# TEST REPORT

**Report Number:** 14040863-E12V4

| | | |
|---|---|---|
| **Applicant** | : | APPLE, INC<br>1 APPLE PARK WAY<br>CUPERTINO, CA 95014, U.S.A. |
| **Model** | : | A2650 (Parent Model)<br>A2889, A2890 (Variant Models) |
| **Brand** | : | APPLE |
| **FCC ID** | : | BCG-E8140A (Parent Model)<br>BCG-E8150A, BCG-E8151A (Variant Models) |
| **IC** | : | 579C-E8140A (Parent Model)<br>579C-E8150A, 579C-E8151A (Variant Models) |
| **EUT Description** | : | SMARTPHONE |
| **Test Standard(s)** | : | FCC CFR47 Part 25<br>ISED RSS-170 ISSUE 3 AMENDED |

**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 | 6/28/2022 | Initial Review | Mengistu Mekuria |
| V2 | 7/11/2022 | Removed yellow highlights | Tewodros Woldemichael |
| V3 | 7/12/2022 | Revised TCB Questions Page 12, 35 and Loop antenna equipment list added. | Tewodros Woldemichael |
| V4 | 8/1/2022 | Added Variant Models | Thu Chan |



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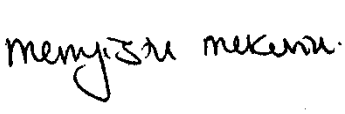
# 1. ATTESTATION OF TEST RESULTS

| | |
|---|---|
| Applicant Name and Address | APPLE, INC<br>1 APPLE PARK WAY<br>CUPERTINO, CA 95014, U.S.A. |
| Model | A2650 (Parent Model, Full Test)<br>A2889, A2890 (Variant Models) |
| Brand | APPLE |
| FCC ID | BCG-E8140A (Parent Model)<br>BCG-E8150A, BCG-E8151A (Variant Models) |
| IC | 579C-E8140A (Parent Model)<br>579C-E8150A, 579C-E8151A (Variant Models) |
| EUT Description | SMARTPHONE |
| Serial Number | P6Q40VXVX1, MX6MQD93RY (CONDUCTED) AND R9VD6JPQTY, JJJ377FDJ2 (RADIATED) |
| Sample Receipt Date | APRIL 11, 2022 |
| Date Tested | FEBRUARY 16, 2022 to JUNE 14, 2022 |
| Applicable Standards | FCC CFR 47 Part 2, Part 25<br>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: |
|---|---|---|
|  |  |  |
| Mengistu Mekuria<br>Staff Engineer<br>UL LLC. | Tewodros Woldemichael<br>Laboratory Engineer<br>UL LLC. | Binod Sitaula<br>Laboratory Engineer<br>UL LLC. |



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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-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 |
|---|---|---|---|---|
| ☒ | 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 |



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# 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.

Parent Model: A2650, FCC ID: BCG-E8140A, IC: 579C-E8140A

Variant Models: A2889, FCC ID: BCG-E8150A, IC: 579C-E8150A
A2890; FCC ID: BCG-E8151A, IC: 579C-E8151A

## 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) | -1.10 |

| 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 | 19.60 | 0.091 | 1093 | 1M09G7W |
| | 16QAM | | | 20.70 | 19.60 | 0.091 | 1093 | 1M09D7W |
| 3.0 | QPSK | 2485.0 | 2493.5 | 20.70 | 19.60 | 0.091 | 2693 | 2M69G7W |
| | 16QAM | | | 20.70 | 19.60 | 0.091 | 2693 | 2M69D7W |
| 5.0 | QPSK | 2486.0 | 2492.5 | 20.70 | 19.60 | 0.091 | 4512 | 4M51G7W |
| | 16QAM | | | 20.70 | 19.60 | 0.091 | 4501 | 4M50D7W |
| 10.0 | QPSK | 2488.5 | 2490.0 | 20.70 | 19.60 | 0.091 | 8974 | 8M97G7W |
| | 16QAM | | | 20.70 | 19.60 | 0.091 | 8981 | 8M98D7W |

**5G NR n53**

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) | -1.10 |

| 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 | 20.70 | 19.60 | 0.091 | 8570 | 8M57G7W |
| | QPSK | | | 20.70 | 19.60 | 0.091 | 8555 | 8M56G7W |
| | 16QAM | | | 20.70 | 19.60 | 0.091 | 8571 | 8M57D7W |

## 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 n5 | 2483.5 – 2495 MHz | -2.5 | -1.1 |



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## 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 |

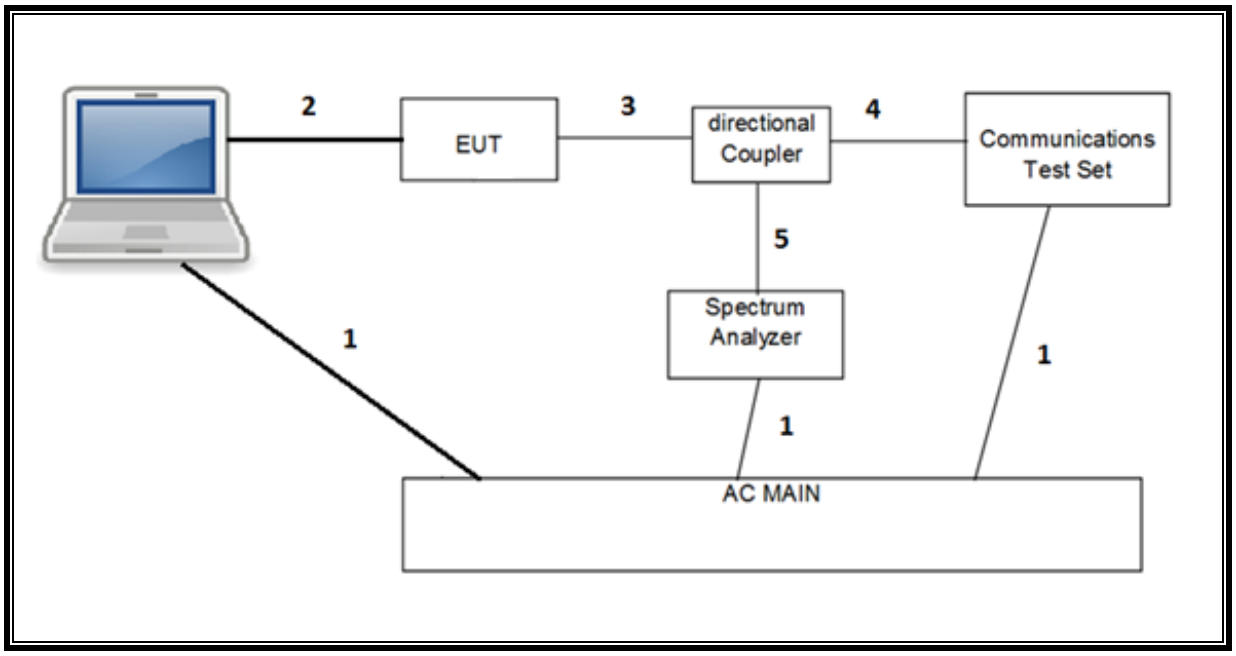
Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

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.

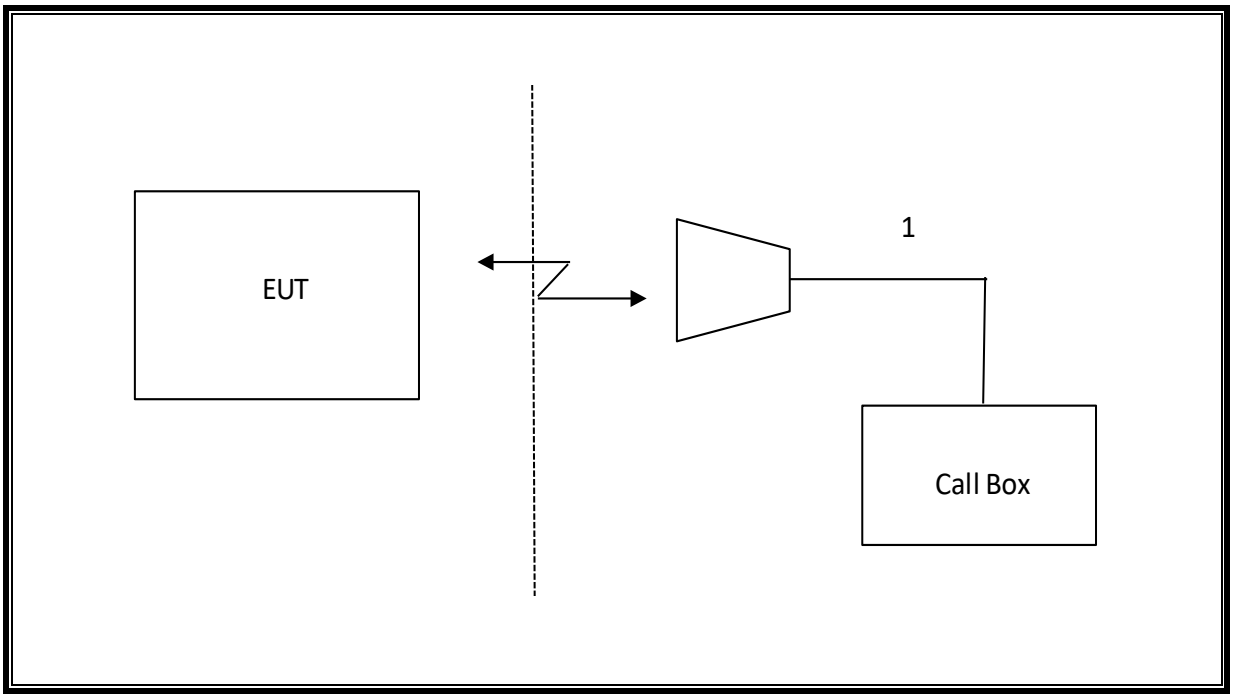
## 6.6. DESCRIPTION OF TEST SETUP

| 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, 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 100KHz to 30MHz | ELECTRO-METRICS | EM-6872 | 219911 | 05/10/2023 |
| Antenna, Active Loop 30Hz to 1MHz | ELECTRO-METRICS | EM-6871 | 219909 | 05/10/2023 |
| **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). 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: | 25780 | Test Date: | 4/2/2022 |
|---|---|---|---|

## 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 | 20.64 | 20.64 | 20.57 | 19.56 | 20.65 | 20.66 |
| | | 1 | 2 | **20.70** | 20.67 | 20.61 | 20.66 | **20.70** | 20.69 |
| | | 1 | 5 | 20.64 | 20.65 | 20.59 | 20.63 | 20.64 | 20.63 |
| | | 3 | 0 | 20.66 | 20.66 | 20.58 | 20.66 | 20.67 | 20.65 |
| | | 3 | 1 | 20.67 | 20.68 | 20.59 | 20.66 | 20.68 | 20.66 |
| | | 3 | 2 | 20.66 | 20.67 | 20.58 | 20.66 | 20.68 | 20.66 |
| | | 6 | 0 | 19.94 | 19.95 | 19.90 | 19.57 | 19.68 | 19.66 |
| | 16QAM | 1 | 0 | 20.66 | **20.70** | 20.50 | 20.58 | 20.59 | 20.67 |
| | | 1 | 2 | 20.66 | 20.56 | 20.66 | 20.63 | 20.61 | 20.54 |
| | | 1 | 5 | 20.69 | 20.47 | 20.66 | 20.57 | 20.65 | **20.70** |
| | | 3 | 0 | 20.45 | 20.38 | 20.31 | 20.45 | 20.41 | 20.50 |
| | | 3 | 1 | 20.40 | 20.52 | 20.30 | 20.45 | 20.45 | 20.40 |
| | | 3 | 2 | 20.43 | 20.52 | 20.45 | 20.45 | 20.46 | 20.49 |
| | | 6 | 0 | 19.36 | 19.33 | 19.27 | 19.25 | 19.36 | 19.30 |
| | 64QAM | 1 | 0 | 20.65 | 20.64 | 20.52 | 20.61 | 20.58 | 20.65 |
| | | 1 | 2 | **20.70** | 20.67 | 20.59 | 20.69 | **20.70** | 20.66 |
| | | 1 | 5 | 20.69 | 20.66 | 20.58 | 20.63 | 20.61 | 20.67 |
| | | 3 | 0 | 20.61 | 20.51 | 20.47 | 20.55 | **20.70** | 20.55 |
| | | 3 | 1 | 20.61 | 20.56 | 20.48 | 20.56 | 20.62 | 20.58 |
| | | 3 | 2 | 20.63 | 20.54 | 20.48 | 20.56 | **20.70** | 20.56 |
| | | 6 | 0 | 19.55 | 19.45 | 19.42 | 19.36 | 20.61 | 19.54 |
| | 256QAM | 1 | 0 | 20.68 | 20.61 | 20.51 | 20.69 | 20.61 | 20.69 |
| | | 1 | 2 | **20.70** | **20.70** | 20.61 | **20.70** | 20.66 | 20.66 |
| | | 1 | 5 | 20.65 | 20.61 | 20.52 | 20.68 | 20.62 | 20.64 |
| | | 3 | 0 | 20.63 | 20.58 | 20.53 | 20.65 | 20.59 | 20.62 |
| | | 3 | 1 | 20.64 | 20.62 | 20.53 | 20.65 | 20.61 | 20.61 |
| | | 3 | 2 | 20.63 | 20.63 | 20.51 | 20.69 | 20.61 | 20.63 |
| | | 6 | 0 | 20.62 | 20.52 | 20.50 | 20.60 | 20.50 | 20.57 |

## 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 | 20.62 | 20.61 | 20.61 | 20.61 | 20.57 | 20.61 |
| | | 1 | 7 | 20.69 | **20.70** | 20.66 | **20.70** | 20.66 | **20.70** |
| | | 1 | 14 | 20.60 | 20.64 | 20.58 | 20.62 | 20.58 | 20.61 |
| | | 8 | 0 | 19.99 | 20.01 | 20.01 | 19.71 | 19.72 | 19.71 |
| | | 8 | 4 | 20.04 | 20.04 | 20.05 | 19.75 | 19.74 | 19.77 |
| | | 8 | 7 | 20.04 | 20.03 | 20.03 | 19.66 | 19.76 | 19.75 |
| | | 15 | 0 | 19.99 | 20.00 | 20.01 | 19.71 | 19.70 | 19.72 |
| | 16QAM | 1 | 0 | 20.55 | 20.53 | 20.52 | 20.53 | 20.49 | 20.56 |
| | | 1 | 7 | **20.70** | 20.65 | 20.59 | 20.68 | 20.66 | **20.70** |
| | | 1 | 14 | 20.52 | 20.56 | 20.48 | 20.55 | 20.50 | 20.57 |
| | | 8 | 0 | 19.29 | 19.32 | 19.29 | 19.31 | 19.34 | 19.38 |
| | | 8 | 4 | 19.36 | 19.38 | 19.35 | 19.39 | 19.34 | 19.42 |
| | | 8 | 7 | 19.35 | 19.37 | 19.34 | 19.26 | 19.37 | 19.43 |
| | | 15 | 0 | 19.29 | 19.30 | 19.28 | 19.30 | 19.29 | 19.33 |
| | 64QAM | 1 | 0 | 20.62 | 20.61 | 20.57 | 20.55 | 20.51 | 20.54 |
| | | 1 | 7 | **20.70** | 20.67 | **20.70** | **20.70** | 20.58 | 20.53 |
| | | 1 | 14 | 20.58 | 20.61 | 20.66 | 20.61 | 20.55 | 20.54 |
| | | 8 | 0 | 19.49 | 19.50 | 19.46 | 19.45 | 20.56 | 20.50 |
| | | 8 | 4 | 19.55 | 19.50 | 19.51 | 19.52 | 20.55 | 20.53 |
| | | 8 | 7 | 19.53 | 19.55 | 19.50 | 19.51 | 20.51 | 20.50 |
| | | 15 | 0 | 19.50 | 19.48 | 19.48 | 19.41 | 20.56 | 20.49 |
| | 256QAM | 1 | 0 | 20.55 | 20.53 | 20.44 | 20.61 | 20.51 | 20.51 |
| | | 1 | 7 | **20.70** | 20.65 | 20.58 | **20.70** | 20.64 | 20.58 |
| | | 1 | 14 | 20.53 | 20.56 | 20.47 | 20.56 | 20.48 | 20.45 |
| | | 8 | 0 | 20.52 | 20.49 | 20.46 | 20.52 | 20.49 | 20.49 |
| | | 8 | 4 | 20.53 | 20.55 | 20.53 | 20.55 | 20.50 | 20.53 |
| | | 8 | 7 | 20.54 | 20.55 | 20.53 | 20.56 | 20.53 | 20.53 |
| | | 15 | 0 | 20.50 | 20.49 | 20.48 | 20.49 | 20.47 | 20.46 |

## 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 |
| | | | | 2486.0 MHz | 2489.0 MHz | 2492.5 MHz | 2486.0 MHz | 2489.0 MHz | 2492.5 MHz |
| 5.0 | QPSK | 1 | 0 | 20.62 | 20.61 | 20.61 | 20.61 | 20.57 | 20.61 |
| | | 1 | 12 | 20.69 | **20.70** | 20.66 | **20.70** | 20.66 | **20.70** |
| | | 1 | 24 | 20.60 | 20.64 | 20.58 | 20.62 | 20.58 | 20.61 |
| | | 12 | 0 | 19.99 | 20.01 | 20.01 | 19.71 | 19.72 | 19.71 |
| | | 12 | 6 | 20.04 | 20.04 | 20.05 | 19.75 | 19.74 | 19.77 |
| | | 12 | 11 | 20.04 | 20.03 | 20.03 | 19.66 | 19.76 | 19.75 |
| | | 25 | 0 | 19.99 | 20.00 | 20.01 | 19.71 | 19.70 | 19.72 |
| | 16QAM | 1 | 0 | 20.55 | 20.53 | 20.52 | 20.53 | 20.49 | 20.56 |
| | | 1 | 12 | **20.70** | 20.65 | 20.59 | 20.68 | 20.66 | **20.70** |
| | | 1 | 24 | 20.52 | 20.56 | 20.48 | 20.55 | 20.50 | 20.57 |
| | | 12 | 0 | 19.29 | 19.32 | 19.29 | 19.31 | 19.34 | 19.38 |
| | | 12 | 6 | 19.36 | 19.38 | 19.35 | 19.39 | 19.34 | 19.42 |
| | | 12 | 11 | 19.35 | 19.37 | 19.34 | 19.26 | 19.37 | 19.43 |
| | | 25 | 0 | 19.29 | 19.30 | 19.28 | 19.30 | 19.29 | 19.33 |
| | 64QAM | 1 | 0 | 20.62 | 20.61 | 20.57 | 20.55 | 20.51 | 20.54 |
| | | 1 | 12 | **20.70** | 20.67 | **20.70** | **20.70** | 20.58 | 20.53 |
| | | 1 | 24 | 20.58 | 20.61 | 20.66 | 20.61 | 20.55 | 20.54 |
| | | 12 | 0 | 19.49 | 19.50 | 19.46 | 19.45 | 20.56 | 20.50 |
| | | 12 | 6 | 19.55 | 19.50 | 19.51 | 19.52 | 20.55 | 20.53 |
| | | 12 | 11 | 19.53 | 19.55 | 19.50 | 19.51 | 20.51 | 20.50 |
| | | 25 | 0 | 19.50 | 19.48 | 19.48 | 19.41 | 20.56 | 20.49 |
| | 256QAM | 1 | 0 | 20.55 | 20.53 | 20.44 | 20.61 | 20.51 | 20.51 |
| | | 1 | 12 | **20.70** | 20.65 | 20.58 | **20.70** | 20.64 | 20.58 |
| | | 1 | 24 | 20.53 | 20.56 | 20.47 | 20.56 | 20.48 | 20.45 |
| | | 12 | 0 | 20.52 | 20.49 | 20.46 | 20.52 | 20.49 | 20.49 |
| | | 12 | 6 | 20.53 | 20.55 | 20.53 | 20.55 | 20.50 | 20.53 |
| | | 12 | 11 | 20.54 | 20.55 | 20.53 | 20.56 | 20.53 | 20.53 |
| | | 25 | 0 | 20.50 | 20.49 | 20.48 | 20.49 | 20.47 | 20.46 |

## 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 |
| | | | | 2488.5 MHz | 2489.0 MHz | 2490.0 MHz | 2488.5 MHz | 2489.0 MHz | 2490.0 MHz |
| 10.0 | QPSK | 1 | 0 | 20.64 | 20.61 | 20.62 | 20.64 | 20.61 | 20.59 |
| | | 1 | 24 | **20.70** | 20.66 | 20.65 | 20.69 | 20.67 | 20.67 |
| | | 1 | 49 | 20.66 | 20.61 | 20.60 | **20.70** | 20.66 | 20.65 |
| | | 25 | 0 | 20.01 | 20.01 | 20.01 | 19.74 | 19.74 | 19.72 |
| | | 25 | 12 | 19.98 | 20.04 | 20.05 | 19.78 | 19.78 | 19.77 |
| | | 25 | 24 | 19.98 | 20.05 | 20.04 | 19.70 | 19.79 | 19.70 |
| | | 50 | 0 | 20.03 | 20.03 | 20.00 | 19.76 | 19.76 | 19.74 |
| | 16QAM | 1 | 0 | 20.62 | 20.60 | 20.58 | 20.62 | 20.63 | 20.57 |
| | | 1 | 24 | **20.70** | 20.58 | 20.54 | **20.70** | 20.62 | 20.67 |
| | | 1 | 49 | 20.63 | 20.59 | 20.53 | **20.70** | 20.66 | 20.67 |
| | | 25 | 0 | 19.33 | 19.32 | 19.35 | 19.36 | 19.34 | 19.31 |
| | | 25 | 12 | 19.28 | 19.32 | 19.37 | 19.40 | 19.38 | 19.35 |
| | | 25 | 24 | 19.28 | 19.35 | 19.37 | 19.34 | 19.39 | 19.30 |
| | | 50 | 0 | 19.34 | 19.33 | 19.34 | 19.36 | 19.34 | 19.34 |
| | 64QAM | 1 | 0 | 20.63 | 20.64 | 20.63 | 20.62 | 20.61 | 20.62 |
| | | 1 | 24 | **20.70** | 20.68 | 20.67 | **20.70** | 20.61 | 20.62 |
| | | 1 | 49 | 20.66 | 20.68 | 20.66 | 20.63 | 20.61 | 20.61 |
| | | 25 | 0 | 19.53 | 19.53 | 19.50 | 19.47 | 20.56 | 20.61 |
| | | 25 | 12 | 19.48 | 19.57 | 19.55 | 19.52 | 20.66 | 20.62 |
| | | 25 | 24 | 19.51 | 19.57 | 19.54 | 19.43 | 20.60 | 20.61 |
| | | 50 | 0 | 19.53 | 19.53 | 19.52 | 19.46 | 20.60 | 20.62 |
| | 256QAM | 1 | 0 | 20.50 | 20.60 | 20.54 | 20.49 | 20.57 | 20.52 |
| | | 1 | 24 | 20.56 | **20.70** | 20.61 | 20.63 | **20.70** | 20.56 |
| | | 1 | 49 | 20.47 | 20.58 | 20.49 | 20.52 | 20.53 | 20.50 |
| | | 25 | 0 | 20.48 | 20.47 | 20.44 | 20.52 | 20.48 | 20.46 |
| | | 25 | 12 | 20.44 | 20.51 | 20.47 | 20.56 | 20.53 | 20.49 |
| | | 25 | 24 | 20.43 | 20.49 | 20.47 | 20.46 | 20.45 | 20.41 |
| | | 50 | 0 | 20.47 | 20.49 | 20.45 | 20.54 | 20.50 | 20.46 |

## 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).

| **Test Engineer ID:** | 25602 | **Test Date:** | 2/22/2022 |
|---|---|---|---|

**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 |
| | | | | 2488.5 MHz | 2489.0 MHz | 2490.0 MHz | 2488.5 MHz | 2489.0 MHz | 2490.0 MHz |
| 10.0 | BPSK | 1 | 0 | 20.52 | 20.49 | 20.45 | 20.38 | 20.24 | 20.35 |
| | | 1 | 1 | 20.60 | 20.69 | 20.59 | 20.55 | 20.54 | 20.59 |
| | | 1 | 22 | **20.70** | 20.60 | 20.60 | 20.64 | 20.66 | **20.70** |
| | | 1 | 23 | 20.41 | 20.44 | 20.46 | 20.39 | 20.34 | 20.45 |
| | | 12 | 6 | 20.56 | 20.54 | 20.60 | 20.51 | 20.56 | 20.59 |
| | | 24 | 0 | 20.39 | 20.40 | 20.35 | 20.34 | 20.36 | 20.45 |
| | QPSK | 1 | 0 | 19.64 | 19.88 | 19.80 | 19.84 | 19.84 | 19.94 |
| | | 1 | 1 | 20.61 | 20.60 | 20.65 | 20.55 | 20.61 | 20.66 |
| | | 1 | 22 | 20.45 | **20.70** | 20.52 | 20.62 | **20.70** | 20.67 |
| | | 1 | 23 | 19.37 | 19.73 | 19.39 | 19.89 | 19.89 | 19.90 |
| | | 12 | 6 | 20.60 | 20.62 | 20.65 | 20.52 | 20.60 | 20.56 |
| | | 24 | 0 | 19.92 | 19.90 | 19.93 | 19.85 | 19.92 | 19.80 |
| | 16QAM | 1 | 0 | 19.51 | 19.53 | 19.48 | 19.47 | 19.68 | 19.70 |
| | | 1 | 1 | **20.70** | 20.45 | 20.41 | 20.43 | 20.47 | 20.61 |
| | | 1 | 22 | 20.51 | 20.55 | 20.49 | 20.55 | 20.62 | **20.70** |
| | | 1 | 23 | 19.54 | 19.55 | 19.51 | 19.56 | 19.53 | 19.64 |
| | | 12 | 6 | 20.30 | 20.21 | 20.22 | 20.29 | 20.42 | 20.36 |
| | | 24 | 0 | 19.29 | 19.22 | 19.23 | 19.34 | 19.35 | 19.42 |
| | 64QAM | 1 | 0 | **20.70** | 20.54 | 20.63 | 20.64 | 20.66 | 20.64 |
| | | 1 | 1 | 20.59 | 20.60 | 20.62 | 20.62 | 20.54 | 20.58 |
| | | 1 | 22 | 20.66 | 20.62 | 20.61 | 20.66 | **20.70** | 20.66 |
| | | 1 | 23 | **20.70** | 20.69 | 20.57 | 20.59 | 20.55 | 20.68 |
| | | 12 | 6 | 20.46 | 20.36 | 20.32 | 20.41 | 20.35 | 20.46 |
| | | 24 | 0 | 20.45 | 20.48 | 20.44 | 20.40 | 20.44 | 20.50 |
| | 256QAM | 1 | 0 | 20.53 | 20.60 | 20.64 | 20.59 | 20.55 | 20.64 |
| | | 1 | 1 | 20.62 | **20.70** | 20.60 | 20.51 | 20.63 | 20.68 |
| | | 1 | 22 | 20.59 | 20.64 | 20.58 | 20.58 | **20.70** | 20.68 |
| | | 1 | 23 | 20.51 | 20.63 | 20.52 | 20.51 | 20.64 | 20.69 |
| | | 12 | 6 | 20.59 | 20.66 | 20.61 | 20.49 | 20.65 | 20.56 |
| | | 24 | 0 | 20.56 | 20.65 | 20.59 | 20.56 | 20.61 | 20.66 |

# 9. CONDUCTED TEST RESULTS

## 9.1. ON TIME AND DUTY CYCLE

**LIMITS**

None; for reporting purposes only.

**PROCEDURE**

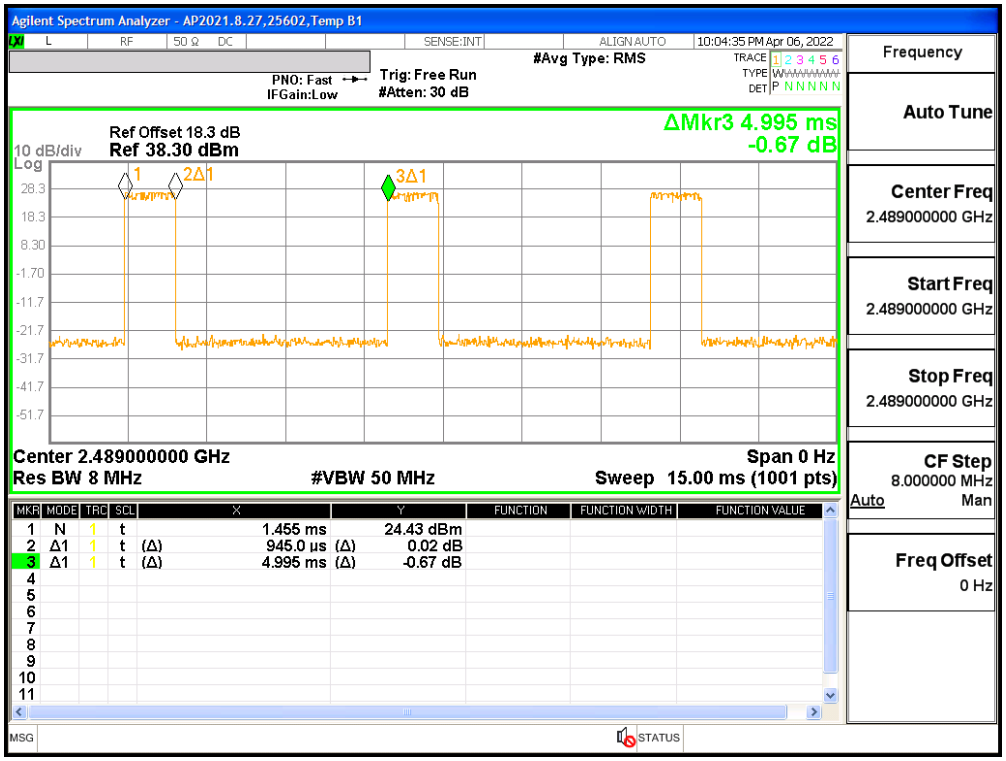
Zero-Span Spectrum Analyzer Method.

**ON TIME AND DUTY CYCLE RESULTS**

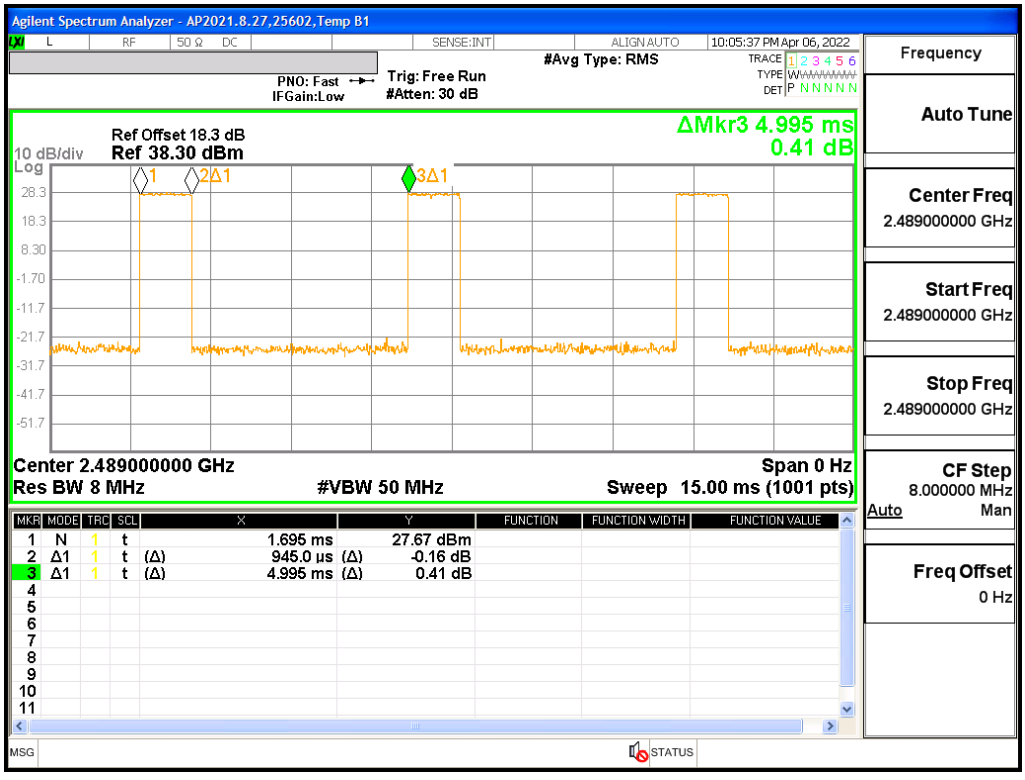
| Band | RB Allocation / Offset | ON Time B (msec) | Period (msec) | Duty Cycle x (linear) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|---|---|---|---|---|---|---|
| LTE Band 53 | 1 / 0 | 0.945 | 4.995 | 0.19 | 18.92 | 7.23 |
| LTE Band 53 | 50 / 0 | 0.945 | 4.995 | 0.19 | 18.92 | 7.23 |
| 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 |



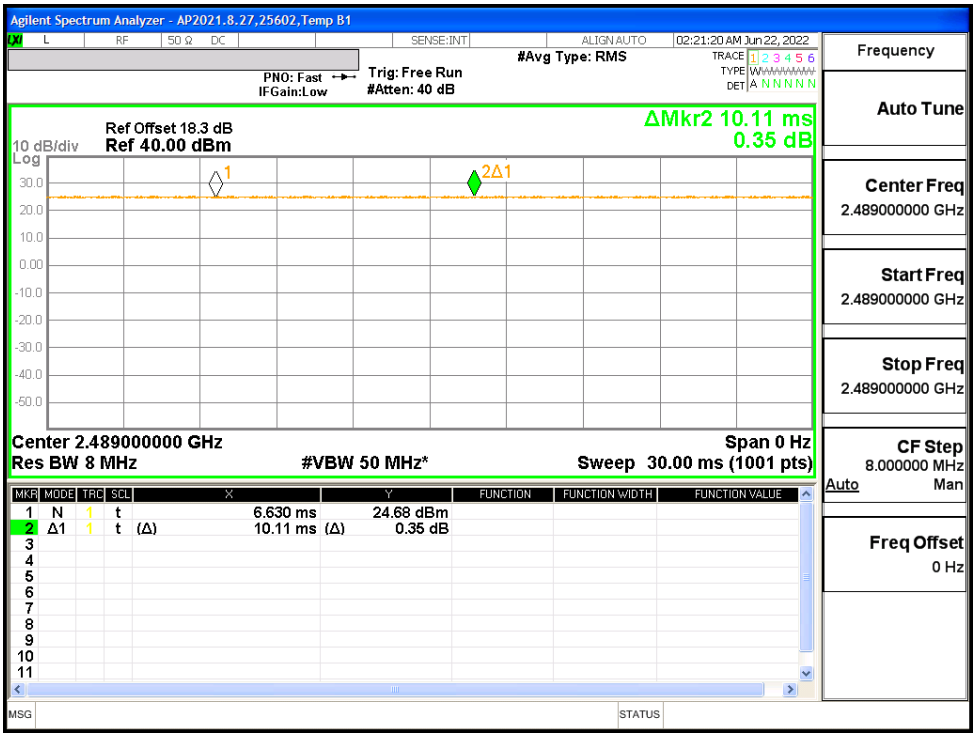
UL VERIFICATION SERVICES INC.
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 319-4000 FAX: (510) 661-0888



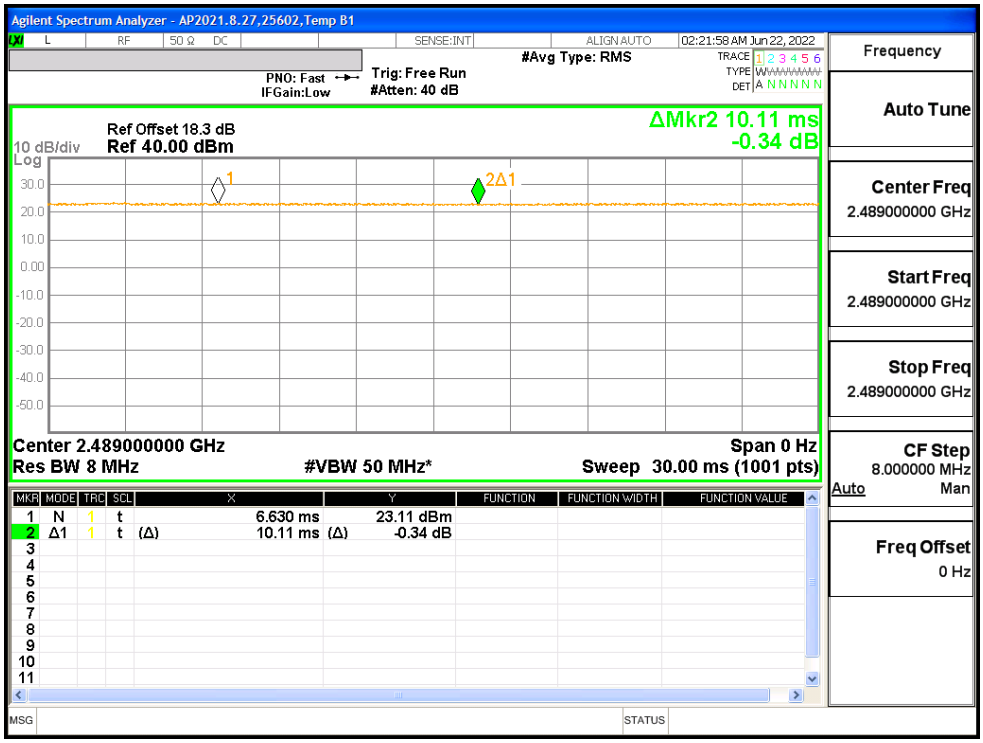

**LTE Band 53 RB1-0**




**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.

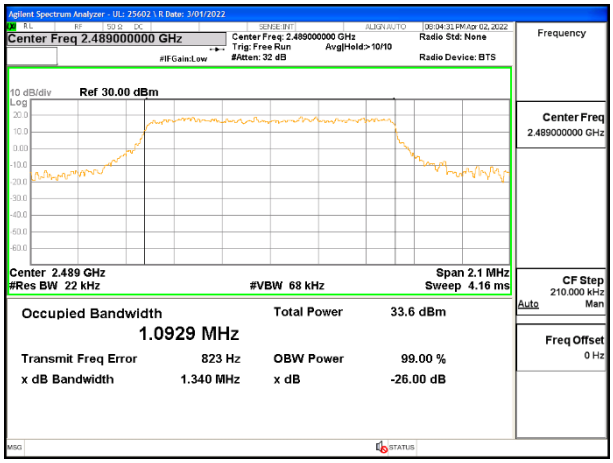
**LTE BAND 53**

| Band | Mode | RB Allocation/RB Offset | f(MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|
| LTE BAND 53 | 1.4MHz, QPSK | 6/0 | 836.5 | 1.093 | 1.34 |
| | 1.4MHz,16QAM | | | 1.093 | 1.33 |
| | 3MHz, QPSK | 15/0 | | 2.693 | 3.11 |
| | 3MHz, 16QAM | | | 2.693 | 3.31 |
| | 5MHz, QPSK | 25/0 | | 4.512 | 5.08 |
| | 5MHz, 16QAM | | | 4.501 | 5.33 |
| | 10MHz, QPSK | 50/0 | | 8.974 | 9.83 |
| | 10MHz, 16QAM | | | 8.981 | 10.18 |
| | 10MHz, QPSK | 1/0 | | 0.240 | 0.38 |

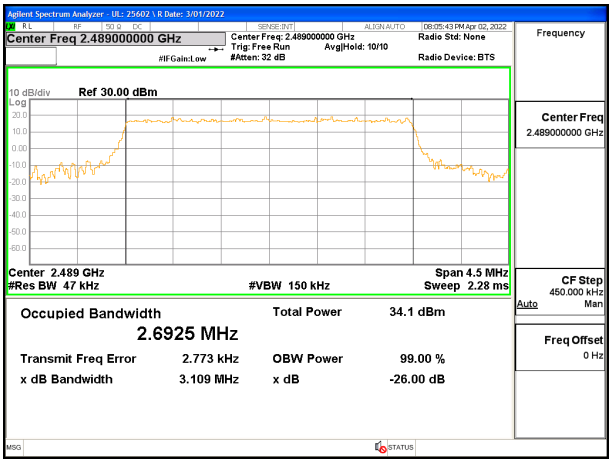
**5G NR n53**

| Band | Mode | RB Allocation/RB Offset | f(MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|---|---|---|---|---|---|
| 5G NR n53 | 10MHz, BPSK | 24/0 | 2489.0 | 8.570 | 9.15 |
| | 10MHz, QPSK | | | 8.555 | 9.14 |
| | 10MHz, 16QAM | | | 8.571 | 9.28 |
| | 10MHz, QPSK | 1/0 | | 0.510 | 0.74 |

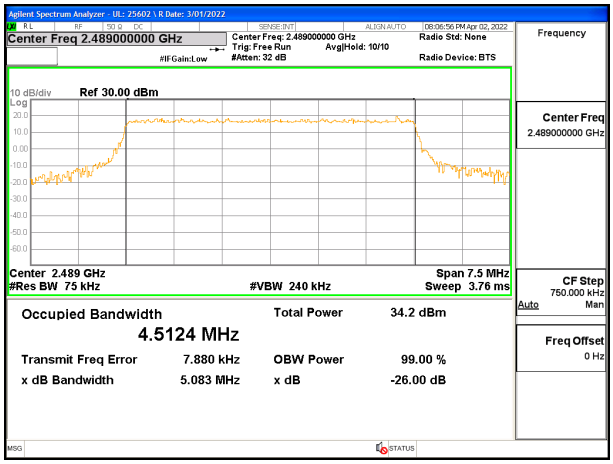
## 9.2.1. LTE BAND 53



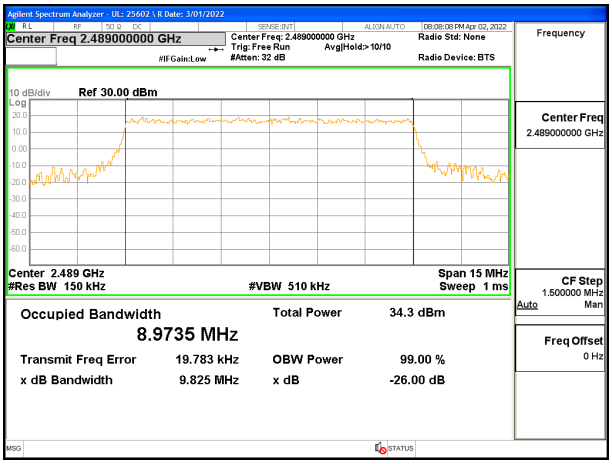

LTE B53 1.4MHz QPSK Middle Channel RB6-0



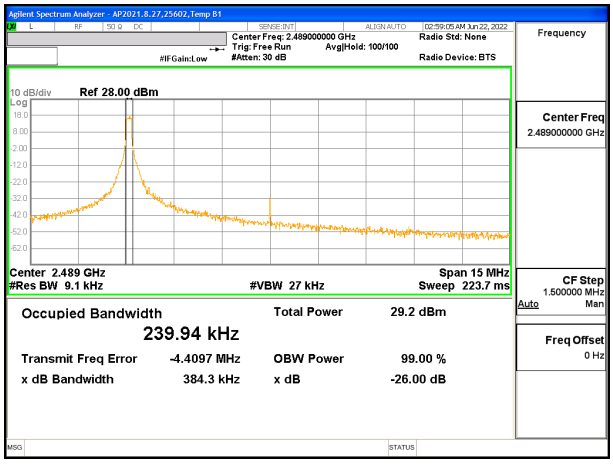

LTE B53 3MHz QPSK Middle Channel RB15-0




LTE B53 5MHz QPSK Middle Channel RB25-0

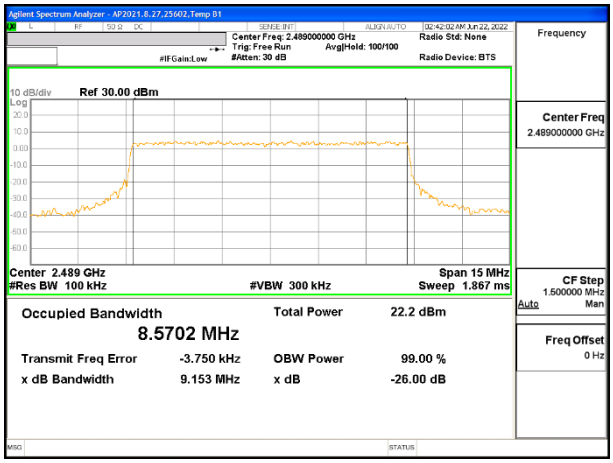



LTE B53 10MHz QPSK Middle Channel RB50-0

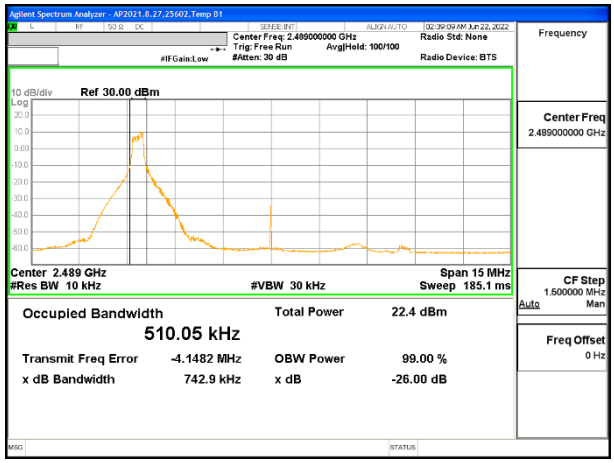



LTE B53 10MHz QPSK Middle Channel RB1-0

## 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**

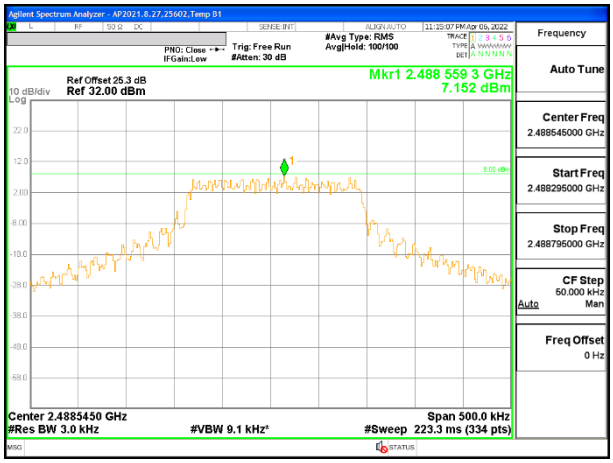
**LTE BAND 53**

| 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 | 7.062 | 8.0 |
| | | | 2489.0 | 7.152 | |
| | | | 2494.3 | 6.305 | |
| | 3MHz, QPSK | 1/0 | 2485.0 | 6.475 | |
| | | | 2489.0 | 7.655 | |
| | | | 2493.5 | 5.061 | |
| | 5MHz, QPSK | 1/0 | 2486.0 | 6.722 | |
| | | | 2489.0 | 6.389 | |
| | | | 2492.5 | 7.354 | |
| | 10MHz, QPSK | 1/0 | 2488.5 | 7.263 | |
| | | | 2489.0 | 6.242 | |
| | | | 2490.0 | 6.167 | |
| | | 50/0 | 2488.5 | -9.456 | |
| | | | 2489.0 | -9.772 | |
| | | | 2490.0 | -10.019 | |

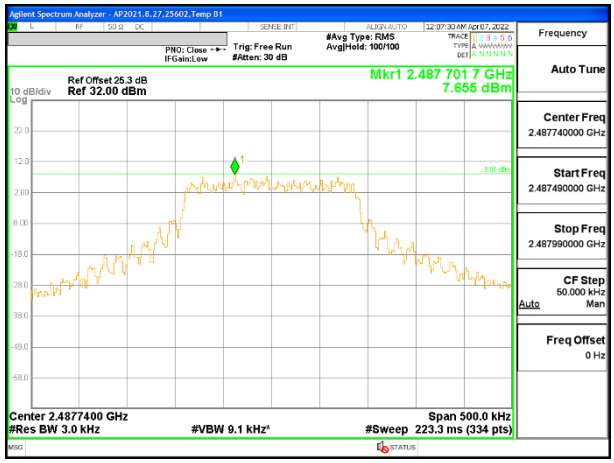
**5G NR n53**

| Band | Mode | RB Allocation/RB Offset | f(MHz) | PSD (dBm/3kHz) | PSD Limit (dBm/3kHz) |
|---|---|---|---|---|---|
| 5G NR n53 | 10MHz, BPSK | 1/1 | 2488.5 | 7.751 | 8.0 |
| | | | 2489.0 | 7.291 | |
| | | | 2490.0 | 7.003 | |
| | | 24/0 | 2488.5 | -0.453 | |
| | | | 2489.0 | -0.195 | |
| | | | 2490.0 | -1.125 | |

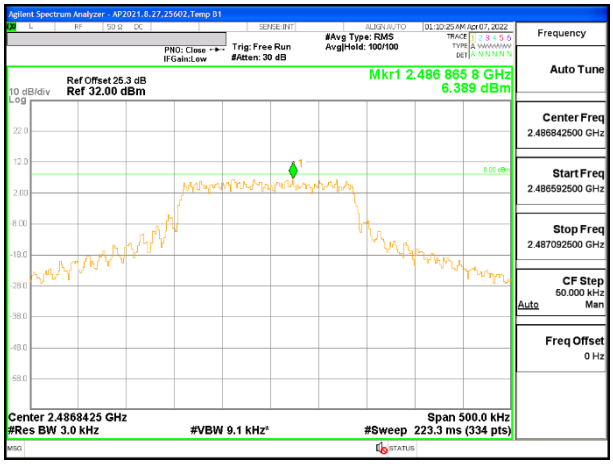
## 9.3.1. LTE BAND 53



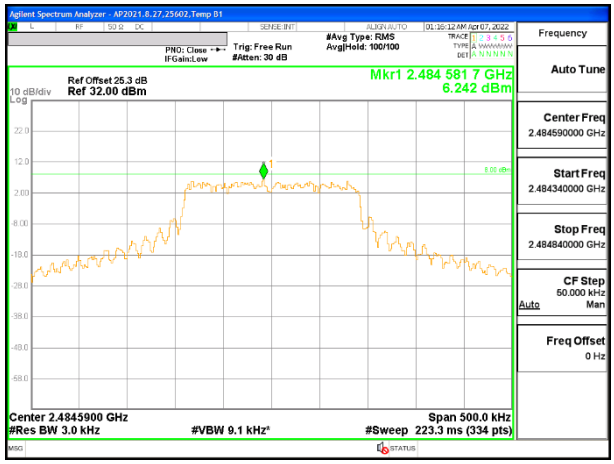

LTE B53 1.4MHz QPSK Middle Channel RB1-0



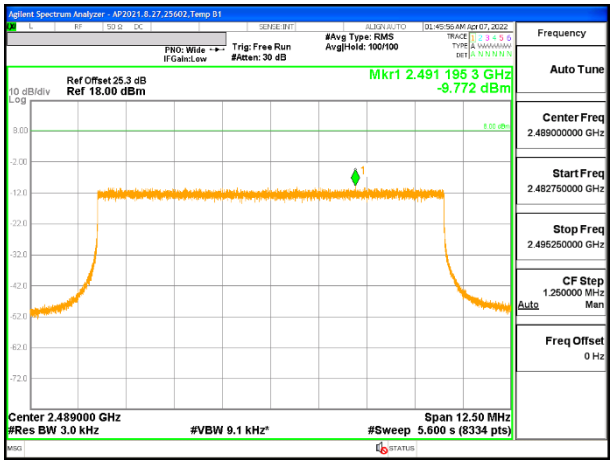

LTE B53 3MHz QPSK Middle Channel RB1-0




LTE B53 5MHz QPSK Middle Channel RB1-0

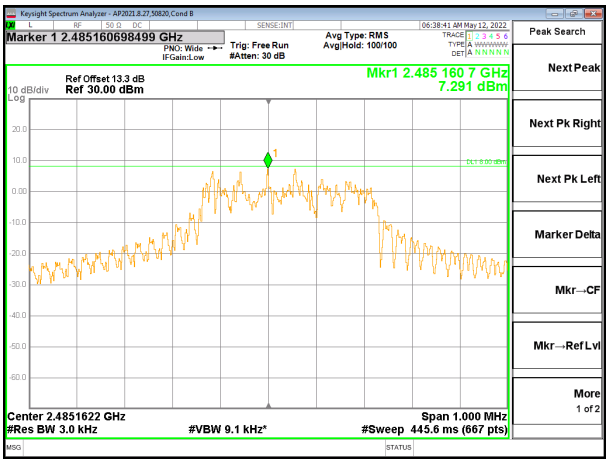



LTE B53 10MHz QPSK Middle Channel RB1-0

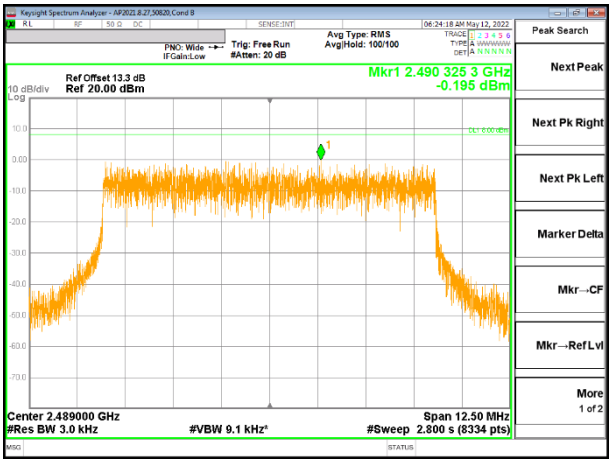



LTE B53 10MHz QPSK Middle Channel RB50-0

## 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**

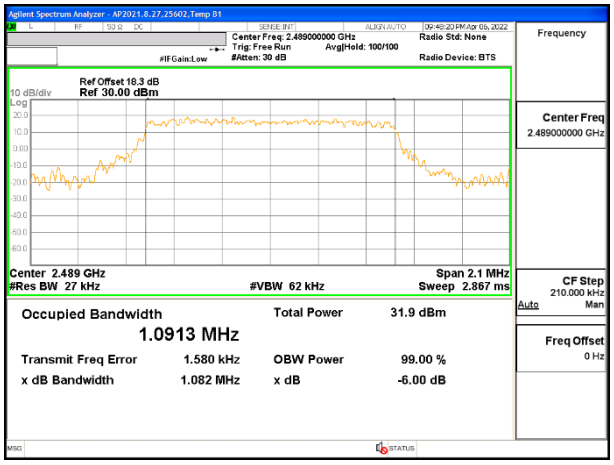
**LTE BAND 53**

| Band | Mode | RB Allocation/RB Offset | f(MHz) | 6dB BW (MHz) | 6dB BW Limit (MHz) |
|---|---|---|---|---|---|
| LTE BAND 53 | 1.4MHz, QPSK | 6/0 | 2489 | 1.082 | 0.5 |
| | 1.4MHz,16QAM | | | 1.058 | |
| | 3MHz, QPSK | 15/0 | | 2.664 | |
| | 3MHz, 16QAM | | | 2.679 | |
| | 5MHz, QPSK | 25/0 | | 4.502 | |
| | 5MHz, 16QAM | | | 4.437 | |
| | 10MHz, QPSK | 50/0 | | 8.984 | |
| | 10MHz, 16QAM | | | 9.038 | |

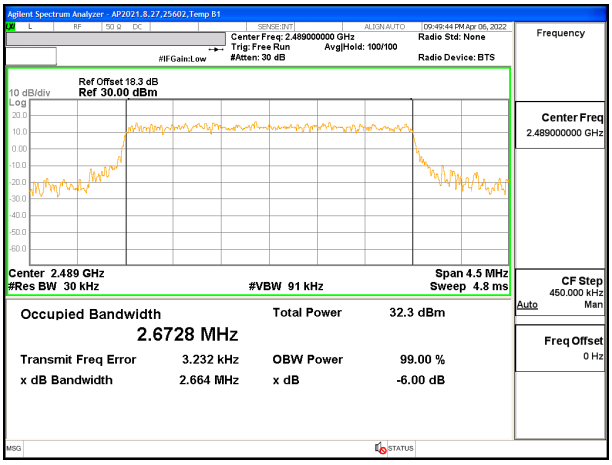
**5G NR n53**

| Band | Mode | RB Allocation/RB Offset | f(MHz) | 6dB BW (MHz) | 6dB BW Limit (MHz) |
|---|---|---|---|---|---|
| 5G NR n53 | 10MHz, BPSK | 24/0 | 2489 | 9.02 | 0.5 |
| | 10MHz, QPSK | 24/0 | | 9.03 | |
| | 10MHz, 16QAM | 24/0 | | 9.02 | |

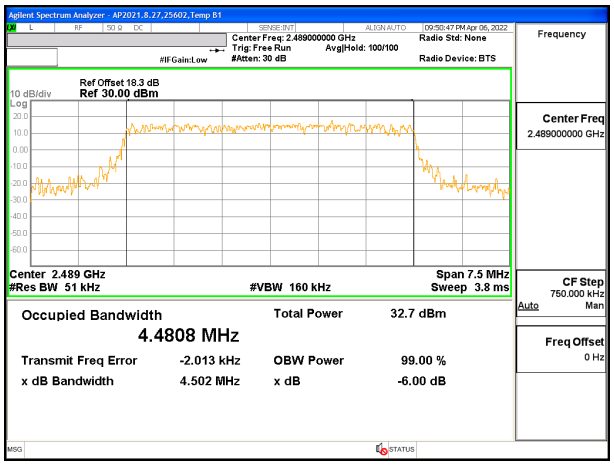
## 9.4.1. LTE BAND 53



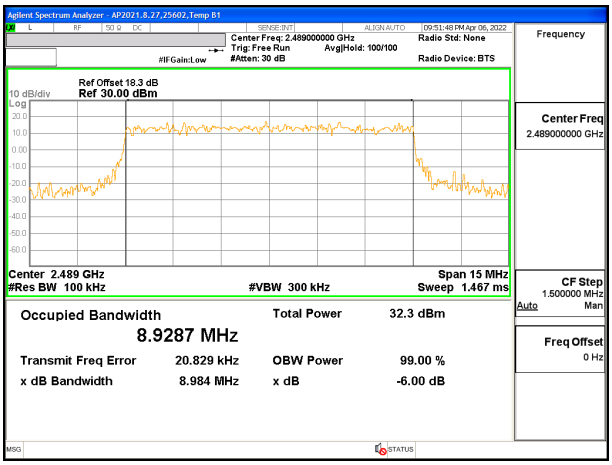

LTE B53 1.4MHz QPSK Middle Channel RB6-0




LTE B53 3MHz QPSK Middle Channel RB15-0

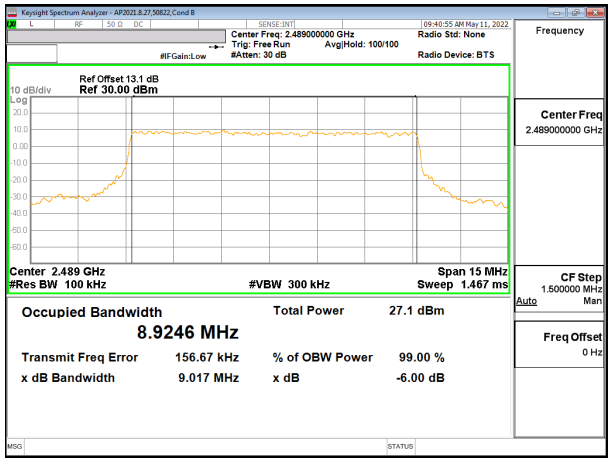



LTE B53 5MHz QPSK Middle Channel RB25-0




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 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**

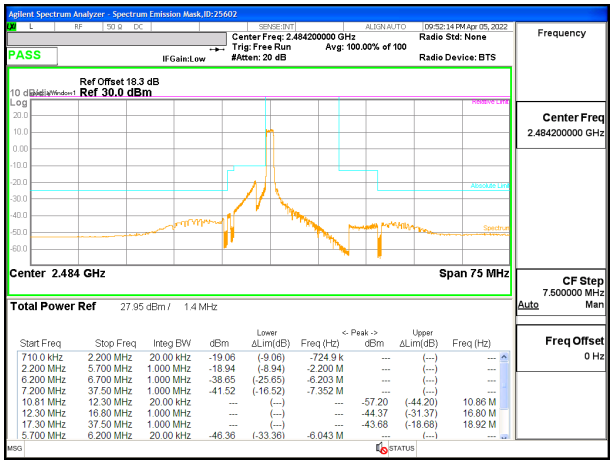
**LTE BAND 53**

| 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 | -14.22 | -1.1 | -15.32 | -14.1 |
| | | 6/0 | 2484.2 | -16.73 | | -17.83 | |
| | | 1/5 | 2494.3 | -14.32 | | -15.42 | |
| | | 6/0 | 2494.3 | -15.21 | | -16.31 | |
| | 3MHz, QPSK | 1/0 | 2485.0 | -17.43 | | -18.53 | |
| | | 15/0 | 2485.0 | -18.13 | | -19.23 | |
| | | 1/14 | 2493.5 | -17.16 | | -18.26 | |
| | | 15/0 | 2493.5 | -20.94 | | -22.04 | |
| | 5MHz, QPSK | 1/0 | 2486.0 | -15.23 | | -16.33 | |
| | | 25/0 | 2486.0 | -20.71 | | -21.81 | |
| | | 1/24 | 2492.5 | -18.03 | | -19.13 | |
| | | 25/0 | 2492.5 | -22.00 | | -23.10 | |
| | 10MHz, QPSK | 1/0 | 2488.5 | -19.37 | | -20.47 | |
| | | 50/0 | 2488.5 | -26.95 | | -28.05 | |
| | | 1/49 | 2490 | -17.37 | | -18.47 | |
| | | 50/0 | 2490 | -25.76 | | -26.86 | |

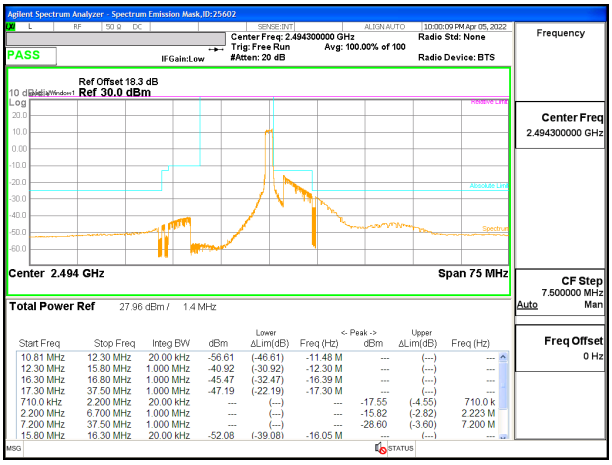
**5G NR n53**

| 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 | -22.71 | -1.1 | -23.81 | -14.1 |
| | | 24/0 | 2488.5 | -26.45 | | -27.55 | |
| | | 1/23 | 2490 | -25.75 | | -26.85 | |
| | | 24/0 | 2490 | -24.03 | | -25.13 | |

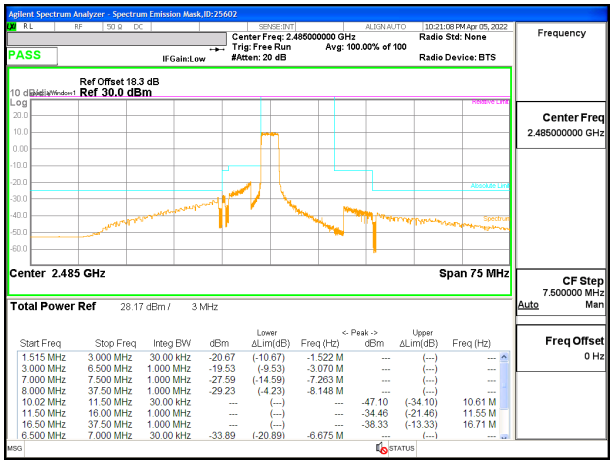
## 9.5.1. LTE BAND 53 BANDEGE



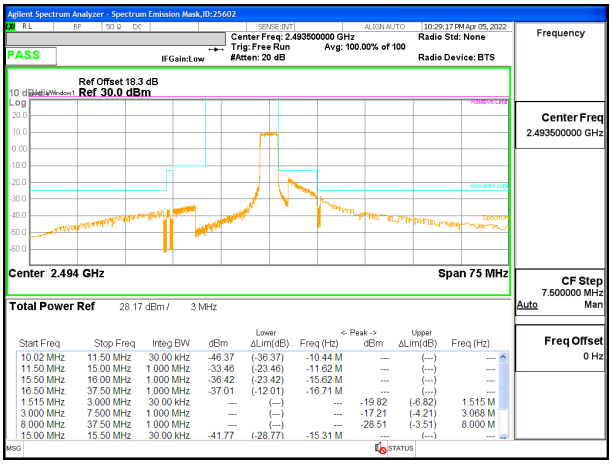

LTE B53 1.4MHz QPSK Low Channel RB6-0



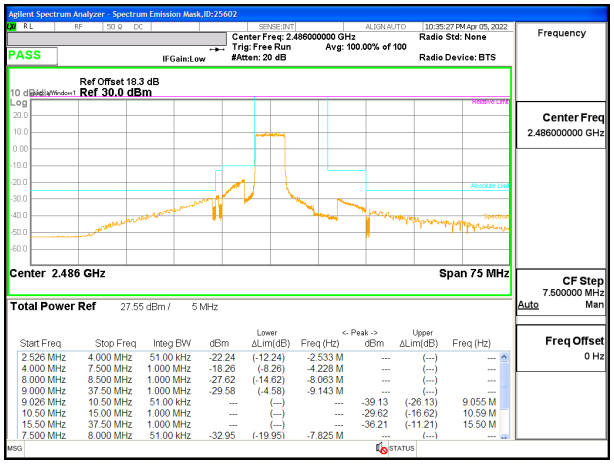

LTE B53 1.4MHz QPSK High Channel RB6-0



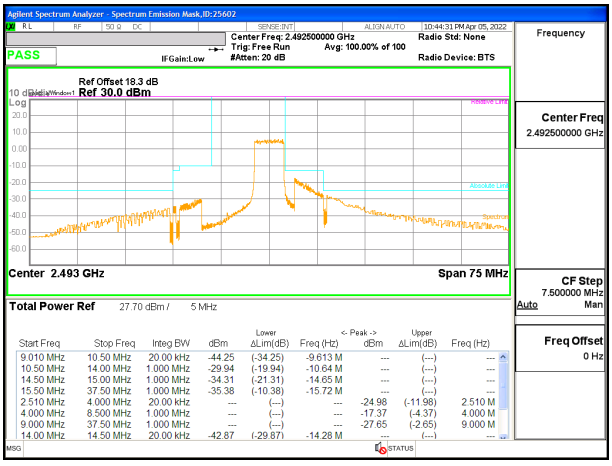

LTE B53 3MHz QPSK Low Channel RB15-0



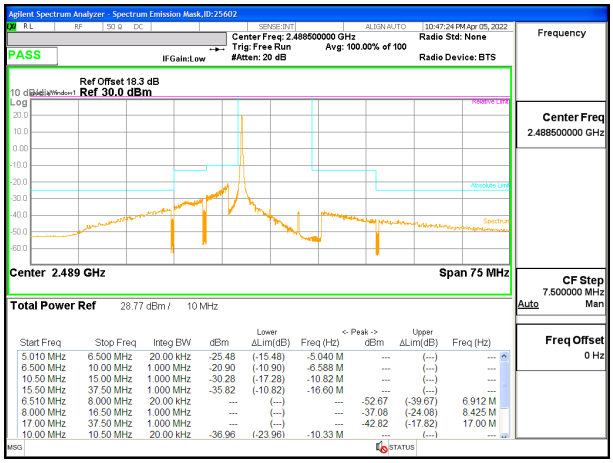

LTE B53 3MHz QPSK High Channel RB15-0



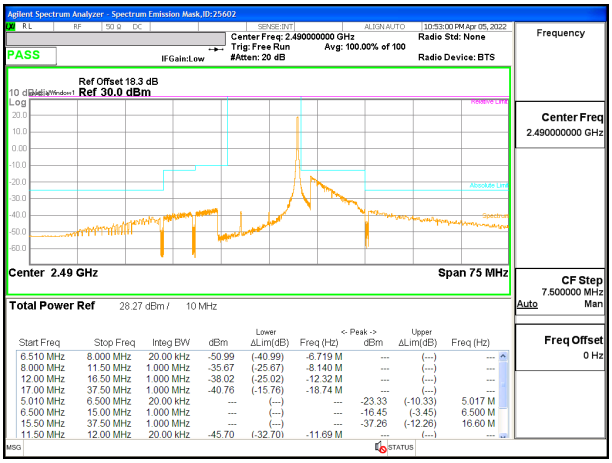

LTE B53 5MHz QPSK Low Channel RB25-0



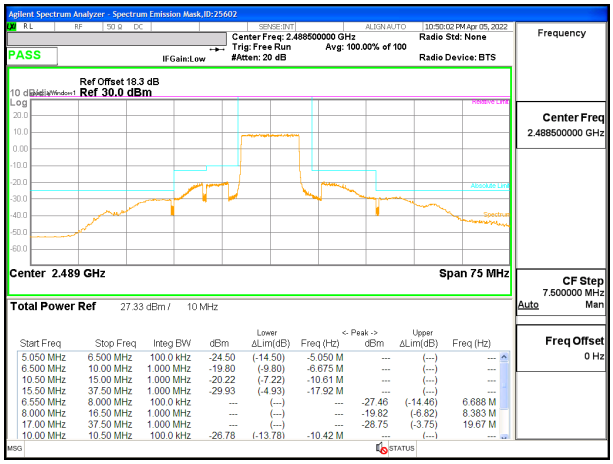

LTE B53 5MHz QPSK High Channel RB25-0



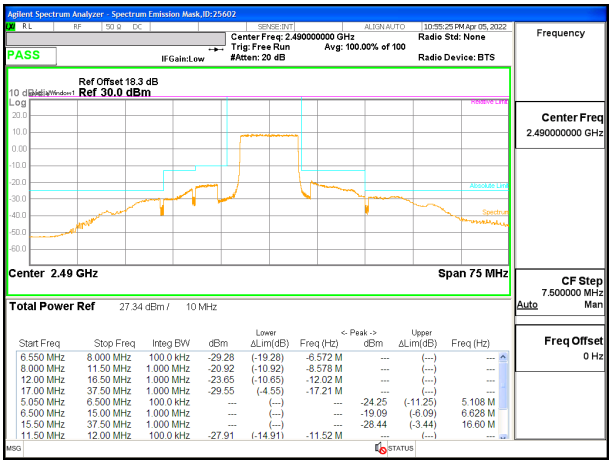

LTE B53 10MHz QPSK Low Channel RB1-0




LTE B53 10MHz QPSK High Channel RB1-49

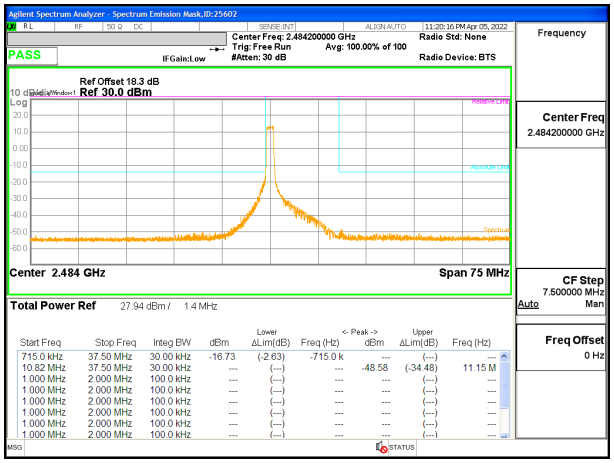



LTE B53 10MHz QPSK Low Channel RB50-0

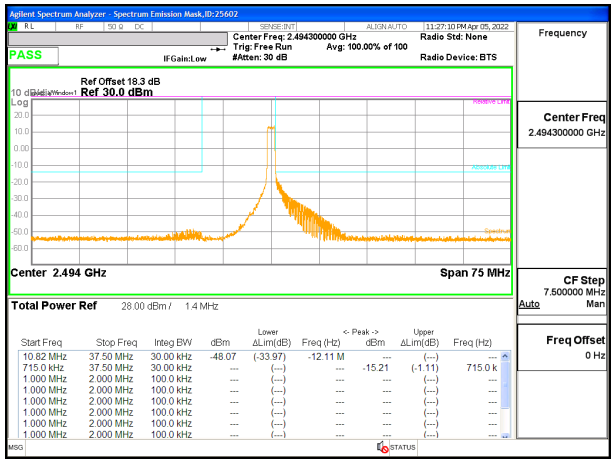



LTE B53 10MHz QPSK High Channel RB50-0

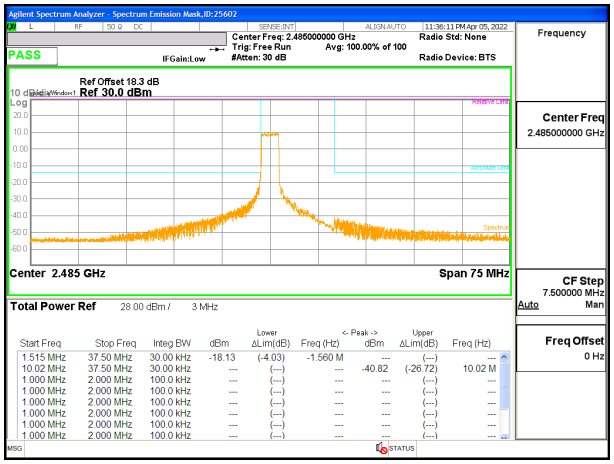
## 9.5.2 LTE BAND 53 EIRP DENSITY



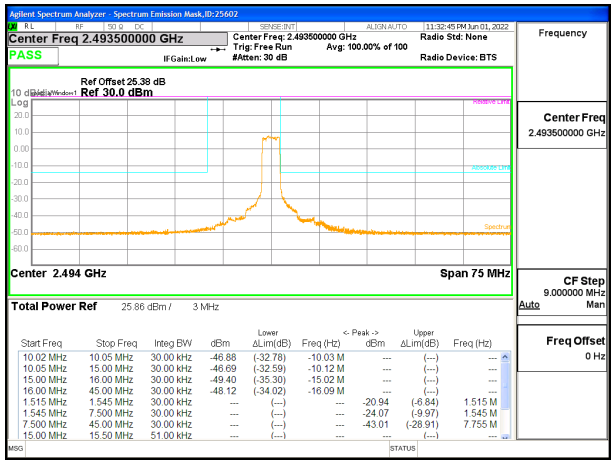

LTE B53 1.4MHz QPSK Low Channel RB6-0



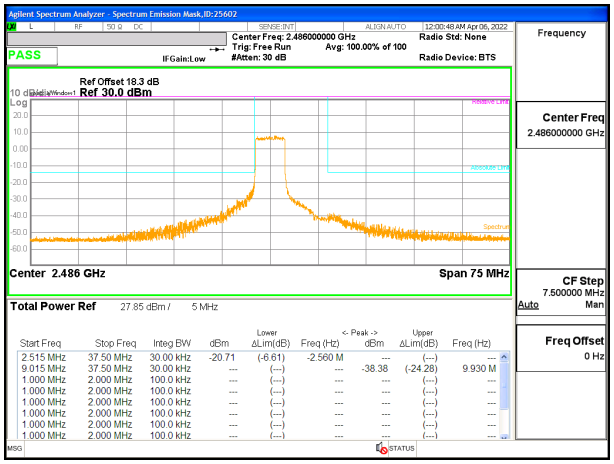

LTE B53 1.4MHz QPSK High Channel RB6-0



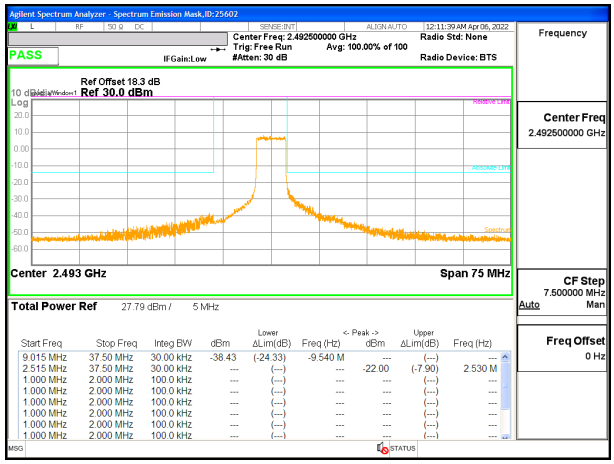

LTE B53 3MHz QPSK Low Channel RB15-0



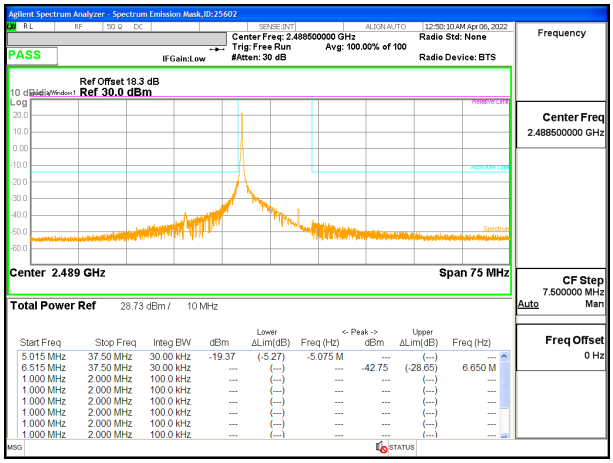

LTE B53 3MHz QPSK High Channel RB15-0



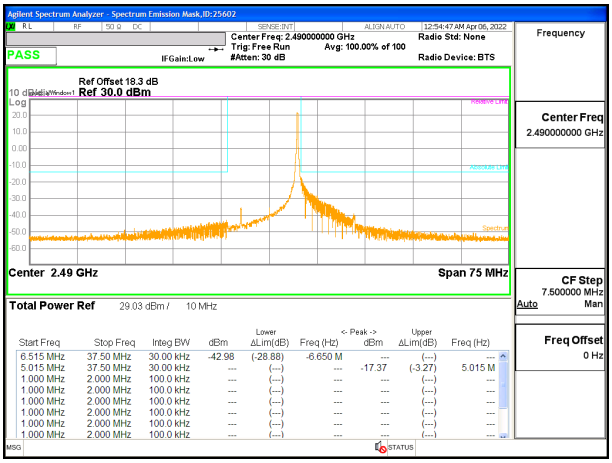

LTE B53 5MHz QPSK Low Channel RB25-0



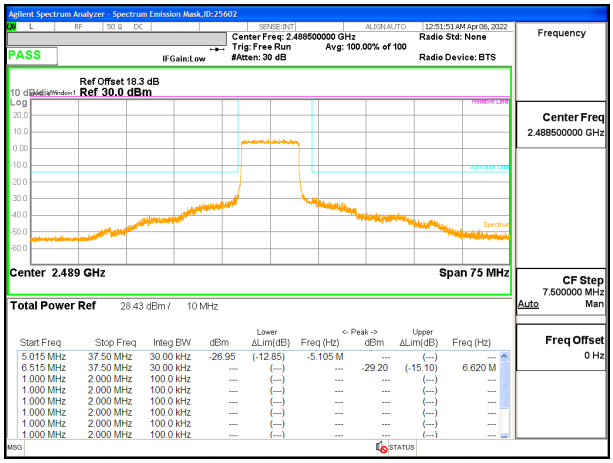

LTE B53 5MHz QPSK High Channel RB25-0



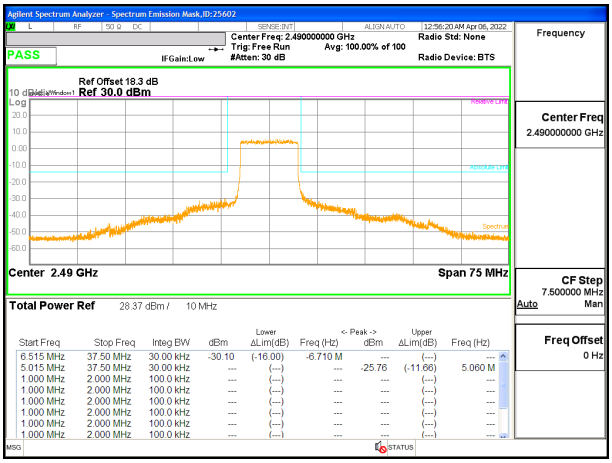

LTE B53 10MHz QPSK Low Channel RB1-0




LTE B53 10MHz QPSK High Channel RB1-49

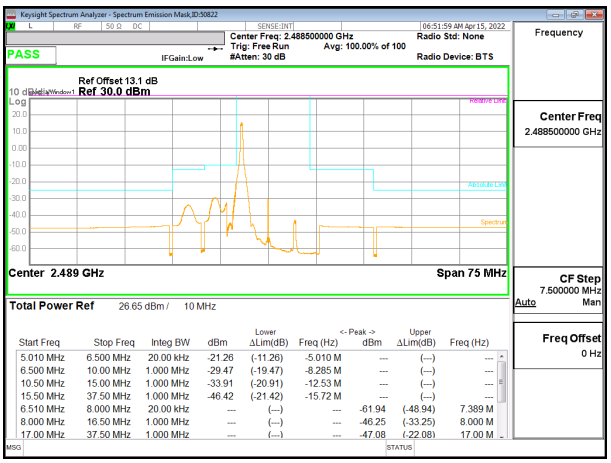



LTE B53 10MHz QPSK Low Channel RB50-0

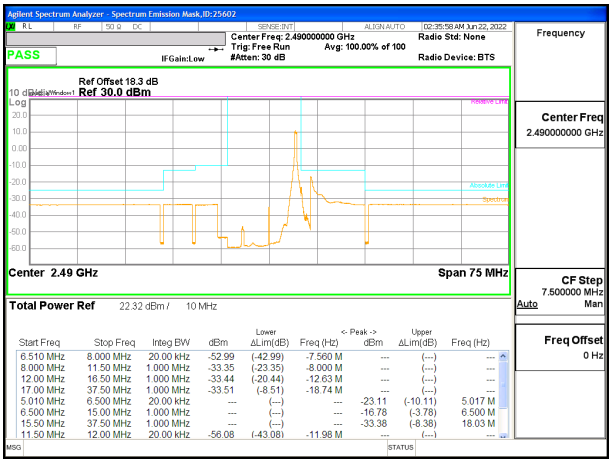



LTE B53 10MHz QPSK High Channel RB50-0

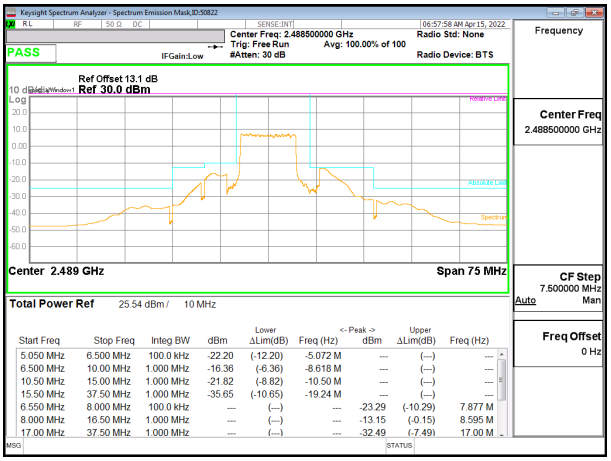
## 9.5.3 5G NR n53 BANDEDGE



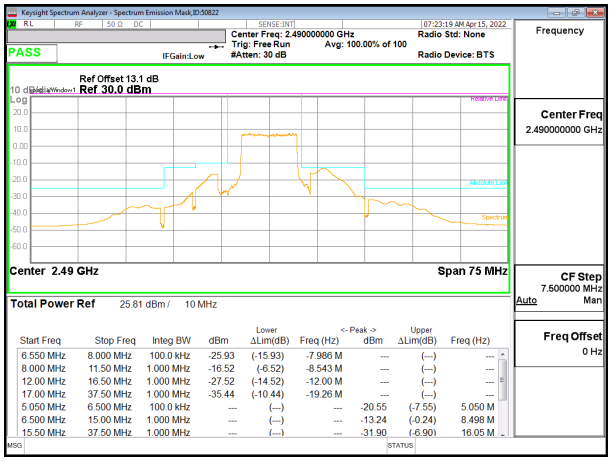

5G NR n53 10MHz BPSK Low Channel RB1-0




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

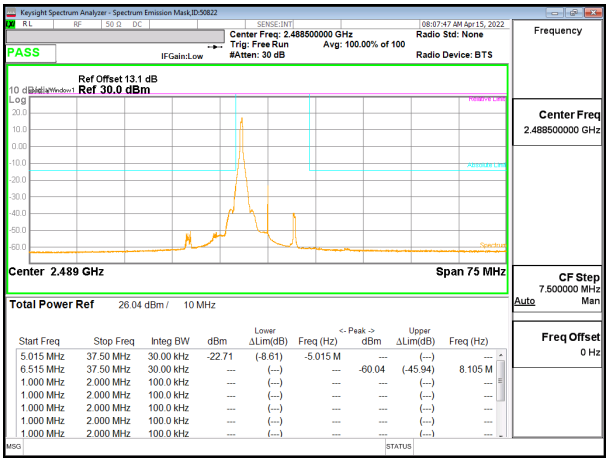



5G NR n53 10MHz BPSK Low Channel RB24-0

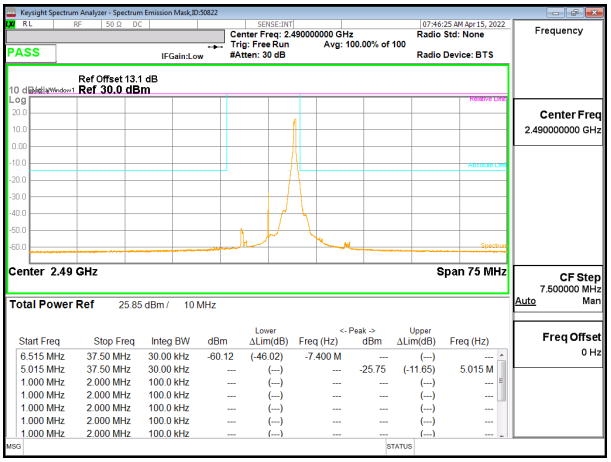



5G NR n53 10MHz BPSK High Channel RB24-0

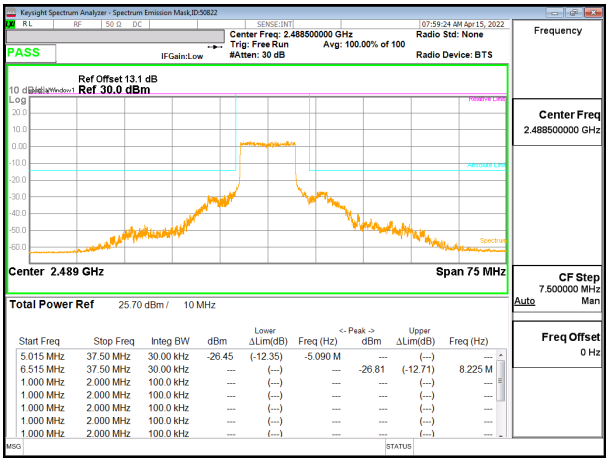
## 9.5.4 5G NR n53 EIRP DENSITY



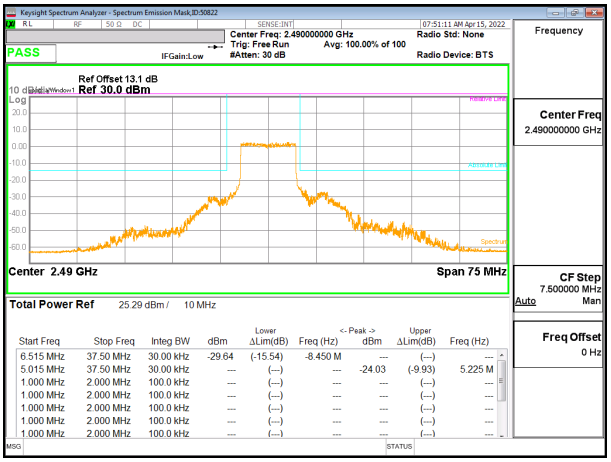

5G NR n53 10MHz BPSK Low Channel RB1-0




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)

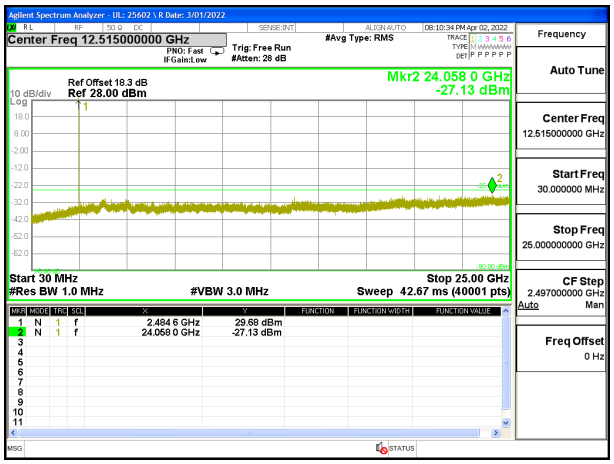
**RESULTS**

## 9.6.1. LTE BAND 53

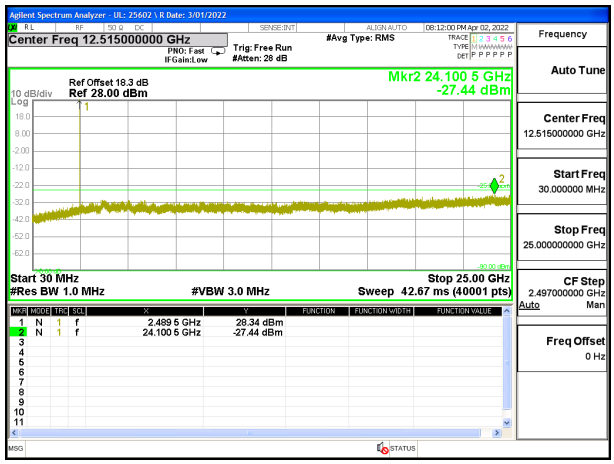
**LIMITS**

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.

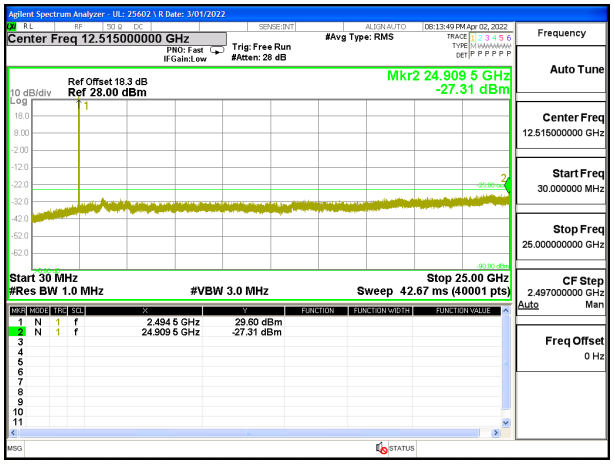
ISED: SMSE-900-20 Annex A 9.g
The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.



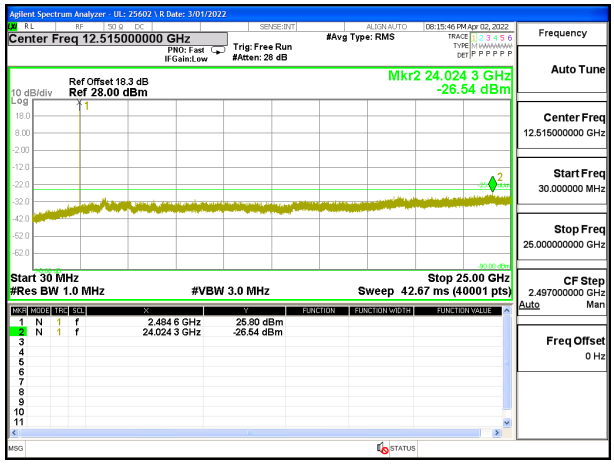

LTE B53 1.4MHz QPSK Low Channel RB1-0



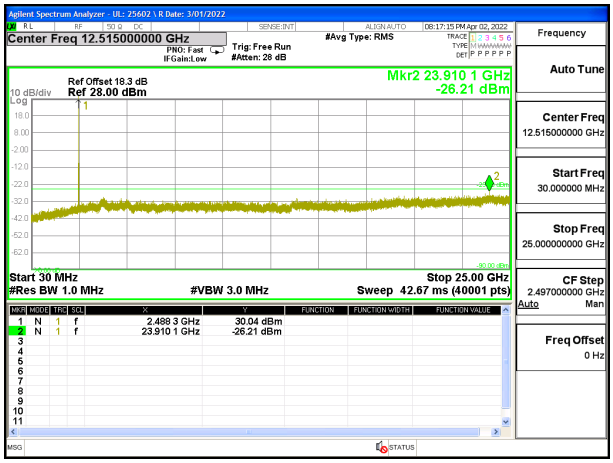

LTE B53 1.4MHz QPSK Middle Channel RB1-0



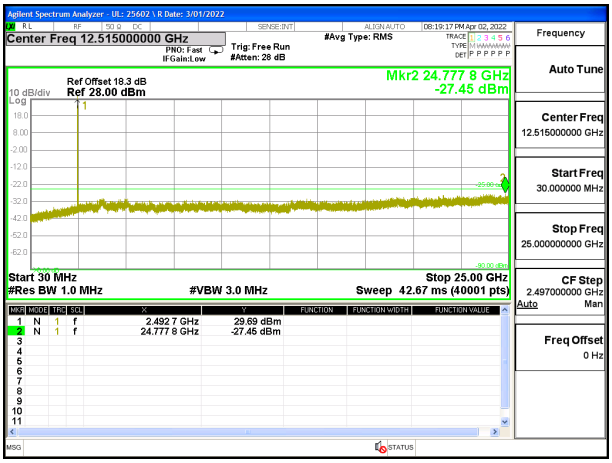

LTE B53 1.4MHz QPSK High Channel RB1-0



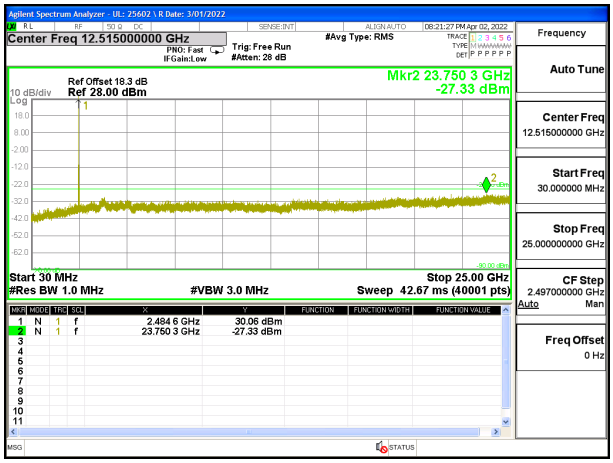

LTE B53 3MHz QPSK Low Channel RB1-0



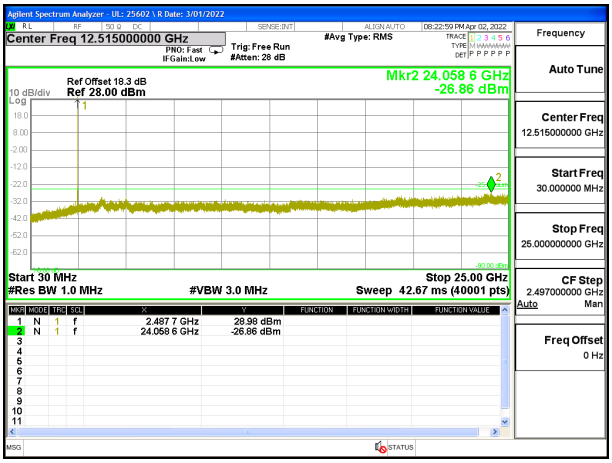

LTE B53 3MHz QPSK Middle Channel RB1-0



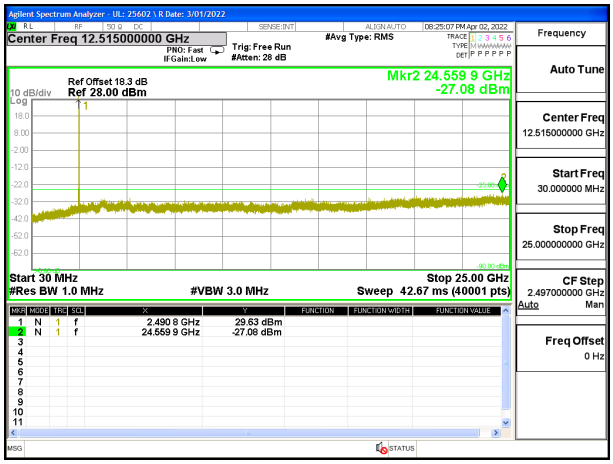

LTE B53 3MHz QPSK High Channel RB1-0



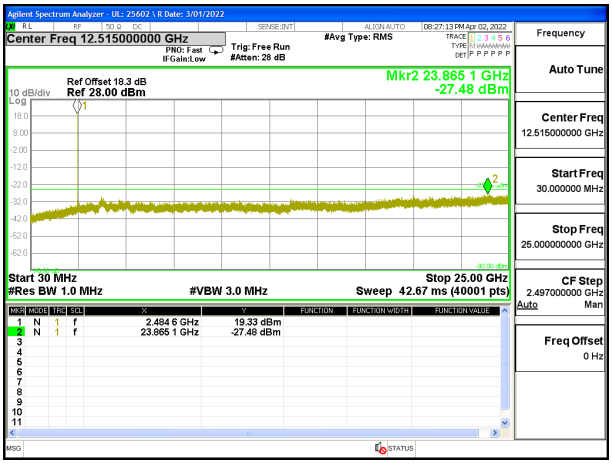

LTE B53 5MHz QPSK Low Channel RB1-0



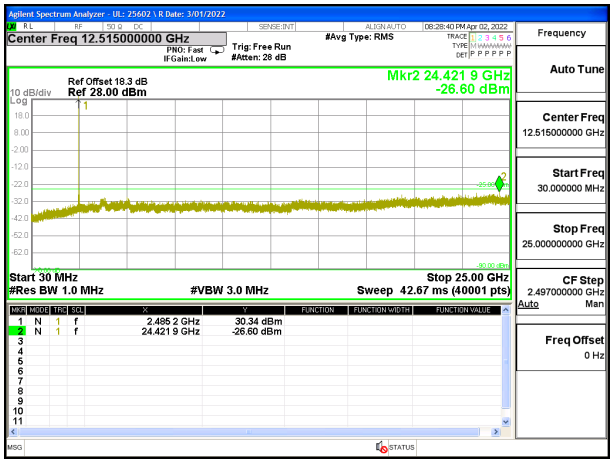

LTE B53 5MHz QPSK Middle Channel RB1-0



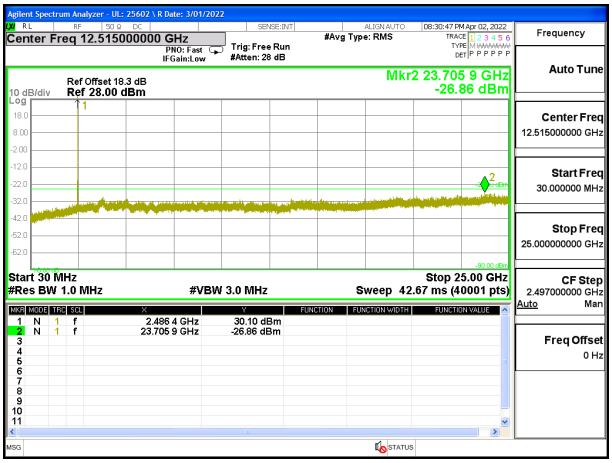

LTE B53 5MHz QPSK High Channel RB1-0




LTE B53 10MHz QPSK Low Channel RB1-0

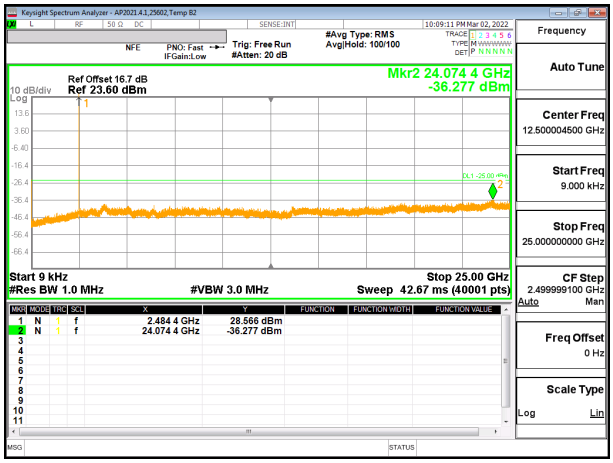



LTE B53 10MHz QPSK Middle Channel RB1-0

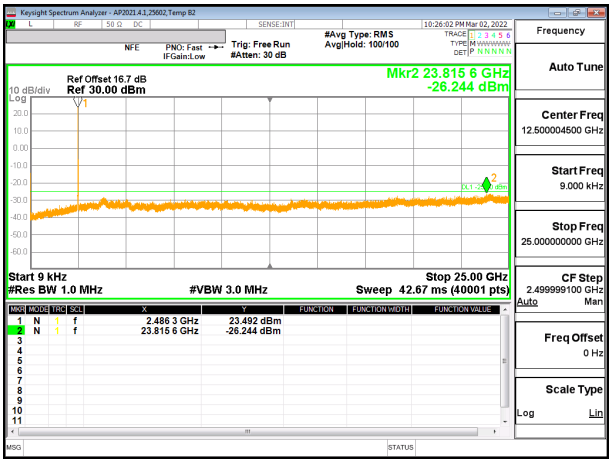



LTE B53 10MHz QPSK High Channel RB1-0

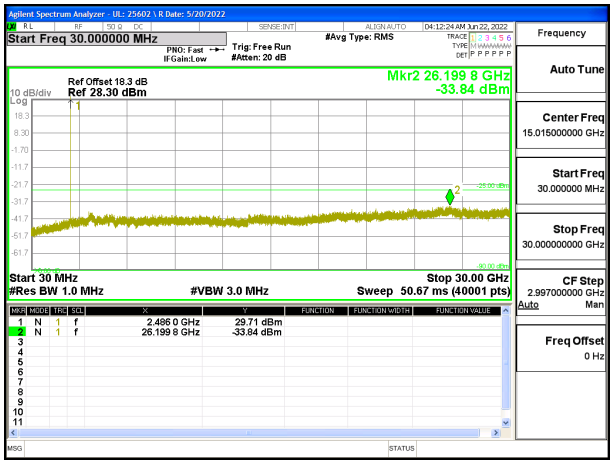
## 9.6.2. 5G NR 53




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

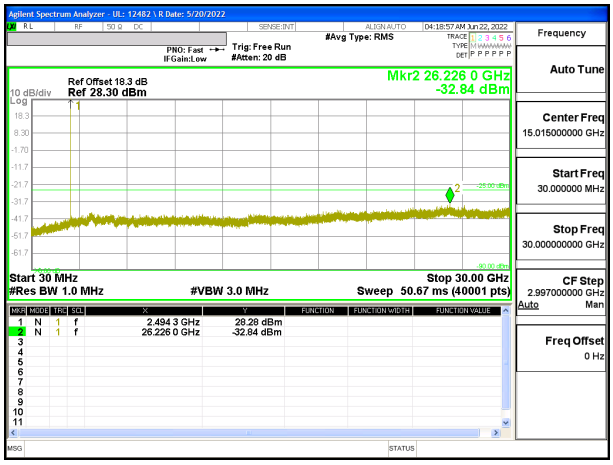



5G NR n53 10MHz BPSK Low Channel RB24-0




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

**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, 2.90VDC.

**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: | 25602 | Test Date: | 5/8/2022 |
|---|---|---|---|

## 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) | | 2483.8591 | 2494.6000 | | | |
| Extreme (50°C) | | 2483.8591 | 2494.6000 | -33.2 | -0.013 | Yes |
| Extreme (40°C) | | 2483.8591 | 2494.6000 | -33.3 | -0.013 | Yes |
| Extreme (30°C) | | 2483.8591 | 2494.6000 | -31.2 | -0.013 | Yes |
| Extreme (10°C) | Normal | 2483.8591 | 2494.6000 | -16.5 | -0.007 | Yes |
| Extreme (0°C) | | 2483.8591 | 2494.6000 | -9.7 | -0.004 | Yes |
| Extreme (-10°C) | | 2483.8591 | 2494.6000 | -9.6 | -0.004 | Yes |
| Extreme (-20°C) | | 2483.8591 | 2494.6000 | -7.2 | -0.003 | Yes |
| Extreme (-30°C) | | 2483.8591 | 2494.6000 | -8.9 | -0.004 | Yes |
| | | | | | | |
| 20°C | 15% | 2483.8591 | 2494.6000 | -10.6 | -0.004 | Yes |
| | -15% | 2483.8591 | 2494.6000 | -10.4 | -0.004 | Yes |
| | End Point Voltage | 2483.8591 | 2494.6000 | -9.5 | -0.004 | 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 | 2484.1827 | 2494.2970 | | | |
| Extreme (50°C) | | 2484.1826 | 2494.2970 | -6.2 | -0.002 | Yes |
| Extreme (40°C) | | 2484.1827 | 2494.2970 | 8.4 | 0.003 | Yes |
| Extreme (30°C) | | 2484.1826 | 2494.2970 | -7.8 | -0.003 | Yes |
| Extreme (10°C) | | 2484.1826 | 2494.2970 | -7.3 | -0.003 | Yes |
| Extreme (0°C) | | 2484.1826 | 2494.2970 | -4.8 | -0.002 | Yes |
| Extreme (-10°C) | | 2484.1826 | 2494.2970 | -6.2 | -0.002 | Yes |
| Extreme (-20°C) | | 2484.1826 | 2494.2970 | -5.8 | -0.002 | Yes |
| Extreme (-30°C) | | 2484.1826 | 2494.2970 | -8.9 | -0.004 | Yes |
| | | | | | | |
| 20°C | 15% | 2484.1826 | 2494.2970 | -5.9 | -0.002 | Yes |
| | -15% | 2484.1826 | 2494.2970 | -5.5 | -0.002 | Yes |
| | End Point Voltage | 2484.1826 | 2494.2970 | -7.1 | -0.003 | Yes |



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

# 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.

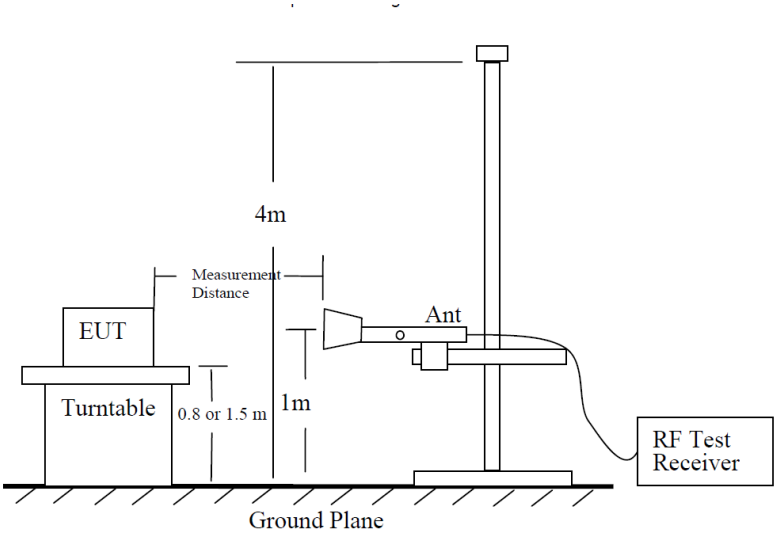



**Figure 6—Test site-up for radiated ERP and/or EIRP measurements**

**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.

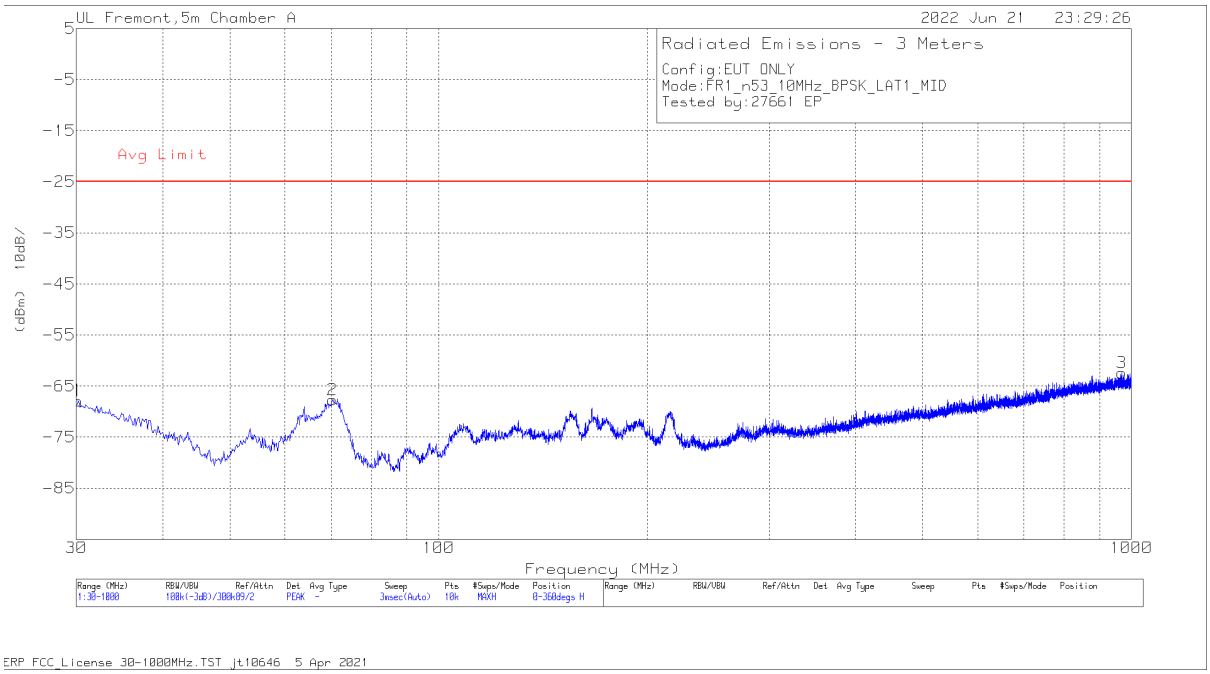
So, from d)

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

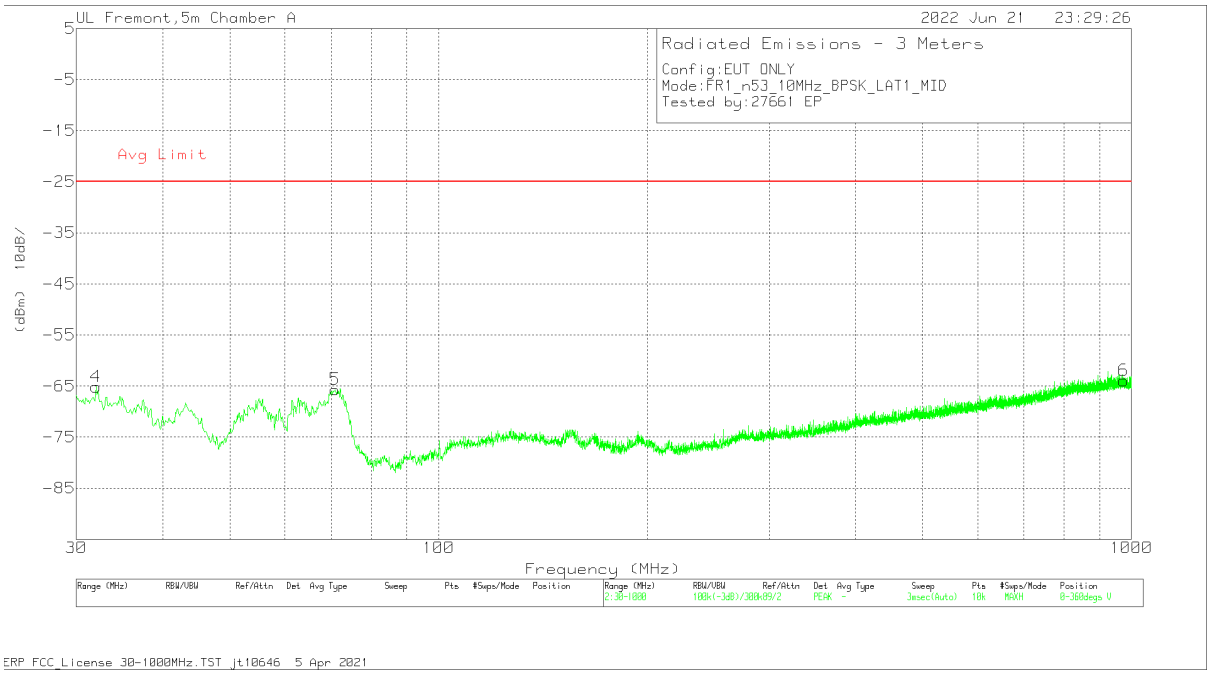
Then, EIRP (dBm) = E (dBμV/m) + 9.5424 − 104.8 = E (dBμV/m) – 95.2576

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

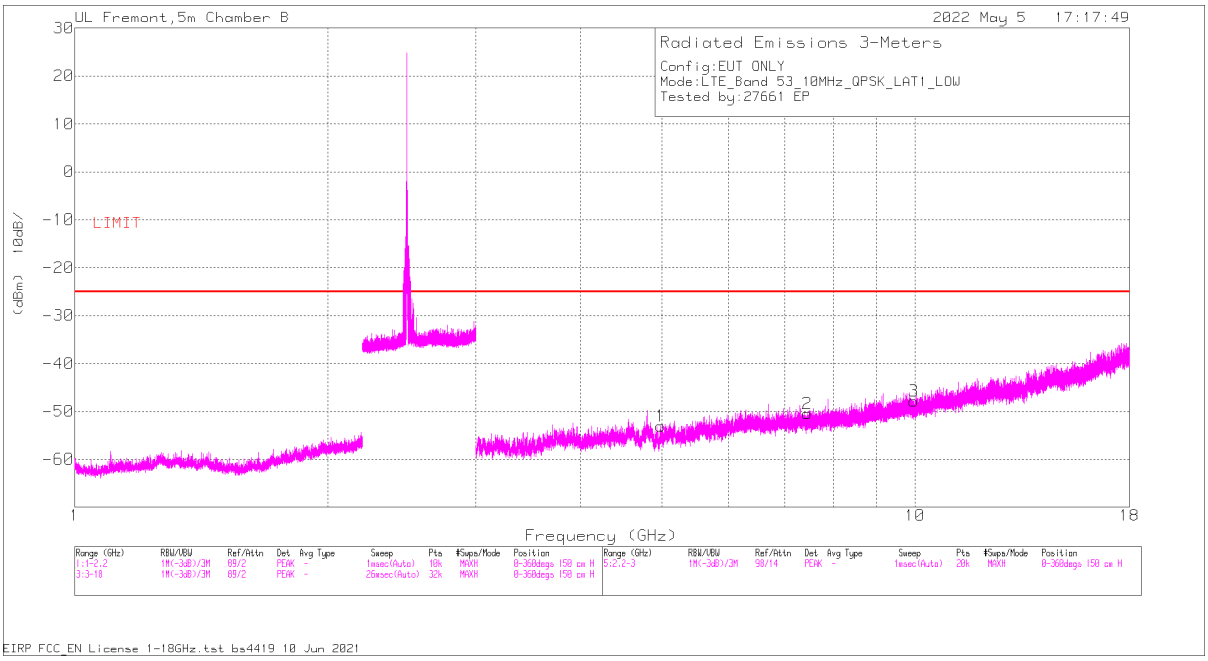



Vertical Polarity

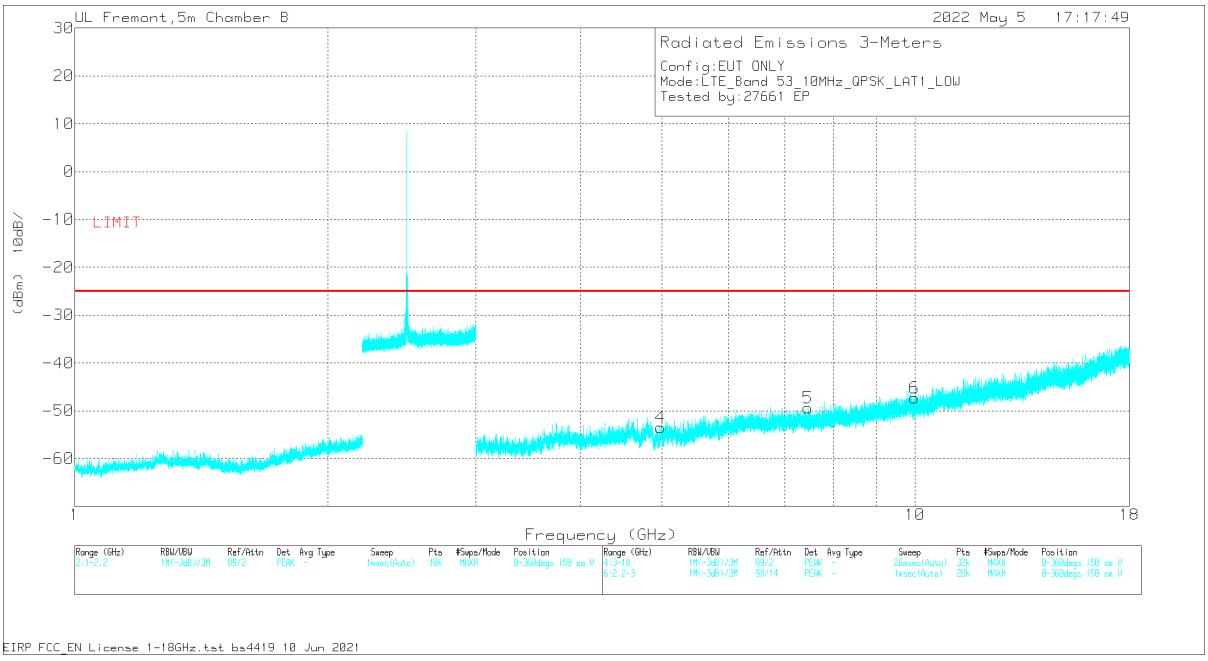
## Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | 85151 ACF (dB)_3m | Amp/Cbl (dB/m) | EIRP CF | Corrected Reading (dBm) | Avg Limit | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30.194 | 27.11 | Pk | 27.5 | -27.3 | -95.2 | -67.89 | -25 | -42.89 | 0-360 | 100 | H |
| 4 | 32.037 | 30.86 | Pk | 26.4 | -27.2 | -95.2 | -65.14 | -25 | -40.14 | 0-360 | 100 | V |
| 2 | 70.352 | 39.8 | Pk | 14.4 | -26.7 | -95.2 | -67.7 | -25 | -42.7 | 0-360 | 199 | H |
| 5 | 70.934 | 41.81 | Pk | 14.4 | -26.7 | -95.2 | -65.69 | -25 | -40.69 | 0-360 | 100 | V |
| 3 | 968.281 | 25.77 | Pk | 29.2 | -22.2 | -95.2 | -62.43 | -25 | -37.43 | 0-360 | 100 | H |
| 6 | 975.265 | 24.38 | Pk | 29.1 | -22.2 | -95.2 | -63.92 | -25 | -38.92 | 0-360 | 199 | V |

**Example Plot Above 1GHz**




Horizontal Polarity




Vertical Polarity

## Trace Markers

| 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 | 38.49 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.11 | -25 | -28.11 | H |
| 4.979063 | 38.1 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.50 | -25 | -28.50 | V |
| 7.448906 | 35.5 | Pk | 35.7 | -26.9 | .4 | -95.2 | -50.50 | -25 | -25.50 | H |
| 7.45875 | 36.53 | Pk | 35.8 | -26.9 | .4 | -95.2 | -49.37 | -25 | -24.37 | V |
| 9.965156 | 34.4 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.80 | -25 | -22.80 | H |
| 9.982031 | 34.97 | Pk | 37.1 | -25 | .8 | -95.2 | -47.33 | -25 | -22.33 | V |



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## 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), 1 RB**

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT Only |
| Mode | LTE53 QPSK 10MHz |
| 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** | | | | | | | | | | |
| 4.9781 | 38.49 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.11 | -25 | -28.11 | H |
| 4.9791 | 38.10 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.50 | -25 | -28.50 | V |
| 7.4489 | 35.50 | Pk | 35.7 | -26.9 | .4 | -95.2 | -50.50 | -25 | -25.50 | H |
| 7.4588 | 36.53 | Pk | 35.8 | -26.9 | .4 | -95.2 | -49.37 | -25 | -24.37 | V |
| 9.9652 | 34.40 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.80 | -25 | -22.80 | H |
| 9.9820 | 34.97 | Pk | 37.1 | -25.0 | .8 | -95.2 | -47.33 | -25 | -22.33 | V |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9758 | 39.22 | Pk | 34.1 | -30.8 | .3 | -95.2 | -52.38 | -25 | -27.38 | V |
| 4.9814 | 38.31 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.29 | -25 | -28.29 | H |
| 7.4391 | 35.50 | Pk | 35.8 | -26.8 | .4 | -95.2 | -50.30 | -25 | -25.30 | V |
| 7.4409 | 35.20 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.70 | -25 | -25.70 | H |
| 9.9595 | 34.70 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.50 | -25 | -22.50 | V |
| 9.9614 | 35.47 | Pk | 37.1 | -24.9 | .8 | -95.2 | -46.73 | -25 | -21.73 | H |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9758 | 39.22 | Pk | 34.1 | -30.8 | .3 | -95.2 | -52.38 | -25 | -27.38 | V |
| 4.9814 | 38.31 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.29 | -25 | -28.29 | H |
| 7.4391 | 35.50 | Pk | 35.8 | -26.8 | .4 | -95.2 | -50.30 | -25 | -25.30 | V |
| 7.4409 | 35.20 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.70 | -25 | -25.70 | H |
| 9.9595 | 34.70 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.50 | -25 | -22.50 | V |
| 9.9614 | 35.47 | Pk | 37.1 | -24.9 | .8 | -95.2 | -46.73 | -25 | -21.73 | H |

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

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT only |
| Mode | LTE53 QPSK 10MHz |
| 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** | | | | | | | | | | |
| 4.9777 | 37.74 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.86 | -25 | -28.86 | V |
| 4.9809 | 38.72 | Pk | 34.1 | -30.8 | .3 | -95.2 | -52.88 | -25 | -27.88 | H |
| 7.4681 | 35.96 | Pk | 35.7 | -26.8 | .4 | -95.2 | -49.94 | -25 | -24.94 | H |
| 7.4892 | 35.43 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.47 | -25 | -25.47 | V |
| 9.9300 | 34.42 | Pk | 37.1 | -25 | .7 | -95.2 | -47.98 | -25 | -22.98 | H |
| 9.9421 | 34.65 | Pk | 37.1 | -24.9 | .7 | -95.2 | -47.65 | -25 | -22.65 | V |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9870 | 39.56 | Pk | 34.0 | -30.8 | .4 | -95.2 | -52.04 | -25 | -27.04 | V |
| 4.9880 | 38.15 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.45 | -25 | -28.45 | H |
| 7.4723 | 36.24 | Pk | 35.7 | -26.8 | .4 | -95.2 | -49.66 | -25 | -24.66 | H |
| 7.4906 | 36.39 | Pk | 35.7 | -26.8 | .4 | -95.2 | -49.51 | -25 | -24.51 | V |
| 9.9567 | 35.95 | Pk | 37.1 | -24.9 | .8 | -95.2 | -46.25 | -25 | -21.25 | H |
| 9.9656 | 34.56 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.64 | -25 | -22.64 | V |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9542 | 37.74 | Pk | 34.1 | -30.9 | .4 | -95.2 | -53.86 | -25 | -28.86 | V |
| 4.9748 | 39.19 | Pk | 34.1 | -30.8 | .3 | -95.2 | -52.41 | -25 | -27.41 | H |
| 7.4827 | 35.82 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.08 | -25 | -25.08 | H |
| 7.4930 | 34.96 | Pk | 35.8 | -26.8 | .4 | -95.2 | -50.84 | -25 | -25.84 | V |
| 9.9623 | 35.07 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.13 | -25 | -22.13 | H |
| 9.9727 | 34.72 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.48 | -25 | -22.48 | V |

## 10.1.2. 5G NR n53

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

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT only |
| Mode | 5G NR n53 10MHz |
| 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** | | | | | | | | | | |
| 4.9800 | 38.43 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.17 | -25 | -28.17 | V |
| 4.9842 | 38.9 | Pk | 34.1 | -30.8 | .4 | -95.2 | -52.60 | -25 | -27.60 | H |
| 7.4559 | 35.09 | Pk | 35.8 | -26.8 | .4 | -95.2 | -50.71 | -25 | -25.71 | V |
| 7.4569 | 35.17 | Pk | 35.8 | -26.9 | .4 | -95.2 | -50.73 | -25 | -25.73 | H |
| 9.9441 | 34.80 | Pk | 37.0 | -24.9 | .7 | -95.2 | -47.60 | -25 | -22.60 | V |
| 9.9628 | 35.26 | Pk | 37.1 | -24.9 | .8 | -95.2 | -46.94 | -25 | -21.94 | H |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9908 | 40.71 | Pk | 34 | -30.8 | .4 | -95.2 | -50.89 | -25 | -25.89 | V |
| 4.9959 | 38.80 | Pk | 34 | -30.8 | .4 | -95.2 | -52.80 | -25 | -27.80 | H |
| 7.4400 | 35.66 | Pk | 35.8 | -26.8 | .4 | -95.2 | -50.14 | -25 | -25.14 | V |
| 7.4808 | 36.20 | Pk | 35.7 | -26.8 | .4 | -95.2 | -49.70 | -25 | -24.70 | H |
| 9.9506 | 34.29 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.91 | -25 | -22.91 | V |
| 9.9534 | 34.81 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.39 | -25 | -22.39 | H |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9917 | 37.91 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.69 | -25 | -28.69 | V |
| 5.0002 | 38.06 | Pk | 34.0 | -30.7 | .4 | -95.2 | -53.44 | -25 | -28.44 | H |
| 7.4714 | 35.73 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.17 | -25 | -25.17 | V |
| 7.4775 | 35.41 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.49 | -25 | -25.49 | H |
| 9.9516 | 35.29 | Pk | 37.1 | -24.9 | .8 | -95.2 | -46.91 | -25 | -21.91 | V |
| 9.9755 | 36.07 | Pk | 37.1 | -24.9 | .8 | -95.2 | -46.13 | -25 | -21.13 | H |

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

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT only |
| Mode | 5G NR n53 10MHz |
| 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** | | | | | | | | | | |
| 4.9964 | 37.93 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.67 | -25 | -28.67 | V |
| 4.9969 | 38.30 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.30 | -25 | -28.30 | H |
| 7.4634 | 35.56 | Pk | 35.8 | -26.8 | .4 | -95.2 | -50.24 | -25 | -25.24 | V |
| 7.4653 | 35.36 | Pk | 35.8 | -26.8 | .4 | -95.2 | -50.44 | -25 | -25.44 | H |
| 9.9469 | 34.70 | Pk | 37.0 | -24.9 | .8 | -95.2 | -47.60 | -25 | -22.60 | V |
| 9.9797 | 34.90 | Pk | 37.1 | -25 | .8 | -95.2 | -47.40 | -25 | -22.40 | H |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9838 | 39.51 | Pk | 34.1 | -30.8 | .4 | -95.2 | -51.99 | -25 | -26.99 | H |
| 4.9898 | 38.36 | Pk | 34 | -30.8 | .4 | -95.2 | -53.24 | -25 | -28.24 | V |
| 7.4419 | 36.44 | Pk | 35.7 | -26.8 | .4 | -95.2 | -49.46 | -25 | -24.46 | H |
| 7.4442 | 34.94 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.96 | -25 | -25.96 | V |
| 9.9666 | 34.69 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.51 | -25 | -22.51 | H |
| 9.9839 | 34.98 | Pk | 37.1 | -25 | .8 | -95.2 | -47.32 | -25 | -22.32 | V |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9777 | 38.52 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.08 | -25 | -28.08 | V |
| 4.9884 | 38.69 | Pk | 34.0 | -30.8 | .4 | -95.2 | -52.91 | -25 | -27.91 | H |
| 7.5038 | 36.58 | Pk | 35.8 | -26.9 | .4 | -95.2 | -49.32 | -25 | -24.32 | V |
| 7.5127 | 36.43 | Pk | 35.7 | -27.0 | .4 | -95.2 | -49.67 | -25 | -24.67 | H |
| 9.9117 | 34.07 | Pk | 37.1 | -25.0 | .6 | -95.2 | -48.43 | -25 | -23.43 | V |
| 9.9609 | 35.02 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.18 | -25 | -22.18 | H |

# 10.2. FIELD STRENGTH OF SPURIOUS RADIATION, ANT 2

## 10.2.1. LTE BAND 53

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

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT Only |
| Mode | LTE53 QPSK 10MHz |
| 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** | | | | | | | | | | |
| 4.9866 | 37.91 | Pk | 34 | -30.8 | .4 | -95.2 | -53.69 | -25 | -28.69 | H |
| 4.9955 | 38.66 | Pk | 34 | -30.8 | .4 | -95.2 | -52.94 | -25 | -27.94 | V |
| 7.4513 | 35.79 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.11 | -25 | -25.11 | V |
| 7.4536 | 36.09 | Pk | 35.8 | -26.8 | .4 | -95.2 | -49.71 | -25 | -24.71 | H |
| 9.9492 | 34.31 | Pk | 37 | -24.9 | .8 | -95.2 | -47.99 | -25 | -22.99 | V |
| 9.9553 | 34.69 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.51 | -25 | -22.51 | H |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9748 | 38.76 | Pk | 34.1 | -30.8 | .3 | -95.2 | -52.84 | -25 | -27.84 | V |
| 4.9917 | 39.21 | Pk | 34.0 | -30.8 | .4 | -95.2 | -52.39 | -25 | -27.39 | H |
| 7.4709 | 34.74 | Pk | 35.7 | -26.8 | .4 | -95.2 | -51.16 | -25 | -26.16 | V |
| 7.4859 | 37.38 | Pk | 35.7 | -26.8 | .4 | -95.2 | -48.52 | -25 | -23.52 | H |
| 9.9333 | 34.31 | Pk | 37.1 | -25.0 | .7 | -95.2 | -48.09 | -25 | -23.09 | V |
| 9.9680 | 34.99 | Pk | 37.0 | -24.9 | .8 | -95.2 | -47.31 | -25 | -22.31 | H |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9931 | 38.50 | Pk | 34 | -30.8 | .4 | -95.2 | -53.10 | -25 | -28.10 | V |
| 4.9973 | 38.52 | Pk | 34 | -30.7 | .4 | -95.2 | -52.98 | -25 | -27.98 | H |
| 7.4977 | 36.33 | Pk | 35.8 | -26.8 | .4 | -95.2 | -49.47 | -25 | -24.47 | H |
| 7.5131 | 36.80 | Pk | 35.7 | -27.0 | .4 | -95.2 | -49.30 | -25 | -24.30 | V |
| 9.9506 | 34.58 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.62 | -25 | -22.62 | H |
| 9.9609 | 34.82 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.38 | -25 | -22.38 | V |

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

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT only |
| Mode | LTE53 QPSK 10MHz |
| 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** | | | | | | | | | | |
| 4.9931 | 38.50 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.10 | -25 | -28.10 | V |
| 4.9973 | 38.52 | Pk | 34.0 | -30.7 | .4 | -95.2 | -52.98 | -25 | -27.98 | H |
| 7.4977 | 36.33 | Pk | 35.8 | -26.8 | .4 | -95.2 | -49.47 | -25 | -24.47 | H |
| 7.5131 | 36.8 | Pk | 35.7 | -27 | .4 | -95.2 | -49.30 | -25 | -24.30 | V |
| 9.9506 | 34.58 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.62 | -25 | -22.62 | H |
| 9.9609 | 34.82 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.38 | -25 | -22.38 | V |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9781 | 38.90 | Pk | 34.1 | -30.8 | .3 | -95.2 | -52.70 | -25 | -27.70 | H |
| 4.9842 | 37.42 | Pk | 34.1 | -30.8 | .4 | -95.2 | -54.08 | -25 | -29.08 | V |
| 7.4756 | 35.91 | Pk | 35.7 | -26.8 | .4 | -95.2 | -49.99 | -25 | -24.99 | H |
| 7.4803 | 36.75 | Pk | 35.7 | -26.8 | .4 | -95.2 | -49.15 | -25 | -24.15 | V |
| 9.9277 | 34.24 | Pk | 37.1 | -25.0 | .6 | -95.2 | -48.26 | -25 | -23.26 | V |
| 9.9455 | 34.96 | Pk | 37.0 | -24.9 | .7 | -95.2 | -47.44 | -25 | -22.44 | H |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9716 | 38.06 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.54 | -25 | -28.54 | V |
| 4.9791 | 38.6 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.00 | -25 | -28.00 | H |
| 7.5028 | 35.66 | Pk | 35.8 | -26.9 | .4 | -95.2 | -50.24 | -25 | -25.24 | V |
| 7.5070 | 36.16 | Pk | 35.7 | -26.9 | .4 | -95.2 | -49.84 | -25 | -24.84 | H |
| 9.9778 | 34.52 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.68 | -25 | -22.68 | H |
| 10.0027 | 34.15 | Pk | 37.1 | -24.9 | .9 | -95.2 | -47.95 | -25 | -22.95 | V |

## 10.2.2. 5G NR n53

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

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT only |
| Mode | 5G NR n53 10MHz |
| 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** | | | | | | | | | | |
| 4.9908 | 38.25 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.35 | -25 | -28.35 | H |
| 4.9908 | 37.86 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.74 | -25 | -28.74 | V |
| 7.4414 | 35.63 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.27 | -25 | -25.27 | V |
| 7.4503 | 36.97 | Pk | 35.7 | -26.9 | .4 | -95.2 | -49.03 | -25 | -24.03 | H |
| 9.9248 | 34.59 | Pk | 37.1 | -25.0 | .6 | -95.2 | -47.91 | -25 | -22.91 | V |
| 9.9384 | 34.70 | Pk | 37.1 | -25.0 | .7 | -95.2 | -47.70 | -25 | -22.70 | H |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9889 | 38.82 | Pk | 34.0 | -30.8 | .4 | -95.2 | -52.78 | -25 | -27.78 | V |
| 4.9913 | 39.23 | Pk | 34.0 | -30.8 | .4 | -95.2 | -52.37 | -25 | -27.37 | H |
| 7.4480 | 35.67 | Pk | 35.7 | -26.9 | .4 | -95.2 | -50.33 | -25 | -25.33 | H |
| 7.4494 | 35.94 | Pk | 35.7 | -26.9 | .4 | -95.2 | -50.06 | -25 | -25.06 | V |
| 9.9530 | 34.99 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.21 | -25 | -22.21 | H |
| 9.9670 | 35.31 | Pk | 37.0 | -24.9 | .8 | -95.2 | -46.99 | -25 | -21.99 | V |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9702 | 38.50 | Pk | 34.1 | -30.9 | .3 | -95.2 | -53.20 | -25 | -28.20 | V |
| 4.9791 | 38.07 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.53 | -25 | -28.53 | H |
| 7.5028 | 35.69 | Pk | 35.8 | -26.9 | .4 | -95.2 | -50.21 | -25 | -25.21 | V |
| 7.5056 | 35.78 | Pk | 35.7 | -26.9 | .4 | -95.2 | -50.22 | -25 | -25.22 | H |
| 9.9581 | 34.70 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.50 | -25 | -22.50 | V |
| 9.9586 | 34.61 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.59 | -25 | -22.59 | H |

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

| | |
|---|---|
| Project #: | 14040863 |
| Date: | 5/5/2022 |
| Test Engineer: | 27661 |
| Configuration: | EUT only |
| Mode | 5G NR n53 10MHz |
| 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** | | | | | | | | | | |
| 4.9927 | 38.39 | Pk | 34.0 | -30.8 | .4 | -95.2 | -53.21 | -25 | -28.21 | V |
| 4.9973 | 38.11 | Pk | 34.0 | -30.7 | .4 | -95.2 | -53.39 | -25 | -28.39 | H |
| 7.4545 | 36.11 | Pk | 35.8 | -26.8 | .4 | -95.2 | -49.69 | -25 | -24.69 | H |
| 7.4808 | 34.77 | Pk | 35.7 | -26.8 | .4 | -95.2 | -51.13 | -25 | -26.13 | V |
| 9.9441 | 34.38 | Pk | 37.0 | -24.9 | .7 | -95.2 | -48.02 | -25 | -23.02 | V |
| 9.9558 | 34.94 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.26 | -25 | -22.26 | H |
| **Mid Channel, 2489MHz** | | | | | | | | | | |
| 4.9875 | 38.79 | Pk | 34.0 | -30.8 | .4 | -95.2 | -52.81 | -25 | -27.81 | H |
| 4.9898 | 39.07 | Pk | 34.0 | -30.8 | .4 | -95.2 | -52.53 | -25 | -27.53 | V |
| 7.4714 | 35.55 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.35 | -25 | -25.35 | V |
| 7.4784 | 35.57 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.33 | -25 | -25.33 | H |
| 9.9553 | 34.59 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.61 | -25 | -22.61 | H |
| 10.0144 | 33.88 | Pk | 37.1 | -24.8 | 1 | -95.2 | -48.02 | -25 | -23.02 | V |
| **High Channel, 2490MHz** | | | | | | | | | | |
| 4.9795 | 37.70 | Pk | 34.1 | -30.8 | .3 | -95.2 | -53.90 | -25 | -28.90 | V |
| 4.9856 | 38.76 | Pk | 34.1 | -30.8 | .4 | -95.2 | -52.74 | -25 | -27.74 | H |
| 7.4714 | 35.74 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.16 | -25 | -25.16 | H |
| 7.4855 | 35.37 | Pk | 35.7 | -26.8 | .4 | -95.2 | -50.53 | -25 | -25.53 | V |
| 9.9516 | 34.90 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.30 | -25 | -22.30 | H |
| 9.9750 | 34.80 | Pk | 37.1 | -24.9 | .8 | -95.2 | -47.40 | -25 | -22.40 | V |

# 11. SETUP PHOTOS

Please refer to 14040863-EP1V1 for setup photos.

# END OF REPORT



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