




TESTREPORT

Applicant Name : IntraNav GmbH
Address : Frankfurter Str. 27, Eschborn, Germany 65760
Report Number: SZNS220718-32553E-RF-00
FCC ID: 2AWK8UWB3040

Test Standard (s)

FCC PART 15F

Sample Description

Product Type: ASSET TAG
Model No.: UWB3010
Multiple Model(s) No.: UWB4010
Trade Mark: 
Date Received: 2022/07/18
Report Date: 2023/01/17

Test Result:	Pass*
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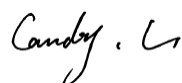
* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:



Nick Fang
EMC Engineer

Approved By:



Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	ASSET TAG
Tested Model	UWB3010
Multiple Models	UWB4010 (model difference see product declaration letter of similarity)
Frequency Range	Channel 5: 6489.6MHz
Antenna Specification*	3.7 dBi (It is provided by the applicant)
Voltage Range	DC3.6V from battery
Sample serial number	SZNS220718-32553E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This report is prepared on behalf in accordance with Part 2-Subpart J, Part 15-Subparts A and F of the Federal Communication Commission's rules.

Test Methodology

All tests and measurements indicated in this document were performed in accordance ANSI C63.10-2013.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter	Uncertainty	
Occupied Channel Bandwidth	5%	
RF Frequency	0.082×10^{-7}	
RF output power, conducted	0.73dB	
Unwanted Emission, conducted	1.6dB	
AC Power Lines Conducted Emissions	2.72dB	
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz -26.5GHz	5.06dB
	26.5GHz -40GHz	4.72dB
Temperature	1°C	
Humidity	6%	
Supply voltages	0.4%	

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 Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing by manufacturer.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

EUT configured in test mode by manufacturer and power level is default*. The power level was provided by the applicant.

Support Equipment List and Details

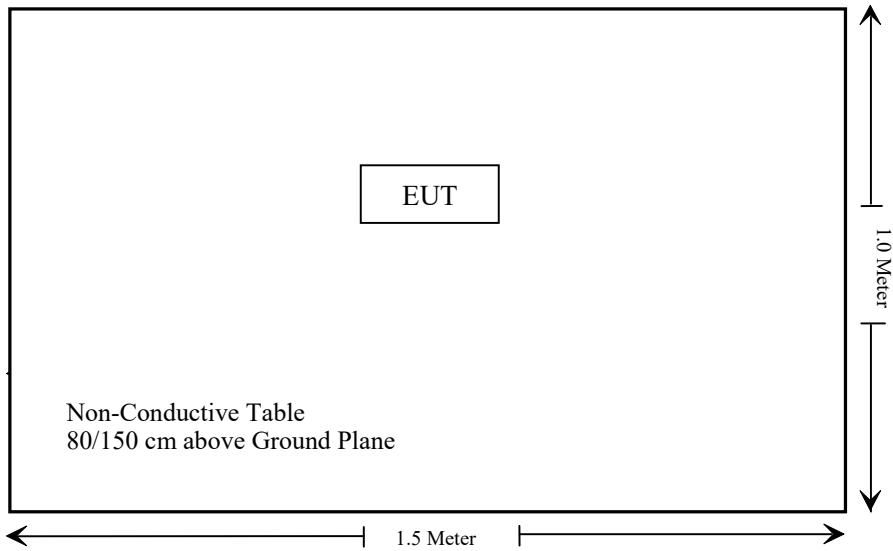
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From/Port	To
/	/	/	/

Block Diagram of Test Setup

For Radiated Emissions:



SUMMARY OF TEST RESULTS

Items	Description of Test	Result
§1.1307 (b) (3) & §2.1093	RF Exposure	Compliant
§15.517(a)	General Requirement	Compliant
§15.203, §15.517(a)(3)	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.503 (a)(d), §15.517(b)	UWB Operation bandwidth	Compliant
§15.209, §15.517(c)(d)	Radiated Emissions	Compliant
§15.517(e)	Peak Emission in a 50 MHz bandwidth	Compliant

Not Applicable: EUT only powered by battery.

Note: Pre-scan all models, the worst case model UWB3010 was selected to test.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emissions Test (Below 1GHz)					
Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Radiated Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test (1-18GHz)					
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2022/11/30	2025/11/29
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Radiated Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test (18-40GHz)					
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
Quinstar	Amplifier	QLW-184055 36-J0	15964001002	2021/11/11	2022/11/10
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
Radiated Emission Test Software: e3 19821b (V9)					

* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. 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) (3) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (3), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission’s guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance

1-mW Test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

For worst case:

Frequency (MHz)	Maximum Tune-up power		Exemption Limit (mW)	Test Exemption
	(dBm)	(mW)		
6489.6	-2.0	0.63	1	Yes

Result: Compliance

FCC §15.517 (A) - GENERAL REQUIREMENT

Applicable Standard

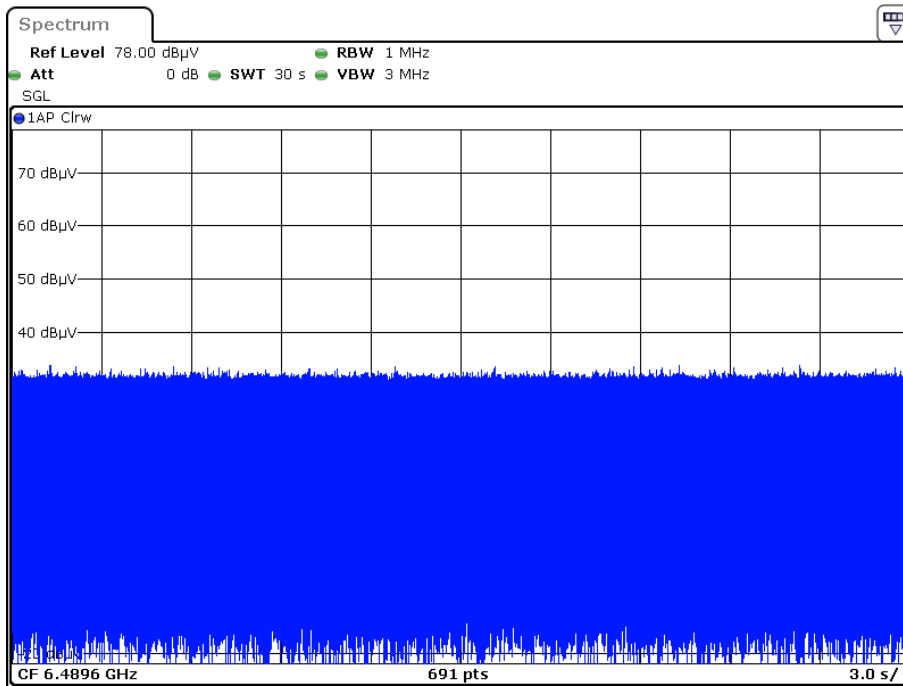
According to § 15.517(A): Operation under the provisions of this section is limited to UWB transmitters employed solely for indoor operation.

- (1) Indoor UWB devices, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.
- (2) The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building.
- (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.
- (4) Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.
- (5) A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.

Result

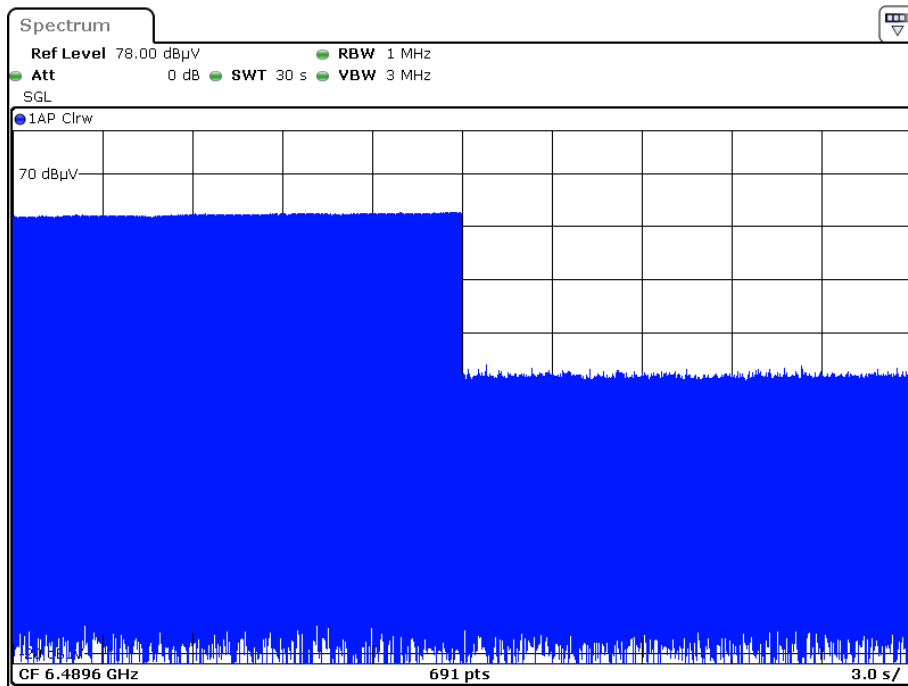
- (1) Compliance, EUT was only for indoor used, detail please refer to user manual.
- (2) Compliance, EUT was only for indoor positioning, detail please refer to user manual.
- (3) Compliance, the device with internal antenna and will never use the outdoor mounted antennas, please refer to EUT photo.
- (4) EUT is not a field disturbance sensor.
- (5) A communications system shall transmit only when the intentional radiator is sending information to an associated receiver. Please refer to the below test plots.

First step: the EUT is switched on, the associated receiver is switched off



Date: 17.JAN.2023 11:56:49

Second step: the EUT is switched on, the associated receiver is switched on, after about 15s the associated receiver is switched off



Date: 17.JAN.2023 11:53:58

FCC §15.203& §15.517 (A)(3) - 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.

And according to FCC 47 CFR section 15.517 (A)(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 one internal antenna which permanently attached to the unit, fulfill the requirement of this section. The antenna gain is 3.7dBi. Please refer to the EUT photos.

Antenna	Type	Antenna Gain	Impedance
	PCB	3.7dBi	50 Ω

Result: Compliant.

§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 fH and the lower boundary is designated fL. The frequency at which the highest radiated emission occurs is designated fM.

(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:	101.0 kPa

The testing was performed by Nick Fang on 2022-08-08.

Test Result: Pass.

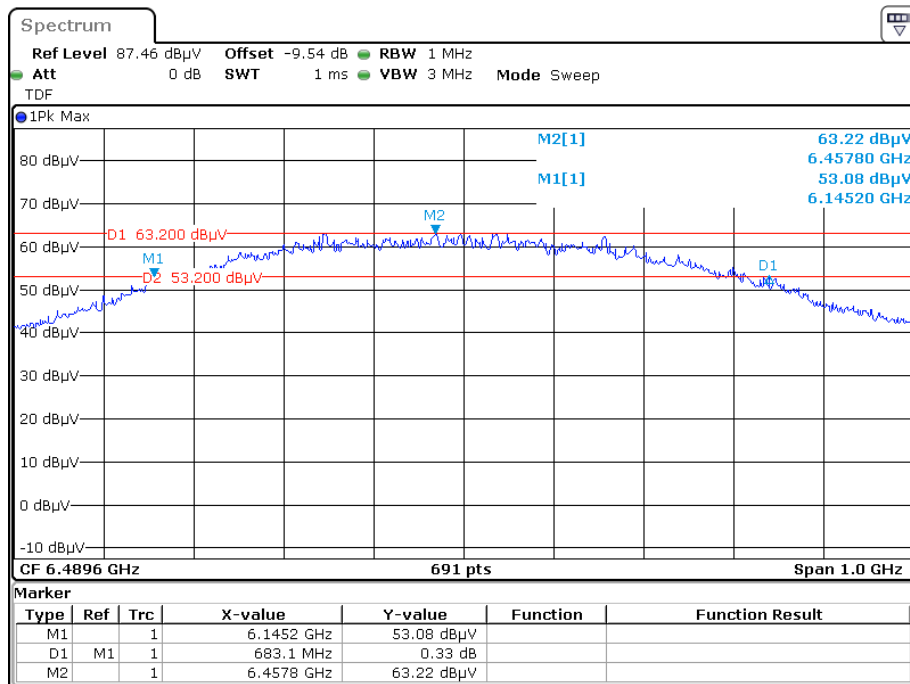
EUT operation mode: Transmitting

Please refer to the following table and plots.

Test distance is 1m.

Item		Result	Limit (MHz)
f_M (MHz)	The highest emission frequency	6457.8	/
f_L (MHz)	10dB below the lowest emission	6145.2	>3100
f_H (MHz)	10dB above the highest emission	6828.3	<10600
f_C (MHz)	$(f_H + f_L)/2$	6486.75	/
10dB bandwidth(MHz)	$f_H - f_L$	683.1	≥ 500
Fractional bandwidth	$2(f_H - f_L) / (f_H + f_L)$	0.105	/

10dB Bandwidth



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

Applicable Standard

FCC §15.517(c)(d); §15.209

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:

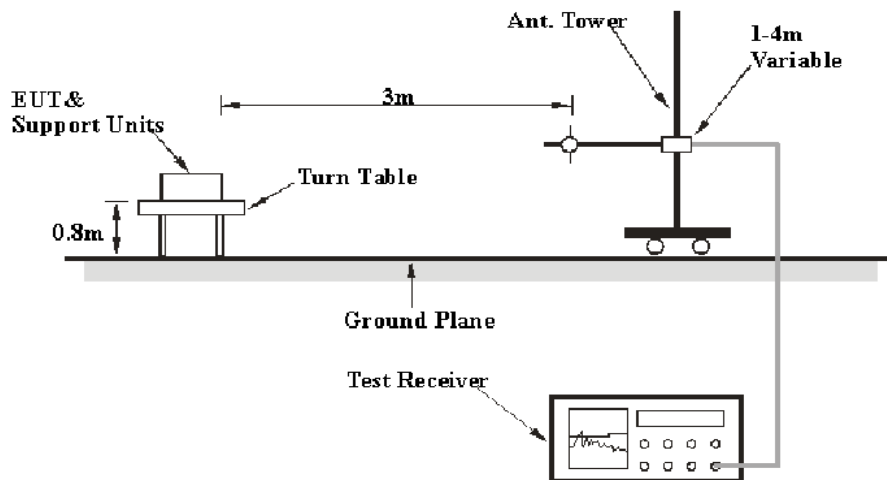
Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-53.3
1990-3100	-51.3
3100-10600	-41.3
Above 10600	-51.3

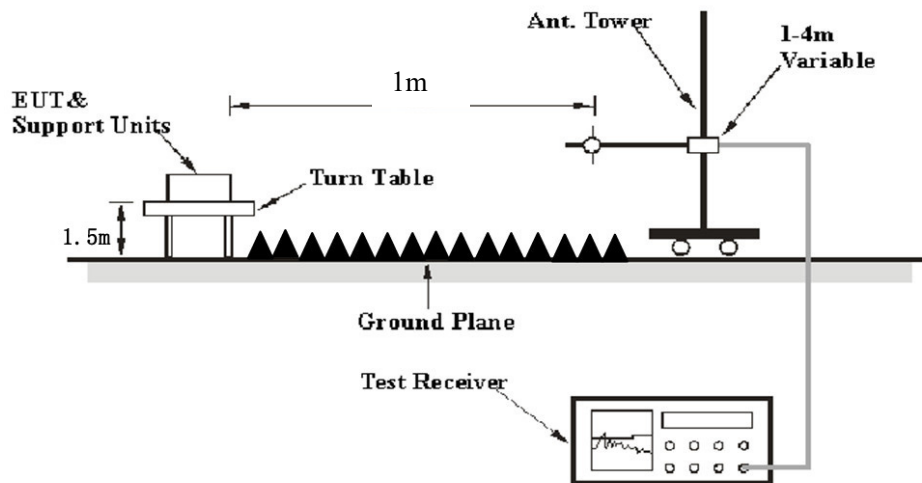
In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

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

EUT Setup

Below 1GHz:



Above 1GHz:

The radiated emission tests were performed in the 3meters 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
30MHz – 960 MHz	100 kHz	300 kHz	120kHz	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 Factor & Margin Calculation

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

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

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

$$\begin{aligned} \text{Over Limit} &= \text{Level} - \text{Limit} \\ \text{Level} &= \text{Meter Reading} + \text{Corrected Factor} \end{aligned}$$

Test Data

Environmental Conditions

Temperature:	26~27°C
Relative Humidity:	52~68 %
ATM Pressure:	101.0 kPa

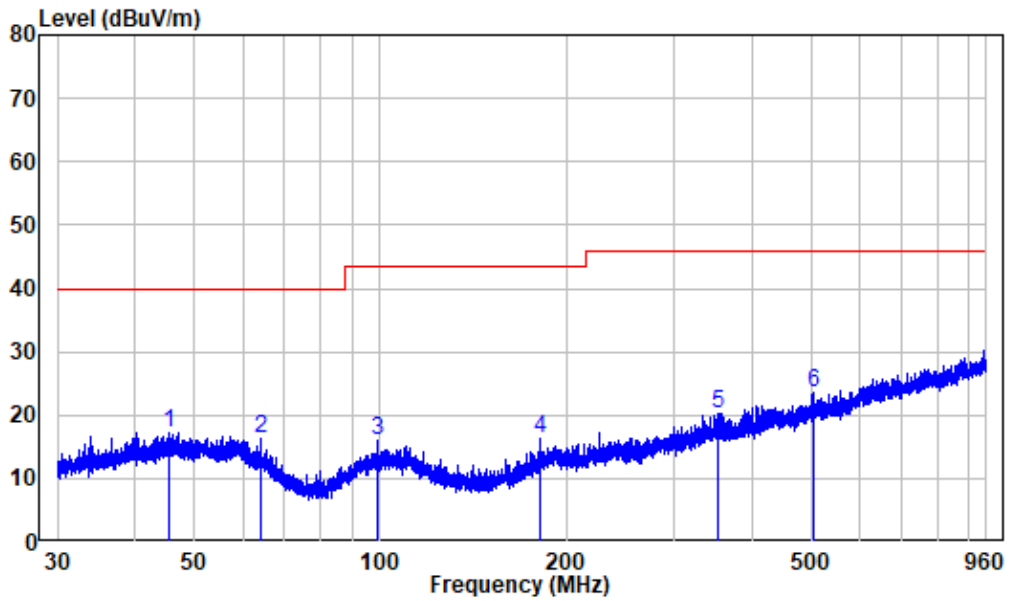
The testing was performed by Level Li on 2022-08-11 for below 960MHz and Zeki Ma on 2022-08-03 for above 960MHz.

EUT operation mode: Transmitting (*Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded*)

30 MHz~960MHz: (worst case)

Note: When the result of peak less than the limit of QP more than 6dB, just peak value was recorded.

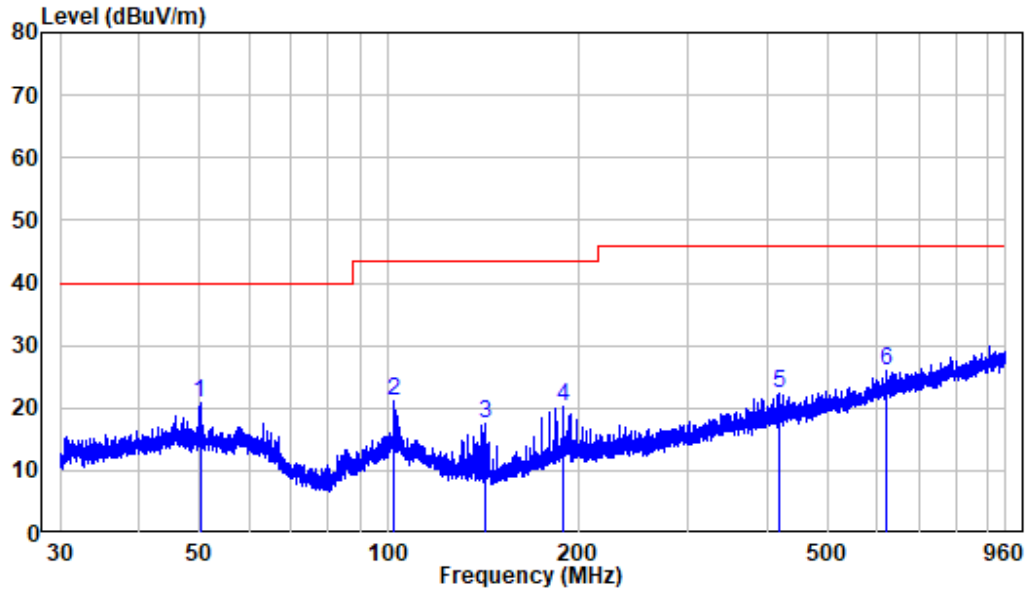
Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No. : SZNS220713-32553E-RF
 Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	45.570	-9.97	27.31	17.34	40.00	-22.66	Peak
2	64.167	-12.21	28.57	16.36	40.00	-23.64	Peak
3	99.303	-11.96	28.06	16.10	43.50	-27.40	Peak
4	181.571	-12.58	28.92	16.34	43.50	-27.16	Peak
5	352.906	-7.42	27.55	20.13	46.00	-25.87	Peak
6	505.613	-4.26	27.70	23.44	46.00	-22.56	Peak

Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No. : SZNS220713-32553E-RF
 Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	50.084	-9.91	30.71	20.80	40.00	-19.20	Peak
2	101.874	-11.58	32.80	21.22	43.50	-22.28	Peak
3	142.458	-15.54	33.18	17.64	43.50	-25.86	Peak
4	189.610	-11.64	31.94	20.30	43.50	-23.20	Peak
5	420.042	-6.13	28.52	22.39	46.00	-23.61	Peak
6	620.867	-2.50	28.57	26.07	46.00	-19.93	Peak

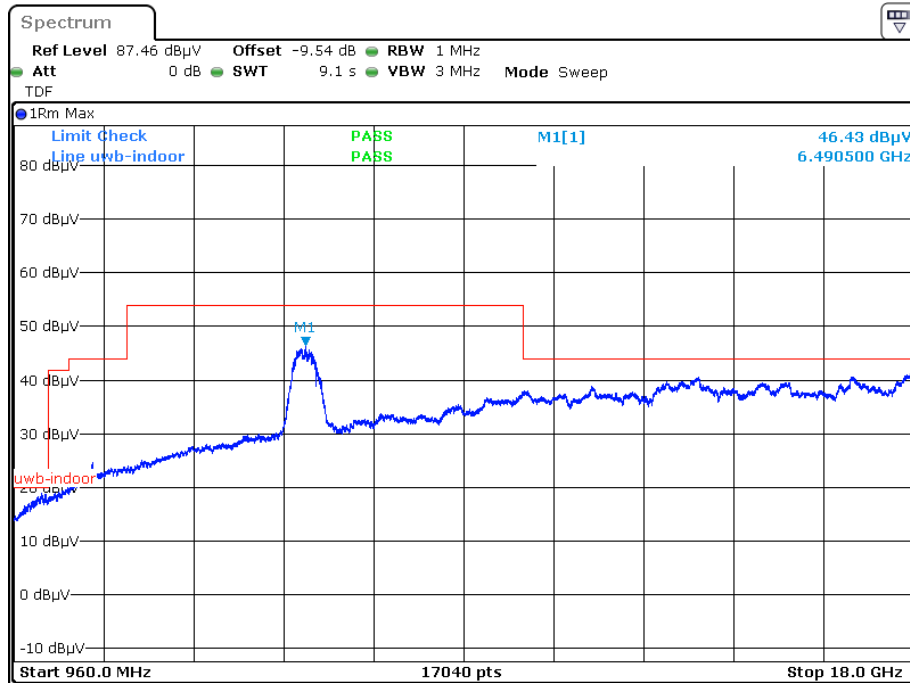
Above 960MHz:

Frequency (MHz)	Corrected Amplitude (dB μ V/m)	EIRP (dBm)	Detector	Turntable	Rx Antenna		Corrected Factor (dB/m)	Part 15F	
				Degree	Height (m)	Polar (H / V)		EIRP Limit (dBm)	Margin (dB)
Emissions in non GPS band									
6490.5	46.43	-48.77	RMS	144	2.2	H	0.50	-41.3	-7.47
6489.5	46.84	-48.36	RMS	215	2.1	V	0.50	-41.3	-7.06
21171.5	41.96	-53.24	RMS	234	1.1	H	9.63	-51.3	-1.94
21197.4	41.74	-53.46	RMS	157	2.2	V	9.66	-51.3	-2.16
Emissions in GPS band									
1176.0385	-5.40	-100.60	RMS	146	1.1	H	-10.27	-85.3	-15.30
1173.8495	-4.64	-99.84	RMS	161	1.7	V	-10.26	-85.3	-14.54
1203.6415	-5.02	-100.22	RMS	225	1.1	H	-10.24	-85.3	-14.92
1213.8075	-5.18	-100.38	RMS	175	1.6	V	-10.20	-85.3	-15.08
1236.9055	-3.76	-98.96	RMS	15	2.1	H	-10.18	-85.3	-13.66
1215.7575	-4.02	-99.22	RMS	58	1.3	V	-10.20	-85.3	-13.92
1559.2415	-3.13	-98.33	RMS	143	2.7	H	-9.20	-85.3	-13.03
1562.7545	-3.49	-98.69	RMS	222	1.5	V	-9.18	-85.3	-13.39
1588.6305	-2.62	-97.82	RMS	153	2.2	H	-9.10	-85.3	-12.52
1607.9615	-1.88	-97.08	RMS	207	2.1	V	-9.02	-85.3	-11.78

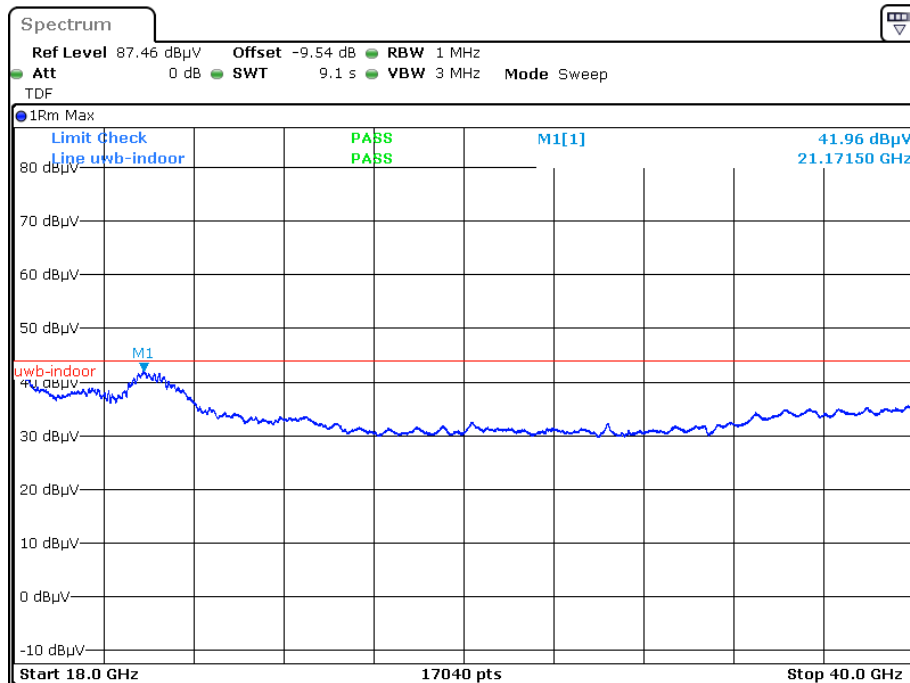
- Note:
1. E [dB μ V/m] = EIRP [dBm] + 95.2, for $d = 3$ meters.
 2. The antenna factor, cable loss and preamplifier gain have been entered into the analyzer as the transducer factor.
 3. The test distance is 1m, the correct factor from 1m to 3m is $20\lg(1/3) = -9.54$ dB, which was added into the offset on the spectrum Analyzer.

Emissions in non GPS bands:

Horizontal

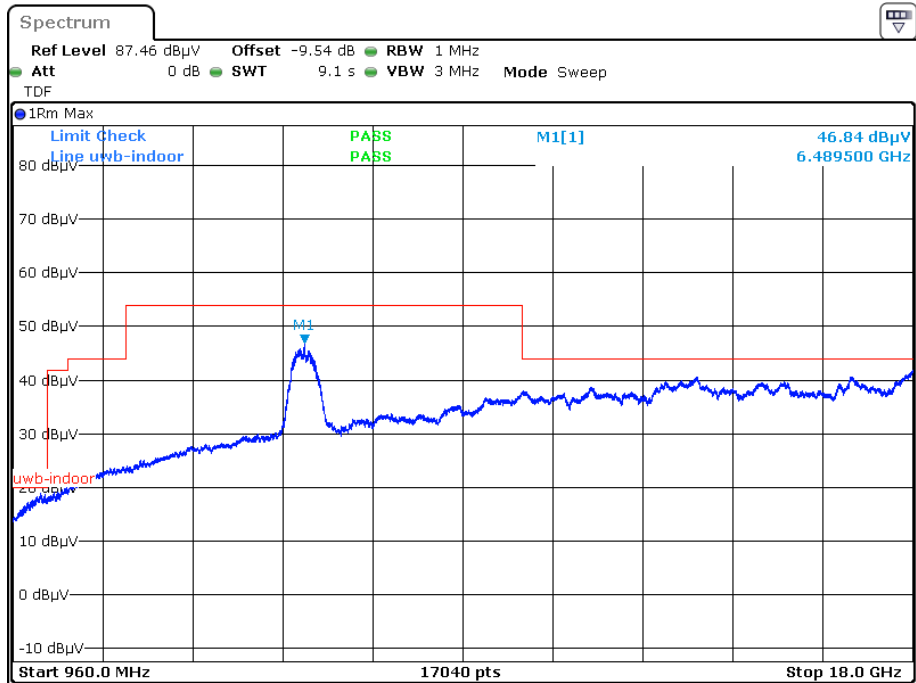


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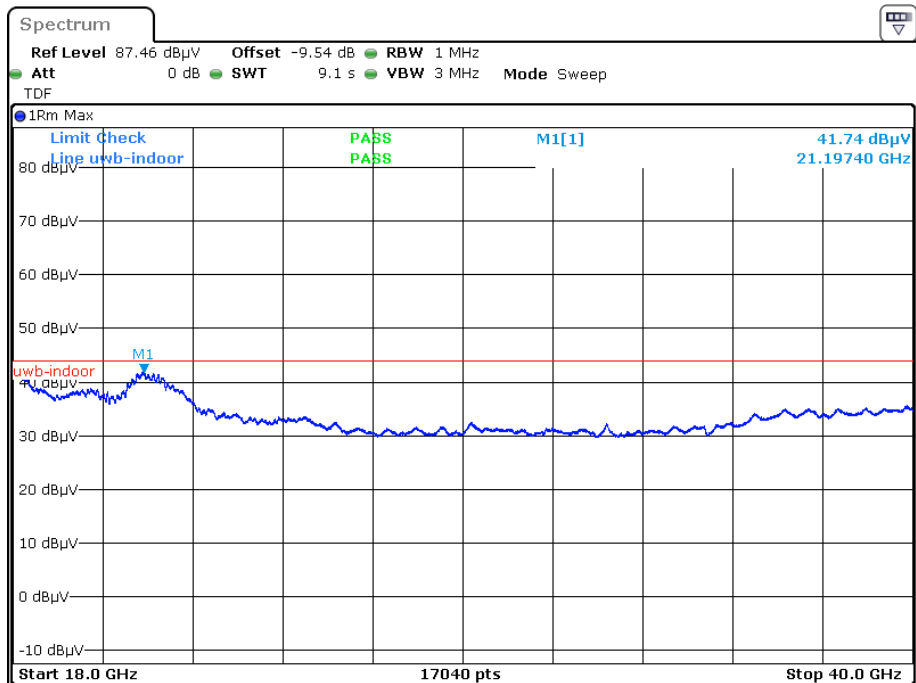


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Vertical



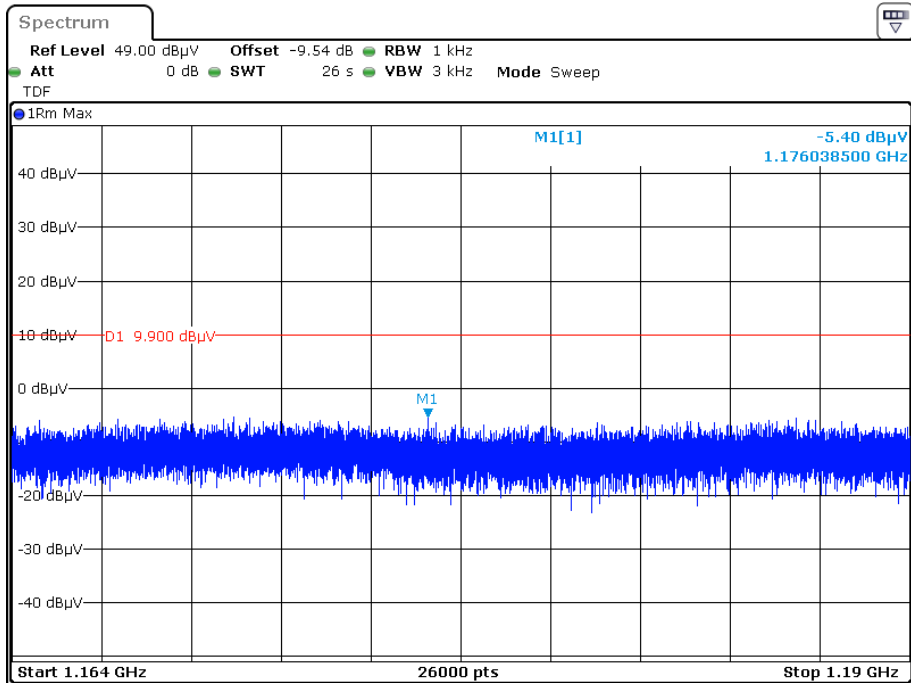
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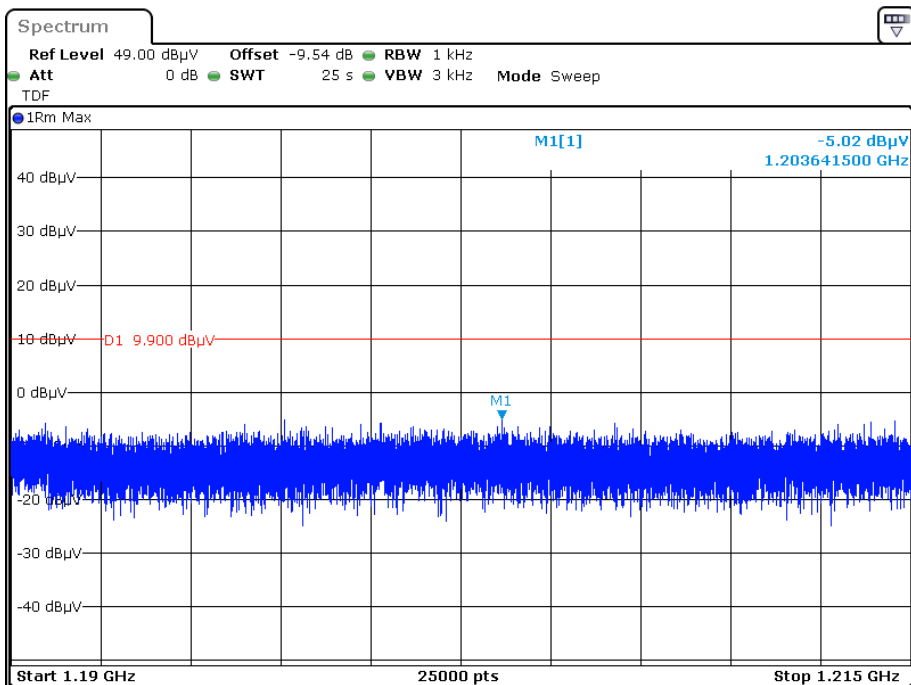
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Emissions in GPS bands:

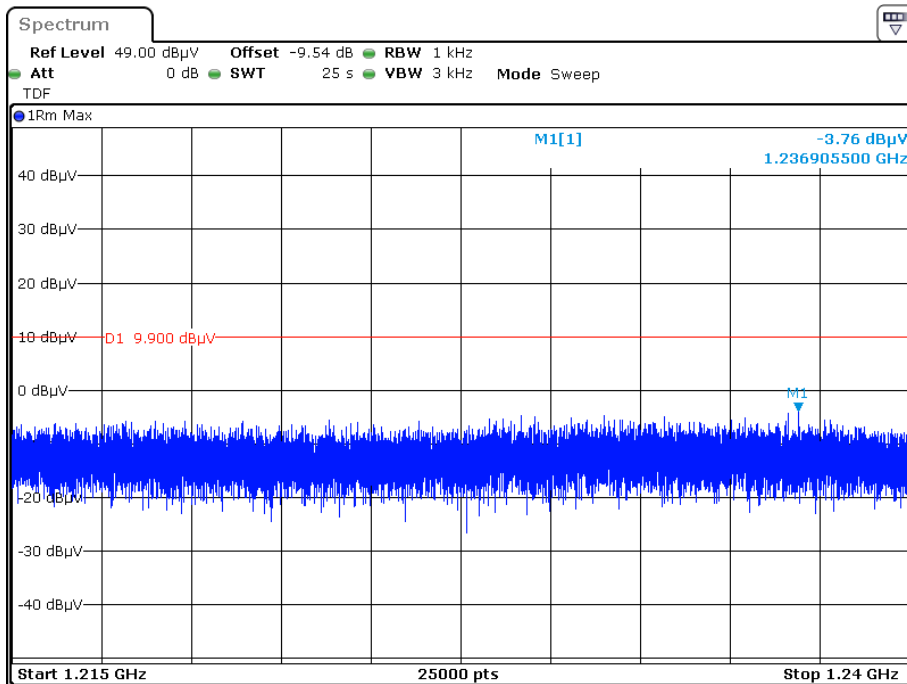
Horizontal



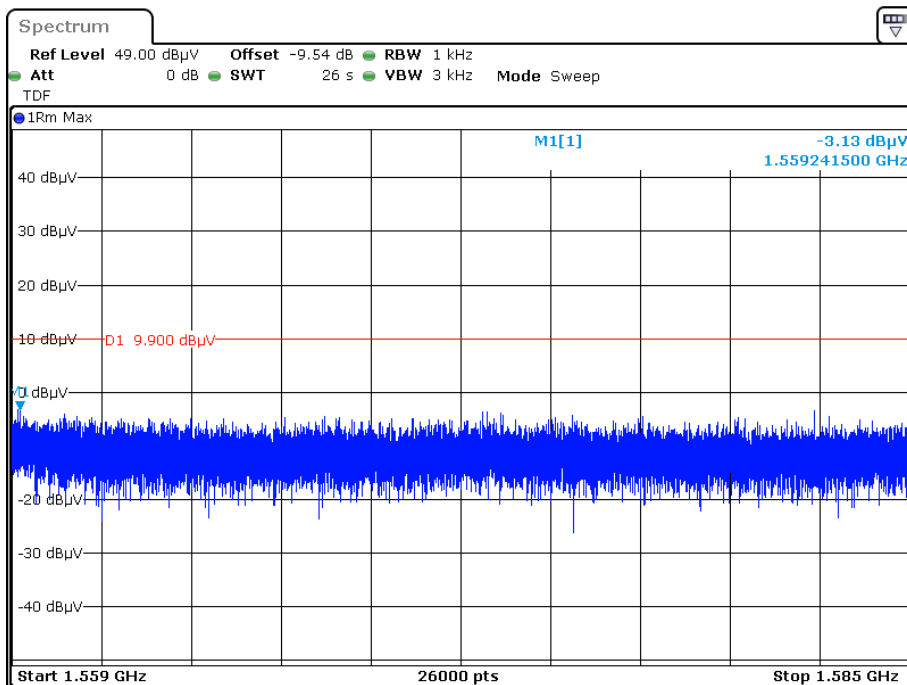
Date: 3.AUG.2022 17:09:09



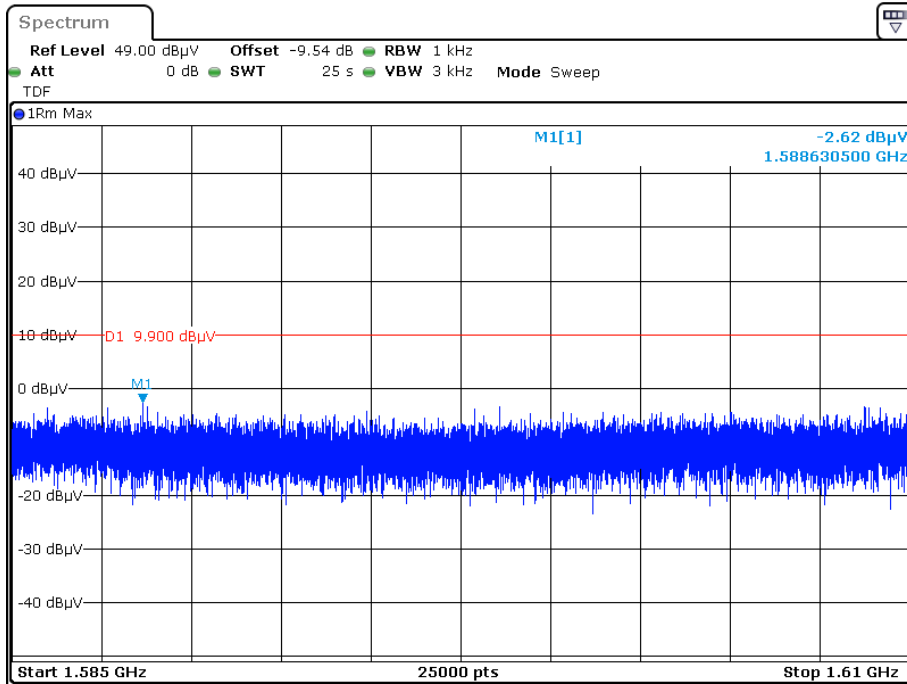
Date: 3.AUG.2022 17:11:55



Date: 3.AUG.2022 17:18:00

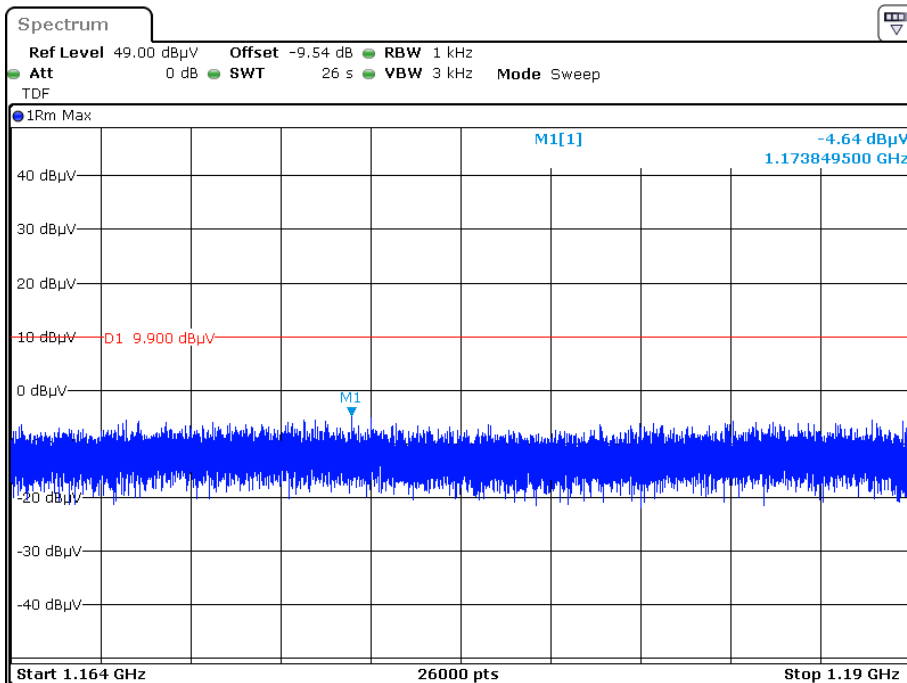


Date: 3.AUG.2022 17:21:10

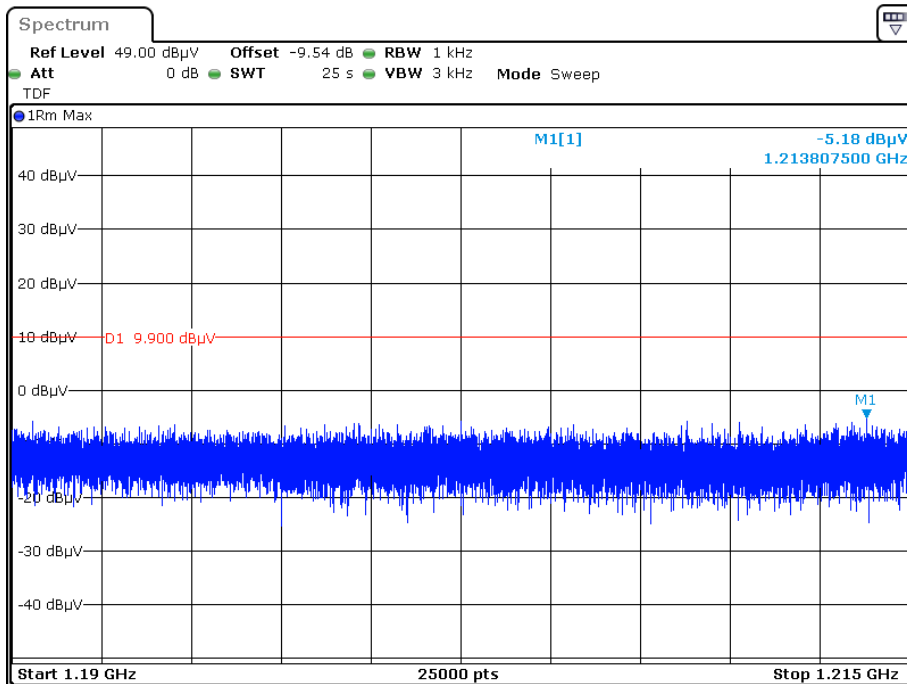


Date: 3.AUG.2022 17:24:34

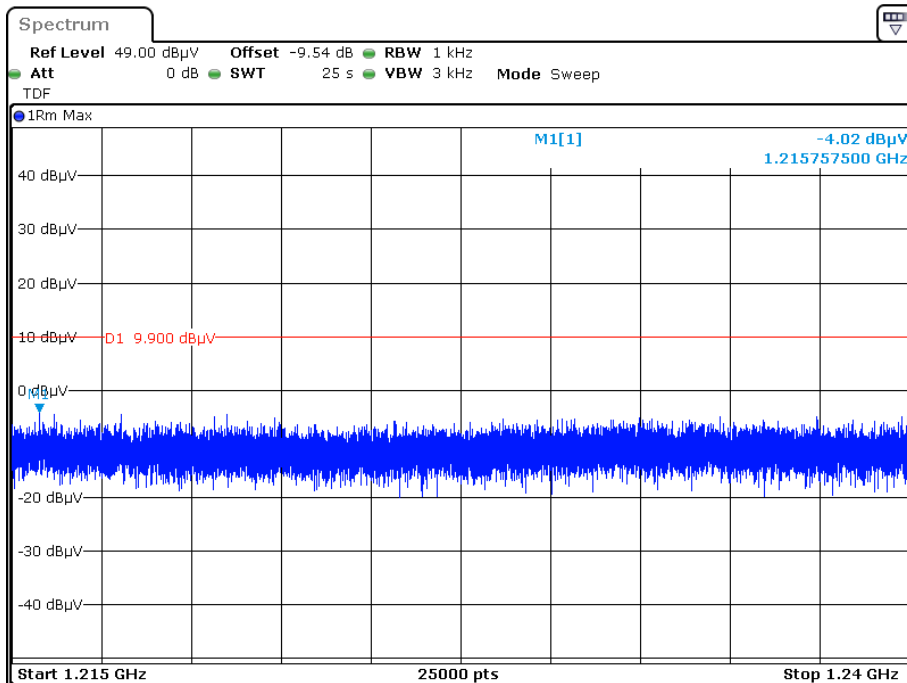
Vertical



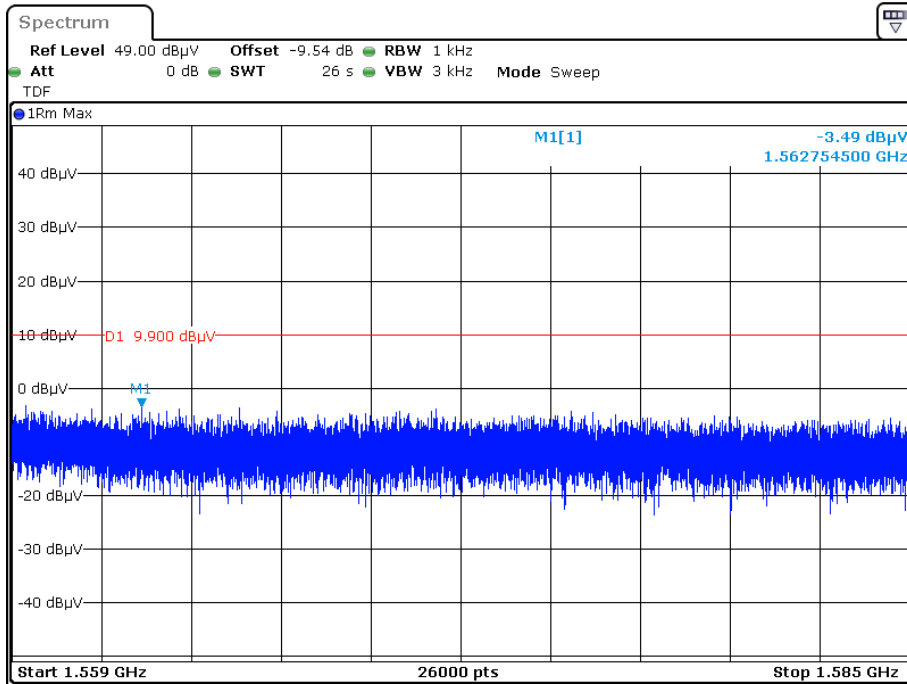
Date: 3.AUG.2022 17:07:16



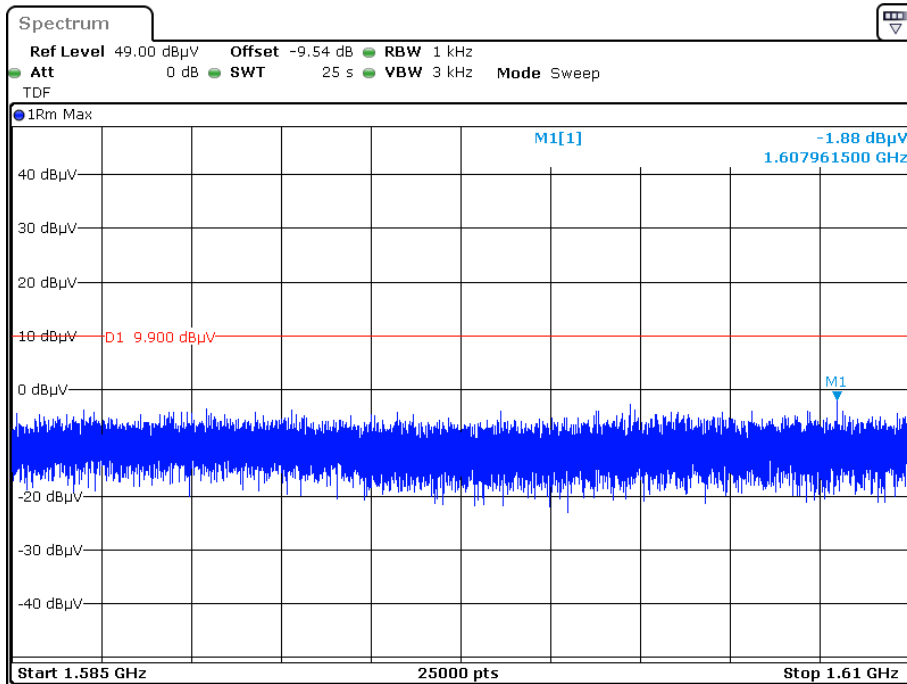
Date: 3.AUG.2022 17:13:11



Date: 3.AUG.2022 17:16:10



Date: 3.AUG.2022 17:22:21



Date: 3.AUG.2022 17:25:52

§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:	101.0 kPa

The testing was performed by Nick Fang on 2022-08-08.

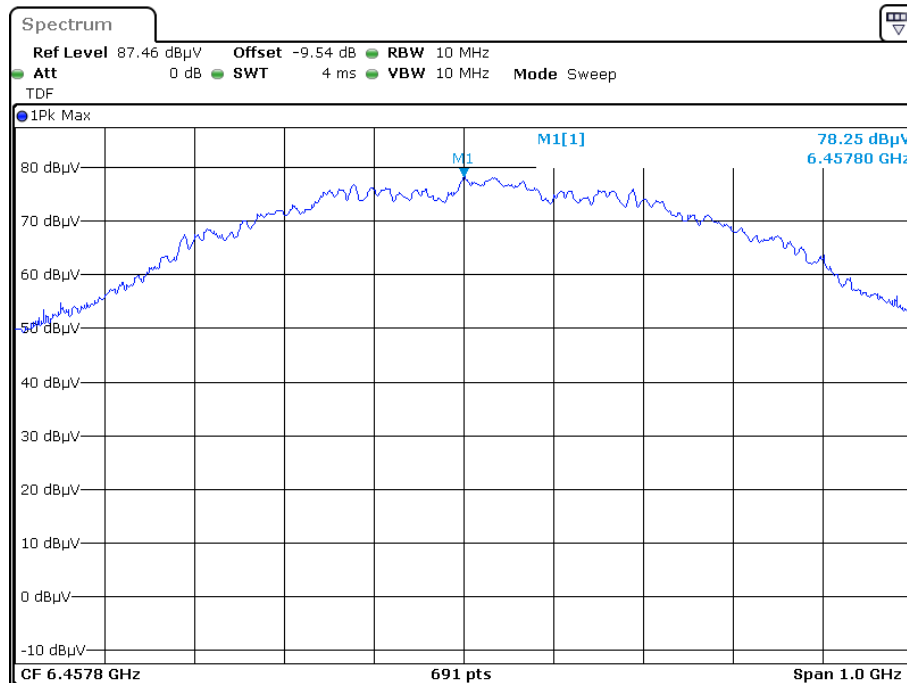
EUT operation mode: Transmitting

Test result: Pass.

Please refer to follow tables and plots:

Frequency (MHz)	Reading level (dBμV/m)	EIRP (dBm/10MHz)	EIRP (dBm/50MHz)	Limit
				dBm/50MHz
6489.6	78.25	-16.95	-2.97	0

- Note:
1. $E [dB\mu V/m] = EIRP [dBm] + 95.2$, for $d = 3$ meters.
 2. The antenna factor, cable loss and preamplifier gain have been entered into the analyzer as the transducer factor.
 3. The test distance is 1m, the correct factor from 1m to 3m is $20\lg(1/3) = -9.54dB$, which was added into the offset on the spectrum Analyzer.
 4. The correct factor of RBW 10MHz to 50MHz is $20 \log (50MHz/10MHz) = 13.98dB$.



Date: 8.AUG.2022 13:14:06

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