TEST REPORT

Report Number : 14790383-E6V2

Applicant	:	APPLE, INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	:	A2595 (Parent Model, Full Test) A2782, A2783, A2784, A2785 (Variant Models)
Brand	:	APPLE
FCC ID	:	BCG-E4082A (Parent Model) BCG-E8064A, BCG-E4083A, BCG-E8076A (Variant Models)
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC CFR47 PART 2, PART 96

Date Of Issue:
JUNE 22, 2023

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 319-4000
FAX: (510) 661-0888

ACCREDITED
CERT #0751.05

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	6/21/2023	Initial Review	Mengistu Mekuria
V2	6/22/2023	Addressed All TCB Questions at Section 5.4, 6.3, and 6.8	Mengistu Mekuria

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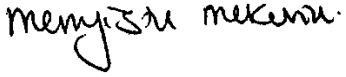
1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE, INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A2595 (PARENT MODEL, FULL TEST) A2782, A2783, A2784, A2785 (Variant Models)
Brand	APPLE
FCC ID	BCG-E4082A (Parent Model) BCG-E8064A, BCG-E4083A, BCG-E8076A (Variant Models)
EUT Description	SMARTPHONE
Serial Number	CQF9R4NQNJ (Conducted) AND XWGGFJ25JV (Radiated)
Sample Receipt Date	SEPTEMBER 08, 2021
Date Tested	SEPTEMBER 08, 2021 to JANUARY 21, 2022
Applicable Standards	FCC CFR47 PART 2, PART 96
Test Results	COMPLIES

UL Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released By:	Reviewed By:	Prepared By:
		
Mengistu Mekuria Operations Leader UL Vérification Services Inc.	John Thompson Laboratory Engineer UL Vérification Services Inc.	Tewodros Woldemichael Laboratory Engineer UL Vérification Services Inc.

2. SUMMARY OF TEST RESULTS

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. 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)	Result	Remarks
Equivalent Isotropic Radiated	48	96.41 (b)	Complies	

Requirement Description	Requirement Clause Number (FCC)	Result	Remarks
Occupied Bandwidth	2.1049	Complies	
Band Edge and Emission Mask	96.41(e)	Complies	
Out of Band Emissions	96.41(e)	Complies	
Frequency Stability	2.1055	Complies	
Peak-to-Average Ratio	96.41 (g)	Complies	
Field Strength of Spurious Radiation	96.41(e)	Complies	

3. TEST METHODOLOGY

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

- ANSI C63.26:2015
- FCC CFR 47 Part 2, Part 96
- 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

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0, 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, California, USA	US0104	2324A	208313
☒	Building 2: 47266 Benicia Street, Fremont, California, USA	US0104	22541	208313
☐	Building 4: 47658 Kato Rd, Fremont, California, USA	US0104	2324B	208313

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

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video),cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G FR1, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM is an UICC based e-SIM (electronic SIM) in some models. China model has 1 p-SIM only. The device supports a built-in inductive charging 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.

6.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID: BCG-E4082A to cover variant model FCC ID: BCG-E8064A, FCC ID: BCG-E4083A, and FCC ID: BCG-E8076A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter, and some LTE and 5G NR Bands. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

6.3. MODEL DIFFERENCES

The manufacturer hereby declares the following for models A2595, A2782, A2783, A2784, A2785.

A2595, A2782, A2783, A22784, and A2785 are highly similar, with the only differences being listed on the table below:

Model	FCC ID	Model Changes
A2595	BCG-E4082A	Reference model, Removed: LTE B11/B21
A2782	BCG-E8064A	Variant model. Removed LTE B14/29/71 from the reference model
A2783	BCG-E4083A	Variant model.Removed LTE B11/14/21/29/71 from the reference model
A2784/A2785	BCG-E8076A	Variant model.Removed LTE B11/14/21/29/71 from the reference model

*Note:

They have the same PCB layout, design, common components, antennas, antenna locations and housing cases.

More specifically, their cellular modem, Wi-Fi, BT, NFC, WPT and UWB transmitters are identical, and removal of cellular bands is done by software and depopulation of band-specific components associated with the removed bands.

Spot check verification has been done on models A2782, A2783, A2784 and A2785 in accordance with the test plan approved via KDB inquiry. Comparison of the models, upper deviation is within 0.5dB range, and all tests are under FCC Technical Limits. The results documented for model A2595 may be applied as representative to models A2782, A2783, A2784, and A2785.

6.4. 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 ERP/EIRP output powers as follows:

5G NR n48

Part 96	
EIRP Limit (W)	0.20
Antenna Gain (dBi)	-0.20

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	3590.0	3660.0	22.67	22.47	0.177	8610	8M61G7W
	QPSK			22.70	22.50	0.178	8589	8M59G7W
	16QAM			21.86	21.66	0.147	8625	8M63D7W
20.0	BPSK	3595.0	3655.0	22.70	22.50	0.178	17878	17M9G7W
	QPSK			22.64	22.44	0.175	17880	17M9G7W
	16QAM			21.83	21.63	0.146	17890	17M9D7W
40.0	BPSK	3600.0	3650.0	22.70	22.50	0.178	35778	35M8G7W
	QPSK			22.60	22.40	0.174	35726	35M7G7W
	16QAM			21.85	21.65	0.146	35680	35M7D7W

6.5. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A2782

A2782 SPOT CHECK RESULTS							
Technology	Worst Mode	Test Item	Measured	Original Model: A2595	Sub Model: A2782	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E4082A Power (dBm)	FCC ID: BCG-E8064A Power (dBm)		
5G NR n48	QPSK @ 40 MHz BW	Cond Power	3550-3700	22.70	22.70	0.00	Ant1

6.6. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A2783

A2783 SPOT CHECK RESULTS							
Technology	Worst Mode	Test Item	Measured	Original Model: A2595	Sub Model: A2783	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E4082A Power (dBm)	FCC ID: BCG-E4083A Power (dBm)		
5G NR n48	QPSK @ 40 MHz BW	Cond Power	3550-3700	22.70	22.70	0.00	Ant1

6.7. SPOT CHECK VERIFICATION RESULTS SUMMARY FOR A2784 AND A2785

A2784 SPOT CHECK RESULTS							
Technology	Worst Mode	Test Item	Measured	Original Model: A2595	Sub Model: A2784/A2785	Delta (dB)	Remarks
			Frequency (MHz)	FCC ID: BCG-E4082A Power (dBm)	FCC ID: BCG-E8076A Power (dBm)		
5G NR n48	QPSK @ 40 MHz BW	Cond Power	3550-3700	22.70	22.70	0.00	Ant1

6.8. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was version: 0.13.02.

6.9. MAXIMUM ANTENNA GAIN

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

LTE Bands	ANT 1 Antenna Gain (dBi)	ANT 4 Antenna Gain (dBi)
5G NR n48, 3550 – 3700 MHz	-0.2	-2.1

6.10. WORST-CASE CONFIGURATION AND MODE

The EUT supports the following LTE and 5G NR Bands:
5G NR n48

For 5G NR, conducted spurious emission tests were conducted on wider bandwidth with inner 1RB since this is the worst bandwidth and the highest output power.

BPSK modulation 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. Then, QPSK and BPSK were observed as the worst mode to LTE bands and 5G NR bands respectively and set for all conducted and radiated. 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
5G NR n48	Ant 1

The EUT was investigated in three orthogonal orientations X/Y/Z on all ANT 1 and ANT4 antennas to determine the worst case orientation. The following table exabit the worst case orientation for different frequency bands. The full tests of the EUT have made upon the orientations that shown in the table below.

Frequency Bands	ANT1	ANT4
3300 – 3980 MHz	Z	Y

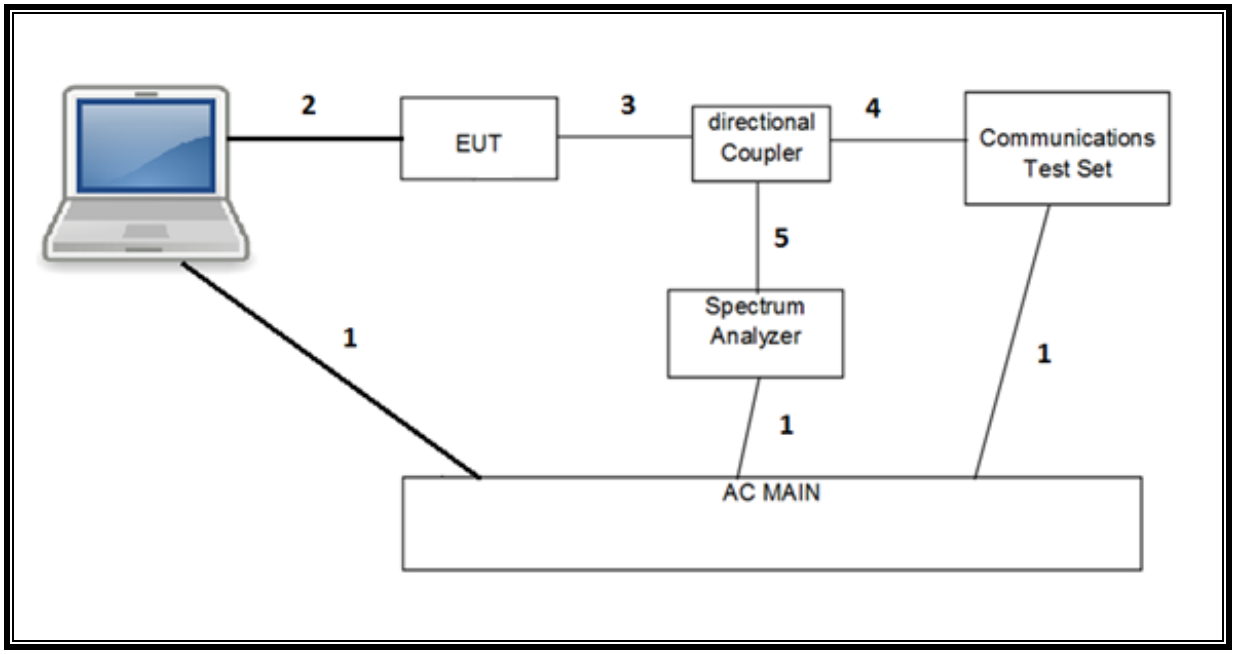
Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. There were no emissions found with less than 20dB of margin from 9kHz to 1GHz.

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.

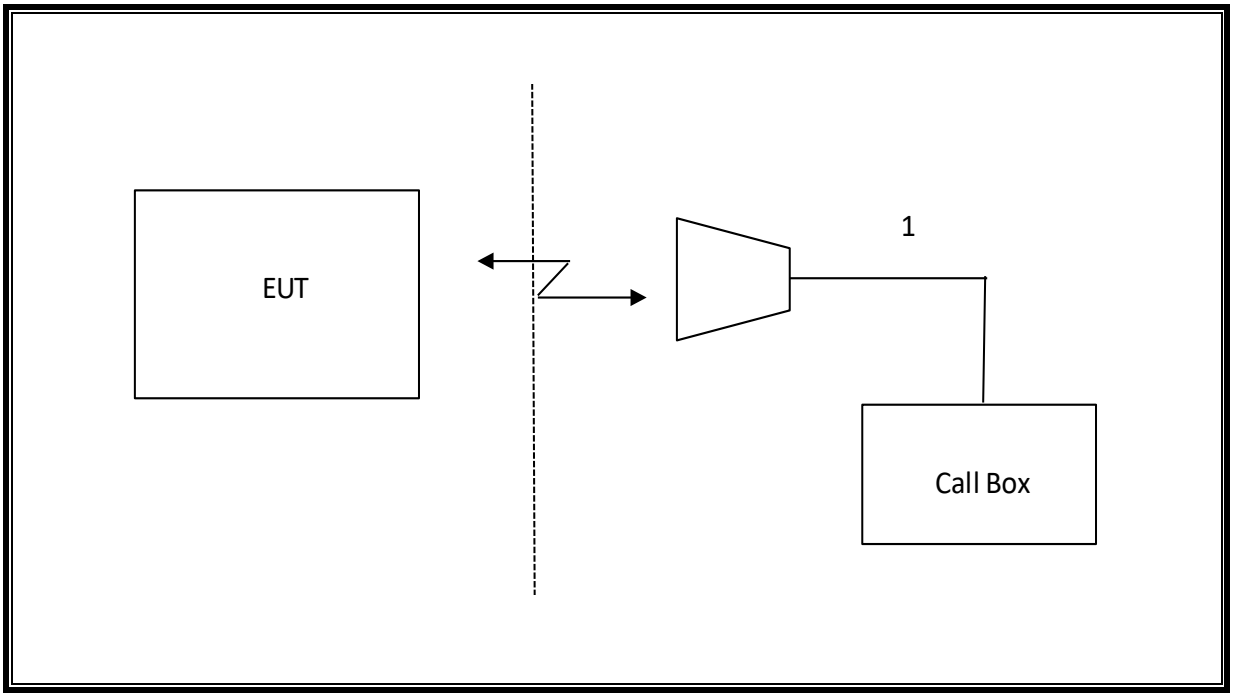
6.11. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT					
Description	**Manufacturer**	**Model**	**Serial Number**		**FCC ID/ DoC**
Laptop	Apple	MacBook Pro	QDS-BRCM1069		A1398
AC/DC adapter	Apple	B123	N/A		PA-1450-BA1
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	T345	05/26/2022
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T136	07/07/2022
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T900	02/24/2022
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	06/12/2022
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T907	07/22/2022
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	N9030A	T123	01/19/2022
Spectrum Analyzer, PSA, 3Hz to 44GHz	Keysight	N9030A	T908	01/28/2022
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T200	01/19/2022
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T905	01/21/2022
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T340	01/28/2022
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T199	01/20/2022
Spectrum Analyzer, PXA 3Hz to 50GHz	Keysight	N9030B	207995	05/27/2022
Spectrum Analyzer, PXA, 3Hz to 50GHz w/Ext. Mixer	Keysight	N9030A	T342	01/25/2022
Spectrum Analyzer, PSA 3Hz to 44GHz	Keysight	E4446A	T123	01/22/2022
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	T1245	01/21/2022
Power Meter, P-series single channel	Keysight	N1912A	T1269	01/25/2022
Power Meter, P-series single channel	Keysight	N1912A	T1272	01/21/2022
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight	N1921A	T1224	01/28/2022
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T1210	01/22/2022
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T1526	02/26/2022
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T260	02/20/2022
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T958	02/22/2022
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T964	02/17/2022
Wideband Communication Test Set, Call Box	R&S GmbH & Co. KG	CMW500	T979	02/22/2022
5G NR Communication Test Set, Call Box	Keysight	UXM	207269	04/07/2022
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T754	06/16/2022
Chamber, Environmental	Cincinnati Sub Zero	ZPHS-8-3.5-SCT/WC	T1154	06/15/2022
Amplifier, 26.5GHz to 40GHz	Miteq	NSP 4000 SP2	T88	04/22/2022
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	T404	04/19/2022
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T447	04/22/2022
Antenna, Horn 26.5GHz to 40GHz	ARA	MWH-2640	T1864	04/19/2022
Spectrum Analyzer	Keysight	8564E	T106	01/27/2022
Antenna, Active Loop 9KHz to 30MHz	EMCO	PRE0154914	T1683	05/24/2022
UL AUTOMATION SOFTWARE				
CLT Software	UL	UL RF	Ver 3.4, June 08, 2021	
Power Measurement Software	UL	UL RF	Ver 3.1.4, May 20, 2021	
Radiated test software	UL	UL RF	Ver 9.5, July 07, 2020	

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 TS136.101 specification.

UE Power Class: 3 (23 +/- 2dBm). Band 41 UE Power Class: 2 (26 +/-2 dBm).The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS136.101.

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 TS138.521-1 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 TS136.101 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

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 conducted output powers as follows:

8.1. 5G NR n48

5G NR n48

Test Engineer ID:	44353	Test Date:	11/12/2021

OUTPUT POWER FOR 5G NR n48 (10.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Conducted Average (dBm)					
				ANT 1			ANT 4		
				637000	641666	646333	637000	641666	646333
				3555.0	3625.0	3695.0	3555.0	3625.0	3695.0
10.0	BPSK	1	0	22.40	22.20	22.25	22.41	22.00	22.14
		1	1	**22.67**	22.43	22.48	**22.43**	22.05	22.20
		1	22	**22.67**	22.47	22.50	22.39	22.06	22.15
		1	23	22.46	22.31	22.24	22.41	22.13	22.13
		12	6	22.63	22.39	22.42	**22.43**	22.06	22.06
		24	0	22.41	22.20	22.20	22.42	22.12	22.17
	QPSK	1	0	21.94	21.67	21.75	21.95	21.63	21.68
		1	1	22.65	22.41	22.44	**22.50**	22.12	22.22
		1	22	**22.70**	22.50	22.40	22.45	22.19	22.20
		1	23	21.90	21.76	21.75	21.95	21.68	21.70
		12	6	22.64	22.45	22.44	22.43	22.13	22.17
		24	0	21.89	21.74	21.69	21.96	21.56	21.68
	16QAM	1	0	20.84	20.66	20.61	21.22	20.90	20.98
		1	1	**21.86**	21.68	21.72	22.15	21.85	22.01
		1	22	21.79	21.73	21.54	**22.24**	22.05	21.99
		1	23	20.92	20.76	20.62	21.22	20.89	20.98
		12	6	21.73	21.55	21.54	21.91	21.60	21.68
		24	0	20.93	20.75	20.73	20.91	20.66	20.71
	64QAM	1	0	20.30	20.02	20.01	20.12	19.75	19.97
		1	1	20.21	20.11	19.99	20.15	19.82	19.87
		1	22	20.11	20.05	19.99	20.26	19.85	19.78
		1	23	19.96	20.11	19.90	20.14	19.79	19.88
		12	6	**20.32**	20.19	20.20	**20.41**	20.05	20.09
		24	0	20.20	20.18	20.16	20.36	20.09	20.07
	256QAM	1	0	18.22	18.11	18.12	18.42	18.04	18.08
		1	1	18.35	18.16	18.15	**18.50**	18.06	18.10
		1	22	18.25	18.16	18.25	18.31	18.13	18.07
		1	23	18.36	18.26	18.11	18.28	18.13	18.12
		12	6	18.37	18.21	18.18	18.42	18.11	18.11
		24	0	**18.38**	18.26	18.27	18.49	18.16	18.13

OUTPUT POWER FOR 5G NR n48 (20.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Conducted Average (dBm)					
				ANT 1			ANT 4		
				637333	641666	646000	637333	641666	646000
				3560.0	3625.0	3690.0	3560.0	3625.0	3690.0
20.0	BPSK	1	0	22.49	22.22	22.34	**22.47**	21.88	22.11
		1	1	**22.70**	22.42	22.52	22.38	21.88	22.07
		1	49	**22.70**	22.53	22.43	22.39	21.96	21.98
		1	50	22.48	22.30	22.10	22.40	22.07	21.95
		25	12	22.65	22.43	22.41	22.41	21.91	22.01
		50	0	22.42	22.22	22.20	22.42	21.93	22.03
	QPSK	1	0	21.86	21.67	21.75	21.96	21.46	21.60
		1	1	22.60	22.33	22.46	22.45	21.97	22.06
		1	49	**22.64**	22.51	22.38	**22.50**	22.08	21.99
		1	50	21.84	21.76	21.61	21.94	21.55	21.51
		25	12	22.56	22.37	22.42	22.42	21.96	22.02
		50	0	21.87	21.66	21.71	21.92	21.42	21.50
	16QAM	1	0	20.84	20.57	20.73	21.18	20.63	20.89
		1	1	21.77	21.70	21.71	22.19	21.86	21.91
		1	49	**21.83**	21.77	21.47	**22.21**	21.63	21.76
		1	50	20.87	20.84	20.60	21.19	20.86	20.77
		25	12	21.76	21.69	21.64	21.93	21.46	21.58
		50	0	20.85	20.76	20.66	20.85	20.44	20.50
	64QAM	1	0	20.02	19.84	20.25	20.05	19.75	19.70
		1	1	20.09	19.88	19.85	20.08	19.43	19.64
		1	49	20.03	20.09	19.78	20.04	19.74	19.56
		1	50	20.03	20.15	19.97	19.79	19.67	19.69
		25	12	20.26	20.21	20.13	**20.37**	19.99	20.07
		50	0	**20.35**	20.21	20.13	20.34	19.97	20.05
	256QAM	1	0	18.22	18.29	18.18	18.38	17.85	18.13
		1	1	18.30	18.19	17.91	18.36	17.95	18.09
		1	49	18.26	18.20	18.06	**18.41**	17.99	17.87
		1	50	18.32	18.19	18.01	18.34	17.95	17.85
		25	12	18.29	18.21	18.15	18.29	17.96	17.99
		50	0	**18.34**	18.19	18.08	18.24	17.92	17.99

OUTPUT POWER FOR 5G NR n48 (40.0 MHz)

Bandwidth (MHz)	Modulation	RB Allocation	RB Offset	Conducted Average (dBm)					
				ANT 1			ANT 4		
				638000	641666	645333	638000	641666	645333
				3570.0	3625.0	3680.0	3570.0	3625.0	3680.0
40.0	BPSK	1	0	21.94	22.07	22.33	22.08	22.11	22.29
		1	1	22.13	22.26	22.55	22.02	22.06	22.42
		1	104	22.39	**22.70**	22.45	22.13	22.42	22.39
		1	105	22.14	22.42	22.22	22.06	**22.50**	22.46
		50	25	22.00	22.32	22.44	21.94	22.18	22.32
		100	0	21.82	22.15	22.28	21.97	22.18	22.30
	QPSK	1	0	21.40	21.56	21.77	21.53	21.64	21.89
		1	1	22.16	22.27	22.57	22.13	22.15	22.36
		1	104	22.42	**22.60**	22.41	22.17	**22.50**	22.43
		1	105	21.55	21.97	21.78	21.68	22.04	22.02
		50	25	22.02	22.35	22.46	21.93	22.21	22.31
		100	0	21.33	21.66	21.73	21.47	21.75	21.78
	16QAM	1	0	19.99	20.58	20.83	20.85	20.83	21.15
		1	1	21.21	21.55	21.81	21.89	22.08	22.12
		1	104	21.46	**21.85**	21.58	21.89	22.20	**22.27**
		1	105	20.49	20.80	20.74	20.89	21.31	21.23
		50	25	21.23	21.62	21.75	21.40	21.67	21.79
		100	0	20.32	20.67	20.80	20.44	20.71	20.82
	64QAM	1	0	19.73	19.67	20.02	19.56	19.61	20.03
		1	1	19.39	20.09	20.04	19.75	19.70	19.98
		1	104	19.89	20.23	20.10	19.72	20.03	20.20
		1	105	19.79	20.10	20.09	19.73	20.06	20.09
		50	25	19.73	20.12	**20.27**	19.91	20.14	20.29
		100	0	19.78	20.16	20.22	19.93	20.12	**20.30**
	256QAM	1	0	17.66	17.88	18.22	17.79	17.87	18.32
		1	1	17.81	17.87	18.30	18.10	18.14	18.46
		1	104	17.76	**18.41**	18.09	18.15	18.50	18.32
		1	105	18.11	18.35	18.18	18.24	18.35	**18.52**
		50	25	17.65	18.03	18.20	17.86	18.07	18.21
		100	0	17.76	18.13	18.27	17.93	18.16	18.29

9. CONDUCTED TEST RESULTS

9.1. 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.

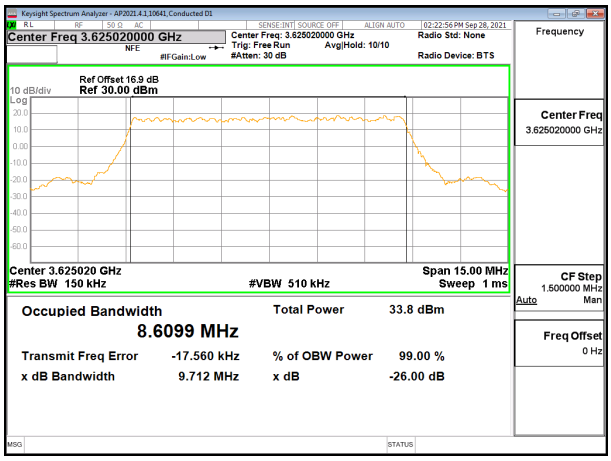
RESULTS

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.

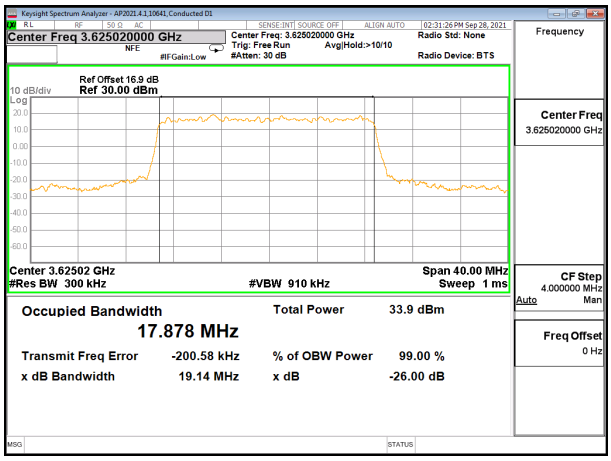
5G NR n48

Band	Mode	RB Allocation/RB Offset	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
5G NR n48	10MHz, BPSK	24/0	3625.0	8.610	9.71
	10MHz, QPSK			8.588	9.38
	10MHz, 16QAM			8.625	9.52
	20MHz, BPSK	50/0		17.878	19.14
	20MHz, QPSK			17.880	19.09
	20MHz, 16QAM			17.890	19.26
	40MHz, BPSK	100/0		35.778	37.50
	40MHz, QPSK			35.726	37.56
	40MHz, 16QAM			35.680	37.72
	40MHz, BPSK	1/0		0.555	0.891

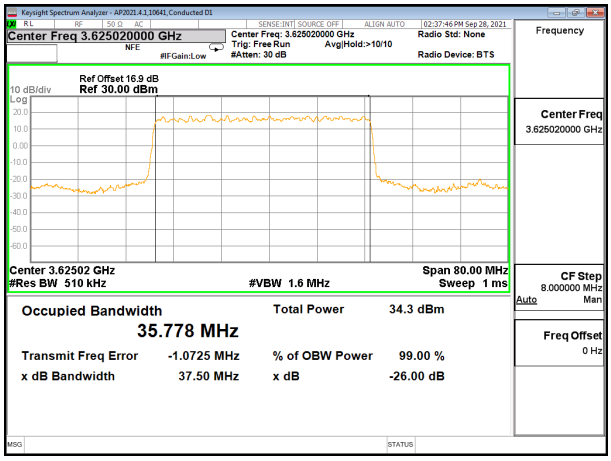
9.1.1. 5G NR n48



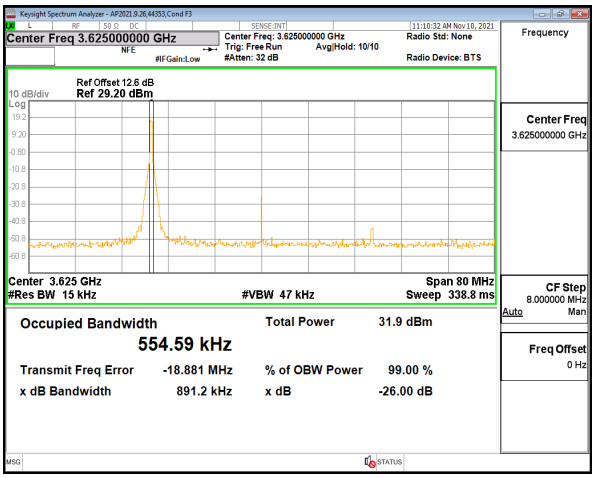
5G NR n48 10MHz BPSK Middle Channel RB24-0



5G NR n48 20MHz BPSK Middle Channel RB50-0



5G NR n48 40MHz BPSK Middle Channel RB100-0



5G NR n48 40MHz BPSK Middle Channel RB1-0

9.2. EMISSION MASK AND ADJACENT CHANNEL POWER

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.

TEST PROCEDURE

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 (5G NR n48)

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring unwanted emissions to demonstrate compliance with the limits, the CBSD and End User Device nominal carrier frequency/channel shall be adjusted as close to the licensee's authorized frequency block edges, both upper and lower, as the design permits.

(iii) Compliance with emission limits shall be demonstrated using either average (RMS)-detected or peak-detected power measurement techniques.

RESULTS

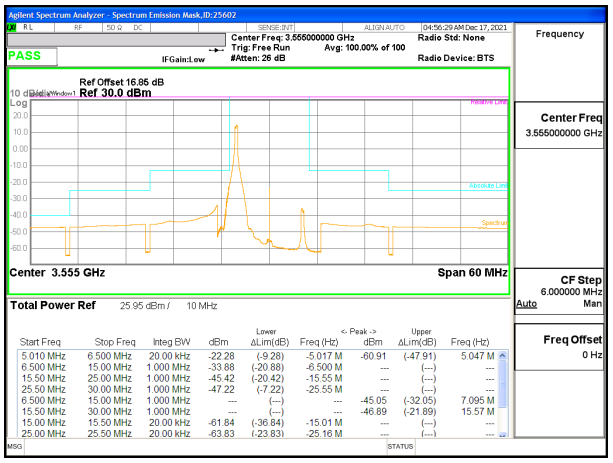
9.2.1. LTE BAND 48 AND 5G NR n48 EMISSION MASK AND ADJACENT CHANNEL POWER

LIMITS

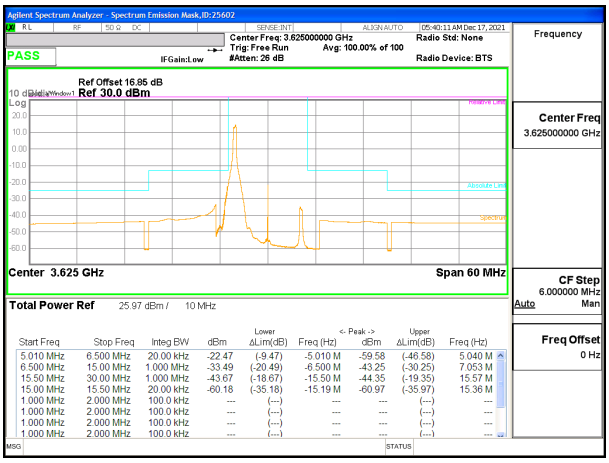
FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(1) General protection levels
(ii) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

(2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

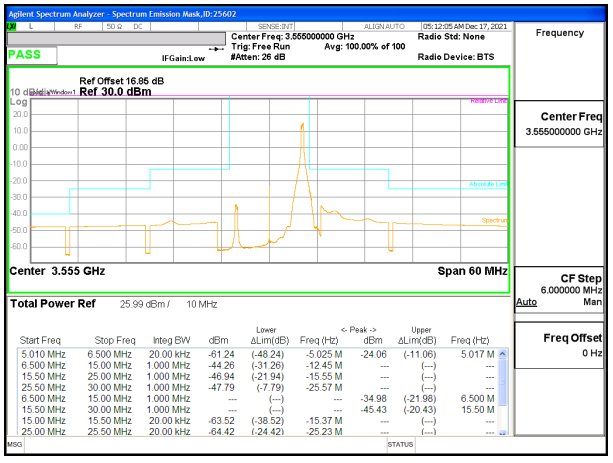
5G NR n48 EMISSION MASK



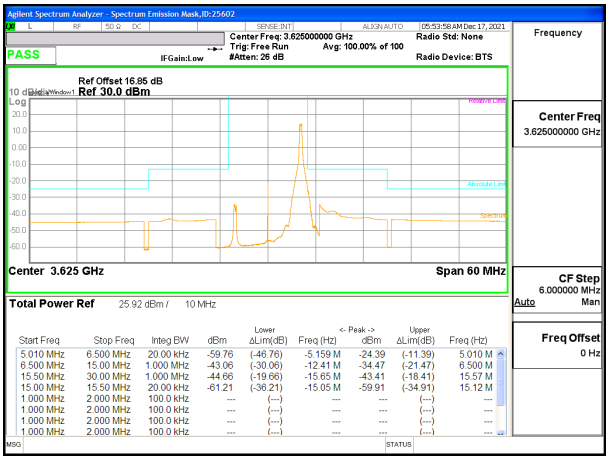
5G NR n48 10MHz BPSK Low Channel RB1-0



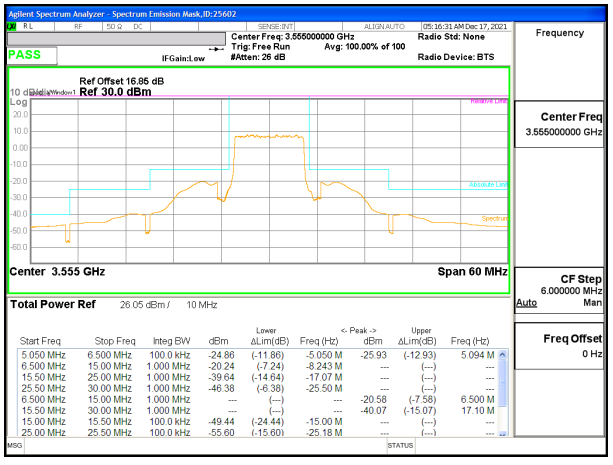
5G NR n48 10MHz BPSK Middle Channel RB1-0



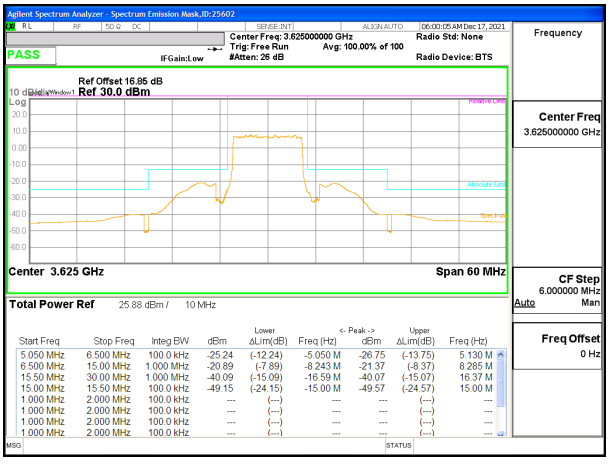
5G NR n48 10MHz BPSK Low Channel RB1-23



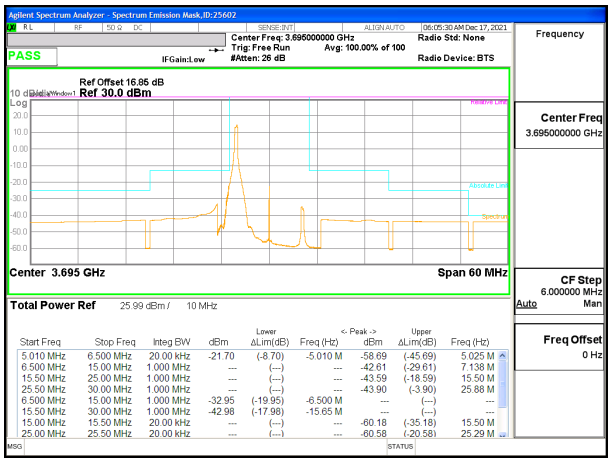
5G NR n48 10MHz BPSK Middle Channel RB1-23



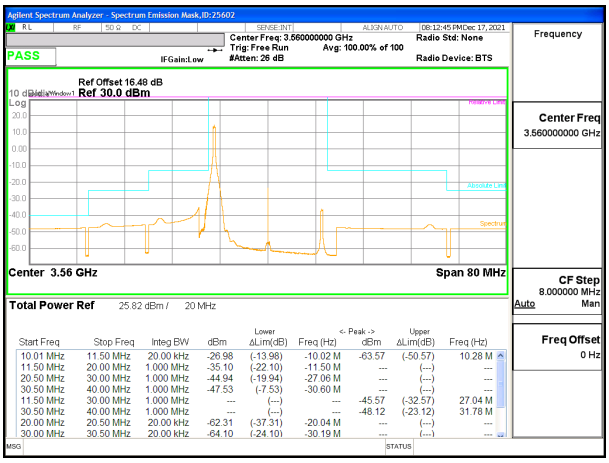
5G NR n48 10MHz BPSK Low Channel RB24-0



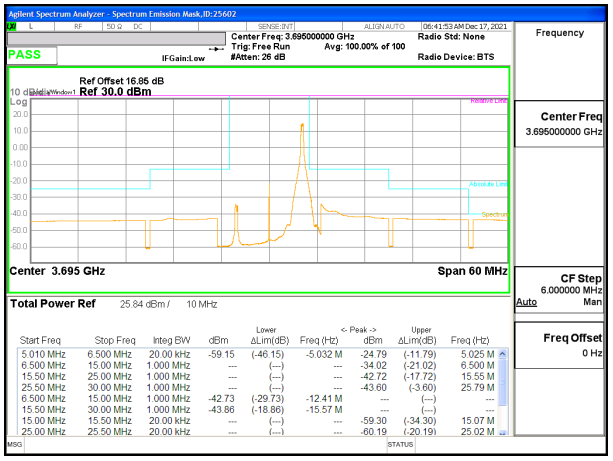
5G NR n48 10MHz BPSK Middle Channel RB24-0



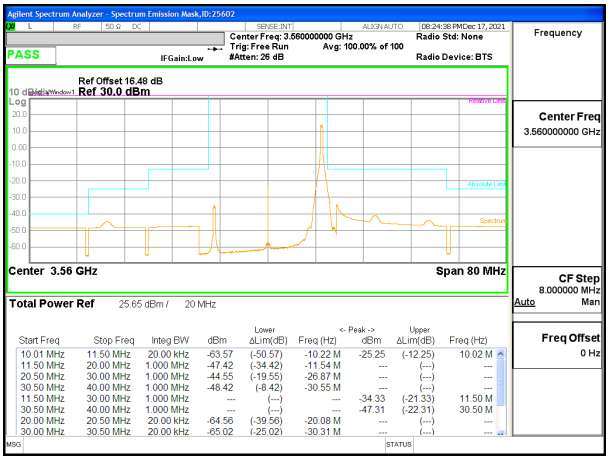
5G NR n48 10MHz BPSK High Channel RB1-0



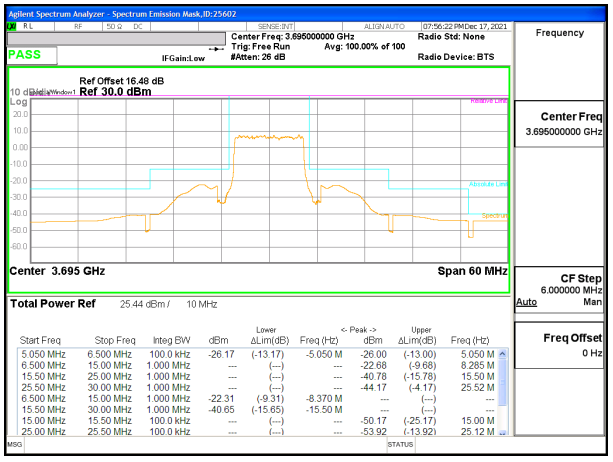
5G NR n48 20MHz BPSK Low Channel RB1-0



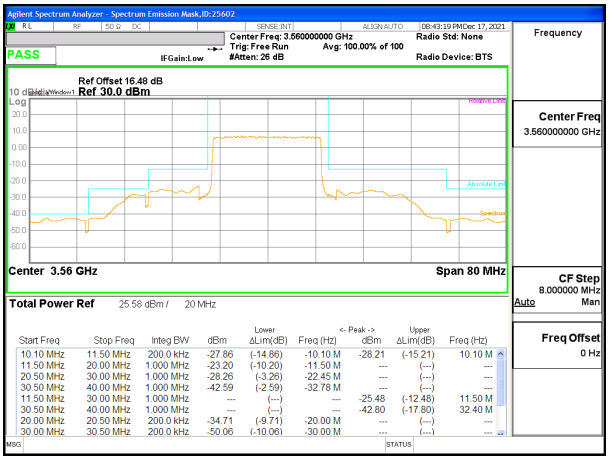
5G NR n48 10MHz BPSK High Channel RB1-23



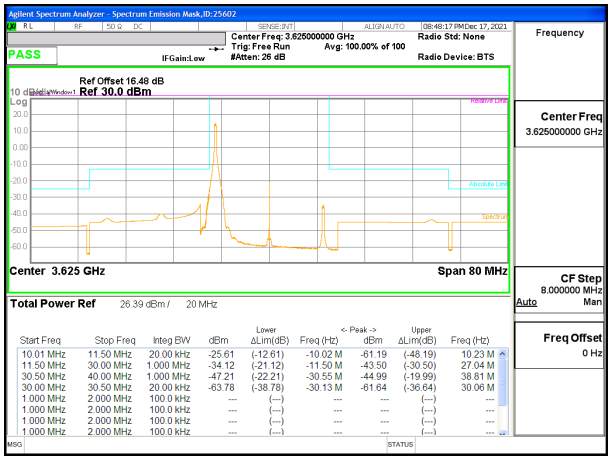
5G NR n48 20MHz BPSK Low Channel RB1-50



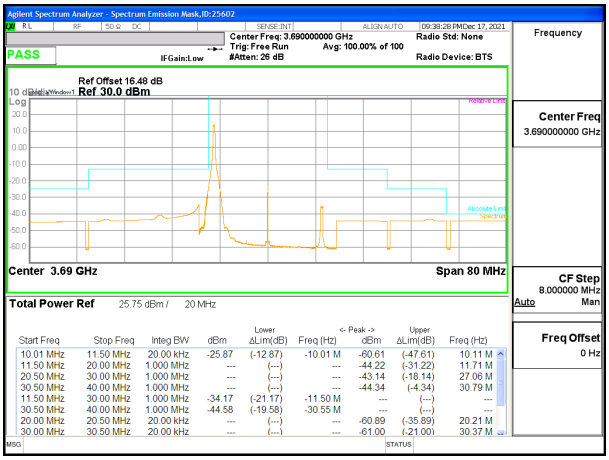
5G NR n48 10MHz BPSK High Channel RB24-0



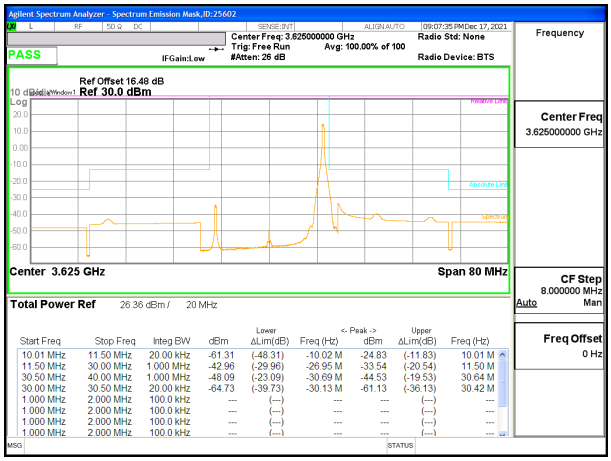
5G NR n48 20MHz BPSK Low Channel RB50-0



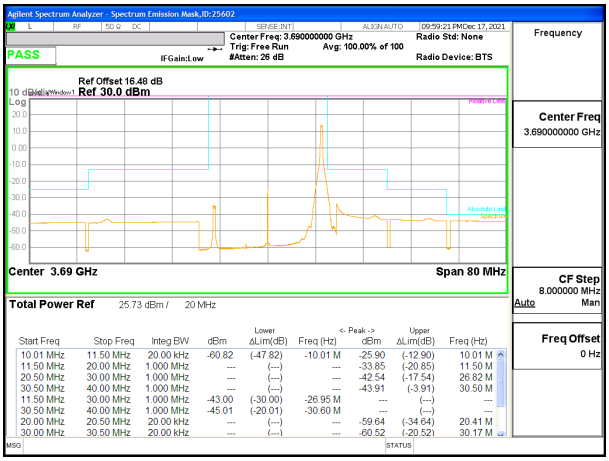
5G NR n48 20MHz BPSK Middle Channel RB1-0



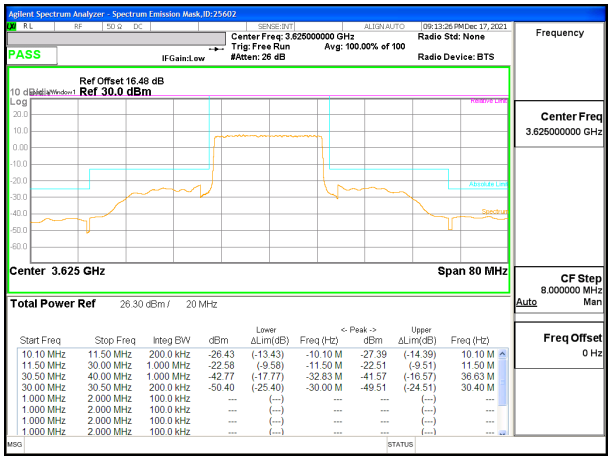
5G NR n48 20MHz BPSK High Channel RB1-0



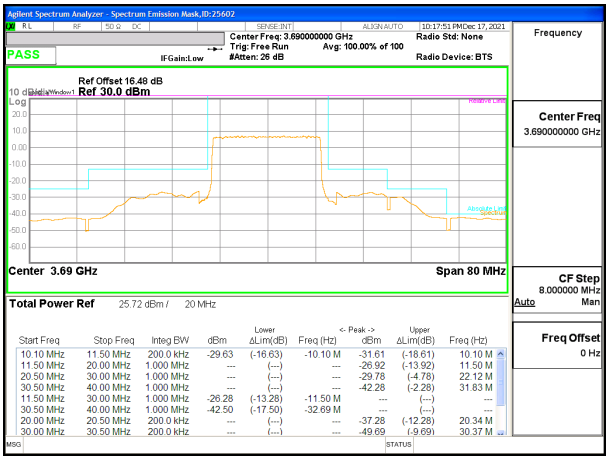
5G NR n48 20MHz BPSK Middle Channel RB1-50



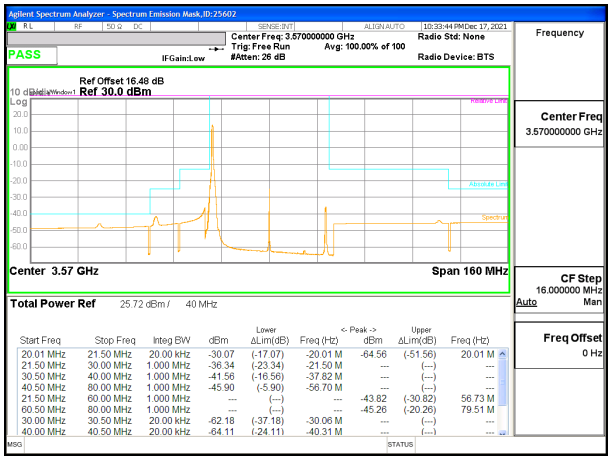
5G NR n48 20MHz BPSK High Channel RB1-50



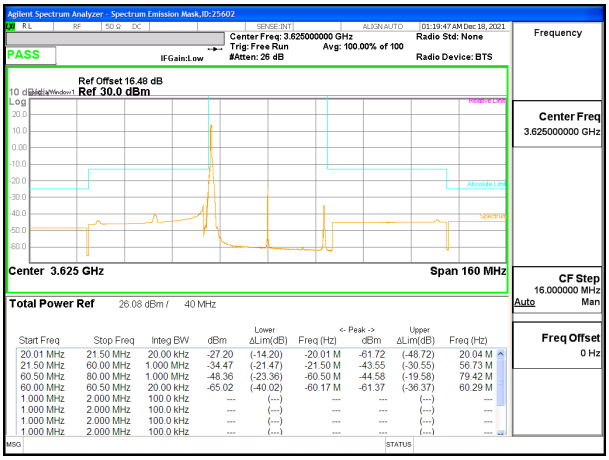
5G NR n48 20MHz BPSK Middle Channel RB50-0



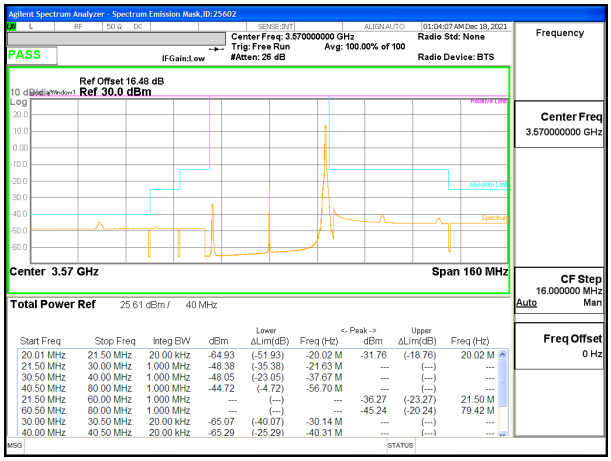
5G NR n48 20MHz BPSK High Channel RB50-0



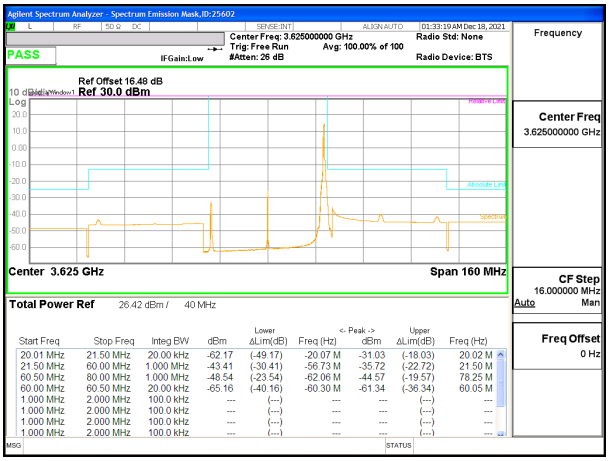
5G NR n48 40MHz BPSK Low Channel RB1-0



5G NR n48 40MHz BPSK Middle Channel RB1-0



5G NR n48 40MHz BPSK Low Channel RB1-105



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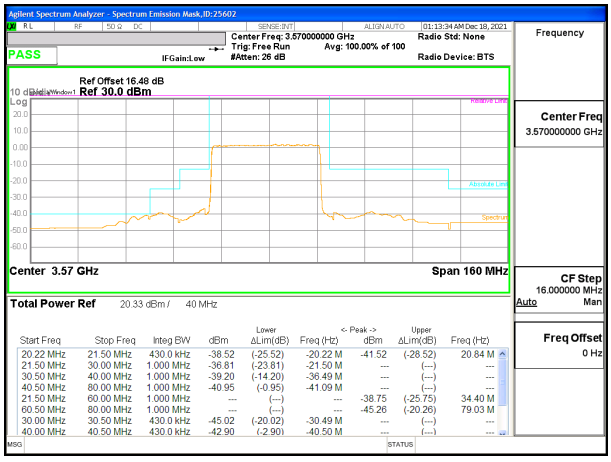

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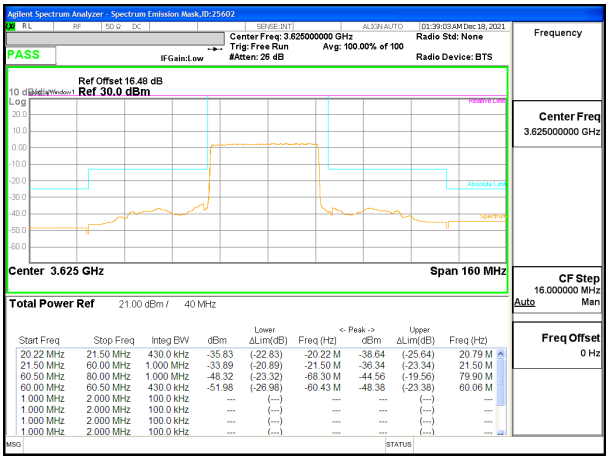

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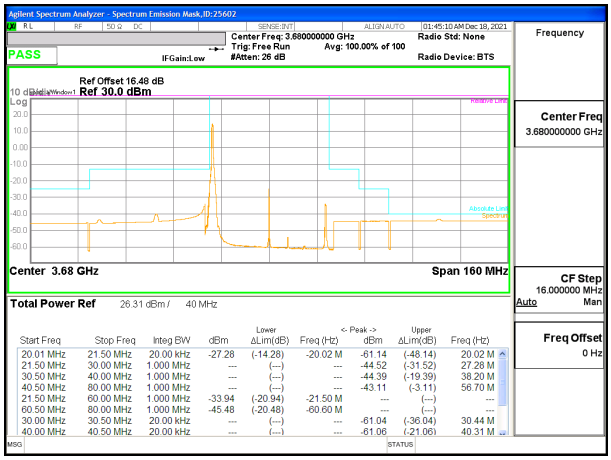
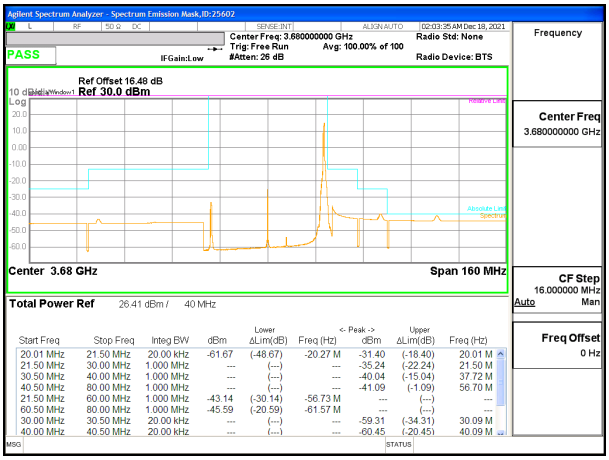


5G NR n48 40MHz BPSK High Channel RB1-0



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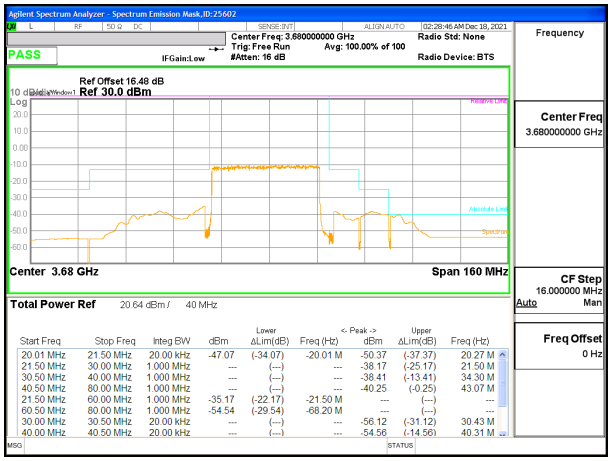
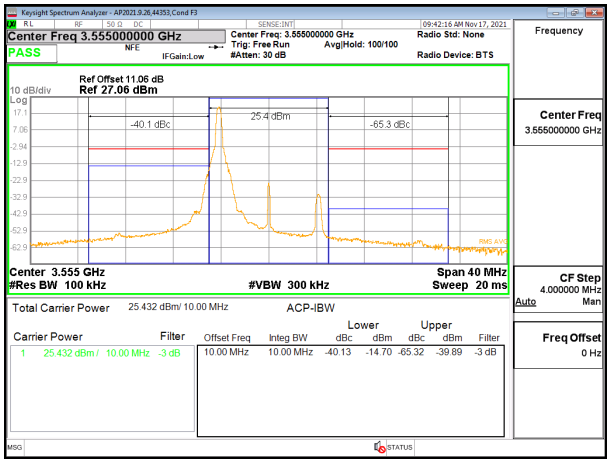


5G NR n48 40MHz BPSK High Channel RB100-0

Intentionally Blank

5G NR n48 ADJACENT CHANNEL POWER



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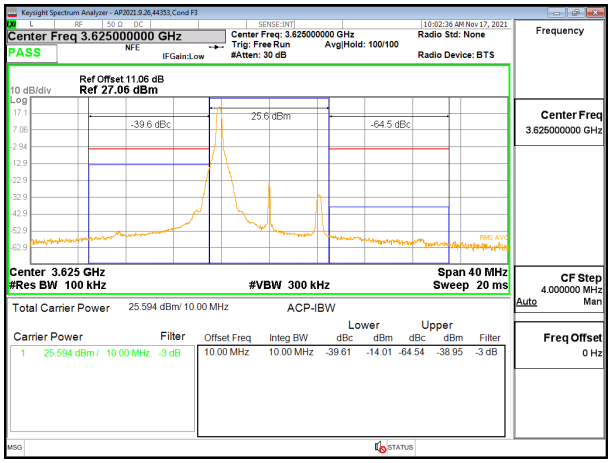

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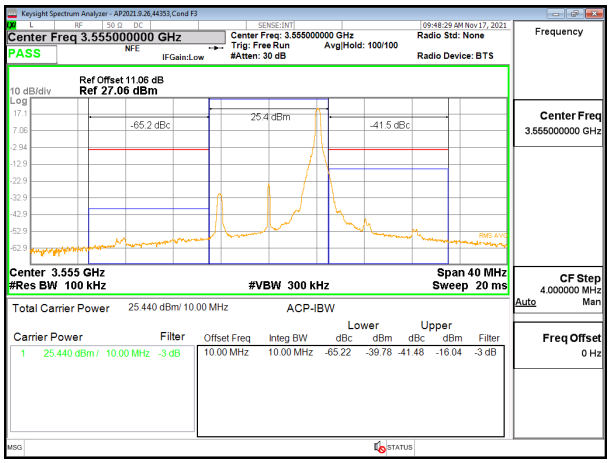
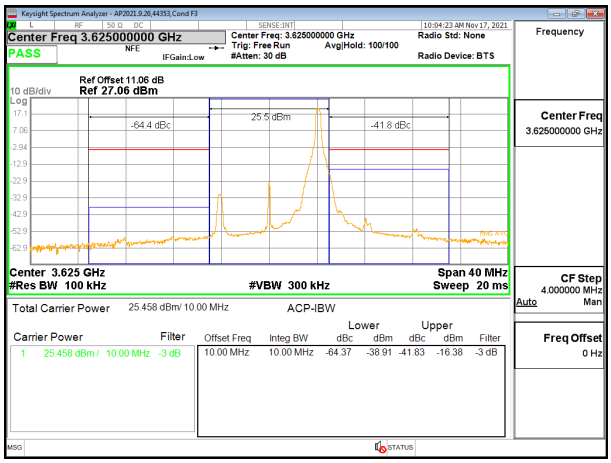


5G NR n48 10MHz BPSK Low Channel RB1-23



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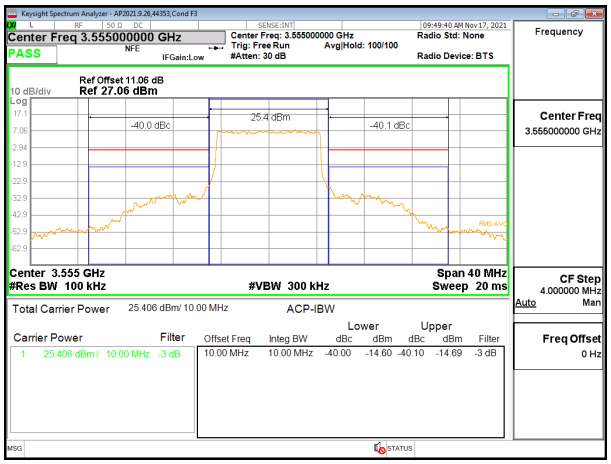
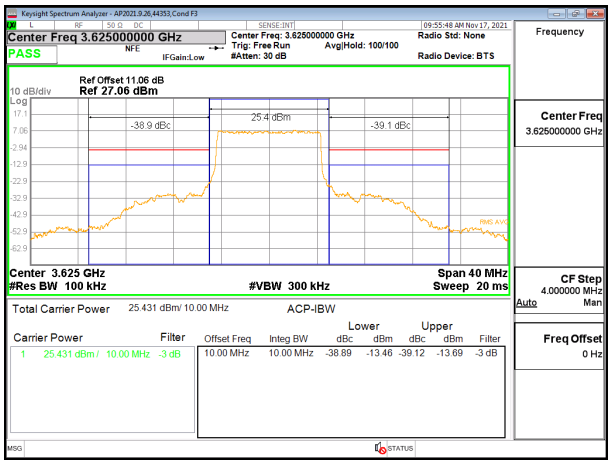


5G NR n48 10MHz BPSK Low Channel RB24-0



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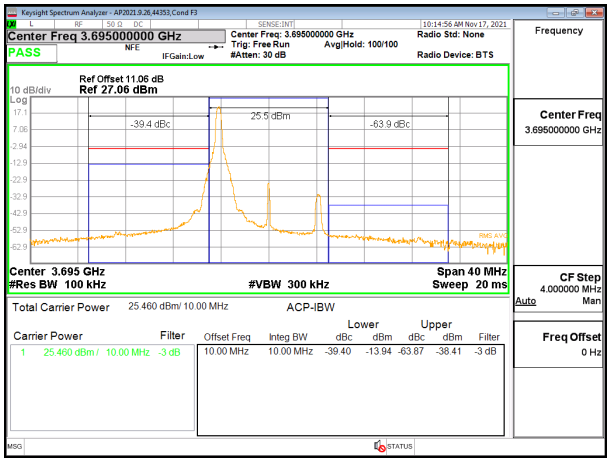
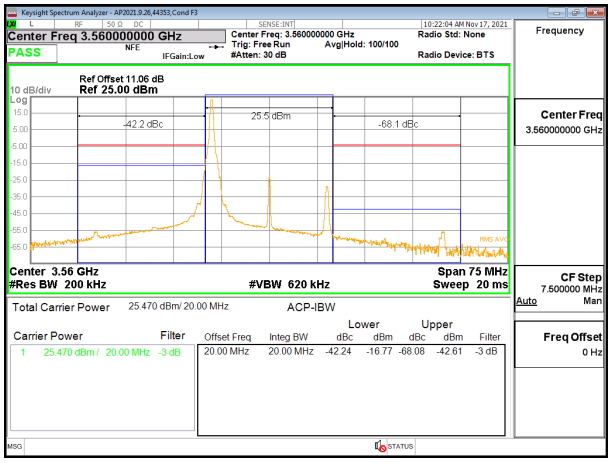
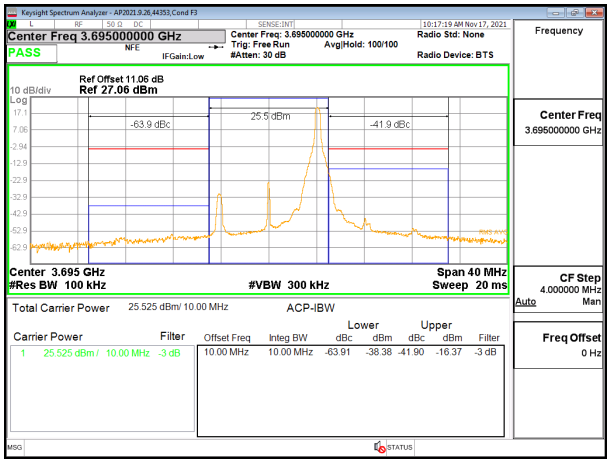


5G NR n48 10MHz BPSK High Channel RB1-0



5G NR n48 20MHz BPSK Low Channel RB1-0



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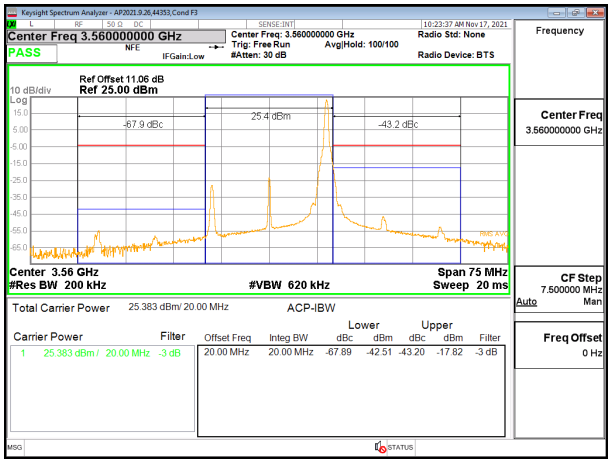
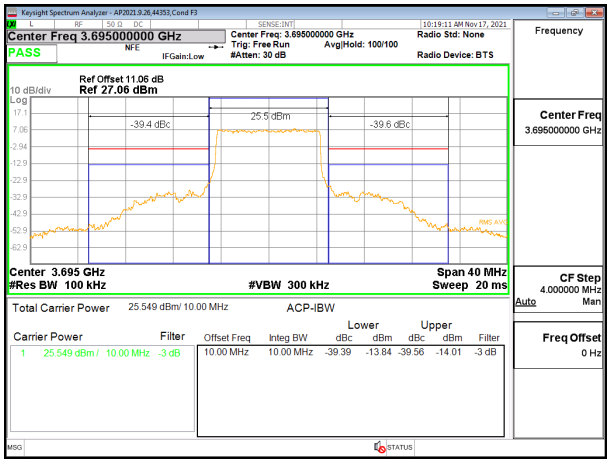


5G NR n48 20MHz BPSK Low Channel RB1-50



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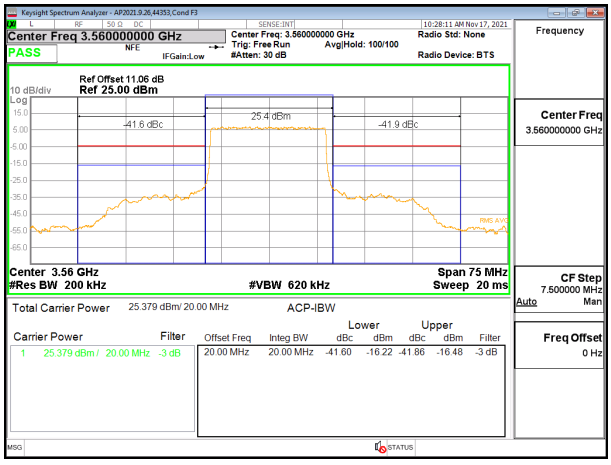

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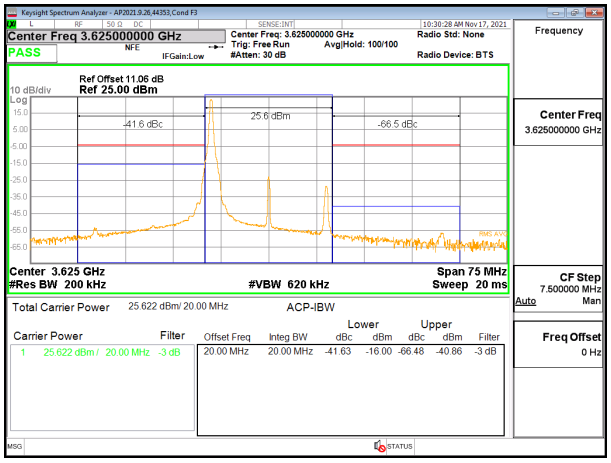
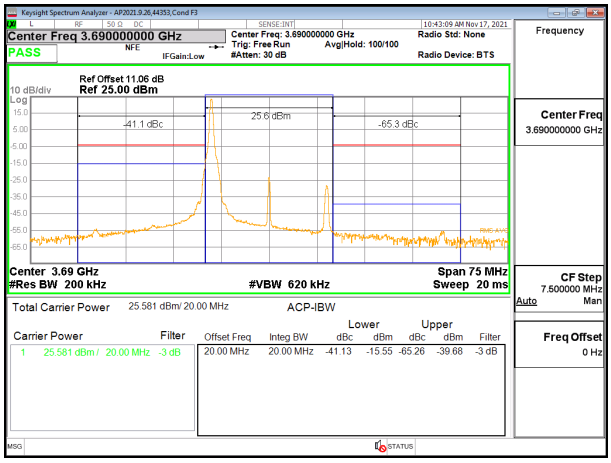


5G NR n48 20MHz BPSK Middle Channel RB1-0



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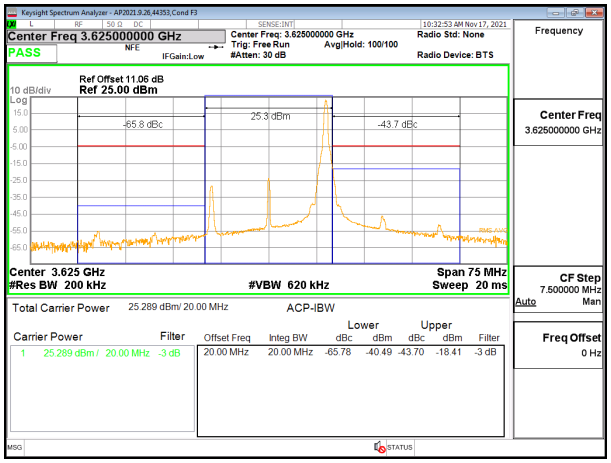

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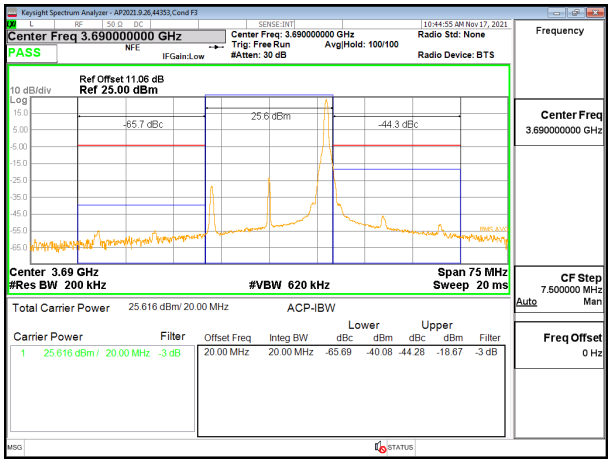

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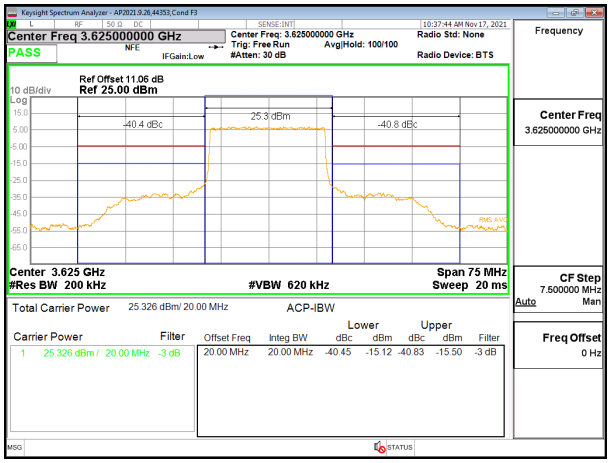

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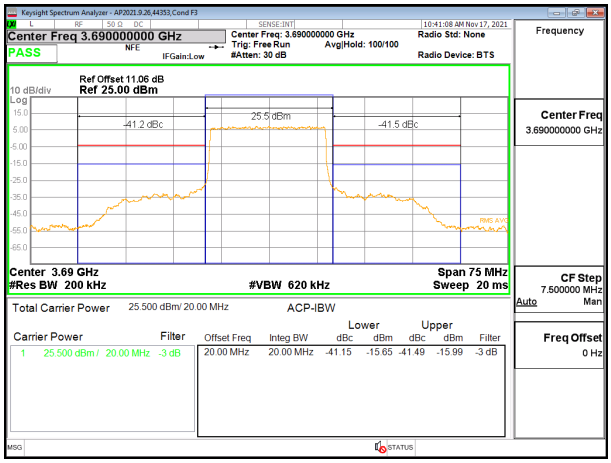

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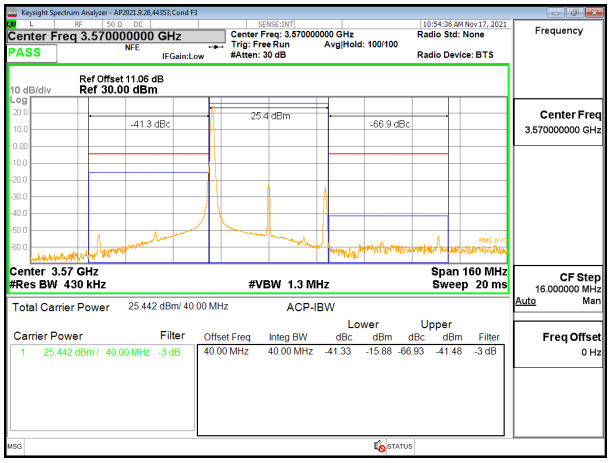
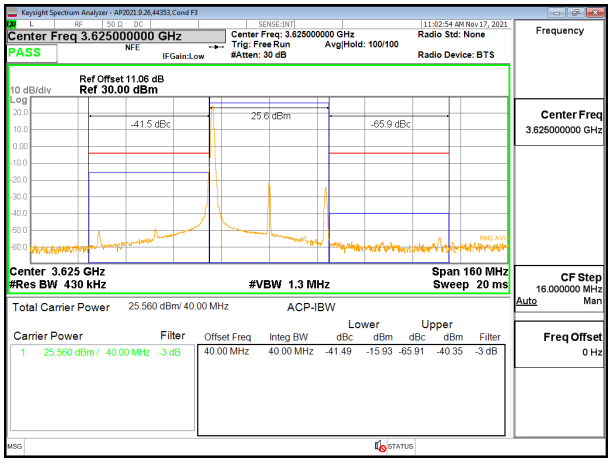


5G NR n48 40MHz BPSK Low Channel RB1-0



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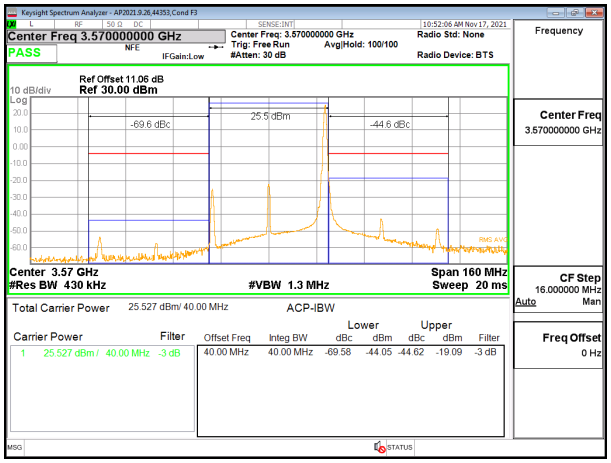
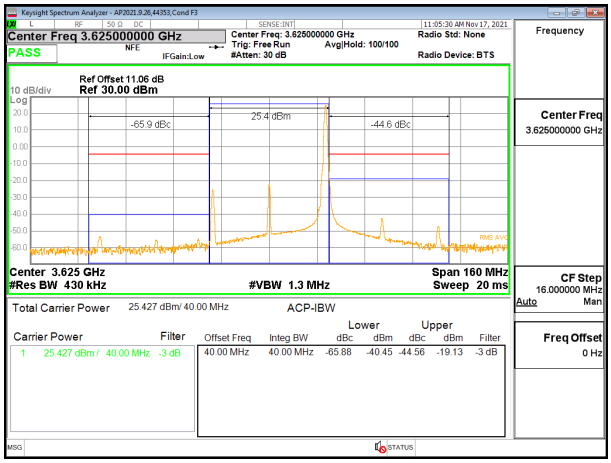
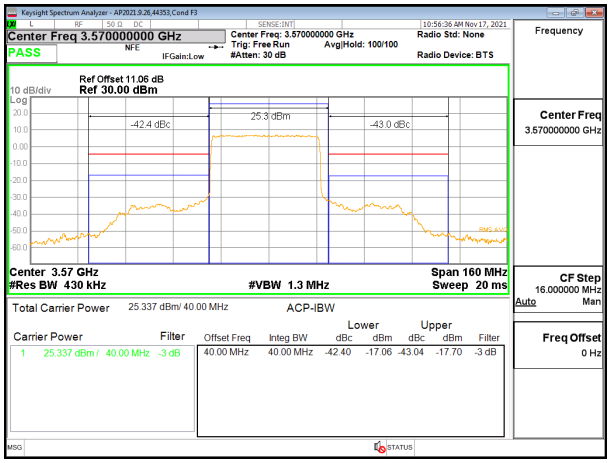


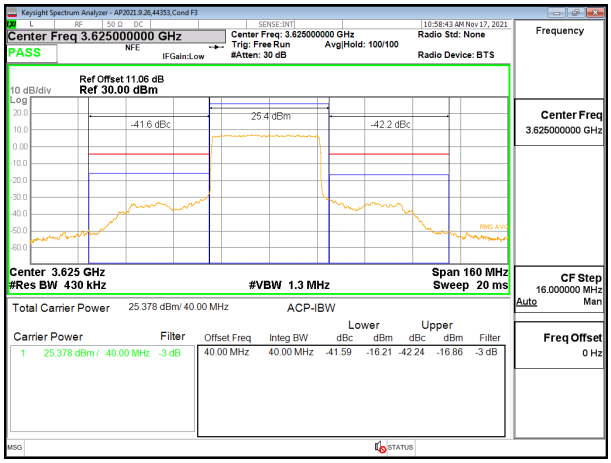
5G NR n48 40MHz BPSK Low Channel RB1-105



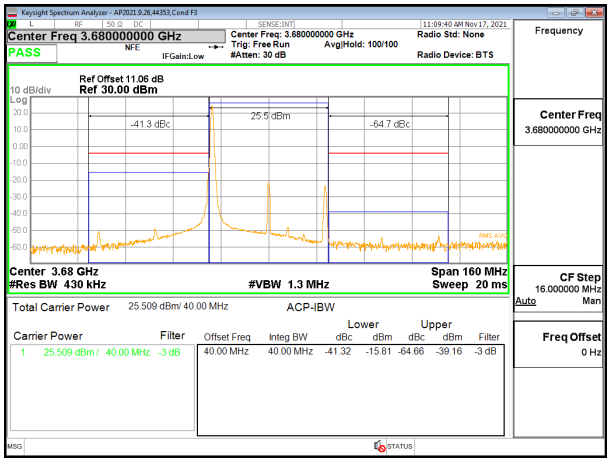
5G NR n48 40MHz BPSK Middle Channel RB1-105



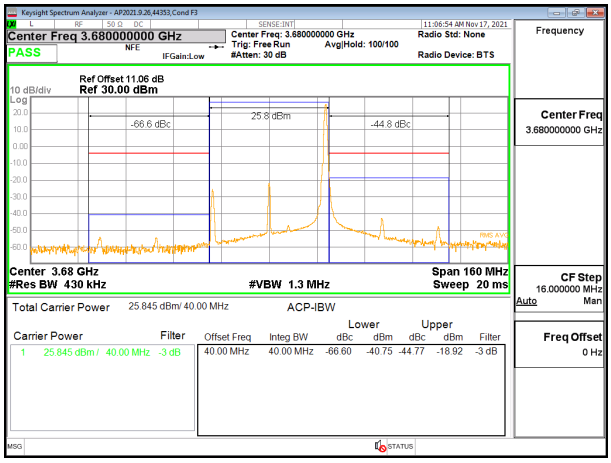
5G NR n48 40MHz BPSK Low Channel RB100-0



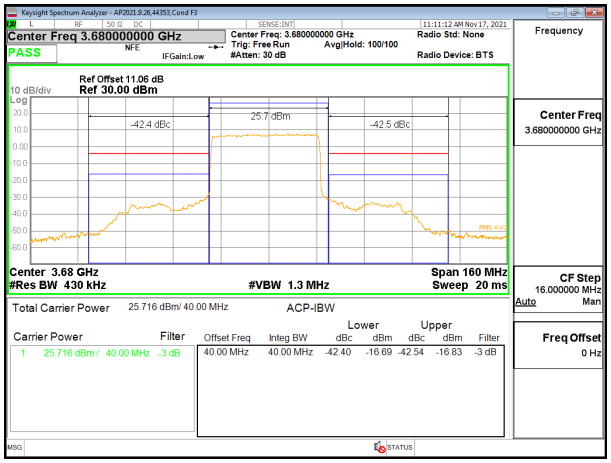
5G NR n48 40MHz BPSK Middle Channel RB100-0



5G NR n48 40MHz BPSK High Channel RB1-0



5G NR n48 40MHz BPSK High Channel RB1-105



5G NR n48 40MHz BPSK High Channel RB100-0

Intentionally Blank

9.3. 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 -13 dBm, -25dBm and -40dBm 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)

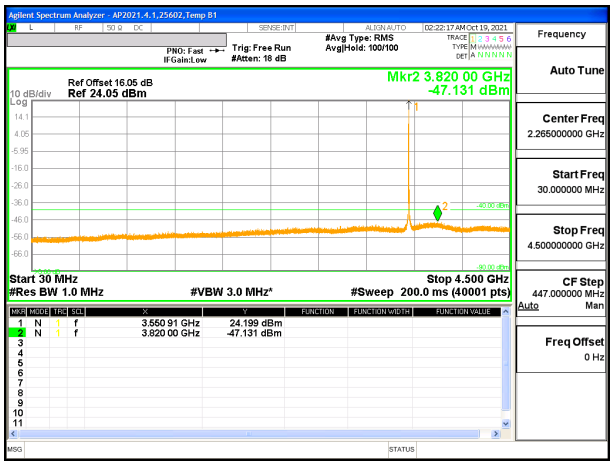
RESULTS

9.3.1. 5G NR n48

LIMITS

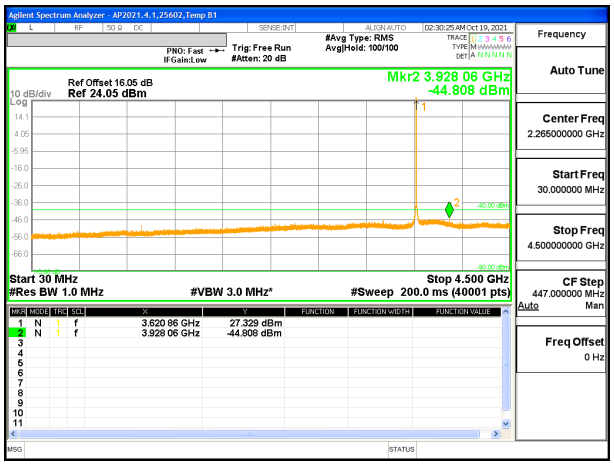
FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

5G NR n48



5G NR n48 10MHz BPSK Low Channel RB1-0 (30M to 4.5G)

5G NR n48 10MHz BPSK Low Channel RB1-0 (4.5G to 40G)



5G NR n48 10MHz BPSK Mid Channel RB1-1 (30M to 4.5G)

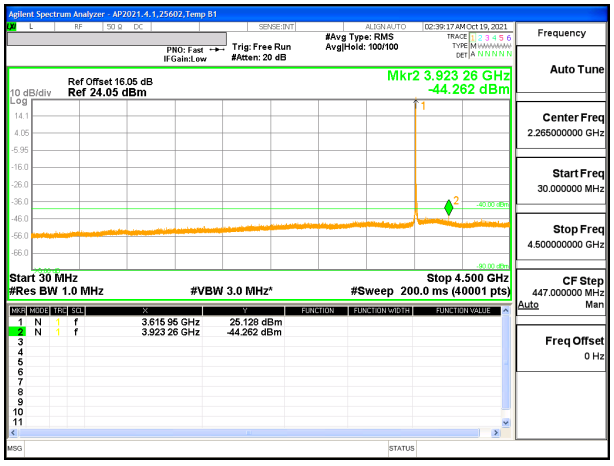
5G NR n48 10MHz BPSK Mid Channel RB1-1 (4.5GHz to 40G)

5G NR n48 10MHz BPSK High Channel RB1-23 (30M to 4.5G)

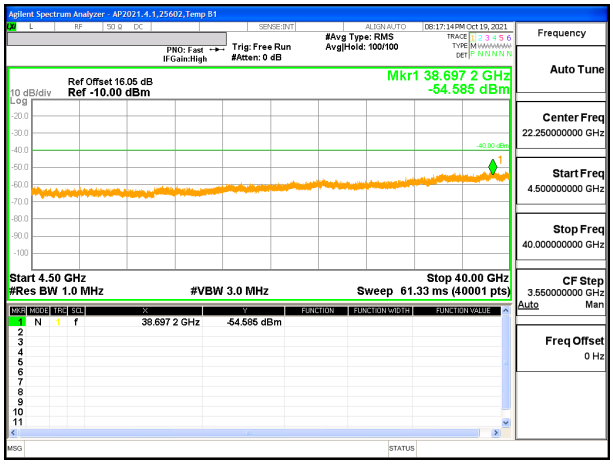
5G NR n48 10MHz BPSK High Channel RB1-23 (4.5G to 40G)

5G NR n48 20MHz BPSK Low Channel RB1-0 (30M to 4.5G)

5G NR n48 20MHz BPSK Low Channel RB1-0 (4.5G to 40G)



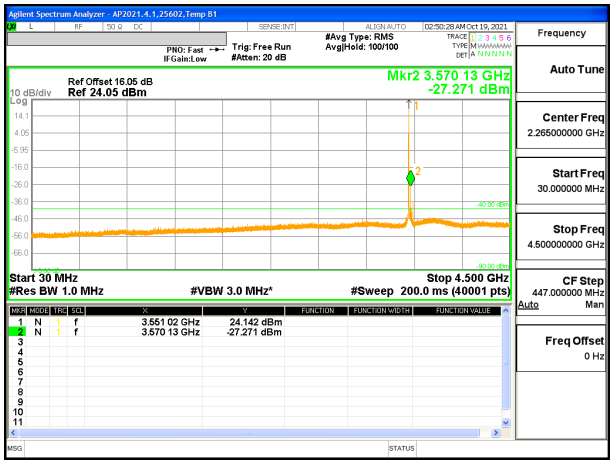
5G NR n48 20MHz BPSK Mid Channel RB1-1 (30M to 4.5G)



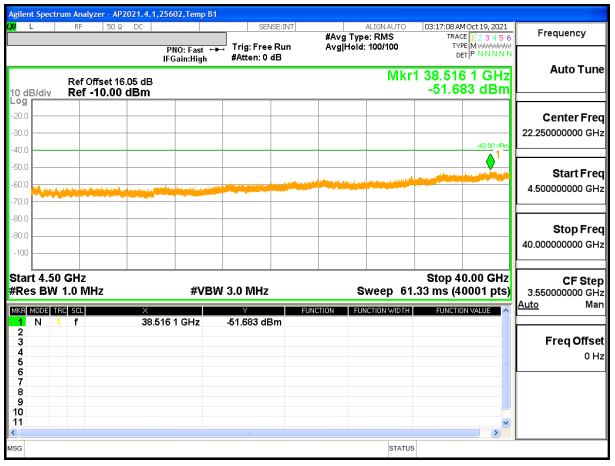
5G NR n48 20MHz BPSK Mid Channel RB1-1 (4.5G to 40G)

5G NR n48 20MHz BPSK High Channel RB1-50 (30M to 4.5G)

5G NR n48 20MHz BPSK High Channel RB1-50 (4.5G to 40G)



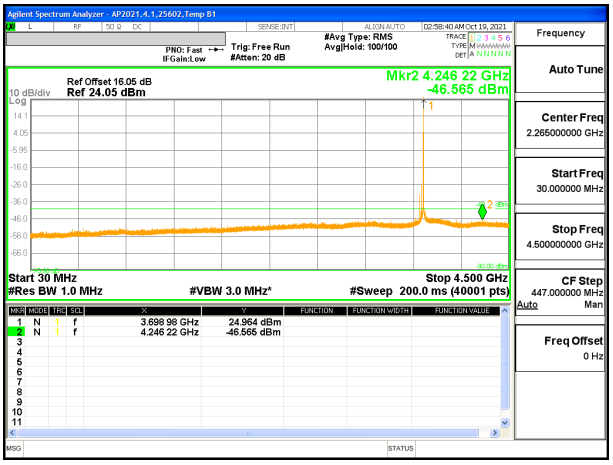
5G NR n48 40MHz BPSK Low Channel RB1-0 (30M to 4.5G)



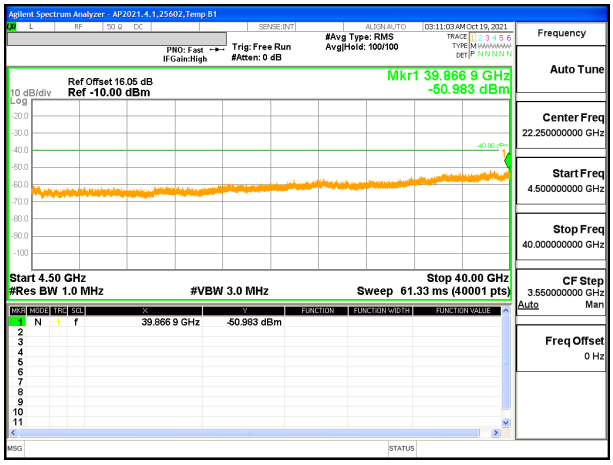
5G NR n48 40MHz BPSK Low Channel RB1-0 (4.5G to 40G)

5G NR n48 40MHz BPSK Mid Channel RB1-1 (30M to 4.5G)

5G NR n48 40MHz BPSK Mid Channel RB1-1 (4.5G to 40G)



5G NR n48 40MHz BPSK High Channel RB1-105 (30M to 4.5G)



5G NR n48 40MHz BPSK High Channel RB1-105 (4.5G to 40G)

9.4. 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, 3.80VDC and High voltage, 4.37VDC.
  End Voltage, 2.8VDC.

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.

9.4.1. 5G NR n48

Test Engineer ID:	25602	Test Date:	11/5/2021

5G NR n48 QPSK (40MHz BANDWIDTH)

Limit		3550	3700	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	3550.9192	3696.8877		
Extreme (50C)		3550.9192	3696.8877	-15.4	-0.004
Extreme (40C)		3550.9192	3696.8877	-19.8	-0.005
Extreme (30C)		3550.9192	3696.8877	-18.8	-0.005
Extreme (10C)		3550.9192	3696.8877	-18.0	-0.005
Extreme (0C)		3550.9192	3696.8877	-14.3	-0.004
Extreme (-10C)		3550.9192	3696.8877	-18.3	-0.005
Extreme (-20C)		3550.9192	3696.8877	-18.2	-0.005
Extreme (-30C)		3550.9192	3696.8877	-16.0	-0.004
20C	15%	3550.9192	3696.8877	-18.0	-0.005
	-15%	3550.9192	3696.8877	-16.7	-0.005
	End Point	3550.9192	3696.8877	-19.5	-0.005

9.5. PEAK-TO-AVERAGE POWER RATIO

LIMIT

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

RESULT

Antenna 1 or 7 was used to measure as the worst case; full resource block (FRB) for each bandwidth was used to measure as the worst case. The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

9.5.1. 5G NR n48

Test Engineer ID:	25602	Test Date:	10/22/2021

Band	Bandwidth (MHz)	Frequency (MHz)	RB Allocation	RB OffSet	Modulation	Conducted Power (dBm)		Peak-to-Average Power Ratio (dB)
						Peak	Average	
LTE 5G NR n48	10MHz	3625.0	24	0	BPSK	28.61	24.65	3.96
					16QAM	29.53	23.15	6.38
	20MHz		50	0	BPSK	28.09	24.50	3.59
					16QAM	28.55	22.90	5.65
	40MHz		100	0	BPSK	27.48	24.56	2.92
					16QAM	28.14	22.81	5.33

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.

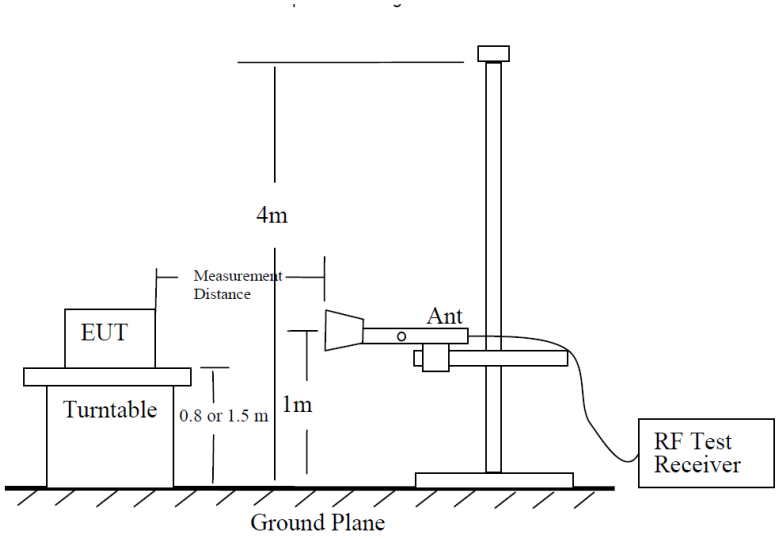


Figure 6 —Test site-up for radiated ERP and/or EIRP measurements

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 that: we do confidence check to our chambers every day to see if any degradation from expected/normal reading reference data. Also we do ambient check to all our chambers every month.

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.

LIMITS

FCC: §96.41
(e) 3.5 GHz Emissions and Interference Limits—
(2) Additional protection levels. Notwithstanding paragraph (d)(1) of this section, the conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

RESULTS

10.1. FIELD STRENGTH OF SPURIOUS RADIATION, ANT 1

BPSK 5G NR n48 (40.0MHZ BANDWIDTH)

Project #:	13911916
Date:	01/14/2022
Test Engineer:	30606
Configuration:	EUT only
Mode	5G NR n48 BPSK 100MHz
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T348 (dB/m)	Amp/Cbl (dB)	T1792 3400-3800MHz BRF	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 3570MHz										
7.140797	26.48	RMS	35.6	-27	.6	-95.2	-59.52	-40	-19.52	H
7.140797	26.25	RMS	35.6	-27	.6	-95.2	-59.75	-40	-19.75	V
10.710741	24.83	RMS	38	-24.1	.5	-95.2	-55.97	-40	-15.97	H
10.710741	24.37	RMS	38	-24.1	.5	-95.2	-56.43	-40	-16.43	V
14.280244	22.94	RMS	39.1	-20	.7	-95.2	-52.46	-40	-12.46	H
14.280244	21	RMS	39.1	-20	.7	-95.2	-54.40	-40	-14.40	V
Mid Channel, 3625MHz										
7.250513	26.84	RMS	35.6	-26.8	.6	-95.2	-58.96	-40	-18.96	H
7.250513	26.27	RMS	35.6	-26.8	.6	-95.2	-59.53	-40	-19.53	V
10.875534	24.04	RMS	37.9	-24	.5	-95.2	-56.76	-40	-16.76	H
10.875534	25.12	RMS	37.9	-24	.5	-95.2	-55.68	-40	-15.68	V
14.500116	21.91	RMS	39.5	-20.1	.8	-95.2	-53.09	-40	-13.09	H
14.500116	23.2	RMS	39.5	-20.1	.8	-95.2	-51.80	-40	-11.80	V
High Channel, 3680MHz										
7.360228	26.8	RMS	35.7	-26.7	.7	-95.2	-58.70	-40	-18.70	H
7.360228	26.47	RMS	35.7	-26.7	.7	-95.2	-59.03	-40	-19.03	V
11.040769	23.18	RMS	37.9	-23.2	.6	-95.2	-56.72	-40	-16.72	H
11.040769	24.71	RMS	37.9	-23.2	.6	-95.2	-55.19	-40	-15.19	V
14.719988	23.19	RMS	39.8	-19.6	.9	-95.2	-50.91	-40	-10.91	H
14.719988	21.39	RMS	39.8	-19.6	.9	-95.2	-52.71	-40	-12.71	V

10.2. FIELD STRENGTH OF SPURIOUS RADIATION, ANT 4

BPSK 5G NR n48 (40.0MHZ BANDWIDTH)

Project #:	13911916
Date:	09/30/2021
Test Engineer:	30606
Configuration:	EUT only
Mode	5G NR n48 BPSK 100MHz
Chamber #:	Chamber A

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T348 (dB/m)	Amp/Cbl (dB)	T1792 3400-3800MHz BRF	EIRP CF	Corrected Reading (dBm)	Harmonics limit	Margin (dB)	Polarity
Low Channel, 3570MHz										
7.14564	23.02	RMS	35.6	-20.5	.5	-95.2	-56.58	-40	-16.58	H
7.14961	22.66	RMS	35.6	-20.4	.5	-95.2	-56.84	-40	-16.84	V
10.70281	21.68	RMS	37.9	-17.1	.5	-95.2	-52.22	-40	-12.22	H
10.70678	21.04	RMS	37.9	-17	.5	-95.2	-52.76	-40	-12.76	V
14.27672	21.87	RMS	39.2	-15.9	.7	-95.2	-49.33	-40	-9.33	V
14.30007	21.48	RMS	39.2	-15.9	.7	-95.2	-49.72	-40	-9.72	H
Mid Channel, 3625MHz										
7.23641	23.5	RMS	35.6	-20.5	.5	-95.2	-56.1	-40	-16.1	V
7.27431	23.34	RMS	35.5	-19.9	.5	-95.2	-55.76	-40	-15.76	H
10.85791	20.5	RMS	38	-16.8	.4	-95.2	-53.1	-40	-13.1	V
10.88126	20.11	RMS	37.8	-16.6	.6	-95.2	-53.29	-40	-13.29	H
14.51554	21.99	RMS	39.8	-16.4	.8	-95.2	-49.01	-40	-9.01	V
14.5173	21.41	RMS	39.7	-16.3	.8	-95.2	-49.59	-40	-9.59	H
High Channel, 3680MHz										
7.35582	22.62	RMS	35.6	-20.2	.6	-95.2	-56.58	-40	-16.58	H
7.36463	22.7	RMS	35.6	-20.3	.6	-95.2	-56.6	-40	-16.6	V
11.04958	20.36	RMS	37.8	-16.3	.6	-95.2	-52.74	-40	-12.74	H
11.05575	21.22	RMS	37.8	-16.3	.6	-95.2	-51.88	-40	-11.88	V
14.71999	20.94	RMS	39.9	-15.7	.9	-95.2	-49.16	-40	-9.16	V
14.73585	20.89	RMS	39.9	-15.8	.8	-95.2	-49.41	-40	-9.41	H

11. SETUP PHOTOS

Please refer to 14790383-EP1V1 FCC Setup Photo for setup photos

END OF REPORT