FCC RF Test Report

APPLICANT	:	Lenovo (Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT	:	Portable Tablet Computer
BRAND NAME	:	Lenovo
MODEL NAME	:	TB360ZJK
FCC ID	:	O57TB360ZJK
STANDARD	:	47 CFR Part 2, 27
CLASSIFICATION	:	Licensed Non-Broadcast Station Transmitter (TNB)
TEST DATE(S)	:	Jun. 30, 2023 ~ Jul. 04, 2023

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

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

Jason Jia

Approved by: Jason Jia

Cert #5145.02

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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG362005C	Rev. 01	Initial issue of report	Jul. 19, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§27.50(h)(2)	Equivalent Isotropic Radiated Power	EIRP < 2Watt		
3.5	N/A	Peak-to-Average Ratio	<13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§27.53(m)(4)	Conducted Band Edge Measurement	§27.53(m)(4)	PASS	-
3.8	§2.1051 §27.53(m)(4)	Conducted Spurious Emission	< $55+10\log_{10}$(P[Watts])	PASS	-
3.9	§2.1055 §22.355	Frequency Stability Temperature & Voltage	< 2.5 ppm for Part 22	PASS	-
	§24.235 §27.54		Within Authorized Band		
4.4	§2.1053 §27.53(m)(4)	Radiated Spurious Emission	< $55+10\log_{10}$(P[Watts])	PASS	Under limit 25.53 dB at 10320.00 MHz

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1 General Description

1.1 Applicant

Lenovo (Shanghai) Electronics Technology Co., Ltd.
Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone

1.2 Manufacturer

Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	Lenovo
Model Name	TB360ZJK
FCC ID	O57TB360ZJK
IMEI Code	Conducted: 869917060004897 Radiation: 869917060004491
HW Version	Lenovo Tablet TB360ZJK
SW Version	TB360ZJK_RF01_230610
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	5G NR n41 : 2496 MHz ~ 2690 MHz
Rx Frequency	5G NR n41 : 2496 MHz ~ 2690 MHz
Bandwidth	n41 : 30MHz
SCS	30kHz
Antenna Gain	Ant2: n41: 0.89 dBi
Type of Modulation	CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM

Remark: 5G NR n41 supports SA mode only.

1.5 Modification of EUT

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

1.6 Maximum EIRP Power and Emission Designator

5G NR n41		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)
30	2511.00 ~ 2674.98	0.3420	27M9G7D	0.2710	27M9W7D

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

1.7 Testing Location

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

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

1.8 Test Software

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

1.9 Applicable Standards

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

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

Remark:

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

2 Test Configuration of Equipment Under Test

2.1 Test Mode

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

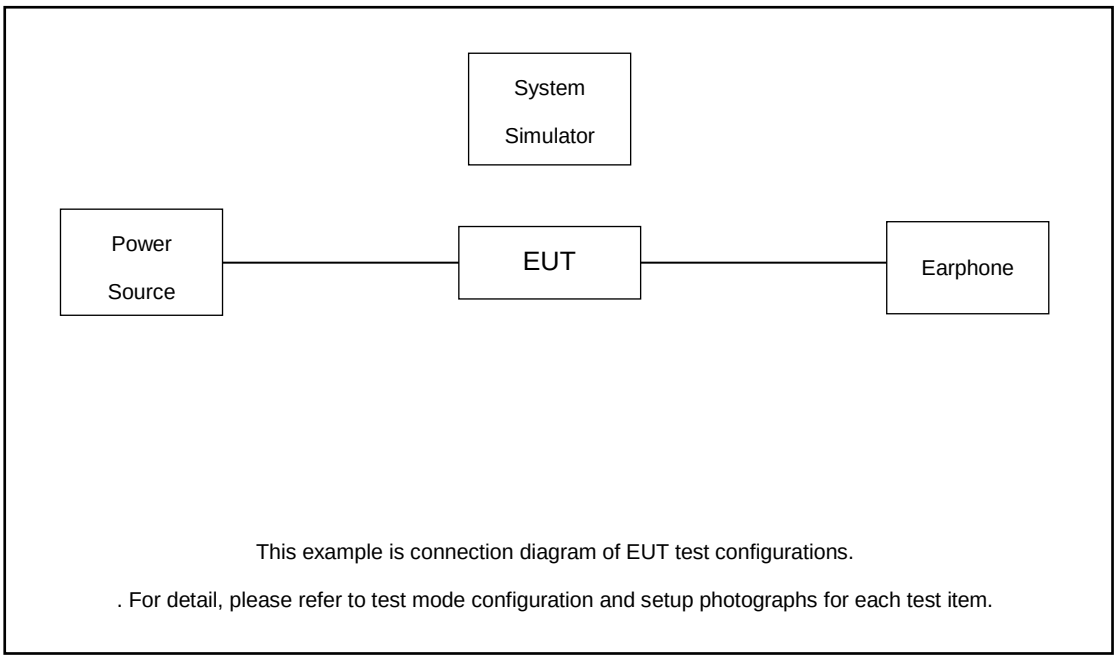
For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

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.

Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			

Test Items	5G NR	Bandwidth (MHz)													Modulation					RB #		Test Channel		
		5	10	15	20	25	30	40	50	60	70	80	90	100	PI/2 BPSK	QPSK	16QAM	64QAM	256QAM	1	Full	L	M	H
Max. Output Power	n41	-	-	-	-	-	v	-	-	-	-	-	-	-	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	n41	-	-	-	-	-	v	-	-	-	-	-	-	-	v	v				v	v		v	
26dB and 99% Bandwidth	n41	-	-	-	-	-	v	-	-	-	-	-	-	-	v	v	v	v	v		v		v	
Conducted Band Edge	n41	-	-	-	-	-	v	-	-	-	-	-	-	-	v	v				v	v	v		v
Conducted Spurious Emission	n41	-	-	-	-	-	v	-	-	-	-	-	-	-	v	v				v		v	v	v
Frequency Stability	n41	-	-	-	-	-	v	-	-	-	-	-	-	-		v					v		v	
E.I.R.P	n41	-	-	-	-	-	v	-	-	-	-	-	-	-	v	v	v	v	v	v	v	v	v	v
Radiated Spurious Emission	n2	Worst Case																					v	
Note	1. The mark "**v** " means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported. 4. Frequency Stability : Normal Voltage = 3.86V ; Low Voltage =3.60V. ; High Voltage =4.43V																							

2.2 Connection Diagram of Test System



The EUT has been configuration operated in a manner tended to maximize its emission characteristics in a typical application.

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
4.	Earphone	N/A	N/A	N/A	N/A	N/A

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 2.99 dB and 10dB attenuator.

Example :

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

= 2.99 + 10 = 12.99 (dB)

2.5 Frequency List of Low/Middle/High Channels

5G NR n41 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
30	Channel	502200	518598	534996
	Frequency	2511	2592.99	2674.98

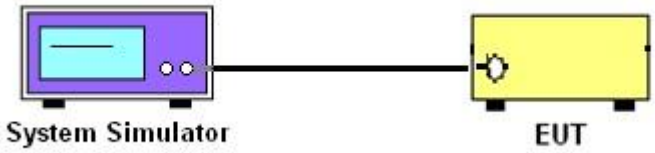
3 Conducted Test Items

3.1 Measuring Instruments

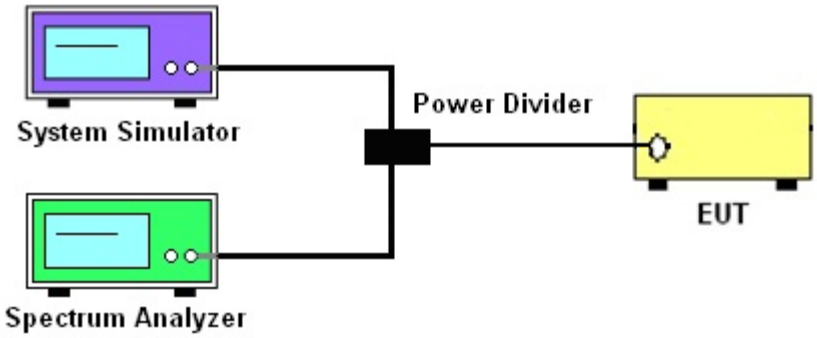
See list of measuring instruments of this test report.

3.2 Test Setup

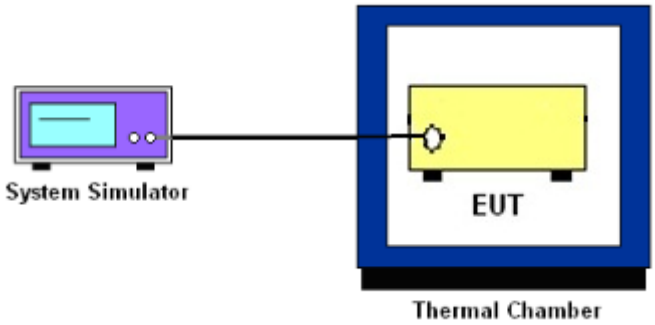
3.2.1 Conducted Output Power



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



3.2.3 Frequency Stability



3.3 Test Result of Conducted Test

Please refer to Appendix A.

3.4 Conducted Output Power and EIRP

3.4.1 Description of the Conducted Output Power Measurement and EIRP Measurement

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

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

According to KDB 412172 D01 Power Approach,

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

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

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

3.4.2 Test Procedures

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

3.5 Peak-to-Average Ratio

3.5.1 Description of the PAR Measurement

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

3.5.2 Test Procedures

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

3.6 Occupied Bandwidth

3.6.1 Description of Occupied Bandwidth Measurement

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

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

3.6.2 Test Procedures

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

3.7 Conducted Band Edge

3.7.1 Description of Conducted Band Edge Measurement

27.53(m)(4)

For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

3.7.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used or a narrower RBW was used (generally limited to no less than 1% of the OBW) and the measured power was integrated over the full required measurement bandwidth.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.
   Example:
   The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
   = P(W)- [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.
9. For 5G NR n41, the other 40 dB, and 55 dB have additionally applied same calculation above.
10. 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

For 5G NR n41:

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 55 + 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. For 5G NR n41

    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)

    = P(W)- [55+ 10log(P)] (dB)

    = [30+ 10log(P)] (dBm) - [55+ 10log(P)] (dB)

    = -25dBm.

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.

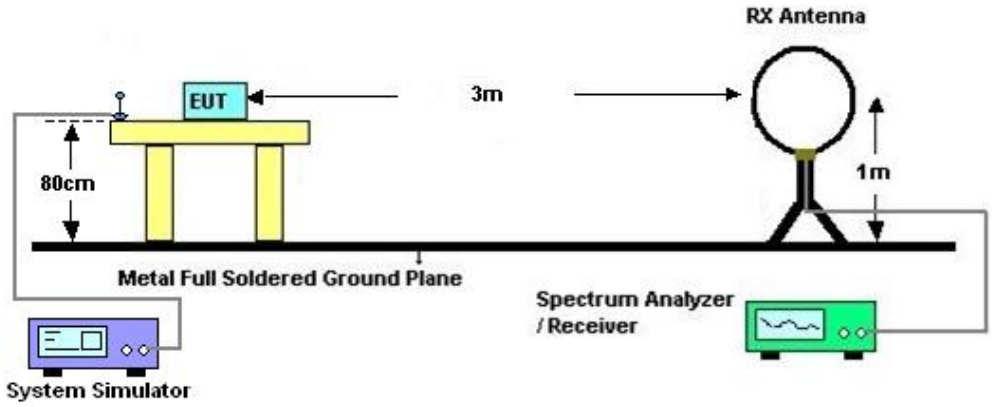
4 Radiated Test Items

4.1 Measuring Instruments

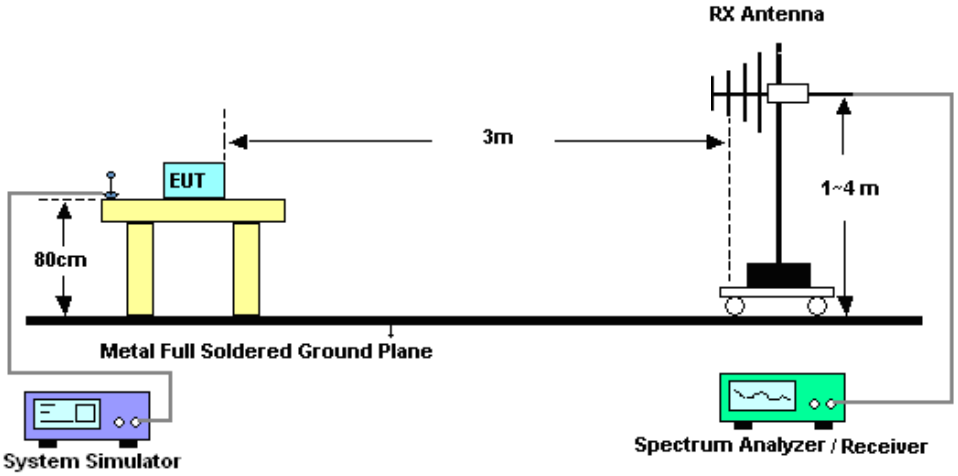
See list of measuring instruments of this test report.

4.2 Test Setup

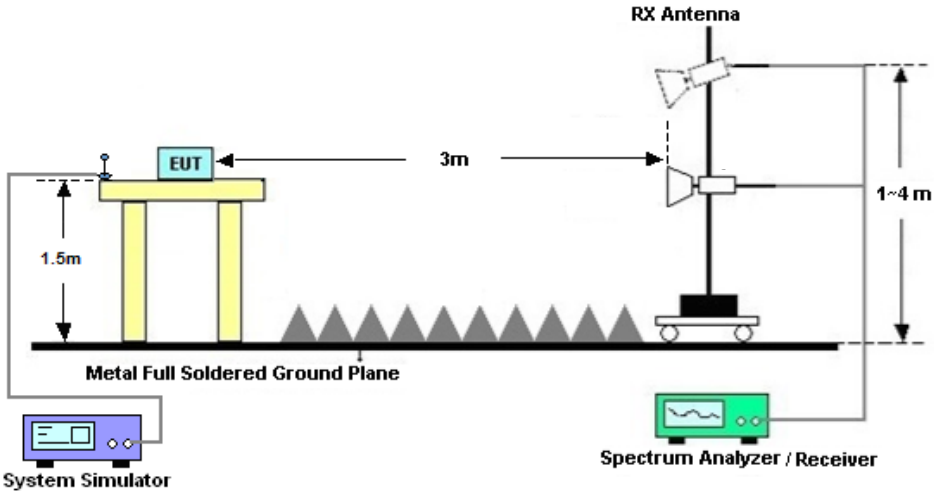
4.2.1 For radiated test below 30MHz



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.

For 5G NR n41

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 55 + 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. For 5G NR n41:
    The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	Jun. 30, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	NCR	Jun. 30, 2023	NCR	Conducted (TH01-KS)
Temperature &humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 15, 2022	Jun. 30, 2023	Jul. 14, 2023	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471079	10Hz-44G,MAX 30dB	Oct. 12, 2022	Jul. 04, 2023	Oct. 11, 2023	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Jul. 04, 2023	Oct. 15, 2023	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Apr. 09, 2023	Jul. 04, 2023	Apr. 08, 2024	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1284	1GHz~18GHz	Oct. 16, 2022	Jul. 04, 2023	Oct. 15, 2023	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 08, 2023	Jul. 04, 2023	Jan. 07, 2024	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	380827	9KHz-1GHz	Jul. 11, 2022	Jul. 04, 2023	Jul. 10, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2023	Jul. 04, 2023	Jan. 04, 2024	Radiation (03CH04-KS)
high gain Amplifier	EM	EM01G18GA	060840	1Ghz-18Ghz	Oct. 12, 2022	Jul. 04, 2023	Oct. 11, 2023	Radiation (03CH04-KS)
Amplifier	Agilent	8449B	3008A02370	1Ghz-18Ghz	Oct. 12, 2022	Jul. 04, 2023	Oct. 11, 2023	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 04, 2023	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 04, 2023	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 04, 2023	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required

6 Measurement Uncertainty

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

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±0.56 dB
Conducted Emissions	±0.92 dB
Occupied Channel Bandwidth	±0.03 %

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

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

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

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

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

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

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

Appendix A. Test Results of Conducted Test

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

Software Version: 23.06.1602

FR1 N41(ANT2)

Transmitter Conducted Output Power And EIRP, (G_T - L_C)=0.89dB

NR Band	SCS	Band Width	Arfcn	Freq(MHz)	Modulation	RB	Conducted Power(dBm)	EIRP(dBm)	EIRP(W)
41	30	30	502200	2511	DFT-s-OFDM PI/2 BPSK	36@18	24.33	25.22	0.3327
41	30	30	502200	2511	DFT-s-OFDM PI/2 BPSK	1@1	24.22	25.11	0.3243
41	30	30	502200	2511	DFT-s-OFDM PI/2 BPSK	1@76	24.32	25.21	0.3319
41	30	30	502200	2511	DFT-s-OFDM QPSK	36@18	24.35	25.24	0.3342
41	30	30	502200	2511	DFT-s-OFDM QPSK	1@1	24.3	25.19	0.3304
41	30	30	502200	2511	DFT-s-OFDM QPSK	1@76	24.44	25.33	0.3412
41	30	30	502200	2511	DFT-s-OFDM 16 QAM	36@18	23.35	24.24	0.2655
41	30	30	502200	2511	DFT-s-OFDM 16 QAM	1@1	23.34	24.23	0.2649
41	30	30	502200	2511	DFT-s-OFDM 16 QAM	1@76	23.44	24.33	0.2710
41	30	30	502200	2511	DFT-s-OFDM 64 QAM	36@18	21.84	22.73	0.1875
41	30	30	502200	2511	DFT-s-OFDM 64 QAM	1@1	21.69	22.58	0.1811
41	30	30	502200	2511	DFT-s-OFDM 64 QAM	1@76	21.83	22.72	0.1871
41	30	30	502200	2511	DFT-s-OFDM 256 QAM	36@18	19.8	20.69	0.1172
41	30	30	502200	2511	DFT-s-OFDM 256 QAM	1@1	19.57	20.46	0.1112
41	30	30	502200	2511	DFT-s-OFDM 256 QAM	1@76	19.73	20.62	0.1153
41	30	30	502200	2511	CP-OFDM QPSK	39@19	22.84	23.73	0.2360
41	30	30	502200	2511	CP-OFDM QPSK	1@1	22.69	23.58	0.2280
41	30	30	502200	2511	CP-OFDM QPSK	1@76	22.85	23.74	0.2366
41	30	30	518598	2592.99	DFT-s-OFDM PI/2 BPSK	36@18	24.25	25.14	0.3266
41	30	30	518598	2592.99	DFT-s-OFDM PI/2 BPSK	1@1	24.17	25.06	0.3206
41	30	30	518598	2592.99	DFT-s-OFDM PI/2 BPSK	1@76	24.33	25.22	0.3327
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	36@18	24.26	25.15	0.3273
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	1@1	24.25	25.14	0.3266
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	1@76	24.45	25.34	0.3420
41	30	30	518598	2592.99	DFT-s-OFDM 16 QAM	36@18	23.26	24.15	0.2600
41	30	30	518598	2592.99	DFT-s-OFDM 16 QAM	1@1	23.26	24.15	0.2600
41	30	30	518598	2592.99	DFT-s-OFDM 16 QAM	1@76	23.43	24.32	0.2704
41	30	30	518598	2592.99	DFT-s-OFDM 64 QAM	36@18	21.74	22.63	0.1832
41	30	30	518598	2592.99	DFT-s-OFDM 64 QAM	1@1	21.64	22.53	0.1791
41	30	30	518598	2592.99	DFT-s-OFDM 64	1@76	21.87	22.76	0.1888

					QAM				
41	30	30	518598	2592.99	DFT-s-OFDM 256 QAM	36@18	19.69	20.58	0.1143
41	30	30	518598	2592.99	DFT-s-OFDM 256 QAM	1@1	19.57	20.46	0.1112
41	30	30	518598	2592.99	DFT-s-OFDM 256 QAM	1@76	19.7	20.59	0.1146
41	30	30	518598	2592.99	CP-OFDM QPSK	39@19	22.77	23.66	0.2323
41	30	30	518598	2592.99	CP-OFDM QPSK	1@1	22.73	23.62	0.2301
41	30	30	518598	2592.99	CP-OFDM QPSK	1@76	23.03	23.92	0.2466
41	30	30	534996	2674.98	DFT-s-OFDM PI/2 BPSK	36@18	24.13	25.02	0.3177
41	30	30	534996	2674.98	DFT-s-OFDM PI/2 BPSK	1@1	24.14	25.03	0.3184
41	30	30	534996	2674.98	DFT-s-OFDM PI/2 BPSK	1@76	24.2	25.09	0.3228
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	36@18	24.11	25	0.3162
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	1@1	24.21	25.1	0.3236
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	1@76	24.28	25.17	0.3289
41	30	30	534996	2674.98	DFT-s-OFDM 16 QAM	36@18	23.14	24.03	0.2529
41	30	30	534996	2674.98	DFT-s-OFDM 16 QAM	1@1	23.34	24.23	0.2649
41	30	30	534996	2674.98	DFT-s-OFDM 16 QAM	1@76	23.39	24.28	0.2679
41	30	30	534996	2674.98	DFT-s-OFDM 64 QAM	36@18	21.6	22.49	0.1774
41	30	30	534996	2674.98	DFT-s-OFDM 64 QAM	1@1	21.63	22.52	0.1786
41	30	30	534996	2674.98	DFT-s-OFDM 64 QAM	1@76	21.69	22.58	0.1811
41	30	30	534996	2674.98	DFT-s-OFDM 256 QAM	36@18	19.57	20.46	0.1112
41	30	30	534996	2674.98	DFT-s-OFDM 256 QAM	1@1	19.56	20.45	0.1109
41	30	30	534996	2674.98	DFT-s-OFDM 256 QAM	1@76	19.6	20.49	0.1119
41	30	30	534996	2674.98	CP-OFDM QPSK	39@19	22.61	23.5	0.2239
41	30	30	534996	2674.98	CP-OFDM QPSK	1@1	22.7	23.59	0.2286
41	30	30	534996	2674.98	CP-OFDM QPSK	1@76	22.85	23.74	0.2366

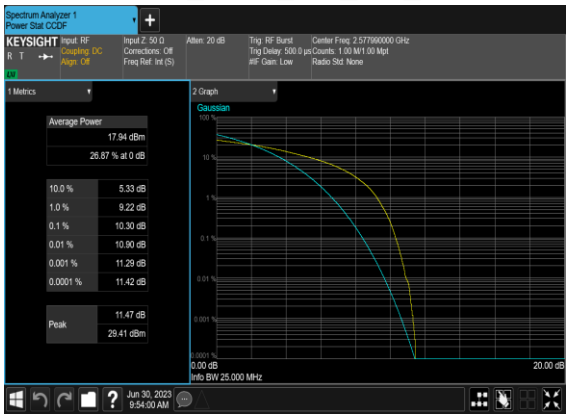
Frequency Stability

NR Band	SCS (kHz)	Bandwidth (MHz)	Arfcn	Freq (MHz)	Modulation	RB	Deviation (ppm)	Verdict	Environment
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0013	**PASS**	NV
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	-0.0016	**PASS**	LV
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0027	**PASS**	HV
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0014	**PASS**	-30℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0025	**PASS**	-20℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	-0.0019	**PASS**	-10℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0011	**PASS**	0℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0022	**PASS**	10℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0024	**PASS**	20℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0015	**PASS**	30℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0006	**PASS**	40℃
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	0.0031	**PASS**	50℃

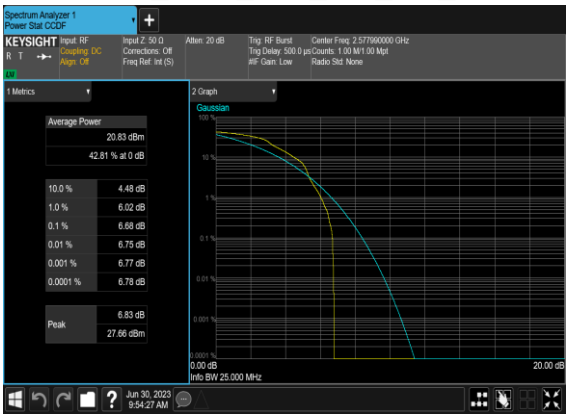
Peak to Average Ratio

NR Band	SCS (kHz)	Bandwidth (MHz)	Arfcn	Freq (MHz)	Modulation	RB	Result (dB)	Limit (dB)	Verdict
41	30	30	518598	2592.99	DFT-s-OFDM PI/2 BPSK	75@0	10.3	13	**PASS**
41	30	30	518598	2592.99	DFT-s-OFDM PI/2 BPSK	1@0	6.68	13	**PASS**
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	75@0	10.04	13	**PASS**
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	1@0	7.55	13	**PASS**

N41(30M)_DFT-s-OFDM_PI_2-BPSK_Outer_Full_Mid_CH

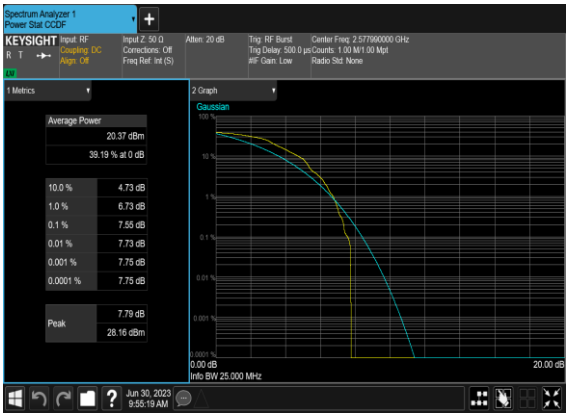


N41(30M)_DFT-s-OFDM_PI_2-BPSK_Edge_1RB_Left_Mid_CH



N41(30M)_DFT-s-OFDM_QPSK_Outer_Full_Mid_CH

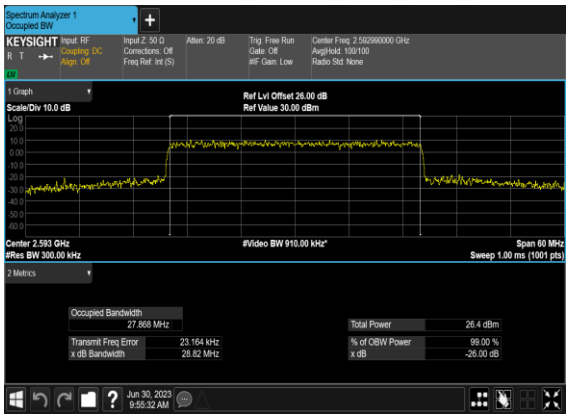
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_Mid_CH



Occupied Bandwidth

NR Band	SCS (kHz)	Bandwidth (MHz)	Arfcn	Freq (MHz)	Modulation	RB	OBW (MHz)	26dB BW (MHz)
41	30	30	518598	2592.99	CP-OFDM QPSK	78@0	27.868	28.82
41	30	30	518598	2592.99	CP-OFDM 16 QAM	78@0	27.859	28.83
41	30	30	518598	2592.99	CP-OFDM 64 QAM	78@0	27.798	29.14
41	30	30	518598	2592.99	CP-OFDM 256 QAM	78@0	27.816	28.91

N41(30M)_CP-OFDM_QPSK_Outer_Full_Mid_CH



N41(30M)_CP-OFDM_16 QAM_Outer_Full_Mid_CH

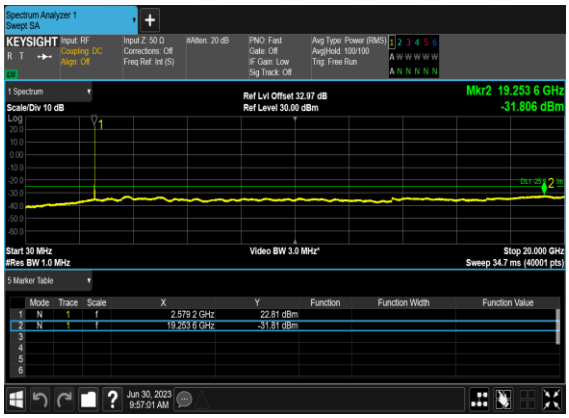
N41(30M)_CP-OFDM_64 QAM_Outer_Full_Mid_CH

N41(30M)_CP-OFDM_256 QAM_Outer_Full_Mid_CH

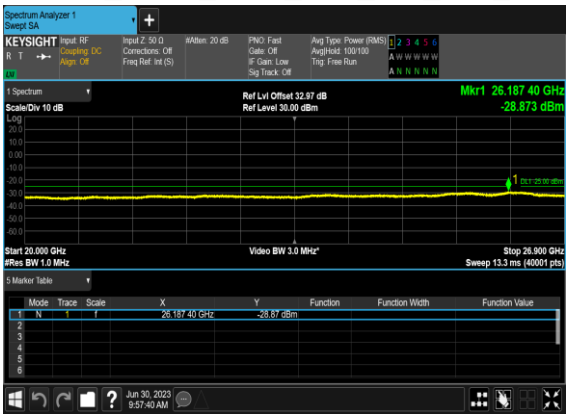
Conducted Spurious Emissions

NR Band	SCS (kHz)	Bandwidth (MHz)	Arfcn	Freq (MHz)	Modulation	RB	Result	Verdict
41	30	30	502200	2592.99	DFT-s-OFDM BPSK	1@0	see graph	**---**
41	30	30	502200	2592.99	DFT-s-OFDM BPSK	1@0	see graph	**PASS**
41	30	30	502200	2592.99	DFT-s-OFDM BPSK	1@0	see graph	**PASS**
41	30	30	502200	2511.0	DFT-s-OFDM QPSK	1@0	see graph	**---**
41	30	30	502200	2511.0	DFT-s-OFDM QPSK	1@0	see graph	**PASS**
41	30	30	502200	2511.0	DFT-s-OFDM QPSK	1@0	see graph	**PASS**
41	30	30	518598	2592.99	DFT-s-OFDM BPSK	1@0	see graph	**---**
41	30	30	518598	2592.99	DFT-s-OFDM BPSK	1@0	see graph	**PASS**
41	30	30	518598	2592.99	DFT-s-OFDM BPSK	1@0	see graph	**PASS**
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	1@0	see graph	**---**
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	1@0	see graph	**PASS**
41	30	30	518598	2592.99	DFT-s-OFDM QPSK	1@0	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM BPSK	1@0	see graph	**---**
41	30	30	534996	2674.98	DFT-s-OFDM BPSK	1@0	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM BPSK	1@0	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	1@0	see graph	**---**
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	1@0	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	1@0	see graph	**PASS**

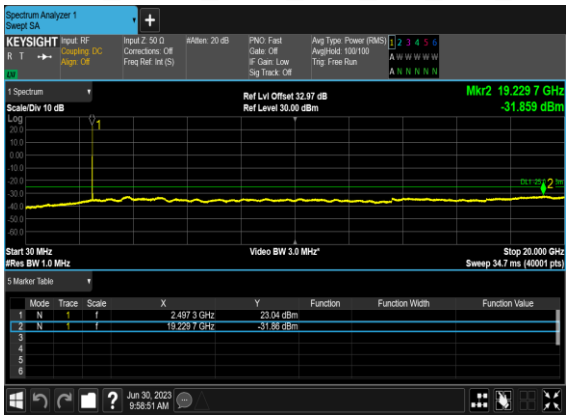
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Left_Low_CH



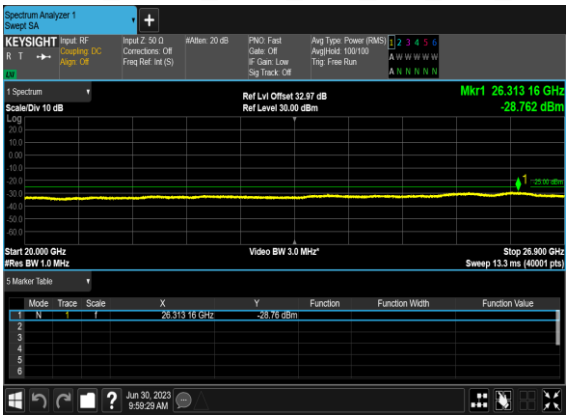
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Left_Low_CH



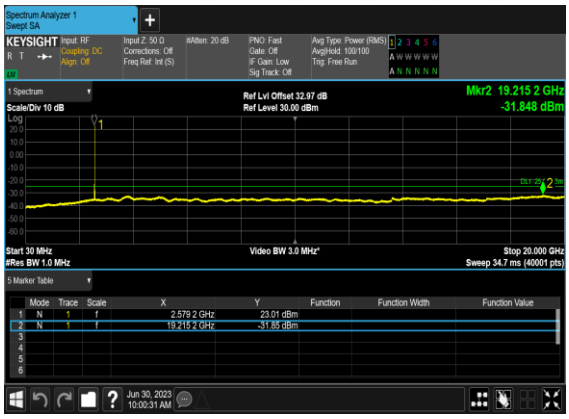
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_Low_CH



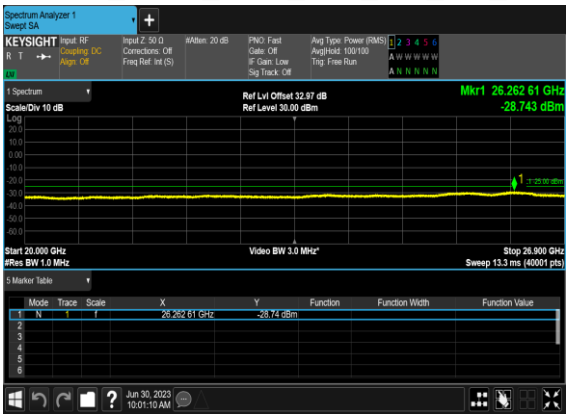
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_Low_CH



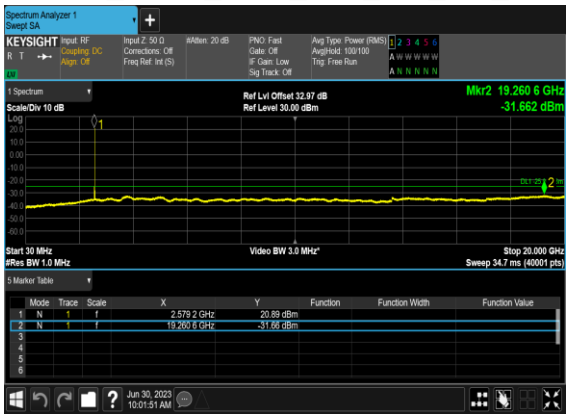
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Left_Mid_CH



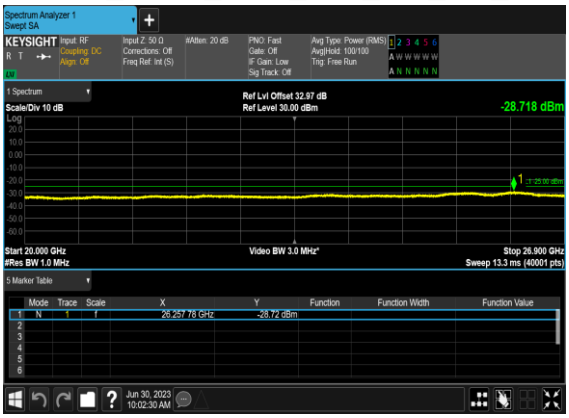
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Left_Mid_CH



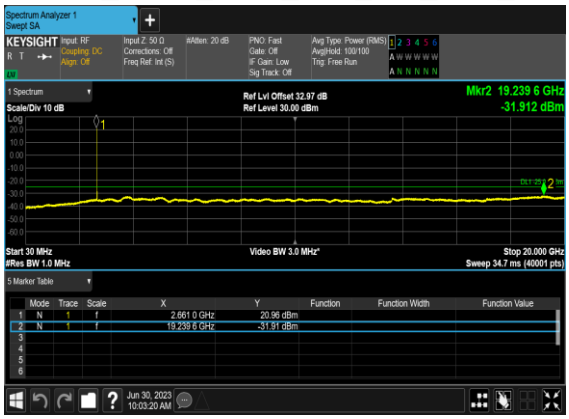
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_Mid_CH



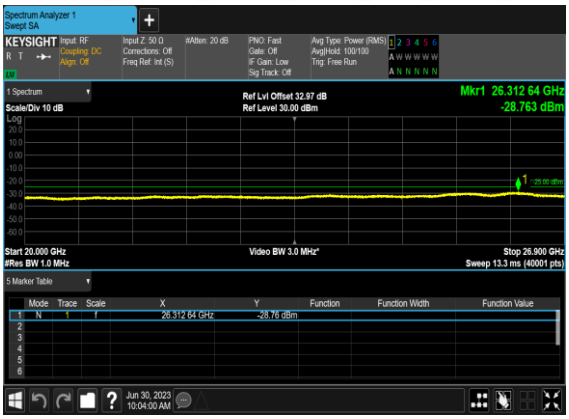
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_Mid_CH



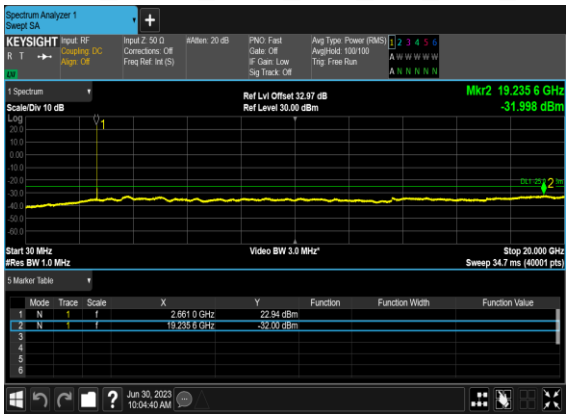
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Left_High_CH



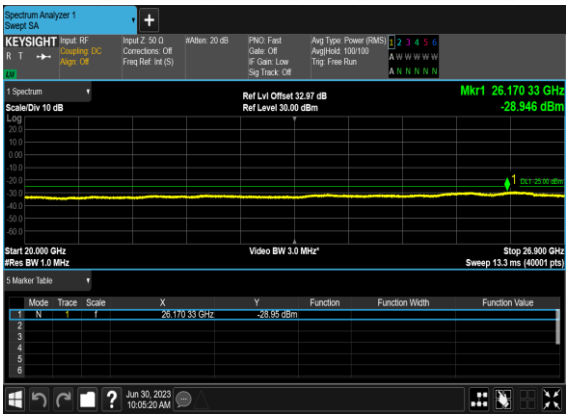
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Left_High_CH



N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_High_CH



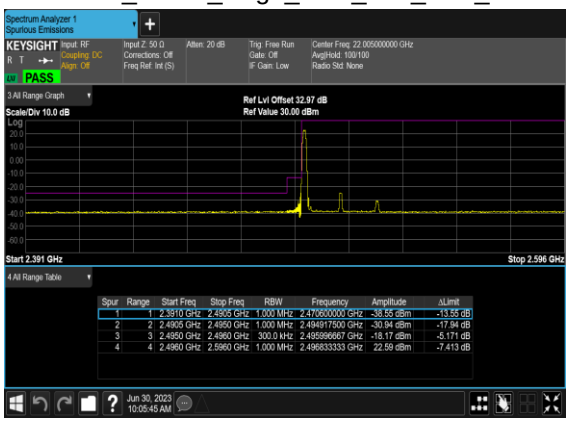
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_High_CH



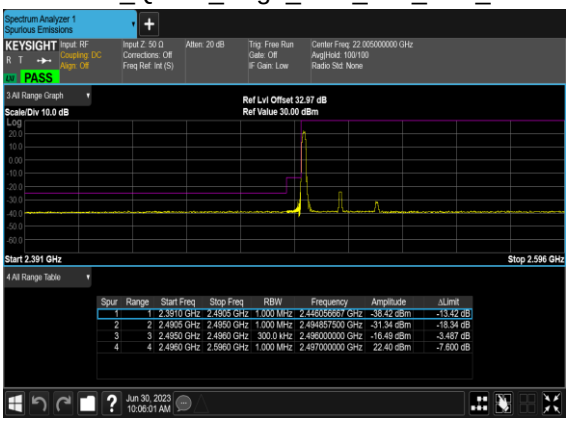
Conducted Band Edge

NR Band	SCS (kHz)	Bandwidth (MHz)	Arfcn	Freq (MHz)	Modulation	RB	Result	Verdict
41	30	30	502200	2511.0	DFT-s-OFDM BPSK	1@0	see graph	**PASS**
41	30	30	502200	2511.0	DFT-s-OFDM QPSK	1@0	see graph	**PASS**
41	30	30	502200	2511.0	DFT-s-OFDM BPSK	75@0	see graph	**PASS**
41	30	30	502200	2511.0	DFT-s-OFDM QPSK	75@0	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM BPSK	1@77	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	1@77	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM BPSK	75@0	see graph	**PASS**
41	30	30	534996	2674.98	DFT-s-OFDM QPSK	75@0	see graph	**PASS**

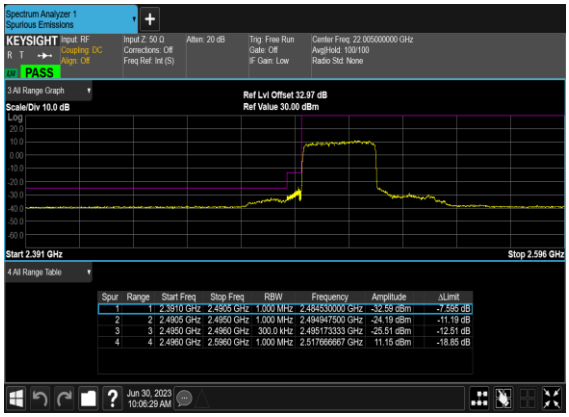
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Left_Low_CH



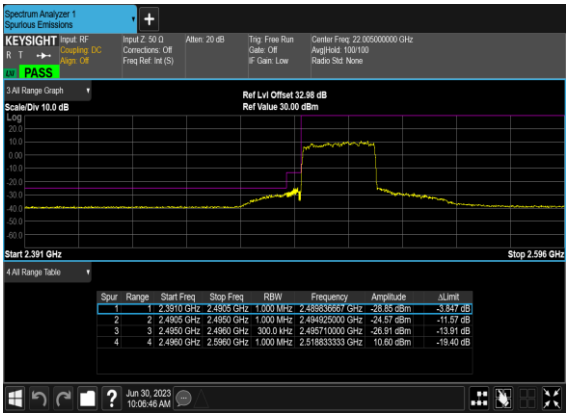
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Left_Low_CH



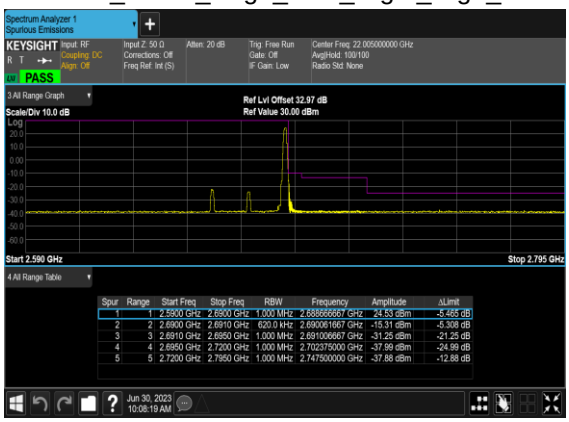
N41(30M)_DFT-s-OFDM_BPSK_Outer_Full_Low_CH



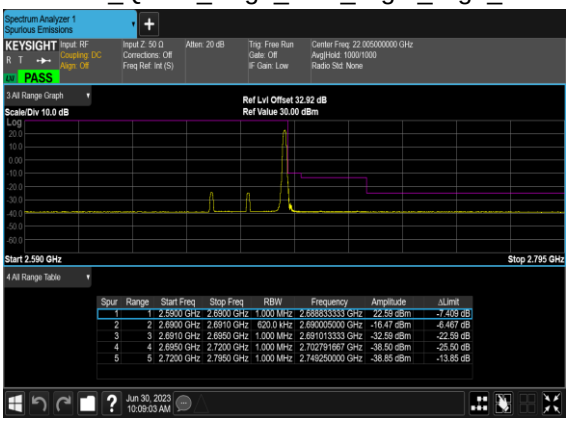
N41(30M)_DFT-s-OFDM_QPSK_Outer_Full_Low_CH



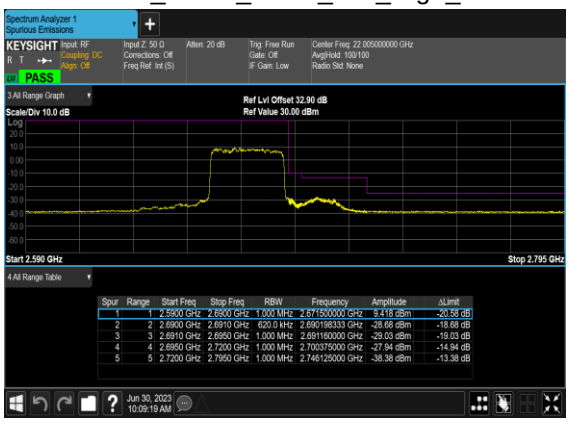
N41(30M)_DFT-s-OFDM_BPSK_Edge_1RB_Right_High_CH



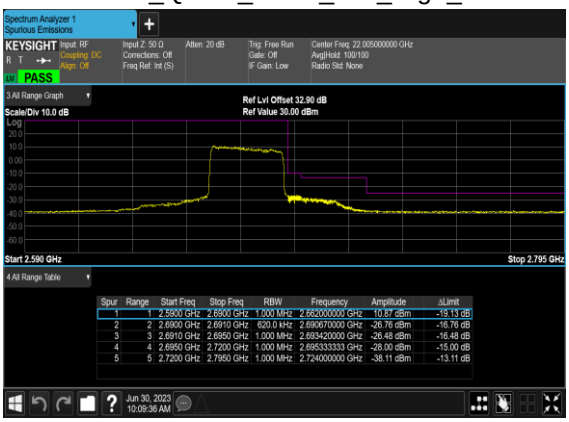
N41(30M)_DFT-s-OFDM_QPSK_Edge_1RB_Right_High_CH



N41(30M)_DFT-s-OFDM_BPSK_Outer_Full_High_CH



N41(30M)_DFT-s-OFDM_QPSK_Outer_Full_High_CH



Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

Test Engineer :	Chris Chen	Temperature :	23~25℃
		Relative Humidity :	41~42%

SA n41 / NR 30MHz / QPSK								
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	5196	-59.77	-25	-34.77	-69.98	3.03	13.24	H
	7740	-55.95	-25	-30.95	-65.40	3.56	13.01	H
	10320	-50.53	-25	-25.53	-60.05	3.92	13.44	H
	5196	-60.06	-25	-35.06	-70.27	3.03	13.24	V
	7740	-54.89	-25	-29.89	-64.34	3.56	13.01	V
	10320	-51.19	-25	-26.19	-60.71	3.92	13.44	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.