FCC RADIO TEST REPORT

FCC ID	:	**A4RGGH2X**
Equipment	:	**Phone**
Model Name	:	**GGH2X, GC15S**
Applicant	:	**Google LLC** **1600 Amphitheatre Parkway,** **Mountain View, CA 94043 USA**
Standard	:	**FCC 47 CFR Part 2, and 25**

The product was received on Feb. 07, 2024 and testing was performed from Feb. 08, 2024 to May 07, 2024. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issue Date
FG3D2001F	01	Initial issue of report	May 16, 2024
FG3D2001F	02	Revise section 2.1, section 3.6.1, Appendix B and add Frequency List of Low/Middle/High Channels This report is an updated version, replacing the report issued on May 16, 2024.	May 27, 2024
FG3D2001F	03	Revise section 3.4.3 This report is an updated version, replacing the report issued on May 27, 2024.	May 29, 2024

Summary of Test Result

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046(a) §25.204(a)	RF Output Power	40dBW(max)	PASS	-
3.2	§2.1055 §25.202(d)	Frequency Stability	within 0.001 percent of the reference frequency.	PASS	-
3.3	§2.1049	Occupied Bandwidth	-	PASS	-
3.4	§2.1051 §25.202(f)	Conducted Emissions Mask	§25.202(f)	PASS	-
3.5	§2.1051 §25.202(f)	Conducted Spurious Emission	§25.202(f)	Pass	-
3.6	§2.1053 §25.202(f)	Field Strength of Spurious Radiation	§25.202(f)	PASS	43.28 dB under the limit at 8080.00 MHz
3.7	§25.216(c)(e)(h)(i)	Additional Limits on Emissions from Mobile Earth Station	§25.216(c)(e)(h)(i)	PASS	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.

Disclaimer:

1. The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.
2. The GGH2X and GC15S are 100% identical in Hardware / Software to each other, and only have different model names for marketing segmentation. The test samples are all model GGH2X.

Reviewed by: William Chen

Report Producer: Clio Lo

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature
General Specs GSM/WCDMA/LTE/5G NR, Bluetooth, BLE, BLE channel sounding, Thread, Wi-Fi 802.11be, UWB, NFC, WPC Rx, NTN and GNSS. **Antenna Type** NTN: ILA Antenna

EUT Information List	
S/N	Performed Test Item
41251FDKD000A9	Conducted Measurement EIRP
	Radiated Spurious Emission

Antenna information <Open Mode>	
Band	**Ant0**
B23	-1.08
B255	-2.21

Antenna information <Close Mode>	
Band	**Ant0**
B23	-4.37
B255	-3.89

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to Disclaimer in report summary.
2. The antenna gain for open mode is higher than close mode. The worse antenna gain is used to determine compliance.

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory	
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	**Sporton Site No.**	
	TH05-HY	03CH21-HY
Test Engineer	Alston Tsai	Jack Cheng, Ray Lung and Sky Chang
Temperature (℃)	24~26	18~26
Relative Humidity (%)	50~53	50~70

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW3786

1.4 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR Part 2, 25
- ANSI C63.26-2015
- ANSI/TIA-603-E
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- FCC KDB 414788 D01 Radiated Test Site v01r01

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

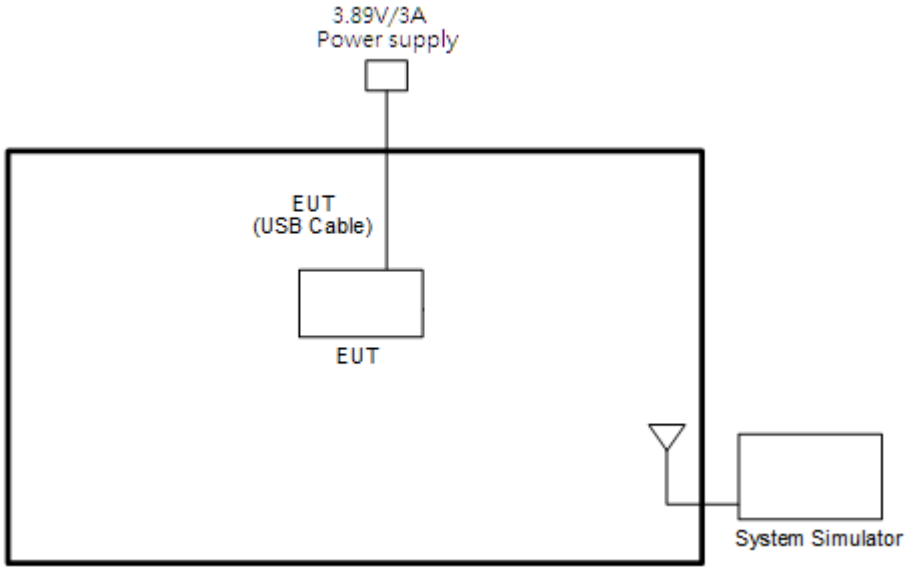
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT (open and close) and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and accessory (Adapter or Earphone) and adjusting the measurement antenna orientation, following C63.26 exploratory test procedures and find X plane with Adapter open mode as worst plane.

Remark:

1. All the radiated test cases were performed with USB Cable 1.
2. During the preliminary test, both charging modes (Adapter mode and WPC Rx mode) and standalone mode were verified. It is determined that the adaptor mode is the worst case for official test.

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMW 500	N/A	N/A	Unshielded, 1.8 m
2.	Power supply	GPE-2323	GEU810970	N/A	N/A	N/A

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.2 + 10 = 14.2 (dB)

2.5 Frequency List of Low/Middle/High Channels

Band 23 Channel and Frequency List			
Channel/Frequency(MHz)	**Lowest**	**Middle**	**Highest**
Channel	25501	25600	25699
Frequency	2000.1	2010	2019.9

Band 255 Channel and Frequency List			
Channel/Frequency(MHz)	**Lowest**	**Middle**	**Highest**
Channel	261505	261674	261843
Frequency	1626.6	1643.5	1660.4

3 Test Result

3.1 RF Output Power

3.1.1 Description of the Conducted Output Power Measurement

FCC Part 25.204 (a)

In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

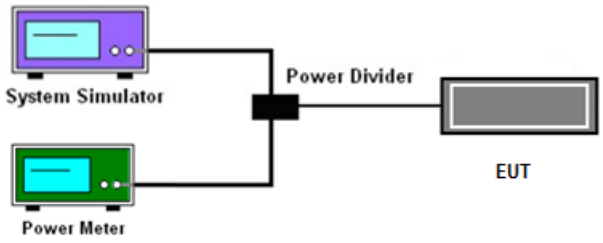
- + 40 dBW in any 4 kHz band for θ ≤0°
- + 40 + 3θ dBW in any 4 kHz band for 0° <θ ≤5°

  Where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

3.1.2 Test Procedures

The output power is measured by using power meter when the transmitter is operating at the manufacturer's rated power and modulated with signals. The maximum antenna gain of EUT for the test range will then be added to the measured conducted power to calculate the EIRP. Since the power meter can only measure the overall power, the measured result will be worse than the one measured in 4 kHz RBW. The test result will be compared to the most restricted limit: +40 dBW.

3.1.3 Test Setup



3.1.4 Test Results

Please refer to Appendix A.

3.2 Frequency Stability

3.2.1 Description of the Frequency Stability Measurement

FCC Part 25.202 (d) Frequency tolerance, Earth stations. The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

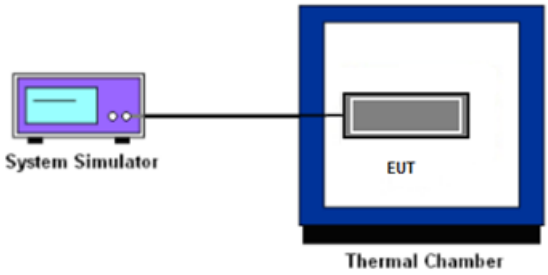
3.2.2 Test Procedures for Temperature Variation

1. The testing follows FCC KDB 971168 D01 v03r01 Section 9.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.2.3 Test Procedures for Voltage Variation

1. The testing follows FCC KDB 971168 D01 Section 9.
2. The EUT was placed in a temperature chamber at 20±5° C and connected with the system simulator.
3. The power supply voltage to the EUT was varied from the lowermost voltage to the uppermost voltage. The range is specified by manufacturer.
4. The variation in frequency was measured for the worst case.

3.2.4 Test Setup



3.2.5 Test Results

Please refer to Appendix A.

3.3 Occupied Bandwidth

3.3.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

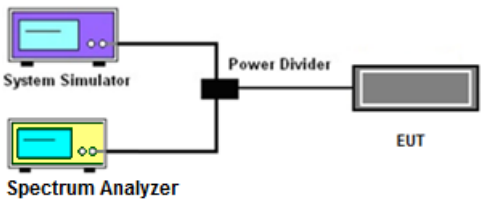
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The testing follows FCC KDB 971168 D01 v03r01 Section 4.2.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
7. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.3.4 Test Setup



3.3.5 Test Result

Please refer to Appendix A.

3.4 Conducted Emissions Mask

3.4.1 Description of Conducted Spurious Emission Measurement

FCC Part 25.202(f) Emissions Limitations The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50% up to and including 100% of the authorized bandwidth: 25 decibels;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100% up to and including 250% of the authorized bandwidth: 35 decibels;

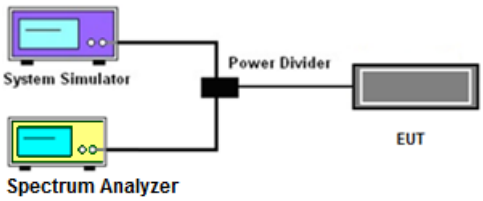
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB 971168 v03r01 D01 Section 6.1.
2. The EUT was connected to the spectrum analyzer.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The highest RF power within the transmitting frequency was measured.
5. Make the measurement with the spectrum analyzer's RBW = 3kHz, VBW = 10kHz, taking the record of the worst unwanted emission with additional RBW factor offset 10log(4kHz/3kHz) = 1.25dB.
6. If the test result in Step 5 exceed the limit, the following procedure will be used:
   6.1. Make the measurement with the spectrum analyzer's RBW = 1kHz, VBW = 3kHz.
   6.2. Record all measured worst frequencies.
   6.3. Use the Channel Power Function of the Spectrum Analyzer.
   6.4. Measure the powers of 4kHz bandwidth center the worst frequencies.
7. The limit line is derived from FCC 25.202 (f) below the transmitter power P(Watts)

3.4.4 Test Setup



3.4.5 Test Result

Please refer to Appendix A.

3.5 Conducted Spurious Emission

3.5.1 Description of Conducted Spurious Emission Measurement

FCC Part 25.202(f) Emissions Limitations The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250% of the authorized bandwidth: an amount equal to 43 decibels plus 10 times Logarithm (to the base 10) of the transmitter power in watts.

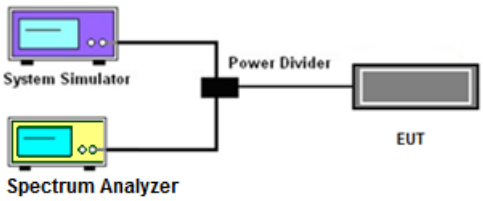
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

1. The testing follows FCC KDB 971168 v03r01 D01 Section 6.1.
2. The EUT was connected to the spectrum analyzer.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The highest RF power within the transmitting frequency was measured.
5. Peak detector is used instead of RMS detector since the measured result of Peak detector is worse than the RMS one. If the test result of Peak detector exceed the limit, RMS detector will then be used.
6. Make the measurement with the spectrum analyzer's RBW = 100kHz, VBW = 300kHz, taking the record of the worst unwanted emission.
7. The conducted spurious emission for the whole frequency range was taken.
8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
9. The limit line is derived from FCC 25.202 (f) below the transmitter power P(Watts)

3.5.4 Test Setup



3.5.5 Test Result

Please refer to Appendix A.

3.6 Field Strength of Spurious Radiation

3.6.1 Description of Radiated Spurious Emission

FCC Part 25.202(f) Emissions Limitations The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250% of the authorized bandwidth: an amount equal to 43 decibels plus 10 times Logarithm (to the base 10) of the transmitter power in watts

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.6.2 Measuring Instruments

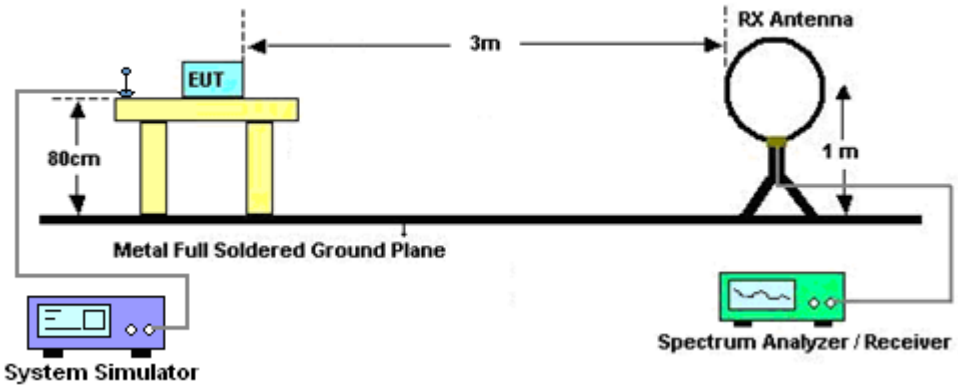
The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

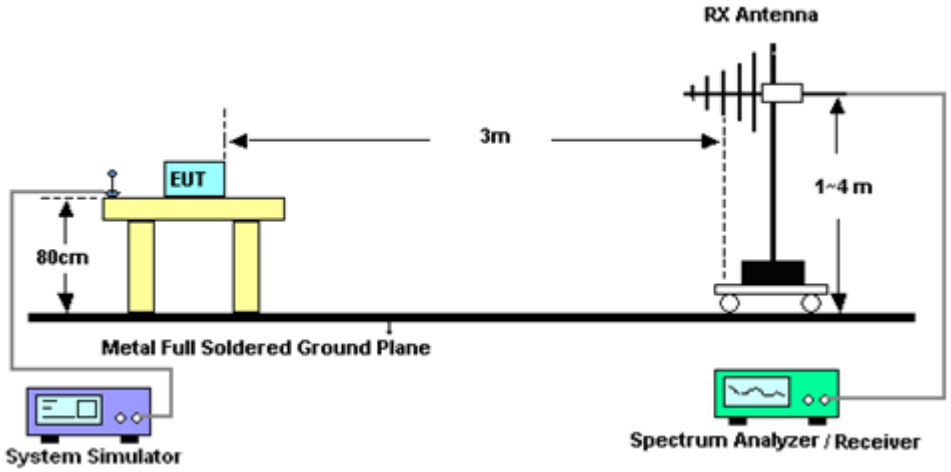
1. The testing follows ANSI/TIA-603-E.
2. The EUT was placed on a rotatable table with:
   - 0.8 meter above ground for emissions under 1 GHz
   - 1.5 meter above ground for emissions above 1 GHz
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
6. Peak detector is used instead of RMS detector since the measured result of Peak detector is worse than the RMS one. If the test result of Peak detector exceed the limit, RMS detector will then be used.
7. Make the measurement with the spectrum analyzer's RBW = 100kHz, VBW = 300kHz, taking the record of maximum spurious emission.
8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.6.4 Test Setup

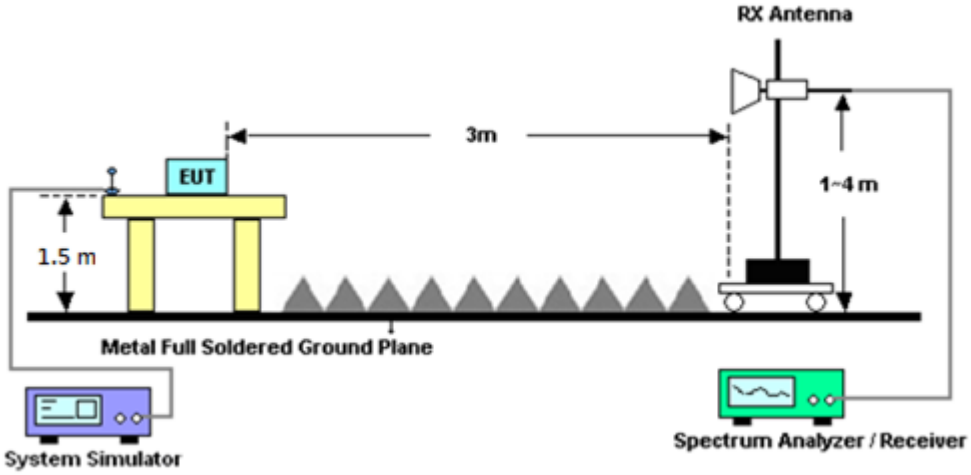
For radiated emissions from 10KHz to 30MHz.



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.6.5 Test Results

Please refer to Appendix B.

3.7 Additional Limits on Emissions from Mobile Earth Station

Additional Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service and Special requirements for ancillary terrestrial components operating in the 1626.5-1660.5 MHz and 2000-2020 MHz bands.

3.7.1 Description of Additional Limits on Emissions from Mobile Earth Station

FCC Part 25.216 Emissions Limitations:

(c) The e.i.r.p. density of emissions from mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed −70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559-1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval, in the 1559-1605 MHz band.

(e) The e.i.r.p density of emissions from mobile earth stations with assigned uplink frequencies between 1990 MHz and 2025 MHz shall not exceed −70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in frequencies between 1559 MHz and 1610 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations between 1559 MHz and 1605 MHz shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations between 1605 MHz and 1610 MHz manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03-283 shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval.

(h) Mobile earth stations manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03-283 with assigned uplink frequencies in the 1626.5-1660.5 MHz band shall suppress the power density of emissions in the 1605-1610 MHz band-segment to an extent determined by linear interpolation from −70 dBW/MHz at 1605 MHz to −46 dBW/MHz at 1610 MHz, averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from −80 dBW at 1605 MHz to −56 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03-283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed −80 dBW/MHz in the 1559-1610 MHz band averaged over any two millisecond interval.

(j) A Root-Mean-Square detector shall be used for all power density measurements.

3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.7.3 Test Procedures

For Conducted test:

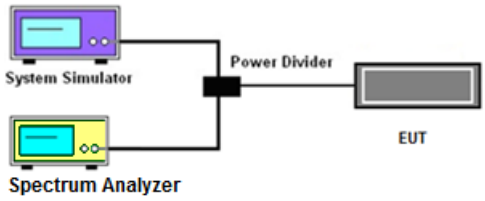
1. The testing follows FCC KDB 971168 v03r01 D01 Section 6.1.
2. The EUT was connected to the spectrum analyzer.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The highest RF power within the transmitting frequency was measured.
5. Make the measurement with the spectrum analyzer's RBW = 1kHz for discrete emissions, RBW = 1MHz for broadband emissions, and VBW = 3 x RBW Taking the record of maximum spurious emission.

For Radiated test:

1. The testing follows ANSI/TIA-603-E.
2. The EUT was placed on a rotatable table with 1.5 meter above ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1kHz for discrete emissions, RBW = 1MHz for broadband emissions, and VBW = 3 x RBW Taking the record of maximum spurious emission.

3.7.4 Test Setup

For conducted test



For Radiated test, please refer to clause 3.6.4 of this test report.

3.7.5 Test Results

For test results of conducted test, please refer to Appendix A.

For test results of Radiated test, please refer to Appendix B.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101907	10Hz~40GHz	Aug. 15, 2023	Feb. 08, 2024~ May 07, 2024	Aug. 14, 2024	Conducted (TH05-HY)
Rohde & Schwarz	R&S	CMW500	149637	GSM/GPRS/WCDMA/LTE(FDD/ TDD 42~44) /IP TPUT/ Volte(Audio)	Sep. 08, 2023	Feb. 08, 2024~ May 07, 2024	Sep. 07, 2024	Conducted (TH05-HY)
DC Power Supply	GW Instek	GPE-2323	GET861546	0V~64V ; 0A~6A	Jun. 14, 2023	Feb. 08, 2024~ May 07, 2024	Jun. 13, 2024	Conducted (TH05-HY)
Temperature Chamber	ESPEC	LHU-113	1012005860	-20℃~85℃	Dec 13, 2023	Feb. 08, 2024~ May 07, 2024	Dec. 12, 2024	Conducted (TH05-HY)
Coupler	MVE	MVE4816	A400014	0.5~18GHz	Mar. 16, 2023	Feb. 08, 2024~ Mar. 12, 2024	Mar. 15, 2024	Conducted (TH05-HY)
Coupler	MVE	MVE4816	A400014	0.5~18GHz	Mar. 12, 2024	Mar. 12, 2024~ May 07, 2024	Mar. 11, 2025	Conducted (TH05-HY)
LOOP Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	Mar. 12, 2024~ Mar. 13, 2024	Sep. 11, 2024	Radiation (03CH21-HY)
Bilog Antenna	TESEQ & WOKEN	CBL 6111D & 00802N1D-06	63303 & 001	30MHz~1GHz	Oct. 15, 2023	Mar. 12, 2024~ Mar. 13, 2024	Oct. 14, 2024	Radiation (03CH21-HY)
Double Ridged Guide Horn Antenna	RFSPIN	DRH18-E	LE2C03A18 EN	1GHz~18GHz	Jul. 12, 2023	Mar. 12, 2024~ Mar. 13, 2024	Jul. 11, 2024	Radiation (03CH21-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	1223	18GHz~40GHz	Jul. 10, 2023	Mar. 12, 2024~ Mar. 13, 2024	Jul. 09, 2024	Radiation (03CH21-HY)
Amplifier	SONOMA	310N	421580	30MHz~1GHz	Jul. 15, 2023	Mar. 12, 2024~ Mar. 13, 2024	Jul. 14, 2024	Radiation (03CH21-HY)
Amplifier	EMEC	EM01G18GA	060876	1GHz~18GHz	Sep. 28, 2023	Mar. 12, 2024~ Mar. 13, 2024	Sep. 27, 2024	Radiation (03CH21-HY)
Preamplifier	EMEC	EM18G40G	060871	18GHz~40GHz	Aug. 30, 2023	Mar. 12, 2024~ Mar. 13, 2024	Aug. 29, 2024	Radiation (03CH21-HY)
Spectrum Analyzer	Keysight	N9010B	MY62170358	10Hz~44GHz	Aug. 28, 2023	Mar. 12, 2024~ Mar. 13, 2024	Aug. 27, 2024	Radiation (03CH21-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9K~30M	Mar. 06, 2024	Mar. 12, 2024~ Mar. 13, 2024	Mar. 05, 2025	Radiation (03CH21-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804397/2,804612/2,804614/2	30MHz~40GHz	Oct. 24, 2023	Mar. 12, 2024~ Mar. 13, 2024	Oct. 23, 2024	Radiation (03CH21-HY)
Hygrometer	TECPEL	DTM-303A	TP211568	N/A	Oct. 30, 2023	Mar. 12, 2024~ Mar. 13, 2024	Oct. 29, 2024	Radiation (03CH21-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Mar. 12, 2024~ Mar. 13, 2024	N/A	Radiation (03CH21-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Mar. 12, 2024~ Mar. 13, 2024	N/A	Radiation (03CH21-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Mar. 12, 2024~ Mar. 13, 2024	N/A	Radiation (03CH21-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Mar. 12, 2024~ Mar. 13, 2024	N/A	Radiation (03CH21-HY)

5 Measurement Uncertainty

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.04 dB**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.33 dB**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.68 dB**

Appendix A. Test Results of Conducted Test

Band 23

Conducted Output Power (Average power) and EIRP

Band 23 SCS 3.75kHz							Limit
Test Frequency (MHz)	SC Size	Conducted Power (dBm)		Antenna Gain (dBi)	EIRP Power (dBm)		Result
		BPSK	QPSK		BPSK	QPSK	
2000.1	1SC0	20.61	21.10	-1.08	19.53	20.02	PASS
	1SC47	20.57	21.03	-1.08	19.49	19.95	
2010	1SC0	20.40	20.66	-1.08	19.32	19.58	
	1SC47	20.27	21.03	-1.08	19.19	19.95	
2019.9	1SC0	20.75	21.14	-1.08	19.67	20.06	
	1SC47	19.98	21.08	-1.08	18.9	20.00	

Band 23 SCS 15kHz					Limit
Test Frequency (MHz)	SC Size	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP Power (dBm)	Result
		QPSK		QPSK	
2000.1	1SC0	N/A	-1.08	N/A	PASS
	1SC11	N/A	-1.08	N/A	
	3SC0	20.84	-1.08	19.76	
	3SC9	20.71	-1.08	19.63	
	6SC0	20.66	-1.08	19.58	
	6SC6	20.50	-1.08	19.42	
	12SC0	20.06	-1.08	18.98	
2010	1SC0	N/A	-1.08	N/A	
	1SC11	N/A	-1.08	N/A	
	3SC0	20.53	-1.08	19.45	
	3SC9	20.73	-1.08	19.65	
	6SC0	20.91	-1.08	19.83	
	6SC6	20.91	-1.08	19.83	
	12SC0	20.03	-1.08	18.95	
2019.9	1SC0	N/A	-1.08	N/A	
	1SC11	N/A	-1.08	N/A	
	3SC0	20.67	-1.08	19.59	
	3SC9	20.55	-1.08	19.47	
	6SC0	20.51	-1.08	19.43	
	6SC6	20.62	-1.08	19.54	
	12SC0	20.10	-1.08	19.02	

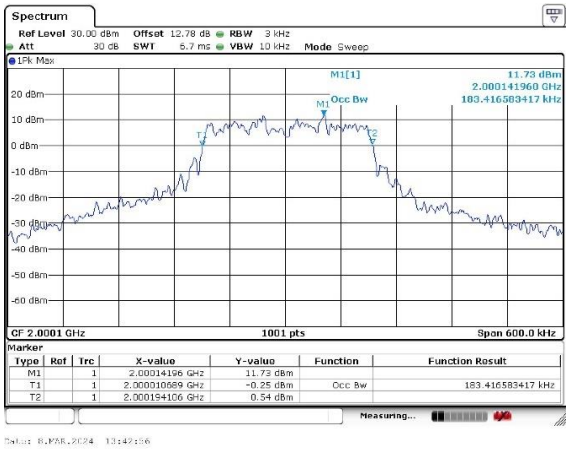
Remark: The output power for SCS15kHz modulation QPSK is worse than BPSK so only QPSK is reported.

Occupied Bandwidth

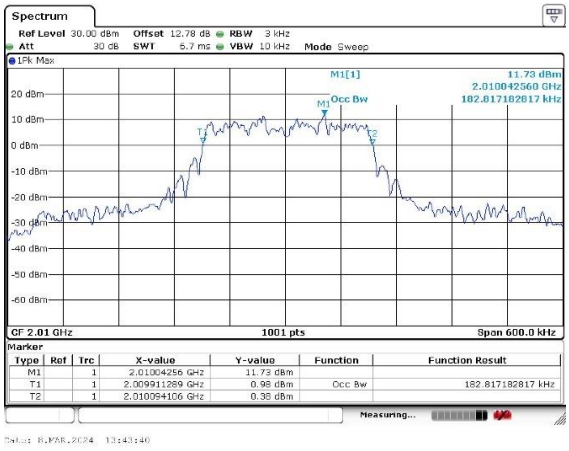
Mode	Band 23 : 99%OBW(kHz)
SCS	15kHz
Mod.	QPSK
SC Size	12SC0
Lowest CH	183.42
Middle CH	182.82
Highest CH	182.82

Band 23 SCS 15kHz

Lowest Channel / 12SC0 / QPSK



Middle Channel / 12SC0 / QPSK

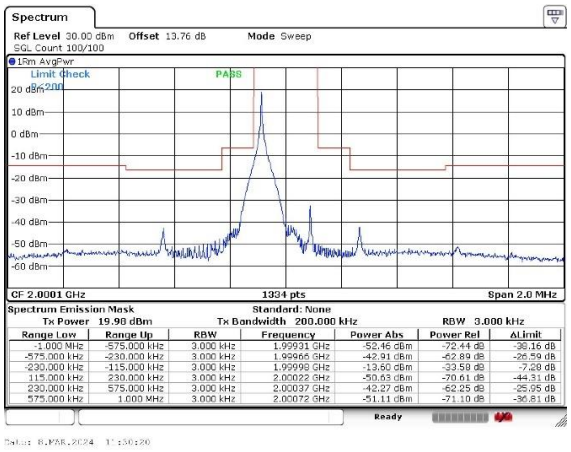


Highest Channel / 12SC0 / QPSK

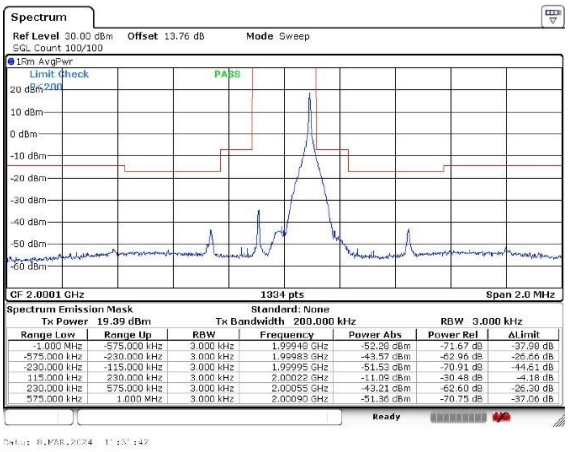
Conducted Emissions Mask

Band 23 SCS 3.75kHz

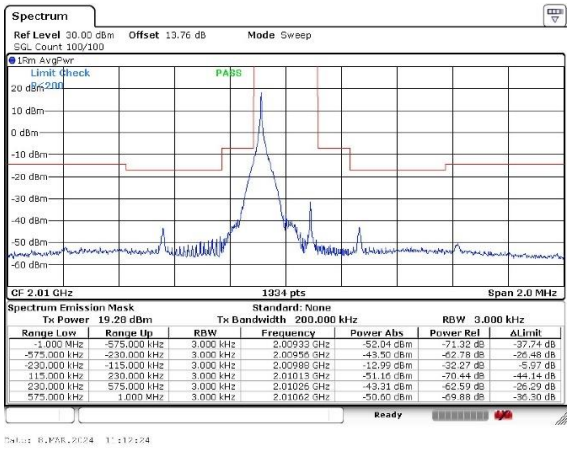
Lowest Channel / 1SC0 / BPSK



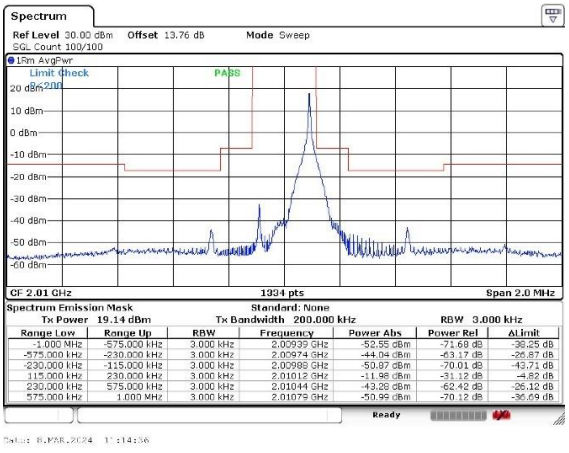
Lowest Channel / 1SC47 / BPSK



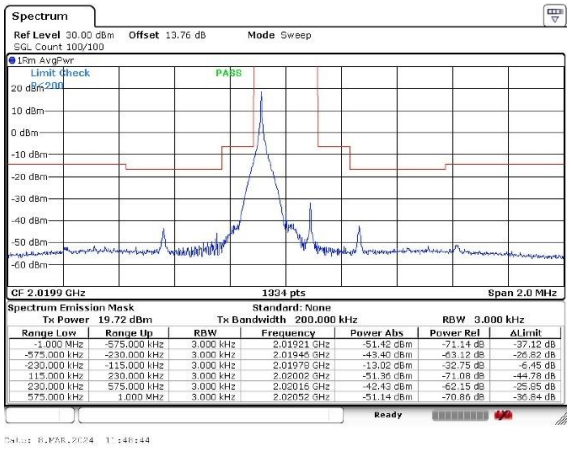
Middle Channel / 1SC0 / BPSK



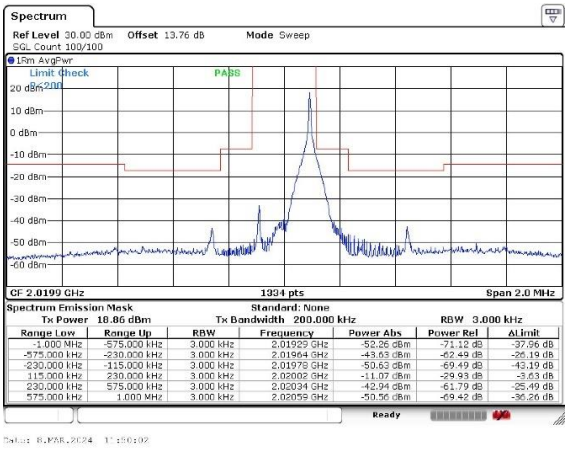
Middle Channel / 1SC47 / BPSK



Highest Channel / 1SC0 / BPSK

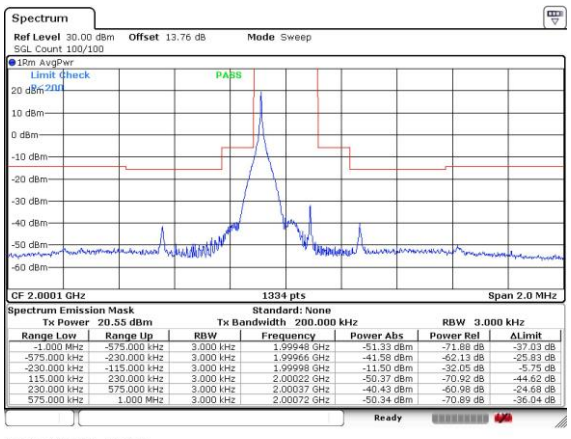


Highest Channel / 1SC47 / BPSK

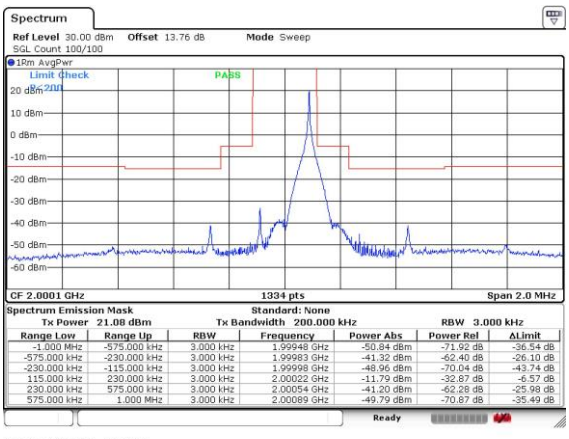


Band 23 SCS 3.75kHz

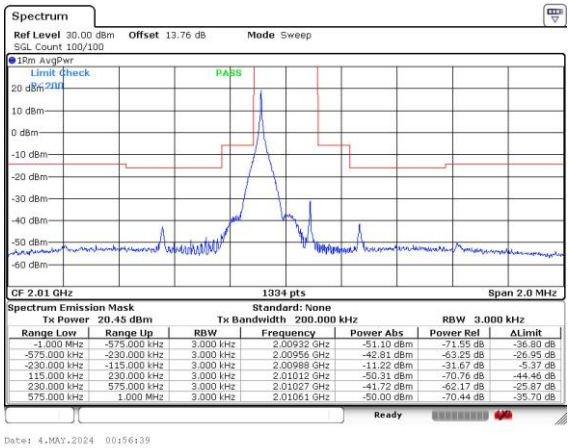
Lowest Channel / 1SC0 / QPSK



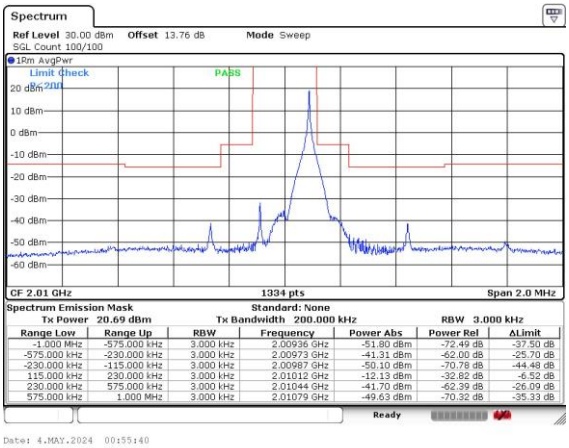
Lowest Channel / 1SC47 / QPSK



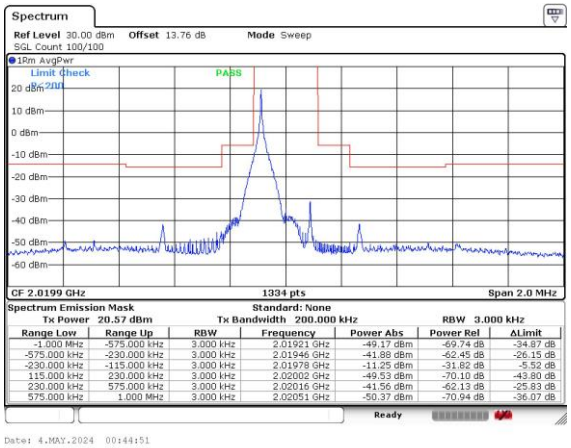
Middle Channel / 1SC0 / QPSK



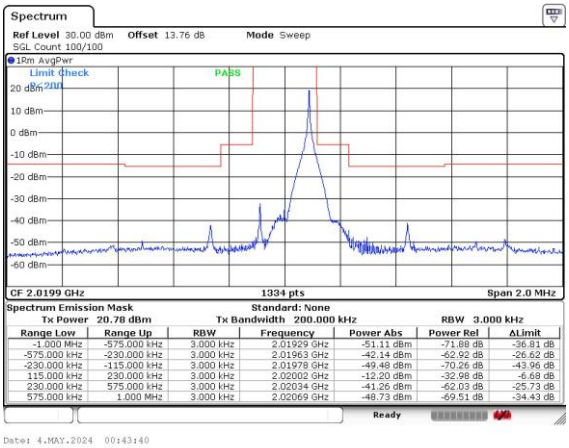
Middle Channel / 1SC47 / QPSK



Highest Channel / 1SC0 / QPSK

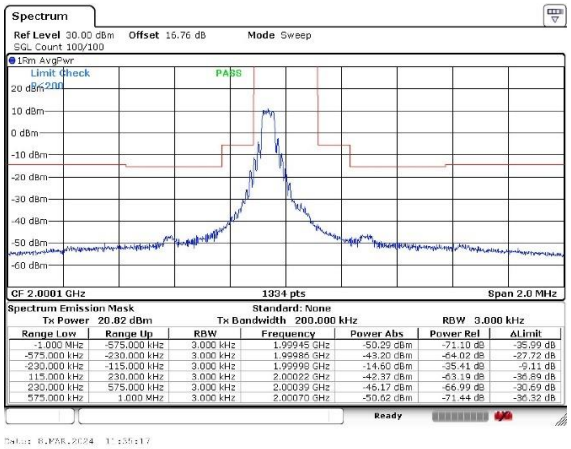


Highest Channel / 1SC47 / QPSK

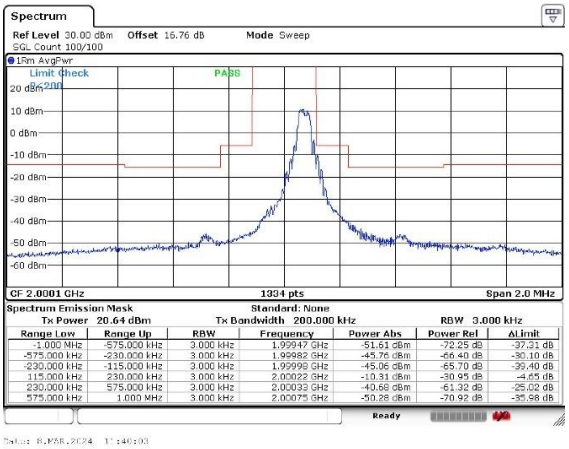


Band 23 SCS 15kHz

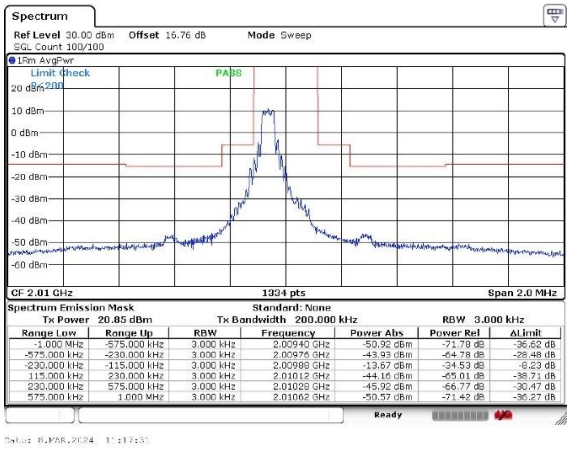
Lowest Channel / 3SC0 / QPSK



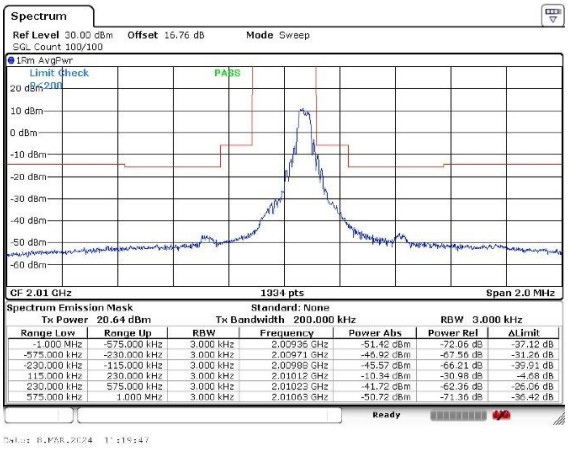
Lowest Channel / 3SC9 / QPSK



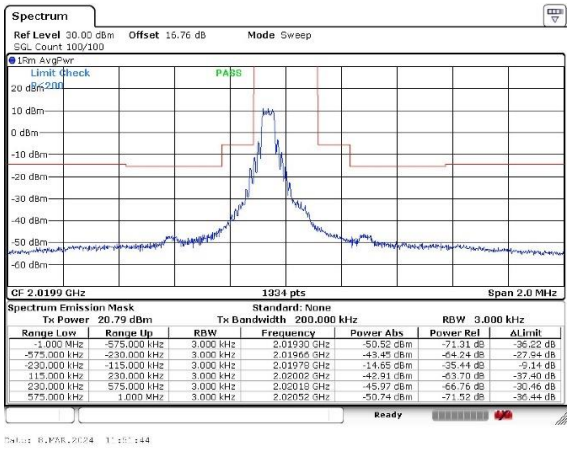
Middle Channel / 3SC0 / QPSK



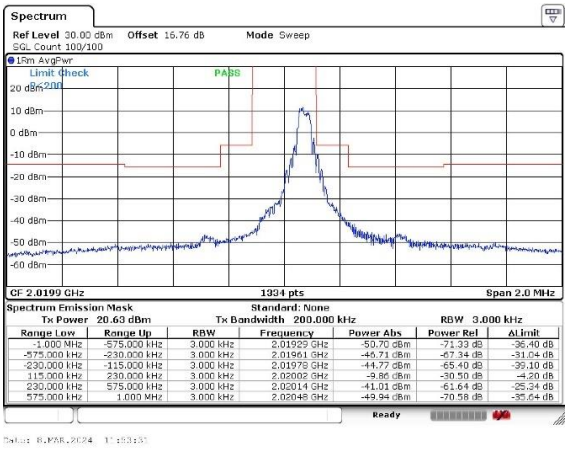
Middle Channel / 3SC9 / QPSK



Highest Channel / 3SC0 / QPSK

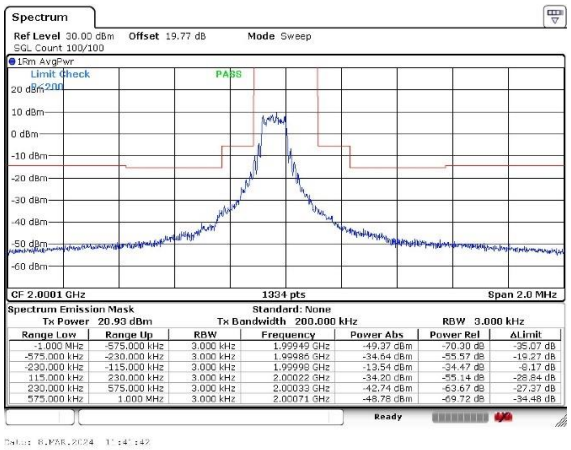


Highest Channel / 3SC9 / QPSK

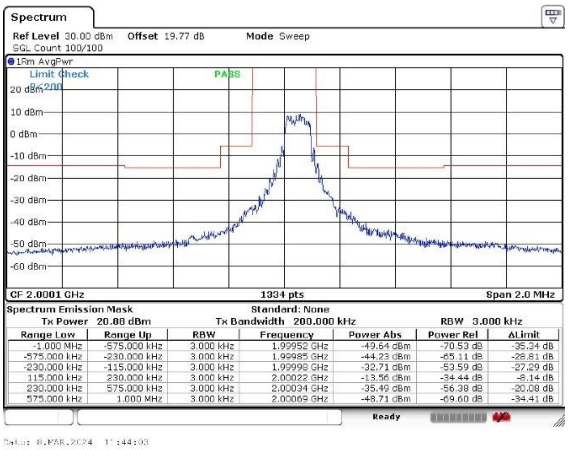


Band 23 SCS 15kHz

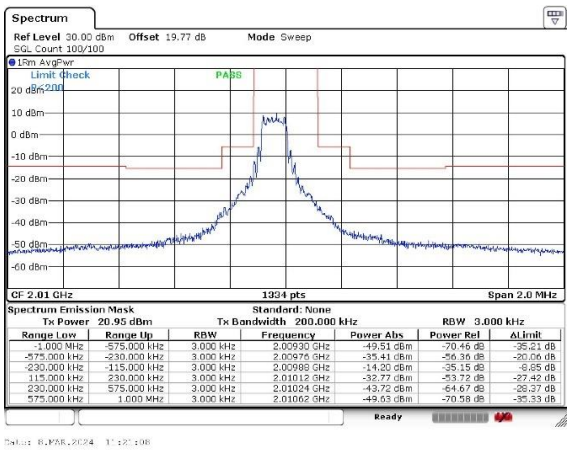
Lowest Channel / 6SC0 / QPSK



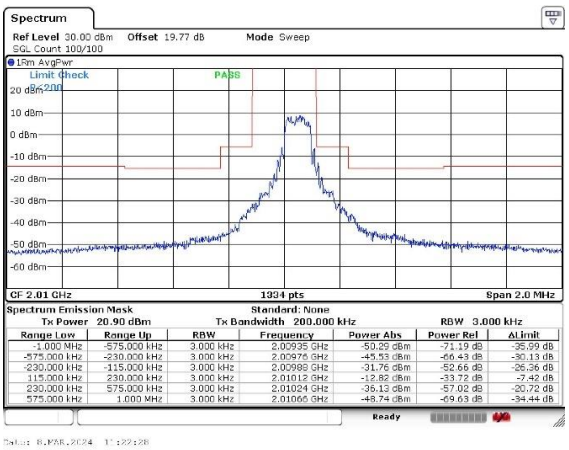
Lowest Channel / 6SC6 / QPSK



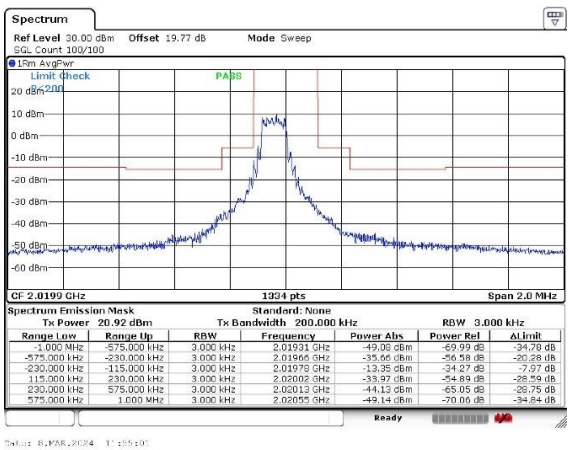
Middle Channel / 6SC0 / QPSK



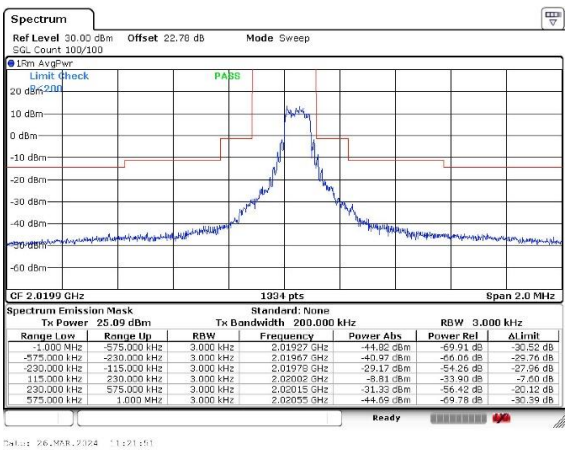
Middle Channel / 6SC6 / QPSK



Highest Channel / 6SC0 / QPSK

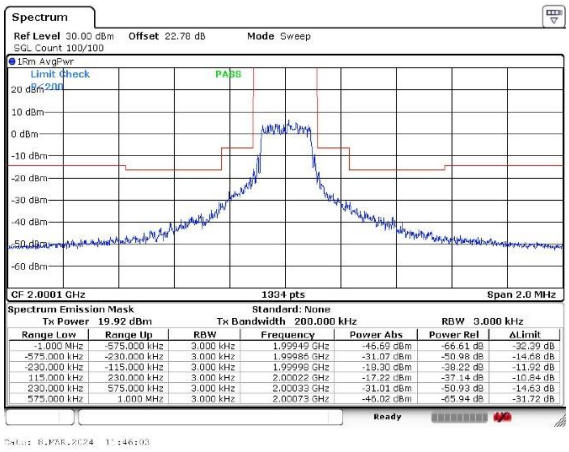


Highest Channel / 6SC6 / QPSK

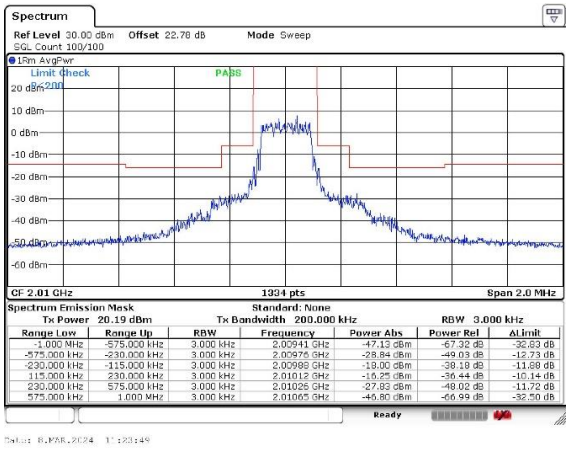


Band 23 SCS 15kHz

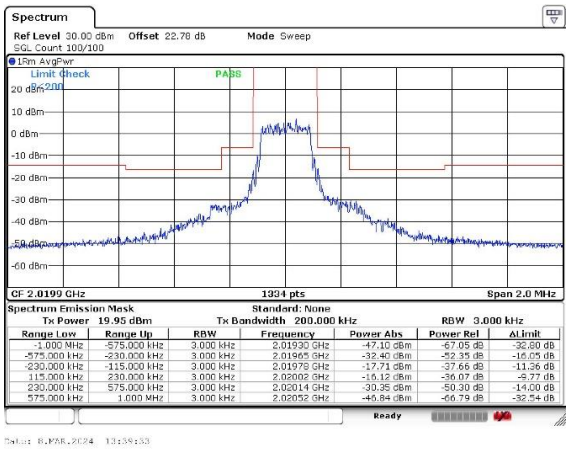
Lowest Channel / 12SC0 / QPSK



Middle Channel / 12SC0 / QPSK



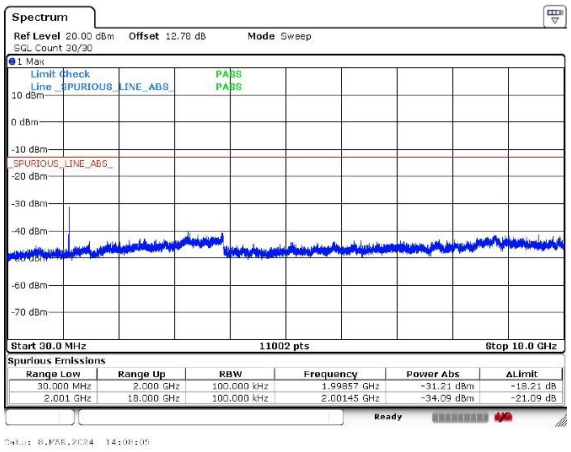
Highest Channel / 12SC0 / QPSK



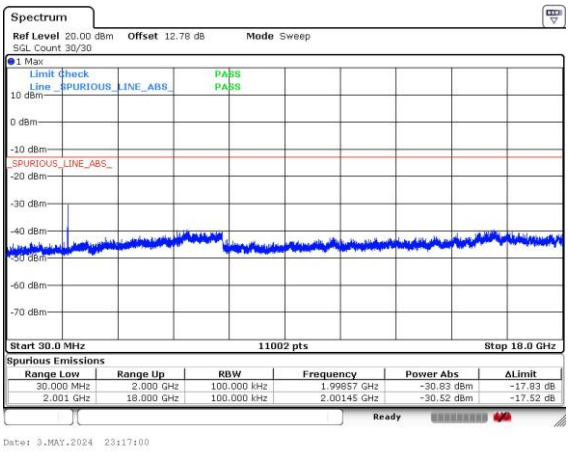
Conducted Spurious Emission

Band 23 SCS 3.75kHz

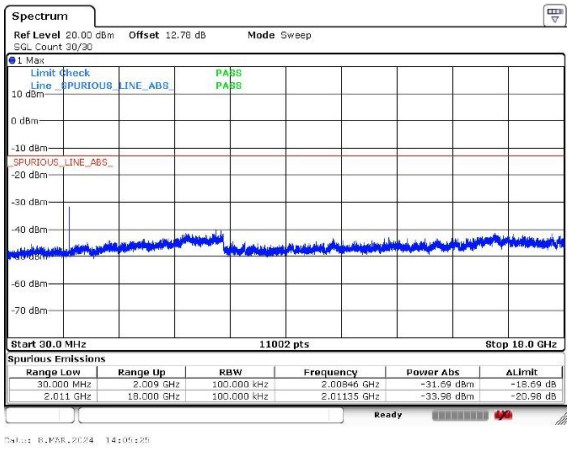
Lowest Channel / 1SC0 / BPSK



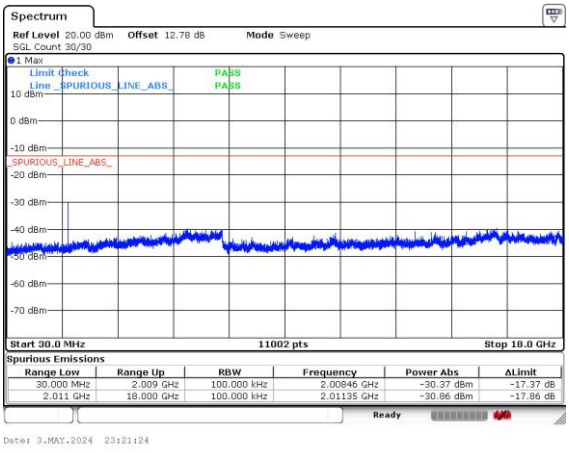
Lowest Channel / 1SC0 / QPSK



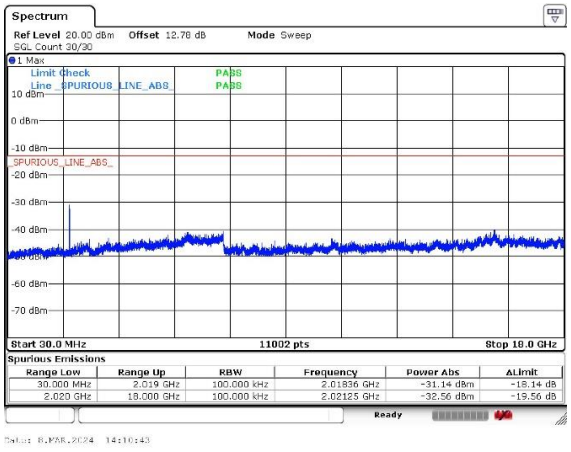
Middle Channel / 1SC0 / BPSK



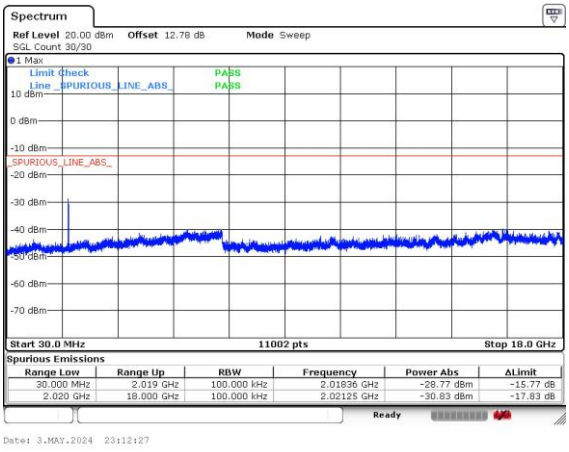
Middle Channel / 1SC0 / QPSK



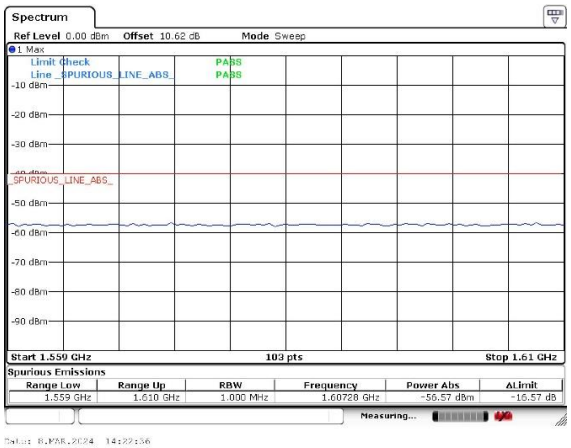
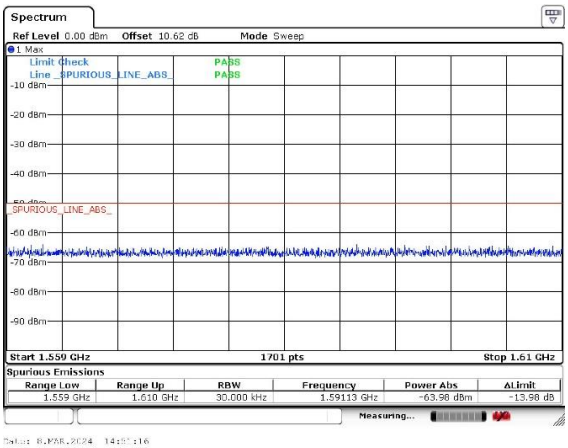
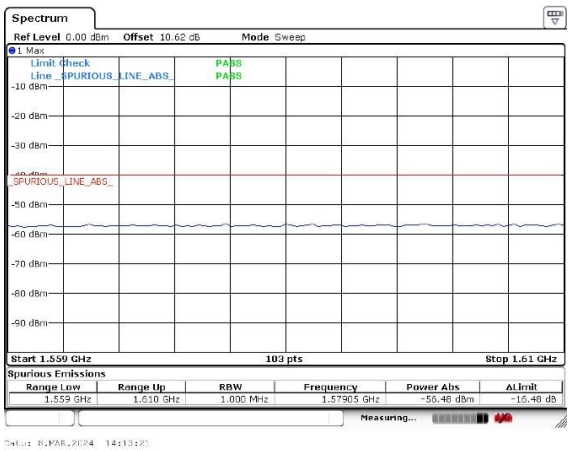
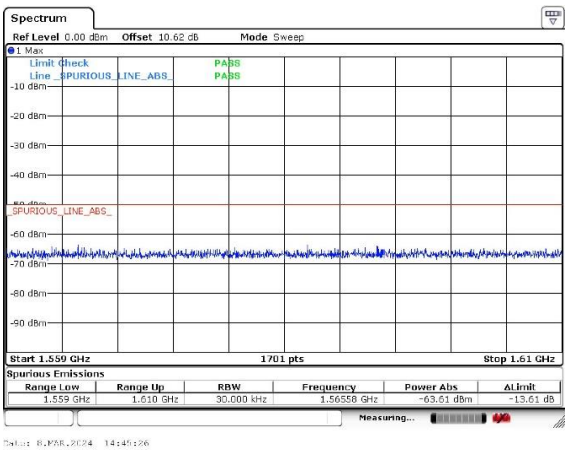
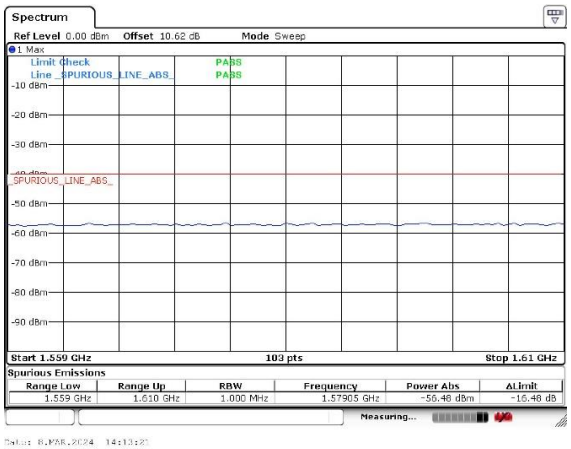
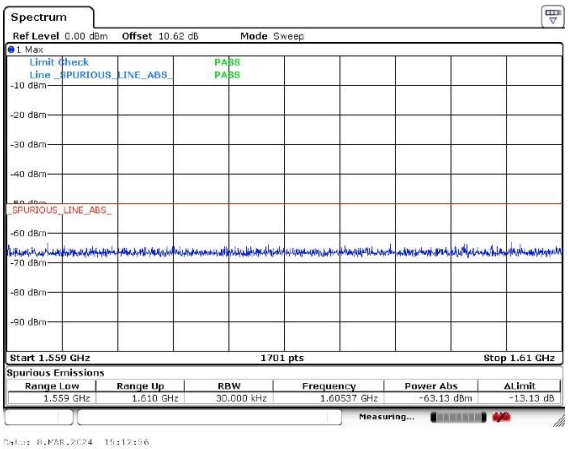
Highest Channel / 1SC0 / BPSK

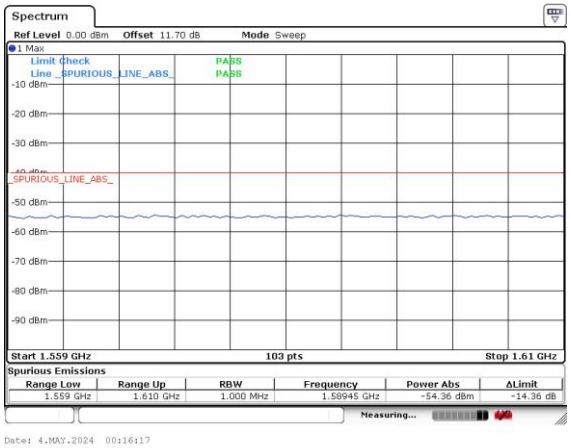
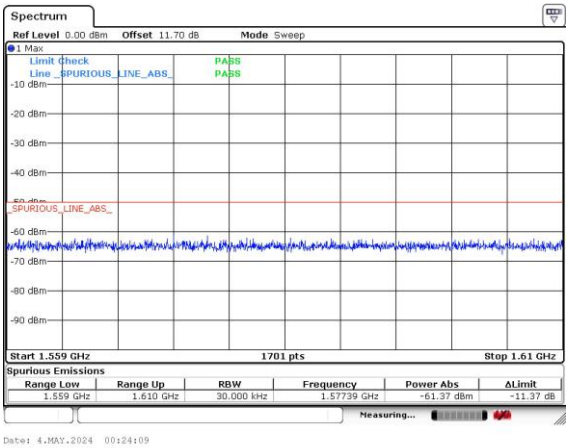
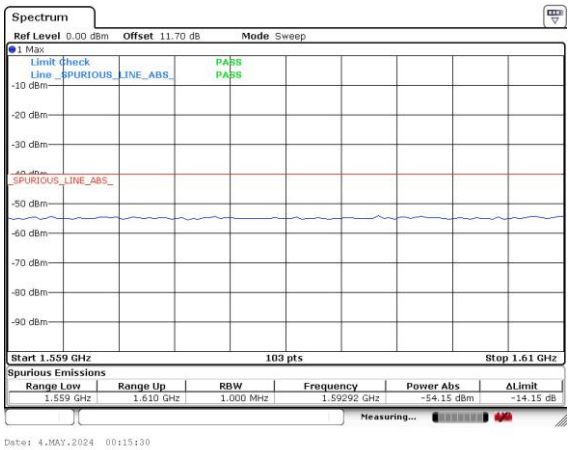
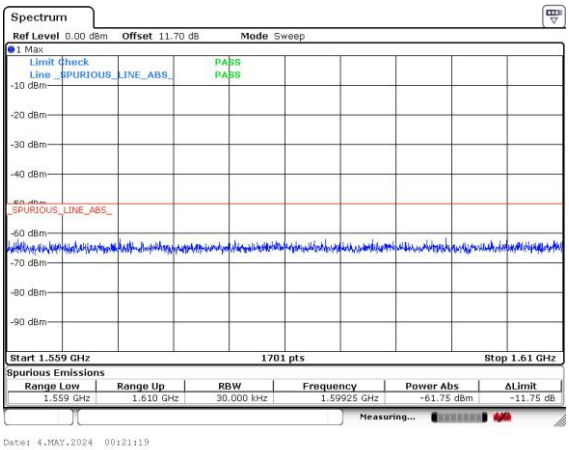
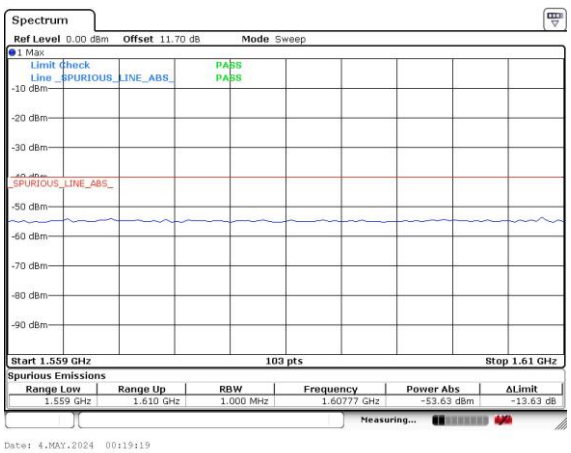
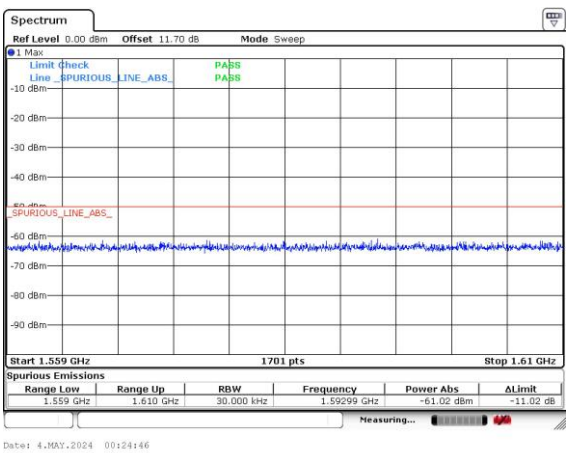


Highest Channel / 1SC0 / QPSK

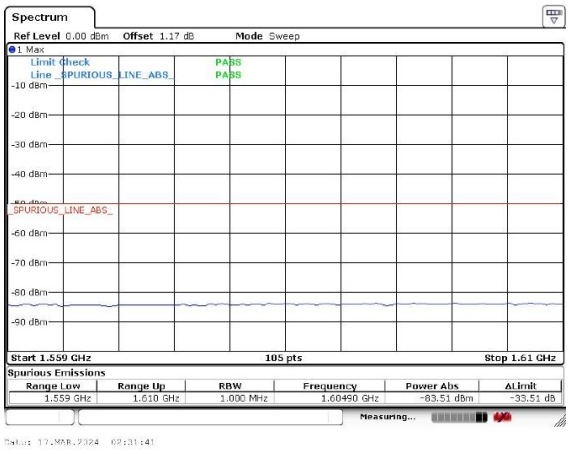


Emission limits for protection of aeronautical service

Band 23 SCS 3.75kHz	
BPSK	
Lowest Channel / 1SC0 Carrier on	Lowest Channel / 1SC0 Discrete
	
Middle Channel / 1SC0 Carrier on	Middle Channel / 1SC0 Discrete
	
Highest Channel / 1SC0 Carrier on	Highest Channel / 1SC0 Discrete
	

Band 23 SCS 3.75kHz	
QPSK	
Lowest Channel / 1SC0 Carrier on	Lowest Channel / 1SC0 Discrete
	
Middle Channel / 1SC0 Carrier on	Middle Channel / 1SC0 Discrete
	
Highest Channel / 1SC0 Carrier on	Highest Channel / 1SC0 Discrete
	

Band 23 Carrier off



Frequency Stability

Test Conditions		Band 23(QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	SCS 15kHz	10ppm
		Deviation (ppm)	Result
50	Normal Voltage	0.0000	PASS
40	Normal Voltage	0.0043	
30	Normal Voltage	0.0016	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0005	
0	Normal Voltage	0.0069	
-10	Normal Voltage	0.0049	
-20	Normal Voltage	0.0062	
-30	Normal Voltage	0.0019	
20	Maximum Voltage	0.0001	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0004	

Note:

1. Normal Voltage =3.89 V.；Battery End Point (BEP) =3.6 V.；Maximum Voltage =4.5 V.
2. Note: The frequency fundamental emissions stay within the authorized frequency block.

Band 255

Conducted Output Power (Average power) and EIRP

Band 255 SCS 3.75kHz							Limit
Test Frequency (MHz)	SC Size	Conducted Power (dBm)		Antenna Gain (dBi)	EIRP Power (dBm)		Result
		BPSK	QPSK		BPSK	QPSK	
1626.6	1SC0	21.40	21.44	-2.21	19.19	19.23	PASS
	1SC47	20.70	21.35	-2.21	18.49	19.14	
1643.5	1SC0	21.05	21.35	-2.21	18.84	19.14	
	1SC47	21.08	21.38	-2.21	18.87	19.17	
1660.4	1SC0	20.97	21.24	-2.21	18.76	19.03	
	1SC47	20.90	21.27	-2.21	18.69	19.06	

Band 255 SCS 15kHz					Limit
Test Frequency (MHz)	SC Size	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP Power (dBm)	Result
		QPSK		QPSK	
1626.6	1SC0	N/A	-2.21	N/A	PASS
	1SC11	N/A	-2.21	N/A	
	3SC0	21.65	-2.21	19.44	
	3SC9	21.92	-2.21	19.71	
	6SC0	21.97	-2.21	19.76	
	6SC6	21.57	-2.21	19.36	
	12SC0	20.89	-2.21	19.68	
1643.5	1SC0	N/A	-2.21	N/A	
	1SC11	N/A	-2.21	N/A	
	3SC0	21.74	-2.21	19.53	
	3SC9	21.77	-2.21	19.56	
	6SC0	21.52	-2.21	19.31	
	6SC6	21.79	-2.21	19.58	
	12SC0	21.11	-2.21	18.90	
1660.4	1SC0	N/A	-2.21	N/A	
	1SC11	N/A	-2.21	N/A	
	3SC0	21.65	-2.21	19.44	
	3SC9	21.59	-2.21	19.38	
	6SC0	21.41	-2.21	19.20	
	6SC6	21.63	-2.21	19.42	
	12SC0	20.74	-2.21	18.53	

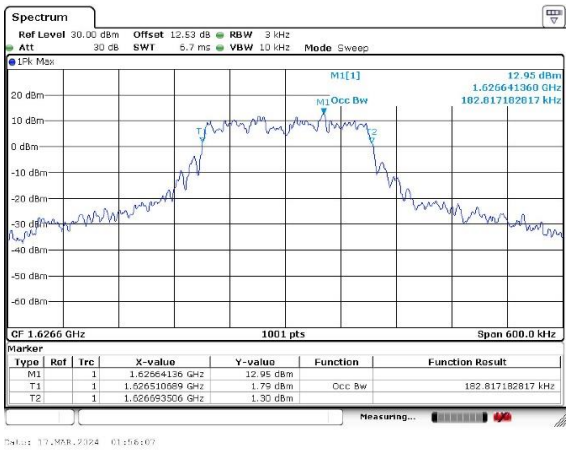
Remark: The output power for SCS15kHz modulation QPSK is worse than BPSK so only QPSK is reported.

Occupied Bandwidth

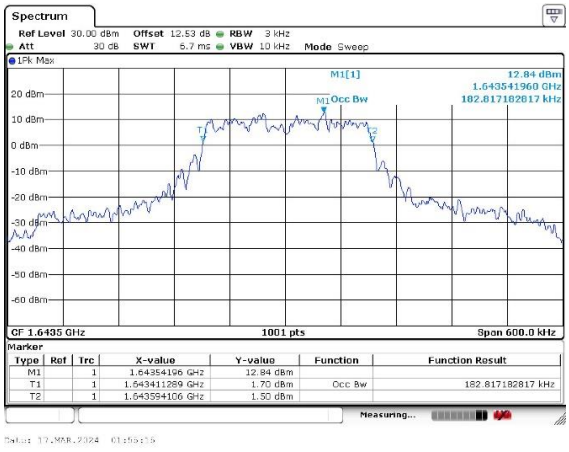
Mode	Band 255 : 99%OBW(kHz)
SCS	15kHz
Mod.	QPSK
SC Size	12SC0
Lowest CH	182.82
Middle CH	182.82
Highest CH	182.82

Band 255 SCS 15kHz

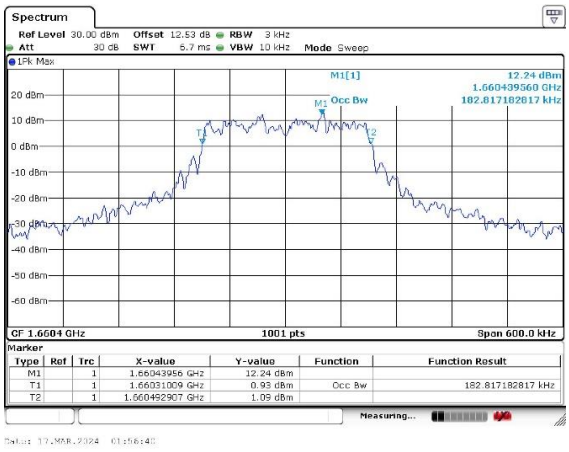
Lowest Channel / 12SC0 / QPSK



Middle Channel / 12SC0 / QPSK



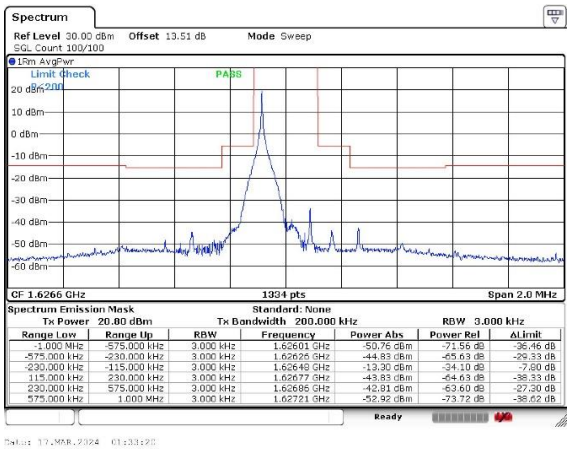
Highest Channel / 12SC0 / QPSK



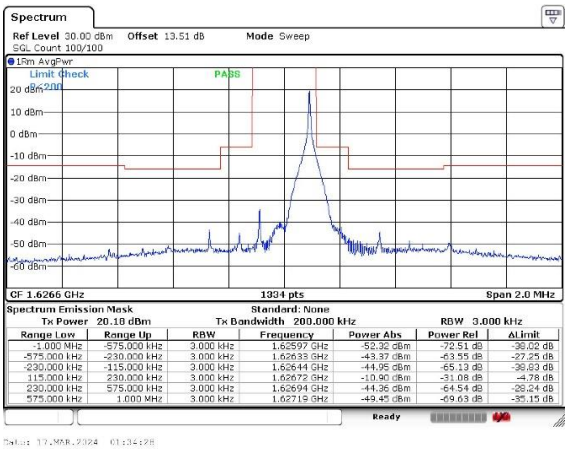
Conducted Emissions Mask

Band 255 SCS 3.75kHz

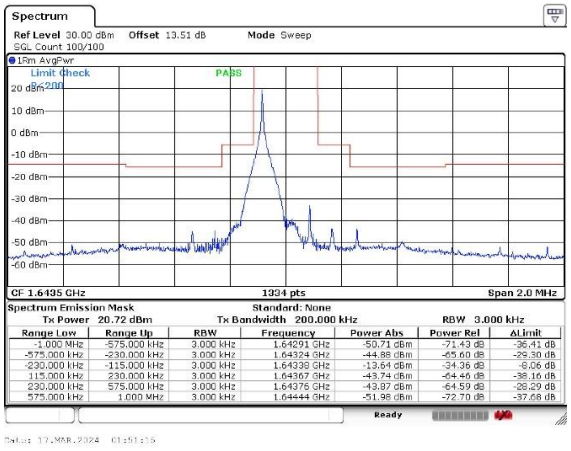
Lowest Channel / 1SC0 / BPSK



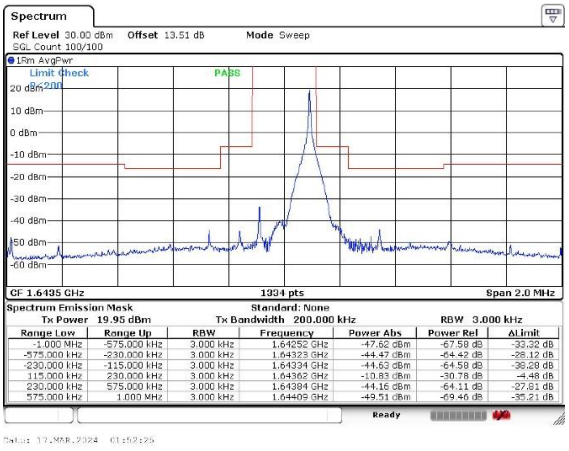
Lowest Channel / 1SC47 / BPSK



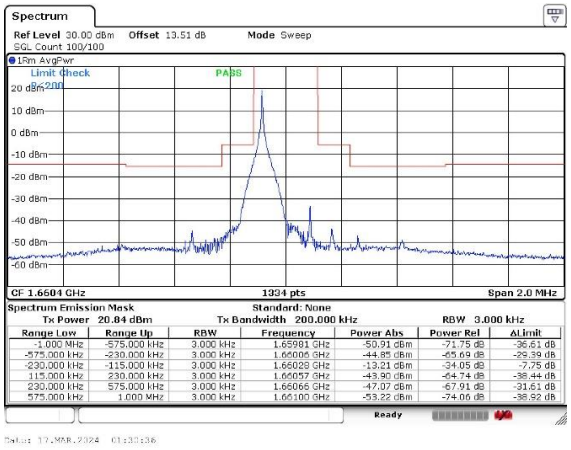
Middle Channel / 1SC0 / BPSK



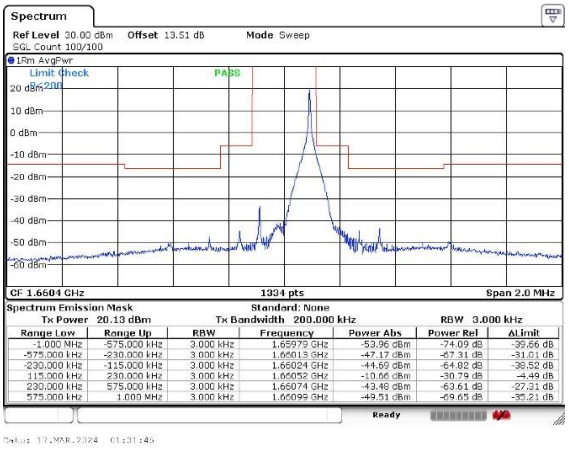
Middle Channel / 1SC47 / BPSK



Highest Channel / 1SC0 / BPSK

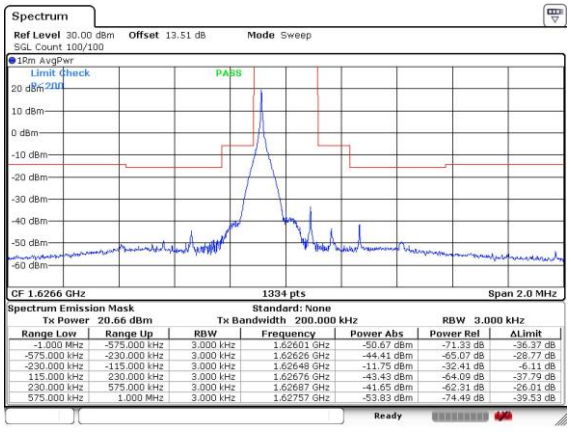


Highest Channel / 1SC47 / BPSK

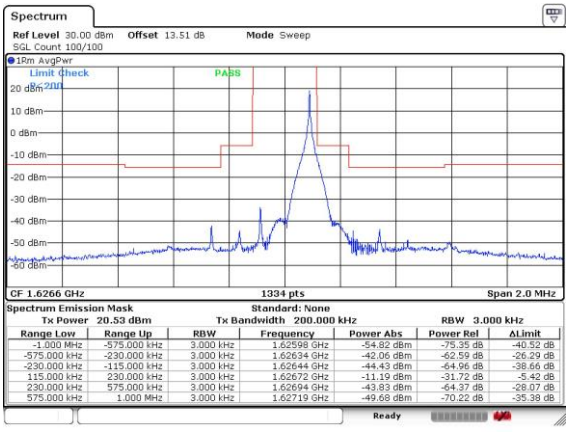


Band 255 SCS 3.75kHz

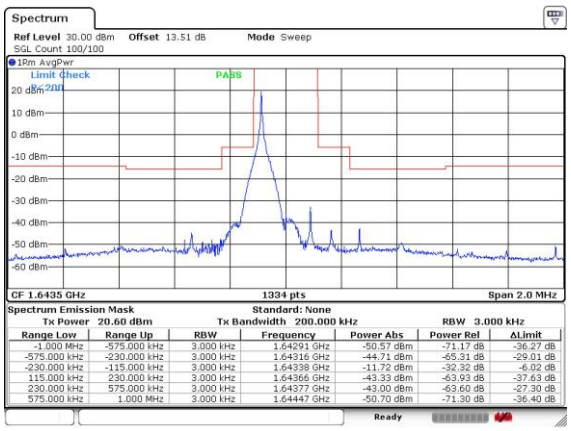
Lowest Channel / 1SC0 / QPSK



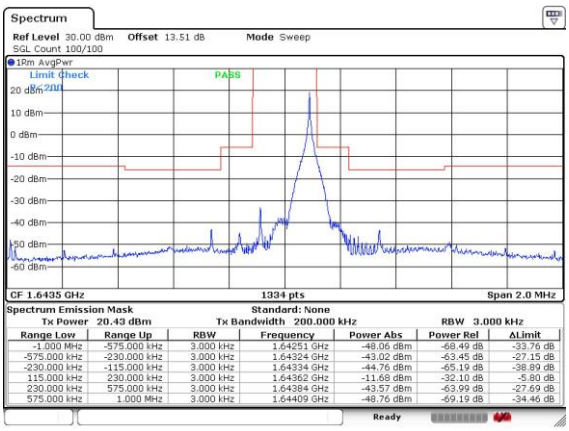
Lowest Channel / 1SC47 / QPSK



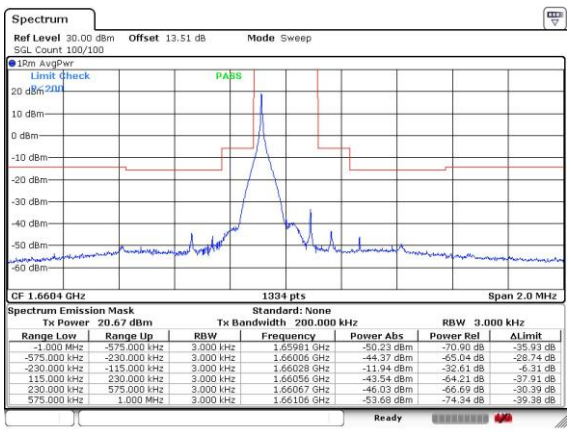
Middle Channel / 1SC0 / QPSK



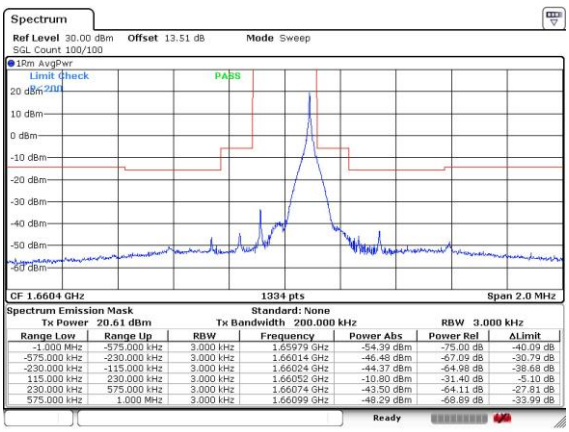
Middle Channel / 1SC47 / QPSK



Highest Channel / 1SC0 / QPSK

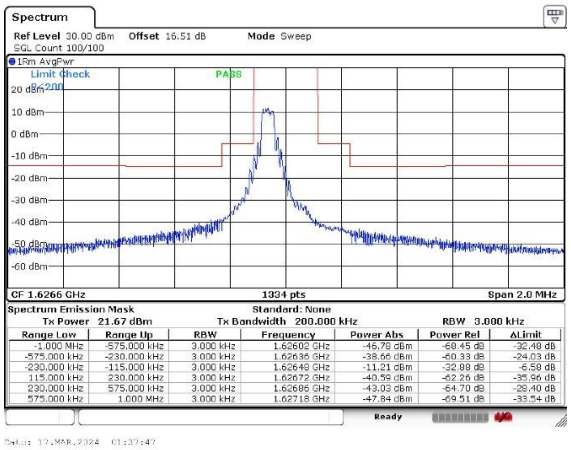


Highest Channel / 1SC47 / QPSK

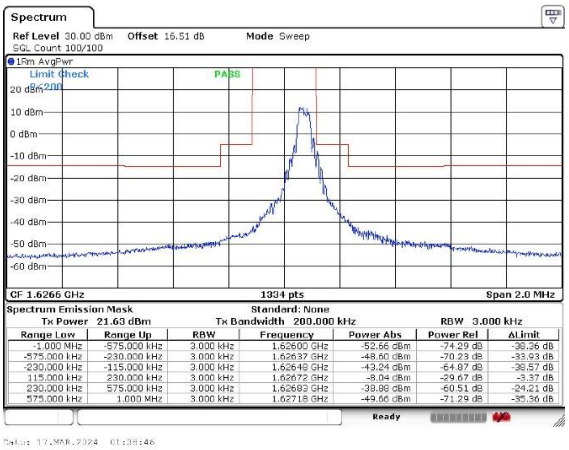


Band 255 SCS 15kHz

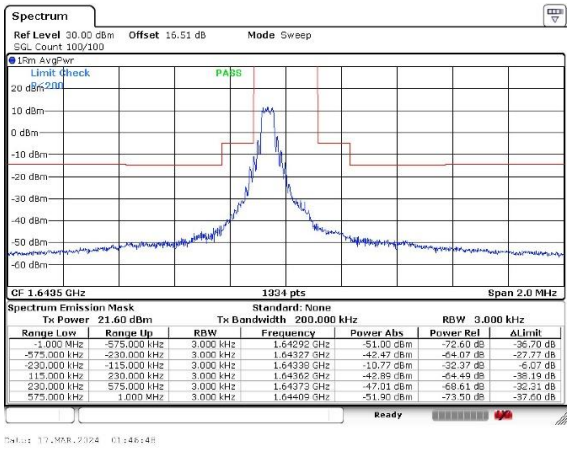
Lowest Channel / 3SC0 / QPSK



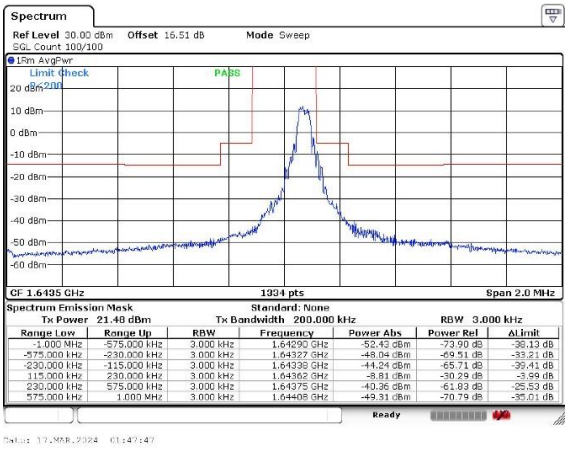
Lowest Channel / 3SC9 / QPSK



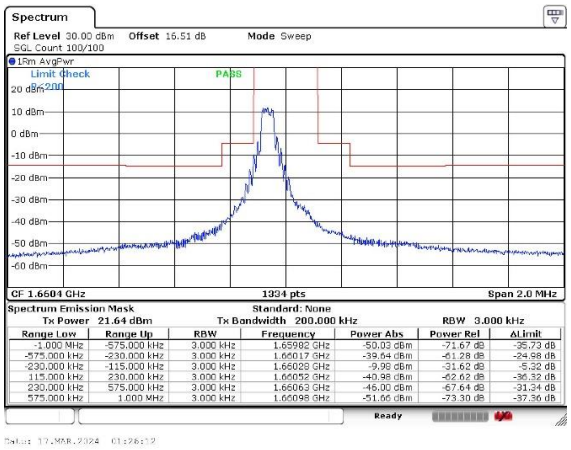
Middle Channel / 3SC0 / QPSK



Middle Channel / 3SC9 / QPSK



Highest Channel / 3SC0 / QPSK



Highest Channel / 3SC9 / QPSK