Test Report

Test Report No.: CQC-IVTS-2024-0385-E4

Product Name	Smart Laser TV
Model Number	JA1-8T2
Applicant	SHENZHEN HOLATEK CO., LTD.
Approval Types	FCC ID: SMC-T91A

CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.

TEST REPORT DECLARATION

Equipment under Test	:	**Smart Laser TV**
Model /Type	:	JA1-8T2
Listed Models	:	JA1-8T1, JA1-8T0, JA1-8T3, JA1-8T4, JA1-8T5, JA1-8T6, JA1-8T7, JA1-8T8, JA1-8T9, JA1-8TA, JA1-8TB, JA1-8TC, JA1-8TD, JA1-8TE, JA1-8TF, JA1-8TG, JA1-8TH
Applicant	:	**SHENZHEN HOLATEK CO., LTD.**
Address	:	#12,Building 1,Chongwen Park, Nanshan Zhiyuan,3370 Liuxian Ave, Nanshan District, Shenzhen, China.
Manufacturer	:	**SHENZHEN HOLATEK CO., LTD.**
Address	:	#12,Building 1,Chongwen Park, Nanshan Zhiyuan,3370 Liuxian Ave, Nanshan District, Shenzhen, China.

The EUT described above is tested by CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd. to determine the maximum emissions from the EUT. CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd. is assumed full responsibility for the accuracy of the test results.

Project Engineer:	 (Yankun Wang 王炎坤)	Date: 2025-07-03
Checked by:	 (Haohao Li 李昊昊)	Date: 2025-07-03
Approved by:	 (Wenliang Li 李文亮)	Date: 2025-07-03

Contents

1. TEST STANDARDS

The tests were performed according to following standards: The equipment under test (EUT) has been tested at CQC-IVTS's (own or subcontracted) laboratories according to the leading reference documents giving table below:

No	Identify	Document Title	Version/Date
1	FCC - Title 47 CFR Part 15F	FCC -Title 47 of the Code of Federal Regulations; Chapter I; Part 15 Subpart F - Ultra-Wideband Operation	05/23/2025
2	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014
3	ANSI C63.10	American National Standard for Testing Unlicensed Wireless Devices	2020
4	UWB KDB393764 D01	ULTRA-WIDEBAND (UWB) DEVICES FREQUENTLY ASKED QUESTIONS	v02r01

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	April 16, 2025
Testing commenced on	:	May 20, 2025
Testing concluded on	:	May 28, 2025

2.2. Product Description*

Product Name:	Smart Laser TV
Trade Mark	JMGO
FCC ID:	SMC-T91A
Test Model:	JA1-8T2
List Model:	JA1-8T1, JA1-8T0, JA1-8T3, JA1-8T4, JA1-8T5, JA1-8T6, JA1-8T7, JA1-8T8, JA1-8T9, JA1-8TA, JA1-8TB, JA1-8TC, JA1-8TD, JA1-8TE, JA1-8TF, JA1-8TG, JA1-8TH
Hardware Version:	VER B
Software Version:	1.1.21.3
Frequency Range:	☒ 3100- 10600 MHz
Modulation Type:	2BPPM
Number of Channels	1 (UWB Channel 9)
Antenna:	Integrated Antenna
Antenna Gain	Maximum Gain: 3.20dBi
Power Supply:	DC 24.0V Adapter from AC110V/60Hz
Model Diference Declaration	Their electrical circuit design, layout, components used and internal wiring are identical. Only the product appearance, body color, pattern, sales customers, and sales regions are different.

*: declared by the applicant. CQC-IVTS not responsible for accuary.

2.3. EUT Operation Mode*

EUT operating mode no	Description of operating modes	Additional information
op. 1	Continuously transmitting and receiving mode	Modulation (normal mode). 7.9872 GHz

*: declared by the applicant

2.4. Modifications

No modifications were implemented to meet testing criteria

2.5. Test Item (Equipment Under Test) Description*

Short designation	EUT Name	EUT Description	Serial number	Hardware status	Software status
EUT A	Smart Laser TV	JA1-8T2	-/-	VER B	1.1.21.3
-/-	-/-	-/-	-/-	-/-	

*: declared by the applicant.

2.6. Auxiliary Equipment (AE) Description*

AE short designation	EUT Name (if available)	EUT Description	Serial number (if available)	Software (if used)
AE1	Adapter	NSA240EC-2401001	-/-	-/-
-/-	-/-	-/-	-/-	-/-

*: declared by the applicant.

2.7. Test Item Set-ups Description

set. 1	EUT A + AE 1	EUT operating mode 1

2.8. Test Conditions*

Temperature, [°C]		Voltage, [V]	
T_{nom}	+25.0	V_{nom}	DC 24.0V
T_{min}	-40.0	V_{min}	DC 21.6V
T_{max}	+125.0	V_{max}	DC 26.4V

*: declared by the applicant

2.9. Additional Information

Test items differences	None
Additional application considerations to test a component or sub-assembly	N/A

2.10. Test Location

Location 1

Company:	CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.
Address:	Building G5, TCL International E City, Xili Street, Nanshan District, Shenzhen, China
Post code:	518112
Contact Person:	Wenliang Li
Telephone:	+86-755-8618 9654
e-Mail:	liwenliang@cqc.com.cn

2.11. Abnormalities from Standard Conditions

None

2.12. Possible verdicts of the results

Test sample meets the requirements	P (PASS) ± the measured value is below the acceptance limit, AL = TL
Test sample does not meet the requirements	F (FAIL) ± the measured value is above the acceptance limit, AL = TL
Test case does not apply to the test sample	N/A (Not applicable)
Test case not performed	N/P (Not performed)

2.13. Formula for Determination of Correction Values (E_C)

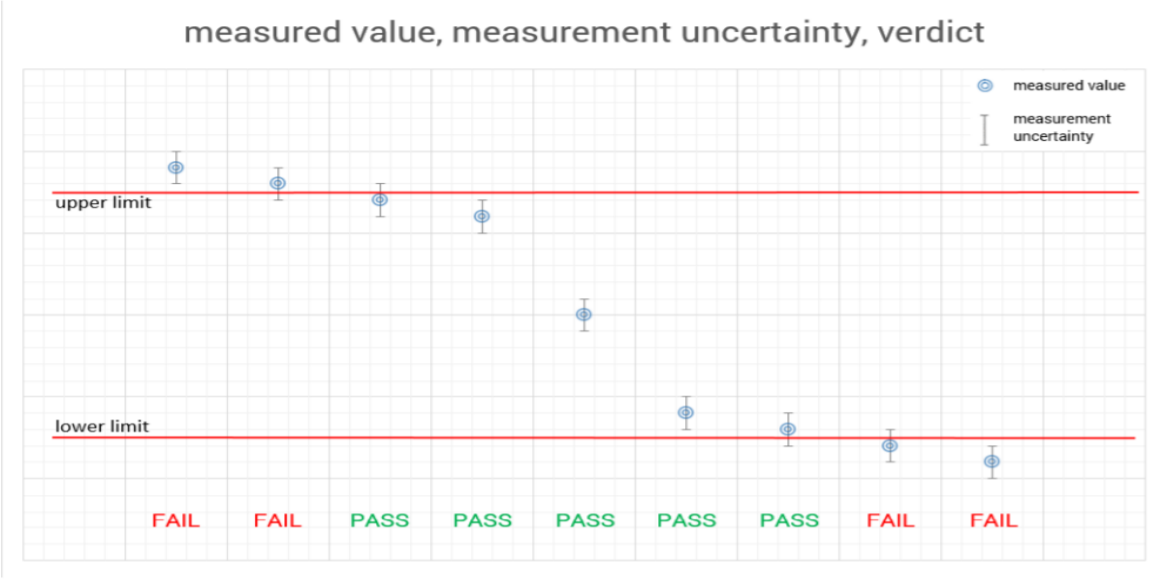
$E_C = E_R + AF + C_L + D_F - G_A$ (1)
$M = L_T - E_C$ (2)

E_C = Electrical field ± corrected value
E_R = Receiver reading
M = Margin
L_T = Limit
AF = Antenna factor
C_L = Cable loss
D_F = Distance correction factor (if used)
G_A = Gain of pre-amplifier (if used)
All units are dB-units, positive margin means value is below limit.

2.14. Reporting Statements of Conformity – Decision Rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed. The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement

results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



2.15. Radiated Emission Measurement Distance

The measurement antenna is in the far field of the EUT per formula $2D^2/\lambda$, where D is the larger between the dimension of the measurement antenna and the transmitting antenna of the EUT. In this case, “D” is the largest dimension of the measurement antenna. The EUT is manipulated through all orthogonal planes representative of its typical use and for both polarities of the measurement antenna in order to achieve the highest signal level. The worst-case position found was used for all radiated testing.

Frequency Range [GHz]	Wavelength [centimetres]	Far Field Distance [meters]	Measurement Distance [meters]
18 – 40	0.750	0.65	1.00
40 – 60	0.522	0.97	1.00
60 – 90	0.322	0.69	1.00
90 – 140	0.210	0.52	1.00
140 – 220	0.148	0.37	1.00
220 – 325	0.101	0.24	1.00

2.16. Antenna Characteristics

Following information is derived from documents “Antenna Specification” provided by applicant.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.
Building G5, TCL International E City, Xili Street, Nanshan District, Shenzhen, China
CQC-IVTS A2LA Certification Number: 6645.01;
FCC Designation Number: CN1329

3.2. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Lative Humidity	55 %
Air Pressure	989 hPa

3.3. Test Description

Test Specification Clause	Test Case	Temperature Condition	Power Supply	PASS	FAIL	NA	NP	Results
§ 15.503, § 15.517 (b)	10dB Bandwidth	Nominal	Nominal	☒	☐	☐	☐	
§ 2.1049	Occupied Bandwidth	Nominal	Nominal	☒	☐	☐	☐	
§ 15.517 (e)	Maximum Peak Power Spectral Density (Peak EIRP)	Nominal	Nominal	☒	☐	☐	☐	
§ 15.517 (c)	Maximum Average Emission (Average EIRP)	Nominal	Nominal	☒	☐	☐	☐	
§ 15.517 (c)	Radiated Emissions Above 960MHz	Nominal	Nominal	☒	☐	☐	☐	
§ 15.517 (d)	Radiated Emissions in the 1164 – 1240Mhz and 1559 – 1610MHz GPS Bands	Nominal	Nominal	☒	☐	☐	☐	
§ 15.517 (c), § 15.209	Radiate Emissions Below 960MHz	Nominal	Nominal	☒	☐	☐	☐	
§ 15.207	AC Line Conducted Emissions 150kHz – 30MHz	Nominal	Nominal	☒	☐	☐	☐	
§ 15.517 (a), § 15.203	Antenna Requirements	Nominal	Nominal	☒	☐	☐	☐	

Note 1: NA means “not applicable”; NP means Not Performed;
Note 2: The measurement uncertainty is not included in the test result.

3.4. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01” Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1” and TR-100028-02 “Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 “ and is documented in the CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd..quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQC Internet of Vehicles Technical Service (Shenzhen) Co., Ltd.:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.90 dB	(1)
Radiated Emission	1~6GHz	4.20 dB	(1)
Radiated Emission	6~18GHz	4.50 dB	(1)
Radiated Emission	18-40GHz	5.42 dB	(1)
Radiated Emission	Above 40 GHz	5.50 dB	(1)
Conducted Disturbance	0.15~30MHz	3.30 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5. Equipments Used during the Test

Radiated Emission						
Item	Test Equipment	Manufacturer	Model No.	Equipment No.	Last Cal.	Cal.Due
1	EMI Test Receiver	R&S	ESW26	103003	2025/04/29	2026/04/28
2	Spectrum Analyzer	R&S	FSW43	10182	2025/04/29	2026/04/28
3	Ultra-Broadband Antenna	Schwarzbeck	VULB9168	1291	2024/08/01	2027/07/31
4	Horn Antenna	ETS-Lindgren	3117	102732	2024/08/01	2027/07/31
5	Amplifier	R&S	SCU01F	100369	2025/04/29	2026/04/28
6	Amplifier	R&S	SCU18F	100868	2025/04/29	2026/04/28
7	Receive Unit	Tonscond	RIRU(QWO1)-18-40G	24D806RTRU0842	2024/07/02	2025/07/01
8	EMI Test Software	R&S	EMC32	N/A	N/A	N/A
8	TC-RX60	Tonscond	Receive Unit	1551	N/A	N/A
9	TC-RX75	Tonscond	Receive Unit	1545	N/A	N/A
10	TC-RX90	Tonscond	Receive Unit	1552	N/A	N/A
11	TC-RX140	Tonscond	Receive Unit	1553	N/A	N/A
12	TC-RX220	Tonscond	Receive Unit	1554	N/A	N/A
13	TC-RX40	Tonscond	Receive Unit	1543	N/A	N/A
14	Antenna Mast	Maturo	BAM4.0	N/A	N/A	N/A
15	Turntable	Maturo	TT3.5	N/A	N/A	N/A
16	Loop Antenna	R&S	HFH2-Z2E	101066	2024/09/04	2025/08/02
17	Thermal chamber	ESPEC	GFS-800-15	0050-001161	2025/04/29	2026/04/28

Note:

1. Receive Unit including the antenna, pre-amplifier and mixer.
2. RIRU(QWO1)-18-40G Receive Unit inclduing antenna and pre-amplifier.

4. TEST CONDITIONS AND RESULTS

4.1. 10dB Bandwidth Measurement [§15.503 §15.517 (b)]

4.1.1. LIMITS

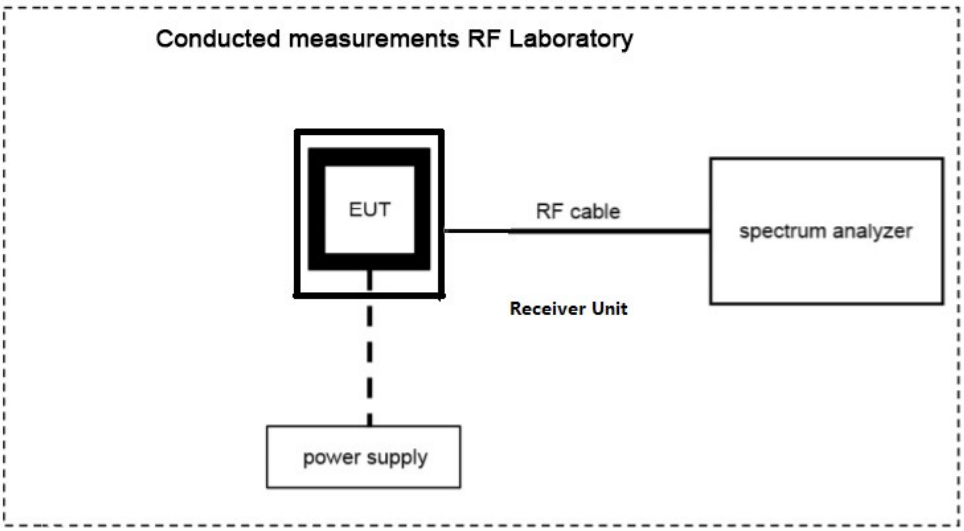
The UWB bandwidth is the frequency band bounded by the points that are 10dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated FH and the lower boundary is designated FL. The frequency at which the highest radiated emission occurs is designated F_M.

- The center frequency, F_C, equals $(F_H + F_L)/2$
- The fractional bandwidth equals $2(F_H - F_L) / (F_H + F_L)$

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

a) The minimum permissible 10dBc Bandwidth is 500 MHz
b) Fractional bandwidth is equal or greater than 0.20

4.1.2. TEST CONFIGURATION



4.1.3. TEST PROCEDURE

1. RBW = 1MHz
2. VBW = 3MHz
3. Detector = Peak
4. Trace mode = max hold
5. Sweep = auto couple
6. The trace was allowed to stabilize

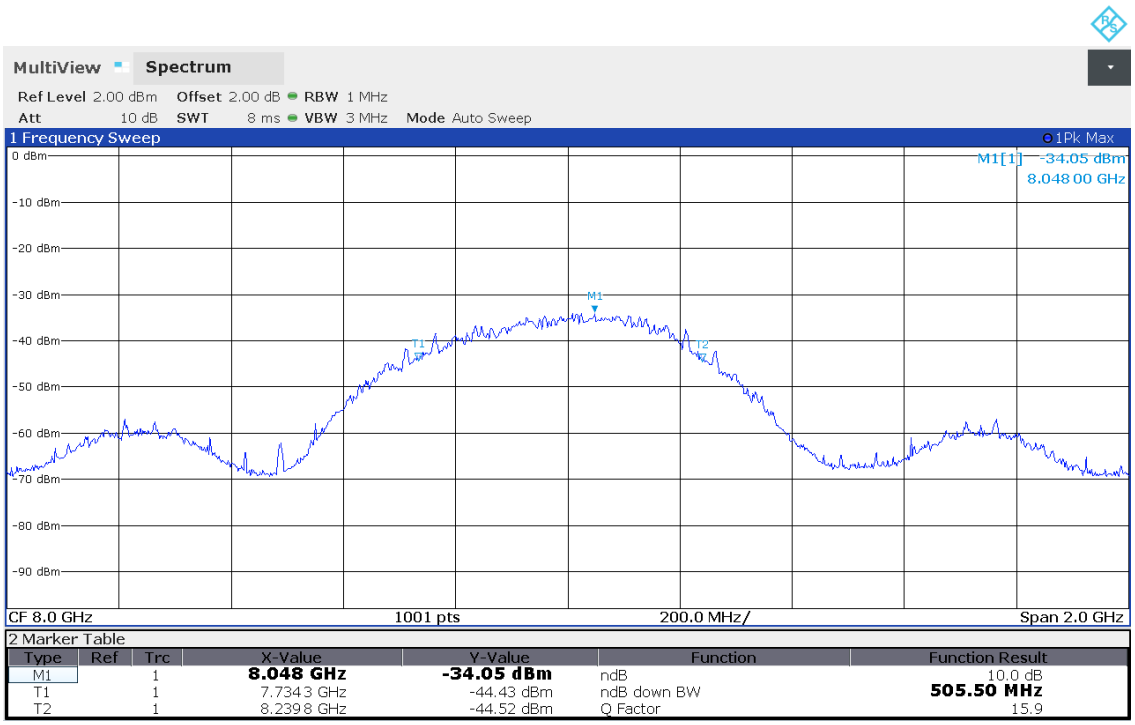
4.1.4. TEST RESULTS

Table: 10dB Bandwidth, Op.1

Frequency [GHz]	Channel	F_M [GHz]	F_H [GHz]	F_L [GHz]	Fc [GHz]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass/Fail
8	9	8.048	8.2398	7.7343	7.9870	505.50	500	Pass

Note:
Note 1: In those cases where the measured emission spectrum contains multiple (more than two) –10dBc points, the outermost points define the UWB bandwidth (i.e., the widest bandwidth is reported).
Note 2: All modes of operation were investigated and the worst-case emissions are reported.

Plots No. 1: -10dB Bandwidth

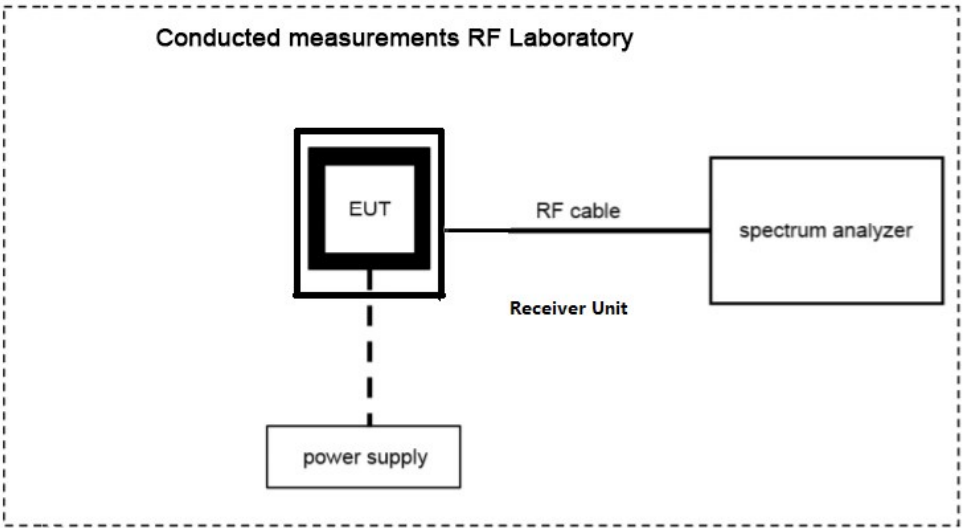


4.2. Occupied Bandwidth Measurement [§2.1049]

4.2.1. LIMITS

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

4.2.2. TEST CONFIGURATION



4.2.3. TEST PROCEDURE

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 10dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

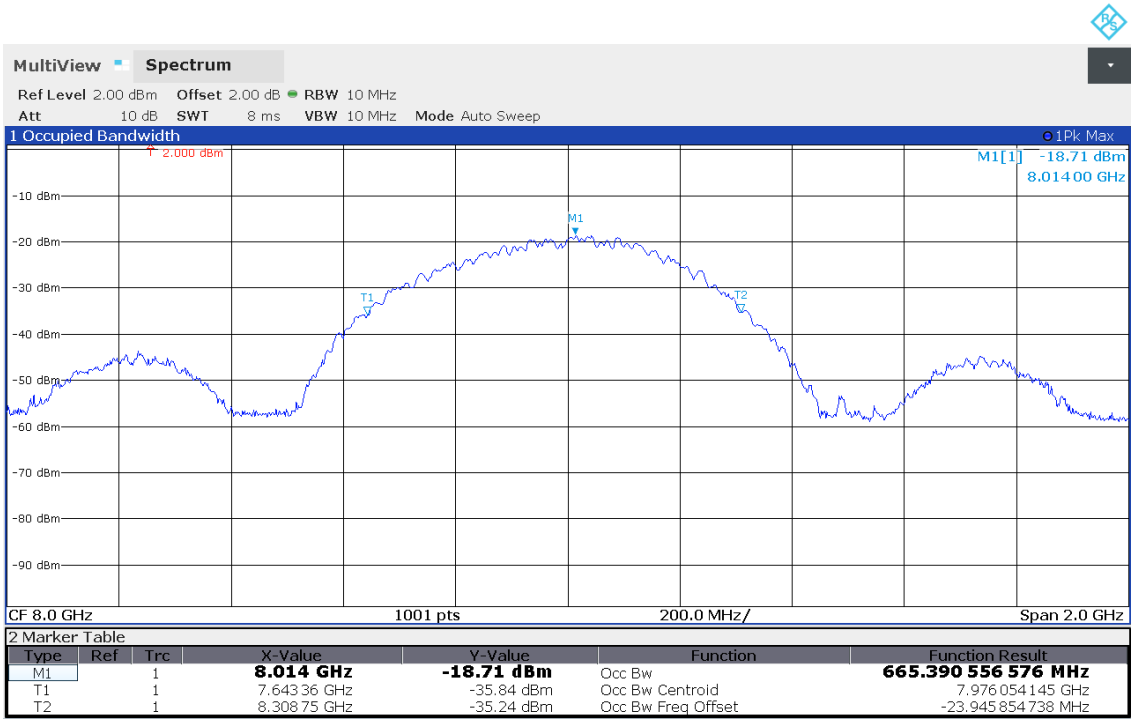
4.2.4. TEST RESULTS

Table: Occupied Bandwidth, Op.1

Frequency Range [GHz]	Occupied Bandwidth [MHz]	Occupied Bandwidth Limit [GHz]	Verdict
7.25 - 10.25	665.39	No Limit	PASS

Note 1: All modes of operation were investigated and the worst-case emissions are reported.

Plots No. 2: 99% Occupied Bandwidth



4.3. Maximum Peak and Average Radiated Power (EIRP) [§15.517 (c) §15.517 (e)]

4.3.1. LIMITS

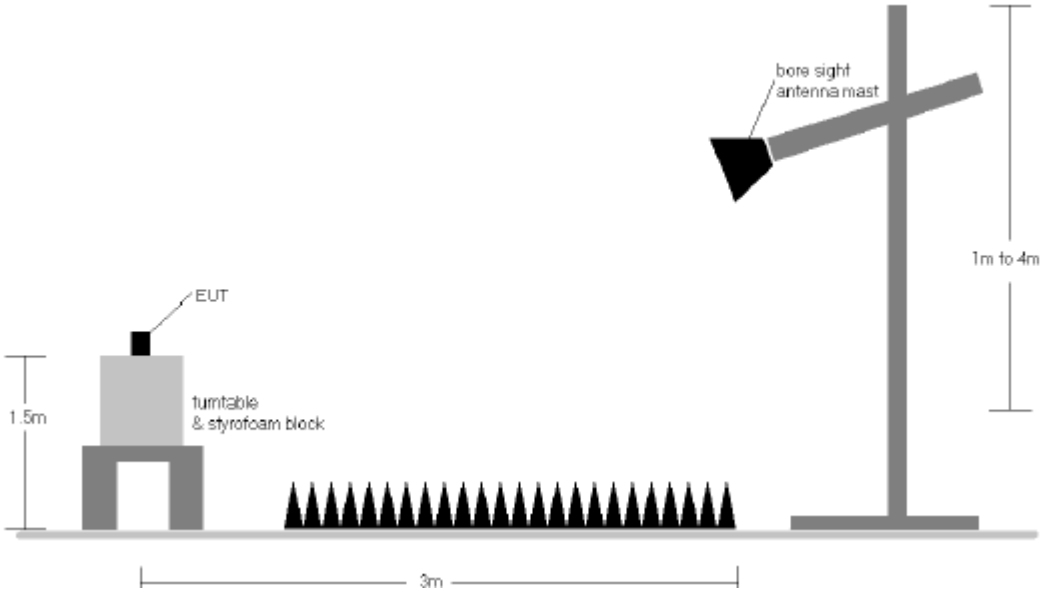
§15.517 (e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, F_M. That limit is 0 dBm for Peak EIRP.

§15.517 (c) 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 [MHz]	EIRP [dBm]
960 – 1610	-75.3
1610 – 1990	-53.3
1990 – 3100	-51.3
3100 - 10600	-41.3
Above 10600	-51.3

§15.521 (g) When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, f_M. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using E(dBuV/m) = P(dBm EIRP) + 95.2. If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

4.3.2. TEST CONFIGURATION



4.3.3. TEST PROCEDURE

According to ANSI C63.10-2020 – Section 10.3.5, Section 10.3.7 and KDB 393764 D01 v02r01 testing settings as;

Average EIRP Measurements

1. RBW = 1MHz
2. VBW = 3MHz
3. Detector = Average (RMS)
4. Sweep time = No more than a 1 ms integration period over each measurement bin
5. Trace mode = Max hold
6. Trace was allowed to stabilize

Peak EIRP Measurements

1. RBW = 10MHz
2. VBW = 10MHz
3. Detector = Peak
4. Sweep time = Auto couple
5. Trace mode = Max hold

6. Trace was allowed to stabilize
7. EIRP (dBm/50MHz) = EIRP (dBm/10MHz) + 20*log(50/10)

4.3.4. TEST RESULTS

Table: Maximum Peak Radiated Power (EIRP), Op.1

Frequency [GHz]	Channel	Ant. Pol. [H/V]	F_M [GHz]	Peak EIRP [dBm/10MHz]	RBW Factor [dB]	Peak EIRP [dBm/50MHz]	Peak EIRP Limit [dBm/50MHz]	Margin [dB]
8.0	9	H	8.0134	-15.008	13.97	-1.038	0	1.038

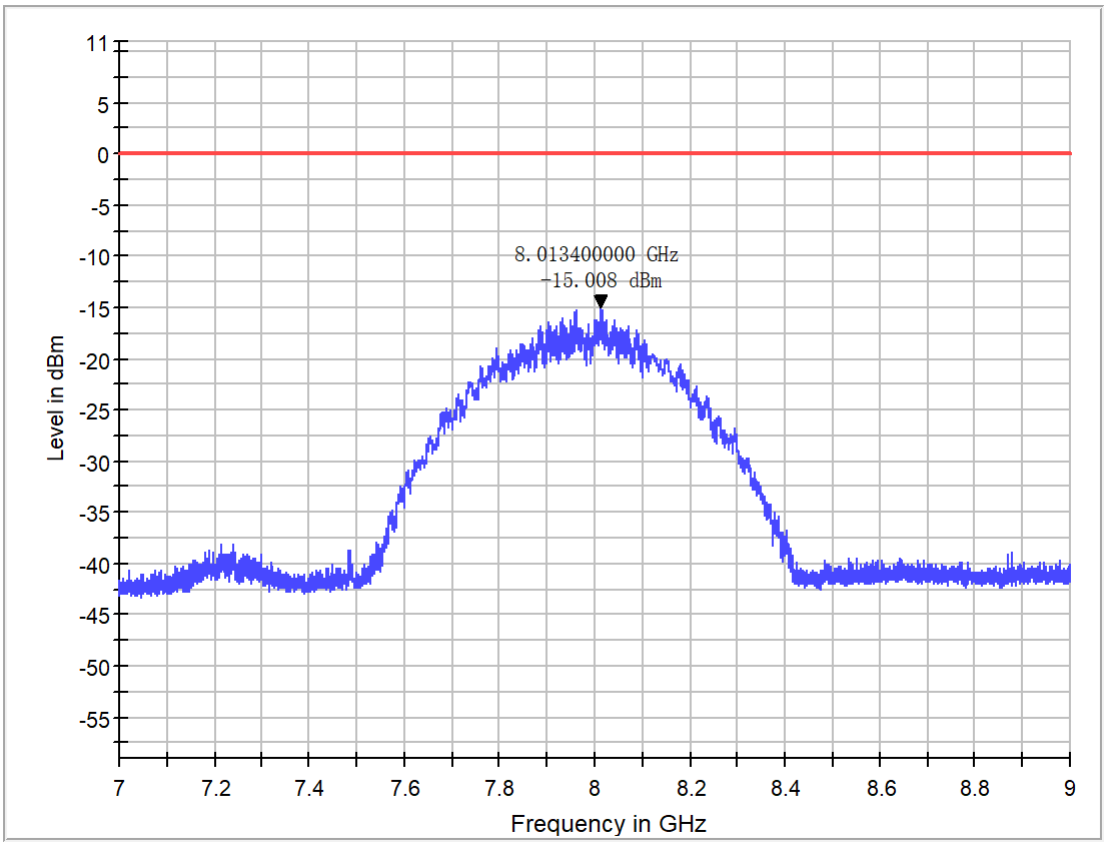
Note 1: The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
Note 2: RBW Factor [dB] = 20*log(50/10) = 13.97 dB
Note 3: All modes of operation were investigated and the worst-case emissions are reported.
Note 4: Magin = Limit - Results

Table: Maximum Average Radiated Power (EIRP), Op.1

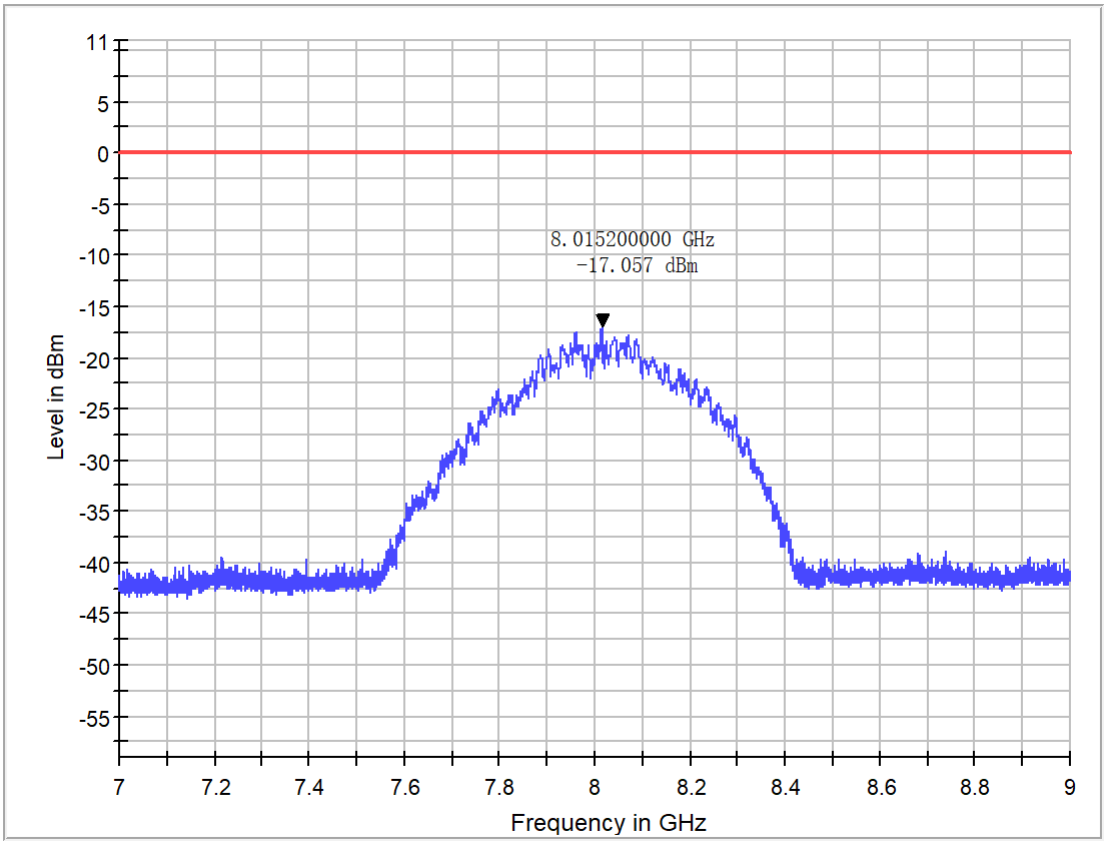
Frequency [GHz]	Channel	Ant. Pol. [H/V]	F_M [GHz]	Average EIRP [dBm/MHz]	Average EIRP Limit [dBm/MHz]	Margin [dB]
8.0	9	V	8.0366	-41.637	-41.3	0.337

Note 1: The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
Note 2: All modes of operation were investigated and the worst-case emissions are reported.

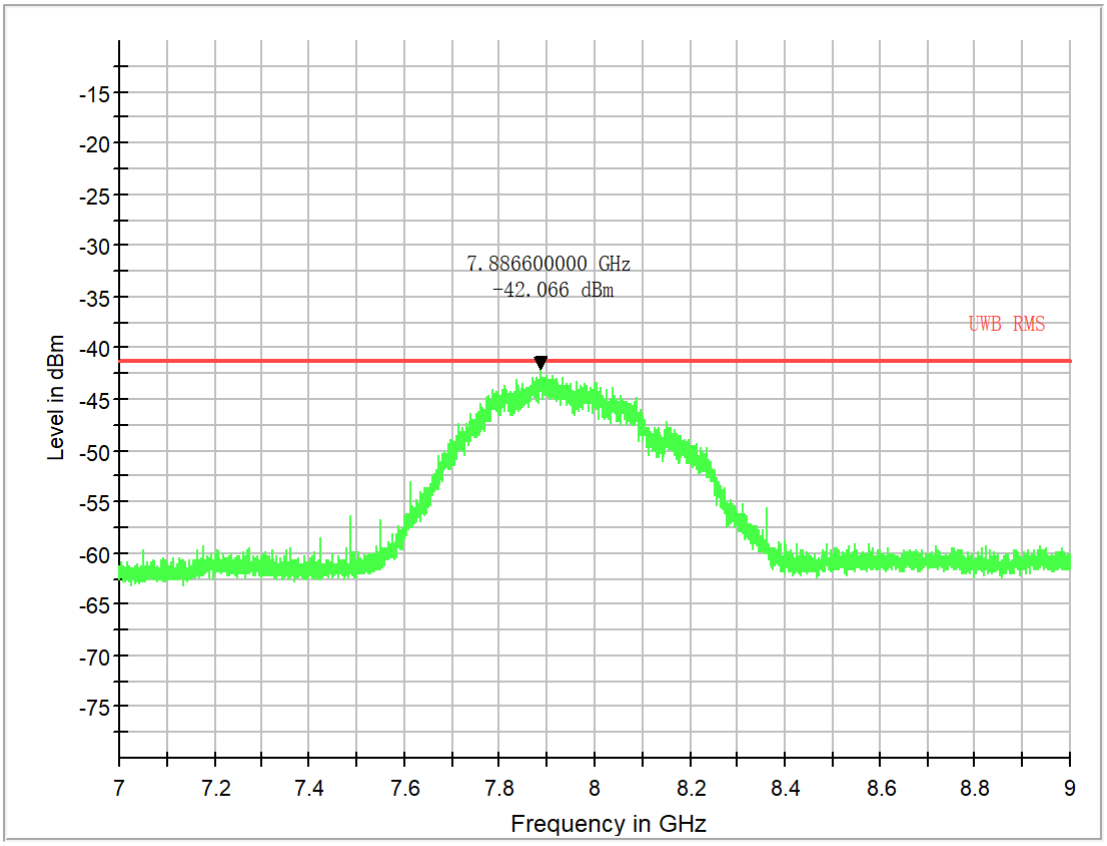
Plots No. 3: Peak Radiated Power (EIRP), Horizontal



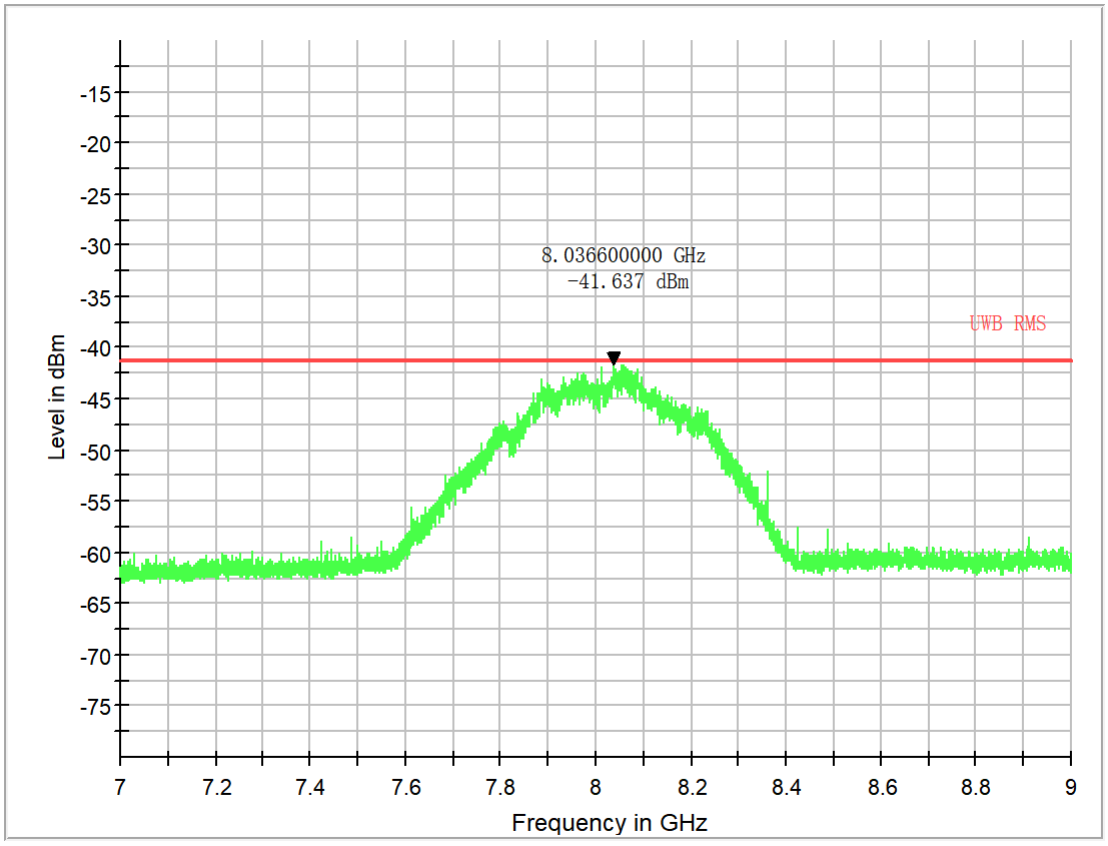
Plots No. 4: Peak Radiated Power (EIRP), Vertical



Plots No. 5: Average Radiated Power (EIRP), Horizontal



Plots No. 6: Average Radiated Power (EIRP), Vertical



4.4. Radiated Spurious Emissions Measurements – Above 960MHz [§15.517 (c) §15.517 (d)]

4.4.1. LIMITS

§15.517 (c) All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. All out of band emissions must not exceed the average limits shown in Table per Section 15.517 (c) when measured using a resolution bandwidth of 1 MHz. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

Frequency [MHz]	EIRP [dBm]
960 – 1610	-75.3
1610 – 1990	-53.3
1990 – 3100	-51.3
3100 - 10600	-41.3
Above 10600	-51.3

§15.517 (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:

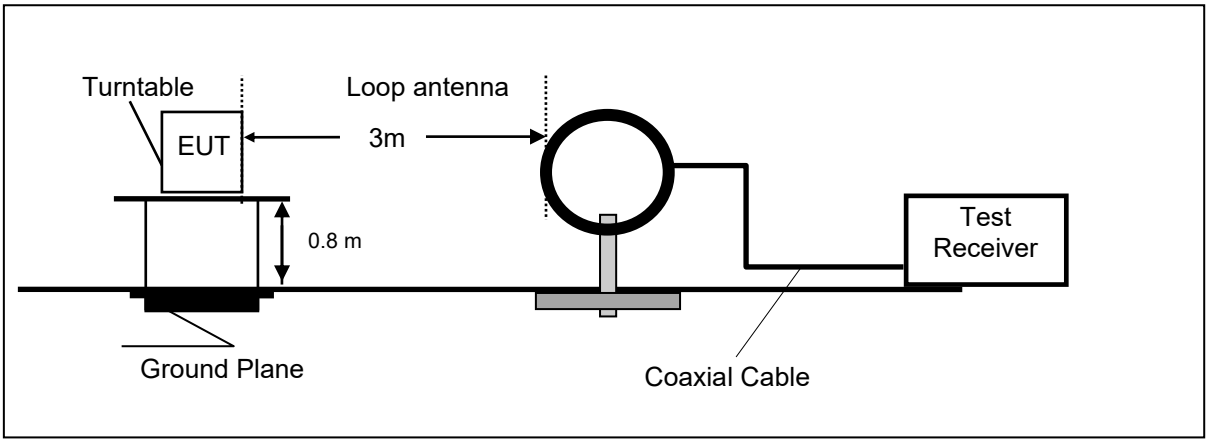
Frequency [MHz]	EIRP [dBm]
1164 – 1240	-85.3
1559 – 1610	-85.3

§15.521 (c) Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in § 15.209, rather than the limits specified in this subpart, provided it can be clearly demonstrated that those emissions from the UWB device are due solely to emissions from digital circuitry contained within the transmitter and that the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in § 15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the UWB transmission, are subject to the limits contained in Subpart B of this part.

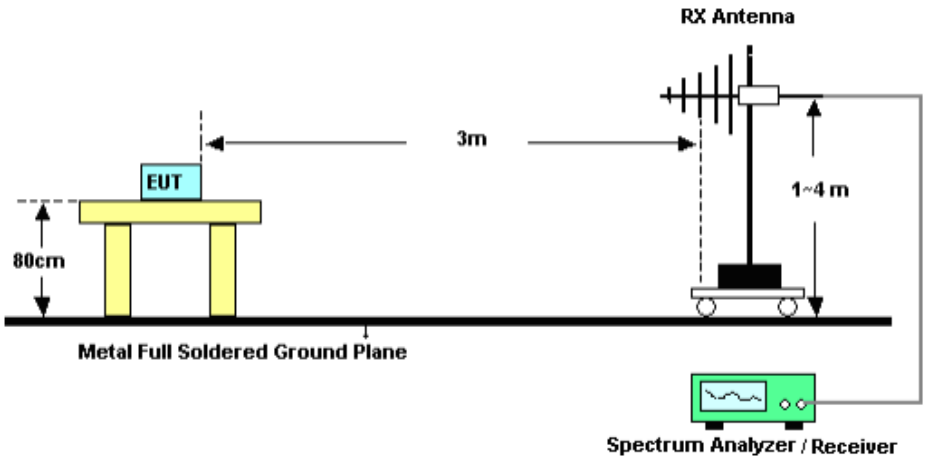
4.4.2. TEST CONFIGURATION

4.4.3. TEST RESULTS

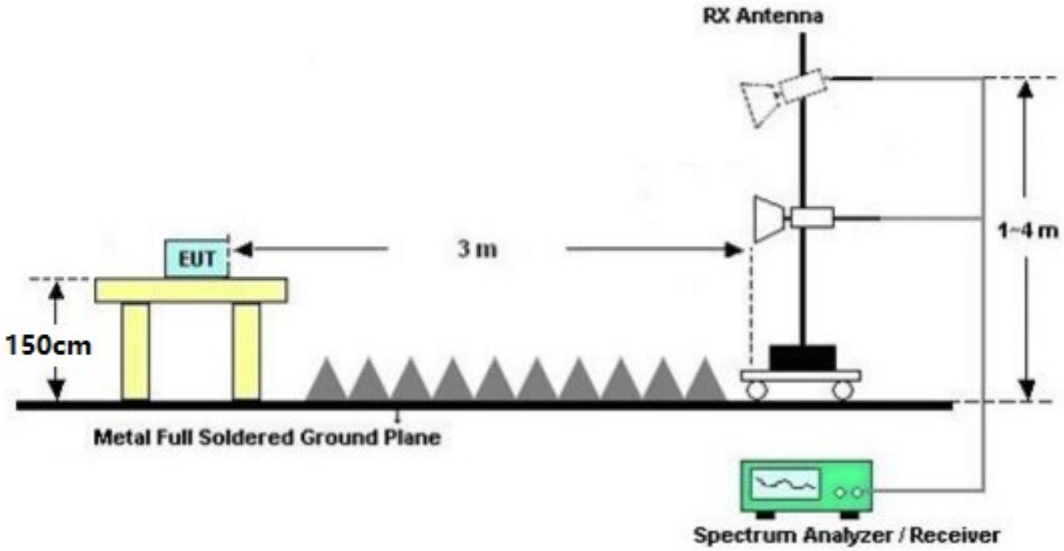
(a) Frequency range 9 KHz – 30MHz



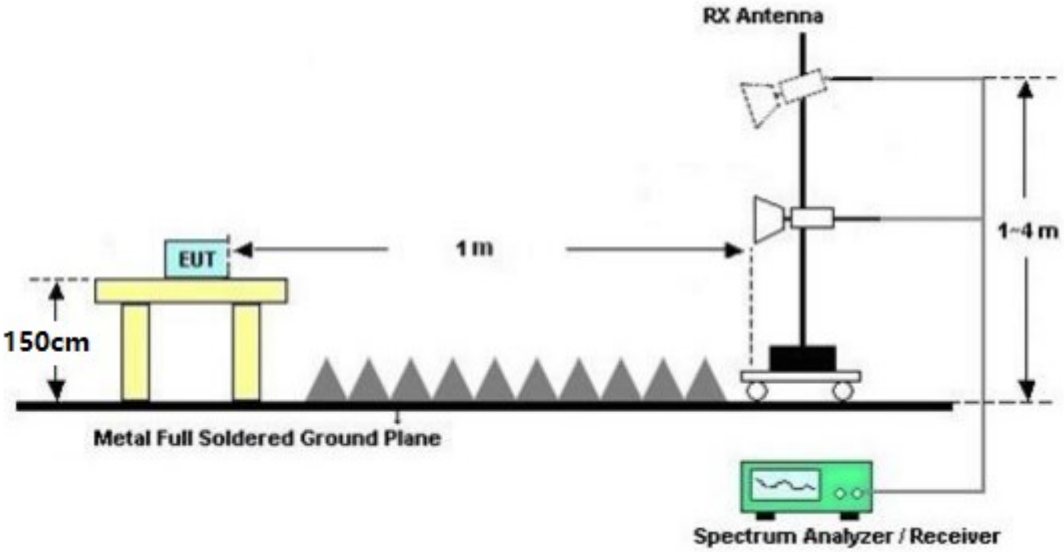
(b) Radiated emission test set-up, frequency range: 30 - 1000MHz



(c) Radiated emission test set-up, frequency range 1GHz – 18 GHz



(d) Radiated emission test set-up, frequency range 18GHz – 40 GHz



4.4.4. TEST PROCEDURE

4.1.3.1 Sequence of testing radiated spurious 9 KHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 3m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0 degree to 360 degree.
- The antenna height is 1m.
- Set RBW = 200 Hz / VBW = 1 KHz, sweep time: Auto
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeaurement are maximized by the software by rotating the turntable from 0 degree to 360 degree.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.3.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 0.8 m height is used, which is placed on the ground plance.
- If the EUT is a floor standing device, it is placed directly on the ground plane.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 3m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0 degree to 360 degree.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set RBW = 120 KHz / VBW = 1 MHz, sweep time: Auto
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement

- The final neasurement is perormed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.3.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup
- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turntable.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 3m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement
- The turntable rotates from 0 degree to 360 degree.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Peak for Peak, RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Average for Average.
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement
- The final neasurement us perormed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable and antenna height between 1 and 4 m.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the height emissions with Peak and Average detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.1.3.4 Sequence of testing radiated spurious 18 GHz – 40 GHz

Setup
- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer
- If the EUT is a tabletop system, 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turntable.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measuremet distance is 1m (see ANSI C63.4) – see test details.
- EUT is set into operation.

Premeasurement
- The turntable rotates from 0 degree to 360 degree.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1m to 4m.
- Set RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Peak for Peak, RBW = 1 MHz / VBW = 3 MHz, sweep time: Auto, detector: Average for Average.
- At each turntable position the anzlyer sweeps with position-peak detector to find the maximum of all emissions.

Final measurement
- The final neasurement is perormed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable and antenna height between 1 and 4 m.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the height emissions with Peak and RMS detector (as described in ANSI C 63.4).
- All final levels should consider distance conversion factor as format: Final values (3 m) = Measurement values (1 m) + Distance conversion factor
  Distance conversion factor = 20 x Log_{10} (d/3), where d = measurement distance in m
  - Distance conversion factor = 20 x Log_{10} (1/3) = -9.54 [dB]

- Final levels, frequency, measuring time, bandwidth, turntable position, conrrection factor, margin to the limit and limit will be recorded. A plot with the graph of the measurement and the limit is stored.

4.4.5. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS (dBuV/m) = RA (dBuV) + AF (dB/m) + CL (dB) – AG (dB)

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

4.4.6. TEST RESULTS

EIRP measurements were ensured to be taken in the Far-Field test distance are shown in Section 2.15.

Sample Calculations

Calculating Field Strength from substitution power:

$$E(dBuV/m) = 126.8 - 20\log(\lambda) + P - G$$

Where;
E is the field strength of the emission at the measurement distance, in dBuV/m
P is the power measured at the output of the test antenna, in dBm; where P includes all applicable instrument correction factors up to the connections to the test antenna.
λ is the wavelength of the emission under investigation [300 / f_{MHz}], in m.
G is the gain of the test antenna, in dBi.

Calculating EIRP from Field Strength;

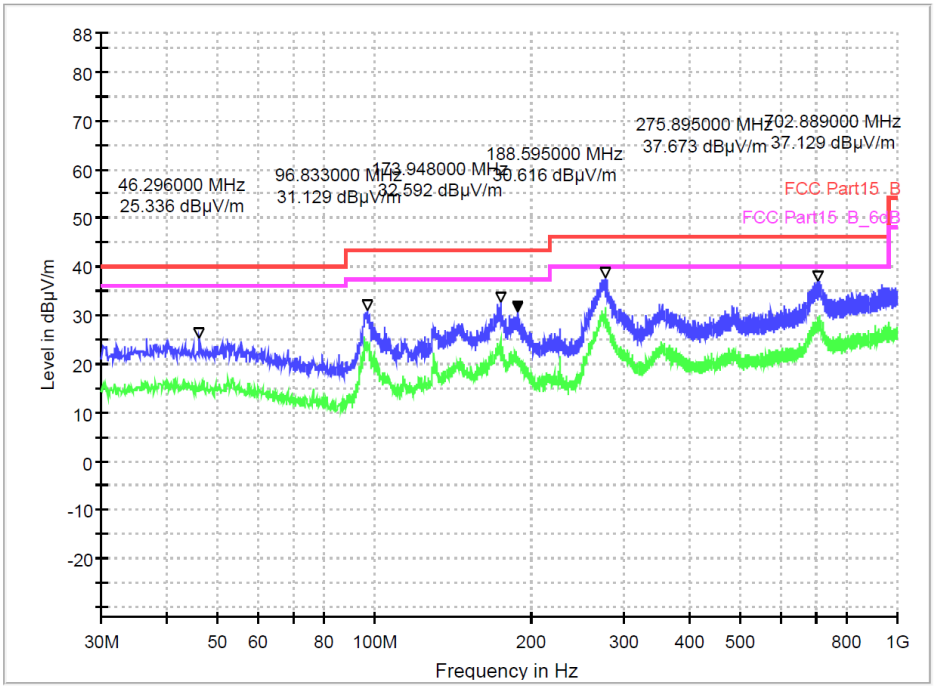
$$EIRP_{[dBm]} = E_{measurement} + 20\log(D_{measured}) - 104.7$$

Where;
EIRP is the equivalent isotropic radiated power in dBm
$E_{measured}$ is the field strength of the emission at the measurement distance, in dBuV/m
$D_{measured}$ is the measurement distance in meters.

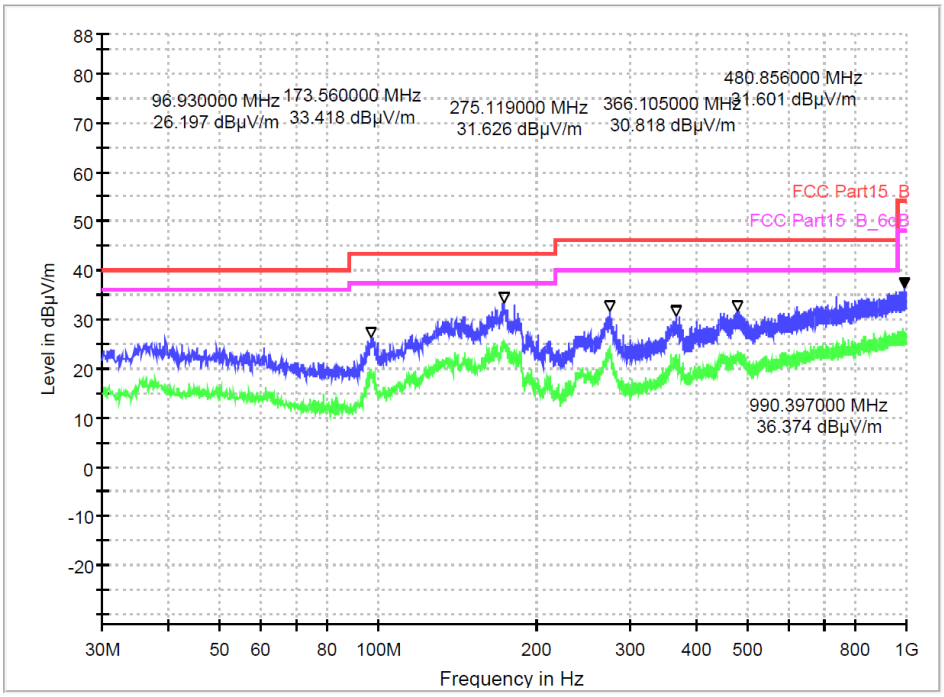
PASS

Note 1: Not recorded values after pre-test below 30 MHz (9 KHz – 30 MHz), values at least 20 dB below limit.

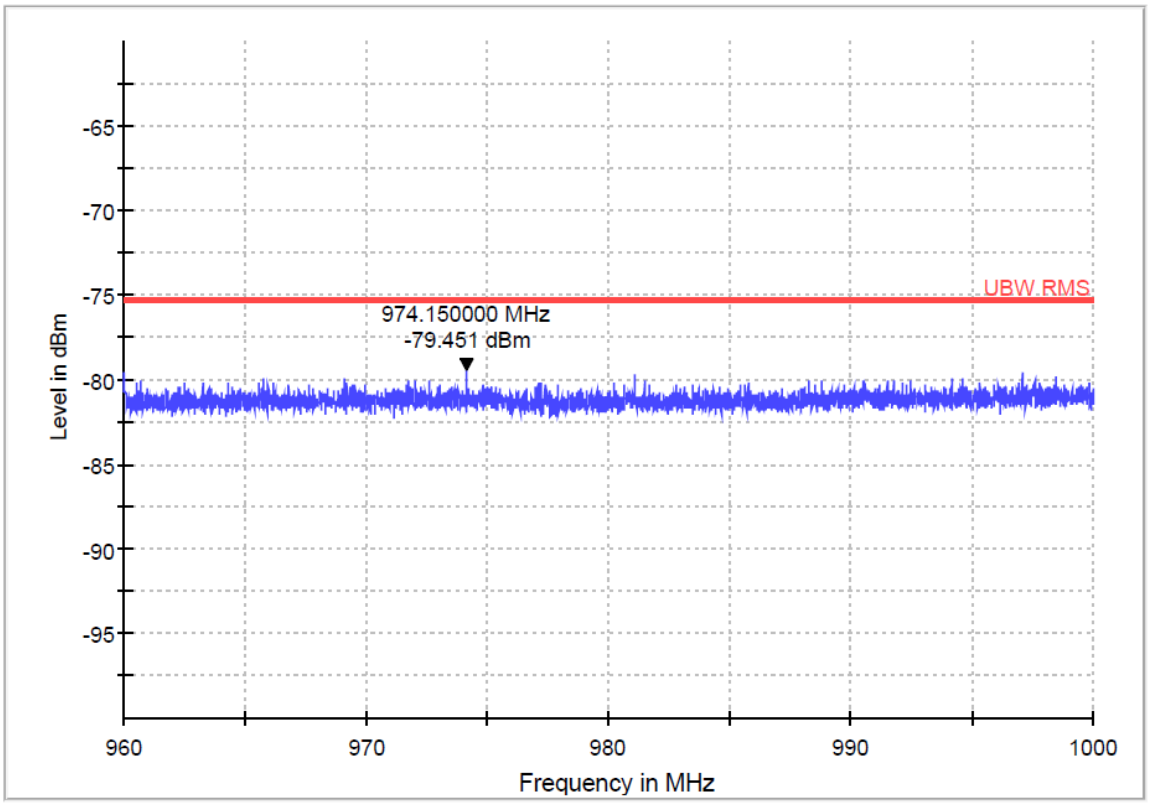
Plots No. 7: Radiated Emission, 30 MHz to 960 MHz, Horizontal



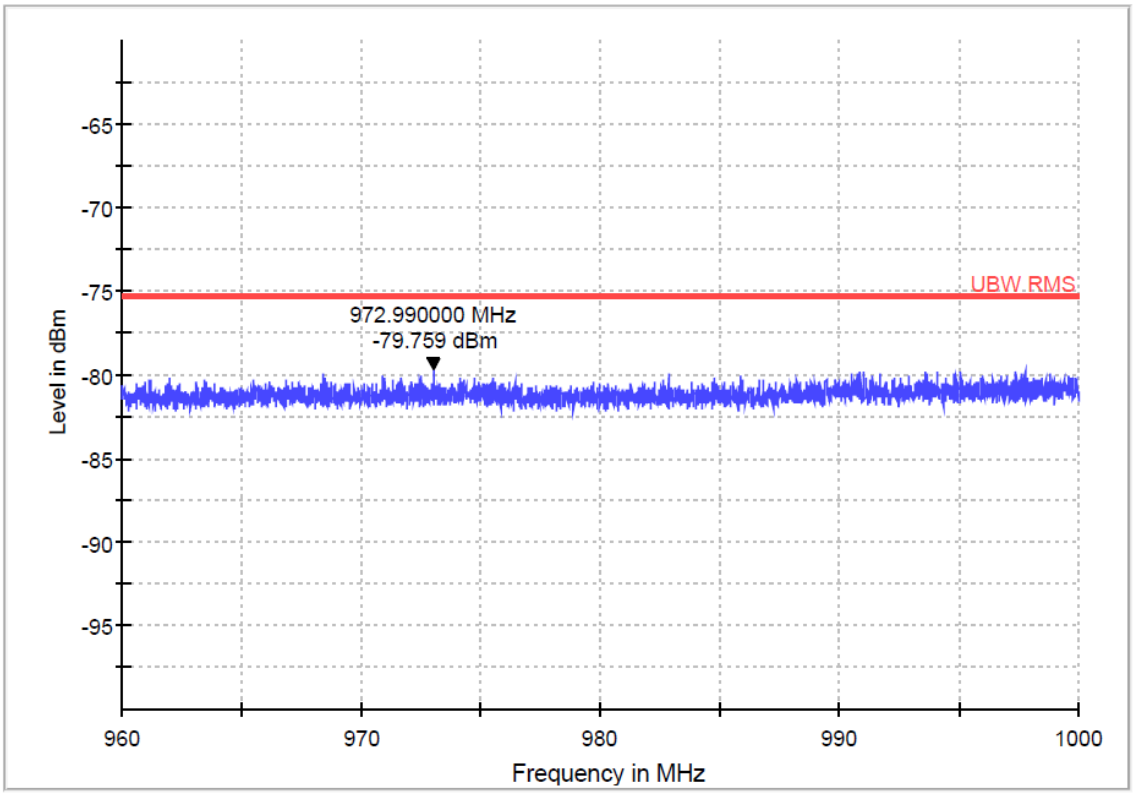
Plots No. 8: Radiated Emission, 30 MHz to 960 MHz, Vertical



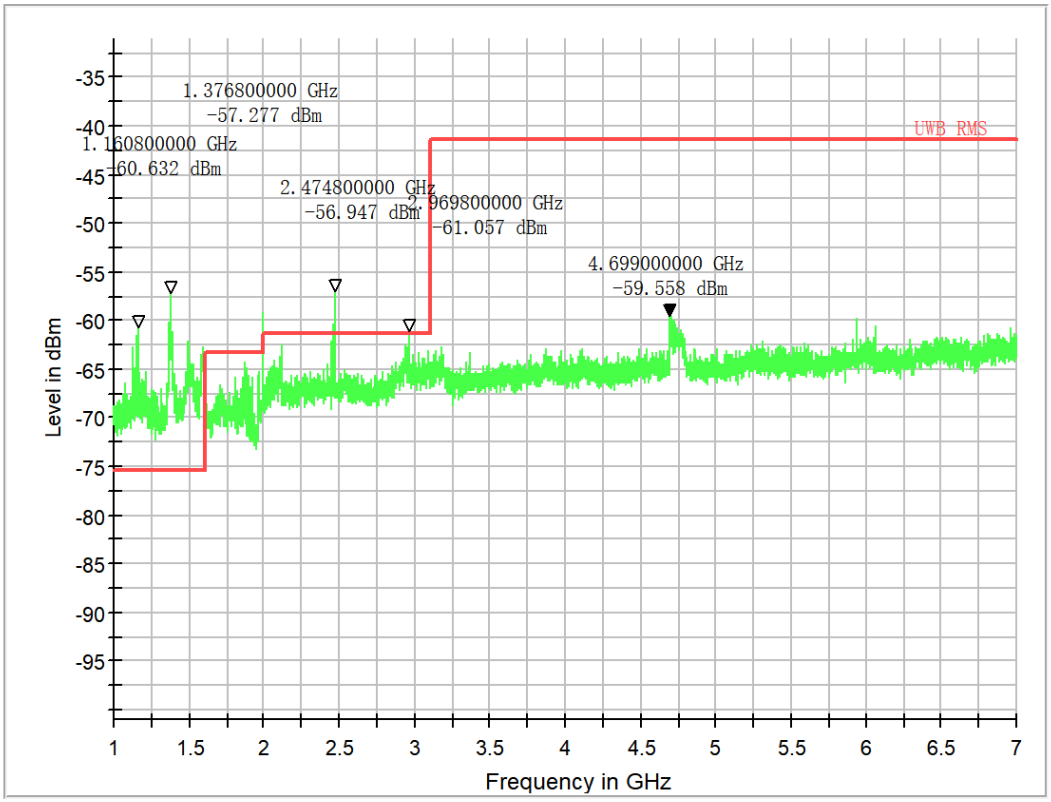
Plots No. 9: Radiated Emission, 960 MHz to 1 GHz, Horizontal



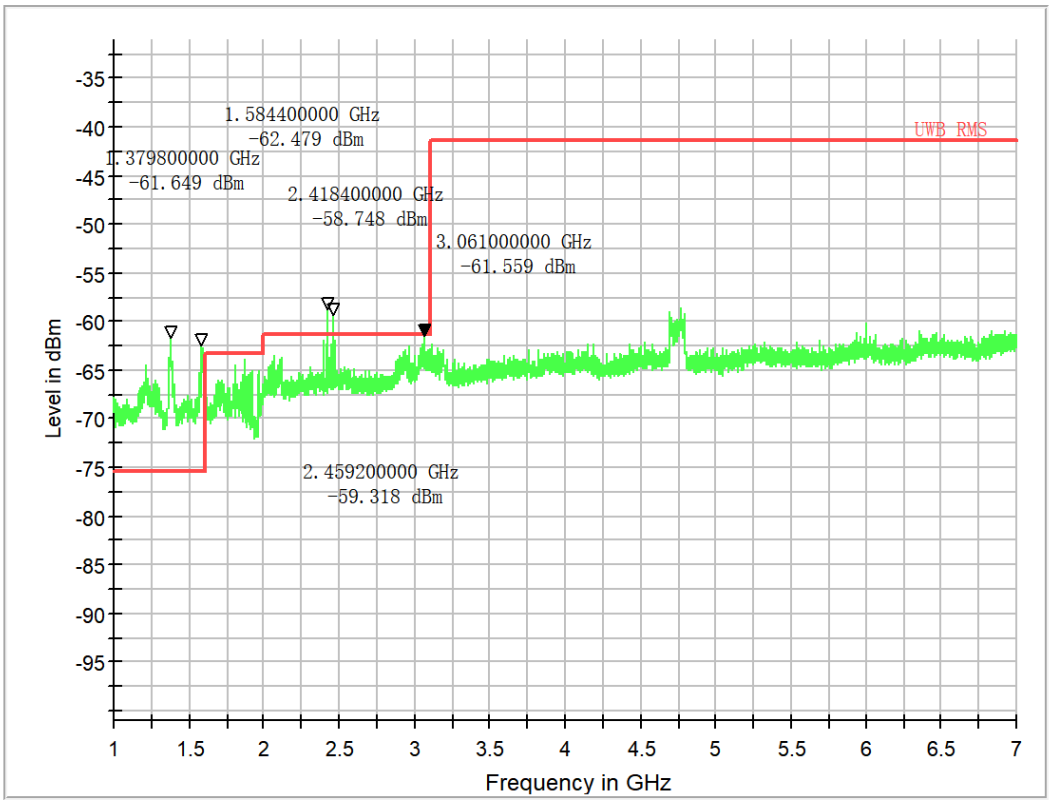
Plots No. 10: Radiated Emission, 960 MHz to 1 GHz, Vertical Polarization



Plots No. 11: Radiated Emission, 1 GHz to 7 GHz, Horizontal Polarization with UWB Open

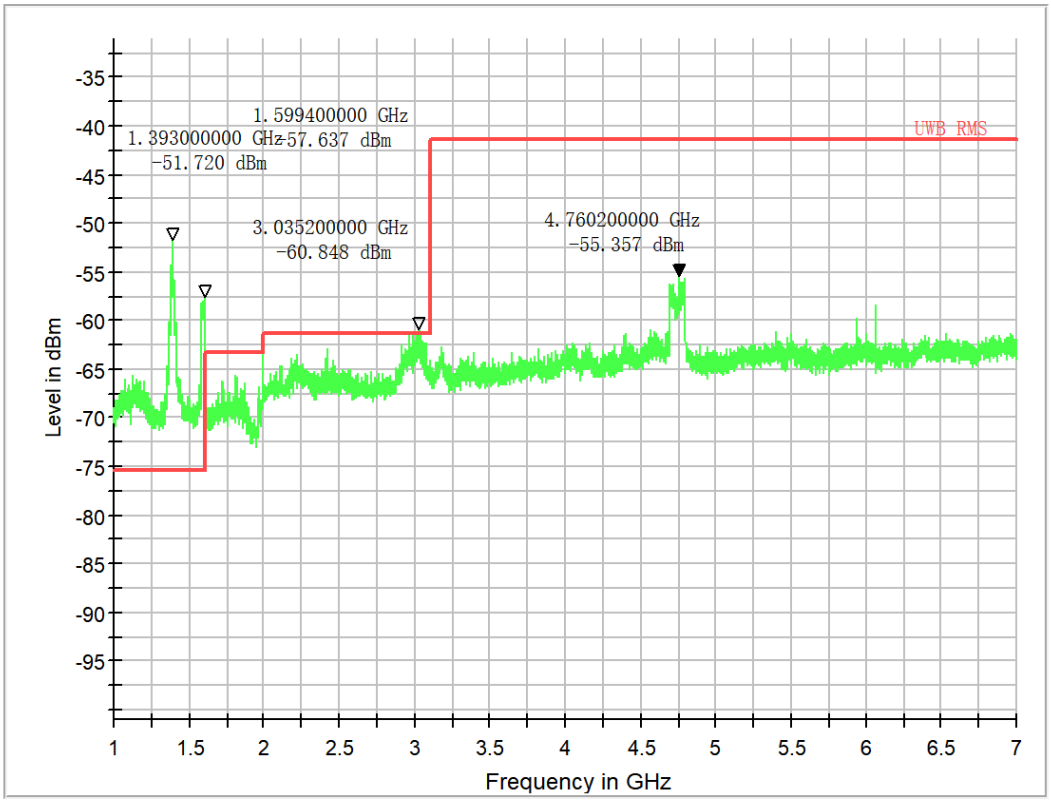


Plots No. 12: Radiated Emission, 1 GHz to 7 GHz, Horizontal Polarization with UWB Close

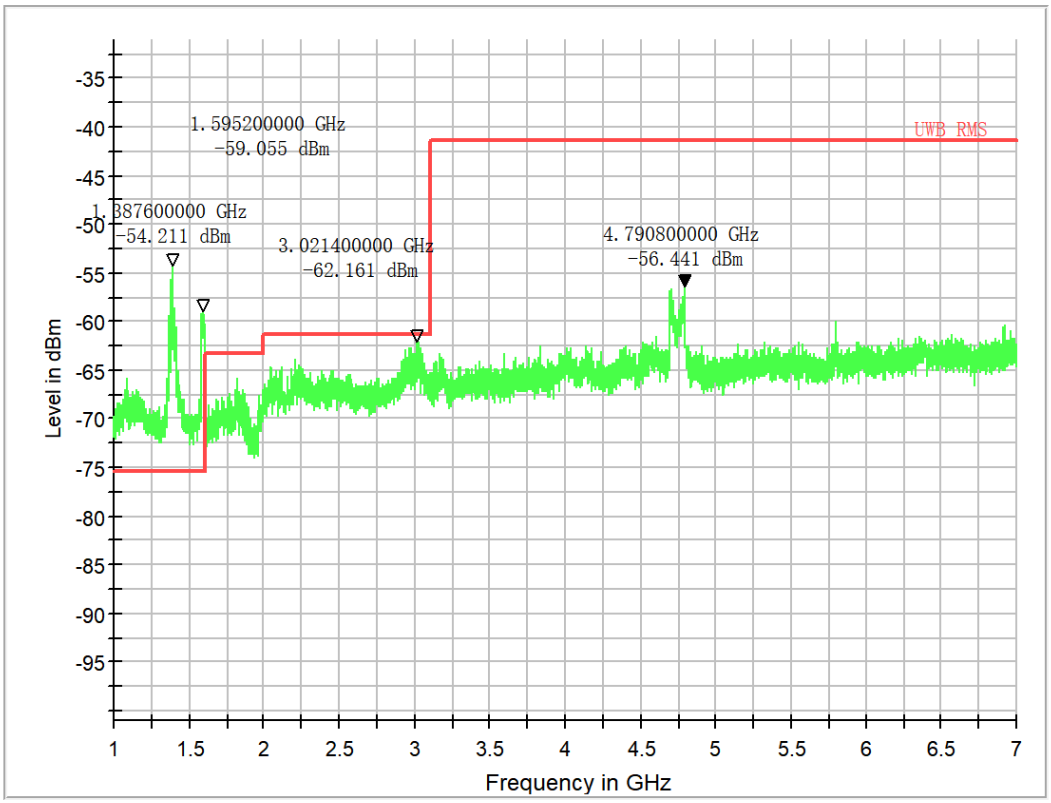


The digital circuitry emisison limit is 54dBuV/m, Calculating EIRP = -41.15dBm.

Plots No. 13: Radiated Emission, 1 GHz to 7 GHz, Vertical Polarization with UWB Open

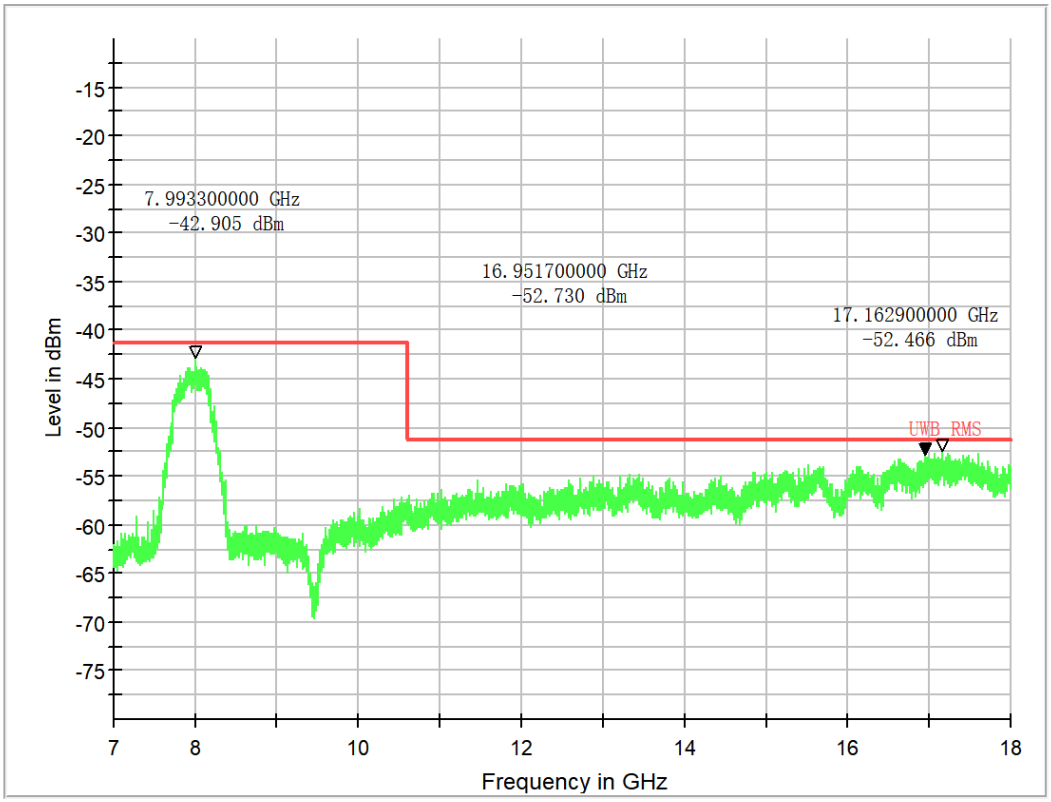


Plots No. 14: Radiated Emission, 1 GHz to 7 GHz, Vertical Polarization with UWB Close

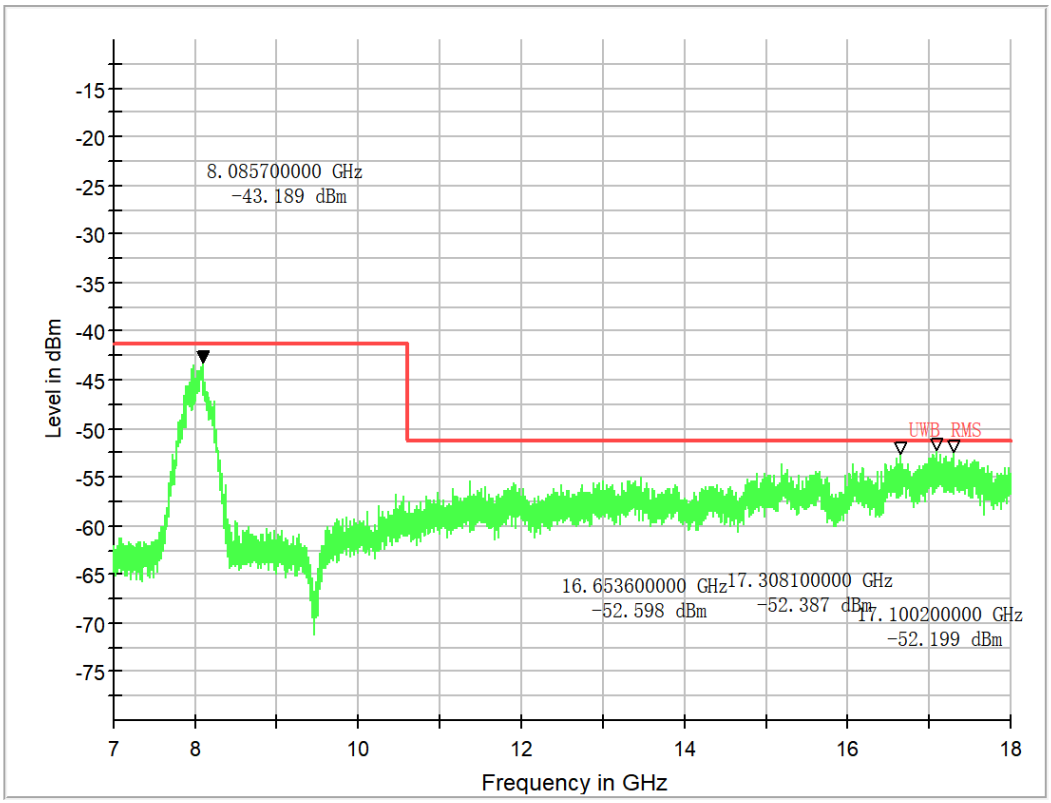


The digital circuitry emisison limit is 54dBuV/m, Calculating EIRP = -41.15dBm.

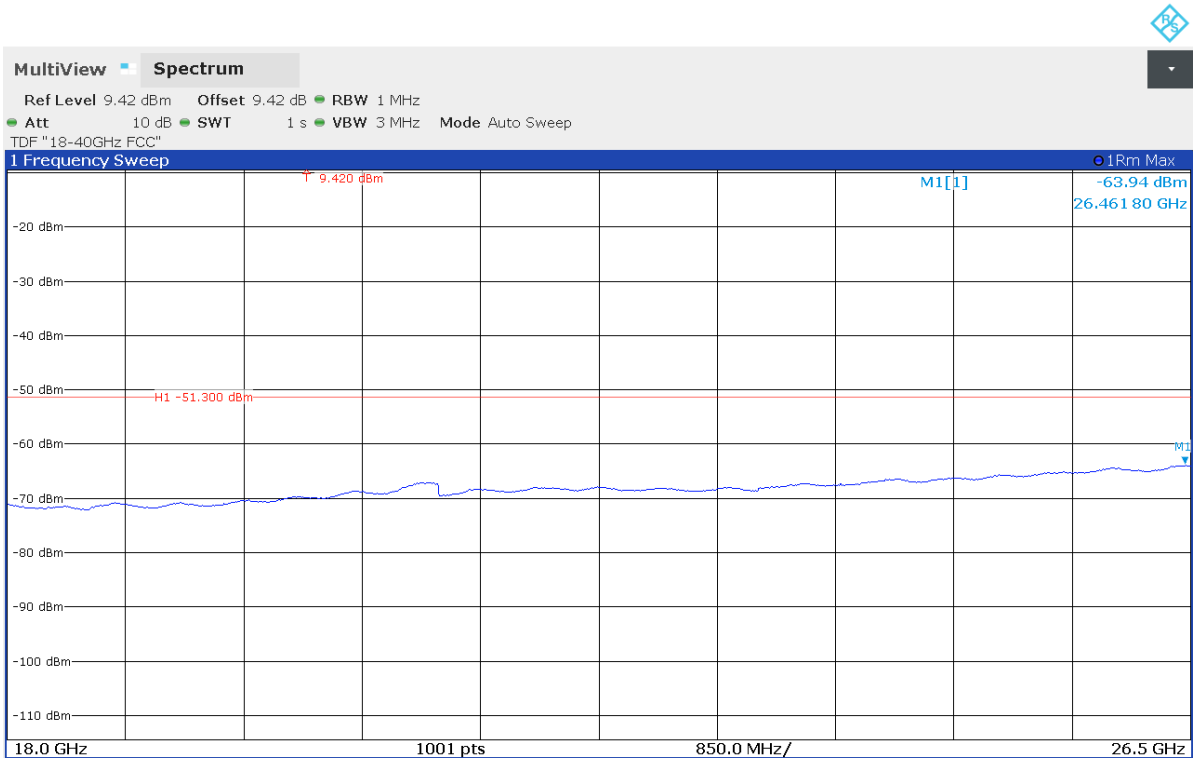
Plots No. 15: Radiated Emission, 7 GHz to 18 GHz, Horizontal Polarization



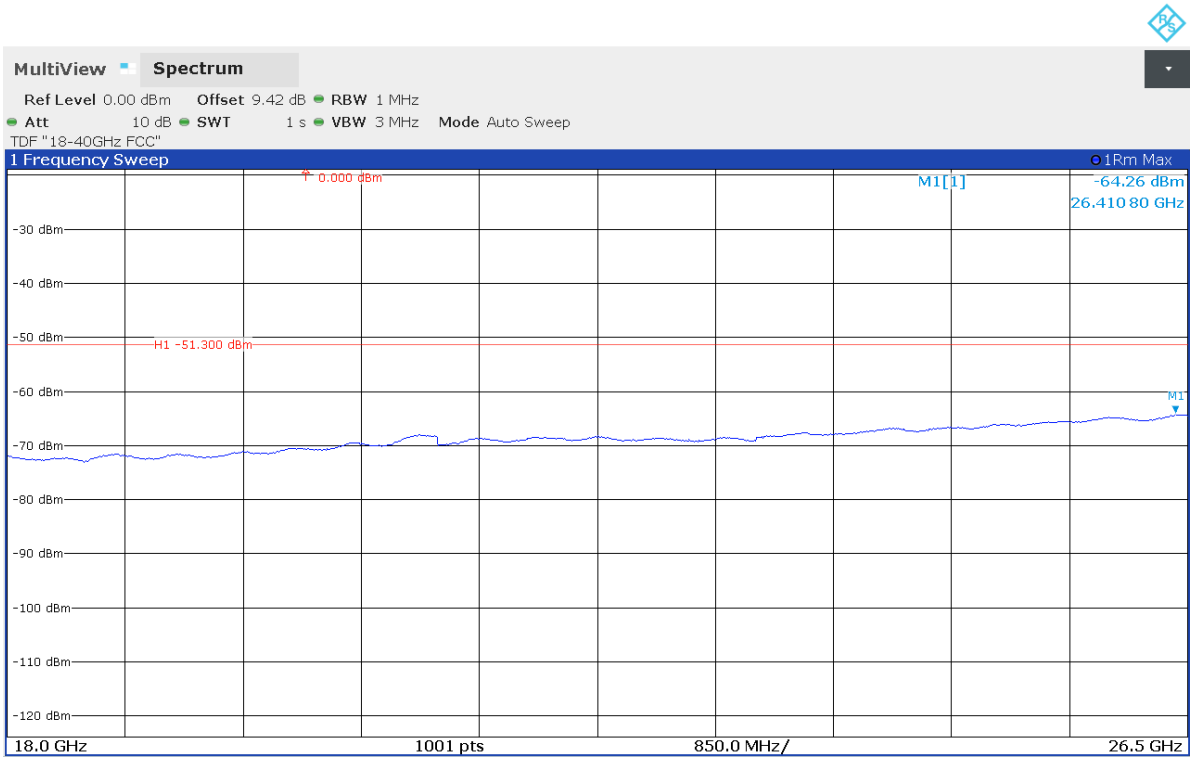
Plots No. 16: Radiated Emission, 7 GHz to 18 GHz, Vertical Polarization



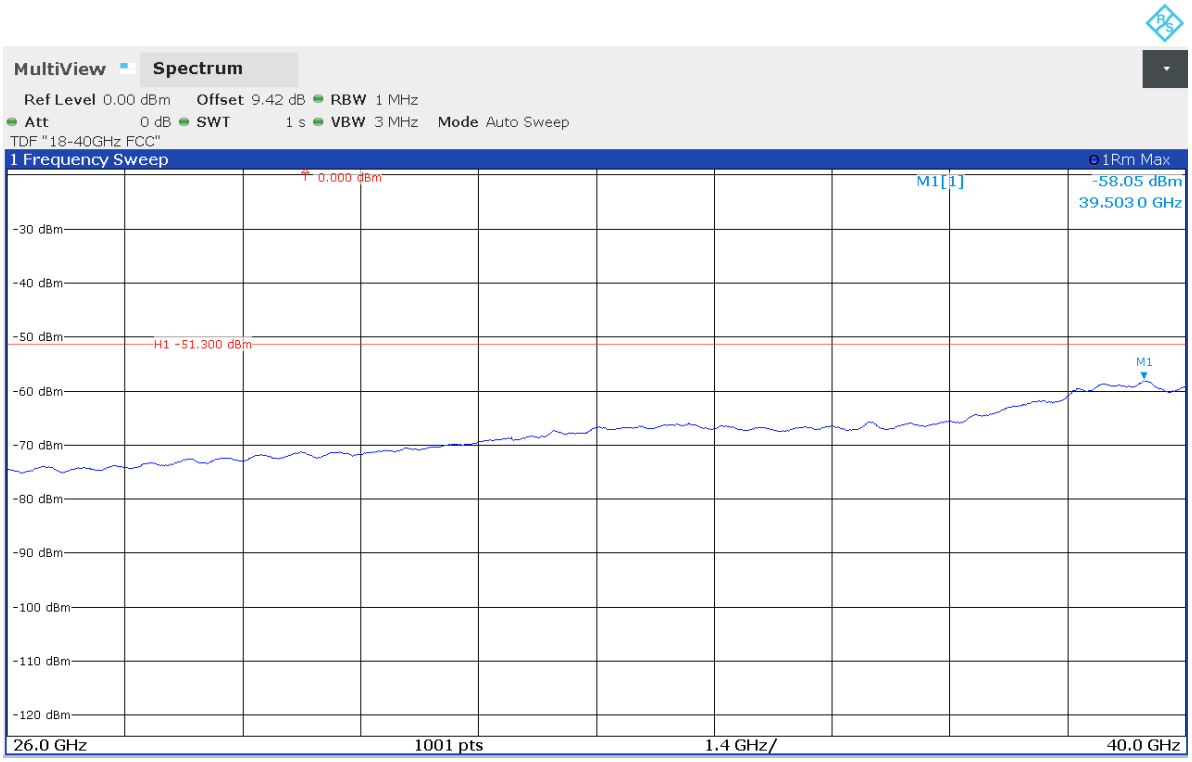
Plots No. 17: Radiated Emission, 18 GHz to 26.5 GHz, Horizontal Polarization



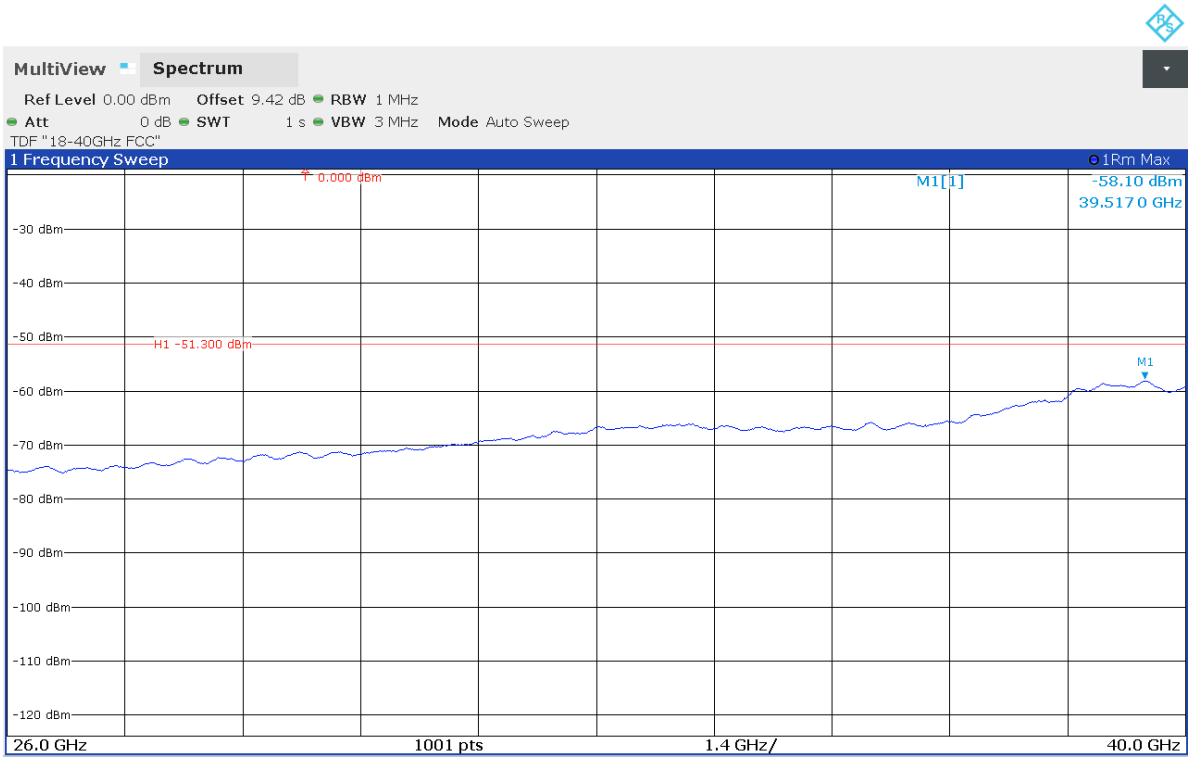
Plots No. 18: Radiated Emission, 18 GHz to 26.5 GHz, Vertical Polarization



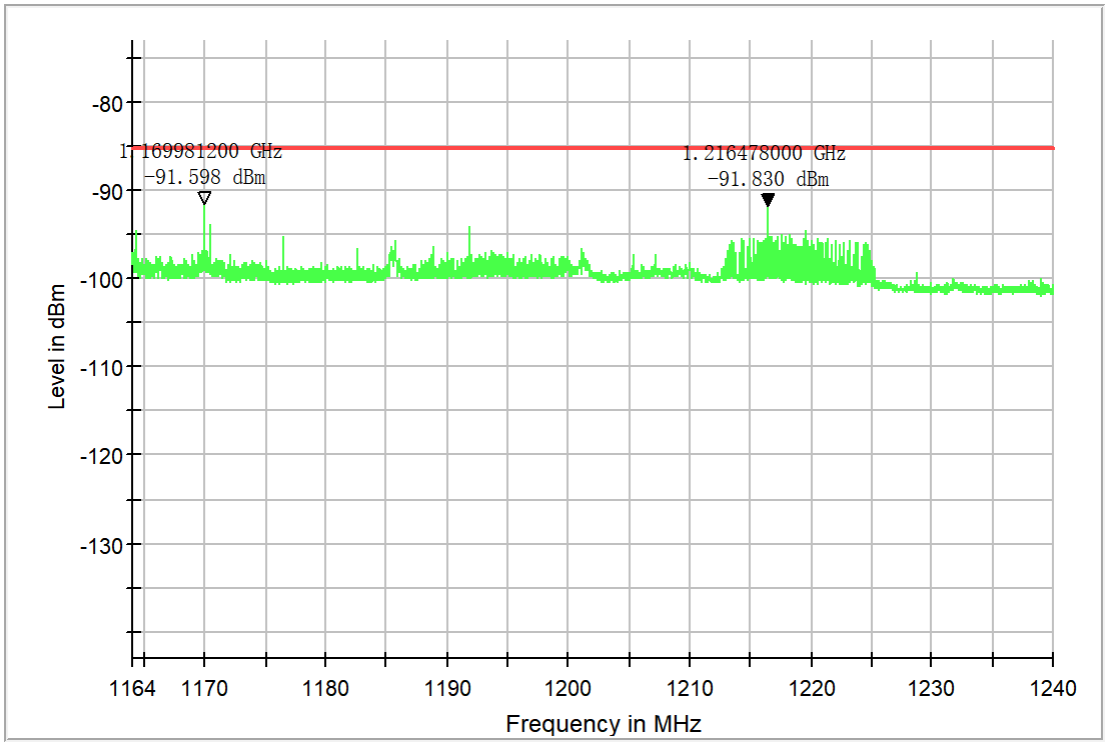
Plots No. 19: Radiated Emission, 26.5 GHz to 40 GHz, Horizontal Polarization



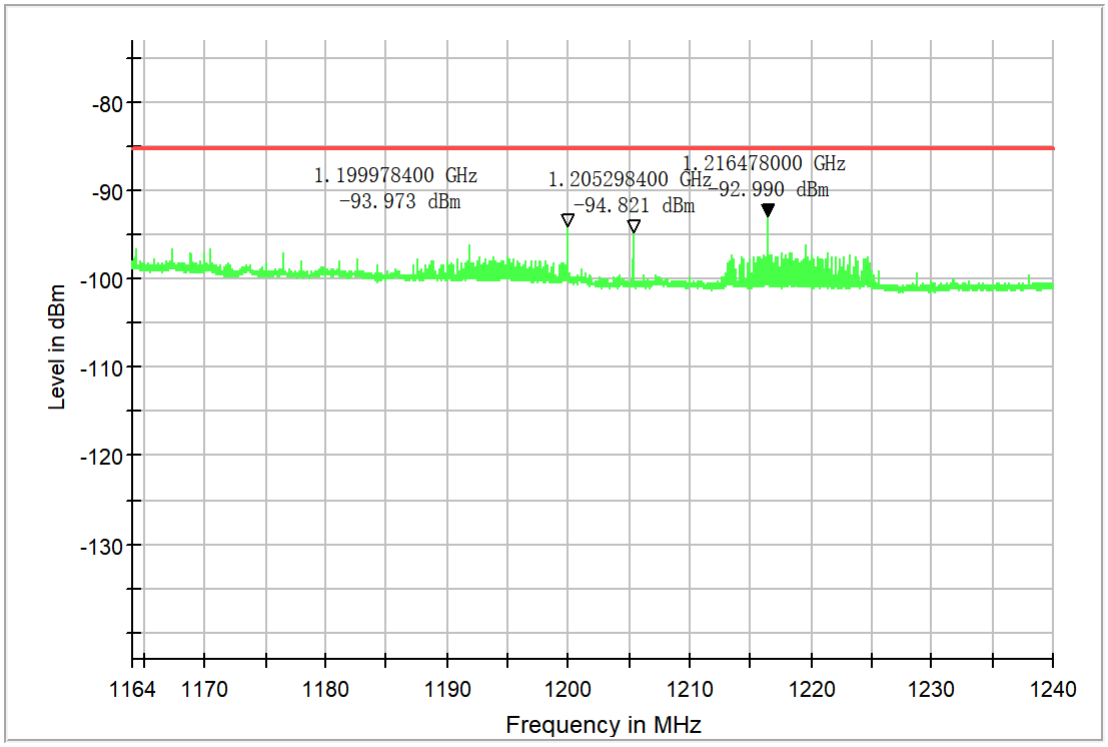
Plots No. 20: Radiated Emission, 26.5 GHz to 40 GHz, Vertical Polarization



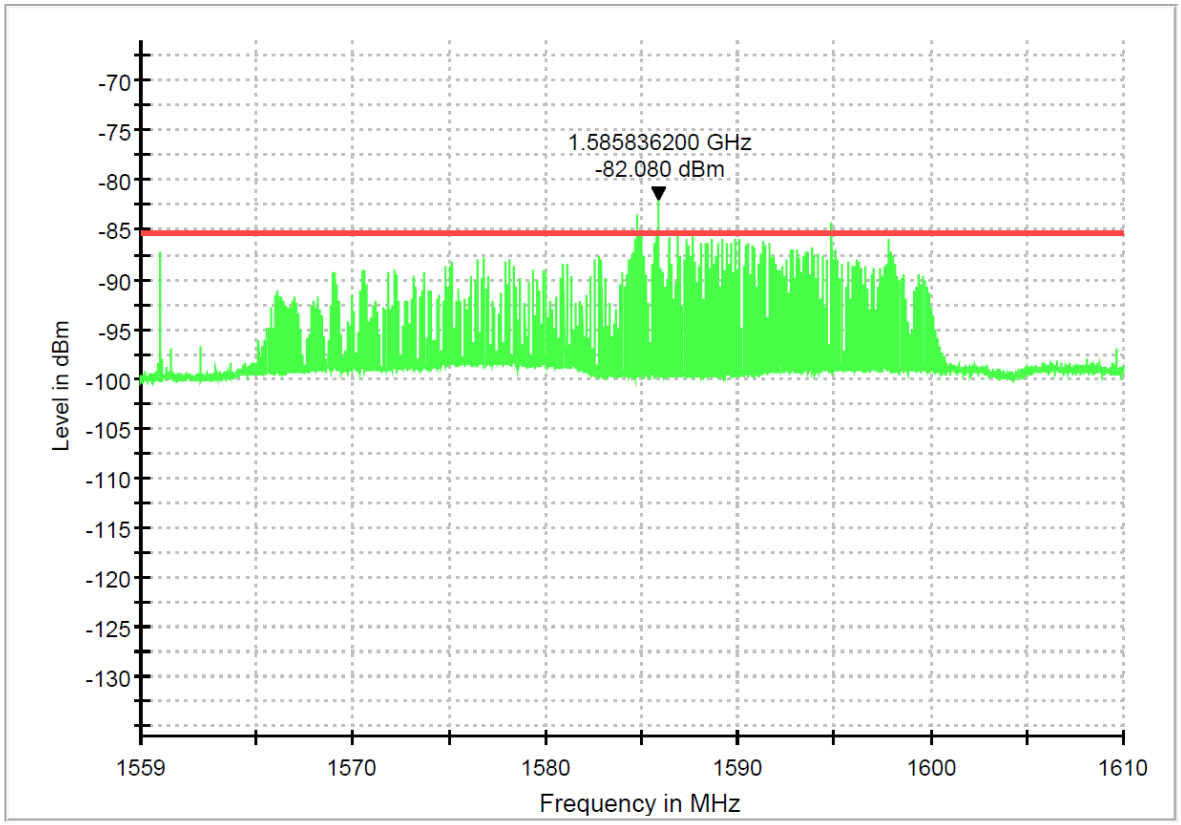
Plots No. 21: Radiated Emission, 1164 MHz to 1240 MHz, Horizontal Polarization



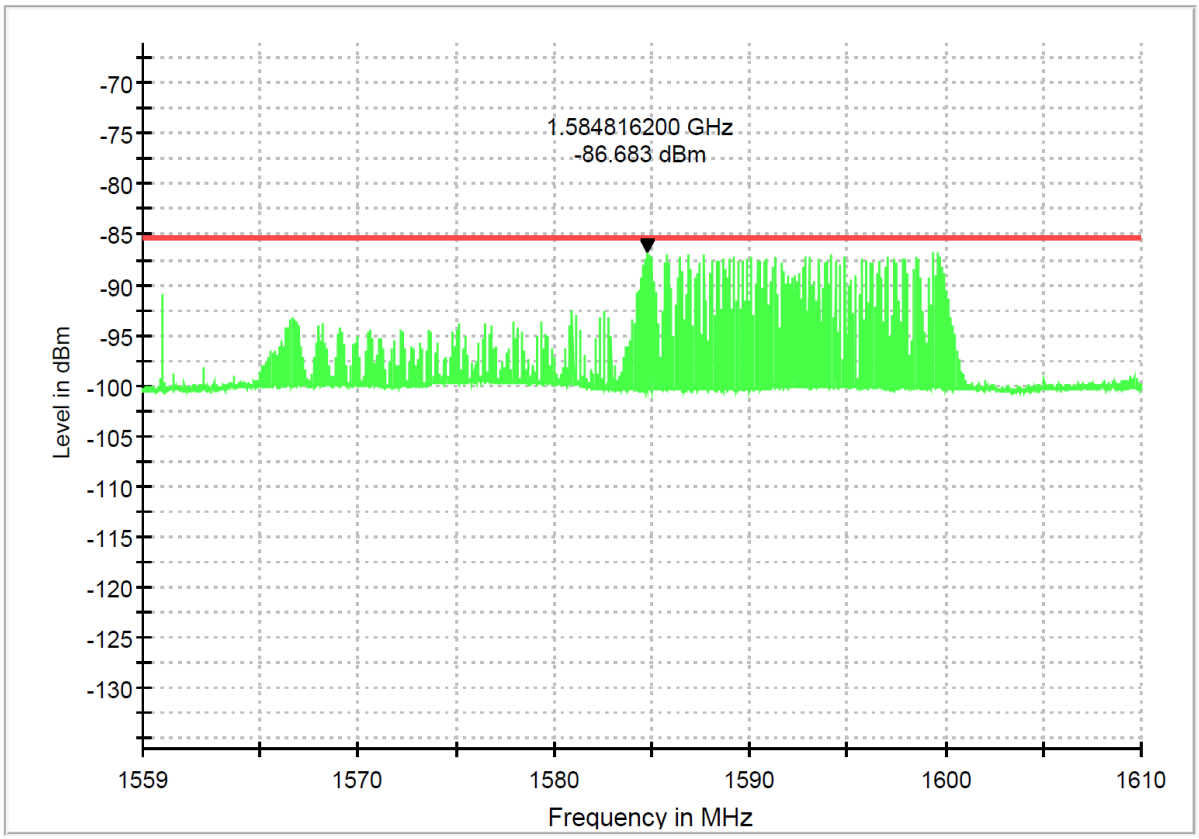
Plots No. 22: Radiated Emission, 1164 MHz to 1240 MHz, Vertical Polarization



Plots No. 23: Radiated Emission, 1559 MHz to 1610 MHz, Horizontal Polarization with UWB Open

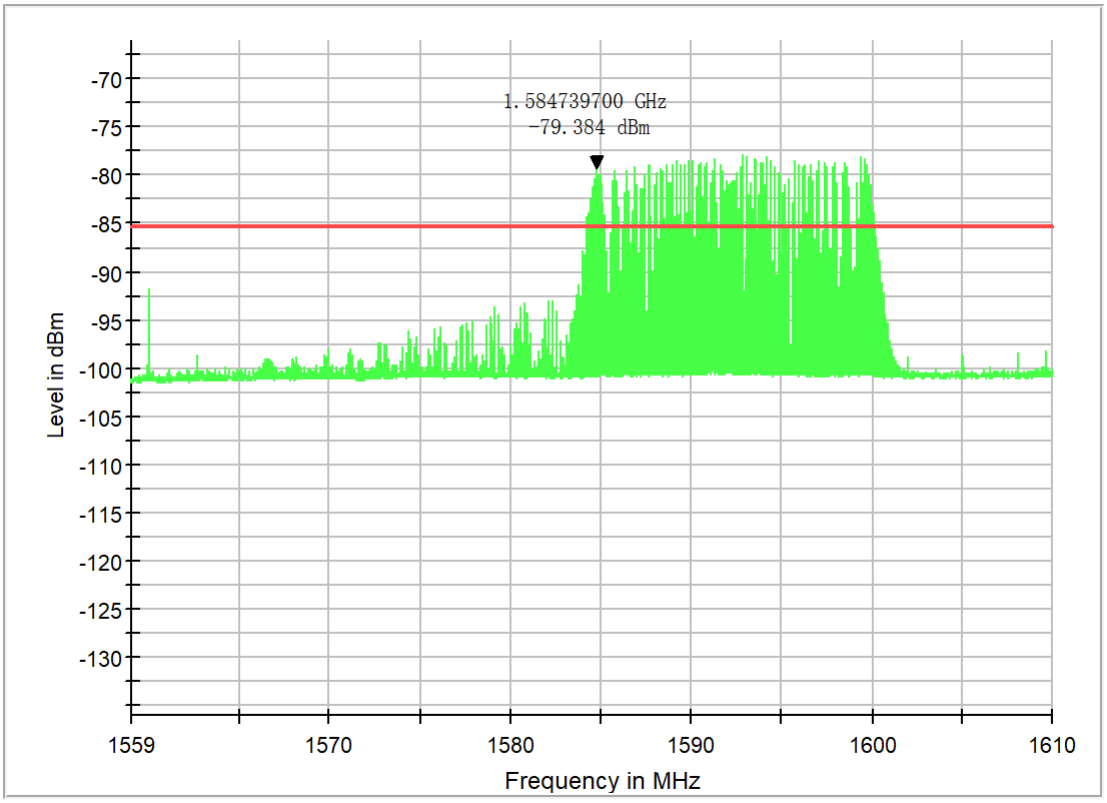


Plots No. 24: Radiated Emission, 1559 MHz to 1610 MHz, Horizontal Polarization with UWB Close

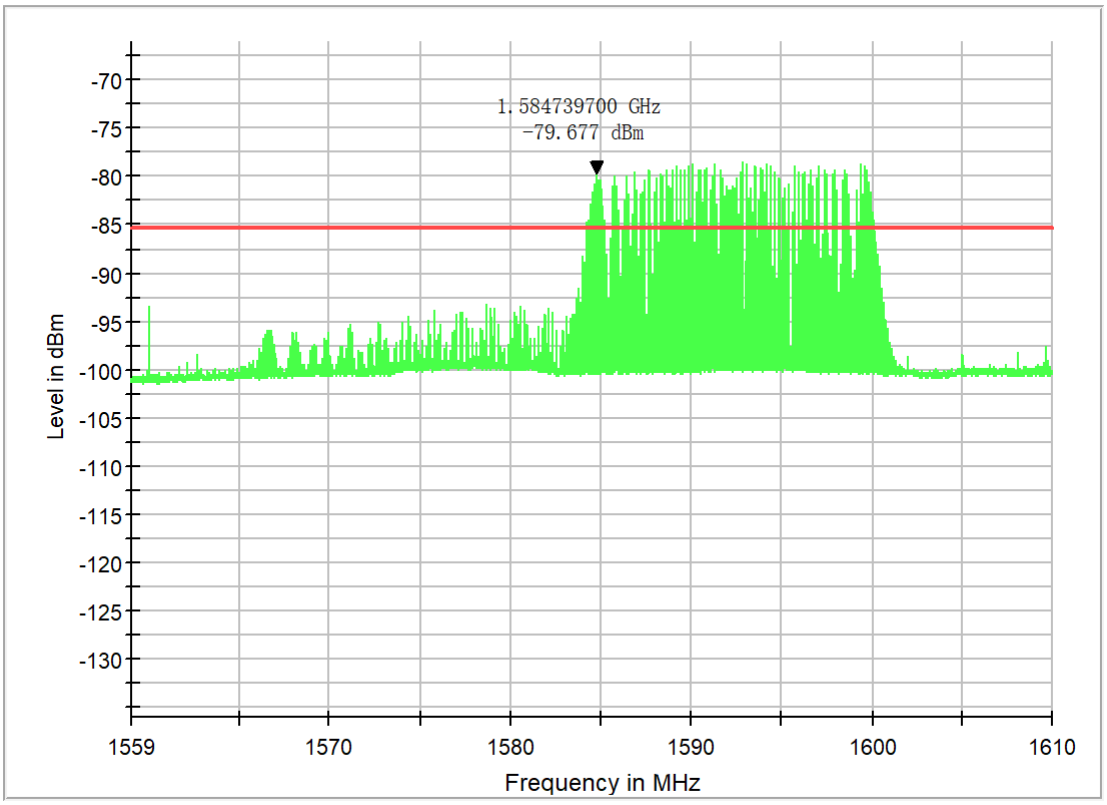


The digital circuitry emisison limit is 54dBuV/m, Calculating EIRP = -41.15dBm, refer to Plots No. 13 meet FCC part 15.209 digital circuitry emisison limit.

Plots No. 25: Radiated Emission, 1559 MHz to 1610 MHz, Vertical Polarization with UWB Open



Plots No. 26: Radiated Emission, 1559 MHz to 1610 MHz, Vertical Polarization with UWB Close



The digital circuitry emisison limit is 54dBuV/m, Calculating EIRP = -41.15dBm, refer to Plots No. 13 meet FCC part 15.209 digital circuitry emisison limit.

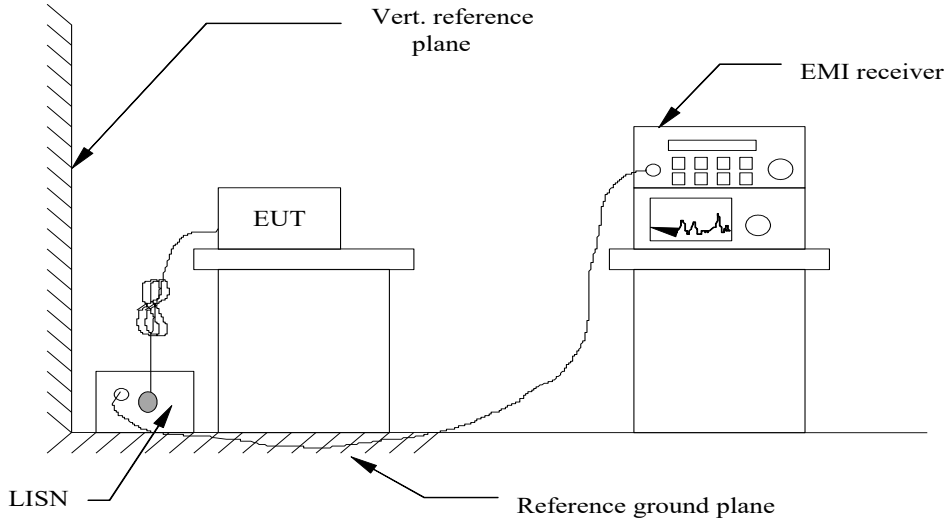
4.5. AC Conducted Emission [§15.209]

4.5.1. LIMITS OF DISTURBANCE

According to RSS Gen 8.8 and § 15.207(a) Line Conducted Emission Limits is as following:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

4.5.2. TEST CONFIGURATION



4.5.3. TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2. Support equipment, if needed, was placed as per ANSI C63.10-2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4. The EUT received DC 12V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipment received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50-ohm load; the second scan had Line 1 connected to a 50-ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

4.5.4. DISTURBANCE CALCULATION

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

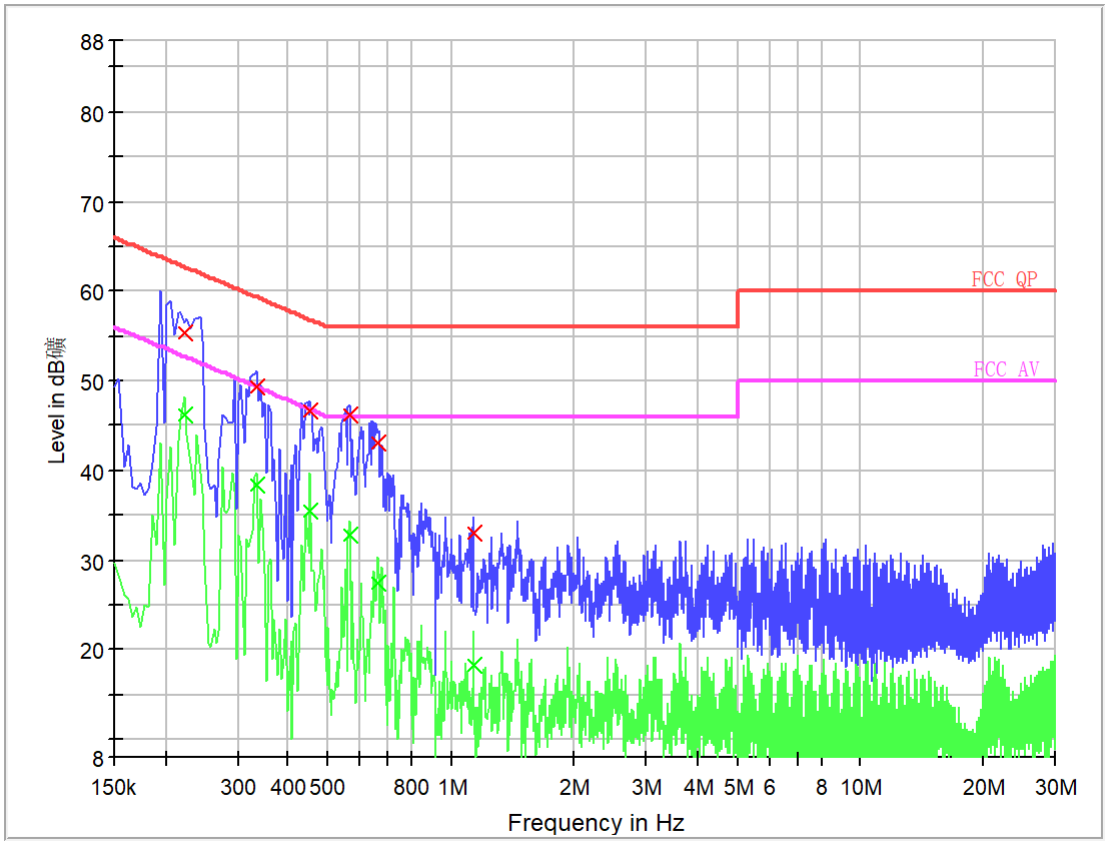
CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

4.5.5. TEST RESULTS

Note 1: Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/50Hz, recorded worst case at AC 120V/60Hz.

N



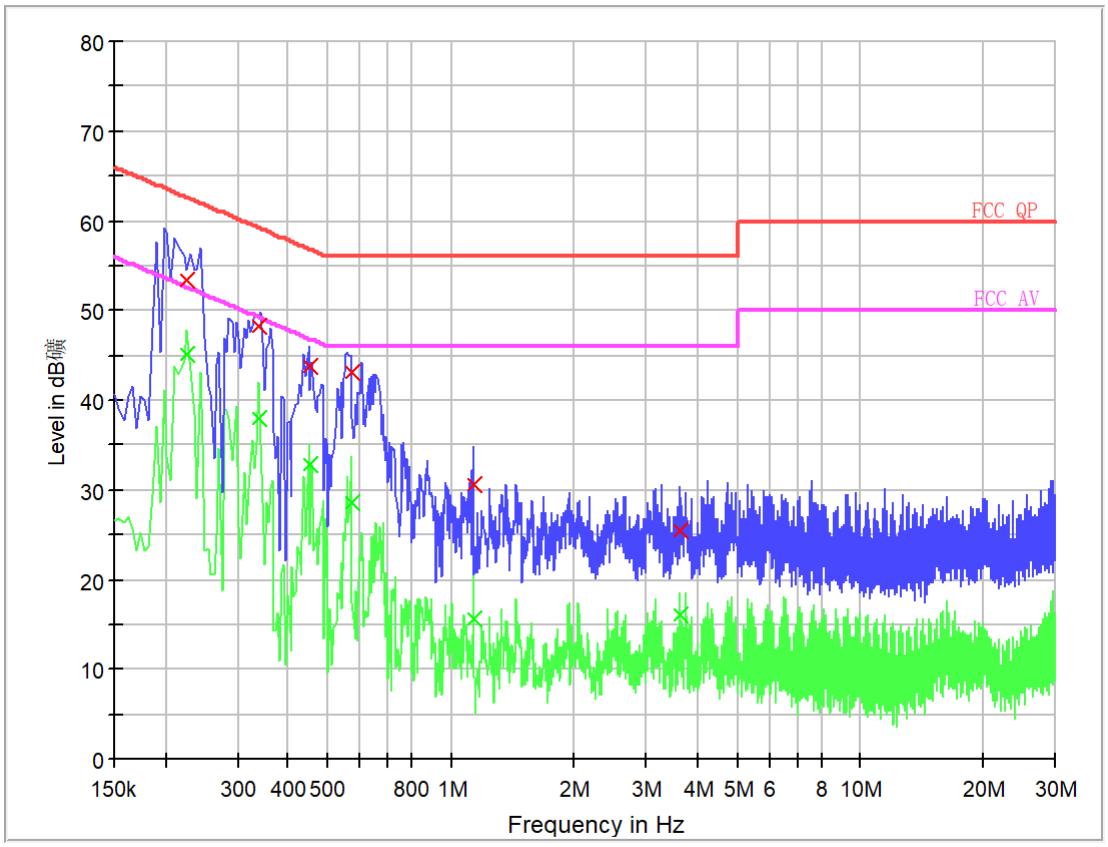
Limit and Margin

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.222	55.4	46.3	---	1000.0	9.000	N	OFF	9.7
0.334	49.4	38.5	---	1000.0	9.000	N	OFF	9.7
0.454	46.7	35.6	---	1000.0	9.000	N	OFF	9.7
0.566	46.2	32.8	---	1000.0	9.000	N	OFF	9.8
0.662	43.1	27.4	---	1000.0	9.000	N	OFF	9.8
1.134	33.1	18.3	---	1000.0	9.000	N	OFF	9.8

(continuation of the "Limit and Margin" table from column 14 ...)

Frequency (MHz)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - AVG (dB)	Limit - AVG (dBµV)	Comment
0.222	7.3	62.7	6.5	52.7	
0.334	10.0	59.4	10.9	49.4	
0.454	10.1	56.8	11.2	46.8	
0.566	9.8	56.0	13.2	46.0	
0.662	12.9	56.0	18.6	46.0	
1.134	22.9	56.0	27.7	46.0	
0.222	7.3	62.7	6.5	52.7	

L



Limit and Margin

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.226	53.5	45.1	---	1000.0	9.000	N	OFF	9.7
0.338	48.2	38.0	---	1000.0	9.000	N	OFF	9.7
0.450	43.9	32.9	---	1000.0	9.000	N	OFF	9.7
0.570	43.2	28.7	---	1000.0	9.000	N	OFF	9.8
1.138	30.6	15.7	---	1000.0	9.000	N	OFF	9.8
3.634	25.4	16.1	---	1000.0	9.000	N	OFF	10.1

(continuation of the "Limit and Margin" table from column 14 ...)

Frequency (MHz)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - AVG (dB)	Limit - AVG (dBµV)	Comment
0.226	9.1	62.6	7.5	52.6	
0.338	11.1	59.3	11.3	49.3	
0.450	13.0	56.9	14.0	46.9	
0.570	12.8	56.0	17.3	46.0	
1.138	25.4	56.0	30.3	46.0	
3.634	30.6	56.0	29.9	46.0	

4.6. Antenna Requirement [§15.203]

4.6.1. REQUIREMENT

According to § 15.203 and RSS-Gen: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited
According to § 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.
According to § 15.521(b): Manufacturers and users are reminded of the provisions of §§ 15.203 and 15.204.

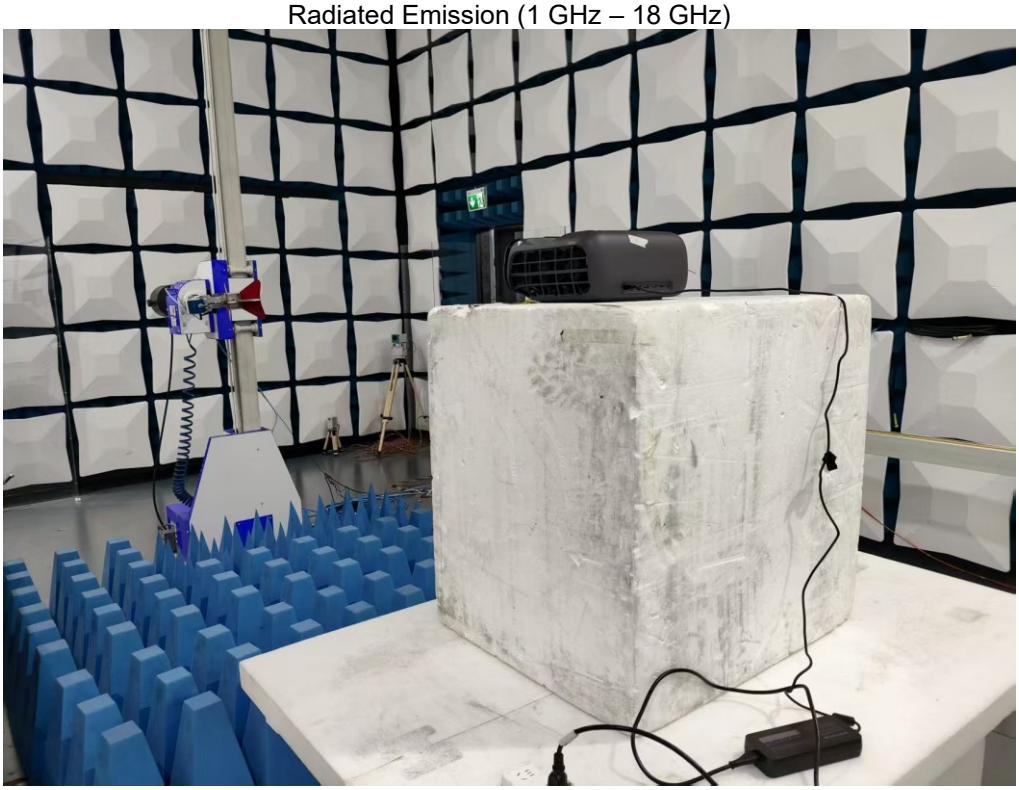
4.6.2. VERDICT

The EUT has an Intergrated antenna which is not user accessible. Hence it compliances with the antenna requirements.

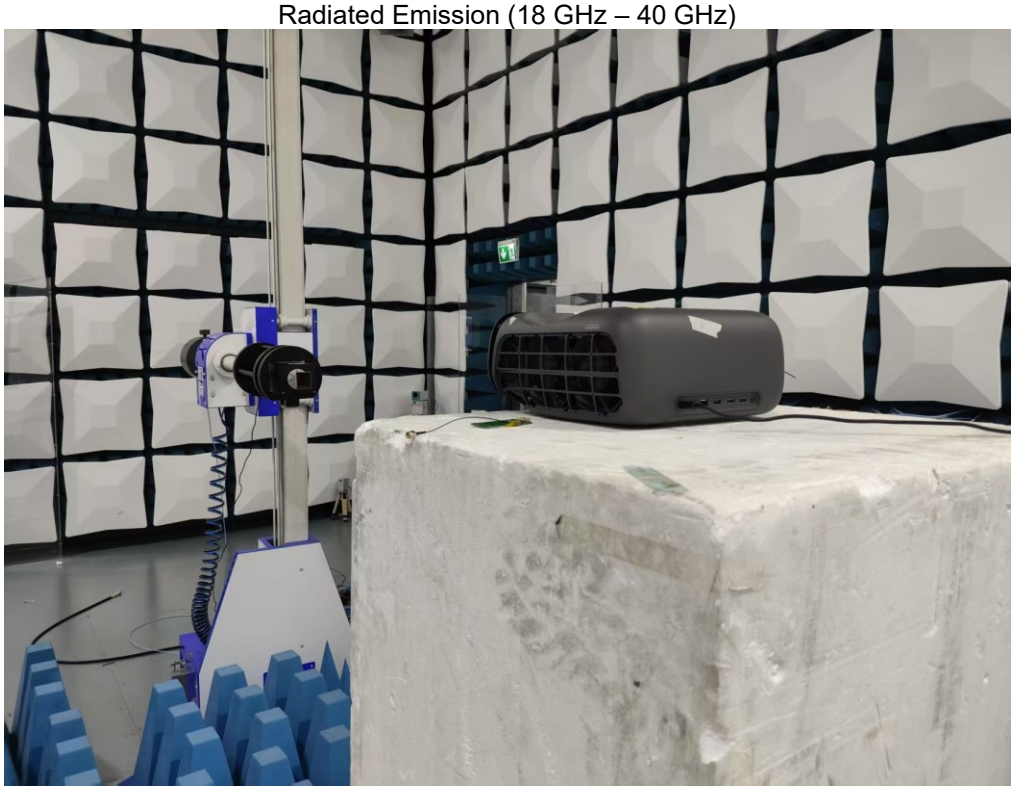
5. Test Set-up Photos of the EUT

Radiated Emission (30 MHz – 1 GHz)

Radiated Emission (1 GHz – 18 GHz)



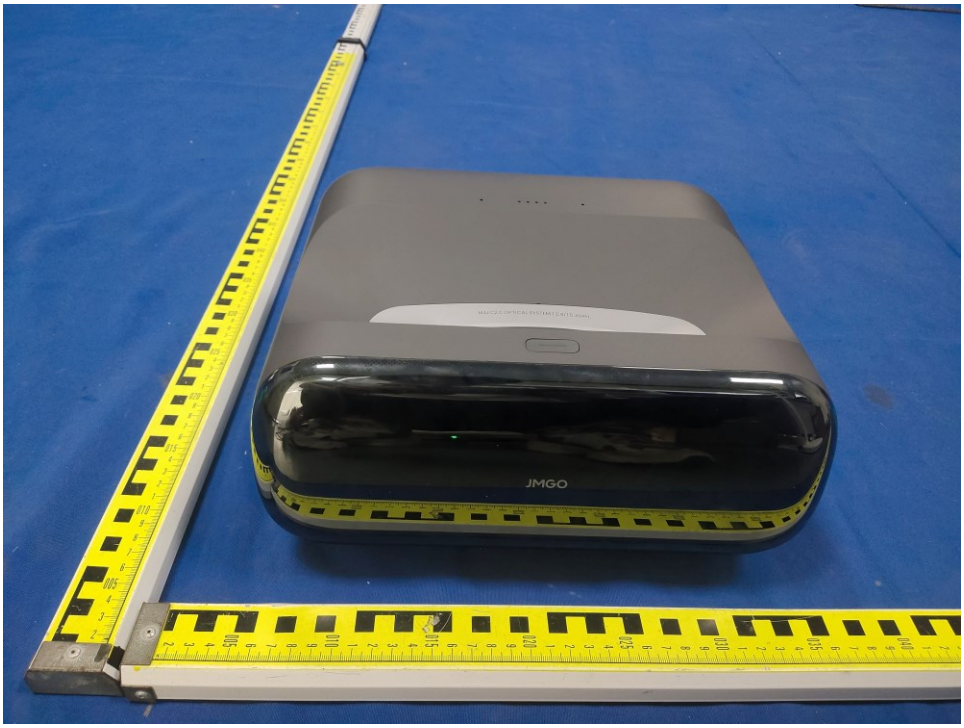
Radiated Emission (18 GHz – 40 GHz)

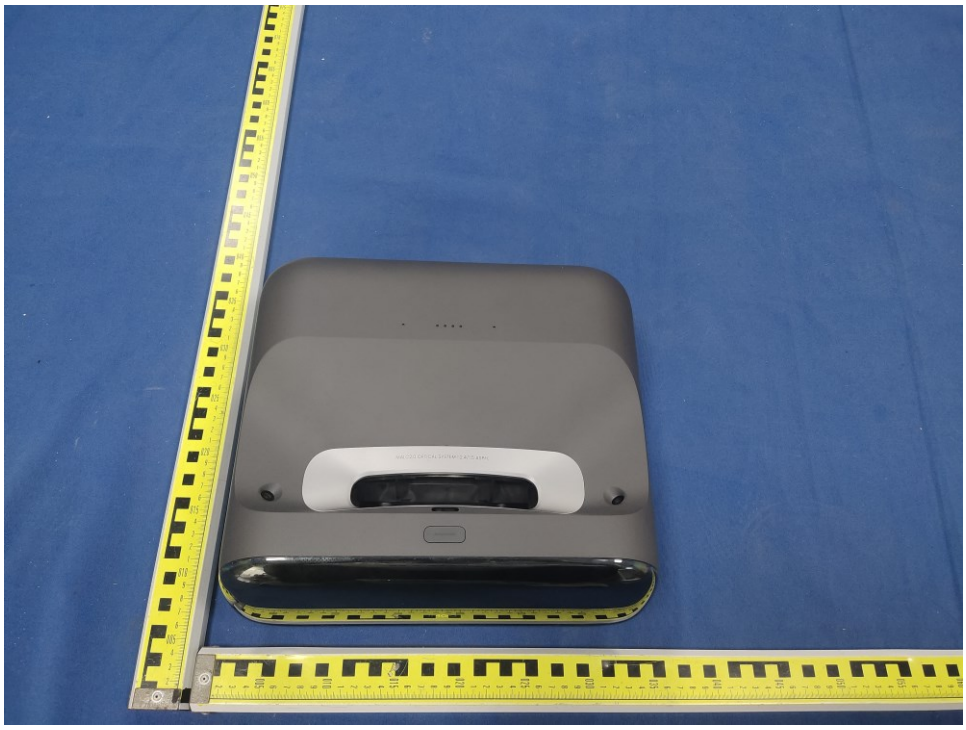


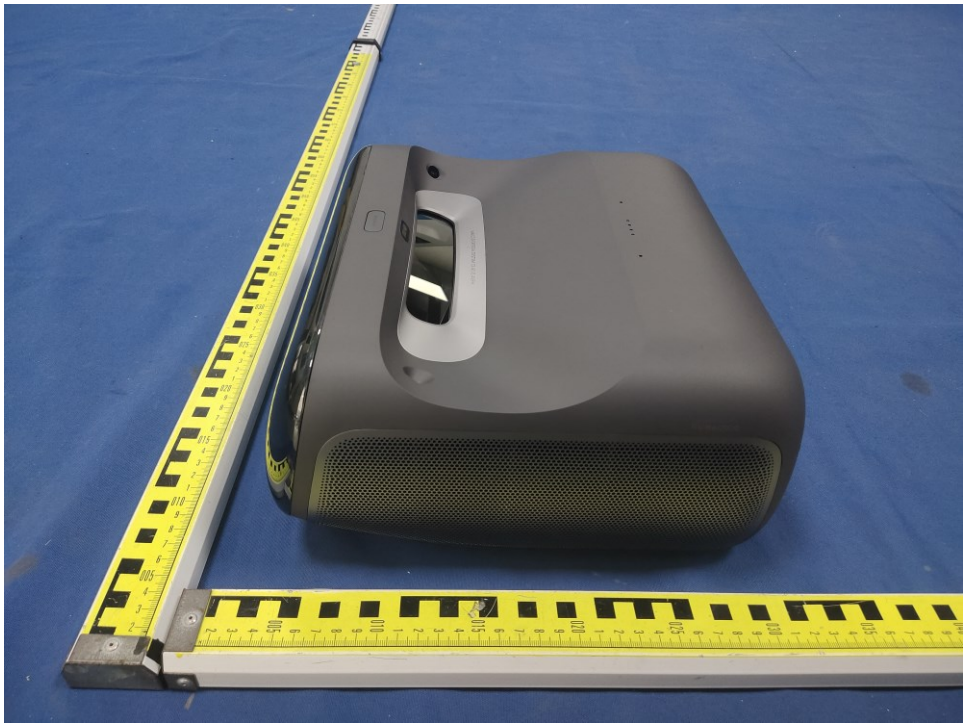
AC Mains Conducted Emission

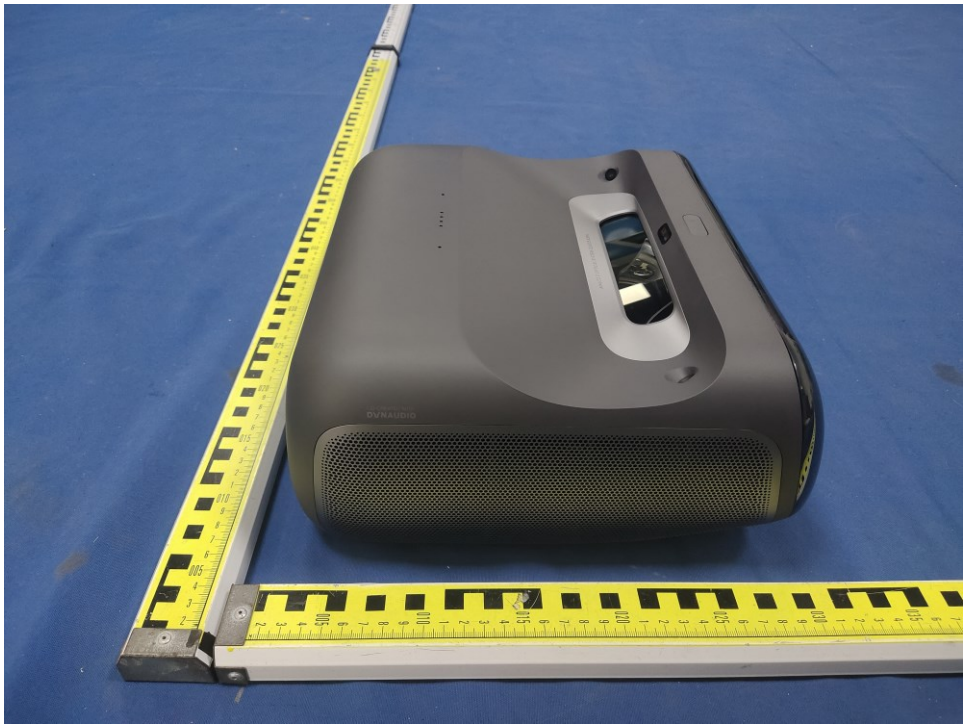
6. External and Internal Photos of the EUT

External Photos



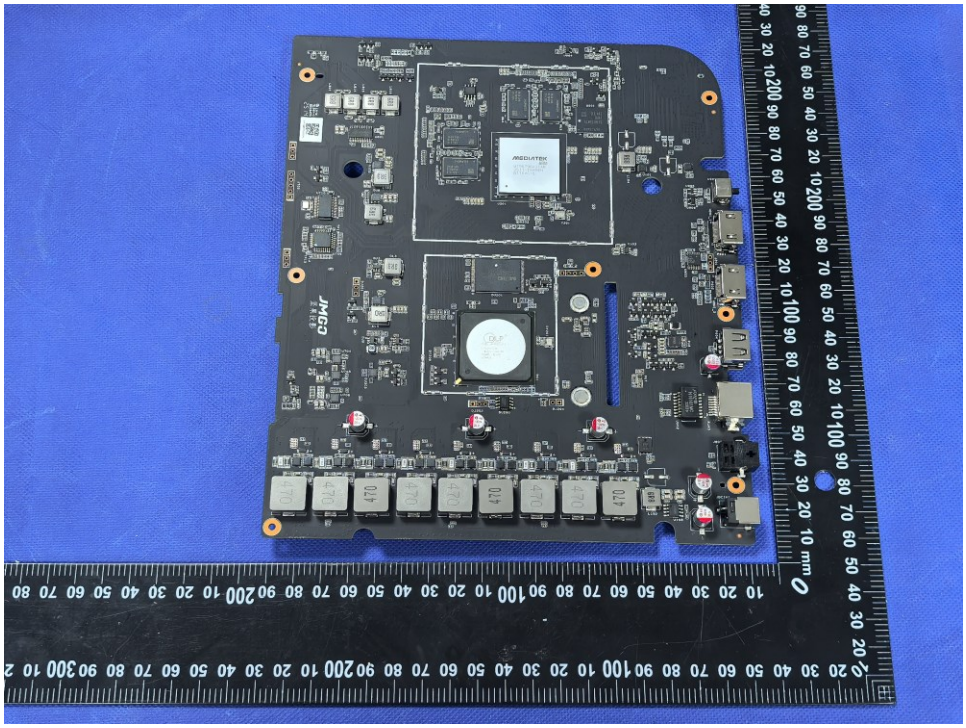


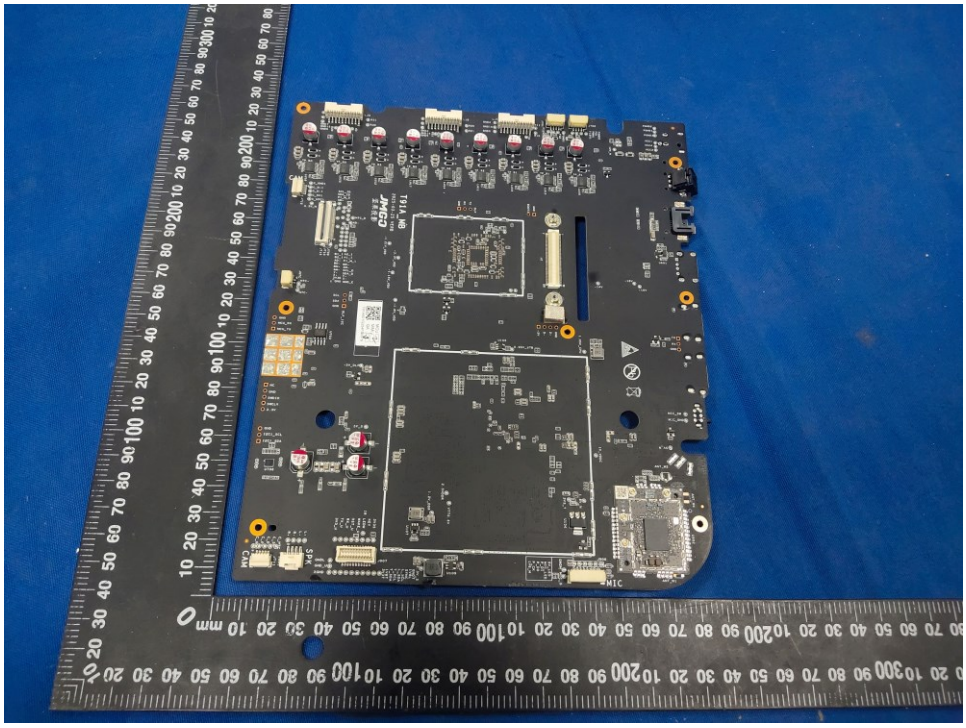


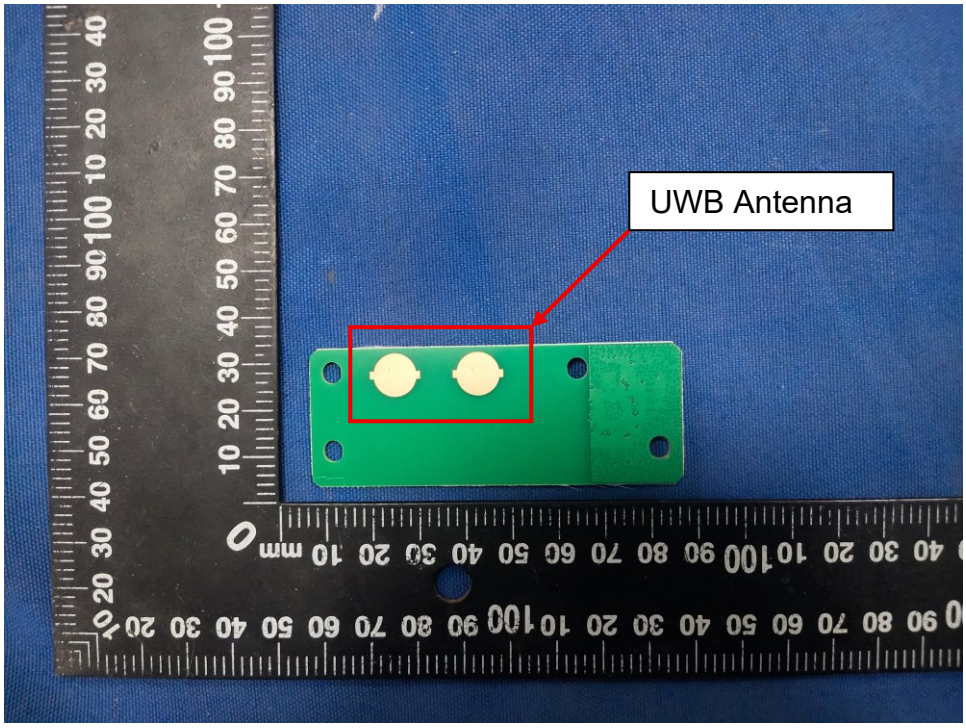


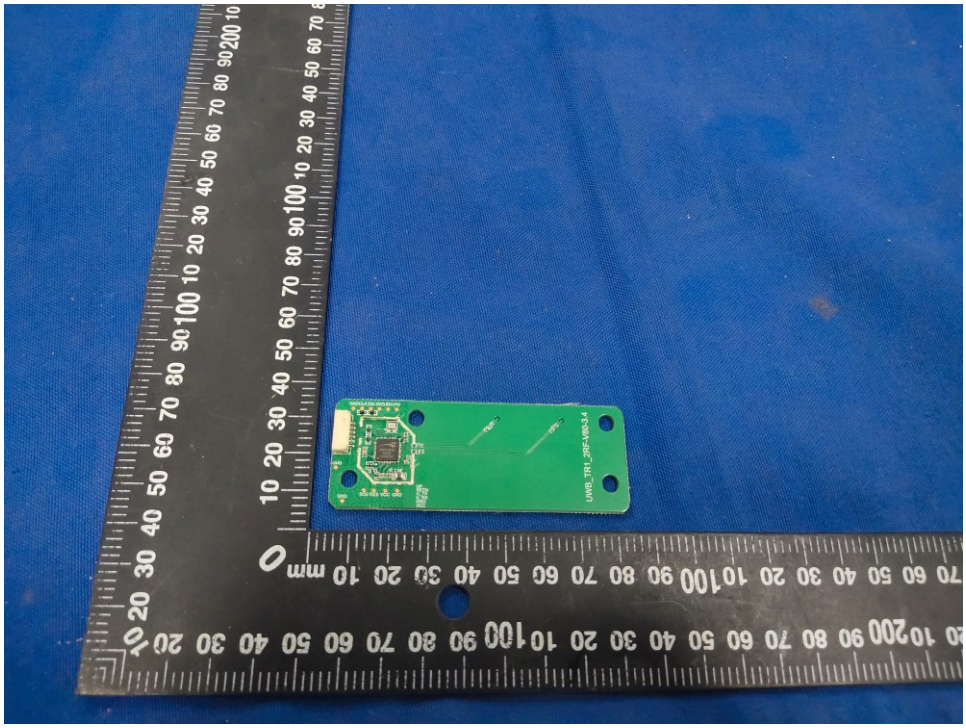

O2S Ultra 4K

Internal Photos






UWB Antenna



Revision History

Revision	Issue Date	Revisions	Revised By
1.0	2025-07-03	Orignal Issue	Wenliang Li

********** End of Report **********

DECLARATION

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.
If you have any questions on this report, please contact us within 15 days after issue this report.

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