TEST REPORT

Report Number: 14040867-E19V3

Applicant	:	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	:	A2649 (Parent Model) A2881, A2882 (Variant Models)
Brand	:	APPLE
FCC ID	:	BCG-E8138A (Parent Model) BCG-E8142A, BCG-E8143A (Variant Models)
IC	:	579C-E8138A (Parent Model) 579C-E8142A, 579C-E8143A (Variant Models)
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC CFR 47 Part 2, Part 25 ISED RSS-GEN ISSUE 5, RSS-170 Issue 3

Date Of Issue:
AUGUST 01, 2022

Prepared by:
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ACCREDITED
CERT #0751.05

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	7/15/2022	Initial Review	Eric Ting
V2	7/19/2022	Address TCB feedback	Eric Ting
V3	8/1/2022	Added Variant Models	Thu Chan

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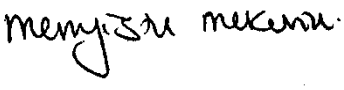
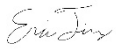
1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY Cupertino, CA 95014, U.S.A
Model	A2649 (Parent Model, Full Test) A2881, A2882 (Variant Models)
Brand	APPLE
FCC ID	BCG-E8138A (Parent Model) BCG-E8142A, BCG-E8143A (Variant Models)
IC	579C-E8138A (Parent Model) 579C-E8142A, 579C-E8143A (Variant Models)
EUT Description	SMARTPHONE
Serial Number	C07210600PX1J1C4 (CONDUCTED), JPFQYDR6CY (RADIATED)
Sample Receipt Date	JANUARY 03, 2022
Date Tested	JANUARY 03, 2022 to MAY 31, 2022
Applicable Standards	FCC CFR 47 Part 2, Part 25 ISED RSS-GEN ISSUE 5, RSS-170 Issue 3
Test Results	COMPLIES

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released By:	Reviewed By:	Prepared By:
		
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2. SUMMARY OF TEST RESULTS

This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

Requirement Description	Band	Requirement Clause Number (FCC)	Requirement Clause Number (ISED)	Result	Remarks
RF Conducted Output Power	53	25.149 (c)(4)(iii)	SMSE-009-20 Annex A 9.d	Complies	
Equivalent Isotropic Radiated	53	25.149 (c)(4)(iii)	SMSE-009-20 Annex A 9.e	Complies	
Maximum Power Spectral Density	53	25.149 (c)(4)(iv)	SMSE-009-20 Annex A 9.f	Complies	
Duty Cycle	53	Reporting purpose	Reporting purpose	Complies	
Occupied Bandwidth		2.1049	Reporting purpose	Complies	
6 dB Bandwidth	53	25.149 (c)(4) (ii)	SMSE-009-20 Annex A 9.c	Complies	
Band Edge and Emission Mask	53	2.1051, 25.149 (c) (4) (v), (vi)	SMSE-009-20 Annex A 9.g and h	Complies	
Out of Band Emissions	53	2.1051, 25.149 (c) (4) (v), (vi)	SMSE-009-20 Annex A 9.g	Complies	
Frequency Stability	53	25.202 (d)	--	Complies	
Field Strength of Spurious Radiation	53	2.1053, 25.149 (c) (4) (v), (vi)	SMSE-009-20 Annex A 9.g, h and i	Complies	
Carrier-Off-State Emissions Radiation	53	25.216 (i)	--	Complies	

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the following:

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 25
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01. Determining ERP and EIRP
- ISED RSS-170 Issue 3 as amended by SMSE-009-20

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification #0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☒	Building 1: 47173 Benicia Street, Fremont, CA 94538, USA	US0104	2324A	550739
☒	Building 2: 47266 Benicia Street, Fremont, CA 94538, USA	US0104	22541	550739
☐	Building 4: 47658 Kato Rd, Fremont, CA 94538, USA	US0104	2324B	550739

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U_{Lab}
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.84 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB
Occupied Channel Bandwidth	±1.22 %
Temperature	±2.26%
Supply voltages	±0.57 %
Time	±3.39 %

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and MSS. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM) in some models. The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

Testing was performed on the parent model and is used to support the application for the parent and variants identified in this report based on the test plan submitted and approved via KDB inquiry by the FCC and by ISED-Canada.

The Model and FCC/IC IDs covered by this report includes:

Parent Model: A2649, FCC ID: BCG-E8138A, IC: 579C-E8138A

Variant Models: A2881, FCC ID: BCG-E8142A, IC: 579C-E8142A
A2882; FCC ID: BCG-E8143A, IC: 579C-E8143A

6.2. MAXIMUM OUTPUT POWER

EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015
KDB 971168 D01 Section 5.6

ERP/EIRP = PMeas + GT − LC
where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);
PMeas = measured transmitter output power or PSD, in dBm or dBW;
GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average conducted and peak EIRP output powers as follows:

LTE BAND 53

FCC: §25.149 (c)(4) (iii): The maximum transmit power is no more than 1 W with a peak EIRP of no more than 6 dBW (36dBm or 3.98W).

ISED: SMSE-009-20 Annex A 9.e: The maximum equivalent isotropically radiated power (e.i.r.p.) shall not exceed 6 dBW (36dBm or 3.98W).

FCC Part 25/ SMSE-009-20	
Peak EIRP Limit (W)	3.98
Conducted Average Limit (W)	1.00
Antenna Gain (dBi)	-0.60

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
1.4	QPSK	2484.2	2494.3	20.70	20.10	0.102	1081.9	1M08G7W
	16QAM			20.70	20.10	0.102	1077.1	1M08D7W
3.0	QPSK	2485.0	2493.5	20.70	20.10	0.102	2678.4	2M68G7W
	16QAM			20.70	20.10	0.102	2674.6	2M67D7W
5.0	QPSK	2486.0	2492.5	20.70	20.10	0.102	4455.8	4M46G7W
	16QAM			20.70	20.10	0.102	4452.7	4M45D7W
10.0	QPSK	2488.5	2490.0	20.70	20.10	0.102	8903.8	8M90G7W
	16QAM			20.70	20.10	0.102	8920.7	8M92D7W

5G NR n53

FCC Part 25 / SMSE-900-20	
Peak EIRP Limit (W)	3.98
Conducted Average Limit (W)	1.00
Antenna Gain (dBi)	-0.60

Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Peak (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
10.0	BPSK	2488.5	2490.0	20.70	20.10	0.102	8650.1	8M65G7W
	QPSK			20.70	20.10	0.102	8595.5	8M60G7W
	16QAM			20.70	20.10	0.102	8607.5	8M61D7W

6.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version: 0.15.02.

6.4. MAXIMUM ANTENNA GAIN

LTE Bands	Frequency Range (MHz)	ANT 1 Antenna Gain (dBi)	ANT 2 Antenna Gain (dBi)
LTE BAND 53, 5G NR n5	2483.5 – 2495 MHz	-0.6	-0.9

6.5. WORST-CASE CONFIGURATION AND MODE

The EUT supports the following LTE and 5G NR Bands:
Band 53, and 5G NR n53

BPSK modulation applied only for 5G NR frequencies and has the same tune up power as QPSK modulations.

The DFT-s-OFDM and CP-OFDM waveforms were investigated, and DFT-s-OFDM was found to be the worst case.

The worst-case scenario for all measurements is based on an engineering evaluation made on different modulations. All modulations had the same target power for the worst-case antenna, so QPSK and BPSK were used to represent the worst mode for LTE bands and 5G NR bands respectively and were set for all conducted and radiated tests. Output power measurements were measured on BPSK, QPSK, 16QAM, 64QAM, and 256QAM modulations. For testing purposes emissions on sections 8 and 9 were measured while QPSK/BPSK was set at or above target power for all bands. Conducted tests were performed on the worst-case antenna because it has the highest conducted power. The worst-case antenna is shown in the table below.

LTE and 5G NR Bands	Worst case Antenna Port For Conducted Power
LTE BAND 53, and 5G NR n53	Ant 1

The EUT was investigated in three orthogonal orientations X/Y/Z on both ANT 1 and ANT2 antennas to determine the worst case orientation. The full tests of the EUT have made upon the orientations that shown in the table below.

Frequency Bands	ANT1	ANT2
2300 – 2700 MHz	X	X

Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

For simultaneous transmission of multiple channels in the 2.4GHz/5GH WLAN, UWB, and Cellular bands, tests were conducted for various configurations having the highest power, least separation in frequencies and widest operation bandwidths. No noticeable new emission was found.

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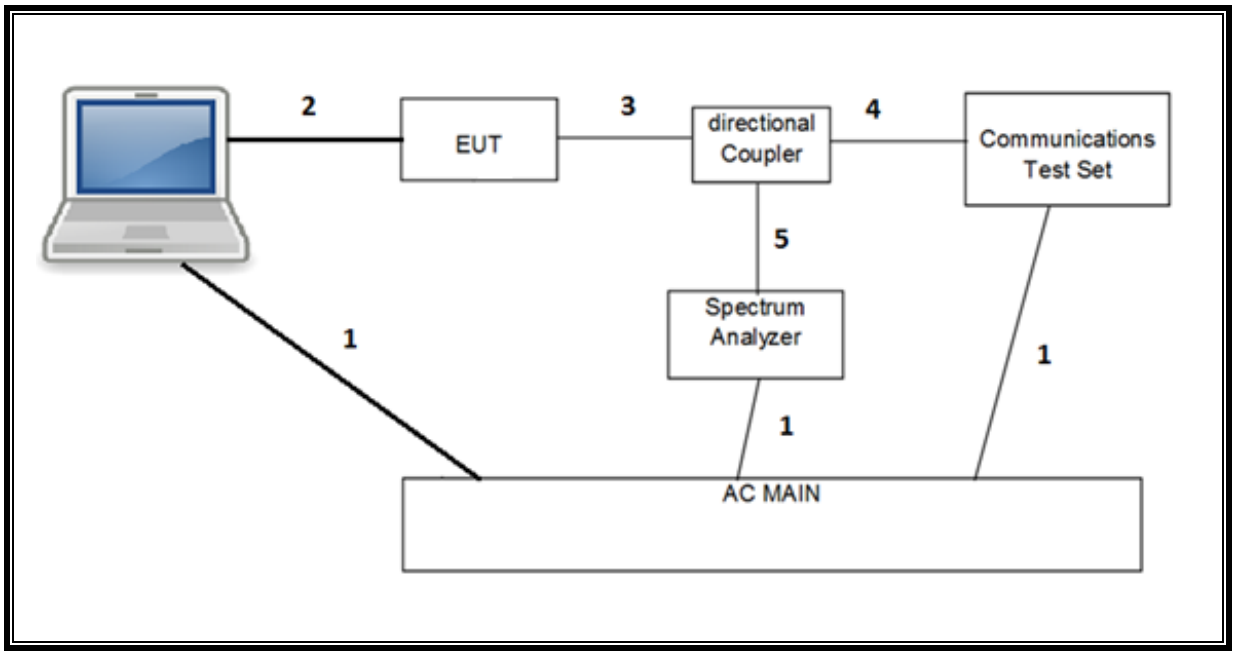
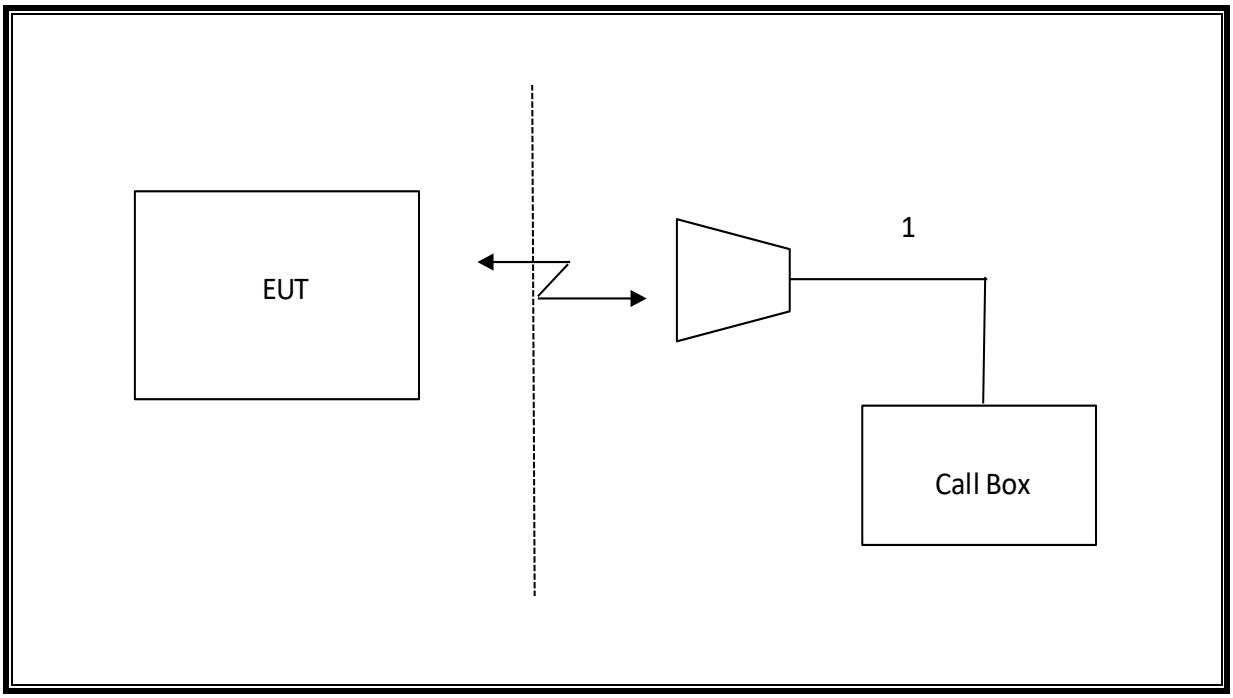
6.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT						
Description		**Manufacturer**	**Model**	**Serial Number**		**FCC ID/ DoC**
Laptop		Apple	MacBook Pro	HRP082673		BCGA1708
AC/DC adapter		Apple	A1718	C4H64450HH3GN8RA6		--
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	3	US 115V	Un-shielded	2.0	N/A
2	USB	1	DC	Un-shielded	1.0	N/A
3	RF In/Out	1	EUT	Un-shielded	0.6	N/A
4	RF In/Out	1	Communication Test Set	Un-shielded	1.2	N/A
5	RF In/Out	1	Barrel	N/A	N/A	N/A
I/O CABLES (RF RADIATED TEST)						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	RF In/Out	1	Antenna	Un-shielded	5.0	N/A

CONDUCTED SETUP



RADIATED SETUP



7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
*Antenna, Horn 1-18GHz	ETS Lindgren	3117	79834	06/14/2222
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	85151	03/21/2023
*RF Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	06/12/2022
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	N9030A	85213	01/19/2023
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	N9030A	125178	01/24/2023
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	85201	02/01/2023
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	85214	02/02/2023
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	80400	02/01/2023
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	80397	02/01/2023
Spectrum Analyzer, PXA, 3Hz to 50GHz w/Ext. Mixer	Keysight	N9030A	T342	02/01/2023
Spectrum Analyzer, PSA 3Hz to 44GHz	Keysight	E4440A	81311	02/02/2023
Directional Coupler	KRYTAR	152610	T1161	09/23/2022
Directional Coupler	KRYTAR	152610	T1536	09/23/2022
Directional Coupler	KRYTAR	152610	T1537	09/23/2022
Power Meter, P-series single channel	Keysight	N1912A	90630	01/24/2023
Power Meter, P-series single channel	Keysight	N1912A	90719	01/24/2023
Power Meter, P-series single channel	Agilent	N1911A	82174	01/24/2023
Power Sensor, P – series, 50MHz to 18GHz, Wideband	Keysight	N1921A	90389	01/25/2023
Filter, HPF 1.2GHz	Micro-Tronics	152043	152043	7/29/2022
Filter, BRF 1850 – 1910 MHz	Micro-Tronics	155055	155055	12/20/2022
Filter, BRF 2495 – 2690 MHz	Micro-Tronics	155050	155055	7/30/2022
Filter, BRF 3.4 – 3.8GHz	Micro-Tronics	208398	208398	7/30/2022
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	80397	02/01/2023
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	85827	02/21/2023
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	80105	02/21/2023
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	159994	02/23/2023
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	85806	02/22/2023
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	85943	02/20/2023
5G NR Communication Test Set, Call Box	Keysight	UXM	207269	01/24/2023
5G NR Communication Test Set, Call Box	Keysight	UXM	MY60101138	12/21/2023
*Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	06/16/2022
Amplifier, 218GHz to 26.5GHz	Amplical	AMP18G26.5-60	215705	02/26/2023
Amplifier, 26.5GHz to 40GHz	Amplical	AMP26G40-65	172346	02/01/2023
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	172362	02/09/2023
Antenna, Horn 26.5GHz to 40GHz	ARA	MWH-2640/B	172365	03/08/2023
Antenna, Active Loop 9KHz to 30MHz	EMCO	6502	T35	10/05/2022
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 3.4, May 20, 2022	
Power Measurement Software	UL	UL RF	Ver 3.1.4, April 29, 2022	
Radiated test software	UL	UL RF	Ver 9.5, Jan 21, 2022	

NOTES:

1. * Testing is completed before equipment expiration date.

8. RF OUTPUT POWER VERIFICATION

CONDUCTED OUTPUT POWER MEASUREMENT PROCEDURE

All LTE bands conducted average power is obtained from the CMW500 telecommunication test set.

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS 36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). Band 41 UE Power Class: 2 (26 +/-2 dBm).The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS 36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS 38.521-1 specification.

The allowed MPR for SRS, PUCCH formats 0, 1, 3 and 4, and PRACH shall be as specified for QPSK modulated DFTs-OFDM of equivalent RB allocation. The allowed MPR for PUCCH format 2 shall be as specified for QPSK modulated CP-OFDM of equivalent RB allocation.

Table 6.2.2.3-1: Maximum power reduction (MPR) for power class 3

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5[1]	≤ 1.2[1]	≤ 0.2[1]
		≤ 0.5[2]		0[2]
	Pi/2 BPSK w Pi/2 BPSK DMRS	≤ 0.5[2]		0[2]
	QPSK	≤ 1		0
	16 QAM	≤ 2		≤ 1
	64 QAM	≤ 2.5		
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3		≤ 1.5
	16 QAM	≤ 3		≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		

NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and if the IE *powerBoostPi2BPSK* is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0dB MPR is 26dBm.

NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 with Pi/2 BPSK modulation and if the IE *powerBoostPi2BPSK* is set to 0 and if more than 40% of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79.

Table 6.2.2.3-2: Maximum power reduction (MPR) for power class 2

Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	≤ 3.5	≤ 0.5	0
	QPSK	≤ 3.5	≤ 1	0
	16 QAM	≤ 3.5	≤ 2	≤ 1
	64 QAM	≤ 3.5	≤ 2.5	
	256 QAM	≤ 4.5		
CP-OFDM	QPSK	≤ 3.5	≤ 3	≤ 1.5
	16 QAM	≤ 3.5	≤ 3	≤ 2
	64 QAM	≤ 3.5		
	256 QAM	≤ 6.5		

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS 36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	N/A
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36, 66, 70	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2, 6.6.3.3.19	41	5, 10, 15, 20	Table 6.2.4-4, Table 6.2.4-4a	

The allowed A-MPR values specified below in Table 6.2.3.3.1-1 of 3GPP TS 38.521-1 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.3.3.1-1: Additional maximum power reduction (A-MPR)

Network signalling label	Requirements (subclause)	NR Band	Channel bandwidth (MHz)	Resources blocks (N_{RB})	A-MPR (dB)
NS_01		Table 5.2-1	5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100	Table 5.3.2-1	N/A
NS_03	6.5.2.3.3.3	n2, n25, n66, n70, n86			Clause 6.2.3.3.7
NS_03U	6.5.2.3.3.3, 6.5.2.4.2.3	n2, n25, n66, n86			Clause 6.2.3.3.7
NS_04	6.5.2.3.3.2, 6.5.3.3.3.1	n41	10, 15, 20, 40, 50, 60, 80, 90, 100		Clause 6.2.3.3.2

AVERAGE OUTPUT POWER TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with directional coupler connected to a power meter via wideband average power sensor. Gated average output power was read directly from power meter.

PEAK OUTPUT POWER TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with directional coupler connected to a power meter via wideband peak power sensor. Peak output power was read directly from power meter.

RESULTS

EUT includes different power levels for head use configuration and body use configuration and the below tables contain the highest of all configurations average and peak conducted output powers as follows:

8.1. LTE BAND 53

RULE PART(S) AND LIMITS

FCC: §25.149 (c)(4) (iii): The maximum transmit power is no more than 1 W (30dBm) with a peak EIRP of no more than 6 dBW.

ISED: SMSE-009-20 Annex A 9.d: Transmitter output power shall not exceed 0 dBW (30dBm).

Test Engineer ID:	39004	Test Date:	2/28/2022

OUTPUT POWER FOR LTE BAND 53 (1.4 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1			Ant 2		
				Conducted Average (dBm)			Conducted Average (dBm)		
				60147	60195	60248	60147	60195	60248
				2484.2 MHz	2489.0 MHz	2494.3 MHz	2484.2 MHz	2489.0 MHz	2494.3 MHz
1.4	QPSK	1	0	20.56	20.64	20.59	20.61	20.66	20.64
		1	2	20.58	**20.70**	20.65	**20.70**	20.67	20.68
		1	5	20.56	20.61	20.61	20.62	20.66	20.58
		3	0	20.56	20.64	20.61	20.61	20.68	**20.70**
		3	1	20.57	20.66	20.64	20.63	**20.70**	20.69
		3	2	20.55	20.65	20.64	20.64	20.69	20.67
		6	0	20.53	20.66	20.55	19.62	19.66	19.65
	16QAM	1	0	20.65	20.67	20.58	20.68	20.64	20.69
		1	2	20.66	**20.70**	20.67	**20.70**	20.69	20.68
		1	5	**20.70**	20.65	**20.70**	20.66	**20.70**	20.69
		3	0	20.47	20.53	20.60	20.38	20.47	20.42
		3	1	20.49	20.53	20.54	20.45	20.48	20.42
		3	2	20.43	20.60	20.58	20.45	20.50	20.47
		6	0	20.38	20.46	20.37	19.31	19.32	19.39
	64QAM	1	0	20.53	**20.70**	20.61	19.49	20.60	**20.70**
		1	2	20.57	**20.70**	20.67	**20.70**	20.55	20.68
		1	5	20.53	**20.70**	20.66	20.69	20.60	20.62
		3	0	20.39	20.60	20.55	20.60	20.54	20.69
		3	1	20.49	20.64	20.59	20.60	20.56	20.58
		3	2	20.44	20.61	20.60	20.63	20.57	20.59
		6	0	20.40	20.51	20.37	19.44	20.64	20.69
	256QAM	1	0	20.42	20.59	20.56	20.66	20.48	20.58
		1	2	20.47	**20.70**	20.68	**20.70**	20.55	20.62
		1	5	20.39	20.66	20.60	20.68	20.63	20.55
		3	0	20.43	20.60	20.47	20.57	20.46	20.51
		3	1	20.44	20.59	20.56	20.49	20.47	20.54
		3	2	20.47	20.60	20.56	20.49	20.46	20.54
		6	0	20.42	20.59	20.43	20.40	20.40	20.39

OUTPUT POWER FOR LTE BAND 53 (3.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1			Ant 2		
				Conducted Average (dBm)			Conducted Average (dBm)		
				60155	60195	60240	60155	60195	60240
				2485.0 MHz	2489.0 MHz	2493.5 MHz	2485.0 MHz	2489.0 MHz	2493.5 MHz
3.0	QPSK	1	0	20.46	20.53	20.51	20.58	20.57	20.62
		1	7	20.54	20.65	20.60	**20.70**	**20.70**	**20.70**
		1	14	20.47	20.54	20.53	20.56	20.59	20.65
		8	0	20.56	20.67	20.66	19.69	19.70	19.72
		8	4	20.60	**20.70**	20.67	19.73	19.74	19.75
		8	7	20.60	**20.70**	20.68	19.73	19.75	19.74
		15	0	20.54	20.68	20.64	19.70	19.68	19.71
	16QAM	1	0	20.62	20.63	20.61	20.50	20.55	20.58
		1	7	**20.70**	20.70	20.70	20.65	20.68	**20.70**
		1	14	20.60	20.65	20.62	20.54	20.56	20.63
		8	0	20.33	20.43	20.44	19.37	19.38	19.36
		8	4	20.38	20.47	20.53	19.39	19.43	19.41
		8	7	20.36	20.50	20.50	19.39	19.41	19.41
		15	0	20.29	20.43	20.41	19.35	19.30	19.35
	64QAM	1	0	20.50	20.60	20.60	20.52	20.63	20.69
		1	7	20.58	20.68	**20.70**	20.63	20.63	**20.70**
		1	14	20.48	20.64	20.66	20.59	20.64	**20.70**
		8	0	19.37	19.44	19.50	19.41	20.64	20.69
		8	4	19.43	19.52	19.56	19.45	20.65	20.68
		8	7	19.42	19.51	19.51	19.47	20.63	**20.70**
		15	0	19.34	19.49	19.49	19.39	20.65	20.69
	256QAM	1	0	20.49	20.63	20.58	20.51	20.63	20.61
		1	7	20.54	**20.70**	20.62	20.57	**20.70**	20.67
		1	14	20.44	20.60	20.55	20.50	20.66	20.60
		8	0	20.41	20.58	20.52	20.44	20.54	20.59
		8	4	20.49	20.61	20.54	20.48	20.57	20.63
		8	7	20.44	20.59	20.54	20.48	20.57	20.65
		15	0	20.41	20.52	20.49	20.42	20.53	20.58

OUTPUT POWER FOR LTE BAND 53 (5.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1 Conducted Average (dBm)			Ant 2 Conducted Average (dBm)		
				60165	60195	60230	60165	60195	60230
				2486.0 MHz	2489.0 MHz	2492.5 MHz	2486.0 MHz	2489.0 MHz	2492.5 MHz
5.0	QPSK	1	0	20.49	20.55	20.56	20.61	20.58	20.59
		1	12	20.62	20.68	**20.70**	**20.70**	**20.70**	20.70
		1	24	20.53	20.60	20.60	20.64	20.60	20.62
		12	0	20.55	20.61	20.55	19.68	19.61	19.63
		12	6	20.52	20.64	20.61	19.63	19.64	19.71
		12	11	20.51	20.64	20.66	19.63	19.64	19.71
		25	0	20.50	20.65	20.58	19.61	19.62	19.65
	16QAM	1	0	20.47	20.53	20.53	20.55	20.34	20.35
		1	12	**20.70**	**20.70**	**20.70**	**20.70**	20.43	20.47
		1	24	20.50	20.61	20.59	20.60	20.37	20.42
		12	0	20.29	20.31	20.27	19.21	19.17	19.15
		12	6	20.26	20.36	20.36	19.17	19.19	19.28
		12	11	20.24	20.29	20.37	19.14	19.19	19.17
		25	0	20.18	20.34	20.28	19.09	19.09	19.15
	64QAM	1	0	20.45	20.53	20.63	20.63	20.65	20.67
		1	12	20.54	20.55	**20.70**	20.66	20.66	20.64
		1	24	20.44	20.57	20.68	20.67	20.68	20.64
		12	0	19.21	19.35	19.35	20.66	20.67	20.69
		12	6	19.19	19.40	19.38	20.68	20.65	20.64
		12	11	19.17	19.36	19.44	**20.70**	20.64	20.68
		25	0	19.18	19.34	19.32	20.67	20.65	20.68
	256QAM	1	0	20.64	20.61	20.49	20.52	20.46	20.55
		1	12	20.64	20.68	**20.70**	20.53	20.56	20.67
		1	24	20.55	20.58	20.63	20.43	20.58	**20.70**
		12	0	20.48	20.49	20.48	20.42	20.38	20.40
		12	6	20.44	20.55	20.54	20.37	20.41	20.46
		12	11	20.41	20.54	20.56	20.36	20.40	20.55
		25	0	20.38	20.49	20.48	20.36	20.37	20.42

OUTPUT POWER FOR LTE BAND 53 (10.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1 Conducted Average (dBm)			Ant 2 Conducted Average (dBm)		
				60190	60195	60205	60190	60195	60205
				2488.5 MHz	2489.0 MHz	2490.0 MHz	2488.5 MHz	2489.0 MHz	2490.0 MHz
10.0	QPSK	1	0	20.57	20.54	20.57	20.62	20.62	20.57
		1	24	20.63	20.64	20.61	**20.70**	**20.70**	**20.70**
		1	49	20.63	20.63	20.62	20.67	20.68	20.61
		25	0	20.65	20.62	20.66	19.74	19.69	19.69
		25	12	20.62	20.68	**20.70**	19.70	19.75	19.71
		25	24	20.61	20.68	**20.70**	19.70	19.74	19.74
		50	0	20.66	20.64	20.68	19.73	19.71	19.70
	16QAM	1	0	20.68	20.67	20.61	20.60	20.62	20.57
		1	24	**20.70**	20.68	20.61	20.66	20.67	20.56
		1	49	**20.70**	**20.70**	20.70	**20.70**	20.64	20.52
		25	0	20.39	20.38	20.41	19.37	19.31	19.33
		25	12	20.37	20.42	20.46	19.33	19.34	19.37
		25	24	20.36	20.42	20.46	19.35	19.35	19.37
		50	0	20.39	20.39	20.41	19.35	19.30	19.29
	64QAM	1	0	20.62	20.60	20.63	20.59	20.63	20.62
		1	24	20.66	20.68	20.69	20.66	20.62	20.60
		1	49	20.70	20.67	**20.70**	**20.70**	20.62	20.60
		25	0	19.46	19.44	19.47	19.49	20.63	20.60
		25	12	19.41	19.49	19.53	19.45	20.62	20.59
		25	24	19.41	19.49	19.51	19.46	20.61	20.59
		50	0	19.46	19.45	19.51	19.51	20.62	20.60
	256QAM	1	0	20.50	20.58	20.56	20.58	20.52	20.50
		1	24	20.61	**20.70**	20.66	20.59	20.62	20.65
		1	49	20.57	20.63	20.69	**20.70**	20.65	20.67
		25	0	20.44	20.48	20.53	20.52	20.47	20.47
		25	12	20.43	20.54	20.59	20.49	20.54	20.52
		25	24	20.43	20.56	20.60	20.49	20.54	20.53
		50	0	20.46	20.53	20.57	20.55	20.52	20.49

8.2. 5G NR n53

Test Engineer ID:	52275	Test Date:	2/2/2022

OUTPUT POWER FOR 5G NR n53 (10.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1 Conducted Average (dBm)			Ant 2 Conducted Average (dBm)		
				497700	497800	498000	497700	497800	498000
				2488.5 MHz	2489.0 MHz	2490.0 MHz	2488.5 MHz	2489.0 MHz	2490.0 MHz
10.0	BPSK	1	0	20.63	20.55	20.41	20.42	20.45	20.37
		1	1	20.69	20.64	20.64	20.61	20.63	**20.70**
		1	22	20.61	**20.70**	**20.70**	**20.70**	**20.70**	20.64
		1	23	20.54	20.51	20.52	20.39	20.34	20.46
		12	6	**20.70**	20.61	20.60	20.63	20.61	20.60
		24	0	20.56	20.45	20.44	19.40	19.39	19.38
	QPSK	1	0	20.17	19.97	19.98	18.36	18.40	18.36
		1	1	20.69	20.63	20.62	19.50	19.53	19.48
		1	22	20.68	**20.70**	**20.70**	18.89	18.98	18.86
		1	23	20.01	19.96	19.96	17.79	17.75	17.69
		12	6	20.50	20.67	20.67	20.68	**20.70**	**20.70**
		24	0	20.06	19.99	19.95	19.97	19.96	19.94
	16QAM	1	0	19.43	19.65	19.67	19.58	19.61	19.62
		1	1	20.65	20.62	20.32	**20.70**	20.48	20.60
		1	22	**20.70**	20.43	20.44	20.59	20.61	20.63
		1	23	19.54	19.58	19.47	19.63	19.53	19.63
		12	6	20.36	20.22	20.21	20.36	20.32	20.40
		24	0	19.32	19.29	19.27	19.41	19.43	19.37
	64QAM	1	0	20.58	20.59	20.47	**20.70**	20.56	20.53
		1	1	20.69	20.55	20.44	**20.70**	20.54	20.62
		1	22	**20.70**	20.47	20.63	20.61	20.67	20.55
		1	23	20.57	20.59	20.59	20.50	20.52	20.63
		12	6	20.46	20.37	20.30	20.53	20.46	20.49
		24	0	20.38	20.26	20.23	20.46	20.46	20.44
	256QAM	1	0	20.61	20.53	20.41	20.66	20.58	20.29
		1	1	20.63	20.61	20.46	**20.70**	20.66	20.65
		1	22	20.67	20.67	20.50	20.41	20.36	20.54
		1	23	**20.70**	20.48	20.64	20.53	20.52	20.44
		12	6	20.61	20.60	20.53	20.42	20.40	20.36
		24	0	20.62	20.50	20.45	20.54	20.45	20.47

9. CONDUCTED TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

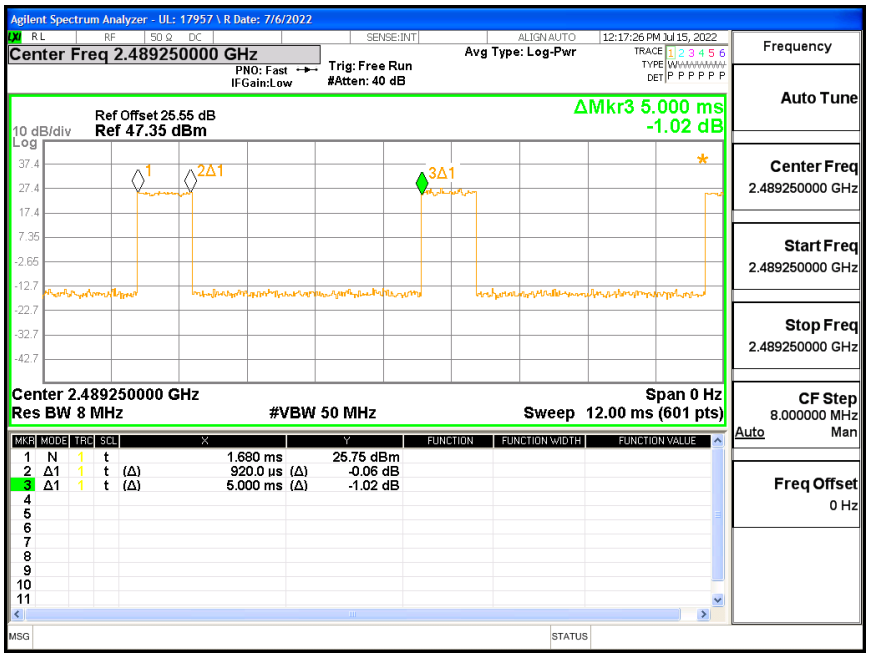
PROCEDURE

Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Band	RB Allocation / Offset	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
LTE Band 53	1 / 0	0.945	4.995	0.189	18.92	7.23
LTE Band 53	50 / 0	0.920	5.000	0.18	18.40	7.35
5G NR n53	1 / 1	N.A.	N.A.	1.00	100.00	0.00
5G NR n53	24 / 0	N.A.	N.A.	1.00	100.00	0.00

LTE Band 53 RB1-0



LTE Band 53 RB50-0

5G NR n53 RB1-1

5G NR n53 RB24-0

9.2. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only.

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the middle channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

RESULTS

There is no limit required and power is the same for low, middle and high channel; therefore, only middle channel was tested. Worst-case plots (highest bandwidth) are reported only.

LTE BAND 53

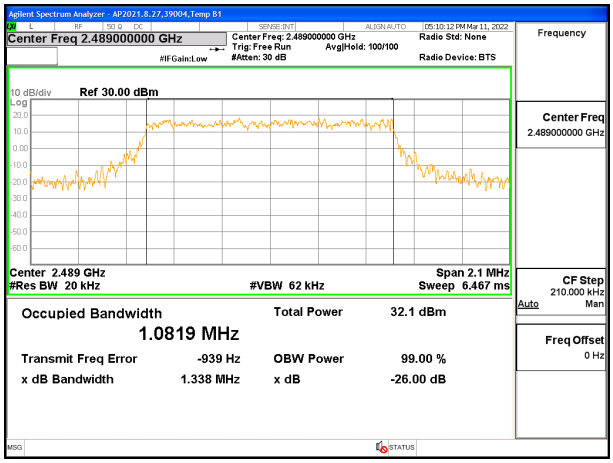
Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 53	1.4MHz, QPSK	6/0	2489.0	1.0819	1.338
	1.4MHz,16QAM			1.0771	1.284
	3MHz, QPSK	15/0		2.6784	2.956
	3MHz, 16QAM			2.6746	2.923
	5MHz, QPSK	25/0		4.4558	4.685
	5MHz, 16QAM			4.4527	4.702
	10MHz, QPSK	50/0		8.9038	9.567
	10MHz, 16QAM			8.9207	9.519
	10MHz, QPSK	1/0		0.232	0.384

5G NR n53

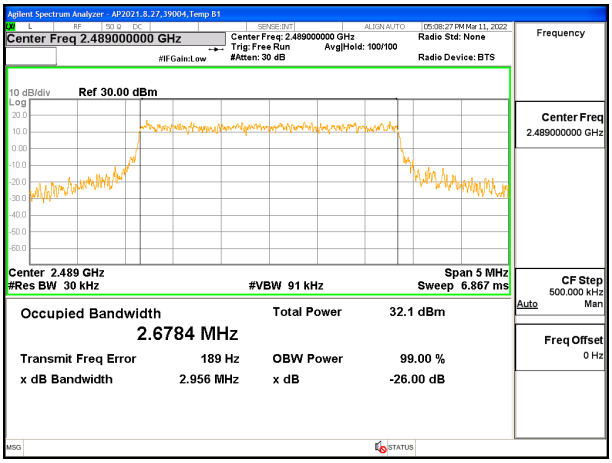
Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
5G NR n53	10MHz, BPSK	24/0	2489.0	8.6501	10.03
	10MHz, QPSK			8.5955	9.831
	10MHz, 16QAM			8.6075	9.570
	10MHz, QPSK	1/0		0.518	0.759

UL VERIFICATION SERVICES INC.
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 319-4000 FAX: (510) 661-0888

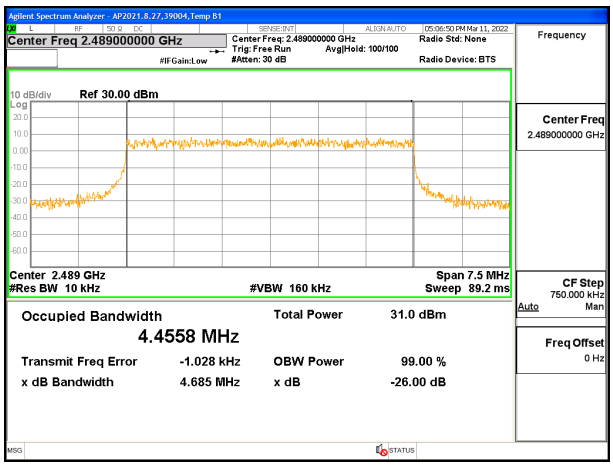
9.2.1. LTE BAND 53



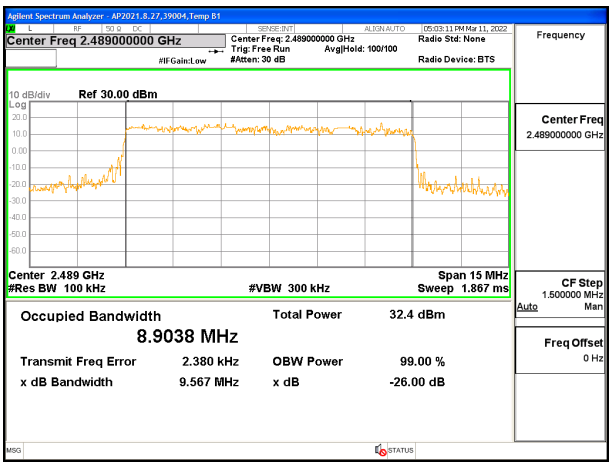
LTE B53 1.4MHz QPSK Middle Channel RB6-0



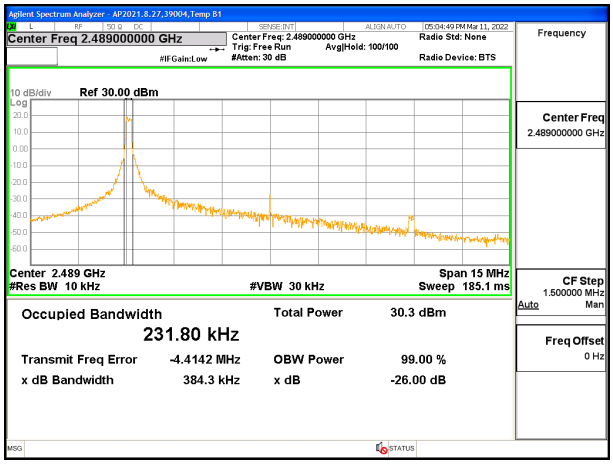
LTE B53 3MHz QPSK Middle Channel RB15-0



LTE B53 5MHz QPSK Middle Channel RB25-0

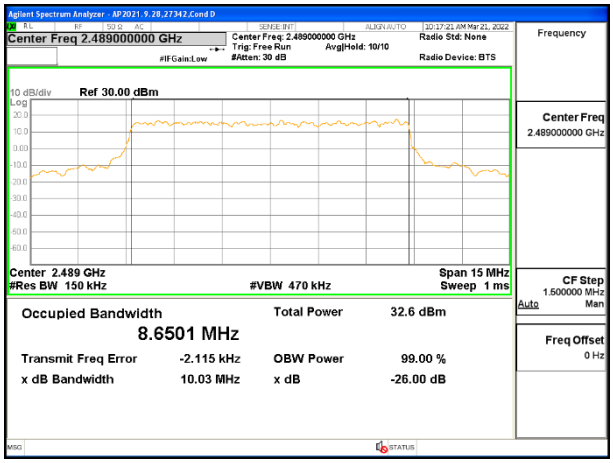


LTE B53 10MHz QPSK Middle Channel RB50-0

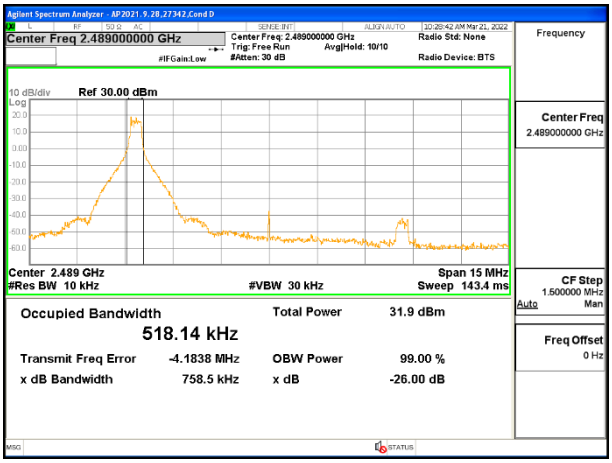


LTE B53 10MHz QPSK Middle Channel RB1-0

9.2.2. 5G NR n53



5G NR n53 10MHz BPSK Middle Channel RB24-0



5G NR n53 10MHz BPSK Middle Channel RB1-0

9.3. MAXIMUM POWER SPECTRAL DENSITY

RULE PART(S)

FCC: §25.149 (c)(4) (iv)
ISED: SMSE-009-20 Annex A 9.f

LIMITS

FCC: The maximum power spectral density conducted to the antenna is not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

ISED: The equipment's maximum power spectral density conducted to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The PSD was measured with the spectrum analyzer at the low/ middle/high channel in each band where RBW=3kHz, VBW ≥ 3 * RBW, detector= RMS (power averaging).

RESULTS

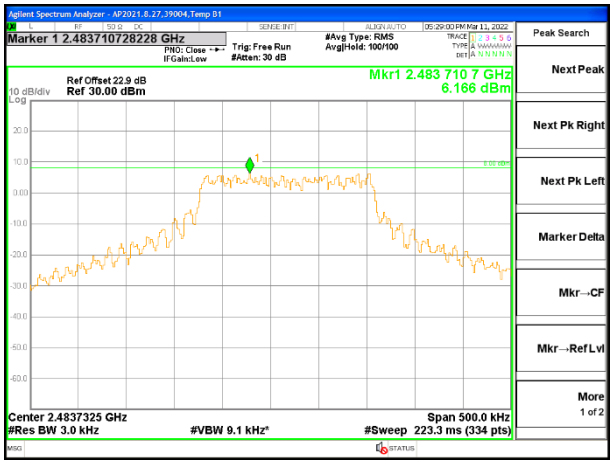
LTE BAND 53

Band	Mode	RB Allocation/RB Offset	f(MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)
LTE BAND 53	1.4MHz, QPSK	1/0	2484.2	6.17	8.0
			2489.0	5.80	
			2494.3	5.37	
	3MHz, QPSK	1/0	2485.0	5.41	
			2489.0	5.89	
			2493.5	5.69	
	5MHz, QPSK	1/0	2486.0	4.84	
			2489.0	6.18	
			2492.5	6.78	
	10MHz, QPSK	1/0	2488.5	5.10	
			2489.0	6.18	
			2490.0	5.22	
		50/0	2488.5	-6.21	
			2489.0	-7.45	
			2490.0	-6.70	

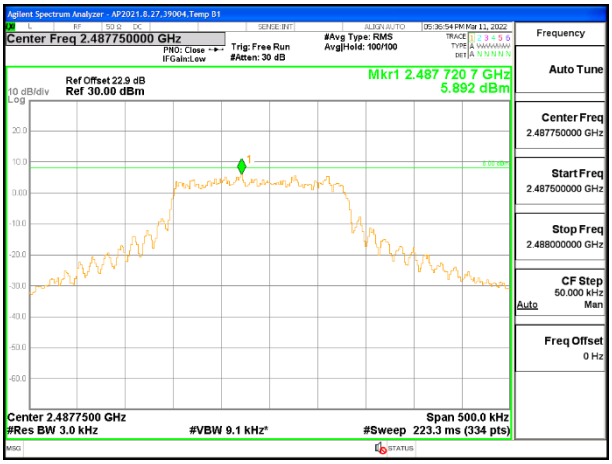
5G NR n53

Band	Mode	RB Allocation/RB Offset	f(MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)
5G NR n53	10MHz, BPSK	1/1	2488.5	7.52	8.0
			2489	7.67	
			2490	7.62	
		24/0	2488.5	-1.92	
			2489	-1.92	
			2490	-1.57	

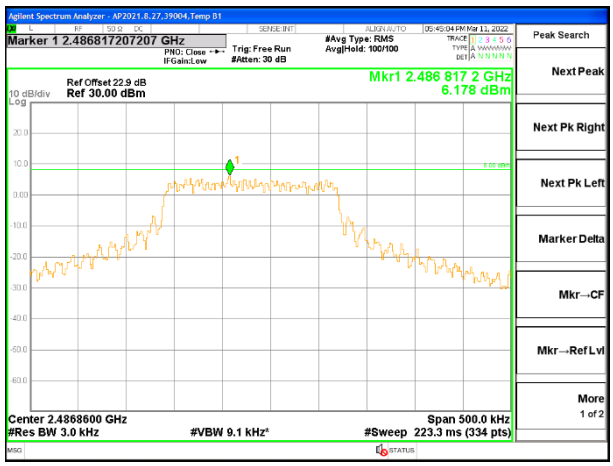
9.3.1. LTE BAND 53



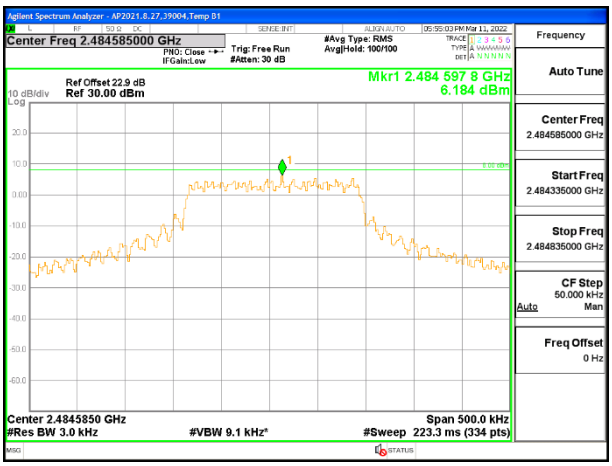
LTE B53 1.4MHz QPSK Middle Channel RB1-0



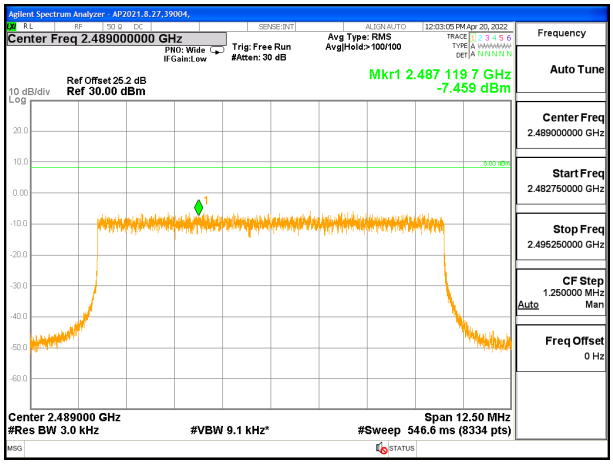
LTE B53 3MHz QPSK Middle Channel RB1-0



LTE B53 5MHz QPSK Middle Channel RB1-0

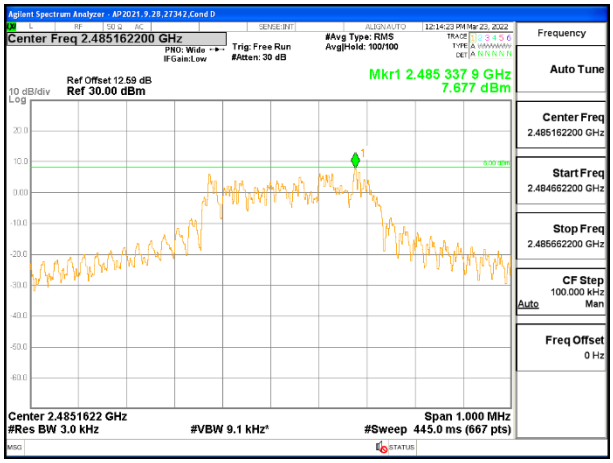


LTE B53 10MHz QPSK Middle Channel RB1-0

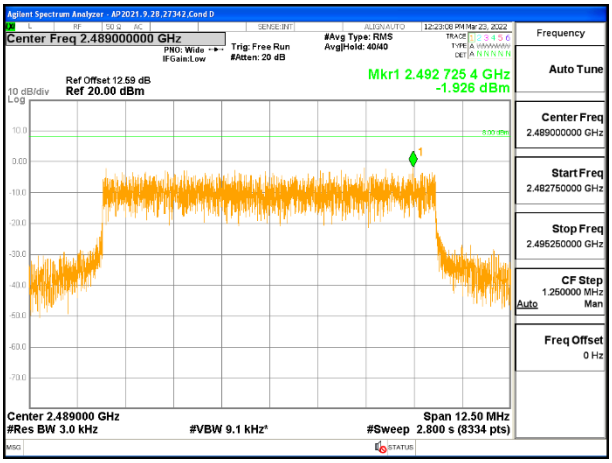


LTE B53 10MHz QPSK Middle Channel RB50-0

9.3.2. 5G NR n53



5G NR n53 10MHz BPSK Middle Channel RB1-1



5G NR n53 10MHz BPSK Middle Channel RB24-0

9.4. 6dB BANDWIDTH

RULE PART(S)

FCC: §25.149 (c)(4) (ii)
ISED: SMSE-009-20 Annex A 9.c

LIMITS

The 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The 6dB bandwidth was measured with the spectrum analyzer at the low/ middle/high channel in each band where RBW is 1%-5% of EBW, VBW ≥ 3 * RBW, Peak detector and max hold.

RESULTS

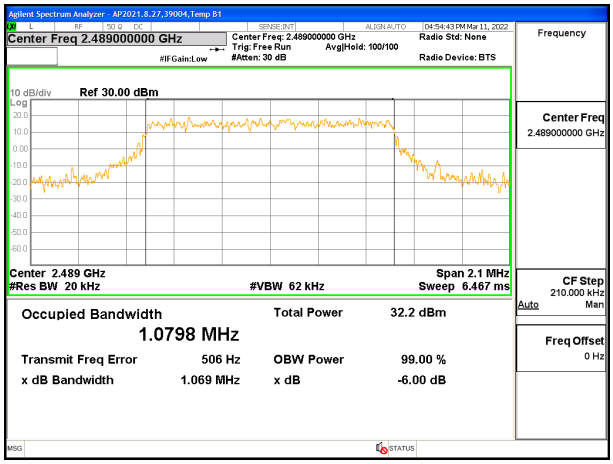
LTE BAND 53

Band	Mode	RB Allocation/RB Offset	f(MHz)	6dB BW (MHz)	6dB BW Limit (MHz)
LTE BAND 53	1.4MHz, QPSK	6/0	2489	1.0798	0.5
	1.4MHz,16QAM			1.0882	
	3MHz, QPSK	15/0		2.6766	
	3MHz, 16QAM			2.6789	
	5MHz, QPSK	25/0		4.4606	
	5MHz, 16QAM			4.4712	
	10MHz, QPSK	50/0		8.9551	
	10MHz, 16QAM			8.9253	

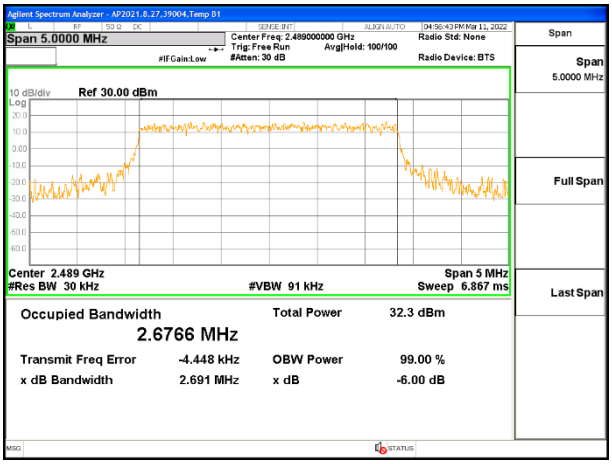
5G NR n53

Band	Mode	RB Allocation/RB Offset	f(MHz)	6dB BW (MHz)	6dB BW Limit (MHz)
5G NR n53	10MHz, BPSK	24/0	2489	8.6514	0.5
	10MHz, QPSK	24/0		8.5961	
	10MHz, 16QAM	24/0		8.9812	

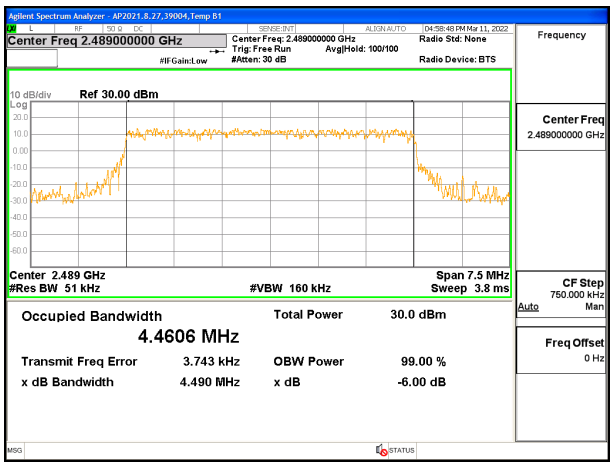
9.4.1. LTE BAND 53



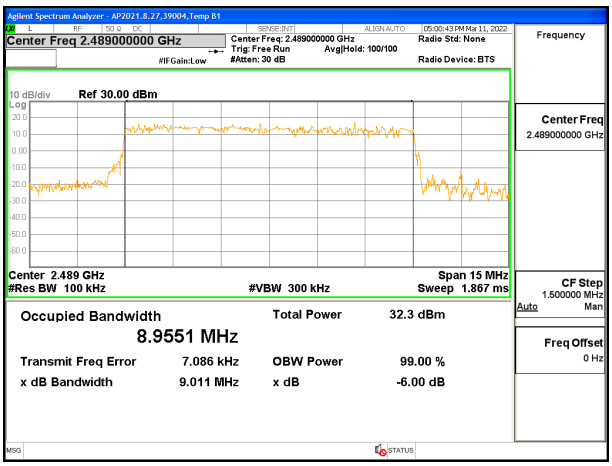
LTE B53 1.4MHz QPSK Middle Channel RB6-0



LTE B53 3MHz QPSK Middle Channel RB15-0

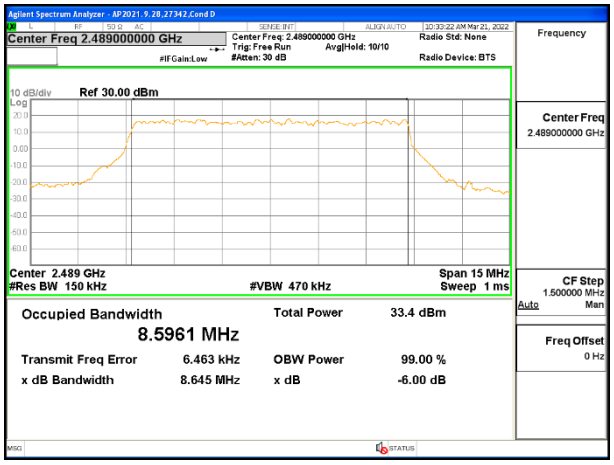


LTE B53 5MHz QPSK Middle Channel RB25-0



LTE B53 10MHz QPSK Middle Channel RB50-0

9.4.2. 5G NR n53



5G NR n53 10MHz BPSK Middle Channel RB24-0

9.5. EMISSION MASK AND BANDEDGE

For Spectrum Emission Mask plots, the Keysight PXA N9030A is configured to sweep with a moving integration window, the width of which can be adjusted to different sizes across the sweep. The window width is configured to be greater than or equal to the required reference bandwidth. The center frequencies of the integration window for the different integration windows were set such that the upper and lower edges of the windows are aligned with the transition points in the reference bandwidths. This is achieved by setting the start / stop frequencies of the window with an offset equal to the reference bandwidth / 2 from the transition point.

RULE PART(S)

FCC: §25.149 (c)(4)
ISED: SMSE-009-20 Annex A 9

LIMITS

FCC: §25.149
(c) Equipment certification. (4) Applications for equipment authorization of terrestrial low-power system equipment that will operate in the 2483.5-2495 MHz band shall demonstrate the following:

(v) Emissions below 2483.5 MHz are attenuated below the transmitter power (P) measured in watts by a factor of at least 40 + 10 log (P) dB at the channel edge at 2483.5 MHz, 43 + 10 log (P) dB at 5 MHz from the channel edge, and 55 + 10 log (P) dB at X MHz from the channel edge where X is the greater of 6 MHz or the actual emission bandwidth.

(vi) Emissions above 2495 MHz are attenuated below the transmitter power (P) measured in watts by a factor of at least 43 + 10 log (P) dB on all frequencies between the channel edge at 2495 MHz and X MHz from this channel edge and 55 + 10 log (P) dB on all frequencies more than X MHz from this channel edge, where X is the greater of 6 MHz or the actual emission bandwidth;

FCC: §25.149 (c)(4)
(vii) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately above and adjacent to the 2495 MHz a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. If 1 percent of the emission bandwidth of the fundamental emission is less than 1 MHz, the power measured must be integrated over the required measurement bandwidth of 1 MHz. A resolution bandwidth narrower than 1 MHz is permitted to improve measurement accuracy, provided the measured power is integrated over the full required measurement bandwidth (*i.e.,* 1 MHz). The emission bandwidth of the fundamental emission of a transmitter 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. When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

ISED: SMSE-900-20 Annex A 9:

(g) For the unwanted emission below 2483.5 MHz, the ATC system's transmitter power, P (Watt), shall be attenuated by at least:

i. 40 + 10 log(P) dB at the channel edge at 2483.5 MHz
ii. 43 + 10 log(P) dB at 5 MHz from the channel edge
iii. 55 + 10 log(P) dB at X MHz from the channel edge

where X is the greater of 6 MHz or the actual emission bandwidth.

(h) For the unwanted emission above 2495 MHz, the ATC system's transmitter power, P (Watt), shall be attenuated by at least:

i. 43 + 10 log(P) dB on all frequencies between the channel edge at 2495 MHz and X MHz from this channel edge
ii. 55 + 10 log(P) dB on all frequencies more than X MHz from this channel edge

where X is the greater of 6 MHz or the actual emission bandwidth.

TEST PROCEDURE FOR UNWANTED EMISSIONS

The transmitter output was connected to a CMW500Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each Emission Mask measurement:

1. Set the spectrum analyzer span to include the block edge frequency.
2. Set the Spectrum Emission Mask to cover all frequencies at their respective limits
3. Set the Spectrum Emission Mask to use the required Measurement Bandwidth
4. Set resolution bandwidth to at least 1% of emission bandwidth.

TEST PROCEDURE For EIRP DENSITY LIMIT

The transmitter output was connected to a CMW500Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each Emission Mask measurement:

1. Set the spectrum analyzer span to include the block edge frequency.
2. Set the Spectrum Emission Mask to cover all frequencies at their respective limits
3. Set the Spectrum Emission Mask to use the Measurement Bandwidth of 30kHz

RESULTS

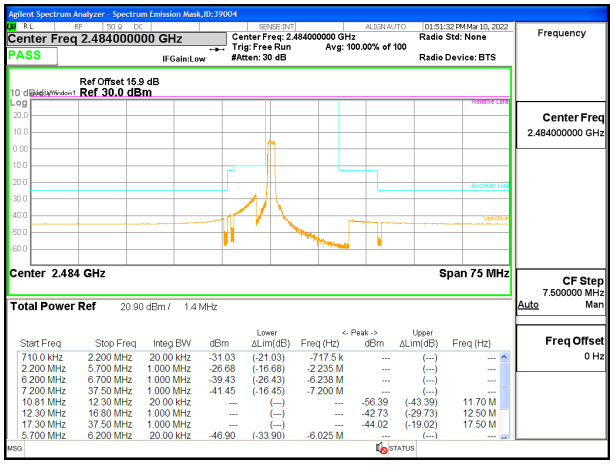
LTE BAND 53

Band	Mode	RB Allocation/ RB Offset	f (MHz)	Highest Cond Power Density (dBm/30kHz)	Highest Antenna Gain (dBi)	Highest EIRP Density (dBm/30kHz)	EIRP Density Limit (dBm/30kHz)
LTE BAND 53	1.4MHz, QPSK	1/0	2484.2	-18.11	-0.6	-19.71	-14.1
		6/0	2484.2	-15.86		-16.46	
		1/5	2494.3	-18.74		-19.34	
		6/0	2494.3	-16.16		-16.76	
	3MHz, QPSK	1/0	2485.0	-20.43		-21.03	
		15/0	2485.0	-17.69		-18.29	
		1/14	2493.5	-21.45		-22.05	
		15/0	2493.5	-17.67		-18.27	
	5MHz, QPSK	1/0	2486.0	-22.79		-23.39	
		25/0	2486.0	-22.81		-23.41	
		1/24	2492.5	-23.36		-23.96	
		25/0	2492.5	-21.41		-22.01	
	10MHz, QPSK	1/0	2488.5	-18.48		-19.08	
		50/0	2488.5	-27.57		-28.17	
		1/49	2490.0	-34.34		-34.94	
		50/0	2490.0	-26.61		-27.21	

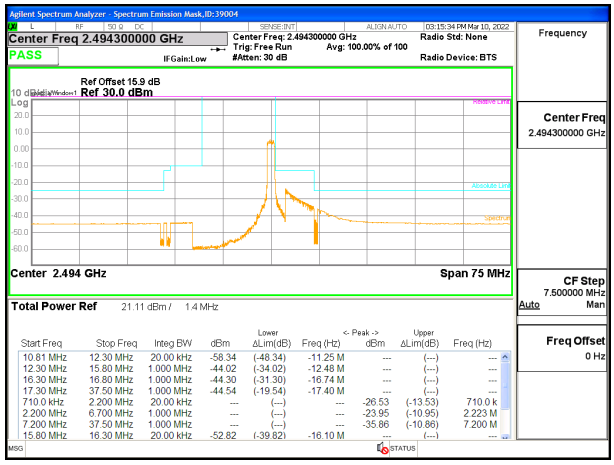
5G NR n53

Band	Mode	RB Allocation/ RB Offset	f (MHz)	Highest Cond Power Density (dBm/30kHz)	Highest Antenna Gain (dBi)	Highest EIRP Density (dBm/30kHz)	EIRP Density Limit (dBm/30kHz)
5G NR n53	10MHz, BPSK	1/0	2488.5	-25.28	-0.6	-25.88	-14.1
		24/0	2488.5	-26.47		-27.07	
		1/23	2490.0	-23.44		-24.04	
		24/0	2490.0	-25.97		-26.57	

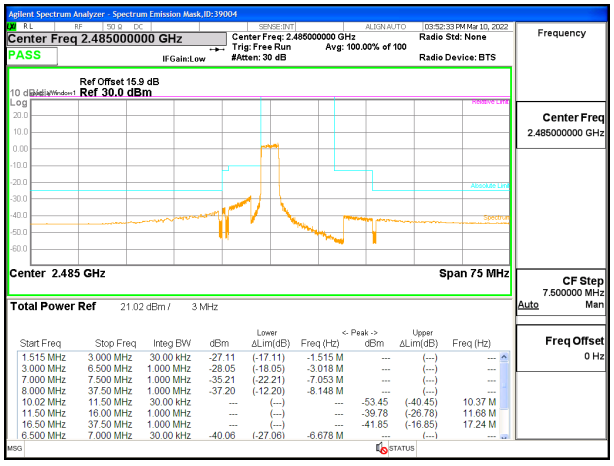
9.5.1. LTE BAND 53 BANDEGE



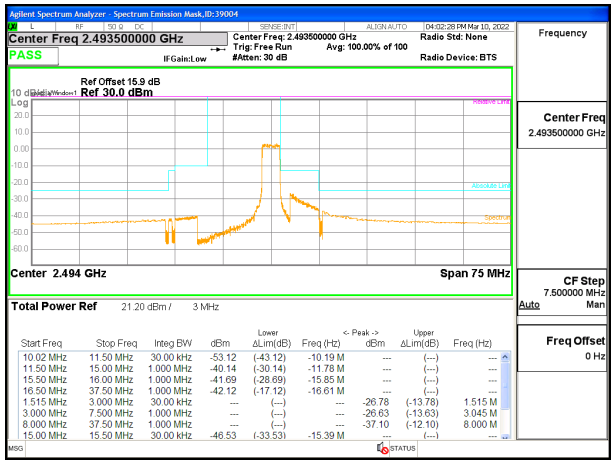
LTE B53 1.4MHz QPSK Low Channel RB6-0



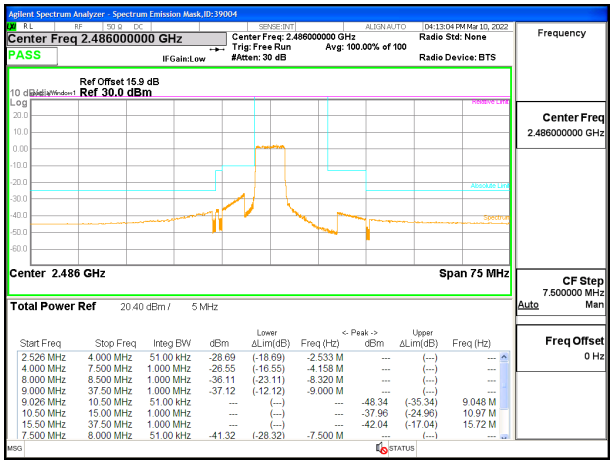
LTE B53 1.4MHz QPSK High Channel RB6-0



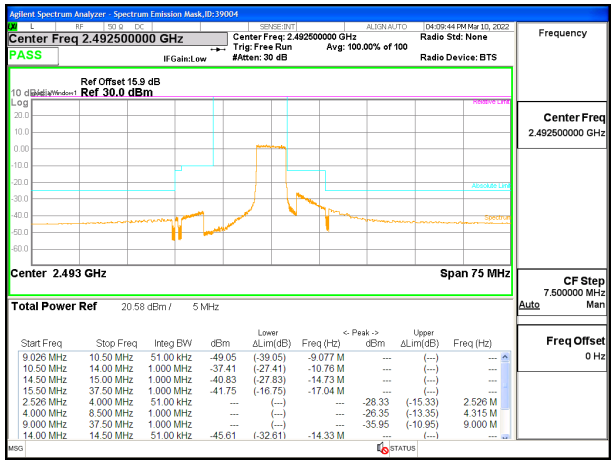
LTE B53 3MHz QPSK Low Channel RB15-0



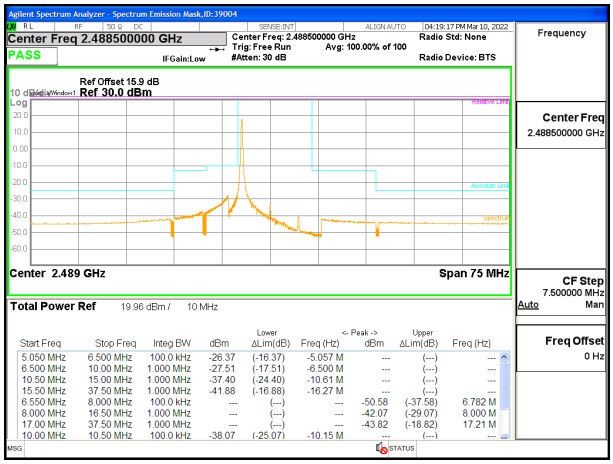
LTE B53 3MHz QPSK High Channel RB15-0



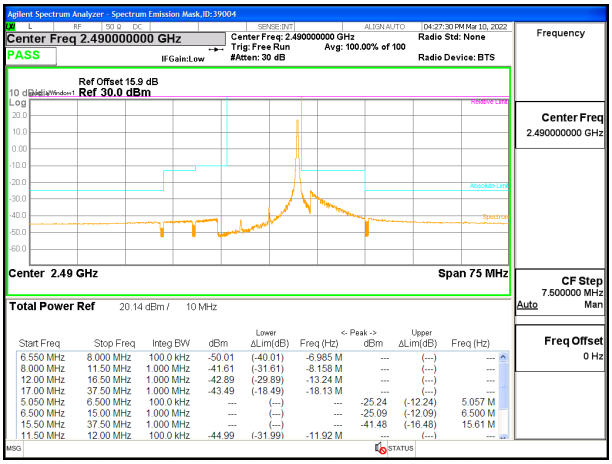
LTE B53 5MHz QPSK Low Channel RB25-0



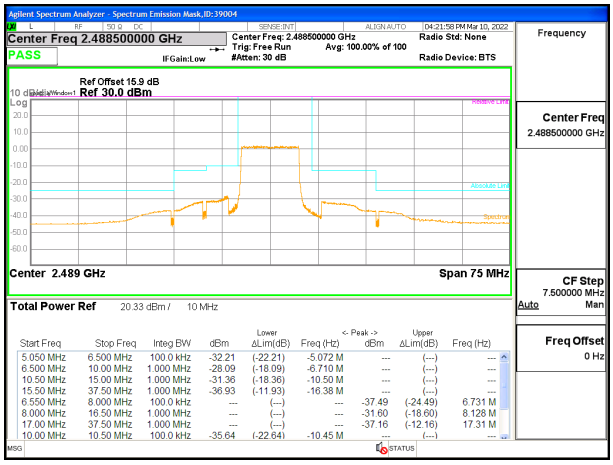
LTE B53 5MHz QPSK High Channel RB25-0



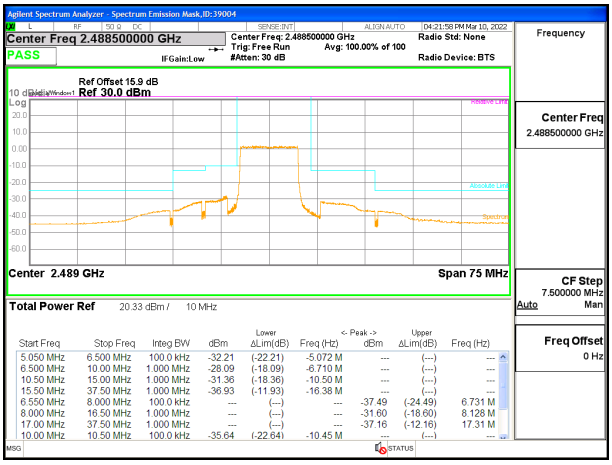
LTE B53 10MHz QPSK Low Channel RB1-0



LTE B53 10MHz QPSK High Channel RB1-49

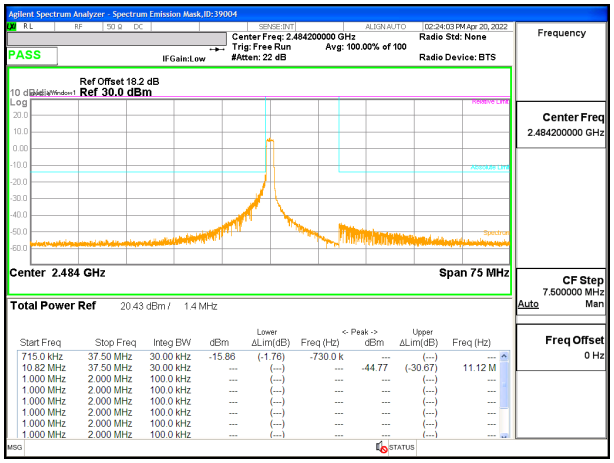


LTE B53 10MHz QPSK Low Channel RB50-0

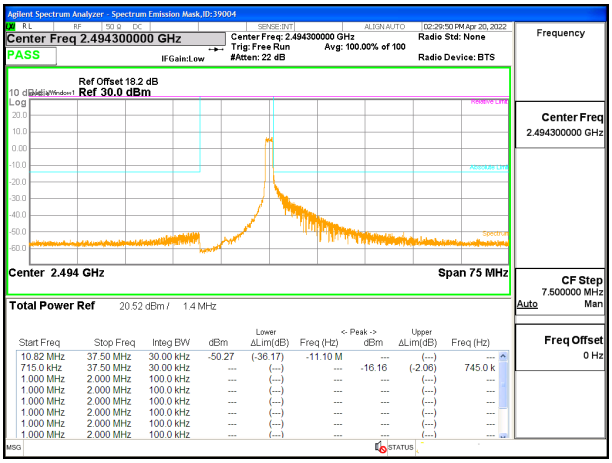


LTE B53 10MHz QPSK High Channel RB50-0

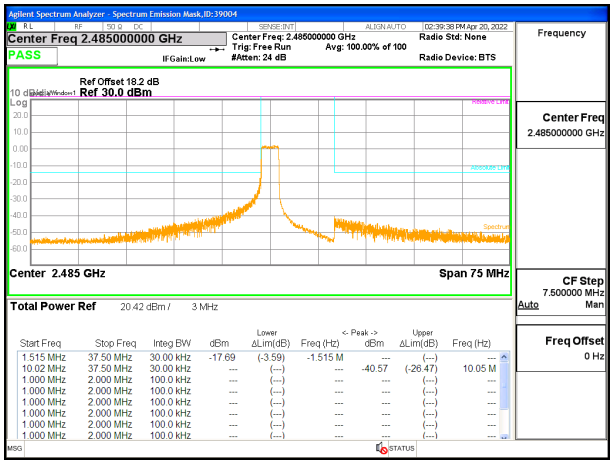
9.5.2 LTE BAND 53 EIRP DENSITY



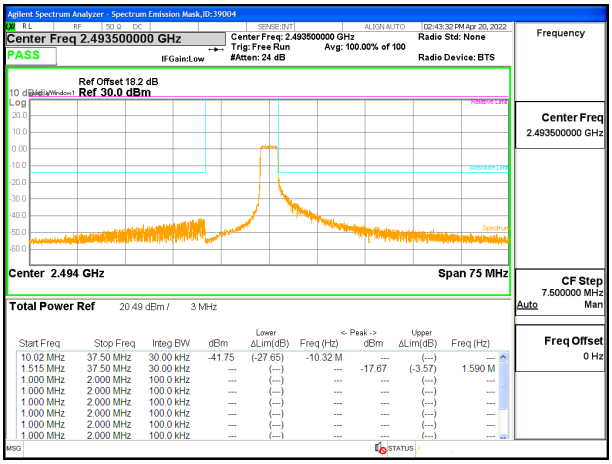
LTE B53 1.4MHz QPSK Low Channel RB6-0



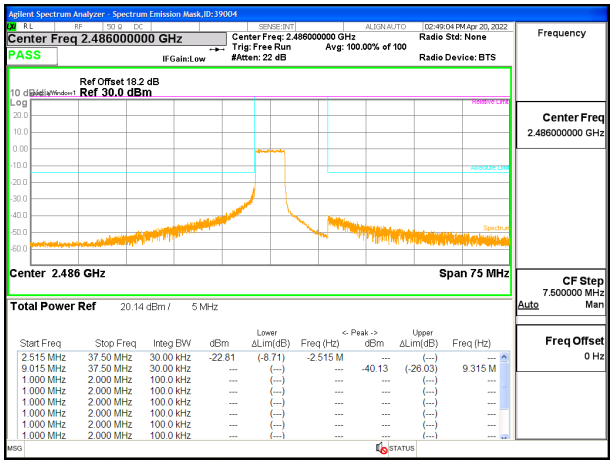
LTE B53 1.4MHz QPSK High Channel RB6-0



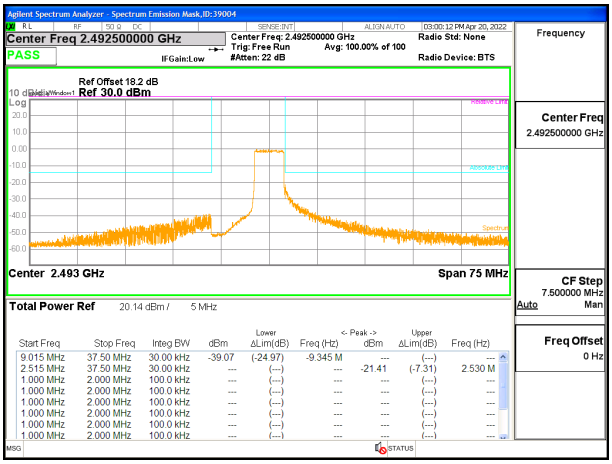
LTE B53 3MHz QPSK Low Channel RB15-0



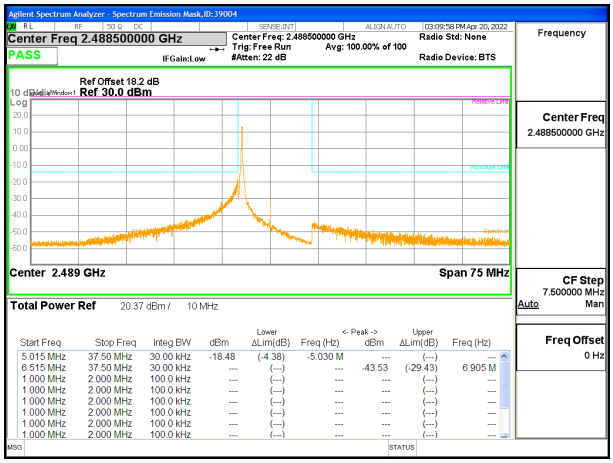
LTE B53 3MHz QPSK High Channel RB15-0



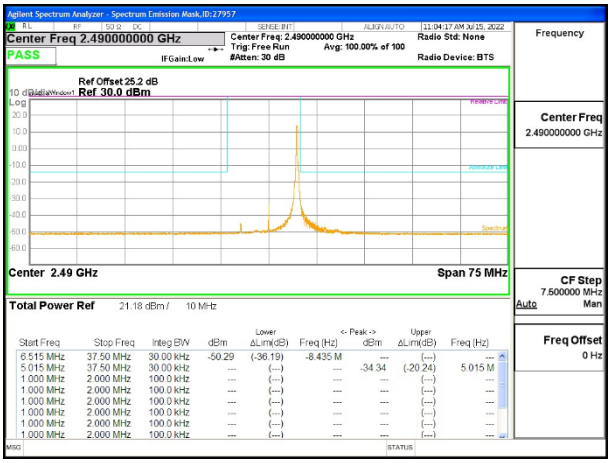
LTE B53 5MHz QPSK Low Channel RB25-0



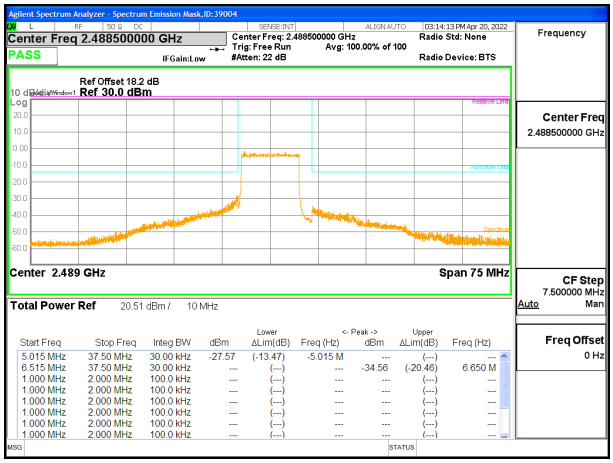
LTE B53 5MHz QPSK High Channel RB25-0



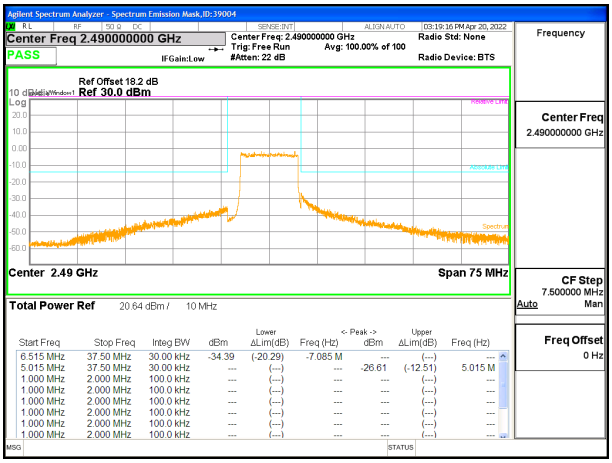
LTE B53 10MHz QPSK Low Channel RB1-0



LTE B53 10MHz QPSK High Channel RB1-49

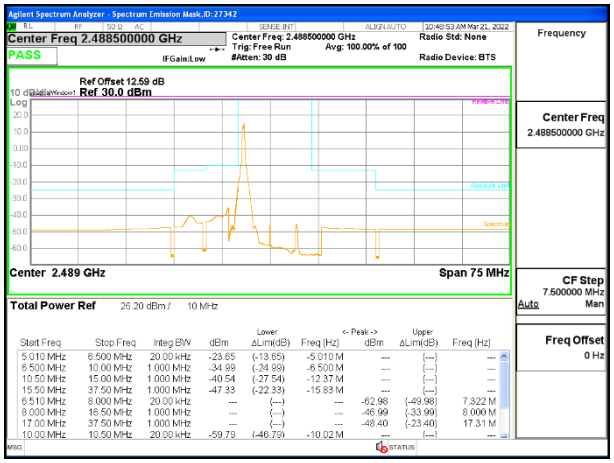


LTE B53 10MHz QPSK Low Channel RB50-0

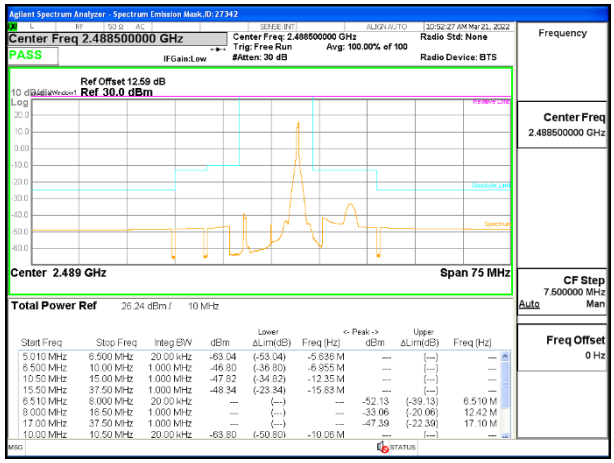


LTE B53 10MHz QPSK High Channel RB50-0

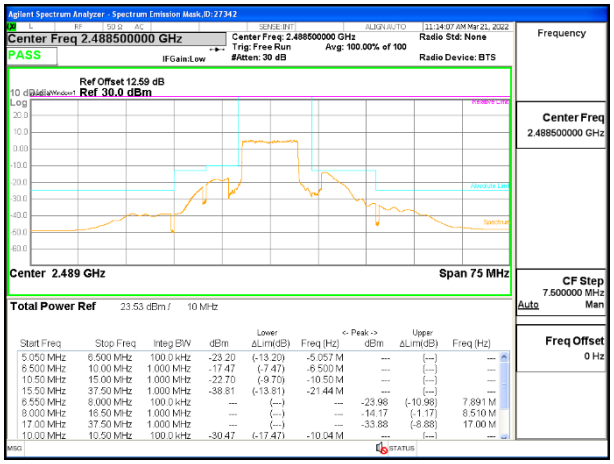
9.5.3. 5G NR n53 BANDEDGE



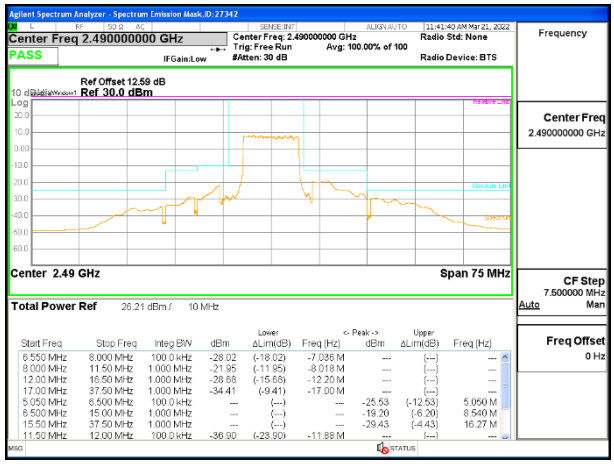
5G NR n53 10MHz BPSK Low Channel RB1-0



5G NR n53 10MHz BPSK High Channel RB1-23

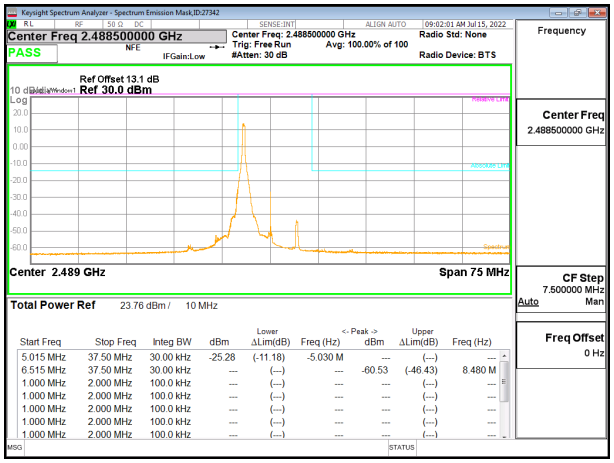


5G NR n53 10MHz BPSK Low Channel RB24-0

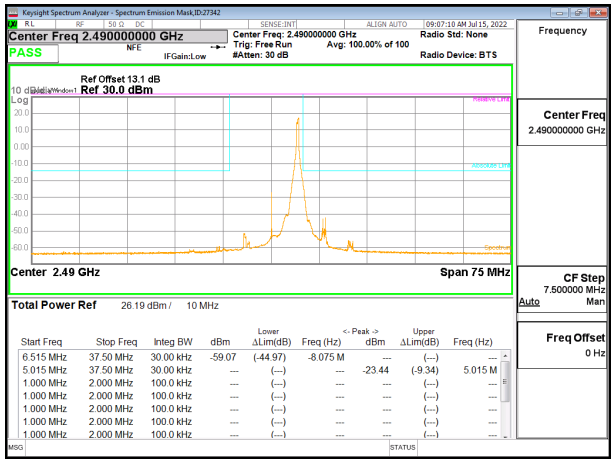


5G NR n53 10MHz BPSK High Channel RB24-0

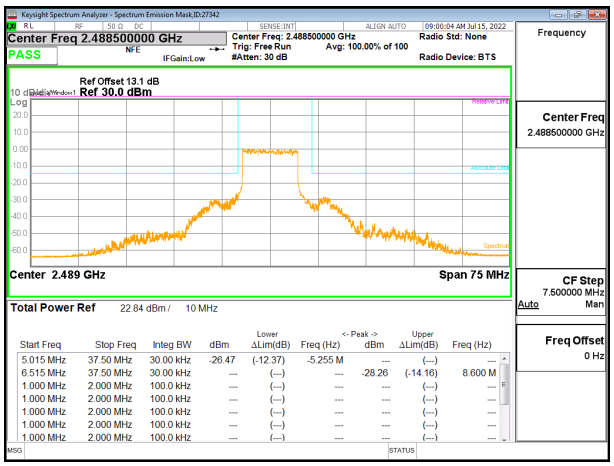
9.5.4. 5G NR n53 EIRP DENSITY



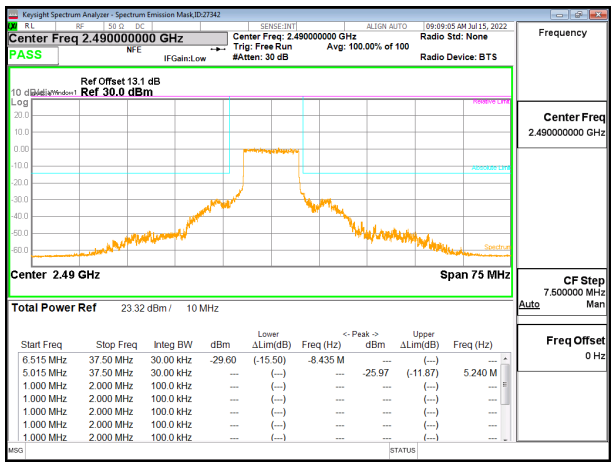
5G NR n53 10MHz BPSK Low Channel RB1-0



5G NR n53 10MHz BPSK High Channel RB1-23



5G NR n53 10MHz BPSK Low Channel RB24-0



5G NR n53 10MHz BPSK High Channel RB24-0

9.6. OUT OF BAND EMISSIONS

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -25dBm according to the band Limit
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

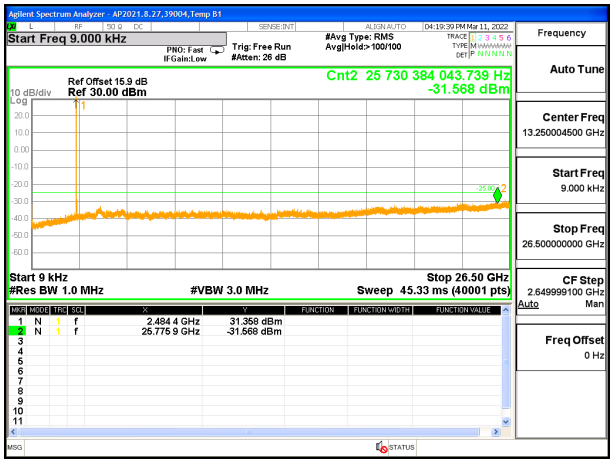
RESULTS

9.6.1. LTE BAND 53

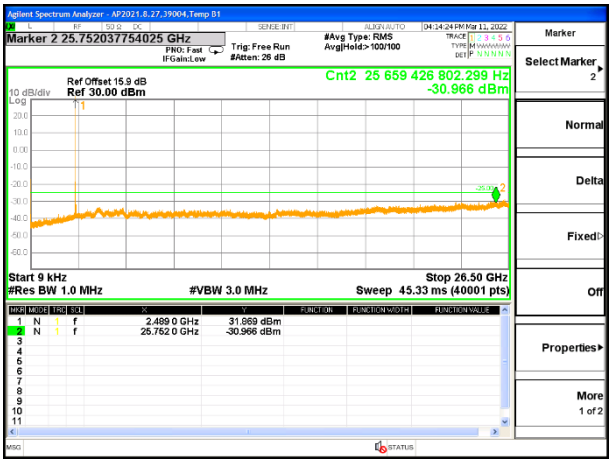
LIMITS

FCC: §25.149 (c)(4)
The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.

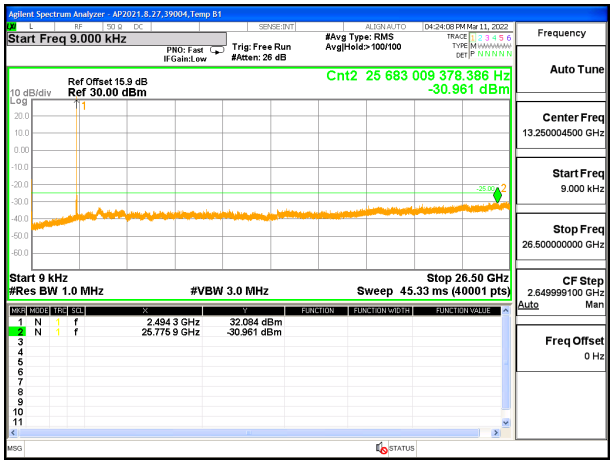
ISED: SMSE-900-20 Annex A 9.g
The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.



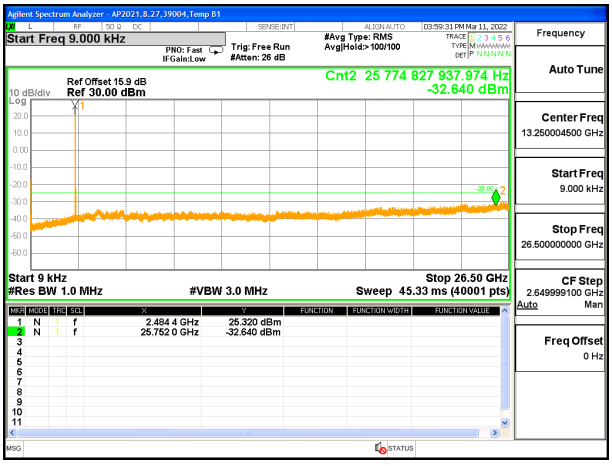
LTE B53 1.4MHz QPSK Low Channel RB1-0



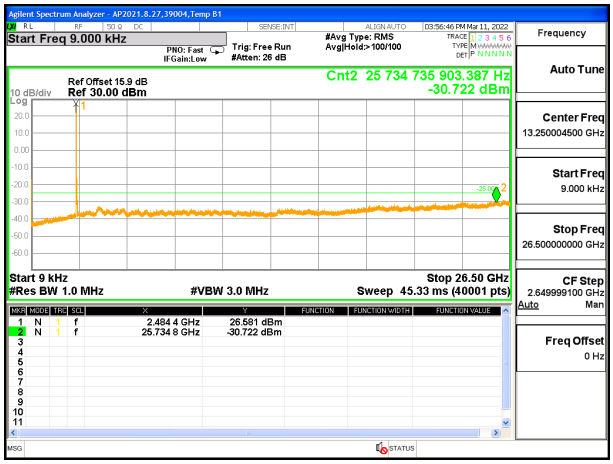
LTE B53 1.4MHz QPSK Middle Channel RB1-0



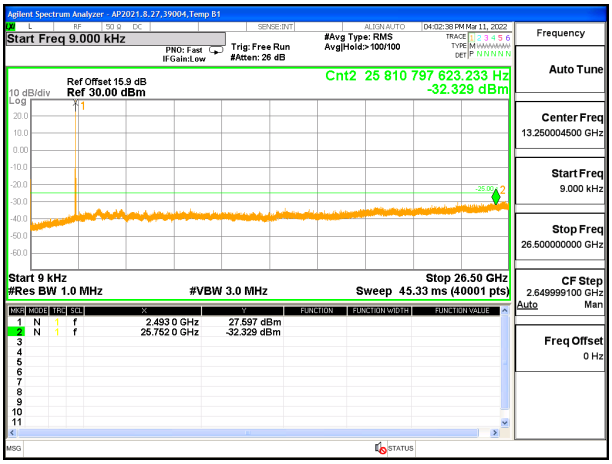
LTE B53 1.4MHz QPSK High Channel RB1-0



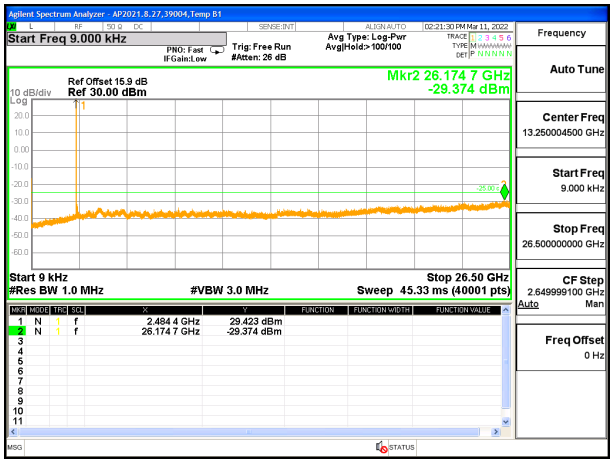
LTE B53 3MHz QPSK Low Channel RB1-0



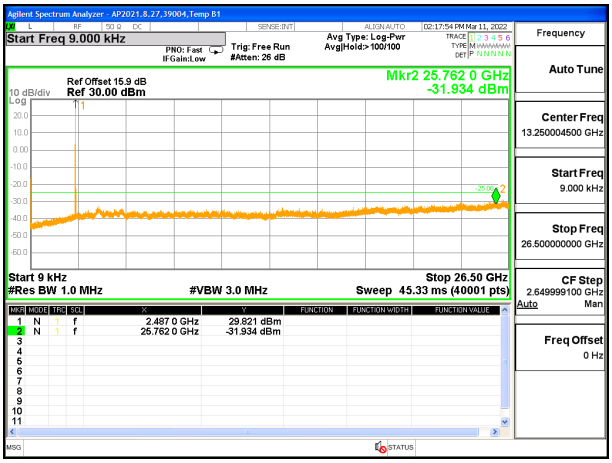
LTE B53 3MHz QPSK Middle Channel RB1-0



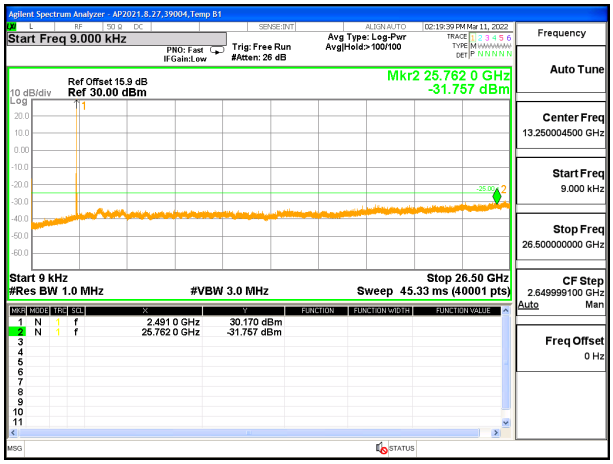
LTE B53 3MHz QPSK High Channel RB1-0



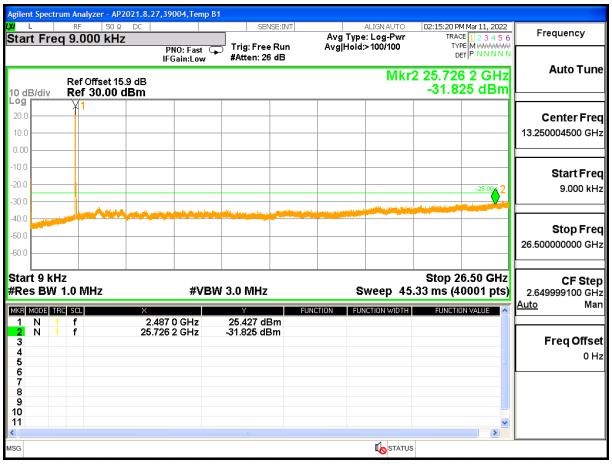
LTE B53 5MHz QPSK Low Channel RB1-0



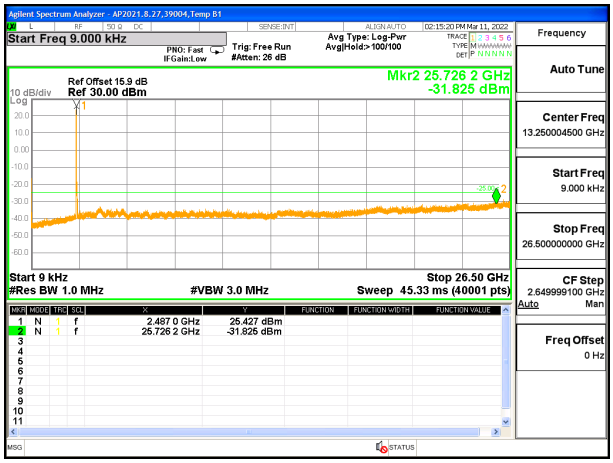
LTE B53 5MHz QPSK Middle Channel RB1-0



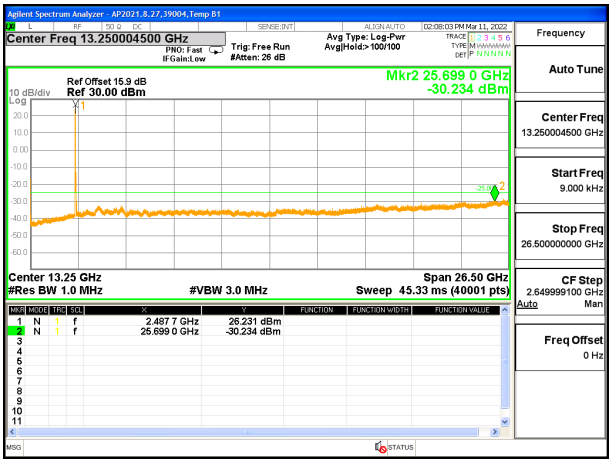
LTE B53 5MHz QPSK High Channel RB1-0



LTE B53 10MHz QPSK Low Channel RB1-0

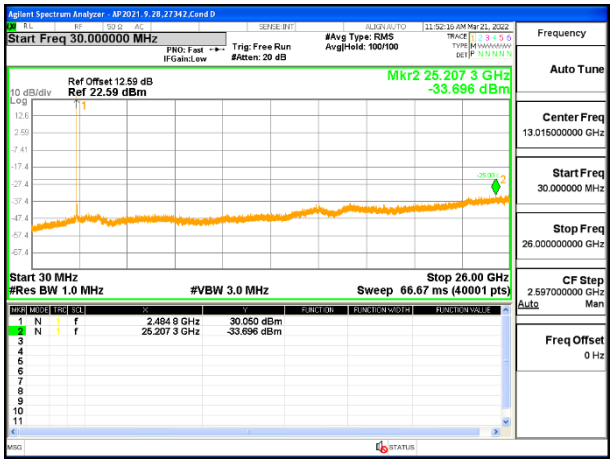


LTE B53 10MHz QPSK Middle Channel RB1-0

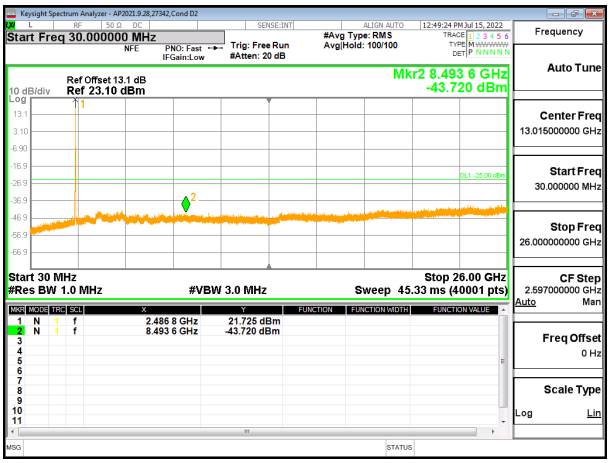


LTE B53 10MHz QPSK High Channel RB1-0

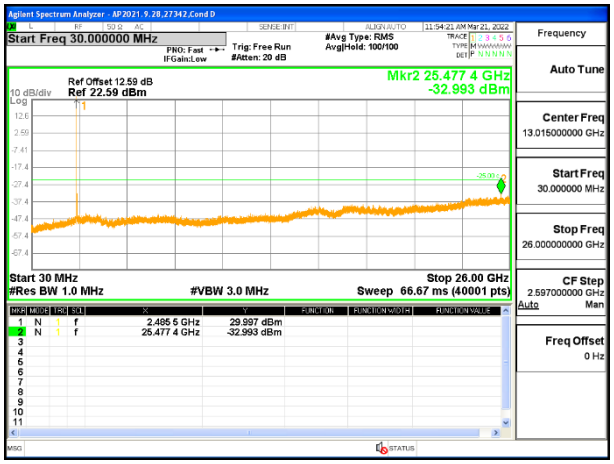
9.6.2. 5G NR n53



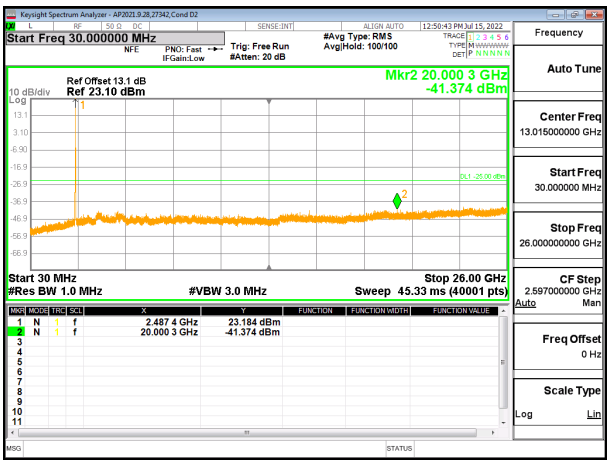
5G NR n53 10MHz BPSK Low Channel RB1-0



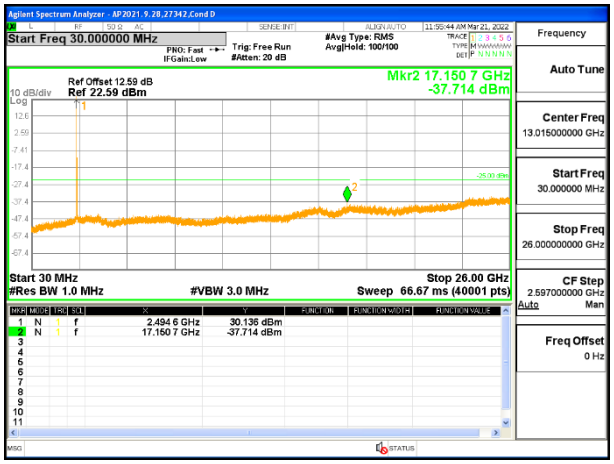
5G NR n53 10MHz BPSK Low Channel RB24-0



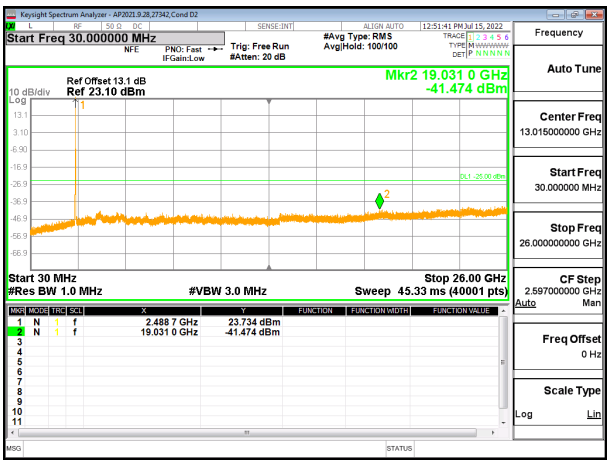
5G NR n53 10MHz BPSK Mid Channel RB1-1



5G NR n53 10MHz BPSK Middle Channel RB24-0



5G NR n53 10MHz BPSK High Channel RB1-23



5G NR n53 10MHz BPSK High Channel RB24-0

9.7. FREQUENCY STABILITY

LIMITS

FCC: §25.202 (d)
(d) Frequency tolerance, Earth stations. The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

222TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = −30°C to +50°C
- Voltage = (85% - 115%)

  Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC.
  End Voltage, 3.2VDC.

Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

RESULTS

See the following pages.

LIMITS

FCC: §25.202 (d)
(d) Frequency tolerance, Earth stations. The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

Test Engineer ID:	38602	Test Date:	3/15/2022

9.7.1. LTE BAND 53 QPSK (10MHz BANDWIDTH)

Band	53	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2483.5	2495		10	
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	2484.0000	2494.4970			
Extreme (50°C)		2484.0000	2494.4970	1.4	0.001	Yes
Extreme (40°C)		2484.0000	2494.4970	-8.5	-0.003	Yes
Extreme (30°C)		2484.0000	2494.4970	-3.3	-0.001	Yes
Extreme (10°C)		2484.0000	2494.4970	-13.4	-0.005	Yes
Extreme (0°C)		2484.0000	2494.4970	0.7	0.000	Yes
Extreme (-10°C)		2484.0000	2494.4970	-13.2	-0.005	Yes
Extreme (-20°C)		2484.0000	2494.4970	-8.3	-0.003	Yes
Extreme (-30°C)		2484.0000	2494.4970	-4.8	-0.002	Yes
20°C	15%	2484.0000	2494.4970	-7.4	-0.003	Yes
	-15%	2484.0000	2494.4970	-5.5	-0.002	Yes
	End Point Voltage	2484.0000	2494.4970	-3.7	-0.001	Yes

9.7.2. 5G NR n53 BPSK (10MHz BANDWIDTH)

Band	53	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2483.5	2495		10	
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	2484.1992	2494.3547			
Extreme (50°C)		2484.1992	2494.3547	-4.0	-0.002	Yes
Extreme (40°C)		2484.1992	2494.3547	-3.2	-0.001	Yes
Extreme (30°C)		2484.1992	2494.3547	-4.8	-0.002	Yes
Extreme (10°C)		2484.1992	2494.3547	-1.1	0.000	Yes
Extreme (0°C)		2484.1992	2494.3547	-2.2	-0.001	Yes
Extreme (-10°C)		2484.1992	2494.3547	-5.5	-0.002	Yes
Extreme (-20°C)		2484.1992	2494.3547	-6.8	-0.003	Yes
Extreme (-30°C)		2484.1992	2494.3547	-4.6	-0.002	Yes
20°C	15%	2484.1992	2494.3547	-2.7	-0.001	Yes
	-15%	2484.1992	2494.3547	-1.7	-0.001	Yes
	End Point Voltage	2484.1992	2494.3547	-2.4	-0.001	Yes

10. RADIATED TEST RESULTS

Radiated measurement using the Field Strength Method

Using the test configuration shown in Figure 6 below, We measure the radiated emissions directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits. As stated in 5.5.1 of ANSI C63.26-2015, the field strength measurement method using a test site validated to the requirements of ANSI C63.4 is an alternative to the substitution measurement method.

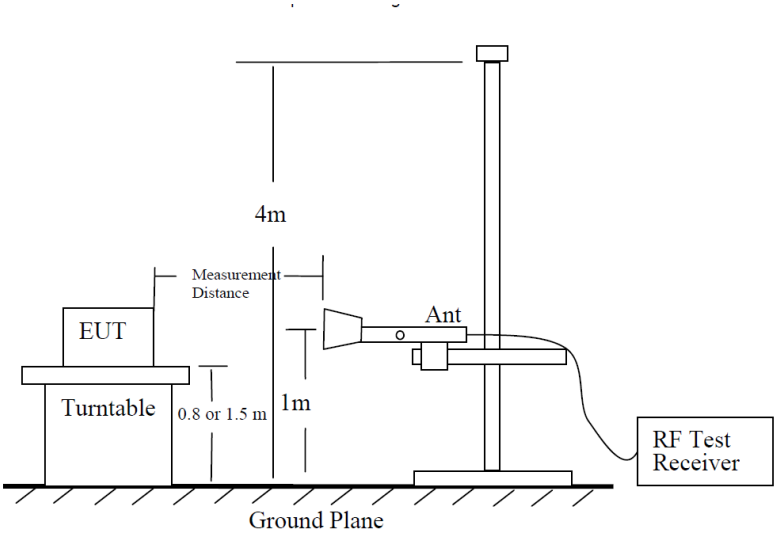


Figure 6 —Test site-up for radiated ERP and/or EIRP measurements

Radiated Power Measurement Calculation According to ANSI C63.26-2015

a) E (dBµV/m) = Measured amplitude level (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m).

b) E (dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m).

c) E (dBµV/m) = EIRP (dBm) − 20log(D) + 104.8; where D is the measurement distance (in the far field region) in m.

d) EIRP (dBm) = E (dBµV/m) + 20log(D) − 104.8; where D is the measurement distance (in the far field region) in m.

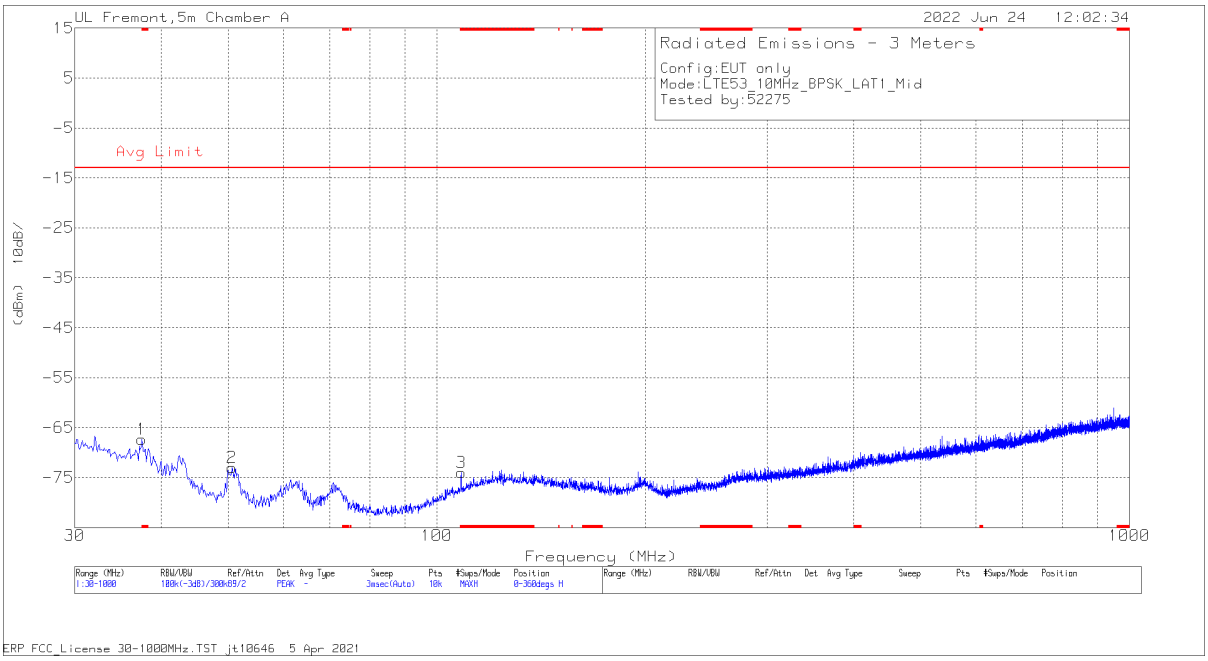
So, from d)

The measuring distance is usually at 3m, then 20*Log(3)=9.5424

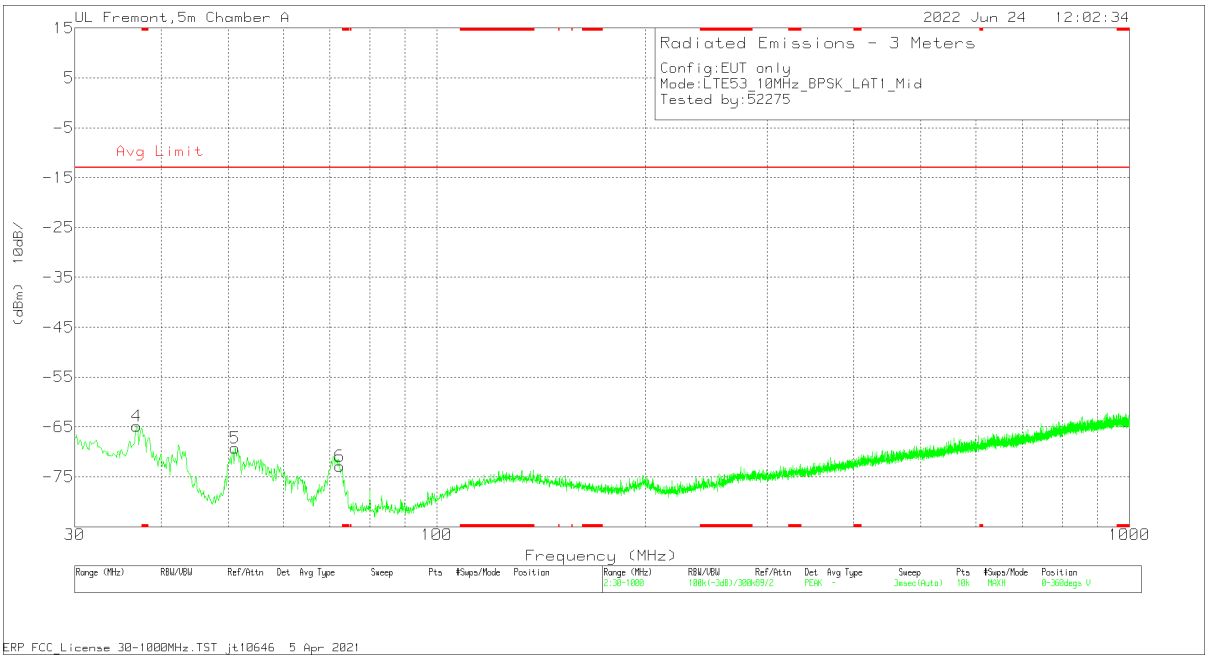
Then, EIRP (dBm) = E (dBµV/m) + 9.5424 − 104.8 = E (dBµV/m) – 95.2576

Note: Confidence check of each chamber is performed daily to see if any degradation from expected/normal reading reference data. Ambient check of each chamber is performed monthly.

Example Plot Below 1GHz



Horizontal Polarity

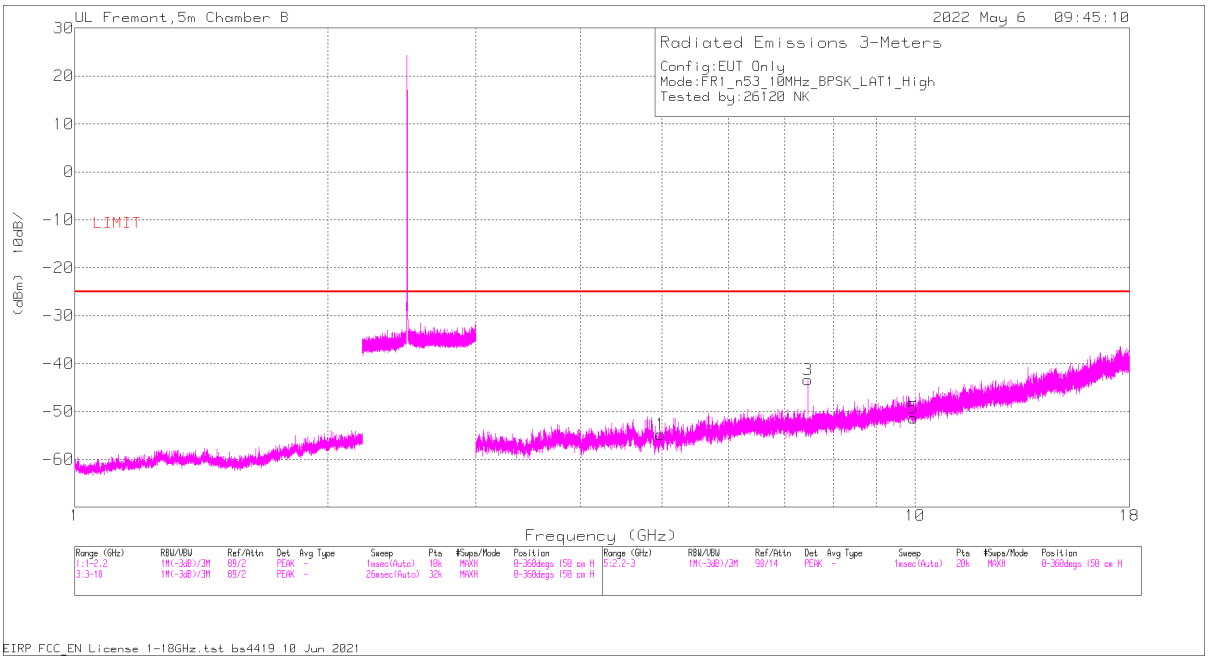


Vertical Polarity

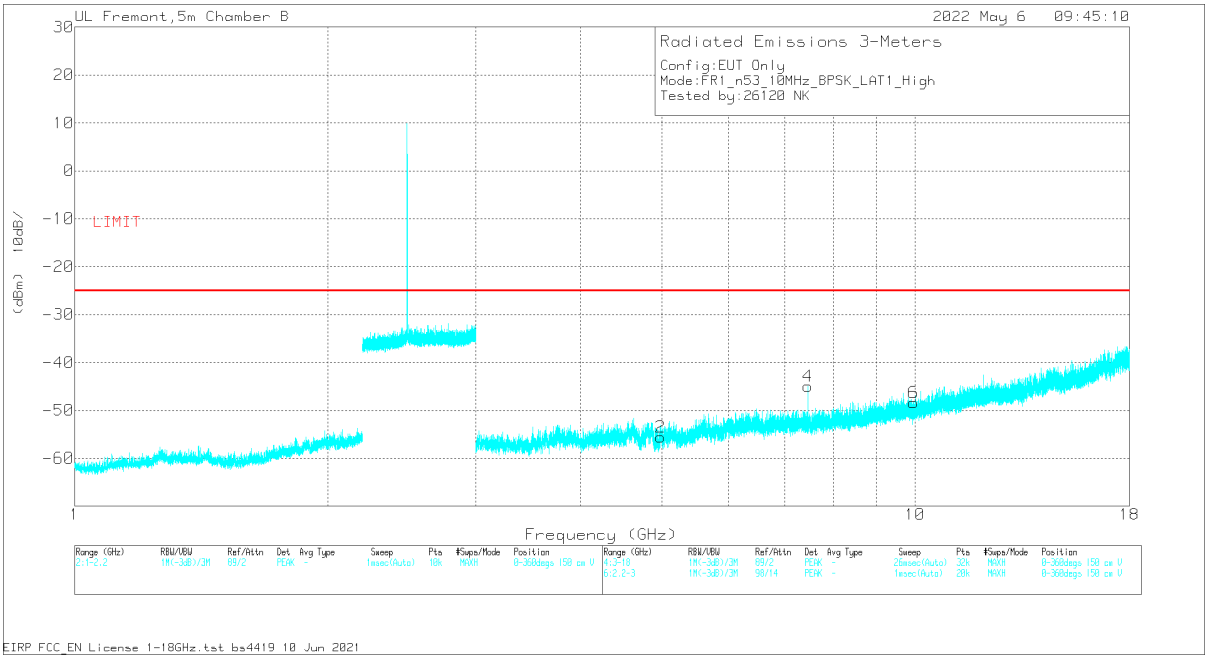
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	85151 ACF (dB)_3m	Amp/Cbl (dB/m)	EIRP CF	Corrected Reading (dBm)	Avg Limit	Margin (dB)	Polarity
3	* 108.376	29.08	Pk	18.3	-26.2	-95.2	-74.02	-13	-61.02	H
4	36.887	34.38	Pk	23.2	-27.2	-95.2	-64.82	-13	-51.82	V
1	37.469	32.3	Pk	22.8	-27.2	-95.2	-67.3	-13	-54.3	H
2	50.564	34.52	Pk	14.6	-26.9	-95.2	-72.98	-13	-59.98	H
5	51.146	38.32	Pk	14.5	-26.9	-95.2	-69.28	-13	-56.28	V
6	72.389	34.76	Pk	14.3	-26.7	-95.2	-72.84	-13	-59.84	V

Example Plot Above 1GHz



Horizontal Polarity



Vertical Polarity

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
1	4.98	36.88	Pk	34.1	-30.8	.3	-95.2	-54.72	-25	-29.72	H
2	4.98	36.07	Pk	34.1	-30.8	.3	-95.2	-55.53	-25	-30.53	V
3	7.456875	42.57	Pk	35.8	-26.9	.4	-95.2	-43.33	-25	-18.33	H
4	7.457813	40.96	Pk	35.8	-26.9	.4	-95.2	-44.94	-25	-19.94	V
5	9.96	30.85	Pk	37.1	-24.9	.8	-95.2	-51.35	-25	-26.35	H
6	9.960469	33.85	Pk	37.1	-24.9	.8	-95.2	-48.35	-25	-23.35	V

Pk - Peak detector

10.1. FIELD STRENGTH OF SPURIOUS RADIATION, ANT 1

TEST PROCEDURE

KDB 971168 D01 v03r01/D02 v02/r01

All tests above 1GHz were done with a Resolution Bandwidth of 1MHz, and a Video Bandwidth of 3MHz.

The transmitter output was connected to a CMW500Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

FCC: §25.149 (c)(4)
(vii) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately above and adjacent to the 2495 MHz a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. If 1 percent of the emission bandwidth of the fundamental emission is less than 1 MHz, the power measured must be integrated over the required measurement bandwidth of 1 MHz. A resolution bandwidth narrower than 1 MHz is permitted to improve measurement accuracy, provided the measured power is integrated over the full required measurement bandwidth (*i.e.,* 1 MHz). The emission bandwidth of the fundamental emission of a transmitter 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. When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

ISED: SMSE-009-20 Annex A 9
j. Compliance with this limit may be based on the use of a measurement resolution bandwidth of at least 1% of the occupied bandwidth. If 1% of the occupied bandwidth is less than 1 MHz, the power measured shall be integrated over the required measurement bandwidth of 1 MHz

RESULTS

10.1.1. LTE BAND 53

QPSK LTE BAND 53 (10.0MHZ BANDWIDTH), 1RB

Project #:	14040867
Date:	5/6/2022
Test Engineer:	45258
Configuration:	EUT Only
Mode	LTE_B53_10MHz_QPSK
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF 80402 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.968281	34.75	Pk	34.3	-24.6	0.3	-95.2	-50.45	-25	-25.45	H
4.968281	35.62	Pk	34.3	-24.6	0.3	-95.2	-49.58	-25	-24.58	V
7.45125	31.73	Pk	35.5	-20.1	0.4	-95.2	-47.67	-25	-22.67	H
7.45125	27.81	Pk	35.5	-20.1	0.4	-95.2	-51.59	-25	-26.59	V
9.93375	27.71	Pk	37.1	-17.2	0.7	-95.2	-46.89	-25	-21.89	H
9.93375	29.98	Pk	37.1	-17.2	0.7	-95.2	-44.62	-25	-19.62	V
Mid Channel, 2489MHz										
4.979063	35.35	Pk	34.2	-24.7	0.3	-95.2	-50.05	-25	-25.05	H
4.979063	33.3	Pk	34.2	-24.7	0.3	-95.2	-52.1	-25	-27.1	V
7.468125	28.64	Pk	35.6	-20.1	0.4	-95.2	-50.66	-25	-25.66	H
7.468125	30	Pk	35.6	-20.1	0.4	-95.2	-49.3	-25	-24.3	V
9.958125	28.96	Pk	37.1	-17.1	0.8	-95.2	-45.44	-25	-20.44	H
9.958125	31.32	Pk	37.1	-17.1	0.8	-95.2	-43.08	-25	-18.08	V
High Channel, 2490MHz										
4.980469	35.05	Pk	34.2	-24.7	0.3	-95.2	-50.35	-25	-25.35	H
4.980469	34.37	Pk	34.2	-24.7	0.3	-95.2	-51.03	-25	-26.03	V
7.471406	29.12	Pk	35.6	-20.2	0.4	-95.2	-50.28	-25	-25.28	H
7.471406	33.69	Pk	35.6	-20.2	0.4	-95.2	-45.71	-25	-20.71	V
9.96	28.53	Pk	37.1	-17.1	0.8	-95.2	-45.87	-25	-20.87	H
9.96	31.95	Pk	37.1	-17.1	0.8	-95.2	-42.45	-25	-17.45	V

QPSK LTE BAND 53 (10.0MHZ BANDWIDTH), 50RB

Project #:	14040867
Date:	5/6/2022
Test Engineer:	45258
Configuration:	EUT Only
Mode	LTE_B53_10MHz_QPSK
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF 80402 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.967344	35.06	Pk	34.3	-24.6	.3	-95.2	-50.14	-25	-25.14	H
4.967344	33.92	Pk	34.3	-24.6	.3	-95.2	-51.28	-25	-26.28	V
7.450313	31.64	Pk	35.5	-20.1	.4	-95.2	-47.76	-25	-22.76	H
7.450313	28.9	Pk	35.5	-20.1	.4	-95.2	-50.5	-25	-25.5	V
9.934688	27.12	Pk	37.1	-17.2	.7	-95.2	-47.48	-25	-22.48	H
9.934688	28.42	Pk	37.1	-17.2	.7	-95.2	-46.18	-25	-21.18	V
Mid Channel, 2489MHz										
4.978594	34.23	Pk	34.2	-24.7	.3	-95.2	-51.17	-25	-26.17	H
4.978594	33.06	Pk	34.2	-24.7	.3	-95.2	-52.34	-25	-27.34	V
7.466719	32.05	Pk	35.6	-20.1	.4	-95.2	-47.25	-25	-22.25	H
7.466719	29.6	Pk	35.6	-20.1	.4	-95.2	-49.7	-25	-24.7	V
9.957656	28.69	Pk	37.1	-17.1	.8	-95.2	-45.71	-25	-20.71	H
9.957656	31.37	Pk	37.1	-17.1	.8	-95.2	-43.03	-25	-18.03	V
High Channel, 2490MHz										
4.989375	34.89	Pk	34.3	-24.6	.4	-95.2	-50.21	-25	-25.21	H
4.989375	36.51	Pk	34.3	-24.6	.4	-95.2	-48.59	-25	-23.59	V
7.484063	30.85	Pk	35.6	-20.4	.4	-95.2	-48.75	-25	-23.75	H
7.484063	28.06	Pk	35.6	-20.4	.4	-95.2	-51.54	-25	-26.54	V
9.973594	29.07	Pk	37.2	-17.3	.8	-95.2	-45.43	-25	-20.43	H
9.973594	28	Pk	37.2	-17.3	.8	-95.2	-46.5	-25	-21.5	V

10.1.2. 5G NR n53

BPSK 5G NR n53 (10.0MHZ BANDWIDTH), 1RB

Project #:	14040867
Date:	5/06/2022
Test Engineer:	26120
Configuration:	EUT Only
Mode	FR1_n53_10MHz_BPSK
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T348 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.977188	35.49	Pk	34.1	-30.8	0.3	-95.2	-56.11	-25	-31.11	H
4.977188	35.61	Pk	34.1	-30.8	0.3	-95.2	-55.99	-25	-30.99	V
7.451882	37.22	Pk	35.7	-26.8	0.4	-95.2	-48.68	-25	-23.68	H
7.453594	36.26	Pk	35.8	-26.8	0.4	-95.2	-49.54	-25	-24.54	V
9.953438	33.37	Pk	37.1	-24.9	0.8	-95.2	-48.83	-25	-23.83	H
9.953906	31.98	Pk	37.1	-24.9	0.8	-95.2	-50.22	-25	-25.22	V
Mid Channel, 2489MHz										
4.977188	36.66	Pk	34.1	-30.8	0.3	-95.2	-54.94	-25	-29.94	H
4.977188	37.55	Pk	34.1	-30.8	0.3	-95.2	-54.05	-25	-29.05	V
7.465313	32.9	Pk	35.8	-26.8	0.4	-95.2	-52.9	-25	-27.9	V
7.465781	32.29	Pk	35.8	-26.8	0.4	-95.2	-53.51	-25	-28.51	H
9.953906	33.42	Pk	37.1	-24.9	0.8	-95.2	-48.78	-25	-23.78	H
9.953906	31.68	Pk	37.1	-24.9	0.8	-95.2	-50.52	-25	-25.52	V
High Channel, 2490MHz										
7.457383	44.3	Pk	35.8	-26.9	0.4	-95.2	-41.6	-25	-16.6	H
7.457461	44.34	Pk	35.8	-26.9	0.4	-95.2	-41.56	-25	-16.56	V
7.456875	42.57	Pk	35.8	-26.9	0.4	-95.2	-43.33	-25	-18.33	H
7.457813	40.96	Pk	35.8	-26.9	0.4	-95.2	-44.94	-25	-19.94	V
9.96	30.85	Pk	37.1	-24.9	0.8	-95.2	-51.35	-25	-26.35	H
9.960469	33.85	Pk	37.1	-24.9	0.8	-95.2	-48.35	-25	-23.35	V

BPSK 5G NR n53 (10.0MHZ BANDWIDTH), 24RB

Project #:	14040867
Date:	5/06/2022
Test Engineer:	26120
Configuration:	EUT Only
Mode	FR1_n53_10MHz_BPSK
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T348 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.977188	35.95	Pk	34.1	-30.8	.3	-95.2	-55.65	-25	-30.65	H
4.977188	35.98	Pk	34.1	-30.8	.3	-95.2	-55.62	-25	-30.62	V
7.465781	34.95	Pk	35.8	-26.8	.4	-95.2	-50.85	-25	-25.85	H
7.465781	32.77	Pk	35.8	-26.8	.4	-95.2	-53.03	-25	-28.03	V
9.953906	31.83	Pk	37.1	-24.9	.8	-95.2	-50.37	-25	-25.37	H
9.953906	32.38	Pk	37.1	-24.9	.8	-95.2	-49.82	-25	-24.82	V
Mid Channel, 2489MHz										
4.977188	35.68	Pk	34.1	-30.8	.3	-95.2	-55.92	-25	-30.92	H
4.977188	35.32	Pk	34.1	-30.8	.3	-95.2	-56.28	-25	-31.28	V
7.464844	32.94	Pk	35.8	-26.8	.4	-95.2	-52.86	-25	-27.86	H
7.464844	33.15	Pk	35.8	-26.8	.4	-95.2	-52.65	-25	-27.65	V
9.754219	30.79	Pk	37	-24.7	.8	-95.2	-51.31	-25	-26.31	H
9.754219	32	Pk	37	-24.7	.8	-95.2	-50.1	-25	-25.1	V
High Channel, 2490MHz										
4.98	35.14	Pk	34.1	-30.8	.3	-95.2	-56.46	-25	-31.46	H
4.98	35.65	Pk	34.1	-30.8	.3	-95.2	-55.95	-25	-30.95	V
7.490156	35.99	Pk	35.7	-26.8	.4	-95.2	-49.91	-25	-24.91	H
7.490156	32.68	Pk	35.7	-26.8	.4	-95.2	-53.22	-25	-28.22	V
9.96	32.29	Pk	37.1	-24.9	.8	-95.2	-49.91	-25	-24.91	H
9.960469	32	Pk	37.1	-24.9	.8	-95.2	-50.2	-25	-25.2	V

10.2. FIELD STRENGTH OF SPURIOUS RADIATION, ANT 2

10.2.1. LTE BAND 53

QPSK LTE BAND 53 (10.0MHZ BANDWIDTH), 1RB

Project #:	14040867
Date:	5/6/2022
Test Engineer:	45258
Configuration:	EUT Only
Mode	LTE_B53_10MHz_QPSK
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF 80402 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.976719	34.17	Pk	34.2	-24.7	.3	-95.2	-51.23	-25	-26.23	H
4.976719	33.57	Pk	34.2	-24.7	.3	-95.2	-51.83	-25	-26.83	V
7.46625	32.18	Pk	35.6	-20.1	.4	-95.2	-47.12	-25	-22.12	H
7.46625	28.05	Pk	35.6	-20.1	.4	-95.2	-51.25	-25	-26.25	V
9.953906	28.9	Pk	37.1	-17.1	.8	-95.2	-45.5	-25	-20.5	H
9.953906	30.06	Pk	37.1	-17.1	.8	-95.2	-44.34	-25	-19.34	V
Mid Channel, 2489MHz										
4.979063	34.75	Pk	34.2	-24.7	.3	-95.2	-50.65	-25	-25.65	H
4.979063	33.3	Pk	34.2	-24.7	.3	-95.2	-52.1	-25	-27.1	V
7.468125	28.26	Pk	35.6	-20.1	.4	-95.2	-51.04	-25	-26.04	H
7.468125	30	Pk	35.6	-20.1	.4	-95.2	-49.3	-25	-24.3	V
9.957656	28.91	Pk	37.1	-17.1	.8	-95.2	-45.49	-25	-20.49	H
9.957656	31.37	Pk	37.1	-17.1	.8	-95.2	-43.03	-25	-18.03	V
High Channel, 2490MHz										
4.979531	35.91	Pk	34.2	-24.7	.3	-95.2	-49.49	-25	-24.49	H
4.979531	33.61	Pk	34.2	-24.7	.3	-95.2	-51.79	-25	-26.79	V
7.470469	31.36	Pk	35.6	-20.2	.4	-95.2	-48.04	-25	-23.04	H
7.470469	31.22	Pk	35.6	-20.2	.4	-95.2	-48.18	-25	-23.18	V
9.961406	26.66	Pk	37.1	-17.1	.8	-95.2	-47.74	-25	-22.74	H
9.961406	29.46	Pk	37.1	-17.1	.8	-95.2	-44.94	-25	-19.94	V

QPSK LTE BAND 53 (10.0MHZ BANDWIDTH), 50RB

Project #:	14040867
Date:	5/6/2022
Test Engineer:	45258
Configuration:	EUT Only
Mode	LTE_B53_10MHz_QPSK
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF 80402 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.977188	34.94	Pk	34.2	-24.7	.3	-95.2	-50.46	-25	-25.46	H
4.977188	33.49	Pk	34.2	-24.7	.3	-95.2	-51.91	-25	-26.91	V
7.464844	30.08	Pk	35.6	-20.1	.4	-95.2	-49.22	-25	-24.22	H
7.464844	31.31	Pk	35.6	-20.1	.4	-95.2	-47.99	-25	-22.99	V
9.953438	28.86	Pk	37.1	-17.1	.8	-95.2	-45.54	-25	-20.54	H
9.953438	30.27	Pk	37.1	-17.1	.8	-95.2	-44.13	-25	-19.13	V
Mid Channel, 2489MHz										
4.98	34.74	Pk	34.2	-24.7	.3	-95.2	-50.66	-25	-25.66	H
4.98	35	Pk	34.2	-24.7	.3	-95.2	-50.4	-25	-25.4	V
7.46625	31.61	Pk	35.6	-20.1	.4	-95.2	-47.69	-25	-22.69	H
7.46625	28.05	Pk	35.6	-20.1	.4	-95.2	-51.25	-25	-26.25	V
9.957656	28.7	Pk	37.1	-17.1	.8	-95.2	-45.7	-25	-20.7	H
9.957656	31.37	Pk	37.1	-17.1	.8	-95.2	-43.03	-25	-18.03	V
High Channel, 2490MHz										
4.98	33.22	Pk	34.2	-24.7	.3	-95.2	-52.18	-25	-27.18	H
4.98	35.42	Pk	34.2	-24.7	.3	-95.2	-49.98	-25	-24.98	V
7.47	28.81	Pk	35.6	-20.2	.4	-95.2	-50.59	-25	-25.59	H
7.47	30.74	Pk	35.6	-20.2	.4	-95.2	-48.66	-25	-23.66	V
9.960469	30.8	Pk	37.1	-17.1	.8	-95.2	-43.6	-25	-18.6	H
9.960469	26.72	Pk	37.1	-17.1	.8	-95.2	-47.68	-25	-22.68	V

10.2.2. AND 5G NR n53

BPSK 5G NR n53 (10.0MHZ BANDWIDTH), 1RB

Project #:	14040867
Date:	5/06/2022
Test Engineer:	26120
Configuration:	EUT Only
Mode	FR1_n53_10MHz_BPSK
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T348 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.978125	35.75	Pk	34.1	-30.8	.3	-95.2	-55.85	-25	-30.85	H
4.978594	37.66	Pk	34.1	-30.8	.3	-95.2	-53.94	-25	-28.94	V
7.464375	35.15	Pk	35.8	-26.8	.4	-95.2	-50.65	-25	-25.65	V
7.465313	32.72	Pk	35.8	-26.8	.4	-95.2	-53.08	-25	-28.08	H
9.953438	33.68	Pk	37.1	-24.9	.8	-95.2	-48.52	-25	-23.52	V
9.953906	33.22	Pk	37.1	-24.9	.8	-95.2	-48.98	-25	-23.98	H
Mid Channel, 2489MHz										
4.978125	36.74	Pk	34.1	-30.8	.3	-95.2	-54.86	-25	-29.86	H
4.978125	36.27	Pk	34.1	-30.8	.3	-95.2	-55.33	-25	-30.33	V
7.467188	32.78	Pk	35.7	-26.8	.4	-95.2	-53.12	-25	-28.12	H
7.467188	32.77	Pk	35.7	-26.8	.4	-95.2	-53.13	-25	-28.13	V
9.95625	31.9	Pk	37.1	-24.9	.8	-95.2	-50.3	-25	-25.3	H
9.95625	31.03	Pk	37.1	-24.9	.8	-95.2	-51.17	-25	-26.17	V
High Channel, 2490MHz										
4.980469	36.67	Pk	34.1	-30.8	.3	-95.2	-54.93	-25	-29.93	H
4.980938	37.13	Pk	34.1	-30.8	.3	-95.2	-54.47	-25	-29.47	V
7.47	34.75	Pk	35.7	-26.8	.4	-95.2	-51.15	-25	-26.15	V
7.470469	35.14	Pk	35.7	-26.8	.4	-95.2	-50.76	-25	-25.76	H
9.960469	34.96	Pk	37.1	-24.9	.8	-95.2	-47.24	-25	-22.24	H
9.960469	33.57	Pk	37.1	-24.9	.8	-95.2	-48.63	-25	-23.63	V

BPSK 5G NR n53 (10.0MHZ BANDWIDTH), 24RB

Project #:	14040867
Date:	5/06/2022
Test Engineer:	26120
Configuration:	EUT Only
Mode	FR1_n53_10MHz_BPSK_
Chamber #:	Chamber B

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T348 (dB/m)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 2488.5MHz										
4.976719	36.96	Pk	34.1	-30.8	.3	-95.2	-54.64	-25	-29.64	V
4.977188	35.53	Pk	34.1	-30.8	.3	-95.2	-56.07	-25	-31.07	H
7.465313	34.44	Pk	35.8	-26.8	.4	-95.2	-51.36	-25	-26.36	V
7.465781	32.55	Pk	35.8	-26.8	.4	-95.2	-53.25	-25	-28.25	H
9.953906	30.92	Pk	37.1	-24.9	.8	-95.2	-51.28	-25	-26.28	H
9.953906	31.66	Pk	37.1	-24.9	.8	-95.2	-50.54	-25	-25.54	V
Mid Channel, 2489MHz										
4.978125	35.93	Pk	34.1	-30.8	.3	-95.2	-55.67	-25	-30.67	H
4.978125	34.91	Pk	34.1	-30.8	.3	-95.2	-56.69	-25	-31.69	V
7.467188	34.58	Pk	35.7	-26.8	.4	-95.2	-51.32	-25	-26.32	H
7.467188	33.54	Pk	35.7	-26.8	.4	-95.2	-52.36	-25	-27.36	V
9.95625	32.15	Pk	37.1	-24.9	.8	-95.2	-50.05	-25	-25.05	H
9.95625	31.52	Pk	37.1	-24.9	.8	-95.2	-50.68	-25	-25.68	V
High Channel, 2490MHz										
4.98	37.73	Pk	34.1	-30.8	.3	-95.2	-53.87	-25	-28.87	H
4.98	35.32	Pk	34.1	-30.8	.3	-95.2	-56.28	-25	-31.28	V
7.47	32.01	Pk	35.7	-26.8	.4	-95.2	-53.89	-25	-28.89	H
7.47	32.34	Pk	35.7	-26.8	.4	-95.2	-53.56	-25	-28.56	V
9.96	31.27	Pk	37.1	-24.9	.8	-95.2	-50.93	-25	-25.93	H
9.96	31.93	Pk	37.1	-24.9	.8	-95.2	-50.27	-25	-25.27	V

11. SETUP PHOTOS

Please refer to 14040867-EP1V1 for setup photos

END OF REPORT

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