FCC RF Test Report

APPLICANT	:	Quectel Wireless Solutions Co., Ltd.
EQUIPMENT	:	5G Sub-6 GHz LGA Module
BRAND NAME	:	Quectel
MODEL NAME	:	RG500L-NA
FCC ID	:	XMR2023RG500LNA
STANDARD	:	47 CFR Part 2, 27 Subpart O (3700-3980MHz)
CLASSIFICATION	:	PCS Licensed Transmitter (PCB)
TEST DATE(S)	:	Feb. 08, 2023 ~ Apr 08, 2023

We, Sporton International Inc. (KunShan), would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

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

Jason Jia

Approved by: Jason Jia

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
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People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG2D0201M	Rev. 01	Initial issue of report	Jun. 02, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§27.50(j)(3)	Equivalent Isotropic Radiated Power (5G NR n77, n78)	EIRP < 1Watt		
3.5	§27.50(j)(4)	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §27.53(l)(2)	Conducted Band Edge Measurement (5G NR n77, n78)	< 43+10log10(P[Watts])	PASS	-
3.8	§2.1051 §27.53(l)(2)	Conducted Spurious Emission (5G NR n77, n78)	< 43+10log10(P[Watts])	PASS	-
3.9	§27.54	Frequency Stability Temperature & Voltage	Within Authorized Band	PASS	-
4.4	§2.1053 §27.53(l)(2)	Radiated Spurious Emission (5G NR n77, n78)	< $43+10\log_{10}$(P[Watts])	PASS	Under limit 45.65 dB at 15540.00 MHz

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.2 Manufacturer

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	5G Sub-6 GHz LGA Module
Brand Name	Quectel
Model Name	RG500L-NA
FCC ID	XMR2023RG500LNA
IMEI Code	Conducted : 860815050004316 Radiation : 860815050004233
HW Version	R1.0
SW Version	RG500LNAAAR04A02E32_OCPU
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency	5G NR n77: 3700 MHz ~ 3980 MHz 5G NR n78: 3700 MHz ~ 3800 MHz
SCS	30kHz
Bandwidth	n77: 10 / 15 / 20 / 40 / 50 / 60 / 80 / 90 / 100MHz n78: 10 / 15 / 20 / 25 / 30 / 40 / 50 / 60 / 80 / 90 / 100MHz
Antenna Gain	<Ant.0 / Ant.6> 5G NR n77: -3.48 dBi 5G NR n78: -4.11 dBi
Type of Modulation	CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM

Remark:

1. 5G NR n77/n78 support UL MIMO mode for Antenna port (0+6).
2. 5G NR n77/n78 SISO mode only support Antenna port 0, not support Antenna port 6.
3. 5G NR n77/n78 UL_MIMO mode only supports CP-OFDM Modulation, the MIMO mode is completely uncorrelated, so the directional gain is selected the maximum gain among all antennas.
4. For MIMO mode, the conducted Bandedge/Spurious are tested at single antenna port and add 10*log(N_{ANT}) according to KDB 662911 D01, only the worst MIMO Ant.0 is shown in the report.
5. 5G NR n77/n78 support SA and NSA mode. The whole testing has assessed SA mode for n77/n78 by referring to the higher conducted power for conducted test items.
6. The device supports HPUE mode for 5G NR n77/n78.
7. All the supported EN-DC combinations are verified conducted power, only the EN-DC combination with highest power are shown in the report.
8. The EN-DC mode combination could be referred to the product spec.

1.5 Modification of EUT

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

1.6 Maximum EIRP and Emission Designator

5G NR n77		PI/2 BPSK / QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
10	3705.00 ~ 3975.00	0.3999	8M75G7D	0.2113	8M73W7D
15	3705.52 ~ 3972.48	0.4055	13M6G7D	0.2094	13M6W7D
20	3710.01 ~ 3969.99	0.3873	18M7G7D	0.2084	18M8W7D
40	3720.00 ~ 3960.00	0.3548	38M1G7D	0.2118	38M2W7D
50	3725.01 ~ 3954.99	0.3846	47M8G7D	0.2133	47M8W7D
60	3730.02 ~ 3949.98	0.3639	58M3G7D	0.2113	59M0W7D
80	3740.01 ~ 3939.99	0.3589	78M0G7D	0.2123	78M2W7D
90	3745.02 ~ 3934.98	0.3412	87M8G7D	0.2080	87M9W7D
100	3750.00 ~ 3930.00	0.4083	97M7G7D	0.2600	97M5W7D

5G NR n77 UL MIMO		QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
10	3705.00 ~ 3975.00	0.3311	8M58G7D	0.2588	8M58W7D
15	3705.52 ~ 3972.48	0.3126	13M6G7D	0.2576	13M6W7D
20	3710.01 ~ 3969.99	0.3097	18M2G7D	0.2588	18M3W7D
40	3720.00 ~ 3960.00	0.2917	37M8G7D	0.2612	37M9W7D
50	3725.01 ~ 3954.99	0.3055	47M4G7D	0.2612	47M6W7D
60	3730.02 ~ 3949.98	0.2891	57M7G7D	0.2600	58M0W7D
80	3740.01 ~ 3939.99	0.2812	77M5G7D	0.2588	77M5W7D
90	3745.02 ~ 3934.98	0.2636	87M4G7D	0.2588	87M6W7D
100	3750.00 ~ 3930.00	0.3524	97M2G7D	0.2661	97M4W7D

5G NR n78		PI/2 BPSK / QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
10	3705.00 ~ 3795.00	0.4083	8M57G7D	0.2118	8M59W7D
15	3707.52 ~ 3792.48	0.4111	13M6G7D	0.2109	13M6W7D
20	3710.01 ~ 3789.99	0.3954	18M2G7D	0.2094	18M2W7D
25	3712.50 ~ 3787.50	0.3767	23M2G7D	0.2061	23M2W7D
30	3715.02 ~ 3784.98	0.3724	27M9G7D	0.2094	27M8W7D
40	3720.00 ~ 3780.00	0.3614	37M7G7D	0.2061	37M9W7D
50	3725.01 ~ 3774.99	0.3819	47M4G7D	0.2080	47M5W7D
60	3730.02 ~ 3769.98	0.3690	57M7G7D	0.2080	57M8W7D
80	3740.01 ~ 3759.99	0.3622	77M3G7D	0.2118	77M5W7D
90	3745.02 ~ 3754.98	0.3443	87M3G7D	0.2128	87M4W7D
100	3750.00	0.4150	97M2G7D	0.2606	97M5W7D

5G NR n78 UL MIMO		QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
10	3705.00 ~ 3795.00	0.3412	8M61G7D	0.2506	8M73W7D
15	3707.52 ~ 3792.48	0.3365	13M7G7D	0.2495	13M7W7D
20	3710.01 ~ 3789.99	0.3428	18M2G7D	0.2477	18M2W7D
25	3712.50 ~ 3787.50	0.3041	23M1G7D	0.2489	23M2W7D
30	3715.02 ~ 3784.98	0.2985	27M8G7D	0.2506	27M8W7D
40	3720.00 ~ 3780.00	0.3083	38M0G7D	0.2489	38M0W7D
50	3725.01 ~ 3774.99	0.3199	47M5G7D	0.2477	47M9W7D
60	3730.02 ~ 3769.98	0.2924	57M9G7D	0.2512	58M0W7D
80	3740.01 ~ 3759.99	0.2831	76M9G7D	0.2529	78M2W7D
90	3745.02 ~ 3754.98	0.2858	87M4G7D	0.2523	87M2W7D
100	3750.00	0.3556	97M7G7D	0.2553	97M7W7D

Note: All modulations have been tested, and only the worst test results of PSK & QAM are shown in the report.

1.7 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-KS TH01-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24al

1.9 Applicable Standards

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

- 47 CFR Part 2, 27
- ANSI C63.26-2015
- FCC KDB 971168 D01 Power Meas License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

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

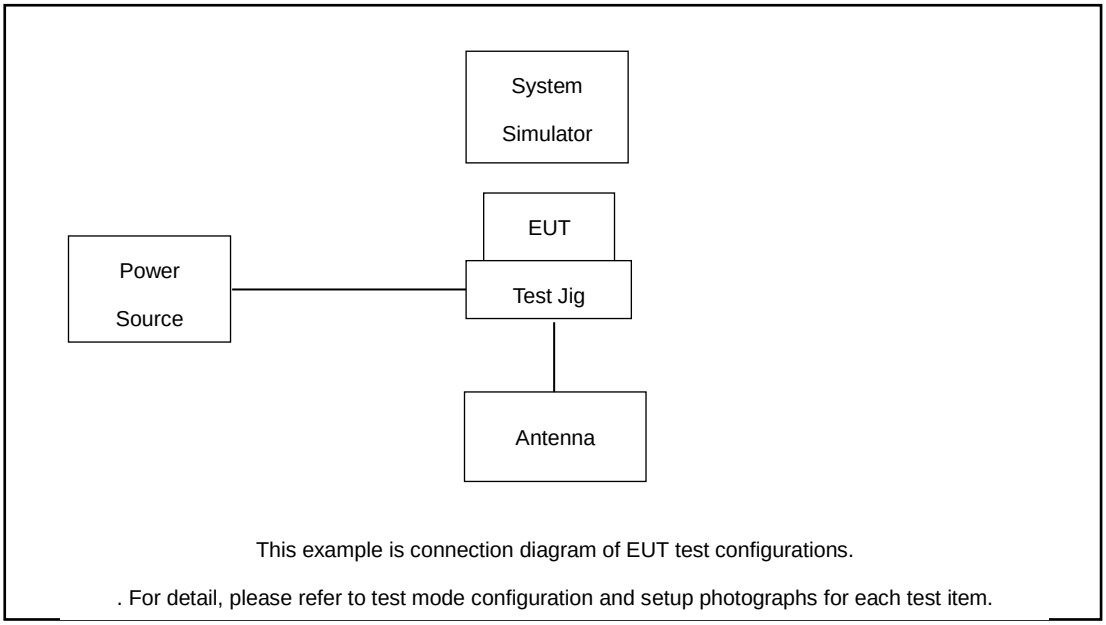
For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

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.

	X Plane	Y Plane	Z Plane
Orthogonal Planes of EUT			

Test Items	5G NR	Bandwidth (MHz)										Modulation					RB #			Test Channel		
		10	15	20	25	30	40	50	60	80/90	100	PI/2 BPSK	QPSK	16 QAM	64 QAM	256 QAM	1	Partial	Full	L	M	H
Max. Output Power	n77	v	v	v	-	-	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	n78	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	n77				-	-					v	v	v				v				v	
	n78										v	v	v				v				v	
26dB and 99% Bandwidth	n77	v	v	v	-	-	v	v	v	v	v		v	v	v	v			v		v	
	n78	v	v	v	v	v	v	v	v	v	v		v	v	v	v			v		v	
Conducted Band Edge	n77	v			-	-		v			v	v	v				v		v	v		v
	n78	v						v			v	v	v				v		v	v		v
Conducted Spurious Emission	n77	v			-	-		v			v	v	v				v			v	v	v
	n78	v						v			v	v	v				v			v	v	v
Frequency Stability	n77			v	-	-							v						v		v	
	n78			v									v						v		v	
E.I.R.P	n77	v	v	v	-	-	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
	n78	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Radiated Spurious Emission	n77	Worst Case																		v	v	v
	n78	Worst Case																			v	
Note	1. The mark "**v** " means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. 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. 4. Frequency Stability : Normal Voltage = 3.8V; Low Voltage =3.3V; High Voltage =4.3V.																					

2.2 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Power Supply	GWINSTEK	PSS-2002	N/A	N/A	Unshielded, 1.8 m
2.	Base Station	Anritsu	MT8820/8821	N/A	N/A	Unshielded, 1.8 m
3.	Adapter	N/A	N/A	N/A	N/A	N/A
4.	Test Jig	N/A	N/A	N/A	N/A	N/A
5.	Antenna	N/A	N/A	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.

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 3.49 dB and 10dB attenuator.

Example :

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

= 3.49 + 10 = 13.49 (dB)

2.5 Frequency List of Low/Middle/High Channels

5G n77 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
100	Channel	650000	656000	662000
	Frequency	3750	3840	3930
90	Channel	649668	656000	662332
	Frequency	3745.02	3840	3934.98
80	Channel	649334	656000	662666
	Frequency	3740.01	3840	3939.99
60	Channel	648668	656000	663332
	Frequency	3730.02	3840	3949.98
50	Channel	648334	656000	663666
	Frequency	3725.01	3840	3954.99
40	Channel	648000	656000	664000
	Frequency	3720	3840	3960
20	Channel	647334	656000	664666
	Frequency	3710.01	3840	3969.99
15	Channel	647168	656000	664832
	Frequency	3707.52	3840	3972.48
10	Channel	647000	656000	665000
	Frequency	3705	3840	3975

5G n78 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
100	Channel		650000	
	Frequency		3750	
90	Channel	649668	650000	650334
	Frequency	3745.02	3750	3755.01
80	Channel	649334	650000	650668
	Frequency	3740.01	3750	3760.02
60	Channel	648668	650000	651334
	Frequency	3730.02	3750	3770.01
50	Channel	648334	650000	651668
	Frequency	3725.01	3750	3775.02
40	Channel	648000	650000	652000
	Frequency	3720	3750	3780
30	Channel	647668	650000	652334
	Frequency	3715.02	3750	3785.01
25	Channel	647500	650000	652500
	Frequency	3712.50	3750	3787.50
20	Channel	647334	650000	652668
	Frequency	3710.01	3750	3790.02
15	Channel	647168	650000	652834
	Frequency	3707.52	3750	3792.51
10	Channel	647000	650000	653000
	Frequency	3705	3750	3795

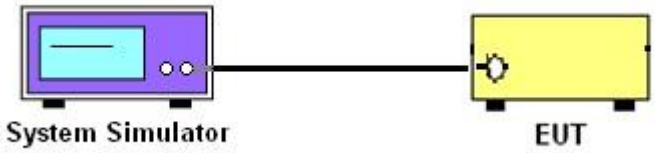
3 Conducted Test Items

3.1 Measuring Instruments

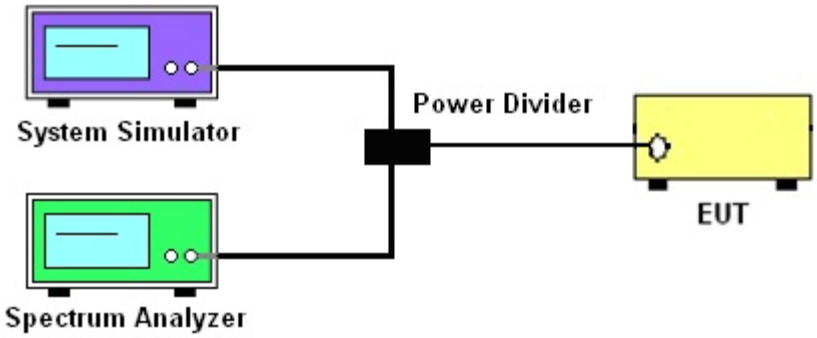
See list of measuring instruments of this test report.

3.2 Test Setup

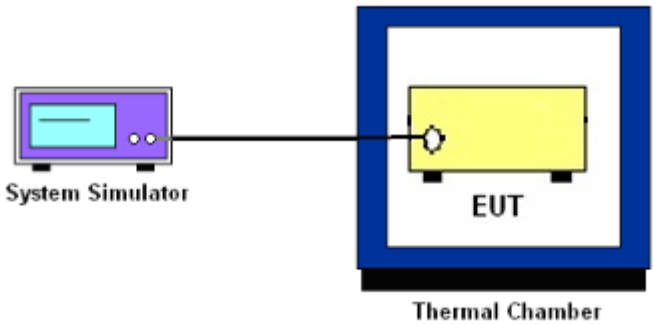
3.2.1 Conducted Output Power



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



3.2.3 Frequency Stability



3.3 Test Result of Conducted Test

Please refer to Appendix A.

3.4 Conducted Output Power and EIRP

3.4.1 Description of the Conducted Output Power Measurement and 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 EIRP of mobile transmitters must not exceed 1 Watts for 5G NR n77, n78.

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

3.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

3.5 Peak-to-Average Ratio

3.5.1 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.

3.5.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

3.6 Occupied Bandwidth

3.6.1 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.

3.6.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.4
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. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. 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.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.7 Conducted Band Edge

3.7.1 Description of Conducted Band Edge Measurement

27.53(l)(2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz. Compliance with this paragraph is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz.

3.7.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used or a narrower RBW was used (generally limited to no less than 1% of the OBW) and the measured power was integrated over the full required measurement bandwidth.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.
   Example:
   The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.
9. When using the integration method, the starting frequency of the integration shall be centered at one-half of the RBW away from the band edge.

3.8 Conducted Spurious Emission

3.8.1 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.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10^{th} harmonic.

3.8.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. 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.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
10. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.

3.9 Frequency Stability

3.9.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

3.9.2 Test Procedures for Temperature Variation

1. The testing follows ANSI C63.26 section 5.6.4
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 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.

3.9.3 Test Procedures for Voltage Variation

1. The testing follows ANSI C63.26 section 5.6.5
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 85% to 115% of the nominal value for other than hand carried battery equipment.
4. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
5. The variation in frequency was measured for the worst case.

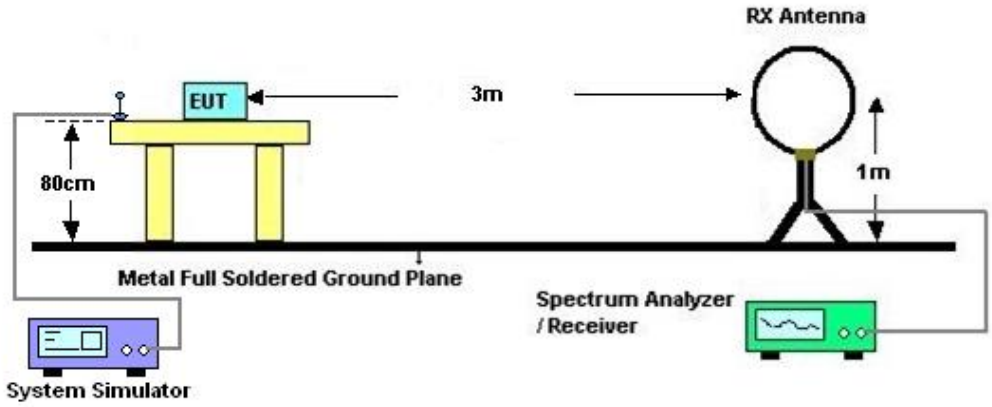
4 Radiated Test Items

4.1 Measuring Instruments

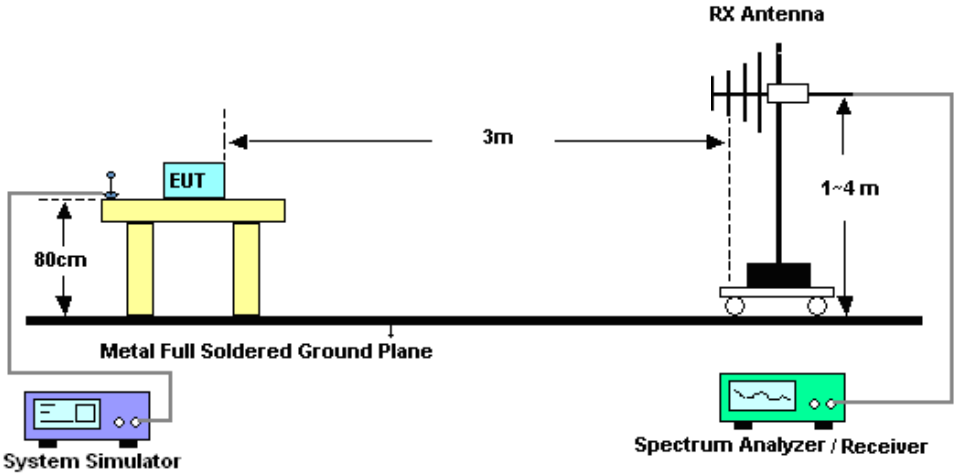
See list of measuring instruments of this test report.

4.2 Test Setup

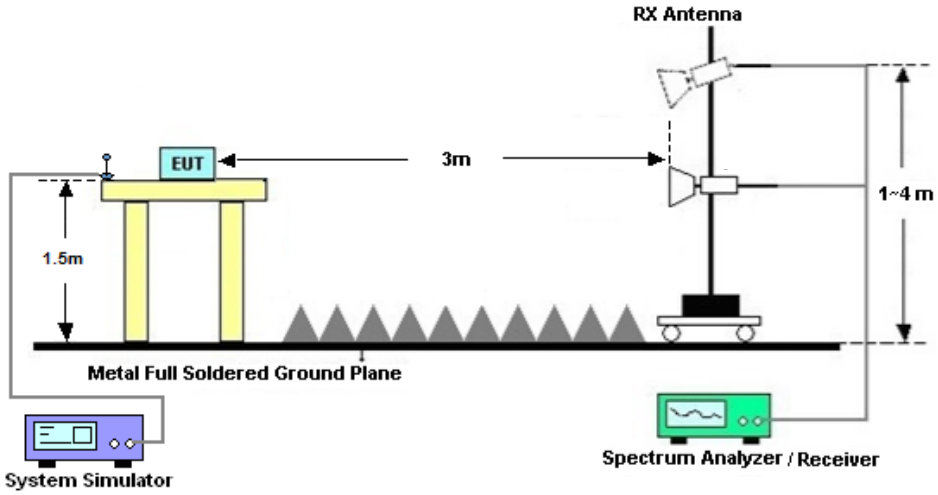
4.2.1 For radiated test below 30MHz



4.2.2 For radiated test from 30MHz to 1GHz



4.2.3 For radiated test above 1GHz



4.3 Test Result of Radiated Test

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.

Please refer to Appendix B.

4.4 Radiated Spurious Emission

4.4.1 Description of Radiated Spurious Emission

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

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

4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna 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 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	Feb. 08, 2023~ Apr. 08, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	NCR	Feb. 08, 2023~ Apr. 08, 2023	NCR	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 15, 2022	Feb. 08, 2023~ Apr. 08, 2023	Jul. 14, 2023	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471079	10Hz-44G,MAX 30dB	Oct. 12, 2022	Mar. 20, 2023	Oct. 11, 2023	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Mar. 20, 2023	Oct. 15, 2023	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 24, 2022	Mar. 20, 2023	May 23, 2023	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1284	1GHz~18GHz	Oct. 16, 2022	Mar. 20, 2023	Oct. 15, 2023	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 08, 2023	Mar. 20, 2023	Jan. 07, 2024	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	May 24, 2022	Mar. 20, 2023	May 23, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2023	Mar. 20, 2023	Jan. 04, 2024	Radiation (03CH04-KS)
high gain Amplifier	EM	EM01G18GA	060840	1Ghz-18Ghz	Oct. 12, 2022	Mar. 20, 2023	Oct. 11, 2023	Radiation (03CH04-KS)
Amplifier	Agilent	8449B	3008A02370	1Ghz-18Ghz	Oct. 12, 2022	Mar. 20, 2023	Oct. 11, 2023	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Mar. 20, 2023	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Mar. 20, 2023	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Mar. 20, 2023	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required

6 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±0.46 dB
Conducted Emissions	±0.48 dB
Occupied Channel Bandwidth	±0.1 %

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.82dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.56 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.54 dB

---------- THE END ----------

Appendix A. Test Results of Conducted Test

Test Engineer :	Smile Wang	Temperature :	22~23℃
		Relative Humidity :	40~42%

Conducted Output Power(Average power) and EIRP

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP (W)		
Channel				650000	656000	662000		L	M	H
Frequency (MHz)				3750	3840	3930				
100	PI/2 BPSK	1	1	26.11	25.91	25.83	-3.48	0.1832	0.1750	0.1718
100	QPSK	1	1	25.23	25.18	25.13	-3.48	0.1496	0.1479	0.1462
100	QPSK	1	137	25.89	25.92	25.82	-3.48	0.1742	0.1754	0.1714
100	QPSK	1	271	25.30	25.26	25.21	-3.48	0.1521	0.1507	0.1489
100	QPSK	135	0	24.71	24.80	24.74	-3.48	0.1327	0.1355	0.1337
100	QPSK	135	69	25.86	25.91	25.95	-3.48	0.1730	0.1750	0.1766
100	QPSK	135	138	24.69	24.71	24.75	-3.48	0.1321	0.1327	0.1340
100	QPSK	270	0	24.72	24.77	24.69	-3.48	0.1330	0.1346	0.1321
100	16QAM	1	1	24.15	24.09	23.88	-3.48	0.1167	0.1151	0.1096
100	64QAM	1	1	22.67	22.53	22.36	-3.48	0.0830	0.0804	0.0773
100	256QAM	1	1	20.42	20.33	20.11	-3.48	0.0494	0.0484	0.0460
Channel				649668	656000	662332	Gain	EIRP (W)		
Frequency (MHz)				3745.02	3840	3934.98				
90	PI/2 BPSK	1	1	25.33	25.21	25.06	-3.48	0.1531	0.1489	0.1439
90	QPSK	1	1	24.02	24.00	23.96	-3.48	0.1132	0.1127	0.1117
90	16QAM	1	1	23.18	23.16	23.12	-3.48	0.0933	0.0929	0.0920
Channel				649334	656000	662666	Gain	EIRP (W)		
Frequency (MHz)				3740.01	3840	3939.99				
80	PI/2 BPSK	1	1	25.55	25.45	25.27	-3.48	0.1611	0.1574	0.1510
80	QPSK	1	1	24.11	24.01	23.96	-3.48	0.1156	0.1130	0.1117
80	16QAM	1	1	23.27	23.17	23.12	-3.48	0.0953	0.0931	0.0920
Channel				648668	656000	663332	Gain	EIRP (W)		
Frequency (MHz)				3730.02	3840	3949.98				
60	PI/2 BPSK	1	1	25.61	25.49	25.28	-3.48	0.1633	0.1589	0.1514
60	QPSK	1	1	24.09	24.02	23.95	-3.48	0.1151	0.1132	0.1114
60	16QAM	1	1	23.25	23.18	23.11	-3.48	0.0948	0.0933	0.0918
Channel				648334	656000	663666	Gain	EIRP (W)		
Frequency (MHz)				3725.01	3840	3954.99				
50	PI/2 BPSK	1	1	25.85	25.67	25.48	-3.48	0.1726	0.1656	0.1585
50	QPSK	1	1	24.13	24.05	23.85	-3.48	0.1161	0.1140	0.1089
50	16QAM	1	1	23.29	23.21	23.01	-3.48	0.0957	0.0940	0.0897
Channel				648000	656000	664000	Gain	EIRP (W)		
Frequency (MHz)				3720	3840	3960				
40	PI/2 BPSK	1	1	25.50	25.48	25.32	-3.48	0.1592	0.1585	0.1528

40	QPSK	1	1	24.10	24.05	23.96	-3.48	0.1153	0.1140	0.1117
40	16QAM	1	1	23.26	23.21	23.12	-3.48	0.0951	0.0940	0.0920
Channel				647334	656000	664666	Gain	EIRP (W)		
Frequency (MHz)				3710.01	3840	3969.99				
20	PI/2 BPSK	1	1	25.88	25.86	25.66	-3.48	0.1738	0.1730	0.1652
20	QPSK	1	1	24.03	23.99	23.91	-3.48	0.1135	0.1125	0.1104
20	16QAM	1	1	23.19	23.15	23.07	-3.48	0.0935	0.0927	0.0910
Channel				647168	656000	664832	Gain	EIRP (W)		
Frequency (MHz)				3707.52	3840	3972.48				
15	PI/2 BPSK	1	1	26.08	25.91	25.68	-3.48	0.1820	0.1750	0.1660
15	QPSK	1	1	24.05	23.96	23.96	-3.48	0.1140	0.1117	0.1117
15	16QAM	1	1	23.21	23.12	23.12	-3.48	0.0940	0.0920	0.0920
Channel				647000	656000	665000	Gain	EIRP (W)		
Frequency (MHz)				3705	3840	3975				
10	PI/2 BPSK	1	1	26.02	25.89	25.89	-3.48	0.1795	0.1742	0.1742
10	QPSK	1	1	24.09	24.00	23.91	-3.48	0.1151	0.1127	0.1104
10	16QAM	1	1	23.25	23.16	23.07	-3.48	0.0948	0.0929	0.0910

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP (W)		
Channel				650000	656000	662000		L	M	H
Frequency (MHz)				3750	3840	3930				
100	QPSK	1	1	25.17	25.24	25.38	-3.48	0.1476	0.1500	0.1549
100	QPSK	1	137	24.98	25.26	25.41	-3.48	0.1413	0.1507	0.1560
100	QPSK	1	271	24.24	24.37	24.74	-3.48	0.1191	0.1227	0.1337
100	QPSK	135	0	23.54	23.93	24.05	-3.48	0.1014	0.1109	0.1140
100	QPSK	135	69	25.11	25.44	25.47	-3.48	0.1455	0.1570	0.1581
100	QPSK	135	138	23.67	23.91	23.92	-3.48	0.1045	0.1104	0.1107
100	QPSK	270	0	23.64	23.94	24.03	-3.48	0.1038	0.1112	0.1135
100	16QAM	1	1	23.92	23.98	24.25	-3.48	0.1107	0.1122	0.1194
100	64QAM	1	1	22.34	22.61	22.70	-3.48	0.0769	0.0818	0.0836
100	256QAM	1	1	19.43	19.69	19.64	-3.48	0.0394	0.0418	0.0413
Channel				649668	656000	662332	Gain	EIRP (W)		
Frequency (MHz)				3745.02	3840	3934.98				
90	QPSK	1	1	24.21	24.14	24.18	-3.48	0.1183	0.1164	0.1175
90	16QAM	1	1	23.99	24.13	24.05	-3.48	0.1125	0.1161	0.1140
Channel				649334	656000	662666	Gain	EIRP (W)		
Frequency (MHz)				3740.01	3840	3939.99				
80	QPSK	1	1	24.49	24.42	24.36	-3.48	0.1262	0.1242	0.1225
80	16QAM	1	1	24.05	24.02	24.13	-3.48	0.1140	0.1132	0.1161
Channel				648668	656000	663332	Gain	EIRP (W)		
Frequency (MHz)				3730.02	3840	3949.98				
60	QPSK	1	1	24.56	24.45	24.61	-3.48	0.1282	0.1250	0.1297
60	16QAM	1	1	23.99	24.06	24.15	-3.48	0.1125	0.1143	0.1167
Channel				648334	656000	663666	Gain	EIRP (W)		
Frequency (MHz)				3725.01	3840	3954.99				
50	QPSK	1	1	24.85	24.69	24.74	-3.48	0.1371	0.1321	0.1337

50	16QAM	1	1	23.96	24.05	24.17	-3.48	0.1117	0.1140	0.1172
Channel				648000	656000	664000	Gain	EIRP (W)		
Frequency (MHz)				3720	3840	3960				
40	QPSK	1	1	24.65	24.51	24.56	-3.48	0.1309	0.1268	0.1282
40	16QAM	1	1	23.98	24.05	24.17	-3.48	0.1122	0.1140	0.1172
Channel				647334	656000	664666	Gain	EIRP (W)		
Frequency (MHz)				3710.01	3840	3969.99				
20	QPSK	1	1	24.86	24.82	24.91	-3.48	0.1374	0.1361	0.1390
20	16QAM	1	1	24.02	24.05	24.13	-3.48	0.1132	0.1140	0.1161
Channel				647168	656000	664832	Gain	EIRP (W)		
Frequency (MHz)				3707.52	3840	3972.48				
15	QPSK	1	1	24.90	24.95	24.86	-3.48	0.1387	0.1403	0.1374
15	16QAM	1	1	23.85	23.96	24.11	-3.48	0.1089	0.1117	0.1156
Channel				647000	656000	665000	Gain	EIRP (W)		
Frequency (MHz)				3705	3840	3975				
10	QPSK	1	1	25.02	25.13	25.20	-3.48	0.1426	0.1462	0.1486
10	16QAM	1	1	24.01	24.13	24.03	-3.48	0.1130	0.1161	0.1135

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BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP (W)		
Channel					650000			L	M	H
Frequency (MHz)					3750					
100	PI/2 BPSK	1	1		26.18		-4.11		0.1611	
100	QPSK	1	1		25.23		-4.11		0.1294	
100	QPSK	1	137		25.97		-4.11		0.1535	
100	QPSK	1	271		25.28		-4.11		0.1309	
100	QPSK	135	0		24.82		-4.11		0.1178	
100	QPSK	135	69		25.95		-4.11		0.1528	
100	QPSK	135	138		24.77		-4.11		0.1164	
100	QPSK	270	0		25.79		-4.11		0.1472	
100	16QAM	1	1		24.16		-4.11		0.1012	
100	64QAM	1	1		22.54		-4.11		0.0697	
100	256QAM	1	1		20.36		-4.11		0.0422	
Channel				649668	650000	650334	Gain	EIRP (W)		
Frequency (MHz)				3745.02	3750	3755.01				
90	PI/2 BPSK	1	1	25.37	25.26	25.13	-4.11	0.1337	0.1303	0.1265
90	QPSK	1	1	24.13	24.15	24.09	-4.11	0.1005	0.1009	0.0995
90	16QAM	1	1	23.26	23.28	23.22	-4.11	0.0822	0.0826	0.0815
Channel				649334	650000	650668	Gain	EIRP (W)		
Frequency (MHz)				3740.01	3750	3760.02				
80	PI/2 BPSK	1	1	25.59	25.48	25.28	-4.11	0.1406	0.1371	0.1309
80	QPSK	1	1	24.02	24.13	24.01	-4.11	0.0979	0.1005	0.0977
80	16QAM	1	1	23.15	23.26	23.14	-4.11	0.0802	0.0822	0.0800
Channel				648668	650000	651334	Gain	EIRP (W)		
Frequency (MHz)				3730.02	3750	3770.01				
60	PI/2 BPSK	1	1	25.67	25.38	25.25	-4.11	0.1432	0.1340	0.1300
60	QPSK	1	1	24.05	23.99	24.03	-4.11	0.0986	0.0973	0.0982

60	16QAM	1	1	23.18	23.12	23.16	-4.11	0.0807	0.0796	0.0804
Channel				648334	650000	651668	Gain	EIRP (W)		
Frequency (MHz)				3725.01	3750	3775.02				
50	PI/2 BPSK	1	1	25.82	25.62	25.44	-4.11	0.1483	0.1416	0.1358
50	QPSK	1	1	24.01	24.05	24.00	-4.11	0.0977	0.0986	0.0975
50	16QAM	1	1	23.14	23.18	23.13	-4.11	0.0800	0.0807	0.0798
Channel				648000	650000	652000	Gain	EIRP (W)		
Frequency (MHz)				3720	3750	3780				
40	PI/2 BPSK	1	1	25.58	25.41	25.45	-4.11	0.1403	0.1349	0.1361
40	QPSK	1	1	24.01	24.00	23.96	-4.11	0.0977	0.0975	0.0966
40	16QAM	1	1	23.14	23.13	23.09	-4.11	0.0800	0.0798	0.0791
Channel				647668	650000	652334	Gain	EIRP (W)		
Frequency (MHz)				3715.02	3750	3785.01				
30	PI/2 BPSK	1	1	25.71	25.47	25.56	-4.11	0.1445	0.1368	0.1396
30	QPSK	1	1	24.08	23.95	23.99	-4.11	0.0993	0.0964	0.0973
30	16QAM	1	1	23.21	23.08	23.12	-4.11	0.0813	0.0789	0.0796
Channel				647500	650000	652500	Gain	EIRP (W)		
Frequency (MHz)				3712.5	3750	3787.5				
25	PI/2 BPSK	1	1	25.76	25.56	25.71	-4.11	0.1462	0.1396	0.1445
25	QPSK	1	1	24.01	23.96	23.91	-4.11	0.0977	0.0966	0.0955
25	16QAM	1	1	23.14	23.09	23.04	-4.11	0.0800	0.0791	0.0782
Channel				647334	650000	652668	Gain	EIRP (W)		
Frequency (MHz)				3710.01	3750	3790.02				
20	PI/2 BPSK	1	1	25.97	25.82	25.72	-4.11	0.1535	0.1483	0.1449
20	QPSK	1	1	24.08	23.93	23.95	-4.11	0.0993	0.0960	0.0964
20	16QAM	1	1	23.21	23.06	23.08	-4.11	0.0813	0.0786	0.0789
Channel				647168	650000	652834	Gain	EIRP (W)		
Frequency (MHz)				3707.52	3750	3792.51				
15	PI/2 BPSK	1	1	26.14	25.96	25.75	-4.11	0.1596	0.1531	0.1459
15	QPSK	1	1	24.08	24.11	23.96	-4.11	0.0993	0.1000	0.0966
15	16QAM	1	1	23.21	23.24	23.09	-4.11	0.0813	0.0818	0.0791
Channel				647000	650000	653000	Gain	EIRP (W)		
Frequency (MHz)				3705	3750	3795				
10	PI/2 BPSK	1	1	26.11	25.98	25.86	-4.11	0.1585	0.1538	0.1496
10	QPSK	1	1	23.97	24.13	23.98	-4.11	0.0968	0.1005	0.0971
10	16QAM	1	1	23.10	23.26	23.11	-4.11	0.0793	0.0822	0.0794

5G NR n78 UL MIMO

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP (W)		
Channel					650000			L	M	H
Frequency (MHz)					3750					
100	QPSK	1	1		25.36		-4.11		0.3436	
100	QPSK	1	137		25.51		-4.11		0.3556	
100	QPSK	1	271		24.42		-4.11		0.2767	
100	QPSK	135	0		23.98		-4.11		0.2500	
100	QPSK	135	69		25.40		-4.11		0.3467	
100	QPSK	135	138		23.88		-4.11		0.2443	

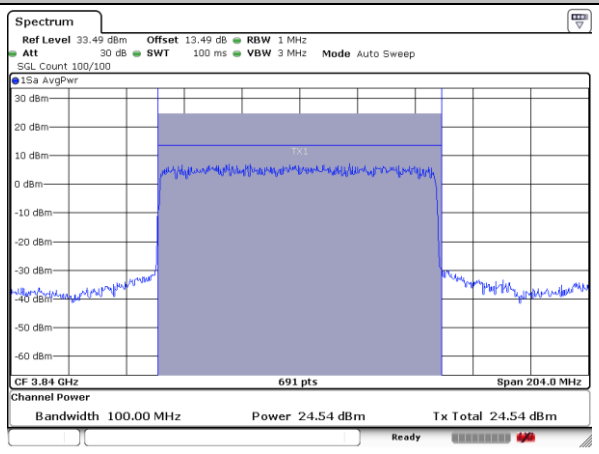
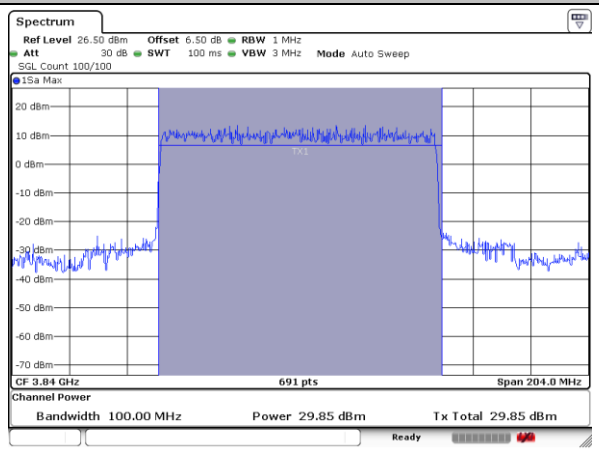
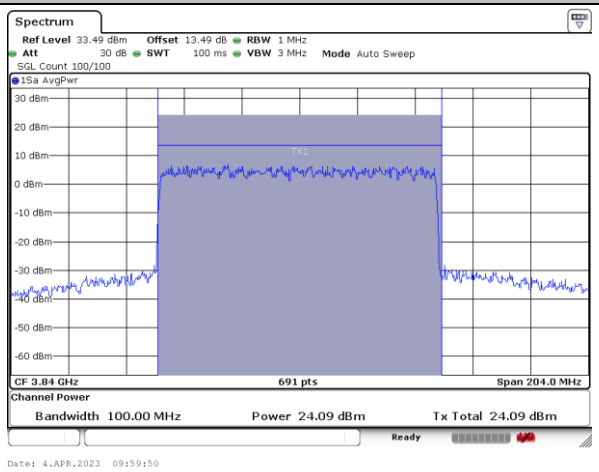
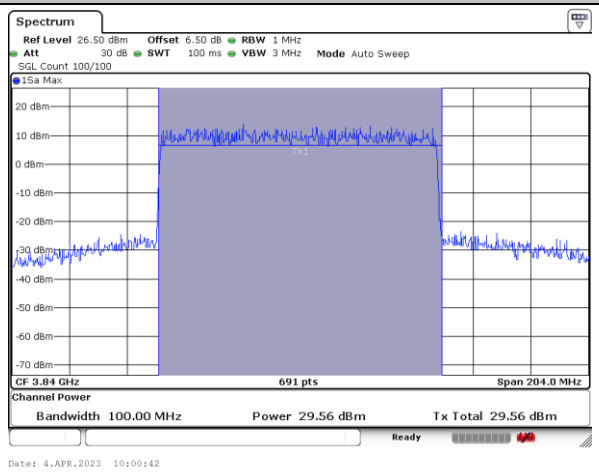
100	QPSK	270	0		23.92		-4.11		0.2466	
100	16QAM	1	1		24.07		-4.11		0.2553	
100	64QAM	1	1		22.64		-4.11		0.1837	
100	256QAM	1	1		19.75		-4.11		0.0944	
Channel				649668	650000	650334	Gain	EIRP (W)		
Frequency (MHz)				3745.02	3750	3755.01				
90	QPSK	1	1	24.56	24.48	24.36	-4.11	0.1109	0.1089	0.1059
90	16QAM	1	1	23.96	24.02	23.99	-4.11	0.0966	0.0979	0.0973
Channel				649334	650000	650668	Gain	EIRP (W)		
Frequency (MHz)				3740.01	3750	3760.02				
80	QPSK	1	1	24.52	24.46	24.41	-4.11	0.1099	0.1084	0.1072
80	16QAM	1	1	23.95	24.03	23.85	-4.11	0.0964	0.0982	0.0942
Channel				648668	650000	651334	Gain	EIRP (W)		
Frequency (MHz)				3730.02	3750	3770.01				
60	QPSK	1	1	24.59	24.47	24.66	-4.11	0.1117	0.1086	0.1135
60	16QAM	1	1	23.95	24.00	23.95	-4.11	0.0964	0.0975	0.0964
Channel				648334	650000	651668	Gain	EIRP (W)		
Frequency (MHz)				3725.01	3750	3775.02				
50	QPSK	1	1	25.05	24.84	24.96	-4.11	0.1242	0.1183	0.1216
50	16QAM	1	1	23.75	23.94	23.86	-4.11	0.0920	0.0962	0.0944
Channel				648000	650000	652000	Gain	EIRP (W)		
Frequency (MHz)				3720	3750	3780				
40	QPSK	1	1	24.89	24.72	24.87	-4.11	0.1197	0.1151	0.1191
40	16QAM	1	1	23.85	23.96	23.74	-4.11	0.0942	0.0966	0.0918
Channel				647668	650000	652334	Gain	EIRP (W)		
Frequency (MHz)				3715.02	3750	3785.01				
30	QPSK	1	1	24.66	24.62	24.75	-4.11	0.1135	0.1125	0.1159
30	16QAM	1	1	23.96	23.99	23.84	-4.11	0.0966	0.0973	0.0940
Channel				647500	650000	652500	Gain	EIRP (W)		
Frequency (MHz)				3712.5	3750	3787.5				
25	QPSK	1	1	24.83	24.75	24.80	-4.11	0.1180	0.1159	0.1172
25	16QAM	1	1	23.81	23.87	23.96	-4.11	0.0933	0.0946	0.0966
Channel				647334	650000	652668	Gain	EIRP (W)		
Frequency (MHz)				3710.01	3750	3790.02				
20	QPSK	1	1	25.06	25.14	25.35	-4.11	0.1245	0.1268	0.1330
20	16QAM	1	1	23.84	23.83	23.94	-4.11	0.0940	0.0938	0.0962
Channel				647168	650000	652834	Gain	EIRP (W)		
Frequency (MHz)				3707.52	3750	3792.51				
15	QPSK	1	1	25.22	25.19	25.27	-4.11	0.1291	0.1282	0.1306
15	16QAM	1	1	23.96	23.97	23.84	-4.11	0.0966	0.0968	0.0940
Channel				647000	650000	653000	Gain	EIRP (W)		
Frequency (MHz)				3705	3750	3795				
10	QPSK	1	1	25.19	25.28	25.33	-4.11	0.1282	0.1309	0.1324
10	16QAM	1	1	23.79	23.99	23.85	-4.11	0.0929	0.0973	0.0942

FR1 n77

Peak-to-Average Ratio

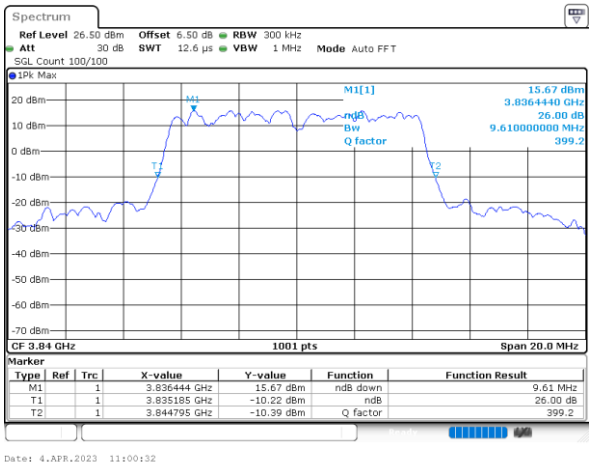
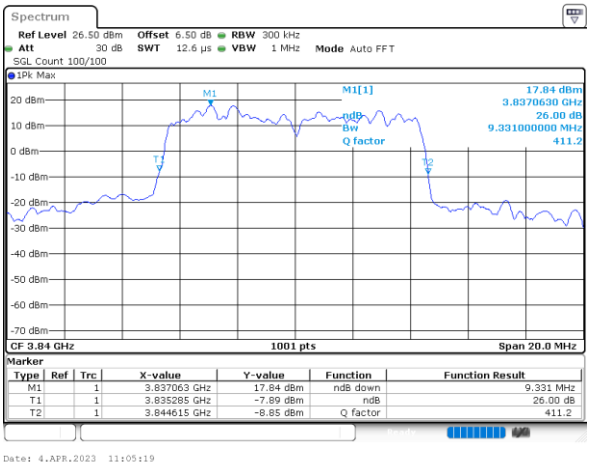
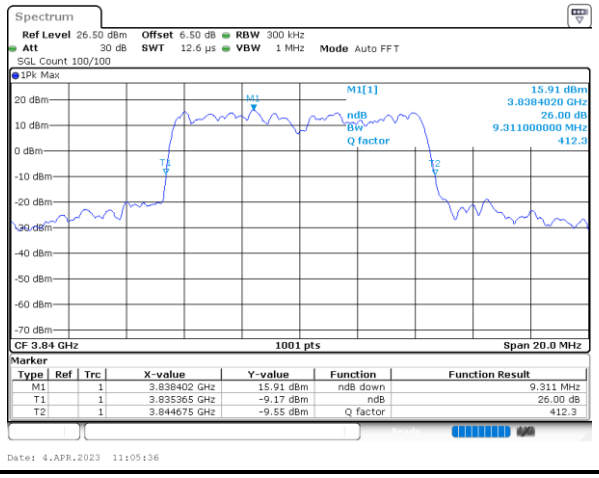
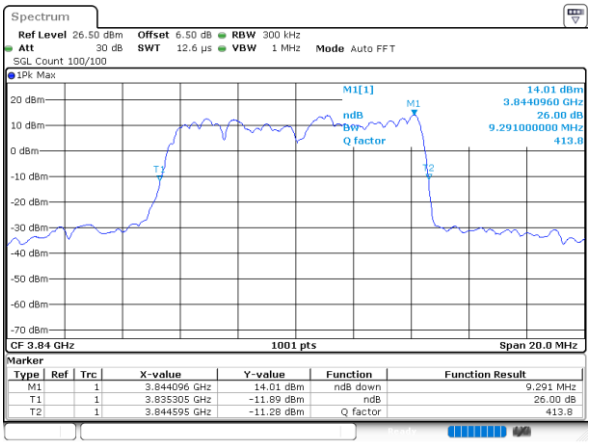
Mode	FR1 n77 / 100MHz / DFT-S OFDM		
Mod.	100M		Limit: 13dB
RB Size	BPSK	QPSK	Result
Middle CH	5.31	5.47	PASS

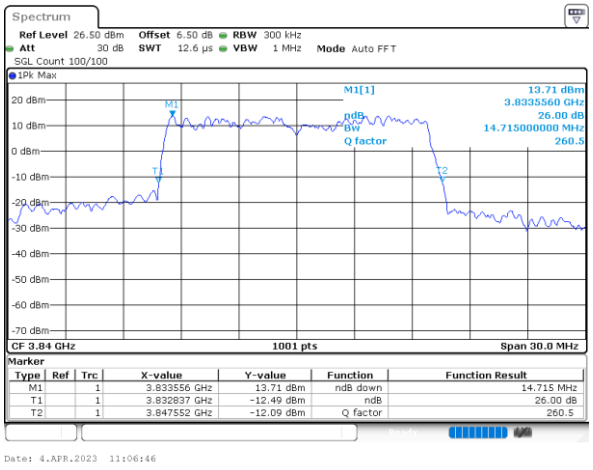
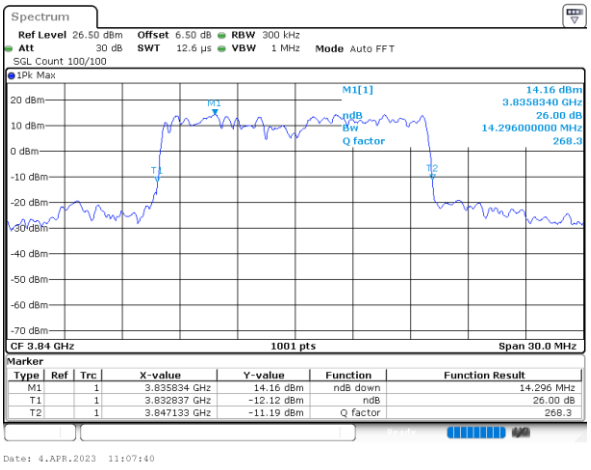
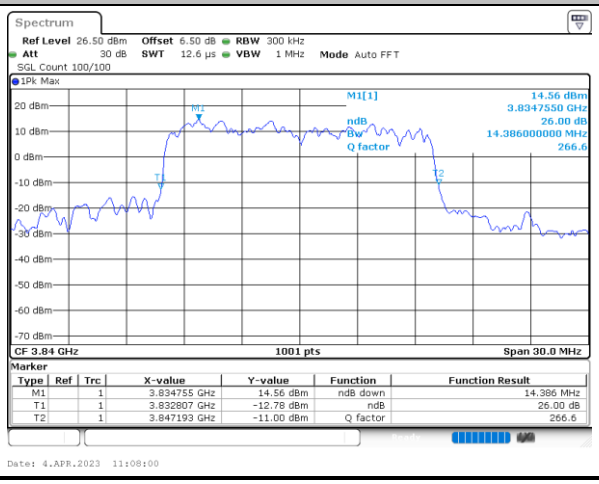
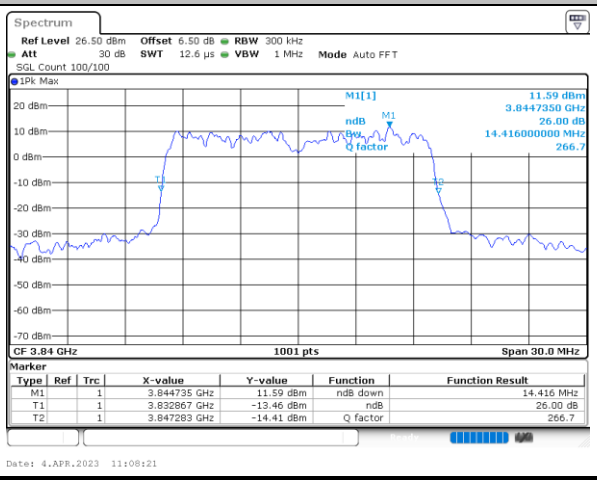
Note: PAR=Peak-Average

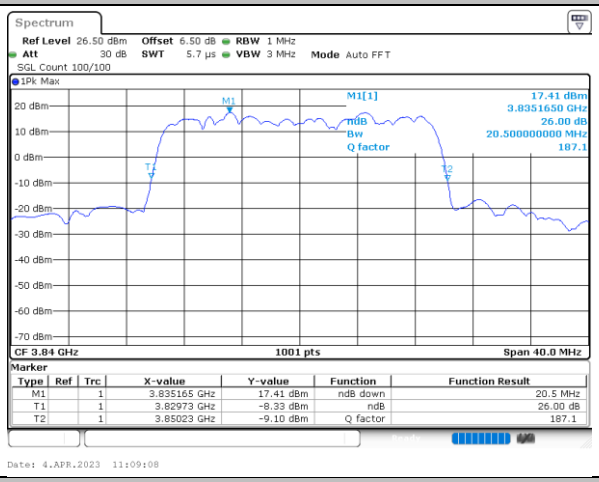
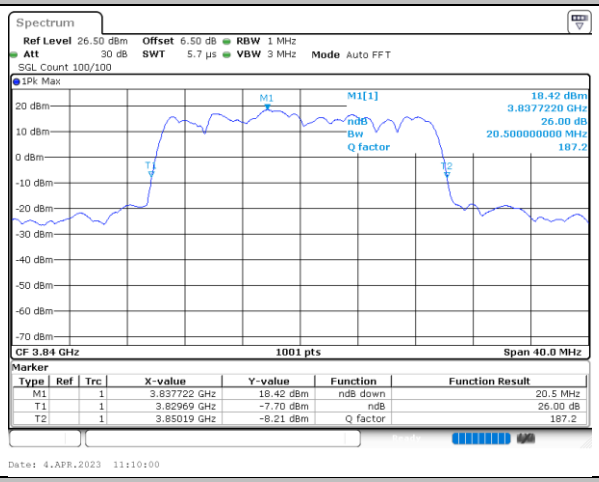
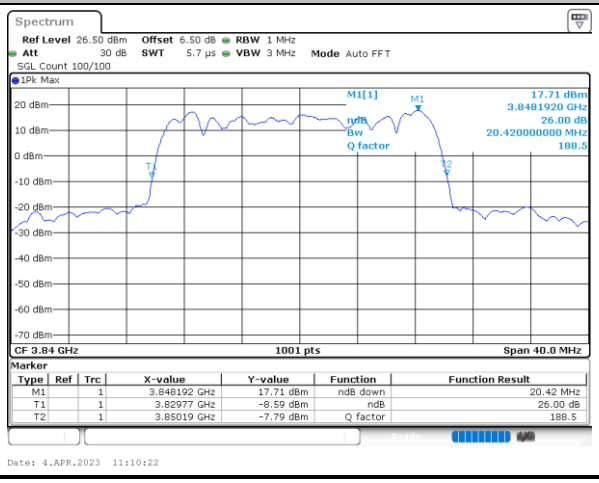
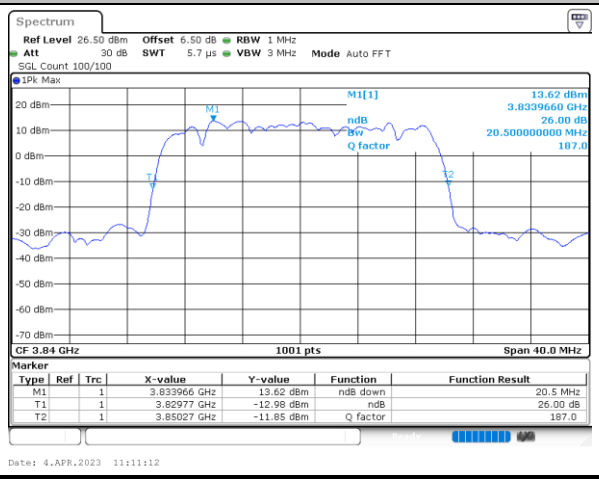
BPSK-Average	BPSK-Peak
	
QPSK-Average	**QPSK-Peak**
	

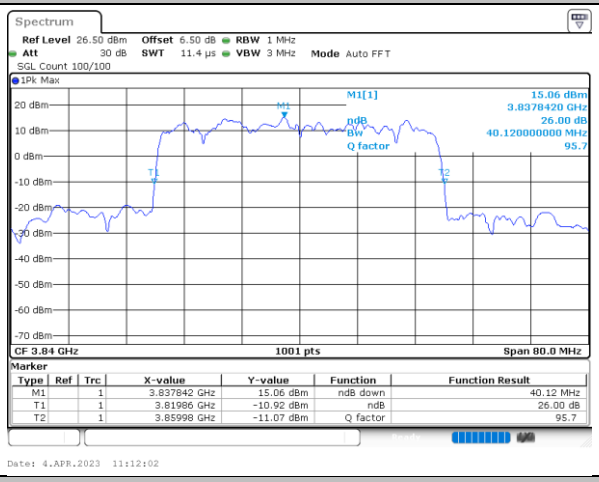
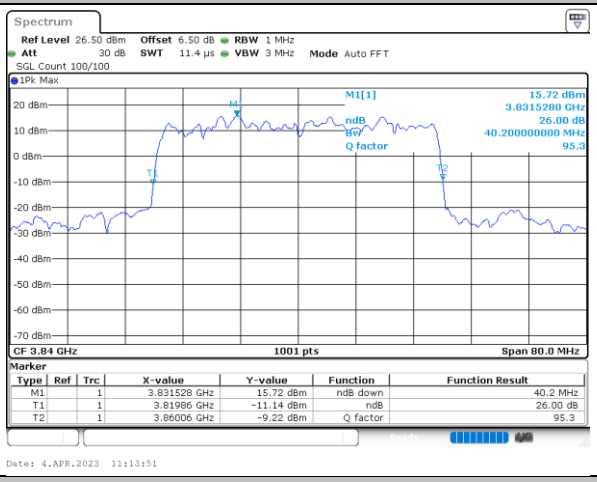
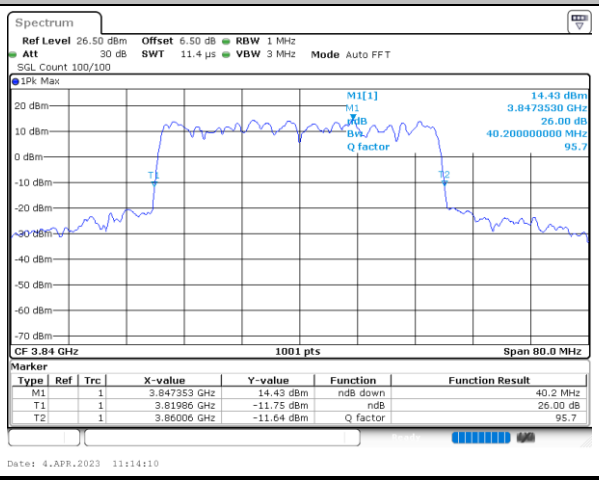
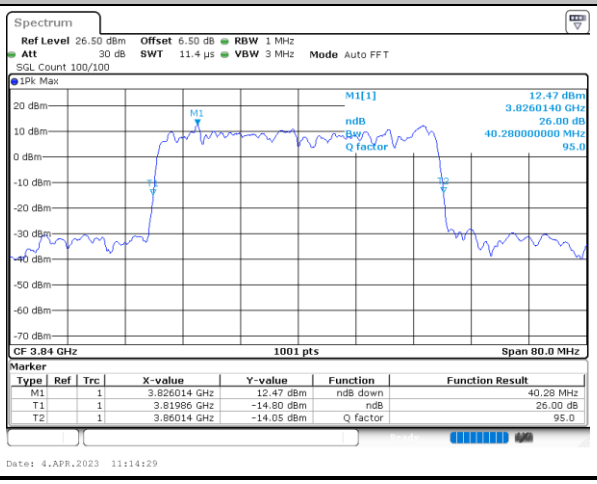
26dB Bandwidth

Mode	FR1 n77 : 26dB BW(10 MHz) / CP-S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	9.61	9.33	9.31	9.29
Mode	FR1 n77 : 26dB BW(15 MHz) / CP-S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	14.72	14.30	14.39	14.42
Mode	FR1 n77 : 26dB BW(20 MHz) / CP S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	20.5	20.5	20.42	20.5
Mode	FR1 n77 : 26dB BW(40 MHz) / CP -S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	40.12	40.2	40.2	40.28
Mode	FR1 n77 : 26dB BW(50 MHz) / CP -S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	49.65	49.55	49.75	49.75
Mode	FR1 n77 : 26dB BW(60 MHz) / CP -S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	62.1	62.46	62.46	62.22
Mode	FR1 n77 : 26dB BW(80 MHz) / CP -S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	82.32	82.32	82.32	82.16
Mode	FR1 n77 : 26dB BW(90 MHz) / CP-S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	92.07	92.07	92.43	92.43
Mode	FR1 n77 : 26dB BW(100 MHz) / CP-S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	102.5	102.1	102.3	102.5

10MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

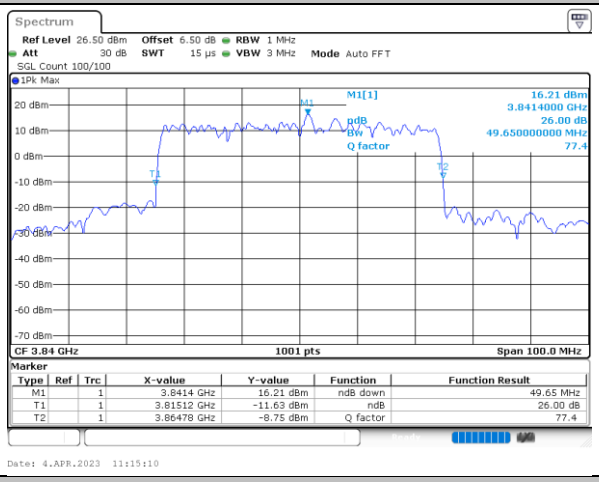
15MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

20MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

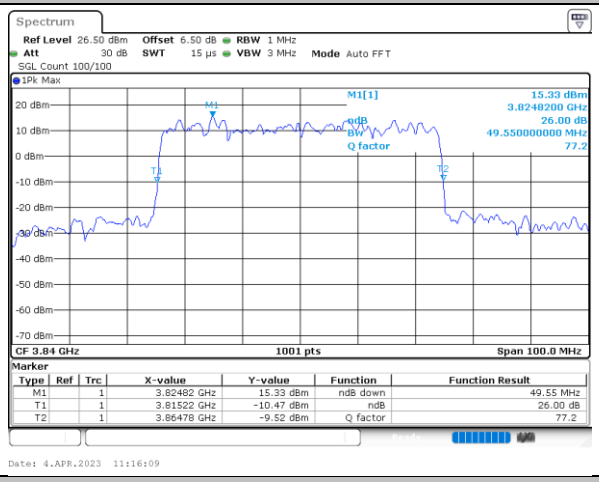
40MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

50MHz CP

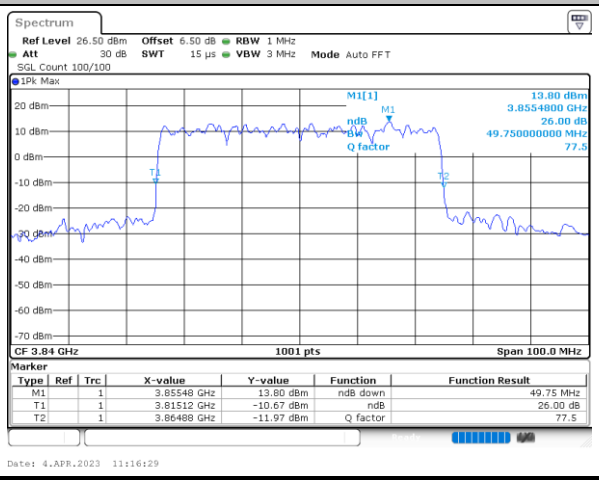
QPSK



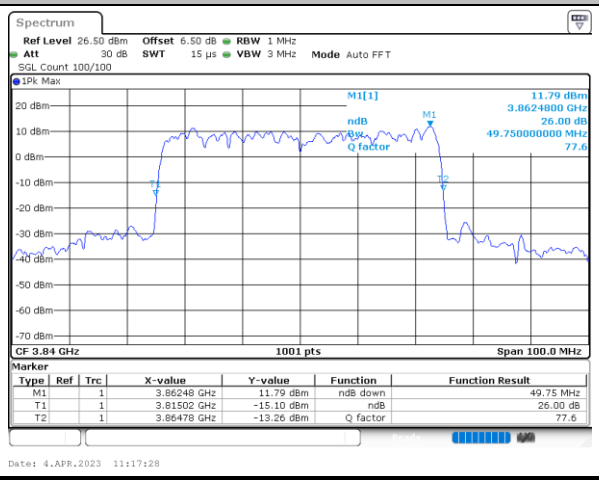
16QAM

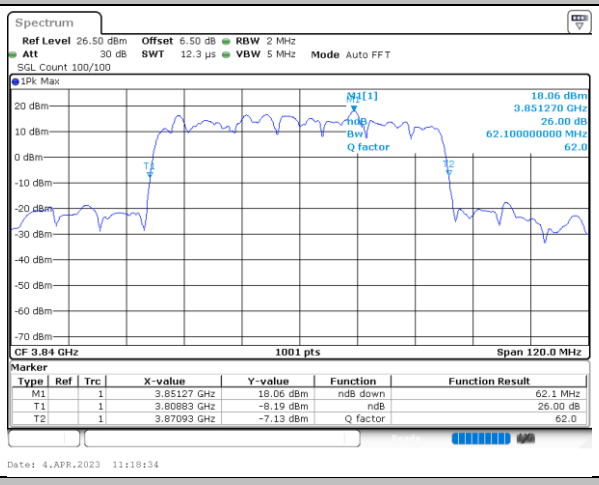
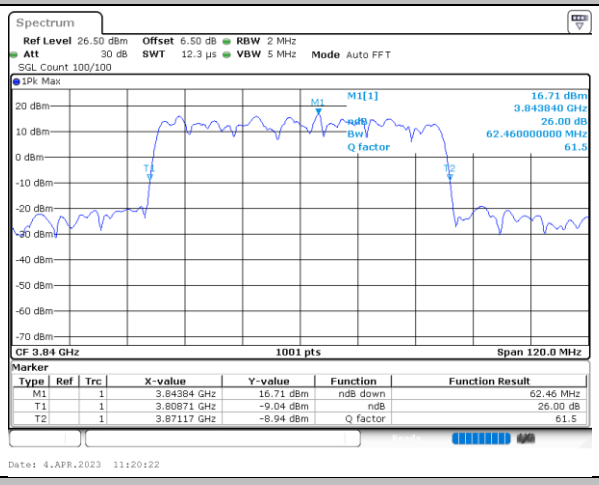
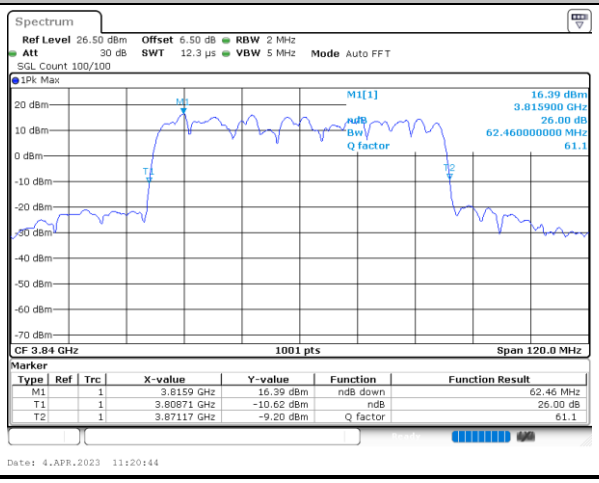
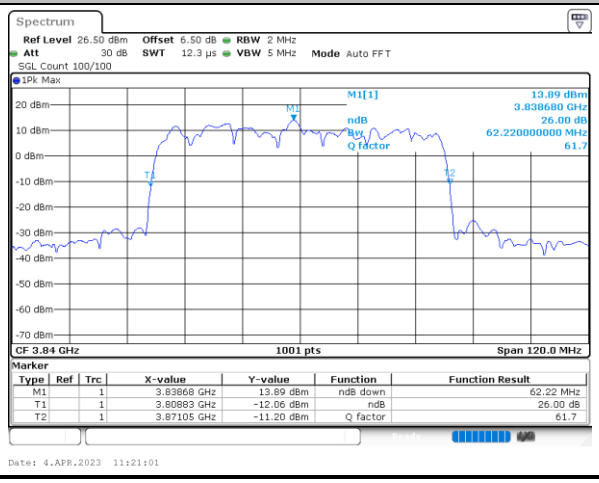


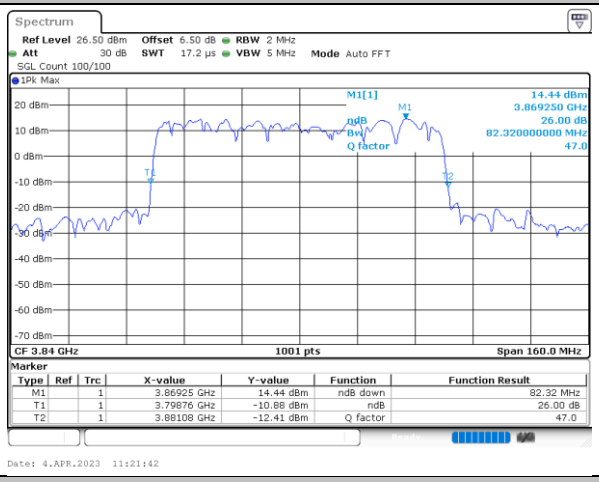
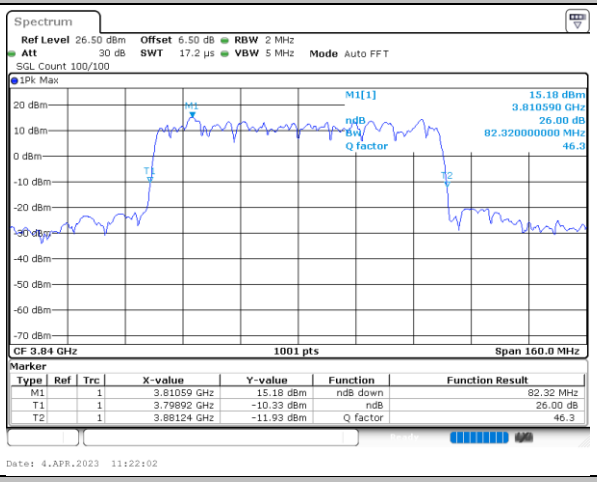
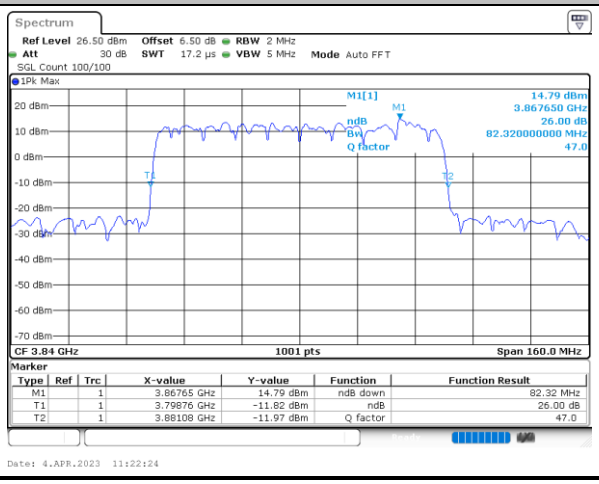
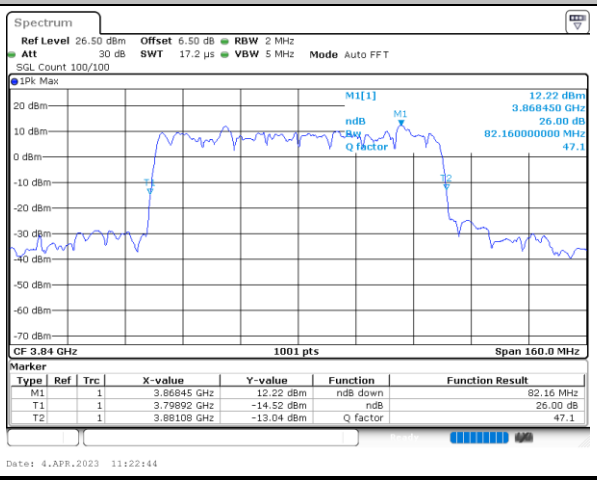
64QAM



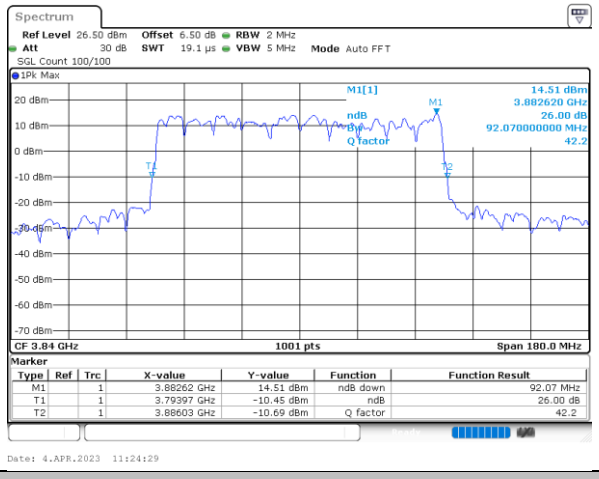
256QAM

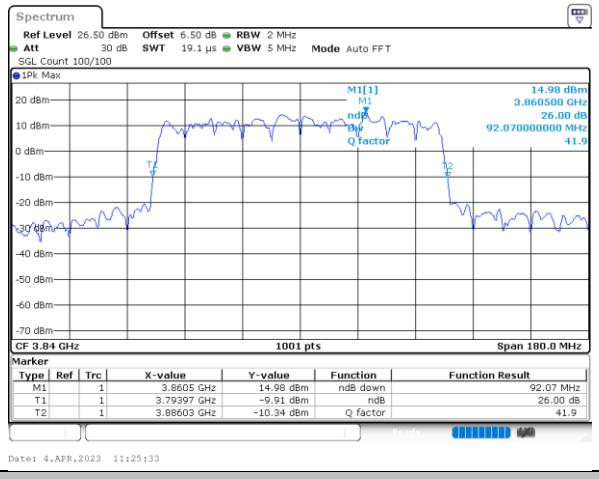


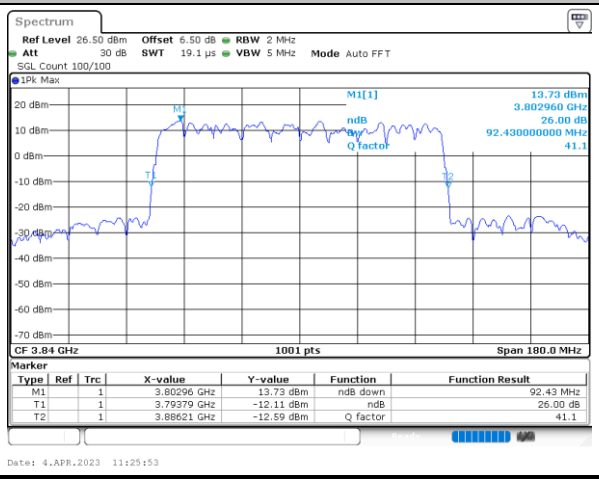
60MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

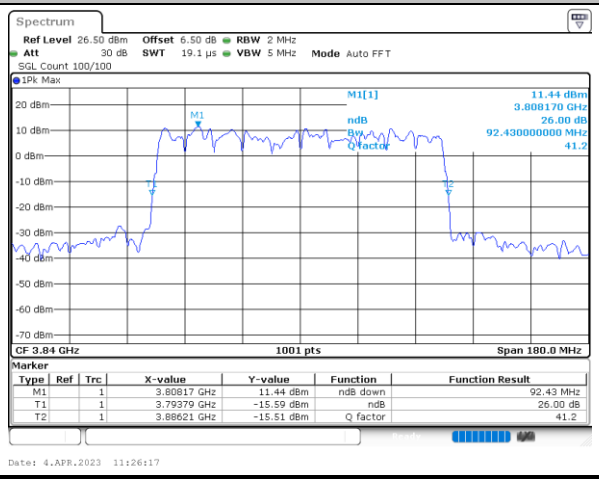
80MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

90MHz CP	
QPSK	16QAM
64QAM	256QAM



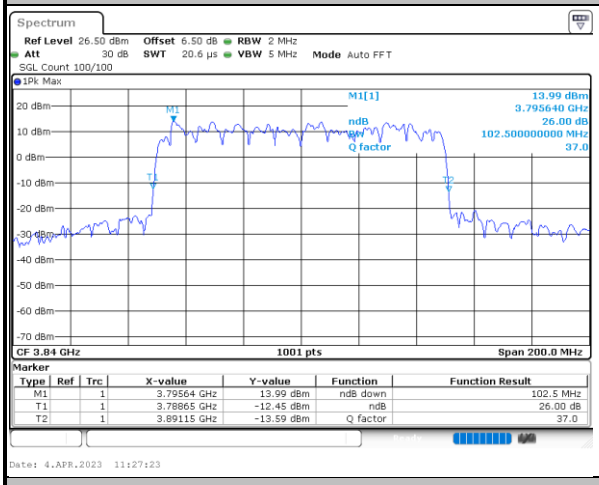




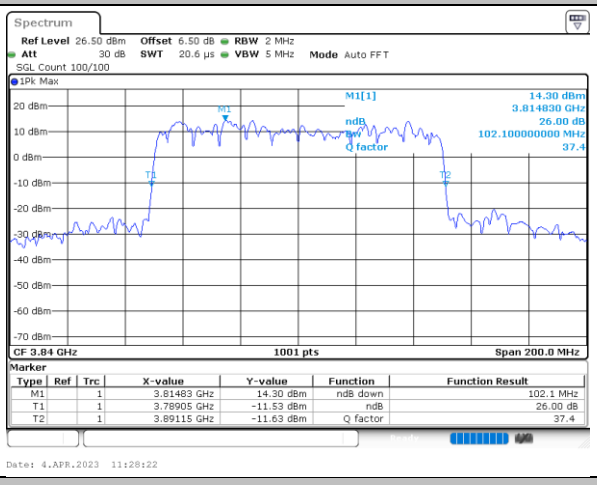


100MHz CP

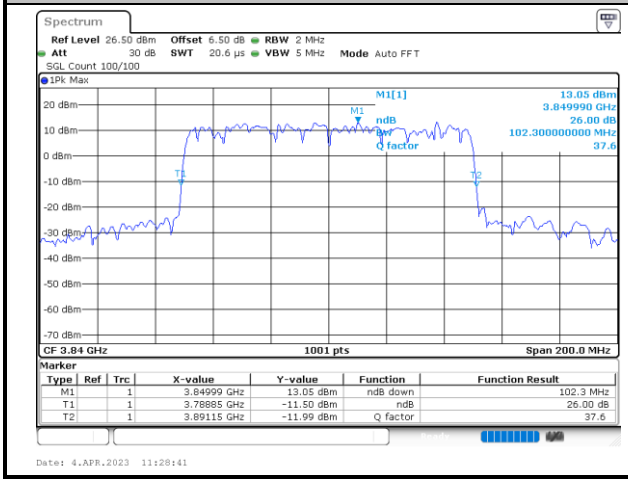
QPSK



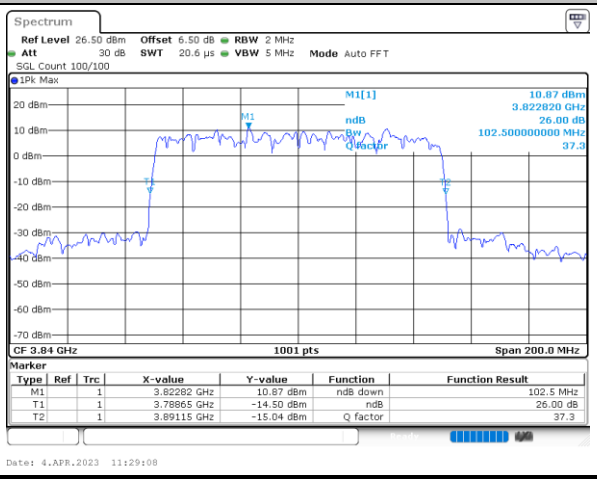
16QAM



64QAM

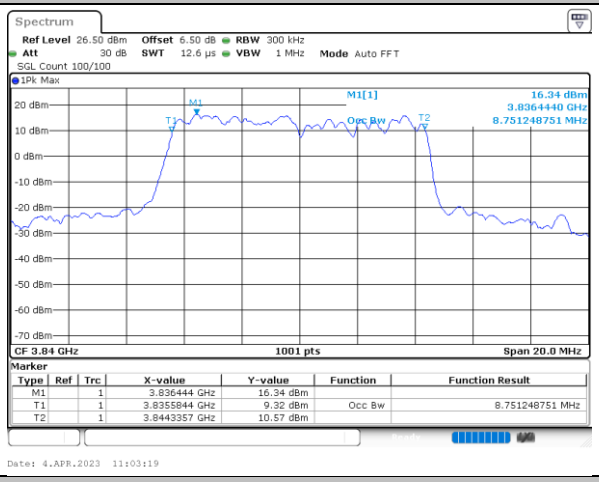
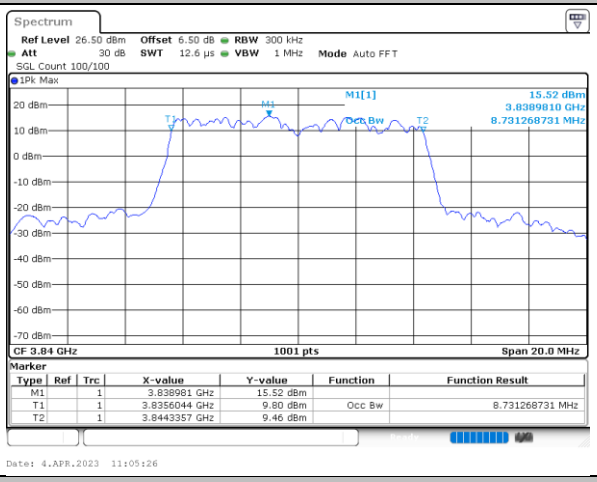
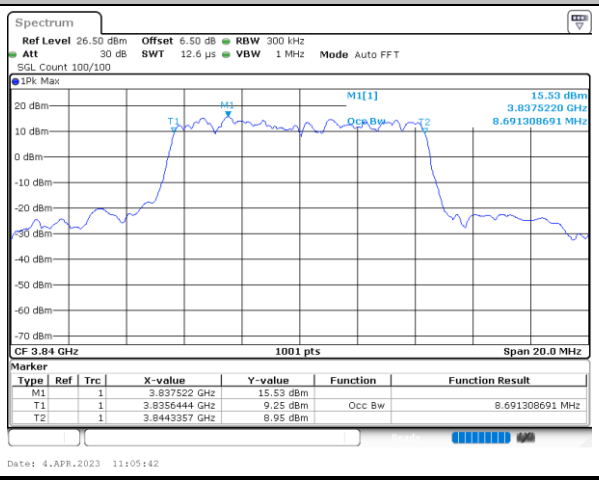
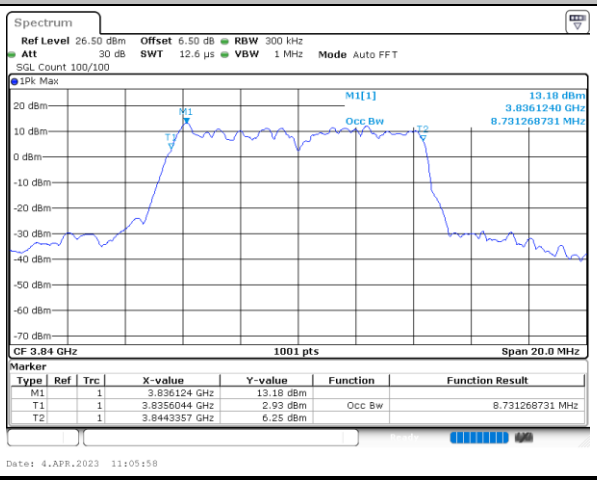


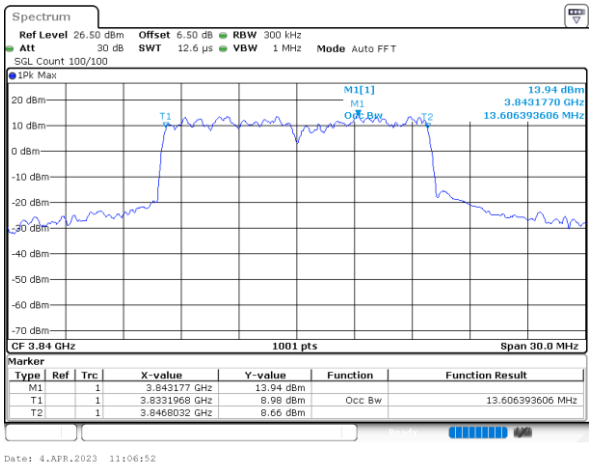
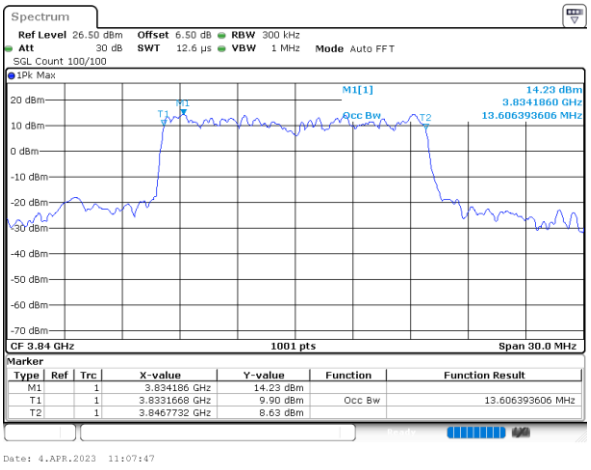
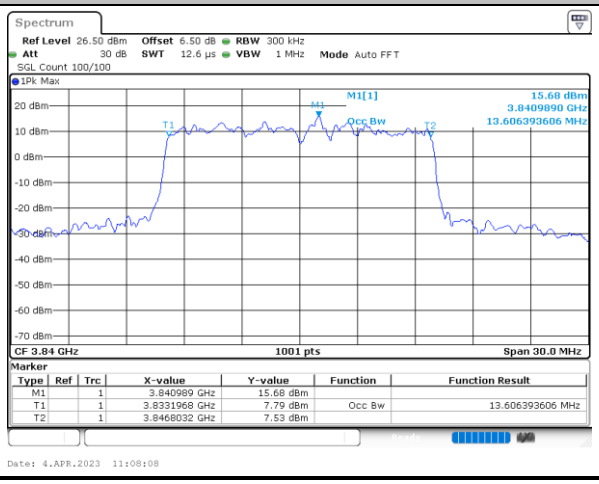
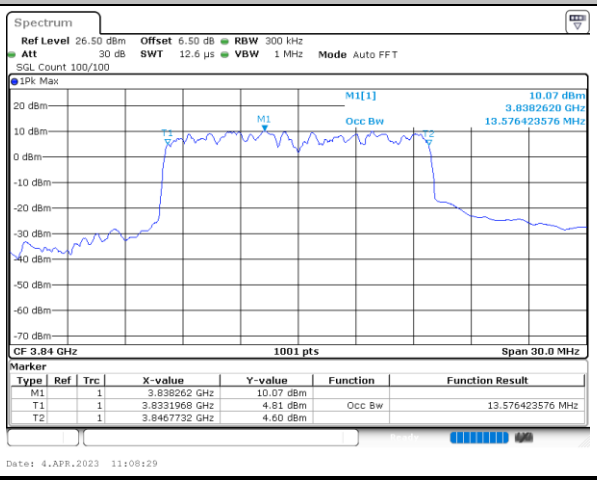
256QAM

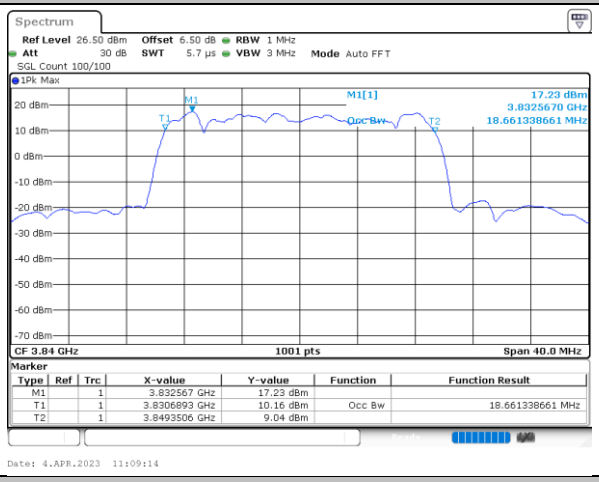
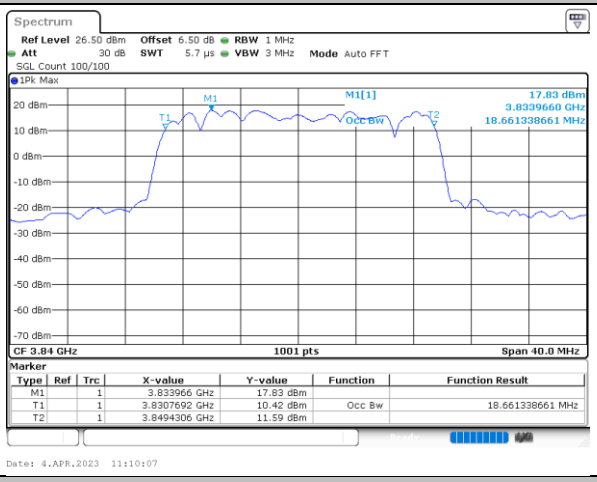
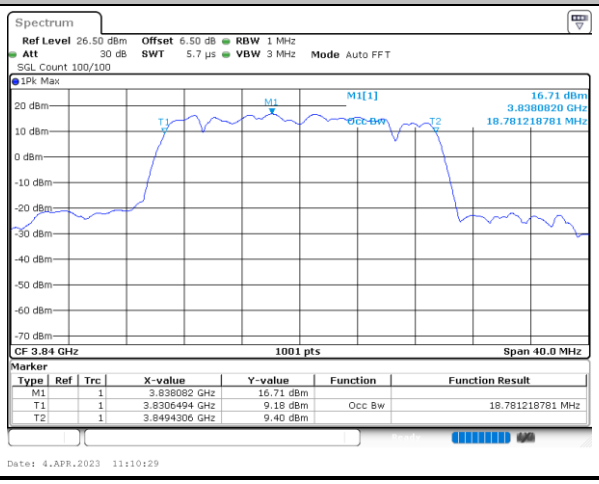
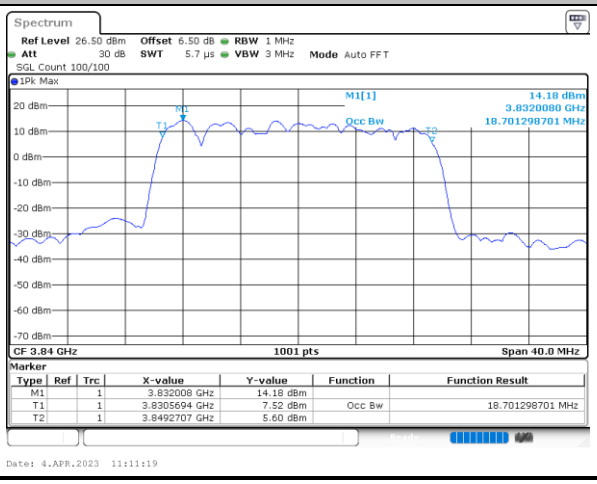


Occupied Bandwidth

Mode	FR1 n77 : OB BW(10 MHz) / CP-S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	8.75	8.73	8.69	8.73
Mode	FR1 n77 : OB BW(15 MHz) / CP-S OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	13.61	13.61	13.61	13.58
Mode	FR1 n77 : OB BW(20 MHz) / CP OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	18.66	18.66	18.78	18.70
Mode	FR1 n77 : OB BW(40 MHz) / CP OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	38.12	38.20	37.96	38.04
Mode	FR1 n77 : OB BW(50 MHz) / CP OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	47.75	47.75	47.75	47.55
Mode	FR1 n77 : OB BW(60 MHz) / CP OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	58.26	58.62	58.98	58.50
Mode	FR1 n77 : OB BW(80 MHz) / CP OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	78.00	78.16	77.52	78.00
Mode	FR1 n77 : OB BW(90 MHz) / CP OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	87.75	86.85	87.93	87.93
Mode	FR1 n77 : OB BW(100 MHz) / CP OFDM				
BW	CP				
Mod.	-	QPSK	16QAM	64QAM	256QAM
Middle CH	-	97.70	97.50	97.50	97.30

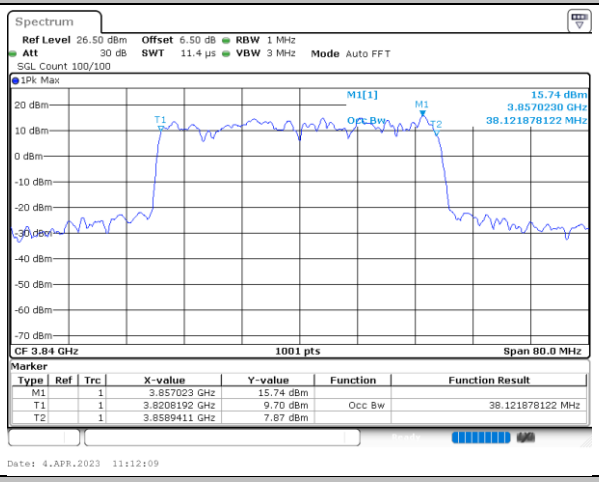
10MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

15MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

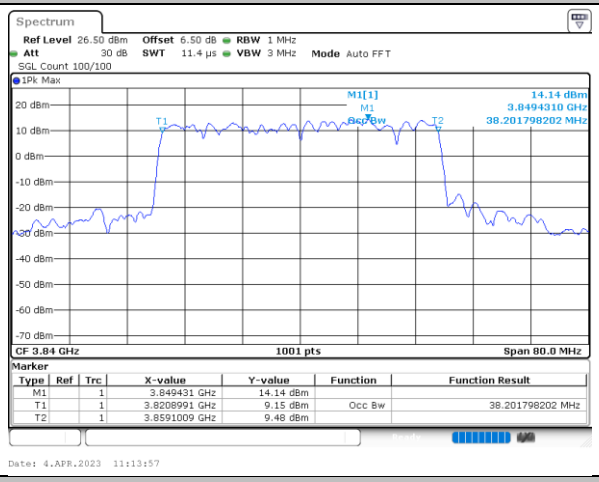
20MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

40MHz CP

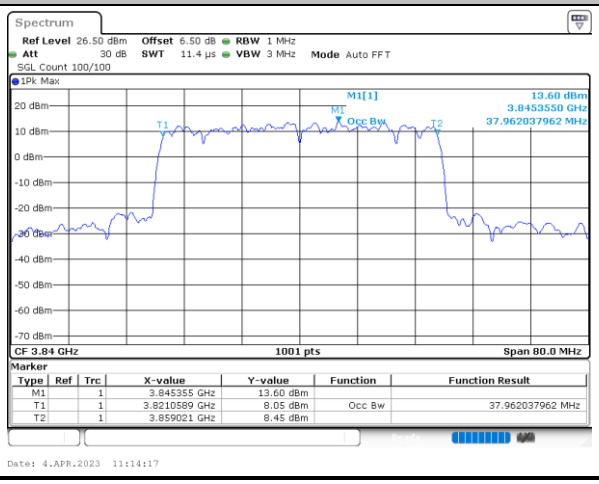
QPSK



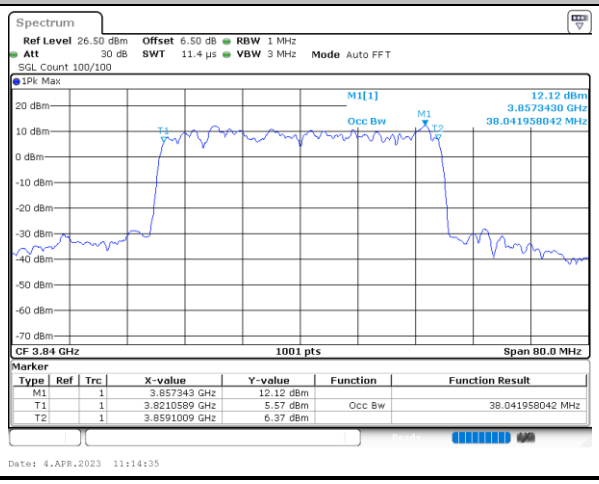
16QAM

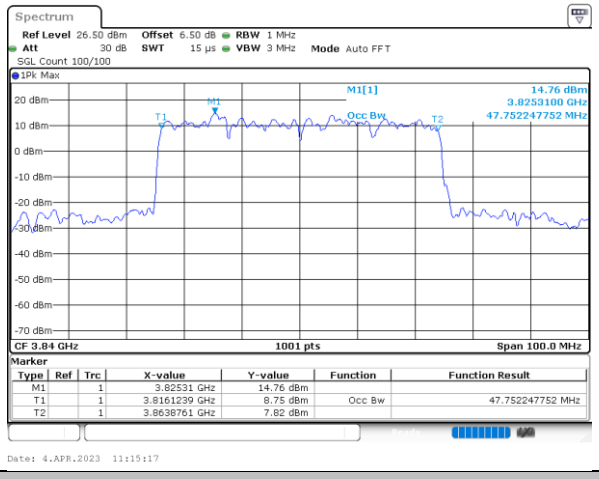
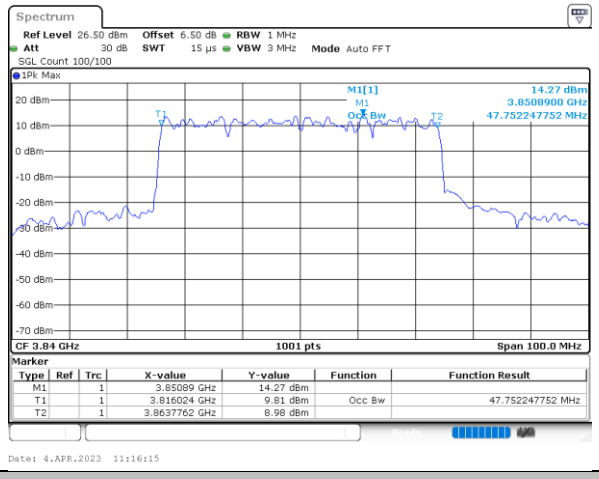
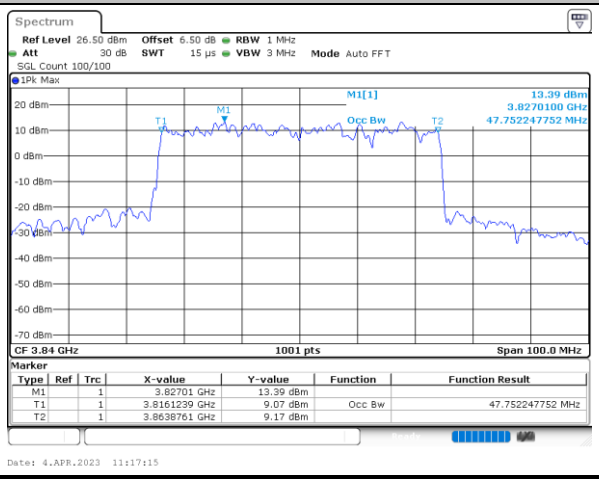
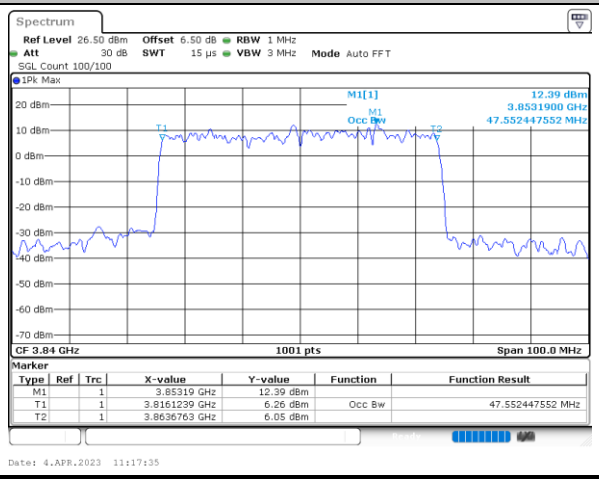


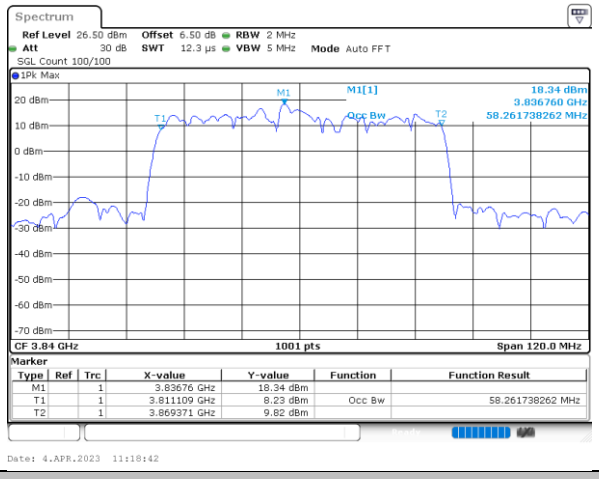
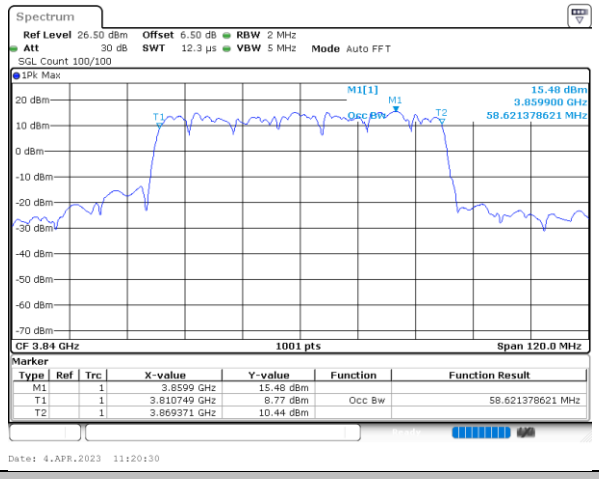
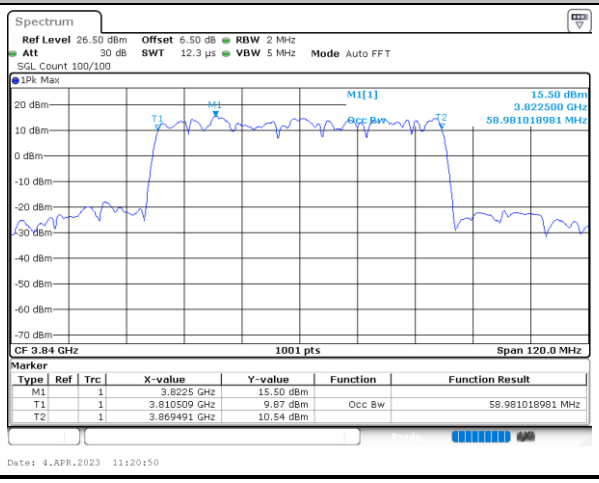
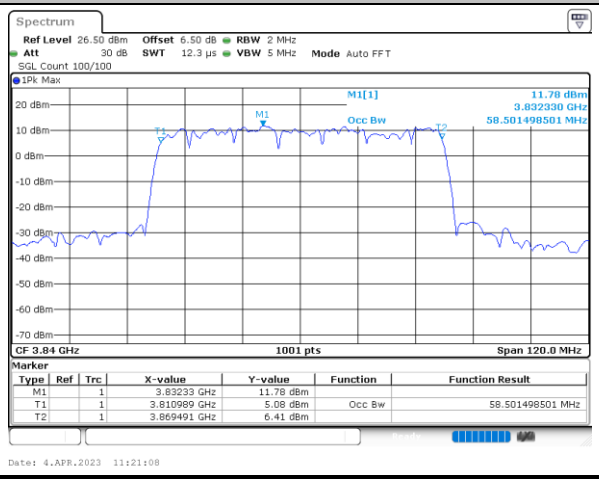
64QAM

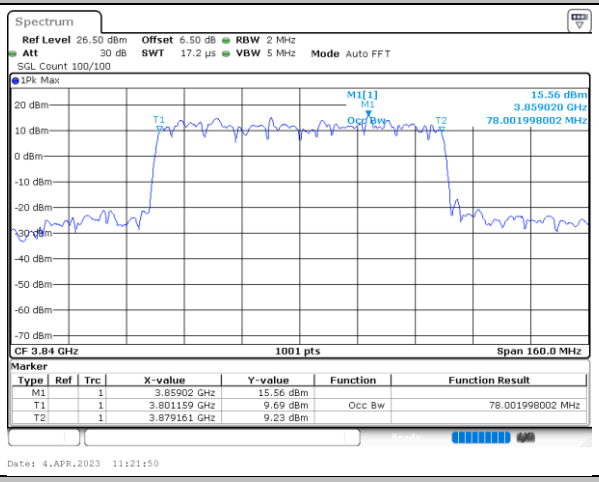
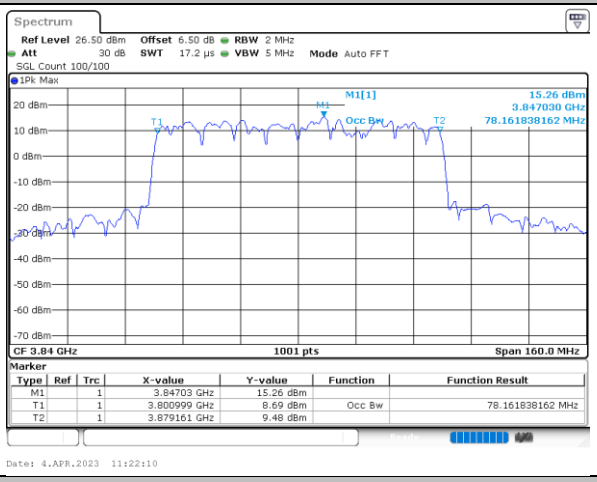
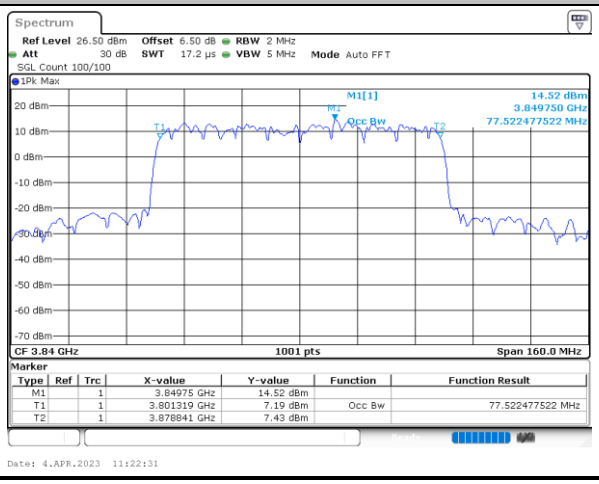
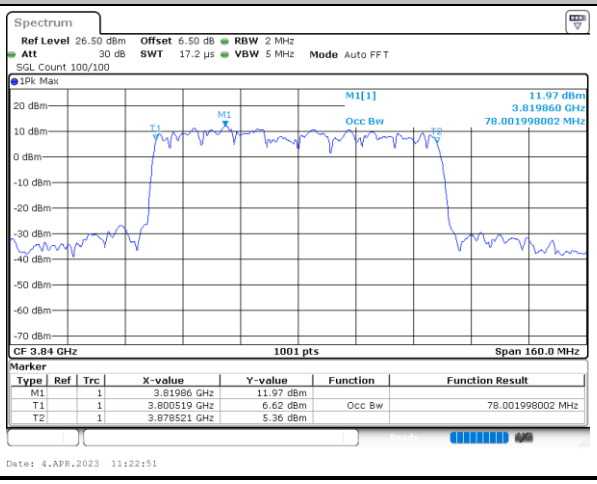


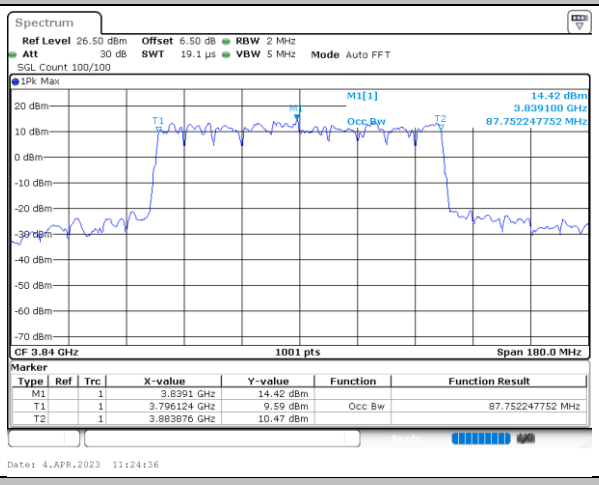
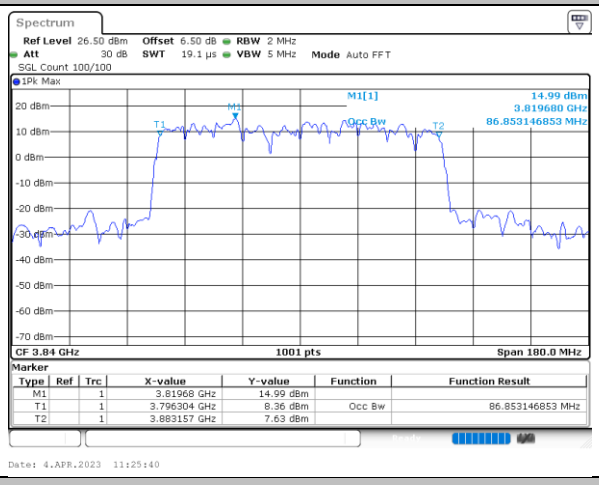
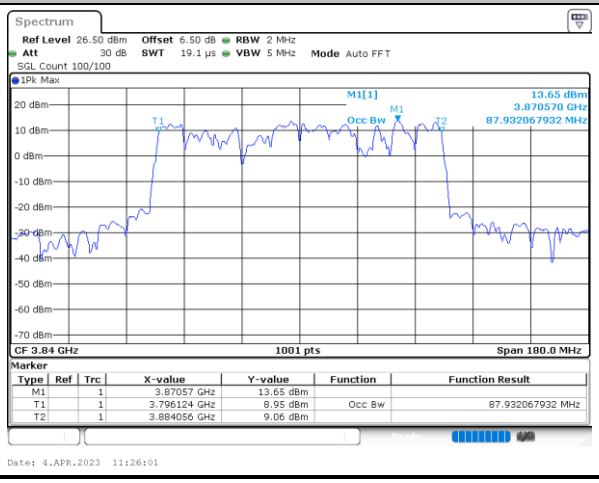
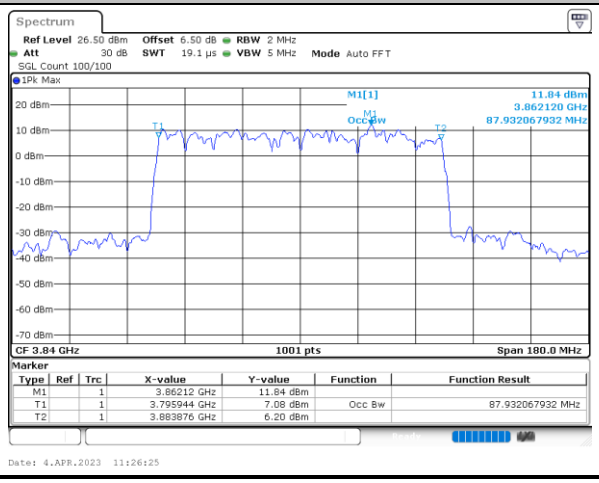
256QAM

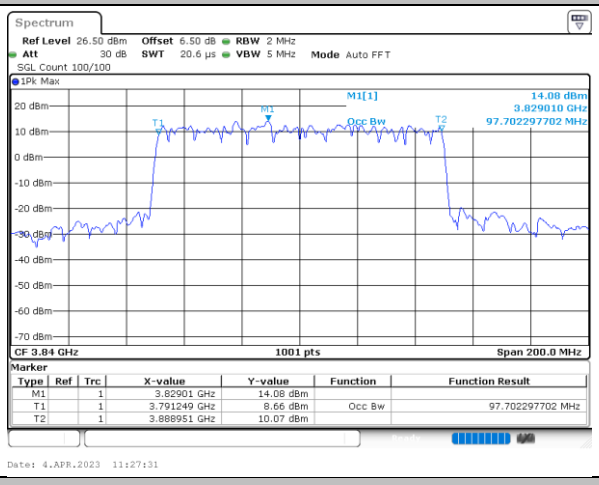
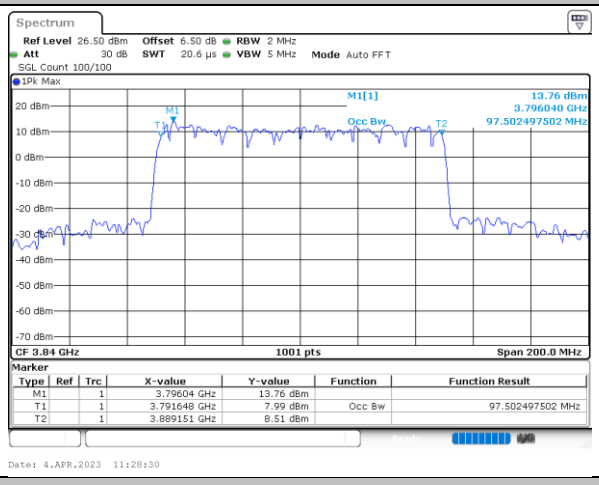
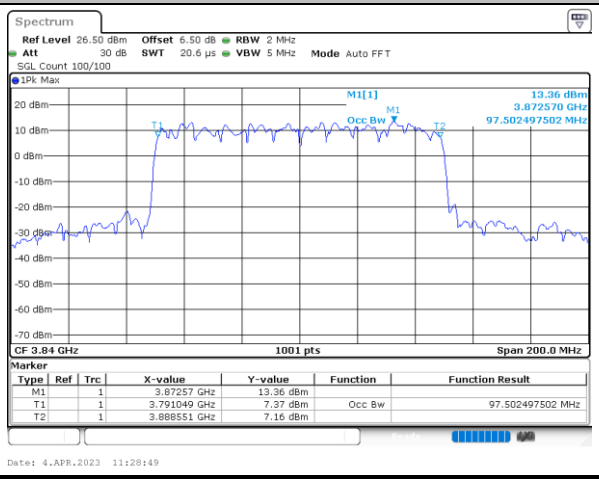
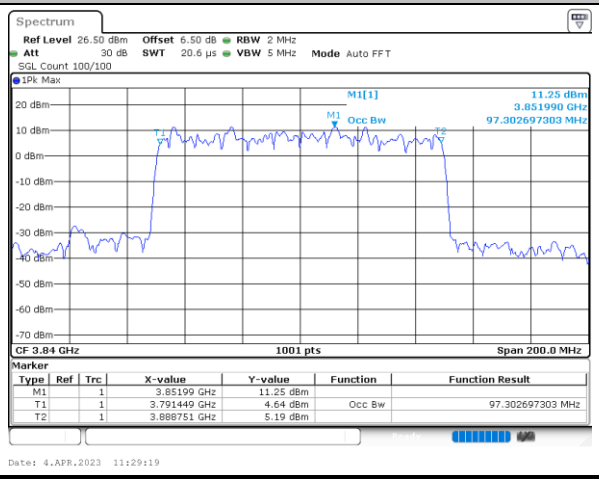


50MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

60MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

80MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

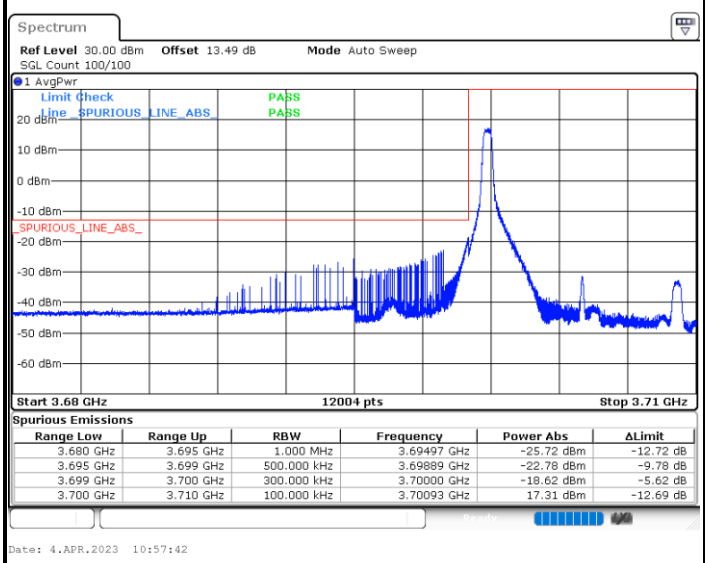
90MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

100MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

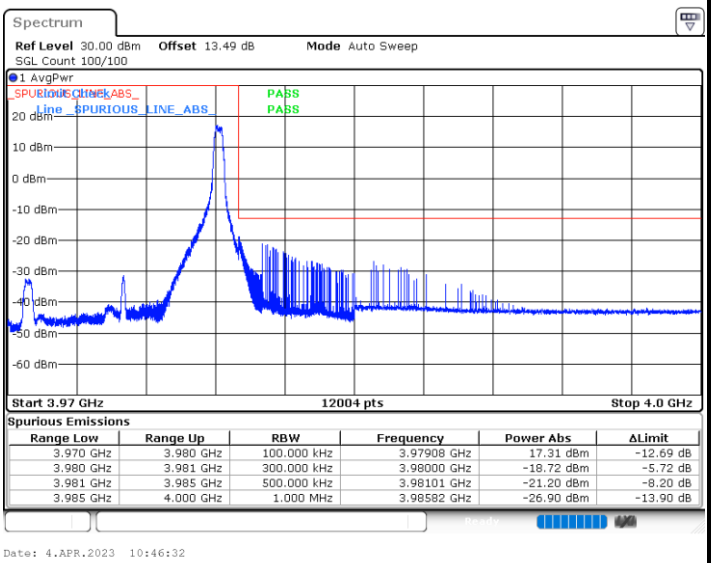
Conducted Band Edge

FR1 n77 / 10MHz / DFT-S OFDM / PI/2 BPSK

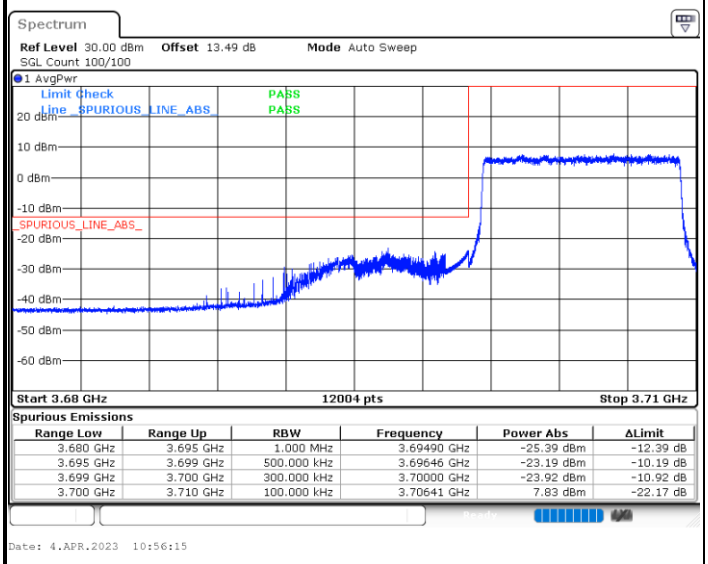
Lowest Band Edge / 1RB0



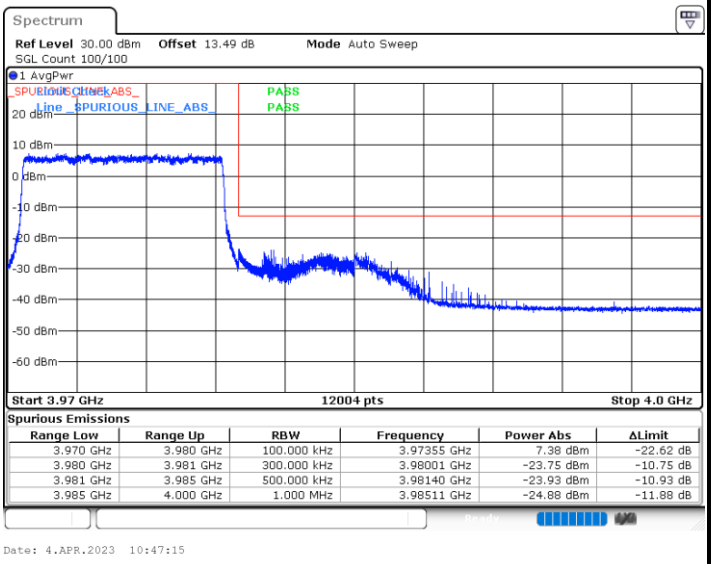
Highest Band Edge / 1RBmax

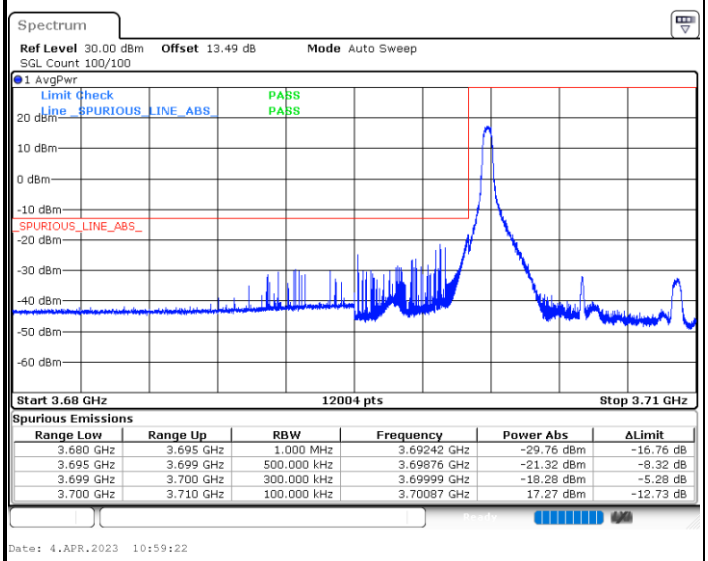
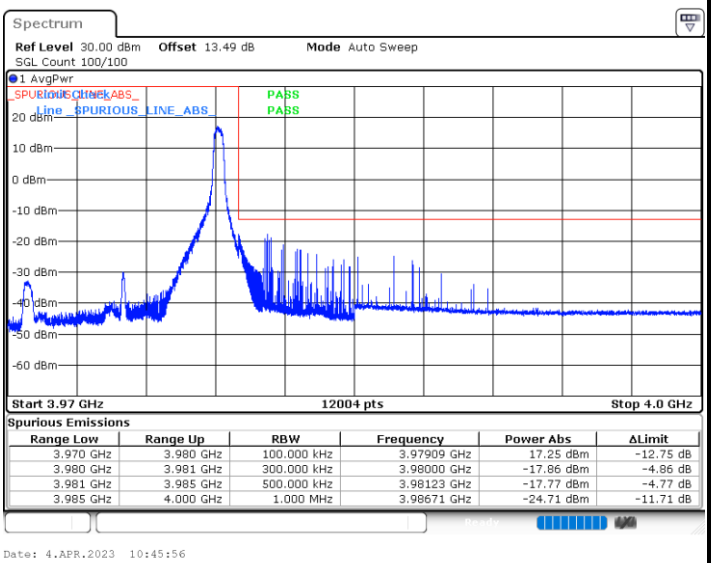
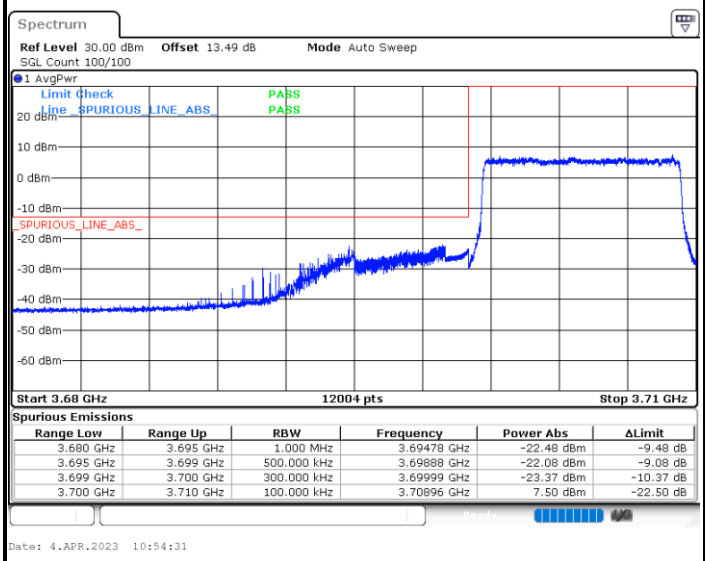
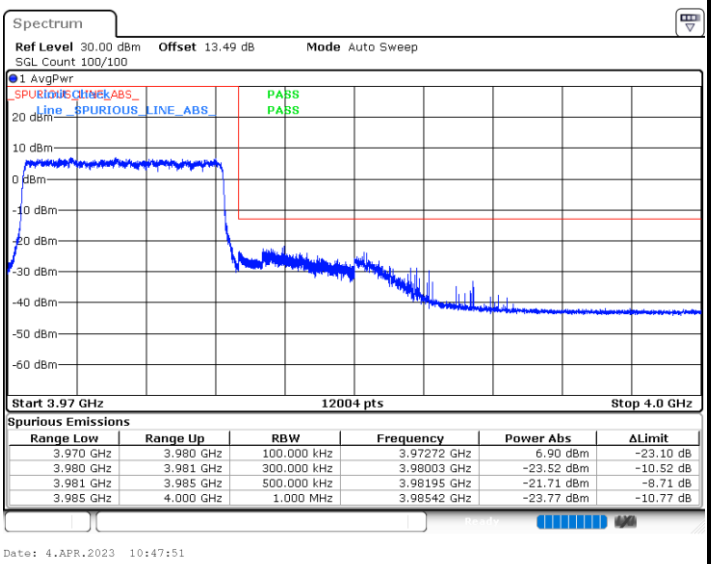


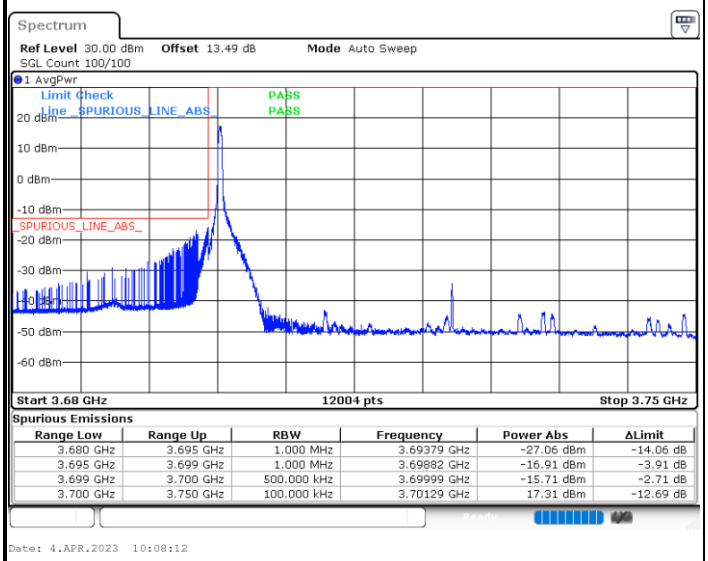
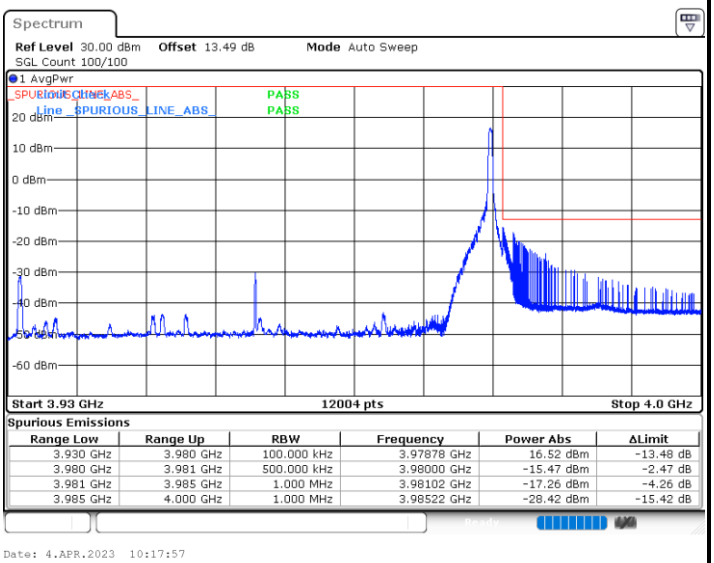
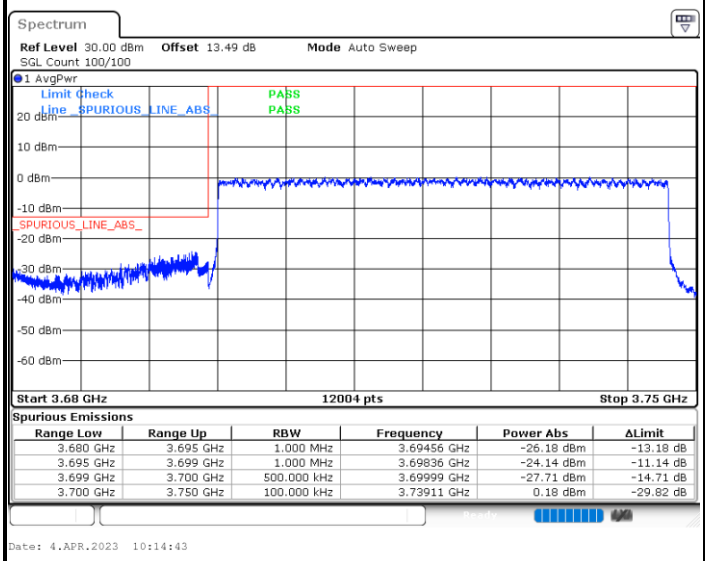
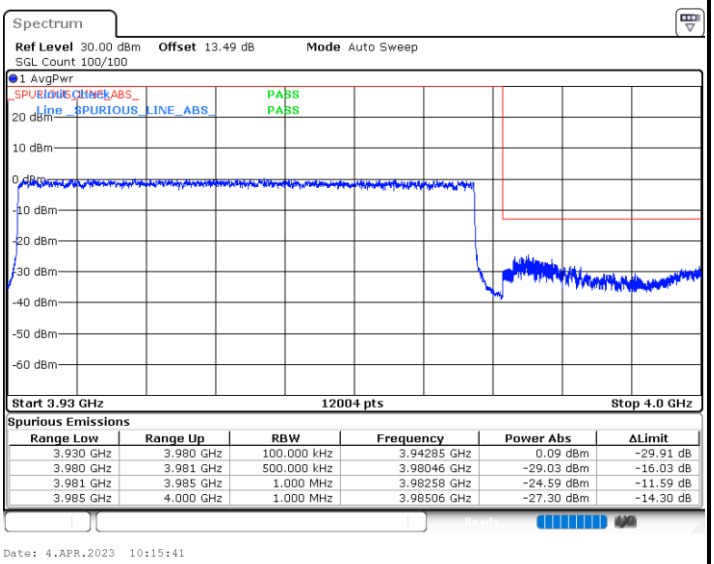
Lowest Band Edge / Full RB

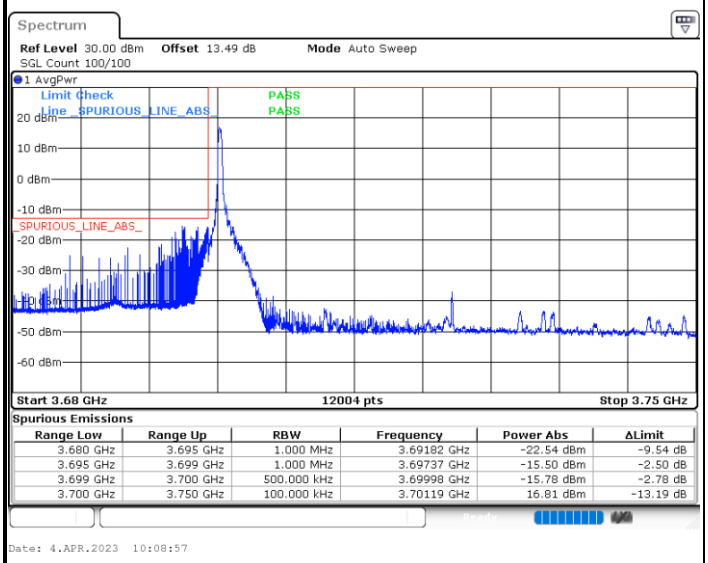
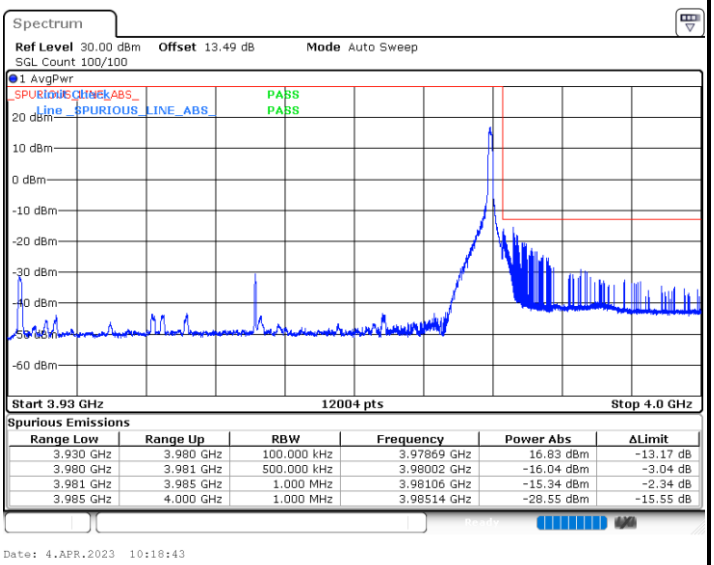
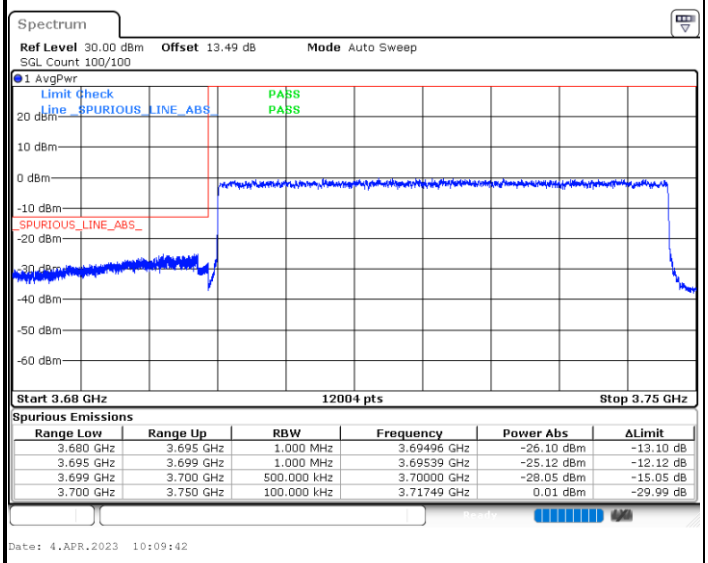
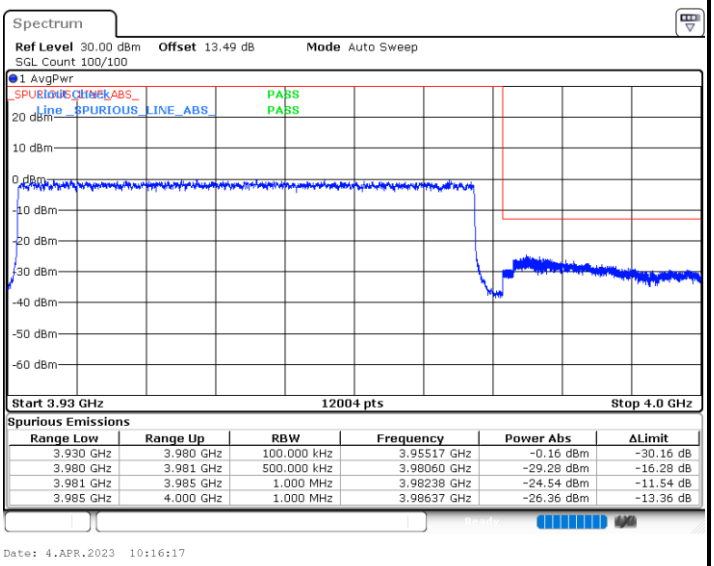


Highest Band Edge / Full RB

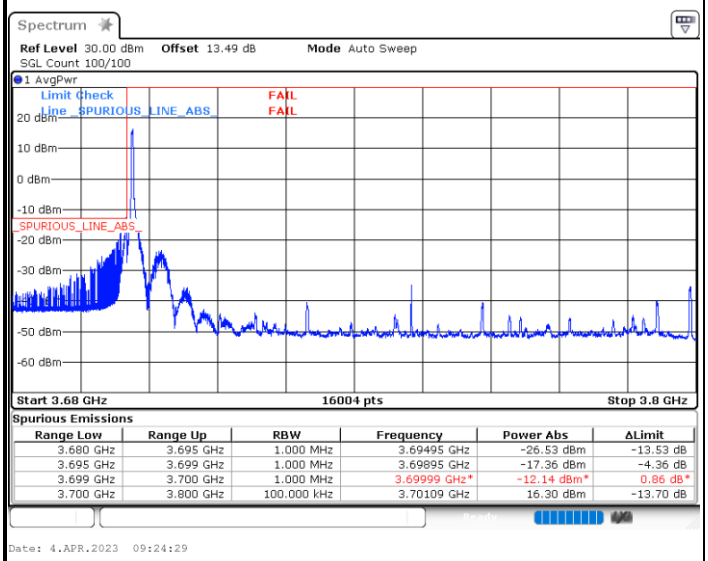


FR1 n77 / 10MHz / DFT-S OFDM / QPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

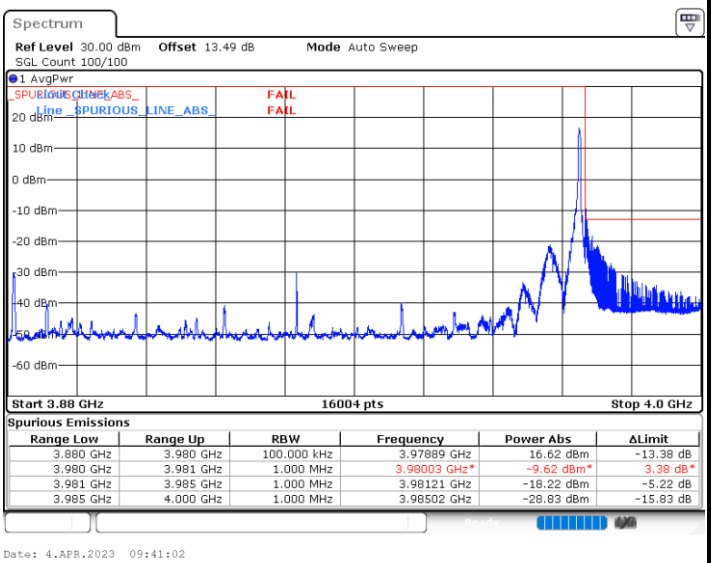
FR1 n77 / 50MHz / DFT-S OFDM / PI/2 BPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

FR1 n77 / 50MHz / DFT-S OFDM / QPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

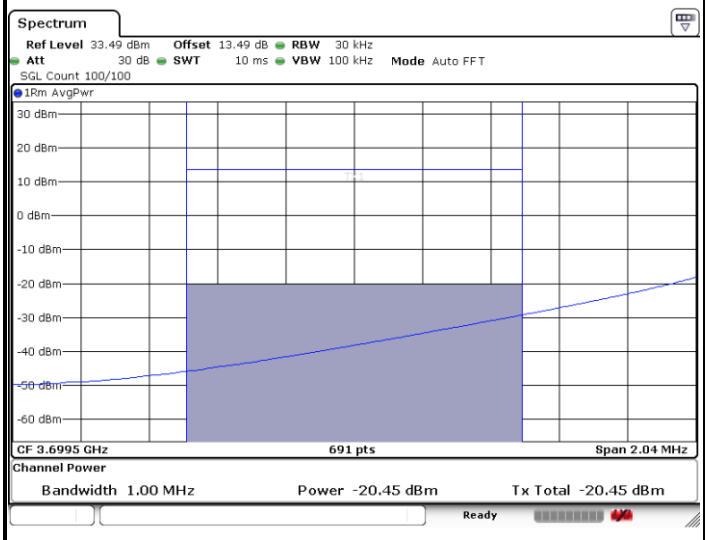
FR1 n77 / 100MHz / DFT-S OFDM / PI/2 BPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**



Date: 4.APR.2023 09:24:29



Date: 4.APR.2023 09:41:02



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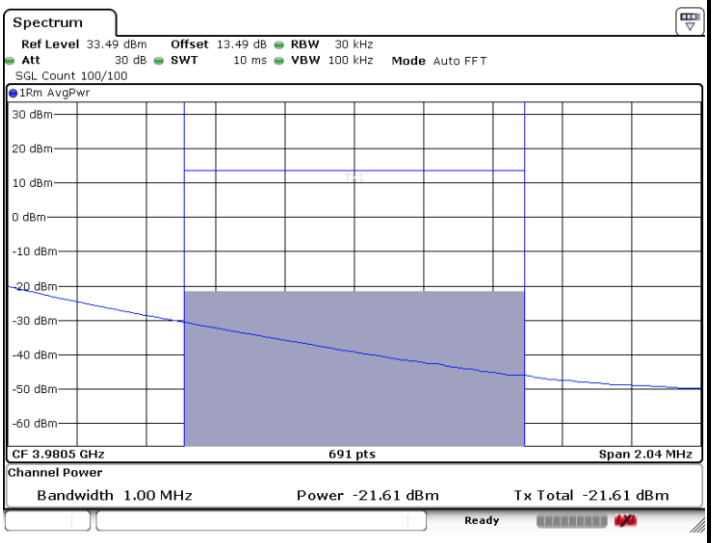

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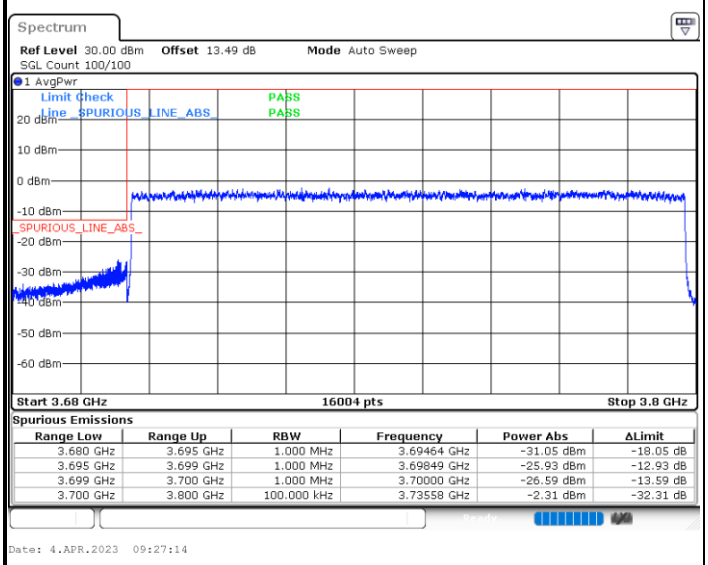
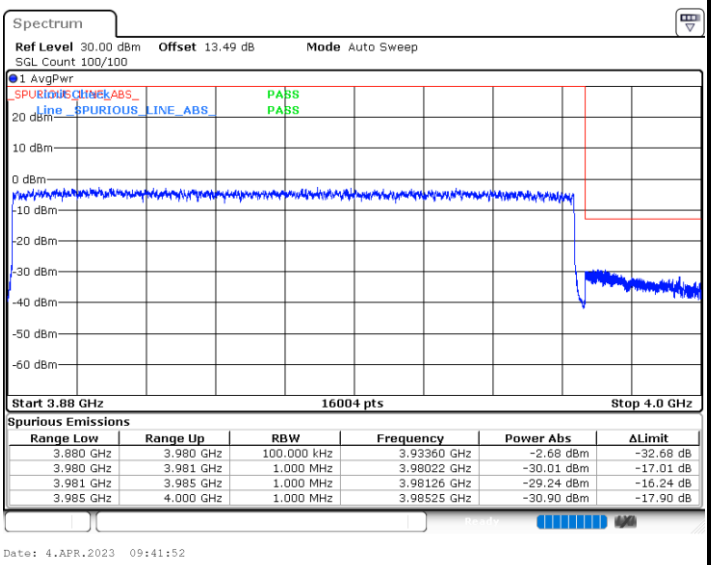
Lowest Band Edge / Full RB	Highest Band Edge / Full RB





FR1 n77 / 100MHz / DFT-S OFDM / QPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**