

PART 27 MEASUREMENT REPORT

Applicant Name:

Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:

01/03/2022 – 02/07/2022

Test Report Issue Date:

02/09/2022

Test Site/Location:

PCTEST Lab. Yongin-Si, Gyeonggi-do, South Korea

Test Report Serial No.:

1M2112270166-05.A3L

FCC ID:

A3LSMA135U

Applicant Name:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-A135U

Additional Model(s):

SM-A135U1, SM-A135U1/DS

EUT Type:

Portable Handset

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

FCC Rule Part:

27

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.

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.



Prepared by



Reviewed by





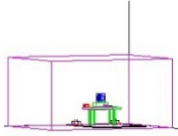
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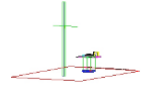
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 30	10 MHz	QPSK	2310.0	0.123	20.91	9M02G7D
		16QAM	2310.0	0.097	19.86	9M04W7D
	5 MHz	QPSK	2307.5 - 2312.5	0.095	19.78	4M54G7D
		16QAM	2307.5 - 2312.5	0.070	18.47	4M53W7D
LTE Band 7	20 MHz	QPSK	2510.0 - 2560.0	0.276	24.40	18M0G7D
		16QAM	2510.0 - 2560.0	0.205	23.12	18M0W7D
	15 MHz	QPSK	2507.5 - 2562.5	0.255	24.07	13M6G7D
		16QAM	2507.5 - 2562.5	0.203	23.08	13M6W7D
	10 MHz	QPSK	2505.0 - 2565.0	0.251	24.00	9M04G7D
		16QAM	2505.0 - 2565.0	0.200	23.01	9M05W7D
	5 MHz	QPSK	2502.5 - 2567.5	0.242	23.84	4M54G7D
		16QAM	2502.5 - 2567.5	0.188	22.74	4M54W7D
LTE Band 41(PC2)	20 MHz	QPSK	2506.0 - 2680.0	0.495	26.95	18M0G7D
		16QAM	2506.0 - 2680.0	0.382	25.82	18M0W7D
	15 MHz	QPSK	2503.5 - 2682.5	0.503	27.02	13M5G7D
		16QAM	2503.5 - 2682.5	0.376	25.75	13M5W7D
	10 MHz	QPSK	2501.0 - 2685.0	0.505	27.04	9M04G7D
		16QAM	2501.0 - 2685.0	0.382	25.82	9M01W7D
	5 MHz	QPSK	2498.5 - 2687.5	0.480	26.82	4M53G7D
		16QAM	2498.5 - 2687.5	0.374	25.73	4M53W7D
LTE Band 41(PC3)/38	20 MHz	QPSK	2506.0 - 2680.0	0.334	25.24	17M9G7D
		16QAM	2506.0 - 2680.0	0.277	24.43	17M9W7D
	15 MHz	QPSK	2503.5 - 2682.5	0.334	25.24	13M4G7D
		16QAM	2503.5 - 2682.5	0.271	24.34	13M5W7D
	10 MHz	QPSK	2501.0 - 2685.0	0.330	25.19	9M05G7D
		16QAM	2501.0 - 2685.0	0.273	24.36	8M98W7D
	5 MHz	QPSK	2498.5 - 2687.5	0.324	25.11	4M51G7D
		16QAM	2498.5 - 2687.5	0.273	24.37	4M51W7D

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 facility located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. 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 located in Yongin-si, Gyeonggi-do, 16954, South Korea.

- PCTEST is an ISO 17025-2017 accredited test facility under the National Voluntary Laboratory Accreditation Program (NVLAP) with Certificate number 600143-0 for Specific Absorption Rate (SAR), 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 (26168) 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 **Samsung Portable Handset FCC ID: A3LSMA135U**. 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 27.

Test Device Serial No.: 0336M, 0436M, 0444M, 0736M, 0764M, 0767M, 0874M, 4500M

2.2 Device Capabilities

This device contains the following capabilities:



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

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.

2.4 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

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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 414788 D01 v01r01.



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	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

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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
Agilent	E5515C	WIRELESS COMMUNICATION TEST SET	2021-02-19	Annual	2022-02-18	MY50262130
Agilent	N9030A	PXA Signal Analyzer	2021-07-06	Annual	2022-07-05	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	2021-07-07	Annual	2022-07-06	6201300731
Anritsu	MA24106A	USB Power Sensor	2021-07-07	Annual	2022-07-06	1244512
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	2020-10-29	Biennial	2022-10-28	10160045
Com-Power	PAM-118A	Preamplifier	2021-07-07	Annual	2022-07-06	551042
Espec	SH-242	Environmental Chamber	2021-09-15	Annual	2022-09-14	93011064
Fairview Microwave	FM2CP1122-10	Coupler	2021-07-07	Annual	2022-07-06	1946
Keysight Technologies	N9030B	MXA Signal Analyzer	2021-05-11	Annual	2022-05-10	MY57142018
Mini Circuits	ZUDC10-83-S+	Coupler	2021-09-15	Annual	2022-09-14	2111
Mini-Circuits	BW-N10W5+	Attenuator	2021-07-06	Annual	2022-07-05	1607
Mini-Circuits	BW-N10W5+	Attenuator	2021-07-06	Annual	2022-07-05	1607
Rohde & Schwarz	SMBV100B	Signal Generator	2021-11-04	Annual	2022-11-03	101568
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2021-07-06	Annual	2022-07-05	116851
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2021-02-19	Annual	2022-02-18	131453
Rohde & Schwarz	ESW	EMI Test Receiver	2021-07-06	Annual	2022-07-05	101761
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2021-02-19	Annual	2022-02-18	102131
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	2021-07-13	Biennial	2023-07-12	9162-217
Schwarzbeck	UHA9105	Dipole Antenna	2020-07-09	Biennial	2022-07-08	91052522
Sunol	DRH-118	Horn Antenna	2021-07-14	Biennial	2023-07-13	A102416-1
Sunol	DRH-118	Horn Antenna	2021-01-12	Biennial	2023-01-11	A060215

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.

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6.0 SAMPLE CALCULATIONS

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: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMA135U
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): LTE

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions (LTE Band 30)	2.1051, 27.53(a)(4)	Undesirable emissions must meet the limits detailed in 27.53(a)(4)	PASS	Sections 7.3, 7.4
	Conducted Band Edge / Spurious Emissions (LTE Band 7, 38, 41)	2.1051, 27.53(m)	Undesirable emissions must meet the limits detailed in 27.53(m)	PASS	Sections 7.3, 7.4
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block	PASS	Section 7.7
RADIATED	Equivalent Isotropic Radiated Power (LTE Band 30)	27.50(a)(3)	≤ 250mW / 5MHz max. EIRP	PASS	Section 7.5
	Equivalent Isotropic Radiated Power (LTE Band 7, 38, 41)	27.50(h)(2)	≤ 2 Watts max. EIRP	PASS	Section 7.5
	Radiated Spurious Emissions (LTE Band 30)	2.1053, 27.53(a)(4)	Undesirable emissions must meet the limits detailed in 27.53(a)(4)	PASS	Section 7.6
	Radiated Spurious Emissions (LTE Band 7, 38, 41)	2.1053, 27.53(m)	Undesirable emissions must meet the limits detailed in 27.53(m)	PASS	Section 7.6

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 v1.0.

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7.2 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 x 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.

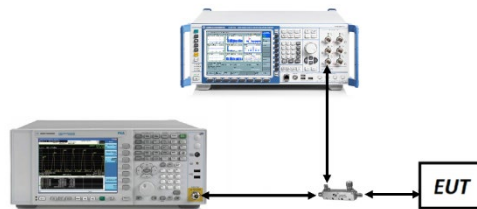


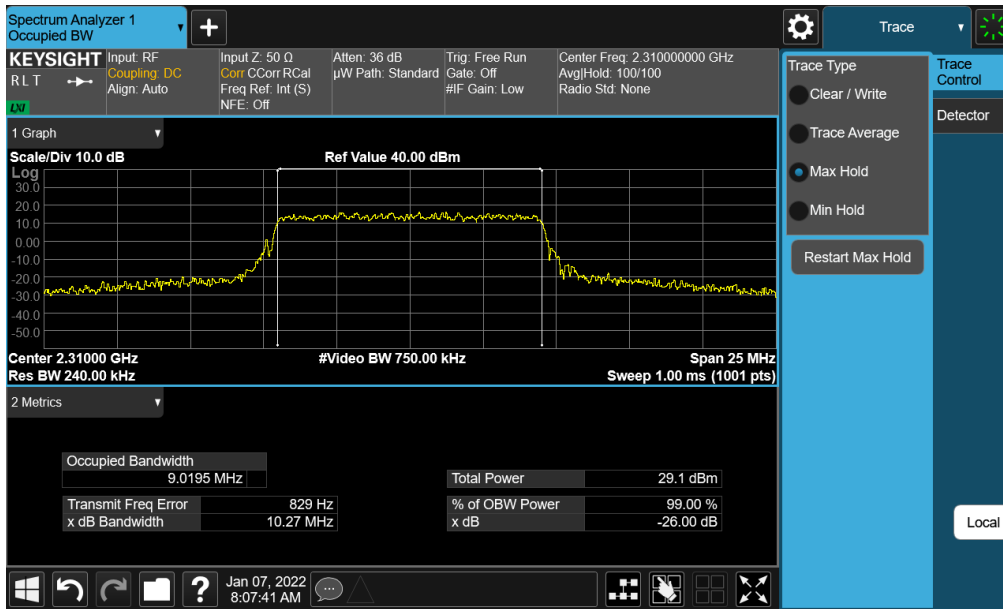
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

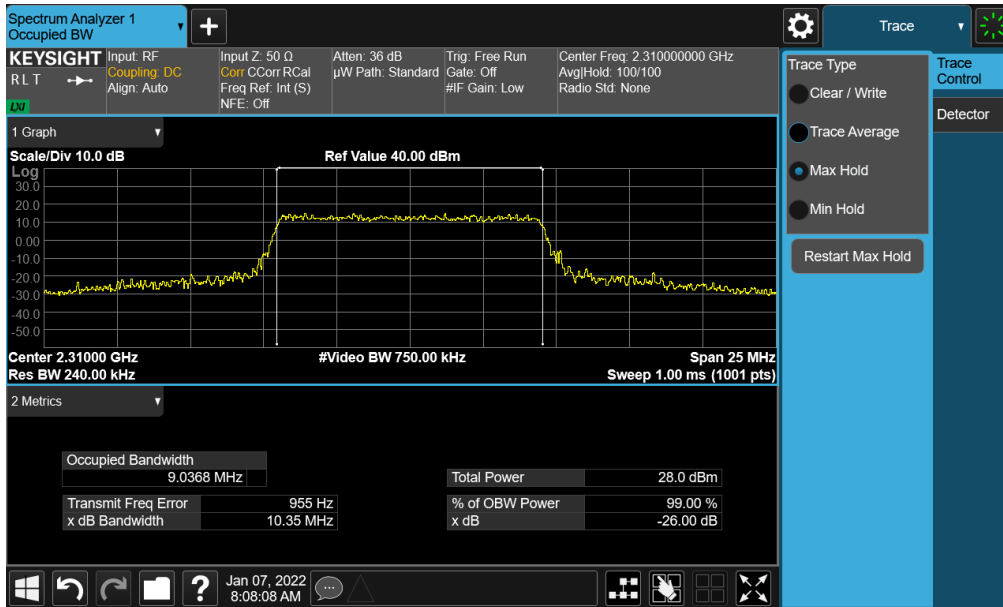
None.

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LTE Band 30

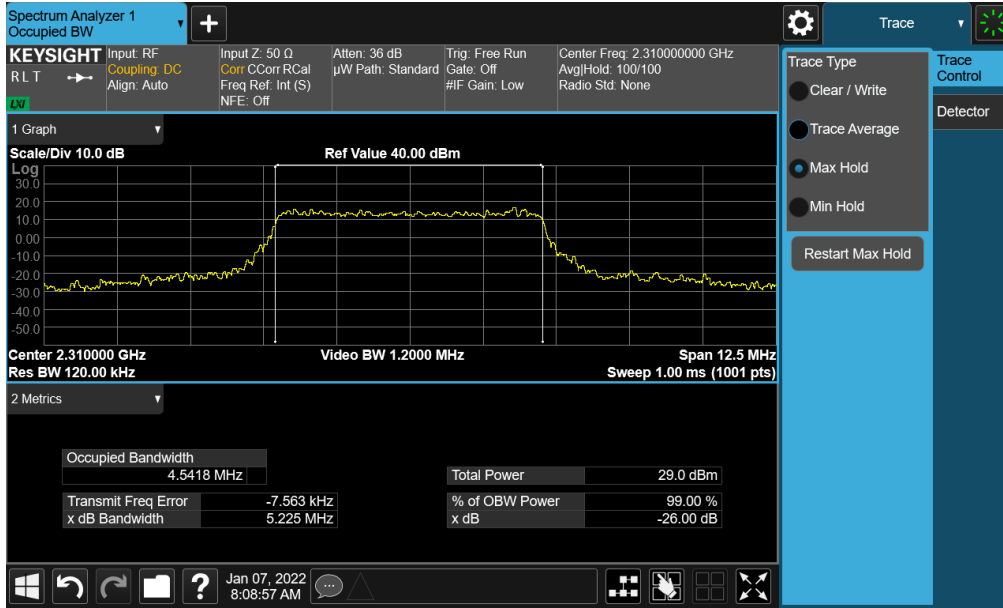


Plot 7-1. Occupied Bandwidth Plot (LTE Band 30 - 10MHz QPSK - Full RB)

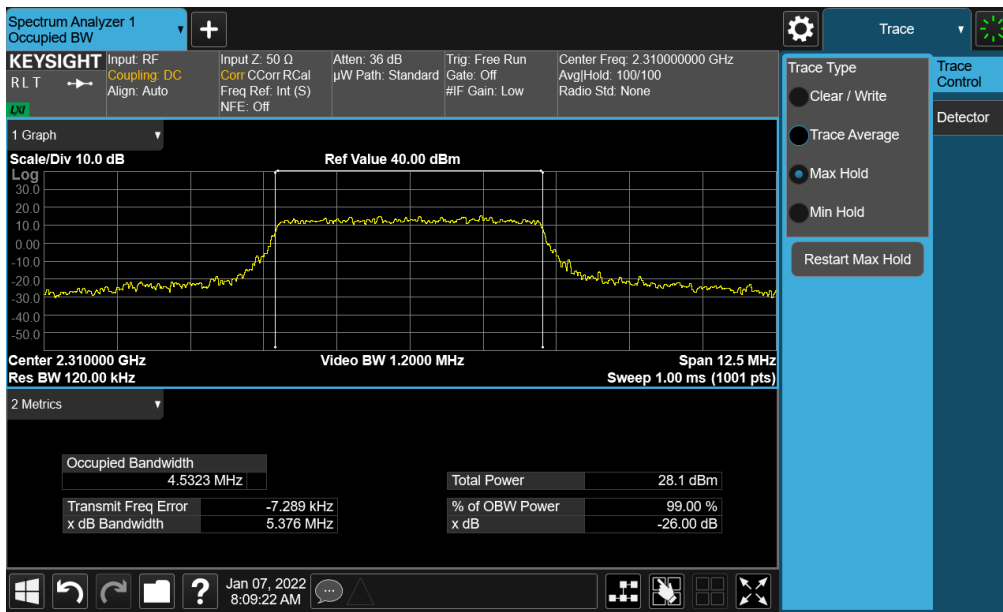


Plot 7-2. Occupied Bandwidth Plot (LTE Band 30 - 10MHz 16-QAM - Full RB)

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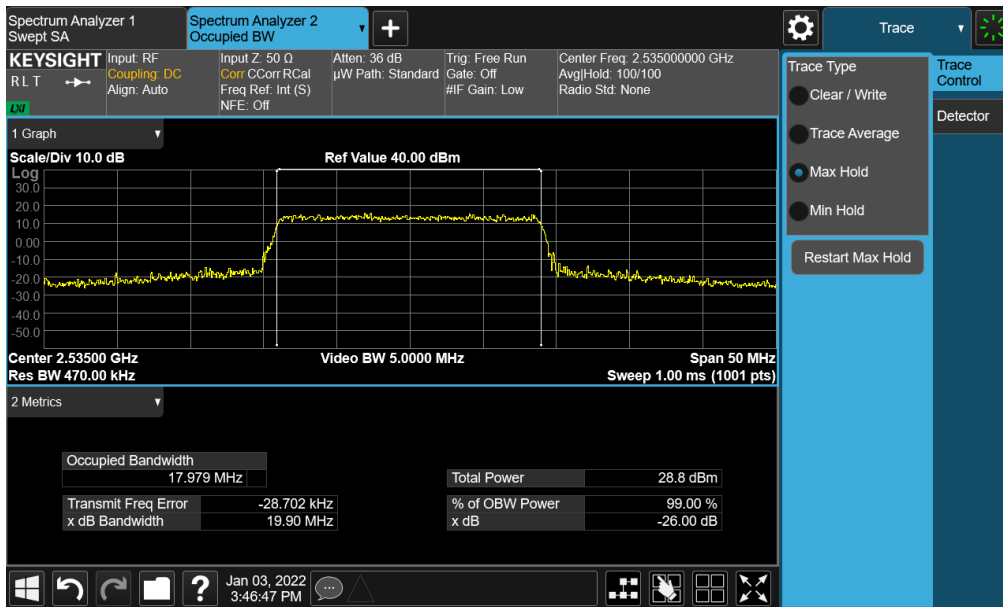
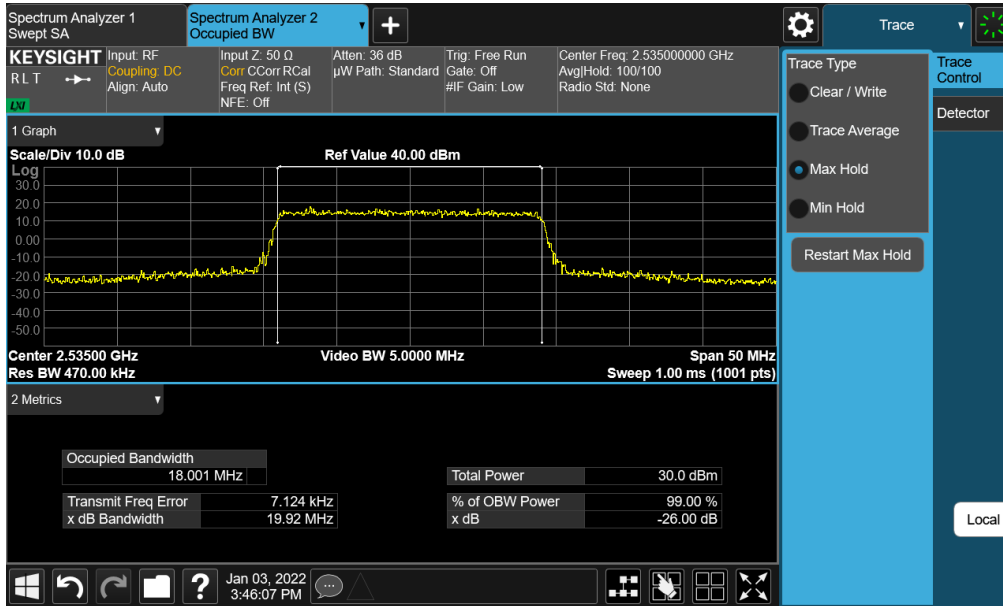
Plot 7-3. Occupied Bandwidth Plot (LTE Band 30 - 5MHz QPSK - Full RB)



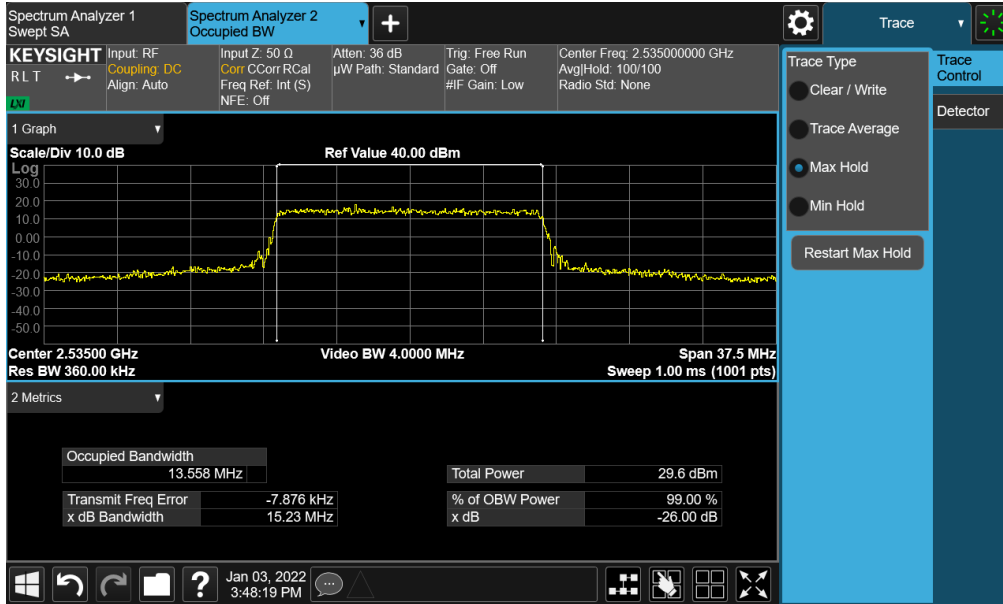
Plot 7-4. Occupied Bandwidth Plot (LTE Band 30 - 5MHz 16-QAM - Full RB)

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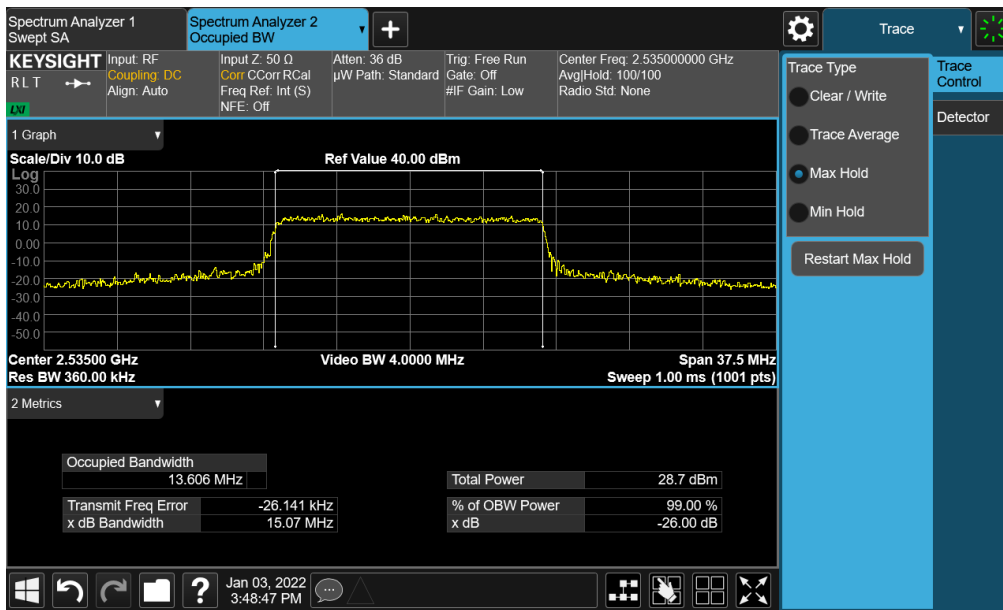
LTE Band 7



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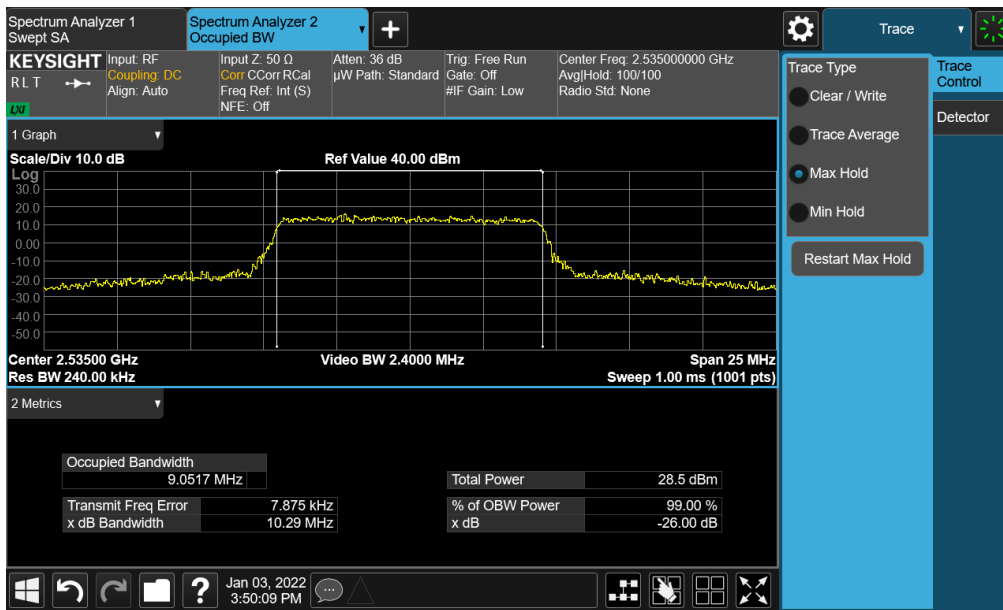
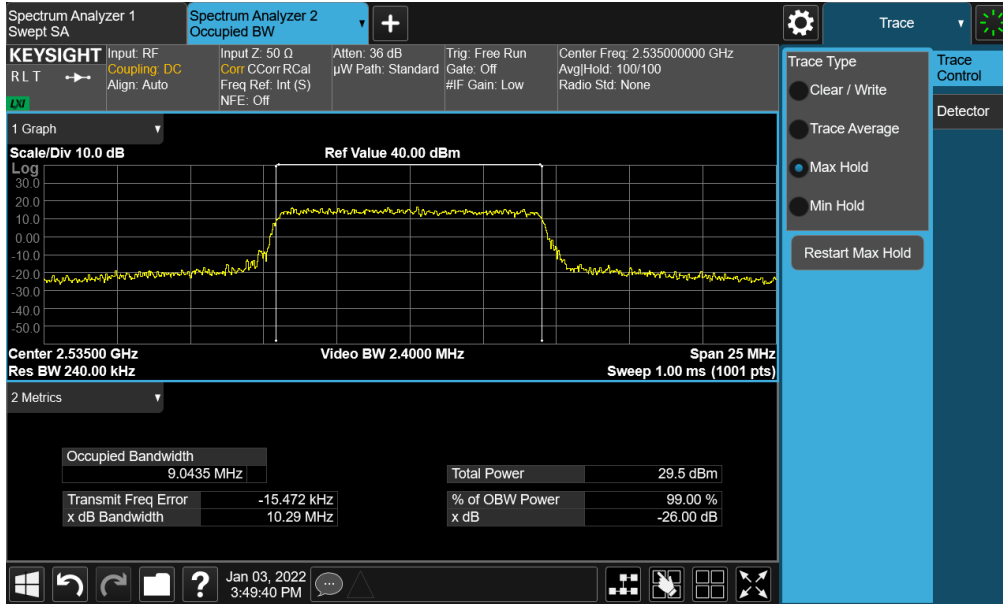


Plot 7-7. Occupied Bandwidth Plot (LTE Band 7 - 15MHz QPSK - Full RB)

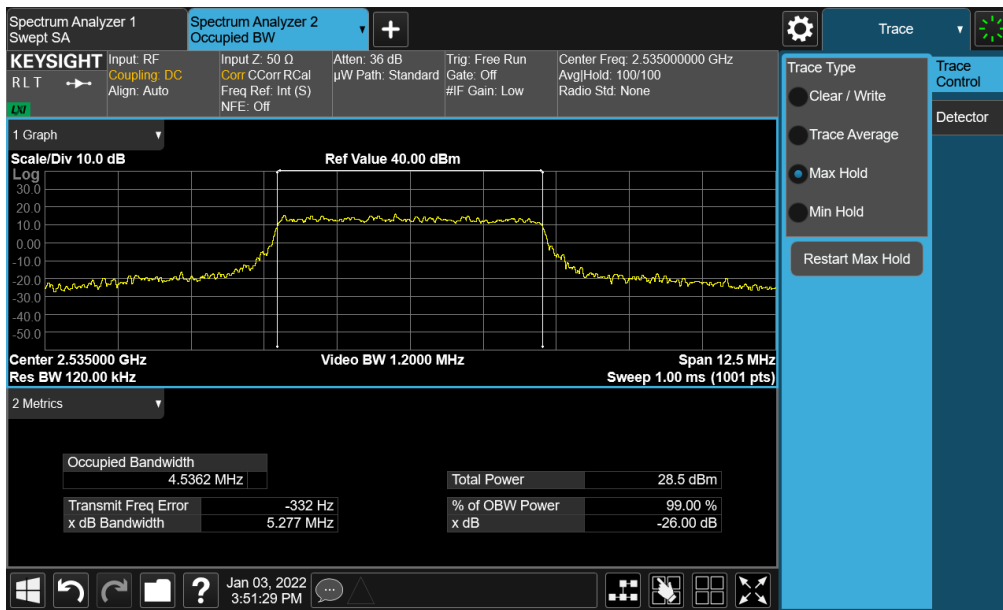
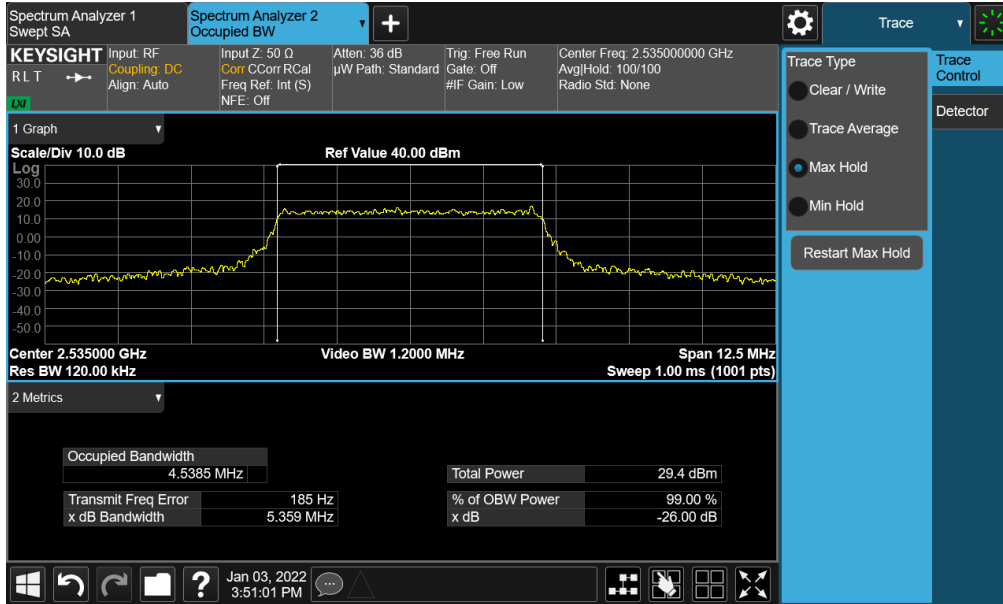


Plot 7-8. Occupied Bandwidth Plot (LTE Band 7 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 16 of 89

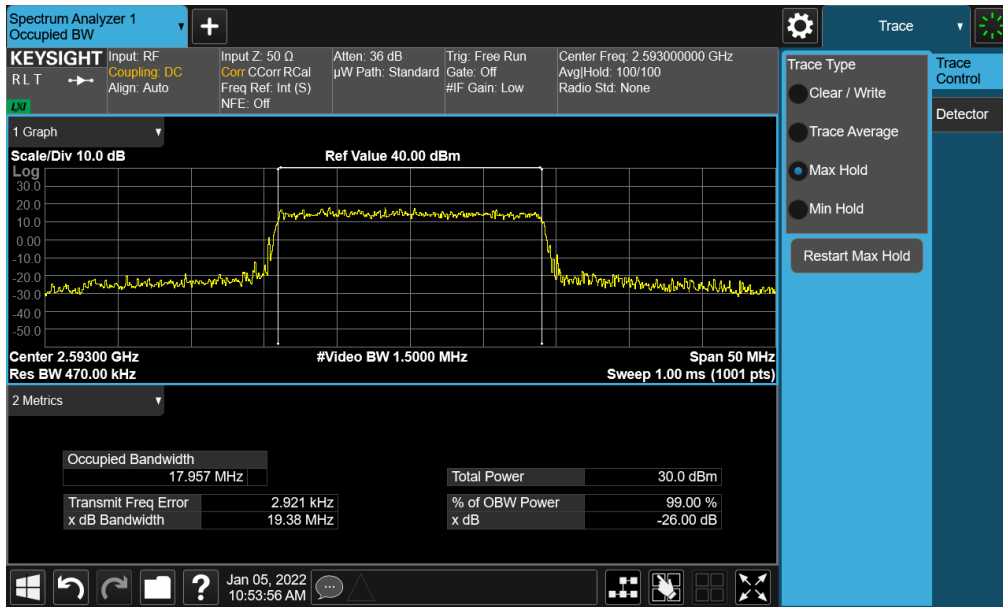
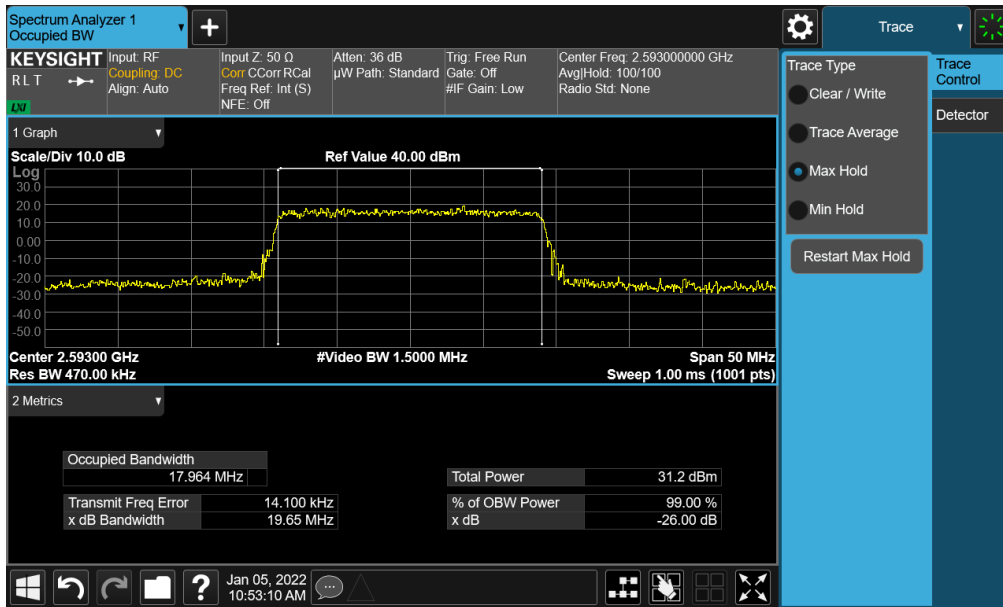


FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 17 of 89

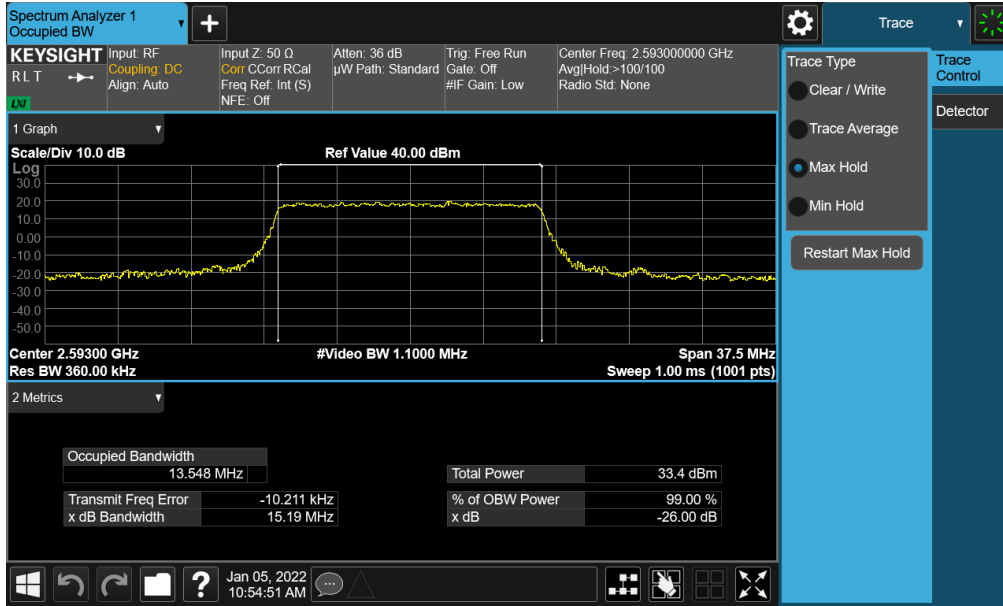


FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 18 of 89

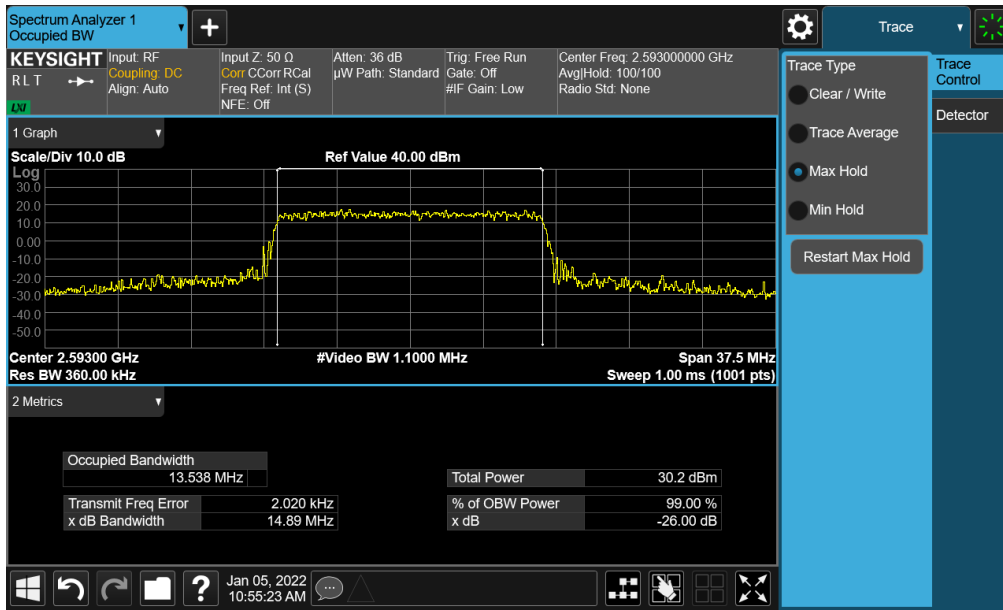
LTE Band 41(PC2)



FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 19 of 89

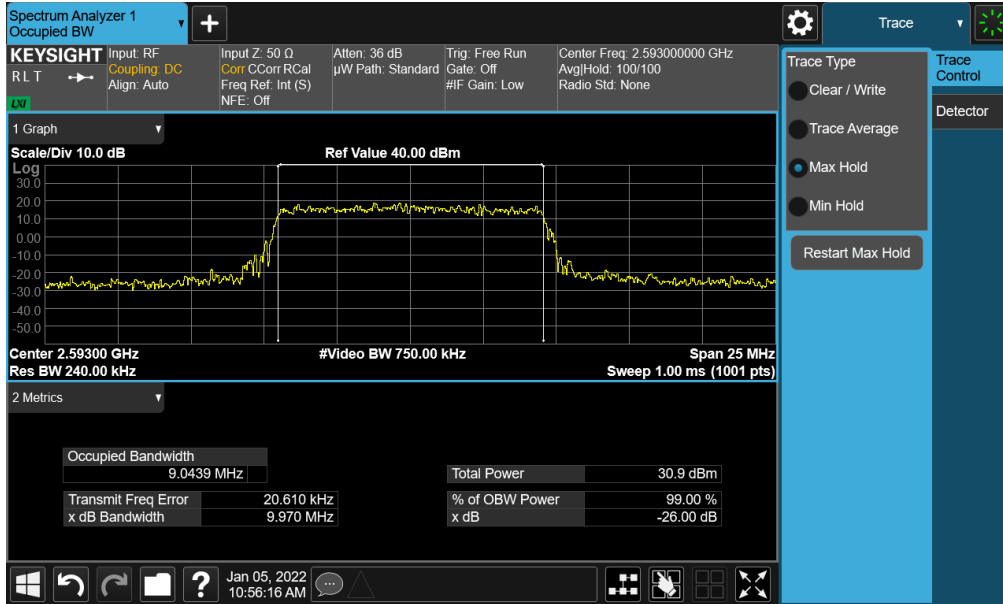


Plot 7-15. Occupied Bandwidth Plot (LTE Band 41(PC2) - 15MHz QPSK - Full RB)



Plot 7-16. Occupied Bandwidth Plot (LTE Band 41(PC2) - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 20 of 89

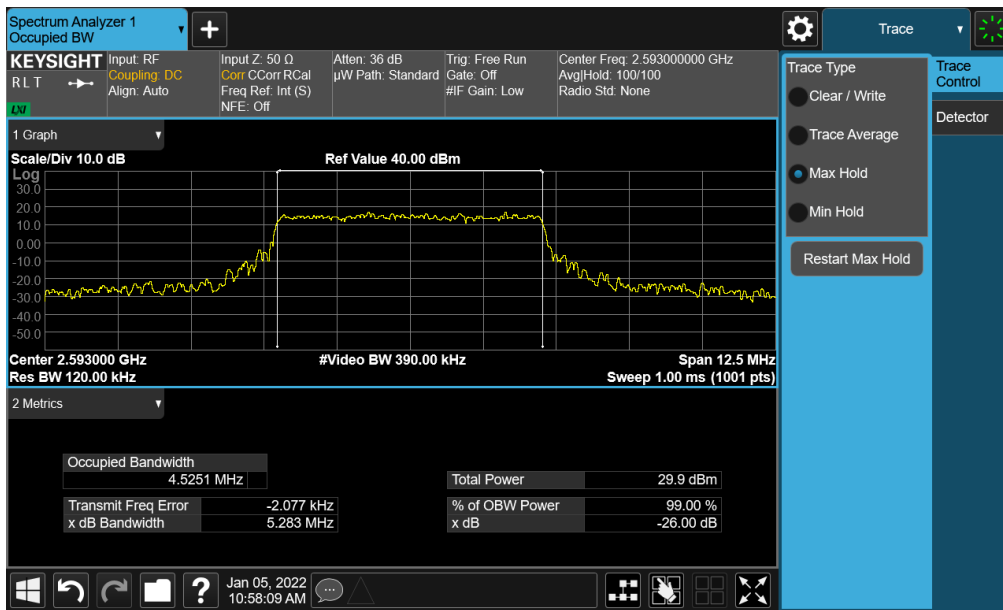
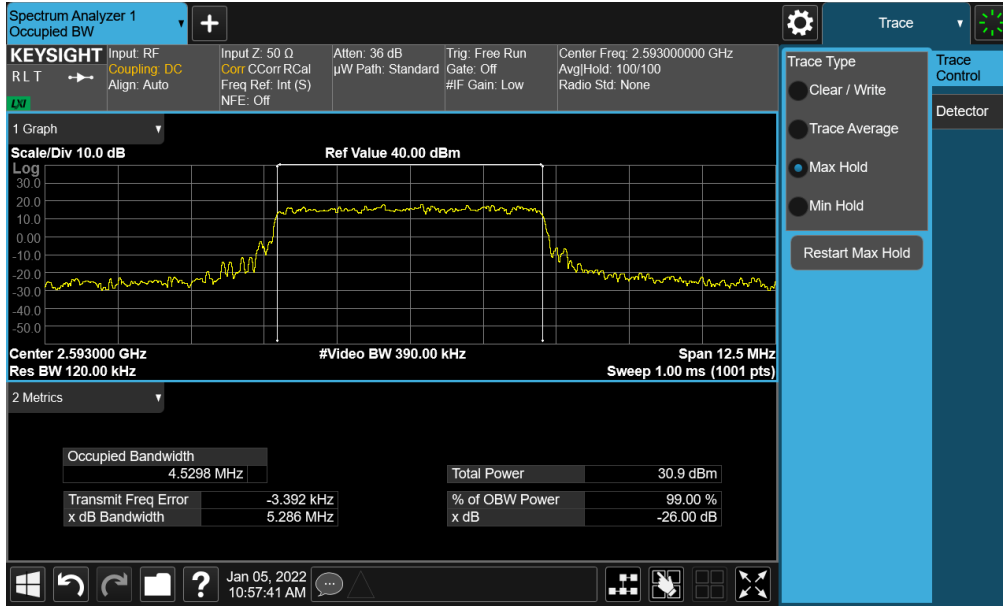


Plot 7-17. Occupied Bandwidth Plot (LTE Band 41(PC2) - 10MHz QPSK - Full RB)



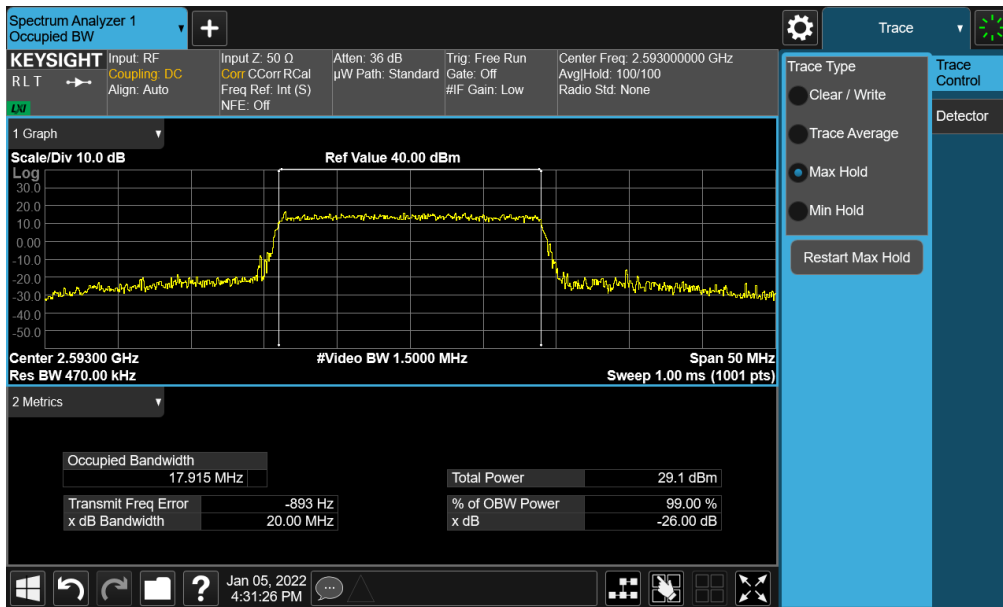
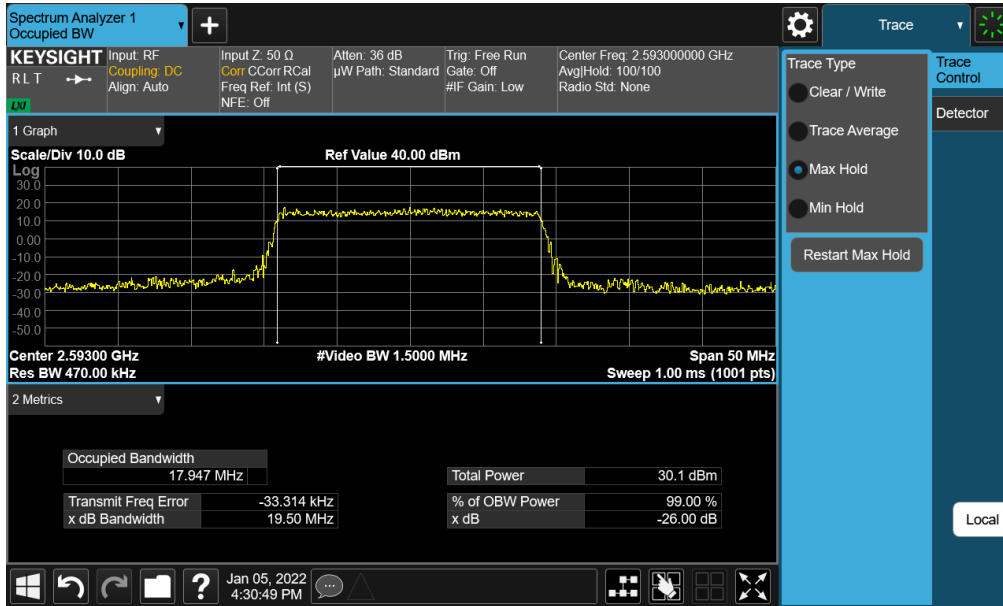
Plot 7-18. Occupied Bandwidth Plot (LTE Band 41(PC2) - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 21 of 89

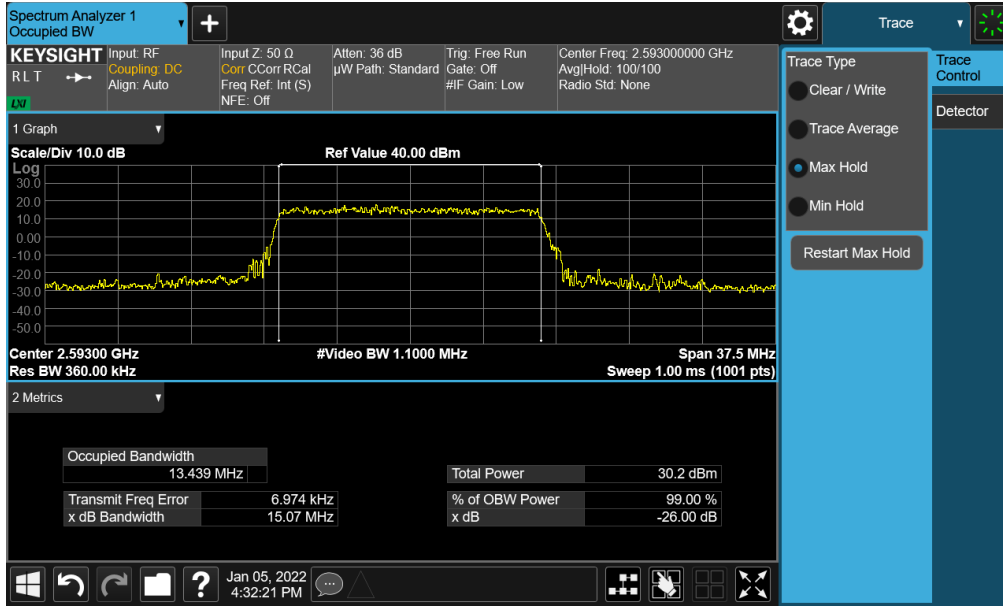


FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 22 of 89

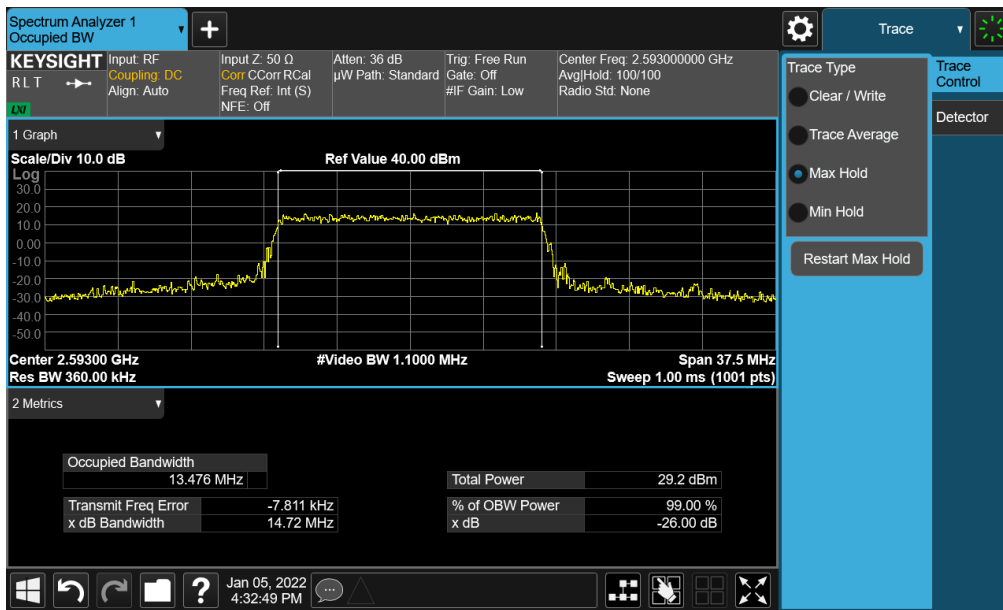
LTE Band 41(PC3)/38



FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 23 of 89

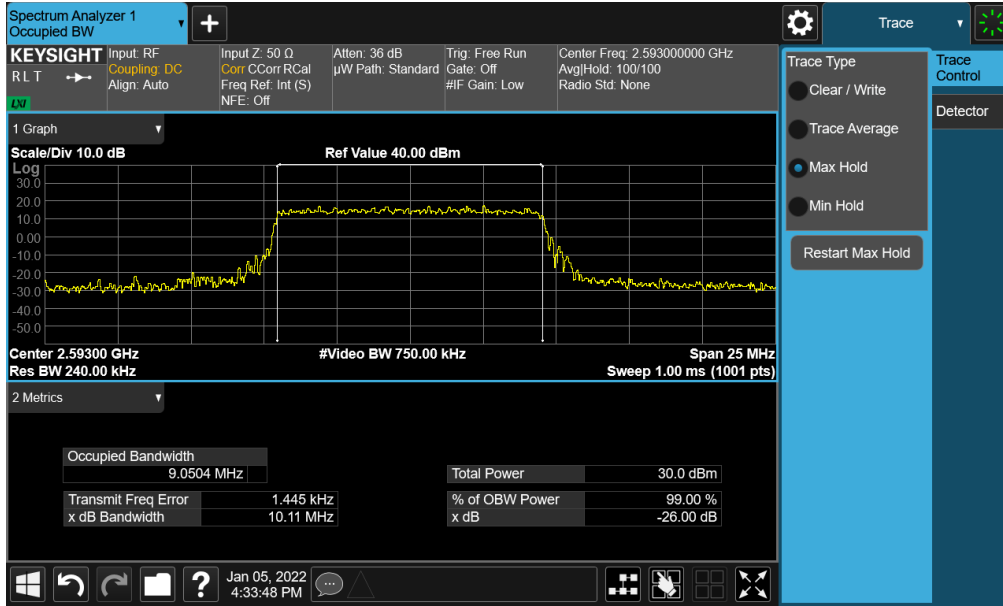


Plot 7-23. Occupied Bandwidth Plot (LTE Band 41(PC3)/38 - 15MHz QPSK - Full RB)

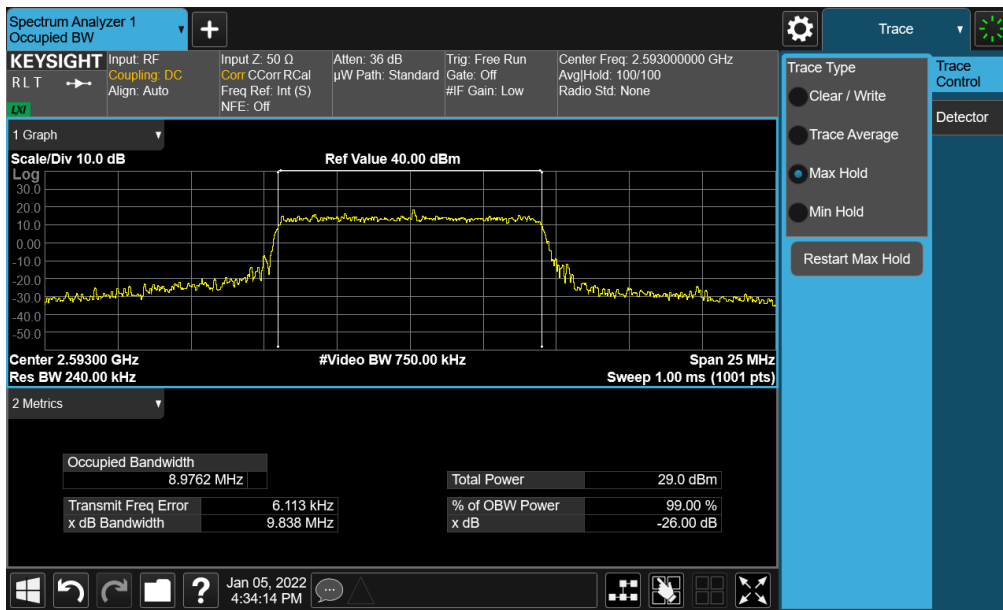


Plot 7-24. Occupied Bandwidth Plot (LTE Band 41(PC3)/38 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 24 of 89

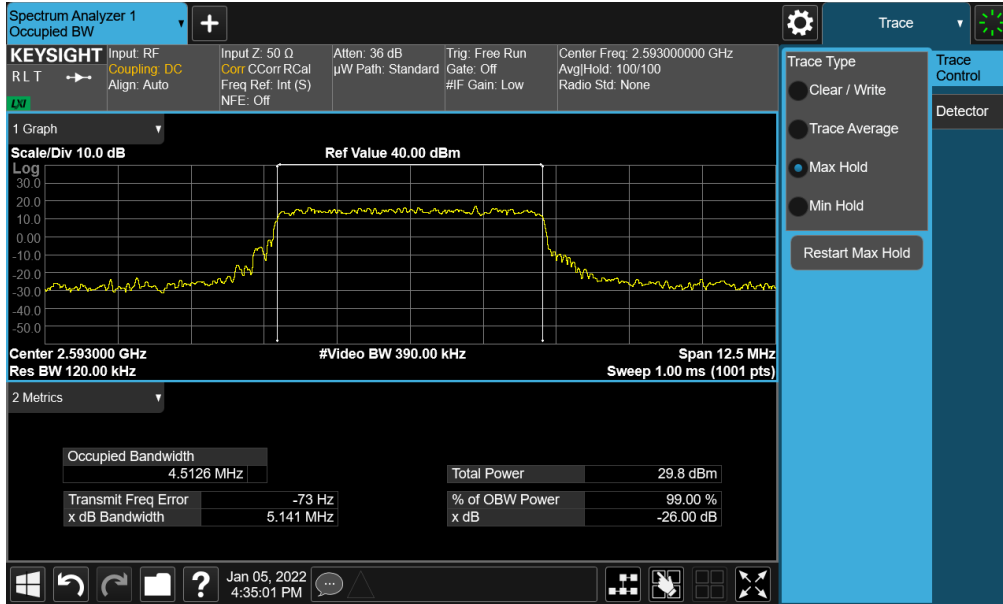


Plot 7-25. Occupied Bandwidth Plot (LTE Band 41(PC3)/38 - 10MHz QPSK - Full RB)

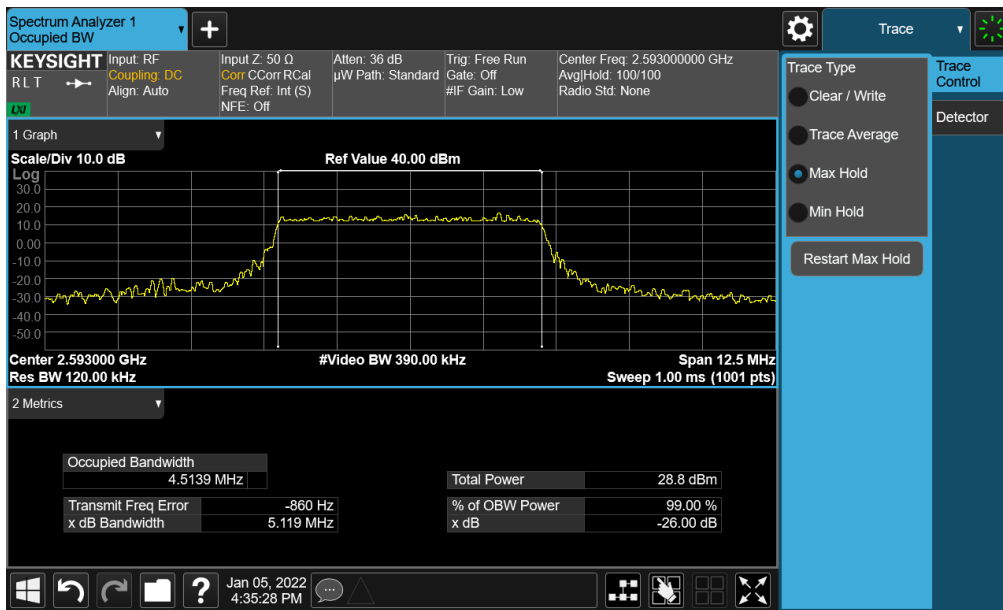


Plot 7-26. Occupied Bandwidth Plot (LTE Band 41(PC3)/38 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-27. Occupied Bandwidth Plot (LTE Band 41(PC3)/38 - 5MHz QPSK - Full RB)



Plot 7-28. Occupied Bandwidth Plot (LTE Band 41(PC3)/38 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 26 of 89

7.3 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 $43 + 10 \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

For Band 30, the minimum permissible attenuation level of any spurious emission <2288MHz and >2365MHz is $70 + 10 \log_{10}(P_{[Watts]})$.

For Band 7 and 41, the minimum permissible attenuation level of any spurious emission is $55 + 10 \log_{10}(P_{[Watts]})$.

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 10GHz (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.

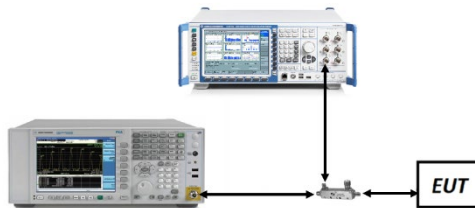




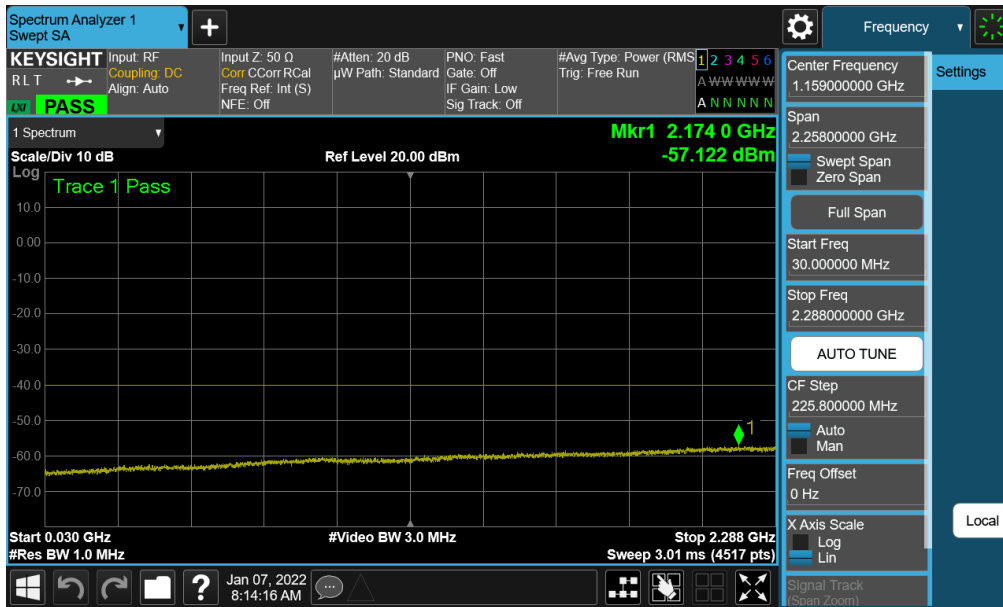
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

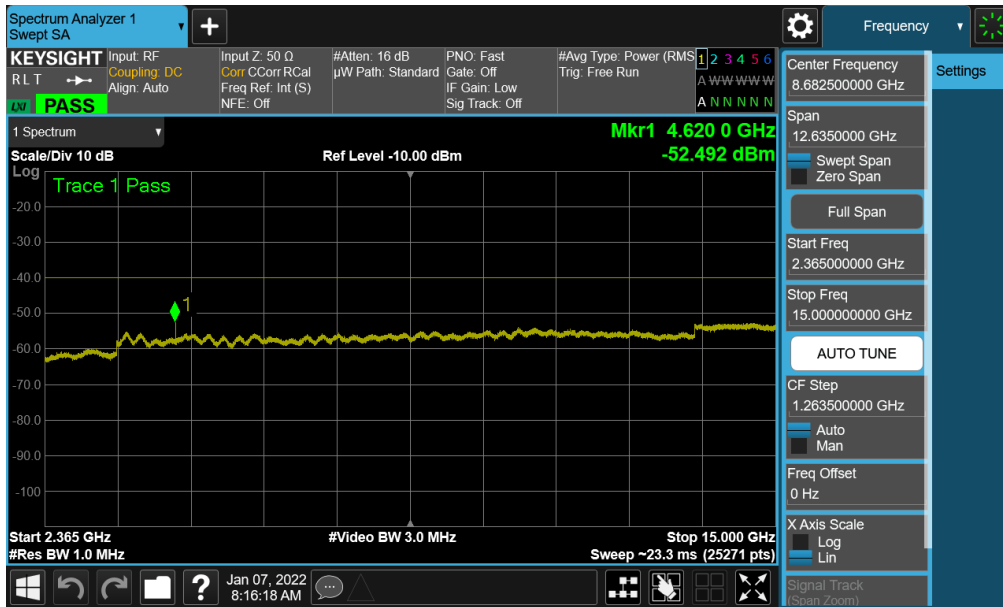
Per Part 27, RSS-195 and RSS-199, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution 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.

FCC ID: A3LSMA135U	 PART 27 MEASUREMENT REPORT 	Approved by: Technical Manager
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LTE Band 30

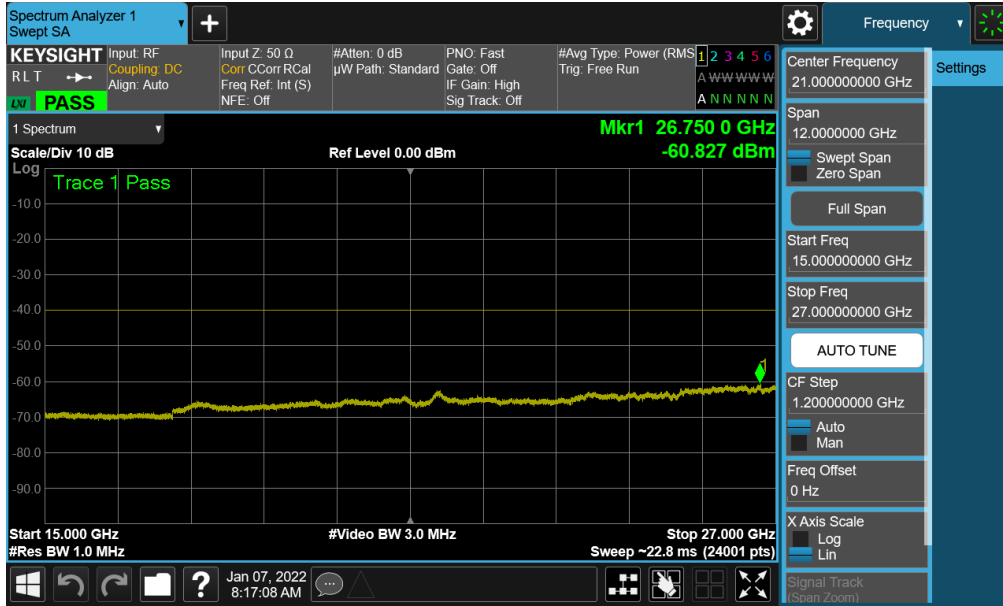


Plot 7-29. Conducted Spurious Plot (LTE Band 30 - 10MHz QPSK - RB Size 1, RB Offset 0)



Plot 7-30. Conducted Spurious Plot (LTE Band 30 - 10MHz QPSK - RB Size 1, RB Offset 0)

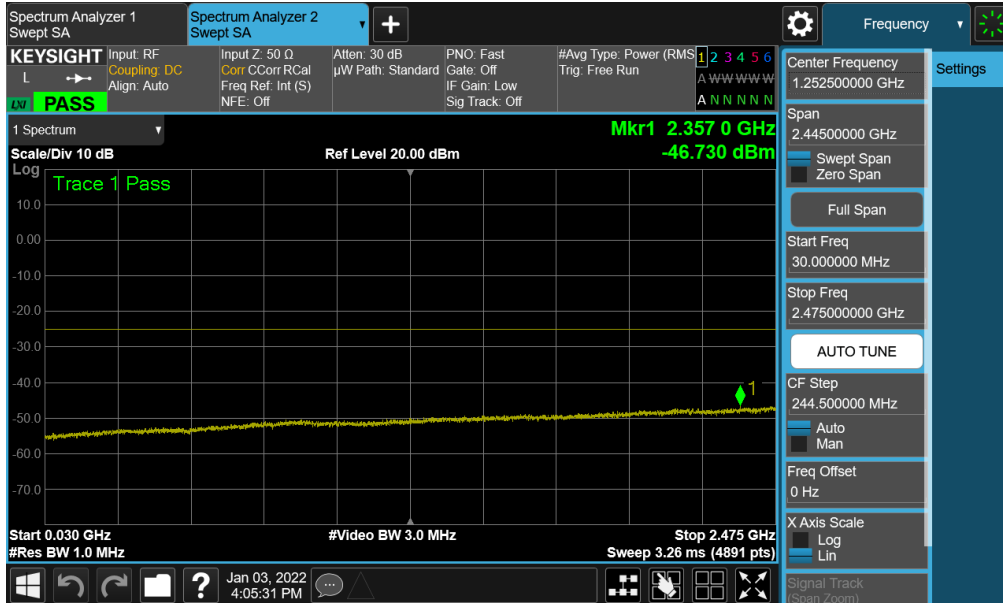
FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 28 of 89



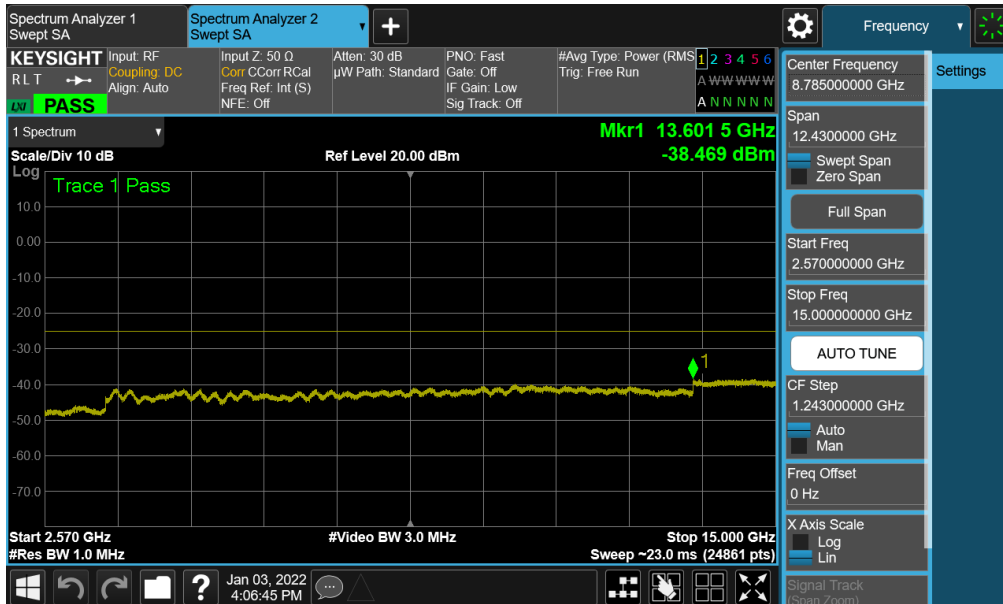
Plot 7-31. Conducted Spurious Plot (LTE Band 30 - 10MHz QPSK - RB Size 1, RB Offset 0)

<p>FCC ID: A3LSMA135U</p>	<p>PCTEST Proud to be part of element</p> <p>PART 27 MEASUREMENT REPORT</p>	<p>Approved by: Technical Manager</p>
<p>Test Report S/N: 1M2112270166-05.A3L</p>	<p>Test Dates: 01/03/2022 – 02/07/2022</p>	<p>EUT Type: Portable Handset</p> <p>Page 29 of 89</p>

LTE Band 7

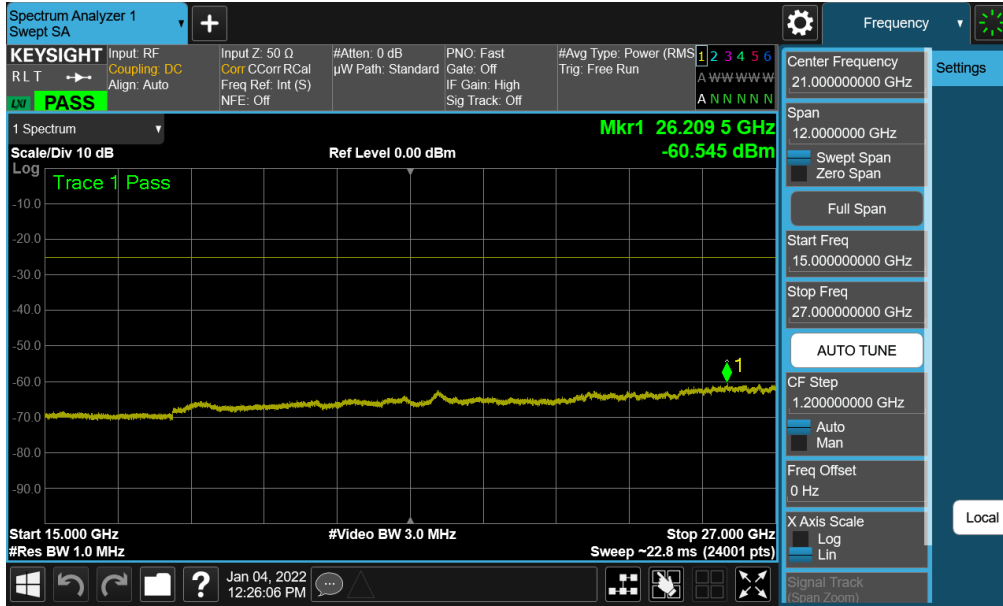


Plot 7-32. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

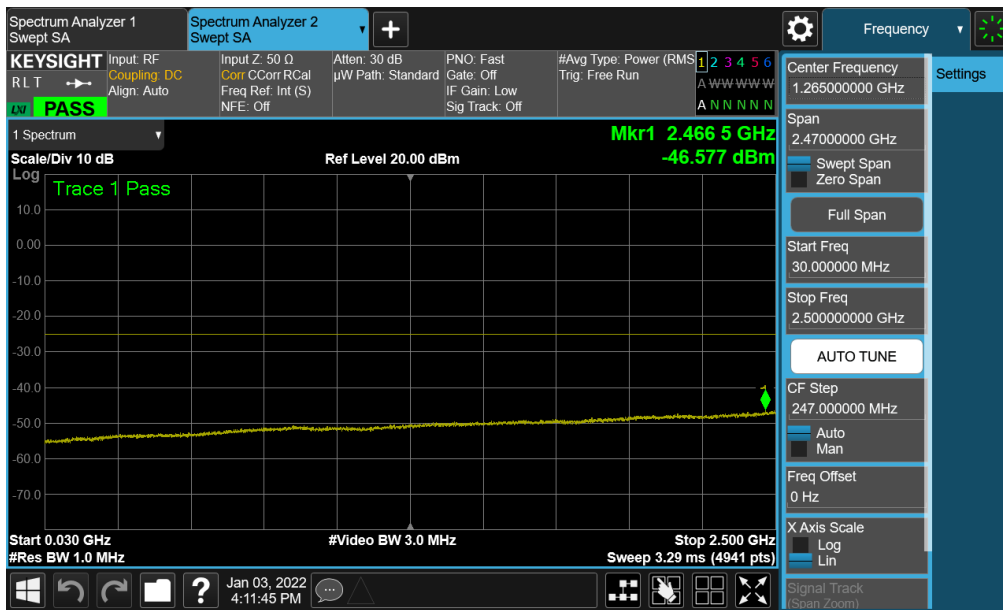


Plot 7-33. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 30 of 89

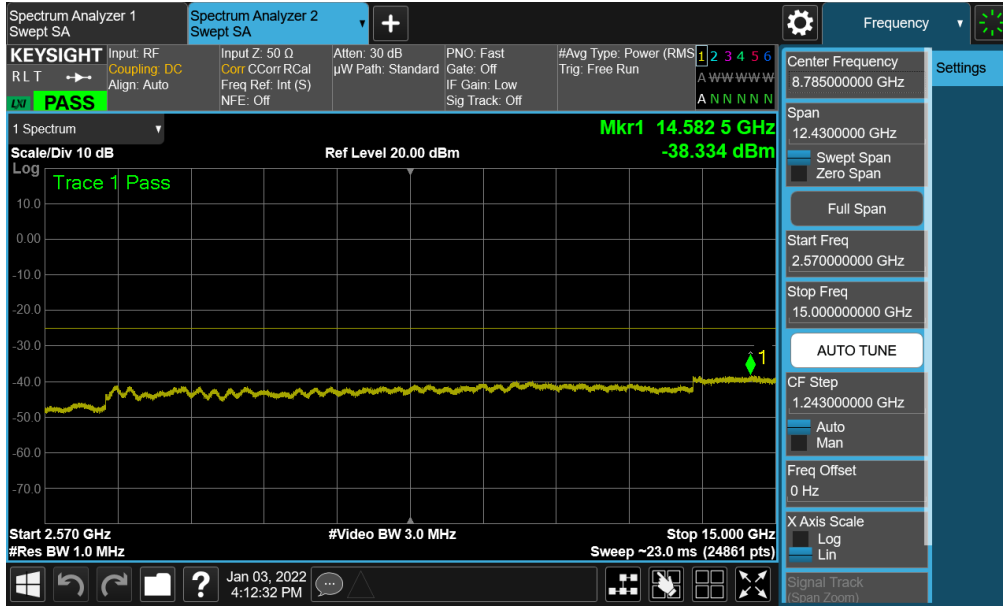


Plot 7-34. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

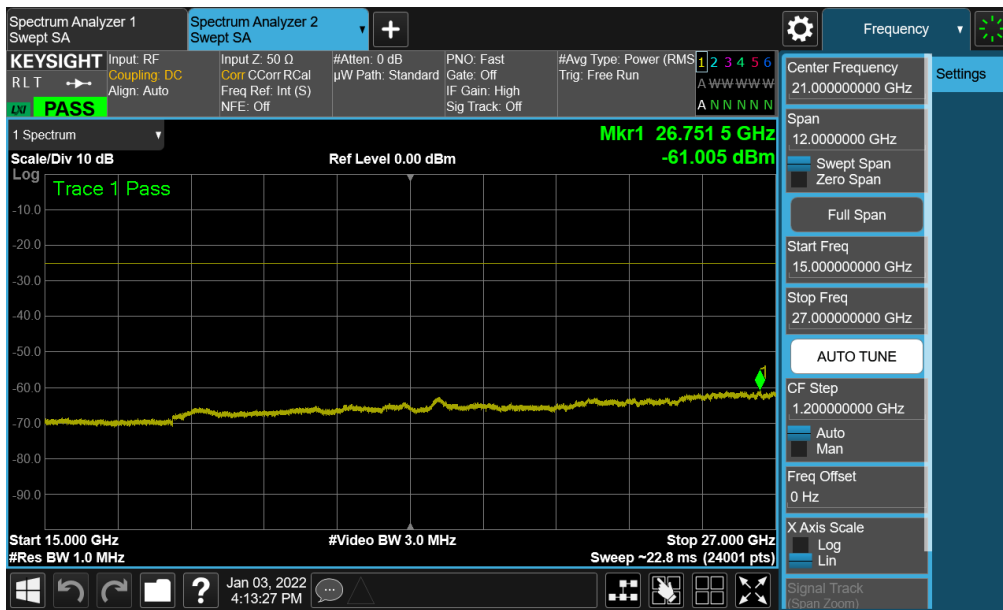


Plot 7-35. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 31 of 89

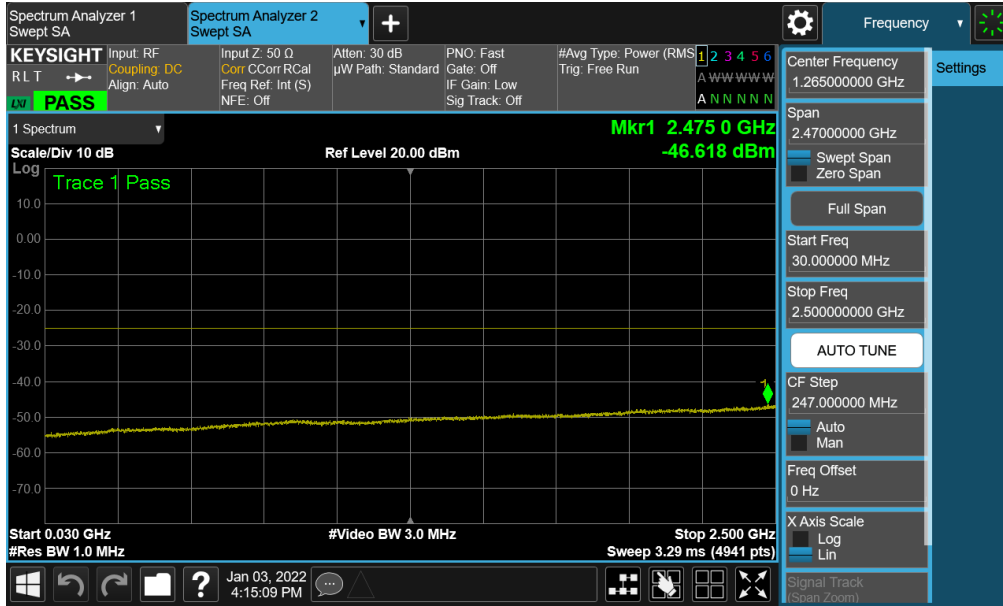


Plot 7-36. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

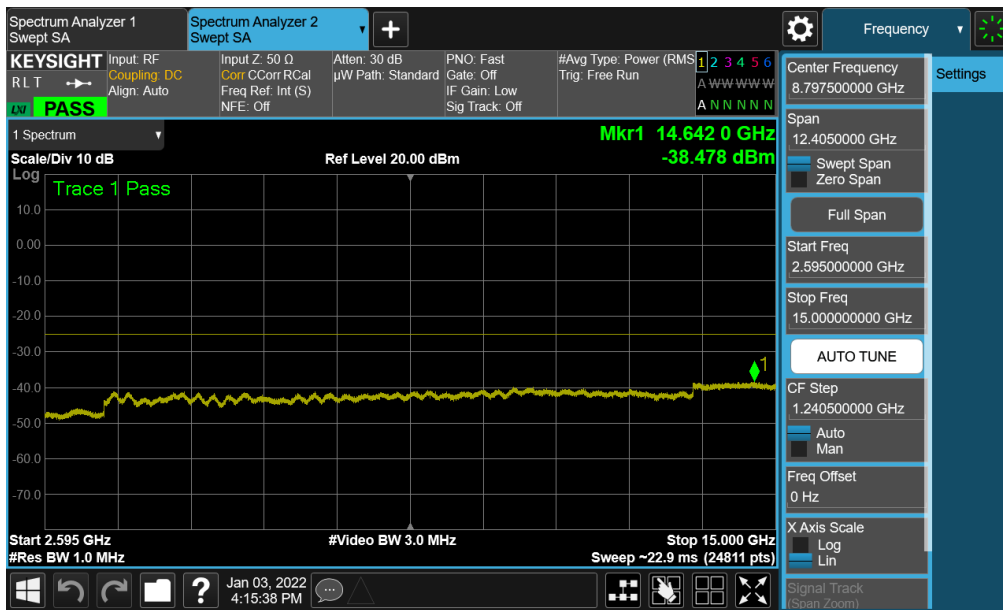


Plot 7-37. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 32 of 89

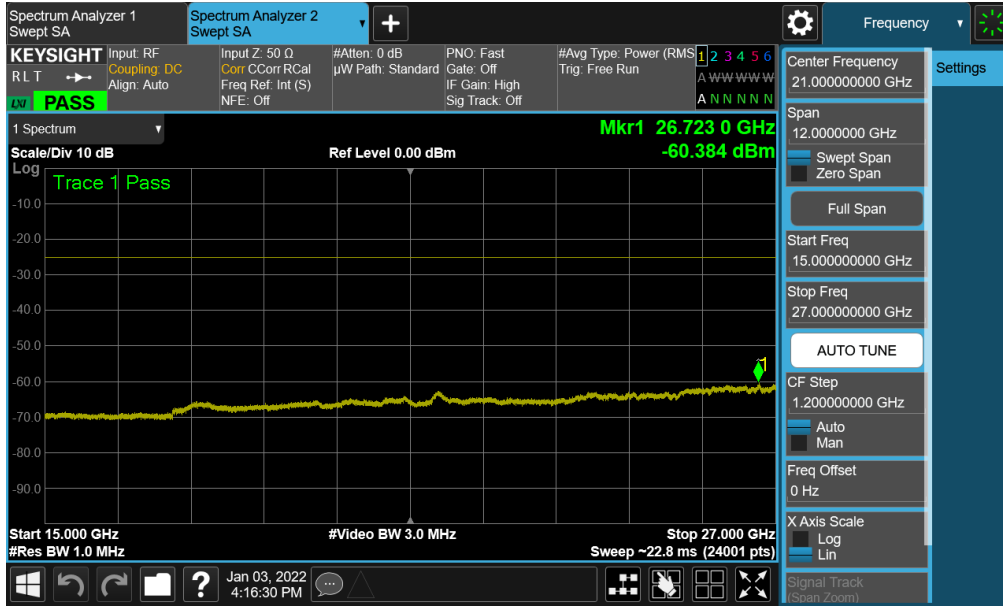


Plot 7-38. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-39. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

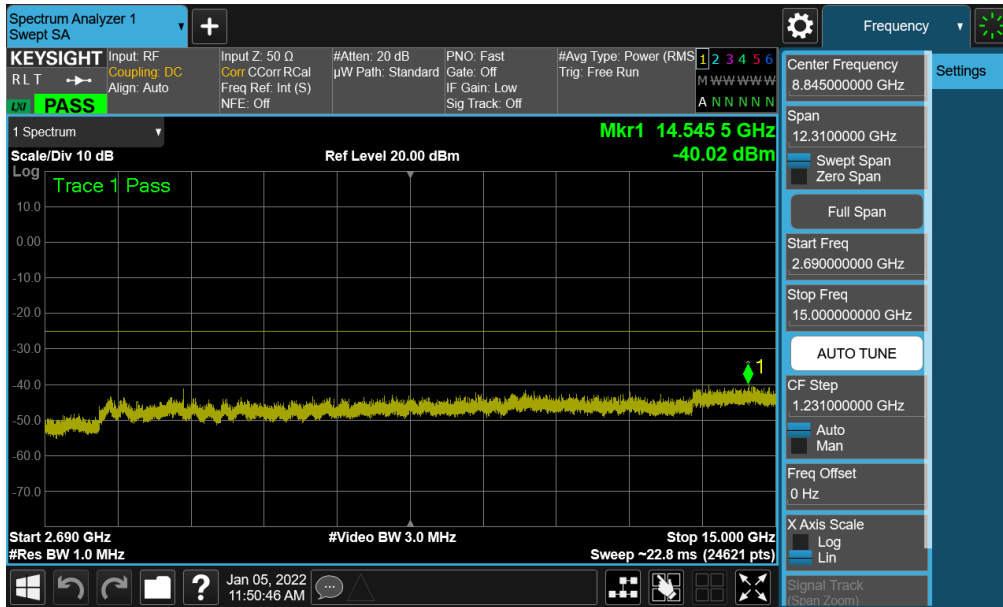
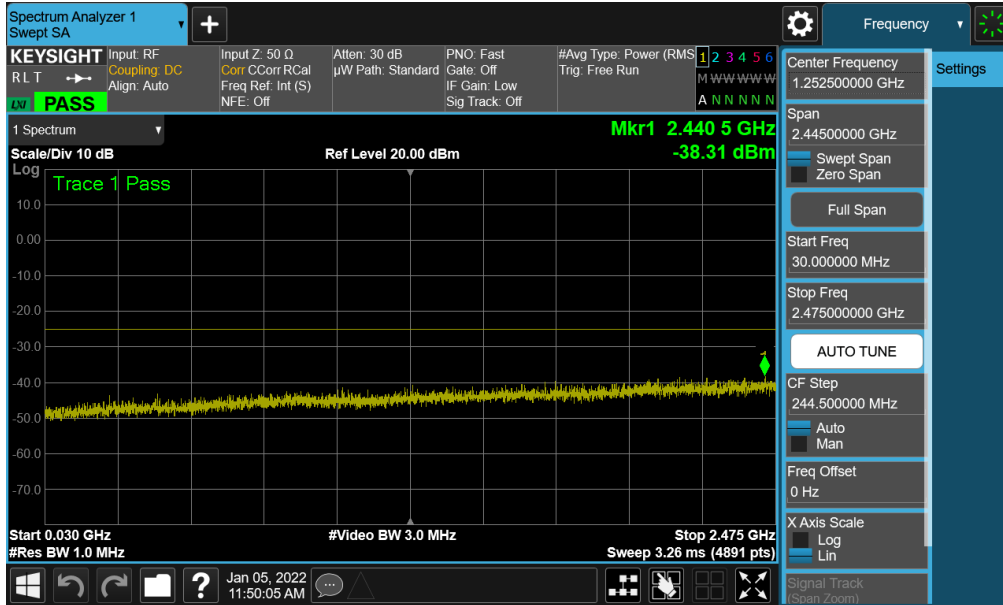
FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2112270166-05.A3L	Test Dates: 01/03/2022 – 02/07/2022	EUT Type: Portable Handset		Page 33 of 89



Plot 7-40. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

<p>FCC ID: A3LSMA135U</p>		<p align="center">PART 27 MEASUREMENT REPORT</p>	<p>Approved by: Technical Manager</p>
<p>Test Report S/N: 1M2112270166-05.A3L</p>	<p>Test Dates: 01/03/2022 – 02/07/2022</p>	<p>EUT Type: Portable Handset</p>	<p>Page 34 of 89</p>

LTE Band 41(PC2)



FCC ID: A3LSMA135U	PCTEST Proud to be part of element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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