On your side







TEST REPORT

FCC/ISED BT LE Test for MR24GA Certification

APPLICANT LG Electronics Inc.

REPORT NO. HCT-RF-2306-FI009

DATE OF ISSUE June 28, 2023

> Tested by Woong Jin Kim

Ant-

Technical Manager Jong Seok Lee

Accredited by KOLAS, Republic of KOREA

HCT CO., LTD. Bonesai Huch BongJai Huh / CEO

HCT CO., LTD. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA Tel. +82 31 634 6300 Fax. +82 31 645 6401 The report shall not be reproduced except in full(only partly) without approval of the laboratory.

F-TP22-03(Rev.04)

1/60

HCT Co., Ltd.
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Tel. +82 31 634 6300 Fax. +82 31 645 6401

Max. RF Output Power

Modulation type

FCC Classification

FC T e s

74, Seoic on-si, Gyeonggi-do, 17383 KOREA Tel. +82 3

TEST REPORT C/ISED BT LE St for MR24GA	REPORT NO. HCT-RF-2306-F1009 DATE OF ISSUE June 28, 2023 Additional Model -
Applicant	LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 17709, Republic of Korea
Eut Type Model Name	8
FCC ID	BEJMR24GA
IC	2703H-MR24GA

3.558 dBm (2.27 mW)

Digital Transmission System(DTS)

GFSK

FCC Rule Part(s) Part 15.247 RSS-247 Issue 2 (February 2017) ISED Rule Part(s) 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	June 28, 2023	Initial Release

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.

KOLAS Statement:

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (KOLAS Accreditation No. KT197)

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



CONTENTS

1. EUT DESCRIPTION	5
2. TEST METHODOLOGY	6
EUT CONFIGURATION	6
EUT EXERCISE	6
GENERAL TEST PROCEDURES	6
DESCRIPTION OF TEST MODES	7
3. INSTRUMENT CALIBRATION	7
4. FACILITIES AND ACCREDITATIONS	7
FACILITIES	7
EQUIPMENT	7
5. ANTENNA REQUIREMENTS	8
6. MEASUREMENT UNCERTAINTY	9
7. DESCRIPTION OF TESTS	10
8. SUMMARY TEST OF RESULTS	28
9. TEST RESULT	30
9.1 DUTY CYCLE	30
9.2 6 dB BANDWIDTH & 99 % BANDWIDTH	32
9.3 OUTPUT POWER	36
9.4 POWER SPECTRAL DENSITY	37
9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS	40
9.6 RADIATED SPURIOUS EMISSIONS	49
9.7 RADIATED RESTRICTED BAND EDGES	53
9.8 RECEIVER SPURIOUS EMISSIONS	55
10. LIST OF TEST EQUIPMENT	58
11. ANNEX A_ TEST SETUP PHOTO	60



1. EUT DESCRIPTION

Model	MR24GA		
Additional Model	-		
EUT Type	Magic Remote		
Power Supply	DC 3.00 V		
Frequency Range	2 402 MHz – 2 4	480 MHz	
	Peak	1 MBit/s : 3.558 dBm (2.27 mW)	
Max. RF Output Power	Average	1 MBit/s : 3.38 dBm (2.18 mW)	
Modulation Type	GFSK		
Bluetooth Version	4.2		
Number of Channels	40 Channels		
Antenna Specification	Antenna type: F Peak Gain : 1.53		
Date(s) of Tests	June 12, 2023	~ June 28, 2023	
EUT Serial Number	Conduction : 2 Radiation : 230		
PMN (Product Marketing Number)	Magic Remote		
HVIN (Hardware Version Identification Number)	MR24GA		
FVIN (Firmware Version Identification Number)	1.0.192.2		
HMN (Host Marketing Name)	N/A		
Manufacturer	LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 17709, Republic of Korea		
	Hansung Electronics CO.,LTD. 49-29, Cheomdangieop 4-ro, Sandong-myeon, Gumi-si, Gyeongsangbuk-do, Korea Jl. Rotan 1 Blok F27 No.37A Lippo, Cikarang Delta Silicon 3, Kelurahan Cicau, Kecamatan Cikarang Pusat, Kabupaten Bekasi, Indonesia 17530		
Factory	OHSUNG Electronics CO.,LTD. 335-4, Sanho-daero, Gumi-si, Gyeongsangbuk-do, KOREA No.188 Tunpu South Road, Qiushe Economic Development Zone, Tongli Town, Wujiang City, Jiangsu Province, China JI. Selayar Blok D7 Kawasan Industri MM 2100, Mekarwangi, Cikarang Barat 17845 Jawa Barat, Indonesia CERRADA CENTINELA 1719, PARQUE INDUSTRIAL CACHANILLA, MEXICALI, BAJA CALIFORNIA, MEXICO 21394		



2. TEST METHODOLOGY

FCC KDB 558074 D01 15.247 Meas Guidance v05r02 dated April 02, 2019 entitled "guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices and the measurement procedure described in ANSI C63.10(Version : 2013) 'the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices'.

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. / 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 30 MHz 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)





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 antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. 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."





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."

- (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.



6. 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 %, <i>k</i> =2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 (Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.82 (Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.74 (Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 (Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (Above 40 GHz)	5.52 (Confidence level about 95 %, <i>k</i> =2)



7. DESCRIPTION OF TESTS

7.1. Duty Cycle

Test Configuration

EUT .	Coax cable	Spectrum Analyzer	
	-		

Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method, 6.0)b) in KDB 558074 v05r02.

The largest available value of RBW is 8 MHz and VBW is 50 MHz.

The zero-span method of measuring duty cycle shall not be used if T \leq 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/T.

- 1. RBW = 8 MHz (the largest available value)
- 2. VBW = 8 MHz (\geq RBW)
- 3. SPAN = 0 Hz
- 4. Detector = Peak
- 5. Number of points in sweep > 100
- 6. Trace mode = Clear write
- 7. Measure T_{total} and T_{on}
- 8. Calculate Duty Cycle = T_{on}/T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

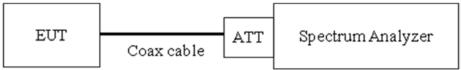


7.2. 6 dB Bandwidth & 99 % Bandwidth(ISED)

Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 8.2 in KDB 558074 v05r02,

Procedure 11.8.1 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW \geq 3 x RBW
- 3) Detector = Peak
- 4) Trace mode = Max hold
- 5) Sweep = auto couple
- 6) Allow the trace to stabilize
- 7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

Test Procedure (99 % Bandwidth for ISED)

The transmitter output is connected to the spectrum analyzer.

RBW = 1 % ~ 5 % of the occupied bandwidth VBW ≒ 3 x RBW Detector = Peak Trace mode = max hold Sweep = auto couple Allow the trace to stabilize

Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

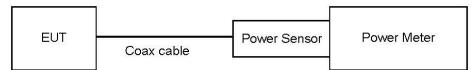


7.3. Output Power

Limit

The maximum permissible conducted output power is 1 Watt.

Test Configuration



Test Procedure

The transmitter output is connected to the Power Meter.

- Peak Power (Procedure 11.9.1.3 in ANSI 63.10-2013)
- : Measure the peak power of the transmitter.
- Average Power (Procedure 8.3.2.3 in KDB 558074 v05r02, Procedure 11.9.2.3 in ANSI 63.10-2013)
 - 1) Measure the duty cycle.
 - 2) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
 - 3) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Sample Calculation

- Conducted Output Power(Peak) = Measured Level + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Level + ATT loss + Cable loss + Duty Cycle Factor

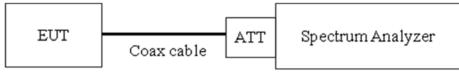


7.4. Power Spectral Density

Limit

The transmitter power density average over 1-second interval shall not be greater than 8 dBm in any 3 kHz BW.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 8.4 in KDB 558074 v05r02, Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set span to at least 1.5 times the OBW.
- 3) RBW = 3 kHz \leq RBW \leq 100 kHz.
- 4) VBW \geq 3 x RBW.
- 5) Sweep = auto couple
- 6) Detector = Peak
- 7) Trace mode = Max hold
- 8) Allow trace to fully stabilize.
- 9) Use the peak marker function to determine the maximum amplitude level.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
 If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Sample Calculation

• Power Spectral Density = Measured Level + ATT loss + Cable loss



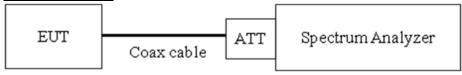


7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

Limit

The maximum conducted (Peak) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz. [Conducted > 20 dBc]

Test Configuration



Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 8.5 in KDB 558074 v05r02, Procedure 11.11 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW \geq 3 x RBW
- 3) Set span to encompass the spectrum to be examined
- 4) Detector = Peak
- 5) Trace Mode = Max hold
- 6) Sweep time = auto couple
- 7) Ensure that the number of measurement points \geq 2 x Span/VBW
- 8) Allow trace to fully stabilize.
- 9) Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

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Freq(MHz)	Factor(dB)
30	20.07
100	20.14
200	20.15
300	20.20
400	20.23
500	20.25
600	20.25
700	20.27
800	20.28
900	20.29
1000	20.33
2000	20.47
2400	20.55
2480	20.53
2500	20.49
3000	20.58
4000	20.67
5000	20.76
5150	20.75
5850	20.84
6000	20.82
7000	20.90
8000	20.94
9000	21.02
10000	21.07
11000	21.12
12000	21.14
13000	21.20
14000	21.24
15000	21.27
16000	21.31
17000	21.38
18000	21.50
19000	21.50
20000	21.56
21000	21.77
22000	21.74
23000	21.94
24000	21.77
25000	21.80
26000	21.80

Note : 1. 2400 ~ 2500 MHz is fundamental frequency range.

2. Factor = Attenuator loss + Cable loss

3. Spectrum offset Loss = Attenuator loss + Cable loss + EUT Cable loss(0.5 dB) = 21.05 dB



7.6. Radiated Test

<u>Limit</u>

FCC

Frequency (MHz)	Field Strength (<u>µV</u> /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 (<u>µ</u> A/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

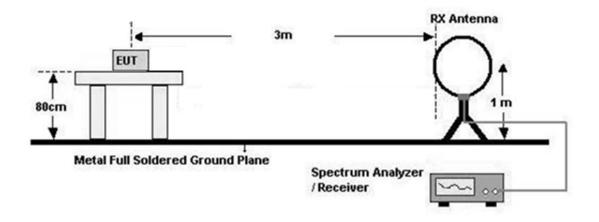
Frequency (MHz)	Field Strength (<u>µ</u> V/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3



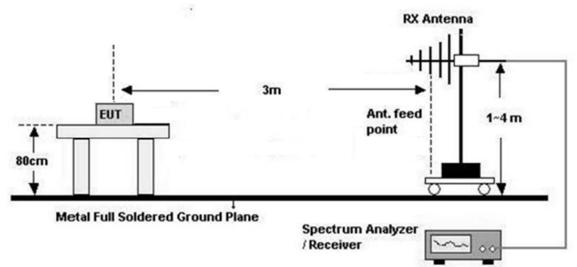
Report No. HCT-RF-2306-FI009

Test Configuration

Below 30 MHz



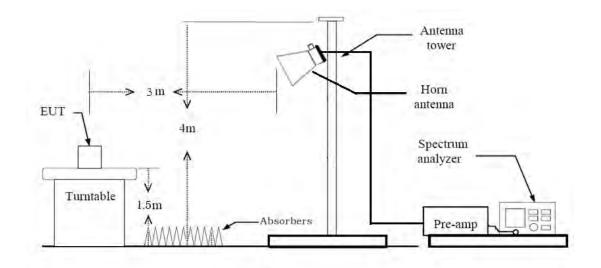
30 MHz - 1 GHz



Report No. HCT-RF-2306-FI009



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 \geq 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 \geq 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. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Measured Frequency Range 1 GHz 10th Harmonics
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 1 MHz
 - VBW \geq 3 x RBW
 - (2) Measurement Type(Average):
 - Duty cycle < 98%, duty cycle variations are less than $\pm 2\%$
 - Measured Frequency Range : 1 GHz 25 GHz
 - Detector = RMS
 - Averaging type = power (*i.e.*, RMS)
 - RBW = 1 MHz
 - VBW \geq 3 x RBW
 - Sweep time = auto.
- 9. 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.
- 10. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 11. Total (Measurement Type : Peak)
 - = Peak Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(G) + Distance Factor(D.F)
 - Total (Measurement Type : Average)
 - = Average Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(G)
 - + Distance Factor(D.F)

- The duty cycle factor was the maximum supported by the protocol , then we measured average with no correction.



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 1m to 4m 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. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Measured Frequency Range : 1 GHz 10th Harmonics
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 1 MHz
 - VBW \geq 3 x RBW
 - (2) Measurement Type(Average):
 - Duty cycle < 98%, duty cycle variations are less than $\pm 2\%$
 - Measured Frequency Range : 1 GHz 10th Harmonics
 - Detector = RMS
 - Averaging type = power (*i.e.*, RMS)
 - RBW = 1 MHz
 - VBW \geq 3 x RBW
 - Sweep time = auto.
 - Trace mode = average (at least 100 traces).
- 8. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 9. Total (Measurement Type : Peak
 - = Peak Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) Total(Measurement Type : Average)

= Average Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

- The duty cycle factor was the maximum supported by the protocol , then we measured average with no correction.

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.





7.7. AC Power line Conducted Emissions

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50μ H/50 ohms line impedance stabilization network (LISN).

Fraguenes Dange (MUT)	Limits	(dBµV)
Frequency Range (MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

Test Procedure

- 1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
- 2. The EUT is connected via LISN to a test power supply.
- 3. The measurement results are obtained as described below:
- 4. Detectors : Quasi Peak and Average Detector.

Sample Calculation

Quasi-peak(Final Result) = Measured Level + Correction Factor



7.8. Receiver Spurious Emissions

Limit

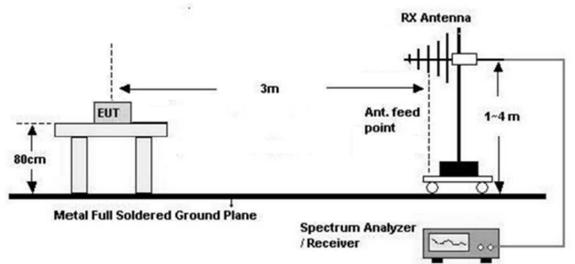
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

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)

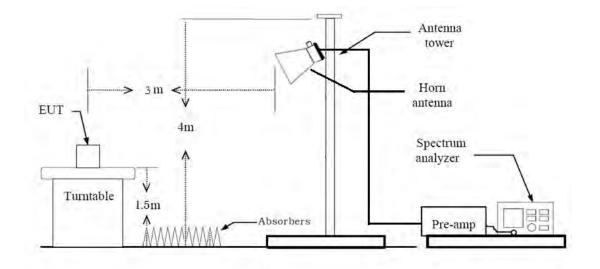
- 1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
- 2. The EUT is placed on a turntable, which is 0.8 m above ground plane.
- 3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1 m to 4 m to find out the highest emissions.
- 4. We have 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 \geq 3 x RBW
 - (2) Measurement Type(Quasi-peak):
 - Measured Frequency Range : 30 MHz 1 GHz
 - Detector = Quasi-Peak
 - RBW = 120 kHz
- 7. Total = Measured 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 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Measured Frequency Range : 1 GHz 25 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 1 MHz
 - VBW \geq 3 x RBW
 - (2) Measurement Type(Average):
 - Duty cycle < 98%, duty cycle variations are less than $\pm 2\%$
 - Measured Frequency Range : 1 GHz 25 GHz



- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW \geq 3 x RBW
- Sweep time = auto.
- 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.
- 9. Distance extrapolation factor = 20log (test distance / specific distance) (dB)

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



7.9. 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 : Z
 - Radiated Restricted Band Edge : X
- 3. All packet length of operation were investigated and the test results are worst case in lowest

packet length.

(Worst case : 37 Byte)

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

AC Power line Conducted Emissions

1. We don't perform powerline conducted emission test. Because this EUT is used DC.

Conducted test

1. The EUT was configured with packet length of highest power.



8. SUMMARY TEST OF RESULTS

FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§ 15.247(a)(2)	> 500 kHz		PASS
Conducted Maximum Output Power	§ 15.247(b)(3)	< 1 Watt	-	PASS
Power Spectral Density	§ 15.247(e)	§ 15.247(e) < 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	§ 15.247(d)	Conducted > 20 dBc	-	PASS
AC Power line Conducted Emissions	§ 15.207	cf. Section 7.7		N/A (#Note1)
Radiated Spurious Emissions	§ 15.247(d), 15.205, cf. Section 7.6 15.209		Dellard	PASS
Radiated Restricted Band Edge	§ 15.247(d), 15.205, 15.209	cf. Section 7.6	- Radiated	PASS

#Note1 : Not Tested

Report No. HCT-RF-2306-FI009



ISED Part

Test Description	ISED Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-247, 5.2	> 500 kHz		PASS
99% Bandwidth	RSS-GEN, 6.7	N/A		PASS
Conducted Maximum Peak Output Power And e.i.r.p.	RSS-247, 5.4.b	<1 Watt <4 Watt(e.i.r.p.)	Conducted	PASS
Power Spectral Density	RSS-247, 5.2	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	RSS-247, 5.5	Conducted > 20 dBc	-	PASS
AC Power line Conducted Emissions	RSS-GEN, 8.8	RSS-GEN section 8.8 table 4	-	N/A(#Note1)
Radiated Spurious Emissions	RSS-GEN, 8.9	RSS-GEN section 8.9 table 5, 6		PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.3	RSS-GEN section 7.3 table 3	Radiated	PASS
Radiated Restricted Band Edge	RSS-GEN, 8.10	RSS-GEN section 8.10 table 7	-	PASS

#Note1 : Not Tested



Report No. HCT-RF-2306-FI009

9. TEST RESULT

9.1 DUTY CYCLE

Data rate	Packet length	T _{on}	T _{total}	Duty Cycle	Duty Cycle Factor
(Bit/s)	(Byte)	(ms)	(ms)		(dB)
1M	37	0.417	0.626	0.666	1.77



IM Bit/s (37 Byte) Test Plots

	Duty Cycle (L	ow-CH 0)		
enter Freq 2.40200000 GHz PNO: Fast - IFGain:Low	EENSE:INT Trig: Free Run Atten: 10 dB	ALIGNAUTO #Avg Type: RMS	06:35:37 PM Jun 13, 2023 TRACE 2 2 4 5 TYPE WWWWWWW DET P N N N N N	Frequency
Ref Offset 21.05 dB Ref 20.00 dBm		4	ΔMkr3 625.7 μs 3.36 dB	Auto Tun
	γ1Δ2	304		Center Free 2.402000000 GH
20.0				Start Fre 2.402000000 GH
50.0		hrendesdeide		Stop Fre 2.402000000 GH
	W 8.0 MHz		Span 0 Hz .267 ms (1001 pts)	CF Ste 8.000000 MH Auto Ma
MKR MODE TRC XL XL 1 Δ2 1 t (Δ) 416.7 μs (Δ) 2 F 1 t 259.7 μs 3 Δ4 1 t (Δ) 625.7 μs (Δ) 4 F 1 t 259.7 μs (Δ) 625.7 μs (Δ) 6 -	-5.84 dBm	FUNCTION WIDTH	FUNCTION VALUE	Freq Offse
8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9		STATUS	*	



9.2 6 dB BANDWIDTH & 99 % BANDWIDTH

FCC

Mode (Bit/s)	Channel	6 dB Bandwidth (kHz)	Limit (kHz)
114	0	678.7	
1M	19	706.5	> 500
37 Byte	39	720.6	

IM Bit/s(37 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)	

RL 85 50.0 JC Center Freq 2.402000000 G	Hz Cente Trig: F	SBSELM 4 r Freq: 2.402000000 GHz ree Run Avg Hold: 1 : 20 dB	IGNAUTO 106:35:49 PM Jun 13; 21 Radio Std: None /1 Radio Device: BTS	Frequency
to dB/dlv Ref 20.00 dBm				
100 000		\sim		Center Freq 2.402000000 GHz
30.0	\sim		-	
10 0 50 0 50 0 50 0 50 0			manner	~
Center 2.402 GHz #Res BW 100 kHz	#	VBW 300 kHz	Span 5 M Sweep 2.533 r	HZ CF Step
Occupied Bandwidth	581 MHz	Total Power	10.2 dBm	Auto Man Freq Offset
Transmit Freq Error x dB Bandwidth	31.188 kHz 678.7 kHz	OBW Power x dB	99.00 % -6.00 dB	0 Hz
🕫 連 Points changed; all traces cle	ared		STATUS	

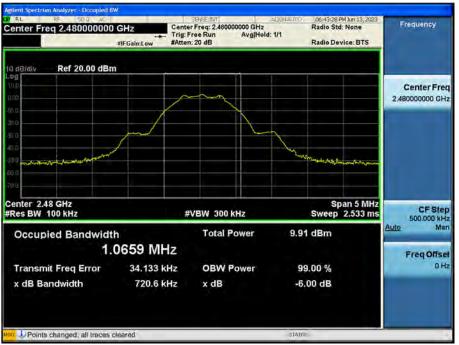
Report No. HCT-RF-2306-FI009



2.440000000 2.55 500.000 2.533 ms 2.533 ms 2.530 m 1.0710 MHz 2.57 500.0000 500.000 500.	RL 85 500 AC Center Freq 2.440000000	GHz Cente	rFreq: 2.440000000 GHz ree Run Avg Hol :: 20 dB	Radio Std:	mare	Frequency
Center 2.44 GHz #Res BW 100 kHz Cocupied Bandwidth 1.0710 MHz Transmit Freq Error 31.606 kHz OBW Power 99.00 %						
Center 2.44 GHz #Res BW 100 kHz Cocupied Bandwidth 1.0710 MHz Transmit Freq Error 31.606 kHz OBW Power 99.00 %	10.0 0.00 					Center Free 2.440000000 GH
#Res BW 100 kHz #VBW 300 kHz Sweep 2.533 ms CFS 500.000 Occupied Bandwidth Total Power 9.95 dBm Auto 1.0710 MHz Freq On Freq On Transmit Freq Error 31.606 kHz OBW Power 99.00 %	40.0 -00			human		
Occupied Bandwidth Total Power 9.95 dBm 1.0710 MHz Transmit Freq Error 31.606 kHz OBW Power 99.00 %		#	VBW 300 kHz			CF Ster 500.000 kH
Transmit Freq Error 31.606 kHz OBW Power 99.00 %			Total Power	9.95 dBm		Auto Mar Freq Offsel
						0 Ha

6 dB Bandwidth plot (Mid-CH 19)

6 dB Bandwidth plot (High-CH 39)





99 % Bandwidth(ISED)

Mode (Bit/s)	Packet length (Byte)	Channel	99 % Bandwidth (MHz)
	37	0	1.0401
1M		19	1.0508
		39	1.0456

IM Bit/s (37 Byte) Test Plots

Center Freq 2.402000000 GH	Center Trig: F	SBNSEINT rFreq: 2.402001 ree Run : 10 dB		416914UNC	Radio Std Radio Dev		Frequency
10 dB/div Ref 20.00 dBm					_		
Log 10.0 0.00 0.00 0.0 0.0 0.0 0.0		~	2-		mmm		Center Free 2.402000000 GHz
Center 2.402 GHz #Res BW 51 kHz	#	VBW 160 k	Hz			an 5 MHz 2.533 ms	CF Step 500.000 kH
Occupied Bandwidth	Total Power 10.8 dBm D1 MHz			10.8 dBm			<u>Auto</u> Mar
	38.635 kHz 594.9 kHz	OBW Po x dB	ower		9.00 % .00 dB		Freq Offsel 0 Hi
50				STATE	<i>Б</i> .		

99 % Bandwidth plot (Low-CH 0)

Report No. HCT-RF-2306-FI009



Center Freq 2.440000000	Trig:	sense with er Freq: 2.440000000 GHz Free Run Avg Hold n: 10 dB	Ra d: 1/1	dio Std: None dio Device: BTS	Frequency
10 dB/div Ref 20.00 dBn	•				
100 000 000		m			Center Fred 2.440000000 GH:
300 300 400	\sim	~	2		
50 7 50 8 www.m.m.m.m.m.m.m.m.m.m.m.m.m.m.m.m.m.m				minin	
Center 2.44 GHz #Res BW 51 kHz		€VBW 160 kHz	Sv	Span 5 MHz veep 2.533 ms	CF Ster
Occupied Bandwidt				3m	<u>Auto</u> Mar
Transmit Freg Error	0508 MHz 36.492 kHz	OBW Power	99.00	1%	Freq Offset 0 Hi
x dB Bandwidth	533.4 kHz	x dB	-6.00	dB	
			STATUS		

99 % Bandwidth plot (Mid-CH 19)

99 % Bandwidth plot (High-CH 39)





9.3 OUTPUT POWER

Peak Power

Data rate	Packet length	LE Mode		Measured	Limit	
(Bit/s)	(Byte)	Frequency [MHz]	Channel	Power(dBm)	(dBm)	
		2402	0	3.558	30	
1M	37	2440	19	3.370		
		2480	39	3.205		

Average Power

Data rate	Packet length	LE Mode		Measured Power	Duty Cycle Factor	Result Limit	
(Bit/s)	(Byte)	Frequency [MHz]	Channel	(dBm)	(dB)	(dBm)	(dBm)
1M	37	2402	0	1.61	1.77	3.38	30
		2440	19	1.46	1.77	3.23	
		2480	39	1.32	1.77	3.09	



9.4 POWER SPECTRAL DENSITY

			Test Re	sult
Frequency (MHz)	Channel No.	Mode (Bit/s)	Measured Power(dBm)	Limit (dBm/3 kHz)
2402	0		3.324	
2440	19	1M Bit/s	3.133	8
2480	39	37 Byte	3.006	

Note :

1. The PSD measured results in plot is already including the actual values of loss for the attenuator and cable combination.



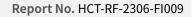
IM Bit/s (37 Byte) Test Plots



Power Spectral Density (Low-CH 0)

Power Spectral Density (Mid-CH 19)







Center F	RF 50.0 AC Treq 2.480000000	GHz PNO: Wide	Trig: Free Run Atten: 20 dB	#Avg Type: RMS Avg Hold: 1/1	06:57:15 PM Jun 13, 2023 TRACE 2 2 4 4 Type Mussion	Frequency
10 dB/div	Ref Offset 21.05 dB Ref 30.00 dBm			Mkr1 2	.480 028 1 GHz 3.006 dBm	Auto Tun
110						Center Fre 2.480000000 GH
(0.0) 0.0)			<u>(</u>)			Start Fre 2.479459552 GH
100						Stop Fre 2.480540448 GH
-30.0						CF Ste 108.090 kH Auto Ma
-50,0						Freq Offse 0 F
-60.0						
Center 2.4 #Res BW	4800000 GHz 100 kHz	#VBW	300 kHz	Sweep '	Span 1.081 MHz 1.000 ms (1001 pts)	

Power Spectral Density (High-CH 39)



9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Result : please refer to the plot below.

In order to simplify the report, attached plots were only the worst case channel and data rate.

[BAND EDGE]

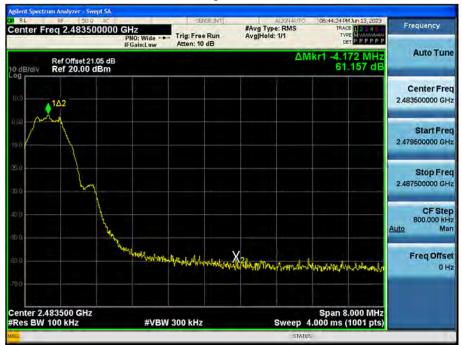
Frequency				Test	Result
Frequency (MHz)	Mode	Channel No.	Position	Measured Level	Limit
				(dB)	(dBc)
2402		0	Lower	58.737	20
2480	1M Bit/s 37 Byte	39	Upper	61.157	20



IM Bit/s (37 Byte) Test Plots -BandEdge

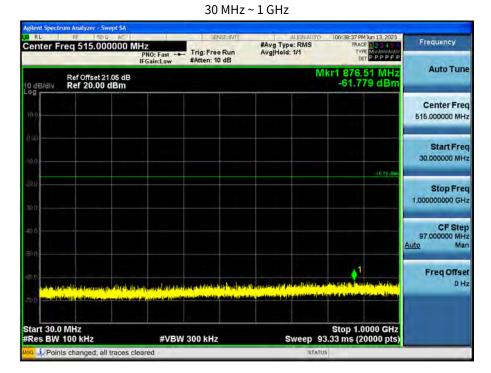


High-CH 39

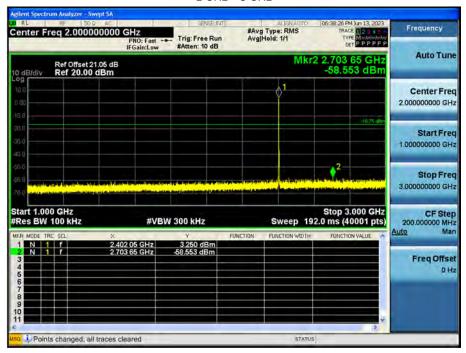


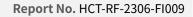


[CONDUCTED SPURIOUS EMISSIONS] 1M Bit/s 37 Byte Test Plots



1 GHz ~ 3 GHz



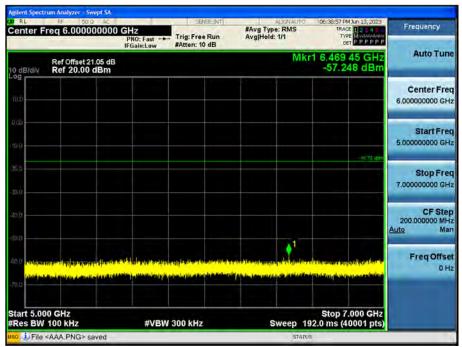




RL 8F 502 AC Center Freq 4.000000000	Trig: Free Run #Atten: 10 dB	#Avg Type: RMS Avg Hold: 1/1	06;38:47 PM Jun 13, 2023 TRACE 2 3 4 T TYPE Michanology DET P P P P P P	
Ref Offset 21.05 dB 0 dB/div Ref 20.00 dBm		Mkr	3.601 85 GHz -56.512 dBm	Auto Tune
1011				Center Free 4.000000000 GH
10 01			-15 75 cm	Start Fre 3.000000000 GH
20.0			-45/9 084	Stop Fre 5.000000000 GH
10,0				CF Ste 200.000000 MH Auto Ma
CO.O. (1999) 1991 1992 1994 1994 1994 1994 1994 1994		el de promotive par parte de la companya de la comp		Freq Offse 0 H
70.0 Start 3.000 GHz Res BW 100 kHz	300 kHz		Stop 5.000 GHz 2.0 ms (40001 pts)	

3 GHz ~ 5 GHz

5 GHz ~ 7 GHz

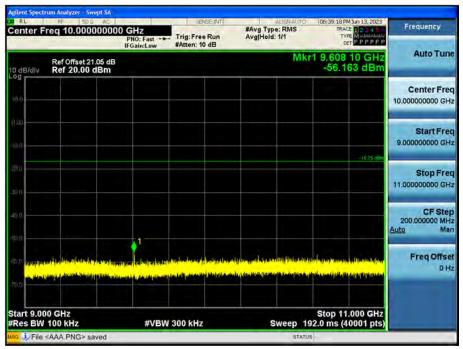




	EFast Trig: Free Ri in:Low #Atten: 10 dl	#Avg Type: RMS an Avg Hold: 1/1	06:39:07 PM Jun 13, 2023 TRACE 2 2 3 4 TYPE MINORMAN DET P P P P P	Frequency
Ref Offset 21.05 dB 0 dB/div Ref 20.00 dBm		MI	r1 7.264 85 GHz -57.147 dBm	Auto Tune
100				Center Free 8.000000000 GH
10.0				Start Fre 7.000000000 GH
0.0			-16.75 cm	Stop Fre 9.000000000 GH
0.0				CF Ste 200.000000 MH Auto Ma
1 10.7 Inhandlation, and a bardin and a stability of	and a summing of the sum	den dielfen de belandet der metstersteren er Referensigenen geben mit die gesteren er en steren	lan temperatury and the second second	Freq Offse 0 H
700 Start 7.000 GHz Res BW 100 kHz	#VBW 300 kHz		Stop 9.000 GHz 192.0 ms (40001 pts)	

7 GHz ~ 9 GHz

9 GHz ~ 11 GHz





ente		12.0000	000000		Trig: Free F	1000	#Avg Type: R Avg Hold: 1/1	MS	TRACE 2 2 4 5 1 TRACE 2 2 4 5 1 TYPE Michaelolut DET P P P P P P P	Frequency
_	_			Gain:Low	#Atten: 10 c				DETPPPPP	
0 dB/		ef Offset 21 ef 20.00 d						Mkr1 12.6 -5	36 50 GHz 6.633 dBm	Auto Tune
10 0 -										Center Free 12.000000000 GH
0.00									-16.75 cm	Start Fre 11.000000000 GH
30.0 20.0									-16/5/200	Stop Fre 13.000000000 GH
										CF Ste 200.000000 MH Auto Ma
80.0 A		de las yadis	ali bailarkat				a da manana da da Kanga da kata da manana	T Transis sites	a de al barra di sul a sul di di di Tanàn di Pangana di Sangara di Sang	Freq Offse 0 H
70.0 +										
	11.000 BW 100			#VBW	300 kHz		Swe		o 13.000 GHz s (40001 pts)	

11 GHz ~ 13 GHz

13 GHz ~ 15 GHz

EINSE INT ALIGN AUTO	06:39:39 PM Jun 13, 2023
#Avg Type: RMS ree Run Avg Hold: 1/1 10 dB	TRACE 2 2 4 5 Frequency TYPE MINIMUM Der P P P P P
Mkr1	14.981 15 GHz Auto Tun -54.595 dBm
	Center Fre 14.00000000 GH
	Start Fre 13.00000000 GH
	Stop Fre 15.00000000 GH
	CF Ste 200.000000 MH <u>Auto</u> Ma
na da an dan sa ka da an ang ka ka bahat ka sa bahat ka sa ba	Freq Offse
	Stop 15.000 GHz .0 ms (40001 pts)
Sweep 19.	

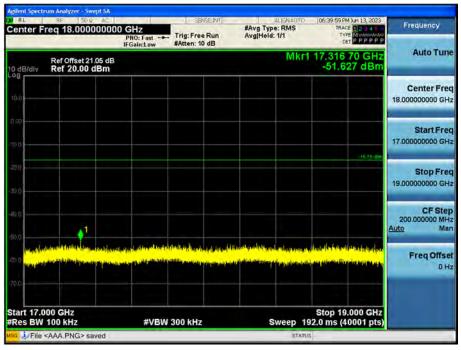




RL ap 502 Ac Center Freq 16.00000000	O GHZ	Trig: Free Run Atten: 10 dB	#Avg Type: RMS Avg Hold: 1/1	06:39:49 PM Jun 13, 2023 TRACE 2 2 3 4 3 0 TYPE M 00000000 DET P P P P P P	Frequency
Ref Offset 21.05 dB			Mkr1	15.100 40 GHz -53.965 dBm	Auto Tune
100					Center Free 16.000000000 GH
10.8				-16.75 daw	Start Fre 15.000000000 GH
30.0					Stop Fre 17.000000000 GH
۵.0					CF Ste 200.000000 MH <u>Auto</u> Ma
00.0 House and the second second second	late data di di Kuta dal Nationali di Kata dalar	alalaradi dalapanalar Alalah fizin ana ang	<mark>nan (aya (akada) juma) mitaman an</mark> ng ginala ang dalaman ang ang ang ang ang ang ang ang ang a	in da 14 fora (da da da da da) <mark>Anglas yapis padan sa tana da</mark>	Freq Offse 0 H
70.0 Start 15.000 GHz #Res BW 100 kHz	#VBW 3	00 kHz	Swaap 10	Stop 17.000 GHz 2.0 ms (40001 pts)	

15 GHz ~ 17 GHz

17 GHz ~ 19 GHz

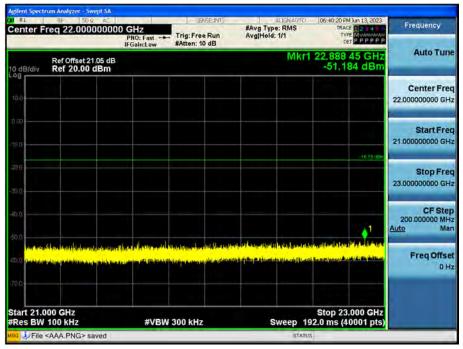




RL BF 502 AC Center Freq 20.000000000	GHZ PNO: Fast	Trig: Free Run #Atten: 10 dB	#Avg Type: RMS Avg Hold: 1/1	06:40:10 PM Jun 13, 2023 TRACE 2 2 3 4 TYPE MINIMUM DET P P P P P P	Frequency
Ref Offset 21.05 dB			Mkr1	20.925 55 GHz -51.912 dBm	Auto Tuni
19.0					Center Fre 20.000000000 GH
0.00					Start Fre 19.000000000 GH
30.0				-16.75 (20)	Stop Fre 21.000000000 GH
40.0				f1	CF Ste 200.000000 MH Auto Ma
ing produktion of the first of the state of	and a state of the data in the state of the	and here are a set	n den fil Den ste der Lens strakter st Inter ander inge der gegensten for	an an de de la tradicional de la constant en la constant de la c	Freq Offse 0 H
Start 19.000 GHz Res BW 100 kHz	#VBW	300 kHz	Sweep 19	Stop 21.000 GHz 2.0 ms (40001 pts)	

19 GHz ~ 21 GHz

21 GHz ~ 23 GHz





	PNO: Fast Trig:	Free Run	#Avg Type: Avg Hold: 1	RMS	6:40:30 PM 3.m 13, 2023 TRACE 2 3 4 TYPE MINNER	Frequency
Ref Offset 21.05 dB 0 dB/div Ref 20.00 dBm					.988 45 GH: -47.030 dBn	
18.0						Center Free 24.000000000 GH
0 m0 +						Start Fre- 23.000000000 GH
30.0					-16 75 00	Stop Fre 25.000000000 GH
	de ter or otherind	and the second state	a lasa bia w	elan da de inacional		CF Ste 200.000000 MH Auto Ma
20.0 Same region to the state of the state o		telling (left) (en alt)	e menterekeniken	lad Mint, on Park	Sardian din menerika Kelek	Freq Offse 0 H
70.0 Start 23.000 GHz #Res BW 100 kHz	#VBW 3001				top 25.000 GH; ms (40001 pts	

23 GHz ~ 25 GHz

Note :

Limit : -16.75 dBm



9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. POL	Total	Limit	Margin
MHz	dBµV/m	dB/m	(H/V)	dBµV/m	dBµV/m	dB
		No Critical peak	s found			

Note:

1. The Measured Level 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 ($dB\mu V$) + Distance extrapolation factor

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F+C.L	Ant. POL	Total	Limit	Margin
MHz	dBµV/m	dB/m	(H/V)	dBµV/m	dBµV/m	dB
	`	No Critical peaks fo	ound			

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

Mode : 1M Bit/s (37 Byte)

Operation Mode: CH Low

Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4804	46.85	3.74	V	50.59	73.98	23.39	PK
4804	39.51	3.74	V	43.25	53.98	10.73	AV
7206	38.71	11.83	V	50.54	73.98	23.44	РК
7206	26.48	11.83	V	38.31	53.98	15.67	AV
4804	47.19	3.74	Н	50.93	73.98	23.05	РК
4804	39.82	3.74	Н	43.56	53.98	10.42	AV
7206	38.95	11.83	Н	50.78	73.98	23.20	PK
7206	26.62	11.83	Н	38.45	53.98	15.53	AV

Operation Mode: CH Mid

Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4880	46.12	3.87	V	49.99	73.98	23.99	PK
4880	39.35	3.87	V	43.22	53.98	10.76	AV
7320	38.47	12.16	V	50.63	73.98	23.35	PK
7320	26.22	12.16	V	38.38	53.98	15.60	AV
4880	46.50	3.87	Н	50.37	73.98	23.61	PK
4880	39.62	3.87	Н	43.49	53.98	10.49	AV
7320	38.51	12.16	Н	50.67	73.98	23.31	PK
7320	26.35	12.16	Н	38.51	53.98	15.47	AV



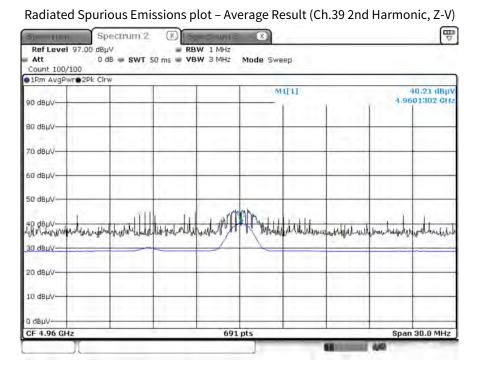
Report No. HCT-RF-2306-FI009

1	0						
Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4960	47.18	4.28	V	51.46	73.98	22.52	PK
4960	40.21	4.28	V	44.49	53.98	9.49	AV
7440	38.21	12.27	V	50.48	73.98	23.50	PK
7440	26.12	12.27	V	38.39	53.98	15.59	AV
4960	46.84	4.28	Н	51.12	73.98	22.86	PK
4960	39.60	4.28	Н	43.88	53.98	10.10	AV
7440	38.45	12.27	Н	50.72	73.98	23.26	PK
7440	26.35	12.27	Н	38.62	53.98	15.36	AV

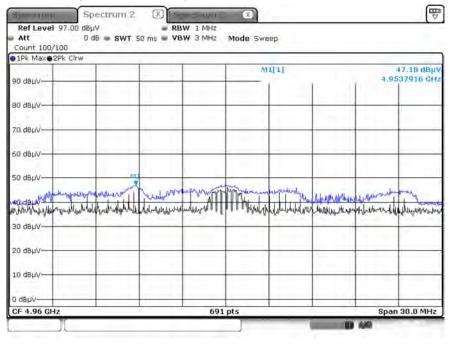
Operation Mode: CH High



IM Bit/s 37 Byte Test Plots



Radiated Spurious Emissions plot – Peak Result (Ch.39 2nd Harmonic, Z-V)



Note:

Plot of worst case are only reported.



9.7 RADIATED RESTRICTED BAND EDGES

Mode : 1 MBit/s (37 Byte)

Channel No.

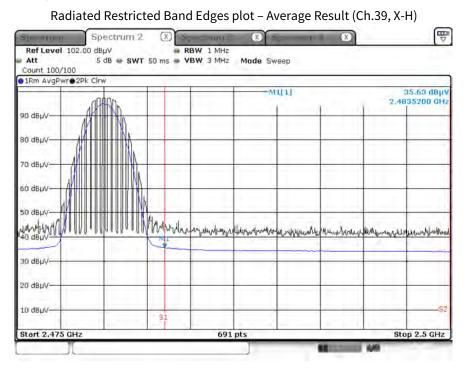
Operating Frequency

2402 MHz & 2480 MHz 0 & 39

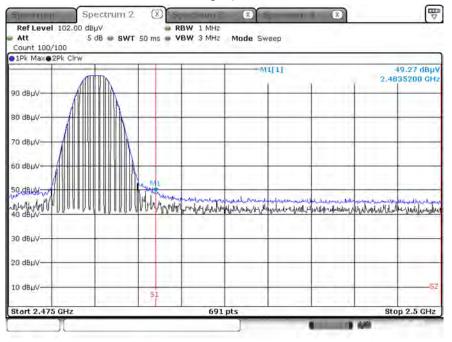
Frequency	Measured Value	Duty Cycle Factor	AF+CL+DF	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
2390.0	46.66	0.00	2.76	Н	49.42	73.98	24.56	PK
2390.0	34.63	1.77	2.76	Н	39.16	53.98	14.82	AV
2390.0	46.58	0.00	2.76	V	49.34	73.98	24.64	PK
2390.0	34.51	1.77	2.76	V	39.04	53.98	14.94	AV
2483.5	49.27	0.00	2.86	Н	52.13	73.98	21.85	PK
2483.5	35.63	1.77	2.86	Н	40.26	53.98	13.72	AV
2483.5	47.41	0.00	2.86	V	50.27	73.98	23.71	PK
2483.5	34.85	1.77	2.86	V	39.48	53.98	14.50	AV



IM Bit/s (37 Byte) Test Plots



Radiated Restricted Band Edges plot - Peak Result (Ch.39, X-H)



Note:

Plot of worst case are only reported.



9.8 RECEIVER SPURIOUS EMISSIONS

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. POL	Total	Limit	Margin		
MHz	dBµV/m	dB/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 Mode : 1M Bit/s (37 Byte)

Operation Mode: CH Low

Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4801	44.99	2.98	V	47.97	73.98	26.01	PK
4801	38.95	2.98	V	41.93	53.98	12.05	AV
4801	45.44	2.98	Н	48.42	73.98	25.56	РК
4801	39.44	2.98	Н	42.42	53.98	11.56	AV

Operation Mode: CH Mid

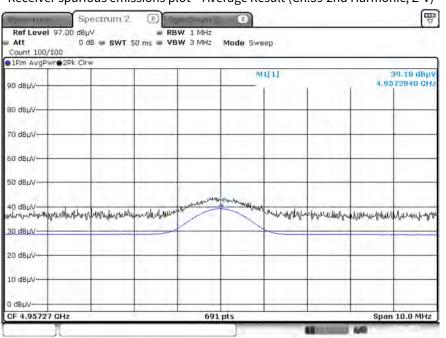
Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4877.3	45.02	3.19	V	48.21	73.98	25.77	PK
4877.3	38.75	3.19	V	41.94	53.98	12.04	AV
4877.3	45.18	3.19	Н	48.37	73.98	25.61	PK
4877.3	38.93	3.19	Н	42.12	53.98	11.86	AV

Operation Mode: CH High

Frequency	Measured Value	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4957.3	45.36	3.53	V	48.89	73.98	25.09	PK
4957.3	39.18	3.53	V	42.71	53.98	11.27	AV
4957.3	45.01	3.53	Н	48.54	73.98	25.44	PK
4957.3	38.85	3.53	Н	42.38	53.98	11.60	AV



IM Bit/s 37 Byte Test Plots



Receiver spurious emissions plot – Average Result (Ch.39 2nd Harmonic, Z-V)

Receiver spurious emissions plot - Peak Result (Ch.39 2nd Harmonic, Z-V)

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70 dBµV					-		-
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							12.1
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						1.00	1000
20 dBµV		-					
33.00		1.1.1.1.1.1			A	10.00	
10 dBµV							

Note:

Plot of worst case are only reported.



10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/22/2023	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	05/26/2024	Annual
Temperature Chamber	SU-642	ESPEC	0093008124	02/22/2024	Annual
Signal Analyzer	N9030A	Agilent	MY49432108	03/02/2024	Annual
Power Measurement Set	OSP 120	Rohde & Schwarz	101231	06/09/2024	Annual
Power Meter	N1911A	Agilent	MY45100523	03/06/2024	Annual
Power Sensor	N1921A	Agilent	MY57820067	03/06/2024	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/02/2023	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2024	Annual
DC Power Supply	E3632A	HP	KR75303243	04/24/2024	Annual
Attenuator(10 dB) (DC-26.5 GHz)	8493C	HP	08285	06/02/2024	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	03/08/2024	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	HCT CO., LTD.	N/A	N/A	N/A
Bluetooth Tester	CBT	Rohde & Schwarz	100808	02/16/2024	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.



Report No. HCT-RF-2306-FI009

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	BBHA 9120D	Schwarzbeck	9120D-2296	05/18/2024	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170342	09/29/2024	Biennial
Spectrum Analyzer	FSV(10 Hz ~ 40 GHz)	Rohde & Schwarz	101055	05/12/2024	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	06/12/2024	Annual
Band Reject Filter	WRCJV12-4900- 5100-5900-6100- 50SS	Wainwright Instruments	6	06/12/2024	Annual
High Pass Filter(7 GHz ~ 18 GHz)	WHKX10-7150- 8000-18000-50SS	Wainwright Instruments	1	03/02/2024	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/01/2023	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/02/2024	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/28/2024	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).





Report No. HCT-RF-2306-FI009

11. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2306-FI009-P