



MEASUREMENT REPORT

FCC Part 30 5G mmWave

Applicant Name:

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

Date of Testing:

02/18/2020 – 03/06/2020

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

8K20012202-01-R1.A3L

FCC ID:

A3LAT1K02-A10

APPLICANT:

Samsung Electronics Co., Ltd.

Model:

AT1K02-A10

Application Type:

Certification

EUT Type:

5G Access Unit

FCC Classification:

Part 30 Fixed Transmitter (5GB)

Test Procedure(s):

ANSI C63.26-2015, 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.

This revised Test Report (S/N: 8K20012202-01-R1.A3L) supersedes and replaces the previously issued test report (S/N: 8K20012202-01.A3L) 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.

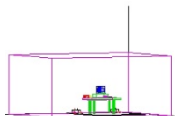

Randy Ortanez
President

FCC ID: A3LAT1K02-A10		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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T A B L E O F C O N T E N T S

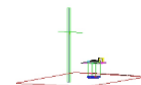
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FCC Part 30



Bandwidth (MHz)	Mode	FCC Rule Part	Antenna	Tx Frequency (MHz)	EIRP Density		Emission Designator	Modulation
					Max. Power (W/100MHz)	Max. Power (dBm/100MHz)		
50	TDD(1CC)	30	A	37000 - 40000	91.840	49.63	46M2G7D	QPSK
	TDD(1CC)	30	A	37000 - 40000	90.580	49.57	46M2W7D	16QAM
	TDD(1CC)	30	A	37000 - 40000	89.543	49.52	46M2W7D	64QAM
100	TDD(1CC)	30	A	37000 - 40000	98.401	49.93	94M6G7D	QPSK
	TDD(1CC)	30	A	37000 - 40000	98.401	49.93	94M7W7D	16QAM
	TDD(1CC)	30	A	37000 - 40000	95.719	49.81	94M7W7D	64QAM
50	TDD(8CC)	30	A	37000 - 40000	89.749	49.53	393MG7D	QPSK
	TDD(8CC)	30	A	37000 - 40000	89.131	49.50	393MW7D	16QAM
	TDD(8CC)	30	A	37000 - 40000	89.749	49.53	393MW7D	64QAM
100	TDD(8CC)	30	A	37000 - 40000	33.963	45.31	788MG7D	QPSK
	TDD(8CC)	30	A	37000 - 40000	33.963	45.31	787MW7D	16QAM
	TDD(8CC)	30	A	37000 - 40000	34.041	45.32	787MW7D	64QAM
50	TDD(1CC)	30	B	37000 - 40000	107.159	50.30	46M4G7D	QPSK
	TDD(1CC)	30	B	37000 - 40000	106.667	50.28	46M3W7D	16QAM
	TDD(1CC)	30	B	37000 - 40000	106.913	50.29	46M3W7D	64QAM
100	TDD(1CC)	30	B	37000 - 40000	102.329	50.10	94M6G7D	QPSK
	TDD(1CC)	30	B	37000 - 40000	105.682	50.24	94M7W7D	16QAM
	TDD(1CC)	30	B	37000 - 40000	106.170	50.26	94M6W7D	64QAM
50	TDD(8CC)	30	B	37000 - 40000	86.105	49.35	393MG7D	QPSK
	TDD(8CC)	30	B	37000 - 40000	86.702	49.38	393MW7D	16QAM
	TDD(8CC)	30	B	37000 - 40000	86.304	49.36	393MW7D	64QAM
100	TDD(8CC)	30	B	37000 - 40000	45.290	46.56	787MG7D	QPSK
	TDD(8CC)	30	B	37000 - 40000	44.566	46.49	788MW7D	16QAM
	TDD(8CC)	30	B	37000 - 40000	44.463	46.48	787MW7D	64QAM
50	TDD(1CC)	30	C	37000 - 40000	79.256	48.99	46M2G7D	QPSK
	TDD(1CC)	30	C	37000 - 40000	79.438	49.00	46M2W7D	16QAM
	TDD(1CC)	30	C	37000 - 40000	79.438	49.00	46M2W7D	64QAM
100	TDD(1CC)	30	C	37000 - 40000	94.406	49.75	94M7G7D	QPSK
	TDD(1CC)	30	C	37000 - 40000	97.949	49.91	94M6W7D	16QAM
	TDD(1CC)	30	C	37000 - 40000	97.949	49.91	94M6W7D	64QAM
50	TDD(8CC)	30	C	37000 - 40000	75.341	48.77	393MG7D	QPSK
	TDD(8CC)	30	C	37000 - 40000	74.995	48.75	393MW7D	16QAM
	TDD(8CC)	30	C	37000 - 40000	75.167	48.76	393MW7D	64QAM
100	TDD(8CC)	30	C	37000 - 40000	42.756	46.31	787MG7D	QPSK
	TDD(8CC)	30	C	37000 - 40000	41.020	46.13	788MW7D	16QAM
	TDD(8CC)	30	C	37000 - 40000	40.926	46.12	788MW7D	64QAM
50	TDD(1CC)	30	D	37000 - 40000	94.630	49.76	46M2G7D	QPSK
	TDD(1CC)	30	D	37000 - 40000	94.195	49.74	46M2W7D	16QAM
	TDD(1CC)	30	D	37000 - 40000	94.413	49.75	46M2W7D	64QAM
100	TDD(1CC)	30	D	37000 - 40000	92.683	49.67	94M6G7D	QPSK
	TDD(1CC)	30	D	37000 - 40000	92.470	49.66	94M6W7D	16QAM
	TDD(1CC)	30	D	37000 - 40000	92.683	49.67	94M6W7D	64QAM
50	TDD(8CC)	30	D	37000 - 40000	73.456	48.66	393MG7D	QPSK
	TDD(8CC)	30	D	37000 - 40000	72.449	48.60	393MW7D	16QAM
	TDD(8CC)	30	D	37000 - 40000	75.514	48.78	392MW7D	64QAM
100	TDD(8CC)	30	D	37000 - 40000	47.424	46.76	787MG7D	QPSK
	TDD(8CC)	30	D	37000 - 40000	47.098	46.73	788MW7D	16QAM
	TDD(8CC)	30	D	37000 - 40000	46.666	46.69	788MW7D	64QAM

EUT Overview for Antenna A, B, C, and D

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Bandwidth (MHz)	Mode	FCC Rule Part	Antenna	Tx Frequency (MHz)	EIRP Density		Emission Designator	Modulation
					Max. Power (W/100MHz)	Max. Power (dBm/100MHz)		
50	TDD(1CC)	30	A+C	37000 - 40000	342.190	55.34	46M4G7D	QPSK
	TDD(1CC)	30	A+C	37000 - 40000	340.036	55.32	46M3W7D	16QAM
	TDD(1CC)	30	A+C	37000 - 40000	337.962	55.29	46M3W7D	64QAM
100	TDD(1CC)	30	A+C	37000 - 40000	192.807	52.85	94M6G7D	QPSK
	TDD(1CC)	30	A+C	37000 - 40000	196.350	52.93	94M7W7D	16QAM
	TDD(1CC)	30	A+C	37000 - 40000	193.668	52.87	94M7W7D	64QAM
50	TDD(8CC)	30	A+C	37000 - 40000	330.180	55.19	393MG7D	QPSK
	TDD(8CC)	30	A+C	37000 - 40000	328.252	55.16	393MW7D	16QAM
	TDD(8CC)	30	A+C	37000 - 40000	329.833	55.18	393MW7D	64QAM
100	TDD(8CC)	30	A+C	37000 - 40000	76.719	48.85	788MG7D	QPSK
	TDD(8CC)	30	A+C	37000 - 40000	74.983	48.75	788MW7D	16QAM
	TDD(8CC)	30	A+C	37000 - 40000	74.967	48.75	787MW7D	64QAM
50	TDD(1CC)	30	B+D	37000 - 40000	403.579	56.06	46M4G7D	QPSK
	TDD(1CC)	30	B+D	37000 - 40000	401.725	56.04	46M3W7D	16QAM
	TDD(1CC)	30	B+D	37000 - 40000	402.651	56.05	46M3W7D	64QAM
100	TDD(1CC)	30	B+D	37000 - 40000	195.012	52.90	94M7G7D	QPSK
	TDD(1CC)	30	B+D	37000 - 40000	198.152	52.97	94M7W7D	16QAM
	TDD(1CC)	30	B+D	37000 - 40000	198.853	52.99	94M6W7D	64QAM
50	TDD(8CC)	30	B+D	37000 - 40000	319.124	55.04	393MG7D	QPSK
	TDD(8CC)	30	B+D	37000 - 40000	318.302	55.03	393MW7D	16QAM
	TDD(8CC)	30	B+D	37000 - 40000	323.637	55.10	393MW7D	64QAM
100	TDD(8CC)	30	B+D	37000 - 40000	92.714	49.67	787MG7D	QPSK
	TDD(8CC)	30	B+D	37000 - 40000	91.663	49.62	788MW7D	16QAM
	TDD(8CC)	30	B+D	37000 - 40000	91.129	49.60	788MW7D	64QAM

EUT Overview for Antenna A + C and B + D

Notes:

The highest EIRP density values are reported from 8CC continuous and non-continuous configurations.

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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 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 in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 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 ISSED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISSED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung 5G Access Unit FCC ID: A3LAT1K02-A10**. The test data contained in this report pertains only to the emissions due to the EUT's 5G mmWave function.

The present document shall be constructed per the guidelines found in KDB 484596 D01 "Referencing Test Data" v01 which can be referred from 10.0 Appendix KDB 484596.

The EUT operates as a 4X4 MIMO system that consists of four antenna arrays (denoted herein as "Antenna A", "Antenna B", "Antenna C" and "Antenna D". Each of the four antenna arrays has 256 antenna elements for a total of 1024 antenna elements. Of the 4 antenna arrays, Antenna A and Antenna C have the same polarization (135 degrees from horizontal) and Antenna B and Antenna D have the same polarization (45 degrees from horizontal). Beamforming is used with Antenna A and Antenna C and it is also used with Antenna B and Antenna D. Signal correlation is possible between the outputs of all four antenna arrays.

This unit is powered by a nominal DC voltage source.

See Section 3.2 for the antenna polarization of the 5G Access Unit and the measurement antenna.

Test Device Serial No.: EP96-05558A

2.2 Device Capabilities

This device contains the following capabilities:

TDD of mmWave

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015 and KDB 971168 D01 v03. See Section 7.0 of this test report for a description of the radiated tests.

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BW	Configuration	Channel	CC	Frequency(MHz)
50M	1CC	Low	CC0	37024.98
		Mid	CC0	38499.96
		High	CC0	39975.00
	8CC contiguous	Low	CC0	37025.04
			CC1	37075.08
			CC2	37125.12
			CC3	37175.16
			CC4	37225.20
			CC5	37275.24
			CC6	37325.28
			CC7	37375.32
		Mid	CC0	38325.00
			CC1	38375.04
			CC2	38425.08
			CC3	38475.12
			CC4	38525.16
			CC5	38575.20
			CC6	38625.24
			CC7	38675.28
		High	CC0	39624.72
			CC1	39674.76
			CC2	39724.80
			CC3	39774.84
			CC4	39824.88
			CC5	39874.92
			CC6	39924.96
			CC7	39975.00
50M	8CC non-contiguous	Low	CC0	37025.04
			CC1	37217.88
			CC2	37410.72
			CC3	37603.56
			CC4	37796.40
			CC5	37989.24
			CC6	38182.08
		Mid	CC7	38374.92
			CC0	37824.96
			CC1	38017.80
			CC2	38210.64
			CC3	38403.48
			CC4	38596.32
			CC5	38789.16
			CC6	38982.00
		High	CC7	39174.84
			CC0	38625.12
			CC1	38817.96
			CC2	39010.80
			CC3	39203.64
			CC4	39396.48
			CC5	39589.32
			CC6	39782.16
			CC7	39975.00

Table 2-1. Declared of EUT configuration Frequency list for 50MHz BW Mode

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BW	Configuration	Channel	CC	Frequency(MHz)
100M	1CC	Low	CC0	37050.00
		Mid	CC0	38499.96
		High	CC0	39949.98
	8CC contiguous	Low	CC0	37050.00
			CC1	37150.02
			CC2	37250.04
			CC3	37350.06
			CC4	37450.08
			CC5	37550.10
			CC6	37650.12
			CC7	37750.14
		Mid	CC0	38150.04
			CC1	38250.06
			CC2	38350.08
			CC3	38450.10
			CC4	38550.12
			CC5	38650.14
			CC6	38750.16
			CC7	38850.18
		High	CC0	39249.84
			CC1	39349.86
			CC2	39449.88
			CC3	39549.90
			CC4	39649.92
			CC5	39749.94
			CC6	39849.96
			CC7	39949.98
100M	8CC non-contiguous	Low	CC0	37050.00
			CC1	37235.70
			CC2	37421.40
			CC3	37607.10
			CC4	37792.80
			CC5	37978.50
			CC6	38164.26
			CC7	38349.96
		Mid	CC0	37849.98
			CC1	38035.68
			CC2	38221.38
			CC3	38407.08
			CC4	38592.78
			CC5	38778.48
			CC6	38964.24
			CC7	39149.94
		High	CC0	38650.02
			CC1	38835.72
			CC2	39021.42
			CC3	39207.12
			CC4	39392.82
			CC5	39578.52
			CC6	39764.28
			CC7	39949.98

Table 2-2. Declared of EUT configuration Frequency list for 100MHz BW Mode

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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 Measurement Procedure

The measurement procedures described in the document titled “American National Standard for Compliance Testing of Transmitter Used in Licensed Radio Service” (ANSI C63.26-2015) and “Measurement Guidance for Certification of Licensed Digital Transmitters” (KDB 971168 D01 v03) were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

§30.202, §30.203, §30.404, §30.405

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for Final measurement 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 DUT tripod. The EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. The receive measurement antenna is in the far field of the EUT per formula $(2 \cdot D^2) / \text{wavelength}$. For spurious emissions, the far field distances used for testing were as follows:

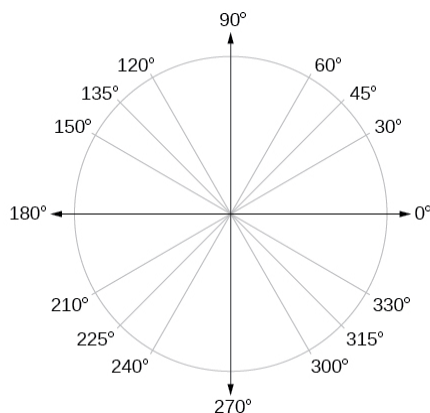
<u>Frequency Range (GHz)</u>	<u>Wavelength (cm)</u>	<u>Far Field Distance (m)</u>	<u>Measurements Distance (m)</u>
18 – 40	0.749	2.61	2.61
40 – 60	0.500	1.39	2.61
60 – 90	0.333	0.91	2.61
90 – 140	0.214	0.58	2.61
140 – 220	0.150	0.39	2.61

Table 3-1. Far-Field Distance per Frequency Range

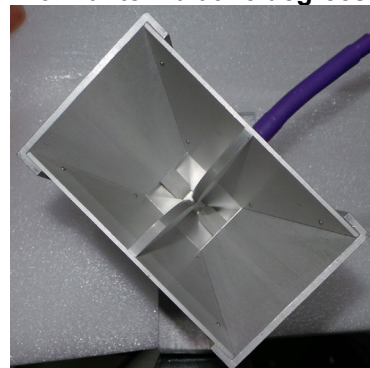
Radiated power levels are investigated with the receive antenna horizontally and vertically polarized. Additionally, the receive antenna was rotated on various angles to investigate worst case emissions on each EUT antenna array. The EUT antenna array polarization and horn antennas angle are denoted as follows:

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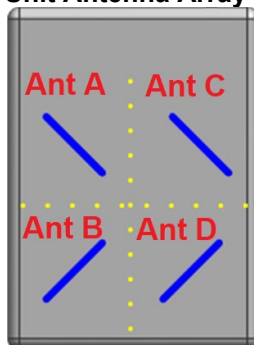
Horn antenna at 135 degrees



Horn antenna at 45 degrees



5G Access Unit Antenna Array Polarization



The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth.

Effective Isotropic Radiated Power Sample Calculation

The measured e.i.r.p is converted to E-field in V/m. Then the distance correction is applied before converted back to calculated e.i.r.p as explained in KDB 971168 D01.

$$\begin{aligned} \text{Field Strength [dB}\mu\text{V/m]} &= \text{Measured Value [dBm]} + \text{AFCL [dB/m]} + 107 \\ &= -5.28 \text{ dBm} + (47.07 \text{ dB/m} + 11.33 \text{ dB}) + 107 = 160.12 \text{ dBuV/m} \\ &= 10^{(160.12/20)/1000000} = 101.39 \text{ V/m} \end{aligned}$$

$$\begin{aligned} \text{e.i.r.p. [dBm]} &= 10 * \log((\text{E-Field} * D_m)^2/30) + 30 \text{ dB} \\ &= 10 * \log((101.39 \text{ V/m} * 2.61 \text{ m})^2/30) + 30 \text{ dB} \\ &= \mathbf{63.68 \text{ dBm e.i.r.p.}} \end{aligned}$$

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Sample MIMO e.i.r.p. Calculation:

The e.i.r.p at Antenna A, Antenna B, Antenna C and Antenna D were first measured individually. The measured values were then summed in linear power units then converted back to dBm for the co-polarized antennas.

Conversion to linear value $= 10^{(e.i.r.p/10)} = 10^{(54.07/10)} = 255270\text{mW}$

MIMO e.i.r.p. $= e.i.r.p.A + e.i.r.p.c$
 $= 208369\text{mW} + 198076\text{mW}$
 $= 10 \cdot \log(406445\text{mW})$
 $= 56.09\text{dBm}$

FCC ID: A3LAT1K02-A10	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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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

FCC ID: A3LAT1K02-A10	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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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	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Agilent	N9030A	50GHz PXA Signal Analyzer	11/22/2019	Annual	11/22/2020	US51350301
COM-Power	AL-130R	Active Loop Antenna	8/22/2019	Annual	8/22/2020	121085
COM-Power	PAM-103	Pre-Amplifier (1-1000MHz)	5/10/2019	Annual	5/10/2020	441112
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
Espec	ESX-CA	Environmental Chamber	6/13/2019	Annual	6/13/2020	17620
ETS-Lindgren	3116C	DRG Horn Antenna	3/11/2019	Annual	3/11/2020	218893
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	5/2/2019	Annual	5/2/2020	MY49430494
OML Inc.	M05RH	WR-05 Horn Antenna, 24dBi, 140 to 200GHz	10/31/2019	Annual	10/31/2020	18073001
OML Inc.	M08RH	WR-08 Horn Antenna, 24dBi, 90 to 140GHz	7/30/2018	Biennial	7/30/2020	18073001
OML Inc.	M12RH	WR-12 Horn Antenna, 24dBi, 60 to 90GHz	10/31/2019	Annual	10/31/2020	18073001
OML Inc.	M19RH	WR-19 Horn Antenna, 24dBi, 40 to 60GHz	10/31/2019	Annual	10/31/2020	18073001
Rohde & Schwarz	180-442-KF	Horn (Small)	8/21/2018	Biennial	8/21/2020	U157403-01
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44GHz	10/16/2019	Annual	10/16/2020	101716
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	5/6/2019	Annual	5/6/2020	103200
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/8/2019	Annual	7/8/2020	102133
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107
Virginia Diodes Inc.	SAX252	SAX Module (60 - 90GHz)	9/30/2019	Annual	9/30/2020	SAX252
Virginia Diodes Inc.	SAX253	SAX Module (90 - 140GHz)	9/30/2019	Annual	9/30/2020	SAX253
Virginia Diodes Inc.	SAX254	SAX Module (140 - 220GHz)	9/30/2019	Annual	9/30/2020	SAX254
Virginia Diodes Inc.	SAX411	SAX Module (40 - 60GHz)	10/2/2019	Annual	10/2/2020	SAX411

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

Emission Designator

QPSK Modulation

Emission Designator = 800MG7D

BW = 800 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 802MW7D

BW = 802 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LAT1K02-A10
FCC Classification: Part 30 Fixed Transmitter (5GB)
Mode(s): TDD

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	RADIATED	PASS	Section 7.2
30.202	EIRP Density	EIRP Density of 75dBm/100MHz		PASS	Section 7.3
2.1046	RF Output Power	N/A		PASS	Section 7.4
2.1051 30.203	Out-of-Band Spurious Emissions	-13dBm/MHz		PASS	Section 7.5
2.1051 30.203	Out-of-Band Emissions at the Band Edge	-13dBm/MHz for all out-of-band emissions, -5dBm/MHz from the band edge up to 10% of the channel BW		PASS	Section 7.6
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 7.7

Table 7-1. Summary of Radiated Test Results

Notes:

- 1) All modes of operation and modulations were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) Per 2.1057(a)(3), spurious emissions were investigated up to 200GHz.
- 3) All radiated emission measurements at the band edge are converted to an equivalent conductive power by subtracting the known antenna gain from the EIRP measured at each frequency of interest. These emissions are compared to the 30.203 spurious emission limits as conductive power levels.
- 4) The radiated RF output power and all out-of-band emissions in the spurious domain are evaluated to the EIRP limits.
- 5) The fundamental band consists of 1 – 8 component carriers, referred as “CC” in this report. Lowest frequency CC is CC0 and highest frequency CC is CC7.
- 6) In the following tables, the term “CCs Active” refers to which component carrier is transmitting for a particular test.
- 7) CCs active 0, 4, 7 = 1 Components Carriers Active, 0-7 = 8 Component Carriers Active. 0-7(NC) = 8 Non-contiguous Component Carriers Active. Each component carrier’s bandwidth is either of 50MHz or 100MHz.

FCC ID: A3LAT1K02-A10	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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- 8) A3LAT1K02-A10 test result is referenced from A3LAT1K02-A00 test result which only AC and DC power supply type. Power condition is not affected to RF specification which had been checked from manufacturer and testing laboratory in PCTEST.

FCC ID: A3LAT1K02-A10	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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7.2 Occupied Bandwidth

\$2.1049

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

ANSI C63.25-2015 Section 5.4.3

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied 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 Notes

A3LAT1K02-A10 test result is referenced as A3LAT1K02-A00 result which only difference of power type as AC and DC which supply condition affect to RF specification.

FCC ID: A3LAT1K02-A10	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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7.2.1 Antenna A Occupied Bandwidth

Bandwidth [MHz]	Antenna	Chan.	CCs active	Modulation	OBW [MHz]
50	A	Mid	4	QPSK	46.24
		Mid	4	16QAM	46.18
		Mid	4	64QAM	46.23
100		Mid	4	QPSK	94.60
		Mid	4	16QAM	94.70
		Mid	4	64QAM	94.65
50		Mid	0-7	QPSK	393.23
		Mid	0-7	16QAM	393.23
		Mid	0-7	64QAM	393.23
100		Mid	0-7	QPSK	788.01
		Mid	0-7	16QAM	787.56
		Mid	0-7	64QAM	787.87

Table 7-2. Antenna A Occupied Bandwidth Summary Data

ACLRResults

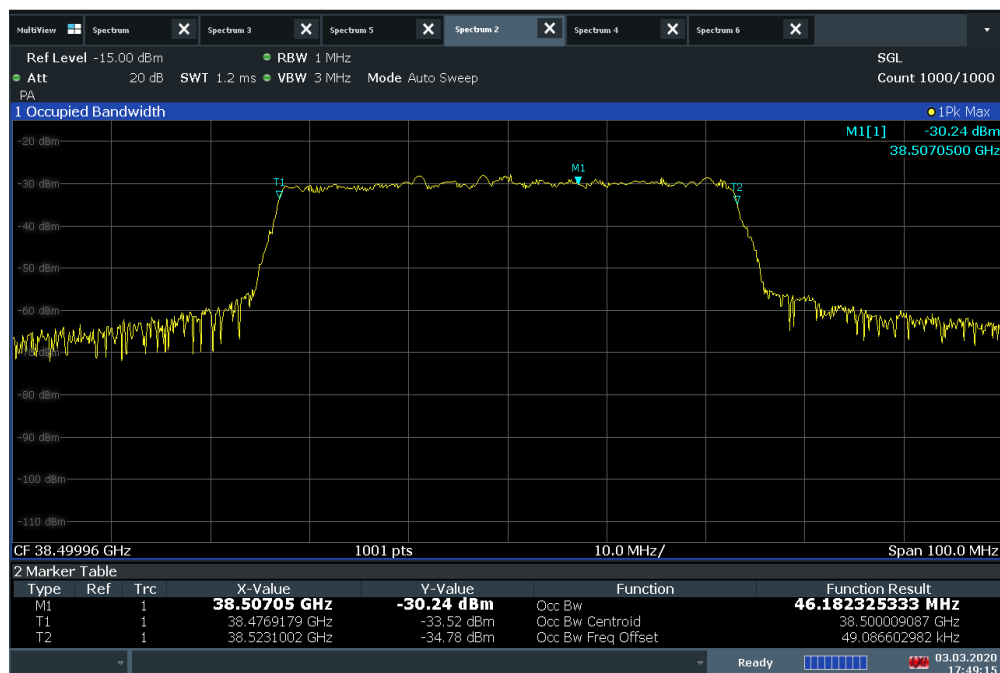


17:48:24 03.03.2020

Plot 7-1. Occupied Bandwidth Plot (50MHz BW 1CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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ACLRRResults



17:49:16 03.03.2020

Plot 7-2. Occupied Bandwidth Plot (50MHz BW 1CC 16QAM Mid Channel)

ACLRRResults

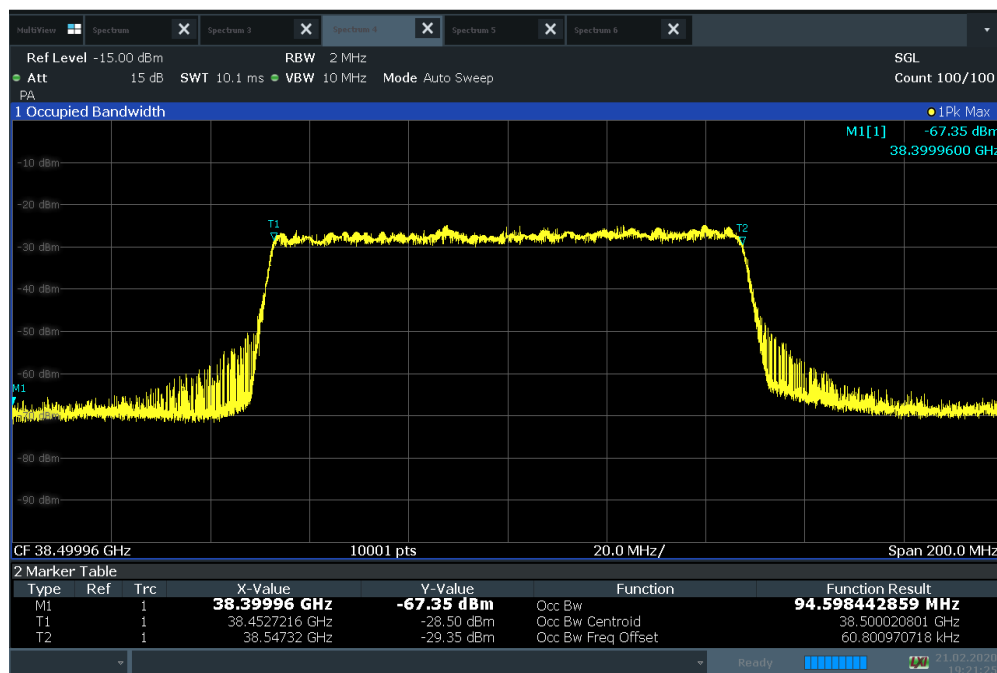


17:49:48 03.03.2020

Plot 7-3. Occupied Bandwidth Plot (50MHz BW 1CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 20 of 360

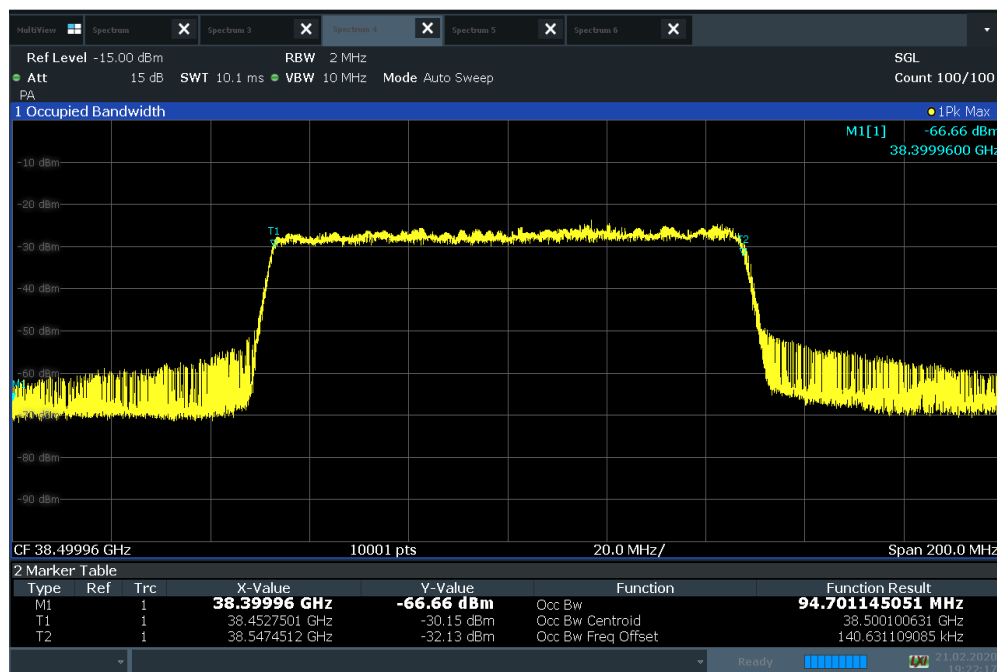
ACLRResults



19:21:26 21.02.2020

Plot 7-4. Occupied Bandwidth Plot (100MHz BW 1CC QPSK Mid Channel)

ACLRResults

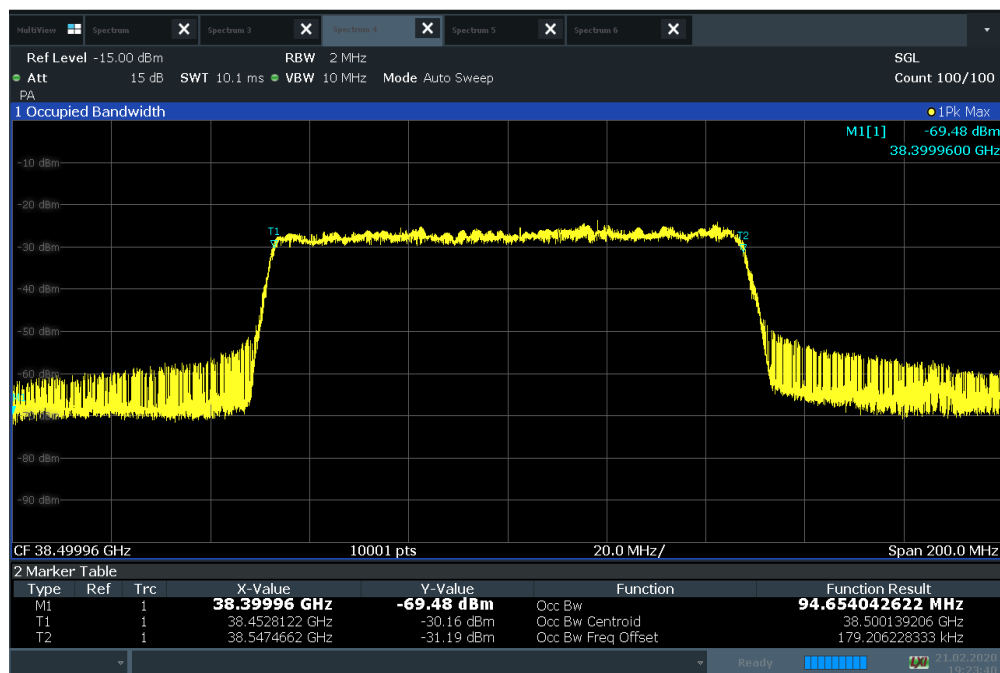


19:22:18 21.02.2020

Plot 7-5. Occupied Bandwidth Plot (100MHz BW 1CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 21 of 360

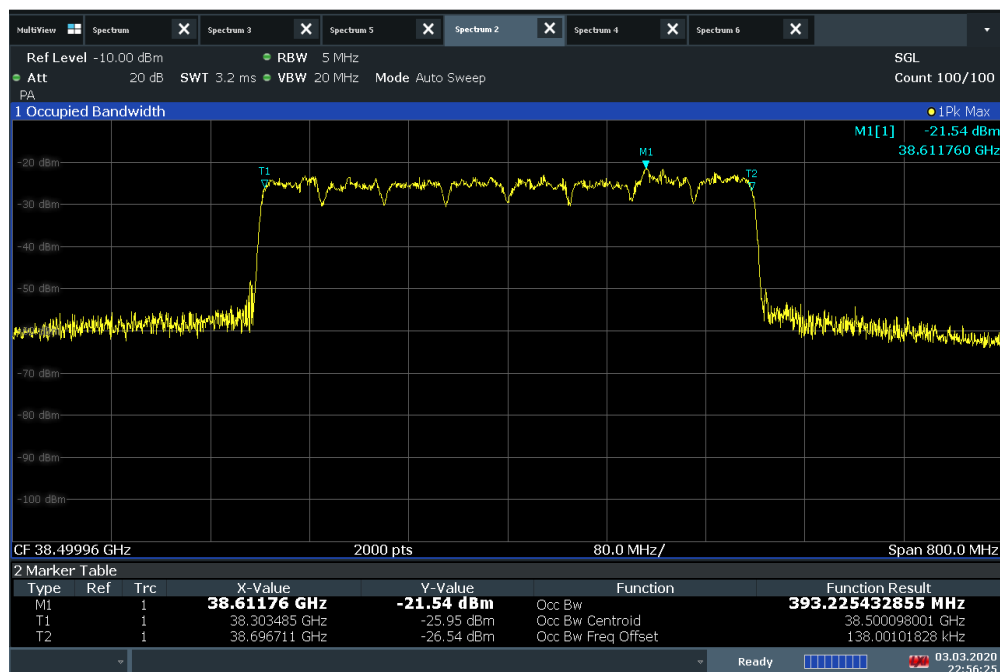
ACLRResults



19:23:40 21.02.2020

Plot 7-6. Occupied Bandwidth Plot (100MHz BW 1CC 64QAM Mid Channel)

ACLRResults



22:56:25 03.03.2020

Plot 7-7. Occupied Bandwidth Plot (50MHz BW 8CC QPSK Mid Channel)

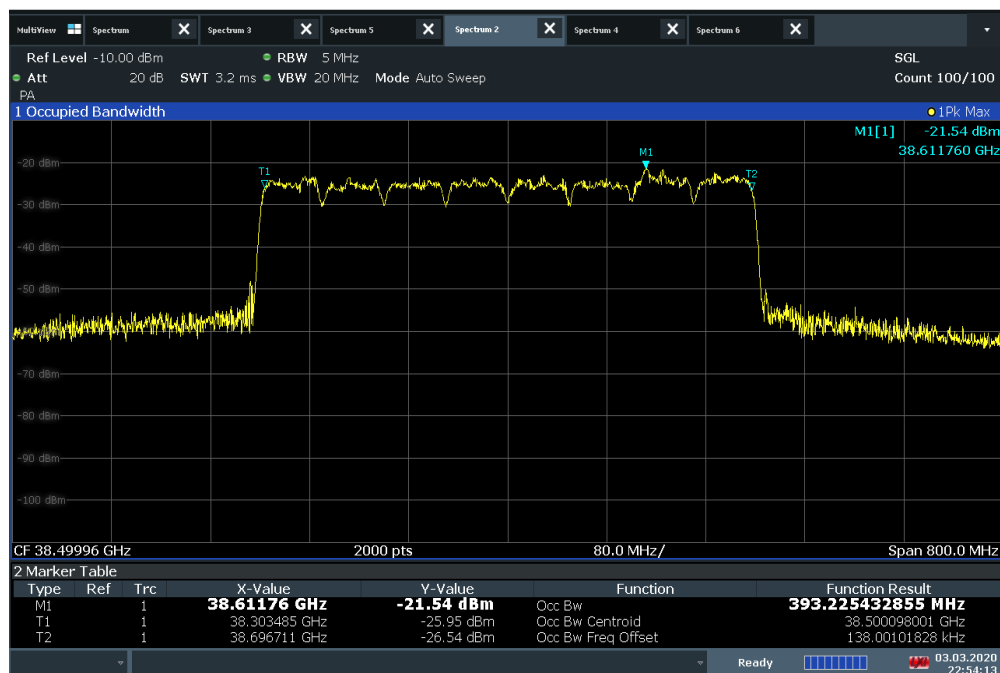
FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 22 of 360

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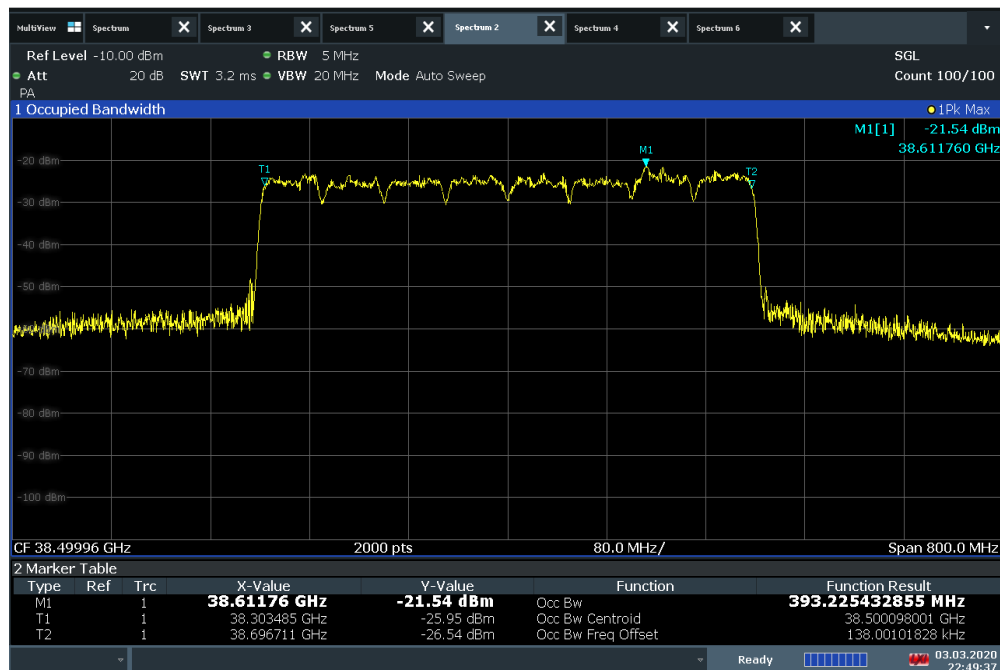
ACLRResults



22:54:13 03.03.2020

Plot 7-8. Occupied Bandwidth Plot (50MHz BW 8CC 16QAM Mid Channel)

ACLRResults

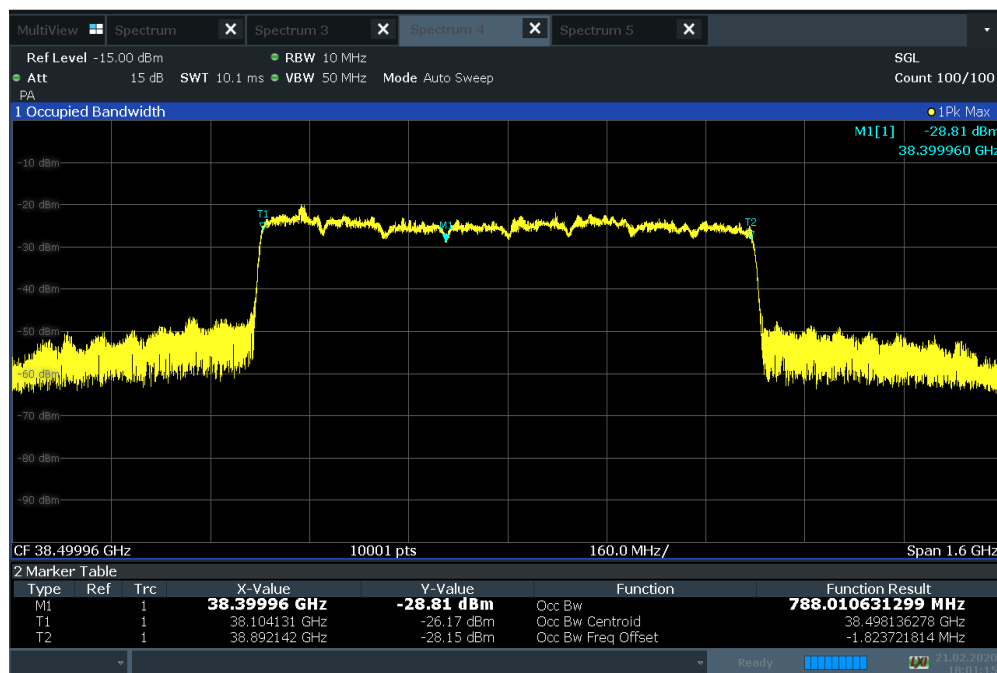


22:49:38 03.03.2020

Plot 7-9. Occupied Bandwidth Plot (50MHz BW 8CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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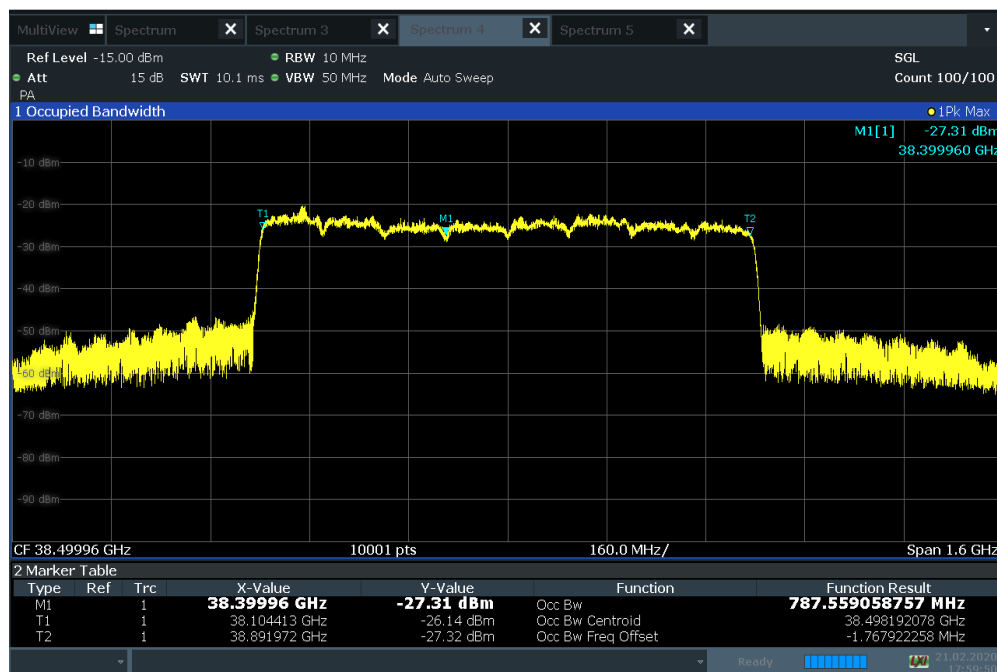
ACLRResults



18:01:15 21.02.2020

Plot 7-10. Occupied Bandwidth Plot (100MHz BW 8CC QPSK Mid Channel)

ACLRResults



17:59:51 21.02.2020

Plot 7-11. Occupied Bandwidth Plot (100MHz BW 8CC 16QAM Mid Channel)

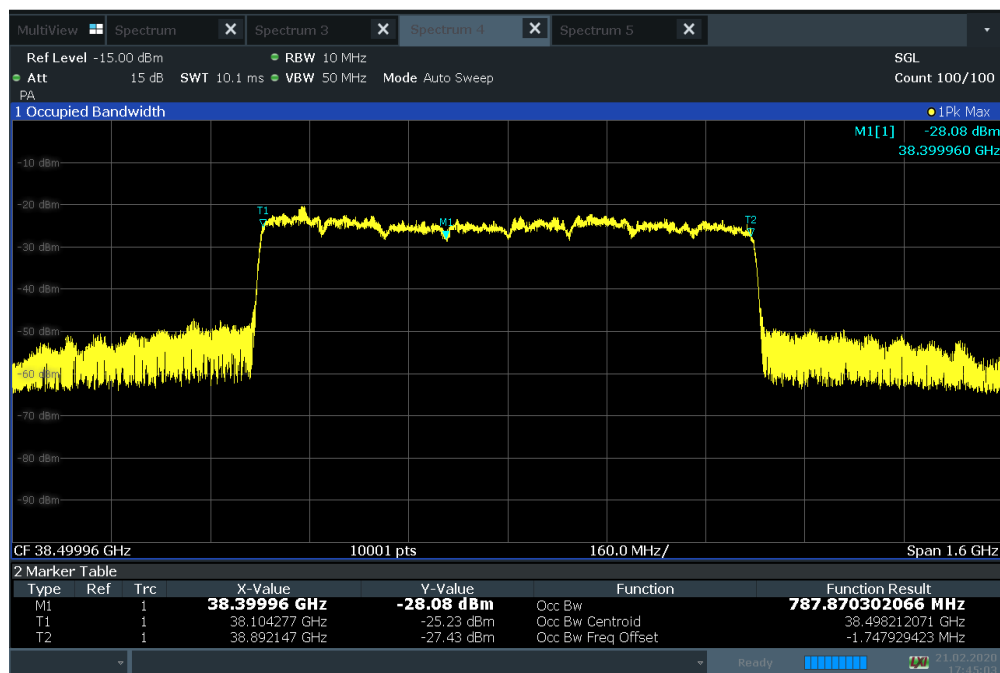
FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 24 of 360

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ACLRResults



17:45:04 21.02.2020

Plot 7-12. Occupied Bandwidth Plot (100MHz BW 8CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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7.2.2 Antenna B Occupied Bandwidth

Bandwidth [MHz]	Antenna	Chan.	CCs active	Modulation	OBW [MHz]
50	B	Mid	4	QPSK	46.39
		Mid	4	16QAM	46.29
		Mid	4	64QAM	46.33
100		Mid	4	QPSK	94.63
		Mid	4	16QAM	94.67
		Mid	4	64QAM	94.63
50		Mid	0-7	QPSK	393.01
		Mid	0-7	16QAM	393.03
		Mid	0-7	64QAM	393.09
100		Mid	0-7	QPSK	787.85
		Mid	0-7	16QAM	788.35
		Mid	0-7	64QAM	787.66

Table 7-3. Antenna B Occupied Bandwidth Summary Data

ACLRRResults



18:03:10 03.03.2020

Plot 7-13. Occupied Bandwidth Plot (50MHz BW 1CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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ACLRResults



18:04:48 03.03.2020

Plot 7-14. Occupied Bandwidth Plot (50MHz BW 1CC 16QAM Mid Channel)

ACLRResults



18:05:26 03.03.2020

Plot 7-15. Occupied Bandwidth Plot (50MHz BW 1CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 27 of 360

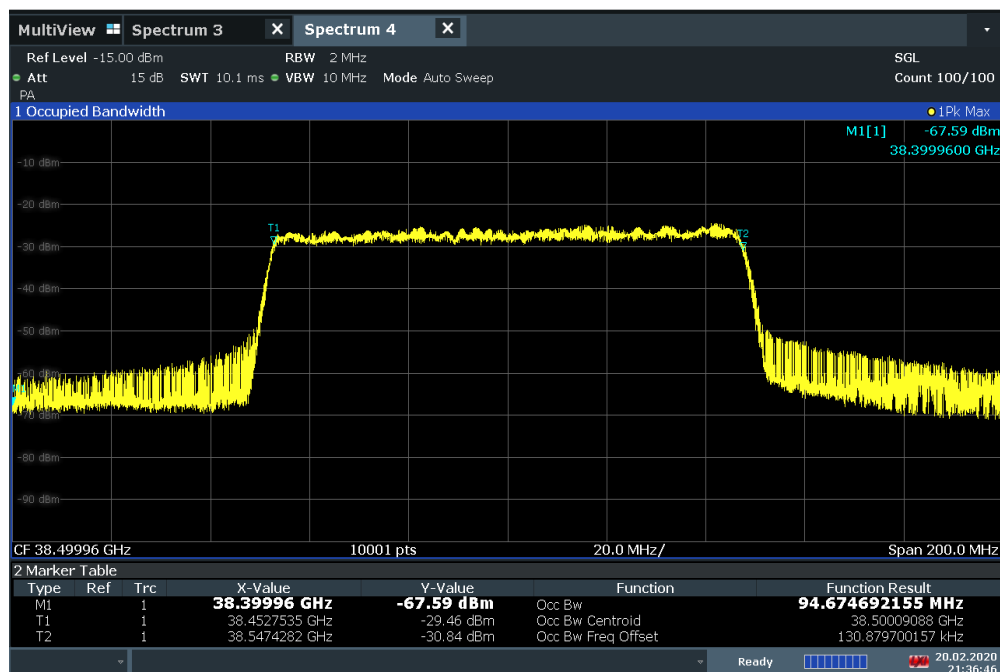
ACLRResults



21:37:23 20.02.2020

Plot 7-16. Occupied Bandwidth Plot (100MHz BW 1CC QPSK Mid Channel)

ACLRResults

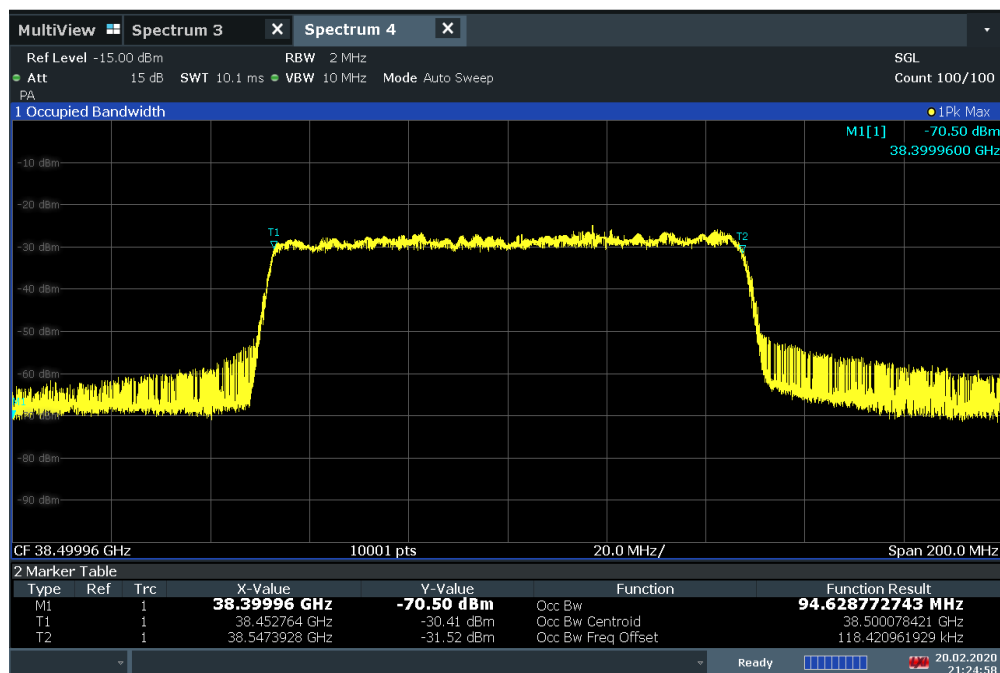


21:36:47 20.02.2020

Plot 7-17. Occupied Bandwidth Plot (100MHz BW 1CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 28 of 360

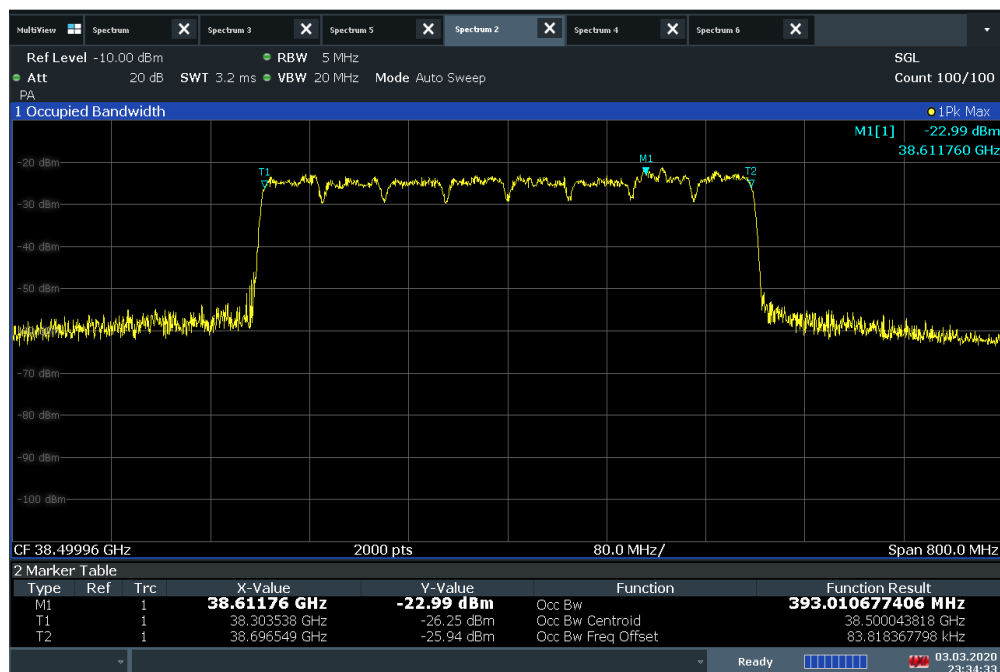
ACLRRResults



21:24:59 20.02.2020

Plot 7-18. Occupied Bandwidth Plot (100MHz BW 1CC 64QAM Mid Channel)

ACLRRResults



23:34:34 03.03.2020

Plot 7-19. Occupied Bandwidth Plot (50MHz BW 8CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 29 of 360

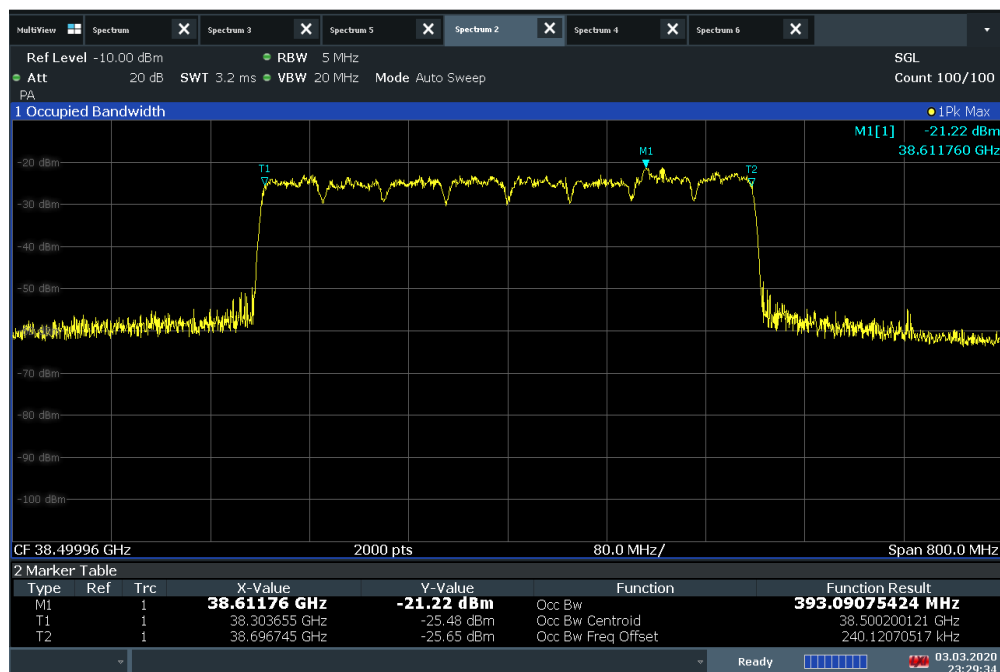
ACLRResults



23:30:48 03.03.2020

Plot 7-20. Occupied Bandwidth Plot (50MHz BW 8CC 16QAM Mid Channel)

ACLRResults



23:29:34 03.03.2020

Plot 7-21. Occupied Bandwidth Plot (50MHz BW 8CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 30 of 360

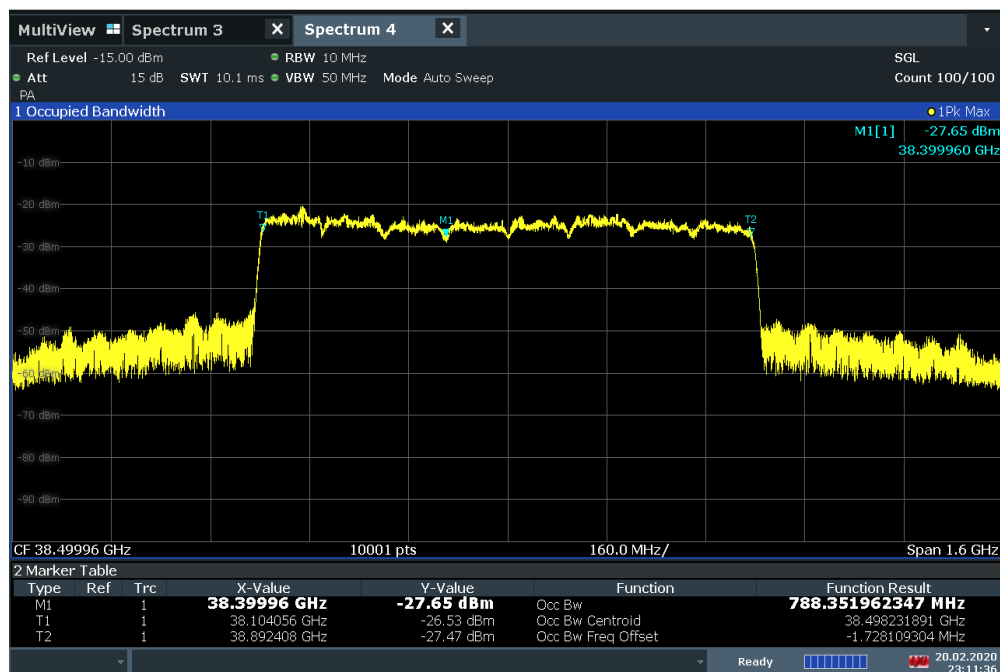
ACLRResults



23:12:47 20.02.2020

Plot 7-22. Occupied Bandwidth Plot (100MHz BW 8CC QPSK Mid Channel)

ACLRResults



23:11:37 20.02.2020

Plot 7-23. Occupied Bandwidth Plot (8CC 100MHz BW 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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ACLRResults



23:08:09 20.02.2020

Plot 7-24. Occupied Bandwidth Plot (8CC 64QAM Mid Channel 100MHz BW)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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7.2.3 Antenna C Occupied Bandwidth

Bandwidth [MHz]	Antenna	Chan.	CCs active	Modulation	OBW [MHz]
50	C	Mid	4	QPSK	46.16
		Mid	4	16QAM	46.17
		Mid	4	64QAM	46.15
100		Mid	4	QPSK	94.68
		Mid	4	16QAM	94.64
		Mid	4	64QAM	94.65
50		Mid	0-7	QPSK	393.32
		Mid	0-7	16QAM	393.39
		Mid	0-7	64QAM	393.06
100		Mid	0-7	QPSK	787.65
		Mid	0-7	16QAM	788.21
		Mid	0-7	64QAM	788.72

Table 7-4. Antenna C Occupied Bandwidth Summary Data

ACLR Results

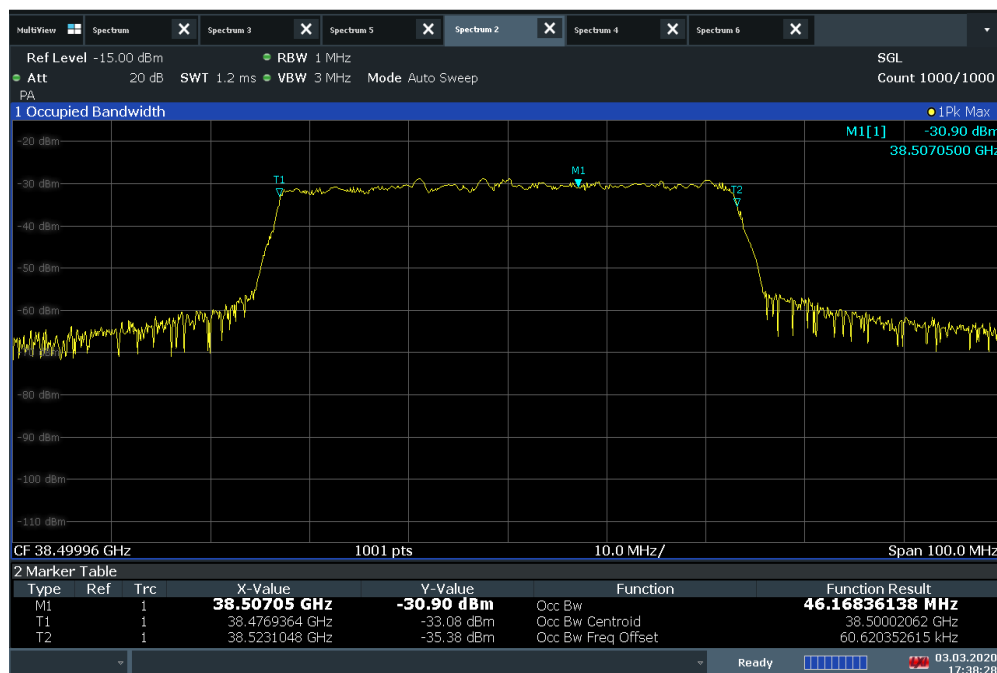


17:36:24 03.03.2020

Plot 7-25. Occupied Bandwidth Plot (50MHz BW 1CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 33 of 360

ACLRResults



17:38:29 03.03.2020

Plot 7-26. Occupied Bandwidth Plot (50MHz BW 1CC 16QAM Mid Channel)

ACLRResults

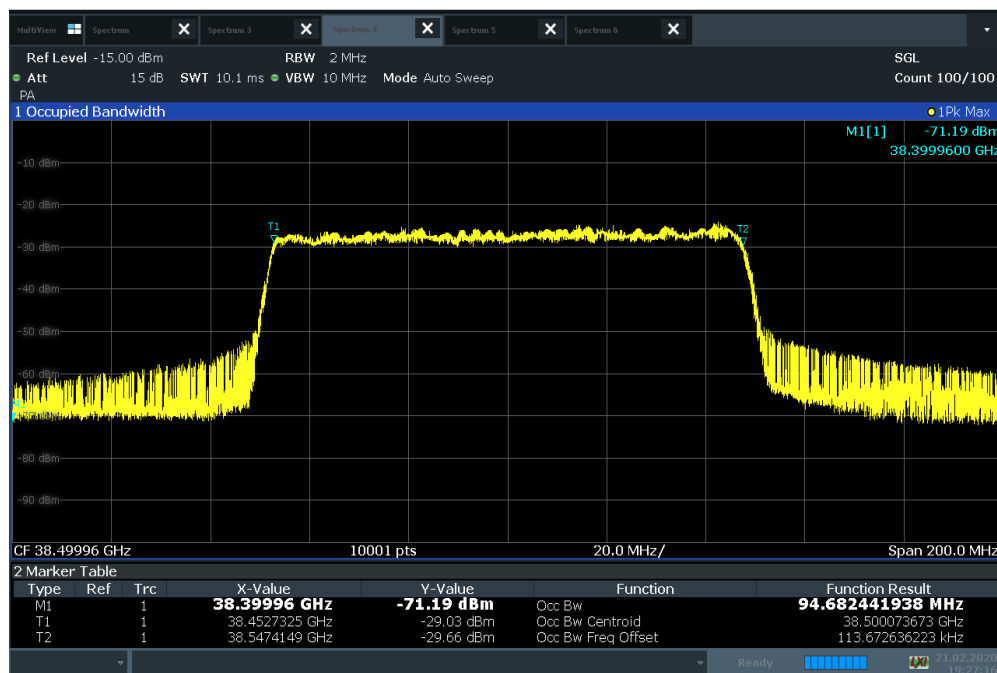


17:37:13 03.03.2020

Plot 7-27. Occupied Bandwidth Plot (50MHz BW 1CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 34 of 360

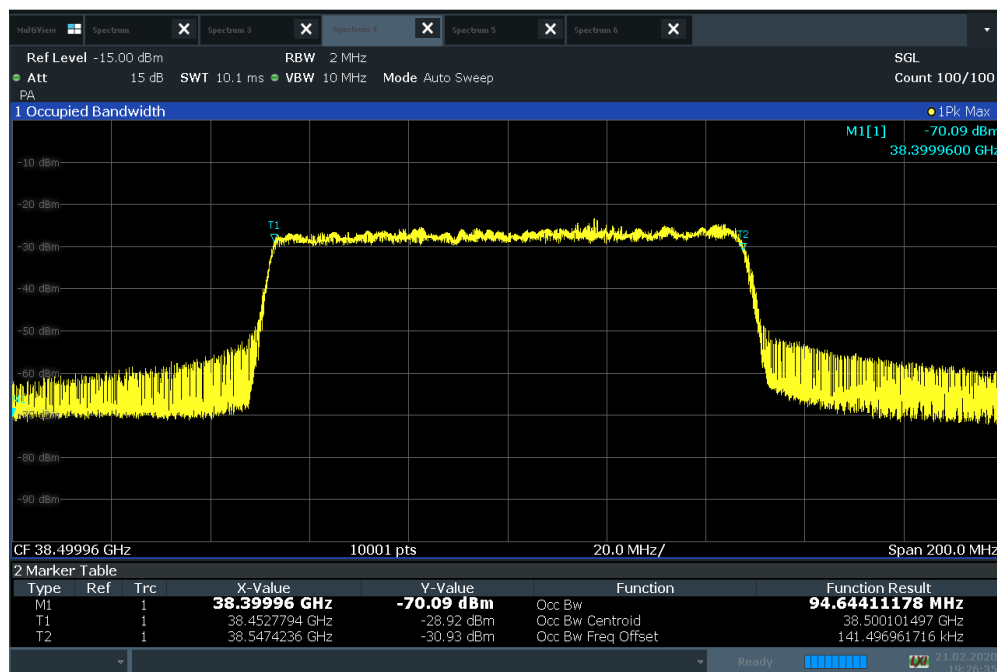
ACLRResults



19:27:17 21.02.2020

Plot 7-28. Occupied Bandwidth Plot (100MHz BW 1CC QPSK Mid Channel)

ACLRResults

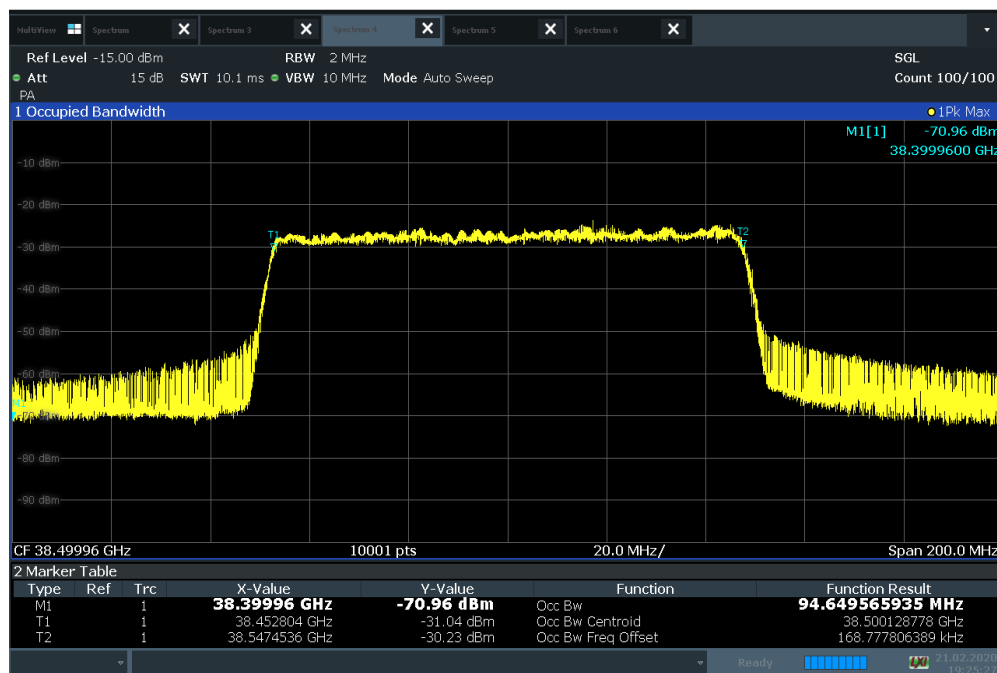


19:26:35 21.02.2020

Plot 7-29. Occupied Bandwidth Plot (100MHz BW 1CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 35 of 360

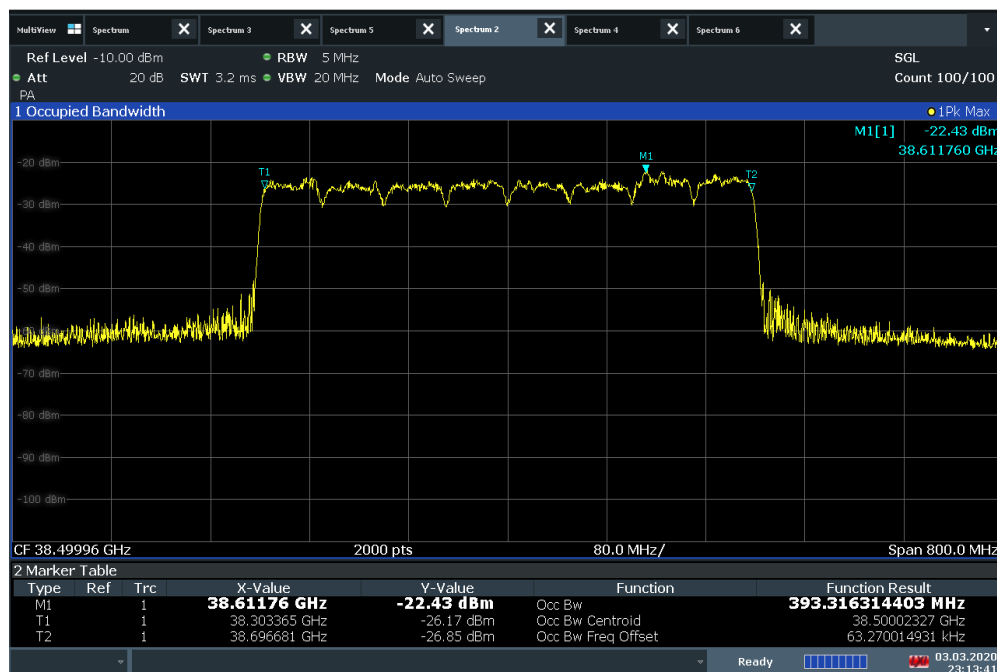
ACLRResults



19:25:27 21.02.2020

Plot 7-30. Occupied Bandwidth Plot (100MHz BW 1CC 64QAM Mid Channel)

ACLRResults

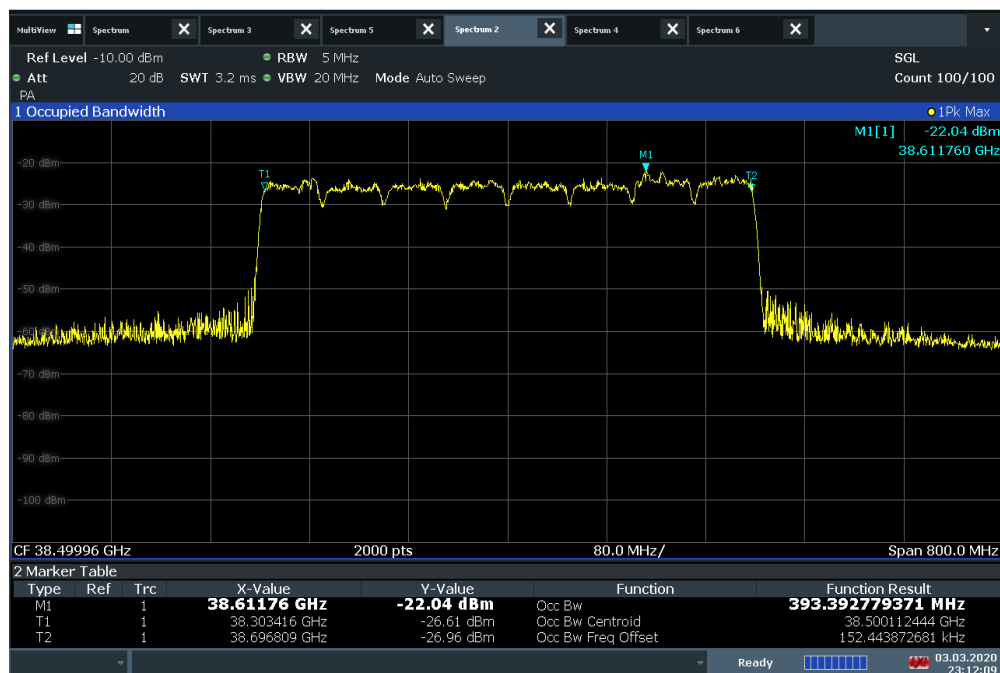


23:13:42 03.03.2020

Plot 7-31. Occupied Bandwidth Plot (50MHz BW 8CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 36 of 360

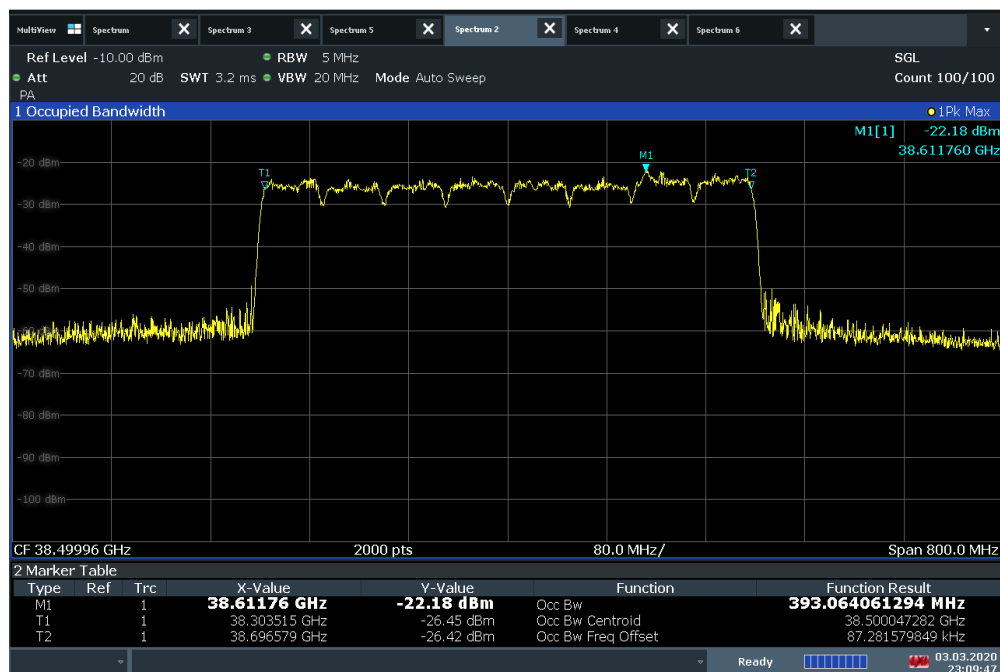
ACLRResults



23:12:09 03.03.2020

Plot 7-32. Occupied Bandwidth Plot (50MHz BW 8CC 16QAM Mid Channel)

ACLRResults



23:09:47 03.03.2020

Plot 7-33. Occupied Bandwidth Plot (50MHz BW 8CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 37 of 360

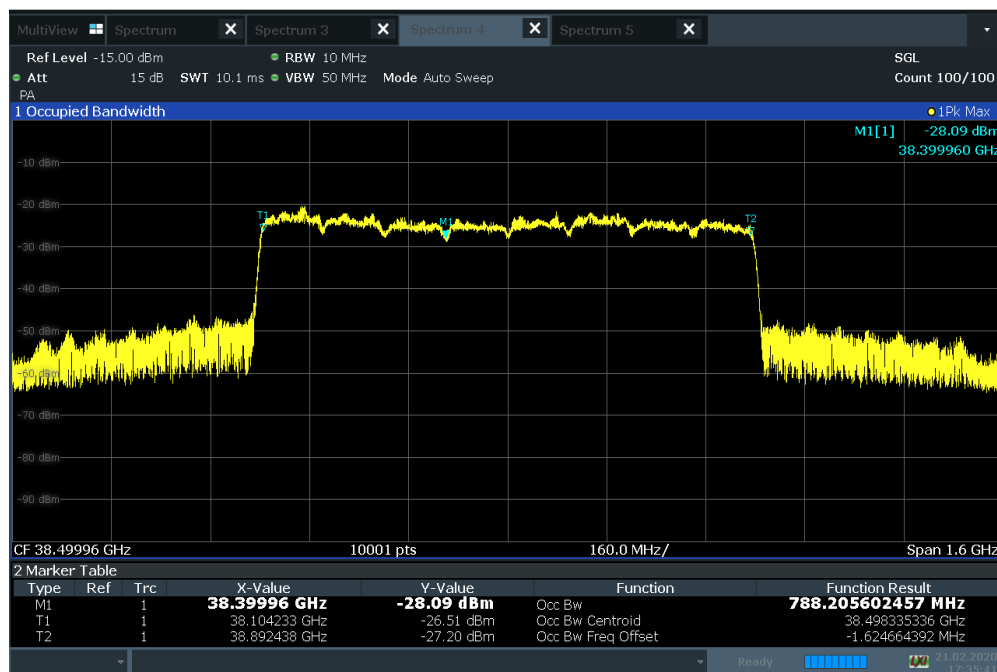
ACLRResults



17:32:17 21.02.2020

Plot 7-34. Occupied Bandwidth Plot (100MHz BW 8CC QPSK Mid Channel)

ACLRResults

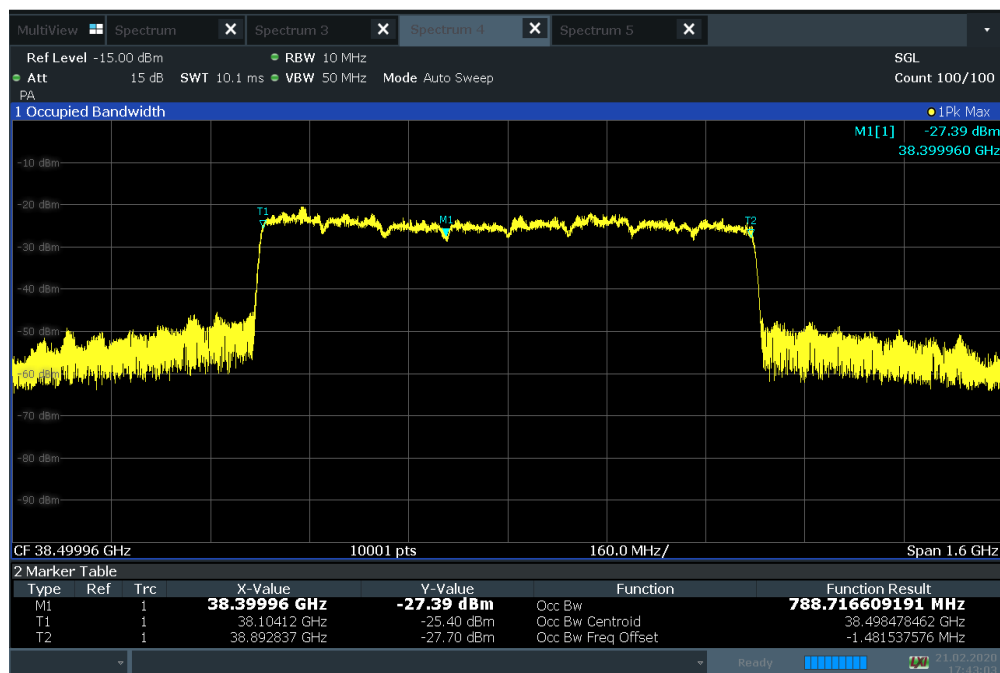


17:35:41 21.02.2020

Plot 7-35. Occupied Bandwidth Plot (100MHz BW 8CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 38 of 360

ACLRResults



17:43:03 21.02.2020

Plot 7-36. Occupied Bandwidth Plot (100MHz BW 8CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 39 of 360

7.2.4 Antenna D Occupied Bandwidth

Bandwidth [MHz]	Antenna	Chan.	CCs active	Modulation	OBW [MHz]
50	D	Mid	4	QPSK	46.25
		Mid	4	16QAM	46.20
		Mid	4	64QAM	46.20
100		Mid	4	QPSK	94.57
		Mid	4	16QAM	94.60
		Mid	4	64QAM	94.63
50		Mid	0-7	QPSK	393.04
		Mid	0-7	16QAM	393.08
		Mid	0-7	64QAM	392.93
100		Mid	0-7	QPSK	787.41
		Mid	0-7	16QAM	788.19
		Mid	0-7	64QAM	788.30

Table 7-5. Antenna D Occupied Bandwidth Summary Data

ACLR Results

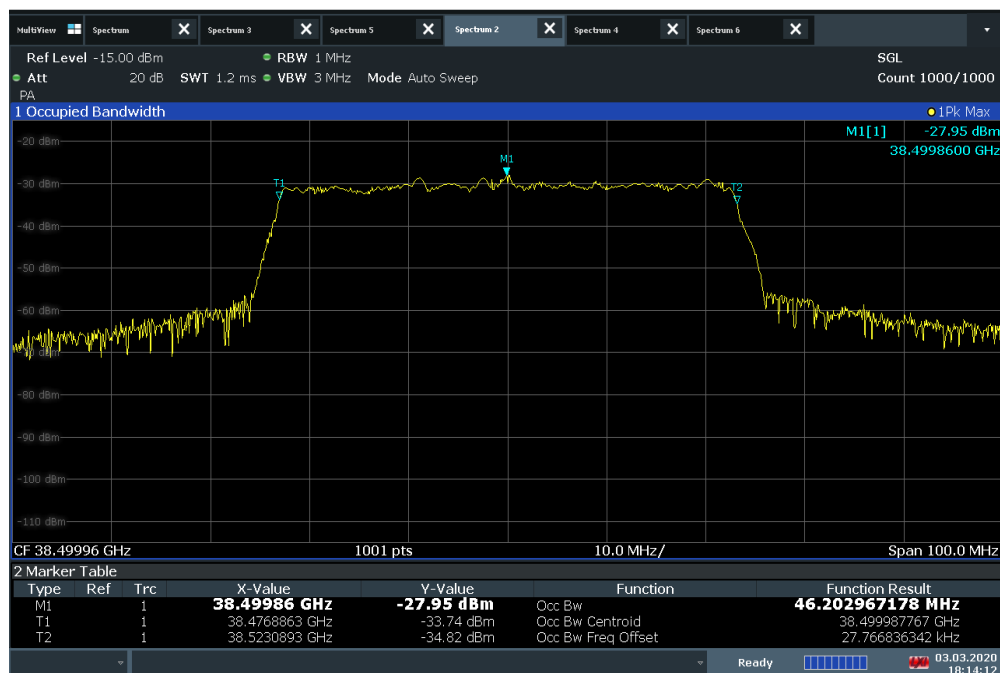


18:15:07 03.03.2020

Plot 7-37. Occupied Bandwidth Plot (50MHz BW 1CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 40 of 360

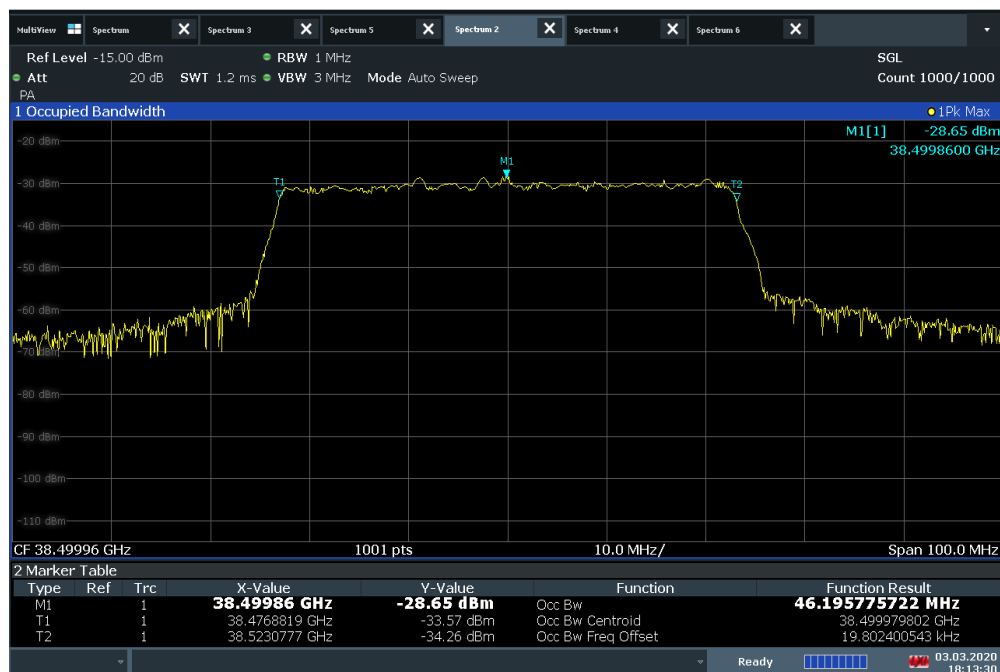
ACLRResults



18:14:13 03.03.2020

Plot 7-38. Occupied Bandwidth Plot (50MHz BW 1CC 16QAM Mid Channel)

ACLRResults



18:13:30 03.03.2020

Plot 7-39. Occupied Bandwidth Plot (50MHz BW 1CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 41 of 360

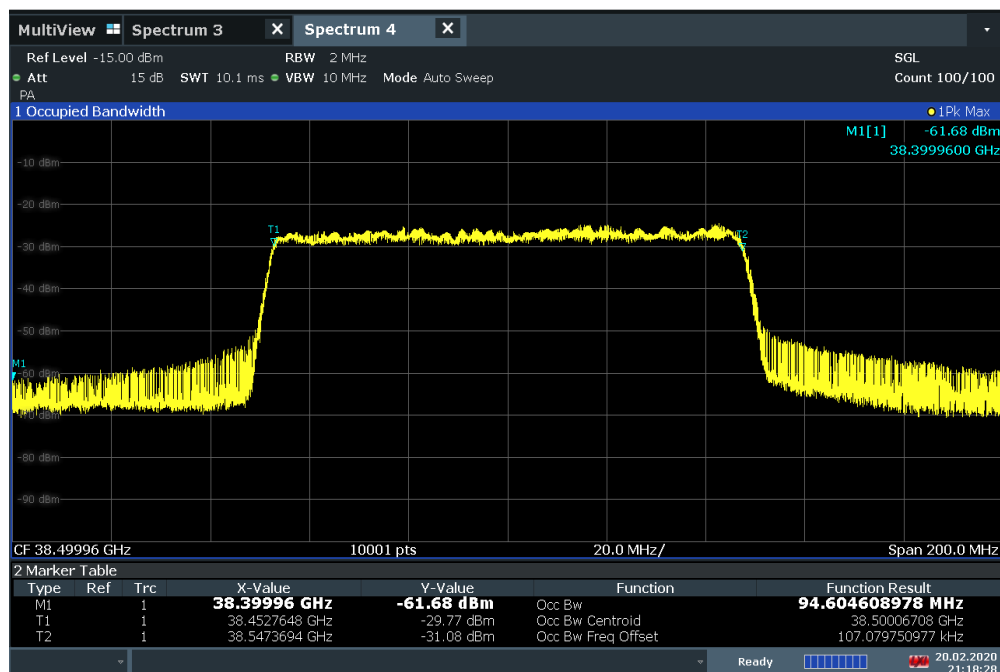
ACLRResults



21:18:06 20.02.2020

Plot 7-40. Occupied Bandwidth Plot (100MHz BW 1CC QPSK Mid Channel)

ACLRResults

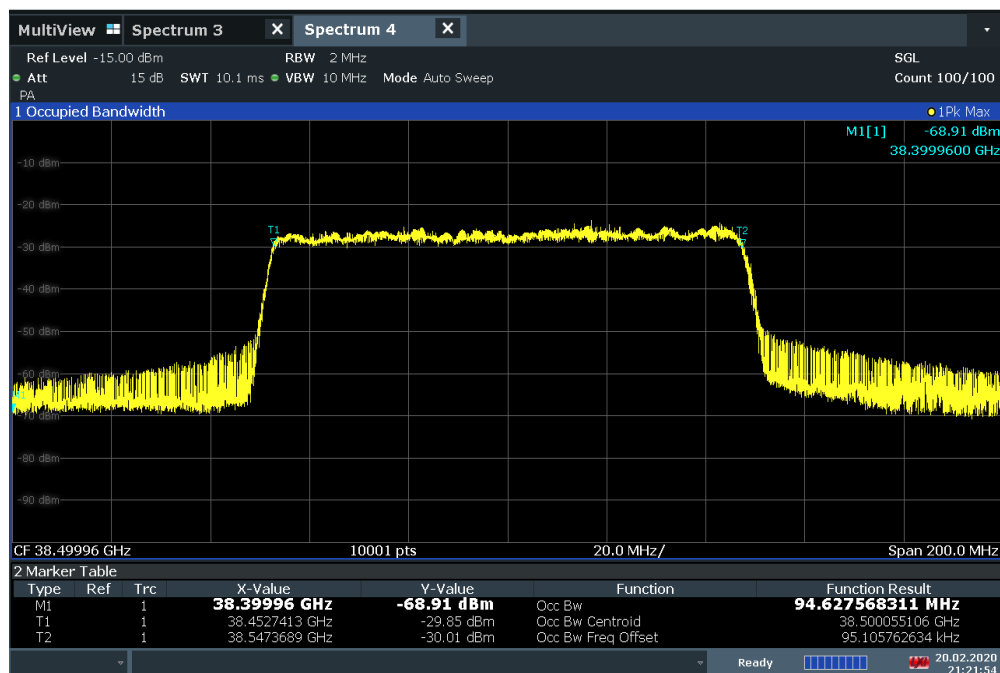


21:18:28 20.02.2020

Plot 7-41. Occupied Bandwidth Plot (100MHz BW 1CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 42 of 360

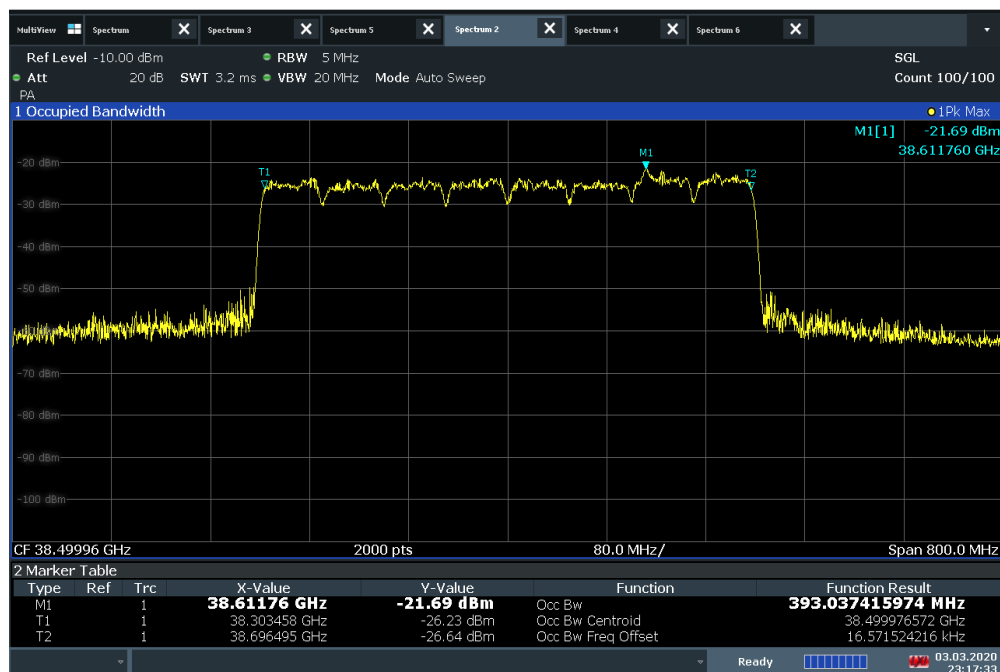
ACLRRResults



21:21:54 20.02.2020

Plot 7-42. Occupied Bandwidth Plot (100MHz BW 1CC 64QAM Mid Channel)

ACLRRResults

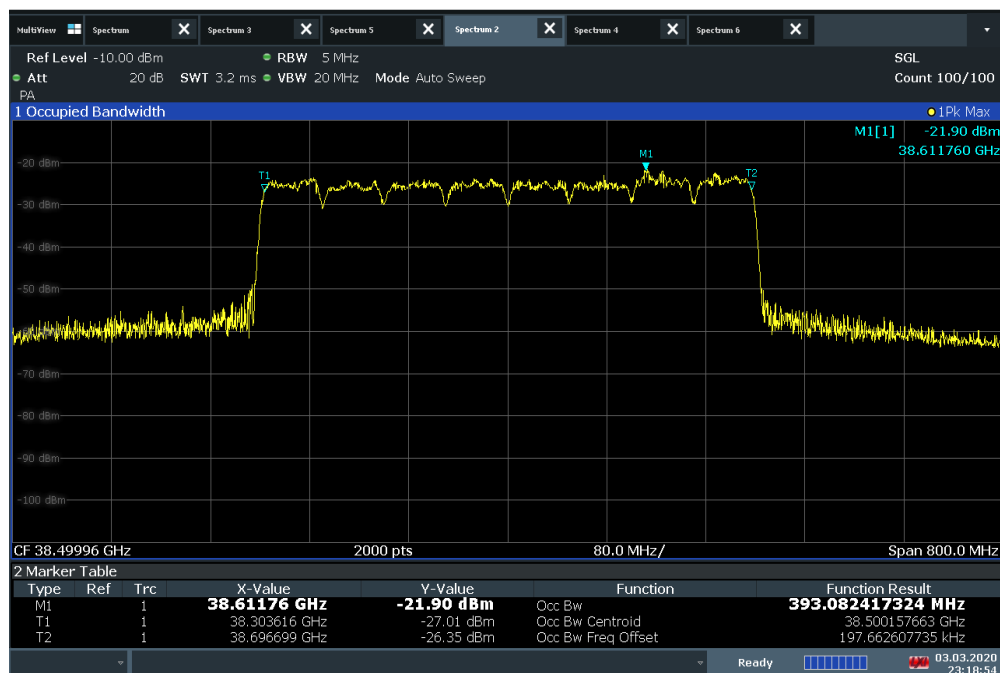


23:17:33 03.03.2020

Plot 7-43. Occupied Bandwidth Plot (50MHz BW 8CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 43 of 360

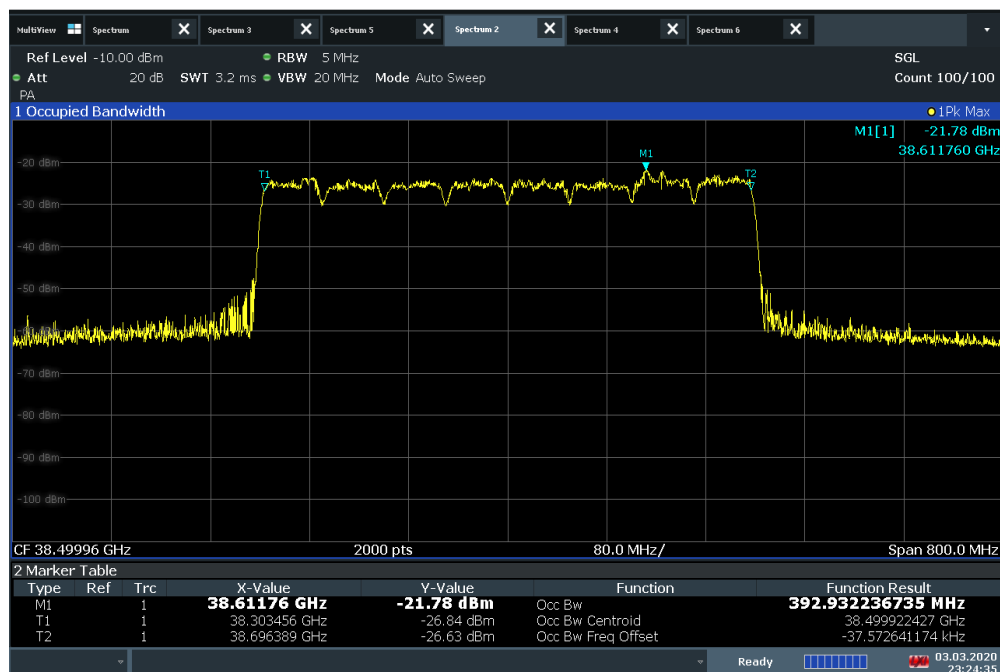
ACLRResults



23:18:54 03.03.2020

Plot 7-44. Occupied Bandwidth Plot (50MHz BW 8CC 16QAM Mid Channel)

ACLRResults



23:24:35 03.03.2020

Plot 7-45. Occupied Bandwidth Plot (50MHz BW 8CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 44 of 360

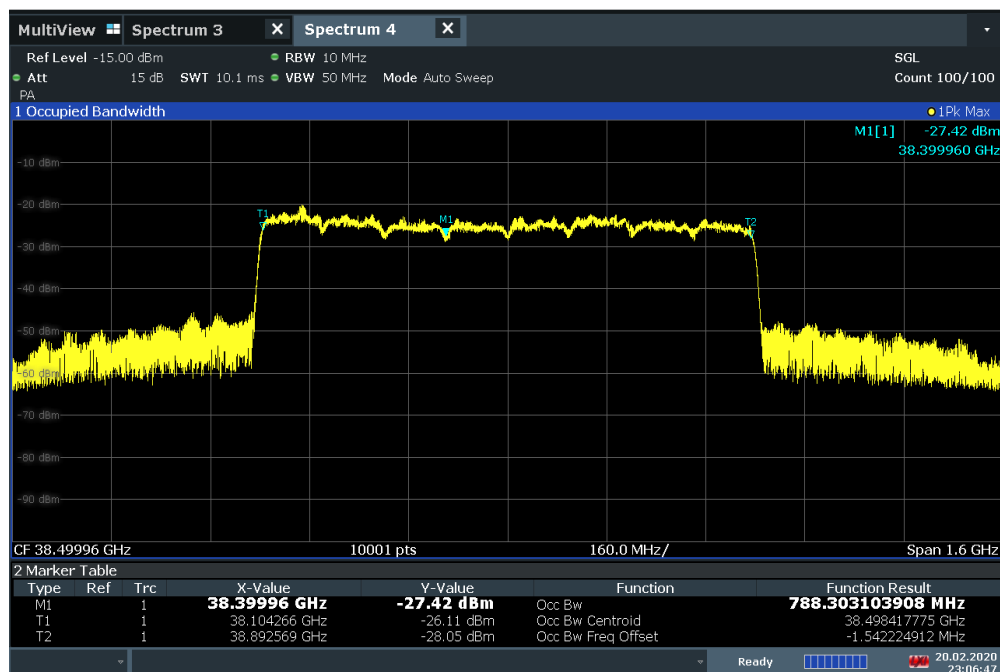
ACLRResults



11:14:23 05.03.2020

Plot 7-46. Occupied Bandwidth Plot (100MHz BW 8CC QPSK Mid Channel)

ACLRResults

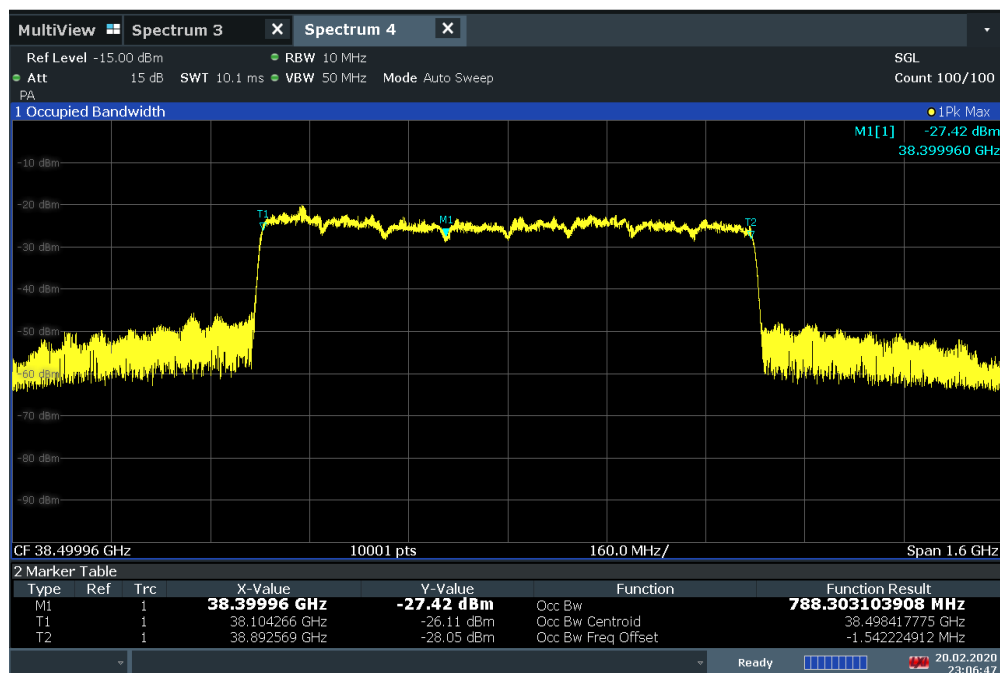


23:06:48 20.02.2020

Plot 7-47. Occupied Bandwidth Plot (100MHz BW 8CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 45 of 360

ACLRResults



23:06:48 20.02.2020

Plot 7-48. Occupied Bandwidth Plot (100MHz BW 8CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 46 of 360

7.3 Equivalent Isotropic Radiated Power (EIRP) Density

\$2.1046 \$30.202

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The average power of the sum of all antenna elements is limited to an equivalent isotopically radiated power (EIRP) density of +75dBm/100 MHz.

Test Procedures Used

ANSI C63.26-2015 Section 5.2.4.4.1
 ANSI C63.26-2015 Section 6.4

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ RBW
4. Span = 2x to 3x the OBW
5. No. of sweep points $\geq 2 \times$ span / RBW
6. Detector = RMS
7. The integration bandwidth was roughly set equal to the measured (EIRP) Density of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
8. Trace mode = trace averaging (RMS) over 100 sweeps
9. The trace was allowed to stabilize

FCC ID: A3LAT1K02-A10	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 47 of 360

Test Notes

- 1) The EUT was tested while positioned upright and mounted on a mast at 1.5m height. The worst case emissions are reported with the EUT in this fixed position and with the modulations and active component carriers shown in the tables below.
- 2) The EIRP measurements of the co-polarized antenna arrays (Antenna A/C and Antenna B/D) were added together to address MIMO concerns referenced in ANSI C36.26-2015 Section 6.4.
- 3) Elements within the same antenna array are correlated to produce beamforming array gain.
- 4) Measurements were taken in the far field of the mmWave signal based on the formula: $R \geq 2D^2/\text{wavelength}$.
- 5) The test case with 1 CC and 8 CC active, was selected for the worst case emission testing as it created the highest EIRP within 50MHz and 100MHz bandwidth.
- 6) Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then 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:

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

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 $P_g [\text{dBm}] - \text{cable loss} [\text{dB}]$.

- 7) The average EIRP reported below is calculate per formula specified in d) of ANSI C63.26-2015 Section 5.2.7:

$\text{EIRP (dBm)} = E (\text{dBuV/m}) + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.

For this section, all EIRP density measurements were performed at a distance of 2.61m, so, the effective correction is:

$$\text{EIRP (dBm)} = E (\text{dBuV/m}) - 96.46\text{dB}$$

$$= \text{Analyzer Level (dBm)} + \text{AFCL (dB/m)} + 107 \text{ dB} - 96.46 \text{ dB}$$

$$= \text{Analyzer Level (dBm)} + \text{AFCL (dB/m)} + 10.53$$

*AFCL (dB/m) contains measurement antenna factor(dB/m) and cable loss(dB) as below:

Freq [GHz]	Antenna Factor [dB/m]	Cable loss [dB]	AFCL [dB]
37.05	48.54	8.68	57.22
38.50	48.8	8.37	57.17
39.95	49.15	9.80	58.95

Table 7-6. Adopted AFCL value in the calculation

FCC ID: A3LAT1K02-A10	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 48 of 360

- 8) For channel bandwidths less than 100 MHz BW the EIRP must be reduced proportionally and lineally based on the bandwidth relative to 100 MHz according to §30.202 Power limits.

For 50MHz BW operation RBW scaling factor,

$$\begin{aligned}\text{Scaling Factor (dB)} &= 10\log(\text{BW}_1/\text{BW}_2) \\ &= 10 * \log(100/50) \\ &= 3.01 \text{ dB}\end{aligned}$$

- 9) The angle of the horn antenna was rotated to maximize and find the worst case emissions. Worst case EIRP is reported below.

- 10) A3LAT1K02-A10 test result is referenced as A3LAT1K02-A00 result which only difference of power type as AC and DC which supply condition affect to RF specification.

FCC ID: A3LAT1K02-A10	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 49 of 360

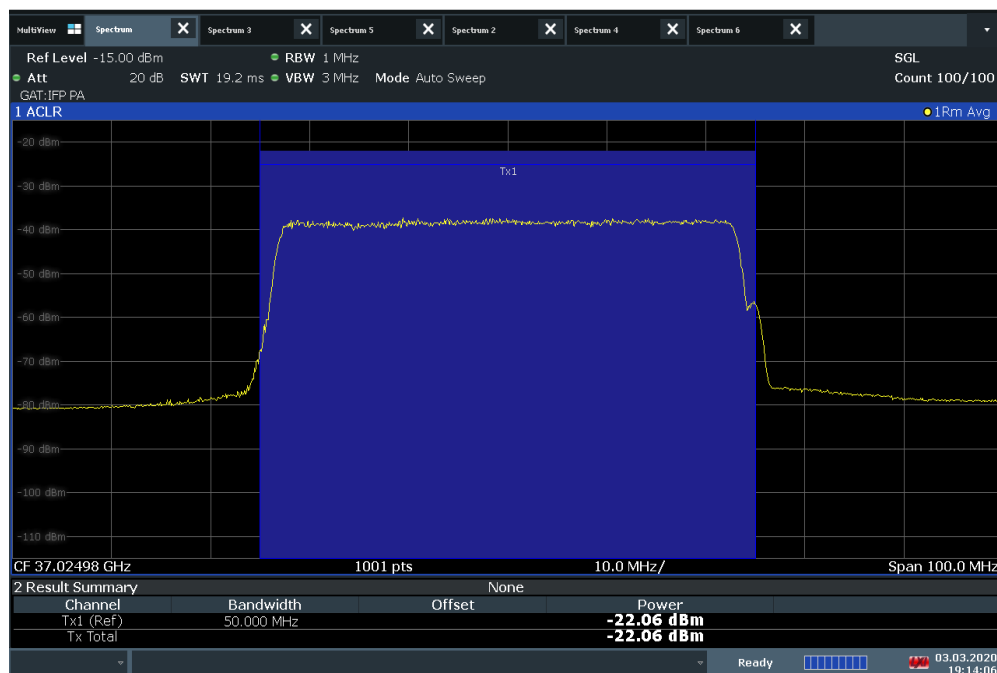
7.3.1 Antenna A EIRP Density

Antenna	Bandwidth	Channel	CCs active	Modulation	Horn Angle	Horn Height	Turntable Azimuth	Analyzer Level	AFCL	Average e.i.r.p. PSD	PSD Limit	Margin
	[MHz]				[degrees]	[cm]	[degrees]	[dBm]	[dB/m]	[dBm/100MHz]	[dBm/100MHz]	[dB]
A	50	Low	0	QPSK	135.0	155	7	-22.06	57.22	48.70	75.00	-29.31
		Low	0	16QAM	135.0	155	7	-22.02	57.22	48.74	75.00	-29.27
		Low	0	64QAM	135.0	155	7	-22.03	57.22	48.73	75.00	-29.28
	100	Low	0	QPSK	135.0	155	7	-18.81	57.22	48.94	75.00	-26.06
		Low	0	16QAM	135.0	155	7	-18.86	57.22	48.89	75.00	-26.11
		Low	0	64QAM	135.0	155	7	-18.89	57.22	48.86	75.00	-26.14
	50	Mid	4	QPSK	135.0	155	7	-22.01	57.17	48.70	75.00	-29.31
		Mid	4	16QAM	135.0	155	7	-22.00	57.17	48.71	75.00	-29.30
		Mid	4	64QAM	135.0	155	7	-21.99	57.17	48.72	75.00	-29.29
	100	Mid	4	QPSK	135.0	155	7	-19.30	57.17	48.40	75.00	-26.60
		Mid	4	16QAM	135.0	155	7	-19.24	57.17	48.46	75.00	-26.54
		Mid	4	64QAM	135.0	155	7	-19.21	57.17	48.49	75.00	-26.51
	50	High	7	QPSK	135.0	155	7	-22.86	58.95	49.63	75.00	-28.38
		High	7	16QAM	135.0	155	7	-22.92	58.95	49.57	75.00	-28.44
		High	7	64QAM	135.0	155	7	-22.97	58.95	49.52	75.00	-28.49
	100	High	7	QPSK	135.0	155	7	-19.55	58.95	49.93	75.00	-25.07
		High	7	16QAM	135.0	155	7	-19.55	58.95	49.93	75.00	-25.07
		High	7	64QAM	135.0	155	7	-19.67	58.95	49.81	75.00	-25.19
	50	Low	0-7	QPSK	135.0	155	7	-24.49	57.22	46.27	75.00	-31.74
		Low	0-7	16QAM	135.0	155	7	-24.37	57.22	46.39	75.00	-31.62
		Low	0-7	64QAM	135.0	155	7	-24.38	57.22	46.38	75.00	-31.63
	100	Low	0-7	QPSK	135.0	155	7	-24.51	57.22	43.24	75.00	-31.76
		Low	0-7	16QAM	135.0	155	7	-24.49	57.22	43.26	75.00	-31.74
		Low	0-7	64QAM	135.0	155	7	-24.47	57.22	43.28	75.00	-31.72
	50	Mid	0-7	QPSK	135.0	155	7	-23.93	57.17	46.78	75.00	-31.23
		Mid	0-7	16QAM	135.0	155	7	-23.93	57.17	46.78	75.00	-31.23
		Mid	0-7	64QAM	135.0	155	7	-23.95	57.17	46.76	75.00	-31.25
	100	Mid	0-7	QPSK	135.0	155	7	-23.46	57.17	44.24	75.00	-30.76
		Mid	0-7	16QAM	135.0	155	7	-23.51	57.17	44.19	75.00	-30.81
		Mid	0-7	64QAM	135.0	155	7	-23.55	57.17	44.15	75.00	-30.85
	50	High	0-7	QPSK	135.0	155	7	-24.56	58.95	47.93	75.00	-30.08
		High	0-7	16QAM	135.0	155	7	-24.56	58.95	47.93	75.00	-30.08
		High	0-7	64QAM	135.0	155	7	-24.60	58.95	47.89	75.00	-30.12
	100	High	0-7	QPSK	135.0	155	7	-24.30	58.95	45.18	75.00	-29.82
		High	0-7	16QAM	135.0	155	7	-24.33	58.95	45.15	75.00	-29.85
		High	0-7	64QAM	135.0	155	7	-24.36	58.95	45.12	75.00	-29.88
	50	Low	0-7(NC)	QPSK	135.0	155	7	-23.15	57.22	47.61	75.00	-30.40
		Low	0-7(NC)	16QAM	135.0	155	7	-23.11	57.22	47.65	75.00	-30.36
		Low	0-7(NC)	64QAM	135.0	155	7	-23.10	57.22	47.66	75.00	-30.35
	100	Low	0-7(NC)	QPSK	135.0	155	7	-24.19	57.22	43.56	75.00	-31.44
		Low	0-7(NC)	16QAM	135.0	155	7	-24.32	57.22	43.43	75.00	-31.57
		Low	0-7(NC)	64QAM	135.0	155	7	-24.33	57.22	43.42	75.00	-31.58
	50	Mid	0-7(NC)	QPSK	135.0	155	7	-23.51	57.17	47.20	75.00	-30.81
		Mid	0-7(NC)	16QAM	135.0	155	7	-23.49	57.17	47.22	75.00	-30.79
		Mid	0-7(NC)	64QAM	135.0	155	7	-23.44	57.17	47.27	75.00	-30.74
	100	Mid	0-7(NC)	QPSK	135.0	155	7	-24.41	57.17	43.29	75.00	-31.71
		Mid	0-7(NC)	16QAM	135.0	155	7	-24.42	57.17	43.28	75.00	-31.72
		Mid	0-7(NC)	64QAM	135.0	155	7	-24.31	57.17	43.39	75.00	-31.61
	50	High	0-7(NC)	QPSK	135.0	155	7	-22.96	58.95	49.53	75.00	-28.48
		High	0-7(NC)	16QAM	135.0	155	7	-22.99	58.95	49.50	75.00	-28.51
		High	0-7(NC)	64QAM	135.0	155	7	-22.96	58.95	49.53	75.00	-28.48
	100	High	0-7(NC)	QPSK	135.0	155	7	-24.17	58.95	45.31	75.00	-29.69
		High	0-7(NC)	16QAM	135.0	155	7	-24.17	58.95	45.31	75.00	-29.69
		High	0-7(NC)	64QAM	135.0	155	7	-24.16	58.95	45.32	75.00	-29.68

Table 7-7. Antenna A Power Density Summary Data

FCC ID: A3LAT1K02-A10	 MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit	Page 50 of 360

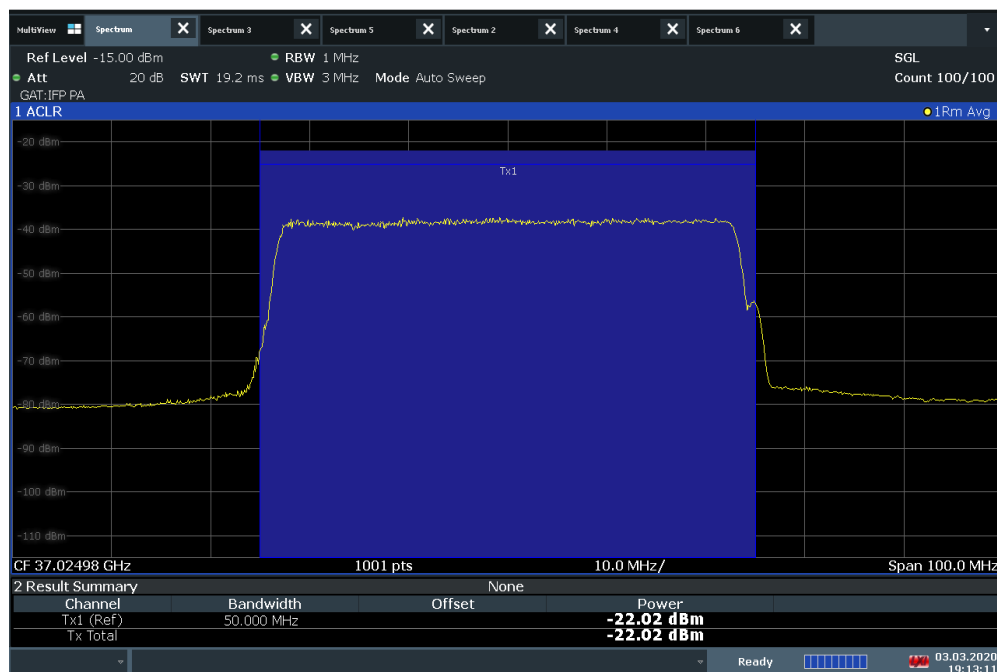
ACLRRResults



19:14:07 03.03.2020

Plot 7-49. Antenna A EIRP Density Plot (50MHz BW 1CC QPSK Low Channel)

ACLRRResults

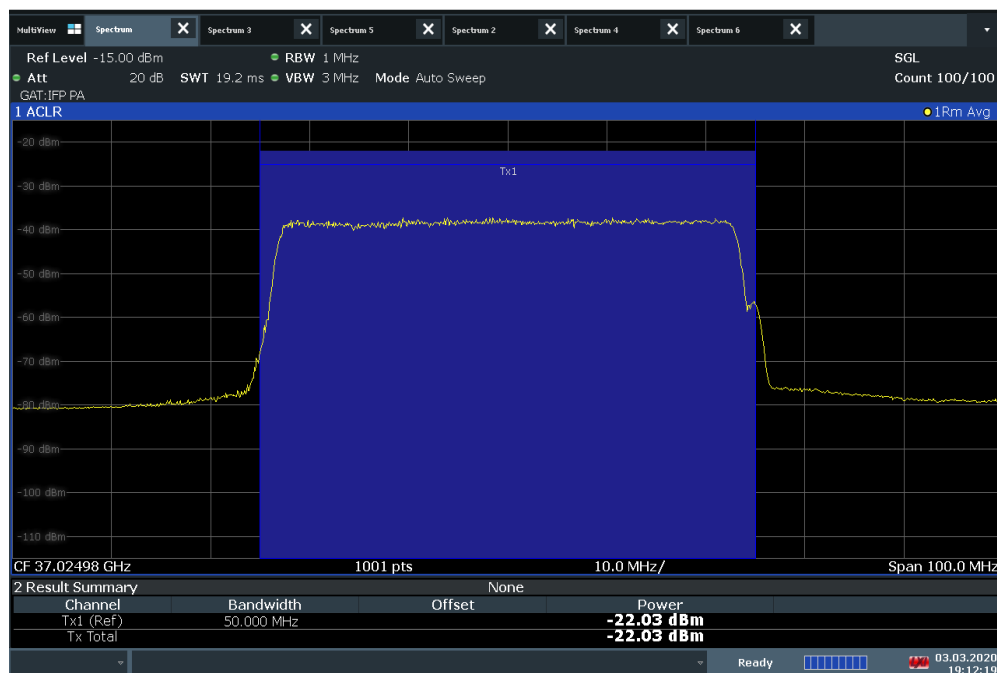


19:13:12 03.03.2020

Plot 7-50. Antenna A EIRP Density Plot (50MHz BW 1CC 16QAM Low Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 51 of 360

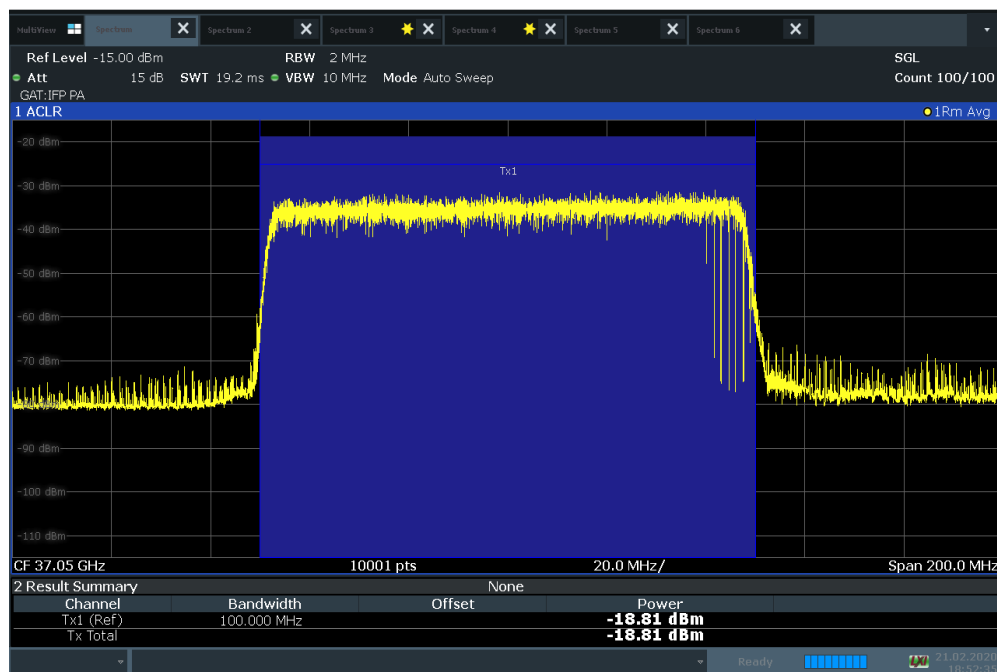
ACLRResults



19:12:20 03.03.2020

Plot 7-51. Antenna A EIRP Density Plot (50MHz BW 1CC 64QAM Low Channel)

ACLRResults

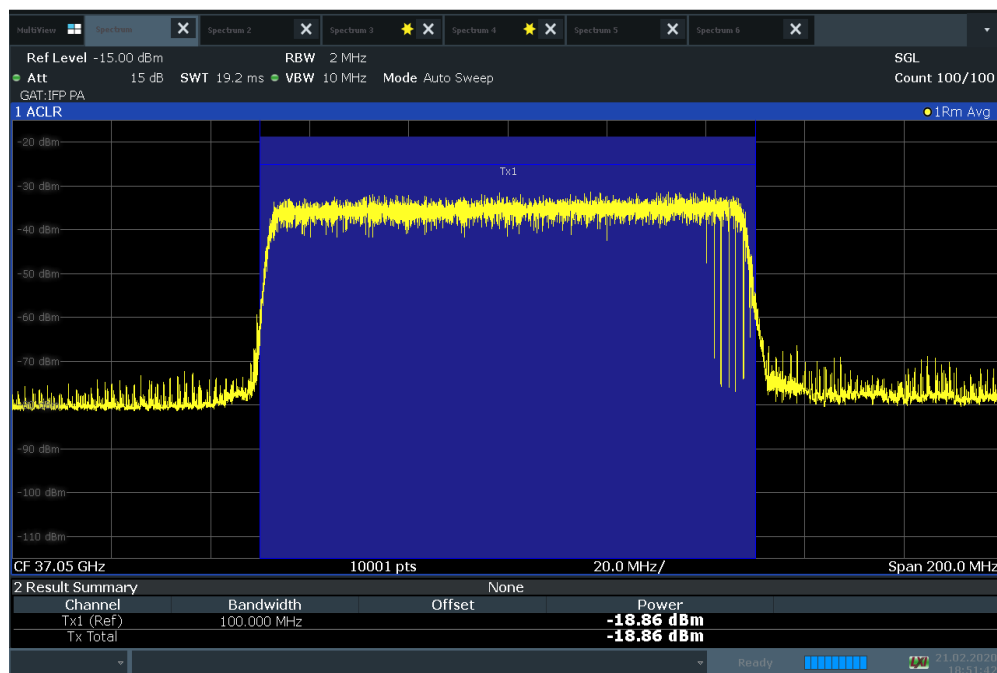


18:52:36 21.02.2020

Plot 7-52. Antenna A EIRP Density Plot (100MHz BW 1CC QPSK Low Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 52 of 360

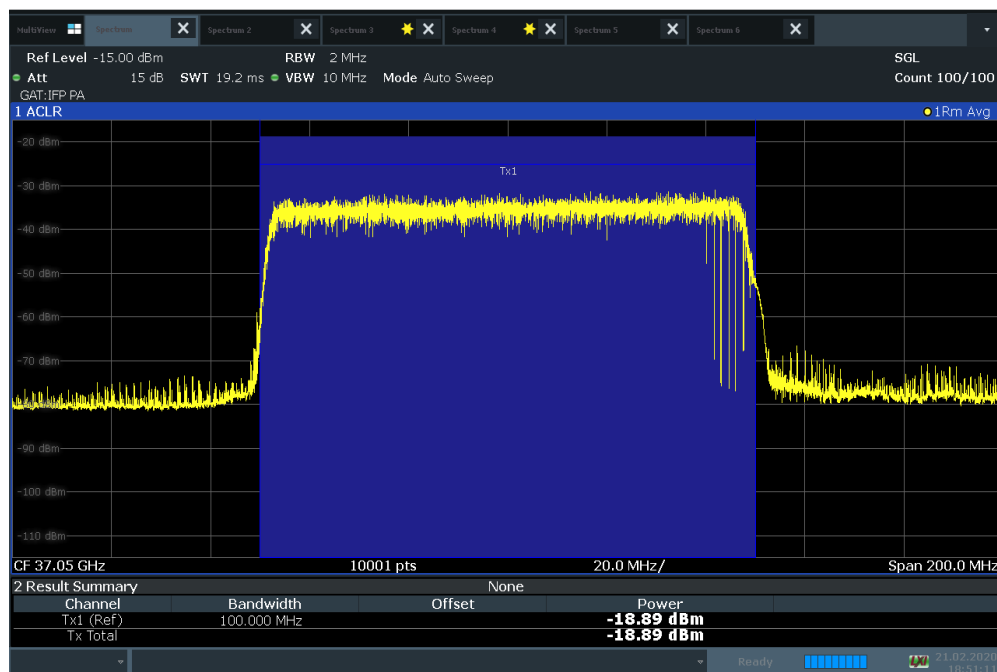
ACLRResults



18:51:42 21.02.2020

Plot 7-53. Antenna A EIRP Density Plot (100MHz BW 1CC 16QAM Low Channel)

ACLRResults

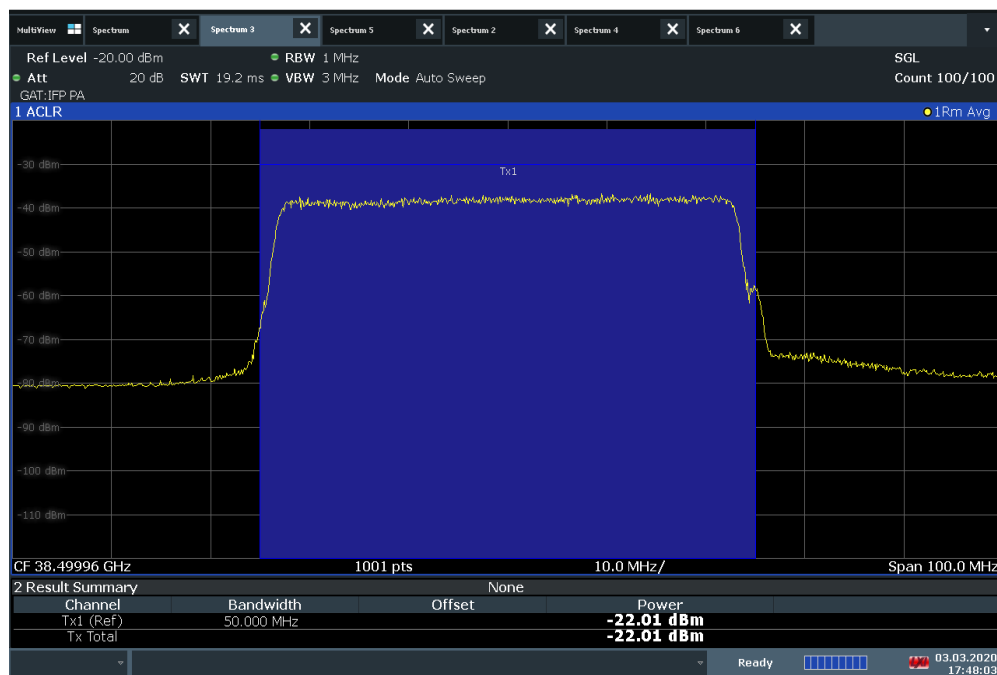


18:51:12 21.02.2020

Plot 7-54. Antenna A EIRP Density Plot (100MHz BW 1CC 64QAM Low Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 53 of 360

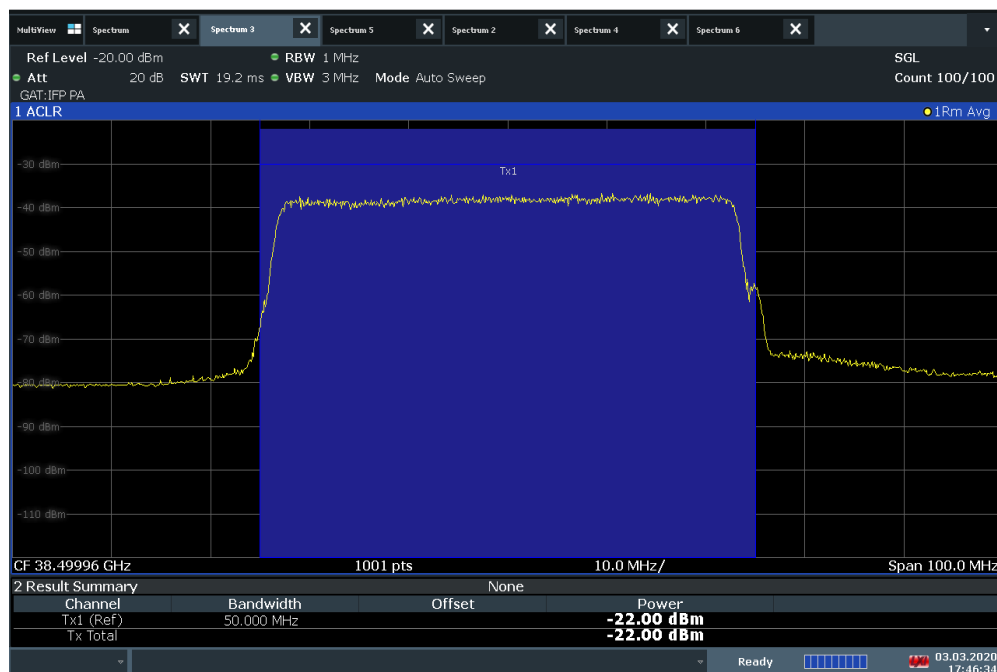
ACLRRResults



17:48:03 03.03.2020

Plot 7-55. Antenna A EIRP Density Plot (50MHz BW 1CC QPSK Mid Channel)

ACLRRResults

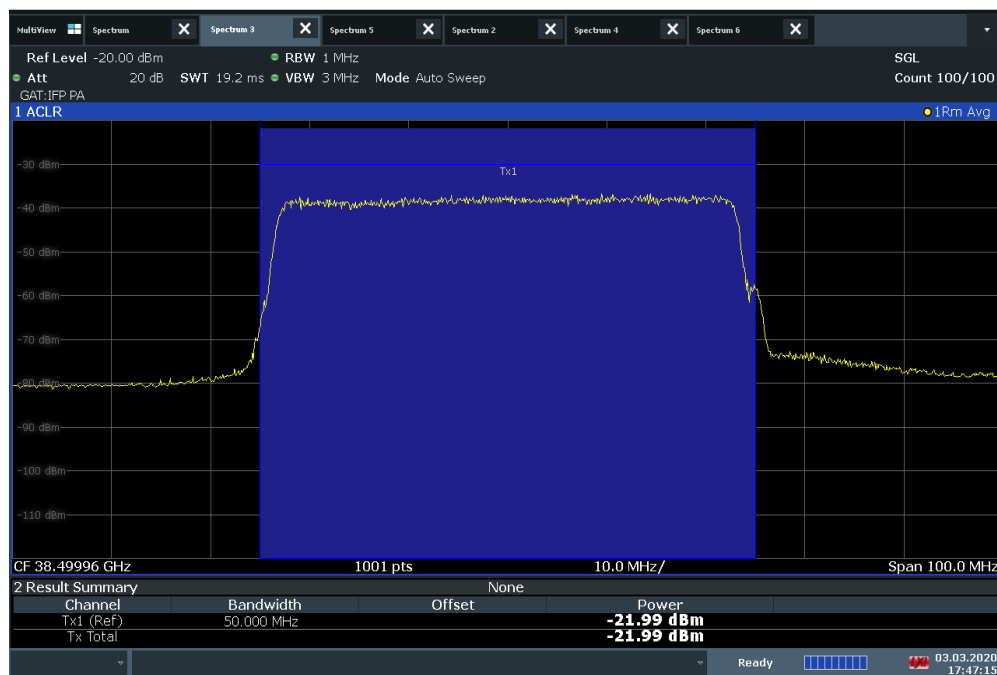


17:46:34 03.03.2020

Plot 7-56. Antenna A EIRP Density Plot (50MHz BW 1CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 54 of 360

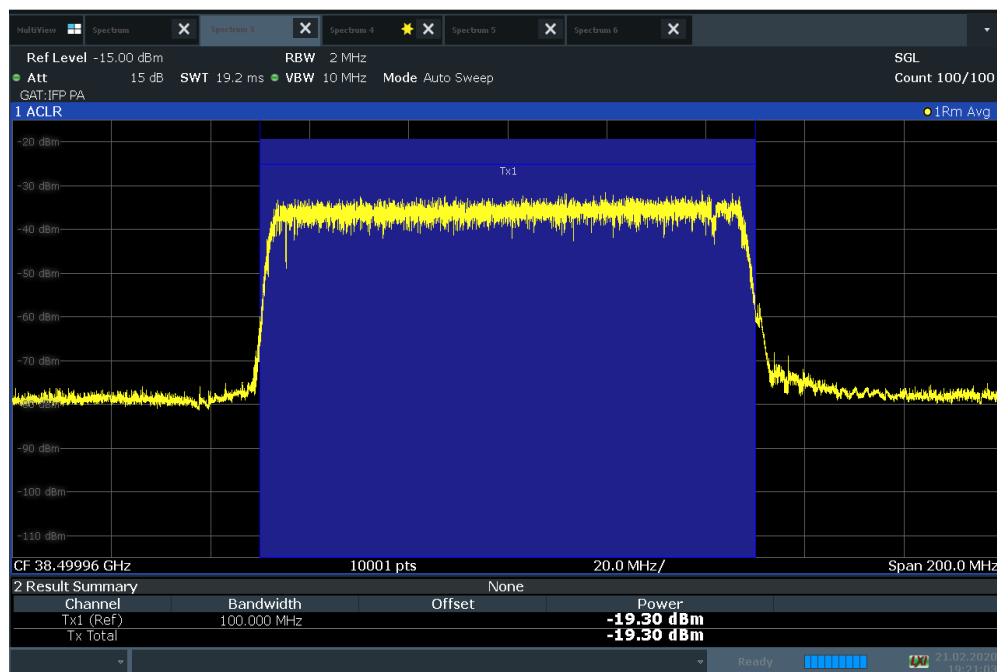
ACLRRResults



17:47:16 03.03.2020

Plot 7-57. Antenna A EIRP Density Plot (50MHz BW 1CC 64QAM Mid Channel)

ACLRRResults

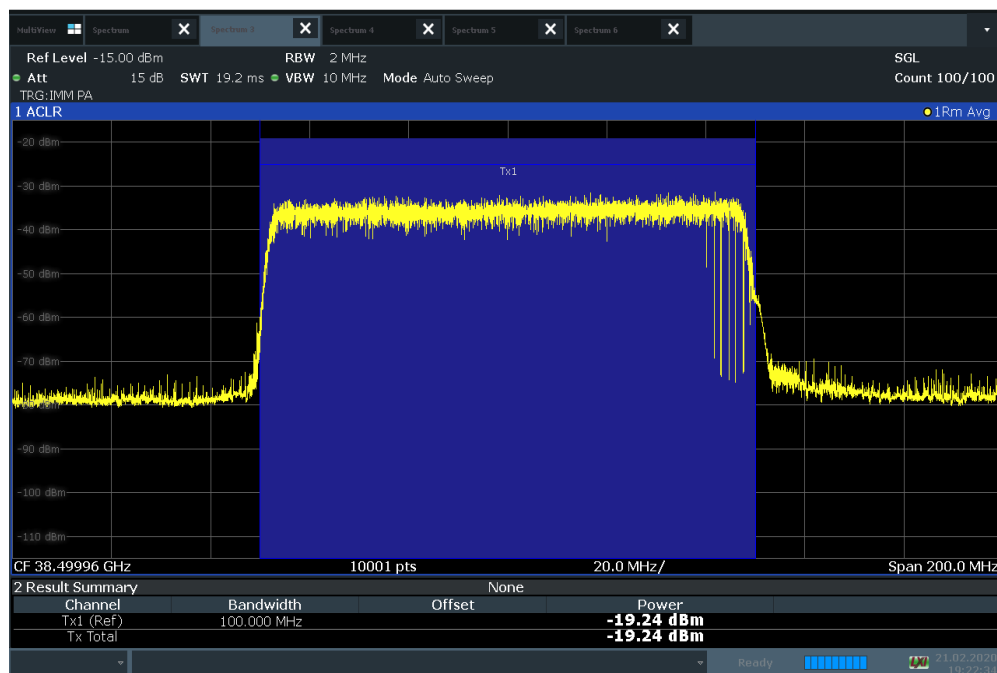


19:21:03 21.02.2020

Plot 7-58. Antenna A EIRP Density Plot (100MHz BW 1CC QPSK Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 55 of 360

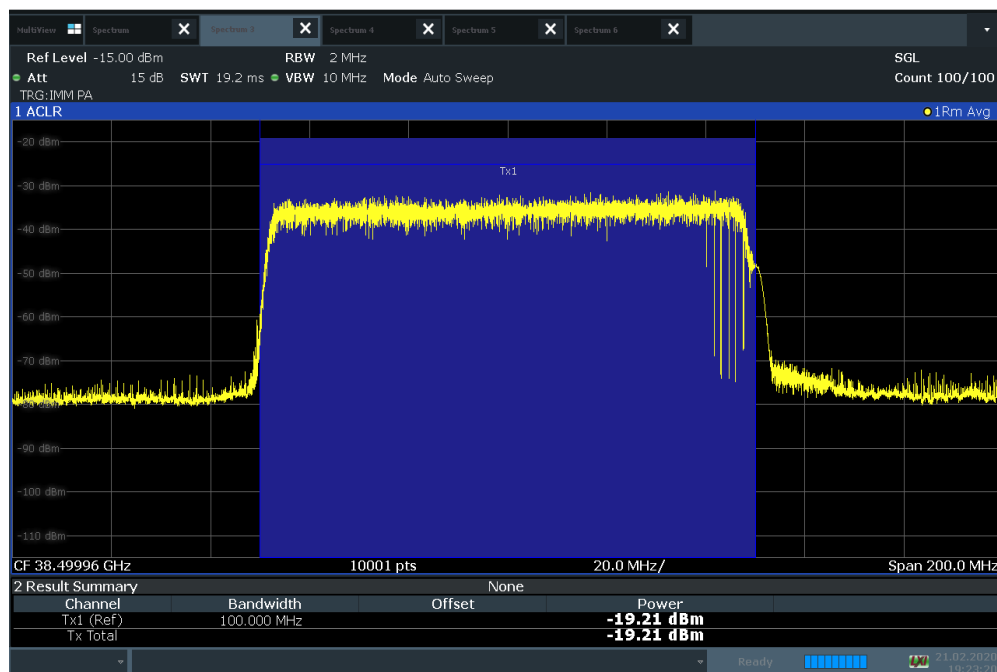
ACLRResults



19:22:34 21.02.2020

Plot 7-59. Antenna A EIRP Density Plot (100MHz BW 1CC 16QAM Mid Channel)

ACLRResults

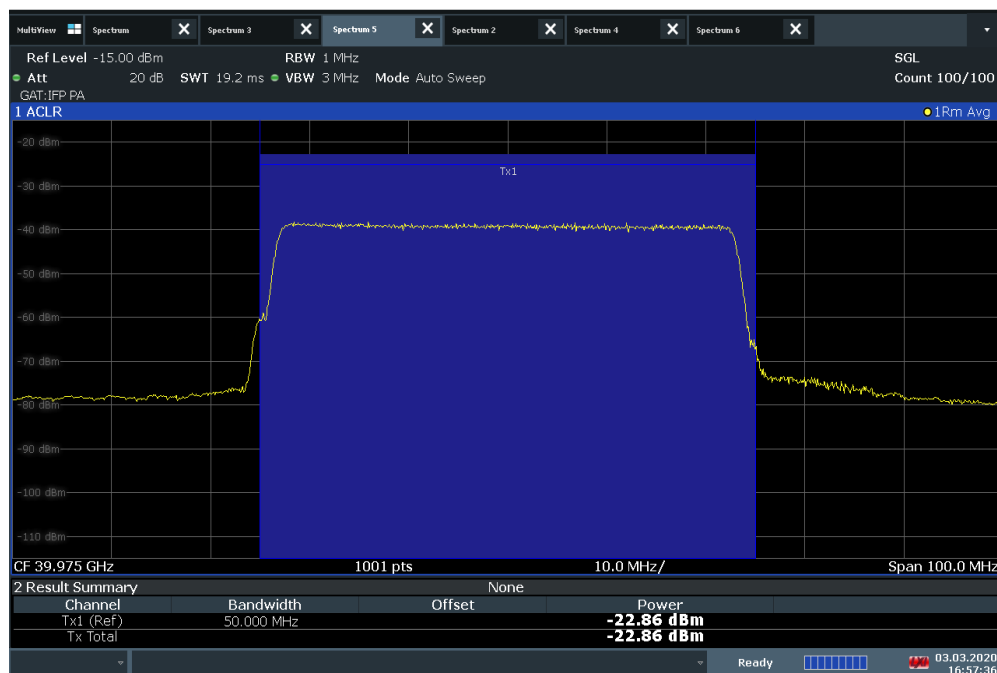


19:23:20 21.02.2020

Plot 7-60. Antenna A EIRP Density Plot (100MHz BW 1CC 64QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 56 of 360

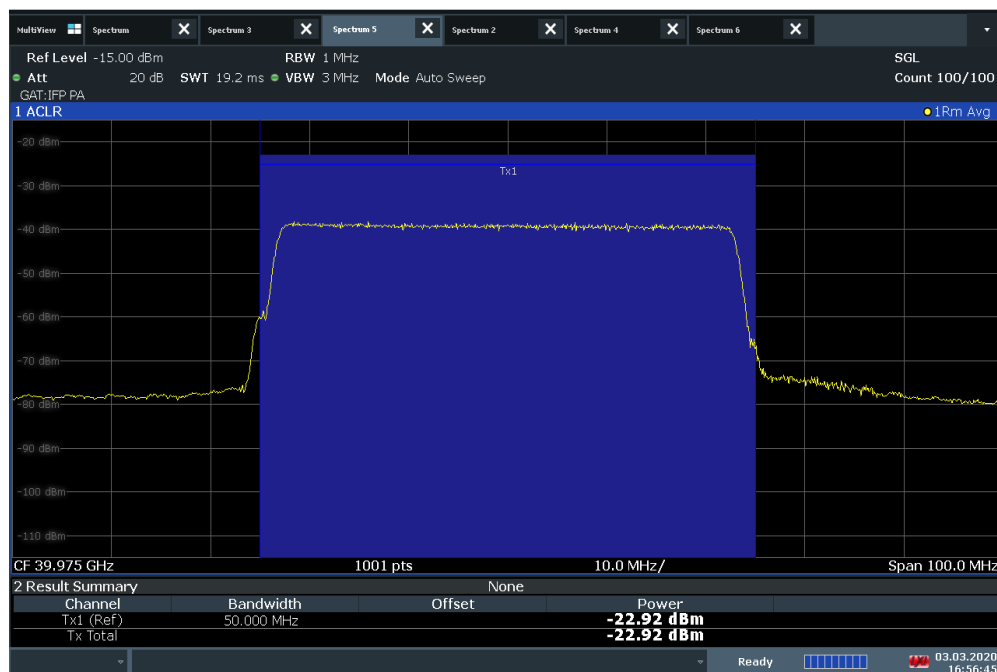
ACLRResults



16:57:37 03.03.2020

Plot 7-61. Antenna A EIRP Density Plot (50MHz BW 1CC QPSK High Channel)

ACLRResults

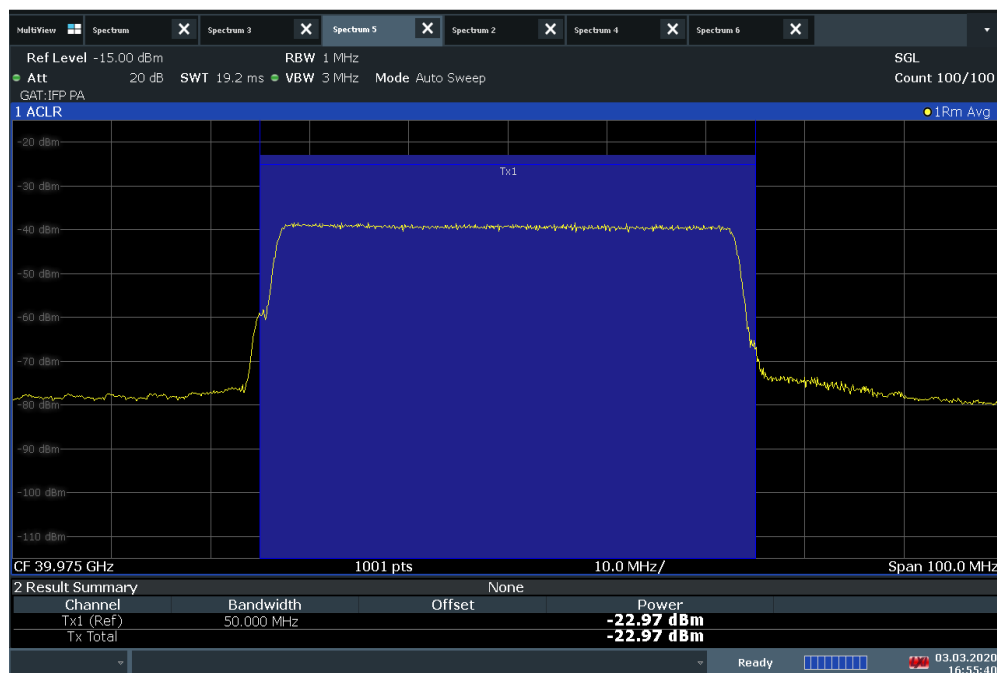


16:56:45 03.03.2020

Plot 7-62. Antenna A EIRP Density Plot (50MHz BW 1CC 16QAM High Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 57 of 360

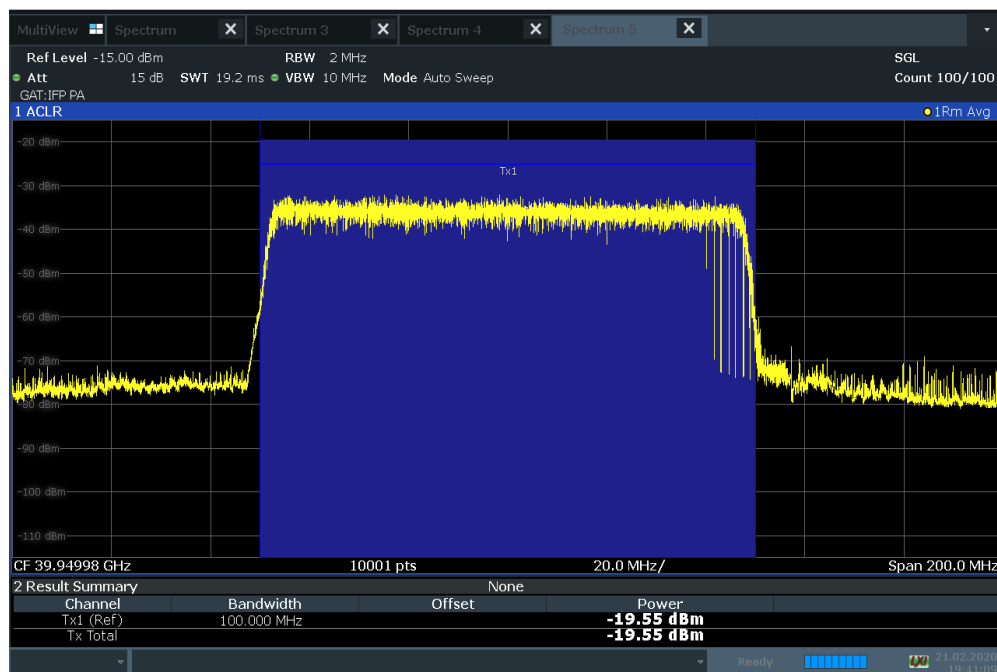
ACLRRResults



16:55:40 03.03.2020

Plot 7-63. Antenna A EIRP Density Plot (50MHz BW 1CC 64QAM High Channel)

ACLRRResults

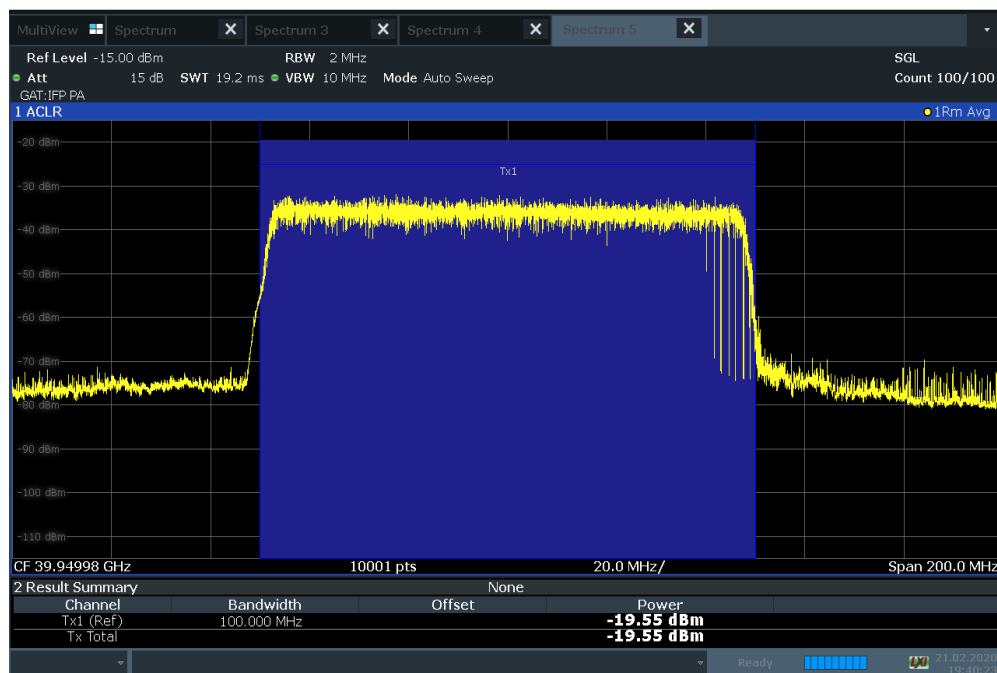


19:41:09 21.02.2020

Plot 7-64. Antenna A EIRP Density Plot (100MHz BW 1CC QPSK High Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 58 of 360

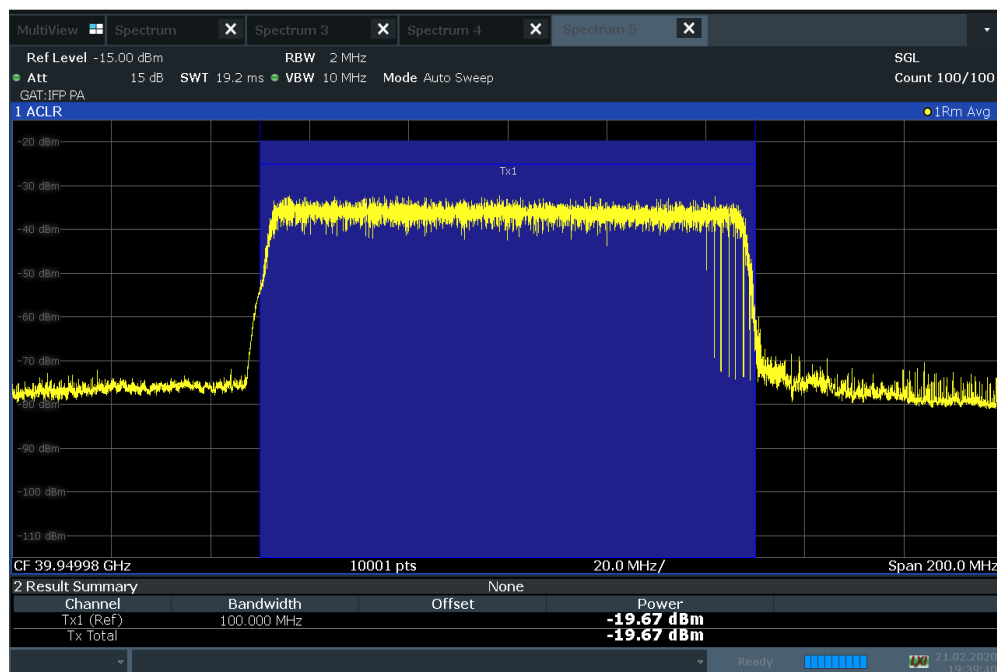
ACLRResults



19:40:24 21.02.2020

Plot 7-65. Antenna A EIRP Density Plot (100MHz BW 1CC 16QAM High Channel)

ACLRResults

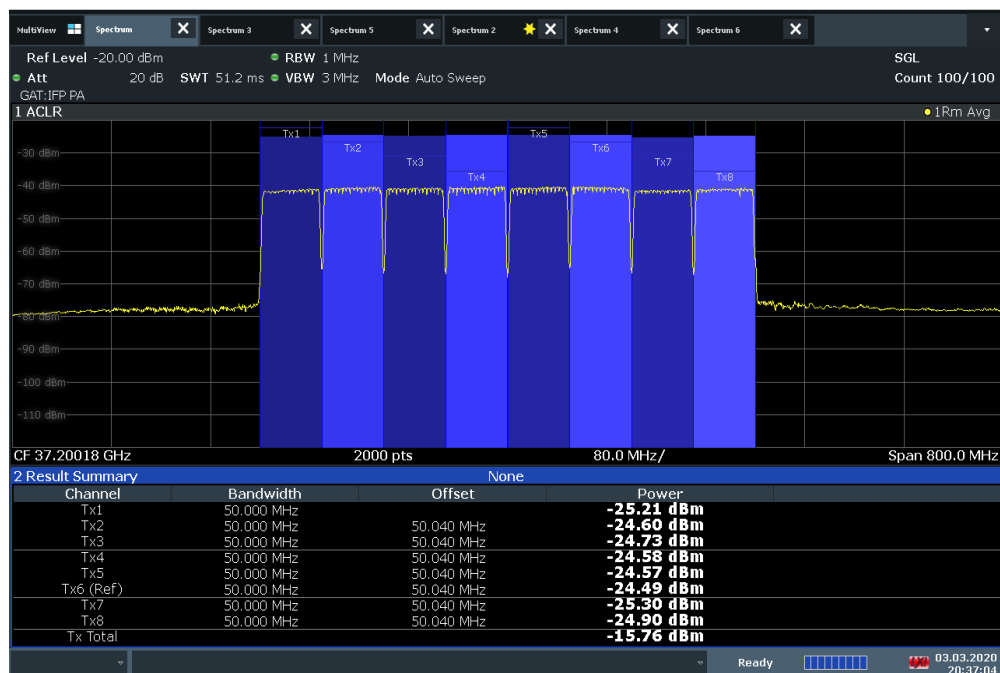


19:39:41 21.02.2020

Plot 7-66. Antenna A EIRP Density Plot (100MHz BW 1CC 64QAM High Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 59 of 360

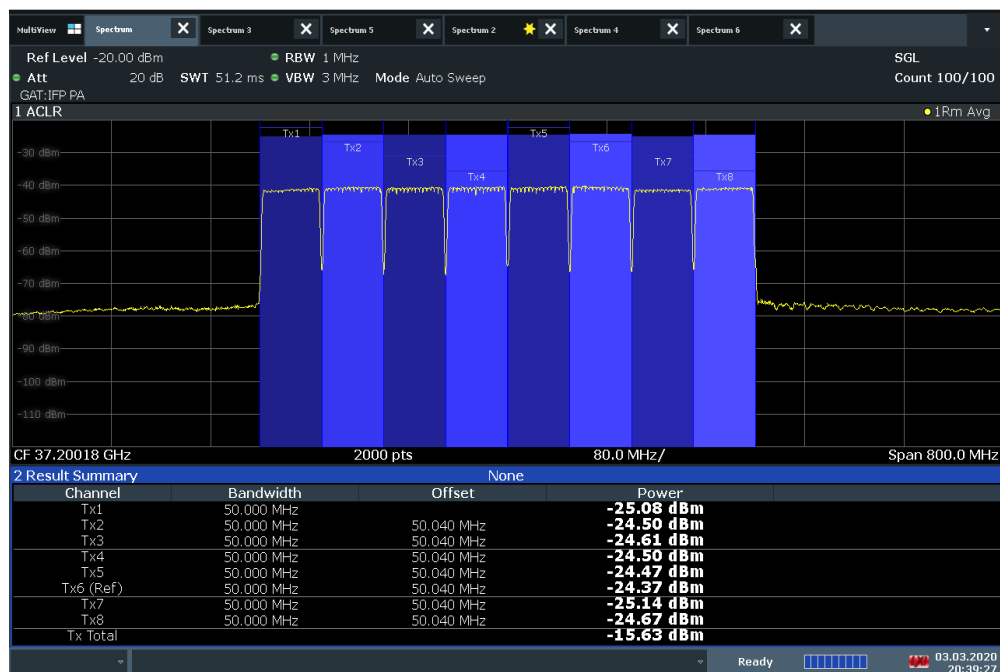
ACLRResults



20:37:04 03.03.2020

Plot 7-67. Antenna A EIRP Density Plot (50MHz BW 8CC QPSK Low Channel)

ACLRResults

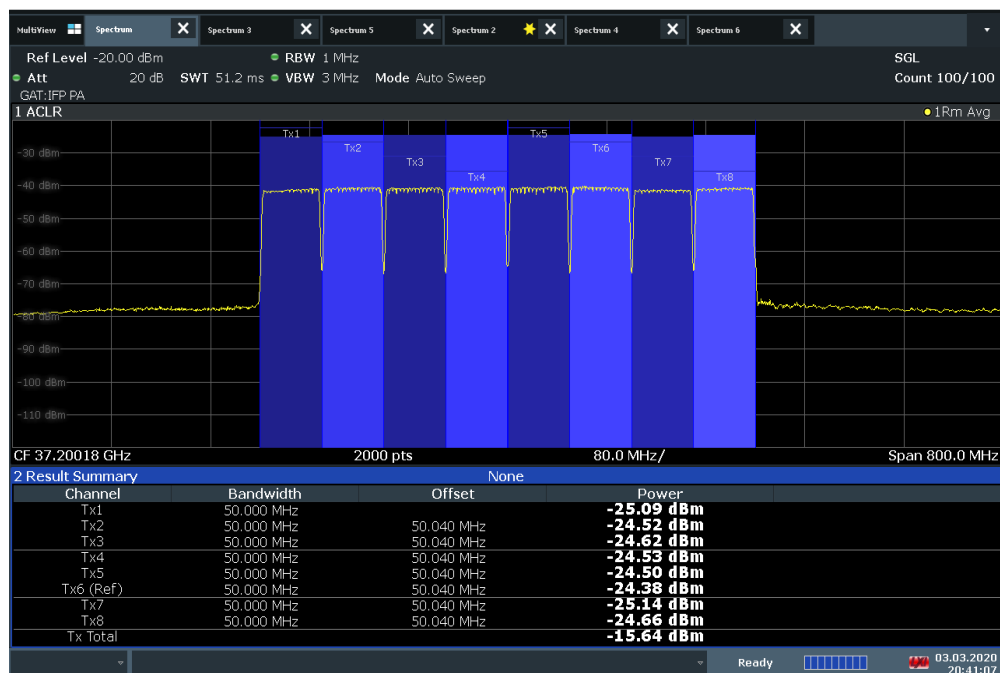


20:39:28 03.03.2020

Plot 7-68. Antenna A EIRP Density Plot (50MHz BW 8CC 16QAM Low Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 60 of 360

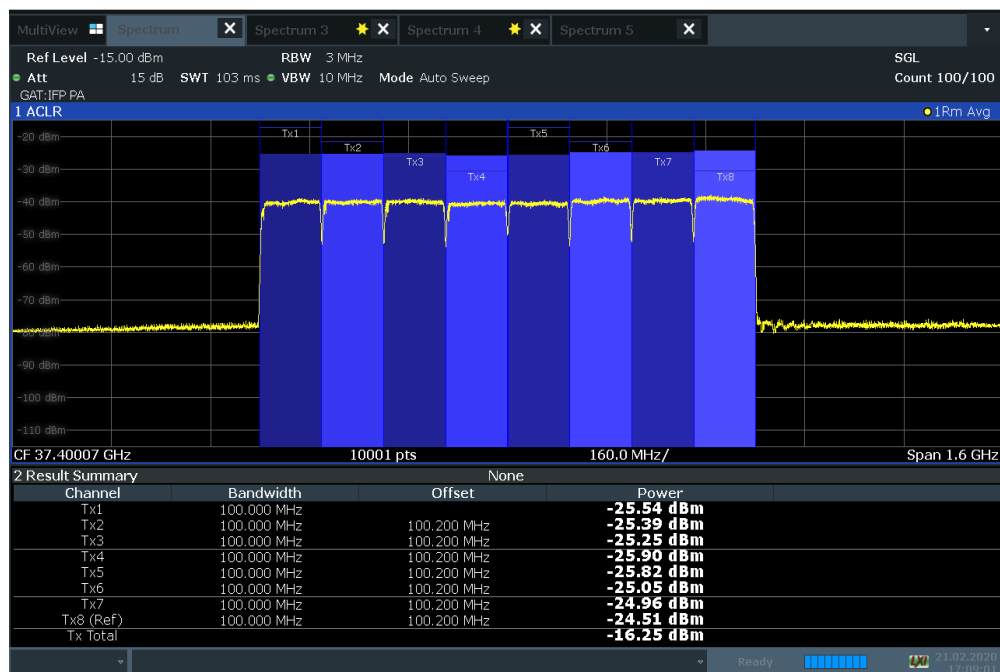
ACLRResults



20:41:08 03.03.2020

Plot 7-69. Antenna A EIRP Density Plot (50MHz BW 8CC 64QAM Low Channel)

ACLRResults

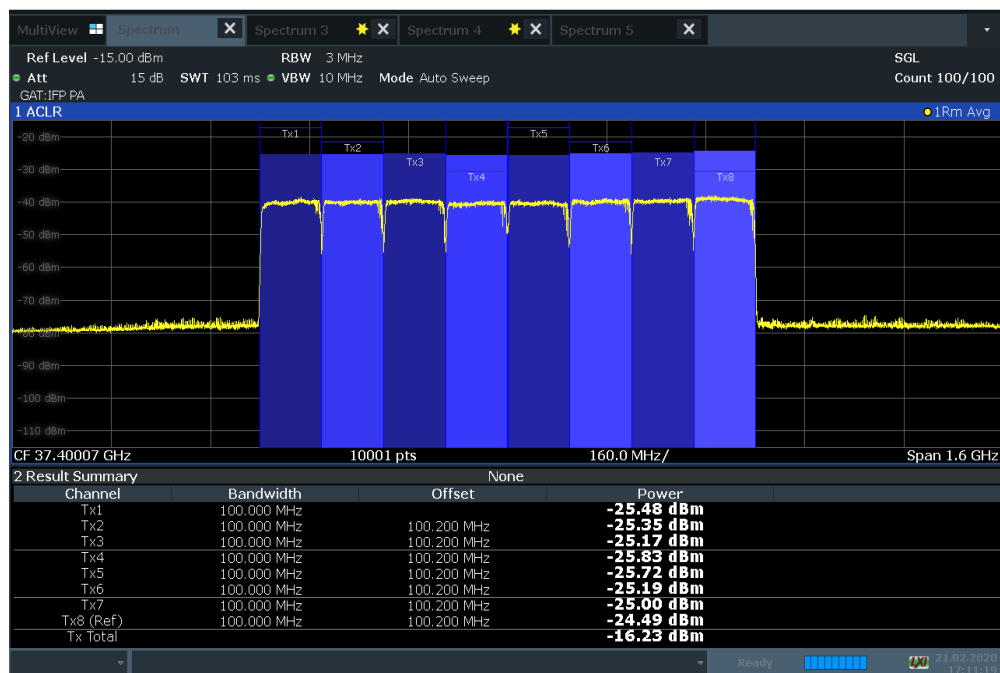


17:09:01 21.02.2020

Plot 7-70. Antenna A EIRP Density Plot (100MHz BW 8CC QPSK Low Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 61 of 360

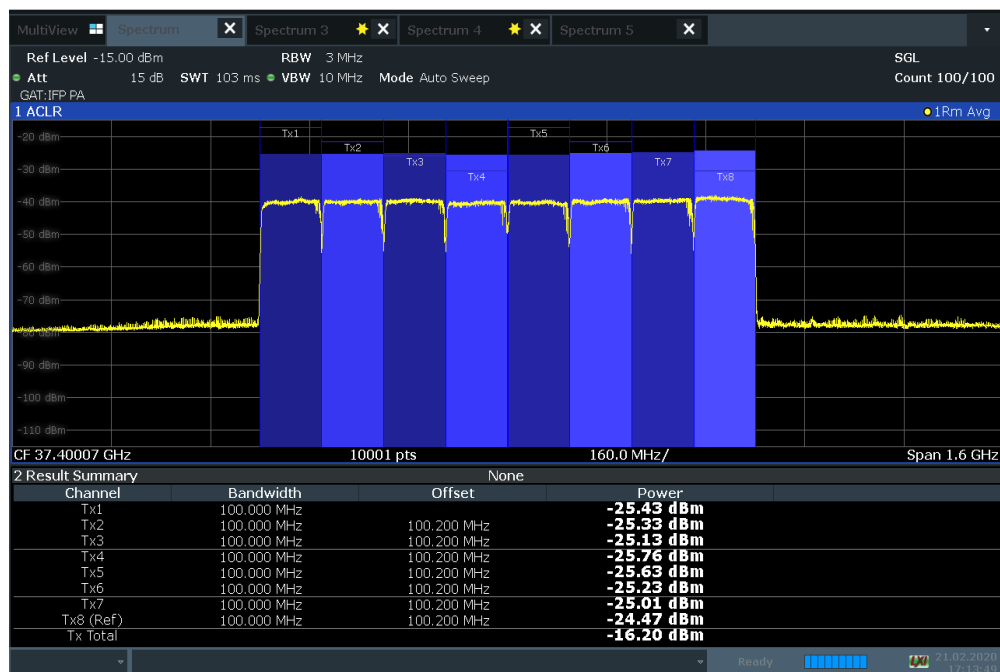
ACLRRResults



17:11:20 21.02.2020

Plot 7-71. Antenna A EIRP Density Plot (100MHz BW 8CC 16QAM Low Channel)

ACLRRResults

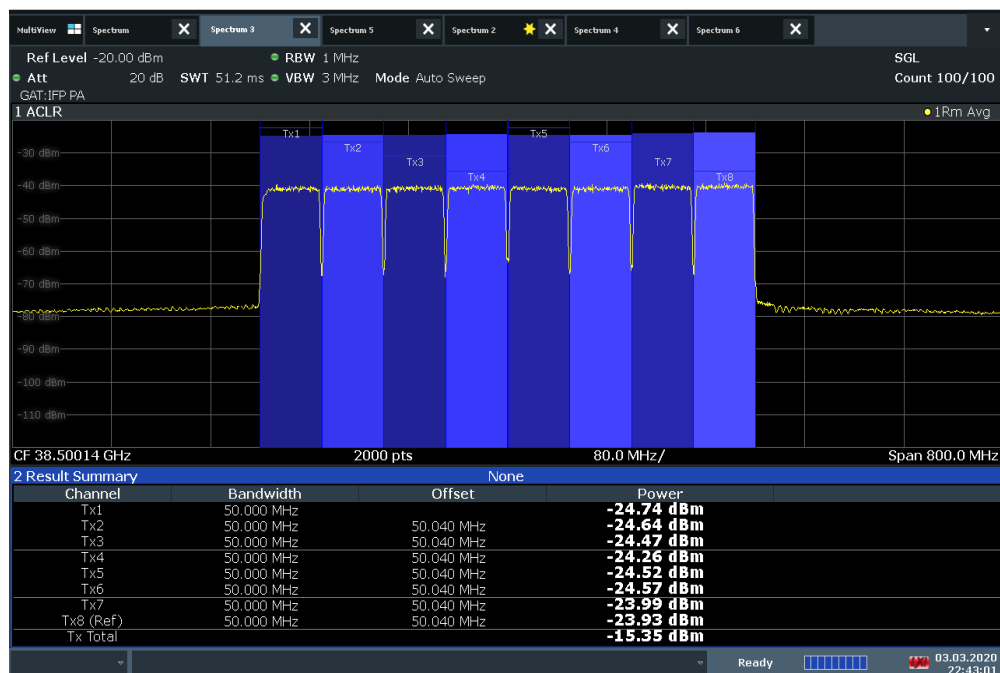


17:13:49 21.02.2020

Plot 7-72. Antenna A EIRP Density Plot (100MHz BW 8CC 64QAM Low Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 62 of 360

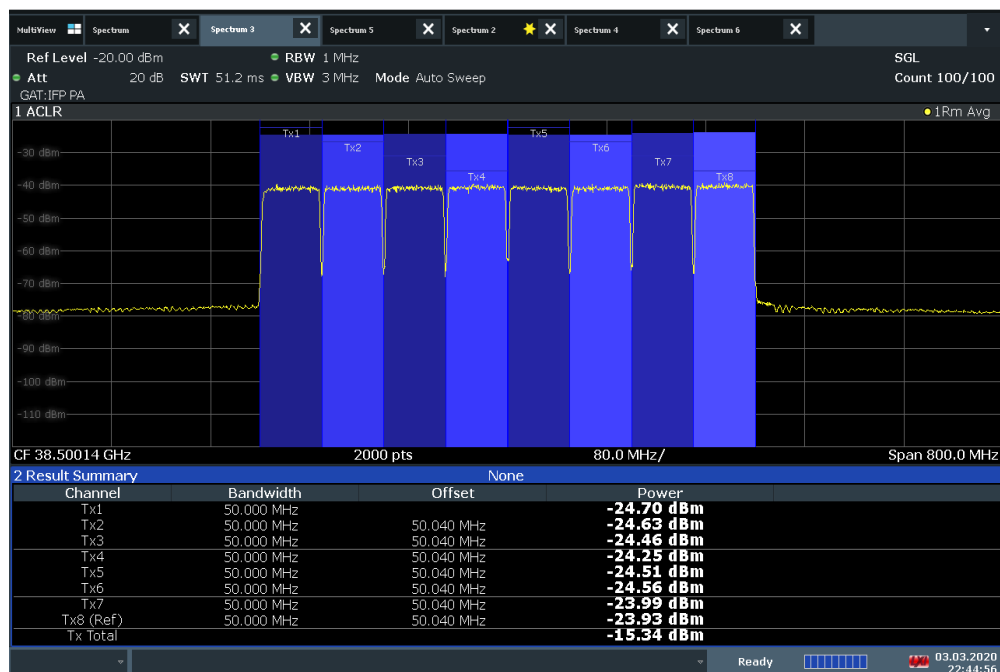
ACLRRResults



22:43:02 03.03.2020

Plot 7-73. Antenna A EIRP Density Plot (50MHz BW 8CC QPSK Mid Channel)

ACLRRResults



22:44:57 03.03.2020

Plot 7-74. Antenna A EIRP Density Plot (50MHz BW 8CC 16QAM Mid Channel)

FCC ID: A3LAT1K02-A10	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110702-01-R1.A3L	Test Dates: 02/18/2020-03/06/2020	EUT Type: 5G Access Unit		Page 63 of 360