FCC RF Test Report

APPLICANT	: Fibocom Wireless Inc.
EQUIPMENT	: 5G Module
BRAND NAME	: Fibocom
MODEL NAME	: FM150-NA
FCC ID	: ZMOFM150NA
STANDARD	: 47 CFR Part 2, 27(L), 27(M), 27(N)
CLASSIFICATION	: PCS Licensed Transmitter (PCB)

The product was received on May 14, 2020 and completely tested on Aug. 25, 2020. We, Sporton International (Kunshan) Inc., 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 (Kunshan) Inc., the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

James Huang

Approved by: James Huang / Manager

ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300

People's Republic of China

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG051416H	Rev. 01	Initial issue of report	Sep. 11, 2020

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§27.50(c)(10)	Effective Radiated Power (5G NR n71)	ERP < 3 Watt		
	§27.50(h)(2)	Equivalent Isotropic Radiated Power (5G NR n7) (5G NR n41)	EIRP < 2Watt		
	§27.50(d)(4)	Equivalent Isotropic Radiated Power (5G NR n66)	EIRP < 1Watt		
3.5	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §27.53(g) §27.53(m)(2)	Conducted Band Edge Measurement (5G NR n66)(5G NR n71) (5G NR n7) (5G NR n41)	< 43+10log10(P[Watts])	PASS	-
3.8	§2.1051 §27.53(g) §27.53(m)(2)	Conducted Spurious Emission (5G NR n66)(5G NR n71) (5G NR n7) (5G NR n41)	< 43+10log10(P[Watts])	PASS	-
3.9	§2.1055 §24.235 §27.54	Frequency Stability Temperature & Voltage	Within Authorized Band	PASS	-
4.4	§2.1053 §27.53(g) §27.53(m)(2)	Radiated Spurious Emission (5G NR n66)(5G NR n71) (5G NR n7) (5G NR n41)	< $43+10\log_{10}$(P[Watts])	PASS	Under limit 36.28 dB at 2036.000 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

Fibocom Wireless Inc.
5/F,Tower A,Technology Building II,1057 Nanhai Avenue,Shenzhen,China

1.2 Manufacturer

Fibocom Wireless Inc.
5/F,Tower A,Technology Building II,1057 Nanhai Avenue,Shenzhen,China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	5G Module
Brand Name	Fibocom
Model Name	FM150-NA
FCC ID	ZMOFM150NA
EUT supports Radios application	WCDMA/LTE/5G NR/GNSS
IMEI Code	Conducted : 867654040313583 Radiation : 867654040223105
HW Version	V1.0.1
SW Version	89601.1000.00.02.11.20
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	5G NR n7: 2502.5 MHz ~ 2567.5 MHz 5G NR n41: 2506.02 MHz ~ 2679.99 MHz 5G NR n66: 1712.5 MHz ~ 1777.5 MHz 5G NR n71: 665.5 MHz ~ 695.5MHz
Rx Frequency	5G NR n7: 2622.5MHz ~ 2687.5 MHz 5G NR n41: 2506.02 MHz ~ 2679.99 MHz 5G NR n66: 2112.5 MHz~ 2197.5 MHz 5G NR n71: 619.5 MHz ~ 649.5MHz
Bandwidth	n7, n66, n71: 5MHz / 10MHz / 15MHz / 20MHz n41 : 20MHz / 40MHz / 50MHz / 60MHz / 80MHz / 90MHz / 100MHz
SCS	n7, n66, n71: 15KHz n41 : 30KHz
Type of Modulation	CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM DFT-s-OFDM: QPSK / 16QAM / 64QAM / 256QAM

WWAN ANTENNA GAIN (dBi)		
Frequency Band	ANT.1： GHT-019A	ANT.2： AN0750-64S01BSM
5G NR n7	1.07	**3.27**
5G NR n41	1.52	**3.27**
5G NR n66	**3.53**	0.13
5G NR n71	**1.61**	-0.52

Remark: Between the two type of antennas, only the worst antenna gain evaluated test is shown in bold.

1.5 Modification of EUT

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

1.6 Maximum Conducted Power, Frequency Tolerance, and Emission Designator

5G NR n7		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)
5	2502.5 ~ 2567.5	4M51G7D	0.2223	4M50W7D	0.1750
10	2505.0 ~ 2565.0	9M05G7D	0.2198	9M07W7D	0.1782
15	2507.5 ~ 2562.5	13M5G7D	0.2249	13M5W7D	0.1786
20	2510.0 ~ 2560.0	18M4G7D	0.2275	18M5W7D	0.1734
Frequency Tolerance (ppm)		0.0021			

5G NR n41		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)
20	2506.02 ~ 2679.99	18M5G7D	0.3802	18M5W7D	0.3055
40	2516.01 ~ 2670.00	36M0G7D	0.3784	36M0W7D	0.3048
50	2521.02 ~ 2664.99	46M0G7D	0.3776	46M1W7D	0.2742
60	2526.00 ~ 2659.98	59M1G7D	0.3614	59M8W7D	0.2754
80	2536.02 ~ 2649.99	79M1G7D	0.3508	77M7W7D	0.2723
90	2541.00 ~ 264.98	87M3G7D	0.3581	87M3W7D	0.2704
100	2546.01 ~ 2640.00	97M1G7D	0.3597	97M1W7D	0.2698
Frequency Tolerance (ppm)		0.0015			

5G NR n66		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)
5	1712.5 ~ 1777.5	4M49G7D	0.2673	4M50W7D	0.2158
10	1715.0 ~ 1775.0	9M05G7D	0.2667	9M07W7D	0.2109
15	1717.5 ~ 1772.5	13M6G7D	0.2685	13M5W7D	0.1959
20	1720.0 ~ 1770.0	18M4G7D	0.1722	18M6W7D	0.1309
Frequency Tolerance (ppm)		0.0036			

5G NR n71		QPSK		16QAM	
BW (MHz)	Frequency Range (MHz)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)
5	665.5 ~ 695.5	4M51G7D	0.2275	4M50W7D	0.1828
10	668.0 ~ 693.0	9M07G7D	0.2239	9M07W7D	0.1774
15	670.5 ~ 690.5	13M6G7D	0.2312	13M5W7D	0.1828
20	673.0 ~ 688.0	18M3G7D	0.2421	18M5W7D	0.1875
Frequency Tolerance (ppm)		0.0032			

1.7 Testing Location

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

Test Firm	Sporton International (Kunshan) Inc.		
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

1.8 Test Software

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

1.9 Applicable Standards

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

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

Remark:

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

2 Test Configuration of Equipment Under Test

2.1 Test Mode

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

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

The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.

	X Plane	Y Plane	Z Plane
Orthogonal Planes of EUT			

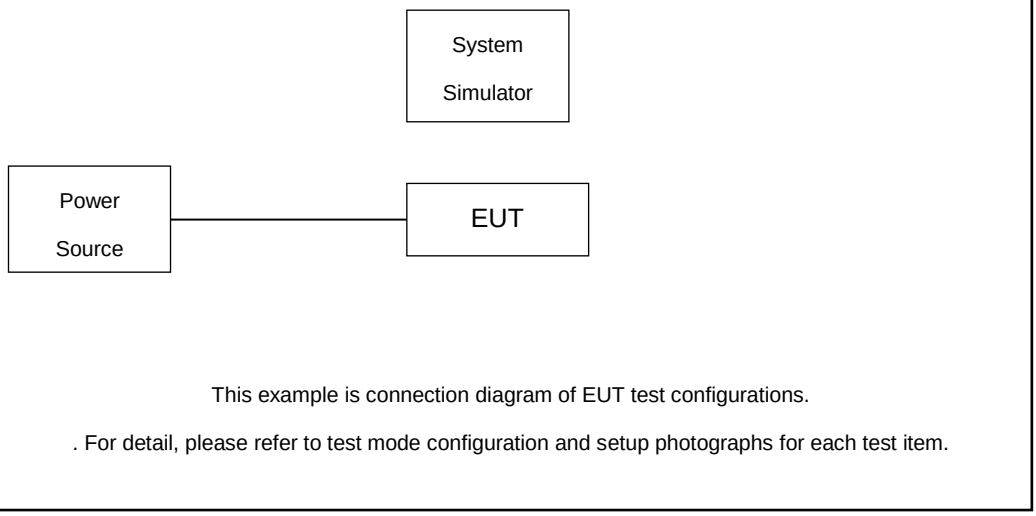
Test Items	5G NR	Bandwidth (MHz)						Modulation					RB #			Test Channel		
		5	10	15	20	40-90	100	PI/2 BPSK	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H
Max. Output Power	n7	v	v	v	v	-	-	-	v	v	v	v	v		v	v	v	v
	n41	-	-	-	v	v	v	-	v	v	v	v	v		v	v	v	v
	n66	v	v	v	v	-	-	-	v	v	v	v	v		v	v	v	v
	n71	v	v	v	v	-	-	-	v	v	v	v	v		v	v	v	v
Peak-to-Average Ratio	n7				v	-	-	-	v				v		v	v	v	v
	n41	-	-	-			v	-	v				v		v	v	v	v
	n66				v	-	-	-	v				v		v	v	v	v
	n71				v	-	-	-	v				v		v	v	v	v
26dB and 99% Bandwidth	n7	v	v	v	v	-	-	-	v	v					v	v	v	v
	n41	-	-	-	v	v	v	-	v	v					v	v	v	v
	n66	v	v	v	v	-	-	-	v	v					v	v	v	v
	n71	v	v	v	v	-	-	-	v	v					v	v	v	v

Test Items	Band	Bandwidth (MHz)						Modulation					RB #			Test Channel		
		5	10	15	20	40-90	100	PI/2 BPSK	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H
Conducted Band Edge	n7	v	v	v	v	-	-	-	v				v		v	v		v
	n41	-	-	-	v	v	v	-	v				v		v	v		v
	n66	v	v	v	v	-	-	-	v				v		v	v		v
	n71	v	v	v	v	-	-	-	v				v		v	v		v
Conducted Spurious Emission	n7	v	v	v	v	-	-	-	v				v			v	v	v
	n41	-	-	-	v	v	v	-	v				v			v	v	v
	n66	v	v	v	v	-	-	-	v				v			v	v	v
	n71	v	v	v	v	-	-	-	v				v			v	v	v
Frequency Stability	n7				v	-	-	-	v						v		v	
	n41	-	-	-	v			-	v						v		v	
	n66				v	-	-	-	v						v		v	
	n71				v	-	-	-	v						v		v	
E.R.P / E.I.R.P	n7	v	v	v	v	-	-	-	v	v	v	v	v		v	v	v	v
	n41	-	-	-	v	v	v	-	v	v	v	v	v		v	v	v	v
	n66	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
Radiated Spurious Emission	n7	Worst Case														v	v	v
	n41	Worst Case														v	v	v
	n66	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. This module is limited to installation in fixed applications.
5. 5G NR n41 supports HPUE.
6. 5G NR supports SA and NSA mode (refer to the Operation Description). According to the maximum power, perform all test for SA mode, and NSA mode verify the worst of SA mode, only record the SA test data in the report.
7. For modulation of CP-OFDM and DFT-s-OFDM output power measurement, according to the maximum power of CP-OFDM is lower than DFT-s-OFDM modulation, therefore, we chose higher power (DFT-s-OFDM modulation) to perform all tests and record them in the report, and after the verify test for CP-OFDM modulation, the 99% measurement Bandwidth test and record it in the report.
8. All modulations (QPSK/16QAM/64QAM/256QAM) have been verify tested. Based on the results of the verify test, we only chose QPSK for complete testing and record in the report .

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.	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
4.	Antenna	N/A	N/A	N/A	N/A	N/A
5.	Adapter	N/A	N/A	N/A	N/A	N/A
6.	Test jig	N/A	N/A	N/A	N/A	N/A

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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 9.4 dB.

Example :

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

= 9.4 (dB)

2.5 Frequency List of Low/Middle/High Channels

5G NR n7 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	526000	531000	536000
	Frequency	2510	2535	2560
15	Channel	525500	531000	536500
	Frequency	2507.5	2535	2562.5
10	Channel	525000	531000	537000
	Frequency	2505	2535	2565
5	Channel	524500	531000	537500
	Frequency	2502.5	2535	2567.5

5G NR n41 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
100	Channel	509202	518598	528000
	Frequency	2546.01	2592.99	2640
90	Channel	508200	518598	528996
	Frequency	2541	2592.99	2644.98
80	Channel	507204	518598	529998
	Frequency	2536.02	2592.99	2649.99
60	Channel	505200	518598	531996
	Frequency	2526	2592.99	2659.98
50	Channel	504204	518598	532998
	Frequency	2521.02	2592.99	2664.99
40	Channel	503202	518598	534000
	Frequency	2516.01	2592.99	2670
20	Channel	501204	518598	535998
	Frequency	2506.02	2592.99	2679.99

5G NR n66 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	424000	429000	438000
	Frequency	1720	1745	1770
15	Channel	423500	429000	438500
	Frequency	1717.5	1745	1772.5
10	Channel	423000	429000	439000
	Frequency	1715	1745	1775
5	Channel	422500	429000	439500
	Frequency	1712.5	1745	1777.5

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

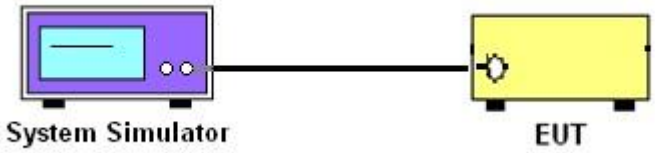
3 Conducted Test Items

3.1 Measuring Instruments

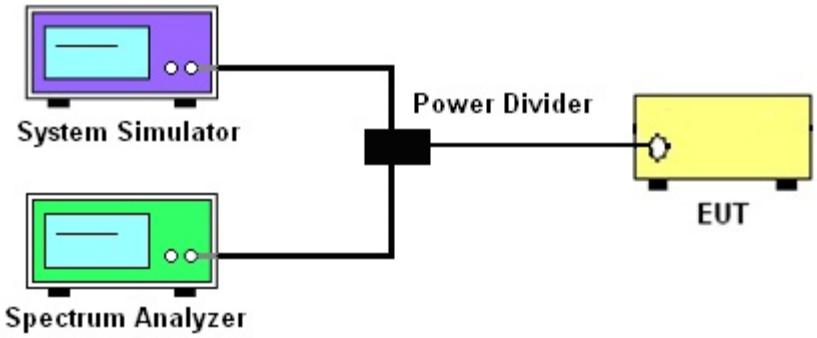
See list of measuring instruments of this test report.

3.2 Test Setup

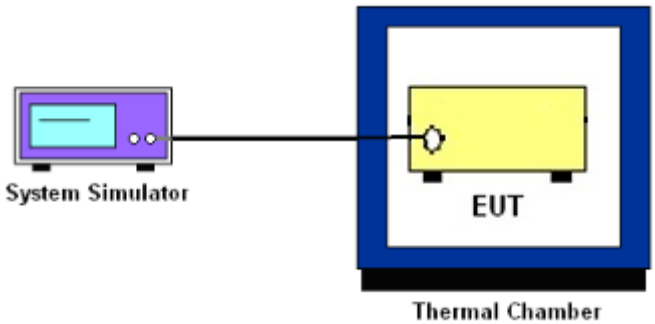
3.2.1 Conducted Output Power



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 3 Watts for 5G NR n71.

The EIRP of mobile transmitters must not exceed 2 Watts for 5G NR n7 and n41.

The EIRP of mobile transmitters must not exceed 1 Watts for 5G NR n66.

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 of the transmission may not exceed 13 dB.

3.5.2 Test Procedures

CCDF:

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.

PAPR:

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) = PPk (dBm) − PAvg (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 Occupied Bandwidth

3.6.1 Description of Occupied Bandwidth Measurement

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

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

3.6.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.4
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “–X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.7 Conducted Band Edge

3.7.1 Description of Conducted Band Edge Measurement

27.53 (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(m)(2)(v)

For all fixed digital user stations, the attenuation factor shall be not less than 43 + 10 log (P) dB at the channel edge

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.

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.

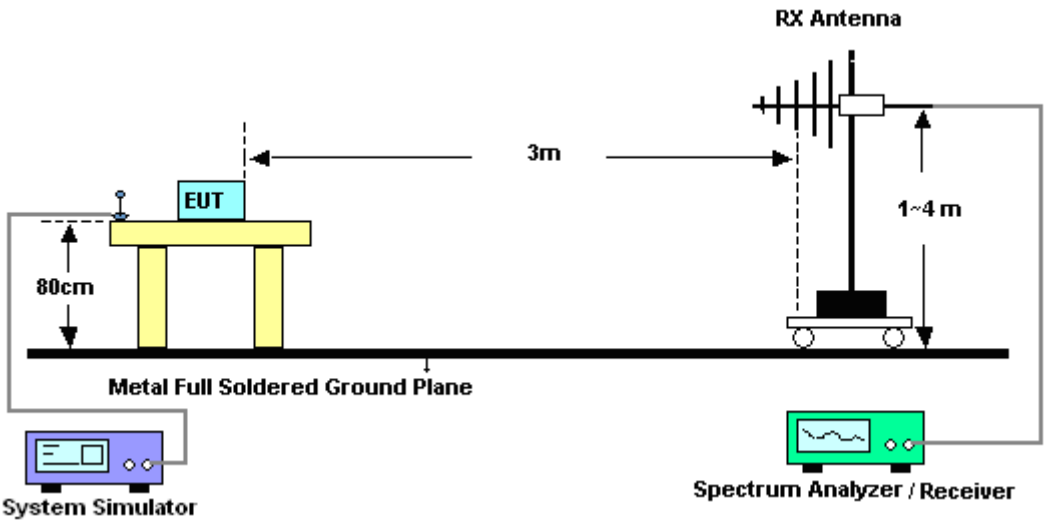
4 Radiated Test Items

4.1 Measuring Instruments

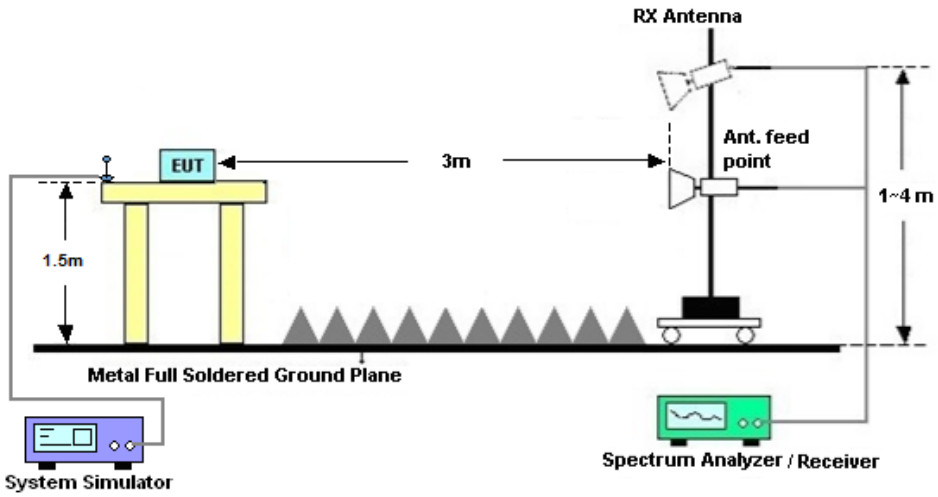
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated test from 30MHz to 1GHz



4.2.2 For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Radiated Spurious Emission

4.4.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI C63.26. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

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

4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Nov. 02, 2019	Jul. 31, 2020~ Aug. 25, 2020	Nov. 01, 2020	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 28, 2019	Jul. 31, 2020~ Aug. 25, 2020	Oct. 27, 2020	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Apr. 15, 2020	Aug. 19, 2020	Apr. 14, 2021	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jan. 03, 2020	Aug. 19, 2020	Jan. 02, 2021	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1356	1GHz~18GHz	Apr. 20, 2020	Aug. 19, 2020	Apr. 19, 2021	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 10, 2019	Aug. 19, 2020	Nov. 09, 2020	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 03, 2020	Aug. 19, 2020	Jan. 02, 2021	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 08, 2020	Aug. 19, 2020	Jan. 07, 2021	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jan. 03, 2020	Aug. 19, 2020	Jan. 02, 2021	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 15, 2019	Aug. 19, 2020	Oct. 14, 2020	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Aug. 19, 2020	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Aug. 19, 2020	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Aug. 19, 2020	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 ~ 40 GHz)

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

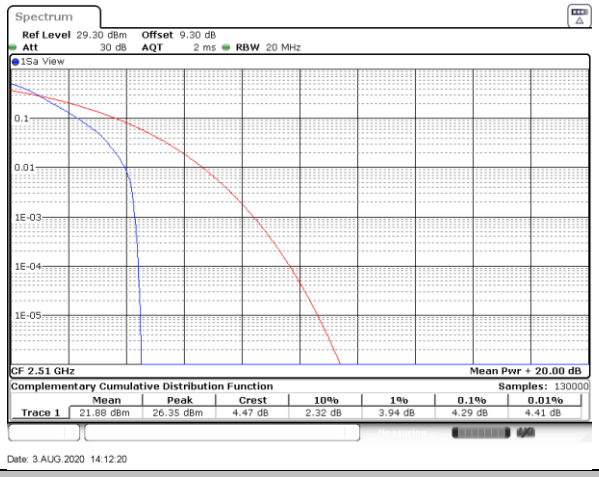
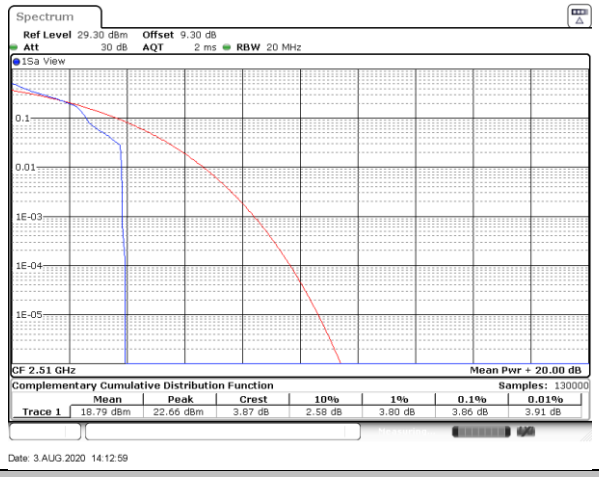
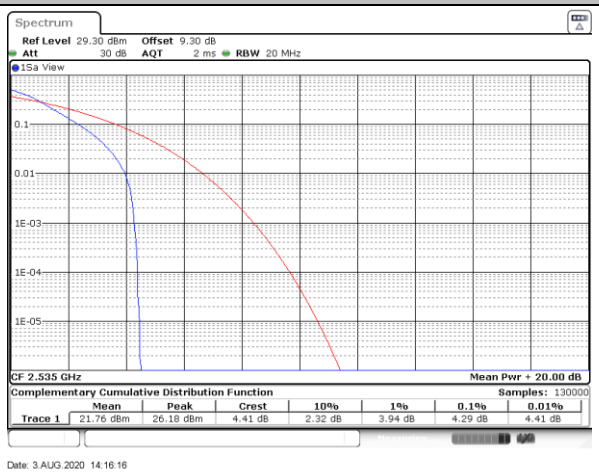
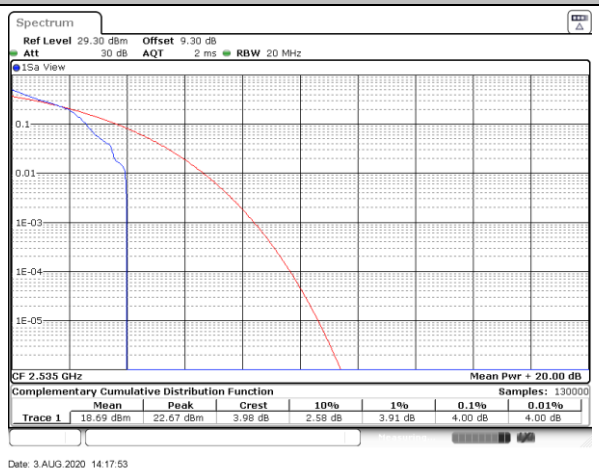
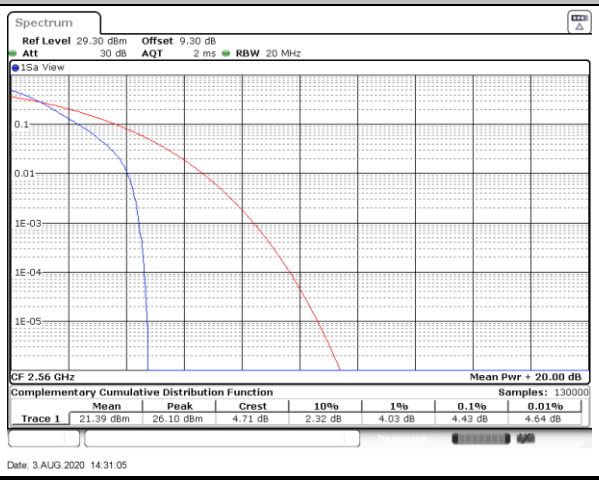
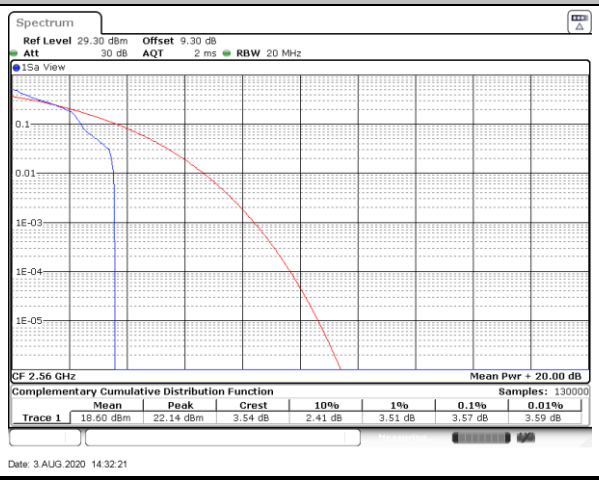
Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power and EIRP)

5G NR n7

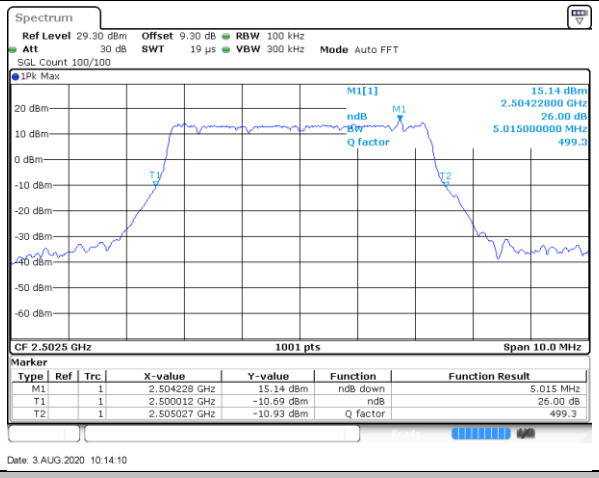
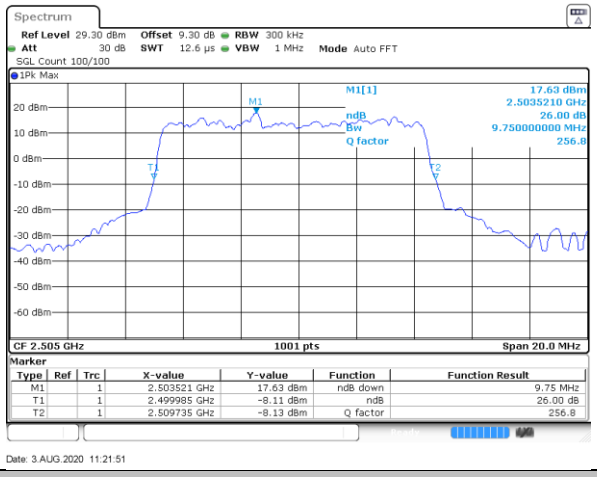
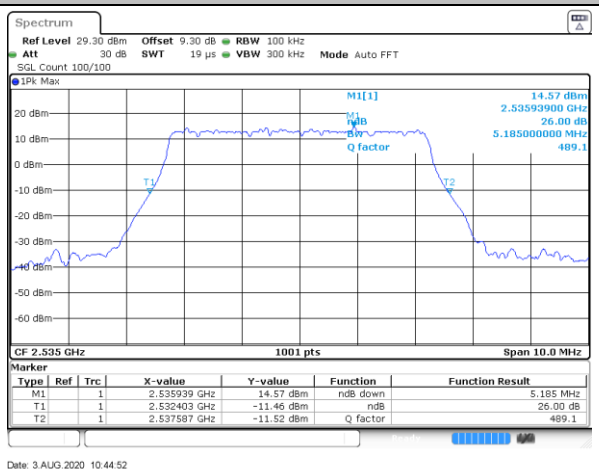
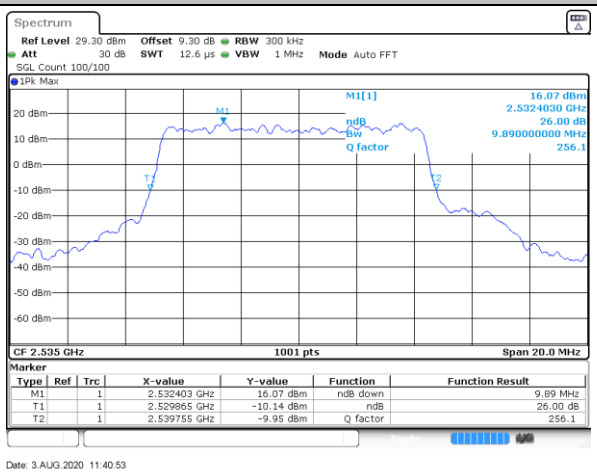
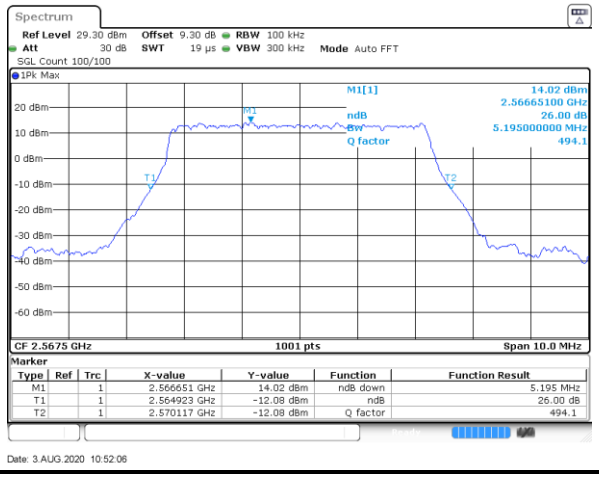
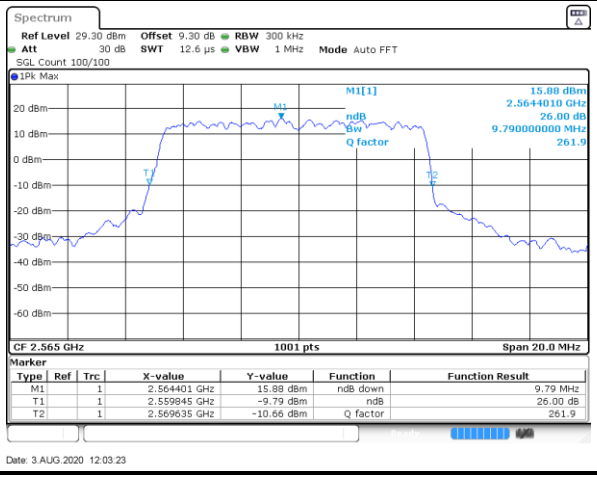
Peak-to-Average Ratio

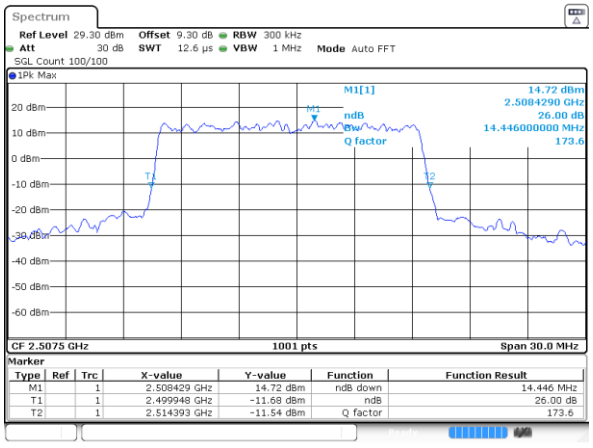
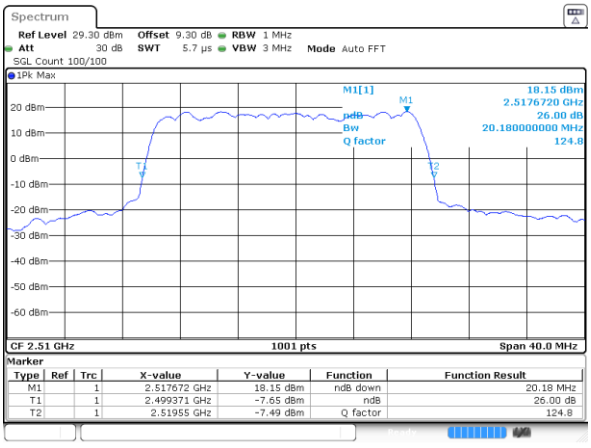
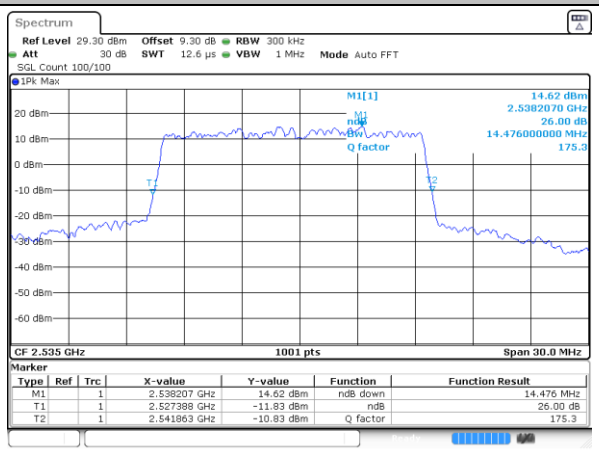
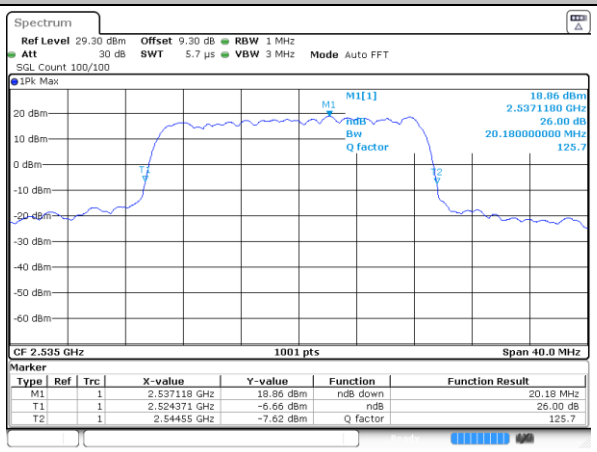
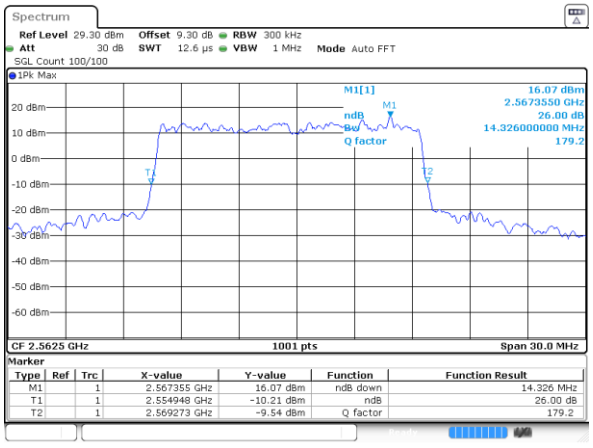
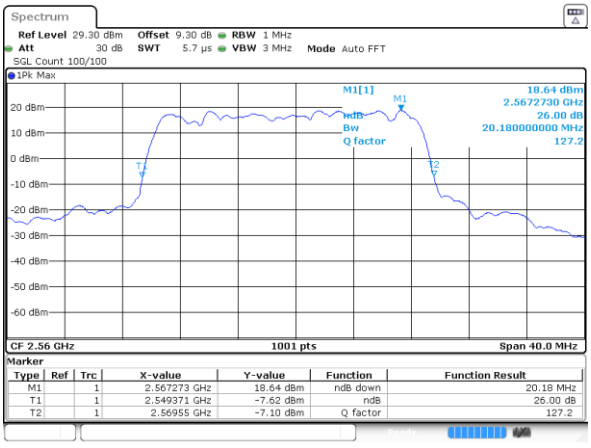
Mode	FR1 n7 / 20MHz / DFT-S OFDM		
Mod.	QPSK	QPSK	Limit: 13dB
RB Size	Full RB	1 RB	Result
Lowest CH	4.29	3.86	PASS
Middle CH	4.29	4.00	
Highest CH	4.43	3.57	

FR1 n7 / 20MHz / DFT-S OFDM	
QPSK	**QPSK**
Lowest Channel / Full RB	**Lowest Channel / 1 RB**
	
Middle Channel / Full RB	**Middle Channel / 1 RB**
	
Highest Channel / Full RB	**Highest Channel / 1 RB**
	

26dB Bandwidth

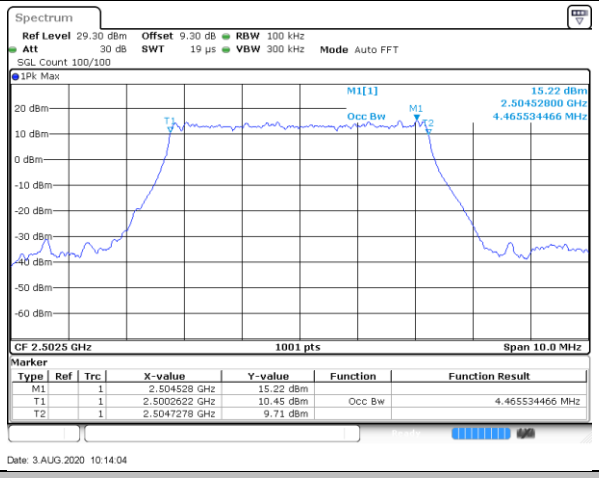
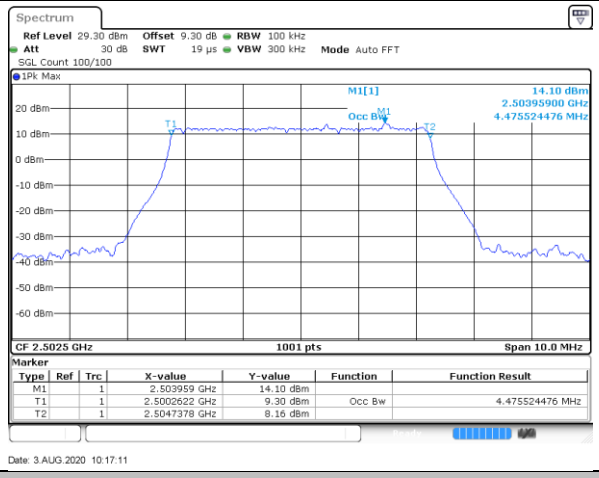
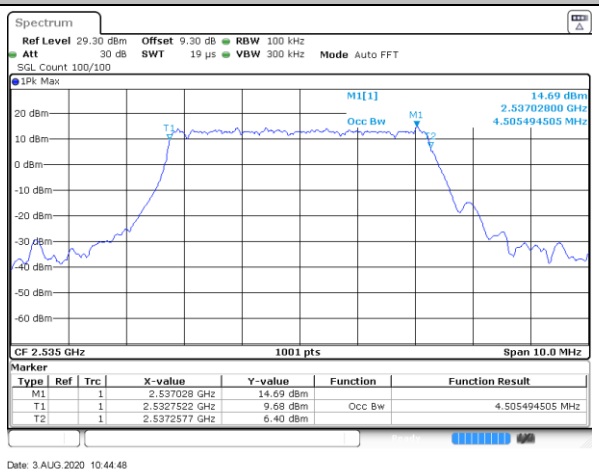
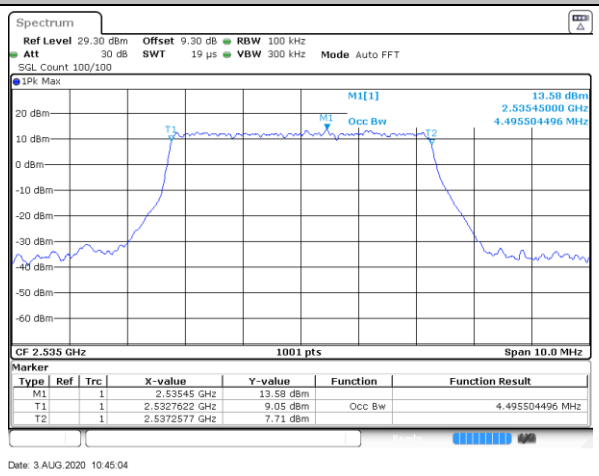
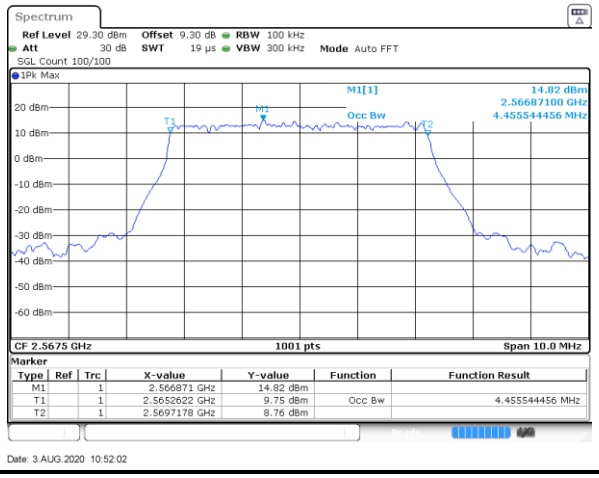
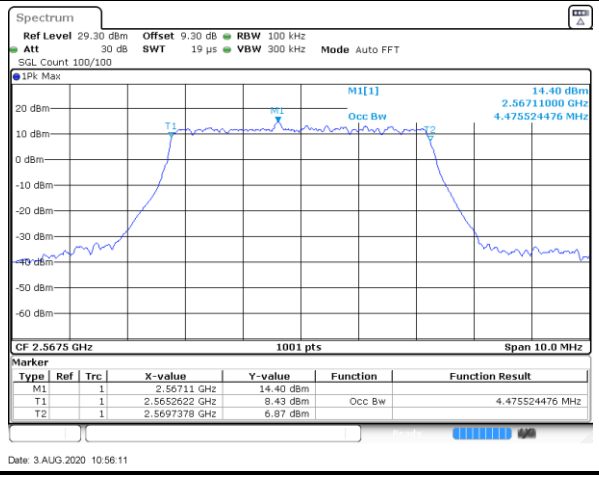
Mode	FR1 n7 : 26dB BW(MHz) / DFT-S OFDM			
BW	5MHz	10MHz	15MHz	20MHz
Mod.	QPSK	QPSK	QPSK	QPSK
Lowest CH	5.015	9.75	14.446	20.18
Middle CH	5.185	9.89	14.476	20.18
Highest CH	5.195	9.79	14.326	20.18

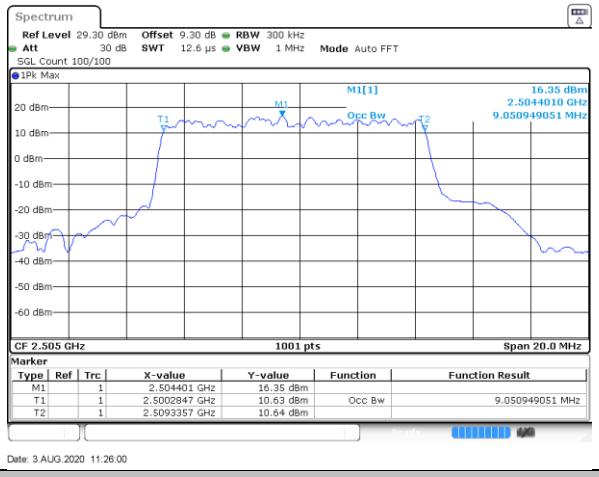
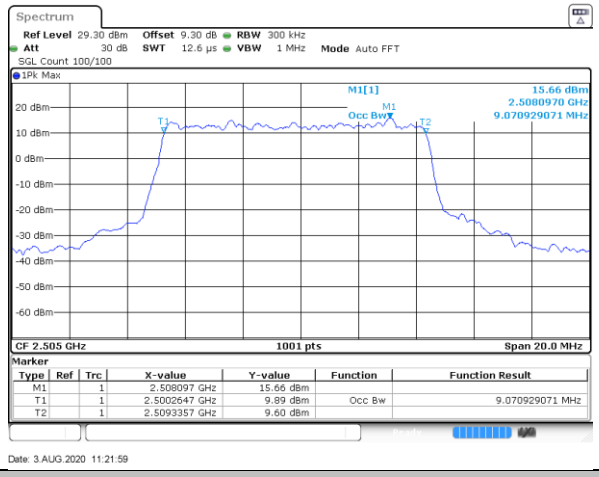
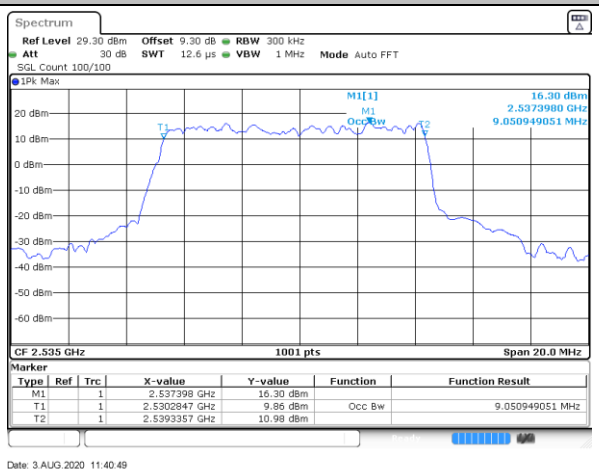
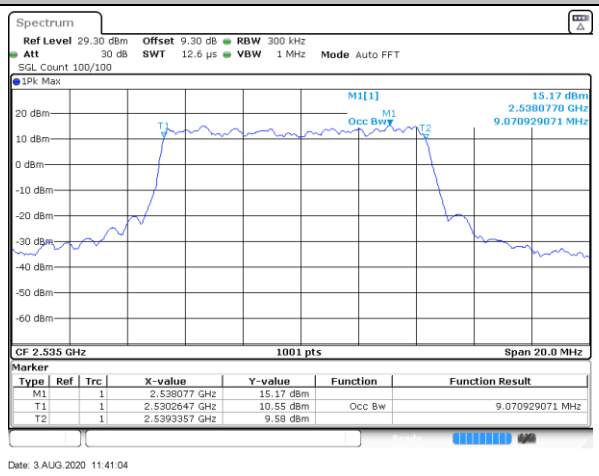
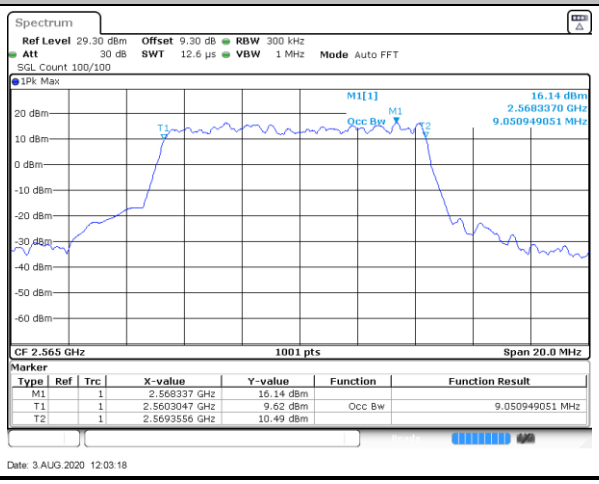
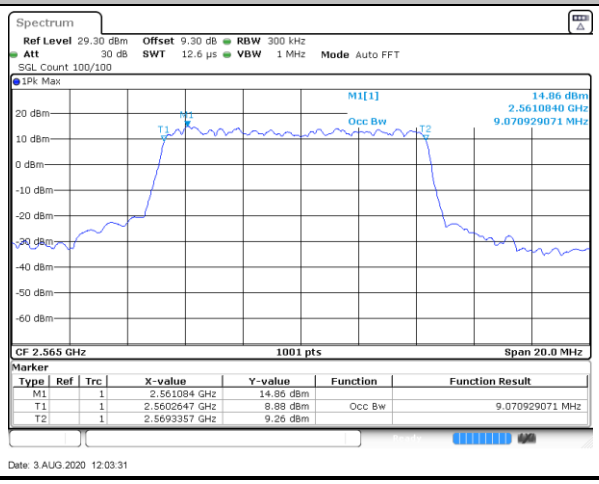
FR1 n7 / 5MHz / DFT-S OFDM	FR1 n7 / 10MHz / DFT-S OFDM
QPSK	QPSK
Lowest Channel	Lowest Channel
	
Middle Channel	Middle Channel
	
Highest Channel	Highest Channel
	

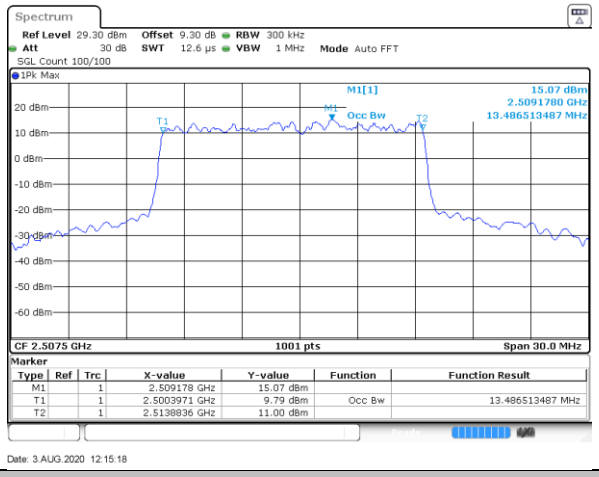
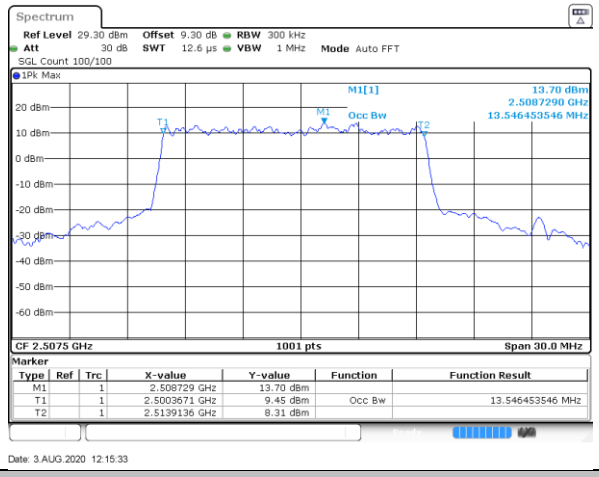
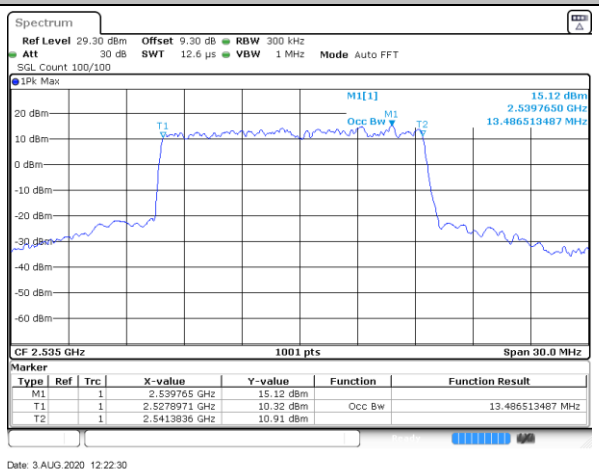
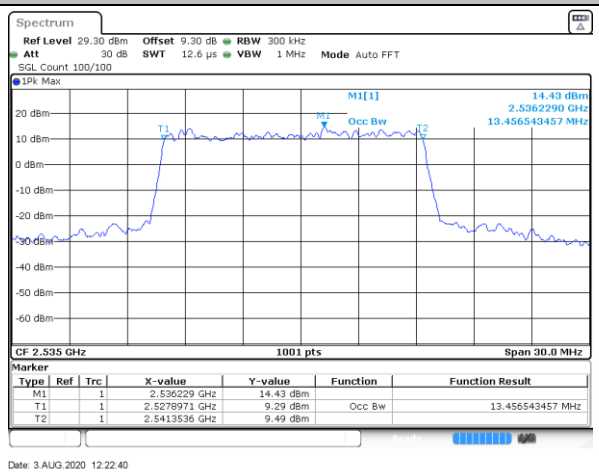
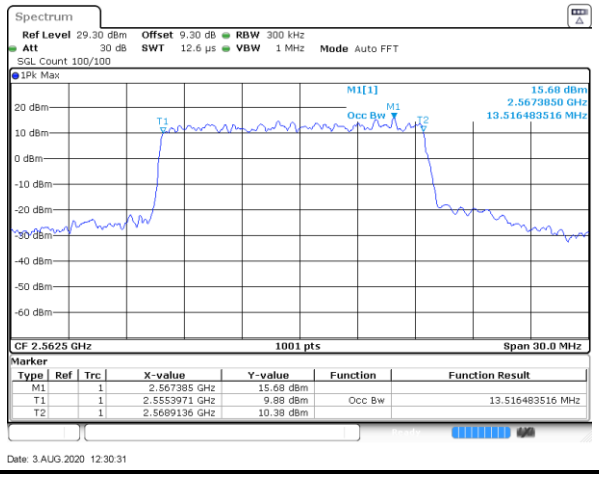
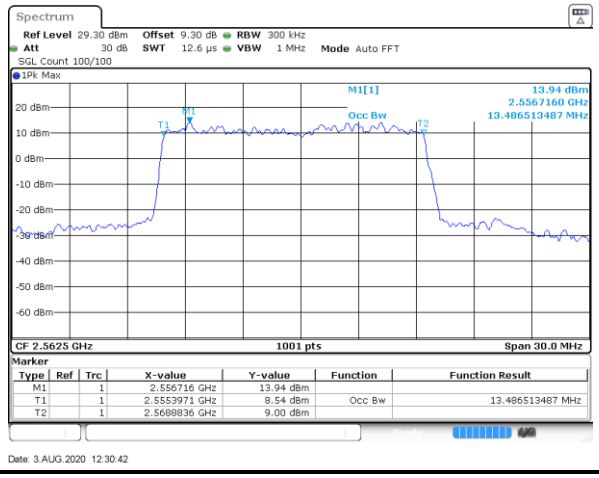
FR1 n7 / 15MHz / DFT-S OFDM	FR1 n7 / 20MHz / DFT-S OFDM
QPSK	QPSK
Lowest Channel	Lowest Channel
	
Middle Channel	Middle Channel
	
Highest Channel	Highest Channel
	

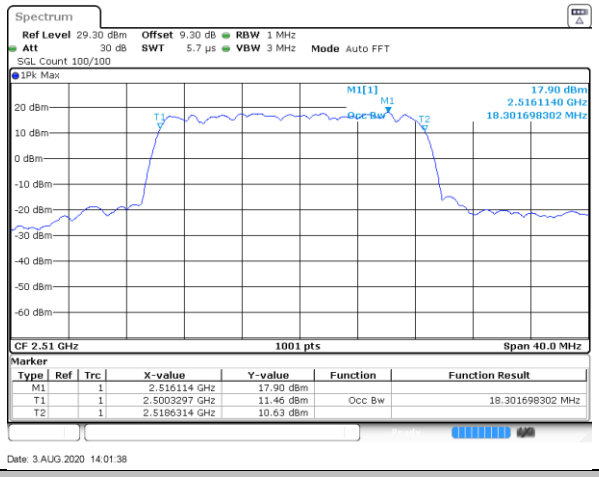
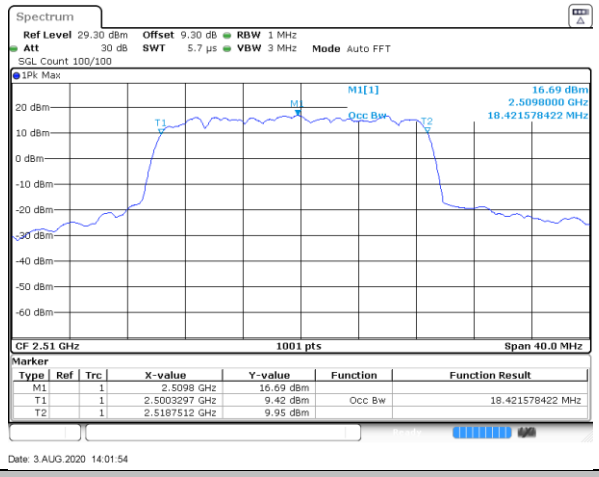
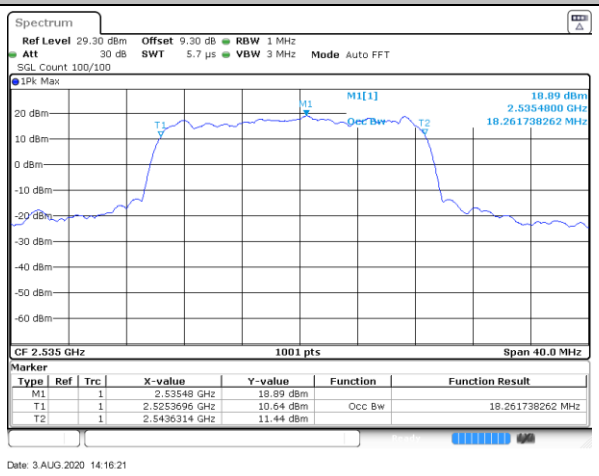
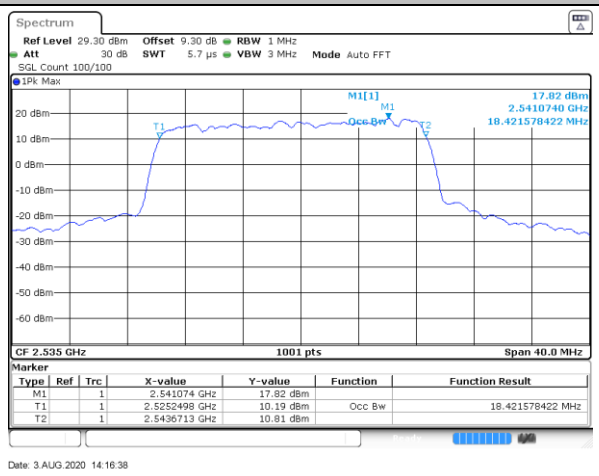
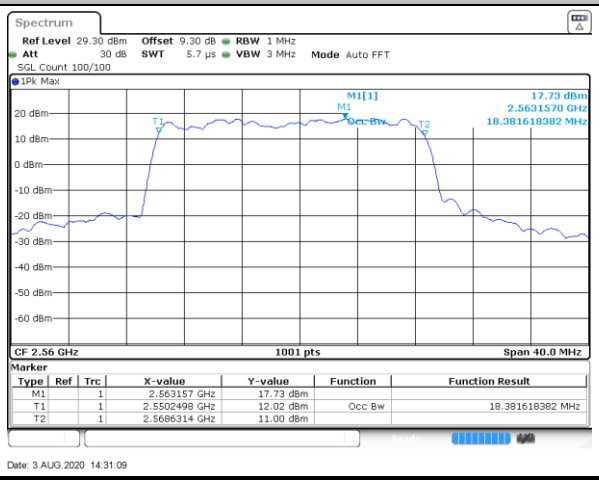
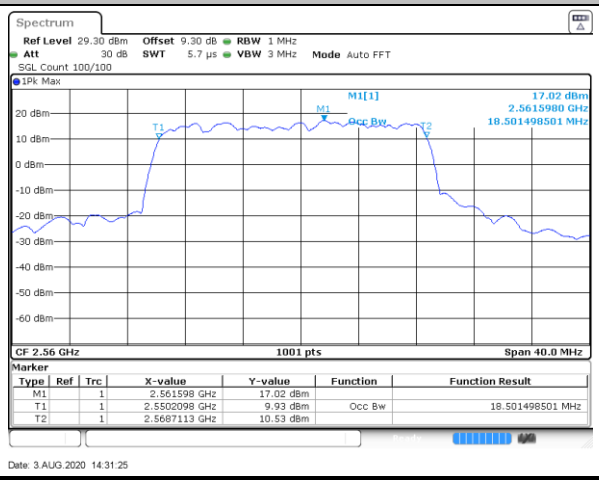
Occupied Bandwidth

Mode	FR1 n7 : 99%OBW (MHz) / DFT-S OFDM							
BW	5MHz		10MHz		15MHz		20MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	4.466	4.476	9.051	9.071	13.487	13.546	18.302	18.422
Middle CH	4.505	4.496	9.051	9.071	13.487	13.457	18.262	18.422
Highest CH	4.456	4.476	9.051	9.071	13.516	13.487	18.382	18.501

FR1 n7 / 5MHz / DFT-S OFDM	
QPSK	**16QAM**
Lowest Channel	**Lowest Channel**
	
Middle Channel	**Middle Channel**
	
Highest Channel	**Highest Channel**
	

FR1 n7 / 10MHz / DFT-S OFDM	
QPSK	**16QAM**
Lowest Channel	**Lowest Channel**
	
Middle Channel	**Middle Channel**
	
Highest Channel	**Highest Channel**
	

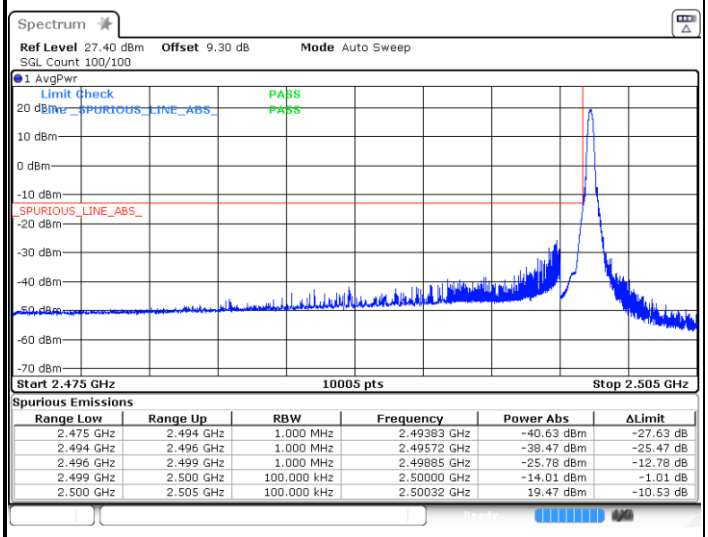
FR1 n7 / 15MHz / DFT-S OFDM	
QPSK	**16QAM**
Lowest Channel	**Lowest Channel**
	
Middle Channel	**Middle Channel**
	
Highest Channel	**Highest Channel**
	

FR1 n7 / 20MHz / DFT-S OFDM	
QPSK	**16QAM**
Lowest Channel	**Lowest Channel**
	
Middle Channel	**Middle Channel**
	
Highest Channel	**Highest Channel**
	

Conducted Band Edge

FR1 n7 / 5MHz / DFT-S OFDM / QPSK

Lowest Band Edge / 1RB0

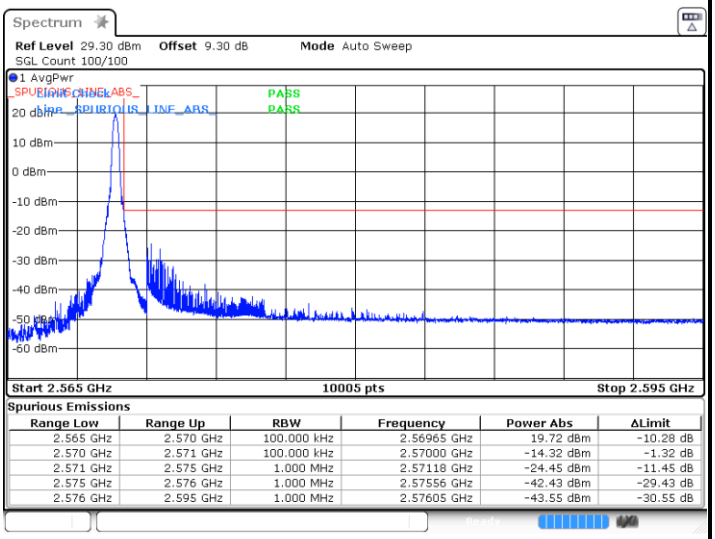


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.494 GHz	1.000 MHz	2.49383 GHz	-40.63 dBm	-27.63 dB
2.494 GHz	2.496 GHz	1.000 MHz	2.49572 GHz	-38.47 dBm	-25.47 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49885 GHz	-25.78 dBm	-12.78 dB
2.499 GHz	2.500 GHz	100.000 kHz	2.50000 GHz	-14.01 dBm	-1.01 dB
2.500 GHz	2.505 GHz	100.000 kHz	2.50032 GHz	19.47 dBm	-10.53 dB

Date: 8.SEP.2020 16:30:09

Highest Band Edge / 1RBMAX

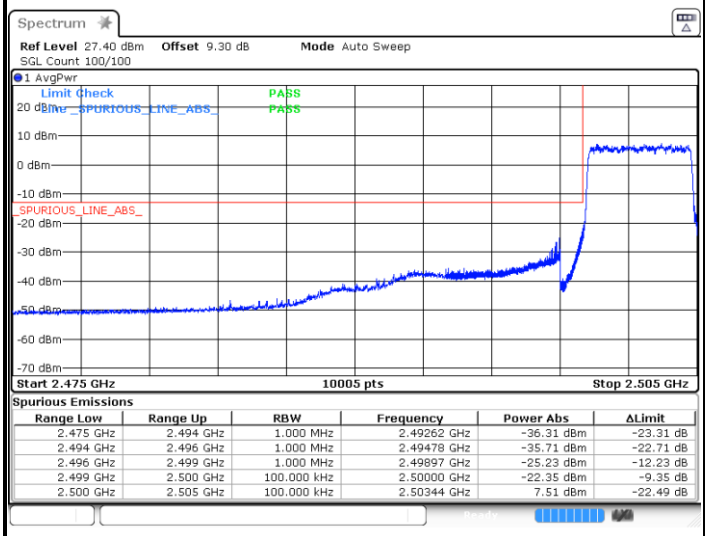


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.565 GHz	2.570 GHz	100.000 kHz	2.56965 GHz	19.72 dBm	-10.28 dB
2.570 GHz	2.571 GHz	100.000 kHz	2.57000 GHz	-14.32 dBm	-1.32 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57118 GHz	-24.45 dBm	-11.45 dB
2.575 GHz	2.576 GHz	1.000 MHz	2.57556 GHz	-42.43 dBm	-29.43 dB
2.576 GHz	2.595 GHz	1.000 MHz	2.57605 GHz	-43.55 dBm	-30.55 dB

Date: 8.SEP.2020 16:33:51

Lowest Band Edge / Full RB

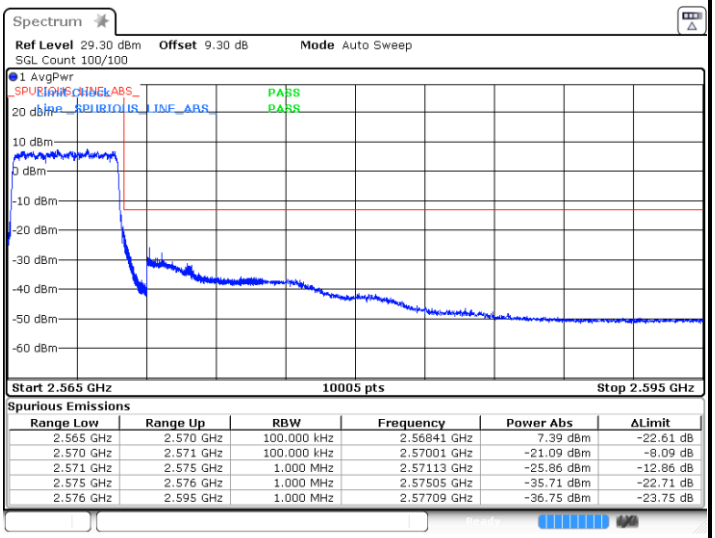


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.494 GHz	1.000 MHz	2.49262 GHz	-36.31 dBm	-23.31 dB
2.494 GHz	2.496 GHz	1.000 MHz	2.49478 GHz	-35.71 dBm	-22.71 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49897 GHz	-25.23 dBm	-12.23 dB
2.499 GHz	2.500 GHz	100.000 kHz	2.50000 GHz	-22.35 dBm	-9.35 dB
2.500 GHz	2.505 GHz	100.000 kHz	2.50344 GHz	7.51 dBm	-22.49 dB

Date: 8.SEP.2020 16:10:40

Highest Band Edge / Full RB



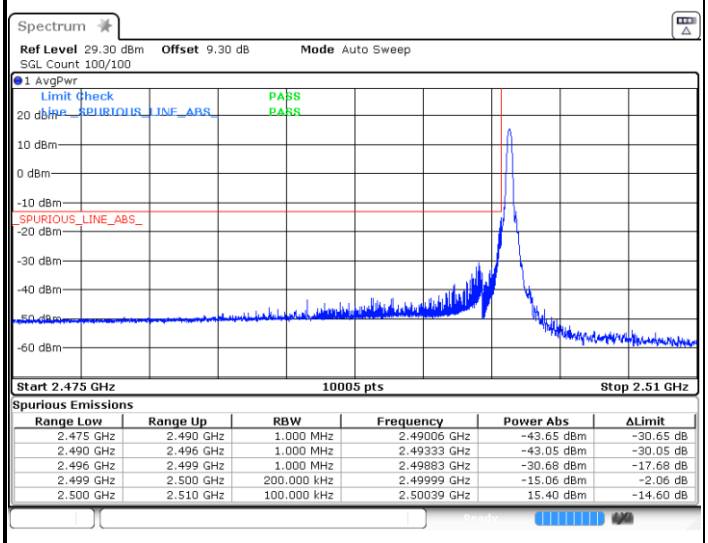
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.565 GHz	2.570 GHz	100.000 kHz	2.56841 GHz	7.39 dBm	-22.61 dB
2.570 GHz	2.571 GHz	100.000 kHz	2.57001 GHz	-21.09 dBm	-8.09 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57113 GHz	-25.86 dBm	-12.86 dB
2.575 GHz	2.576 GHz	1.000 MHz	2.57505 GHz	-35.71 dBm	-22.71 dB
2.576 GHz	2.595 GHz	1.000 MHz	2.57709 GHz	-36.75 dBm	-23.75 dB

Date: 8.SEP.2020 16:40:27

FR1 n7 / 10MHz / DFT-s-OFDM / QPSK

Lowest Band Edge / 1RB0

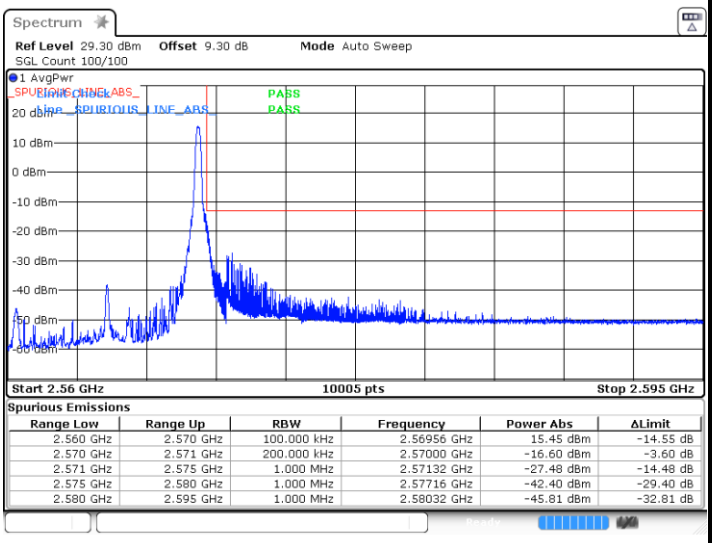


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.490 GHz	1.000 MHz	2.49006 GHz	-43.65 dBm	-30.65 dB
2.490 GHz	2.496 GHz	1.000 MHz	2.49333 GHz	-43.05 dBm	-30.05 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49883 GHz	-30.68 dBm	-17.68 dB
2.499 GHz	2.500 GHz	200.000 kHz	2.49999 GHz	-15.06 dBm	-2.06 dB
2.500 GHz	2.510 GHz	100.000 kHz	2.50039 GHz	15.40 dBm	-14.60 dB

Date: 8.SEP.2020 16:56:10

Highest Band Edge / 1RBMAX

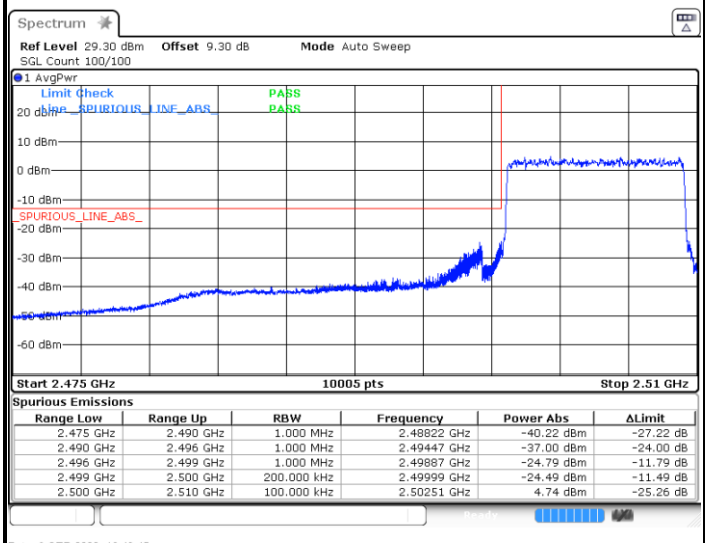


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.560 GHz	2.570 GHz	100.000 kHz	2.56956 GHz	15.45 dBm	-14.55 dB
2.570 GHz	2.571 GHz	200.000 kHz	2.57000 GHz	-16.60 dBm	-3.60 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57132 GHz	-27.48 dBm	-14.48 dB
2.575 GHz	2.580 GHz	1.000 MHz	2.57716 GHz	-42.40 dBm	-29.40 dB
2.580 GHz	2.595 GHz	1.000 MHz	2.58032 GHz	-45.81 dBm	-32.81 dB

Date: 8.SEP.2020 17:08:34

Lowest Band Edge / Full RB

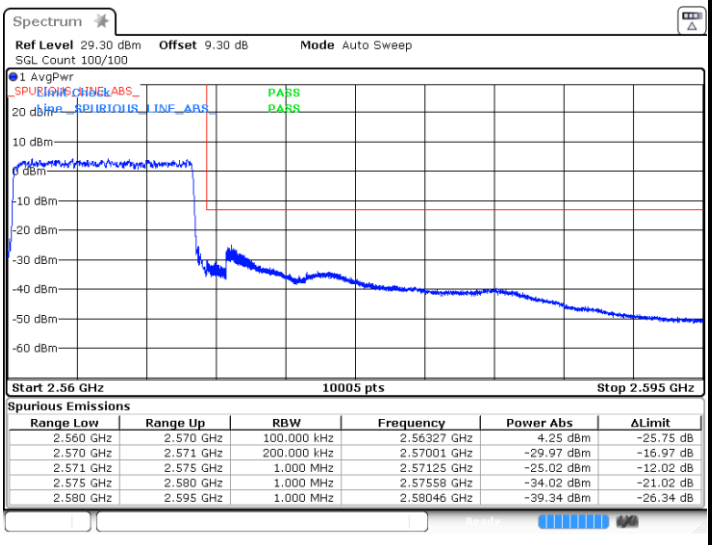


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.490 GHz	1.000 MHz	2.48822 GHz	-40.22 dBm	-27.22 dB
2.490 GHz	2.496 GHz	1.000 MHz	2.49447 GHz	-37.00 dBm	-24.00 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49887 GHz	-24.79 dBm	-11.79 dB
2.499 GHz	2.500 GHz	200.000 kHz	2.49999 GHz	-24.49 dBm	-11.49 dB
2.500 GHz	2.510 GHz	100.000 kHz	2.50251 GHz	4.74 dBm	-25.26 dB

Date: 8.SEP.2020 16:43:45

Highest Band Edge / Full RB



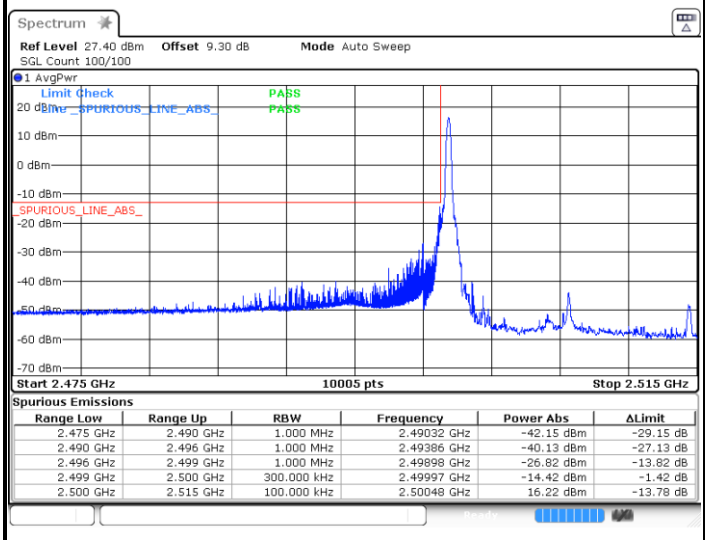
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.560 GHz	2.570 GHz	100.000 kHz	2.56327 GHz	4.25 dBm	-25.75 dB
2.570 GHz	2.571 GHz	200.000 kHz	2.57001 GHz	-29.97 dBm	-16.97 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57125 GHz	-25.02 dBm	-12.02 dB
2.575 GHz	2.580 GHz	1.000 MHz	2.57558 GHz	-34.02 dBm	-21.02 dB
2.580 GHz	2.595 GHz	1.000 MHz	2.58046 GHz	-39.34 dBm	-26.34 dB

Date: 8.SEP.2020 17:13:43

FR1 n7 / 15MHz / DFT-s-OFDM / QPSK

Lowest Band Edge / 1RB0

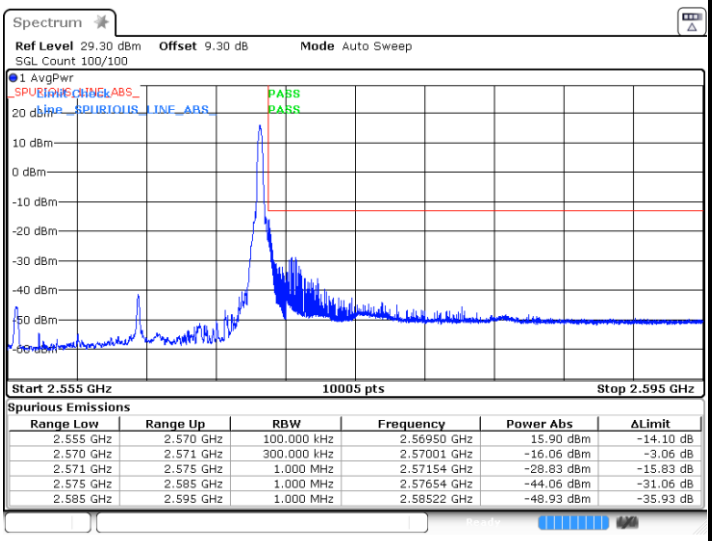


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.490 GHz	1.000 MHz	2.49032 GHz	-42.15 dBm	-29.15 dB
2.490 GHz	2.496 GHz	1.000 MHz	2.49386 GHz	-40.13 dBm	-27.13 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49898 GHz	-26.82 dBm	-13.82 dB
2.499 GHz	2.500 GHz	300.000 kHz	2.49997 GHz	-14.42 dBm	-1.42 dB
2.500 GHz	2.515 GHz	100.000 kHz	2.50048 GHz	16.22 dBm	-13.78 dB

Date: 8.SEP.2020 17:33:44

Highest Band Edge / 1RBMAX

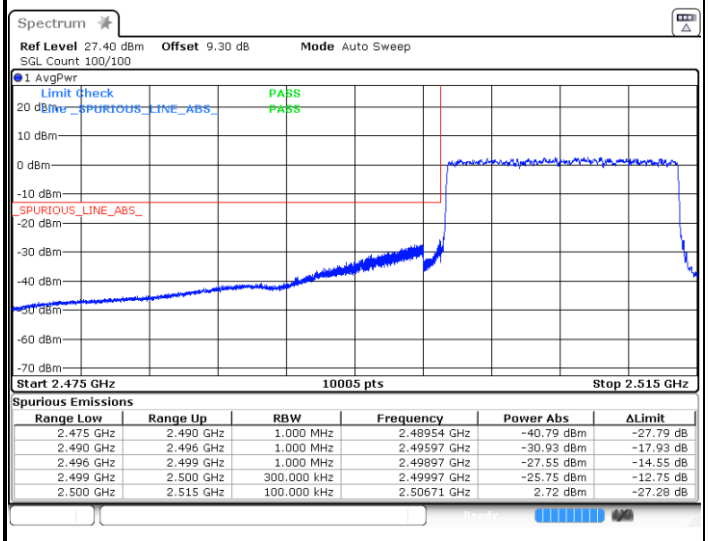


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.555 GHz	2.570 GHz	100.000 kHz	2.56950 GHz	15.90 dBm	-14.10 dB
2.570 GHz	2.571 GHz	300.000 kHz	2.57001 GHz	-16.06 dBm	-3.06 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57154 GHz	-28.83 dBm	-15.83 dB
2.575 GHz	2.585 GHz	1.000 MHz	2.57654 GHz	-44.06 dBm	-31.06 dB
2.585 GHz	2.595 GHz	1.000 MHz	2.58522 GHz	-48.93 dBm	-35.93 dB

Date: 8.SEP.2020 17:54:48

Lowest Band Edge / Full RB

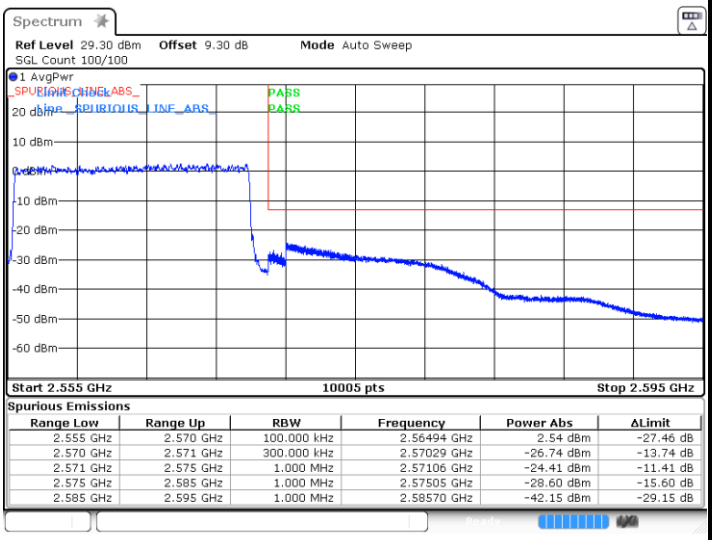


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.490 GHz	1.000 MHz	2.48954 GHz	-40.79 dBm	-27.79 dB
2.490 GHz	2.496 GHz	1.000 MHz	2.49597 GHz	-30.93 dBm	-17.93 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49897 GHz	-27.55 dBm	-14.55 dB
2.499 GHz	2.500 GHz	300.000 kHz	2.49997 GHz	-25.75 dBm	-12.75 dB
2.500 GHz	2.515 GHz	100.000 kHz	2.50671 GHz	2.72 dBm	-27.28 dB

Date: 8.SEP.2020 17:28:30

Highest Band Edge / Full RB



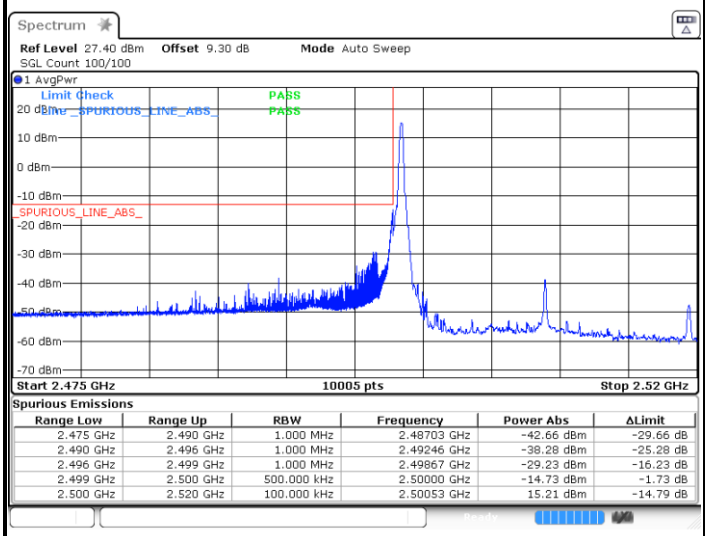
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.555 GHz	2.570 GHz	100.000 kHz	2.56494 GHz	2.54 dBm	-27.46 dB
2.570 GHz	2.571 GHz	300.000 kHz	2.57029 GHz	-26.74 dBm	-13.74 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57106 GHz	-24.41 dBm	-11.41 dB
2.575 GHz	2.585 GHz	1.000 MHz	2.57505 GHz	-28.60 dBm	-15.60 dB
2.585 GHz	2.595 GHz	1.000 MHz	2.58570 GHz	-42.15 dBm	-29.15 dB

Date: 8.SEP.2020 17:49:50

FR1 n7 / 20MHz / DFT-s-OFDM / QPSK

Lowest Band Edge / 1RB0

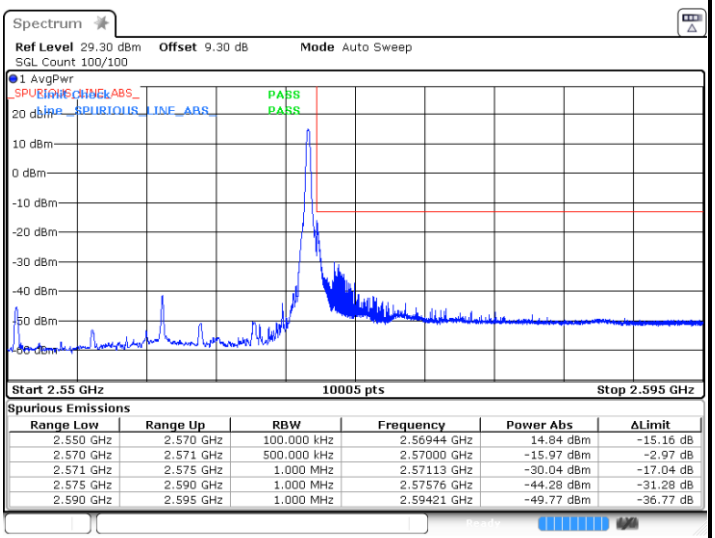


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.490 GHz	1.000 MHz	2.48703 GHz	-42.66 dBm	-29.66 dB
2.490 GHz	2.496 GHz	1.000 MHz	2.49246 GHz	-38.28 dBm	-25.28 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49867 GHz	-29.23 dBm	-16.23 dB
2.499 GHz	2.500 GHz	500.000 kHz	2.50000 GHz	-14.73 dBm	-1.73 dB
2.500 GHz	2.520 GHz	100.000 kHz	2.50053 GHz	15.21 dBm	-14.79 dB

Date: 8.SEP.2020 18:22:26

Highest Band Edge / 1RBMAX

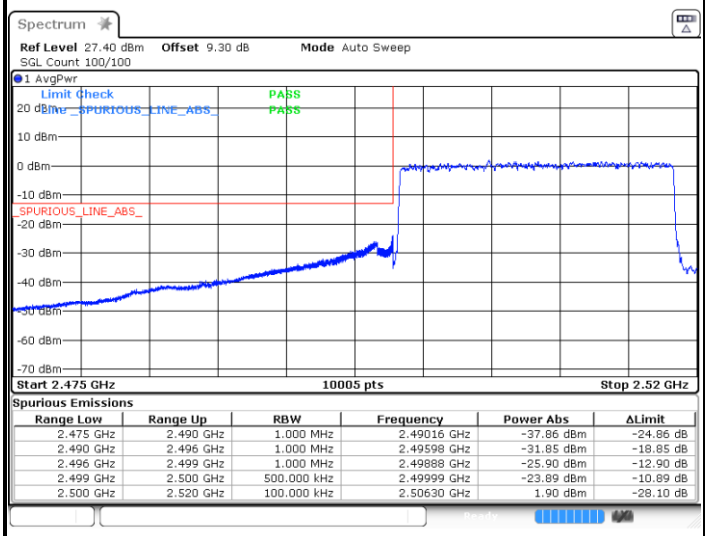


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.550 GHz	2.570 GHz	100.000 kHz	2.56944 GHz	14.84 dBm	-15.16 dB
2.570 GHz	2.571 GHz	500.000 kHz	2.57000 GHz	-15.97 dBm	-2.97 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57113 GHz	-30.04 dBm	-17.04 dB
2.575 GHz	2.590 GHz	1.000 MHz	2.57576 GHz	-44.28 dBm	-31.28 dB
2.590 GHz	2.595 GHz	1.000 MHz	2.59421 GHz	-49.77 dBm	-36.77 dB

Date: 8.SEP.2020 18:30:54

Lowest Band Edge / Full RB

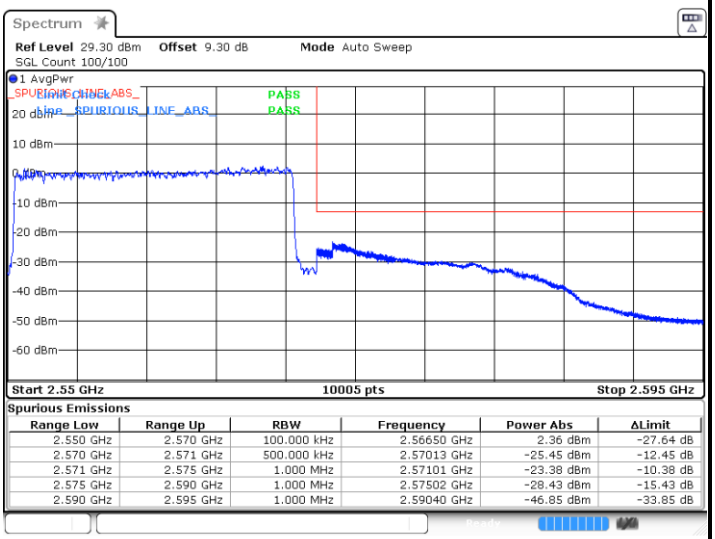


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.475 GHz	2.490 GHz	1.000 MHz	2.49016 GHz	-37.86 dBm	-24.86 dB
2.490 GHz	2.496 GHz	1.000 MHz	2.49598 GHz	-31.85 dBm	-18.85 dB
2.496 GHz	2.499 GHz	1.000 MHz	2.49888 GHz	-25.90 dBm	-12.90 dB
2.499 GHz	2.500 GHz	500.000 kHz	2.49999 GHz	-23.89 dBm	-10.89 dB
2.500 GHz	2.520 GHz	100.000 kHz	2.50630 GHz	1.90 dBm	-28.10 dB

Date: 8.SEP.2020 18:16:56

Highest Band Edge / Full RB



Spurious Emissions

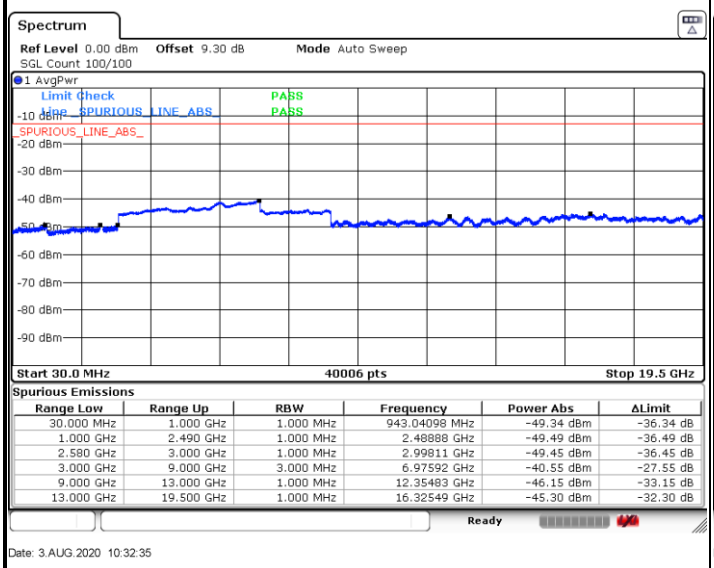
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
2.550 GHz	2.570 GHz	100.000 kHz	2.56650 GHz	2.36 dBm	-27.64 dB
2.570 GHz	2.571 GHz	500.000 kHz	2.57013 GHz	-25.45 dBm	-12.45 dB
2.571 GHz	2.575 GHz	1.000 MHz	2.57101 GHz	-23.38 dBm	-10.38 dB
2.575 GHz	2.590 GHz	1.000 MHz	2.57502 GHz	-28.43 dBm	-15.43 dB
2.590 GHz	2.595 GHz	1.000 MHz	2.59040 GHz	-46.85 dBm	-33.85 dB

Date: 8.SEP.2020 18:34:25

Conducted Spurious Emission

FR1 n7 / 5MHz / DFT-S OFDM / QPSK

Lowest Channel / 1RB0

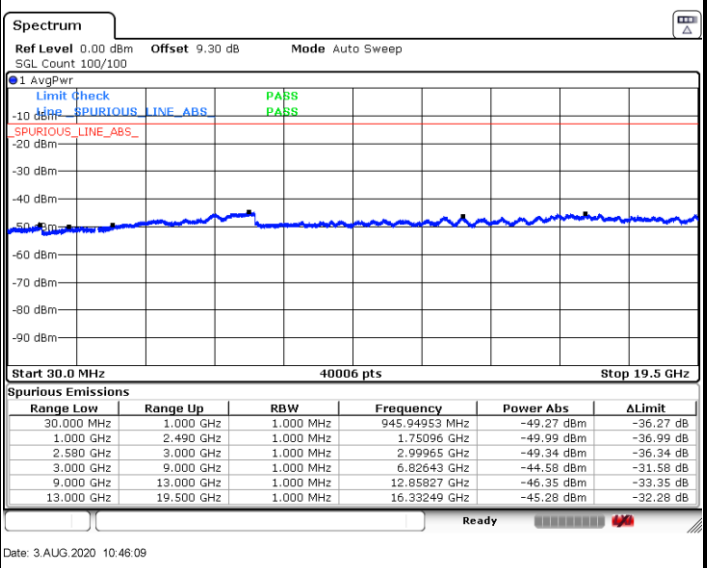


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	943.04098 MHz	-49.34 dBm	-36.34 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.48888 GHz	-49.49 dBm	-36.49 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.99811 GHz	-49.45 dBm	-36.45 dB
3.000 GHz	9.000 GHz	3.000 MHz	6.97592 GHz	-40.55 dBm	-27.55 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.35483 GHz	-46.15 dBm	-33.15 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.32549 GHz	-45.30 dBm	-32.30 dB

Date: 3.AUG.2020 10:32:35

Middle Channel / 1RB0

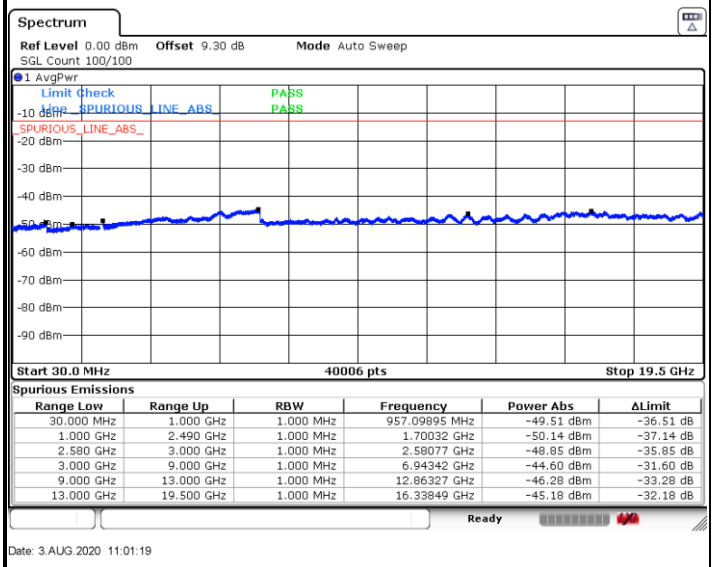


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	945.94953 MHz	-49.27 dBm	-36.27 dB
1.000 GHz	2.490 GHz	1.000 MHz	1.75096 GHz	-49.99 dBm	-36.99 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.99965 GHz	-49.34 dBm	-36.34 dB
3.000 GHz	9.000 GHz	1.000 MHz	6.82643 GHz	-44.58 dBm	-31.58 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.85827 GHz	-46.35 dBm	-33.35 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.33249 GHz	-45.28 dBm	-32.28 dB

Date: 3.AUG.2020 10:46:09

Highest Channel / 1RB0



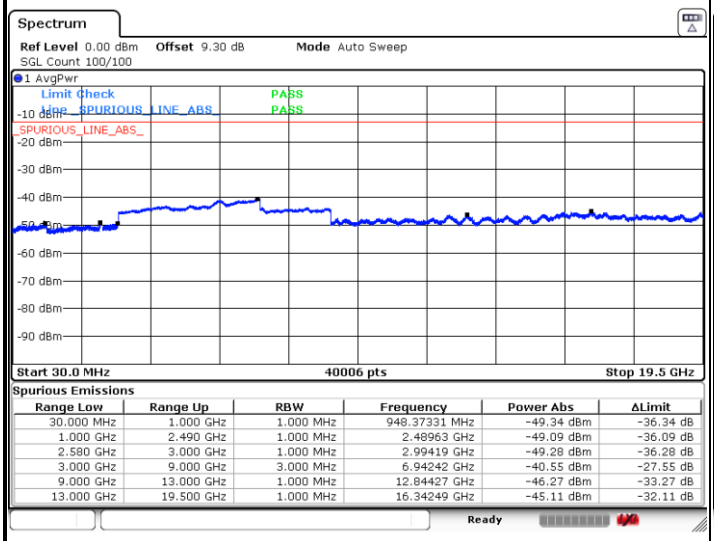
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	957.09895 MHz	-49.51 dBm	-36.51 dB
1.000 GHz	2.490 GHz	1.000 MHz	1.70032 GHz	-50.14 dBm	-37.14 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.58077 GHz	-48.85 dBm	-35.85 dB
3.000 GHz	9.000 GHz	1.000 MHz	6.94342 GHz	-44.60 dBm	-31.60 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.86327 GHz	-46.28 dBm	-33.28 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.33849 GHz	-45.18 dBm	-32.18 dB

Date: 3.AUG.2020 11:01:19

FR1 n7 / 10MHz / DFT-S OFDM / QPSK

Lowest Channel / 1RB0

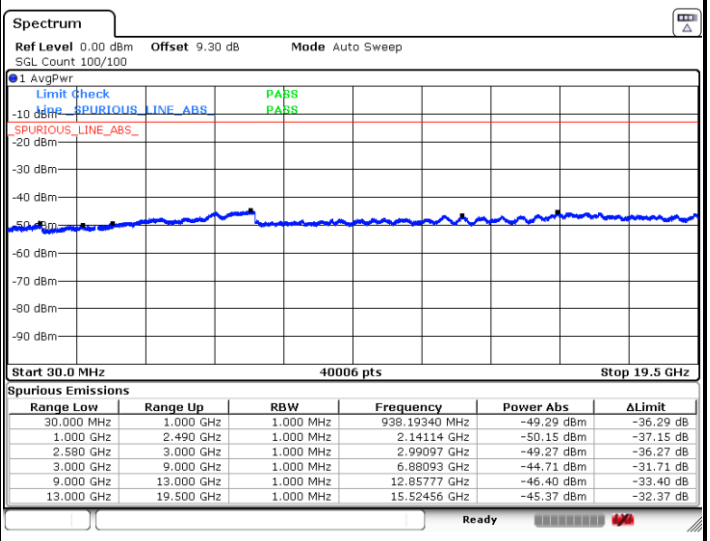


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	948.37331 MHz	-49.34 dBm	-36.34 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.48963 GHz	-49.09 dBm	-36.09 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.99419 GHz	-49.28 dBm	-36.28 dB
3.000 GHz	9.000 GHz	3.000 MHz	6.94242 GHz	-40.55 dBm	-27.55 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.84427 GHz	-46.27 dBm	-33.27 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.34249 GHz	-45.11 dBm	-32.11 dB

Date: 3.AUG.2020 11:33:46

Middle Channel / 1RB0

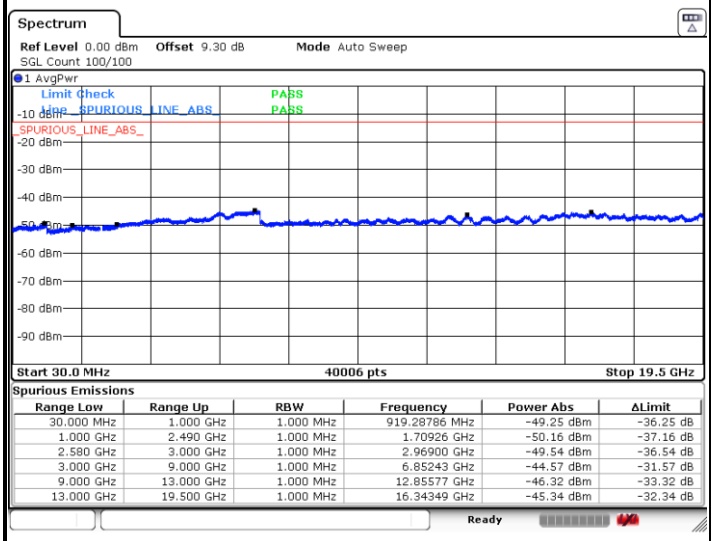


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	938.19340 MHz	-49.29 dBm	-36.29 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.14114 GHz	-50.15 dBm	-37.15 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.99097 GHz	-49.27 dBm	-36.27 dB
3.000 GHz	9.000 GHz	1.000 MHz	6.88093 GHz	-44.71 dBm	-31.71 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.85777 GHz	-46.40 dBm	-33.40 dB
13.000 GHz	19.500 GHz	1.000 MHz	15.52456 GHz	-45.37 dBm	-32.37 dB

Date: 3.AUG.2020 11:42:47

Highest Channel / 1RB0



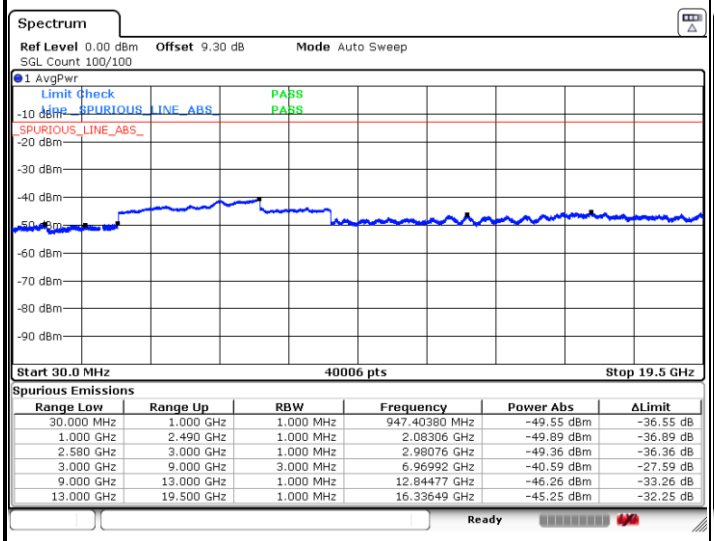
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	919.28786 MHz	-49.25 dBm	-36.25 dB
1.000 GHz	2.490 GHz	1.000 MHz	1.70926 GHz	-50.16 dBm	-37.16 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.96900 GHz	-49.54 dBm	-36.54 dB
3.000 GHz	9.000 GHz	1.000 MHz	6.85243 GHz	-44.57 dBm	-31.57 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.85577 GHz	-46.32 dBm	-33.32 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.34349 GHz	-45.34 dBm	-32.34 dB

Date: 3.AUG.2020 12:08:42

FR1 n7 / 15MHz / DFT-S OFDM / QPSK

Lowest Channel / 1RB0

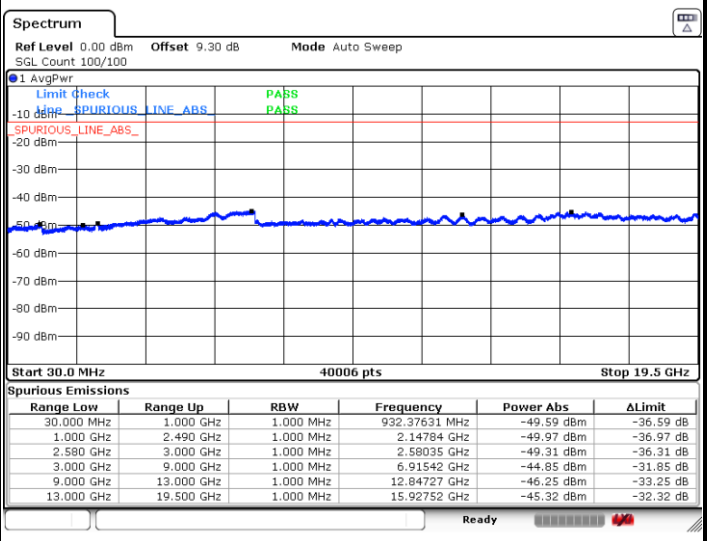


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	947.40380 MHz	-49.55 dBm	-36.55 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.08306 GHz	-49.89 dBm	-36.89 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.98076 GHz	-49.36 dBm	-36.36 dB
3.000 GHz	9.000 GHz	3.000 MHz	6.96992 GHz	-40.59 dBm	-27.59 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.84477 GHz	-46.26 dBm	-33.26 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.33649 GHz	-45.25 dBm	-32.25 dB

Date: 3.AUG.2020 12:19:10

Middle Channel / 1RB0

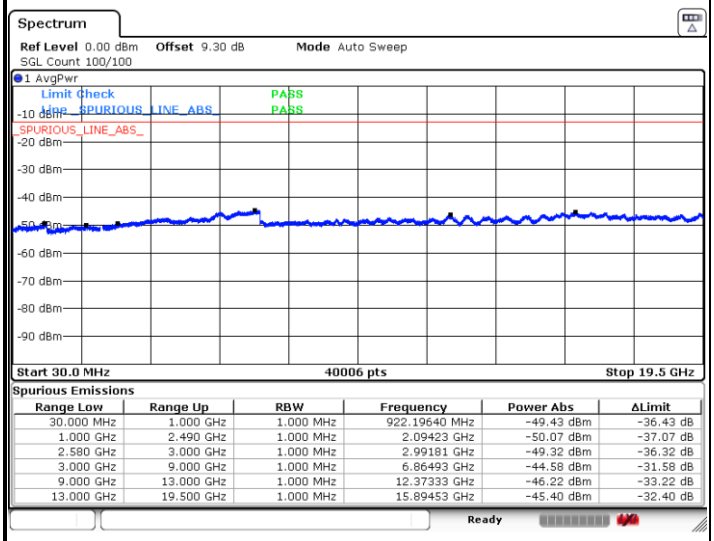


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	932.37631 MHz	-49.59 dBm	-36.59 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.14784 GHz	-49.97 dBm	-36.97 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.58035 GHz	-49.31 dBm	-36.31 dB
3.000 GHz	9.000 GHz	1.000 MHz	6.91542 GHz	-44.85 dBm	-31.85 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.84727 GHz	-46.25 dBm	-33.25 dB
13.000 GHz	19.500 GHz	1.000 MHz	15.92752 GHz	-45.32 dBm	-32.32 dB

Date: 3.AUG.2020 12:26:48

Highest Channel / 1RB0



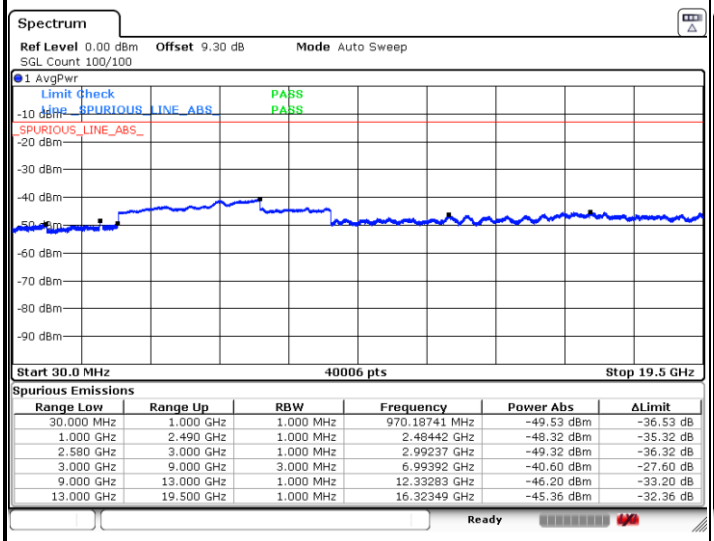
Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	922.19640 MHz	-49.43 dBm	-36.43 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.09423 GHz	-50.07 dBm	-37.07 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.99181 GHz	-49.32 dBm	-36.32 dB
3.000 GHz	9.000 GHz	1.000 MHz	6.86493 GHz	-44.58 dBm	-31.58 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.37333 GHz	-46.22 dBm	-33.22 dB
13.000 GHz	19.500 GHz	1.000 MHz	15.89453 GHz	-45.40 dBm	-32.40 dB

Date: 3.AUG.2020 12:36:37

FR1 n7 / 20MHz / DFT-S OFDM / QPSK

Lowest Channel / 1RB0

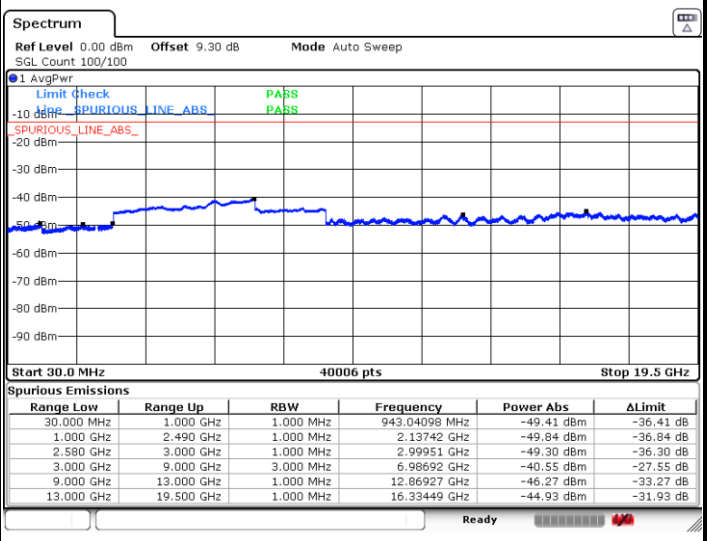


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	970.18741 MHz	-49.53 dBm	-36.53 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.48442 GHz	-48.32 dBm	-35.32 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.99237 GHz	-49.32 dBm	-36.32 dB
3.000 GHz	9.000 GHz	3.000 MHz	6.99392 GHz	-40.60 dBm	-27.60 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.33283 GHz	-46.20 dBm	-33.20 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.32349 GHz	-45.36 dBm	-32.36 dB

Date: 3.AUG.2020 14:08:54

Middle Channel / 1RB0

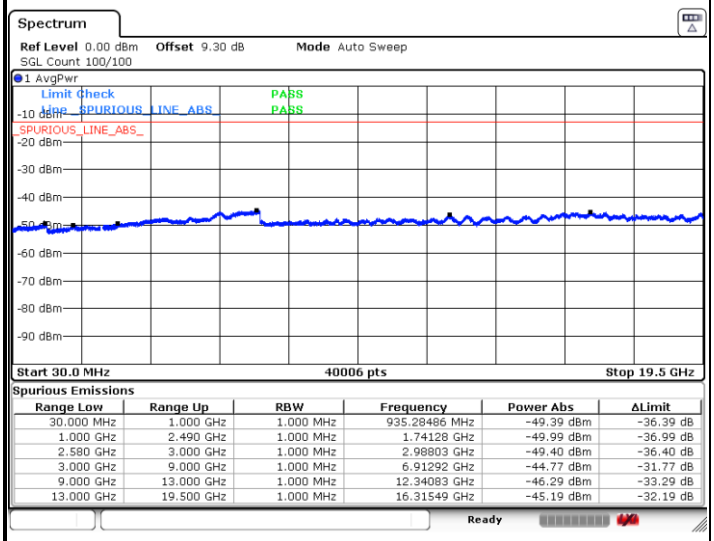


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	943.04098 MHz	-49.41 dBm	-36.41 dB
1.000 GHz	2.490 GHz	1.000 MHz	2.13742 GHz	-49.84 dBm	-36.84 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.99951 GHz	-49.30 dBm	-36.30 dB
3.000 GHz	9.000 GHz	3.000 MHz	6.98692 GHz	-40.55 dBm	-27.55 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.86927 GHz	-46.27 dBm	-33.27 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.33449 GHz	-44.93 dBm	-31.93 dB

Date: 3.AUG.2020 14:26:29

Highest Channel / 1RB0



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	1.000 GHz	1.000 MHz	935.28486 MHz	-49.39 dBm	-36.39 dB
1.000 GHz	2.490 GHz	1.000 MHz	1.74128 GHz	-49.99 dBm	-36.99 dB
2.580 GHz	3.000 GHz	1.000 MHz	2.98803 GHz	-49.40 dBm	-36.40 dB
3.000 GHz	9.000 GHz	1.000 MHz	6.91292 GHz	-44.77 dBm	-31.77 dB
9.000 GHz	13.000 GHz	1.000 MHz	12.34083 GHz	-46.29 dBm	-33.29 dB
13.000 GHz	19.500 GHz	1.000 MHz	16.31549 GHz	-45.19 dBm	-32.19 dB

Date: 3.AUG.2020 14:37:50

Frequency Stability

Test Conditions		FR1 n7 (QPSK) / Middle Channel	Limit
Temperature (°C)	Voltage (Volt)	BW 20MHz	Note 2.
		Deviation (ppm)	Result
50	Normal Voltage	0.0013	PASS
40	Normal Voltage	0.0017	
30	Normal Voltage	0.0009	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0003	
0	Normal Voltage	0.0021	
-10	Normal Voltage	0.0005	
-20	Normal Voltage	0.0004	
-30	Normal Voltage	0.0013	
20	Maximum Voltage	0.0003	
20	Normal Voltage	0.0021	
20	Battery End Point	0.0021	

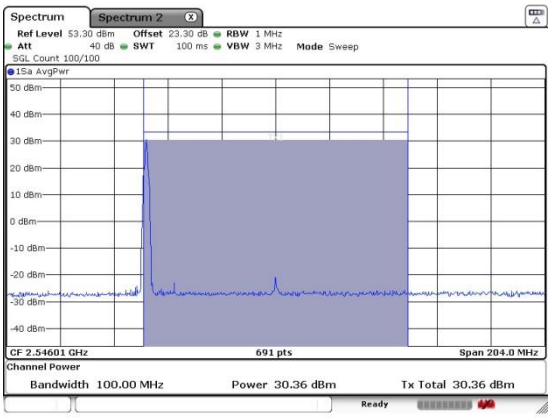
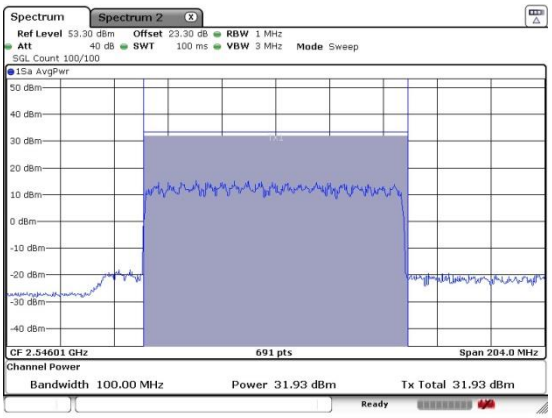
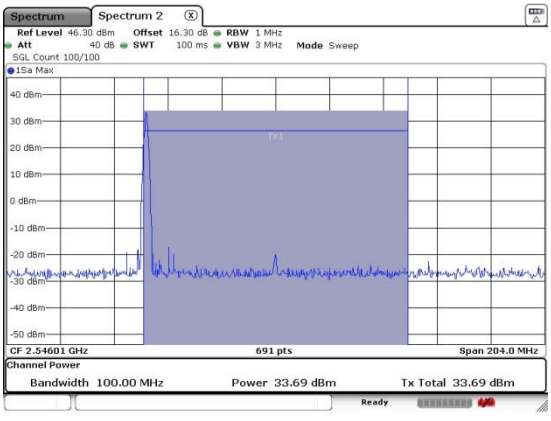
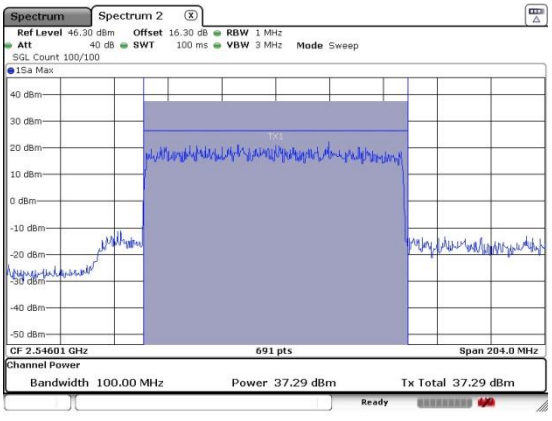
Note:

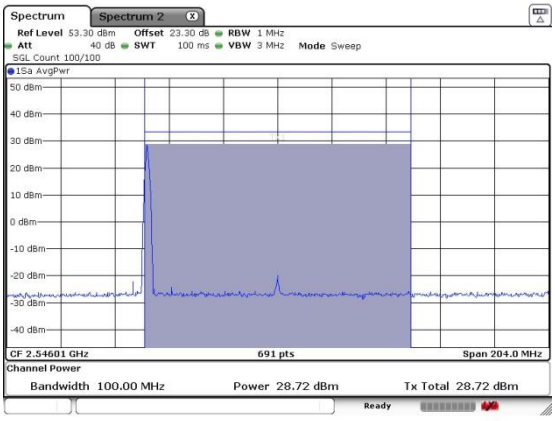
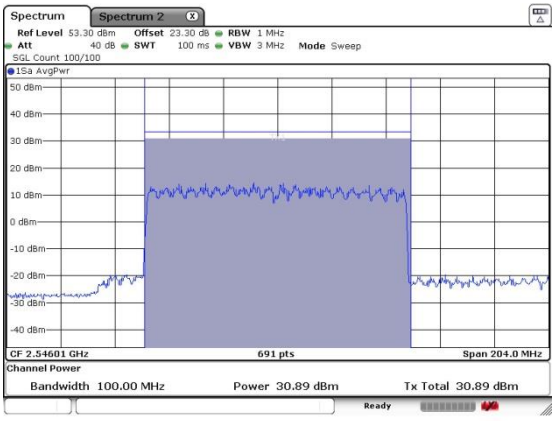
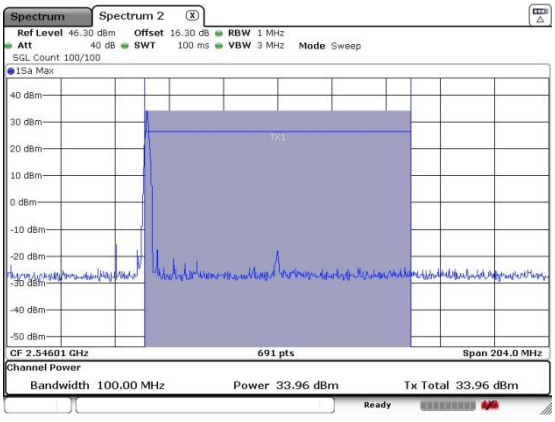
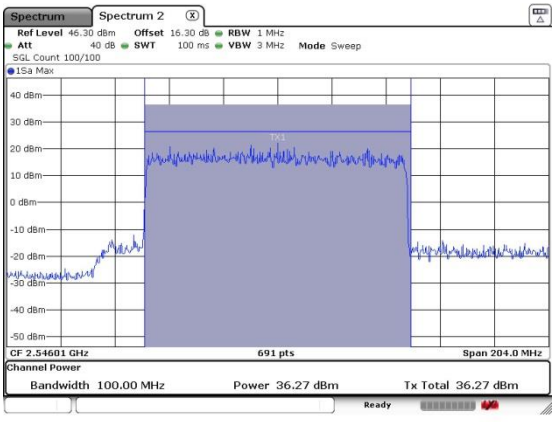
1. Normal Voltage =3.8 V.；Battery End Point (BEP) =3.135 V.；Maximum Voltage =4.4 V.
2. Note: The frequency fundamental emissions stay within the authorized frequency block.

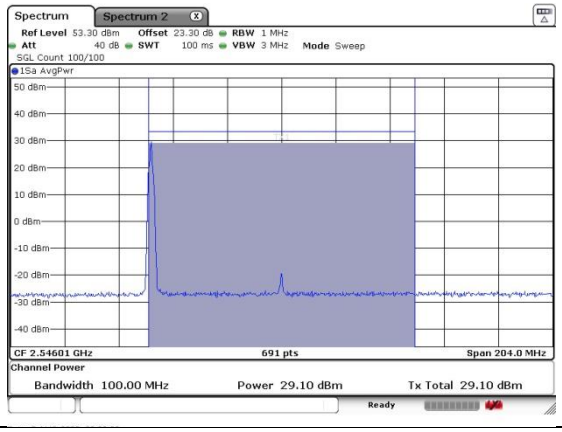
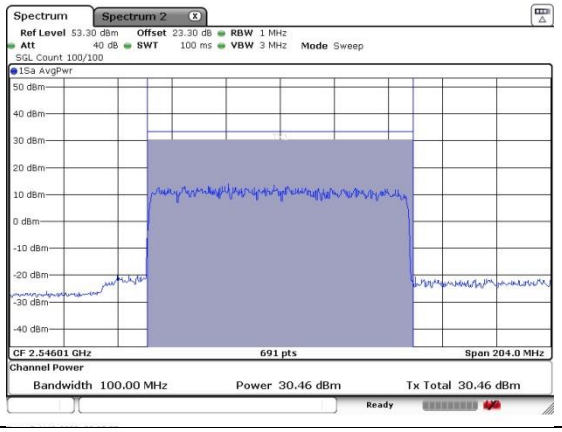
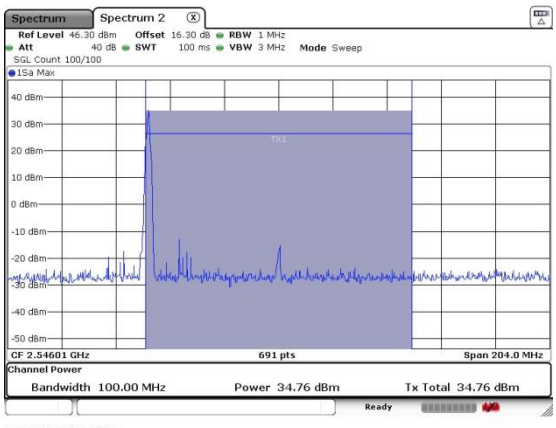
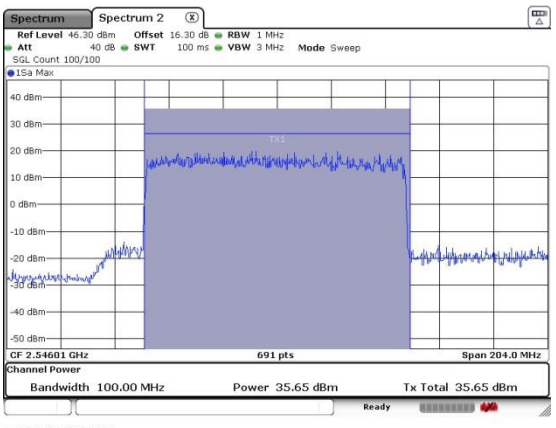
5G NR n41

Peak-to-Average Ratio

Mode	N 41 / 100MHz / DFT-S OFDM		
Mod.	QPSK	QPSK	Limit: 13dB
RB Size	1RB	Full RB	Result
Lowest CH	3.33	5.36	PASS
Middle CH	3.72	5.3	
Highest CH	3.9	5.93	

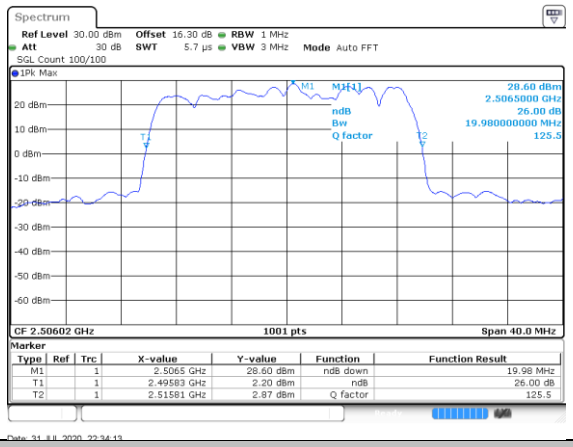
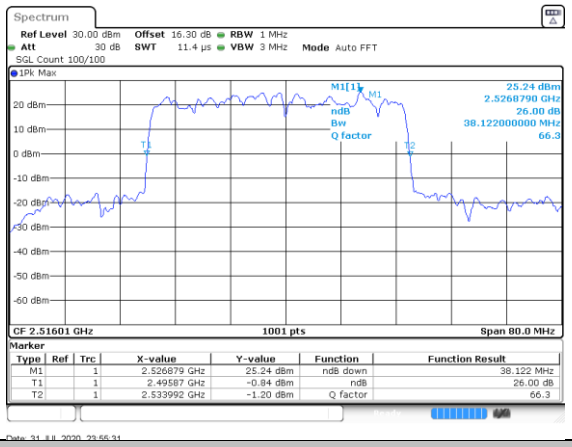
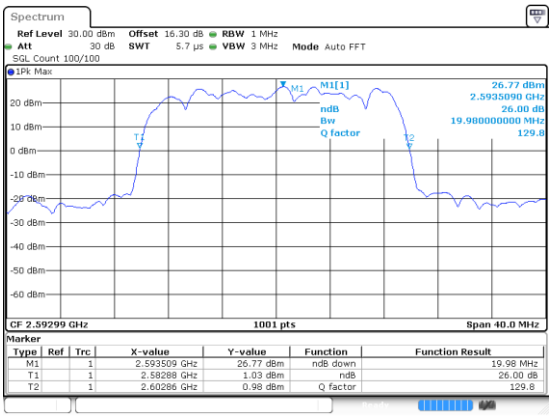
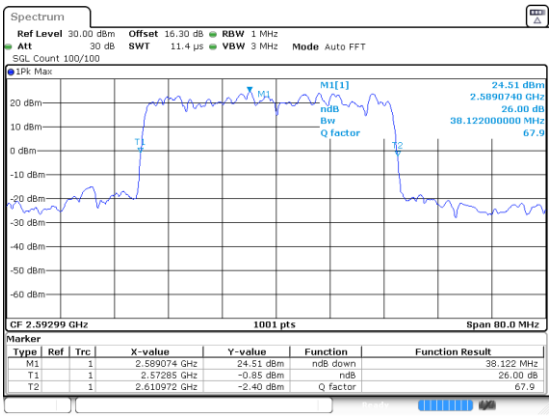
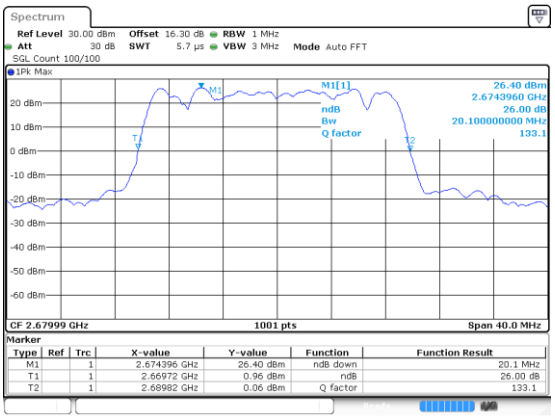
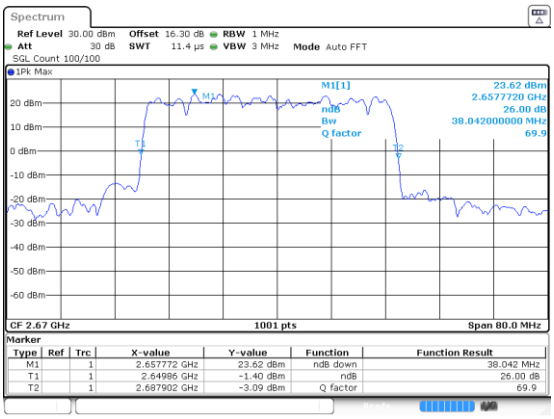
FR1 n41 / 100MHz / QPSK	
Lowest Channel / 1RB0	**Lowest Channel / 270RB0**
	
	

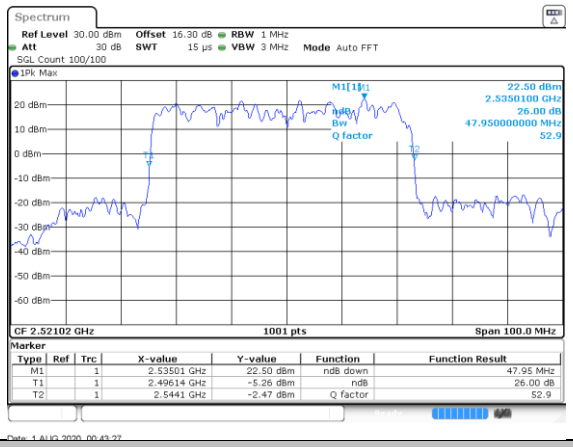
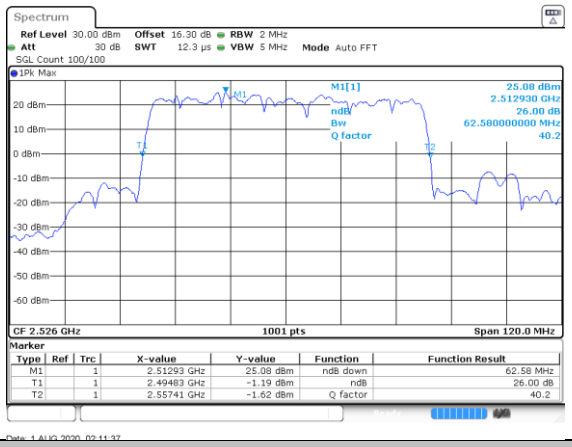
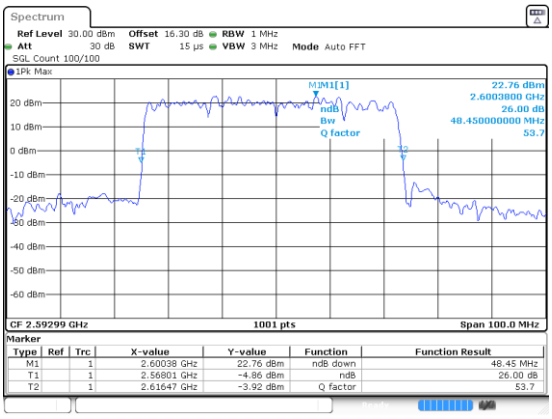
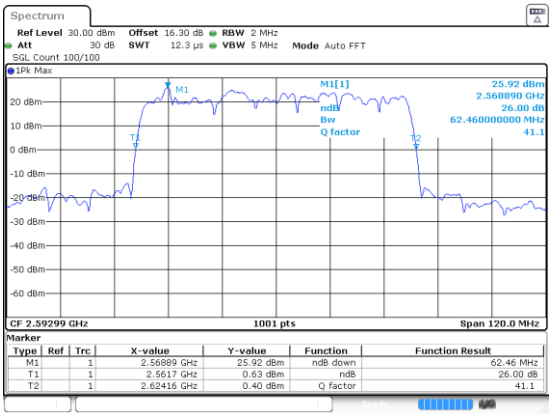
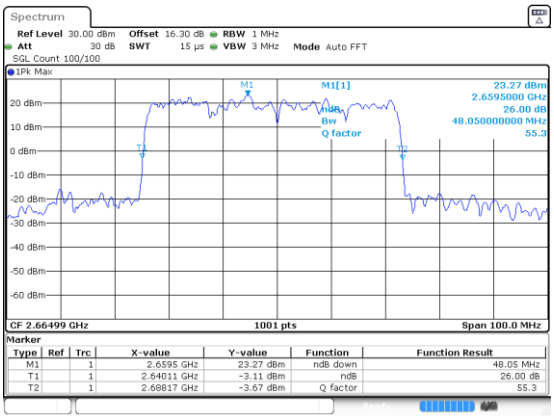
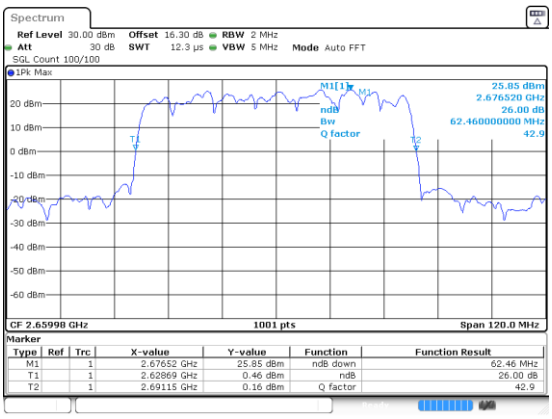
Middle Channel / 1RB0	Middle Channel / 270RB0
	
	

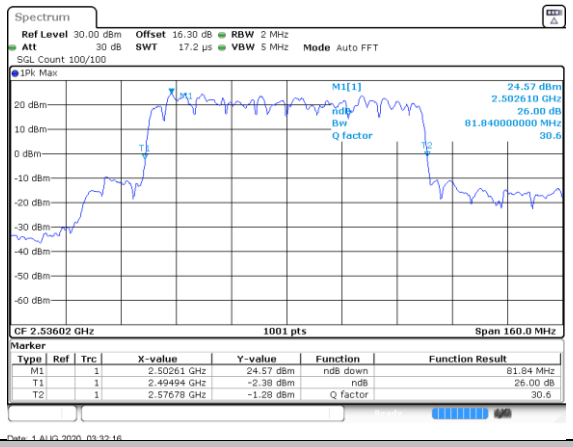
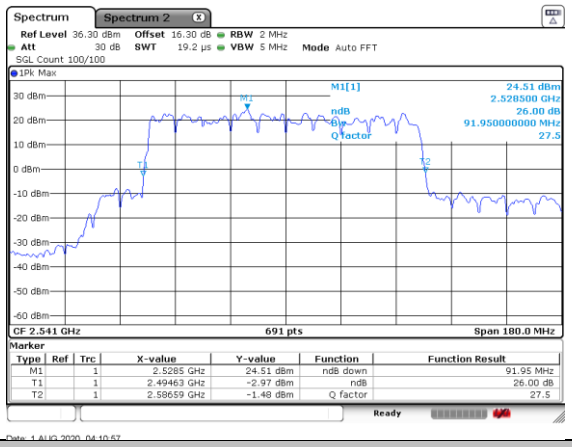
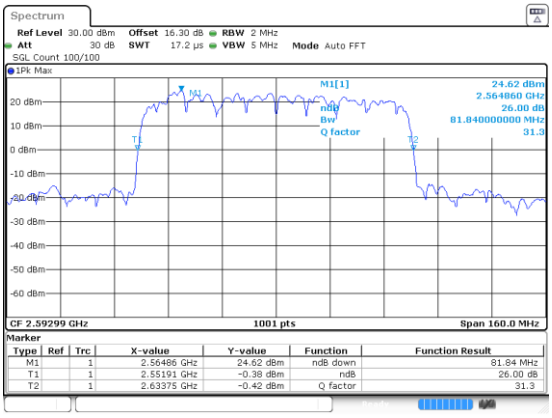
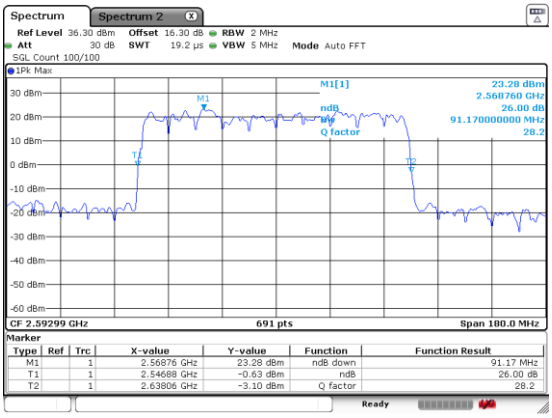
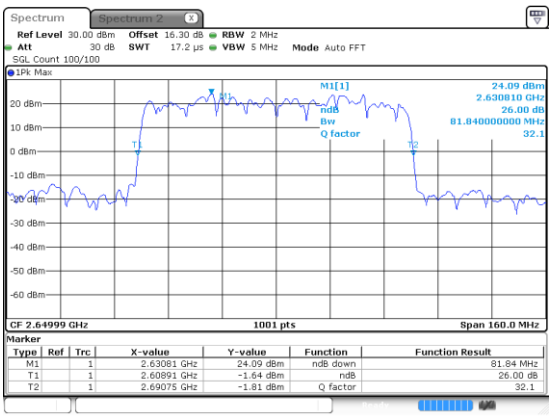
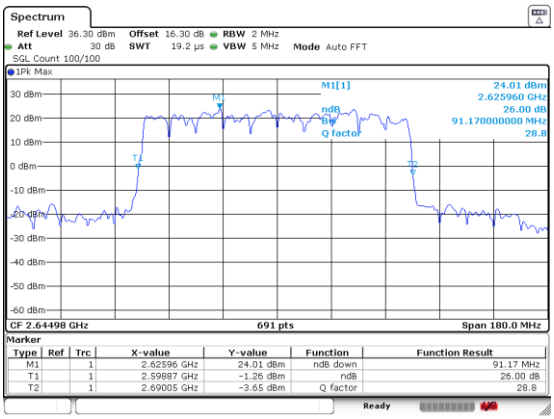
Highest Channel / 1RB0	Highest Channel / 270RB0
	
	

26dB Bandwidth

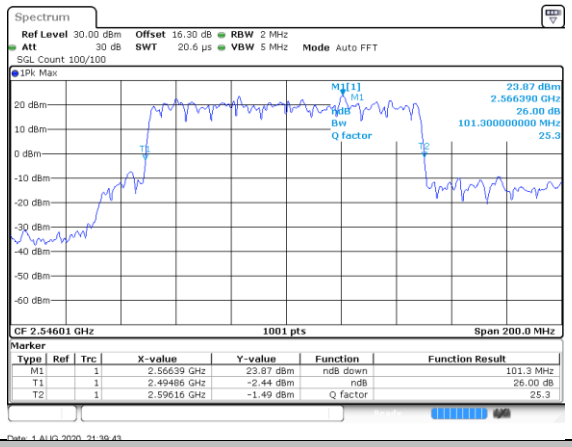
Mode	N 41 : 26dB BW(MHz) / DFT-S OFDM						
BW	20MHz	40MHz	50MHz	60MHz	80MHz	90MHz	100MHz
Mod.	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Lowest CH	19.98	38.122	47.95	62.58	81.84	91.95	101.30
Middle CH	19.98	38.122	48.45	62.46	81.84	91.17	101.30
Highest CH	20.10	38.042	48.05	62.46	81.84	91.17	100.90

FR1 n41	
20MHz	**40MHz**
Lowest Channel / QPSK	**Lowest Channel / QPSK**
	
Middle Channel / QPSK	**Middle Channel / QPSK**
	
Highest Channel / QPSK	**Highest Channel / QPSK**
	

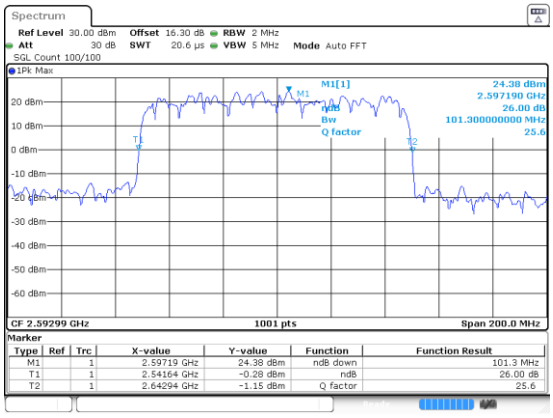
FR1 n41	
50MHz	**60MHz**
Lowest Channel / QPSK	**Lowest Channel / QPSK**
	
Middle Channel / QPSK	**Middle Channel / QPSK**
	
Highest Channel / QPSK	**Highest Channel / QPSK**
	

FR1 n41	
80MHz	**90MHz**
Lowest Channel / QPSK	**Lowest Channel / QPSK**
	
Middle Channel / QPSK	**Middle Channel / QPSK**
	
Highest Channel / QPSK	**Highest Channel / QPSK**
	

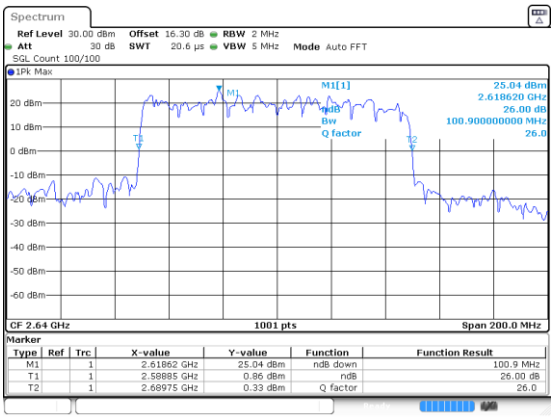
FR1 n41
100MHz
Lowest Channel / QPSK



Middle Channel / QPSK



Highest Channel / QPSK



Occupied Bandwidth

Mode	N41 : OB BW(MHz) / DFT-S OFDM									
BW	20MHz		40MHz		50MHz		60MHz		80MHz	
Mod.	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM	QPSK	16QAM
Lowest CH	18.462	18.302	35.804	35.724	45.954	45.854	58.022	58.382	77.363	77.682
Middle CH	18.302	18.422	36.044	35.964	45.954	46.054	58.741	58.142	77.363	77.203
Highest CH	18.501	18.462	35.964	36.044	45.854	45.654	59.101	59.820	79.121	77.363

Mode	N41 : OB BW(MHz) / DFT-S OFDM							
BW	90MHz				100MHz			
Mod.	QPSK	16QAM			QPSK	16QAM		
Lowest CH	87.265	87.265			96.104	97.103		
Middle CH	87.004	86.483			97.103	96.703		
Highest CH	86.744	86.483			96.703	97.103		