

PART 24 / RSS-133 MEASUREMENT REPORT

Applicant Name:
Microsoft Corporation
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Redmond, WA, 98052
United States

Date of Testing:
5/25/2021 – 8/31/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2105060048-03-R1.C3K

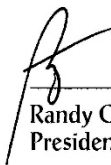
FCC ID:	C3K1995
IC:	3048A-1995
Applicant Name:	Microsoft Corporation

Application Type:	Certification
Model/HVIN:	1995
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	24
ISED Specification:	RSS-133 Issue 6 Amendment 1
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

Note: This revised Test Report (S/N: 1M2105060048-03-R1.C3K) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.


Randy Ortanez
President







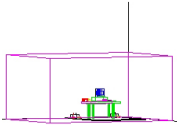
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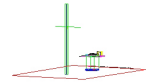
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	1850.2 - 1909.8	0.740	28.69	247KGXW
WCDMA	N/A	Spread Spectrum	1852.4 - 1907.6	0.268	24.27	4M16F9W
LTE Band 25/2	20 MHz	QPSK	1860 - 1905	0.299	24.76	17M9G7D
		16QAM	1860 - 1905	0.261	24.17	17M9W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.301	24.79	13M5G7D
		16QAM	1857.5 - 1907.5	0.266	24.25	13M5W7D
	10 MHz	QPSK	1855 - 1910	0.296	24.72	9M01G7D
		16QAM	1855 - 1910	0.261	24.16	8M98W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.298	24.74	4M52G7D
		16QAM	1852.5 - 1912.5	0.256	24.09	4M52W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.306	24.86	2M72G7D
		16QAM	1851.5 - 1913.5	0.259	24.13	2M73W7D
	1.4 MHz	QPSK	1850.7 - 1914.3	0.290	24.62	1M09G7D
		16QAM	1850.7 - 1914.3	0.247	23.93	1M10W7D
NR Band n25	40 MHz	$\pi/2$ BPSK	1870 - 1895	0.280	24.47	38M6G7D
		QPSK	1870 - 1895	0.285	24.54	38M7G7D
		16QAM	1870 - 1895	0.250	23.97	38M7W7D
	30 MHz	$\pi/2$ BPSK	1865 - 1900	0.266	24.24	28M8G7D
		QPSK	1865 - 1900	0.241	23.81	28M6G7D
		16QAM	1865 - 1900	0.194	22.87	28M7W7D
	25 MHz	$\pi/2$ BPSK	1862.5 - 1902.5	0.333	25.22	22M9G7D
		QPSK	1862.5 - 1902.5	0.328	25.16	23M9G7D
		16QAM	1862.5 - 1902.5	0.268	24.29	23M9W7D
NR Band n25/2	20 MHz	$\pi/2$ BPSK	1860 - 1905	0.322	25.08	18M0G7D
		QPSK	1860 - 1905	0.324	25.11	19M0G7D
		16QAM	1860 - 1905	0.285	24.54	19M0W7D
	15 MHz	$\pi/2$ BPSK	1857.5 - 1907.5	0.324	25.10	13M4G7D
		QPSK	1857.5 - 1907.5	0.310	24.92	14M2G7D
		16QAM	1857.5 - 1907.5	0.274	24.39	14M1W7D
	10 MHz	$\pi/2$ BPSK	1855 - 1910	0.317	25.02	8M99G7D
		QPSK	1855 - 1910	0.308	24.88	9M32G7D
		16QAM	1855 - 1910	0.286	24.56	9M31W7D
	5 MHz	$\pi/2$ BPSK	1852.5 - 1912.5	0.323	25.10	4M51G7D
		QPSK	1852.5 - 1912.5	0.298	24.75	4M52G7D
		16QAM	1852.5 - 1912.5	0.284	24.54	4M50W7D

EUT Overview

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.



1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Microsoft Corporation Portable Handset FCC ID:C3K1995 / IC: 3048A-1995**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 24 & RSS-133.

Test Device Serial No.: 45346, 48084, 47888, 46328, 50387, M4211, GE211

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS, 850/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR, 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC

LTE Band 25 (1850 - 1915 MHz) overlaps the entire frequency range of LTE Band 2 (1850 - 1910 MHz). Therefore, test data provided in this report covers Band 2 as well as Band 25.

NR Band n25 (1850 - 1915 MHz) overlaps the entire frequency range of NR Band n2 (1850 - 1910 MHz). Therefore, test data provided in this report covers n2 as well as n25 for the operating BWs that overlap between the 2 bands.

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.



This device supports open and closed configurations. Multiple angles are tested and the worst case radiated emissions data is shown in the report.

2.4 Software and Firmware

The firmware installed during testing was Build number developer - generic 2021.728.20.

2.5 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Measurement Guidance for Certification of Licensed Digital Transmitters” (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI/TIA-603-E-2016. A half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]};$$

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:



$$E_{\text{[dB}\mu\text{V/m]}} = \text{Measured amplitude level}_{\text{[dBm]}} + 107 + \text{Cable Loss}_{\text{[dB]}} + \text{Antenna Factor}_{\text{[dB/m]}}$$

And

$$\text{EIRP}_{\text{[dBm]}} = E_{\text{[dB}\mu\text{V/m]}} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.



Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI/TIA-603-E-2016.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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5.0 TEST EQUIPMENT CALIBRATION DATA



Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP2	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2
-	AP1	EMC Cable and Switch System	3/9/2021	Annual	3/9/2022	AP1
-	ETS	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS
-	LTx4	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx4
-	LTx5	Licensed Transmitter Cable Set	3/3/2021	Annual	3/3/2022	LTx5
Agilent	E5515C	Wireless Communications Test Set	N/A			GB45360985
Agilent	E5515C	Wireless Communications Test Set	N/A			GB46310798
Agilent	N9030A	50GHz PXA Signal Analyzer	1/20/2021	Annual	1/20/2022	US51350301
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6200901190
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
ETS Lindgren	3816/2NM	LISN	7/9/2020	Biennial	7/9/2022	00114451
Keysight Technologies	N9020A	MXA Signal Analyzer	9/22/2020	Annual	9/22/2021	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer	10/16/2020	Annual	10/16/2021	MY54490576
Keysight Technologies	N9030A	PXA Signal Analyzer	9/2/2020	Annual	9/2/2021	MY55410501
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/17/2020	Annual	9/17/2021	MY57141001
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	2/10/2021	Annual	2/10/2022	103187

Table 5-1. Test Equipment

Notes:

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
- Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW

GSM BW = 250 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W

WCDMA BW = 4.16 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated



7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm - (-24.80) = 50.3 dBc.

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7.0 TEST RESULTS

7.1 Summary



Company Name: Microsoft Corporation
 FCC ID: C3K1995
 IC: 3048A-1995
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): GSM/GPRS/WCDMA/NR/LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049	RSS-Gen(6.7)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	RSS-133(6.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	24.232(d)	RSS-133(6.4)	≤ 13 dB	PASS	Sections 7.6
	Transmitter Conducted Output Power	2.1046	RSS-133(4.1)	N/A	PASS	Section 7.2
	Frequency Stability	2.1055, 24.235	RSS-133(6.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.9
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	24.232(c)	RSS-132(5.4)	< 2 Watts max. EIRP	PASS	Section 7.7
	Radiated Spurious Emissions	2.1053, 24.238(a)	RSS-133(6.5)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.8

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST EMC Software Tool Beta 8.

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7.2 Conducted Power Output Data

§2.1046

Test Overview

The EUT is set up to transmit at maximum power for LTE. All power levels are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

A-MPR is implemented in this device per the A-MPR specification in 3GPP TS 36.101. The conducted powers are shown herein to cover the different A-MPR levels specified in the standard. Measurement equipment was set up with triggering/gating on the spectrum analyzer such that powers were measured only during the on-time of the signal.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Span = 2 x OBW to 3 x OBW
2. RBW = 1% to 5% of the OBW
3. Number of measurement points in sweep $\geq 2 \times \text{span} / \text{RBW}$
4. Sweep = auto-couple (less than transmission burst duration)
5. Detector = RMS (power)
6. Trigger was set to enable power measurements only on full power bursts
7. Trace was allowed to stabilize
8. Spectrum analyzer's "Channel Power" function was used to compute the power by integrating the spectrum across the OBW of the signal

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

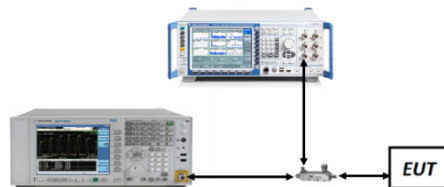




Figure 7-1. Test Instrument & Measurement Setup

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	26140	1860.0	1 / 50	24.94
		26365	1882.5	1 / 0	24.88
		26590	1905.0	1 / 50	24.66
	16-QAM	26140	1860.0	1 / 0	24.34
15 MHz	QPSK	26115	1857.5	1 / 37	24.99
		26365	1882.5	1 / 0	24.91
		26615	1907.5	1 / 37	24.79
	16-QAM	26115	1857.5	1 / 0	24.48
10 MHz	QPSK	26090	1855.0	1 / 25	24.83
		26365	1882.5	1 / 0	24.84
		26640	1910.0	1 / 0	24.82
	16-QAM	26090	1855.0	1 / 25	24.08
5 MHz	QPSK	26065	1852.5	1 / 24	24.95
		26365	1882.5	1 / 12	24.86
		26665	1912.5	1 / 0	24.21
	16-QAM	26065	1852.5	1 / 12	24.44
3 MHz	QPSK	26055	1851.5	1 / 14	24.94
		26365	1882.5	1 / 14	24.98
		26675	1913.5	1 / 0	22.94
	16-QAM	26055	1851.5	1 / 0	24.22
1.4 MHz	QPSK	26047	1850.7	1 / 5	24.92
		26365	1882.5	1 / 0	24.73
		26683	1914.3	1 / 3	22.86
	16-QAM	26047	1850.7	1 / 3	24.22

Table 7-2. Conducted Power Output Data (LTE Band 25/2 – North)

FCC ID: C3K1995 IC: 3048A-1995	 PART 24 / RSS-133 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset	Page 12 of 150

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
40 MHz	$\pi/2$ BPSK	374000	1870.0	1 / 54	22.92
		376500	1882.5	1 / 161	22.91
		379000	1895.0	1 / 161	22.95
	QPSK	374000	1870.0	1 / 54	22.77
		376500	1882.5	1 / 161	22.79
		379000	1895.0	1 / 161	22.76
	16-QAM	374000	1870.0	1 / 54	22.28
30 MHz	$\pi/2$ BPSK	372000	1865.0	1 / 119	23.38
		376500	1882.5	1 / 119	23.39
		381000	1900.0	1 / 40	23.26
	QPSK	372000	1865.0	1 / 119	23.22
		376500	1882.5	1 / 119	23.26
		381000	1900.0	1 / 40	23.38
	16-QAM	372000	1865.0	1 / 119	22.42
25 MHz	$\pi/2$ BPSK	372000	1862.5	1 / 33	22.81
		376500	1882.5	1 / 99	22.84
		381000	1902.5	1 / 99	22.89
	QPSK	372000	1862.5	1 / 33	22.68
		376500	1882.5	1 / 99	22.70
		381000	1902.5	1 / 99	22.73
	16-QAM	372000	1862.5	1 / 33	22.27
20 MHz	$\pi/2$ BPSK	372000	1860.0	1 / 26	22.83
		376500	1882.5	1 / 53	22.78
		381000	1905.0	1 / 53	22.63
	QPSK	372000	1860.0	1 / 26	22.80
		376500	1882.5	1 / 53	22.70
		381000	1905.0	1 / 26	22.55
	16-QAM	372000	1860.0	1 / 26	22.47
15 MHz	$\pi/2$ BPSK	371500	1857.5	1 / 58	22.69
		376500	1882.5	1 / 39	22.75
		381500	1907.5	1 / 20	22.65
	QPSK	371500	1857.5	1 / 20	22.69
		376500	1882.5	1 / 58	22.55
		381500	1907.5	1 / 58	22.64
	16-QAM	371500	1857.5	1 / 39	22.31
10 MHz	$\pi/2$ BPSK	371000	1855.0	1 / 38	22.76
		376500	1882.5	1 / 38	22.59
		382000	1910.0	1 / 26	22.69
	QPSK	371000	1855.0	1 / 26	22.73
		376500	1882.5	1 / 13	22.71
		382000	1910.0	1 / 26	22.77
	16-QAM	371000	1855.0	1 / 26	22.10
5 MHz	$\pi/2$ BPSK	370500	1852.5	1 / 12	22.62
		376500	1882.5	1 / 12	22.52
		382500	1912.5	1 / 12	22.64
	QPSK	370500	1852.5	1 / 12	22.80
		376500	1882.5	1 / 18	22.52
		382500	1912.5	1 / 12	22.73
	16-QAM	370500	1852.5	1 / 12	22.25

Table 7-3. Conducted Power Output Data (NR Band n25/2 – North)

FCC ID: C3K1995 IC: 3048A-1995	 PART 24 / RSS-133 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset	Page 13 of 150

7.3 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

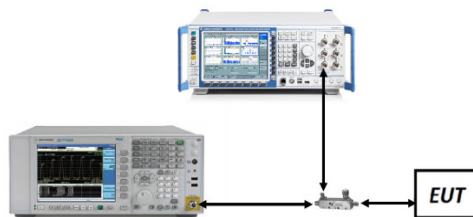


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

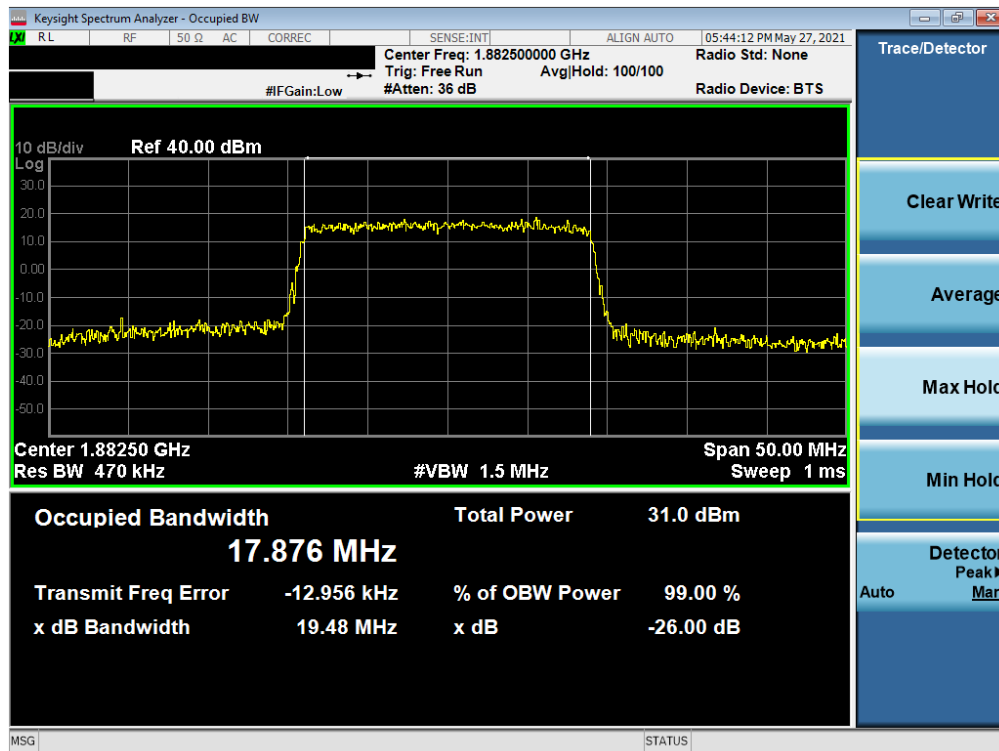
None.

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 14 of 150

LTE Band 25/2

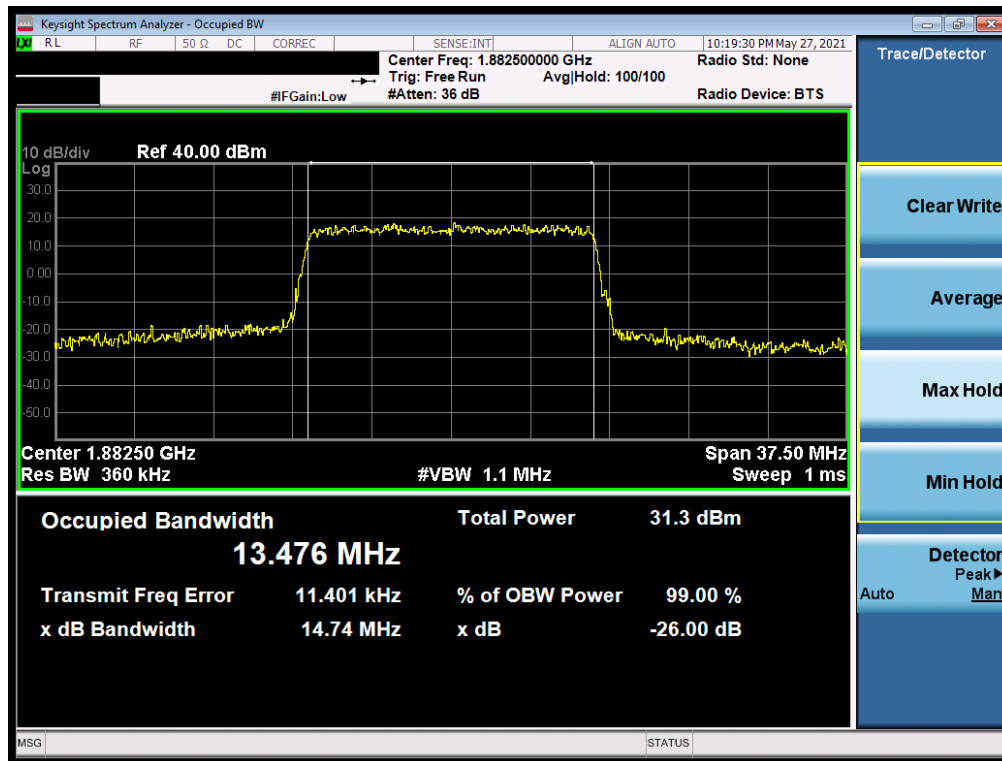


Plot 7-1. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB)

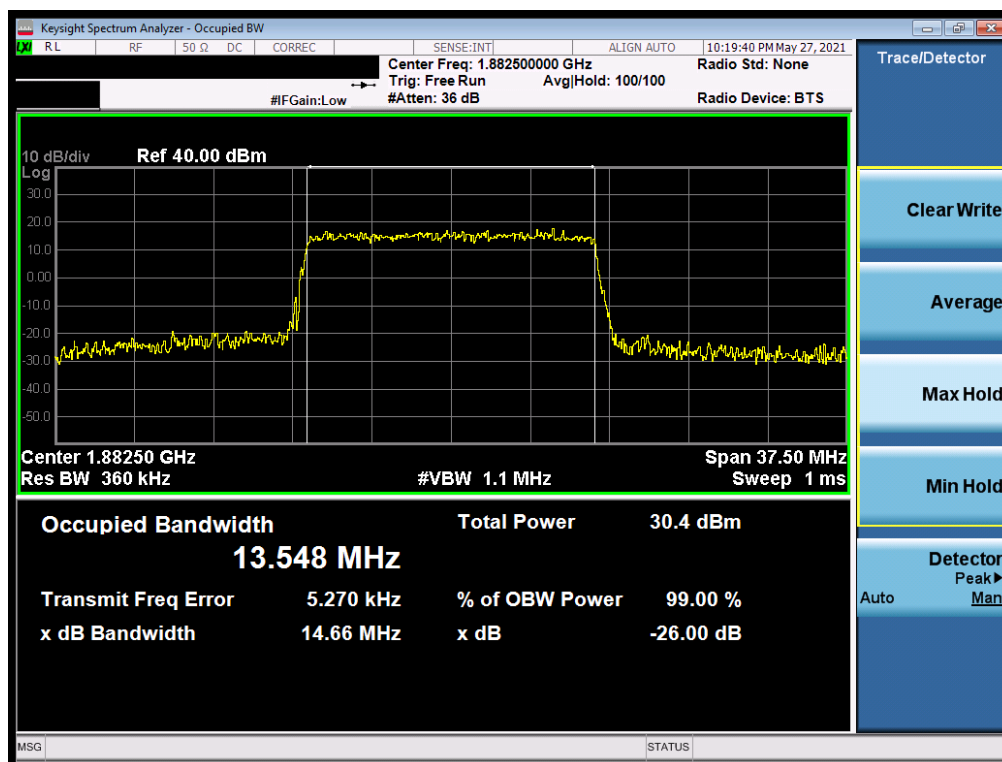


Plot 7-2. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 15 of 150

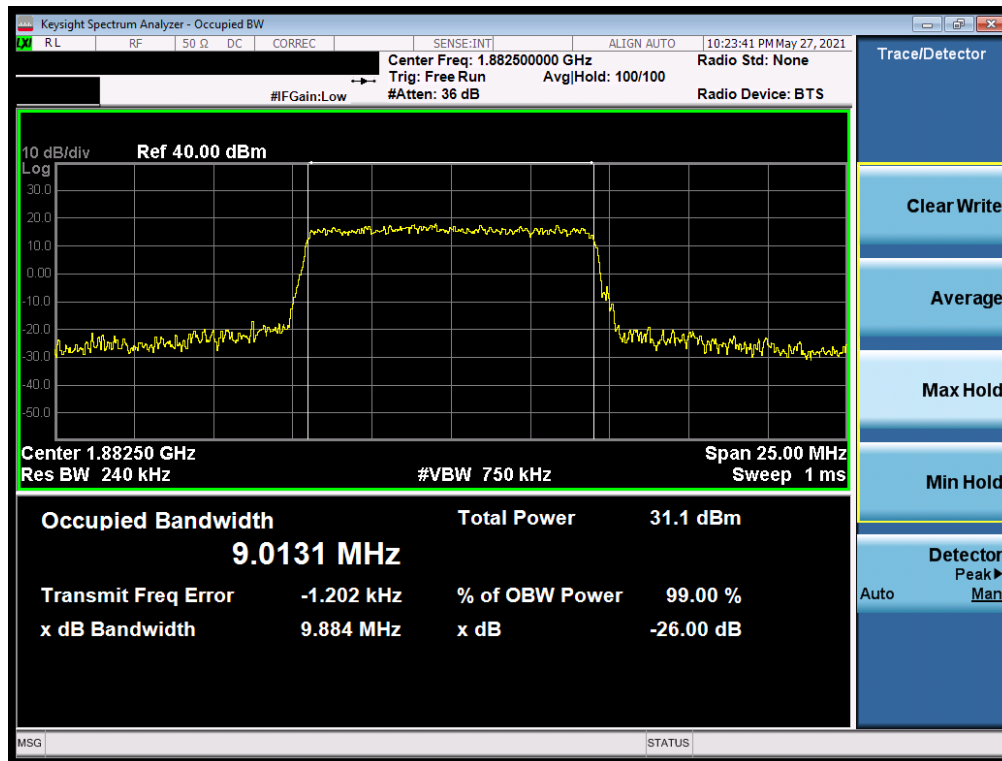


Plot 7-3. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB)

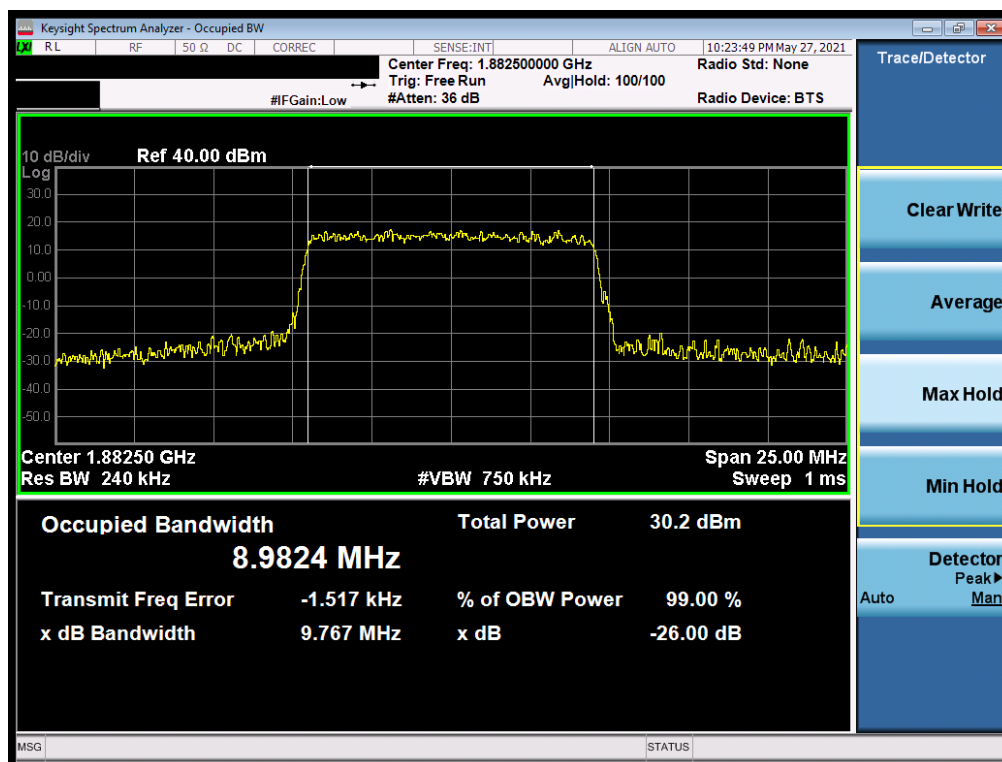


Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 16 of 150

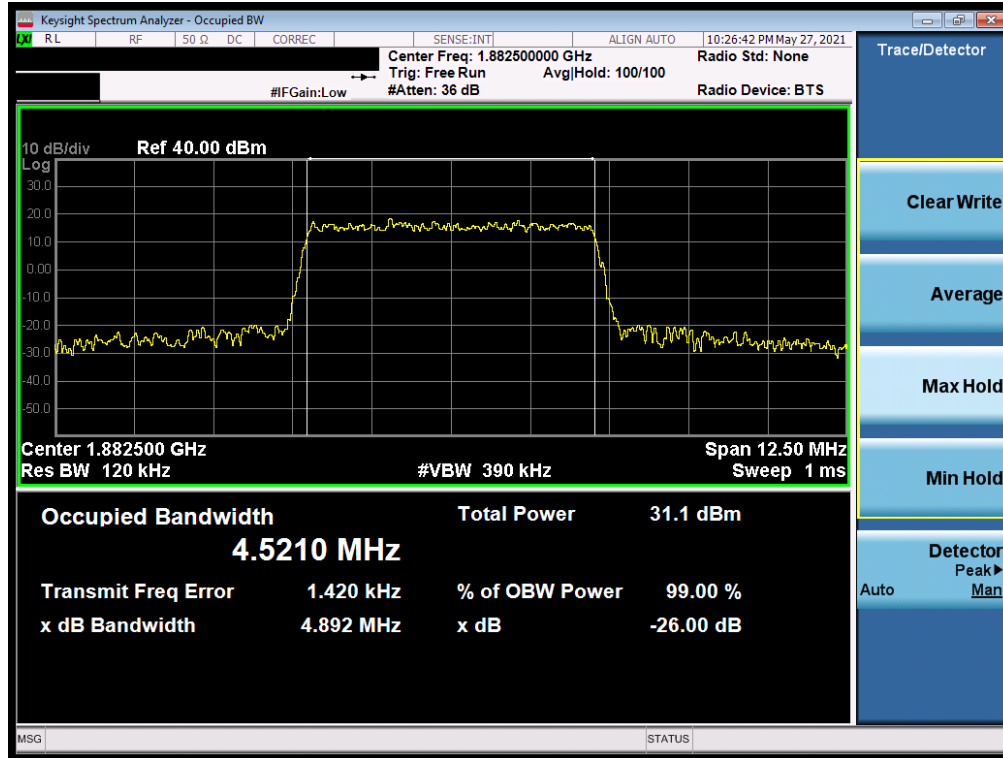


Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB)

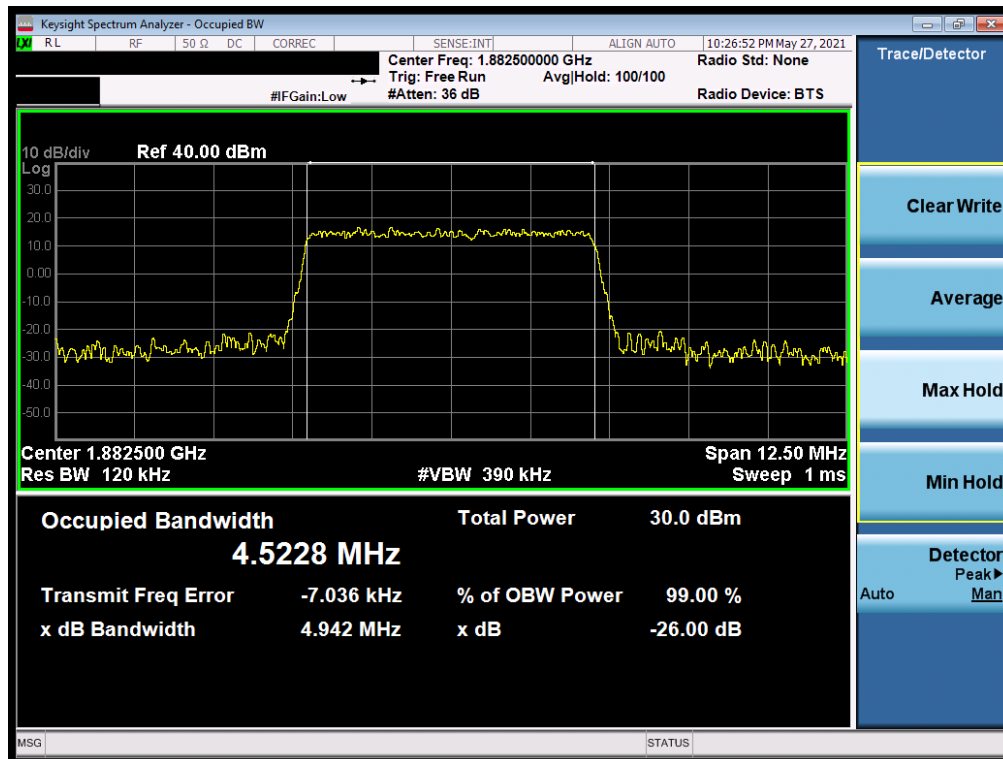


Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 17 of 150

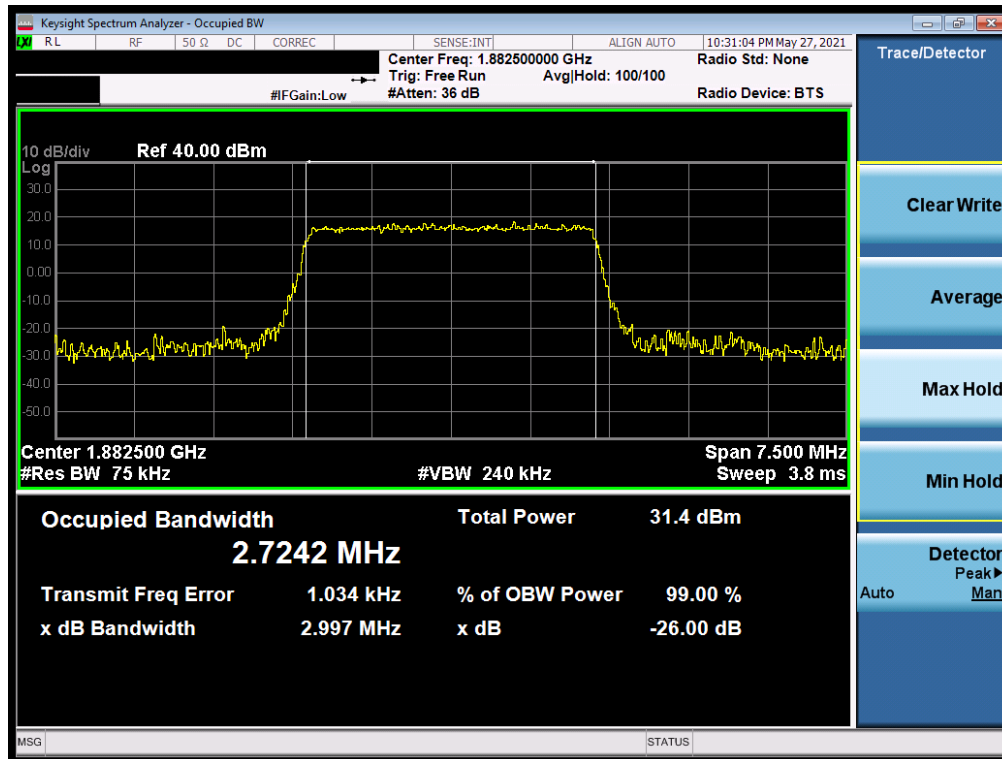


Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB)

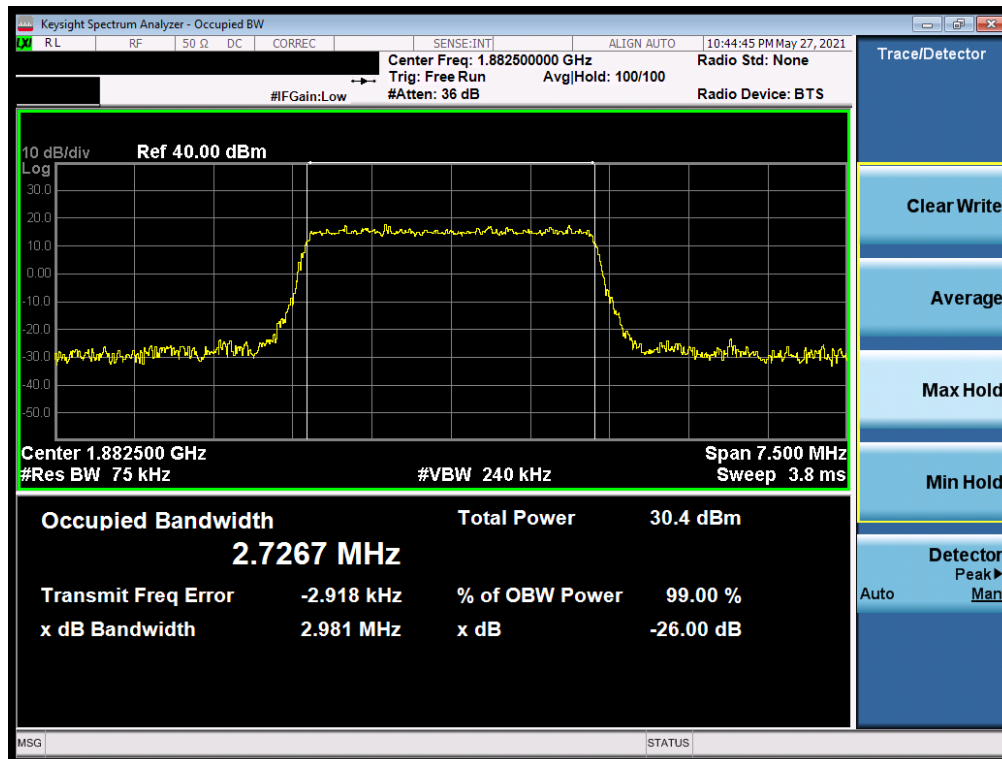


Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 18 of 150

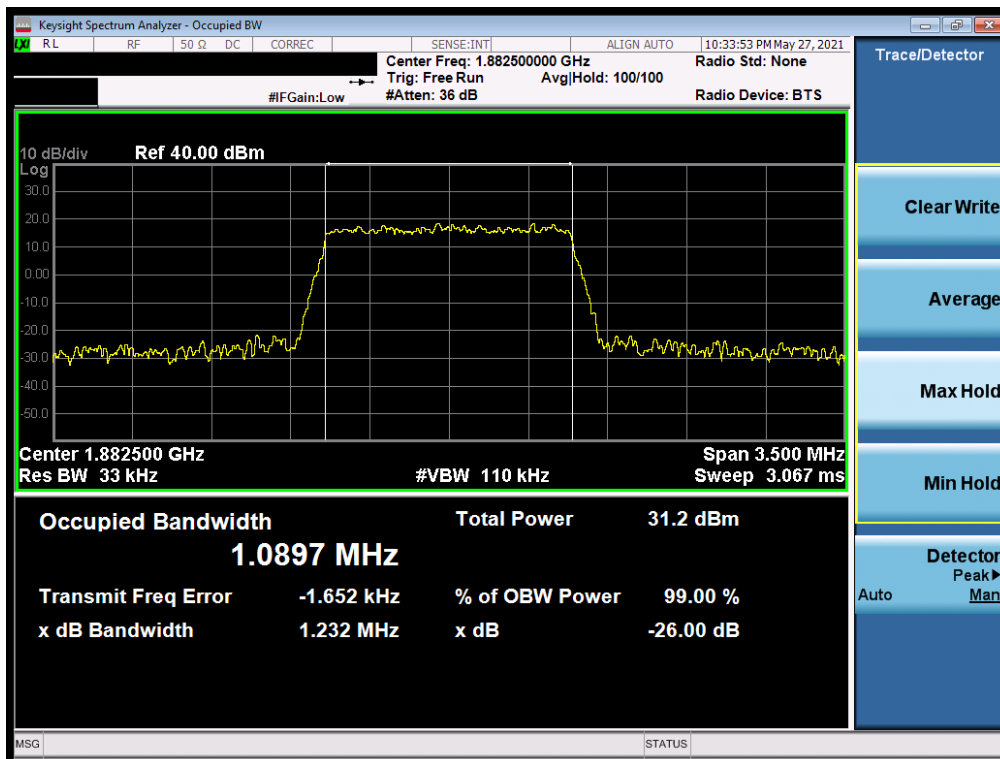


Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB)

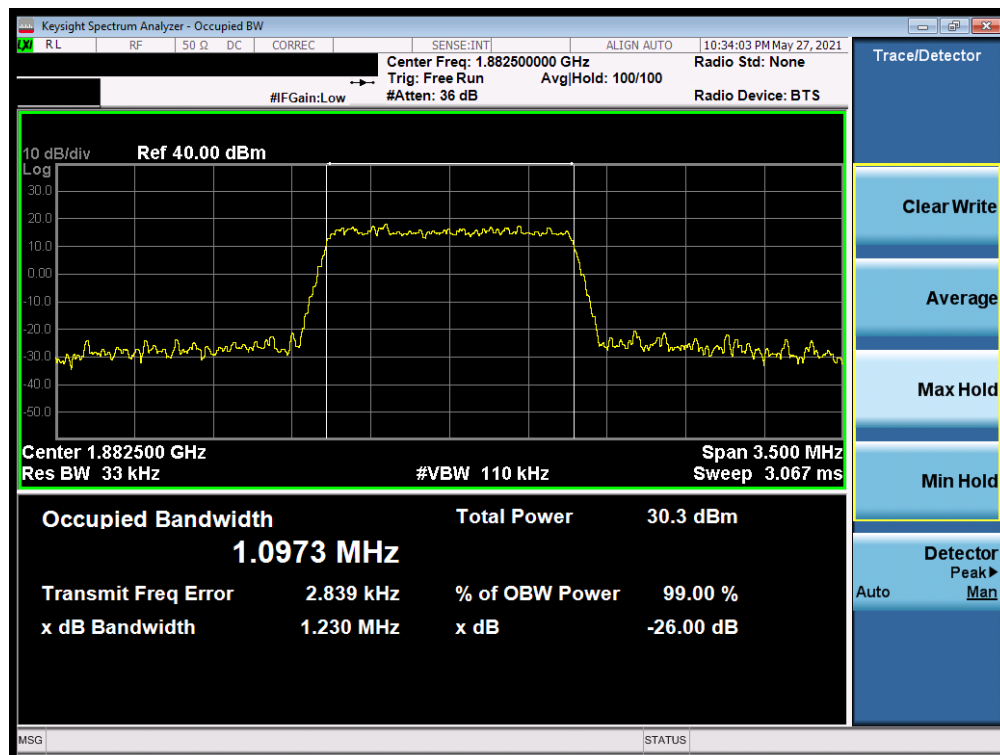


Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 19 of 150



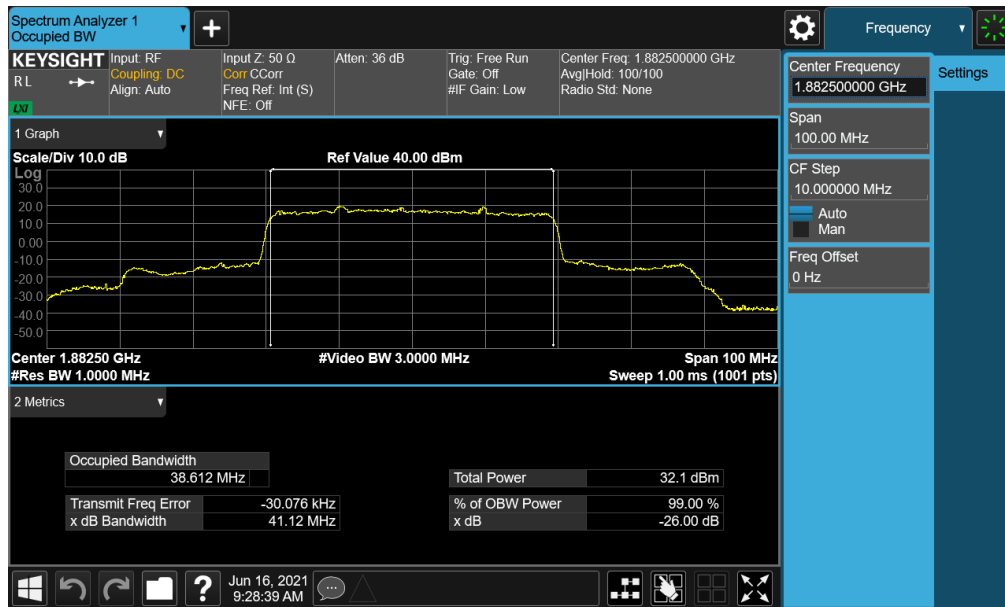
Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB)



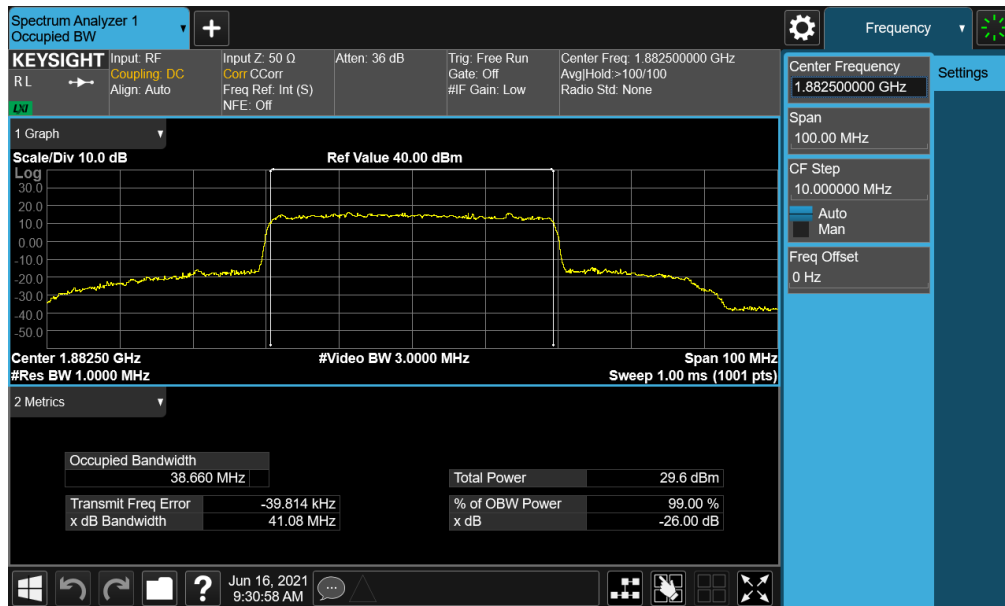
Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 20 of 150

NR Band n25/2

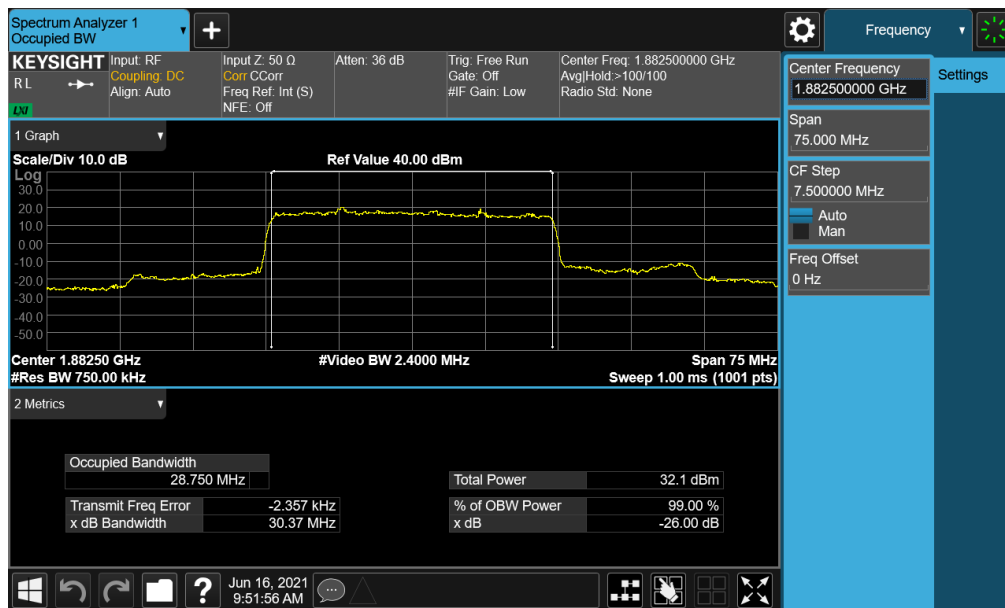
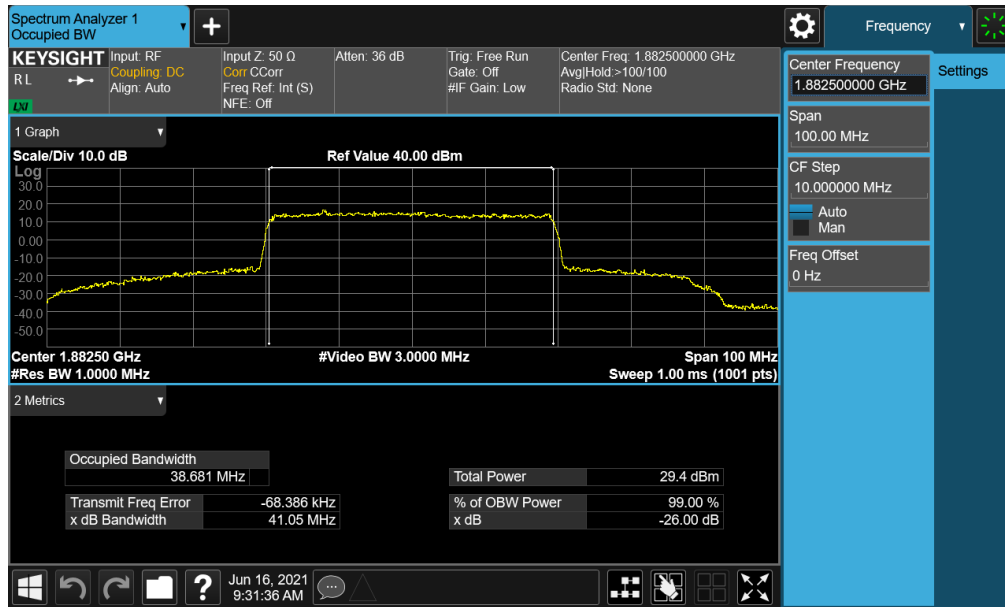


Plot 7-13. Occupied Bandwidth Plot (NR Band n25 - 40.0MHz DFT-s-OFDM BPSK - Full RB)

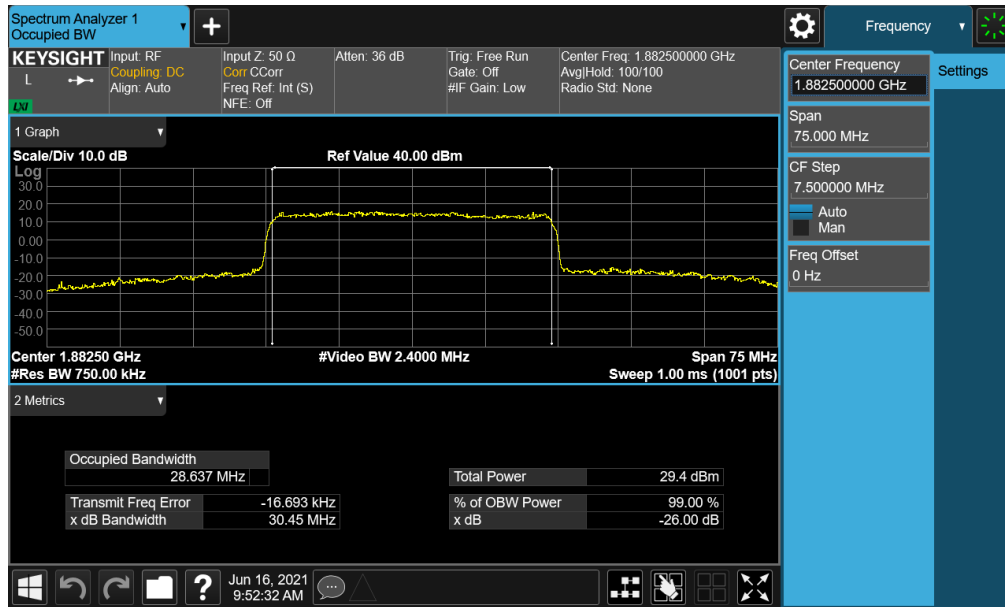


Plot 7-14. Occupied Bandwidth Plot (NR Band n25 - 40.0MHz CP-OFDM QPSK - Full RB)

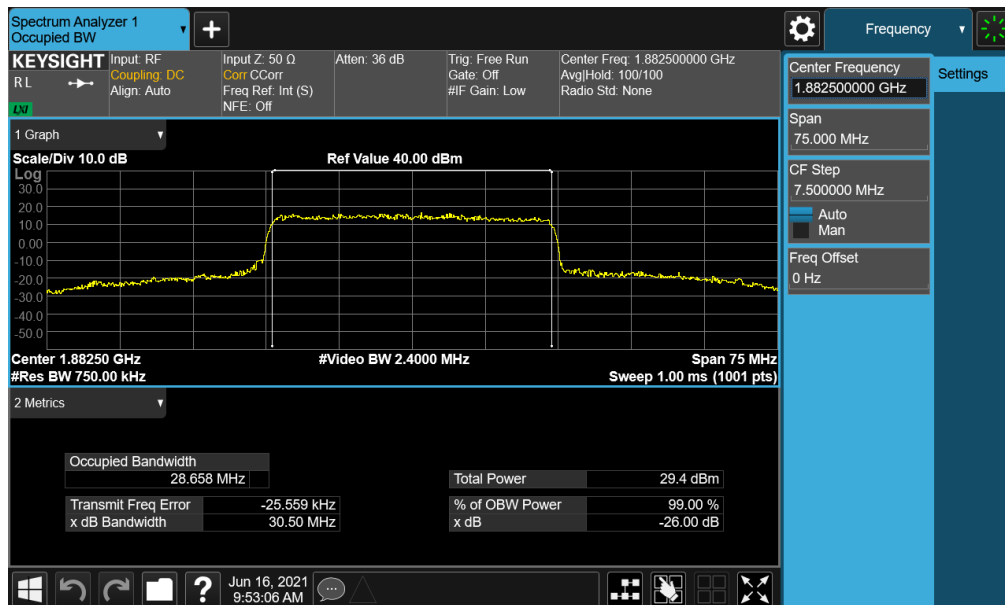
FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 21 of 150



FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 22 of 150

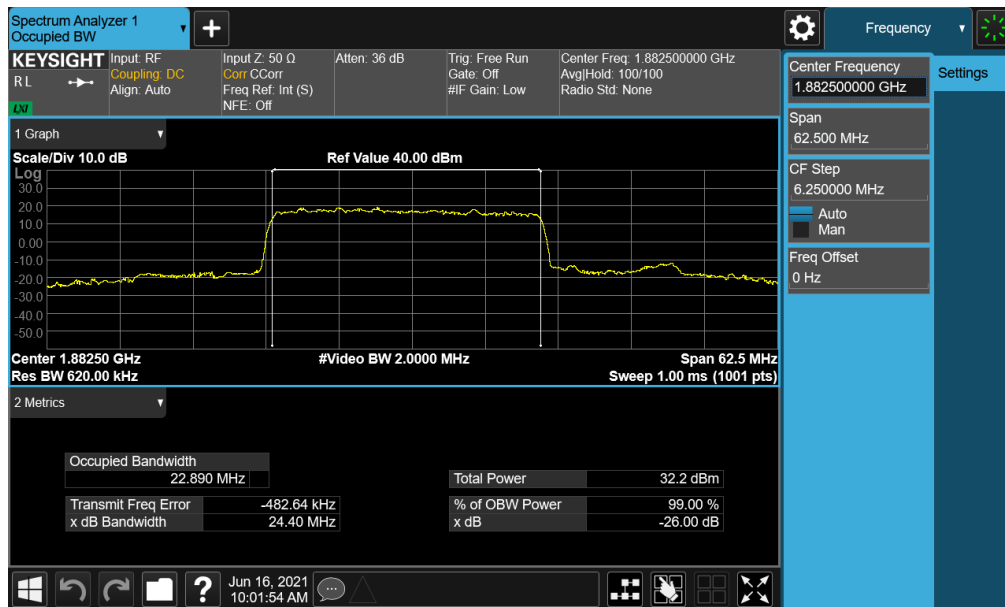


Plot 7-17. Occupied Bandwidth Plot (NR Band n25 - 30.0MHz CP-OFDM QPSK - Full RB)

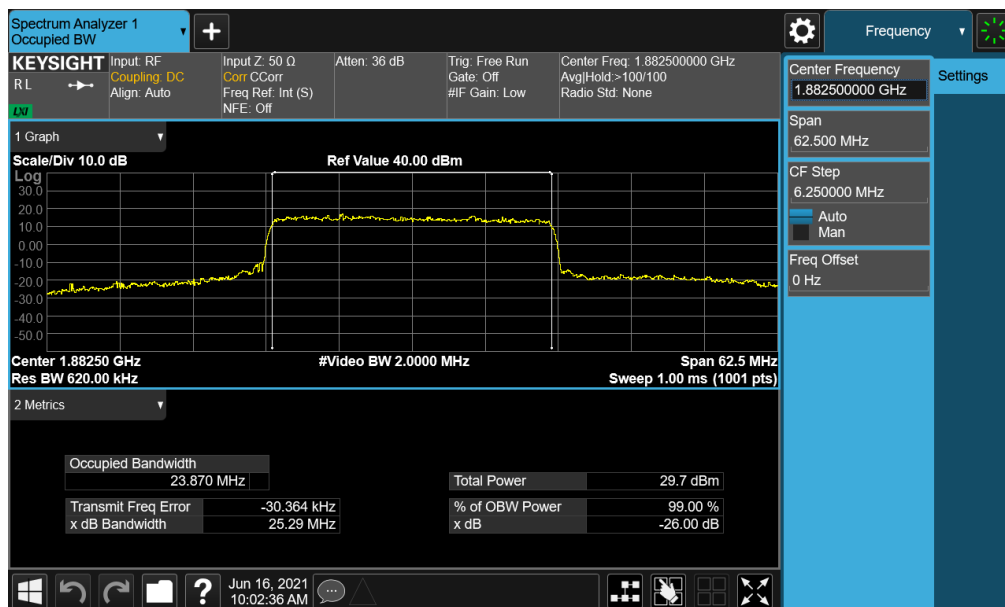


Plot 7-18. Occupied Bandwidth Plot (NR Band n25 - 30.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 23 of 150

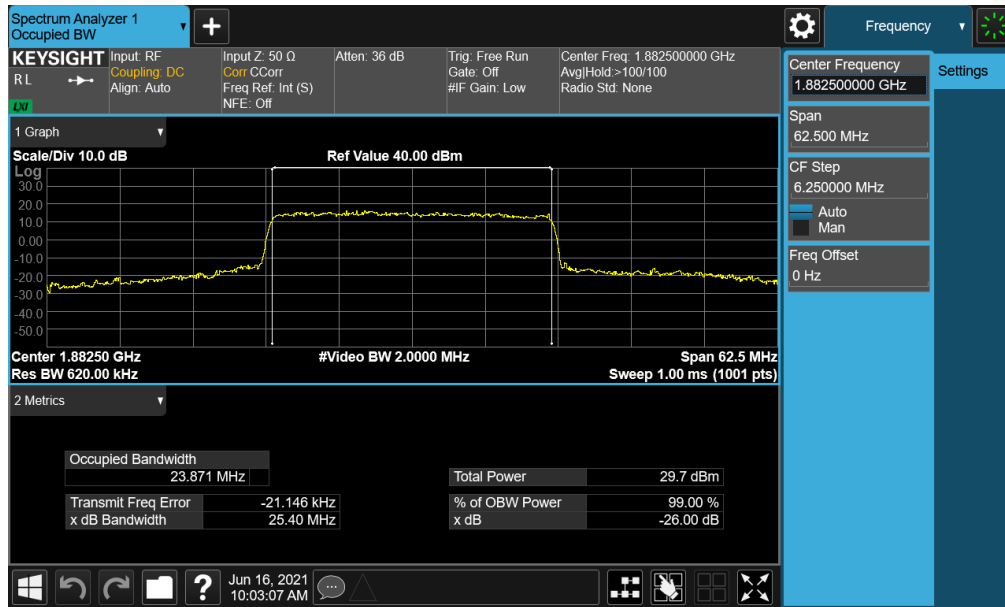


Plot 7-19. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz DFT-s-OFDM BPSK - Full RB)

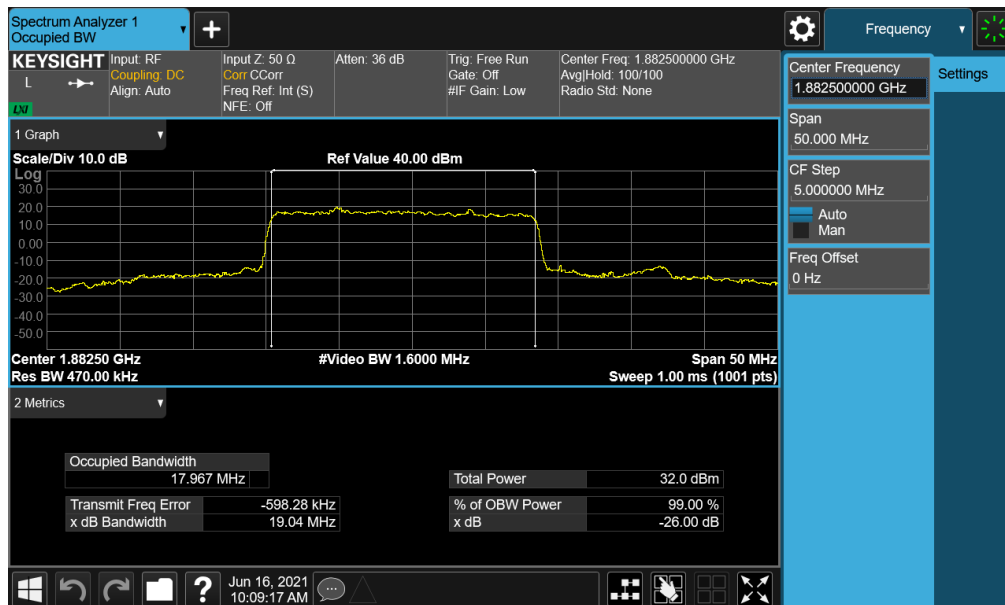


Plot 7-20. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz CP-OFDM QPSK - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 24 of 150

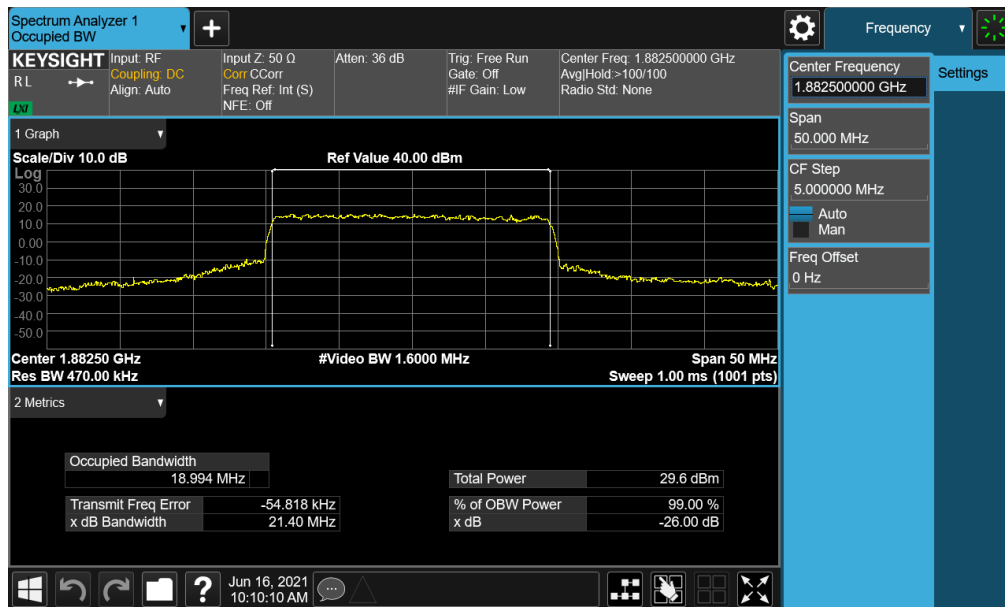


Plot 7-21. Occupied Bandwidth Plot (NR Band n25 - 25.0MHz CP-OFDM 16QAM - Full RB)

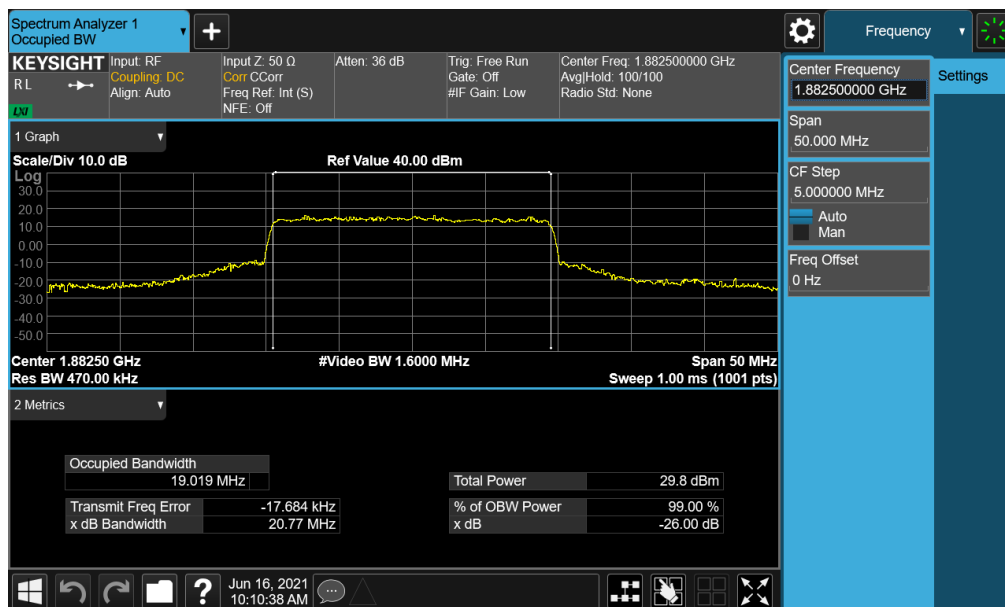


Plot 7-22. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 25 of 150

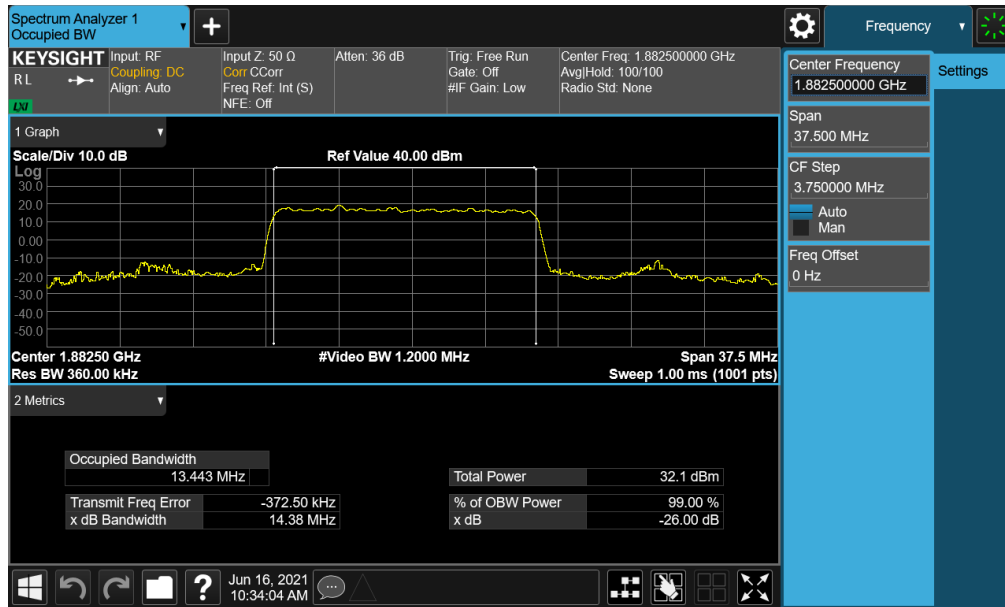


Plot 7-23. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM QPSK - Full RB)

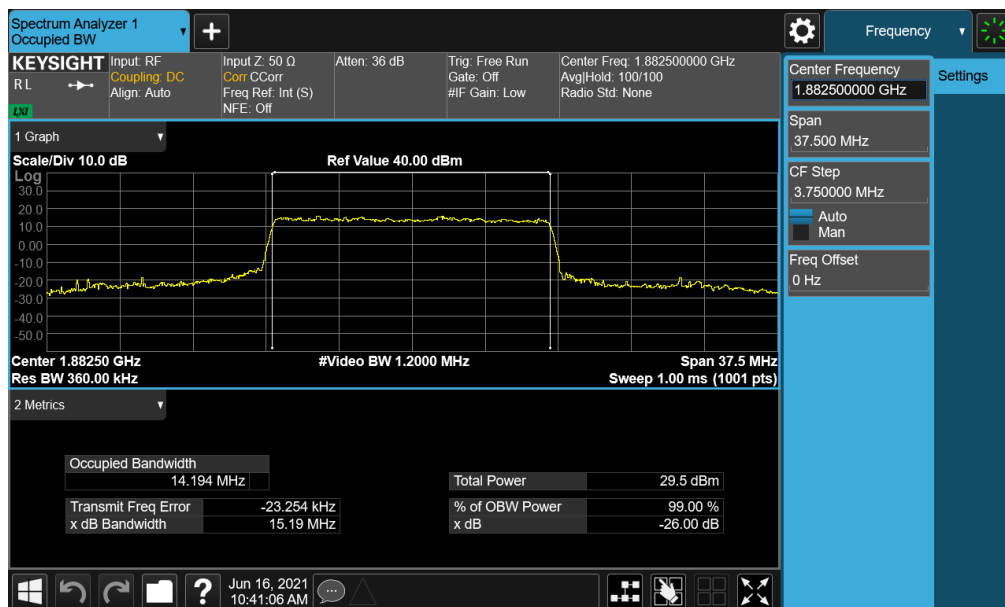


Plot 7-24. Occupied Bandwidth Plot (NR Band n25/2 - 20.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 26 of 150

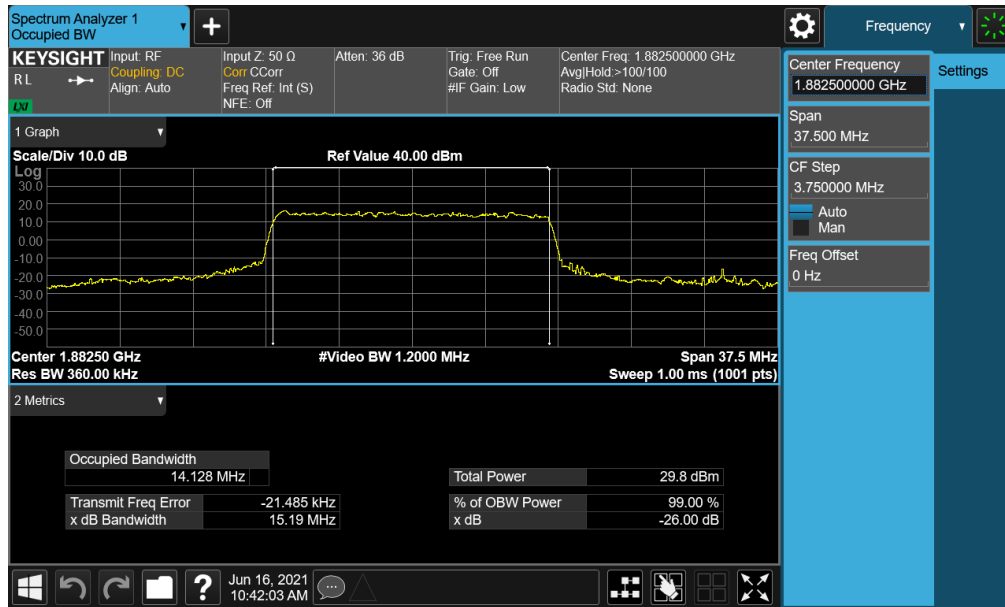


Plot 7-25. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz DFT-s-OFDM BPSK - Full RB)

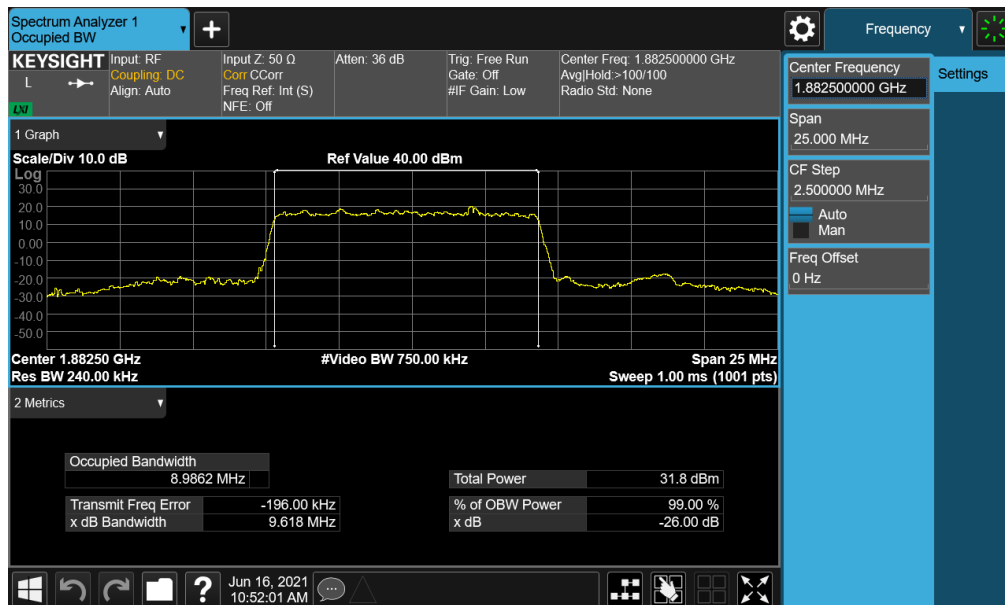


Plot 7-26. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM QPSK - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 27 of 150

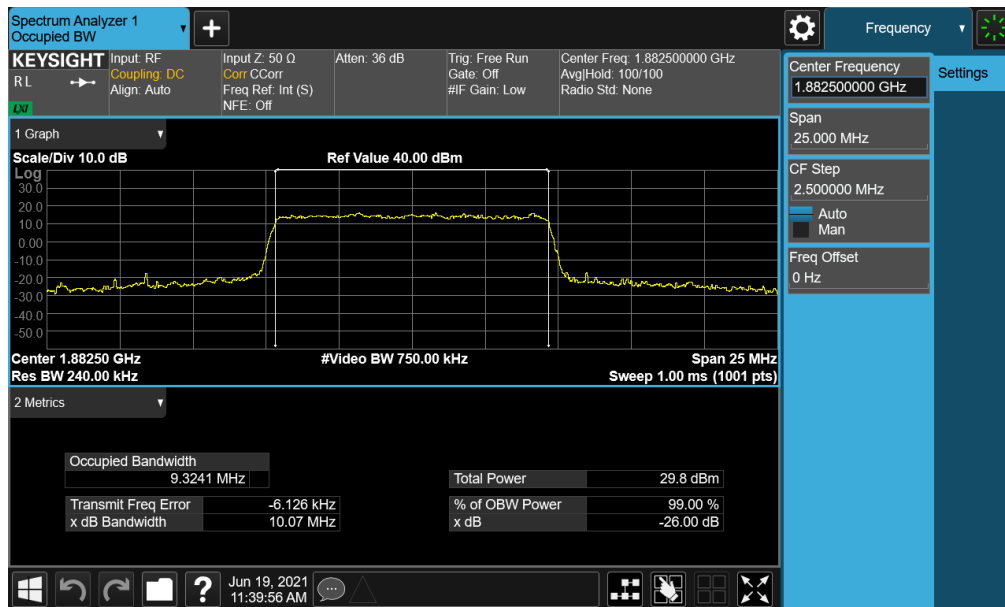


Plot 7-27. Occupied Bandwidth Plot (NR Band n25/2 - 15.0MHz CP-OFDM 16QAM - Full RB)

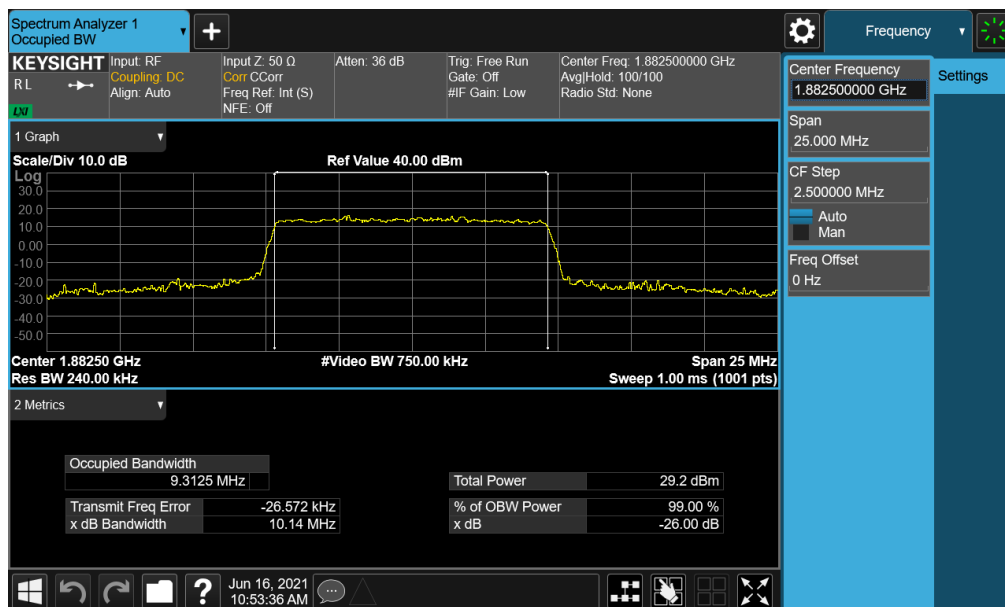


Plot 7-28. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz DFT-s-OFDM BPSK - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 28 of 150

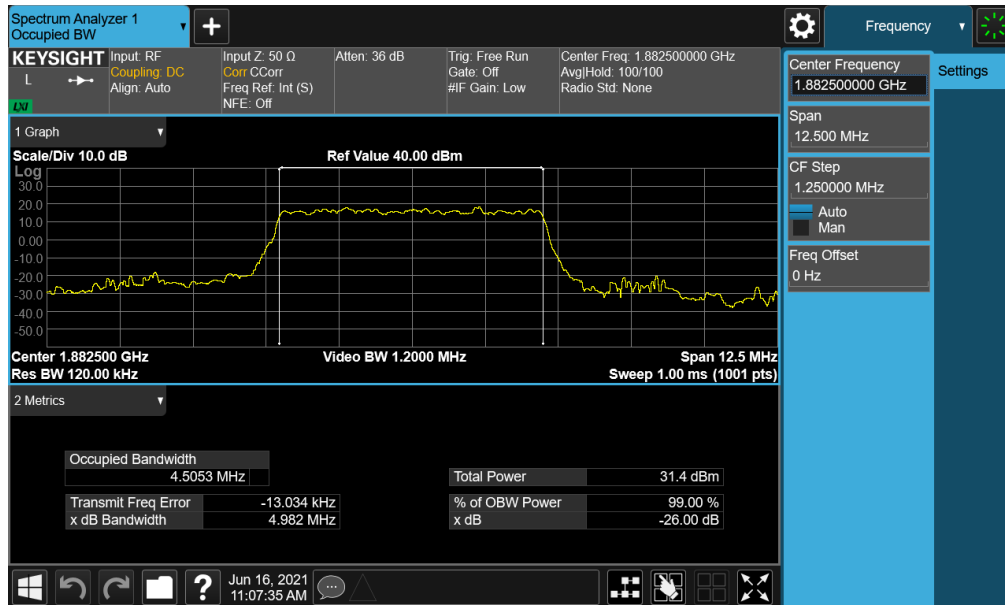


Plot 7-29. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM QPSK - Full RB)

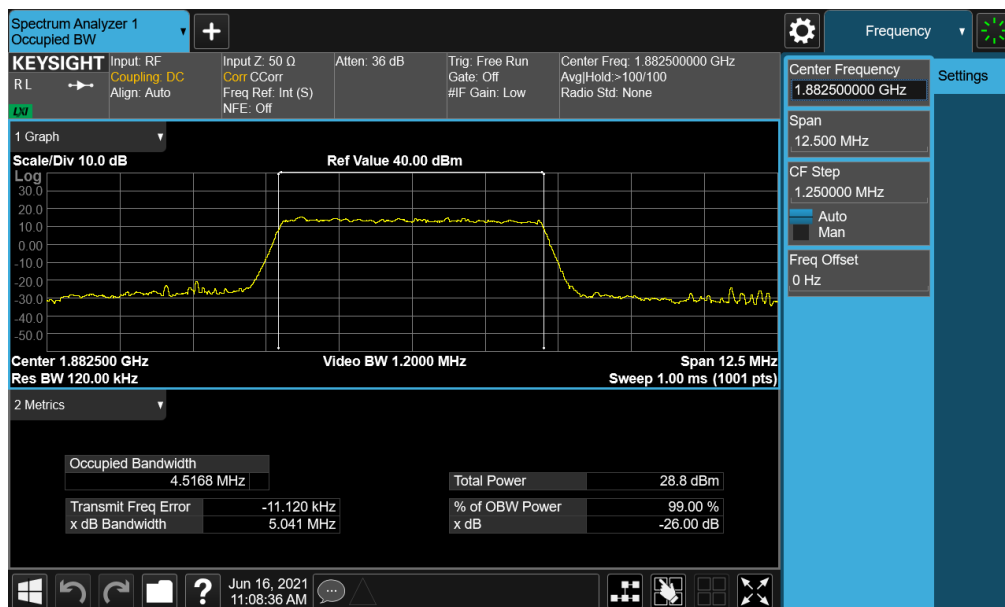


Plot 7-30. Occupied Bandwidth Plot (NR Band n25/2 - 10.0MHz CP-OFDM 16QAM - Full RB)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 29 of 150

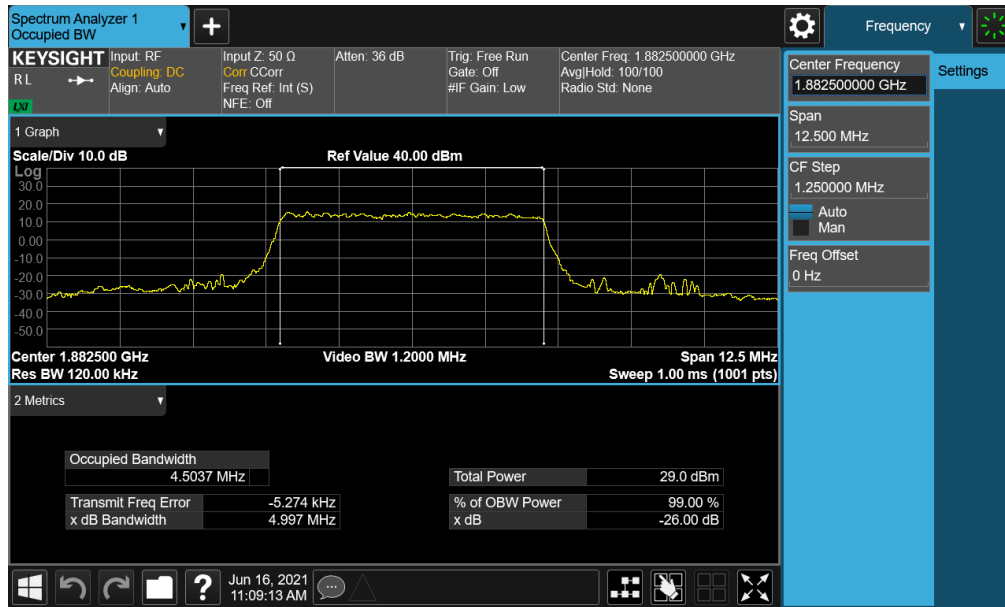


Plot 7-31. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz DFT-s-OFDM BPSK - Full RB)



Plot 7-32. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM QPSK - Full RB)

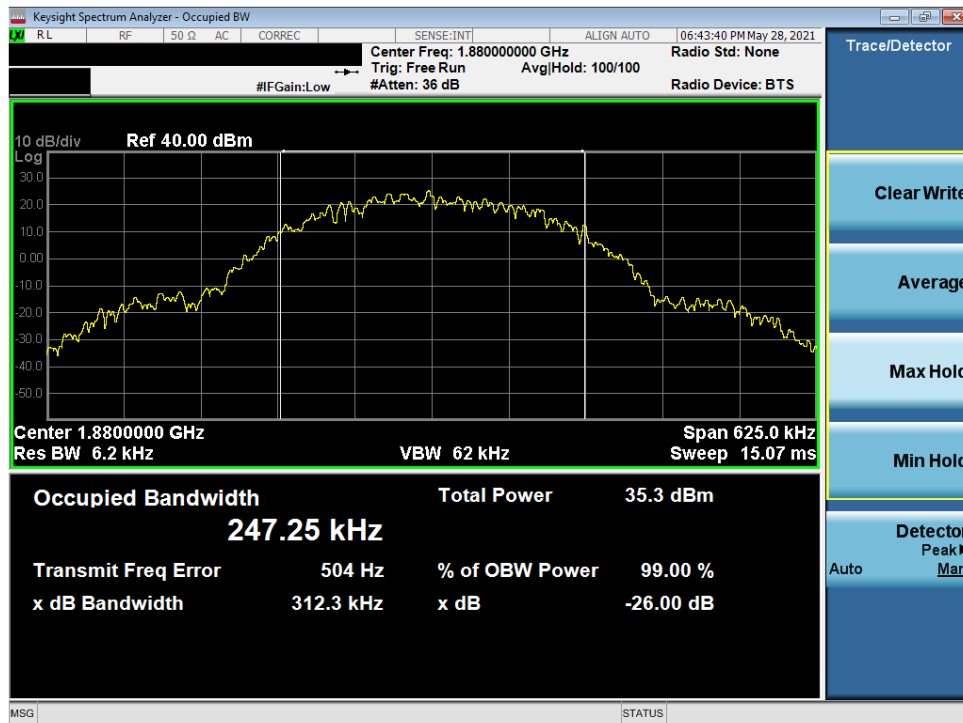
FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 30 of 150



Plot 7-33. Occupied Bandwidth Plot (NR Band n25/2 - 5.0MHz CP-OFDM 16QAM - Full RB)

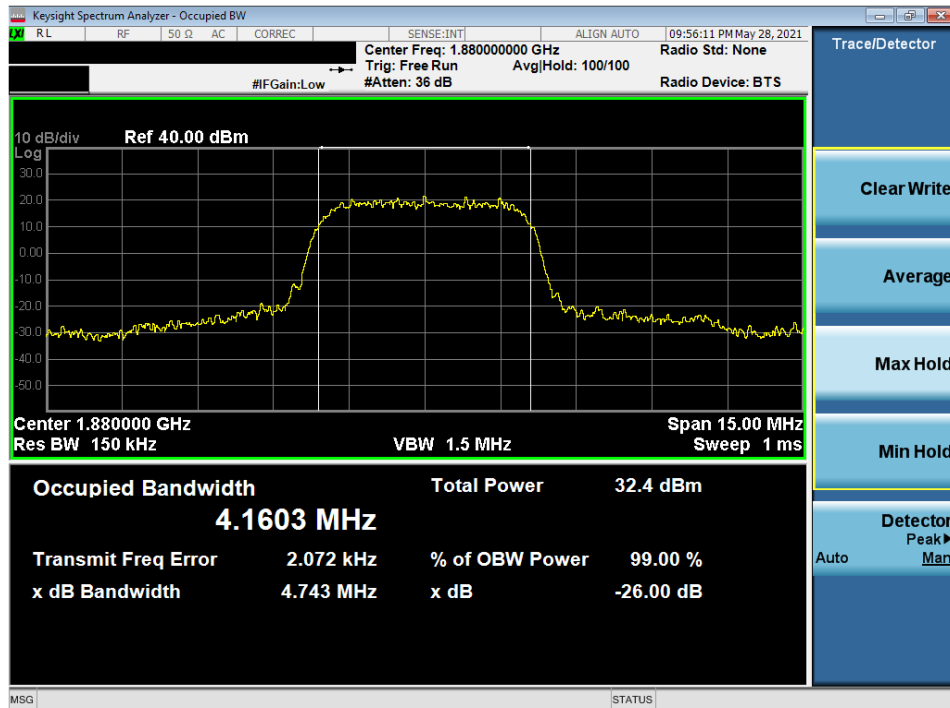
FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 31 of 150

GSM/GPRS PCS



Plot 7-34. Occupied Bandwidth Plot (GPRS, Ch. 661)

WCDMA PCS



Plot 7-35. Occupied Bandwidth Plot (WCDMA, Ch. 9400)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 32 of 150

7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is $43 + 10 \log_{10}(P_{\text{Watts}})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 20GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

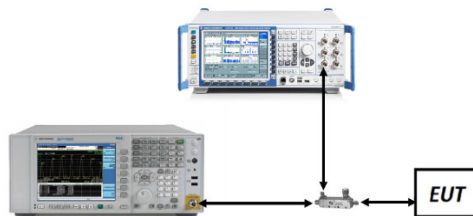


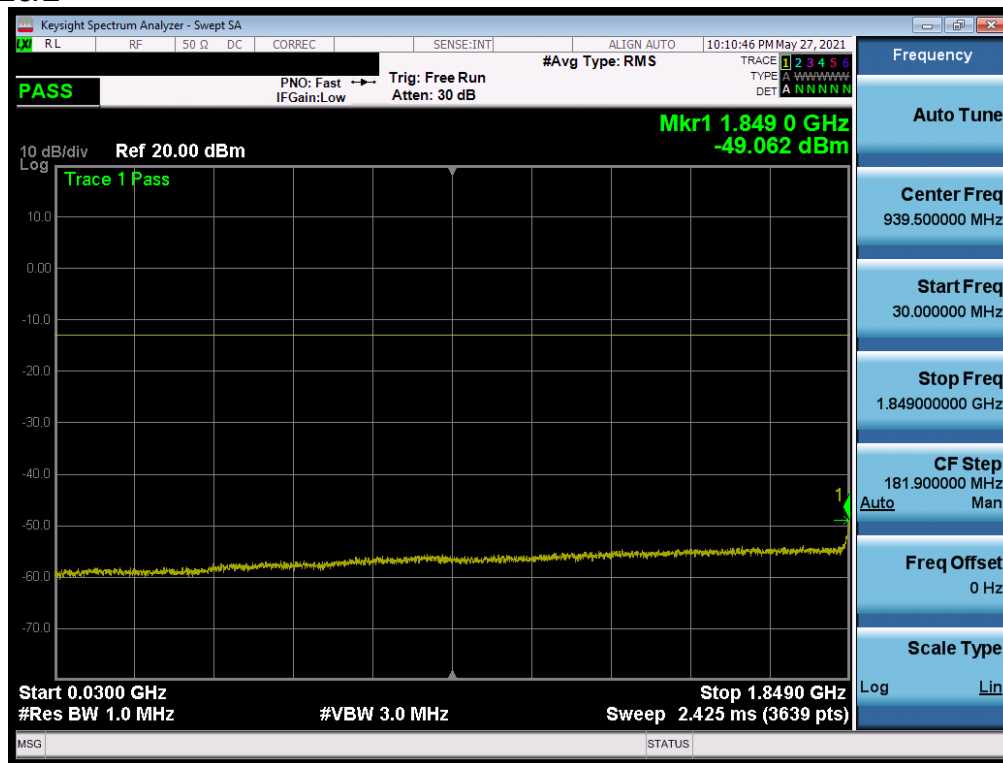
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

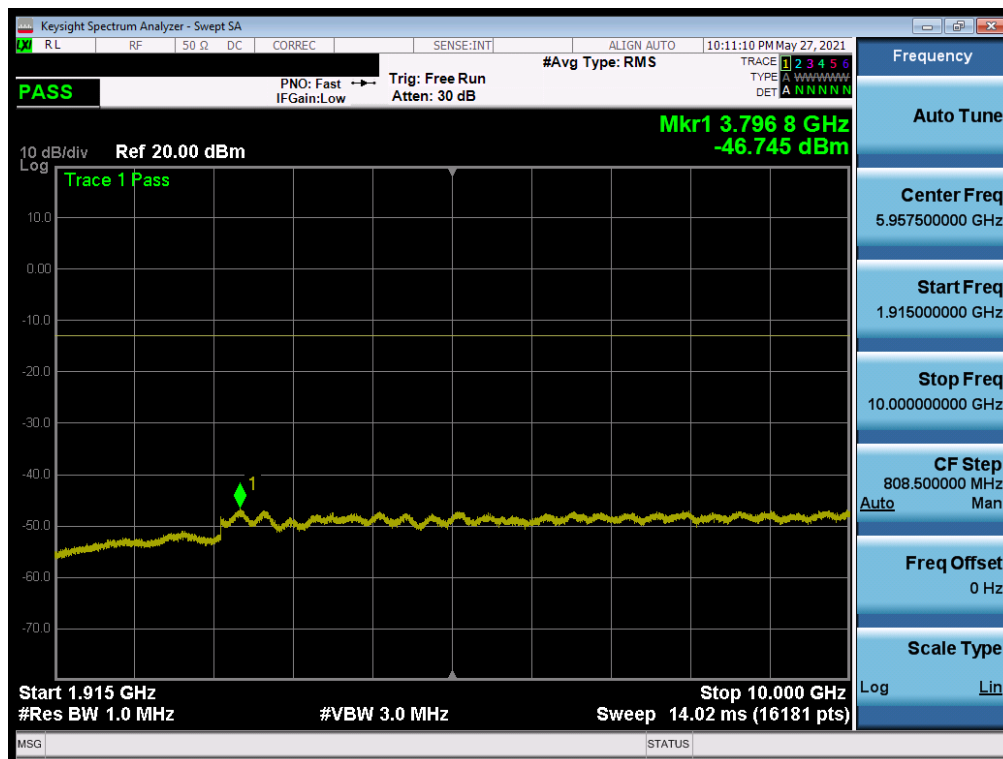
1. Per Part 24 and RSS-133, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The 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 emission are attenuated at least 26 dB below the transmitter power.
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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LTE Band 25/2

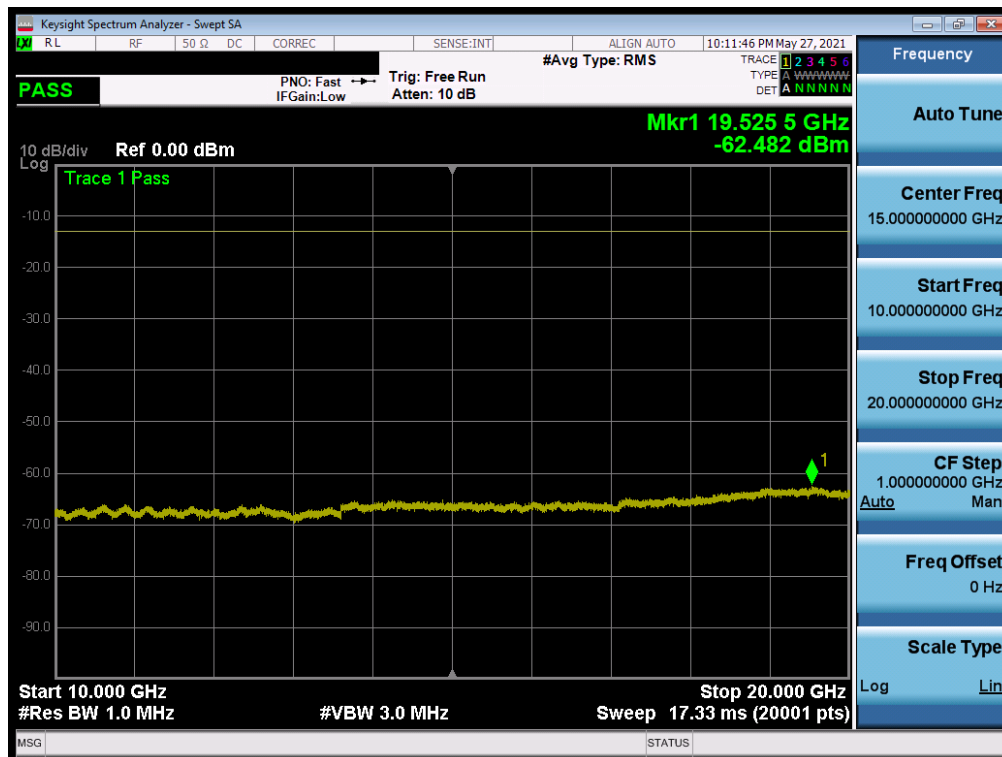


Plot 7-36. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel)



Plot 7-37. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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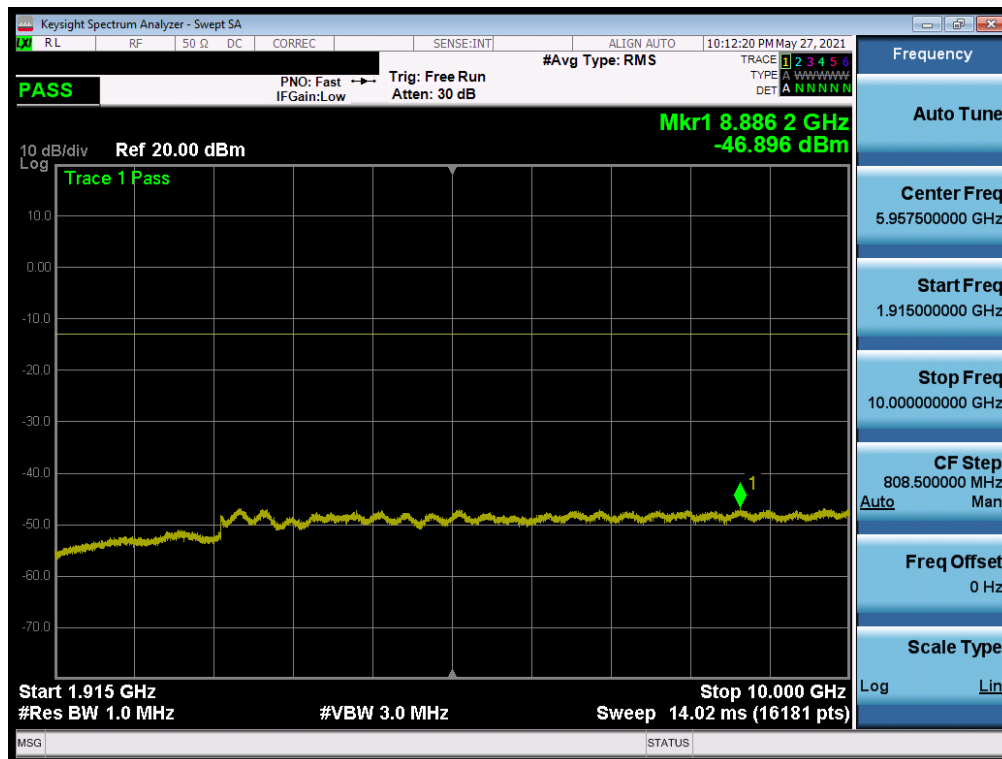


Plot 7-38. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Low Channel)

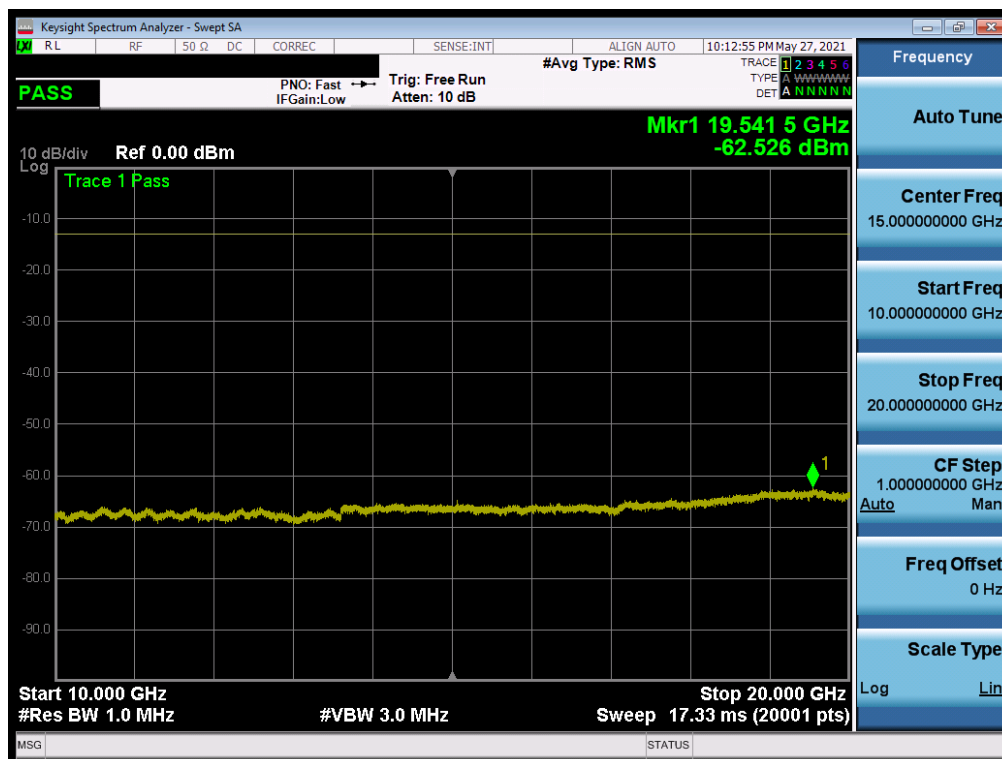


Plot 7-39. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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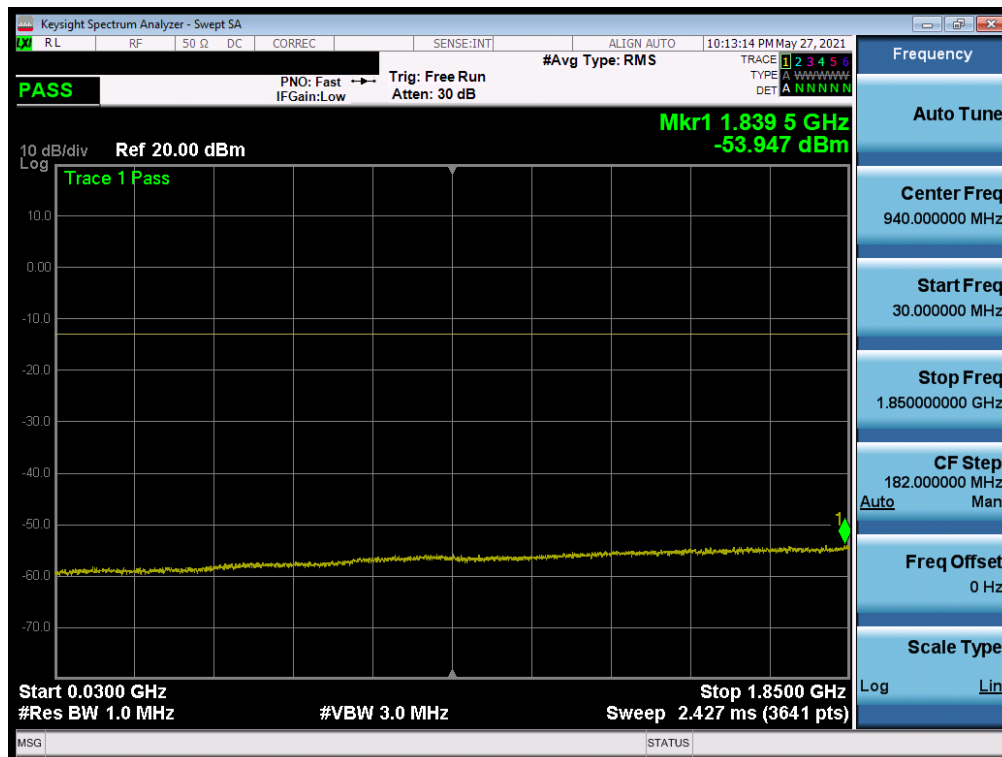


Plot 7-40. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

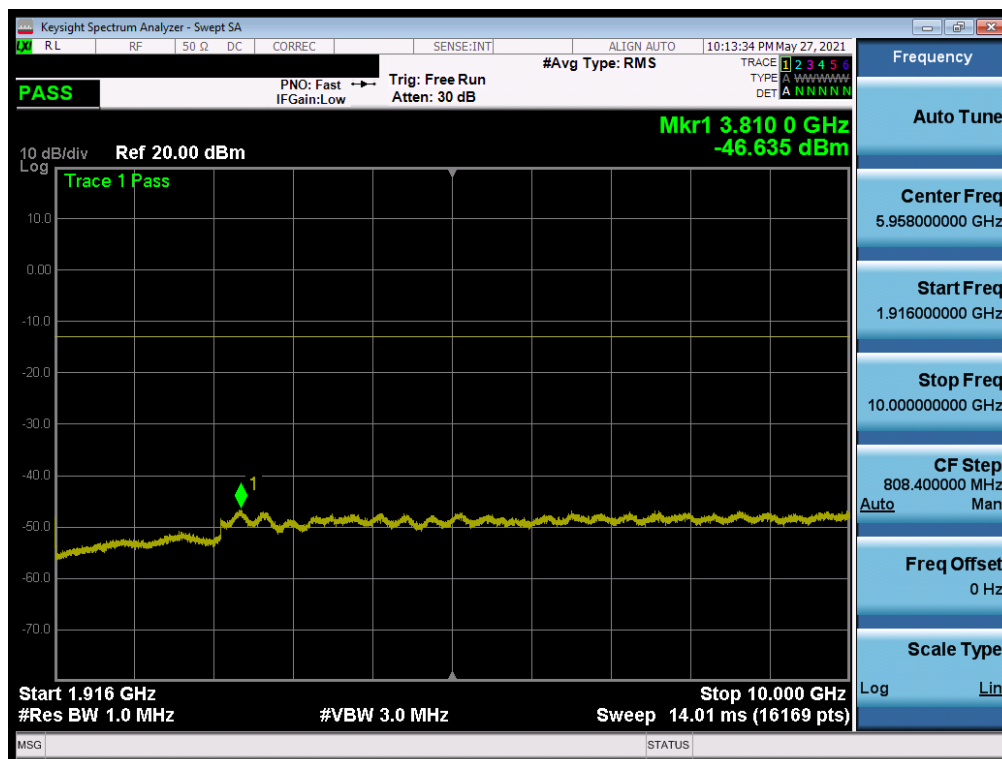


Plot 7-41. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - Mid Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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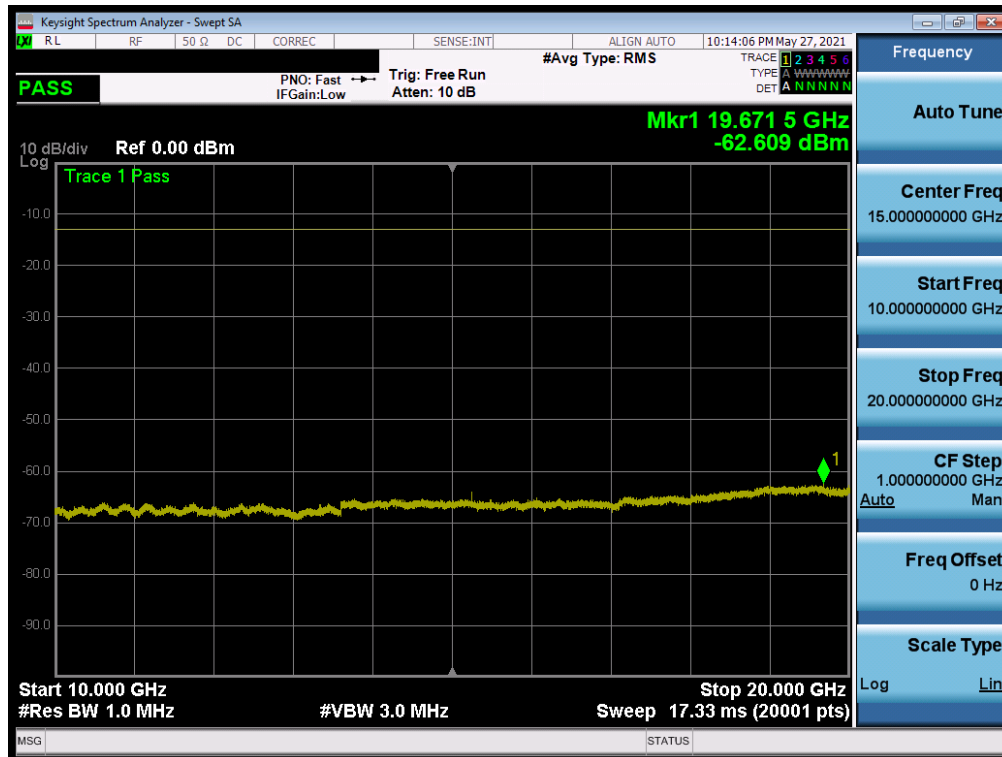


Plot 7-42. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)



Plot 7-43. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)

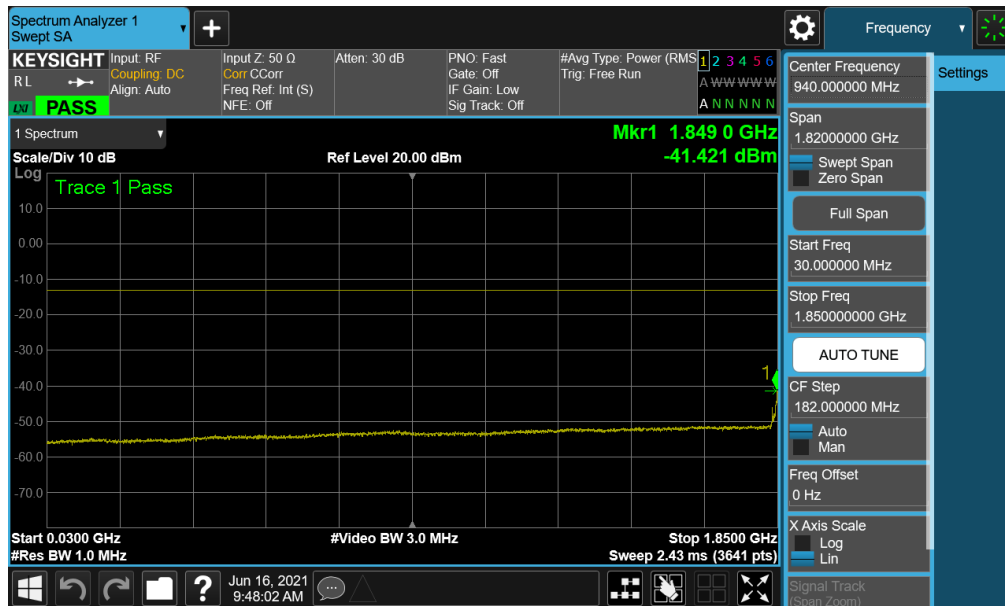
FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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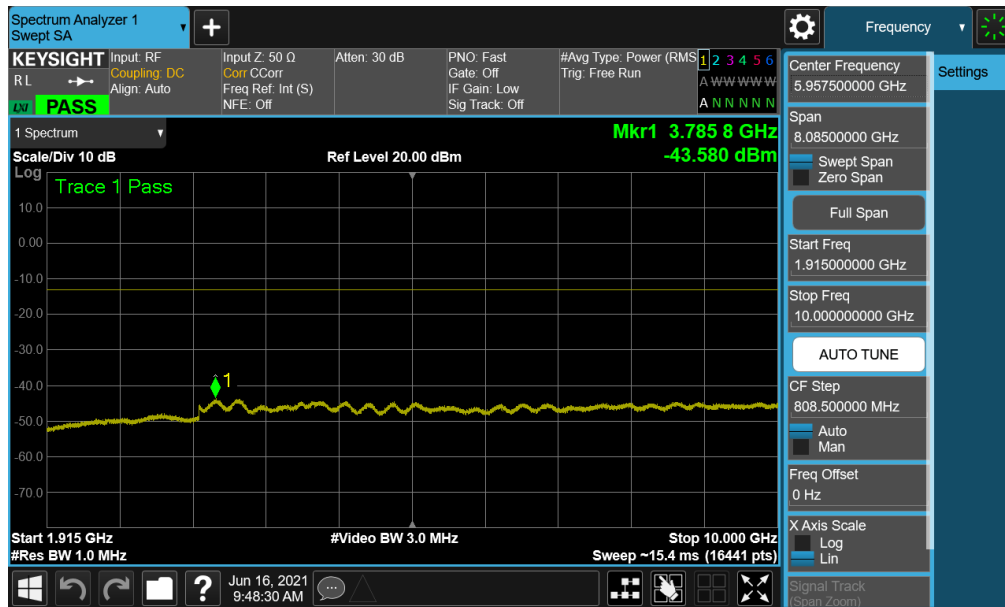
Plot 7-44. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - 1RB - High Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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NR Band n25/2

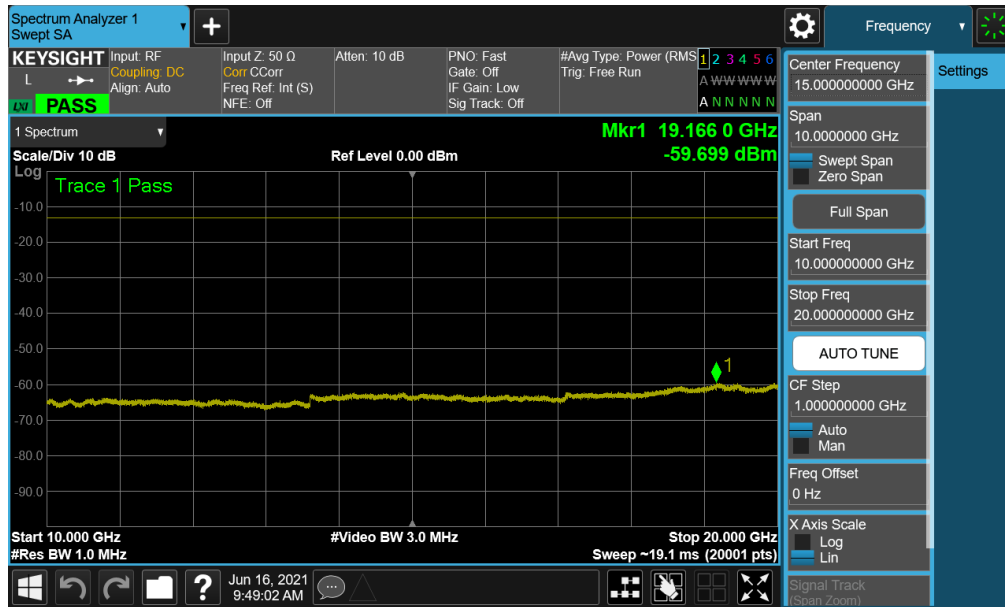


Plot 7-45. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - Low Channel)

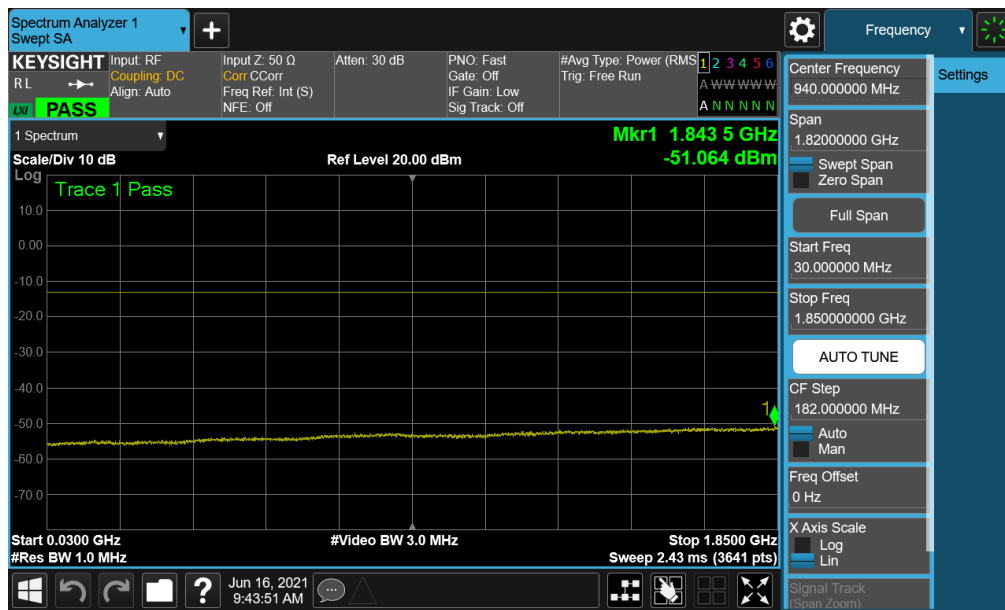


Plot 7-46. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - Low Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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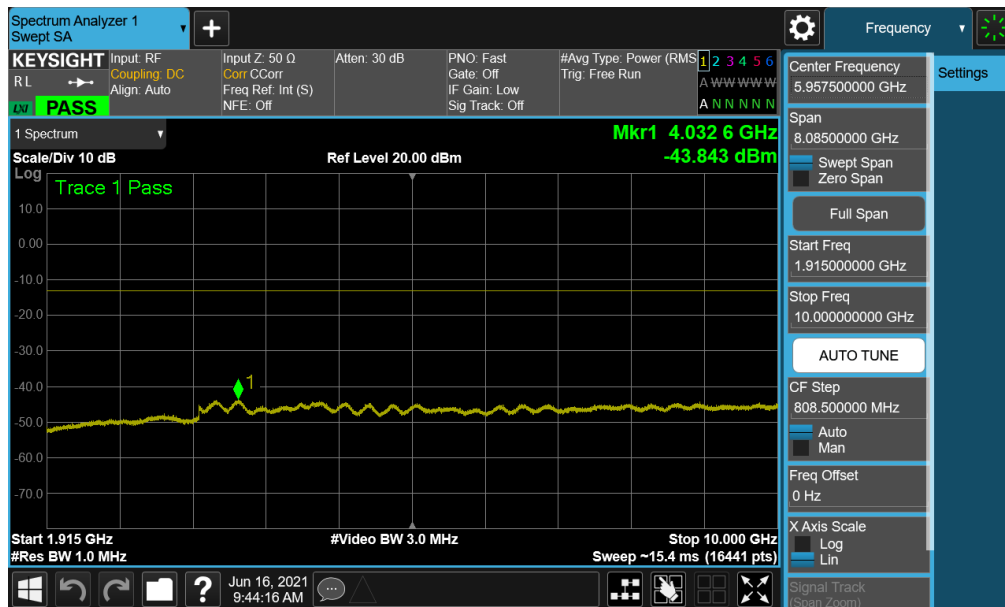


Plot 7-47. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - Low Channel)

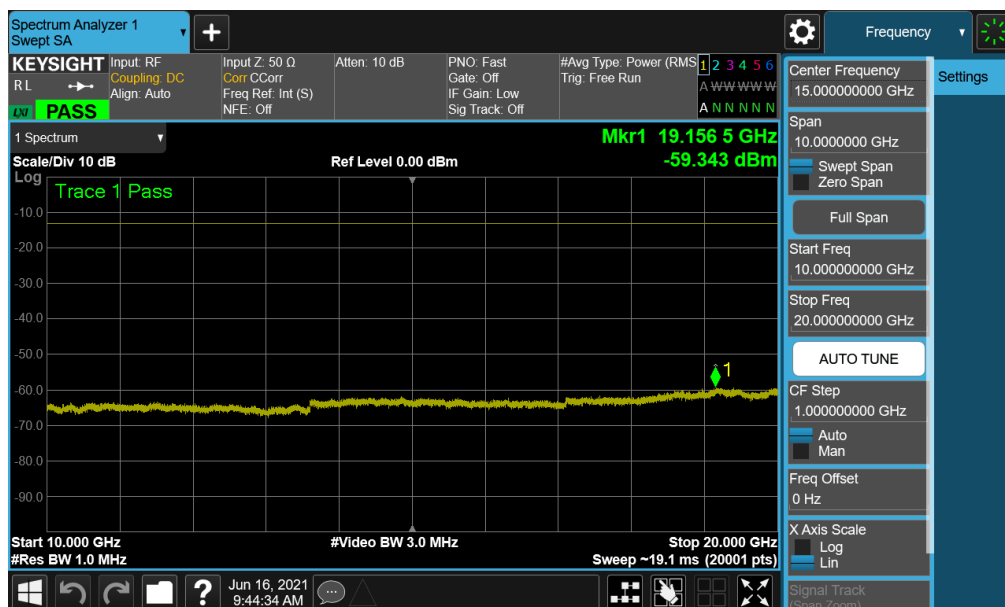


Plot 7-48. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - Mid Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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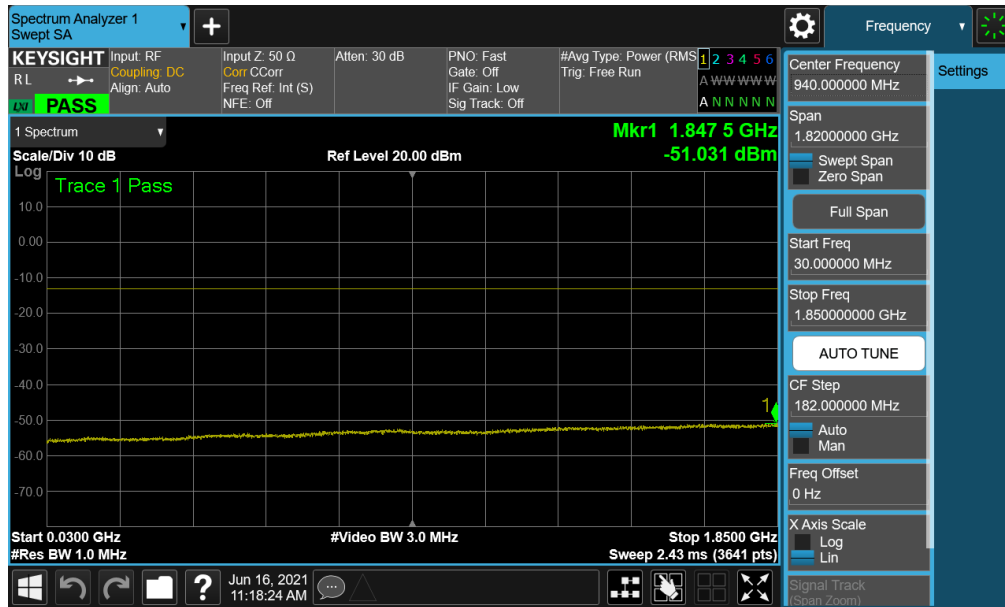


Plot 7-49. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - Mid Channel)

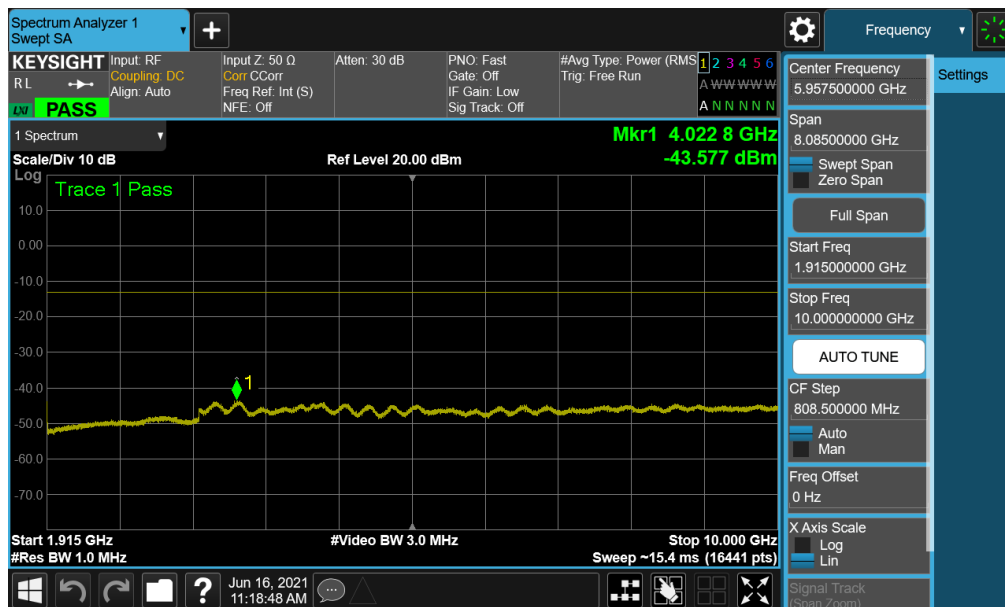


Plot 7-50. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - Mid Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 41 of 150

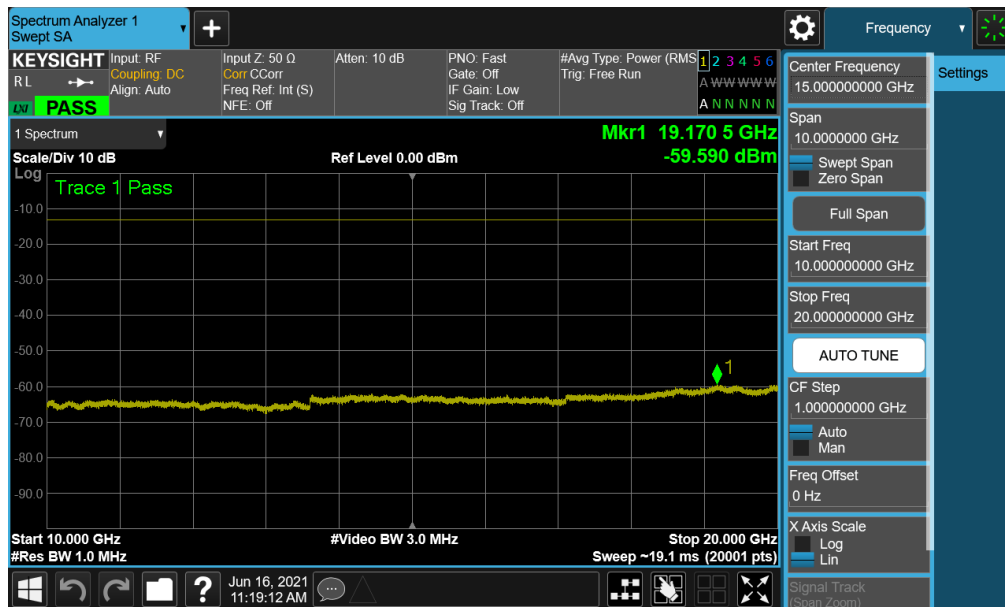


Plot 7-51. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - High Channel)



Plot 7-52. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - High Channel)

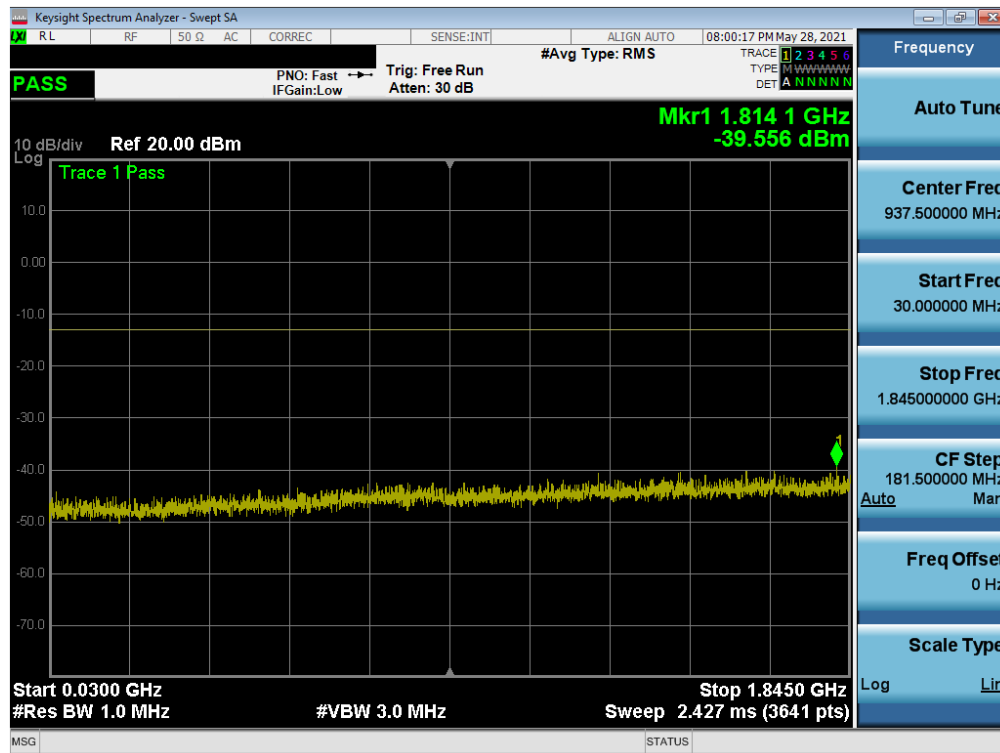
FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 42 of 150



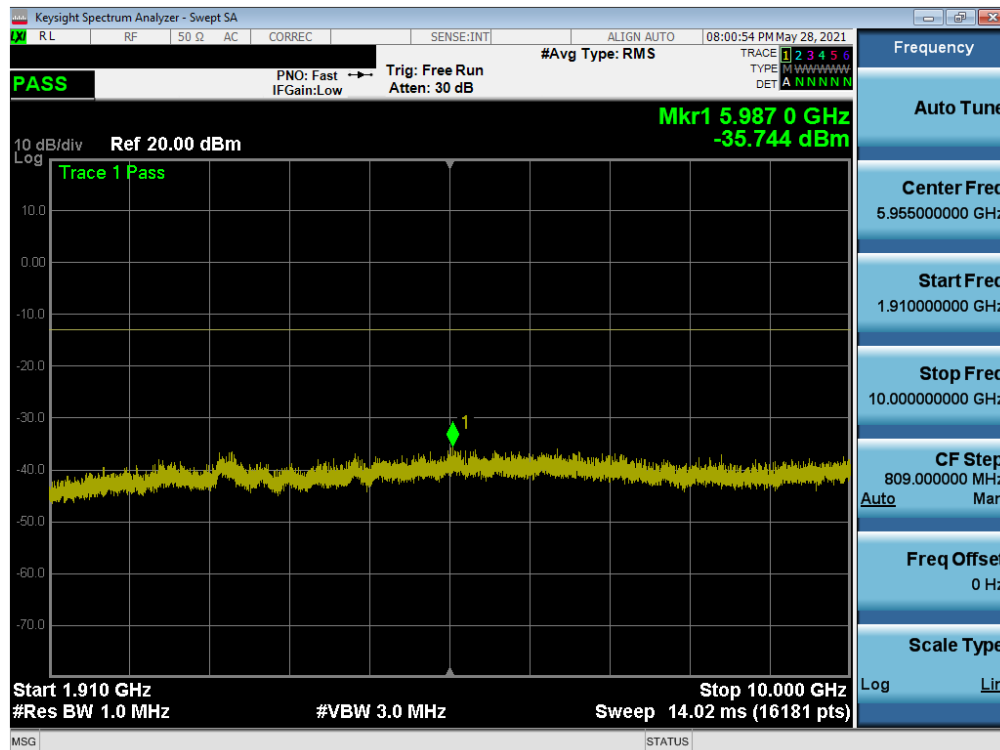
Plot 7-53. Conducted Spurious Plot (NR Band n25 - 40.0MHz - 1RB - High Channel)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 43 of 150

GSM/GPRS PCS

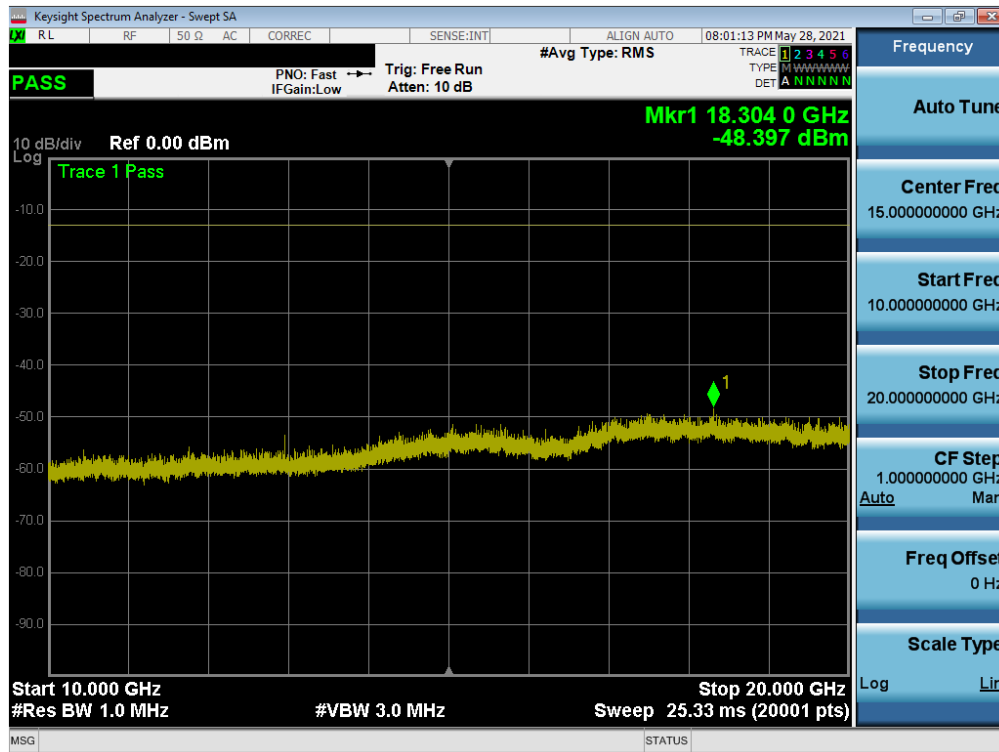


Plot 7-54. Conducted Spurious Plot (GPRS Ch. 512)

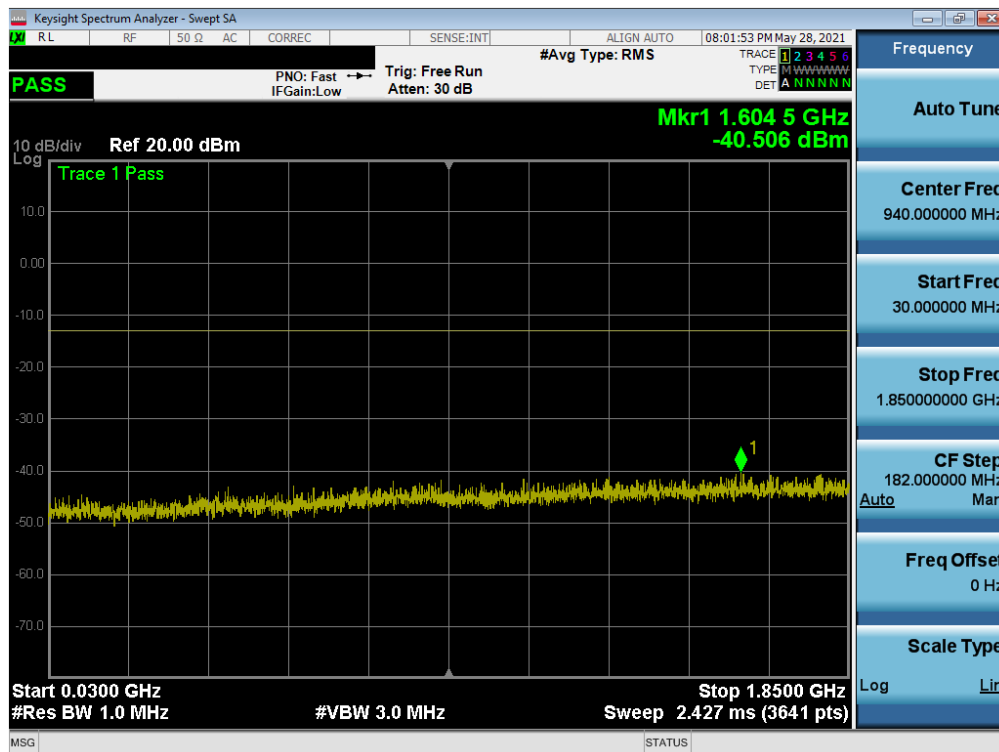


Plot 7-55. Conducted Spurious Plot (GPRS Ch. 512)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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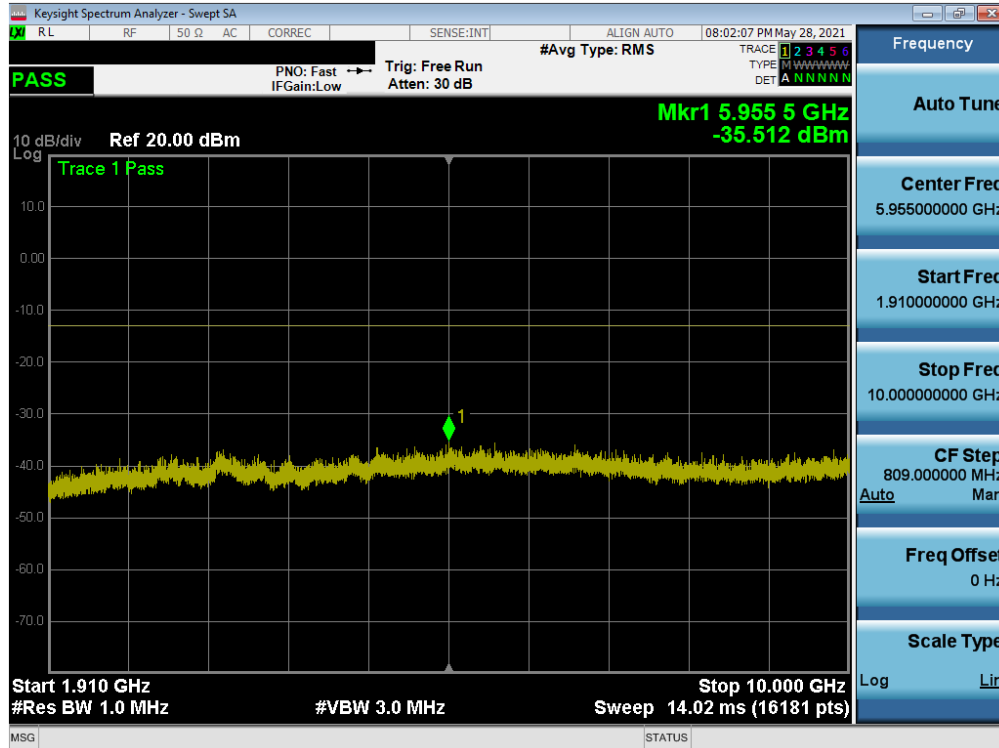


Plot 7-56. Conducted Spurious Plot (GPRS Ch. 512)

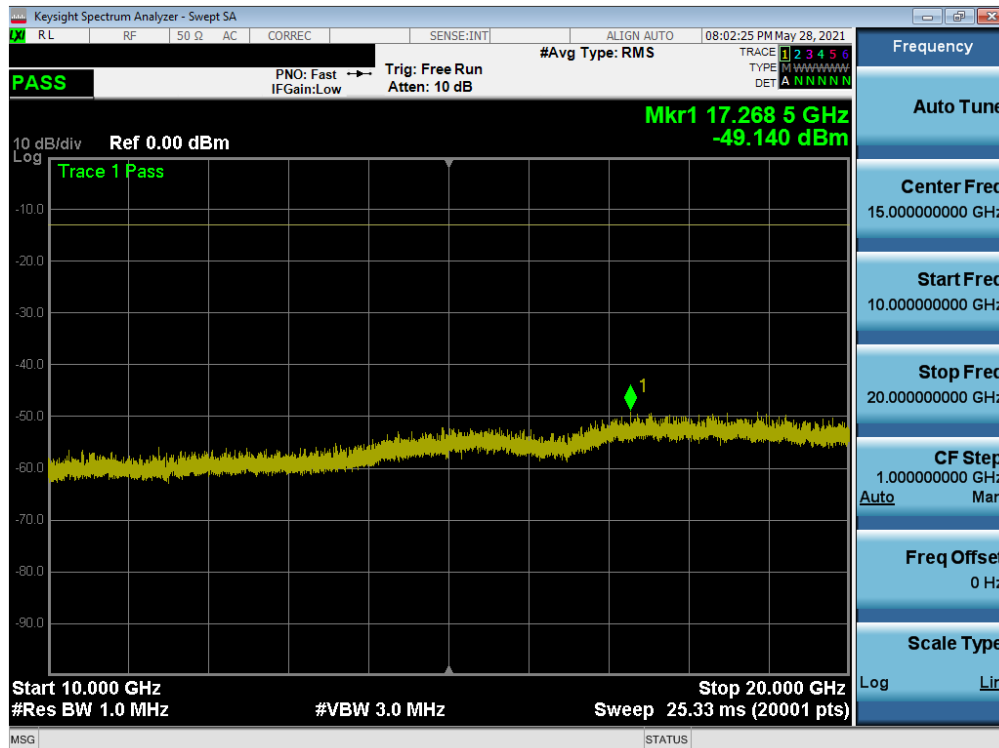


Plot 7-57. Conducted Spurious Plot (GPRS Ch. 661)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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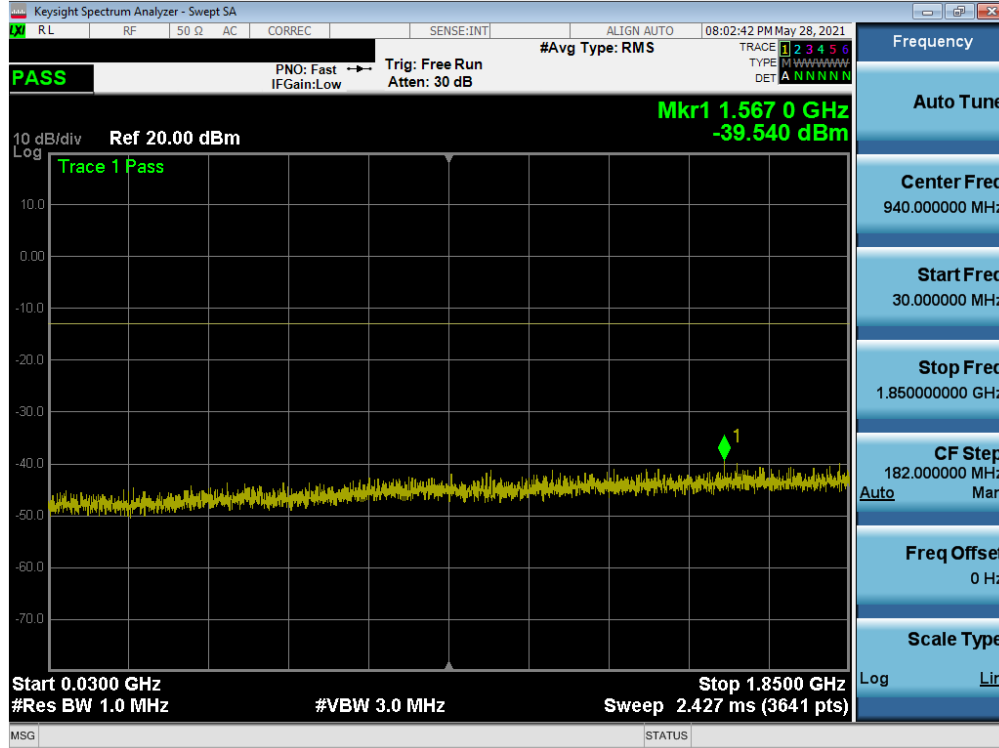


Plot 7-58. Conducted Spurious Plot (GPRS Ch. 661)

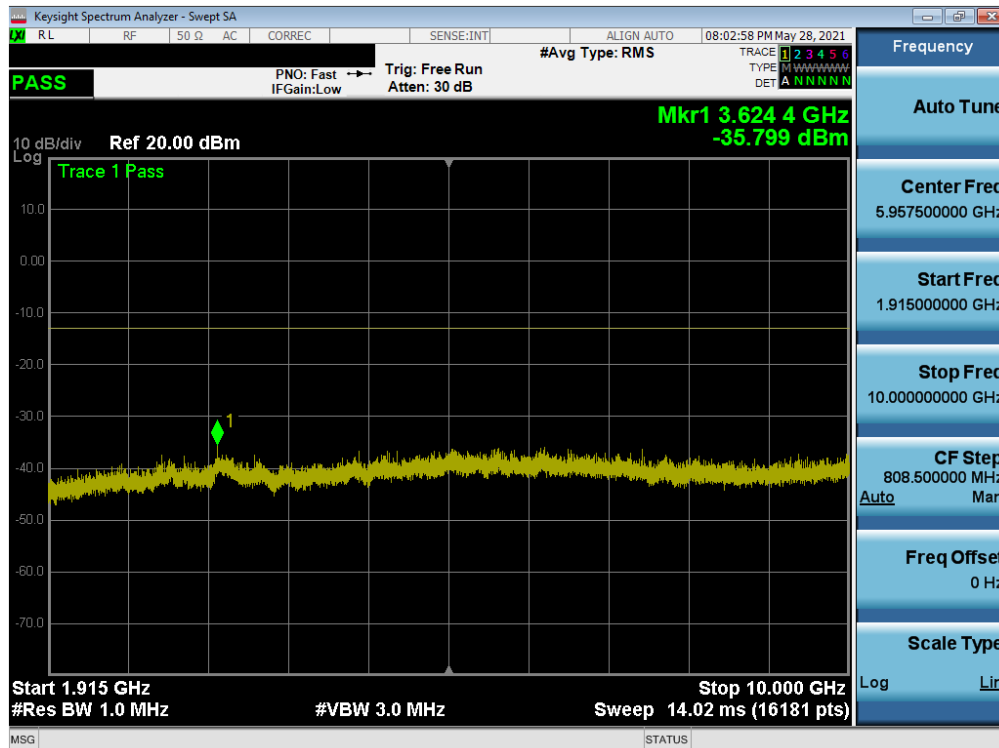


Plot 7-59. Conducted Spurious Plot (GPRS Ch. 661)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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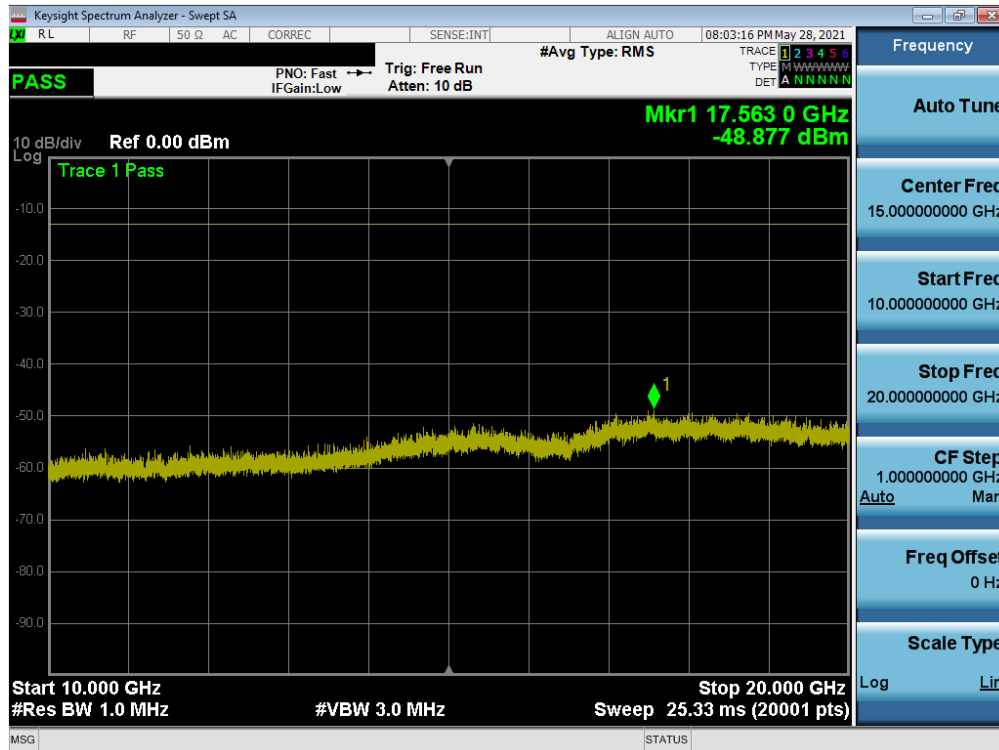


Plot 7-60. Conducted Spurious Plot (GPRS Ch. 810)



Plot 7-61. Conducted Spurious Plot (GPRS Ch. 810)

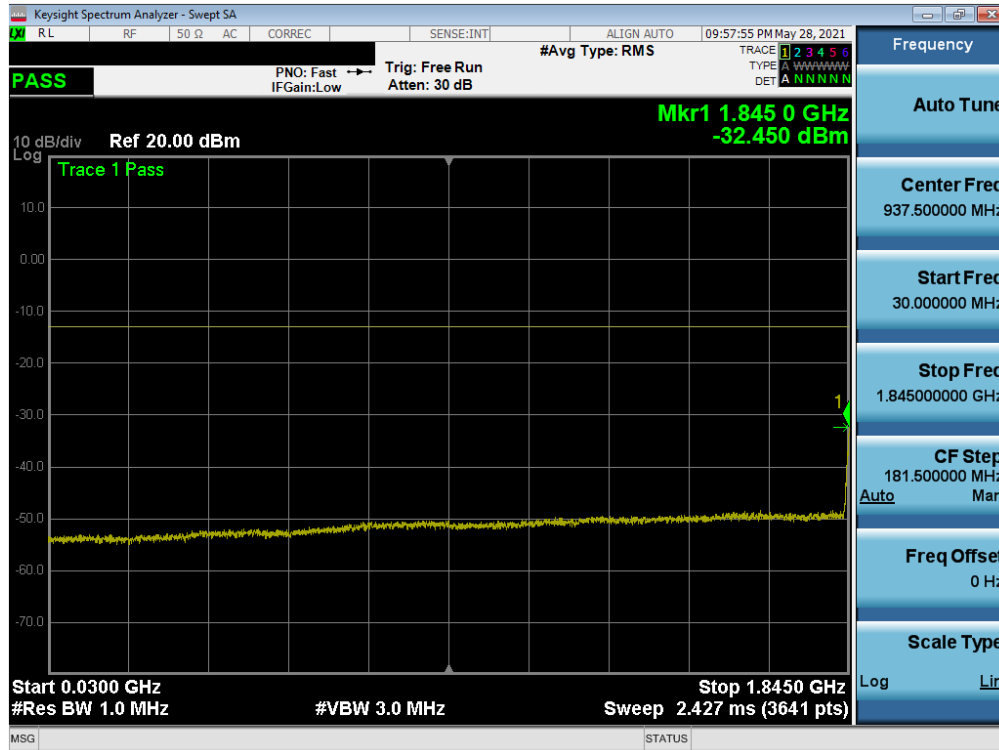
FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 47 of 150



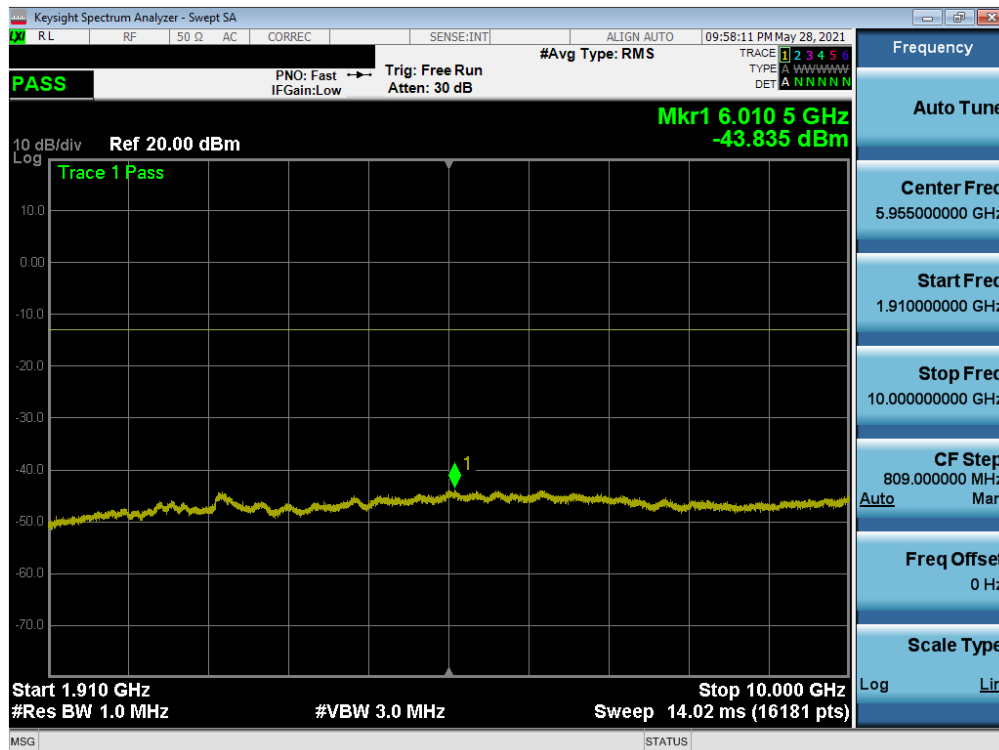
Plot 7-62. Conducted Spurious Plot (GPRS Ch. 810)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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WCDMA PCS

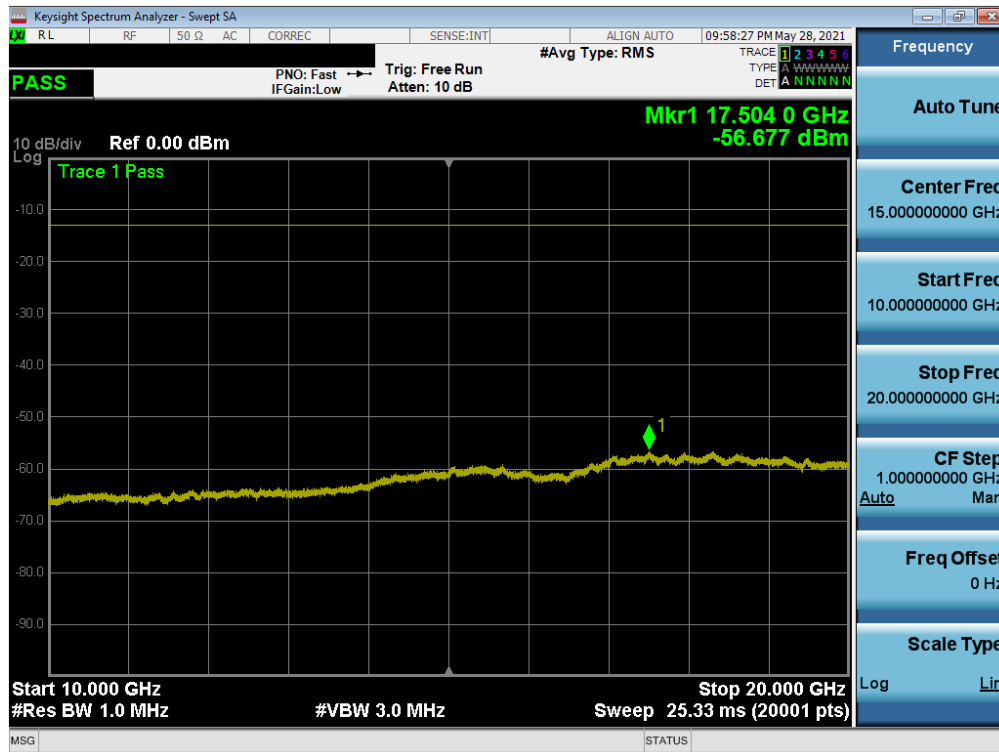


Plot 7-63. Conducted Spurious Plot (WCDMA Ch. 9262)

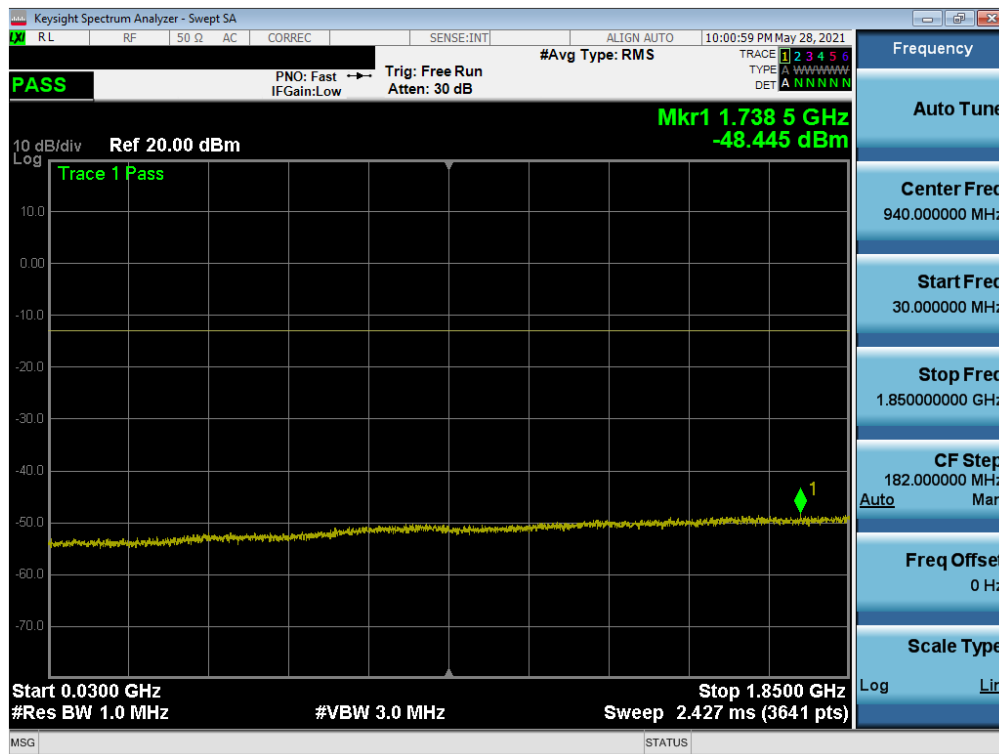


Plot 7-64. Conducted Spurious Plot (WCDMA Ch. 9262)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
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Plot 7-65. Conducted Spurious Plot (WCDMA Ch. 9262)



Plot 7-66. Conducted Spurious Plot (WCDMA Ch. 9400)

FCC ID: C3K1995 IC: 3048A-1995	PCTEST Proud to be part of element	PART 24 / RSS-133 MEASUREMENT REPORT	Microsoft	Approved by: Technical Manager
Test Report S/N: 1M2105060048-03-R1.C3K	Test Dates: 5/25/2021 - 8/31/2021	EUT Type: Portable Handset		Page 50 of 150