

FCC BT REPORT Certification

Applicant Name: SAMSUNG Electronics Co., Ltd.

Address:

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Test Site/Location: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

	Report No.: HCT-RF-2201-FC089
FCC ID:	A3LSMM236B
APPLICANT:	SAMSUNG Electronics Co., Ltd.
Model:	SM-M236B/DS
Additional Model:	-
EUT Type:	Mobile Phone
Max. RF Output Power:	15.364 dBm (34.39 mW)
Frequency Range:	2 402 MHz – 2 480 MHz (Bluetooth)
Modulation type	GFSK(Normal), π /4DQPSK and 8DPSK(EDR)
FCC Classification:	FCC Part 15 Spread Spectrum Transmitter (DSS)
FCC Rule Part(s):	Part 15 subpart C 15.247

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.



REVIEWED BY

Report prepared by : Jeong Ho Kim Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked *. 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. (HCT Accreditation No.: KT197)

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<u>Version</u>

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2201-FC089	January 26, 2022	- First Approval Report



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1. EUT DESCRIPTION

Model	SM-M236B/DS	
Additional Model	-	
EUT Type	Mobile Phone	
Power Supply	DC 3.86 V	
Frequency Range	2 402 MHz ~ 2 480 MHz	
Max. RF Output Power	15.364 dBm (34.39 mW)	
BT Operating Mode	Normal, EDR, AFH	
Modulation Type	GFSK(Normal), π/4DQPSK and 8DPSK(EDR)	
Modulation Technique	FHSS	
Number of Channels	79 Channels, Minimum 20 Channels(AFH)	
Date(s) of Tests	December 13, 2021 ~ January 26, 2022	
Serial number	Radiated : R3CRB0HNWZV Conducted : R3CRB0HPHPA	



2. Requirements for Bluetooth transmitter(15.247)

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

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

• 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.

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

3. TEST METHODOLOGY

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

EUT CONFIGURATION

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



EUT EXERCISE

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

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). To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120 kHz for frequencies below 1 GHz or 1 MHz for frequencies above 1 GHz. For average measurements above 1 GHz, the analyzer was set to peak detector and add the DCCF calsulations.

DESCRIPTION OF TEST MODES

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



4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration 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).

5. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,

Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- (1) The antennas of this E.U.T are permanently attached.
- (2) The E.U.T Complies with the requirement of §15.203

7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

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

The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, <i>k</i> =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 %, <i>k</i> =2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (Confidence level about 95 %, <i>k</i> =2)



8. DESCRIPTION OF TESTS

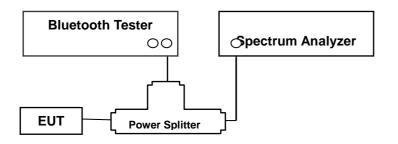
8.1. Conducted Maximum Peak Output Power

<u>Limit</u>

The maximum peak output power of the intentional radiator shall not exceed the following:

- 1. For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 nonoverlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 W. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 W.
- 2. The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the peak detector mode. This test is performed with hopping off.

The Spectrum Analyzer is set to (7.8.5 in ANSI 63.10-2013 & Procedure 10(b)(6)(i) in KDB 558074 v05r02)

- 1) Span: approximately 5 times the 20 dB bandwidth, centered on a hopping channel
- 2) RBW > the 20 dB bandwidth of the emission being measured
- 3) VBW ≥ RBW
- 4) Sweep = Auto
- 5) Detector = Peak
- 6) Trace = Max hold

Sample Calculation

Output Power = Spectrum Measured Power + Power Splitter loss + Cable loss(2 ea)

= 10 dBm + 6 dB + 1.5 dB = 17.5 dBm

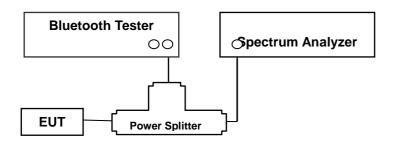


8.2. Conducted Band Edge(Out of Band Emissions)

<u>Limit</u>

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Configuration



Test Procedure

This test is performed with hopping off and hopping on.

The Spectrum Analyzer is set to (6.10.4 in ANSI 63.10-2013 & Procedure 8.5 and 8.6 in KDB 558074 v05r02)

- 1) Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
- Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.
- 3) Attenuation: Auto (at least 10 dB preferred).
- 4) Sweep time: Coupled.
- 5) RBW: 100 kHz
- 6) VBW: 300 kHz
- 7) Detector: Peak
- 8) Trace: Max hold

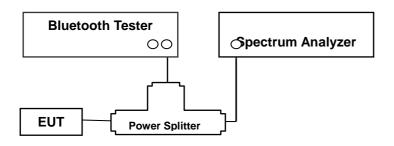


8.3. Frequency Separation & 20 dB Bandwidth

<u>Limit</u>

According to §15.247(a)(1), Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Configuration



Test Procedure(Frequency Separation)

The Channel Separation test is performed with hopping on. And the 20 dB Bandwidth test is performed with hopping off.

The Spectrum Analyzer is set to (7.8.2 in ANSI 63.10-2013 & Procedure 10(b)(6)(iii) in KDB 558074 v05r02)

- 1) Span: Wide enough to capture the peaks of two adjacent channels
- 2) RBW: Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- 3) VBW ≥ RBW
- 4) Sweep: Auto
- 5) Detector: Peak
- 6) Trace: Max hold
- 7) All the trace to stabilize.
- 8) Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.



Test Procedure (20 dB Bandwidth)

And the 20 dB Bandwidth test is performed with hopping off.

The Spectrum Analyzer is set to (6.9.2 in ANSI 63.10-2013)

- 1) Span: Set between two times and five times the OBW
- 2) RBW: 1 % to 5 % of the OBW.
- 3) VBW \ge 3 x RBW
- 4) Sweep: Auto
- 5) Detector: Peak
- 6) Trace: Max hold
- 7) All the trace to stabilize.

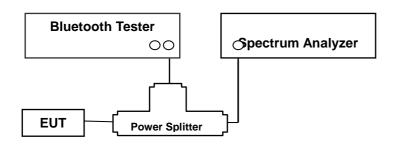


8.4. Number of Hopping Frequencies

<u>Limit</u>

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands shall use at least 15 hopping frequencies.

Test Configuration



Test Procedure

The Bluetooth frequency hopping function of the EUT was enabled.

The Spectrum Analyzer is set to (7.8.3 in ANSI 63.10-2013 & Procedure 10(b)(4) in KDB 558074 v05r02)

- 1) Span: the frequency band of operation
- 2) RBW: To identify clearly the individual channels, set the RBW to less than 30 % of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- 3) VBW ≥ RBW
- 4) Sweep: Auto
- 5) Detector: Peak
- 6) Trace: Max hold
- 7) Allow the trace to stabilize.

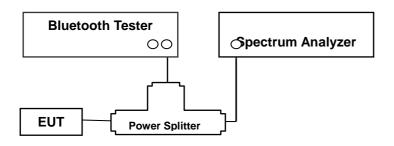


8.5. Time of Occupancy

<u>Limit</u>

According to \$15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

Test Configuration



Test Procedure

This test is performed with hopping off.

The Spectrum Analyzer is set to (7.8.4 in ANSI 63.10-2013 & Procedure 10(b)(6)(iv) in KDB 558074 v05r02)

- 1) Span: Zero span, centered on a hopping channel
- RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
- 3) Sweep = as necessary to capture the entire dwell time per hopping channel
- 4) Detector: Peak
- 5) Trace: Max hold

The marker-delta function was used to determine the dwell time.



Sample Calculation

The following calculation process is not relevant to our measurement results. It is just an example.

- (1) Non-AFH Mode
- DH 5 (GFSK) : 2.890 x (1600/6)/79 x 31.6 = 308.27 (ms)
- 2-DH 5 (π/4DQPSK) : 2.890 x (1600/6)/79 x 31.6 = 308.27 (ms)
- 3-DH 5 (8DPSK) : 2.890 x (1600/6)/79 x 31.6 = 308.27 (ms)
- (2) AFH Mode
- DH 5 (GFSK) : 2.890 x (800/6)/20 x 8.0 = 154.13 (ms)
- 2-DH 5 (π/4DQPSK) : 2.890 x (800/6)/20 x 8.0 = 154.13 (ms)
- 3-DH 5 (8DPSK) : 2.890 x (800/6)/20 x 8.0 = 154.13 (ms)

Note :

DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving.

Then the system makes worst case 1600/6 hops per second with 79 channels. So the system have each channel 3.3755 times per second and so for 31.6 seconds the system have 106.667 times of appearance. Each tx-time per appearance of DH5 is 2.890 ms.

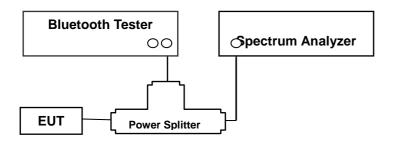
Dwell time = Tx-time x 106.667 = 308.27 (ms)



8.6. Conducted Spurious Emissions

<u>Limit</u> Conducted > 20 dBc

Test Configuration



Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer.

The Spectrum Analyzer is set to (7.8.8 in ANSI 63.10-2013 & Procedure 8.5 and 8.6 in KDB 558074 v05r02)

- 1) Span: 30 MHz to 10 times the operating frequency in GHz.
- 2) RBW: 100 kHz
- 3) VBW: 300 kHz
- 4) Sweep: Coupled
- 5) Detector: Peak

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

This test is performed with hopping off.



Factors for frequency

Freq(MHz)	Factor(dB)
30	16.09
100	16.19
200	16.26
300	16.37
400	16.43
500	16.46
600	16.46
700	16.50
800	16.53
900	16.57
1000	16.60
2000	16.88
2400	16.99
2480	16.99
2500	16.99
3000	17.09
4000	17.27
5000	17.43
5150	17.46
5850	17.55
6000	17.55
7000	17.72
8000	17.86
9000	17.99
10000	18.14
11000	18.21
12000	18.37
13000	18.55
14000	18.50
15000	18.57
16000	18.66
17000	18.74
18000	18.87
19000	18.94
20000	19.04
21000	19.42
22000	19.38
23000	19.61
24000	19.48
25000	19.55
26000	19.64

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

2. Factor = Attenuator loss(10 dB) + Cable loss(2 EA) + Splitter loss(6 dB)



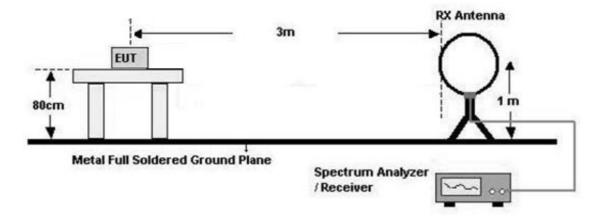
8.7. Radiated Test

<u>Limit</u>

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

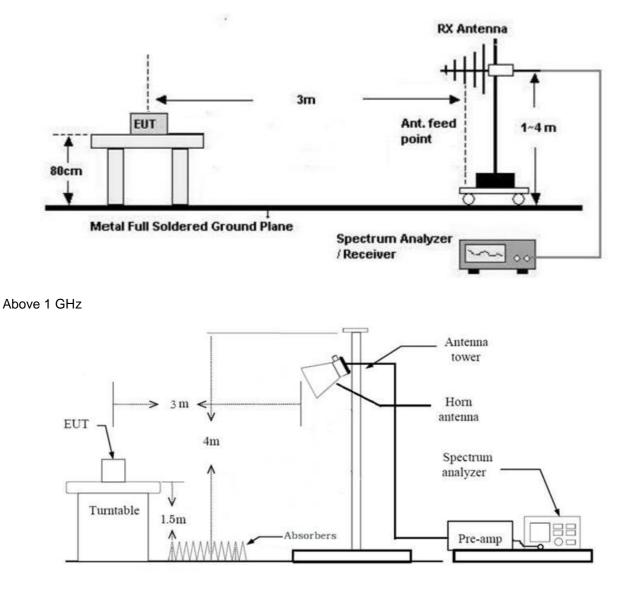
Below 30 MHz





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30 MHz - 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.
- 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 \ge 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 1m 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 \ge 3 x RBW
 - (2) Measurement Type(Quasi-peak):
 - Measured Frequency Range : 30 MHz 1 GHz
 - Detector = Quasi-Peak
 - RBW = 120 kHz
 - * In general, (1) is used mainly
- 7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)
- 8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from



the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

Test Procedure of Radiated spurious emissions (Above 1 GHz)

- 1. Radiated test is performed with hopping off.
- 2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
- 3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
- 4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 5. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 8. The unit was tested with its standard battery.
- 9. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Measured Frequency Range : 1 GHz 25 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 1 MHz
 - VBW ≥ 3 x RBW
 - (2) Measurement Type(Average):
 - Average value of pulsed emissions
 - Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determined from the peak field strength after correcting for the worst-case duty cycle as described in Number.14 (On Page. 23)
 - ◆ Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB
- 10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- 11. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 12. Total
 - (1)Measurement(Peak)

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Reading Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F)
(2)Measurement(Avg)
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Reading Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F) + + DCCF(AFH)

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

Test Procedure of Radiated Restricted Band Edge

- 1. Radiated test is performed with hopping off.
- 2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
- 3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
- 4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 5. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. The unit was tested with its standard battery.
- 8. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 1 MHz
 - VBW \ge 3 x RBW
 - (2) Measurement Type(Average):
 - Average value of pulsed emissions
 - Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determined from the peak field strength after correcting for the worst-case duty cycle as described in Number.14 (On Page. 23)
 - Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB
- 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

(1)Measurement(Peak)

Reading Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F) (2)Measurement(Avg)

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



8.8. AC Power line Conducted Emissions

<u>Limit</u>

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 μ 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.
- 5. The EUT is the device operating below 30 MHz.
 - For unterminated the Antenna, the AC line conducted tests are performed with the antenna connected
 - For terminated the Antenna, the AC line conducted tests are performed with a dummy load connected to the EUT antenna output terminal.

Sample Calculation

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



8.9 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, Stand alone + External accessories (Earphone, etc)
- Worstcase : Stand alone
- 2. EUT Axis
 - Radiated Spurious Emissions : Y
 - Radiated Restricted Band Edge : X

3. All data rate of operation were investigated and the test results are worst case in highest datarate of each mode.

- GFSK : DH5
- $\pi/4DQPSK$: 2-DH5
- 8DPSK : 3-DH5
- 4. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
 - Position : Horizontal, Vertical, Parallel to the ground plane

Radiated test(DBS)

1. All modes of operation were investigated and the worst case configuration results are reported.

- Mode : Stand alone, Stand alone + External accessories(Earphone, etc)
- Worstcase : Stand alone
- 2. EUT Axis
 - Radiated Spurious Emissions : Z
- 3. The following tables show the worst case configurations determined during testing.

Description	Bluetooth Emission	5 GHz Emission
Antenna	WIFI/BT	WIFI/BT
Channel	39	40
Data Rate	1 Mbps	6 Mbps
Mode	GFSK : 2-DH5	802.11a



AC Power line Conducted Emissions

- 1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone + External accessories(Earphone, etc)+Travel Adapter
 - Stand alone + Travel Adapter
 - Worstcase : Stand alone + Travel Adapter

Conducted test

- 1. The EUT was configured with data rate of highest power.
 - GFSK : DH5
 - $\pi/4DQPSK$: 2-DH5
 - 8DPSK : 3-DH5
- 2. AFH & Non-AFH were tested and the worst case results are reported. (Worst case : Non-AFH)



9. SUMMARY OF TEST RESULTS

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

Note: Average Power data refer to SAR report



10. TEST RESULT

10.1 PEAK POWER

Channel	Frequency	Output Power (GFSK)		Limit
	(MHz)	(dBm)	(mW)	(mW)
Low	2402	14.118	25.81	
Mid	2441	14.343	27.18	125
High	2480	15.364	34.39	

Channel	Frequency (MHz)	Output Power (8DPSK)		Limit
		(dBm)	(mW)	(mW)
Low	2402	13.624	23.04	
Mid	2441	13.814	24.07	125
High	2480	14.699	29.51	

Channel	Frequency (MHz)	Outpu (π/4D	Limit (mW)	
	(1112)	(dBm)	(mW)	()
Low	2402	13.144	20.63	
Mid	2441	13.429	22.02	125
High	2480	14.464	27.95	

Note:

1. Spectrum measured values are not plot data.

The power results in plot is already including the actual values of loss for the splitter and cable combination.

 Actual value of loss for the splitter and cable combination is 16.99 dB at 2400 MHz and is 16.99 dB at 2500 MHz. So, 16.99 dB is offset. And the offset gap in the 2.4 GHz range do not affect the conducted peak power final result.



Test Plots (GFSK)

Peak Power (CH.0)

F 50 9. AC 2,402000000 f Offset 16.99 dB ef 25.00 dBm	GHZ PN0: Fast IFGain:Low			#Avg Type Avg Hold:	1/1	TRAC TYL DI 2.401 9	MJan 07, 2022 E 1 2 3 4 5 6 P P P P P P P 95 GHz 18 dBm	Frequency Auto Tu
f Offset 16.99 dB f 25.00 dBm			1 _		Mkr1	2.401 9 14.1	95 GHz 18 dBm	Auto Tu
			1 _					
								Center Fr 2.402000000 G
								Start Fr 2.399621520 G
								Stop Fr 2.404378480 G
								CF St 475.696 k <u>Auto</u> M
								Freq Offs 0
000 GHz MHz	#\/B\A	(50 MHz			Sween 1	Span 4	.757 MHz	
	DOD GHZ MHz					MHz #VBW 50 MHz Sweep 1		000 GHz Span 4.757 MHz MHz #VBW 50 MHz Sweep 1.000 ms (1001 pts)

Test Plots (GFSK) Peak Power (CH.39)





Test Plots (GFSK)

Peak Power (CH.78)

	um Analyzer - Swept SA					
Center Fr	RF 50 Ω AC req 2.480000000	GHz PNO: Fast	SENSE:INT	#Avg Type: RMS Avg Hold: 1/1	11:57:01 AM Jan 07, 2022 TRACE 123456 TYPE MANNAN DET PPPPPP	Frequency
10 dB/div	Ref Offset 16.99 dB Ref 25.00 dBm	IF-Gain:Low	Atten: 20 GB	Mkr1	2.479 705 GHz 15.364 dBm	Auto Tun
15.0			♦ ¹			Center Fre 2.480000000 GH
5.00						Start Fre 2.477622505 GH
-15.0						Stop Fre 2.482377495 G⊦
35.0						CF Ste 475.499 kł <u>Auto</u> Ma
45.0 55.0 						Freq Offs 0 F
-65.0	180000 GHz				Span 4.755 MHz	
#Res BW		#VBW 5	0 MHz	Sweep	1.000 ms (1001 pts)	
ISG				STATU	s	

Test Plots (8DPSK) Peak Power (CH.0)





Test Plots (8DPSK)

Peak Power (CH.39)



Test Plots (8DPSK) Peak Power (CH.78)





Test Plots (π/4DQPSK)

Peak Power (CH.0)

gilent Spectrum Analyzer - Swept : RL RF 50Ω A Center Freg 2.4020000	AC	SENSE:INT	ALIGNAUTO #Avg Type: RMS	11:57:14 AM Jan 07, 2022 TRACE 12 3 4 5 6	Frequency
	PNO: Fast ++ IFGain:Low	Trig: Free Run Atten: 20 dB	Avg Hold: 1/1		Auto Tun
Ref Offset 16.99 0 dB/div Ref 25.00 dBi			Mkr	2.401 890 GHz 13.144 dBm	Auto Tu
		1			Center Fre
15.0		V			2.402000000 GI
5.00					Start Fre
5.00					2.398772500 GI
5.0					Stop Fr
5.0					2.405227500 G
5.0					CF St
					645.500 k <u>Auto</u> M
5.0					
5.0					Freq Offs 0
5.0					
enter 2.402000 GHz				Span 6.455 MHz	
Res BW 3.0 MHz	#VBW	50 MHz	Sweep	5pan 6.455 MHz 1.000 ms (1001 pts)	
G			STATU	IS	

Test Plots (π/4DQPSK) Peak Power (CH.39)





Test Plots (π /4DQPSK)

Peak Power (CH.78)

^d RL Center F	RF 50 Ω AC req 2.480000000	GHz PNO: Fast ↔ IFGain:Low	SENSE:INT Trig: Free Run Atten: 20 dB	ALIGNAUTO #Avg Type: RMS Avg Hold: 1/1	11:57:36 AM Jan 07, 2022 TRACE 1 2 3 4 5 6 TYPE MWWAMW DET P P P P P P	Frequency
0 dB/div	Ref Offset 16.99 dB Ref 25.00 dBm			Mkr1 2	480 109 48 GHz 14.464 dBm	Auto Tur
15.0			↓ ¹			Center Fr 2.480000000 GI
5.00						Start Fr 2.476780000 G
5.0						Stop Fr 2.483220000 G
5.0						CF St 644.000 k <u>Auto</u> M
5.0						Freq Off 0
55.0						
	480000 GHz 3.0 MHz	#VBW	50 MHz	Sweep	Span 6.440 MHz 1.000 ms (1001 pts)	



10.2 BAND EDGES

Without hopping

Outcido Eroquenov Band	GFSK	8DPSK	π/4DQPSK	Limit
Outside Frequency Band	(dB)	(dB)	(dB)	(dBc)
Lower	55.629	55.902	56.018	00
Upper	66.563	65.035	64.448	20

With hopping

Outoide Fremuenou Dend	GFSK	8DPSK	π/4DQPSK	Limit
Outside Frequency Band	(dB)	(dB)	(dB)	(dBc)
Lower	56.874	57.035	60.800	00
Upper	67.666	66.859	65.981	20

Note :

1. Spectrum measured levels are not plot data.

The power results in plot is already including the actual values of loss for the splitter and cable combination.

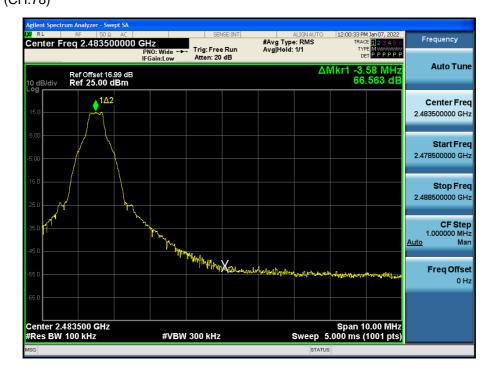
 Actual value of loss for the splitter and cable combination is 16.99 dB at 2400 MHz and is 16.99 dB at 2500 MHz. So, 16.99 dB is offset. And the offset gap in the 2.4 GHz range do not affect the conducted peak power final result.



Test Plots without hopping (GFSK) Band Edges (CH.0)



Test Plots without hopping (GFSK) Band Edges (CH.78)





Test Plots without hopping (8DPSK)

Band Edges (CH.0)



Test Plots without hopping (8DPSK) Band Edges (CH.78)



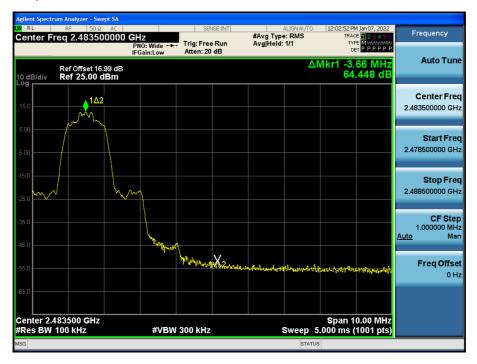


Test Plots without hopping (π /4DQPSK)

Band Edges (CH.0)



Test Plots without hopping (π /4DQPSK) Band Edges (CH.78)





Test Plots with hopping (GFSK)

Band Edges (CH.0)



Test Plots with hopping (GFSK) Band Edges (CH.78)





Test Plots with hopping (8DPSK)

Band Edges (CH.0)



Test Plots with hopping (8DPSK) Band Edges (CH.78)





Test Plots with hopping (π /4DQPSK)

Band Edges (CH.0)



Test Plots with hopping (π/4DQPSK) Band Edges (CH.78)





10.3 FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (99 % BW)

99 % BW (kHz)										
Channel	ChannelGFSK8DPSKπ/4DQPSK									
CH.0	853.57	1173.3	1172.8							
CH.39	851.68	1176.0	1169.2							
CH.78	853.62	1187.8	1178.6							

	20 dB BW (kHz)										
Channel	ChannelGFSK8DPSKπ/4DQPSK										
CH.0	951.4	1299	1291								
CH.39	951.0	1300	1288								
CH.78	951.0	1302	1288								

	Channel Separation(kHz)							
GFSK	8DPSK	π/4DQPSK	(kHz)					
			>25 kHz					
974	998	971	or					
			>2/3 of the 20 dB BW					

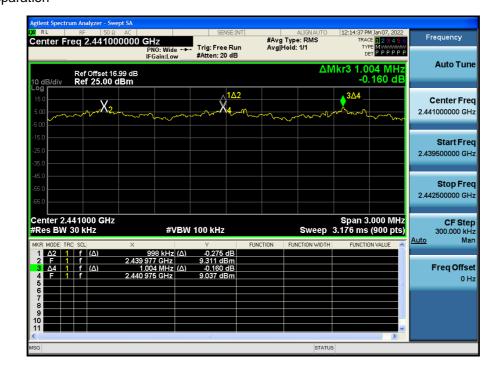


Test Plots (GFSK)

Channel Separation



Test Plots (8DPSK) Channel Separation





Test Plots (π/4DQPSK)

Channel Separation

	rum Analyzer - Swept							
Center F	RF 50 Ω A req 2.4410000	000 GHz	SENSE:INT	#Avg Typ Avg Hold:			07, 2022 2 3 4 5 6	Frequency
10 dB/div	Ref Offset 16.99 Ref 25.00 dB		#Atten: 20 dB	Arginou.		DET P	PPPPP	Auto Tune
Log 15.0 5.00	, X2,	Lumm-	142	2 Marine Marine	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	304	\sim	Center Freq 2.441000000 GHz
-15.0 -25.0 -35.0								Start Freq 2.439500000 GHz
-45.0 -55.0 -65.0								Stop Freq 2.442500000 GHz
#Res BW		#VBV	V 100 kHz		Sweep 3	Span 3.00 8.176 ms (90	00 pts)	CF Step 300.000 kHz Auto Man
MKR MODE TH 1 Δ2 1 2 F 1 3 Δ4 1 4 F 1 5 6 1 7 8 9 10 11 1	f (Δ) f :: f (Δ)	× 1.018 MHz (Δ) 2.439 981 GHz 971 HHz (Δ) 2.440 998 GHz	Y -1.644 dB 9.225 dBm 0.819 dB 7.581 dBm	FUNCTION FUN	NCTION WIDTH	FUNCTION VA		Freq Offset 0 Hz
MSG					STATUS			



Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (CH.0)



Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (CH.39)





Test Plots (GFSK)

20 dB Bandwidth & Occupied Bandwidth (CH.78)



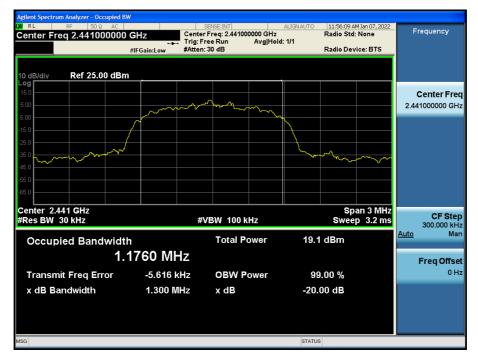
Test Plots (8DPSK) 20 dB Bandwidth & Occupied Bandwidth (CH.0)





Test Plots (8DPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.39)



Test Plots (8DPSK) 20 dB Bandwidth & Occupied Bandwidth (CH.78)





Test Plots (π/4DQPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.0)



Test Plots (π/4DQPSK) 20 dB Bandwidth & Occupied Bandwidth (CH.39)





Test Plots (π/4DQPSK)

20 dB Bandwidth & Occupied Bandwidth (CH.78)





10.4 NUMBER OF HOPPING FREQUENCY

	Limit				
GFSK	GFSK 8DPSK π/4DQPSK				
79	79	79	>15		

Note :

In case of AFH mode, minimum number of hopping channels is 20.



Test Plots (GFSK)

Number of Channels (2.4 GHz - 2.441 GHz)



Test Plots (GFSK)

Number of Channels (2.441 GHz - 2.483.5 GHz)





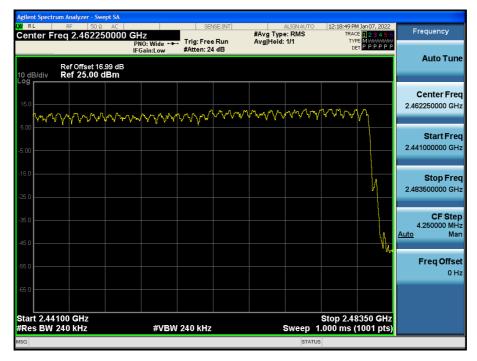
Test Plots (8DPSK)

Number of Channels (2.4 GHz - 2.441 GHz)

Agilent Spectrum Analy: RE RE Center Freq 2.4	50Ω AC			ISE:INT	#Avg Type		TRAC	1 Jan 07, 2022 E <mark>1 2 3 4 5 6</mark> E M V W W W W	Frequency
10 dB/div Ref 2		PNO: Wide ++ IFGain:Low	Trig: Free #Atten: 24		Avg Hold:	1/1	DE	PPPPP	Auto Tun
15.0	MANN	ᢣᠬᠽᡘᢦᠶ᠆ᠬ	ለሊኊ		~~~~	$\sim \sim $	᠕᠕᠕	~~~~	Center Fre 2.420500000 GH
5.00									Start Fre 2.400000000 GH
25.0									Stop Fre 2.441000000 G⊦
5.0									CF Ste 4.100000 MH <u>Auto</u> Ma
5.0									Freq Offs 0 F
55.0 tart 2.40000 GH Res BW 240 kH		#VBW	240 kHz				Stop 2.44	100 GHz 1001 pts)	
sg 🛈 Alignment Co						STATUS			

Test Plots (8DPSK)

Number of Channels (2.441 GHz - 2.483.5 GHz)



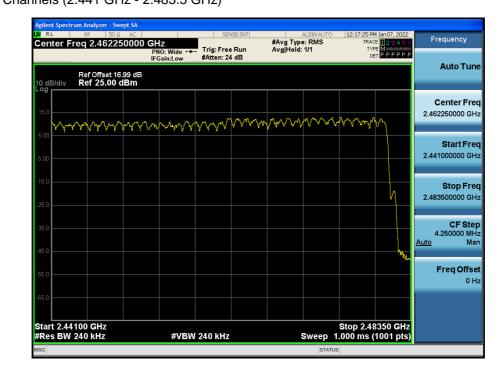


Test Plots (π/4DQPSK)

Number of Channels (2.4 GHz - 2.441 GHz)

RL	RF	50 Ω			SEM	ISE:INT		ALIGNAUTO		1 Jan 07, 2022	Frequency
enter	Freq 2.4	120500	PN	Z O: Wide 🕶 Jain:Low	Trig: Free #Atten: 24		#Avg Typ Avg Hold:		TRAC TYP DE	E 123456 E M MMMMM T P P P P P P	Trequency
0 dB/div		fset 16.9 5.00 di									Auto Tur
. og 15.0	ᡗᡊᢦᠰᢩᠬ	/~~/\	$\sim \sim $	᠂ᢍᡀ᠊᠆ᡐᡎ᠊ᡗ᠋ᢩᡘ᠕ᡕ	<u>አ</u> ላላኒ	ᡎ᠋ᠬ᠕ᢩ᠕	ᢦᡗᢧᠬ᠋ᢩ᠕᠂᠕	MMM	ᠰᢦ᠆ᢧᠬᢧᠰ	$\sqrt{\gamma}$	Center Fre 2.420500000 GH
i.00				· · · · · ·							Start Fre 2.400000000 GH
5.0											Stop Fre 2.441000000 GH
5.0											CF Ste 4.100000 Mi <u>Auto</u> Mi
5.0											Freq Offs 0
	40000 GI								Stop 2.44	100 GHz	
	W 240 kH	Z		#VBW	240 kHz			Sweep 1	.000 ms (roor pts)	

Test Plots (π/4DQPSK) Number of Channels (2.441 GHz - 2.483.5 GHz)





10.5 TIME OF OCCUPANCY (DWELL TIME)

	Channel	GFSK	8DPSK	π/4DQPSK
Pulse Time	Low	2.890	2.890	2.890
(ms)	Mid	2.890	2.890	2.890
	High	2.890	2.890	2.890

Non-AFH Mode

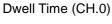
	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell	Low	308.27	308.27	308.27	31.6	
(ms)	Mid	308.27	308.27	308.27	31.6	400
	High	308.27	308.27	308.27	31.6	

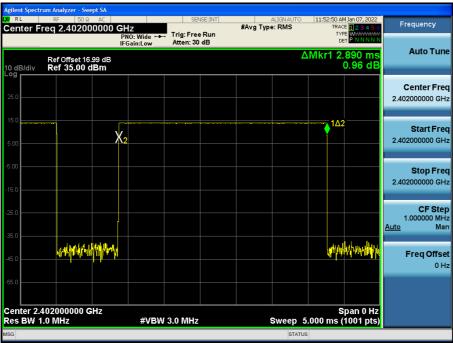
AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell	Low	154.13	154.13	154.13	8.0	
(ms)	Mid	154.13	154.13	154.13	8.0	400
	High	154.13	154.13	154.13	8.0	



Test Plots (GFSK)





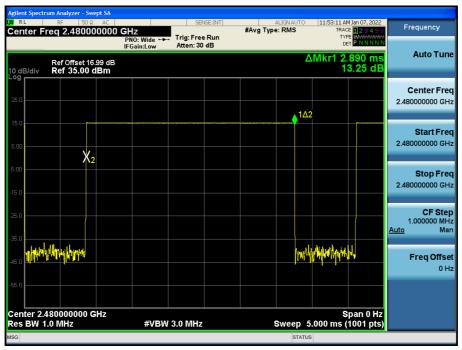
Test Plots (GFSK) Dwell Time (CH.39)





Test Plots (GFSK)

Dwell Time (CH.78)



Test Plots (8DPSK) Dwell Time (CH.0)



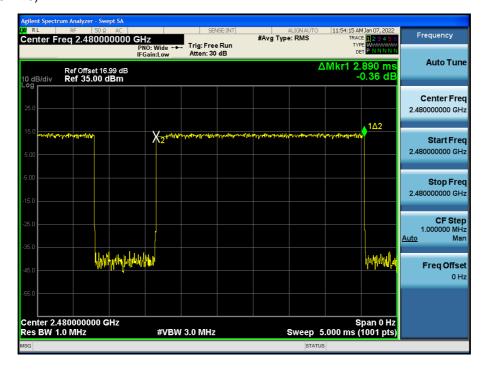


Test Plots (8DPSK)

Dwell Time (CH.39)



Test Plots (8DPSK) Dwell Time (CH.78)



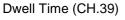


Test Plots (π/4DQPSK)

Dwell Time (CH.0)



Test Plots ($\pi/4DQPSK$)







Test Plots (π /4DQPSK)

Dwell Time (CH.78)

Agilent Spectr	um Analyzer - Swept SA RF 50 Ω AC		ortics	75. 177				11	
	RF 50 Ω AC req 2.480000000	GHz PNO: Wide ↔	SENSE		#Avg Type	ERMS	TRAC	1 Jan 07, 2022 E 1 2 3 4 5 6 E WMMMMM T P N N N N N	Frequency
		IFGain:Low	Atten: 30 d						Auto Tune
10 dB/div Log	Ref Offset 16.99 dB Ref 35.00 dBm					4	\Mkr1 2.	890 ms 1.58 dB	
									Center Freq
25.0									2.480000000 GHz
15.0			and the contract of the contra	1	Δ2		Pallon alphant freedom	water	
5 00									Start Freq 2.48000000 GHz
3.00									
-5.00									Stop Fred
-15.0									2.480000000 GHz
-25.0									CF Ster
-23.0									1.000000 MH: Auto Mar
-35.0					. 11 . 5				
-45.0				W	Marker (Marker)	NAM.			Freq Offset
									0 Hz
-55.0									
Center 2.4	180000000 GHz						s	pan 0 Hz	
Res BW 1	.0 MHz	#VBW	3.0 MHz			_	5.000 ms (1001 pts)	
MSG						STATU	IS		



10.6 SPURIOUS EMISSIONS 10.6.1 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.

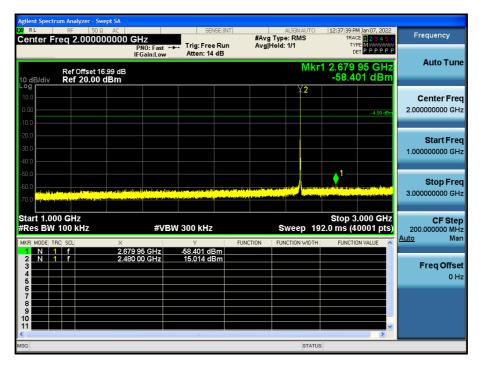


Test Plots (GFSK)- 30 MHz - 1 GHz

Spurious Emission (CH.78)

Agilent Spectr	r <mark>um Analyzer - Swe</mark> RF 50 Ω			SEN	ISE:INT		ALIGNAUTO	12:37:40 D	4 Jan 07, 2022	
	req 515.000	000 MHz	NO: Fast 🔸	Trig: Free	Run	#Avg Type Avg Hold:	e: RMS	TRAC	E 23456 MMMMMM TPPPPP	Frequency
10 dB/div Log	Ref Offset 16. Ref 20.00 d	99 dB	Gain:Low	Atten: 14	dB		MI	kr1 945.	10 MHz 04 dBm	Auto Tune
10.0									2 <u>→</u>	Center Freq 515.000000 MHz
-10.0									-4.99 dBm	Start Freq 30.000000 MHz
-20.0										Stop Freq 1.000000000 GHz
-40.0										CF Step 97.000000 MHz <u>Auto</u> Man
-60.0	Hereiter Handling Bereiter	<u>Al kator a divati</u>	فيرود فأعربهم ومترافع	dal ^a po banana.	dan dalama kan sa	, which is the state of the sta	a dha na fashanna r	hand data mida	1 Jadirek tenener	Freq Offset 0 Hz
-70.0 1 ^{10.1} 101111	an yan Maraka yan da yan da yan yan yan yan yan yan yan yan yan ya	ika dan tang segai kangan tah J	an a	n na her som en som	<mark>rinstaalai _{(Yun} yydentaan a</mark>	e <u>m</u> elikin (staten inin)	n litte provinsi kale over tille de	Cherner and the	niikaadmeke _n akkean	
start 30.0 #Res BW			#VBW	300 kHz		s	weep 93	.33 ms (2	0000 GHz 0000 pts)	
MSG							STATUS			

Test Plots (GFSK)- 1 GHz – 3 GHz



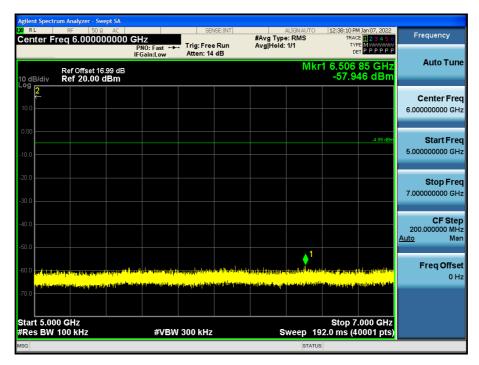


Test Plots(GFSK)- 3 GHz - 5 GHz

Spurious Emission (CH.78)

Agilen		im Analyzer - S	Swept SA		SEA	NSE:INT		ALIGNAUTO	12:27:50 0	4 Jan 07, 2022	
		eq 4.000		GHz PN0: Fast ↔			#Avg Type Avg Hold:	e: RMS	TRAC	E 123456 E MWWWWW	Frequency
				IFGain:Low	Atten: 14	dB		Mler	DE	аррьььр	Auto Tune
10 dE Log	3/div	Ref Offset 7 Ref 20.00						IVINI	-53.9	95 GHz 74 dBm	
209	<mark>2</mark> ←										Center Freq
10.0											4.00000000 GHz
0.00											
-10.0										-4.99 dBm	Start Freq 3.00000000 GHz
- 10.0											
-20.0											Stop Freq
-30.0											5.00000000 GHz
-40.0											CF Step
-40.0											200.000000 MHz Auto Man
-50.0											
-60.0	na kana kana		والمراقعة والأروا	alititeen elsa,	a da an i Manian Ian	al al faith an that a state of the state of	hine the last of the second		u a se an an an ^{sh} ala a l	a a farmer far far far far far far far far far fa	Freq Offset
-70.0	aleonated		nangarang gang tang ta	and the start party of	-	(all fill all and the second	landan Make	and a state of the	the states of the state	ik sek konfereikkeljek	0 Hz
-70.0											
Star	t 3.00) GHz							Stop 5	.000 GHz	
	s BW	100 kHz		#VBW	300 kHz		S		2.0 ms (4	0001 pts)	
MSG								STATUS			

Test Plots (GFSK)- 5 GHz - 7 GHz



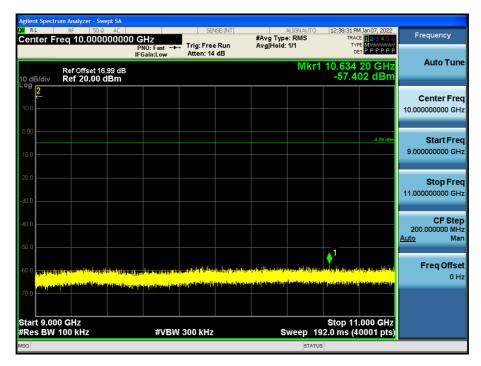


Test Plots(GFSK)- 7 GHz - 9 GHz

Spurious Emission (CH.78)

	ım Analyzer - Swept								
Center Fr	RF 50Ω A				#Avg Type Avg Hold:		TRAC	Jan 07, 2022 1 2 3 4 5 6 E M	Frequency
		IFGain:Low	Atten: 14		in ginera.		DE	TPPPPP	Auto Tune
10 dB/div Log	Ref Offset 16.99 Ref 20.00 dBi	dB m				Mkr	1 7.094 -57.5	10 GHz 33 dBm	Auto Tune
2									Center Freq
10.0									8.000000000 GHz
0.00								-4.99 dBm	Start Freq
-10.0								-4.35 (10)	7.000000000 GHz
-20.0									Stop Freq 9.00000000 GHz
-30.0									9.00000000 GH2
-40.0									CF Step 200.000000 MHz
-50.0									Auto Man
-30.0									Freg Offset
-60.0 WWWW	lithen etter (speckere) an	and a relative degramming		an de line de line Norden de line	lain) na dd draet	(<mark>Partestan</mark> and	<mark>de hader kom</mark>	anang kanang termi	0 Hz
-70.0	a na sa kasa na sa kas	an in the first the state of th	na politici dalla della	and the second second	and the second	ndon staat deel	n in the second seco	iana, dan panini ini i	
Start 7.000 #Res BW		#VB\	N 300 kHz		s	weep 19	Stop 9. 2.0 ms (4	000 GHz 0001 pts)	
MSG						STATUS			

Test Plots(GFSK)- 9 GHz - 11 GHz



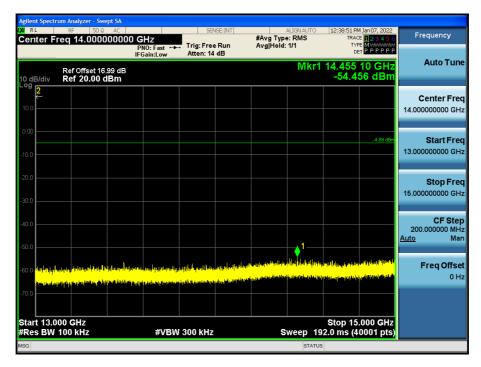


Test Plots(GFSK) 11 GHz - 13 GHz

Spurious Emission (CH.78)

Agilent Spectr	r <mark>um Analyzer - Swe</mark> RF 50 Ω			CEN	ISE:INT		ALIGN AUTO	10/00/41 0	4 Jan 07, 2022	
	req 12.0000	00000 G	iHz NO: Fast ↔	Trig: Free	Run	#Avg Type Avg Hold:	: RMS	TRAC		Frequency
10 dB/div Log	Ref Offset 16. Ref 20.00 d	99 dB	Gain:Low	Atten: 14	dB		Mkr1	12.309	35 GHz 56 dBm	Auto Tune
10.0										Center Freq 12.000000000 GHz
-10.0									-4.99 dBm	Start Freq 11.000000000 GHz
-20.0										Stop Fred 13.000000000 GH:
-40.0						1				CF Step 200.000000 MH; <u>Auto</u> Mar
and the first	n periodo a segura de la segura En la segura de la s	lan <mark>bananan ba</mark>	ata dist bilitari Mangatari	dell'honnouell nemetricalitation	daddan orange and a new min		enertenten bilte antioentelspire	A LOCK MADE	ngh di Hidi ya kwa Yumfan ija kwa a	Freq Offse 0 H:
Start 11.0	00 GHz							Stop 13	.000 GHz	
#Res BW	100 KHz		#VBW	300 kHz		s	STATUS		0001 pts)	

Test Plots (GFSK)- 13 GHz – 15 GHz



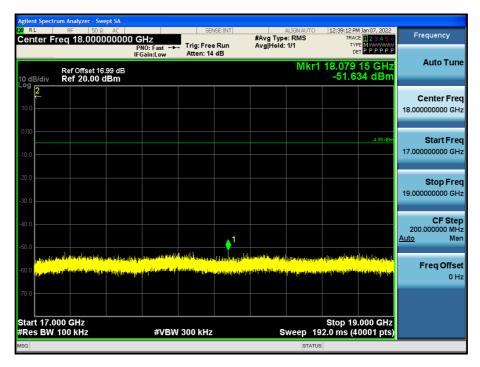


Test Plots(GFSK)- 15 GHz - 17 GHz

Spurious Emission (CH.78)

Agilent S	Spectrum	Analyzer - Sw	ept SA AC		SEN	ISE:INT		ALIGNAUTO	12:30:02 0	4 Jan 07, 2022	
	er Fre	q 16.000(000000	GHz NO: Fast ↔			#Avg Typ Avg Hold:	e: RMS	TRAC	E 123456	Frequency
				Gain:Low	Atten: 14	dB		Mkr4		05 GHz	Auto Tune
10 dB/ Log		Ref Offset 16 Ref 20.00 (IVINII	-53.2	00 dBm	
2											Center Freq
10.0											16.00000000 GHz
0.00											
-10.0										-4.99 dBm	Start Freq 15.00000000 GHz
- 10.0											
-20.0											Stop Freq
-30.0											17.000000000 GHz
-40.0											CF Step
-40.0											200.000000 MHz Auto Man
-50.0 —		1									
-60.0	n hairden fr	in the second		Lapite Hulley Indian					and an indication of the		Freq Offset
-70.0			e so no traffadare	na aktin Mahasana	1.	na kilon ni falikitan	n na hain na haina na haine na Na haine na h	المعرادي خلال	ALL COLORING	a volumi	0 Hz
-70.0											
	15.000								Stop 17	.000 GHz	
	BW 10	00 kHz		#VBW	300 kHz		S			0001 pts)	
MSG								STATUS			

Test Plots(GFSK)- 17 GHz - 19 GHz





Test Plots (GFSK)- 19 GHz - 21 GHz

Spurious Emission (CH.78)

9		um Analyzer - Sv									
Cen		RF 50 s	2 AC 000000	GHz		ISE:INT	#Avg Type		TRAC	4 Jan 07, 2022 E 123456	Frequency
				PNO: Fast 🔸 Gain:Low	Trig: Free Atten: 14		Avg[Hold:	1/1	TYF		
		Ref Offset 1	5 99 dB					Mkr1	20.799	50 GHz	Auto Tune
10 dE Log		Ref 20.00							-51.6	18 dBm	
208	<mark>2</mark> ←										Center Freq
10.0											20.000000000 GHz
0.00										-4.99 dBm	Start Freq
-10.0											19.00000000 GHz
-20.0											Stop Freq
-30.0											21.000000000 GHz
-30.0											
-40.0											CF Step 200.000000 MHz
										1	Auto Man
-50.0		and dushed by a		1			م المعالم الم	In the first state of the	والمرابعة والمرابع	almatumint to at a	
-60.0	4.1. 0.			an the second						linina en prese	Freq Offset
00.0	later the second se	and the second de-	the life of the second se	te diplomente a				da et e lissifie e de	n l		0 Hz
-70.0											
		00 GHz							Stop 21	.000 GHz	
	s BW	100 kHz		#VBW	300 kHz		s	weep 19	2.0 ms (4	0001 pts)	
MSG								STATUS			

Test Plots (GFSK)- 21 GHz - 23 GHz

9		um Analyzer									
Cen		RF 1	50 Q AC	0 GHz	SEN	ISE:INT	#Avg Typ	ALIGNAUTO e: RMS	TRA	4 Jan 07, 2022 E <mark>1 2 3 4 5 6</mark>	Frequency
				PNO: Fast ++ IFGain:Low	Trig: Free Atten: 14		Avg Hold:	1/1	TY D	PPPPPP	
		Def Offere	t 16.99 dB	II GUILLOW				Mkr	1 22.238	50 GHz	Auto Tune
10 di	B/div	Ref 20.0							-50.9	48 dBm	
10 de Log	2										Center Freq
10.0	<u> </u>										22.000000000 GHz
0.00										-4.99 dBm	Start Freq
-10.0											21.000000000 GHz
10.0											
-20.0											Stop Freq
											23.00000000 GHz
-30.0											
-40.0											CF Step
							1				200.000000 MHz <u>Auto</u> Man
-50.0	1				di ana anta	Na	an of a lot a lot as	ball to rus	a the post of the second	a davadir. A ik ik kalika	
		ante da da Arda Arda		and hading and a state of a state of the							Freq Offset
-00:0		annin filminin	denting territer.		الانتسام						0 Hz
-70.0											
		00 GHz								.000 GHz	
#Re	sBW	100 kHz		#VBW	/ 300 kHz		S	weep	192.0 ms (4	0001 pts)	
MSG								STAT	rus		



Test Plots (GFSK)- 23 GHz - 25 GHz

Agilent Spectr	r <mark>um Analyzer - Swept SA</mark> RF 50 Ω AC		CEN	ISE:INT		ALIGNAUT	50 10/00/40 P	M Jan 07, 2022	
	req 24.0000000	00 GHz PNO: Fast			#Avg Type Avg Hold:	: RMS	TRAC TY	E 1 2 3 4 5 6	Frequency
		IFGain:Low	Atten: 14	dB			r1 24.971	ET PPPPP	Auto Tune
10 dB/div Log	Ref Offset 16.99 d Ref 20.00 dBm	В				IVIN		48 dBm	
^{∠0g}									Center Freq
10.0									24.000000000 GHz
0.00								-4.99 dBm	Start Freq
-10.0								-4.35 (10)	23.000000000 GHz
-20.0									Stop Freq 25.00000000 GHz
-30.0									
-40.0									CF Step 200.000000 MHz
-50.0	an the former and the state of		an nevel at t	an is the subble to	an di si ka kila	ndagishina Indagishina	<mark>h la filia ha na sa ta ƙ</mark>	d offerendad by	<u>Auto</u> Man
freelingert	lan terretari kara terretari da anti da seria. Nationa da antida da seria da	and managements and the state of the state o	and a second second	nusian abijorijstv	Angeloogiatik personalitiki	under Hartlig	<mark>hillon an feiligeachadh</mark>	nd a deale gall (the state of the	Freq Offset
-60.0									0 Hz
-70.0									
Start 23.0	00 CH2						Stop 25	.000 GHz	
#Res BW		#VBW	300 kHz		s	weep	192.0 ms (4		
MSG						ST	ATUS		



10.6.2 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30 MHz

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

Note:

1. The Measured 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 μ V) + Distance extrapolation factor
- 4. Radiated test is performed with hopping off.

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F+C.L	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.

2. Radiated test is performed with hopping off.



Frequency Range : Above 1 GHz

Operation Mode: CH Low(GFSK)

		A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	- 71
4804	44.59	5.14	V	0.00	49.73	73.98	24.25	PK
4804	44.59	5.14	V	-24.73	25.00	53.98	28.98	AV
7206	38.75	12.89	V	0.00	51.64	73.98	22.34	PK
7206	38.75	12.89	V	-24.73	26.91	53.98	27.07	AV
4804	45.25	5.14	Н	0.00	50.39	73.98	23.59	PK
4804	45.25	5.14	Н	-24.73	25.66	53.98	28.32	AV
7206	39.07	12.89	Н	0.00	51.96	73.98	22.02	PK
7206	39.07	12.89	Н	-24.73	27.23	53.98	26.75	AV
Operation M	lode: CH N	1id(GFSK)		-				
Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
4882	43.33	5.46	V	0.00	48.79	73.98	25.19	PK
4882	43.33	5.46	V	-24.73	24.06	53.98	29.92	AV
7323	38.99	12.94	V	0.00	51.93	73.98	22.05	PK
7323	38.99	12.94	V	-24.73	27.20	53.98	26.78	AV
4882	43.62	5.46	Н	0.00	49.08	73.98	24.90	PK
4882	43.62	5.46	Н	-24.73	24.35	53.98	29.63	AV
7323	39.08	12.94	Н	0.00	52.02	73.98	21.96	PK
7323	39.08	12.94	н	-24.73	27.29	53.98	26.69	AV
Operation M Frequency	Measured	ligh(GFSK) A.F+C.L-A.G+D.F	Pol.	Duty Cycle	Total	Limit	Margin	Measurement
[MHz]	Value [dBµV]	[dB/m]	[H/V]	Correction			-	Туре
4960	43.60	6.25	V	0.00	49.85	73.98	24.13	PK
4960	43.60	6.25	V	-24.73	25.12	53.98	28.86	AV
7440	39.28	12.61	V	0.00	51.89	73.98	22.09	PK
7440	39.28	12.61	V	-24.73	27.16	53.98	26.82	AV
4960	44.02	6.25	Н	0.00	50.27	73.98	23.71	PK
4960	44.02	6.25	Н	-24.73	25.54	53.98	28.44	AV
7440	39.32	12.61	Н	0.00	51.93	73.98	22.05	PK
7440	39.32	12.61	Н	-24.73	27.20	53.98	26.78	AV



Report No.: HCT-RF-2201-FC089

Operation Mode: CH Low($\pi/4DQPSK$)

		A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	- 71
4804	43.43	5.14	V	0.00	48.57	73.98	25.41	PK
4804	43.43	5.14	V	-24.73	23.84	53.98	30.14	AV
7206	38.55	12.89	V	0.00	51.44	73.98	22.54	PK
7206	38.55	12.89	V	-24.73	26.71	53.98	27.27	AV
4804	44.25	5.14	Н	0.00	49.39	73.98	24.59	PK
4804	44.25	5.14	Н	-24.73	24.66	53.98	29.32	AV
7206	38.63	12.89	Н	0.00	51.52	73.98	22.46	PK
7206	38.63	12.89	Н	-24.73	26.79	53.98	27.19	AV
Operation M	lode: CH M	lid(π/4DQPSK)						
Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
4882	42.43	5.46	V	0.00	47.89	73.98	26.09	PK
4882	42.43	5.46	V	-24.73	23.16	53.98	30.82	AV
7323	39.08	12.94	V	0.00	52.02	73.98	21.96	PK
7323	39.08	12.94	V	-24.73	27.29	53.98	26.69	AV
4882	42.78	5.46	Н	0.00	48.24	73.98	25.74	PK
4882	42.78	5.46	Н	-24.73	23.51	53.98	30.47	AV
7323	39.25	12.94	Н	0.00	52.19	73.98	21.79	PK
7323	39.25	12.94	Н	-24.73	27.46	53.98	26.52	AV
		ligh(π/4DQPSK)		Destas				
Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4960	43.10	6.25	V	0.00	49.35	73.98	24.63	PK
4960	43.10	6.25	V	-24.73	24.62	53.98	29.36	AV
7440	38.83	12.61	V	0.00	51.44	73.98	22.54	PK
7440	38.83	12.61	V	-24.73	26.71	53.98	27.27	AV
4960	43.49	6.25	Н	0.00	49.74	73.98	24.24	PK
4960	43.49	6.25	Н	-24.73	25.01	53.98	28.97	AV
7440	39.01	12.61	Н	0.00	51.62	73.98	22.36	PK
7440	39.01	12.61	Н	-24.73	26.89	53.98	27.09	AV



Report No.: HCT-RF-2201-FC089

Operation Mode: CH Low(8DPSK)

		A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
4804	43.21	5.14	V	0.00	48.35	73.98	25.63	PK
4804	43.21	5.14	V	-24.73	23.62	53.98	30.36	AV
7206	38.56	12.89	V	0.00	51.45	73.98	22.53	PK
7206	38.56	12.89	V	-24.73	26.72	53.98	27.26	AV
4804	44.05	5.14	Н	0.00	49.19	73.98	24.79	PK
4804	44.05	5.14	Н	-24.73	24.46	53.98	29.52	AV
7206	38.68	12.89	Н	0.00	51.57	73.98	22.41	PK
7206	38.68	12.89	Н	-24.73	26.84	53.98	27.14	AV
Operation M	lode: CH M	1id(8DPSK)						
Frequency	Measured Value	A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
4882	42.44	5.46	V	0.00	47.90	73.98	26.08	PK
4882	42.44	5.46	V	-24.73	23.17	53.98	30.81	AV
7323	38.98	12.94	V	0.00	51.92	73.98	22.06	PK
7323	38.98	12.94	V	-24.73	27.19	53.98	26.79	AV
4882	43.16	5.46	Н	0.00	48.62	73.98	25.36	PK
4882	43.16	5.46	Н	-24.73	23.89	53.98	30.09	AV
7323	39.20	12.94	н	0.00	52.14	73.98	21.84	PK
7323	39.20	12.94	н	-24.73	27.41	53.98	26.57	AV
		ligh(8DPSK) A.F+C.L-A.G+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4960	43.76	6.25	V	0.00	50.01	73.98	23.97	PK
4960	43.76	6.25	V	-24.73	25.28	53.98	28.70	AV
7440	38.87	12.61	V	0.00	51.48	73.98	22.50	PK
7440	38.87	12.61	V	-24.73	26.75	53.98	27.23	AV
4960	44.01	6.25	Н	0.00	50.26	73.98	23.72	PK
4960	44.01	6.25	Н	-24.73	25.53	53.98	28.45	AV
7440	39.09	12.61	Н	0.00	51.70	73.98	22.28	PK
7440	39.09	12.61	Н	-24.73	26.97	53.98	27.01	AV



[DBS Mode]

	, and a	A.F+C.L-A.G+D.F		Correction		Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4882	42.02	6.82	V	0.00	48.84	73.98	25.14	PK
4882	42.02	6.82	V	-24.73	24.11	53.98	29.87	AV
7323	38.87	14.10	V	0.00	52.97	73.98	21.01	PK
7323	38.87	14.10	V	-24.73	28.24	53.98	25.74	AV
4882	42.33	6.82	Н	0.00	49.15	73.98	24.83	PK
4882	42.33	6.82	Н	-24.73	24.42	53.98	29.56	AV
7323	38.96	14.10	н	0.00	53.06	73.98	20.92	PK
7323	38.96	14.10	Н	-24.73	28.33	53.98	25.65	AV

WLAN/BT Ant : 802.11a 6 Mbps ch. 40 & Bluetooth Ch. 39 (π /4DQPSK)

Note :

- 1. Used duty cycle correction factor.
- 2. WLAN DBS Data refer to UNII Test Report.



RESULT PLOTS

Radiated Spurious Emissions plot – Peak & Average Result (GFSK, Ch.0 3rd Harmonic, Y-H)

Spectrun	n Sp	ectrum 2	X S	pectrum 3	Xs	pectrum -	4 X		
	l 97.00 dBµ			W 1 MHz	_				
Att Count 100,		B 👄 SWT 5	50 ms 👄 VB	W 3 MHz	Mode Swe	ер			
●1Pk Max●									
90 dBµV					M	1[1]	I		39.08 dBµV 271030 GHz
80 dBµV									
70 dBµV									
60 dBµV									
50 dBµV									
40 dBµV	holomente	ummunum	mpronumente	erren brown britter	manul	muluum	MI	gallenation	an month and a start
Члинчни 30 dвµV—	Malpublic	uruwaliyihadar	hiphladagentation	lhour-bryally	-likullulu-mon	Walter	fulonithinghise	habblar	white
20 dBµV—									
10 dBµV									
0 dBµV									
CF 7.323 (GHz			691	pts			Span	15.0 MHz
					Mea	suring		4/4	18:45:15

Radiated Spurious Emissions plot – Peak & Average Result (π /4DQPSK, Ch.39 3rd Harmonic, Y-H)

Spectrum	Sp	ectrum 2	X SI	bectrum 3	Xs	pectrum	4 X		
Ref Level 97	.00 dBµ	V	e RB	W 1 MHz					
Att 🗧		B 👄 SWT 5	0 ms 👄 🛛 🛛	W 3 MHz	Mode Swe	ep			
Count 100/100									
●1Pk Max●2Pk	Clrw								
					M1[1] 39.25 d 7.3231740				
90 dBµV						1	1	7.32	31740 GH2
80 dBµV									
70 dBµV									
60 dBµV									
50 dBuV									
40 dBuV					M1				
Level Contract	manden	where the hard	howenered	my presenting	elevenment	With which	mount	multim	unun
ԴեՎԻԿՄԿՎՆՆՆՎԵՐՆԻԿ 30 dBµV	164,044	plantraduration	unable	walk-analy-	aranglara	May Markey	Larrand	ի®ԻՎՐՆիա((ՆԱ-ԾԻՎ	ֈֈնուկիսունեկի
20 dBµV-									
10 dBµV									
0 dBµV									
CF 7.323 GHz				691	pts			Span	15.0 MHz
					Mea	suring		440	3.01.2022



Radiated Spurious Emissions plot – Peak & Average Result (8DPSK, Ch.0 3rd Harmonic, Y-H)

Spectrum	Spectrum 2	x s	pectrum 3	×s	pectrum ·	4 X		
Ref Level 97.00			3W 1 MHz					
Att	0 dB 👄 SWT 9	0 ms 👄 🛛 🛛	3W 3 MHz	Mode Swe	ep			
Count 100/100 1Pk Maxe2Pk Clr								
JIPK Maxe2PK Cir	W		1		1[1]			
				IN IN	1[1]			39.20 dBµV 58580 GHz
90 dBµV							7.01	
BO dBµV								
70 dBµV								
60 dBµV								
50 dBuV								
M1 47 dBuV								
40 dBUV	what muse me	mulphing	muner	manum	malution	wraw when	unnermen	unan habe
տ∥MMMAAAAballAMA 30 dBµV——	for the providence	walling manage	MARSHIM	hadentering	HANGHANA	hyxllalandallactailty	elegildere parte shi	Linger Manga
30 GBHA								
20 dBµV								
10 dBµV								
0 dBµV								
CF 7.323 GHz			691	pts			Span	15.0 MHz
CF 7.323 GHz			691	pts	suring		Span	15.0 MHz

Note:

Plot of worst case are only reported.



RESULT PLOTS(DBS)

WLAN/BT Ant : 802.11a 6 Mbps ch. 40 & Bluetooth Ch. 39 (π /4DQPSK)

Radiated Spurious Emissions plot – Average & Peak Result (3rd Harmonic, Y-H)

●1Pk Max●2Pk Clrv	N								
90 dBµV				M	1[1]	1	38.96 dBµV 7.3409090 GHz		
30 dBµV									
0 dBµV									
0 dBµV									
i0 dBµV									
O dBUV	M		dulkaraugurut.at.	Alla and a c	, hu a Araa a		M1	www.hrutakus	
, has by the part of the part		WWWWWWWWW			all for the second	aller hill roll	hill particular	alleration of the second s	
ю dBµV									
O dBµV									

Note:

Plot of worst case are only reported.



10.6.3 RADIATED RESTRICTED BAND EDGES

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

Frequency	Measured Level	A.F+C.L+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
2390.0	49.90	2.99	Н	0	52.89	73.98	21.09	PK
2390.0	49.90	2.99	Н	-24.73	28.16	53.98	25.82	AV
2390.0	49.81	2.99	V	0	52.80	73.98	21.18	PK
2390.0	49.81	2.99	V	-24.73	28.07	53.98	25.91	AV
2483.5	61.99	4.20	Н	0	66.19	73.98	7.79	PK
2483.5	61.99	4.20	Н	-24.73	41.46	53.98	12.52	AV
2483.5	63.49	4.20	V	0	67.69	73.98	6.29	PK
2483.5	63.49	4.20	V	-24.73	42.96	53.98	11.02	AV

Operation Mode

 $EDR(\pi/4DQPSK)$

Operating Frequency

Channel No

2402 MHz, 2480 MHz

CH 0, CH 78

Frequency	Level	A.F+C.L+D.F		Duty Cycle Correction		Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
2390.0	49.47	2.99	Н	0	52.46	73.98	21.52	PK
2390.0	49.47	2.99	Н	-24.73	27.73	53.98	26.25	AV
2390.0	49.29	2.99	V	0	52.28	73.98	21.70	PK
2390.0	49.29	2.99	V	-24.73	27.55	53.98	26.43	AV
2483.5	60.01	4.20	Н	0	64.21	73.98	9.77	PK
2483.5	60.01	4.20	Н	-24.73	39.48	53.98	14.50	AV
2483.5	63.46	4.20	V	0	67.66	73.98	6.32	PK
2483.5	63.46	4.20	V	-24.73	42.93	53.98	11.05	AV



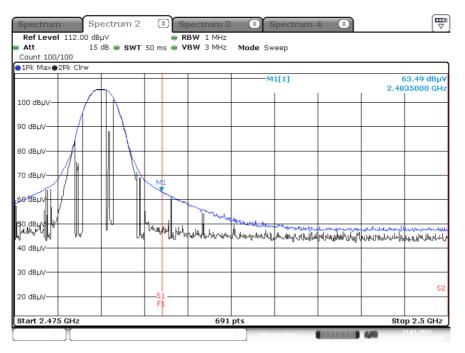
EDR(8DPSK)
2402 MHz, 2480 MHz
CH 0, CH 78

Frequency	Measured Level	A.F+C.L+D.F	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
2390.0	49.78	2.99	Н	0	52.77	73.98	21.21	PK
2390.0	49.78	2.99	н	-24.73	28.04	53.98	25.94	AV
2390.0	49.56	2.99	V	0	52.55	73.98	21.43	PK
2390.0	49.56	2.99	V	-24.73	27.82	53.98	26.16	AV
2483.5	60.23	4.20	н	0	64.43	73.98	9.55	PK
2483.5	60.23	4.20	Н	-24.73	39.70	53.98	14.28	AV
2483.5	63.17	4.20	v	0	67.37	73.98	6.61	PK
2483.5	63.17	4.20	۷	-24.73	42.64	53.98	11.34	AV

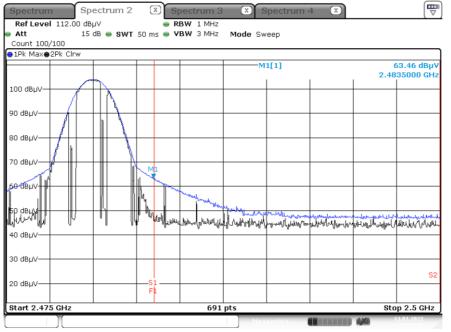


RESULT PLOTS

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



Radiated Restricted Band Edges plot – Average & Peak Result (π/4DQPSK, Ch.78, Y-V)





Spectrum 2 Spectrum Spectrum 3 X Spectrum 4 X Ref Level 112.00 dBμV RBW 1 MHz Att 15 dB SWT 50 ms VBW 3 MHz Mode Sweep Count 100/100 ●1Pk Max●2Pk Clrw 63.17 dBµ\ 2.4835000 GH M1[1] 100 dBµV-90 dBµV 80 dBµV 70 dBµV M 68 (18µV so եթյլչ Խմիլ IJ K Warry work were were were and the second with the second were and 40 dBµV∙ 30 dBµV S2 20 dBµV F Stop 2.5 GHz Start 2.475 GHz 691 pts

Radiated Restricted Band Edges plot – Average & Peak Result (8DPSK, Ch.78, Y-V)

Note:

Plot of worst case are only reported.

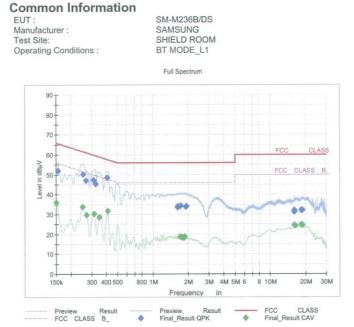


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10.7 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

BT MODE_L1



Test Report

Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	(dB)
0.1545	51.78	65.75	13.97	9.000	L1	OFF	9.6
0.2558	50.26	61.57	11.30	9.000	L1	OFF	9.6
0.2693	47.04	61.14	14.10	9.000	L1	OFF	9.6
0.3120	47.36	59.92	12.56	9.000	L1	OFF	9.6
0.3255	45.33	59.57	14.23	9.000	L1	OFF	9.6
0.4088	48.59	57.67	9.08	9.000	L1	OFF	9.7
1.6205	33.99	56.00	22.01	9.000	L1	OFF	9.7
1.6318	33.62	56.00	22.38	9.000	L1	OFF	9.7
1.6363	33.53	56.00	22.47	9.000	L1	OFF	9.7
1.7173	34.19	56.00	21.81	9.000	L1	OFF	9.7
1.8995	33.78	56.00	22.22	9.000	L1	OFF	9.7
1.9243	34.00	56.00	22.00	9.000	L1	OFF	9.7
15.9643	31.34	60.00	28.66	9.000	L1	OFF	10.2
15.9710	32.04	60.00	27.96	9.000	L1	OFF	10.2
15.9800	31.10	60.00	28.90	9.000	L1	OFF	10.2
18.3425	32.14	60.00	27.86	9.000	L1	OFF	10.3
18.3515	32.11	60.00	27.89	9.000	L1	OFF	10.3
18.6395	31.89	60.00	28.11	9.000	L1	OFF	10.3

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BT MODE_L1

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Final	Result	CAV

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	36.00	56.00	20.00	9.000	L1	OFF	9.6
0.2513	33.84	51.72	17.88	9.000	L1	OFF	9.6
0.2715	29.80	51.07	21.28	9.000	L1	OFF	9.6
0.3165	30.38	49.80	19.42	9.000	L1	OFF	9.6
0.3503	28.58	48.96	20.38	9.000	L1	OFF	9.6
0.4110	31.70	47.63	15.93	9.000	L1	OFF	9.7
1.6970	18.89	46.00	27.11	9.000	L1	OFF	9.7
1.7083	18.64	46.00	27.36	9.000	L1	OFF	9.7
1.7623	18.60	46.00	27.40	9.000	L1	OFF	9.7
1.7735	18.58	46.00	27.42	9.000	L1	OFF	9.7
1.8455	18.16	46.00	27.84	9.000	L1	OFF	9.7
1.8635	18.74	46.00	27.26	9.000	L1	OFF	9.7
15.9688	24.52	50.00	25.48	9.000	L1	OFF	10.2
16.3108	24.34	50.00	25.66	9.000	L1	OFF	10.3
18.3470	24.71	50.00	25.29	9.000	L1	OFF	10.3
18.7003	24.43	50.00	25.57	9.000	L1	OFF	10.3
18.7070	24.52	50.00	25.48	9.000	L1	OFF	10.3
18.7453	24.48	50.00	25.52	9.000	L1	OFF	10.3

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Conducted Emissions (Line 2)

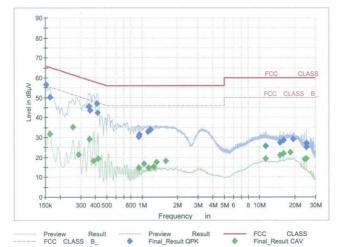
BT MODE_N

Test Report

Common Information

EUT : Manufacturer : Test Site: Operating Conditions : SM-M236B/DS SAMSUNG SHIELD ROOM BT MODE_N





Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	56.54	65.88	9.34	9.000	N	OFF	9.6
0.1635	50.09	65.28	15.20	9.000	N	OFF	9.6
0.3525	45.52	58.90	13.39	9.000	N	OFF	9.6
0.3615	43.59	58.69	15.10	9.000	N	OFF	9.6
0.4133	47.12	57.58	10.47	9.000	N	OFF	9.7
0.4178	42.35	57.49	15.15	9.000	N	OFF	9.7
0.9388	30.41	56.00	25.59	9.000	N	OFF	9.7
0.9433	30.44	56.00	25.56	9.000	N	OFF	9.7
0.9500	31.38	56.00	24.62	9.000	N	OFF	9.7
1.1210	32.87	56.00	23.13	9.000	N	OFF	9.7
1.1728	34.06	56.00	21.94	9.000	N	OFF	9.7
1.1795	33.83	56.00	22.17	9.000	N	OFF	9.7
11.2145	25.55	60.00	34.45	9.000	N	OFF	10.1
14.9540	27.31	60.00	32.69	9.000	N	OFF	10.3
15.9688	28.47	60.00	31.53	9.000	N	OFF	10.3
19.3663	29.12	60.00	30.88	9.000	N	OFF	10.4
25.1443	27.16	60.00	32.84	9.000	N	OFF	10.6
25.1533	25.03	60.00	34.97	9.000	N	OFF	10.6

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BT MODE_N

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Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1635	31.65	55.28	23.63	9.000	N	OFF	9.6
0.2580	35.15	51.50	16.34	9.000	N	OFF	9.6
0.2895	21.24	50.54	29.30	9.000	N	OFF	9.6
0.3548	29.20	48.85	19.65	9.000	N	OFF	9.6
0.3863	18.29	48.14	29.86	9.000	N	OFF	9.6
0.4200	19.45	47.45	28.00	9.000	N	OFF	9.7
0.9388	14.82	46.00	31.18	9.000	N	OFF	9.7
1.0378	16.84	46.00	29.16	9.000	N	OFF	9.7
1.1300	14.63	46.00	31.37	9.000	N	OFF	9.7
1.2583	15.42	46.00	30.58	9.000	N	OFF	9.7
1.3258	17.71	46.00	28.29	9.000	N	OFF	9.7
1.5980	18.12	46.00	27.88	9.000	N	OFF	9.7
11.2145	19.47	50.00	30.53	9.000	N	OFF	10.1
14.9518	21.08	50.00	28.92	9.000	N	OFF	10.3
15.9710	21.82	50.00	28.18	9.000	N	OFF	10.3
18.3515	22.48	50.00	27.52	9.000	N	OFF	10.4
24.1273	19.05	50.00	30.95	9.000	N	OFF	10.6
25.1488	19.47	50.00	30.53	9.000	N	OFF	10.6

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11. 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	ESPEC	0093008124	03/15/2022	Annual	
Signal Analyzer	N9030A	Agilent	MY49432108	03/09/2022	Annual	
Power Meter	N1911A	Agilent	MY45100523	04/08/2022	Annual	
Power Sensor	N1921A	Agilent	MY57820067	04/08/2022	Annual	
Power Splitter	11667B	Hewlett Packard	10545	02/09/2022	Annual	
DC Power Supply	E3632A	HP	MY50360067	02/26/2022	Annual	
Attenuator(10 dB)(DC-26.5 GHz)	8493C	HP	07560	06/18/2022	Annual	
Attenuator(10 dB)(DC-26.5 GHz)	8493C	HP	08285	06/28/2022	Annual	
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	03/08/2022	Annual	
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A	
FCC WLAN&BT&BLE Conducted	N/A	HCT CO., LTD.	N/A	N/A	N/A	
Test Software v3.0		1101 00., ETD.	IWA	11/7		

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-2201-FC089

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
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	1513	Schwarzbeck	1513-333	03/19/2022	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	09/04/2022	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	02296	05/19/2022	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	04/12/2023	Biennial
Spectrum Analyzer	FSV(10 Hz ~ 40 GHz)	Rohde & Schwarz	101055	05/14/2022	Annual
Band Reject Filter	WRCJV2400/2483.5- 2370/2520-60/12SS	Wainwright Instruments	2	01/06/2023	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
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	Annual
HPF(3~18GHz) + LNA1(1~18GHz)	FMSR-05B	TNM system	F6	01/19/2023	Annual
ATT(10dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/19/2023	Annual
ATT(3dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/19/2023	Annual
LNA1(1~18GHz)	FMSR -05B	TNM system	25540	01/19/2023	Annual
HPF(7~18GHz) + LNA2(6~18GHz)	FMSR -05B	TNM system	28550	01/19/2023	Annual
Thru(30MHz ~ 18GHz)	FMSR -05B	TNM system	None	01/19/2023	Annual

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.

2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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



12. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2201-FC089-P