FCC RADIO TEST REPORT

FCC ID	:	**PKRISGM3000B**
Equipment	:	**Wireless Hotspot**
Brand Name	:	**Inseego**
Model Name	:	**M3000B, M3000B-NA**
Applicant	:	**Inseego Corp.** **9710 Scranton Road Suite 200, San Diego, CA 92121**
Manufacturer	:	**Inseego Corp.** **9710 Scranton Road Suite 200, San Diego, CA 92121**
Standard	:	**FCC 47 CFR Part 2, 22(H), 24(E), 27D**

The product was received on Jul. 08, 2024 and testing was performed from Jul. 11, 2024 to Aug. 07, 2024. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Louis Wu

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issue Date
FG1D2409-02B	01	Initial issue of report	Aug. 07, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1046	Conducted Output Power	Pass	-
	§27.50 (c)(10)	Effective Radiated Power (n12)	Pass	
	§27.50 (a)(3)	Effective Isotropic Radiated Power (n30)		
3.3	-	Peak-to-Average Ratio	Pass	-
3.4	§2.1049	Occupied Bandwidth	Pass	-
3.5	§2.1051 §27.53 (g)	Conducted Band Edge Measurement (n12)	Pass	-
	§2.1051 §27.53 (a)(4)	Conducted Band Edge Measurement (n30)		
3.6	§2.1051 §27.53 (g)	Conducted Spurious Emission (n12)	Pass	-
	§2.1051 §27.53 (a)(4)	Conducted Spurious Emission (n30)		
3.7	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Pass	-
4.2	§2.1053 §22.917 (a) §24.238 (a) §27.53 (g) §27.53 (h)	Radiated Spurious Emission (n2) (n5) (n12) (n25) (n66) (n71)	Pass	13.78 dB under the limit at 9242.00 MHz
	§2.1053 §27.53 (a)(4)	Radiated Spurious Emission (n30)		
	§2.1053 §27.53 (l)(2)	Radiated Spurious Emission (n77)		
	§2.1053 §27.53 (n)(2)	Radiated Spurious Emission (n77)		

Remark: This is a variant report to add 4G-LTE SA B17, B30, Qty.9 CA's, and 5G-FR1 SA n12, n30 and NSA Qty.25 ENDC's via Software Enablement. New Model Number M3000B-NA for marketing purposes is also introduced. All the test cases were performed on original report which can be referred to Sporton Report Number FG1D2409C. Based on the original report, only worst case was verified.

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 purpose of different model name is for marketing segmentation

Reviewed by: Avis Chuang

Report Producer: Lucy Wu

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature
General Specs 3G-WCDMA, 4G-LTE, 5G-FR1, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, and GNSS **Antenna Type** WWAN: Internal Antenna WLAN <Ant. 0>: Internal Antenna <Ant. 1>: Internal Antenna GPS / Glonass / BDS / Galileo: Internal Antenna

Support band and evaluated information	
Added band	n12, n30
Evaluated and Tested band	n12, n30

Antenna information							
Band	**Ant0**	**Ant1**	**Ant2**	**Ant4**	**Ant8**	**Main Ant. #**	**Sub Ant. #**
n12	-0.1					0	-
n30	-0.6					0	-

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	TH03-HY
Test Engineer	George Chen
Temperature (℃)	22~25
Relative Humidity (%)	51~57

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.**
	03CH12-HY (TAF Code: 3786)
Test Engineer	Jesse Fan, Tim Lee, Wilson Wu and Ken Kuo
Temperature (℃)	20~25
Relative Humidity (%)	50~60
Remark	The Radiated Spurious Emission test item subcontracted to Sporton International Inc. Wensan Laboratory.

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

FCC Designation No.: TW1190 and TW3786

1.4 Applicable Standards

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

- ANSI C63.26-2015
- FCC 47 CFR Part 2, 22(H), 24(E), 27D
- 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. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. 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 and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.26 exploratory test procedures and only the worst case emissions were reported in this report..

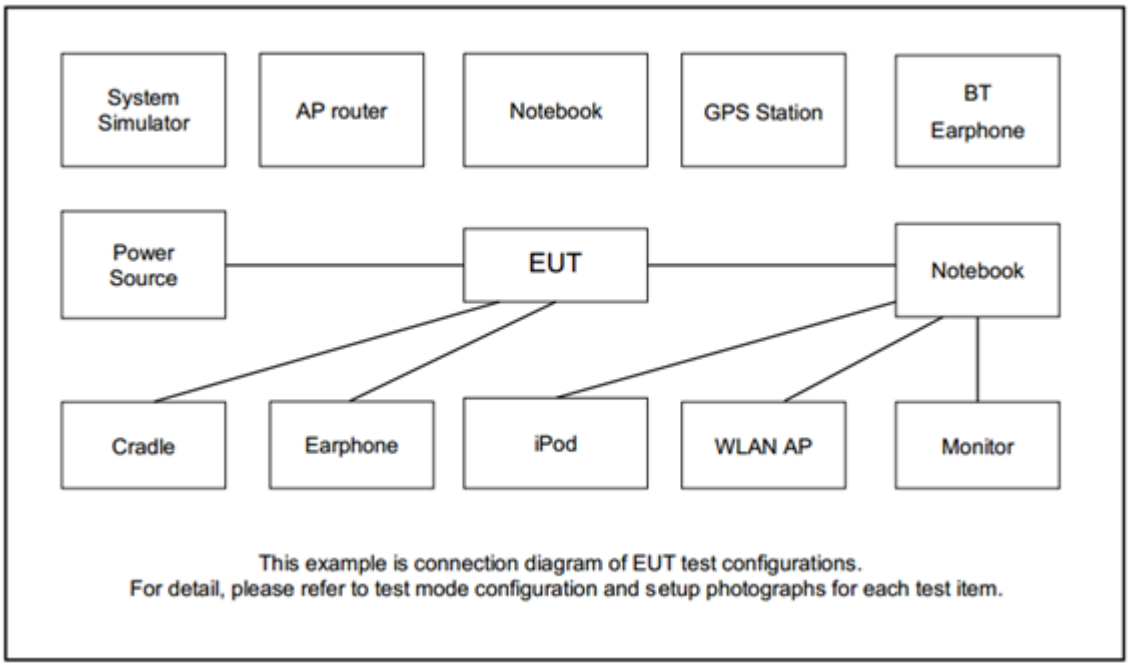
Modulation Type	Modulation	Modulation Type	Modulation
A	DFT-s-OFDM pi/2 BPSK	N/A	N/A
B	DFT-s-OFDM QPSK	F	CP-OFDM QPSK
C	DFT-s-OFDM 16QAM	G	CP-OFDM 16QAM
D	DFT-s-OFDM 64QAM	H	CP-OFDM 64QAM
E	DFT-s-OFDM 256QAM	I	CP-OFDM 256QAM

Test Item	Modulation Type	Bandwidth	RB Size	Channel
Conducted Power	A, B, C, D, E	All	1, Half, Full	L, M, H
EIRP	A, B, C, D, E	All	1, Half, Full	L, M, H
PAR	A, B, C, D, E	10 MHz	Outer_Full	M
Bandwidth	A, F, G, H, I	All	Outer_Full	M
CBE	A, B, C, D, E, F	All	Outer_1RB Outer_Full	L, M, H
CSE	B	5 MHz	Inner_1RB	L, M, H
Frequency Stability	B	10 MHz	Outer_Full	M
RSE	A, B	10 MHz or Minimum	Inner_1RB	L, M, H

Remark:

1. Evaluated all the transmitter signal and reporting worst-case configuration among all modulation types.
2. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst-case emissions are reported.
3. For 5G-FR1 NSA test combination are EN-DC 48A_n5A, EN-DC 2A_n5A, EN-DC 30A_n5A, EN-DC 66A_n5A, EN-DC 5A_n2A, EN-DC 4A_n2A, EN-DC 13A_n2A, EN-DC 30A_n2A, EN-DC 66A_n2A, EN-DC 2A_n12A, EN-DC 48A_n12A, EN-DC 66A_n12A, EN-DC 12A_n25A, EN-DC 5A_n66A, EN-DC 13A_n66A, EN-DC 30A_n66A, EN-DC 48A_n71A, EN-DC 2A_n77A, EN-DC 5A_n77A, EN-DC 7A_n77A, EN-DC 12A_n77A, EN-DC 13A_n77A, EN-DC 30A_n77A, EN-DC 66A_n77A, EN-DC 71A_n77A.
4. One representative bandwidth is selected to perform PAR and frequency stability.

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8821	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	Anritsu	MT8000A	N/A	N/A	Unshielded, 1.8 m

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.

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.

Example :

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

= 4.2 + 10 = 14.2 (dB)

2.5 Frequency List of Low/Middle/High Channels

5G-FR1 n2 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	371000	376000	381000
	Frequency	1855	1880	1905

5G-FR1 NR n5 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	165800	167300	168800
	Frequency	829	836.5	844

5G-FR1 n12 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	140800	141500	142200
	Frequency	704	707.5	711
5	Channel	140300	141500	142700
	Frequency	701.5	707.5	713.5

5G-FR1 n25 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	371000	376500	382000
	Frequency	1855	1882.5	1910

5G-FR1 n30 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	-	27710	-
	Frequency	-	2310	-
5	Channel	27685	27710	27735
	Frequency	2307.5	2310	2312.5

5G-FR1 n66 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	343000	349000	355000
	Frequency	1715	1745	1775

5G-FR1 n71 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	133600	136100	138600
	Frequency	668	680.5	693

5G-FR1 n77 (Part27O) Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	647334	656000	664666
	Frequency	3710.01	3840	3969.99

5G-FR1 n77 (Part27Q) Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	630668	633334	636000
	Frequency	3460.02	3500.01	3540

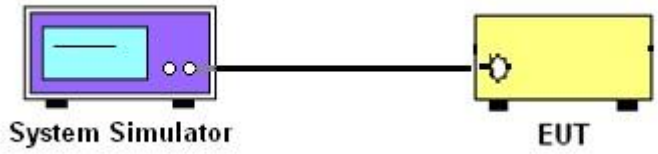
3 Conducted Test Items

3.1 Measuring Instruments

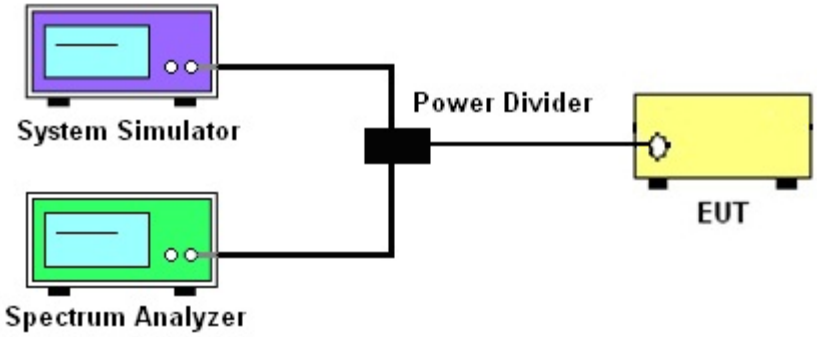
See list of measuring instruments of this test report.

3.1.1 Test Setup

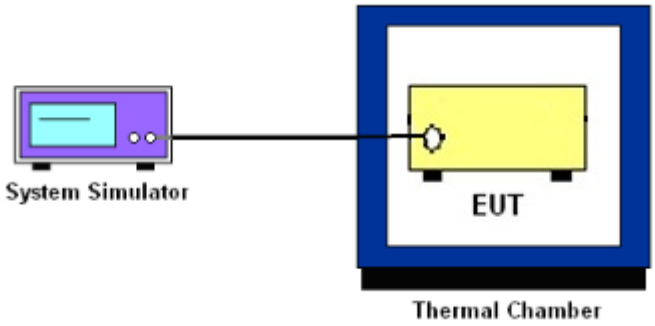
3.1.2 Conducted Output Power



3.1.3 Peak-to-Average Ratio, Occupied Bandwidth ,Conducted Band-Edge and Conducted Spurious Emission



3.1.4 Frequency Stability



3.1.5 Test Result of Conducted Test

Please refer to Appendix A.

3.2 Conducted Output Power and ERP/EIRP

3.2.1 Description of the Conducted Output Power Measurement and ERP/EIRP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 3 Watts for 5G-FR1 n12

The EIRP of mobile transmitters must not exceed 250mW/5MHz for 5G-FR1 n30

According to KDB 412172 D01 Power Approach,

EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

3.3 Peak-to-Average Ratio

3.3.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.3.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.2.6

1. The EUT was connected to spectrum and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. Record the deviation as Peak to Average Ratio.

3.4 Occupied Bandwidth

3.4.1 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.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.4.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.4.3 (26dB) and Section 5.4.4 (99OB)

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. 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.
3. 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.
4. Set the detection mode to peak, and the trace mode to max hold.
5. 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)
6. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
7. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “–X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
8. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.5 Conducted Band Edge

3.5.1 Description of Conducted Band Edge Measurement

27.53 (g)

For operations in the 600MHz band and 698-746 MHz band, the FCC limit is 43 + 10log10(P[Watts]) dB below the transmitter power P(Watts) in a 100 kHz bandwidth. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

27.53 (a)(4)

For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than: 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz.

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz.

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

3.5.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.1.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured.
3. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
5. Set spectrum analyzer with RMS detector.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. Checked that all the results comply with the emission limit line.
   The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)

3.6 Conducted Spurious Emission

3.6.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.
For 5G-FR1 n30
The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 70 + 10 log (P) dB.
It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10^{th} harmonic.

3.6.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.1.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The conducted spurious emission for the whole frequency range was taken.
4. Make the measurement with the spectrum analyzer's RBW = 100 kHz if the authorized frequency band/block is at or below 1 GHz and 1 MHz if the authorized frequency band/block is above 1 GH, VBW = 3 * RBW.
5. Set spectrum analyzer with RMS detector.
6. Taking the record of maximum spurious emission.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. For 5G-FR1 n30
   For 5G NR n30
   The limit line is derived from 70 + 10log(P)dB below the transmitter power P(Watts)

3.7 Frequency Stability

3.7.1 Description of Frequency Stability Measurement

27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

3.7.2 Test Procedures for Temperature Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

1. The EUT was set up in the thermal chamber and connected with the system simulator.
2. 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.
3. With power OFF, the temperature was raised in 10°C step 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.

3.7.3 Test Procedures for Voltage Variation

The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.

1. The EUT was placed in a temperature chamber at 20±5° C and connected with the system simulator.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

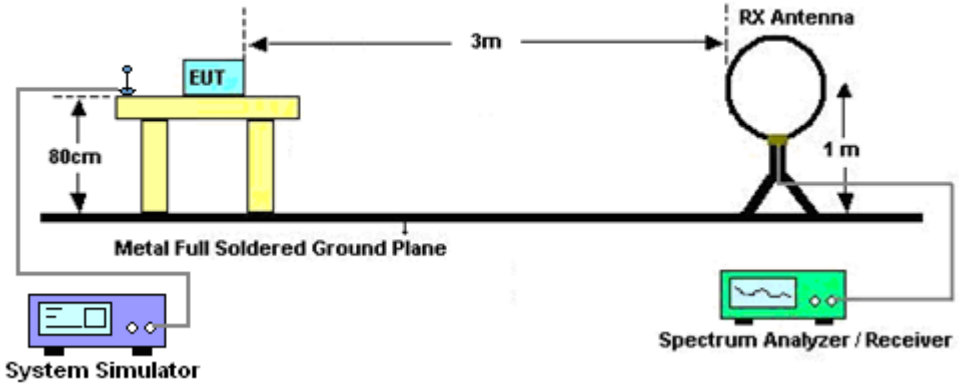
4 Radiated Test Items

4.1 Measuring Instruments

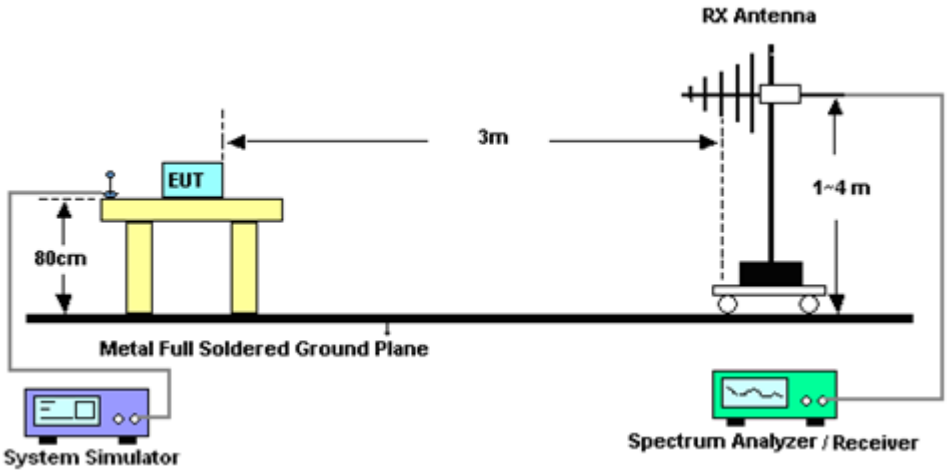
See list of measuring instruments of this test report.

4.1.1 Test Setup

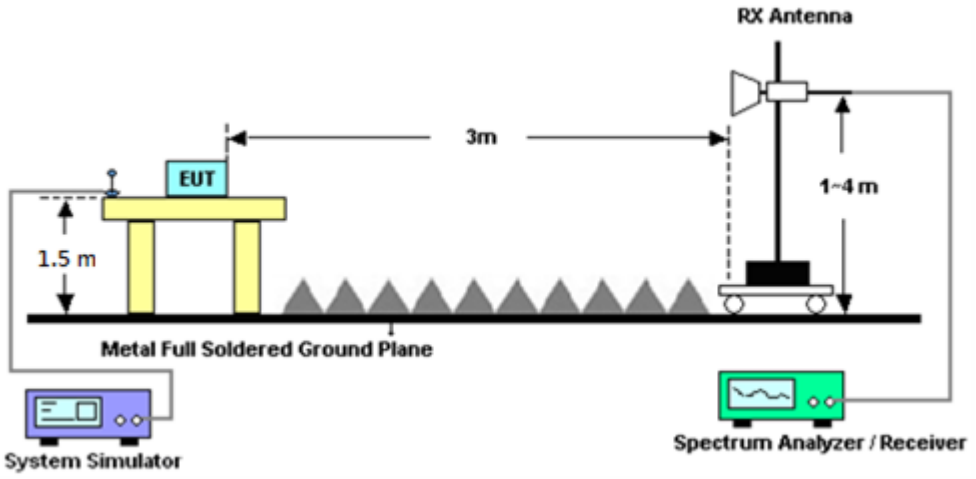
For radiated test below 30MHz



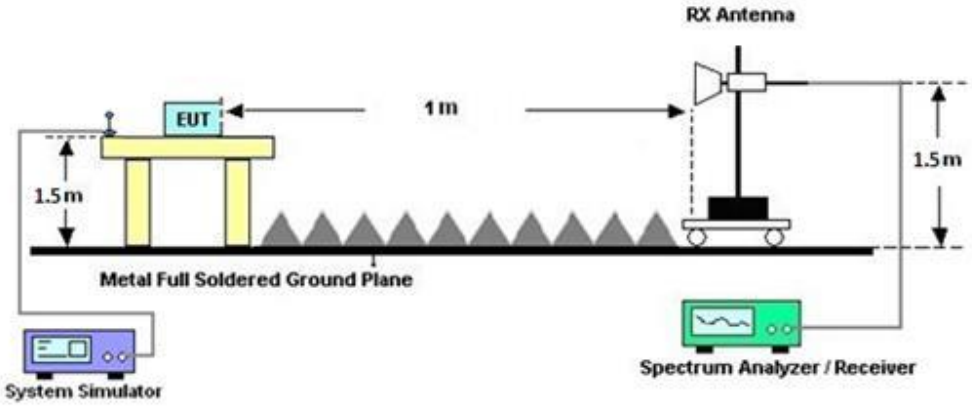
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



4.1.2 Test Result of Radiated Test

Please refer to Appendix B.

Note:

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

4.2 Radiated Spurious Emission Measurement

4.2.1 Description of Radiated Spurious Emission Measurement

The radiated spurious emission was measured by substitution method according to ANSI C63.26-2015.

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB

For 5G-FR1 n30

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 70 + 10 log (P) dB.

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

4.2.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI C63.26-2015 section 5.5.4 Radiated measurement using the field strength method.

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. 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.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. To convert spectrum reading E(dBuV/m) to EIRP(dBm)

   EIRP(dBm) = Level (dBuV/m) + 20log(d) -104.77,

   where d is the distance at which filed strength limit is specified in the rules
7. Field Strength Level (dBm) = Spectrum Reading (dBm) + Antenna Factor + Cable Loss + Read Level - Preamp Factor.
8. ERP (dBm) = EIRP (dBm) - 2.15
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

5 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Feb. 23, 2024	Jul. 19, 2024~ Aug. 07, 2024	Feb. 22, 2025	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	37059 & 01	30MHz~1GHz	Nov. 03, 2023	Jul. 19, 2024~ Aug. 07, 2024	Nov. 02, 2024	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-02114	1GHz~18GHz	Jul. 11, 2024	Jul. 19, 2024~ Aug. 07, 2024	Jul. 10, 2025	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00993	18GHz-40GHz	Nov. 24, 2023	Jul. 19, 2024~ Aug. 07, 2024	Nov. 23, 2024	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 20, 2024	Jul. 19, 2024~ Aug. 07, 2024	Mar. 19, 2025	Radiation (03CH12-HY)
Preamplifier	Agilent	8449B	3008A02375	1GHz~26.5GHz	May 22, 2024	Jul. 19, 2024~ Aug. 07, 2024	May 21, 2025	Radiation (03CH12-HY)
Preamplifier	E-INSTRUMENT TECH LTD.	ERA-100M-18G-56-01-A70	EC1900249	1GHz-18GHz	Dec. 20, 2023	Jul. 19, 2024~ Aug. 07, 2024	Dec. 19, 2024	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 07, 2023	Jul. 19, 2024~ Aug. 07, 2024	Dec. 06, 2024	Radiation (03CH12-HY)
Spectrum Analyzer	Agilent	N9010A	MY53470118	10Hz~44GHz	Jan. 10, 2024	Jul. 19, 2024~ Aug. 07, 2024	Jan. 09, 2025	Radiation (03CH12-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz~44GHz	May 13, 2024	Jul. 19, 2024~ Aug. 07, 2024	May 12, 2025	Radiation (03CH12-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY53290053	20Hz~26.5GHz	Aug. 29, 2023	Jul. 19, 2024~ Aug. 07, 2024	Aug. 28, 2024	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-900-1000-15000-60SS	SN11	1GHz High Pass Filter	Mar. 13, 2024	Jul. 19, 2024~ Aug. 07, 2024	Mar. 12, 2025	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN2	3GHz High Pass Filter	Mar. 13, 2024	Jul. 19, 2024~ Aug. 07, 2024	Mar. 12, 2025	Radiation (03CH12-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN2	6.75GHz High Pass Filter	Mar. 13, 2024	Jul. 19, 2024~ Aug. 07, 2024	Mar. 12, 2025	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9kHz~30MHz	Mar. 06, 2024	Jul. 19, 2024~ Aug. 07, 2024	Mar. 05, 2025	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30MHz~18GHz	Dec. 18, 2023	Jul. 19, 2024~ Aug. 07, 2024	Dec. 17, 2024	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Dec. 18, 2023	Jul. 19, 2024~ Aug. 07, 2024	Dec. 17, 2024	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803953/2	30MHz~40GHz	Dec. 18, 2023	Jul. 19, 2024~ Aug. 07, 2024	Dec. 17, 2024	Radiation (03CH12-HY)
Hygrometer	TECPEL	DTM-303B	TP210117	N/A	Oct. 19, 2023	Jul. 19, 2024~ Aug. 07, 2024	Oct. 18, 2024	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Jul. 19, 2024~ Aug. 07, 2024	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Jul. 19, 2024~ Aug. 07, 2024	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Jul. 19, 2024~ Aug. 07, 2024	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Jul. 19, 2024~ Aug. 07, 2024	N/A	Radiation (03CH12-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
DC Power Supply	GW Instek	GPE2323	GET910884	0V~64V ;0A~6A	Nov. 16, 2023	Jul. 11, 2024~ Aug. 06, 2024	Nov. 15, 2024	Conducted (TH03-HY)
Signal Analyzer	Rohde & Schwarz	FSV3044	101049	10Hz~44GHz	Sep. 26, 2023	Jul. 11, 2024~ Aug. 06, 2024	Sep. 25, 2024	Conducted (TH03-HY)
Temperature Chamber	ESPEC	SU-241	92003713	-30℃ ~95℃	May 14, 2024	Jul. 11, 2024~ Aug. 06, 2024	May 13, 2025	Conducted (TH03-HY)
Hygrometer	TECPEL	DTM-303B	TP200886	NA	Mar. 14, 2024	Jul. 11, 2024~ Aug. 06, 2024	Mar. 13, 2025	Conducted (TH03-HY)
Base Station (Measure)	Anritsu	MT8821C	6262116725	LTE	Oct. 25, 2023	Jul. 11, 2024~ Aug. 06, 2024	Oct. 24, 2024	Conducted (TH03-HY)
Base Station (Measure)	Anritsu	MT8000A	6262148275	FR1	Oct. 24, 2023	Jul. 11, 2024~ Aug. 06, 2024	Oct. 23, 2024	Conducted (TH03-HY)
Power divider	Anritsu	K241C	2143398	9KHz~40GHz	Jun. 13, 2024	Jul. 11, 2024~ Aug. 06, 2024	Jun. 12, 2025	Conducted (TH03-HY)
Software 1	Sporton	FCC 5GNR_FSV3044_20231106	N/A	Conducted Test Item	N/A	Jul. 11, 2024~ Aug. 06, 2024	N/A	Conducted (TH03-HY)

6 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.291 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.073 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.082 dB**

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power and ERP/EIRP)

NR n12 Maximum Average Power [dBm] (GT - LC = -0.1 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	ERP (dBm)	ERP(W)
5	1	1	PI/2 BPSK	23.86	23.84	23.82	21.70	0.1479
5	1	23		23.95	23.79	23.72		
5	12	6		23.88	23.75	23.84		
5	1	0		23.52	23.40	23.27		
5	1	24		23.53	23.28	23.26		
5	25	0		23.44	23.42	23.26		
5	1	1	QPSK	23.93	23.91	23.86		
5	1	23		23.88	23.81	23.74		
5	12	6		23.95	23.78	23.82		
5	1	0		22.98	22.90	22.86		
5	1	24		23.06	22.82	22.79		
5	25	0		22.97	22.94	22.77		
5	1	1	16-QAM	23.02	22.84	22.75	20.77	0.1194
5	1	1	64-QAM	21.73	21.45	21.40		
5	1	1	256-QAM	19.02	18.84	18.76		
Limit	ERP < 3W			Result			Pass	

NR n12 Maximum Average Power [dBm] (GT - LC = -0.1 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	ERP (dBm)	ERP(W)
10	1	1	PI/2 BPSK	23.94	23.88	23.90	21.71	0.1483
10	1	50		23.91	23.94	23.87		
10	25	12		23.95	23.79	23.91		
10	1	0		23.70	23.50	23.47		
10	1	51		23.56	23.27	23.31		
10	50	0		23.49	23.36	23.41		
10	1	1	QPSK	23.94	23.86	23.95		
10	1	50		23.91	23.79	23.86		
10	25	12		23.96	23.93	23.94		
10	1	0		23.08	22.96	23.08		
10	1	51		22.91	22.74	22.93		
10	50	0		22.92	22.85	22.86		
10	1	1	16-QAM	22.97	22.87	22.97	20.72	0.1180
10	1	1	64-QAM	21.71	21.54	21.68		
10	1	1	256-QAM	18.96	18.82	18.90		
Limit	ERP < 3W			Result			Pass	

NR n30 Maximum Average Power [dBm] (GT - LC = -0.6 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
5	1	1	PI/2 BPSK	22.57	22.65	22.70	22.17	0.1648
5	1	23		22.50	22.71	22.75		
5	12	6		22.56	22.69	22.69		
5	1	0		22.09	22.27	22.30		
5	1	24		22.02	22.24	22.26		
5	25	0		22.08	22.20	22.19		
5	1	1	QPSK	22.61	22.69	22.73		
5	1	23		22.50	22.73	22.77		
5	12	6		22.56	22.71	22.71		
5	1	0		21.61	21.77	21.82		
5	1	24		21.49	21.75	21.79		
5	25	0		21.57	21.68	21.76		
5	1	1	16-QAM	21.59	21.64	21.67	21.07	0.1279
5	1	1	64-QAM	20.27	20.41	20.38		
5	1	1	256-QAM	17.61	17.63	17.72		
Limit	EIRP < 250 mW/5MHz			Result			Pass	

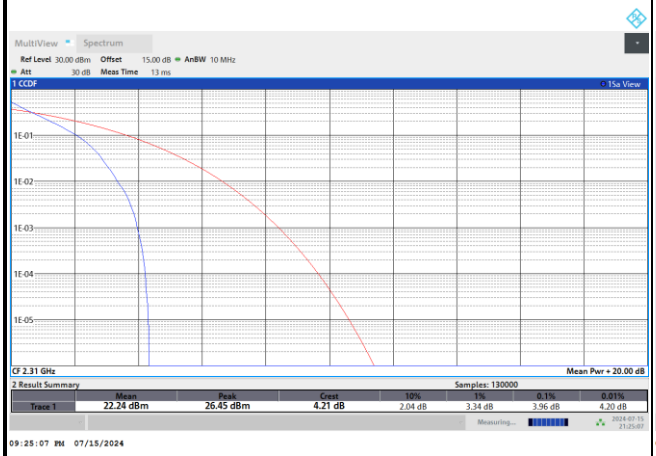
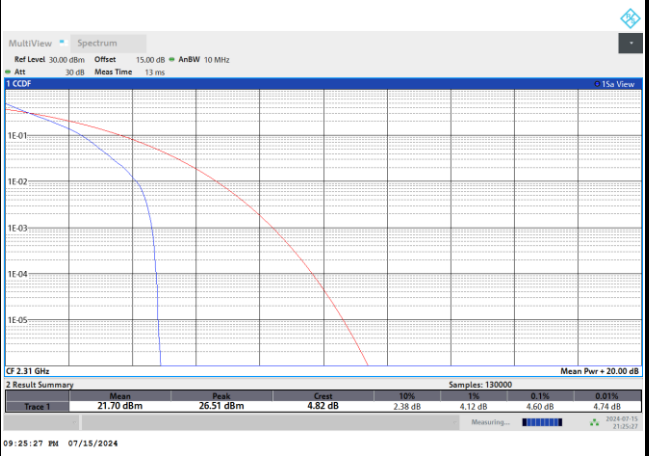
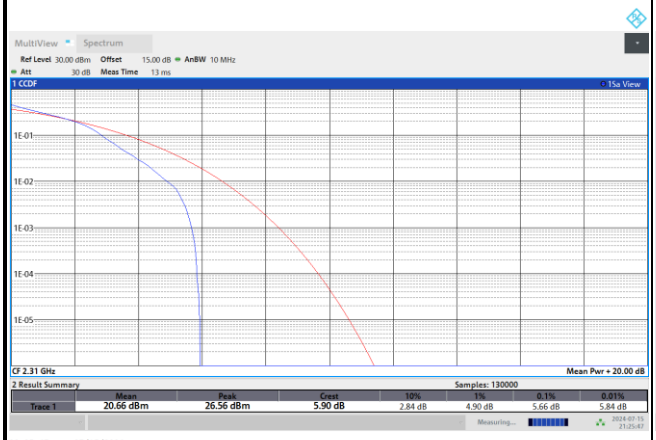
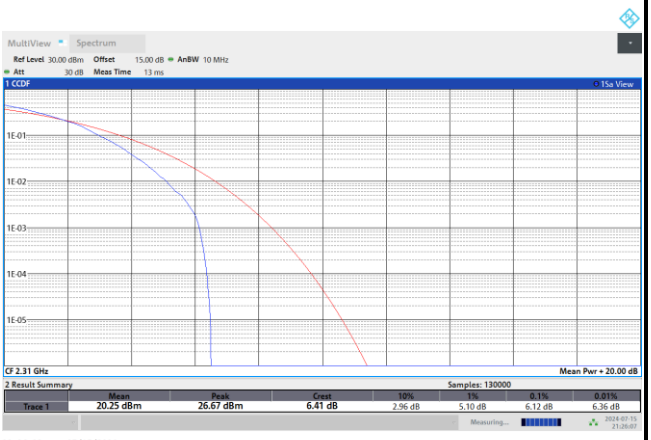
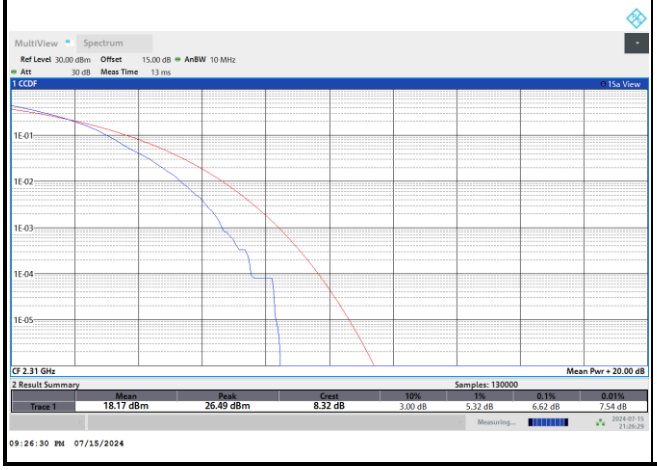
NR n30 Maximum Average Power [dBm] (GT - LC = -0.6 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
10	1	1	PI/2 BPSK	-	22.82	-	22.22	0.1667
10	1	50		-	22.76	-		
10	25	12		-	22.70	-		
10	1	0		-	22.36	-		
10	1	51		-	22.29	-		
10	50	0		-	22.21	-		
10	1	1	QPSK	-	22.76	-		
10	1	50		-	22.79	-		
10	25	12		-	22.68	-		
10	1	0		-	21.81	-		
10	1	51		-	21.78	-		
10	50	0		-	21.71	-		
10	1	1	16-QAM	-	21.72	-	21.12	0.1294
10	1	1	64-QAM	-	20.53	-		
10	1	1	256-QAM	-	17.67	-		
Limit	EIRP < 250 mW/5MHz			Result			Pass	

Total EIRP power is less than partial EIRP limit 250 mW/5MHz.

FR1 n30

Peak-to-Average Ratio

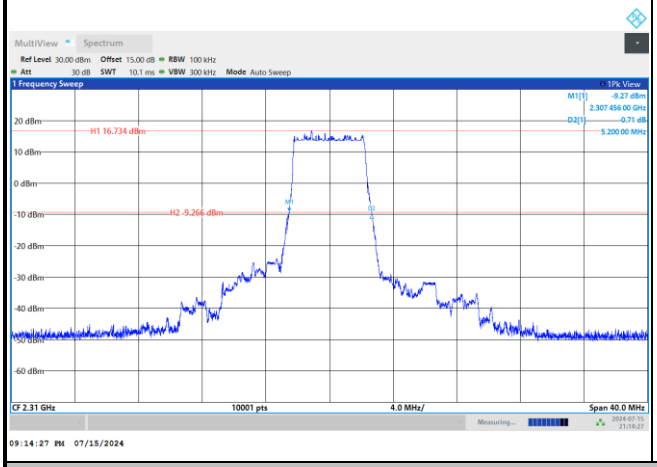
Mode	FR1 n30 / 10MHz / DFT-S OFDM				
Mod.	PI/2 BPSK	QPSK	16QAM	64QAM	Limit: 13dB
RB Size	Full RB	Full RB	Full RB	Full RB	Result
Middle CH	3.96	4.60	5.66	6.12	PASS
Mode	FR1 n30 / 10MHz / DFT-S OFDM				
Mod.	256QAM				Limit: 13dB
RB Size	Full RB				Result
Middle CH	6.62				PASS

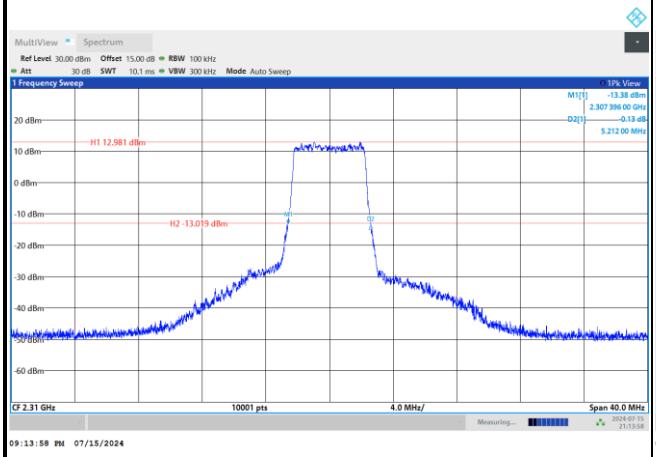
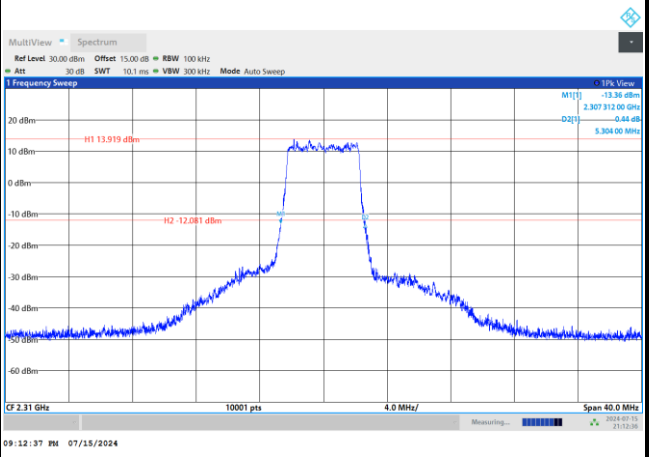
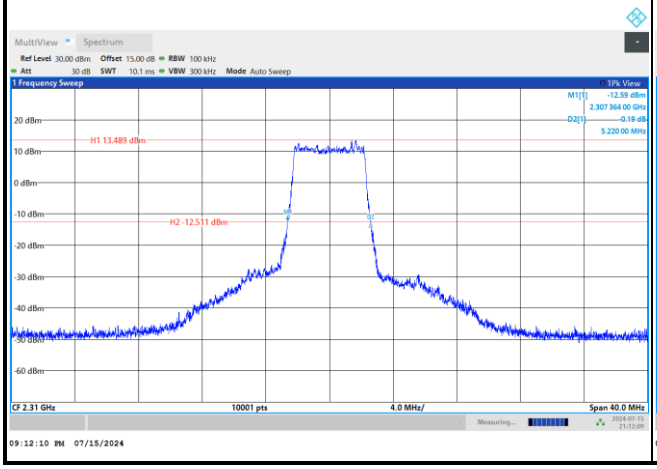
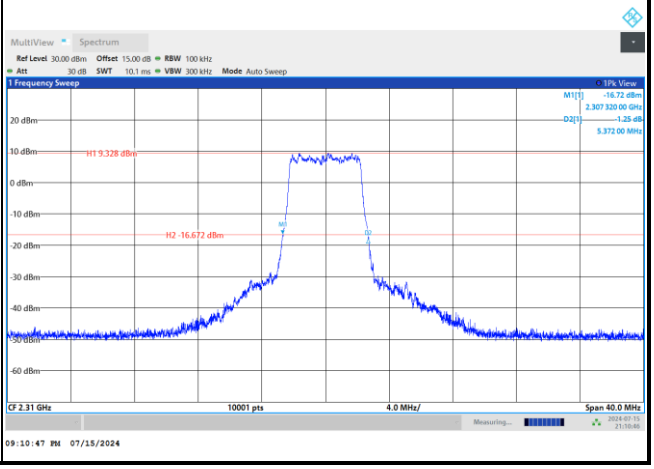
FR1 n30 / 10MHz / DFT-S OFDM / Middle Channel / Full RB	
PI/2 BPSK	QPSK
	
16QAM	64QAM
	
256QAM	
	

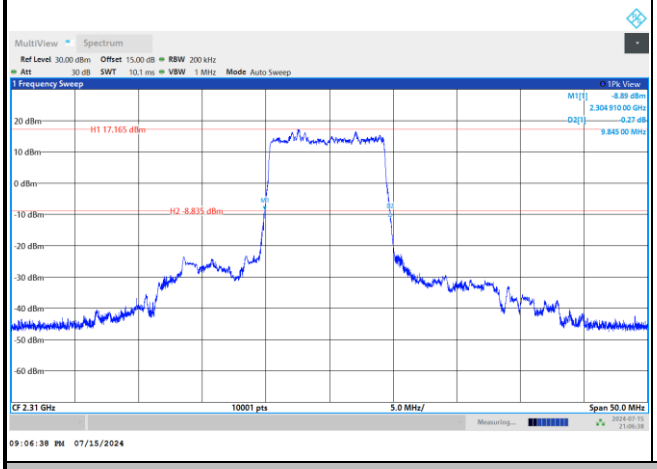
26dB Bandwidth

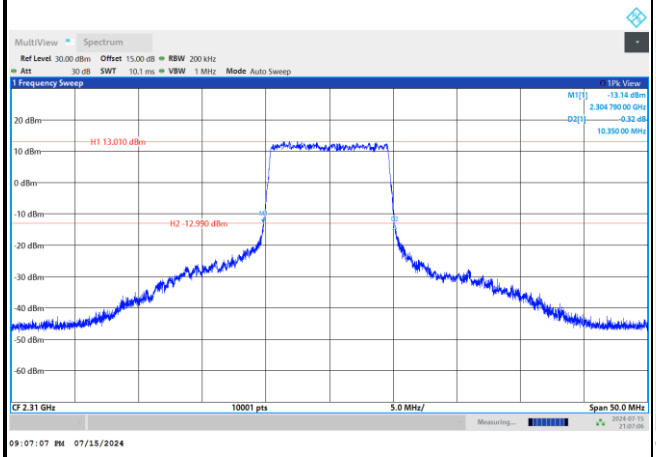
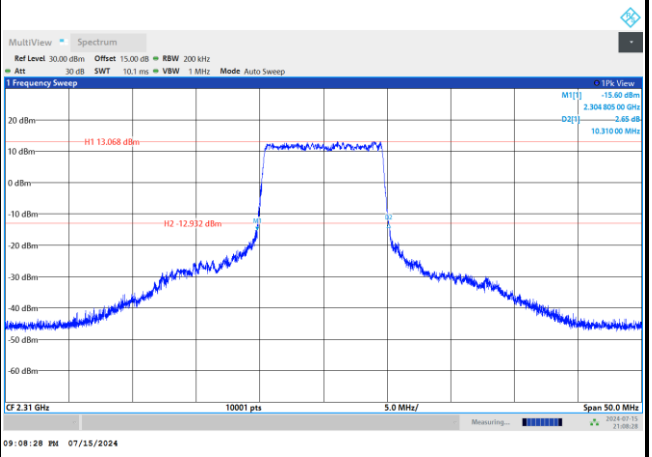
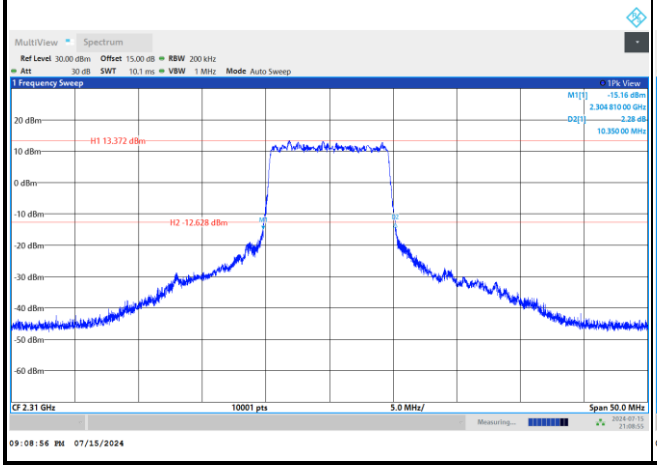
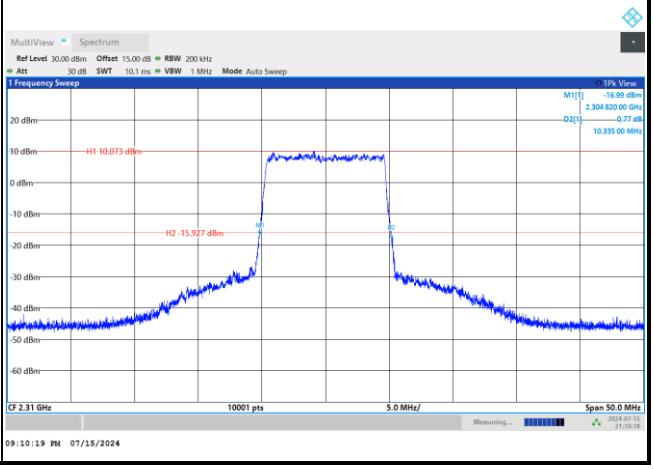
Mode	FR1 n30 : 26dB BW(MHz) / DFT-S OFDM							
BW	5MHz		10MHz					
Mod.	PI/2 BPSK		PI/2 BPSK					
Middle CH	5.20		9.84					

Mode	FR1 n30 : 26dB BW(MHz) / CP OFDM							
BW	5MHz		10MHz					
Mod.	QPSK	16QAM	QPSK	16QAM				
Middle CH	5.21	5.30	10.35	10.31				
Mod.	64QAM	256QAM	64QAM	256QAM				
Middle CH	5.22	5.37	10.35	10.33				

FR1 n30 / 5MHz / DFT-S OFDM / Middle Channel / Full RB	
PI/2 BPSK	
	

FR1 n30 / 5MHz / CP OFDM / Middle Channel / Full RB	
QPSK	16QAM
	
64QAM	256QAM
	

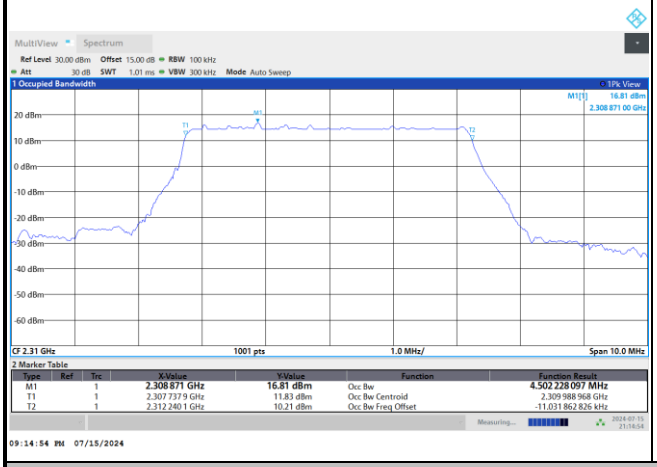
FR1 n30 / 10MHz / DFT-S OFDM / Middle Channel / Full RB	
PI/2 BPSK	
	

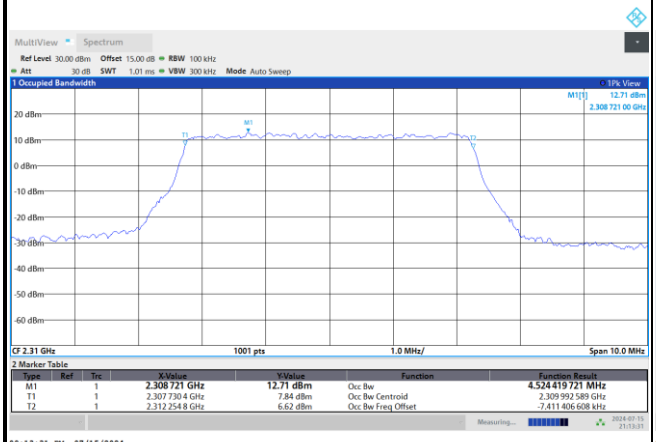
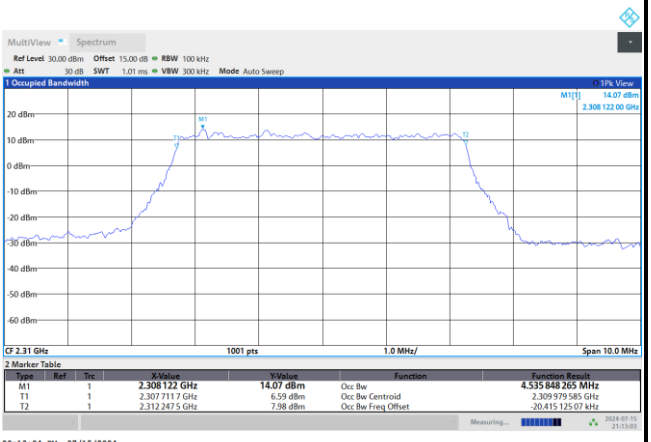
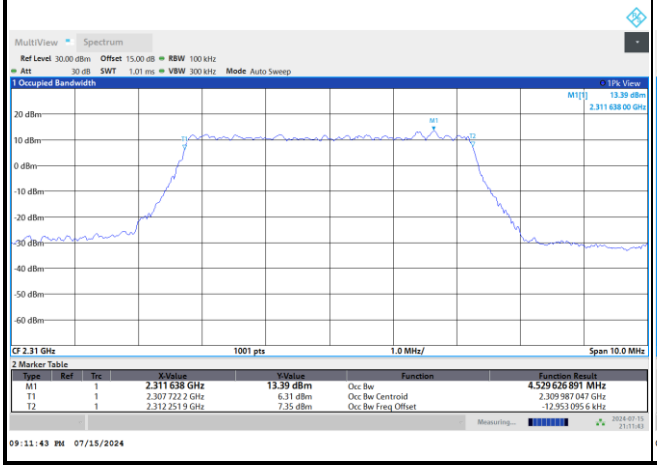
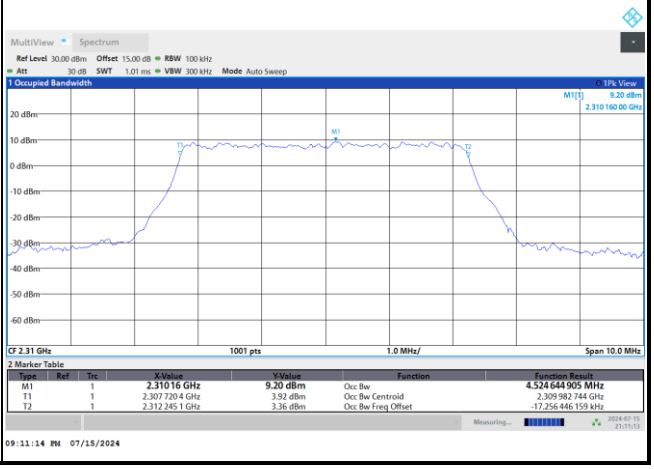
FR1 n30 / 10MHz / CP OFDM / Middle Channel / Full RB	
QPSK	16QAM
	
64QAM	256QAM
	

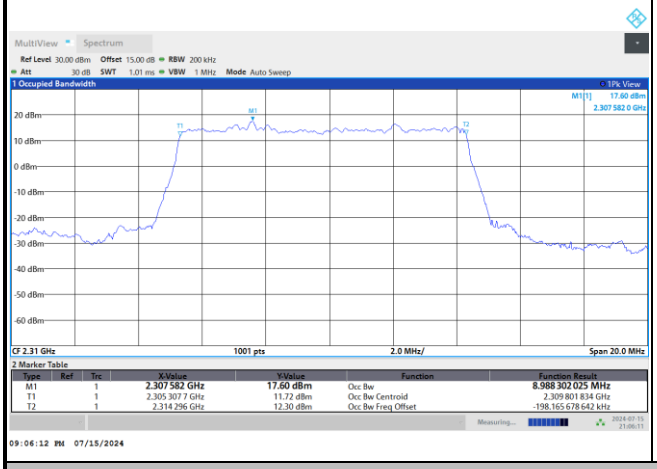
Occupied Bandwidth

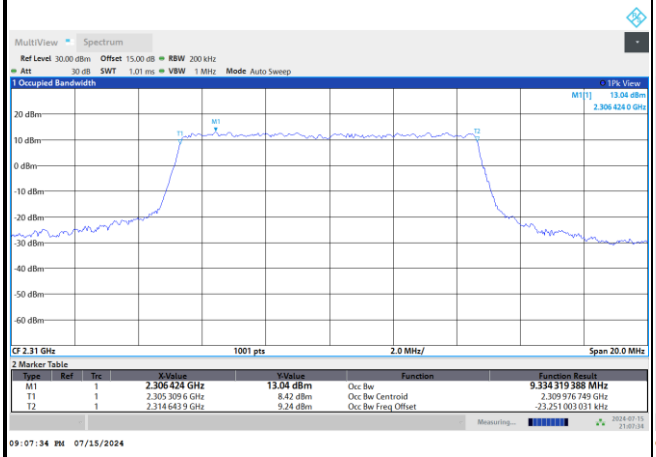
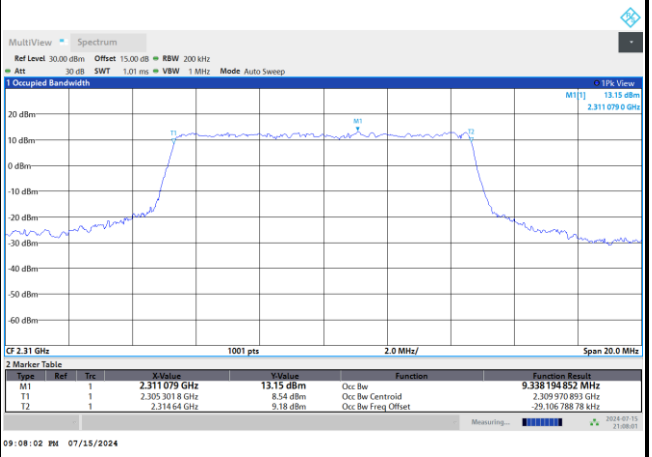
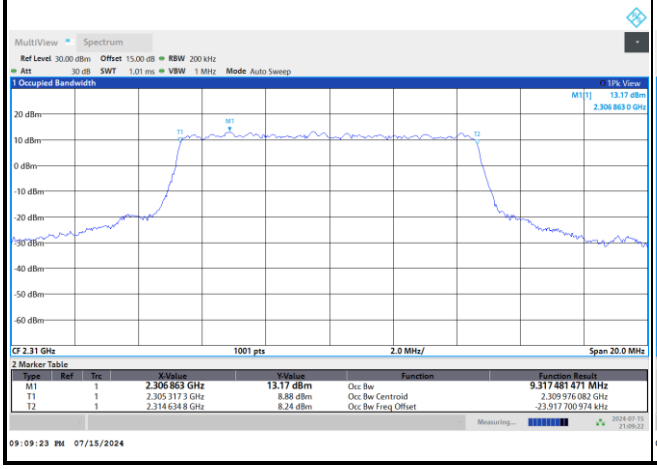
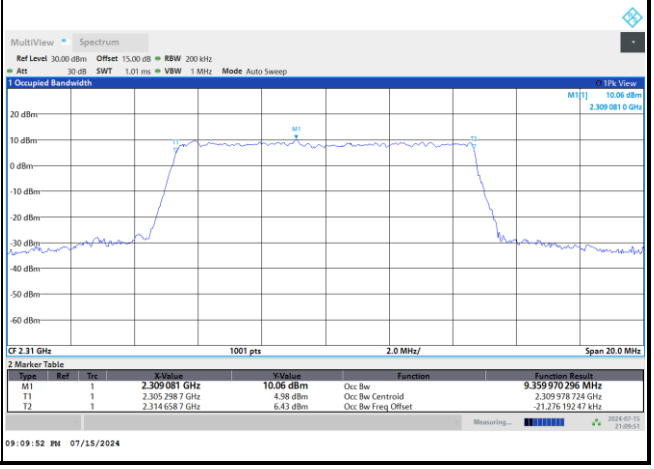
Mode	FR1 n30 : 99%OBW(MHz) / DFT-S OFDM							
BW	5MHz		10MHz					
Mod.	PI/2 BPSK		PI/2 BPSK					
Middle CH	4.50		8.98					

Mode	FR1 n30 : 99%OBW (MHz) / CP OFDM							
BW	5MHz		10MHz					
Mod.	QPSK	16QAM	QPSK	16QAM				
Middle CH	4.52	4.53	9.33	9.33				
Mod.	64QAM	256QAM	64QAM	256QAM				
Middle CH	4.52	4.52	9.31	9.35				

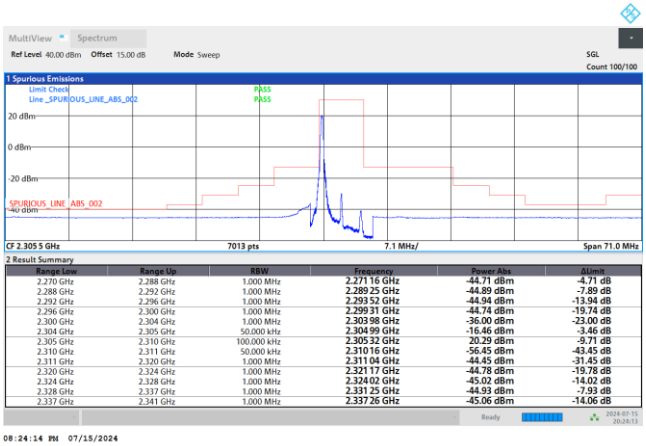
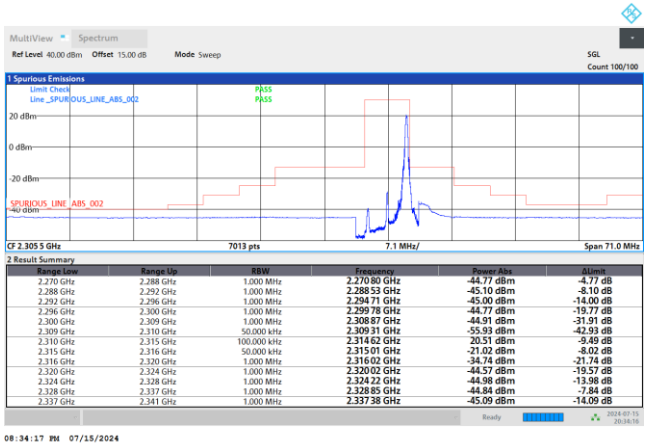
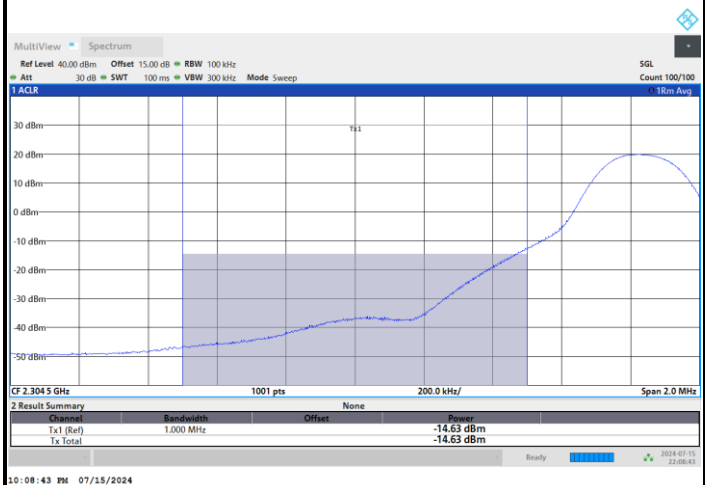
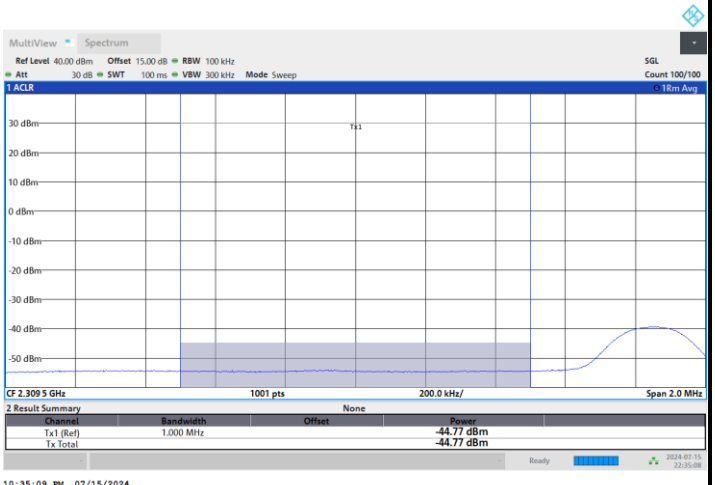
FR1 n30 / 5MHz / DFT-S OFDM / Middle Channel / Full RB	
PI/2 BPSK	
	

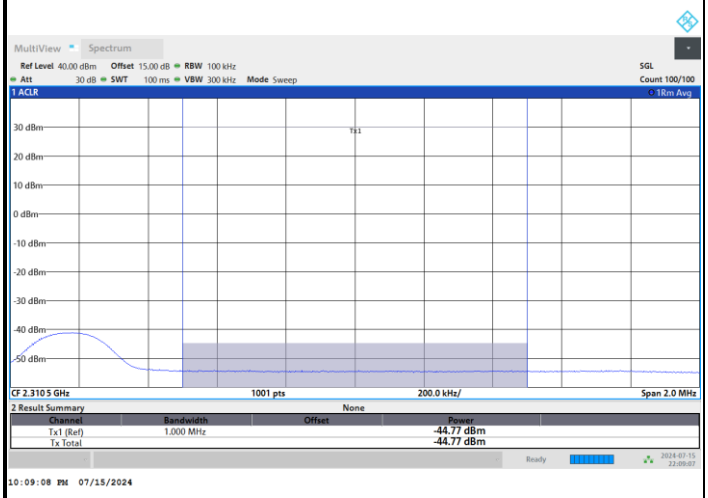
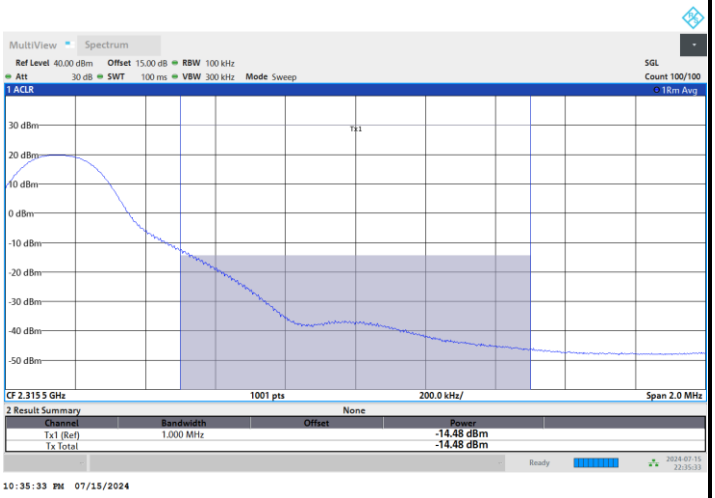
FR1 n30 / 5MHz / CP OFDM / Middle Channel / Full RB	
QPSK	16QAM
	
64QAM	256QAM
	

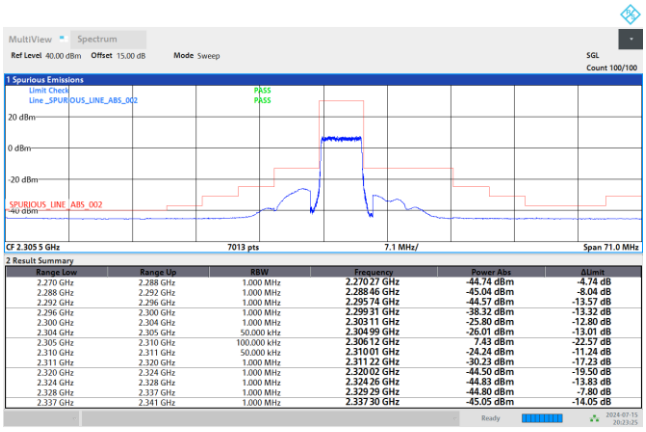
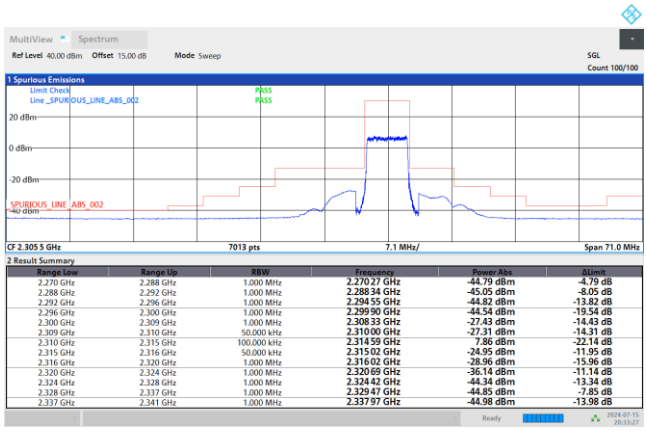
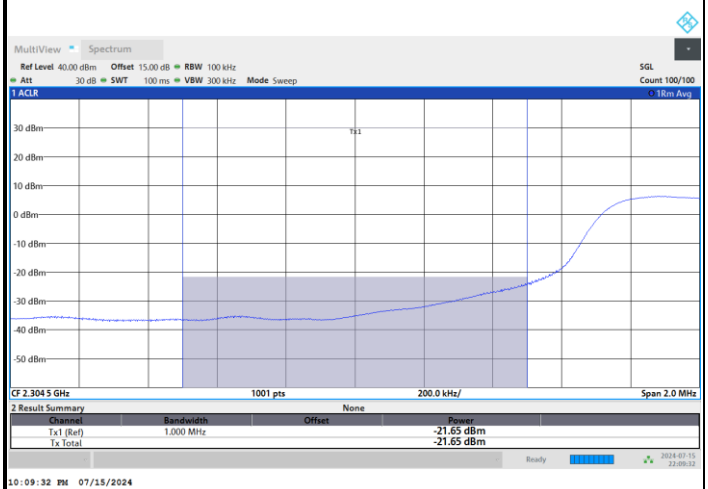
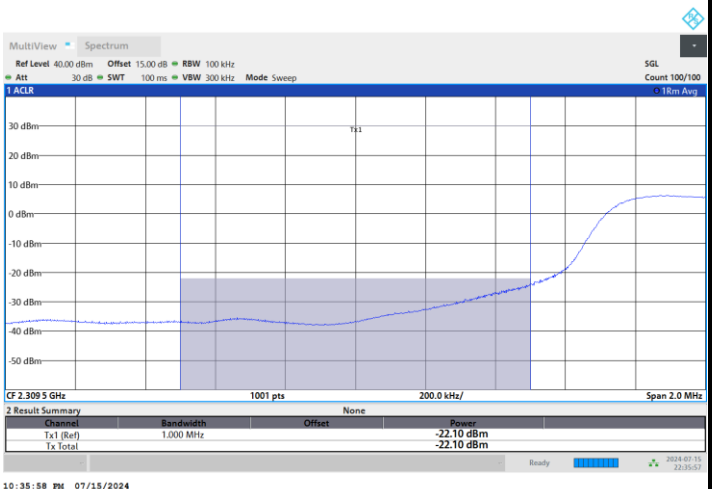
FR1 n30 / 10MHz / DFT-S OFDM / Middle Channel / Full RB	
PI/2 BPSK	
	

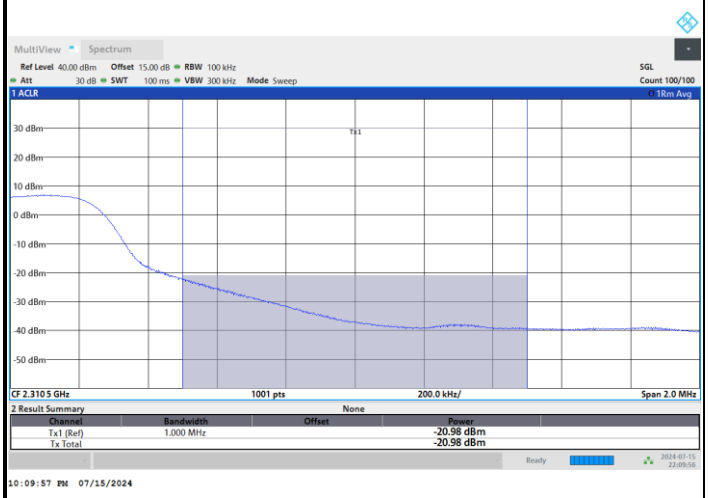
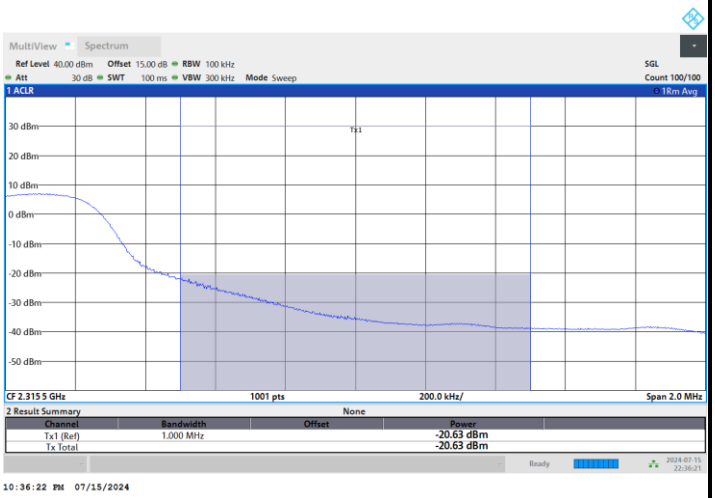
FR1 n30 / 10MHz / CP OFDM / Middle Channel / Full RB	
QPSK	16QAM
	
64QAM	256QAM
	

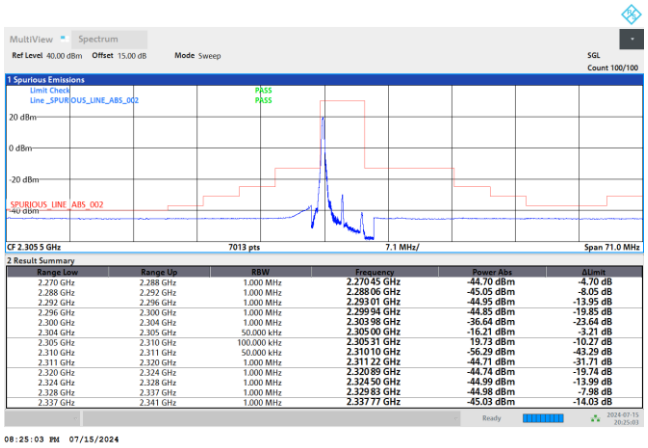
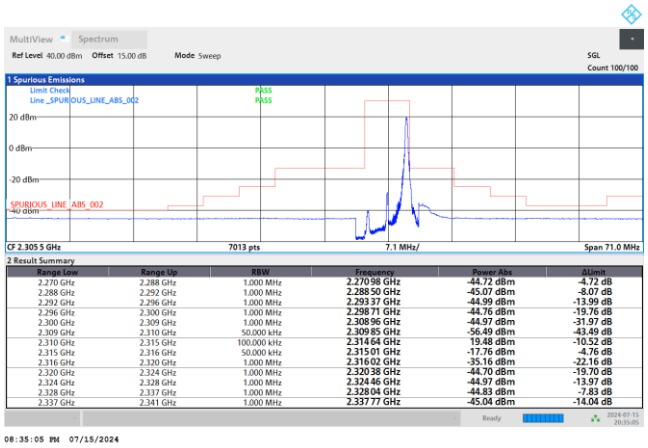
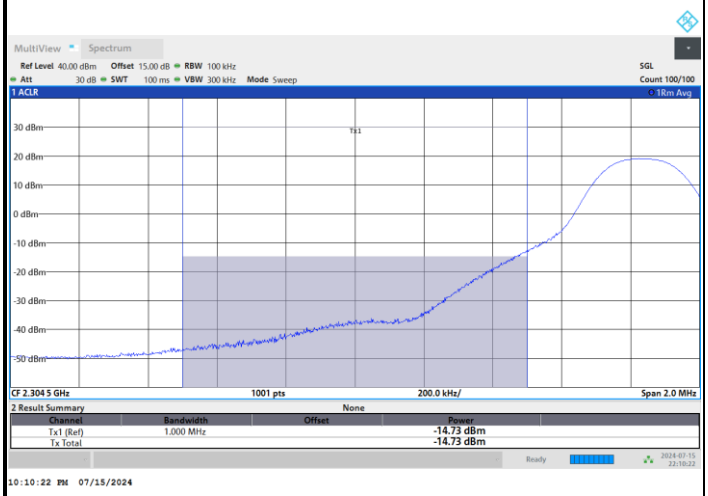
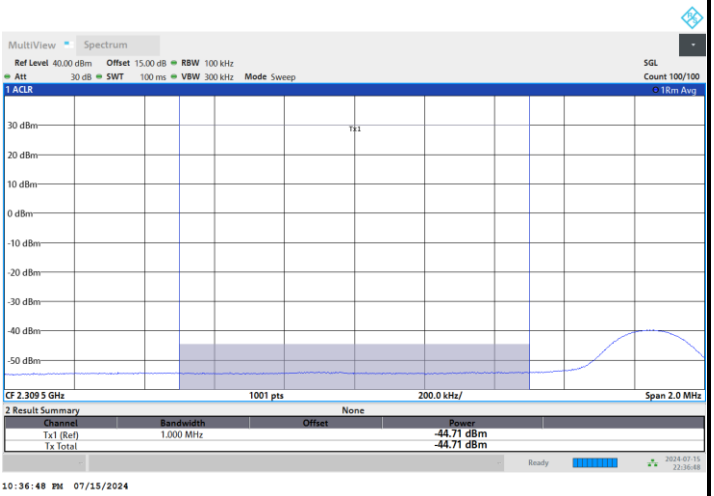
Conducted Band Edge

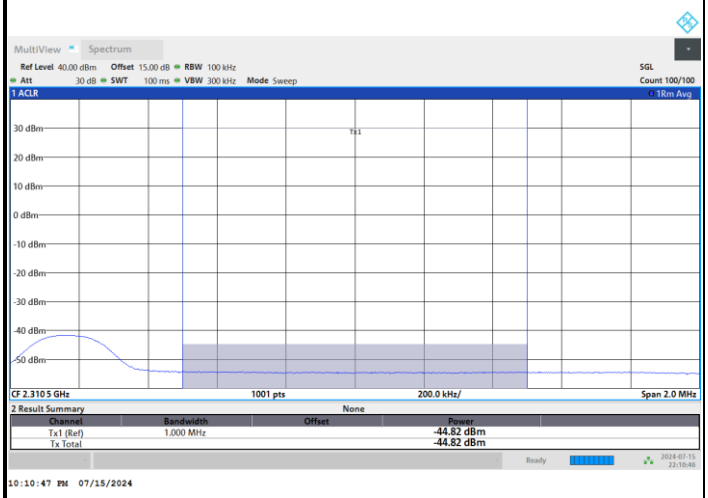
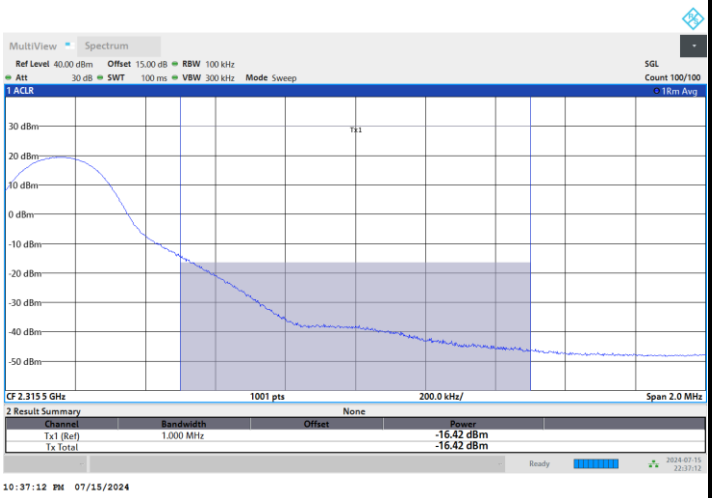
FR1 n30 / 5MHz / DFT-S OFDM / PI/2 BPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / 1 RB / Lower zoom in	**Highest Band Edge / 1 RB / Lower zoom in**
	

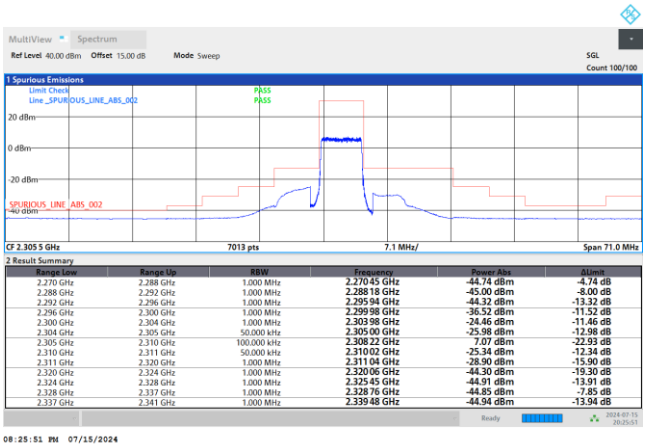
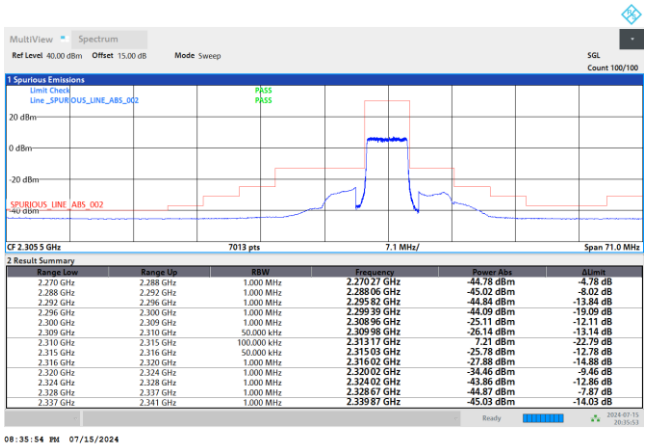
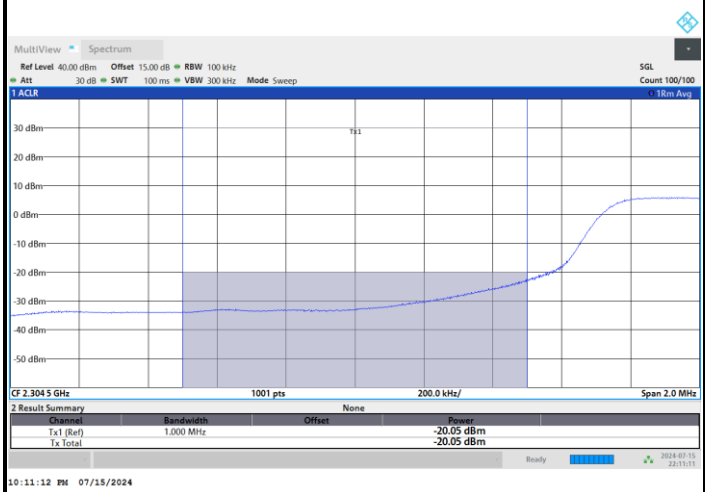
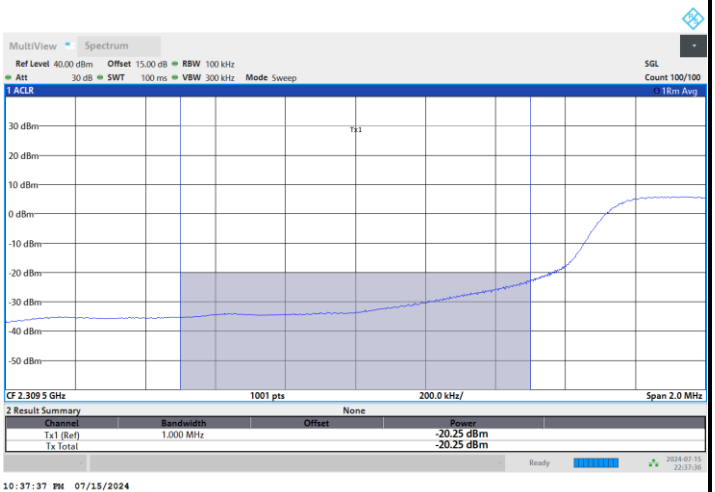
Lowest Band Edge / 1 RB / Upper zoom in	Highest Band Edge / 1 RB / Upper zoom in
	

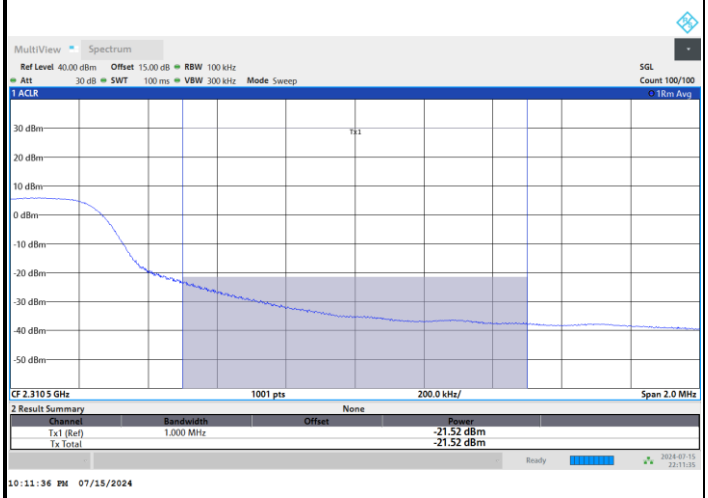
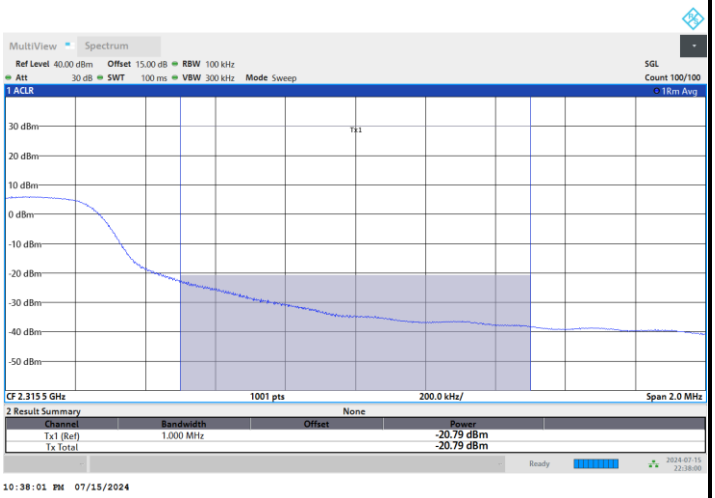
Lowest Band Edge / Full RB	Highest Band Edge / Full RB
	
Lowest Band Edge / Full RB / Lower zoom in	**Highest Band Edge / Full RB / Lower zoom in**
	

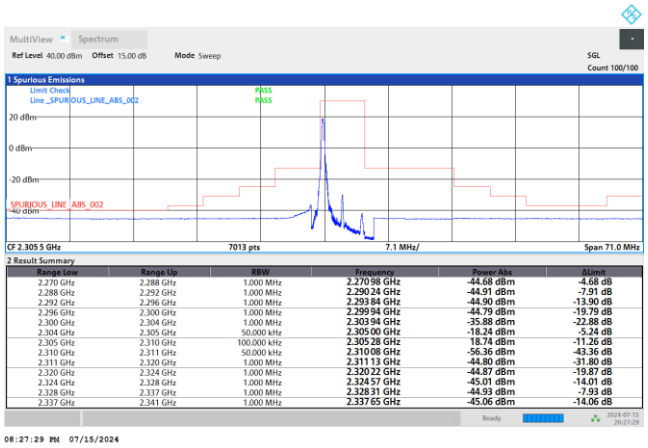
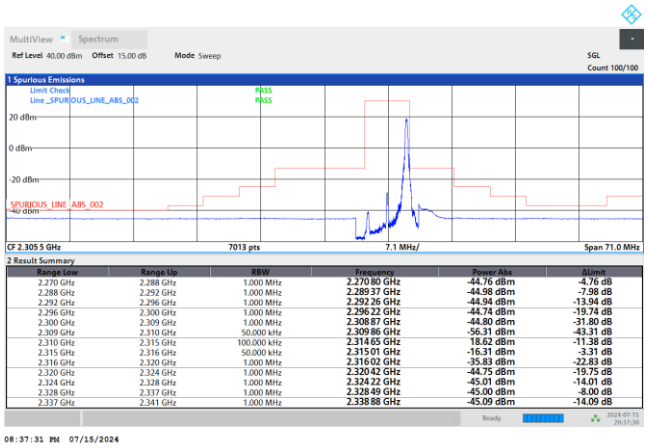
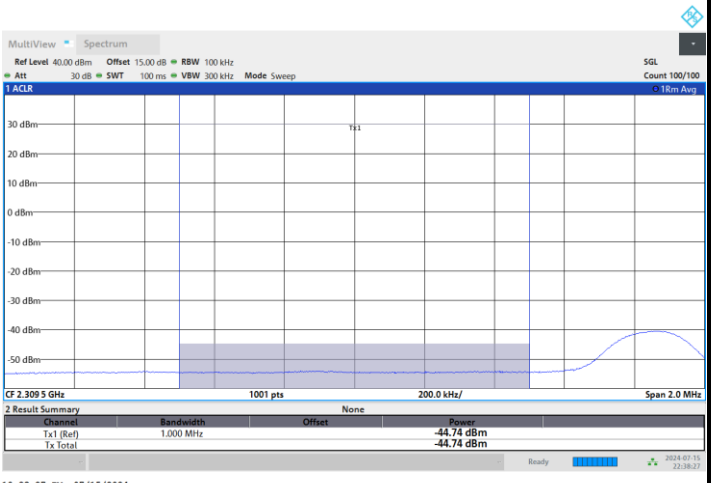
Lowest Band Edge / Full RB / Upper zoom in	Highest Band Edge / Full RB / Upper zoom in
	

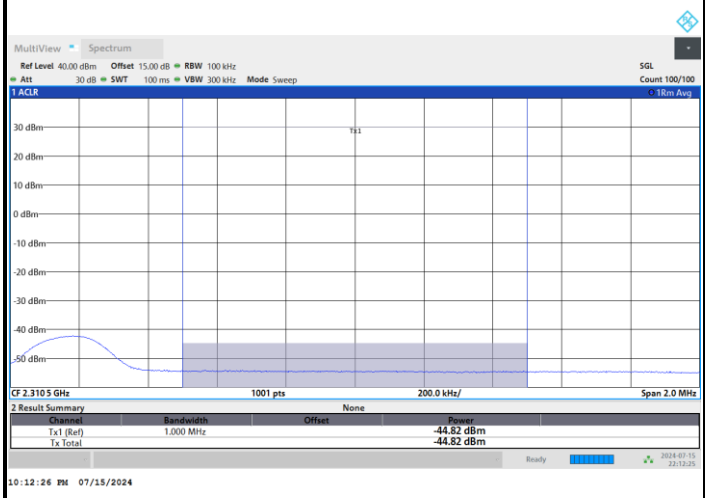
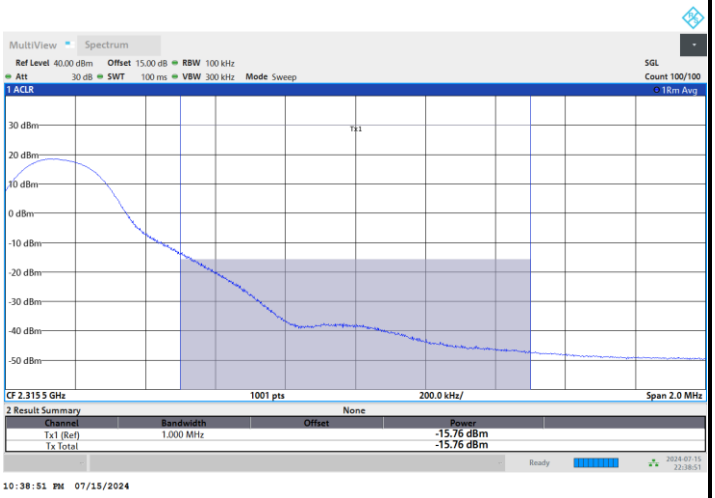
FR1 n30 / 5MHz / DFT-S OFDM / QPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / 1 RB / Lower zoom in	**Highest Band Edge / 1 RB / Lower zoom in**
	

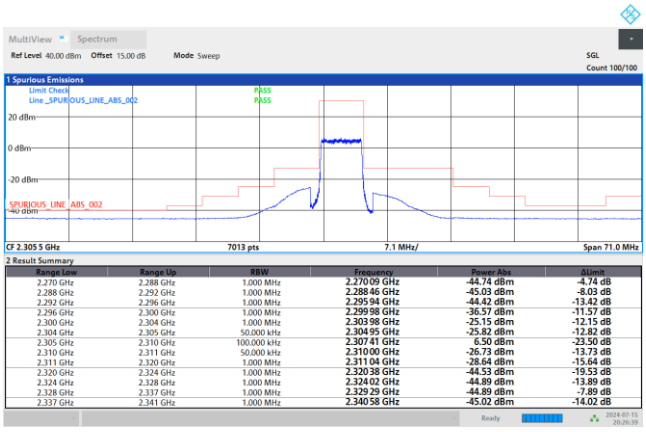
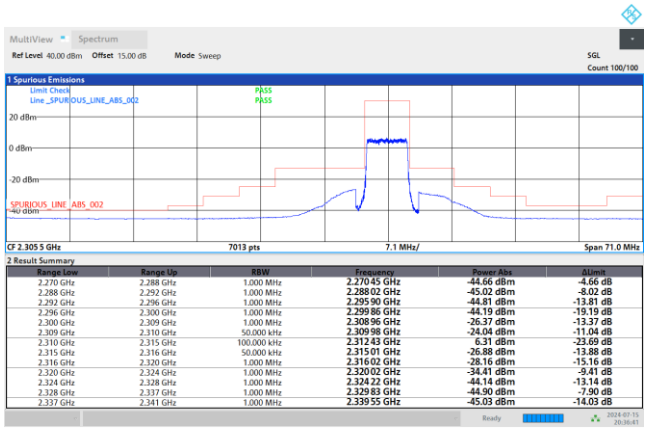
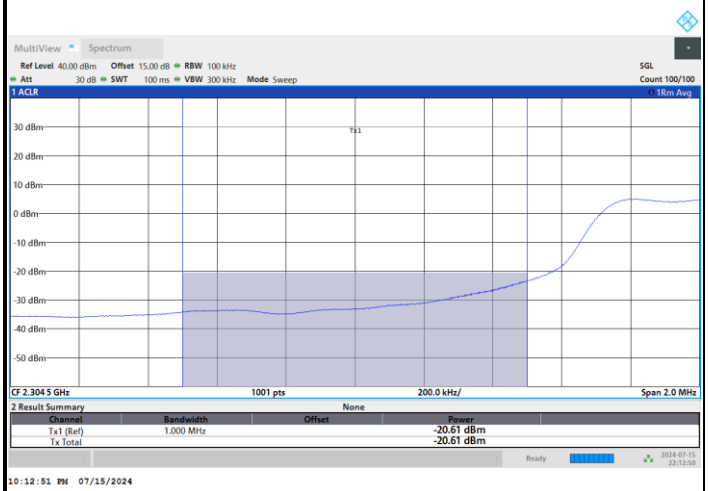
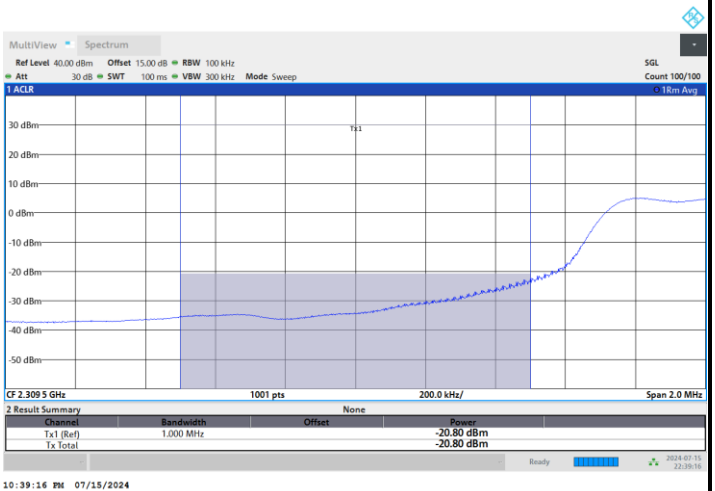
Lowest Band Edge / 1 RB / Upper zoom in	Highest Band Edge / 1 RB / Upper zoom in
	

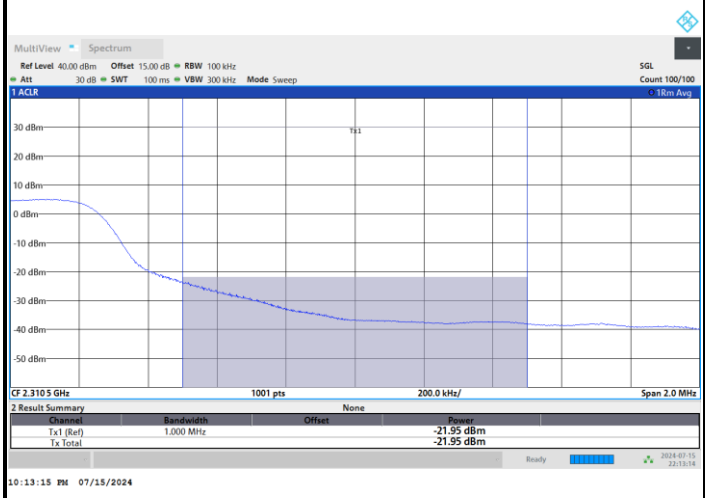
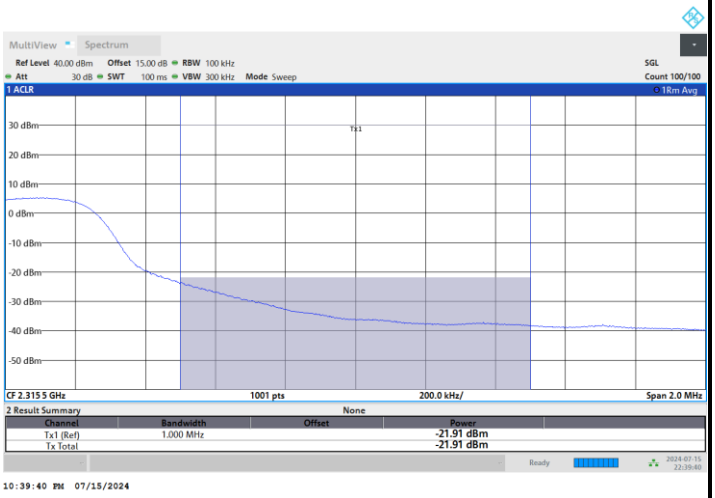
Lowest Band Edge / Full RB	Highest Band Edge / Full RB
	
Lowest Band Edge / Full RB / Lower zoom in	**Highest Band Edge / Full RB / Lower zoom in**
	

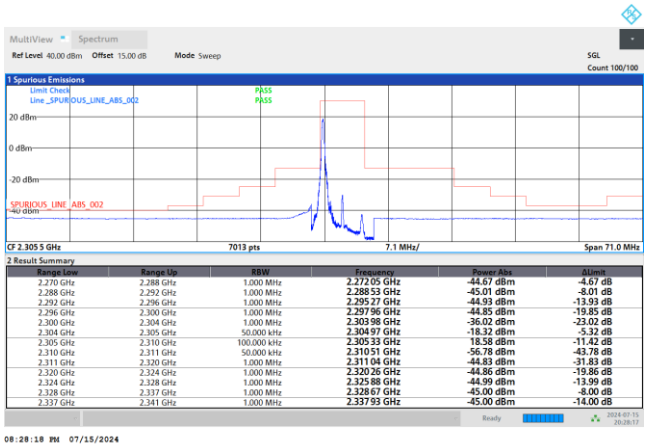
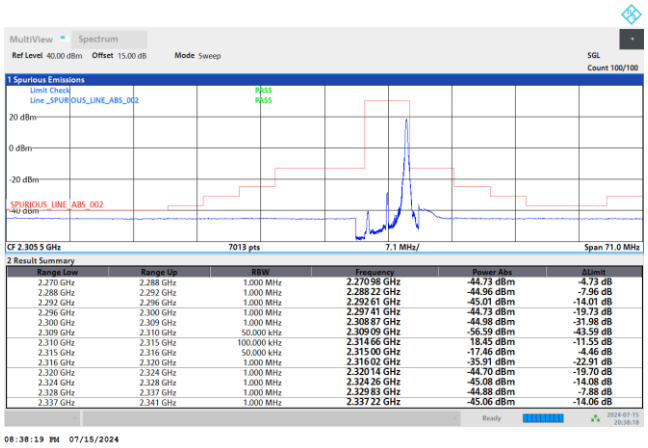
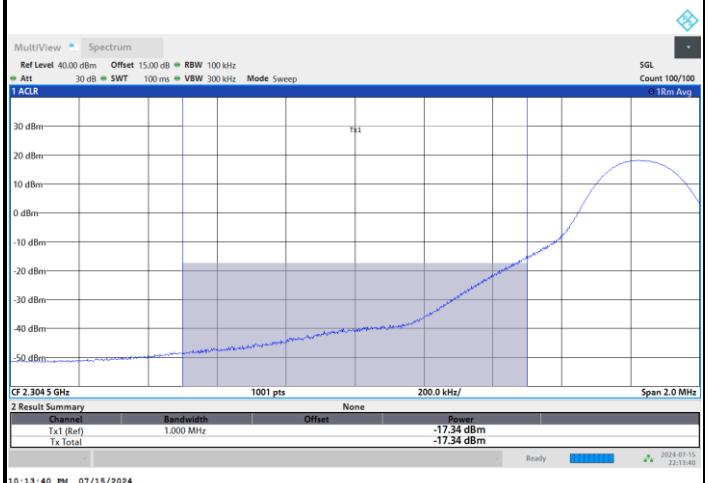
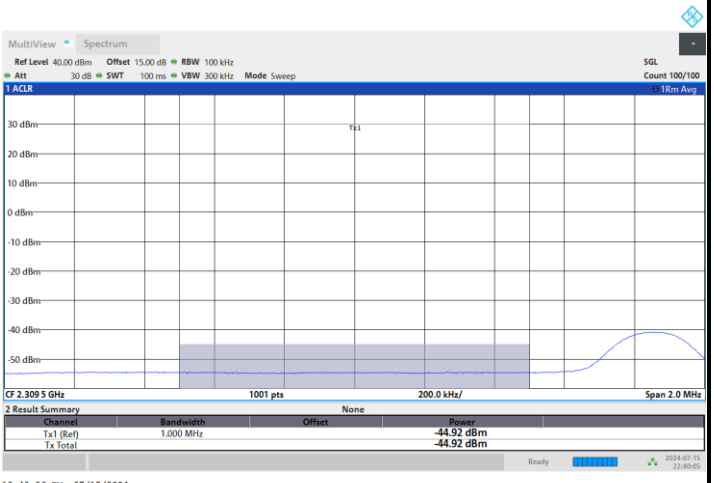
Lowest Band Edge / Full RB / Upper zoom in	Highest Band Edge / Full RB / Upper zoom in
	

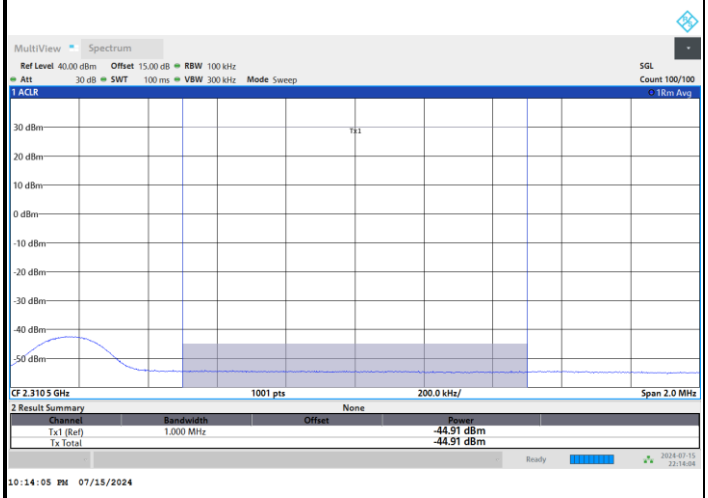
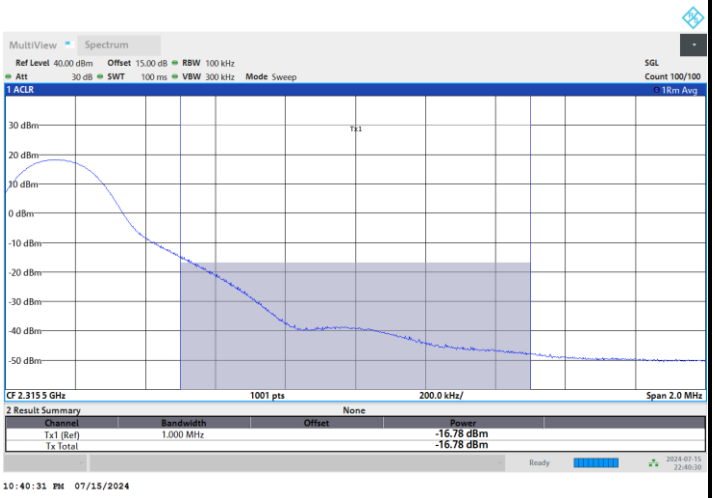
FR1 n30 / 5MHz / DFT-S OFDM / 16QAM	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / 1 RB / Lower zoom in	**Highest Band Edge / 1 RB / Lower zoom in**
	

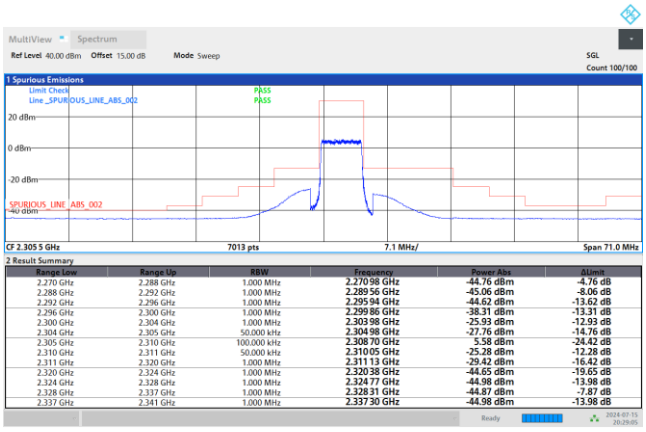
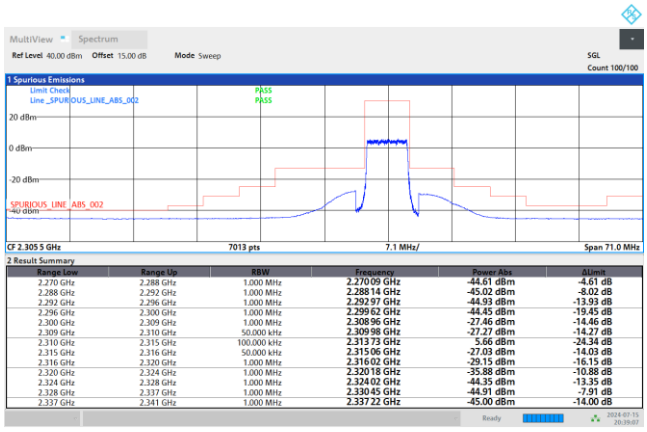
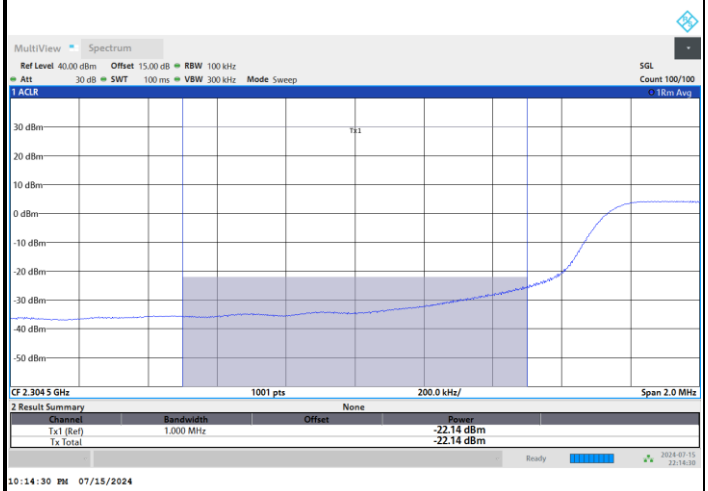
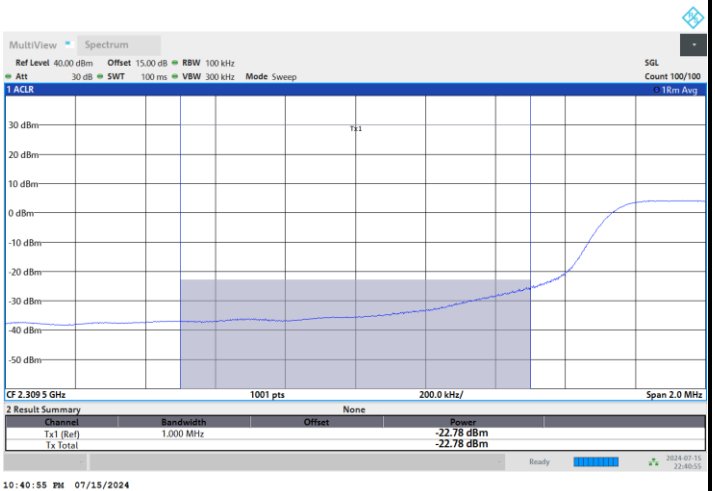
Lowest Band Edge / 1 RB / Upper zoom in	Highest Band Edge / 1 RB / Upper zoom in
	

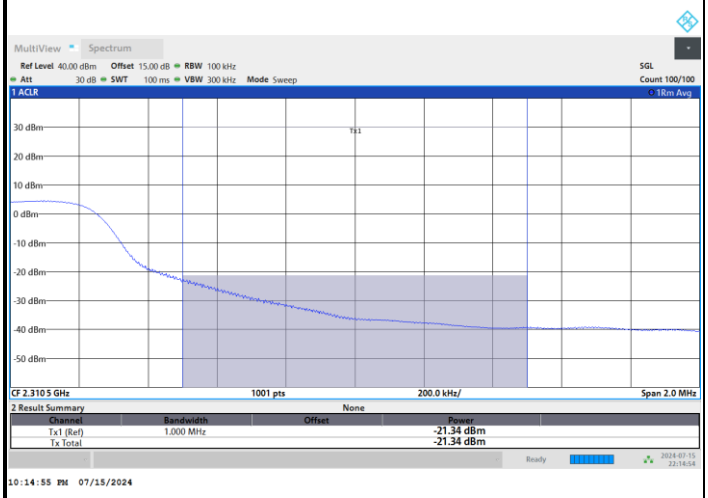
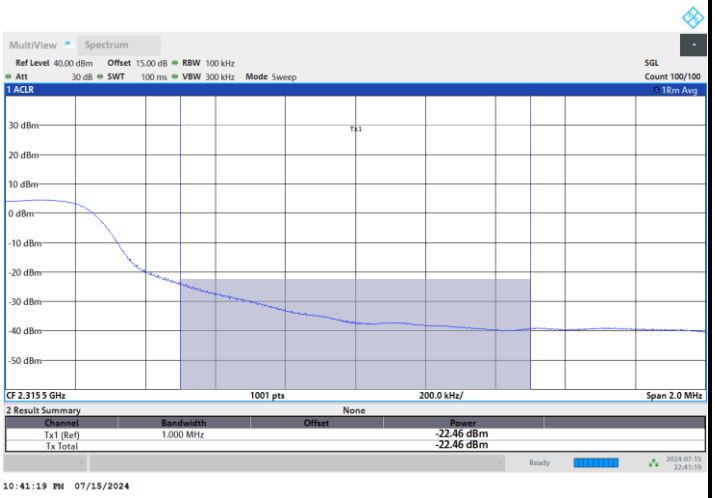
Lowest Band Edge / Full RB	Highest Band Edge / Full RB
	
Lowest Band Edge / Full RB / Lower zoom in	**Highest Band Edge / Full RB / Lower zoom in**
	

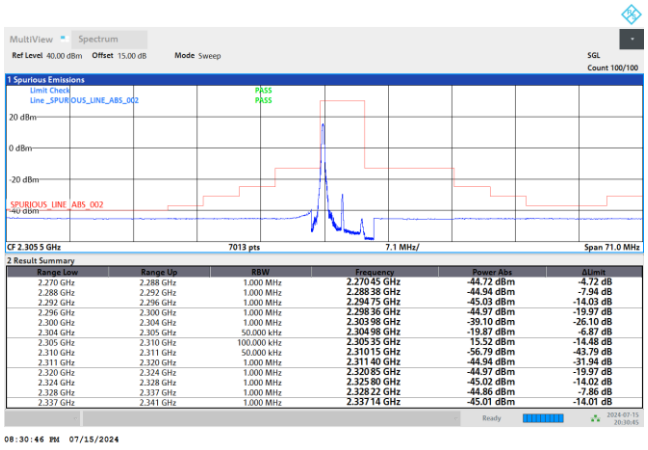
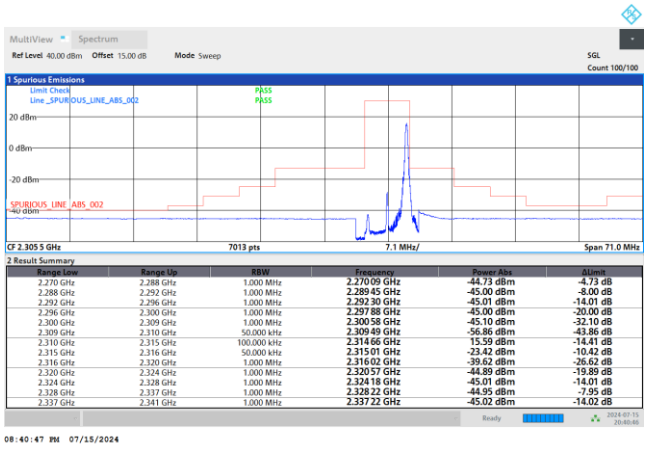
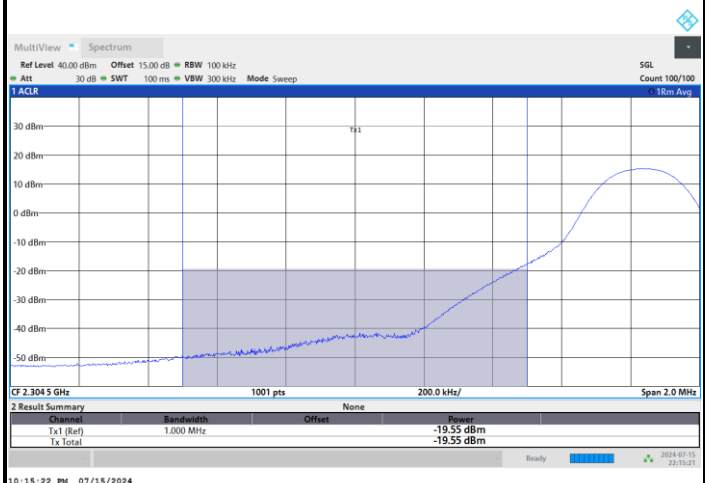
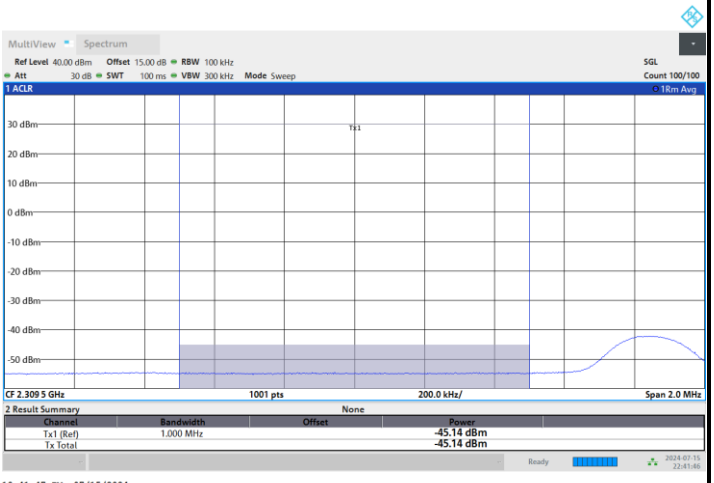
Lowest Band Edge / Full RB / Upper zoom in	Highest Band Edge / Full RB / Upper zoom in
	

FR1 n30 / 5MHz / DFT-S OFDM / 64QAM	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / 1 RB / Lower zoom in	**Highest Band Edge / 1 RB / Lower zoom in**
	

Lowest Band Edge / 1 RB / Upper zoom in	Highest Band Edge / 1 RB / Upper zoom in
	

Lowest Band Edge / Full RB	Highest Band Edge / Full RB
	
Lowest Band Edge / Full RB / Lower zoom in	**Highest Band Edge / Full RB / Lower zoom in**
	

Lowest Band Edge / Full RB / Upper zoom in	Highest Band Edge / Full RB / Upper zoom in
	

FR1 n30 / 5MHz / DFT-S OFDM / 256QAM	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / 1 RB / Lower zoom in	**Highest Band Edge / 1 RB / Lower zoom in**
	

Lowest Band Edge / 1 RB / Upper zoom in	Highest Band Edge / 1 RB / Upper zoom in