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TEST REPORT

FCC Test for ICR010
Certification

APPLICANT
HYUNDAI MOBIS CO., LTD.

REPORT NO.
HCT-RF-2301-FC089-R1

DATE OF ISSUE
February 20, 2023

Tested by Sang Su Lee	
Technical Manager Jong Seok Lee	

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Additional Model
-

Applicant	**HYUNDAI MOBIS CO., LTD.** 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, South Korea (06141)
Product Name Model Name	SENSOR ASSY-REAR OCCUPANT ALERT ICR010
FCC ID	TQ8-ICR010
Date of Test	September 1, 2022 ~ February 20, 2023
Test Standard Used	FCC Part 15.255
Frequency Range	60 GHz ~ 64 GHz
FCC Classification	DXX (Part 15 Low Power Communication Device Transmitter)
Max. RF Output Power	Peak E.I.R.P.: 12.68 dBm

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	February 03, 2023	Initial Release
1	February 20, 2023	- Changed the product (EUT) type on page 2 and 5. - Added the Waiver requirement and a note for off-time period. - Added plots and note for off-time between two successive pulses.

Engineering Statement:
The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

CONTENTS

1. EUT DESCRIPTION

Model	ICR010
Additional Model	-
EUT Type	**SENSOR ASSY-REAR OCCUPANT ALERT**
EUT Serial Number	95740-N1000
Power Supply	DC 12 V
Frequency Range	60 GHz ~ 64 GHz
EIRP	Peak: 12.68 dBm
Modulation Type	FMCW
Antenna Specification	Antenna type: Micro-strip Patch Antenna Peak Gain(dBi): 5.2 dBi
Date(s) of Tests	September 1, 2022 ~ February 20, 2023

2. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) Operating Under § 15.255" were used in the measurement.

2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on EIRP measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx Frequency that was for the purpose of the measurements.

2.3 GENERAL TEST PROCEDURES

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above the ground plane below 1 GHz and 1.5 m above 1 GHz with absorbers between the EUT and receiving antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set far-field distance away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

2.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.
Especially, all antennas(Up to 40 GHz) for measurement are calibrated in accordance with the requirements of C63.5 (Version : 2006).

4. FACILITIES AND ACCREDITATIONS

4.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,
Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.
The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.
Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

4.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR § 15.203:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antennas of this E.U.T are permanently attached.
- The E.U.T Complies with the requirement of § 15.203

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

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

Parameter	Expanded Uncertainty (± dB)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.82 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.74 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 (Confidence level about 95 %, *k*=2)
Radiated Disturbance (Above 40 GHz)	5.52 (Confidence level about 95 %, *k*=2)

7. SUMMARY TEST OF RESULTS

Section	§ 15.255 Spec Clause	Test Description	Test Condition	Test Result
-	§ 15.207(a)	AC Line Conducted Emissions	Conducted	N/A (Note 1)
8.1	FCC DA-21-816 Waiver	Duty Cycle	Radiated	PASS
8.2	§ 15.215(c)	Occupied Bandwidth	Radiated	PASS
8.3	§ 15.255(c) and (e) FCC DA-21-816 Waiver	Radiated Power	Radiated	PASS (Note 2)
8.4	§ 15.209 § 15.255(d)	Unwanted Emissions	Radiated	PASS (Note 2)
8.5	§ 15.255(f)	Frequency Stability	Radiated	PASS

NOTE:

1. This test is not performed. The EUT is restricted for vehicular use only. Therefore, there is no provision for the EUT to be connected to the public AC Mains.

2. Tests performed by radiated measurement were in the far-field condition as shown below.

Wavelength = Speed of light / Measurement frequency = 30 / 6 400 = 0.0047

(2 X (Max antenna length of EUT)^2) / Wavelength = (2 X (0.0212)^2 / 0.0047 = 0.192 m

: Spurious emissions measurement distance is shown in table below. (Far field)

Frequency Rage (GHz)	Wavelength (cm)	Far Field Distance (m)	Measured Distance (m)
18 ~ 40	0.75	2.460	3.00
40 ~ 60	0.50	1.354	1.50
60 ~ 90	0.33	0.856	1.00
90 ~ 140	0.21	0.572	1.00
140 ~ 220	0.13	0.365	1.00

8. TEST RESULT

8.1 DUTY CYCLE

▣ Waiver Condition

FCC DA-21-816 Waiver

Each individual radar device shall not exceed a maximum transmit duty cycle of 10% in any 33 milliseconds (ms) interval (i.e., the device will not transmit longer than a total of 3.3 ms in any 33 ms time period).

Any radar off-time period between two successive radar pulses that is less than 2 ms shall be considered “on time” for purposes of computing the duty cycle.

▣ TEST RESULTS

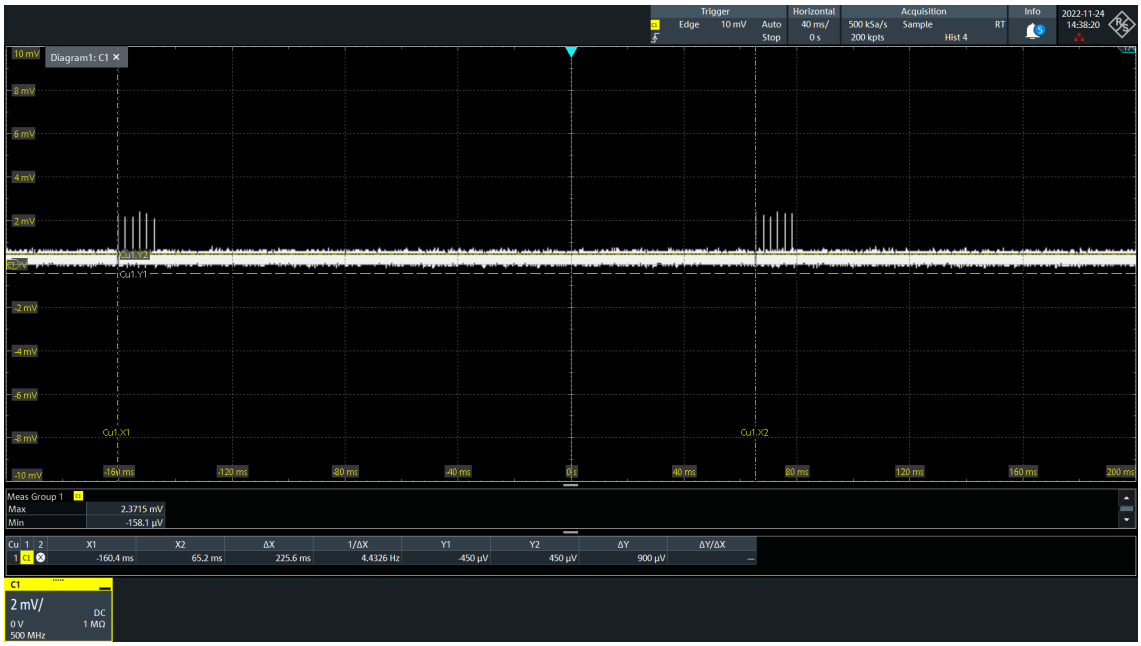
Pulse Width (us)	No. of Pulses	On time*Note (ms)	Period (ms)	Duty Cycle (%)
40	6	0.240	225.5	0.106

Pulse Width (us)	Max. No. of Pulses in 33 ms	On time in 33 ms*Note (ms)	Duty Cycle in any 33 ms (%)
40	6	0.240	0.727

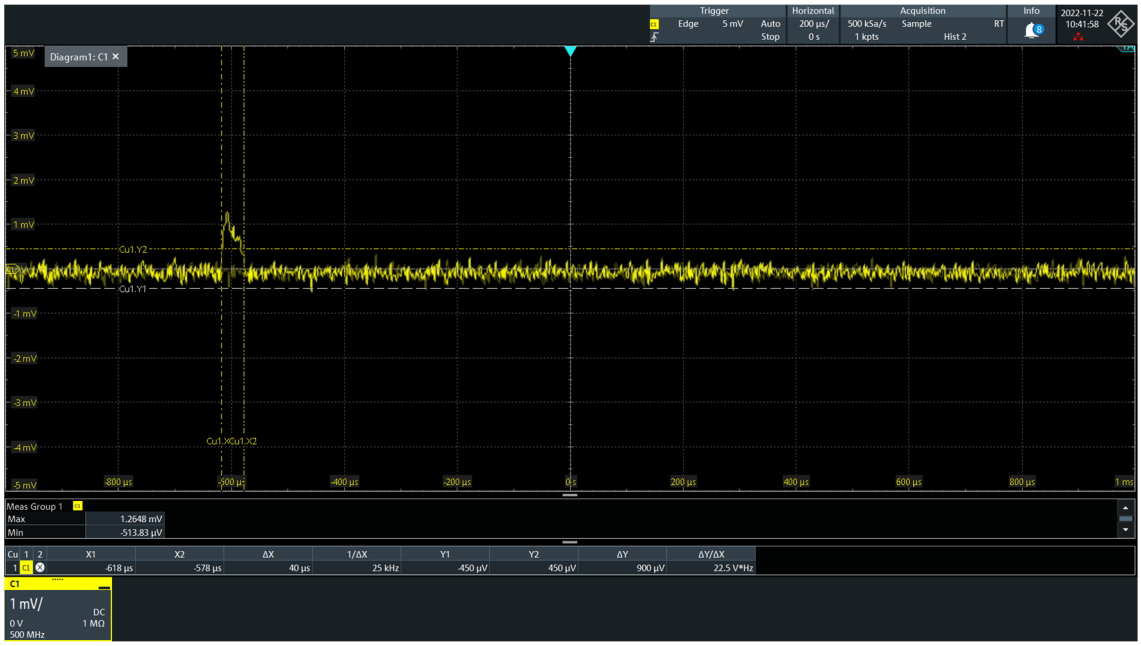
Note: “any radar off-time period between two successive radar pulses that is less than 2 ms” was considered “on time” for purposes of computing the duty cycle.

▣ TEST PLOTS

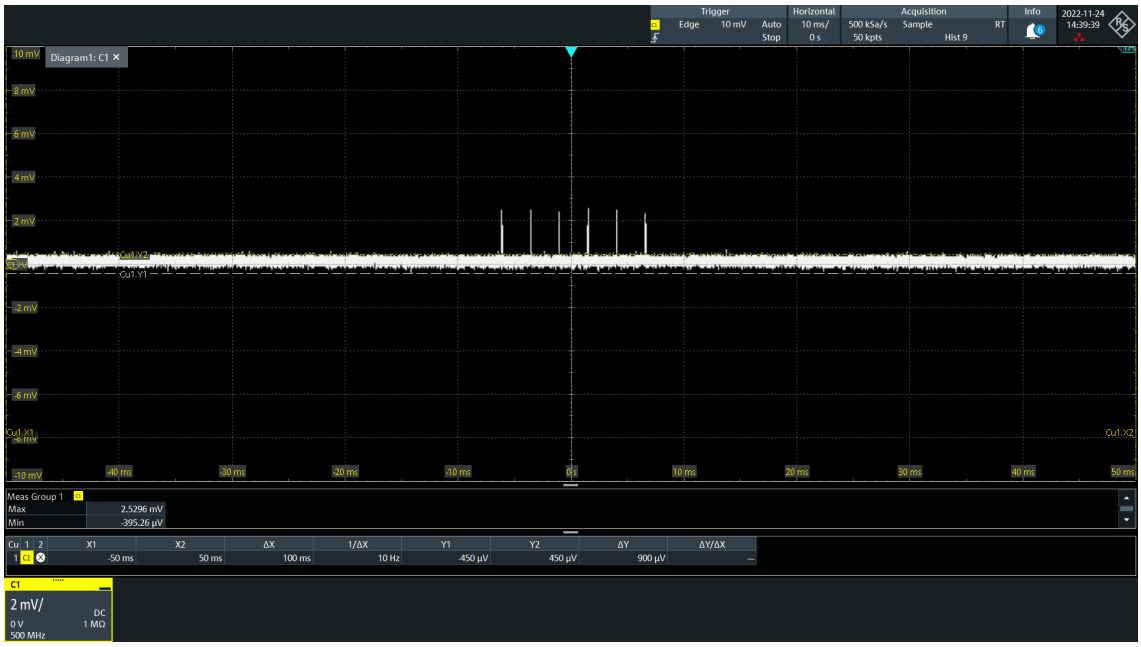
Chirp Period



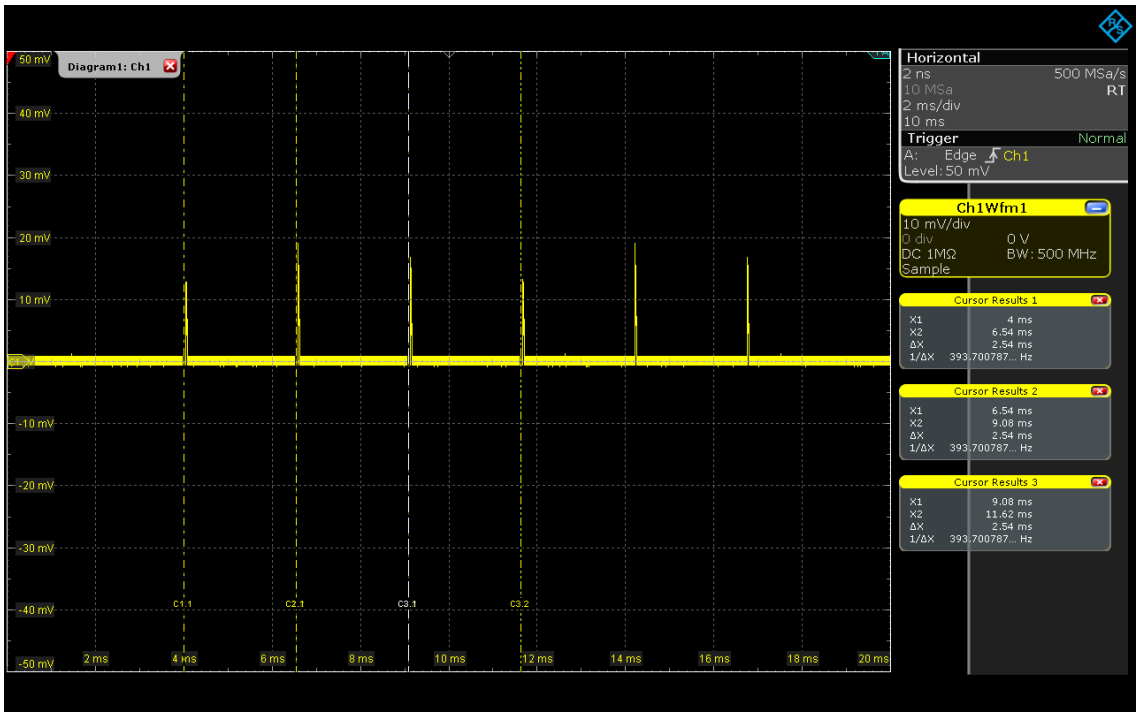
Pulse Width

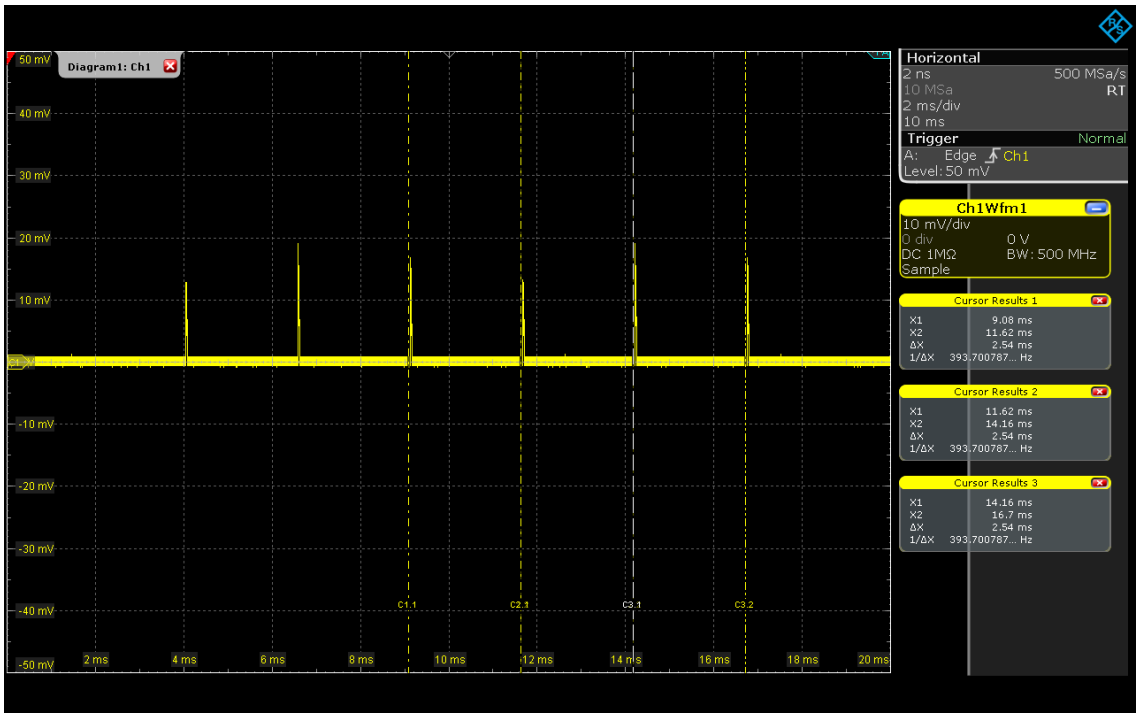


Number of Pulses per Chirp



Off-time between successive two pulses





Note: The off-time between pulses exceeds 2 ms.

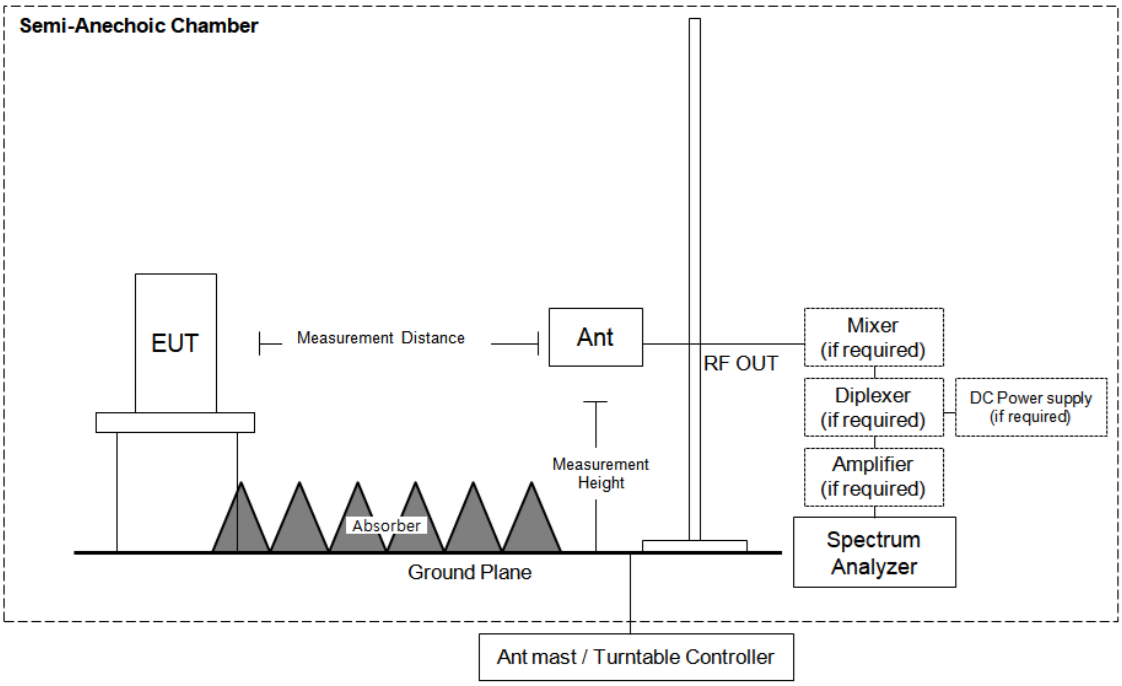
8.2 OCCUPIED BANDWIDTH

▣ Specification Reference

FCC 47 CFR Part 15, Clause 15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § § 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

RBW = Maximum value of the equipment

VBW ≥ RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

▣ TEST RESULTS

TEST CONDITIONS:		Occupied Bandwidth
T nom	V nom	3.483 GHz
Measurement Uncertainty : 95 ㎑ (Confidence level about 95 %, *k*=2)		

▣ TEST PLOTS

Occupied Bandwidth

8.3 RADIATED POWER

▣ Specification Reference

FCC 47 CFR Part 15, Clause 15.255(c)(3)

For fixed field disturbance sensors other than those operating under the provisions of paragraph (c)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed −10 dBm and the peak EIRP level shall not exceed 10 dBm.

FCC 47 CFR Part 15, Clause 15.255(e)

Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (b) of this section.

(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

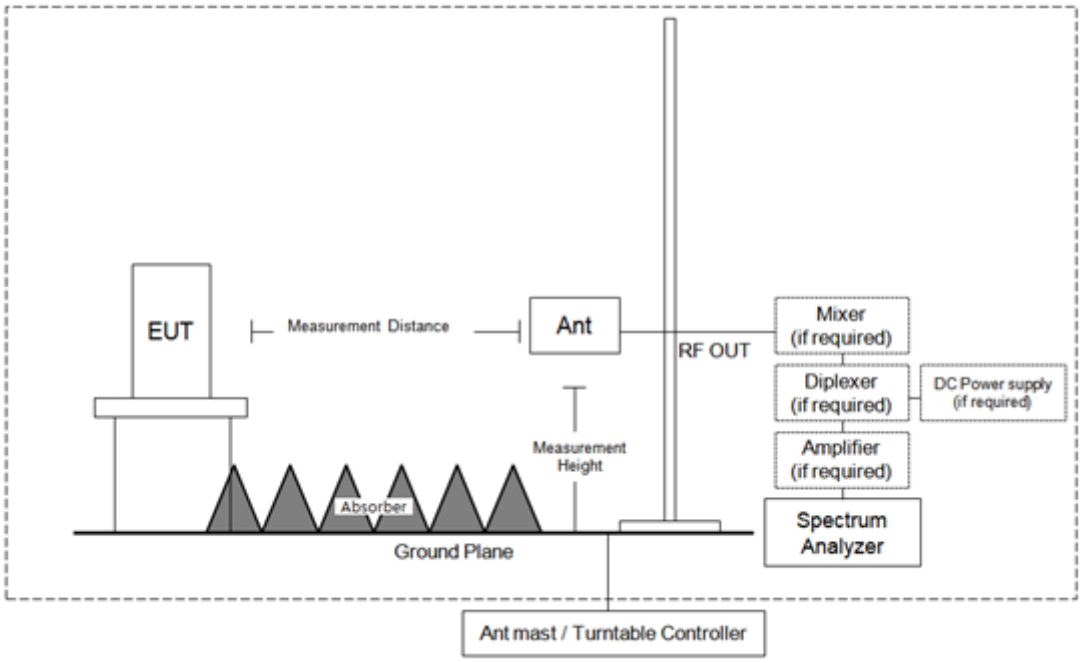
(2) Peak transmitter conducted output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and that has a video bandwidth of at least 10 MHz.

▣ Waiver Condition

FCC DA-21-816 Waiver

The radar shall be certified for compliance with all the technical specifications applicable to operation under 47 CFR Part 15, with the exception of the following provisions in 47 CFR § § 15.255(a)(2) and (c)(3), which are waived to allow the device to operate as a radar on new passenger motor vehicles in the 60-64 GHz band at a maximum +13 dBm EIRP, +10 dBm transmitter conducted output power, and +13 dBm/MHz power spectral density.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

1) Record the average and peak voltages from the DSO.
2) Disconnect the test antenna or EUT (as applicable for radiated or conducted tests) from the RF input port of the instrumentation system.
3) Connect a mm-wave source to the RF input port of the instrumentation system via a waveguide variable attenuator.
4) The mm-wave source shall be unmodulated.
5) Adjust the frequency of the mm-wave source to the center of the frequency range occupied by the transmitter.
6) Adjust the amplitude of the mm-wave source and/or the variable attenuator such that the DSO indicates a voltage equal to the peak voltage recorded in step e1).
7) Disconnect the waveguide variable attenuator from the RF input port of the instrumentation system.
8) Without changing any settings, connect the waveguide variable attenuator to a wideband mm-wave power meter with a thermocouple detector or equivalent.
9) Measure and note the power.

▣ TEST RESULTS

Peak E.I.R.P.

DSO Reading (mV)	Frequency (GHz)	Source Power (dBm)	Test Ant. Gain (dBi)	Attenuation (dB)	E.I.R.P. (dBm)	Limit (dBm)	Margin (dB)	Detector (Avg/Pk)
1.1462	62	4.86	22.5	14.68	12.68	13	0.32	Pk

Note:

1. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
2. E.I.R.P. (dBm) = Source Power (dBm) + Test Ant. Gain (dBi) – Attenuation (dB)

Peak Conducted Output Power

Peak E.I.R.P. (dBm)	Ant. Gain (dBi)	Peak Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)
12.68	5.2	7.48	10	2.52

Note:

Peak Conducted Output Power (dBm) = Peak E.I.R.P. (dBm) – Antenna Gain (dBi)

Peak Power Spectral Density

Frequency (GHz)	Reading (dBm/MHz)	Conversion Loss (dB)	Calculated E.I.R.P. (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
61.090	-60.45	58.39	-2.06	13	15.06

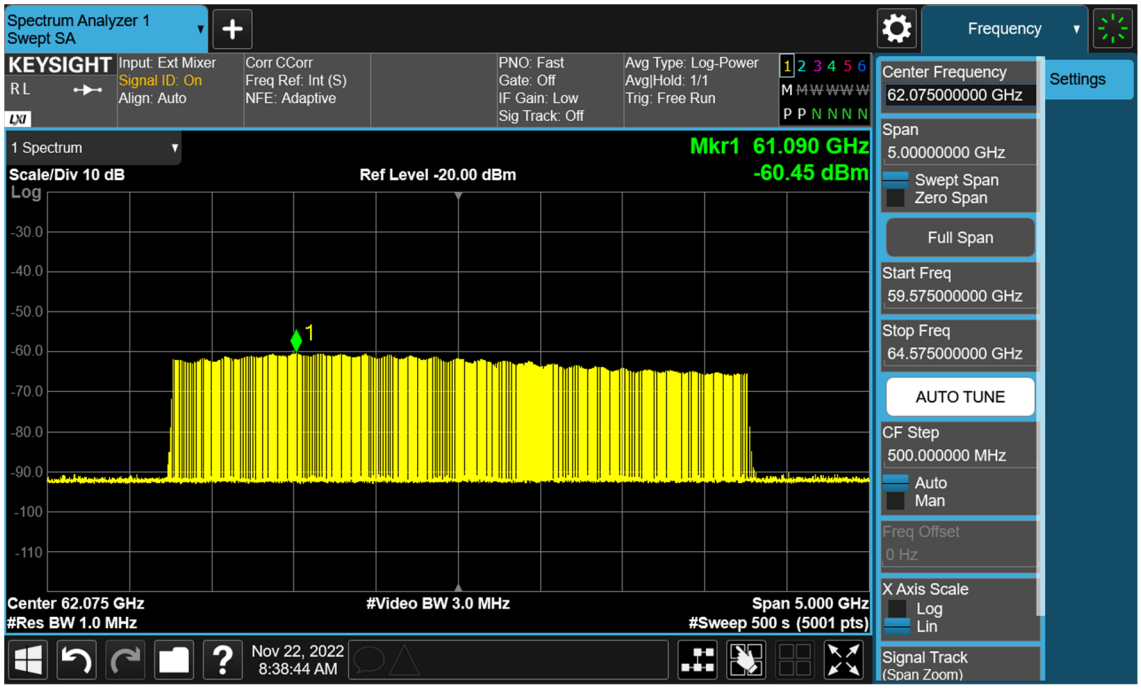
Note:

Calculated E.I.R.P. (dBm/MHz) = Reading (dBm/MHz) + Conversion Loss (dB)

Conversion Loss (dB) = FSPL (dB) – Antenna Gain (dBi) + Mixer Loss (dB) + Cable Loss (dB)

▣ TEST PLOTS

Peak Power Spectral Density



8.4 UNWANTED EMISSIONS

▣ Specification Reference

FCC 47 CFR Part 15, Clause 15.209

The levels of the spurious emissions shall not exceed the level of the fundamental emission.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meter)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/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

FCC 47 CFR Part 15, Clause 15.255(d)

(1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm2 at a distance of 3 meters.

▣ TEST PROCEDURE

For below 40 GHz

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until the measurements for all frequencies are complete.

For Above 40 GHz

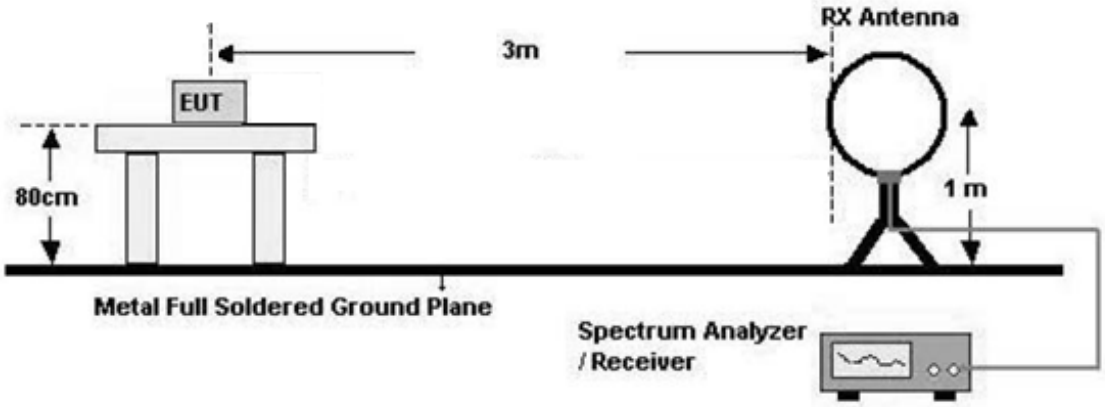
1. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.
2. Set spectrum analyzer RBW = 1 MHz, VBW =3M Hz, average detector.
3. Calculate the distance to the far field boundary and determine the maximum measurement distance.
4. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.
5. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.
6. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.
7. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.

h. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.

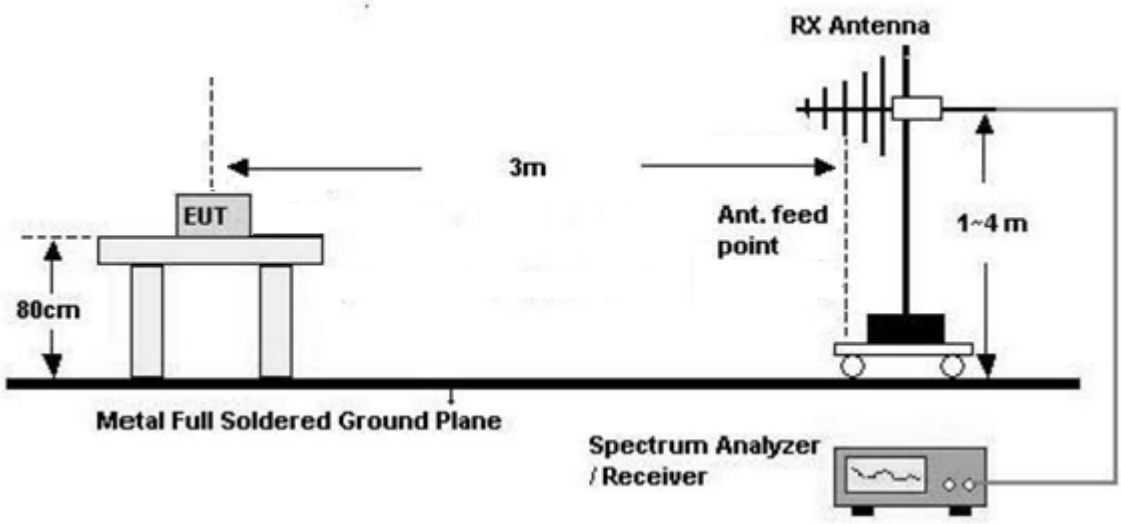
8. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.
9. Calculate the EIRP from the measured field strength and then convert to the linear.
10. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.
11. Repeat the preceding sequence for every emission observed in the frequency band under investigation

▣ TEST CONFIGURATION

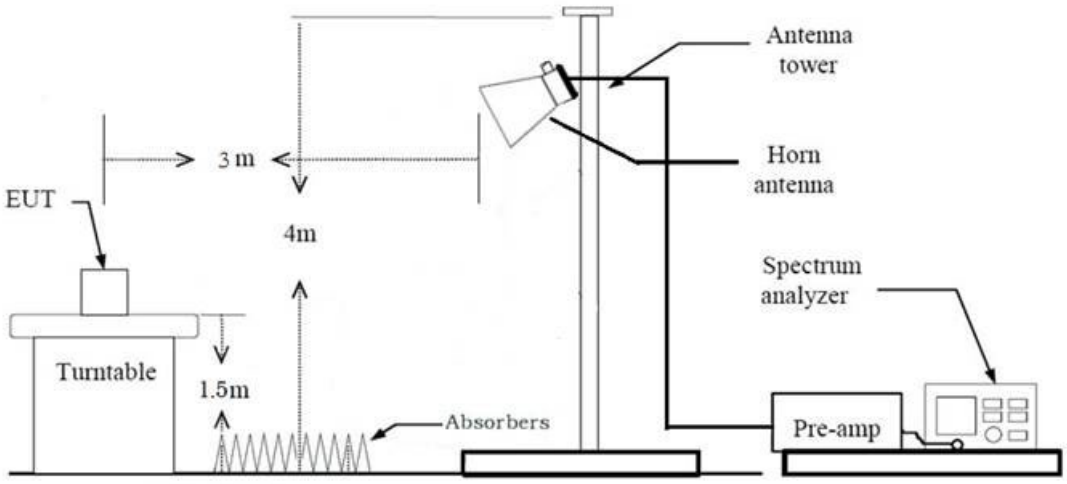
Below 30 MHz



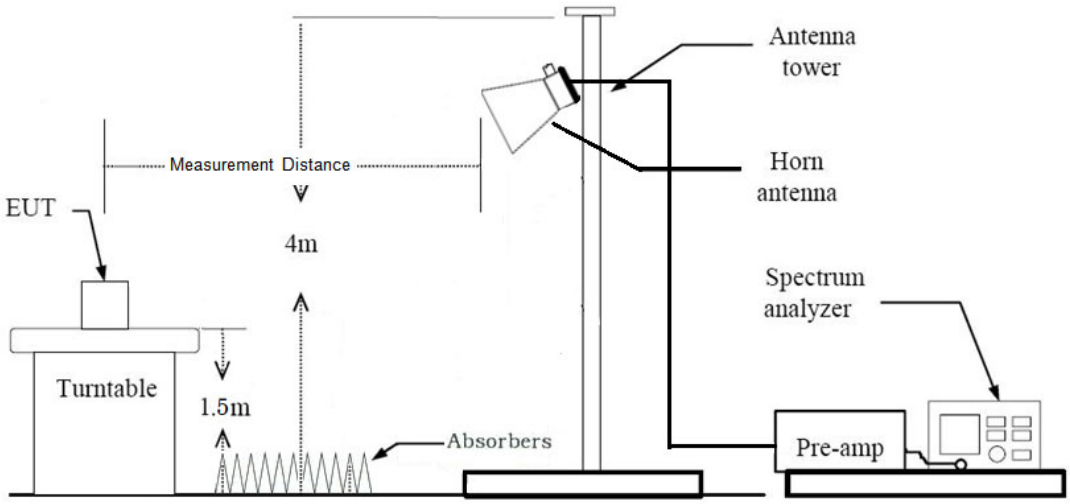
30 MHz - 1 GHz



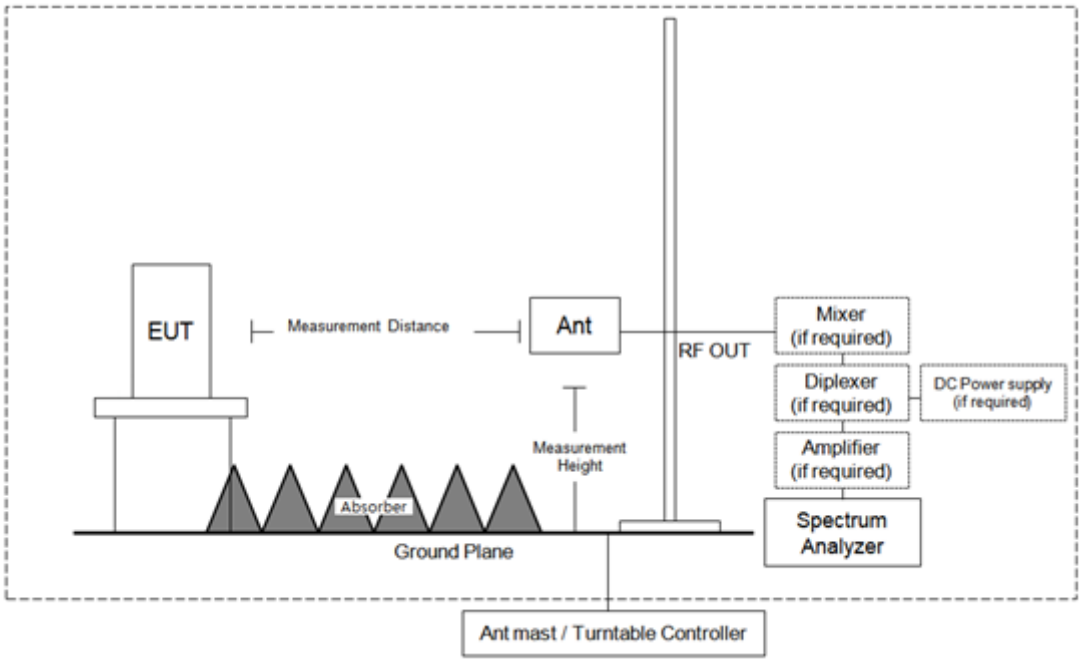
1 GHz – 18 GHz



18 GHz – 40 GHz



40 GHz – 200 GHz



▣ **TEST RESULTS**

9 kHz – 30 MHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμV/m	dBm/m	dBm	H/V	dBμV/m	dBμV/m	dB
No Critical Peaks Found							

Note:

1. Measuring frequencies from 9 kHz to the 30 MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
6. The test results for below 30 MHz is correlated to an open site.
   The result on OFTS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

Below 1 GHz

Operation Mode: Continuous TX Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμV/m	dBm/m	dBm	H/V	dBμV/m	dBμV/m	dB
No Critical Peaks Found							

Note:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

1 GHz – 18 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F.+C.L.-AMP G +D.F.	ANT. POL	Total	Limit	Margin	Measurement Type
MHz	dBµV/m	dBm	H/V	dBµV/m	dBµV/m	dB	
No Critical Peaks Found							

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP G: AMPLIFIER GAIN

Note:

1. Measuring frequencies from 1 GHz to the 5th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain + Distance Factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

18 GHz – 40 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F.+C.L.-AMP G +D.F.	ANT. POL	Total	Limit	Margin	Measurement Type
MHz	dBμV/m	dBm	H/V	dBμV/m	dBμV/m	dB	
No Critical Peaks Found							

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP G: AMPLIFIER GAIN

Note:

1. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor – Amp Gain
2. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. Worst case is y plane and vertical polarization.

40 GHz – 90 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F.+C.L.-AMP G +D.F.	ANT. POL	Total	Limit	Margin	Measurement Type
MHz	dBμV/m	dBm	H/V	dBμV/m	dBμV/m	dB	
No Critical Peaks Found							

Note:

1. Total(dBμV/m) = Reading Value(dBm) + AFCL(dB)
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. Worst case is y plane and horizontal polarization.
3. In this test, AFCL factor consists of antenna factor, cable loss, mixer loss, amplifier gain
4. AV: Average

90 GHz – 200 GHz

Operation Frequency: Continuous TX Mode

Frequency	Reading	A.F.+C.L.-AMP G +D.F.	ANT. POL	Total	Limit	Margin	Measurement Type
MHz	dBµV/m	dBm	H/V	dBµV/m	dBµV/m	dB	
No Critical Peaks Found							

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP G: AMPLIFIER GAIN

Note:

1. Measuring frequencies from 1 GHz to the 5th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain + Distance Factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

8.5 FREQUENCY STABILITY

▣ Specification Reference

FCC 47 CFR Part 15, Clause 15.255(f)

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range − 20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

RBW = Maximum value of the equipment

VBW ≥ RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

The frequency drift was investigated for every 10 °C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -40 to 85 °C. Voltage supplied to EUT is 12 V and the reference temperature was done at 20°C. The voltage was varied in 9 V to 16 V and the temperature and voltage are declared by the manufacturer.

▣ TEST RESULTS

Reference: 12 V at 20°c **Freq.** = 62 GHz

Voltage	Temp.	Low Frequency	High Frequency	Limit	Result
(V)	(°C)	(GHz)	(GHz)	(GHz)	
12	+20(Ref)	60.3450	63.8100	57 ~ 71	Pass
	-40	60.3425	63.8125		Pass
	-30	60.3425	63.8125		Pass
	-20	60.3450	63.8100		Pass
	-10	60.3425	63.8125		Pass
	0	60.3375	63.8175		Pass
	+10	60.3425	63.8100		Pass
	+30	60.3375	63.7925		Pass
	+40	60.3375	63.7925		Pass
	+50	60.3325	63.7875		Pass
	+60	60.3375	63.7900		Pass
	+70	60.3375	63.8050		Pass
	+80	60.3325	63.8125		Pass
	+85	60.3425	63.8100		Pass
9	+20	60.3425	63.8125		Pass
16	+20	60.3425	63.8125		Pass

9. LIST OF TEST EQUIPMENT

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
PXA Signal Analyzer	N9030B	Keysight	MY55480110	07/13/2023	Annual
PXA Signal Analyzer	N9030A	Keysight	MY55410714	02/15/2024	Annual
Spectrum Analyzer	FSW85	Rohde & Schwarz	101256	10/31/2023	Annual
Controller (Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Temperature and Humidity Chamber	PL-4KP	ESPEC	14021890	10/04/2023	Annual
Spectrum Analyzer	FSP40	Rohde & Schwarz	100843	11/08/2023	Annual
Turn Table	DS2000-S	Innco system	N/A	N/A	N/A
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-175	06/04/2023	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	02296	05/18/2024	Biennial
Horn Antenna	BBHA 9170	Schwarzbeck	BBHA9170541	11/16/2023	Biennial
Horn Antenna	WR-19 Horn Antenna	OML INC.	M19RH-180423-1	03/14/2024	Biennial
Horn Antenna	WR-19 Horn Antenna	OML INC.	M19RH-180423-2	03/14/2024	Biennial
Horn Antenna	WR-12 Horn Antenna	OML INC.	M12RH-180423-1	03/14/2024	Biennial
Horn Antenna	WR-12 Horn Antenna	OML INC.	M12RH-180423-2	03/14/2024	Biennial
Horn Antenna	WR-08 Horn Antenna	OML INC.	M08RH-180501-1	03/15/2024	Biennial
Horn Antenna	WR-08 Horn Antenna	OML INC.	M08RH-180501-2	03/15/2024	Biennial
Horn Antenna	WR-05 Horn Antenna	OML INC.	M05RH-180501-1	03/15/2024	Biennial
Horn Antenna	WR-05 Horn Antenna	OML INC.	M05RH-180501-2	03/15/2024	Biennial
Spectrum Analyzer Extension Module	WR19SAX-M	VDI	SAX 771	03/16/2023	Annual
Spectrum Analyzer Extension Module	WR15SAX	VDI	SAX 936	07/19/2023	Annual
Spectrum Analyzer Extension Module	WR12SAX-M	VDI	SAX 773	03/17/2023	Annual
Spectrum Analyzer Extension Module	WR8.0SAX-M	VDI	SAX 779	03/17/2023	Annual
Spectrum Analyzer Extension Module	WR5.1SAX-M	VDI	SAX 774	03/17/2023	Annual
Source Module	WR-19	OML INC.	S19MS-A-160516-1	07/19/2023	Annual
Source Module	WR-12	OML INC.	S12MS-A-160419-1	07/19/2023	Annual
Source Module	WR-08	OML INC.	S08MS-A-160419-1	09/05/2023	Annual
Source Module	WR-05	OML INC.	S05MS-A-160419-1	07/19/2023	Annual
Signal Generator	SMB100A	Rohde & Schwarz	177633	07/05/2023	Annual
Oscilloscope	RTO2024	Rohde & Schwarz	300090	06/15/2023	Annual
Horn Antenna	SAR-2309-15-S2	ERAVANT	08394-01	12/23/2024	Biennial
Waveguide Detector	SFD-503753-15SF-P1	ERAVANT	08395-01	01/09/2024	Annual

Note:

1. All equipment is calibrated with traceable calibrations.
2. Each calibration is traceable to the national or international standards.

3. Equipment listed above that calibrated during the testing period was set for test after the calibration.
4. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date, or will be test after the calibration is completed.

10. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2301-FC089-P