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TEST REPORT

FCC/ISED BT Test for VT253G9AN&VT253G9AN
Class II Permissive Change

APPLICANT
HYUNDAI MOBIS CO., LTD.

REPORT NO.
HCT-RF-2302-FI003-R2

DATE OF ISSUE
March 16, 2023

Tested by
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Technical Manager
Jong Seok Lee

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TEST REPORT

FCC/ISED BT Test
for
VT253G9AN
&VT253G9KN

REPORT NO.
HCT-RF-2302-FI003-R2

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Additional Model
FCC: VT252G9AN, VT252G9AU, VT253G9AU, VT262G9AN, VT263G9AN, VT262G9AU, VT263G9AU, VT255G9AN, VT254G9AN, VT254G9AU, VT255G9AU, VT264G9AN, VT265G9AN, VT264G9AU, VT265G9AU
ISED: VT252G9KN, VT263G9KN, VT262G9KN, VT255G9KN, VT254G9KN, VT264G9KN, VT265G9KN

Applicant	**HYUNDAI MOBIS CO., LTD.** 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, South Korea
Eut Type	Car Audio System
FCC Model Name	VT253G9AN
ISED Model Name	VT253G9KN
FCC ID	TQ8-VT253G9AN
IC	5074A-VT253G9KN
Max. RF Output Power	2.877 dBm (1.94 mW)
FCC Classification	FCC Part 15 Spread Spectrum Transmitter
FCC Rule Part(s)	Part 15 subpart C 15.247
ISED Rule Part(s)	RSS-247 Issue 2 (February 2017) RSS-Gen Issue 5_Amendment 2 (February 2021)

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 06, 2023	Initial Release
1	March 07, 2023	Revised the EUT serial number.
2	March 16, 2023	Added the Test Setup Photo File No. on page 37.

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 / ISED 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

FCC Model	VT253G9AN
ISED Model	VT253G9KN
FCC Additional Model	VT252G9AN, VT252G9AU, VT253G9AU, VT262G9AN, VT263G9AN, VT262G9AU, VT263G9AU, VT255G9AN, VT254G9AN, VT254G9AU, VT255G9AU, VT264G9AN, VT265G9AN, VT264G9AU, VT265G9AU
ISED Additional Model	VT252G9KN, VT263G9KN, VT262G9KN, VT255G9KN, VT254G9KN, VT264G9KN, VT265G9KN
EUT Type	Car Audio System
Power Supply	DC 14.4 V
Frequency Range	2 402 MHz – 2 480 MHz
Max. RF Output Power	2.877 dBm (1.94 mW)
BT Operating Mode	Normal, EDR, AFH
Modulation Type	GFSK(Normal), π/4DQPSK and 8DPSK(EDR)
Modulation Technique	FHSS
Number of Channels	79Channels, Minimum 20 Channels(AFH)
Antenna Specification	Antenna type: Bluetooth Single Band Antenna Peak Gain : -0.38 dBi
Date(s) of Tests	January 13, 2023 ~ February 6, 2023
PMN (Product Marketing Number)	VT253G9KN, VT252G9KN, VT263G9KN, VT262G9KN, VT255G9KN, VT254G9KN, VT264G9KN, VT265G9KN
HVIN (Hardware Version Identification Number)	VT253G9KN, VT252G9KN, VT263G9KN, VT262G9KN, VT255G9KN, VT254G9KN, VT264G9KN, VT265G9KN
FVIN (Firmware Version Identification Number)	IKFLUSA.0000.V034.001.200410
HMN (Host Marketing Name)	N/A
EUT serial numbers	96560-G9VG0

2. Requirements for Bluetooth transmitter(15.247)

This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:

1) This system is hopping pseudo-randomly.
2) Each frequency is used equally on the average by each transmitter.
3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters
4) The receiver shifts frequencies in synchronization with the transmitted signals.

- 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.
- 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

- RSS-247 5.1 (a): The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and sh
all shift frequencies in synchronization with the transmitted signals.

The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

3. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Device (ANSI C63.10-2013, KDB 558074) is used in the measurement of the test device.

EUT CONFIGURATION

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

EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the RSS-GEN issue 5, RSS-247 issue 2.

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1 GHz. Above 1 GHz with 1.5 m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m 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 6.6.5 of ANSI C63.10. (Version: 2013). To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120 kHz for frequencies below 1 GHz or 1 MHz for frequencies above 1 GHz. For average measurements above 1 GHz, the analyzer was set to peak detector and add the DCCF calculations.

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.

4. 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 equipments, which is traceable to recognized national standards.
Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

5. FACILITIES AND ACCREDITATIONS

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).
For ISED, test facility was accepted dated February 14, 2019 (CAB identifier: KR0032).

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.”

6. 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."

(1) The antennas of this E.U.T are permanently attached.

(2) The E.U.T Complies with the requirement of § 15.203

According to RSS-GEN(Issue 5) Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested..

7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of
ANSI C63.10-2013.
All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.90 (Confidence level about 95 %, k=2)
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)

8. DESCRIPTION OF TESTS

8.1. Radiated Test

Limit

FCC

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30

ISED

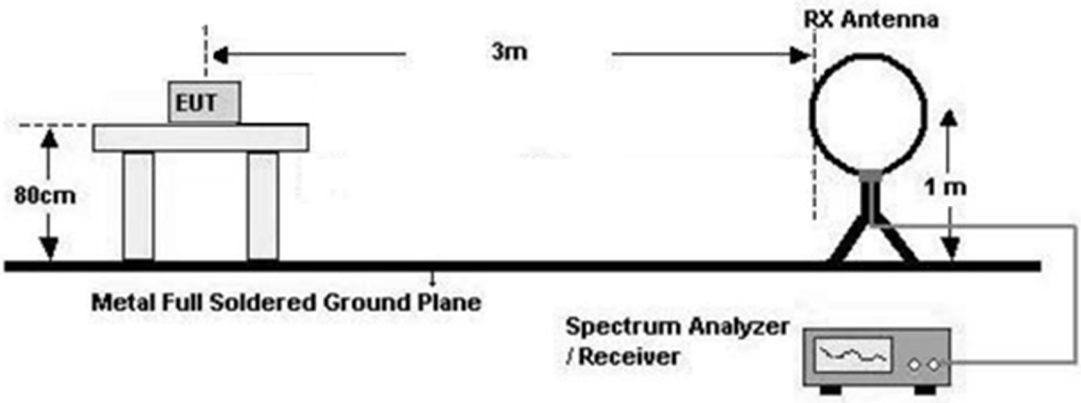
Frequency (MHz)	Field Strength (μA/m)	Measurement Distance (m)
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

FCC&ISED

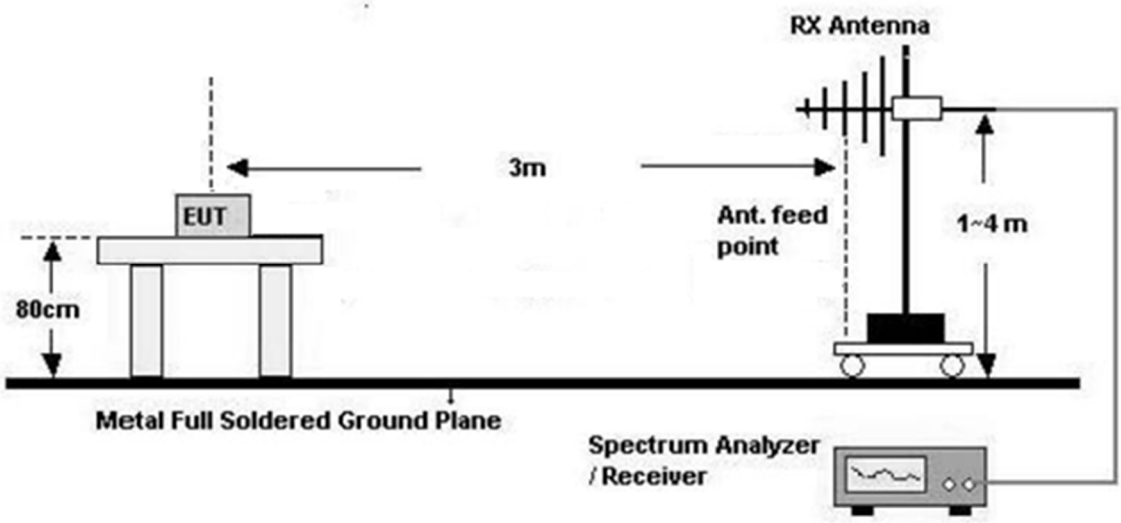
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

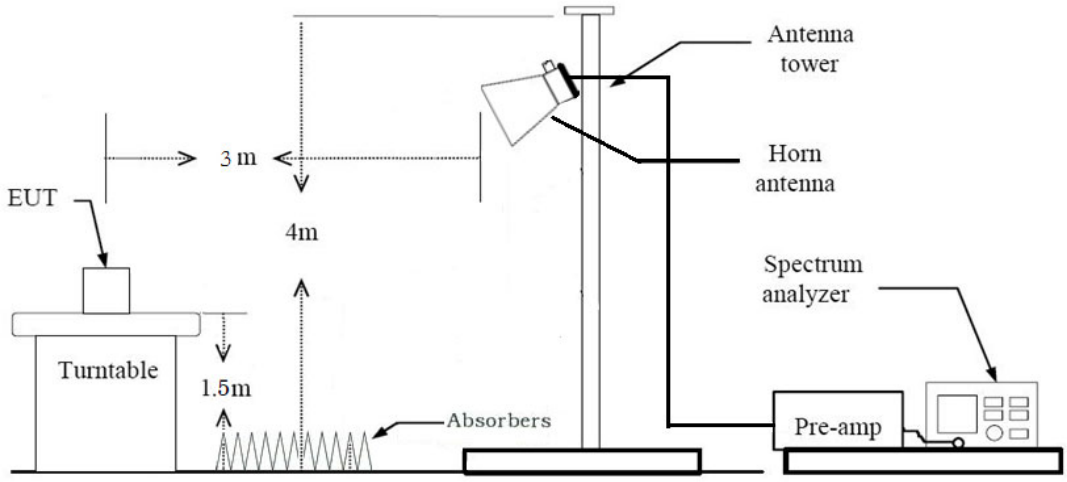
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions (Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m from the EUT
3. The EUT is placed on a turntable, which is 0.8 m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = 40log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3 x RBW
9. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value 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.

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

Test Procedure of Radiated spurious emissions (Below 1 GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8 m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1 m to 4 m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Quasi-peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Quasi-Peak
      - RBW = 120 kHz

   ※In general, (1) is used mainly
7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value 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.

Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. Radiated test is performed with hopping off.
2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Average):
      - Average value of pulsed emissions
        - Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determined from the peak field strength after correcting for the worst-case duty cycle as described in Number.14
      - Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB
10. Measurement value 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.
11. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
12. Total
   (1)Measurement(Peak)
   Measured Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F)
   (2)Measurement(Avg)

Measured Value (Peak) + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F) + D.C.C.F(AFH)

13. Duty Cycle Correction Factor (79 channel hopping)
    a. Time to cycle through all channels= Δ t= τ [ms] x 79 channels = 229.100 ms, where τ = pulse width
    b. 100 ms/ Δt [ms] = H → Round up to next highest integer, H ' =1
    c. Worst Case Dwell Time = τ [ms] x H ' = 2.9 ms
    d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB
14. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
    a. Time to cycle through all channels= Δ t= τ [ms] x 20 channels = 58.00 ms, where τ = pulse width
    b. 100 ms/ Δt [ms] = H → Round up to next highest integer, H ' = 2
    c. Worst Case Dwell Time = τ [ms] x H ' = 5.800 ms
    d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

Test Procedure of Radiated Restricted Band Edge

1. Radiated test is performed with hopping off.
2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
   (1) Measurement Type(Peak):
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Average):
      - Average value of pulsed emissions
      - Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determined from the peak field strength after correcting for the worst-case duty cycle as

described in Number.14

- Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

9. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
10. Total

(1) Measurement(Peak)

= Measured Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) – Amp Gain(A.G) + Attenuator(ATT) + Distance Factor(D.F)

(2) Measurement(Avg)

= Measured Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) – Amp Gain(A.G) + Attenuator(ATT) + Distance Factor(D.F) + D.C.C.F(AFH)

11. Measurement value 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.

8.2. Receiver Spurious Emissions

Limit

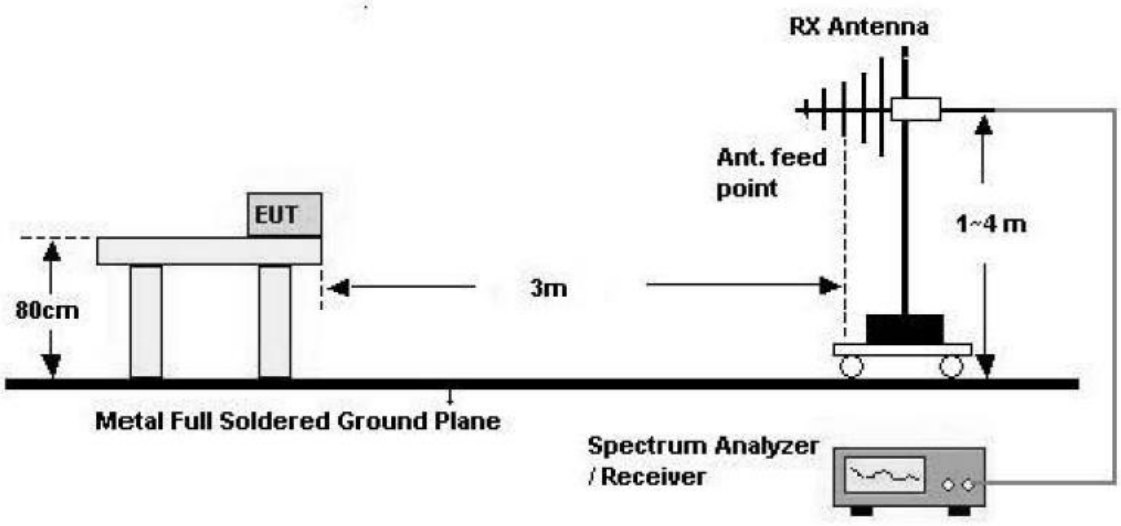
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

Test Configuration

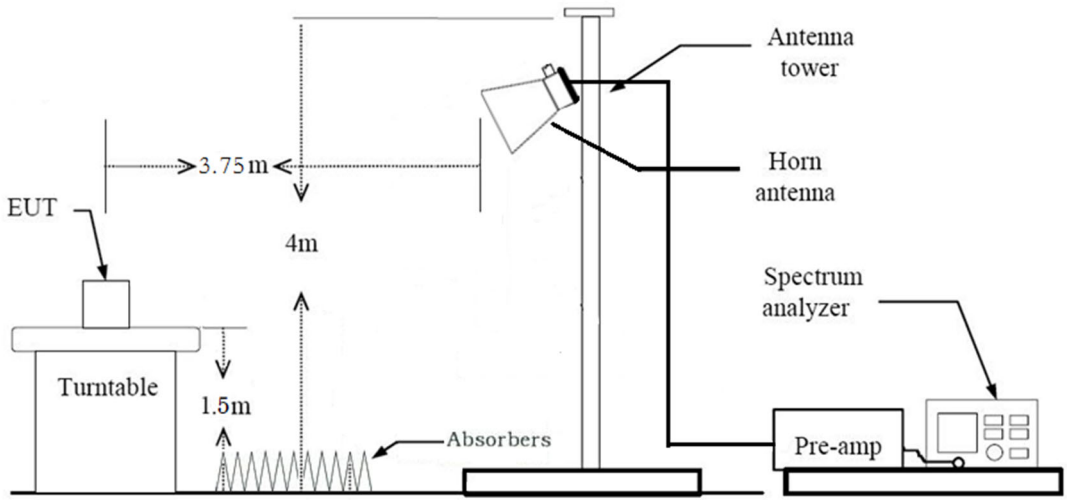
30 MHz - 1 GHz



Test Procedure of Receiver Spurious Emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Quasi-peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Quasi-Peak
      - RBW = 120 kHz
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

Above 1 GHz



Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
   ◆ Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak

- Trace = Maxhold
- RBW = 1 MHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Average):

- We performed using a reduced video BW method was done with the analyzer in linear mode
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW ≥ 1/τ Hz, where τ = pulse width in seconds

The actual setting value of VBW = 1 kHz

10. Measurement value 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.
11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

8.3. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone
   - Worstcase : Stand alone
2. EUT Axis
   - Radiated Spurious Emissions : X
   - Radiated Restricted Band Edge : X
3. All data rate of operation were investigated and the test results are worst case in highest datarate of each mode.
   - GFSK : DH5
   - π/4DQPSK : 2-DH5
   - 8DPSK : 3-DH5
4. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
   - Position : Horizontal, Vertical, Parallel to the ground plane
5. Additional Model were tested and the worst case results are reported.

(Worst case : VT255G9AN(FCC)& VT255G9KN(ISED))

9. SUMMARY OF TEST RESULTS

Test Description	FCC Part Section(s)	ISED Part Section(s)	Test Limit	Test Condition	Test Result
20 dB Bandwidth	§ 15.247(a)(1)	RSS-247, 5.1	N/A	Conducted	NT[Note2]
Occupied Bandwidth	N/A	RSS-GEN, 6.7	N/A		NT[Note2]
Conducted Maximum Peak Output Power	§ 15.247(b)(1)	RSS-247, 5.1 b)	< 0.125 W		NT[Note2]
Carrier Frequency Separation	§ 15.247(a)(1)	RSS-247, 5.1 b)	> 25 kHz or >2/3 of the 20dB BW		NT[Note2]
Number of Hopping Frequencies	§ 15.247(a)(1)(iii)	RSS-247, 5.1 d)	≥ 15		NT[Note2]
Time of Occupancy	§ 15.247(a)(1)(iii)	RSS-247, 5.1 d)	< 400 ms		NT[Note2]
Conducted Spurious Emissions	§ 15.247(d)	RSS-247, 5.5	> 20 dB for all out-of band emissions		NT[Note2]
Band Edge (Out of Band Emissions)	§ 15.247(d)	RSS-247, 5.5	> 20 dB for all out-of band emissions		NT[Note2]
AC Power line Conducted Emissions	§ 15.207(a)	RSS-GEN, 8.8	cf. Section 8.8		NT[Note2]
Radiated Spurious Emissions	§ 15.247(d), 15.205, 15.209	RSS-GEN, 8.9	cf. Section 8.7	Radiated	C[Note3]
Radiated Restricted Band Edge	§ 15.247(d), 15.205, 15.209	RSS-GEN, 8.9 RSS-GEN, 8.10	cf. Section 8.7		C[Note3]
Receiver Spurious Emissions	N/A	RSS-GEN, 7	cf. Section 8.9		NT[Note2]

Note:

1. C = Comply, NT = Not Tested, NA = Not Applicable, NC = Not Comply
2. C1PC model is electrically identical to the Original model.
   The Product Equality Declaration includes detailed information about the changes between the devices.
3. The data from that application has been verified through appropriate spot checks to demonstrate compliance for this device as shown in the test result of section 10
4. See SAR Report
5. Output power was verified to be within the expected tune up tolerances prior to performing the spot checks for radiated spurious emissions and band edge to confirm that the proposed changes to the digital circuitry had not adversely affected the previously reported values in the original filing.

10. TEST RESULT

10.1 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

Frequency	Measured Value	A.F + C.L + D.F	Ant. POL	Total	Limit	Margin
MHz	dBμV	dBm/m	H/V	dBμV/m	dBμV/m	dB
No Critical peaks found						

Note:

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = 40log (specific distance / test distance) (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor
4. Radiated test is performed with hopping off.

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F + C.L	Ant. POL	Total	Limit	Margin
MHz	dBμV	dBm/m	H/V	dBμV/m	dBμV/m	dB
No Critical peaks found						

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
2. Radiated test is performed with hopping off.

Frequency Range : Above 1 GHz

Operation Mode: CH Low(GFSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4804	44.27	3.87	V	0.00	48.14	73.98	25.84	PK
4804	44.27	3.87	V	-24.73	23.41	53.98	30.57	AV
7206	38.65	11.52	V	0.00	50.17	73.98	23.81	PK
7206	38.65	11.52	V	-24.73	25.44	53.98	28.54	AV
4804	43.95	3.87	H	0.00	47.82	73.98	26.16	PK
4804	43.95	3.87	H	-24.73	23.09	53.98	30.89	AV
7206	38.55	11.52	H	0.00	50.07	73.98	23.91	PK
7206	38.55	11.52	H	-24.73	25.34	53.98	28.64	AV

Operation Mode: CH Mid(GFSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4882	41.22	4.26	V	0.00	45.48	73.98	28.50	PK
4882	41.22	4.26	V	-24.73	20.75	53.98	33.23	AV
7323	38.59	11.86	V	0.00	50.45	73.98	23.53	PK
7323	38.59	11.86	V	-24.73	25.72	53.98	28.26	AV
4882	41.87	4.26	H	0.00	46.13	73.98	27.85	PK
4882	41.87	4.26	H	-24.73	21.40	53.98	32.58	AV
7323	38.64	11.86	H	0.00	50.50	73.98	23.48	PK
7323	38.64	11.86	H	-24.73	25.77	53.98	28.21	AV

Operation Mode: CH High(GFSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4960	42.08	4.81	V	0.00	46.89	73.98	27.09	PK
4960	42.08	4.81	V	-24.73	22.16	53.98	31.82	AV
7440	39.89	11.99	V	0.00	51.88	73.98	22.10	PK
7440	39.89	11.99	V	-24.73	27.15	53.98	26.83	AV
4960	41.78	4.81	H	0.00	46.59	73.98	27.39	PK
4960	41.78	4.81	H	-24.73	21.86	53.98	32.12	AV
7440	39.92	11.99	H	0.00	51.91	73.98	22.07	PK
7440	39.92	11.99	H	-24.73	27.18	53.98	26.80	AV

Operation Mode: CH Low(π/4DQPSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4804	43.96	3.87	V	0.00	47.83	73.98	26.15	PK
4804	43.96	3.87	V	-24.73	23.10	53.98	30.88	AV
7206	38.88	11.52	V	0.00	50.40	73.98	23.58	PK
7206	38.88	11.52	V	-24.73	25.67	53.98	28.31	AV
4804	43.62	3.87	H	0.00	47.49	73.98	26.49	PK
4804	43.62	3.87	H	-24.73	22.76	53.98	31.22	AV
7206	38.69	11.52	H	0.00	50.21	73.98	23.77	PK
7206	38.69	11.52	H	-24.73	25.48	53.98	28.50	AV

Operation Mode: CH Mid(π/4DQPSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4882	41.55	4.26	V	0.00	45.81	73.98	28.17	PK
4882	41.55	4.26	V	-24.73	21.08	53.98	32.90	AV
7323	38.68	11.86	V	0.00	50.54	73.98	23.44	PK
7323	38.68	11.86	V	-24.73	25.81	53.98	28.17	AV
4882	41.77	4.26	H	0.00	46.03	73.98	27.95	PK
4882	41.77	4.26	H	-24.73	21.30	53.98	32.68	AV
7323	38.71	11.86	H	0.00	50.57	73.98	23.41	PK
7323	38.71	11.86	H	-24.73	25.84	53.98	28.14	AV

Operation Mode: CH High (π/4DQPSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	41.99	4.81	V	0.00	46.80	73.98	27.18	PK
4960	41.99	4.81	V	-24.73	22.07	53.98	31.91	AV
7440	39.48	11.99	V	0.00	51.47	73.98	22.51	PK
7440	39.48	11.99	V	-24.73	26.74	53.98	27.24	AV
4960	41.58	4.81	H	0.00	46.39	73.98	27.59	PK
4960	41.58	4.81	H	-24.73	21.66	53.98	32.32	AV
7440	39.51	11.99	H	0.00	51.50	73.98	22.48	PK
7440	39.51	11.99	H	-24.73	26.77	53.98	27.21	AV

Operation Mode: CH Low(8DPSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4804	44.02	3.87	V	0.00	47.89	73.98	26.09	PK
4804	44.02	3.87	V	-24.73	23.16	53.98	30.82	AV
7206	38.74	11.52	V	0.00	50.26	73.98	23.72	PK
7206	38.74	11.52	V	-24.73	25.53	53.98	28.45	AV
4804	43.88	3.87	H	0.00	47.75	73.98	26.23	PK
4804	43.88	3.87	H	-24.73	23.02	53.98	30.96	AV
7206	38.68	11.52	H	0.00	50.20	73.98	23.78	PK
7206	38.68	11.52	H	-24.73	25.47	53.98	28.51	AV

Operation Mode: CH Mid(8DPSK)

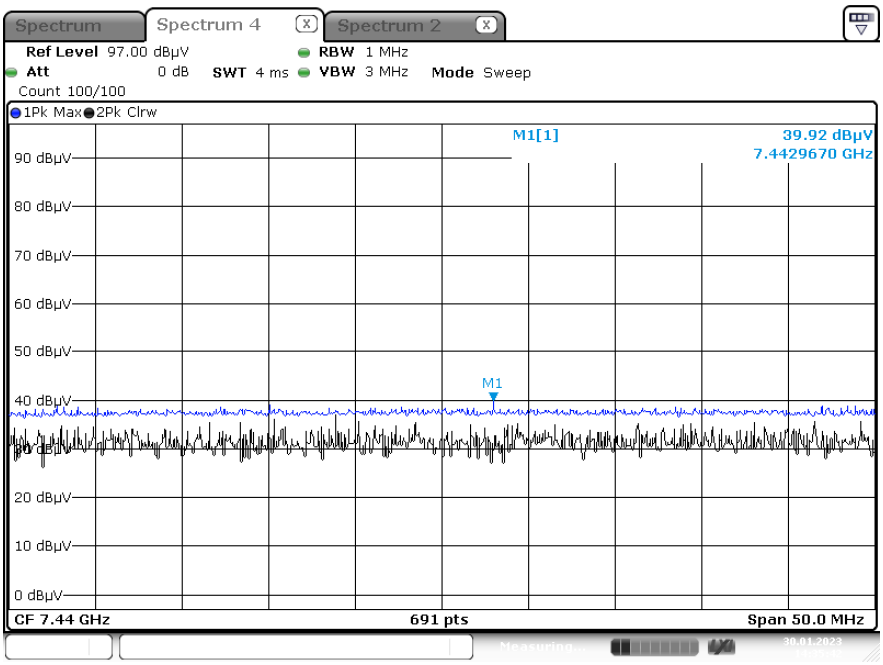
Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4882	41.32	4.26	V	0.00	45.58	73.98	28.40	PK
4882	41.32	4.26	V	-24.73	20.85	53.98	33.13	AV
7323	36.62	11.86	V	0.00	48.48	73.98	25.50	PK
7323	38.62	11.86	V	-24.73	25.75	53.98	28.23	AV
4882	41.68	4.26	H	0.00	45.94	73.98	28.04	PK
4882	41.68	4.26	H	-24.73	21.21	53.98	32.77	AV
7323	38.82	11.86	H	0.00	50.68	73.98	23.30	PK
7323	38.82	11.86	H	-24.73	25.95	53.98	28.03	AV

Operation Mode: CH High(8DPSK)

Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4960	41.98	4.81	V	0.00	46.79	73.98	27.19	PK
4960	41.98	4.81	V	-24.73	22.06	53.98	31.92	AV
7440	39.60	11.99	V	0.00	51.59	73.98	22.39	PK
7440	39.60	11.99	V	-24.73	26.86	53.98	27.12	AV
4960	41.75	4.81	H	0.00	46.56	73.98	27.42	PK
4960	41.75	4.81	H	-24.73	21.83	53.98	32.15	AV
7440	39.65	11.99	H	0.00	51.64	73.98	22.34	PK
7440	39.65	11.99	H	-24.73	26.91	53.98	27.07	AV

RESULT PLOTS

Radiated Spurious Emissions plot – Average & Peak Value (GFSK, Ch.78 3rd Harmonic, X-H)



Note:

Plot of worst case are only reported.

10.2 RADIATED RESTRICTED BAND EDGES

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

Frequency	Measured Value	※ A.F+C.L-A.G +ATT+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Detect
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	47.78	2.45	H	0	50.23	73.98	23.75	PK
2390.0	47.78	2.45	H	-24.73	25.50	53.98	28.48	AV
2390.0	48.03	2.45	V	0	50.48	73.98	23.50	PK
2390.0	48.03	2.45	V	-24.73	25.75	53.98	28.23	AV
2483.5	49.72	2.65	H	0	52.37	73.98	21.61	PK
2483.5	49.72	2.65	H	-24.73	27.64	53.98	26.34	AV
2483.5	66.69	2.65	V	0	69.34	73.98	4.64	PK
2483.5	66.69	2.65	V	-24.73	44.61	53.98	9.37	AV

Operation Mode	EDR(π/4DQPSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

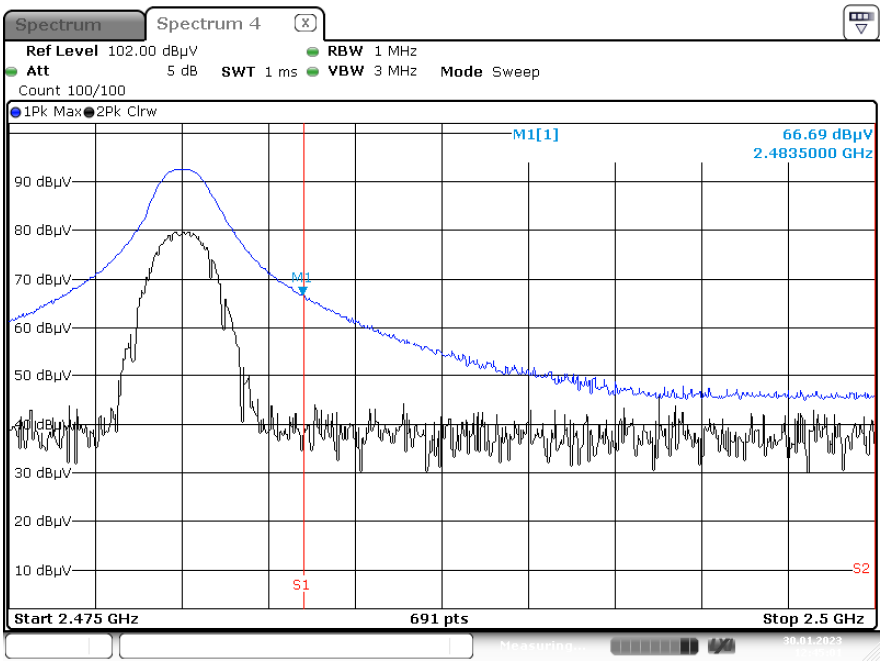
Frequency	Measured Value	※ A.F+C.L-A.G +ATT+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Detect
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	47.62	2.45	H	0	50.07	73.98	23.91	PK
2390.0	47.62	2.45	H	-24.73	25.34	53.98	28.64	AV
2390.0	48.02	2.45	V	0	50.47	73.98	23.51	PK
2390.0	48.02	2.45	V	-24.73	25.74	53.98	28.24	AV
2483.5	48.55	2.65	H	0	51.20	73.98	22.78	PK
2483.5	48.55	2.65	H	-24.73	26.47	53.98	27.51	AV
2483.5	66.63	2.65	V	0	69.28	73.98	4.70	PK
2483.5	66.63	2.65	V	-24.73	44.55	53.98	9.43	AV

Operation Mode	EDR(8DPSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

Frequency	Measured Value	※ A.F+C.L-A.G +ATT+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Detect
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	47.55	2.45	H	0	50.00	73.98	23.98	PK
2390.0	47.55	2.45	H	-24.73	25.27	53.98	28.71	AV
2390.0	48.12	2.45	V	0	50.57	73.98	23.41	PK
2390.0	48.12	2.45	V	-24.73	25.84	53.98	28.14	AV
2483.5	48.68	2.65	H	0	51.33	73.98	22.65	PK
2483.5	48.68	2.65	H	-24.73	26.60	53.98	27.38	AV
2483.5	66.53	2.65	V	0	69.18	73.98	4.80	PK
2483.5	66.53	2.65	V	-24.73	44.45	53.98	9.53	AV

RESULT PLOTS

Radiated Restricted Band Edges plot – Average & Peak Reading (GFSK, Ch.78, X-V)



Note:

Plot of worst case are only reported.

10.3 RECEIVER SPURIOUS EMISSIONS

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F + C.L	Ant. POL	Total	Limit	Margin
MHz	dBμV	dBm/m	H/V	dBμV/m	dBμV/m	dB
No Critical peaks found						

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

Frequency Range : Above 1 GHz

Frequency	Measured Value	A.F + C.L – A.G + D.F	Ant. POL	Total	Limit	Margin
MHz	dBμV	dBm/m	H/V	dBμV/m	dBμV/m	dB
No Critical peaks found						

11. LIST OF TEST EQUIPMENT

Radiated Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
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
EM1000 / Controller	EM1000	Audix	060520	N/A	N/A
Turn Table	N/A	Audix	N/A	N/A	N/A
Amp &Filter Bank Switch Controller	FBSM-01B	TNM system	TM19050002	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1300	01/18/2024	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	04/12/2023	Biennial
Spectrum Analyzer	FSV(10 Hz ~ 40 GHz)	Rohde & Schwarz	101055	05/16/2023	Annual
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/05/2024	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/13/2023	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/13/2023	Annual
High Pass Filter(7 GHz ~ 18 GHz)	WHKX10-7150-8000-18000-50SS	Wainwright Instruments	1	03/11/2023	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/01/2023	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/11/2023	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	04/05/2023	Annual
HPF(3~18GHz)+LNA1(1~18GHz)	FMSR-05B	TNM system	F6	01/17/2024	Annual
ATT(10dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/17/2024	Annual
ATT(3dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/17/2024	Annual
LNA1(1~18GHz)	FMSR -05B	TNM system	25540	01/17/2024	Annual
HPF(7~18GHz)+LNA2(6~18GHz)	FMSR -05B	TNM system	28550	01/17/2024	Annual
Thru(30MHz ~ 18GHz)	FMSR -05B	TNM system	None	01/17/2024	Annual

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).

12. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2302-FI003-P