

TEST REPORT

of

FCC Part 15 Subpart F §15.503, §15.519 and §15.521
IC RSS-220 Issue 1 and RSS-Gen Issue 5

FCC ID: TQ8-FOB-4FC1U44
IC Certification: 5074A-FOB4FC1U44

Equipment Under Test : FOB Smart Key
Model Name : FOB-4FC1U44
Variant Model Name(s) : FOB-4FC1U33, FOB-4FC1U22
FCC Applicant : HYUNDAI MOBIS CO., LTD.
IC Applicant : Hyundai MOBIS Co., Ltd
Manufacturer : Hyundai Mobis Co., Ltd.
Date of Receipt : 2026.05.19
Date of Test(s) : 2026.05.29 ~ 2026.06.17
Date of Issue : 2026.06.30

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

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 - 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
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Tested by:



Ethan Lim

Technical
Manager:



Jinhyoung Cho

SGS Korea Co., Ltd. Gunpo Laboratory

INDEX

<u>Table of Contents</u>	Page
1. General Information -----	3
2. Maximum Peak Power and Radiated Emissions -----	8
3. 10 dB Bandwidth -----	26
4. 99 % Bandwidth -----	29
5. Cease Transmission Time -----	32
6. Antenna Requirement-----	34

1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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1.2. Details of Applicant

FCC Applicant : HYUNDAI MOBIS CO., LTD.

FCC Address : 203, Teheran-ro, Gangnam-gu, Seoul, South Korea, 135-977

IC Applicant : Hyundai MOBIS Co., Ltd

IC Address : 203, Teheran-ro, Gangnam-gu, Seoul, Korea (Republic Of), 135-977

Contact Person : Choe, Seung-hoon

Phone No. : +82 31 260 0098

1.3. Details of Manufacturer

Company : Hyundai Mobis Co., Ltd.

Address : 203, Teheran-ro, Gangnam-gu, Seoul, Republic of Korea

1.4. Description of EUT

Kind of Product	FOB Smart Key
Model Name	FOB-4FC1U44
Variant Model Names	FOB-4FC1U33, FOB-4FC1U22
Serial Number	Conducted: 003 Radiated: 004
Power Supply	DC 3.0 V
Frequency Range	Tx: 7 987.2 MHz, Rx: 7 987.2 MHz
Modulation Type	BPM-BPSK
Number of Channel	1
Antenna Type	PCB Pattern Antenna
Antenna Gain*	-1.69 dBi
H/W Version	A.00
S/W Version	A.00
FVIN	N/A

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMA100B	106887	10/20/2025	Annual	10/20/2026
Spectrum Analyzer	R&S	FSV30	100768	02/20/2026	Annual	02/20/2027
Spectrum Analyzer	R&S	FSW67	1003242	01/26/2026	Annual	01/26/2027
Attenuator	AEROFLEX / INMET	40AH2W-6	1	03/09/2026	Annual	03/09/2027
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	10/01/2025	Biennial	10/01/2027
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB 9163	01126	03/09/2026	Biennial	03/09/2028
Horn Antenna	R&S	HF906	100326	03/03/2026	Annual	03/03/2027
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	9170-540	12/05/2025	Annual	12/05/2026
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/38330 516/L	N.C.R.	N/A	N.C.R.
Antenna Mast	Innco systems GmbH	MA4640-XP-ET	MA4640/536/38330 516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	SENSORVIEW	NMST-13A26-NMST-5 m	TPC2402190004	04/17/2026	Semi-Annual	10/17/2026
Coaxial Cable	SENSORVIEW	NMST-13A26-NMST-10 m	TPC2402190001	04/17/2026	Semi-Annual	10/17/2026
EMI Test Receiver	R&S	ESU26	100109	01/21/2026	Annual	01/21/2027
Spectrum Analyzer	Agilent	N9020A	MY53421758	09/10/2025	Annual	09/10/2026
SIGNAL CONDITIONING UNIT ¹⁾	R&S	SCU18F	101058	06/02/2026	Annual	06/02/2027
Preamplifier	H.P.	8447F	2944A03909	03/31/2026	Annual	03/31/2027
Preamplifier	TESTEK	TK-PA1840H	130016	03/06/2026	Annual	03/06/2027

Note;

1) The equipment was not used for testing during the period from 05/29/2026 to 06/04/2026.

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part15 subpart F, IC RSS-220 Issue 1 and RSS-Gen Issue 5			
Section in FCC	Section in IC	Test Item(s)	Result
15.519(e) 15.519(c) 15.521(g)	RSS-220 Issue 1 5.3.1(d)(g)	Maximum Peak Power and Average Emissions	Pass
15.209(a) 15.505(b) 15.519(c) 15.519(d) 15.521(a) 15.521(c) 15.521(h)	RSS-220 Issue 1 3.4 5.3.1(d)(e)(f)	Radiated emissions	Pass
15.503(a) 15.519(b) 15.521(e)	RSS-220 Issue 1 2	10 dB Bandwidth	Pass
-	RSS-Gen Issue 5 6.7	99 % Bandwidth	Pass
15.519(a)(1)	RSS-220 Issue 1 5.3.1(b)	Cease Transmission Time	Pass
15.207	RSS-Gen Issue 5 8.8	AC Conducted Emissions	N/A ¹⁾

Note;

1) The AC power line test was not performed because the EUT use battery power for operation and which do not operate from the AC power lines.

1.7. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty	
Cease Transmission Time	0.39 ms	
Radiated Emission, 9 kHz to 30 MHz	H	3.60 dB
	V	3.60 dB
Radiated Emission, below 1 GHz	H	5.50 dB
	V	5.10 dB
Radiated Emission, above 1 GHz	H	3.50 dB
	V	3.40 dB

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicate a 95 % level of confidence.

1.8. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL007140	2026.06.30	Initial

1.9. Information of software for test

- Operating software of EUT has integrated test interface. No additional software was used.

1.10. Description of Variant Models

Model name		Description
Basic model	FOB-4FC1U44	- Basic model (8 buttons)
Variant models	FOB-4FC1U33	- Same as basic model, but the difference in the number of external buttons of the product (6 buttons)
	FOB-4FC1U22	- Same as basic model, but the difference in the number of external buttons of the product (4 buttons)

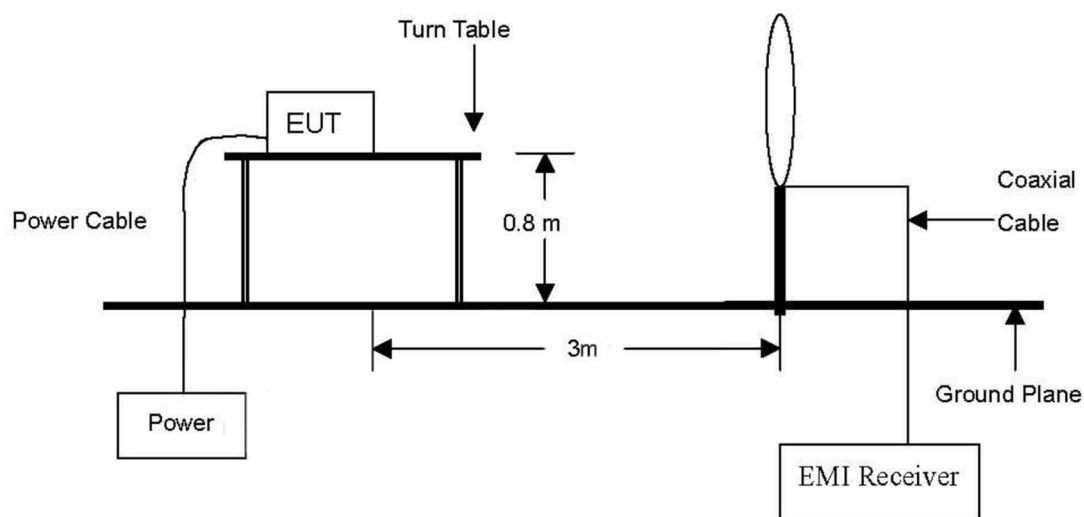
Note;

All the test items were performed with basic model.

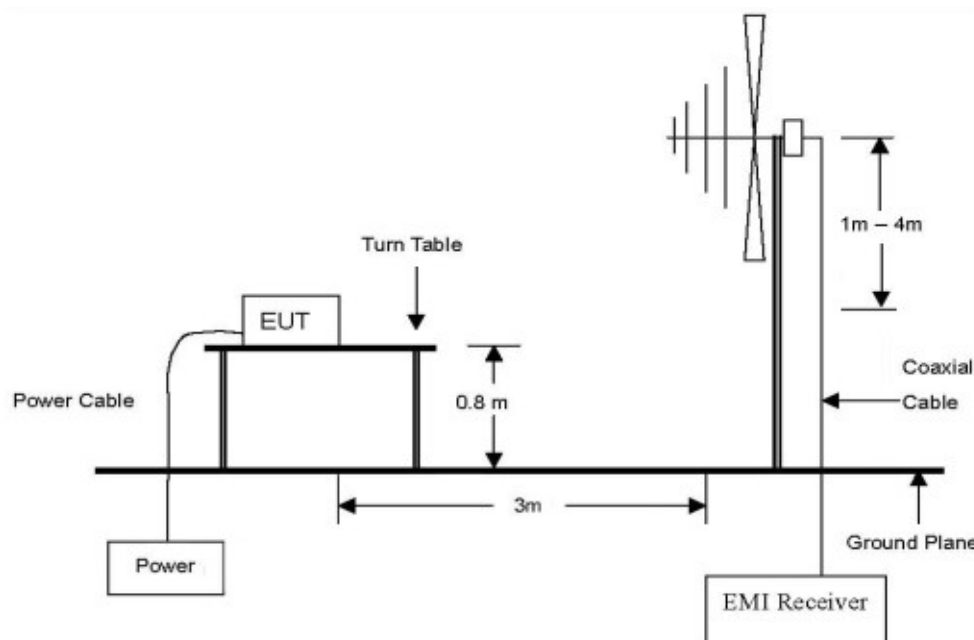
2. Maximum Peak Power and Radiated Emissions

2.1. Test Setup

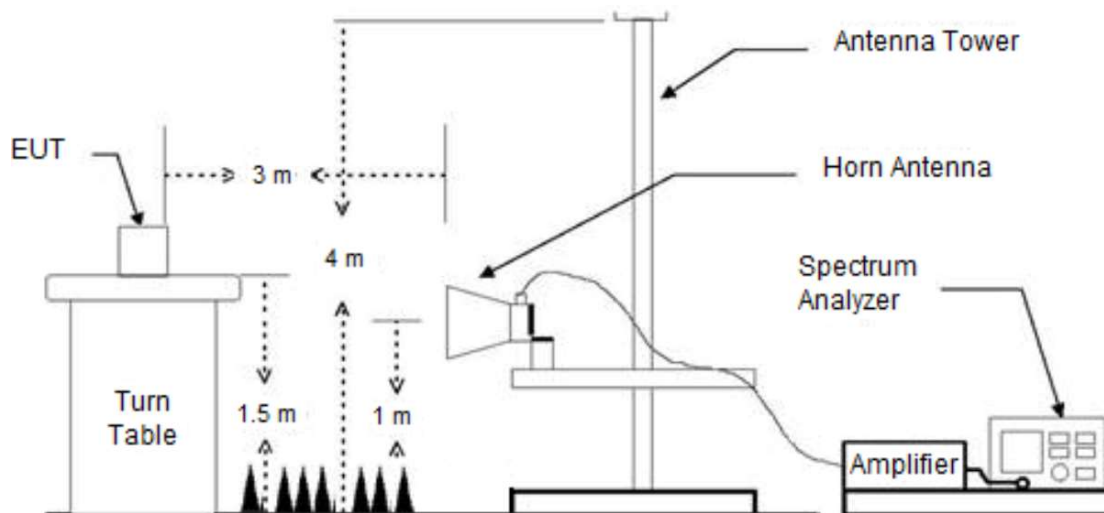
The diagram below shows the test setup that is utilized to make the measurements for emission below 30 MHz.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz.



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated from 1 GHz to the 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



2.2. Limit

2.2.1. FCC

2.2.1.1. Maximum Peak Power

According to §15.519(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 EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521(g).

2.2.1.2. Radiated Emissions at or below 960 MHz

According to §15.519(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(a).

According to §15.521(c), Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in § 15.209(a), 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.

According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009-0.490	2 400/F(kHz)	300
0.490-1.705	24 000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

2.2.1.3. Radiated Emissions above 960 MHz

According to §15.519(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 in MHz	EIRP in dB m
960-1 610	-75.3
1 610-1 990	-63.3
1 990-3 100	-61.3
3 100-10 600	-41.3
Above 10 600	-61.3

According to §15.519(d), in addition to the radiated emission limits specified in the table in paragraph I 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 dB m
1 164-1 240	-85.3
1 559-1 610	-85.3

According to §15.521(h), The highest frequency employed in § 15.33 to determine the frequency range over which radiated measurements are made shall be based on the center frequency, f_c , unless a higher frequency is generated within the UWB device. For measuring emission levels, the spectrum shall be investigated from the lowest frequency generated in the UWB transmitter, without going below 9 kHz, up to the frequency range shown in § 15.33(a) or up to $f_c + 3/(\text{pulse width in seconds})$, whichever is higher. There is no requirement to measure emissions beyond 40 GHz provided f_c is less than 10 GHz; beyond 100 GHz if f_c is at or above 10 GHz and below 30 GHz; or beyond 200 GHz if f_c is at or above 30 GHz.

2.2.2. IC

2.2.2.1. Maximum Peak Power

According to RSS-220 Issue 1 5.3.1(g), the peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

According to RSS-220 Issue 1 section 4 of the Annex, peak measurements shall be made in addition to average measurements. Transmissions shall not exceed 0 dBm e.i.r.p. in any 50 MHz bandwidth when the average limit is -41.3 dBm/MHz. This is the equivalent peak limit as calculated by combining the 6 dB peak-to-average conversion with a resolution bandwidth (RBW) scaling factor of $20 \log(1 \text{ MHz}/50 \text{ MHz})$. Only the 50 MHz bandwidth, centred on the frequency f_m where the highest power occurs, needs to be measured to satisfy the peak requirements for all frequencies. A different resolution bandwidth and a correspondingly different peak limit may also be used, in which case the RBW may be set anywhere between 1 MHz and 50 MHz. The peak e.i.r.p. limit is then calculated as $20 \log(\text{RBW}/50) \text{ dBm}$ where the RBW is in MHz. This may be converted to a peak field strength level at 3 metres using $E(\text{dB}\mu\text{V/m}) = P(\text{e.i.r.p.}(\text{dBm})) + 95.2$. If the RBW is greater than 3 MHz, the application for certification shall contain a detailed description of the test procedure, the calibration of the test set-up and the instrumentation used in the testing.

2.2.2.2. Radiated Emissions at or Below 960 MHz

According to RSS-220 Issue 1 3.4, radiated emissions at or below 960 MHz for all subclasses of UWB device shall not exceed the following limits. Measurements of radiated emissions at and below 960 MHz are to be made using a CISPR quasi-peak detector. CISPR measurement bandwidth specifications are to be used.

Frequency (MHz)	Field Strength (Microvolts/m)	Measurement Distance (Metres)	E.i.r.p. (dBmW)
0.009-0.490	2 400/F (F in kHz)	300	$10 \log(17.28 / F^2)$ (F in kHz)
0.490-1.705	24 000/F (F in kHz)	30	$10 \log(17.28 / F^2)$ (F in kHz)
1.705-30.0	30	30	-45.7
30-88	100	3	-55.2
88-216	150	3	-51.7
216-960	200	3	-49.2

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

2.2.2.3. Radiated Emissions Above 960 MHz

According to RSS-220 Issue 1 5.3.1(d), radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Hand-held (Outdoor) Communication, Measurement, Location Sensing, and Tracking Devices	
Frequency	EIRP in a Resolution Bandwidth of 1 MHz
960-1 610 MHz	-75.3 dB m
1.61-4.75 GHz	-70.0 dB m
4.75-10.6 GHz	-41.3 dB m
Above 10.6 GHz	-61.3 dB m

According to RSS-220 Issue 1 5.3.1(e), in addition to the limits specified in paragraph (d) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth greater than or equal to 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Frequency	EIRP in a Resolution Bandwidth of 1 kHz
1 164-1 240 MHz	-85.3 dB m
1 559-1 610 MHz	-85.3 dB m

2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10-2020 for FCC and ANSI C63.10-2020+Cor.1-2023+C63.10a-2024 + Errata to C63.10a-2024 for ISSED.

2.3.1. Test Procedures for emission below 30 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum Hold Mode.

2.3.2. Test Procedures for emission from 30 MHz to 1 000 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna is a bi-log antenna and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. For measurements below 1 GHz resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

2.3.3. Test Procedures for emission above 1 GHz

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a horn antenna and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

1. Peak power Measurement

- The Peak power measurement refer to section 10.3.5 and 10.3.6

The RBW = less than 50 MHz (but no less than 1 MHz), VBW is set to at least 1 MHz (3 MHz is recommended),

When this approach is employed, the peak emissions EIRP limit (0 dBm / 50 MHz) is converted to a limit commensurate with the RBW by employing a $[20 \log (RBW / 50 \text{ MHz})]$ relationship.

When a resolution bandwidth of less than 50 MHz is used, this measurement shall be performed over a 50 MHz span centered on the frequency associated with the highest detected average emission level.

2. Average Measurement

- The Average Measurement refer to section 10.3.7

Set the RBW to 1 MHz (1 kHz for emission in the GPS bands), VBW to be at least 1 MHz (3 kHz for emission in the GPS bands), Detector = RMS, Sweep time = no more than a 1 ms integration period over each measurement bin.

2.4. Test Result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 %

2.4.1. Maximum peak power and Average emission

All emissions tested both horizontal and vertical. The following table shows the highest levels of radiated emissions on the worst polarization.

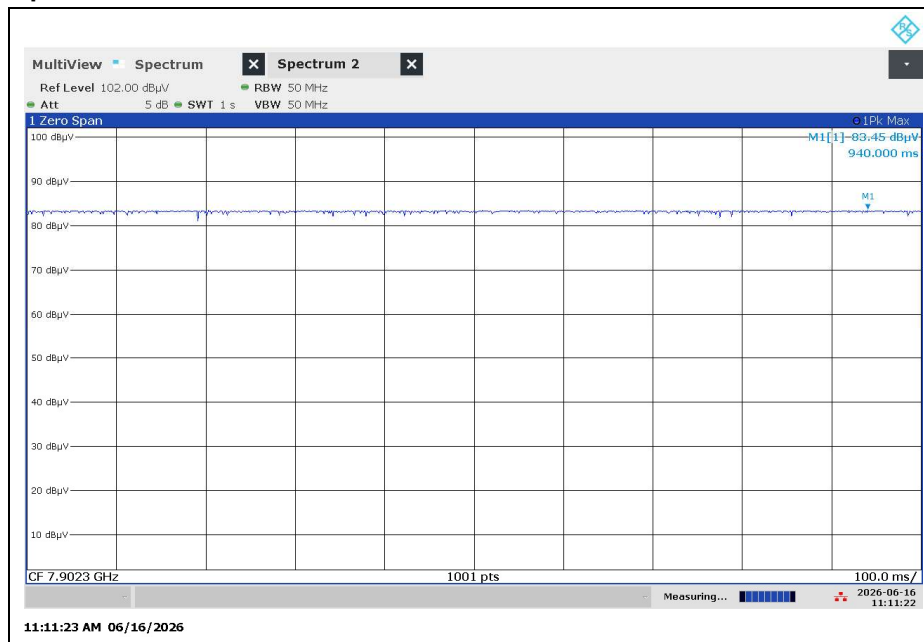
Frequency (MHz)	Reading (dB μ V)	Ant. Pol.	Detect Mode	AF (dB/m)	AMP+CL (dB)	E (dB μ V/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
7 902.30	83.45	H	Peak	36.00	-26.89	92.56	-104.80	-12.24	0	12.24
7 902.30	43.12	H	Average	36.00	-26.89	52.23	-104.80	-52.57	-41.3	11.27

Remark;

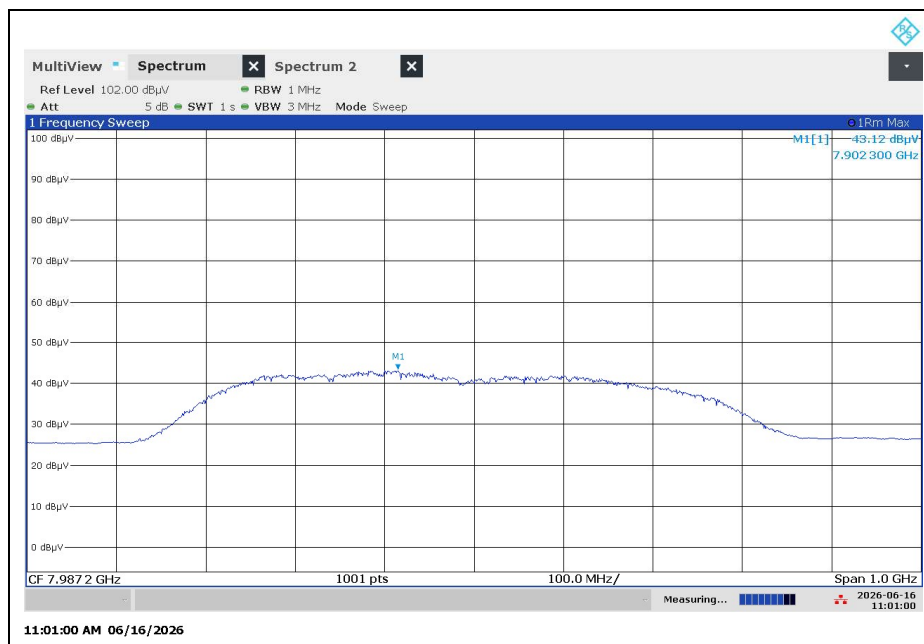
1. $E \text{ (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Amp (dB)} + \text{Cable Loss (dB)}$.
2. $\text{E.I.R.P. (dB m)} = E \text{ (dB}\mu\text{V/m)} + 20 \log D - 104.8$; where D is the measurement distance in meters.
3. $\text{CF (dB) (E.I.R.P.)} = 20 \log D - 104.8$;
4. All the emissions were measured at a 1 meter test distance.
5. AF = Antenna Factor, AMP = Amplifier, CL = Cable Loss.

- Test plots

Maximum Peak power



Average emission



2.4.2. Radiated Spurious Emission below 960 MHz

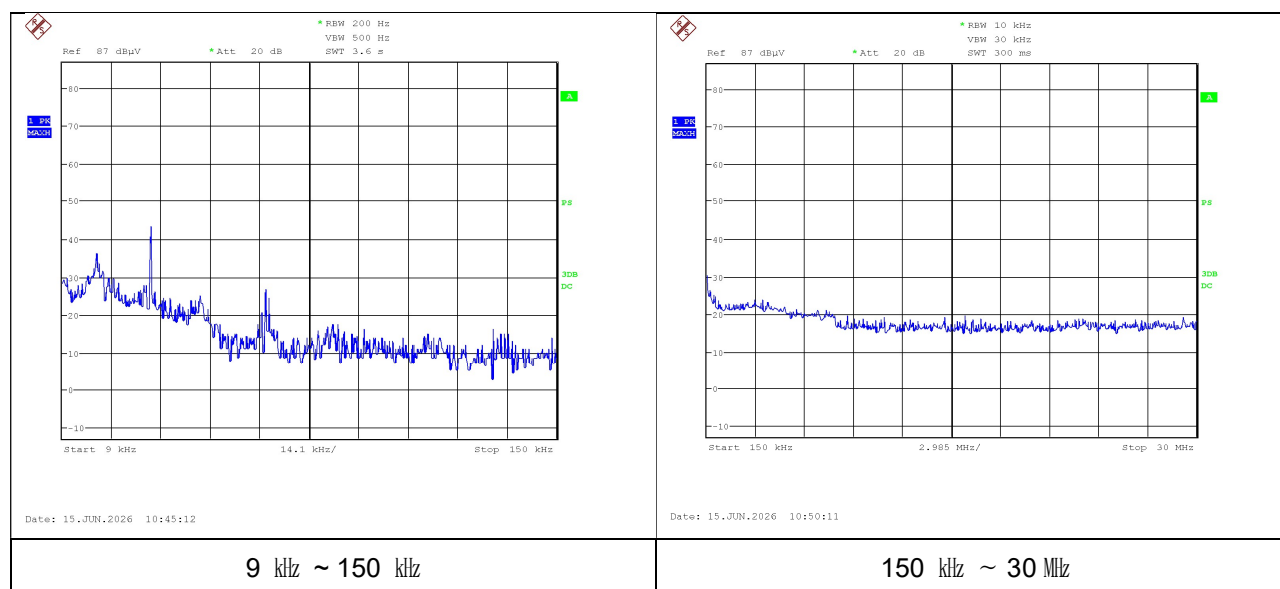
The frequency spectrum from 9 kHz to 960 MHz was investigated.

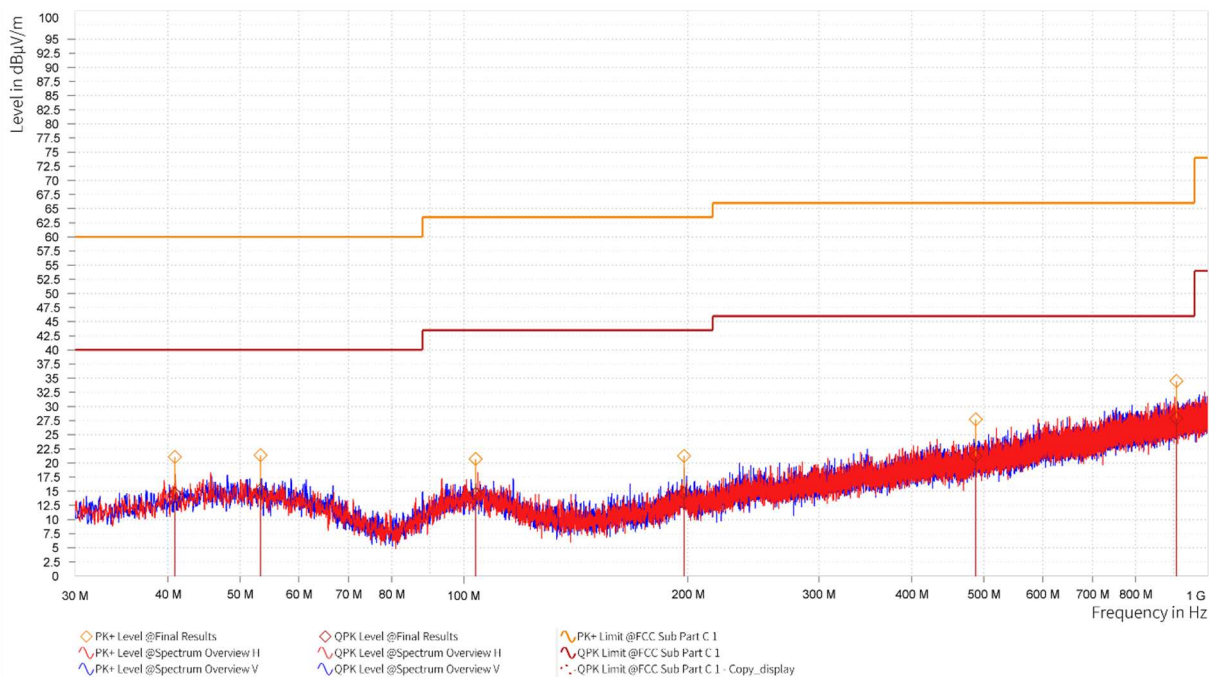
Radiated Emissions			Ant.	Correction Factors (dB/m)	Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.		Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
907.69	23.51	Quasi Peak	V	4.38	27.89	46.00	18.11

Remark;

1. Test from 30 MHz to 1 000 MHz was performed using the software of ELEKTRA(V5.02) from Rohde & Schwarz GmbH & Co. KG.
2. Radiated spurious emission measurement as below.
 (Actual = Reading + AF + AMP + CL)
 (Correction = Antenna Factor + AMP Factor + Cable loss)
3. According to §15.31(o), emission levels are not report much lower than the limits by over 20 dB.

- Test plots





30 MHz ~ 1 GHz

2.4.3. Radiated Spurious Emission above 960 MHz

All emissions tested both horizontal and vertical. The following table shows the highest levels of radiated emissions on the worst polarization.

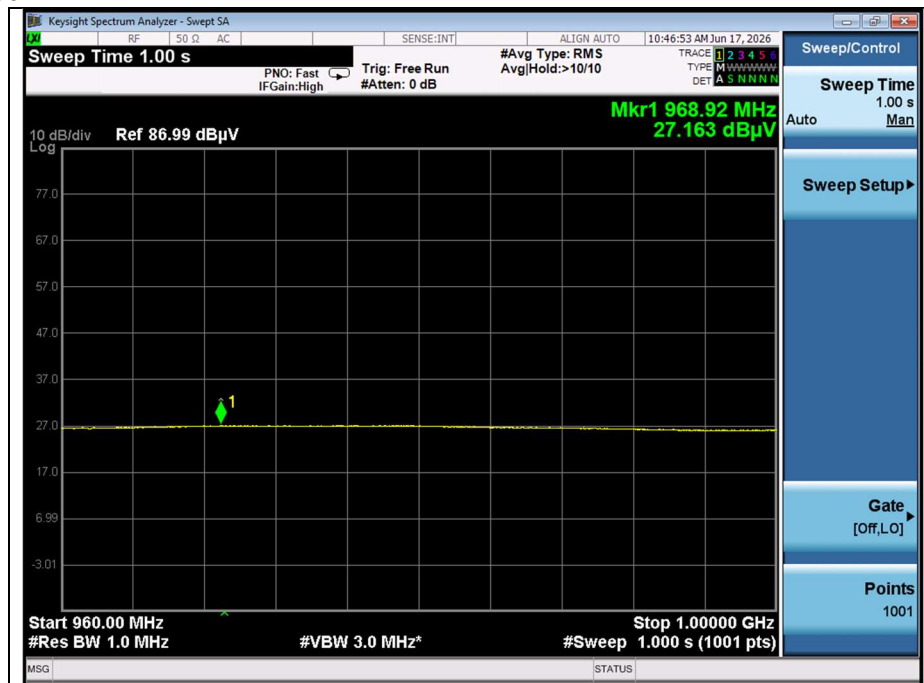
Frequency (MHz)	Reading (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)		Margin (dB)	
								FCC	IC	FCC	IC
968.92	27.16	H	28.20	-33.51	21.85	-110.82	-88.97	-75.30		13.67	
1 032.33	33.65	H	24.23	-37.77	20.11	-110.82	-90.71	-75.30		15.41	
*1 173.85	5.10	H	25.05	-37.39	-7.24	-110.82	-118.06	-85.30		32.76	
*1 584.26	4.10	H	25.34	-35.88	-6.44	-110.82	-117.26	-85.30		31.96	
1 736.92	32.22	H	26.80	-35.50	23.52	-110.82	-87.30	-63.30	-70.00	24.00	17.30
2 470.60	33.90	H	28.32	-34.16	28.06	-110.82	-82.76	-61.30	-70.00	21.46	12.76
3 199.00	29.34	H	30.50	-32.91	26.93	-110.82	-83.89	-41.30	-70.00	42.59	13.89
4 766.38	25.93	H	32.57	-29.65	28.85	-110.82	-81.97	-41.30		40.67	
16 679.84	23.09	H	41.66	-18.89	45.86	-110.82	-64.96	-61.30		3.66	
Above 16 700.00	Not detected	-	-	-	-	-	-	-		-	

Remark;

1. $E \text{ (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Amp (dB)} + \text{Cable Loss (dB)}$.
2. $E.I.R.P. \text{ (dB m)} = E \text{ (dB}\mu\text{V/m)} + 20 \log D - 104.8$; where D is the measurement distance in meters.
3. $CF \text{ (dB)} (E.I.R.P.) = 20 \log D - 104.8$
4. All the emissions above 960 MHz were measured at a 0.5 meter test distance.
5. “*” means the GPS band.
6. Measurement In frequency 1 162 MHz ~ 1 240 MHz and 1 559 MHz ~ 1 610 MHz, RBW is set to 1 kHz.
7. According to § 15.31(o), Emission levels are not reported much lower than the limits by over 20 dB.
8. AF = Antenna Factor, AMP = Amplifier, CL = Cable Loss.

- Test plots

960 MHz ~ 1 000 MHz



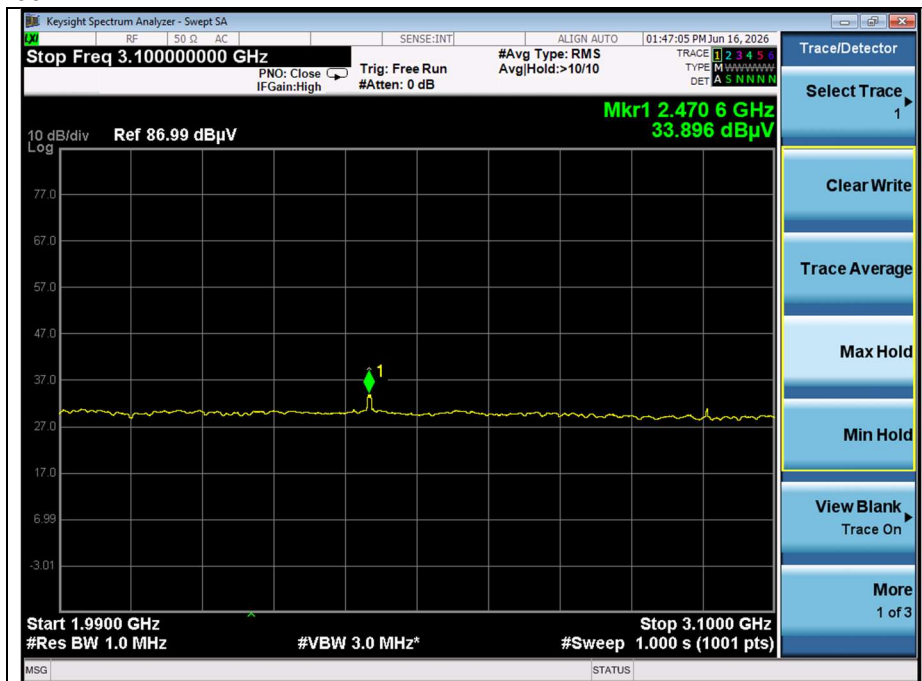
1 000 MHz ~ 1 610 MHz



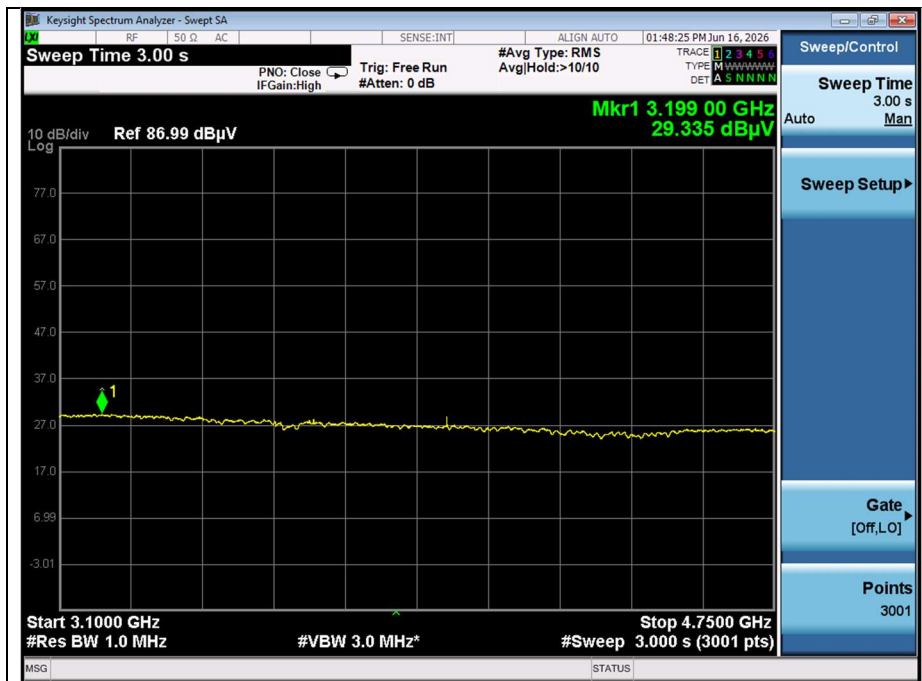
1 610 MHz ~ 1 990 MHz



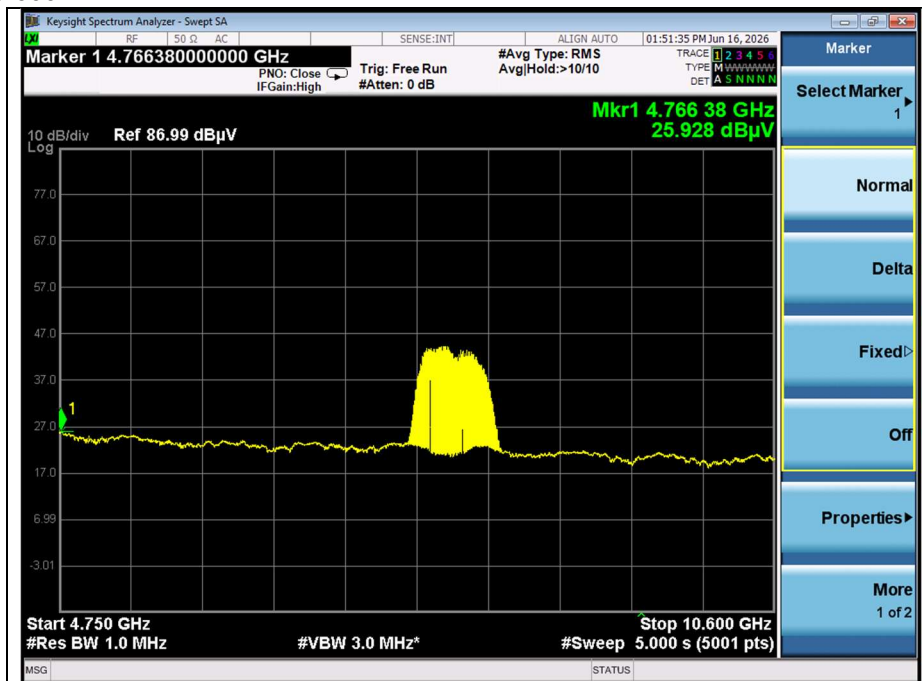
1 990 MHz ~ 3 100 MHz



3 100 MHz ~ 4 750 MHz



4 750 MHz ~ 10 600 MHz

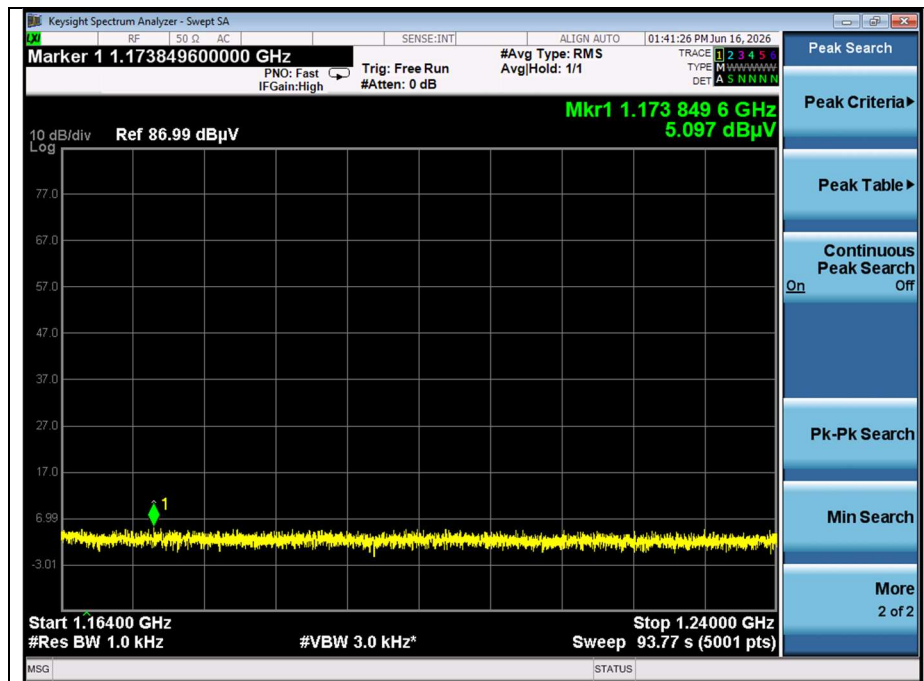


10 600 MHz ~ 18 000 MHz

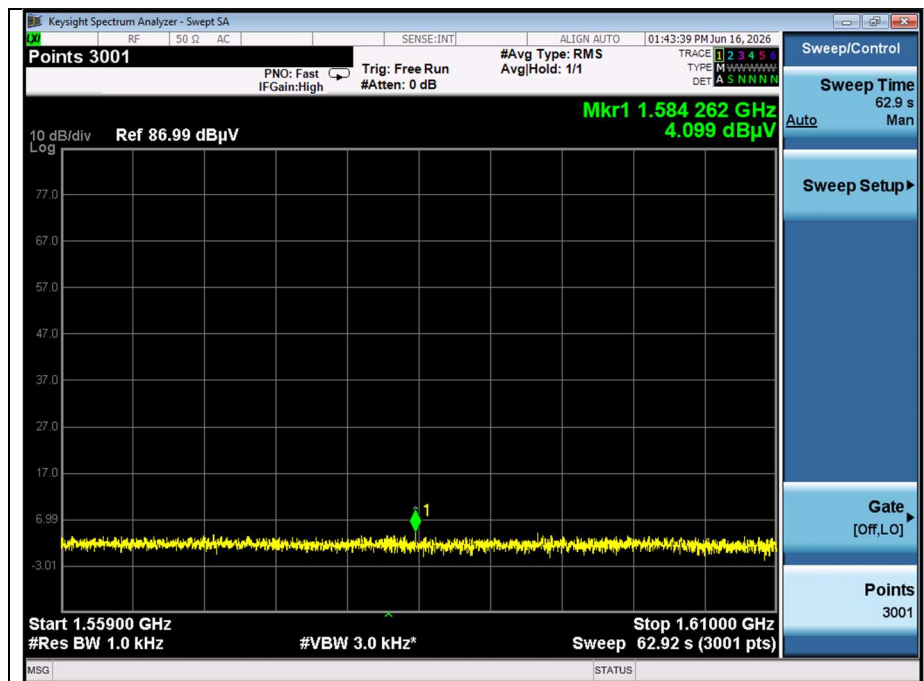


- GPS Band

1 164 - 1 240 MHz

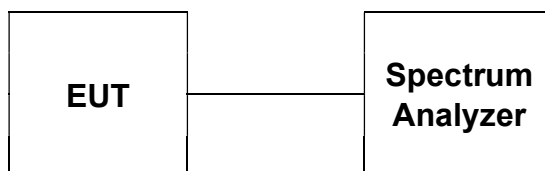


1 559 - 1 610 MHz



3. 10 dB Bandwidth

3.1. Test Setup



3.2. Limit

3.2.1. FCC

According to §15.503(a), 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.

According to §15.519(b), the UWB bandwidth of a device operating under the provisions of this section must be contained between 3 100 MHz and 10,600 MHz.

According to §15.521(e), The frequency at which the highest radiated emission occurs, f_m , must be contained within the UWB bandwidth.

3.2.2. IC

According to 2 of RSS-220 Issue 1, a UWB device is an intentional radiator that has either a -10 dB bandwidth of at least 500 MHz or a -10 dB fractional bandwidth greater than 0.2. There are eight distinct subclasses of UWB device.

3.3. Test Procedure

10 dB Bandwidth

The test follows section 10.1 of ANSI C63.10-2020 for FCC and ANSI C63.10-2020+Cor.1-2023+C63.10a-2024 + Errata to C63.10a-2024 for ISSED.

The frequency at which the maximum power level is measured with the peak detector is designated f_M . The peak power measurements shall be made using a spectrum analyzer or EMI receiver with a 1 MHz resolution bandwidth and a video bandwidth of 1 MHz or greater. The instrument shall be set to peak detection using the maximum-hold trace mode. The outermost 1 MHz segments above and below f_M , where the peak power falls by 10 dB relative to the level at f_M , are designated as f_H and f_L , respectively:

a) For the lowest frequency bound f_L , the emission is searched from a frequency lower than f_M that has, by inspection, a peak power much lower than 10 dB less than the power at f_M and increased toward f_M until the peak power indicates 10 dB less than the power at f_M . The frequency of that segment is recorded.

b) This process is repeated for the highest frequency bound f_H , beginning at a frequency higher than f_M that has, by inspection, a peak power much lower than 10 dB below the power at f_M . The frequency of that segment is recorded.

c) The two recorded frequencies represent the highest (f_H) and lowest (f_L) bounds of the UWB transmission, and the -10 dB bandwidth (B_{-10}) is defined as $(f_H - f_L)$. The center frequency (f_c) is calculated from $(f_H + f_L) / 2$.

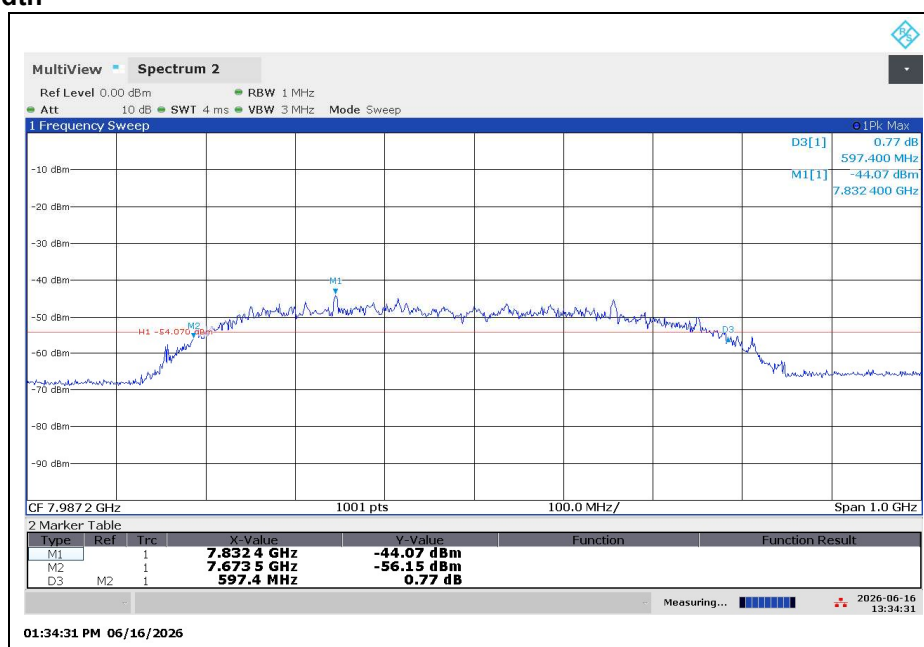
3.4. Test Result

Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 %

Frequency (MHz)	f _M (MHz)	f _L (MHz)	f _H (MHz)	f _C (MHz)	10 dB Bandwidth (MHz)	Minimum Bandwidth (MHz)	Remark
7 987.2	7 832.4	7 673.5	8 270.9	7 972.2	597.4	500	Pass

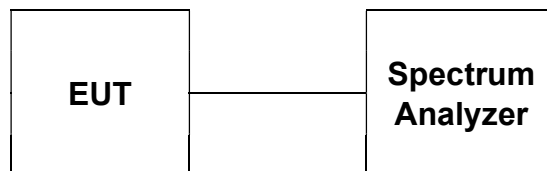
- Test plot

10 dB Bandwidth



4. 99 % Bandwidth

4.1. Test Setup



4.2. Limit

Limit: Not Applicable

4.3. Test Procedure

99 % Bandwidth

The test follows section 6.9.3 of ANSI C63.10-2020 for FCC and ANSI C63.10-2020+Cor.1-2023+C63.10a-2024 + Errata to C63.10a-2024 for ISED.

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

- a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW without going below the values in 6.9.1 and video bandwidth (VBW) shall be at least three times RBW, unless otherwise specified by the applicable requirement.
 - 1) When measuring OBW for UWB, the VBW shall be set to three times the RBW or the maximum available VBW of the measuring instrument.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $10 \log(\text{OBW}/\text{RBW})$ below the reference level. Specific guidance is given in 4.1.6.2.
- d) Step a) through step c) might require iteration to adjust within the specified range.
- e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max-hold mode (until the trace stabilizes) shall be used.
- f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

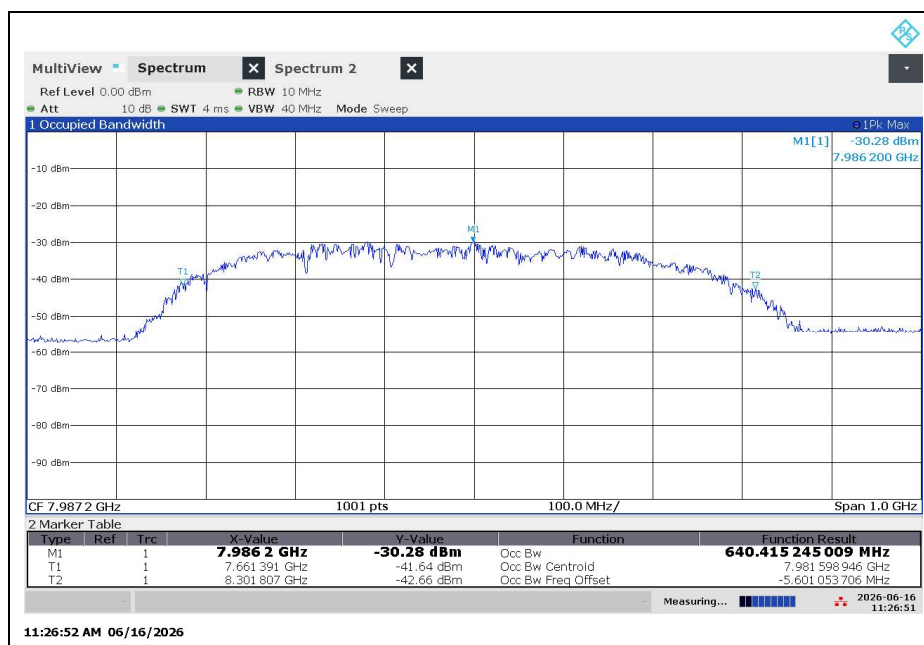
- g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.
- h) The occupied bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

4.4. Test Result

Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 %

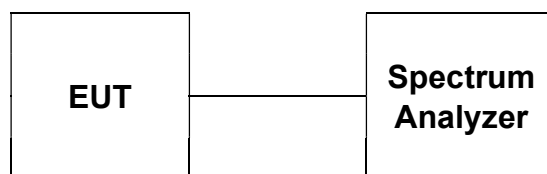
Frequency (MHz)	99 % Bandwidth (MHz)	Remark
7 987.2	640.415	99 % Occupied bandwidth

- Test plot



5. Cease Transmission Time

5.1. Test Setup



5.2. Limit

5.2.1. FCC

According to §15.519(a)(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.

5.2.2. IC

According to 5.3.1(b) of RSS-220 Issue 1, the device is to transmit only when it is sending information to an associated receiver. The device shall cease transmission of information 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 device at least every 10 seconds or the UWB device shall cease transmitting any information other than periodic signals used for the establishment or re-establishment of a communication link with an associated receiver.

5.3. Test Procedure

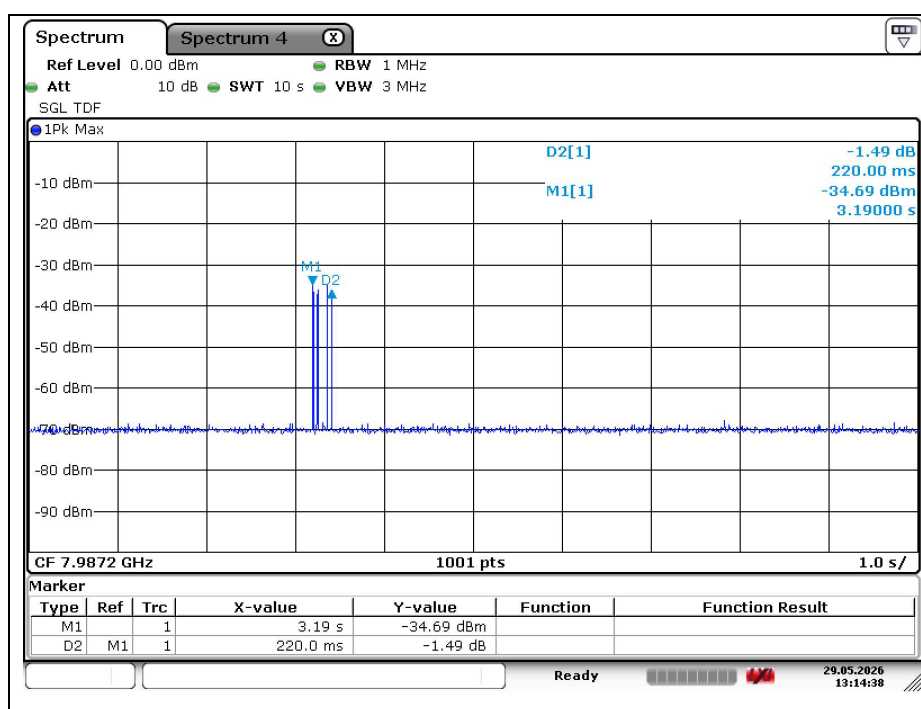
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW = 1 MHz, VBW = 3 MHz, Span = 0 Hz.

5.4. Test Result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 %

Frequency (MHz)	Transmission Time (ms)	Limit (sec)	Remark
7 987.2	220.00	10	Pass

- Test plot



Remark;

The EUT transmit only 220.00 ms when sending information to an associated receiver.

6. Antenna Requirement

6.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §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. And according to FCC 47 CFR Section §15.519 (a)(2), the use of antennas mounted on outdoor structures, e.g., antenna 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.

6.2. Antenna Connected Construction

Antenna used in this product is PCB Pattern Antenna with gain of -1.69 dB i.

- End of the Test Report -