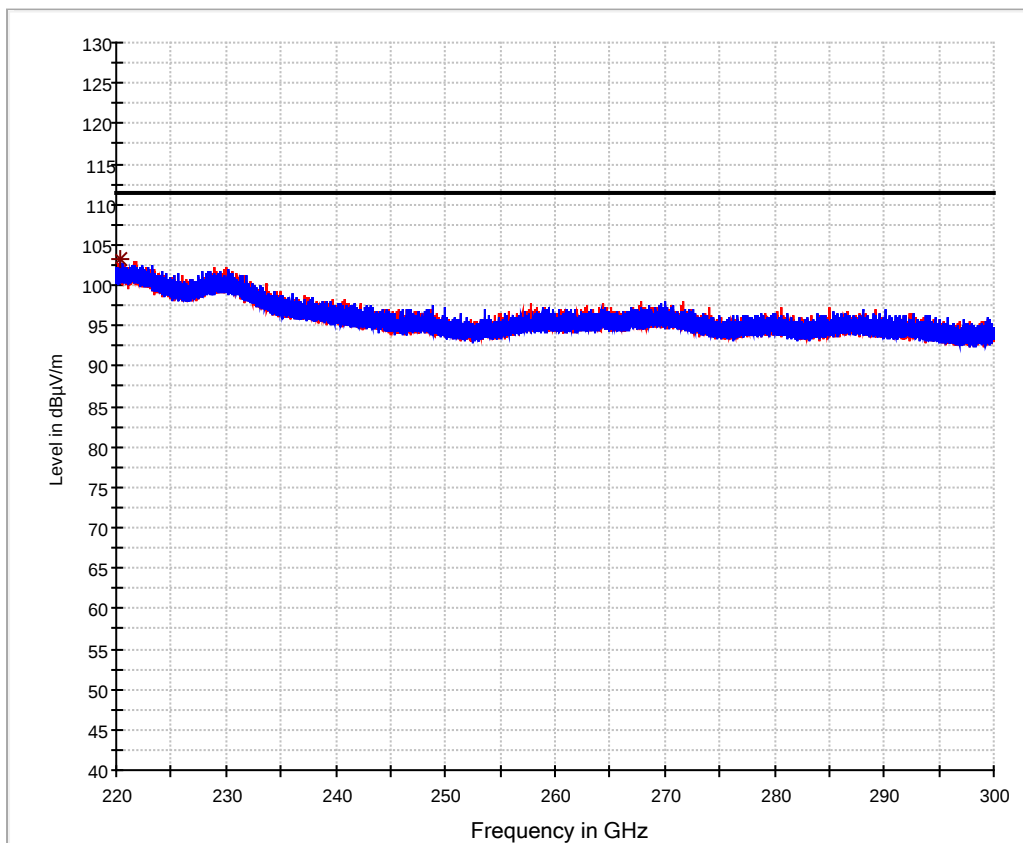
Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
105623.857143	84.57	93.55	8.97	2.5	1000.000	150.0	H	296.0	50



— Preview Result 1H-PK+ — Preview Result 1V-PK+
— FCC 95.3379(2) (1m) * Final_Result PK+

Frequency	MaxPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
155903.750000	87.60	103.09	15.48	2.5	1000.000	150.0	H	14.0	50.1





— Preview Result 1H-PK+
— FCC 95.3379(2) (0.5m)
 — Preview Result 1V-PK+
* Final_Result PK+

Frequency MHz	MaxPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB	Trd Corr. dB	Raw Rec dBµV
220392.500000	103.34	111.33	7.99	2.5	1000.000	150.0	V	345.0	59.0	59	44

10.4 Frequency Stability

Date of Test	2019-03-21, 2019-04-10
Operator	Martin Steindl
Test Site	Non shielded room

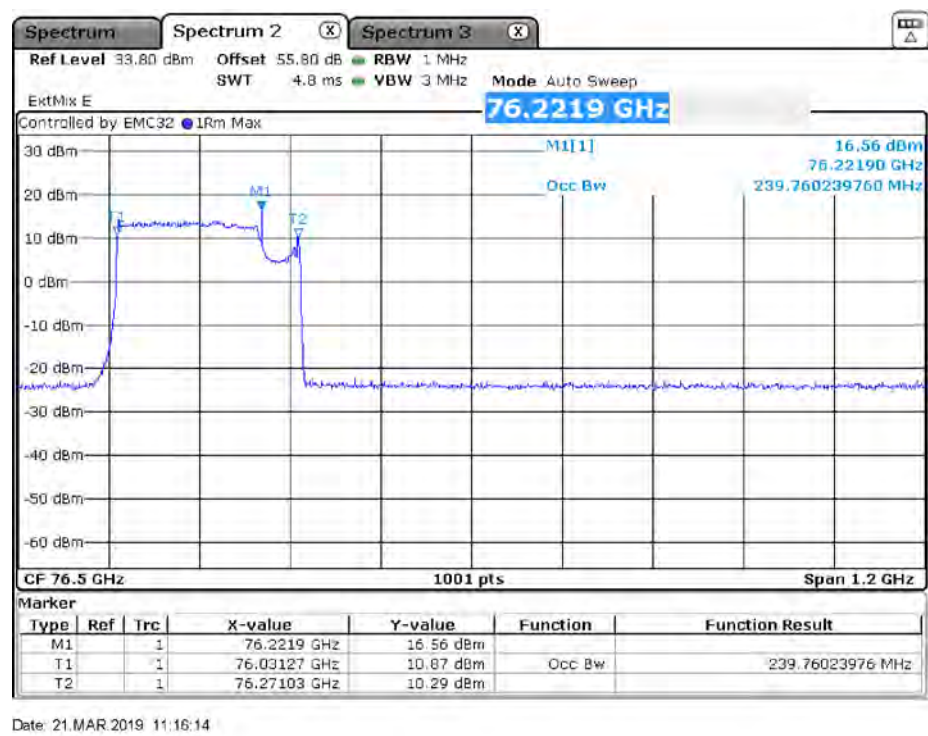
Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Barometric pressure:	981 hPa
Relative humidity:	33 %
Ambient temperature:	22 °C

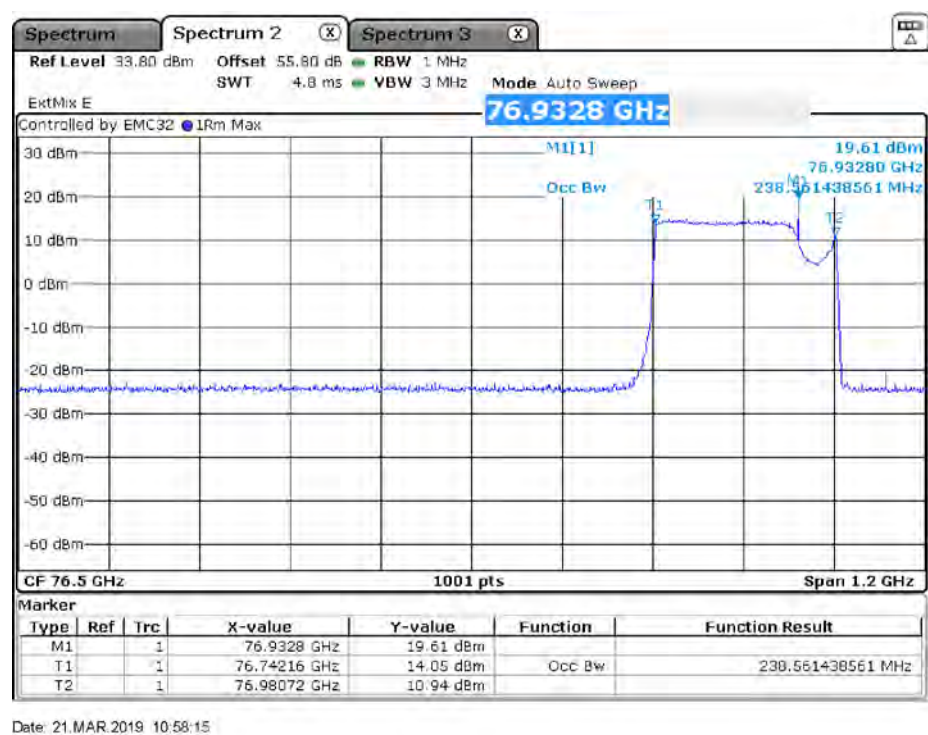
Specifications:	CFR 47, Part 95, Subpart M, §95.3379(b) ISED RSS-251, Issue1, Section 11
Description:	b) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 °C to 50 °C with a input voltage variation of 85 % to 115 % of rated input voltage unless justification is presented to demonstrate otherwise.
Operation mode: Comment :	Test was performed as radiated test. The test was performed for the wider temperature range - 40 °C to +85 °C.

All emissions are within the 76 – 77 GHz frequency band.
See plots for details

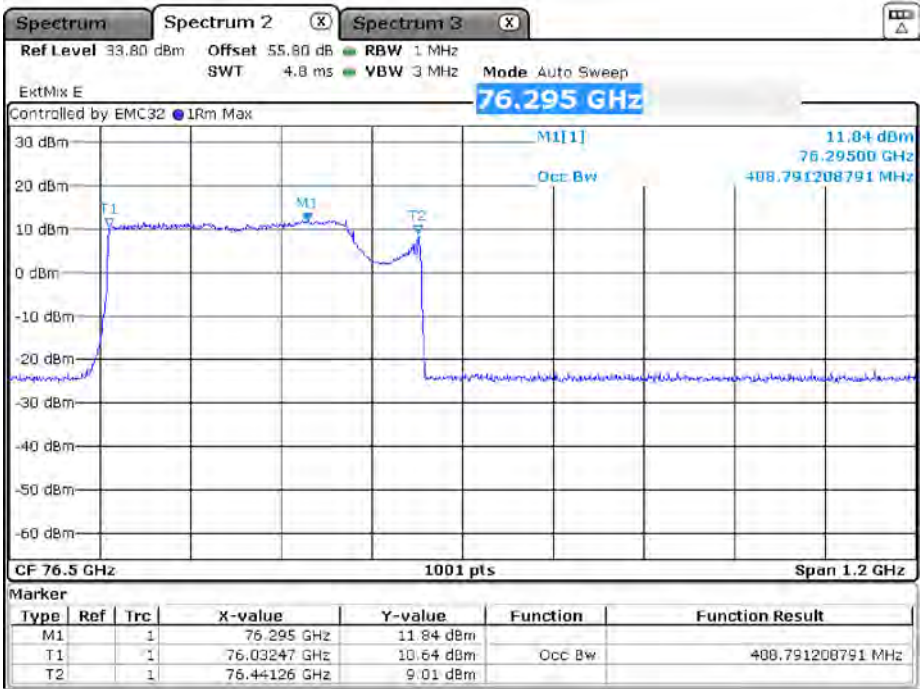
Plots taken during test



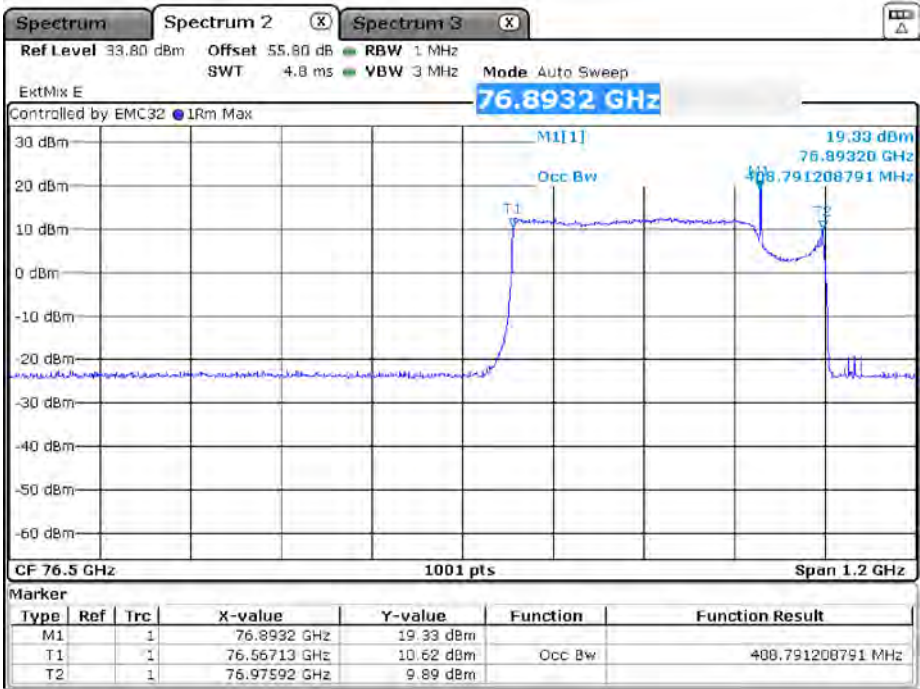
175 MHz, 20 °C, 10.8 V



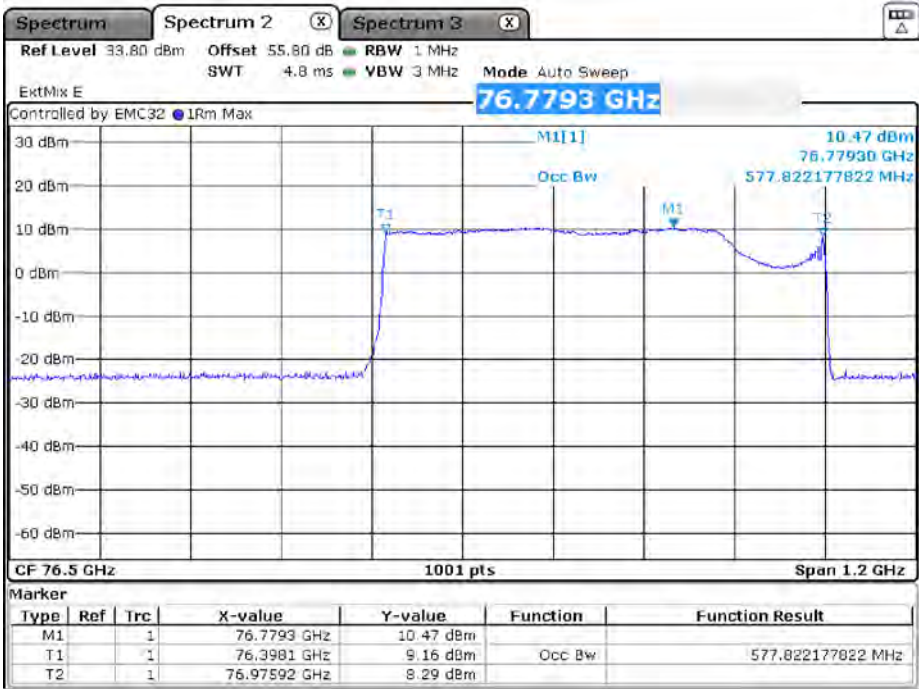
175 MHz, 20 °C, 10.8 V



300 MHz, 20 °C, 10.8 V

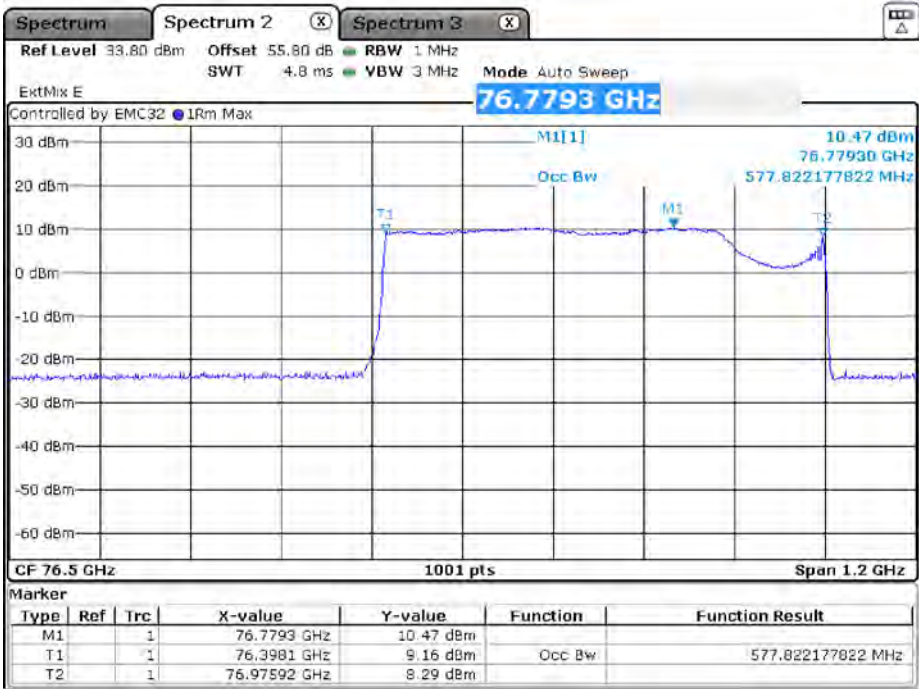


300 MHz, 20 °C, 10.8 V



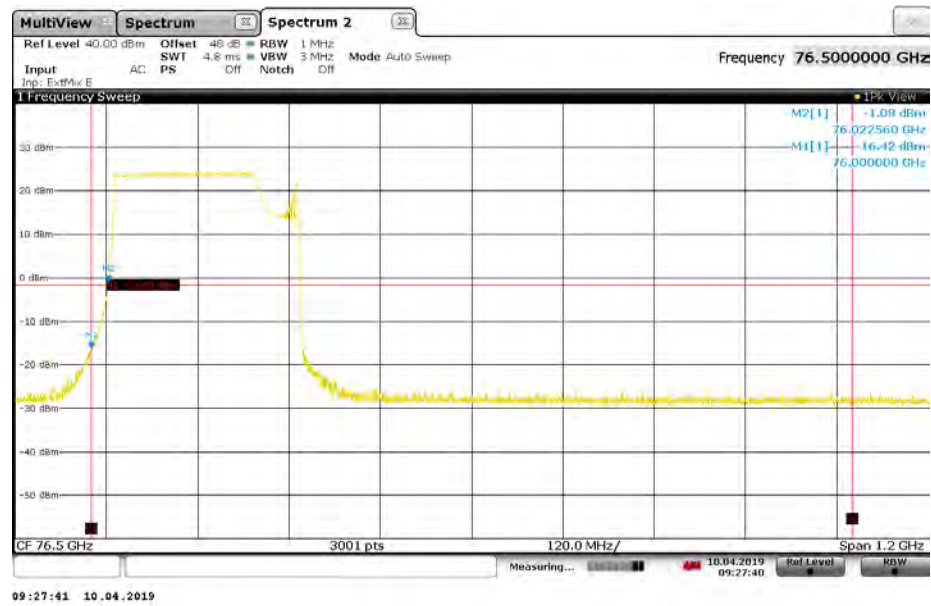
Date: 21.MAR.2019 11:39:52

425 MHz, 20 °C, 10.8 V

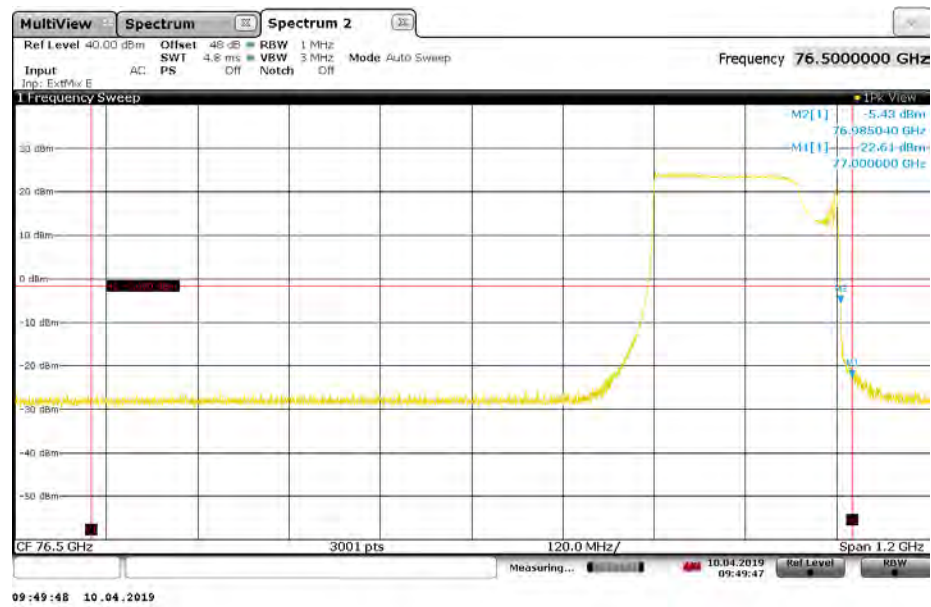


Date: 21.MAR.2019 11:39:52

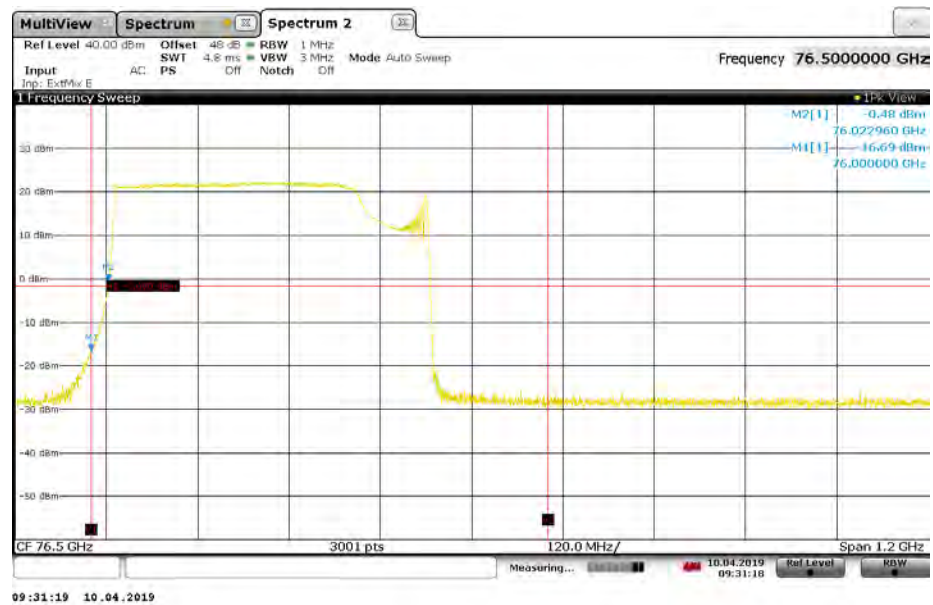
425 MHz, 20 °C, 10.8 V



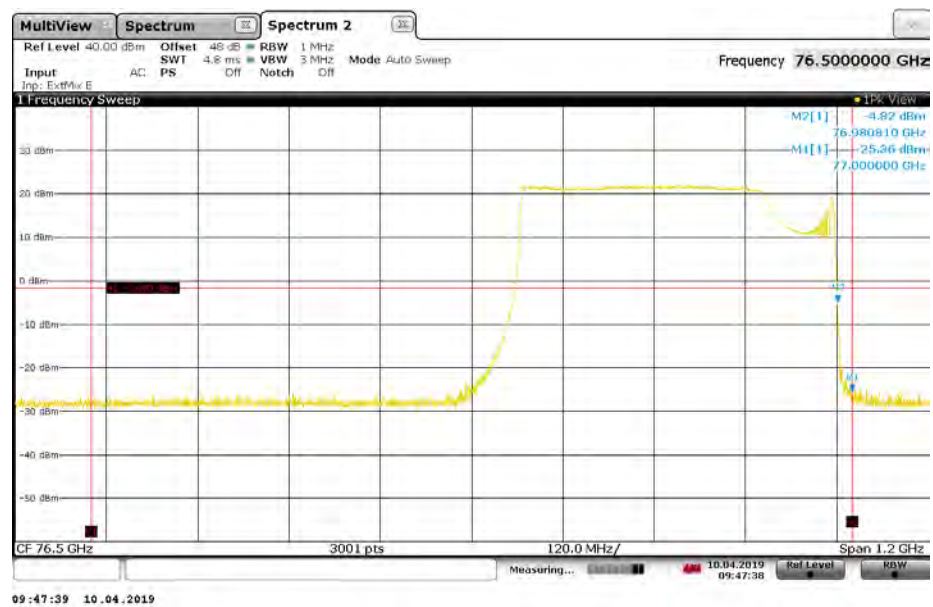
175 MHz, 20 °C, 13.2 V



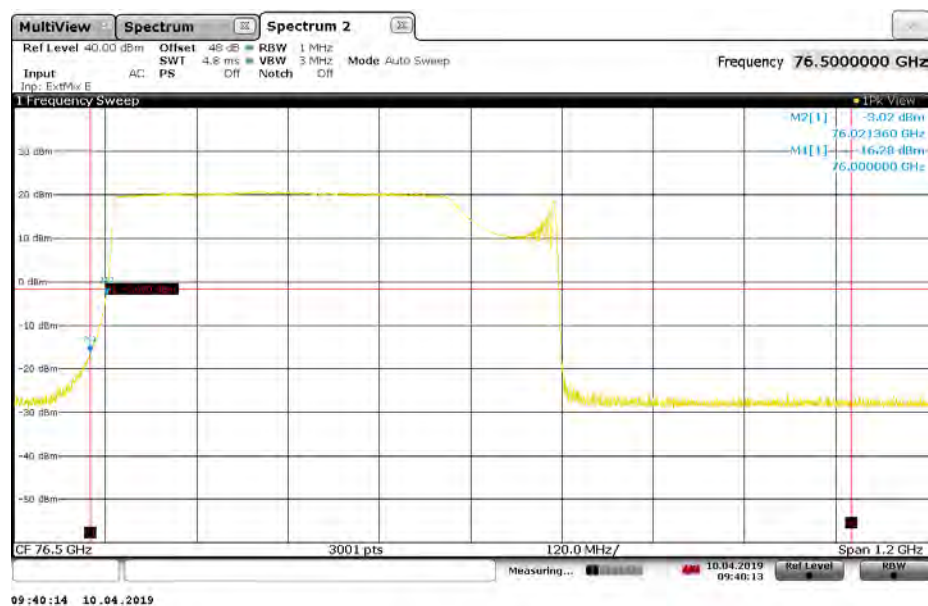
175 MHz, 20 °C, 13.2 V



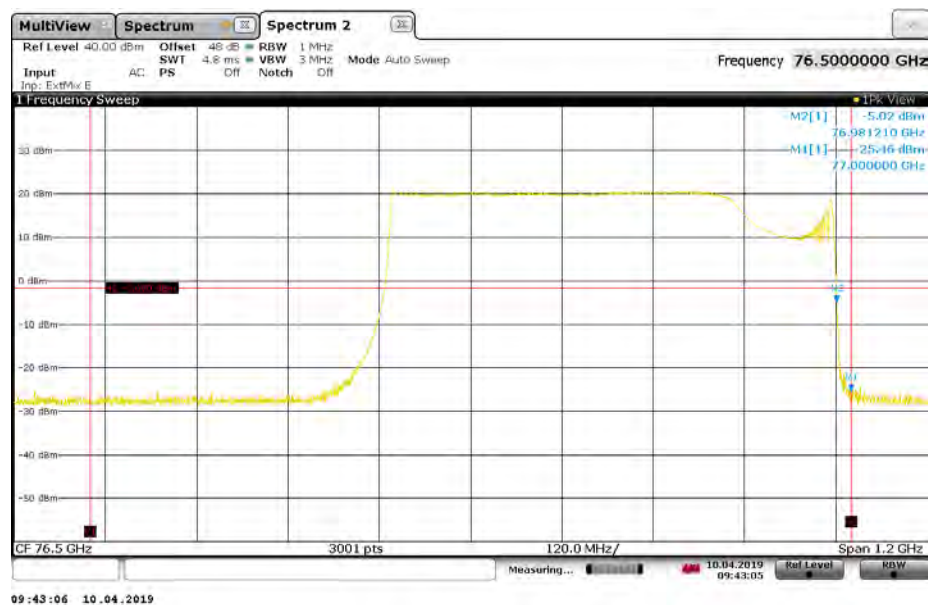
300 MHz, 20 °C, 13.2 V



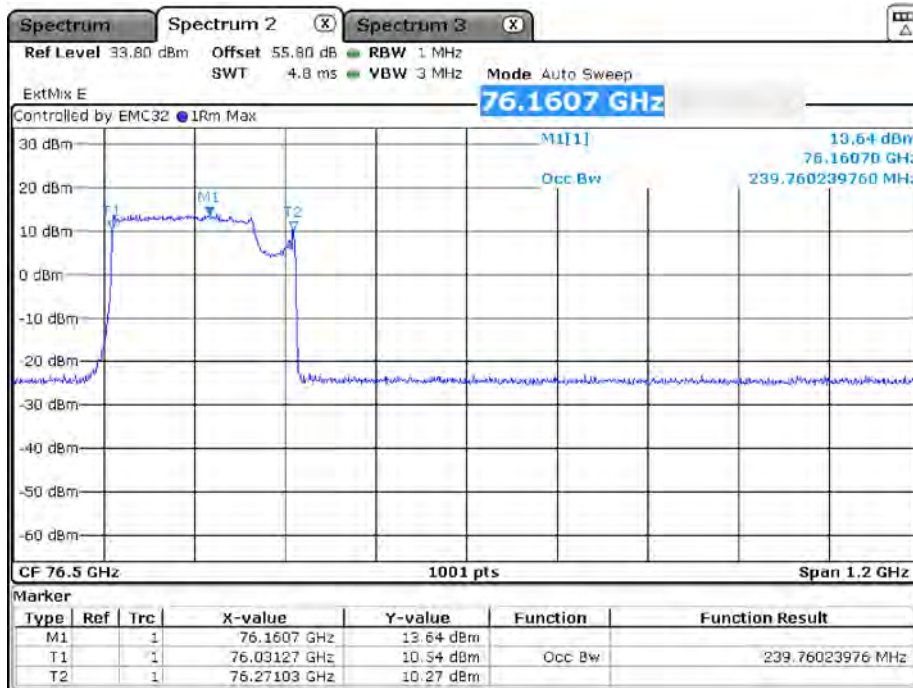
300 MHz, 20 °C, 13.2 V



425 MHz, 20 °C, 13.2 V

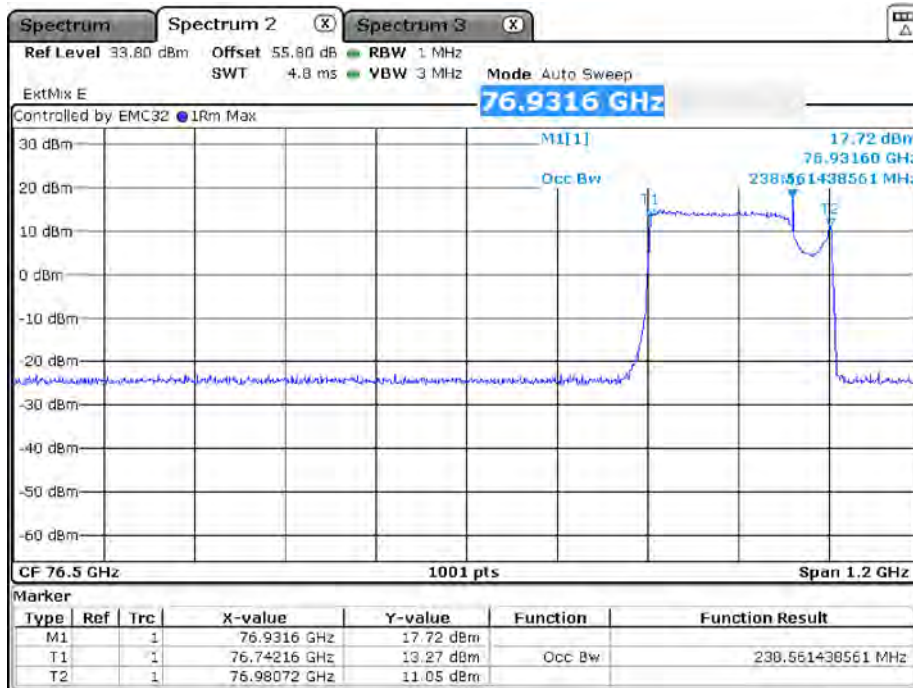


425 MHz, 20 °C, 13.2 V



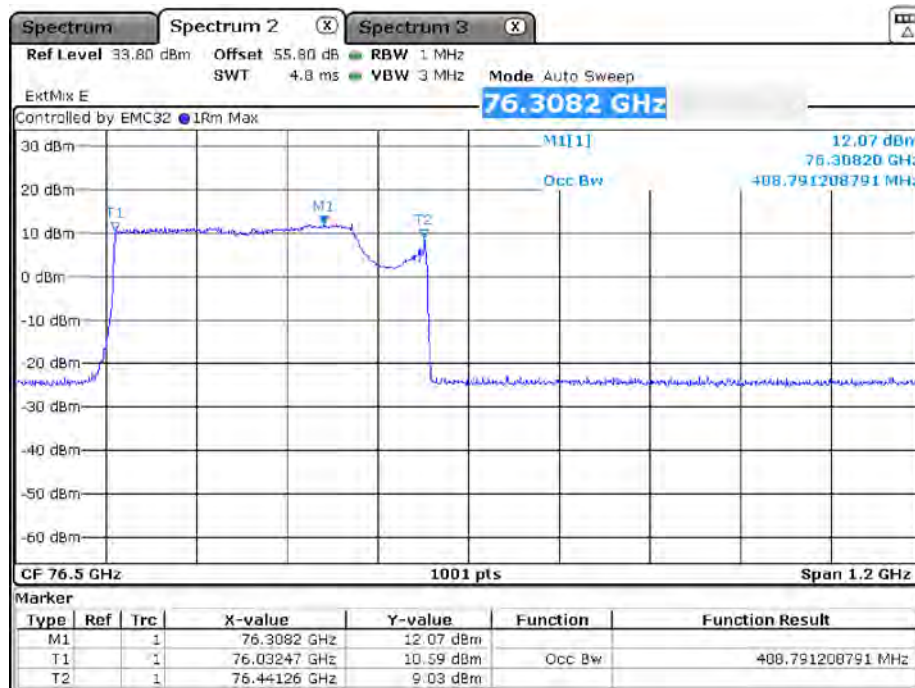
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175 MHz, 20 °C, 13.2 V



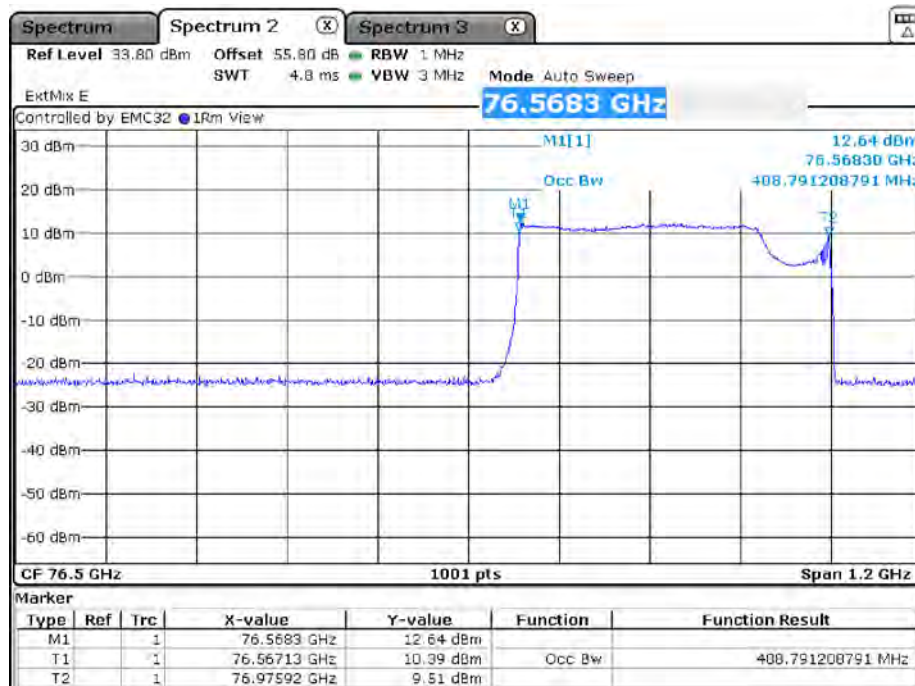
Date: 21.MAR 2019 10:57:35

175 MHz, 20 °C, 13.2 V



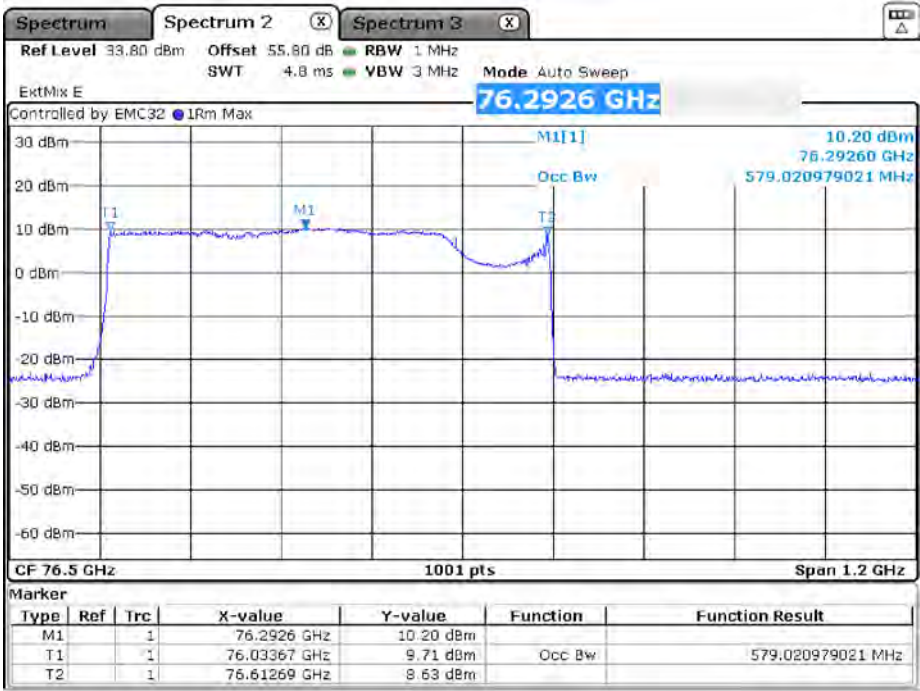
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300 MHz, 20 °C, 13.2 V



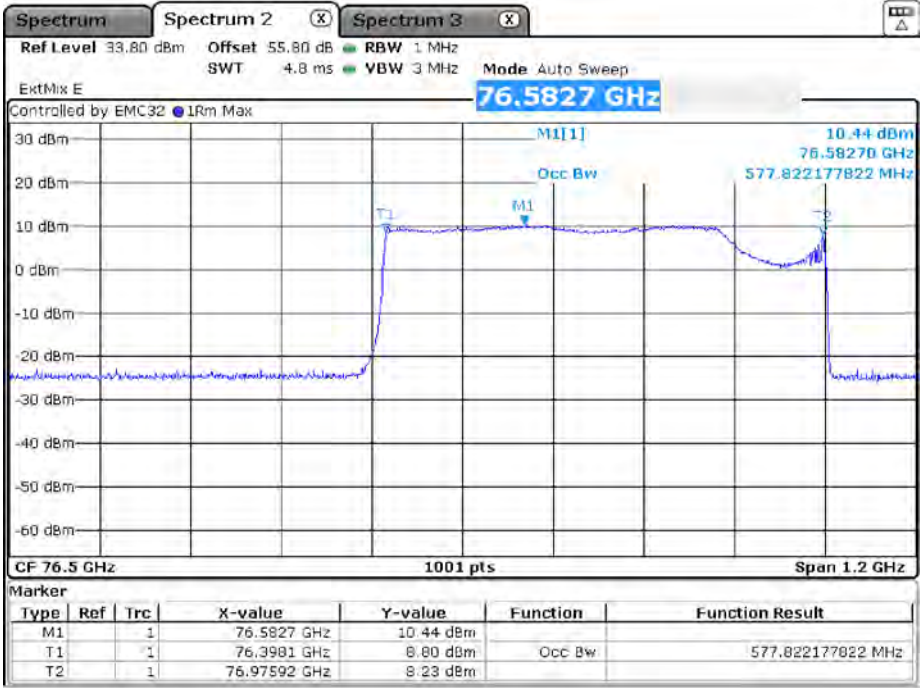
Date: 21.MAR 2019 10:55:50

300 MHz, 20 °C, 13.2 V



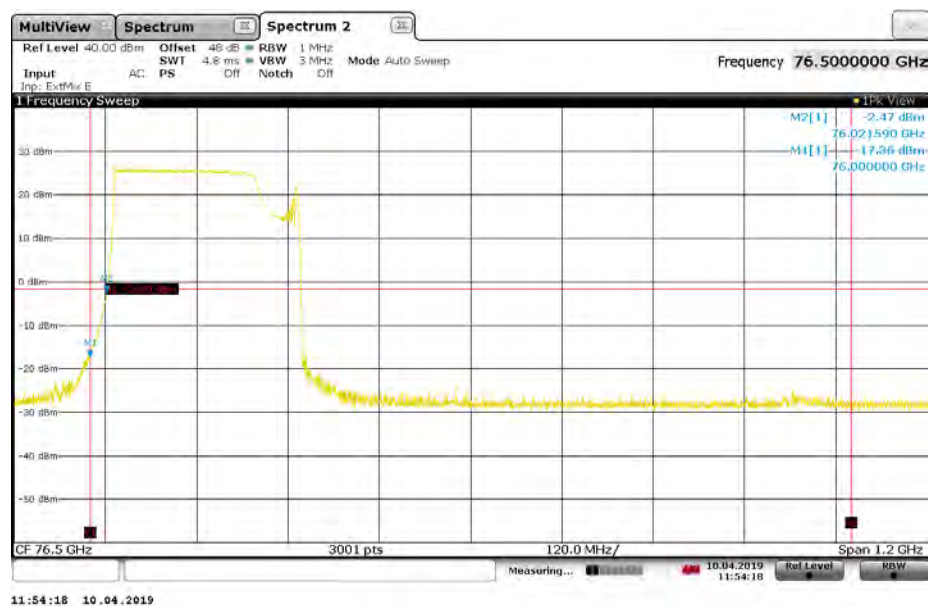
Date: 21.MAR.2019 11:19:19

425 MHz, 20 °C, 13.2 V

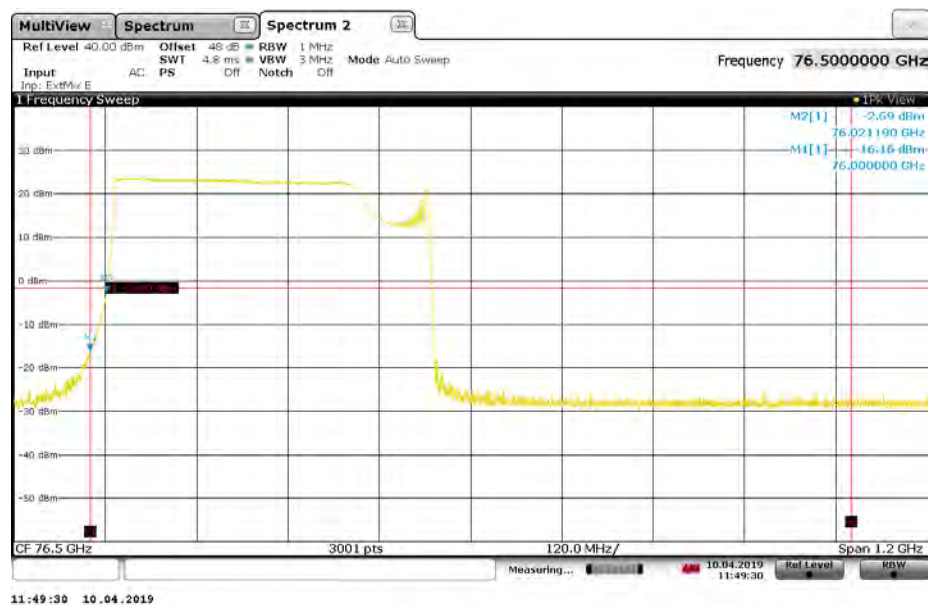


Date: 21.MAR.2019 11:47:06

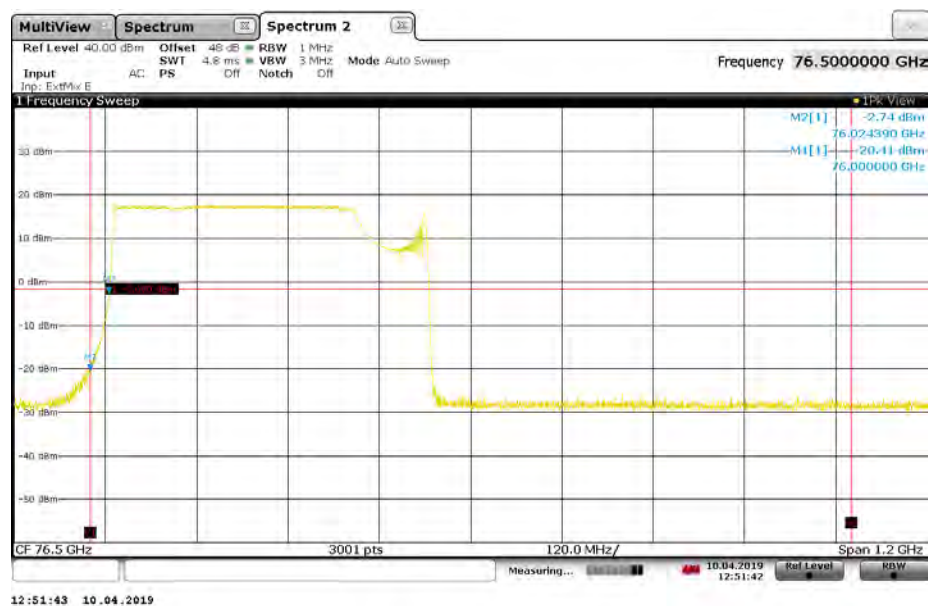
425 MHz, 20 °C, 13.2 V



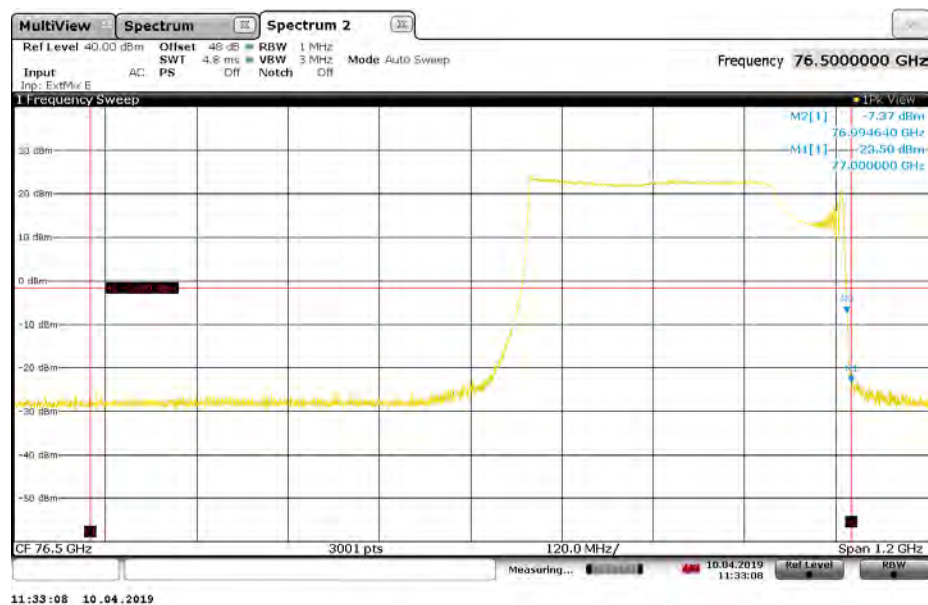
175 MHz, -40 °C, 13.2 V



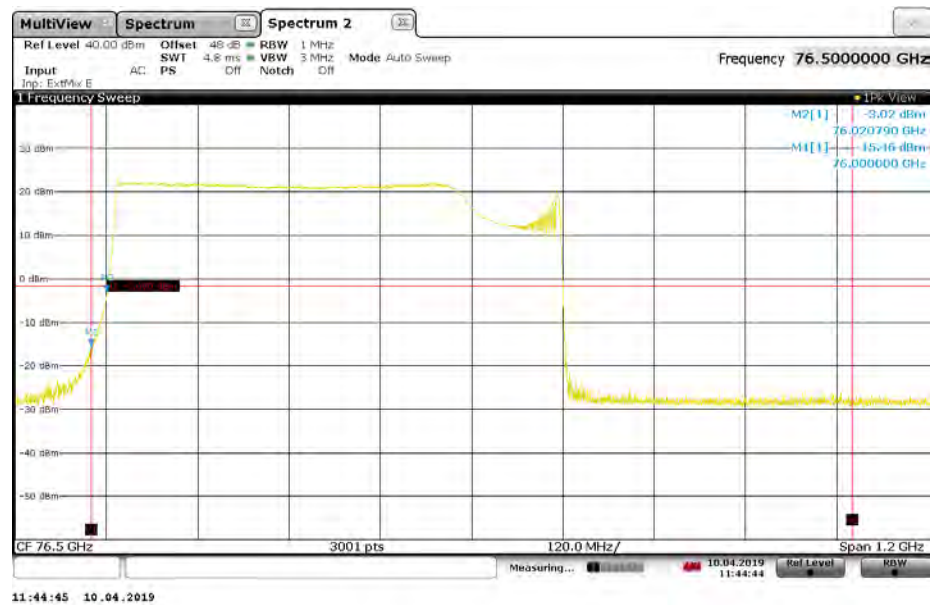
175 MHz, -40 °C, 13.2 V



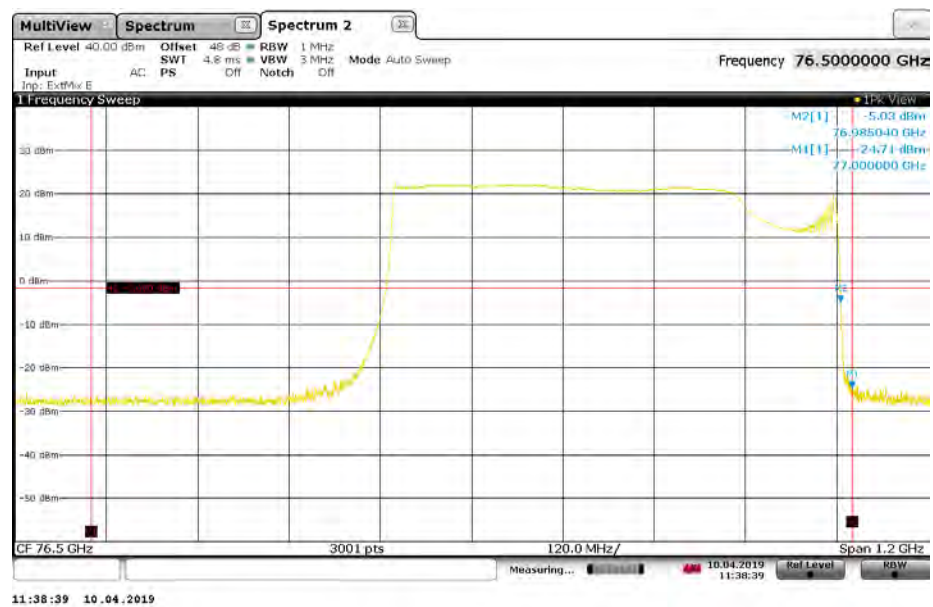
300 MHz, -40 °C, 13.2 V



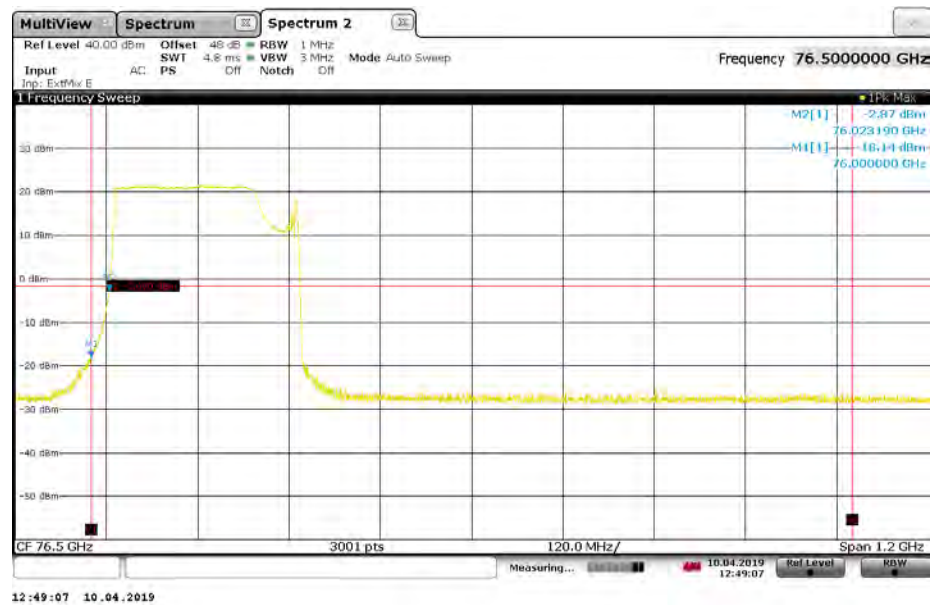
300 MHz, -40 °C, 13.2 V



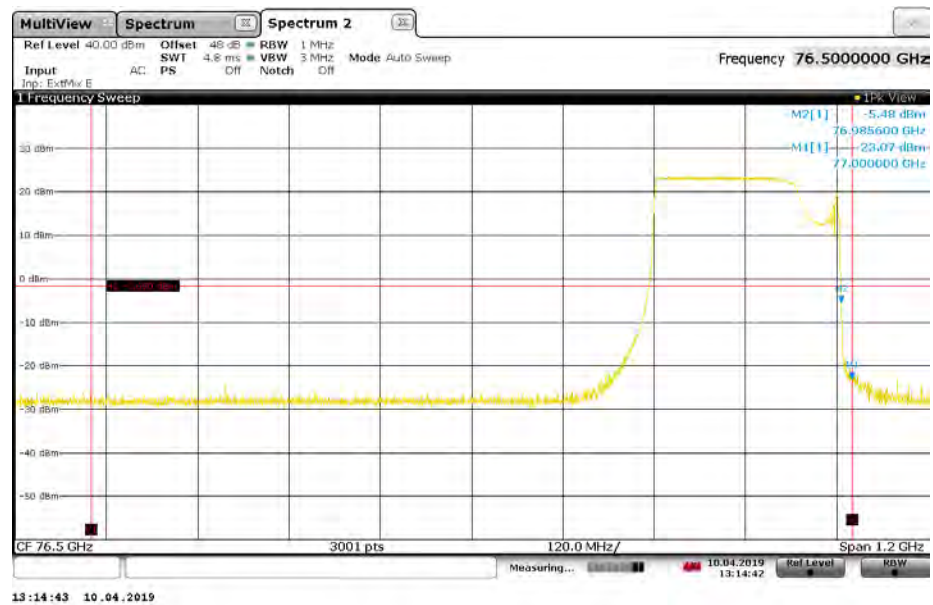
425 MHz, -40 °C, 13.2 V



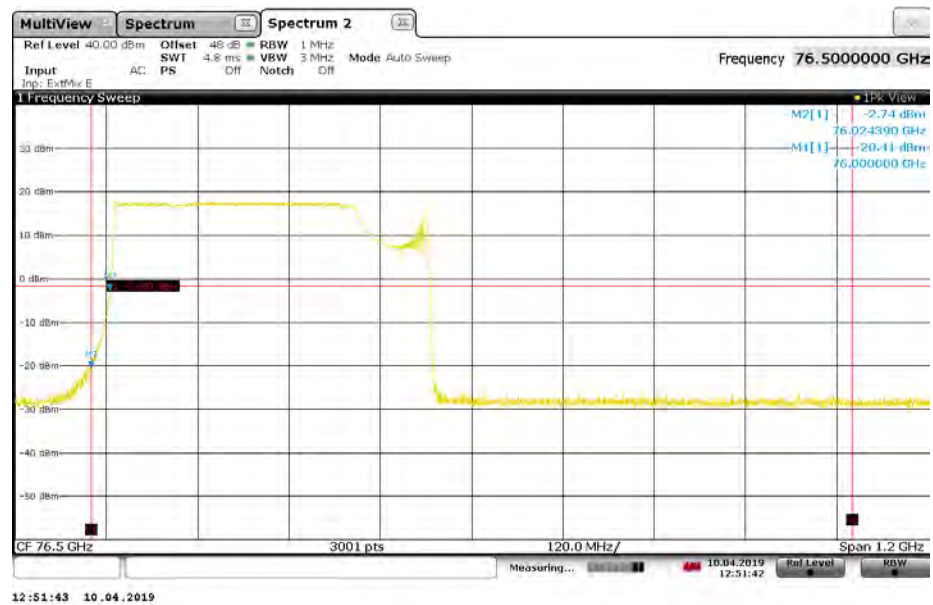
425 MHz, -40 °C, 13.2 V



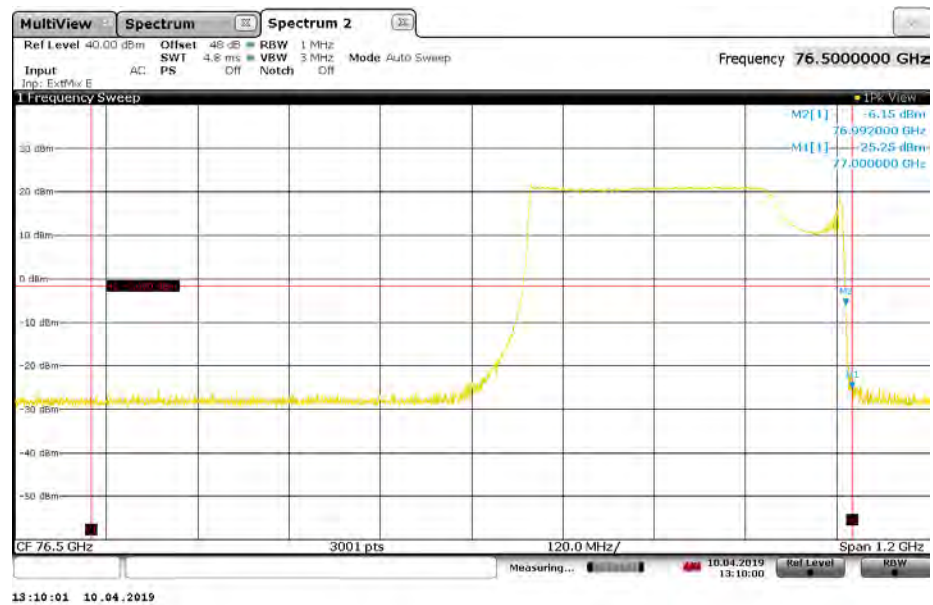
175 MHz, 85 °C, 13.2 V



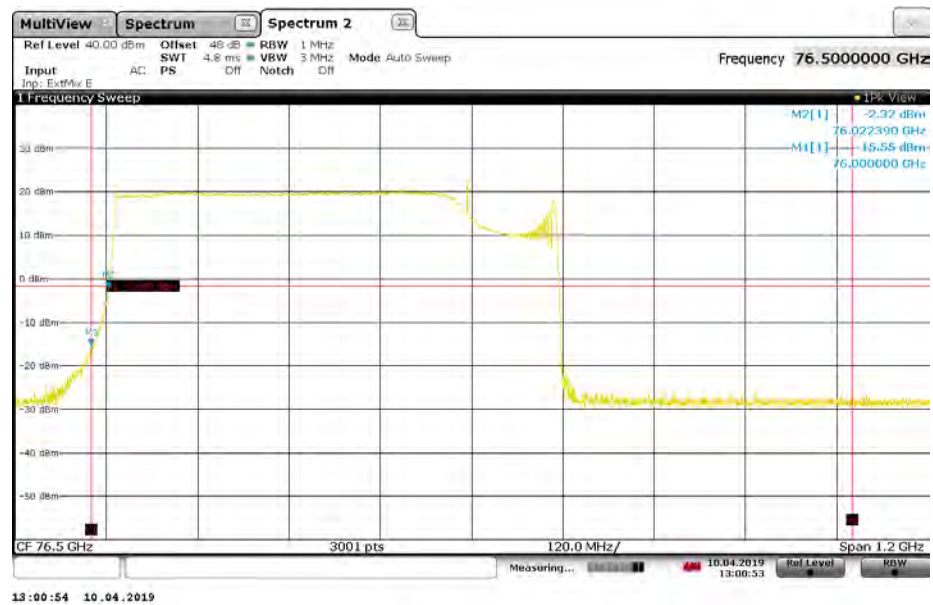
175 MHz, 85 °C, 13.2 V



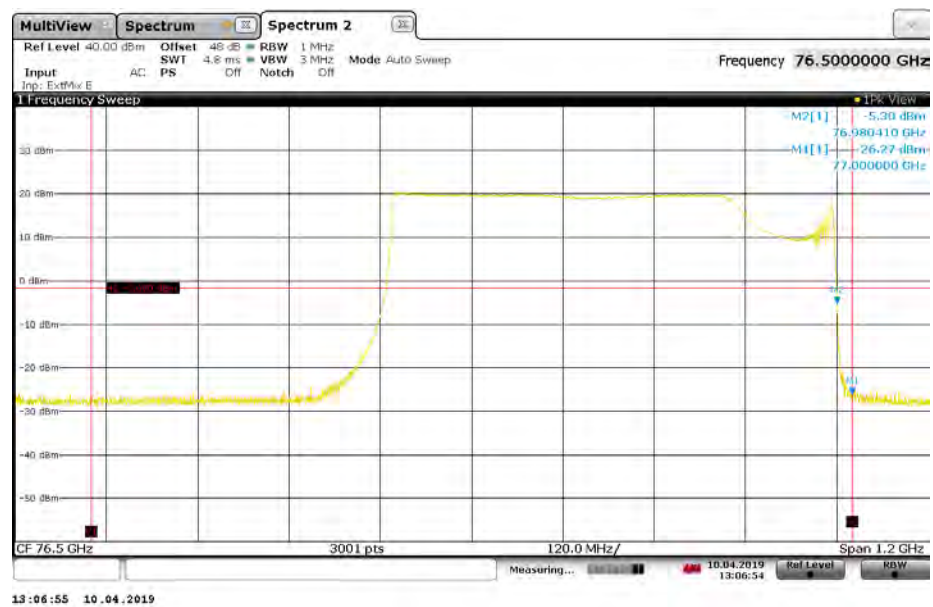
300 MHz, 85 °C, 13.2 V



300 MHz, 85 °C, 13.2 V



425 MHz, 85 °C, 13.2 V



425 MHz, 85 °C, 13.2 V

10.5 SAR Evaluation

Date of Test	2019-09-25
Operator	Martin Steindl
Test Site	Non shielded room

Test Result	
☒	Passed
☐	Not Passed

Specifications:	CFR 47, Part 1, Section 1310(d)(4) RSS-102, Issue 5, (4) Table 4 KDB 447498
Description:	SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level for the specified separation distance. Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power.
Operation mode:	Transmitting continuously on lowest and highest frequency with modulation 175 MHz, 300 MHz and 425 MHz.
Comment :	For test results see chapter 10.1 of this test report

Maximum <i>EIRP</i> (worst case):	24.3 dBm = 269.2 mW (Peak) 9.0 dBm = 7.9 mW (Average)
Frequency:	76 GHz to 77 GHz (> 5800 MHz)
Minimum separation distance <i>r</i> :	20 cm (declared by applicant)
Power density $S = \frac{EIRP}{4\pi r^2}$:	0.005 mW/cm ² (Peak) 0.002 mW/cm ² (Average)
FCC Limit	1.0 mW/cm ²
ISED Limit:	100 mW/cm ²

11 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	2019-05-24	Martin Steindl	First Edition
2	2019-09-25	Martin Steindl	Added description of tests and laboratory accreditation information Added SAR / RF-Exposure Exemption Excluded test setup photos into Annex I Altered "Marking Plate" to draft of marking plate Added IC and FCC-ID.