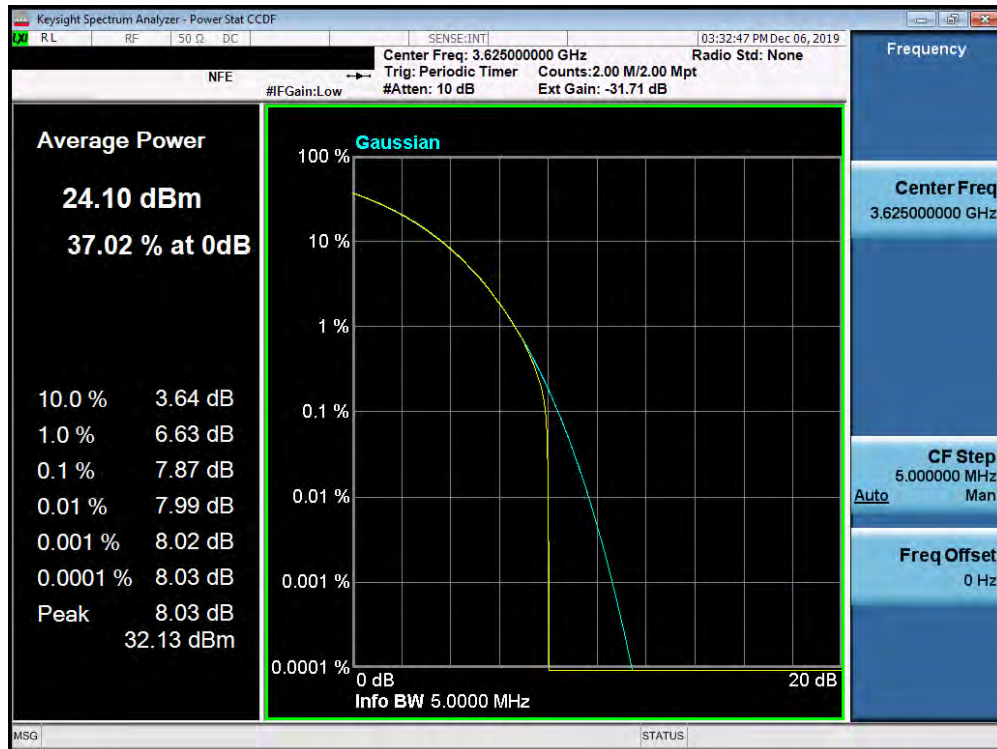
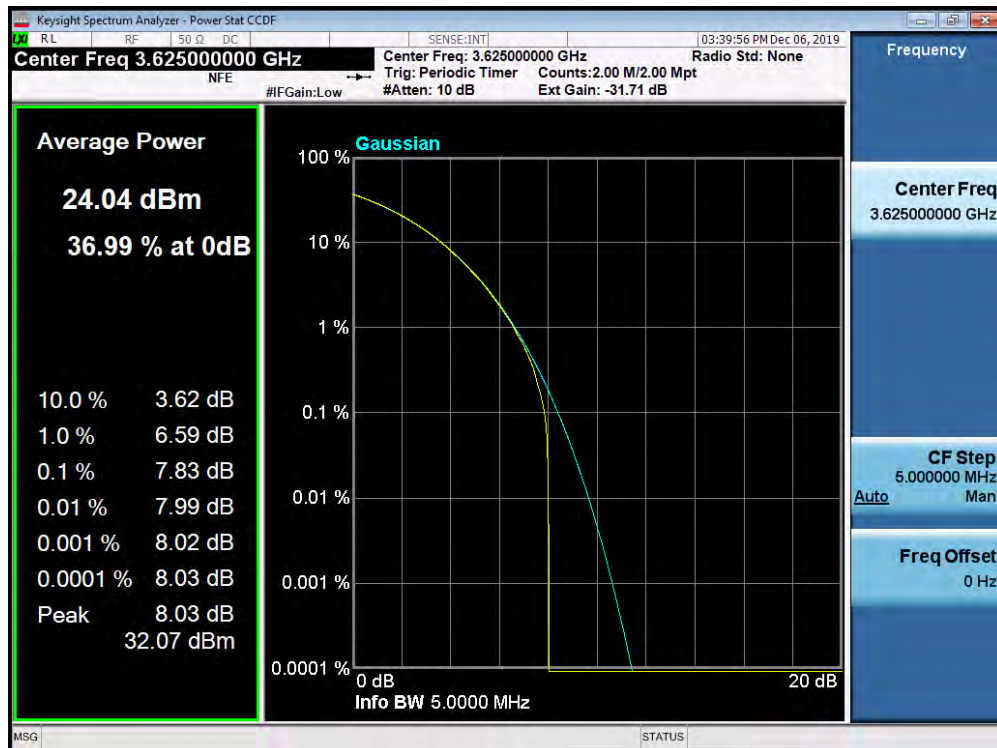




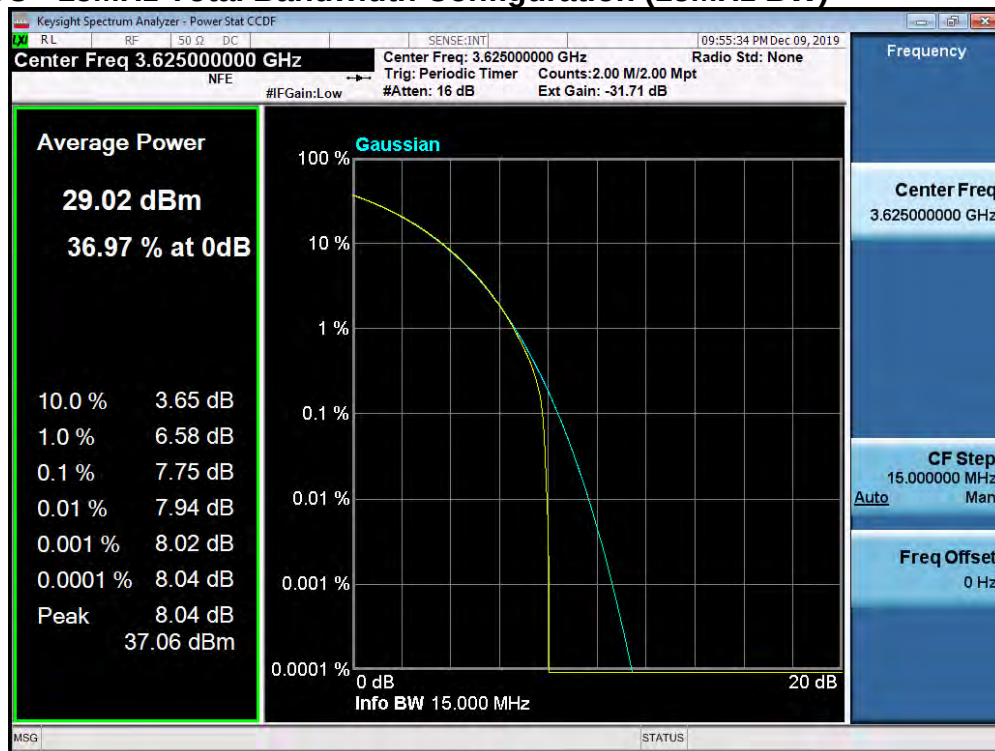
Plot 7-159. Common mode PAR Plot (5MHz Total Bandwidth 64QAM - Mid Channel)



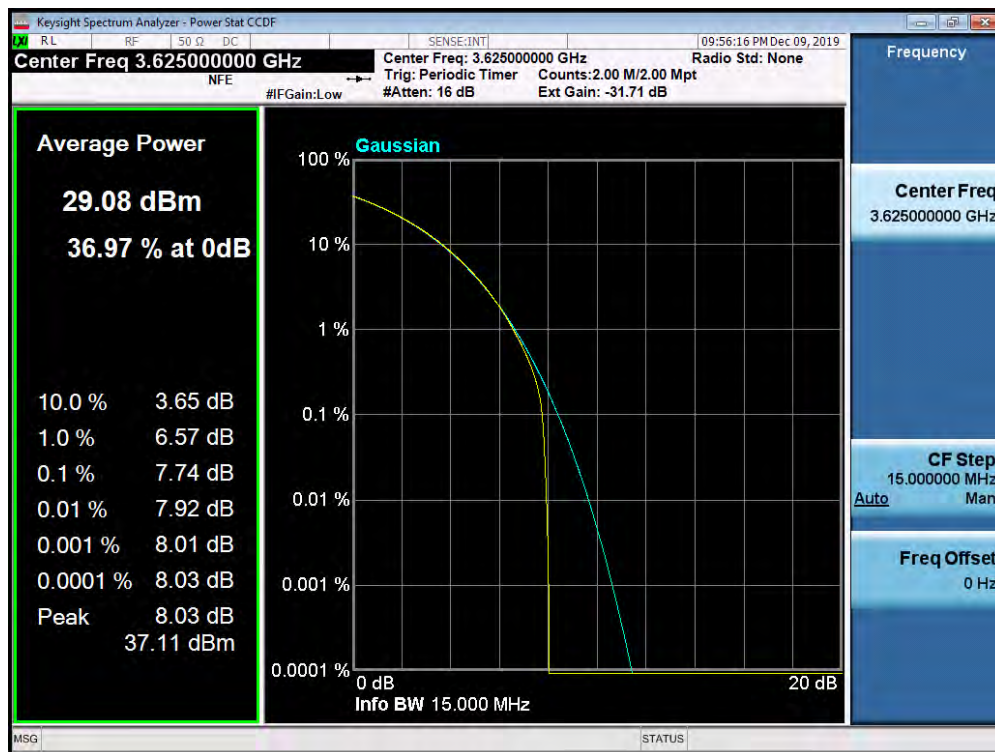
Plot 7-160. Common mode PAR Plot (5MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 108 of 161

Case02. 1CC - 15MHz Total Bandwidth Configuration (15MHz BW)

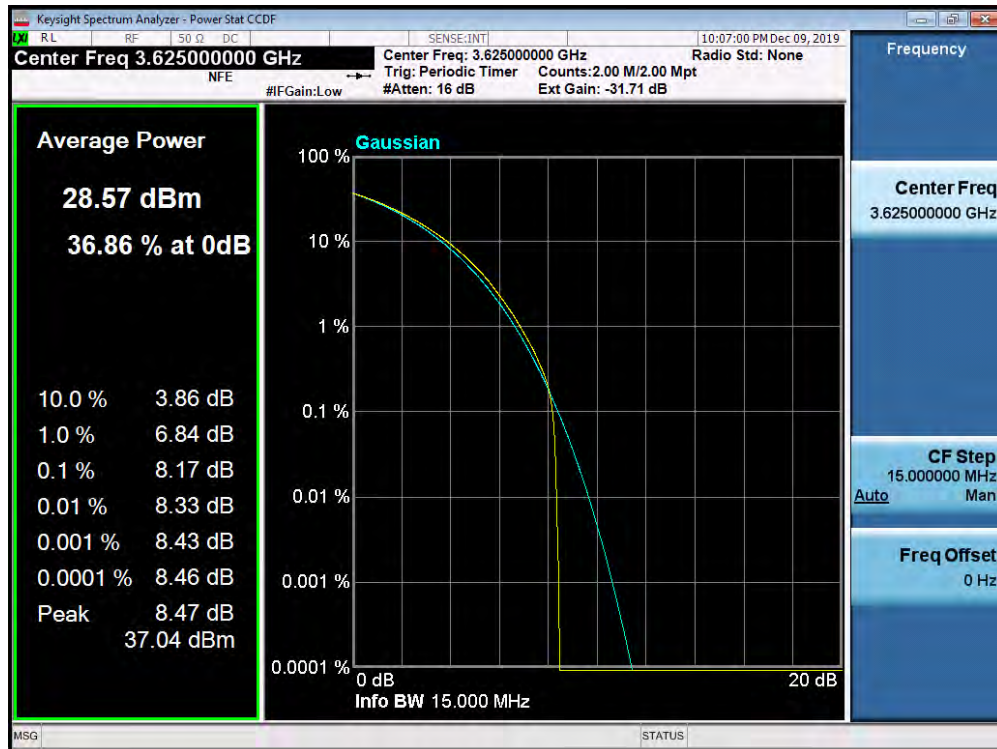


Plot 7-161. Common mode PAR Plot (15MHz Total Bandwidth QPSK - Mid Channel)

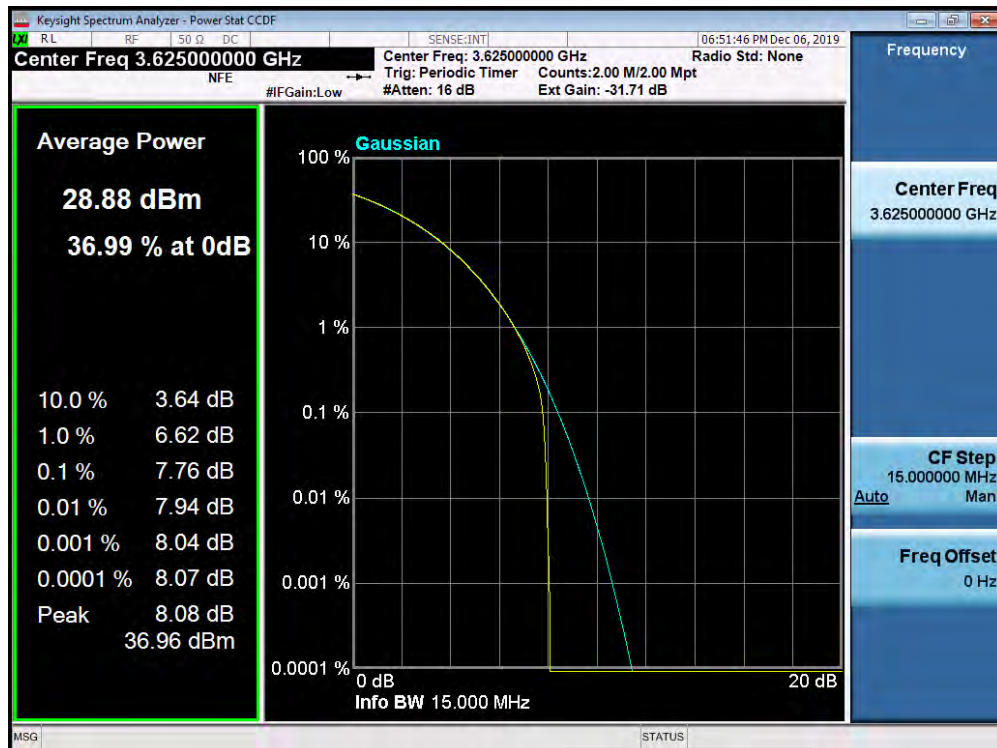


Plot 7-162. Common mode PAR Plot (15MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 109 of 161



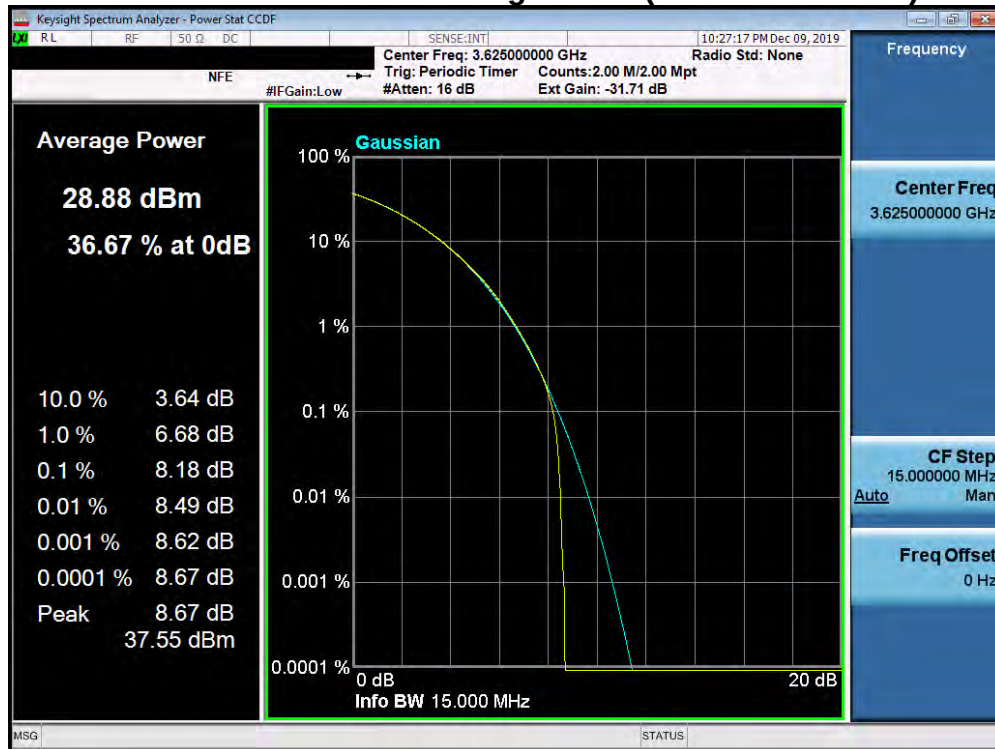
Plot 7-163. Common mode PAR Plot (15MHz Total Bandwidth 64QAM - Mid Channel)



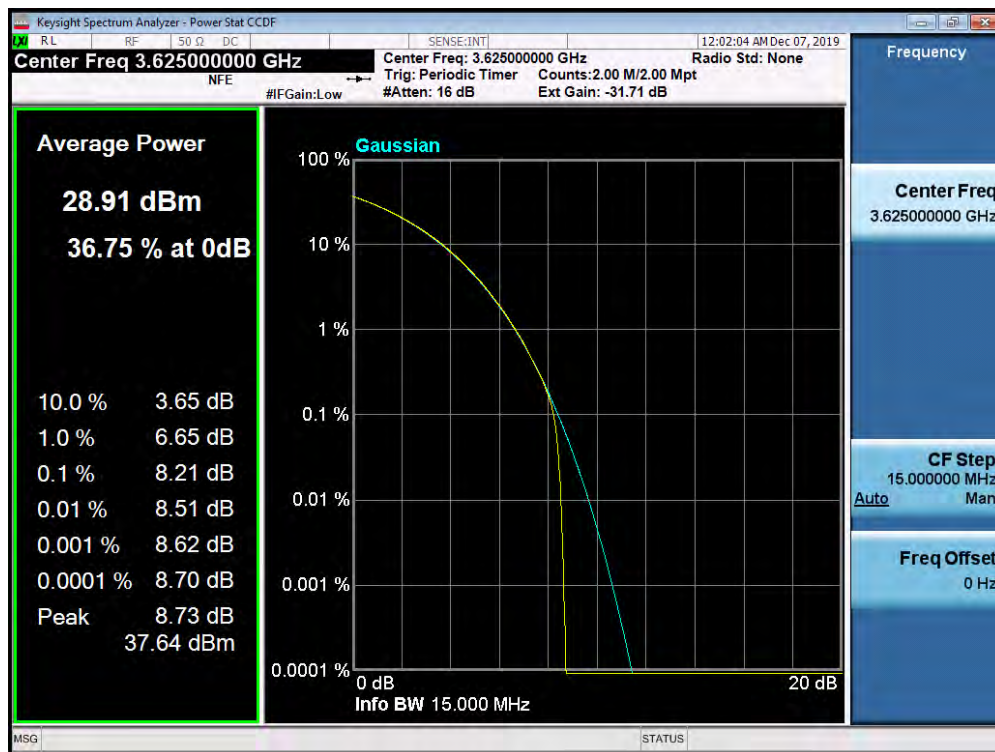
Plot 7-164. Common mode PAR Plot (15MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 110 of 161

Case03. 3CC - 15MHz Total Bandwidth Configuration (5 + 5 + 5MHz BW)

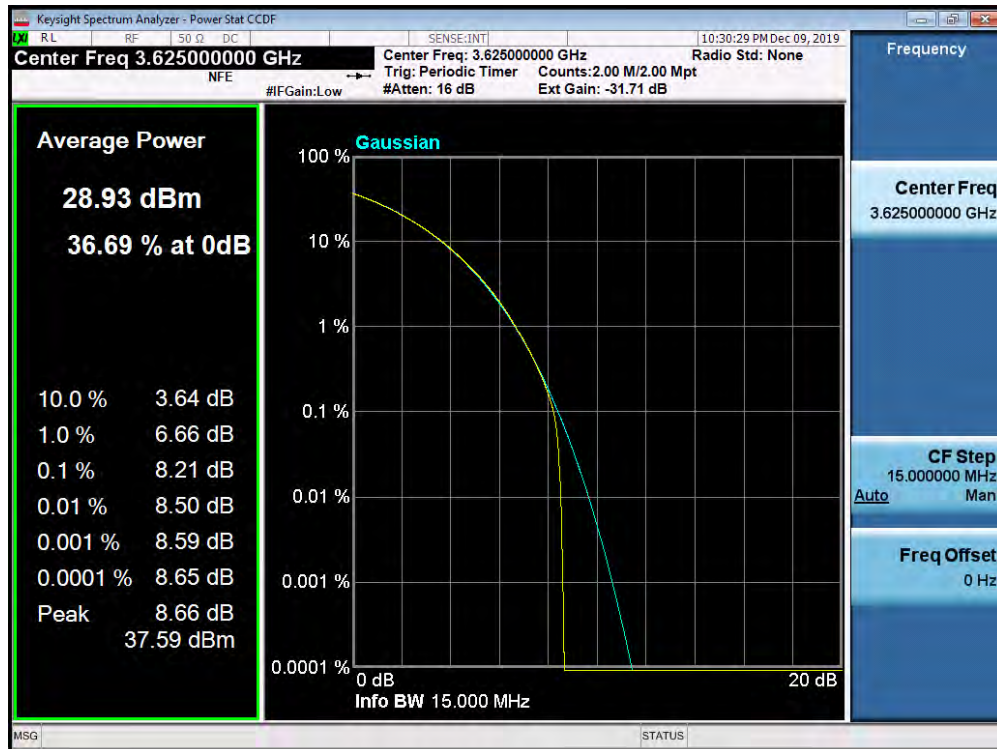


Plot 7-165. Common mode PAR Plot (15MHz Total Bandwidth QPSK - Mid Channel)

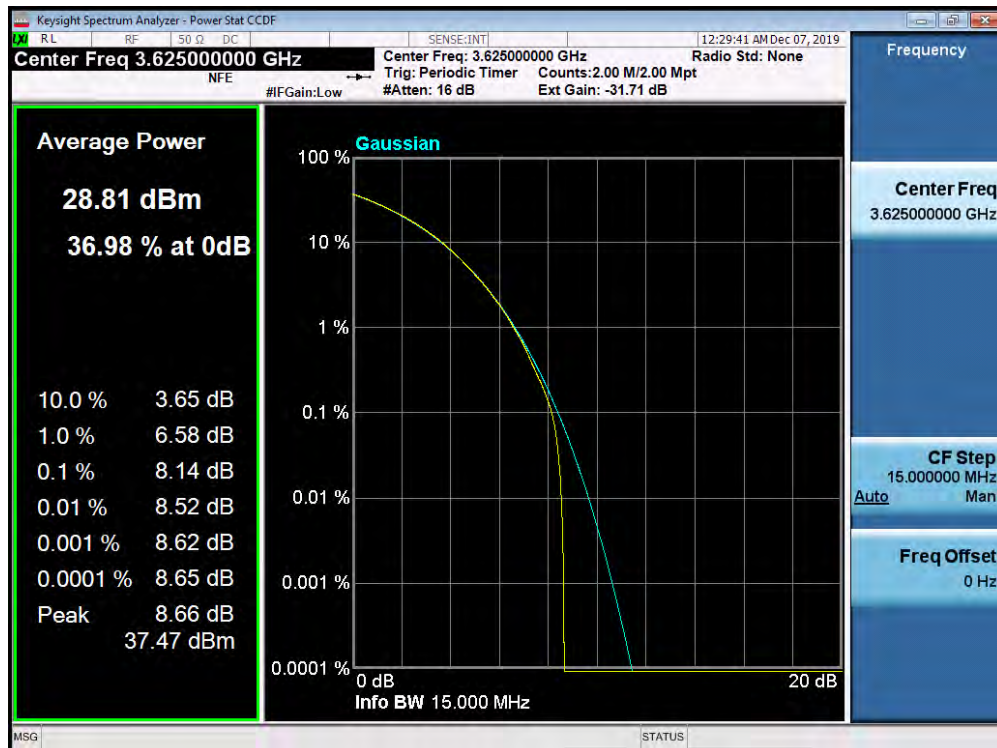


Plot 7-166. Common mode PAR Plot (15MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 111 of 161



Plot 7-167. Common mode PAR Plot (15MHz Total Bandwidth 64QAM - Mid Channel)

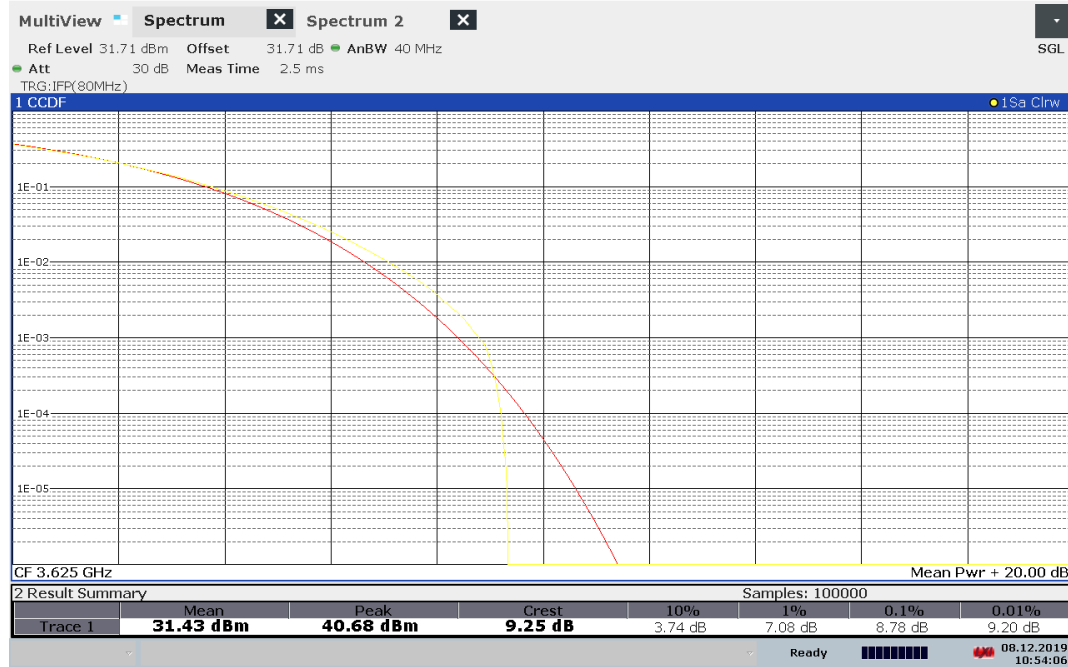


Plot 7-168. Common mode PAR Plot (15MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 112 of 161

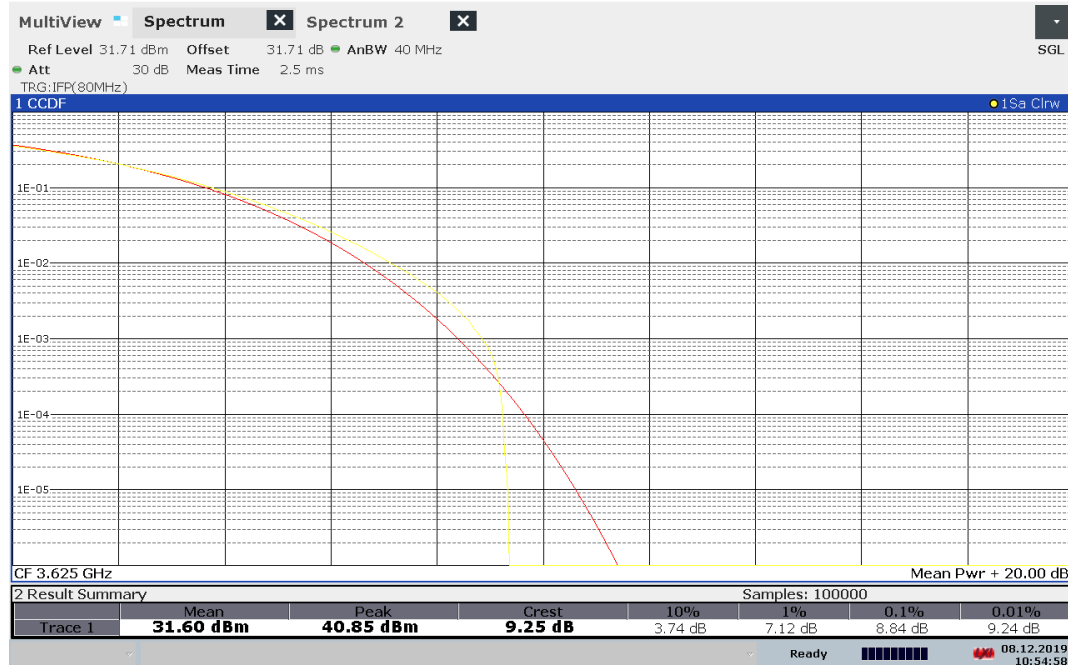
Case05. 4CC - 25MHz Total Bandwidth Configuration (5 + 5 + 5 + 10MHz BW)

ACLRRResults



Plot 7-169. Common mode PAR Plot (25MHz Total Bandwidth QPSK - Mid Channel)

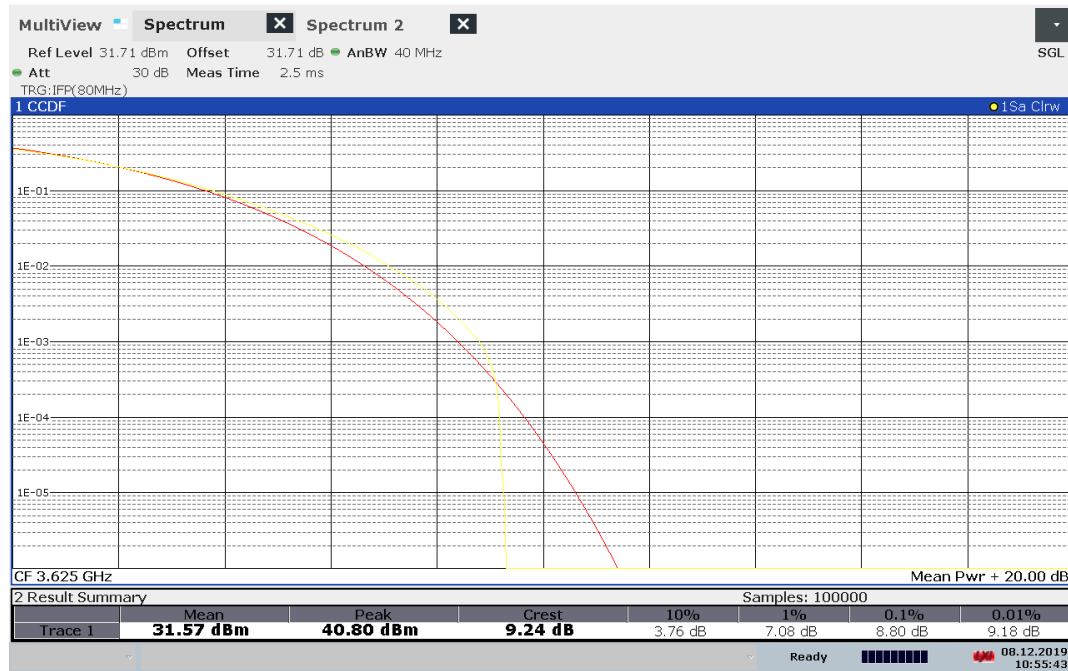
ACLRRResults



Plot 7-170. Common mode PAR Plot (25MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 113 of 161

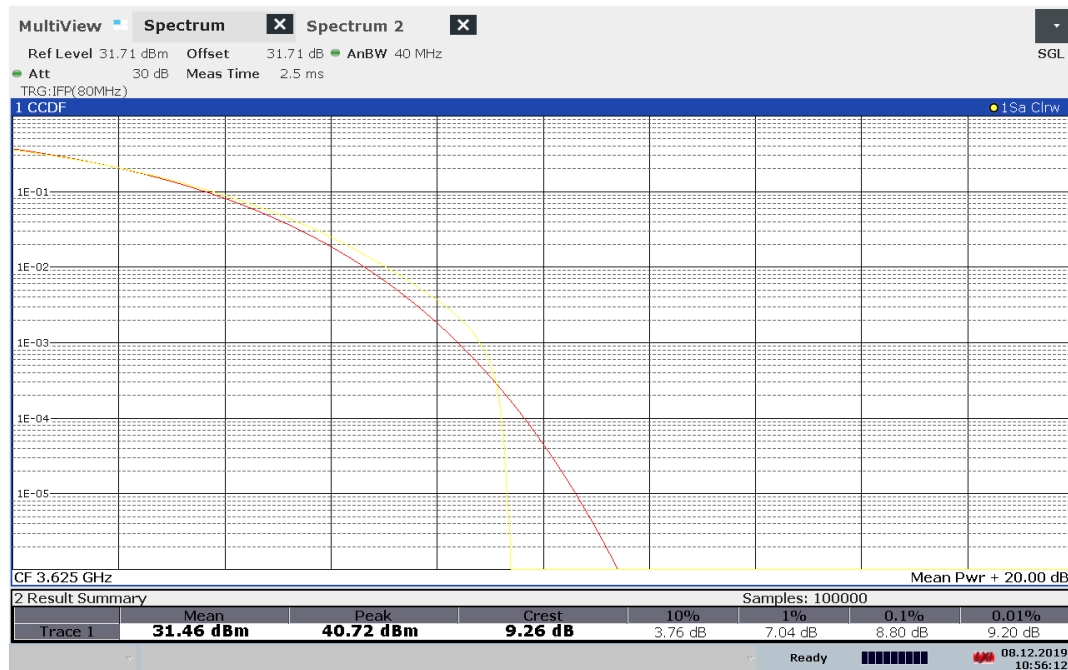
ACLRRResults



10:55:43 08.12.2019

Plot 7-171. Common mode PAR Plot (25MHz Total Bandwidth 64QAM - Mid Channel)

ACLRRResults



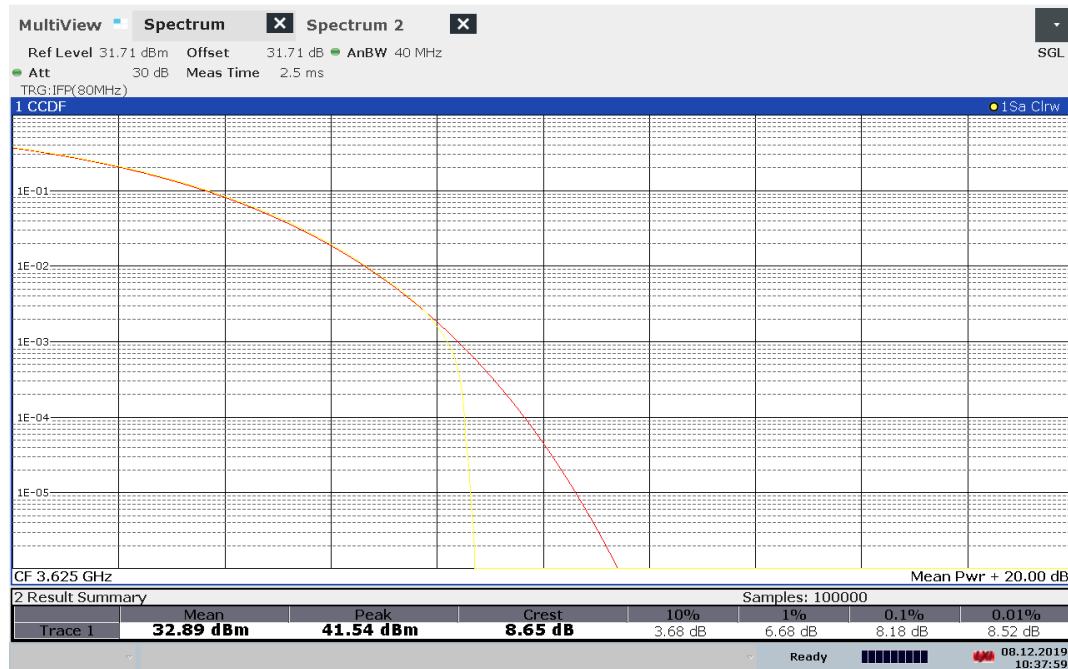
10:56:13 08.12.2019

Plot 7-172. Common mode PAR Plot (25MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	MEASUREMENT REPORT (Class II Permissive Change)			Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 114 of 161

Case07. 4CC - 35MHz Total Bandwidth Configuration (5 + 5 + 5 + 20MHz BW)

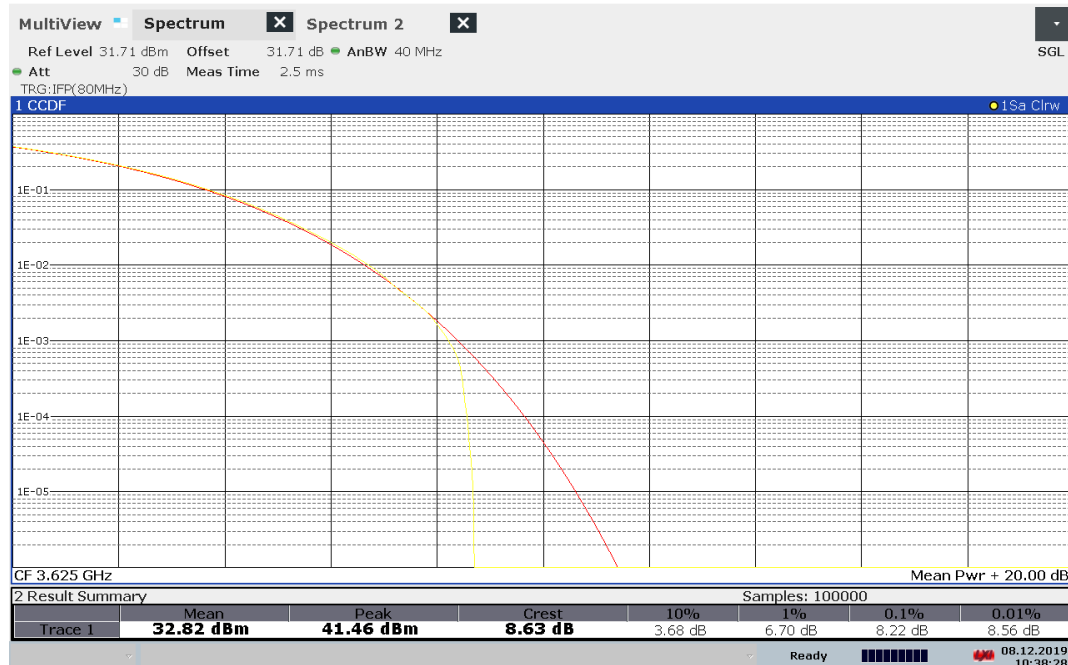
ACLRRResults



10:38:00 08.12.2019

Plot 7-173. Common mode PAR Plot (35MHz Total Bandwidth QPSK - Mid Channel)

ACLRRResults

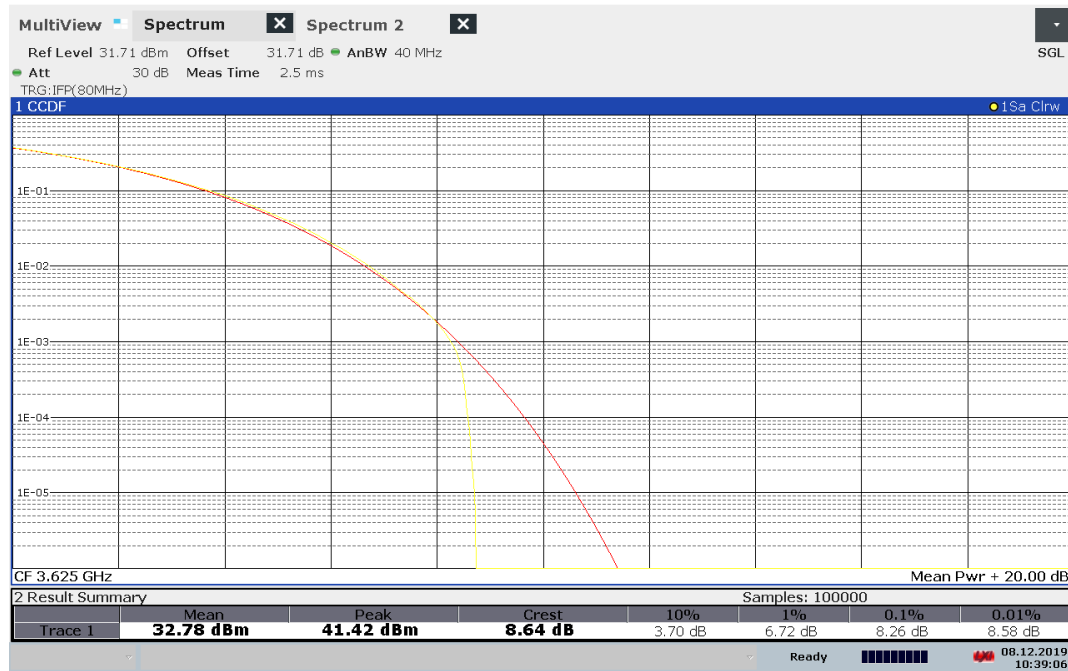


10:38:29 08.12.2019

Plot 7-174. Common mode PAR Plot (35MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 115 of 161

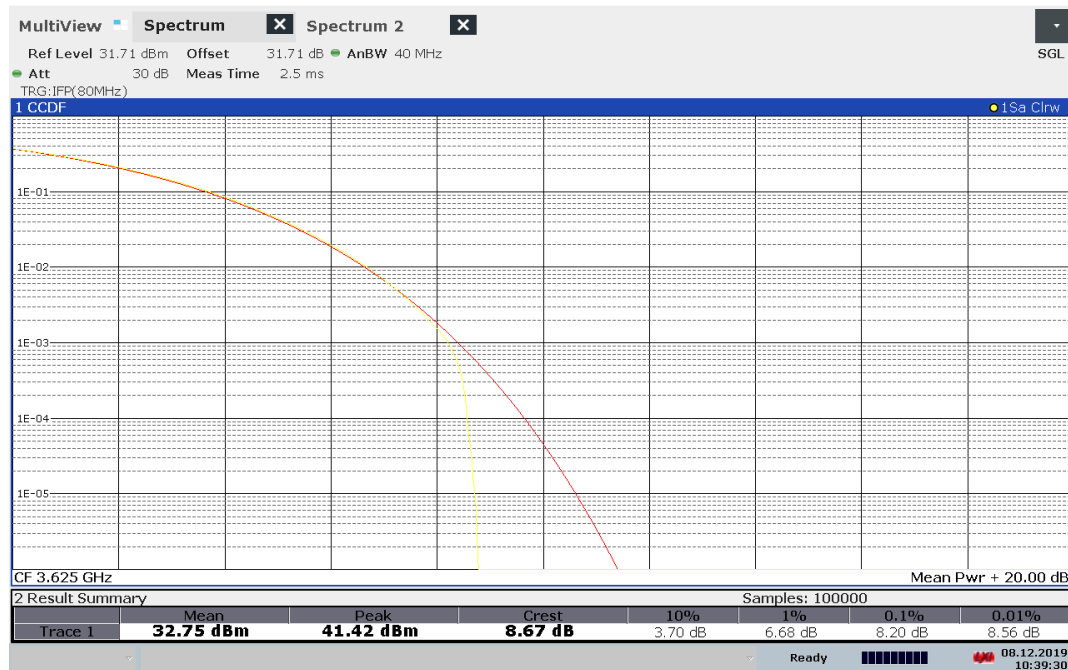
ACLRRResults



10:39:06 08.12.2019

Plot 7-175. Common mode PAR Plot (35MHz Total Bandwidth 64QAM - Mid Channel)

ACLRRResults



10:39:31 08.12.2019

Plot 7-176. Common mode PAR Plot (35MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	MEASUREMENT REPORT (Class II Permissive Change)			Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 116 of 161

Case09. 4CC - 45MHz Total Bandwidth Configuration (5 + 5 + 15 + 20MHz BW)



01:08:21 08.12.2019

Plot 7-177. Common mode PAR Plot (45MHz Total Bandwidth QPSK - Mid Channel)



14:37:14 07.12.2019

Plot 7-178. Common mode PAR Plot (45MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A	MEASUREMENT REPORT (Class II Permissive Change)			Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 117 of 161	

ACLRRResults



14:37:51 07.12.2019

Plot 7-179. Common mode PAR Plot (45MHz Total Bandwidth 64QAM - Mid Channel)

ACLRRResults



14:38:35 07.12.2019

Plot 7-180. Common mode PAR Plot (45MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 118 of 161

Case11. 4CC - 55MHz Total Bandwidth Configuration (5 + 10 + 20 + 20MHz BW)



15:42:09 07.12.2019

Plot 7-181. Common mode PAR Plot (55MHz Total Bandwidth QPSK - Mid Channel)



17:22:30 07.12.2019

Plot 7-182. Common mode PAR Plot (55MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 119 of 161

ACLRRResults



17:28:25 07.12.2019

Plot 7-183. Common mode PAR Plot (55MHz Total Bandwidth 64QAM - Mid Channel)

ACLRRResults



17:32:49 07.12.2019

Plot 7-184. Common mode PAR Plot (55MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 120 of 161

Case13. 4CC - 65MHz Total Bandwidth Configuration (5 + 20 + 20 + 20MHz BW)



19:15:26 07.12.2019

Plot 7-185. Common mode PAR Plot (65MHz Total Bandwidth QPSK - Mid Channel)



19:33:35 07.12.2019

Plot 7-186. Common mode PAR Plot (65MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 121 of 161

ACLRRResults



19:38:57 07.12.2019

Plot 7-187. Common mode PAR Plot (65MHz Total Bandwidth 64QAM - Mid Channel)

ACLRRResults



19:43:22 07.12.2019

Plot 7-188. Common mode PAR Plot (65MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	MEASUREMENT REPORT (Class II Permissive Change) 		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 122 of 161

Case15. 4CC - 75MHz Total Bandwidth Configuration (15 + 20 + 20 + 20MHz BW)



23:13:23 07.12.2019

Plot 7-189. Common mode PAR Plot (75MHz Total Bandwidth QPSK - Mid Channel)



23:17:46 07.12.2019

Plot 7-190. Common mode PAR Plot (75MHz Total Bandwidth 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 123 of 161

ACLRRResults



23:23:14 07.12.2019

Plot 7-191. Common mode PAR Plot (75MHz Total Bandwidth 64QAM - Mid Channel)

ACLRRResults



00:24:47 08.12.2019

Plot 7-192. Common mode PAR Plot (75MHz Total Bandwidth 256QAM - Mid Channel)

FCC ID: A3LRT4401-48A	 MEASUREMENT REPORT (Class II Permissive Change) 		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 124 of 161

7.6 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §96.41(e)

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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements

- a) Absolute Emission Limits
- (iii) Measure and add 10 log(NANT) Db

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
1. Trace mode and Detector= RMS
2. Sweep time = auto couple
3. The trace was allowed to stabilize
4. 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.

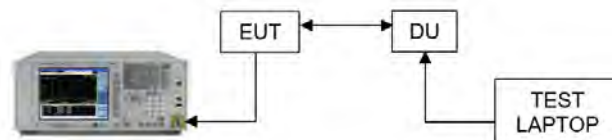


Figure 7-5. Test Instrument & Measurement Setup

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 125 of 161

Test Notes

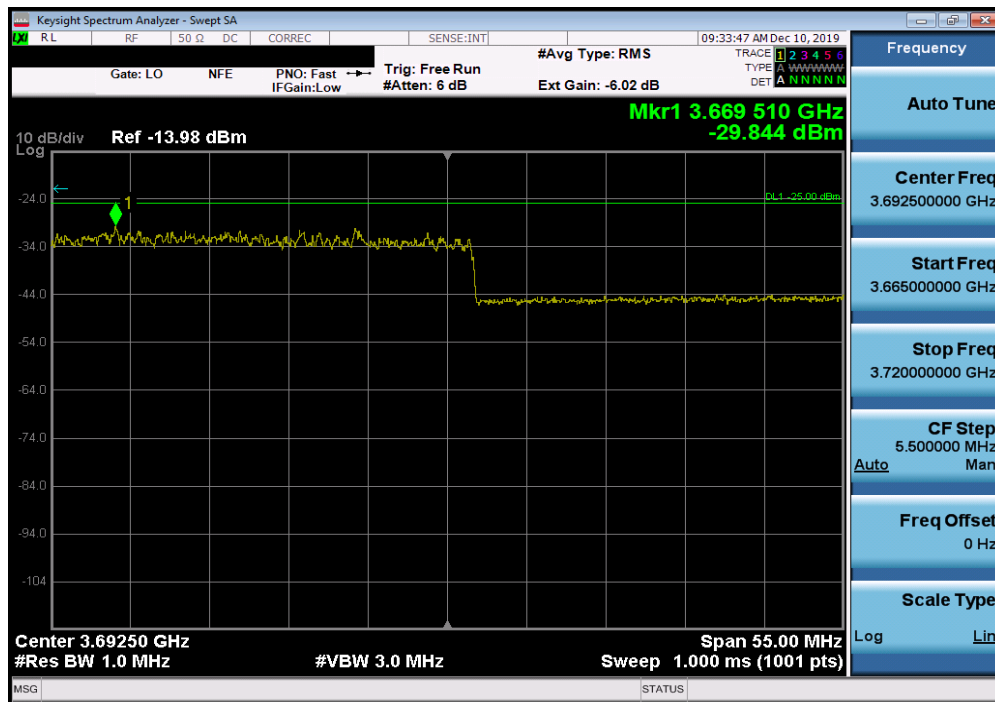
1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
2. Common mode mode is the worst case mode and all conducted spurious emissions are measured in this mode.
3. The 16QAM modulated test case 15(15 + 20 + 20 + 20MHz BW) is the worst case based on RF output power.
4. Periodic trigger was used with gating ON. Gate sweep time, Gate delay and gate length were set accordingly to capture ON time of the transmission.
5. Mid Channel plots are measured.
 - a. MIMO plots show the conducted spurious emissions with all 4 transmit ports combined.
 - b. The offset calculation:
 $10 \cdot \log(4) = 6.02 \text{ dB}$
 This value has been added in the MIMO Plots.
 Refer KDB 662911 D01 v02r01 – Section E)2)c) for details.

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 126 of 161

Case01. 4CC - 75MHz Total Bandwidth Configuration (15 + 20 + 20 + 20MHz BW)

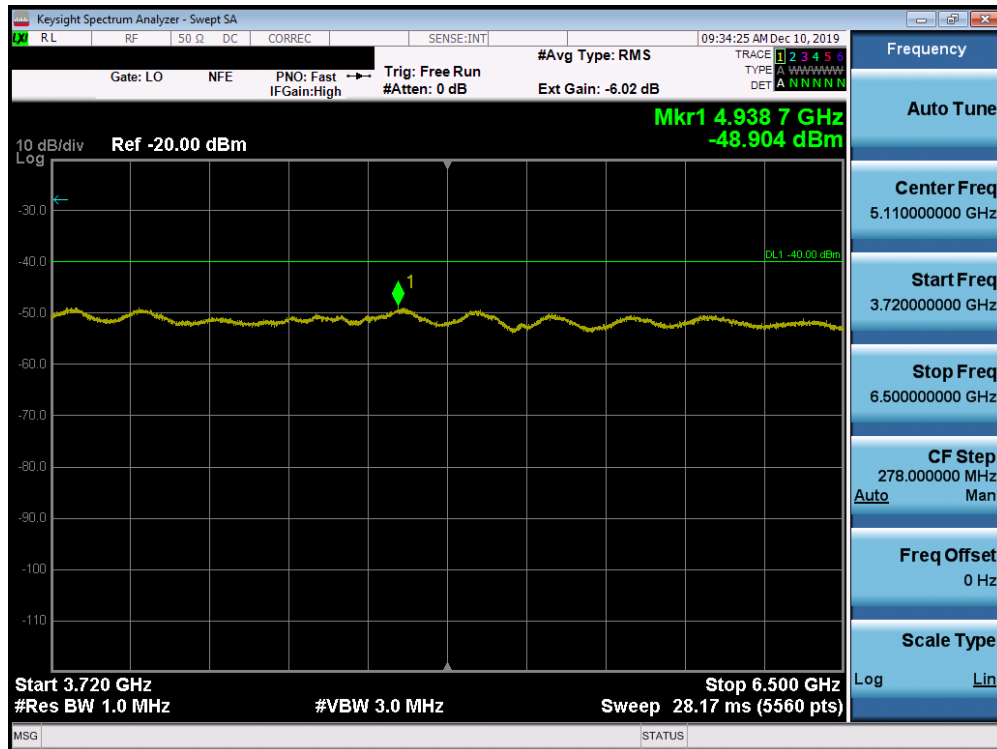


Plot 7-193. Conducted Spurious Emission at Antenna Port (75MHz Total Bandwidth 16QAM - Low Channel, 30M ~ 3530MHz)

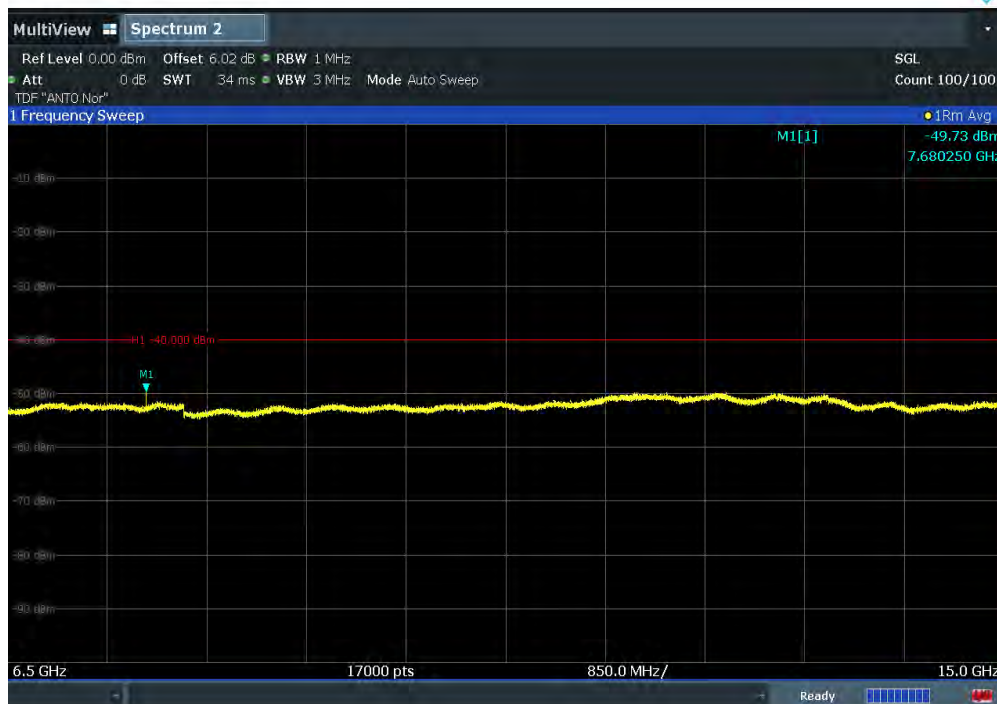


Plot 7-194. Conducted Spurious Emission at Antenna Port (75MHz Total Bandwidth 16QAM - Low Channel, 3665M ~ 3720MHz)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 127 of 161

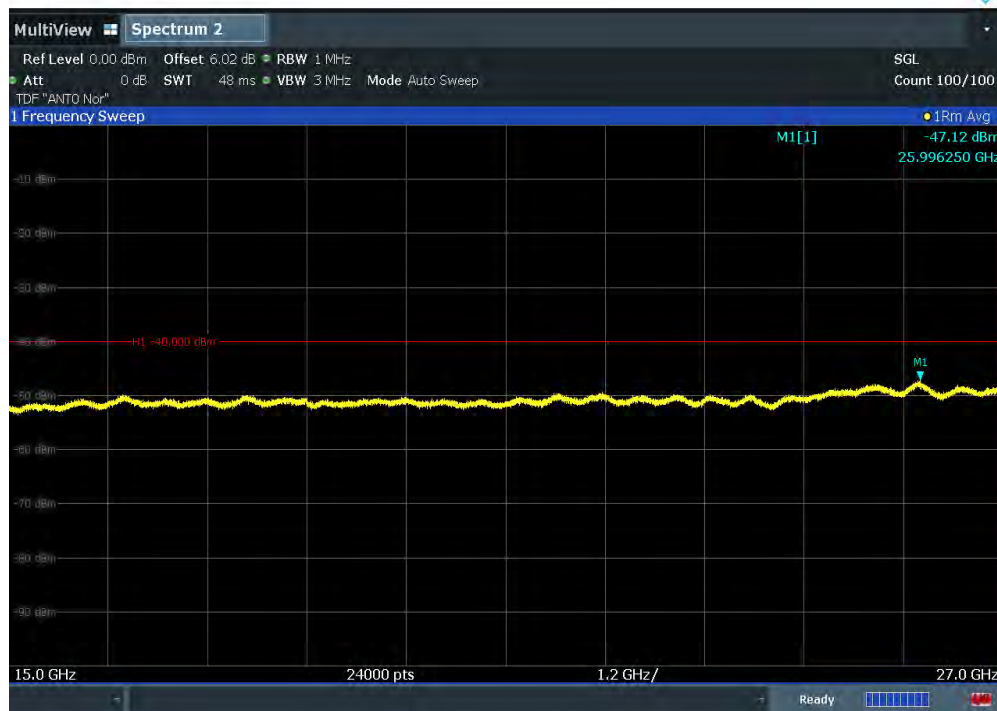


Plot 7-195. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Low Channel, 3720M ~ 6500MHz)

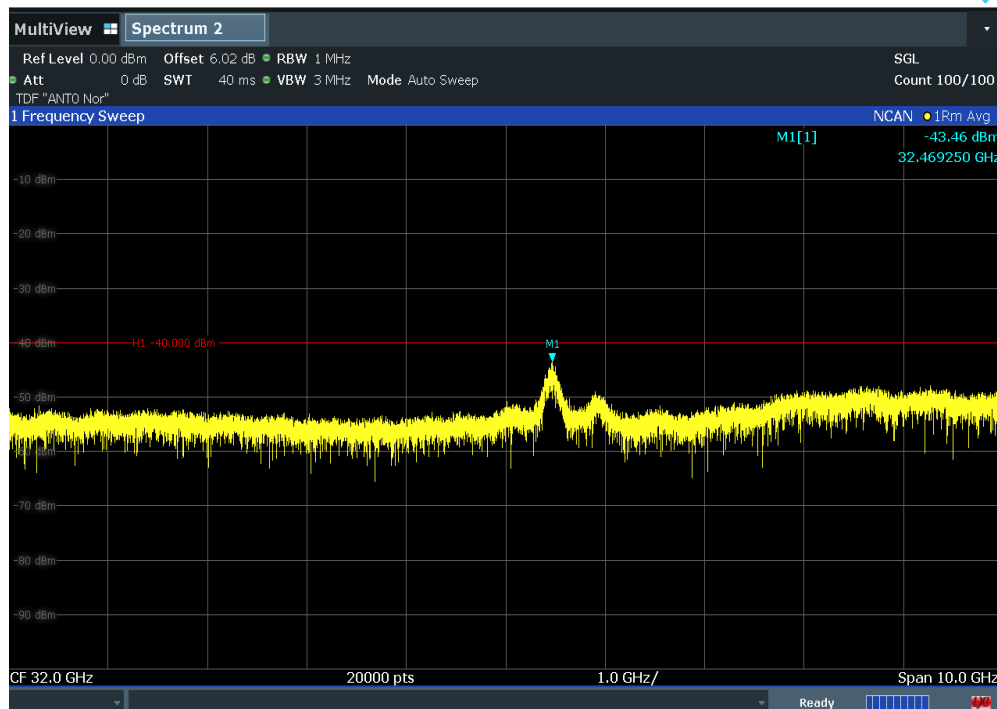


Plot 7-196. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Low Channel, 6.5G ~ 15GHz)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 128 of 161



**Plot 7-197. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Low Channel, 15G ~ 27GHz)**

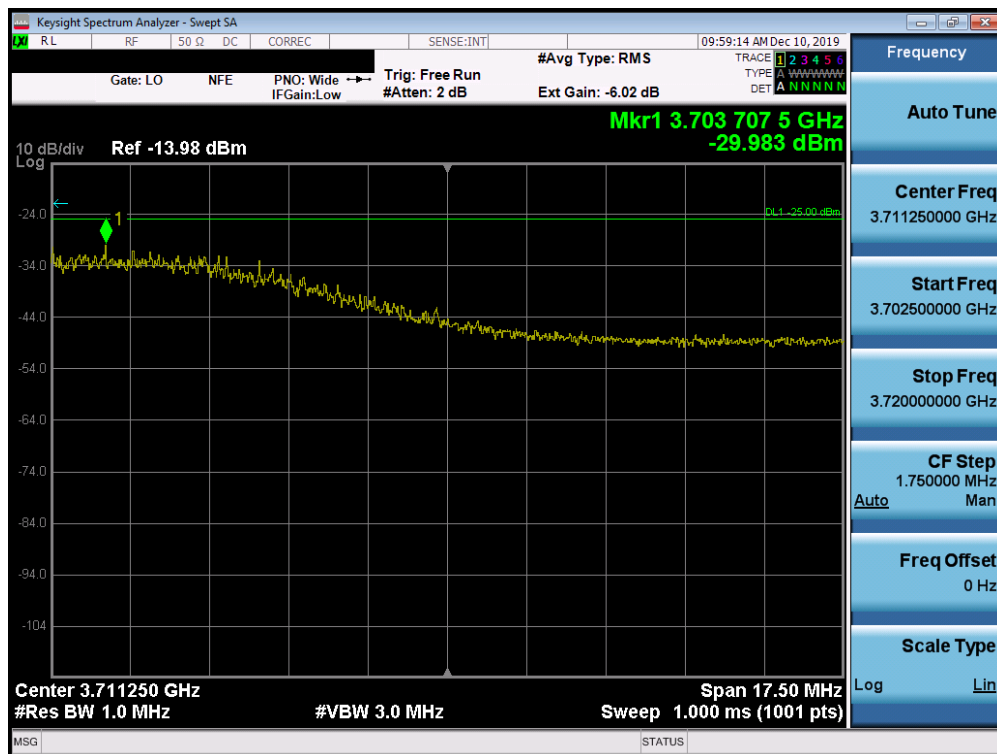


**Plot 7-198. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Low Channel, 27G ~ 37GHz)**

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 129 of 161

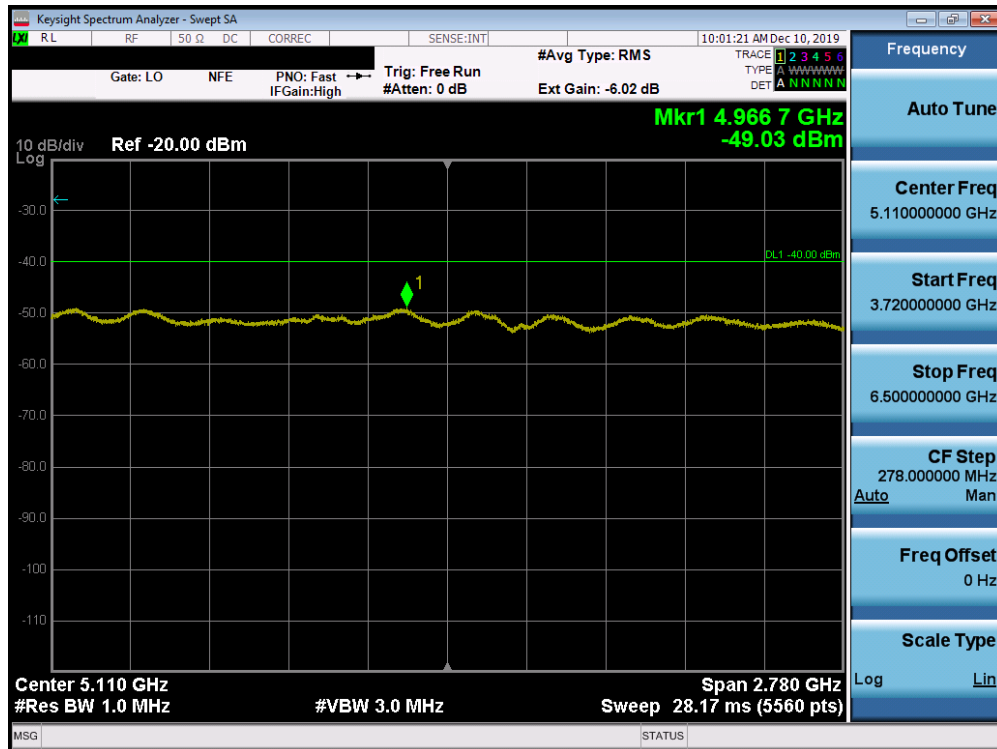


**Plot 7-199. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Mid Channel, 30M ~ 3530MHz)**

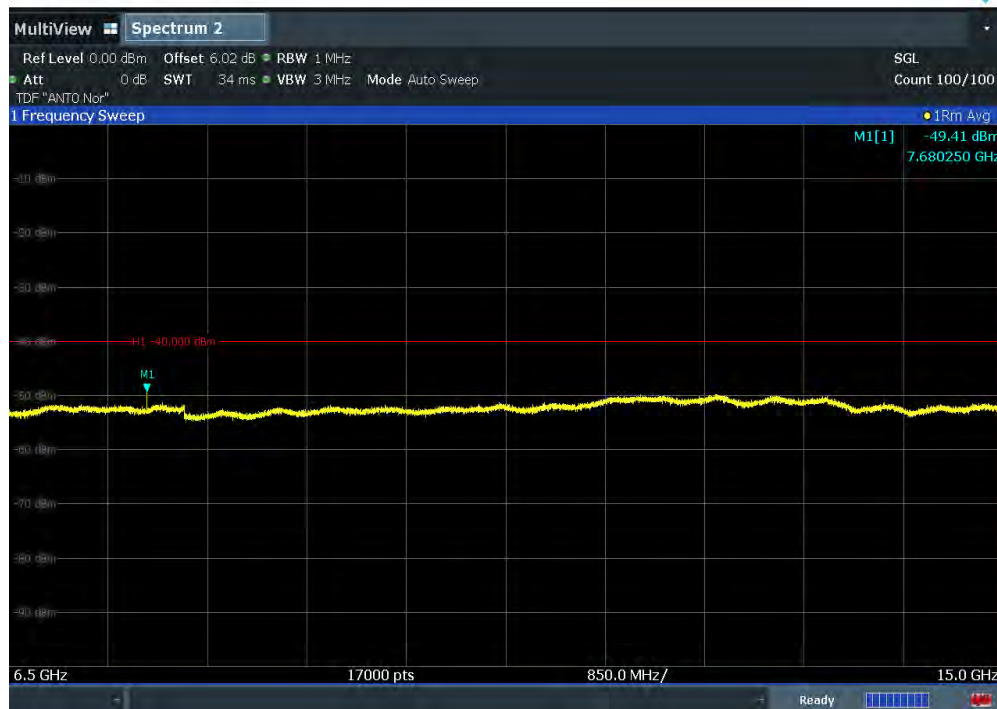


**Plot 7-200. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Mid Channel, 3702.5M ~ 3720MHz)**

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 130 of 161

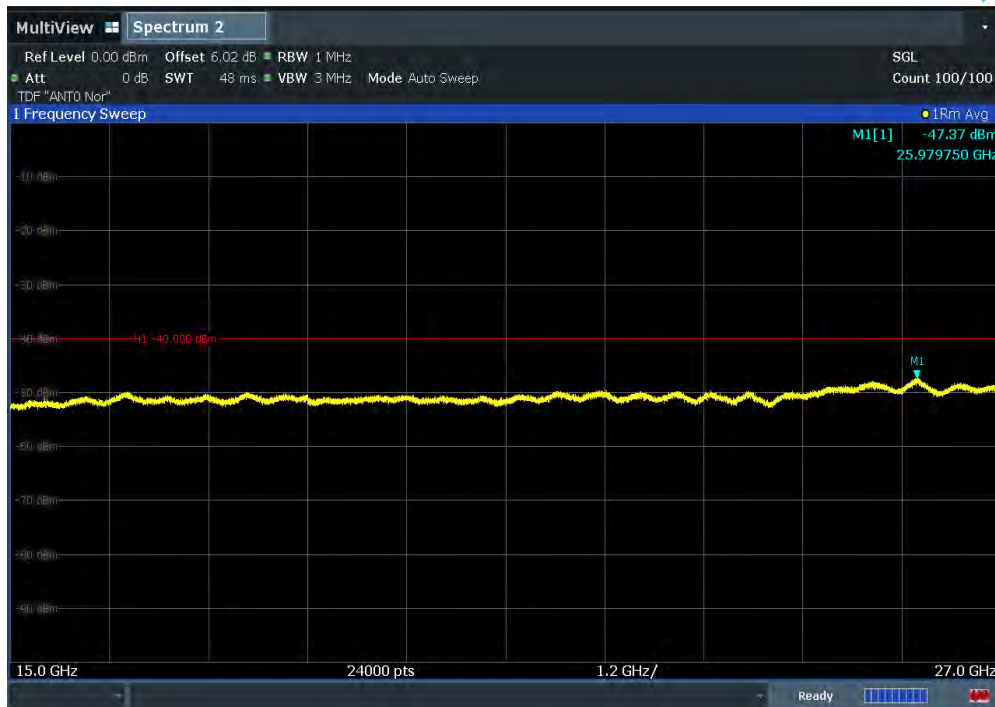


Plot 7-201. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Mid Channel, 3720M ~ 6500MHz)

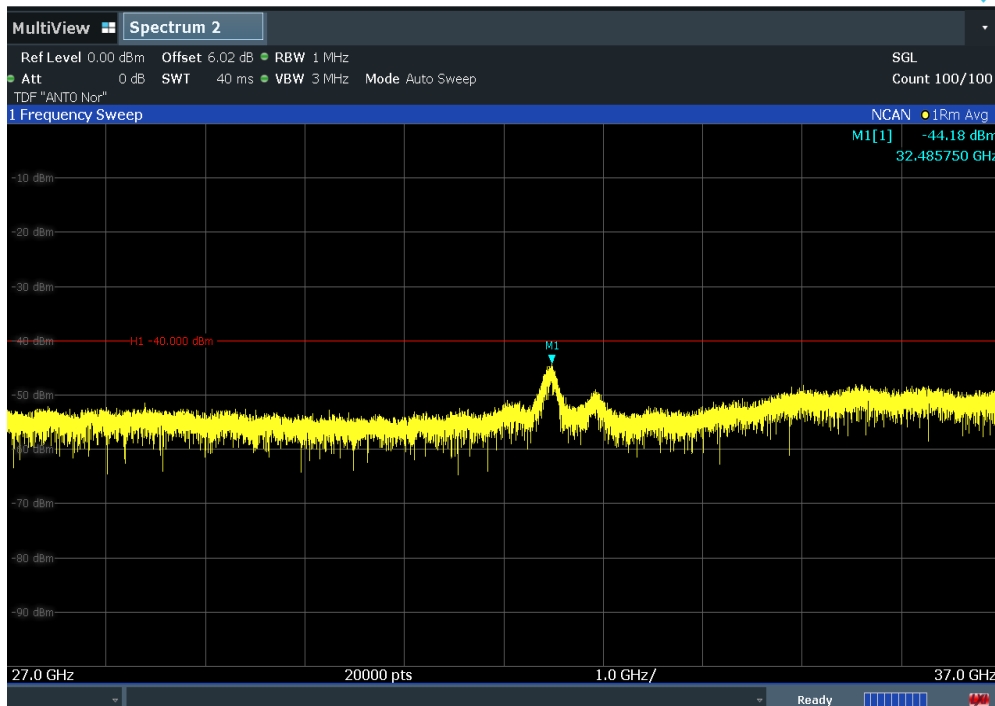


Plot 7-202. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Mid Channel, 6.5G ~ 15GHz)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 131 of 161



**Plot 7-203. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Mid Channel, 15G ~ 27GHz)**

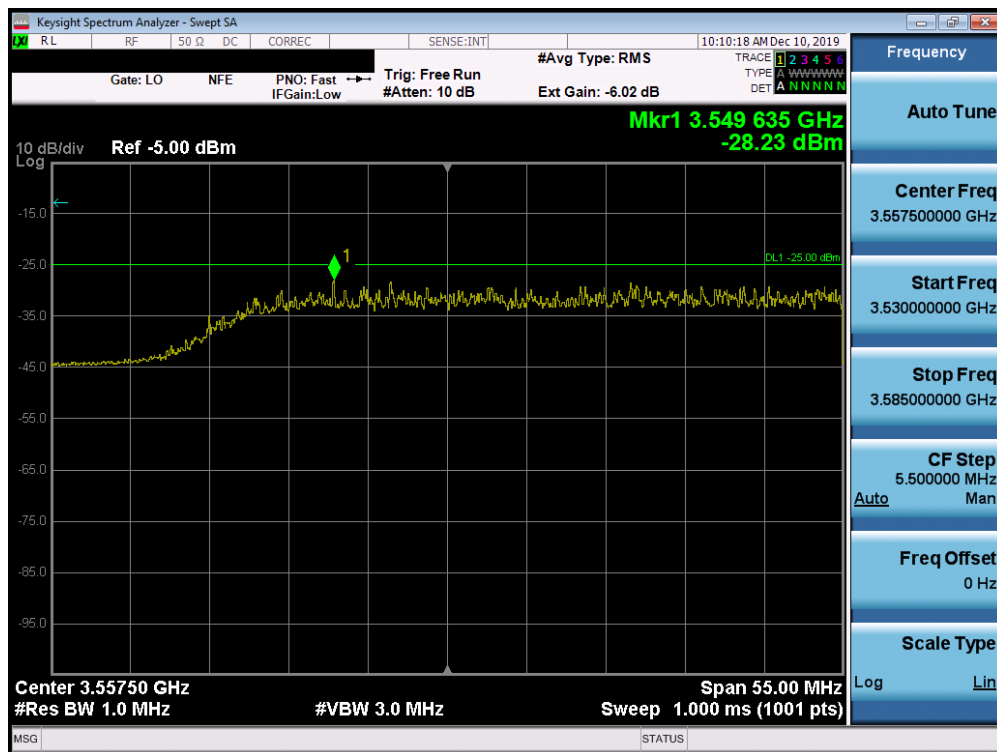


**Plot 7-204. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - Mid Channel, 27G ~ 37GHz)**

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 132 of 161

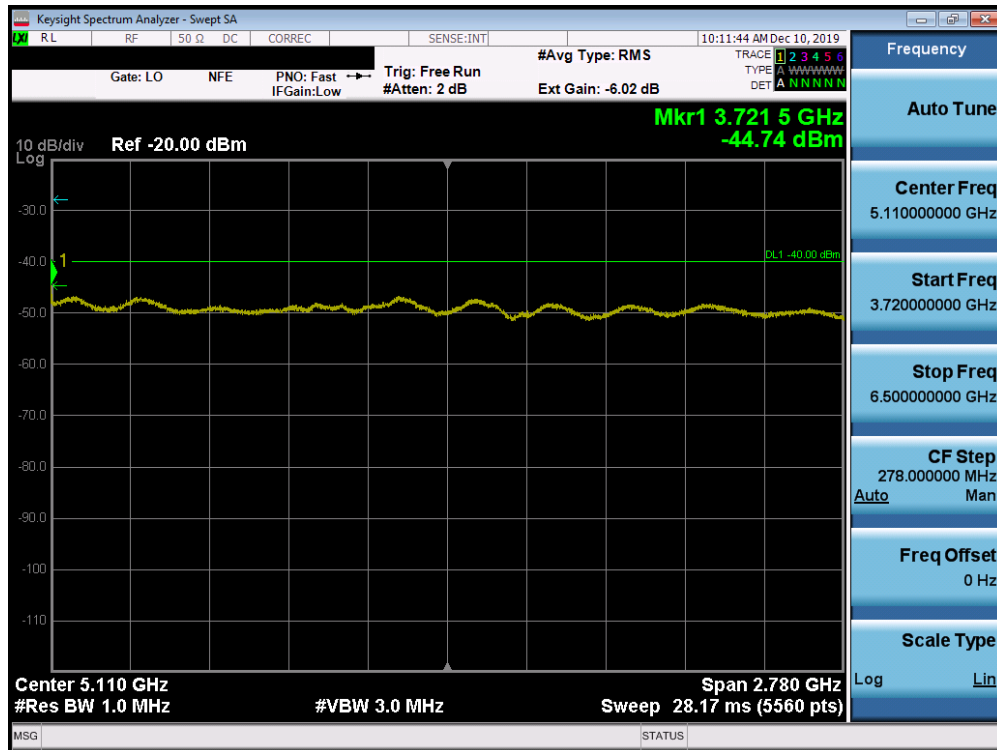


**Plot 7-205. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - High Channel, 30M ~ 3530MHz)**

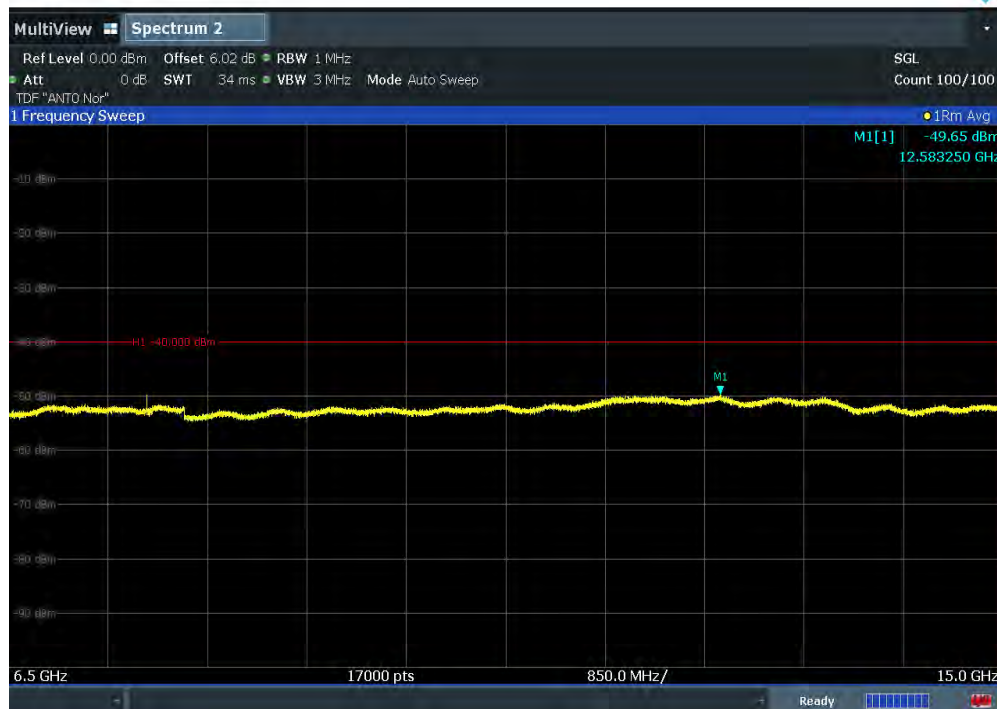


**Plot 7-206. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - High Channel, 3530M ~ 3585MHz)**

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 133 of 161

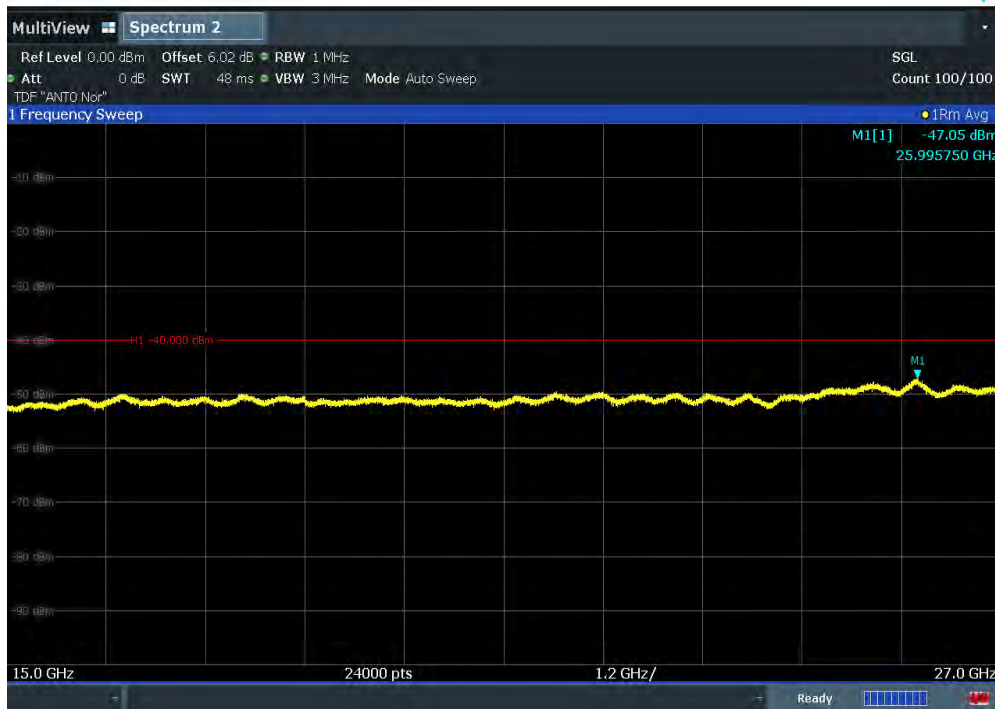


Plot 7-207. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - High Channel, 3720M ~ 6500MHz)

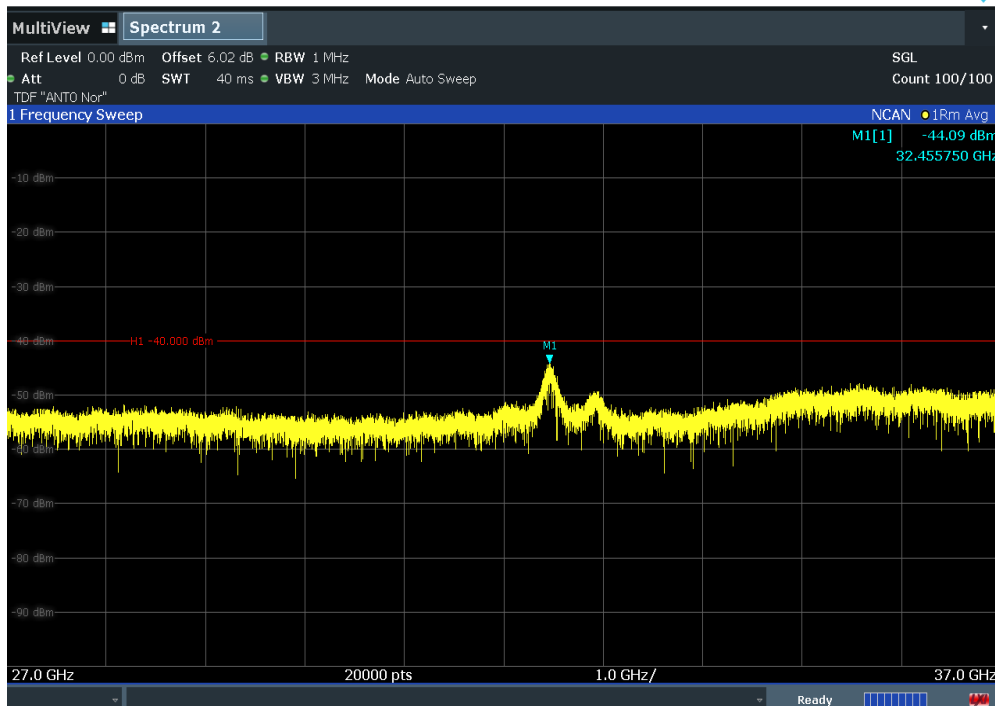


Plot 7-208. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - High Channel, 6.5G ~ 15GHz)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 134 of 161



**Plot 7-209. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - High Channel, 15G ~ 27GHz)**



**Plot 7-210. Conducted Spurious Emission at Antenna Port
(75MHz Total Bandwidth 16QAM - High Channel, 27G ~ 37GHz)**

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 135 of 161

7.7 Case Radiated Spurious and Harmonic Emissions

§2.1053 §96.41(e)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting. All antenna ports were terminated in 50Ω. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using dual polarized vivaldi antennas.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements

- b) Absolute Emission Limits
- (iii) Measure and add $10 \log(N_{ANT})$ dB

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least $10 \times$ the fundamental frequency (separated into at least two plots per channel)
2. Trace mode = Average
3. Detector = RMS
4. Each emission was triggered on the pulse
5. Sweep time = auto couple
6. The trace was allowed to stabilize
7. 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.

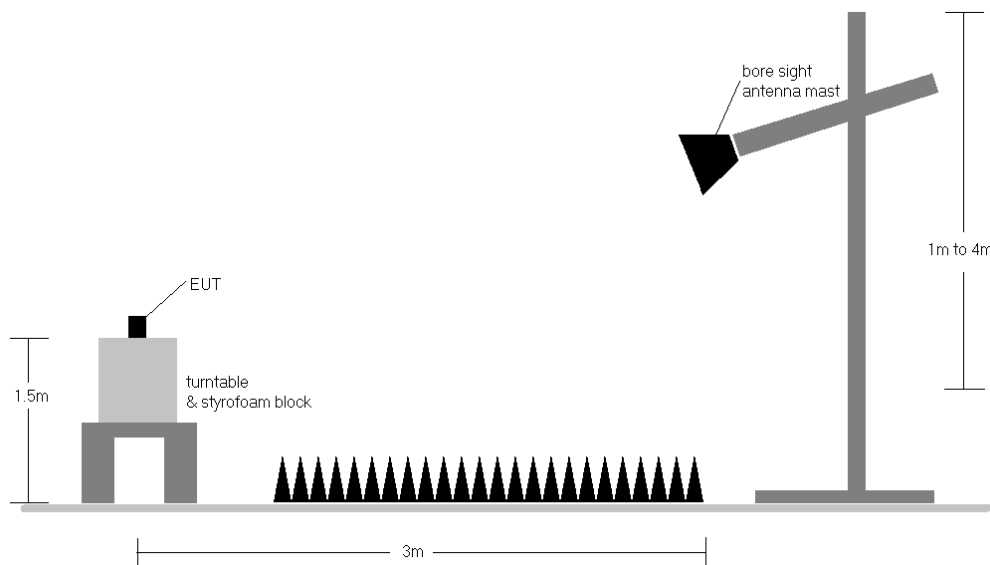


Figure 7-6. Radiated Test Setup >1GHz

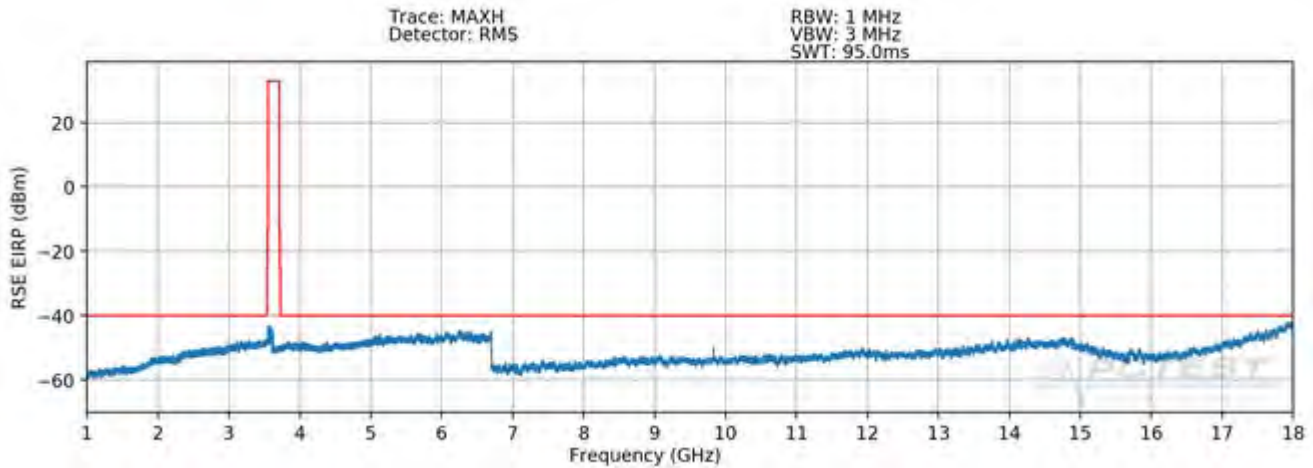
FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 136 of 161

Test Notes

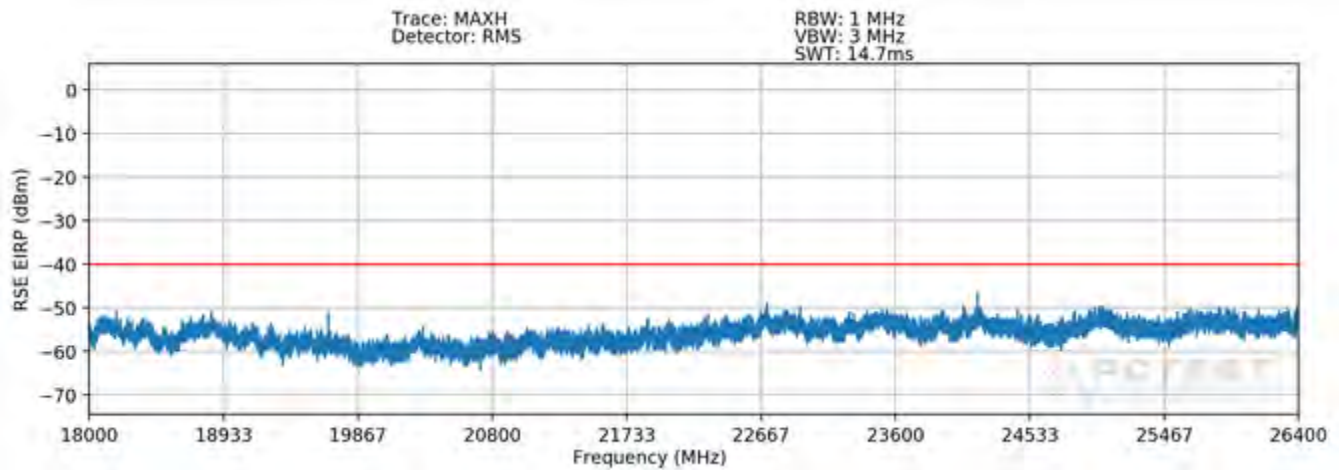
1. The EUT was tested in both horizontal and vertical antenna polarizations and in all possible test configurations and positioning. Multiple carriers were investigated with 4CC 75MHz bandwidth being found to be the worst case transmission mode. The worst case emissions are reported with the EUT positioning, modulations, channel bandwidth configurations shown in the tables below.
2. Common mode mode is the worst case mode and all radiated spurious emissions are measured in this mode.
3. This unit was tested while powered by a AC power source.
4. The modulation 16QAM for single carrier is the worst case.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
6. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 137 of 161

Case15. 4CC - 75MHz Total Bandwidth Configuration (15 + 20 + 20 + 20MHz BW)

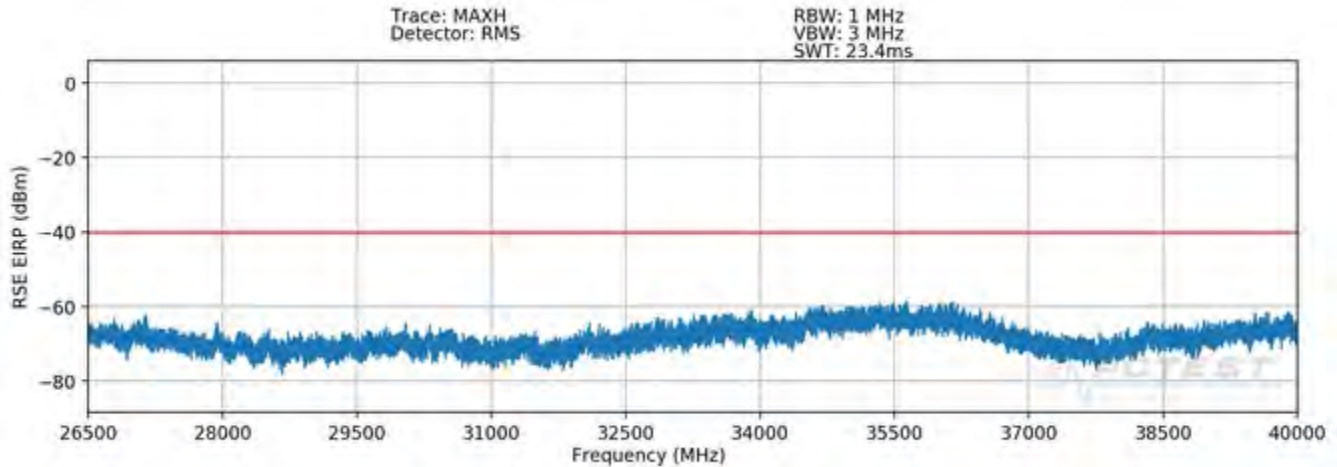


Plot 7-211. Radiated Spurious Plot 1-18GHz (4CC-75MHz 16QAM- Mid Channel)



Plot 7-212. Radiated Spurious Plot 18-26.5GHz (4CC-75MHz 16QAM- Mid Channel)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 138 of 161



Plot 7-213. Radiated Spurious Plot 26.5-40GHz (4CC-75MHz 16QAM- Mid Channel)

Note: Pre-scan measurements were taken with trace on maxhold. Pre-scan plots are used for emissions detection and identification. All final spurious emission measurements were taken by maximizing each emission separately using trace average with RMS detector, and triggering on the emission. Final emission levels are recorded in the data tables to follow.

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 139 of 161

OPERATING FREQUENCY: 3587.50 MHz
 MODULATION SIGNAL: 16QAM
 BANDWIDTH: 75.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7175.00	H	-	-	-70.67	11.55	-59.12	-19.1
9830.50	H	129	331	-57.89	12.09	-45.80	-5.8
10762.50	H	-	-	-69.68	12.62	-57.06	-17.1
14350.00	H	-	-	-63.40	11.33	-52.08	-12.1
17937.50	H	-	-	-55.13	9.37	-45.75	-5.8

Table 7-18. Radiated Spurious Emissions (4CC-75.0MHz 16QAM - Low Channel)

OPERATING FREQUENCY: 3625.00 MHz
 MODULATION SIGNAL: 16QAM
 BANDWIDTH: 75.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7250.00	H	-	-	-68.94	11.32	-57.62	-17.6
9830.50	H	143	332	-53.29	12.09	-41.20	-1.2
10875.00	H	-	-	-68.23	12.71	-55.52	-15.5
14500.00	H	-	-	-61.96	11.61	-50.35	-10.3

Table 7-19. Radiated Spurious Emissions (4CC-75.0MHz 16QAM - Mid Channel)

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 140 of 161	

OPERATING FREQUENCY: 3662.50 MHz
 MODULATION SIGNAL: 16QAM
 BANDWIDTH: 75.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7325.00	V	-	-	-69.82	11.03	-58.78	-18.8
9830.50	V	148	90	-60.64	12.09	-48.55	-8.5
10987.50	V	-	-	-62.02	12.75	-49.26	-9.3
14650.00	V	-	-	-63.79	11.67	-52.11	-12.1

Table 7-20. Radiated Spurious Emissions (4CC-75.0MHz 16QAM - High Channel)

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 141 of 161

7.8 Band Edge Emissions at Antenna Terminal

\$2.1051 \$96.41(e)

Test Overview

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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW $\geq$ 1% of the emission bandwidth
4. VBW $\geq$ 3 x RBW
5. Detector = RMS
6. Number of sweep points $\geq$ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

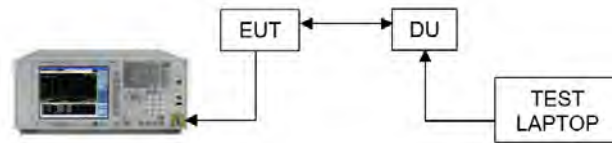


Figure 7-7. Test Instrument & Measurement Setup

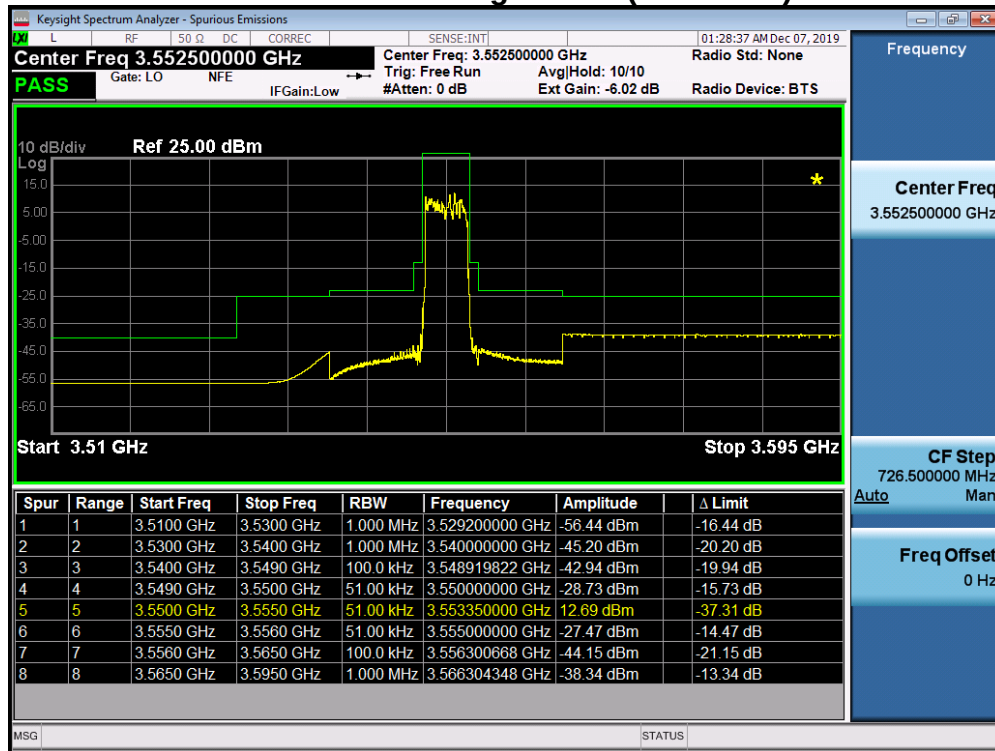
FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 142 of 161

Test Notes

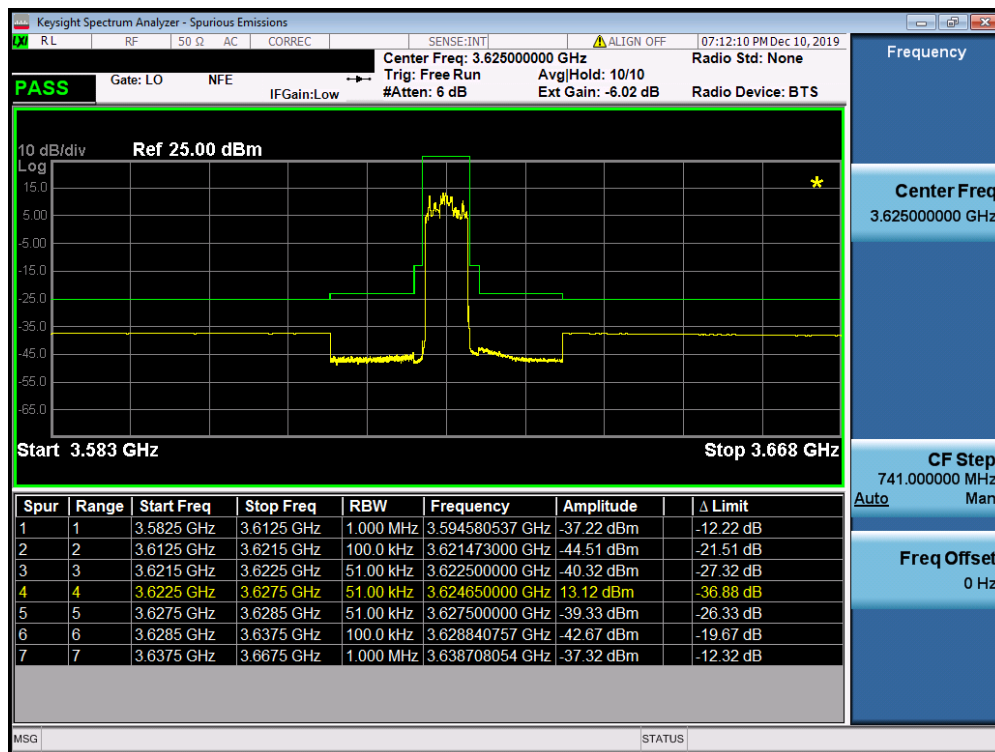
1. The signal was gated with an appropriate sweep time, gate delay and length to capture the on time of the transmission.
2. MIMO plots show band edge for 4 transmit ports combined. Refer to the following calculation:
 $10 \cdot \log(4) = 6.02 \text{ dB}$
 This offset has been added in the MIMO Plots.
3. Narrower RBW parameter is applied according to Section 5.7 of ANSI C63.26-2015 for some edge channels due to improving measurement accuracy.

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 143 of 161	

Case01. 1CC - 5MHz Total Bandwidth Configuration (5MHz BW)

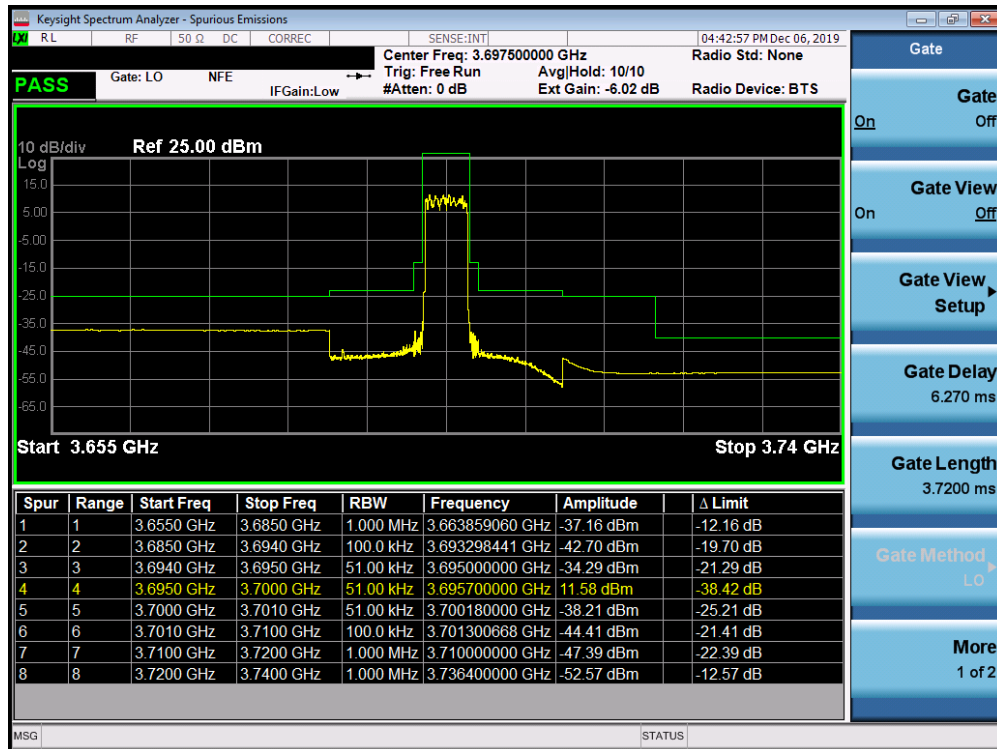


Plot 7-214. Low Channel Edge Plot (5MHz Total Bandwidth 16QAM)



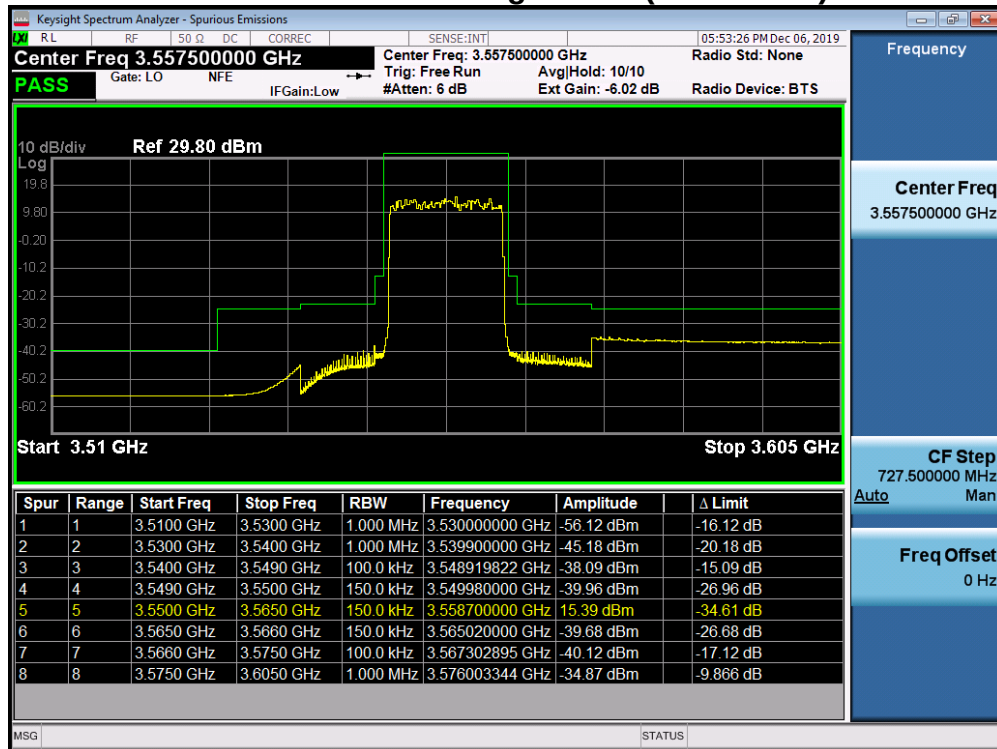
Plot 7-215. Mid Channel Edge Plot (5MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 144 of 161



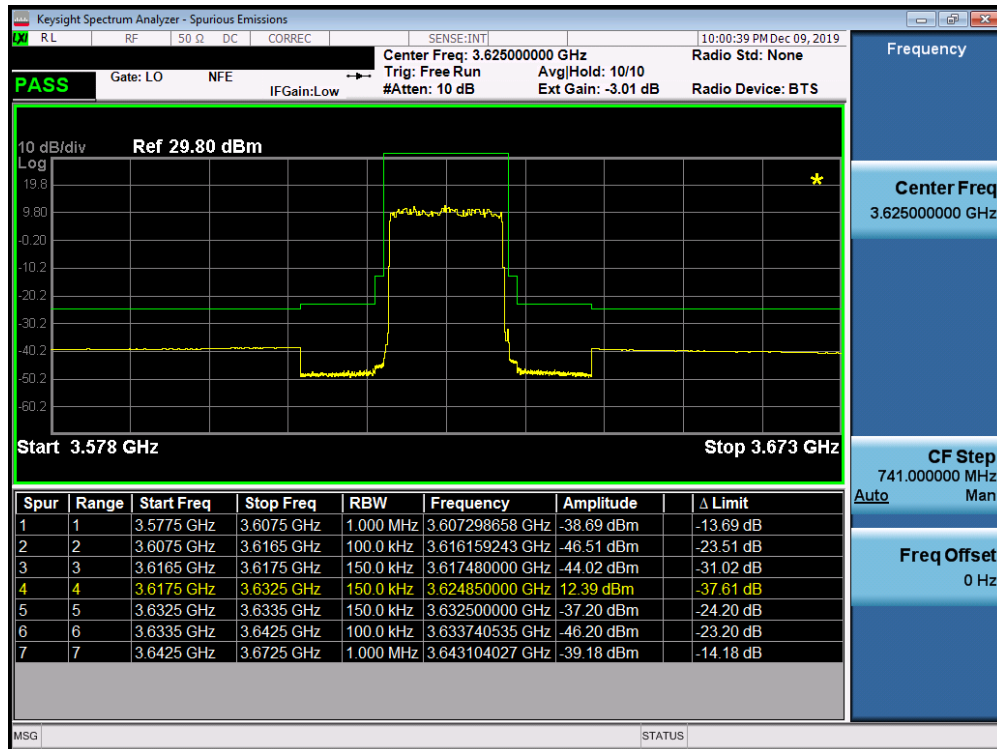
Plot 7-216. High Channel Edge Plot (5MHz Total Bandwidth 16QAM)

Case02. 1CC - 15MHz Total Bandwidth Configuration (15MHz BW)

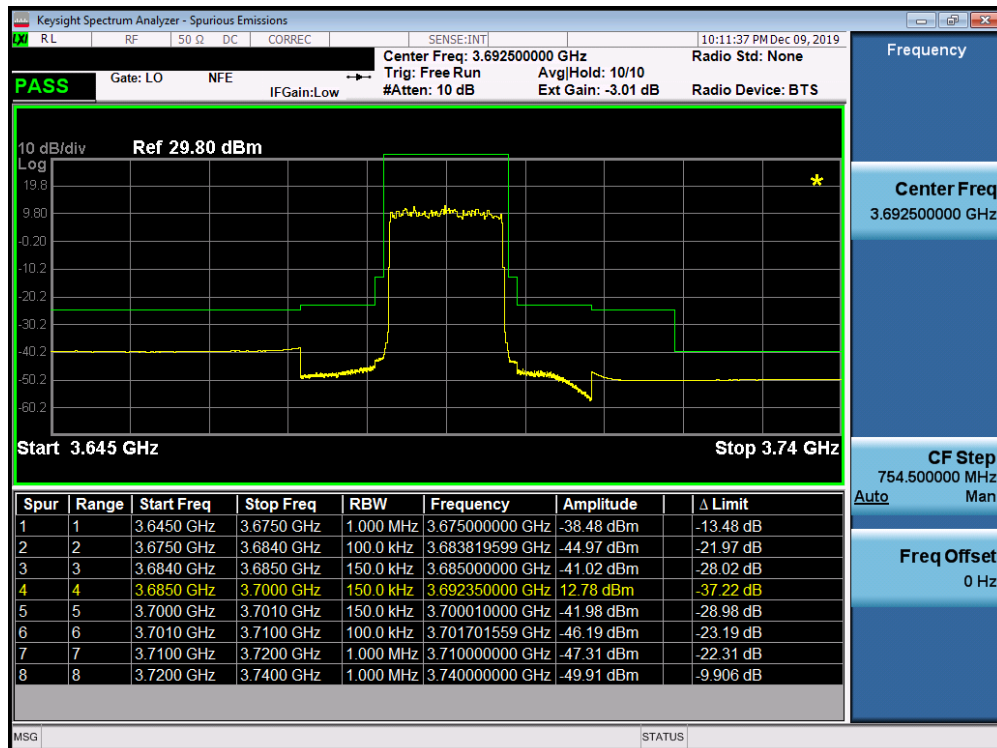


Plot 7-217. Low Channel Edge Plot (15MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 145 of 161



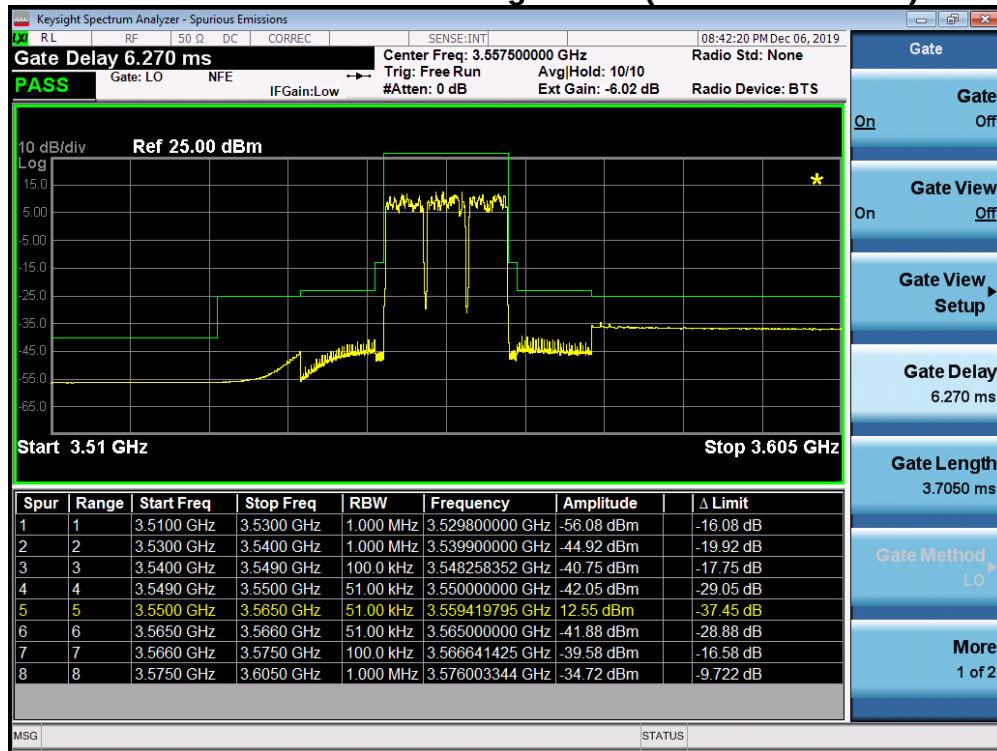
Plot 7-218. Mid Channel Edge Plot (15MHz Total Bandwidth 16QAM)



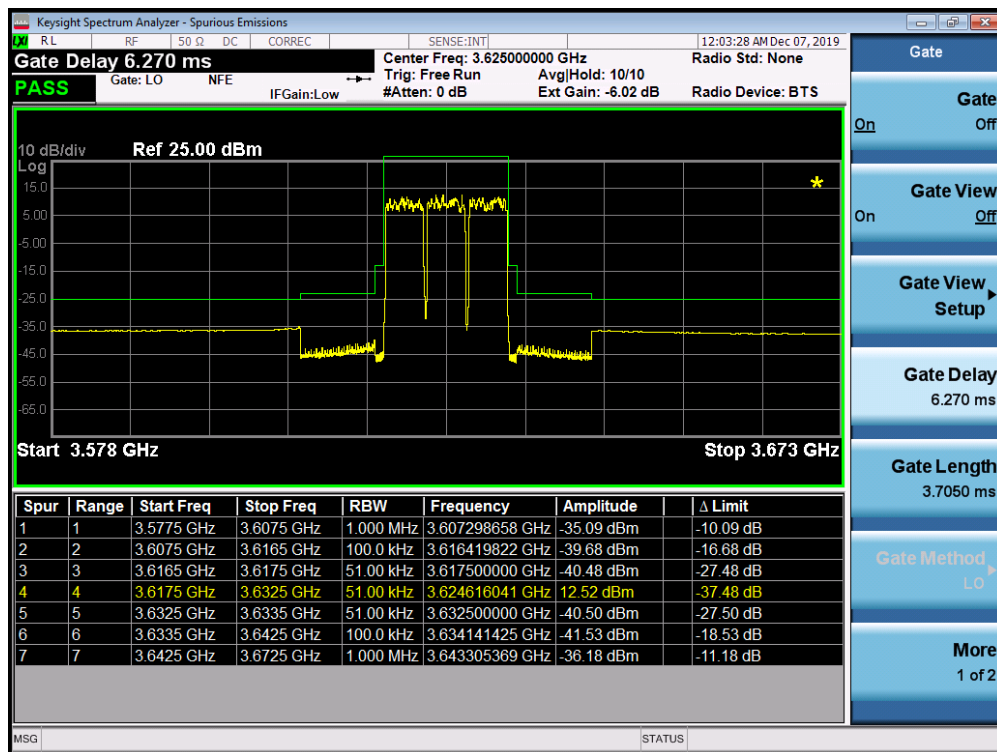
Plot 7-219. High Channel Edge Plot (15MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A			MEASUREMENT REPORT (Class II Permissive Change)			Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)				Page 146 of 161

Case03. 3CC - 15MHz Total Bandwidth Configuration (5 + 5 + 5MHz BW)

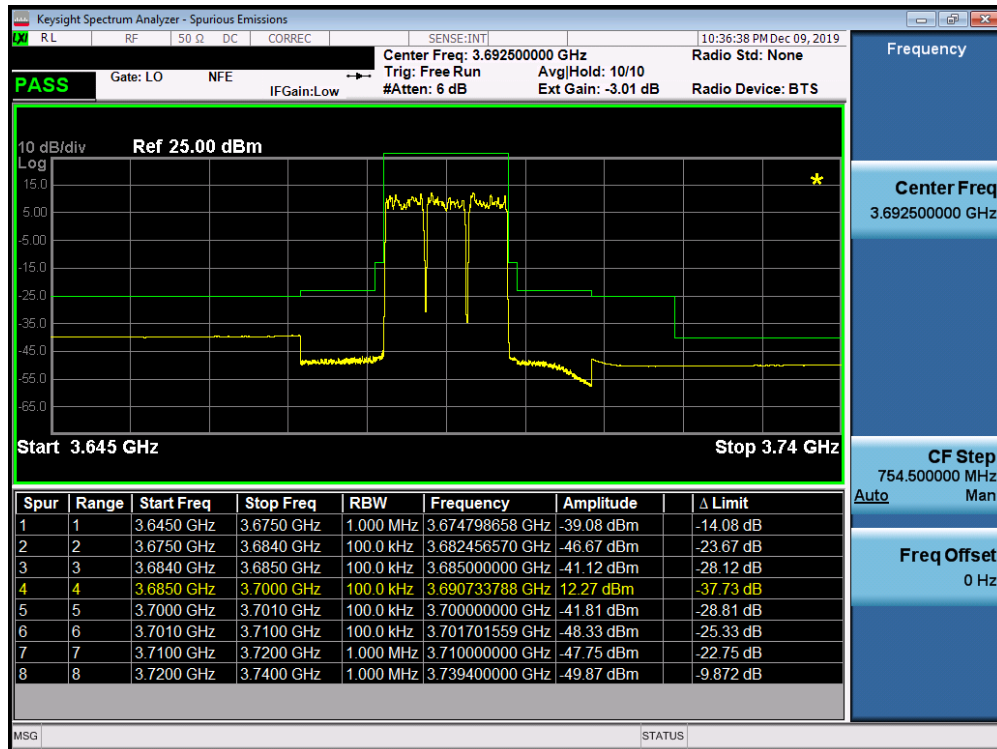


Plot 7-220. Low Channel Edge Plot (15MHz Total Bandwidth 16QAM)



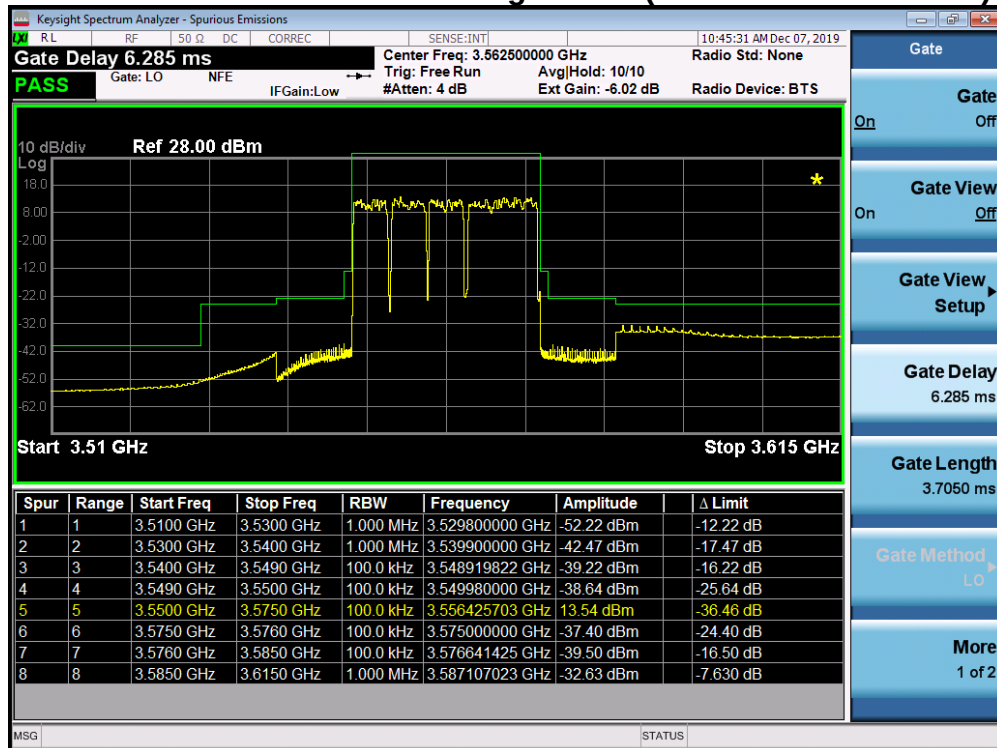
Plot 7-221. Mid Channel Edge Plot (15MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 147 of 161



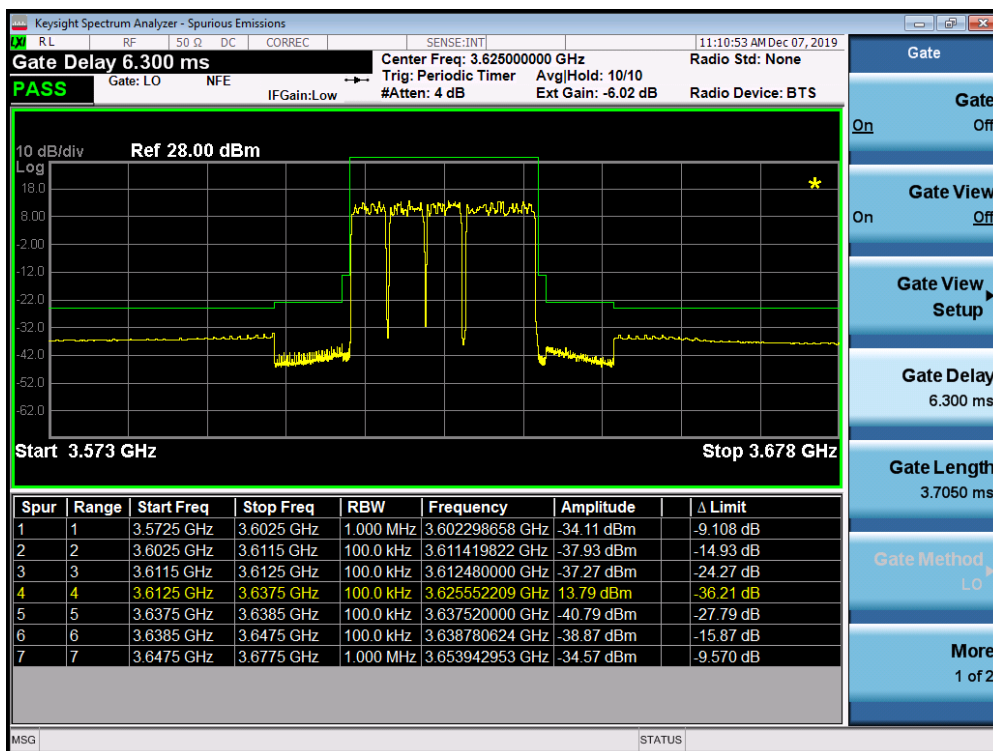
Plot 7-222. High Channel Edge Plot (15MHz Total Bandwidth 16QAM)

Case05. 4CC - 25MHz Total Bandwidth Configuration (5 + 5 + 5 + 10MHz BW)

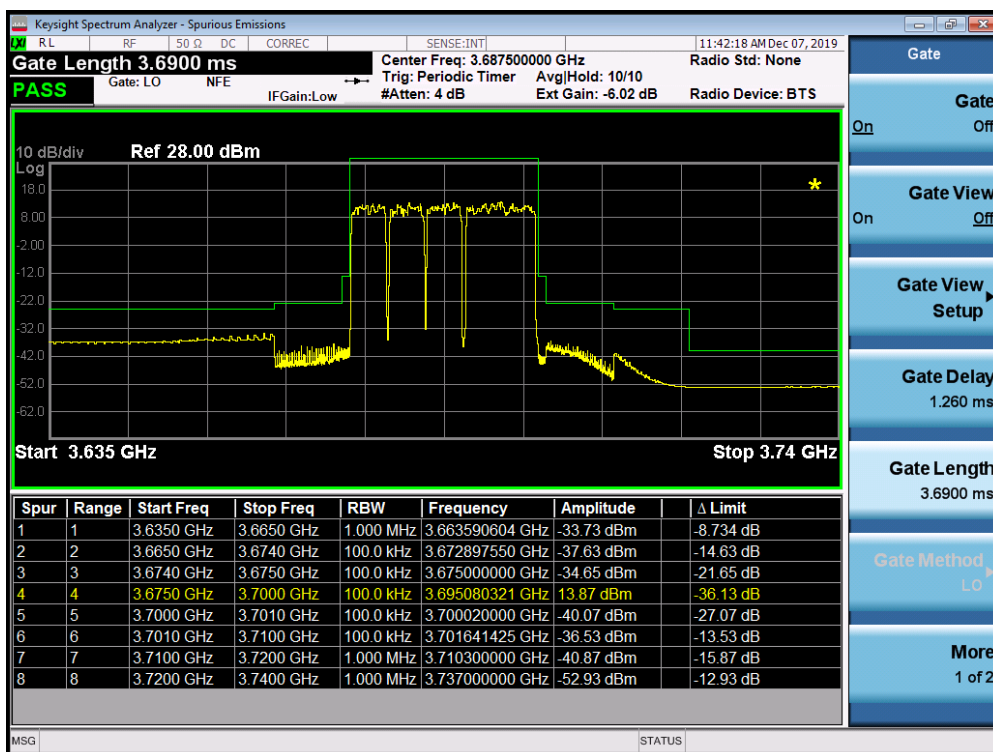


Plot 7-223. Low Channel Edge Plot (25MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 148 of 161



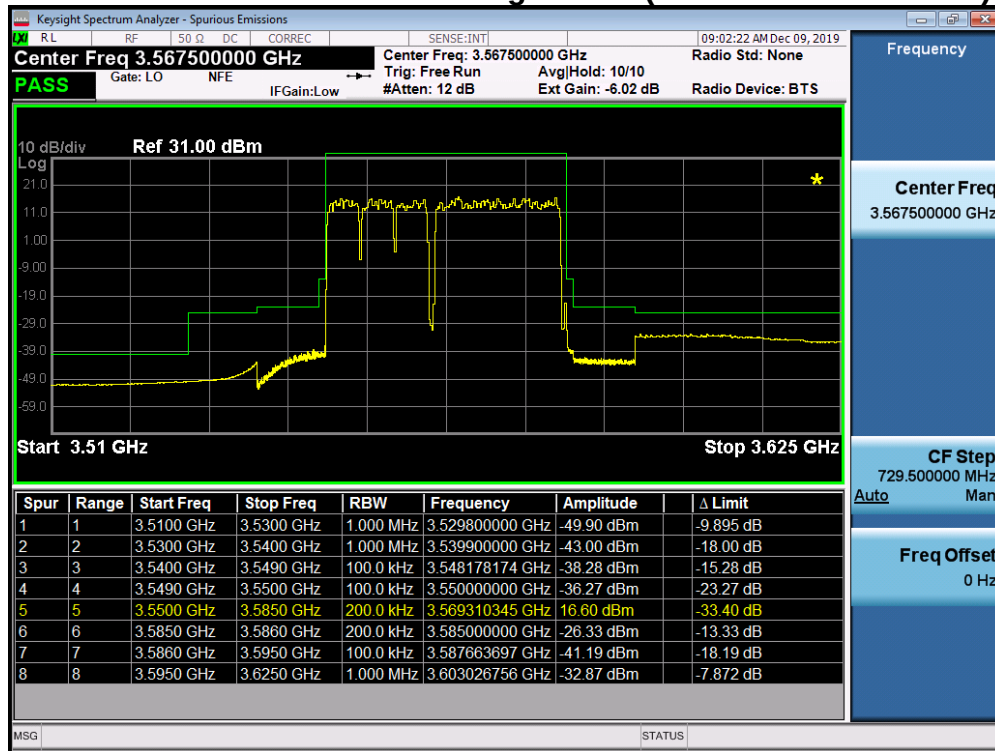
Plot 7-224. Mid Channel Edge Plot (25MHz Total Bandwidth 16QAM)



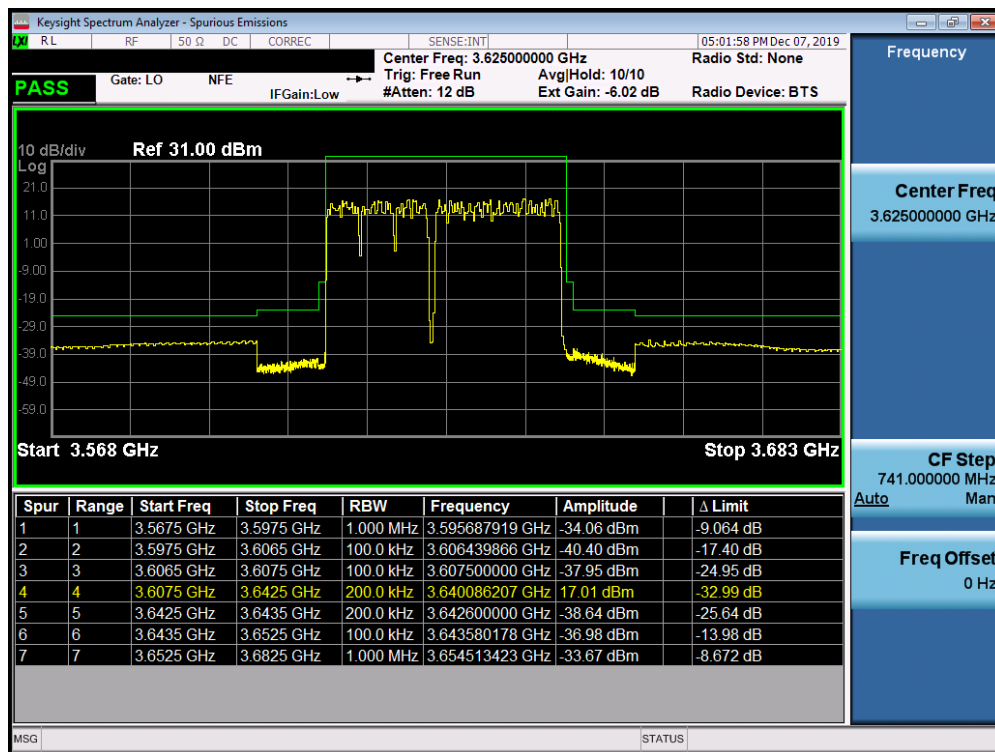
Plot 7-225. High Channel Edge Plot (25MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	 MEASUREMENT REPORT (Class II Permissive Change) 		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 149 of 161

Case07. 4CC - 35MHz Total Bandwidth Configuration (5 + 5 + 5 + 20MHz BW)

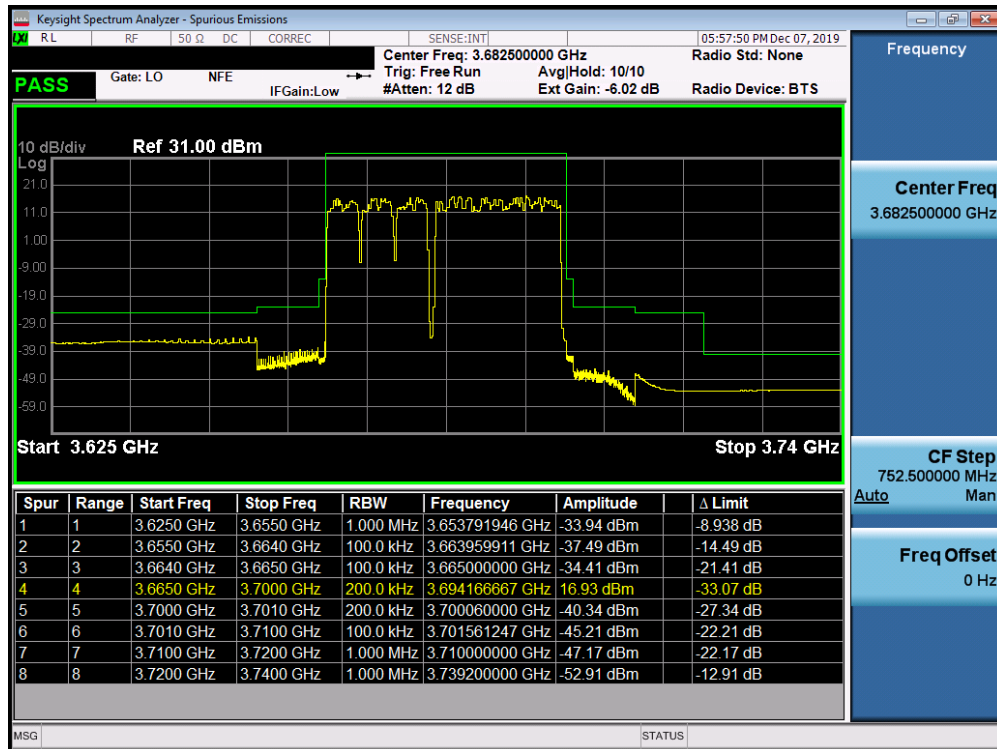


Plot 7-226. Low Channel Edge Plot (35MHz Total Bandwidth 16QAM)



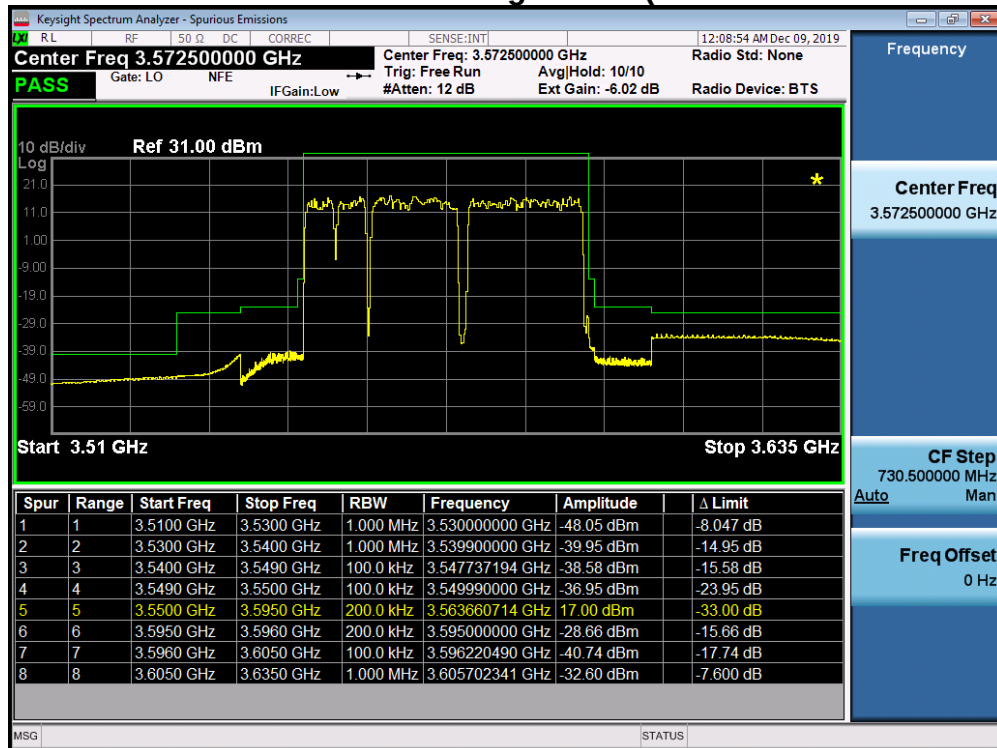
Plot 7-227. Mid Channel Edge Plot (35MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 150 of 161



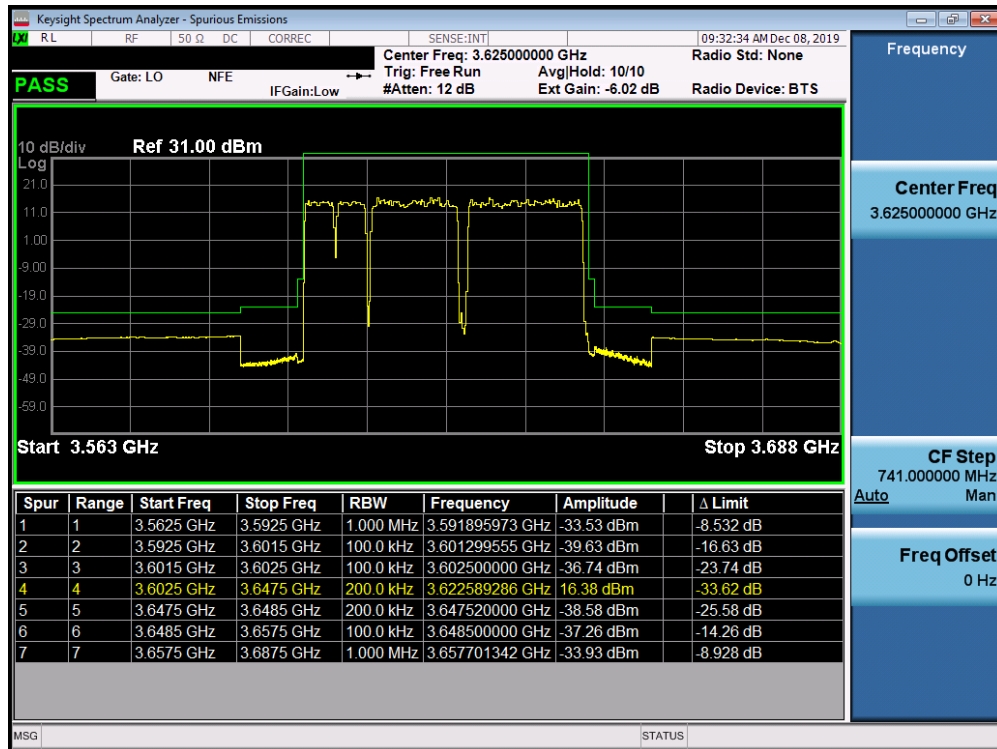
Plot 7-228. High Channel Edge Plot (35MHz Total Bandwidth 16QAM)

Case09. 4CC - 45MHz Total Bandwidth Configuration (5 + 5 + 15 + 20MHz BW)

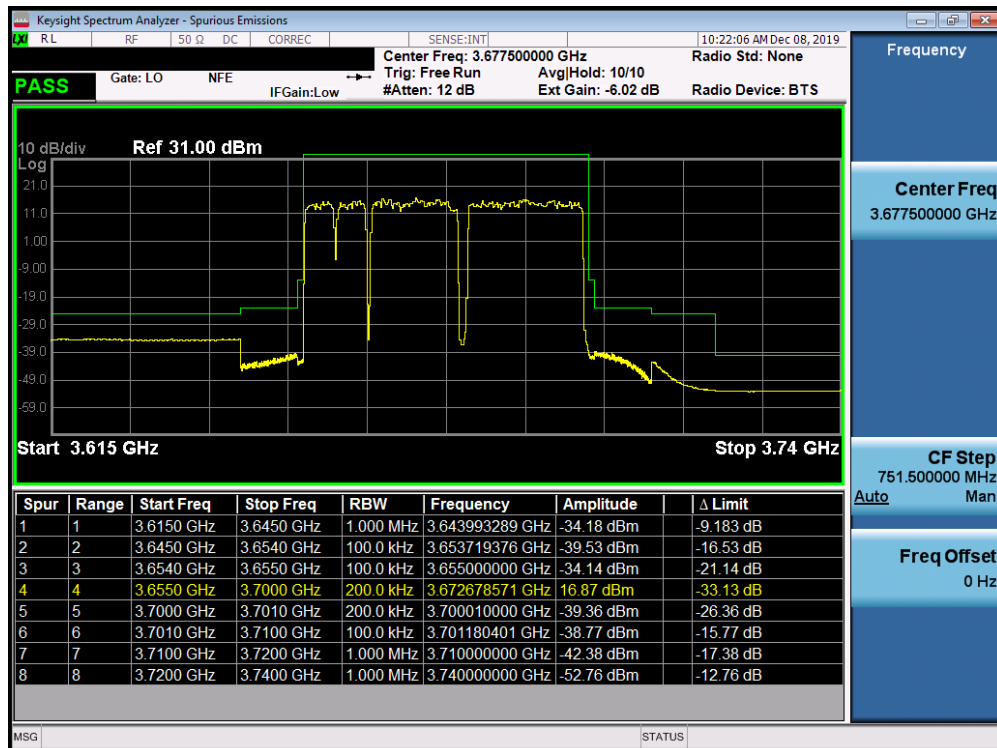


Plot 7-229. Low Channel Edge Plot (45MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 151 of 161



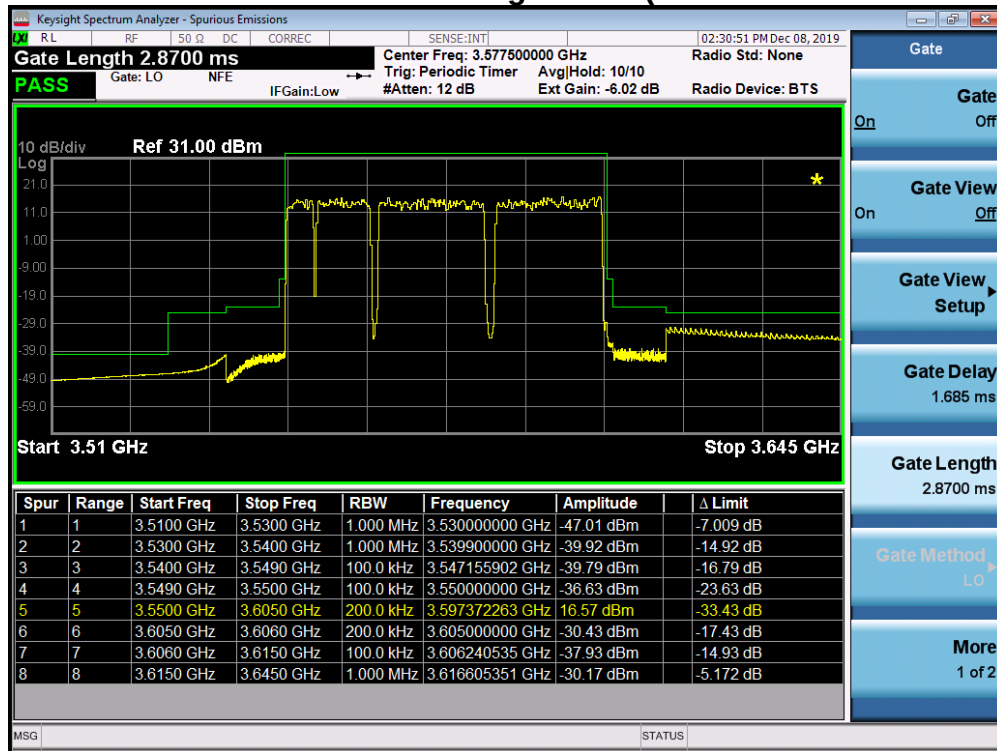
Plot 7-230. Mid Channel Edge Plot (45MHz Total Bandwidth 16QAM)



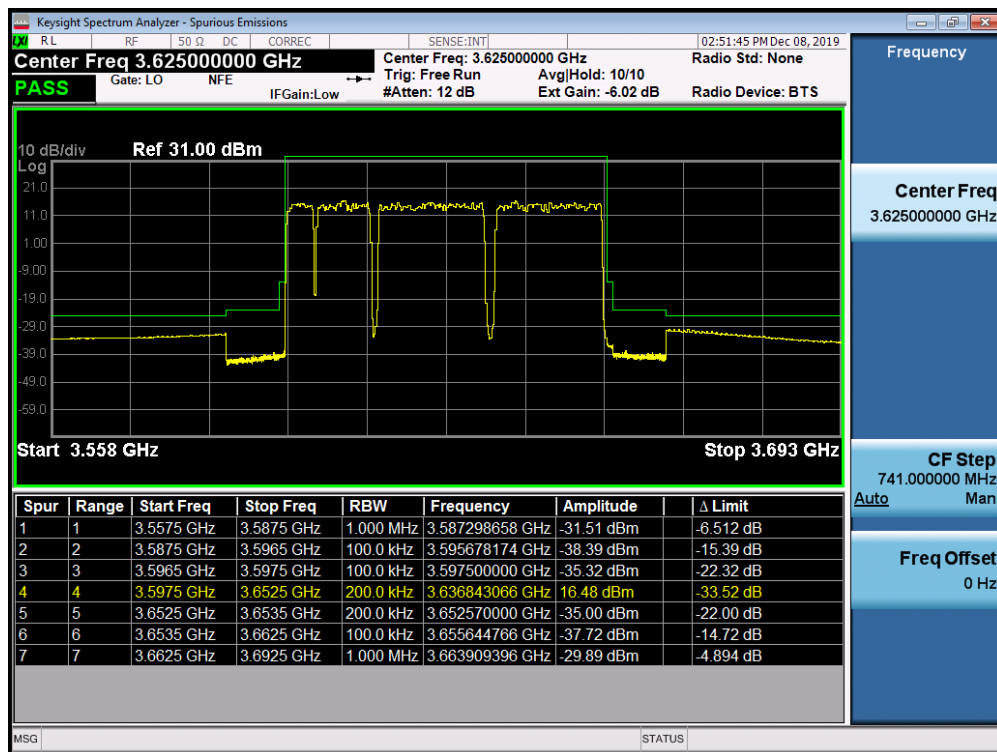
Plot 7-231. High Channel Edge Plot (45MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 152 of 161

Case11. 4CC - 55MHz Total Bandwidth Configuration (5 + 10 + 20 + 20MHz BW)

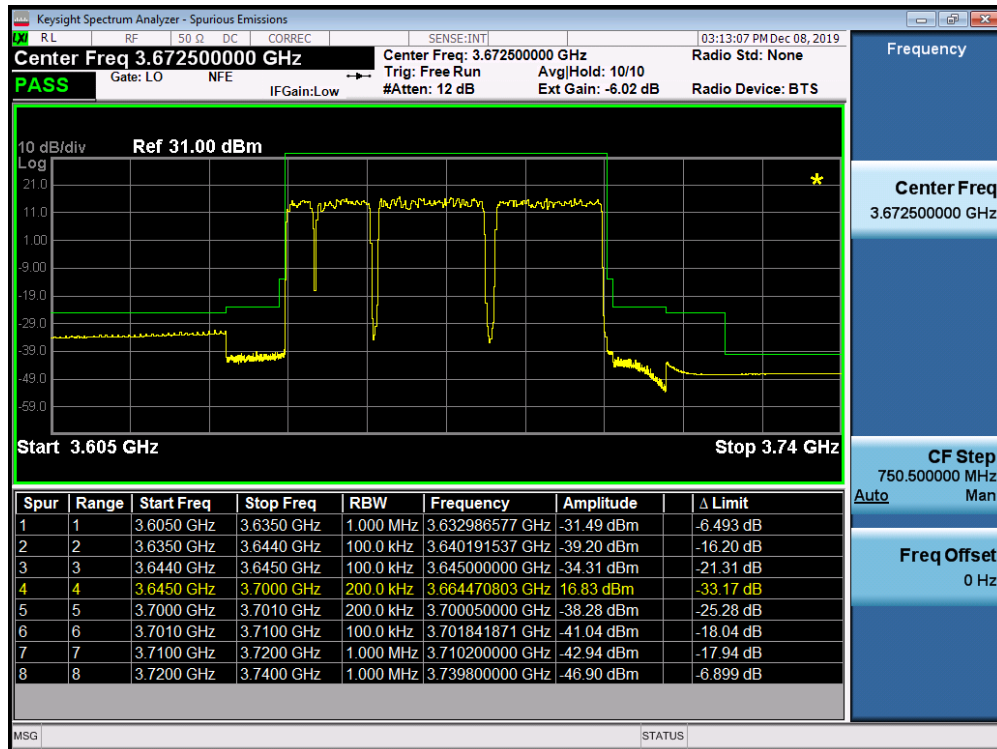


Plot 7-232. Low Channel Edge Plot (55MHz Total Bandwidth 16QAM)



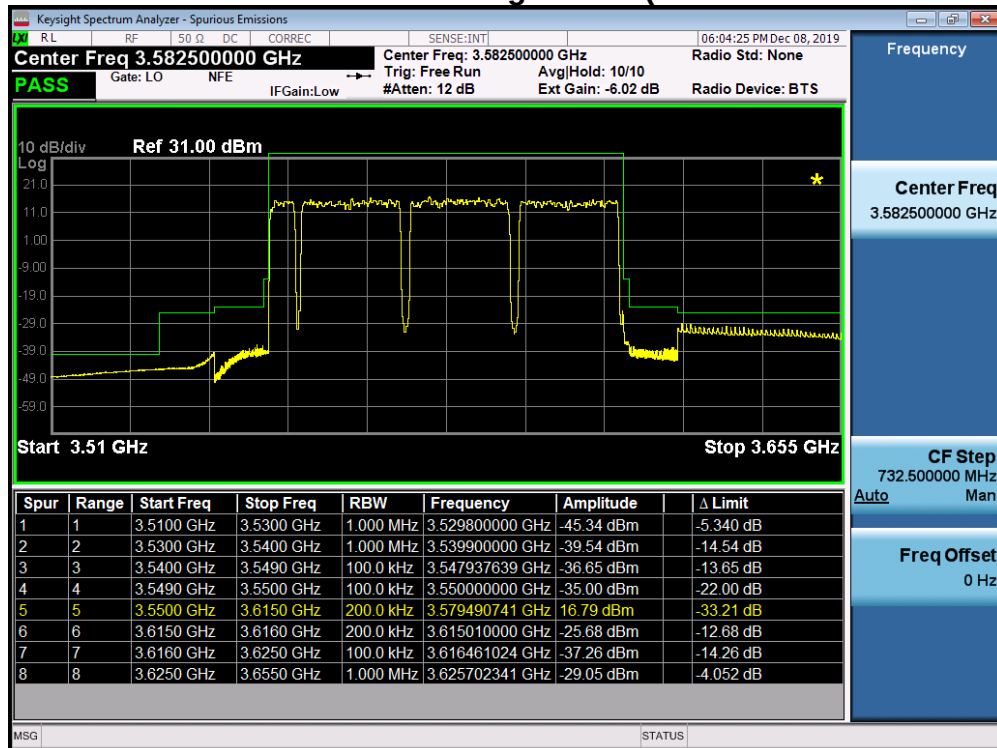
Plot 7-233. Mid Channel Edge Plot (55MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 153 of 161



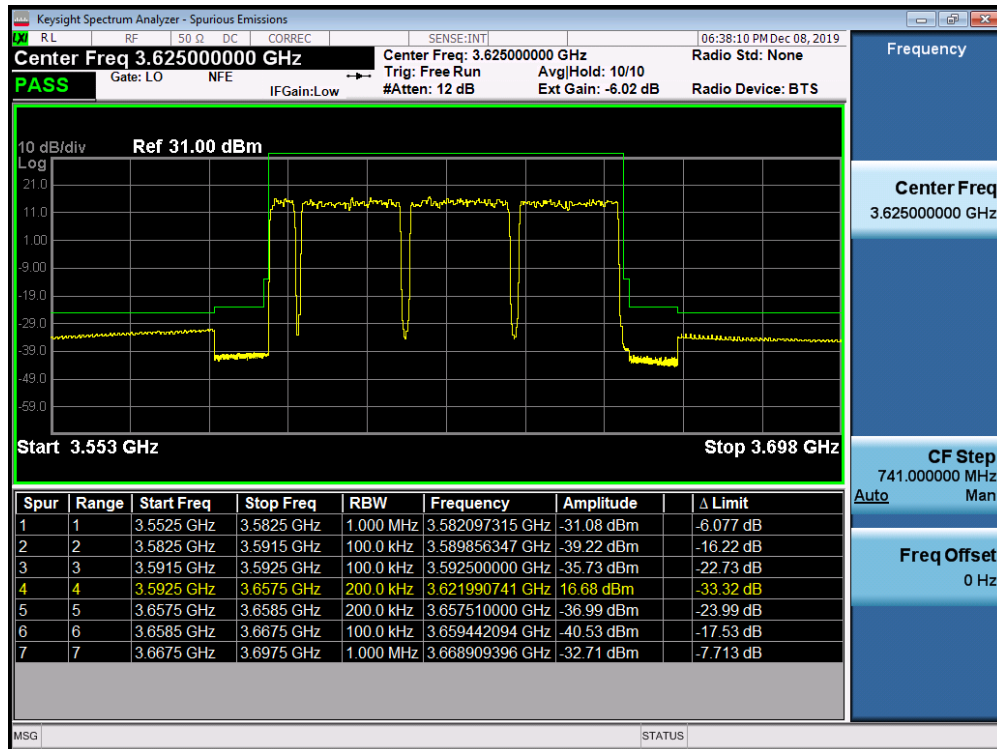
Plot 7-234. High Channel Edge Plot (55MHz Total Bandwidth 16QAM)

Case13. 4CC - 65MHz Total Bandwidth Configuration (5 + 20 + 20 + 20MHz BW)

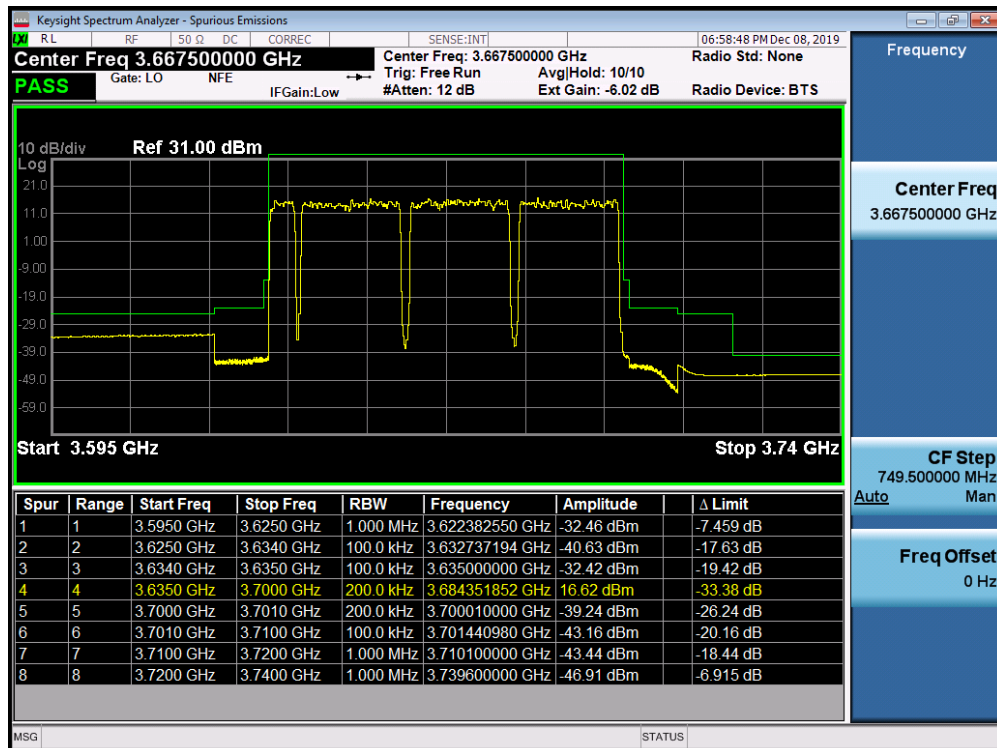


Plot 7-235. Low Channel Edge Plot (65MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 154 of 161



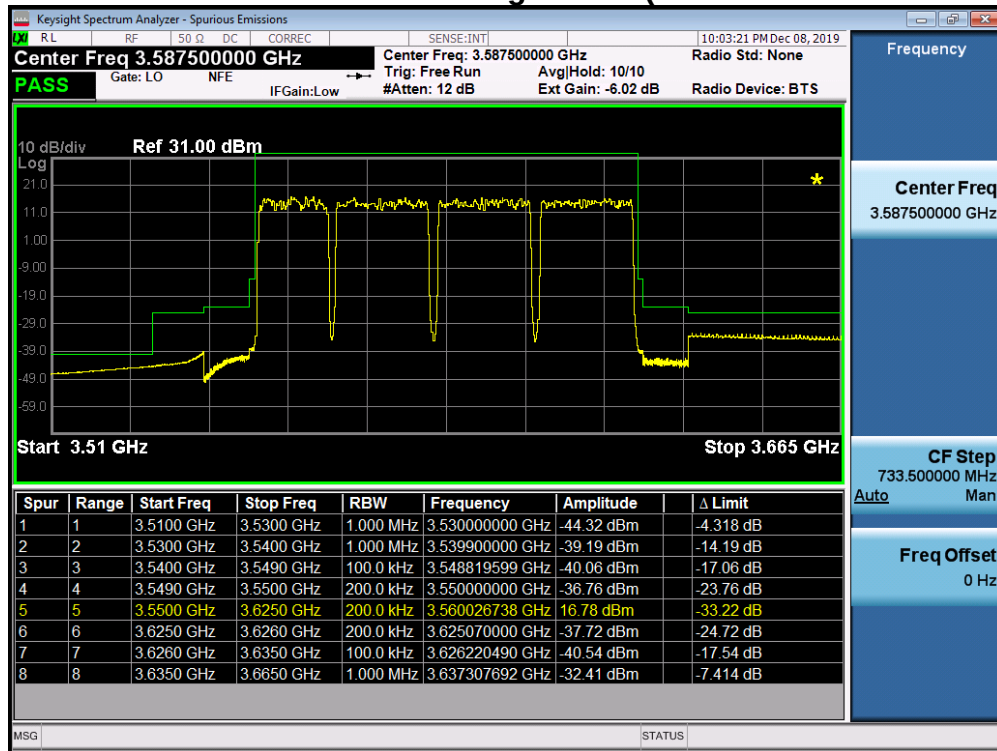
Plot 7-236. Mid Channel Edge Plot (65MHz Total Bandwidth 16QAM)



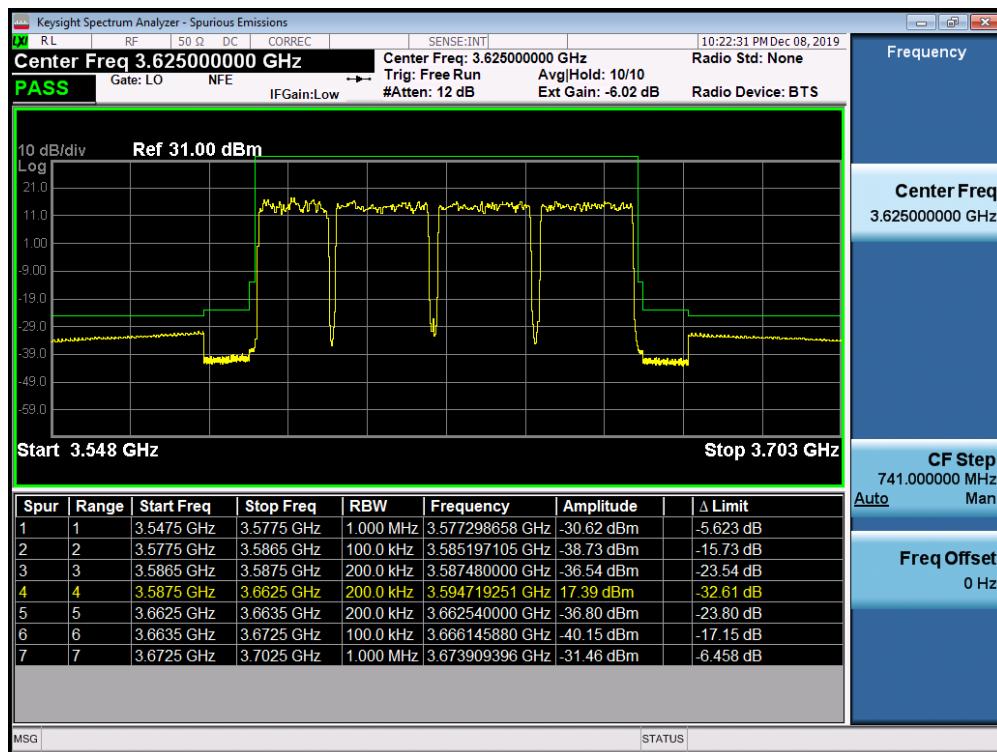
Plot 7-237. High Channel Edge Plot (65MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 155 of 161

Case15. 4CC - 75MHz Total Bandwidth Configuration (15 + 20 + 20 + 20MHz BW)

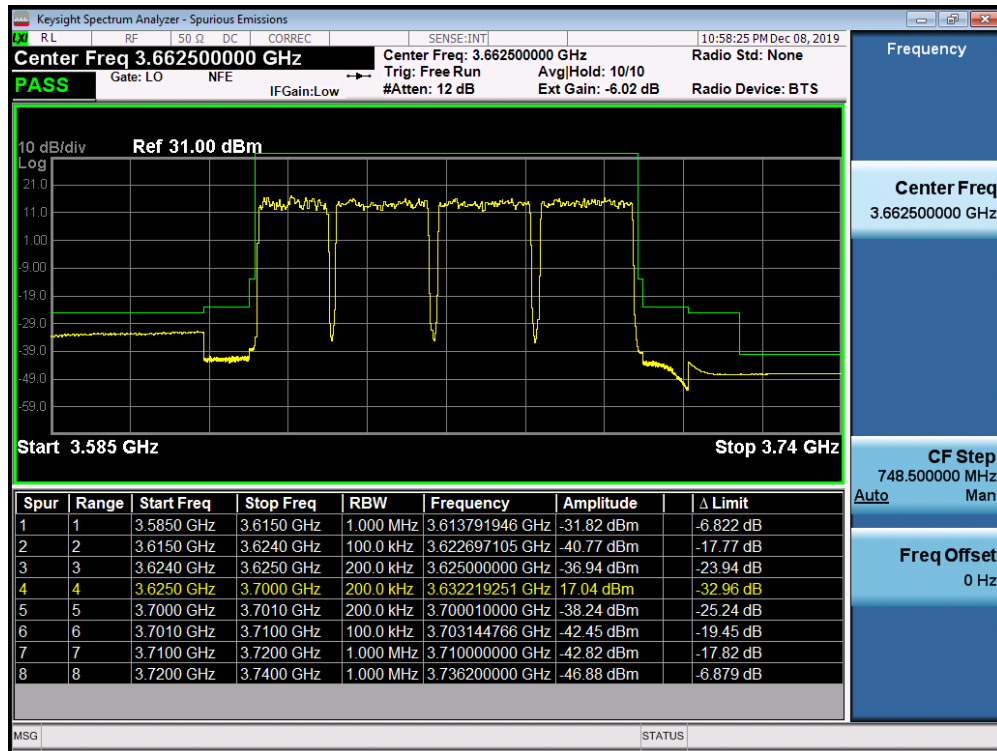


Plot 7-238. Low Channel Edge Plot (75MHz Total Bandwidth 16QAM)



Plot 7-239. Mid Channel Edge Plot (75MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (Class II Permissive Change)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 156 of 161



Plot 7-240. High Channel Edge Plot (75MHz Total Bandwidth 16QAM)

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 157 of 161

7.9 Frequency Stability / Temperature Variation

§2.1055

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

A spectrum analyzer was used for this test with settings as follows:

1. Trace = Average RMS
2. Detector = Peak
3. RBW = 100kHz
4. VBW = 600 kHz

Corrections for the cable, connectors and attenuators was accounted for as an offset before measurement.

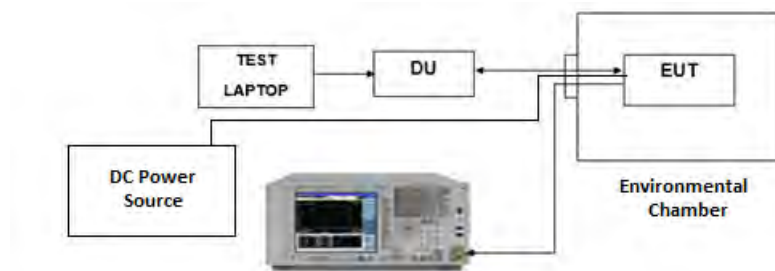


Figure 7-8. Test Instrument & Measurement Setup

FCC ID: A3LRT4401-48A	 MEASUREMENT REPORT (Class II Permissive Change) 		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 158 of 161

Band 48 Frequency Stability Measurements

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	48.00	+ 20 (Ref)	3,625,008,020	0	0.0000000
100 %	48.00	- 30	3,625,008,027	6.68	0.0000002
100 %		- 20	3,625,008,028	7.52	0.0000002
100 %		- 10	3,625,008,024	3.58	0.0000001
100 %		0	3,625,008,023	2.79	0.0000001
100 %		+ 10	3,625,008,023	2.77	0.0000001
100 %		+ 30	3,625,008,020	-0.84	0.0000000
100 %		+ 40	3,625,008,030	9.28	0.0000003
100 %		+ 50	3,625,008,020	-0.81	0.0000000
85 %	40.80	+ 20	3,625,008,021	0.33	0.0000000
115 %	55.20	+ 20	3,625,008,021	0.10	0.0000000

Table 7-21. Frequency Stability Data (Band 48)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

This Frequency Stability / Temperature Variation test is adopted of test case 15(15 + 20 + 20 + 20MHz BW) with 16QAM as the worst case based on RF output power.

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 159 of 161	

Band 48 Frequency Stability Measurements

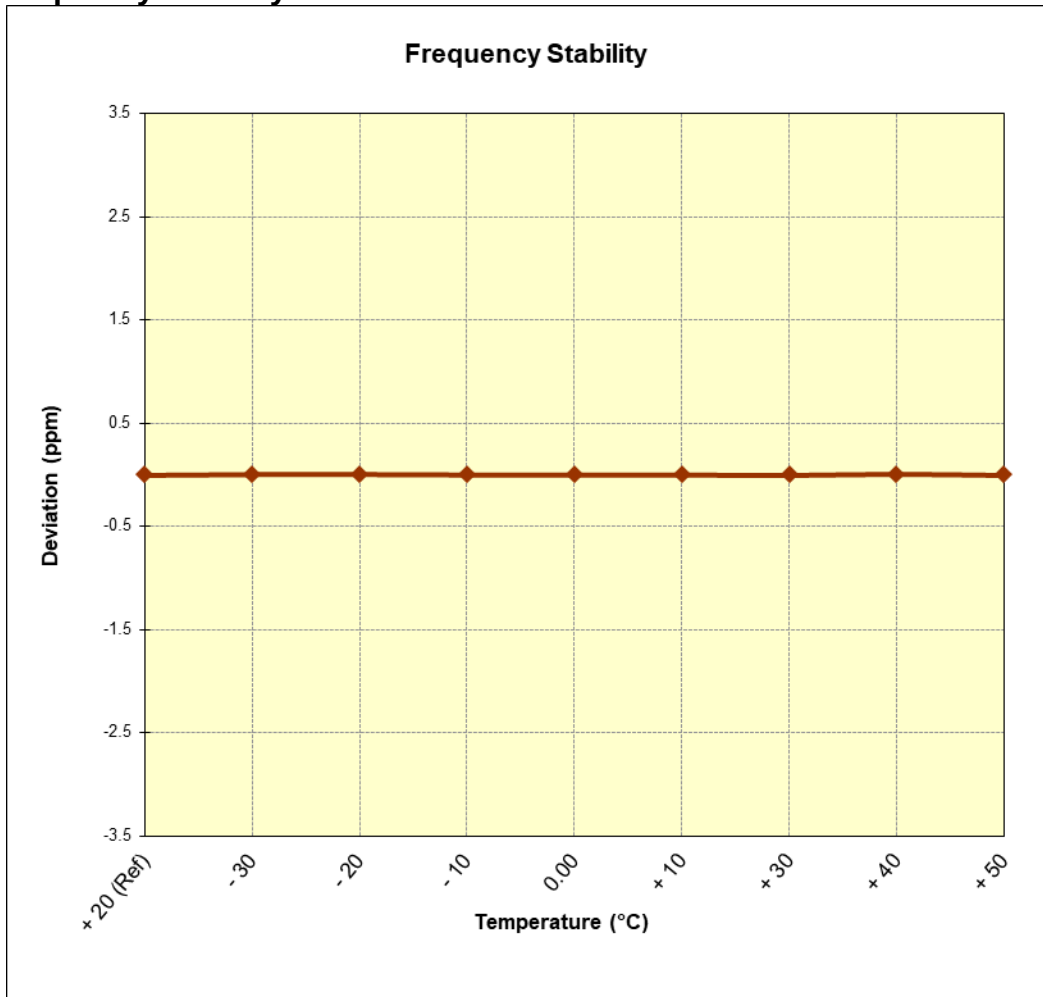


Figure 7-9. Frequency Stability Graph (Band 48)

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)	Page 160 of 161	

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung RRU(RT4401) CBSD FCC ID: A3LRT4401-48A** complies with all of the Category B CBSD requirements of Part 96 of the FCC Rules.

FCC ID: A3LRT4401-48A		MEASUREMENT REPORT (Class II Permissive Change)		Approved by: Quality Manager
Test Report S/N: 8K19110701.01R01.A3L	Test Dates: 12/2/2019-12/13/2019	EUT Type: RRU(RT4401)		Page 161 of 161