

EMC Test Report

Project Number: 4476045**Proposal Number: 8918****Report Number: 4476045EMC01****Revision Level: 1****Client: Catapult Sports Pty Ltd****Equipment Under Test: UWB Data Collection Device****Model Number: VR7401****FCC ID: 2ADAL-VR7401****Applicable Standards: FCC Part 15, Subpart F****ANSI C63.10:2013****Report issued on: 18 July 2019****Test Result: Compliant**

Tested by:


Brandon Osborn, Project Engineer

Reviewed by:


David Schramm, Operations 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

Reference	Description	Test Result
15.517(a)(5)	Transmission Timing	Compliant
15.517(b)	10dB bandwidth contained within 3100 to 10600 MHz	Compliant
15.503(d)	10dB bandwidth greater than 500 MHz	Compliant
15.517(c)	Radiated emissions above 960 MHz	Compliant
15.517(d)	Radiated emissions in GPS receive band	Compliant
15.517(e)	Peak emission in a 50 MHz bandwidth	Compliant
15.517(c)	Radiated emissions below 960 MHz per 15.209	Compliant
15.207	Conducted emissions	Compliant

1.1 Modifications Required to Compliance

None

2 General Information

2.1 *Client Information*

Name: Catapult Sports Pty Ltd
Address: 75-83 High St
City, Zip, Country: Prahran, 3181, Australia

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: VR7401
Serial Number: EUT1
Marketing Name: S7 Vector Anchor

Voltage: 3.7 VDC, 5000mA; 5 VDC (USB)

Sample Received Date: 29 May 2019

Dates of testing: 14-20 June 2019 and 18 July 2019

2.4 *Operating Modes and Conditions*

Manufacturer provided software to interface and control the EUT to transmit continuously, on channel 2, and a selected power level. RF power level was set as described in the Technical Description exhibit.

EUT was tested in Flat and Upright positions. This report contains worst case data.

3 UWB Bandwidth requirements

3.1 Test Result

Test Description	Reference	Test Result
10dB bandwidth contained within 3100 MHz and 10,600 MHz	15.517(b)	Compliant
10dB bandwidth greater than 500 MHz	15.503(d)	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 10,600 MHz.

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: 22.2°C

Relative Humidity: 56.4 %

3.4 Test Equipment

Test End Date: 17-Jun-2019

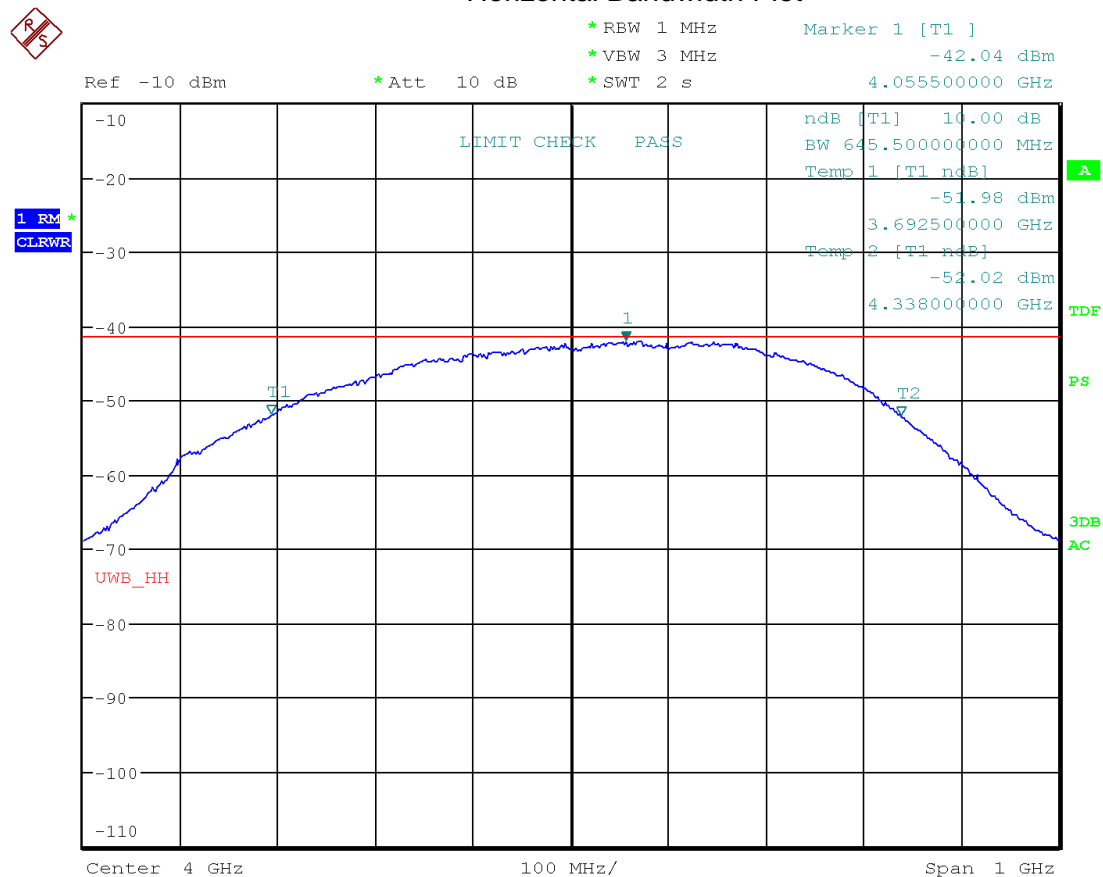
Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	10-Aug-2020

Note: The calibration period for this equipment is 1 year.

3.5 *Test Data*

Horizontal Bandwidth Plot



Date: 17.JUN.2019 14:19:23

3.6 *Data Table*

Bandwidth Results					
Antenna Polarity	Frequency 10dB below peak MHz	Frequency 10dB above peak MHz	10 dB bandwidth MHz	Bandwidth requirement >500 MHz	Detectors / RBW / VBW
Horizontal	3692.5	4338	645.5	Compliant	RMS 1MHz / 3MHz

Note: This measurement was the worst case.

4 Radiated emissions above 960 MHz

4.1 Test Result

Test Description	Reference	Test Result
Radiated emissions above 960 MHz	15.517(c)	Compliant

4.2 Test Method

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 in dBm
960–1610	-75.3
1610–1990	-53.3
1990–3100	-51.3
3100–10600	-41.3
Above 10600	-51.3

A measurement distance of 1 meter was determined to provide the optimum dynamic range. Because the limits are so low, some frequency ranges may have been scanned at a distance closer than 1 meter. The actual distance for final measurement was indicated in the measurement data.

4.3 Test Site

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

Environmental Conditions

Temperature: 22.2°C

Relative Humidity: 56.4 %

4.4 Test Equipment

Test End Date: 17-Jun-2019

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	10-Aug-2020
ANTENNA, HORN (SMALL)	LB-180400-20-C-KF	A-INFO	15007	30-Mar-2020
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2019
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	27-Jul-2019

Note: The equipment calibration period is 1 year.

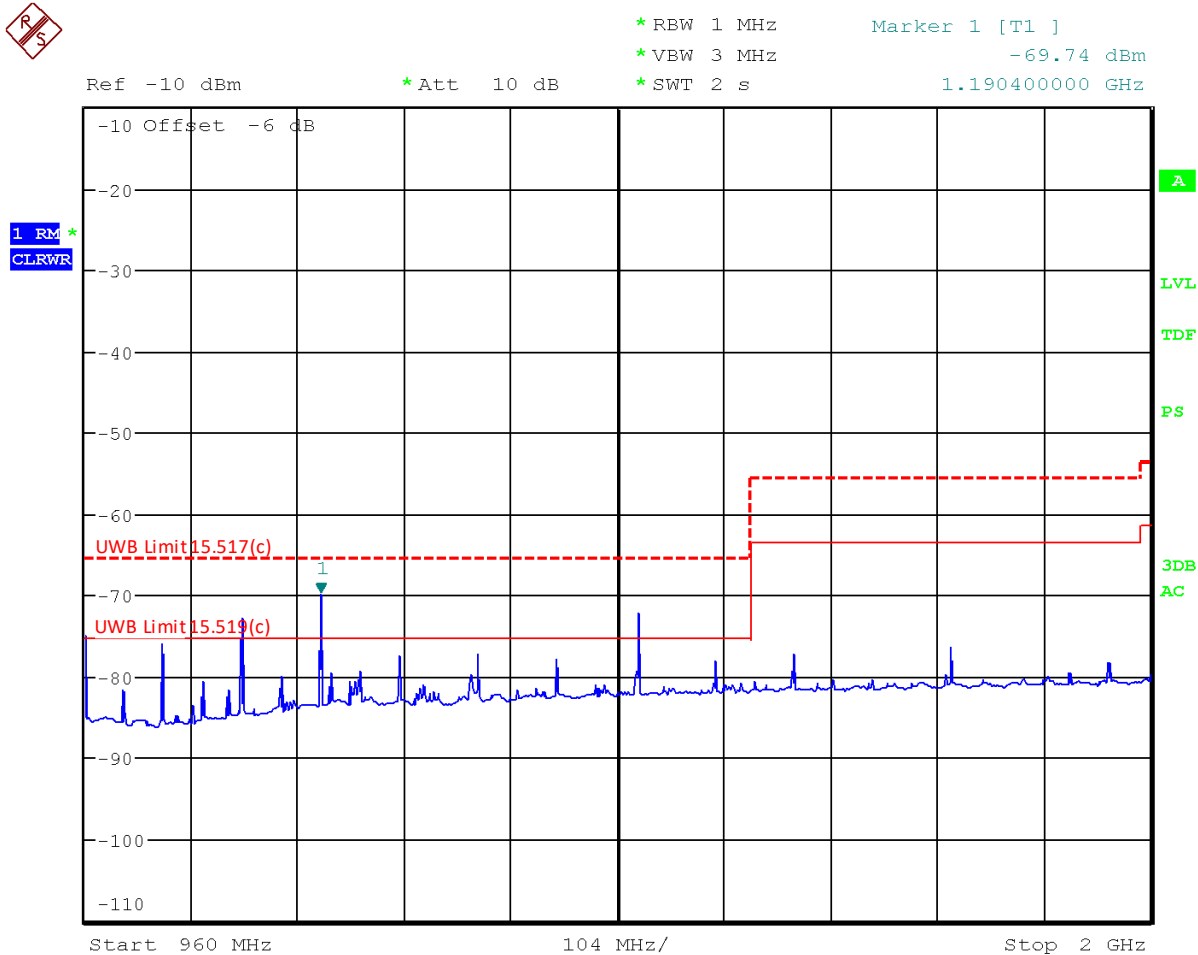
Software:

“Radiated Emissions 1-18GHz.TIL” TILE! profile dated Jul 2018

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

4.5 Test Data – Horizontal

Radiated Emissions (960MHz – 2GHz) – Horizontal
Test Distance = 0.5 meter



Date: 17.JUN.2019 16:16:30

Emissions are discrete CW signals unrelated to UWB. Significant reduction in UWB power levels cause no change in the amplitude of these emissions.

Radiated Emissions (2 GHz – 3.5GHz) – Horizontal Test Distance = 1 meter



*RBW 1 MHz Marker 1 [T1]
VBW 10 MHz -66.80 dBm
*SWT 3 s 3.498500000 GHz

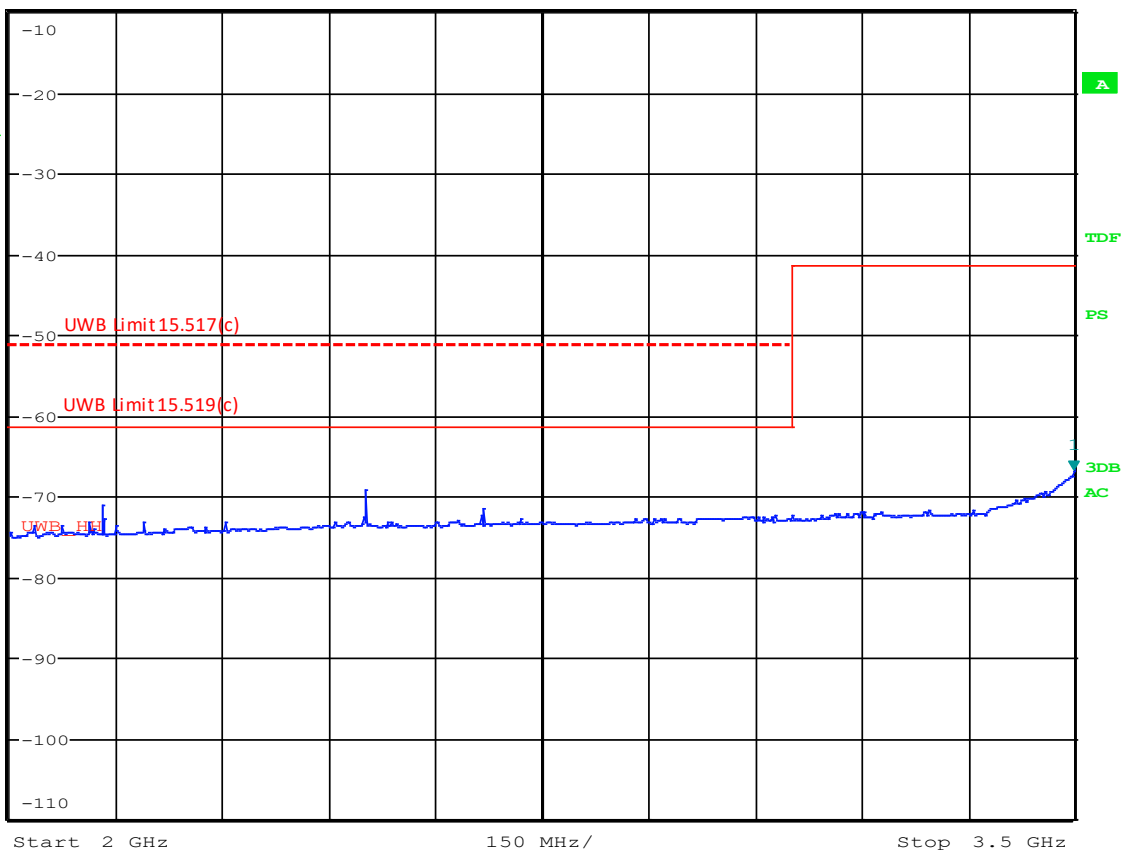
Ref -10 dBm

*Att 10 dB

*SWT 3 s

3.498500000 GHz

1 RM
CLRWR



Date: 20.JUN.2019 16:17:01

Radiated Emissions (3.5GHz – 4.5GHz) – Horizontal Test Distance = 1 meter



*RBW 1 MHz
*VBW 3 MHz
*SWT 2 s

Marker 1 [T1]
-42.04 dBm
4.055500000 GHz

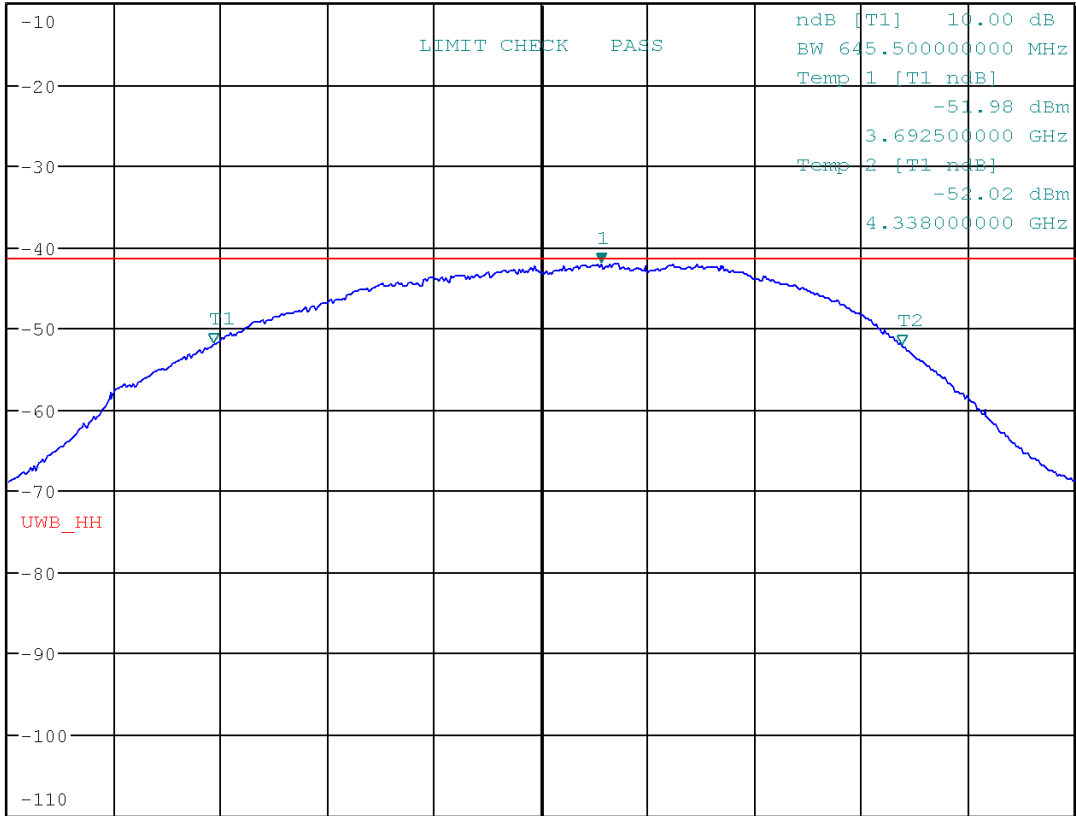
Ref -10 dBm

*Att 10 dB

*SWT 2 s

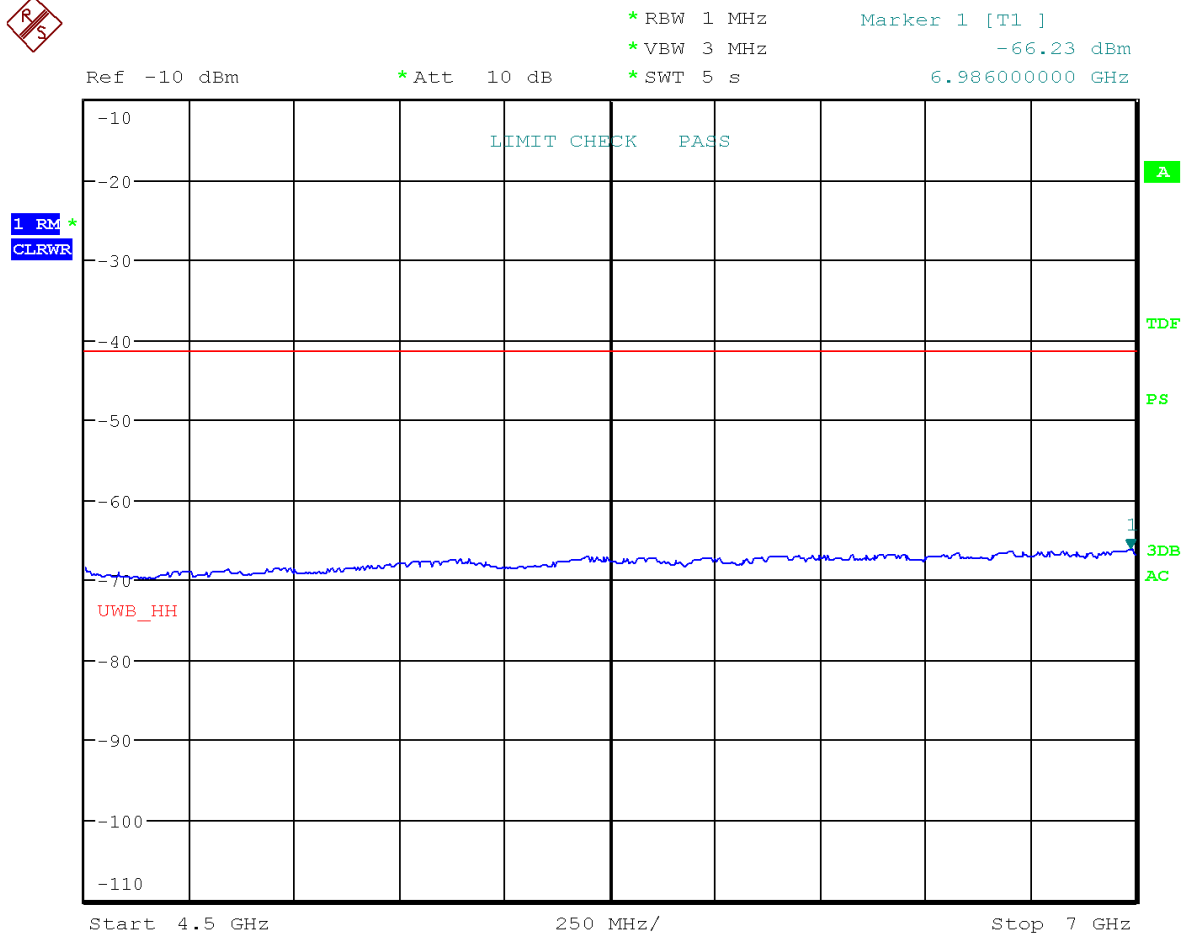
4.055500000 GHz

1 RM*
CLRWR



Date: 17.JUN.2019 14:19:23

Radiated Emissions (4.5GHz – 7GHz) – Horizontal Test Distance = 1 meter



Date: 17.JUN.2019 14:28:06

Radiated Emissions (7GHz – 11GHz) – Horizontal Test Distance = 1 meter



*RBW 1 MHz
*VBW 3 MHz
*SWT 8 s

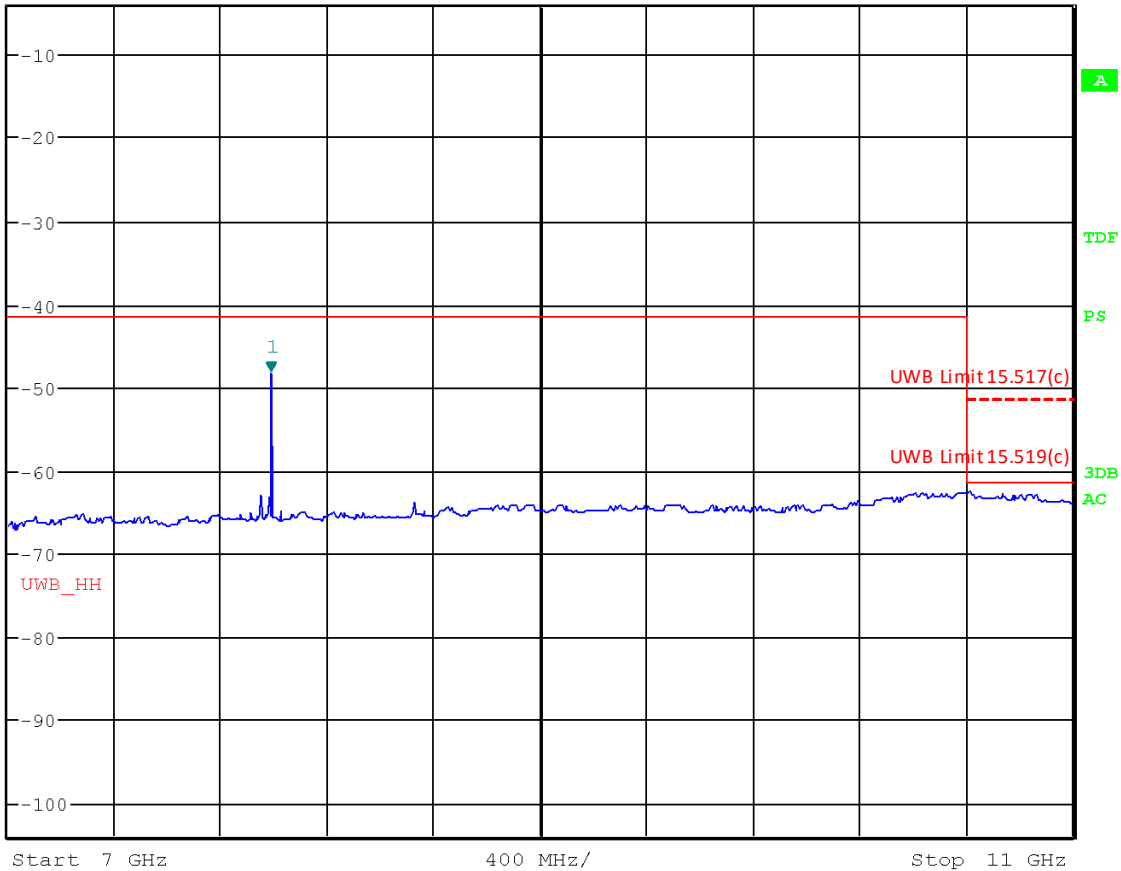
Marker 1 [T1]
-48.27 dBm
7.987000000 GHz

Ref -4 dBm

*Att 10 dB

7.987000000 GHz

1 RM
CLRWR



Date: 17.JUN.2019 17:18:28

Radiated Emissions (11GHz – 18GHz) – Horizontal Test Distance = 0.5 meter



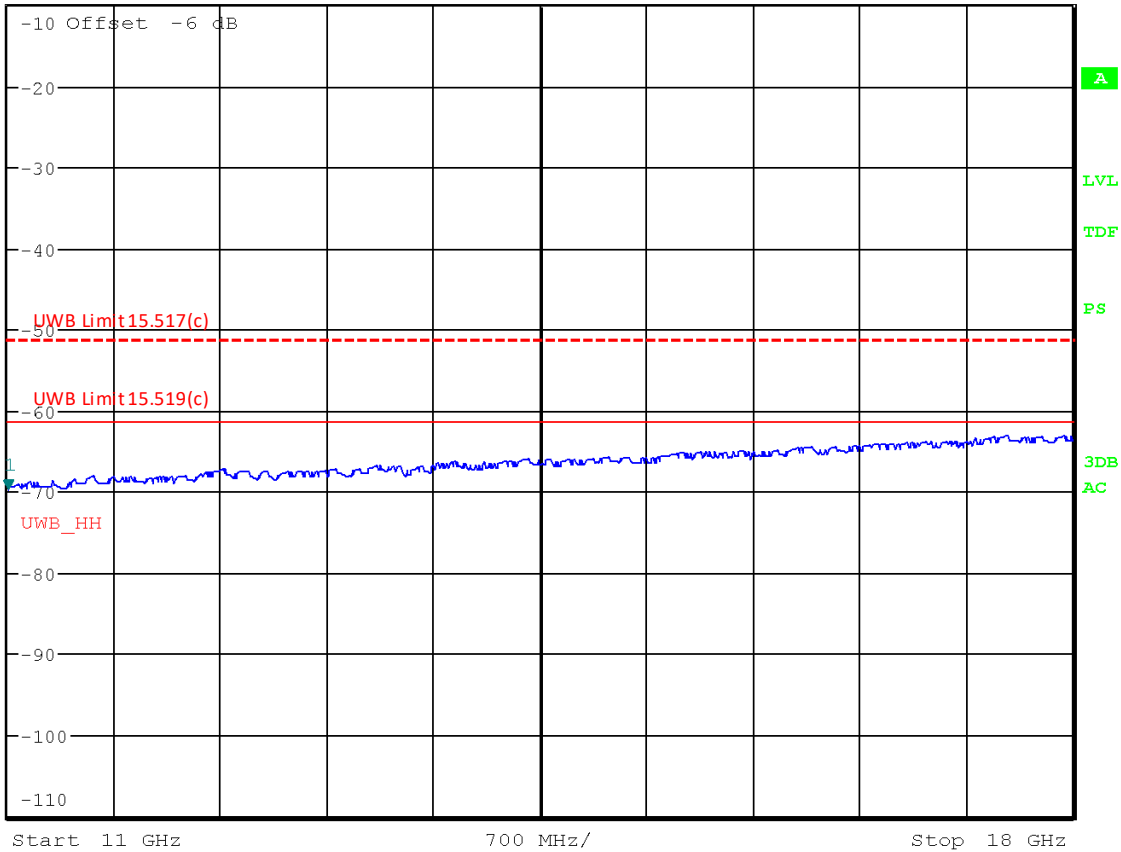
* RBW 1 MHz
* VBW 3 MHz
* SWT 18 s

Marker 1 [T1]
-69.67 dBm
11.000000000 GHz

Ref -10 dBm

* Att 10 dB

11.000000000 GHz



Date: 17.JUN.2019 15:48:25

Radiated Emissions (18GHz – 29GHz) – Horizontal Test Distance = 0.5 meter



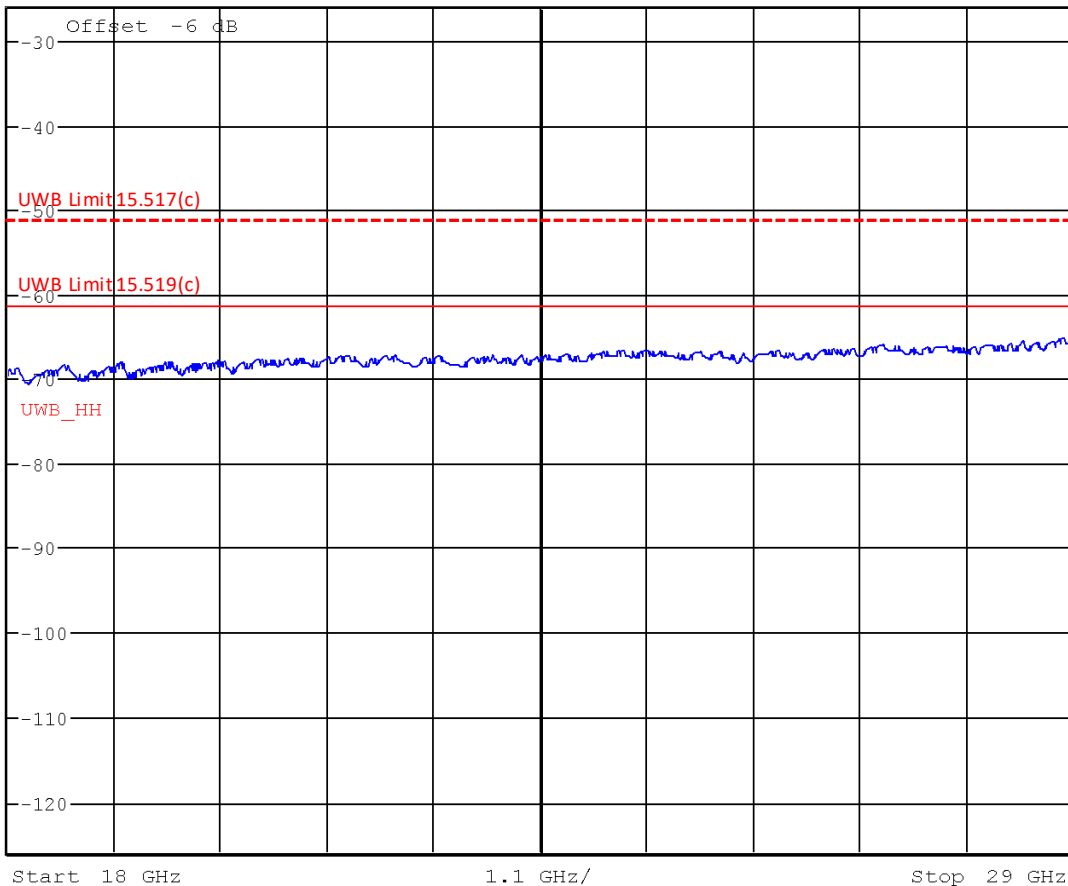
* RBW 1 MHz

* VBW 3 MHz

* SWT 22 s

Ref -26 dBm

* Att 10 dB



Date: 19.JUN.2019 09:02:28

Radiated Emissions (29GHz – 40GHz) – Horizontal Test Distance = 0.3 meter



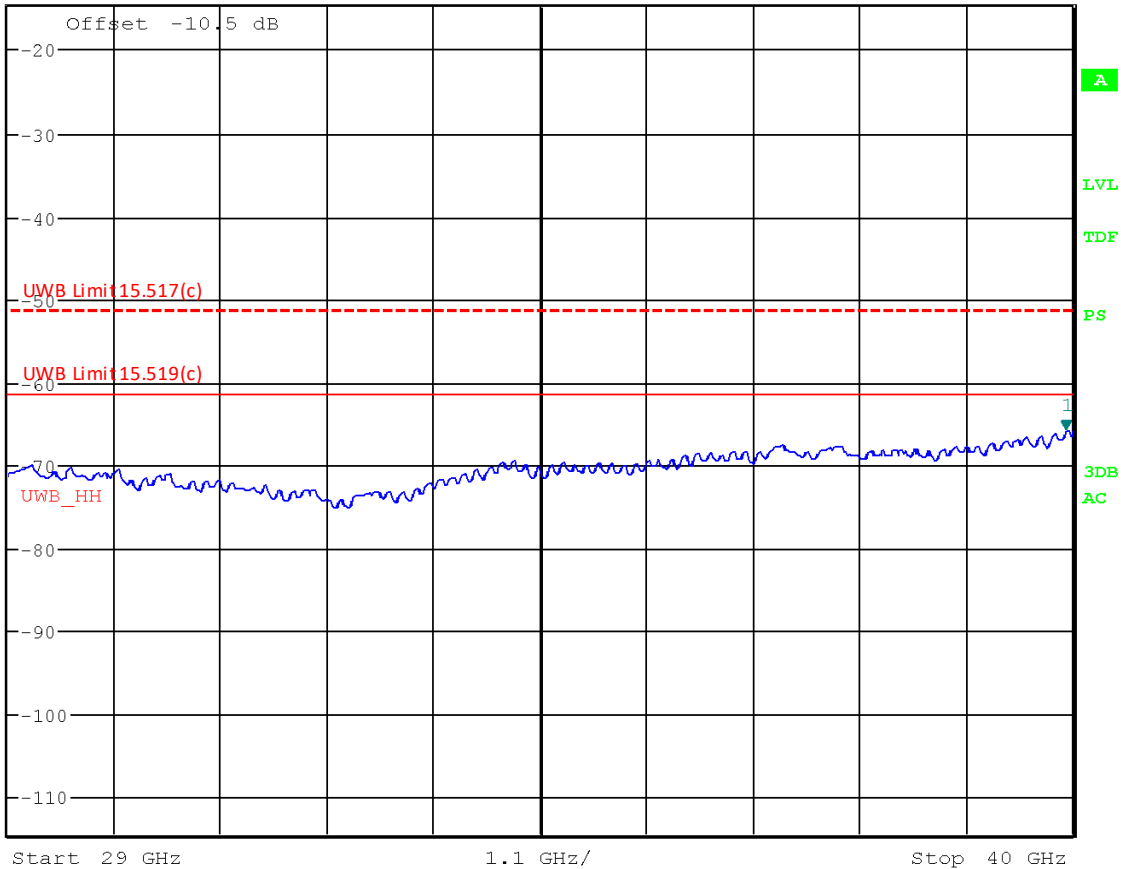
*RBW 1 MHz
*VBW 3 MHz
*SWT 22 s

Marker 1 [T1]
-65.84 dBm
39.928500000 GHz

Ref -14.5 dBm

*Att 10 dB

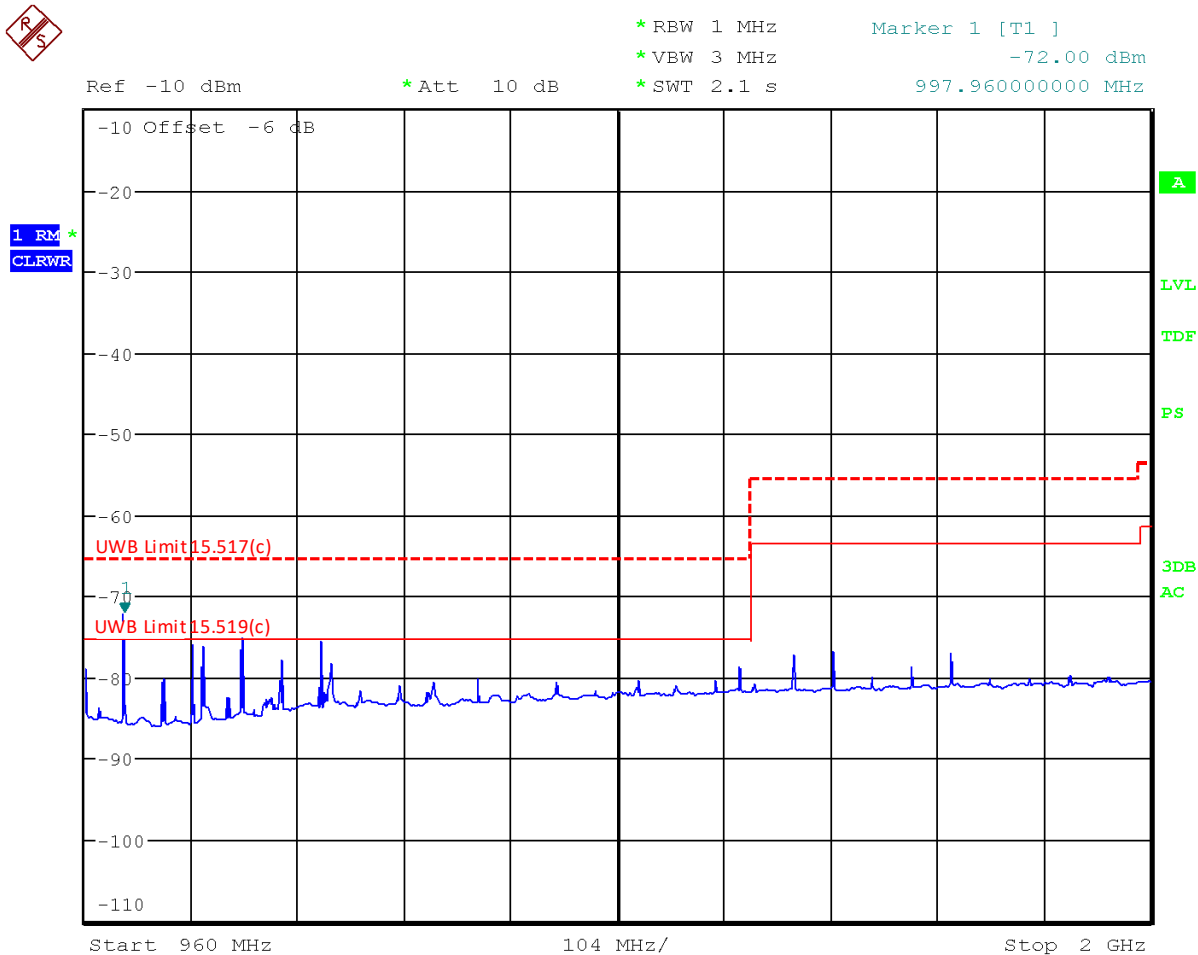
39.928500000 GHz



Date: 24.JUN.2019 12:41:45

4.6 Test Data – Vertical

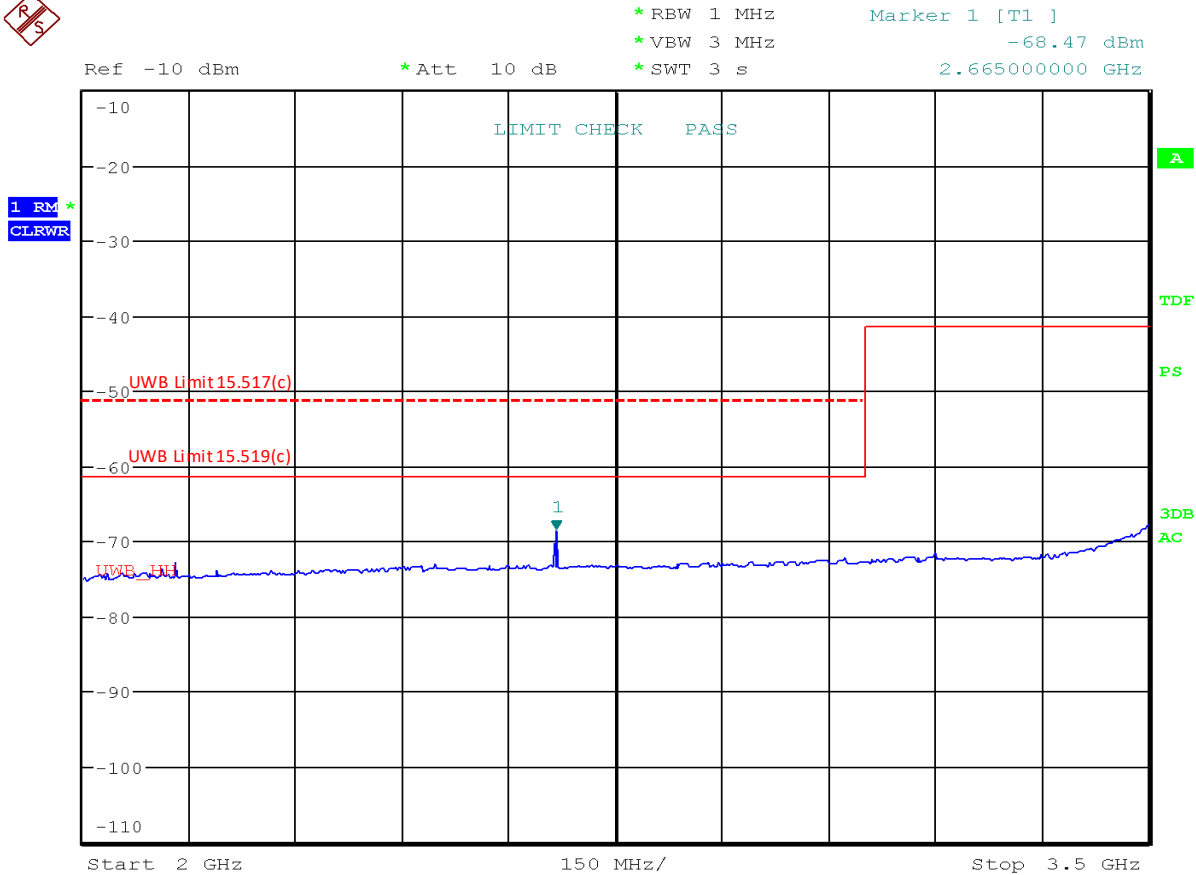
Radiated Emissions (960MHz – 2GHz) – Vertical Test Distance = 0.5 meter



Date: 17.JUN.2019 16:28:40

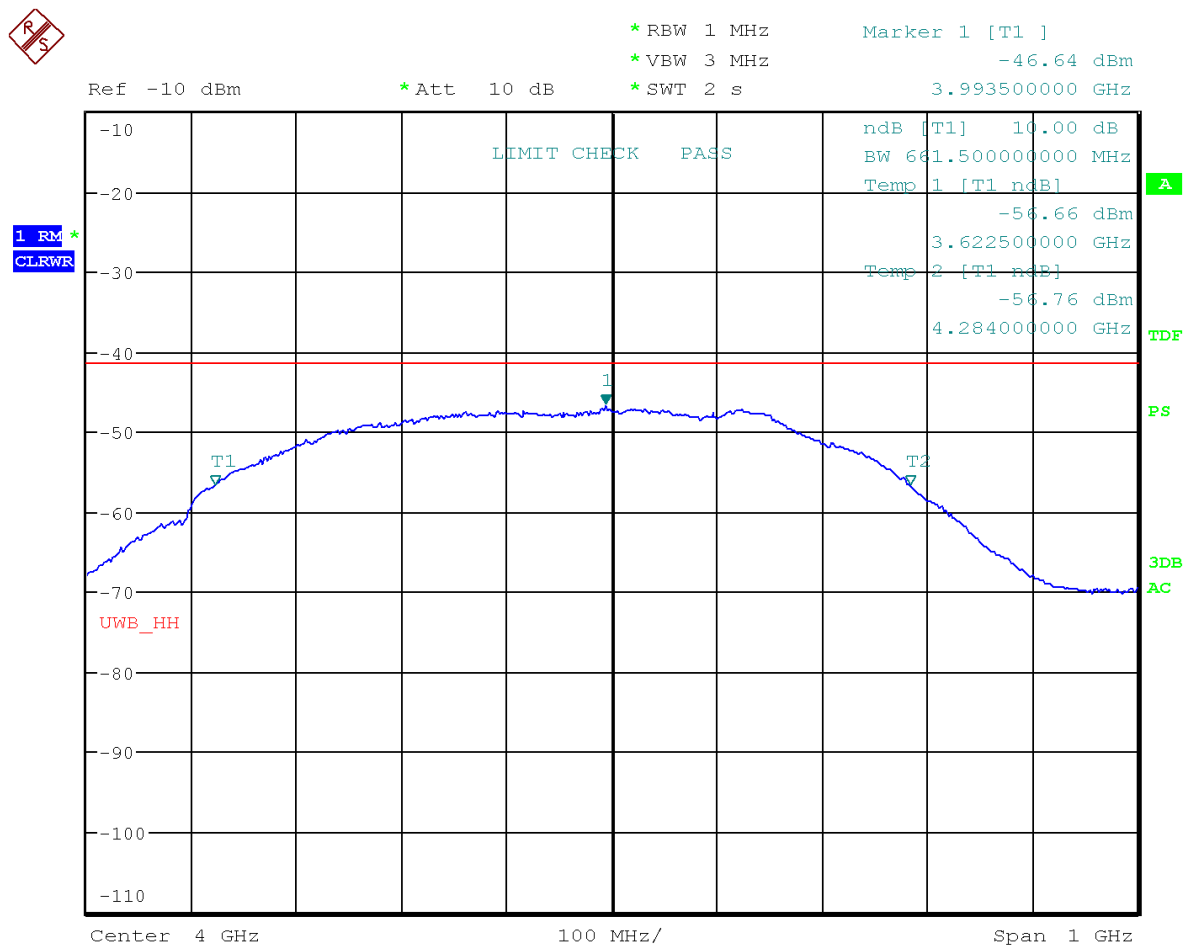
Emissions above limit are discrete CW signals unrelated to UWB. Significant reduction in UWB power levels cause no change in the amplitude of these emissions.

Radiated Emissions (2.0GHz – 3.5GHz) – Vertical Test Distance = 1 meter



Date: 17.JUN.2019 14:41:06

Radiated Emissions (3.5GHz – 4.5GHz) – Vertical
Test Distance = 1 meter



Date: 17.JUN.2019 14:38:12

Radiated Emissions (4.5GHz – 7.0GHz) – Vertical Test Distance = 1 meter



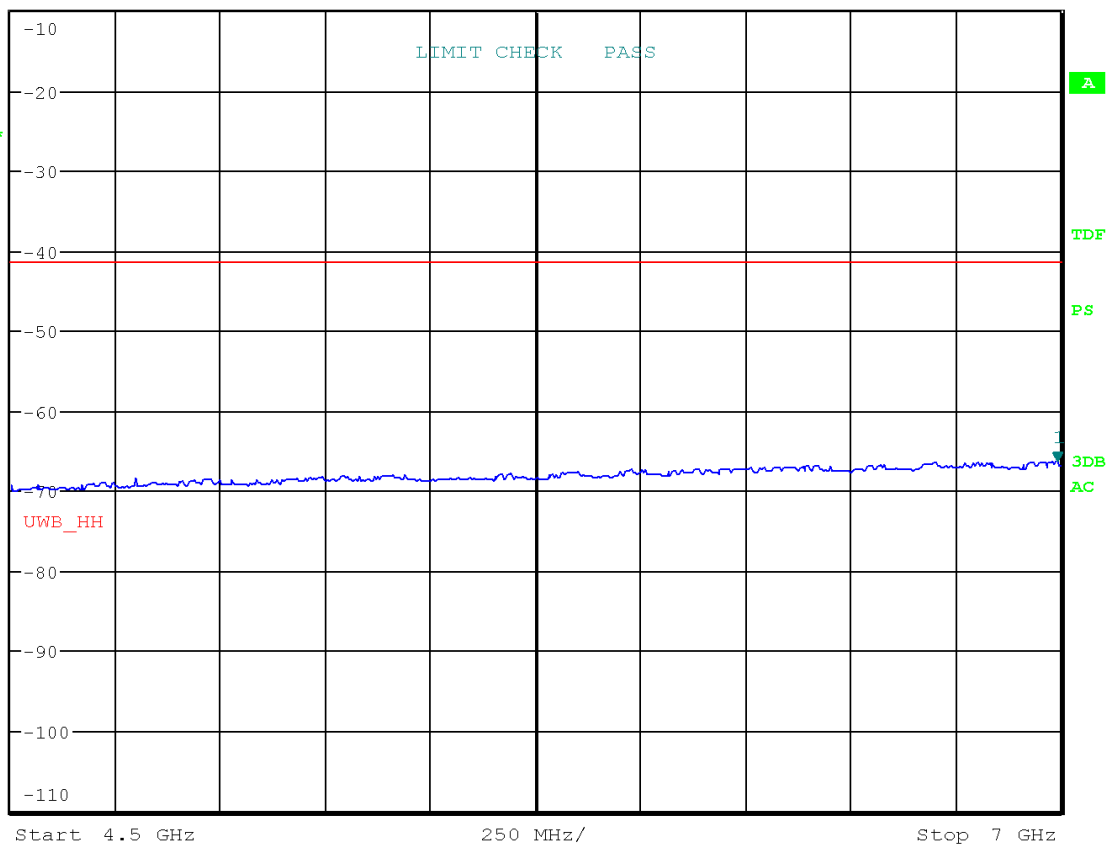
*RBW 1 MHz
*VBW 3 MHz
*SWT 5 s

Marker 1 [T1]
-66.38 dBm
6.990500000 GHz

Ref -10 dBm

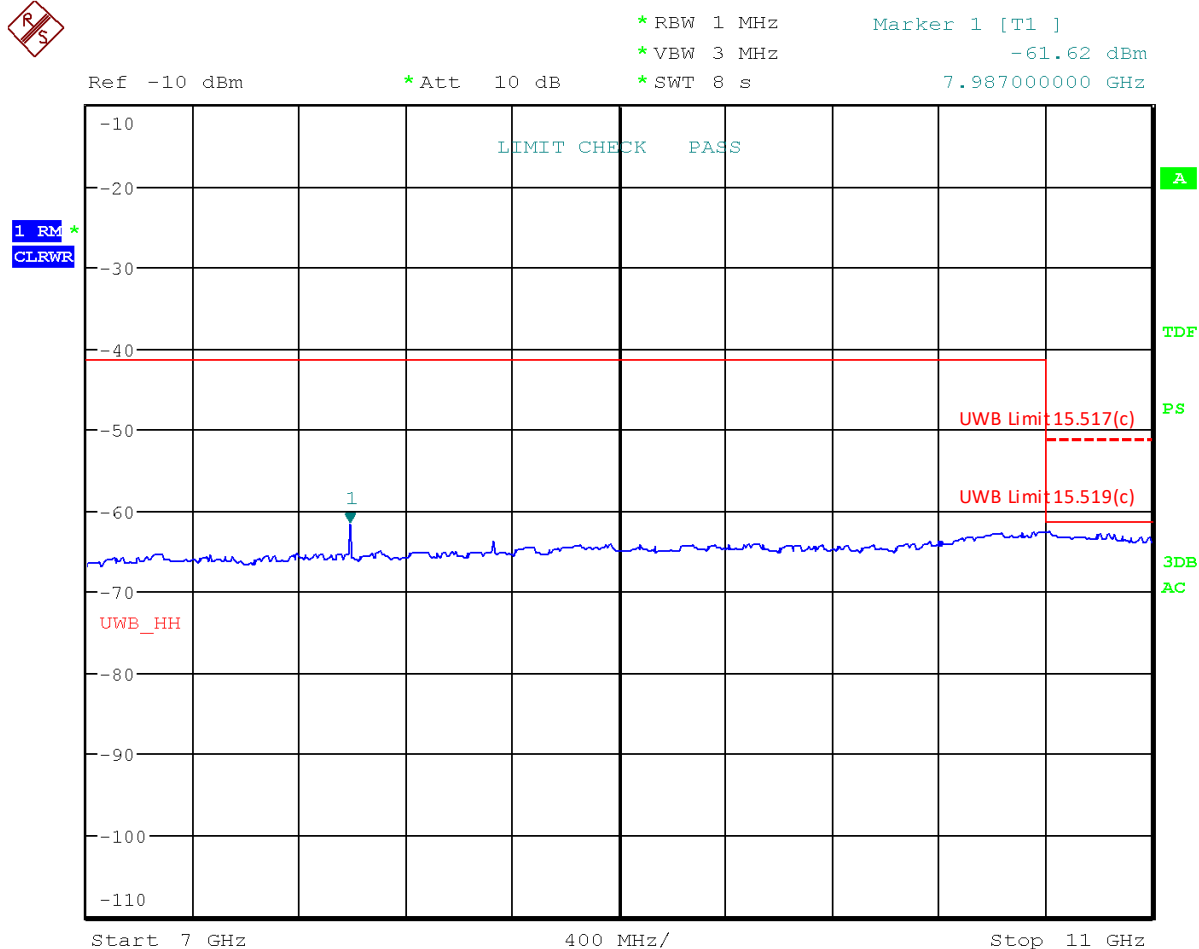
*Att 10 dB

1 RM*
CLRWR



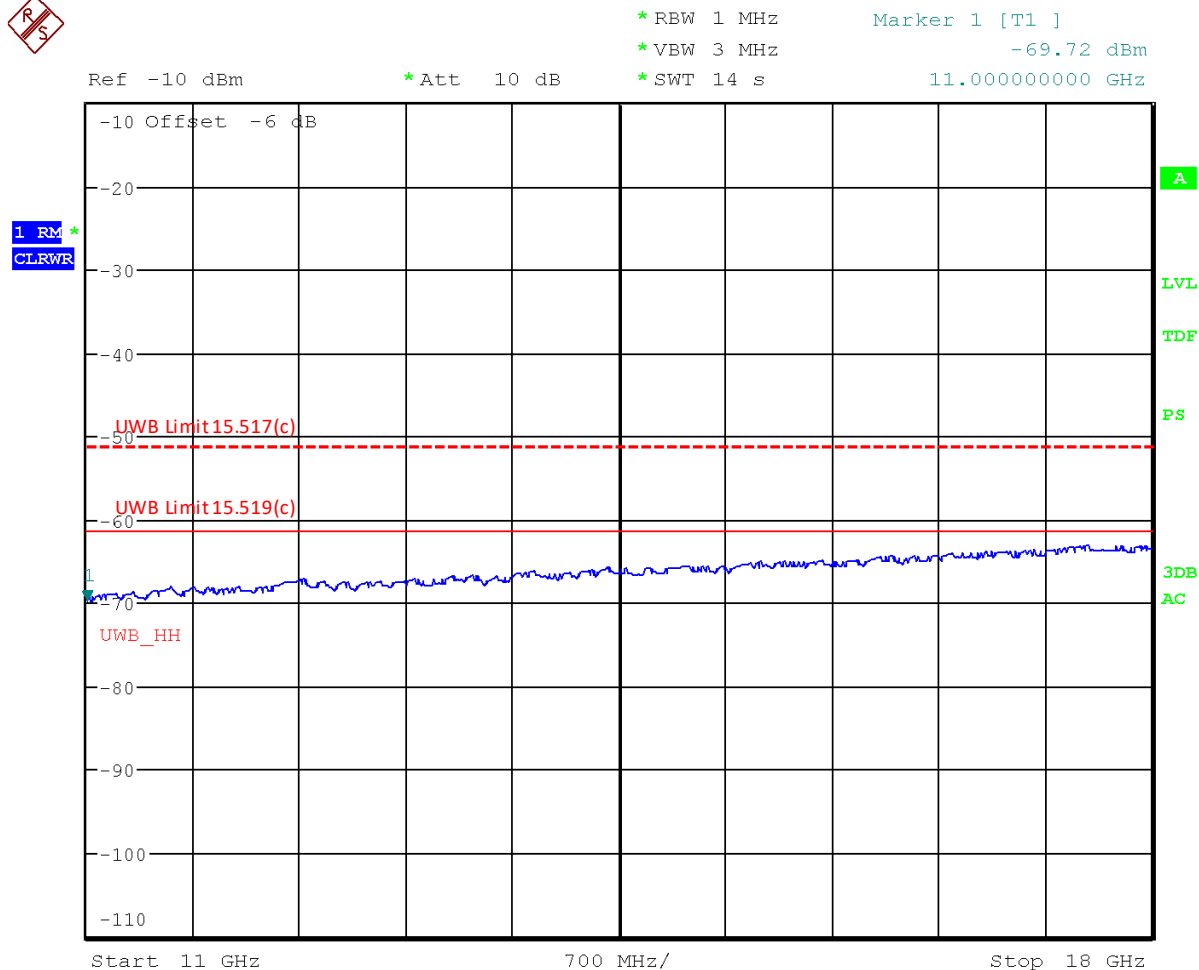
Date: 17.JUN.2019 14:44:38

Radiated Emissions (7GHz-11GHz) – Vertical Test Distance = 1 meter



Date: 17 JUN 2019 14:51:52

Radiated Emissions (11-18GHz) – Vertical Test Distance = 0.5 meter



Date: 17.JUN.2019 16:32:15

Radiated Emissions (18-29 GHz) – Vertical Test Distance = 0.5 meter



* RBW 1 MHz

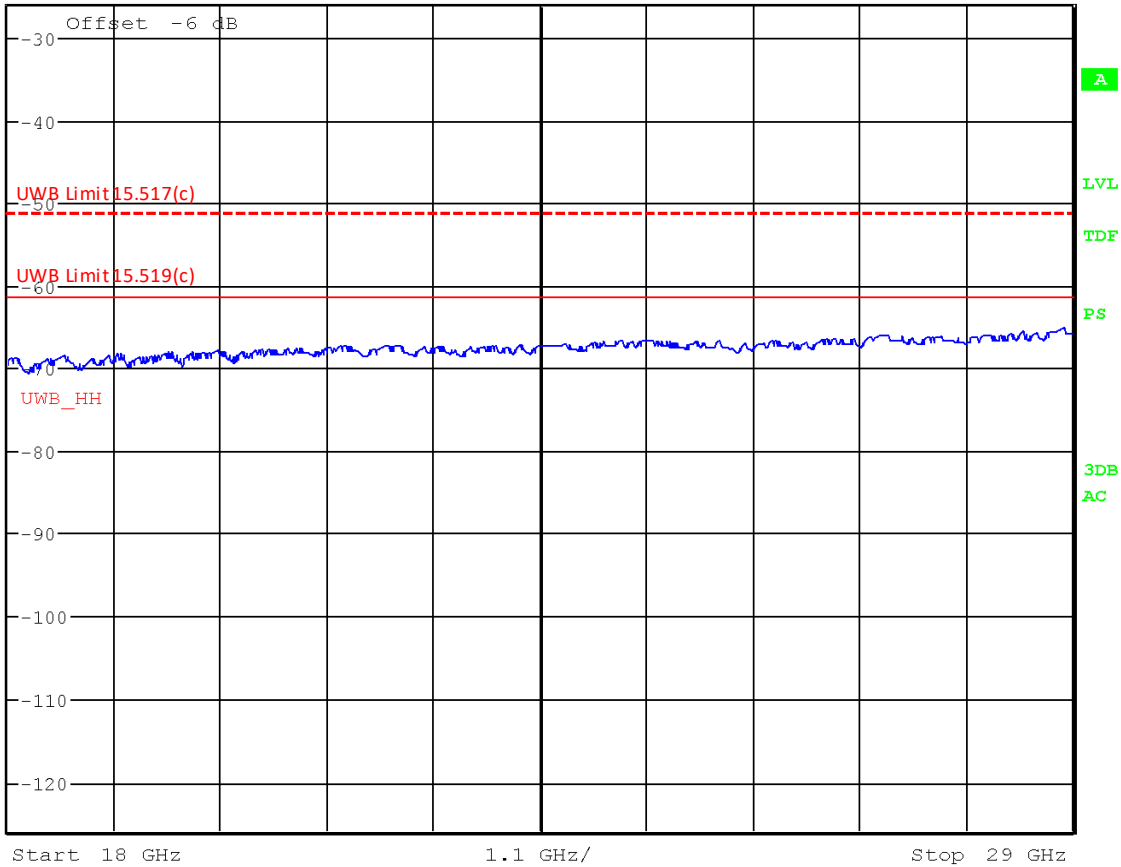
* VBW 3 MHz

* SWT 22 s

Ref -26 dBm

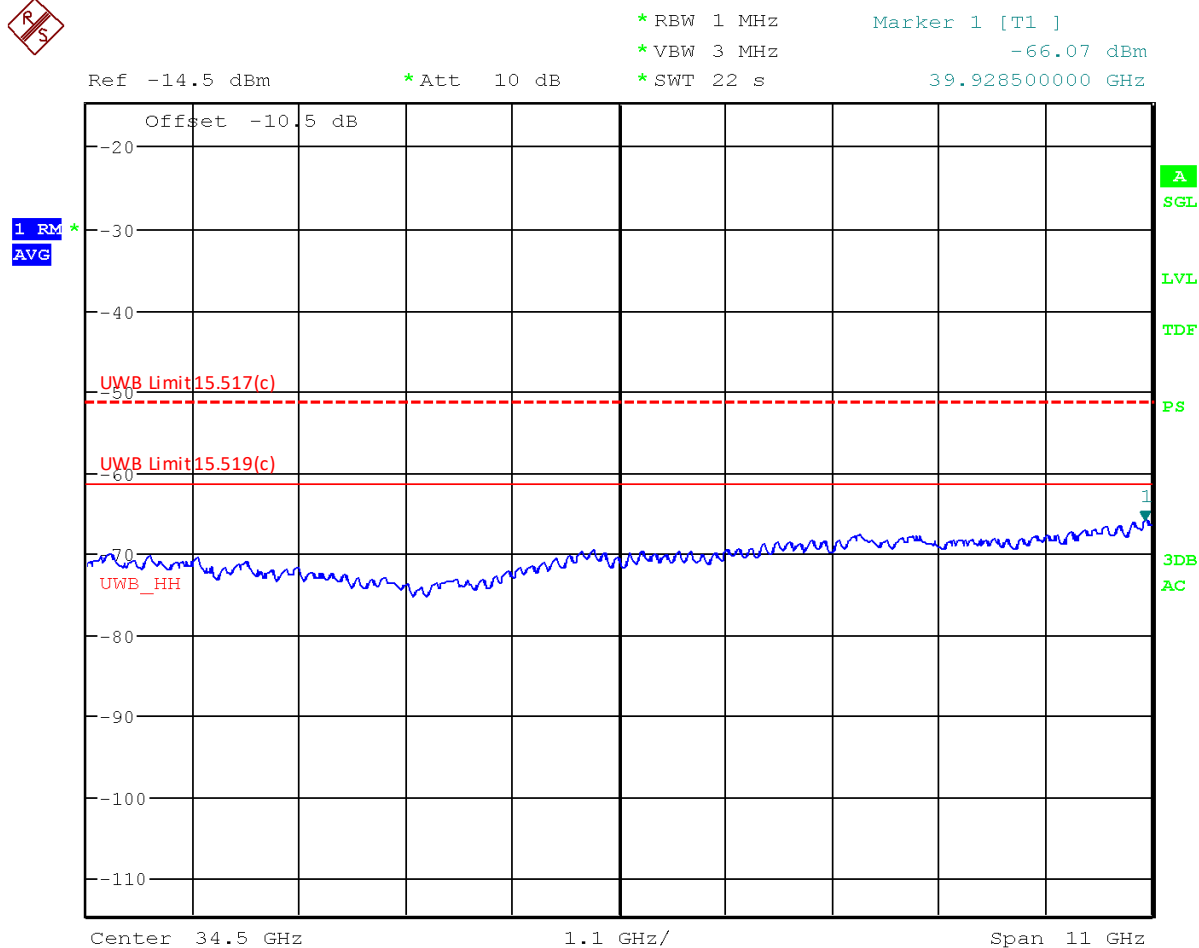
* Att 10 dB

1 RM*
CLRWR



Date: 19.JUN.2019 08:54:59

Radiated Emissions (29-40 GHz) – Vertical Test Distance = 0.3 meter



Date: 24.JUN.2019 12:49:24

5 Radiated emissions in GPS receive band

5.1 Test Result

Test Description	Reference	Test Result
Radiated emissions in GPS receive band	15.517(d)	Compliant

5.2 Test Method

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

5.3 Test Site

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

Environmental Conditions

Temperature: 22.2°C

Relative Humidity: 56.4 %

5.4 Test Equipment

Test End Date: 17-Jun-2019

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	10-Aug-2020

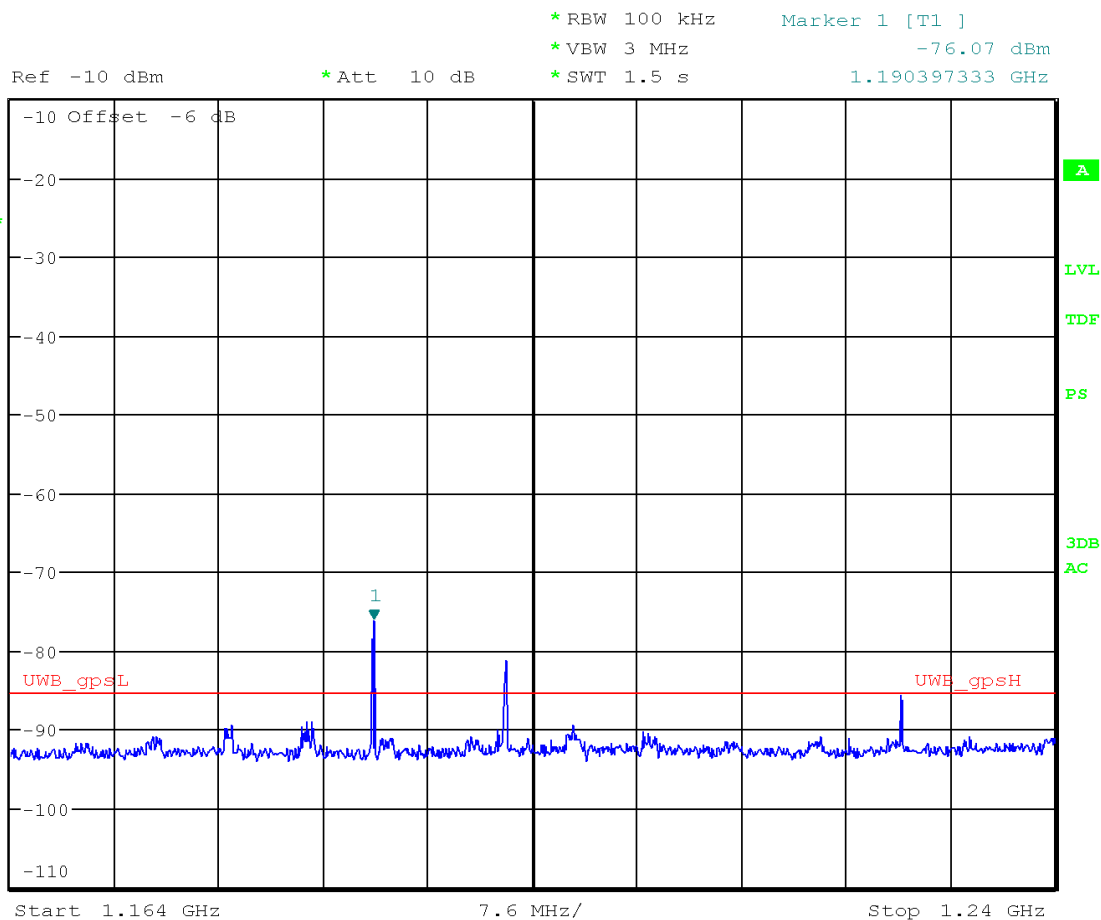
Note: The equipment calibration period is 1 year.

Software:

“Radiated Emissions 1-18GHz.TIL” TILE! profile dated July 2018

5.5 Test Data

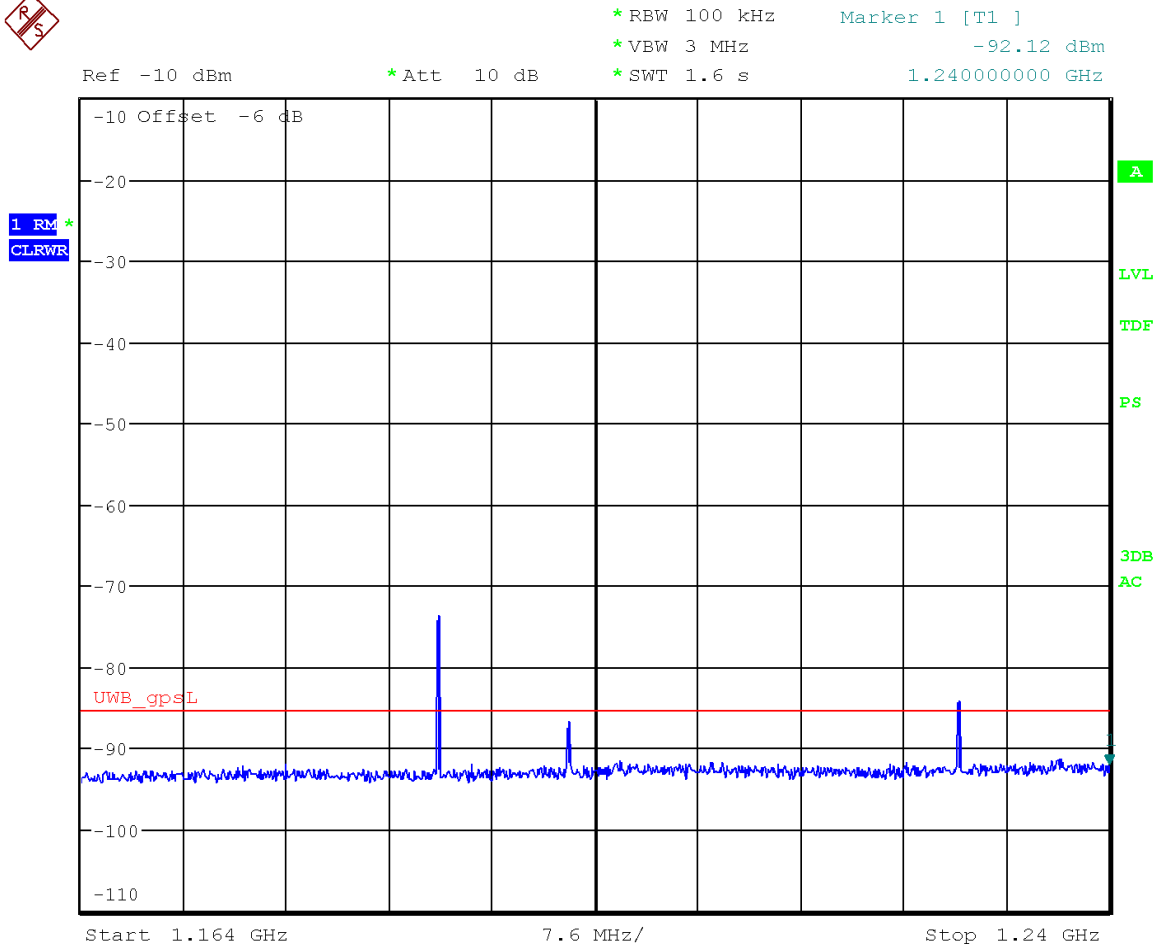
Vertical Radiated Emissions in lower GPS Receive Band



Date: 17.JUN.2019 16:40:27

Emissions above limit are discrete CW signals unrelated to UWB. Significant reduction in UWB power levels cause no change in the amplitude of these emissions.

Horizontal Radiated Emissions in lower GPS Receive Band



Date: 17.JUN.2019 16:56:26

Emissions above limit are discrete CW signals unrelated to UWB. Significant reduction in UWB power levels cause no change in the amplitude of these emissions.

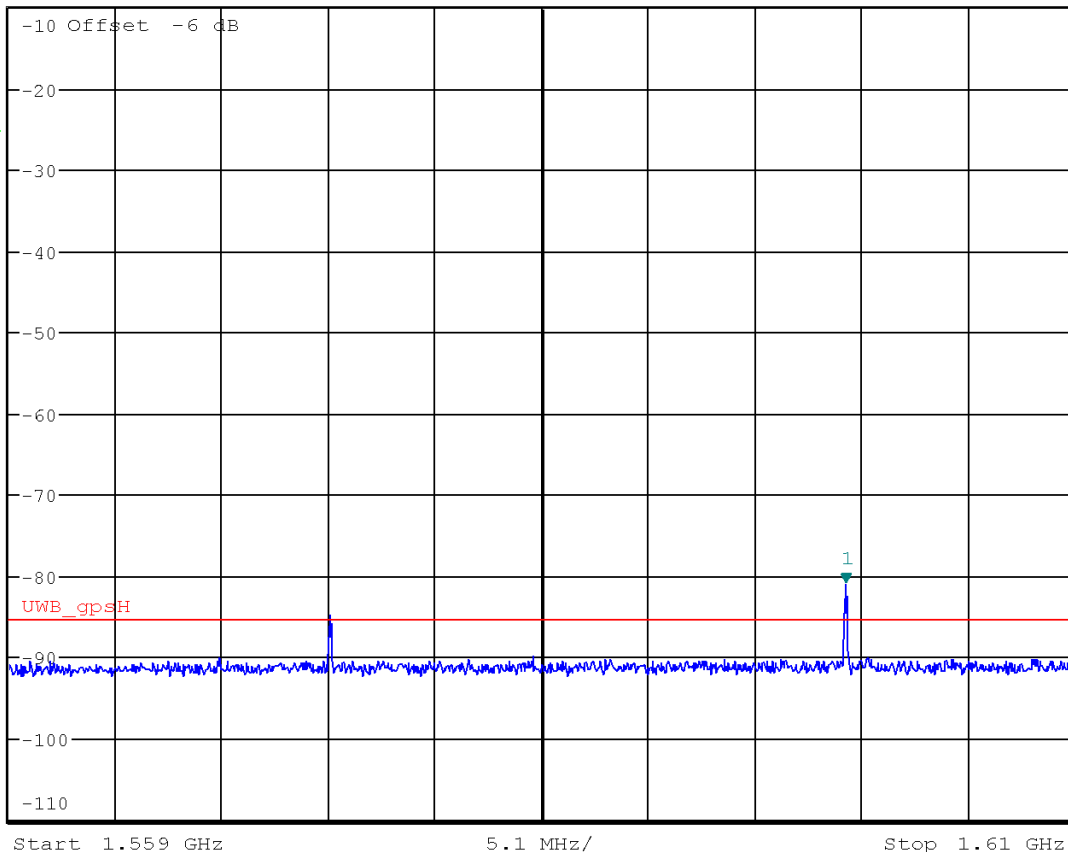
Vertical Radiated Emissions in upper GPS Receive Band



* RBW 100 kHz Marker 1 [T1]
 * VBW 3 MHz -80.87 dBm
 * SWT 1.5 s 1.599052000 GHz

Ref -10 dBm

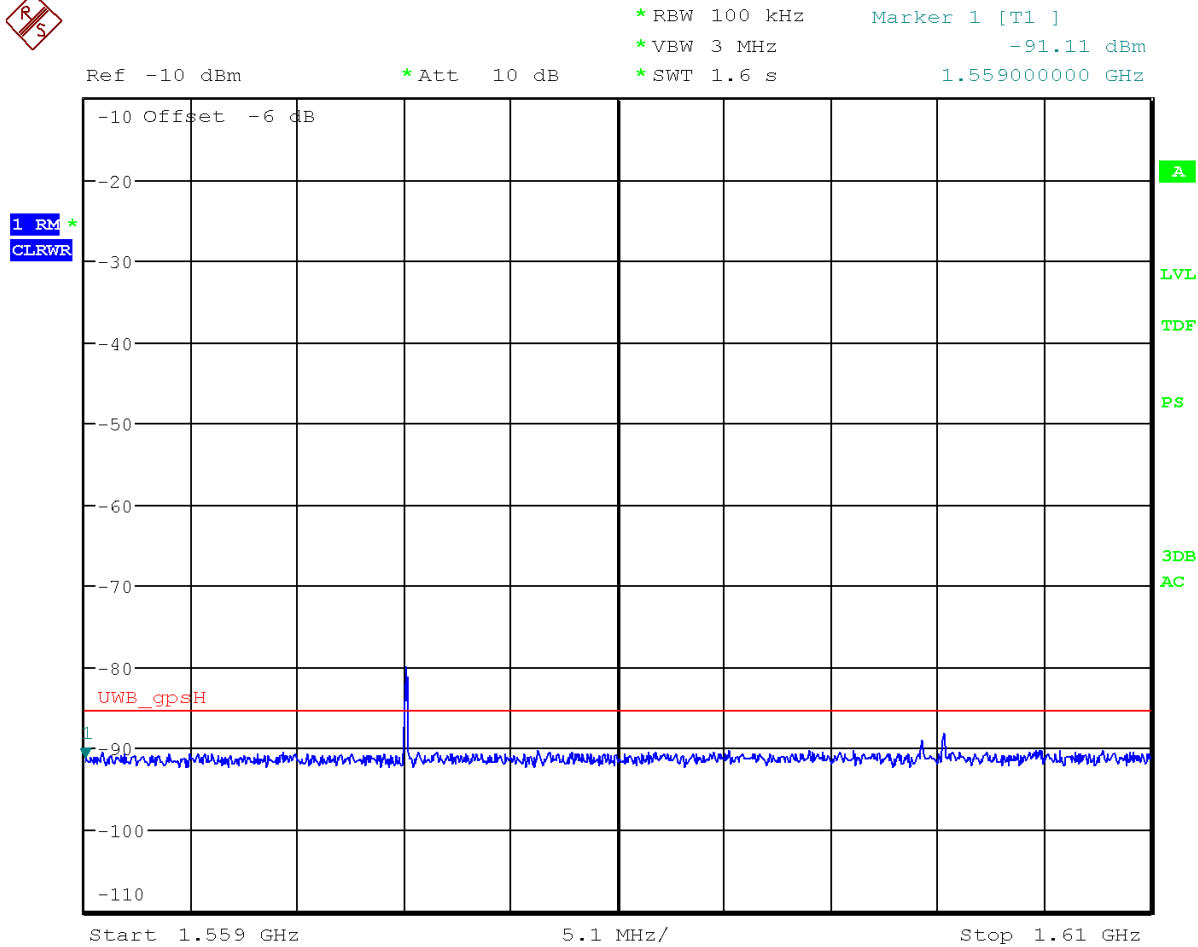
* Att 10 dB



Date: 17.JUN.2019 16:44:22

Emissions above limit are discrete CW signals unrelated to UWB. Significant reduction in UWB power levels cause no change in the amplitude of these emissions.

Horizontal Radiated Emissions in upper GPS Receive Band



Date: 17.JUN.2019 17:09:44

Emissions above limit are discrete CW signals unrelated to UWB. Significant reduction in UWB power levels cause no change in the amplitude of these emissions.

Data: Radiated Emissions in Lower GPS Receive Bands

Test Distance: 0.5m

GPS Band	Frequency MHz	Antenna Polarity	Measured RMS value	RMS Limit dBm	Margin dB*
Lower	1109.4	V	-76.4	-	-
Lower	1109.4	H	-74.7	-	-
Upper	1599.0	V	-80.9	-	-
Upper	1599.0	H	-91.1	-	-

* Emissions above limit are discrete CW signals unrelated to UWB. Significant reduction in UWB power levels cause no change in the amplitude of these emissions.

6 Peak Power within a 50 MHz bandwidth

6.1 Test Result

Test Description	Basic Standards	Test Result
Peak Power in a 50 MHz Bandwidth	15.517(e)	Compliant

6.2 Test Method

- 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 occurs 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.

6.3 Test Site

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

Environmental Conditions

Temperature: 22.2°C

Relative Humidity: 56.4 %

6.4 Test Equipment

Test End Date: 17-Jun-2019

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	10-Aug-2020

Note: The calibration period for this equipment is 1 year.

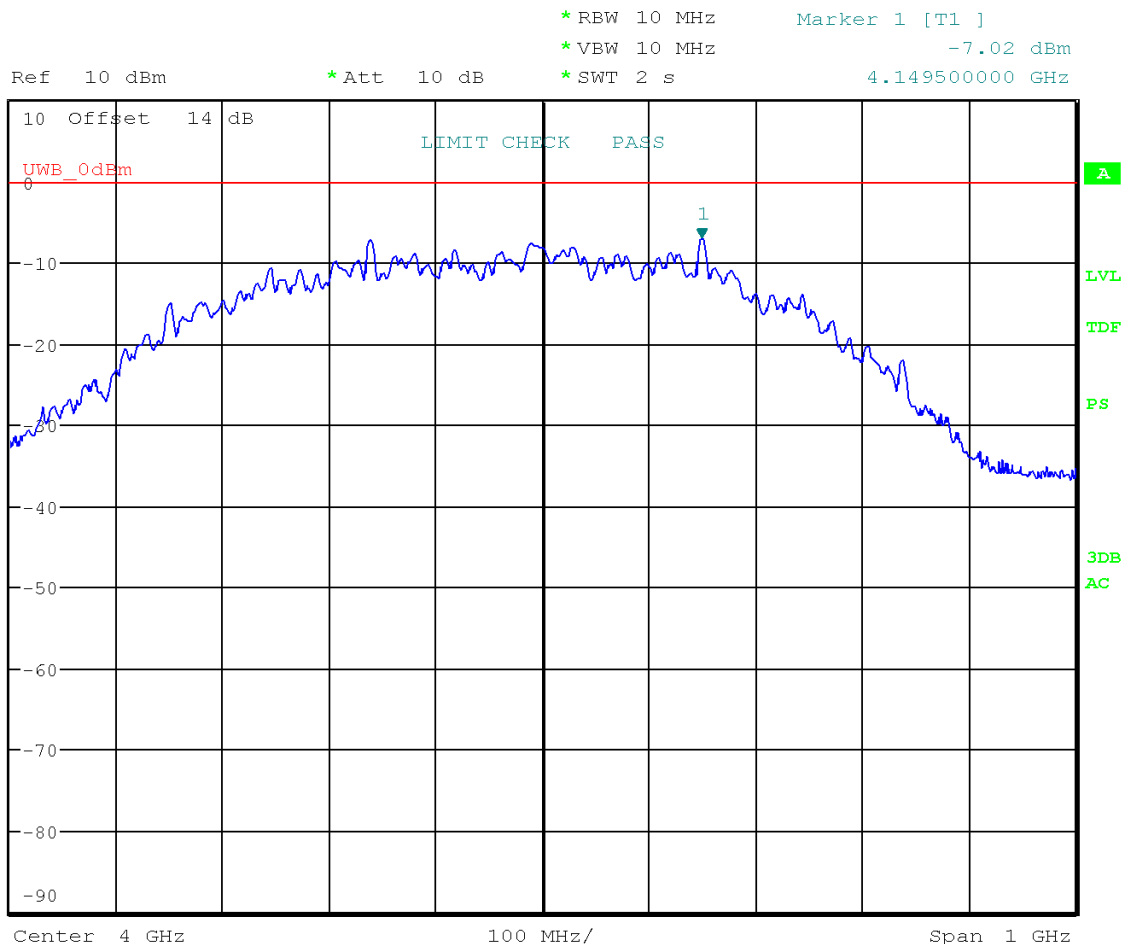
Software:

“Radiated Emissions 1-18GHz.TIL” TILE! profile dated Jul 2018

6.5 Test Data

Peak Power per 50MHz - Vertical

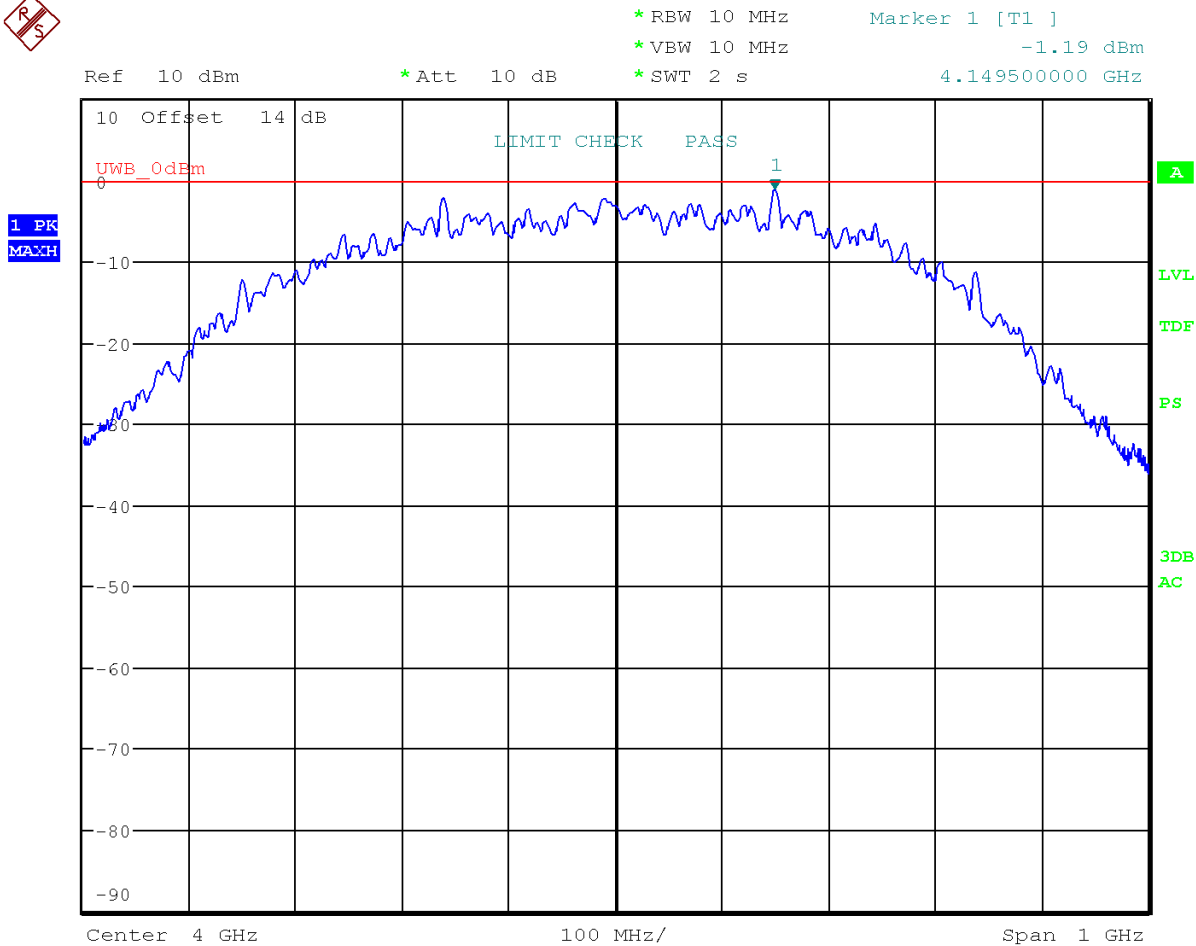
Note: Offset value is equal to $20 \cdot \log(10\text{MHz}/50\text{MHz})$



Date: 17.JUN.2019 15:09:19

Peak Power per 50MHz - Horizontal

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



Date: 17.JUN.2019 15:16:43

6.6 Data Table

Channel	Polarity	Corrected Value 50 MHz RBW dBm	Limit, dBm 50 MHz RBW	Result
2	Horizontal	-1.2	0	Compliant
2	Vertical	-7.0	0	Compliant

7 Radiated emissions below 960 MHz

7.1 Test Result

Test Description	Basic Standards	Test Result
Radiated Emissions	FCC Part 15.517(c) and 15.209	Compliant

7.2 Test Method

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

7.3 Test Site

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

Environmental Conditions

Temperature: 23.7°C

Relative Humidity: 46.6 %

7.4 Test Equipment

Test End Date: 14-Jun-2019

Tester: BEO

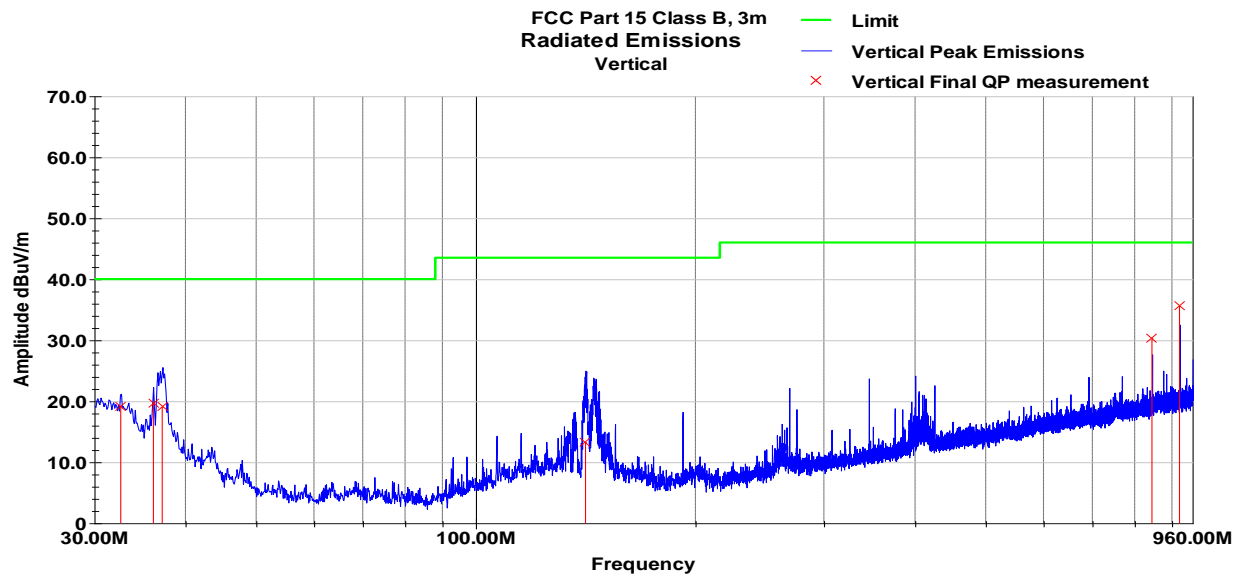
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
ANTENNA, BILOG	JB6	SUNOL	B079689	30-Oct-2019

Note: The equipment calibration period is 1 year.

Software: "Radiated Emissions" TILE! profile dated Dec 2018

7.5 Test Data

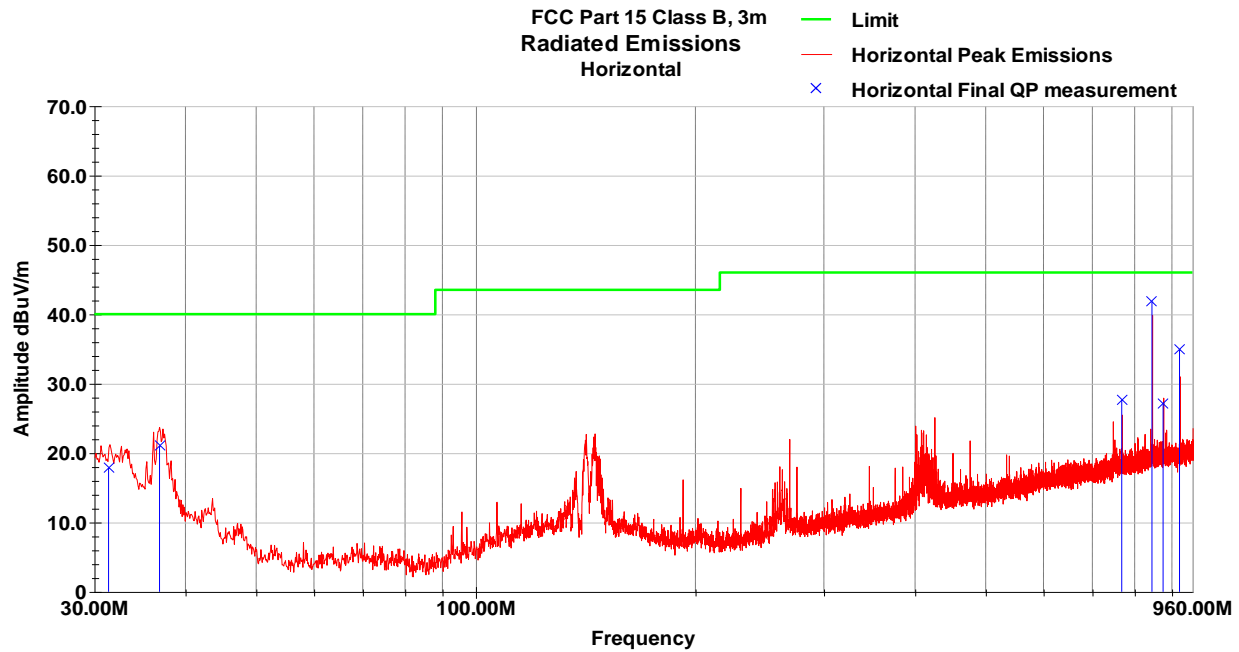
Vertical Radiated Emissions Plot – Channel 2



Vertical Radiated Emissions Data – Channel 2

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)
32.61	30.2	V	265.0	250.0	20.2	0.6	31.8	19.2	40.0	-20.8
36.15	33.9	V	245.0	238.0	17.4	0.6	32.1	19.7	40.0	-20.3
37.17	34.1	V	218.0	138.0	16.6	0.6	32.2	19.1	40.0	-20.9
141.38	33.7	V	187.0	249.0	13.1	1.2	34.7	13.3	43.5	-30.2
844.80	39.1	V	21.0	151.0	22.6	3.1	34.5	30.3	46.0	-15.7
921.60	43.7	V	140.0	112.0	23.1	3.3	34.5	35.6	46.0	-10.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Horizontal Radiated Emissions Plot – Channel 2



Horizontal Radiated Emissions Data – Channel 2

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)
31.39	27.8	H	15.0	166.0	21.2	0.5	31.7	17.9	40.0	-22.1
36.86	35.8	H	221.0	166.0	16.8	0.6	32.2	21.0	40.0	-19.0
768.01	37.6	H	176.0	100.0	21.6	3.0	34.5	27.7	46.0	-18.3
844.80	50.6	H	175.0	100.0	22.6	3.1	34.5	41.8	46.0	-4.2
875.09	35.7	H	302.0	300.0	22.8	3.2	34.5	27.2	46.0	-18.8
921.60	43.0	H	0.0	148.0	23.1	3.3	34.5	34.9	46.0	-11.1
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

8 Conducted Emissions

8.1 Test Result

Test Description	Basic Standards	Test Result
Conducted Emissions, Class B	FCC Part 15, Subpart B	Compliant

8.2 Test Method

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

8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.1°C

Relative Humidity: 56.6%

8.4 Test Equipment

Test End Date: 20-Jun-2019

Tester: BEO

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B087573	3-Dec-2019
RF CABLE	UC-N-MM-78	MAURY MICROWAVE	17017	24-Jul-2019
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	17-Aug-2019
CONDUCTED COMB GENERATOR	CGC-255	COM-POWER	B079696	CNR

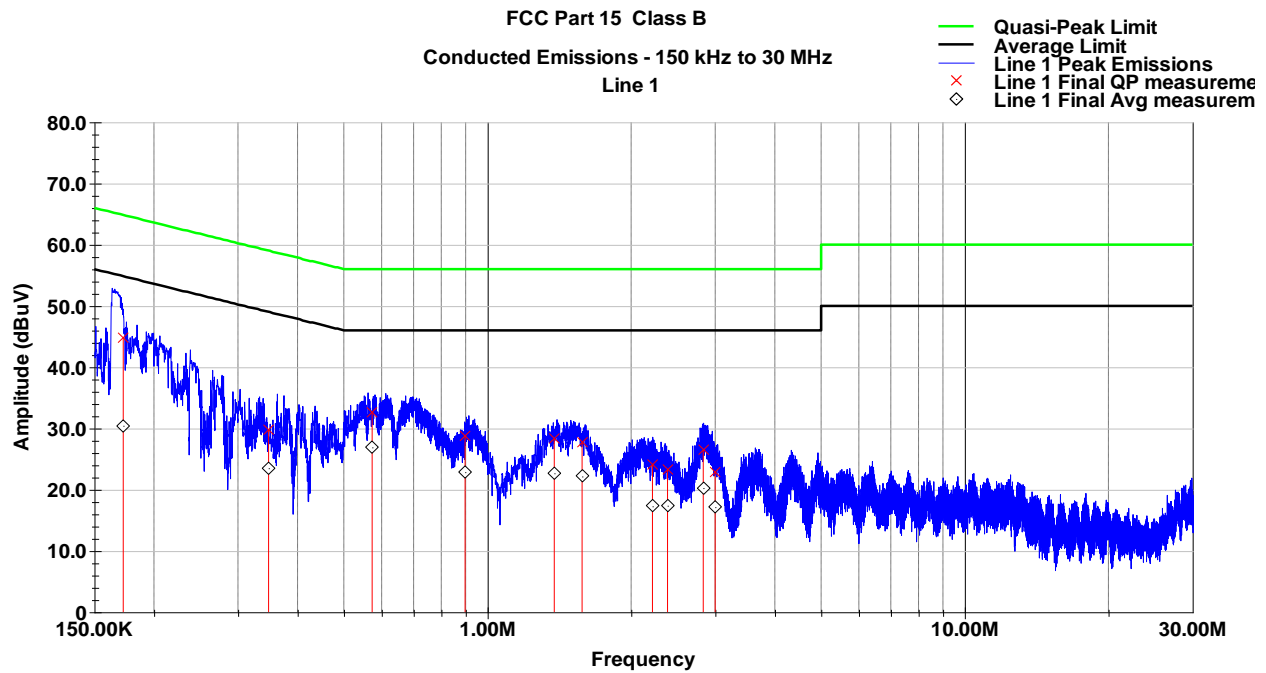
Note: The equipment calibration period is 1 year.

Software:

"Conducted Emissions" TILE! profile dated Jan 2018

8.5 Test Data

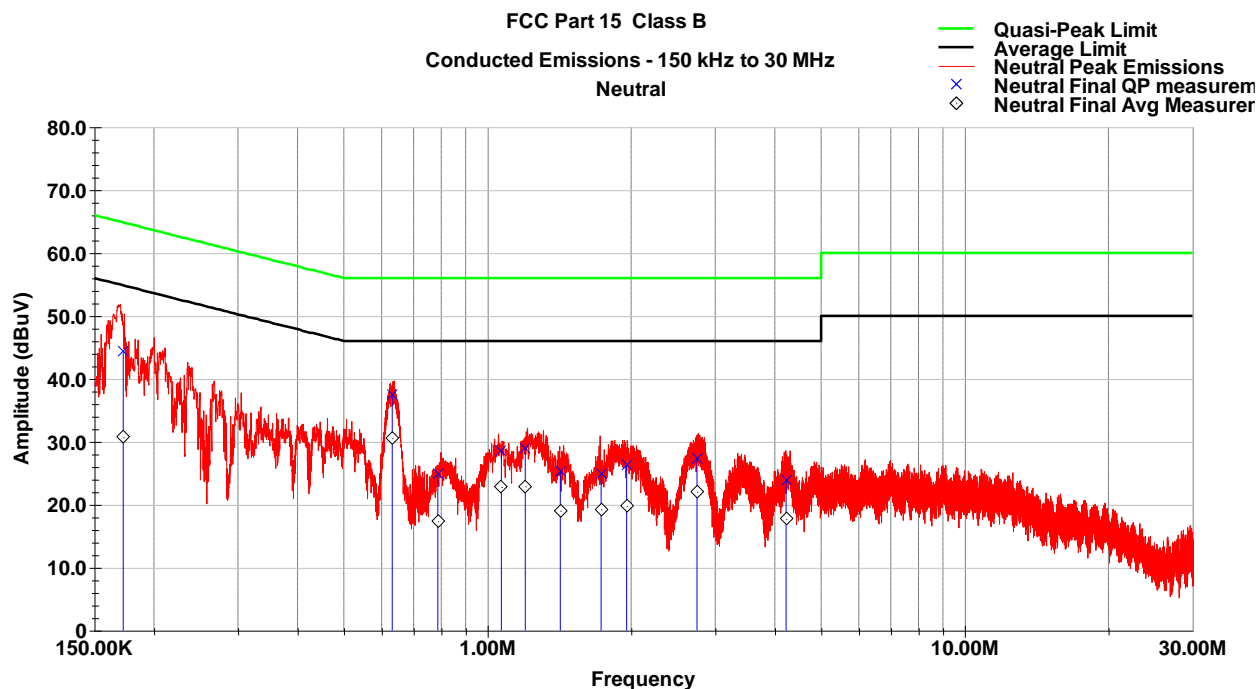
Line 1 Conducted Emissions Plot



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
0.172	44.9	64.8	-20.0	30.4	54.8	-24.4
0.348	29.8	59.0	-29.3	23.5	49.0	-25.5
0.573	32.7	56.0	-23.3	26.9	46.0	-19.1
0.897	28.8	56.0	-27.2	22.9	46.0	-23.1
1.380	28.3	56.0	-27.7	22.7	46.0	-23.3
1.578	27.7	56.0	-28.3	22.2	46.0	-23.8
2.216	24.1	56.0	-31.9	17.3	46.0	-28.7
2.383	23.4	56.0	-32.6	17.4	46.0	-28.6
2.832	26.6	56.0	-29.4	20.3	46.0	-25.7
2.999	22.9	56.0	-33.1	17.2	46.0	-28.8

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
0.172	44.5	64.8	-20.4	30.7	54.9	-24.1
0.631	37.4	56.0	-18.6	30.6	46.0	-15.4
0.787	24.9	56.0	-31.1	17.4	46.0	-28.6
1.069	28.5	56.0	-27.5	22.8	46.0	-23.2
1.200	28.9	56.0	-27.1	22.9	46.0	-23.1
1.421	25.3	56.0	-30.7	19.1	46.0	-26.9
1.730	24.9	56.0	-31.1	19.3	46.0	-26.7
1.957	26.3	56.0	-29.7	19.8	46.0	-26.2
2.748	27.3	56.0	-28.7	22.1	46.0	-23.9
4.223	23.8	56.0	-32.2	17.7	46.0	-28.3

9 Transmission Timing

9.1 Test Result

Test Description	Reference	Test Result
Cessation of transmission	15.517(a)(5)	Compliant

9.2 Test Method

A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.

The EUT transmission timing was measured to ensure continuous transmission is not used when the receiver is not associated with the transmitter. As indicated in answer 4 of FCC KDB 393764 UWB FAQ v02, periodic signals for use in the establishment or re-establishment of a communications link with an associated receiver is allowed.

9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.6°C

Relative Humidity: 57.7 %

9.4 Test Equipment

Test End Date: 18-Jul-2019

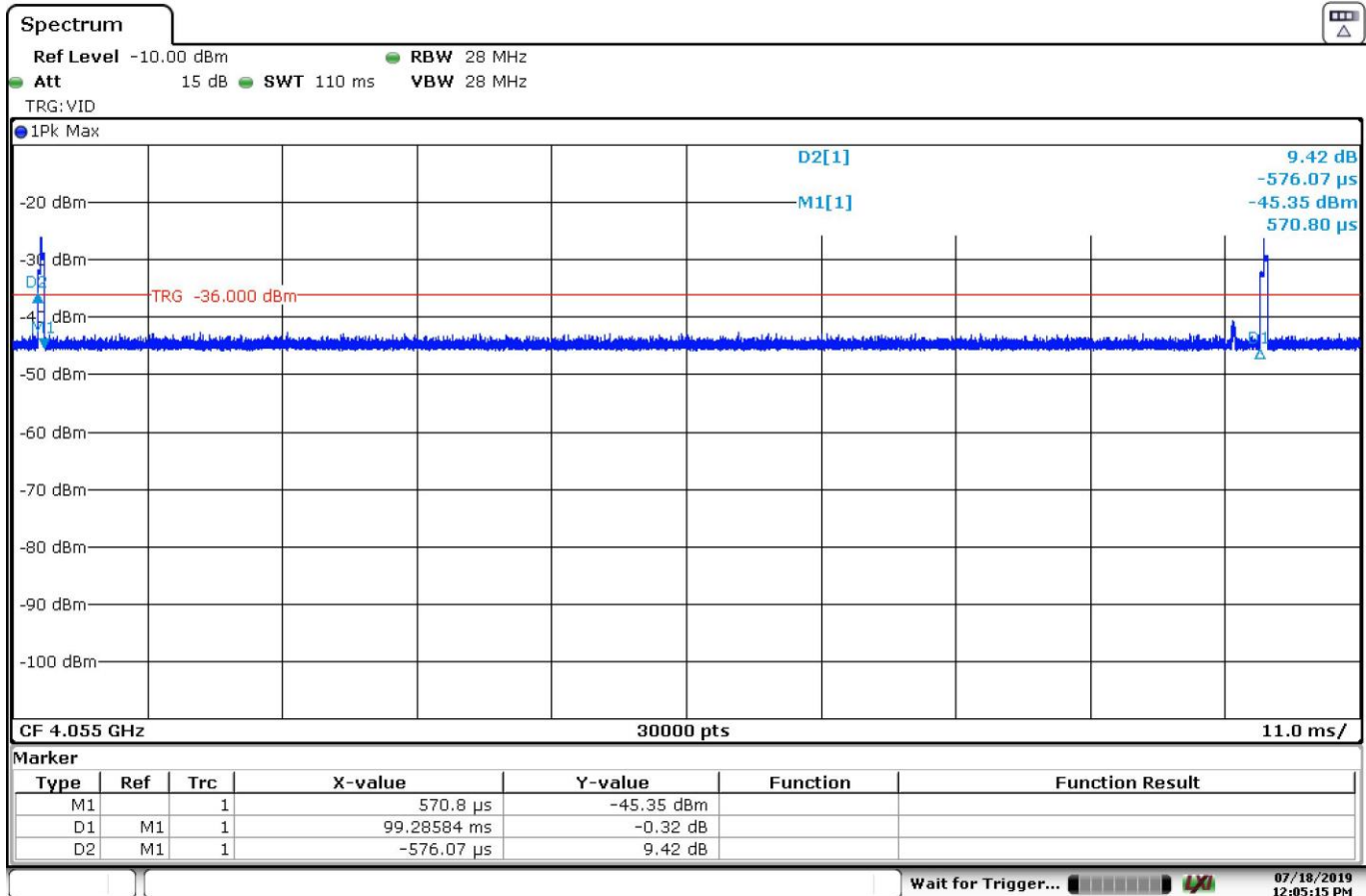
Tester: BEO/DJS

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095585	30-Sep-2019
RF CABLE (TS8997)	141	HUBER & SUHNER	B095588	30-Sep-2019
ANTENNA, HORN	BBHA 9120 B	SCHWARZBECK	16001	2-Apr-2020

Note: The calibration period for this equipment is 1 year.

9.5 Test Data

Transmission bursts when transmitter is not associated with receiver



Marker 1, 2dB; Mk 2, 1dB; Mk 3, 0dB

Date: 18.JUL.2019 12:05:15

Note: When the receiver is removed, the maximum polling on-time is less than 0.6 ms and the minimum off-time is more than 99.4 ms.

10 Revision History

Revision Level	Description of changes	Revision Date
DRAFT	--	24 June 2019
0	Initial release	9 July 2019
1	Changed applicable rule part from 15.519 to 15.517. Added 15.517(c) limit to plots in Section 4. Added Section 9 to show transmitter timing.	18 July 2019