



# TEST REPORT

**Report Number. :** 14040868-E19V3

**Applicant :** APPLE, INC  
1 APPLE PARK WAY  
CUPERTINO, CA 95014, U.S.A

**Model :** A2632 (Parent Model)  
A2885, A2886 (Variant Models)

**Brand :** APPLE

**FCC ID :** BCG-E8139A (Parent Model)  
BCG-E8146A, BCG-E8147A (Variant Models)

**IC :** 579C-E8139A (Parent Model)  
579C-E8146A, 579C-E8147A (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:**  
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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	7/19/2022	Initial Review	Eric Ting
V2	8/2/2022	Added Variant Models	Thu Chan
V3	8/12/2022	Addressed Section 6.4	Eric Ting

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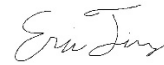

# 1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A
Model	A2631 (Parent Model, Full Test) A2885, A2886 (Variant Models)
Brand	APPLE
FCC ID	BCG-E8139A (Parent Model) BCG-E8146A, BCG-E8147A (Variant Models)
IC	579C-E8139A (Parent Model) 579C-E8146A, 579C-E8147A (Variant Models)
EUT Description	SMARTPHONE
Serial Number	Conducted (C7205400BJ1LYT2U), Radiated (FRQKN2FCWX)
Sample Receipt Date	APRIL 20, 2022
Date Tested	APRIL 21, 2022 to JULY 12, 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:
		
Thu Chan Staff Engineer UL LLC	Eric Ting Test Engineer UL LLC	Tony Li Test Engineer UL LLC

## 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	

### 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-Gen Issue 5, 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
<input checked="" type="checkbox"/>	Building 1: 47173 Benicia Street, Fremont, CA 94538, USA	US0104	2324A	550739
<input checked="" type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, CA 94538, USA	US0104	22541	550739
<input type="checkbox"/>	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 <sub>Lab</sub>
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



## 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 FR1, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC, and MSS. All models except reference model support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). 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.

Parent Model: A2632, FCC ID: BCG-E8139A, IC: 579C-E8139A

Variant Models: A2885, FCC ID: BCG-E8146A, IC: 579C-E8146A

A2886; FCC ID: BCG-E8147A, IC: 579C-E8147A

### 6.2. MAXIMUM OUTPUT POWER

#### EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015  
KDB 971168 D01 Section 5.6

$ERP/EIRP = P_{Meas} + GT - LC$

where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as  $P_{Meas}$ , typically dBW or dBm);

$P_{Meas}$  = 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.

The transmitter has a maximum average conducted and peak EIRP output powers as follows:

**LTE BAND 53, ANT 1**

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)		-1.50						
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	20.7	19.20	0.083	1090.3	1M09G7W
	16QAM			20.7	19.20	0.083	1090.3	1M09D7W
3.0	QPSK	2485.0	2493.5	20.7	19.20	0.083	2684.4	2M68G7W
	16QAM			20.7	19.20	0.083	2687.2	2M69D7W
5.0	QPSK	2486.0	2492.5	20.7	19.20	0.083	4471	4M47G7W
	16QAM			20.7	19.20	0.083	4479.9	4M48D7W
10.0	QPSK	2488.5	2490.0	20.7	19.20	0.083	8939.1	8M94G7W
	16QAM			20.7	19.20	0.083	8932	8M93D7W

**5G NR n53, ANT 1**

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-900-20								
Peak EIRP Limit (W)		3.98						
Conducted Average Limit (W)		1.00						
Antenna Gain (dBi)		-1.50						
Bandwidth (MHz)	Modulation	Low Frequency (MHz)	Upper Frequency (MHz)	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (kHz)	Emission Designator
10.0	BPSK	2488.5	2490.0	20.7	19.20	0.083	8629.3	8M63G7W
	QPSK			20.7	19.20	0.083	8595.7	8M60G7W
	16QAM			20.7	19.20	0.083	8611.1	8M61D7W

### 6.3. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version: 0.15.02.

### 6.4. MAXIMUM ANTENNA GAIN

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

LTE Bands	Frequency Range (MHz)	ANT 1 Antenna Gain (dBi)	ANT 2 Antenna Gain (dBi)
LTE BAND 53, 5G NR n53	2483.5 – 2495 MHz	-1.5	-4.3

### 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

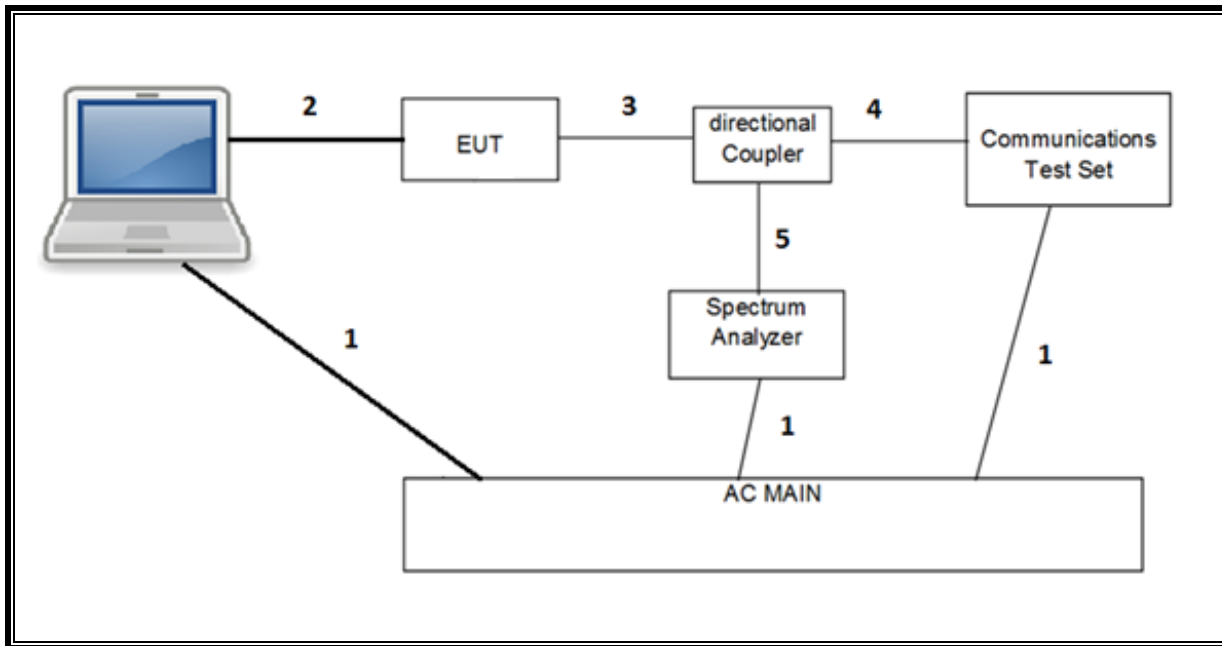
Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 18GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

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.

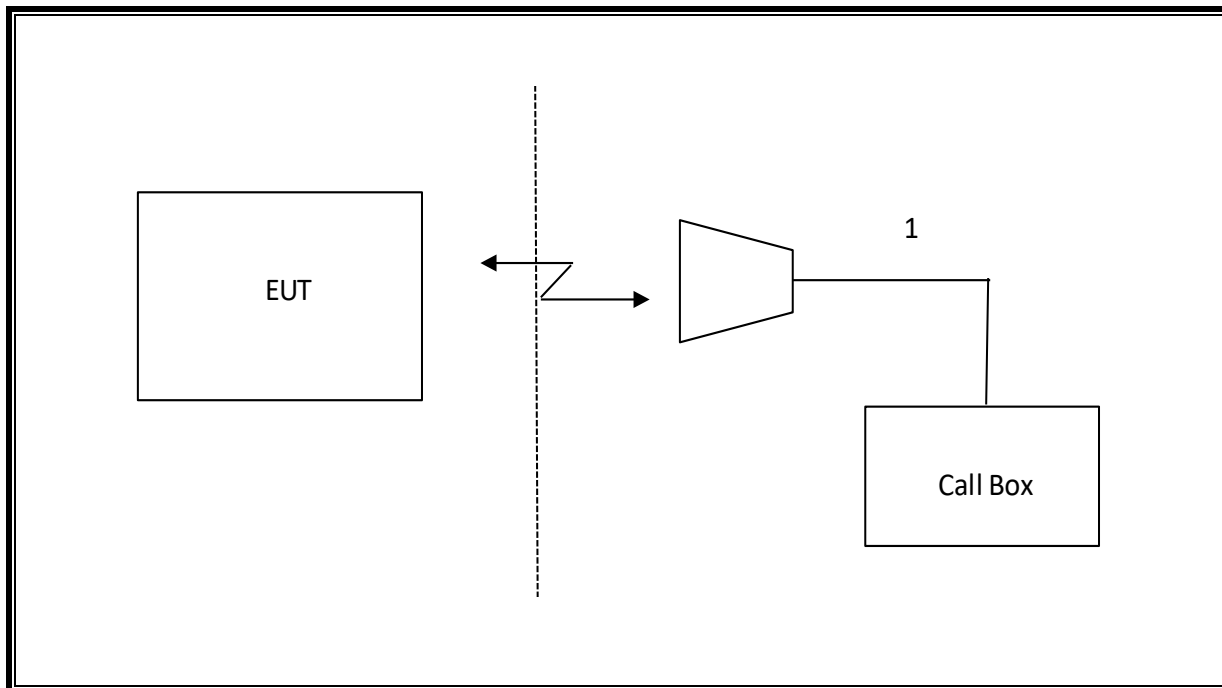
## 6.6. DESCRIPTION OF TEST SETUP

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	06/08/2223
*Antenna, Horn 1-18GHz	ETS Lindgren	3117	80403	06/08//2023
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	85151	03/21/2023
*Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	06/12/2022
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	85212	01/30/2023
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	11/12/2022
*Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T1154	11/12/2022
Amplifier, 218GHz to 26.5GHz	Ampical	AMP18G26.5-60	215705	02/26/2023
Amplifier, 26.5GHz to 40GHz	Ampical	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.
2. \*\* Equipment listed above that has a calibration due date during the testing period, the 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). 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 <sub>RB</sub> )						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 <sup>1</sup>	≤ 1.2 <sup>1</sup>	≤ 0.2 <sup>1</sup>
	Pi/2 BPSK w Pi/2 BPSK DMRS	≤ 0.5 <sup>2</sup>		0 <sup>2</sup>
		≤ 0.5 <sup>2</sup>		0 <sup>2</sup>
	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 <i>powerBoosting-pi2BPSK</i> and if the IE <i>powerBoostPi2BPSK</i> 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 <i>powerBoostPi2BPSK</i> 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
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).

<b>Test Engineer ID:</b>	39004	<b>Test Date:</b>	5/18/2022
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### 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 2484.2 MHz	60195 2489.0 MHz	60248 2494.3 MHz	60147 2484.2 MHz	60195 2489.0 MHz	60248 2494.3 MHz
1.4	QPSK	1	0	19.99	20.61	20.58	20.66	20.59	20.56
		1	2	20.70	20.67	20.63	20.70	20.64	20.62
		1	5	20.66	20.63	20.60	20.65	20.62	20.60
		3	0	20.69	20.66	20.60	20.66	20.62	20.60
		3	1	20.70	20.68	20.63	20.67	20.62	20.65
		3	2	20.70	20.69	20.62	20.68	20.63	20.65
	16QAM	6	0	19.98	19.96	19.92	19.59	19.61	19.55
		1	0	20.64	20.57	20.53	20.65	20.68	20.56
		1	2	20.70	20.62	20.57	20.70	20.57	20.69
		1	5	20.67	20.58	20.52	20.70	20.69	20.67
		3	0	20.33	20.39	20.30	20.51	20.35	20.42
		3	1	20.43	20.36	20.30	20.47	20.38	20.42
	64QAM	3	2	20.32	20.42	20.30	20.50	20.38	20.49
		6	0	19.30	19.28	19.23	19.31	19.33	19.25
		1	0	20.63	20.65	20.45	20.58	20.56	20.58
		1	2	20.70	20.51	20.49	20.65	20.59	20.56
		1	5	20.67	20.56	20.55	20.57	20.59	20.70
		3	0	20.59	20.52	20.46	20.51	20.53	20.69
	256QAM	3	1	20.62	20.54	20.57	20.53	20.57	20.57
		3	2	20.59	20.65	20.52	20.56	20.60	20.68
		6	0	19.54	20.53	20.50	19.41	20.58	20.57
		1	0	20.63	20.66	20.52	20.61	20.63	20.58
		1	2	20.70	20.65	20.56	20.70	20.64	20.68
		1	5	20.70	20.60	20.51	20.55	20.56	20.60
	3	0	20.59	20.57	20.49	20.51	20.52	20.47	
	3	1	20.63	20.57	20.46	20.55	20.54	20.56	
	3	2	20.61	20.59	20.48	20.53	20.52	20.58	
	6	0	20.57	20.45	20.44	20.39	20.49	20.43	

**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
3.0	QPSK	1	0	19.99	20.61	20.58	20.66	20.59	20.56
		1	7	<b>20.70</b>	20.67	20.63	<b>20.70</b>	20.64	20.62
		1	14	20.66	20.63	20.60	20.65	20.62	20.60
		8	0	20.69	20.66	20.60	20.66	20.62	20.60
		8	4	<b>20.70</b>	20.68	20.63	20.67	20.62	20.65
		8	7	<b>20.70</b>	20.69	20.62	20.68	20.63	20.65
	15	0	19.98	19.96	19.92	19.59	19.61	19.55	
	16QAM	1	0	20.64	20.57	20.53	20.65	20.68	20.56
		1	7	<b>20.70</b>	20.62	20.57	<b>20.70</b>	20.57	20.69
		1	14	20.67	20.58	20.52	<b>20.70</b>	20.69	20.67
		8	0	20.33	20.39	20.30	20.51	20.35	20.42
		8	4	20.43	20.36	20.30	20.47	20.38	20.42
		8	7	20.32	20.42	20.30	20.50	20.38	20.49
	15	0	19.30	19.28	19.23	19.31	19.33	19.25	
	64QAM	1	0	20.63	20.65	20.45	20.58	20.56	20.58
		1	7	<b>20.70</b>	20.51	20.49	20.65	20.59	20.56
		1	14	20.67	20.56	20.55	20.57	20.59	<b>20.70</b>
		8	0	20.59	20.52	20.46	20.51	20.53	20.69
		8	4	20.62	20.54	20.57	20.53	20.57	20.57
		8	7	20.59	20.65	20.52	20.56	20.60	20.68
	15	0	19.54	20.53	20.50	19.41	20.58	20.57	
	256QAM	1	0	20.63	20.66	20.52	20.61	20.63	20.58
		1	7	<b>20.70</b>	20.65	20.56	<b>20.70</b>	20.64	20.68
		1	14	<b>20.70</b>	20.60	20.51	20.55	20.56	20.60
		8	0	20.59	20.57	20.49	20.51	20.52	20.47
		8	4	20.63	20.57	20.46	20.55	20.54	20.56
		8	7	20.61	20.59	20.48	20.53	20.52	20.58
	15	0	20.57	20.45	20.44	20.39	20.49	20.43	

**OUTPUT POWER FOR LTE BAND 53 (5.0 MHz)**

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	LAT			UAT		
				Conducted Average (dBm)			Conducted Average (dBm)		
				60165	60195	60230	60165	60195	60230
5.0	QPSK	1	0	20.61	20.61	20.55	20.61	20.58	20.54
		1	12	<b>20.70</b>	20.68	20.62	20.69	20.67	<b>20.70</b>
		1	24	20.62	20.57	20.53	20.55	20.58	20.62
		12	0	19.97	19.93	19.90	19.64	19.61	19.54
		12	6	19.93	19.97	19.95	19.67	19.67	19.65
		12	11	19.94	19.96	19.89	19.60	19.64	19.64
		25	0	19.91	19.95	19.91	19.66	19.63	19.62
	16QAM	1	0	20.43	20.29	20.43	20.40	20.36	20.51
		1	12	20.54	20.40	<b>20.70</b>	20.53	20.49	<b>20.70</b>
		1	24	20.40	20.28	20.43	20.40	20.35	20.58
		12	0	19.19	19.17	18.98	19.25	19.02	19.08
		12	6	19.10	19.23	19.04	19.25	19.06	19.21
		12	11	19.10	19.17	18.99	19.17	19.04	19.20
		25	0	19.01	19.08	19.03	19.12	19.12	19.11
	64QAM	1	0	20.59	20.60	20.50	20.65	20.55	20.51
		1	12	<b>20.70</b>	20.66	20.53	<b>20.70</b>	20.62	20.50
		1	24	20.57	20.63	20.55	20.64	20.55	20.52
		12	0	19.37	20.66	20.57	19.51	20.53	20.51
		12	6	19.34	20.66	20.53	19.56	20.51	20.51
		12	11	19.31	20.61	20.56	19.43	20.55	20.51
		25	0	19.35	20.63	20.53	19.41	20.60	20.56
	256QAM	1	0	20.65	20.60	20.54	20.51	20.65	20.50
		1	12	<b>20.70</b>	20.63	20.55	20.68	20.66	<b>20.70</b>
		1	24	20.56	20.46	20.50	20.55	20.62	20.62
		12	0	20.49	20.47	20.44	20.45	20.45	20.38
12		6	20.47	20.51	20.46	20.48	20.51	20.49	
12		11	20.44	20.48	20.44	20.37	20.47	20.46	
25		0	20.44	20.45	20.42	20.44	20.46	20.47	

**OUTPUT POWER FOR LTE BAND 53 (10.0 MHz)**

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1			Ant 2		
				Conducted Average (dBm)			Conducted Average (dBm)		
				60190	60195	60205	60190	60195	60205
10.0	QPSK	1	0	20.65	20.64	20.61	20.66	20.63	20.60
		1	24	20.67	<b>20.70</b>	20.66	<b>20.70</b>	20.67	20.67
		1	49	20.61	20.63	20.58	20.67	20.68	20.67
		25	0	20.04	20.03	20.03	19.73	19.72	19.66
		25	12	20.00	20.06	20.05	19.76	19.77	19.72
		25	24	19.98	20.03	19.96	19.77	19.75	19.71
	50	0	19.97	20.04	20.02	19.74	19.73	19.71	
	16QAM	1	0	<b>20.70</b>	20.63	20.61	20.63	<b>20.70</b>	20.67
		1	24	20.57	20.62	20.52	20.63	<b>20.70</b>	20.66
		1	49	20.58	20.60	20.49	20.64	20.67	20.69
		25	0	19.35	19.29	19.30	19.39	19.36	19.38
		25	12	19.29	19.32	19.32	19.43	19.41	19.41
		25	24	19.28	19.32	19.22	19.43	19.40	19.42
	50	0	19.24	19.30	19.31	19.41	19.37	19.34	
	64QAM	1	0	20.68	20.67	20.63	20.63	20.66	20.67
		1	24	<b>20.70</b>	20.65	20.61	20.64	20.68	20.68
		1	49	20.62	20.67	20.64	20.67	<b>20.70</b>	20.66
		25	0	19.49	20.64	20.64	19.48	20.69	20.66
		25	12	19.43	20.64	20.63	19.51	<b>20.70</b>	20.67
		25	24	19.41	20.67	20.66	19.49	<b>20.70</b>	20.65
	50	0	19.38	20.69	20.61	19.46	20.68	20.68	
	256QAM	1	0	20.64	20.64	20.52	20.63	20.57	20.58
		1	24	<b>20.70</b>	20.68	20.61	<b>20.70</b>	20.65	20.69
		1	49	20.56	20.60	20.50	20.60	20.66	20.67
		25	0	20.54	20.49	20.49	20.46	20.50	20.50
		25	12	20.49	20.54	20.52	20.52	20.55	20.51
		25	24	20.47	20.51	20.41	20.48	20.54	20.51
	50	0	20.44	20.50	20.49	20.49	20.51	20.48	

## 8.2. 5G NR n53

### 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).

<b>Test Engineer ID:</b>	27342	<b>Test Date:</b>	4/21/2022
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### OUTPUT POWER FOR 5G NR n53 (10.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Ant 1			Ant 2				
				Conducted Average (dBm)			Conducted Average (dBm)				
				497700	497800	498000	497700	497800	498000		
10.0	BPSK	1	0	2488.5 MHz	2489.0 MHz	2490.0 MHz	2488.5 MHz	2489.0 MHz	2490.0 MHz		
				20.33	20.40	20.45	20.35	20.50	20.51		
				20.69	20.60	20.65	20.62	20.70	20.61		
		1	22	1	23	20.67	20.70	20.62	20.65	20.60	20.66
						20.37	20.47	20.44	20.36	20.38	20.43
						20.61	20.62	20.61	20.57	20.62	20.62
		12	6	24	0	20.43	20.45	20.43	20.42	20.39	20.39
						19.91	19.94	19.97	19.88	19.89	19.90
						20.62	20.65	20.60	20.63	20.64	20.60
		QPSK	1	1	22	20.67	20.68	20.70	20.61	20.67	20.70
						19.98	19.95	19.97	19.89	19.89	19.94
						20.59	20.65	20.61	20.53	20.56	20.62
	12		6	24	0	19.86	19.90	20.00	19.89	19.92	19.94
						18.80	19.15	19.25	19.10	19.14	19.11
						19.66	20.11	20.06	20.15	20.12	20.32
	16QAM	1	1	22	20.21	20.56	20.70	20.55	20.70	20.61	
					19.34	19.46	19.70	19.84	19.58	19.64	
					20.38	20.21	20.46	20.51	20.53	20.43	
		12	6	24	0	19.35	19.41	19.44	19.50	19.54	19.51
						19.25	19.00	19.02	19.14	19.07	19.14
						18.99	18.85	18.88	19.06	19.18	19.20
	64QAM	1	1	22	18.93	18.95	19.12	19.22	19.23	19.16	
					20.59	20.45	20.70	20.39	20.70	20.56	
					20.43	20.37	20.44	20.44	20.43	20.37	
		12	6	24	0	20.34	20.28	20.48	20.42	20.44	20.50
						18.42	18.20	18.41	18.51	18.35	18.38
						18.38	18.10	18.24	18.39	18.43	18.61
	256QAM	1	1	22	18.30	18.38	18.44	18.54	18.36	18.54	
					18.32	18.39	18.39	18.30	18.30	18.44	
					20.58	20.60	20.67	20.59	20.55	20.49	
		12	6	24	0	20.52	20.43	20.58	20.36	20.58	20.44

## 9. CONDUCTED TEST RESULTS

### 9.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

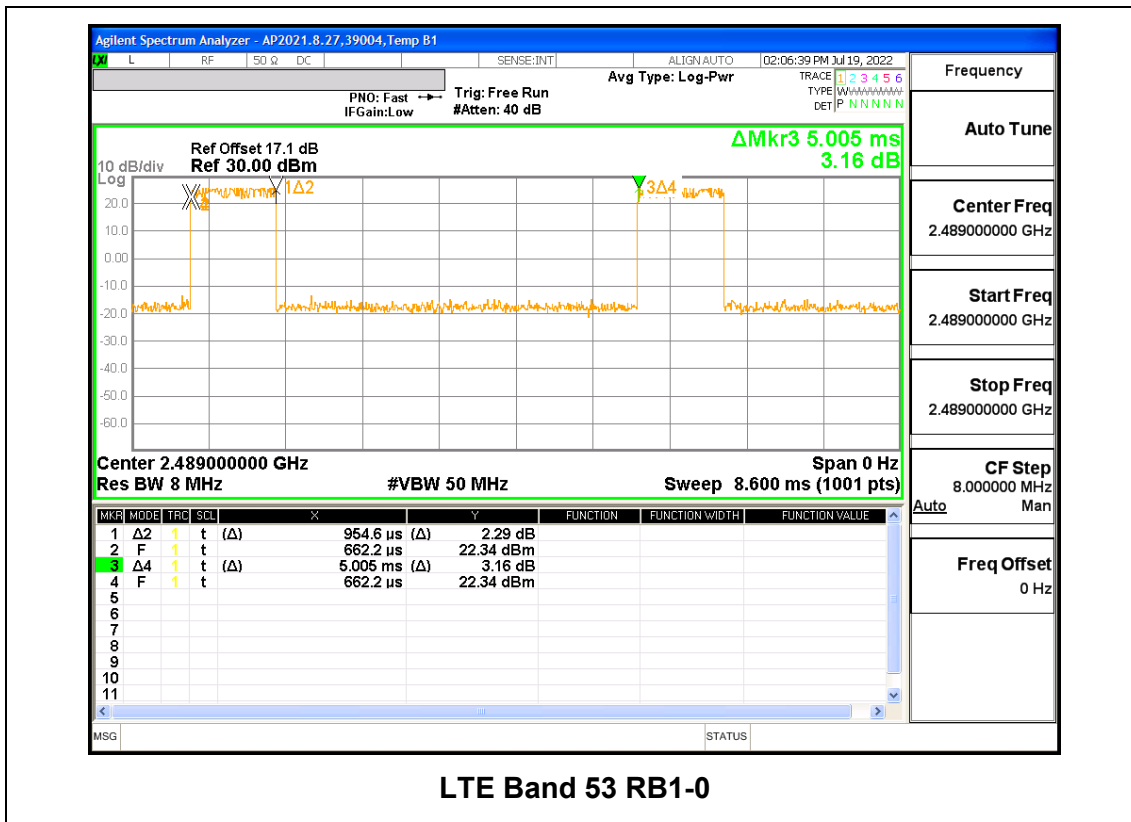
#### PROCEDURE

Zero-Span Spectrum Analyzer Method.

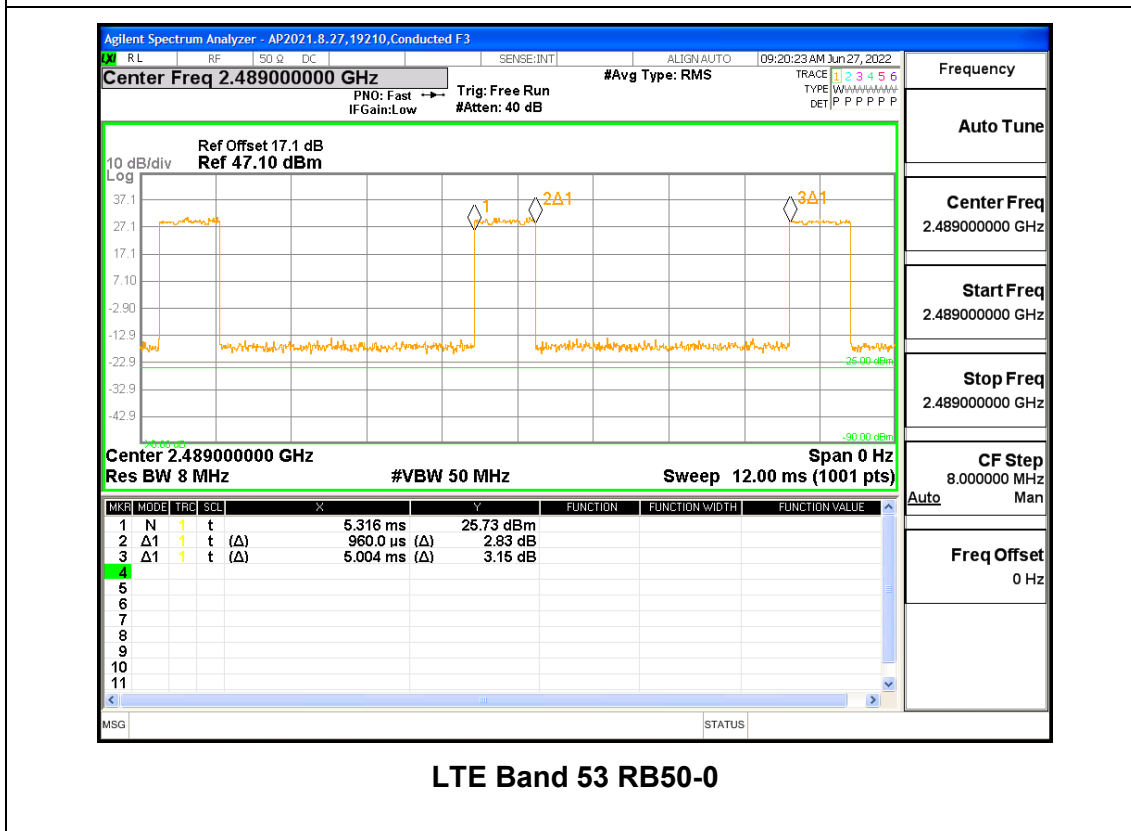
#### ON TIME AND DUTY CYCLE RESULTS

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	0.95	5.01	0.19	19.06	7.20
LTE Band 53	50 / 0	0.96	5.04	0.19	19.05	7.20
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

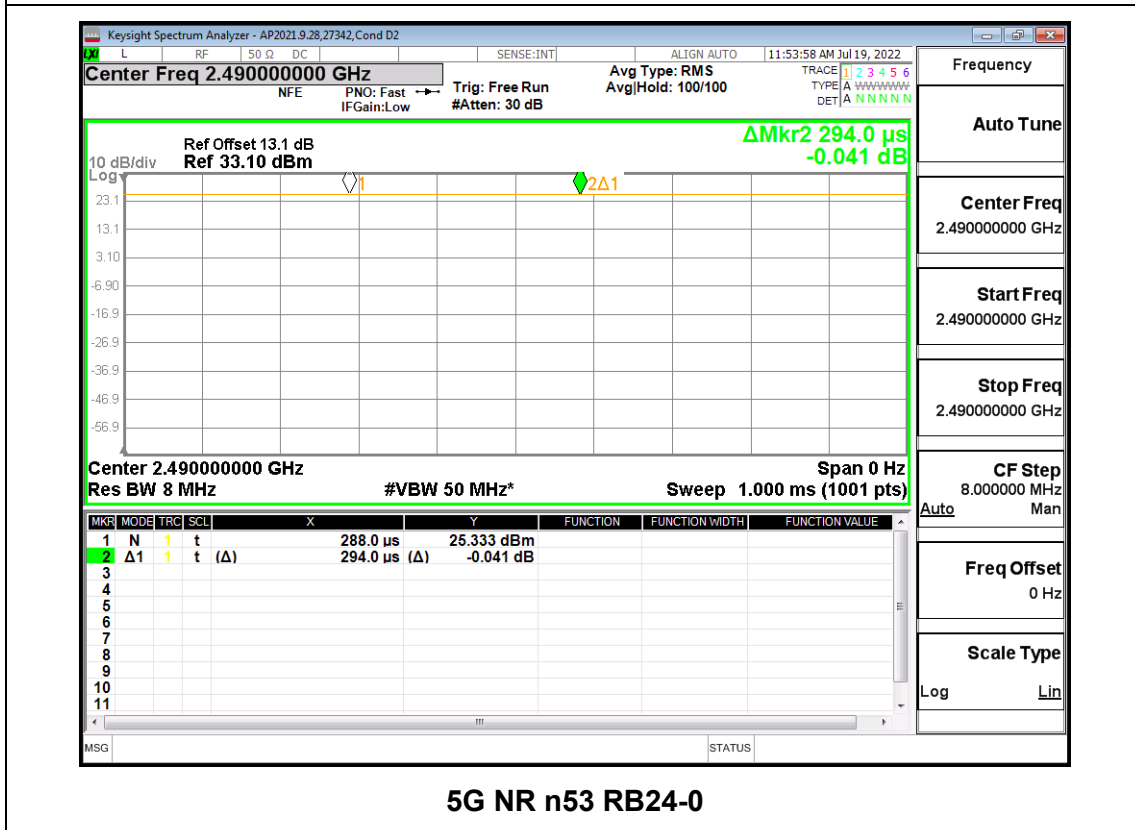
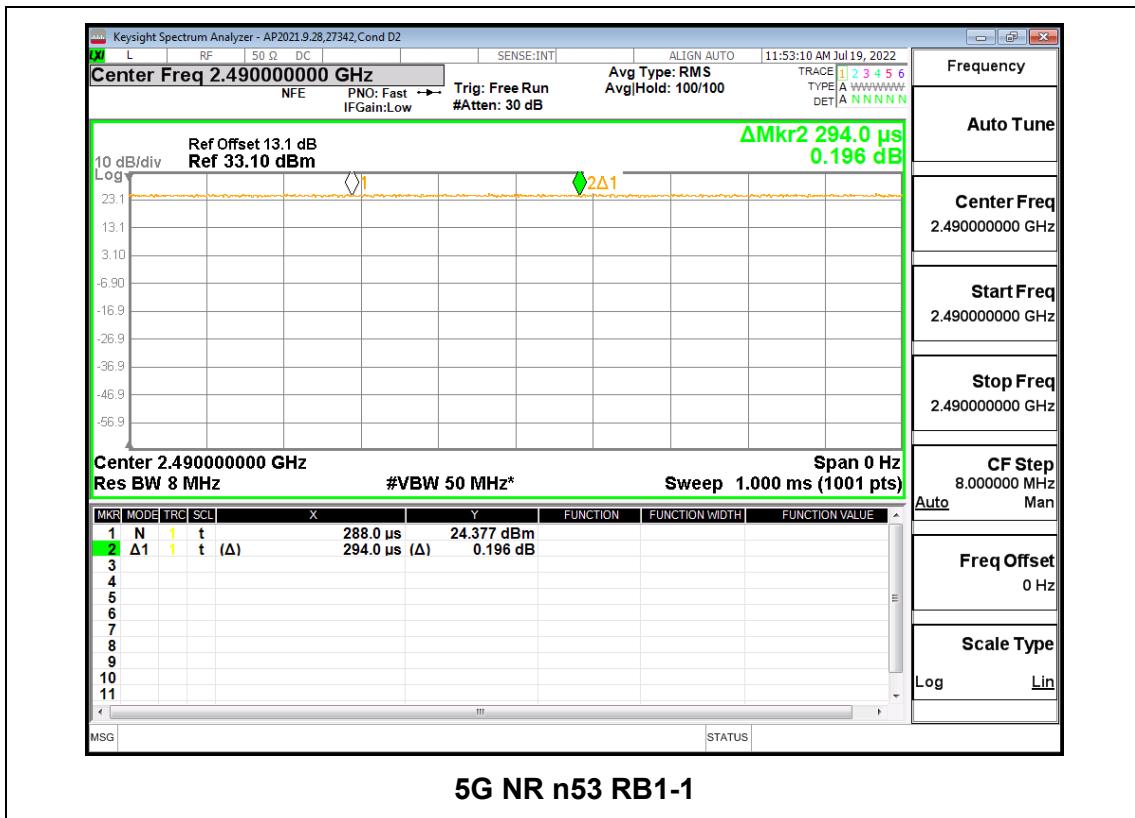




LTE Band 53 RB1-0



LTE Band 53 RB50-0



## 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.

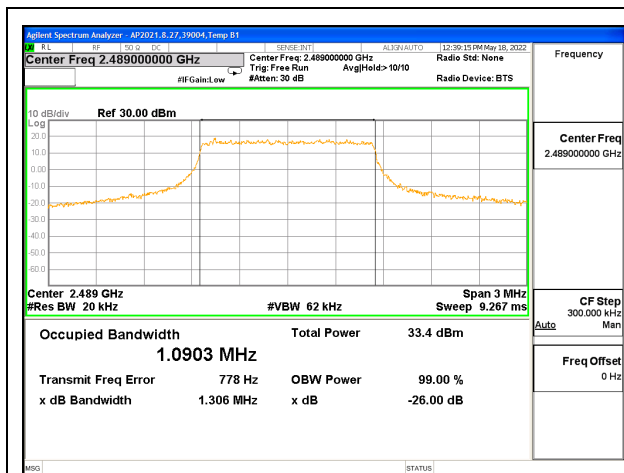
**LTE BAND 53**

Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
LTE BAND 53	1.4MHz, QPSK	6/0	2489	1.0903	1.306
	1.4MHz, 16QAM			1.0903	1.325
	3MHz, QPSK	15/0		2.6844	3.013
	3MHz, 16QAM			2.6872	3.001
	5MHz, QPSK	25/0		4.4710	5.138
	5MHz, 16QAM			4.4799	5.056
	10MHz, QPSK	50/0		8.9391	10.14
	10MHz, 16QAM			8.9320	9.708
	10MHz, QPSK	1/0		0.2242	0.3919

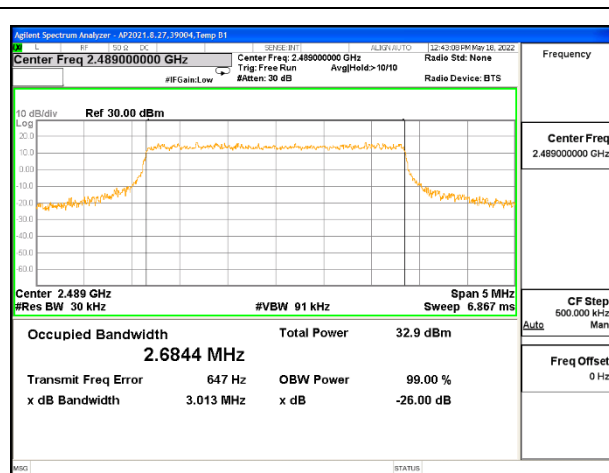
**5G NR n53**

Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
5G NR n53	10MHz, BPSK	24/0	2489	8.6293	9.851
	10MHz, QPSK			8.5957	9.857
	10MHz, 16QAM			8.6111	9.712
	10MHz, QPSK	1/0		0.5189	0.7563

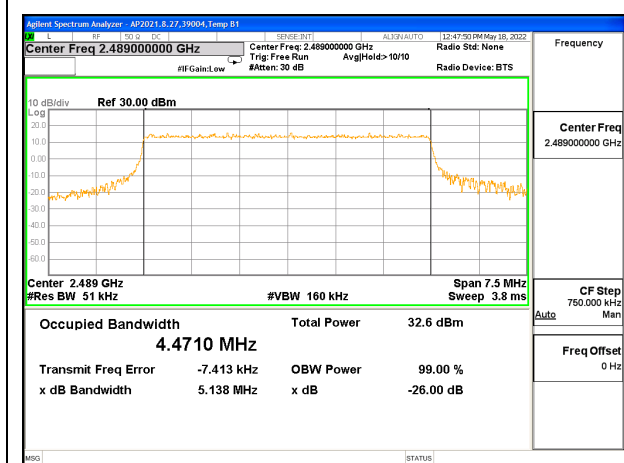
### 9.2.1. LTE BAND 53



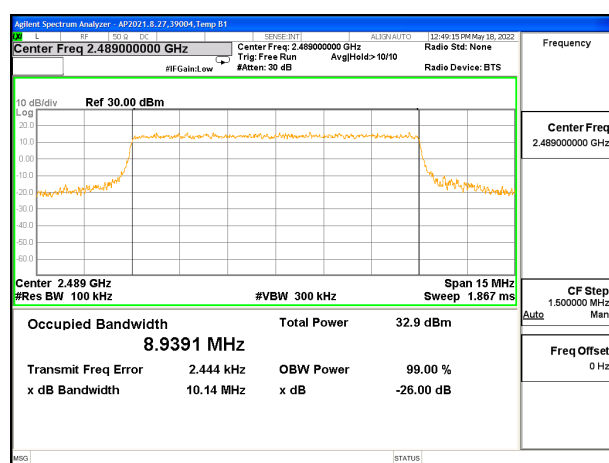
LTE B53 1.4MHz QPSK Middle Channel RB6-0



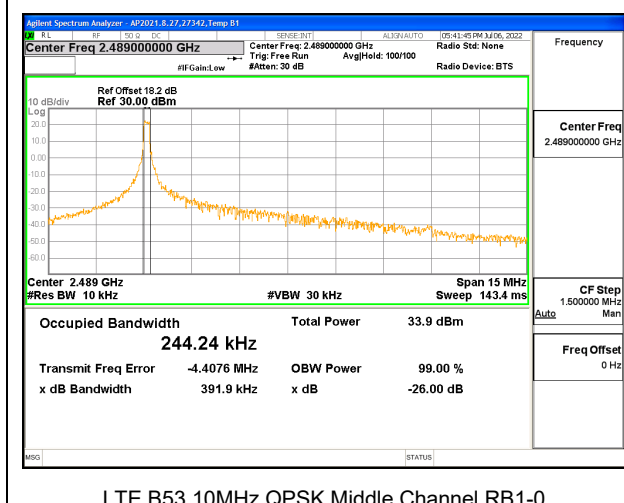
LTE B53 3MHz QPSK Middle Channel RB15-0



LTE B53 5MHz QPSK Middle Channel RB25-0

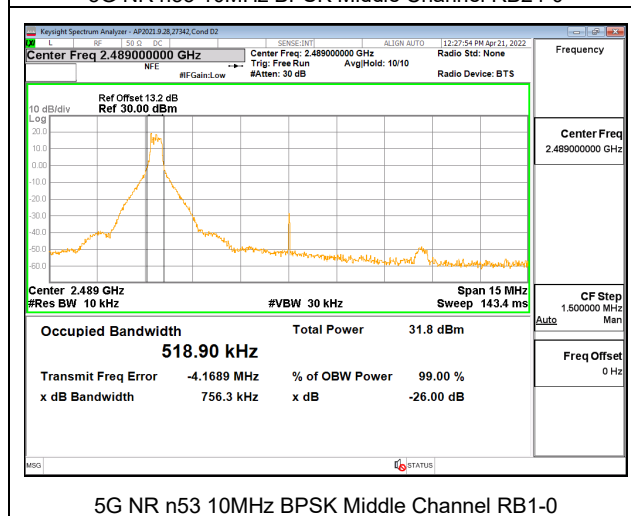
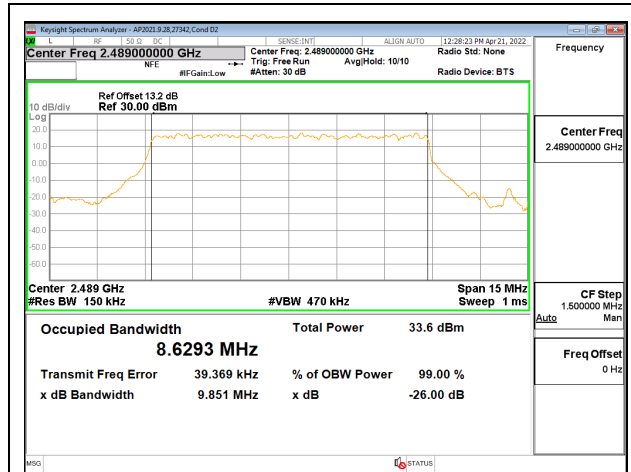


LTE B53 10MHz QPSK Middle Channel RB50-0



LTE B53 10MHz QPSK Middle Channel RB1-0

9.2.2. 5G NR n53



### **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  $\geq 3 * RBW$ , detector= RMS (power averaging).

#### **RESULTS**

**LTE BAND 53**

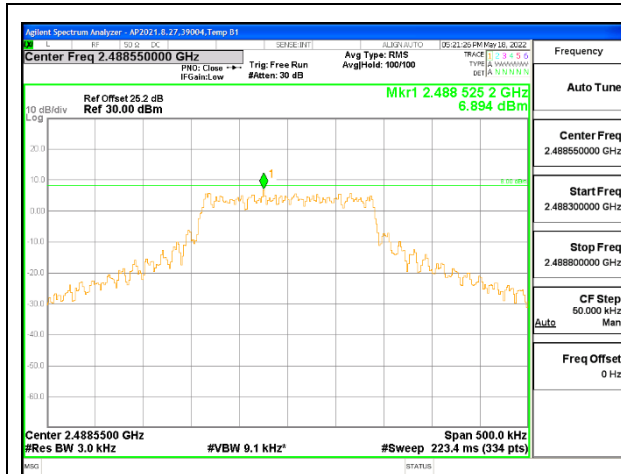
Band	Mode	RB Allocation/RB Offset	f(MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)
LTE BAND 53	1.4MHz, QPSK	1/0	2484.2	6.18	8.0
			2489.0	6.89	
			2494.3	5.54	
	3MHz, QPSK	1/0	2485.0	6.49	
			2489.0	6.48	
			2493.5	6.07	
	5MHz, QPSK	1/0	2486.0	5.46	
			2489.0	6.18	
			2492.5	7.03	
	10MHz, QPSK	1/0	2488.5	5.76	
			2489.0	6.80	
			2490.0	5.88	
		50/0	2488.5	-9.87	
2489.0			-9.64		
2490.0			-9.43		

**5G NR n53**

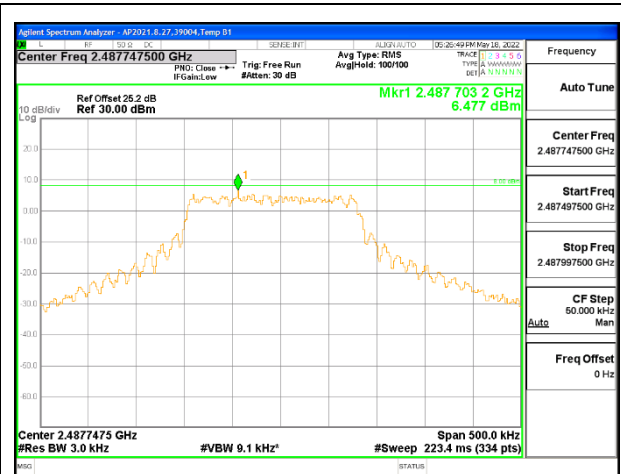
Band	Mode	RB Allocation/RB Offset	f(MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)
5G NR n53	10MHz, BPSK	1/1	2488.5	7.43	8.0
			2489.0	7.52	
			2490.0	7.53	
		24/0	2488.5	-1.16	
			2489.0	-0.97	
			2490.0	-1.24	



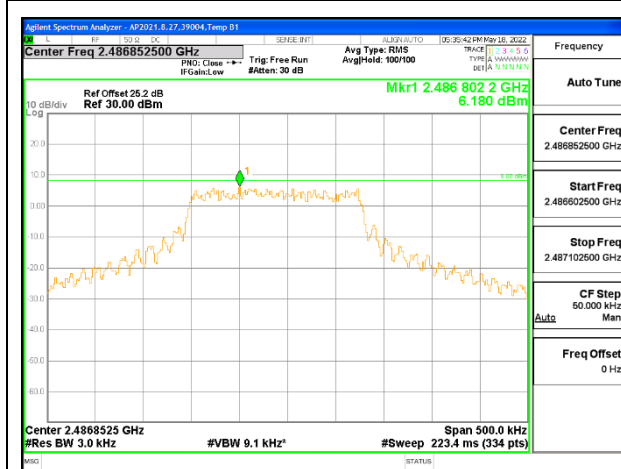
### 9.3.1. LTE BAND 53



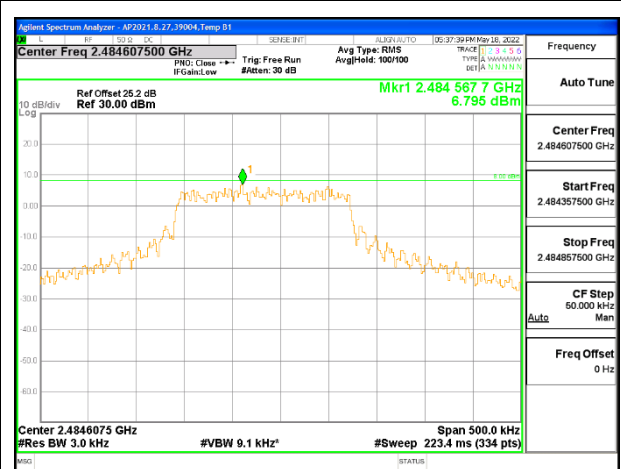
LTE B53 1.4MHz QPSK Middle Channel RB1-0



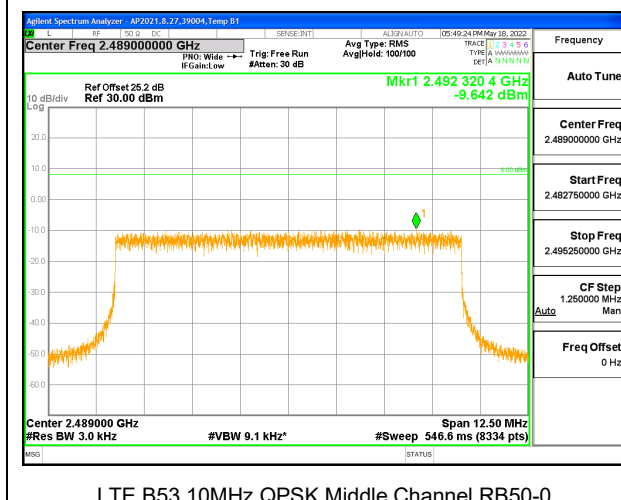
LTE B53 3MHz QPSK Middle Channel RB1-0



LTE B53 5MHz QPSK Middle Channel RB1-0

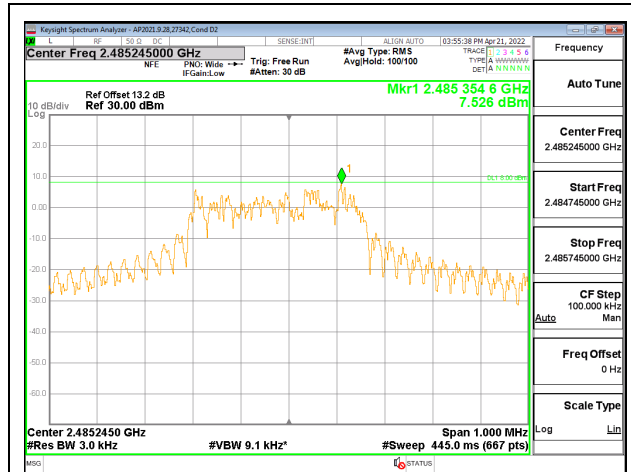


LTE B53 10MHz QPSK Middle Channel RB1-0

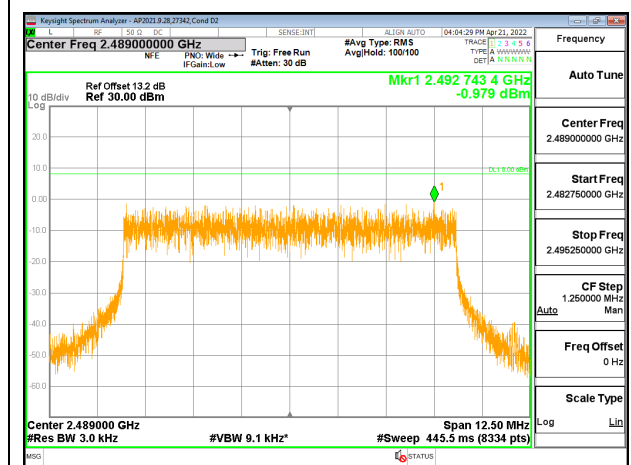


LTE B53 10MHz QPSK Middle Channel RB50-0

### 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  $\geq 3 * RBW$ , Peak detector and max hold.

### **RESULTS**

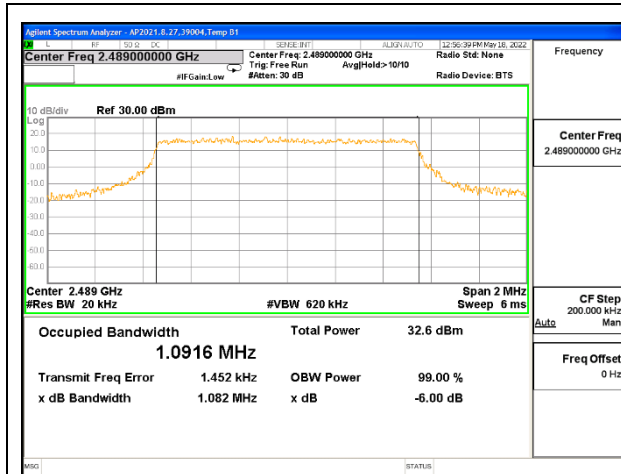
**LTE BAND 53**

Band	Mode	RB Allocation/RB Offset	f(MHz)	6dB BW (MHz)	6dB BW Limit (MHz)
LTE BAND 53	1.4MHz, QPSK	6/0	2484.2	1.089	0.5
			2489.0	1.082	
			2494.3	1.079	
	1.4MHz, 16QAM	6/0	2484.2	1.081	
			2489.0	1.075	
			2494.3	1.089	
	3MHz, QPSK	15/0	2485.0	2.706	
			2489.0	2.700	
			2493.5	2.702	
	3MHz, 16QAM	15/0	2485.0	2.699	
			2489.0	2.695	
			2493.5	2.697	
	5MHz, QPSK	25/0	2486.0	4.517	
			2489.0	4.505	
			2492.5	4.506	
	5MHz, 16QAM	25/0	2486.0	4.505	
			2489.0	4.510	
			2492.5	4.515	
	10MHz, QPSK	50/0	2488.5	9.034	
			2489.0	9.016	
			2490.0	9.008	
10MHz, 16QAM	50/0	2488.5	9.023		
		2489.0	9.013		
		2490.0	9.006		

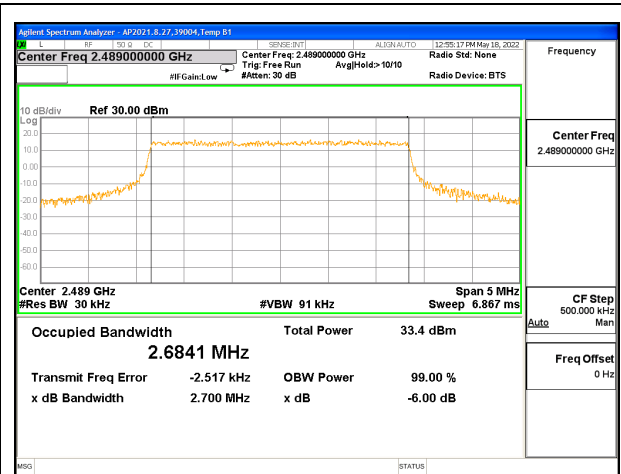
**5G NR n53**

Band	Mode	RB Allocation/RB Offset	f(MHz)	6dB BW (MHz)	6dB BW Limit (MHz)
5G NR n53	10MHz, BPSK	24/0	2488.5	8.664	0.5
			2489.0	8.724	
			2490.0	8.697	
	10MHz, QPSK	24/0	2488.5	8.623	
			2489.0	8.647	
			2490.0	8.623	
	10MHz, 16QAM	24/0	2488.5	8.654	
			2489.0	8.689	
			2490.0	8.609	

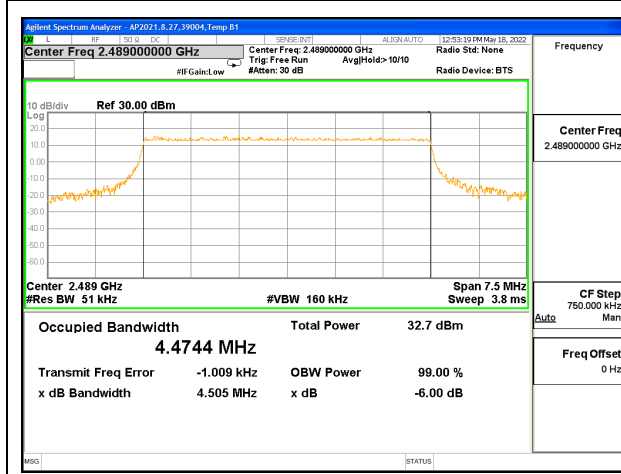
### 9.4.1. LTE BAND 53



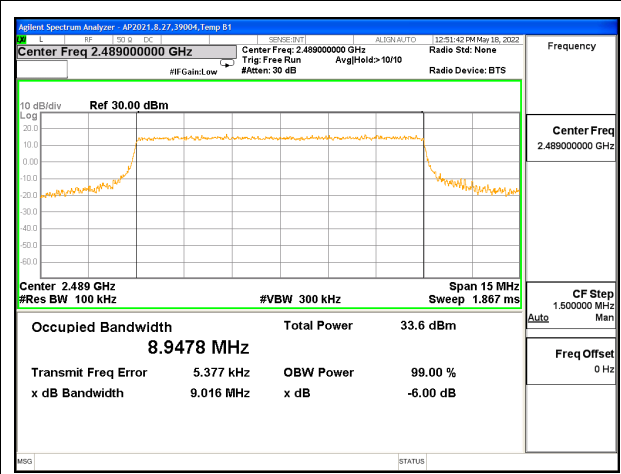
LTE B53 1.4MHz QPSK Middle Channel RB6-0



LTE B53 3MHz QPSK Middle Channel RB15-0

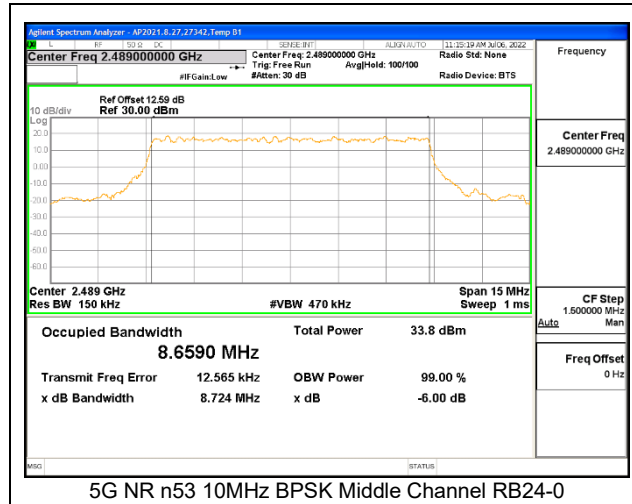


LTE B53 5MHz QPSK Middle Channel RB25-0



LTE B53 10MHz QPSK Middle Channel RB50-0

**9.4.2. 5G NR n53**



## 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 was 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**

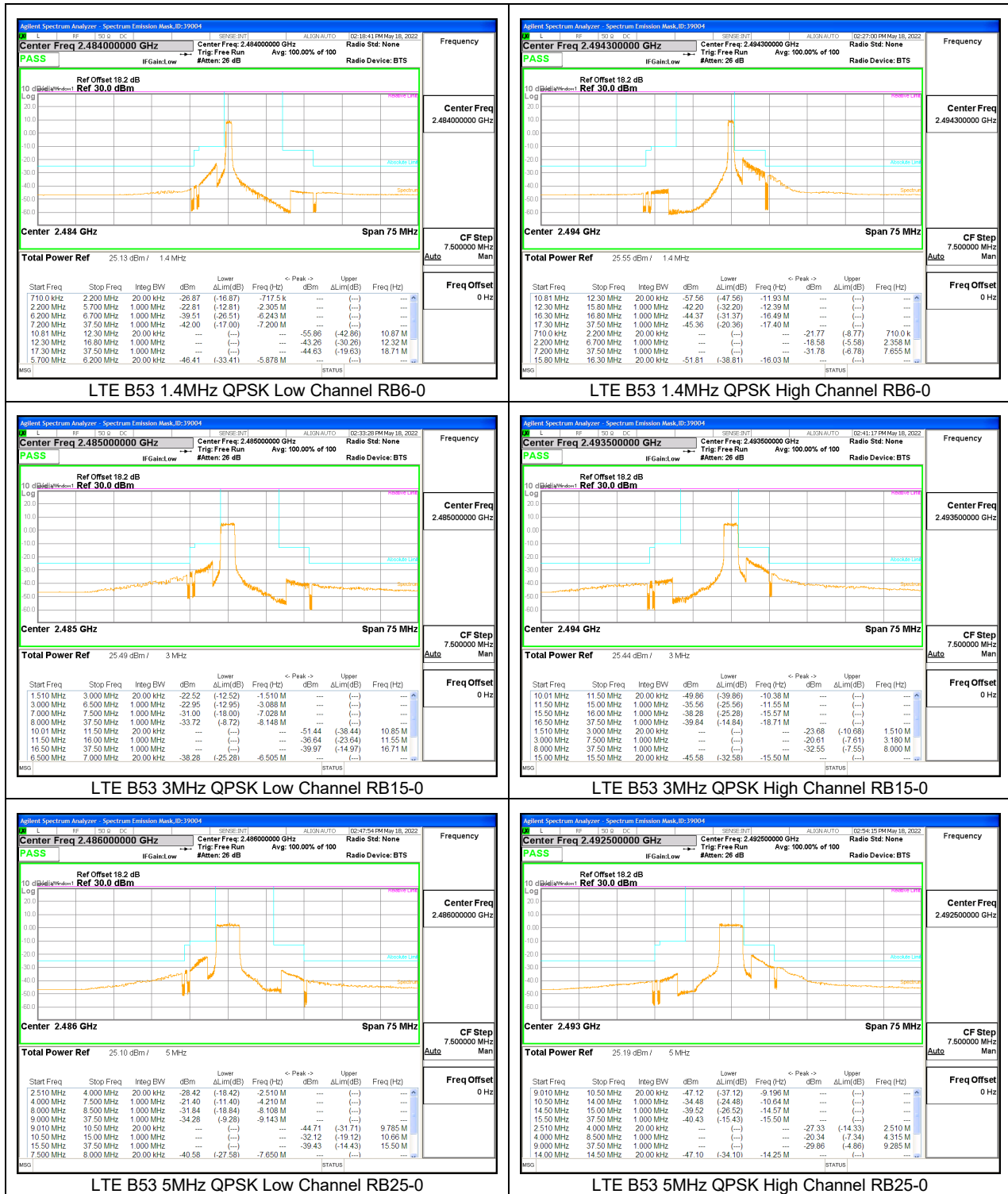
**LTE BAND 53**

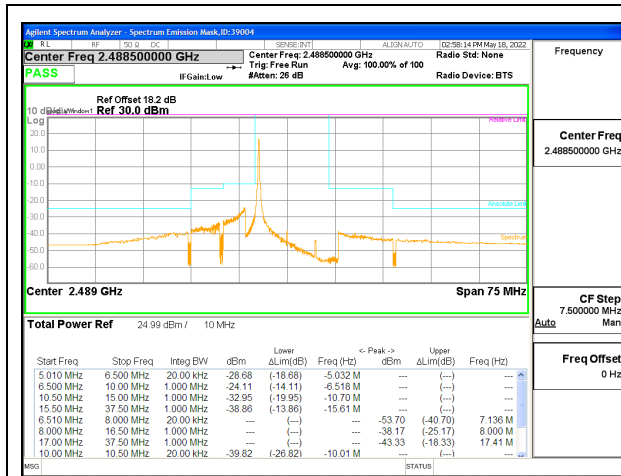
Band	Mode	RB Allocation/ RB Offset	f (MHz)	Highest Cond Power Density (dBm/30kHz)	Highest Antenna Gain (dBi)	Highest EIRP Density (dBm/30kHz)	EIRP Density Limit (dBm/30kHz)
LTE BAND 53	1.4MHz, QPSK	1/0	2484.2	-16.41	-0.6	-17.01	-14.1
		6/0	2484.2	-19.09		-19.69	
		1/5	2494.3	-15.69		-16.29	
		6/0	2494.3	-17.68		-18.28	
	3MHz, QPSK	1/0	2485.0	-19.10		-19.7	
		15/0	2485.0	-20.57		-21.17	
		1/14	2493.5	-18.90		-19.5	
		15/0	2493.5	-20.63		-21.23	
	5MHz, QPSK	1/0	2486.0	-20.78		-21.38	
		25/0	2486.0	-24.16		-24.76	
		1/24	2492.5	-20.82		-21.42	
		25/0	2492.5	-25.08		-25.68	
	10MHz, QPSK	1/0	2488.5	-28.10		-28.7	
		50/0	2488.5	-29.44		-30.04	
		1/49	2490.0	-34.34		-34.94	
		50/0	2490.0	-29.88		-30.48	

**5G NR n53**

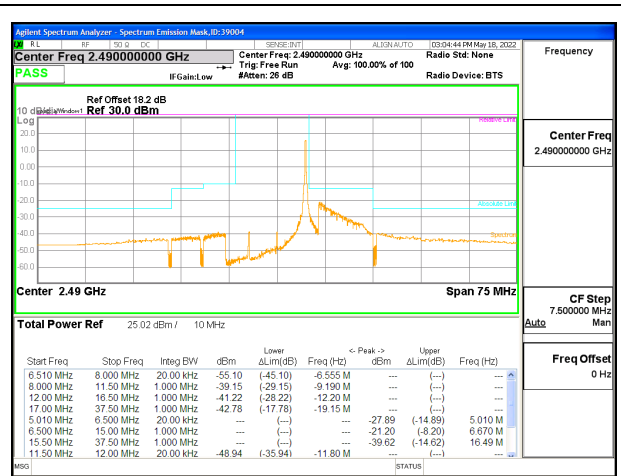
Band	Mode	RB Allocation/ RB Offset	f (MHz)	Highest Cond Power Density (dBm/30kHz)	Highest Antenna Gain (dBi)	Highest EIRP Density (dBm/30kHz)	EIRP Density Limit (dBm/30kHz)
5G NR n53	10MHz, BPSK	1/0	2488.5	-21.87	-0.6	-22.47	-14.1
		24/0	2488.5	-30.23		-30.83	
		1/23	2490.0	-22.78		-23.38	
		24/0	2490.0	-29.89		-30.49	

### 9.5.1. LTE BAND 53 BANDEGE

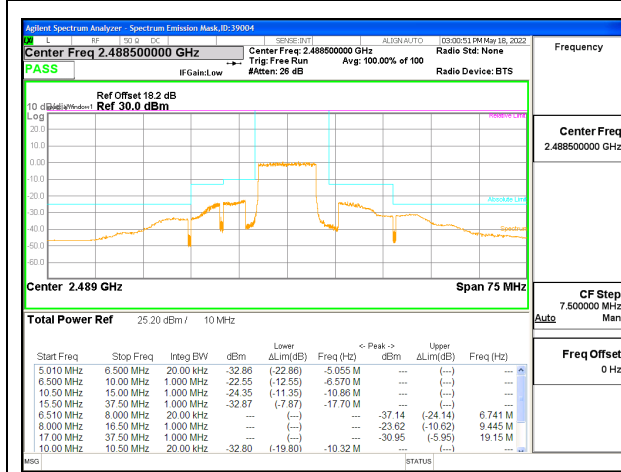




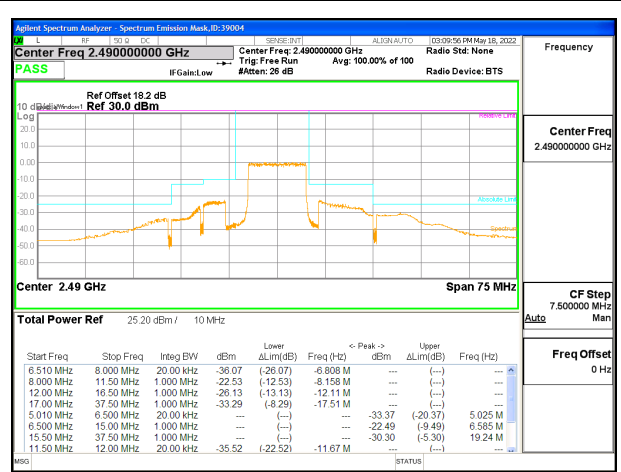
LTE B53 10MHz QPSK Low Channel RB1-0



LTE B53 10MHz QPSK High Channel RB1-49

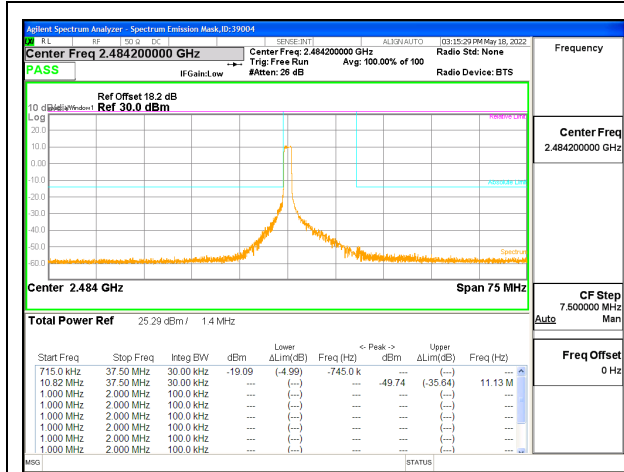


LTE B53 10MHz QPSK Low Channel RB50-0

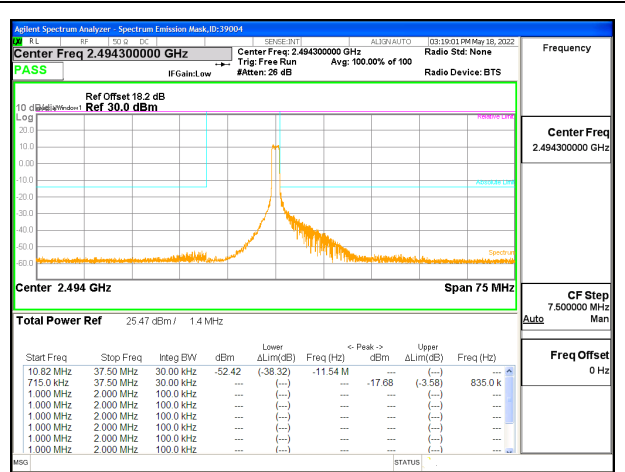


LTE B53 10MHz QPSK High Channel RB50-0

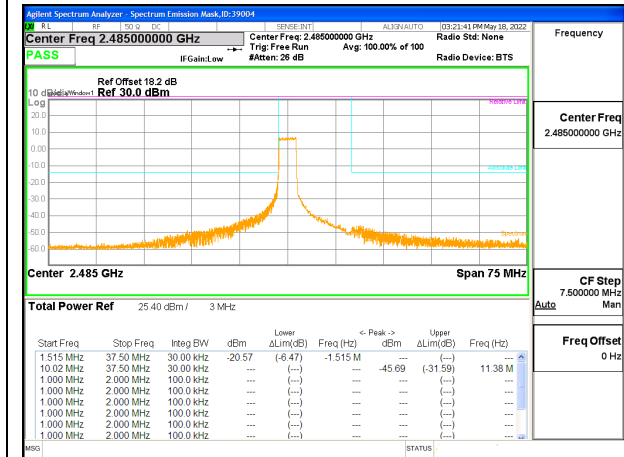
### 9.5.2. LTE BAND 53 EIRP DENSITY



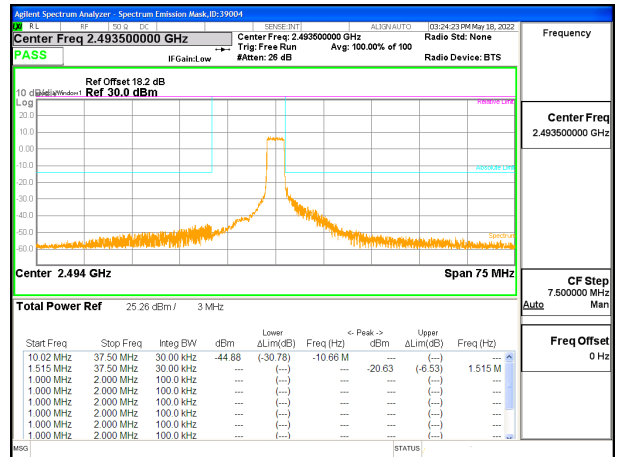
LTE B53 1.4MHz QPSK Low Channel RB6-0



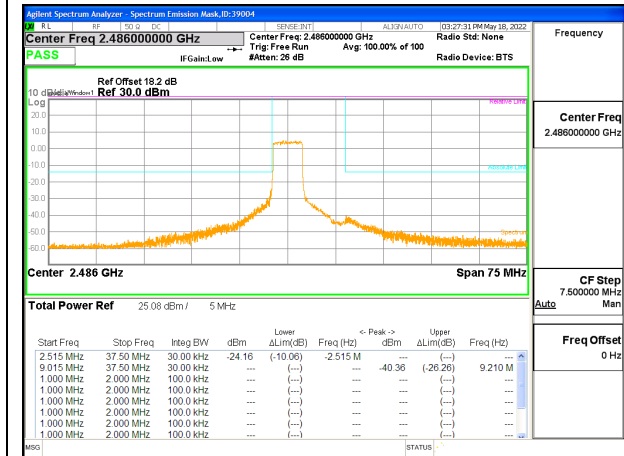
LTE B53 1.4MHz QPSK High Channel RB6-0



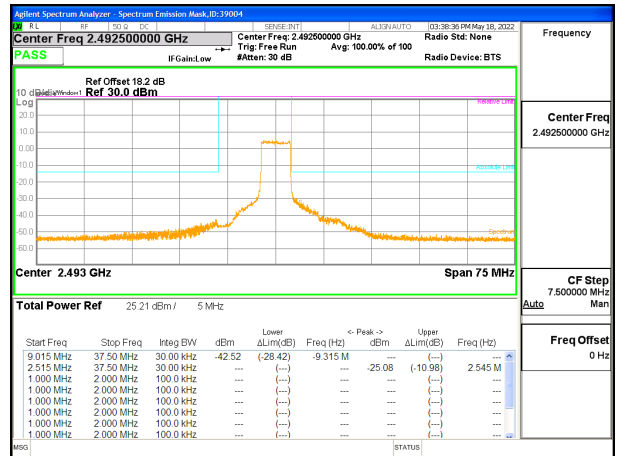
LTE B53 3MHz QPSK Low Channel RB15-0



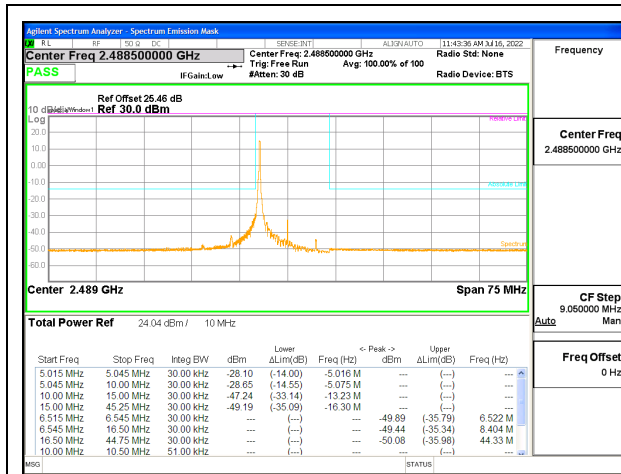
LTE B53 3MHz QPSK High Channel RB15-0



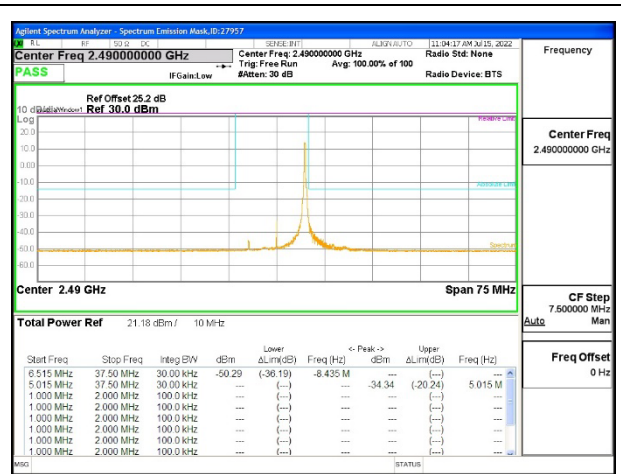
LTE B53 5MHz QPSK Low Channel RB25-0



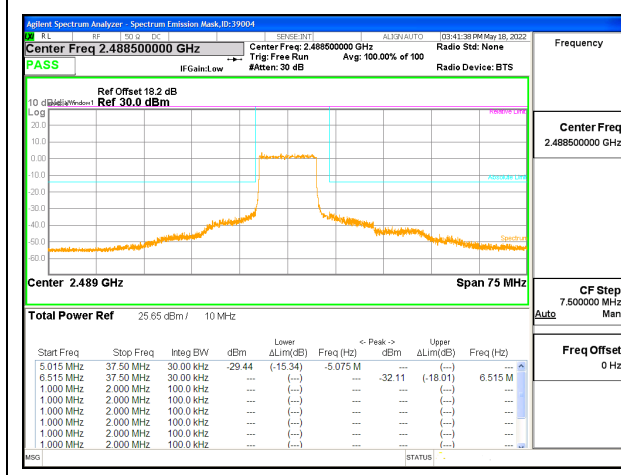
LTE B53 5MHz QPSK High Channel RB25-0



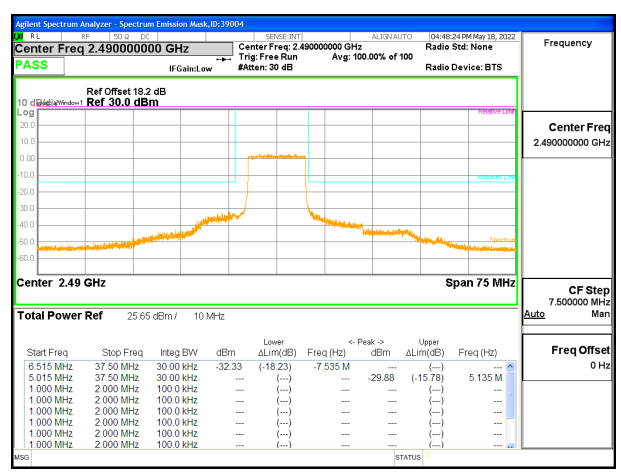
LTE B53 10MHz QPSK Low Channel RB1-0



LTE B53 10MHz QPSK High Channel RB1-49

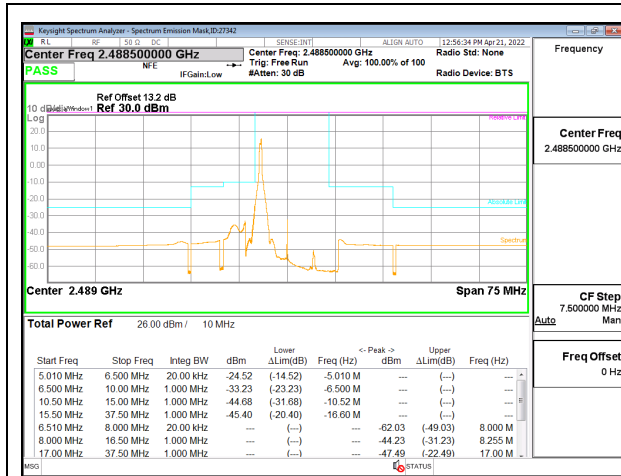


LTE B53 10MHz QPSK Low Channel RB50-0

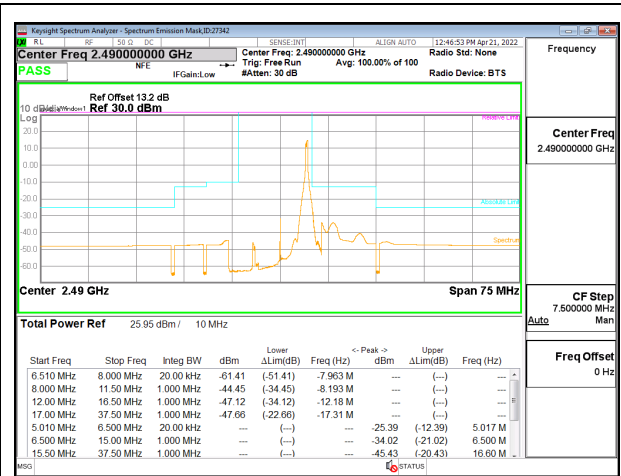


LTE B53 10MHz QPSK High Channel RB50-0

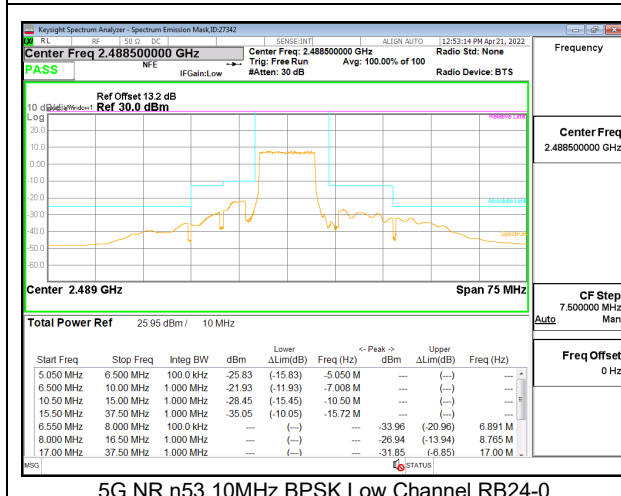
### 9.5.3. 5G NR n53 BANDEDGE



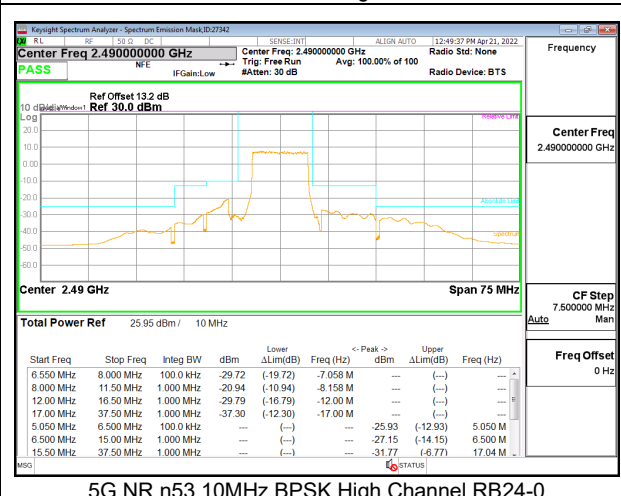
5G NR n53 10MHz BPSK Low Channel RB1-0



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

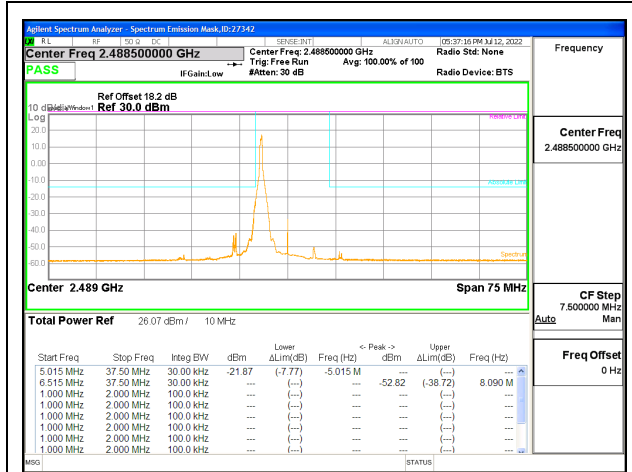


5G NR n53 10MHz BPSK Low Channel RB24-0

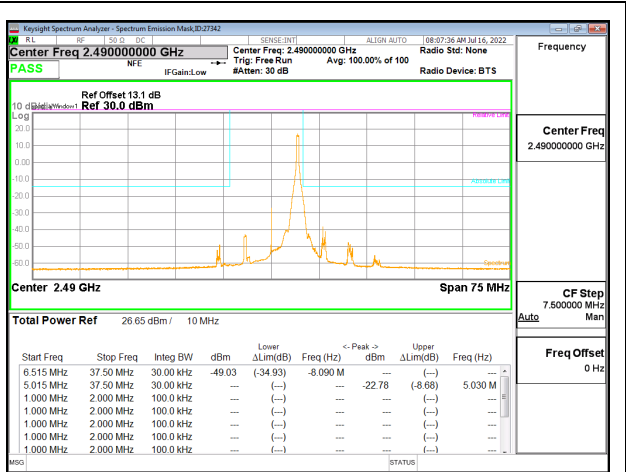


5G NR n53 10MHz BPSK High Channel RB24-0

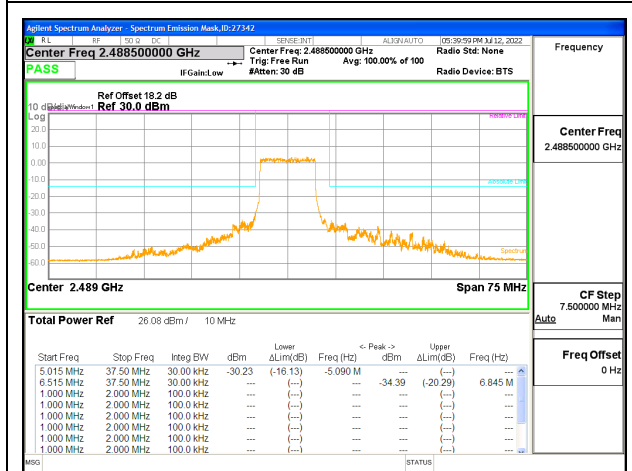
### 9.5.4. 5G NR n53 EIRP DENSITY



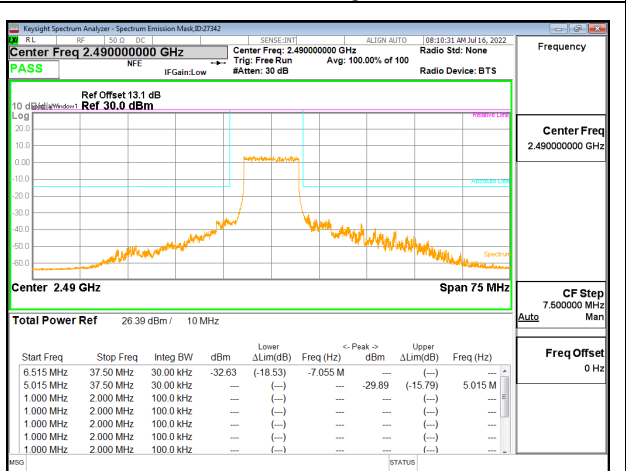
5G NR n53 10MHz BPSK Low Channel RB1-0



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)

### LIMITS

FCC: §25.149 (c)(4)

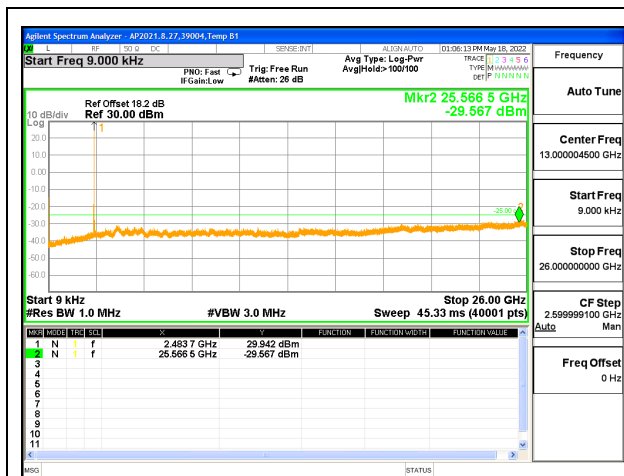
The minimum permissible attenuation level of any spurious emissions is  $55 + 10 \log (P)$  dB where transmitting power (P) in Watts.

ISED: SMSE-900-20 Annex A 9.g

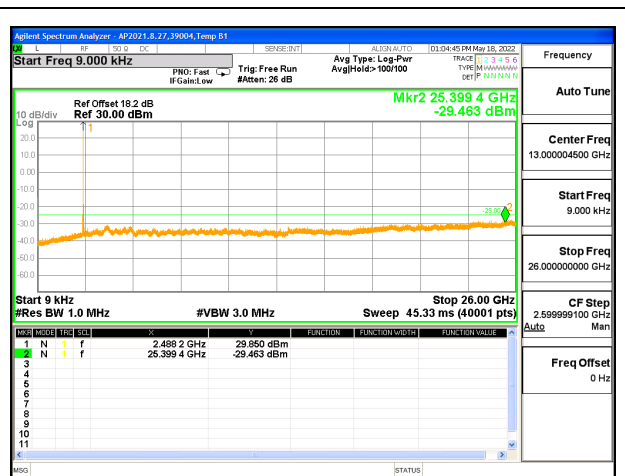
The minimum permissible attenuation level of any spurious emissions is  $55 + 10 \log (P)$  dB where transmitting power (P) in Watts.

### RESULTS

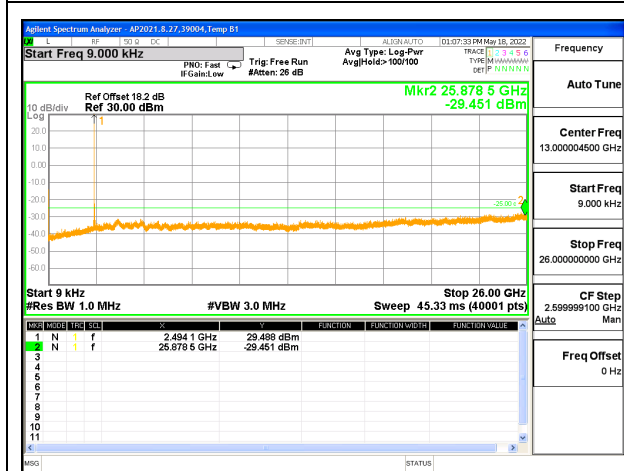
### 9.6.1. LTE BAND 53



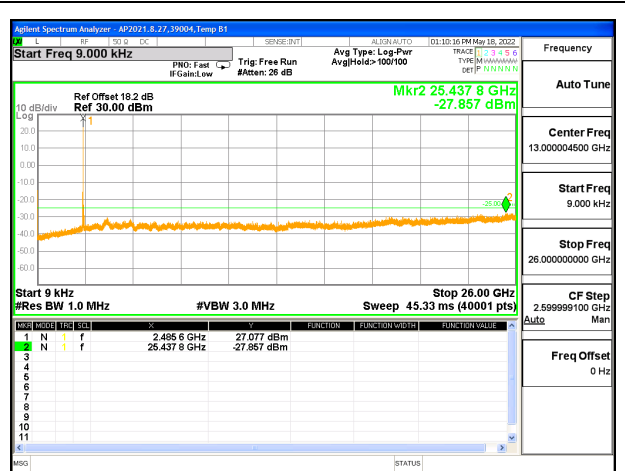
LTE B53 1.4MHz QPSK Low Channel RB1-0



LTE B53 1.4MHz QPSK Middle Channel RB1-0



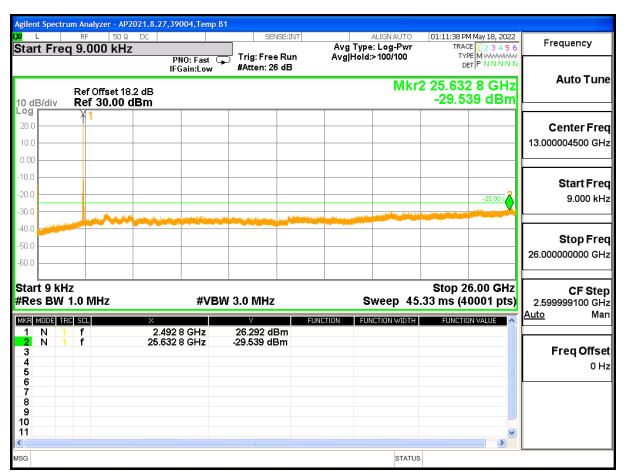
LTE B53 1.4MHz QPSK High Channel RB1-0



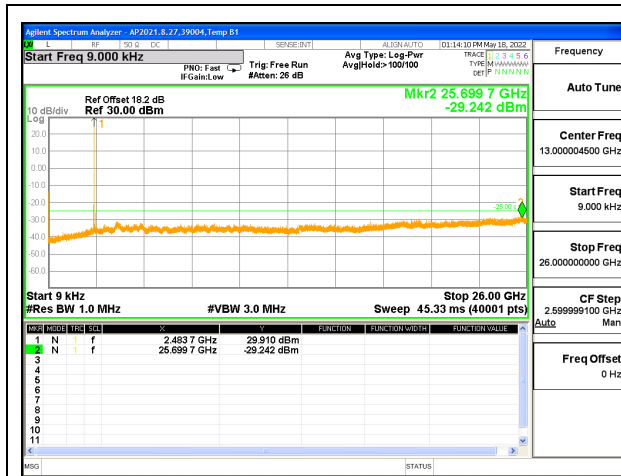
LTE B53 3MHz QPSK Low Channel RB1-0



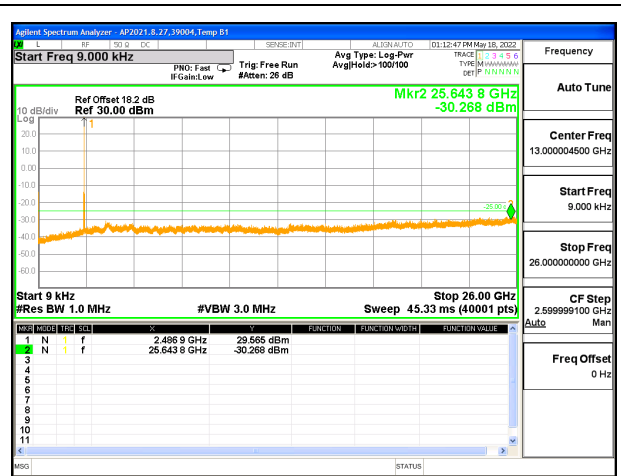
LTE B53 3MHz QPSK Middle Channel RB1-0



LTE B53 3MHz QPSK High Channel RB1-0



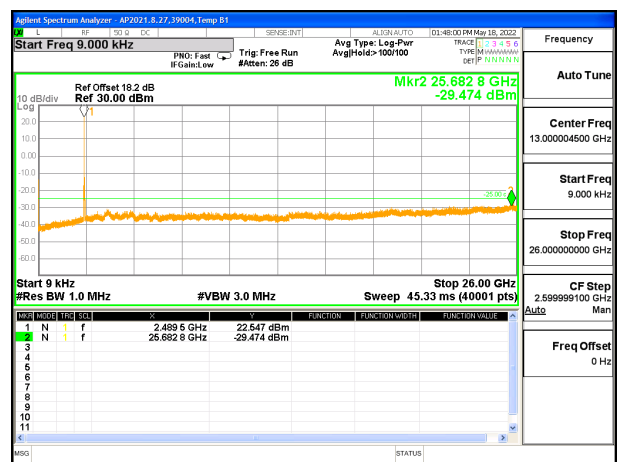
LTE B53 5MHz QPSK Low Channel RB1-0



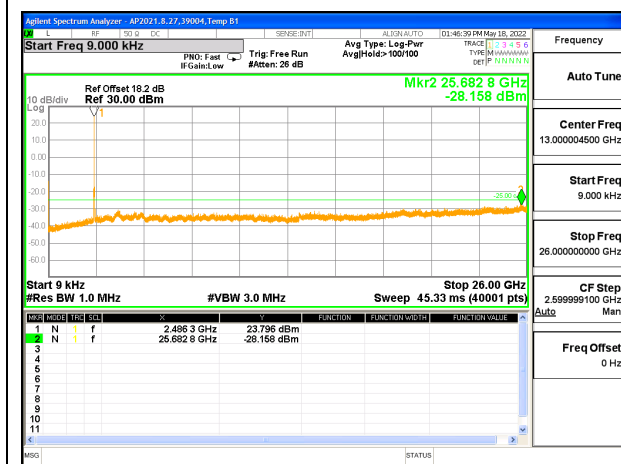
LTE B53 5MHz QPSK Middle Channel RB1-0



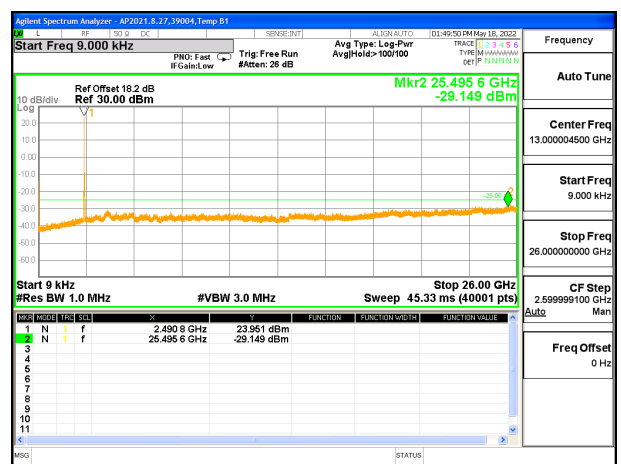
LTE B53 5MHz QPSK High Channel RB1-0



LTE B53 10MHz QPSK Low Channel RB1-0

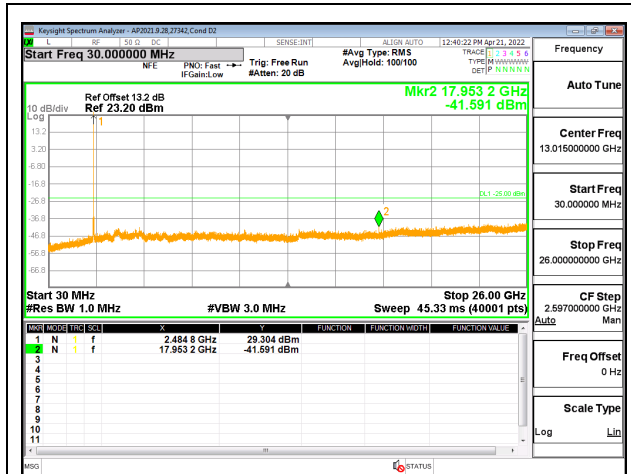


LTE B53 10MHz QPSK Middle Channel RB1-0

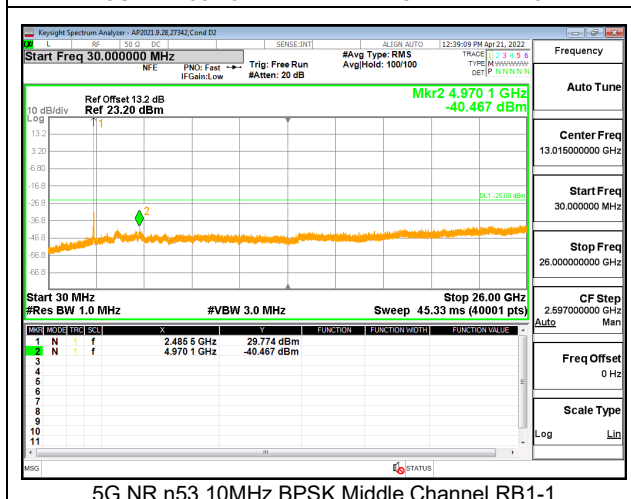


LTE B53 10MHz QPSK High Channel RB1-0

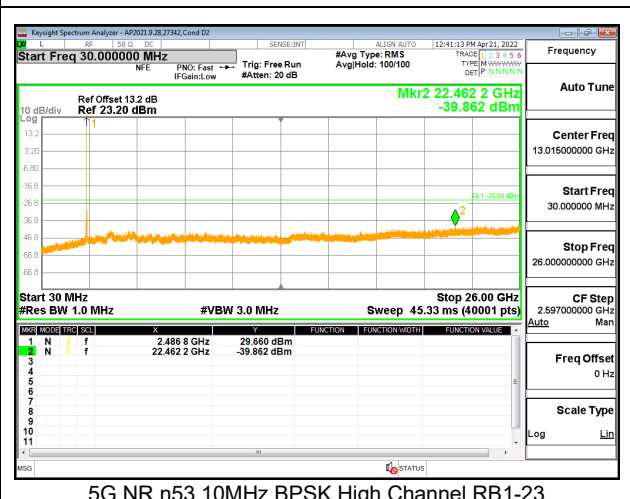
### 9.6.2. 5G NR n53



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



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



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

## 9.7. FREQUENCY STABILITY

### TEST 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, 3.0VDC.

### **Frequency Stability vs Temperature:**

The EUT is placed inside a temperature chamber. The temperature is set to 20°C 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 +50°C is reached.

### **Frequency Stability vs Voltage:**

The peak frequency error is recorded (worst-case).

### 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.

### RESULTS

See the following pages.

<b>Test Engineer ID:</b>	27979	<b>Test Date:</b>	5/25/2022
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**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	2483.7260	2494.7860			
Extreme (50°C)		2483.7260	2494.7860	-2.5	-0.001	Yes
Extreme (40°C)		2483.7260	2494.7860	-3.3	-0.001	Yes
Extreme (30°C)		2483.7260	2494.7860	-2.1	-0.001	Yes
Extreme (10°C)		2483.7260	2494.7860	1.7	0.001	Yes
Extreme (0°C)		2483.7260	2494.7860	-3.8	-0.002	Yes
Extreme (-10°C)		2483.7260	2494.7860	1.1	0.000	Yes
Extreme (-20°C)		2483.7260	2494.7860	1.3	0.001	Yes
Extreme (-30°C)		2483.7260	2494.7860	-1.8	-0.001	Yes
20°C	15%	2483.7260	2494.7860	-1.4	-0.001	Yes
	-15%	2483.7260	2494.7860	-1.5	-0.001	Yes
	End Point Voltage	2483.7260	2494.7860	-7.4	-0.003	Yes

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

Band		53		Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		2483.5	2495	10			Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)					
Normal (20°C)	Normal	2484.1803	2494.3046					
Extreme (50°C)		2484.1803	2494.3046	-6.32	-0.003	Yes		
Extreme (40°C)		2484.1803	2494.3046	-3.11	-0.001	Yes		
Extreme (30°C)		2484.1803	2494.3046	-2.72	-0.001	Yes		
Extreme (10°C)		2484.1803	2494.3046	-6.19	-0.002	Yes		
Extreme (0°C)		2484.1803	2494.3046	-2.93	-0.001	Yes		
Extreme (-10°C)		2484.1803	2494.3046	-2.5	-0.001	Yes		
Extreme (-20°C)		2484.1803	2494.3046	3.72	0.001	Yes		
Extreme (-30°C)		2484.1803	2494.3046	-3.43	-0.001	Yes		
20°C		15%	2484.1803	2494.3046	-1.35	-0.001	Yes	
	-15%	2484.1803	2494.3046	-2.68	-0.001	Yes		
	End Point Voltage	2484.1803	2494.3046	-9.03	-0.004	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.

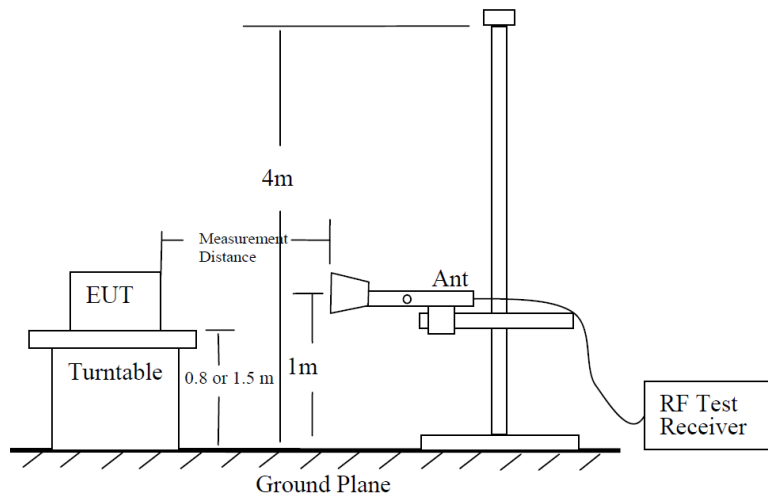


Figure 6—Test site-up for radiated ERP and/or EIRP measurements

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

- a)  $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$ .
- b)  $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$ .
- c)  $E \text{ (dB}\mu\text{V/m)} = \text{EIRP (dBm)} - 20\log(D) + 104.8$ ; where D is the measurement distance (in the far field region) in m.
- d)  $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8$ ; where D is the measurement distance (in the far field region) in m.

So, from d)

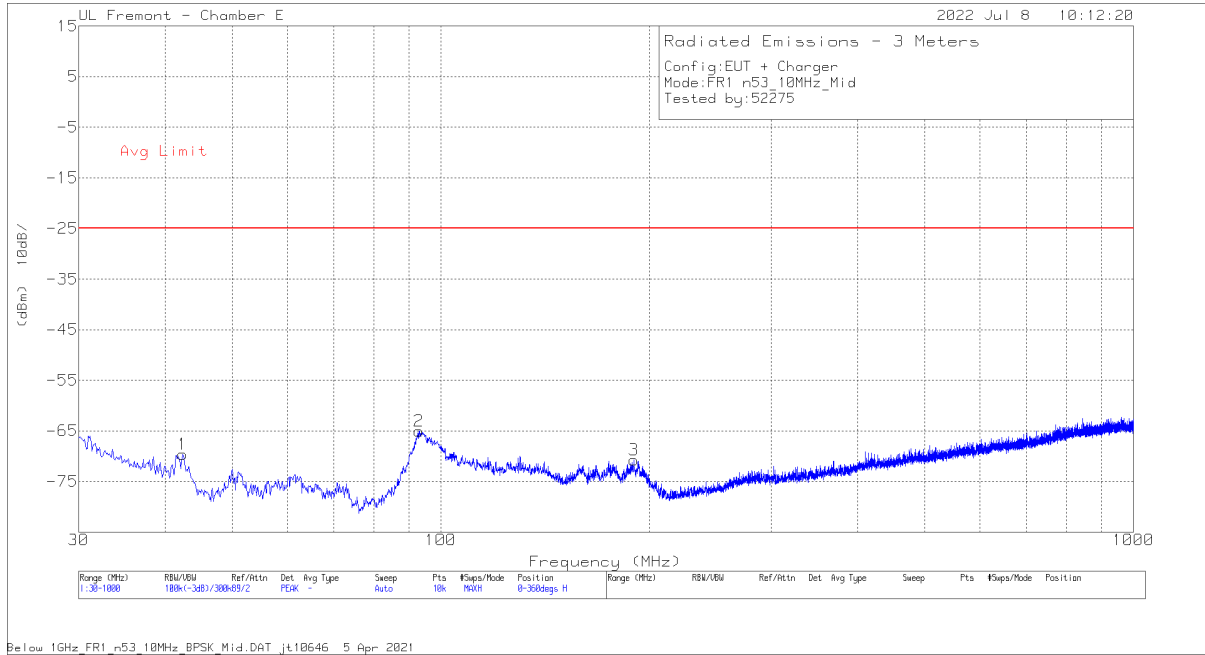
The measuring distance is usually at 3m, then  $20 \cdot \log(3) = 9.5424$

Then,  $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 9.5424 - 104.8 = E \text{ (dB}\mu\text{V/m)} - 95.2576$

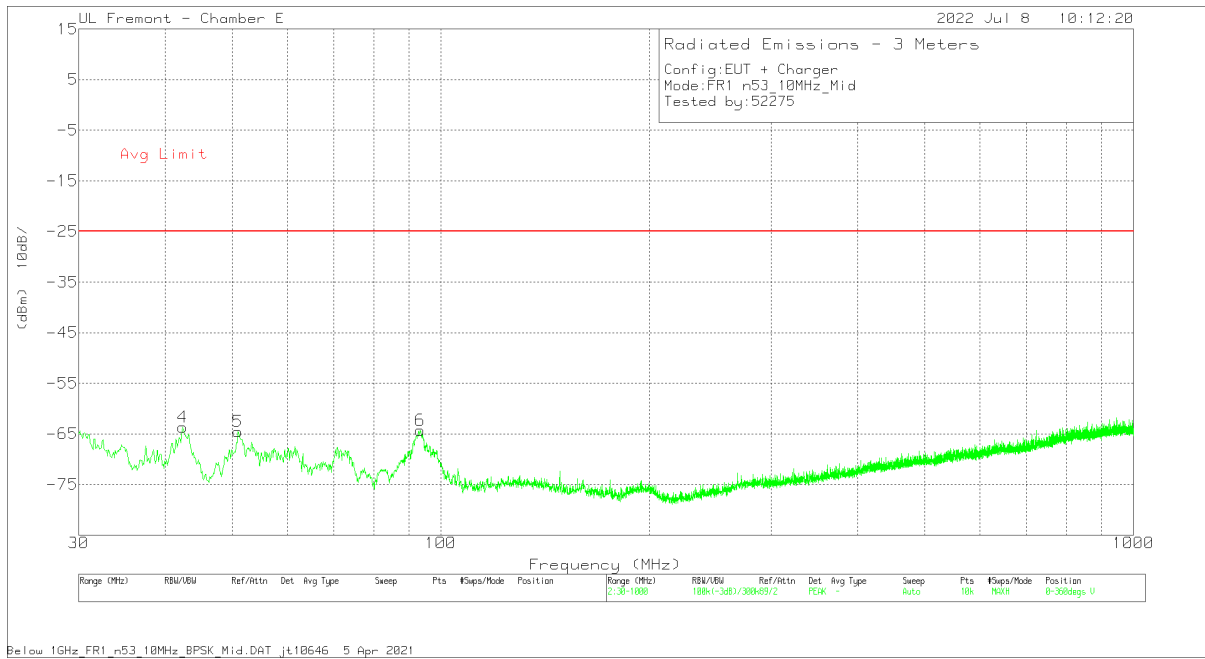
Note: Confidence check of each chamber is performed daily to see if any degradation from expected/normal reading reference data. Ambient check of each chamber is performed monthly.



**Example Plot Below 1GHz**



Horizontal Polarity

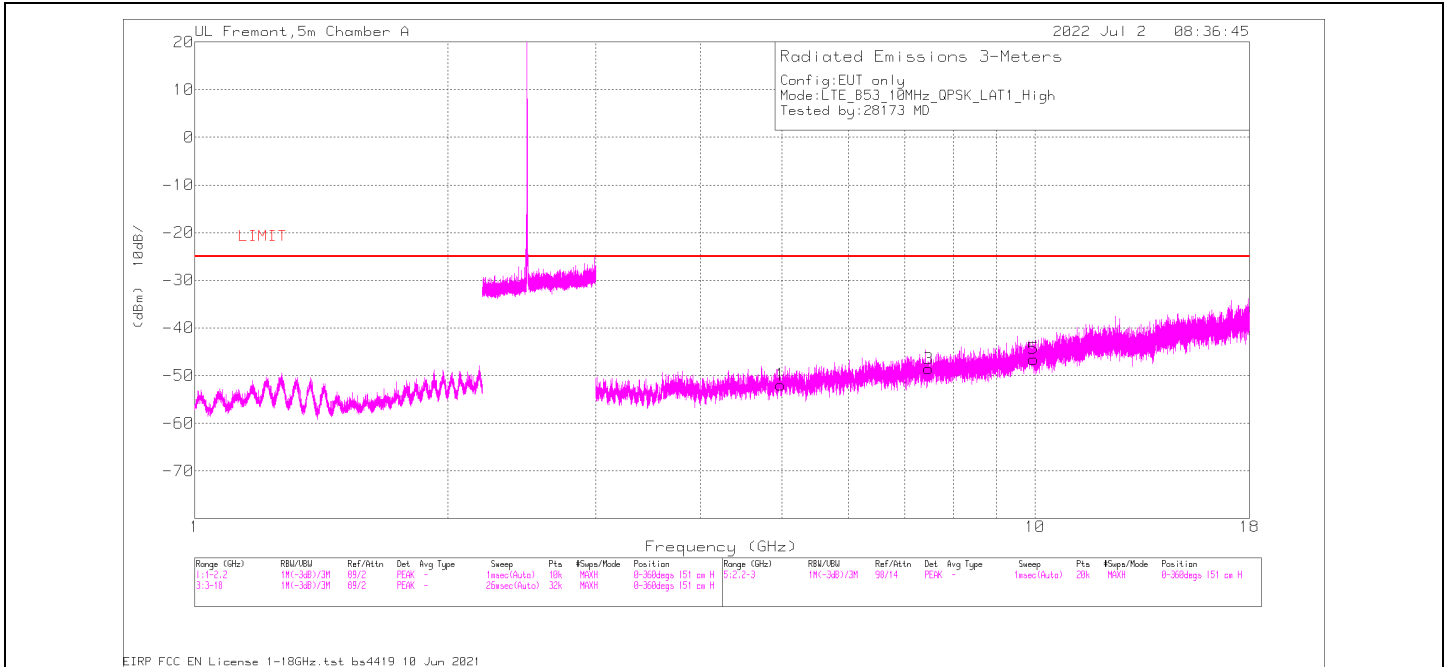


Vertical Polarity

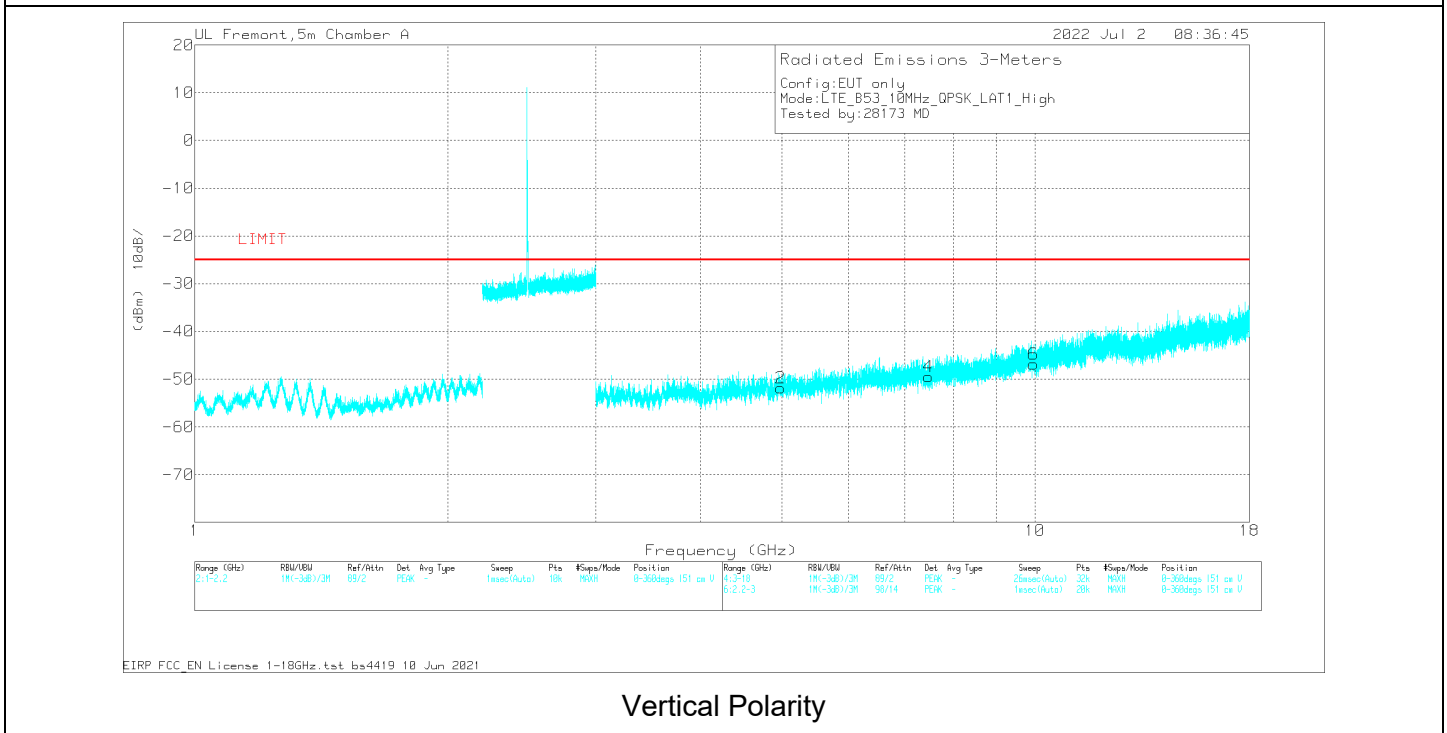
**Trace Markers**

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
1	42.416	33.43	Pk	19.2	-27.1	-95.2	-69.67	-25	-44.67	H
4	42.416	39.45	Pk	19.2	-27.1	-95.2	-63.65	-25	-38.65	V
5	50.952	43.07	Pk	14.5	-26.9	-95.2	-64.53	-25	-39.53	V
2	93.05	42.08	Pk	14.5	-26.4	-95.2	-65.02	-25	-40.02	H
6	93.438	42.67	Pk	14.6	-26.4	-95.2	-64.33	-25	-39.33	V
3	189.856	31.81	Pk	17.9	-25.3	-95.2	-70.79	-25	-45.79	H

**Example Plot Above 1GHz**



Horizontal Polarity



Vertical Polarity

**Trace Markers**

Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
4.980469	33.49	Pk	34.2	-24.7	.3	-95.2	-51.91	-25	-26.91	H
4.980469	33.55	Pk	34.2	-24.7	.3	-95.2	-51.85	-25	-26.85	V
7.470469	30.93	Pk	35.5	-20.2	.4	-95.2	-48.57	-25	-23.57	H
7.470469	30.02	Pk	35.5	-20.2	.4	-95.2	-49.48	-25	-24.48	V
9.960469	28.18	Pk	36.8	-17.1	.8	-95.2	-46.52	-25	-21.52	H
9.960469	27.86	Pk	36.8	-17.1	.8	-95.2	-46.84	-25	-21.84	V

## 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

**10.1.1. LTE BAND 53**

**QPSK LTE BAND 53 (10.0MHZ BANDWIDTH-1RB)**

Project #:	14040868
Date:	7/2/22
Test Engineer:	28173
Configuration:	EUT Only
Mode	LTE_B53_10MHz_QPSK_1RB
Chamber #:	A

Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.977188	33.73	Pk	34.2	-24.7	0.3	-95.2	-51.67	-25	-25.45	H
4.977188	34.36	Pk	34.2	-24.7	0.3	-95.2	-51.04	-25	-24.58	V
7.465313	32.64	Pk	35.5	-20.1	0.4	-95.2	-46.76	-25	-22.67	H
7.465313	30.03	Pk	35.5	-20.1	0.4	-95.2	-49.37	-25	-26.59	V
9.954375	29.12	Pk	36.8	-17.1	0.8	-95.2	-45.58	-25	-21.89	H
9.954375	28.15	Pk	36.8	-17.1	0.8	-95.2	-46.55	-25	-19.62	V
<b>Mid Channel, 2489MHz</b>										
4.978125	34.29	Pk	34.2	-24.7	0.3	-95.2	-51.11	-25	-26.11	H
4.978125	34.97	Pk	34.2	-24.7	0.3	-95.2	-50.43	-25	-25.43	V
7.467656	29.16	Pk	35.5	-20.1	0.4	-95.2	-50.24	-25	-25.24	H
7.467656	31.09	Pk	35.5	-20.1	0.4	-95.2	-48.31	-25	-23.31	V
9.95625	28.5	Pk	36.8	-17.1	0.8	-95.2	-46.2	-25	-21.2	H
9.95625	27.49	Pk	36.8	-17.1	0.8	-95.2	-47.21	-25	-22.21	V
<b>High Channel, 2490MHz</b>										
4.980469	33.49	Pk	34.2	-24.7	0.3	-95.2	-51.91	-25	-26.91	H
4.980469	33.55	Pk	34.2	-24.7	0.3	-95.2	-51.85	-25	-26.85	V
7.470469	30.93	Pk	35.5	-20.2	0.4	-95.2	-48.57	-25	-23.57	H
7.470469	30.02	Pk	35.5	-20.2	0.4	-95.2	-49.48	-25	-24.48	V
9.960469	28.18	Pk	36.8	-17.1	0.8	-95.2	-46.52	-25	-21.52	H
9.960469	27.86	Pk	36.8	-17.1	0.8	-95.2	-46.84	-25	-21.84	V

**QPSK LTE BAND 53 (10.0MHZ BANDWIDTH-FRB)**

Project #:	14040868
Date:	7/2/22
Test Engineer:	28173
Configuration:	EUT Only
Mode	LTE_B53_10MHz_QPSK_FRB
Chamber #:	A

Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.977188	32.76	Pk	34.2	-24.7	0.3	-95.2	-52.64	-25	-27.64	H
4.977188	33.43	Pk	34.2	-24.7	0.3	-95.2	-51.97	-25	-26.97	V
7.465781	31.43	Pk	35.5	-20.1	0.4	-95.2	-47.97	-25	-22.97	H
7.465781	31.56	Pk	35.5	-20.1	0.4	-95.2	-47.84	-25	-22.84	V
9.954375	27.61	Pk	36.8	-17.1	0.8	-95.2	-47.09	-25	-22.09	H
9.954375	27.2	Pk	36.8	-17.1	0.8	-95.2	-47.5	-25	-22.5	V
<b>Mid Channel, 2489MHz</b>										
4.978125	33.45	Pk	34.2	-24.7	0.3	-95.2	-51.95	-25	-26.95	H
4.978125	32.11	Pk	34.2	-24.7	0.3	-95.2	-53.29	-25	-28.29	V
7.467188	30.34	Pk	35.5	-20.1	0.4	-95.2	-49.06	-25	-24.06	H
7.467188	32.57	Pk	35.5	-20.1	0.4	-95.2	-46.83	-25	-21.83	V
9.95625	29.37	Pk	36.8	-17.1	0.8	-95.2	-45.33	-25	-20.33	H
9.95625	28.13	Pk	36.8	-17.1	0.8	-95.2	-46.57	-25	-21.57	V
<b>High Channel, 2490MHz</b>										
4.980469	32.88	Pk	34.2	-24.7	0.3	-95.2	-52.52	-25	-27.52	H
4.980469	35.77	Pk	34.2	-24.7	0.3	-95.2	-49.63	-25	-24.63	V
7.470469	30.96	Pk	35.5	-20.2	0.4	-95.2	-48.54	-25	-23.54	H
7.470469	30.22	Pk	35.5	-20.2	0.4	-95.2	-49.28	-25	-24.28	V
9.960469	29.73	Pk	36.8	-17.1	0.8	-95.2	-44.97	-25	-19.97	H
9.960469	27.54	Pk	36.8	-17.1	0.8	-95.2	-47.16	-25	-22.16	V

**10.1.2. 5G NR n53**

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

Project #:	14040868
Date:	7/2/22
Test Engineer:	26120
Configuration:	EUT Only
Mode	FR1 n53 10MHz BPSK 1RB
Chamber #:	B

Frequency (GHz)	Meter Reading (dBuV)	Det	81886 ACF (dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.977188	35.4	Pk	34.1	-30.9	0.3	-95.2	-56.3	-25	-31.3	H
4.977188	36.94	Pk	34.1	-30.9	0.3	-95.2	-54.76	-25	-29.76	V
7.464844	33.03	Pk	36	-26.9	0.4	-95.2	-52.67	-25	-27.67	H
7.464844	31.77	Pk	36	-26.9	0.4	-95.2	-53.93	-25	-28.93	V
9.953906	33.07	Pk	37.3	-24.8	0.8	-95.2	-48.83	-25	-23.83	H
9.953906	30.83	Pk	37.3	-24.8	0.8	-95.2	-51.07	-25	-26.07	V
<b>Mid Channel, 2489MHz</b>										
4.957031	34.35	Pk	34.1	-30.9	0.3	-95.2	-57.35	-25	-32.35	H
4.957031	39.26	Pk	34.1	-30.9	0.3	-95.2	-52.44	-25	-27.44	V
7.467188	33.34	Pk	36	-26.9	0.4	-95.2	-52.36	-25	-27.36	H
7.467188	31.94	Pk	36	-26.9	0.4	-95.2	-53.76	-25	-28.76	V
9.95625	31.74	Pk	37.3	-24.8	0.8	-95.2	-50.16	-25	-25.16	H
9.95625	33.43	Pk	37.3	-24.8	0.8	-95.2	-48.47	-25	-23.47	V
<b>High Channel, 2490MHz</b>										
4.98	37.47	Pk	34.1	-31	0.3	-95.2	-54.33	-25	-29.33	H
4.98	37.97	Pk	34.1	-31	0.3	-95.2	-53.83	-25	-28.83	V
7.47	32.95	Pk	36.1	-26.9	0.4	-95.2	-52.65	-25	-27.65	H
7.47	34.3	Pk	36.1	-26.9	0.4	-95.2	-51.3	-25	-26.3	V
9.96	31.87	Pk	37.3	-24.7	0.8	-95.2	-49.93	-25	-24.93	H
9.96	33.91	Pk	37.3	-24.7	0.8	-95.2	-47.89	-25	-22.89	V



**BPSK 5G NR n53 (10.0MHZ BANDWIDTH FRB)**

Project #:	14040868
Date:	7/1/22
Test Engineer:	26120
Configuration:	EUT Only
Mode	FR1_n53_10MHz_BPSK_FRB
Chamber #:	B

Frequency (GHz)	Meter Reading (dBuV)	Det	81886 ACF (dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.977188	37.49	Pk	34.1	-30.9	0.3	-95.2	-54.21	-25	-29.21	H
4.977188	38.18	Pk	34.1	-30.9	0.3	-95.2	-53.52	-25	-28.52	V
7.464844	32.96	Pk	36	-26.9	0.4	-95.2	-52.74	-25	-27.74	H
7.464844	33.18	Pk	36	-26.9	0.4	-95.2	-52.52	-25	-27.52	V
9.953906	31.22	Pk	37.3	-24.8	0.8	-95.2	-50.68	-25	-25.68	H
9.953906	31.99	Pk	37.3	-24.8	0.8	-95.2	-49.91	-25	-24.91	V
<b>Mid Channel, 2489MHz</b>										
4.978125	36.03	Pk	34.1	-30.9	0.3	-95.2	-55.67	-25	-30.67	H
4.978125	38.01	Pk	34.1	-30.9	0.3	-95.2	-53.69	-25	-28.69	V
7.467188	34.91	Pk	36	-26.9	0.4	-95.2	-50.79	-25	-25.79	H
7.467188	32.71	Pk	36	-26.9	0.4	-95.2	-52.99	-25	-27.99	V
9.95625	33.46	Pk	37.3	-24.8	0.8	-95.2	-48.44	-25	-23.44	H
9.95625	32.7	Pk	37.3	-24.8	0.8	-95.2	-49.2	-25	-24.2	V
<b>High Channel, 2490MHz</b>										
4.98	36.92	Pk	34.1	-31	0.3	-95.2	-54.88	-25	-29.88	H
4.98	37.76	Pk	34.1	-31	0.3	-95.2	-54.04	-25	-29.04	V
7.47	32.66	Pk	36.1	-26.9	0.4	-95.2	-52.94	-25	-27.94	H
7.47	32.94	Pk	36.1	-26.9	0.4	-95.2	-52.66	-25	-27.66	V
9.96	31.13	Pk	37.3	-24.7	0.8	-95.2	-50.67	-25	-25.67	H
9.96	30.92	Pk	37.3	-24.7	0.8	-95.2	-50.88	-25	-25.88	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 #:	14040868									
Date:	7/12/2022									
Test Engineer:	45258									
Configuration:	EUT Only									
Mode	LTE_B53_10MHz_QPSK_1RB									
Chamber #:	A									
Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.977188	33.2	Pk	34.2	-24.7	.3	-95.2	-52.2	-25	-27.2	H
4.977188	33.75	Pk	34.2	-24.7	.3	-95.2	-51.65	-25	-26.65	V
7.465313	31.71	Pk	35.5	-20.1	.4	-95.2	-47.69	-25	-22.69	H
7.465313	26.51	Pk	35.5	-20.1	.4	-95.2	-52.89	-25	-27.89	V
9.954844	30.5	Pk	36.8	-17.1	.8	-95.2	-44.2	-25	-19.2	H
9.954844	27.36	Pk	36.8	-17.1	.8	-95.2	-47.34	-25	-22.34	V
<b>Mid Channel, 2489MHz</b>										
4.978594	33.84	Pk	34.2	-24.7	.3	-95.2	-51.56	-25	-26.56	H
4.978594	32.55	Pk	34.2	-24.7	.3	-95.2	-52.85	-25	-27.85	V
7.467188	29.41	Pk	35.5	-20.1	.4	-95.2	-49.99	-25	-24.99	H
7.467188	30.11	Pk	35.5	-20.1	.4	-95.2	-49.29	-25	-24.29	V
9.95625	29.3	Pk	36.8	-17.1	.8	-95.2	-45.4	-25	-20.4	H
9.95625	27.9	Pk	36.8	-17.1	.8	-95.2	-46.8	-25	-21.8	V
<b>High Channel, 2490MHz</b>										
4.979531	31.66	Pk	34.2	-24.7	.3	-95.2	-53.74	-25	-28.74	H
4.979531	32.02	Pk	34.2	-24.7	.3	-95.2	-53.38	-25	-28.38	V
7.469531	29.52	Pk	35.5	-20.2	.4	-95.2	-49.98	-25	-24.98	H
7.469531	30.08	Pk	35.5	-20.2	.4	-95.2	-49.42	-25	-24.42	V
9.959531	27.64	Pk	36.8	-17.1	.8	-95.2	-47.06	-25	-22.06	H
9.959531	28.24	Pk	36.8	-17.1	.8	-95.2	-46.46	-25	-21.46	V

**QPSK LTE BAND 53 (10.0MHZ BANDWIDTH-FRB)**

Project #:	14040868
Date:	7/12/2022
Test Engineer:	45258
Configuration:	EUT Only
Mode	LTE_B53_10MHz_QPSK_fRB
Chamber #:	A

Frequency (GHz)	Meter Reading (dBuV)	Det	Horn Antenna ACF(dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.977656	33.8	Pk	34.2	-24.7	.3	-95.2	-51.6	-25	-26.6	H
4.977656	32.09	Pk	34.2	-24.7	.3	-95.2	-53.31	-25	-28.31	V
7.465313	28.72	Pk	35.5	-20.1	.4	-95.2	-50.68	-25	-25.68	H
7.465313	31.28	Pk	35.5	-20.1	.4	-95.2	-48.12	-25	-23.12	V
9.954375	28.87	Pk	36.8	-17.1	.8	-95.2	-45.83	-25	-20.83	H
9.954375	28.81	Pk	36.8	-17.1	.8	-95.2	-45.89	-25	-20.89	V
<b>Mid Channel, 2489MHz</b>										
4.978125	32.37	Pk	34.2	-24.7	.3	-95.2	-53.03	-25	-28.03	H
4.978125	31.19	Pk	34.2	-24.7	.3	-95.2	-54.21	-25	-29.21	V
7.467656	28.56	Pk	35.5	-20.1	.4	-95.2	-50.84	-25	-25.84	H
7.467656	31.77	Pk	35.5	-20.1	.4	-95.2	-47.63	-25	-22.63	V
9.956719	27.96	Pk	36.8	-17.1	.8	-95.2	-46.74	-25	-21.74	H
9.956719	27.44	Pk	36.8	-17.1	.8	-95.2	-47.26	-25	-22.26	V
<b>High Channel, 2490MHz</b>										
4.979063	35.9	Pk	34.2	-24.7	.3	-95.2	-49.5	-25	-24.5	H
4.979063	34.26	Pk	34.2	-24.7	.3	-95.2	-51.14	-25	-26.14	V
7.47	30.08	Pk	35.5	-20.2	.4	-95.2	-49.42	-25	-24.42	H
7.47	29.7	Pk	35.5	-20.2	.4	-95.2	-49.8	-25	-24.8	V
9.959531	29.02	Pk	36.8	-17.1	.8	-95.2	-45.68	-25	-20.68	H
9.959531	28.96	Pk	36.8	-17.1	.8	-95.2	-45.74	-25	-20.74	V

**10.2.2. 5G NR n53**

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

Project #:	14040868
Date:	7/5/22
Test Engineer:	45258
Configuration:	EUT Only
Mode	FR1 n53 10MHz BPSK 1RB
Chamber #:	A

Frequency (GHz)	Meter Reading (dBuV)	Det	81886 ACF (dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.966875	33.47	Pk	34.1	-24.6	.3	-95.2	-51.93	-25	-26.93	V
4.967344	33.21	Pk	34.1	-24.6	.3	-95.2	-52.19	-25	-27.19	H
7.450313	29.37	Pk	35.4	-20.1	.4	-95.2	-50.13	-25	-25.13	H
7.450313	29.02	Pk	35.4	-20.1	.4	-95.2	-50.48	-25	-25.48	V
9.934219	28.14	Pk	36.8	-17.2	.7	-95.2	-46.76	-25	-21.76	H
9.934219	27.3	Pk	36.8	-17.2	.7	-95.2	-47.6	-25	-22.6	V
<b>Mid Channel, 2489MHz</b>										
4.979531	35.12	Pk	34.2	-24.7	.3	-95.2	-50.28	-25	-25.28	H
4.979531	34.18	Pk	34.2	-24.7	.3	-95.2	-51.22	-25	-26.22	V
7.467656	30.2	Pk	35.5	-20.1	.4	-95.2	-49.2	-25	-24.2	H
7.467656	29.91	Pk	35.5	-20.1	.4	-95.2	-49.49	-25	-24.49	V
9.957656	28.02	Pk	36.8	-17.1	.8	-95.2	-46.68	-25	-21.68	H
9.957656	28.94	Pk	36.8	-17.1	.8	-95.2	-45.76	-25	-20.76	V
<b>High Channel, 2490MHz</b>										
4.990313	31.87	Pk	34.2	-24.6	.4	-95.2	-53.33	-25	-28.33	H
4.990313	33.55	Pk	34.2	-24.6	.4	-95.2	-51.65	-25	-26.65	V
7.485	31.6	Pk	35.5	-20.4	.4	-95.2	-48.1	-25	-23.1	H
7.485	27.85	Pk	35.5	-20.4	.4	-95.2	-51.85	-25	-26.85	V
9.980156	28.49	Pk	36.8	-17.4	.8	-95.2	-46.51	-25	-21.51	V
9.981094	28.04	Pk	36.8	-17.5	.8	-95.2	-47.06	-25	-22.06	H

**BPSK 5G NR n53 (10.0MHZ BANDWIDTH FRB)**

Company:										
Project #:										
Date:		7/6/22								
Test Engineer:		28567								
Configuration:		EUT Only								
Mode		FR1_n53_10MHz_BPSK FRB								
Chamber #:		A								
Frequency (GHz)	Meter Reading (dBuV)	Det	81886 ACF (dB)	Amp/Cbl (dB)	BRF 2.4-2.5GHz T1786 1-18GHz	EIRP CF	Corrected Reading (dBm)	LIMIT	Margin (dB)	Polarity
<b>Low Channel, 2488.5MHz</b>										
4.966875	32.49	Pk	34.1	-24.6	.3	-95.2	-52.91	-25	-27.91	H
4.966875	35.77	Pk	34.1	-24.6	.3	-95.2	-49.63	-25	-24.63	V
7.450313	29.3	Pk	35.4	-20.1	.4	-95.2	-50.2	-25	-25.2	H
7.450313	30.04	Pk	35.4	-20.1	.4	-95.2	-49.46	-25	-24.46	V
9.934219	28.09	Pk	36.8	-17.2	.7	-95.2	-46.81	-25	-21.81	H
9.934219	28.86	Pk	36.8	-17.2	.7	-95.2	-46.04	-25	-21.04	V
<b>Mid Channel, 2489MHz</b>										
4.978125	34.78	Pk	34.2	-24.7	.3	-95.2	-50.62	-25	-25.62	H
4.978125	33.57	Pk	34.2	-24.7	.3	-95.2	-51.83	-25	-26.83	V
7.467188	32.66	Pk	35.5	-20.1	.4	-95.2	-46.74	-25	-21.74	H
7.467188	28.38	Pk	35.5	-20.1	.4	-95.2	-51.02	-25	-26.02	V
9.957656	28.39	Pk	36.8	-17.1	.8	-95.2	-46.31	-25	-21.31	H
9.957656	28.28	Pk	36.8	-17.1	.8	-95.2	-46.42	-25	-21.42	V
<b>High Channel, 2490MHz</b>										
4.990313	32.73	Pk	34.2	-24.6	.4	-95.2	-52.47	-25	-27.47	H
4.990313	33.79	Pk	34.2	-24.6	.4	-95.2	-51.41	-25	-26.41	V
7.485469	28.78	Pk	35.5	-20.4	.4	-95.2	-50.92	-25	-25.92	H
7.485469	30.02	Pk	35.5	-20.4	.4	-95.2	-49.68	-25	-24.68	V
9.980156	29.89	Pk	36.8	-17.4	.8	-95.2	-45.11	-25	-20.11	H
9.980156	29.91	Pk	36.8	-17.4	.8	-95.2	-45.09	-25	-20.09	V

## 11. SETUP PHOTOS

Please refer to 14040868-EP1V1 for setup photos.