FCC RF Test Report

FCC ID	:	**UZ7ET45BB**
Equipment	:	**Tablet**
Brand Name	:	**Zebra**
Model Name	:	**ET45BB**
Applicant	:	**Zebra Technologies Corporation** **1 Zebra Plaza, Holtsville, NY 11742**
Manufacturer	:	**Zebra Technologies Corporation** **1 Zebra Plaza, Holtsville, NY 11742**
Standard	:	**47 CFR Part 2, 22, 24, 27**
Classification	:	**PCS Licensed Transmitter (PCB)**
Test Date(s)	:	**May 26, 2022 ~ Jun. 24, 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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG230405G	Rev. 01	Initial issue of report	Aug. 03, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	-	Report Only	-
	§22.913(a)(5)	Effective Radiated Power (5G NR n5)	ERP < 7 Watt	PASS	-
	§27.50(b)(10) §27.50(c)(10)	Effective Radiated Power (5G NR n12) (5G NR n13) (5G NR n71)	ERP < 3 Watt		-
	§24.232(c)	Equivalent Isotropic Radiated Power (5G NR n2) (5G NR n25)	EIRP < 2Watt		-
3.5	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	-	Report Only	-
3.7	§2.1051 §22.917(a) §24.238(a) §27.53(c)(2)(4) §27.53(g)	Conducted 5G NR nEdge Measurement (5G NR n2) (5G NR n5) (5G NR n12) (5G NR n13) (5G NR n25) (5G NR n71)	< 43+10log10(P[Watts])	PASS	-
3.8	§2.1051 §22.917(a) §24.238(a) §27.53(c)(2) §27.53(g)	Conducted Spurious Emission (5G NR n2) (5G NR n5) (5G NR n12) (5G NR n13) (5G NR n25) (5G NR n71)	< 43+10log10(P[Watts])	PASS	-
3.9	§2.1055 §22.355	Frequency Stability Temperature & Voltage	< 2.5 ppm for Part 22	PASS	-
	§2.1055 §24.235 §27.54		Within Authorized Band		
4.4	§2.1053 §22.917(a) §24.238(a) §27.53(c)(2) §27.53(f) §27.53(g)	Radiated Spurious Emission (5G NR n2) (5G NR n5) (5G NR n12) (5G NR n13) (5G NR n25) (5G NR n71)	< 43+10log$_{10}$(P[Watts])	PASS	Under limit 23.37 dB at 1568.000 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 Product Feature of Equipment Under Test

Product Feature	
Equipment	Tablet
Brand Name	Zebra
Model Name	ET45BB
FCC ID	UZ7ET45BB
HW Version	EV2-2
SW Version	ET45USERDEBUG 11 11-10-12.00-RG-U00-PRD-GSE MXJ release-keys
MFD	07MAY22
EUT Stage	Identical Prototype

Specification of Accessory				
Battery	**Brand Name**	Zebra	**Model Number**	BT-000456

Supported Unit Used in Test Configuration and System				
AC Adapter	**Brand Name**	Zebra	**Part Number**	PWR-WUA5V12W0US
Earphone 1	**Brand Name**	Zebra	**Part Number**	HDST-35MM-PTVP-01
Earphone 2	**Brand Name**	Zebra	**Part Number**	HDST-USBC-PTT1-01
USB Cable (Type C to Type A)	**Brand Name**	Zebra	**Part Number**	CBL-TC5X-USBC2A-01
Type C-Audio Cable (Type C to 3.5mm)	**Brand Name**	Zebra	**Part Number**	ADP-USBC-35MM1-01

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n12 : 699 MHz ~ 716 MHz 5G NR n13 : 777 MHz ~ 787 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n71: 663 MHz ~ 698 MHz
Rx Frequency	5G NR n2 : 1930 MHz ~ 1990 MHz 5G NR n5 : 869 MHz ~ 894 MHz 5G NR n12 : 729 MHz ~ 746 MHz 5G NR n13 : 746 MHz ~ 756 MHz 5G NR n25 : 1930 MHz ~ 1995 MHz 5G NR n71: 617 MHz ~ 652 MHz
Bandwidth	**SA:** n2, n5, n25, n71 : 5MHz / 10MHz / 15MHz / 20MHz n12: 5MHz / 10MHz / 15MHz n13: 5MHz / 10MHz **NSA:** n2, n5, n25, n71 : 5MHz / 10MHz / 15MHz / 20MHz n12: 5MHz / 10MHz / 15MHz
SCS	15kHz
Maximum Output Power to Antenna	**<Ant. 0>:** 5G NR n2: 23.48 dBm 5G NR n5 : 23.79 dBm 5G NR n12 : 22.92 dBm 5G NR n13 : 22.95 dBm 5G NR 12A-n25A : 23.98 dBm 5G NR n71 : 23.55 dBm
Antenna Gain	**<Ant. 0>:** 5G NR n2: 0.1 dBi 5G NR n5: -0.1 dBi 5G NR n12: -0.3 dBi 5G NR n13: -1.0 dBi 5G NR n25: 0.1 dBi 5G NR n71: -1.6 dBi **<Ant. 2>:** 5G NR n2: 1.10 dBi 5G NR n5: -2.40 dBi 5G NR n25: 1.10 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/ERP is calculated from max output power and max antenna gain, only the maximum EIRP/ERP of Antenna 0 is shown in the report.
2. 5G NR n2/n5 n12/n25/n71 support SA mode and NSA mode, n13 support SA mode only. According to the maximum power between SA and NSA mode, SA covers NSA mode for n2/n5/n12/n71, NSA covers SA mode for n25.
3. The EN-DC mode combination could be referred to the product spec.
4. The device supports two PAs for 5G NR n5/n25/n71 (main PA for SA mode and other PA for NSA

mode), the maximum power of main PA is higher than the other PA for n5/n71 and other PA is higher than the main PA for 12A-n25A , therefore, we chose higher power PA to calculate the EIRP and show in the report.

1.3 Modification of EUT

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

1.4 Maximum ERP/EIRP and Emission Designator

5G NR n2 SA		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)
5	1852.5 ~ 1907.5	0.2270	4M48G7D	0.1820	4M50W7D
10	1855.0 ~ 1905.0	0.2280	9M39G7D	0.1849	9M41W7D
15	1857.5 ~ 1902.5	0.2244	14M2G7D	0.1811	14M2W7D
20	1860.0 ~ 1900.0	0.2178	19M5G7D	0.1807	19M5W7D

5G NR n5 SA		PI/2 BPSK / QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum ERP(W)	Emission Designator (99%OBW)	Maximum ERP(W)	Emission Designator (99%OBW)
5	826.5 ~ 846.5	0.1416	4M51G7D	0.1167	4M49W7D
10	829.0 ~ 844.0	0.1374	9M37G7D	0.1151	9M37W7D
15	831.5 ~ 841.5	0.1384	14M2G7D	0.1148	14M2W7D
20	834.0 ~ 839.0	0.1426	19M3G7D	0.1175	19M3W7D

5G NR n12 SA		PI/2 BPSK / QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum ERP(W)	Emission Designator (99%OBW)	Maximum ERP(W)	Emission Designator (99%OBW)
5	701.5 ~ 713.5	0.1047	4M49G7D	0.0879	4M48W7D
10	704.0~ 711.0	0.1081	9M29G7D	0.0908	9M35W7D
15	706.5 ~ 708.5	0.1114	14M1G7D	0.0893	14M1W7D

5G NR n13 SA		PI/2 BPSK / QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum ERP(W)	Emission Designator (99%OBW)	Maximum ERP(W)	Emission Designator (99%OBW)
5	779.5 ~ 784.5	0.0948	4M49G7D	0.0759	4M51W7D
10	782	0.0955	9M05G7D	0.0745	9M05W7D

5G NR n25 NSA ENDC_12A-n25A		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)
5	1852.5 ~ 1912.5	0.2421	4M48G7D	0.2188	4M50W7D
10	1855.0 ~ 1910.0	0.2443	9M39G7D	0.2213	9M41W7D
15	1857.5 ~ 1907.5	0.2404	14M2G7D	0.2213	14M2W7D
20	1860.0 ~ 1905.0	0.2559	19M5G7D	0.2123	19M5W7D

5G NR n71 SA		PI/2 BPSK / QPSK		16QAM / 64QAM / 256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum ERP(W)	Emission Designator (99%OBW)	Maximum ERP(W)	Emission Designator (99%OBW)
5	665.5 ~ 695.5	0.0946	4M48G7D	0.0759	4M53W7D
10	668.0 ~ 693.0	0.0931	9M33G7D	0.0762	9M39W7D
15	670.5 ~ 690.5	0.0948	14M1G7D	0.0771	14M1W7D
20	673.0 ~ 688.0	0.0955	19M2G7D	0.0757	19M4W7D

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

2. 5G NR n25 overlaps the entire frequency range of 5G NR n2. Therefore, the test results provided in this report covers 5G NR n25 as well as 5G NR n2.

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

1.6 Test Software

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

1.7 Applicable Standards

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

- 47 CFR Part 2, 22, 24, 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.

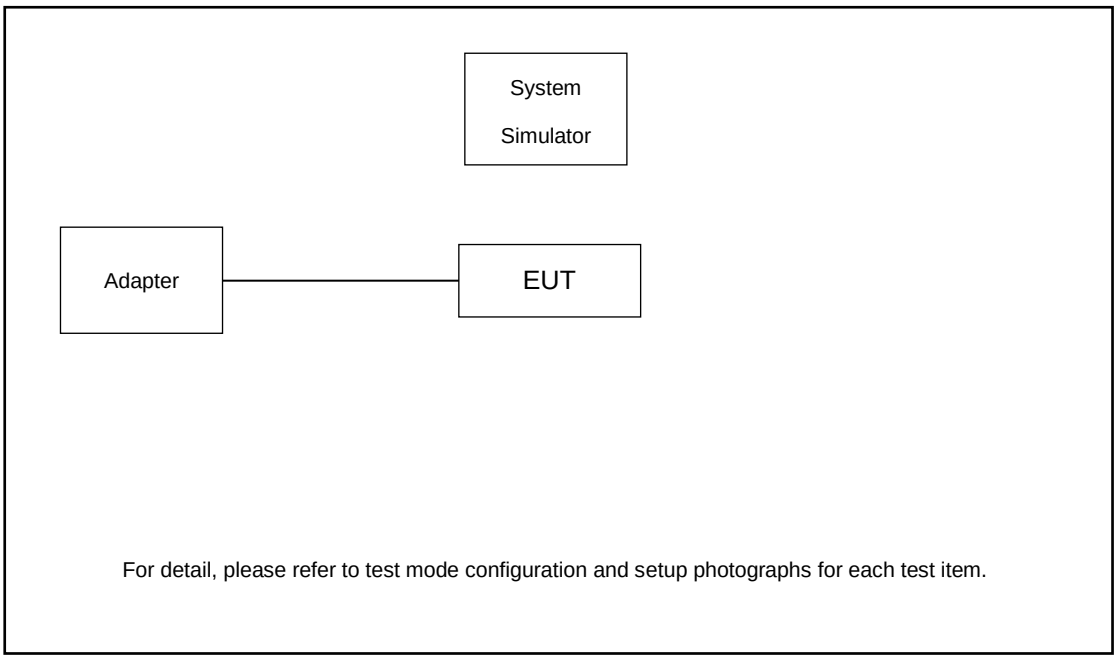
For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z and accessory configurations. The worst-cases were recorded in this report.

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.

Test Items	5G NR	Bandwidth (MHz)							Modulation					RB #		Test Channel		
		5	10	15	20	25	30	40	PI/2 BPSK	QPSK	16QAM	64QAM	256 QAM	1	Full	L	M	H
Max. Output Power	n2	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
	n5	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
	n12	v	v	v	-	-	-	-	v	v	v	v	v	v	v	v	v	v
	n13	v	v	-	-	-	-	-	v	v	v	v	v	v	v	v	v	v
	n25	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
	n71	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	n5				v	-	-	-	v	v				v	v		v	
	n12			v				-	v	v				v	v		v	
	n13		v	-	-	-	-	-	v	v				v	v		v	
	n25				v	-	-	-	v	v				v	v		v	
	n71				v	-	-	-	v	v				v	v		v	
26dB and 99% Bandwidth	n5	v	v	v	v	-	-	-		v	v	v	v		v		v	
	n12	v	v	v	-	-	-	-		v	v	v	v		v		v	
	n13	v	v	-	-	-	-	-		v	v	v	v		v		v	
	n25	v	v	v	v	-	-	-		v	v	v	v		v		v	
	n71	v	v	v	v	-	-	-		v	v	v	v		v		v	
Conducted Band Edge	n5	v	v		v	-	-	-	v	v				v	v	v		v
	n12	v	v	v	-	-	-	-	v	v				v	v	v		v
	n13	v	v	-	-	-	-	-	v	v				v	v	v		v
	n25	v	v		v	-	-	-	v	v				v	v	v		v
	n71	v	v		v	-	-	-	v	v				v	v	v		v

Test Items	5G NR	Bandwidth (MHz)							Modulation					RB #		Test Channel		
		5	10	15	20	25	30	40	PI/2 BPSK	QPSK	16QAM	64QAM	256 QAM	1	Full	L	M	H
Conducted Spurious Emission	n5	v	v		v	-	-	-	v	v				v		v	v	v
	n12	v	v	v	-	-	-	-	v	v				v		v	v	v
	n13	v	v	-	-	-	-	-	v	v				v		v	v	v
	n25	v	v		v	-	-	-	v	v				v		v	v	v
	n71	v	v		v	-	-	-	v	v				v		v	v	v
Frequency Stability	n5				v	-	-	-		v					v		v	
	n12			v	-	-	-	-		v					v		v	
	n13		v	-	-	-	-	-		v					v		v	
	n25				v	-	-	-		v					v		v	
	n71				v	-	-	-		v					v		v	
E.R.P / E.I.R.P	n2	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
	n5	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
	n12	v	v	v	-	-	-	-	v	v	v	v	v	v	v	v	v	v
	n13	v	v	-	-	-	-	-	v	v	v	v	v	v	v	v	v	v
	n25	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
	n71	v	v	v	v	-	-	-	v	v	v	v	v	v	v	v	v	v
Radiated Spurious Emission	n5	Worst Case														v	v	v
	n12	Worst Case														v	v	v
	n13	Worst Case														v	v	v
	n25	Worst Case														v	v	v
	n71	Worst Case														v	v	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 modulation test results are shown in the report. 5. Frequency Stability：Normal Voltage = 3.87V；Low Voltage =3.55V；High Voltage =4.45V																	

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	DC Power Supply	GW	GPS-3030D	N/A	N/A	Unshielded, 1.8 m
2.	LTE Base Station	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m
3.	NR Base Station	Anritsu	MT8000A	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 4.6 dB.

Example :

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

= 4.6 (dB)

2.5 Frequency List of Low/Middle/High Channels

5G NR n2 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	388000	392000	396000
	Frequency	1860	1880	1900
15	Channel	387500	392000	396500
	Frequency	1857.5	1880	1902.5
10	Channel	387000	392000	397000
	Frequency	1855	1880	1905
5	Channel	386500	392000	397500
	Frequency	1852.5	1880	1907.5

5G NR n5 Channel and Frequency List for				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	175800	176300	176800
	Frequency	834	836.5	839
15	Channel	175300	176300	177300
	Frequency	831.5	836.5	841.5
10	Channel	174800	176300	177800
	Frequency	829	836.5	844
5	Channel	174300	176300	178300
	Frequency	826.5	836.5	846.5

5G NR n12 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
15	Channel	147300	147500	147700
	Frequency	706.5	707.5	708.5
10	Channel	146800	147500	148200
	Frequency	704	707.5	711
5	Channel	146300	147500	148700
	Frequency	701.5	707.5	713.5

5G NR n13 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	149700	150200	150700
	Frequency	779.5	782	784.5
5	Channel		150200	
	Frequency		782	

5G NR n25 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	388000	392500	397000
	Frequency	1860	1882.5	1905
15	Channel	387500	392500	397500
	Frequency	1857.5	1882.5	1907.5
10	Channel	387000	392500	398000
	Frequency	1855	1882.5	1910
5	Channel	386500	392500	398500
	Frequency	1852.5	1882.5	1912.5

5G NR n71 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	125400	126900	128400
	Frequency	673	680.5	688
15	Channel	124900	126900	128900
	Frequency	670.5	680.5	690.5
10	Channel	124400	126900	129400
	Frequency	668	680.5	693
5	Channel	123900	126900	129900
	Frequency	665.5	680.5	695.5

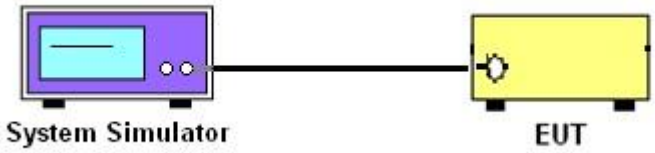
3 Conducted Test Items

3.1 Measuring Instruments

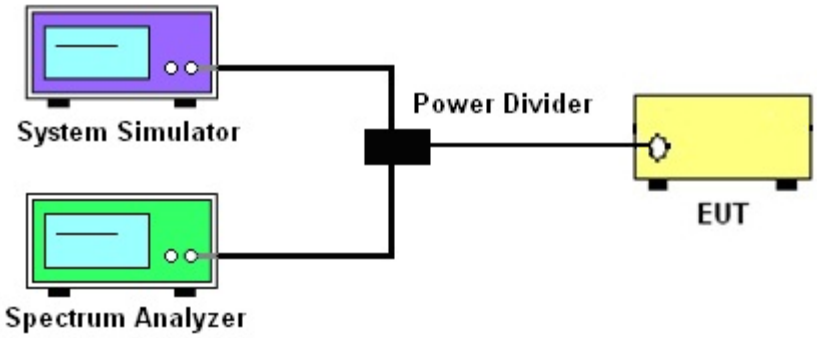
See list of measuring instruments of this test report.

3.2 Test Setup

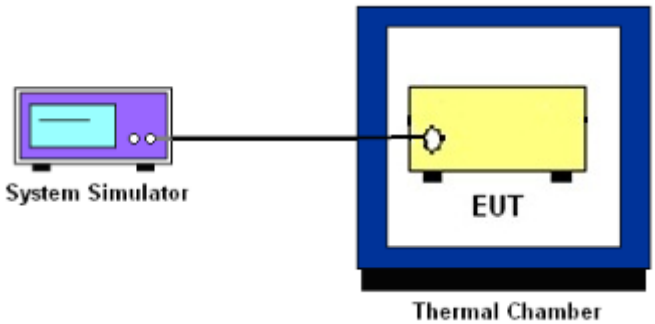
3.2.1 Conducted Output Power



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 ERP/EIRP

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

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

The ERP of mobile transmitters must not exceed 7 Watts for 5G NR n5.

The ERP of mobile transmitters must not exceed 3 Watts for 5G NR n12 and n13 and n71.

The EIRP of mobile transmitters must not exceed 2 Watts for 5G NR n2 and n25.

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

22.917(a)

For operations in the 824 – 849 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 100kHz bandwidth. However, in the 1MHz 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.

24.238 (a)

For operations in the 1850-1910 and 1930-1990 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 1MHz bandwidth. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

27.53 (g)

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

27.53 (c)

For operations in the 776-788 MHz band, the FCC limit is 43 + $10\log_{10}$(P[Watts]) dB below the transmitter power P(Watts) in a 100 kHz bandwidth. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. In addition, the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least 65 + 10 log10 p(watts), dB, for mobile and portable equipment.

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.
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.

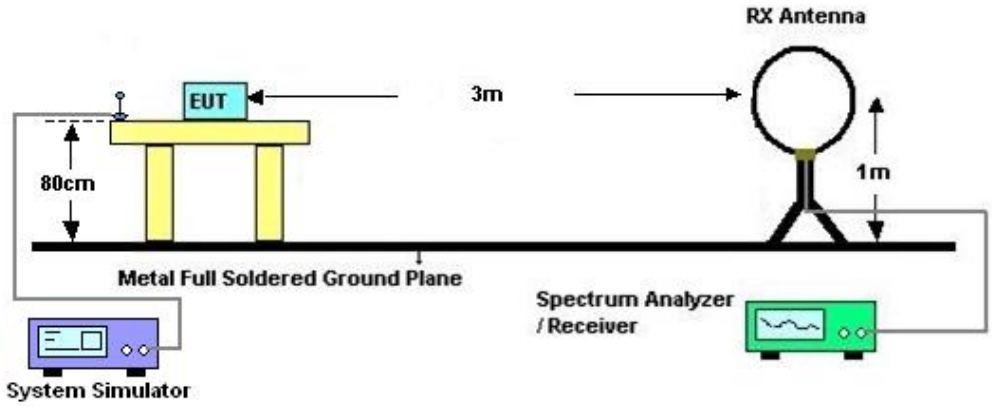
4 Radiated Test Items

4.1 Measuring Instruments

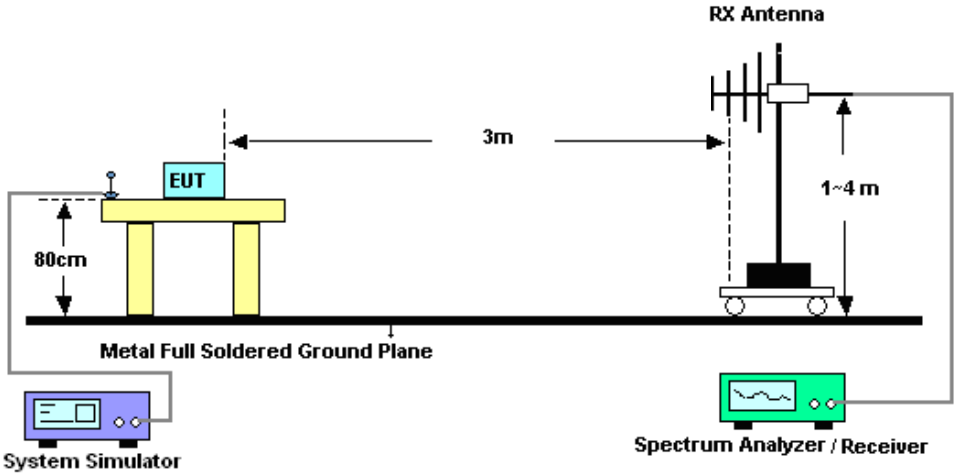
See list of measuring instruments of this test report.

4.2 Test Setup

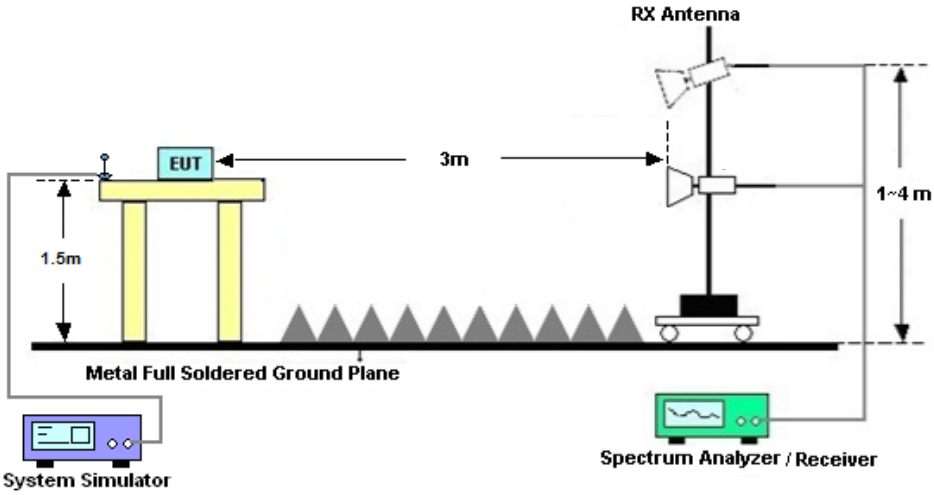
4.2.1 For radiated test below 30MHz



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.

For 5G NR N13

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

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. 14, 2021	May 26, 2022~ Jun. 22, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	Aug. 26, 2021	May 26, 2022~ Jun. 22, 2022	Aug. 25, 2022	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 12, 2021	May 26, 2022~ Jun. 22, 2022	Jul. 11, 2022	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57541079	10Hz-44G,MAX 30dB	Oct. 14, 2022	Jun. 24, 2022	Oct. 13, 2023	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jun. 24, 2022	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 24, 2022	Jun. 24, 2022	May 23, 2023	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1284	1GHz~18GHz	Jan. 05, 2022	Jun. 24, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Jun. 24, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 05, 2022	Jun. 24, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 05, 2022	Jun. 24, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
high gain Amplifier	EM	EM01G18G A	060839	1Ghz-18Ghz	Oct. 14, 2021	Jun. 24, 2022	Oct. 13, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 13, 2021	Jun. 24, 2022	Oct. 12, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jun. 24, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jun. 24, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jun. 24, 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 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 ~ 18 GHz)

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

Uncertainty of Radiated Emission Measurement (18 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 :	Lex Wu	Temperature :	22~23℃
		Relative Humidity :	40~42%

Conducted Output Power(Average power) and EIRP

5G NR n2										
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP	EIRP	EIRP
Channel				372000	376000	380000		L	M	H
Frequency (MHz)				1860	1880	1900				
20	PI/2 BPSK	1	1	23.16	23.13	23.07	0.1	0.2118	0.2104	0.2075
20	QPSK	1	1	23.28	23.20	23.21	0.1	0.2178	0.2138	0.2143
20	QPSK	1	53	23.27	23.26	23.22	0.1	0.2173	0.2168	0.2148
20	QPSK	1	104	23.25	23.18	23.19	0.1	0.2163	0.2128	0.2133
20	QPSK	50	0	22.25	22.26	22.20	0.1	0.1718	0.1722	0.1698
20	QPSK	50	28	23.18	23.19	23.23	0.1	0.2128	0.2133	0.2153
20	QPSK	50	56	22.23	22.17	22.17	0.1	0.1710	0.1687	0.1687
20	QPSK	100	0	22.24	22.24	22.21	0.1	0.1714	0.1714	0.1702
20	16QAM	1	1	22.47	22.35	22.27	0.1	0.1807	0.1758	0.1726
20	64QAM	1	1	20.59	20.53	20.49	0.1	0.1172	0.1156	0.1146
20	256QAM	1	1	18.74	18.65	18.57	0.1	0.0766	0.0750	0.0736
Channel				371500	376000	380500	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				1857.5	1880	1902.5				
15	QPSK	1	1	23.41	23.33	23.30	0.1	0.2244	0.2203	0.2188
15	16QAM	1	1	22.48	22.40	22.31	0.1	0.1811	0.1778	0.1742
Channel				371000	376000	381000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				1855	1880	1905				
10	QPSK	1	1	23.42	23.48	23.45	0.1	0.2249	0.2280	0.2265
10	16QAM	1	1	22.57	22.44	22.47	0.1	0.1849	0.1795	0.1807
Channel				370500	376000	381500	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				1852.5	1880	1907.5				
5	QPSK	1	1	23.35	23.46	23.42	0.1	0.2213	0.2270	0.2249
5	16QAM	1	1	22.34	22.49	22.50	0.1	0.1754	0.1816	0.1820

5G NR n5										
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	ERP	ERP	ERP
Channel				166800	167300	167800		L	M	H
Frequency (MHz)				834	836.5	839				
20	PI/2 BPSK	1	1	23.76	23.68	23.59	-0.1	0.1416	0.1390	0.1361
20	QPSK	1	1	23.79	23.59	23.78	-0.1	0.1426	0.1361	0.1422
20	QPSK	1	53	23.56	23.32	23.47	-0.1	0.1352	0.1279	0.1324
20	QPSK	1	104	23.22	23.03	23.23	-0.1	0.1250	0.1197	0.1253
20	QPSK	50	0	22.65	22.62	22.58	-0.1	0.1096	0.1089	0.1079
20	QPSK	50	28	23.46	23.32	23.36	-0.1	0.1321	0.1279	0.1291
20	QPSK	50	56	22.28	22.16	22.22	-0.1	0.1007	0.0979	0.0993
20	QPSK	100	0	22.52	22.44	22.35	-0.1	0.1064	0.1045	0.1023
20	16QAM	1	1	22.86	22.95	22.86	-0.1	0.1151	0.1175	0.1151
20	64QAM	1	1	21.06	20.85	21.03	-0.1	0.0760	0.0724	0.0755
20	256QAM	1	1	19.13	19.11	19.13	-0.1	0.0488	0.0485	0.0488
Channel				166300	167300	168300	Gain	ERP	ERP	ERP
Frequency (MHz)				831.5	836.5	841.5				
15	QPSK	1	1	23.66	23.58	23.32	-0.1	0.1384	0.1358	0.1279
15	16QAM	1	1	22.85	22.78	22.53	-0.1	0.1148	0.1130	0.1067
Channel				165800	167300	168800	Gain	ERP	ERP	ERP
Frequency (MHz)				829	836.5	844				
10	QPSK	1	1	23.63	23.41	23.13	-0.1	0.1374	0.1306	0.1225
10	16QAM	1	1	22.86	22.53	22.36	-0.1	0.1151	0.1067	0.1026
Channel				165300	167300	169300	Gain	ERP	ERP	ERP
Frequency (MHz)				826.5	836.5	846.5				
5	QPSK	1	1	23.76	23.32	23.21	-0.1	0.1416	0.1279	0.1247
5	16QAM	1	1	22.92	22.58	22.35	-0.1	0.1167	0.1079	0.1023

5G NR n12										
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	ERP	ERP	ERP
Channel				141300	141500	141700		L	M	H
Frequency (MHz)				706.5	707.5	708.5				
15	PI/2 BPSK	1	1	22.56	22.79	22.63	-0.3	0.1026	0.1081	0.1042
15	QPSK	1	1	22.32	22.83	22.71	-0.3	0.0971	0.1091	0.1062
15	QPSK	1	40	22.65	22.92	22.86	-0.3	0.1047	0.1114	0.1099
15	QPSK	1	77	22.61	22.75	22.78	-0.3	0.1038	0.1072	0.1079
15	QPSK	36	0	21.72	21.77	21.69	-0.3	0.0845	0.0855	0.0839
15	QPSK	36	22	22.75	22.86	22.74	-0.3	0.1072	0.1099	0.1069
15	QPSK	36	43	21.78	21.89	21.76	-0.3	0.0857	0.0879	0.0853
15	QPSK	75	0	21.73	21.83	21.74	-0.3	0.0847	0.0867	0.0849
15	16QAM	1	1	21.72	21.96	21.92	-0.3	0.0845	0.0893	0.0885
15	64QAM	1	1	19.83	20.12	20.13	-0.3	0.0547	0.0585	0.0586
15	256QAM	1	1	18.03	17.95	18.06	-0.3	0.0361	0.0355	0.0364
Channel				140800	141500	142200	Gain	ERP	ERP	ERP
Frequency (MHz)				704	707.5	711				
10	QPSK	1	1	22.54	22.76	22.79	-0.3	0.1021	0.1074	0.1081
10	16QAM	1	1	21.66	21.92	22.03	-0.3	0.0834	0.0885	0.0908
Channel				140300	141500	142700	Gain	ERP	ERP	ERP
Frequency (MHz)				701.5	707.5	713.5				
5	QPSK	1	1	22.32	22.65	22.58	-0.3	0.0971	0.1047	0.1030
5	16QAM	1	1	21.75	21.88	21.89	-0.3	0.0851	0.0877	0.0879

5G NR n13										
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	ERP	ERP	ERP
Channel					156400			L	M	H
Frequency (MHz)					782					
10	PI/2 BPSK	1	1		22.72		-1.0	0.0005	0.0906	0.0005
10	QPSK	1	1		22.95		-1.0	0.0005	0.0955	0.0005
10	QPSK	1	0		21.83		-1.0	0.0005	0.0738	0.0005
10	QPSK	1	51		22.07		-1.0	0.0005	0.0780	0.0005
10	QPSK	50	0		21.75		-1.0	0.0005	0.0724	0.0005
10	16QAM	1	1		21.87		-1.0	0.0005	0.0745	0.0005
10	64QAM	1	1		20.14		-1.0	0.0005	0.0500	0.0005
10	256QAM	1	1		18.03		-1.0	0.0005	0.0308	0.0005
Channel				155900	156400	156900	Gain	ERP	ERP	ERP
Frequency (MHz)				779.5	782	784.5				
5	QPSK	1	1	22.86	22.91	22.92	-1.0	0.0935	0.0946	0.0948
5	16QAM	1	1	21.89	21.95	21.94	-1.0	0.0748	0.0759	0.0757

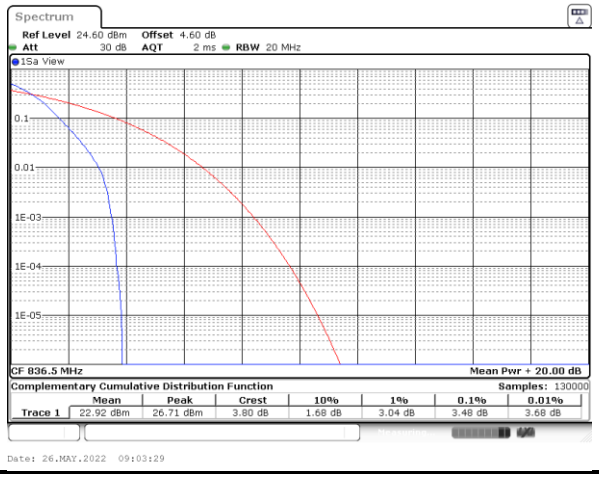
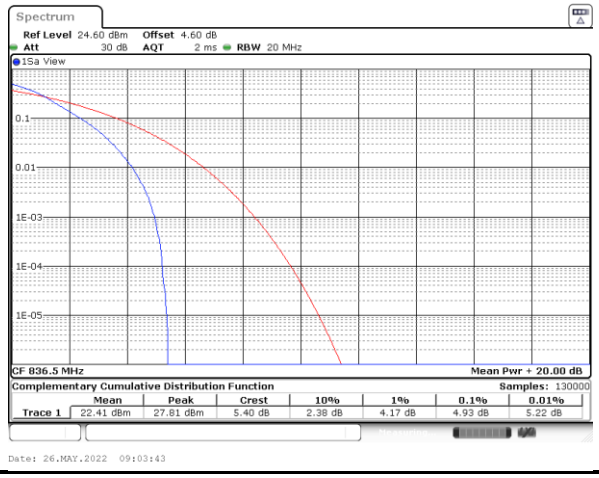
ENDC_12A-n25A										
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	EIRP	EIRP	EIRP
Channel				372000	376500	381000		L	M	H
Frequency (MHz)				1860	1882.5	1905				
20	PI/2 BPSK	1	1	23.68	23.71	23.69	0.1	0.2388	0.2404	0.2393
20	QPSK	1	1	23.58	23.64	23.57	0.1	0.2333	0.2366	0.2328
20	QPSK	1	53	23.64	23.52	23.36	0.1	0.2366	0.2301	0.2218
20	QPSK	1	104	23.65	23.46	22.55	0.1	0.2371	0.2270	0.1841
20	QPSK	50	0	22.97	22.84	22.90	0.1	0.2028	0.1968	0.1995
20	QPSK	50	28	23.98	23.81	23.55	0.1	0.2559	0.2460	0.2317
20	QPSK	50	56	22.94	22.75	22.39	0.1	0.2014	0.1928	0.1774
20	16QAM	1	1	23.16	23.17	23.07	0.1	0.2118	0.2123	0.2075
20	64QAM	1	1	21.24	21.16	21.12	0.1	0.1361	0.1337	0.1324
20	256QAM	1	1	19.22	19.14	19.11	0.1	0.0855	0.0839	0.0834
Channel				371500	376500	381500	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				1857.5	1882.5	1907.5				
15	QPSK	1	1	23.71	23.52	23.63	0.1	0.2404	0.2301	0.2360
15	16QAM	1	1	23.35	23.20	22.82	0.1	0.2213	0.2138	0.1959
Channel				371000	376500	382000	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				1855	1882.5	1910				
10	QPSK	1	1	23.78	23.71	23.17	0.1	0.2443	0.2404	0.2123
10	16QAM	1	1	23.35	23.25	22.59	0.1	0.2213	0.2163	0.1858
Channel				370500	376500	382500	Gain	EIRP	EIRP	EIRP
Frequency (MHz)				1852.5	1882.5	1912.5				
5	QPSK	1	1	23.74	23.60	23.11	0.1	0.2421	0.2344	0.2094
5	16QAM	1	1	23.30	23.27	22.47	0.1	0.2188	0.2173	0.1807

5G NR n71										
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Gain	ERP	ERP	ERP
Channel				134600	136100	137600		L	M	H
Frequency (MHz)				673	680.5	688				
20	PI/2 BPSK	1	1	23.38	22.92	22.67	-1.60	0.0918	0.0826	0.0780
20	QPSK	1	1	23.55	23.06	22.79	-1.60	0.0955	0.0853	0.0802
20	QPSK	1	53	23.02	22.60	22.51	-1.60	0.0845	0.0767	0.0752
20	QPSK	1	104	22.60	22.63	22.68	-1.60	0.0767	0.0773	0.0782
20	QPSK	50	0	22.18	21.84	21.58	-1.60	0.0697	0.0644	0.0607
20	QPSK	50	28	22.94	22.67	22.57	-1.60	0.0830	0.0780	0.0762
20	QPSK	50	56	21.62	21.59	21.59	-1.60	0.0612	0.0608	0.0608
20	QPSK	100	0	21.98	21.67	21.60	-1.60	0.0665	0.0619	0.0610
20	16QAM	1	1	22.54	22.13	21.82	-1.60	0.0757	0.0689	0.0641
20	64QAM	1	1	20.64	20.57	20.12	-1.60	0.0489	0.0481	0.0434
20	256QAM	1	1	19.39	18.26	18.05	-1.60	0.0366	0.0282	0.0269
Channel				134100	136100	138100	Gain	ERP	ERP	ERP
Frequency (MHz)				670.5	680.5	690.5				
15	QPSK	1	1	23.52	23.01	22.63	-1.60	0.0948	0.0843	0.0773
15	16QAM	1	1	22.62	22.24	21.64	-1.60	0.0771	0.0706	0.0615
Channel				133600	136100	138600	Gain	ERP	ERP	ERP
Frequency (MHz)				668	680.5	693				
10	QPSK	1	1	23.44	22.91	22.77	-1.60	0.0931	0.0824	0.0798
10	16QAM	1	1	22.57	21.95	21.90	-1.60	0.0762	0.0661	0.0653
Channel				133100	136100	139100	Gain	ERP	ERP	ERP
Frequency (MHz)				665.5	680.5	695.5				
5	QPSK	1	1	23.51	22.79	22.86	-1.60	0.0946	0.0802	0.0815
5	16QAM	1	1	22.55	21.82	21.65	-1.60	0.0759	0.0641	0.0617

FR1 n5

Peak-to-Average Ratio

Mode	FR1 n5 / 20MHz / DFT-S OFDM				
Mod.	PI/2 BPSK	QPSK			Limit: 13dB
RB Size	Full RB	Full RB			Result
Middle CH	3.48	4.93			PASS

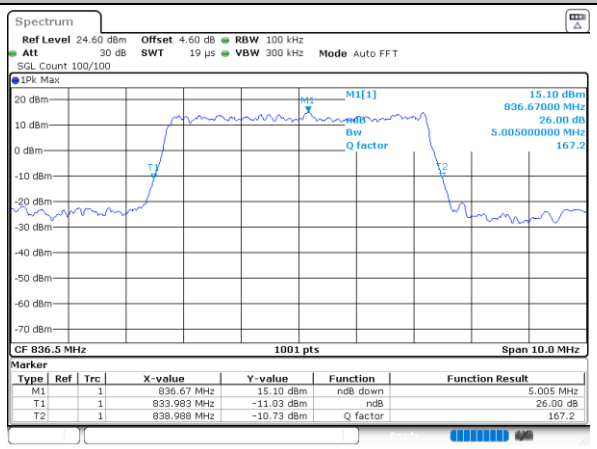
FR1 n5 / 20MHz / DFT-S OFDM / Middle Channel / Full RB	
PI/2 BPSK	QPSK
	

26dB Bandwidth

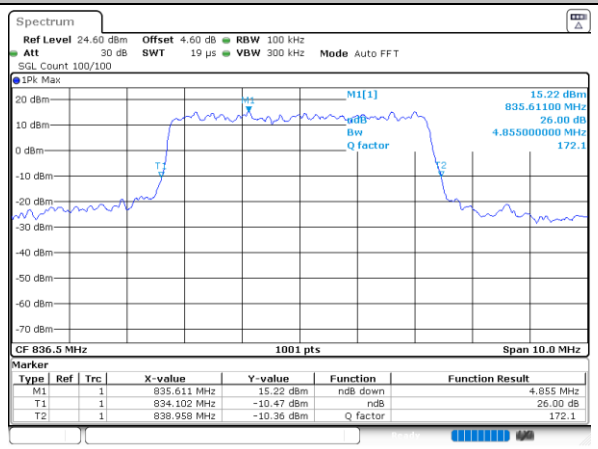
Mode	FR1 n5 : 26dBW (MHz) / CP OFDM									
BW	5M					10M				
Mod.		QPSK	16QAM	64QAM	256QAM		QPSK	16QAM	64QAM	256QAM
Middle CH		5.01	4.86	4.93	4.91		9.73	10.05	9.99	10.09
BW	15M					20M				
Mod.		QPSK	16QAM	64QAM	256QAM		QPSK	16QAM	64QAM	256QAM
Middle CH		15.05	14.90	15.11	14.96		21.10	21.26	21.14	21.18

FR1 n5 / 5MHz / CP OFDM

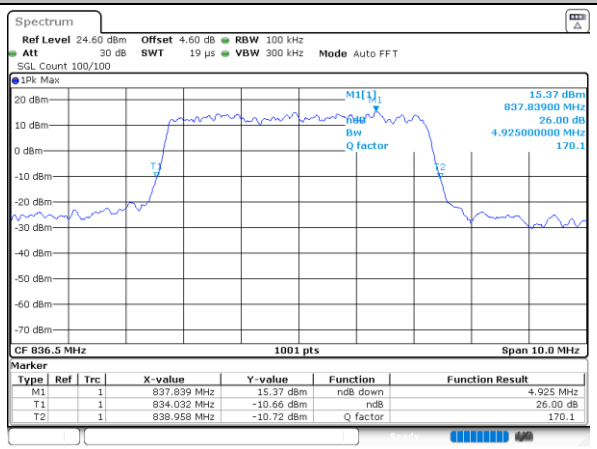
QPSK



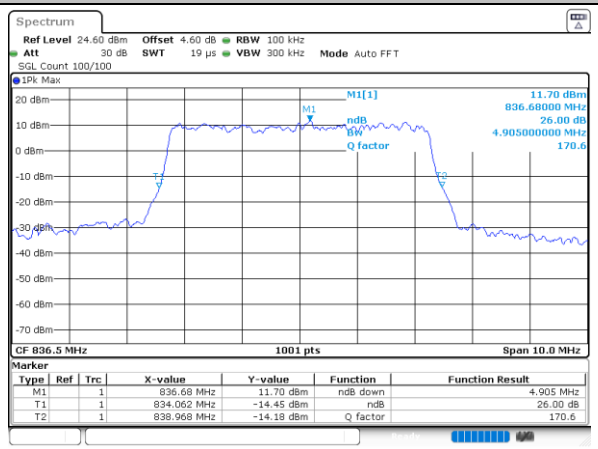
16QAM



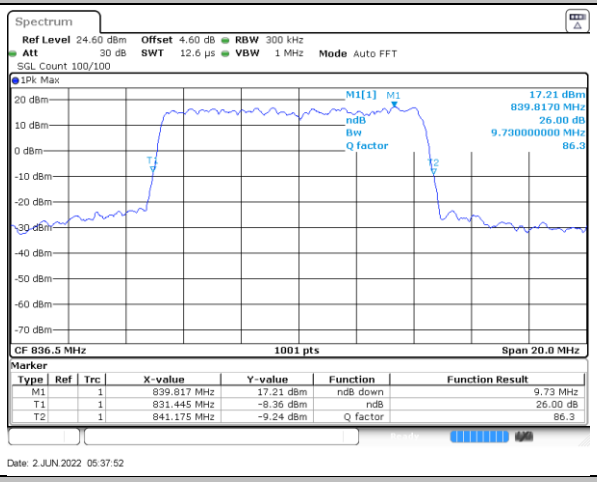
64QAM

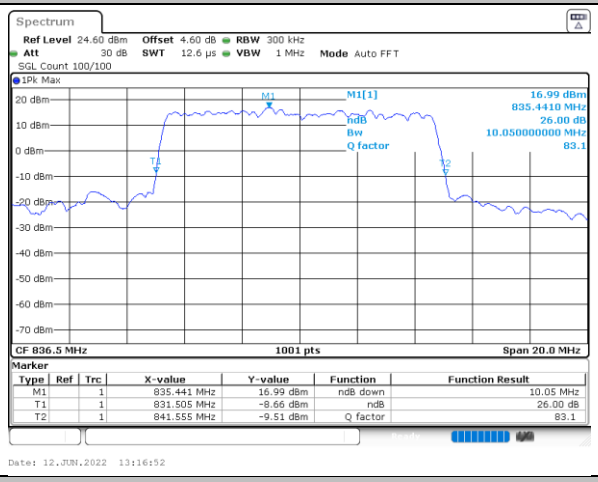


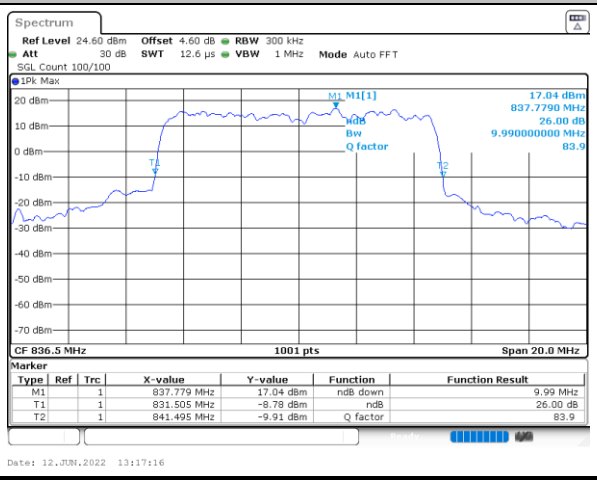
256QAM

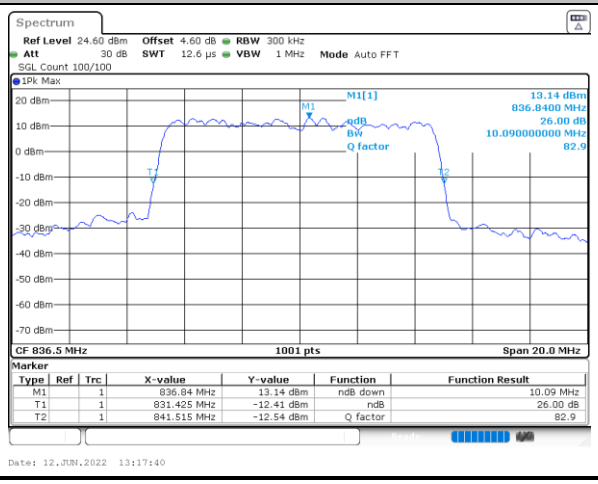


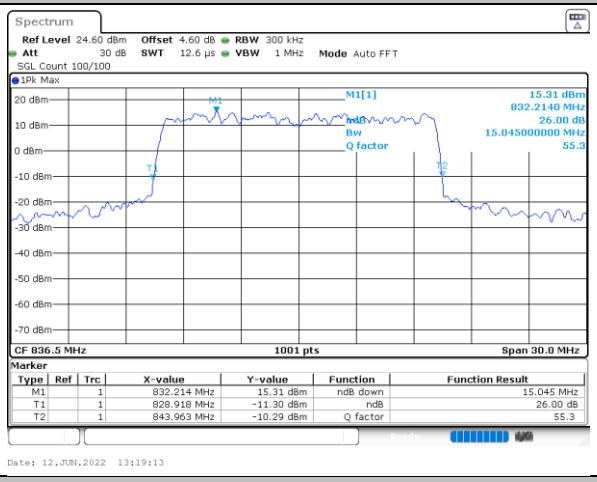
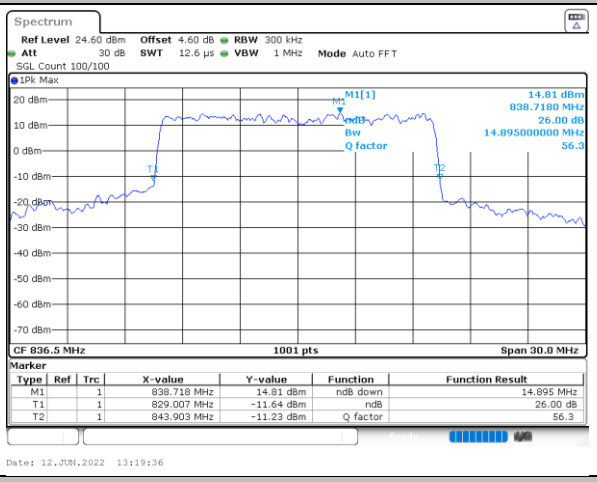
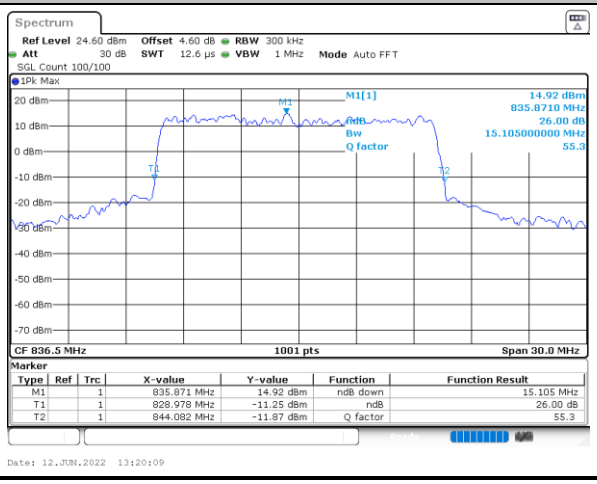
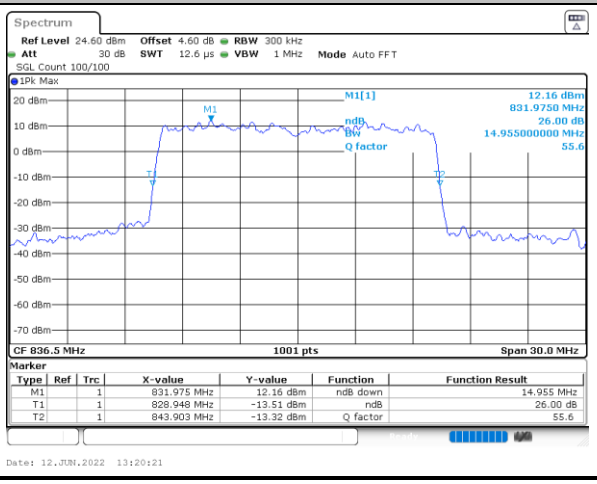
FR1 n5 / 10MHz / CP OFDM	
QPSK	16QAM
64QAM	256QAM

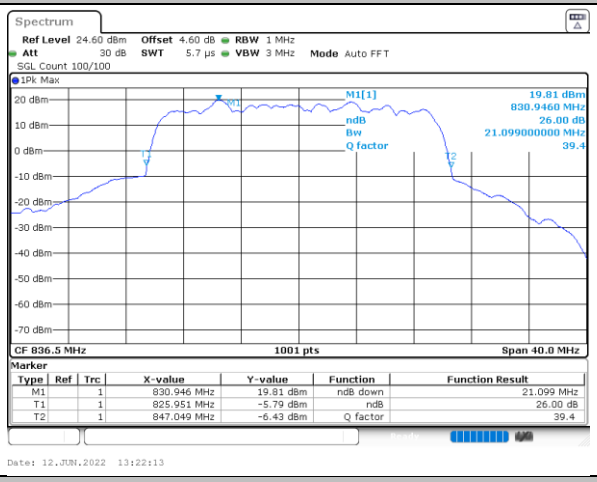
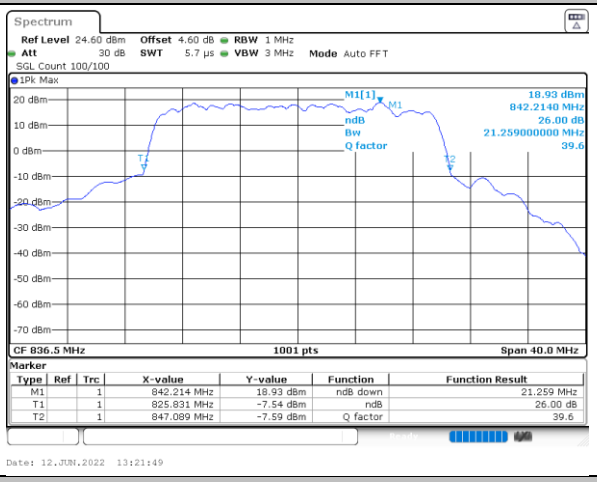
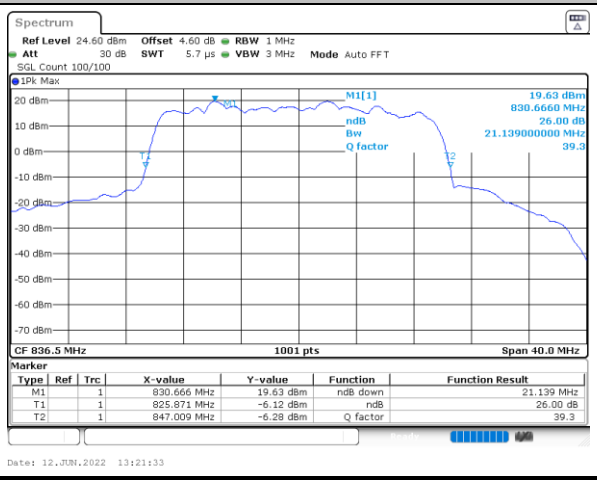
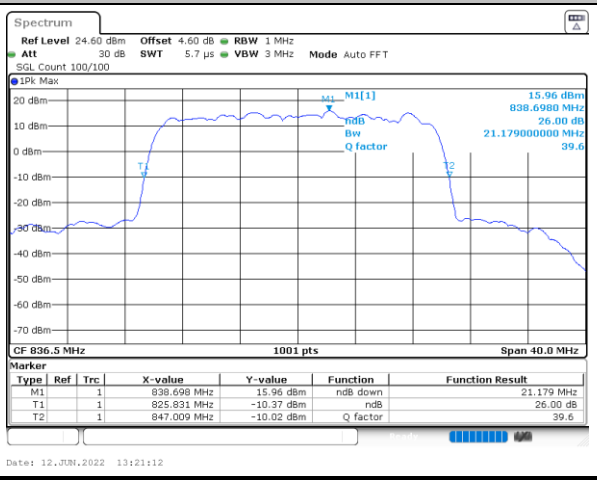








FR1 n5 / 15MHz / CP OFDM	
QPSK	16QAM
	
64QAM	256QAM
	

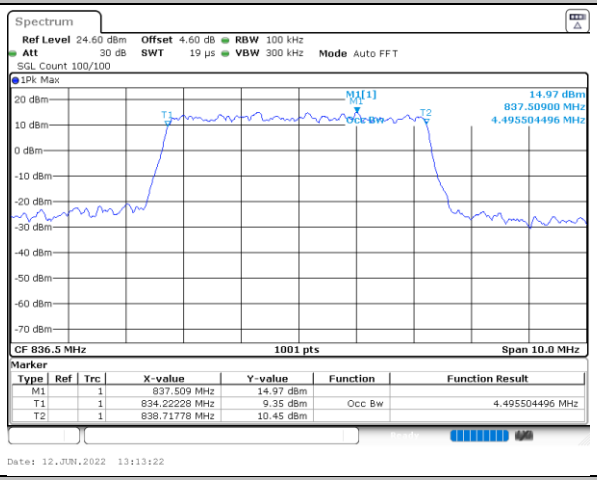
FR1 n5 / 20MHz / CP OFDM	
QPSK	16QAM
	
64QAM	256QAM
	

Occupied Bandwidth

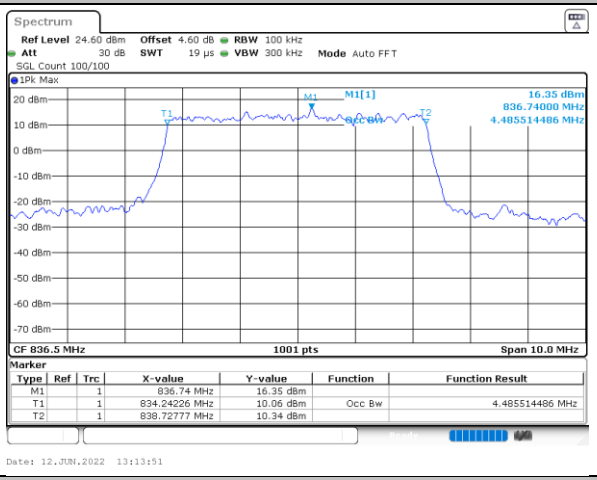
Mode	FR1 n5 : OB (MHz) / CP OFDM									
BW	5M					10M				
Mod.		QPSK	16QAM	64QAM	256QAM		QPSK	16QAM	64QAM	256QAM
Middle CH		4.50	4.49	4.49	4.49		9.37	9.33	9.35	9.37
BW	15M					20M				
Mod.		QPSK	16QAM	64QAM	256QAM		QPSK	16QAM	64QAM	256QAM
Middle CH		14.15	14.15	14.15	14.18		19.30	19.30	19.26	19.22

FR1 n5 / 5MHz / CP OFDM

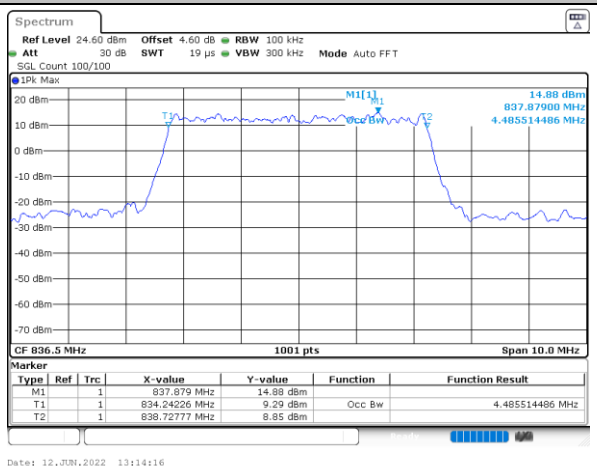
QPSK



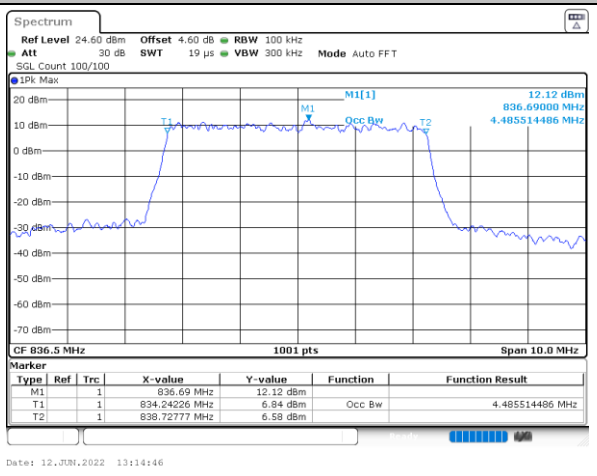
16QAM

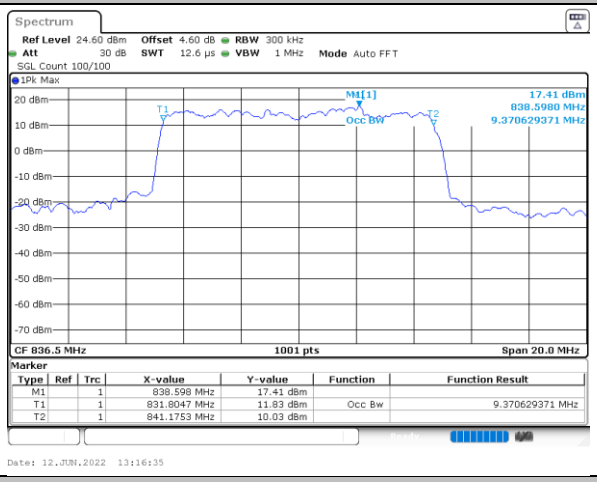
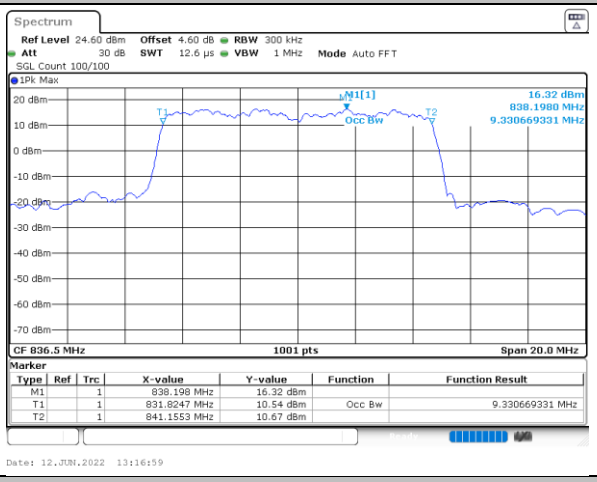
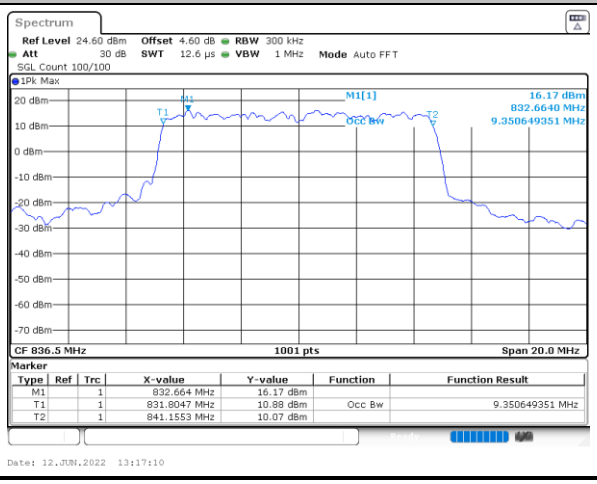
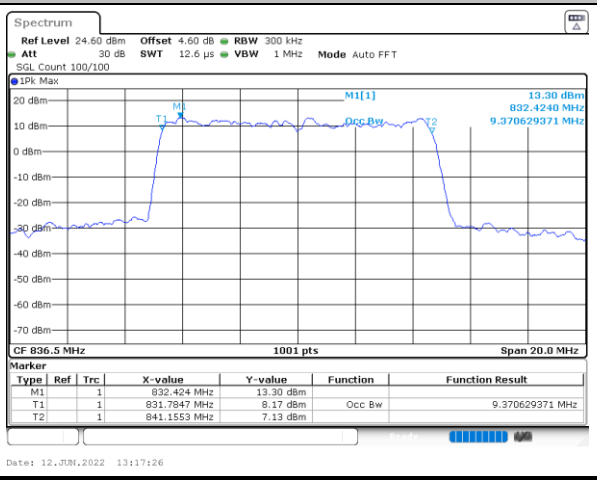


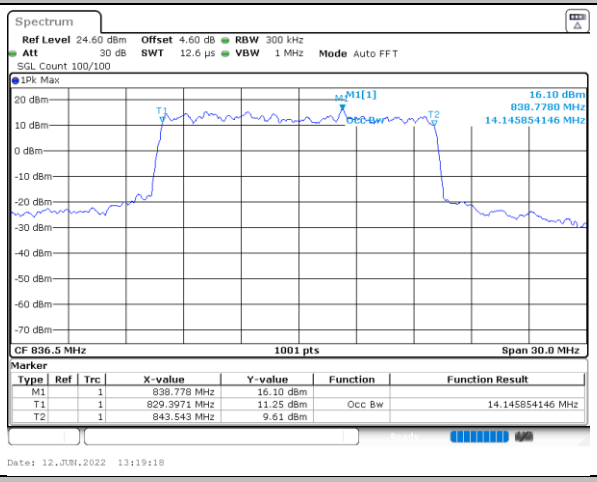
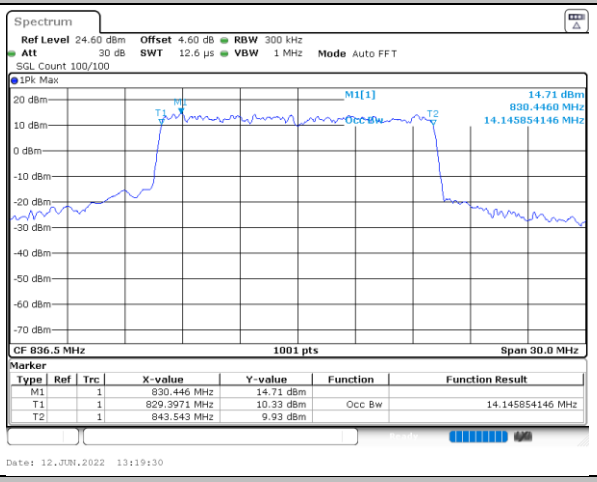
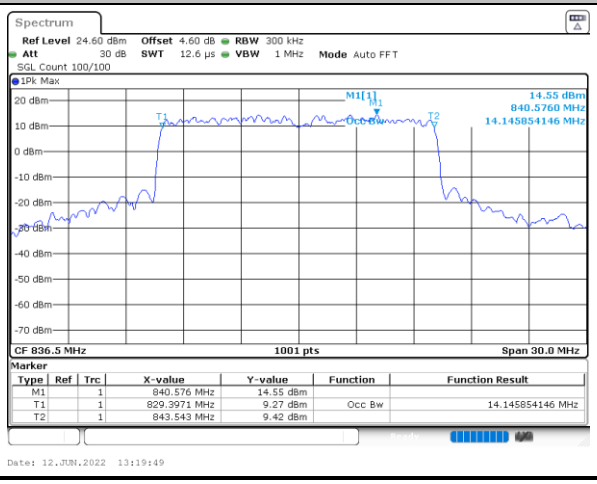
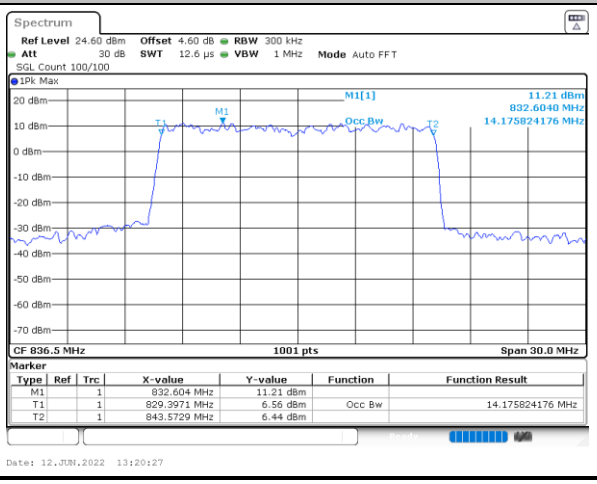
64QAM

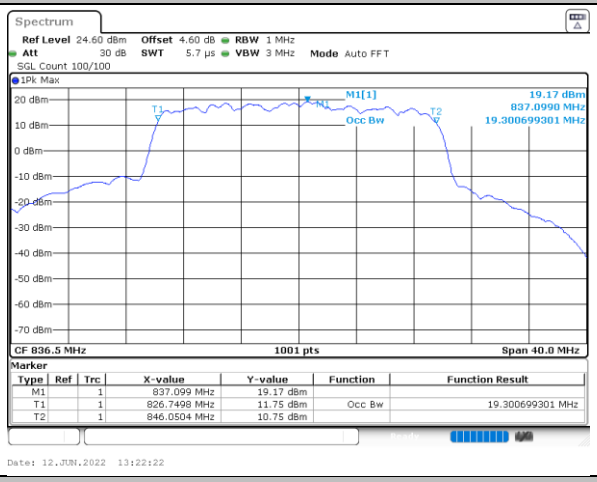
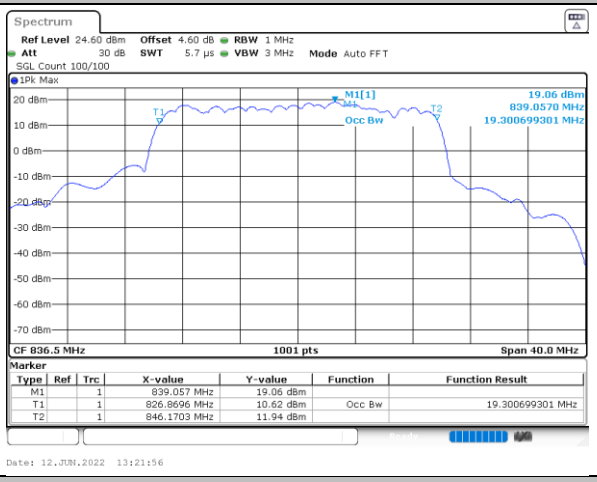
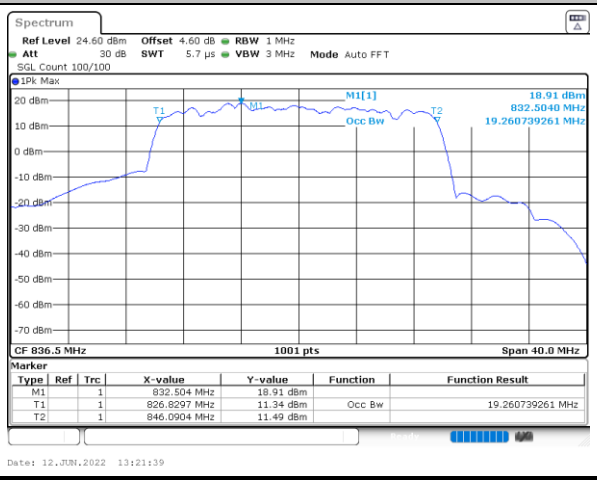
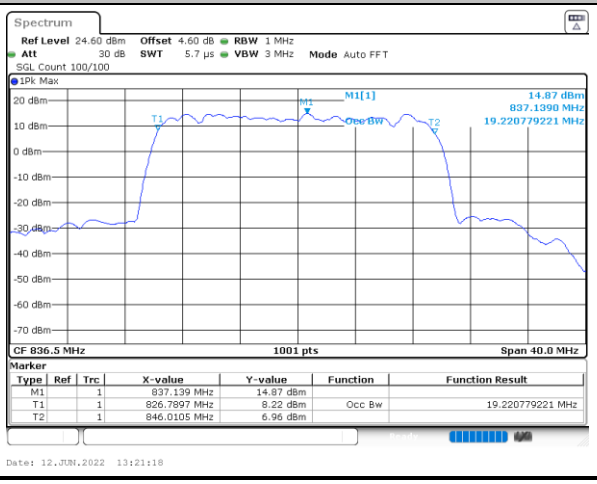


256QAM



FR1 n5 / 10MHz / CP OFDM	
QPSK	16QAM
	
64QAM	256QAM
	

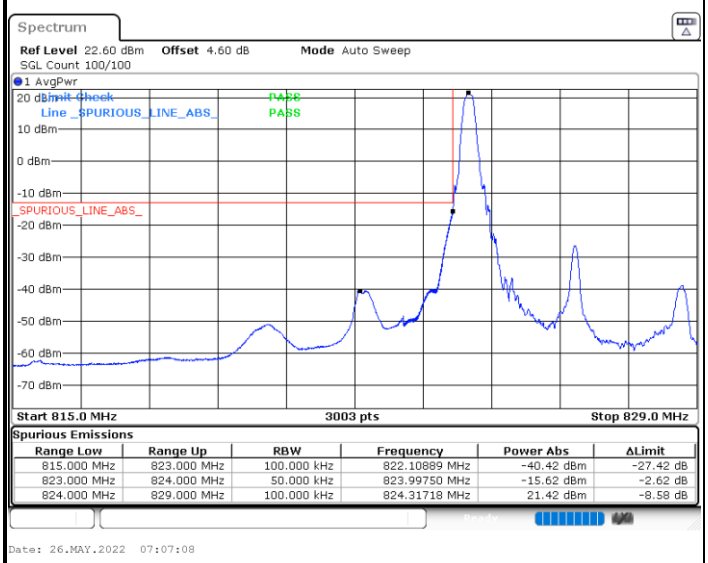
FR1 n5 / 15MHz / CP OFDM	
QPSK	16QAM
	
64QAM	256QAM
	

FR1 n5 / 20MHz / CP OFDM	
QPSK	16QAM
	
64QAM	256QAM
	

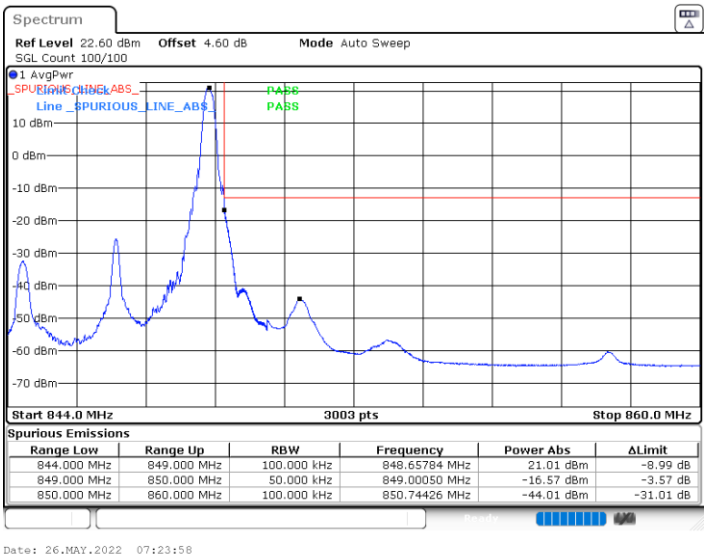
Conducted Band Edge

FR1 n5 / 5MHz / DFT-S OFDM / PI/2 BPSK

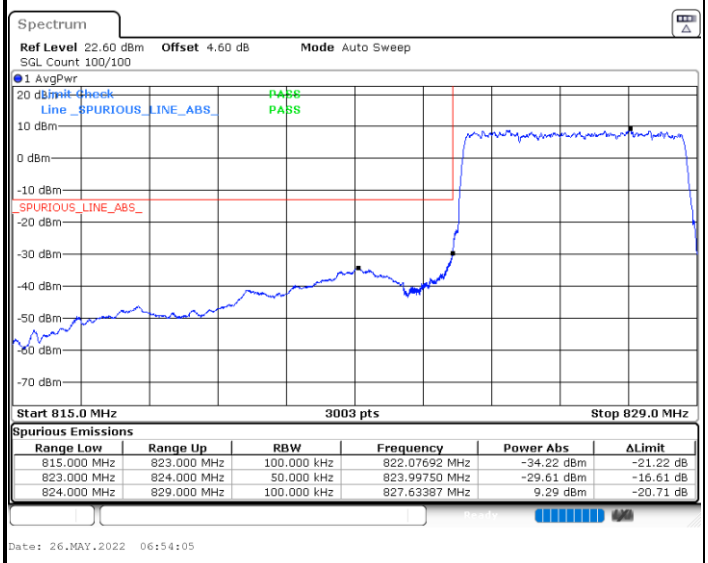
Lowest Band Edge / 1RB0



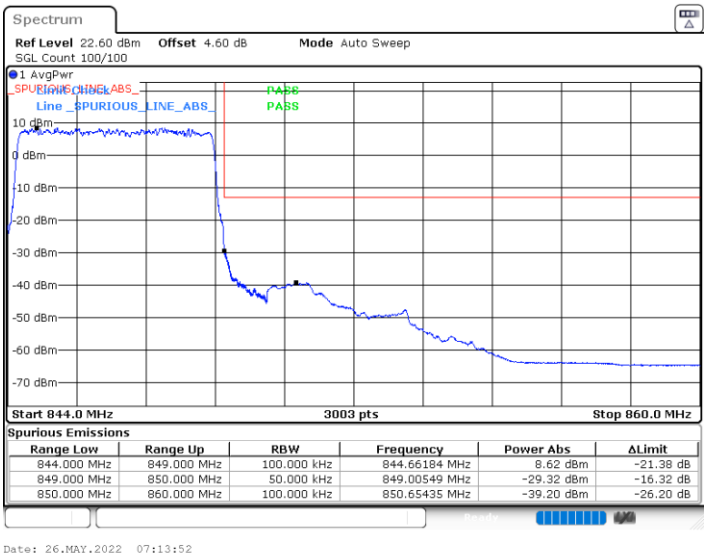
Highest Band Edge / 1RBmax

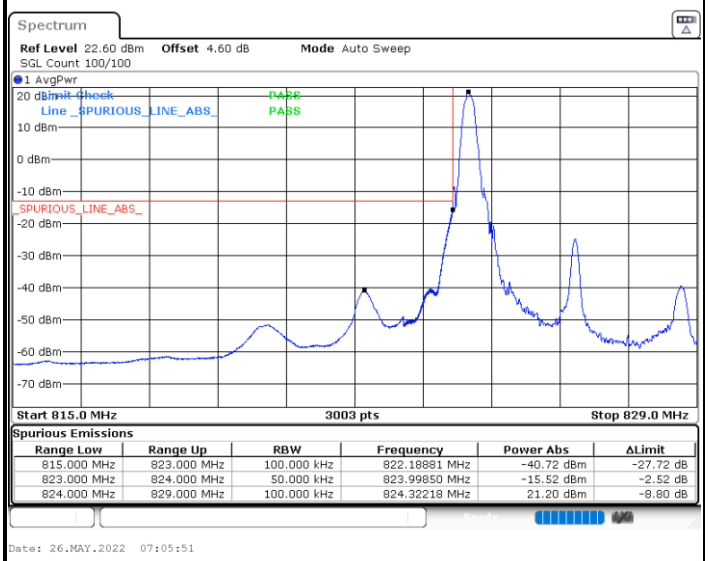
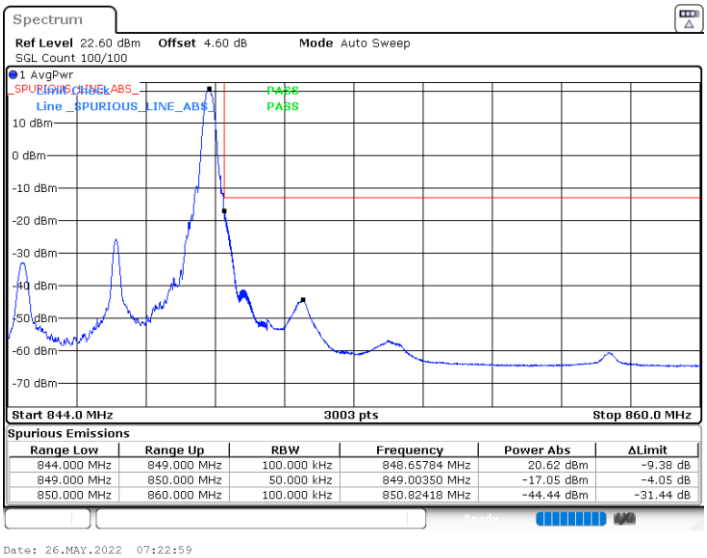
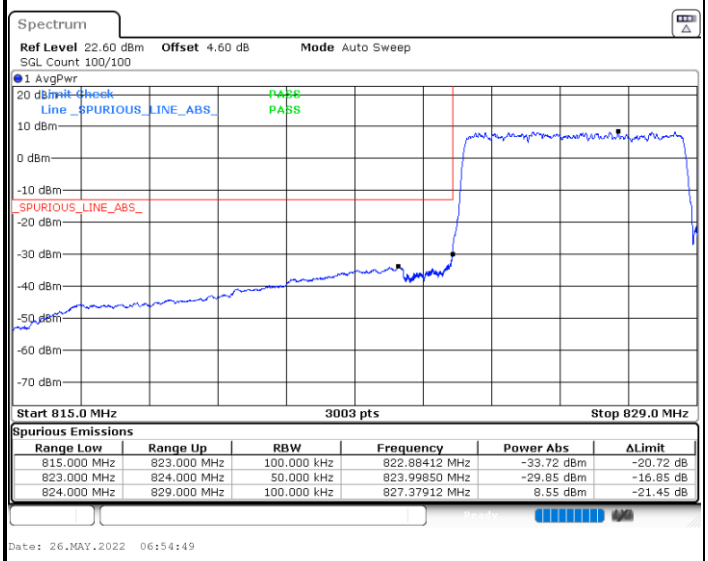
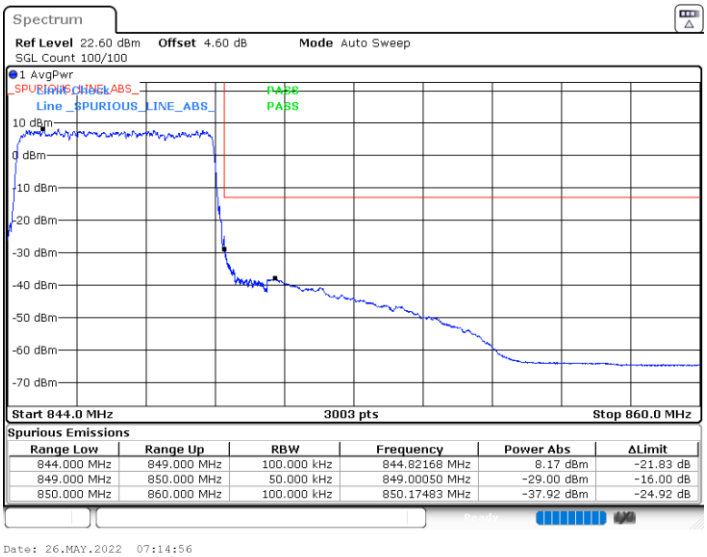


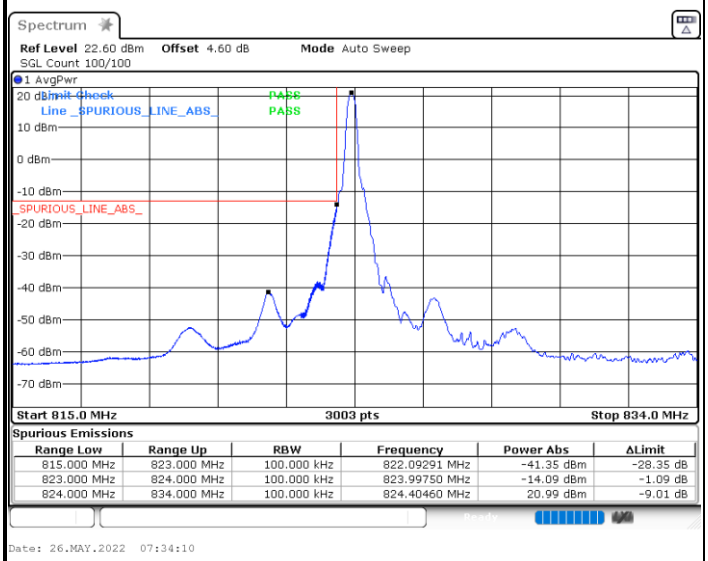
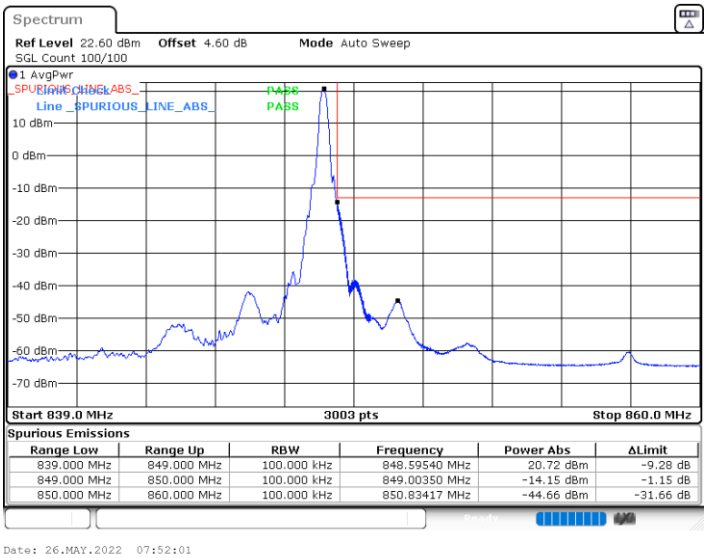
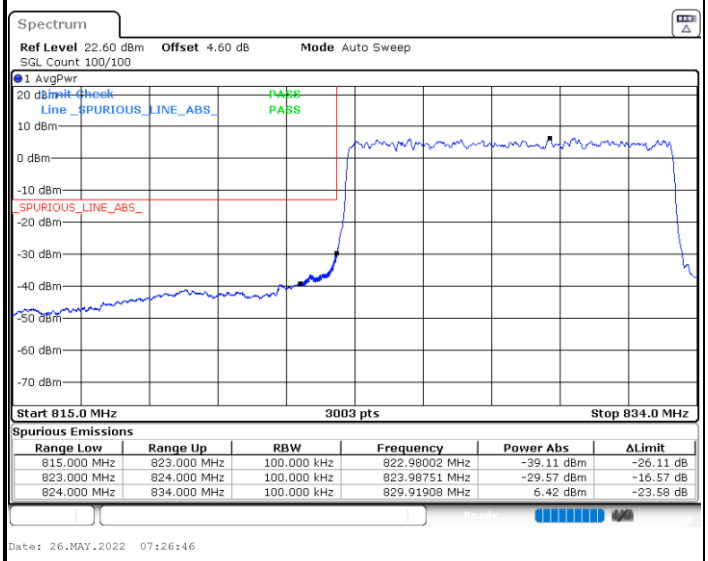
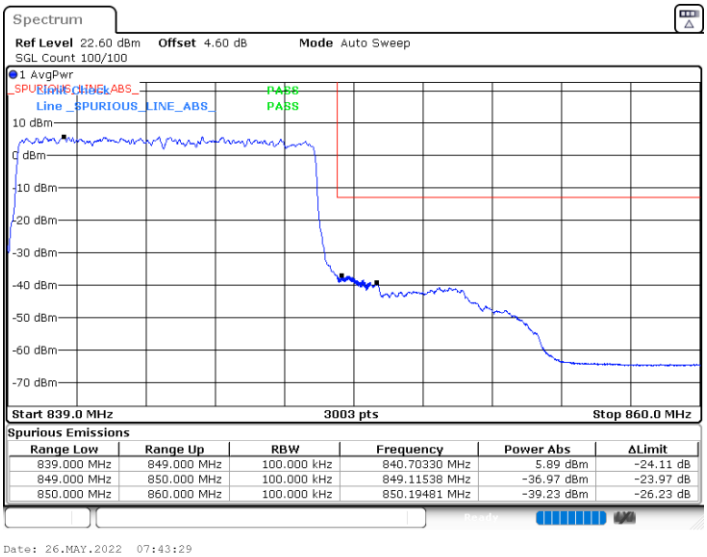
Lowest Band Edge / Full RB

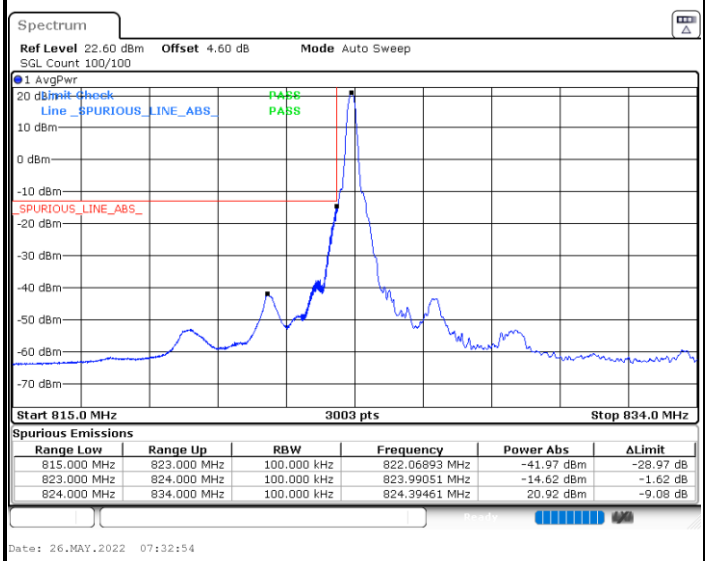
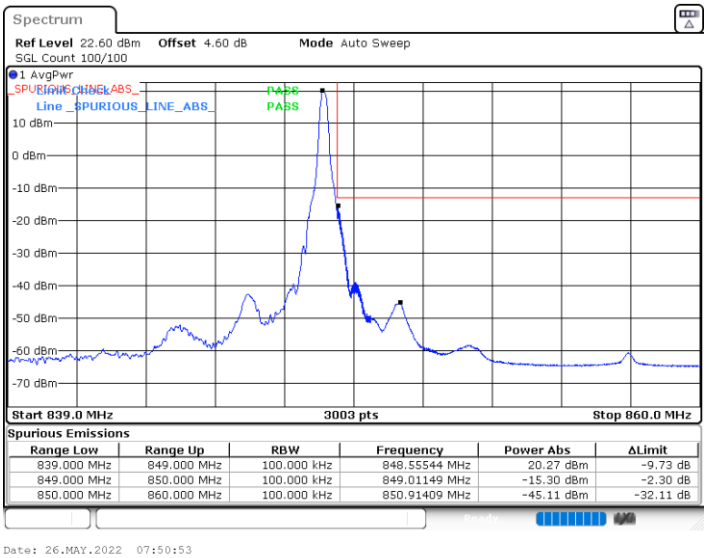
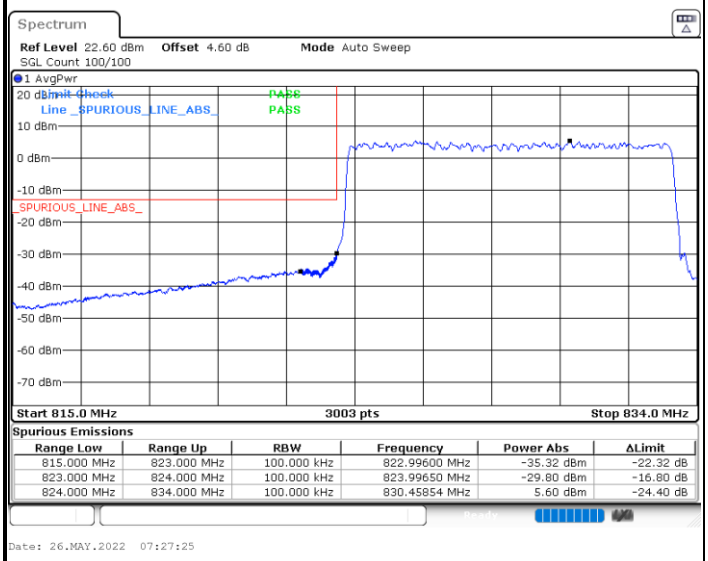
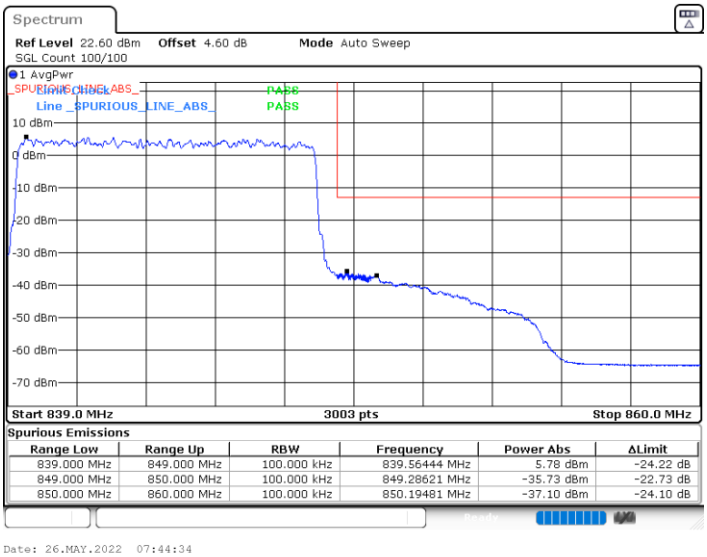


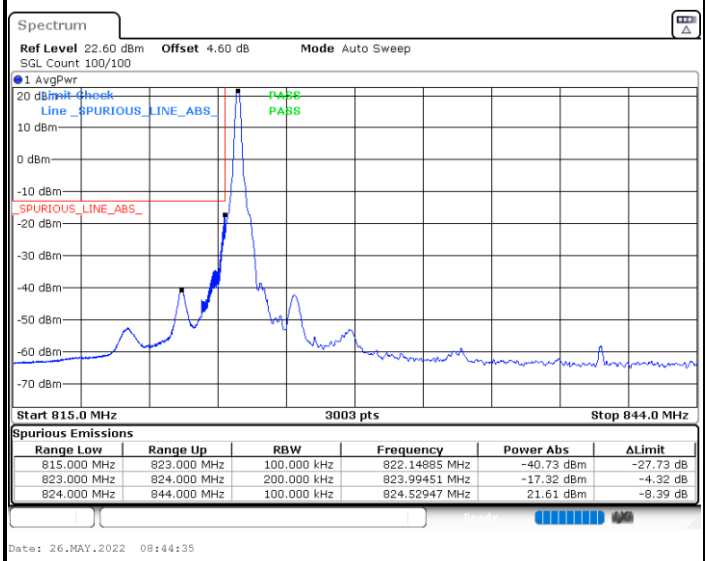
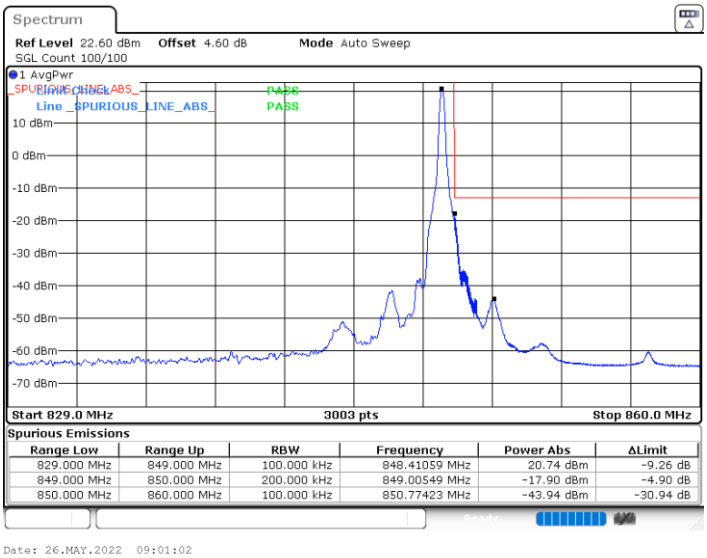
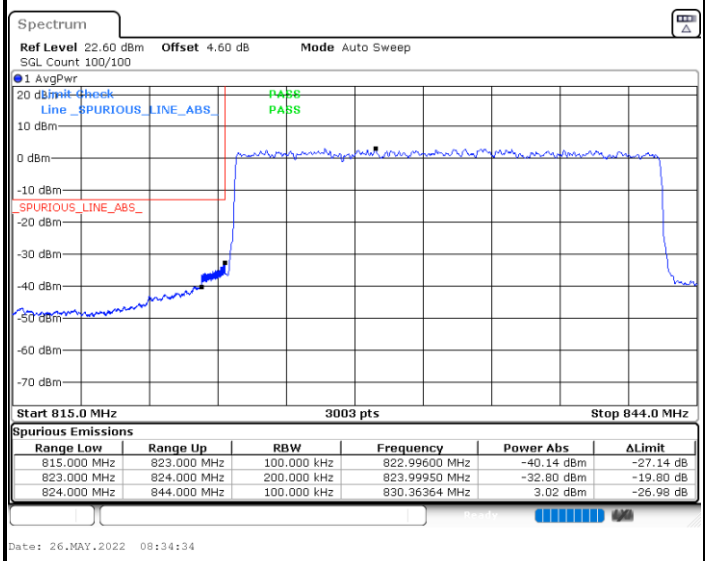
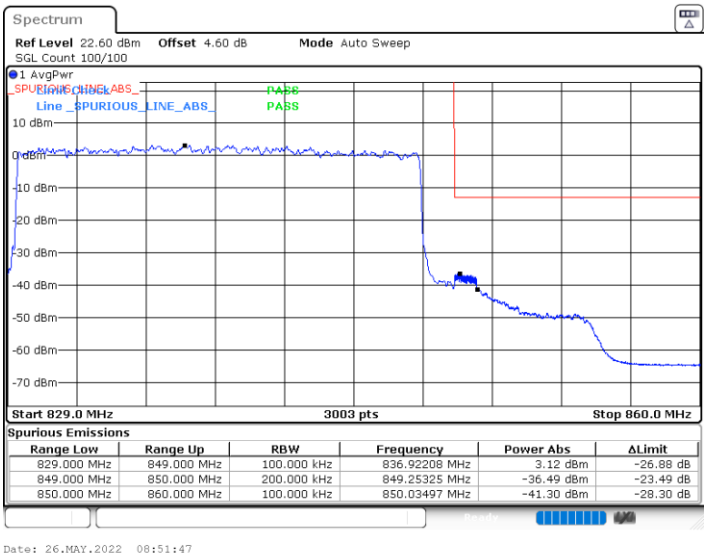
Highest Band Edge / Full RB

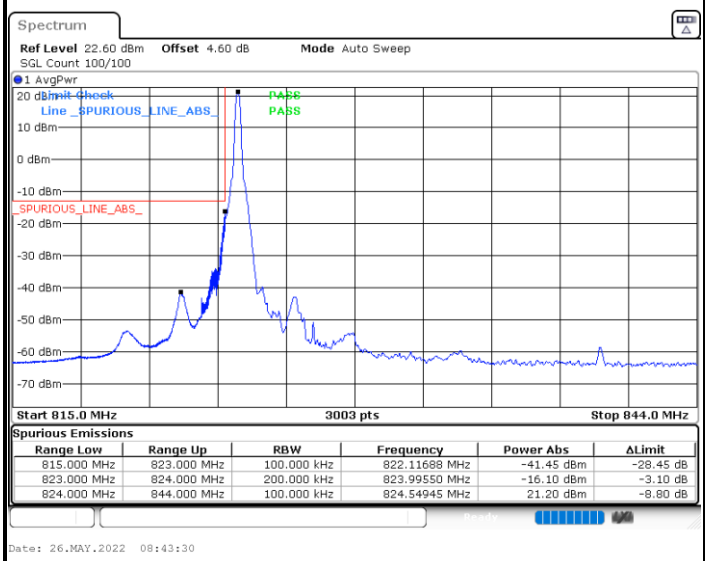
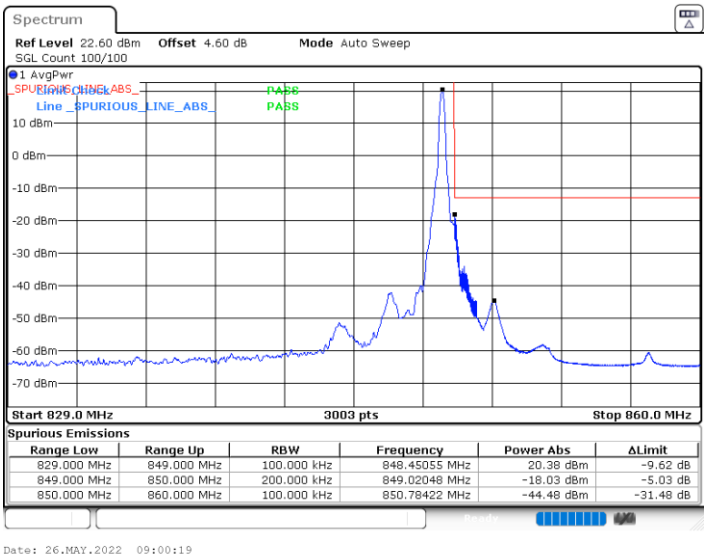
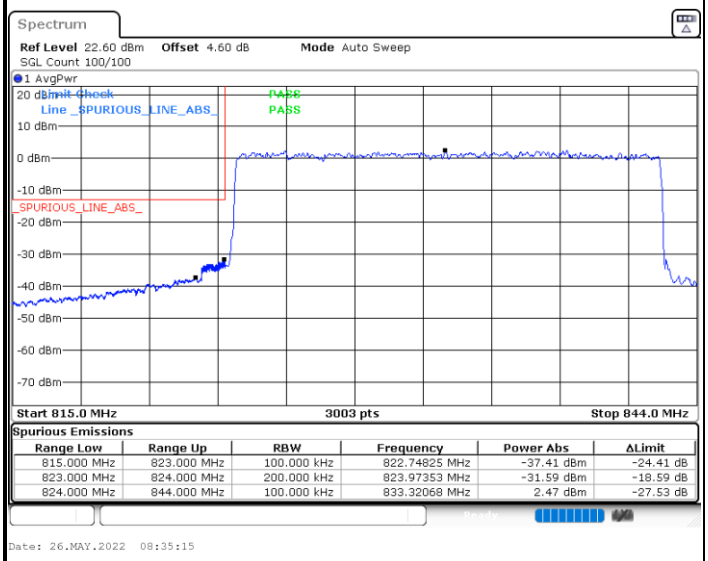
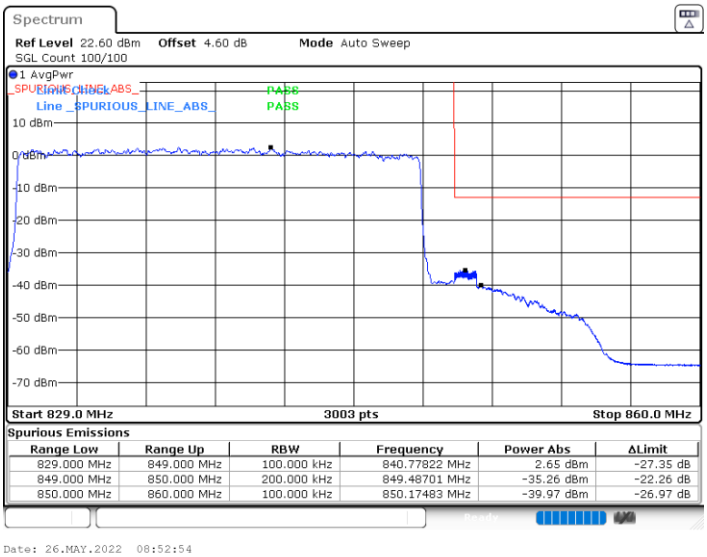


FR1 n5 / 5MHz / DFT-S OFDM / QPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

FR1 n5 / 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 n5 / 10MHz / DFT-s-OFDM / QPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

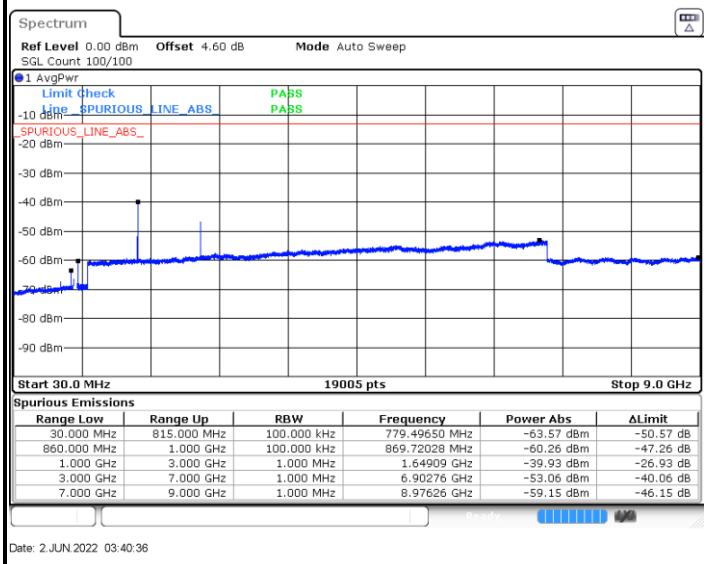
FR1 n5 / 20MHz / DFT-s-OFDM / PI/2 BPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

FR1 n5 / 20MHz / DFT-s-OFDM / QPSK	
Lowest Band Edge / 1RB0	**Highest Band Edge / 1RBmax**
	
Lowest Band Edge / Full RB	**Highest Band Edge / Full RB**
	

Conducted Spurious Emission

FR1 n5 / 5MHz / DFT-S OFDM / BPSK

Lowest Channel / 1RB1



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	815.000 MHz	100.000 kHz	779.49650 MHz	-63.57 dBm	-50.57 dB
860.000 MHz	1.000 GHz	100.000 kHz	869.72028 MHz	-60.26 dBm	-47.26 dB
1.000 GHz	3.000 GHz	1.000 MHz	1.64909 GHz	-39.93 dBm	-26.93 dB
3.000 GHz	7.000 GHz	1.000 MHz	6.90276 GHz	-53.06 dBm	-40.06 dB
7.000 GHz	9.000 GHz	1.000 MHz	8.97626 GHz	-59.15 dBm	-46.15 dB

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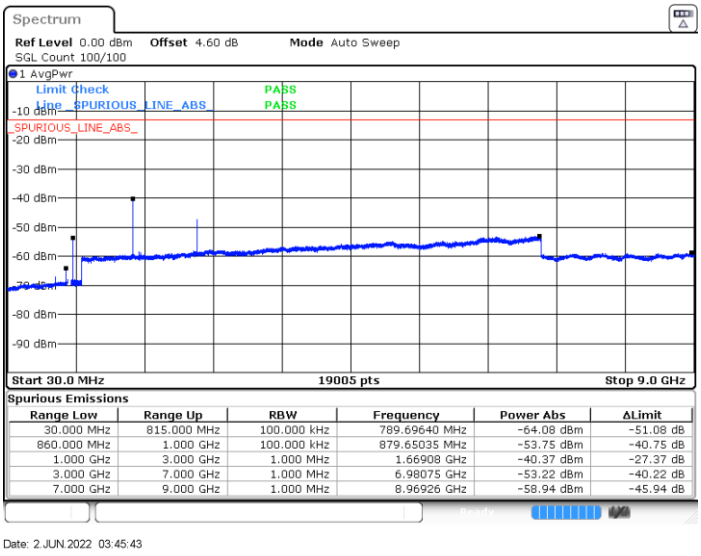
Middle Channel / 1RB1

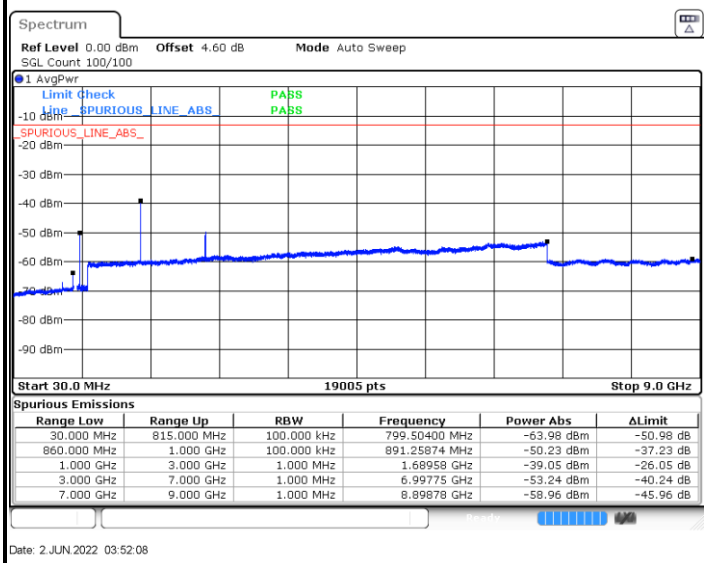


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	815.000 MHz	100.000 kHz	789.69640 MHz	-64.08 dBm	-51.08 dB
860.000 MHz	1.000 GHz	100.000 kHz	879.65035 MHz	-53.75 dBm	-40.75 dB
1.000 GHz	3.000 GHz	1.000 MHz	1.66908 GHz	-40.37 dBm	-27.37 dB
3.000 GHz	7.000 GHz	1.000 MHz	6.98075 GHz	-53.22 dBm	-40.22 dB
7.000 GHz	9.000 GHz	1.000 MHz	8.96926 GHz	-58.94 dBm	-45.94 dB

Date: 2.JUN.2022 03:45:43

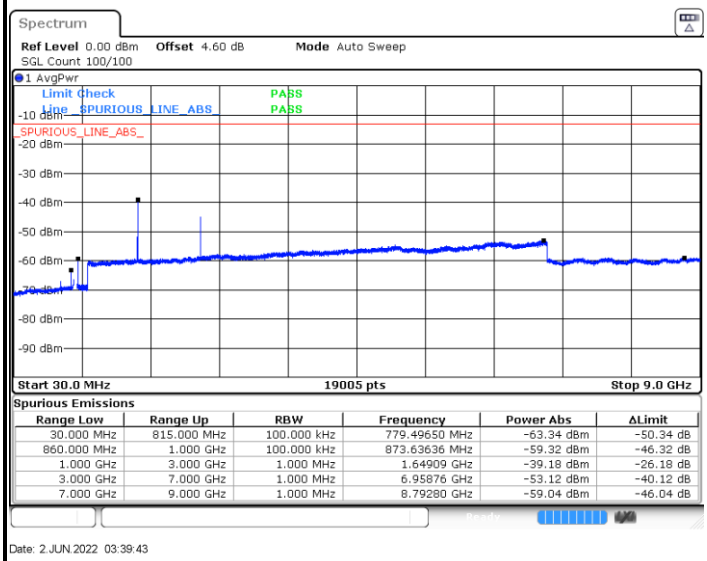
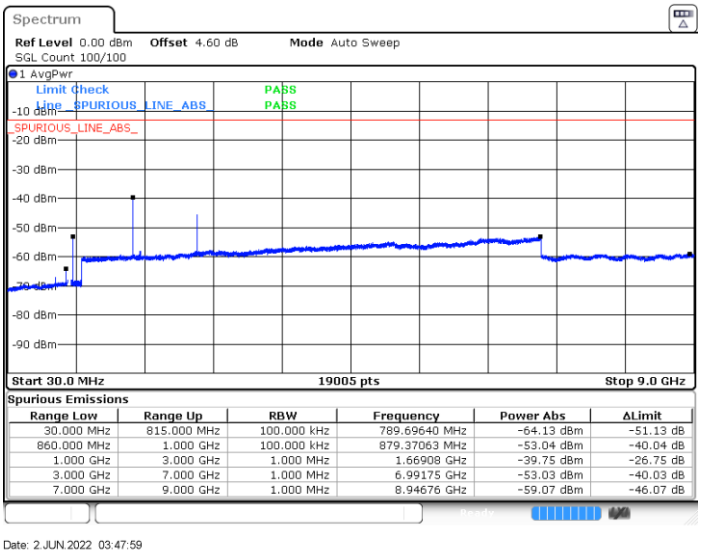
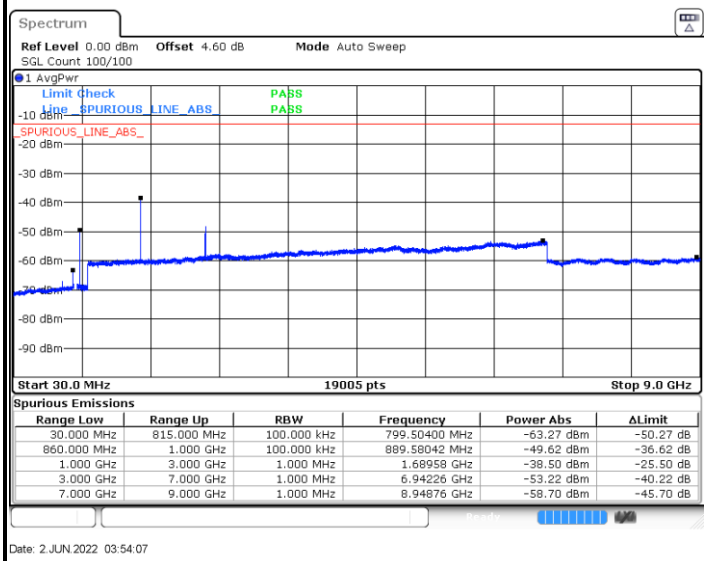
Highest Channel / 1RB1

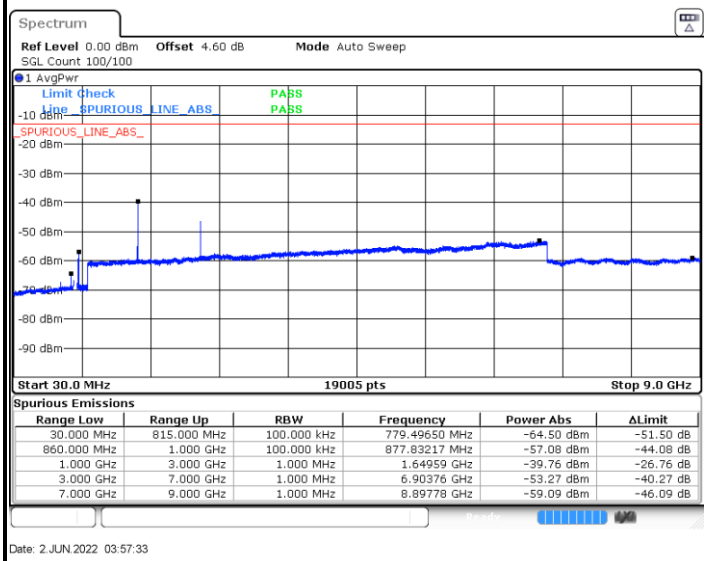
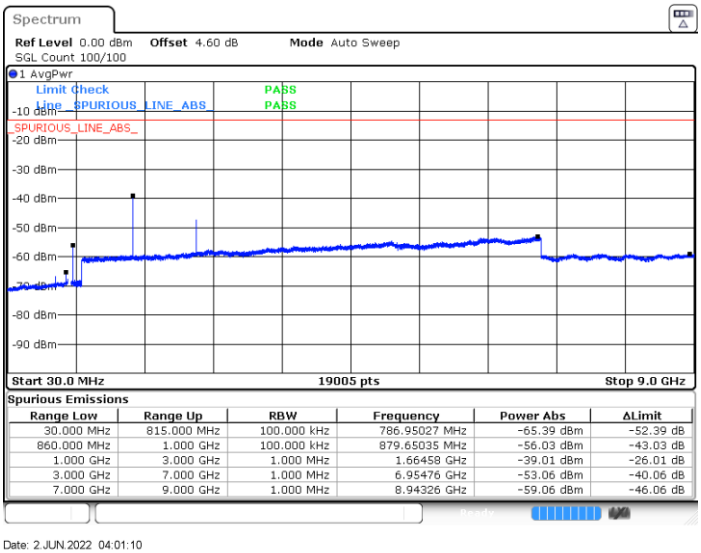
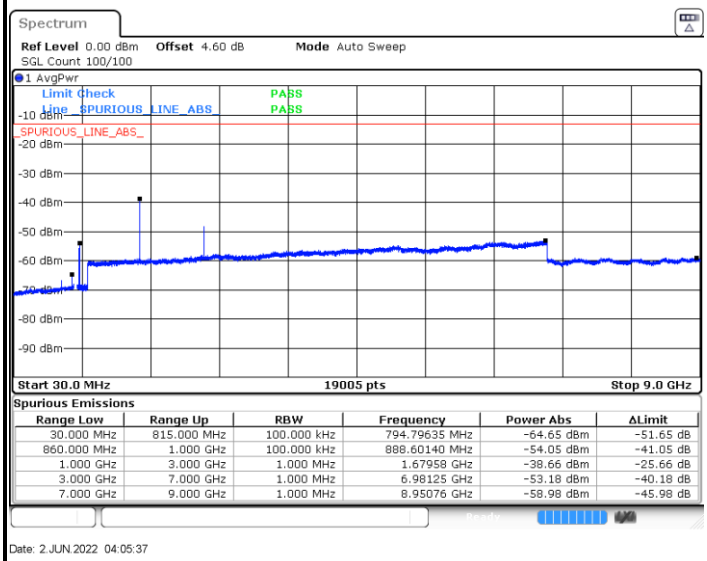


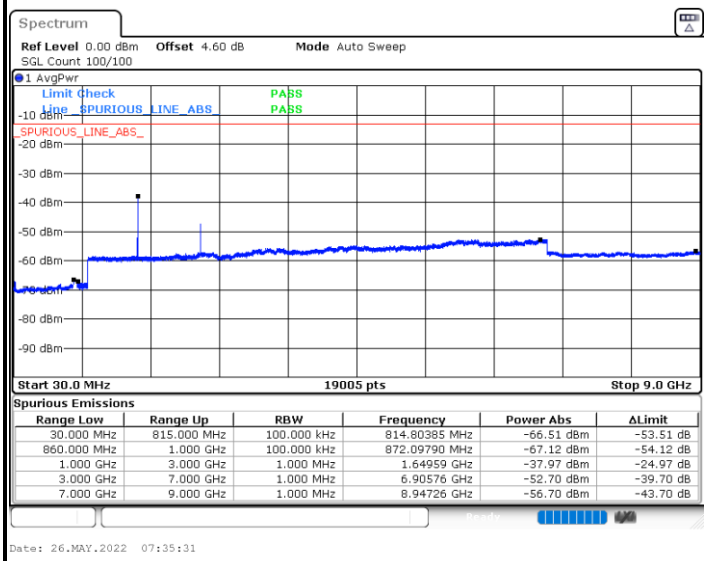
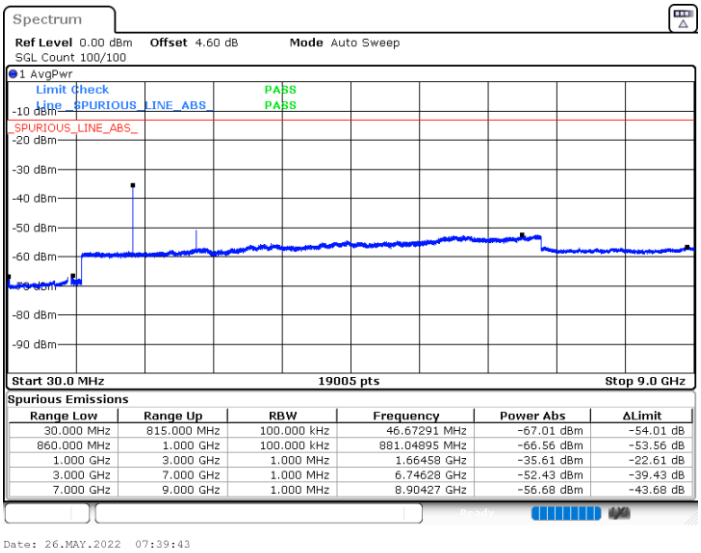
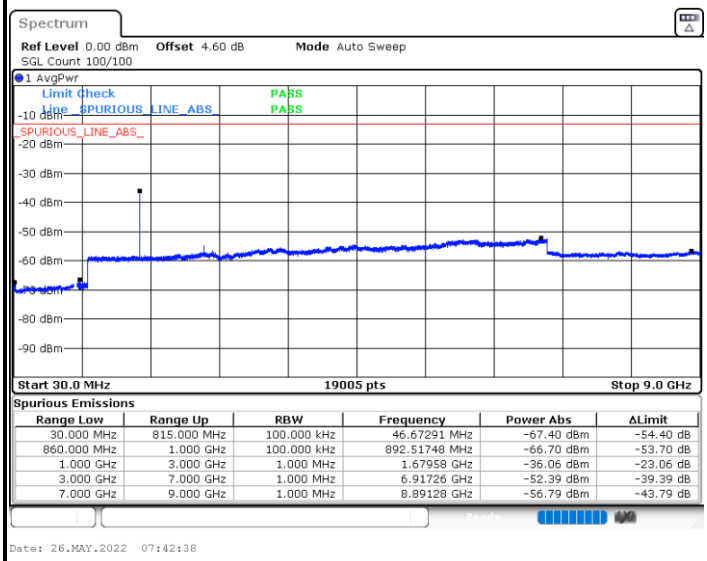
Spurious Emissions

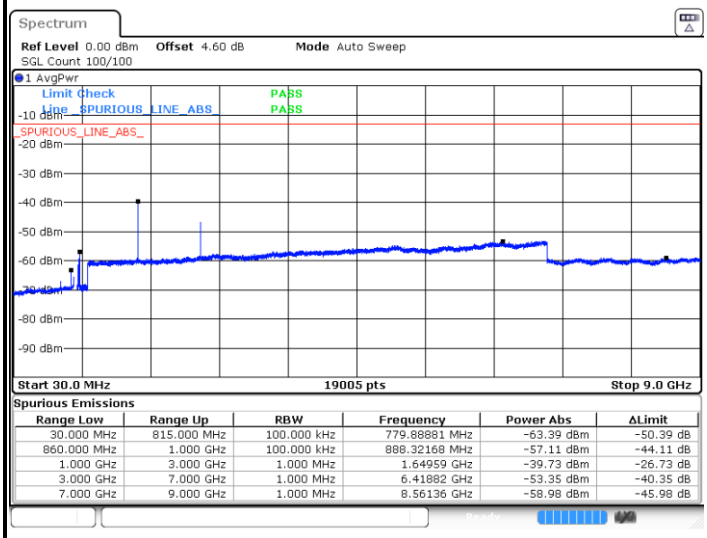
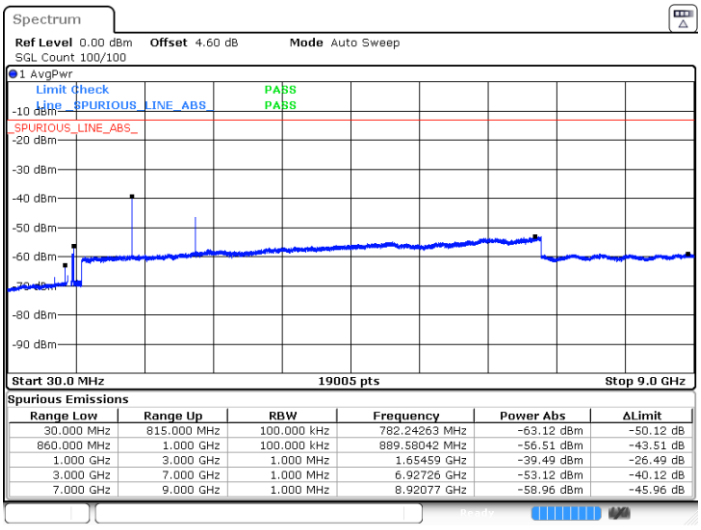
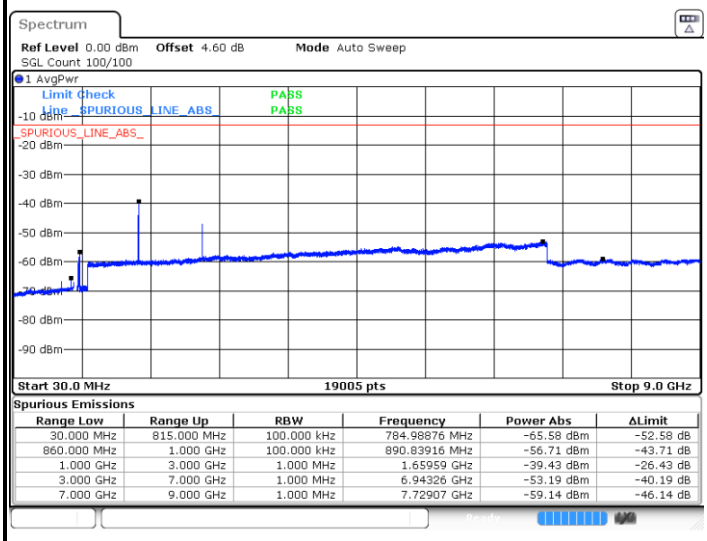
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	815.000 MHz	100.000 kHz	799.50400 MHz	-63.98 dBm	-50.98 dB
860.000 MHz	1.000 GHz	100.000 kHz	891.25874 MHz	-50.23 dBm	-37.23 dB
1.000 GHz	3.000 GHz	1.000 MHz	1.68958 GHz	-39.05 dBm	-26.05 dB
3.000 GHz	7.000 GHz	1.000 MHz	6.99775 GHz	-53.24 dBm	-40.24 dB
7.000 GHz	9.000 GHz	1.000 MHz	8.89878 GHz	-58.96 dBm	-45.96 dB

Date: 2.JUN.2022 03:52:08

FR1 n5 / 5MHz / DFT-S OFDM / QPSK	
Lowest Channel / 1RB1	**Middle Channel / 1RB1**
	
Highest Channel / 1RB1	
	

FR1 n5 / 10MHz / DFT-S OFDM / BPSK	
Lowest Channel / 1RB1	**Middle Channel / 1RB1**
	
Highest Channel / 1RB1	
	

FR1 n5 / 10MHz / DFT-S OFDM / QPSK	
Lowest Channel / 1RB1	**Middle Channel / 1RB1**
	
Highest Channel / 1RB1	
	

FR1 n5 / 20MHz / DFT-S OFDM / BPSK	
Lowest Channel / 1RB1	**Middle Channel / 1RB1**
	
Highest Channel / 1RB1	
	

Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	815.000 MHz	100.000 kHz	779.88881 MHz	-63.39 dBm	-50.39 dB
860.000 MHz	1.000 GHz	100.000 kHz	888.32168 MHz	-57.11 dBm	-44.11 dB
1.000 GHz	3.000 GHz	1.000 MHz	1.64959 GHz	-39.73 dBm	-26.73 dB
3.000 GHz	7.000 GHz	1.000 MHz	6.41882 GHz	-53.35 dBm	-40.35 dB
7.000 GHz	9.000 GHz	1.000 MHz	8.56136 GHz	-58.98 dBm	-45.98 dB

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Spurious Emissions

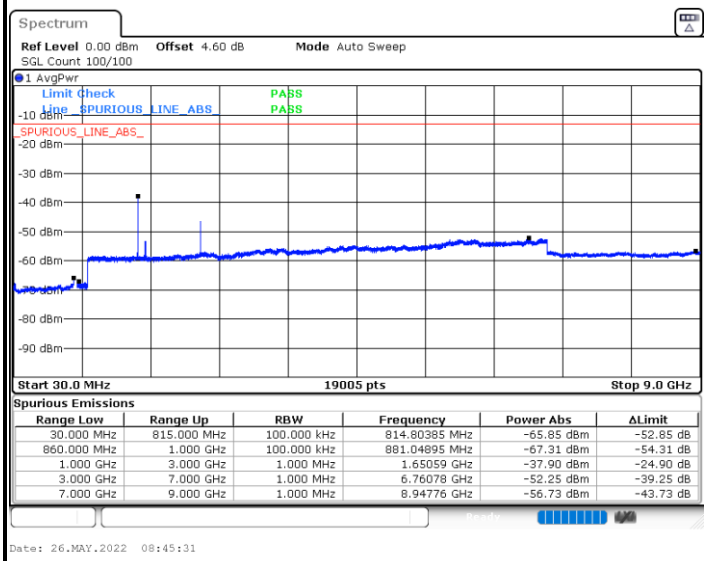
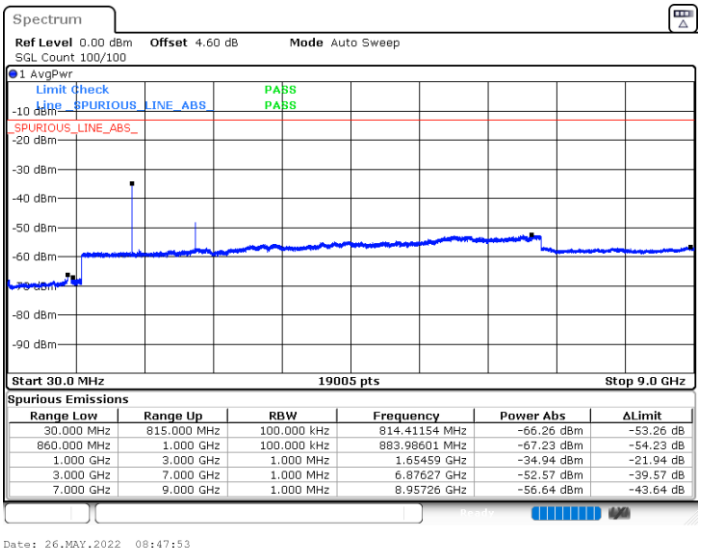
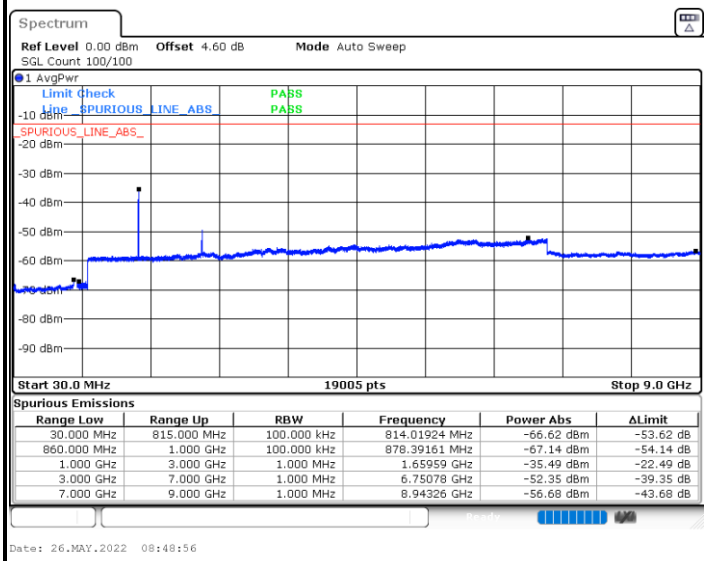
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	815.000 MHz	100.000 kHz	782.24263 MHz	-63.12 dBm	-50.12 dB
860.000 MHz	1.000 GHz	100.000 kHz	889.58042 MHz	-56.51 dBm	-43.51 dB
1.000 GHz	3.000 GHz	1.000 MHz	1.65459 GHz	-39.49 dBm	-26.49 dB
3.000 GHz	7.000 GHz	1.000 MHz	6.92726 GHz	-53.12 dBm	-40.12 dB
7.000 GHz	9.000 GHz	1.000 MHz	8.92077 GHz	-58.96 dBm	-45.96 dB

Date: 2.JUN.2022 04:32:25

Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	815.000 MHz	100.000 kHz	784.98876 MHz	-65.58 dBm	-52.58 dB
860.000 MHz	1.000 GHz	100.000 kHz	890.83916 MHz	-56.71 dBm	-43.71 dB
1.000 GHz	3.000 GHz	1.000 MHz	1.65959 GHz	-39.43 dBm	-26.43 dB
3.000 GHz	7.000 GHz	1.000 MHz	6.94326 GHz	-53.19 dBm	-40.19 dB
7.000 GHz	9.000 GHz	1.000 MHz	7.72907 GHz	-59.14 dBm	-46.14 dB

Date: 2.JUN.2022 04:36:36

FR1 n5 / 20MHz / DFT-S OFDM / QPSK	
Lowest Channel / 1RB1	**Middle Channel / 1RB1**
	
Highest Channel / 1RB1	
	

Frequency Stability

Test Conditions		FR1 n5 (QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	BW 20MHz	2.5ppm
		Deviation (ppm)	Result
50	Normal Voltage	0.0022	PASS
40	Normal Voltage	0.0031	
30	Normal Voltage	0.0025	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0028	
0	Normal Voltage	0.0015	
-10	Normal Voltage	0.0026	
-20	Normal Voltage	0.0032	
-30	Normal Voltage	0.0025	
20	Maximum Voltage	0.0017	
20	Normal Voltage	0.0028	
20	Battery End Point	0.0016	

Note:

1. Normal Voltage =3.87 V. ; Battery End Point (BEP) =3.55 V. ; Maximum Voltage =4.45 V.

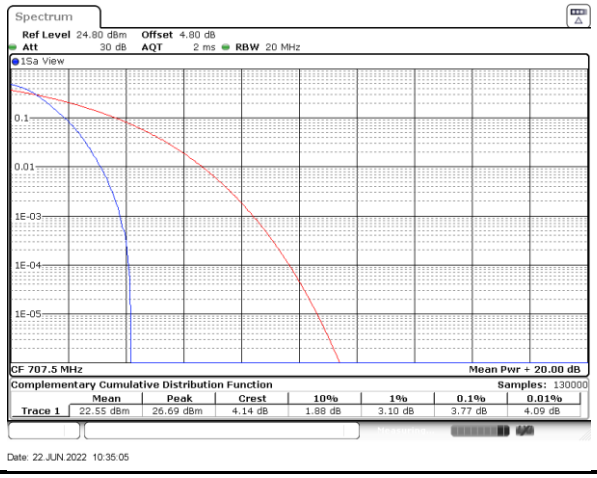
FR1 n12

Peak-to-Average Ratio

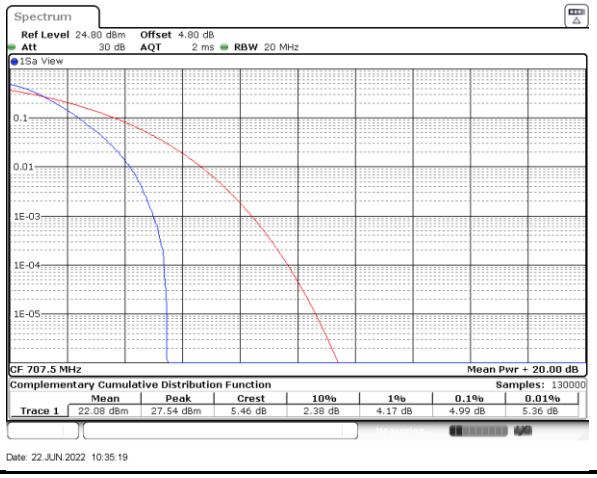
Mode	FR1 n12 / 15MHz / DFT-S OFDM		
Mod.	PI/2 BPSK	QPSK	Limit: 13dB
RB Size	Full RB	Full RB	Result
Middle CH	3.77	4.99	PASS

FR1 n12 / 15MHz / DFT-S OFDM / Middle Channel / Full RB

PI/2 BPSK



QPSK

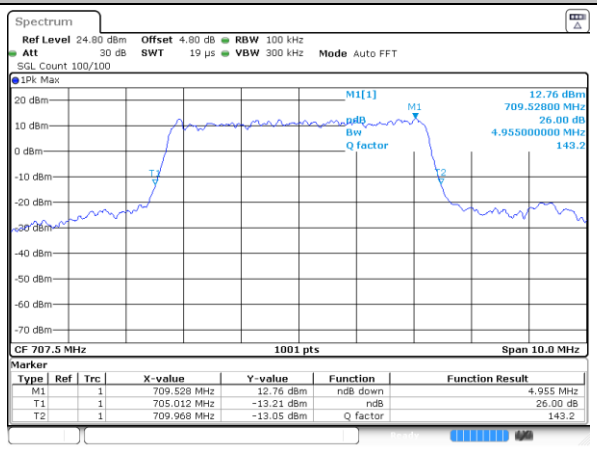


26dB Bandwidth

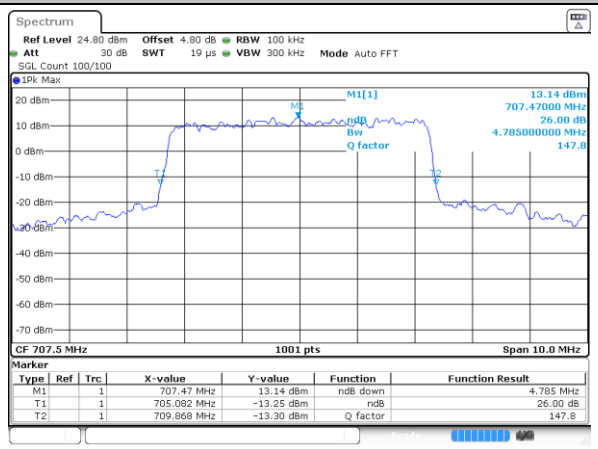
Mode	FR1 n12 : 26dBW (MHz) / CP OFDM							
BW	5M				10M			
Mod.	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
Middle CH	4.96	4.79	4.96	4.88	10.01	9.99	10.07	10.05
BW	15M							
Mod.	QPSK		16QAM		64QAM		256QAM	
Middle CH	14.93		14.90		14.93		14.96	

FR1 n12 / 5MHz / CP OFDM

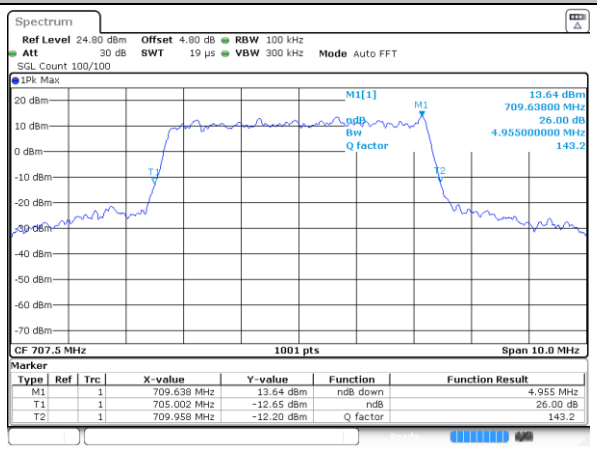
QPSK



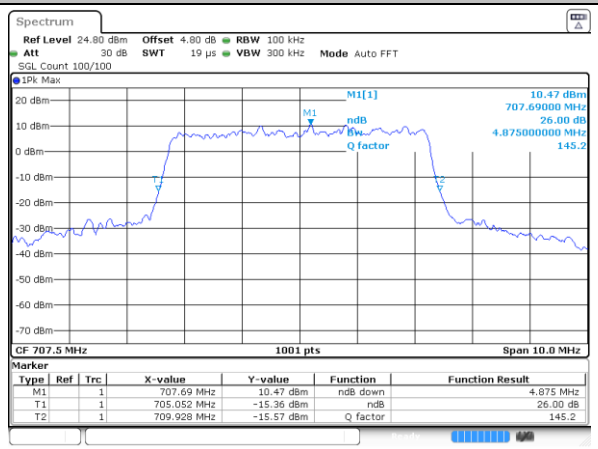
16QAM

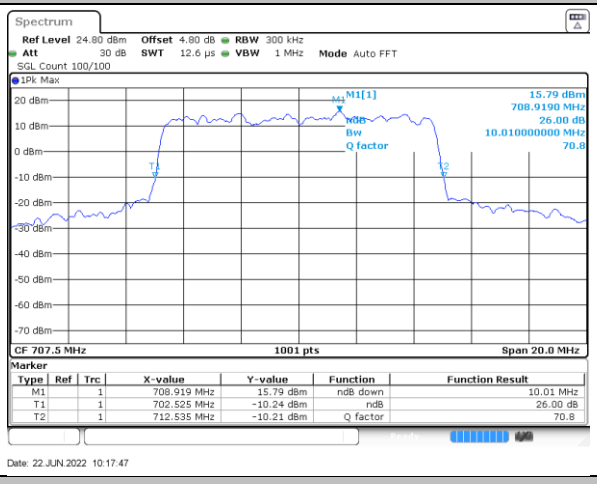
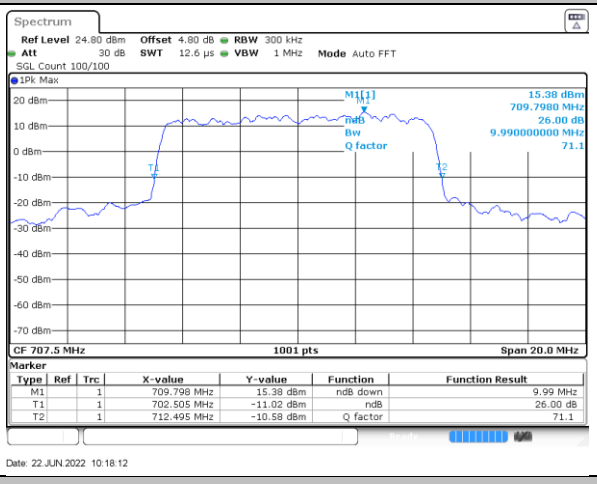
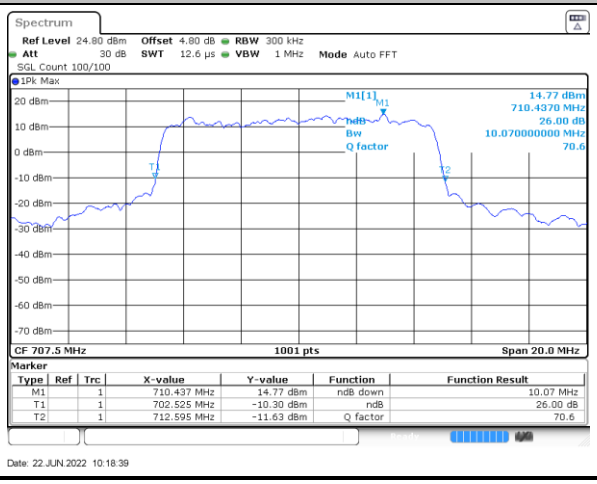
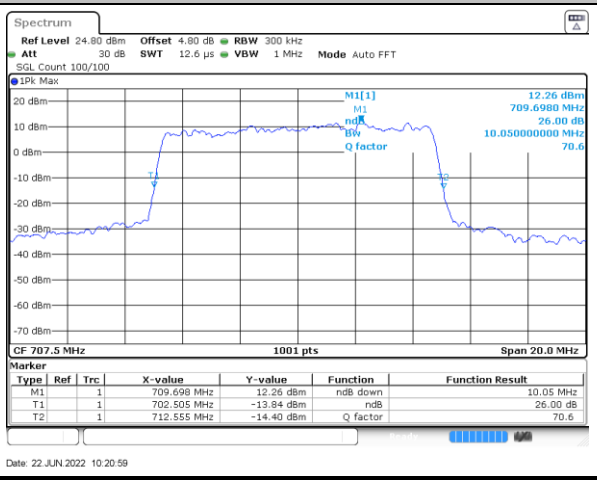


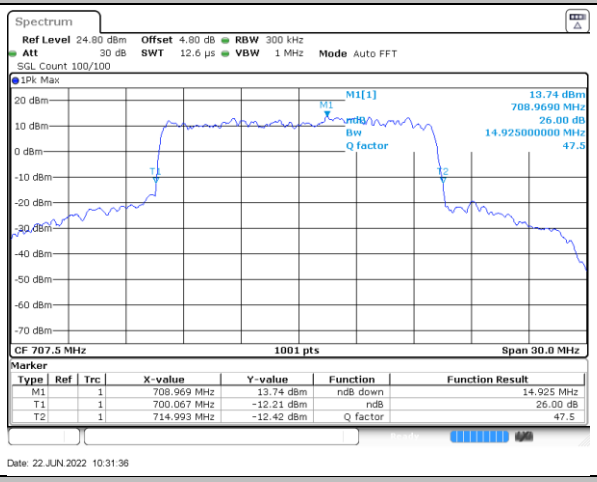
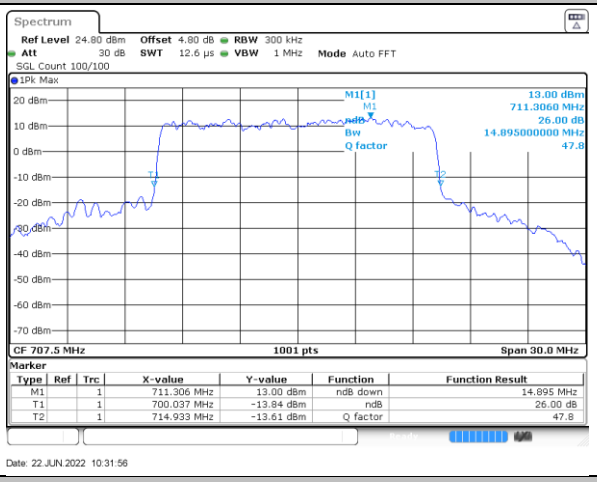
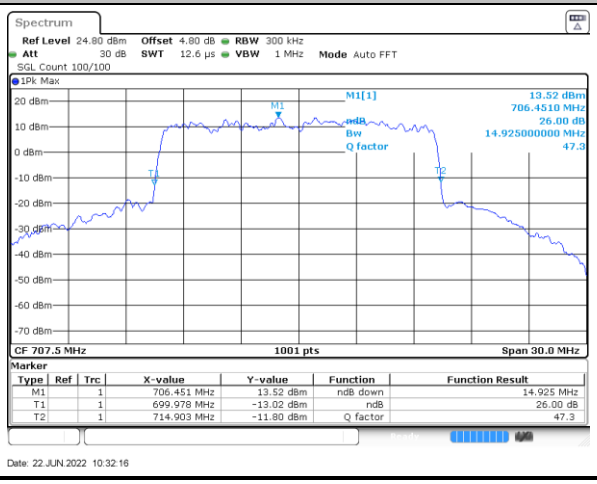
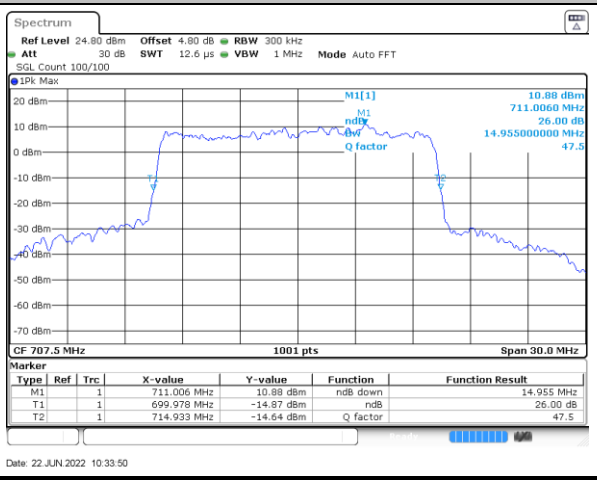
64QAM



256QAM



FR1 n12 / 10MHz / CP OFDM	
QPSK	16QAM
	
64QAM	256QAM
	

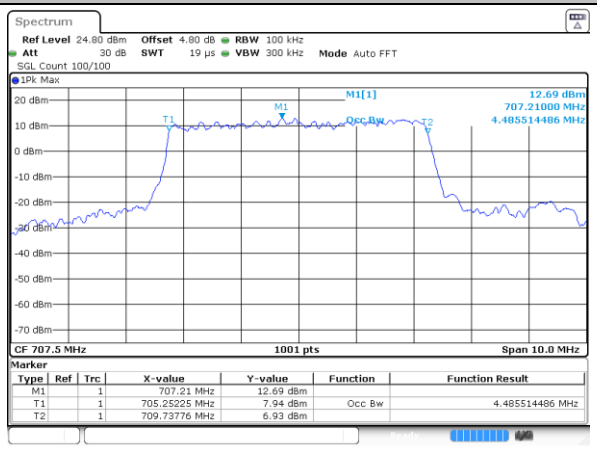
FR1 n12 / 15MHz / CP OFDM	
QPSK	16QAM
	
64QAM	256QAM
	

Occupied Bandwidth

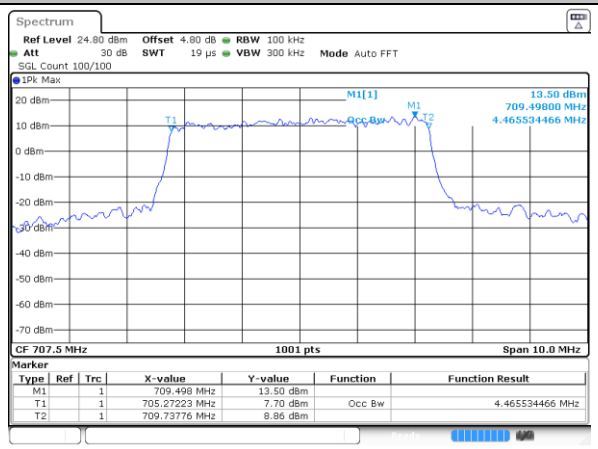
Mode	FR1 n12 : OBW (MHz) / CP OFDM							
BW	5M				10M			
Mod.	QPSK	16QAM	64QAM	256QAM	QPSK	16QAM	64QAM	256QAM
Middle CH	4.49	4.47	4.48	4.47	9.29	9.29	9.29	9.35
BW	15M							
Mod.	QPSK		16QAM		64QAM		256QAM	
Middle CH	14.12		14.09		14.12		14.12	

FR1 n12 / 5MHz / CP OFDM

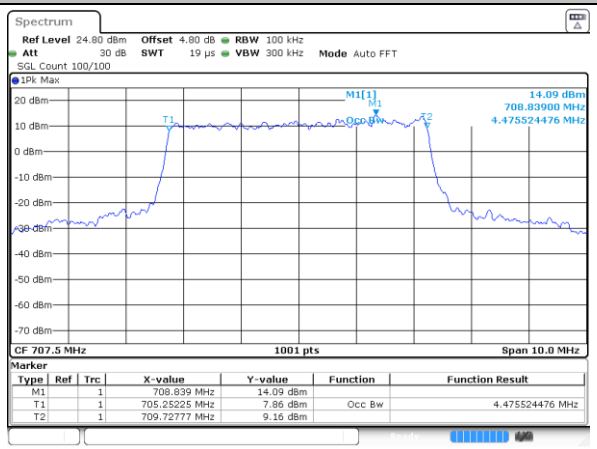
QPSK



16QAM



64QAM



256QAM