FCC RF Test Report

APPLICANT	: Motorola Mobility LLC
EQUIPMENT	: Mobile Cellular Phone
BRAND NAME	: Motorola
MODEL NAME	: XT2309-3
FCC ID	: IHDT56AG9
STANDARD	: 47 CFR Part 2, Part 27 Subpart Q
CLASSIFICATION	: PCS Licensed Transmitter Held to Ear (PCE)
TEST DATE(S)	: Dec. 16, 2022 ~ Dec. 23, 2022

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)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG2O2807-01H	Rev. 01	Initial issue of report	Jan. 10, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	—	Report Only	-
3.5	§27.50 (k)(4)	Peak-to-Average Ratio	<13dB	PASS	
3.6	§27.50 (k)(3)	EIRP	EIRP < 1W (30dBm)	PASS	-
3.7	§2.1049	Occupied Bandwidth	—	Report Only	-
3.8	§2.1051 §27.53 (n)(2)	Conducted Band Edge Measurement	-13dBm/MHz	PASS	-
3.9	§2.1051 §27.53 (n)(2)	Conducted Spurious Emission	-13dBm/MHz	PASS	-
3.10	§2.1055 §27.54	Frequency Stability Temperature & Voltage	Within the band	PASS	-
4.4	§2.1053 §27.53 (n)(2)	Radiated Spurious Emission	-13dBm/MHz	PASS	Under limit 35.44 dB at 10356.000 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

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2309-3
FCC ID	IHDT56AG9
IMEI Code	Conducted : 351347720007731 Radiation : 351347720008168
HW Version	DVT2
SW Version	T1TB33.20
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Product Feature	
Tx/Rx Frequency	5G NR n77/n78: 3450 MHz ~ 3550 MHz
Bandwidth	5G NR n77/n78: 10MHz / 15MHz / 20MHz / 30MHz / 40MHz / 50MHz / 60MHz / 70MHz / 80MHz / 90MHz / 100MHz
Antenna Gain	**<Ant. 2>** 5G NR n77 : -2.1 dBi 5G NR n78 : -2.1 dBi **<Ant. 4>** 5G NR n77 : -5.8 dBi 5G NR n78 : -5.8 dBi **<Ant. 5>** 5G NR n77 : -6.7 dBi 5G NR n78 : -6.7 dBi **<Ant. 7>** 5G NR n77 : -5.1 dBi 5G NR n78 : -5.1 dBi
Type of Modulation	CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM

Remark:

1. The maximum EIRP is calculated from max output power and max antenna gain, only the maximum EIRP of Antenna 2 is shown in the report.
2. 5G NR n77/n78 support SA mode and NSA mode. According to the maximum power between SA and NSA mode, SA covers NSA mode for n77, and NSA covers SA mode for n78.
3. The device supports n77(1T4R) SRS resources on ant.2/4/5/7, only the test data of worst ant.2 is showed in the report according to the maximum power.
4. The device supports HPUE mode for 5G NR n77.
5. For NSA mode of all EN-DC combination, we only show the combination of the maximum power among all NSA combinations in the report.
6. 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 Specification of Accessory

Specification of Accessory				
AC Adapter 1(US)	**Brand Name**	Motorola (Chenyang)	**Model Name**	MC-681N
AC Adapter 2(US)	**Brand Name**	Motorola (Acbel)	**Model Name**	MC-681N
Battery	**Brand Name**	Motorola(SCUD)	**Model Name**	PB50
USB Cable 1	**Brand Name**	Motorola (Saibao)	**Model Name**	SC18D24968
USB Cable 2	**Brand Name**	Motorola (Saibao)	**Model Name**	SC18D71644
Wireless Charging dock	**Marketing Name**	TurboPower 15W Wireless Charging Stand	**Model Name**	MW - 03

1.7 Maximum EIRP Power and Emission Designator

5G NR n77		PI/2 BPSK / QPSK		16QAM/64QAM/256QAM	
BW (MHz)	**Frequency Range (MHz)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**
100	3500.01	0.2529	97M9G7D	0.1766	98M3W7D

5G NR n78 DC_66A_n78A		PI/2 BPSK / QPSK		16QAM/64QAM/256QAM	
BW (MHz)	**Frequency Range (MHz)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**	**Maximum EIRP(W)**	**Emission Designator (99%OBW)**
100	3500.01	0.1567	97M7G7D	0.0906	97M9W7D

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

1.8 Testing Site

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 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-KS TH01-KS	CN1257	314309

1.9 Test Software

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

1.10 Applied Standards

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

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

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

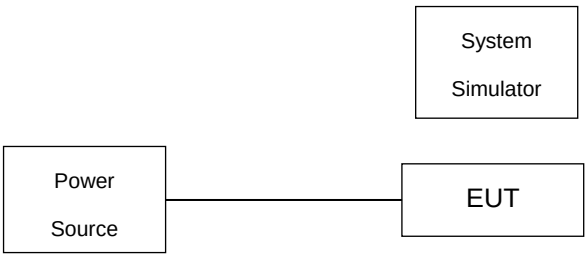
2.1 Test Mode

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.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Items	5G NR	Bandwidth (MHz)											Modulation			RB #			Test Channel		
		10	15	20	30	40	50	60	70	80	90	100	PI/2 BPSK	QPSK	16/64/256 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	v
	n78	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		v	
	n78											v	v	v		v		v		v	
26dB and 99% Bandwidth	n77	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	
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	v
	n78	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	
	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. Based on engineering evaluation, only the worst modulations test results are shown in the report. 5. Frequency Stability：Normal Voltage = 3.89V ；Low Voltage =3.4V.；High Voltage =4.48V																				

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	MT8820C	N/A	N/A	Unshielded, 1.8 m
3.	Base Station	Anritsu	MT8821C	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.

Following shows an offset computation example with cable loss 6.5 dB.

Example :

Offset(dB) = RF cable loss(dB).

= 6.5 (dB)

2.5 Frequency List of Low/Middle/High Channels

5G n77/n78 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
100	Channel	-	633334	-
	Frequency	-	3500.01	-
90	Channel	633000	633334	633668
	Frequency	3495	3500.01	3505.02
80	Channel	632668	633334	634000
	Frequency	3490.02	3500.01	3510
70	Channel	632334	633334	634334
	Frequency	3485.01	3500.01	3515.01
60	Channel	632000	633334	634668
	Frequency	3480	3500.01	3520.02
50	Channel	631668	633334	635000
	Frequency	3475.02	3500.01	3525
40	Channel	631334	633334	635334
	Frequency	3470.01	3500.01	3530.01
30	Channel	631000	633334	635668
	Frequency	3465	3500.01	3535.02
20	Channel	630668	633334	636000
	Frequency	3460.02	3500.01	3540
15	Channel	630500	633334	636168
	Frequency	3457.5	3500.01	3542.52
10	Channel	630334	633334	636334
	Frequency	3455.01	3500.01	3545.01

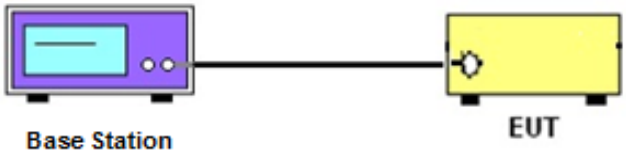
3 Conducted Test Items

3.1 Measuring Instruments

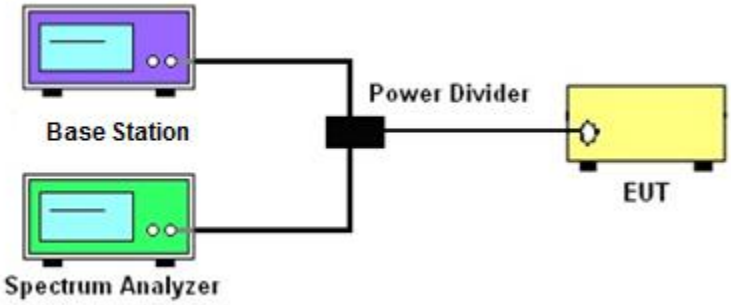
See list of measuring instruments of this test report.

3.2 Test Setup

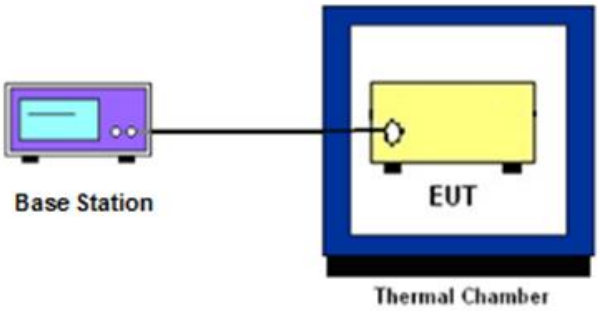
3.2.1 Conducted Output Power



3.2.2 Peak-to-Average Ratio, Occupied / 26dB Bandwidth ,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 Measurement

3.4.1 Description of the Conducted Output Power Measurement

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

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 5.2.6 (PAPR).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set EUT in maximum power output.
4. Set the RBW = 1MHz, VBW = 3MHz, Detector = Peak, Trace mode = max hold, Set span ≥ 2 × OBW in spectrum analyzer.
5. Set the RBW = 1MHz, VBW = 3MHz, Detector = power averaging, Trace mode = max hold, Set span ≥ 2 × OBW in spectrum analyzer.
6. Add [10 log (1/duty cycle)] to the measured maximum power level to compute the average power during continuous transmission.
7. PAPR (dB) = P_{Pk} (dBm) − P_{Avg} (dBm)
   where
   PAPR peak-to-average power ratio, in dB
   P_{Pk} measured peak power level, in dBm
   P_{Avg} measured average power level, in dBm
8. Record the deviation as Peak to Average Ratio.

3.6 EIRP

3.6.1 Description of EIRP Limit

§ 27.50 (k)(3)

Mobile devices are limited to 1Watt (30 dBm) EIRP. Mobile devices operating in these bands must employ a means for limiting power to the minimum necessary for successful communications

3.6.2 Test Procedures

1. According to KDB 412172 D01 Power Approach,
2. 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

3.7 Occupied Bandwidth

3.7.1 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.

3.7.2 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.

3.8 Conducted Band Edge Measurement

3.8.1 Description of Conducted Band Edge Measurement

§ 27.53 (n)(2)

For mobile operations in the 3450-3550 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, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 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.

3.8.2 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 band edges of low and high channels for the highest RF powers were measured.
4. Set RBW ≥ 1% EBW but limited to a maximum of 200 kHz in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz and 5 MHz removed from the band edge, set RBW ≥ 500KHz.
6. Beyond the 5 MHz removed from the band edge, set RBW = 1MHz.
7. Set spectrum analyzer with RMS detector.
8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
9. Checked that all the results comply with the emission limit line.

3.9 Conducted Spurious Emission Measurement

3.9.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges shall not exceed −13 dBm/MHz.

It is measured by means of a calibrated spectrum analyzer and scanned from 9 kHz up to a frequency including its 10^{th} harmonic.

3.9.2 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. Checked that all the results comply with the emission limit line.

3.10 Frequency Stability Measurement

3.10.1 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.

3.10.2 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.

3.10.3 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.

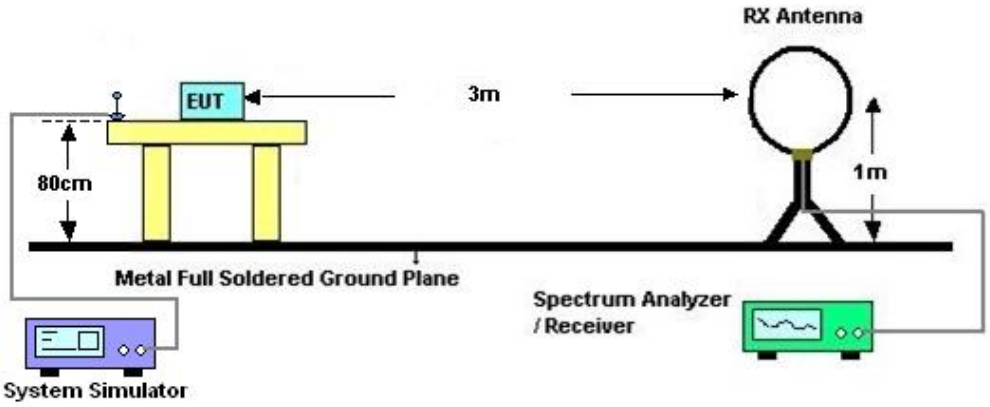
4 Radiated Test Items

4.1 Measuring Instruments

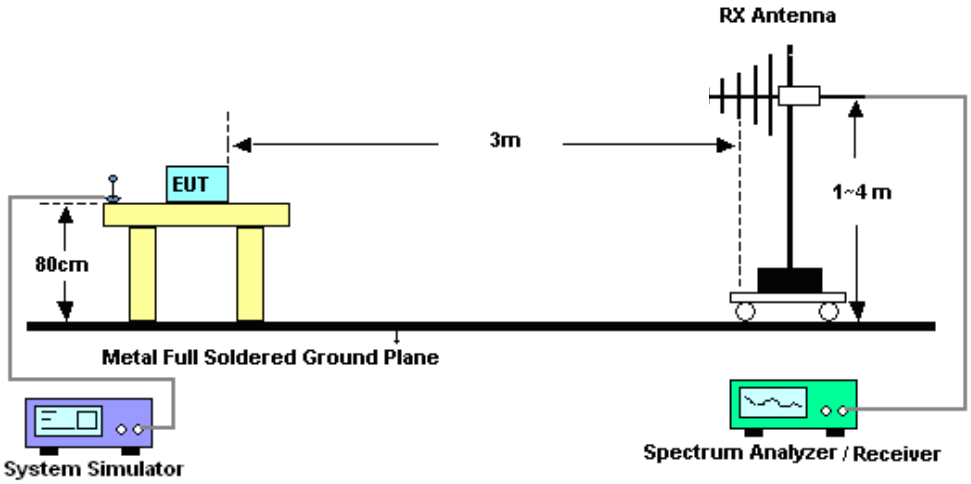
See list of measuring instruments of this test report.

4.2 Test Setup

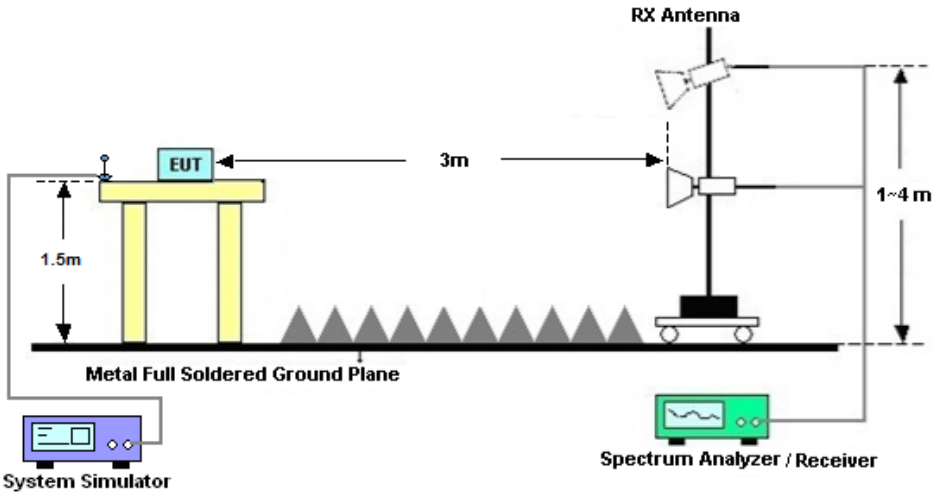
4.2.1 For radiated test below 30MHz



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 Measurement

4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI/TIA-603-E.

The power of any emission outside of the authorized operating frequency ranges shall not exceed −13 dBm/MHz.

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.
   EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
   ERP (dBm) = EIRP - 2.15
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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	Dec. 22, 2022~ Dec. 23, 2022	Oct. 11, 2023	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	/	Dec. 22, 2022~ Dec. 23, 2022	/	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 15, 2022	Dec. 22, 2022~ Dec. 23, 2022	Jul. 14, 2023	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471079	10Hz-44G,MAX 30dB	Oct. 12, 2022	Dec. 16, 2022	Oct. 11, 2023	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Dec. 16, 2022	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 24, 2022	Dec. 16, 2022	May 23, 2023	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1284	1GHz~18GHz	Jan. 05, 2022	Dec. 16, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Dec. 16, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 05, 2022	Dec. 16, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	Dec. 16, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
high gain Amplifier	EM	EM01G18GA	060840	1Ghz-18Ghz	Oct. 12, 2022	Dec. 16, 2022	Oct. 11, 2023	Radiation (03CH04-KS)
Amplifier	Agilent	8449B	3008A02370	1Ghz-18Ghz	Oct. 12, 2022	Dec. 16, 2022	Oct. 11, 2023	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Dec. 16, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Dec. 16, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Dec. 16, 2022	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))	3.3dB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8dB

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

Appendix A. Test Results of Conducted Test

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

Conducted Output Power(Average power) and EIRP

5G NR n77

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP	EIRP	EIRP
Channel				633334	633334	633334				
Frequency (MHz)				3500.01	3500.01	3500.01		L	M	H
100	PI/2 BPSK	1	1		26.13		-2.1		0.2529	
100	QPSK	1	1		26.05		-2.1		0.2483	
100	QPSK	1	137		25.67		-2.1		0.2275	
100	QPSK	1	271		25.63		-2.1		0.2254	
100	QPSK	135	0		24.90		-2.1		0.1905	
100	QPSK	135	67		25.75		-2.1		0.2317	
100	QPSK	135	138		24.86		-2.1		0.1888	
100	QPSK	270	0		24.74		-2.1		0.1837	
100	16QAM	1	1		24.57		-2.1		0.1766	
100	64QAM	1	1		23.30		-2.1		0.1318	
100	256QAM	1	1		21.11		-2.1		0.0796	
Channel				633000	633334	633668	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3495	3500.01	3505.02				
90	PI/2 BPSK	1	1	25.87	25.70	25.72	-2.1	0.2382	0.2291	0.2301
90	QPSK	1	1	25.96	25.85	25.79	-2.1	0.2432	0.2371	0.2339
Channel				632668	633334	634000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3490.02	3500.01	3510				
80	PI/2 BPSK	1	1	25.89	25.98	25.84	-2.1	0.2393	0.2443	0.2366
80	QPSK	1	1	25.93	25.84	25.89	-2.1	0.2415	0.2366	0.2393
Channel				632334	633334	634334	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3485.01	3500.01	3515.01				
70	PI/2 BPSK	1	1	25.93	25.76	25.88	-2.1	0.2415	0.2323	0.2388
70	QPSK	1	1	25.91	25.81	25.85	-2.1	0.2404	0.2350	0.2371
Channel				632000	633334	634668	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3480	3500.01	3520.02				
60	PI/2 BPSK	1	1	25.92	25.76	26.02	-2.1	0.2410	0.2323	0.2466
60	QPSK	1	1	25.90	25.86	25.80	-2.1	0.2399	0.2377	0.2344
Channel				631668	633334	635000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3475.02	3500.01	3525				
50	PI/2 BPSK	1	1	25.92	25.98	26.01	-2.1	0.2410	0.2443	0.2460

50	QPSK	1	1	25.81	25.75	25.79	-2.1	0.2350	0.2317	0.2339
Channel				631334	633334	635334	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3470.01	3500.01	3530.01				
40	PI/2 BPSK	1	1	26.01	26.02	26.00	-2.1	0.2460	0.2466	0.2455
40	QPSK	1	1	25.79	25.85	25.73	-2.1	0.2339	0.2371	0.2307
Channel				631000	633334	635668	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3465	3500.01	3535.02				
30	PI/2 BPSK	1	1	26.09	26.07	26.09	-2.1	0.2506	0.2495	0.2506
30	QPSK	1	1	25.93	25.74	25.77	-2.1	0.2415	0.2312	0.2328
Channel				630668	633334	636000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3460.02	3500.01	3540				
20	PI/2 BPSK	1	1	25.88	25.96	26.01	-2.1	0.2388	0.2432	0.2460
20	QPSK	1	1	25.95	25.79	25.88	-2.1	0.2427	0.2339	0.2388
Channel				630500	633334	636168	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3457.5	3500.01	3542.52				
15	PI/2 BPSK	1	1	25.98	26.02	26.10	-2.1	0.2443	0.2466	0.2512
15	QPSK	1	1	25.77	25.89	25.94	-2.1	0.2328	0.2393	0.2421
Channel				630334	633334	636334	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3455.01	3500.01	3545.01				
10	PI/2 BPSK	1	1	25.79	25.90	25.96	-2.1	0.2339	0.2399	0.2432
10	QPSK	1	1	25.79	25.84	25.88	-2.1	0.2339	0.2366	0.2388

5G NR n78(DC_66A_n78A)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP	EIRP	EIRP
Channel				633334	633334	633334		L	M	H
Frequency (MHz)				3500.01	3500.01	3500.01				
100	PI/2 BPSK	1	1		24.05		-2.1		0.1567	
100	QPSK	1	1		23.98		-2.1		0.1542	
100	QPSK	1	137		23.90		-2.1		0.1514	
100	QPSK	1	271		23.82		-2.1		0.1486	
100	QPSK	135	0		21.80		-2.1		0.0933	
100	QPSK	135	67		23.80		-2.1		0.1479	
100	QPSK	135	138		21.75		-2.1		0.0923	
100	QPSK	270	0		21.84		-2.1		0.0942	
100	16QAM	1	1		21.67		-2.1		0.0906	
100	64QAM	1	1		20.41		-2.1		0.0678	
100	256QAM	1	1		18.05		-2.1		0.0394	
Channel				633000	633334	633668	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3495	3500.01	3505.02				
90	PI/2 BPSK	1	1	23.79	23.80	23.84	-2.1	0.1476	0.1479	0.1493
90	QPSK	1	1	23.95	23.88	23.79	-2.1	0.1531	0.1507	0.1476

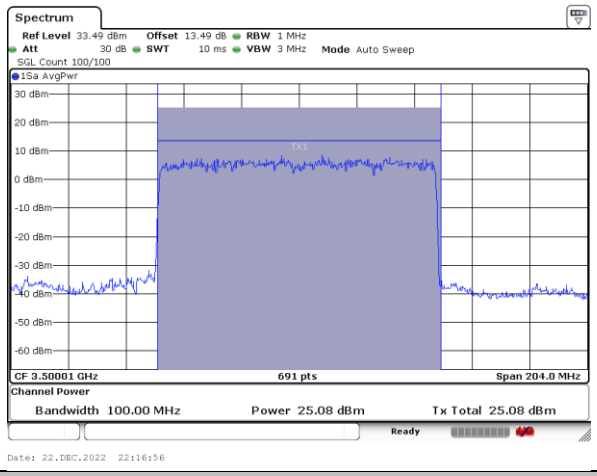
Channel				632668	633334	634000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3490.02	3500.01	3510				
80	PI/2 BPSK	1	1	23.79	23.80	23.81	-2.1	0.1476	0.1479	0.1483
80	QPSK	1	1	23.85	23.96	23.80	-2.1	0.1496	0.1535	0.1479
Channel				632334	633334	634334	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3485.01	3500.01	3515.01				
70	QPSK	1	1	23.78	23.90	23.82	-2.1	0.1472	0.1514	0.1486
70	QPSK	1	1	23.82	23.92	23.77	-2.1	0.1486	0.1521	0.1469
Channel				632000	633334	634668	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3480	3500.01	3520.02				
60	PI/2 BPSK	1	1	23.94	23.95	23.97	-2.1	0.1528	0.1531	0.1538
60	QPSK	1	1	23.77	23.84	23.79	-2.1	0.1469	0.1493	0.1476
Channel				631668	633334	635000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3475.02	3500.01	3525				
50	PI/2 BPSK	1	1	23.86	23.85	23.94	-2.1	0.1500	0.1496	0.1528
50	QPSK	1	1	23.88	23.71	23.78	-2.1	0.1507	0.1449	0.1472
Channel				631334	633334	635334	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3470.01	3500.01	3530.01				
40	PI/2 BPSK	1	1	23.98	24.01	24.03	-2.1	0.1542	0.1552	0.1560
40	QPSK	1	1	23.81	23.77	23.79	-2.1	0.1483	0.1469	0.1476
Channel				631000	633334	635668	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3465	3500.01	3535.02				
30	PI/2 BPSK	1	1	24.02	24.00	23.98	-2.1	0.1556	0.1549	0.1542
30	QPSK	1	1	23.70	23.79	23.84	-2.1	0.1445	0.1476	0.1493
Channel				630668	633334	636000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3460.02	3500.01	3540				
20	PI/2 BPSK	1	1	23.90	24.01	23.88	-2.1	0.1514	0.1552	0.1507
20	QPSK	1	1	23.80	23.75	23.91	-2.1	0.1479	0.1462	0.1517
Channel				630500	633334	636168	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3457.5	3500.01	3542.52				
15	QPSK	1	1	24.01	23.99	23.89	-2.1	0.1552	0.1545	0.1510
15	QPSK	1	1	23.91	23.81	23.77	-2.1	0.1517	0.1483	0.1469
Channel				630334	633334	636334	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				3455.01	3500.01	3545.01				
10	QPSK	1	1	23.90	24.02	24.01	-2.1	0.1514	0.1556	0.1552
10	QPSK	1	1	23.79	23.84	23.88	-2.1	0.1476	0.1493	0.1507

FR1 n77

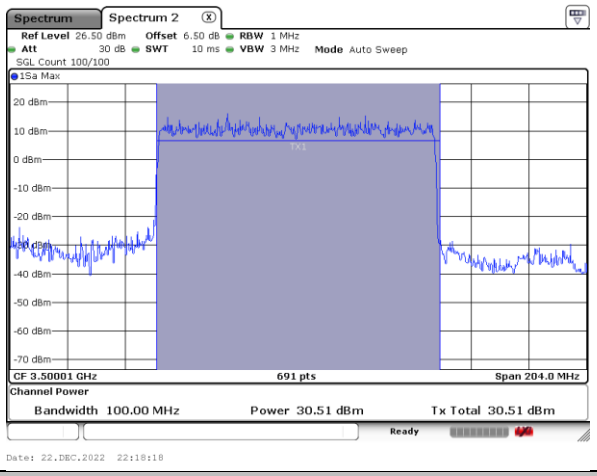
Peak-to-Average Ratio

Mode	FR1 n77 /100MHz / DFT-S OFDM		
Mod.	100M		Limit: 13dB
RB Size	BPSK	QPSK	Result
Middle CH	5.43	5.42	PASS

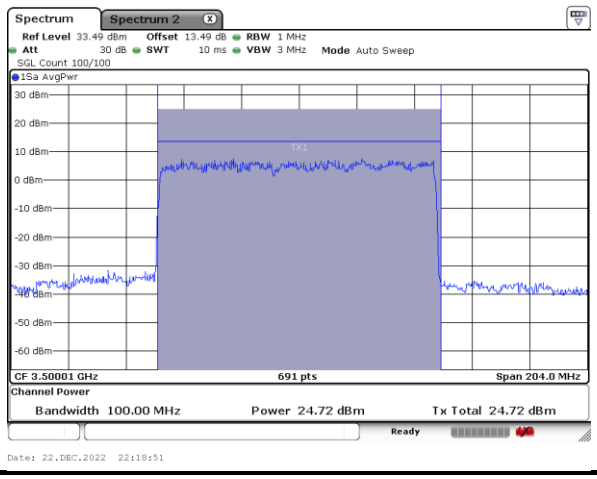
BPSK-A



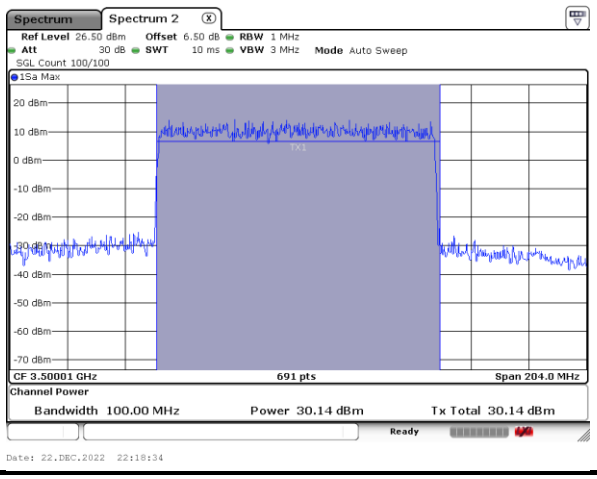
BPSK-P



QPSK-A

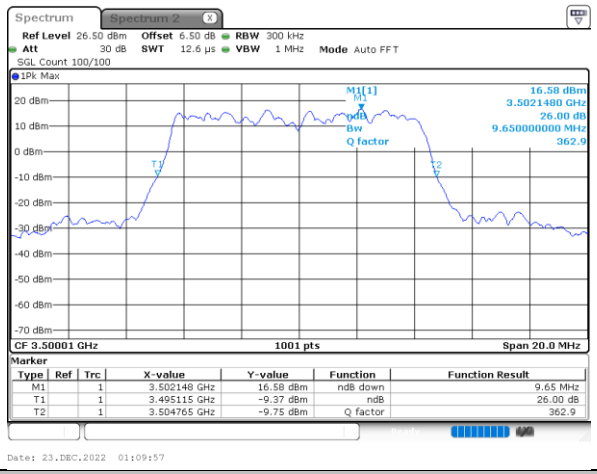
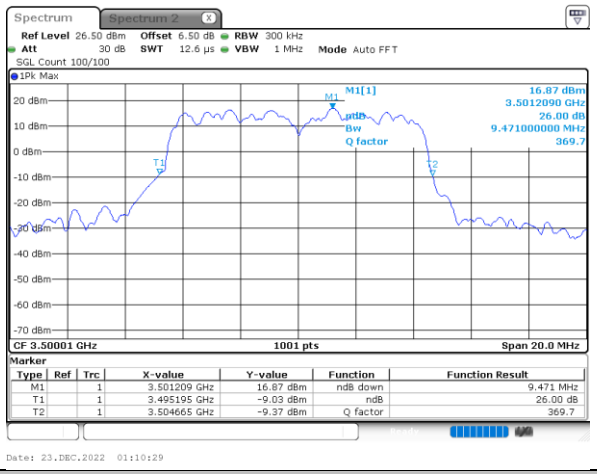
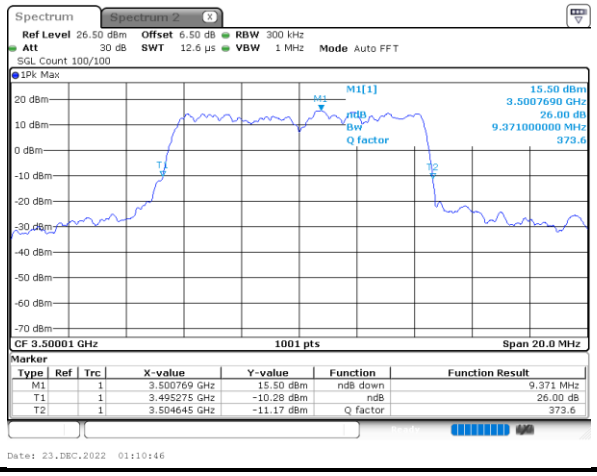
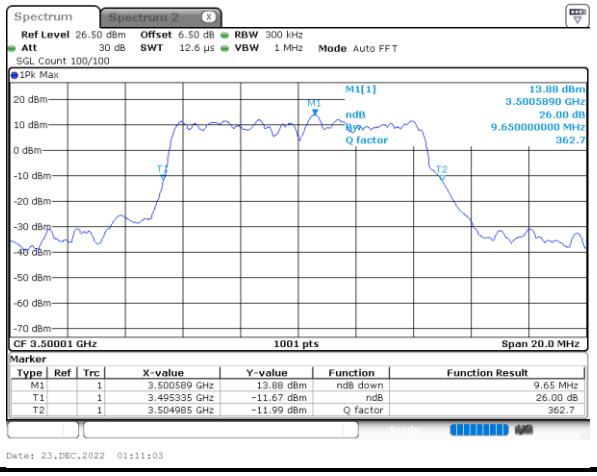


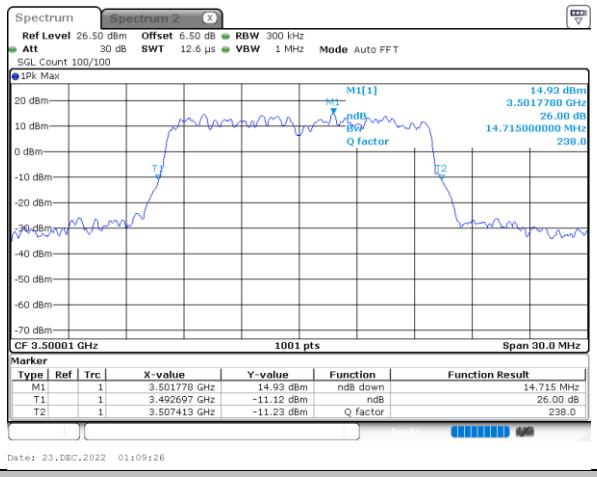
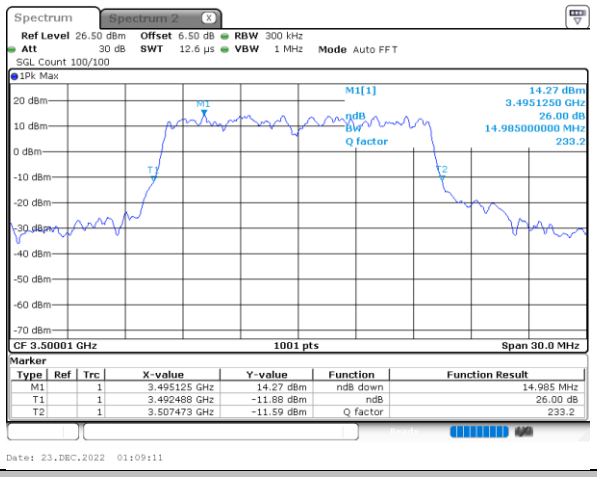
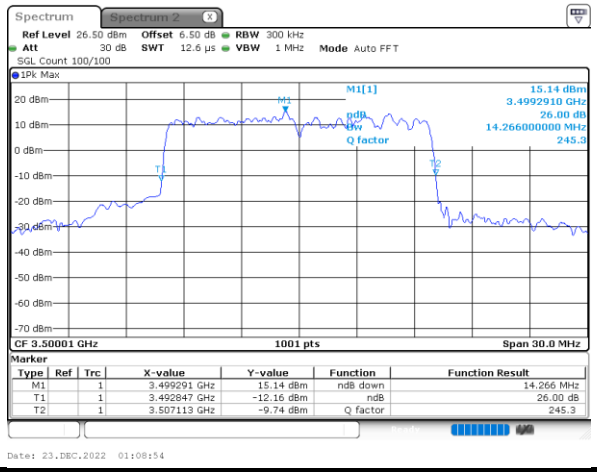
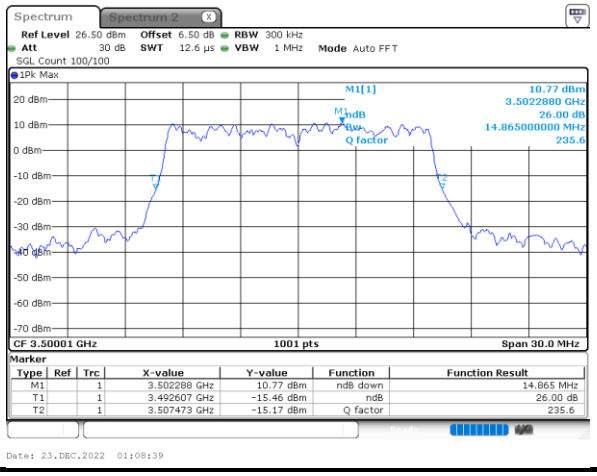
QPSK-P

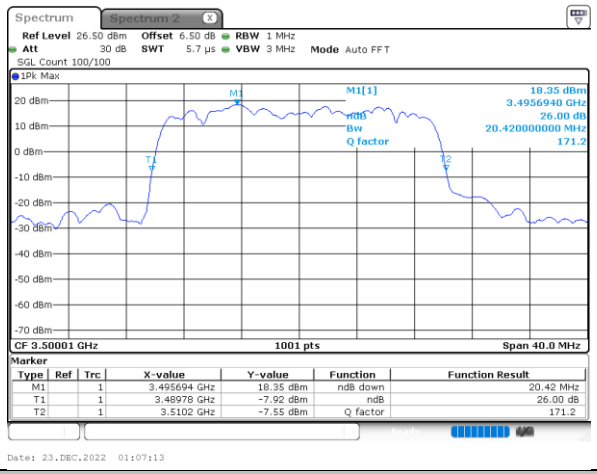
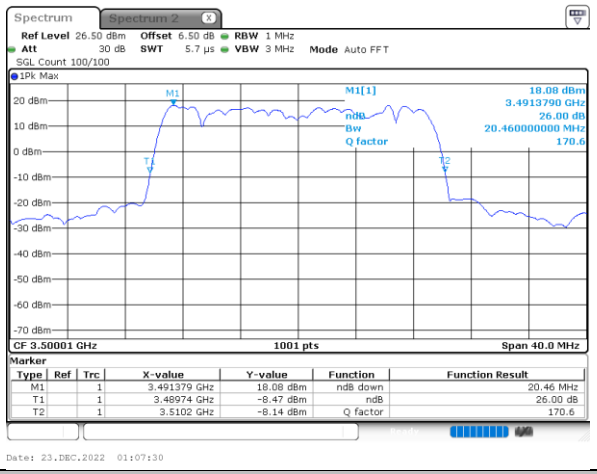
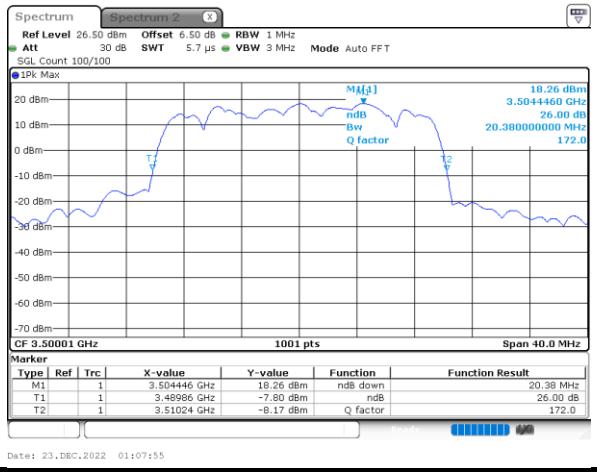
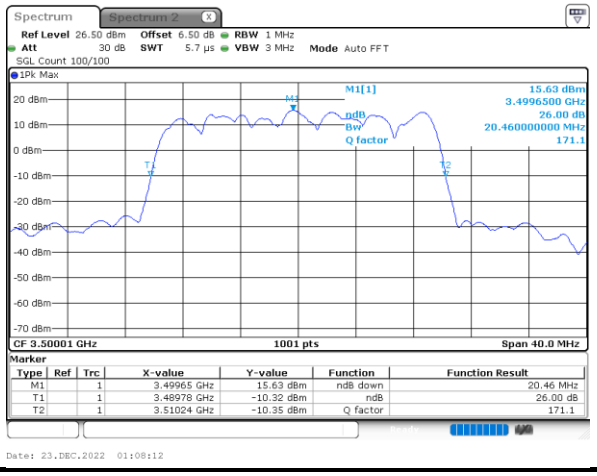


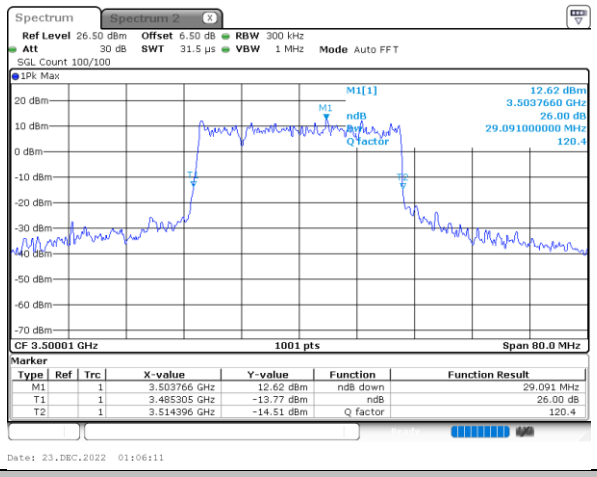
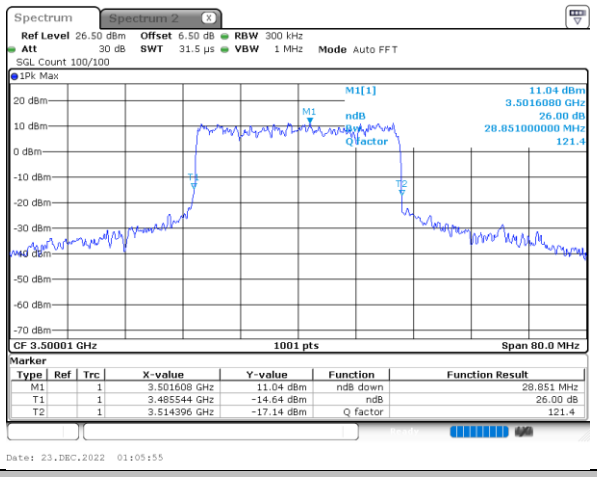
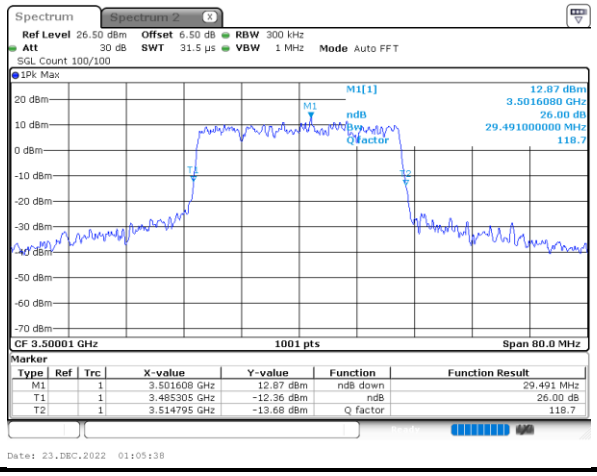
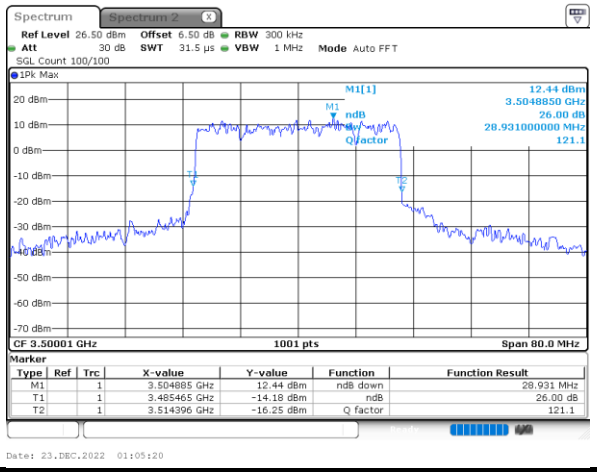
26dB Bandwidth

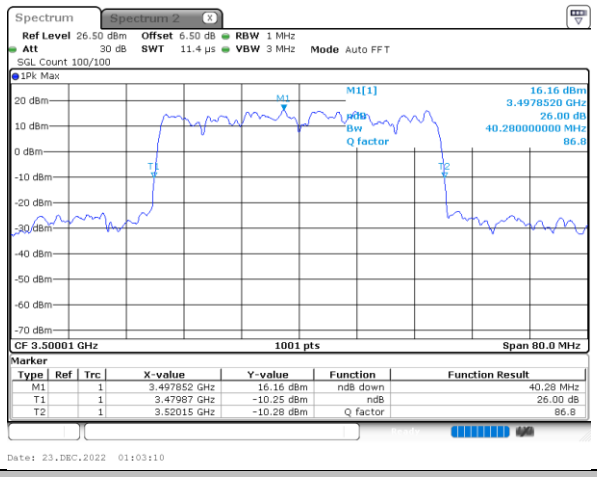
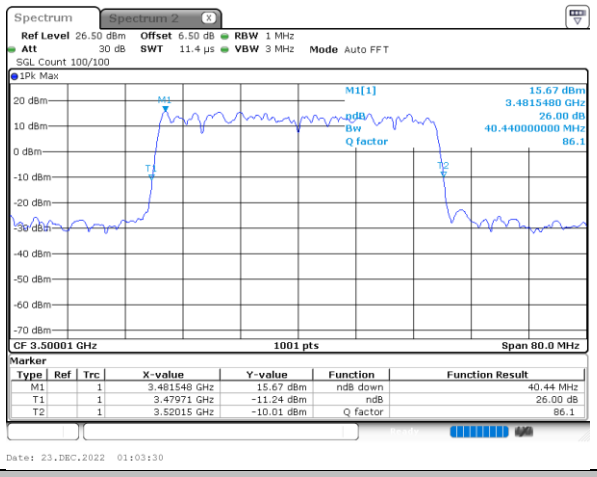
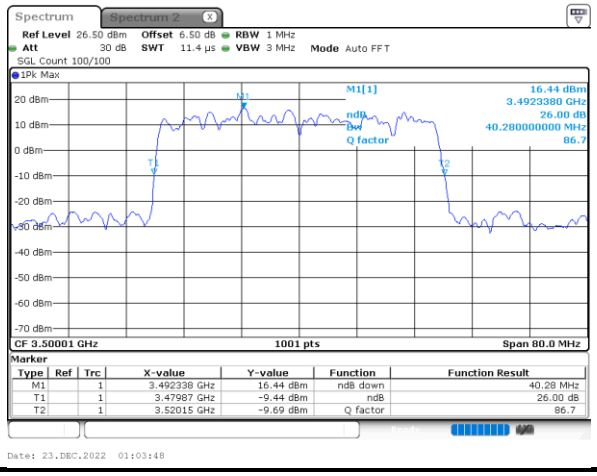
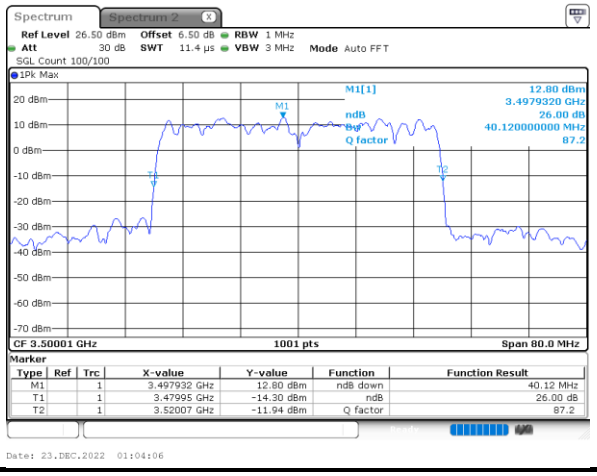
Mode	FR1 n77 : 26dB BW(10 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	9.65	9.47	9.37	9.65
Mode	FR1 n77 : 26dB BW(15MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	14.72	14.99	14.27	14.87
Mode	FR1 n77 : 26dB BW(20 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	20.42	20.46	20.38	20.46
Mode	FR1 n77 : 26dB BW(30 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	29.09	28.85	29.49	28.93
Mode	FR1 n77 : 26dB BW(40 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	40.28	40.44	40.28	40.12
Mode	FR1 n77 : 26dB BW(50 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	49.75	49.75	49.75	49.65
Mode	FR1 n77 : 26dB BW(60 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	62.34	62.46	62.34	62.58
Mode	FR1 n77 : 26dB BW(70 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	71.93	72.25	71.61	72.41
Mode	FR1 n77 : 26dB BW(80 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	82.32	82.16	82.16	82.32
Mode	FR1 n77 : 26dB BW(90 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	92.07	92.43	92.43	92.43
Mode	FR1 n77 : 26dB BW(100 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	102.3	102.5	102.7	102.5

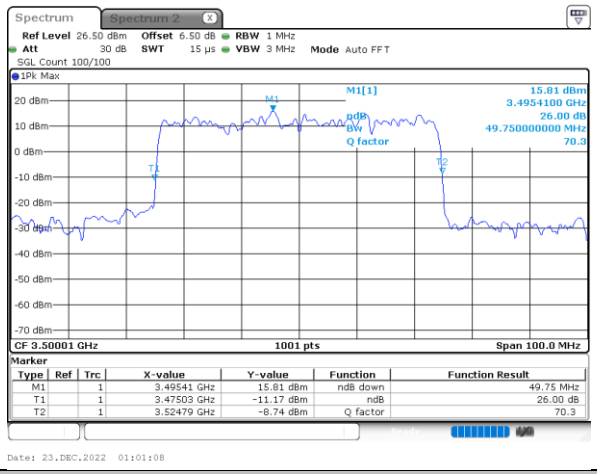
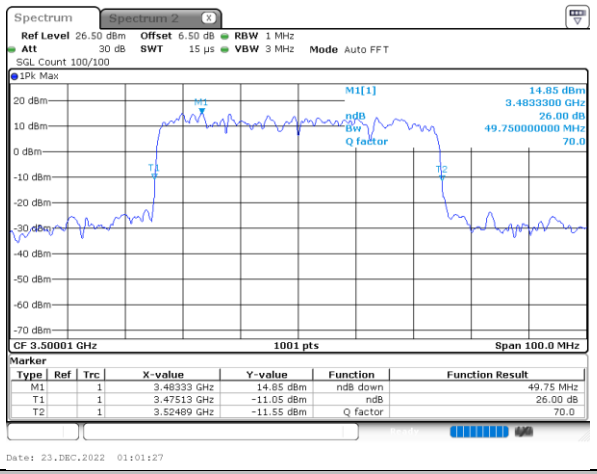
10MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

15MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

20MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

30MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

40MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

50MHz CP	
QPSK	16QAM
	
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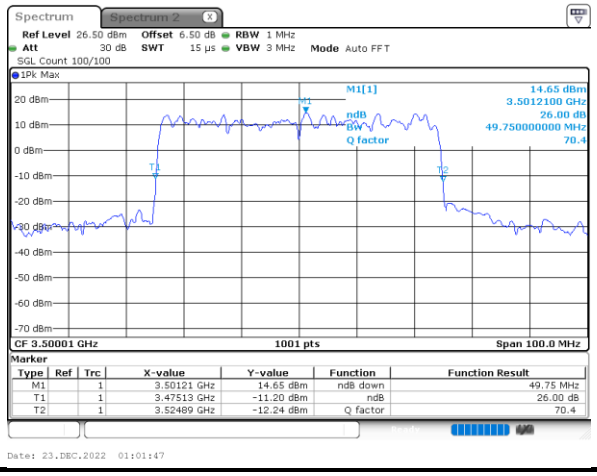
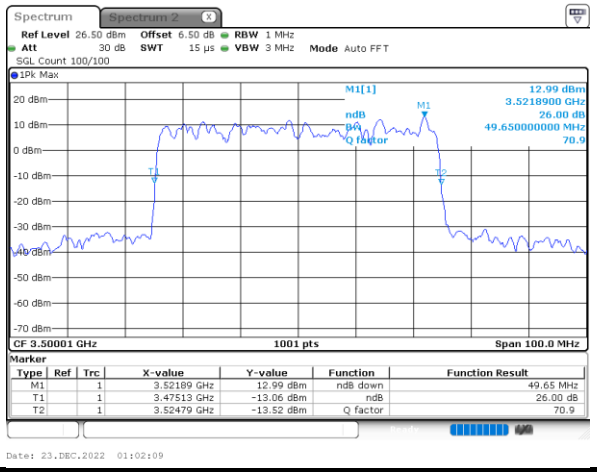
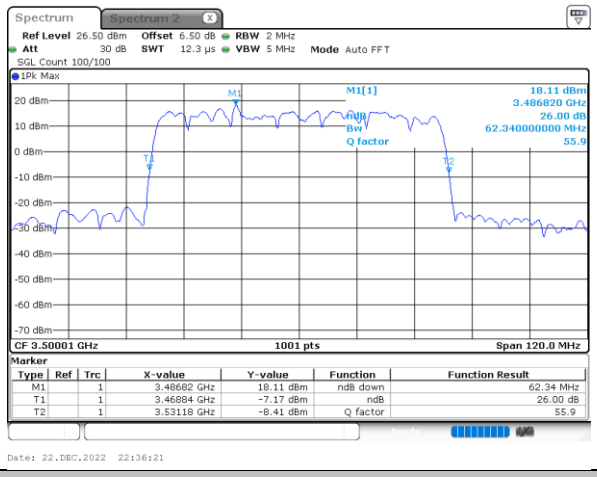
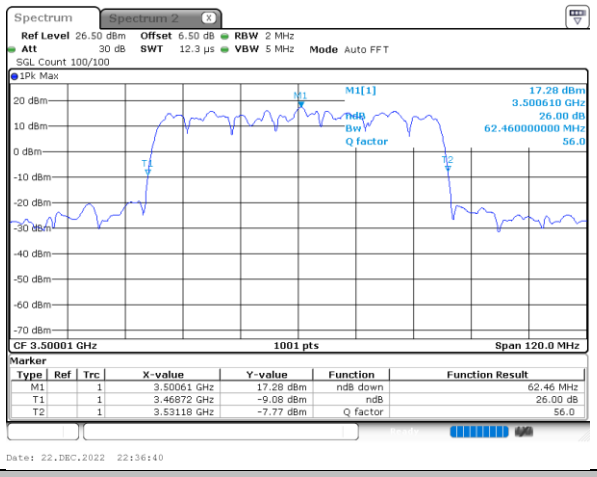
	

60MHz CP	
QPSK	16QAM
	
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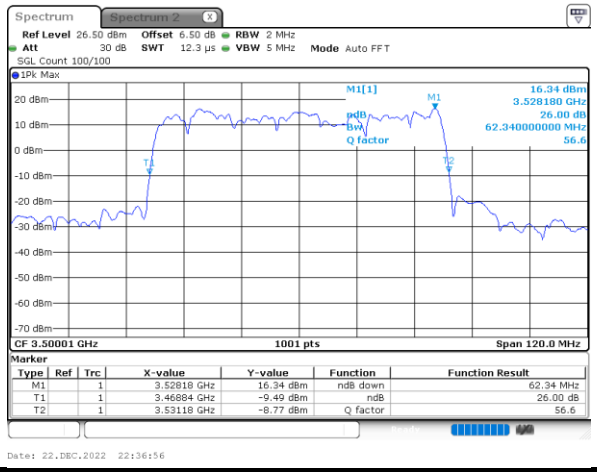
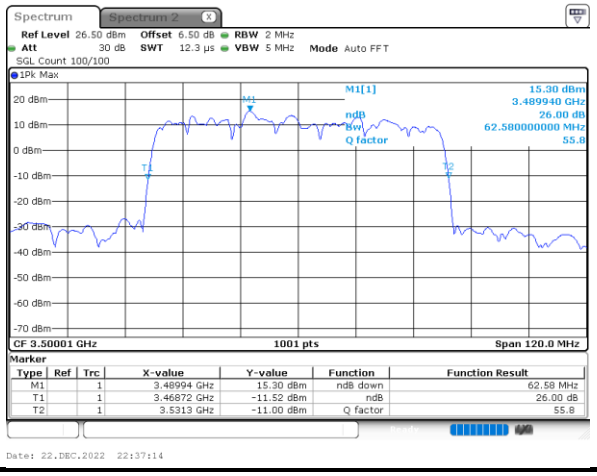
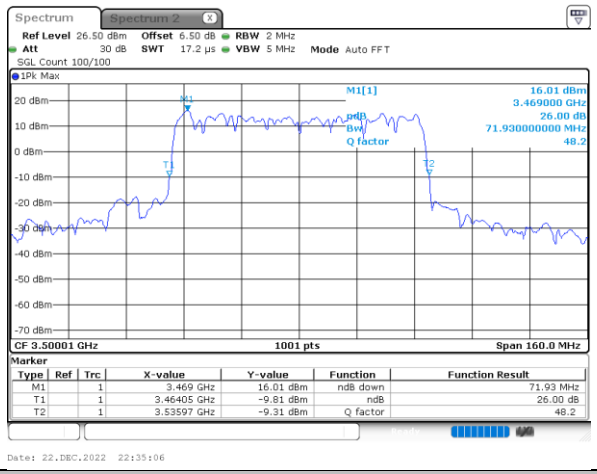
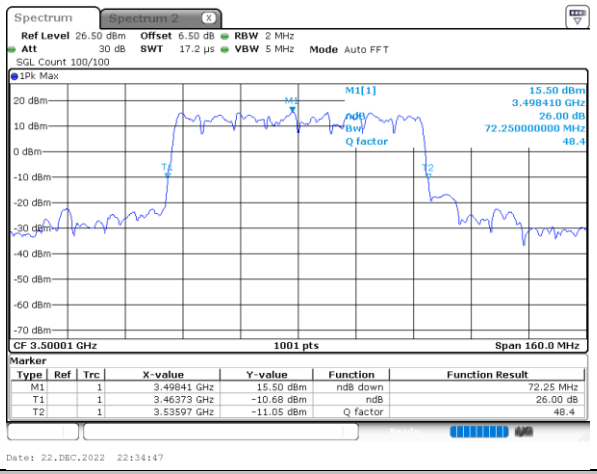
	

70MHz CP	
QPSK	16QAM
	
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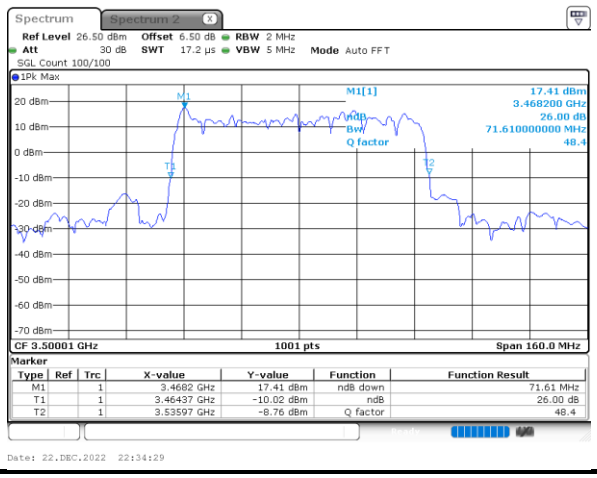
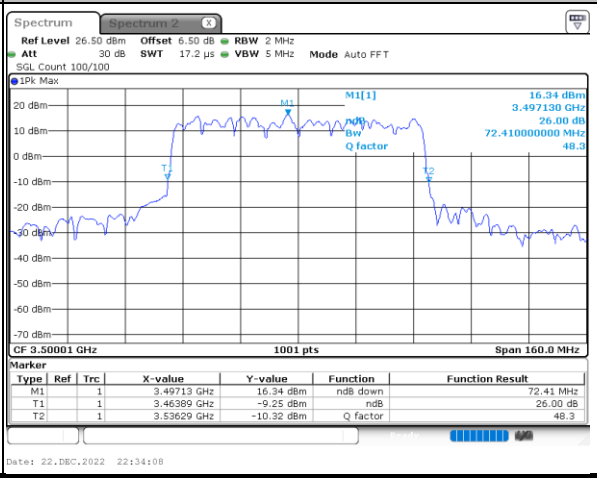
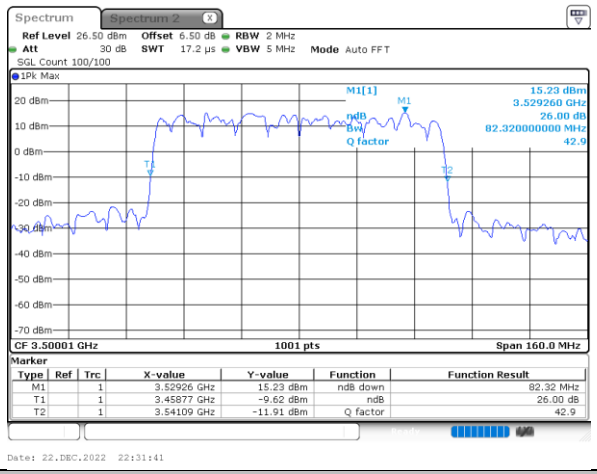
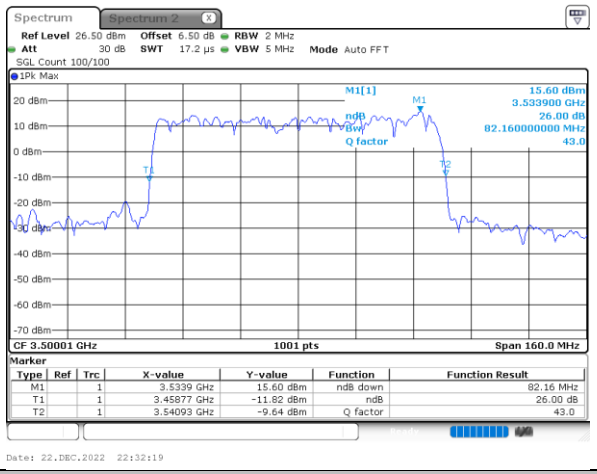
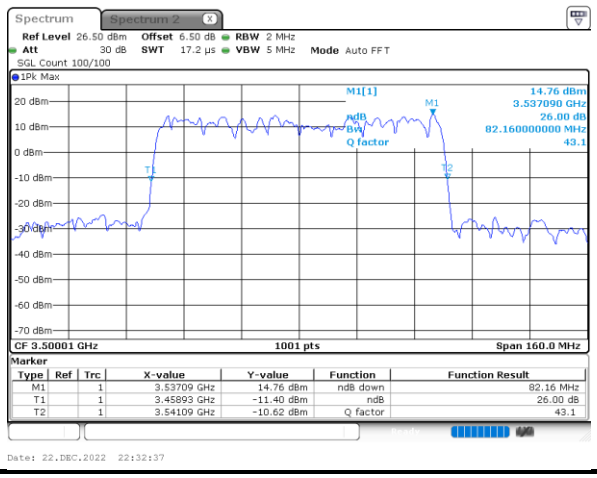
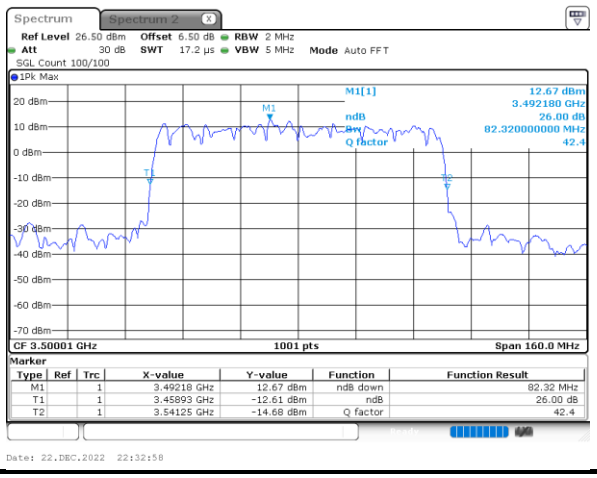
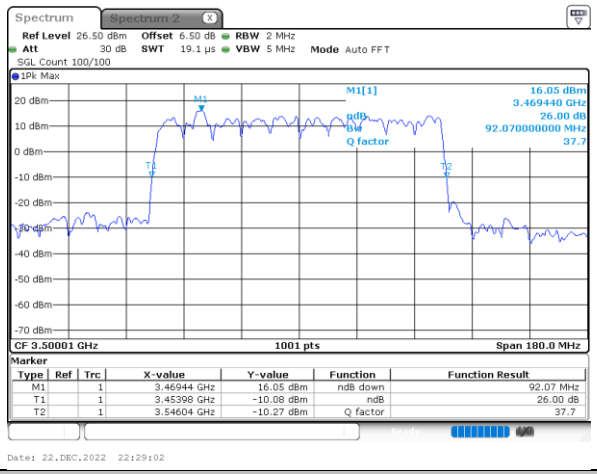
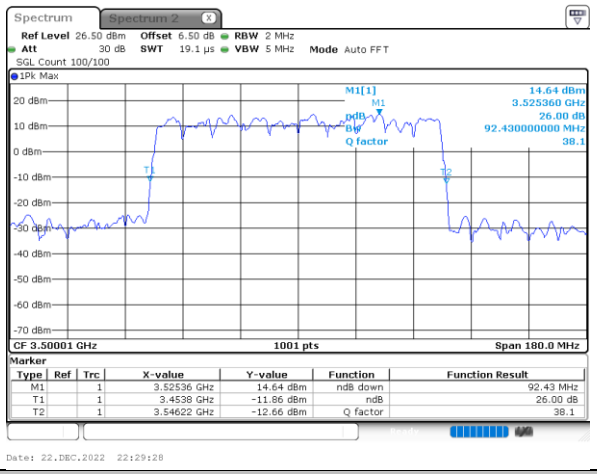
	

80MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

90MHz CP	
QPSK	16QAM
	
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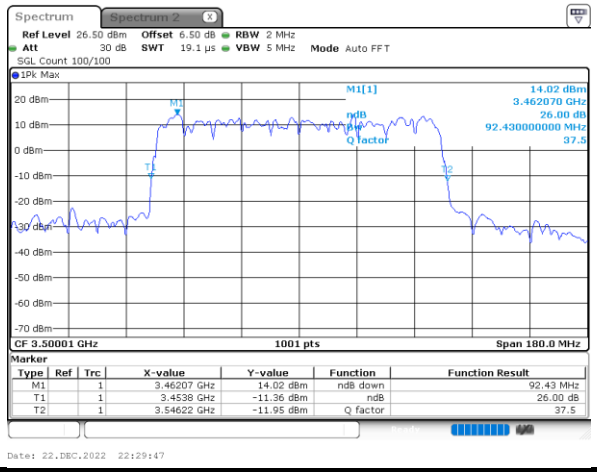
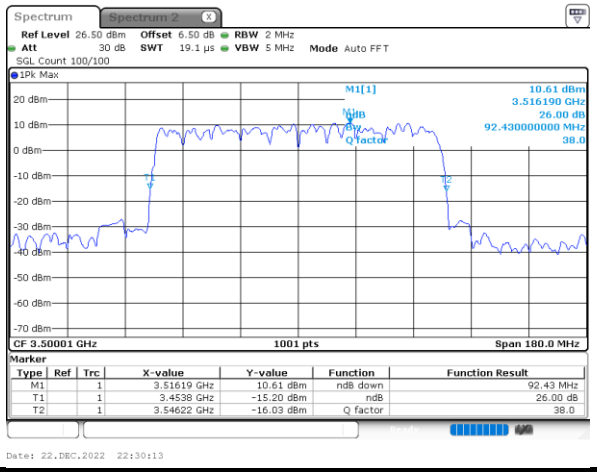
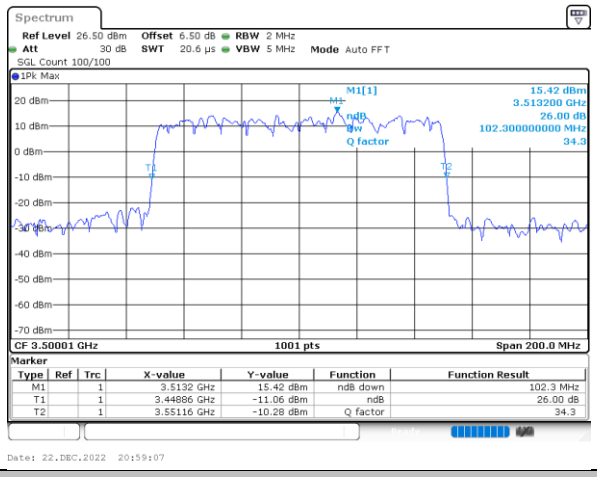
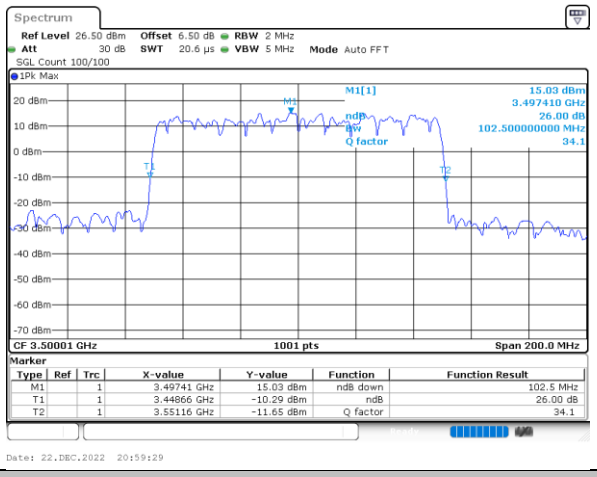
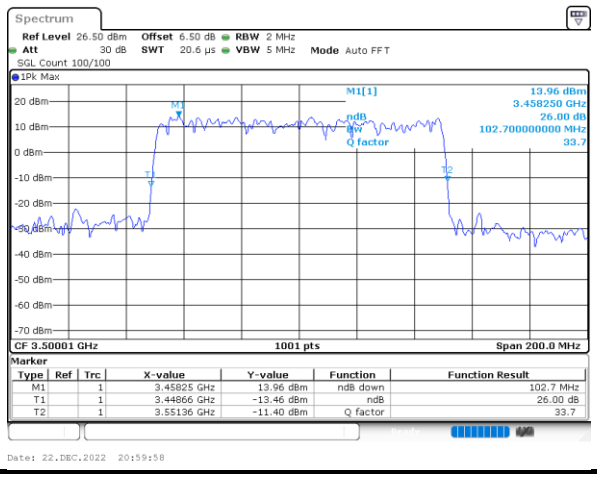
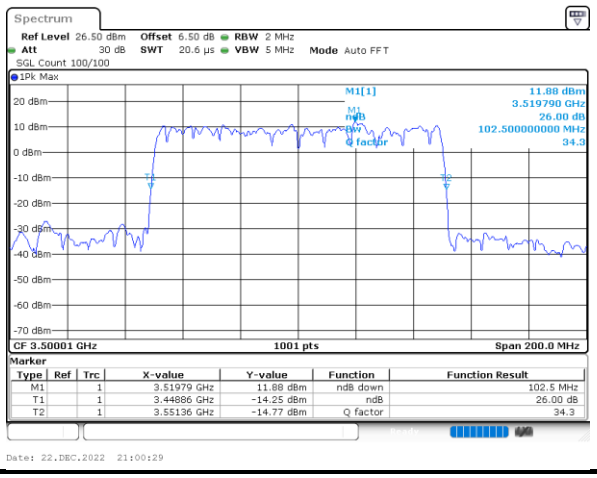
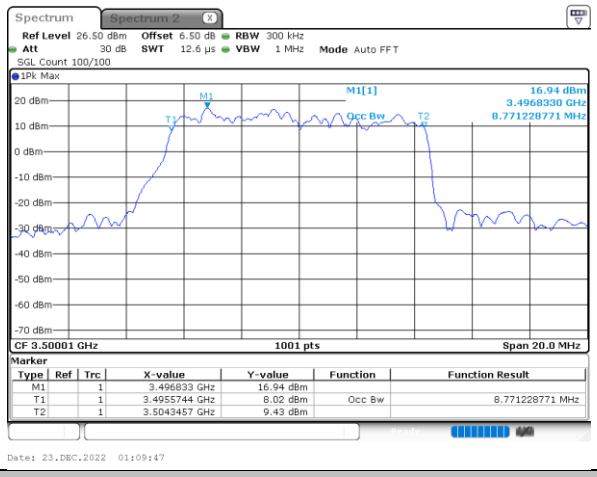
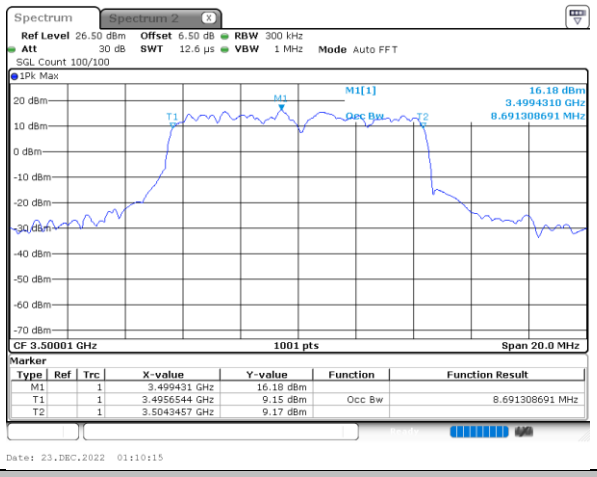
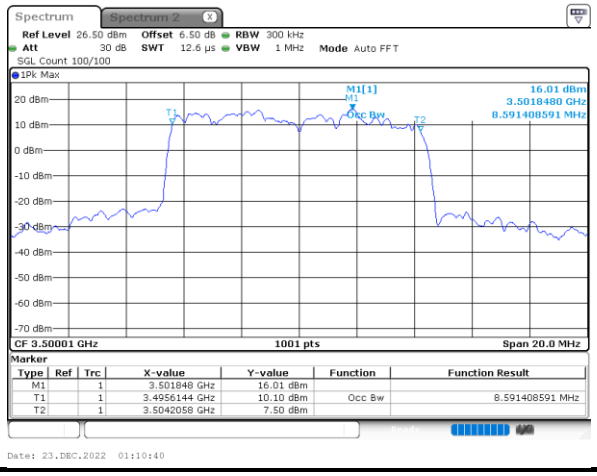
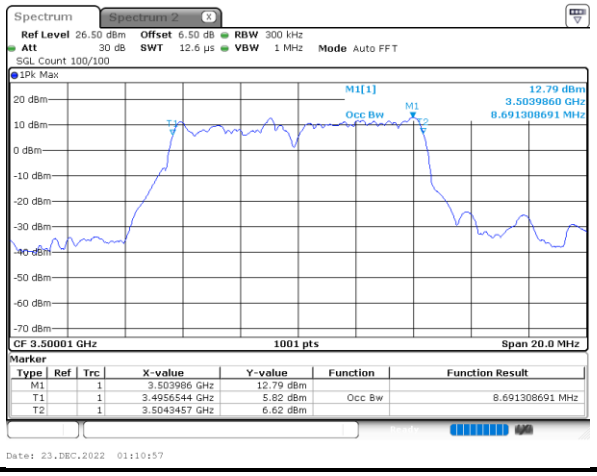
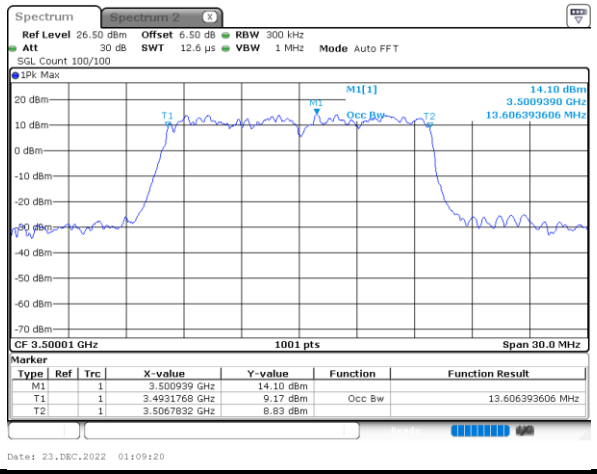
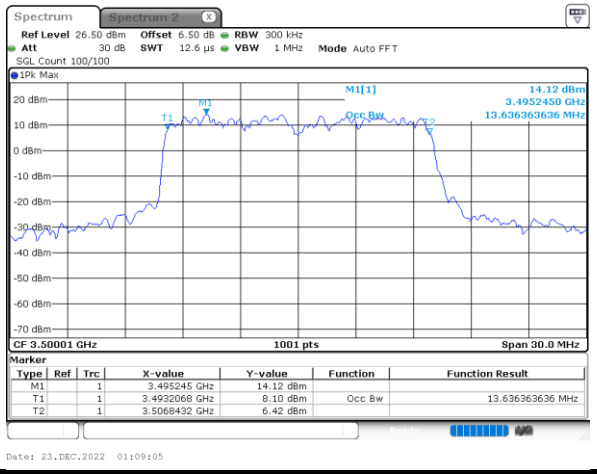
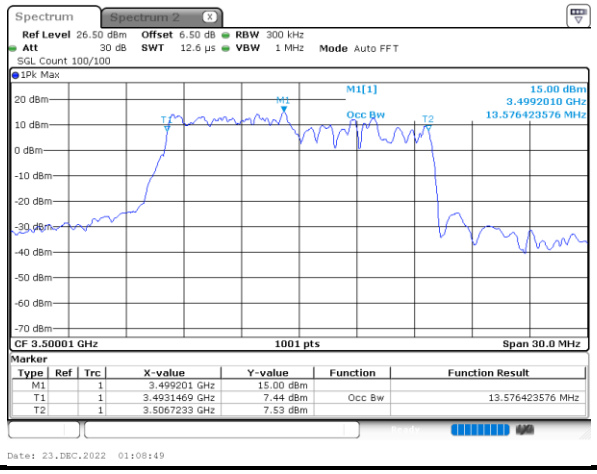
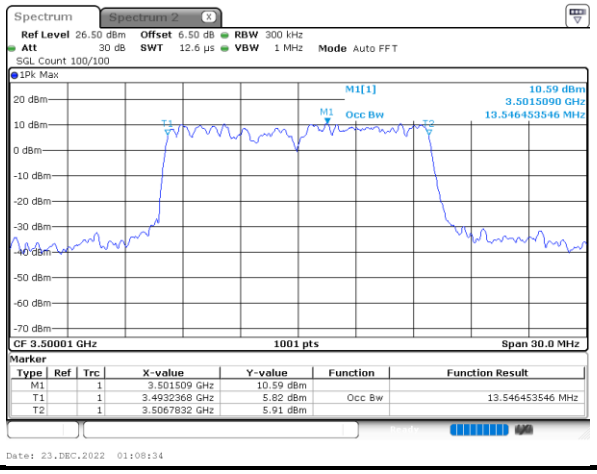
	

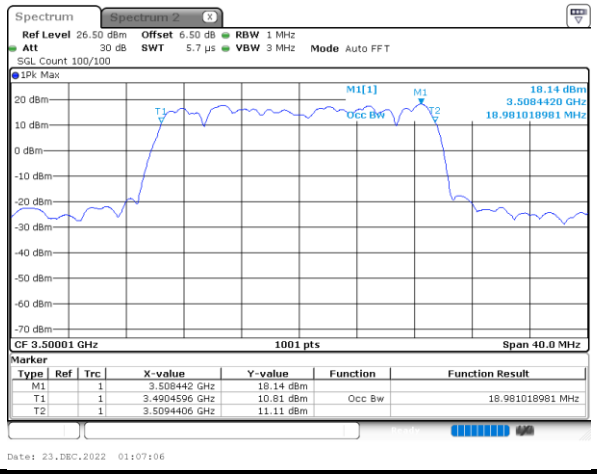
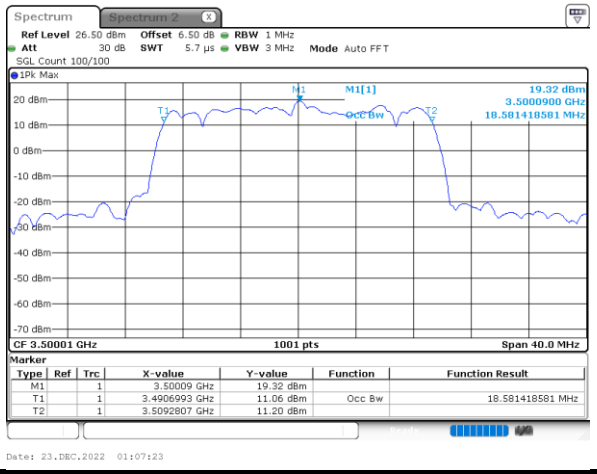
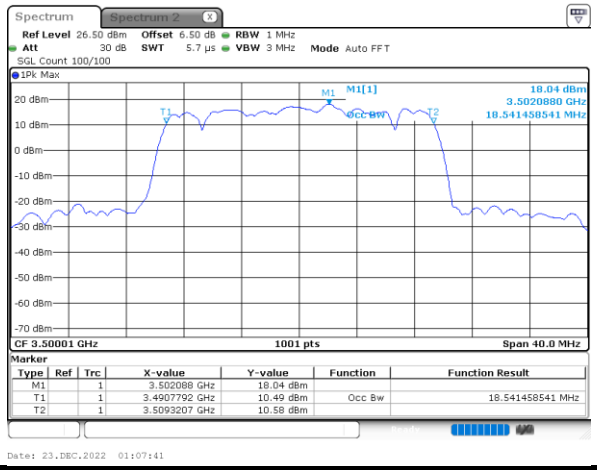
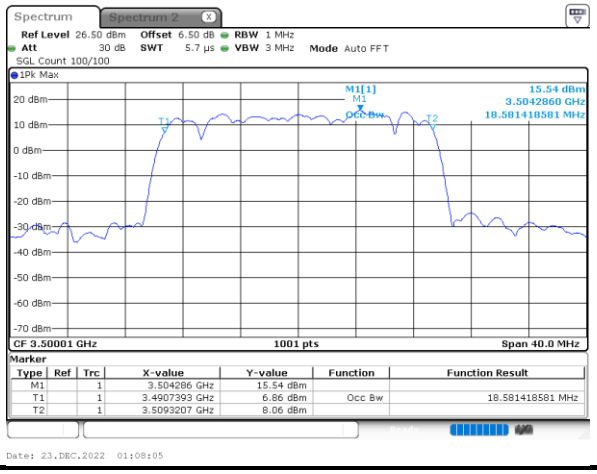
100MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

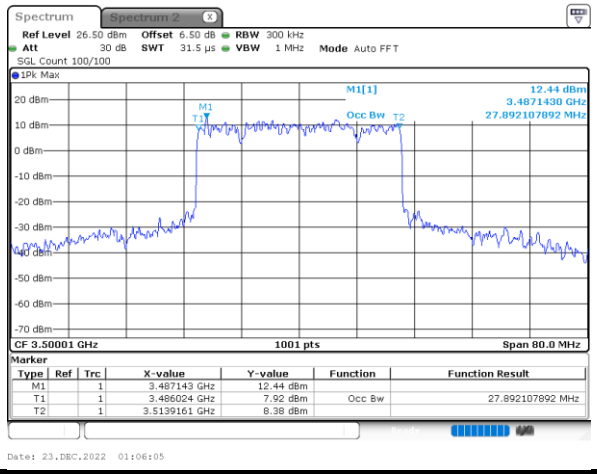
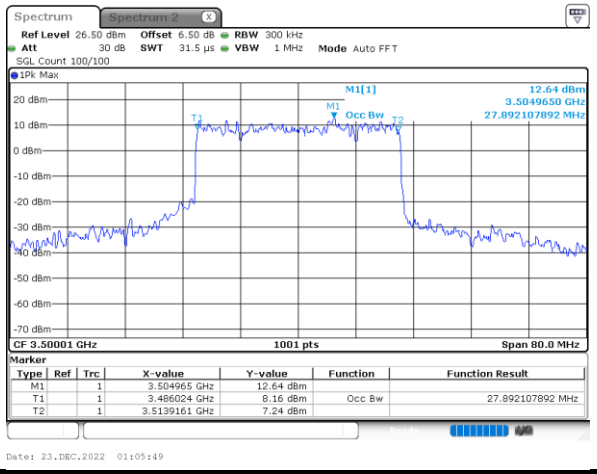
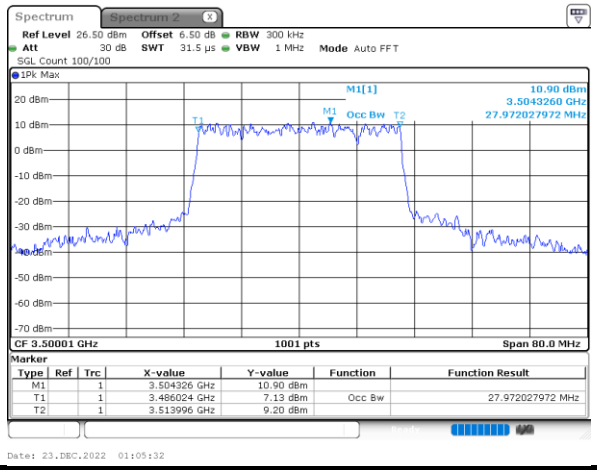
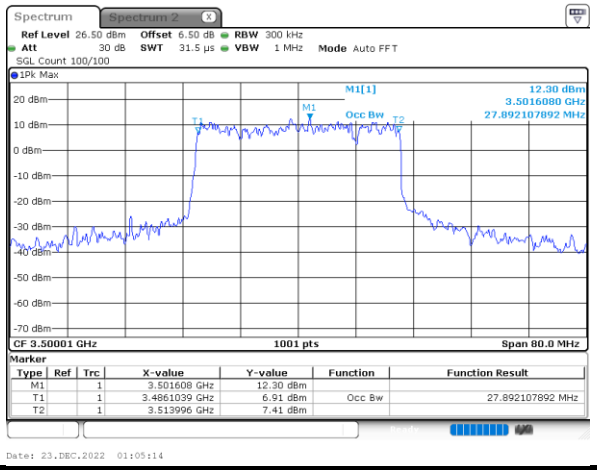
Occupied Bandwidth

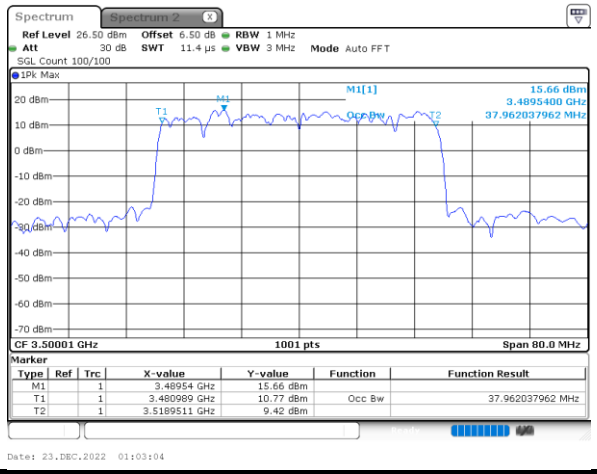
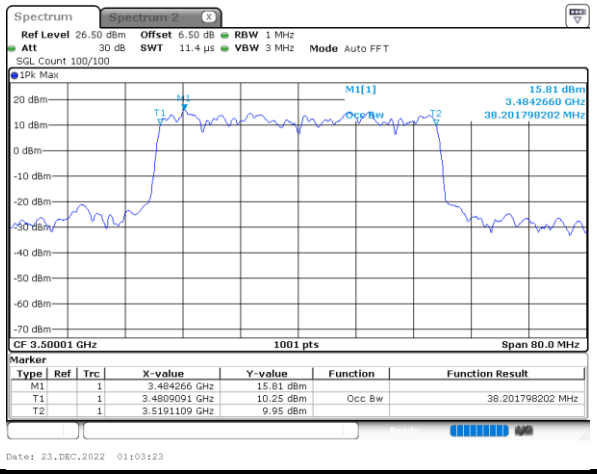
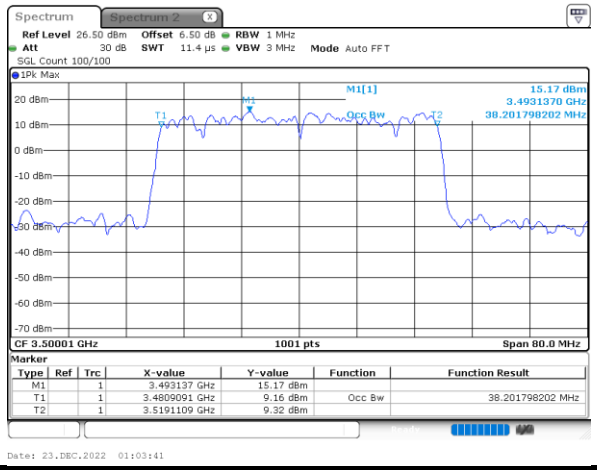
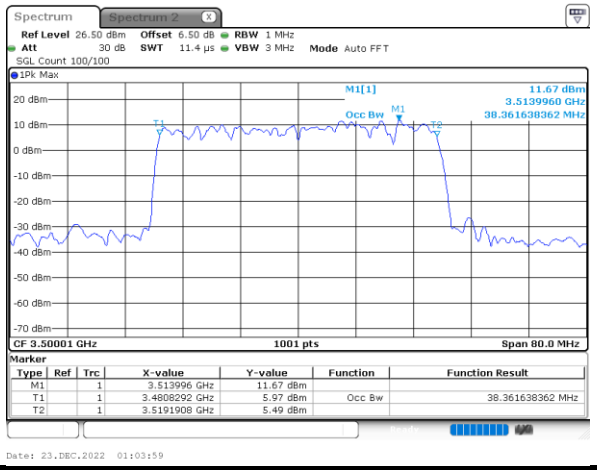
Mode	FR1 n77 : OB BW(10 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	8.77	8.69	8.59	8.69
Mode	FR1 n77 : OB BW(15 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	13.61	13.64	13.58	13.55
Mode	FR1 n77 : OB BW(20 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	18.98	18.58	18.54	18.58
Mode	FR1 n77 : OB BW(30 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	27.89	27.89	27.97	27.89
Mode	FR1 n77 : OB BW(40 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	37.96	38.20	38.20	38.36
Mode	FR1 n77 : OB BW(50 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	47.75	47.55	47.55	47.45
Mode	FR1 n77 : OB BW(60 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	58.38	58.86	58.50	58.02
Mode	FR1 n77 : OB BW(70 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	67.93	67.77	67.77	67.77
Mode	FR1 n77 : OB BW(80 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	77.84	77.52	78.00	77.64
Mode	FR1 n77 : OB BW(90 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	87.39	86.85	87.57	87.39
Mode	FR1 n77 : OB BW(100 MHz) / CP OFDM			
Mod.	QPSK	16QAM	64QAM	256QAM
Middle CH	97.90	98.30	97.90	98.10

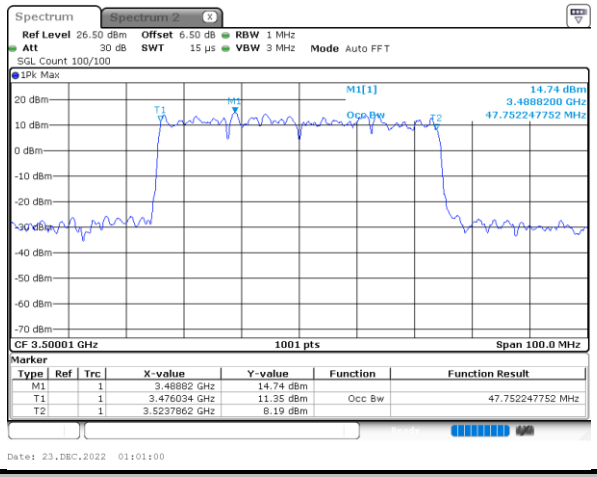
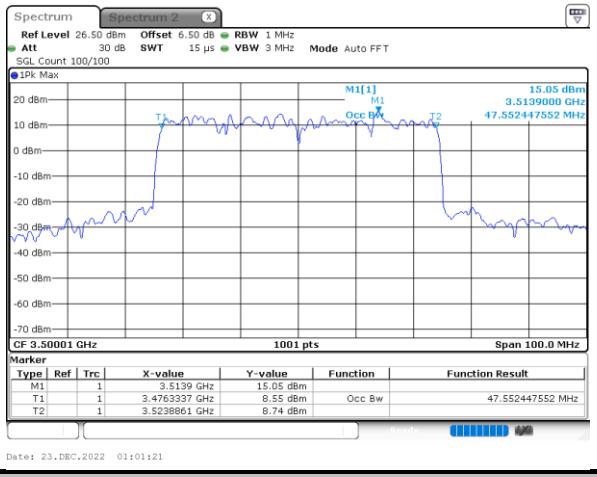
10MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

15MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

20MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

30MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

40MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

50MHz CP	
QPSK	16QAM
	
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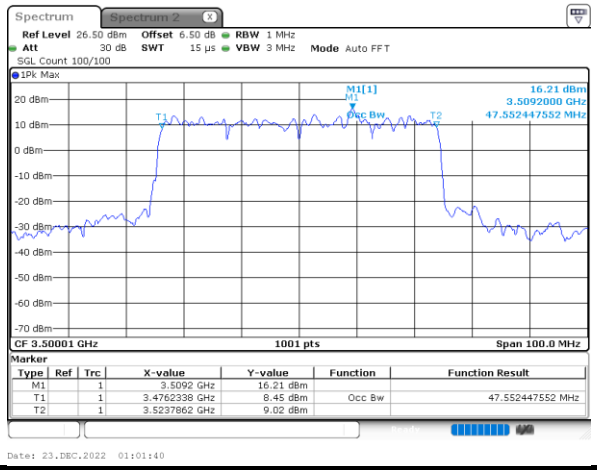
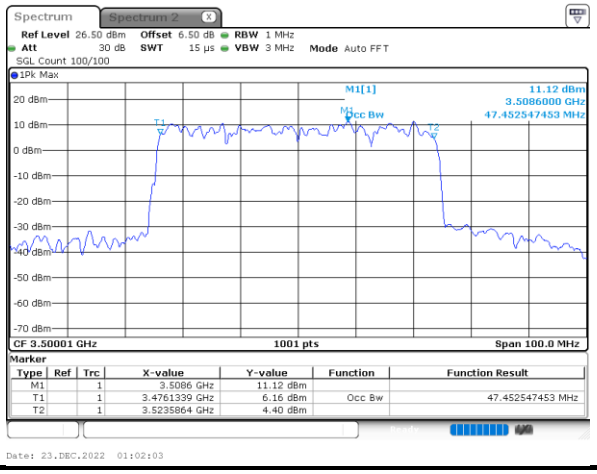
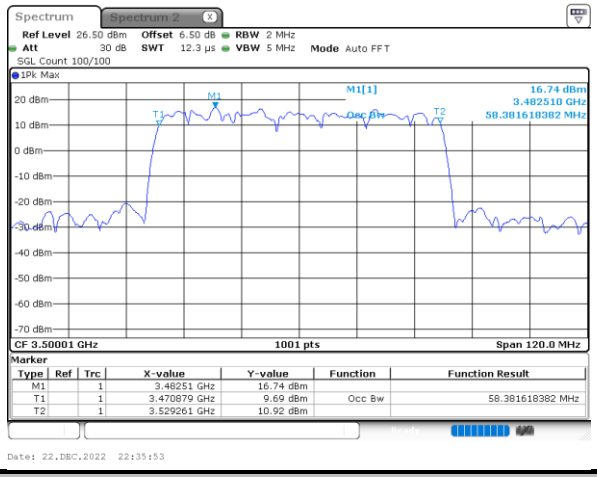
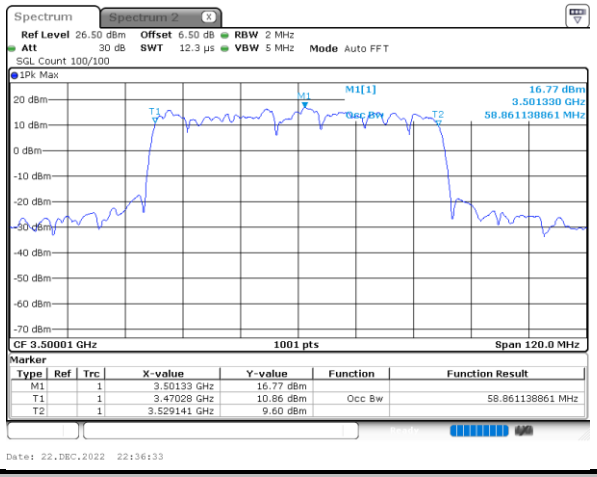
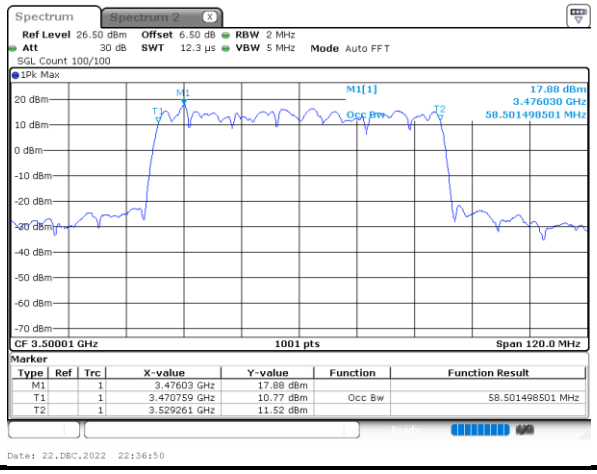
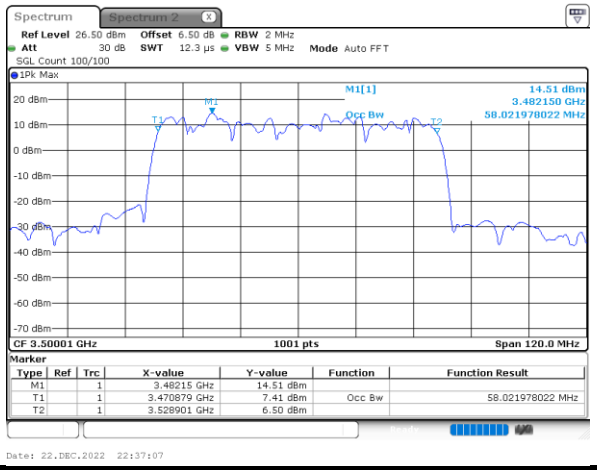
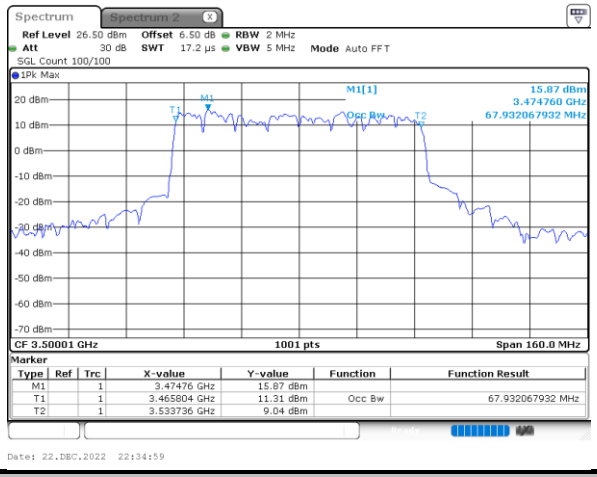
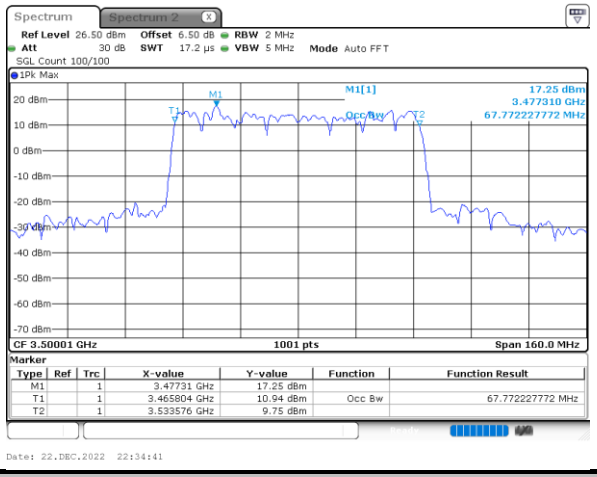
	

60MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

70MHz CP	
QPSK	16QAM
	
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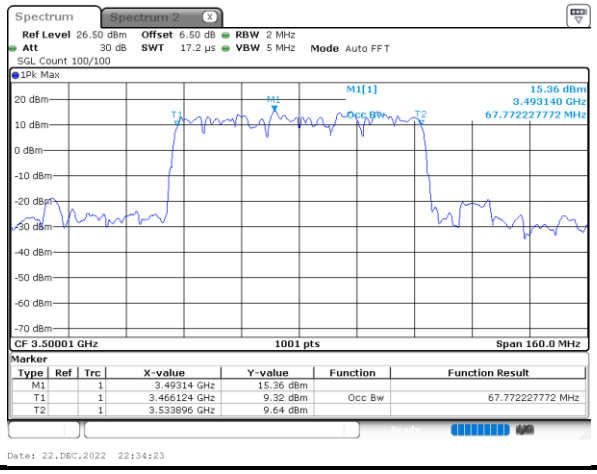	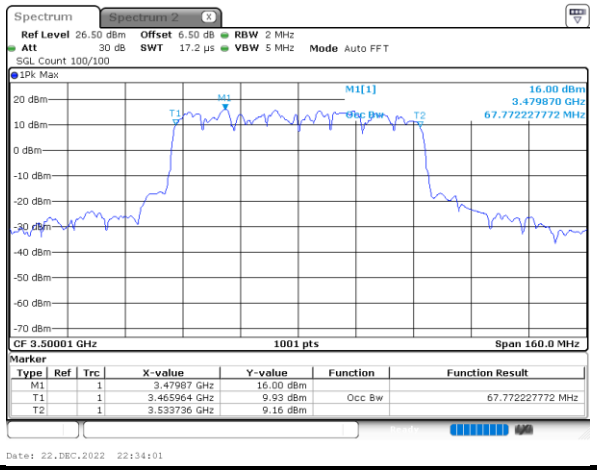

80MHz CP	
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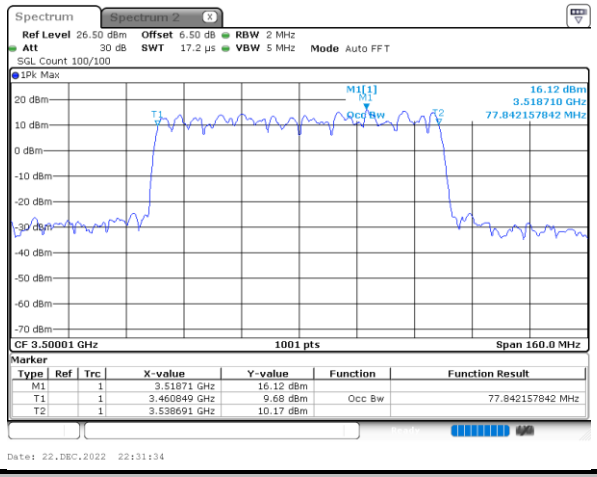
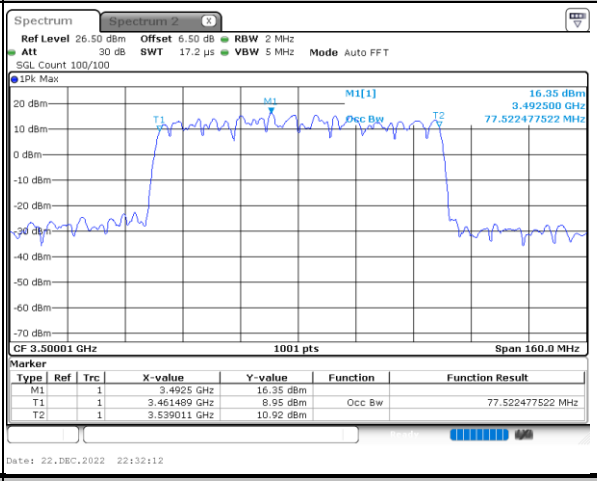
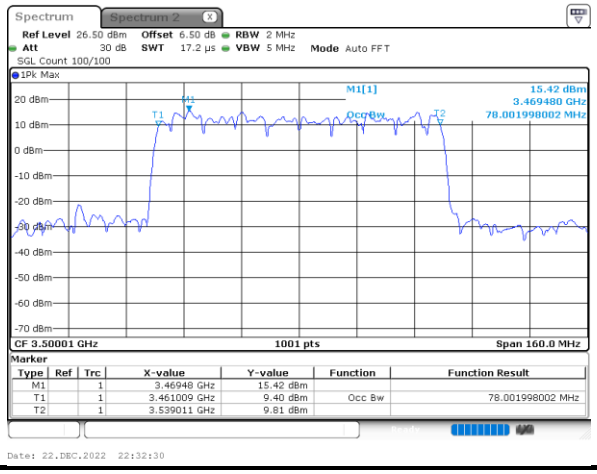
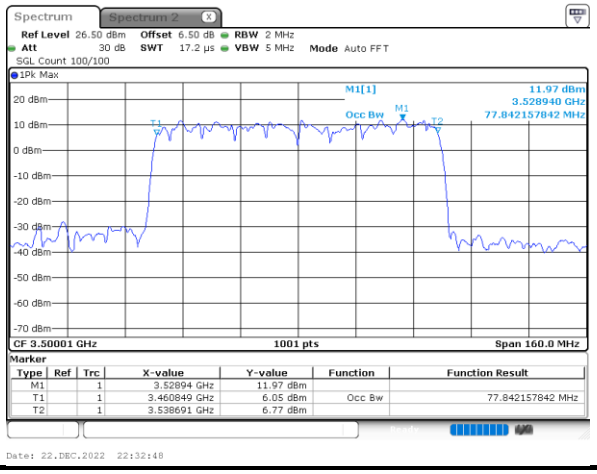
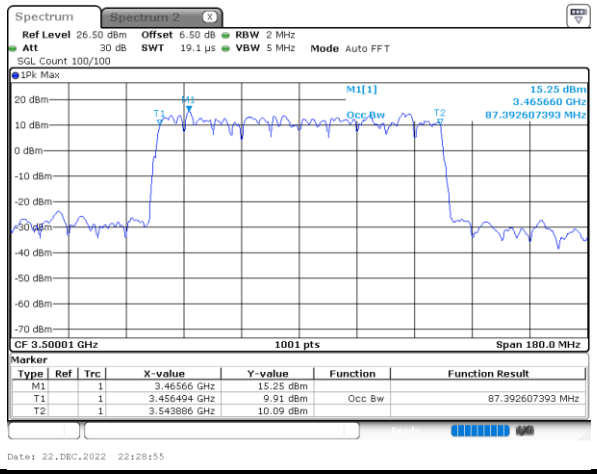
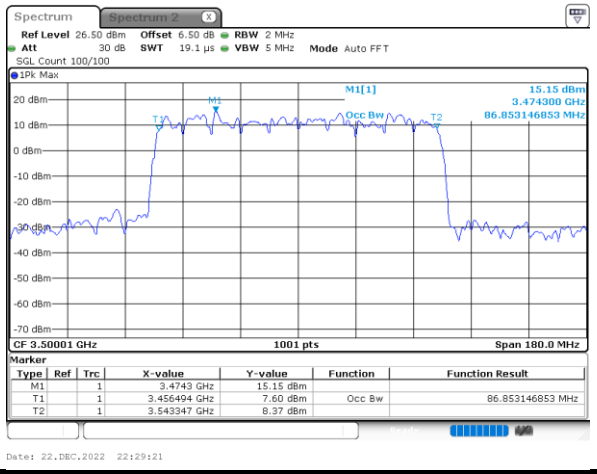
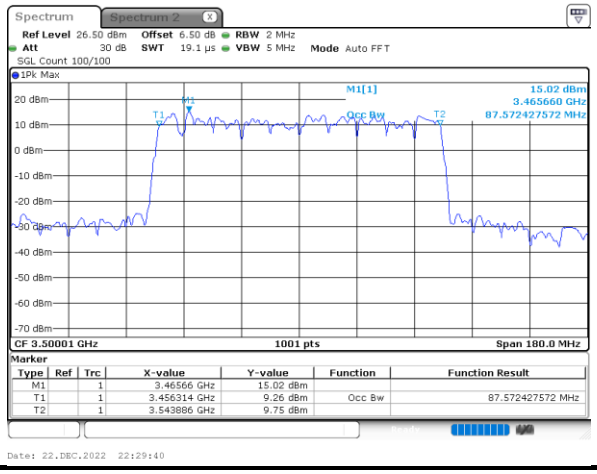
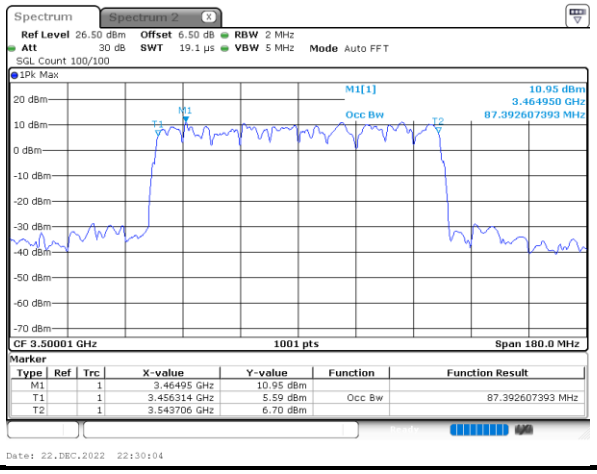
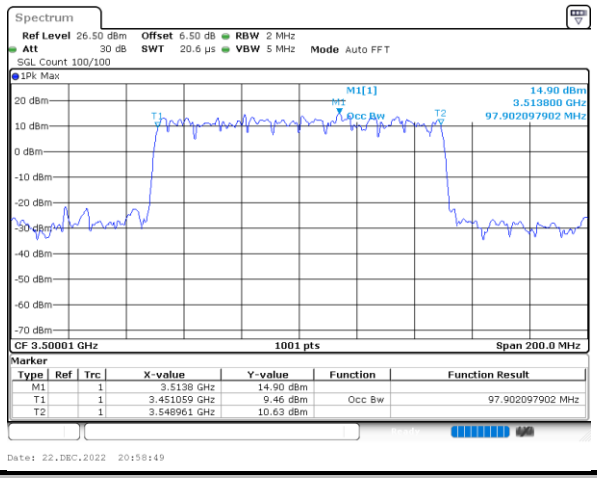
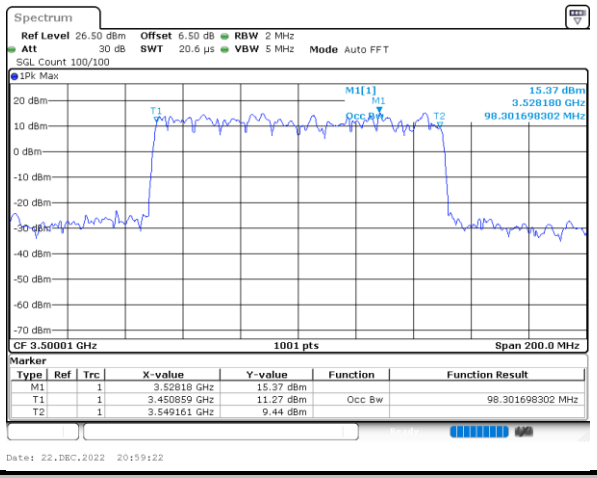
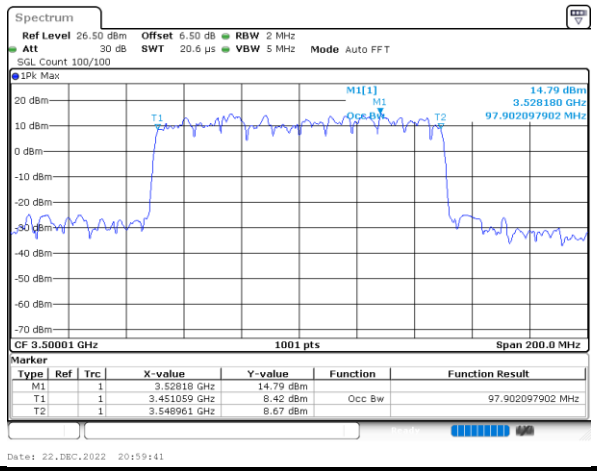
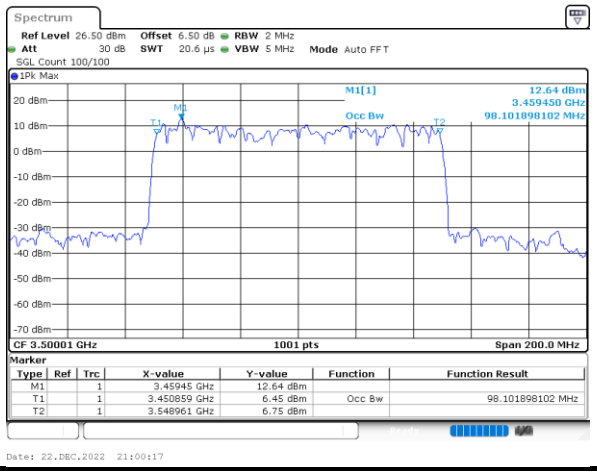
	
64QAM	256QAM
	

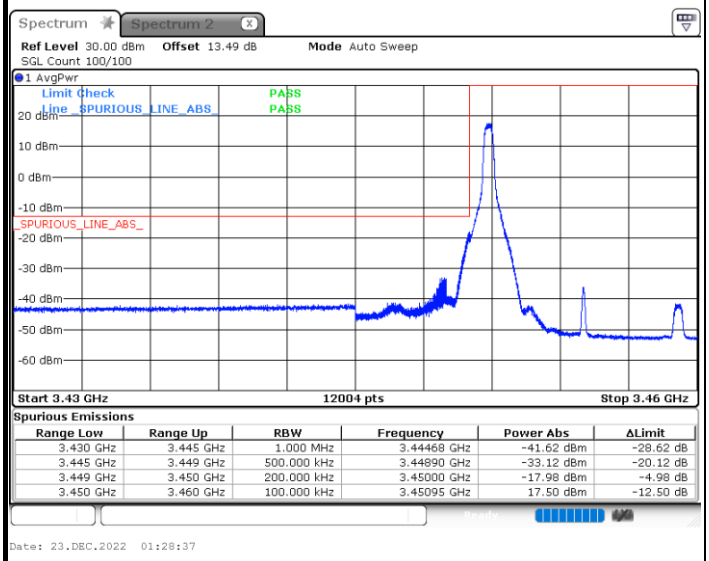
90MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

100MHz CP	
QPSK	16QAM
	
64QAM	256QAM
	

Conducted Band Edge

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

Lowest Band Edge / 1RB0



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
3.430 GHz	3.445 GHz	1.000 MHz	3.44468 GHz	-41.62 dBm	-28.62 dB
3.445 GHz	3.449 GHz	500.000 kHz	3.44890 GHz	-33.12 dBm	-20.12 dB
3.449 GHz	3.450 GHz	200.000 kHz	3.45000 GHz	-17.98 dBm	-4.98 dB
3.450 GHz	3.460 GHz	100.000 kHz	3.45095 GHz	17.50 dBm	-12.50 dB

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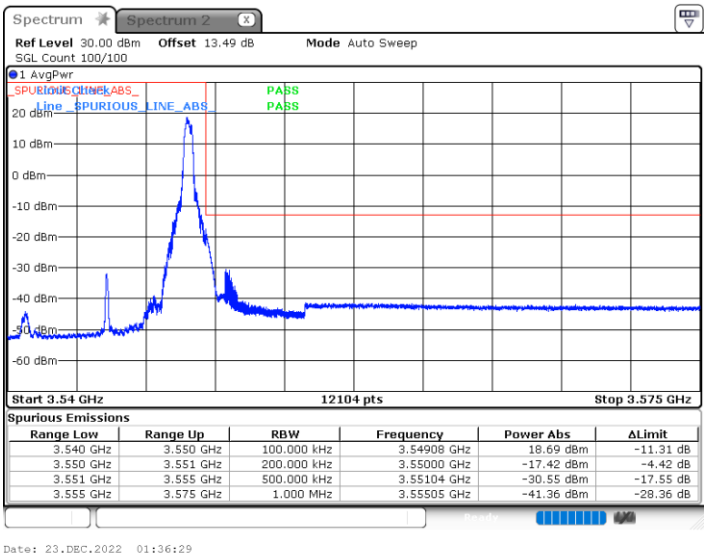
Highest Band Edge / 1RBmax



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
3.540 GHz	3.550 GHz	100.000 kHz	3.54908 GHz	18.69 dBm	-11.31 dB
3.550 GHz	3.551 GHz	200.000 kHz	3.55000 GHz	-17.42 dBm	-4.42 dB
3.551 GHz	3.555 GHz	500.000 kHz	3.55104 GHz	-30.55 dBm	-17.55 dB
3.555 GHz	3.575 GHz	1.000 MHz	3.55505 GHz	-41.36 dBm	-28.36 dB

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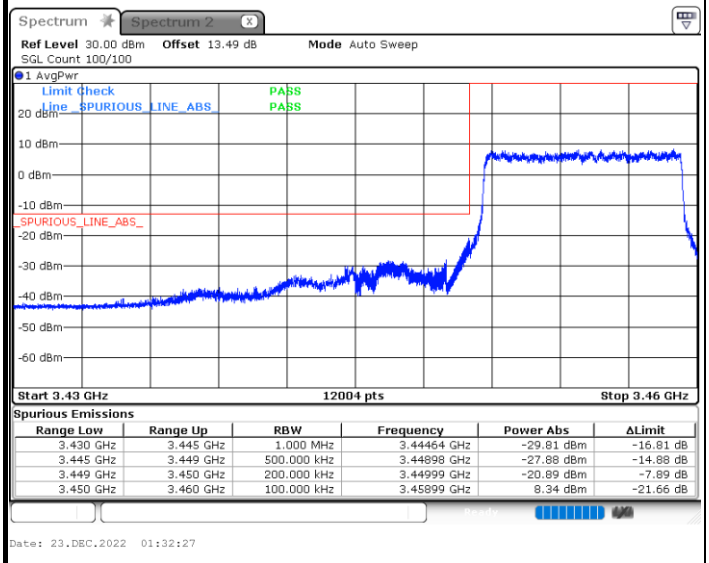
Lowest Band Edge / Full RB

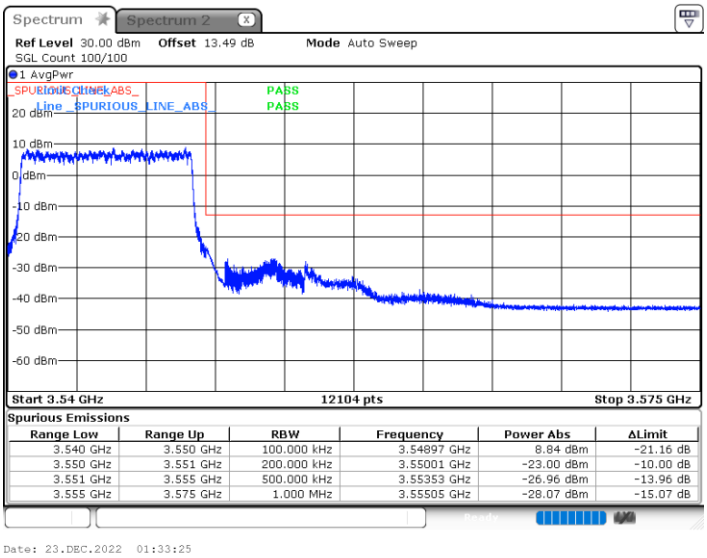


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
3.430 GHz	3.445 GHz	1.000 MHz	3.44464 GHz	-29.81 dBm	-16.81 dB
3.445 GHz	3.449 GHz	500.000 kHz	3.44898 GHz	-27.88 dBm	-14.88 dB
3.449 GHz	3.450 GHz	200.000 kHz	3.44999 GHz	-20.89 dBm	-7.89 dB
3.450 GHz	3.460 GHz	100.000 kHz	3.45899 GHz	8.34 dBm	-21.66 dB

Date: 23.DEC.2022 01:32:27

Highest Band Edge / Full RB



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
3.540 GHz	3.550 GHz	100.000 kHz	3.54897 GHz	8.84 dBm	-21.16 dB
3.550 GHz	3.551 GHz	200.000 kHz	3.55001 GHz	-23.00 dBm	-10.00 dB
3.551 GHz	3.555 GHz	500.000 kHz	3.55353 GHz	-26.96 dBm	-13.96 dB
3.555 GHz	3.575 GHz	1.000 MHz	3.55505 GHz	-28.07 dBm	-15.07 dB

Date: 23.DEC.2022 01:33:25