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FCC BT REPORT Certification

Applicant Name: SAMSUNG Electronics Co., Ltd.

Address:

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea Date of Issue: October 21, 2022

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

Report No.: HCT-RF-2210-FC031

FCC ID:A3LSMS911BAPPLICANT:SAMSUNG Electronics Co., Ltd.Model:SM-S911B/DSAdditional Model:SM-S911BEUT Type:Mobile PhoneMax. RF Output Power:Ant.1: 16.498 dBm (44.65 mW)
Ant.2: 16.100 dBm (40.74 mW)

Ant.2: 16.100 dBm (40.74 mW)Frequency Range:2402 MHz– 2480 MHz (Bluetooth)Modulation typeGFSK(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 : Kyung Jun Woo 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-2210-FC031	October 21, 2022	- First Approval Report



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1. EUT DESCRIPTION

Model	SM-S911B/DS
Additional Model	SM-S911B
EUT Type	Mobile Phone
Power Supply	DC 3.88 V
Frequency Range	2 402 MHz ~ 2 480 MHz
Max. RF Output Power	Ant.1: 16.498 dBm (44.65 mW) Ant.2: 16.100 dBm (40.74 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	September 06, 2022 ~ October 21, 2022
Serial number	Radiated: R3CT90BE36R Conducted : R3CT706PF2A



ANTENNA CONFIGURATIONS

1. The device employs MIMO technology. Below are the possible configurations

Configurations	SI	Dual BT	
Configurations	Ant1(core-0)	Ant2(Core-1)	Ant1 & Ant2
Bluetooth	0	0	Х

Note:

- 1) O = Support, X = Not Support
- 2) SISO = Single Input Single Output
- 3) Dual BT = Single Output 1& 2



2. This device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the 2.4 GHz and 5 GHz bands simultaneously on each antenna.

RSDB Scenario	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5 GHz WiFi Ant.1	5 GHz WiFi Ant.2	6 GHz WiFi Ant.1	6 GHz WiFi Ant.2	Bluetooth Ant.1	Bluetooth Ant.2
2.4 GHz WiFi MIMO +	on	on			on	on		
6 GHz WiFi MIMO								
2.4 GHz WiFi MIMO +	on	on	on	on				
5 GHz WiFi MIMO	OII	011	511	011				
Bluetooth ANT.1 +								
2.4 GHz WiFi ANT.2 +		on	on	on			on	
5 GHz WiFi MIMO								
Bluetooth ANT.1 +								
2.4 GHz WiFi ANT.2 +		on			on	on	on	
6 GHz WiFi MIMO								

Non-DBS	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5 GHz WiFi Ant.1	5 GHz WiFi Ant.2	6 GHz WiFi Ant.1	6 GHz WiFi Ant.2	Bluetooth Ant.1	Bluetooth Ant.2
Bluetooth ANT.2 +					0.7	0.0		0.12
6 GHz WiFi MIMO					on	on		on
Bluetooth ANT.2 +			- 17					
5GHz WiFi MIMO			on	on				on
Bluetooth ANT.1 +								
6 GHz WiFi MIMO					on	on	on	
Bluetooth ANT.1 +			- 17					
5GHz WiFi MIMO			on	on	-	-	on	-



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 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013). To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120 kHz for frequencies below 1 GHz or 1 MHz for frequencies above 1 GHz. For average measurements above 1 GHz, the analyzer was set to peak detector and add the DCCF calculations.

DESCRIPTION OF TEST MODES

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



4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration 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)	2.00 (Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.74 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.51 (Confidence level about 95 %, <i>k</i> =2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.92 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.48 (Confidence level about 95 %, k=2)



8. DESCRIPTION OF TESTS

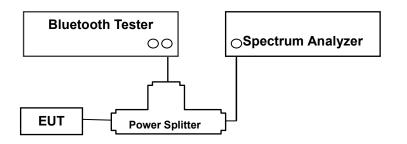
8.1. Conducted Maximum Peak Output Power

<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

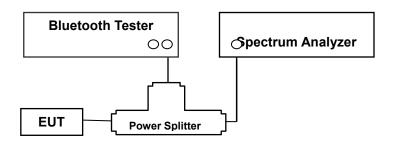


8.2. Conducted Band Edge(Out of Band Emissions)

<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

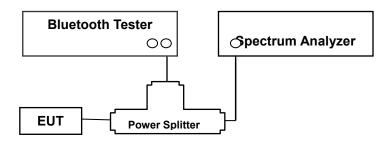


8.3. Frequency Separation & 20 dB Bandwidth

<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 \geq 3 x RBW
- 4) Sweep: Auto
- 5) Detector: Peak
- 6) Trace: Max hold
- 7) All the trace to stabilize.

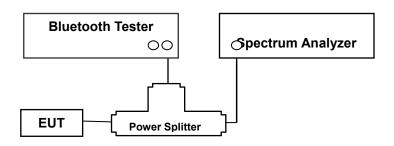


8.4. Number of Hopping Frequencies

<u>Limit</u>

According to $\frac{15.247(a)(1)(iii)}{1000}$, 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.

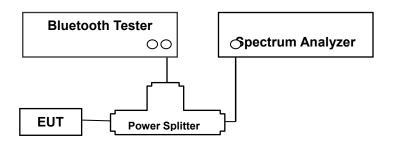


8.5. Time of Occupancy

<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)

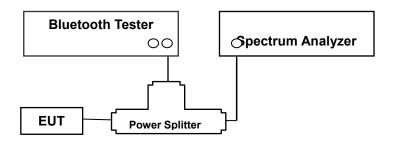


8.6. Conducted Spurious Emissions

<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	16.59
100	16.67
200	16.75
300	16.88
400	16.94
500	16.96
600	16.96
700	17.00
800	17.04
900	17.07
1000	17.11
2000	17.38
2400	17.70
2500	17.70
3000	17.59
4000	17.77
5000	17.97
6000	17.97
7000	18.08
8000	18.07
9000	18.26
10000	18.38
11000	18.51
12000	18.65
13000	18.74
14000	18.86
15000	18.97
16000	19.05
17000	19.17
18000	19.19
19000	19.18
20000	19.23
21000	19.26
22000	19.33
23000	19.49
24000	19.50
25000	19.52
26000	19.58

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

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



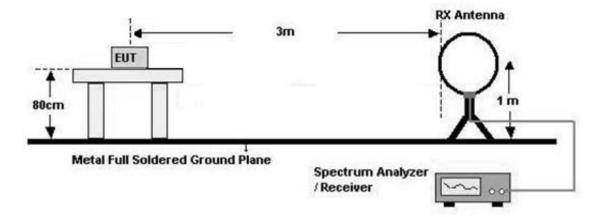
8.7. Radiated Test

<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

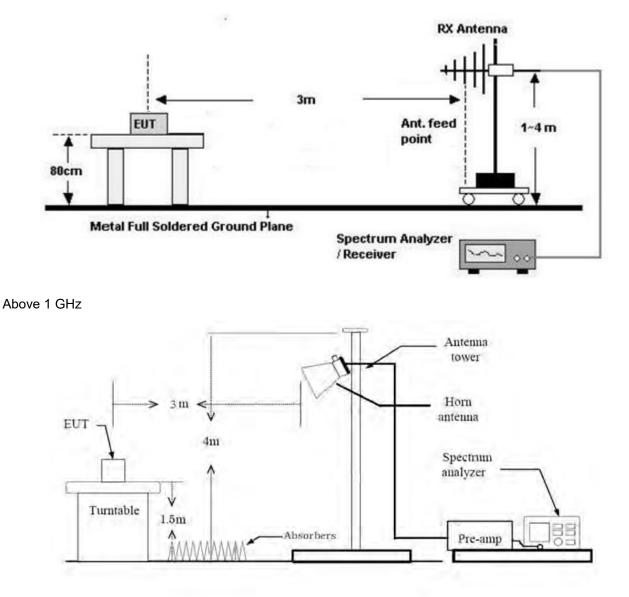
Test Configuration

Below 30 MHz





30 MHz - 1 GHz



Test Procedure of Radiated spurious emissions(Below30 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 3m from the EUT
- 3. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
- 5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 6. Distance Correction Factor(0.009 MHz 0.490 MHz) =40log(3 m/300 m)= 80 dB Measurement Distance : 3 m
- 7. Distance Correction Factor(0.490 MHz 30 MHz) =40log(3 m/30 m)= 40 dB

Measurement Distance : 3 m



- 8. Spectrum Setting
 - Frequency Range = 9 kHz ~ 30 MHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 9 kHz
 - VBW \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 0.8m above ground plane.
- 3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
- 4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
- 5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 6. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Measured Frequency Range : 30 MHz 1 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 100 kHz
 - VBW \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 \ge 3 x RBW
 - (2) Measurement Type(Average):
 - We performed using a reduced video BW method was done with the analyzer in linear mode
 - Measured Frequency Range : 1 GHz 25 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 1 MHz
 - VBW \ge 1/T Hz, where T = pulse width in seconds
 - The actual setting value of VBW = 1 kHz
- 10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- 11. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 12.Total
 - (1) Measurement(Peak)
 - = Measured Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Attenuator(ATT)
 - + Distance Factor(D.F)



- (2) Measurement(Avg)
- = Measured Value(Avg) + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Attenuator(ATT) + Distance Factor(D.F)

Test Procedure of Radiated Restricted Band Edge

- 1. Radiated test is performed with hopping off.
- 2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
- 3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
- 4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 5. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out
 - the highest emissions.
- 6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. The unit was tested with its standard battery.
- 8. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 1 MHz
 - VBW ≥ 3 x RBW
 - (2) Measurement Type(Average):
 - Average value of pulsed emissions
 - Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determine from the peak field strength after correcting for the worst-case duty cycle as described in Number.13 (On Page. 26)
- 9. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 10. Total
 - (1) Measurement (Peak)
 - = Measured Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Attenuator(ATT) + Distance Factor(D.F)
 - (2) Measurement (Avg)
 - = Measured Value(Peak) + Antenna Factor(A.F) + Cable Loss(C.L) Amp Gain(A.G) + Attenuator(ATT)
 - + Distance Factor(D.F) + D.C.C.F

11. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

- 12. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
- 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



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 30MHz.
 - 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
 - (1) Ant 1
 - Radiated Spurious Emissions : Y
 - Radiated Restricted Band Edge : X
 - (2) Ant 2
 - Radiated Spurious Emissions : Z
 - Radiated Restricted Band Edge : Y

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

- GFSK : DH5
- π/4DQPSK : 2-DH5
- 8DPSK : 3-DH5

4. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.

- Position : Horizontal, Vertical, Parallel to the ground plane
- 5. SM-S911B/DS, SM-S911B were tested and the worst case results are reported.
- (Worst case : SM-S911B/DS)



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, Keyboard, etc)
 - Worstcase : Stand alone
- 2. EUT Axis
 - Radiated Spurious Emissions : Z
- 3. All of RSDB Scenario were investigated and the worst case configuration results are reported.
 - Worst case : Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO

RSDB Scenario	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5 GHz WiFi Ant.1	5 GHz WiFi Ant.2	6 GHz WiFi Ant.1	6 GHz WiFi Ant.2	Bluetooth Ant.1	Bluetooth Ant.2
2.4 GHz WiFi MIMO + 6 GHz WiFi MIMO	on	on			on	on		
2.4 GHz WiFi MIMO + 5 GHz WiFi MIMO	on	on	on	on				
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO		on	on	on			on	
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 6 GHz WiFi MIMO		on			on	on	on	

Non-DBS	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5 GHz WiFi Ant.1	5 GHz WiFi Ant.2	6 GHz WiFi Ant.1	6 GHz WiFi Ant.2	Bluetooth Ant.1	Bluetooth Ant.2
Bluetooth ANT.2 +					0.0	0.0		on
6 GHz WiFi MIMO					on	on		on
Bluetooth ANT.2 +			0.5	a n				0.12
5GHz WiFi MIMO			on	on				on
Bluetooth ANT.1 +					a n	a n	0.0	
6 GHz WiFi MIMO					on	on	on	
Bluetooth ANT.1 +			0.0	<u></u>			<u></u>	
5GHz WiFi MIMO			on	on	-	-	on	-



4. The following tables show the worst case configurations determined during testing.

(Worst case: The lowest margin condition the channels and modes were selected for test.)

RSDB Scenario	Description	Bluetooth Emission	2.4GHz Emission	5 GHz Emission
Bluetooth ANT.1 +	Antenna	ANT1	ANT2	Ant All
	Channel	78	1	36
2.4 GHz WiFi ANT.2 +	Data Rate	1 Mbps	MCS 0	MCS 0
5 GHz WiFi MIMO	Mode	π/4DQPSK	802.11ax(HE20), SU	802.11ax(HE20), SU

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
- 2. SM-S911B/DS, SM-S911B were tested and the worst case results are reported.

(Worst case : SM-S911B/DS)

Conducted test

- 1. The EUT was configured with data rate of highest power.
 - GFSK : DH5
 - π/4DQPSK : 2-DH5
 - 8DPSK : 3-DH5
- 2. AFH & Non-AFH were tested and the worst case results are reported.
 - (Worst case : Non-AFH)
- 3. SM-S911B/DS, SM-S911B were tested and the worst case results are reported.

(Worst case : SM-S911B/DS)



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	<0.125 W	
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	Dadistad	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

[Ant.1]

Channel Frequency		Output Power (GFSK)		Limit
	(MHz)	(dBm)	(mW)	(mW)
Low	2402	15.784	37.88	
Mid	2441	16.498	44.65	125
High	2480	15.009	31.69	

Channel	Frequency	Output Power (8DPSK)		Limit
	(MHz)	(dBm)	(mW)	(mW)
Low	2402	15.703	37.18	
Mid	2441	16.452	44.18	125
High	2480	15.106	32.40	

Channel	Frequency (MHz)	Output Power (π/4DQPSK)		Limit (mW)
	(WITZ)	(dBm)	(mW)	(11144)
Low	2402	15.117	32.49	
Mid	2441	15.896	38.87	125
High	2480	14.665	29.28	



[Ant.2]

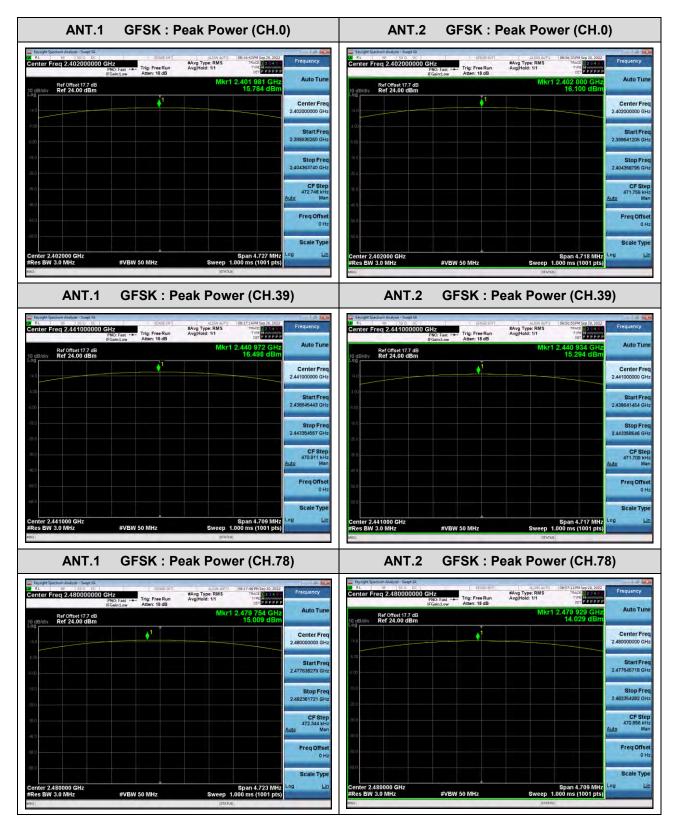
Channel	Frequency	Output Power (GFSK)		Limit
	(MHz)	(dBm)	(mW)	(mW)
Low	2402	16.100	40.74	
Mid	2441	15.294	33.84	125
High	2480	14.029	25.29	

Channel Frequency		Output Power (8DPSK)		Limit
	(MHz)	(dBm)	(mW)	(mW)
Low	2402	16.048	40.25	
Mid	2441	15.253	33.52	125
High	2480	13.985	25.03	

Channel	Frequency (MHz)	Output Power (π/4DQPSK)		Limit (mW)
	()	(dBm)	(mW)	()
Low	2402	15.554	35.93	
Mid	2441	14.729	29.71	125
High	2480	13.454	22.15	



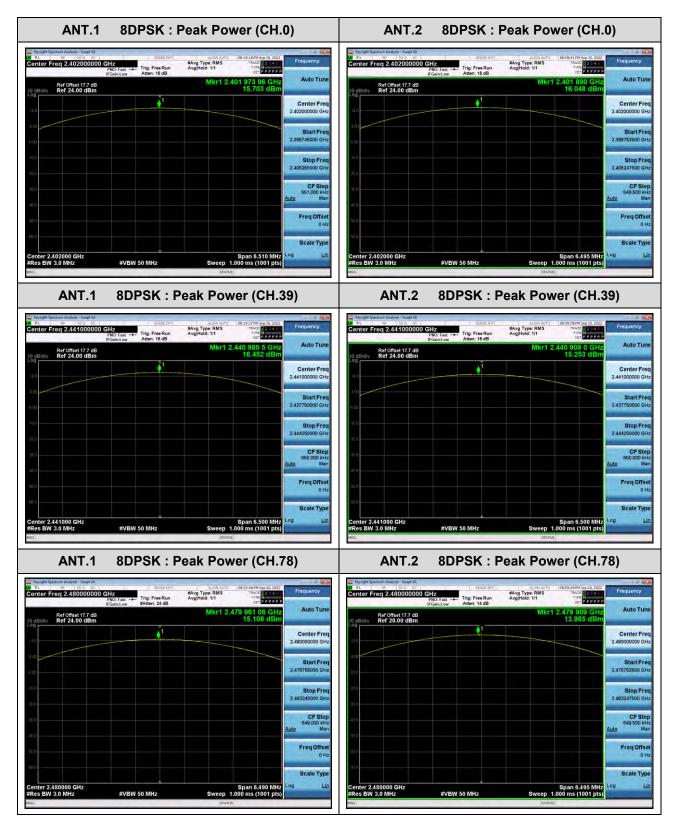
TEST PLOTS



HCT CO.,LTD.

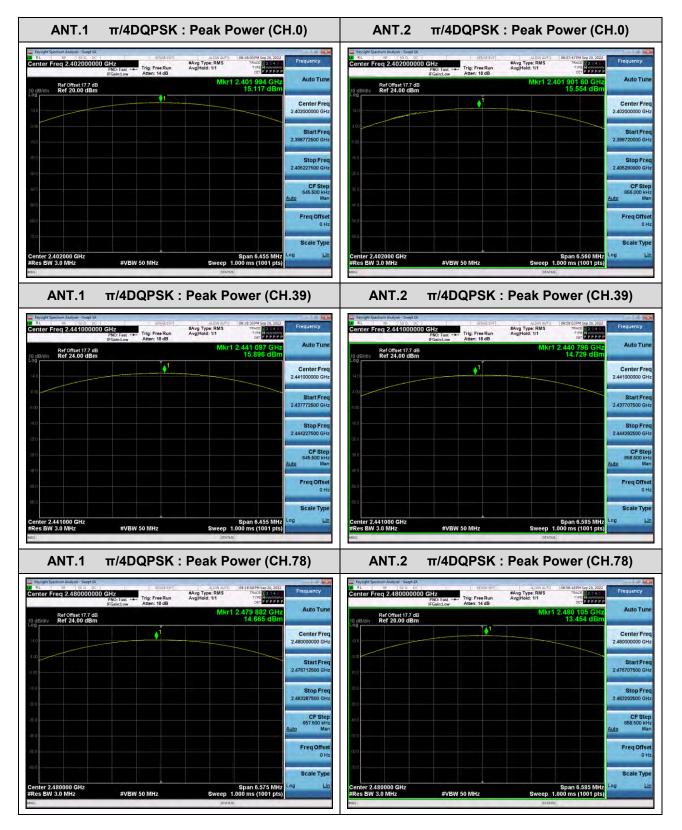


TEST PLOTS





TEST PLOTS





10.2 BAND EDGES

[Ant.1]

Without hopping

Outoido Eroquanou Band	GFSK	8DPSK	π/4DQPSK	Limit
Outside Frequency Band	(dB)	(dB)	(dB)	(dBc)
Lower	61.793	59.286	60.033	20
Upper	69.571	67.957	67.391	20

With hopping

Outoido Eroquanov Band	GFSK	8DPSK	π/4DQPSK	Limit
Outside Frequency Band	(dB)	(dB)	(dB)	(dBc)
Lower	62.788	60.999	62.344	00
Upper	67.208	66.202	67.177	20

[Ant.2]

Without hopping

Outoido Ereguenou Bond	GFSK	8DPSK	π/4DQPSK	Limit
Outside Frequency Band	(dB)	(dB)	(dB)	(dBc)
Lower	61.653	59.727	59.954	20
Upper	68.596	66.381	66.531	20

With hopping

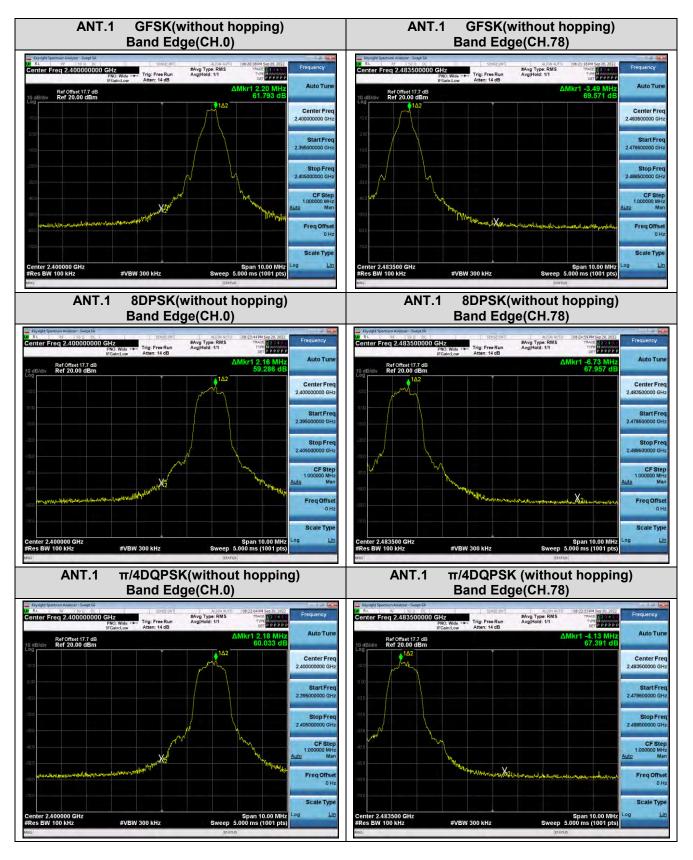
Outside Frequency Band	GFSK	8DPSK	π/4DQPSK	Limit
	(dB)	(dB)	(dB)	(dBc)
Lower	62.649	65.234	62.487	00
Upper	65.402	64.285	66.441	20

Note :

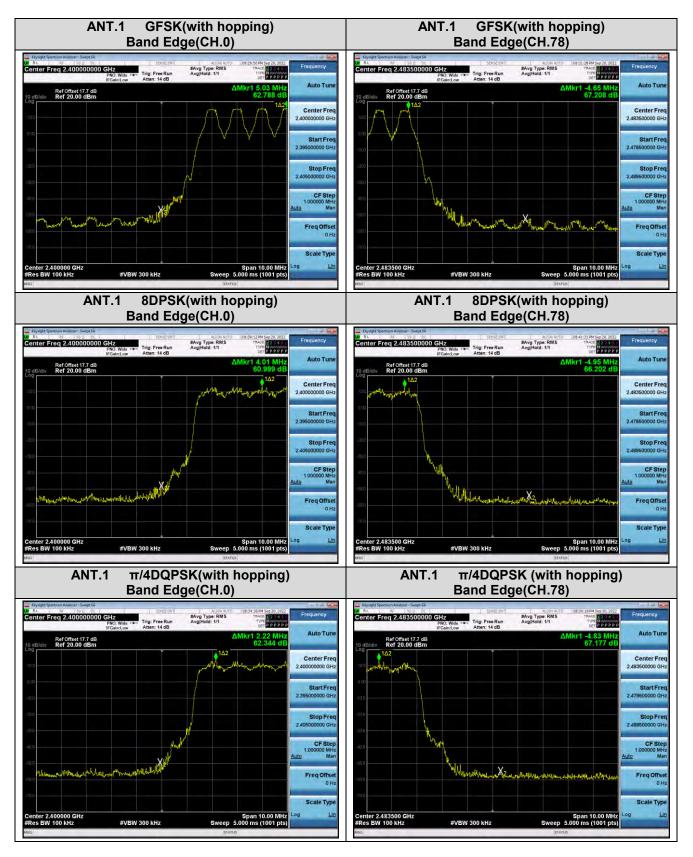
1. Actual value of loss for the splitter and cable combination is 17.70 dB at 2400 \mbox{MHz}

and is 17.70 dB at 2500 MHz. So, 17.70 dB is offset. And the offset gap in the 2.4 GHz range do not affect the conducted peak power final result.

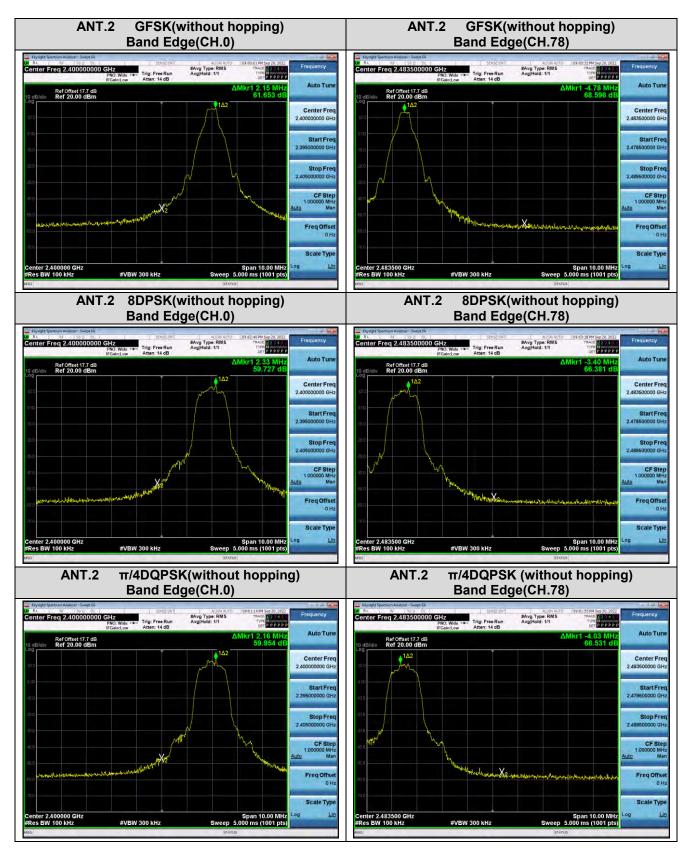




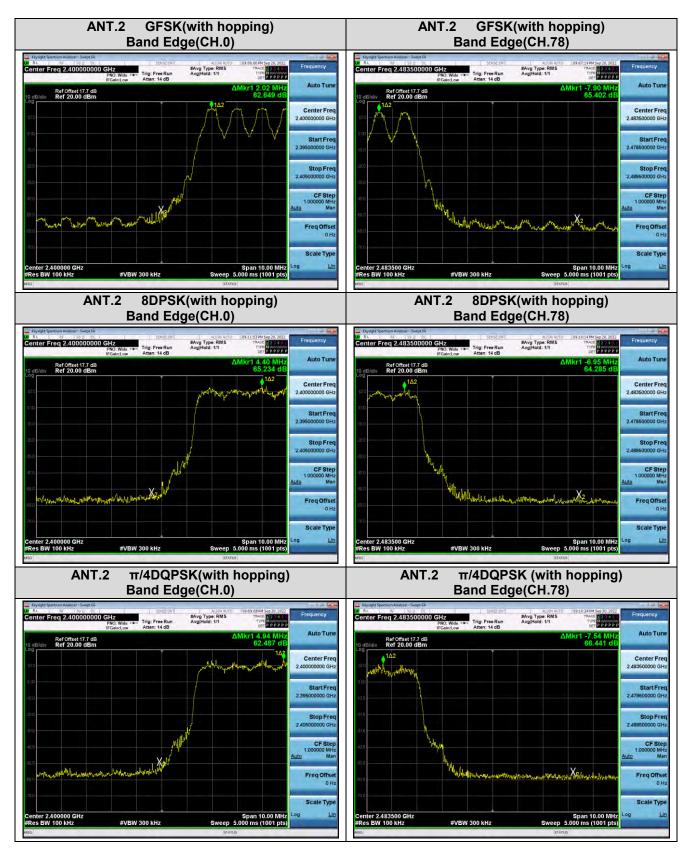














10.3 FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (99 % BW)

99 % BW (kHz)				
Channel	GFSK	8DPSK	π/4DQPSK	
CH.0	831.67	1175.5	1174.4	
CH.39	828.94	1174.5	1172.1	
CH.78	832.37	1175.9	1172.2	

20 dB BW (kHz)				
Channel	GFSK	8DPSK	π/4DQPSK	
CH.0	945.5	1302	1291	
CH.39	941.8	1300	1291	
CH.78	944.7	1298	1315	

	Limit		
GFSK	8DPSK	π/4DQPSK	(kHz)
			>25 kHz
1001	998	978	or
			>2/3 of the 20 dB BW



99 % BW (kHz)				
Channel	GFSK	8DPSK	π/4DQPSK	
CH.0	830.06	1174.3	1173.0	
CH.39	831.27	1175.1	1172.8	
CH.78	832.52	1174.4	1173.6	

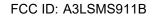
20 dB BW (kHz)				
Channel	GFSK	8DPSK	π/4DQPSK	
CH.0	943.5	1299	1312	
CH.39	943.4	1300	1317	
CH.78	941.7	1299	1317	

	Limit		
GFSK	8DPSK π/4DQPSK		(kHz)
			>25 kHz
974	1004	958	or
			>2/3 of the 20 dB BW

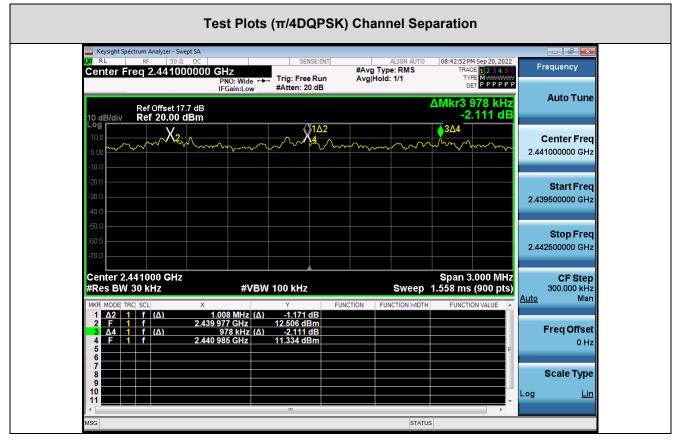


Report No.: HCT-RF-2210-FC031

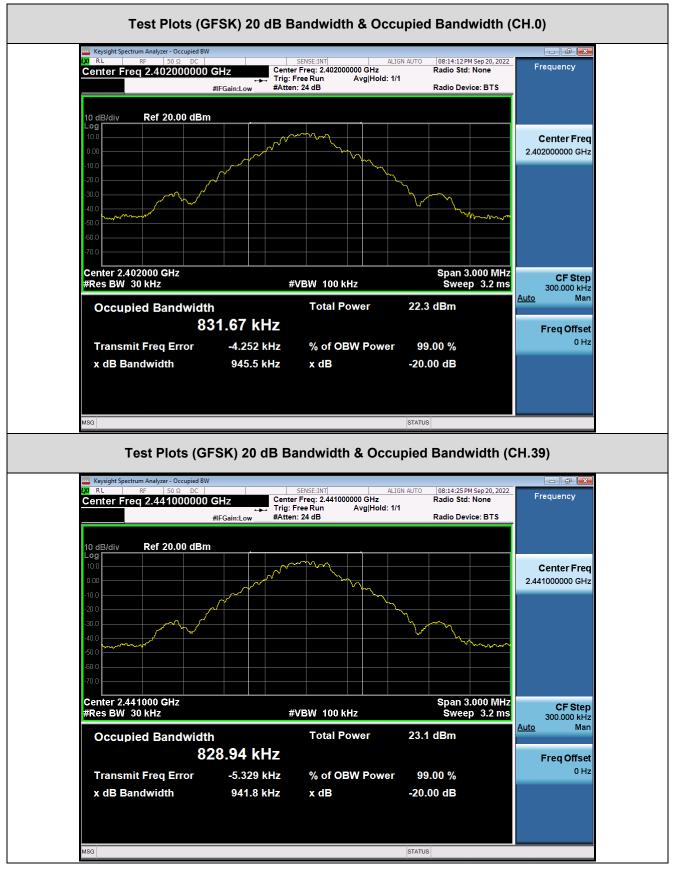






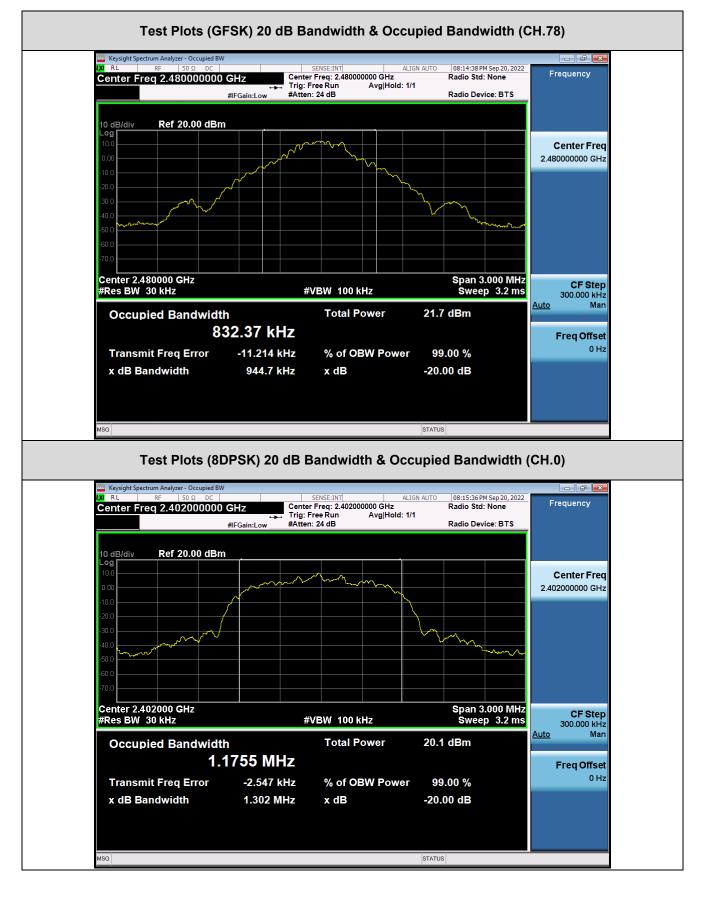


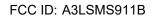




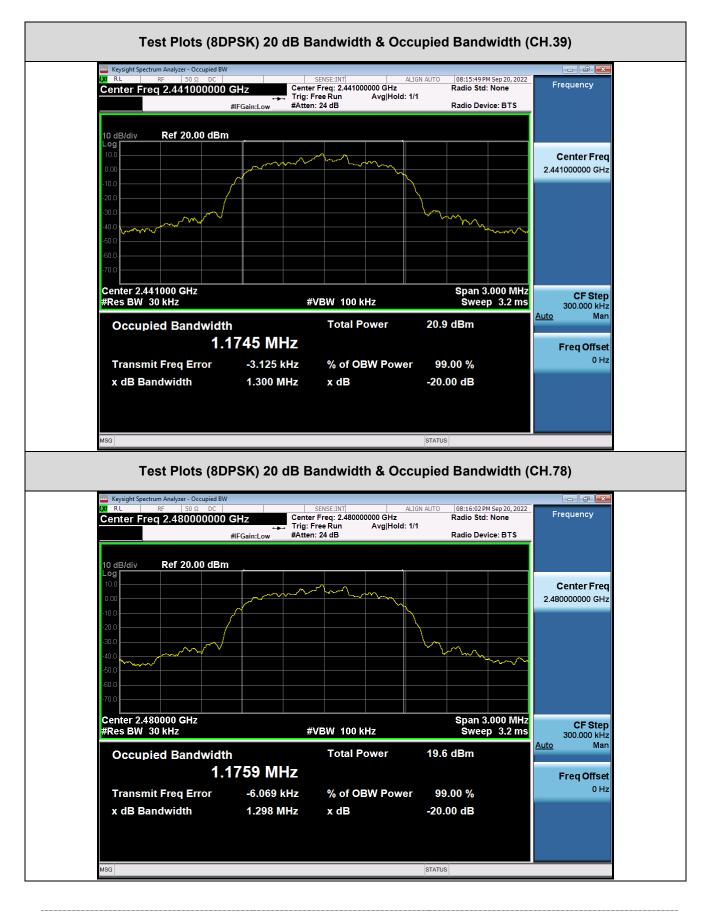






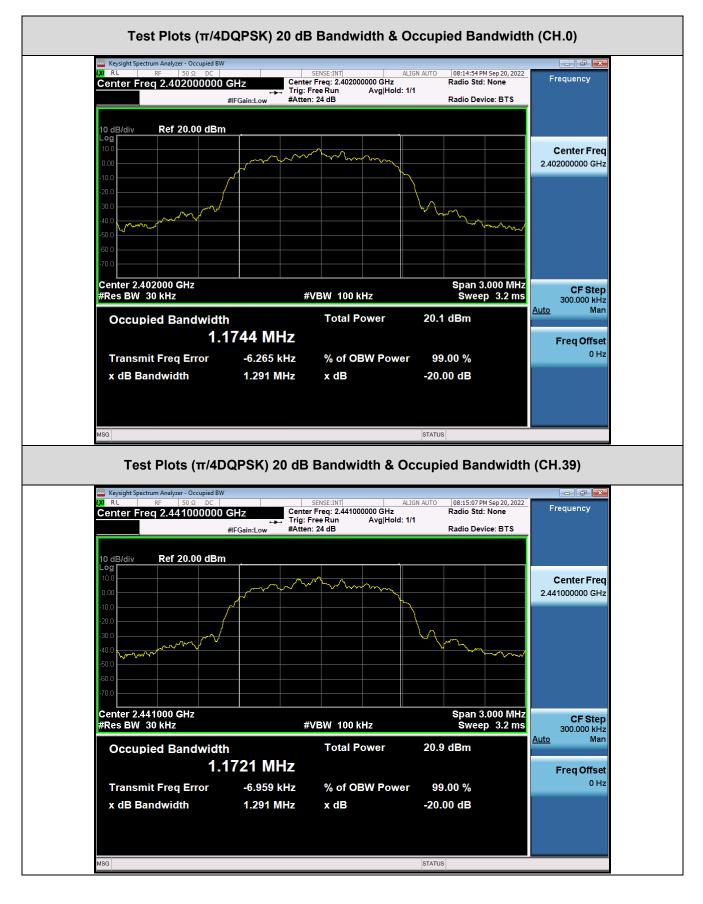




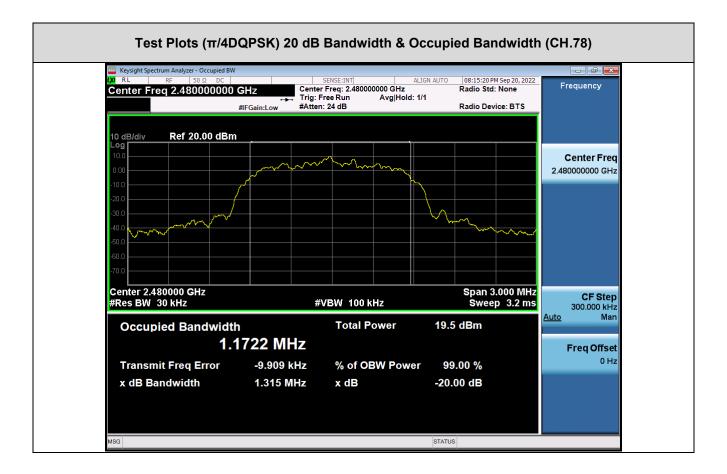






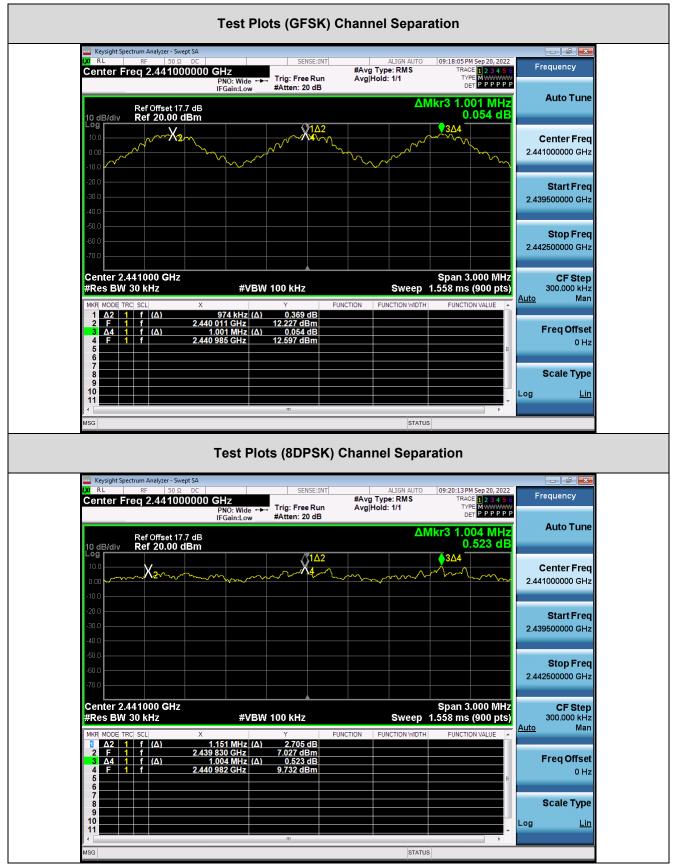


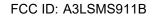




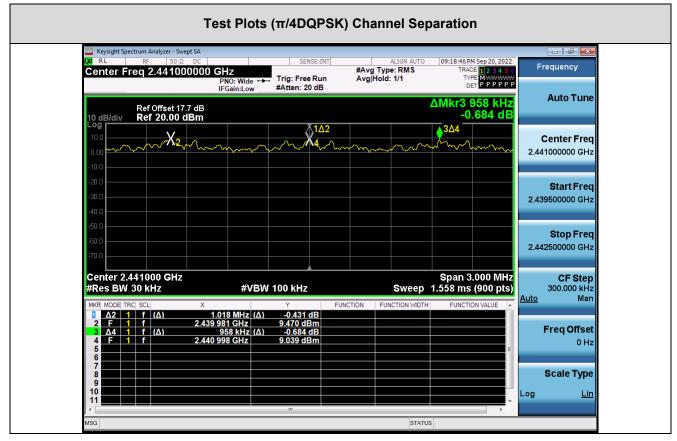


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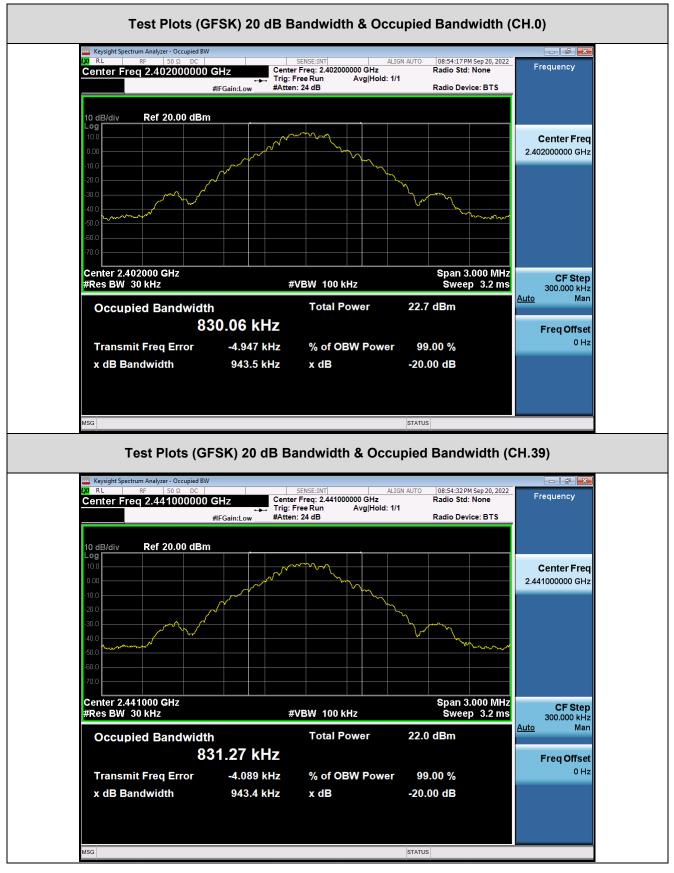






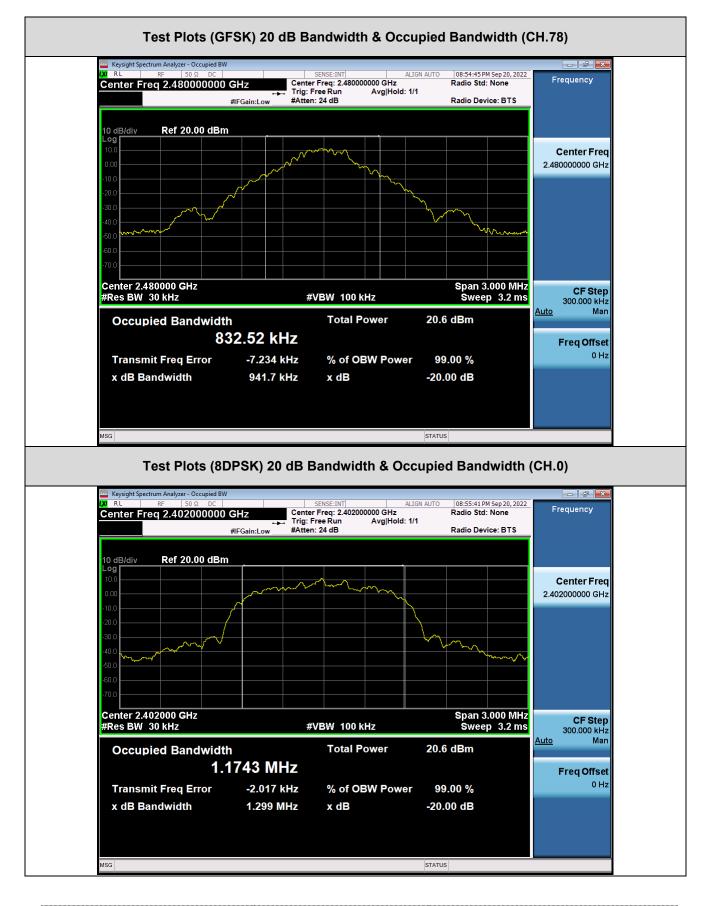


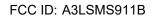




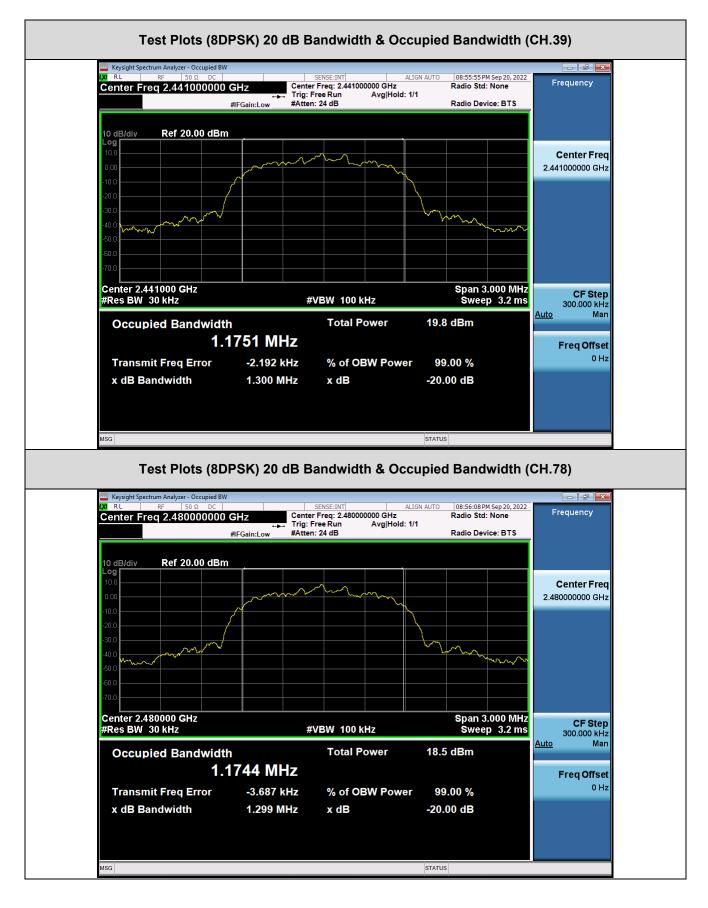






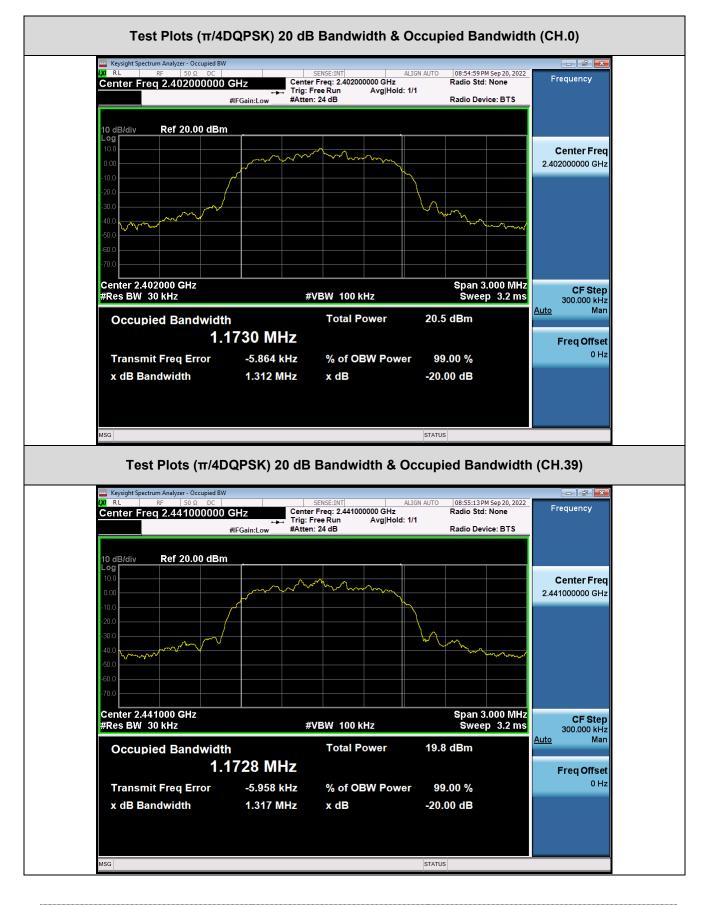




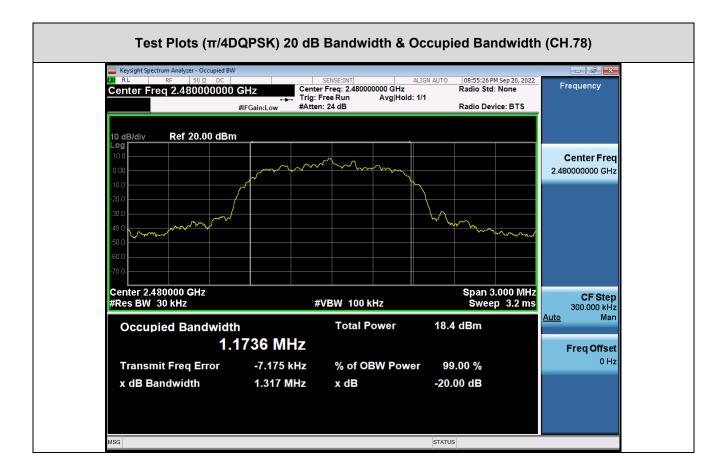














10.4 NUMBER OF HOPPING FREQUENCY

[Ant.1]

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

[Ant.2]

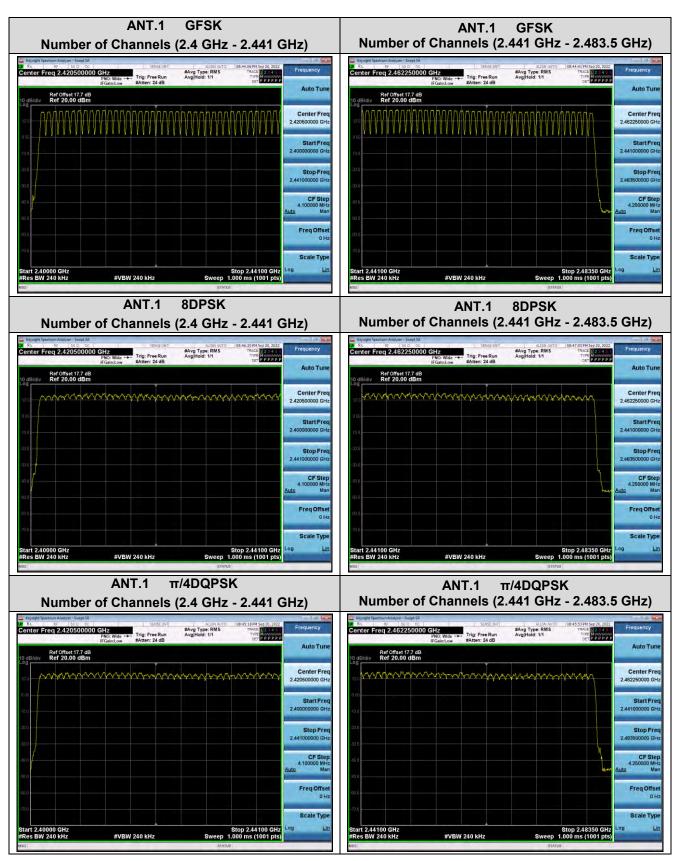
	Limit			
GFSK	8DPSK	π/4DQPSK	Linit	
79	79	79	>15	

Note :

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

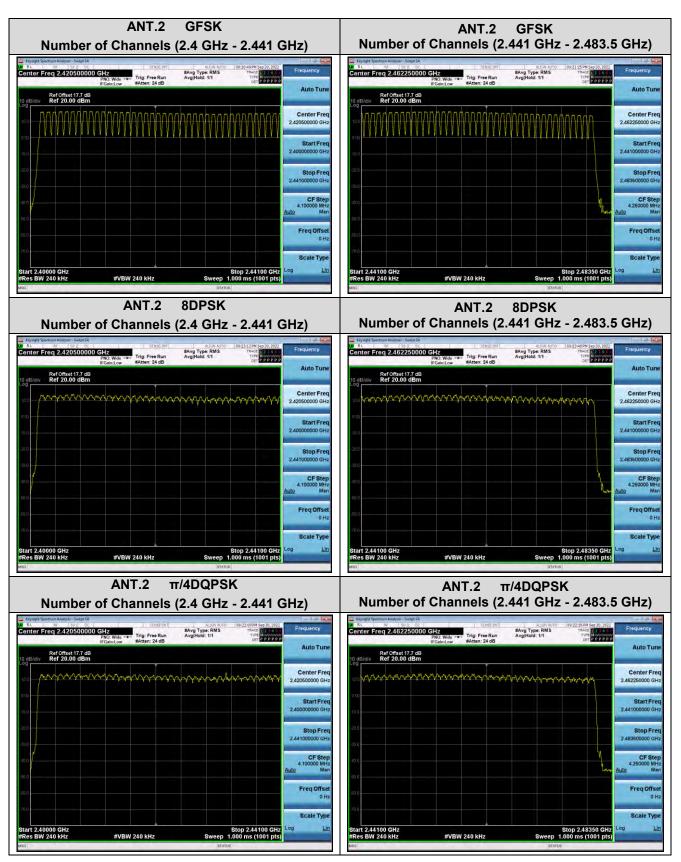


TEST PLOTS [ANT1]





TEST PLOTS [ANT2]





10.5 TIME OF OCCUPANCY (DWELL TIME)

[Ant.1]

	Channel	GFSK	8DPSK	π/4DQPSK
Pulse Time	Low	2.885	2.885	2.885
(ms)	Mid	2.885	2.890	2.885
	High	2.880	2.885	2.885

Non-AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell	Low	307.73	307.73	307.73	31.6	
(ms)	Mid	307.73	308.27	307.73	31.6	400
	High	307.20	307.73	307.73	31.6	

AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell	Low	153.87	153.87	153.87	8.0	
(ms)	Mid	153.87	154.13	153.87	8.0	400
	High	153.60	153.87	153.87	8.0	



[Ant.2]

	Channel	GFSK	8DPSK	π/4DQPSK
Pulse Time	Low	2.885	2.890	2.890
(ms)	Mid	2.885	2.890	2.885
	High	2.885	2.890	2.885

Non-AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell	Low	307.73	308.27	308.27	31.6	
(ms)	Mid	307.73	308.27	307.73	31.6	400
	High	307.73	308.27	307.73	31.6	

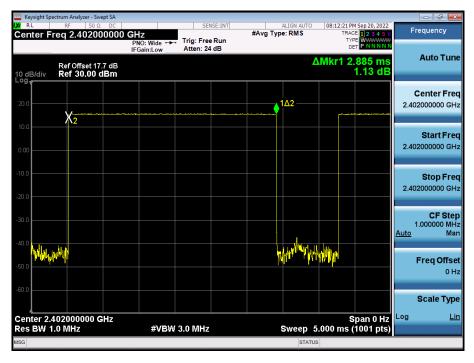
AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell	Low	153.87	154.13	154.13	8.0	
(ms)	Mid	153.87	154.13	153.87	8.0	400
	High	153.87	154.13	153.87	8.0	

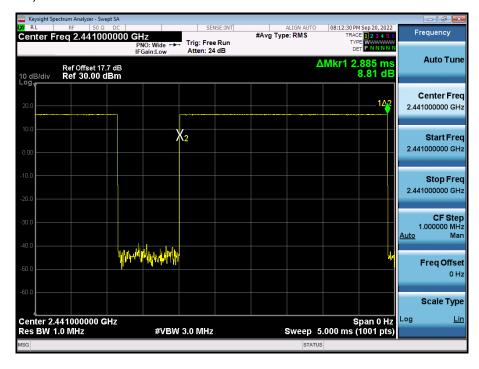


[Ant.1]

Test Plots (GFSK) Dwell Time (CH.0)



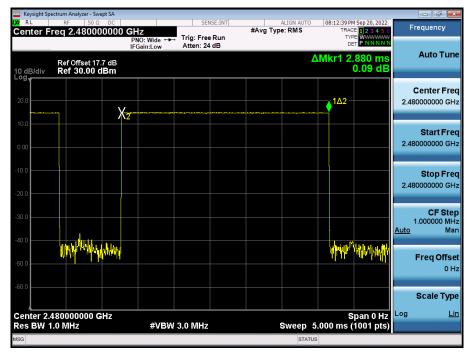
Test Plots (GFSK) Dwell Time (CH.39)



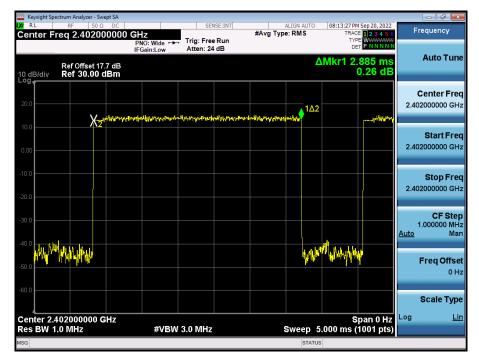


Test Plots (GFSK)

Dwell Time (CH.78)



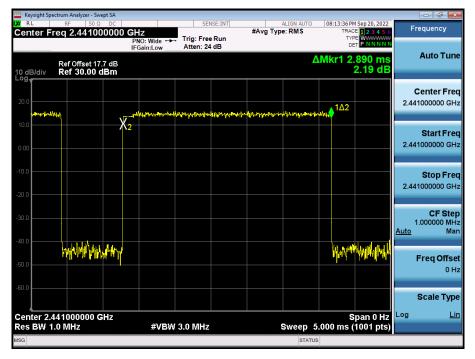
Test Plots (8DPSK) Dwell Time (CH.0)



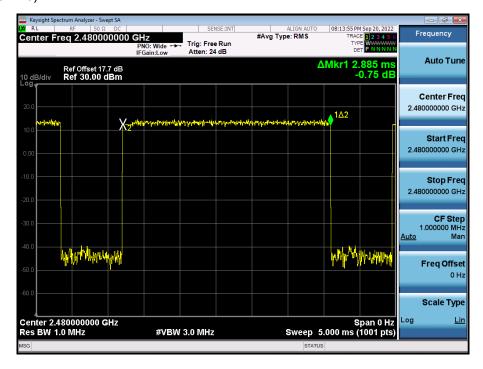


Test Plots (8DPSK)

Dwell Time (CH.39)



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



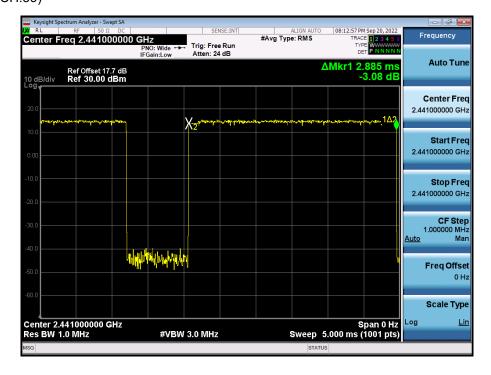


Test Plots (π/4DQPSK)

Dwell Time (CH.0)



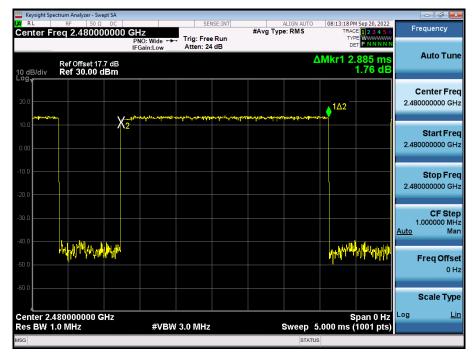
Test Plots (π/4DQPSK) Dwell Time (CH.39)





Test Plots (π /4DQPSK)

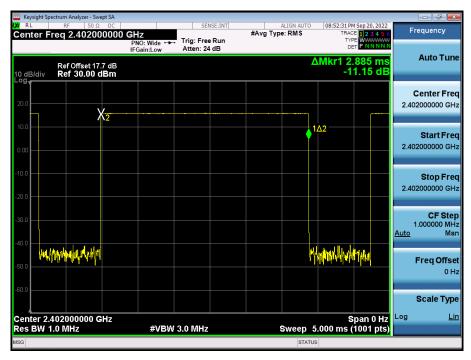
Dwell Time (CH.78)



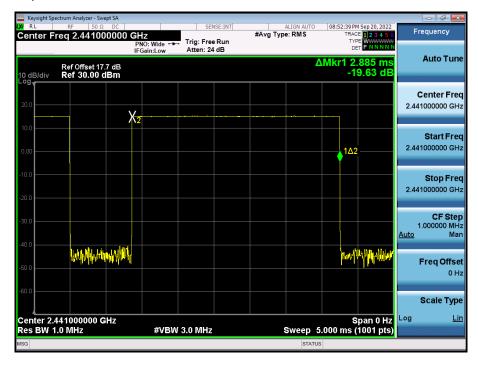


[Ant.2]

Test Plots (GFSK) Dwell Time (CH.0)



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



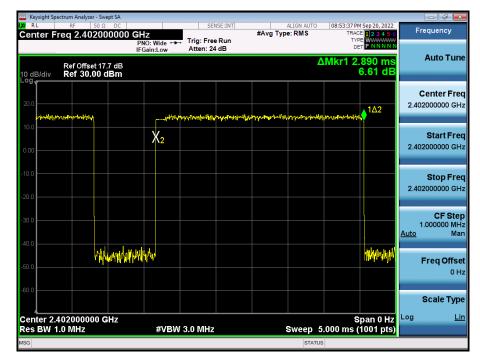


Test Plots (GFSK)

Dwell Time (CH.78)



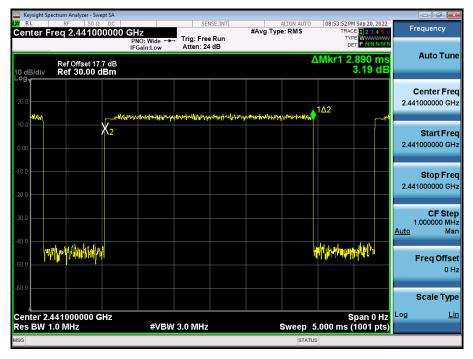
Test Plots (8DPSK) Dwell Time (CH.0)



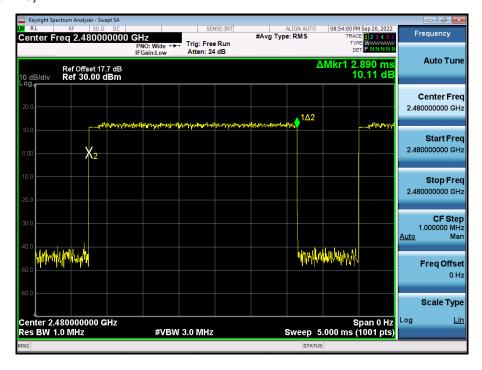


Test Plots (8DPSK)

Dwell Time (CH.39)



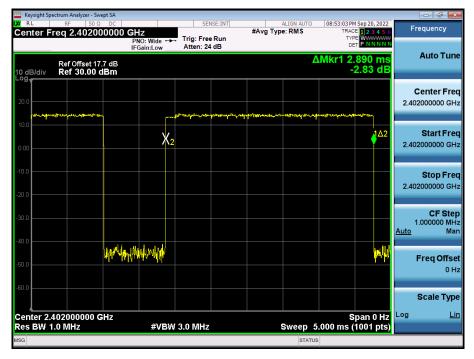
Test Plots (8DPSK) Dwell Time (CH.78)



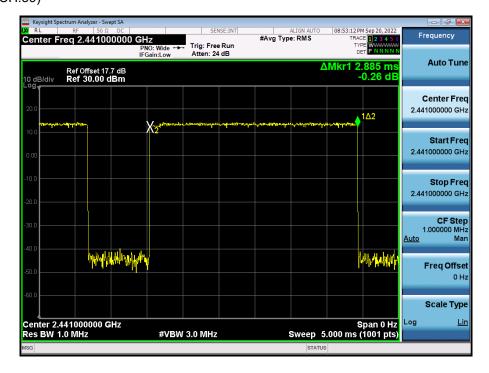


Test Plots (π/4DQPSK)

Dwell Time (CH.0)



Test Plots (π/4DQPSK) Dwell Time (CH.39)





Test Plots (π /4DQPSK)

Dwell Time (CH.78)





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.



[Ant.1]

Test Plots (GFSK)- 30 MHz - 1 GHz Spurious Emission (CH.39)



Test Plots (GFSK)- 1 GHz – 3 GHz

Keysight Spe	ectrum Analyzer - Sw RF 50 Ω	vept SA		SEN	SE:INT		ALIGN AUTO	08:47:24 P	M Sep 20, 2022	_	- 8 2
enter F	req 2.0000	00000 G	NO: Fast ↔	Trig: Free		#Avg Ty Avg Hol	rpe:RMS d:1/1	TRAC	E 1 2 3 4 5 6 E M		equency
10 dB/div	Ref Offset 17 Ref 20.00	7.7 dB	Gain:Low	Atten: 14	dB		Mki	1 2.452			Auto Tun
							¥2		DL1 -4.14 dBm		enter Fre 0000000 G⊦
20.0 30.0 40.0										1.000	Start Fre
50.0 60.0 70.0	adar para a dina ta bina pakila da		N Di lana manan di kina dalam Mangatan di kata da kat	n Freezen de general en set biel de na general de la consta de alt foi en na general de la consta de alt foi en na general de la consta de alt foi en na general de la consta de			<u></u>	a da anta tatin da ta Tata se sa ang pagada	lan da da na jada se paggan se a	3.000	Stop Fre 0000000 GF
	100 kHz		#VB\	W 300 kHz			Sweep 74	.67 ms (4		200 Auto	CF Ste .000000 MI
2 N 1 3 4 5 5	f (Δ)		80 GHz (∆ 05 GHz	Y -54.962 dB 15.859 dB	m	CTION FI	UNCTION WIDTH	FUNCTI	DN VALUE		Freq Offs 0 H
6 7 8 9											Scale Typ
10				m						Log	L
sg 🔱 Point	ts changed; all	traces clea	red				STATU	s			

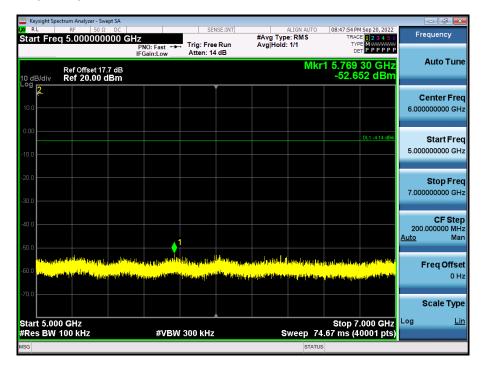


Test Plots(GFSK)- 3 GHz - 5 GHz

Spurious Emission (CH.39)

	ectrum Analyzer - Swept SA									- 7 💌
Start Fre	RF 50 Ω DC		SEN	SE:INT	#Avg Type		TRAC	E 1 2 3 4 5 6	Freq	uency
		PNO: Fast ++-	Trig: Free Atten: 14		Avg Hold:	1/1	TYP			
						Mkr	1 3.778	60 GHz	A	uto Tune
10 dB/div	Ref Offset 17.7 dl Ref 20.00 dBn						-51.1	32 dBm		
10 dB/div Log				(nter Frea
10.0										00000 GHz
									4.00000	0000 0112
0.00								DL1 -4.14 dBm		
								DET METHODIN		tart Freq
-10.0									0.00000	0000 0112
-20.0										
										top Freq
-30.0									0.00000	0000 0112
										CF Step
-40.0										0000 MHz
-50.0			1						<u>Auto</u>	Man
		والمالغ وسلق ومعرور والمكر	alida ay ya da	anti-the and a	والمعمولية وأرار	فتقلد اللجمادين فلجرنا	nu di Ugarten <mark>a</mark>	a and a state of the state	_	
-60.0 <mark></mark>	la cetti detti olgi di setger bet	rt (for the standard standards	and and a statistic	and in the second second	an in the state of the second s	in the state	Handin ayal Hermot	Recently and the second se	Fre	e q Offset 0 Hz
	terieta fisiela ficial di Andreia de La Constante da Constante da Constante da Constante da Constante da Const	<u>a inapalitati</u>								0112
-70.0									Sc	ale Type
Start 3.00 #Res BW		41/D10/	300 kHz				Stop 5	.000 GHz	Log	Lin
#Res BW	100 KH2	#VBW	300 KHZ		5	status	.07 ms (4	0001 pts)		
Mag						STATUS				

Test Plots (GFSK)- 5 GHz - 7 GHz



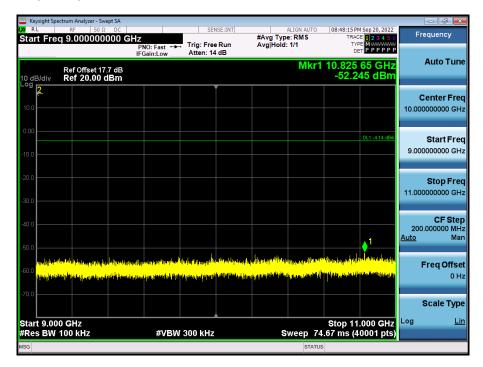


Test Plots(GFSK)- 7 GHz - 9 GHz

Spurious Emission (CH.39)

	ectrum Analyzer - Swep										- 6 -
Start Fre	RF 50 Ω g 7.0000000				NSE:INT	#Avg Typ		TRAC	E 1 2 3 4 5 6	F	requency
		PI	IO: Fast ↔► Gain:Low	Trig: Free Atten: 14		Avg Hold:	1/1				
	Ref Offset 17.7						Mkr	1 7.972	40 GHz		Auto Tune
10 dB/div	Ref 20.00 dE							-53.0	93 dBm		
10 dB/div Log				Ì							Center Freq
10.0											0000000 GHz
0.00									DL1 -4.14 dBm		Start Freq
-10.0										7.00	0000000 GHz
-10.0											
-20.0											Stop Freq
										9.00	0000000 GHz
-30.0											
-40.0											CF Step
-10.0										20 Auto	0.000000 MHz Man
-50.0					1						
	a shi ka da she she she she she	<mark>abh thanal a</mark>	n programme and a star	and the second second	haline and have be	landille ale la la po	hiller harded	and descharge	<mark>la Mandrida (</mark>		Freq Offset
-60.0	and Contraction	Material and the second se	والمتناقية والمروا	and a local dist	and the second states of the	<mark>danah ku publika</mark>	الأألية فرادر وماطاتك	Indunenation	(antiphentica)		0 Hz
-70.0											
											Scale Type
Start 7.00	0 CH7							Stop 9	.000 GHz	Log	Lin
#Res BW			#VBW	300 kHz		s	weep 74		0001 pts)		
MSG							STATUS				

Test Plots(GFSK)- 9 GHz - 11 GHz



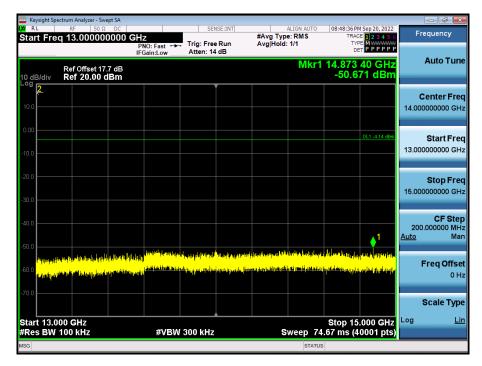


Test Plots(GFSK) 11 GHz - 13 GHz

Spurious Emission (CH.39)

0.00 2 Center Freq 0.00 0.01 0.01 0.01 0.00 0.01 0.01 0.01 0.00 0.01 0.01 0.01 0.00 0.01 0.01 0.01 0.00 0.01 0.01 0.01 0.00 0.01 0.01 0.01 0.00 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01		um Analyzer - Swept SA								- 6
PNO: Fast Trig: Free Run Atten: 14 dB Avg Hold: 1/1 PPP PP Ref Offset 17.7 dB Ref 20.00 dBm Mikr1 12.803 35 GHz -51.947 dBm Center Freq 12.00000000 GHz 100 Dot 1414 4B Dot 1414 4B 000 Dot 1414 4B Dot 1414 4B			GHz		 #Avg Typ	e: RMS	TRAC	E 1 2 3 4 5 6	Fre	quency
Ref Offset 17.7 dB MikT1 12.803 35 GHz 0 dB/div Start Freq 100 Center Freq 1100 Cen			PNO: Fast +		Avg Hold	: 1/1	TYP			
2 Center Freq 10.0 Conter Freq 11.00000000 GHz 11.00000000 GHz 11.00000000 GHz 11.00000000 GHz 11.00000000 GHz 11.00000000 GHz 11.000 GHz<	10 dB/div					Mkr1				Auto Tune
100 1	~ 2									
300 Stop Freq 300 Stop Freq 300 Stop Freq 400 Stop Freq <td< td=""><td>-10.0</td><td></td><td></td><td></td><td></td><td></td><td></td><td>DL1 -4:14 dBm</td><td></td><td></td></td<>	-10.0							DL1 -4:14 dBm		
ALLO MAIN	-20.0									
co. or bit Heile Indextdon data in the second of the se	-40.0							1		000000 MHz
Start 11.000 GHz Res BW 100 kHz #VBW 300 kHz Sweep 74.67 ms (40001 pts)	-60.0 <mark>Applification</mark>				 The second second	1.1	1	let annen betenget b Nijse en jet wet bete	F	
#Res BW 100 kHz #VBW 300 kHz Sweep 74.67 ms (40001 pts)	-70.0									
			#VB14	(300 kHz	s	ween 74	Stop 13	.000 GHz 0001 pts)	Log	Lin
	MSG		~ V E.V.	-000 KH2				ooo r ptsj		

Test Plots (GFSK)- 13 GHz – 15 GHz



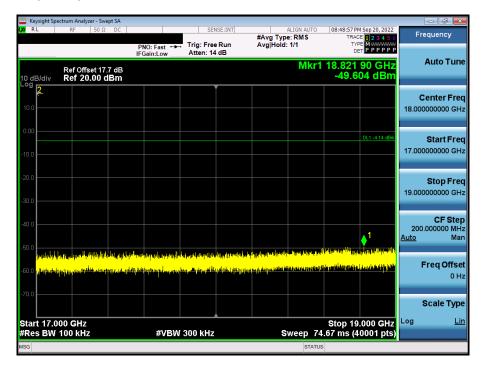


Test Plots(GFSK)- 15 GHz - 17 GHz

Spurious Emission (CH.39)

Keysight Spectrum Analyzer - S										
LXI RL RF 50	Ω DC		SEN	NSE:INT	#Avg Typ	ALIGN AUTO e: RMS		E 1 2 3 4 5 6	Frequenc	;y
Ref Offset 1	ا 7.7 dB	PNO: Fast ↔ FGain:Low	 Trig: Free Atten: 14 		Avg Hold:		TYF DE 15.204	60 GHz 72 dBm	Auto	Tune
Log 2			`						Center 16.00000000	
-10.0								DL1 -4:14 dBm	Start 15.00000000	
-20.0									Stop 17.00000000	
-40.0									CF 200.000000 <u>Auto</u>	Step 0 MHz Man
-2000 <mark>-2000 -2000</mark>	ndele la tel la caracia 19 koltono (oscol _a 1903)	ta parata para para <mark>Alamata para para</mark>	n ferel og på forset forset for Here af som attende af som attende af som attende af som attende af som attende Here af som attende a	lastri <mark>Madalas</mark> Manakang Ka	<mark>hala da da seria.</mark> Terra da genera da	analan salah Peringi Internetari	a loada ata ta Tasi kangarata	heitsteninend für Indenstandigen	Freq C	O ffset 0 Hz
Start 15.000 GHz		41 (F214					Stop 17	.000 GHz	Scale	Type Lin
#Res BW 100 kHz		#VBW	300 kHz		s	weep 74		ooon pts)		

Test Plots(GFSK)- 17 GHz - 19 GHz



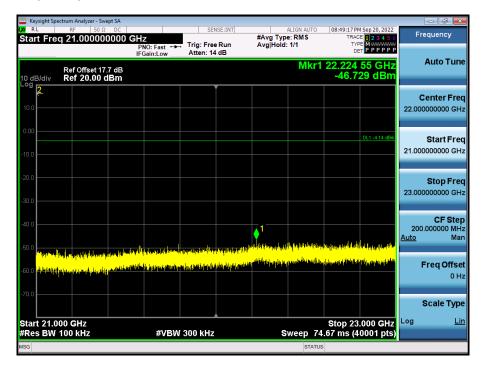


Test Plots (GFSK)- 19 GHz - 21 GHz

Spurious Emission (CH.39)

Keysight Spectrum Analyzer - Swept SA					- 7
RE RF 50 Ω DC Start Freq 19.000000000	GHz	SENSE:INT	#Avg Type: RMS	08:49:07 PM Sep 20, 2022 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 17.7 dB	PNO: Fast +++ T	rig: Free Run Atten: 14 dB	AvgiHold: 1/1	1 19.107 70 GHz -48.615 dBm	Auto Tune
					Center Freq 20.000000000 GHz
-10.0				DL1 -4:14 dBm	Start Freq 19.000000000 GHz
-20.0					Stop Freq 21.00000000 GHz
-40.0	a bel ak a transmitter a	di na silata da ser a			CF Step 200.000000 MHz <u>Auto</u> Man
-60.0					Freq Offset 0 Hz
Start 19.000 GHz				Stop 21.000 GHz	Scale Type Log <u>Lin</u>
#Res BW 100 kHz	#VBW 30	00 kHz	Sweep 7	4.67 ms (40001 pts)	
MSG			STATL	JS	

Test Plots (GFSK)- 21 GHz - 23 GHz





Test Plots (GFSK)- 23 GHz - 25 GHz

Keysight Spectrum Analyzer - Swept SA					
X RL RF 50Ω DC Start Freq 23.000000000 C	GHz	#Avg Typ	e: RMS TRAC	M Sep 20, 2022 E 1 2 3 4 5 6 E M WWWWWW	Frequency
Ref Offset 17.7 dB 10 dB/div Ref 20.00 dBm	PNO: Fast ++- Trig: Free IFGain:Low Atten: 14		Mkr1 24.175	T P P P P P	Auto Tune
10.0				2	Center Fred 4.000000000 GH;
-10.0				DL1 -4.14 dBm 2	Start Free 3.000000000 GH:
30.0				2	Stop Fre 5.00000000 GH
-40.0 -50.0 <mark>เสียงจิ.ป.ส.อน ปละปริษณิตสามชัยได้เป</mark>	inin da faligi fansa sila pi <mark>tin ditini kana saangi</mark>	1- 	deline of the strend strend strends	annianna At	CF Ste 200.000000 MH <u>ito</u> Ma
eo o <mark>ul fean^{tar fh}eild an an ann an an an an an an an an an an</mark>	n regional from a construction of the spectrum of the second	y nazise plane the new Height Law Appendicated Add	, Hertenpurjets kyretet til konnen skilligense ste	alifet internet til	Freq Offse 0 H
-70.0 Start 23.000 GHz				.000 GHz La	Scale Type
#Res BW 100 kHz	#VBW 300 kHz	S	weep 74.67 ms (4	0001 pts)	



[Ant.2]

Test Plots (GFSK)- 30 MHz - 1 GHz Spurious Emission (CH.0)



Test Plots (GFSK)- 1 GHz – 3 GHz

Keysight Spe	ectrum Analyzer - Sv RF 50 S	wept SA Ω DC		SEN	SE:INT		ALIGN AUTO	09:24:06 P	M Sep 20, 2022	_	- 6
	q 1.000000	0000 GHz	NO: Fast 🛏			#Avg Ty Avg Ho	/pe: RMS	TRA			equency
			Gain:Low	Atten: 14							Auto Tun
0 dB/div	Ref Offset 1 Ref 20.00						Mkr		70 GHz 06 dBm		, and the
.og 10.0				Ĭ			¥2				Center Fre
0.00									DL1 -4.74 dBm		0000000 GH
10.0											
20.0 30.0											Start Fre
40.0										1.00	0000000 GI
50.0							_ _ • ¹				Oton En
60.0	de contra crimiti de	leg and addining of			projetje i solovo til solov		Addition	aliga Milana katanga Milang katangan	dia ana di kashala ta a	3.00	Stop Fre 0000000 GH
70.0	and the failed from the state										
tart 1.00	0 GHz 100 kHz		#\/B)	N 300 kHz			Sweep 74		.000 GHz	200	CF Ste
IKR MODE TH		X		Y JOO KIIZ	FUN				ON VALUE	Auto	
1 N 1 2 N 1	f (Δ)		70 GHz (Δ) 95 GHz	-52.206 dB 15.264 dB	m m						_
3 4											Freq Offs ۱۱
5									=		
8											Scale Typ
9										Log	L
				m					•		
SG							STATU	6			



Test Plots(GFSK)- 3 GHz - 5 GHz

Spurious Emission (CH.0)

	pectrum Analyzer - Swept SA									×
Span 2.	RF 50 Ω DC 00000000 GHz		SEN	NSE:INT	#Avg Typ		TRAC	M Sep 20, 2022	Span	
opan II		PNO: Fast ++- IFGain:Low	Trig: Free Run / Atten: 14 dB		Avg Hold:	Avg Hold: 1/1				
	_					Mkr	1 3.797	70 GHz		pan GH7
10 dB/div	Ref Offset 17.7 dB Ref 20.00 dBm						-51.7	01 dBm	2.00000000	
Log 2)	Í						
10.0										
10.0										
0.00										
								DL1 -4.74 dBm	Full Sp	ban
-10.0										
-20.0									Zero Sp	pan
-30.0										
0.0.0										
-40.0									Last Sp	nan
			1						Lasiop	Jan
-50.0			· · · · · · · · · · · · · · · · · · ·	tation to a				1.1.1		
	a state of the state		The state of the second		The second s	a an dhishdadh	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	all are first the last		
	Provident Statistics and party of	general official social designations of the	- Internetional State	a surface for the shear of	an pieterine interity	Intel teach time	ni interneti jan lagos	AND DURING THE		
-70.0	a sa ang ang ang ang ang ang ang ang ang an	العار بالخريان								
									Signal Tra	
							8 4 5		(Špan Zo On	om) Off
Start 3.0 #Res BM	00 GHZ / 100 kHz	#VBW	300 kHz		s	weep 74	Stop 5 .67 ms_/4	.000 GHz 0001 pts)		<u>u</u>
MSG			0001112			STATUS		e e e e proy		

Test Plots (GFSK)- 5 GHz - 7 GHz

