Test Report

Prepared for: Wilson Electronics, LLC (weBoost)

Model: Enterprise 1398

Description: 5G NR Industrial Signal Booster

FCC ID: PWO072

To

FCC Part 20
FCC Part 27

Date of Issue: August 13, 2024

On the behalf of the applicant:	**Wilson Electronics, LLC (weBoost)** **3301 E Deseret Drive** **St. George, UT 84790**
Attention of:	**Ilesh Patel, Senior Engineering Product Manager** **Ph: (435)673-5021** **Email: ipatel@wilsonelectronics.com**

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Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	August 13, 2024	Greg Corbin	Original Document

Table of Contents

Table of Annexes

Test Result Summary

Receipt of Sample: July 24, 21024
Test Date Range: July 25, 2024 – August 12, 2024

Specification	Test Name	Pass, Fail, N/A	Comments
KDB 935210 D05	AGC Threshold	Pass	
KDB 935210 D05	Out-of-Band Rejection	Pass	
KDB 935210 D05	Input-Versus-Output Signal Comparison	Pass	
2.1046 27.50(j) 27.50(k) KDB 935210 D05	Mean Output Power and Amplifier gain	Pass	
2.1049 27.53(l)(1) 27.53(n)(1) KDB 935210 D05	Out-Of-Band/Block Emissions Conducted	Pass	
2.1051 27.53(l)(1) 27.53(n)(1) KDB 935210 D05	Spurious Emissions Conducted	Pass	
2.1053 27.53(l)(1) 27.53(n)(1) KDB 935210 D05	Spurious Emissions Radiated	Pass	
KDB 935210 D05	Frequency Stability	N/A	Does not have Frequency translation

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, KDB 935210 D05 Industrial Booster Basic Measurements v01r04, ANSI C63-26:2015 and FCC Part 2, Part 20.21, Part 27 where appropriate.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
25.3 – 30.8	38.7 – 62.9	968 - 970.58

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description
Model: Enterprise 1398 460072 (wall mount)
S/N: 102142277
HVIN: 460072, PMN: 460072

Model: Enterprise 1398 461072 (rack mount)
S/N: 102142415
HVIN: 461072, PMN: 461072

Description: 5G NR Industrial Signal Booster
Highest Clock Frequency: 122.88 MHz

Additional Information:
The Equipment Under Test (EUT) is a bi-directional industrial signal booster.
The test data contained in this report pertains only to the emissions due to the 5G-NR operation.
The test data contained in this report covers both uplink and downlink operation for the booster device.
This EUT is capable of transmitting boosted 5G-NR TDD signals with the internal bi-directional amplifier.
The EUT does not generate its own RF. The EUT supports any combination of 5G-NR n77 band bandwidths, number of carriers, and modulations.
The EUT supports the frequency bands, modulation and bandwidths listed in Table 1.
The EUT will transmit all signals within the 5G-NR n77 band that are received.
The EUT has 2 donor ports and 2 server ports all with an impedance of 50 ohms.
The ports are referred to as Main and Aux ports, Main Uplink (UL) and Main Downlink (DL), Aux UL and Aux DL.
The server ports are tested by inputting uplink signal on server ports as input port and measured output signal from donor port as output port. The donor ports are tested by inputting downlink signal on donor ports as input port and measured output signal from server port as output port.

There are 2 enclosures available (wall mount and rack mount) with the only difference is the location of the front panel display.
All the tests were performed using the booster with the rack mount configuration. Additional tests were performed for radiated emissions with both the rack mount and wall mount configurations.

Table 1 – Frequency Band, Modulation, and Bandwidths

Frequency Band (MHz)	Modulation	5G NR Emission Designator	Bandwidths (MHz)
3450 - 3550	5G NR	G7D, W7D	20, 40
3700 - 3980	5G NR	G7D, W7D	20, 40, 60, 80, 100

The tests were performed using the minimum and maximum bandwidths listed in Table 1.

All antenna gain calculations include 100 feet of Wilson 400 cable as listed in the 460072 Antenna Kitting document supplied with this certification. The kitting document lists 2 outside antennas and 3 inside antennas as shown in Table 2.

Table 2 - Antenna Type and Gain

Location	Antenna Type	Wilson Antenna Kit P/N	Coax Loss (dB)	Antenna Gain (dBi)	Final Gain (dBi)
Outside	Wideband Directional	310002-952300	9.6	7.0	-2.6
Outside	Wideband Directional	311245-952300	9.6	11.5	1.9
Inside	Dome	W6010026-952300	9.6	5.4	-4.2
Inside	Panel	311243-952300	9.6	7.0	-2.6
Inside	Dome	311242-952300	9.6	5.5	-4.1

EUT Operation during Tests

The EUT is powered by 120 vac input.
The EUT was operated under normal operating conditions.
The EUT has no external manual gain control adjustments.

	Accessories: None

	Cables:					
Qty	**Description**	**Length (M)**	**Ferrites (Y/N)**	**Shielding Y/N**	**Shielded Hood Y/N**	**Termination / Connection**
1	Power Cable	2	N	N	N	EUT to AC power

	Modifications: none

AGC Threshold

Engineer: Greg Corbin

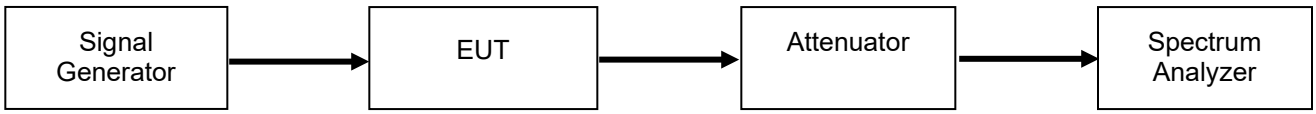
Test Date: 7/25/2024

Test Procedure

A signal generator was connected to the input of the EUT. A spectrum analyzer was connected to the EUT in order to monitor the output power levels. The signal generator was configured to produce the necessary 5G NR band signals. The input power level was increase in 1 dB increments until the power no longer increased. The input levels were recorded in the table below.
The test frequency was the frequency of the maximum amplitude recorded during the Out of Band Rejection test. If the peak frequency from the Out of Band Rejection test was too close to the band edge for the 20 MHz or 100 MHz signal to be completely contained within the band edge, the test signal was moved to the next highest point in the band that allowed the test signal BW to remain in-band.

Spectrum Analyzer settings
Power Channel integration
RBW = 1-5% of EBW
Video BW = 3x RBW

Test Setup



Frequency Band (MHz)	Port	Test Signal BW (MHz)	Test Frequency (MHz)	Input Power AGC Threshold dBm
3450 - 3550	Main DL	20	3520	-55.6
3450 - 3550	Main UL	20	3465	-55.2
3450 - 3550	Aux DL	20	3512	-55.0
3450 - 3550	Aux UL	20	3520	-55.6
3450 - 3550	Main DL	40	3520	-56.3
3450 - 3550	Main UL	40	3470	-55.8
3450 - 3550	Aux DL	40	3512	-55.9
3450 - 3550	Aux UL	40	3520	-56.5
3700 - 3980	Main DL	20	3714	-55.0
3700 - 3980	Main UL	20	3750	-53.5
3700 - 3980	Aux DL	20	3710	-55.3
3700 - 3980	Aux UL	20	3723	-55.1
3700 - 3980	Main DL	100	3750	-51.0
3700 - 3980	Main UL	100	3750	-51.6
3700 - 3980	Aux DL	100	3807	-50.1
3700 - 3980	Aux UL	100	3750	-52.7

Out-Of-Band Rejection
Engineer: Greg Corbin
Test Date: 7/25/2024

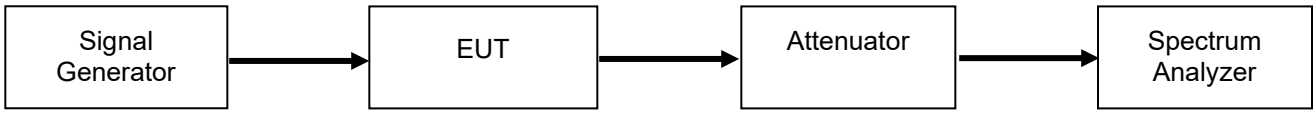
Test Procedure

The EUT was connected to a spectrum analyzer through a 20 dB power attenuator. A signal generator was utilized to produce a swept CW signal with the RF input level set to 3 dB below the AGC Threshold level. The Uplink and Downlink filter response and the -20 dB bandwidth were measured. The marker table function of the spectrum analyzer was used to show the peak amplitude in the passband and the -20 dB bandwidth of the pass band filter.

The booster operates in 20 MHz segments. In order to show a wideband frequency response, the input was swept with a CW signal several times with the trace set to max hold. The manufacturer would turn on each 20 MHz segment until the entire band was recorded.

RBW = 100 kHz
Video BW = 3x RBW

Test Setup



Annex A – Out of Band Rejection

Refer to Annex A for Out of Band Rejection plots.

Input-Versus-Output Signal Comparison
Engineer: Greg Corbin
Test Date: 7/26/2024, 8/8/2024

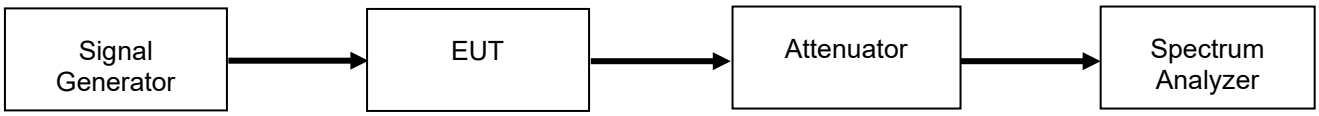
Test Procedure

A signal generator was connected to the input of the EUT and was configured to transmit a 5G NR signal.
The amplitude was set to be just below the AGC threshold level but not more than 0.5 dB.
The Occupied BW tool on the spectrum analyzer was used to record the Occupied BW for the input vs output comparison.

Spectrum analyzer settings:
Span greater than the EBW or alternatively the OBW.
Frequency set to the center frequency of the operational band under test.
RBW to 1% to 5 % of the anticipated OBW.
VBW ≥ 3 × RBW
Detector: Peak, max hold

The -26dB bandwidth was compared between the input and the output of the EUT and verified that the output was not greater than 5% of the input signal. All passbands applicable to the EUT were investigated. The input level was then increased by 3 dB above and the comparison repeated.

Test Setup



Input vs Output signal Comparison test results

Frequency Band	Port	Test Signal BW	Test Frequency	Input signal BW (MHz)		Output Signal BW (MHz)		Output Signal BW (MHz) AGC Input power + 3 dB		Pass / Fail
(MHz)		(MHz)	(MHz)	99%	-26 dB	99%	-26 dB	99%	-26 dB	
3450 - 3550	Main DL	20	3500	18.174	19.179	18.092	19.100	18.123	19.120	Pass
3450 - 3550	Main UL	20	3500	18.174	19.179	18.078	19.140	18.127	19.096	Pass
3450 - 3550	Aux DL	20	3500	18.174	19.179	18.105	19.081	18.116	19.090	Pass
3450 - 3550	Aux UL	20	3500	18.174	19.179	18.111	19.054	18.112	19.090	Pass
3450 - 3550	Main DL	40	3500	37.872	39.850	37.653	39.700	37.632	39.840	Pass
3450 - 3550	Main UL	40	3500	37.872	39.850	37.669	39.84	37.617	39.80	Pass
3450 - 3550	Aux DL	40	3500	37.872	39.850	37.657	39.790	37.679	39.640	Pass
3450 - 3550	Aux UL	40	3500	37.872	39.850	37.677	39.700	37.645	39.840	Pass
3700 - 3980	Main DL	20	3840	18.179	19.137	18.086	19.041	18.065	19.055	Pass
3700 - 3980	Main UL	20	3840	18.179	19.137	18.070	19.092	18.128	19.149	Pass
3700 - 3980	Aux DL	20	3840	18.179	19.137	18.084	19.015	18.097	19.068	Pass
3700 - 3980	Aux UL	20	3840	18.179	19.137	18.089	19.077	18.098	19.083	Pass
3700 - 3980	Main DL	100	3840	97.495	101.6	96.806	101.202	96.778	101.376	Pass
3700 - 3980	Main UL	100	3840	97.495	101.6	96.574	101.271	96.608	101.312	Pass
3700 - 3980	Aux DL	100	3840	97.495	101.6	96.833	101.353	96.895	101.238	Pass
3700 - 3980	Aux UL	100	3840	97.495	101.6	96.726	101.234	96.792	101.423	Pass

Annex B – Input vs Output Signal Comparison

Refer to Annex B for Input vs Output Signal Comparison plots.

Mean Output and Amplifier Gain

Engineer: Greg Corbin

Test Date: 7/26/2024, 8/8/2024

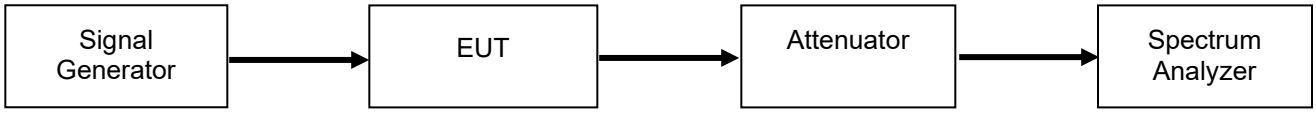
Test Procedure

An input signal using 5G NR modulation was connected to the EUT input.
The test frequency was the frequency of the maximum amplitude recorded during the Out of Band Rejection test.
If the peak frequency from the Out of Band Rejection test was too close to the band edge for the 20 MHz or 100 MHz signal to be completely contained within the band edge, the test signal was moved to the next highest point in the band that allowed the test signal BW to remain in-band

A spectrum analyzer output power tool with the integration BW set to the emission BW was used to measure the EUT output power.
The input power level was set to 0.2 dB below the AGC trip level.
The input and output power levels were recorded in the table below.
The amplifier gain was determined from the delta between the input and output levels.
The input level was increased 3 dB and the output power was recorded.

Spectrum Analyzer settings
Channel Power integration was used
RBW = 1-5% of EBW
Video BW = 3x RBW

Test Setup



Output Power and Gain

Frequency Band	Port	Test Signal BW	Test Frequency	Input Power	Output Power	Gain	Output Power AGC Input power + 3 dB	Pass / Fail
(MHz)		(MHz)	(MHz)	dBm	dBm	dB	dBm	
3450 - 3550	Main DL	20	3520	-55.6	26.8	82.4	26.8	Pass
3450 - 3550	Main UL	20	3465	-55.2	25.8	81.0	25.7	Pass
3450 - 3550	Aux DL	20	3512	-55	26.2	81.2	26.1	Pass
3450 - 3550	Aux UL	20	3520	-55.6	26.4	82.0	26.3	Pass
3450 - 3550	Main DL	40	3520	-56.3	25.3	81.6	25.3	Pass
3450 - 3550	Main UL	40	3470	-55.8	24.8	80.6	24.7	Pass
3450 - 3550	Aux DL	40	3512	-55.9	24.7	80.6	24.6	Pass
3450 - 3550	Aux UL	40	3520	-56.5	24.9	81.4	24.8	Pass
3700 - 3980	Main DL	20	3714	-55.0	27.9	82.9	27.9	Pass
3700 - 3980	Main UL	20	3750	-53.5	27.5	81.0	27.5	Pass
3700 - 3980	Aux DL	20	3710	-55.3	28.3	83.6	28.3	Pass
3700 - 3980	Aux UL	20	3723	-55.1	28.6	83.7	28.5	Pass
3700 - 3980	Main DL	100	3750	-51.0	26.7	77.7	26.7	Pass
3700 - 3980	Main UL	100	3750	-51.6	26.2	77.8	26.2	Pass
3700 - 3980	Aux DL	100	3807	-50.1	28.3	78.4	28.3	Pass
3700 - 3980	Aux UL	100	3750	-52.7	28.5	81.2	28.6	Pass

Out-Of-Band/Block Emission (Dual Carrier)

Engineer: Greg Corbin

Test Date: 8/6/2024

Test Procedure

A dual output signal generator was configured to produce two 5G NR modulated carriers.
The center frequencies were chosen such that the modulated signal at the band edge remained within the band.
The input power level was set to just below the AGC threshold but not more than 0.5dB.

For each out of band, band edge measurement, the lower and upper 3 MHz at the frequency block edge was measured per KDB 935210 D05 v01r04 section 3.6.2

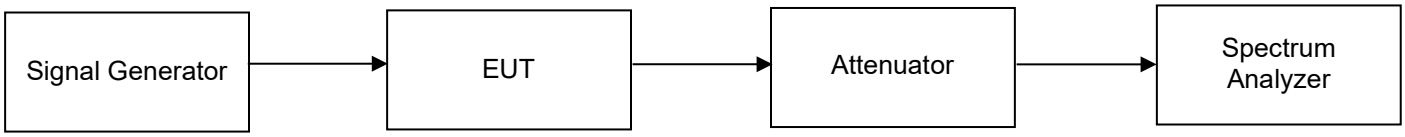
2 measurements were performed. 1 with the RBW set to 200 kHz for the first 1 MHz from the frequency block edge and the 2nd with the RBW set to 1 MHz for the remainder of the 3 MHz from the frequency block edge.

The signal booster emission limits are in FCC CFR Part 27.
FCC CFR Part 27.53(n)(1) for the 3.45 – 3.55 GHz band and FCC CFR Part 27.53(l)(1) for the 3.7 – 3.98 GHz band. Both rule sections allow an RBW =200 kHz for the first 1 MHz at the frequency block edge.
The limit for the first 3 MHz from the block edge is -13 dBm.

The spectrum analyzer was set with the following parameters
RBW = 200 kHz, 1 MHz
VBW = 3 × RBW
Average detector with trace averaging
Sweep time = auto-couple

For the upper band edge, the start frequency was set low enough to show the passband leading up to the band edge and the stop frequency set to the band edge + 3 MHz.
3 markers were placed on the plots, 1 at the band edge, 1 MHz from the band edge and the highest emission for the measurement being recorded.
After the trace was recorded, the input level was increased by 3dB, and the trace was recorded.
The same measurements were repeated for the lower band edge.

Test Setup



Dual Carrier OOBE Test Results

Frequency Band 3450 – 3550 MHz

Port	Test Signal BW	Band Edge	Test Frequency		Emission within 1 MHz of Band Edge RBW=200 kHz		Emission within 1 MHz of Band Edge AGC Input power + 3 dB		Emission 1 – 3 MHz from Band Edge RBW=1 MHz		Emission 1 – 3 MHz from Band Edge AGC Input power + 3 dB		Limit	Pass / Fail
	MHz	Lower / Upper	MHz		Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	dBm	
Main DL	20	Lower	3460	3480	3449.984	-35.0	3449.944	-36.4	3448.880	-29.2	3448.920	-30.0	-13	Pass
Main UL	20	Lower	3460	3480	3449.960	-35.5	3449.992	-37.0	3448.784	-29.6	3448.800	-30.4	-13	Pass
Main DL	20	Upper	3520	3540	3550.032	-34.2	3550.168	-35.4	3551.968	-27.5	3551.872	-29.2	-13	Pass
Main UL	20	Upper	3520	3540	3550.224	-34.6	3550.368	-35.2	3551.192	-28.4	3551.248	-28.8	-13	Pass
Aux DL	20	Lower	3460	3480	3449.976	-36.3	3449.992	-37.2	3448.960	-31.7	3448.696	-31.5	-13	Pass
Aux UL	20	Lower	3460	3480	3448.896	-36.8	3449.944	-37.8	3448.968	-32.2	3448.928	-32.5	-13	Pass
Aux DL	20	Upper	3520	3540	3550.040	-36.2	3550.144	-37.5	3551.312	-31.3	3551.088	-31.1	-13	Pass
Aux UL	20	Upper	3520	3540	3550.000	-35.7	3550.000	-37.0	3551.048	-35.1	3551.576	-31.2	-13	Pass
Main DL	40	Lower	3470	3510	3449.992	-37.5	3449.992	-38.9	3448.984	-36.0	3448.984	-36.7	-13	Pass
Main UL	40	Lower	3470	3510	3449.952	-38.4	3449.992	-39.7	3448.968	-35.8	3448.984	-35.7	-13	Pass
Main DL	40	Upper	3490	3530	3550.064	-37.4	3550.024	-39.0	3551.032	-36.1	3551.008	-36.7	-13	Pass
Main UL	40	Upper	3490	3530	3550.008	-38.9	3550.008	-39.8	3551.008	-36.7	3551.048	-36.1	-13	Pass
Aux DL	40	Lower	3470	3510	3449.976	-38.2	3449.992	-39.5	3448.967	-34.5	3448.992	-35.3	-13	Pass
Aux UL	40	Lower	3470	3510	3449.944	-38.4	3449.936	-40.8	3448.976	-35.6	3448.984	-36.5	-13	Pass
Aux DL	40	Upper	3490	3530	3550.008	-37.9	3550.056	-39.6	3551.008	-35.4	3551.016	-35.9	-13	Pass
Aux UL	40	Upper	3490	3530	3550.040	-38.2	3550.040	-39.3	3551.016	-36.7	3551.024	-36.6	-13	Pass

Frequency Band 3780 - 3900 MHz

Port	Test Signal BW	Band Edge	Test Frequency		Emission within 1 MHz of Band Edge RBW=200 kHz		Emission within 1 MHz of Band Edge AGC Input power + 3 dB		Emission 1 – 3 MHz from Band Edge RBW=1 MHz		Emission 1 – 3 MHz from Band Edge AGC Input power + 3 dB		Limit	Pass / Fail
	MHz	Lower / Upper	MHz		Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	dBm	
Main DL	20	Lower	3710	3730	3700	-35.1	3699.632	-32.8	3698.928	-30.4	3698.856	-28.0	-13	Pass
Main UL	20	Lower	3710	3730	3699.488	-33.0	3699.960	-35.0	3698.896	-28.4	3698.904	-30.1	-13	Pass
Main DL	20	Upper	3950	3970	3980.096	-30.3	3980.040	-31.5	3981.736	-24.8	3981.656	-24.5	-13	Pass
Main UL	20	Upper	3950	3970	3980.680	-30.5	3980.328	-30.3	3981.256	-22.8	3981.392	-23.7	-13	Pass
Aux DL	20	Lower	3710	3730	3699.768	-29.2	3699.600	-29.1	3697.488	-34.4	3698.760	-24.3	-13	Pass
Aux UL	20	Lower	3710	3730	3699.616	-27.9	3699.568	-28.0	3698.896	-25.4	3698.432	-22.9	-13	Pass
Aux DL	20	Upper	3950	3970	3980.152	-25.0	3980.704	-25.9	3981.832	-18.1	3981.336	-17.6	-13	Pass
Aux UL	20	Upper	3950	3970	3980.256	-24.0	3980.480	-24.7	3982.104	-17.9	3981.864	-17.4	-13	Pass
Main DL	100	Lower	3750	3850	3699.936	-29.9	3699.864	-30.0	3698.776	-22.7	3698.528	-24.0	-13	Pass
Main UL	100	Lower	3750	3850	3699.920	-31.0	3699.144	-30.3	3697.752	-24.1	3698.536	-24.2	-13	Pass
Main DL	100	Upper	3830	3930	3980.032	-32.1	3980.400	-31.8	3981.152	-25.0	3981.176	-25.2	-13	Pass
Main UL	100	Upper	3830	3930	3980.520	-32.3	3980.024	-32.7	3981.320	-25.8	3981.296	-25.3	-13	Pass
Aux DL	100	Lower	3750	3850	3699.424	-29.0	3699.360	-28.1	3698.440	-22.0	3698.856	-21.9	-13	Pass
Aux UL	100	Lower	3750	3850	3699.992	-28.0	3700.000	-27.8	3698.376	-21.2	3698.376	-23.0	-13	Pass
Aux DL	100	Upper	3830	3930	3980.136	-27.8	3980.704	-27.7	3981.448	-21.0	3981.624	-21.5	-13	Pass
Aux UL	100	Upper	3830	3930	3980.000	-27.2	3980.688	-26.9	3981.088	-21.3	3982.096	-20.3	-13	Pass

Annex C - Out of Band/Block Emission (Dual Carrier)_3450 – 3550 MHz
Refer to Annex C for Out of Band/Block Emission plots (Dual Carrier)_3450 – 3550 MHz

Annex D_ Out of Band/Block Emission (Dual Carrier)_3700 - 3980 MHz
Refer to Annex D for Out of Band/Block Emission plots (Dual Carrier)_3700 - 3980 MHz

Out-Of-Band/Block Emission (Single Carrier)
Engineer: Greg Corbin
Test Date: 8/6/2024

Test Procedure

A signal generator was configured to produce a 5G NR modulated carrier.
The center frequencies were chosen such that the modulated signal at the band edge remained within the band.
The input power level was set to just below the AGC threshold but not more than 0.5dB.

For each out of band, band edge measurement, the lower and upper 3 MHz at the frequency block edge was measured per KDB 935210 D05 v01r04 section 3.6.2

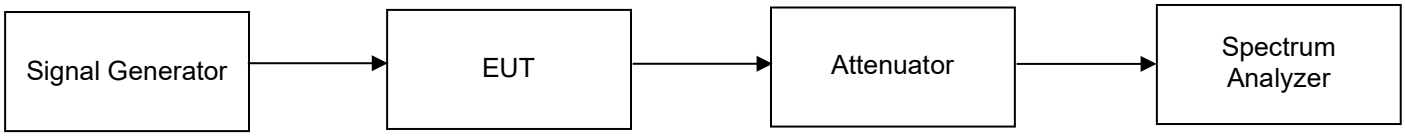
2 measurements were performed. 1 with the RBW set to 200 kHz for the first 1 MHz from the frequency block edge and the 2nd with the RBW set to 1 MHz for the remainder of the 3 MHz from the frequency block edge.

The signal booster emission limits are in FCC CFR Part 27.
FCC CFR Part 27.53(n)(1) for the 3.45 – 3.55 GHz band and FCC CFR Part 27.53(l)(1) for the 3.7 – 3.98 GHz band. Both rule sections allow an RBW =200 kHz for the first 1 MHz at the frequency block edge.
The limit for the first 3 MHz from the block edge is -13 dBm.

The spectrum analyzer was set with the following parameters
RBW = 200 kHz, 1 MHz
VBW = 3 × RBW
Average detector with trace averaging
Sweep time = auto-couple

For the upper band edge, the start frequency was set low enough to show the passband leading up to the band edge and the stop frequency set to the band edge + 3 MHz.
3 markers were placed on the plots, 1 at the band edge, 1 MHz from the band edge and the highest emission for the measurement being recorded.
After the trace was recorded, the input level was increased by 3dB, and the trace was recorded.
The same measurements were repeated for the lower band edge.

Test Setup



Single Carrier OOBE Test Results

Frequency Band 3450 – 3550 MHz

Port	Test Signal BW	Band Edge	Test Freq	Emission within 1 MHz of Band Edge RBW=200 kHz		Emission within 1 MHz of Band Edge AGC Input power + 3 dB		Emission 1 – 3 MHz from Band Edge RBW=1 MHz		Emission 1 – 3 MHz from Band Edge AGC Input power + 3 dB		Limit	Pass / Fail
	MHz	Lower / Upper	MHz	Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	dBm	
Main DL	20	Lower	3460	3449.952	-32.6	3449.928	-33.6	3448.392	-28.7	3448.920	-27.4	-13	Pass
Main UL	20	Lower	3460	3449.992	-33.0	3449.976	-33.6	3447.296	-30.4	3448.480	-27.0	-13	Pass
Main DL	20	Upper	3540	3550.008	-32.5	3550.064	-32.3	3551.776	-25.1	3551.144	-25.7	-13	Pass
Main UL	20	Upper	3540	3550.128	-32.4	3550.328	-33.0	3551.424	-26.1	3552.000	-25.9	-13	Pass
Aux DL	20	Lower	3460	3449.912	-34.8	3449.928	-35.2	3448.712	-28.4	3448.904	-29.4	-13	Pass
Aux UL	20	Lower	3460	3450.000	-36.1	3449.920	-34.9	3448.000	-30.8	3448.808	-28.7	-13	Pass
Aux DL	20	Upper	3540	3550.008	-33.8	3550.144	-35.2	3551.576	-27.5	3551.400	-28.6	-13	Pass
Aux UL	20	Upper	3540	3550.016	-32.9	3550.008	-33.6	3551.784	-29.3	3551.616	-26.9	-13	Pass
Main DL	40	Lower	3470	3449.992	-37.3	3449.944	-38.8	3448.968	-34.2	3448.698	-35.5	-13	Pass
Main UL	40	Lower	3470	3449.992	-37.4	3449.992	-38.1	3448.904	-33.4	3448.936	-34.1	-13	Pass
Main DL	40	Upper	3530	3550.008	-38.3	3550.040	-39.3	3551.056	-36.8	3551.072	-35.9	-13	Pass
Main UL	40	Upper	3530	3550.024	-37.6	3550.144	-38.7	3551.008	-35.1	3551.176	-33.6	-13	Pass
Aux DL	40	Lower	3470	3449.992	-37.3	3449.944	-38.6	3448.960	-34.0	3448.880	-34.0	-13	Pass
Aux UL	40	Lower	3470	3449.992	-37.7	3449.904	-39.4	3448.960	-35.1	3448.936	-35.5	-13	Pass
Aux DL	40	Upper	3530	3550.032	-37.2	3550.008	-39.1	3551.016	-35.1	3551.008	-35.2	-13	Pass
Aux UL	40	Upper	3530	3550.104	-37.8	3550.080	-39.0	3551.040	-36.3	3551.056	-37.2	-13	Pass

Frequency Band 3780 - 3900 MHz

Port	Test Signal BW	Band Edge	Test Freq	Emission within 1 MHz of Band Edge RBW=200 kHz		Emission within 1 MHz of Band Edge AGC Input power + 3 dB		Emission 1 – 3 MHz from Band Edge RBW=1 MHz		Emission 1 – 3 MHz from Band Edge AGC Input power + 3 dB		Limit	Pass / Fail
	MHz	Lower / Upper	MHz	Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	Freq MHz	Level dBm	dBm	
Main DL	20	Lower	3710	3699.920	-29.8	3698.016	-29.1	3698.664	-26.9	3697.184	-26.6	-13	Pass
Main UL	20	Lower	3710	3699.776	-31.1	3699.920	-32.7	3697.920	-30.6	3697.480	-28.7	-13	Pass
Main DL	20	Upper	3970	3980.224	-25.6	3981.272	-18.5	3981.272	-18.5	3982.352	-19.3	-13	Pass
Main UL	20	Upper	3970	3980.512	-27.8	3980.272	-27.7	3981.544	-20.3	3981.120	-19.7	-13	Pass
Aux DL	20	Lower	3710	3699.760	-26.9	3699.528	-25.7	3698.064	-23.5	3698.384	-23.8	-13	Pass
Aux UL	20	Lower	3710	3699.736	-26.7	3699.848	-25.9	3698.104	-22.6	3697.576	-21.2	-13	Pass
Aux DL	20	Upper	3970	3980.480	-21.5	3980.536	-21.3	3981.392	-14.9	3981.272	-15.2	-13	Pass
Aux UL	20	Upper	3970	3980.160	-21.5	3980.472	-21.5	3982.056	-15.8	3981.256	-14.7	-13	Pass
Main DL	100	Lower	3750	3699.504	-31.3	3699.880	-31.2	3698.168	-23.3	3698.256	-23.7	-13	Pass
Main UL	100	Lower	3750	3699.984	-32.7	3699.952	-31.8	3698.856	-24.1	3697.864	-25.0	-13	Pass
Main DL	100	Upper	3930	3980.216	-33.5	3980.088	-34.0	3981.904	-25.5	3981.816	-26.5	-13	Pass
Main UL	100	Upper	3930	3980.000	-32.6	3980.672	-33.6	3982.432	-25.4	3981.696	-26.0	-13	Pass
Aux DL	100	Lower	3750	3700.000	-28.9	3699.232	-28.2	3698.736	-22.3	3698.272	-21.2	-13	Pass
Aux UL	100	Lower	3750	3699.856	-27.2	3699.312	-27.6	3698.904	-20.5	3698.736	-20.6	-13	Pass
Aux DL	100	Upper	3930	3980.224	-29.1	3980.696	-29.6	3981.248	-21.7	3981.384	-22.0	-13	Pass
Aux UL	100	Upper	3930	3980.080	-27.1	3980.712	-27.6	3981.376	-20.8	3981.512	-20.5	-13	Pass

Annex E - Out of Band/Block Emission (Single Carrier)_3450 – 3550 MHz
Refer to Annex E for Out of Band/Block Emission plots (Single Carrier)_3450 – 3550 MHz

Annex F - Out of Band/Block Emission (Single Carrier)_3700 - 3980 MHz
Refer to Annex F for Out of Band/Block Emission plots (Single Carrier)_3700 - 3980 MHz

Conducted Spurious Emissions

Engineer: Greg Corbin

Test Date: 7/31/2024, 8/2/2024

Test Procedure

A signal generator was configured to produce a 5G NR modulated carrier.
The booster output was connected to a spectrum analyzer through a 20 dB attenuator. All cable and attenuator losses were input into the spectrum analyzer as a combination of reference level offset and correction factor as needed to ensure accurate readings were obtained.
The RF input signal level was set to 0.2 dB below the AGC Threshold.

The frequency range investigated was from 30 MHz to 40 GHz. The frequency ranges were broken down into segments that accommodate the different emission limits in FCC CFR Part 27.53(l) and (n).
The signal booster emission limits are in FCC CFR Part 27.

FCC CFR Part 27.53(n)(1) for the 3.45 – 3.55 GHz band

(1) *For base station operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz. Compliance with the provisions of this paragraph (n)(1) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1-megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Notwithstanding the channel edge requirement of −13 dBm per megahertz, for base station operations in the 3450-3550 MHz band, the conducted power of any emission below 3440 MHz or above 3560 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3430 MHz or above 3570 MHz shall not exceed −40 dBm/MHz.*

FCC CFR Part 27.53(l)(1) for the 3.7 – 3.98 GHz band

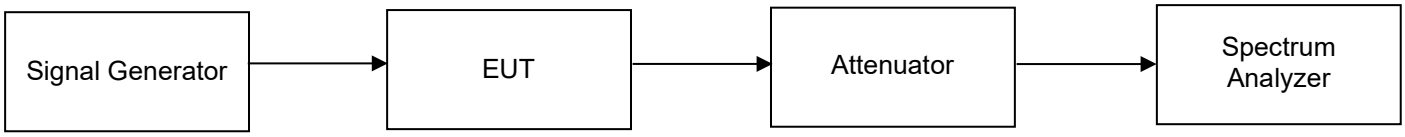
(1) *For base station operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed −13 dBm/MHz. Compliance with this paragraph (l)(1) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1-megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.*

The RBW was set to 1 MHz
The VBW was set to 3 times the RBW.
A Average detector with trace averaging was used.
The # of sweep points was always greater than the sweep width x2/RBW.
A peak marker was placed at the highest amplitude and the trace was recorded.

The test summary table shows the highest emission for each emission limit as required per FCC CFR Part 27.53(l)and (n).

The test was repeated for the low, middle, high channels within the passband.

Test Setup



Conducted Spurious Emissions Test Results

3450 – 3550 MHz

Main Port Uplink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3460 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3540 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3429.975	-50.0	3256.496	-47.9	3285.225	-48.0	Pass
3430 - 3440	-25	3440.000	-34.4	3439.769	-49.7	3440.000	-54.9	Pass
3440 – to lower block edge	-13	3450.000	-16.6	3490.000	-15.8	3530.000	-16.3	Pass
Upper block edge to – 3560	-13	3470.000	-18.8	3510.000	-17.2	3550.000	-17.9	Pass
3560 – 3570	-25	3560.967	-50.4	3566.204	-50.4	3561.730	-32.5	Pass
3570 - 40000	-40	4068.247	-41.0	4112.326	-40.8	4153.348	-42.9	Pass

Main Port Downlink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3460 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3540 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3429.028	-44.6	3254.746	-46.1	3289.228	-47.6	Pass
3430 - 3440	-25	3440.000	-34.5	3435.464	-51.0	3434.396	-50.3	Pass
3440 – to lower block edge	-13	3450.000	-15.6	3490.000	-15.6	3530.000	-15.2	Pass
Upper block edge to – 3560	-13	3470.000	-18.4	3510.000	-17.0	3550.000	-16.7	Pass
3560 – 3570	-25	3561.291	-50.4	3563.867	-50.1	3560.937	-32.6	Pass
3570 - 40000	-40	4072.898	-40.9	4114.408	-40.8	4152.949	-43.1	Pass

Aux Port Uplink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3460 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3540 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3428.833	-44.5	3248.307	-46.7	3288.718	-46.5	Pass
3430 - 3440	-25	3439.280	-37.3	34373639	-50.4	3434.513	-50.8	Pass
3440 – to lower block edge	-13	3450.000	-16.3	3490.000	-16.6	3530.000	-15.0	Pass
Upper block edge to – 3560	-13	3470.000	-18.6	3510.000	-17.3	3550.000	-17.5	Pass
3560 – 3570	-25	3560.000	-52.8	3566.490	-49.9	3560.132	-35.6	Pass
3570 - 40000	-40	4073.917	-40.1	4113.344	-40.7	4154.632	-42.3	Pass

Aux Port Downlink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3460 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3540 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3429.100	-41.1	3372.918	-47.3	3295.692	-47.1	Pass
3430 - 3440	-25	3439.949	-37.7	3438.300	-50.9	3435.154	-50.7	Pass
3440 – to lower block edge	-13	3450.000	-16.5	3490.000	-16.8	3530.000	-16.4	Pass
Upper block edge to – 3560	-13	3470.000	-19.5	3510.000	-18.5	3550.000	-18.7	Pass
3560 – 3570	-25	3563.215	-52.6	3564.646	-50.5	3560.215	-34.9	Pass
3570 - 40000	-40	4077.771	-40.7	4113.167	-41.1	4152.019	-42.7	Pass

Main Port Uplink_ 40 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3470 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3530 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3427.254	-40.5	3427.262	-46.6	3281.914	-46.7	Pass
3430 - 3440	-25	3439.321	-36.1	3439.969	-45.6	3435.574	-49.9	Pass
3440 – to lower block edge	-13	3450.000	-26.0	3480.000	-26.0	3510.000	-25.3	Pass
Upper block edge to – 3560	-13	3490.000	-25.0	3520.000	-24.3	3550.000	-25.2	Pass
3560 – 3570	-25	3561.104	-48.8	3560.477	-46.0	3560.310	-38.5	Pass
3570 - 40000	-40	39056.95	-43.9	39189.75	-43.7	3570.443	-40.6	Pass

Main Port Downlink_ 40 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3470 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3530 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3428.007	-40.3	3253.555	-46.5	3295.230	-46.5	Pass
3430 - 3440	-25	3438.797	-38.4	3439.098	-48.1	3562.778	-38.6	Pass
3440 – to lower block edge	-13	3450.000	-25.9	3480.000	-25.8	3510.000	-25.1	Pass
Upper block edge to – 3560	-13	3490.000	-24.0	3520.000	-24.7	3550.000	-25.5	Pass
3560 – 3570	-25	3563.503	-50.1	3560.000	-48.6	3562.778	-38.6	Pass
3570 - 40000	-40	3716.058	-48.0	3745.607	-45.9	3573.588	-41.2	Pass

Aux Port Uplink_ 40 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3470 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3530 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3426.452	-41.4	3258.586	-45.3	3283.420	-45.7	Pass
3430 - 3440	-25	3439.032	-38.7	3434.842	-48.1	3435.608	-50.5	Pass
3440 – to lower block edge	-13	3450.000	-26.2	3480.000	-27.6	3510.000	-25.9	Pass
Upper block edge to – 3560	-13	3490.000	-25.6	3520.000	-26.4	3550.000	-25.8	Pass
3560 – 3570	-25	3560.538	-49.3	3560.152	-48.7	3561.359	-41.5	Pass
3570 - 40000	-40	39864.64	-44.6	39038.07	-43.8	3573.942	-42.5	Pass

Aux Port Downlink_ 40 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3470 MHz		Spurious Emissions Test Freq = 3500 MHz		Spurious Emissions Test Freq = 3530 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3430	-40	3427.910	-40.5	3243.058	-46.4	3289.544	-45.9	Pass
3430 - 3440	-25	3438.920	-37.0	3439.527	-47.8	3435.118	-49.2	Pass
3440 – to lower block edge	-13	3450.000	-25.8	3480.000	-26.6	3510.000	-26.3	Pass
Upper block edge to – 3560	-13	3490.000	-28.5	3520.000	-25.7	3550.000	-41.1	Pass
3560 – 3570	-25	3562.112	-50.8	3560.835	-48.6	3560.751	-39.3	Pass
3570 - 40000	-40	39006.39	-43.9	39210.87	-43.3	3574.119	-42.5	Pass

Conducted Spurious Emissions Test Results

3700 - 3980 MHz

Note: The first 1 MHz outside the band was measured during the out of band emission tests and not repeated here.

Main Port Uplink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3710 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3970 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3694.3	-26.1	3225.9	-35.0	3351.4	-34.6	Pass
3981 - 40000	-13	38535.1	-28.0	38580.8	-28.3	3983.5	-22.6	Pass

Main Port Downlink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3710 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3970 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3699.0	-24.0	3223.2	-33.9	3354.1	-33.7	Pass
3981 - 40000	-13	38709.1	-28.5	39206.9	-27.9	3981.0	-24.3	Pass

Aux Port Uplink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3710 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3970 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3699.0	-30.1	3222.5	-33.0	3356.1	-32.9	Pass
3981 - 40000	-13	38651.4	-28.8	39193.9	-27.7	38603.5	-27.6	Pass

Aux Port Downlink_ 20 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3710 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3970 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
MHz	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3699.0	-29.4	3224.5	-33.5	3355.5	-32.7	Pass
3981 - 40000	-13	39105.6	-27.9	38662.6	-27.5	3981.7	-28.0	Pass

Main Port Uplink_ 100 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3750 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3930 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3692.3	-27.0	3693.6	-26.5	3661.9	-46.0	Pass
3981 - 40000	-13	38497.6	-27.3	39204.3	-28.9	39113.6	-27.4	Pass

Main Port Downlink_ 100 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3750 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3930 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3690.9	-26.0	3696.3	-29.4	3692.9	-45.9	Pass
3981 - 40000	-13	38556.1	-28.0	385478.0	-27.6	3994.7	-28.2	Pass

Aux Port Uplink_ 100 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3750 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3930 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3690.9	-35.6	3699.0	-42.4	3681.5	-36.0	Pass
3981 - 40000	-13	38776.4	-28.7	38750.8	-27.6	38244.8	-28.1	Pass

Aux Port Downlink_ 100 MHz BW

Spectrum analyzer start / stop frequencies	Limit	Spurious Emissions Test Freq = 3750 MHz		Spurious Emissions Test Freq = 3840 MHz		Spurious Emissions Test Freq = 3930 MHz		Pass / Fail
		Freq	Amplitude	Freq	Amplitude	Freq	Amplitude	
	dBm	MHz	dBm	MHz	dBm	MHz	dBm	
30 - 3699	-13	3681.5	-35.0	3697.0	-42.3	3668.6	-44.9	Pass
3981 - 40000	-13	39030.7	-28.0	39085.8	-28.1	38659.4	-27.9	Pass

Annex G – Conducted Spurious Emission_3450 – 3550 MHz
Refer to Annex G for the Conducted Spurious Emissions Plots_3450 – 3550 MHz

Annex H – Conducted Spurious Emission_3700 – 3980 MHz
Refer to Annex H for the Conducted Spurious Emissions Plots_3700 – 3980 MHz

Radiated Spurious Emissions

Engineer: Greg Corbin

Test Date: 5/5/2020

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions.
The EUT was tested by rotating it 360 degrees with the antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized.
All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm.

A 20 MHz 5G NR modulated signal, set to the center frequency of the passband, was input to the EUT with the power level set to 0.2 dB below the AGC set level. The EUT outputs were terminated with 50-ohm terminations.

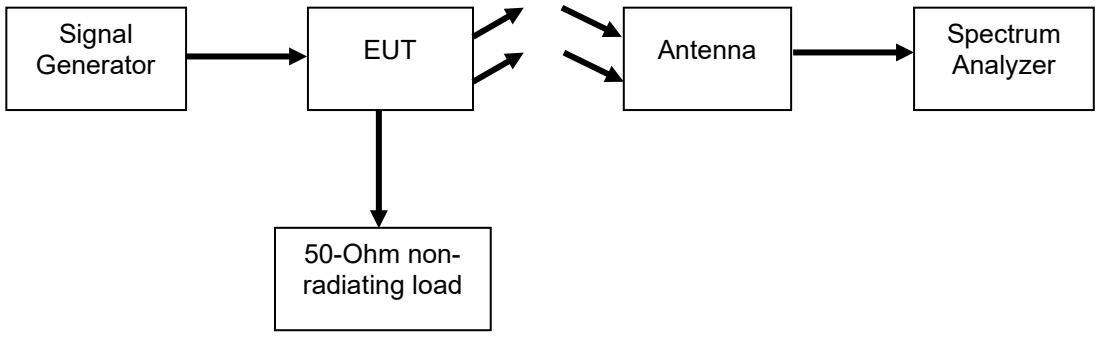
The RBW was set to 1 MHz per the FCC CFR Part 27.53(l)(1) and (n)(1).
The VBW was set to 3 times the RBW.
The # of trace points were > (2 x span)/RBW
The limit = -13 dBm/MHz

The radiated spurious emissions were measured from 30 MHz to the 10th harmonic.

For the 1 – 18 GHz frequency range, the EUT input frequency (3500 MHz or 3840 MHz) is displayed on the graph. There is a 2nd marker on this emission and this emission is excluded in the final tabular results.

The tests were recorded for both the rack mount and wall mount units.

Test Setup



Radiated Spurious Test Results

3450 – 3550 MHz

Spectrum analyzer start / stop frequencies	Type Rack mount Wall mount	Port	Spurious Emission		Limit	Pass / Fail
			Frequency	Amplitude		
GHz			MHz	dBm	dBm	
0.030 – 1.0	Rack	Main UL	319.739	-59.8	-13	Pass
0.030 – 1.0	Rack	Main DL	201.011	-53.7	-13	Pass
0.030 – 1.0	Rack	Aux UL	350.003	-61.8	-13	Pass
0.030 – 1.0	Rack	Aux DL	201.011	-54.9	-13	Pass
1 - 18	Rack	Main UL	17404.1	-44.3	-13	Pass
1 - 18	Rack	Main DL	14770.8	-44.3	-13	Pass
1 - 18	Rack	Aux UL	14722.7	-44.3	-13	Pass
1 - 18	Rack	Aux DL	17484.0	-44.7	-13	Pass
18 – 40	Rack	Main UL	33778.1	-44.3	-13	Pass
18 – 40	Rack	Main DL	33837.6	-46.4	-13	Pass
18 – 40	Rack	Aux UL	33785.9	-43.7	-13	Pass
18 – 40	Rack	Aux DL	39930.1	-44.3	-13	Pass
0.030 – 1.0	Wall	Main UL	660.015	-49.4	-13	Pass
0.030 – 1.0	Wall	Main DL	819.968	-53.5	-13	Pass
0.030 – 1.0	Wall	Aux UL	820.065	-58.5	-13	Pass
0.030 – 1.0	Wall	Aux DL	660.015	-60.1	-13	Pass
1 - 18	Wall	Main UL	17644.7	-44.9	-13	Pass
1 - 18	Wall	Main DL	14769.1	-44.8	-13	Pass
1 - 18	Wall	Aux UL	17702.1	-44.9	-13	Pass
1 - 18	Wall	Aux DL	14790.3	-43.7	-13	Pass
18 – 40	Wall	Main UL	33034.66	-44.2	-13	Pass
18 – 40	Wall	Main DL	33793.24	-43.8	-13	Pass
18 – 40	Wall	Aux UL	33819.20	-44.1	-13	Pass
18 – 40	Wall	Aux DL	33263.47	-43.9	-13	Pass

3700 – 3980 MHz

Spectrum analyzer start / stop frequencies	Type Rack mount Wall mount	Port	Spurious Emission		Limit	Pass / Fail
			Frequency	Amplitude		
GHz			MHz	dBm	dBm	
0.030 – 1.0	Rack	Main UL	201.011	-56.5	-13	Pass
0.030 – 1.0	Rack	Main DL	201.011	-55.2	-13	Pass
0.030 – 1.0	Rack	Aux UL	201.011	-57.3	-13	Pass
0.030 – 1.0	Rack	Aux DL	201.011	-56.5	-13	Pass
1 - 18	Rack	Main UL	17368.0	-44.8	-13	Pass
1 - 18	Rack	Main DL	14718.1	-44.6	-13	Pass
1 - 18	Rack	Aux UL	17529.1	-44.5	-13	Pass
1 - 18	Rack	Aux DL	14730.8	-44.3	-13	Pass
18 – 40	Rack	Main UL	39326.35	-34.4	-13	Pass
18 – 40	Rack	Main DL	39981.08	-33.8	-13	Pass
18 – 40	Rack	Aux UL	39837.64	-34.5	-13	Pass
18 – 40	Rack	Aux DL	33255.55	-34.1	-13	Pass
0.030 – 1.0	Wall	Main UL	659.918	-58.1	-13	Pass
0.030 – 1.0	Wall	Main DL	779.907	-56.0	-13	Pass
0.030 – 1.0	Wall	Aux UL	819.968	-58.6	-13	Pass
0.030 – 1.0	Wall	Aux DL	660.015	-55.3	-13	Pass
1 - 18	Wall	Main UL	17491.3	-44.7	-13	Pass
1 - 18	Wall	Main DL	14635.6	-44.2	-13	Pass
1 - 18	Wall	Aux UL	17982.6	-44.9	-13	Pass
1 - 18	Wall	Aux DL	14732.3	-42.4	-13	Pass
18 – 40	Wall	Main UL	34801.3	-34.2	-13	Pass
18 – 40	Wall	Main DL	34911.74	-34.7	-13	Pass
18 – 40	Wall	Aux UL	34354.69	-35.0	-13	Pass
18 – 40	Wall	Aux DL	33805.12	-34.5	-13	Pass

Annex I – Radiated Spurious Emission_3450 – 3550 MHz
Refer to Annex I for Radiated Spurious Emission plots_3450 – 3550 MHz

Annex J – Radiated Spurious Emission_3700 – 3980 MHz
Refer to Annex J for the Radiated Spurious Emissions Plots_3700 – 3980 MHz

Measurement Uncertainty

Measurement Uncertainty (U_{lab}) for Compliance Testing is listed in the table below.

Measurement	U_{lab}
Radio Frequency	± 3.3 x 10^{-8}
RF Power, conducted	± 1.5 dB
RF Power Density, conducted	± 1.0 dB
Conducted Emissions	± 1.8 dB
Radiated Emissions 9kHz-30MHz	± 3.6 dB
Radiated Emissions 30MHz-1000MHz	± 4.25 dB
Radiated Emissions – 1GHz-18GHz	± 4.5 dB
Temperature	± 1.5 deg C
Humidity	± 4.3 %
DC voltage	± 0.20 VDC
AC Voltage	± 1.2 VAC

The reported expanded uncertainty +/- U_{lab}(dB) has been estimated at a 95% confidence level (k=2)

U_{lab} is less than or equal to U_{ETSI} therefore

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna (18-40GHz)	EMCO	3116	i00085	3/14/23	3/14/25
Horn Antenna	ARA	DRG-118/A	i00271	8/11/22	8/11/24
Voltmeter	Fluke	87-iii	i00319	5/21/24	5/21/25
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	2/7/23	2/7/25
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/13/23	7/13/26
PSA Spectrum Analyzer	Agilent	E4445A	i00471	1/5/24	1/5/25
Spectrum Analyzer	Keysight	N9038A	i00552	3/1/24	3/1/25
Temp./humidity/pressure monitor (Main Lab)	Omega Engineering	iBTHX-W-5	i00686	1/25/2024	1/25/2025
Signal Generator	Rohde & Schwarz	SMW200A	105411 (rental)	7/18/24	2/4/25

In addition to the above-listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT