

RF Test Report

Project Number: 4694815**Proposal Number:** 11548r2**Report Number:** 4694815EMC04**Revision Level:** 1**Client:** BlueCats US LLC**Equipment Under Test:** BC2611**Model:** BC2611**FCC ID:** 2AHXCBC2611**IC ID:** 21338-BC2611**Applicable Standards:** ANSI C63.10:2013

FCC Part 15, Subpart F

RSS-220, Issue 1, July 2018

RSS-GEN Issue 5, March 2019

Report issued on: 12 February 2021**Test Result:** Compliant

Tested by:



Brandon Osborn, Project Engineer

Reviewed by:



Jeremy Pickens, RF Lab Manager

Remarks: This report details the results of the testing carried out on one sample; the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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1 Summary of Test Results

Description	Reference		Test Result
Transmission Timing	15.519(a)	RSS-220, S5.3.1(b)	-- ¹
10dB bandwidth contained within 3100 to 10600 MHz	15.519(b)	RSS-220, S5.1(a)	Compliant
10dB bandwidth greater than 500 MHz	15.503(d)	RSS-220, S2	Compliant
Radiated emissions above 960 MHz	15.519(c)	RSS-220, S5.3.1(d)	Compliant
Radiated emissions in GPS receive band	15.519(d)	RSS-220, S5.3.1(e)	Compliant
Peak emission in a 50 MHz bandwidth	15.519(e)	RSS-220, S5.3.1(g)	Compliant
Radiated emissions below 960 MHz	15.519(c) 15.209	RSS-220, S3.4	Compliant
Conducted emissions	15.207	RSS-GEN 8.8	Compliant

Note 1: See Technical Description for details of the transmission timing.

1.1 Modifications Required to Compliance

None

2 General Information

2.1 Client Information

Name: BlueCats US LLC
Address: 6767 Old Madison Pike NW, Suite 300
City, State, Zip, Country: Huntsville, AL 35806, USA

2.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

2.3 General Information of EUT

Model Number: BC2611
Hardware: Pre-production
Serial Number: D42CC701515

Frequency Range: 6-8.5GHz (Channels 5 and 9)
Data Rates: HRP (850Kbps and 6.8Mbps)
Antenna: Integrated PCB trace, 0dBi
Device Subclass: Hand-held Communications Device

Voltage: 3.6 VDC, 4500mA (Tag) 100-240 Vac 50/60Hz (Charger)

Sample Received Date: 03 November 2020
Dates of testing: 06-23 November 2020

2.4 Operating Modes and Conditions

The manufacturer provided specially programmed test samples where a button press can control the EUT to transmit continuously at different power levels up to max transmit power. Firmware build number of these samples were BC2611_Pre64.

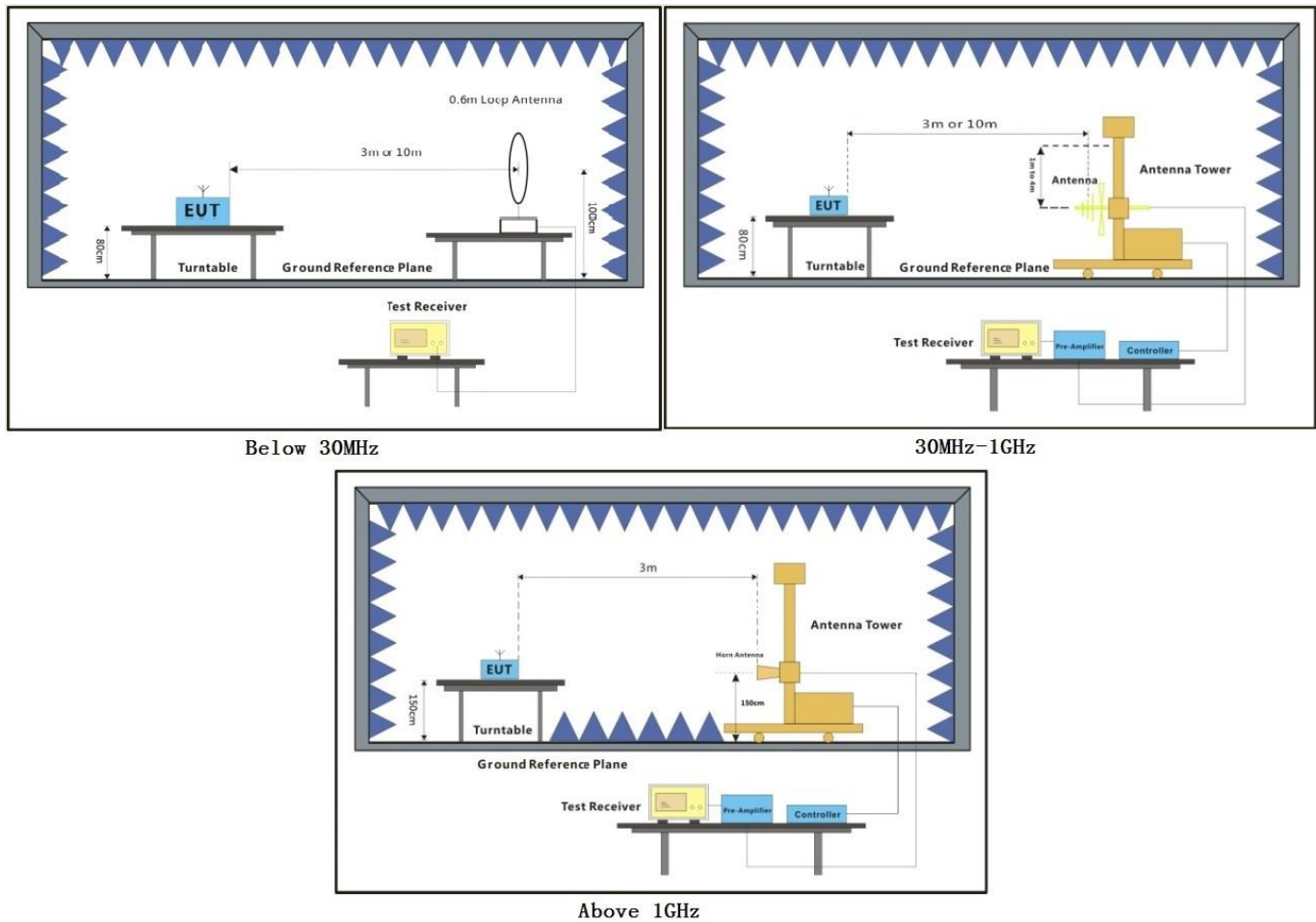
Max power setting on both channels was 18.

During radiated measurements, the EUT was rotated through 3 orthogonal axes. This report contains the worst-case data.

For performing AC conducted emissions, the tag as installed in a single unit charger.

2.5 EUT Connection Block Diagram

DUT
(A)



2.6 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	BlueCats US	Wearable UWB Radio	BC2611	D42CC701515 (RAD 1)

3 UWB Bandwidth requirements

3.1 Test Result

Test Description	Reference		Test Result
10dB bandwidth contained within 3100 MHz and 10,600 MHz	15.519(b)	RSS-220, S5.1(a)	Compliant
10dB bandwidth greater than 500 MHz	15.503(d)	RSS-220, S2	Compliant

3.2 Test Method

The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3,100 MHz and 10,600MHz.

Test method: ANSI C63.10, Clause 10.2

Ultra-wideband (UWB) transmitter: An intentional radiator that, at any point in time, 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.

3.3 Test Site

10m Absorber Lined Shielded Enclosure, SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 21.8°C

Relative Humidity: 34.1 %

3.4 Test Equipment

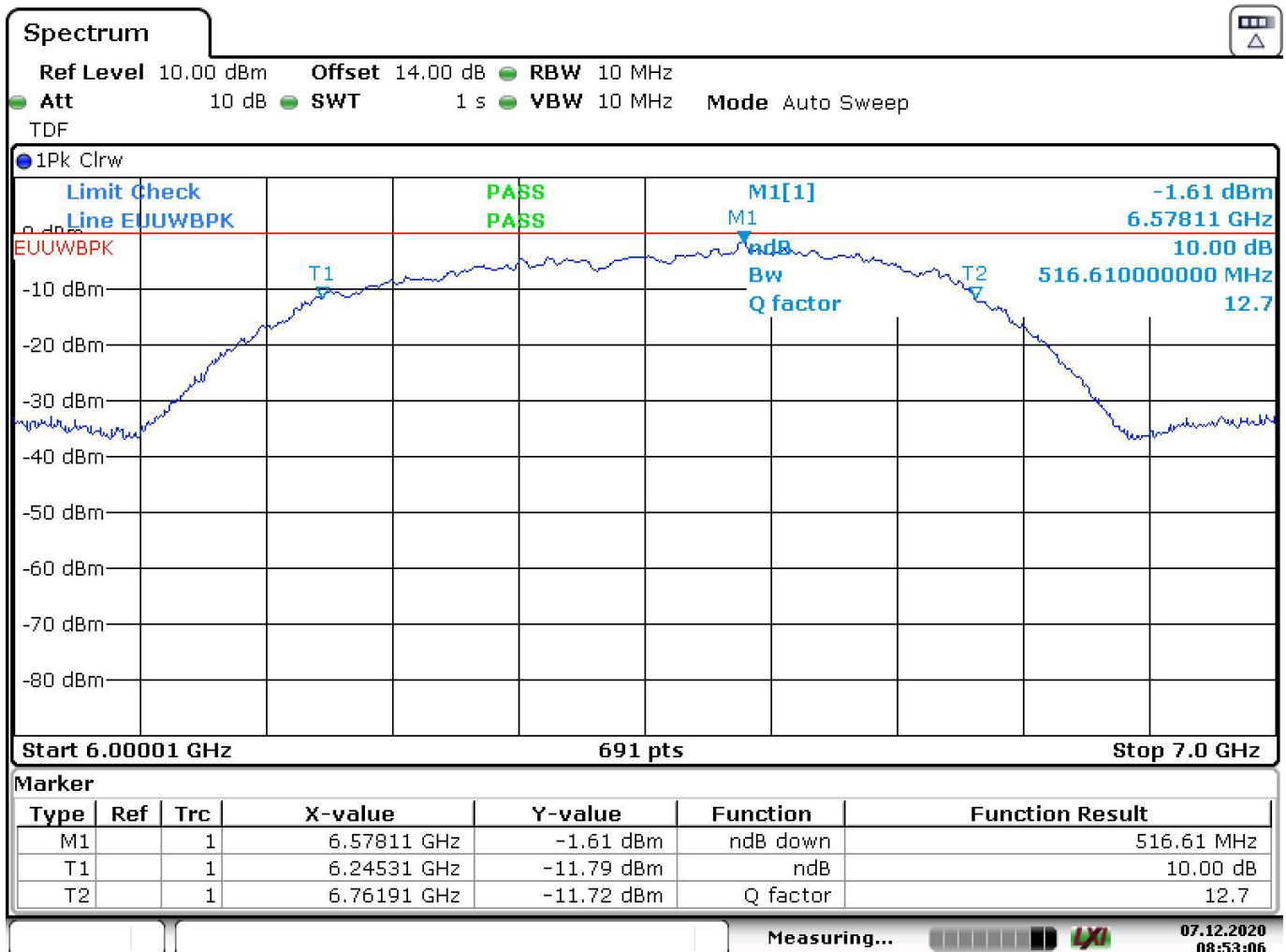
Test End Date: 7-Dec-2020

Tester: BEO

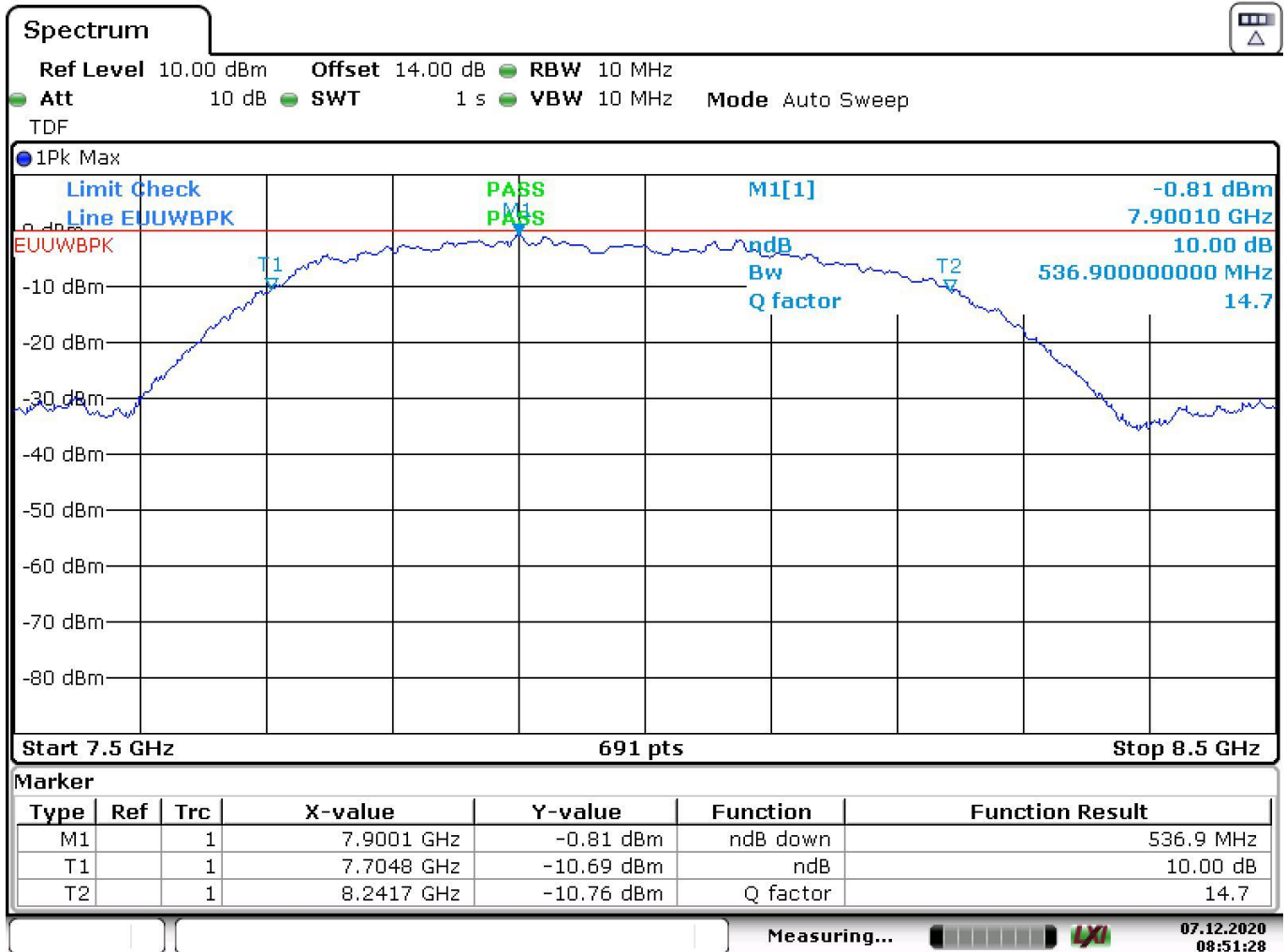
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	27-Dec-2019	27-Dec-2021
RF Cable SMA to SMA, 0.01-40GHz	084-0505-059	TELEDYNE STORM MICROWAVE	20108	6-Mar-2020	6-Mar-2021

3.5 Test Data

Channel 5 Bandwidth Plot



Channel 9 Bandwidth Plot



Channel 5 -Bandwidth Results

Method	f_M , Frequency of Max level, MHz	f_L , Frequency 10dB below Max MHz	f_H , Frequency 10dB above Max MHz	$(f_H - f_L)$, 10 dB bandwidth MHz	Bandwidth requirement >500 MHz	Detectors / RBW / VBW
Conducted	6578.11	6245.31	6761.91	516.6	Compliant	Peak 10MHz / 10MHz

Channel 9 - Bandwidth Results

Method	f_M , Frequency of Max level, MHz	f_L , Frequency 10dB below Max MHz	f_H , Frequency 10dB above Max MHz	$(f_H - f_L)$, 10 dB bandwidth MHz	Bandwidth requirement >500 MHz	Detectors / RBW / VBW
Conducted	7900.1	7704.8	8241.7	536.9	Compliant	Peak 10MHz / 10MHz

4 Radiated emissions above 960 MHz

4.1 Test Result

Test Description	Reference		Test Result
Radiated emissions above 960 MHz	15.519(c)	RSS-220, S5.3.1(d)	Compliant

4.2 Test Method

Test method: ANSI C63.10, Clause 10.3

Emissions from a transmitter operating under this section shall not exceed the following equivalent isotropically radiated power (EIRP) density levels:

- 1) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following RMS average limits based on measurements using a 1 MHz resolution bandwidth:

Frequency (MHz)	EIRP (dBm)
960–1610	-75.3
1610–1990	-63.3
1990–3100	-61.3
3100–10600	-41.3
Above 10600	-61.3

Measurements were recorded at either a distance of 1 meter or 3 meters. The actual distance for final measurement was indicated in the measurement data. Worst-case orientations were X-Axis for Channel 5 and Z-Axis for Channel 9.

4.3 Test Site

10m Absorber Lined Shielded Enclosure, SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6°C
Relative Humidity: 46.8%

4.4 Test Equipment

1-18 GHz

Test End Date: 23-Nov-2020

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Oct-2020	28-Oct-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-276	TELEDYNE STORM MICROWAVE	20114	2-Mar-2020	2-Mar-2021
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	3-Sep-2020	3-Sep-2021
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079691	10-Aug-2020	10-Aug-2022

18-40 GHz

Test End Date: 10-Nov-2020

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	3-Nov-2020	3-Nov-2021
RF Cable SMA to SMA, 0.01-40GHz	084-0505-138	TELEDYNE STORM MICROWAVE	20110	6-Mar-2020	6-Mar-2021
Laser Measure	GLM 35	BOSCH	17007	3-Feb-2020	3-Feb-2021
RF CABLE	SF102	Huber & Suhner	B079823	24-Aug-2020	24-Aug-2021

Software:

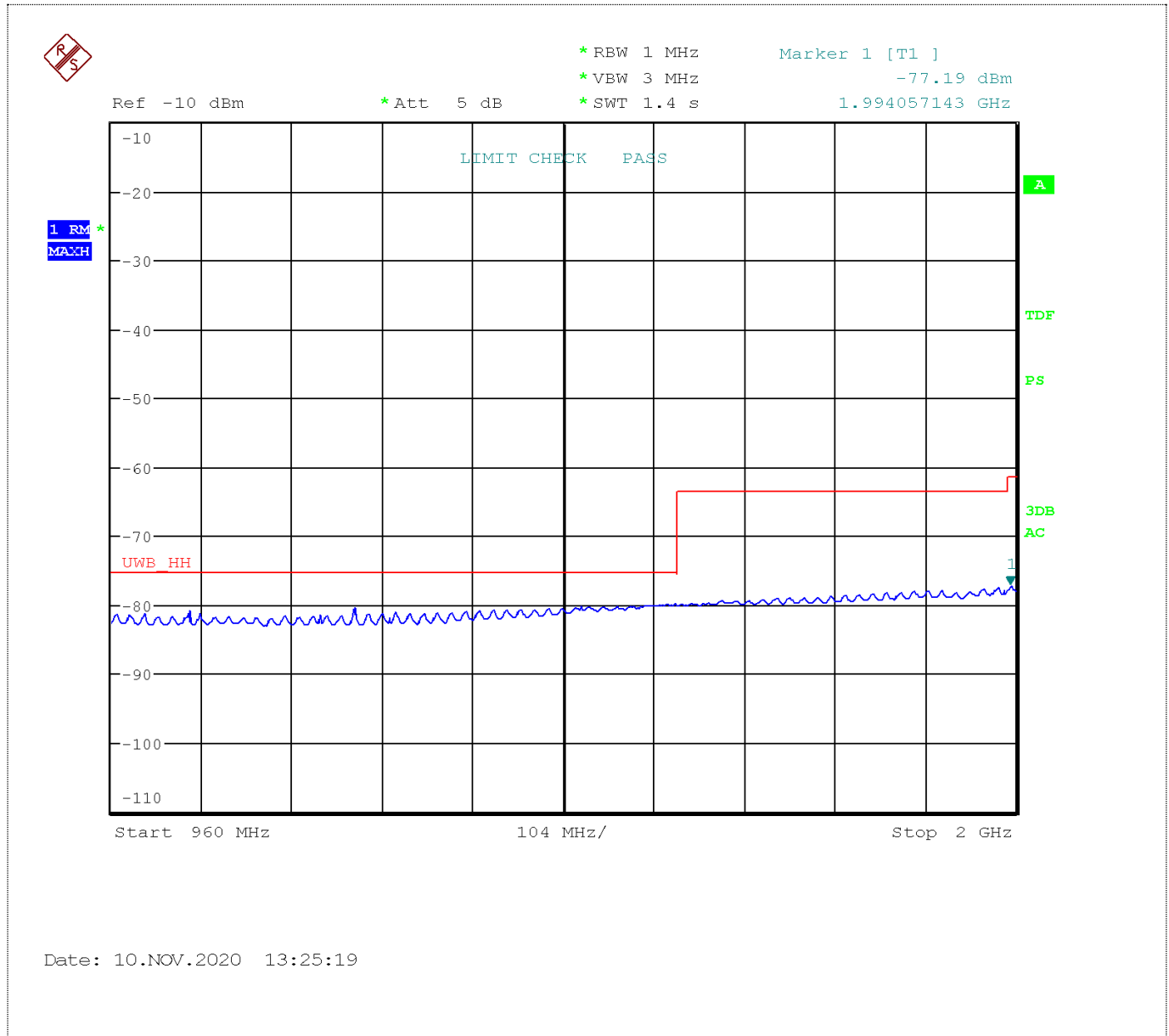
“Radiated Emissions 1-18GHz.TIL” TILE! profile dated Oct 2020

“Radiated Emissions 18-40GHz.TIL” TILE! profile dated Jul 2019

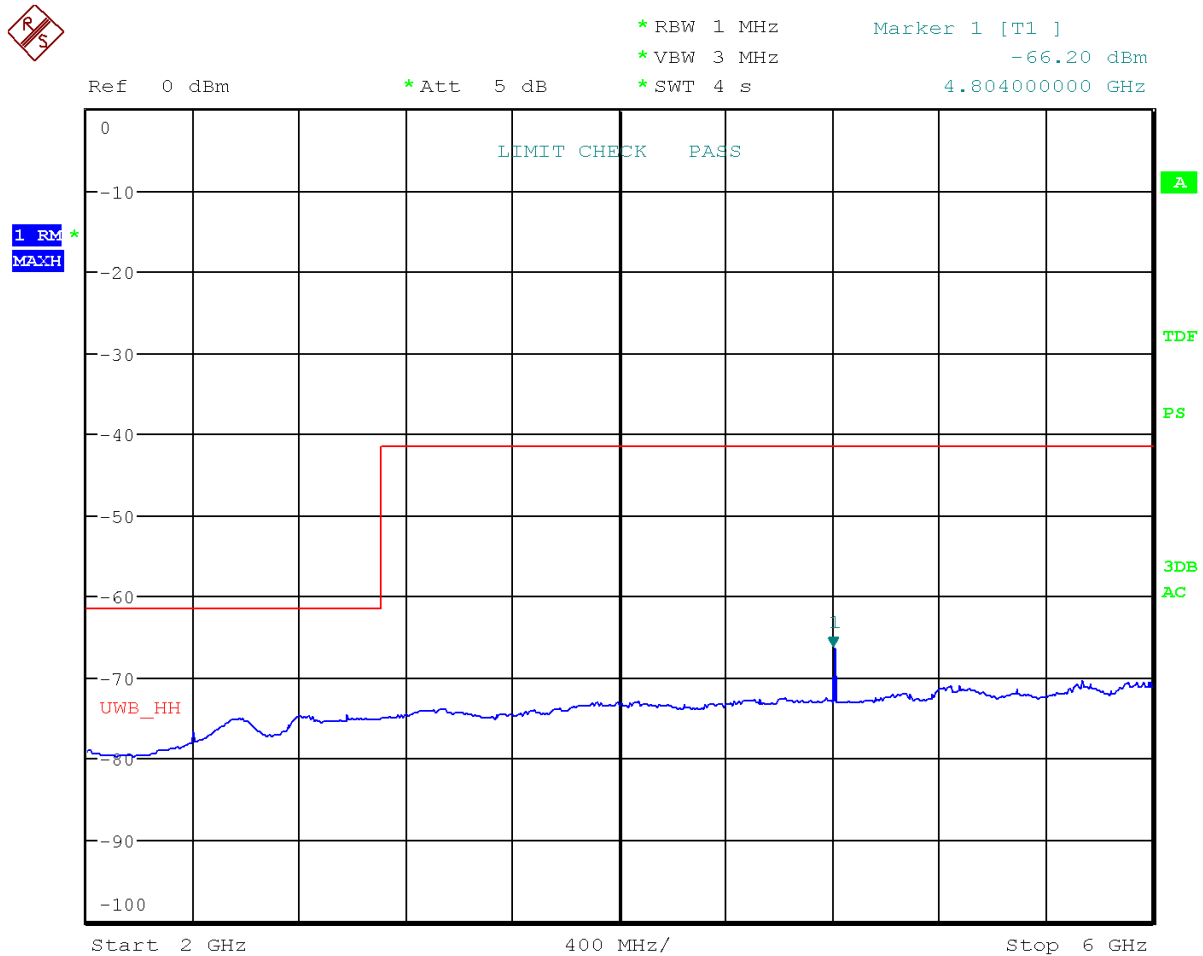
4.5 Test Data – Channel 5

4.5.1 Horizontal

Radiated Emissions (960MHz – 2.0GHz) – Horizontal
Test Distance = 3 meters



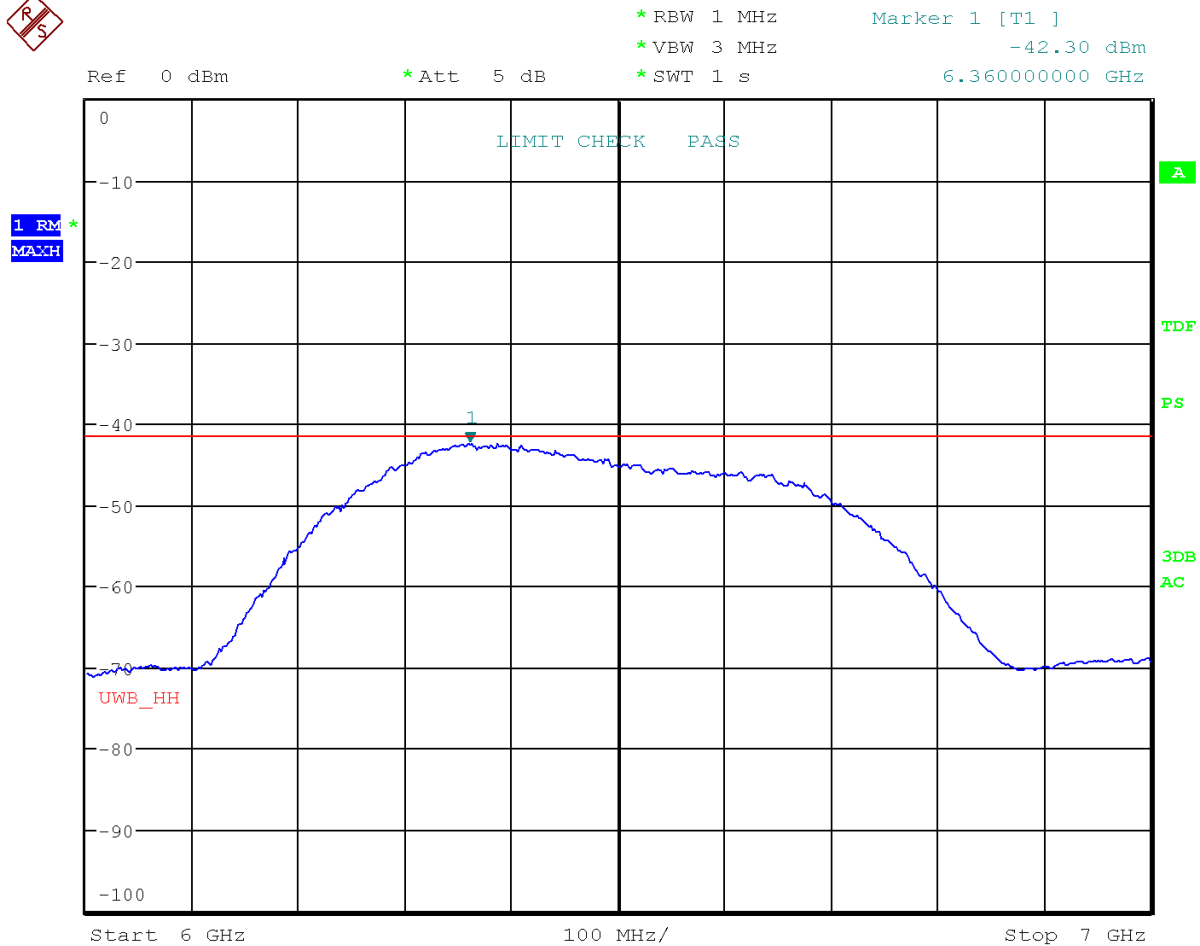
Radiated Emissions (2.0GHz – 6.0GHz) – Horizontal Test Distance = 3 meters



Date: 10.NOV.2020 13:11:28

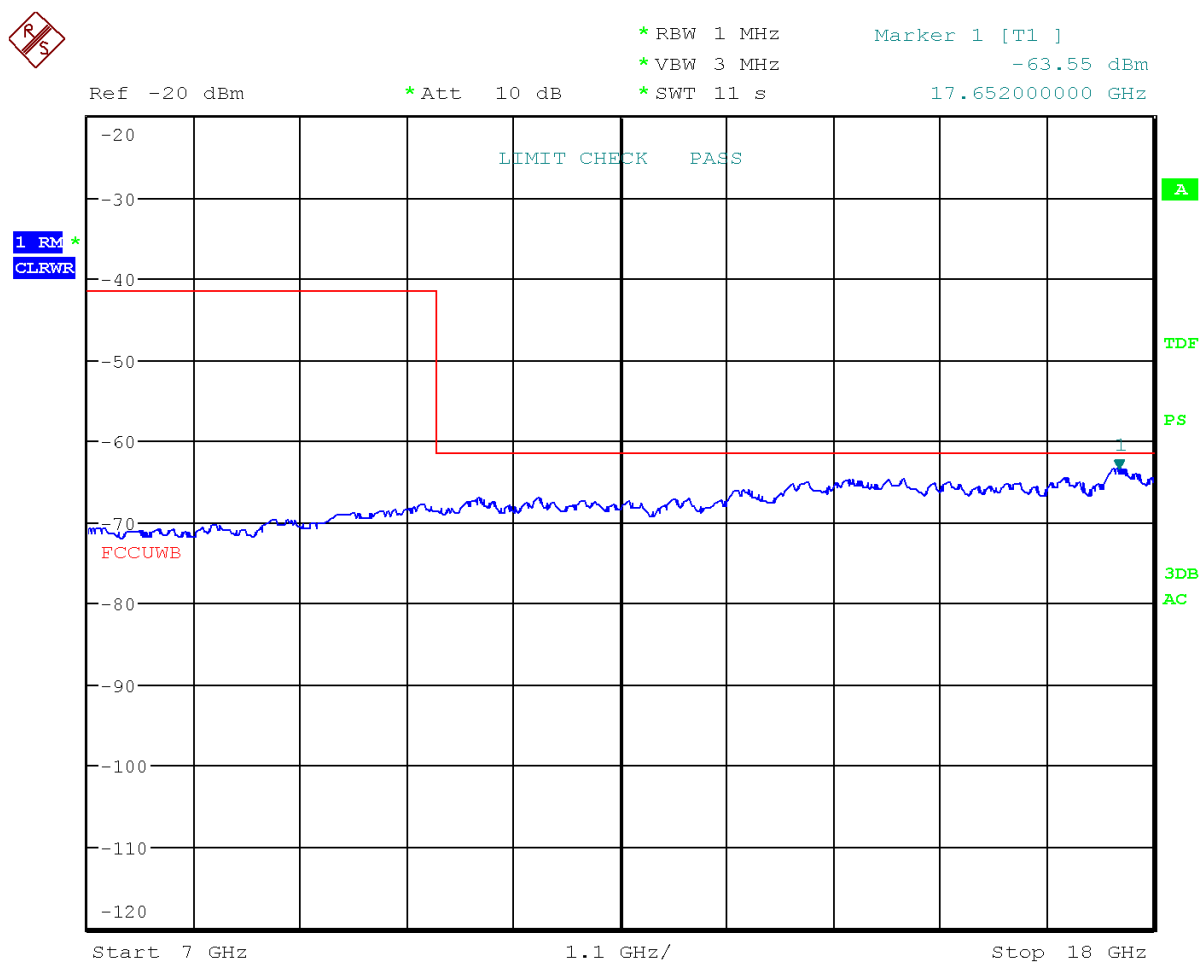
4.804 GHz second harmonic of active BLE radiator

Radiated Emissions (6.0GHz – 7.0GHz) – Horizontal Test Distance = 3 meters



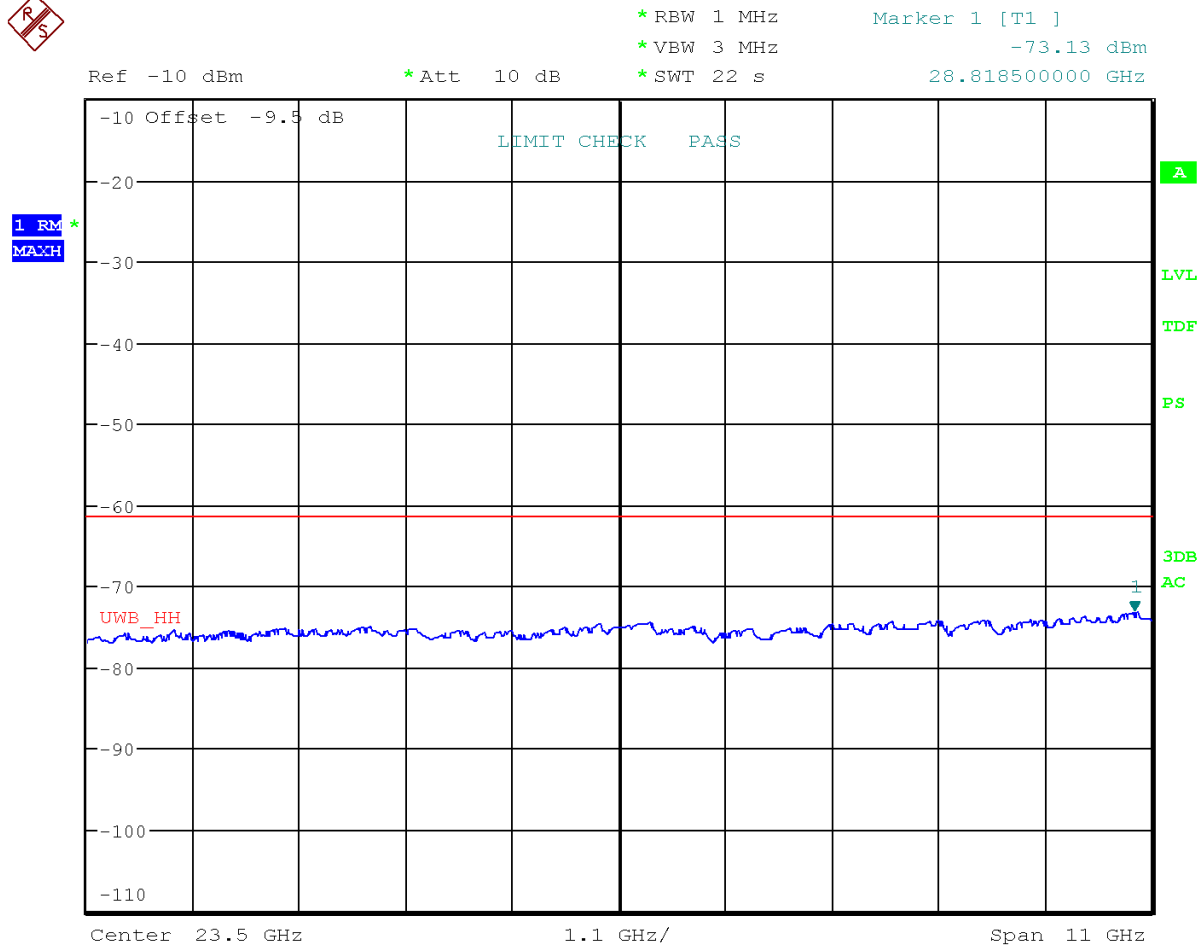
Date: 10.NOV.2020 13:12:57

Radiated Emissions (7GHz – 18GHz) – Horizontal
Test Distance = 3 meters



Date: 23.NOV.2020 13:36:14

Radiated Emissions (18GHz – 29GHz) – Horizontal Test Distance = 1.0 meter

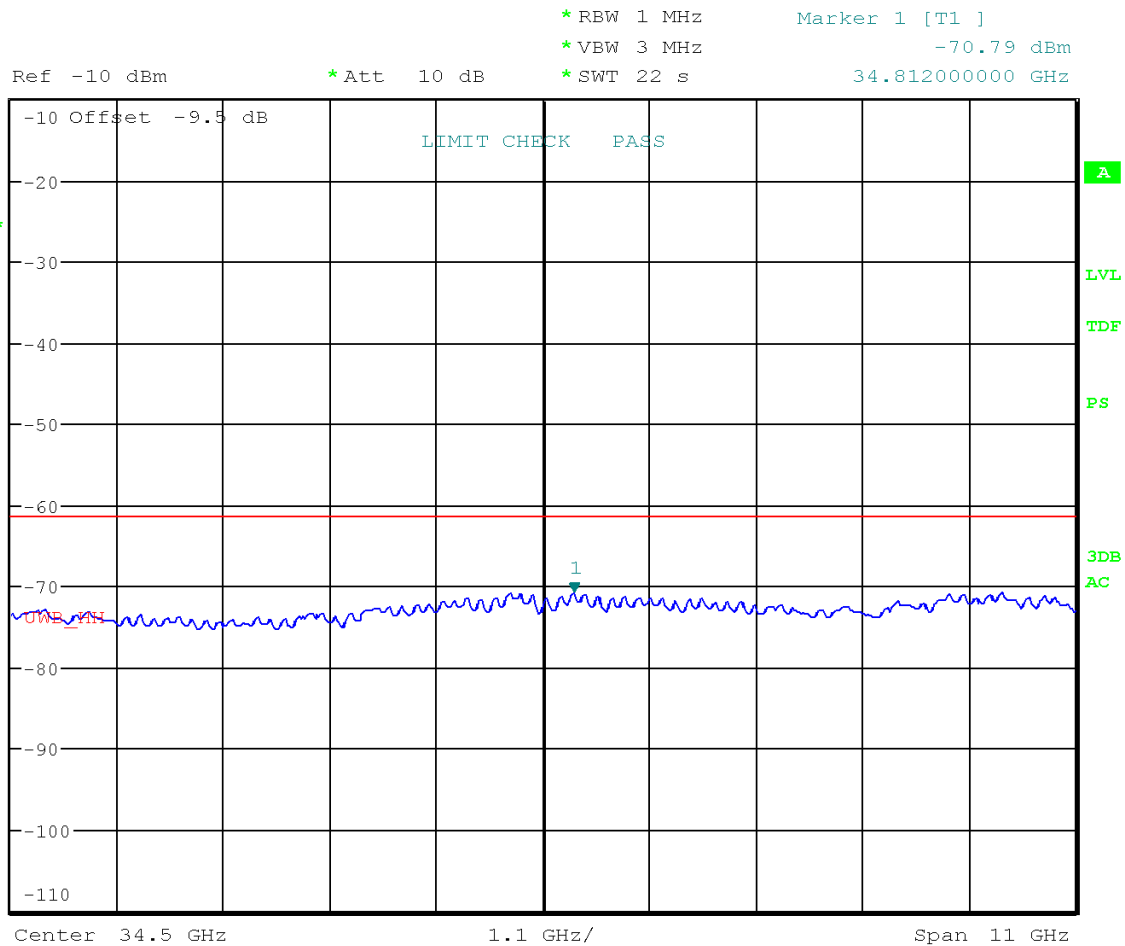


Date: 10.NOV.2020 15:02:30

Radiated Emissions (29GHz – 40GHz) – Horizontal Test Distance = 1.0 meter



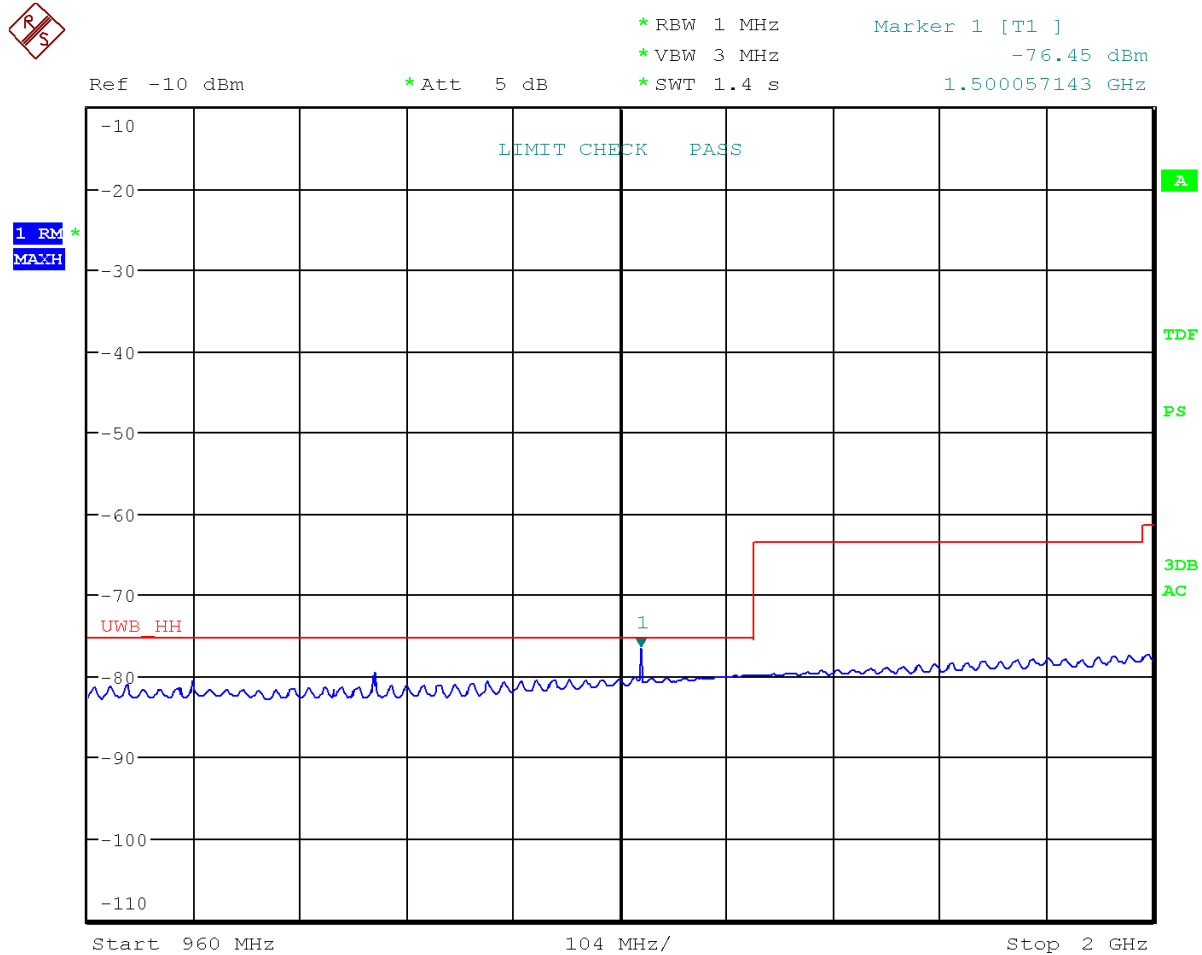
1 RM *
MATH



Date: 10.NOV.2020 15:01:30

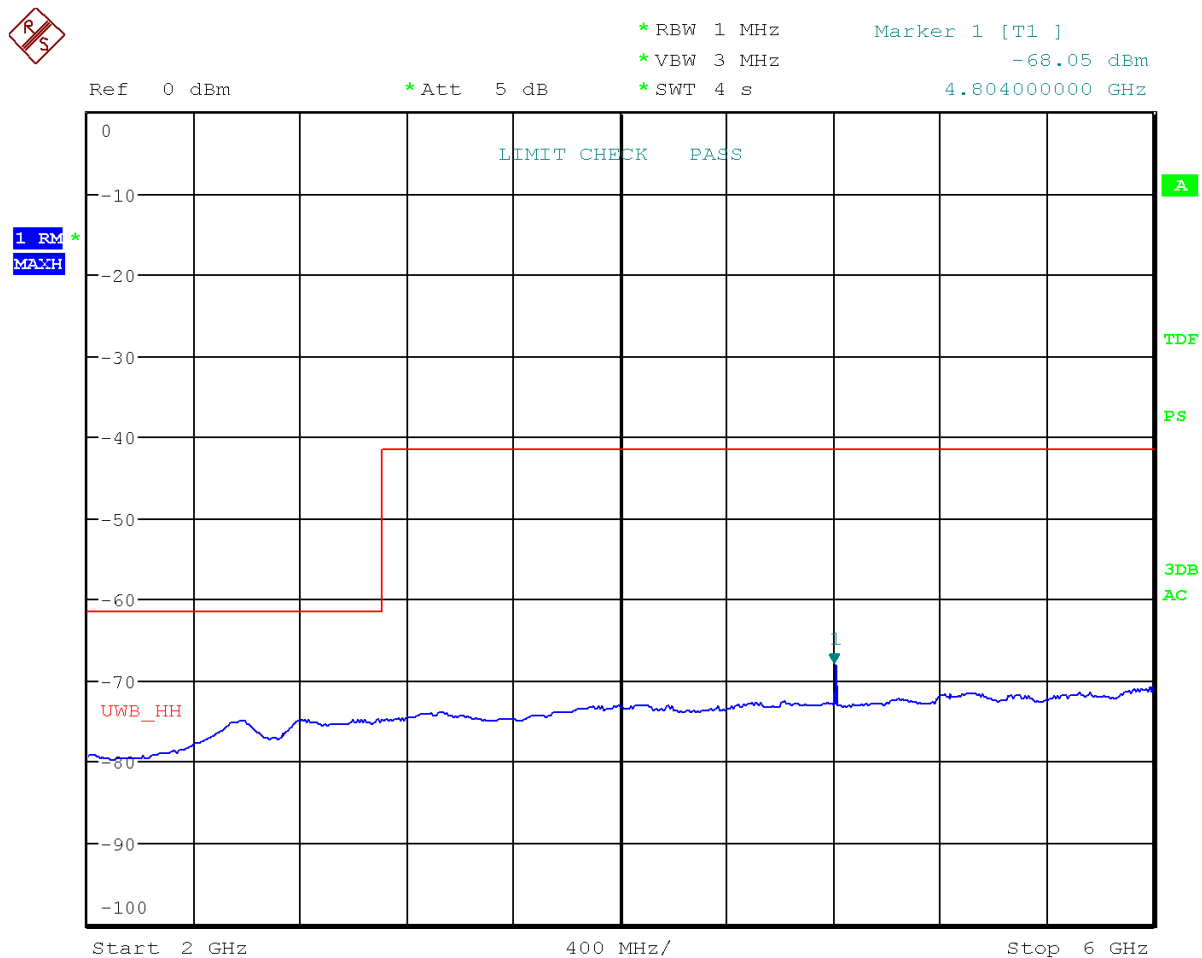
4.5.2 Vertical

Radiated Emissions (960MHz – 2.0GHz) – Vertical Test Distance = 3 meters



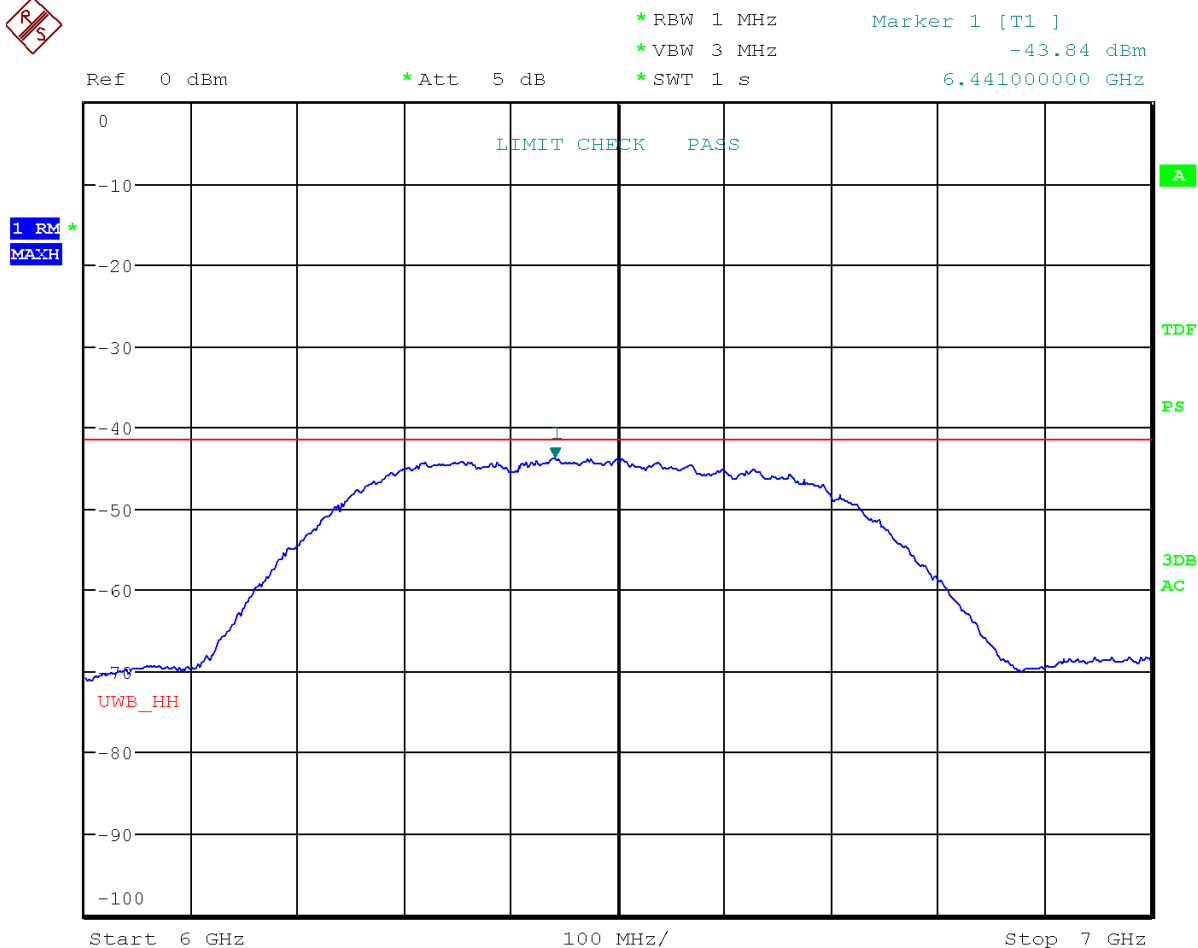
Date: 10.NOV.2020 13:23:53

Radiated Emissions (2.0GHz – 6.0GHz) – Vertical Test Distance = 3 meters



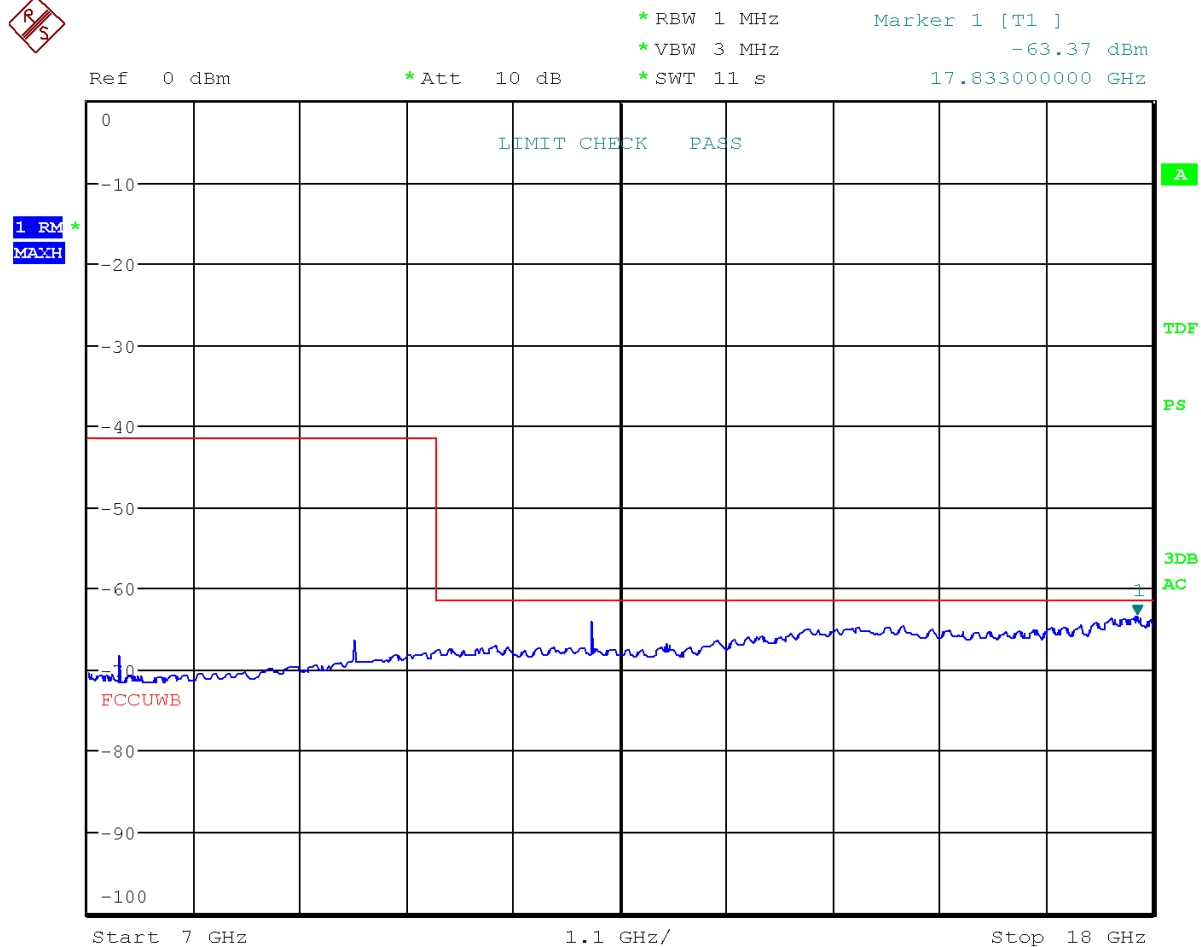
Date: 10.NOV.2020 13:20:20

Radiated Emissions (6.0GHz – 7.0GHz) – Vertical Test Distance = 3 meters



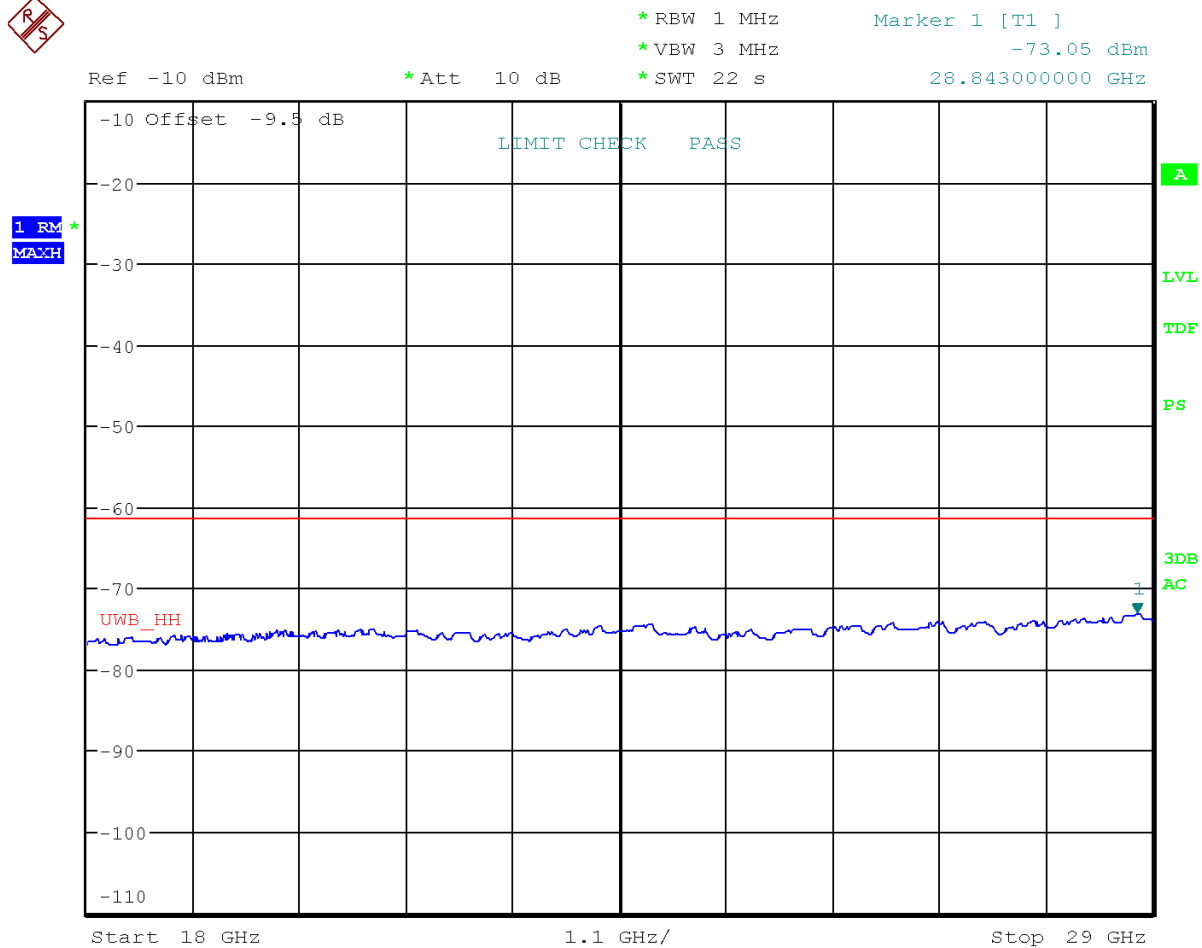
Date: 10.NOV.2020 13:18:27

Radiated Emissions (7.0GHz-18.0GHz) – Vertical Test Distance = 3 meters



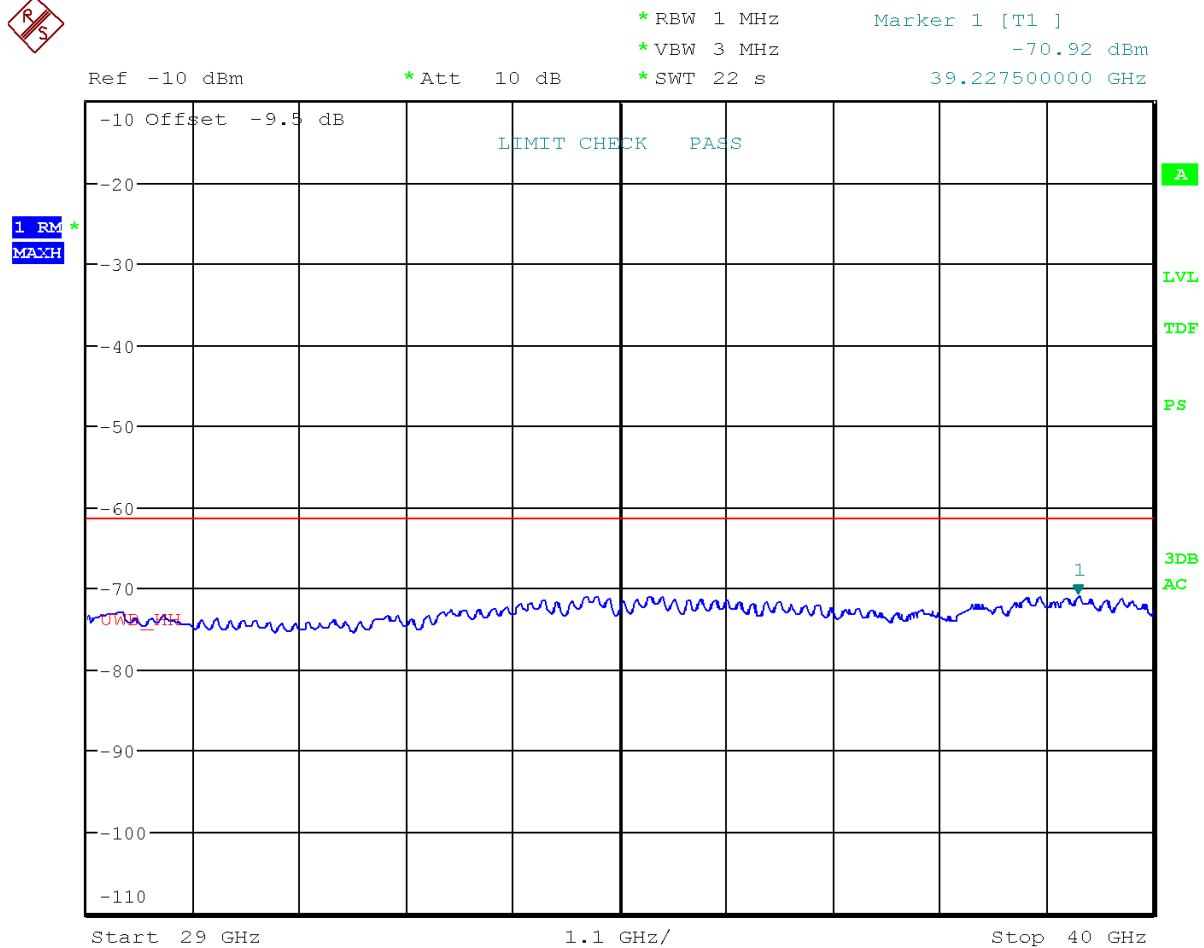
Date: 23.NOV.2020 13:19:58

Radiated Emissions (18-29 GHz) – Vertical Test Distance = 1.0 meter



Date: 10.NOV.2020 15:04:34

Radiated Emissions (29-40 GHz) – Vertical Test Distance = 1.0 meter

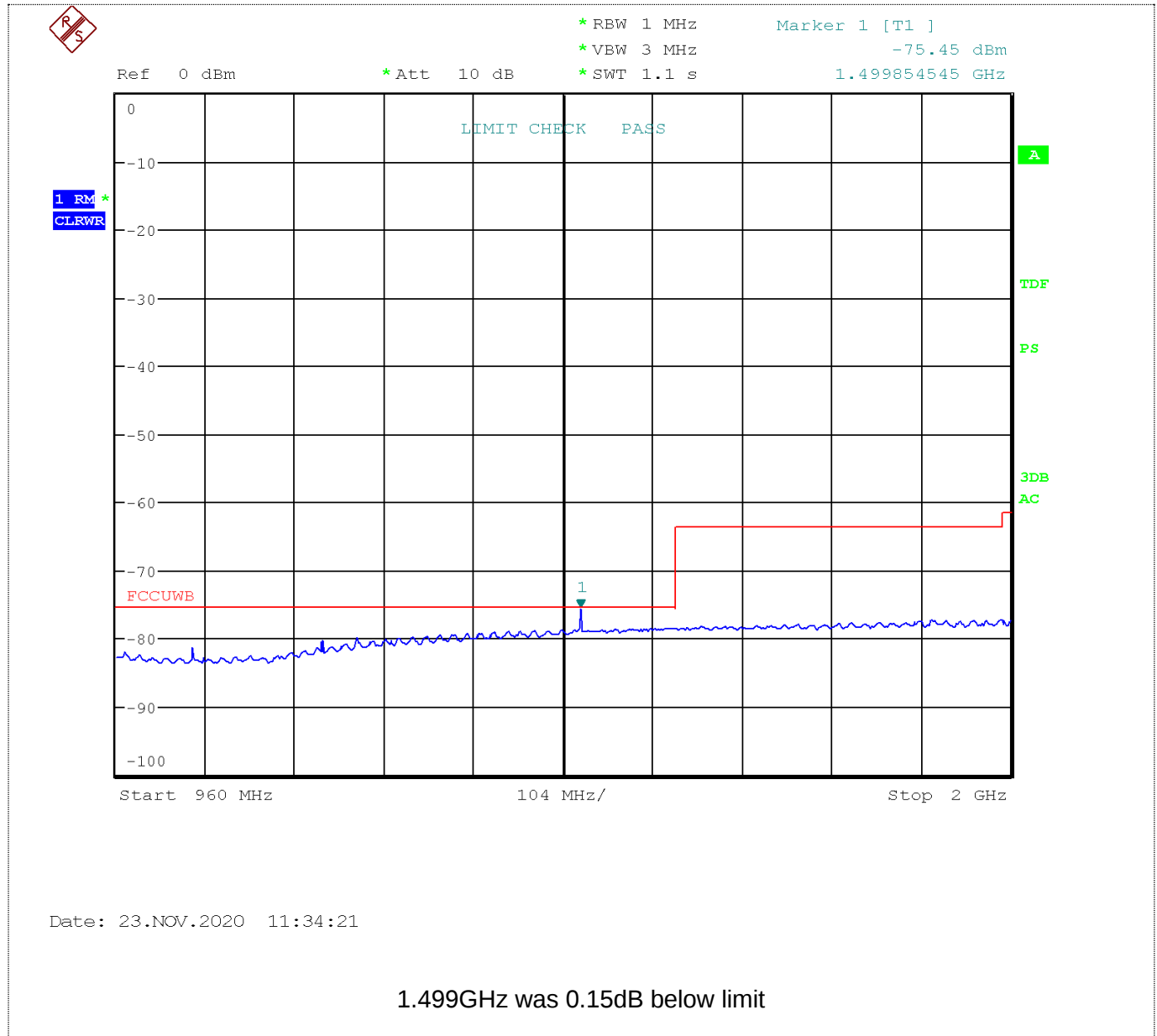


Date: 10.NOV.2020 15:05:48

5.1 Test Data – Channel 9

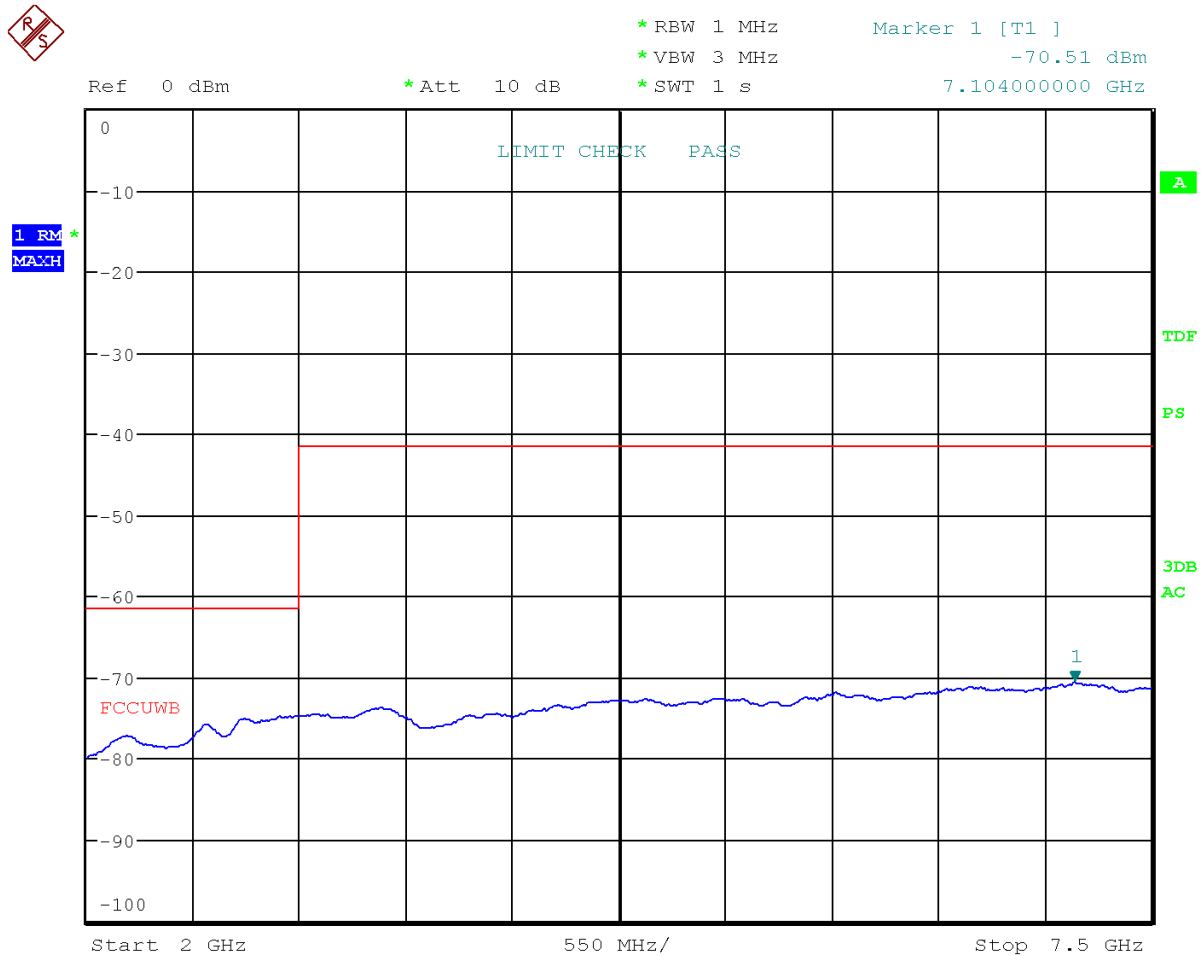
5.1.1 Horizontal

Radiated Emissions (960MHz – 2.0GHz) – Horizontal Test Distance = 3 meters



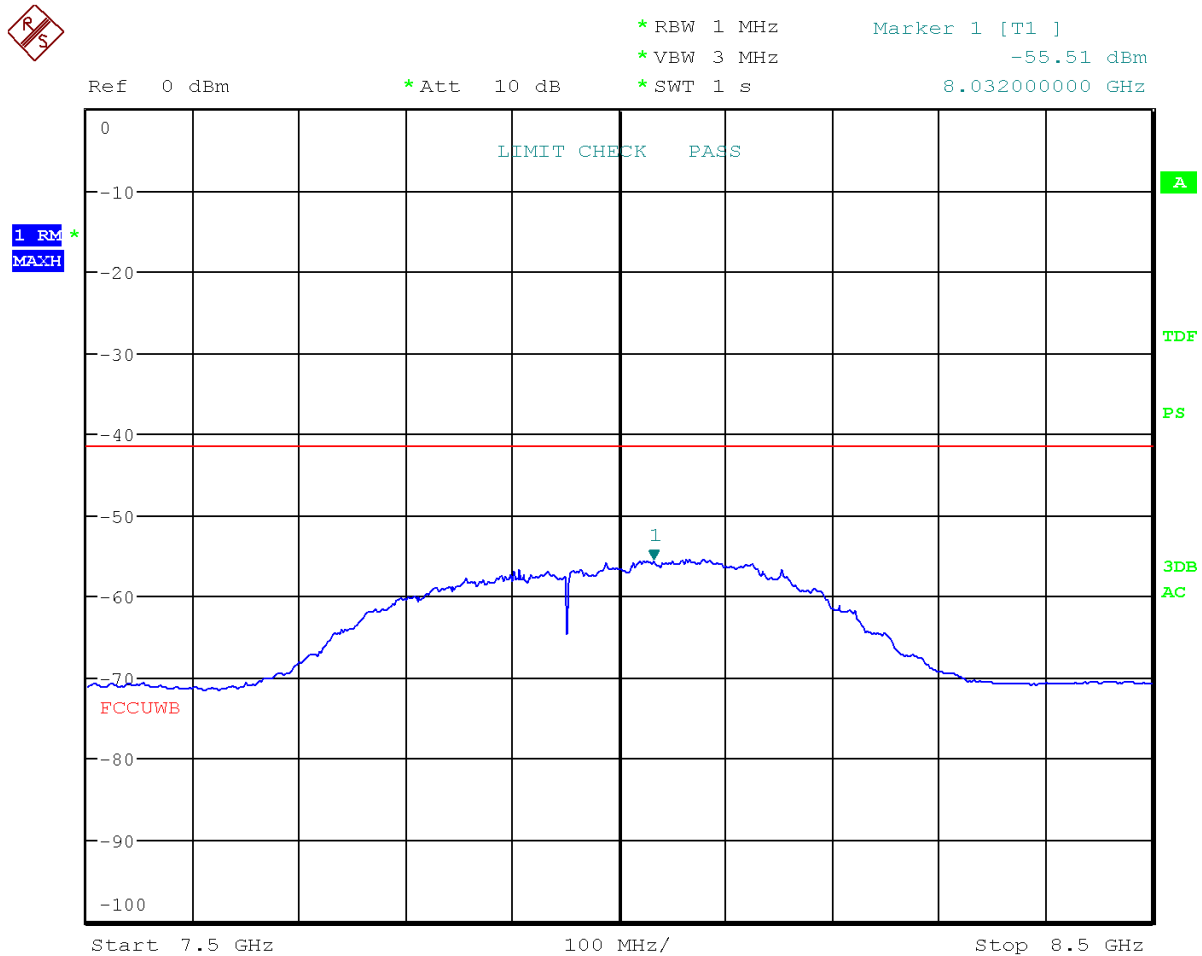
Date: 23.NOV.2020 11:34:21

Radiated Emissions (2.0GHz – 7.5GHz) – Horizontal Test Distance = 3 meters



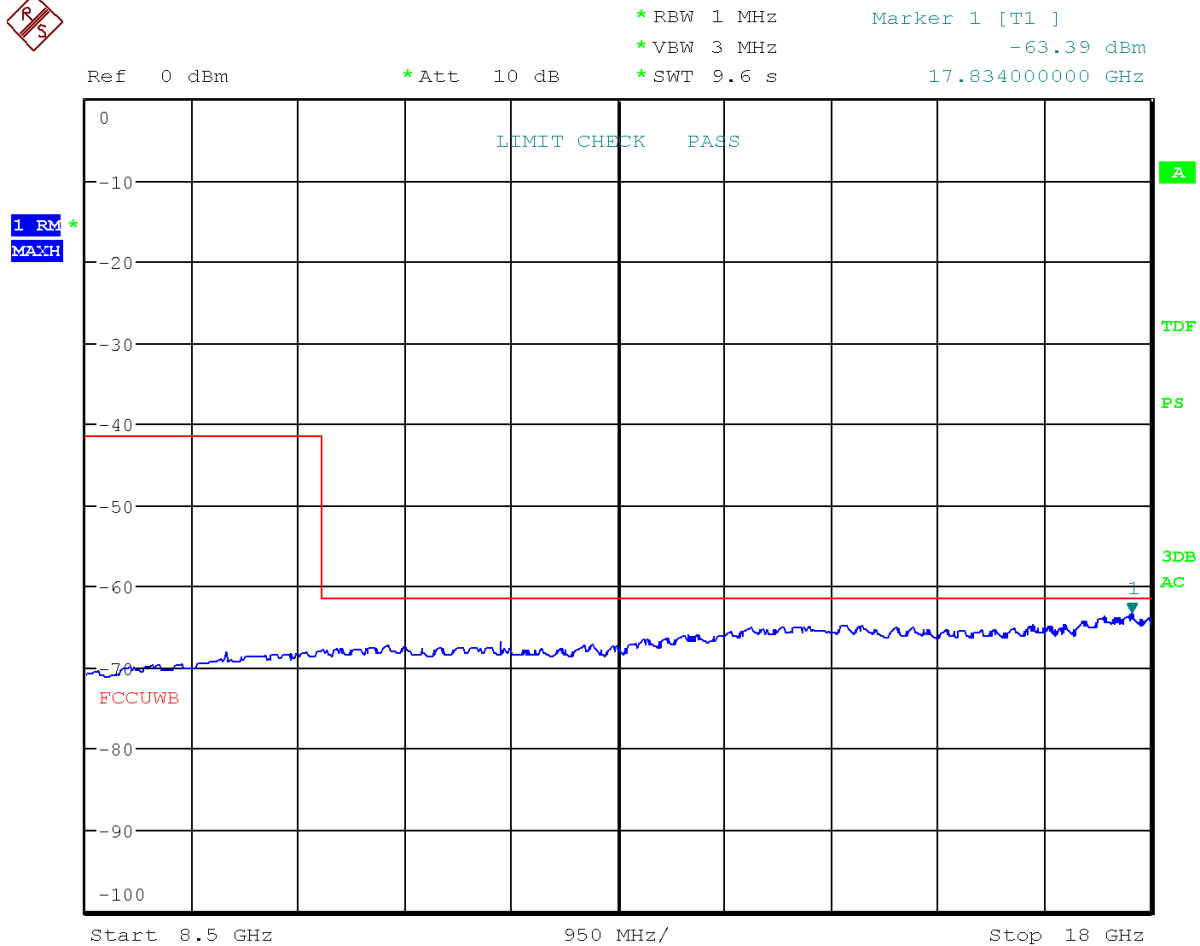
Date: 23.NOV.2020 11:09:18

Radiated Emissions (7.5GHz – 8.5GHz) – Horizontal Test Distance = 3 meters



Date: 23.NOV.2020 14:26:28

Radiated Emissions (8.5GHz – 18GHz) – Horizontal Test Distance = 3 meters



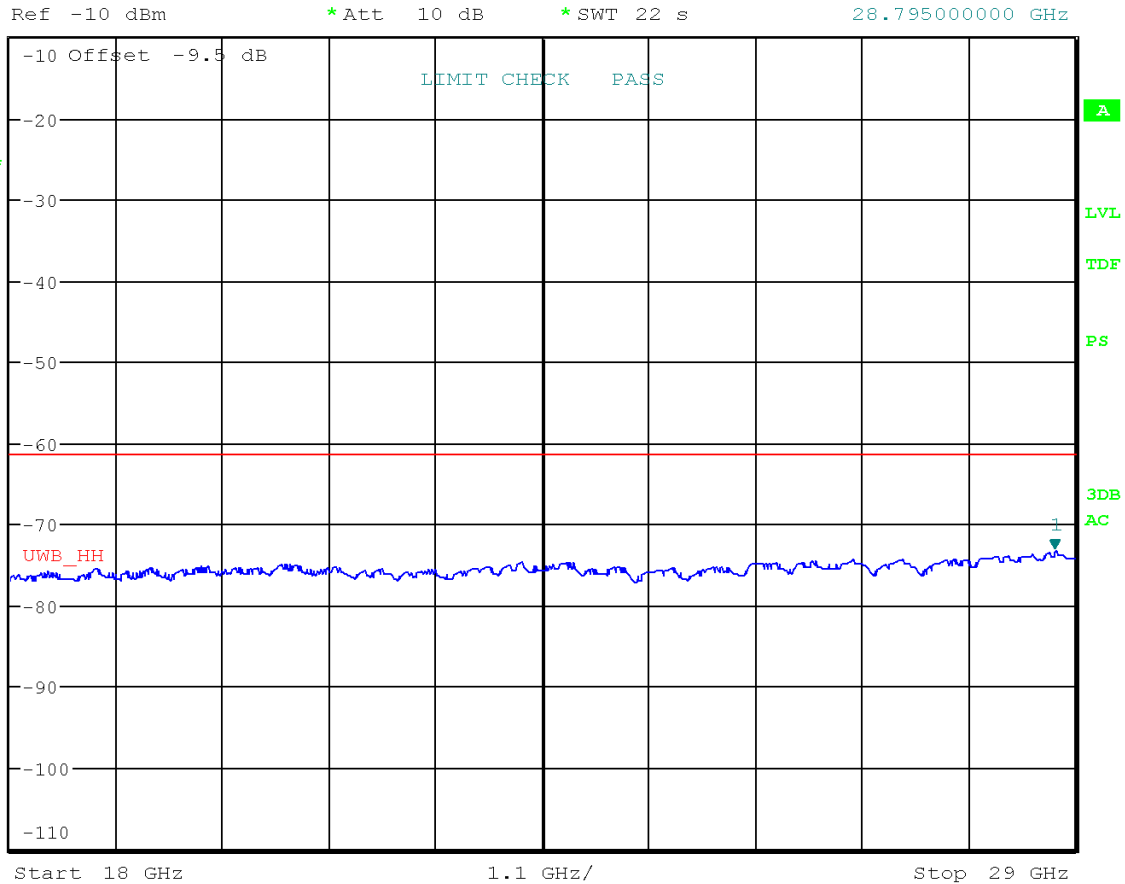
Date: 23.NOV.2020 11:36:19

Radiated Emissions (18GHz – 29GHz) – Horizontal Test Distance = 1.0 meter



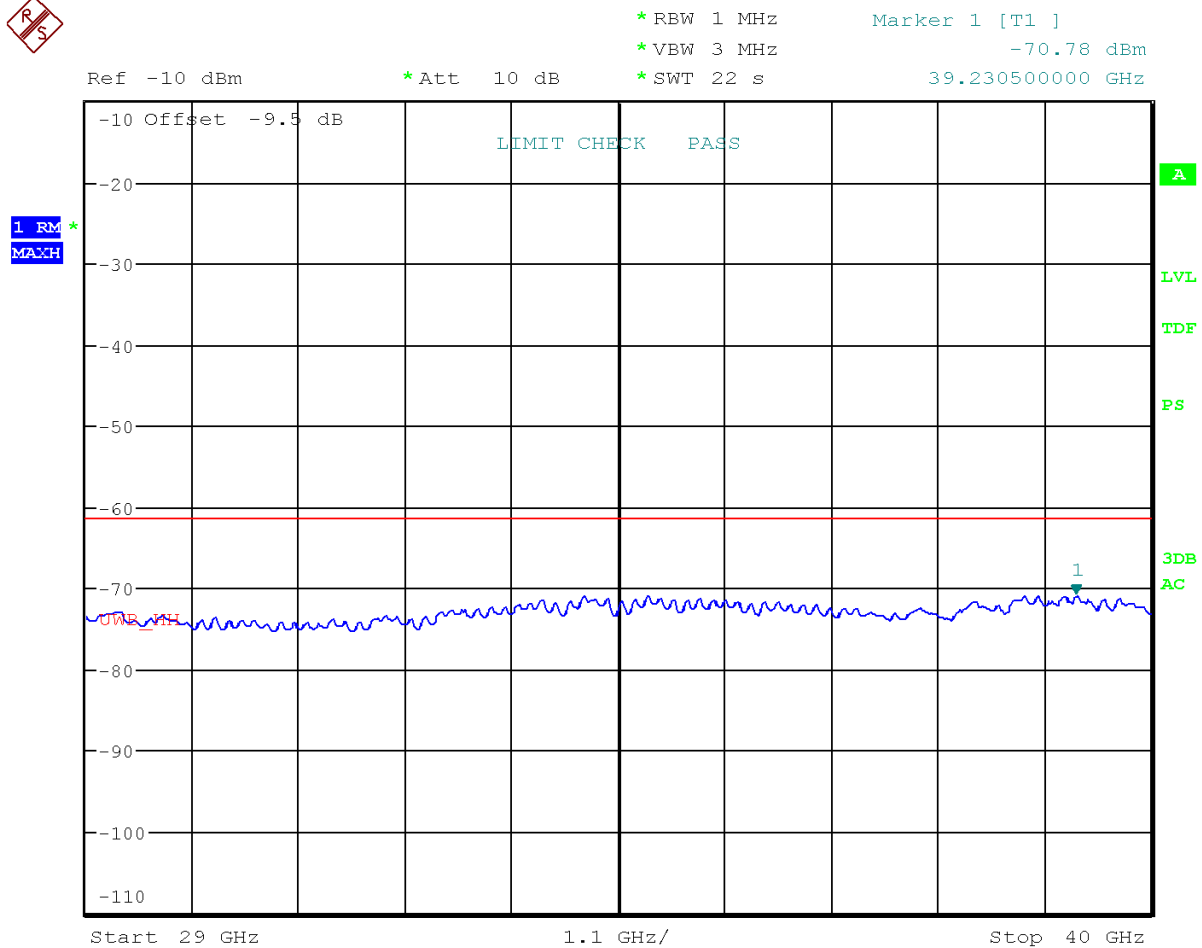
* RBW 1 MHz
* VBW 3 MHz
* SWT 22 s

Marker 1 [T1]
-73.21 dBm
28.795000000 GHz



Date: 10.NOV.2020 15:47:39

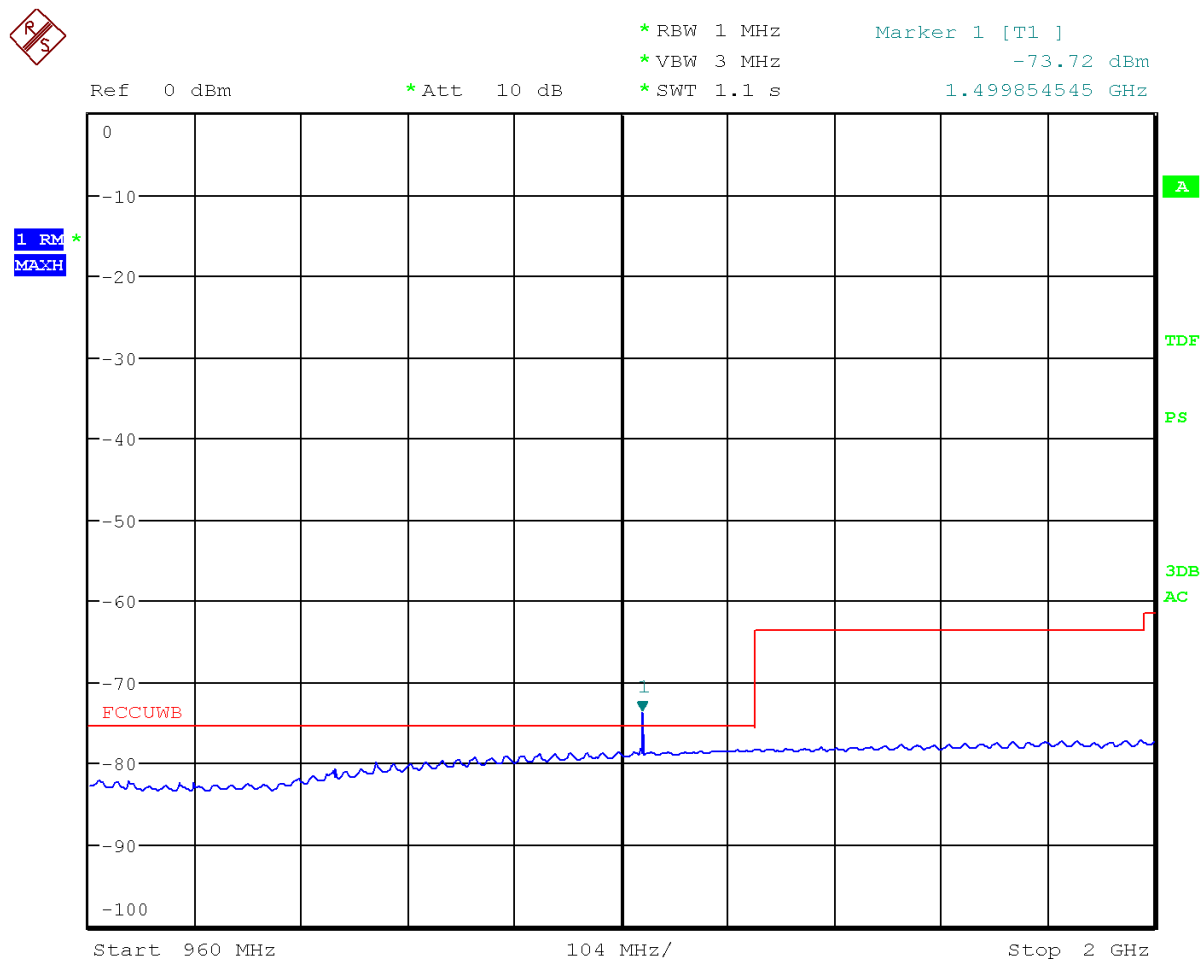
Radiated Emissions (29GHz – 40GHz) – Horizontal Test Distance = 1.0 meter



Date: 10.NOV.2020 15:46:28

5.1.2 Vertical

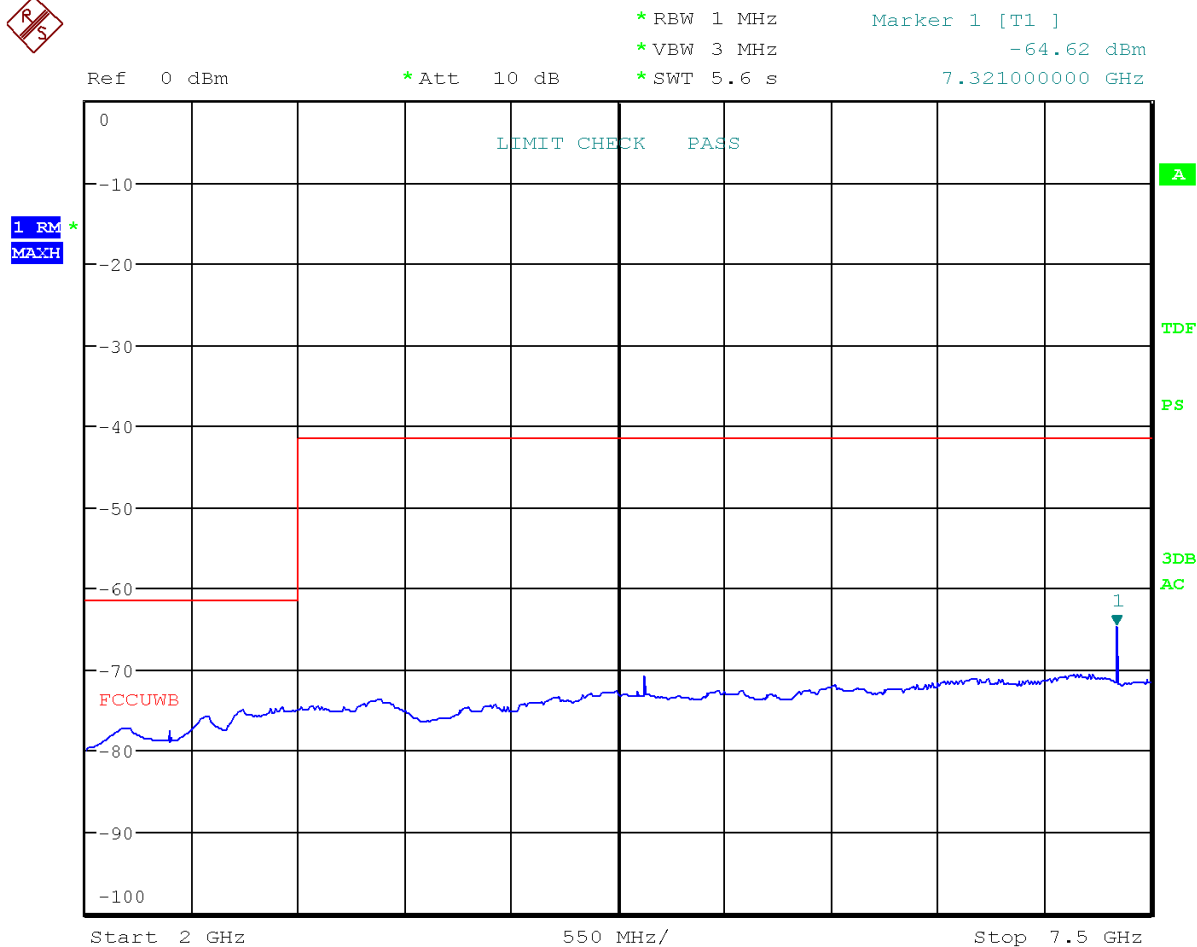
Radiated Emissions (960MHz – 2.0GHz) – Vertical Test Distance = 3 meters



Date: 23.NOV.2020 11:28:46

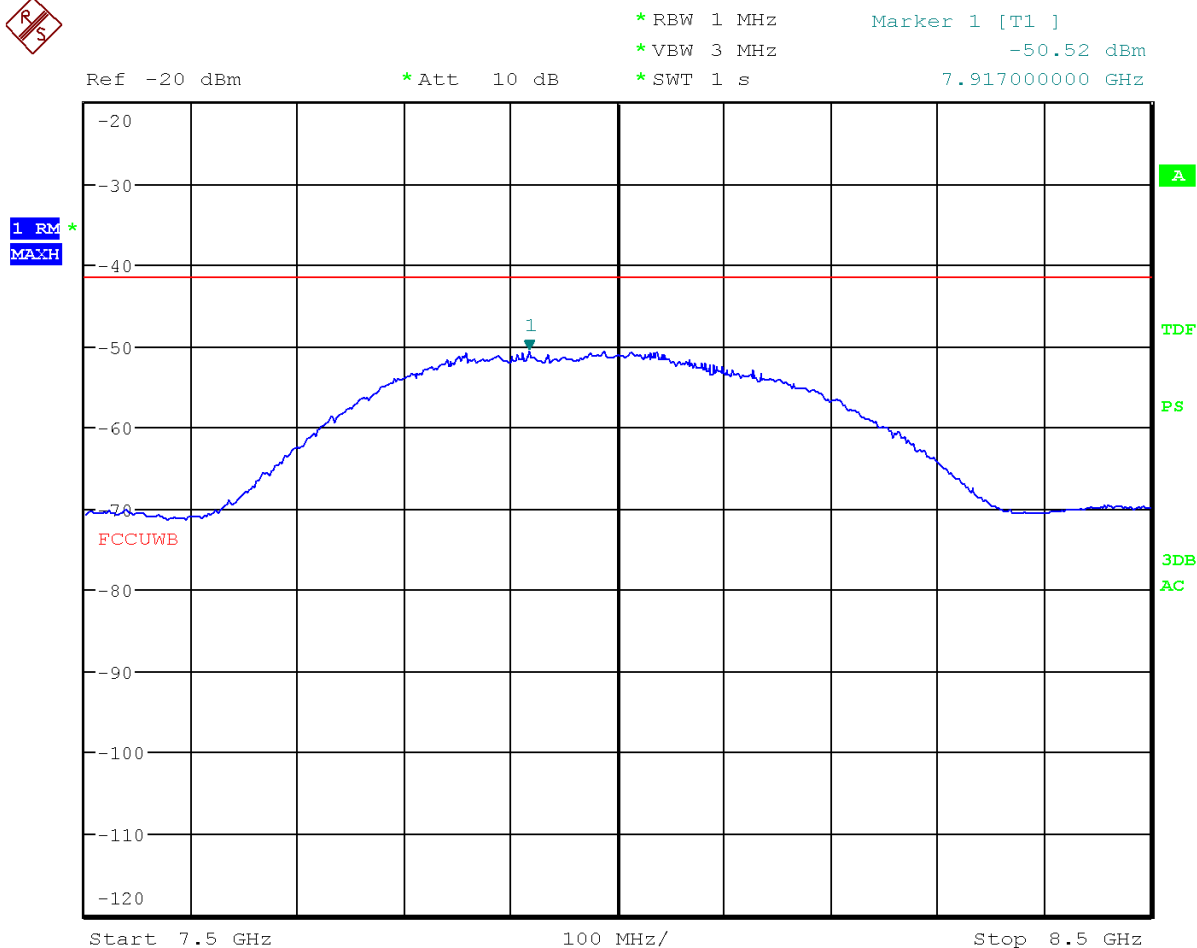
1.499GHz was a digital signal not related to UWB transmitter.

Radiated Emissions (2.0GHz – 7.5GHz) – Vertical Test Distance = 3 meters



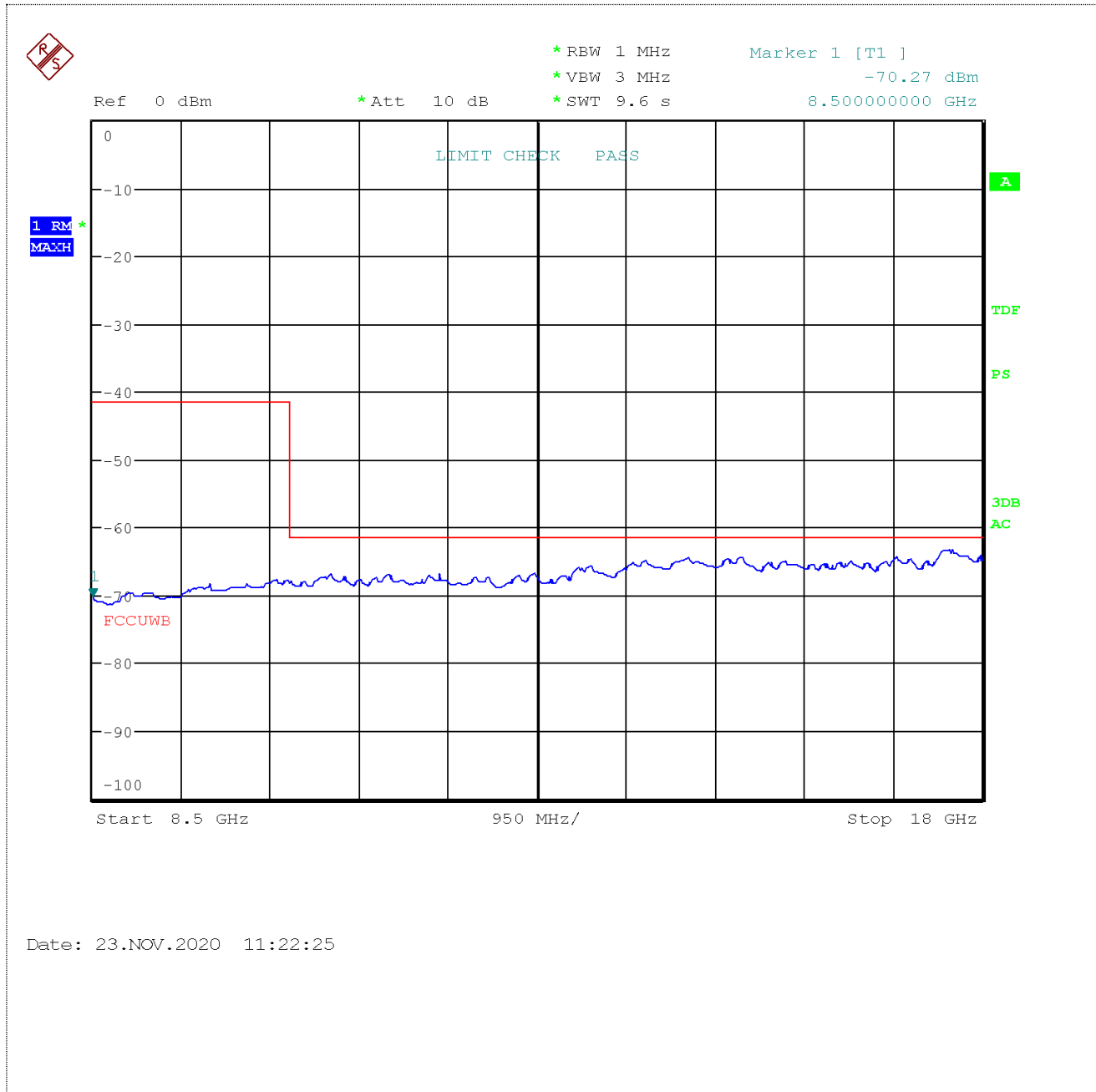
Date: 23.NOV.2020 11:24:22

Radiated Emissions (7.5GHz – 8.5GHz) – Vertical Test Distance = 3 meters

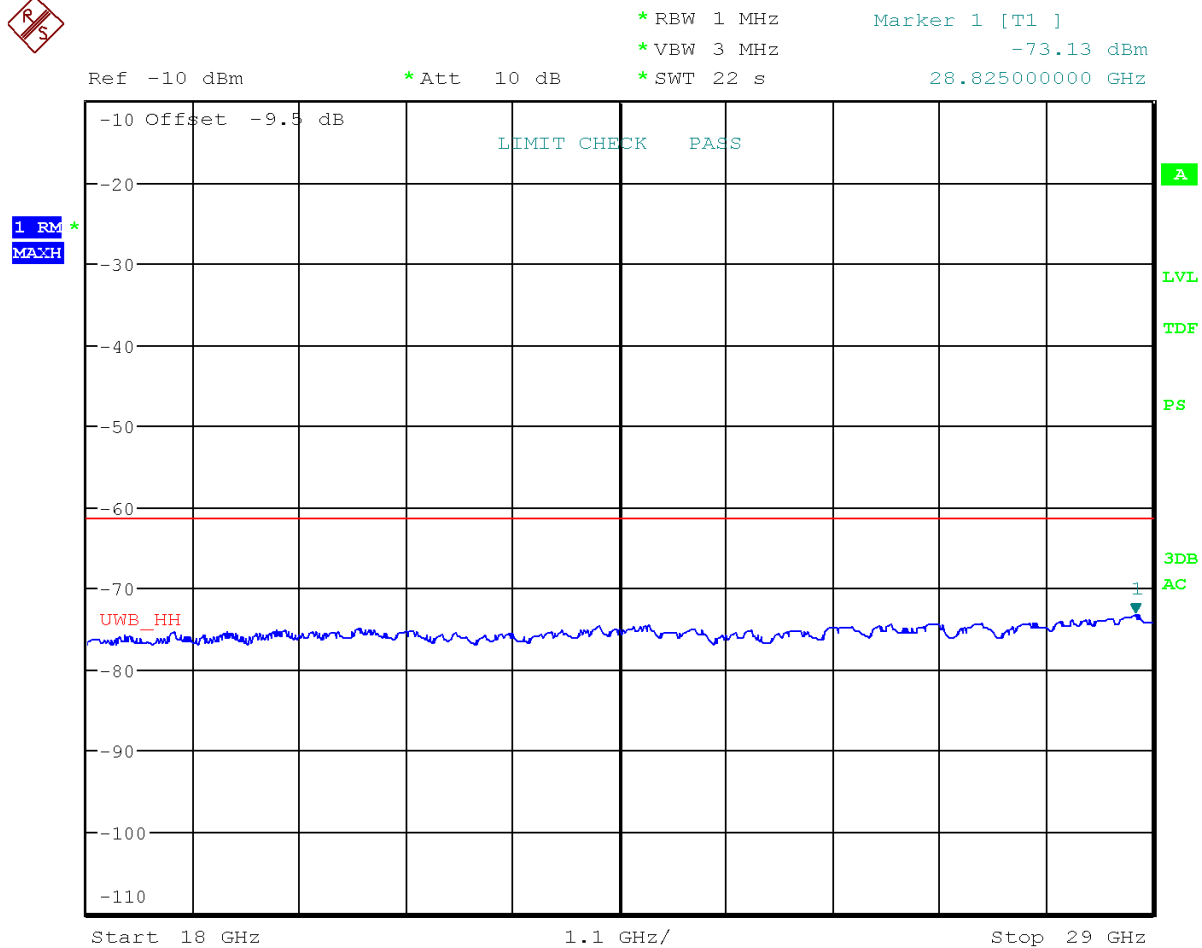


Date: 23.NOV.2020 14:18:01

Radiated Emissions (8.5GHz-18.0GHz) – Vertical Test Distance = 3 meters

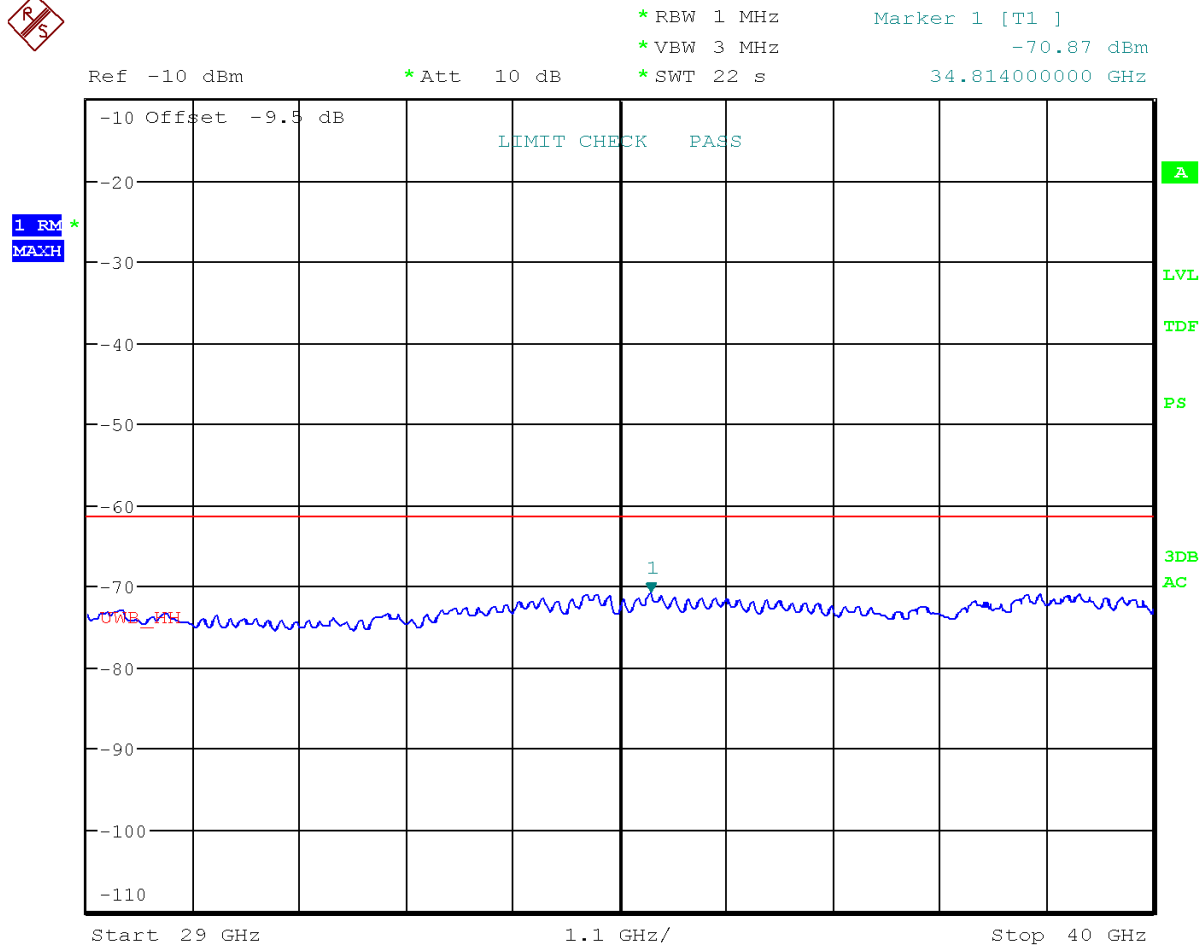


Radiated Emissions (18-29 GHz) – Vertical Test Distance = 1.0 meter



Date: 10.NOV.2020 15:39:56

Radiated Emissions (29-40 GHz) – Vertical Test Distance = 1.0 meter



Date: 10.NOV.2020 15:50:32

6 Radiated emissions in GPS receive band

6.1 Test Result

Test Description	Reference		Test Result
Radiated emissions in GPS receive band	15.519(d)	RSS-220, S5.3.1(e)	Compliant

6.2 Test Method

Test method: ANSI C63.10, Clause 10.3

In addition to the radiated emission limits specified in the table in paragraph (c) of this section, transmitters operating under the provisions of this section shall not exceed the following RMS average limits when measured using a resolution bandwidth of no less than 1 kHz:

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

6.3 Test Site

10m Absorber Lined Shielded Enclosure, SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.3 °C

Relative Humidity: 40.1 %

6.4 Test Equipment

Test End Date: 19-Nov-2020

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Oct-2020	28-Oct-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-276	TELEDYNE STORM MICROWAVE	20114	2-Mar-2020	2-Mar-2021
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	3-Sep-2020	3-Sep-2021
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079691	10-Aug-2020	10-Aug-2022

Software:

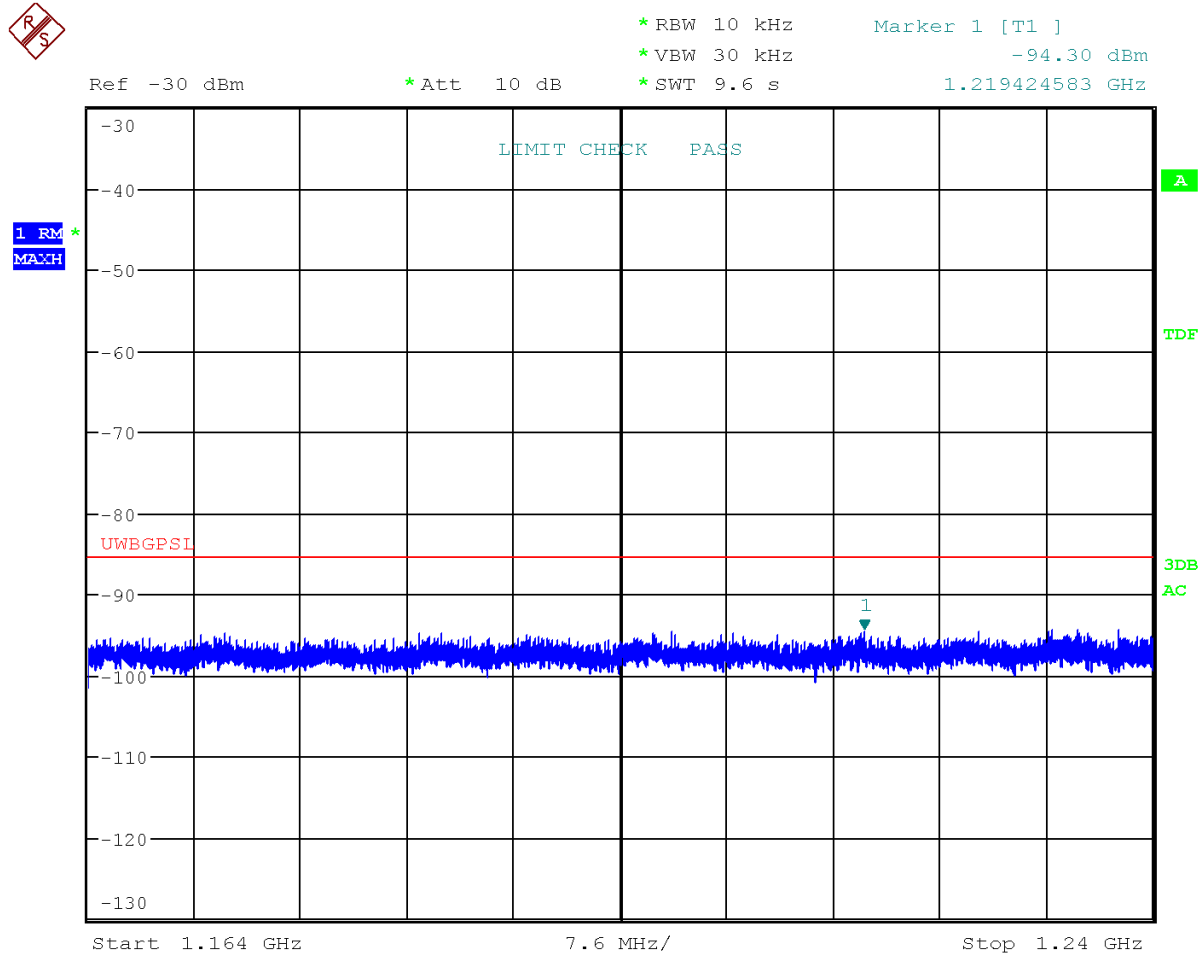
“Radiated Emissions 1-18GHz.TIL” TILE! profile dated Oct 2020

6.5 Test Data

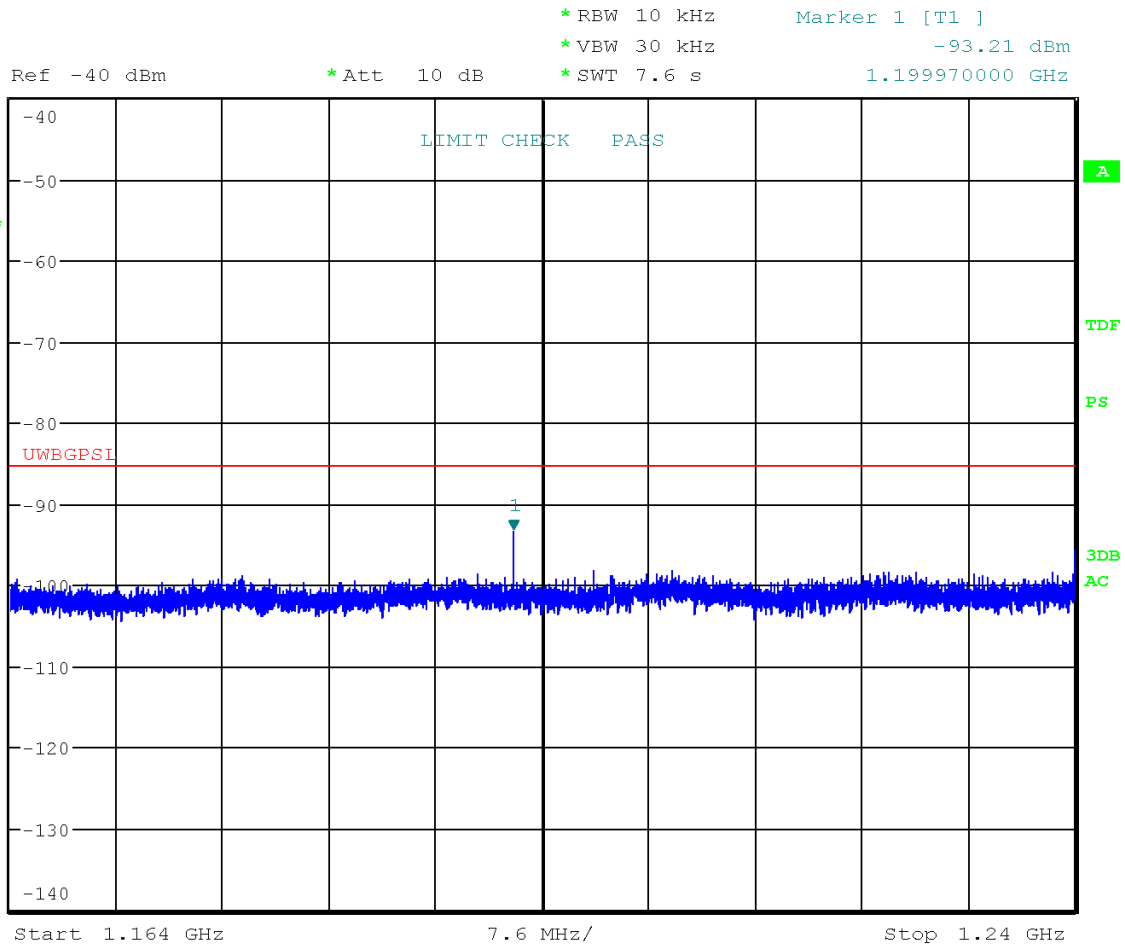
6.5.1 Channel 5 (X-axis results reported)

Vertical Radiated Emissions in lower GPS Receive Band

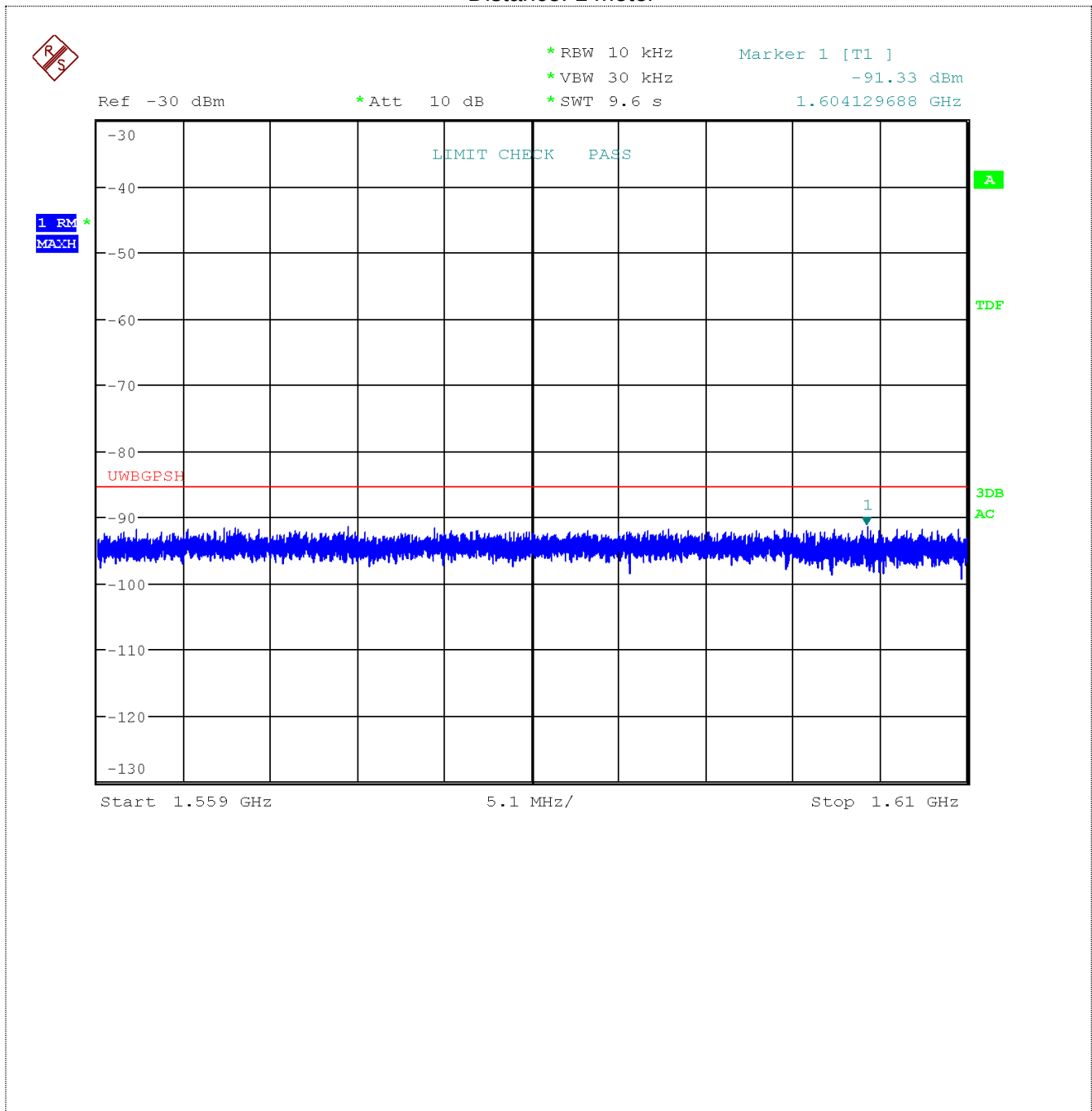
Distance: 1 meter



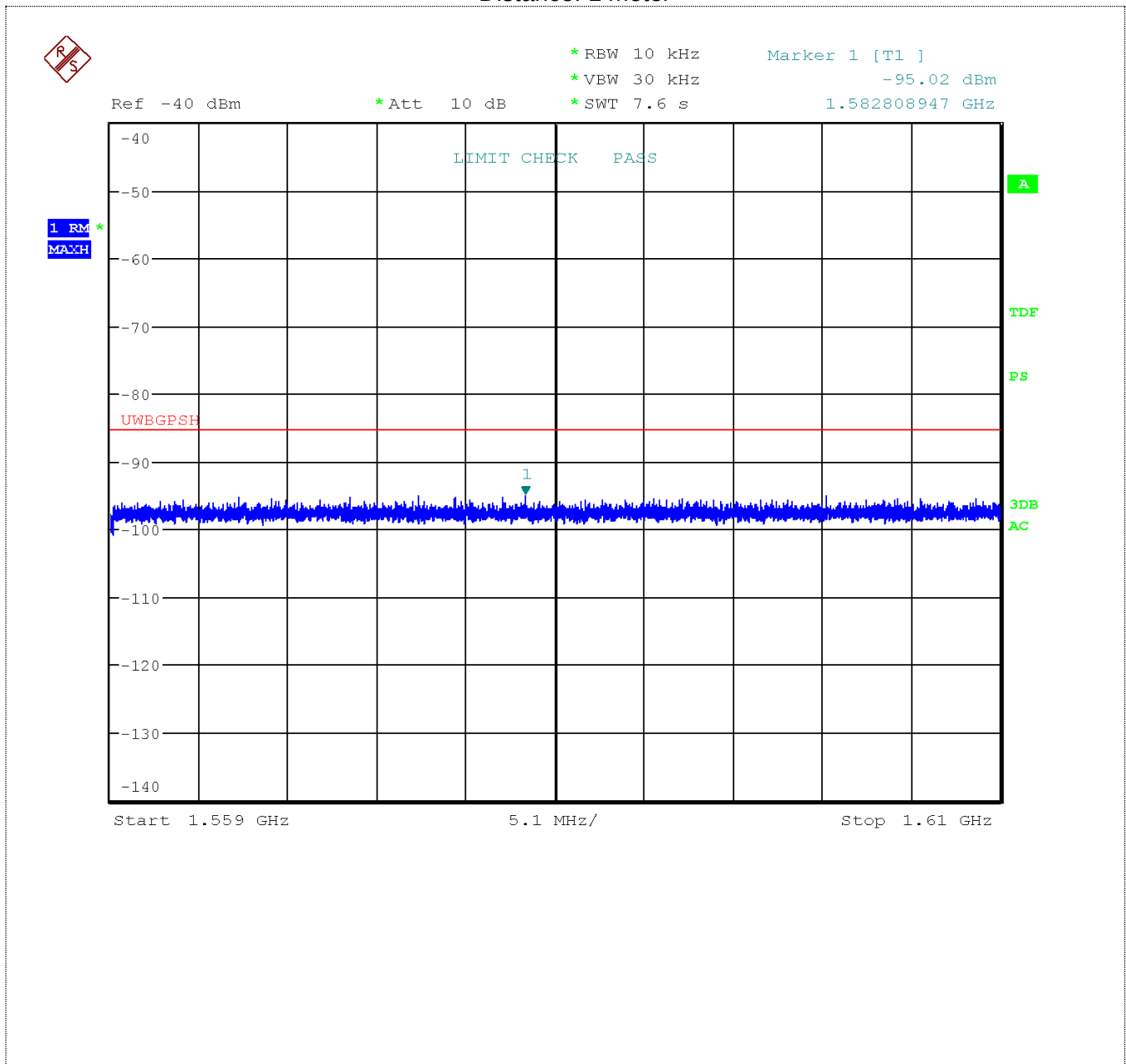
Horizontal Radiated Emissions in lower GPS Receive Band Distance: 1 meter



Vertical Radiated Emissions in upper GPS Receive Band Distance: 1 meter



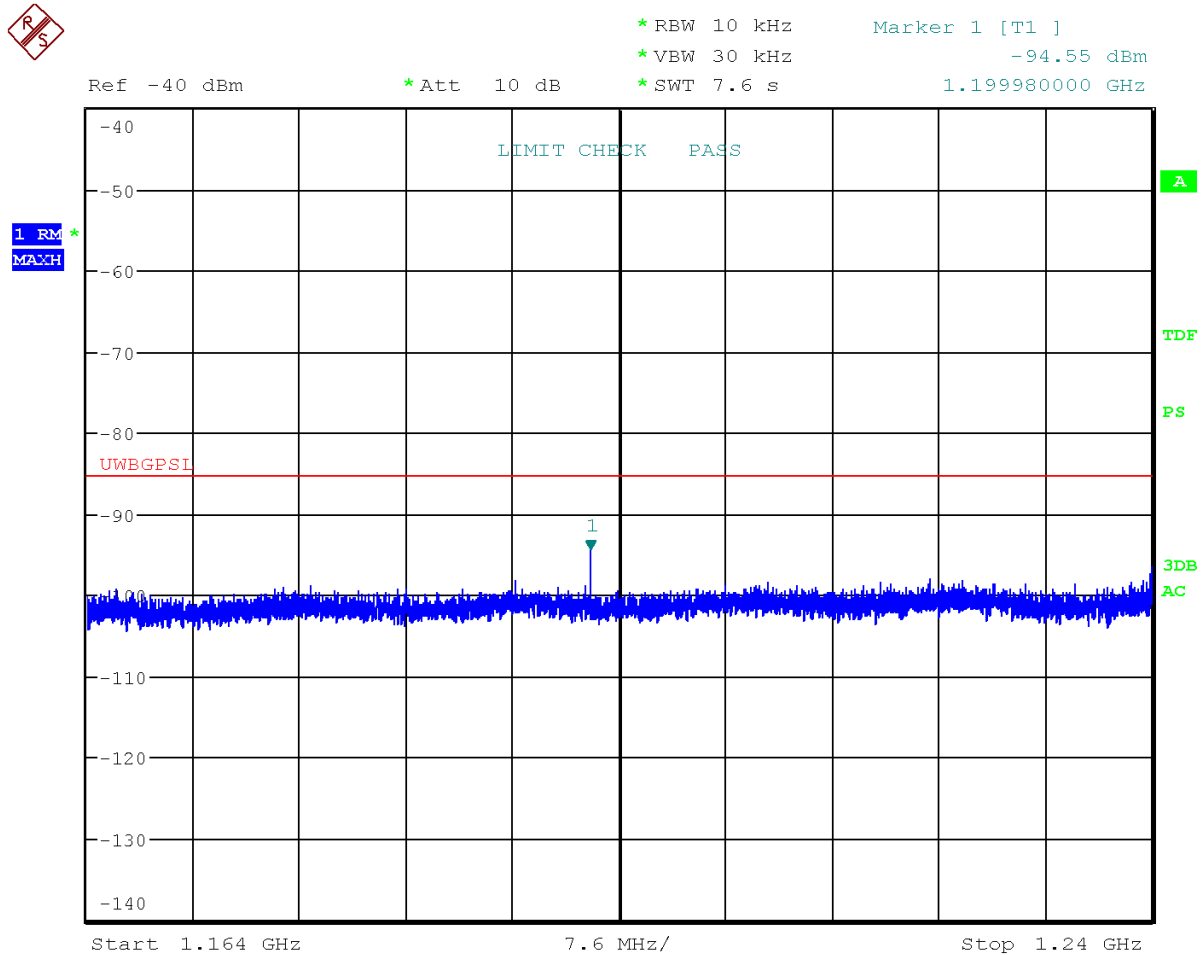
Horizontal Radiated Emissions in upper GPS Receive Band Distance: 1 meter



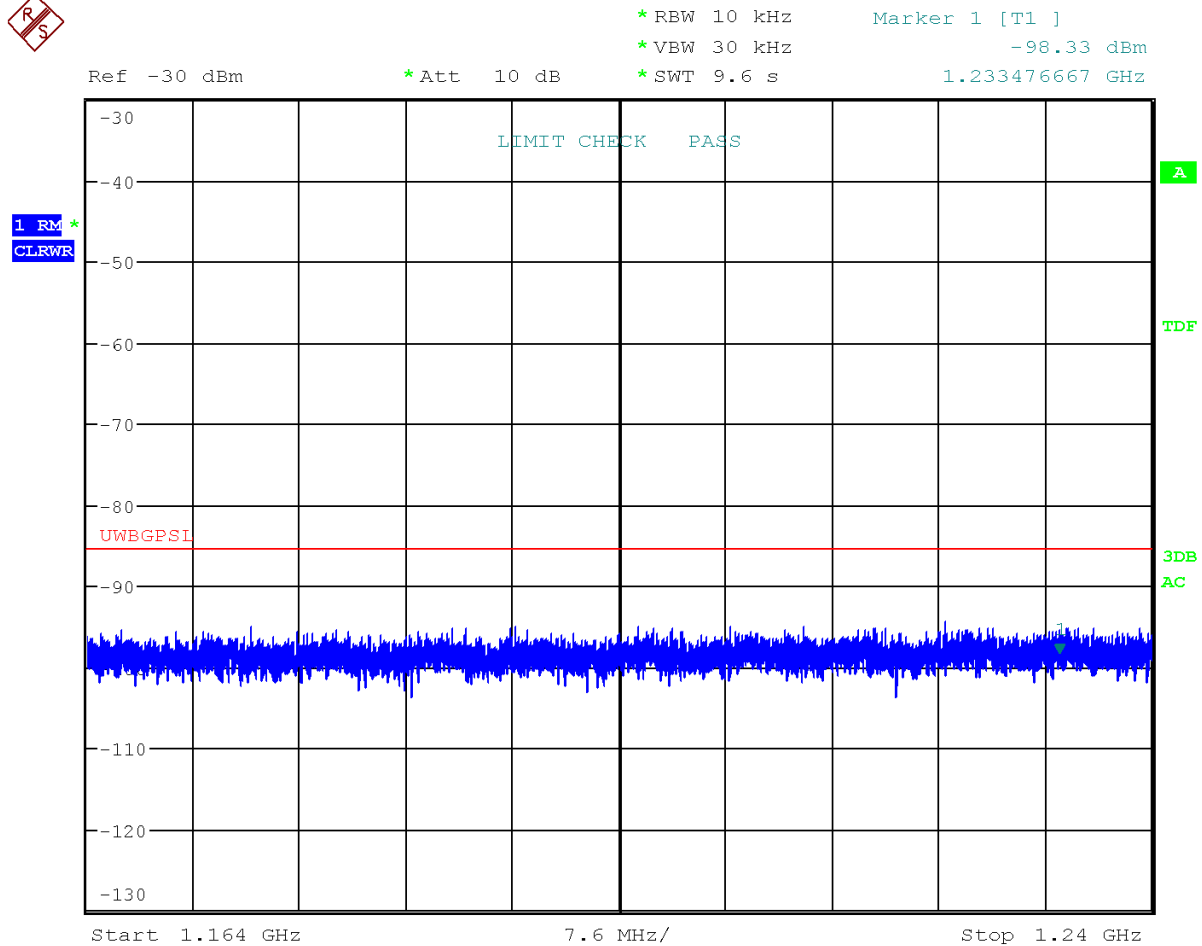
6.5.2 Channel 9 (Z-axis results reported)

Vertical Radiated Emissions in lower GPS Receive Band

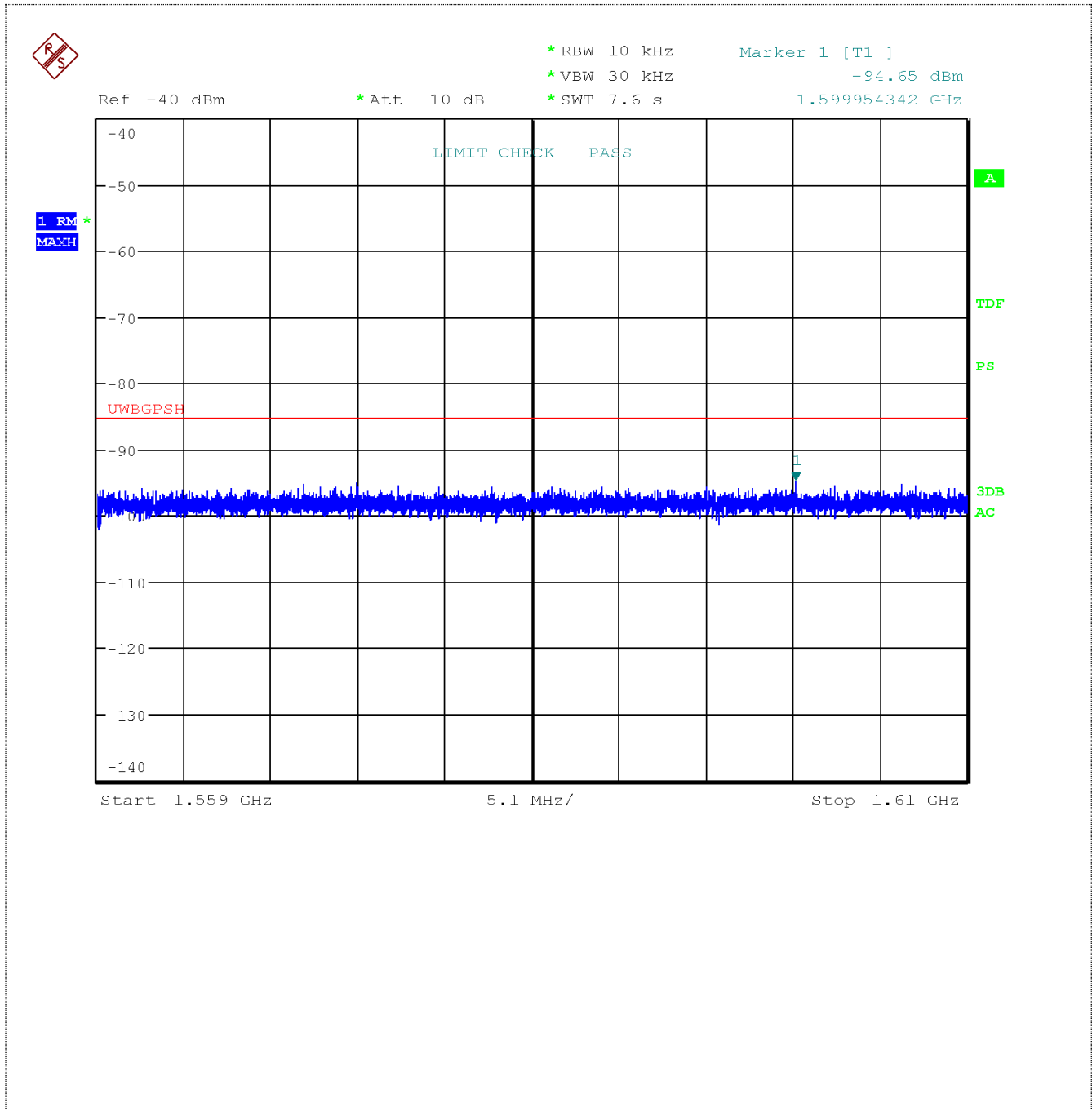
Distance: 1 meter



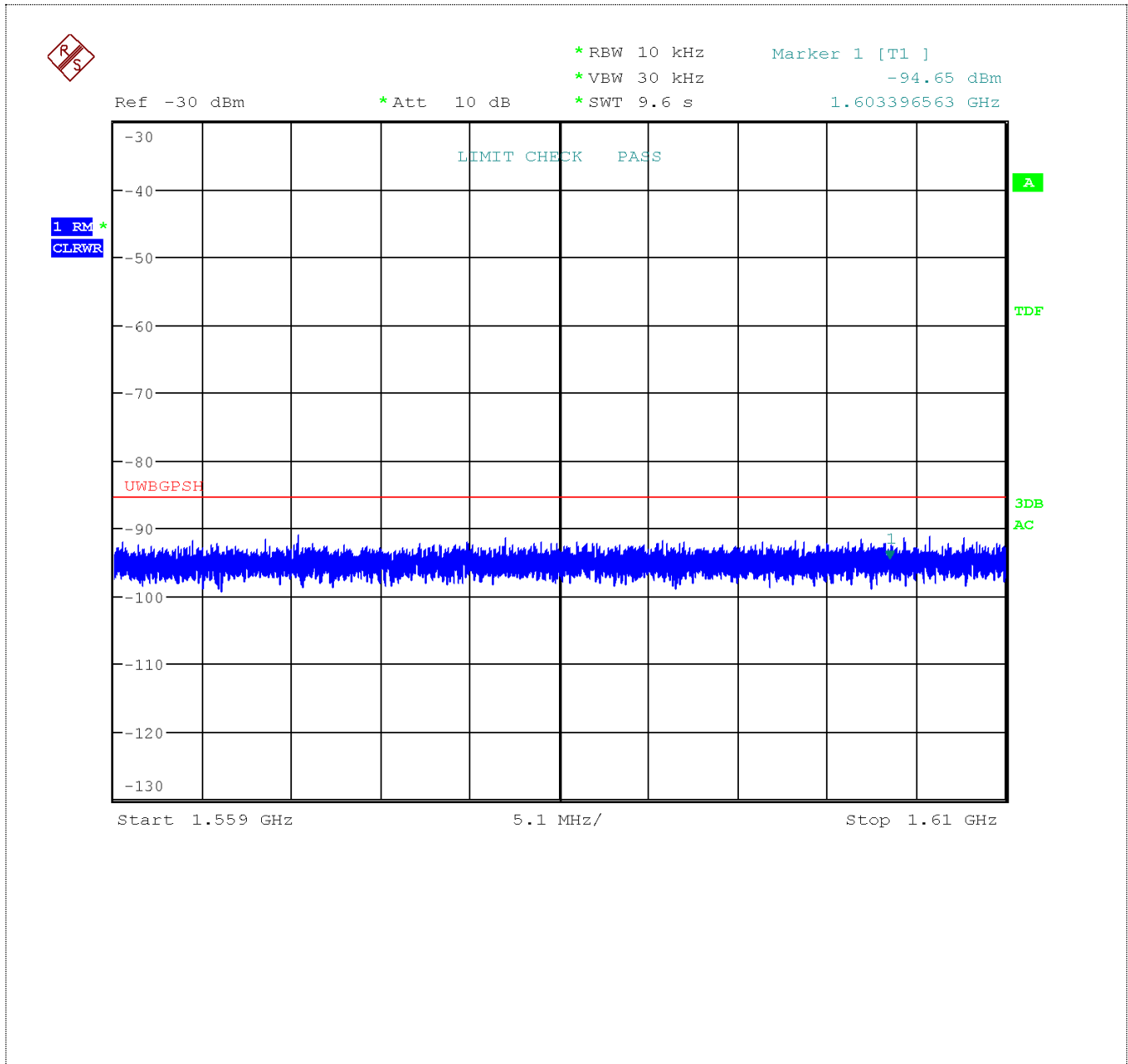
Horizontal Radiated Emissions in lower GPS Receive Band Distance: 1 meter



Vertical Radiated Emissions in upper GPS Receive Band Distance: 1 meter



Horizontal Radiated Emissions in upper GPS Receive Band Distance: 1 meter



Channel 5 Data: Radiated Emissions in GPS Receive Bands
Test Distance: 1m

GPS Band	Frequency MHz	Antenna Polarity	Measured RMS vValue	RMS Limit dBm	Margin dB
Low	1219.4	V	-94.3	-85.3	--9.00
Low	1199.9	H	-93.21	-85.3	-7.91
High	1604.1	V	-91.33	-85.3	-6.03
High	1582.9	H	-95.02	-85.3	-9.72

Channel 9 Data: Radiated Emissions in GPS Receive Bands
Test Distance: 1m

GPS Band	Frequency MHz	Antenna Polarity	Measured RMS vValue	RMS Limit dBm	Margin dB
Low	1199.9	V	-94.55	-85.3	--9.25
Low	1233.5	H	-98.33	-85.3	-13.03
High	1599.9	V	-94.65	-85.3	-9.35
High	1603.3	H	-94.65	-85.3	-9.35

7 Peak Power within a 50 MHz bandwidth

7.1 Test Result

Test Description	Reference		Test Result
Peak Power in a 50 MHz Bandwidth	15.519(e)	RSS-220, S5.3.1(g)	Compliant

7.2 Test Method

Test method: ANSI C63.10, Clause 10.3

- 1) 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 occur and this 50 MHz bandwidth must be contained within the 3100–10600 MHz band.
- 2) The peak EIRP limit is $20 \log (RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than RBW.
- 3) The Limit is 0dBm EIRP.

7.3 Test Site

10m Absorber Lined Shielded Enclosure, SGS EMC Laboratory, Suwanee, GA

Environmental Conditions	Nov 20	Nov 23
Temperature:	22.5 °C	23.1 °C
Relative Humidity:	30.1 %	37.7 %

7.4 Test Equipment

Test Date: 20-Nov-2020

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Oct-2020	28-Oct-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-276	TELEDYNE STORM MICROWAVE	20114	2-Mar-2020	2-Mar-2021
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	3-Sep-2020	3-Sep-2021
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079691	10-Aug-2020	10-Aug-2022

Test Date: 23-Nov-2020

Tester: BEO

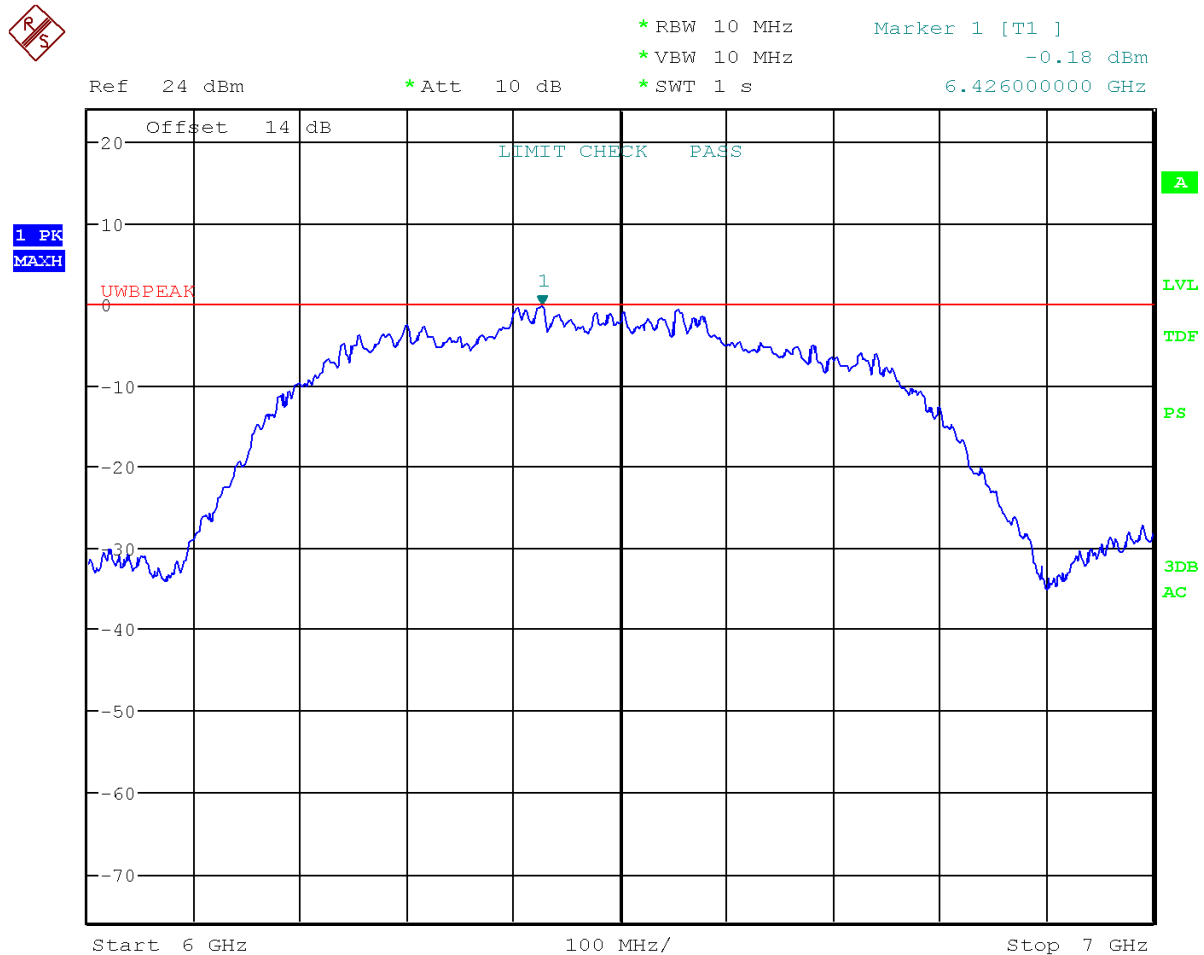
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Oct-2020	28-Oct-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-276	TELEDYNE STORM MICROWAVE	20114	2-Mar-2020	2-Mar-2021
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	3-Sep-2020	3-Sep-2021
ANTENNA, DRG HORN (MEDIUM)	3117	ETS Lindgren	B079691	10-Aug-2020	10-Aug-2022

7.5 Test Data

7.5.1 Channel 5

Peak Power per 50MHz – Vertical

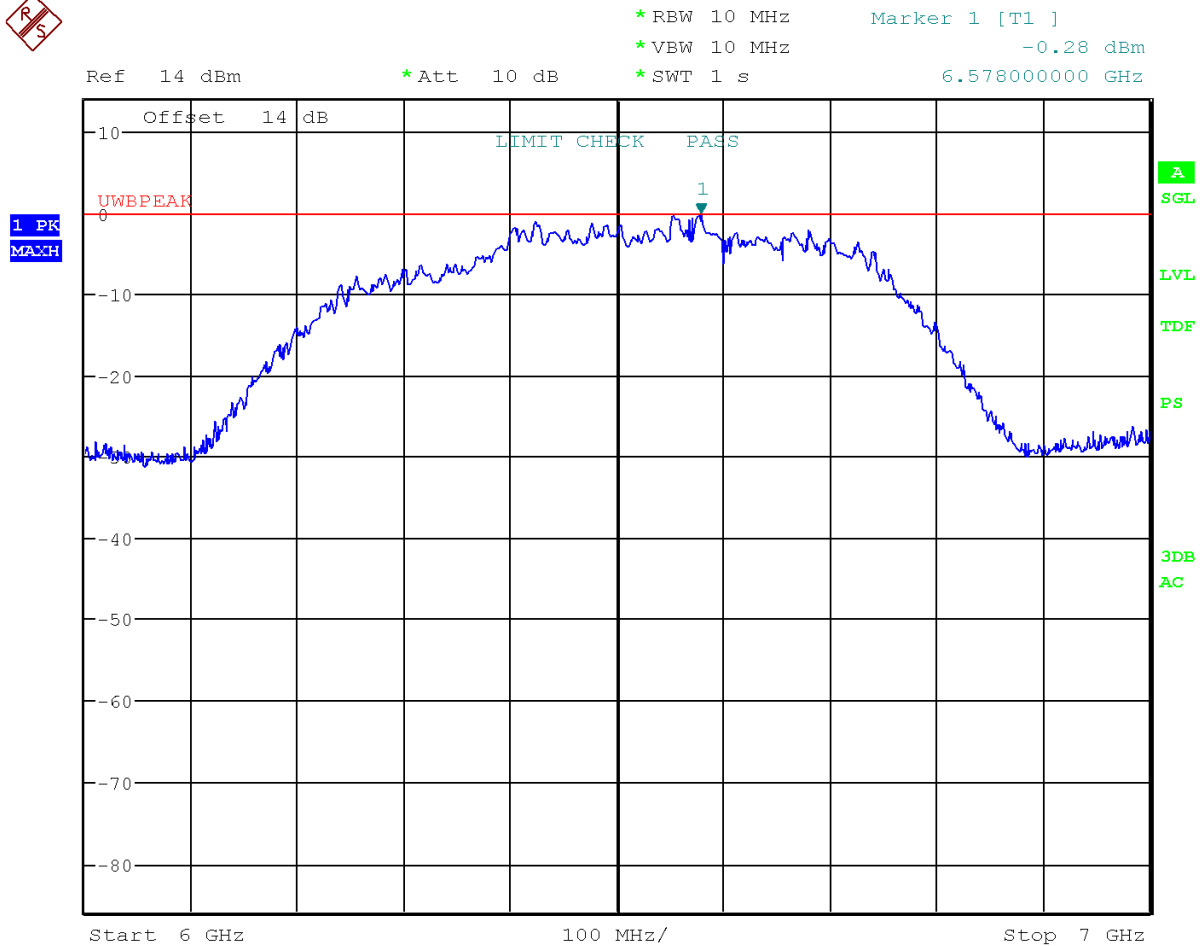
Note: Offset value is equal to $20 \cdot \log(50\text{MHz}/10\text{MHz})$



Date: 20.NOV.2020 11:09:33

Peak Power per 50MHz - Horizontal

Note: Offset value is equal to $20 \cdot \log(50\text{MHz}/10\text{MHz})$

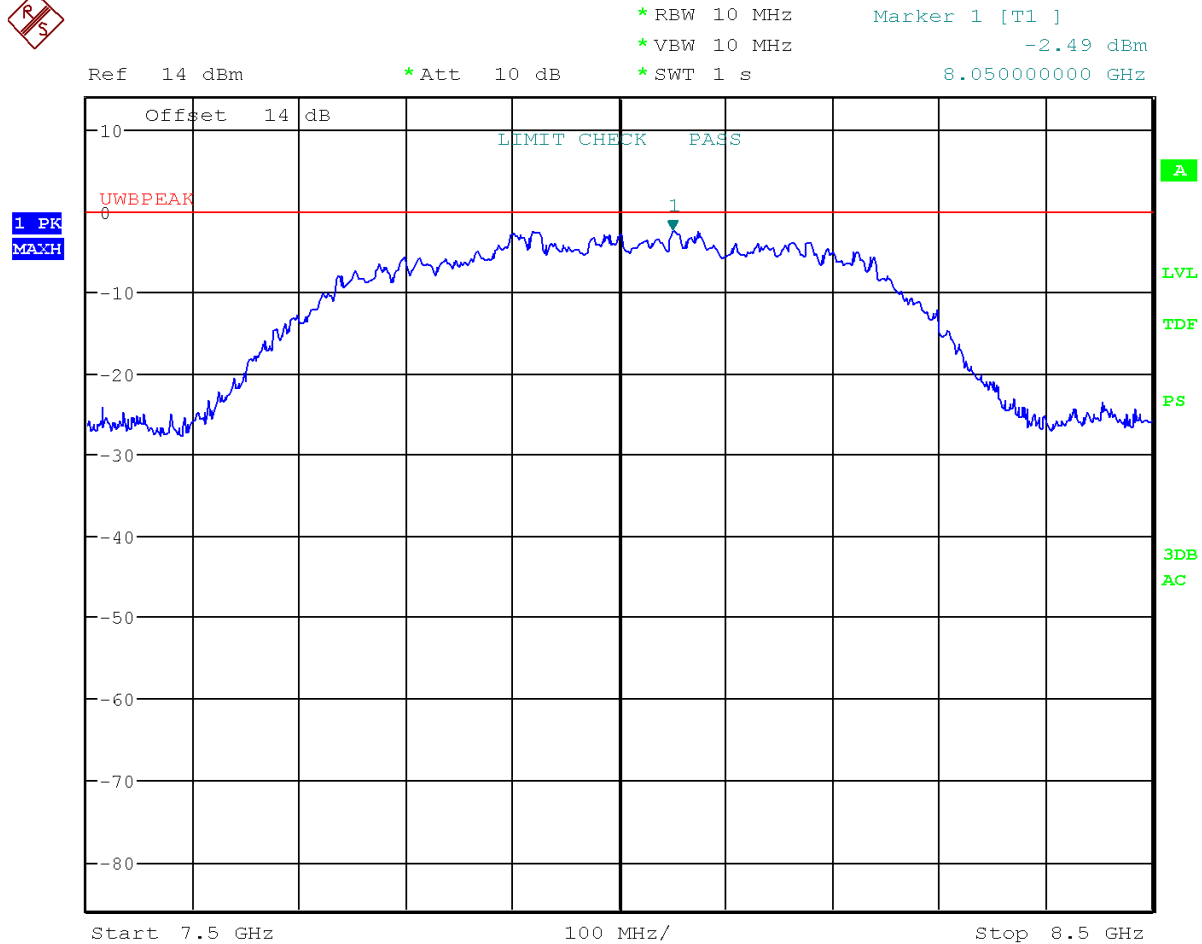


Date: 20.NOV.2020 14:04:03

7.6.1 Channel 9

Peak Power per 50MHz – Vertical

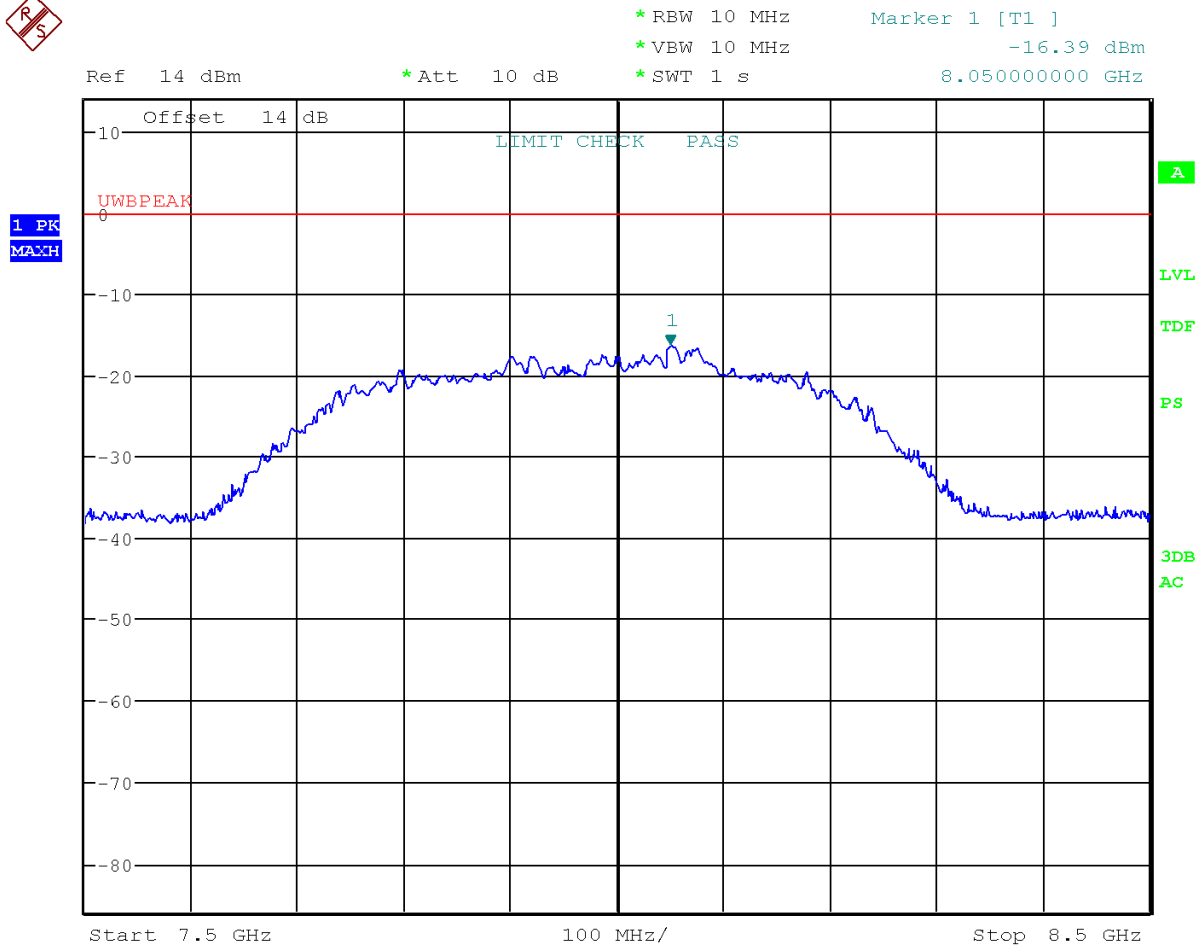
Note: Offset value is equal to $20 \cdot \log(50\text{MHz}/10\text{MHz})$



Date: 20.NOV.2020 11:56:06

Peak Power per 50MHz - Horizontal

Note: Offset value is equal to $20 \cdot \log(50\text{MHz}/10\text{MHz})$



Date: 23.NOV.2020 10:58:09

7.7 Data Table

7.7.1 Channel 5

Tested Frequency	Polarity	Corrected Value 50 MHz RBW dBm	Limit, dBm 50 MHz RBW	Result
6578	Horizontal	-0.28	0	Compliant
6426	Vertical	-0.18	0	Compliant

7.7.2 Channel 9

Tested Frequency	Polarity	Corrected Value 50 MHz RBW dBm	Limit, dBm 50 MHz RBW	Result
8050	Horizontal	-16.39	0	Compliant
8050	Vertical	-2.49	0	Compliant

8 Radiated emissions below 960 MHz

8.1 Test Result

Test Description	Reference		Test Result
Radiated emissions below 960 MHz	15.519(c)	15.209 RSS-220, S3.4	Compliant

8.2 Test Method

Test method: ANSI C63.10, Clause 10.2

The initial scans were performed over the frequency range as indicated in the tables below using the max hold function and incorporating a Peak detector and using TILE! software. The final test data was measured using a Quasi-Peak detector. The receiver's resolution bandwidth was set to 120 kHz for measurements taken in the 30MHz to 1GHz frequency range. Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency. The radiated measurements were recorded and compared to the limits indicated in the table below.

Radiated emissions limit below 1 GHz		
Frequency Range(MHz)	Limit(QP dBμV/m)	Distance
30 – 88	40	3m
88 – 216	43.5	3m
216 – 960	46	3m

8.3 Test Site

10m Absorber Lined Shielded Enclosure, SGS EMC Laboratory, Suwanee, GA

Environmental Conditions	Nov 10	Nov 19
Temperature:	22.6 °C	23.3 °C
Relative Humidity:	46.8 %	40.1 %

8.4 Test Equipment

30-1000MHz

Test End Date: 10-Nov-2020

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Oct-2020	28-Oct-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-276	TELEDYNE STORM MICROWAVE	20114	2-Mar-2020	2-Mar-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-354	TELEDYNE STORM MICROWAVE	20119	2-Mar-2020	2-Mar-2021
RF CABLE	SUCOFLEX 100	Huber & Suhner	B108523	3-Sep-2020	3-Sep-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-118	TELEDYNE STORM MICROWAVE	20126	2-Mar-2020	2-Mar-2021

Software: "Radiated Emissions 30-1000Mhz" TILE! profile dated Oct 2020

9kHz-30MHz

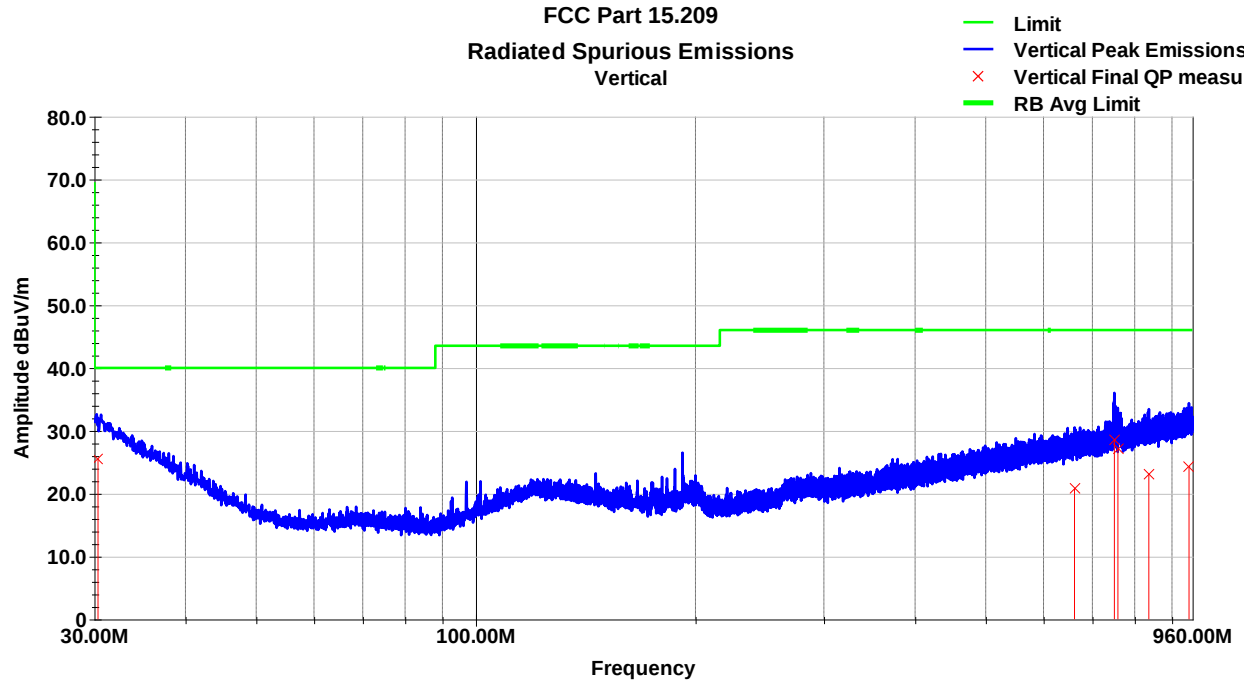
Test End Date: 19-Nov-2020

Tester: ZH

Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	6-Apr-2020	6-Apr-2021
ANTENNA, LOOP, ACTIVE	6502	ETS Lindgren	B085752	20-Aug-2020	20-Aug-2022
RF Cable Nm to Nm, 0.01-18GHz	90-195-276	TELEDYNE STORM MICROWAVE	20114	2-Mar-2020	2-Mar-2021
RF CABLE	SF106	HUBER & SUHNER	B079713	3-Sep-2020	3-Sep-2021
RF Cable Nm to Nm, 0.01-18GHz	90-195-118	TELEDYNE STORM MICROWAVE	20126	2-Mar-2020	2-Mar-2021

8.5 Test Data – Channel 5

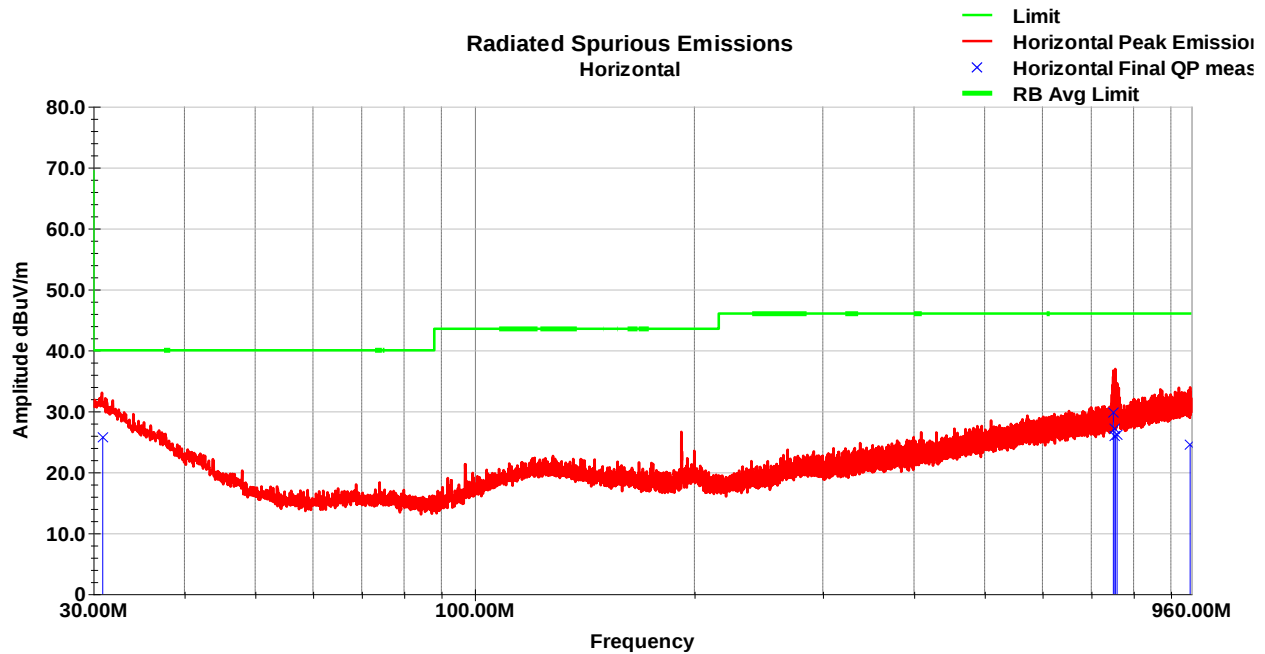
(X-axis highest emissions)
Vertical Radiated Emissions Plot



Vertical Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.35	31.9	V	355.0	325.0	21.9	6.5	34.7	25.6	40.0	-14.4
661.73	26.2	V	208.0	175.0	20.5	9.1	35.0	20.8	46.0	-25.2
750.32	33.1	V	186.0	267.0	21.2	9.4	35.0	28.6	46.0	-17.4
758.69	31.5	V	307.0	347.0	21.3	9.4	35.0	27.2	46.0	-18.8
836.56	26.2	V	141.0	312.0	22.4	9.6	35.0	23.1	46.0	-22.9
949.66	26.2	V	186.0	186.0	23.3	9.8	35.0	24.3	46.0	-21.7
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Emissions Plot

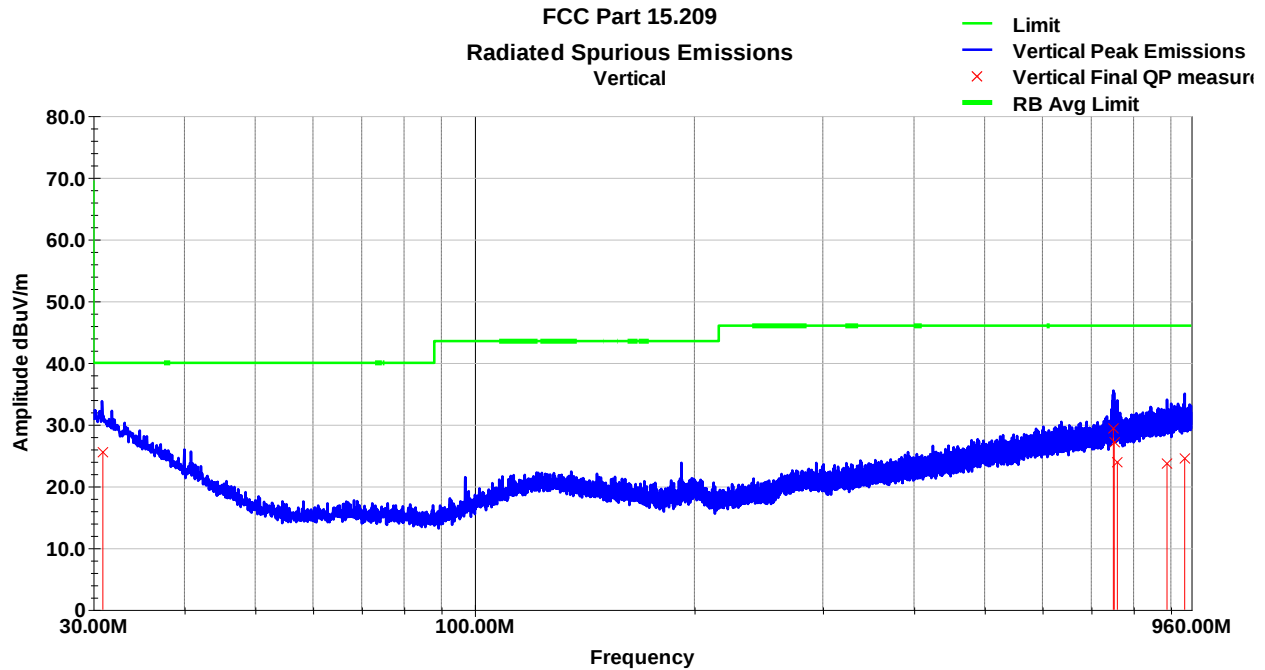


Horizontal Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.91	32.4	H	21.0	102.0	21.4	6.5	34.7	25.7	40.0	-14.3
750.64	34.2	H	173.0	243.0	21.2	9.4	35.0	29.8	46.0	-16.3
754.39	31.5	H	270.0	150.0	21.2	9.4	35.0	27.1	46.0	-18.9
755.20	30.3	H	343.0	119.0	21.2	9.4	35.0	25.9	46.0	-20.1
759.52	30.4	H	332.0	121.0	21.3	9.4	35.0	26.1	46.0	-19.9
956.31	26.2	H	292.0	392.0	23.4	9.8	35.0	24.5	46.0	-21.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

8.6 Test Data – Channel 9

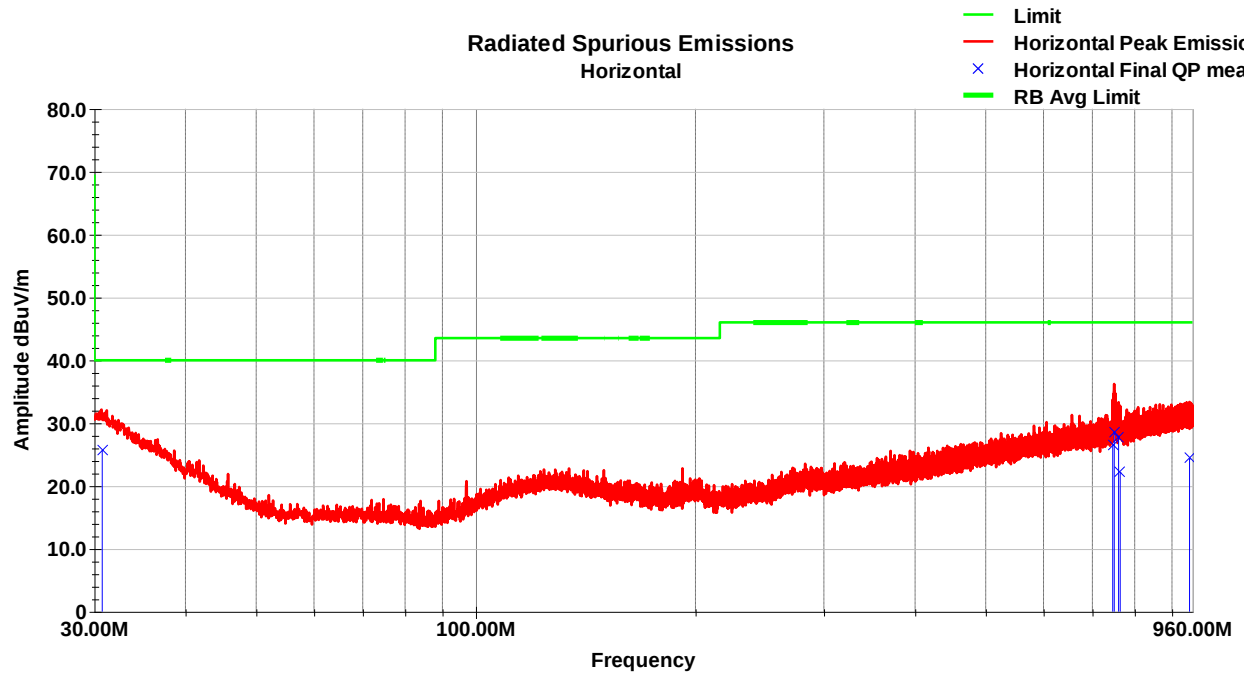
(Z-axis highest emissions)
Vertical Radiated Emissions Plot



Vertical Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.92	32.3	V	216.0	284.0	21.4	6.5	34.7	25.6	40.0	-14.4
750.49	33.7	V	187.0	155.0	21.2	9.4	35.0	29.3	46.0	-16.7
752.54	31.6	V	289.0	348.0	21.2	9.4	35.0	27.1	46.0	-18.9
760.17	28.3	V	250.0	151.0	21.3	9.4	35.0	24.0	46.0	-22.0
888.97	26.3	V	232.0	101.0	22.7	9.7	35.0	23.7	46.0	-22.3
940.12	26.3	V	169.0	370.0	23.3	9.8	34.9	24.5	46.0	-21.5
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Emissions Plot

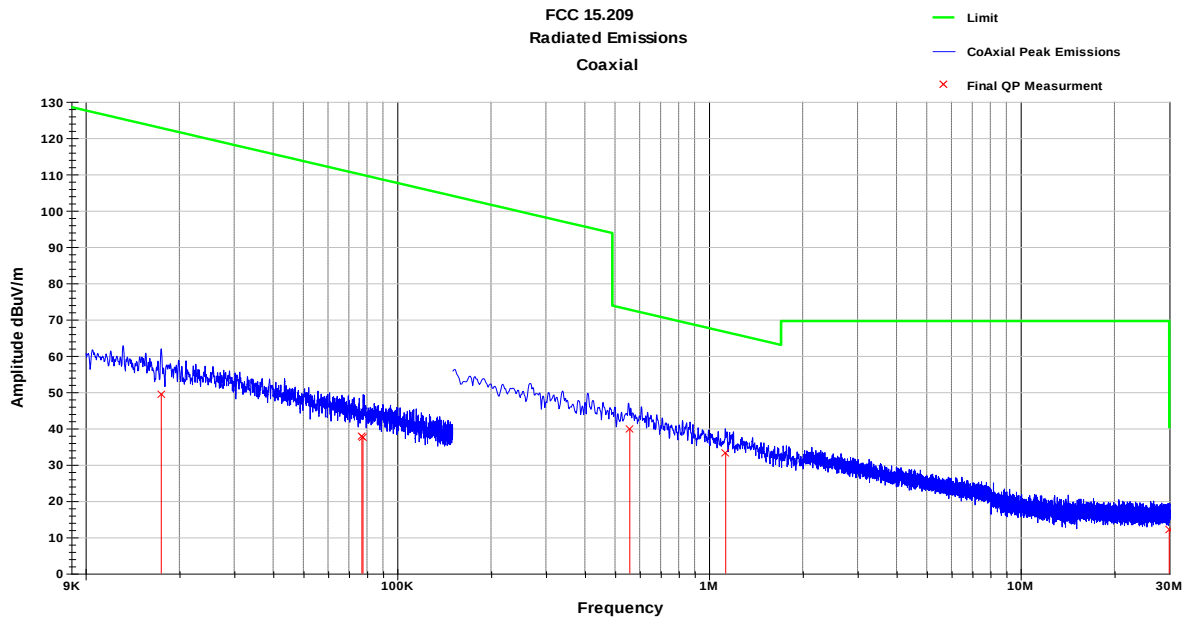


Horizontal Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.76	32.3	H	310.0	175.0	21.5	6.5	34.7	25.7	40.0	-14.3
746.35	31.0	H	156.0	106.0	21.2	9.4	35.0	26.6	46.0	-19.4
749.99	33.1	H	205.0	325.0	21.2	9.4	35.0	28.6	46.0	-17.4
760.43	32.1	H	139.0	247.0	21.3	9.4	35.0	27.8	46.0	-18.2
764.38	26.4	H	321.0	369.0	21.3	9.4	35.0	22.2	46.0	-23.8
951.12	26.2	H	233.0	175.0	23.3	9.8	35.0	24.4	46.0	-21.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

8.7 Test Data – 9kHz-30MHz

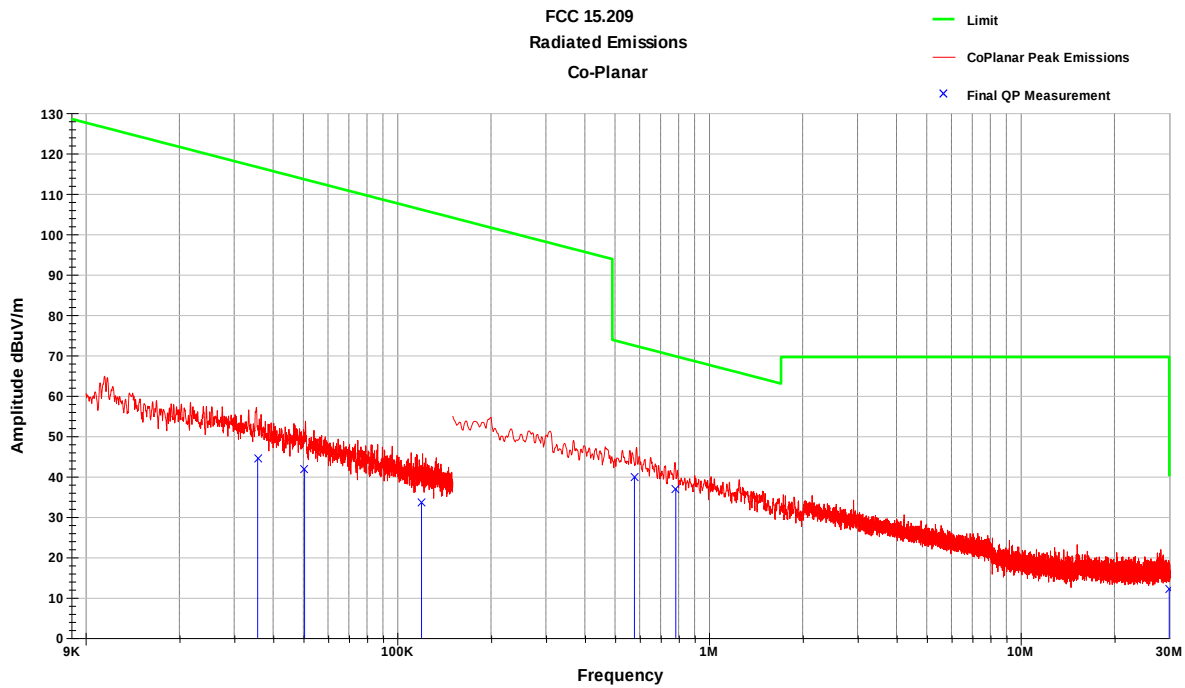
CoAxial Radiated Emissions Plot



CoAxial Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Azimuth (degrees)	Height (cm)	AF (dB)	CL (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
0.02	33.8	239.0	100.0	16.0	0.0	50.0	123.0	-73.0
0.08	26.2	102.0	100.0	12.0	0.0	38.0	110.0	-72.0
0.08	25.8	96.0	100.0	12.0	0.0	37.0	110.0	-72.0
0.56	28.6	64.0	100.0	11.3	0.1	40.0	72.7	-32.7
1.13	21.7	291.0	100.0	11.5	0.1	33.3	66.5	-33.3
29.99	3.4	348.0	100.0	8.2	0.5	12.2	69.5	-57.4
QP Value = Level + AF + CL - Amp								
Margin = QP Value - Limit								

CoPlanar Radiated Emissions Plot



CoPlanar Radiated Emissions Data

Frequency MHz	Raw QP (dBuV)	Azimuth (degrees)	Height (cm)	AF (dB)	CL (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
0.04	31.1	29.0	100.0	13.4	0.1	44.5	116.6	-72.1
0.05	29.6	277.0	100.0	12.0	0.1	41.7	113.5	-71.9
0.12	22.1	359.0	100.0	11.3	0.1	33.4	106.0	-72.6
0.58	28.4	321.0	100.0	11.3	0.1	39.8	72.4	-32.6
0.78	25.5	154.0	100.0	11.3	0.1	36.9	69.7	-32.8
29.99	3.5	19.0	100.0	8.2	0.5	12.2	69.5	-57.4
QP Value = Level + AF + CL - Amp								
Margin = QP Value - Limit								

9 Conducted Emissions

9.1 Test Result

Test Description	Test Specification		Test Result
Conducted Emissions	15.107, 15.207	RSS-GEN S8.8	Compliant

9.2 Test Method

Test Method: ANSI C63.10, Clause 6.2

With the receiver's resolution bandwidth set to 9 kHz the initial preliminary exploratory scans were performed over the measuring frequency range (0.15MHz to 30MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)	Class B Limits (dBuV)
0.15 to 0.5 MHz	Avg 66 QP 79	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 60 QP 73	Avg 46 Pk 56
5 to 30 MHz	Avg 60 QP 73	Avg 50 Pk 60

9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions 09 Nov 2020
Temperature: 22.6 °C
Relative Humidity: 46.8 %

9.4 Test Equipment

Test Date: 9-Nov-2020

Tester: PL

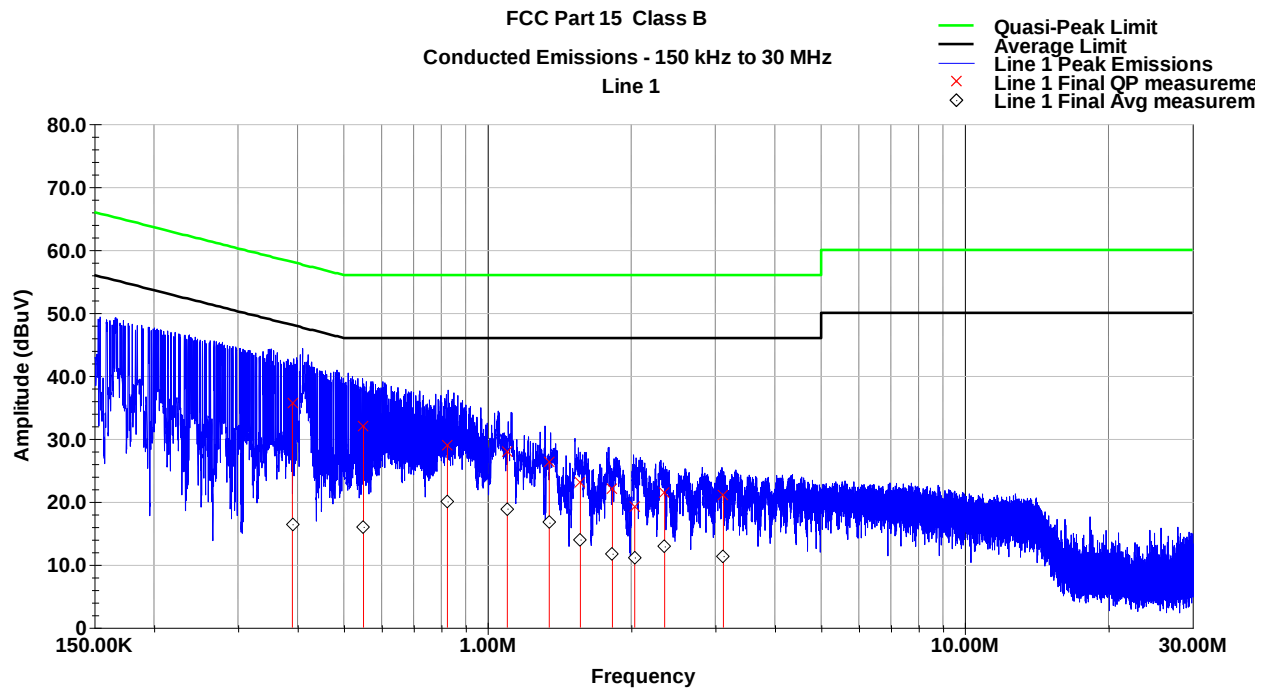
Equipment	Model	Manufacturer	Asset Number	Cal Date	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	7-May-2020	7-May-2021
RF CABLE	UC-N-MM-78	MAURY MICROWAVE	17017	3-Sep-2020	3-Sep-2021
CONDUCTED COMB GENERATOR	CGC-255	Com-Power Corporation	B079696	CNR	CNR

Software:

"Conducted Emissions" TILE! profile dated Oct 2020

9.6 Test Data

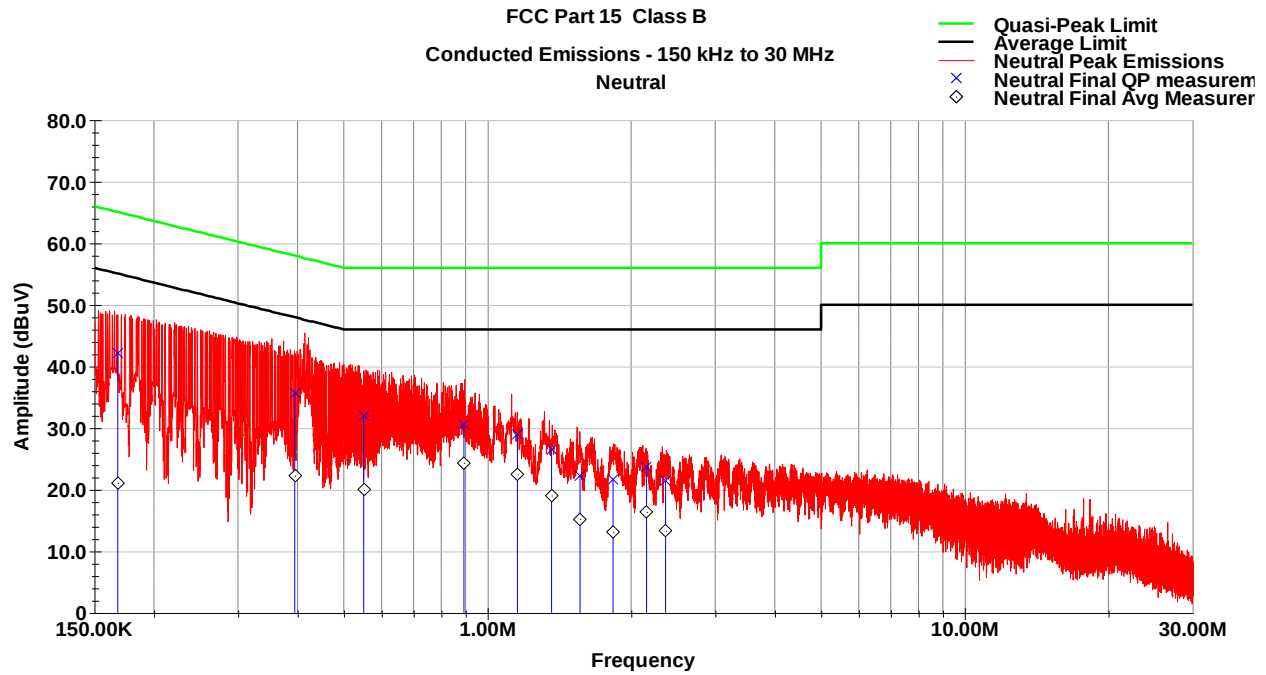
Line 1 Conducted Emissions Plot



Line 1 Conducted Emissions Data

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.390	35.6	58.1	-22.5	16.4	48.1	-31.7
0.550	32.0	56.0	-24.0	16.0	46.0	-30.0
0.824	29.1	56.0	-26.9	20.1	46.0	-25.9
1.100	28.0	56.0	-28.0	18.9	46.0	-27.1
1.347	26.3	56.0	-29.7	16.7	46.0	-29.3
1.565	23.1	56.0	-32.9	14.0	46.0	-32.0
1.827	22.2	56.0	-33.8	11.8	46.0	-34.2
2.034	19.2	56.0	-36.8	11.2	46.0	-34.8
2.350	21.5	56.0	-34.5	12.9	46.0	-33.1
3.121	21.0	56.0	-35.0	11.4	46.0	-34.6

Neutral Conducted Emissions Plot



Neutral Conducted Emissions Data

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.168	42.1	65.1	-22.9	21.1	55.1	-34.0
0.395	35.6	58.0	-22.4	22.3	48.0	-25.7
0.550	32.0	56.0	-24.0	20.0	46.0	-26.0
0.892	30.6	56.0	-25.4	24.4	46.0	-21.6
1.155	29.0	56.0	-27.0	22.5	46.0	-23.5
1.362	26.5	56.0	-29.5	19.1	46.0	-26.9
1.563	22.2	56.0	-33.8	15.2	46.0	-30.8
1.833	21.7	56.0	-34.3	13.1	46.0	-32.9
2.155	23.6	56.0	-32.4	16.4	46.0	-29.6
2.362	21.5	56.0	-34.5	13.3	46.0	-32.7

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	12 January 2021
1	Updated RSS 220 Subclass in section 2.3	12 February 2021