FCC PART 15F

TEST REPORT

For

WIZZILAB SAS

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FCC ID: 2ARZVUK

Report Type:	Product Type:
Original Report	USPACE-KYD

Report Number:	RSZ201204010-00C
Report Date:	2021-02-02
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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	USPACE-KYD
Tested Model	USPACE-KYD-2F
Frequency Range	6239.6 – 6739.2MHz
Antenna Specification*	0.8dBi(It is provided by the applicant)
Voltage Range	DC3.7V from battery
Date of Test	2020-12-10 to 2021-02-02
Sample serial number	RSZ201204010-RF-S1(Assigned by BACL, Shenzhen)
Received date	2020-12-04
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.

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 15.519 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. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
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 Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, 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.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

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

"**Start Command Prompt with Ruby**"* exercise software was used and power level is default*. The software and power level was provided by the applicant.

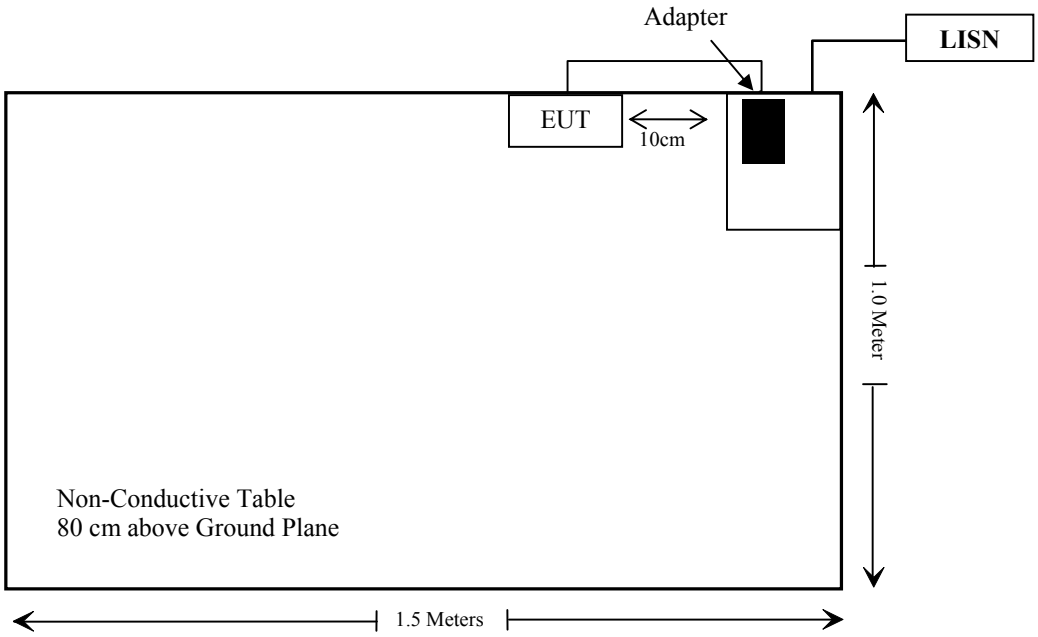
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HuaJin	Adapter	HJ-05020000W2-US	HJ-05020000W2-US

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Detachable USB cable	1.0	EUT	Adapter

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310, §2.1093	RF Exposure	Compliance
§15.203, §15.519(a)(2)	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.519(a)(1)	Shutoff Timing Requirement	Compliance
§15.503 (a)(d), §15.519(b)	UWB Operation bandwidth	Compliance
§15.209, §15.519(c)(d)	Radiated Emissions	Compliance
§15.519(e)	Peak Emission in a 50 MHz bandwidth	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2020/11/29	2021/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2020/11/29	2021/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/28	2021/11/29
Unknown	Cable	Chamber Cable 1	F-03-EM236	2020/11/28	2021/11/29
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2020/11/29	2021/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/29	2021/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
the electro-Mechanics Co	Horn Antenna	3116	9510-2270	2019/10/13	2022/10/12
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2020/11/29	2021/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2020/11/29	2021/11/28
Unknown	Signal Cable	RG-214	2	2020/11/29	2021/11/28

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

§1.1310 &§2.1093 – RF EXPOSURE

Applicable Standard

RF Exposure for devices that operate above 6 GHz (1.1310):

2.1093 (d): Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified 47 CFR 1.1310. Measurements and calculations to demonstrate compliance with MPE Field strength or power density limits for device operating above 6 GHz should be made at a minimum distance of 0.5 cm from the radiating source.

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)

Frequency (GHz)	**Tune up EIRP**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBm)	**(mW)**			
6.24-6.74	0	1	0.5	0.32	1

Note: the 900M radio, BLE and UWB function can't transmit at the same time.

Result: Compliance

FCC §15.203, §15.519(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.

(2) The use of antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand held UWB device.

Antenna Connector Construction

The EUT has internal antenna arrangement which was permanently attached and the antenna gain is 0.8dBi, fulfill the requirement of this section. Please refer to the EUT photos.

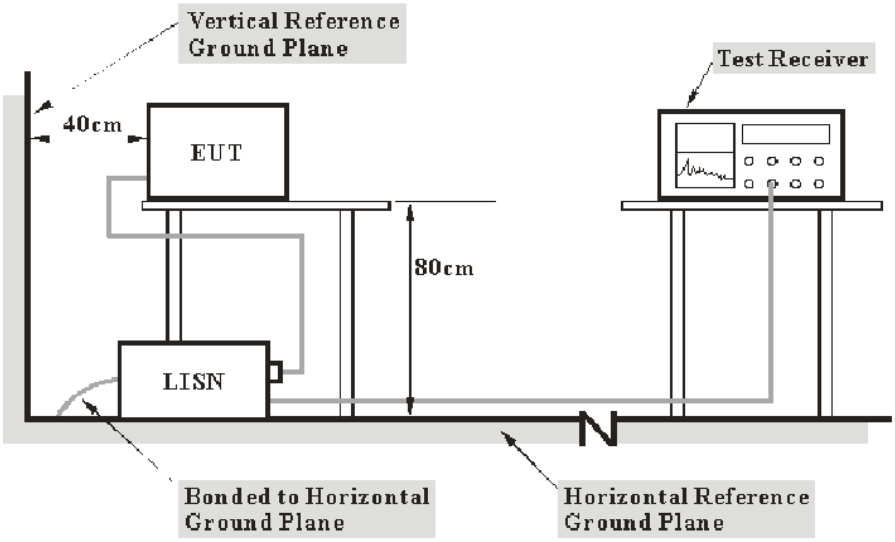
Result: Compliance.

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:

Correction Factor = LISN VDF + Cable Loss + 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:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the EUT complied with the FCC Part 15.207,

Test Data

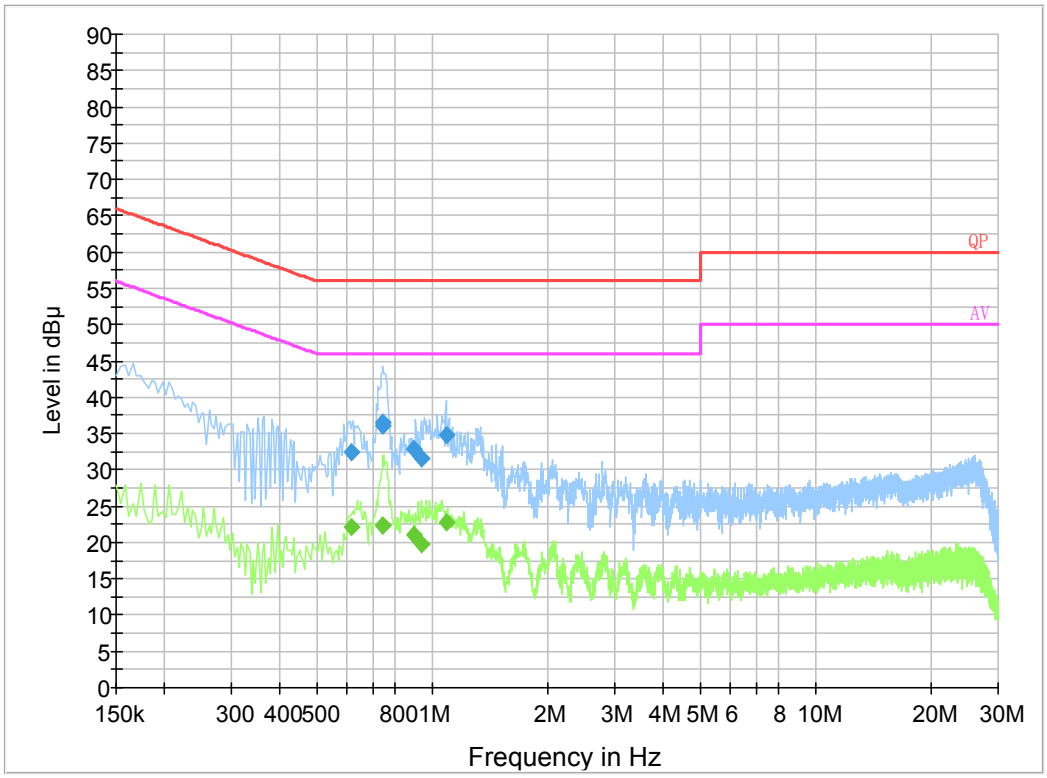
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	65
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-12-11.

EUT operation mode: Transmitting & Charging

AC 120V/60 Hz, Line



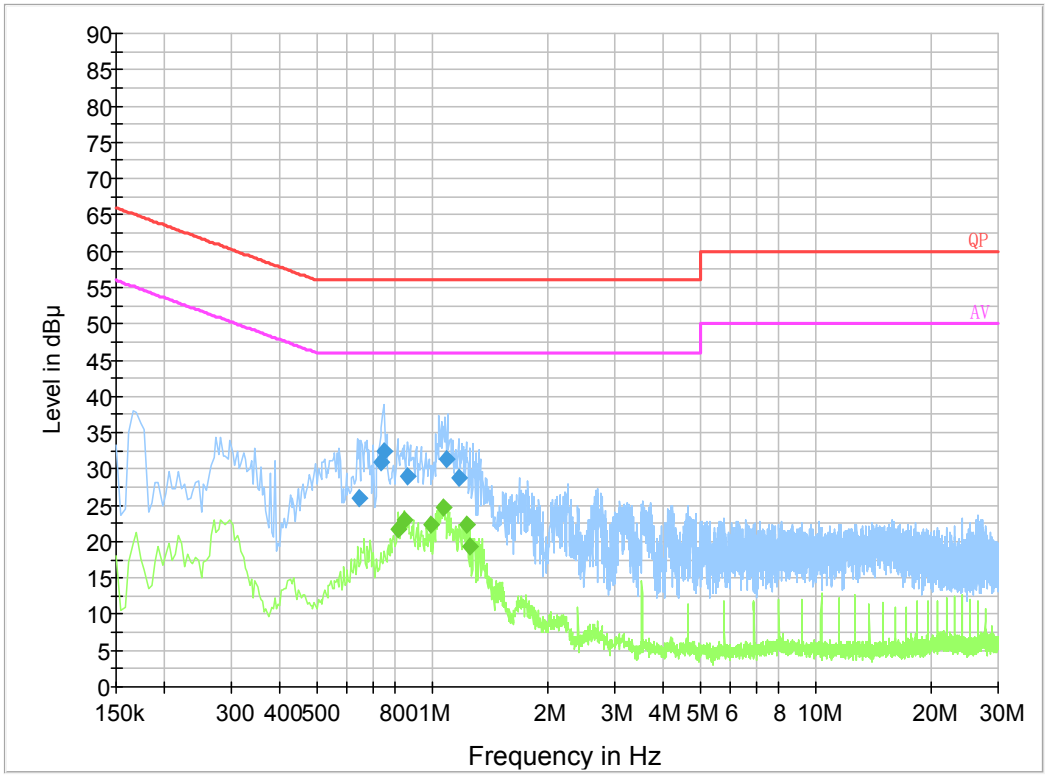
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.616850	32.5	9.000	L1	19.8	23.5	56.0
0.742990	36.1	9.000	L1	19.8	19.9	56.0
0.746810	36.5	9.000	L1	19.8	19.5	56.0
0.896410	32.9	9.000	L1	19.8	23.1	56.0
0.939690	31.6	9.000	L1	19.8	24.4	56.0
1.093650	34.8	9.000	L1	19.8	21.2	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.616850	22.2	9.000	L1	19.8	23.8	46.0
0.742990	22.4	9.000	L1	19.8	23.6	46.0
0.746810	22.3	9.000	L1	19.8	23.7	46.0
0.896410	21.0	9.000	L1	19.8	25.0	46.0
0.939690	19.8	9.000	L1	19.8	26.2	46.0
1.093650	22.8	9.000	L1	19.8	23.2	46.0

AC 120V/60 Hz, Neutral



Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.647570	26.1	9.000	N	19.8	29.9	56.0
0.738990	30.9	9.000	N	19.8	25.1	56.0
0.750750	32.4	9.000	N	19.8	23.6	56.0
0.865010	29.1	9.000	N	19.8	26.9	56.0
1.093530	31.3	9.000	N	19.8	24.7	56.0
1.176390	28.7	9.000	N	19.8	27.3	56.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.814000	21.6	9.000	N	19.8	24.4	46.0
0.846000	22.9	9.000	N	19.8	23.1	46.0
0.998000	22.4	9.000	N	19.8	23.6	46.0
1.074000	24.6	9.000	N	19.8	21.4	46.0
1.230000	22.3	9.000	N	19.8	23.7	46.0
1.254000	19.3	9.000	N	19.8	26.7	46.0

§15.519(a) (1)-Shutoff Timing Requirement

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

Test Procedure

1. Set the EUT in normal operating mode.
2. RBW/VBW=1MHz/1MHz.
3. SWT=20S

Test Data

Environmental Conditions

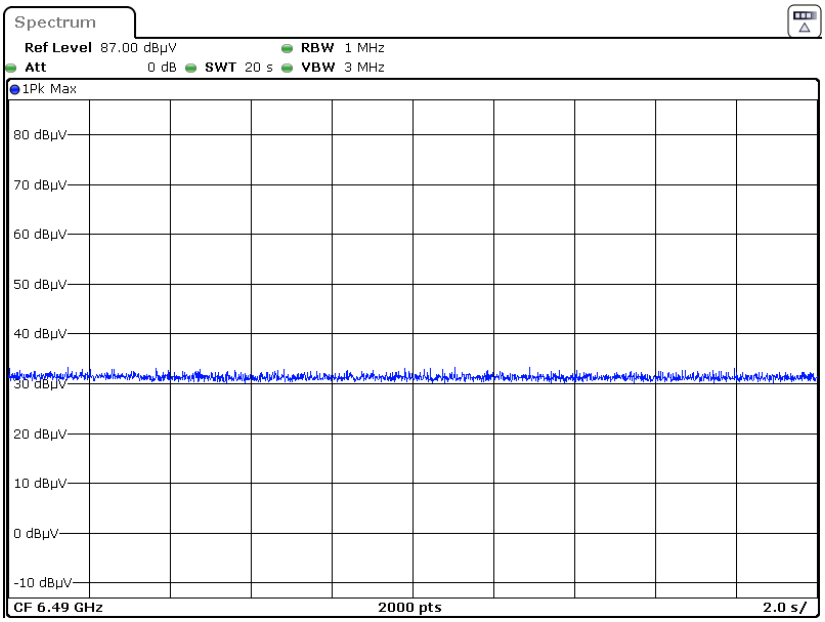
Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2021-02-02.

Test Result: Pass.

EUT operation mode: Transmitting

Without associated receiver, EUT no transmit



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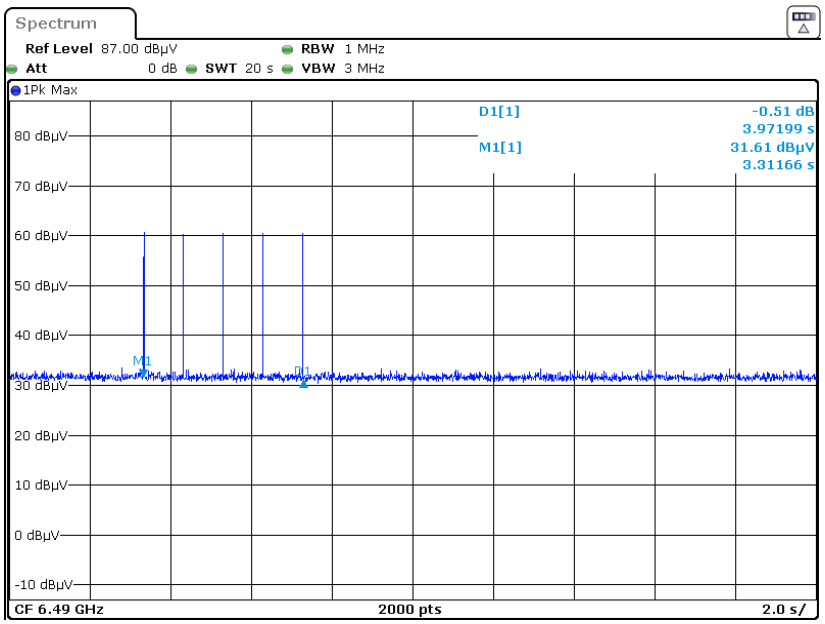
Communication with receiver, EUT start transmit, after approximate 4s, power off receiver, EUT cease transmit



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§15.503 (a)(d), §15.519(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:	24.7 ℃
Relative Humidity:	58%
ATM Pressure:	100.9 kPa

The testing was performed by Jacob Kong on 2020-12-14.

Test Result: Pass.

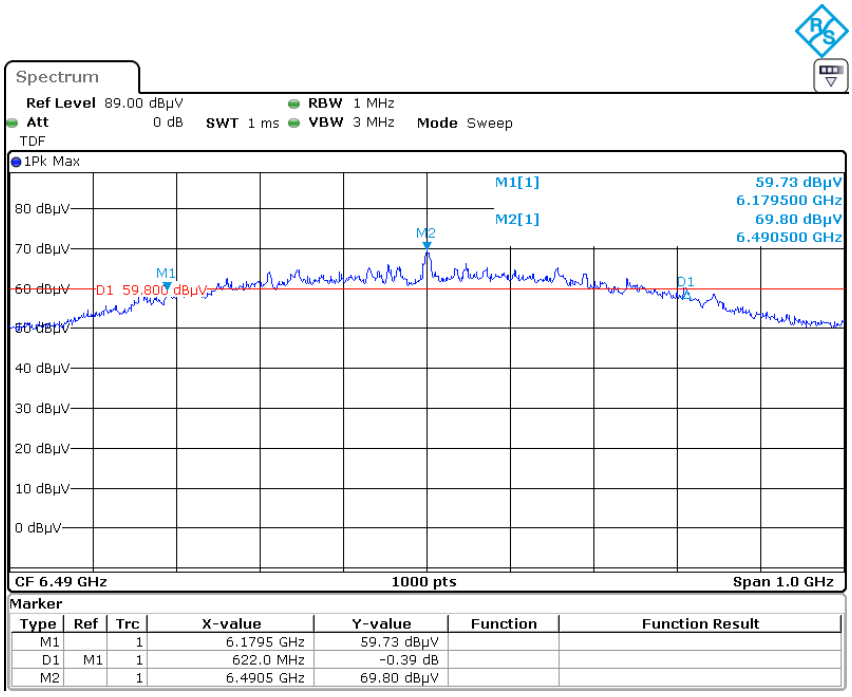
EUT operation mode: Transmitting

Please refer to the following table and plots.

Test distance is 3m.

Item		Result	Limit (MHz)
f_M(MHz)	The highest emission frequency	6490.5	/
f_L(MHz)	10dB below the highest emission	6179.5	>3100
f_H(MHz)	10dB above the highest emission	6801.5	<10600
f_C(MHz)	$(f_H + f_L)/2$	6490.5	/
10dB bandwidth(MHz)	$f_H - f_L$	622.0	≥500
Fractional bandwidth	$2(f_H - f_L)/(f_H + f_L)$	0.096	/

10dB Bandwidth



FCC §15.209, §15.519(c)(d)- SPURIOUS EMISSIONS

Applicable Standard

FCC §15.209; §15.519(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:

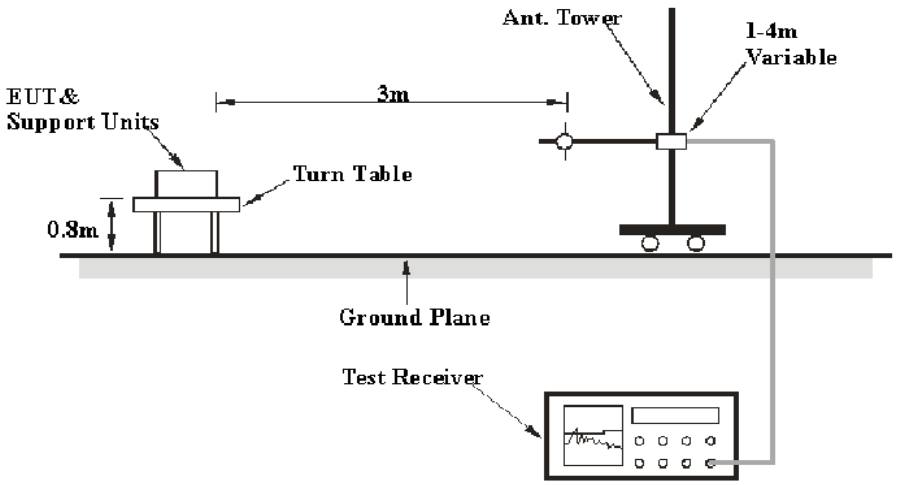
Frequency in MHz	EIRP in dBm
960-1610	−75.3
1610-1990	−63.3
1990-3100	−61.3
3100-10600	−41.3
Above 10600	−61.3

(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:

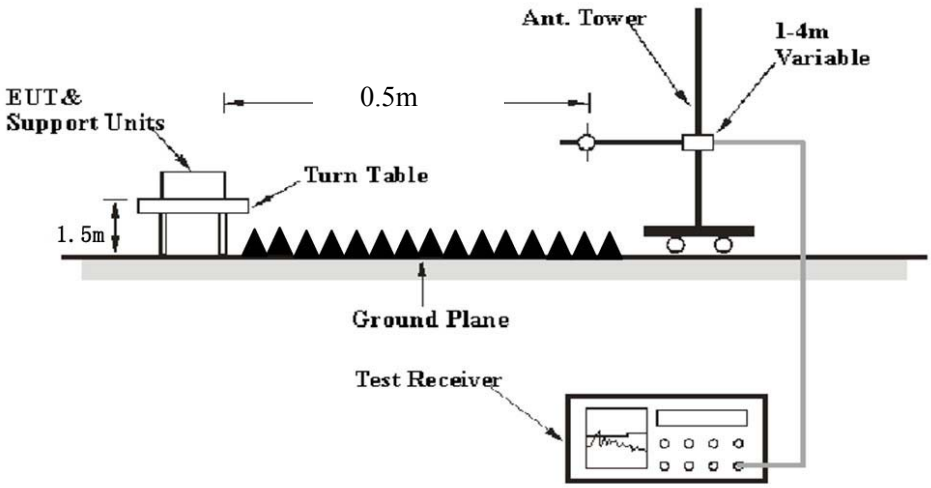
Frequency in MHz	EIRP in dBm
1164-1240	−85.3
1559-1610	−85.3

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 15.519 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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the EUT complied with the FCC Title 47, Part 15, Subpart F, section 15.205, 15.209 and 15.519.

Test Data

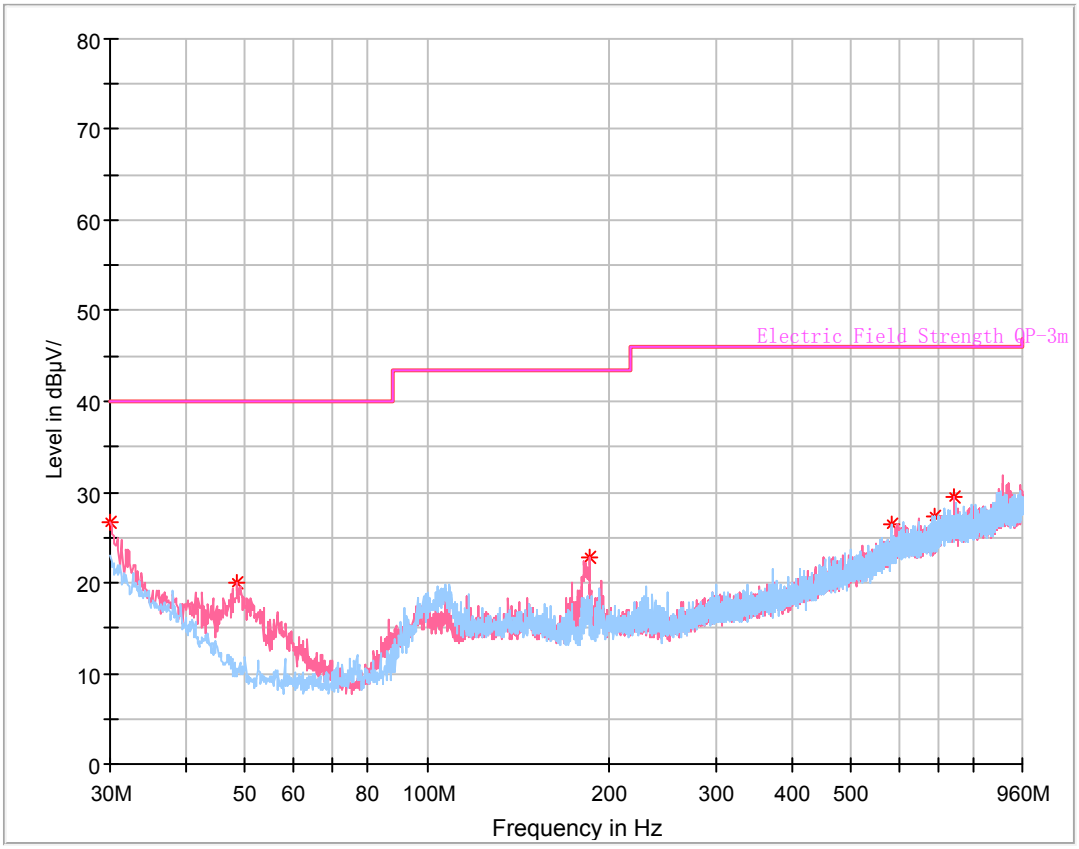
Environmental Conditions

Temperature:	23.1~24 ℃
Relative Humidity:	53~60%
ATM Pressure:	101.0 kPa

The testing was performed by Harris He on 2020-12-10 for below 1GHz and Jacob Kong on 2020-12-16 for above 1GHz.

EUT operation mode: Transmitting

30 MHz~960MHz:



Critical_Freqs

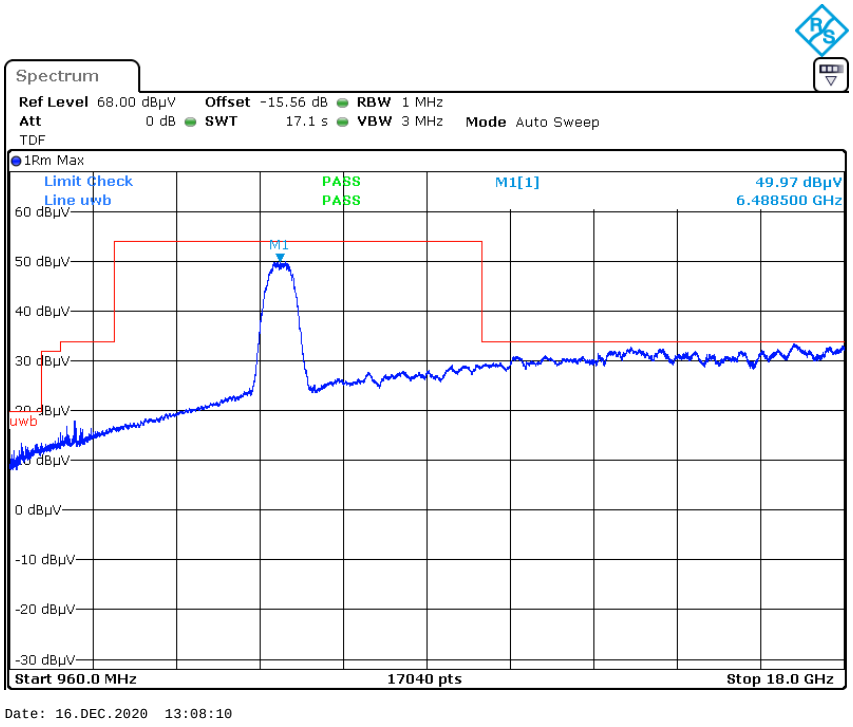
Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.000000	26.70	40.00	13.30	105.0	V	247.0	-4.4
48.672500	20.10	40.00	19.90	105.0	V	33.0	-15.9
184.957500	22.69	43.50	20.81	105.0	V	298.0	-12.0
582.415000	26.46	46.00	19.54	300.0	H	271.0	-2.8
690.448750	27.33	46.00	18.67	300.0	H	37.0	-1.4
743.313750	29.36	46.00	16.64	105.0	V	278.0	-0.3

Spurious radiated emission above 960MHz in non GPS band:

1. The test distance is 0.5m, so the correct factor from 3m to 0.5m is 20log(3/0.5)=15.56dB which was added into the offset on the spectrum analyzer.
2. E[dBμV/m] = EIRP[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 (dBμV/m)	EIRP (dBm)	Detector	Turntable Degree	Rx Antenna Height (m)	Rx Antenna Polar (H / V)	Part 15.519 EIRP Limit (dBm)	Part 15.519 Margin (dB)
6488.5	49.97	-45.23	RMS	129	1.4	H	-41.3	3.93
6543.5	46.34	-48.86	RMS	267	1.5	V	-41.3	7.56
21044.5	27.56	-67.64	RMS	163	1.3	H	-61.3	6.34
21053.5	27.59	-67.61	RMS	48	1.6	V	-61.3	6.31

Horizontal



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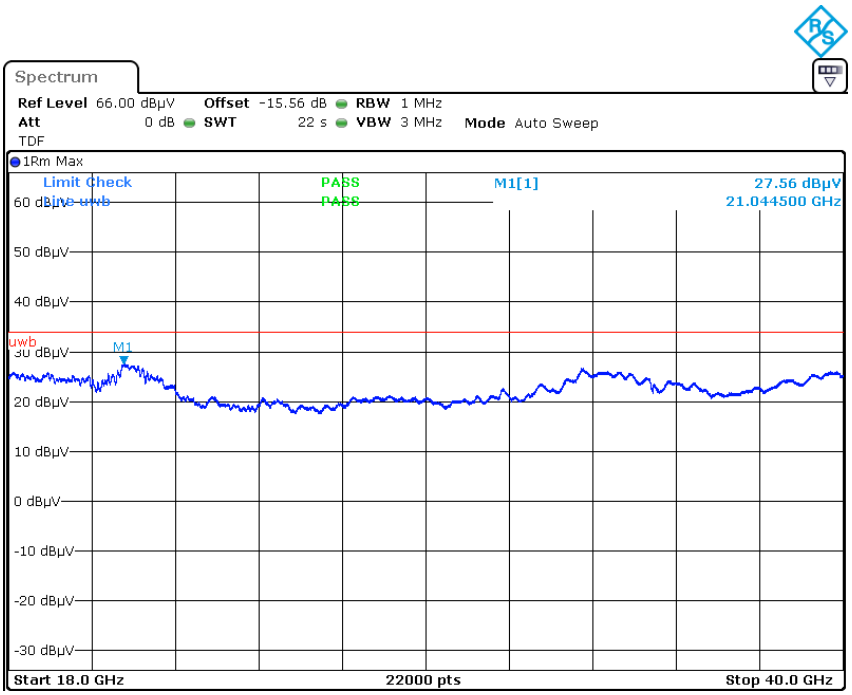

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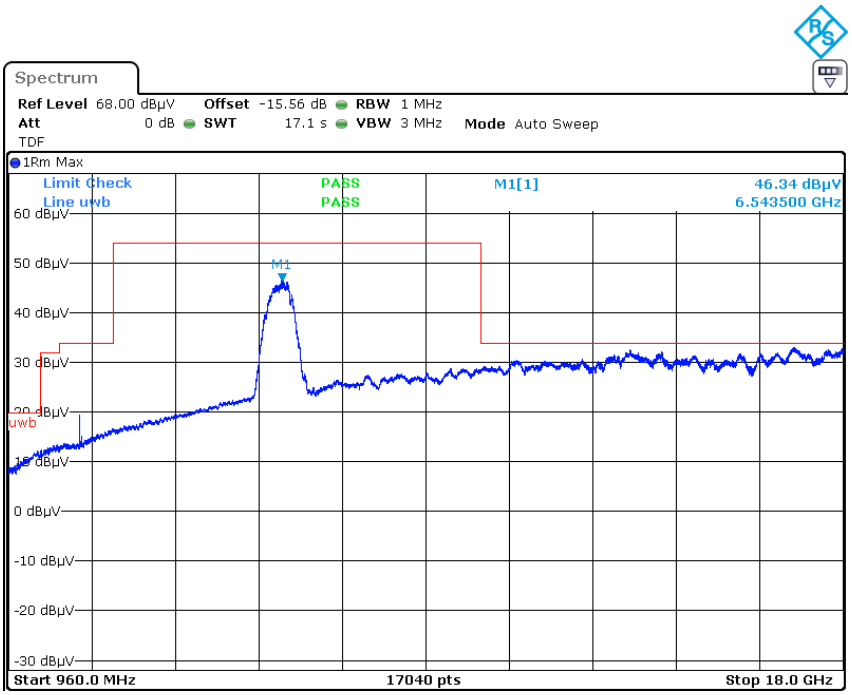
Vertical



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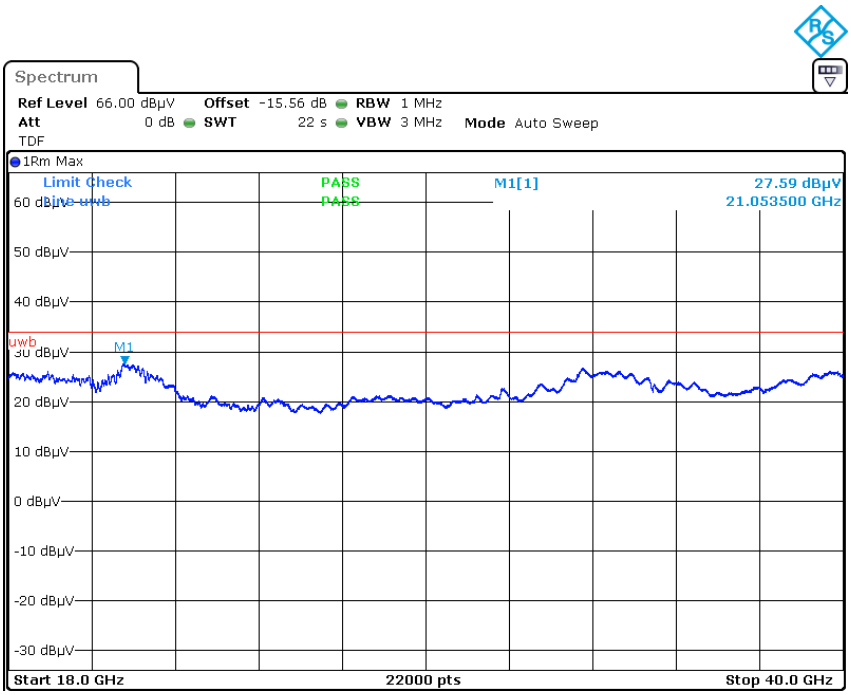

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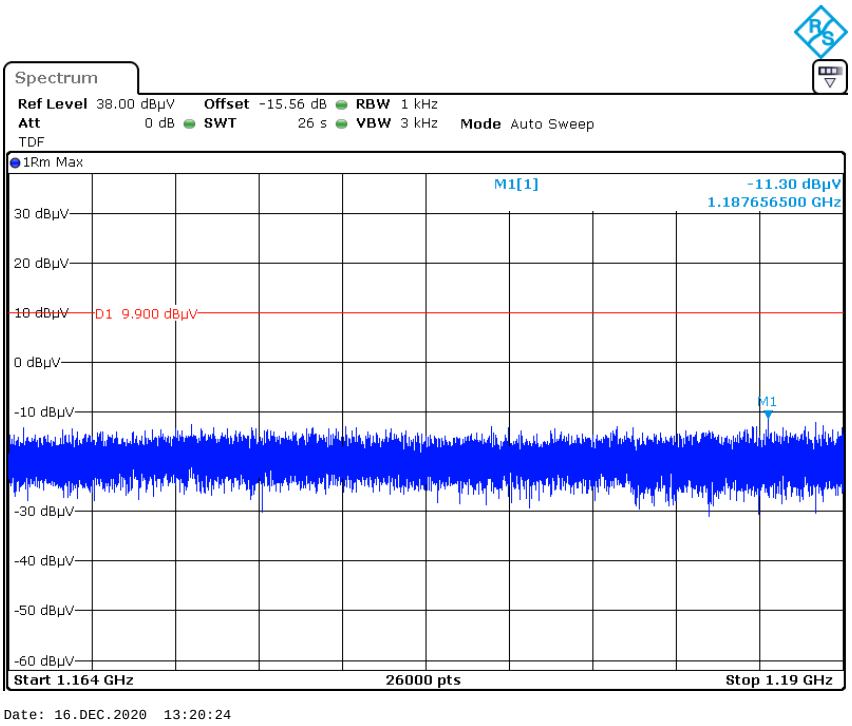
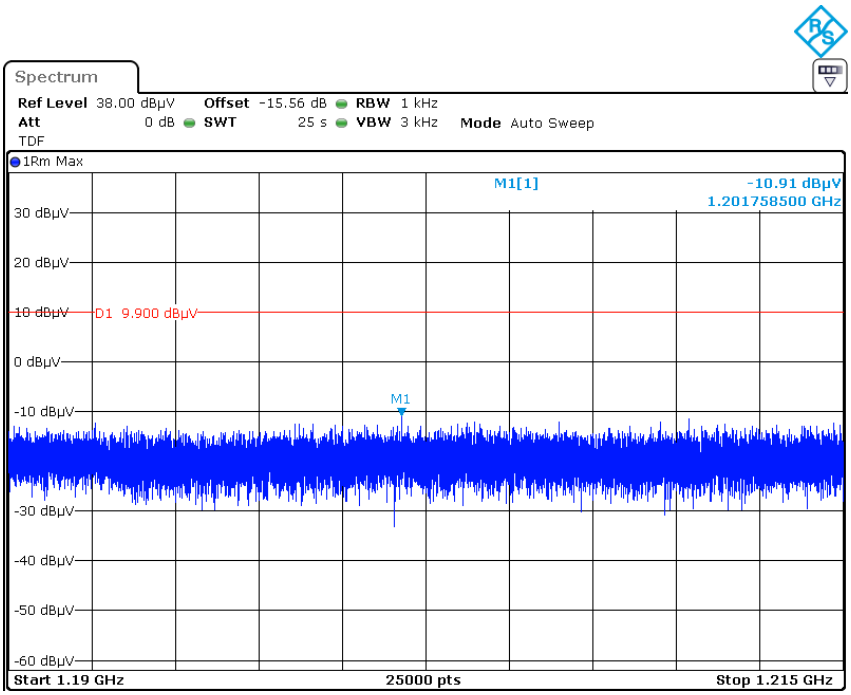
Spurious radiated emission above 960MHz in GPS band:

1. **The test distance is 0.5m, so the correct factor from 3m to 0.5m is 20log(3/0.5)=15.56dB which was added into the offset on the spectrum analyzer.**
2. **E[dBµV/m] = EIRP[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	Corrected Amplitude (dBµV/m)	EIRP (dBm)	Detector	Turntable	Rx Antenna		Part 15.519	
(MHz)				Degree	Height (m)	Polar (H / V)	EIRP Limit (dBm)	Margin (dB)
1187.66	-11.30	-106.50	RMS	197	1.3	H	-85.3	21.20
1168.92	-12.35	-107.55	RMS	73	1.6	V	-85.3	22.25
1201.76	-10.91	-106.11	RMS	17	1.4	H	-85.3	20.81
1190.42	-11.43	-106.63	RMS	128	1.5	V	-85.3	21.33
1217.34	-11.01	-106.21	RMS	298	1.3	H	-85.3	20.91
1223.67	-11.21	-106.41	RMS	175	1.5	V	-85.3	21.11
1574.42	-2.89	-98.09	RMS	110	1.6	H	-85.3	12.79
1570.79	-9.67	-104.87	RMS	140	1.4	V	-85.3	19.57
1593.62	-9.37	-104.57	RMS	276	1.4	H	-85.3	19.27
1605.15	-8.36	-103.56	RMS	96	1.5	V	-85.3	18.26

Horizontal





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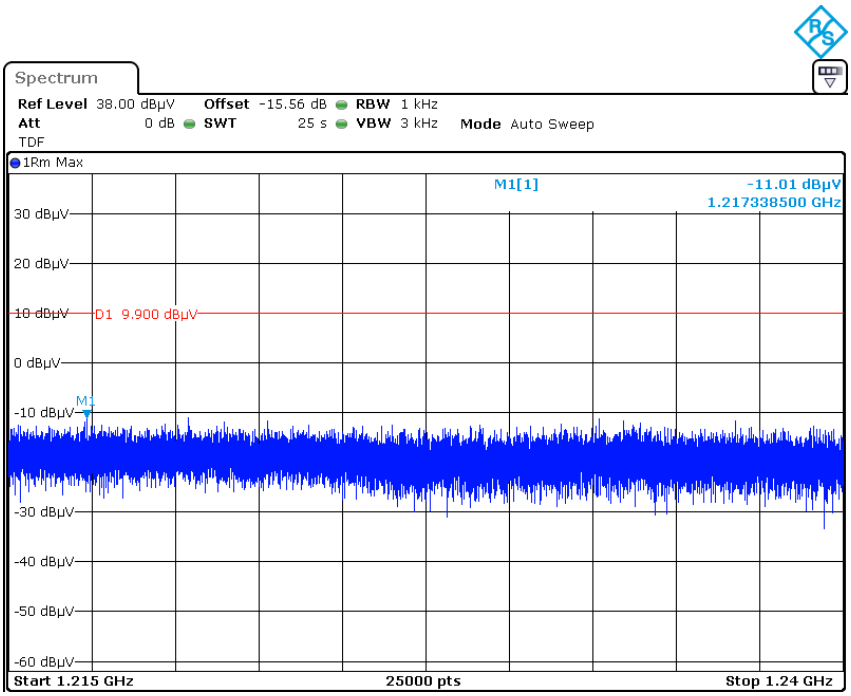

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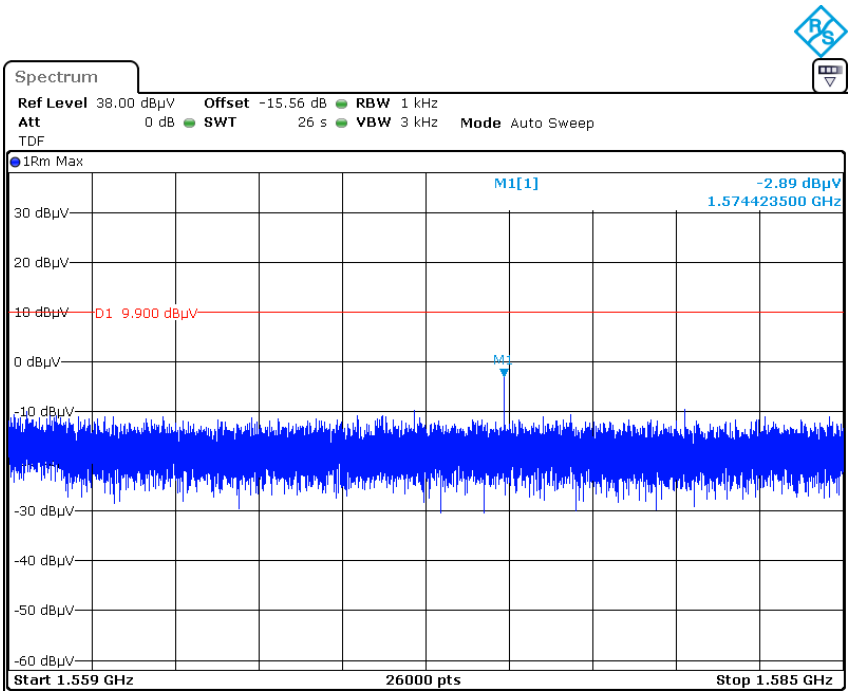

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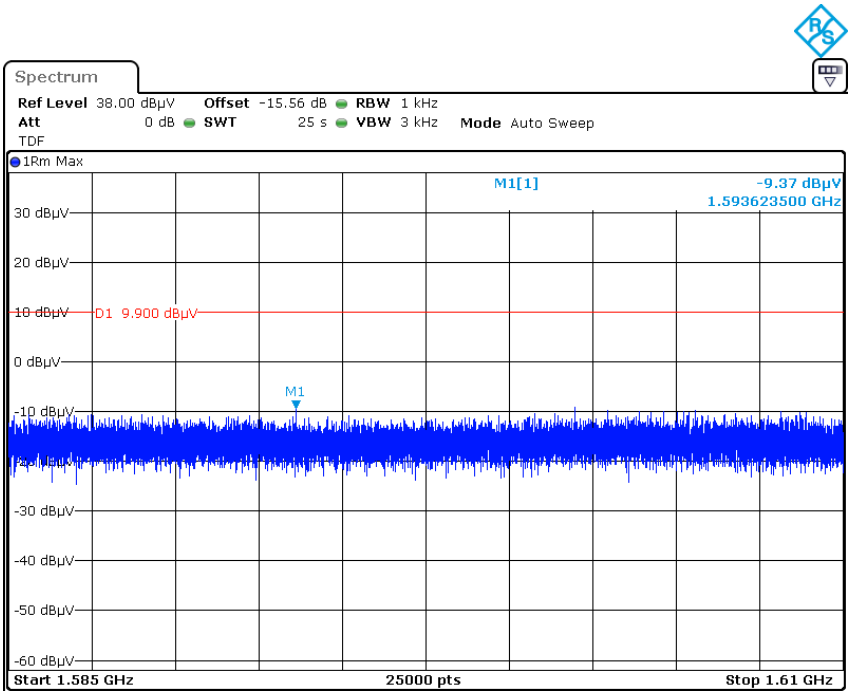

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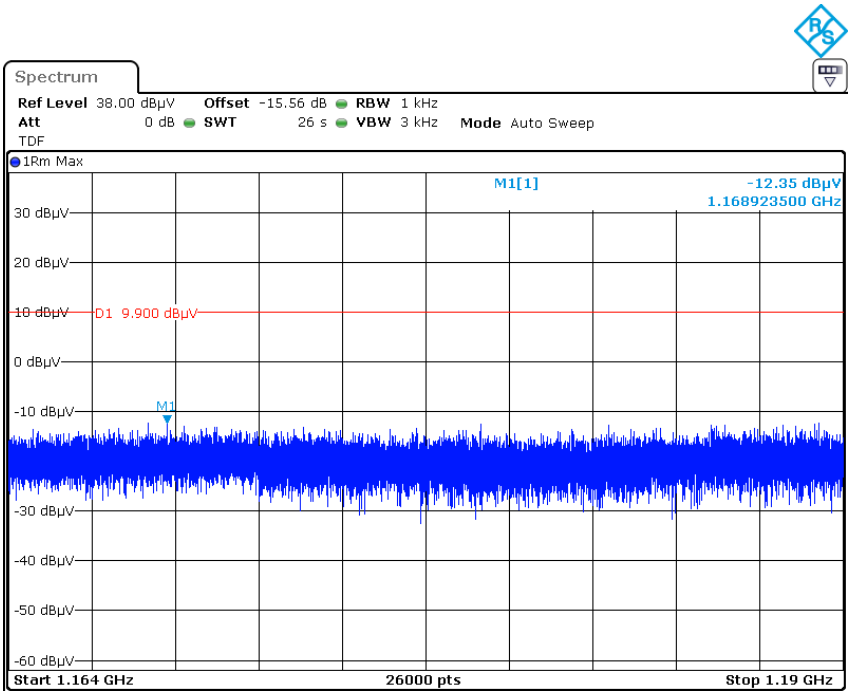
Vertical



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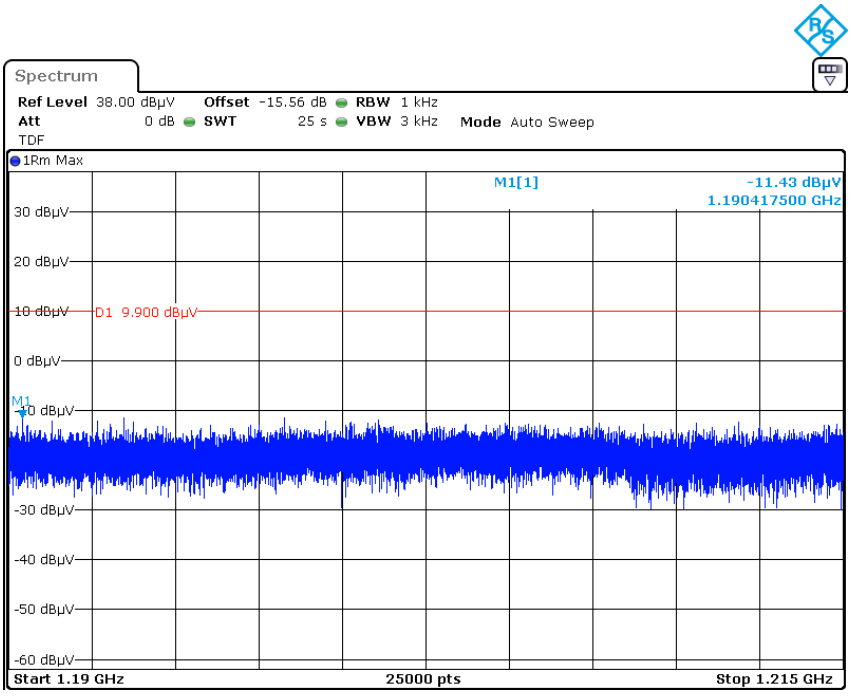

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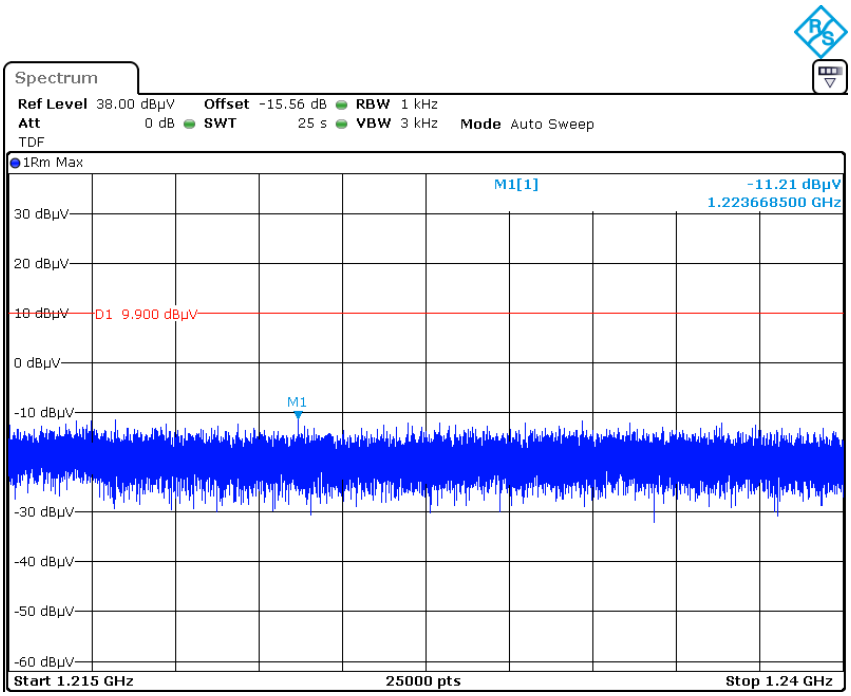

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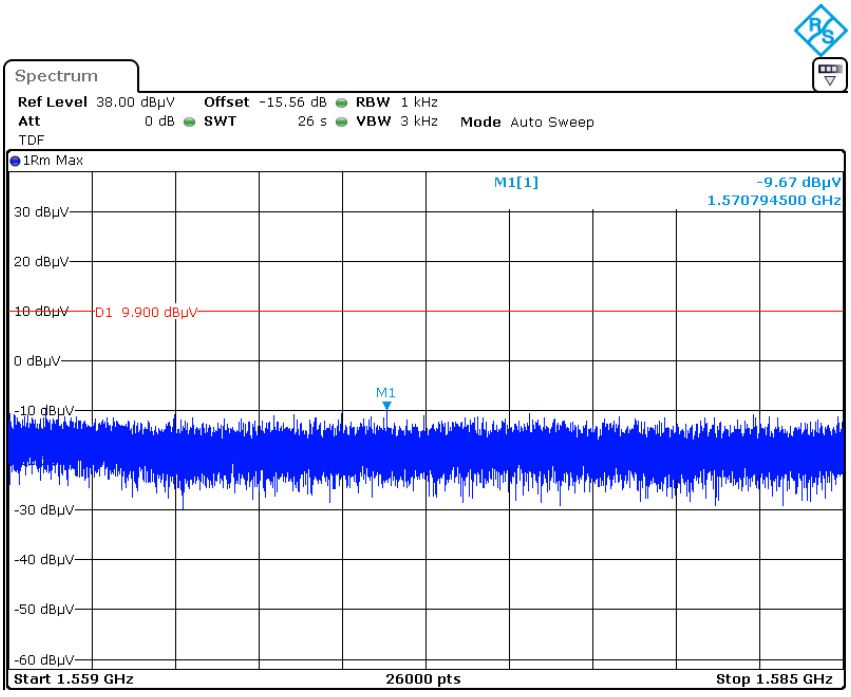

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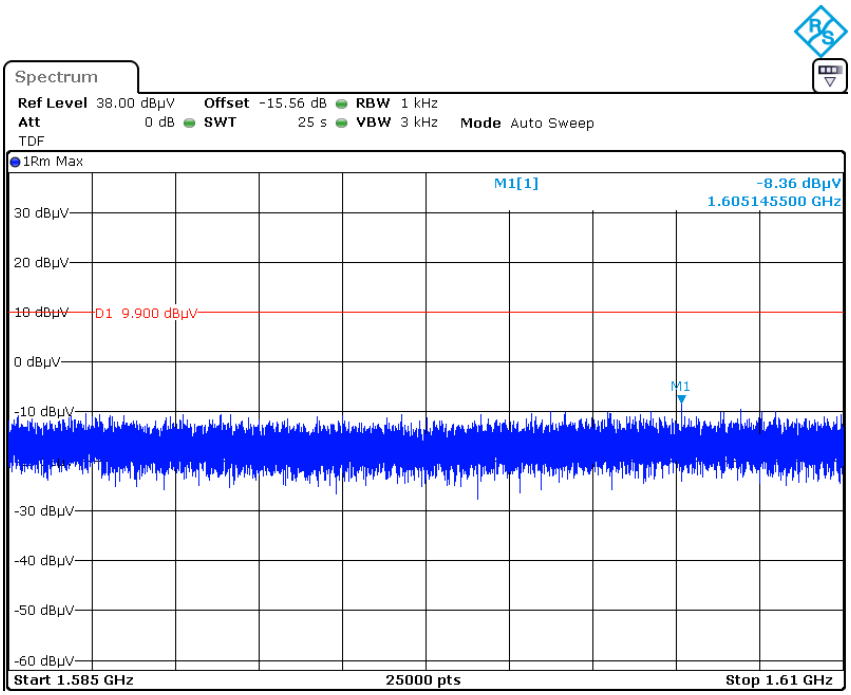

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§15.519(e) - PEAK EMISSION IN A 50 MHZ BANDWIDTH

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:	24.7 ℃
Relative Humidity:	58 %
ATM Pressure:	100.9 kPa

The testing was performed by Jacob Kong on 2020-12-14.

EUT operation mode: Transmitting

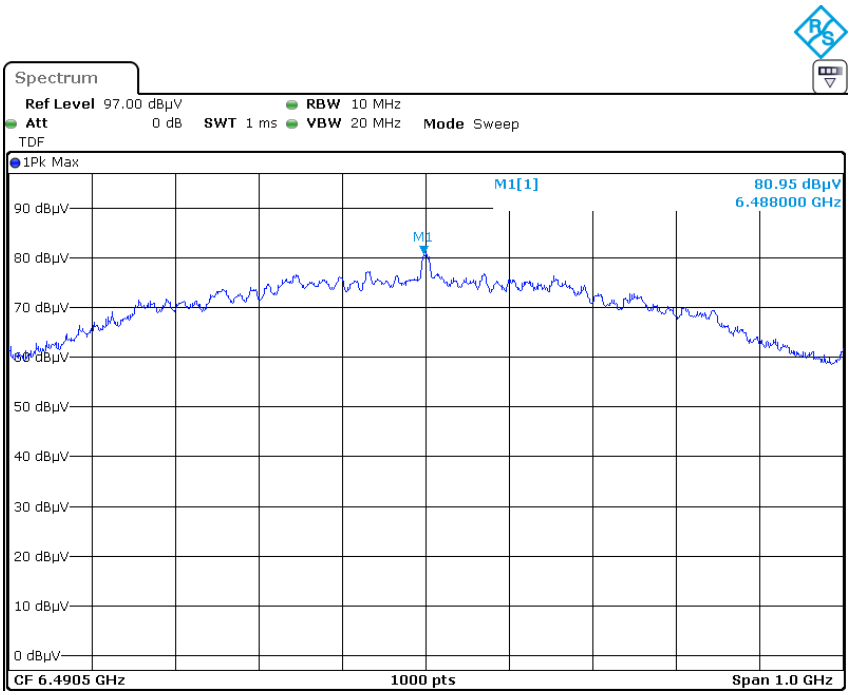
Frequency (MHz)	Reading level (dBμV/m) RBW=10MHz	E (dBμV/m) RBW=50MHz	EIRP (dBm/50MHz)	Limit
				dBm/50MHz
6488	80.95	94.93	-0.27	0

Note: the correct factor of RBW 10MHz to 50MHz is 20 log (50MHz/10 MHz) =13.98

E[dBμV/m] = EIRP[dBm] + 95.2, for d = 3 meters.

The test distance is 3m.

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



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