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Carrier Aggregation Report

Class II Permissive Change

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Date of Issue:
May 15, 2018

Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-1805-FC016-R2

FCC ID:	**A3LSMG8850**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model(s):	SM-G8850
Additional Model(s):	SM-G8858
EUT Type:	Mobile Phone
FCC Classification:	Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§27, §2

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by : Kwon Jeong
Engineer of Telecommunication Testing Center

Report approved by : Yong Hyun Lee
Manager of Telecommunication Testing Center

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1805-FC016	May 09, 2018	- First Approval Report
HCT-RF-1805-FC016-R1	May 14, 2018	- Added the limit of Conducted Spurious Emissions on page 16. - Revised the test note on page 14 – 15. - Added the additional model.
HCT-RF-1805-FC016-R2	May 15, 2018	- Added the Equivalent Isotropic Radiated Power. - Added the Modulation of Occupied Bandwidth. - Added the Emission Designator. - Added the sample calculation.

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID:	A3LSMG8850
Application Type:	Class II Permissive Change
FCC Classification:	Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§27, §2
EUT Type:	Mobile Phone
Model(s):	SM-G8850
Additional Model(s):	SM-G8858
Tx Frequency:	2557.5 – 2652.5 : 5 MHz 2560.0 – 2650.0 : 10 MHz 2562.5 – 2647.5 : 15 MHz 2565.0 – 2645.0 : 20 MHz
Date(s) of Tests:	April 06, 2018 ~ May 15, 2018
LTE CA :	CA 41C(Uplink)

2. INTRODUCTION

2.1. DESCRIPTION OF EUT

The EUT was a Mobile Phone with GSM/GPRS/EGPRS/UMTS and LTE.

It also supports IEEE 802.11a/b/g/n/ac (HT20/40/80), Bluetooth, NFC and ANT+.

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

3. DESCRIPTION OF TESTS

3.1 TEST PROCEDURE

Test Description	Test Procedure Used
Occupied Bandwidth	- KDB 971168 D01 v03r01 – Section 4.3 - ANSI C63.26-2015 – Section 5.4.4
Channel Edge	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Spurious and Harmonic Emissions at Antenna Terminal	- KDB 971168 D01 v03r01 – Section 6.0 - ANSI C63.26-2015 – Section 5.7
Conducted Output Power	- N/A (See SAR Report)
Radiated Spurious and Harmonic Emissions	- KDB 971168 D01 v03r01 – Section 6.2 - ANSI/TIA-603-E-2016 – Section 2.2.12
Effective Isotropic Radiated Power	- KDB 971168 D01 v03r01 – Section 5.2 & 5.8 - ANSI C63.26-2015 – Section 5.2 - ANSI/TIA-603-E-2016 – Section 2.2.17

3.2 RADIATED POWER

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17.

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, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Note

1. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission.
2. 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 and the previously recorded signal was duplicated.

   The power is calculated by the following formula;

   $$P_{d(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

   Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.
3. The maximum value is calculated by adding the forward power to the calibrated source plus its appropriate gain value.

   These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration
4. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
5. 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.

3.3 RADIATED SPURIOUS EMISSIONS

Test Overview

Radiated tests are performed in the Fully-anechoic chamber.

Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA-603-E-2016.

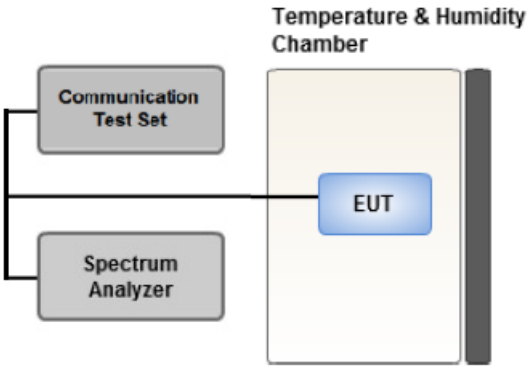
Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x span / RBW
5. Detector = Peak
6. Trace mode = Max Hold
7. The trace was allowed to stabilize
8. Test channel : Low/ Middle/ High
9. Frequency range : We are performed all frequency to 10th harmonics from 9 kHz.

Test Note

1. Measurements value show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
2. The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
   The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the test data

3.4 OCCUPIED BANDWIDTH.



Test setup

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

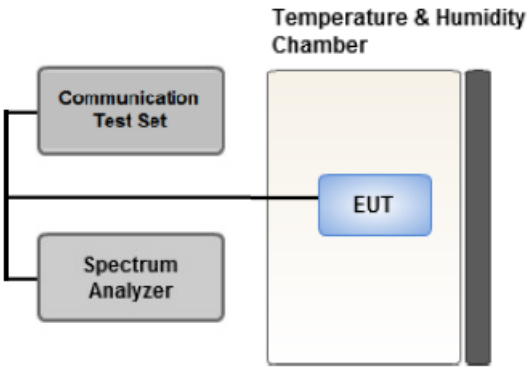
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

Test Settings

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

3.5 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL



Test setup

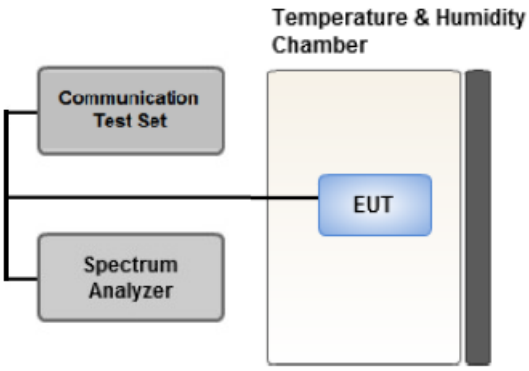
Test Overview

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.

Test Settings

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = Peak
4. Trace Mode = max hold
5. Sweep time = auto
6. Number of points in sweep ≥ 2 * Span / RBW

3.6 CHANNEL EDGE



Test setup

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.

Test Settings

1. Start and stop frequency were set such that the channel 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 > 2% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Notes

1. The attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge.In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.
2. All measurements were done at 3 channels.
3. The channel edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
REOHDE & SCHWARZ	SCU 18 / AMPLIFIER	10094	04/17/2018	Annual	04/17/2019
Wainwright	WHK1.2/15G-10EF/H.P.F	4	04/04/2018	Annual	04/04/2019
Wainwright	WHK3.3/18G-10EF/H.P.F	2	04/04/2018	Annual	04/04/2019
Hewlett Packard	* 11667B / Power Splitter(DC~26.5 GHz)	11275	05/04/2017	Annual	05/04/2018
Hewlett Packard	11667B / Power Splitter(DC~26.5 GHz)	05001	06/12/2017	Annual	06/12/2018
Agilent	E3632A/DC Power Supply	KR75303243	07/18/2017	Annual	07/18/2018
ESPEC	SU-642 / Chamber	93000718	07/21/2017	Annual	07/21/2018
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	147	09/09/2016	Biennial	09/09/2018
Schwarzbeck	BBHA 9120D/ Horn Antenna(1~18GHz)	9120D-1298	10/14/2016	Biennial	10/14/2018
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	04/25/2017	Biennial	04/25/2019
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170124	04/25/2017	Biennial	04/25/2019
Agilent	N9020A/Signal Analyzer(10Hz~26.5GHz)	MY52090906	06/01/2017	Annual	06/01/2018
Hewlett Packard	8493C/ATTENUATOR(20dB)	17280	06/22/2017	Annual	06/22/2018
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer(10Hz~40GHz)	100931	10/30/2017	Annual	10/30/2018
Agilent	8960 (E5515C)/ Base Station	MY48360800	09/26/2017	Annual	09/26/2018
Schwarzbeck	FMZB1513/ Loop Antenna(9kHz~30MHz)	1513-175	04/19/2017	Biennial	04/19/2019
Schwarzbeck	VULB9160/ Bilog Antenna	3150	09/30/2016	Biennial	09/30/2018
Schwarzbeck	VULB9160/ Bilog Antenna	9360-3368	10/14/2016	Biennial	10/14/2018
Anritsu Corp.	MT8821C/Wideband Radio Communication Tester	6201502997	08/10/2017	Annual	08/10/2018
REOHDE & SCHWARZ	SMB100A/ SIGNAL GENERATOR (100kHz~40GHz)	177633	07/18/2017	Annual	07/18/2018
REOHDE & SCHWARZ	FSV40/Spectrum Analyzer	100931	10/30/2017	Annual	10/30/2018
REOHDE & SCHWARZ	ESU40 / EMI TEST RECEIVER	100524	08/16/2017	Annual	08/16/2018
HCT CO., LTD.,	FCC LTE Mobile Conducted RF Automation Test Software	-	-	-	-

* The Power Splitter(S/N:11275) was used from April 06, 2018 to May 01, 2018.

5. 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 data shown herein 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.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	6.07

6. SUMMARY OF TEST RESULTS

6.1 Test Condition : Conducted Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Occupied Bandwidth	§2.1049	N/A	PASS
Channel Edge / Spurious and Harmonic Emissions at Antenna Terminal.	§2.1051, §27.53(m)(4)	■ < 40 + 10log10 (P[Watts]) at Channel edges ■ < 43 + 10log10 (P[Watts]) between 5 and X MHz from Channel edges ■ < 55 + 10log10 (P[Watts]) beyond X MHz beyond from Channel edges ■ < 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz	PASS
Conducted Output Power	§2.1046	N/A	**See Note1**

Note:

1. See SAR Report

6.2 Test Condition : Radiated Test

Test Description	FCC Part Section(s)	Test Limit	Test Result
Equivalent Isotropic Radiated Power	§27.50(h)(2)	< 2 Watts max. EIRP	PASS
Radiated Spurious and Harmonic Emissions	§2.1053, §27.53(m)(4)	< 55 + 10log10 (P[Watts])	PASS

7. SAMPLE CALCULATION

7.1 ERP

Ch./ Freq.		Measured Level(dBm)	Substitute Level(dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
channel	Freq.(MHz)						W	dBm
128	824.20	-21.37	38.40	-10.61	0.95	H	0.483	26.84

ERP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
2) During the test , the turn table is rotated until the maximum signal is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power.

7.2 EIRP

Ch./ Freq.		Measured Level(dBm)	Substitute Level(dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
40620	2593.0	-15.75	18.45	9.90	1.76	H	0.456	26.59

EIRP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a non-conductive turntable is 2.5 meter above test site ground level.
2) During the test , the turn table is rotated until the maximum signal is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with Ant. Gain and cable loss are the rating of equivalent isotropic radiated power.

7.3 Emission Designator

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

16QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

64QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

8. TEST DATA

Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers 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.

Test Note

1. All tests were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth.
2. Channel bandwidth is shown in the tables below based only on the channel bandwidths that were supported in this device.

Channel Bandwidth (PCC)	Channel Bandwidth (SCC)	Maximum aggregated bandwidth (MHz)
10	20	40
15	15, 20	40
20	10, 15, 20	40
5, 10	20	40
15	15, 20	40
20	5, 10, 15, 20	40
10	15, 20	40
15	10, 15, 20	40
20	10, 15, 20	40
10	20	40
20	20	40

3. All modes of operation were investigated and the worst case configuration results are reported in this section.
   - Worst case : We have selected higher of the Conduction Output Power, please refer to the table below.
   * Conducted Output Power value can be confirmed on the SAR report.

[Worst case]

Test Description	Mod	Operating frequency	PCC				SCC			
			BW (MHz)	Ch.	RB	RB	BW (MHz)	Ch.	RB	RB
Conducted Spurious Emissions	QPSK	Low	10	40290	1	49	15	40410	1	0
	QPSK	Mid	20	40740	1	0	10	40596	1	49
	QPSK	High	10	41190	1	0	20	41046	1	99
	QPSK	Low	20	40340	100	0	5	40457	25	0
	QPSK	Mid	15	40740	75	0	10	40620	50	0
	QPSK	High	15	41165	75	0	15	41015	75	0
Channel Edge	QPSK	Low	20	40340	100	0	5	40457	25	0
	QPSK	Mid	15	40740	75	0	10	40620	50	0
	QPSK	High	15	41165	75	0	15	41015	75	0
Radiated Spurious Emissions	QPSK	Low	10	40290	1	49	15	40410	1	0
	QPSK	Mid	20	40740	1	0	10	40596	1	49
	QPSK	High	10	41190	1	0	20	41046	1	99
	QPSK	Low	20	40340	100	0	5	40457	25	0
	QPSK	Mid	15	40740	75	0	10	40620	50	0
	QPSK	High	15	41165	75	0	15	41015	75	0
Occupied Bandwidth	QPSK	Low	20	40340	100	0	5	40457	25	0
	QPSK	Mid	15	40740	75	0	10	40620	50	0
	QPSK	High	15	41165	75	0	15	41015	75	0
	QPSK	Low	20	40340	100	0	20	40538	100	0
	QPSK	Mid	20	40740	100	0	20	40542	100	0
	QPSK	High	20	41140	100	0	20	40942	100	0

4. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

8.1 Equivalent Isotropic Radiated Power

PCC			SCC			Measured	Substitude	Ant.			E.I.R.P	
BW [MHz]	Channel	RB/ Offset	BW [MHz]	Channel	RB/ Offset	Level (dBm)	Level (dBm)	Gain (dBi)	C.L	Pol.	W	dBm
10	40290	1/49	20	40434	1/0	-24.42	11.66	11.00	2.39	H	0.11	20.27
15	40315	1/74	15	40465	1/0	-24.22	11.86	11.00	2.39	H	0.11	20.47
15	40315	1/74	20	40486	1/0	-24.42	11.66	11.00	2.39	H	0.11	20.27
20	40340	1/99	10	40484	1/0	-24.54	11.54	11.00	2.39	H	0.10	20.15
20	40340	1/99	15	40511	1/0	-24.81	11.27	11.00	2.39	H	0.10	19.88
20	40340	1/99	20	40538	1/0	-24.30	11.78	11.00	2.39	H	0.11	20.39
5	40265	1/24	20	40382	1/0	-24.36	11.72	11.00	2.39	H	0.11	20.33
20	40340	1/99	5	40457	1/0	-24.54	11.54	11.00	2.39	H	0.10	20.15
10	40290	1/49	15	40410	1/0	-24.20	11.88	11.00	2.39	H	0.11	20.49
15	40315	1/74	10	40435	1/0	-24.50	11.58	11.00	2.39	H	0.10	20.19
10	40740	1/0	20	40596	1/99	-24.69	11.23	11.03	2.40	H	0.10	19.86
15	40740	1/0	15	40590	1/74	-25.21	10.71	11.03	2.40	H	0.09	19.34
15	40740	1/0	20	40569	1/99	-25.32	10.60	11.03	2.40	H	0.08	19.23
20	40740	1/0	10	40596	1/49	-24.52	11.40	11.03	2.40	H	0.10	20.03
20	40740	1/0	15	40569	1/74	-25.16	10.76	11.03	2.40	H	0.09	19.39
20	40740	1/0	20	40542	1/99	-24.89	11.03	11.03	2.40	H	0.09	19.66
5	40740	1/0	20	40623	1/99	-24.59	11.33	11.03	2.40	H	0.10	19.96
20	40740	1/0	5	40623	1/24	-24.93	10.99	11.03	2.40	H	0.09	19.62
10	40740	1/0	15	40620	1/74	-24.68	11.24	11.03	2.40	H	0.10	19.87
15	40740	1/0	10	40620	1/49	-25.04	10.88	11.03	2.40	H	0.09	19.51
10	41190	1/0	20	41046	1/99	-24.49	11.60	11.07	2.43	H	0.11	20.24
15	41165	1/0	15	41015	1/74	-24.85	11.24	11.07	2.43	H	0.10	19.88
15	41165	1/0	20	40994	1/99	-24.82	11.27	11.07	2.43	H	0.10	19.91
20	41140	1/0	10	40996	1/49	-24.50	11.59	11.07	2.43	H	0.11	20.23
20	41140	1/0	15	40969	1/74	-24.85	11.24	11.07	2.43	H	0.10	19.88
20	41140	1/0	20	40942	1/99	-24.86	11.23	11.07	2.43	H	0.10	19.87
5	41215	1/0	20	41098	1/99	-24.93	11.16	11.07	2.43	H	0.10	19.80
20	41140	1/0	5	41023	1/24	-24.66	11.43	11.07	2.43	H	0.10	20.07
10	41190	1/0	15	41070	1/74	-24.78	11.31	11.07	2.43	H	0.10	19.95
15	41165	1/0	10	41045	1/49	-24.63	11.46	11.07	2.43	H	0.10	20.10

Note:

1. Modulation : QPSK
2. Limit : < 2 Watts

PCC			SCC			Measured	Substitude	Ant.			E.I.R.P	
BW [MHz]	Channel	RB/ Offset	BW [MHz]	Channel	RB/ Offset	Level (dBm)	Level (dBm)	Gain (dBi)	C.L	Pol.	W	dBm
10	40290	1/49	20	40434	1/0	-25.55	10.53	11.00	2.39	H	0.08	19.14
15	40315	1/74	15	40465	1/0	-26.01	10.07	11.00	2.39	H	0.07	18.68
15	40315	1/74	20	40486	1/0	-25.44	10.64	11.00	2.39	H	0.08	19.25
20	40340	1/99	10	40484	1/0	-25.46	10.62	11.00	2.39	H	0.08	19.23
20	40340	1/99	15	40511	1/0	-25.75	10.33	11.00	2.39	H	0.08	18.94
20	40340	1/99	20	40538	1/0	-24.87	11.21	11.00	2.39	H	0.10	19.82
5	40265	1/24	20	40382	1/0	-25.54	10.54	11.00	2.39	H	0.08	19.15
20	40340	1/99	5	40457	1/0	-25.65	10.43	11.00	2.39	H	0.08	19.04
10	40290	1/49	15	40410	1/0	-24.75	11.33	11.00	2.39	H	0.10	19.94
15	40315	1/74	10	40435	1/0	-25.56	10.52	11.00	2.39	H	0.08	19.13
10	40740	1/0	20	40596	1/99	-25.65	10.27	11.03	2.40	H	0.08	18.90
15	40740	1/0	15	40590	1/74	-26.16	9.76	11.03	2.40	H	0.07	18.39
15	40740	1/0	20	40569	1/99	-26.32	9.60	11.03	2.40	H	0.07	18.23
20	40740	1/0	10	40596	1/49	-25.63	10.29	11.03	2.40	H	0.08	18.92
20	40740	1/0	15	40569	1/74	-26.05	9.87	11.03	2.40	H	0.07	18.50
20	40740	1/0	20	40542	1/99	-26.02	9.90	11.03	2.40	H	0.07	18.53
5	40740	1/0	20	40623	1/99	-25.70	10.22	11.03	2.40	H	0.08	18.85
20	40740	1/0	5	40623	1/24	-26.13	9.79	11.03	2.40	H	0.07	18.42
10	40740	1/0	15	40620	1/74	-25.65	10.27	11.03	2.40	H	0.08	18.90
15	40740	1/0	10	40620	1/49	-26.11	9.81	11.03	2.40	H	0.07	18.44
10	41190	1/0	20	41046	1/99	-25.50	10.59	11.07	2.43	H	0.08	19.23
15	41165	1/0	15	41015	1/74	-25.82	10.27	11.07	2.43	H	0.08	18.91
15	41165	1/0	20	40994	1/99	-25.86	10.23	11.07	2.43	H	0.08	18.87
20	41140	1/0	10	40996	1/49	-25.53	10.56	11.07	2.43	H	0.08	19.20
20	41140	1/0	15	40969	1/74	-25.77	10.32	11.07	2.43	H	0.08	18.96
20	41140	1/0	20	40942	1/99	-25.78	10.31	11.07	2.43	H	0.08	18.95
5	41215	1/0	20	41098	1/99	-25.94	10.15	11.07	2.43	H	0.08	18.79
20	41140	1/0	5	41023	1/24	-25.56	10.53	11.07	2.43	H	0.08	19.17
10	41190	1/0	15	41070	1/74	-25.90	10.19	11.07	2.43	H	0.08	18.83
15	41165	1/0	10	41045	1/49	-25.52	10.57	11.07	2.43	H	0.08	19.21

Note:

1. Modulation : 16QAM
2. Limit : < 2 Watts

PCC			SCC			Measured	Substitude	Ant.			E.I.R.P	
BW [MHz]	Channel	RB/ Offset	BW [MHz]	Channel	RB/ Offset	Level (dBm)	Level (dBm)	Gain (dBi)	C.L	Pol.	W	dBm
10	40290	1/49	20	40434	1/0	-27.35	8.73	11.00	2.39	H	0.05	17.34
15	40315	1/74	15	40465	1/0	-27.69	8.39	11.00	2.39	H	0.05	17.00
15	40315	1/74	20	40486	1/0	-27.76	8.32	11.00	2.39	H	0.05	16.93
20	40340	1/99	10	40484	1/0	-27.30	8.78	11.00	2.39	H	0.05	17.39
20	40340	1/99	15	40511	1/0	-27.61	8.47	11.00	2.39	H	0.05	17.08
20	40340	1/99	20	40538	1/0	-26.97	9.11	11.00	2.39	H	0.06	17.72
5	40265	1/24	20	40382	1/0	-27.40	8.68	11.00	2.39	H	0.05	17.29
20	40340	1/99	5	40457	1/0	-27.44	8.64	11.00	2.39	H	0.05	17.25
10	40290	1/49	15	40410	1/0	-26.95	9.13	11.00	2.39	H	0.06	17.74
15	40315	1/74	10	40435	1/0	-27.61	8.47	11.00	2.39	H	0.05	17.08
10	40740	1/0	20	40596	1/99	-27.36	8.56	11.03	2.40	H	0.05	17.19
15	40740	1/0	15	40590	1/74	-28.09	7.83	11.03	2.40	H	0.04	16.46
15	40740	1/0	20	40569	1/99	-27.93	7.99	11.03	2.40	H	0.05	16.62
20	40740	1/0	10	40596	1/49	-27.35	8.57	11.03	2.40	H	0.05	17.20
20	40740	1/0	15	40569	1/74	-27.70	8.22	11.03	2.40	H	0.05	16.85
20	40740	1/0	20	40542	1/99	-27.65	8.27	11.03	2.40	H	0.05	16.90
5	40740	1/0	20	40623	1/99	-27.54	8.38	11.03	2.40	H	0.05	17.01
20	40740	1/0	5	40623	1/24	-27.88	8.04	11.03	2.40	H	0.05	16.67
10	40740	1/0	15	40620	1/74	-27.46	8.46	11.03	2.40	H	0.05	17.09
15	40740	1/0	10	40620	1/49	-28.01	7.91	11.03	2.40	H	0.05	16.54
10	41190	1/0	20	41046	1/99	-27.33	8.76	11.07	2.43	H	0.05	17.40
15	41165	1/0	15	41015	1/74	-27.59	8.50	11.07	2.43	H	0.05	17.14
15	41165	1/0	20	40994	1/99	-27.38	8.71	11.07	2.43	H	0.05	17.35
20	41140	1/0	10	40996	1/49	-27.39	8.70	11.07	2.43	H	0.05	17.34
20	41140	1/0	15	40969	1/74	-27.41	8.68	11.07	2.43	H	0.05	17.32
20	41140	1/0	20	40942	1/99	-27.39	8.70	11.07	2.43	H	0.05	17.34
5	41215	1/0	20	41098	1/99	-27.74	8.35	11.07	2.43	H	0.05	16.99
20	41140	1/0	5	41023	1/24	-27.44	8.65	11.07	2.43	H	0.05	17.29
10	41190	1/0	15	41070	1/74	-27.66	8.43	11.07	2.43	H	0.05	17.07
15	41165	1/0	10	41045	1/49	-27.59	8.50	11.07	2.43	H	0.05	17.14

Note:

1. Modulation : 64QAM
2. Limit : < 2 Watts

8.2 Conducted Spurious Emissions

PCC				SCC				Measurement Maximum Frequency (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)
BW [MHz]	Ch.	RB	RB Offset	BW [MHz]	Ch.	RB	RB Offset				
10	40290	1	49	15	40410	1	0	6.4950	28.591	-60.81	-32.22
20	40740	1	0	10	40596	1	49	3.7134	27.976	-61.44	-33.46
10	41190	1	0	20	41046	1	99	6.5738	28.591	-61.48	-32.89
20	40340	100	0	5	40457	25	0	3.7373	27.976	-60.87	-32.90
15	40740	75	0	10	40620	50	0	3.7039	27.976	-61.60	-33.62
15	41165	75	0	15	41015	75	0	5.7024	28.591	-61.92	-33.33

Note:

1. Plots of the EUT's Conducted Spurious Emission are shown Page 16 ~ 21.
2. Modulation : QPSK
3. Factor(dB) = Cable Loss + Ext. Attenuator + Power Splitter
4. Factors for frequency :

Frequency Range (GHz)	Factor [dB]
0.03 – 1	25.270
1 – 5	27.976
5 – 10	28.591
10 – 15	29.116
15 – 20	29.489
Above 20(26.5)	30.131

5. Limit : -25.0 dBm

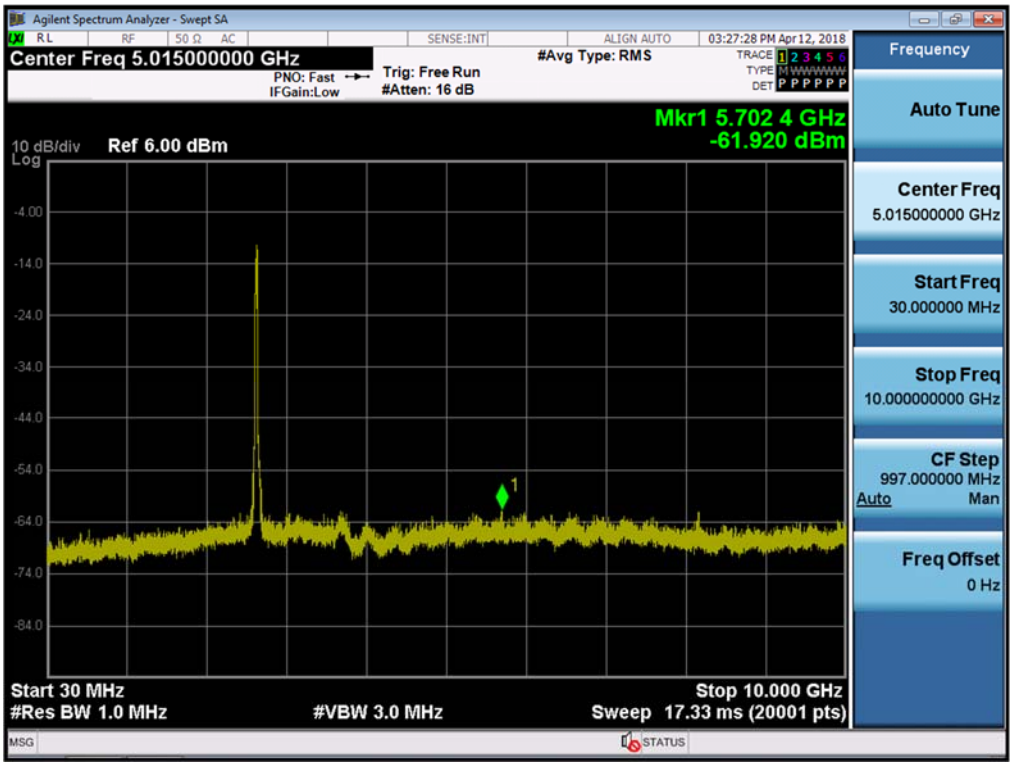
Frequency Range : 30MHz ~ 10GHz

PCC 10MHz Ch40290 RB1 Offset49/ SCC 15MHz Ch40410 RB1 Offset0

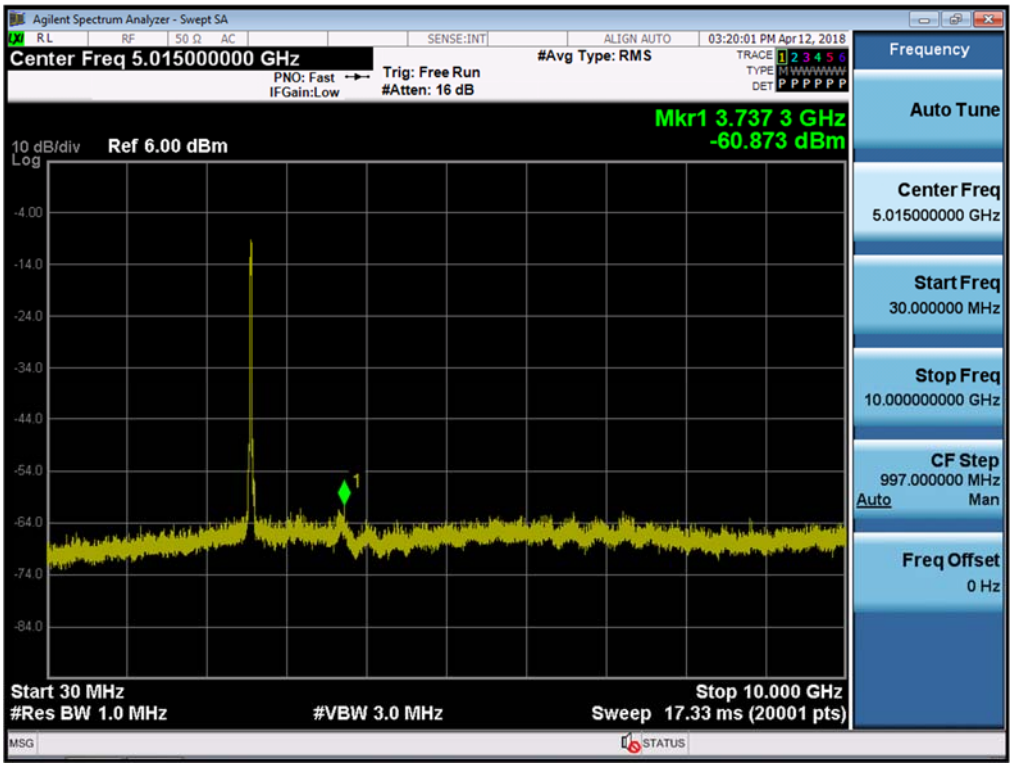
PCC 10MHz Ch41190 RB1 Offset0/ SCC 20MHz Ch41046 RB1 Offset99

PCC 15MHz Ch40740 RB75 Offset0/ SCC 10MHz Ch40620 RB50 Offset0

PCC 15MHz Ch41165 RB75 Offset0/ SCC 15MHz Ch41015 RB75 Offset0



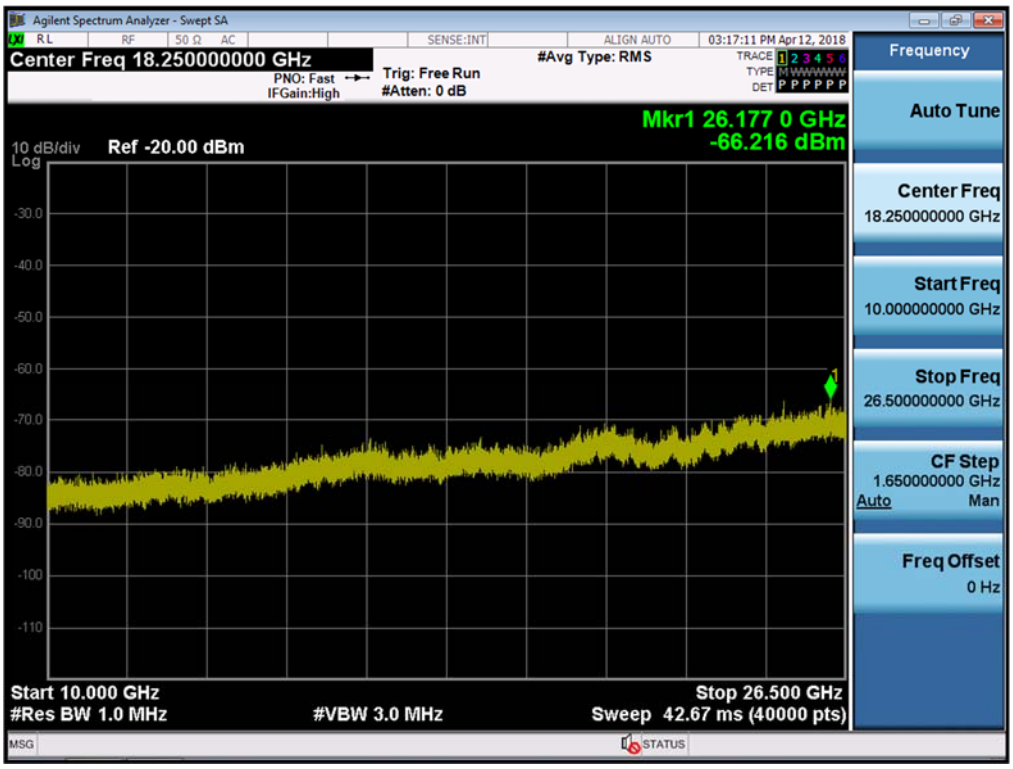
PCC 20MHz Ch40340 RB100 Offset0/ SCC 5MHz Ch40457 RB25 Offset0



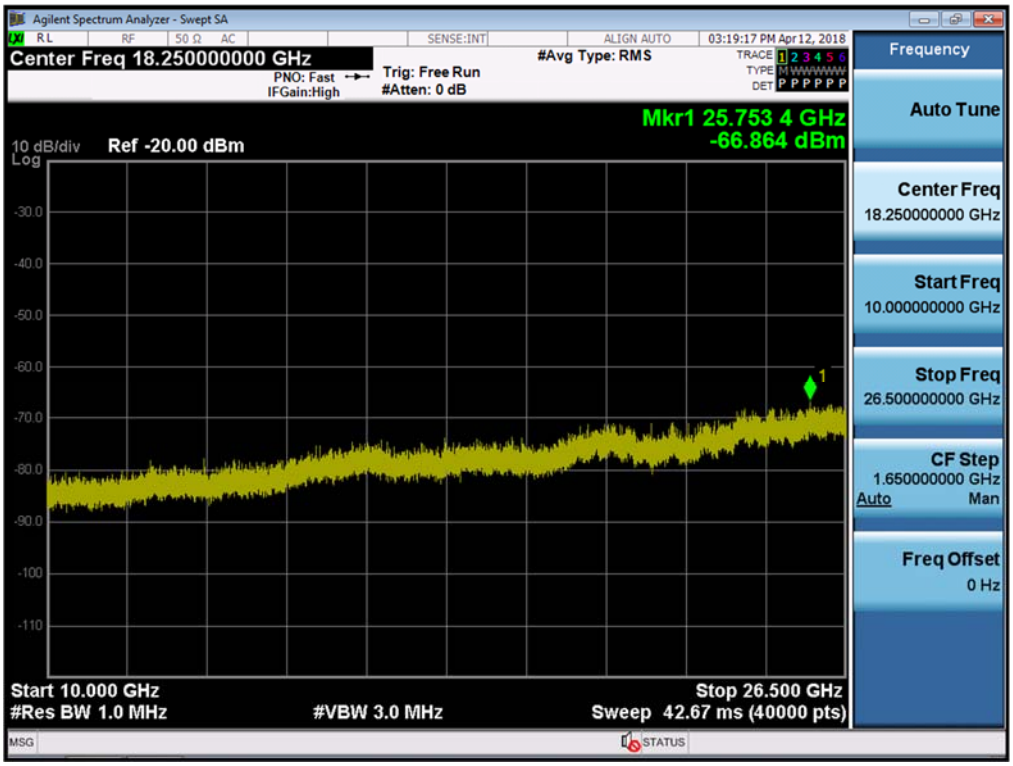
PCC 20MHz Ch40740 RB1 Offset0/ SCC 10MHz Ch40596 RB1 Offset49

Frequency Range : 10GHz ~ 26.5GHz

PCC 10MHz Ch40290 RB1 Offset49/ SCC 15MHz Ch40410 RB1 Offset0

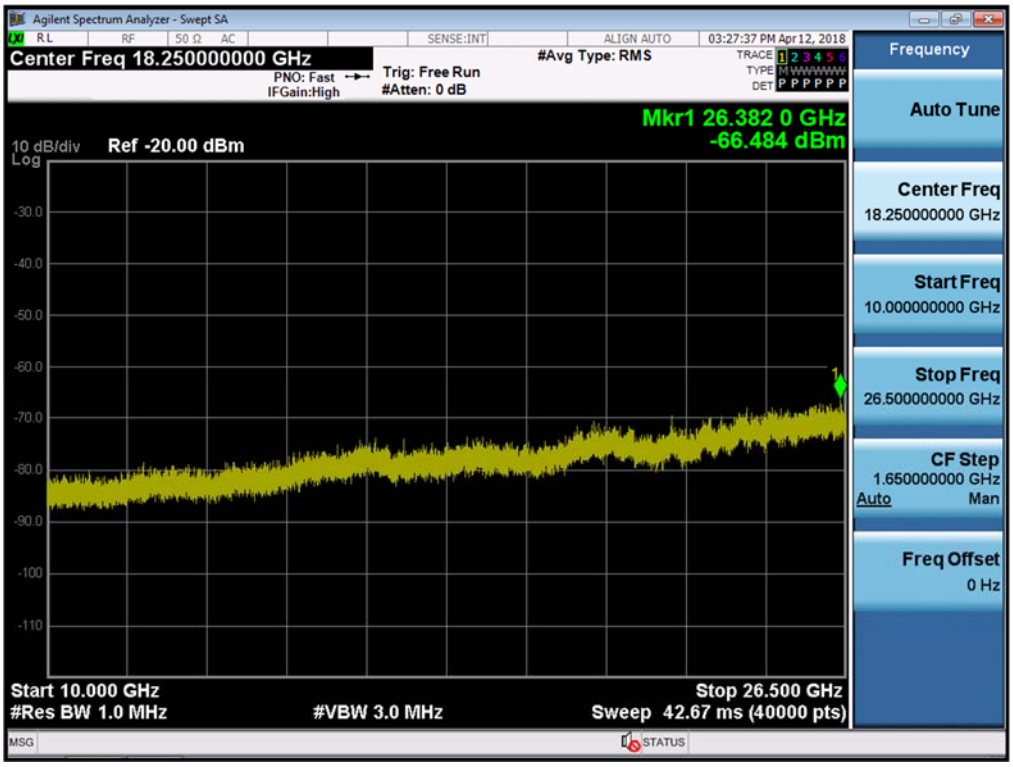


PCC 10MHz Ch41190 RB1 Offset0/ SCC 20MHz Ch41046 RB1 Offset99



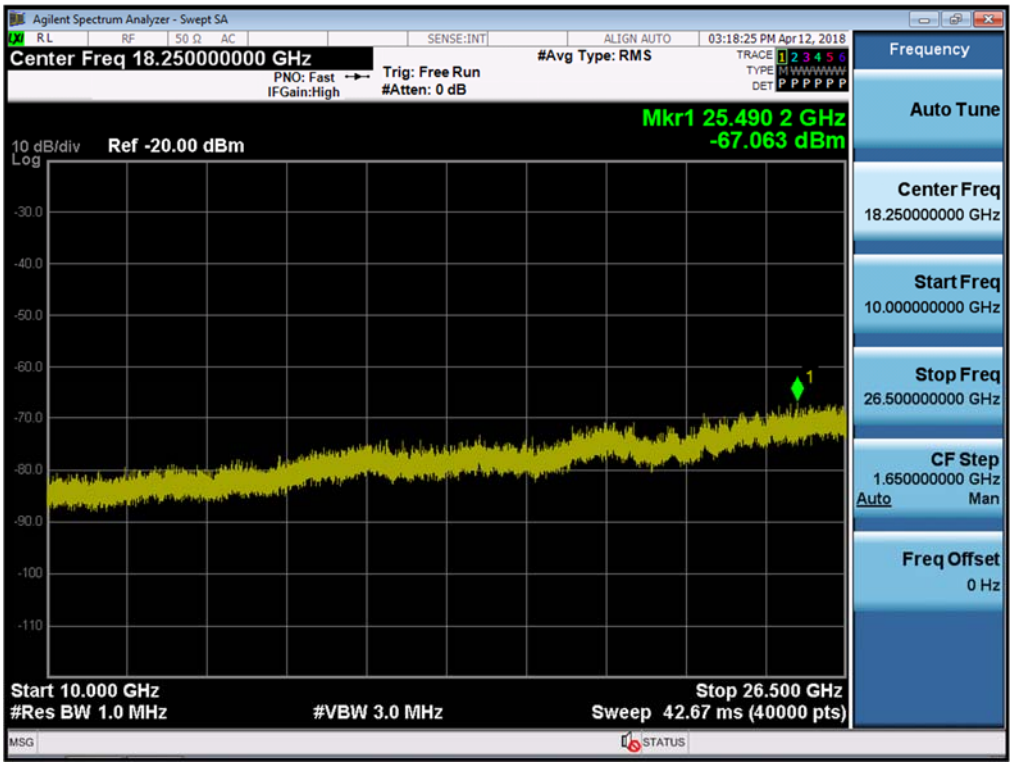
PCC 15MHz Ch40740 RB75 Offset0/ SCC 10MHz Ch40620 RB50 Offset0

PCC 15MHz Ch41165 RB75 Offset0/ SCC 15MHz Ch41015 RB75 Offset0



PCC 20MHz Ch40340 RB100 Offset0/ SCC 5MHz Ch40457 RB25 Offset0

PCC 20MHz Ch40740 RB1 Offset0/ SCC 10MHz Ch40596 RB1 Offset49



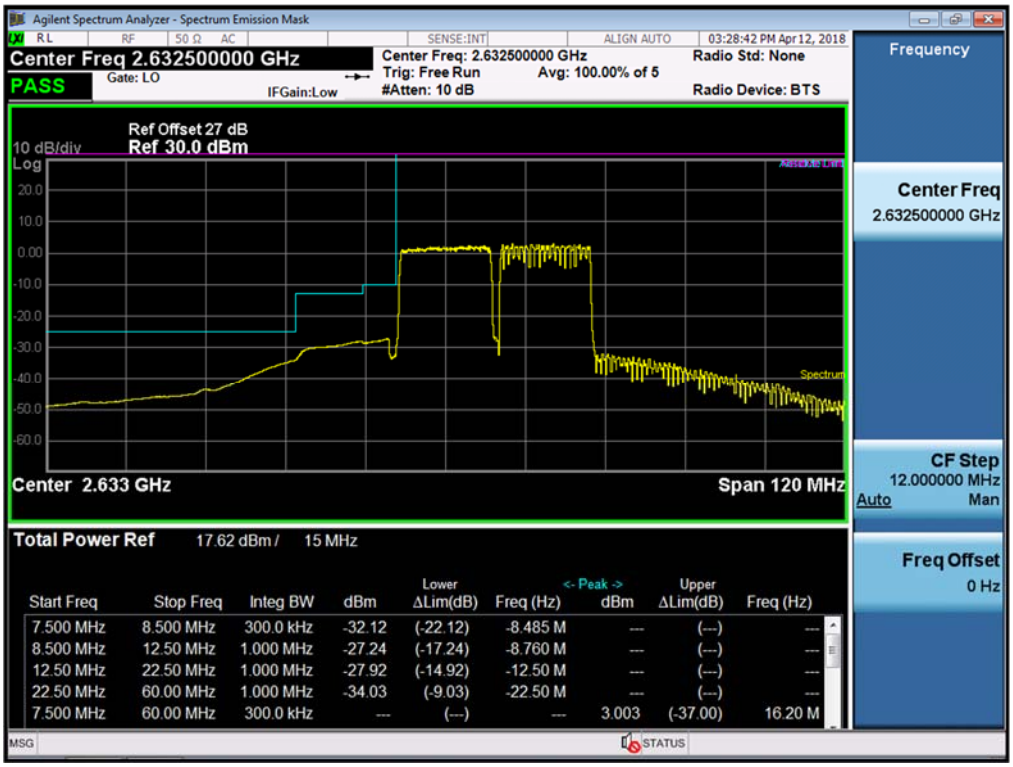
8.3 Channel Edge

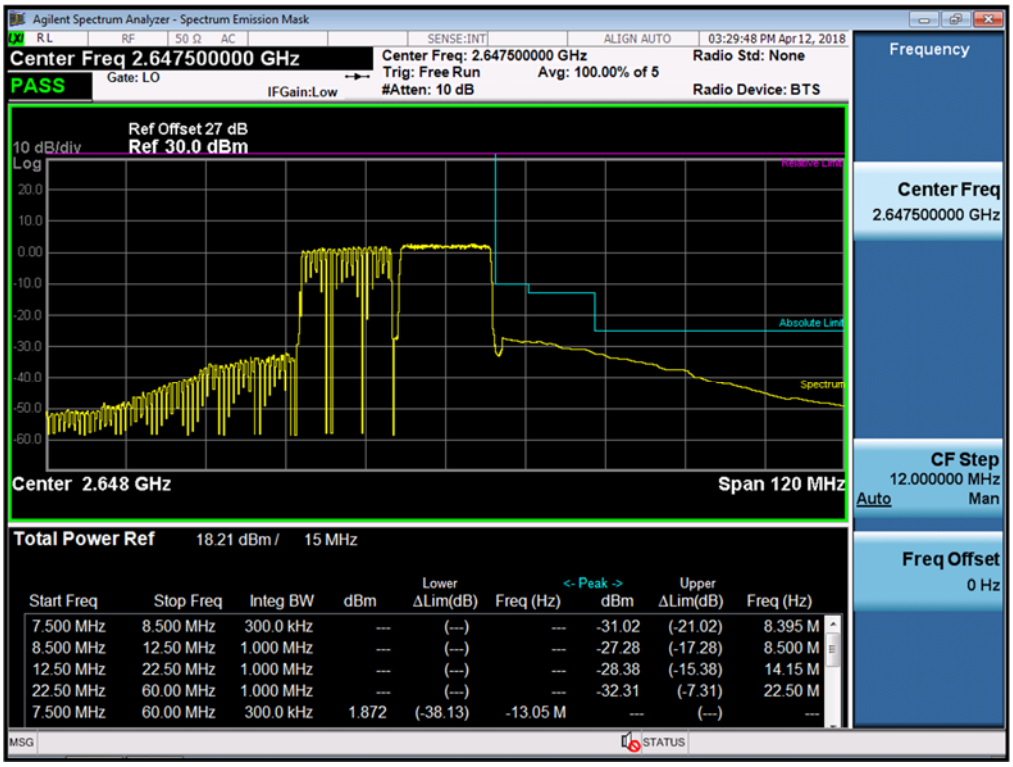
PCC : BW15MHz, Ch40740, RB75, Offset0

SCC : BW10MHz, Ch40620, RB50, Offset0

PCC : BW15MHz, Ch41165, RB75 Offset0

SCC : BW15MHz, Ch41015, RB75 Offset0

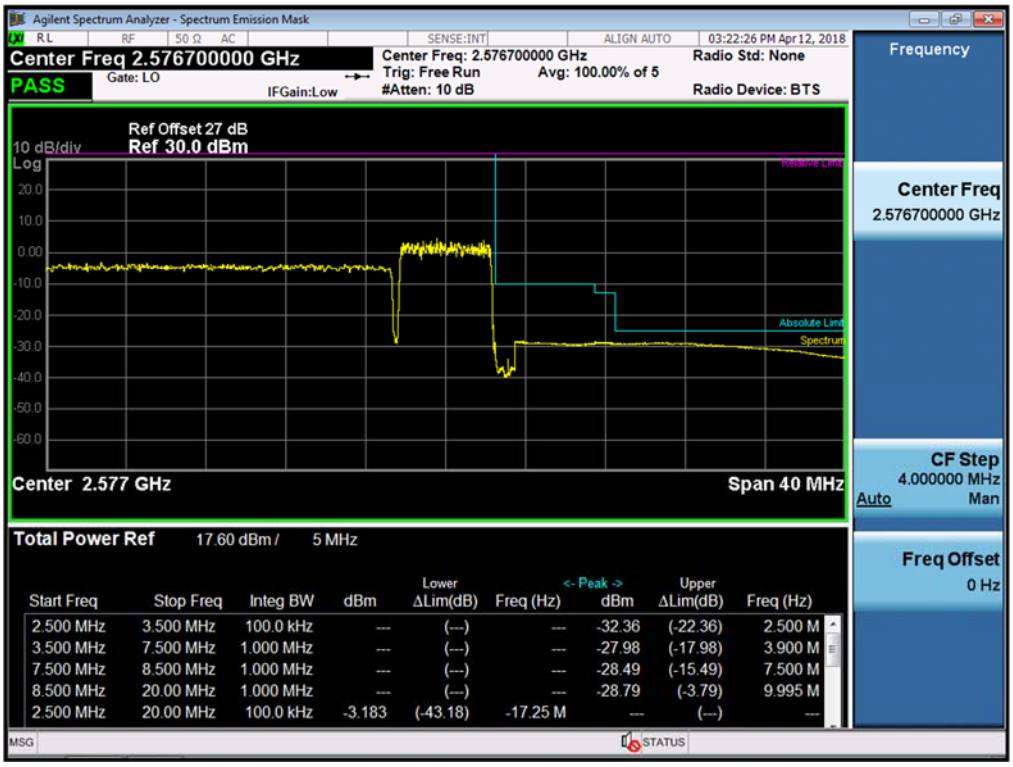




PCC : BW20MHz, Ch40340, RB100, Offset0

SCC : BW5MHz, Ch40457, RB25, Offset0

Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
10.00 MHz	11.00 MHz	430.0 kHz	-29.83	(-19.83)	-10.00 M	---	(---)	---
11.00 MHz	15.00 MHz	1.000 MHz	-28.81	(-18.81)	-11.04 M	---	(---)	---
15.00 MHz	30.00 MHz	1.000 MHz	-30.77	(-17.77)	-16.20 M	---	(---)	---
30.00 MHz	80.00 MHz	1.000 MHz	-41.55	(-16.55)	-30.00 M	---	(---)	---
10.00 MHz	80.00 MHz	430.0 kHz	---	(---)	---	6.516	(-33.48)	12.15 M



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBm	Upper ΔLim(dB)	Upper Freq (Hz)
2.500 MHz	3.500 MHz	100.0 kHz	---	(---)	---	-32.36	(-22.36)	2.500 M
3.500 MHz	7.500 MHz	1.000 MHz	---	(---)	---	-27.98	(-17.98)	3.900 M
7.500 MHz	8.500 MHz	1.000 MHz	---	(---)	---	-28.49	(-15.49)	7.500 M
8.500 MHz	20.00 MHz	1.000 MHz	---	(---)	---	-28.79	(-3.79)	9.995 M
2.500 MHz	20.00 MHz	100.0 kHz	-3.183	(-43.18)	-17.25 M	---	(---)	---

8.4 Radiated Spurious Emissions

▣ PCC Channel : 40290

▣ PCC BW(MHz) : 10

▣ PCC RB/ RB Offset : 1/ 49

▣ SCC Channel : 40410

▣ SCC BW(MHz) : 15

▣ SCC RB/ RB Offset : 1/ 0

▣ DISTANCE: 1 meters

▣ LIMIT: -25.0 dBm

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)
5,129.25	-40.25	12.76	-51.70	3.44	V	-42.38
7,693.25	-33.38	11.57	-41.92	4.26	V	-34.61
10,257.75	-34.48	10.88	-39.03	5.04	H	-33.19
12,822.25	-43.41	13.67	-48.55	5.74	V	-40.62

▣ PCC Channel : 40740

▣ PCC BW(MHz) : 20

▣ PCC RB/ RB Offset : 1/ 0

▣ SCC Channel : 40596

▣ SCC BW(MHz) : 10

▣ SCC RB/ RB Offset : 1/ 49

▣ DISTANCE: 1 meters

▣ LIMIT: -25.0 dBm

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)
5,192.25	-41.49	12.86	-55.24	3.48	H	-45.86
7,788.25	-34.04	11.50	-41.88	4.27	V	-34.65
10,384.75	-33.65	10.80	-37.00	5.05	H	-31.25
12,980.75	-45.46	13.48	-48.42	5.71	V	-40.65

▣ PCC Channel : 41190

▣ PCC BW(MHz) : 10

▣ PCC RB/ RB Offset : 1/ 0

▣ SCC Channel : 41046

▣ SCC BW(MHz) : 20

▣ SCC RB/ RB Offset : 1/ 99

▣ DISTANCE: 1 meters

▣ LIMIT: -25.0 dBm

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)
5,291.75	-42.98	13.00	-57.68	3.51	V	-48.19
7,936.75	-34.37	11.38	-41.38	4.36	V	-34.36
10,582.25	-35.41	10.72	-39.58	5.14	H	-34.00
13,228.25	-48.45	13.07	-52.20	5.86	V	-44.99

▣ PCC Channel : 40340

▣ PCC BW(MHz) : 20

▣ PCC RB/ RB Offset : 100/ 0

▣ SCC Channel : 40457

▣ SCC BW(MHz) : 5

▣ SCC RB/ RB Offset : 25/ 0

▣ DISTANCE: 1 meters

▣ LIMIT: -25.0 dBm

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)
5,130.25	-46.51	12.76	-57.96	3.44	V	-48.64
7,705.25	-40.53	11.56	-49.26	4.27	V	-41.97
10,260.25	-38.98	10.87	-44.10	5.00	H	-38.23
12,827.75	-52.94	13.67	-58.08	5.74	H	-50.15

▣ PCC Channel : 40740

▣ PCC BW(MHz) : 15

▣ PCC RB/ RB Offset : 75/ 0

▣ SCC Channel : 40620

▣ SCC BW(MHz) : 10

▣ SCC RB/ RB Offset : 50/ 0

▣ DISTANCE: 1 meters

▣ LIMIT: -25.0 dBm

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)
5,210.25	-47.30	12.89	-60.66	3.48	V	-51.25
7,816.25	-42.09	11.48	-50.43	4.24	V	-43.19
10,433.75	-37.66	10.77	-40.74	5.08	H	-35.05
13,044.75	-52.94	13.46	-56.87	5.73	V	-49.14

▣ PCC Channel : 41165

▣ PCC BW(MHz) : 15

▣ PCC RB/ RB Offset : 75/0

▣ SCC Channel : 41015

▣ SCC BW(MHz) : 15

▣ SCC RB/ RB Offset : 75/0

▣ DISTANCE: 1 meters

▣ LIMIT: -25.0 dBm

Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	Result (dBm)
5,295.25	-48.60	13.00	-63.30	3.51	V	-53.81
7,943.75	-42.59	11.38	-49.60	4.36	H	-42.58
10,589.75	-39.15	13.07	-45.67	5.14	H	-37.74

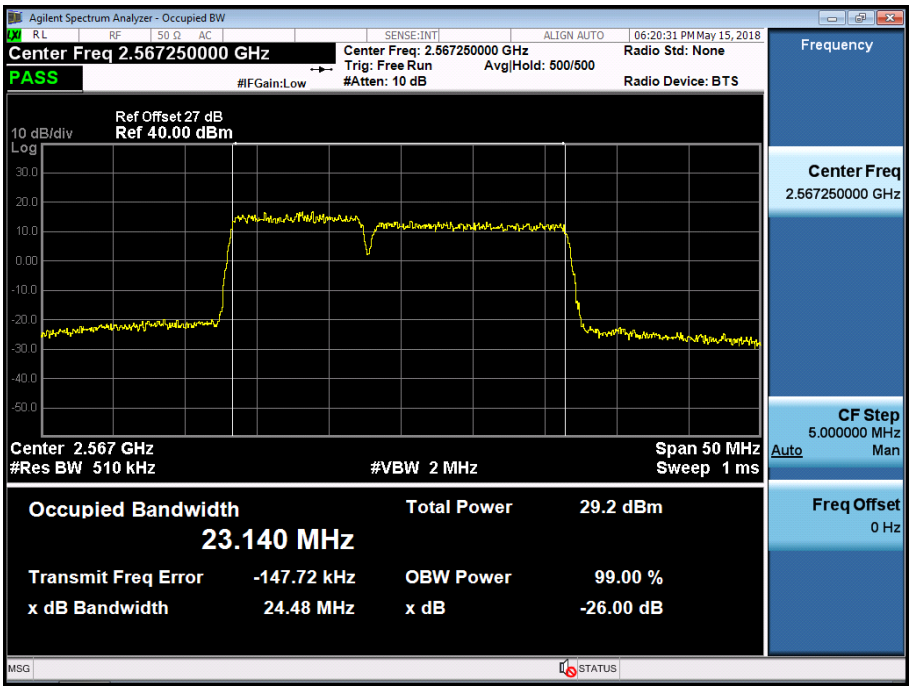
8.5 Occupied Bandwidth

PCC				SCC				Data (MHz)
Bandwidth [MHz]	Channel	Mod	RB/ RB Offset	Bandwidth [MHz]	Channel	Mod	RB/ RB Offset	
10	40290	QPSK	50/ 0	15	40410	QPSK	75/ 0	23.140
20	40740	QPSK	100/ 0	10	40596	QPSK	50/ 0	27.822
10	41190	QPSK	50/ 0	20	41046	QPSK	100/ 0	27.858
20	40340	QPSK	100/ 0	5	40457	QPSK	25/ 0	23.006
15	40740	QPSK	75/ 0	10	40620	QPSK	50/ 0	23.207
15	41165	QPSK	75/ 0	15	41015	QPSK	75/ 0	28.358
20	40340	QPSK	100/ 0	20	40538	QPSK	100/ 0	37.578
20	40740	QPSK	100/ 0	20	40542	QPSK	100/ 0	37.702
20	41140	QPSK	100/ 0	20	40942	QPSK	100/ 0	37.609

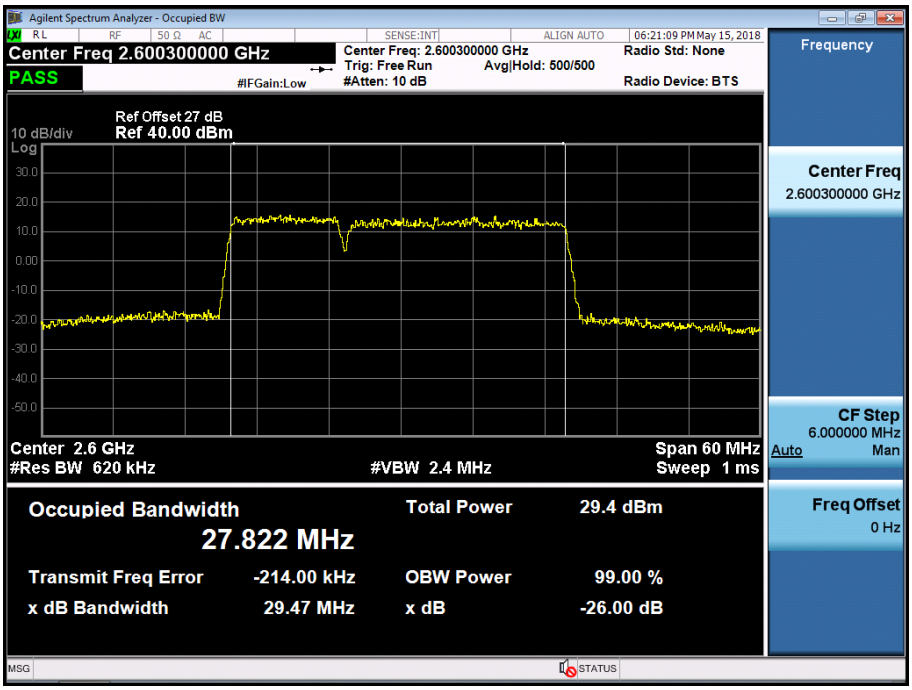
PCC				SCC				Data (MHz)
Bandwidth [MHz]	Channel	Mod	RB/ RB Offset	Bandwidth [MHz]	Channel	Mod	RB/ RB Offset	
10	40290	16QAM	50/ 0	15	40410	16QAM	75/ 0	23.161
20	40740	16QAM	100/ 0	10	40596	16QAM	50/ 0	27.853
10	41190	16QAM	50/ 0	20	41046	16QAM	100/ 0	27.736
20	40340	16QAM	100/ 0	5	40457	16QAM	25/ 0	22.917
15	40740	16QAM	75/ 0	10	40620	16QAM	50/ 0	23.206
15	41165	16QAM	75/ 0	15	41015	16QAM	75/ 0	28.317
20	40340	16QAM	100/ 0	20	40538	16QAM	100/ 0	37.656
20	40740	16QAM	100/ 0	20	40542	16QAM	100/ 0	37.695
20	41140	16QAM	100/ 0	20	40942	16QAM	100/ 0	37.627

PCC				SCC				Data (MHz)
Bandwidth [MHz]	Channel	Mod	RB/ RB Offset	Bandwidth [MHz]	Channel	Mod	RB/ RB Offset	
10	40290	64QAM	50/ 0	15	40410	64QAM	75/ 0	23.130
20	40740	64QAM	100/ 0	10	40596	64QAM	50/ 0	27.824
10	41190	64QAM	50/ 0	20	41046	64QAM	100/ 0	27.704
20	40340	64QAM	100/ 0	5	40457	64QAM	25/ 0	22.946
15	40740	64QAM	75/ 0	10	40620	64QAM	50/ 0	23.187
15	41165	64QAM	75/ 0	15	41015	64QAM	75/ 0	28.386
20	40340	64QAM	100/ 0	20	40538	64QAM	100/ 0	37.646
20	40740	64QAM	100/ 0	20	40542	64QAM	100/ 0	37.625
20	41140	64QAM	100/ 0	20	40942	64QAM	100/ 0	37.622

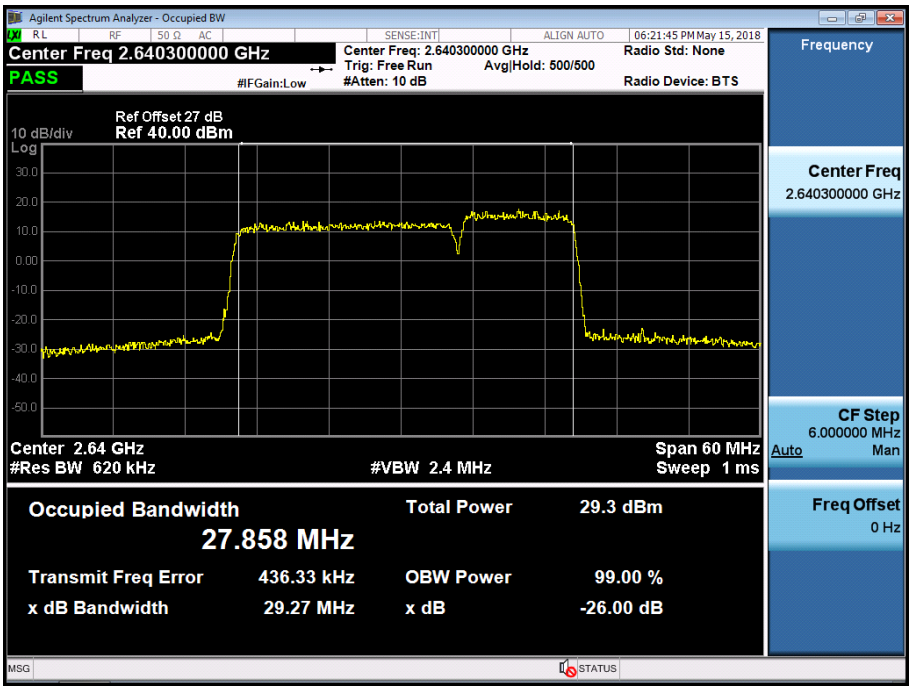
PCC 10MHz Ch40290 RB50 Offset0, SCC 15MHz Ch40410 RB75 Offset0_QPSK



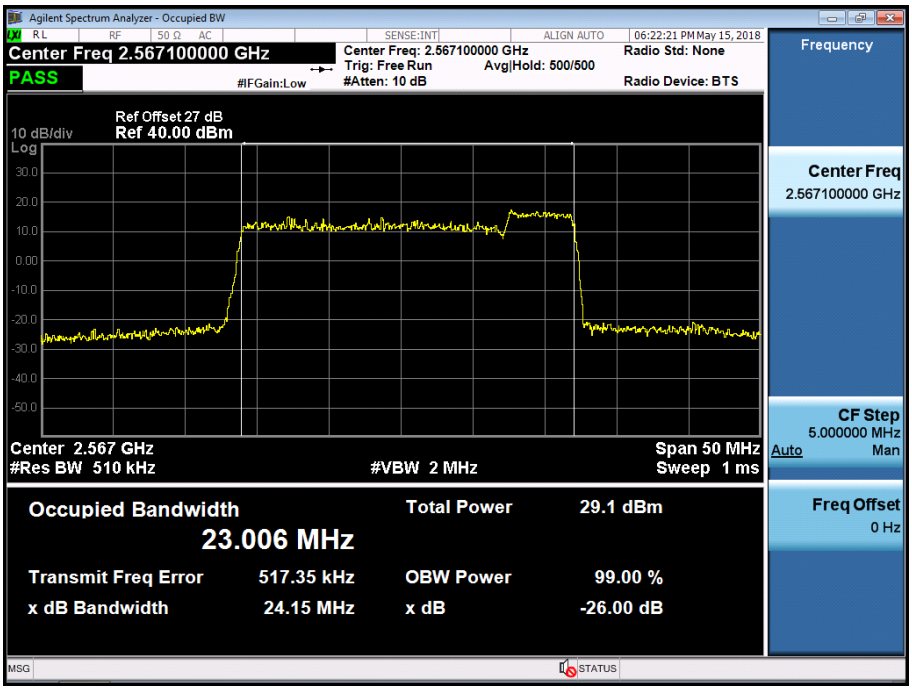
PCC 20MHz Ch40740 RB100 Offset0, SCC 10MHz Ch40596 RB50 Offset0_QPSK



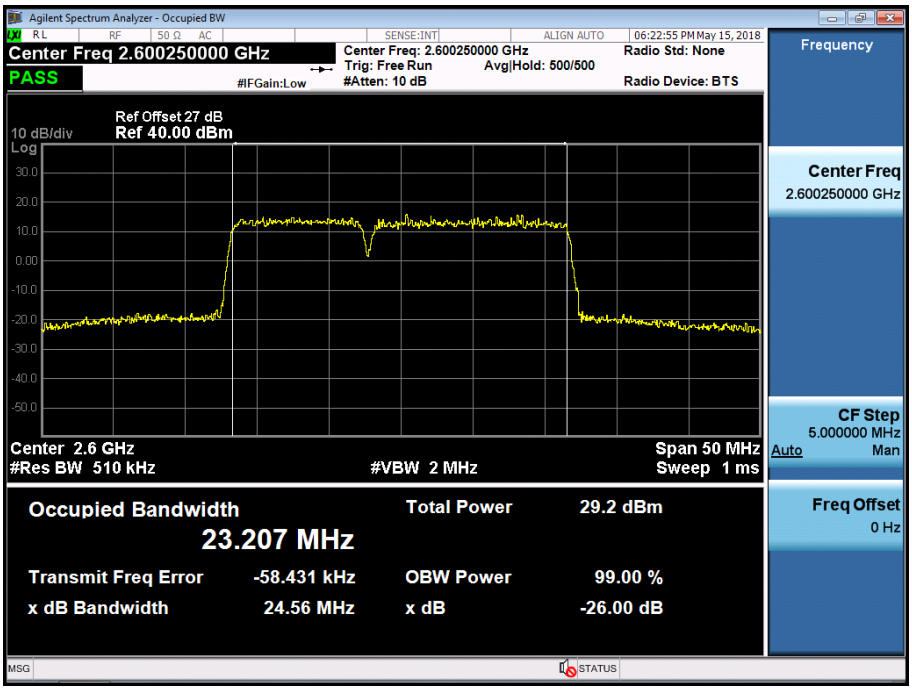
PCC 10MHz Ch41190 RB50 Offset0, SCC 20MHz Ch41046 RB100 Offset0_QPSK



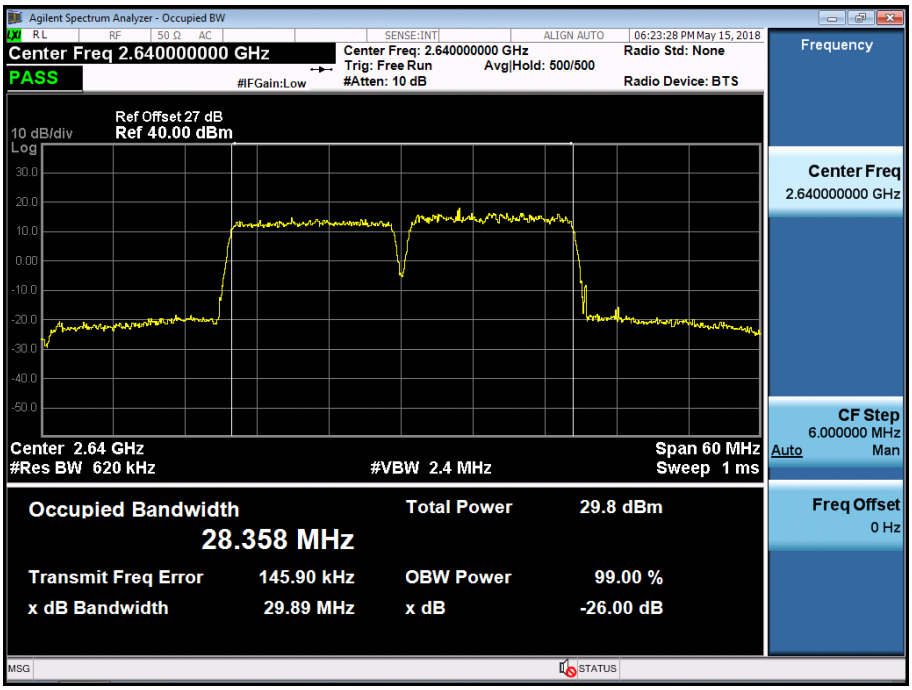
PCC 20MHz Ch40340 RB100 Offset0, SCC 5MHz Ch40457 RB25 Offset0_QPSK



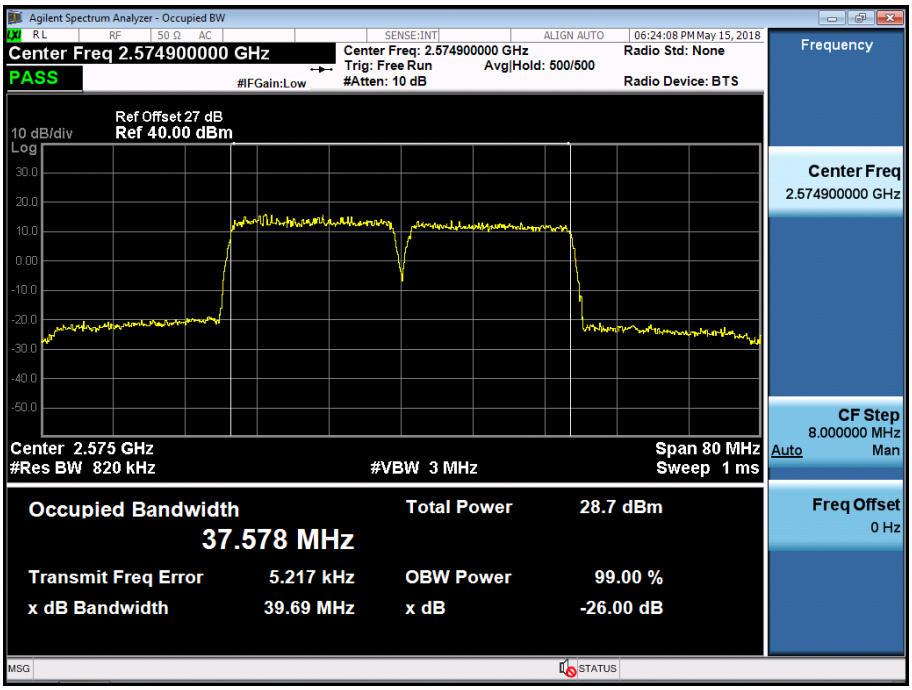
PCC 15MHz Ch40740 RB75 Offset0, SCC 10MHz Ch40620 RB50 Offset0_QPSK



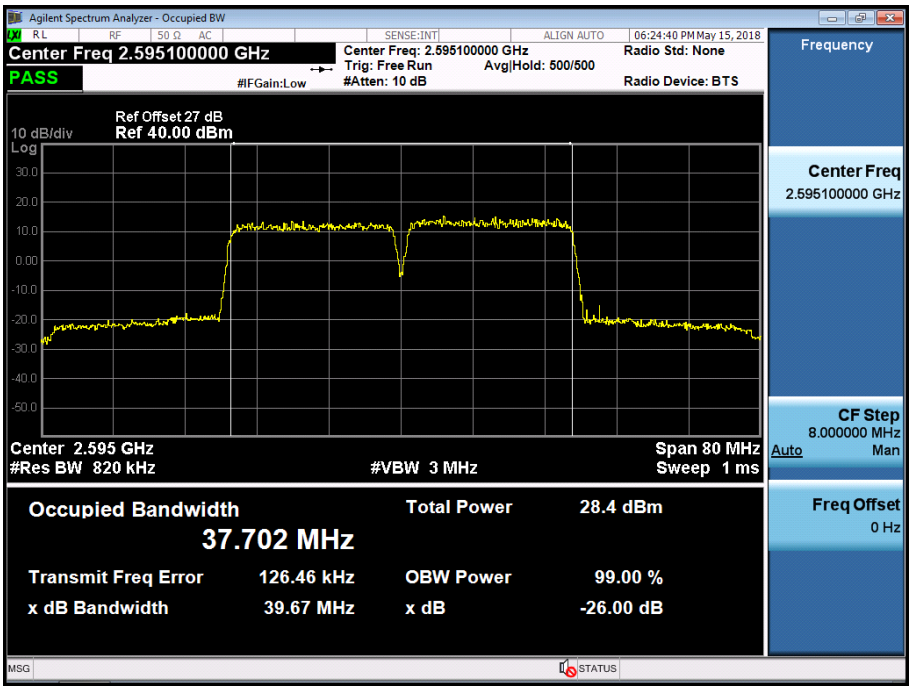
PCC 15MHz Ch41165 RB75 Offset0, SCC 15MHz Ch41015 RB75 Offset0_QPSK



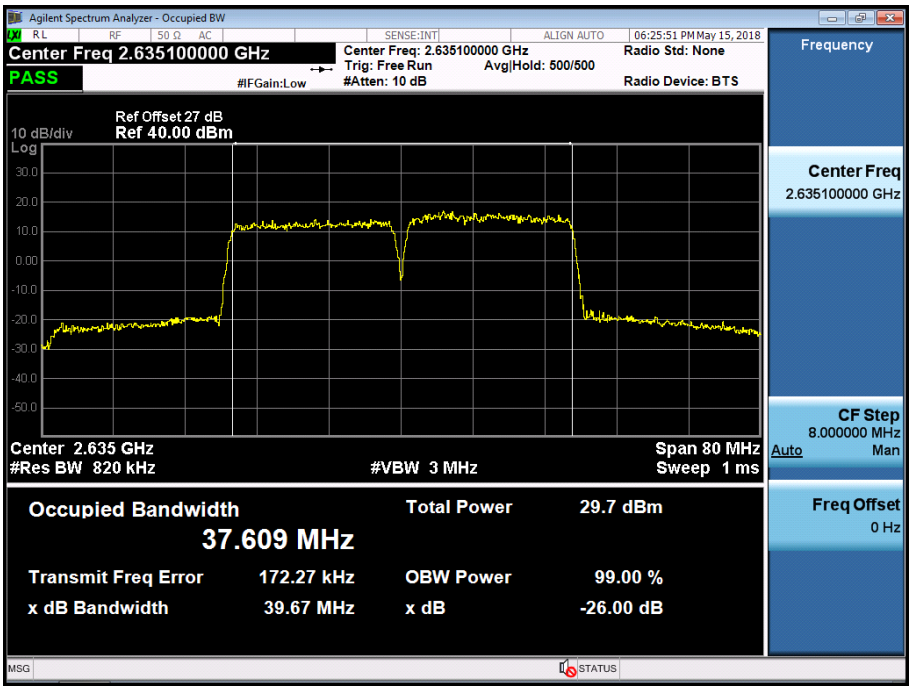
PCC 20MHz Ch40340 RB100 Offset0, SCC 20MHz Ch40538 RB100 Offset0_QPSK



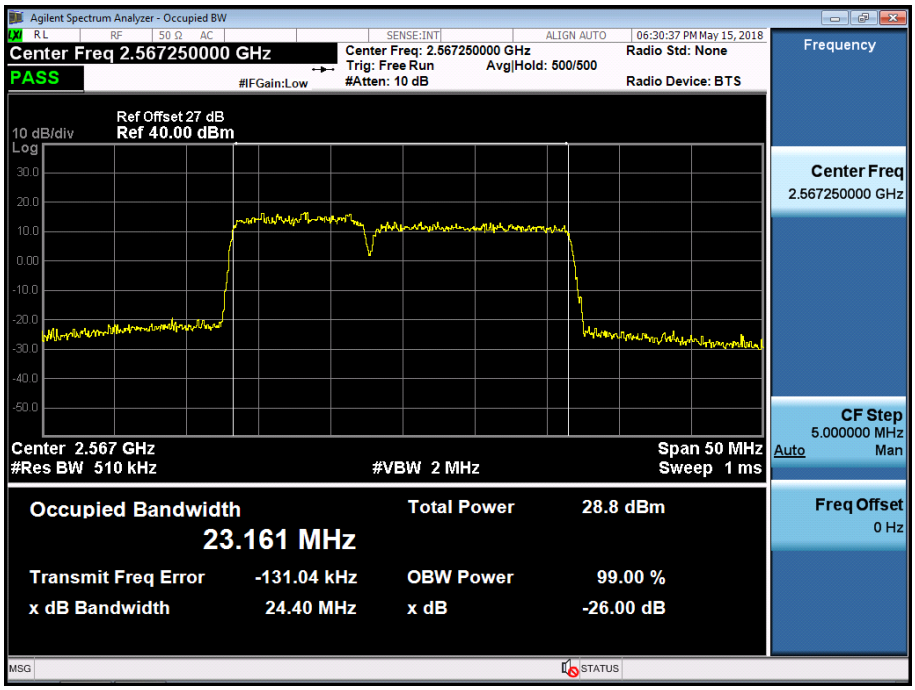
PCC 20MHz Ch40740 RB100 Offset0, SCC 20MHz Ch40542 RB100 Offset0_QPSK



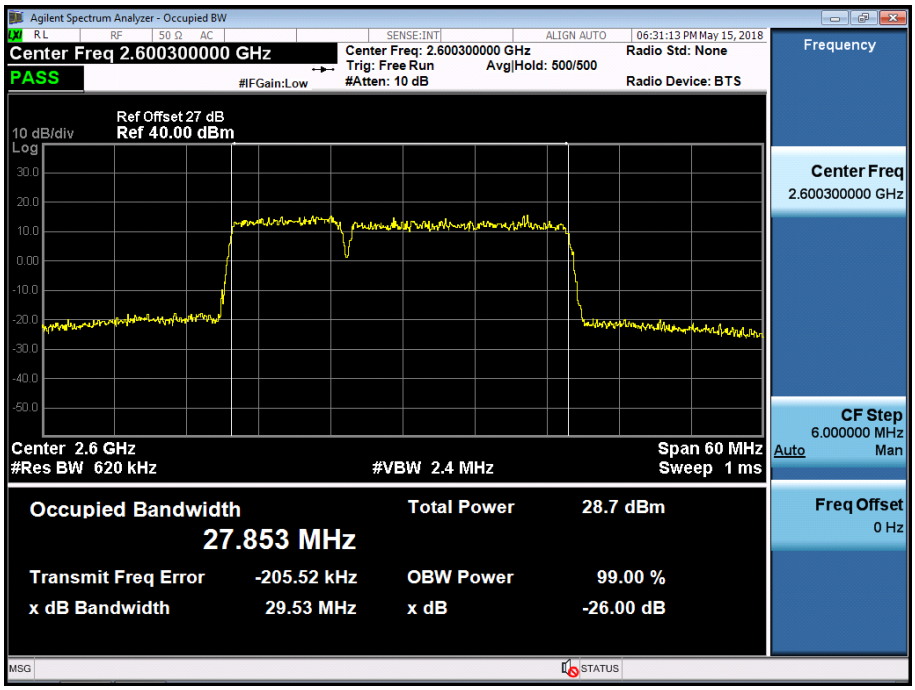
PCC 20MHz Ch41140 RB100 Offset0, SCC 20MHz Ch40942 RB100 Offset0_QPSK



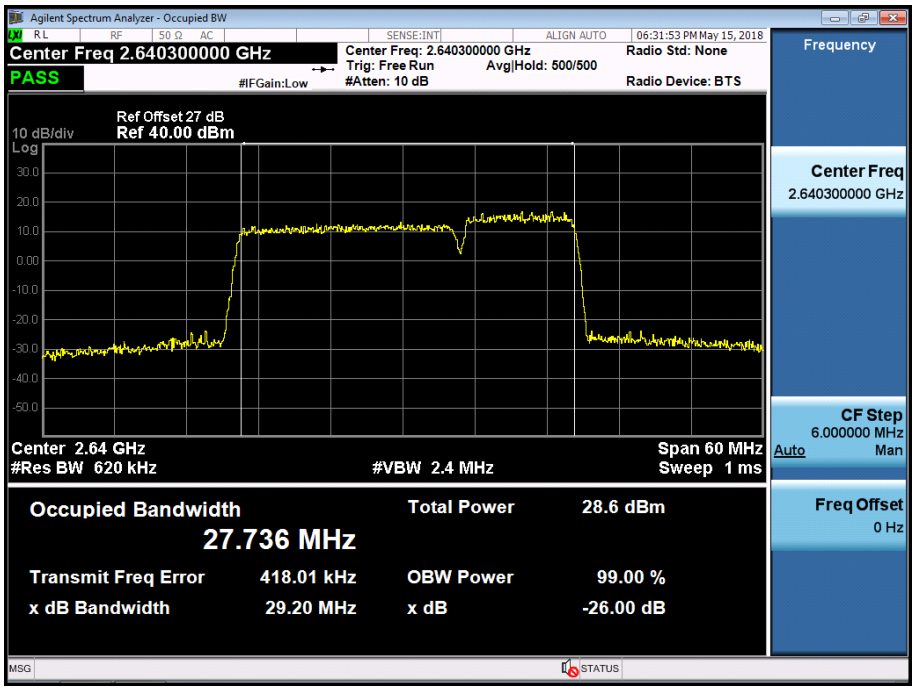
PCC 10MHz Ch40290 RB50 Offset0, SCC 15MHz Ch40410 RB75 Offset0_16QAM



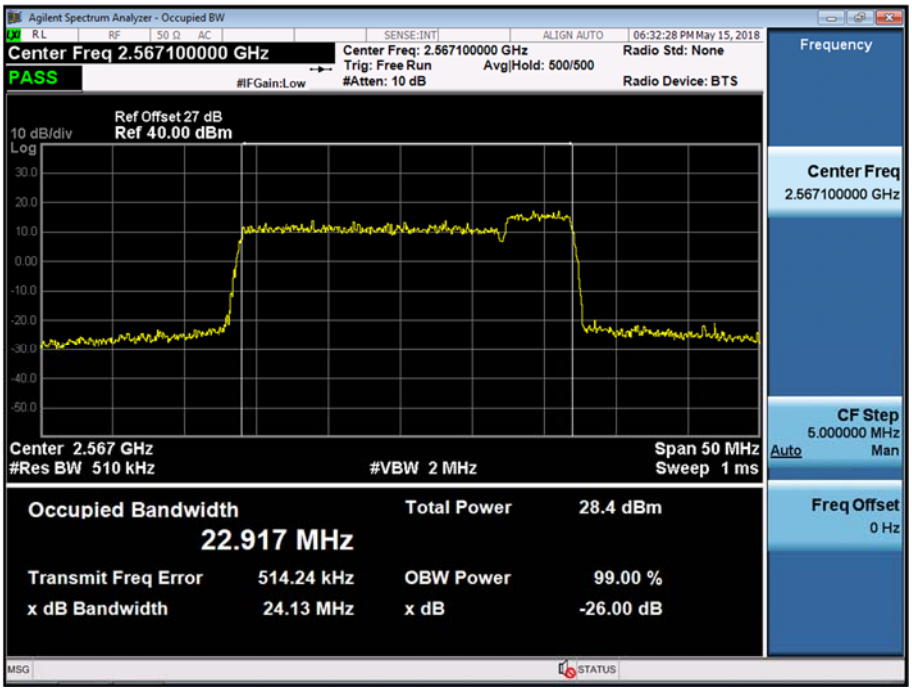
PCC 20MHz Ch40740 RB100 Offset0, SCC 10MHz Ch40596 RB50 Offset0_16QAM



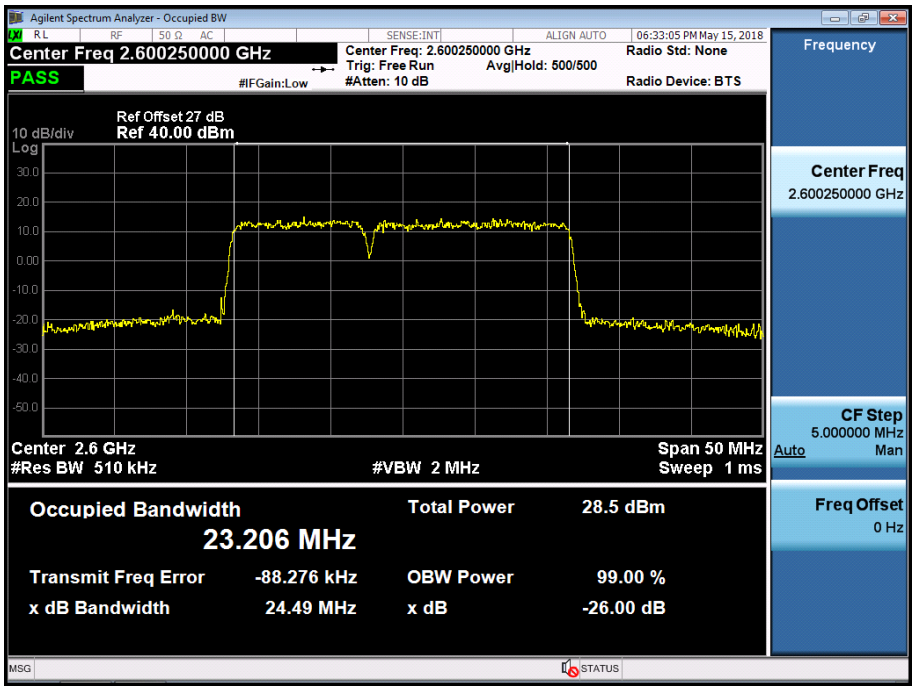
PCC 10MHz Ch41190 RB50 Offset0, SCC 20MHz Ch41046 RB100 Offset0_16QAM



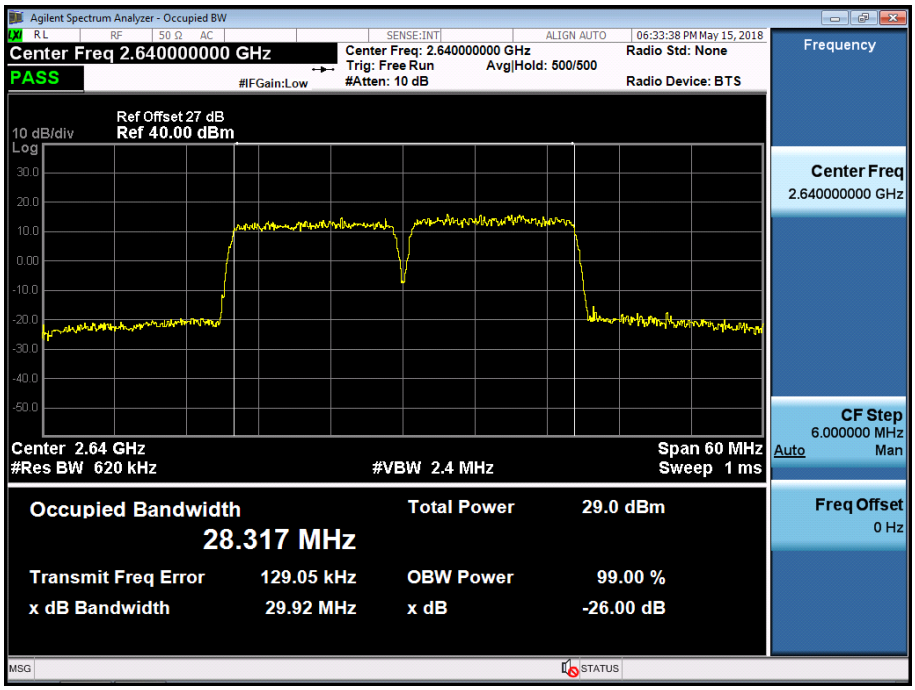
PCC 20MHz Ch40340 RB100 Offset0, SCC 5MHz Ch40457 RB25 Offset0_16QAM



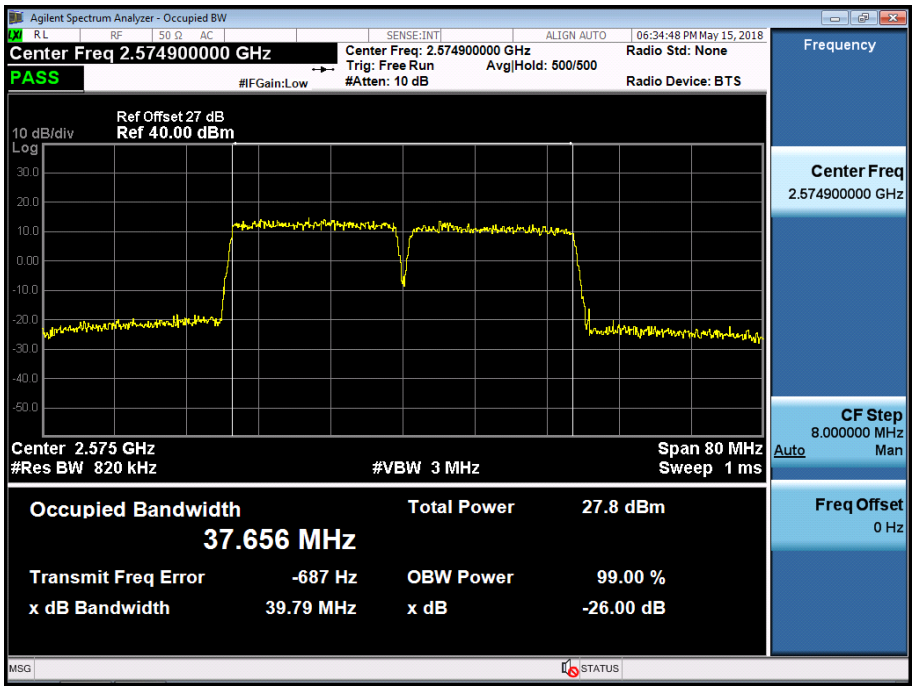
PCC 15MHz Ch40740 RB75 Offset0, SCC 10MHz Ch40620 RB50 Offset0_16QAM



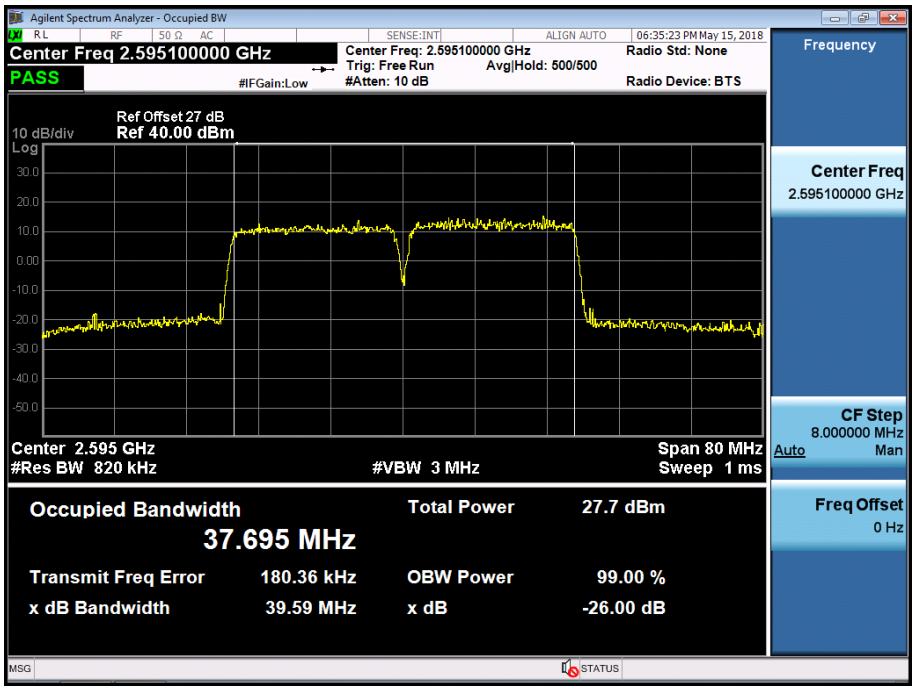
PCC 15MHz Ch41165 RB75 Offset0, SCC 15MHz Ch41015 RB75 Offset0_16QAM



PCC 20MHz Ch40340 RB100 Offset0, SCC 20MHz Ch40538 RB100 Offset0_16QAM



PCC 20MHz Ch40740 RB100 Offset0, SCC 20MHz Ch40542 RB100 Offset0_16QAM



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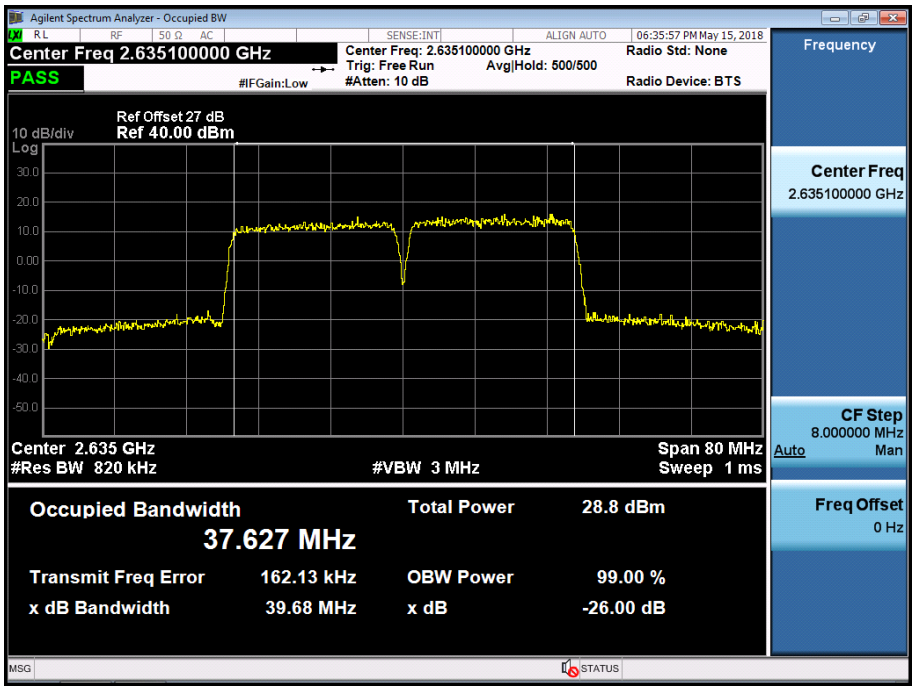
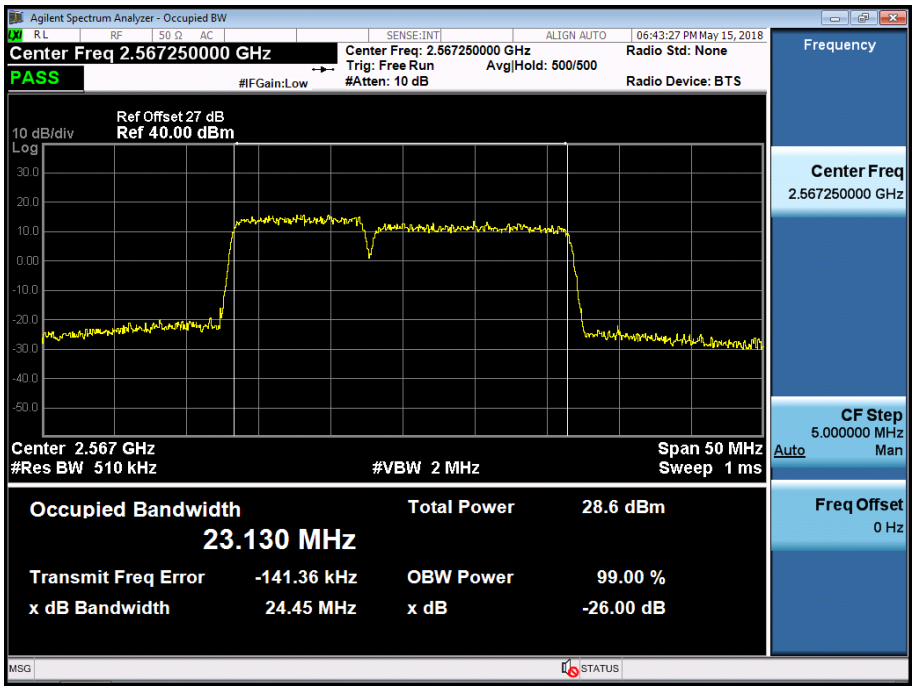
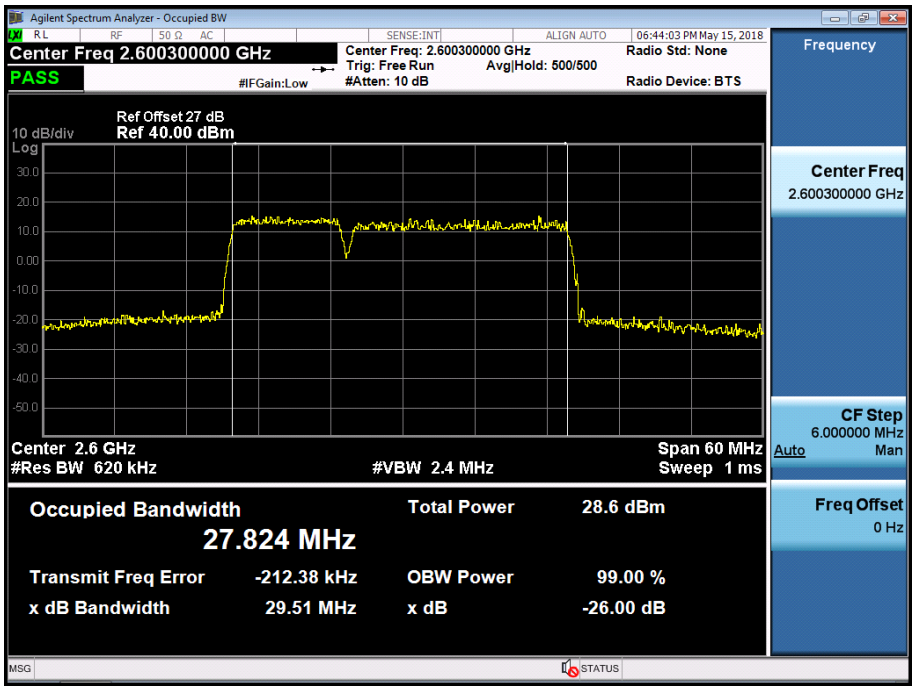


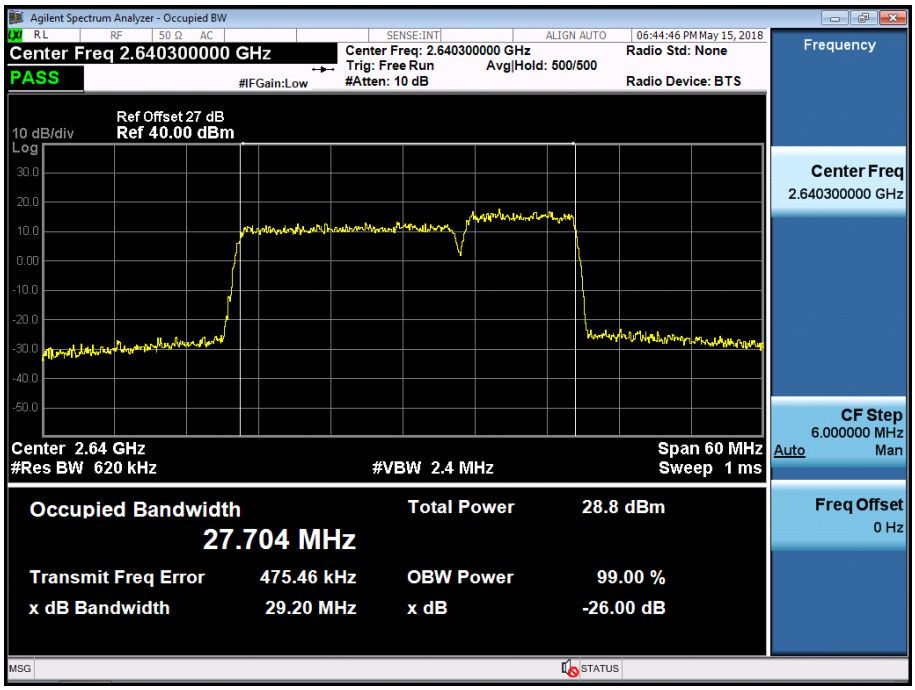
PCC 10MHz Ch40290 RB50 Offset0, SCC 15MHz Ch40410 RB75 Offset0_64QAM



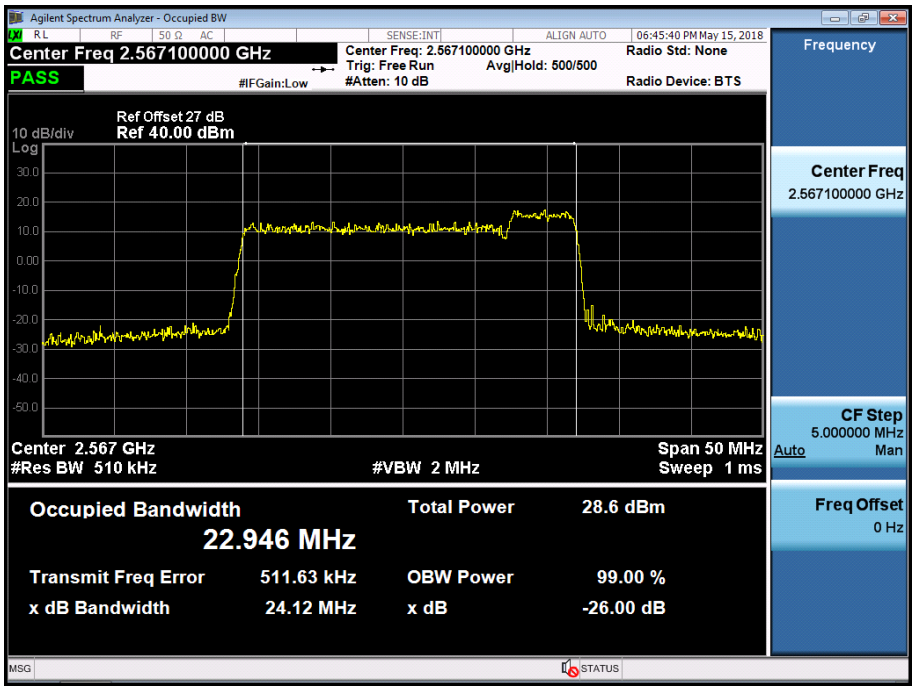
PCC 20MHz Ch40740 RB100 Offset0, SCC 10MHz Ch40596 RB50 Offset0_64QAM



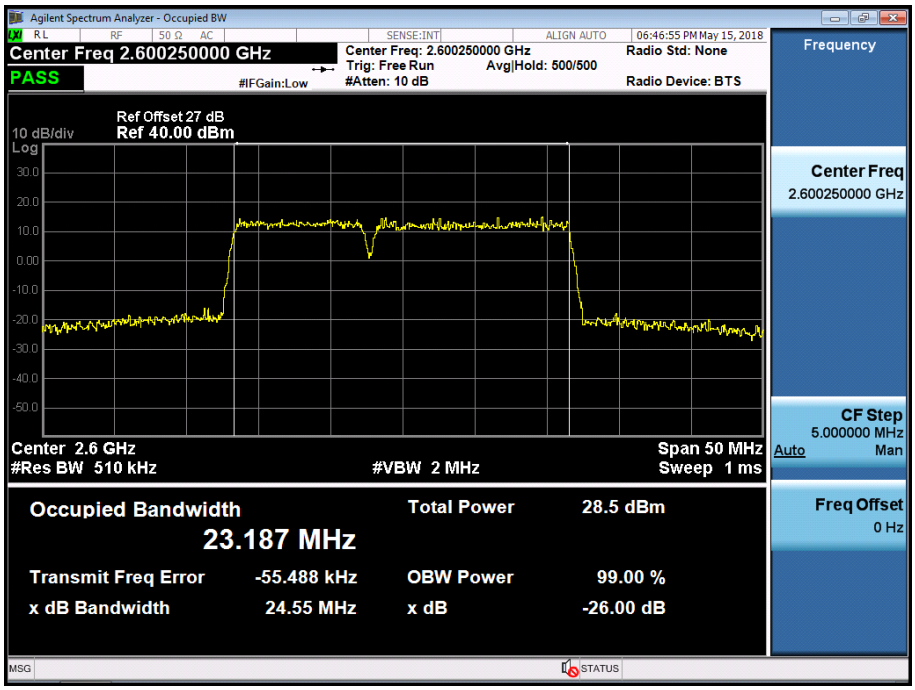
PCC 10MHz Ch41190 RB50 Offset0, SCC 20MHz Ch41046 RB100 Offset0_64QAM



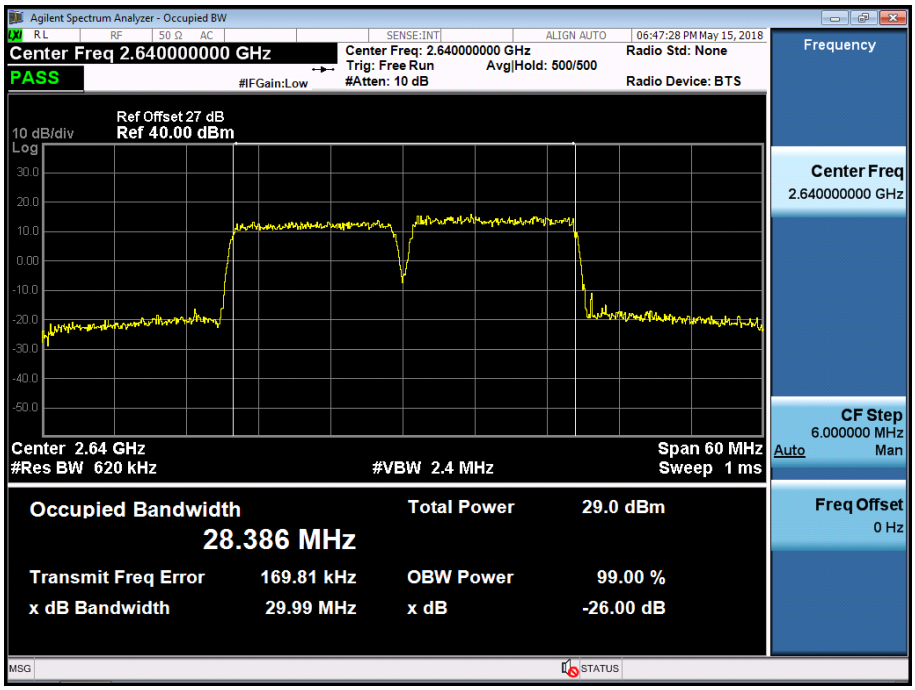
PCC 20MHz Ch40340 RB100 Offset0, SCC 5MHz Ch40457 RB25 Offset0_64QAM



PCC 15MHz Ch40740 RB75 Offset0, SCC 10MHz Ch40620 RB50 Offset0_64QAM



PCC 15MHz Ch41165 RB75 Offset0, SCC 15MHz Ch41015 RB75 Offset0_64QAM



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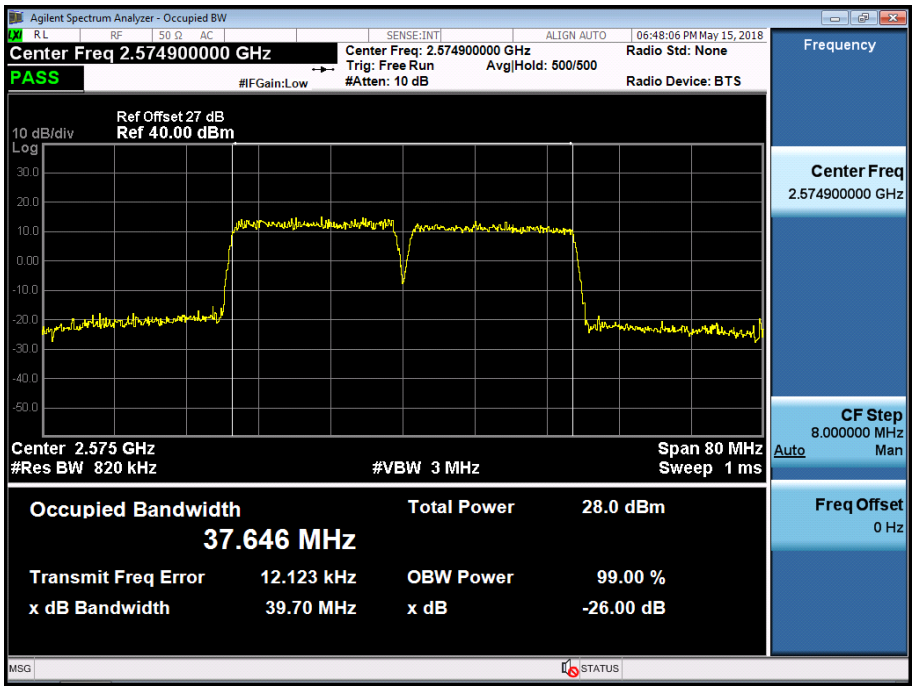
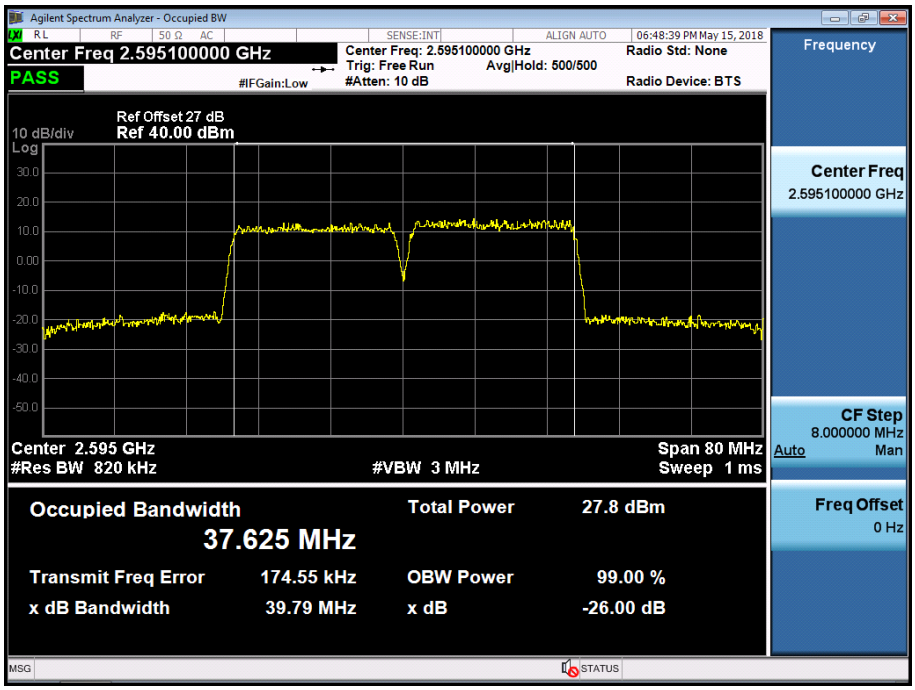
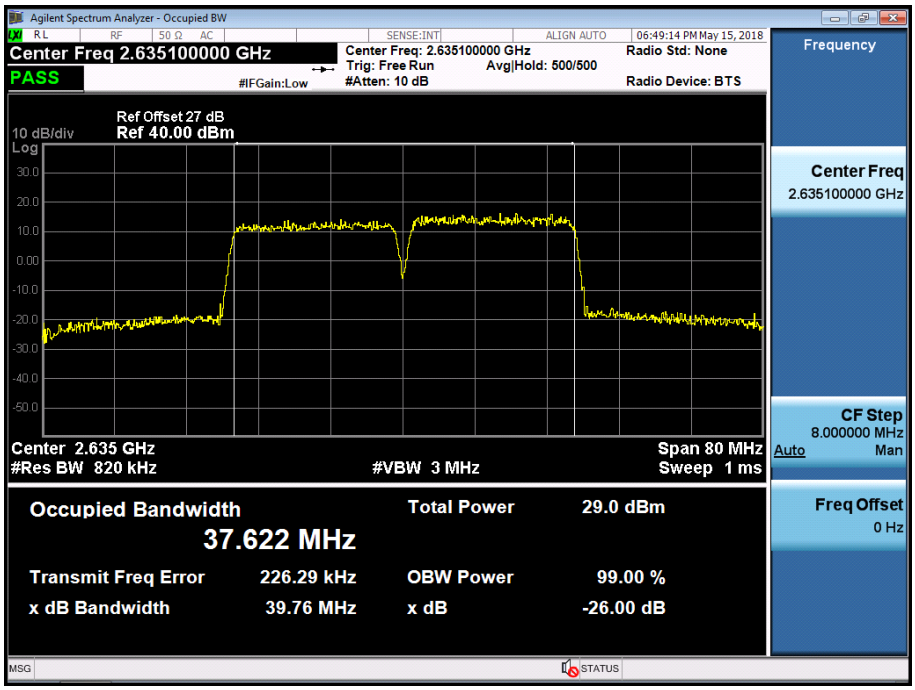


PCC 20MHz Ch40740 RB100 Offset0, SCC 20MHz Ch40542 RB100 Offset0_64QAM



PCC 20MHz Ch41140 RB100 Offset0, SCC 20MHz Ch40942 RB100 Offset0_64QAM



8.6 Emission Designator.

Mode	Modulation	Emission Designator
10MHz+15MHz	QPSK	23M1G7D
	16QAM	23M2W7D
	64QAM	23M1W7D
20MHz+10MHz	QPSK	27M8G7D
	16QAM	27M9W7D
	64QAM	27M8W7D
10MHz+20MHz	QPSK	27M9G7D
	16QAM	27M7W7D
	64QAM	27M7W7D

Mode	Modulation	Emission Designator
20MHz+5MHz	QPSK	23M0G7D
	16QAM	22M9W7D
	64QAM	22M9W7D
15MHz+10MHz	QPSK	23M2G7D
	16QAM	23M2W7D
	64QAM	23M2W7D
15MHz+15MHz	QPSK	28M4G7D
	16QAM	28M3W7D
	64QAM	28M4W7D

Mode	Modulation	Emission Designator
20MHz+20MHz	QPSK	37M6G7D
	16QAM	37M7W7D
	64QAM	37M6W7D
	QPSK	37M7G7D
	16QAM	37M7W7D
	64QAM	37M6W7D
	QPSK	37M6G7D
	16QAM	37M6W7D
	64QAM	37M6W7D