

TEST REPORT

FCC BT LE Test for T9

APPLICANT VC Inc.

REPORT NO. HCT-RF-2112-FC046

DATE OF ISSUE December 24, 2021

> Tested by Chang Hee Hwang

Technical Manager Jong Seok Lee

Ho

HCT CO., LTD. Bonejai Huh 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)

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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

TEST REPORT FCC BT LE Test for T9	REPORT NO. HCT-RF-2112-FC046 DATE OF ISSUE December 24, 2021 Additional Model -
Applicant	VC Inc. 3F-4F, Hwawon Building, 417, Nonhyeon-ro, Gangnam-gu, Seoul, Republic of Korea
Eut Type Model Name	Voice Caddie GPS Golf Watch T9
FCC ID	2ABTKT9
Max. RF Output Power	0.698 dBm (1.17 mW)
Modulation type	GFSK
FCC Classification	Digital Transmission System(DTS)
FCC Rule Part(s)	Part 15.247
	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	December 24, 2021	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 Rules under normal use and maintenance.

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





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1. EUT DESCRIPTION

ModelT9Additional Model-EUT TypeVoice Caddie Gaddie Gadie Gaddi								
EUT TypeVoice Caddie GPS Golf WatchPower SupplyDC 3.7 VFrequency Range $2402 \text{ MHz} - 248 \cup \text{MHz}$ Max. RF Output Power $Peak$ $1 \text{ M Bit/s} : 0.649 \text{ dBm } (1.16 \text{ mW})$ $2 \text{ M Bit/s} : 0.698 \text{ dBm } (1.17 \text{ mW})$ Max. RF Output Power $Peak$ $1 \text{ M Bit/s} : 0.598 \text{ dBm } (1.13 \text{ mW})$ $2 \text{ M Bit/s} : 0.55 \text{ dBm } (1.13 \text{ mW})$ $2 \text{ M Bit/s} : 0.58 \text{ dBm } (1.14 \text{ mW})$ Modulation TypeGFSKBluetooth Version 5.0 Number of Channels 40 Channels Antenna typeDielectric Chip AntennaAntenna Peak Gain 1.8 dBi Date(s) of TestsDecember $8, 2 \cup 1 \sim \text{ December 16, 2021}$ EUT serial numbers $Radiated: VCT \cup 2100184$	Model	Т9						
Power SupplyDC 3.7 VFrequency Range2402 MHz - 2480 MHzMax. RF Output PowerPeak1 M Bit/s : 0.649 dBm (1.16 mW) 2 M Bit/s : 0.698 dBm (1.17 mW)Modulation TypeAverage1 M Bit/s : 0.55 dBm (1.13 mW) 2 M Bit/s : 0.58 dBm (1.14 mW)Modulation TypeGFSKBluetooth Version5.0Number of Channels40 ChannelsAntenna typeDielectric Chip AntennaAntenna Peak Gain1.8 dBiDate(s) of TestsDecember 8, 2021 ~ December 16, 2021EUT serial numbersRadiated: VCT95100184	Additional Model	-	-					
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Anderson Production of the product	Power Supply	DC 3.7 V						
Max. RF Output PowerPeak2 M Bit/s : 0.698 dBm (1.17 mW)Average1M Bit/s : 0.55 dBm (1.13 mW) 2M Bit/s : 0.58 dBm (1.14 mW)Modulation TypeGFSKBluetooth Version5.0Number of Channels40 ChannelsAntenna typeDielectric Chip AntennaAntenna Peak Gain1.8 dBiDate(s) of TestsDecember 8, 2021 ~ December 16, 2021EUT serial numbersRadiated: VCT9G2100184	Frequency Range	2402 MHz - 2	480 MHz					
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Antenna Peak Gain1.8 dBiDate(s) of TestsDecember 8, 2021 ~ December 16, 2021EUT serial numbersRadiated: VCT9G2100184	Number of Channels	40 Channels	40 Channels					
Date(s) of Tests December 8, 2021 ~ December 16, 2021 EUT serial numbers Radiated: VCT9G2100184	Antenna type	Dielectric Ch	ip Antenna					
EUT serial numbers Radiated: VCT9G2100184	Antenna Peak Gain	1.8 dBi	1.8 dBi					
EUT serial numbers	Date(s) of Tests	December 8,	. 2021 ~ December 16, 2021					
		Radiated: VC	T9G2100184					
	EUT Serial numbers	Conducted:	VCT9G2100130					



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.

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).

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

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.

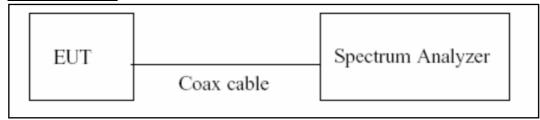
Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (Confidence level about 95 %, k=2)



7. DESCRIPTION OF TESTS

7.1. Duty Cycle

Test Configuration



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)

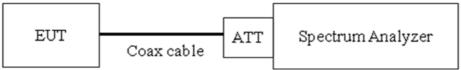


7.2. 6dB Bandwidth

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.

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



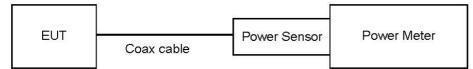


7.3. Output Power

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



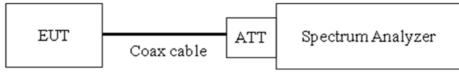


7.4. Power Spectral Density

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 Value + ATT loss + Cable loss

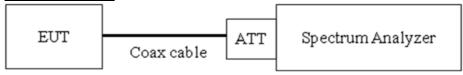


7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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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Factors for frequency

Freq(MHz)	Factor(dB)
30	10.04
100	10.07
200	10.12
300	10.17
400	10.20
500	10.21
600	10.21
700	10.23
800	10.24
900	10.26
1000	10.27
2000	10.40
2400	10.43
2500	10.45
3000	10.52
4000	10.60
5000	10.71
6000	10.73
7000	10.80
8000	10.85
9000	10.91
10000	10.97
11000	11.02
12000	11.10
13000	11.19
14000	11.16
15000	11.21
16000	11.22
17000	11.25
18000	11.30
19000	11.32
20000	11.36
21000	11.48
22000	11.55
23000	11.55
24000	11.59
25000	11.68

Note : 1. 2400 \sim 2500 MHz is fundamental frequency range.

2. Factor = Attenuator loss(10 dB) + Cable loss(1ea)

3. EUT Cable loss = 0.5 dB





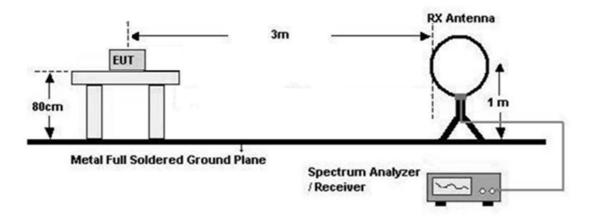
7.6. Radiated Test

Limit

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
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

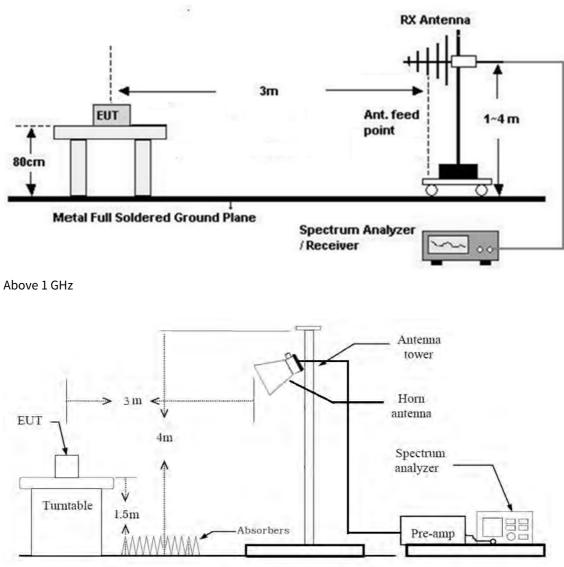
Below 30 MHz



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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 = Max hold
 - 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 = Max hold
 - 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. 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 1 m to 4 m 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. The unit was tested with its standard battery.
- 8. Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)
 - (1) Measurement Type(Peak):
 - Measured Frequency Range : 1 GHz 25 GHz
 - Detector = Peak
 - Trace = Max hold
 - RBW = 1 MHz
 - VBW \geq 3 x RBW
 - (2) Measurement Type(Average):
 - Duty cycle < 98 %, duty cycle variations are less than ± 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.
 - Trace mode = average (at least 100 traces).
 - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1

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) + Duty Cycle Factor

Test Procedure of Radiated Restricted Band Edge

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 1 m to 4 m 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 : 2310 MHz \sim 2390 MHz/ 2483.5 MHz \sim 2500 MHz
 - Detector = Peak
 - Trace = Max hold
 - 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 : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
 - 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).
 - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.





- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

- 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(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)
 - + Duty Cycle Factor



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 $50 \,\mu$ H/50 ohms line impedance stabilization network (LISN).

	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) = Reading Value + Correction Factor





7.8. 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, Stand alone+ Travel adaptor + charge cable
- Worstcase : Stand alone
- 2. EUT Axis:
 - Radiated Spurious Emissions : X, Y
 - Radiated Restricted Band Edge : Y, Z
- 3. All packet length of operation were investigated and the test results are worst case in lowest packet length.
 - Worst case : 1M 37Bytes
- 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. All modes of operation were investigated and the worst case configuration results are reported.

- Mode : Stand alone + Travel adaptor + charge cable + Notebook
- Worst case : Stand alone + Travel adaptor + charge cable + Notebook

Conducted test

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

EUT supported All mode was tested.



8. SUMMARY TEST OF RESULTS

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)	< 8 dBm / 3 kHz Band	Conducted	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		PASS
Radiated Spurious Emissions	§ 15.247(d), 15.205, 15.209	cf. Section 7.6	Dediated	PASS
Radiated Restricted Band Edge	§ 15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS

9. TEST RESULT

9.1 DUTY CYCLE

Data rate (Bit/s)	Packet length (Byte)	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
1 M	37	0.362	0.480	0.754	1.23
1 M	255	2.108	2.224	0.948	0.23
2.14	37	0.188	0.306	0.614	2.12
2 M	255	1.061	1.179	0.900	0.46



I M Bit/s(37 Byte) Test Plots

enter	Fr	RF 99		00000	GHz PNO: Fat IFGain:Lo		Trig: Fr		#Av:	g Type: RMS		TYPE	Dec 10, 2021	Frequency
0 dB/div			Offset 1 20.00		IFGain:LC	JW .	Pateri				Δ١	/kr3 48 1	80.0 µs .20 dB	Auto Tun
09 10.0						1	X					↑1∆2	3∆4	Center Fre 2.402000000 GH
00														Start Fre 2.402000000 GH
00 00 00						laber	vaqahay					Walthan	w.pri	Stop Fre 2.402000000 GH
enter es BW			00000 z	GHz	#	VBW	8.0 MH	z		Swee	p 1.00		oan 0 Hz 001 pts)	8.000000 MH
KR MODE 1 Δ2 2 F	TRO 1	t t	(Δ)	×	362.0 µs 474.0 µs		-1.32	3 dB dBm	FUNCTION	FUNCTION	NDTH	FUNCTION	VALUE A	Auto Ma
Δ4 4 5 6 7 8 9	1	t	<u>(</u> Δ)		480.0 μs 474.0 μs		-1.32	0 dB dBm						Freq Offse 0 H

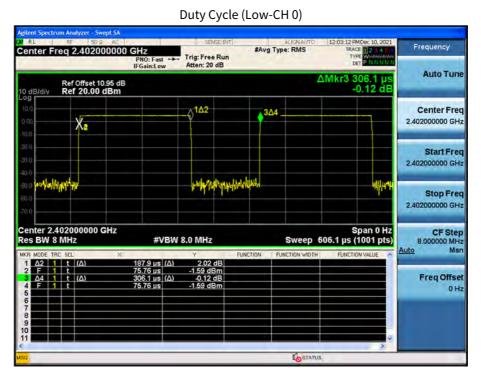
I M Bit/s(255 Byte) Test Plots

Duty Cycle (Low-CH 0)

enter Freq 2.402	2000000 GHz PN0: Fast	SENSE INT	#Avg Type: RMS	10:28:56 AM Dec 10, 2021 TRACE 2 3 4 5 TYPE	Frequency
	IFGain:Low	Atten: 20 dB		DET PININININ	Auto Tune
Ref Offsel			ΔΝ	/kr3 2.224 ms 1.45 dB	Autorun
	1 1				Center Fre
0.0	X.				2.40200000 011
100 100					Start Fre 2.402000000 GH
00 00	Hay		ALM .		
20 A					Stop Fre 2.402000000 GH
enter 2.40200000 es BW 8 MHz		W 8.0 MHz	Sweep 4.0	Span 0 Hz 00 ms (1001 pts)	CF Ste 8.000000 MH
KR MODE TRC SCL	× 2.108 ms (/		UNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Ma
2 F 1 t 3 Δ4 1 t (Δ) 4 F 1 t	812.0 µs 2.224 ms (/ 812.0 µs	-2.12 dBm			Freq Offse
5 1 1 1 1 1 1 1 1 1 1					
8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9					
1				v.	



2 M Bit/s(37 Byte) Test Plots



2 M Bit/s(255 Byte) Test Plots

Duty Cycle (Low-CH 0)

enter	Fre	RF q 2	40200	0000 GHz	: Fast ++	SENSE IN Trig: Free Run Atten: 20 dB	#Av	g Type: RMS	12:08:25 PM Dec 1 TRACE 12 TYPE OF DET P	3450	Frequency
0 dB/div			Offset 10. 20.00 d	95 dB	in:Low	Aden: 20 db			ΔMkr3 1.179 2.24	ms dB	Auto Tun
09 10,0 0.00					< <mark>a</mark>				102 304		Center Fre
20:0 30:0 40:0											Start Fre
50 0 60 9 70 0				freesed					wijiki		Stop Fre .40200000 GH
Res BW	V 8 N	ЛHz	00000 G		#VBW	8.0 MHz			Span 2.267 ms (100	i pts)	CF Ste 8.000000 MH
I A2			(Δ)	× 1.06 ⁴	ms (A)	1.41 dB	FUNCTION	FUNCTION WIDT	H FUNCTION VAL	JE	
2 F 3 Δ4 4 F 5 6	1		(Δ)	704. 1.179 704.	ms (Δ)	0.11 dBm 2.24 dB 0.11 dBm					Freq Offse 0 H
7 8 9 10										2	
		-	_					Lo STAT	115	2	



9.2 6dB BANDWIDTH

Mode	Channel	6 dB Bandwidth	Limit (kHz)	
(Bit/s)	Channel	(kHz)		
	0	520.8		
1 M 37 Byte	19	521.0	> 500	
-	39	511.7		
	0	518.5		
1 M 255 Byte	19	520.2	> 500	
-	39	522.4		
	0	896.0		
2 M 37 Byte	19	837.6	> 500	
-	39	697.3		
	0	809.4		
2 M 255 Byte	19	813.9	> 500	
-	39	886.7		

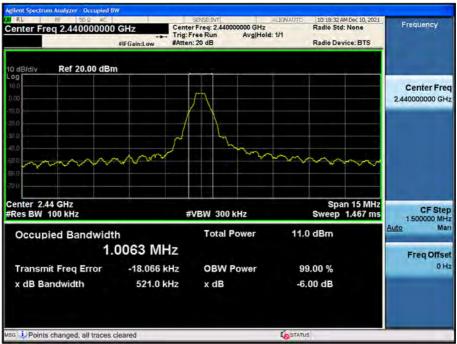


■ 1 M Bit/s(37 Byte) Test Plots



6 dB Bandwidth plot (Low-CH 0)

6 dB Bandwidth plot (Mid-CH 19)







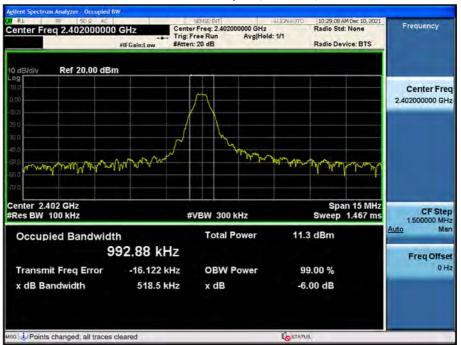
Stent Spectrum Analyzer - Occupied BW RL RF 50 2 #C SEVERINT SUSPECTION 10:20-23 AM Dec 10, 2 Senter Freq 2.480000000 GHz Radio Std: None #IFGain:Luw #Atten: 20 dB Radio Device: BTS					Frequency	
10 dB/div Ref 20.00 dBn	n					
10.0 0.00 		\bigwedge			Center Fre 2.480000000 GH	
-40,0 50,0 68,0 -70,0	~~~~^			~~~~		
Center 2.48 GHz #Res BW 100 kHz		#VBW 300 kHz	Sv	Span 15 MHz veep 1.467 ms	CF Step 1.500000 MH <u>Auto</u> Ma	
Occupied Bandwidt	հ 0175 MHz	Total Power	10.8 dE	3m		
	-20.765 kHz 511.7 kHz	765 kHz OBW Power		dB	Freq Offse 0 H:	
Isg 🧼 Points changed; all traces	cleared		STATUS			

6 dB Bandwidth plot (High-CH 39)



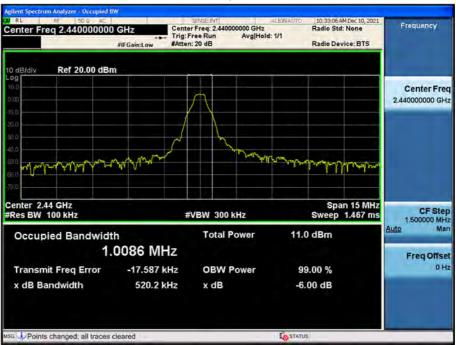
Report No. HCT-RF-2112-FC046

■ 1 M Bit/s(255 Byte) Test Plots



6 dB Bandwidth plot (Low-CH 0)

6 dB Bandwidth plot (Mid-CH 19)







	ter Freq 2.480000000 GHz #FGain:Low #FGain:Low #Atten: 20 dB Radio Device; BTS				
10 dB/div Ref 20.00 dBn Log 10.0) 			Center Fre 2.48000000 GH	
10.0 30.0 40.0 50.0 50.0 50.0 50.0 50.0 50.0 5	www.w	the second se	a man an a	r	
Center 2.48 GHz #Res BW 100 kHz		#VBW 300 kHz	Span 15 M Sweep 1.467		
Occupied Bandwidth 1.0093 MHz Transmit Freq Error x dB Bandwidth 522.4 kHz		Total Power OBW Power x dB	11.1 dBm 99.00 % -6.00 dB	Freq Offse 0 H	
855 🤳 Points changed; all traces o	leared		L'ASTATUS		

6 dB Bandwidth plot (High-CH 39)

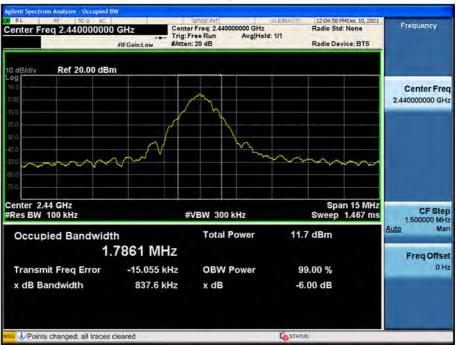


2 M Bit/s(37 Byte) Test Plots



6 dB Bandwidth plot (Low-CH 0)

6 dB Bandwidth plot (Mid-CH 19)







RL RE 500 AC Center Freq 2.480000000	GHz Cente Trig: F	SENSEINT r Freq: 2.480000000 GHz ree Run Avg Hold: ;: 20 dB	12:06:08 PMDec 10 Radio Std: None 1/1 Radio Device: B1	Frequency
10 dB/div Ref 20.00 dBm				
		My My		Center Free 2.480000000 GH
Center 2.48 GHz #Res BW 100 kHz	#	VBW 300 kHz	Span 15 l Sweep 1.467	
Occupied Bandwidth		Total Power	11.4 dBm	Auto Mar
Transmit Freq Error x dB Bandwidth	-6.844 kHz 697.3 kHz	OBW Power x dB	99.00 % -6.00 dB	Freq Offse 0 H
use 1 Points changed: all traces c	eared		Lostatus	

6 dB Bandwidth plot (High-CH 39)



2 M Bit/s(255 Byte) Test Plots



6 dB Bandwidth plot (Low-CH 0)

6 dB Bandwidth plot (Mid-CH 19)







RL 85 500 45 Center Freq 2.480000000						
10 dB/div Ref 20.00 dBn	<u>,</u>			_		
100 100 100 100 100 100 100 100			n an	m	Center Fre 2.480000000 GH	
Center 2.48 GHz #Res BW 100 kHz	#	VBW 300 kHz		an 15 MHz 1.467 ms	CF Ste 1.500000 MH	
Occupied Bandwidt		Total Power	12.2 dBm		Auto Mar	
1. Transmit Freq Error x dB Bandwidth	8351 MHz -19.094 kHz 886.7 kHz	OBW Power x dB	99.00 % -6.00 dB		Freq Offse 0 H	
usg 1 Points changed; all traces	leared		STATUS		_	

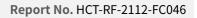
6 dB Bandwidth plot (High-CH 39)



9.3 OUTPUT POWER

Peak Power

Data rate	Packet length	LE M	lode	Measured	Limit
(Bit/s)	(Byte)	Frequency (MHz)	Channel	Power (dBm)	(dBm)
		2402	0	0.649	
	37	2440	19	0.581	
1.14		2480	39	0.553	
1 M —		2402	0	0.636	
	255	2440	19	0.569	
		2480		0.539	
		2402	0	0.698	- 30
	37	2440	19	0.608	
2.14		2480	39	0.602	_
2 M		2402	0	0.643	
	255	2440	19	0.594	
		2480	39	0.533	





Average Power

Data rate	Packet length	LE M	ode	Measured	Duty Cycle Factor	Result	Limit
(Bit/s)	(Byte)	Frequency (MHz)	Channel	Power (dBm)	(dB)	(dBm)	(dBm)
		2402	0	-0.68	1.23	0.55	
	37	2440	19	-0.75	1.23	0.48	
1.14		2480	39	-0.81	1.23	0.42	
1 M	255	2402	0	0.31	0.23	0.54	_
		2440	19	0.29	0.23	0.52	
		2480	39	0.25	0.23	0.48	
		2402	0	-1.54	2.12	0.58	- 30
	37	2440	19	-1.66	2.12	0.46	
2 M		2480	39	-1.69	2.12	0.43	
		2402	0	0.08	0.46	0.54	
	255	2440	19	0.06	0.46	0.52	
		2480	39	0.02	0.46	0.48	

Note :

1. Power meter offset = Attenuator loss + Cable loss + EUT Cable loss

2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.

So, 10.95 dB is offset for 2.4 GHz Band.





9.4 POWER SPECTRAL DENSITY

			Test Resu	ılt	
Frequency (MHz)	Channel No.	Mode (Bit/s)	Measured Power(dBm)	Limit (dBm)	
2402	0		0.591		
2440	19	1 M 37 Byte	0.521	-	
2480	39	ST Dyte	0.488		
2402	0		0.555		
2440	19	1 M 255 Byte	0.527		
2480	39	200 2900	0.478	0	
2402	0		0.607	8	
2440	19	2 M 37 Byte	0.514		
2480	39	<i></i>	0.491		
2402	0		0.542		
2440	19	2 M 255 Byte	0.498		
2480	39		0.434		

Note :

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

2. Spectrum offset = Attenuator loss + Cable loss + EUT cable loss

3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.

So, 10.95 dB is offset for 2.4 GHz Band.



2 M Bit/s (37 Byte) Test Plots



Power Spectral Density (Mid-CH 19)







RL RF 500 40 Center Freq 2.48000000		SENSE INT Trig: Free Run Atten: 20 dB	#Avg Type: RMS Avg Hold: 1/1	02:05:33 PMDec 10, 2021 TRACE 2 2 4 5 TYPE MWWWWWWW DET PHINNIN	
Ref Offset 10.95 dE	3		Mkr1 2	.479 977 5 GHz 0.491 dBm	
10.0					Center Free 2.480000000 GH
10.0					Start Fre 2,479477017 GH
30.0					Stop Fre 2.480522983 GH
-40.0					CF Ste 104.597 kH Auto Ma
-60,0					Freq Offs 0 H
Center 2.4800000 GHz				Span 1.046 MHz	
#Res BW 100 kHz		300 kHz	Sweep	1.021 ms (697 pts)	

Power Spectral Density (High-CH 39)



고 객 비 밀 CUSTOMER SECRET

Report No. HCT-RF-2112-FC046

9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

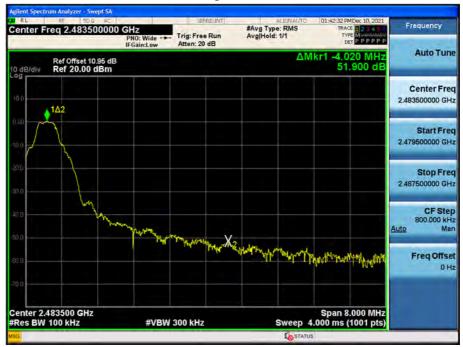
Test Result : please refer to the plot below. In order to simplify the report, attached plots were only the worst case channel and data rate.



I M Bit/s (37 Byte) Test Plots -BandEdge



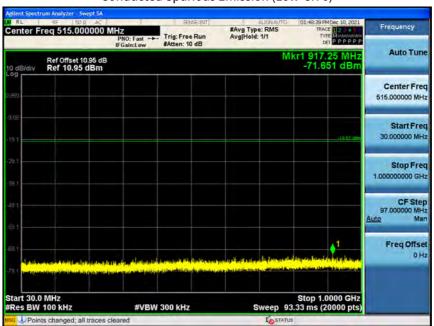
High-CH 39





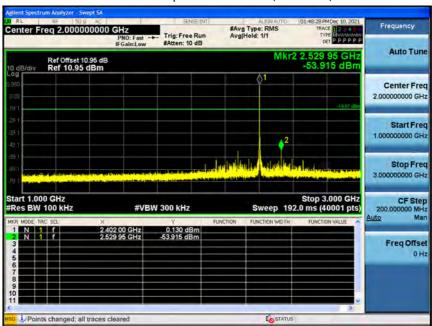
■ 1 M Bit/s (37 Byte) Test Plots -Conducted Spurious Emission

30 MHz ~ 1 GHz



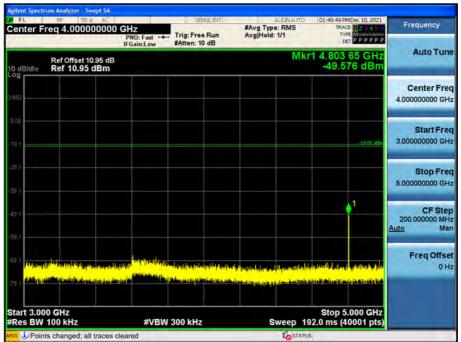
Conducted Spurious Emission (Low-CH 0)

1 GHz ~ 3 GHz





3 GHz ~ 5 GHz



Conducted Spurious Emission (Low-CH 0)

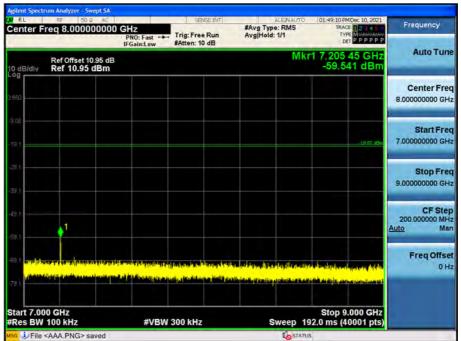
5 GHz ~ 7 GHz



RL RF 50 Q AC enter Freq 6.000000000			01:48:59 PMDec 10, 2021 TRACE 12:3:4:5 TYPE MUMANANAN DET P.P.P.P.P.P	Frequency Auto Tune			
Ref Offset 10.95 dB Mkr1 6.344 50 GHz							
950				Center Free 6.000000000 GH			
91			าวล สวี. สรีพ	Start Fre 5.000000000 GH			
9,1				Stop Fre 7.000000000 GH			
9.1				CF Ste 200.000000 MF Auto Ma			
and the balance of the second second	searched and a loss second solls, and so	1 nadala dinika na kata kata kata kata kata kata kata		Freq Offse 0 H			
tart 5.000 GHz Res BW 100 kHz	#VBW 300 kHz		Stop 7.000 GHz 92.0 ms (40001 pts)				



7 GHz ~ 9 GHz



Conducted Spurious Emission (Low-CH 0)

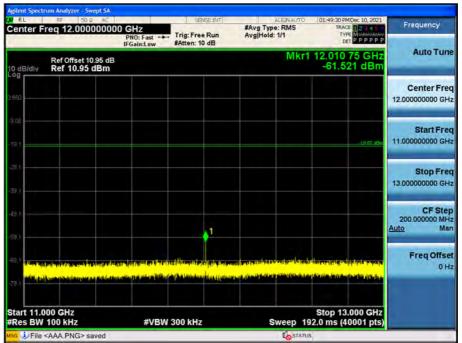
9 GHz ~ 11 GHz



O GHz PNO: Fast +++ IFGain:Low #Atten: 10 dB	#Avg Type: RMS Avg[Hold: 1/1	01:49:20 PMDec 10, 2021 TRACE 12 3 4 5 TYPE MUSIC TO P P P P P	Frequency Auto Tune			
Ref Offset 10.95 dB Mkr1 9.781 05 GHz 0 dB/div Ref 10.95 dBm -67.992 dBm						
			Center Fred 10.000000000 GH;			
		.13 87 . G e	Start Free 9.000000000 GH:			
			Stop Free 11.000000000 GH			
			CF Step 200.000000 MH Auto Mar			
	and the second se		Freq Offse 0 H:			
#VBW 300 kHz		Stop 11.000 GHz				
	D GHZ PRO: Fast IFGain:Low #Atten: 10 dB	O GHZ PRO: Fast IFGain:Low Trig: Free Run #Atten: 10 dB #Avg Type: RMS Avg Hold: 1/1 MKP1 #MKP1 Image: State of the	O GHz PRO: Fast +++ Trig: Free Run #Atten: 10 dB #Avg Type: RMS Avg Held: 1/1 Trace D at a second sec			



11 GHz ~ 13 GHz



Conducted Spurious Emission (Low-CH 0)

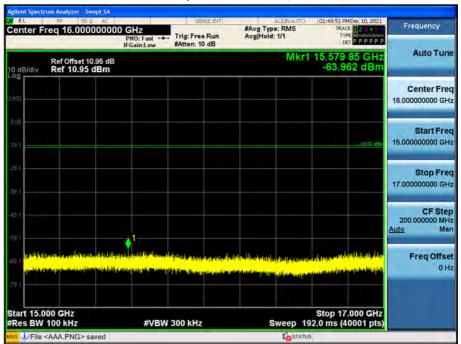
13 GHz ~ 15 GHz



RL RF 50 2 AC enter Freq 14.00000000	DO GHZ PNO: Fast Trig: Free Run IFGain:Low #Atten: 10 dB	#Avg Type: RMS Avg Hold: 1/1	01:49:40 PMDec 10, 2021 TRACE 2 3 4 5 TYPE MUMANANA DET P P P P P	Frequency
Ref Offset 10.95 dB		Mkr1	14.873 90 GHz -64.875 dBm	Auto Tune
50				Center Free 14.000000000 GH
90			.19 87 <i>-</i> 690	Start Free 13.000000000 GH
9,1				Stop Fre 15.000000000 GH
9.1				CF Ste 200.000000 MH Auto Ma
	na taking pana ang kapatah kanalya dari kapalika ta Na takun gabaran kata tang panana ta	and the state of t		Freq Offse 0 H
tart 13.000 GHz Res BW 100 kHz	#VBW 300 kHz	Sween 192	Stop 15.000 GHz 2.0 ms (40001 pts)	



15 GHz ~ 17 GHz



Conducted Spurious Emission (Low-CH 0)

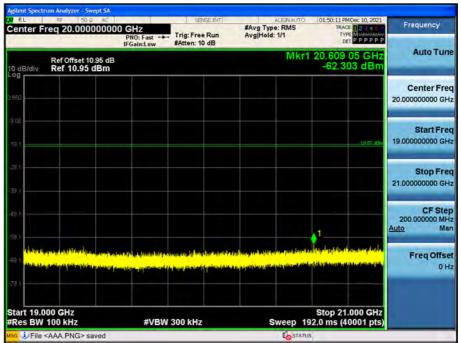
17 GHz ~ 19 GHz



			Mkr1	18.437 -61.75	60 GHz 33 dBm	Auto Tune
						Center Free 18.00000000 GH
					.19 <i>87.1</i> 999	Start Free 17.000000000 GH
						Stop Fre 19.000000000 GH
			1			CF Stej 200.000000 MH <u>Auto</u> Ma
ning badari da in da ma da andara. Na badari da anga da marang	u <mark>latika di mana bisina.</mark> (na kangangana dala	inguna alarika Tanang Ka	Hundley and	alla selecteda napa virnema	Nicana da Naziona da J	Freq Offse 0 H
#VBW 3001	KHZ	s	weep 19	Stop 19. 2.0 ms (40	000 GHz	
		#(film is if no if a first film if a first fil			Stop 19.0 #VBW 300 kHz Sweep 192.0 ms (40	1 المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز المركز الم المركز المركز المركز المركز المركز ا



19 GHz ~ 21 GHz



Conducted Spurious Emission (Low-CH 0)

21 GHz ~ 23 GHz



enter Freq 22.0000000	PNO: Fast	SENSE INT Trig: Free Run #Atten: 10 dB	#Avg Type: RMS Avg[Hold: 1/1	01:50:22 PMDec 10, 2021 TRACE 2 3 4 5 0 TYPE MWAAAAAAA DET P P P P P	Frequency
Ref Offset 10.95 dB 0 dB/div Ref 10.95 dBm			Mkr1	22.957 65 GHz -61.691 dBm	Auto Tune
950					Center Free 22.000000000 GH
19.1				.13 87. 19 9	Start Free 21.000000000 GH
29,1					Stop Free 23.000000000 GH
49.1					CF Stej 200.000000 MH Auto Ma
Alalashi bu duluan balaki bi dalari 19.1 Sendashari - Aneriyya dalari mu	lahasalin polingan Ang populati Pa	ly partition of a start of the start and the start of the	telletenkonski jalan in Salaashi Panaa kiga konseria tahan 194	netersionale para dia p	Freq Offse 0 H
Res BW 100 KHz	#VBW	300 kHz	Sweep 19	Stop 23.000 GHz 2.0 ms (40001 pts)	

Report No. HCT-RF-2112-FC046



23 GHz ~ 25 GHz



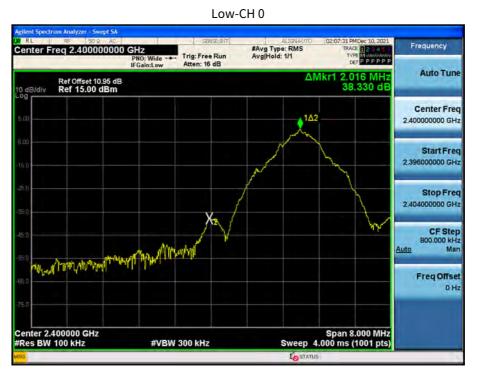
Conducted Spurious Emission (Low-CH 0)

Note :

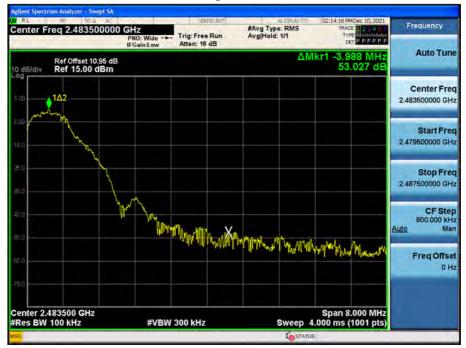
Limit : -19.87 dBm

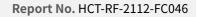


2 M Bit/s (255 Byte) Test Plots -BandEdge



High-CH 39

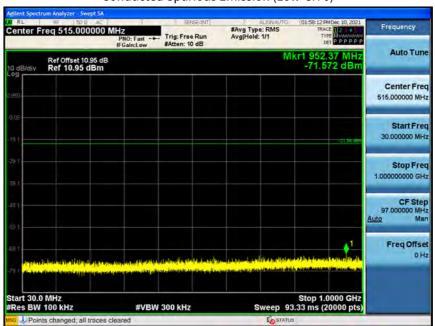




HCT

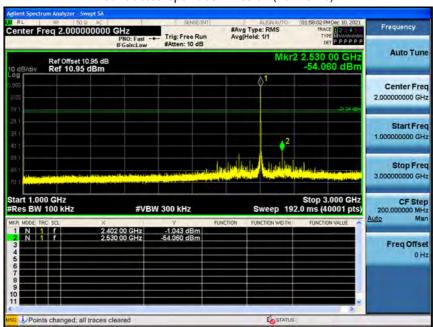
2 M Bit/s (37 Byte) Test Plots -Conducted Spurious Emission

30 MHz ~ 1 GHz



Conducted Spurious Emission (Low-CH 0)

1 GHz ~ 3 GHz





$3 \text{ GHz} \sim 5 \text{ GHz}$



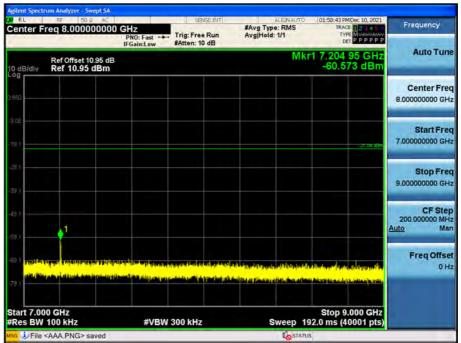
Conducted Spurious Emission (Low-CH 0)

5 GHz ~ 7 GHz

Frequency	01:58:32 PMDec 10, 2021 TRACE 2 2 4 5 TYPE MUMAMMAN DET P P P P P	#Avg Type: RMS Avg[Hold: 1/1	rig: Free Run Atten: 10 dB	HZ NO: Fast +++ Trig: F		nter Freq	
Auto Tun	Ref Offset 10.95 dB Mkr1 6.065 05 GHz 0 dB/div Ref 10.95 dBm -67.754 dBm						
Center Fre 6.000000000 GH						0	
Start Fre 5.000000000 GH	2° 94 iiGm					1	
Stop Fre 7.000000000 GH						1:	
CF Ste 200.000000 MH Auto Ma						1	
Freq Offse 0 H		anenen de la celasina e			dia		
	Stop 7.000 GHz 2.0 ms (40001 pts)	Sweep 19		#VBW 300 ki		art 5.000 G es BW 100	
		Sweep 19	U KHZ	#VBW 300 Kr		JFile <aa <="" td=""></aa>	



7 GHz ~ 9 GHz



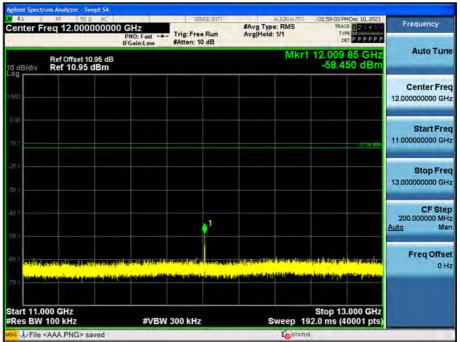
Conducted Spurious Emission (Low-CH 0)

9 GHz ~ 11 GHz

Frequency	01:58:53 PMDec 10, 2021 TRACE 2 3 4 5 TYPE MUMANANA DET P P P P P	#Avg Type: RMS Avg[Hold: 1/1	Trig: Free Run #Atten: 10 dB	50 Ω AC 0.000000000 GHz PN0: Fast ↔ IFGain:Low	RL RF enter Freq
Auto Tun	10.863 90 GHz -67.390 dBm	Mkr1		offset 10.95 dB 10.95 dBm	
Center Free 10.000000000 GH					50
Start Fre 9.000000000 GH	37.04 iBro				0 ()
Stop Free 11.000000000 GH					h
CF Ster 200.000000 MH Auto Ma					a
Freq Offse 0 H				alatinal participation of a constrained and	1
	Stop 11.000 GHz				art 9.000 GH
	2.0 ms (40001 pts)	Sweep 19	300 kHz		es BW 100



11 GHz ~ 13 GHz



Conducted Spurious Emission (Low-CH 0)

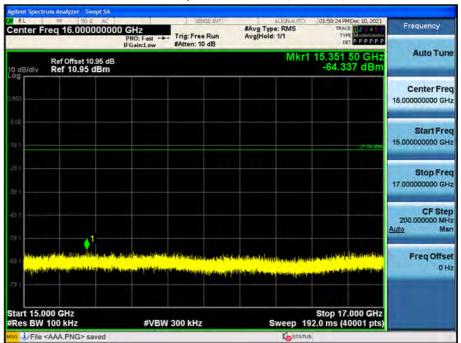
13 GHz ~ 15 GHz



enter Freq 14.00000000	O GHZ PNO: Fast +++ IFGain:Low #Atten: 10 dB	#Avg Type: RMS Avg Hold: 1/1	01:59:14 PMDec 10, 2021 TRACE 12349 TYPE MUMOUNT	Frequency
Ref Offset 10.95 dB 0 dB/div Ref 10.95 dBm		Mkr1 1	4.836 95 GHz -64.978 dBm	Auto Tune
950				Center Fred 14.000000000 GH;
19.1			27 D4 18m	Start Free 13.00000000 GH
19.1				Stop Fre 15.00000000 GH
19.1				CF Ste 200.000000 MH Auto Ma
	n a thu sao a fhan di satifan nizas (y a fan hanna ti tan ja tau na sin a tan ta			Freq Offse 0 H
13.000 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep 192	Stop 15.000 GHz 0 ms (40001 pts)	



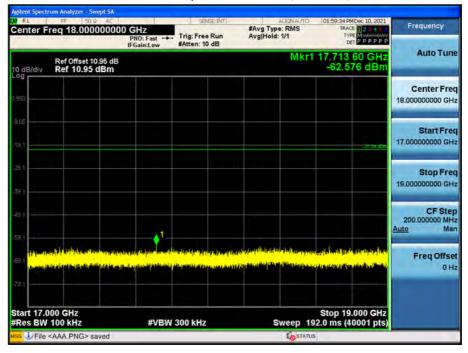
15 GHz ~ 17 GHz



Conducted Spurious Emission (Low-CH 0)

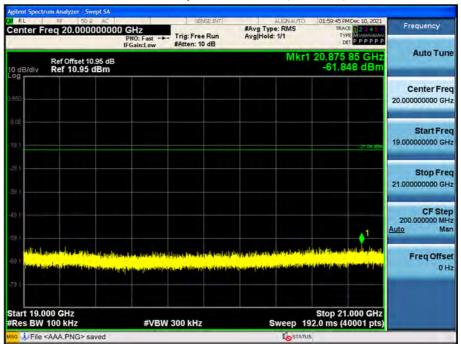
17 GHz ~ 19 GHz







19 GHz ~ 21 GHz



Conducted Spurious Emission (Low-CH 0)

21 GHz ~ 23 GHz

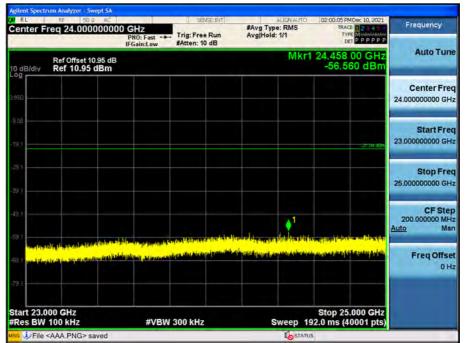


Frequency	59:55 PMDec 10, 2021 TRACE 2 3 4 5 TYPE MUSEUMAN DET P P P P P P	ALIENAUTO e: RMS : 1/1	un i	Trig: Free #Atten: 10	GHz PNO: Fast	111111	eq 22.000	ter Fr
Auto Tun	.703 35 GHz 60.545 dBm	Mkr1					Ref Offset 10 Ref 10.95	B/div
Center Fre 22.000000000 GH								
Start Fre 21.000000000 GH	-2° 04 88m							
Stop Fre 23.000000000 GH								
CF Ste 200.000000 MH Auto Ma								
Freq Offso 0 H	and a low and see show	estadiosilis Nemeration	ihon daan Reference	haidhean dain Marainnean Ch	hat shathatar ann	Hille de statik he Nata insert (ner	den sinternin Ny managana amin'ny desira	della de Terreferen
	op 23.000 GHz ms (40001 pts)	weep 192		300 kHz	#VBW		00 GHz 100 kHz	
		STATUS				aved	AAA.PNG>s	

Report No. HCT-RF-2112-FC046



23 GHz ~ 25 GHz



Conducted Spurious Emission (Low-CH 0)

Note :

Limit : -21.04 dBm



9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

Frequency	Measured Value	A.F+C.L+D.F	Ant. POL	Total	Limit	Margin				
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]				
	No Critical peaks 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]	[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: 1 M Bit/s (37 Byte)

Operation Mode: CH Low

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4804	51.01	0.00	3.75	V	54.76	73.98	19.22	PK
4804	45.02	1.23	3.75	V	50.00	53.98	3.98	AV
7206	41.11	0.00	12.70	V	53.81	73.98	20.17	PK
7206	31.51	1.23	12.70	V	45.44	53.98	8.54	AV
4804	51.31	0.00	3.75	Н	55.06	73.98	18.92	PK
4804	45.71	1.23	3.75	Н	50.69	53.98	3.29	AV
7206	41.35	0.00	12.70	Н	54.05	73.98	19.93	PK
7206	31.78	1.23	12.70	Н	45.71	53.98	8.27	AV

Operation Mode: CH Mid

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4880	47.92	0.00	3.71	V	51.63	73.98	22.35	PK
4880	41.88	1.23	3.71	V	46.82	53.98	7.16	AV
7320	41.22	0.00	11.70	V	52.92	73.98	21.06	PK
7320	30.81	1.23	11.70	V	43.74	53.98	10.24	AV
4880	48.26	0.00	3.71	Н	51.97	73.98	22.01	PK
4880	42.01	1.23	3.71	Н	46.95	53.98	7.03	AV
7320	41.43	0.00	11.70	Н	53.13	73.98	20.85	PK
7320	31.15	1.23	11.70	Н	44.08	53.98	9.90	AV





Report No. HCT-RF-2112-FC046

Opera	tion Mode: C	H High						
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	туре
4960	48.08	0.00	4.49	V	52.57	73.98	21.41	PK
4960	40.52	1.23	4.49	V	46.24	53.98	7.74	AV
7440	41.31	0.00	12.08	V	53.39	73.98	20.59	PK
7440	29.52	1.23	12.08	V	42.83	53.98	11.15	AV
4960	47.82	0.00	4.49	Н	52.31	73.98	21.67	PK
4960	40.22	1.23	4.49	Н	45.94	53.98	8.04	AV
7440	41.45	0.00	12.08	Н	53.53	73.98	20.45	PK
7440	29.72	1.23	12.08	Н	43.03	53.98	10.95	AV

Measurement Type

ΡK

ΡK

 AV

ΡK

 AV

ΡK

AV

[dB]

22.25

8.26

20.77

10.84

21.88

8.14

20.56

10.61

+00+	43.15	2.12	5.15	11	45.00	55.50	7.52					
7206	41.31	0.00	12.70	Н	54.01	73.98	19.97					
7206	29.85	2.12	12.70	Н	44.67	53.98	9.31					
Operation Mode: CH Mid												
Frequency	Measured	Duty Cycle	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin					
Frequency	Value	Factor	A.FTC.L-A.GTD.F	Ant. FOI.	TOLAL	LIIIIL	Margin					

[dB/m]

3.71

3.71

11.70

11.70

3.71

3.71

11.70

11.70

[H/V]

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Н

Н

Н

Н

 $[dB\mu V/m]$ $[dB\mu V/m]$

73.98

53.98

73.98

53.98

73.98

53.98

73.98

53.98

51.73

45.72

53.21

43.14

52.10

45.84

53.42

43.37

[dB]

0.00

2.12

0.00

2.12

0.00

2.12

0.00

2.12

Mode : 2 M Bit/s (37 Byte)

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4804	50.91	0.00	3.75	V	54.66	73.98	19.32	PK
4804	42.98	2.12	3.75	V	48.85	53.98	5.13	AV
7206	41.12	0.00	12.70	V	53.82	73.98	20.16	PK
7206	29.78	2.12	12.70	V	44.60	53.98	9.38	AV
4804	51.09	0.00	3.75	Н	54.84	73.98	19.14	PK
4804	43.19	2.12	3.75	Н	49.06	53.98	4.92	AV
7206	41.31	0.00	12.70	Н	54.01	73.98	19.97	РК
7206	29.85	2.12	12.70	Н	44.67	53.98	9.31	AV





[MHz]

4880

4880

7320

7320

4880

4880

7320

7320

[dBµV]

48.02

39.89

41.51

29.32

48.39

40.01

41.72

29.55

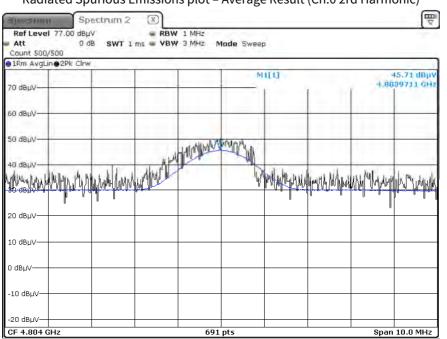




Opera	tion Mode: C	:H High						
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Туре
4960	47.21	0.00	4.49	V	51.70	73.98	22.28	PK
4960	38.72	2.12	4.49	V	45.33	53.98	8.65	AV
7440	40.02	0.00	12.08	V	52.10	73.98	21.88	PK
7440	28.22	2.12	12.08	V	42.42	53.98	11.56	AV
4960	47.02	0.00	4.49	Н	51.51	73.98	22.47	PK
4960	38.51	2.12	4.49	Н	45.12	53.98	8.86	AV
7440	40.38	0.00	12.08	Н	52.46	73.98	21.52	PK
7440	28.48	2.12	12.08	Н	42.68	53.98	11.30	AV



I M Bit/s (37 Byte) Test Plots (Worst case : X-H)



Radiated Spurious Emissions plot – Average Result (Ch.0 2rd Harmonic)

Radiated Spurious Emissions plot - Peak Result (Ch.0 2rd Harmonic)

Spestimi Spe	ectrum 2 🛞						
Ref Level 77.00 dBμ\ Att 0 dE Count 500/500 0		WIMHZ WIMHZ M	lode Sweep				
1Pk Maxe2Pk Clrw							
70 dBµV-			M	1[1]		4.80	51.31 dBµV 44197 GH
60 dBµV		-		-	-		
50 dBµV		MAN	WWWW AND	a.			
to opponenter mon	Anna manual	hart .	"V W	A HUN A	A hala ola	Mahaine la	Line-
30 GBTAT <u>+ I Alaha</u> tati Ia Maritan					I AWAYA ANA	al ANA A	h a the flat
20 dBµV							
10 dBµV							
0 dBµV							
-10 dBµV							
-20 dBµV CF 4.804 GHz		691	nts			Snan	10.0 MHz

Note:

Plot of worst case are only reported.





9.7 RADIATED RESTRICTED BAND EDGES

Mode: 1 M Bit/s (37 Byte)

Channel No.

Operating Frequency

2402 MHz & 2480 MHz 0 & 39

Frequency	Measured Value	Duty Cycle Factor	A.F.+C.L+D.F	Ant. Pol.	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2390.0	16.882	0.00	34.04	н	50.92	73.98	23.06	PK
2390.0	5.426	1.23	34.04	Н	40.70	53.98	13.28	AV
2390.0	16.768	0.00	34.04	V	50.81	73.98	23.17	PK
2390.0	5.401	1.23	34.04	V	40.67	53.98	13.31	AV
2483.5	26.880	0.00	35.00	Н	61.88	73.98	12.10	PK
2483.5	6.383	1.23	35.00	Н	42.61	53.98	11.37	AV
2483.5	26.576	0.00	35.00	V	61.58	73.98	12.40	PK
2483.5	6.312	1.23	35.00	V	42.54	53.98	11.44	AV

Mode : 2 M Bit/s (37 Byte)

Operating Frequency	2402 MHz & 2480 MHz
Channel No.	0 & 39

Frequency	Measured Value	Duty Cycle Factor	A.F.+C.L+D.F	Ant. Pol.	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2390.0	16.625	0.00	34.04	Н	50.67	73.98	23.32	PK
2390.0	5.459	2.12	34.04	Н	41.62	53.98	12.36	AV
2390.0	16.552	0.00	34.04	V	50.59	73.98	23.39	PK
2390.0	5.435	2.12	34.04	V	41.60	53.98	12.39	AV
2483.5	26.402	0.00	35.00	Н	61.40	73.98	12.58	PK
2483.5	7.135	2.12	35.00	Н	44.26	53.98	9.73	AV
2483.5	26.138	0.00	35.00	V	61.14	73.98	12.84	PK
2483.5	7.067	2.12	35.00	V	44.19	53.98	9.79	AV



2 M Bit/s (37 Byte) Test Plots (Worst case : Z-H)

Radiated Restricted Band Edges plot - Average Result (Ch.39)



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



Note:

Plot of worst case are only reported.



9.8 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

T9_N

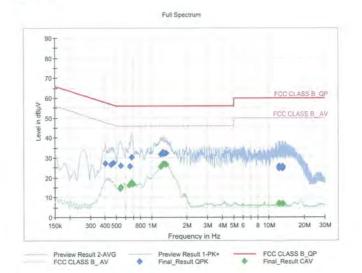
1/2

Test Report

Common Information

EUT : Manufacturer : Test Site: Operating Conditions : Operator Name: Comment:

T9 N Voice caddie SHIELD ROOM N



Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.4043	27.10	57.77	30.67	9.000	N	OFF	9.6
0.4515	26.63	56.85	30.22	9.000	N	OFF	9.6
0.4718	27.35	56.48	29.13	9.000	N	OFF	9.6
0.5473	26.08	56.00	29.92	9.000	N	OFF	9.6
0.6530	25.55	56.00	30.45	9.000	N	OFF	9.6
0.6755	30.43	56.00	25.57	9.000	N	OFF	9.6
1.1975	31.74	56.00	24.26	9.000	N	OFF	9.7
1.2358	32.22	56.00	23.78	9.000	N	OFF	9.7
1.2425	32.39	56.00	23.61	9.000	N	OFF	9.7
1.2560	32.94	56.00	23.06	9.000	N	OFF	9.7
1.2673	32.15	56.00	23.85	9.000	N	OFF	9.7
1.3280	32.25	56.00	23.75	9.000	N	OFF	9.7
12.1978	24.62	60.00	35.38	9.000	N	OFF	10.2
12.2135	25.56	60.00	34.44	9.000	N	OFF	10.2
12.9875	24.95	60.00	35.05	9.000	N	OFF	10.2
12.9943	25.71	60.00	34.29	9.000	N	OFF	10.2
13.0010	25.49	60.00	34.51	9.000	N	OFF	10.2
13.0100	24.55	60.00	35.45	9.000	N	OFF	10.2

2021-12-17

오전 9:16:47

2/2



T9_N

Final_Result_CAV

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.5383	14.53	46.00	31.47	9.000	N	OFF	9,6
0.5495	15.26	46.00	30.74	9.000	N	OFF	9.6
0.6463	16.27	46.00	29.73	9.000	N	OFF	9,6
0.6643	16.98	46.00	29.02	9.000	N	OFF	9.6
0.6755	17.63	46.00	28.37	9.000	N	OFF	9.6
0.6935	16.61	46.00	29.39	9.000	N	OFF	9.6
1.1953	25.42	46.00	20.58	9.000	N	OFF	9.7
1.2313	26.23	46.00	19.77	9.000	N	OFF	9.7
1.2425	26.49	46.00	19.51	9.000	N	OFF	9.7
1.2538	26.72	46.00	19.28	9.000	N	OFF	9.7
1.2650	26.68	46.00	19.32	9.000	N	OFF	9.7
1.3145	26.76	46.00	19.24	9.000	N	OFF	9.7
1.3258	26.65	46.00	19.35	9.000	N	OFF	9.7
12.2068	6.82	50.00	43.18	9.000	N	OFF	10.2
12.2158	6.76	50.00	43.24	9.000	N	OFF	10.2
12.2203	6.65	50.00	43.35	9.000	N	OFF	10.2
13.0010	6.78	50.00	43.22	9.000	N	OFF	10.2
13.0055	6.79	50.00	43.21	9.000	N	OFF	10.2

2021-12-17

오전 9:16:47



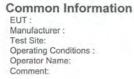
Conducted Emissions (Line 2)

HCT

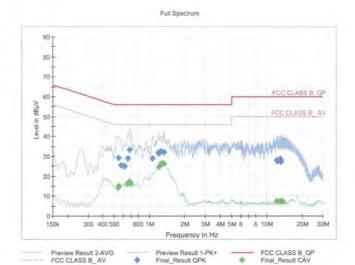
T9_L1

1/2

Test Report



T9 L1 Voice caddie SHIELD ROOM L1



Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.5473	29.04	56.00	26.96	9.000	L1	OFF	9.7
0.5698	25.48	56.00	30.52	9.000	L1	OFF	9.7
0.6103	24.90	56.00	31.10	9.000	L1	OFF	9.7
0.6148	25.04	56.00	30.96	9.000	L1	OFF	9.7
0.6553	28.98	56.00	27.02	9.000	L1	OFF	9.7
0.6800	33.09	56.00	22.91	9.000	L1	OFF	9.7
1.0648	28.88	56.00	27.12	9.000	L1	OFF	9.7
1.1908	31.59	56.00	24.41	9.000	L1	OFF	9.7
1.1998	31.47	56.00	24.53	9.000	L1	OFF	9.7
1.2403	32.17	56.00	23.83	9.000	L1	OFF	9.7
1.2560	32.24	56.00	23.76	9.000	L1	OFF	9.7
1.3235	31.89	56.00	24.11	9.000	L1	OFF	9.7
12.2068	28.09	60.00	31.91	9.000	L1	OFF	10.1
12.3395	27.33	60.00	32.67	9.000	L1	OFF	10.1
13.0010	28.42	60.00	31.58	9.000	L1	OFF	10.2
13.0100	28.34	60.00	31.66	9.000	L1	OFF	10.2
13.1293	27.19	60.00	32.81	9.000	L1	OFF	10.2
13.1405	27.16	60.00	32.84	9,000	L1	OFF	10.2

2021-12-17

오전 9:19:43

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T9_L1

Final Result CAV

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.5383	14.23	46.00	31.77	9.000	L1	OFF	9.7
0.5495	15.01	46.00	30.99	9.000	L1	OFF	9.7
0.6463	16.01	46.00	29.99	9.000	L1	OFF	9.7
0.6643	16.73	46.00	29.28	9.000	L1	OFF	9.7
0.6755	17.35	46.00	28.65	9.000	L1	OFF	9.7
0.6935	16.48	46.00	29.52	9.000	L1	OFF	9.7
1.1953	24.62	46.00	21.38	9.000	L1	OFF	9.7
1.2425	25.71	46.00	20.29	9.000	L1	OFF	9.7
1.2538	26.21	46.00	19.79	9.000	L1	OFF	9.7
1.3033	26.16	46.00	19.84	9.000	L1	OFF	9.7
1.3145	26.15	46.00	19.85	9.000	L1	OFF	9.7
1.3258	26.16	46.00	19.84	9,000	L1	OFF	9.7
12.2158	7.53	50.00	42.47	9.000	L1	OFF	10.1
12.2225	7.37	50.00	42.63	9.000	L1	OFF	10.1
13.0055	7.64	50.00	42.36	9.000	L1	OFF	10.2
13.0123	7.41	50.00	42.59	9.000	L1	OFF	10.2
13.1405	7.30	50.00	42.70	9.000	L1	OFF	10.2
13.6648	7.34	50.00	42.66	9.000	L1	OFF	10.2

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10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/23/2022	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	06/17/2022	Annual
Temperature Chamber	SU-642	ESPAC	0093008124	03/15/2022	Annual
Signal Analyzer	N9030A	Agilent	MY49431210	01/11/2022	Annual
Power Measurement Set	OSP 120	Rohde & Schwarz	101231	07/02/2022	Annual
BLUETOOTH TESTER	CBT	Rohde & Schwarz	100808	02/23/2022	Annual
Power Meter	N1911A	Agilent	MY45100523	04/08/2022	Annual
Power Sensor	N1921A	Keysight	MY57820067	04/08/2022	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/02/2022	Annual
Power Splitter	11667B	Hewlett Packard	05001	05/20/2022	Annual
DC Power Supply	E3632A	Hewlett Packard	MY50360067	02/16/2022	Annual
Attenuator(10 dB)	8493C	Hewlett Packard	07560	06/18/2022	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

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-2112-FC046



Radiated Test		1			
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
Controller	EM1000	Audix	060520	N/A	N/A
Turn Table	N/A	Audix	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/19/2022	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	760	02/22/2023	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	02299	05/19/2022	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170541	11/16/2023	Biennial
Spectrum Analyzer	FSV40-N	Rohde & Schwarz	102168	07/05/2022	Annual
Signal Analyzer	N9030A	Agilent	MY49431210	01/11/2022	Annual
Band Reject Filter	WRCJV12-4900-5100- 5900-6100-50SS	Wainwright Instruments	5	06/24/2022	Annual
Band Reject Filter	WRCJV12-4900-5100- 5900-6100-50SS	Wainwright Instruments	6	06/24/2022	Annual
Band Reject Filter	WRCJV2400/2483.5- 2370/2520-60/12SS	Wainwright Instruments	2	01/06/2022	Annual
Band Reject Filter	WRCJV5100/5850- 40/50-8EEK	Wainwright Instruments	1	02/08/2022	Annual
High Pass Filter	WHK3.0/18G-10EF	Wainwright Instruments	8	02/03/2022	Annual
High Pass Filter	WHKX8-6090-7000- 18000-40SS	Wainwright Instruments	25	02/03/2022	Annual
Attenuator (3 dB)	18B-03	Api tech.	1	02/03/2022	Annual
Attenuator(10 dB)	8493C-10	Agilent	08285	02/03/2022	Annual
Power Amplifier	CBLU1183540	CERNEX	22964	02/03/2022	Annual
Power Amplifier	CBL06185030	CERNEX	22965	02/03/2022	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	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).





11. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2112-FC046-P