

FCC PART 15F TEST REPORT

For

**Wanma yun Electronic Technology (zhengzhou) Co.,
Ltd**

Intelligent Terminal Mobile Phone Industrial Park, Crossing at Xingang Avenue and Renmin
Road, Zhengzhou Airport District, P.R.China

FCC ID: 2AZQ7SLU-A1000-B

Report Type: Original Report	Product Type: UWB Indoor Anchor
Report Number: <u>ATC210514-17257E-RF</u>	
Report Date: <u>2021-06-08</u>	
Reviewed By:	Ivan Cao Assistant Manager 
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan) No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China. Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	3
SYSTEM TEST CONFIGURATION	5
DESCRIPTION OF TEST CONFIGURATION	5
EQUIPMENT MODIFICATIONS	5
EUT EXERCISE SOFTWARE	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL I/O CABLE	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS	7
TEST EQUIPMENT LIST	8
§1.1307 (B) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)	9
APPLICABLE STANDARD	9
RESULT	9
FCC §15.203, §15.517(a)(2) - ANTENNA REQUIREMENT	11
APPLICABLE STANDARD	11
ANTENNA CONNECTOR CONSTRUCTION	11
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS	12
APPLICABLE STANDARD	12
EUT SETUP	12
EMI TEST RECEIVER SETUP	12
TEST PROCEDURE	12
CORRECTED FACTOR & MARGIN CALCULATION	13
TEST RESULTS SUMMARY	13
TEST DATA	13
§15.503 (a)(d), §15.517(b) –UWB OPEARTION BANDWIDTH	18
APPLICABLE STANDARD	18
TEST PROCEDURE	18
TEST DATA	18
FCC §15.209, §15.517(c)(d)- SPURIOUS EMISSIONS	21
APPLICABLE STANDARD	21
EUT SETUP	21
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	22
TEST PROCEDURE	22
CORRECTED AMPLITUDE & MARGIN CALCULATION	23
TEST RESULTS SUMMARY	23
TEST DATA	23
§15.517(e) - PEAK EMISSION IN A 50 MHZ BANDWIDTH	40
APPLICABLE STANDARD	40
TEST PROCEDURE	40
TEST DATA	40

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	UWB Indoor Anchor
Tested Model	SLU-A1000-B
Frequency	CH2: 3993.6MHz CH5: 6489.6MHz
Antenna Specification [▲]	CH2: 2.9dBi, CH5: 3.4dBi
Voltage Range	DC5V from Adapter or POE
Date of Test	2021-05-18 to 2021-05-22
Sample serial number	ATC210514-17257E-RF-S1
Received date	2021-05-14
Sample/EUT Status	Good condition

Objective

This report is prepared on behalf of Wanma yun Electronic Technology (zhengzhou) Co., Ltd in accordance with Part 2-Subpart J, Part 15-Subparts A and F of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart F, and section 15.203, 15.205, 15.207, 15.209 and 15.517 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	5 %
RF output power, conducted	0.61dB
Power Spectral Density, conducted	0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB, 1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Unwanted Emissions, conducted	1.5 dB
Temperature	1 °C
Humidity	5%
DC and low frequency voltages	0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

Radio	Channel	Frequency (MHz)	Rate (Mbps)	Power Setting [▲]
UWB	2	3993.6	6.8	Default
	5	6489.6	6.8	Default

Note: This product is indoor UWB systems, which declared by the manufacturer.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

No exercise software was used.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
MERCURY	PoE Switch	SG108P	119C110000568
MERCURY	Adapter for Switch	M5351200-2X1	19A057
Citiland	Adapter 2	P0571-BZ	02-830-3913

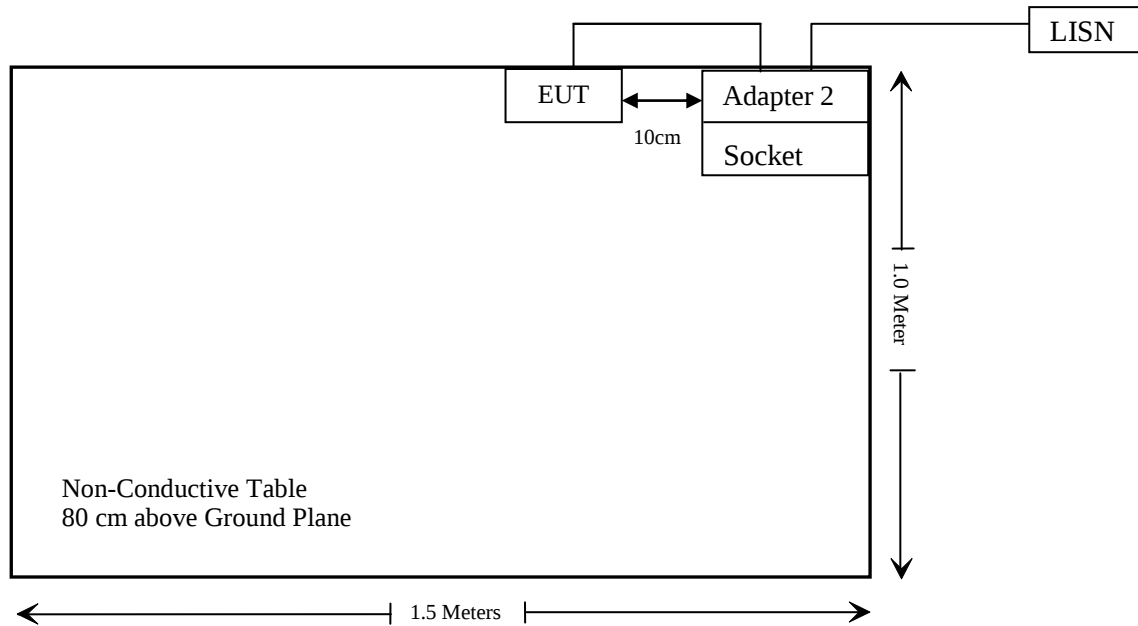
External I/O Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	No	No	1.0	Adapter 2	EUT
RJ45 Cable	No	No	1.2	PoE Switch	EUT
DC Power Line	No	No	0.8	Adapter for Switch	PoE Switch

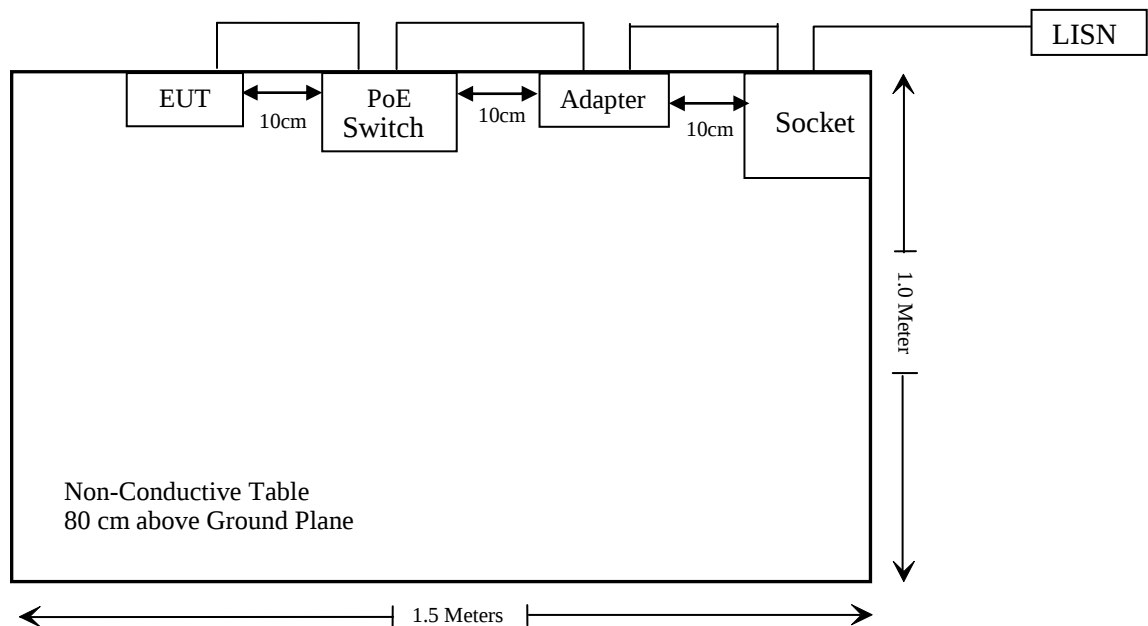
Block Diagram of Test Setup

For conducted emission:

EUT operation mode 1: Transmitting & Power by adapter



EUT operation mode 2: Transmitting & Power by POE



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	Maximum Permissible Exposure	Compliance
§15.203, §15.517(a)(2)	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.517(a)	Limited to UWB transmitters employed solely for indoor operation	Compliance*
§15.503 (a)(d), §15.517(b)	UWB Operation bandwidth	Compliance
§15.209, §15.517(c)(d)	Radiated Emissions	Compliance
§15.517(e)	Peak Emission in a 50 MHz bandwidth	Compliance

Compliance*: Please refer to statement in the User manual, which declared by manufacturer.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emission Test					
R&S	LISN	ENV 216	101614	2020-09-12	2021-09-12
R&S	EMI Test Receiver	ESCI	101121	2020-07-07	2021-07-07
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2020-09-05	2021-09-05
R&S	Test Software	EMC32	Version 9.10.00	N/A	N/A
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102453	2020-09-12	2021-09-12
HP	Amplifier	8447D	2727A05902	2020-09-05	2021-09-05
Sunol Sciences	Antenna	JB3	A060611-1	2020-11-10	2023-11-10
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2021-05-06	2022-05-06
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
R&S	Spectrum Analyzer	FSP 38	100478	2020-07-07	2021-07-07
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2020-09-05	2021-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2020-06-27	2021-06-27
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2020-12-05	2023-12-04
HUBER+SUHNER	Coaxial Cable	SUCOFLEX 126EA	MY369/26/26 EA	2020-09-25	2021-09-25
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	Each time	N/A
Unknown	Coaxial Cable	C-SJ00-0010	C0010/04	Each time	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§1.1307 (B) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

For worst case:

Frequency (MHz)	Tune up EIRP		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBm)	(mW)			
UWB CH2 (3993.6)	-54	0.000004	20	0.0000000008	1.0
UWB CH5 (6489.6)	-50	0.00001	20	0.0000000002	1.0

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
Wi-Fi (2412-2462)	3.5	2.24	22	158.49	20	0.07	1.0

Note 1: The tune up conducted power was declared by the applicant.

Note 2: Test data of Wi-Fi refer to report NO. GTS20210419013-1-1(FCC ID: 2AZQ7SLU-A1000-B) and Wi-Fi function can transmit at the same time with the UWB.

So the worst simultaneous transmitting consideration:

The ratio = $MPE_{Wi-Fi}/limit + MPE_{UWB}/limit = 0.000000002/1.0 + 0.07/1.0 = 0.0700000002 < 1.0$

So simultaneous exposure is not required.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

FCC §15.203, §15.517(a)(2) - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
 - b. Antenna must use a unique type of connector to attach to the EUT.
- Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

(3) The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.

Antenna Connector Construction

The EUT has internal antenna arrangement which was permanently attached and the antenna gain is 2.9dBi(CH2) and 3.4dBi(CH5), fulfill the requirement of this section. Please refer to the EUT photos.

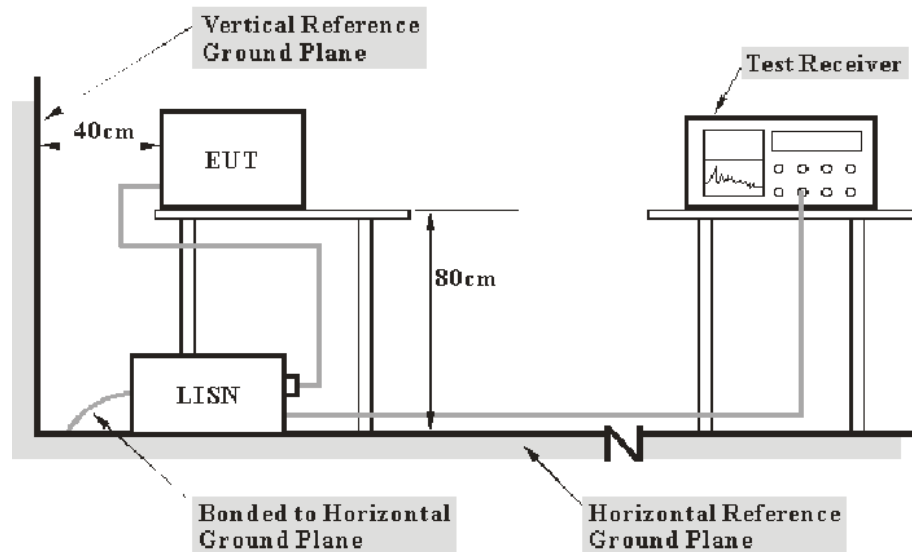
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the EUT complied with the FCC Part 15.207,

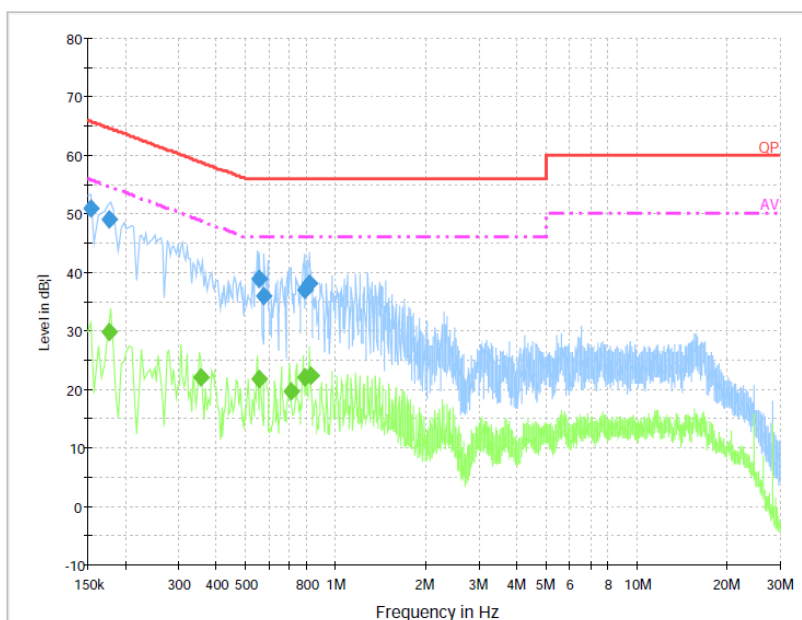
Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa
Tester:	Barry Yang
Test Date:	2021-05-21

EUT operation mode 1: Transmitting & Power by adapter

AC 120V/60 Hz, Line

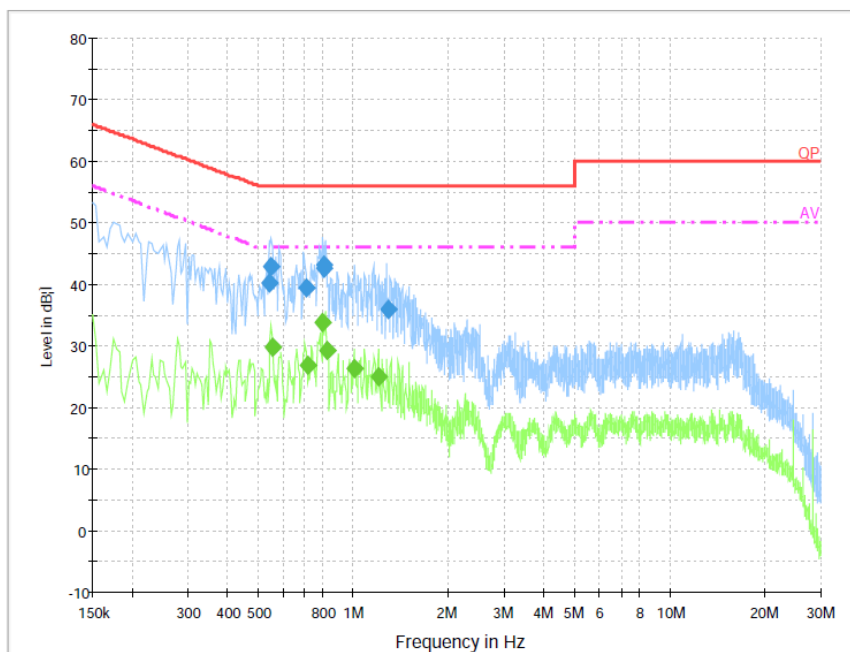


Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	50.9	9.000	L1	9.6	14.9	65.8
0.177500	49.1	9.000	L1	9.6	15.5	64.6
0.553750	38.9	9.000	L1	9.6	17.1	56.0
0.577330	36.0	9.000	L1	9.6	20.0	56.0
0.790210	37.0	9.000	L1	9.6	19.0	56.0
0.817670	38.1	9.000	L1	9.6	17.9	56.0

Final Result 2

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.177500	29.8	9.000	L1	9.6	24.8	54.6
0.356690	21.9	9.000	L1	9.6	26.9	48.8
0.558250	21.9	9.000	L1	9.6	24.1	46.0
0.711410	19.7	9.000	L1	9.6	26.3	46.0
0.789670	22.1	9.000	L1	9.6	23.9	46.0
0.825670	22.4	9.000	L1	9.6	23.6	46.0

AC 120V/60 Hz, Neutral**Final Result 1**

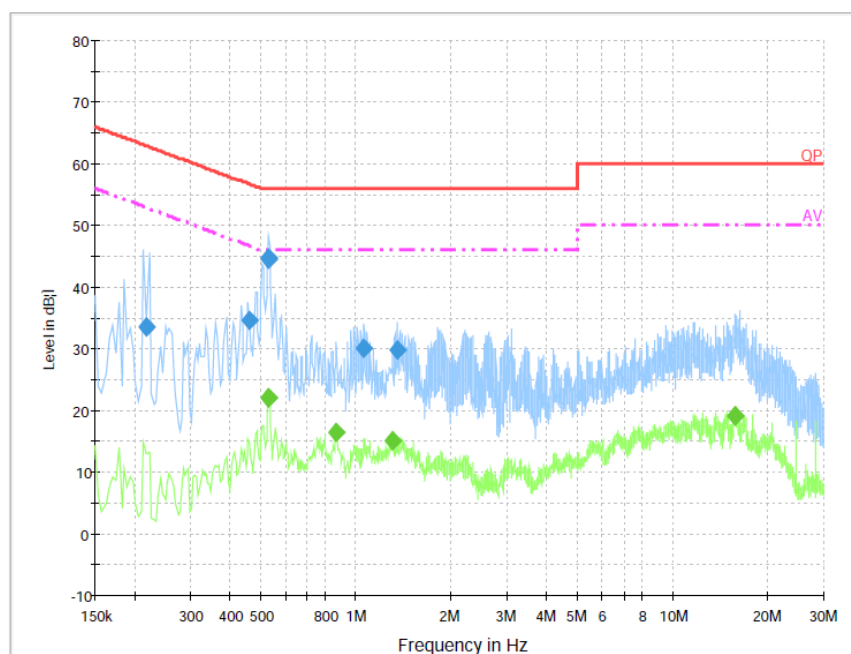
Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.541990	40.3	9.000	N	9.6	15.7	56.0
0.549750	42.8	9.000	N	9.6	13.2	56.0
0.707530	39.4	9.000	N	9.6	16.6	56.0
0.809670	43.1	9.000	N	9.6	12.9	56.0
0.809970	42.6	9.000	N	9.6	13.4	56.0
1.282890	35.9	9.000	N	9.6	20.1	56.0

Final Result 2

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.558250	29.7	9.000	N	9.6	16.3	46.0
0.716590	26.8	9.000	N	9.6	19.2	46.0
0.801790	33.9	9.000	N	9.6	12.1	46.0
0.829670	29.4	9.000	N	9.6	16.6	46.0
1.010910	26.3	9.000	N	9.6	19.7	46.0
1.200030	25.1	9.000	N	9.6	20.9	46.0

EUT operation mode 2: Transmitting & Power by POE

AC 120V/60 Hz, Line

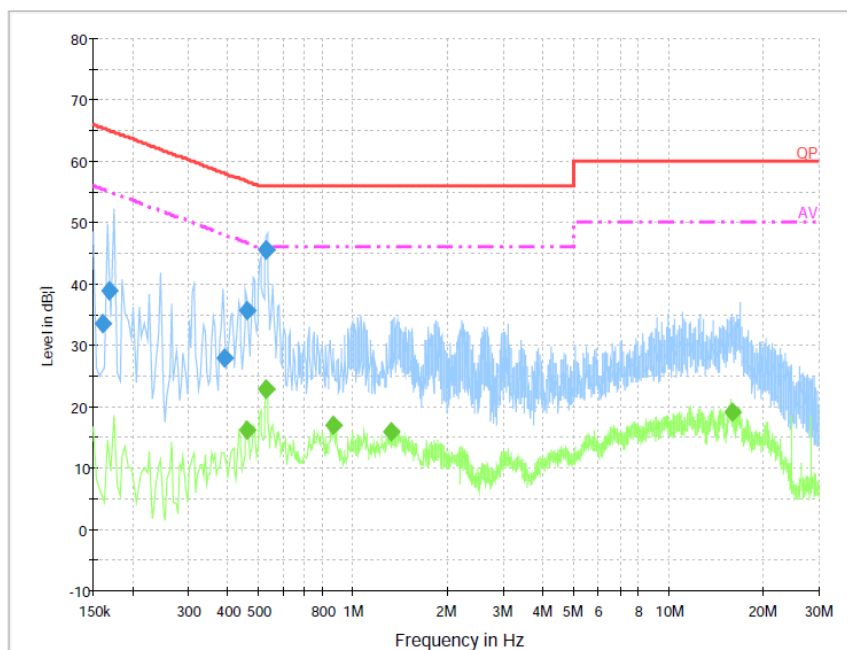


Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.218501	33.4	9.000	L1	9.6	29.5	62.9
0.459130	34.5	9.000	L1	9.6	22.2	56.7
0.529930	44.6	9.000	L1	9.6	11.4	56.0
0.530050	44.6	9.000	L1	9.6	11.4	56.0
1.062070	30.1	9.000	L1	9.6	25.9	56.0
1.353750	29.7	9.000	L1	9.6	26.3	56.0

Final Result 2

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.529930	22.1	9.000	L1	9.6	23.9	46.0
0.530050	22.1	9.000	L1	9.6	23.9	46.0
0.865010	16.5	9.000	L1	9.6	29.5	46.0
1.306110	15.0	9.000	L1	9.6	31.0	46.0
15.807230	19.1	9.000	L1	9.7	30.9	50.0
15.815950	19.1	9.000	L1	9.7	30.9	50.0

AC 120V/60 Hz, Neutral**Final Result 1**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.161500	33.5	9.000	N	9.6	31.9	65.4
0.169500	38.9	9.000	N	9.6	26.1	65.0
0.391790	27.9	9.000	N	9.6	30.1	58.0
0.459130	35.6	9.000	N	9.6	21.2	56.7
0.529930	45.5	9.000	N	9.6	10.5	56.0
0.529990	45.5	9.000	N	9.6	10.5	56.0

Final Result 2

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.459130	16.2	9.000	N	9.6	30.5	46.7
0.529930	22.9	9.000	N	9.6	23.1	46.0
0.529990	22.9	9.000	N	9.6	23.1	46.0
0.865010	16.9	9.000	N	9.6	29.1	46.0
1.326110	15.9	9.000	N	9.6	30.1	46.0
15.861870	19.2	9.000	N	9.7	30.8	50.0

§15.503 (a)(d), §15.517(b) –UWB OPEARTION BANDWIDTH**Applicable Standard**

(a) UWB bandwidth. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L . The frequency at which the highest radiated emission occurs is designated f_M .

(d) 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.

(b) The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

Test Procedure

Refer to the C63.10-2013 Section 10.1

Test Data**Environmental Conditions**

Temperature:	25°C
Relative Humidity:	52 %
ATM Pressure:	101.0kPa
Tester:	Joker Chen
Test Date:	2021-05-22

Test Result: Pass.

EUT operation mode: Transmitting

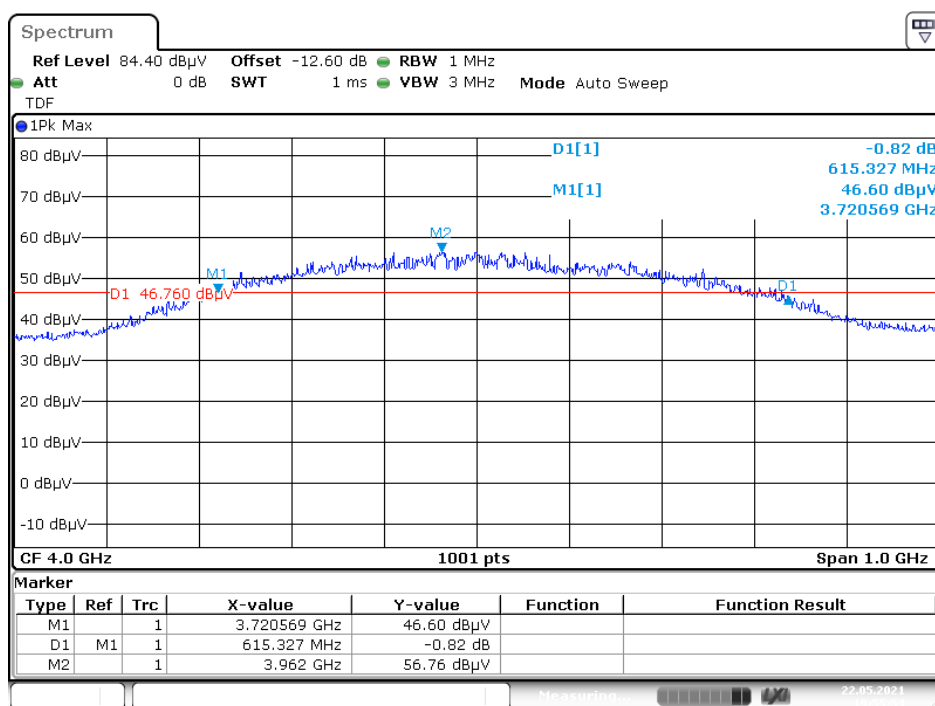
Please refer to the following table and plots.

Test distance is 0.7m.

CH2:

Item		Result	Limit (MHz)
f_M (MHz)	The highest emission frequency	3962	/
f_L (MHz)	10dB below the highest emission	3720.569	>3100
f_H (MHz)	10dB above the highest emission	4335.896	<10600
f_C (MHz)	$(f_H + f_L)/2$	4028.233	/
10dB bandwidth(MHz)	$f_H - f_L$	615.327	≥ 500
Fractional bandwidth	$2(f_H - f_L) / (f_H + f_L)$	0.153	/

10dB Bandwidth

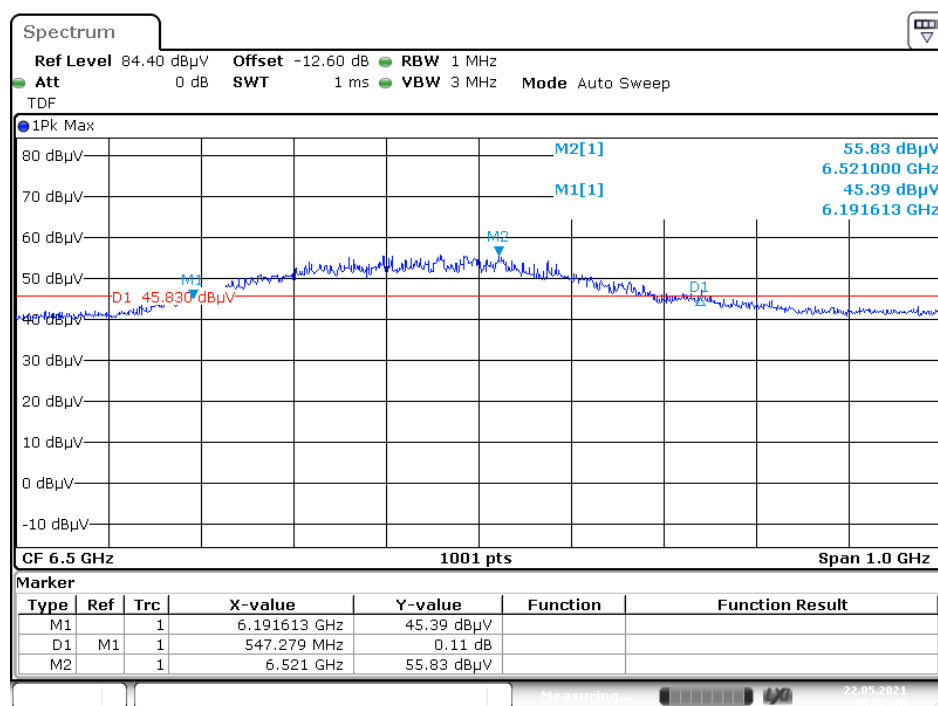


Date: 22.MAY.2021 19:55:54

CH5:

Item		Result	Limit (MHz)
f_M (MHz)	The highest emission frequency	6521	/
f_L (MHz)	10dB below the highest emission	6191.613	>3100
f_H (MHz)	10dB above the highest emission	6738.892	<10600
f_C (MHz)	$(f_H + f_L)/2$	6465.253	/
10dB bandwidth(MHz)	$f_H - f_L$	547.279	≥ 500
Fractional bandwidth	$2(f_H - f_L) / (f_H + f_L)$	0.085	/

10dB Bandwidth



Date: 22.MAY.2021 19:52:10

FCC §15.209, §15.517(c)(d)- SPURIOUS EMISSIONS

Applicable Standard

FCC §15.209; §15.517(c)(d);

(c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. 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:

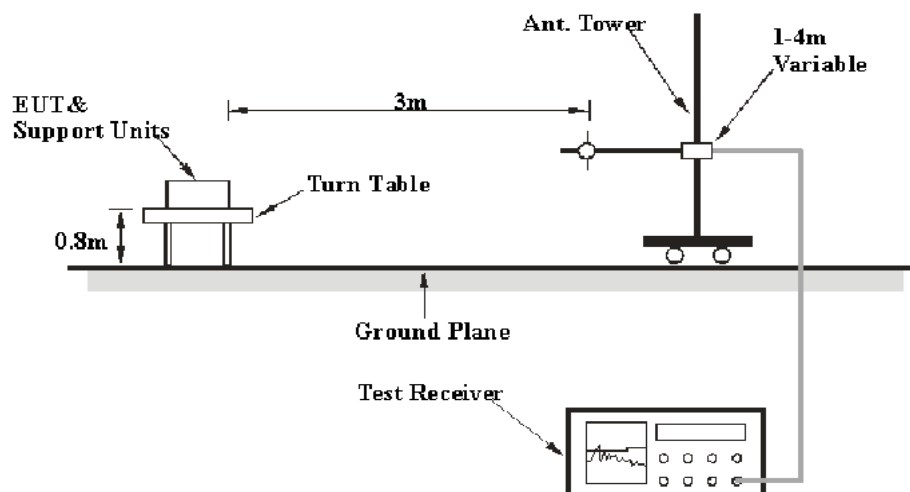
Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-53.3
1990-3100	-51.3
3100-10600	-41.3
Above 10600	-51.3

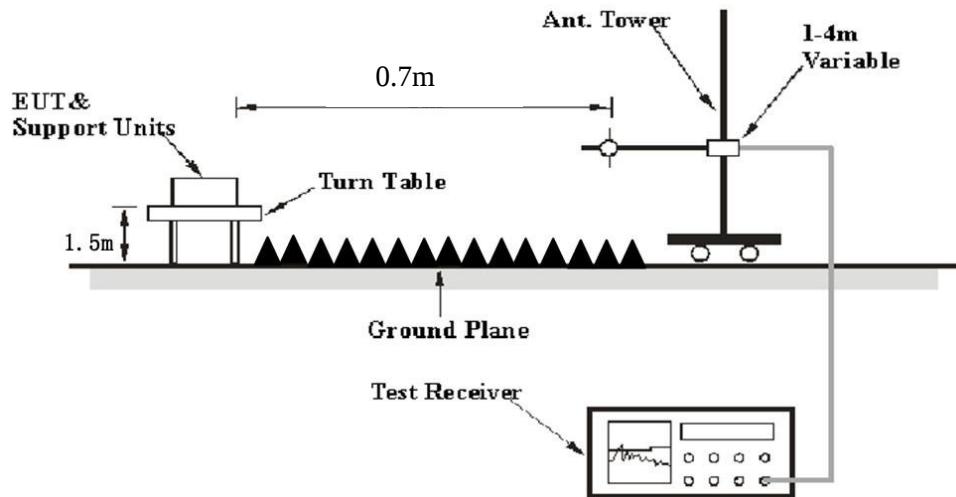
(d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

EUT Setup

Below 960MHz:



Above 960MHz:

The radiated emission tests were performed in the 3 meters chamber, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.517 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 960 MHz	100 kHz	300 kHz	120 kHz	QP
Above 960 MHz	1MHz	3 MHz	/	Average
	1kHz	3kHz	/	Average*

Note: * For the radiated spurious emission in the GPS band.

Test Procedure

Refer to the C63.10-2013 Section 10.2 & 10.3

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Result} - \text{Limit}$$

Test Results Summary

According to the EUT complied with the FCC Title 47, Part 15, Subpart F, section 15.205, 15.209 and 15.517.

Test Data

Environmental Conditions

Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	27°C	27-28°C
Relative Humidity:	55%	56-58%
ATM Pressure:	101.0kPa	101.0kPa
Tester:	Jalon Liu	Joker Chen
Test Date:	2021-05-18	2021-05-18 ~ 2021-05-22

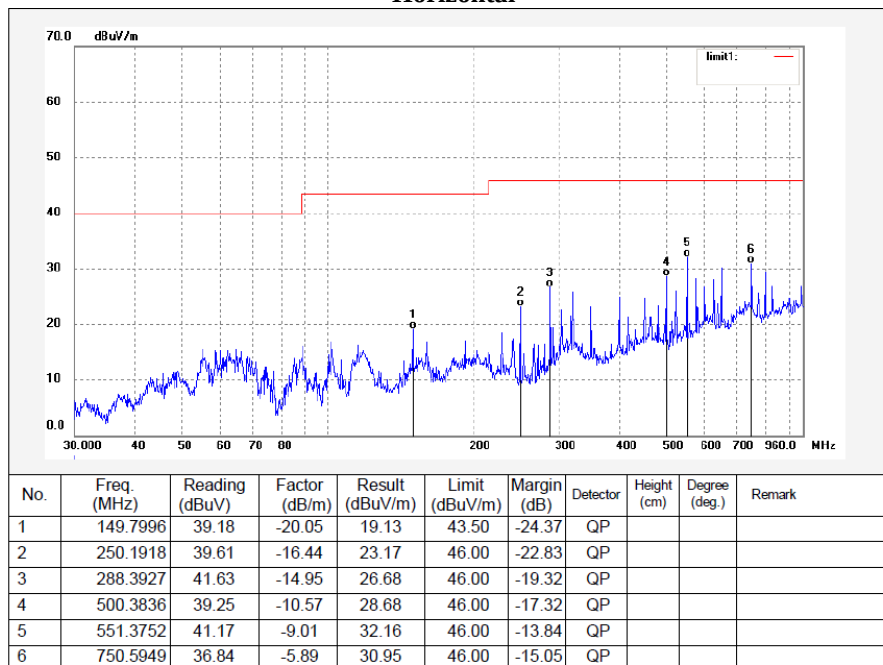
EUT operation mode: Transmitting

EUT operation mode: Transmitting & Power by adapter

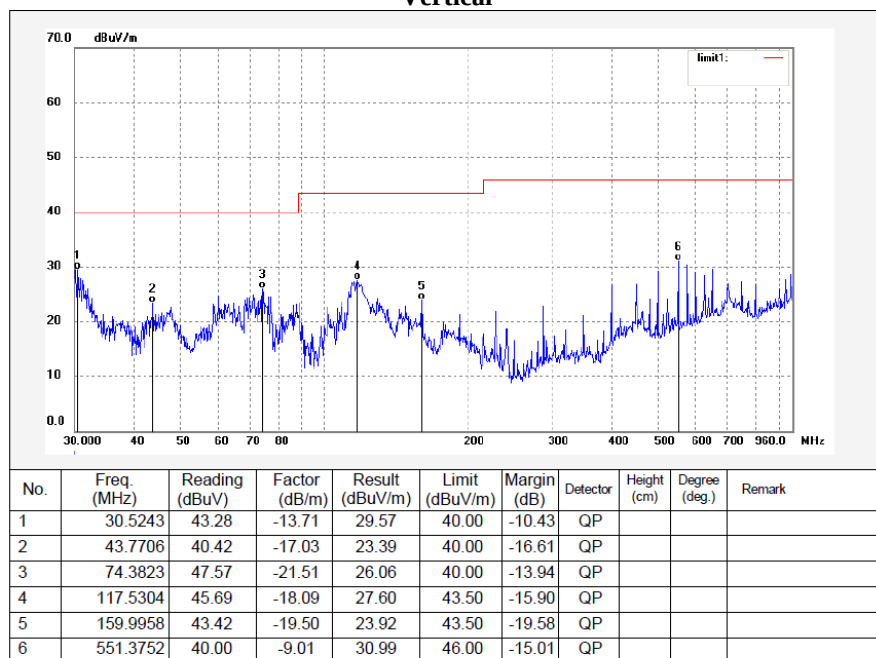
30 MHz~960MHz:

CH2:

Horizontal

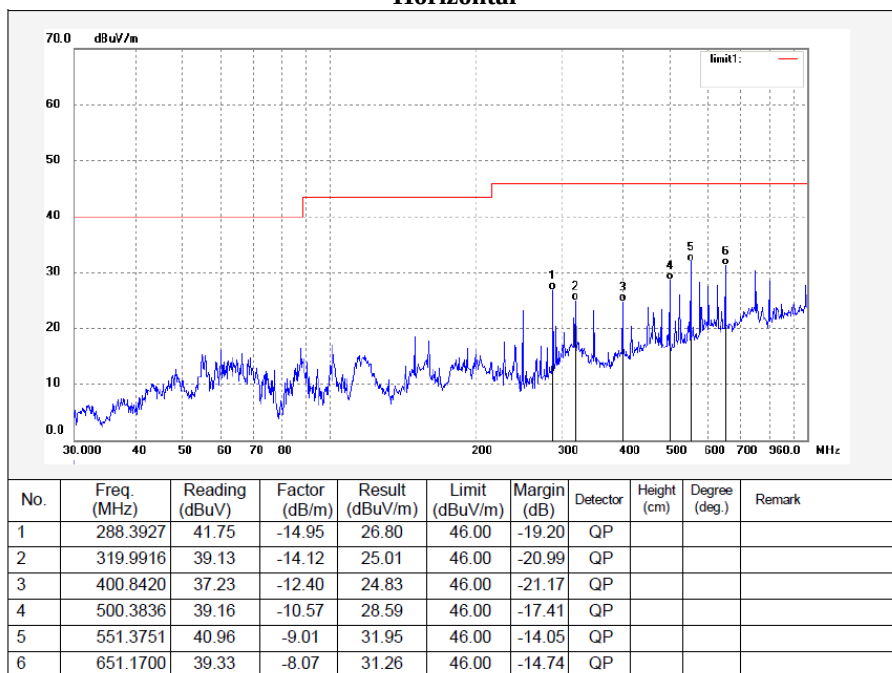


Vertical

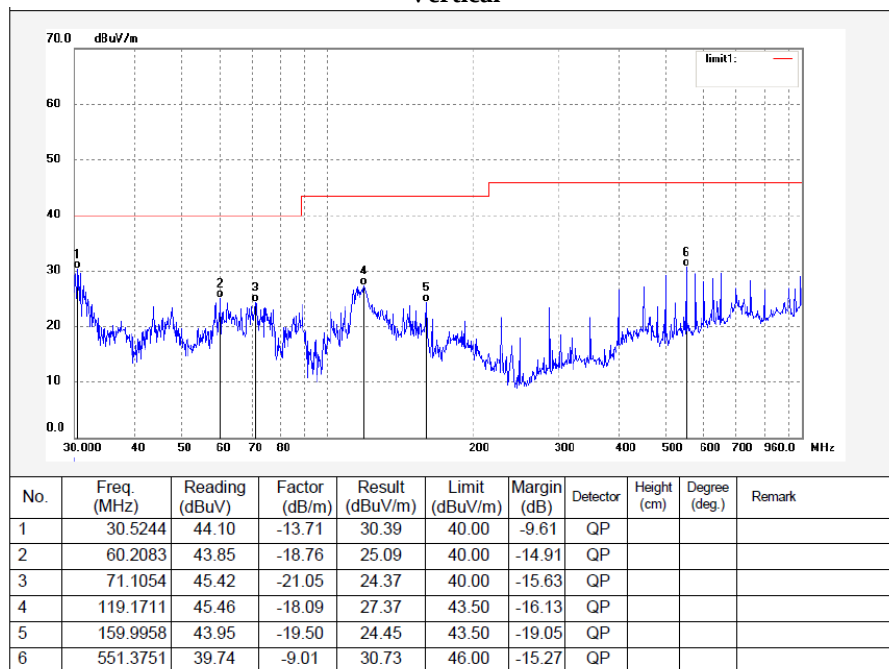


CH5:

Horizontal



Vertical

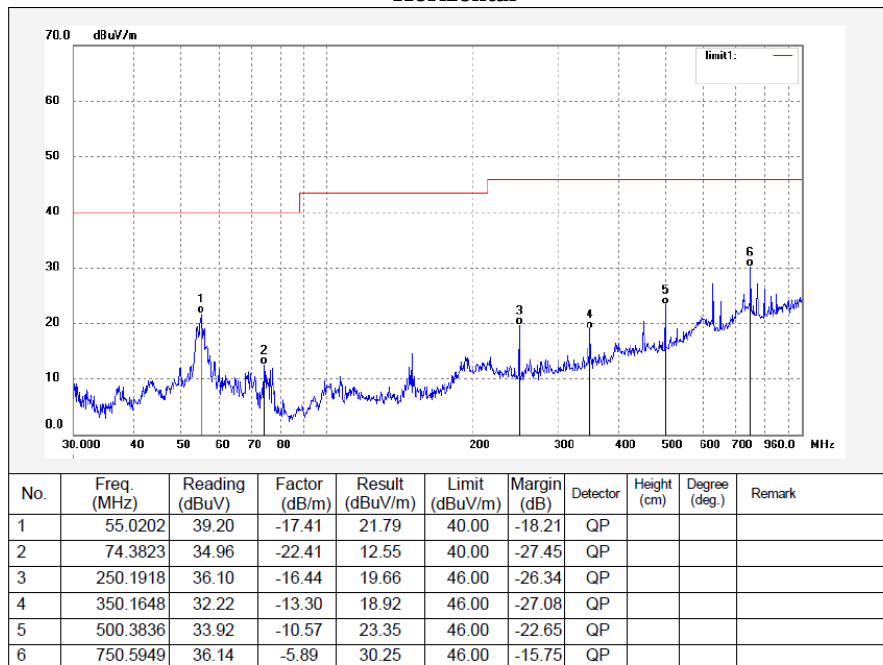


EUT operation mode 2: Transmitting & Power by POE

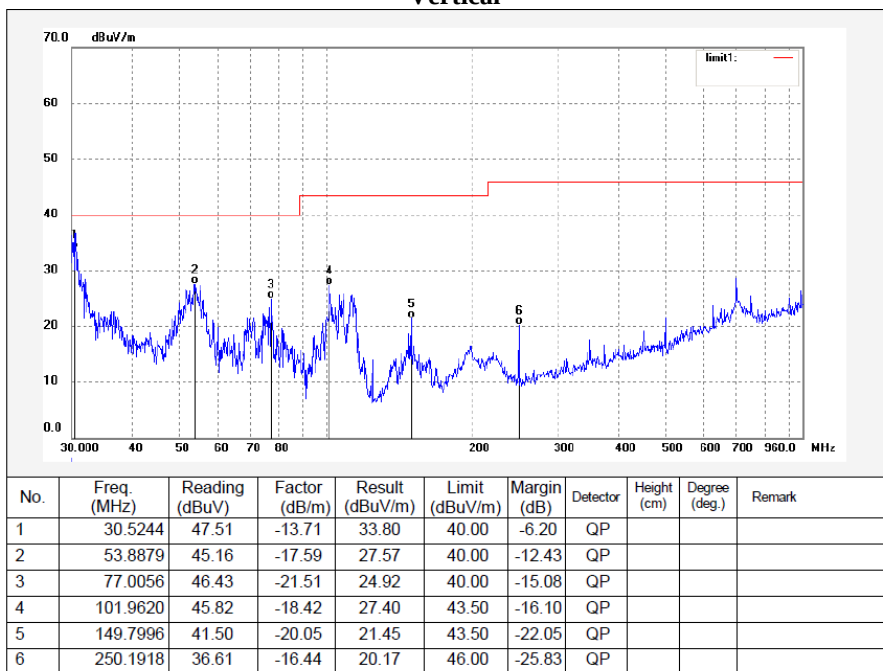
30 MHz~960MHz:

CH2:

Horizontal

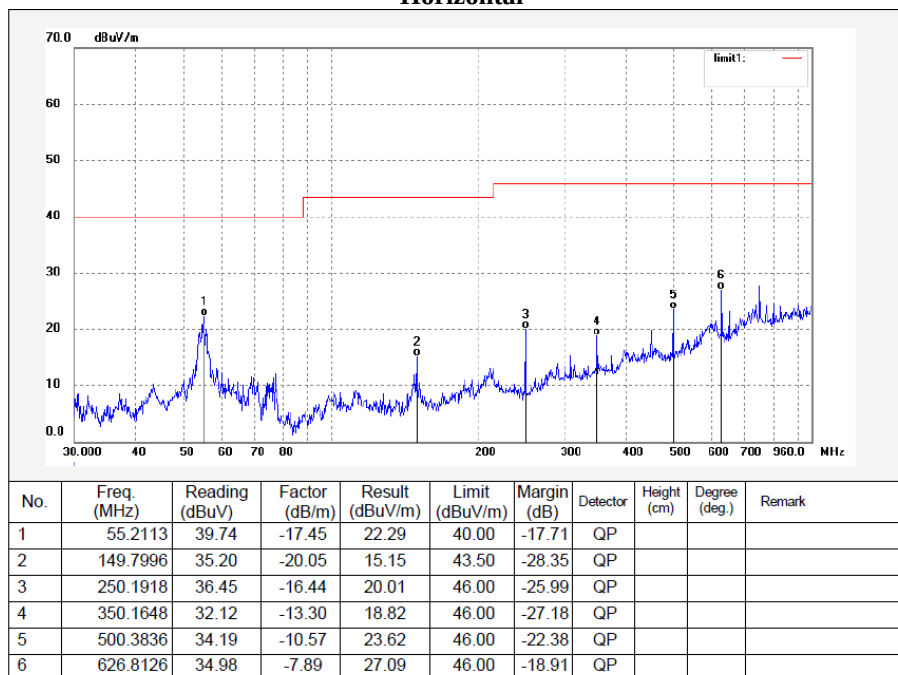


Vertical

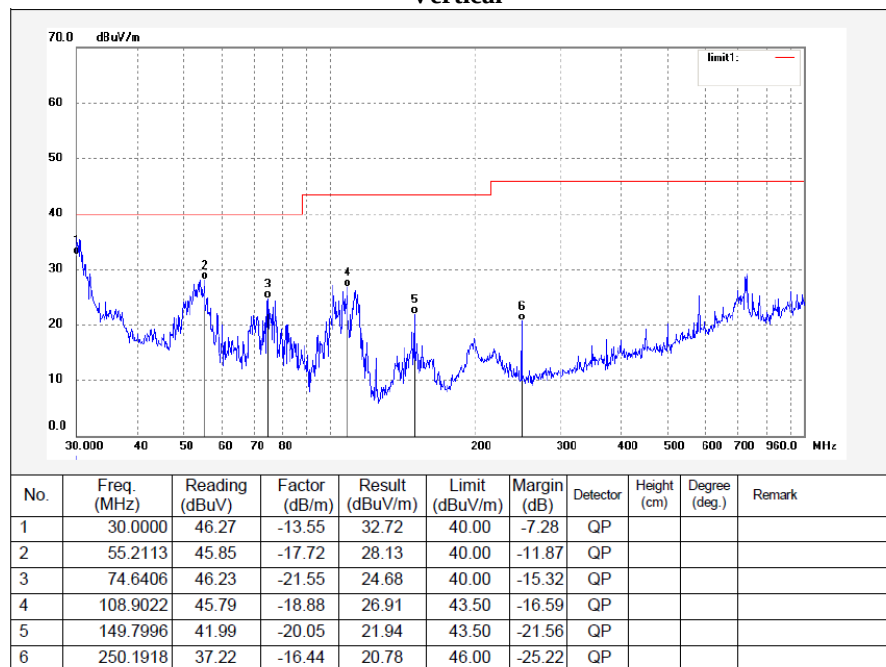


CH5:

Horizontal



Vertical



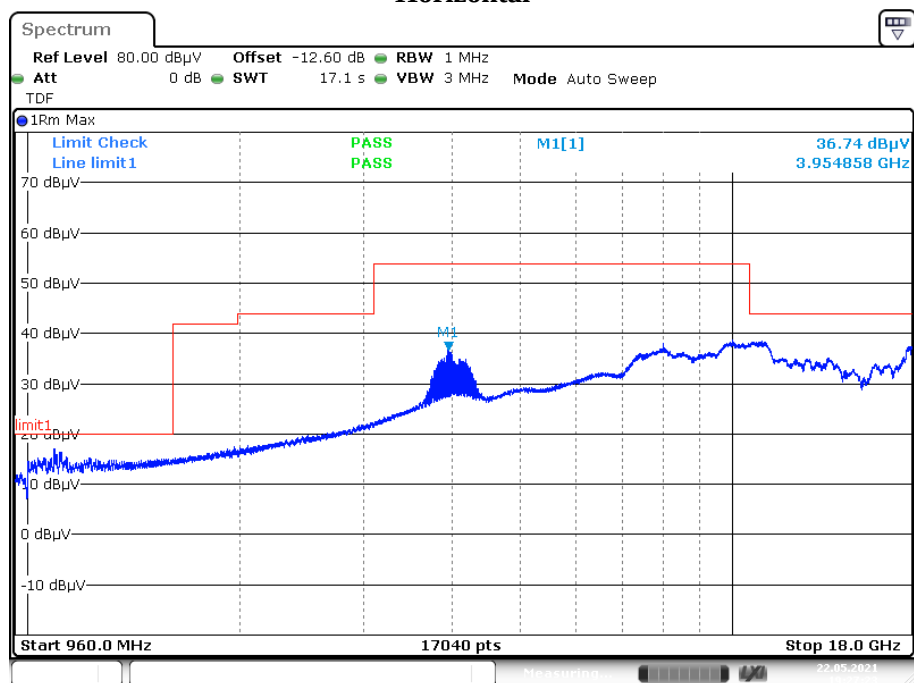
Spurious radiated emission above 960MHz in non GPS band:

1. The test distance is 0.7m, so the correct factor from 3m to 0.7m is $20\log(3/0.7)=12.6\text{dB}$ which was added into the offset on the spectrum analyzer.
2. $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2$, for $d = 3$ meters.
3. The antenna factor, cable loss and preamplifier gain have been entered into the analyzer as the transducer factor.

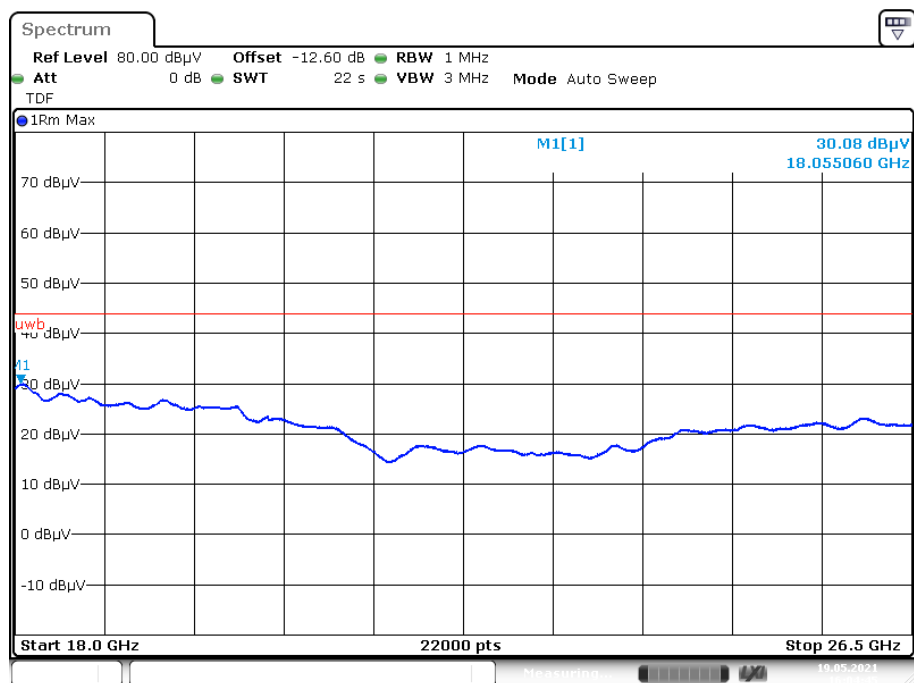
Frequency (MHz)	Corrected Amplitude (dB $\mu\text{V/m}$)	EIRP (dBm)	Detector	Turntable Degree	Rx Antenna		Part 15.17	
					Height (m)	Polar (H / V)	EIRP Limit (dBm)	Margin (dB)
CH2								
3954.86	36.74	-58.46	RMS	98	1.6	H	-41.30	17.16
18055.06	30.08	-65.12	RMS	142	1.7	H	-51.30	13.82
38447.81	36.42	-58.78	RMS	173	1.8	H	-51.30	7.48
3948.17	41.09	-54.11	RMS	168	1.9	V	-41.30	12.81
18053.51	30.09	-65.11	RMS	276	1.6	V	-51.30	13.81
38449.65	36.49	-58.71	RMS	213	1.5	V	-51.30	7.41
CH5								
6396.76	44.50	-50.70	RMS	338	1.7	H	-41.30	9.40
18063.56	30.03	-65.17	RMS	102	2.0	H	-51.30	13.87
38452.10	36.28	-58.92	RMS	112	1.6	H	-51.30	7.62
6430.97	44.16	-51.04	RMS	45	1.7	V	-41.30	9.74
18063.94	30.06	-65.14	RMS	235	1.4	V	-51.30	13.84
38444.74	36.29	-58.91	RMS	246	1.5	V	-51.30	7.61

CH2

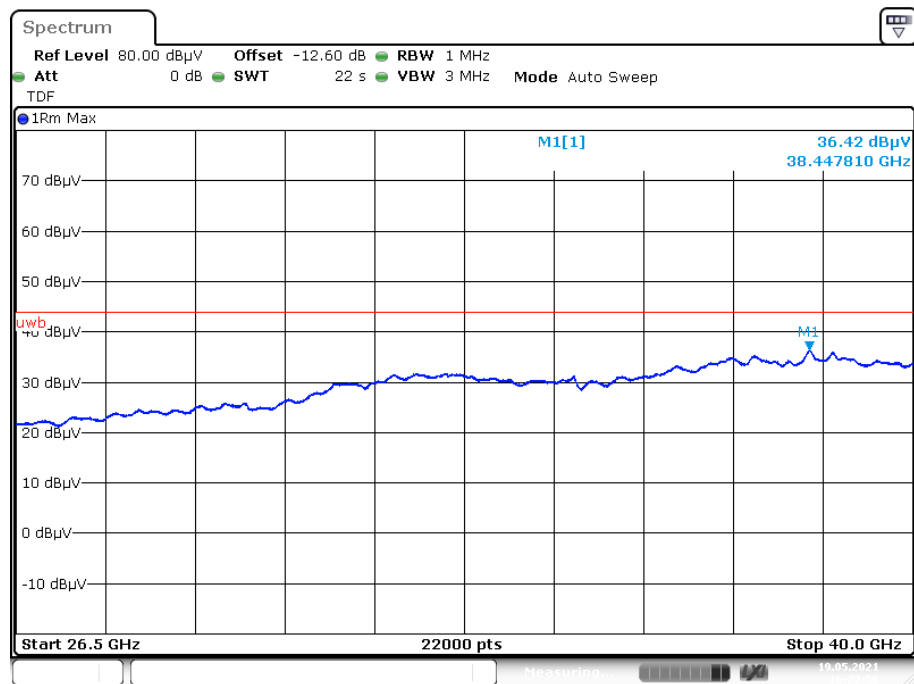
Horizontal



Date: 22.MAY.2021 19:27:23

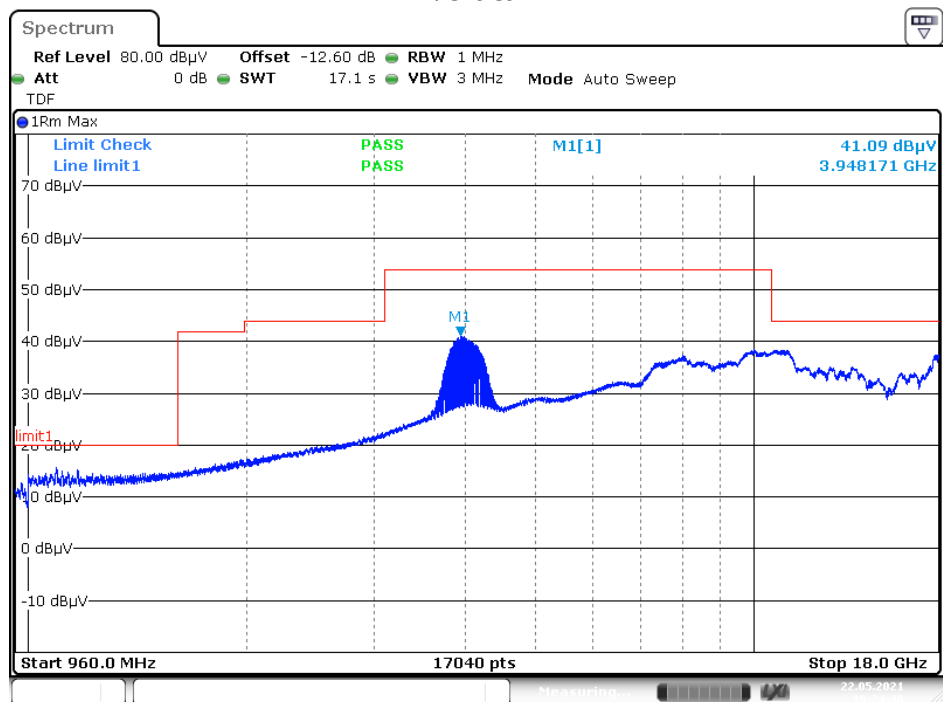


Date: 19.MAY.2021 16:04:44

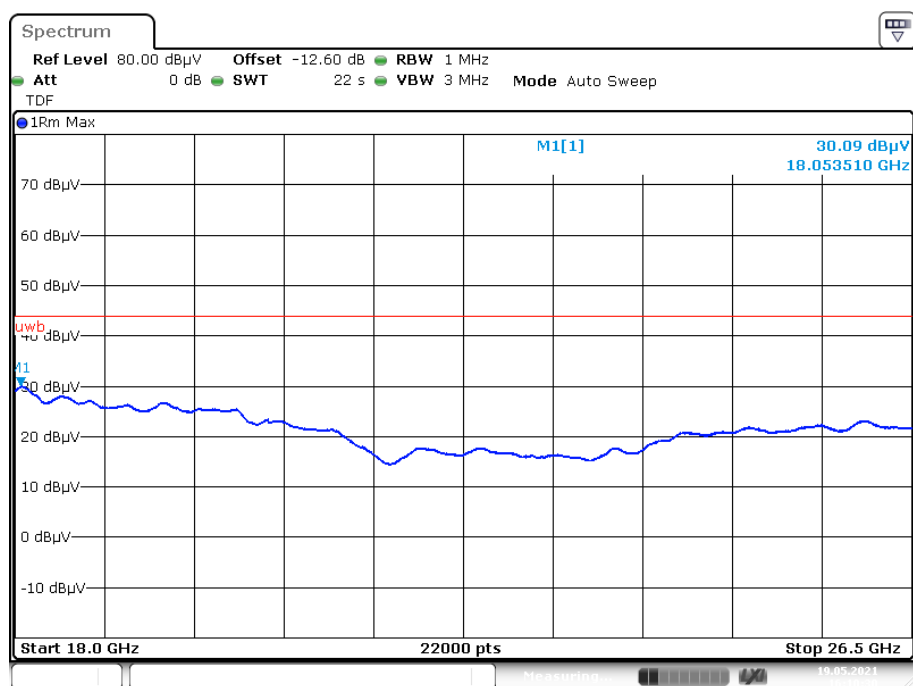


Date: 19.MAY.2021 16:22:56

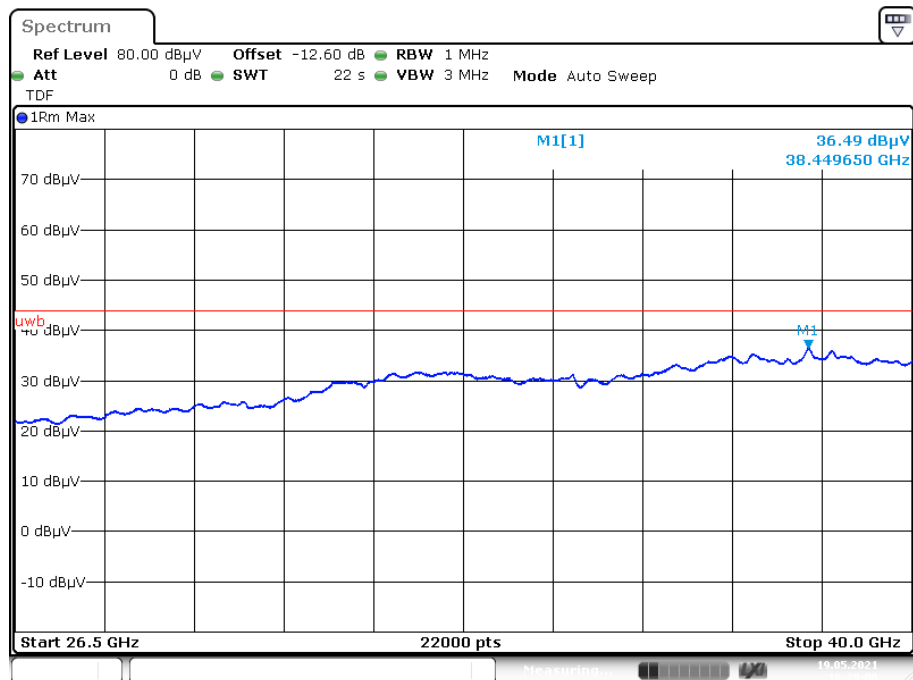
Vertical



Date: 22.MAY.2021 19:24:48



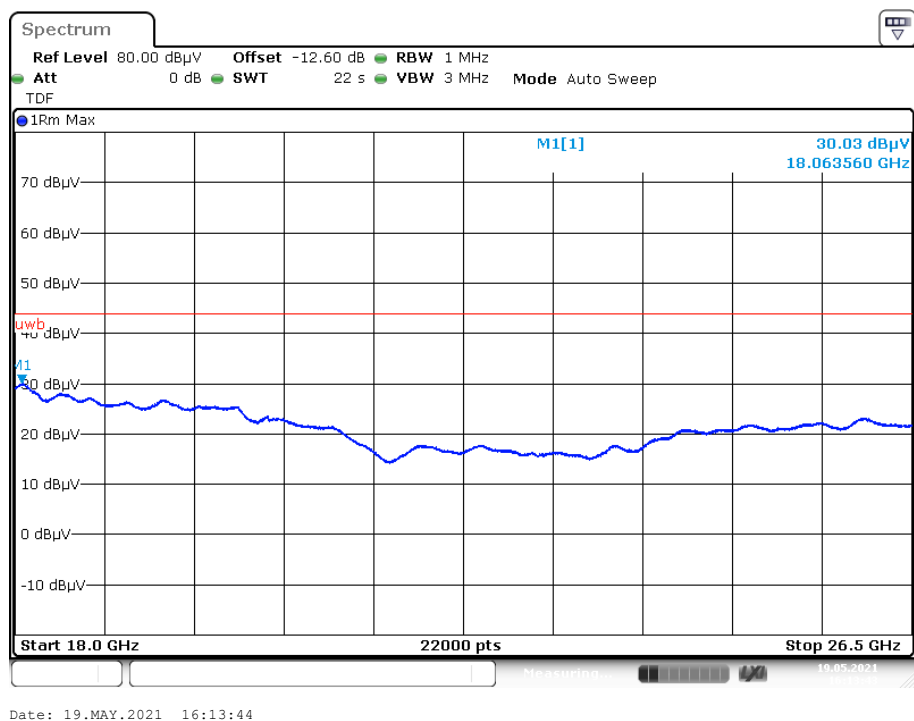
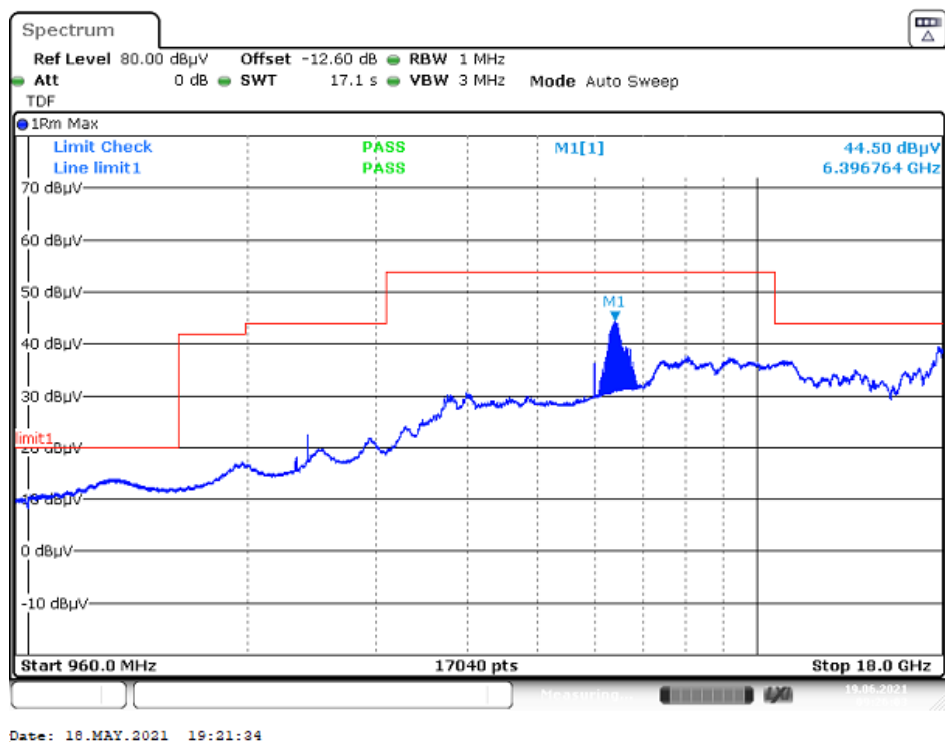
Date: 19.MAY.2021 16:10:30

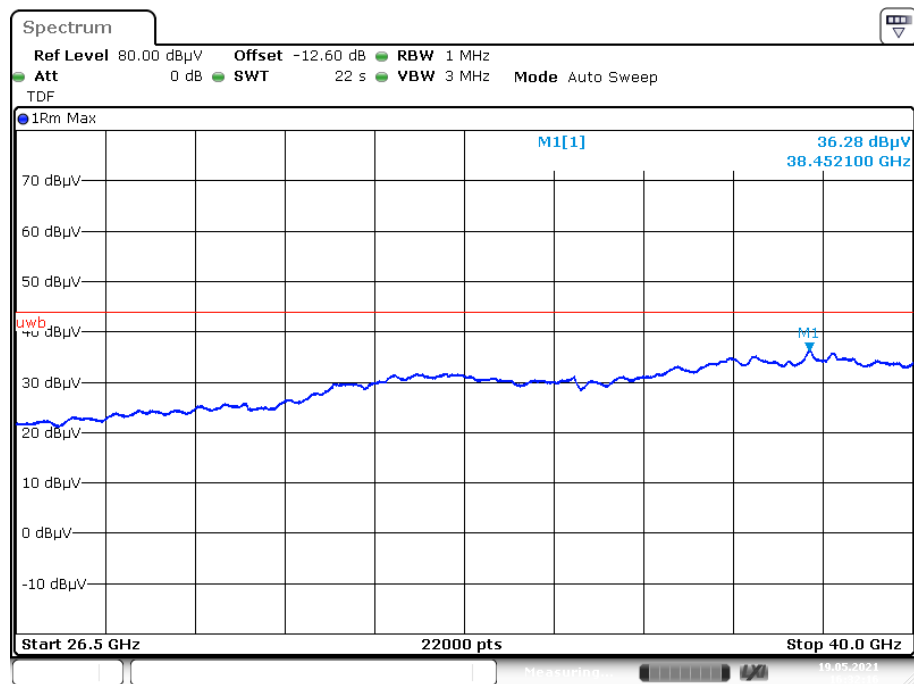


Date: 19.MAY.2021 16:29:00

CH5

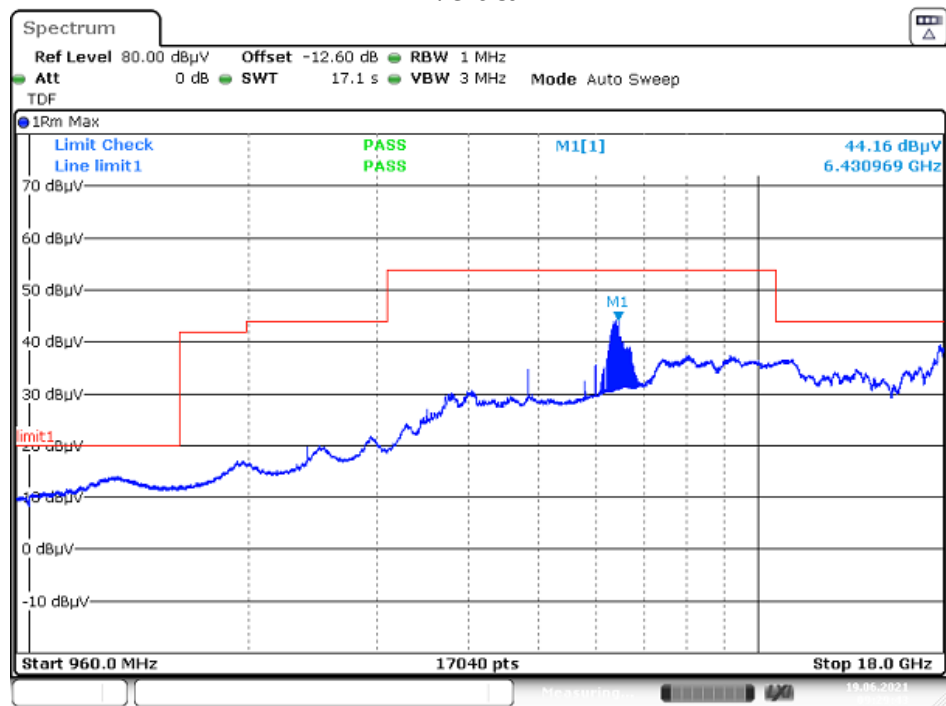
Horizontal



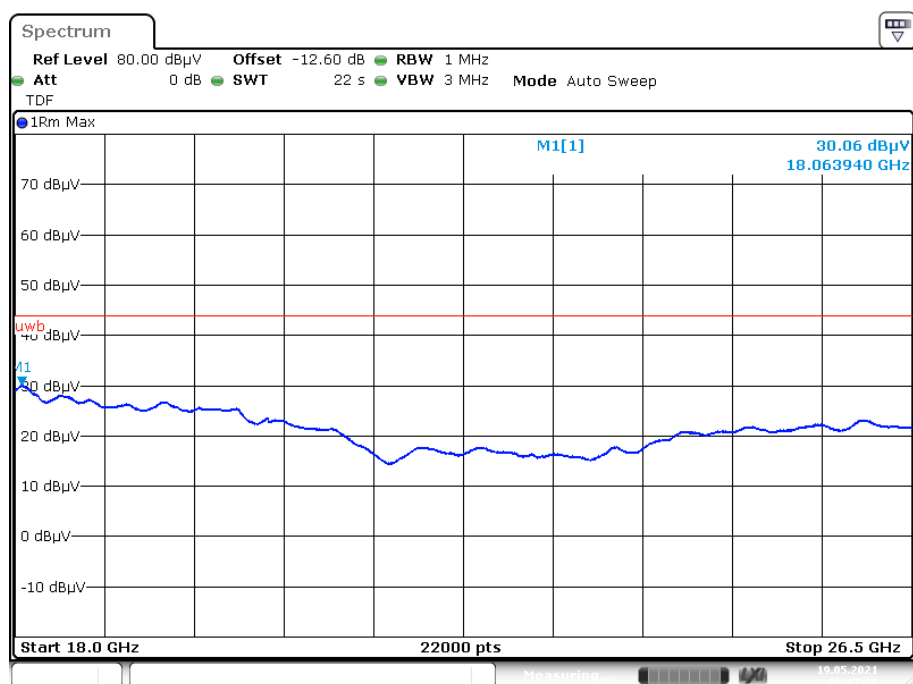


Date: 19.MAY.2021 16:32:16

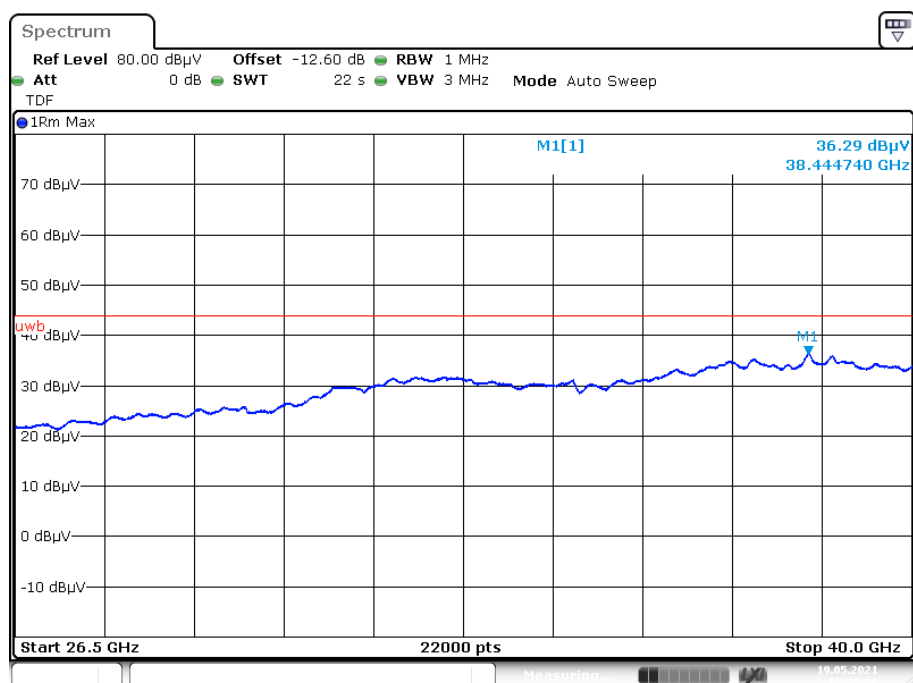
Vertical



Date: 18.MAY.2021 19:28:42



Date: 19.MAY.2021 16:17:39



Date: 19.MAY.2021 16:35:48

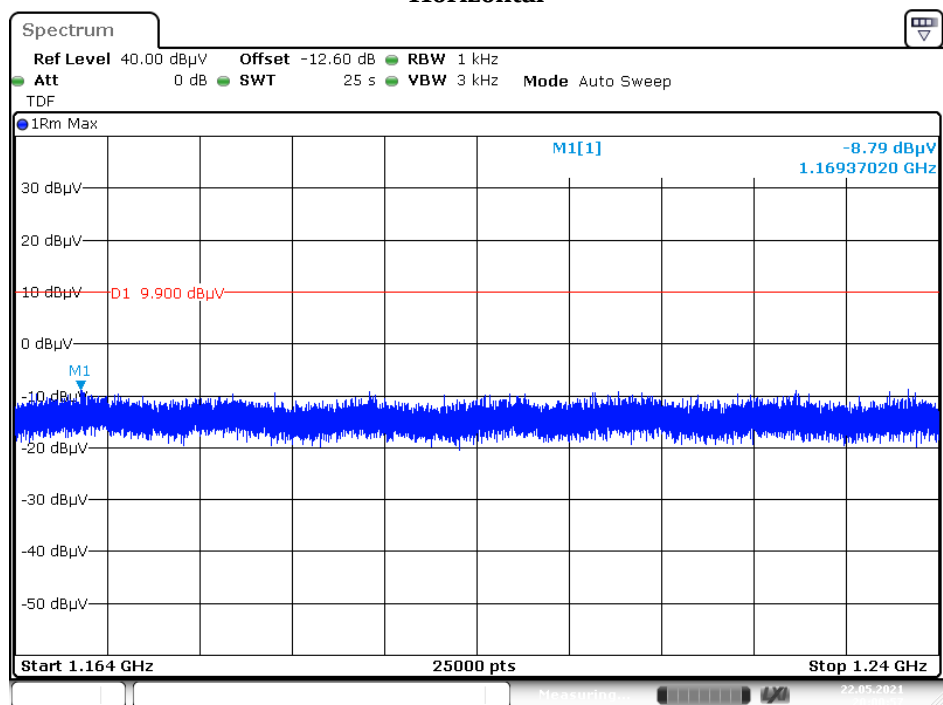
Spurious radiated emission above 960MHz in GPS band:

1. The test distance is 0.7m, so the correct factor from 3m to 0.7m is $20\log(3/0.7)=12.6\text{dB}$ which was added into the offset on the spectrum analyzer.
2. $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2$, for $d = 3$ meters.
3. The antenna factor, cable loss and preamplifier gain have been entered into the analyzer as the transducer factor.

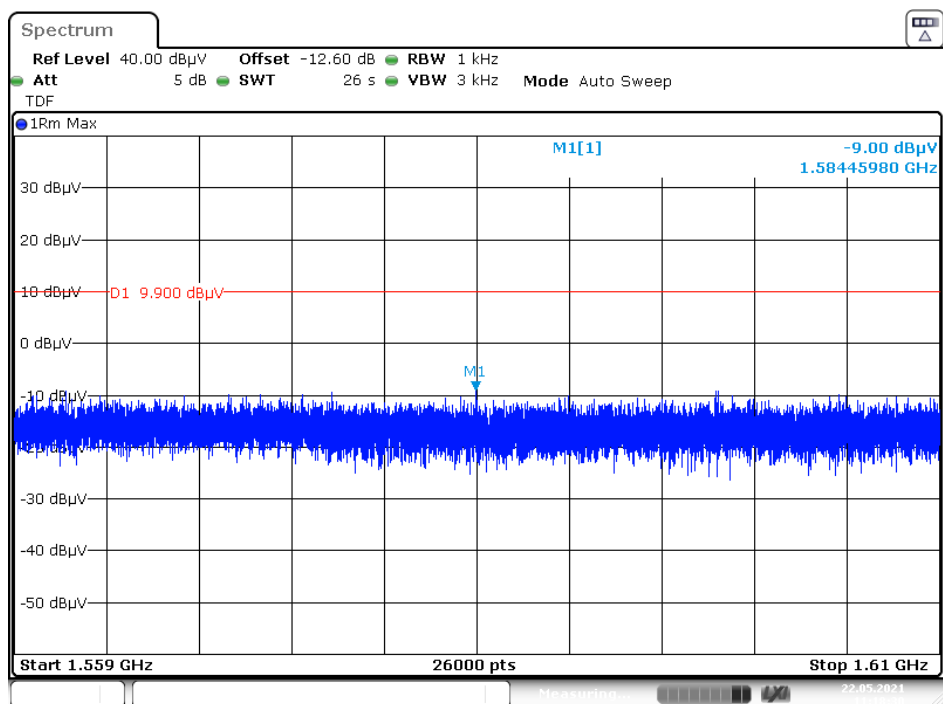
Frequency (MHz)	Corrected Amplitude (dB $\mu\text{V/m}$)	EIRP (dBm)	Detector	Turntable Degree	Rx Antenna		Part 15.517	
					Height (m)	Polar (H / V)	EIRP Limit (dBm)	Margin (dB)
CH2								
1169.38	-8.79	-103.99	RMS	18	1.6	H	-85.3	18.69
1213.02	-8.96	-104.16	RMS	255	1.5	V	-85.3	18.86
1584.46	-9.00	-104.20	RMS	326	1.3	H	-85.3	18.90
1561.92	-9.40	-104.60	RMS	142	2.0	V	-85.3	19.30
CH5								
1214.85	-8.85	-104.05	RMS	138	1.8	H	-85.3	18.75
1210.97	-8.84	-104.04	RMS	169	1.7	V	-85.3	18.74
1564.81	-8.91	-104.11	RMS	203	2.0	H	-85.3	18.81
1579.29	-9.11	-104.31	RMS	17	1.6	V	-85.3	19.01

CH2:

Horizontal

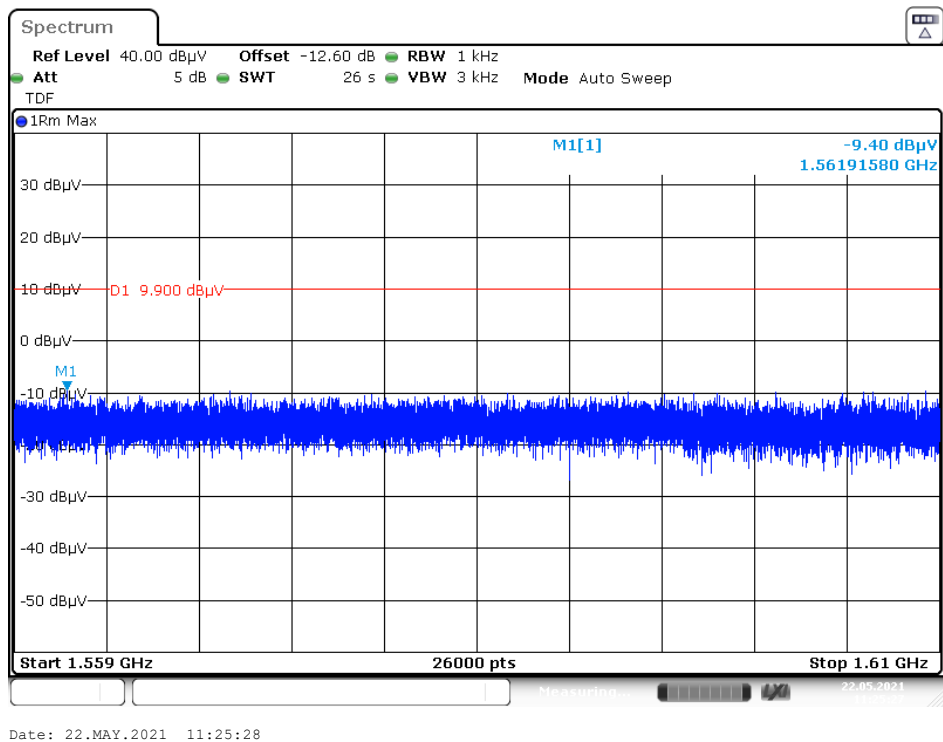
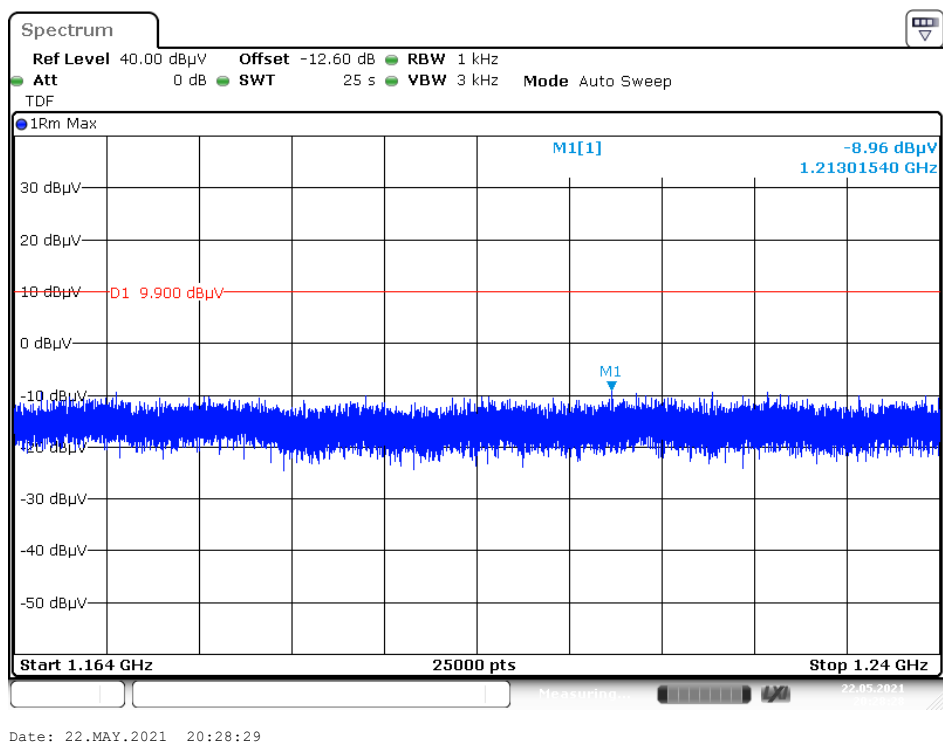


Date: 22.MAY.2021 20:00:57



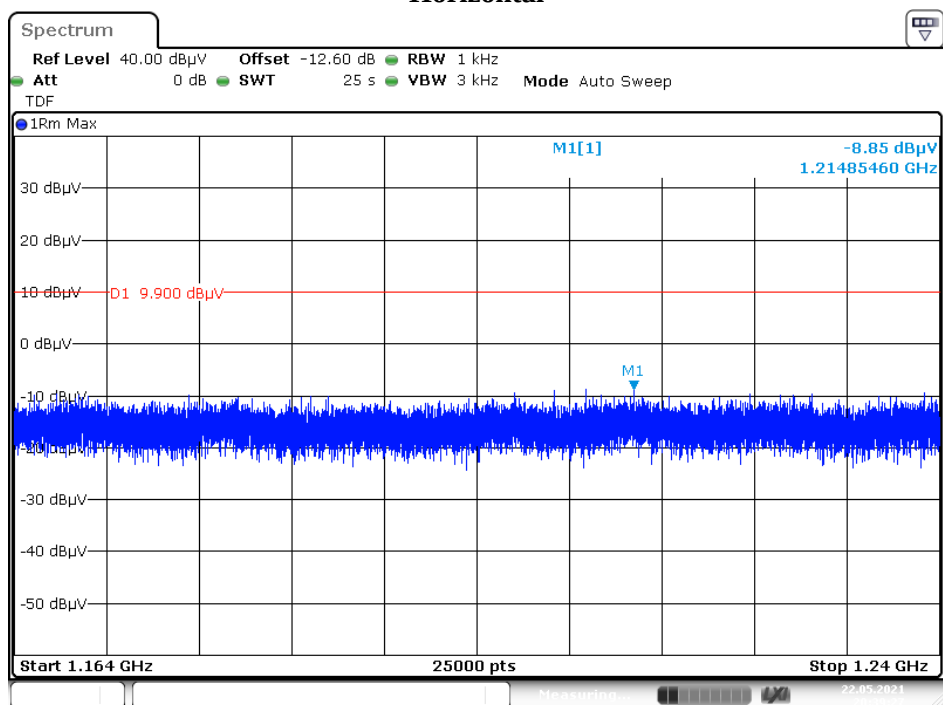
Date: 22.MAY.2021 11:18:31

Vertical

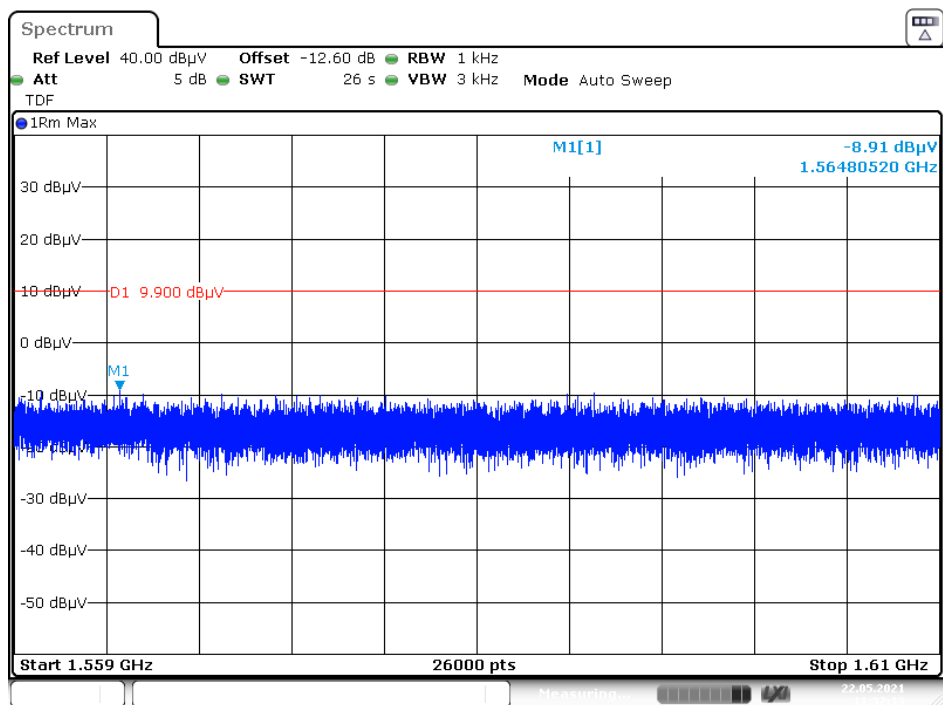


CH5:

Horizontal

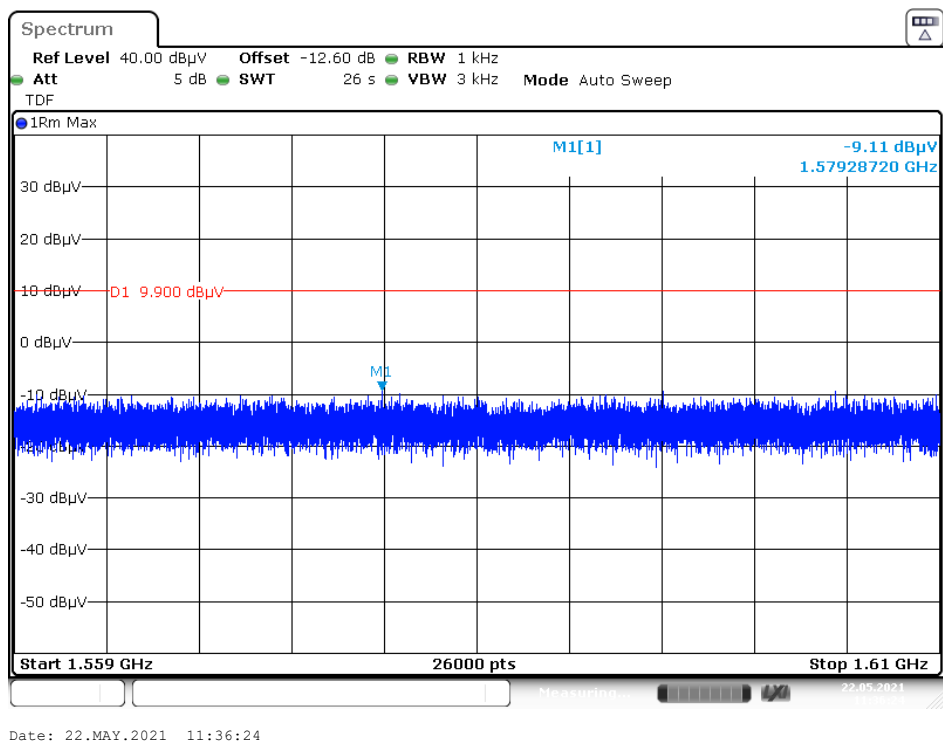
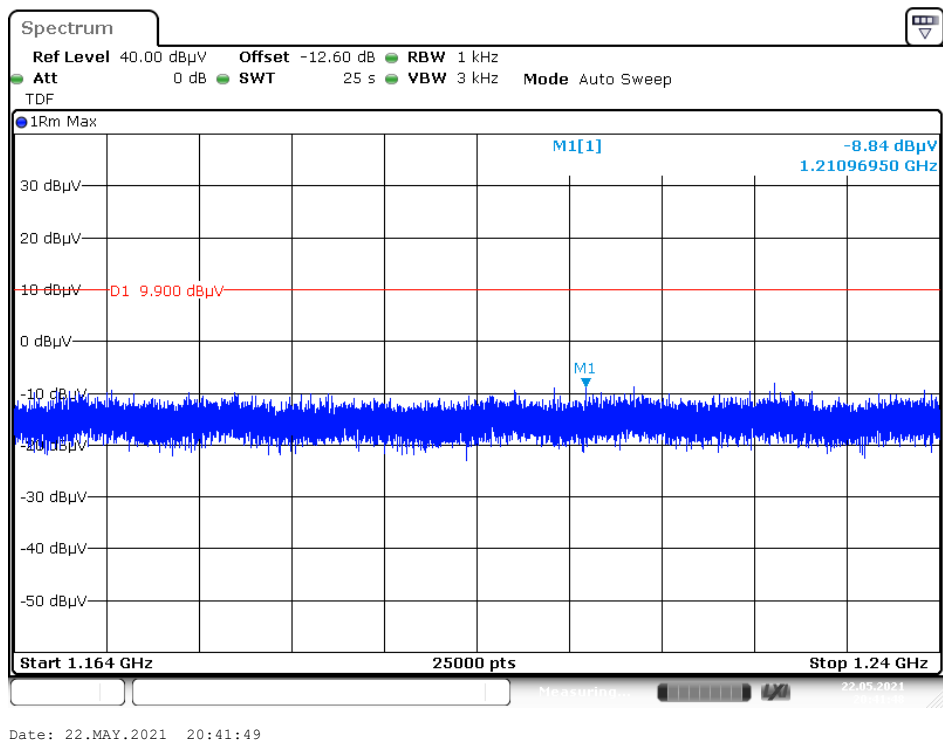


Date: 22.MAY.2021 20:39:28



Date: 22.MAY.2021 11:32:13

Vertical



§15.517(e) - PEAK EMISSION IN A 50 MHZ BANDWIDTH

Applicable Standard

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, f_M . 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.

Test Procedure

Refer to the C63.10-2013 Section 10.3.5.

Test Data

Environmental Conditions

Temperature:	25°C
Relative Humidity:	52 %
ATM Pressure:	101.0kPa
Tester:	Joker Chen
Test Date:	2021-05-22

EUT operation mode: Transmitting

Frequency (MHz)	Reading level (dBμV/m) RBW=10MHz	EIRP (dBm/10MHz)	EIRP (dBm/50MHz)	Limit
				dBm/50MHz
3965.229	73.83	-21.37	-7.37	0
6525	71.14	-24.06	-9.98	0

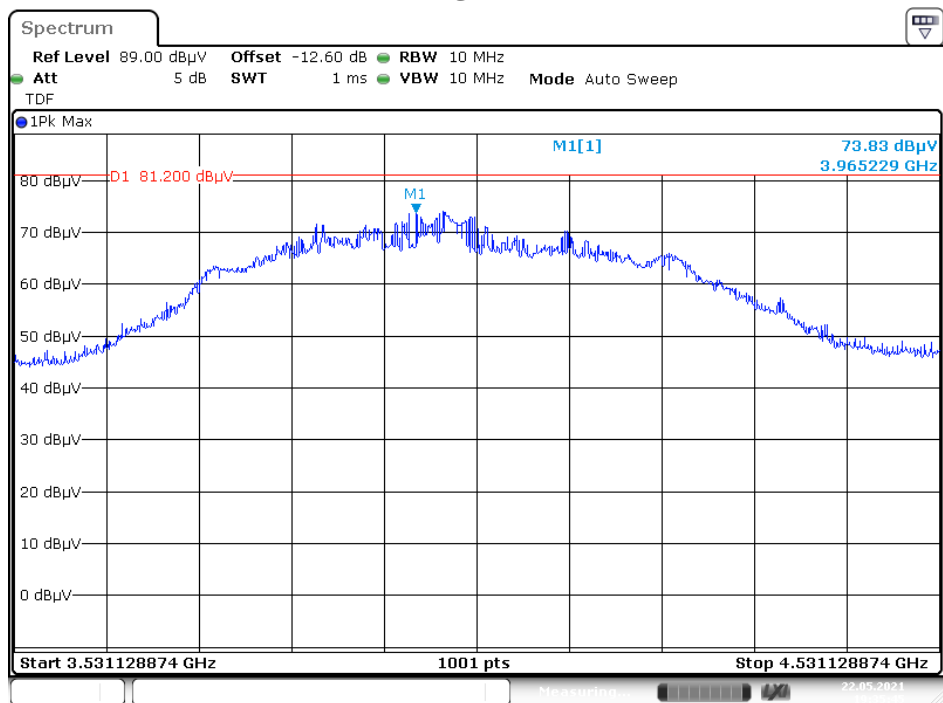
Note: 1. The test distance is 0.7m, so the correct factor from 3m to 0.7m is $20\log(3/0.7)=12.6\text{dB}$ which was added into the offset on the spectrum analyzer.

2. The correct factor of RBW 10MHz to 50MHz is $20 \log (50\text{MHz}/10 \text{ MHz}) = 14$

3. $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2$, for $d = 3$ meters.

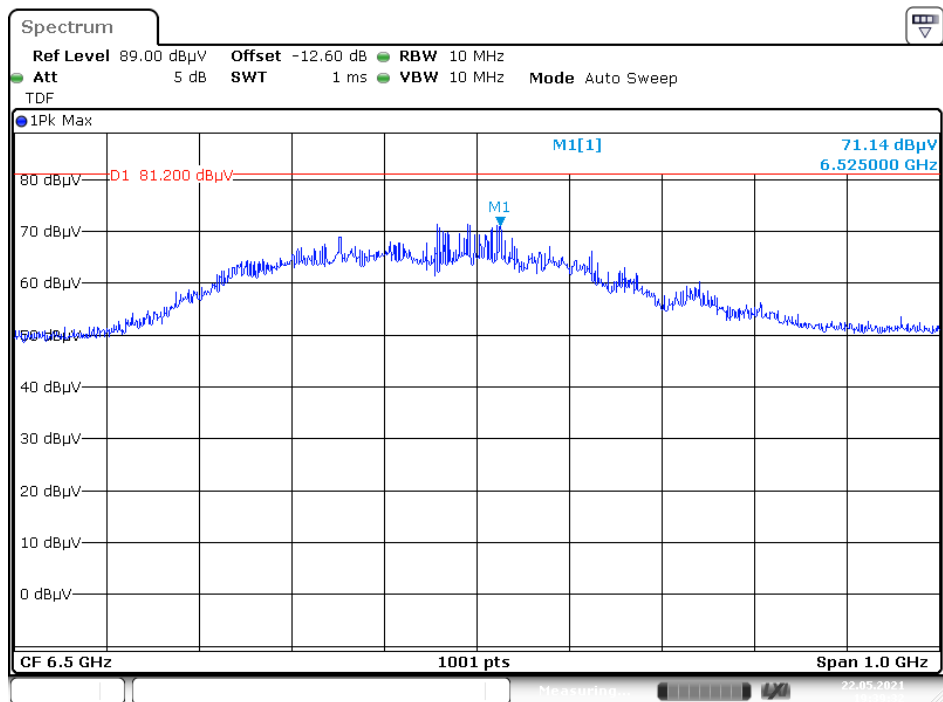
The antenna factor, cable loss and preamplifier gain have been entered into the analyzer as the transducer factor.

CH2



Date: 22.MAY.2021 19:35:46

CH5



Date: 22.MAY.2021 19:39:33

***** END OF REPORT *****