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DATE: 14 November 2016

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

For

Corning Optical Communication Wireless

Equipment under test:

ONE Distributed Antenna System

Remote Extender Unit RXU 2325

(WCS Section 2350-2360MHz Band)

Tested by: _____
M. Zohar

Approved by: _____
D. Shidlowsky

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Measurement/Technical Report for
Corning Optical Communication Wireless
ONE Distributed Antenna System

FCC ID: OJF1RXUN

This report concerns:	Original Grant: X Class II change: Class I change:
Equipment type:	B21 – Part 20 Industrial Booster (CMRS)
Limits used:	47CFR Parts 2, 27

Measurement procedure used is KDB 971168 D03 v01 and
KDB 935210 D05 v01r01

Substitution Method used as in ANSI/TIA-603-D: 2010

Application for Certification
prepared by:

R. Pinchuck
ITL (Product Testing) Ltd.
1 Bat Sheva St.
Lod 7120101
Israel
e-mail rpinchuck@itl.co.il

Applicant for this device:
(different from "prepared by")

Habib Riazi
Corning Optical Communication Wireless
13221 Woodland Park Rd., Suite #400
Herndon, VA. 20171
U.S.A.
Tel: +1-541-758-2880
Fax: +1-703-848-0260
e-mail: RiaziH@corning.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Corning Optical Communication Wireless
Manufacturer's Address:	13221 Woodland Park Rd., Suite #400 Herndon, VA. 20171 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Habib Riazi
Equipment Under Test (E.U.T):	ONE Distributed Antenna System
Equipment Model No.:	Remote Extender Unit RXU 2325
Equipment Serial No.:	1016070009
Date of Receipt of E.U.T:	July 03, 2016
Start of Test:	July 11, 2016
End of Test:	September 9, 2016
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St, Lod, Israel 7116002
Test Specifications:	FCC Parts 2, 27

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by/registered with the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation Number IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1, IC 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The RxU2325 is an add-on module which plugs into the RAU (either RAU5x, RAU5 or RAU4) and enables support for two additional bands: 2.3 GHz WCS and 2.5 GHz LTE (TDD).

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in KDB 971168 D03 v01 and KDB 935210 D05 v01r01. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

Both conducted and radiated emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is IL1005.

1.6 Measurement Uncertainty

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)
0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.98 dB

2. System Test Configuration

2.1 Justification

The test setup was configured to closely resemble the standard installation.
The EUT consists of the RXU2325 installed in RAU5X.
All source signals are represented in the setup by appropriate signal generators.
An "Exercise" SW on the computer was used to enable / disable transmission of the RXU2325, while the EUT output was connected to the spectrum analyzer.
All channels transmitted during the testing.
There is neither an intermediate amplified nor donor antenna in the uplink.
All components included in the UL path are connected by cables.

2.2 EUT Exercise Software

HCM SW Version: 2.2 B21
Embedded SW Version for RXU2325: rxut_ab64_22_12

2.3 Special Accessories

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance.

2.5 Configuration of Tested System

Product Name	ONE Distributed Antenna System
Model Name	RXU 2325
Working voltage	48.0VDC
Mode of operation	Industrial Booster for WCS band
Modulations	64QAM, 16QAM, QPSK
Assigned Frequency Range	2345.0MHz-2360.0MHz
Operating Frequency Range	2350.0MHz -2360.0MHz
Transmit power	~20.0dBm
Antenna Gain	12.5 dBi
DATA rate	N/A
Modulation BW	10.0MHz

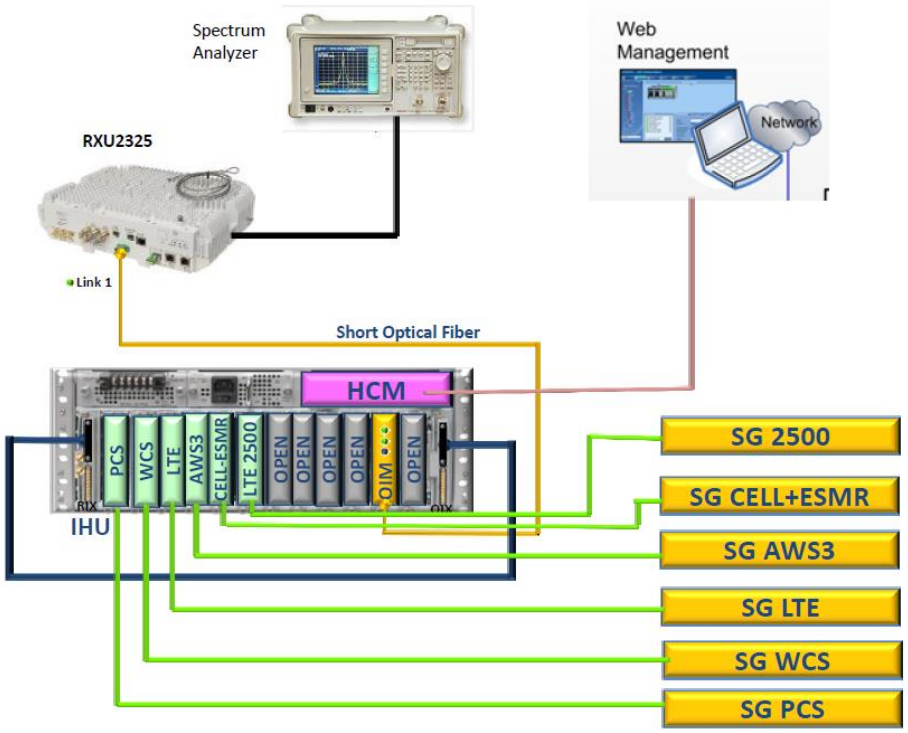


Figure 1. Test Set-Up – Conducted

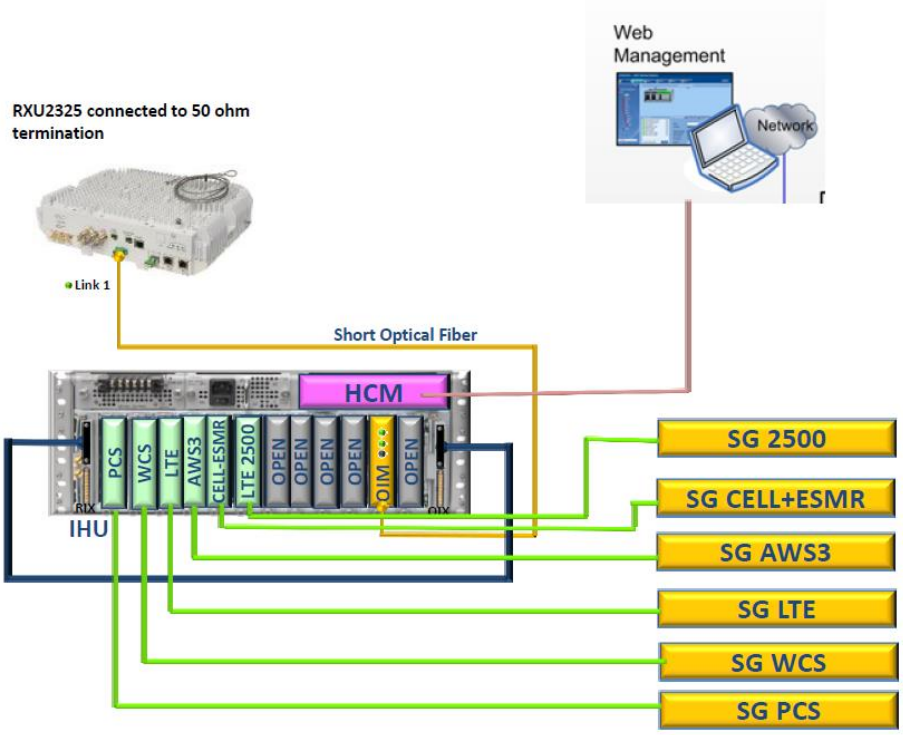


Figure 2. Test Set-Up - Radiated

3. Test Set-up Photos

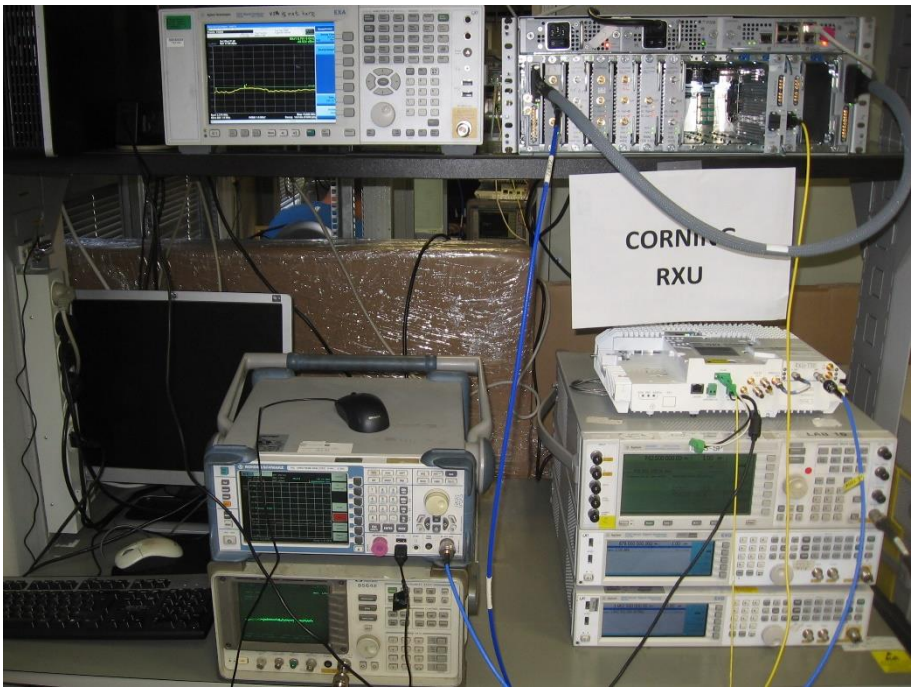


Figure 3. Conducted Emission From Antenna Port Tests

Figure 4. Radiated Emission Test

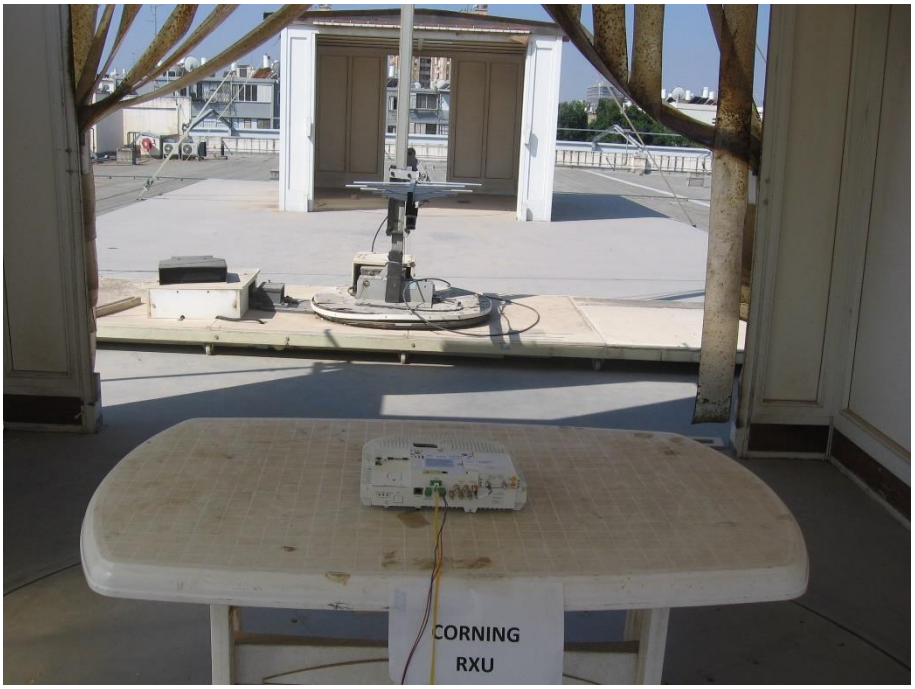


Figure 5. Radiated Emission Test

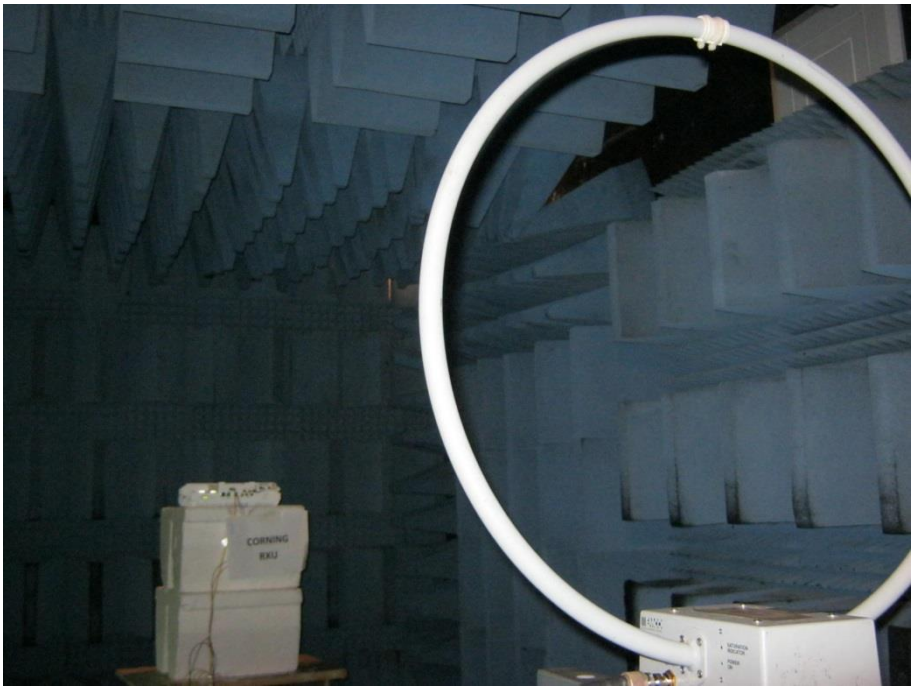


Figure 6. Radiated Emission Test

Figure 7. Radiated Emission Test

Figure 8. Radiated Emission Test

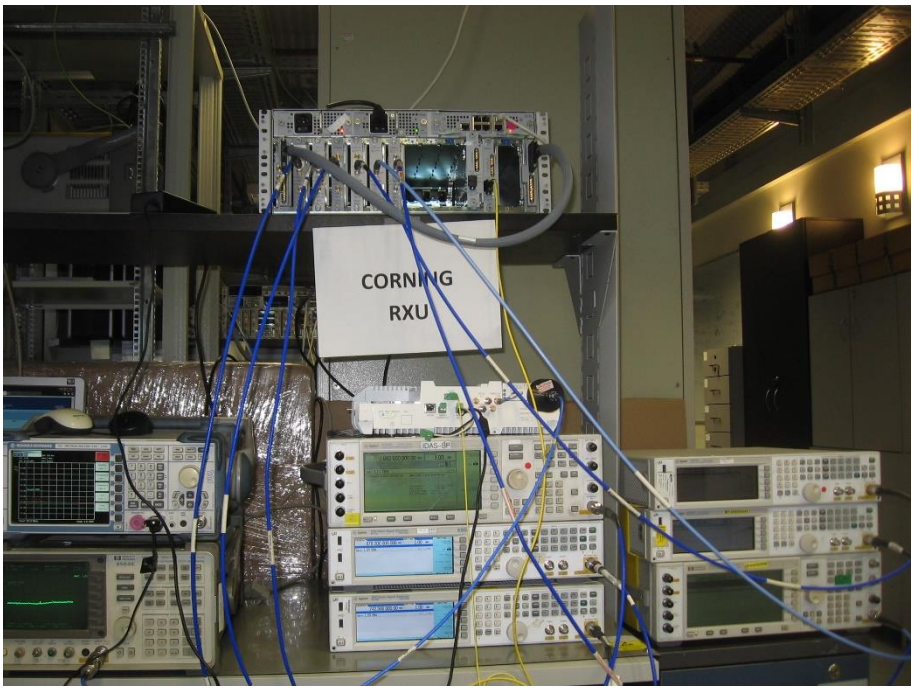


Figure 9. Intermodulation Conducted Emission Test

4. Peak Output Power

4.1 Test Specification

FCC Part 27, Subpart C, Section 27.50(a)(ii)

4.2 Test Procedure

(Temperature (22°C)/ Humidity (36%RH))

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss=31.0 dB). The E.U.T. RF output was modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload.

4.3 Test Limit

Peak Power Output must not exceed 2000 Watts (63dBm).

4.4 Test Results

Modulation	Operation Frequency	Reading	Antenna Gain	EIRP	Specification	Margin
	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)
64QAM	2355.0	21.0	12.5	33.5	63.0	-29.5
16QAM	2355.0	21.0	12.5	33.5	63.0	-29.5
QPSK	2355.0	20.8	12.5	33.3	63.0	-29.7

Figure 10 Peak Output Power

JUDGEMENT: Passed by 29.5 dB

See additional information in *Figure 11* to *Figure 13.*

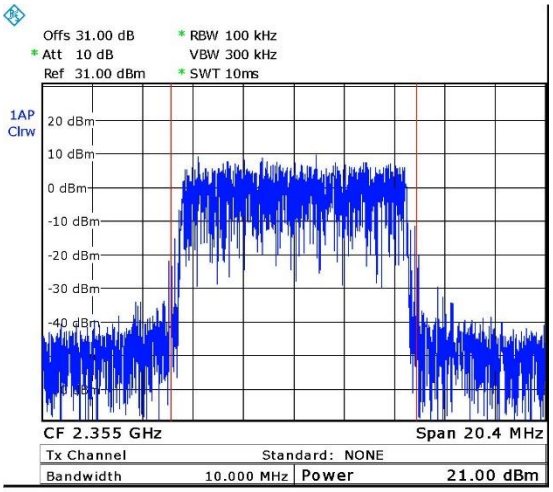


Figure 11. — 2355.0 MHz –64QAM

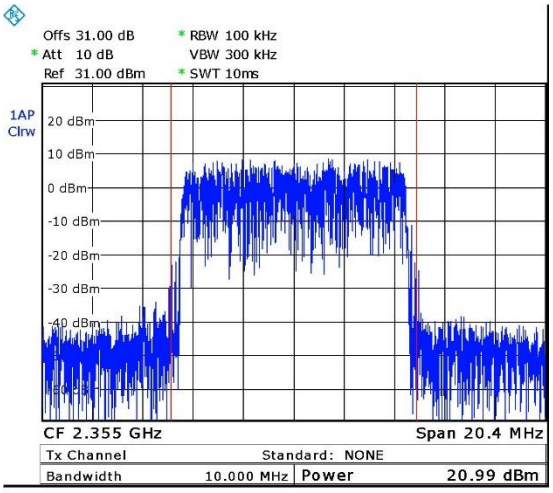


Figure 12. — 2355.0 MHz –16QAM

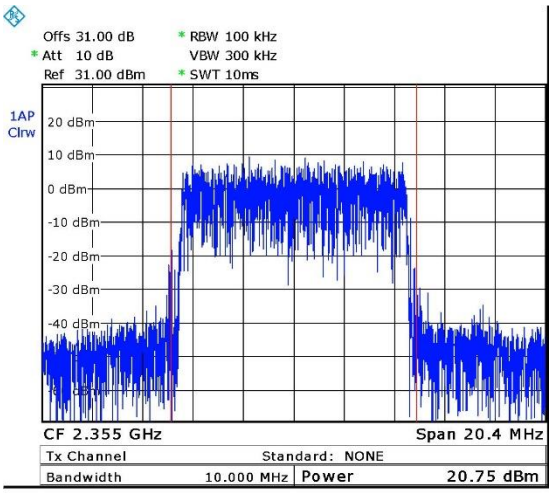


Figure 13. — 2355.0 MHz QPSK

4.5 Test Equipment Used; Peak Output Power

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	February 29, 2016	March 1, 2017
Vector Signal Generator	Agilent	N5172B	MY51350584	July 1, 2016	July 1, 2017
30 dB Attenuator	MCL	BW-S30W5	533	July 5, 2016	July 5, 2017

Figure 14 Test Equipment Used

5. Average Power Spectral Density

5.1 Test Specification

FCC, Part 27, Subpart C, Section 27.50(a)(1)(A)

5.2 Test Procedure

(Temperature (22°C)/ Humidity (36%RH))

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss=31.0 dB). The E.U.T. RF output was modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 1000 kHz RBW. The output power level was measured at each modulation.

For PSD in any 5MHz the equation: $10\log\left(\frac{5MHz}{1MHz}\right) = 7dB$. This factor was added to the test results in 1MHz. The total results were compared to the PSD 5MHz limit as detailed below.

5.3 Test Limit

Average PSD in any 1 MHz must not exceed 400 Watts (56dBm) and in any 5MHz, must not exceed 2000 Watts (63dBm).

5.4 Test Results

Modulation	Operation Frequency	Reading	Antenna Gain	EIRP	Limit	Margin
	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)
64QAM	2355.0	21.9	12.5	34.4	56.0	-21.6
16QAM	2355.0	21.7	12.5	34.2	56.0	-21.8
QPSK	2355.0	21.7	12.5	34.2	56.0	-21.8

Figure 15 1 MHz - Average Power Spectral Density

Modulation	Operation Frequency	Reading	Antenna Gain	EIRP	Limit	Margin
	(MHz)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)
64QAM	2355.0	28.9	12.5	41.4	63.0	-21.6
16QAM	2355.0	28.7	12.5	41.2	63.0	-21.8
QPSK	2355.0	28.7	12.5	41.2	63.0	-21.8

Figure 16 5 MHz - Average Power Spectral Density

JUDGEMENT: Passed by 21.6 dB

See additional information in Figure 17 to Figure 19.

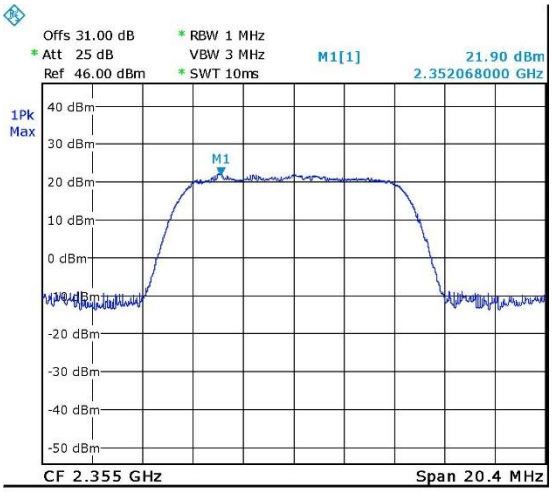


Figure 17. — 2355.0 MHz –64QAM

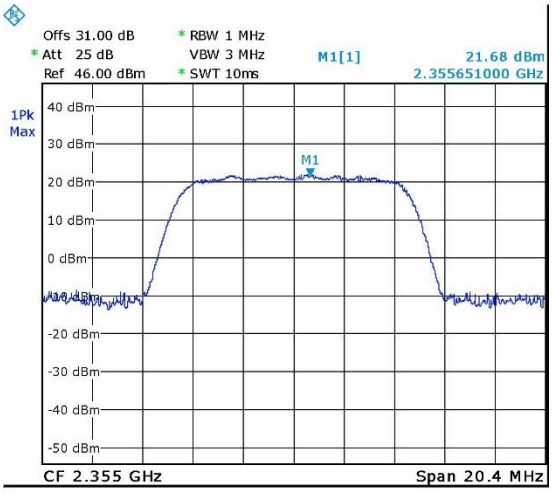


Figure 18. — 2355.0 MHz –16QAM

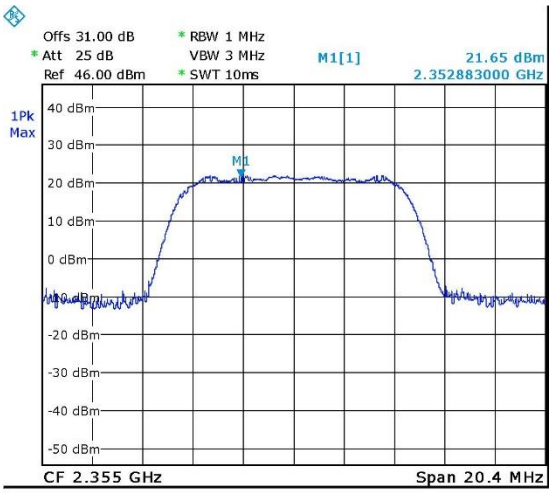


Figure 19. — 2355.0 MHz QPSK

5.5 Test Equipment Used; Average Power Spectral Density

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	February 29, 2016	March 1, 2017
Vector Signal Generator	Agilent	N5172B	MY51350584	July 1, 2016	July 1, 2017
30 dB Attenuator	MCL	BW-S30W5	533	July 5, 2016	July 5, 2017

Figure 20 Test Equipment Used

6. Peak to Average Power Ratio

6.1 Test Specification

FCC Part 27.50(a)(1)(B)

6.2 Test Procedure

(Temperature (22°C)/ Humidity (36%RH))
The method used is detailed in FCC KDB 971168 D03 v01

Measurements was using CCDF function for each modulation.

6.3 Test Limit

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

6.4 Test Results

Modulation	Operation Frequency	0.1% PAPR	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
64QAM	2355.0	8.3	13.0	-4.7
16QAM	2355.0	8.4	13.0	-4.6
QPSK	2355.0	8.2	13.0	-4.8

Figure 21 Test Results Peak to Average Power Ratio

JUDGEMENT: Passed

For additional information see *Figure 22* to *Figure 24*.

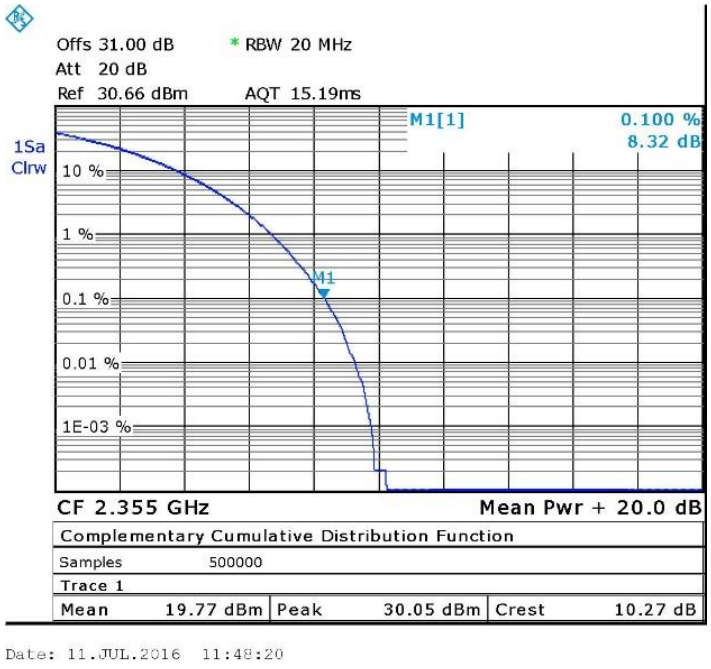


Figure 22. —64QAM, 2355.0 MHz

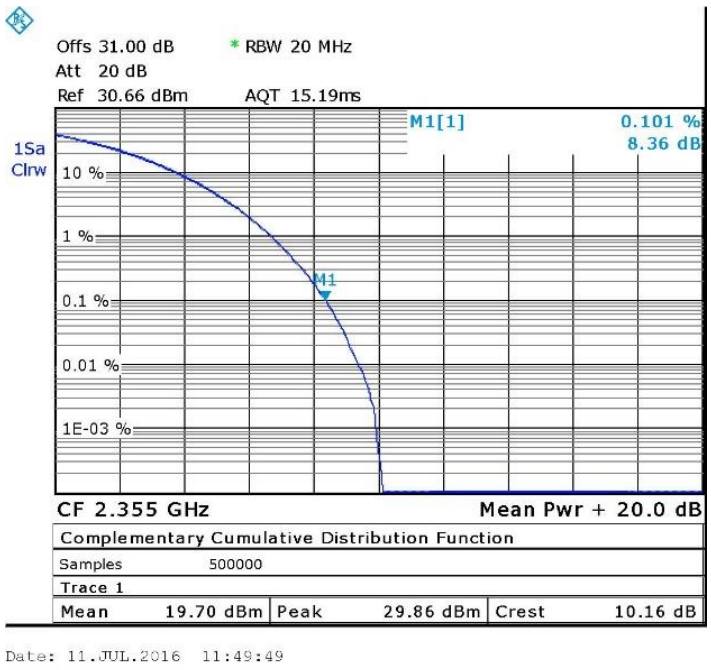


Figure 23. — 16QAM, 2355.0 MHz

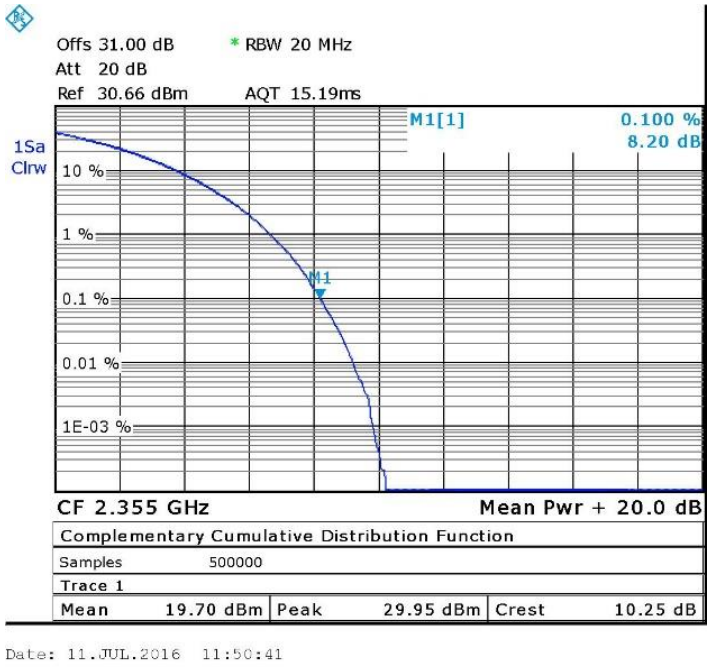


Figure 24. — QPSK, 2355.0 MHz

6.5 Test Equipment Used; 0.1% PAPR

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	February 29, 2016	March 1, 2017
Vector Signal Generator	Agilent	N5172B	MY51350584	July 1, 2016	July 1, 2017
30 dB Attenuator	MCL	BW-S30W5	533	July 5, 2016	July 5, 2017

Figure 25 Test Equipment Used

7. Occupied Bandwidth

7.1 Test Specification

FCC Part 2, Section 1049

7.2 Test Procedure

(Temperature (22°C)/ Humidity (36%RH))
The E.U.T. was set to the applicable test frequency with modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable. The OBW function (99%) was used for this evaluation. RBW was set to 100 kHz.
Occupied bandwidth measured was repeated for each modulation.

7.1 Test Limit

N/A

7.2 Test Results

Modulation	Port	Operating Frequency	Reading
	(Input/ Output)	(MHz)	(MHz)
64QAM	Input	2355.0	8.9
64QAM	Output	2355.0	8.9
16QAM	Input	2355.0	8.9
16QAM	Output	2355.0	8.9
QPSK	Input	2355.0	8.9
QPSK	Output	2355.0	8.9

Figure 26 Occupied Bandwidth

JUDGEMENT: Passed

See additional information in *Figure 27* to *Figure 32*.

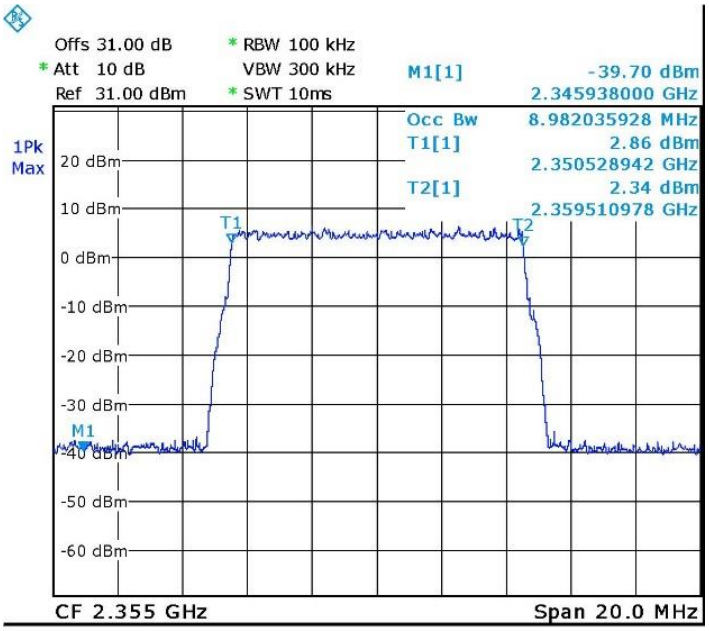


Figure 27 Occupied Bandwidth INPUT, 64QAM

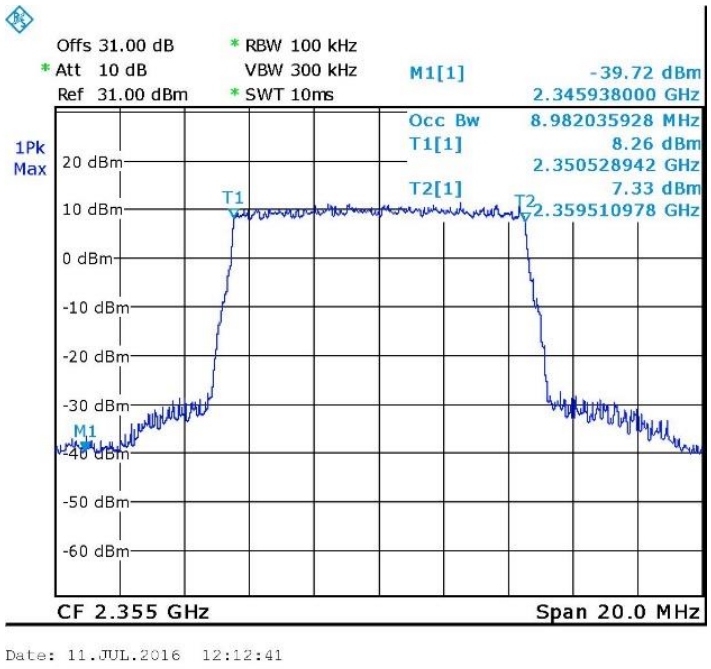


Figure 28 Occupied Bandwidth OUTPUT, 64QAM

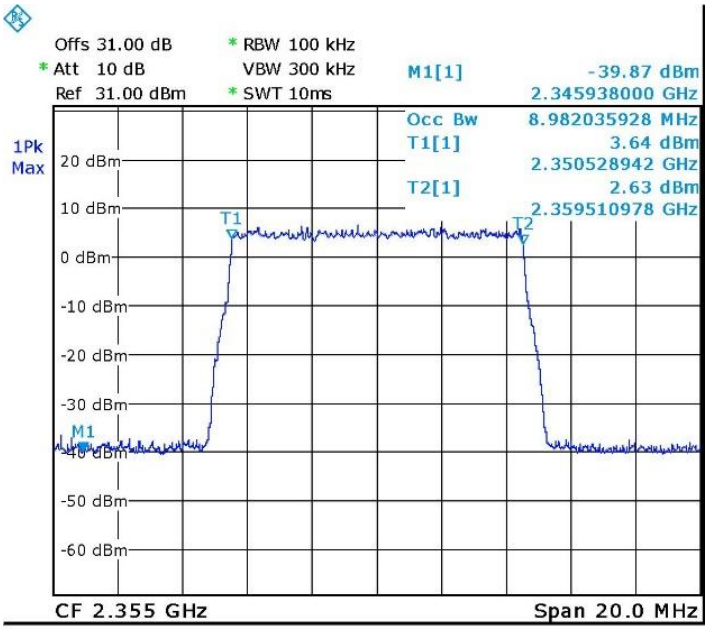


Figure 29 Occupied Bandwidth INPUT, 16QAM

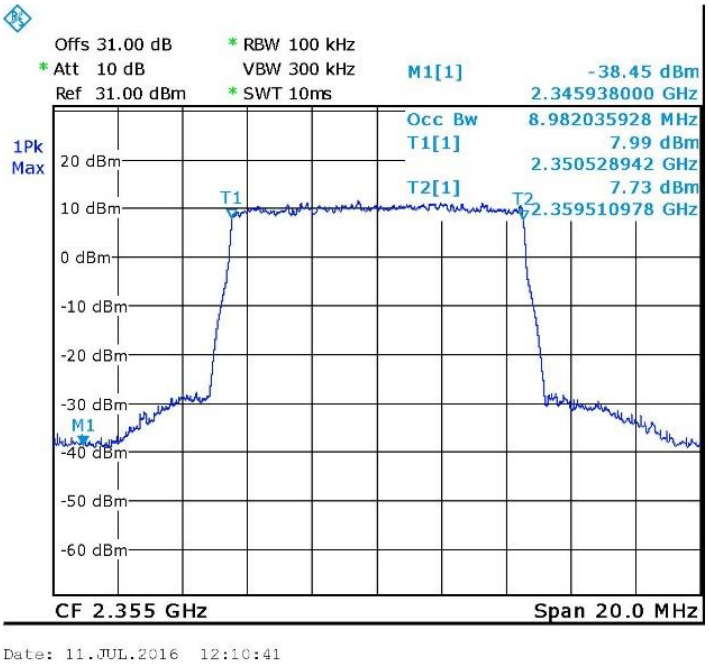


Figure 30 Occupied Bandwidth OUTPUT, 16QAM

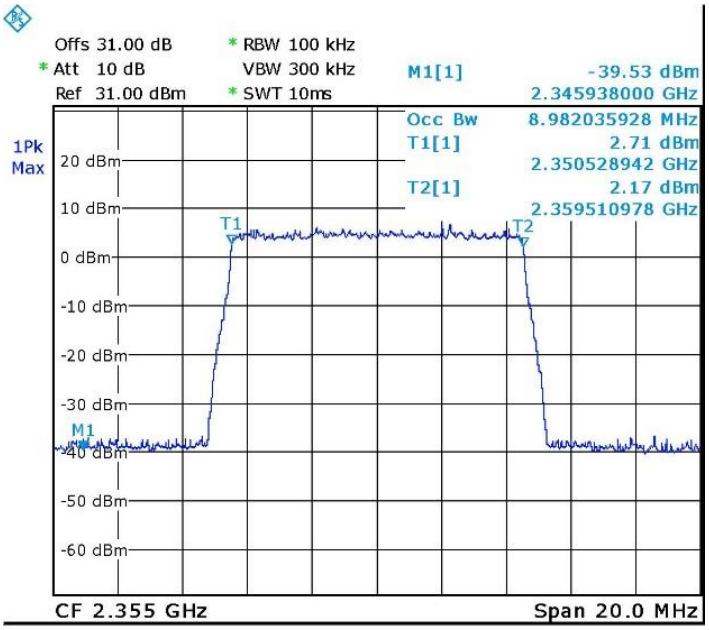


Figure 31 Occupied Bandwidth INPUT, QPSK

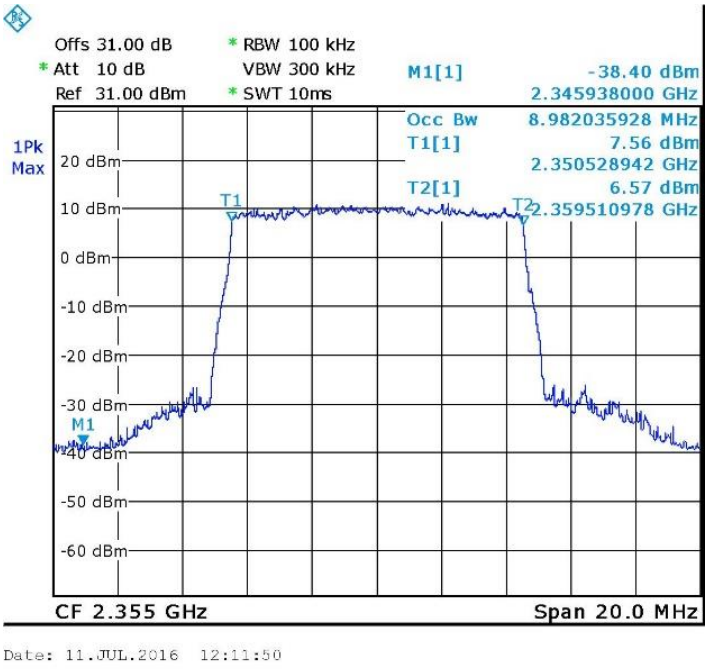


Figure 32 Occupied Bandwidth OUTPUT, QPSK

7.3 Test Equipment Used; Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	February 29, 2016	March 1, 2017
Vector Signal Generator	Agilent	N5172B	MY51350584	July 1, 2016	July 1, 2017
30 dB Attenuator	MCL	BW-S30W5	533	July 5, 2016	July 5, 2017

Figure 33 Test Equipment Used

8. Spurious Emissions at Antenna Terminals

8.1 Test Specification

FCC Part 27, Section: 53(a)(1)

8.2 Test Procedure

(Temperature (23°C)/ Humidity (36%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max loss 34.0 dB).

Testing was performed in the 9K-24GHz frequency band without band edges tests, and for each modulation separately.

8.3 Test Limit

The power of any emission outside of the authorized operating frequency ranges (2345-2360 MHz) must be attenuated below the transmitting power (P) by a factor of at least as specified in this section.

Frequency Band (MHz)	Calculated Factor (dBc)
f<2285.0	75+10*log(0.1)=65.0
2285.0MHz<f<2287.5MHz	72+10*log(0.1)=62.0
2287.5MHz<f<2300.0MHz	70+10*log(0.1)=60.0
2300.0MHz<f<2305.0MHz	43+10*log(0.1)=33.0
2305.0MHz<f<2320.0MHz	43+10*log(0.1)=33.0
2320.0MHz<f<2345.0MHz	75+10*log(0.1)=65.0
2345.0MHz<f<2360.0MHz	43+10*log(0.1)=33.0
2360.0MHz<f<2362.50MHz	43+10*log(0.1)=33.0
2362.5MHz<f<2365.0MHz	55+10*log(0.1)=45.0
2365.0MHz<f<2367.5MHz	70+10*log(0.1)=60.0
2367.5MHz<f<2370.0MHz	72+10*log(0.1)=62.0
2370.0<f	75+10*log(0.1)=65.0

Figure 34 Mask Limit Table

8.4 Test Results

JUDGEMENT: Passed

See additional information in *Figure 35* to *Figure 61*.

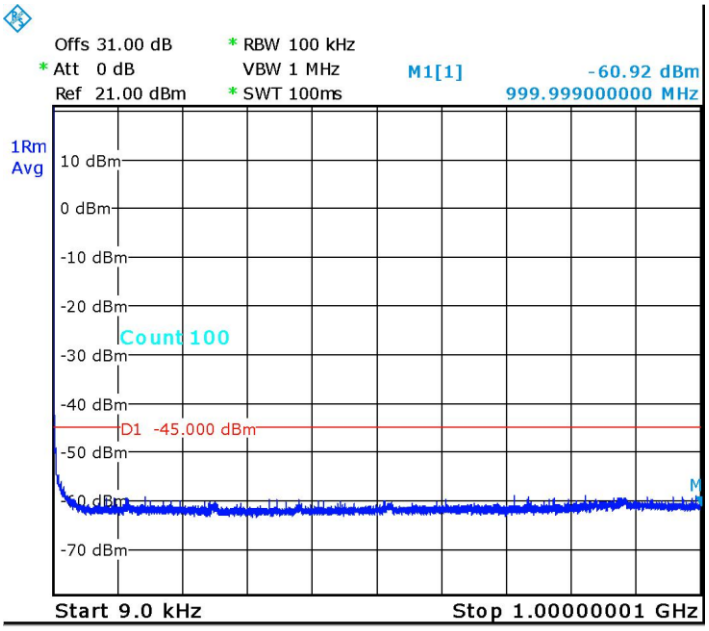


Figure 35. — 0.009 MHz-1000.0 MHz –64QAM

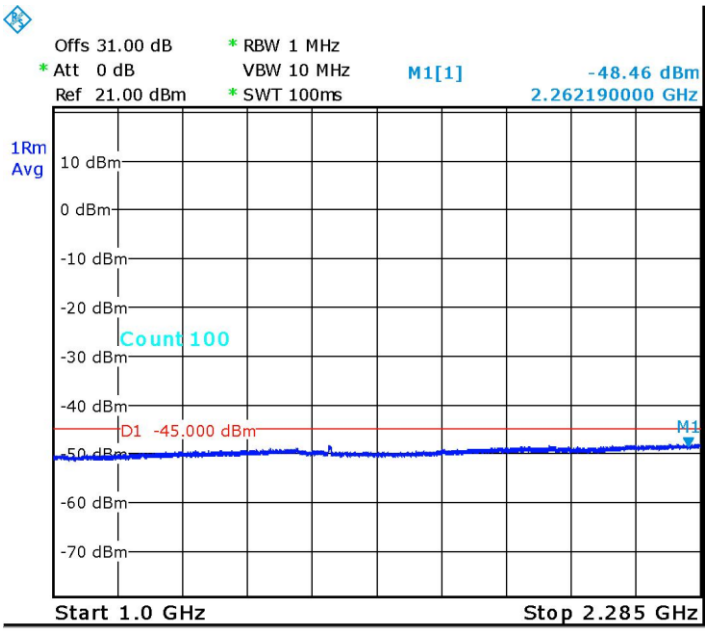


Figure 36. — 1000 MHz-2285 MHz –64QAM

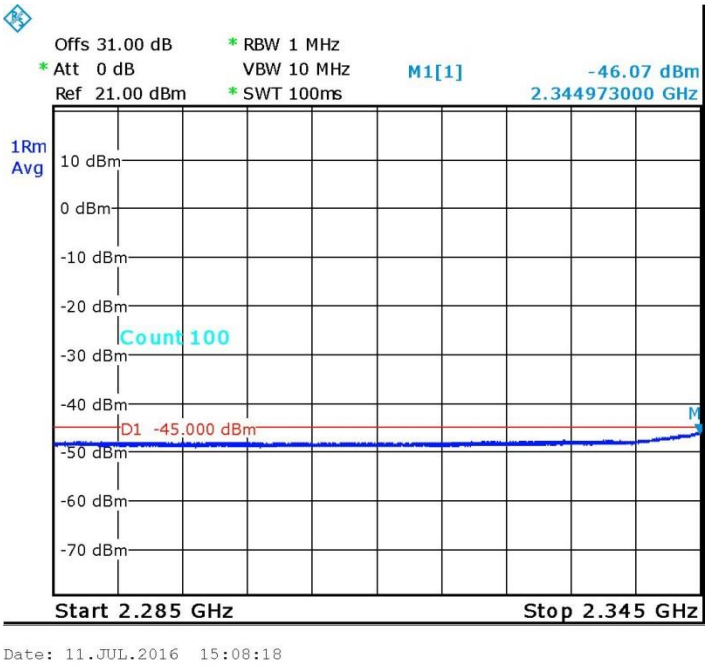


Figure 37. — 2285 MHz-2345 MHz –64QAM

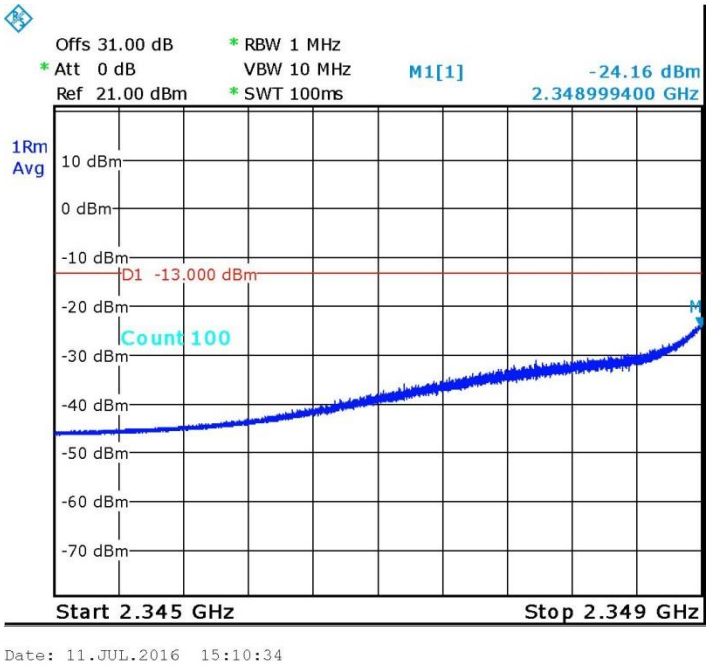


Figure 38. — 2345 MHz-2349 MHz –64QAM

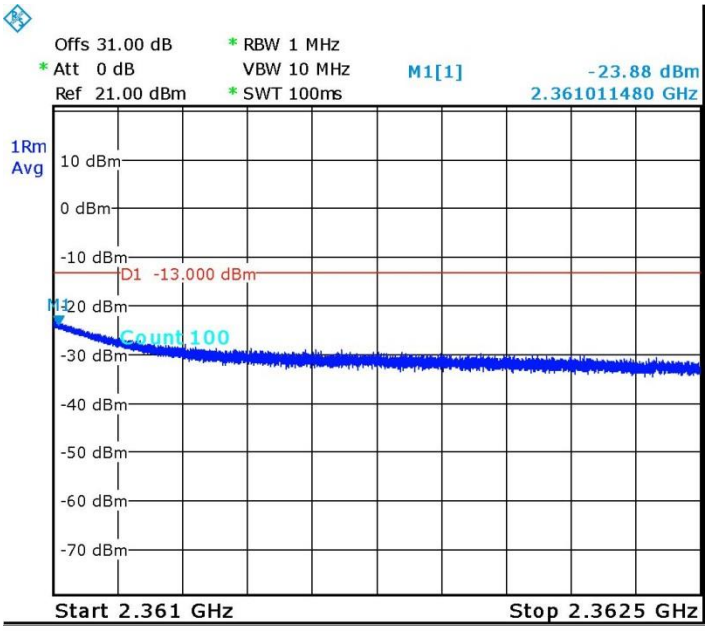


Figure 39. — 2361.0 MHz-2362.5 MHz – LTE 64QAM

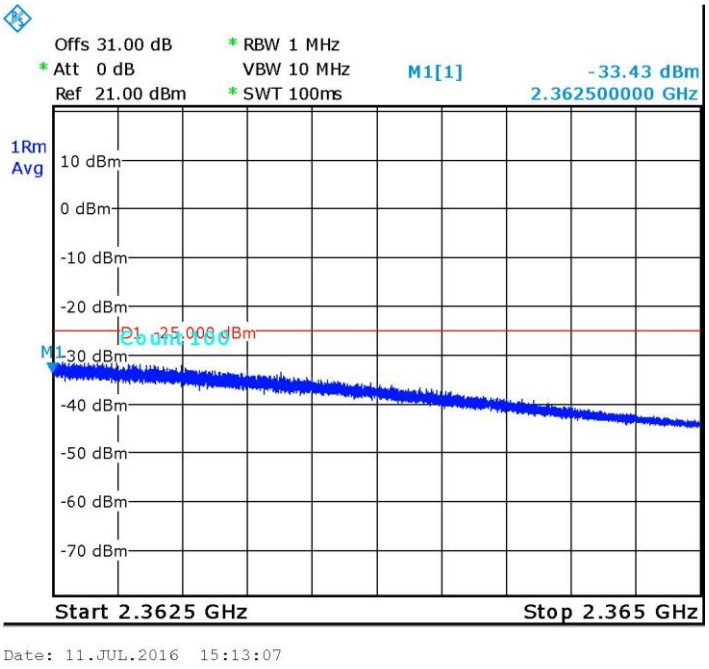


Figure 40. — 2362.5 MHz-2365.0 MHz – LTE 64QAM

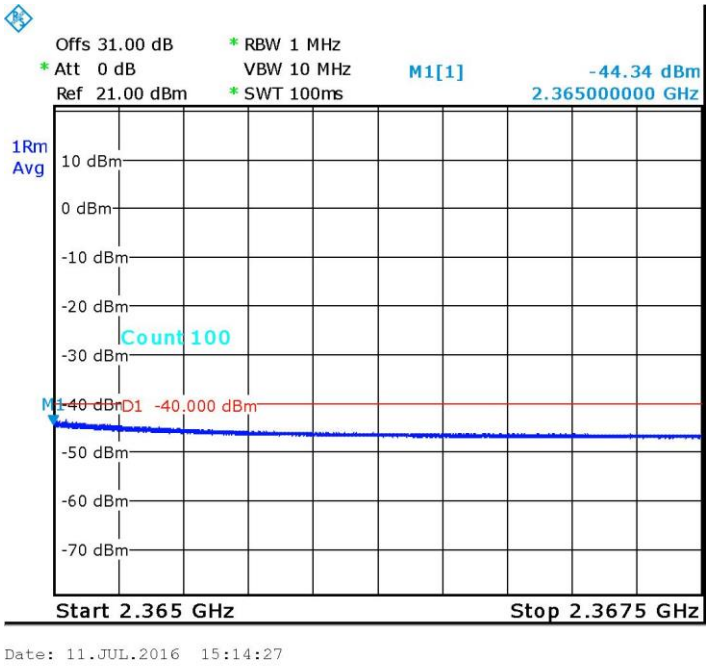


Figure 41. — 2365.0 MHz-2367.5 MHz – LTE 64QAM

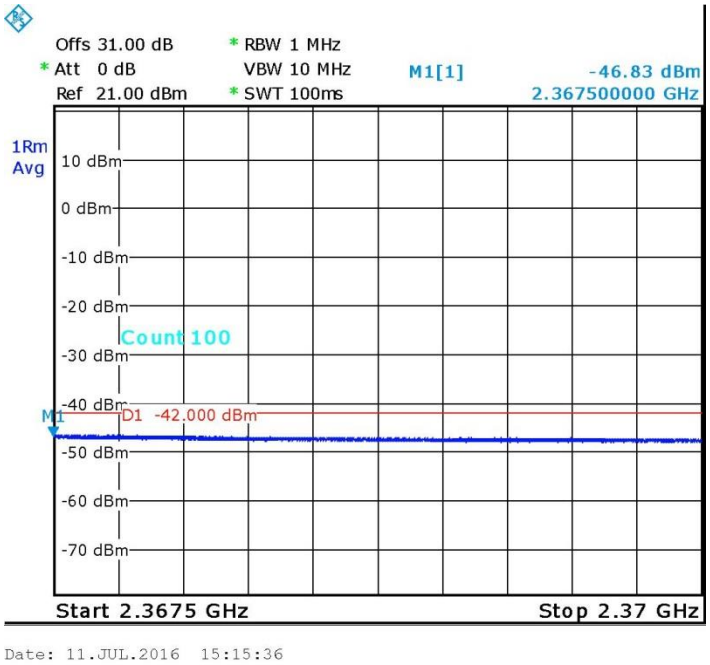


Figure 42. — 2367.5 MHz-2370.0 MHz –64QAM

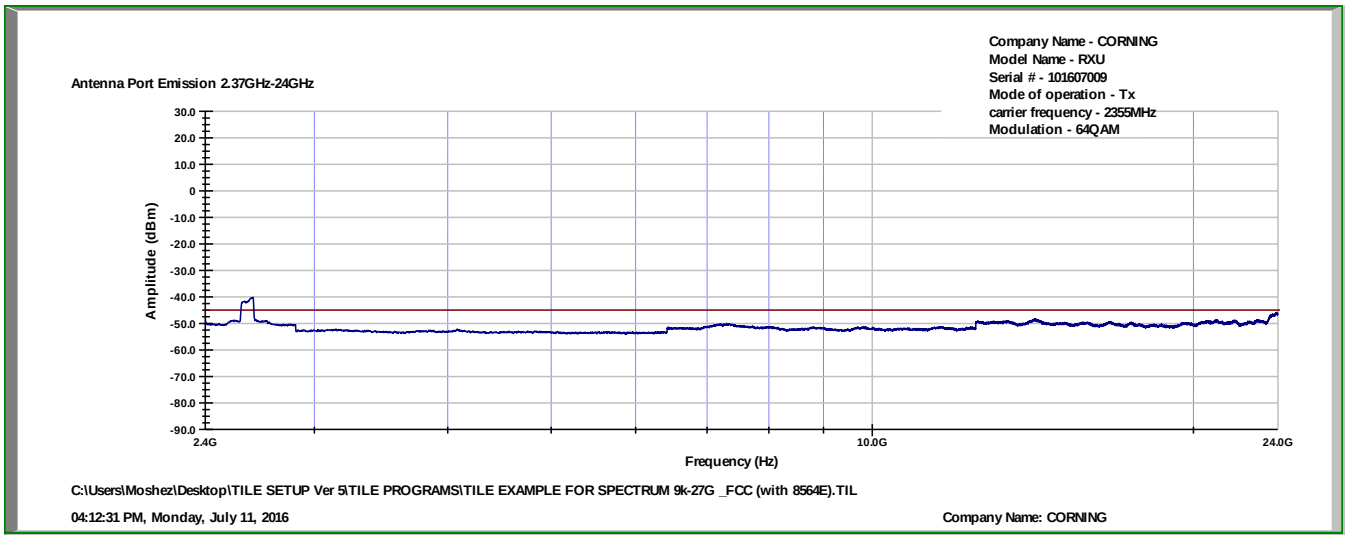


Figure 43. — 2370.0 MHz-24,000.0 MHz –64QAM

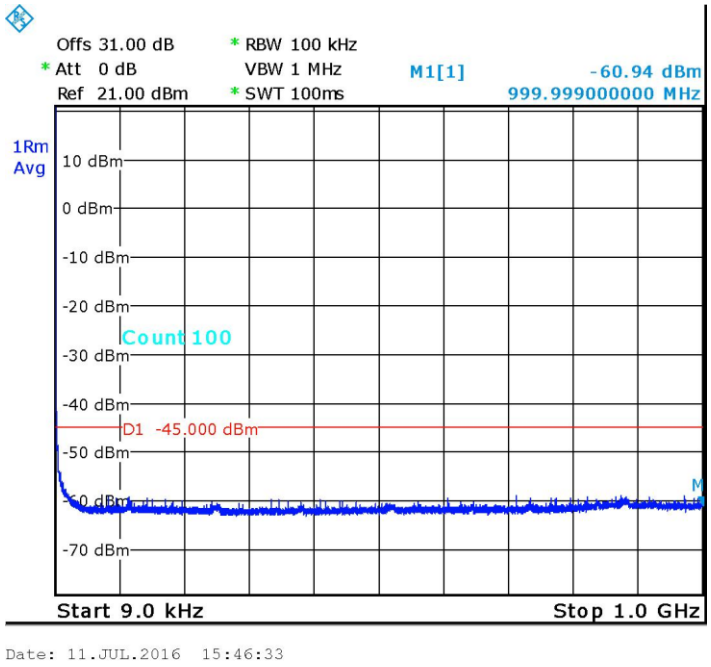


Figure 44. — 0.009 MHz-1000.0 MHz – 16QAM

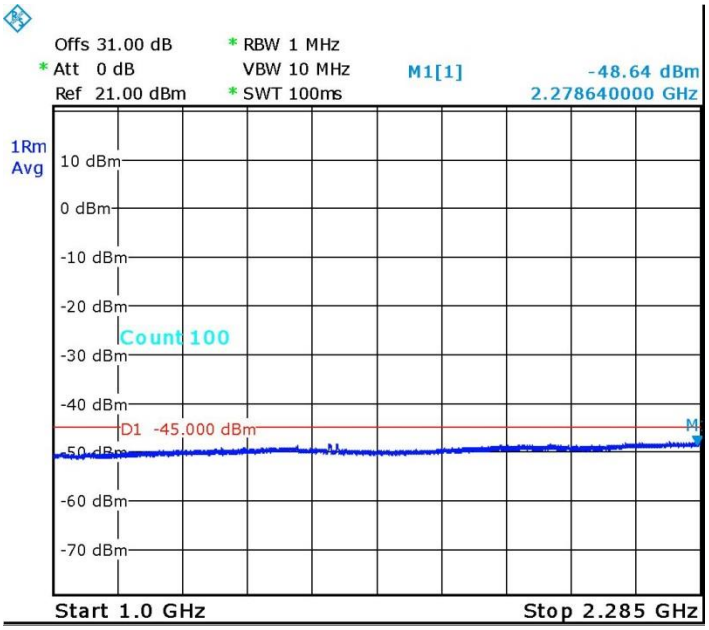


Figure 45 — 1000.0 MHz-2285.0 MHz - 16QAM

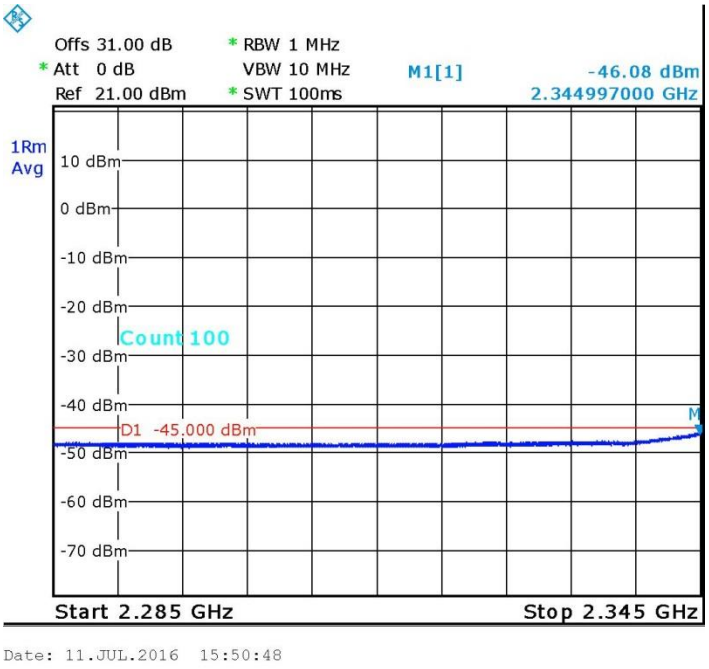


Figure 46. — 2285.0 MHz-2345.0 MHz - 16QAM

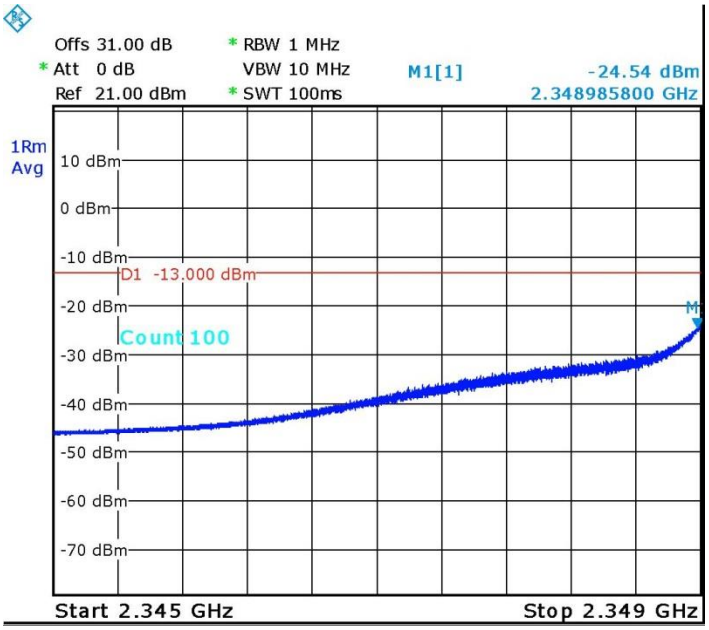


Figure 47. — 2345 MHz-2349 MHz - 16QAM

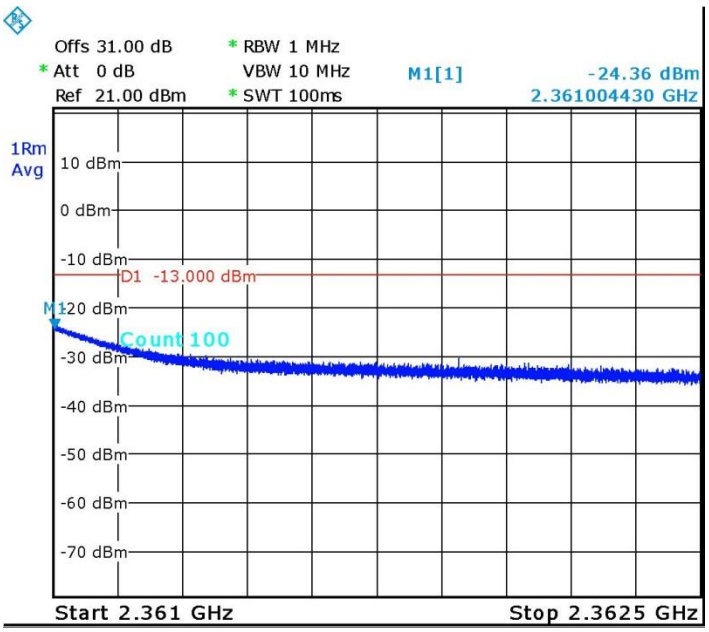


Figure 48. — 2361.0 MHz-2362.5 MHz - 16QAM

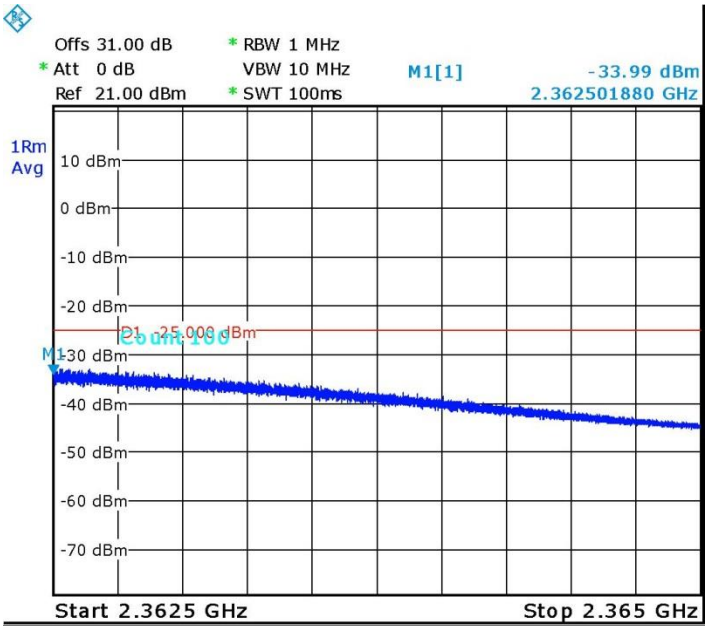


Figure 49. — 2362.5 MHz-2365.0 MHz - 16QAM

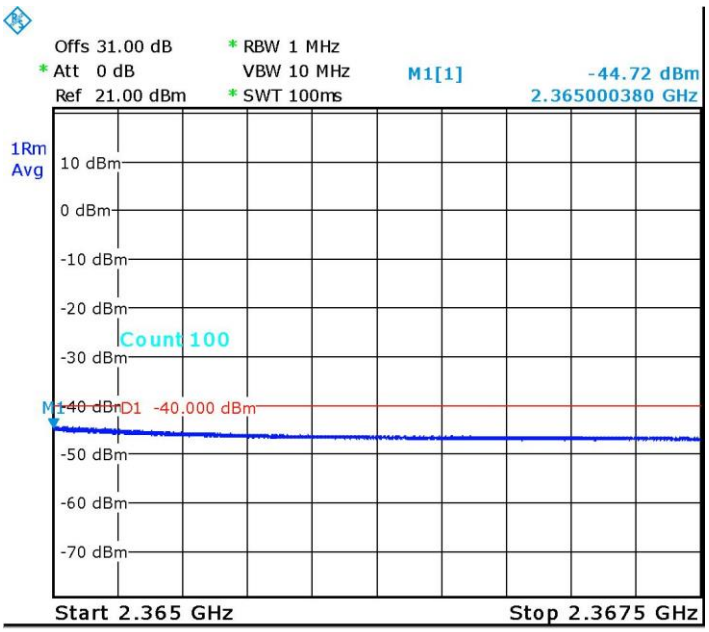


Figure 50. — 2365.0 MHz-2367.5 MHz - 16QAM

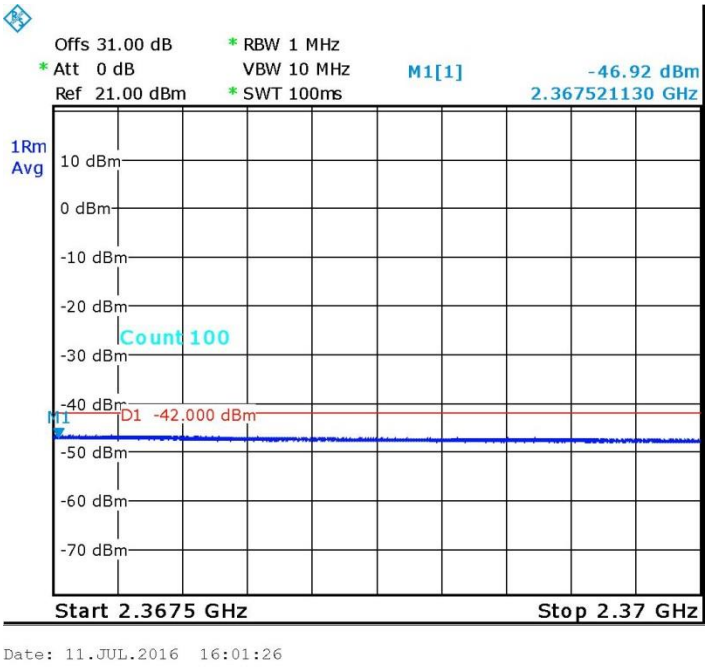


Figure 51. — 2367.5 MHz-2370.0 MHz - 16QAM

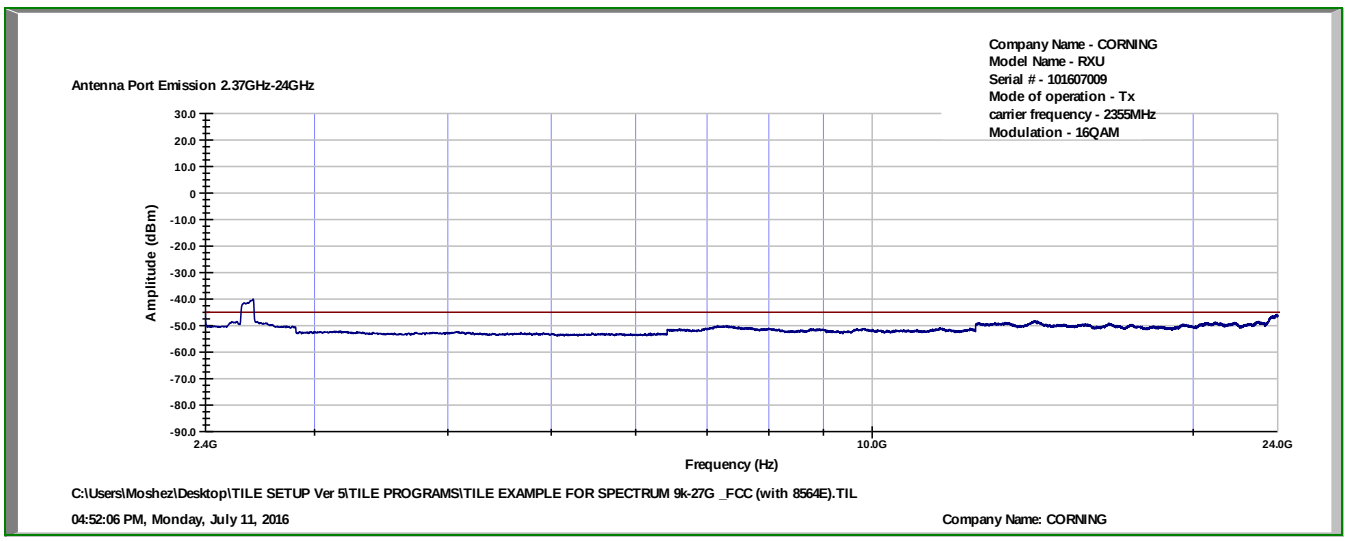


Figure 52. — 2370.0 MHz-24,000.0 MHz - 16QAM

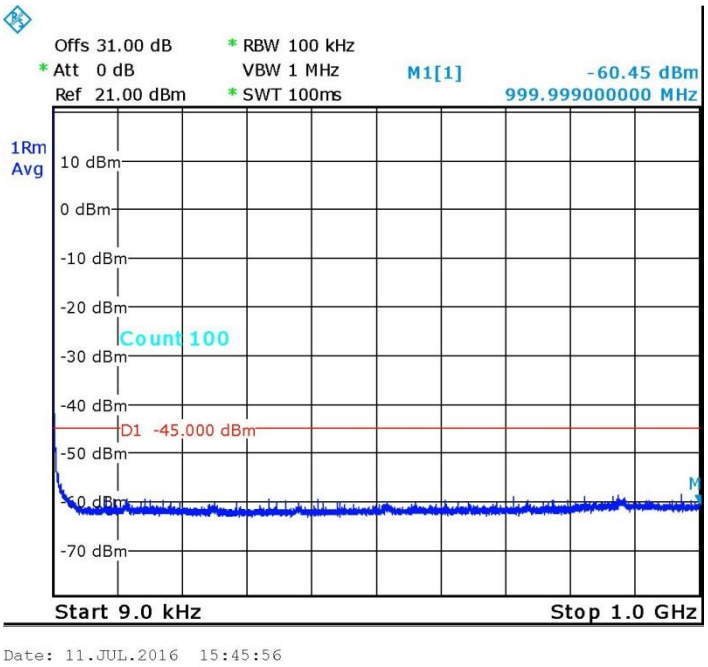


Figure 53. — 0.009 MHz-1000.0MHz – QPSK

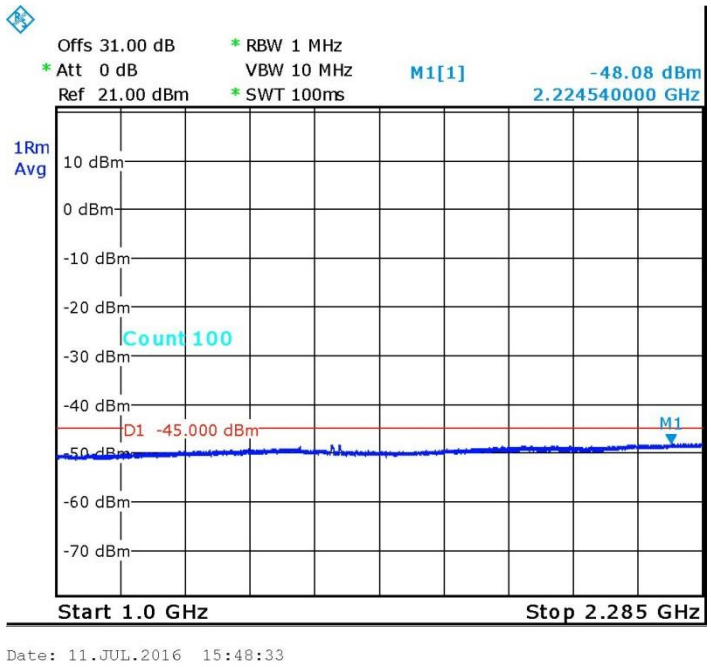


Figure 54. — 1000.0 MHz-2285.0 MHz - QPSK

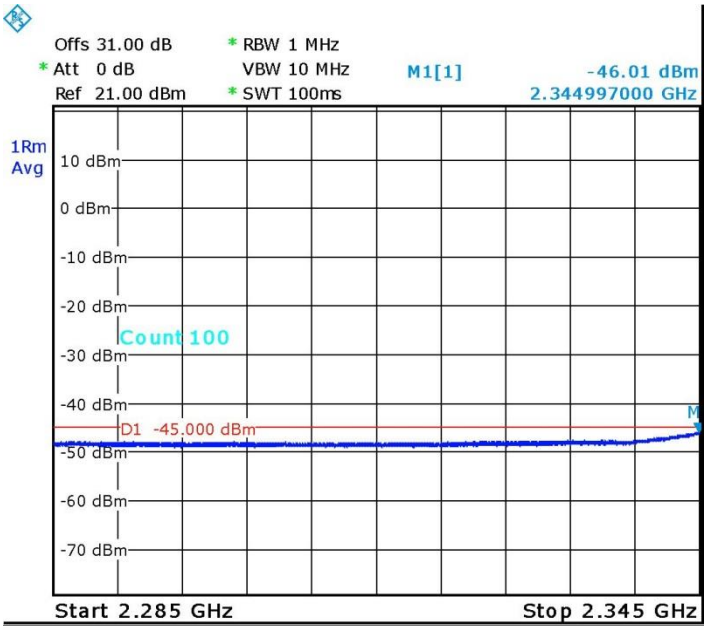


Figure 55. — 2285.0 MHz-2345.0 MHz – QPSK

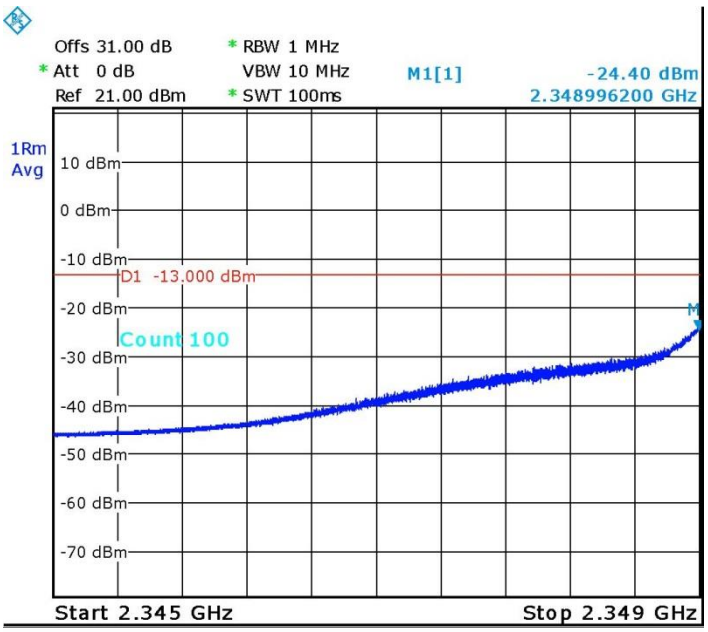
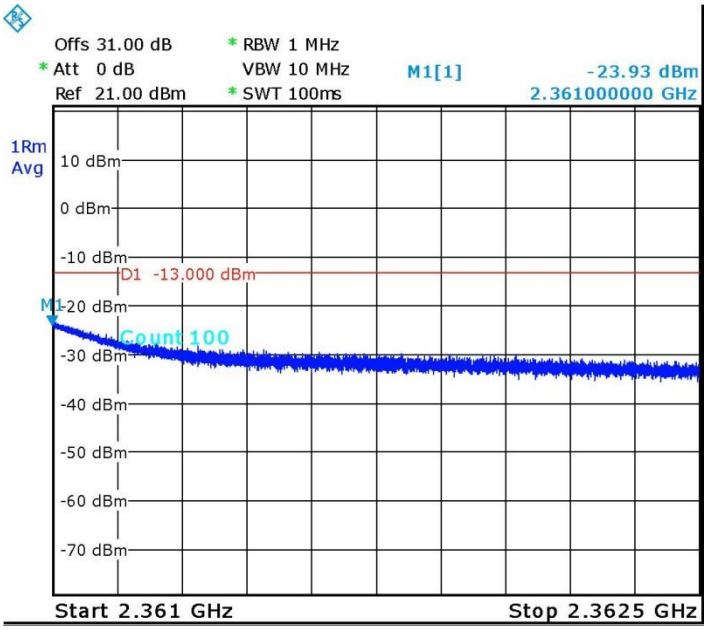
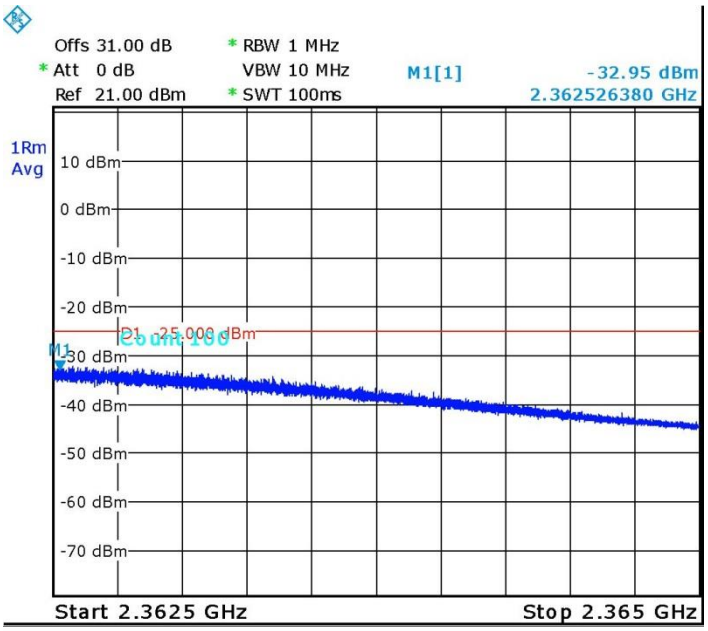


Figure 56. — 2345.0 MHz-2349.0 MHz – QPSK



Date: 11.JUL.2016 15:54:14

Figure 57. — 2361.0 MHz-2362.5MHz – QPSK



Date: 11.JUL.2016 15:58:02

Figure 58. — 2362.5 MHz-2365.0MHz – QPSK

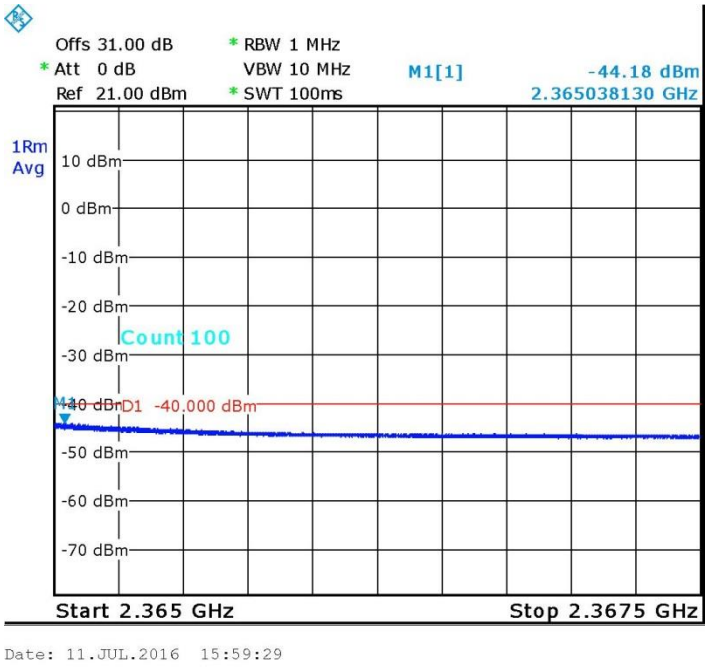


Figure 59.—2365.0 MHz-2367.5MHz – QPSK

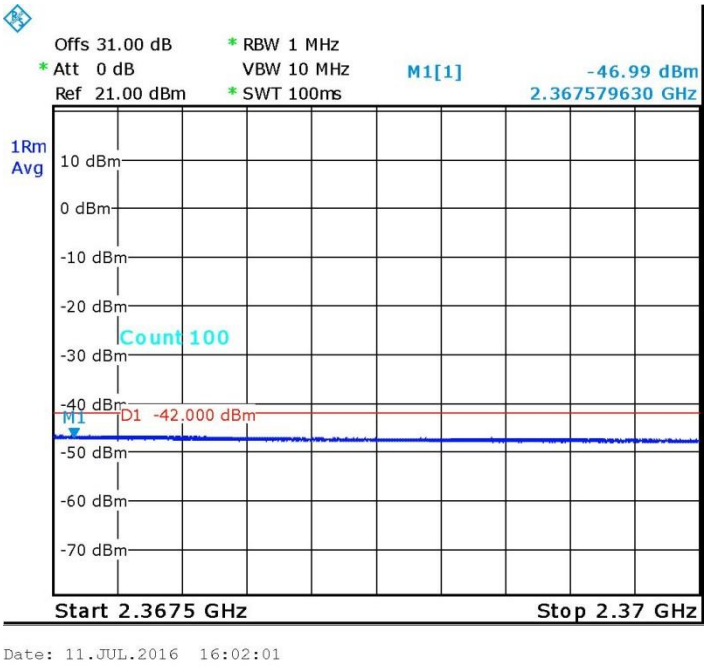


Figure 60. — 2367.5 MHz-2370.0 MHz – QPSK

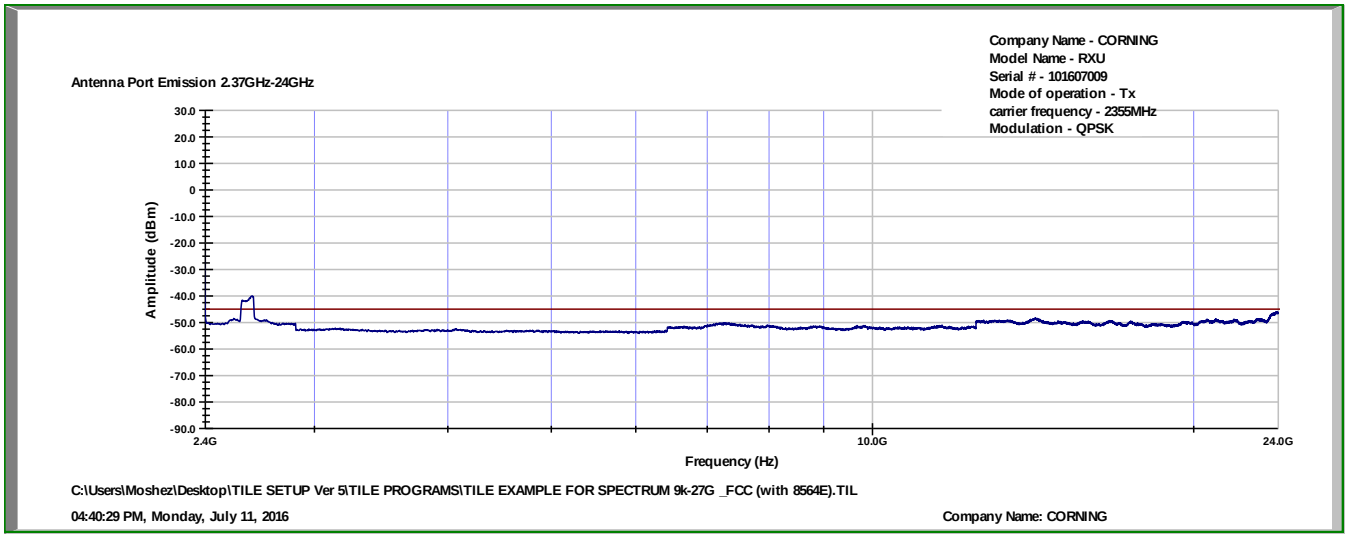


Figure 61. — 2370.0 MHz-24,000.0 MHz – QPSK

8.5 Test Equipment Used; Out of Band Emission at Antenna Terminals

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXG Vector Signal Generator	Agilent	N5172B	MY51350584	July 1, 2016	July 1, 2017
Spectrum Analyzer	HP	8564E	3442A00275	March 10, 2016	March 10, 2017
Spectrum Analyzer	R&S	FSL6	100194	February 29, 2016	March 1, 2017
30 dB Attenuator	MCL	BW-S30W5	533	July 5, 2016	July 5, 2017

Figure 62 Test Equipment Used

9. Band Edge Spectrum

9.1 Test Specification

FCC Part 27, Section 53(a)(1)

9.2 Test Procedure

(Temperature (22°C)/ Humidity (35%RH))
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (31.0 dB).
The spectrum analyzer RBW was set to at least 1% from OBW.
The evaluation was repeated for all modulations.

9.3 Test Limit

The power of any emission in the 1 MHz bands immediately outside and adjacent to the channel blocks (2350-2360MHz) was attenuated below the transmitting power (P) by a factor of at least 43 +10 log (P) dB , yielding – 13dBm.

9.4 Test Results

Modulation	Operation Frequency	Band Edge Frequency	Reading	Limit	Margin
	(MHz)	(MHz)	(dBm)	(dBm)	(dB)
64QAM	2355.0	2350	-26.4	-13.0	-13.4
	2355.0	2360	-25.9	-13.0	-12.9
16QAM	2355.0	2350	-29.0	-13.0	-16.0
	2355.0	2360	-28.5	-13.0	-15.5
QPSK	2355.0	2350	-27.0	-13.0	-14.0
	2355.0	2360	-30.4	-13.0	-17.4

Figure 63 Band Edge Spectrum Results

JUDGEMENT: Passed by 12.9 dB

See additional information in *Figure 64* to *Figure 69*.

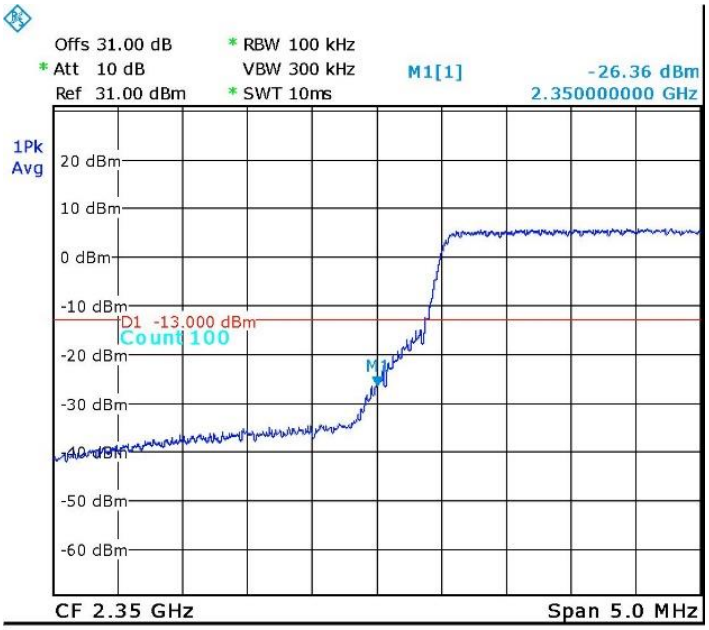


Figure 64. — Lower Block Edge -1MHz –64QAM

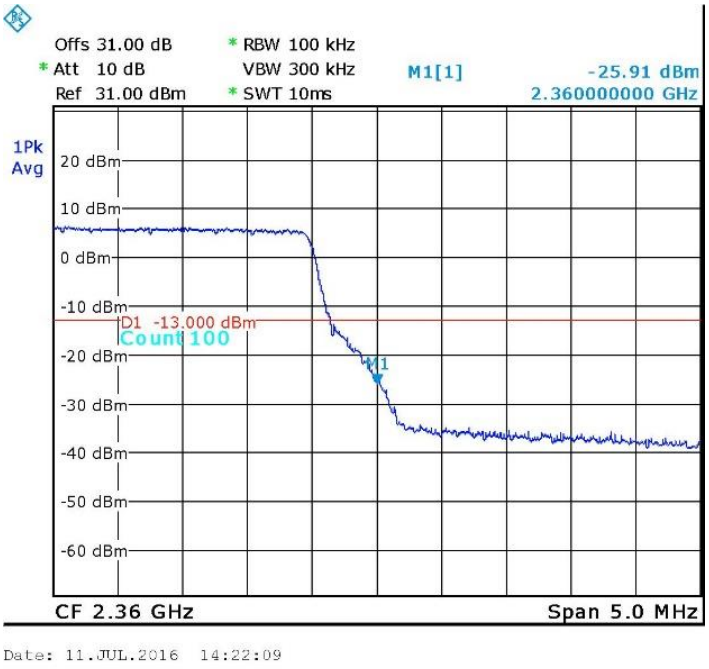


Figure 65. — Upper Band Edge +1MHz –64QAM

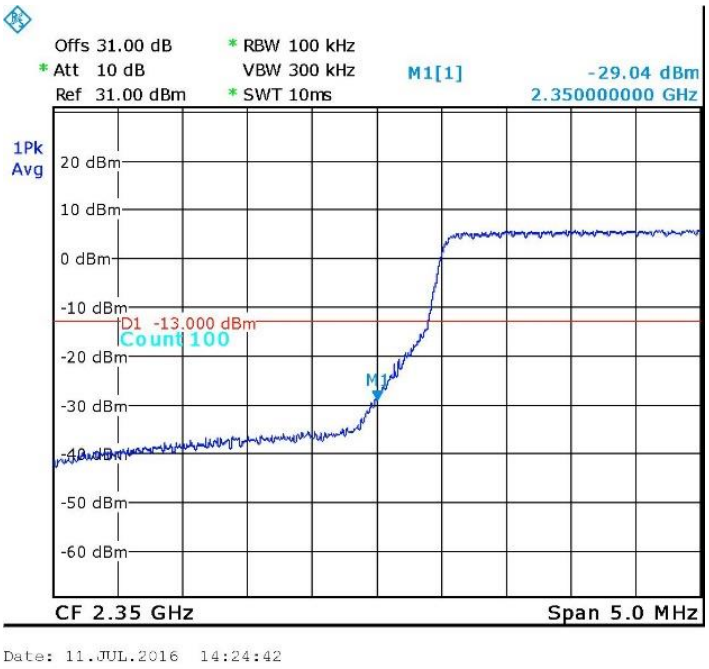


Figure 66. — Lower Block Edge -1MH – 16QAM

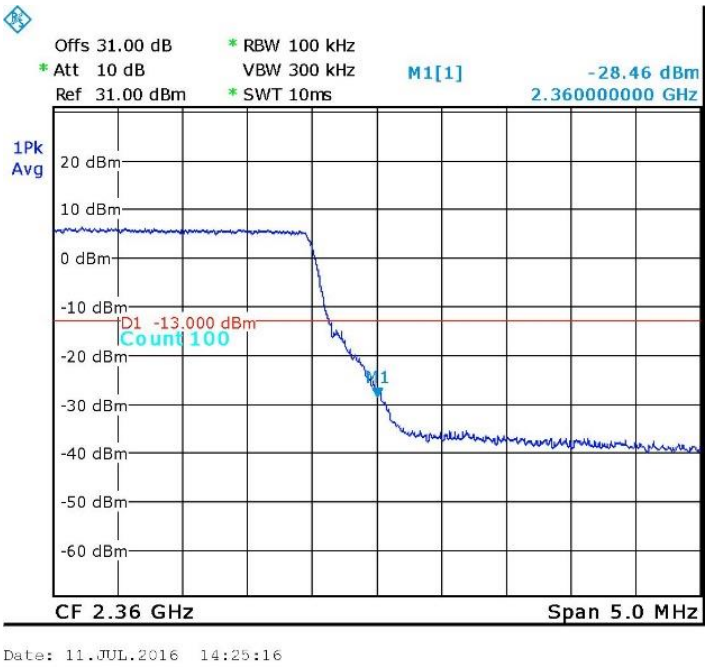


Figure 67. — Upper Band Edge +1MHz – 16QAM

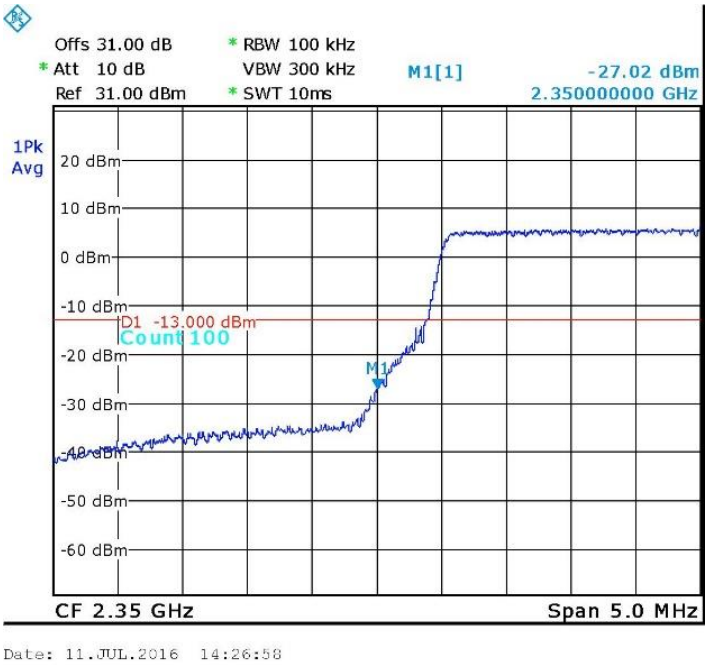


Figure 68. — Lower Block Edge -1MHz – QPSK

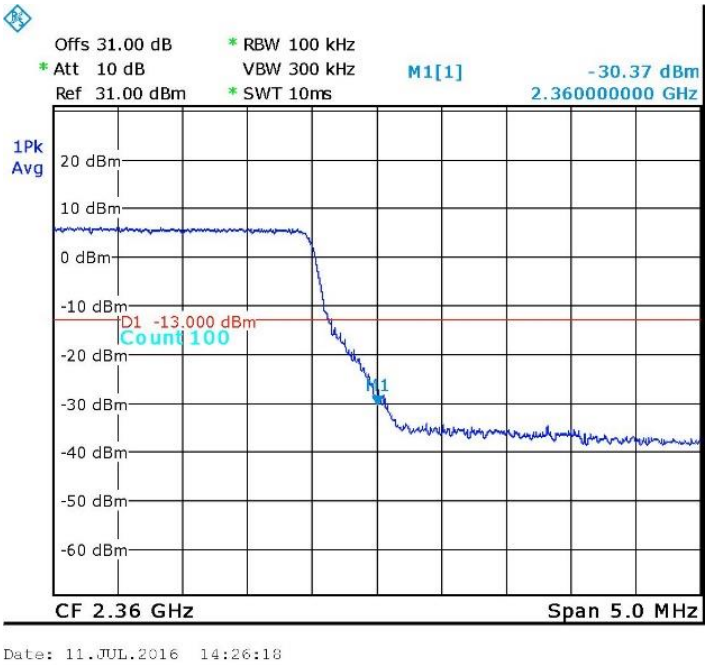


Figure 69. — Upper Band Edge +1MHz – QPSK

9.5 Test Equipment Used; Band Edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	R&S	FSL6	100194	February 29, 2016	March 1, 2017
Vector Signal Generator	Agilent	N5172B	MY51350584	July 1, 2016	July 1, 2017
30 dB Attenuator	MCL	BW-S30W5	533	July 5, 2016	July 5, 2017

Figure 70 Test Equipment Used

10. Spurious Emissions (Radiated)

10.1 Test Specification

FCC Part 27.53

10.2 Test Procedure

(Temperature (23°C)/ Humidity (53%RH))

The test method was based on ANSI/TIA-603-D: 2010, Section 2.2.12 Unwanted Emissions: Radiated Spurious.

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

For measurements between 0.009MHz-30.0MHz:

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 0.009MHz-30MHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

For measurements between 30.0MHz-1.0GHz:

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The frequency range 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

For measurements between 1.0GHz-24.0GHz:

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 1.0GHz -24.0GHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator.
The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:

$P_d(dBm) = P_g(dBm) – Cable\ Loss\ (dB) + Substitution\ Antenna\ Gain\ (dBd)$

P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

A Peak detector was using for this test.

The test was performed in one operation frequency (2355.0MHz) with all modulations.

Testing was performed when the RF port was connected to 50 Ω termination.

The table below describe only results with the highest radiation.

10.3 Test Limit

Frequency Band (MHz)	Calculated Factor (dBc)
f<2285.0	75+10*log(0.1)=65.0
2285.0MHz<f<2287.5MHz	72+10*log(0.1)=62.0
2287.5MHz<f<2300.0MHz	70+10*log(0.1)=60.0
2300.0MHz<f<2305.0MHz	43+10*log(0.1)=33.0
2305.0MHz<f<2320.0MHz	43+10*log(0.1)=33.0
2320.0MHz<f<2345.0MHz	75+10*log(0.1)=65.0
2345.0MHz<f<2360.0MHz	43+10*log(0.1)=33.0
2360.0MHz<f<2362.50MHz	43+10*log(0.1)=33.0
2362.5MHz<f<2365.0MHz	55+10*log(0.1)=45.0
2365.0MHz<f<2367.5MHz	70+10*log(0.1)=60.0
2367.5MHz<f<2370.0MHz	72+10*log(0.1)=62.0
2370.0<f	75+10*log(0.1)=65.0

Figure 71 Mask Limit Table

10.4 Test Results

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Limit	Margin
(MHz)	(MHz)	(V/H)	(dBµV/m)	(dBm)	(dB)	(dBd)	(dBm)	(dBm)	(dB)
2355.0	4710.0	V	33.5	-69.7	0.5	10.8	-59.4	-45.0	-14.4
	4710.0	H	34.0	-64.7	0.5	9.5	-55.7	-45.0	-10.7
2355.0	6145.0	V	43.8	-56.5	1.0	9.7	-47.8	-45.0	-2.8
	6145.0	H	36.5	-68.1	1.0	10.0	-59.1	-45.0	-14.1
2355.0	7065.0	V	38.2	-65.3	1.0	10.0	-56.3	-45.0	-11.3
	7065.0	H	38.0	-66.1	1.0	10.0	-57.1	-45.0	-12.1

Figure 72 Spurious Emission (Radiated)

JUDGEMENT; Passed by 2.8 dB

The E.U.T met the requirements of the FCC Part 27, Section 917; FCC Part 2.1053 specifications.

10.5 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EMI Receiver	HP	85422E	3906A00276	March 3, 2016	March 3, 2017
RF Filter Section	HP	85420E	3705A00248	March 3, 2016	March 3, 2017
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Spectrum Analyzer	HP	8593EM	3536A00120ADI	March 10, 2016	March 10, 2017
Active Loop Antenna	EMCO	6502	9506-2950	November 5, 2015	November 30, 2016
Antenna Biconical	EMCO	3110B	9912-3337	March 24, 2016	March 24, 2018
Antenna Log Periodic	EMCO	3146	9505-4081	April 23, 2016	April 23, 2017
Horn Antenna 1G-18G	ETS	3115	29845	May 19, 2015	May 19, 2018
Horn Antenna 18G-26G	ARA	SWH-28	1007	March 30, 2014	September 30, 2016
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	March 1, 2015	September 30, 2016
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	March 1, 2015	September 30, 2016
MXG Vector Signal generator	Agilent	N5182A	MY49060440	July 1, 2016	July 1, 2017
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	N/A	N/A
Antenna Mast	ETS	2070-2	-	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 73 Test Equipment Used

11. Intermodulation Conducted

11.1 Test Procedure

(Temperature (22°C)/ Humidity (37%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max loss = 34.0dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10 kHz for the frequency range 150 kHz–1.0 MHz, 100 kHz for the frequency range 1.0 MHz – 30 MHz, and 1MHz for the frequency range 30 MHz - 24GHz.

2 input signals were sent simultaneously to the E.U.T. as follows:

WCS band: 2355.0MHz, 0 dBm

TDD 2.5G band: 2593.0MHz, 0 dBm

The frequency range of 9 kHz – 24.0 GHz was scanned for unwanted signals.

11.2 Test Limit

Frequency Band (MHz)	Calculated Factor (dBc)
f<2285.0	75+10*log(0.1)=65.0
2285.0MHz<f<2287.5MHz	72+10*log(0.1)=62.0
2287.5MHz<f<2300.0MHz	70+10*log(0.1)=60.0
2300.0MHz<f<2305.0MHz	43+10*log(0.1)=33.0
2305.0MHz<f<2320.0MHz	43+10*log(0.1)=33.0
2320.0MHz<f<2345.0MHz	75+10*log(0.1)=65.0
2345.0MHz<f<2360.0MHz	43+10*log(0.1)=33.0
2360.0MHz<f<2362.50MHz	43+10*log(0.1)=33.0
2362.5MHz<f<2365.0MHz	55+10*log(0.1)=45.0
2365.0MHz<f<2367.5MHz	70+10*log(0.1)=60.0
2367.5MHz<f<2370.0MHz	72+10*log(0.1)=62.0
2370.0<f	75+10*log(0.1)=65.0

Figure 74 Mask Limit Table

11.3 Test Results

JUDGEMENT: Passed

See additional information in *Figure 75* to *Figure 84*.

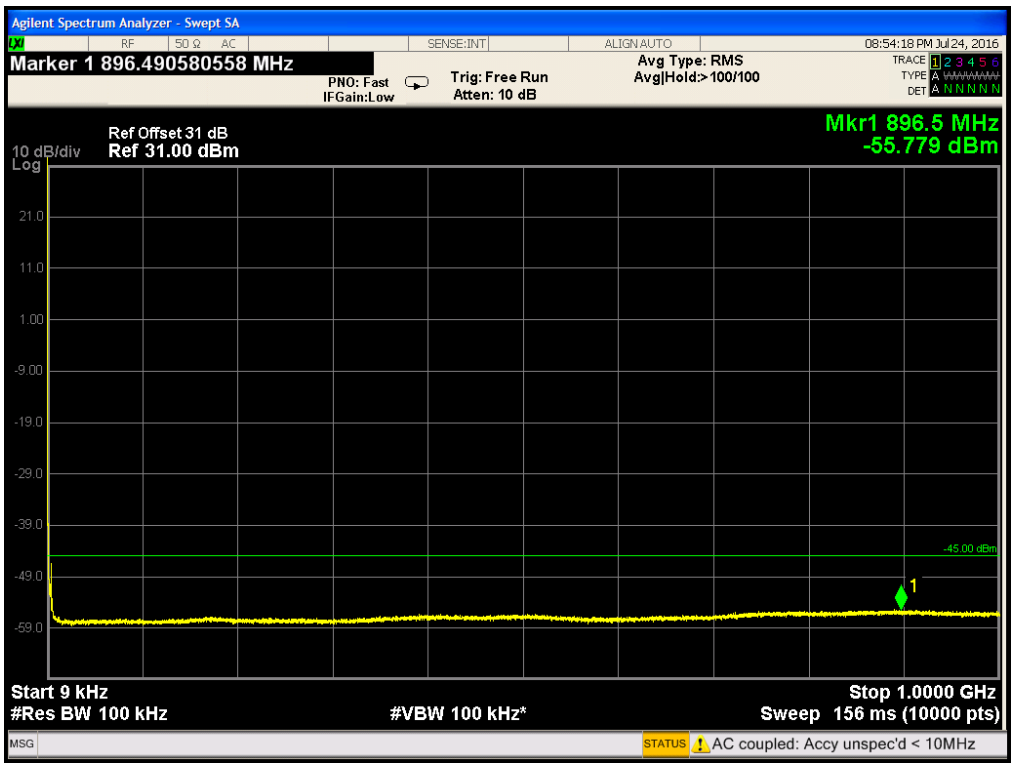


Figure 75 9kHz-1GHz

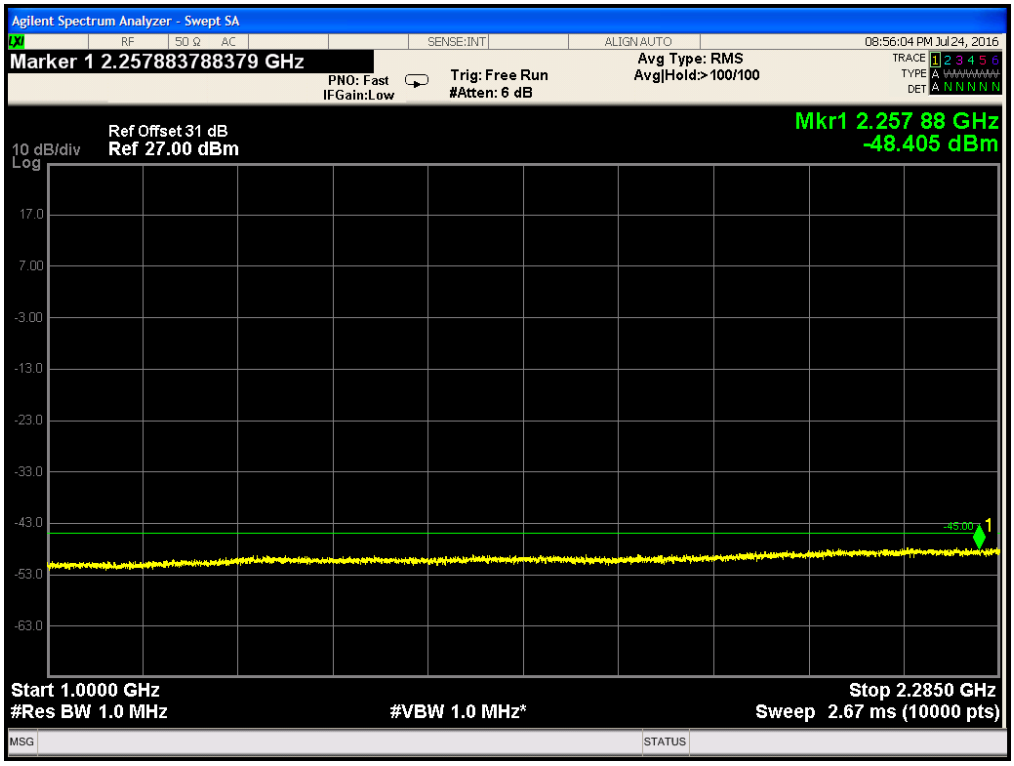


Figure 76 1GHz-2.285GHz

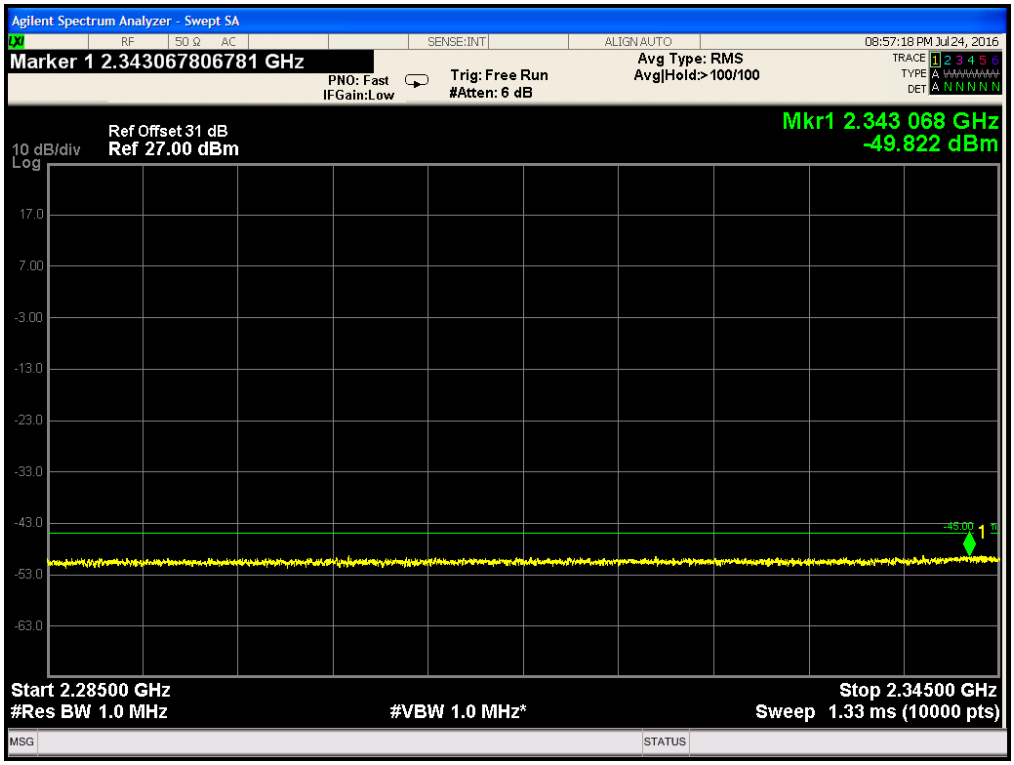


Figure 77 2.285GHz-2.345GHz

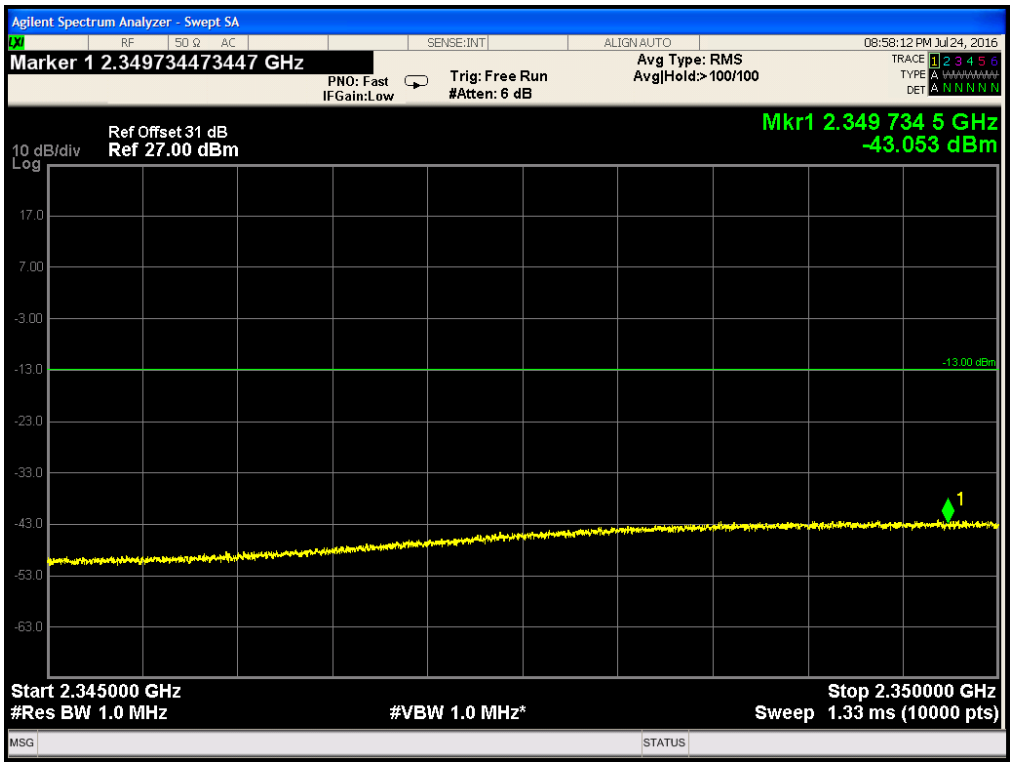


Figure 78 2.345GHz-2.35GHz

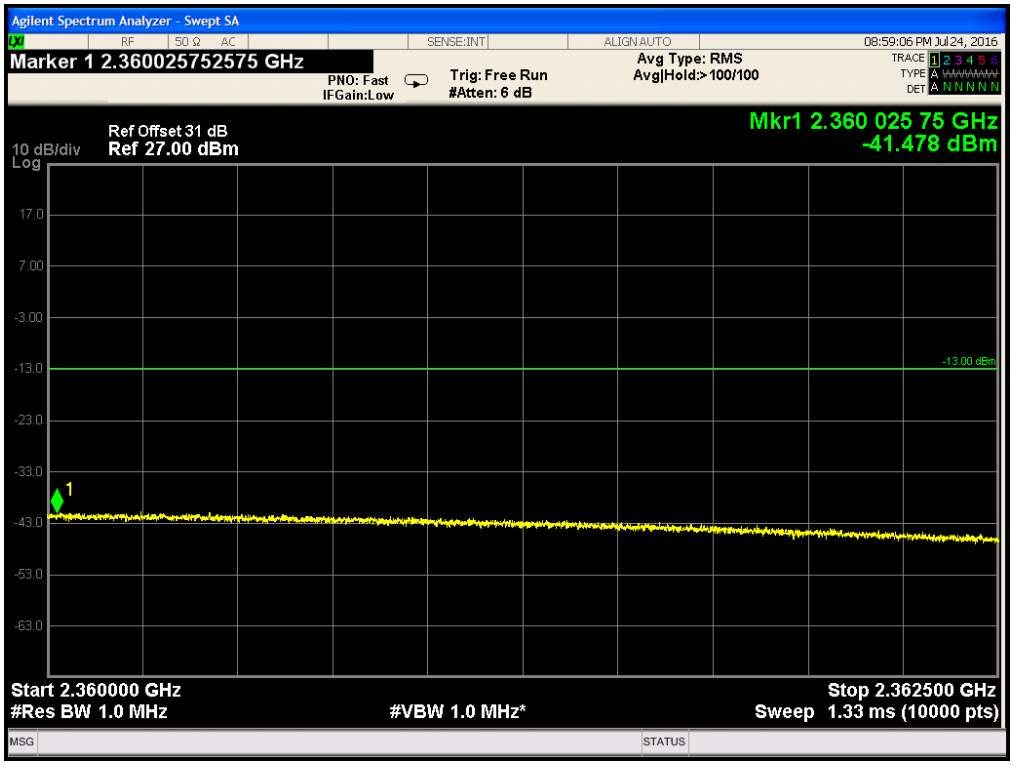


Figure 79 2.36GHz-2.3625GHz

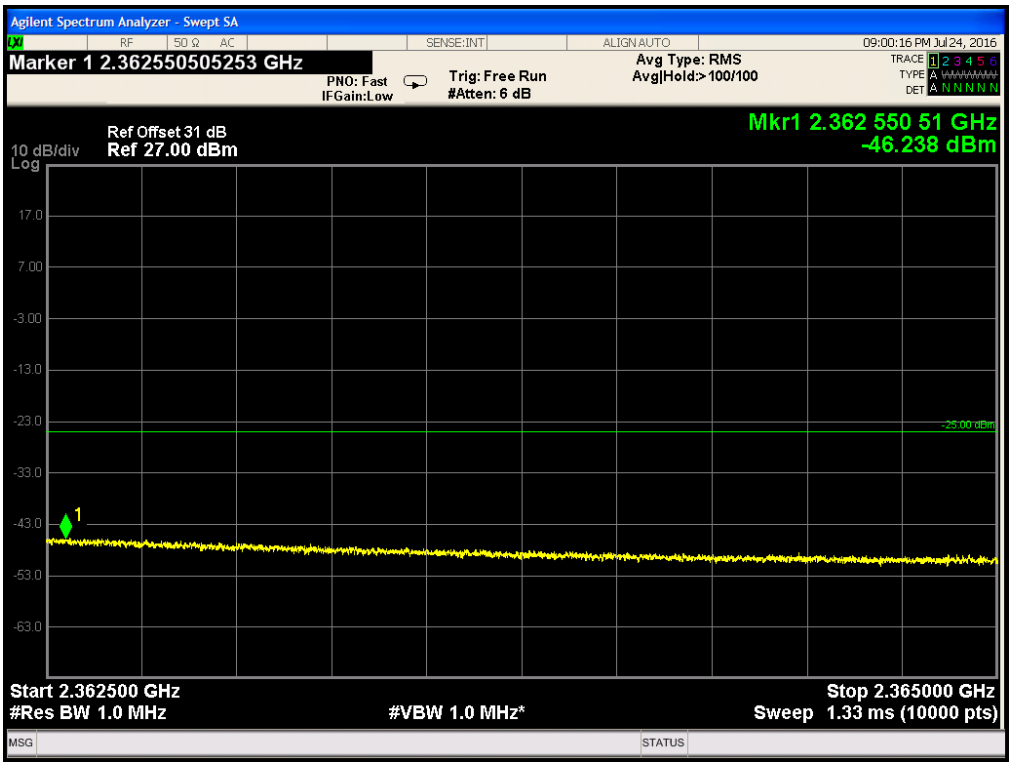


Figure 80 2.3625GHz-2365GHz

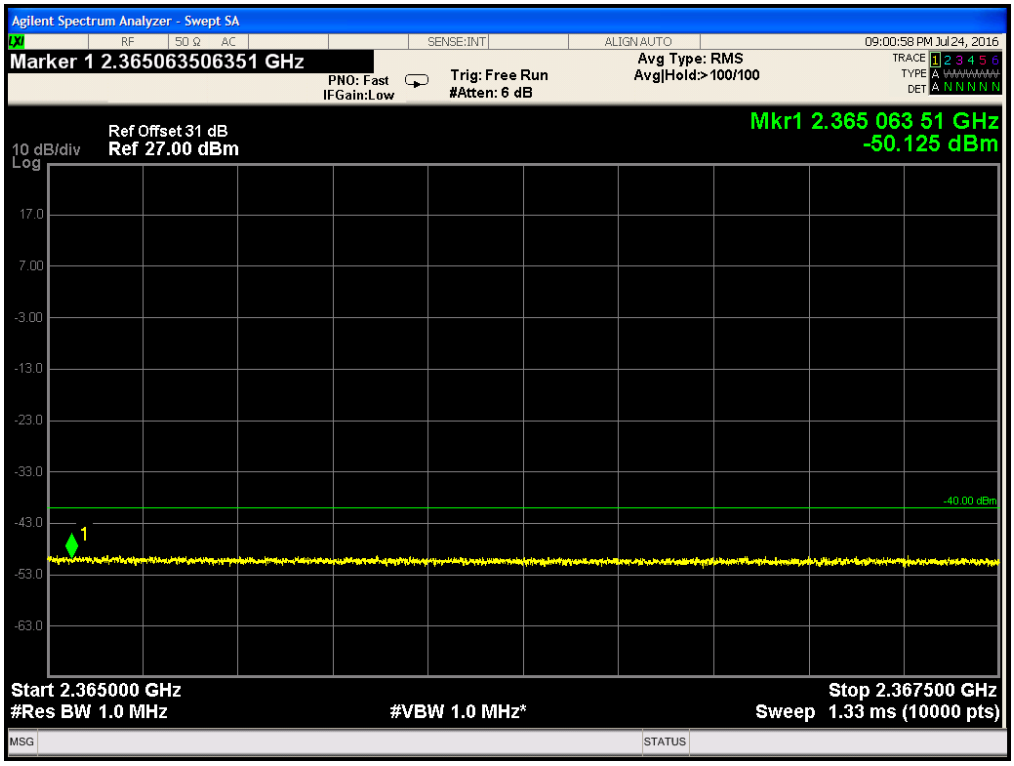


Figure 81 2.365GHz-2.3675GHz

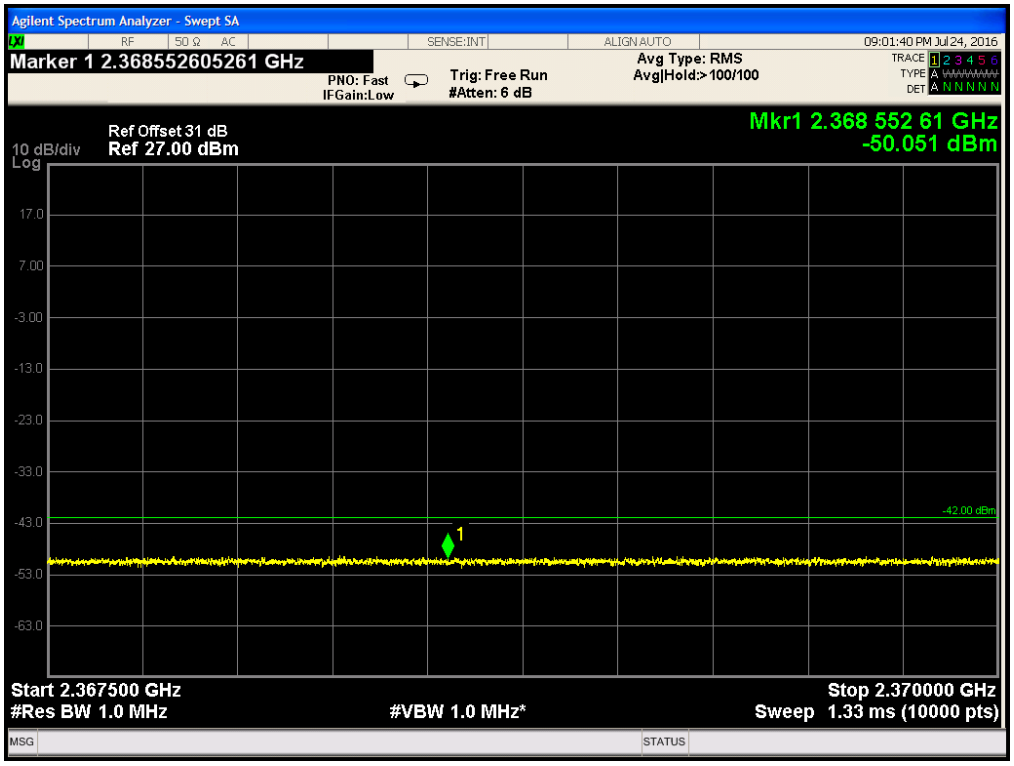


Figure 82 2.3675GHz-2.37GHz

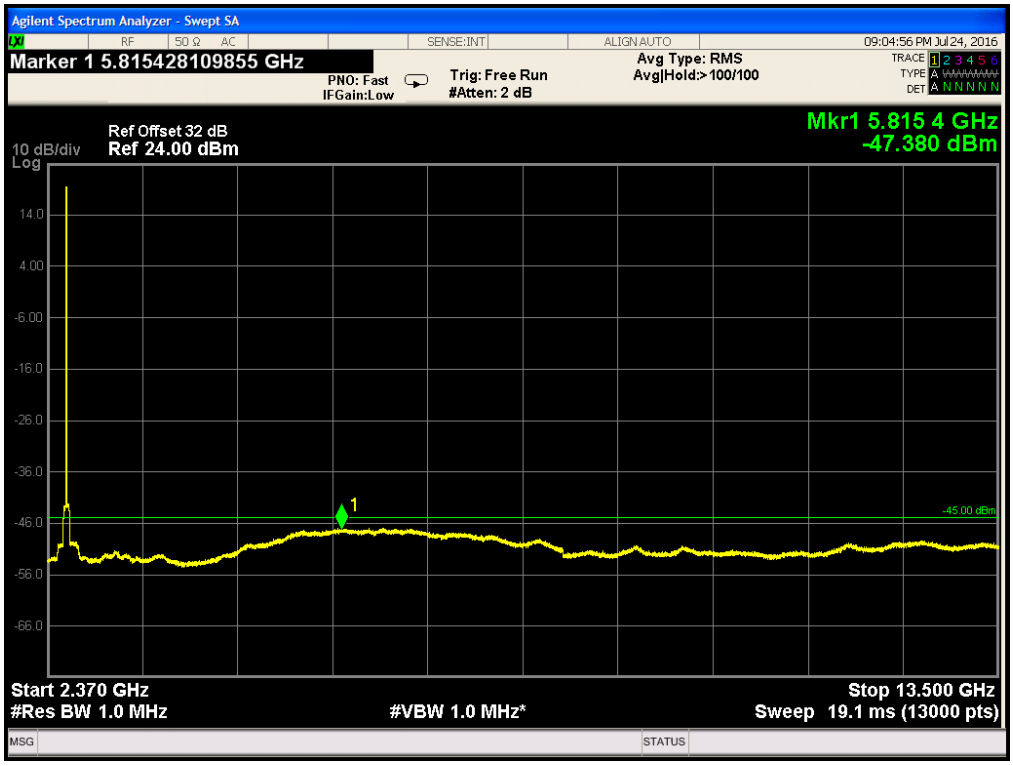


Figure 83 2.37GHz-13.5GHz

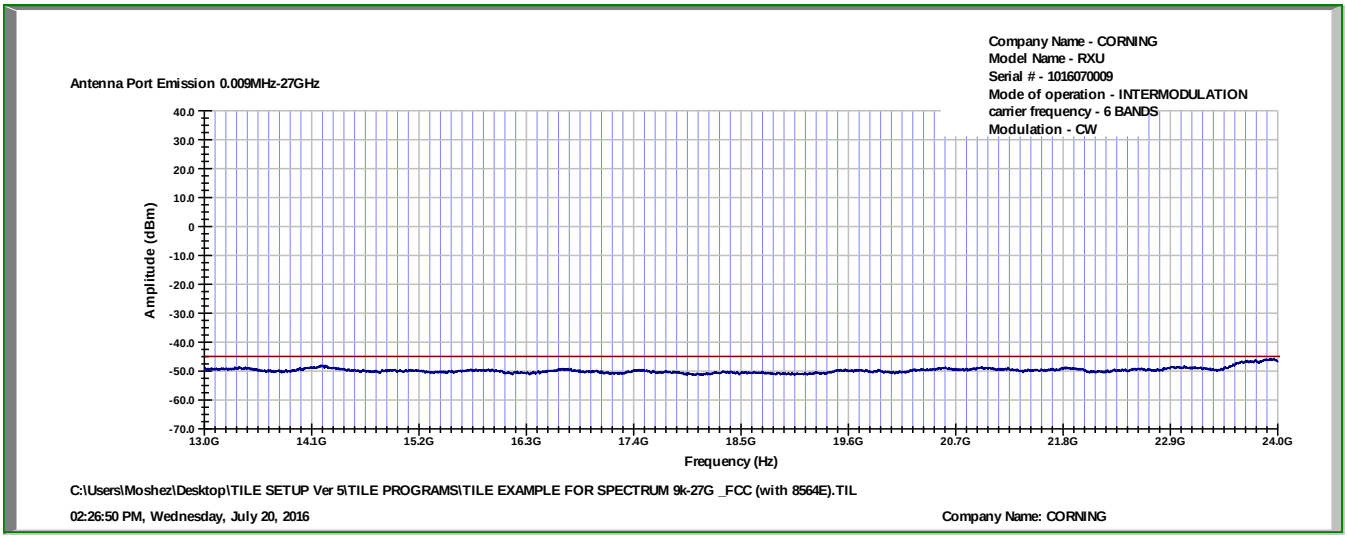


Figure 84 13GHz-24GHz

11.4 Test Equipment Used; Intermodulation Conducted

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
Spectrum Analyzer	HP	8564E	3442A00275	March 10, 2016	March 10, 2017
EXA Signal Analyzer	Agilent	N9010A	MY52221237	February 12, 2015	February 12, 2017
EXG Vector Signal Generator	Agilent	N5172B	TE4384	July 1, 2016	July 1, 2017
EXG Vector Signal Generator	Agilent	N5172B	MY513500584	July 1, 2016	July 1, 2017
30 dB Attenuator	MCL	BW-S30W5	533	July 5, 2016	July 5, 2017

Figure 85 Test Equipment Used

12. Intermodulation Radiated

12.1 Test Procedure

The test method was based on ANSI/TIA-603-D: 2010, Section 2.2.12 Unwanted Emissions: Radiated Spurious.

For measurements between 0.009MHz-30.0MHz:

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 0.009MHz-30MHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

For measurements between 30.0MHz-1.0GHz:

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.0 meters above the ground. The frequency range 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

For measurements between 1.0GHz-27.0GHz:

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 1.0GHz -27.0GHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator.
The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:

$P_d(dBm) = P_g(dBm) – Cable\ Loss\ (dB) + Substitution\ Antenna\ Gain\ (dBd)$

P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

A Peak detector was used for this test.

Testing was performed when the RF port was connected to 50 Ω termination.

The table below describe only results with the highest radiation.

2 input signals were sent simultaneously to the E.U.T. as follows:

WCS band: 2355.0MHz, 0 dBm

TDD 2.5G band: 2593.0MHz, 0 dBm

12.2 Test Limit

Frequency Band (MHz)	Calculated Factor (dBc)
f<2285.0	75+10*log(0.1)=65.0
2285.0MHz<f<2287.5MHz	72+10*log(0.1)=62.0
2287.5MHz<f<2300.0MHz	70+10*log(0.1)=60.0
2300.0MHz<f<2305.0MHz	43+10*log(0.1)=33.0
2305.0MHz<f<2320.0MHz	43+10*log(0.1)=33.0
2320.0MHz<f<2345.0MHz	75+10*log(0.1)=65.0
2345.0MHz<f<2360.0MHz	43+10*log(0.1)=33.0
2360.0MHz<f<2362.50MHz	43+10*log(0.1)=33.0
2362.5MHz<f<2365.0MHz	55+10*log(0.1)=45.0
2365.0MHz<f<2367.5MHz	70+10*log(0.1)=60.0
2367.5MHz<f<2370.0MHz	72+10*log(0.1)=62.0
2370.0<f	75+10*log(0.1)=65.0

12.3 Test Results

Frequency	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Limit	Margin
(MHz)	(V/H)	(dBµV/m)	(dBm)	(dB)	(dBd)	(dBm)	(dBm)	(dB)
1403.0	V	38.4	-61.2	0.5	6.0	-55.7	-45.0	-10.7
1403.0	H	38.4	-61.1	0.5	6.0	-55.6	-45.0	-10.6
1641.0	V	38.5	-61.6	0.5	6.0	-56.1	-45.0	-11.1
1641.0	H	38.6	-60.6	0.5	6.0	-55.1	-45.0	-10.1
1879.0	V	39.0	-60.6	0.5	6.0	-55.1	-45.0	-10.1
1879.0	H	38.8	-60.4	0.5	6.0	-54.9	-45.0	-9.9
2117.0	V	39.3	-65.6	0.5	10.0	-56.1	-45.0	-11.1
2117.0	H	39.1	-60.8	0.5	7.0	-54.3	-45.0	-9.3
2831.0	V	40.4	-64.3	0.5	10.0	-54.8	-45.0	-9.8
2831.0	H	40.8	-63.5	0.5	10.0	-54.0	-45.0	-9.0
3069.0	V	42.5	-62.9	0.5	10.0	-53.4	-45.0	-8.4
3069.0	H	42.4	-61.5	0.5	10.0	-52.0	-45.0	-7.0
3307.0	V	45.6	-59.9	0.5	10.0	-50.4	-45.0	-5.4
3307.0	H	45.6	-58.5	0.5	10.0	-49.0	-45.0	-4.0
3545.0	V	47.3	-55.1	0.5	9.5	-46.1	-45.0	-1.1
3545.0	H	47.4	-55.7	0.5	9.5	-46.7	-45.0	-1.7

Figure 86 Intermodulation Radiated Results

JUDGEMENT: Passed

12.4 Test Instrumentation Used; Radiated Measurements Intermodulation

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EMI Receiver	HP	85422E	3906A00276	March 3, 2016	March 3, 2017
RF Filter Section	HP	85420E	3705A00248	March 3, 2016	March 3, 2017
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Spectrum Analyzer	HP	8593EM	3536A00120ADI	March 10, 2016	March 10, 2017
Active Loop Antenna	EMCO	6502	9506-2950	November 5, 2015	November 30, 2016
Antenna Biconical	EMCO	3110B	9912-3337	March 24, 2016	March 24, 2018
Antenna Log Periodic	EMCO	3146	9505-4081	April 23, 2016	April 23, 2017
Horn Antenna 1G-18G	ETS	3115	29845	May 19, 2015	May 19, 2018
Horn Antenna 18G-26G	ARA	SWH-28	1007	March 30, 2014	September 30, 2016
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	March 1, 2015	September 30, 2016
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	March 1, 2015	September 30, 2016
ESG Vector Signal generator	Agilent	E4438C	MY45094064	July 1, 2016	July 1, 2017
Signal generator	Agilent	E4432B	GB40050998	July 1, 2016	July 1, 2017
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	N/A	N/A
Antenna Mast	ETS	2070-2	-	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 87 Test Equipment Used

13. Out-of-Band Rejection (WCS)

13.1 Test Specification

KDB 935210 D05 v01r01, Section 3.3

13.2 Test Procedure

(Temperature (22°C)/ Humidity (37%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max Loss= 41.5 dB).

The signal and spectrum analyzer frequency range was set to ±250% of the passband, Dwell time set to approximately 10msec.

RBW was set between 1% to 5% of the E.U.T passband and VBW set to ≥3*RBW.

13.3 Test Limit

N/A

13.4 Test Results

JUDGEMENT: Passed

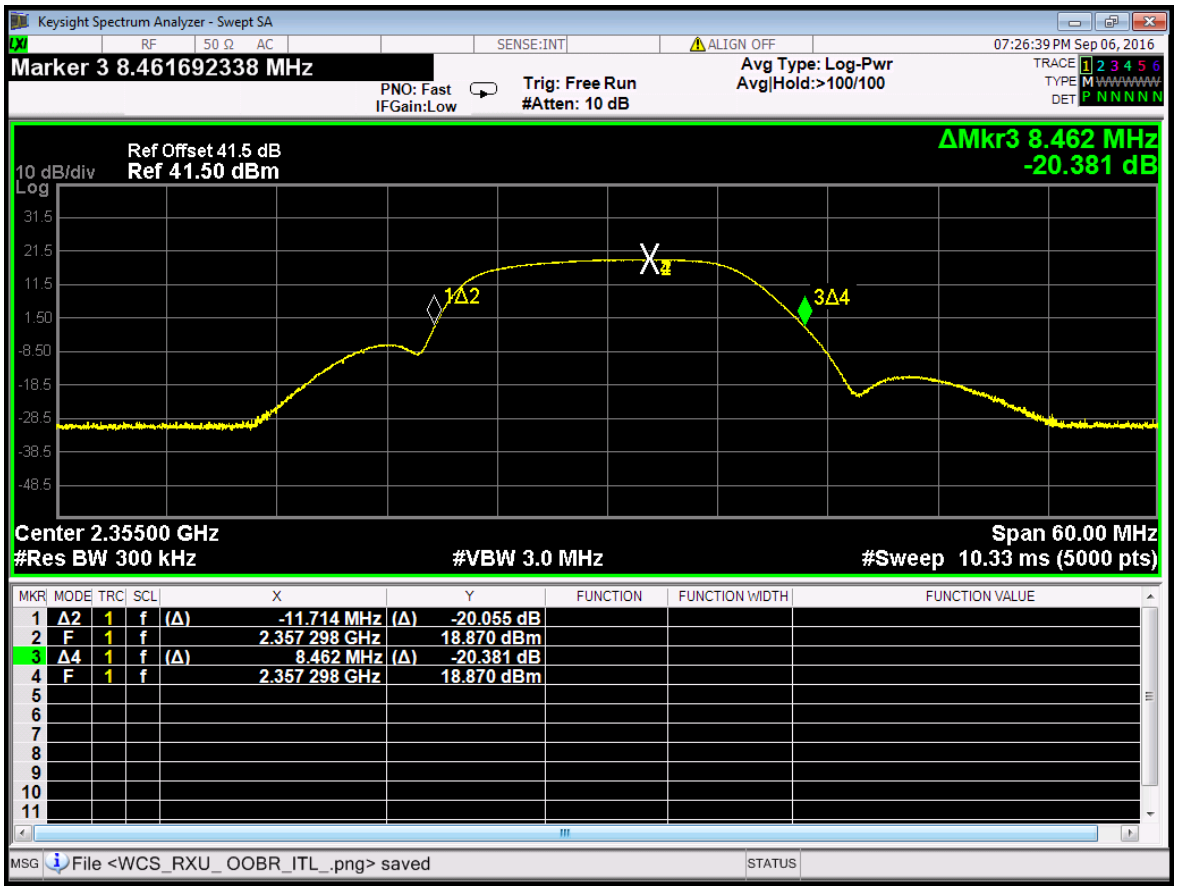


Figure 88. — Out-of-Band Rejection Plot

13.5 Test Equipment Used; Out-of-Band Rejection

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Date
EXA Spectrum Analyzer	Agilent	N9010A	MY49061070	July 21, 2016	July 21, 2017
EXG Vector Signal Generator	Agilent	N5172B	MY51350584	July 1, 2016	July 1, 2017
40 dB Attenuator	Weinschel	WA 39-40-33	A1323	April 3, 2016	April 3, 2017

Figure 89 Test Equipment Used

14. APPENDIX A - CORRECTION FACTORS

14.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

Frequency (MHz)	Cable Loss (dB)	Frequency (MHz)	Cable Loss (dB)
0.010	0.4	50.00	1.2
0.015	0.2	100.00	0.7
0.020	0.2	150.00	2.1
0.030	0.3	200.00	2.3
0.050	0.3	300.00	2.9
0.075	0.3	500.00	3.8
0.100	0.2	750.00	4.8
0.150	0.2	1000.00	5.4
0.200	0.3	1500.00	6.7
0.500	0.4	2000.00	9.0
1.00	0.4	2500.00	9.4
1.50	0.5	3000.00	9.9
2.00	0.5	3500.00	10.2
5.00	0.6	4000.00	11.2
10.00	0.8	4500.00	12.1
15.00	0.9	5000.00	13.1
20.00	0.8	5500.00	13.5
		6000.00	14.5

NOTES:

1. The cable type is SPUMA400 RF-11N(X2) and 39m long

2. The cable is manufactured by Huber + Suhner

14.2 Correction factors for RF Cable for Semi Anechoic Chamber

FREQ (MHz)	LOSS (dB)
1000.0	1.5
2000.0	2.1
3000.0	2.7
4000.0	3.1
5000.0	3.5
6000.0	4.1
7000.0	4.6
8000.0	4.9
9000.0	5.7
10000.0	5.7
11000.0	6.1
12000.0	6.1
13000.0	6.2
14000.0	6.7
15000.0	7.4
16000.0	7.5
17000.0	7.9
18000.0	8.1
19000.0	8.8
20000.0	9.1

14.3 Correction factors for Horn ANTENNA

Model: 3115
Antenna serial number: 29845
10 meter range

FREQUENCY (MHz)	AFE (dB/m)	FREQUENCY (MHz)	AFE (dB/m)
1000	22.4	10000	36.1
2000	25.2	11000	37.0
3000	31.1	12000	41.3
4000	30.2	13000	38.1
5000	34.2	14000	41.7
6000	31.6	15000	39.0
7000	34.7	16000	38.8
8000	34.8	17000	43.2
9000	36.2	18000	43.7

14.4 Correction factors for Horn ANTENNA

Model: SWH-28
Antenna serial number: 1007
1 meter range

FREQUENCY (GHz)	AFE (dB/m)	Gain (dBi)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

14.5 Correction factors forACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dBs/m)	Electric Antenna Factor (dB/m)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	-42.3	9.2

14.6 Correction factors forBiconical Antenna EMCO Model 3110B serial 9912-3337

Frequency [MHz]	AF [dB/m]
30.0	14.18
35.0	13.95
40.0	12.84
45.0	11.23
50.0	11.10
60.0	10.39
70.0	9.34
80.0	9.02
90.0	9.31
100.0	8.95
120.0	11.53
140.0	12.20
160.0	12.56
180.0	13.49
200.0	15.27

14.7 Correction factors for Log Periodic Antenna EMCO Model 3146 serial 9505-4081

Frequency [MHz]	AF [dB/m]
200.0	11.47
250.0	12.06
300.0	14.77
400.0	15.77
500.0	18.01
600.0	18.84
700.0	20.93
800.0	21.27
900.0	22.44
1000.0	24.10