

Report on the FCC and IC Testing of the Siemens AG SIMATIC RTLS PCB OEM In accordance with FCC 47 CFR Part 15F

Prepared for: Siemens AG
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FCC ID: NXWOEMAC



COMMERCIAL-IN-CONFIDENCE

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Project Management	Alex Fink	2019-11-11	
Authorised Signatory	Matthias Stumpe	2019-11-11	

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

ENGINEERING STATEMENT

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

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Alex Fink	2019-11-11	

Laboratory Accreditation
DAkkS Reg. No. D-PL-11321-11-02

Laboratory recognition
Registration No. BNetzA-CAB-16/21-15

ISED Canada test site registration
3050A-2

EXECUTIVE SUMMARY

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

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Annex A: 5 pages



1 Report Summary

1.1 Report Modification Record

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

Issue	Description of Change	Date of Issue
1	First Issue	2019-10-28
2	Page 2 and 4: MLFB added.	2019-11-11

Table 1

1.2 Introduction

Applicant	Siemens AG
Manufacturer	Siemens AG
Model Number(s)	SIMATIC RTLS PCB OEM AC
MLFB	6GT2700-8DF00-0AX1 6GT2700-8DF10-0AX1 6GT2700-8DF20-0AX1 6GT2700-8DF30-0AX1
Serial Number(s)	A55882 (radiated)
Hardware Version(s)	0606
Software Version(s)	2.1.0
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15F
Test Plan/Issue/Date	---
Order Number	5121883
Date	2018-07-30
Date of Receipt of EUT	2018-11-19
Start of Test	2019-06-27
Finish of Test	2019-10-21
Name of Engineer(s)	Alex Fink, Patrick Müller
Related Document(s)	ANSI C63.10 (2013)



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15F.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Continuously Transmitting				
2.1	15.503 (a) (d) and 15.519 (b)	UWB Bandwidth	Pass	ANSI C63.10 (2013)
2.2	15.519 (c)	Radiated Emissions 30 MHz to 40 GHz	Pass	ANSI C63.10 (2013)
2.3	15.519 (d)	Radiated Emissions in the GPS Bands	Pass	ANSI C63.10 (2013)
2.4	15.519 (e)	Peak Emissions in a 50 MHz Bandwidth	Pass	ANSI C63.10 (2013)
2.5	15.207	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
2.6	15.519 (a)	Signal deactivation	Pass	ANSI C63.10 (2013)

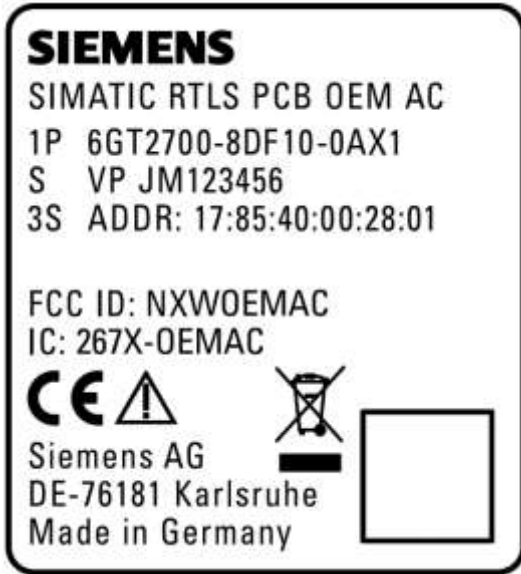
Table 2



1.4 Application Form

Eigenschaften des Prüflings: Equipment characteristics:				
Type of equipment:	Communication and Real Time Location System in 2.4 GHz ISM Band and UWB			
Type designation:	SIMATIC RTLS PCB OEM AC			
MLFB	6GT2700-8DF00-0AX1 6GT2700-8DF10-0AX1 6GT2700-8DF20-0AX1 6GT2700-8DF30-0AX1			
Parts of the system:	Tag			
Intended use	Communication and Real Time Location System			
Hardware Version:	0606			
Software Version:	2.1.0			
Intended area of use	☐ residential environment (home) ☒ industrial environment		☐ vehicle (automotive)	
Power supply:	☐ AC Nominal: Minimum: Maximum: Nominal frequency: Hz		☒ DC Nominal: 3.3 V Minimum: 3.1 V Maximum: 3.4 V	☐ Batterie Nominal: Max.
Dimensions (in cm)	2.5 x 2.5 x 1.8 cm			
General requirements according to RED:	☒ Funk / Radio	☒ Sicherheit / Safety	☒ EMV / EMC	☒ EMF
Application:	Short Range Devices			
Kind of equipment:	Transceiver			
Frequency band:	Phase: 2410 – 2480 MHz, UWB: 3774 – 4243.2 MHz, 6240 – 6739.2 MHz			
Number of RF-channels:	Phase: 14, Channel 12 (2400 MHz) – Channel 26 (2483.5 MHz) UWB: 2 (Channel 2, without DAA, Center 3993.6 MHz) (Channel 5, without DAA, Center 6489.6 MHz)			
Channel spacing	Phase: 5 MHz UWB: 499.2 MHz			
Rated Carrier Power:	Phase: 4 dBm UWB: -14.31 dBm			
Type(s) of Modulation (e.g. BPSK, FSK, ASK, ...)	Phase: OQPSK in ISM 2.4 GHz UWB: BPSK with BPM			



Type of radio transmission / Use of frequency spectrum (e.g. DSSS, OFDM,..)	Phase: 4QAM UWB: BPM-BPSK
Number / Type of Antenna(s)	2 PCB antennas (both internal)
Antenna Gain	2 dBi
Minimum Distance of the Antenna to the human body	> 20 cm
Nominal Temperature & Temperature Range:	20°C / 0 °C to +50 °C
Marking plate	 SIEMENS SIMATIC RTLS PCB OEM AC 1P 6GT2700-8DF10-0AX1 S VP JM123456 3S ADDR: 17:85:40:00:28:01 FCC ID: NXWOEMAC IC: 267X-OEMAC CE    Siemens AG DE-76181 Karlsruhe Made in Germany

Test configuration:

Channel	2 or 5
Puls Repetition Frequency	16 MHz
Data Rate	850k
Preamble Code	3 for Channel 2; 10 for Channel 5
Preamble Length	256
Tx-Power Attenuation	9



1.4.1 EUT Modification Record

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

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer SIMATIC RTLS PCB OEM AC, S/N: A55882	Not Applicable	Not Applicable

Table 3

1.5 Test Location

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

Test Name	Name of Engineer(s)
Configuration and Mode: Continuously Transmitting	
UWB Bandwidth	Alex Fink
Radiated Emissions 30 MHz to 40 GHz	Alex Fink
Radiated Emissions in the GPS Bands	Alex Fink
Peak Emissions in a 50 MHz Bandwidth	Alex Fink
AC Power Line Conducted Emissions	Alex Fink
Signal deactivation	Alex Fink

Table 4

Office Address:

Äußere Frühlingsstraße 45
94315 Straubing
Germany



2 Test Details

2.1 UWB Bandwidth

2.1.1 Specification Reference

FCC 47 CFR Part 15F, Clause 15.503 (a) (d) and 15.519 (b)

2.1.2 Equipment Under Test and Modification State

SIMATIC RTLS PCB OEM AC, S/N: A55882 - Modification State 0

2.1.3 Date of Test

2019-06-27

2.1.4 Test Method

Test according to FCC title 47 part 15 §15.519 (b) and ANSI C63.10-2013, 10.1

2.1.5 Environmental Conditions

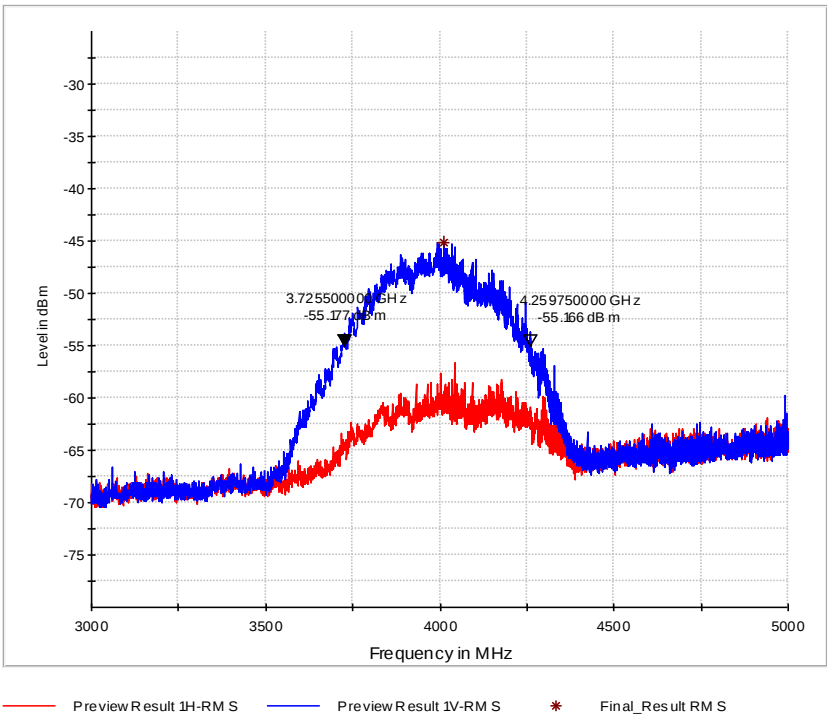
Ambient Temperature 21.0 °C
Relative Humidity 35.0 %

2.1.6 Test Results

Channel	f _L [GHz]	f _H [GHz]	f _M [GHz]	OBW [MHz]	f _c [GHz]	Result
Ch 2 [Lowest]	3.73	4.26	4.11	530	4.00	PASS
Ch 5 [Highest]	6.21	6.75	6.49	540	6.54	PASS



Transmission on Channel 2

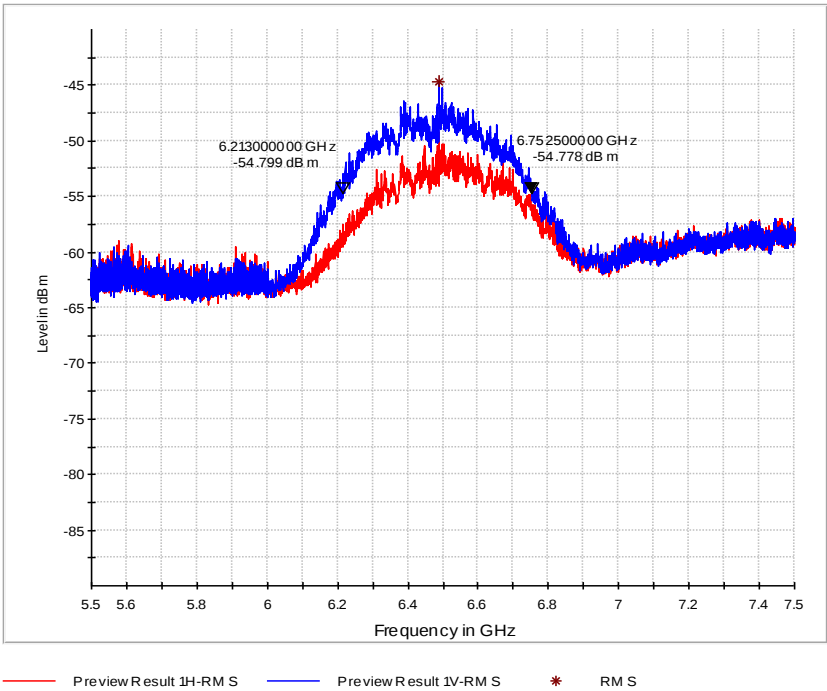


Final Results:

Frequency MHz	RMS dBm	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
4011.250000	-45.20	2.5	1000.000	150.0	V	158.0	-99



Transmission on Channel 5



Final Results:

Frequency MHz	RMS dBm	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
6489.000000	-44.72	2.5	1000.000	150.0	V	43.0	-94.3

FCC 47 CFR Part 15, Limit Clause 15.519 (b) and ANSI C63.10-2013 10.1

The UWB bandwidth of a device operating under the provisions of this section shall be contained between 3,100 MHz and 10,600 MHz and at any point in time and has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.



Product Service

2.1.7 Test Location and Test Equipment Used

Radiated Tests were carried out in FAR No.8

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2020-02-29
Horn Antenna	EMCO	3115	19383	36	2020-02-29
EMC measurement software	Rohde & Schwarz	EMC32-MEB	---	---	---

Table 5

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable



2.2 Radiated Emissions 30 MHz to 40 GHz

2.2.1 Specification Reference

FCC 47 CFR Part 15F, Clause 15.519 (c)

2.2.2 Equipment Under Test and Modification State

SIMATIC RTLS PCB OEM AC, S/N: A55882 - Modification State 0

2.2.3 Date of Test

2019-09-20 to 2019-09-25

2.2.4 Test Method

Test below 960 MHz was performed in accordance with ANSI C63.10, clause 6.10.5.

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

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

Test above 960 MHz was performed in accordance with FCC title 47 part 15 §15.519 (c) and ANSI C63.10-2013, 10.3

Frequency range	Measurement distance (m)
1 GHz to 3100 MHz	0.25 m
3100 MHz to 18 GHz	0.50 m
18 GHz to 40 GHz	0.05 m

2.2.5 Environmental Conditions

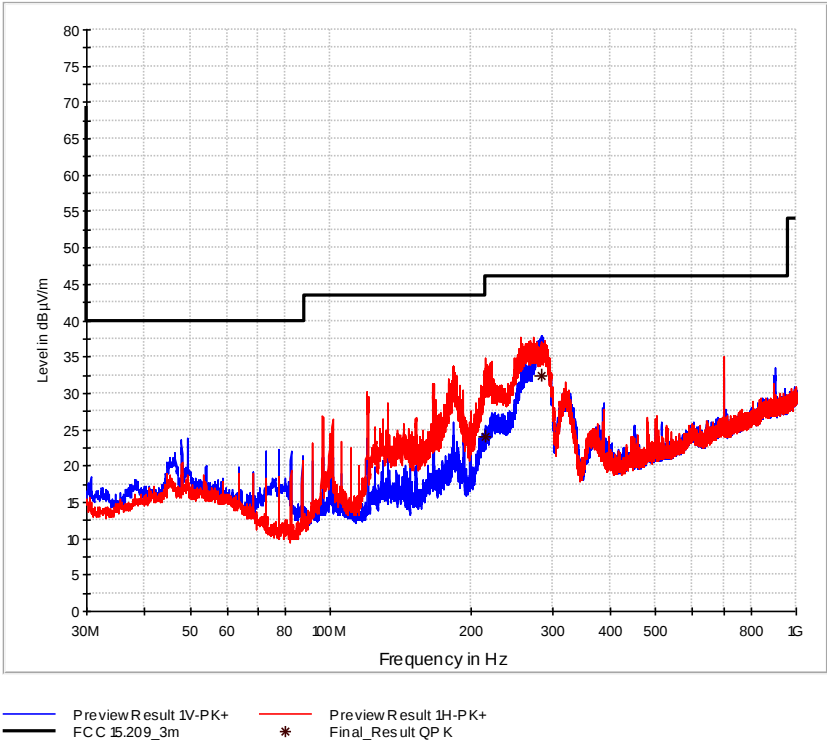
Ambient Temperature 25.0 °C
Relative Humidity 53.0 %

2.2.6 Test Results



Product Service

1.orthogonal axis, xz plane - channel 2

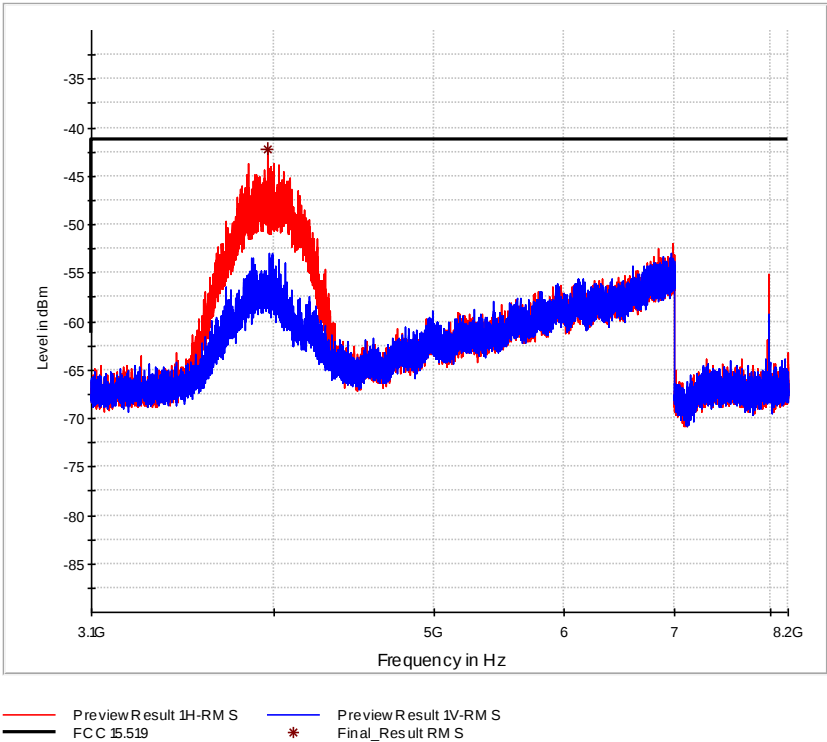
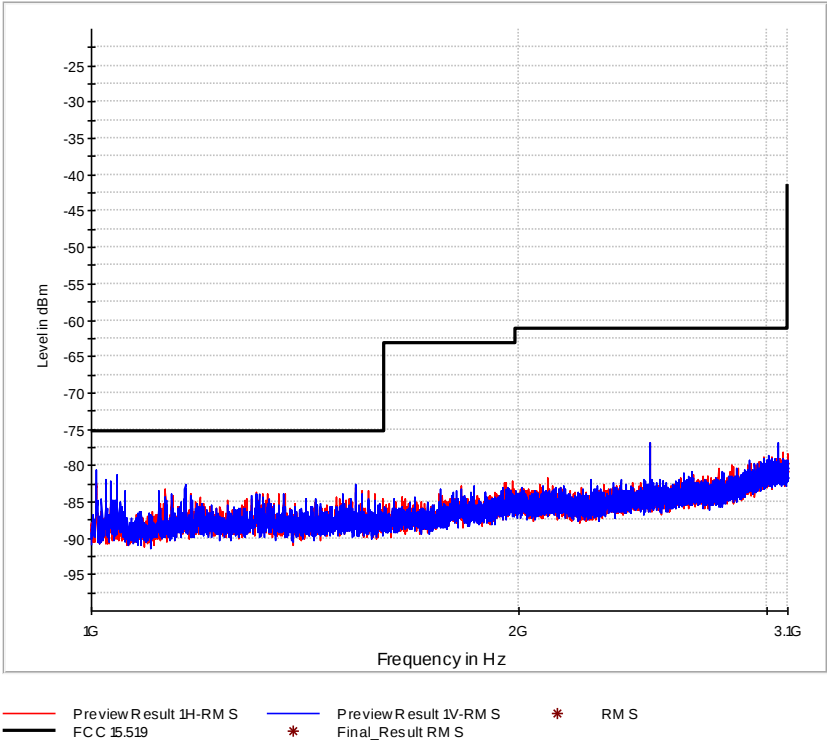


Final Results:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
216.020000	24.04	46.00	21.96	1000.0	120.000	171.0	H	-34.0	12.9
284.895000	32.35	46.00	13.65	1000.0	120.000	160.0	V	194.0	15.1

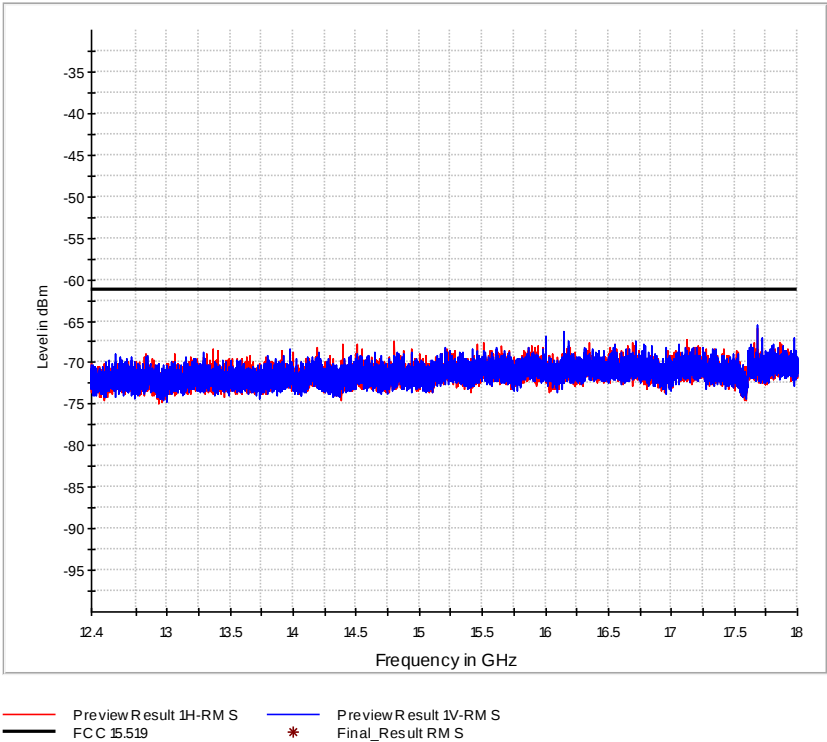
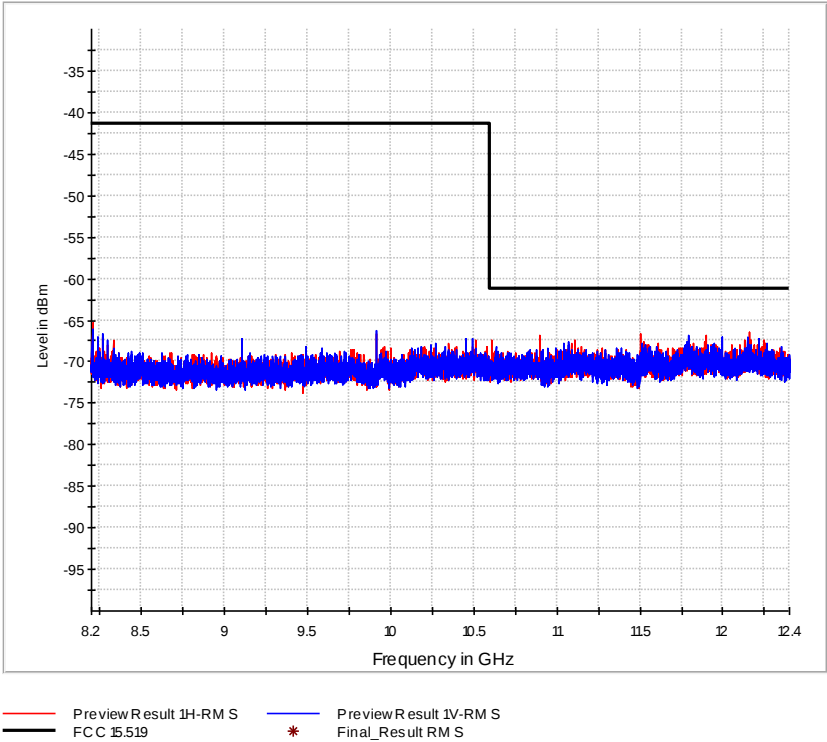


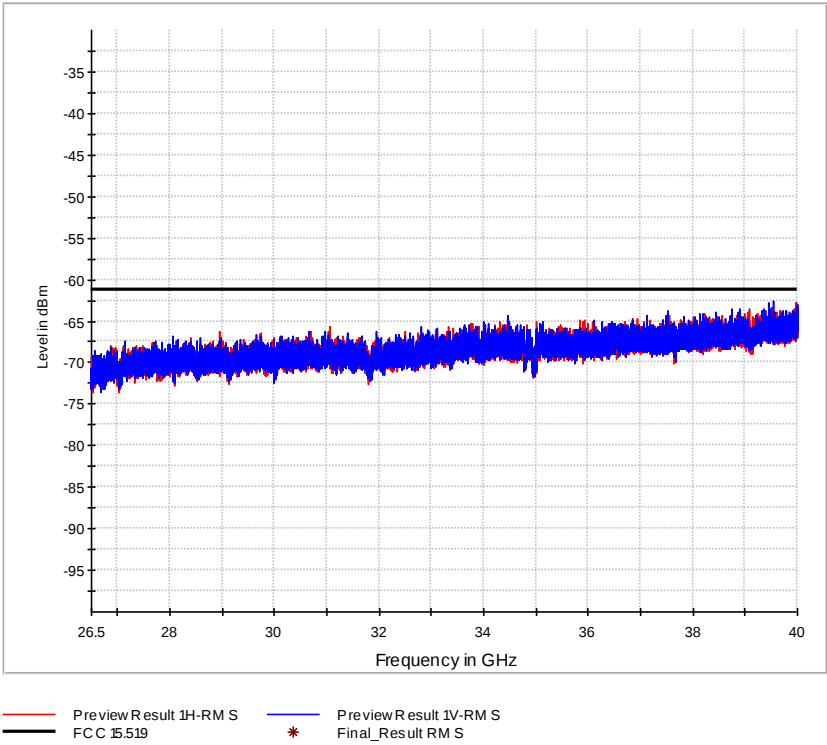
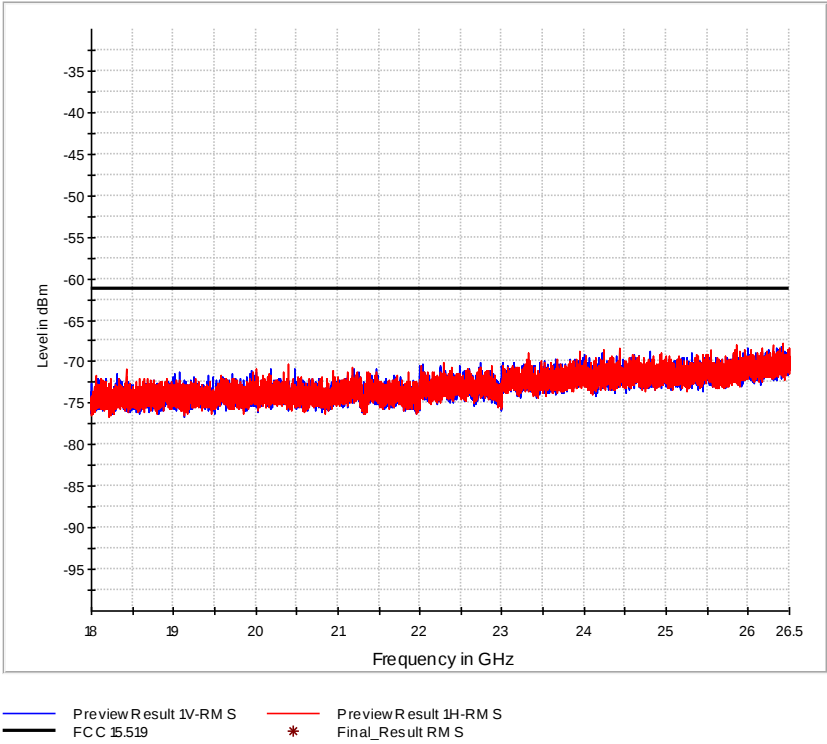
Product Service



Final Results:

Frequency MHz	RMS dBm	Limit dBm	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
3960.625000	-42.16	-41.30	0.86	5.0	1000.000	150.0	H	181.0	-77.6

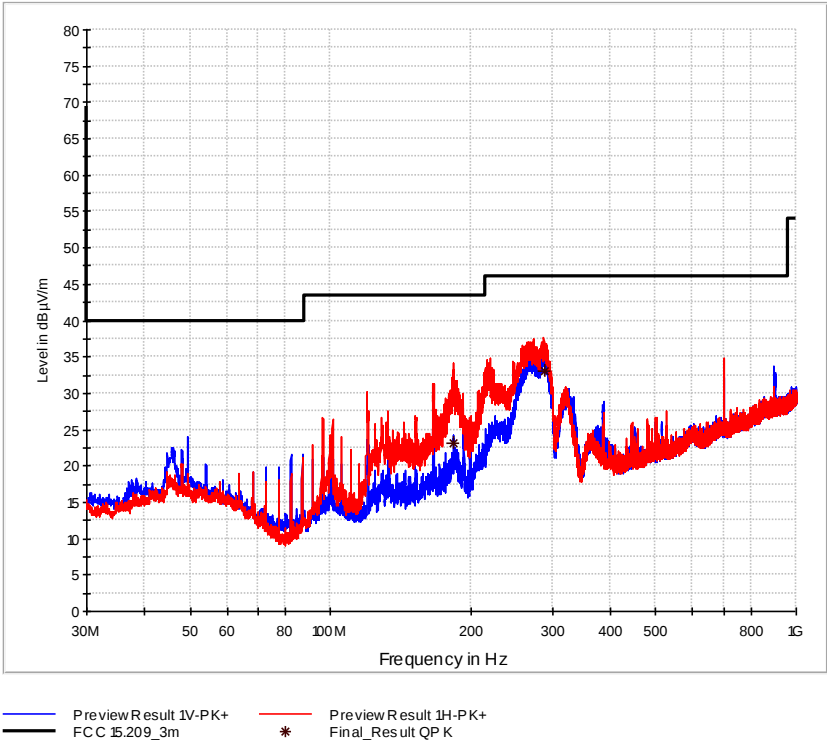






Product Service

1.orthogonal axis, xz plane - channel 5

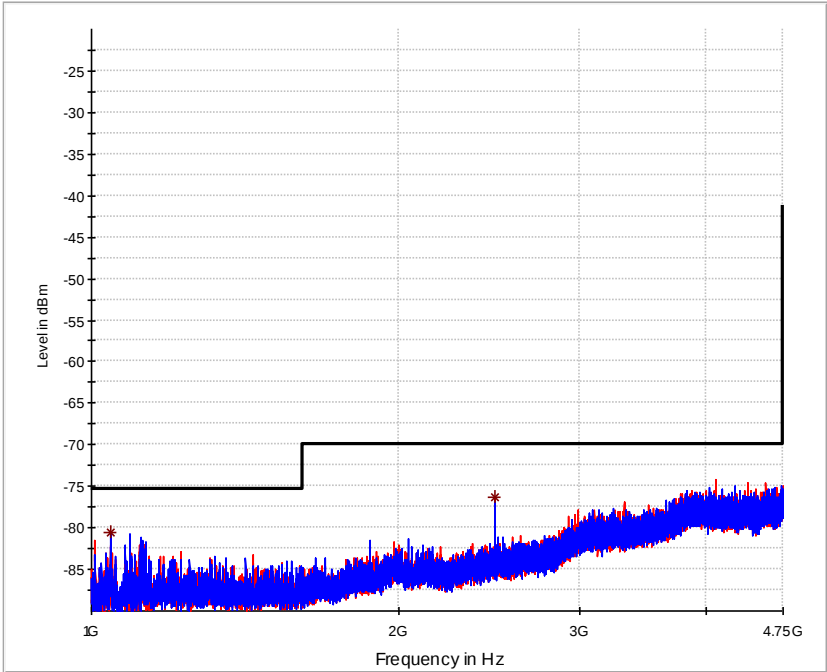


Final Results:

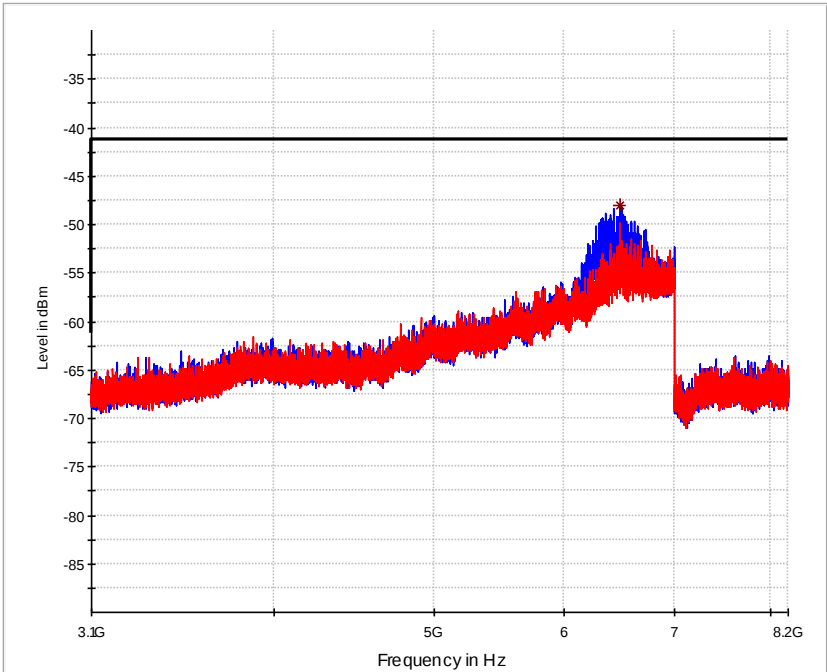
Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
183.330000	23.19	43.50	20.31	1000.0	120.000	106.0	H	117.0	11.3
288.405000	33.09	46.00	12.91	1000.0	120.000	105.0	H	-104.0	15.1



Product Service



Preview Result 1H-RM S Preview Result 1V-RM S
RSS-220 5.2.1 * Final Result RM S



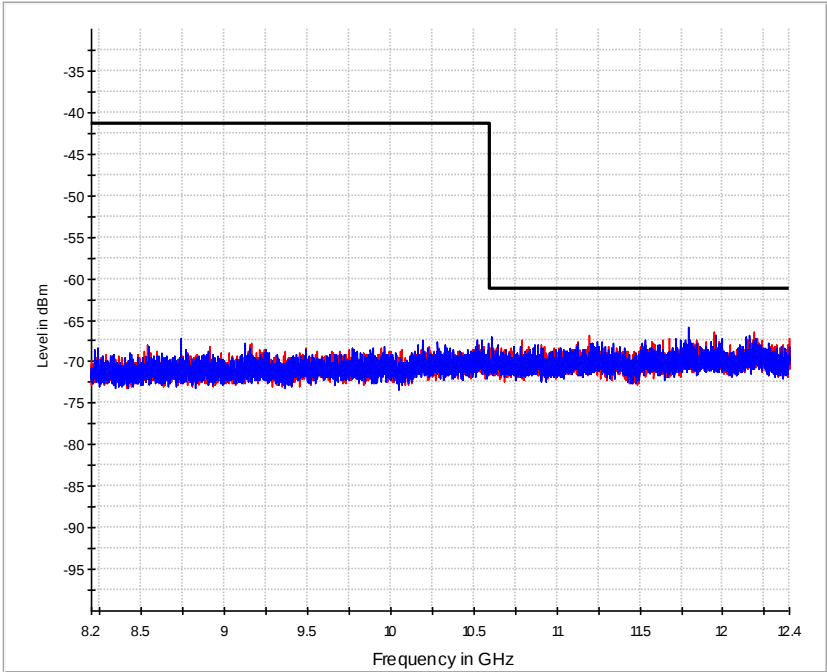
Preview Result 1V-RM S Preview Result 1H-RM S
FCC 15.519 * Final Result RM S

Final Results:

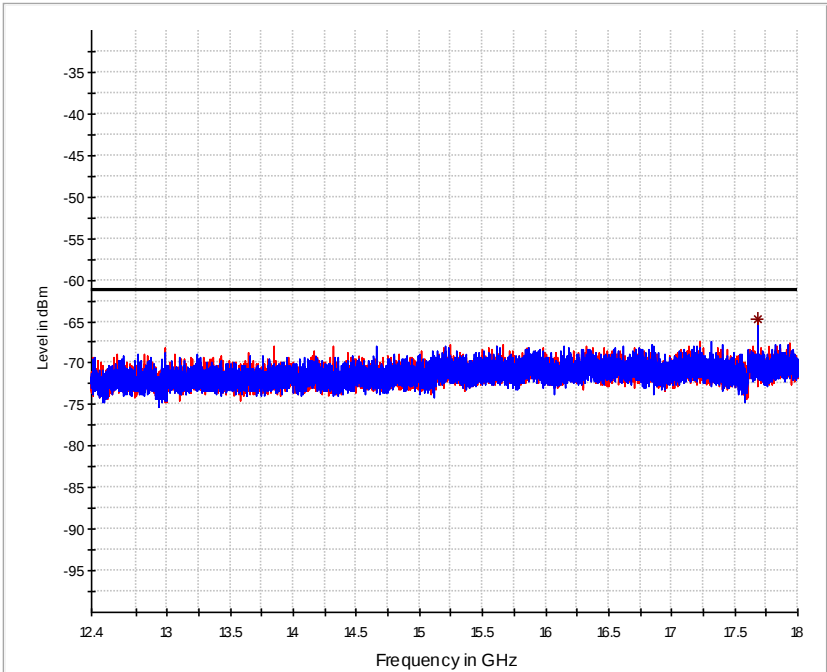
Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
6489.268750	-48.02	-41.30	6.72	5.0	1000.000	150.0	V	296.0	-75.8



Product Service



Preview Result 1H-RMS Preview Result 1V-RMS
FCC 15.519 * Final Result RMS



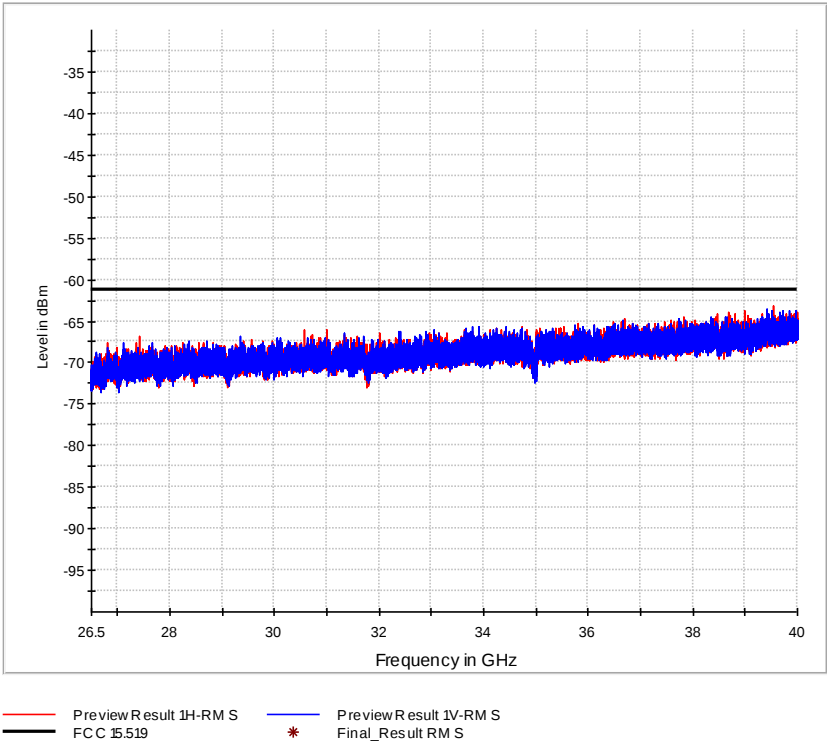
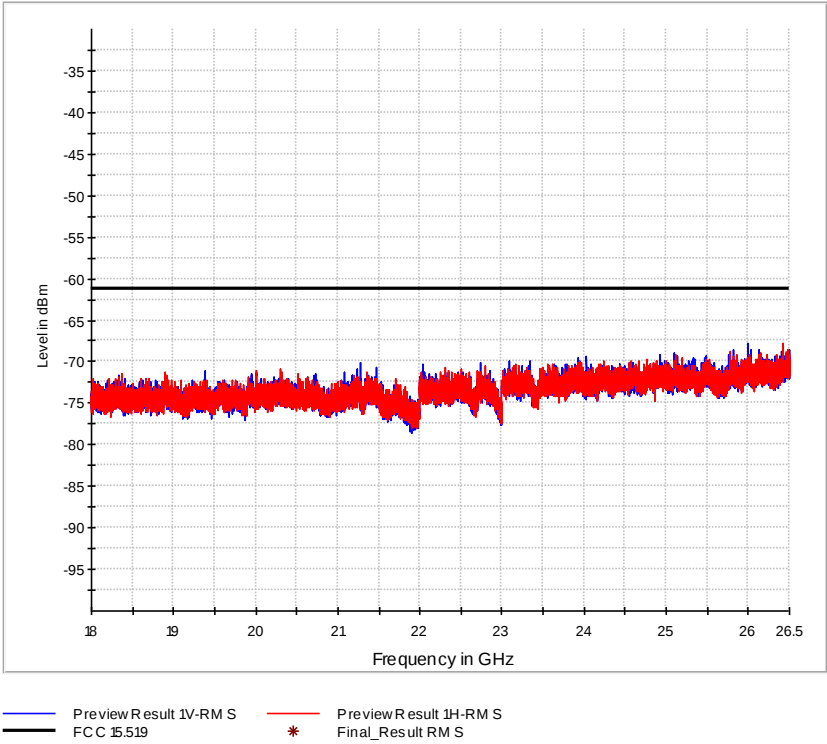
Preview Result 1H-RMS Preview Result 1V-RMS
FCC 15.519 * Final Result RMS

Final Results:

Frequency MHz	RMS dBm	Limit dBm	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
17683.600000	-64.66	-61.30	3.36	5.0	1000.000	150.0	H	291.0	-78

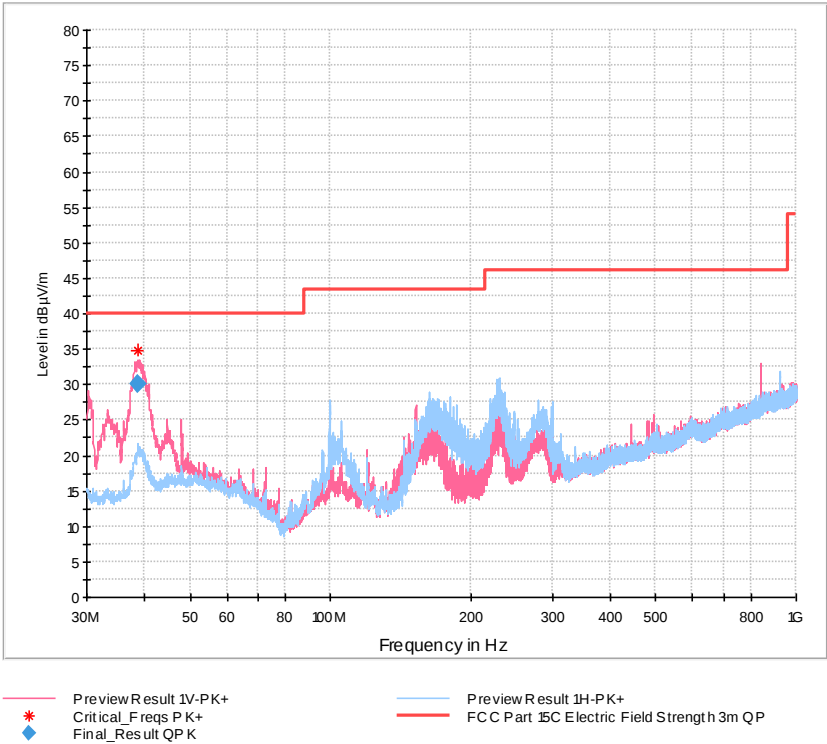


Product Service





2.orthogonal axis, xy plane - channel 2

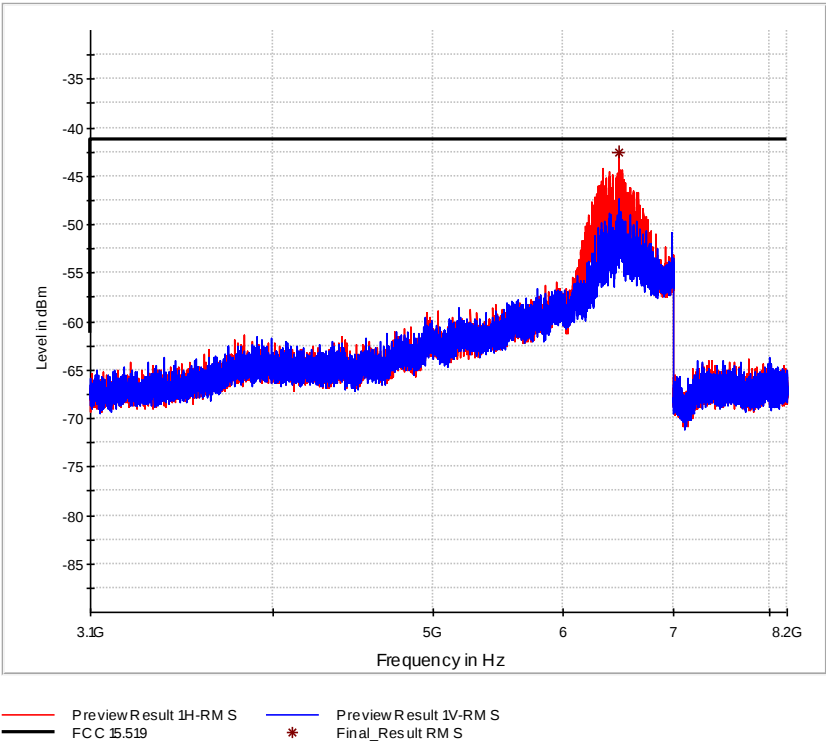
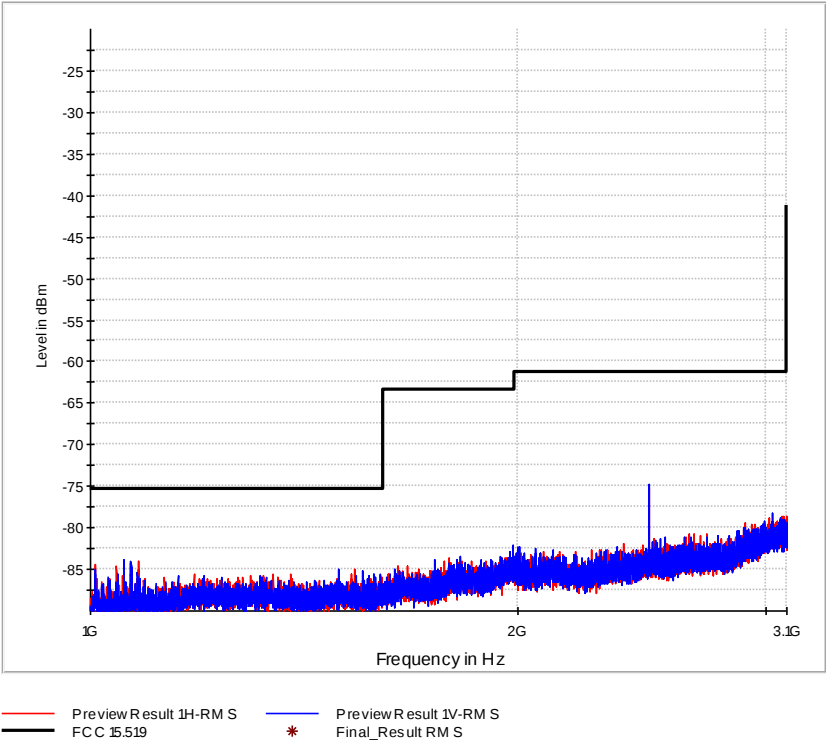


Final Results:

Frequency	QuasiPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
38.550000	30.03	40.00	9.97	1000.0	120.000	100.0	V	148.0	12.4

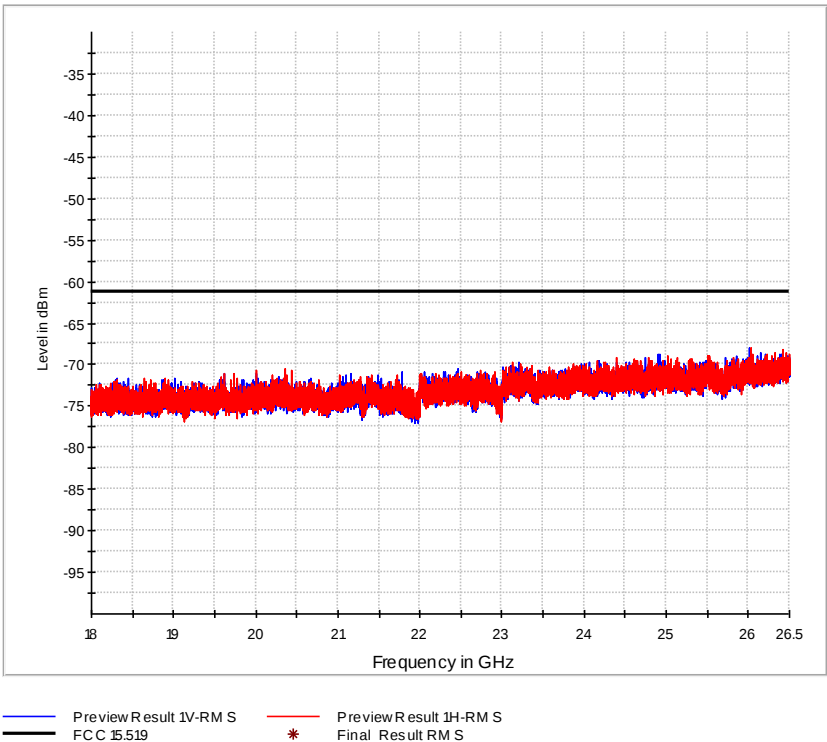
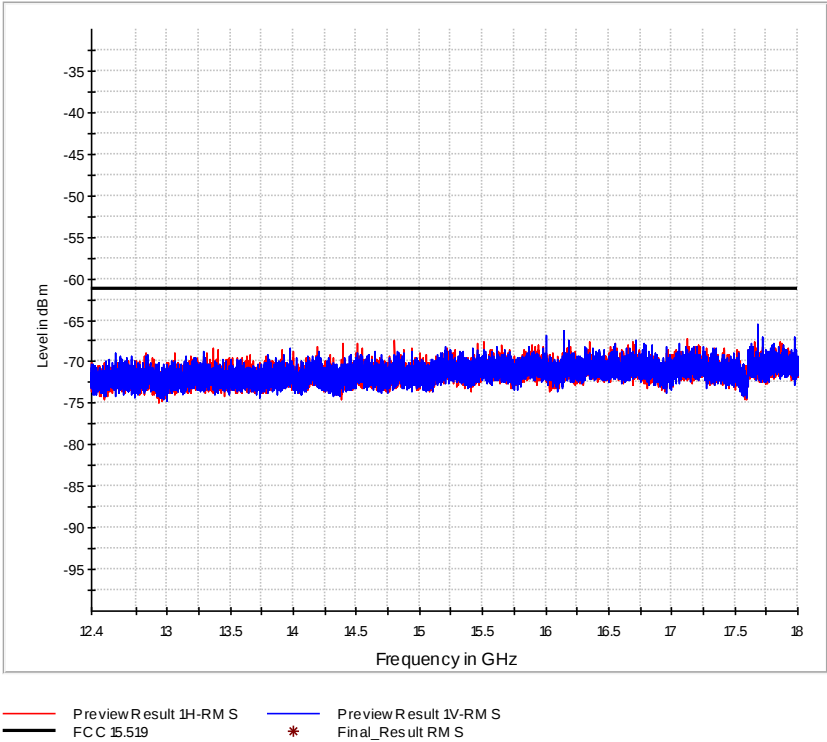


Product Service



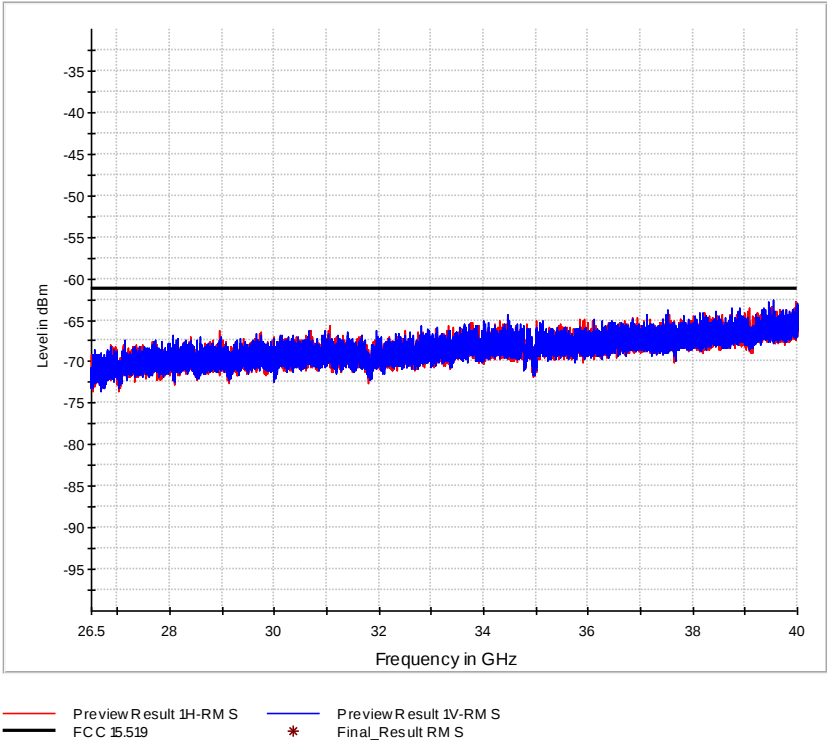
Final Results:

Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
6477.793750	-42.49	-41.30	1.19	5.0	1000.000	150.0	H	47.0	-75.8



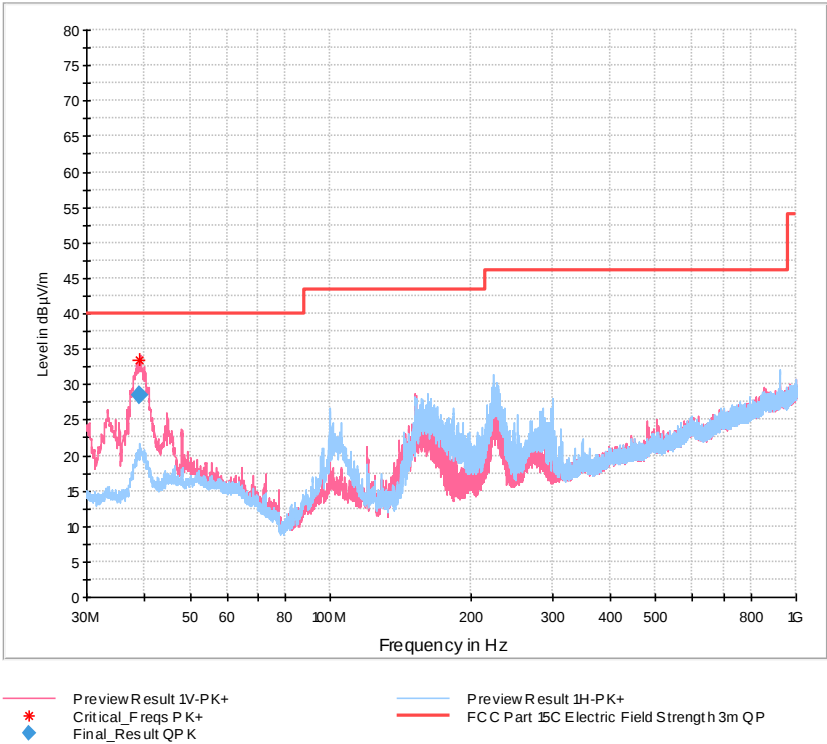


Product Service





2.orthogonal axis, xy plane - channel 5

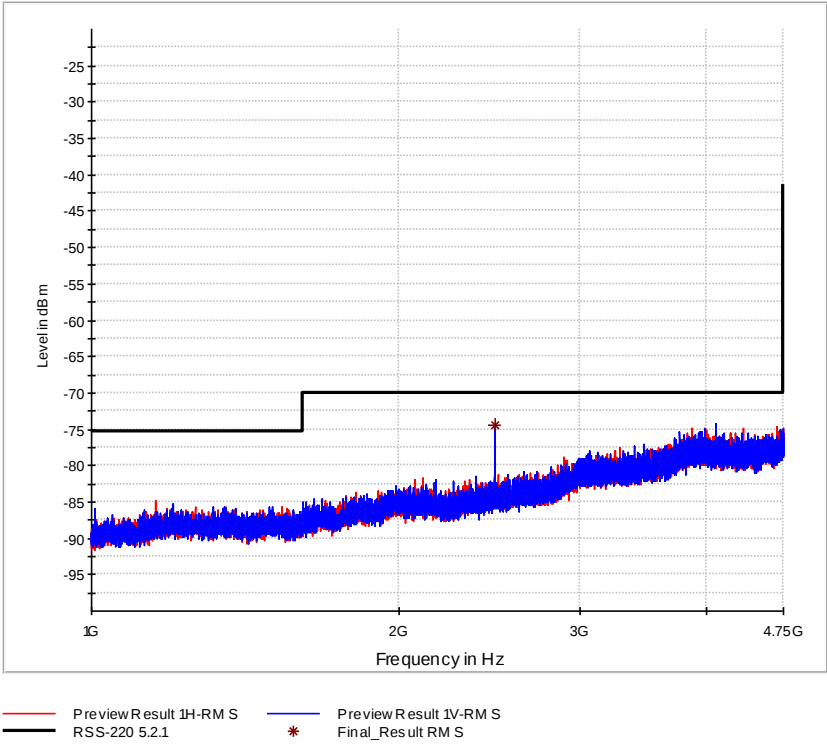


Final Results:

Frequency	QuasiPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
38.910000	28.42	40.00	11.58	1000.0	120.000	100.0	V	116.0	12.5



Product Service

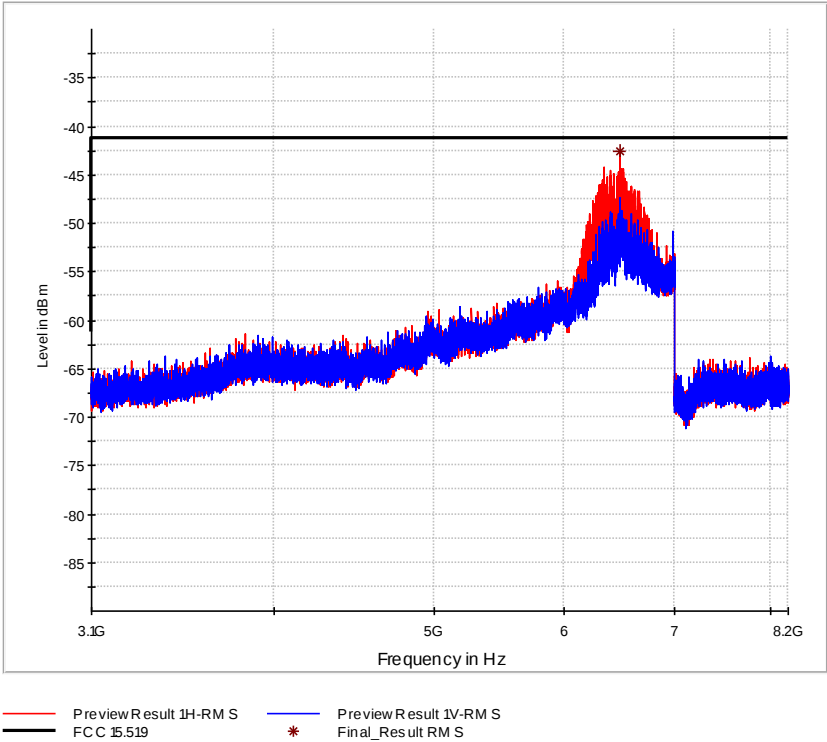


Final Results:

Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
2477.968750	-74.51	-70.00	4.51	5.0	1000.000	150.0	H	0.0	-96

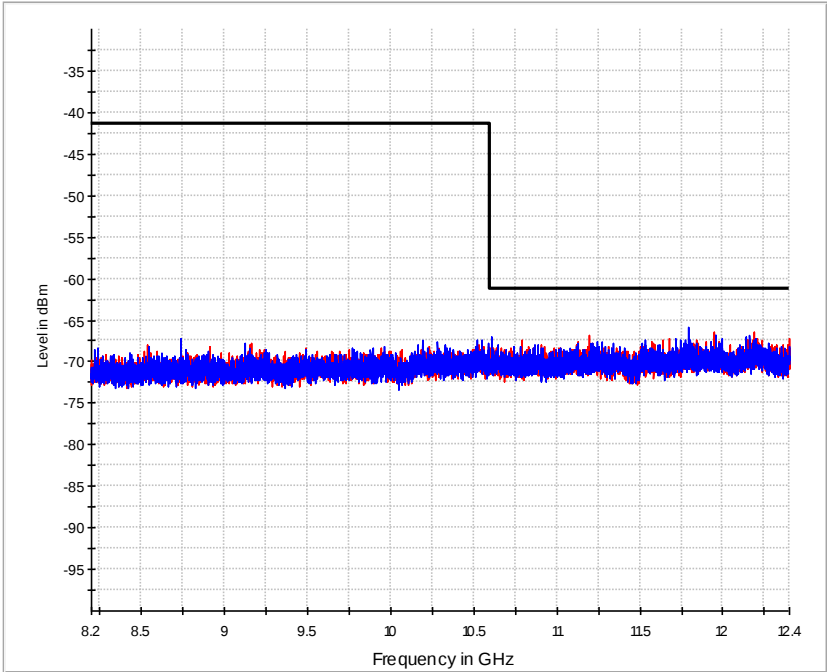


Product Service

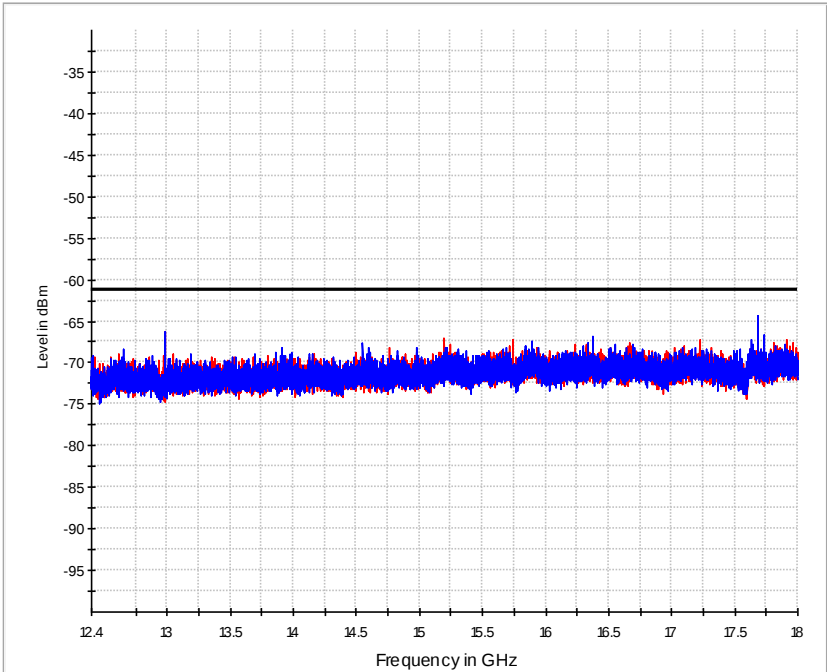


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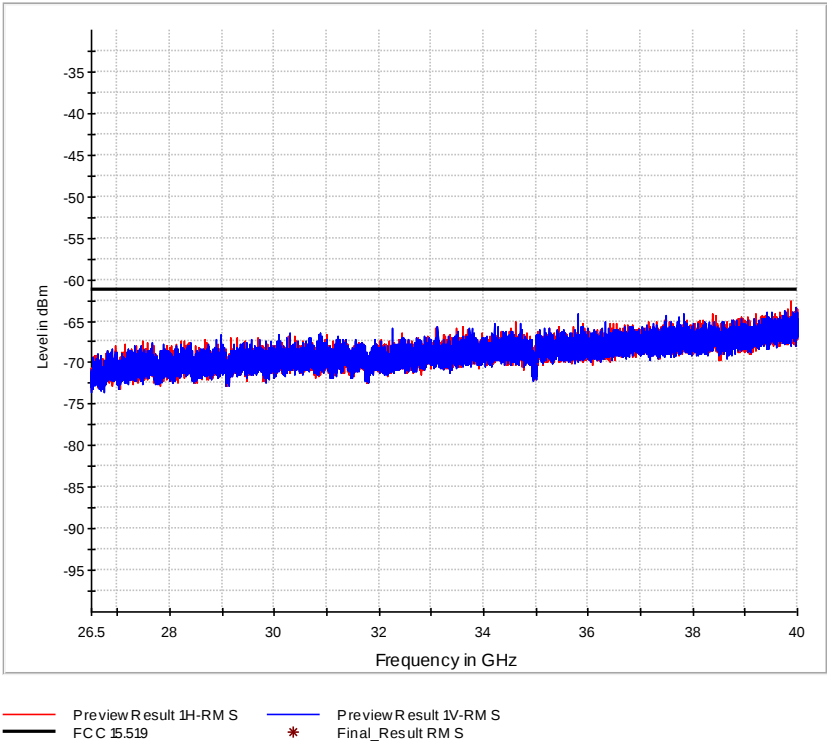
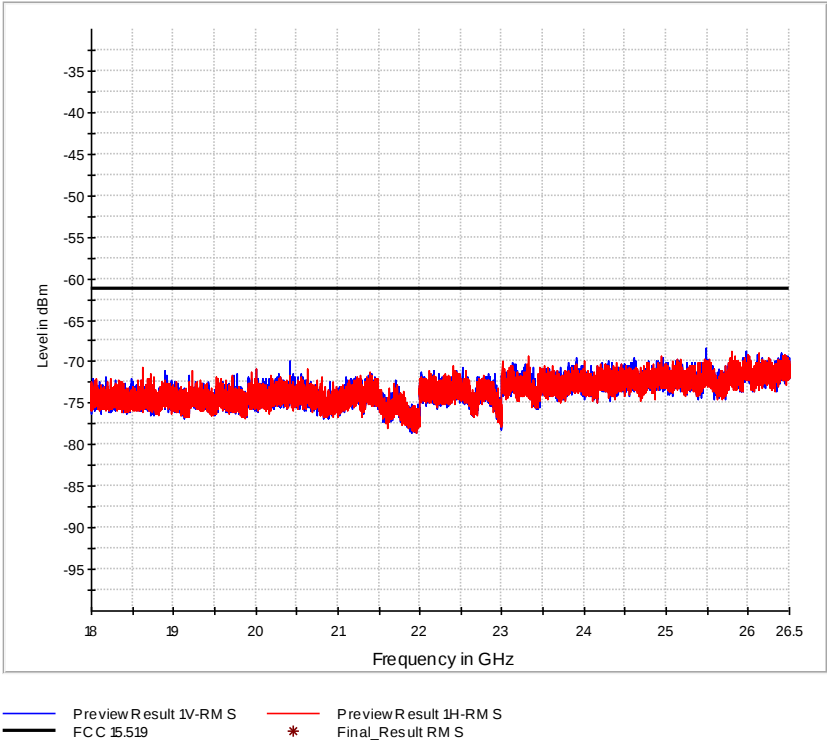
Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
6477.793750	-42.49	-41.30	1.19	5.0	1000.000	150.0	H	47.0	-75.8



Preview Result 1H-RM S Preview Result 1V-RM S
FCC 15.519 * Final_Result RM S

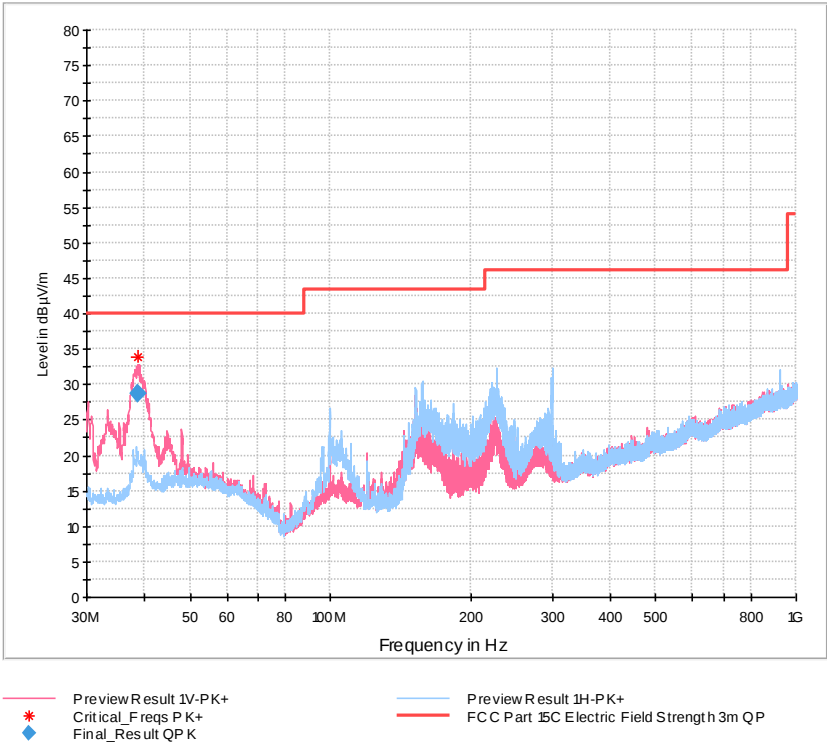


Preview Result 1H-RM S Preview Result 1V-RM S
FCC 15.519 * Final_Result RM S





3.orthogonal axis, yz plane - channel 2

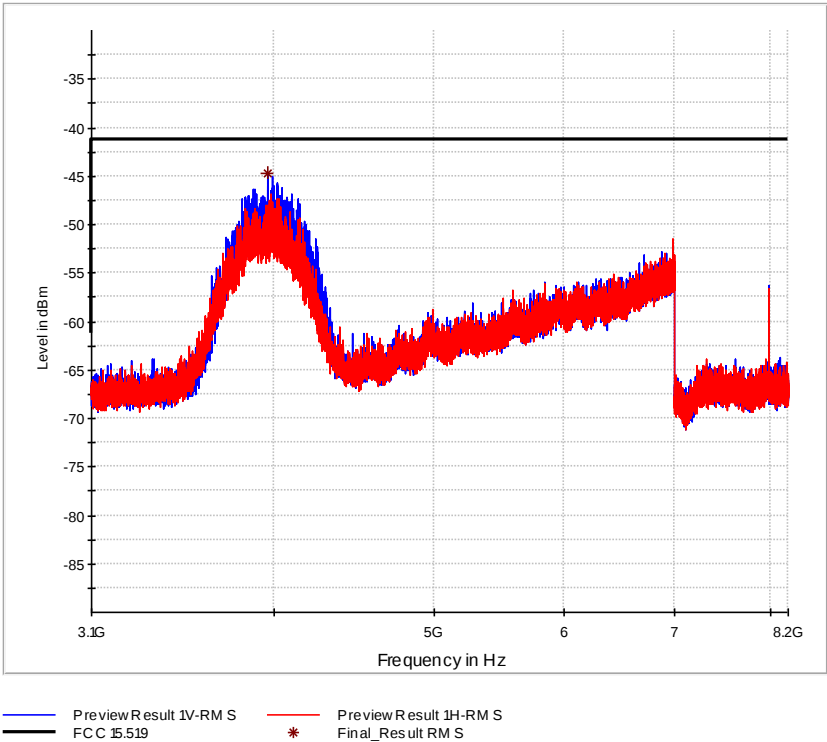
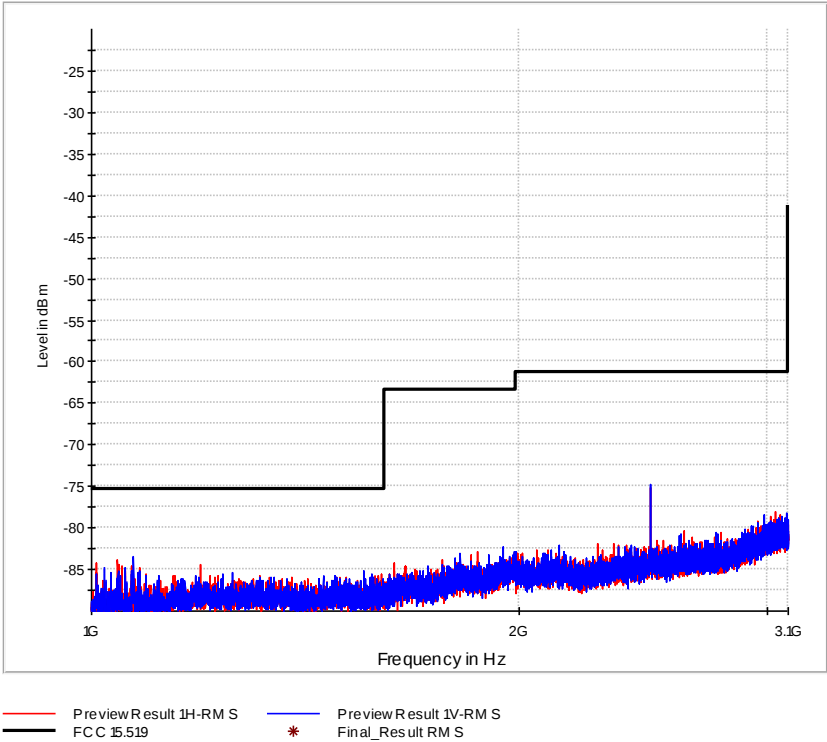


Final Results:

Frequency	QuasiPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
38.580000	28.73	40.00	11.27	1000.0	120.000	103.0	V	155.0	12.4

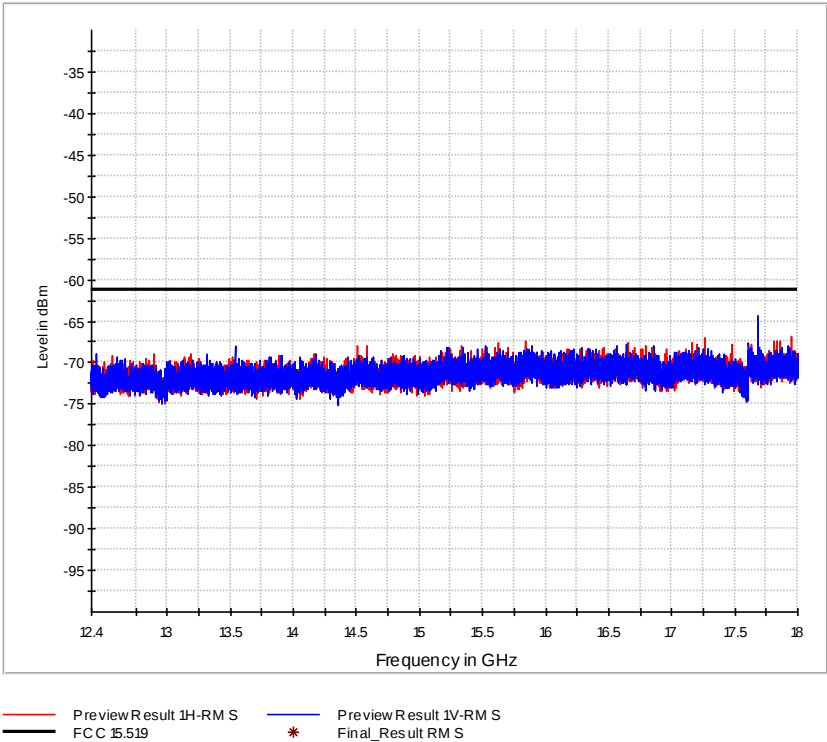
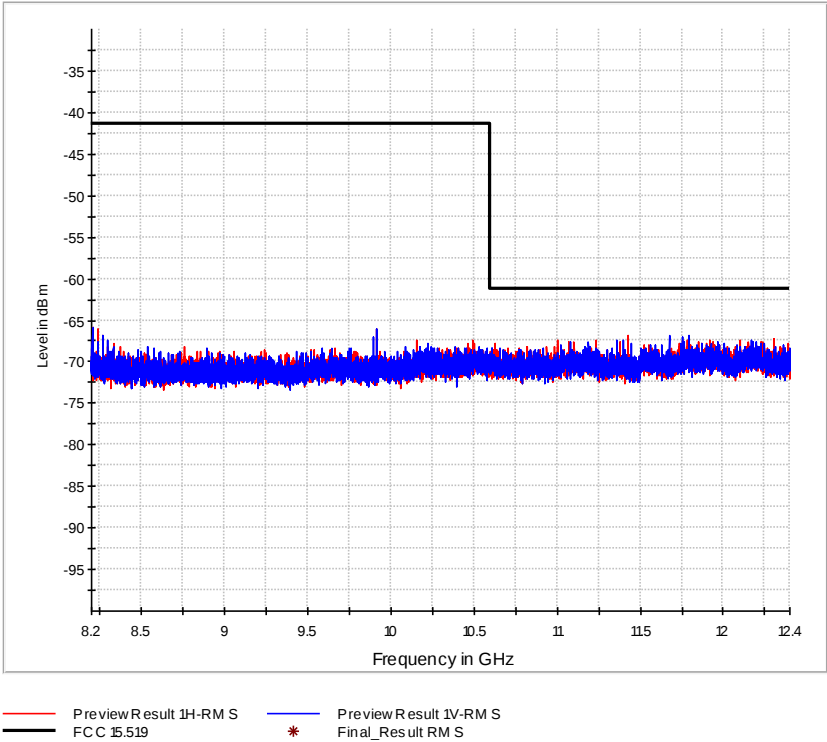


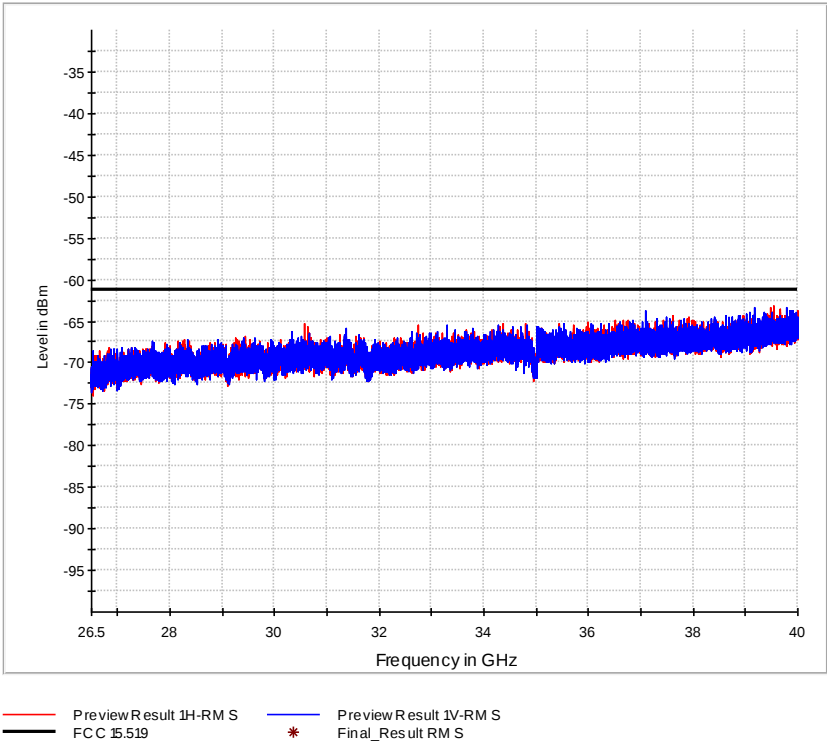
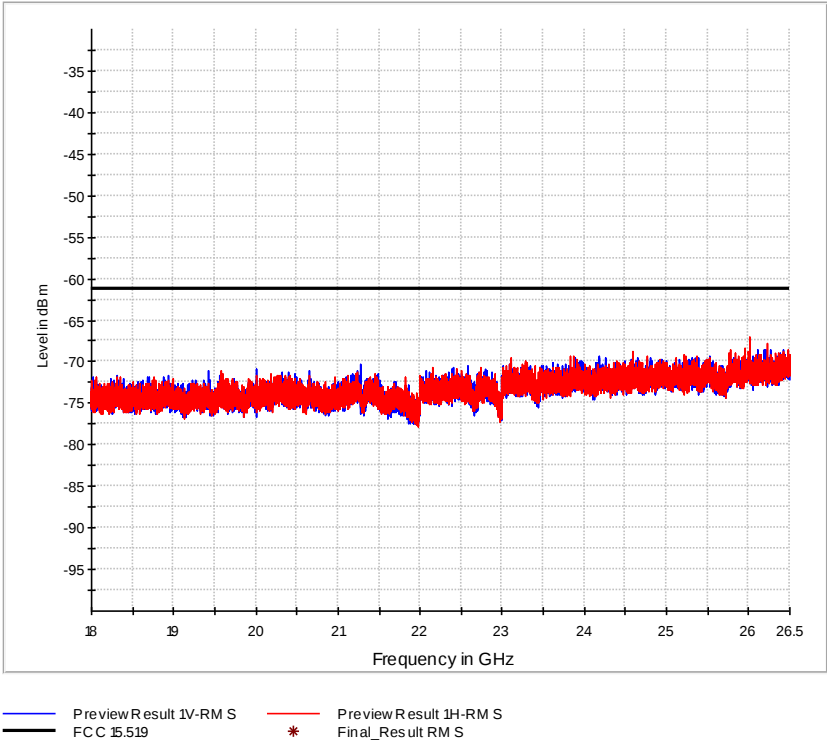
Product Service



Final Results:

Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
3963.493750	-44.67	-41.30	3.37	5.0	1000.000	150.0	V	190.0	-77.7

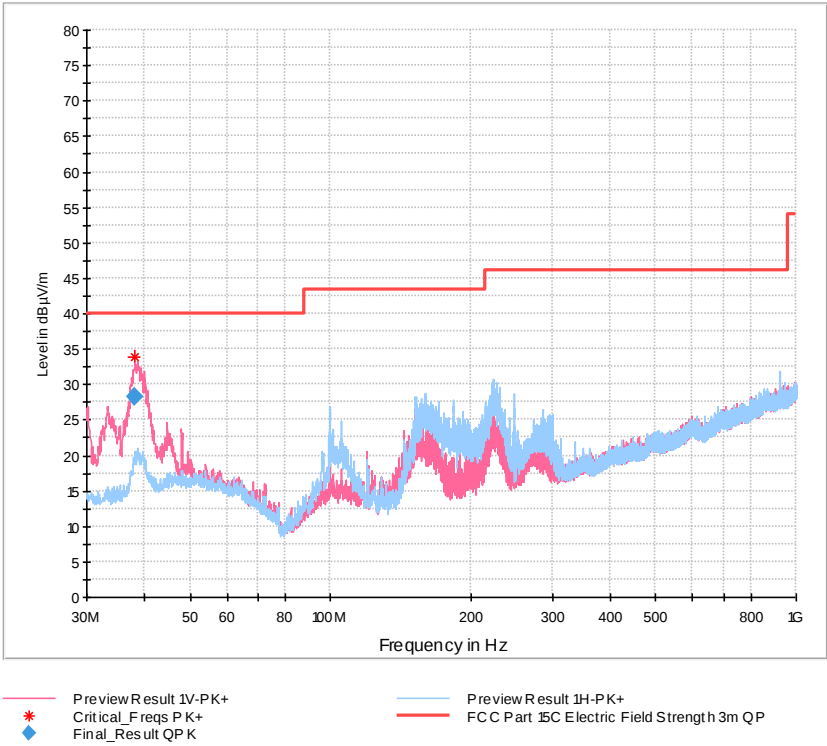






Product Service

3.orthogonal axis, yz plane - channel 5

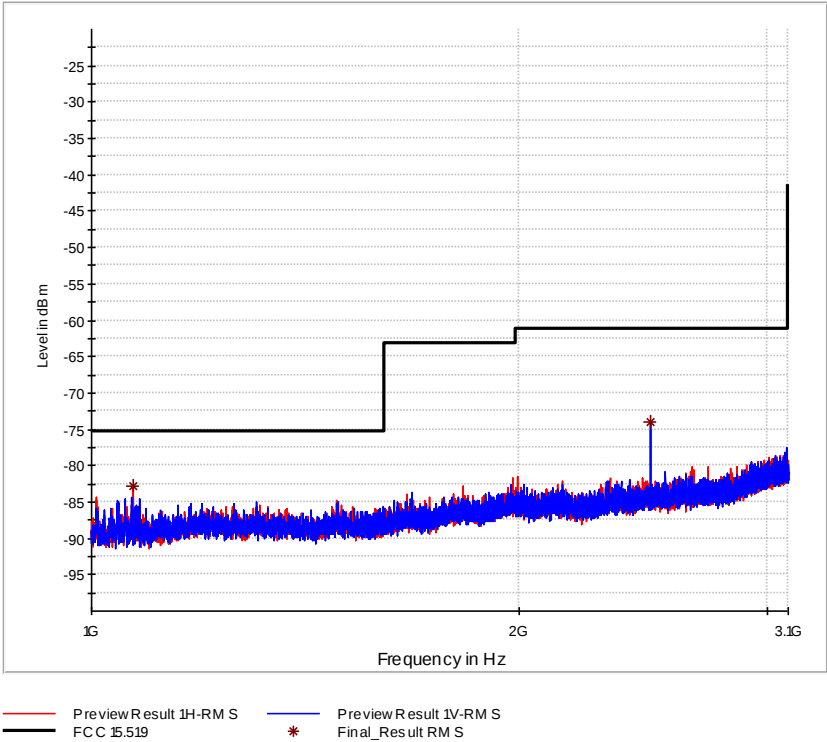


Final Results:

Frequency	QuasiPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
38.130000	28.29	40.00	11.71	1000.0	120.000	100.0	V	-137.0	12.2



Product Service

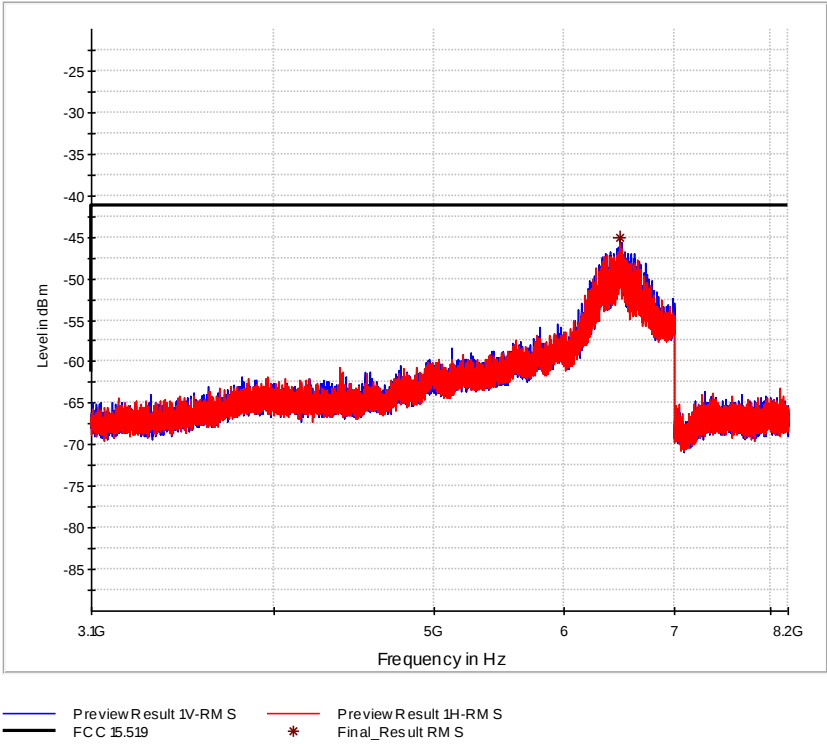


Final Results:

Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
1069.843750	-82.82	-75.30	7.52	5.0	1000.000	150.0	H	42.0	-100
2477.968750	-74.09	-70.00	4.09	5.0	1000.000	150.0	V	120.0	-96



Product Service

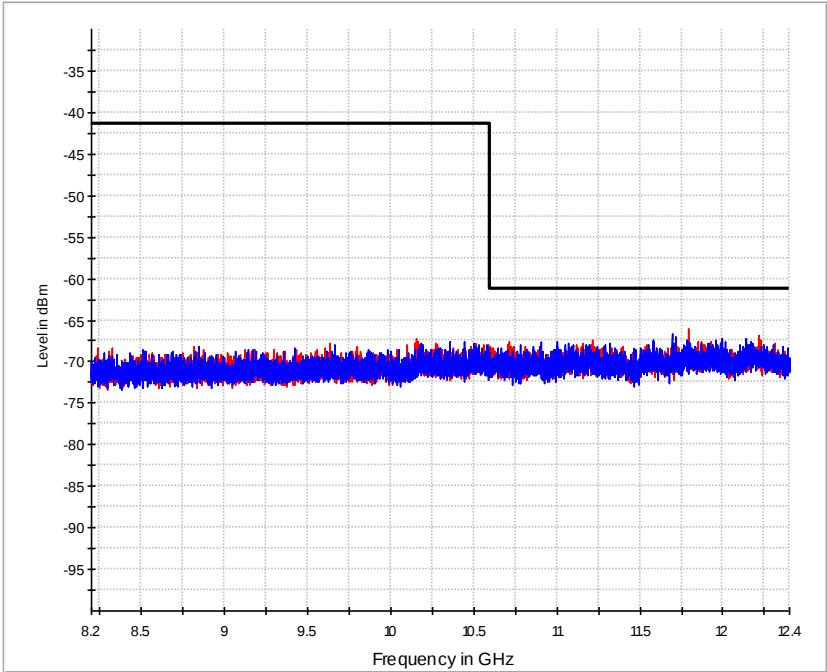


Final Results:

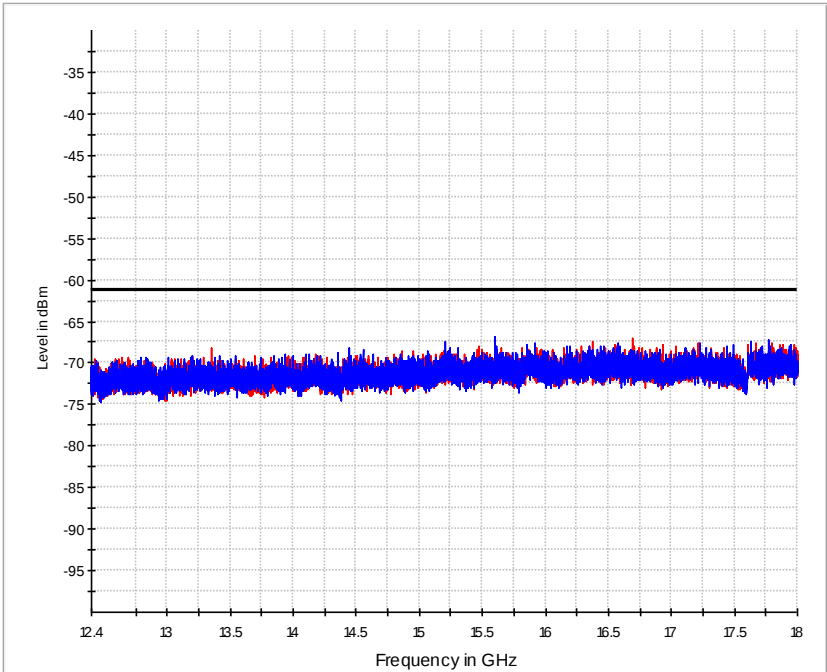
Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
6489.587500	-44.99	-41.30	3.69	5.0	1000.000	150.0	V	348.0	-76



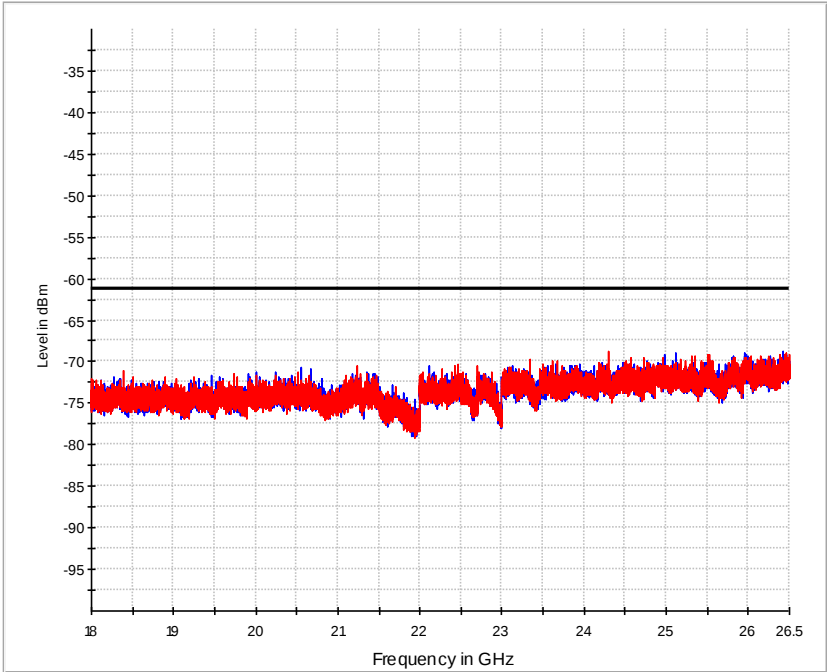
Product Service



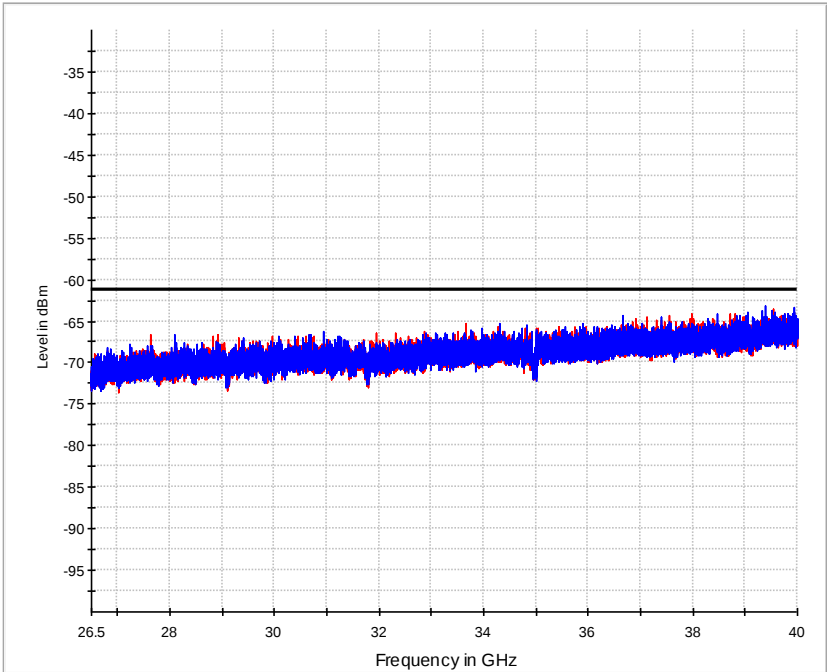
Preview Result 1H-RM S Preview Result 1V-RM S
FCC 15.519 * Final Result RM S



Preview Result 1H-RM S Preview Result 1V-RM S
FCC 15.519 * Final Result RM S



Preview Result 1V-RM S Preview Result 1H-RM S
FCC 15.519 * Final_Result RM S



Preview Result 1H-RM S Preview Result 1V-RM S
FCC 15.519 * Final_Result RM S



FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 6

FCC 47 CFR Part 15, Limit Clause 15.519 (c)

The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency (MHz)	EIRP (dBm)
960 to 1610	-75.3
1610 to 1990	-53.3
1990 to 3100	-51.3
3100 to 10600	-41.3
Above 10600	-51.3

2.2.7 Test Location and Test Equipment Used

Radiated Tests were carried out in FAR No.8

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2020-02-29
TRILOG Antenna	Schwarzbeck	VULB 9163	19691	24	2020-12-31
Horn Antenna	EMCO	3115	19383	24	2020-02-29
Horn Antenna	EMCO	3160-09	19125	N/A	N/A
Horn Antenna	EMCO	3160-10	19442	N/A	N/A
Semi Anechoic Room	Albatross	Cabin No. 8	19917	36	2020-09-30
EMC measurement software	Rohde & Schwarz	EMC32-MEB	---	---	---

Table 7

TU - Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment
 N/A - Not Applicable



Product Service

2.3 Radiated Emissions in the GPS Bands

2.3.1 Specification Reference

FCC 47 CFR Part 15F, 15.519 (d)

2.3.2 Equipment Under Test and Modification State

SIMATIC RTLS PCB OEM AC, S/N: A55882 - Modification State 0

2.3.3 Date of Test

2019-09-26

2.3.4 Test Method

Test according to FCC title 47 part 15 §15.519 (d) and ANSI C63.10-2013, 10.1

Radiated emissions in the GPS bands were only evaluated in the 1. orthogonal axis (xz plane),
The plane with the highest emissions.

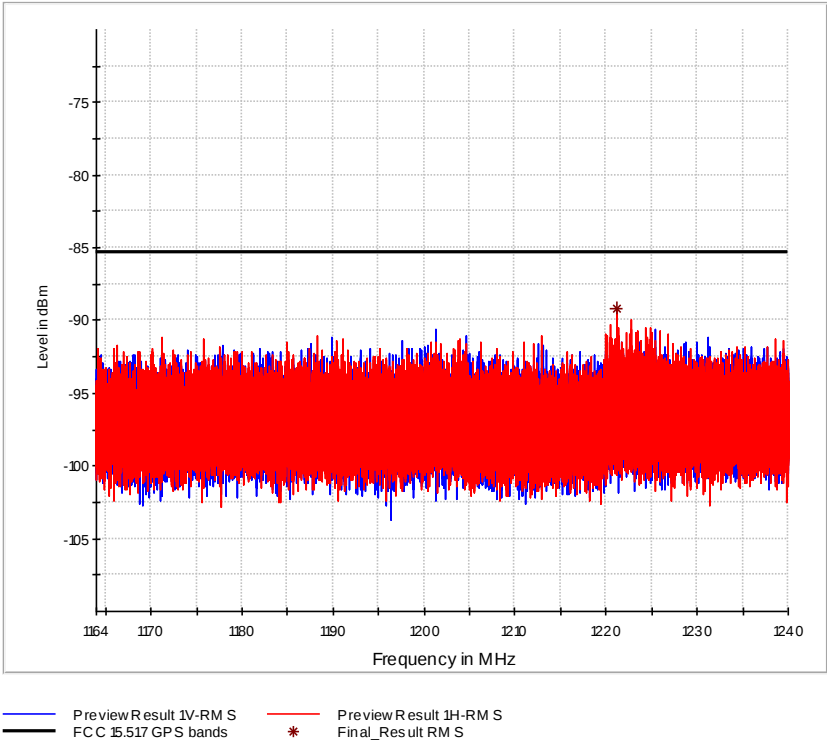
2.3.5 Environmental Conditions

Ambient Temperature	22.0 °C
Relative Humidity	53.0 %

2.3.6 Test Results



Transmission on Channel 2, GPS band from 1164 MHz to 1240 MHz

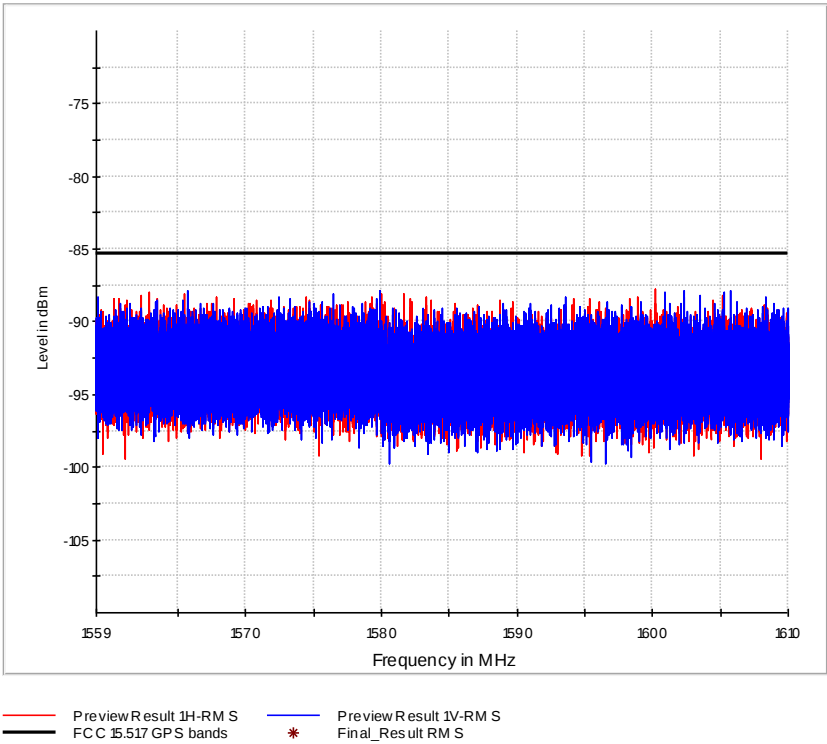


Final Results:

Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
1221.187500	-89.16	-85.30	3.86	5.0	1.000	150.0	H	212.0	-76.5



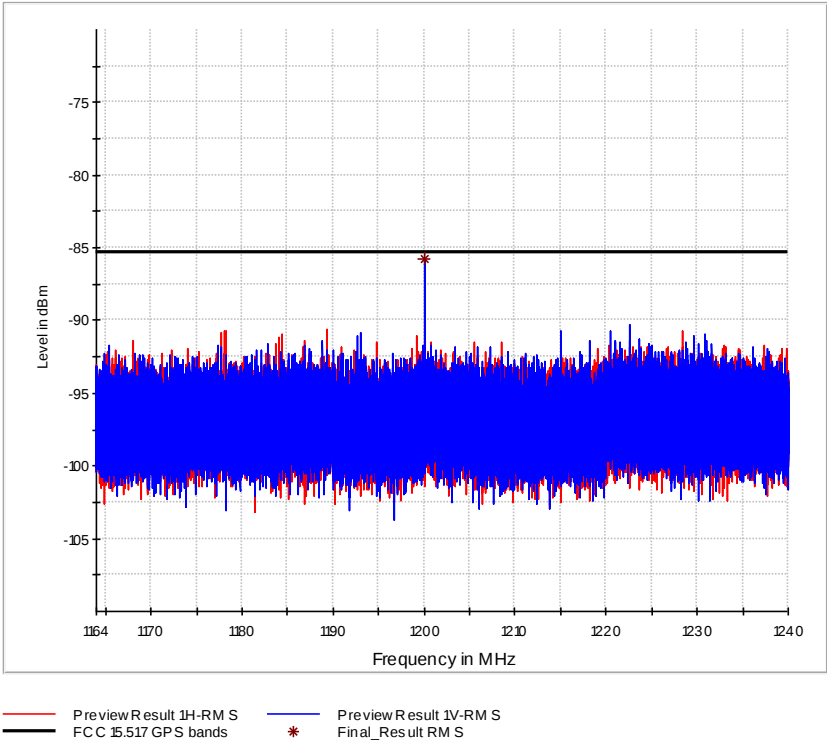
Transmission on Channel 2, GPS band from 1559 MHz to 1610 MHz





Product Service

Transmission on Channel 5, GPS band from 1164 MHz to 1240 MHz

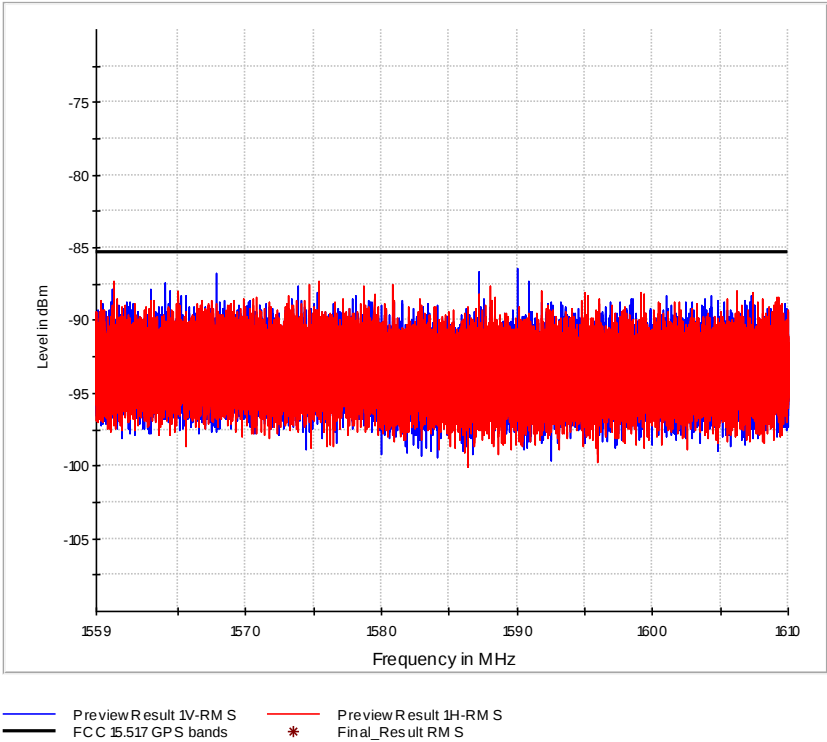


Final Results:

Frequency	RMS	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	dBm	dB	ms	kHz	cm		deg	dB
1200.003125	-85.72	-85.30	0.42	5.0	1.000	150.0	V	102.0	-76.5



Transmission on Channel 5, GPS band from 1559 MHz to 1610 MHz





FCC 47 CFR Part 15, Limit Clause 15.519 (d) and ANSI C63.10-2013 10.3

UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency (MHz)	EIRP (dBm)
1164 to 1240	-85.3
1559 to 1610	-85.3

2.3.7 Test Location and Test Equipment Used

Radiated Tests were carried out in FAR No.8

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2020-02-29
Horn Antenna	EMCO	3115	19383	36	2020-02-29
EMC measurement software	Rohde & Schwarz	EMC32-MEB	---	---	---

Table 8

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable



2.4 Peak Emissions in a 50 MHz Bandwidth

2.4.1 Specification Reference

FCC 47 CFR Part 15F, Clause 15.519 (e)

2.4.2 Equipment Under Test and Modification State

SIMATIC RTLS PCB OEM AC, S/N: A55882 - Modification State 0

2.4.3 Date of Test

2019-09-23

2.4.4 Test Method

Test according to FCC title 47 part 15 §15.519 (e) and ANSI C63.10-2013, 10.1

2.4.5 Environmental Conditions

Ambient Temperature 23.0 °C

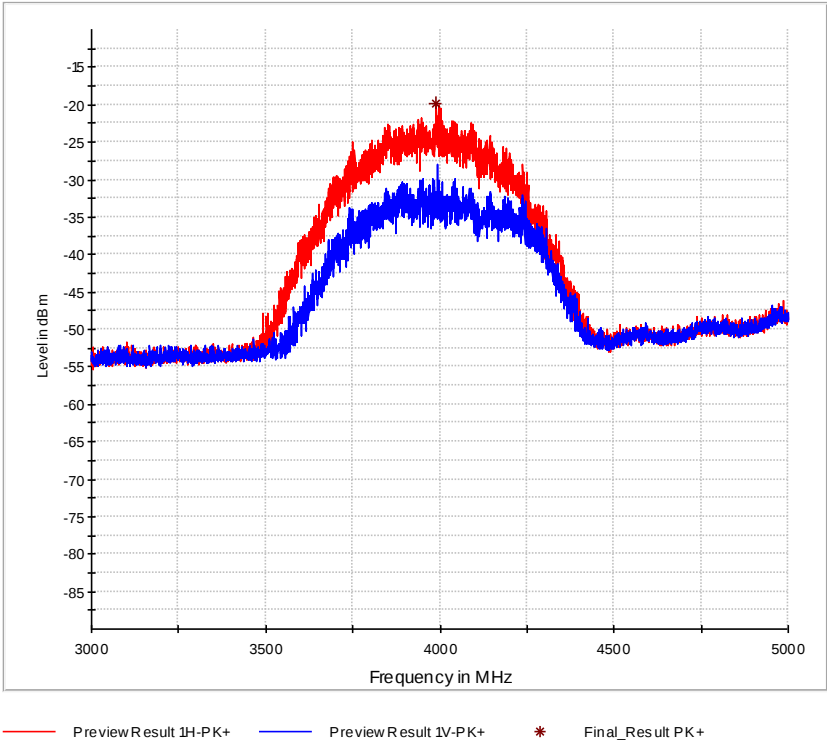
Relative Humidity 51.0 %

2.4.6 Test Results

Center frequency [GHz]	Frequency with highest emission [GHz]	Maximum value of peak power		Limit [dBm / 50MHz]	Result
		<i>tested</i> [dBm / 10MHz]	<i>calculated</i> [dBm / 50MHz]		
Ch 2 [Lowest]	4.00	-19.89	-5.89	< 0	PASS
Ch 5 [Highest]	6.49	-20.98	-6.98	< 0	PASS



Transmission on Channel 2

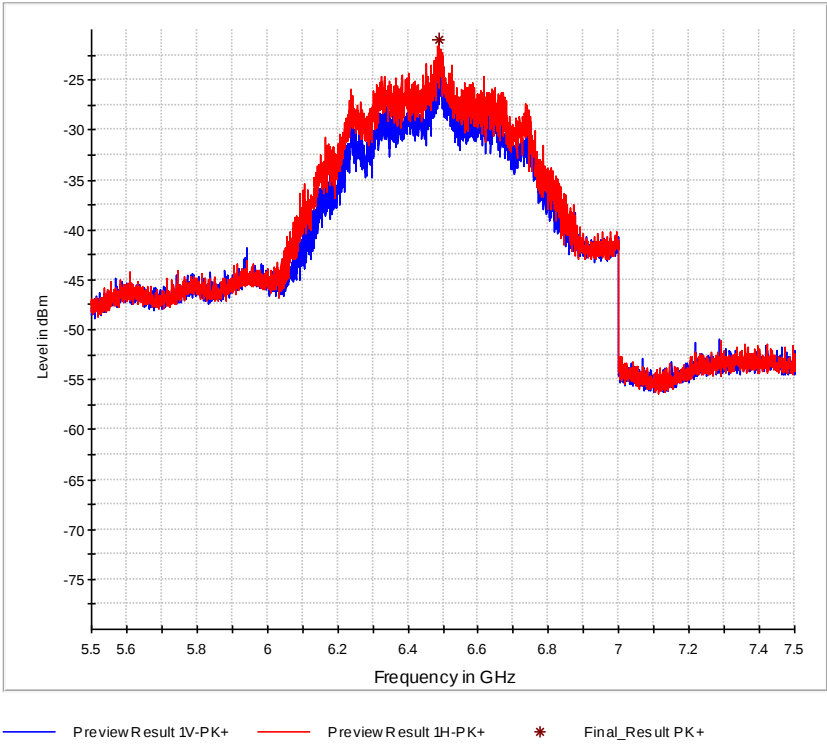


Final Results:

Frequency	MaxPeak	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBm	ms	kHz	cm		deg	dB
3990.700000	-19.89	5.0	10000.000	150.0	H	167.0	-77.7



Transmission on Channel 5



Final Results:

Frequency MHz	MaxPeak dBm	Limit dBm	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
6488.650000	-20.98	0.00	10000.000	150.0	H	346.0	-75.8



Limit Clause FCC 47 CFR Part 15, 15.519 (e), 15.521 (g)

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

Frequency (MHz)	EIRP (dBm) within 50 MHz
3100 to 10600	0

If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be $20 \log (RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed.

Frequency (MHz)	EIRP (dBm) within 10 MHz
3100 to 10600	-14

2.4.7 Test Location and Test Equipment Used

Radiated Tests were carried out in FAR No.8

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2020-02-29
Horn Antenna	EMCO	3115	19383	36	2020-02-29
EMC measurement software	Rohde & Schwarz	EMC32-MEB	---	---	---

Table 9

TU - Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment
 N/A - Not Applicable



Product Service

2.5 AC Power Line Conducted Emissions

2.5.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.207

2.5.2 Equipment Under Test and Modification State

SIMATIC RTLS PCB OEM AC, S/N: A55882 - Modification State 0

2.5.3 Date of Test

2019-09-23

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.2.

2.5.5 Environmental Conditions

Ambient Temperature	24.0 °C
Relative Humidity	56.0 %



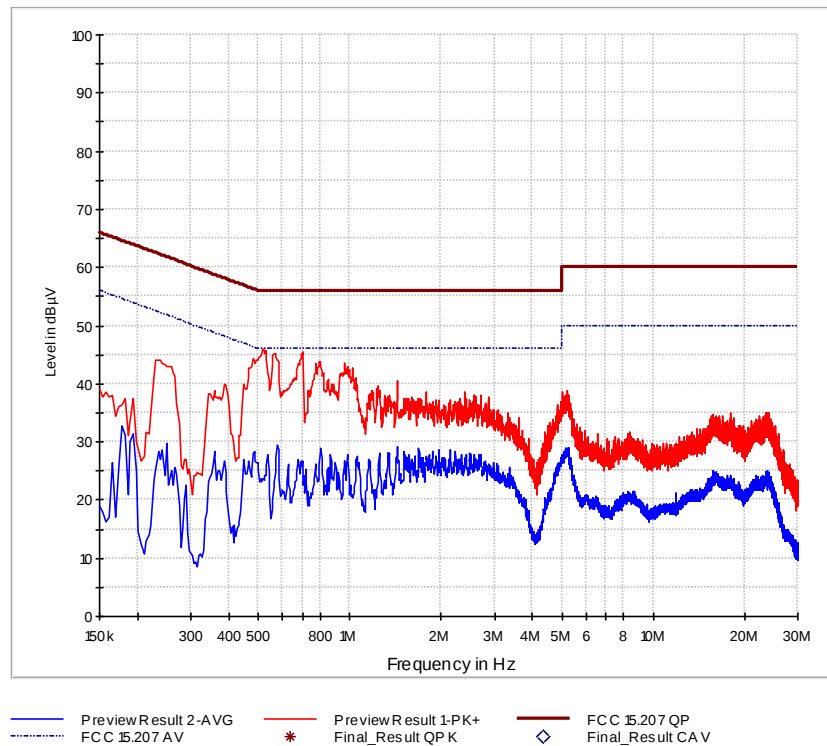
2.5.6 Test Results

Results for Configuration and Mode: Normal operation mode - 3 V DC by serial USB adapter.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Line Under Test: AC mains Live and Neutral





FCC 47 CFR Part 15, Limit Clause 15.207

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 10

*Decreases with the logarithm of the frequency.

2.5.7 Test Location and Test Equipment Used

This test was carried out in Shielded room - cabin no. 4.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESCI3	19730	18	2020-11-31
V-network	Rohde & Schwarz	ENV216	39911	12	2020-02-29
EMC measurement software	Rohde & Schwarz	EMC32-MEB	---	---	---

Table 11

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



2.6 Signal deactivation

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.519 (a)

2.6.2 Equipment Under Test and Modification State

SIMATIC RTLS PCB OEM AC, S/N: A55882 - Modification State 0

2.6.3 Date of Test

2019-10-21

2.6.4 Test Method

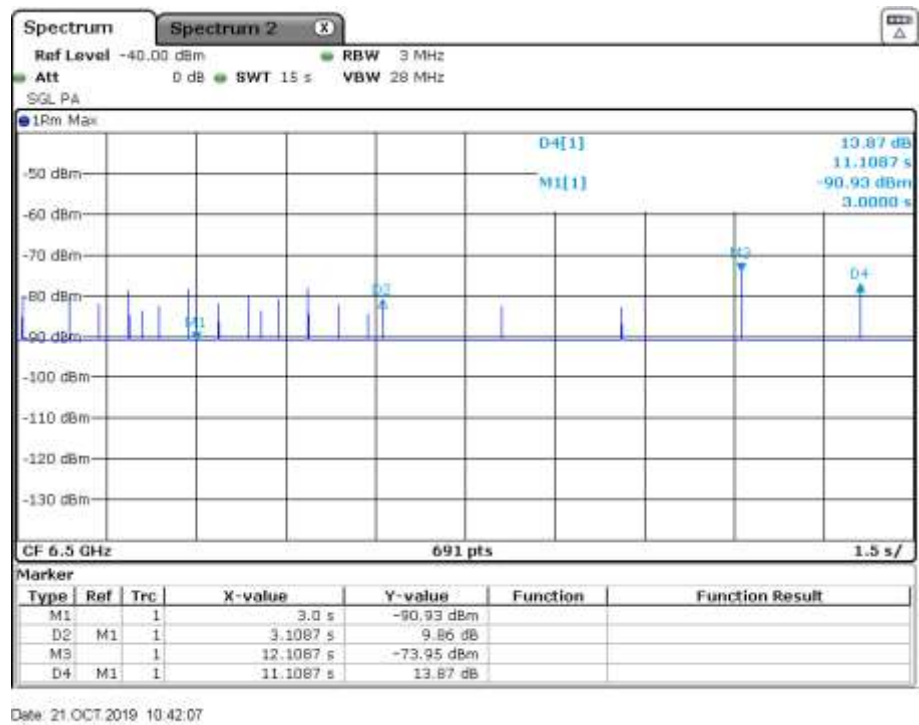
2.6.5 Environmental Conditions

Ambient Temperature	23.0 °C
Relative Humidity	50.0 %

2.6.6 Test Results



Product Service



Description:

Associated receiver (Wireless Mesh Gateway) was turned off at 3 seconds (Marker 1)
Device under test, SIMATIC RTLS PCB OEM AC, stopped transmission after 3.1087 seconds (Marker 2).
Applicant stated after the transmission the SIMATIC RTLS PCB OEM AC tries every 2 seconds two establish a connection to a receiver (Marker 3 and 4).

Result:

The requirement is fulfilled.



FCC 47 CFR Part 15, Limit Clause 15.519 (a)

A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

2.6.7 Test Location and Test Equipment Used

Radiated Tests were carried out in FAR No.8

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESW44	39897	12	2020-02-29
Horn Antenna	EMCO	3115	19383	36	2020-02-29
EMC measurement software	Rohde & Schwarz	EMC32-MEB	---	---	---

Table 12

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment
N/A - Not Applicable



Product Service

3 **Photographs**

See Annex A.



4 Measurement Uncertainty

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

Radio Testing			
Test Name	kp	Expanded Uncertainty	Note
Occupied Bandwidth	2.0	$\pm 1.14 \%$	2
RF-Frequency error	1.96	$\pm 1 \cdot 10^{-7}$	7
RF-Power, conducted carrier	2	$\pm 0.079 \text{ dB}$	2
RF-Power uncertainty for given BER	1.96	$+0.94 \text{ dB} / -1.05$	7
RF power, conducted, spurious emissions	1.96	$+1.4 \text{ dB} / -1.6 \text{ dB}$	7
RF power, radiated			
25 MHz – 4 GHz	1.96	$+3.6 \text{ dB} / -5.2 \text{ dB}$	8
1 GHz – 18 GHz	1.96	$+3.8 \text{ dB} / -5.6 \text{ dB}$	8
18 GHz – 26.5 GHz	1.96	$+3.4 \text{ dB} / -4.5 \text{ dB}$	8
40 GHz – 170 GHz	1.96	$+4.2 \text{ dB} / -7.1 \text{ dB}$	8
Spectral Power Density, conducted	2.0	$\pm 0.53 \text{ dB}$	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	$\pm 2.89 \%$	2
6 kHz – 25 kHz	2	$\pm 0.2 \text{ dB}$	2
Maximum frequency deviation for FM	2	$\pm 2.89 \%$	2
Adjacent channel power 25 MHz – 1 GHz	2	$\pm 2.31 \%$	2
Temperature	2	$\pm 0.39 \text{ K}$	4
(Relative) Humidity	2	$\pm 2.28 \%$	2
DC- and low frequency AC voltage			
DC voltage	2	$\pm 0.01 \%$	2
AC voltage up to 1 kHz	2	$\pm 1.2 \%$	2
Time	2	$\pm 0.6 \%$	2

Table 13



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

Table 14



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		a	4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Table 15

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 $p = 95.45\%$