

Company: Kumu Networks

Test of: KU5B01LTE02-US

To: FCC Part 24E & IC RSS 133 Issue 6

Report No.: KUMU03-U4 Rev A



TEST REPORT
FROM
MiCOM Labs
opening wireless markets

Test of: Kumu Networks KU5B01LTE02-US

To: FCC Part 24E & IC RSS 133

Test Report Serial No.: KUMU03-U4 Rev A

This report supersedes: NONE

Applicant: Kumu Networks
960 Hamlin Court,
Sunnyvale California 94089
USA

Product Function: LTE Network Relay

Issue Date: 17th August 2017

This Test Report is Issued Under the Authority of:

MiCOM Labs, In c.
575 Boulder Court
Pleasanton California 94566 USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com



MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

Table of Contents

1. ACCREDITATION, LISTINGS & RECOGNITION	4
1.1. Testing Accreditation	4
1.2. Recognition	5
1.3. Product Certification	6
2. DOCUMENT HISTORY	7
3. TEST RESULT CERTIFICATE	8
4. REFERENCES AND MEASUREMENT UNCERTAINTY	9
4.1. References	9
4.2. Test and Uncertainty Procedure	10
5. PRODUCT DETAILS AND TEST CONFIGURATIONS	11
5.1. Technical Details	11
5.2. Scope Of Test Program	12
5.3. Equipment Model(s) and Serial Number(s)	16
5.4. Antenna Details	16
5.5. Cabling and I/O Ports	16
5.6. Test Configurations.....	16
5.7. Equipment Modifications	16
5.8. Deviations from the Test Standard	17
6. TEST SUMMARY	18
7. MEASUREMENT AND PRESENTATION OF TEST DATA	19
8. TEST EQUIPMENT CONFIGURATION(S)	20
8.1. Conducted Testing.....	20
8.2. Radiated Emissions - 3m Chamber	23
9. TEST RESULTS	26
9.1. Conducted Output Power	26
9.2. Peak-to-average power ratio	31
Conducted Test Conditions for Peak-to-average power ratio	31
9.3. Frequency Stability	36
9.4. Emission Bandwidth	41
9.5. Out of Band Emissions	43
9.5.1 <i>Radiated Out of Band Emissions</i>	56
9.6. Receiver Spurious Emissions	57
10. PHOTOGRAPHS	59
10.1. Conducted	59
10.2. Radiated	60
APPENDIX	61
A.1. CONDUCTED TEST PLOTS	62
A.1.1. <i>Peak-to-average power ratio</i>	62
A.1.2. <i>Emissions Bandwidth</i>	86
A.1.3. <i>Out of Band Emissions</i>	92
A.1.4. <i>Radiated Spurious Out of Band Emissions</i>	126
A.1.5. <i>Radiated Receiver Emissions</i>	127

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. Testing Accreditation

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-01.pdf>



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

1.2. Recognition

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication) VCCI	CAB	APEC MRA 2	RCB 210
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

EU MRA – European Union Mutual Recognition Agreement.

NB – Notified Body

APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement. Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing

Phase II – recognition for both product testing and certification

1.3. Product Certification

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-02.pdf>



United States of America – Telecommunication Certification Body (TCB)

Industry Canada – Certification Body, CAB Identifier – US0159

Europe – Notified Body (NB), NB Identifier - 2280

Japan – Recognized Certification Body (RCB), RCB Identifier - 210

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	1st August 2017	Draft report for client review.
Rev A	17 th August 2017	Initial release

In the above table the latest report revision will replace all earlier versions.

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 8 of 128

3. TEST RESULT CERTIFICATE

Manufacturer: Kumu Networks
960 Hamlin Court
Sunnyvale California 94089
USA

Tested By: MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
USA

Model: KU5B01LTE02-US

Telephone: +1 925 462 0304

Type Of Equipment: LTE Network Relay

Fax: +1 925 462 0306

S/N's: RG5-2-R009-D015-U013-B22B10

Test Date(s): 17th March – 18th July 2017

Website: www.micomlabs.com

STANDARD(S)

FCC Part 24E & IC RSS-133 Issue 6

TEST RESULTS

EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:



TESTING CERT #2381.01

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. References

REF.	PUBLICATION	YEAR	TITLE
I	FCC Part 24E	June 24, 1994	Subpart E—Broadband PCS; This subpart sets out the regulations governing the licensing and operations of personal communications services authorized in the 1850-1910 and 1930-1990 MHz bands.
II	RSS-133 Issue 6	January 2013	RSS-133 2GHz Personal Communications Services. This Radio Standards Specification (RSS) sets out the requirements for certification of transmitters and receivers used in radiocommunications systems to provide Personal Communications Services (PCS) in the bands 1850-1915 MHz and 1930-1995 MHz.
III	KDB 412172 D01	August 7, 2015	EIRP and ERP are similarly defined as the product of the power supplied to the antenna and the antenna gain (when the power and gain are represented in linear terms). The primary difference is that for ERP the antenna gain is expressed relative to an ideal half-wave dipole antenna, whereas with EIRP the antenna gain is expressed relative to an ideal (theoretical) isotropic antenna. EIRP and ERP can be expressed mathematically as described in the following sections. ¹
IV	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
V	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
VI	A2LA	June 2015	R105 - Requirement's When Making Reference to A2LA Accreditation Status

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Kumu Networks KU5B01LTE02-US Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE) for compliance to the requirements of FCC Part 24E & IC RSS-133 Issue 6.
Applicant:	Kumu Networks 960 Hamlin Court, Sunnyvale, California 94089 USA
Manufacturer:	As Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court, Pleasanton California 94566 USA
Test report reference number:	KUMU03- U4 Rev A
Date EUT received:	29 th December 2016
Standard(s) applied:	FCC PART 24E & IC RSS 133 ISSUE 6
Dates of test (from - to):	17 th March – 18 th July 2017
No of Units Tested:	1
Type of Equipment:	LTE Network Relay
Product Code:	Relay Gen 5B
Product Family Name:	Self Backhaul UE Relay
Location for use:	Outdoor
Declared Frequency Band(s):	LTE Band 2
Primary function of equipment:	LTE Self Backhaul/Relay
Secondary function of equipment:	None Provided
Type of Modulation:	QPSK, QAM
EUT Modes of Operation:	Uplink (Tx): QPSK, 16QAM Downlink (Rx): QPSK, 16QAM, 64QAM
Average Output Power:	+24 dBm
Transmit/Receive Operation:	Transceiver - Half Duplex
Rated Input Voltage and Current:	AC Nominal 230Vac, 1.25 A Maximum: 264 Vac Minimum: 90 Vac
Operating Temperature Range:	Declared Range -40°C to +85°C
Equipment Dimensions:	(HxWxD)10.25 in X 20 in X 6.25 in
Weight:	30 lbs
Hardware PN/Rev:	810-000005-1
Software Version:	Release 5
Firmware Version:	Release 6
Antenna Configuration:	2 backhaul and 2 eNode B access antennas specified and provided by the service provider

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

5.2. Scope Of Test Program

Kumu Networks KU5B01LTE02-US

The scope of the test program was to test the Kumu Networks Self Backhaul UE Relay configurations in the specified frequency bands for compliance against the following IMT Cellular Network specification:

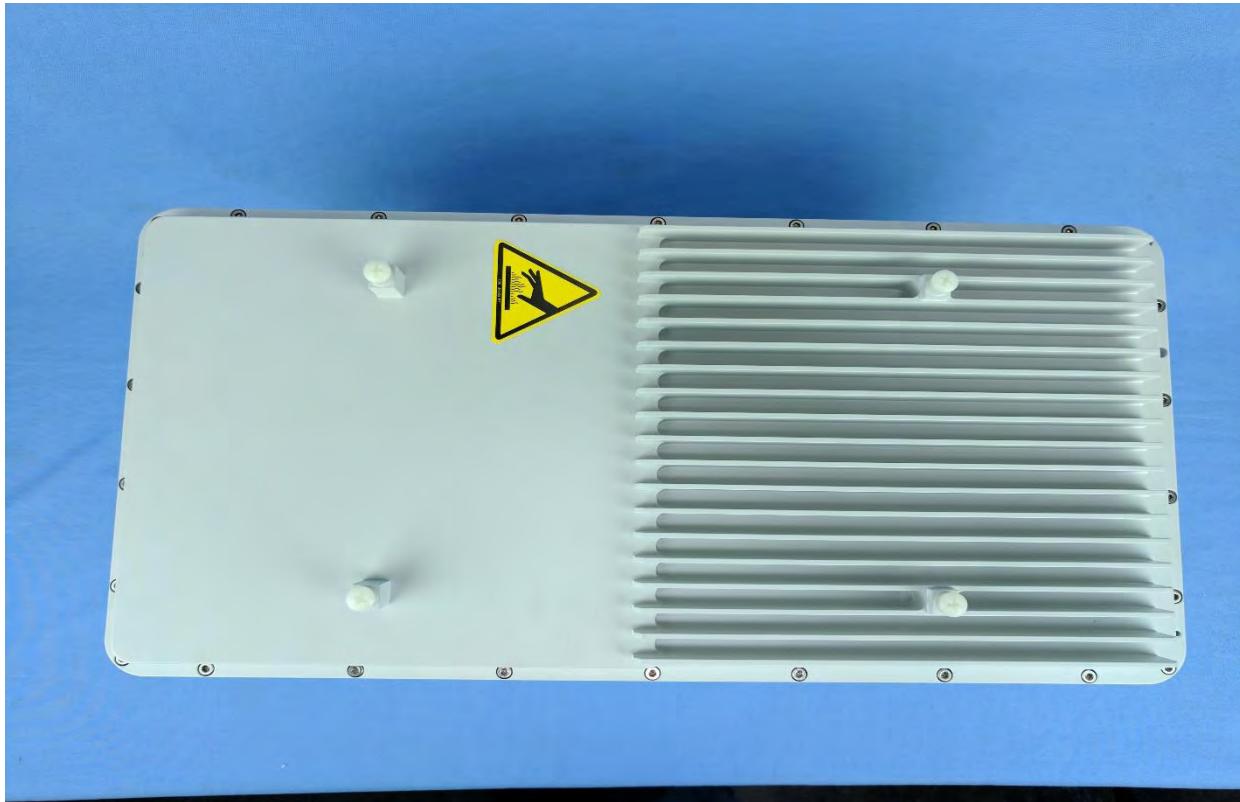
FCC PART 24 Subpart E – Broadband PCS

This subpart sets out the regulations governing the licensing and operations of personal communications services authorized in the 1850-1910 and 1930-1990 MHz bands.

Industry Canada RSS-133 Issue 6

This Radio Standards Specification (RSS) sets out the requirements for certification of transmitters and receivers used in radiocommunications systems to provide Personal Communications Services (PCS) in the bands 1850-1915 MHz and 1930-1995 MHz.

Kumu Networks Self Backhaul UE Relay



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Kumu Networks Self Backhaul UE Relay



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Kumu Networks Self Backhaul UE Relay



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Kumu Networks Self Backhaul UE Relay



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

5.3. Equipment Model(s) and Serial Number(s)

Type	Description	Manu.	Model	Serial no.	Delivery Date
EUT	LTE Self Backhaul/Relay	Kumu Networks	KU5B01LTE02-US	RG5-2-R009-D015-U013-B22B10	29 th Dec 2016
Support Equipment	Laptop	Lenovo	W520	--	--

*Replacement unit required

5.4. Antenna Details

Antenna Configuration: 2 backhaul and 2 eNode B access antennas specified and provided by the service provider.

5.5. Cabling and I/O Ports

Port Type	Max Cable Length	# Of Ports	Screened	Conn Type	Data Type
Ethernet	12ft	1	Y	RJ-45	Packet Data
Ethernet (Maintenance Port)	--	1	Y	RJ-45	Packet Data

5.6. Test Configurations

The KU5B01LTE02-US was tested in QPSK and 16 QAM modes

Results for the following configurations are provided in this report:

LTE Band No.	Bandwidth (MHz)	Channels No.'s	Frequencies (MHz)
2	5	18625, 18900, 19175	1852.5, 1880.0, 1907.5
	10	18650, 18900, 19150	1855.0, 1880.0, 1905.0
	15	18675, 18900, 19125	1857.5, 1880.0, 1902.5
	20	18700, 18900, 19100	1860.0, 1880.0, 1900.0

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

6. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link
Transmitter Test Parameters		
Output Power	Complies	View Data
Peak-to-average power ratio	Complies	View Data
Frequency Stability	Complies	View Data
Emission Bandwidth	Complies	View Data
Out of Band Emissions	Complies	View Data
Receiver Spurious Emissions	Complies	View Data

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

7. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical plots to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by [MiTest](#). [MiTest](#) is an automated test system developed by MiCOM Labs. [MiTest](#) is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.



The MiCOM Labs "[MiTest](#)" Automated Test System" (Patent Pending)

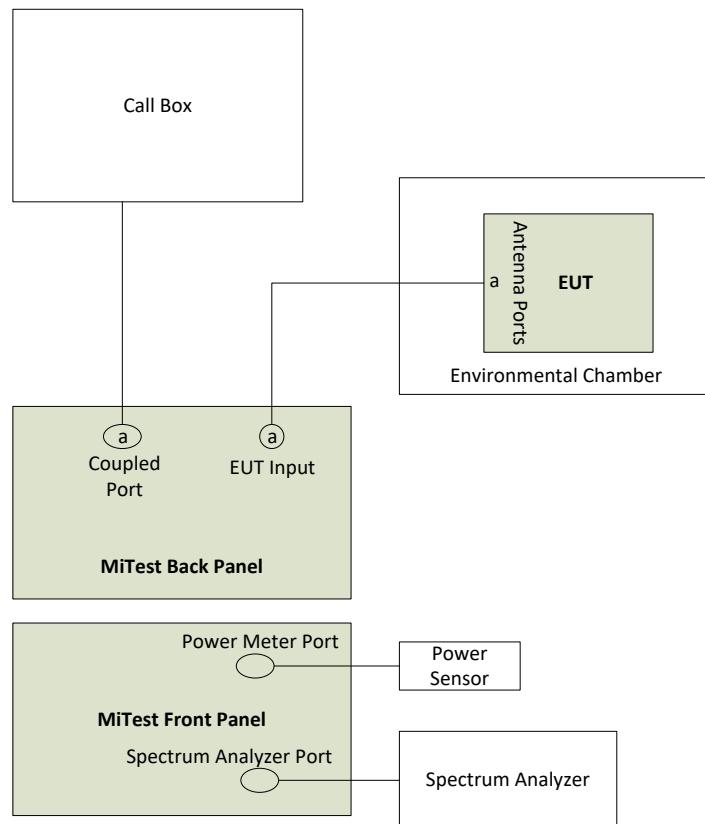
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

8. TEST EQUIPMENT CONFIGURATION(S)

8.1. Conducted Testing

Conducted Test Set-up(s)

All transmitter conducted testing and Receiver Spurious Emissions testing was performed using the test setup below;



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
127	Power Supply	HP	6674A	US36370530	Cal when used
158	Barometer/Thermometer	Control Company	4196	E2846	30 Nov 2017
248	Resistance Thermometer	Thermotronics	GR2105-02	9340 #1	21 Oct 2017
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	2 May 2018
376	USB 10MHz - 18GHz Average Power Sensor	Agilent	U2000A	MY51440005	23 Oct 2017
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	4 Nov 2017
381	4x4 RF Switch Box	MiCOM Labs	MiTest RF Switch Box	MIC002	2 Oct 2017
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.1	Not Required
419	Laptop with Labview Software	Lenova	W520	TS02	Not Required
420	USB to GPIB Interface	National Instruments	GPIB-USB HS	1346738	Not Required
440	USB Wideband Power Sensor	Boonton	55006	9178	25 Sep 2017
442	USB Wideband Power Sensor	Boonton	55006	9181	6 Oct 2017
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
460	Dell Computer with installation of MiTest executable.	Dell	Optiplex330	BC944G1	Not Required
493	USB Wideband Power Sensor	Boonton	55006	9634	10 Mar 2018
494	USB Wideband Power Sensor	Boonton	55006	9726	10 Mar 2018
74	Environmental Chamber Chamber 3	Tenney	TTC	12808-1	29 Sep 2017
RF#2 GPIB#1	GPIB cable to Power Supply	HP	GPIB	None	Not Required
RF#2 SMA#1	EUT to Mitest box port 1	Flexco	SMA Cable port1	None	2 Oct 2017
RF#2 SMA#2	EUT to Mitest box port 2	Flexco	SMA Cable port2	None	2 Oct 2017
RF#2 SMA#3	EUT to Mitest box port 3	Flexco	SMA Cable port3	None	2 Oct 2017
RF#2	EUT to Mitest box port 4	Flexco	SMA Cable	None	2 Oct 2017

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



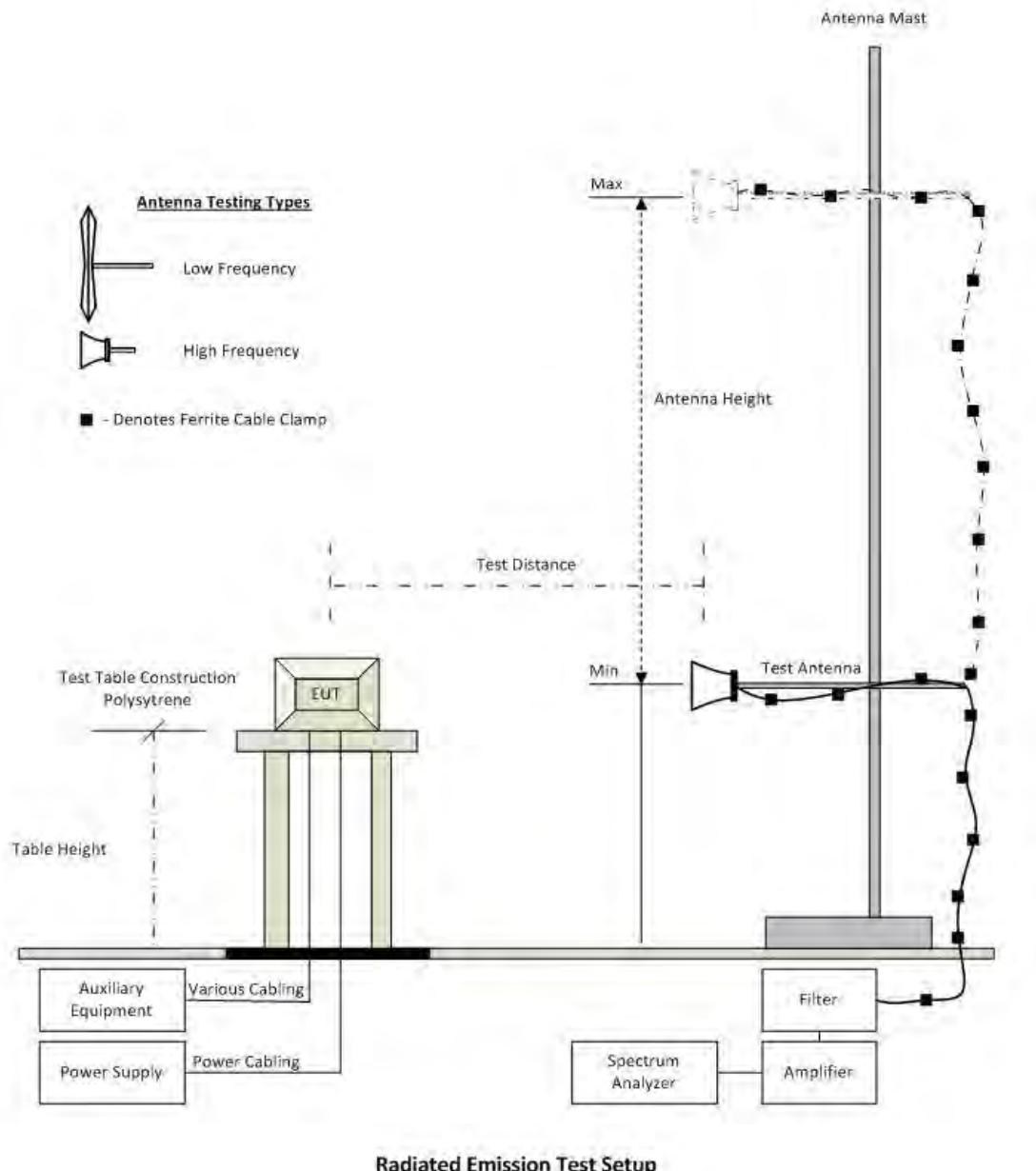
Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 22 of 128

SMA#4			port4		
RF#2 SMA#SA	Mitest box to SA	Flexco	SMA Cable SA	None	2 Oct 2017
RF#2 USB#1	USB Cable to Mitest Box	Dynex	USB Cable	None	Not Required

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

8.2. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below. Radiated emissions below 1GHz; and Radiated Emissions above 1GHz.



A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 24 of 128

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Termometer	Control Company	4196	E2846	30 Nov 2017
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	2 May 2018
330	Variac 0-280 Vac	Staco Energy Co	3PN1020B	0546	Cal when used
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	30 Oct 2017
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	26 Oct 2017
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	4 Nov 2017
393	DC - 1050 MHz Low Pass Filter	Microcircuits	VLFX-1050	N/A	30 Oct 2017
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	30 Oct 2017
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	9 Oct 2017
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	10 Oct 2017
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	9 Oct 2017
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	30 Oct 2017
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	30 Oct 2017
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	30 Oct 2017

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 25 of 128

480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	30 Oct 2017
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	30 Oct 2017
482	Cable - Amp to Antenna	SRC Haverhill	157-3051574	482	30 Oct 2017
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
VLF-1700	Low pass filter DC-1700 MHz	Mini Circuits	VLF-1700	None	30 Oct 2017

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

9. TEST RESULTS

9.1. Conducted Output Power

Conducted Test Conditions for Output Power			
Standard:	FCC Part 24E & IC RSS-133	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Output Power	Rel. Humidity (%):	32 - 45
Standard Section(s):	FCC 24E: 24.232 (c) RSS-133: 6.4	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Output Power
With reference to the test configuration identified in Section 8.1 Conducted Test Setup the EUT was set to transmit on the appropriate centre frequency of the selected frequency band and bandwidth. Output Power was measured on each of the active chain(s) (antenna outputs) using a power sensor connected to each antenna terminal.

Testing was performed under ambient conditions.

Limits Output Power

FCC 24E: (c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

RSS-133: 6.4 Transmitter Output Power and Equivalent Isotropically Radiated Power The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 27 of 128

Equipment Configuration for Output Power

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
5	18625	1852.5	0	1	24.20	24.20	22.05	33.0	-8.8
			0	8	23.91	23.91	21.76	33.0	-9.1
			0	25	23.71	23.71	21.56	33.0	-9.3
	18900	1880	0	1	23.63	23.63	21.48	33.0	-9.4
			0	8	23.44	23.44	21.29	33.0	-9.6
			0	25	22.86	22.86	20.71	33.0	-10.1
	19175	1907.5	0	1	23.08	23.08	20.93	33.0	-9.9
			0	8	21.78	21.78	19.63	33.0	-11.2
			0	25	22.07	22.07	19.92	33.0	-10.9

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
10	18650	1855	0	1	24.69	24.69	22.54	33.0	-8.3
			0	12	23.63	23.63	21.48	33.0	-9.4
			0	50	23.50	23.50	21.35	33.0	-9.5
	18900	1880	0	1	23.89	23.89	21.74	33.0	-9.1
			0	12	23.70	23.70	21.55	33.0	-9.3
			0	50	22.73	22.73	20.58	33.0	-10.3
	19150	1905	0	1	23.33	23.33	21.18	33.0	-9.7
			0	12	22.99	22.99	20.84	33.0	-10.0
			0	50	22.44	22.44	20.29	33.0	-10.6

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 28 of 128

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
15	18675	1857.5	0	1	24.15	24.15	22.00	33.0	-8.9
			0	16	23.77	23.77	21.62	33.0	-9.2
			0	75	22.86	22.86	20.71	33.0	-10.1
	18900	1880	0	1	24.67	24.67	22.52	33.0	-8.3
			0	16	23.66	23.66	21.51	33.0	-9.3
			0	75	23.55	23.55	21.40	33.0	-9.5
	19125	1902.5	0	1	23.90	23.90	21.75	33.0	-9.1
			0	16	22.81	22.81	20.66	33.0	-10.2
			0	75	22.15	22.15	20.00	33.0	-10.9

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
20	18700	1860	0	1	24.10	24.10	21.95	33.0	-8.9
			0	18	23.57	23.57	21.42	33.0	-9.4
			0	100	23.56	23.56	21.41	33.0	-9.4
	18900	1880	0	1	24.49	24.49	22.34	33.0	-8.5
			0	18	24.18	24.18	22.03	33.0	-8.8
			0	100	23.14	23.14	20.99	33.0	-9.9
	19100	1900	0	1	23.03	23.03	20.88	33.0	-10.0
			0	18	22.46	22.46	20.31	33.0	-10.5
			0	100	23.86	23.86	21.71	33.0	-9.1

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	1.33 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 29 of 128

Equipment Configuration for Output Power

Band:	2	Duty Cycle (%):	99.00
Modulation:	16 QAM	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
5	18625	1852.5	0	1	23.40	23.40	21.25	33.0	-9.6
			0	8	22.91	22.91	20.76	33.0	-10.1
			0	25	22.97	22.97	20.82	33.0	-10.0
	18900	1880	0	1	23.29	23.29	21.14	33.0	-9.7
			0	8	23.03	23.03	20.88	33.0	-10.0
			0	25	22.66	22.66	20.51	33.0	-10.3
	19175	1907.5	0	1	21.24	21.24	19.09	33.0	-11.8
			0	8	22.24	22.24	20.09	33.0	-10.8
			0	25	21.76	21.76	19.61	33.0	-11.2

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
10	18650	1855	0	1	23.69	23.69	21.54	33.0	-9.3
			0	12	23.51	23.51	21.36	33.0	-9.5
			0	50	23.94	23.94	21.79	33.0	-9.1
	18900	1880	0	1	23.72	23.72	21.57	33.0	-9.3
			0	12	23.71	23.71	21.56	33.0	-9.3
			0	50	22.88	22.88	20.73	33.0	-10.1
	19150	1905	0	1	23.05	23.05	20.90	33.0	-10.0
			0	12	22.81	22.81	20.66	33.0	-10.2
			0	50	21.76	21.76	19.61	33.0	-11.2

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 30 of 128

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
15	18675	1857.5	0	1	22.79	22.79	20.64	33.0	-10.2
			0	16	22.69	22.69	20.54	33.0	-10.3
			0	75	22.45	22.45	20.30	33.0	-10.6
	18900	1880	0	1	23.33	23.33	21.18	33.0	-9.7
			0	16	23.05	23.05	20.90	33.0	-10.0
			0	75	22.50	22.50	20.35	33.0	-10.5
	19125	1902.5	0	1	22.56	22.56	20.41	33.0	-10.4
			0	16	22.63	22.63	20.48	33.0	-10.4
			0	75	21.62	21.62	19.47	33.0	-11.4

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	O/P Power (dBm)	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
20	18700	1860	0	1	22.88	22.88	20.73	33.0	-10.1
			0	18	22.95	22.95	20.80	33.0	-10.1
			0	100	23.19	23.19	21.04	33.0	-9.8
	18900	1880	0	1	23.33	23.33	21.18	33.0	-9.7
			0	18	22.80	22.80	20.65	33.0	-10.2
			0	100	22.16	22.16	20.01	33.0	-10.8
	19100	1900	0	1	22.39	22.39	20.24	33.0	-10.6
			0	18	21.51	21.51	19.36	33.0	-11.5
			0	100	21.97	21.97	19.82	33.0	-11.0

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	1.33 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

9.2. Peak-to-average power ratio

Conducted Test Conditions for Peak-to-average power ratio			
Standard:	FCC Part 24E & IC RSS-133	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Peak-to-average power ratio	Rel. Humidity (%):	32 - 45
Standard Section(s):	FCC 24E: 24.232 (d) RSS-133: 6.4	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Peak-to-average power ratio
With reference to the test configuration identified in Section 8.1 Conducted Test Setup the EUT was set to transmit on the appropriate centre frequency of the selected frequency band and bandwidth.

Testing was performed under ambient conditions.

Limits Peak-to-average power ratio
FCC 24E (d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

RSS-133: 6.4 In addition, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 32 of 128

Equipment Configuration for Peak-to-Average Power Ratio (PAPR)

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
5	18625	1852.5	0	1	1.64	13.0	-11.4
			0	8	1.68	13.0	-11.3
			0	25	2.82	13.0	-10.2
	18900	1880	0	1	2.70	13.0	-10.3
			0	8	2.70	13.0	-10.3
			0	25	3.58	13.0	-9.4
	19175	1907.5	0	1	3.25	13.0	-9.8
			0	8	3.28	13.0	-9.7
			0	25	3.79	13.0	-9.2

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
10	18650	1855	0	1	1.77	13.0	-11.2
			0	12	2.83	13.0	-10.2
			0	50	4.15	13.0	-8.9
	18900	1880	0	1	2.53	13.0	-10.5
			0	12	3.23	13.0	-9.8
			0	50	4.37	13.0	-8.6
	19150	1905	0	1	3.01	13.0	-10.0
			0	12	3.58	13.0	-9.4
			0	50	4.55	13.0	-8.5

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 33 of 128

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
15	18675	1857.5	0	1	3.82	13.0	-9.2
			0	16	5.89	13.0	-7.1
			0	75	5.59	13.0	-7.4
	18900	1880	0	1	3.63	13.0	-9.4
			0	16	5.85	13.0	-7.2
			0	75	5.53	13.0	-7.5
	19125	1902.5	0	1	3.78	13.0	-9.2
			0	16	5.90	13.0	-7.1
			0	75	5.56	13.0	-7.4

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
20	18700	1860	0	1	4.00	13.0	-9.0
			0	18	9.87	13.0	-3.1
			0	100	6.32	13.0	-6.7
	18900	1880	0	1	3.49	13.0	-9.5
			0	18	9.40	13.0	-3.6
			0	100	6.20	13.0	-6.8
	19100	1900	0	1	2.74	13.0	-10.3
			0	18	9.29	13.0	-3.7
			0	100	6.75	13.0	-6.3

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-01 MEASURING PEAK-TO-AVERAGE-POWER
Uncertainty:	1.33 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 34 of 128

Equipment Configuration for Peak-to-Average Power Ratio (PAPR)

Band:	2	Duty Cycle (%):	99.00
Modulation:	16 QAM	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
5	18625	1852.5	0	1	1.90	13.0	-11.1
			0	8	2.00	13.0	-11.0
			0	25	3.82	13.0	-9.2
	18900	1880	0	1	2.68	13.0	-10.3
			0	8	2.79	13.0	-10.2
			0	25	4.30	13.0	-8.7
	19175	1907.5	0	1	3.58	13.0	-9.4
			0	8	3.60	13.0	-9.4
			0	25	4.24	13.0	-8.8

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
10	18650	1855	0	1	8.39	13.0	-4.6
			0	12	8.42	13.0	-4.6
			0	50	8.42	13.0	-4.6
	18900	1880	0	1	3.80	13.0	-9.2
			0	12	4.70	13.0	-8.3
			0	50	8.51	13.0	-4.5
	19150	1905	0	1	3.64	13.0	-9.4
			0	12	4.04	13.0	-9.0
			0	50	5.53	13.0	-7.5

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 35 of 128

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
15	18675	1857.5	0	1	4.08	13.0	-8.9
			0	16	6.28	13.0	-6.7
			0	75	6.14	13.0	-6.9
	18900	1880	0	1	4.02	13.0	-9.0
			0	16	6.23	13.0	-6.8
			0	75	6.09	13.0	-6.9
	19125	1902.5	0	1	4.45	13.0	-8.6
			0	16	6.28	13.0	-6.7
			0	75	6.29	13.0	-6.7

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	PAPR (dB)	Limit (dB)	Margin (dB)
20	18700	1860	0	1	3.37	13.0	-9.6
			0	18	10.43	13.0	-2.6
			0	100	6.82	13.0	-6.2
	18900	1880	0	1	2.97	13.0	-10.0
			0	18	6.72	13.0	-6.3
			0	100	6.58	13.0	-6.4
	19100	1900	0	1	2.41	13.0	-10.6
			0	18	9.75	13.0	-3.3
			0	100	6.70	13.0	-6.3

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-01 MEASURING PEAK-TO-AVERAGE-POWER
Uncertainty:	1.33 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

9.3. Frequency Stability

Conducted Test Conditions for Frequency Stability			
Standard:	FCC Part 24E & IC RSS-133	Ambient Temp. (°C):	20.0 - 24.5
Test Heading:	Frequency Stability	Rel. Humidity (%):	32 - 45
Standard Section(s):	FCC 24E: 24.235 RSS-133: 6.3	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Frequency Stability

The center frequency is the center of the channel declared by the manufacturer as part of the declared channel plan(s). Centre

Testing was performed over environmental extremes of voltage and temperature and results reported are for a single antenna port. Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.

Limits Frequency Stability

FCC 24E: The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-133: The carrier frequency shall not depart from the reference frequency, in excess of ± 2.5 ppm for mobile stations and ± 1.0 ppm for base stations. In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 37 of 128

Equipment Configuration for Frequency Stability

Band:	2	Duty Cycle (%):	Not Applicable
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	Temperature C	Vac	Frequency Error		Limit	Margin
					kHz	ppm		
5	18625	1852.5	-30	110	2.1600	1.17E-03	2.5 to 2.5	-2.50
			-20	110	0.0160	8.64E-06	2.5 to 2.5	-2.50
			-10	110	0.0052	2.81E-06	2.5 to 2.5	-2.50
			0	110	0.0116	6.26E-06	2.5 to 2.5	-2.50
			10	110	0.0110	5.94E-06	2.5 to 2.5	-2.50
			20	93.5	0.0088	4.75E-06	2.5 to 2.5	-2.50
			20	126.5	0.0015	8.10E-07	2.5 to 2.5	-2.50
			30	110	0.0013	7.02E-07	2.5 to 2.5	-2.50
			40	110	0.0127	6.86E-06	2.5 to 2.5	-2.50
			50	110	0.0022	1.19E-06	2.5 to 2.5	-2.50

5	18900	1880	-30	110	1.1200	5.96E-04	2.5 to 2.5	-2.50
			-20	110	0.0048	2.55E-06	2.5 to 2.5	-2.50
			-10	110	0.0008	4.26E-07	2.5 to 2.5	-2.50
			0	110	0.0030	1.60E-06	2.5 to 2.5	-2.50
			10	110	0.0029	1.54E-06	2.5 to 2.5	-2.50
			20	93.5	0.0060	3.19E-06	2.5 to 2.5	-2.50
			20	126.5	0.0009	4.79E-07	2.5 to 2.5	-2.50
			30	110	0.0079	4.20E-06	2.5 to 2.5	-2.50
			40	110	0.0037	1.97E-06	2.5 to 2.5	-2.50
			50	110	0.0027	1.44E-06	2.5 to 2.5	-2.50

5	19175	1907.5	-30	110	0.0250	1.31E-05	2.5 to 2.5	-2.50
			-20	110	0.0064	3.36E-06	2.5 to 2.5	-2.50
			-10	110	0.0077	4.04E-06	2.5 to 2.5	-2.50
			0	110	0.0004	2.10E-07	2.5 to 2.5	-2.50
			10	110	0.0011	5.77E-07	2.5 to 2.5	-2.50
			20	93.5	0.0050	2.62E-06	2.5 to 2.5	-2.50
			20	126.5	0.0046	2.41E-06	2.5 to 2.5	-2.50
			30	110	0.0088	4.61E-06	2.5 to 2.5	-2.50
			40	110	0.0020	1.05E-06	2.5 to 2.5	-2.50
			50	110	0.0088	4.61E-06	2.5 to 2.5	-2.50

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-02 MEASURING FREQUENCY
Measurement Uncertainty:	±0.86 ppm

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 38 of 128

Equipment Configuration for Frequency Stability

Band:	2	Duty Cycle (%):	Not Applicable
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	Temperature C	Vac	Frequency Error		Limit	Margin
					kHz	ppm		
10	18650	1855	-30	110	0.0250	1.35E-05	2.5 to 2.5	-2.50
			-20	110	0.0085	4.58E-06	2.5 to 2.5	-2.50
			-10	110	0.1340	7.22E-05	2.5 to 2.5	-2.50
			0	110	0.0122	6.58E-06	2.5 to 2.5	-2.50
			10	110	0.0104	5.61E-06	2.5 to 2.5	-2.50
			20	93.5	0.0041	2.21E-06	2.5 to 2.5	-2.50
			20	126.5	0.0113	6.09E-06	2.5 to 2.5	-2.50
			30	110	0.0010	5.39E-07	2.5 to 2.5	-2.50
			40	110	0.0006	3.23E-07	2.5 to 2.5	-2.50
			50	110	0.0015	8.09E-07	2.5 to 2.5	-2.50

10	18900	1880	-30	110	0.1000	5.32E-05	2.5 to 2.5	-2.50
			-20	110	0.0060	3.19E-06	2.5 to 2.5	-2.50
			-10	110	0.0072	3.83E-06	2.5 to 2.5	-2.50
			0	110	0.0062	3.30E-06	2.5 to 2.5	-2.50
			10	110	0.0062	3.30E-06	2.5 to 2.5	-2.50
			20	93.5	0.0074	3.94E-06	2.5 to 2.5	-2.50
			20	126.5	0.0057	3.03E-06	2.5 to 2.5	-2.50
			30	110	0.0012	6.38E-07	2.5 to 2.5	-2.50
			40	110	0.0155	8.24E-06	2.5 to 2.5	-2.50
			50	110	0.0065	3.46E-06	2.5 to 2.5	-2.50

10	19150	1905	-30	110	0.0060	3.15E-06	2.5 to 2.5	-2.50
			-20	110	0.0060	3.15E-06	2.5 to 2.5	-2.50
			-10	110	0.0009	4.72E-07	2.5 to 2.5	-2.50
			0	110	0.0062	3.25E-06	2.5 to 2.5	-2.50
			10	110	0.0155	8.14E-06	2.5 to 2.5	-2.50
			20	93.5	0.0130	6.82E-06	2.5 to 2.5	-2.50
			20	126.5	0.0029	1.52E-06	2.5 to 2.5	-2.50
			30	110	0.0032	1.68E-06	2.5 to 2.5	-2.50
			40	110	0.0016	8.40E-07	2.5 to 2.5	-2.50
			50	110	0.0025	1.31E-06	2.5 to 2.5	-2.50

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-02 MEASURING FREQUENCY
Measurement Uncertainty:	±0.86 ppm

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 39 of 128

Equipment Configuration for Frequency Stability

Band:	2	Duty Cycle (%):	Not Applicable
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	Temperature C	Vac	Frequency Error		Limit	Margin
					kHz	ppm		
15	18675	1857.5	-30	110	0.0440	2.37E-05	2.5 to 2.5	-2.50
			-20	110	0.0780	4.20E-05	2.5 to 2.5	-2.50
			-10	110	0.0061	3.28E-06	2.5 to 2.5	-2.50
			0	110	0.0057	3.07E-06	2.5 to 2.5	-2.50
			10	110	0.0090	4.85E-06	2.5 to 2.5	-2.50
			20	93.5	0.0057	3.07E-06	2.5 to 2.5	-2.50
			20	126.5	0.0042	2.26E-06	2.5 to 2.5	-2.50
			30	110	0.0033	1.78E-06	2.5 to 2.5	-2.50
			40	110	0.0014	7.54E-07	2.5 to 2.5	-2.50
			50	110	0.0057	3.07E-06	2.5 to 2.5	-2.50

15	18900	1880	-30	110	0.0142	7.55E-06	2.5 to 2.5	-2.50
			-20	110	0.0120	6.38E-06	2.5 to 2.5	-2.50
			-10	110	0.0110	5.85E-06	2.5 to 2.5	-2.50
			0	110	0.0081	4.31E-06	2.5 to 2.5	-2.50
			10	110	0.0043	2.29E-06	2.5 to 2.5	-2.50
			20	93.5	0.0053	2.82E-06	2.5 to 2.5	-2.50
			20	126.5	0.0001	5.32E-08	2.5 to 2.5	-2.50
			30	110	0.0063	3.35E-06	2.5 to 2.5	-2.50
			40	110	0.0018	9.57E-07	2.5 to 2.5	-2.50
			50	110	0.0184	9.79E-06	2.5 to 2.5	-2.50

15	19125	1902.5	-30	110	0.0080	4.20E-06	2.5 to 2.5	-2.50
			-20	110	0.0111	5.83E-06	2.5 to 2.5	-2.50
			-10	110	0.0052	2.73E-06	2.5 to 2.5	-2.50
			0	110	0.0024	1.26E-06	2.5 to 2.5	-2.50
			10	110	0.0034	1.79E-06	2.5 to 2.5	-2.50
			20	93.5	0.0016	8.41E-07	2.5 to 2.5	-2.50
			20	126.5	0.0028	1.47E-06	2.5 to 2.5	-2.50
			30	110	0.0011	5.78E-07	2.5 to 2.5	-2.50
			40	110	0.0092	4.84E-06	2.5 to 2.5	-2.50
			50	110	0.0009	4.73E-07	2.5 to 2.5	-2.50

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-02 MEASURING FREQUENCY
Measurement Uncertainty:	±0.86 ppm

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 40 of 128

Equipment Configuration for Frequency Stability

Band:	2	Duty Cycle (%):	Not Applicable
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	Temperature C	Vac	Frequency Error		Limit	Margin
					kHz	ppm		
20	18700	1860	-30	110	0.0190	1.02E-05	2.5 to 2.5	-2.50
			-20	110	0.0043	2.31E-06	2.5 to 2.5	-2.50
			-10	110	0.0112	6.02E-06	2.5 to 2.5	-2.50
			0	110	0.0075	4.03E-06	2.5 to 2.5	-2.50
			10	110	0.0046	2.47E-06	2.5 to 2.5	-2.50
			20	93.5	0.0196	1.05E-05	2.5 to 2.5	-2.50
			20	126.5	0.0080	4.30E-06	2.5 to 2.5	-2.50
			30	110	0.0119	6.40E-06	2.5 to 2.5	-2.50
			40	110	0.0130	6.99E-06	2.5 to 2.5	-2.50
			50	110	0.0037	1.99E-06	2.5 to 2.5	-2.50

20	18900	1880	-30	110	0.0110	5.85E-06	2.5 to 2.5	-2.50
			-20	110	0.0050	2.66E-06	2.5 to 2.5	-2.50
			-10	110	0.0028	1.49E-06	2.5 to 2.5	-2.50
			0	110	0.0042	2.23E-06	2.5 to 2.5	-2.50
			10	110	0.0102	5.43E-06	2.5 to 2.5	-2.50
			20	93.5	0.0012	6.38E-07	2.5 to 2.5	-2.50
			20	126.5	0.0034	1.81E-06	2.5 to 2.5	-2.50
			30	110	0.0023	1.22E-06	2.5 to 2.5	-2.50
			40	110	0.0009	4.79E-07	2.5 to 2.5	-2.50
			50	110	0.0042	2.23E-06	2.5 to 2.5	-2.50

20	19100	1900	-30	110	0.0010	5.26E-07	2.5 to 2.5	-2.50
			-20	110	0.0760	4.00E-05	2.5 to 2.5	-2.50
			-10	110	0.0043	2.26E-06	2.5 to 2.5	-2.50
			0	110	0.0006	3.16E-07	2.5 to 2.5	-2.50
			10	110	0.0133	7.00E-06	2.5 to 2.5	-2.50
			20	93.5	0.0022	1.16E-06	2.5 to 2.5	-2.50
			20	126.5	0.0059	3.11E-06	2.5 to 2.5	-2.50
			30	110	0.0010	5.26E-07	2.5 to 2.5	-2.50
			40	110	0.0068	3.58E-06	2.5 to 2.5	-2.50
			50	110	0.0069	3.63E-06	2.5 to 2.5	-2.50

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-02 MEASURING FREQUENCY
Measurement Uncertainty:	±0.86 ppm

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

9.4. Emission Bandwidth

Conducted Test Conditions for Emission Bandwidth						
Standard:	FCC Part 24E & IC RSS-133	Ambient Temp. (°C):	20.0 - 24.5			
Test Heading:	Emission Bandwidth	Rel. Humidity (%):	32 - 45			
Standard Section(s):	FCC 24E: 24.238 (b) RSS-133:	Pressure (mBars):	999 - 1001			
Reference Document(s):	See Normative References					
Test Procedure for Emission Bandwidth Per the standard emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.						
Testing was performed under ambient conditions.						
Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document.						

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 42 of 128

Equipment Configuration for Emissions Bandwidth

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5	18625	1852.5	0	25	6.06	11.28
	18900	1880	0	25	4.55	9.82
	19175	1907.5	0	25	4.54	8.66

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
10	18650	1855	0	50	10.79	21.86
	18900	1880	0	50	9.13	19.04
	19150	1905	0	50	9.07	18.29

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
15	18675	1857.5	0	75	14.62	28.34
	18900	1880	0	75	13.61	25.11
	19125	1902.5	0	75	13.53	22.11

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
20	18700	1860	0	100	18.13	31.72
	18900	1880	0	100	18.03	31.59
	19100	1900	0	100	17.94	25.47

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

9.5. Out of Band Emissions

Conducted Test Conditions for Out of Band Emissions			
Standard:	FCC Part 24E & IC RSS-133	Ambient Temp. (°C):	20.0 - 24.5
Test Heading:	Frequency Stability	Rel. Humidity (%):	32 - 45
Standard Section(s):	FCC 24E: 24.238 a & b RSS-133: 6.5	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Out of Band Emissions

With reference to the test configuration identified in Section 8.1 Conducted Test Setup the EUT was set to transmit on the appropriate center frequency of the selected frequency band and bandwidth. Out of Band emissions was tested under QPSK.

Testing was performed under ambient conditions.

Limits Out of Band Emissions

FCC 24E: §24.238 Emission limitations for Broadband PCS equipment.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

RSS-133: (i) In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts). 2 GHz Personal Communications Services RSS-133 4

(ii) After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 44 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18625	1852.5	5	0	1	0.009 – 0.150	-13	-48.86	-35.86	Pass
			0	25	0.009 – 0.150	-13	-48.80	-35.80	Pass
			0	1	0.150 – 30.00	-13	-65.78	-52.78	Pass
			0	25	0.150 – 30.00	-13	-65.86	-52.86	Pass
			0	1	30.00 – 1000.00	-13	-64.70	-51.70	Pass
			0	25	30.00 – 1000.00	-13	64.72	77.72	Pass
			0	1	1000.00 – 1850.0	-13	20.29	33.29	-
			0	25	1000.00 – 1850.0	-13	15.02	28.02	-
			0	1	1849.00 - 18510.00	-13	-21.49	-8.49	Pass
			0	25	1849.00 - 18510.00	-13	-16.95	-3.95	Pass
			0	1	1910.00 – 26000.0	-13	-47.11	-34.11	Pass
			0	25	1910.00 – 26000.0	-13	-47.12	-34.12	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 45 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18900	1880	5	0	1	0.009 – 0.150	-13	-48.82	-35.82	Pass
			0	25	0.009 – 0.150	-13	-48.76	-35.76	Pass
			0	1	0.150 – 30.00	-13	-65.91	-52.91	Pass
			0	25	0.150 – 30.00	-13	-65.51	-52.51	Pass
			0	1	30.00 – 1000.00	-13	-64.71	-51.71	Pass
			0	25	30.00 – 1000.00	-13	64.75	77.75	Pass
			0	1	1000.00 – 1850.0	-13	-54.95	-41.95	Pass
			0	25	1000.00 – 1850.0	-13	-53.62	-40.62	Pass
			0	1	1910.00 – 26000.0	-13	-47.12	-34.12	Pass
			0	25	1910.00 – 26000.0	-13	-47.11	-34.11	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 46 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
19175	1907.5	5	0	1	0.009 – 0.150	-13	-48.88	-35.88	Pass
			0	25	0.009 – 0.150	-13	-48.84	-35.84	Pass
			0	1	0.150 – 30.00	-13	-65.30	-52.30	Pass
			0	25	0.150 – 30.00	-13	-65.10	-52.10	Pass
			0	1	30.00 – 1000.00	-13	-64.80	-51.80	Pass
			0	25	30.00 – 1000.00	-13	-64.80	-51.80	Pass
			0	1	1000.00 – 1850.0	-13	-54.98	-41.98	Pass
			0	25	1000.00 – 1850.0	-13	-55.08	-42.08	Pass
			0	1	1909.00 - 1911.00	-13	-61.72	-48.72	Pass
			0	25	1909.00 - 1911.00	-13	-19.86	-6.86	Pass
			0	1	1910.00 – 26000.0	-13	-47.10	-34.10	Pass
			0	25	1910.00 – 26000.0	-13	7.01	20.01	-

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 47 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18650	1855	10	0	1	0.009 – 0.150	-13	-48.73	-35.73	Pass
			0	50	0.009 – 0.150	-13	-48.90	-35.90	Pass
			0	1	0.150 – 30.00	-13	-64.40	-51.40	Pass
			0	50	0.150 – 30.00	-13	-65.59	-52.59	Pass
			0	1	30.00 – 1000.00	-13	-64.87	-51.87	Pass
			0	50	30.00 – 1000.00	-13	-64.65	-51.65	Pass
			0	1	1000.00 – 1850.0	-13	20.84	33.84	-
			0	50	1000.00 – 1850.0	-13	11.01	24.01	-
			0	1	1849.00 - 18510.00	-13	-29.65	-16.65	Pass
			0	50	1849.00 - 18510.00	-13	-17.77	-4.77	Pass
			0	1	1910.00 – 26000.0	-13	-47.12	-34.12	Pass
			0	50	1910.00 – 26000.0	-13	-47.12	-34.12	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 48 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18900	1880	10	0	1	0.009 – 0.150	-13	-48.80	-35.80	Pass
			0	50	0.009 – 0.150	-13	-48.76	-35.76	Pass
			0	1	0.150 – 30.00	-13	-64.82	-51.82	Pass
			0	50	0.150 – 30.00	-13	-65.86	-52.86	Pass
			0	1	30.00 – 1000.00	-13	-64.76	-51.76	Pass
			0	50	30.00 – 1000.00	-13	-64.65	-51.65	Pass
			0	1	1000.00 – 1850.0	-13	-54.85	-41.85	Pass
			0	50	1000.00 – 1850.0	-13	-44.32	-31.32	Pass
			0	1	1910.00 – 26000.0	-13	-47.06	-34.06	Pass
			0	50	1910.00 – 26000.0	-13	-47.12	-34.12	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 49 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
19150	1905	10	0	1	0.009 – 0.150	-13	-48.88	-35.88	Pass
			0	50	0.009 – 0.150	-13	-48.78	-35.78	Pass
			0	1	0.150 – 30.00	-13	-65.95	-52.95	Pass
			0	50	0.150 – 30.00	-13	-65.95	-52.95	Pass
			0	1	30.00 – 1000.00	-13	-64.60	-51.60	Pass
			0	50	30.00 – 1000.00	-13	-64.67	-51.67	Pass
			0	1	1000.00 – 1850.0	-13	-54.99	-41.99	Pass
			0	50	1000.00 – 1850.0	-13	-53.97	-40.97	Pass
			0	1	1909.00 - 1911.00	-13	-59.08	-46.08	Pass
			0	50	1909.00 - 1911.00	-13	-19.71	-6.71	Pass
			0	1	1910.00 – 26000.0	-13	-47.10	-34.10	Pass
			0	50	1910.00 – 26000.0	-13	-16.58	-3.58	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 50 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18675	1857.5	15	0	1	0.009 – 0.150	-13	-48.8	-35.8	Pass
			0	75	0.009 – 0.150	-13	-48.82	-35.82	Pass
			0	1	0.150 – 30.00	-13	-64.99	-51.99	Pass
			0	75	0.150 – 30.00	-13	-65.7	-52.7	Pass
			0	1	30.00 – 1000.00	-13	-64.74	-51.74	Pass
			0	75	30.00 – 1000.00	-13	-64.59	-51.59	Pass
			0	1	1000.00 – 1850.0	-13	20.77	33.77	-
			0	75	1000.00 – 1850.0	-13	-64.59	-51.59	Pass
			0	1	1849.00 - 18510.00	-13	-29.19	-16.19	Pass
			0	75	1849.00 - 18510.00	-13	-19.54	-6.54	Pass
			0	1	1910.00 – 26000.0	-13	-47.18	-34.18	Pass
			0	75	1910.00 – 26000.0	-13	-47.1	-34.1	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 51 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18900	1880	15	0	1	0.009 – 0.150	-13	-48.82	-35.82	Pass
			0	75	0.009 – 0.150	-13	-48.6	-35.6	Pass
			0	1	0.150 – 30.00	-13	-65.83	-52.83	Pass
			0	1	0.150 – 30.00	-13	-66.01	-53.01	Pass
			0	75	30.00 – 1000.00	-13	-64.63	-51.63	Pass
			0	25	30.00 – 1000.00	-13	-64.74	-51.74	Pass
			0	1	1000.00 – 1850.0	-13	-52.21	-39.21	Pass
			0	75	1000.00 – 1850.0	-13	-36.37	-23.37	Pass
			0	1	1910.00 – 26000.0	-13	-47.09	-34.09	Pass
			0	75	1910.00 – 26000.0	-13	-47.18	-34.18	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 52 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
19125	1902.5	15	0	1	0.009 – 0.150	-13	-48.89	-35.89	Pass
			0	75	0.009 – 0.150	-13	-48.82	-35.82	Pass
			0	1	0.150 – 30.00	-13	-65.03	-52.03	Pass
			0	1	0.150 – 30.00	-13	-66.14	-53.14	Pass
			0	75	30.00 – 1000.00	-13	-64.67	-51.67	Pass
			0	25	30.00 – 1000.00	-13	-64.76	-51.76	Pass
			0	1	1000.00 – 1850.0	-13	-54.85	-41.85	Pass
			0	75	1000.00 – 1850.0	-13	-48.37	-35.37	Pass
			0	1	1909.00 - 1911.00	-13	-60.40	-47.4	Pass
			0	75	1909.00 - 1911.00	-13	-20.27	-7.27	Pass
			0	1	1910.00 – 26000.0	-13	-47.11	-34.11	Pass
			0	75	1910.00 – 26000.0	-13	-18.73	-5.73	Pass

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 53 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18700	1860	20	0	1	0.009 – 0.150	1	-13	-48.8	-35.8
			0	100	0.009 – 0.150	1	-13	-48.86	-35.86
			0	1	0.150 – 30.00	10	-13	-65.56	-52.56
			0	100	0.150 – 30.00	10	-13	-65.81	-52.81
			0	1	30.00 – 1000.00	100	-13	-64.66	-51.66
			0	100	30.00 – 1000.00	100	-13	-64.65	-51.65
			0	1	1000.00 – 1850.0	1000	-13	20.21	33.21
			0	100	1000.00 – 1850.0	1000	-13	4.92	17.92
			0	1	1849.00 - 18510.00	160	-13	-32.82	-19.82
			0	100	1849.00 - 18510.00	160	-13	-20.41	-7.41
			0	1	1910.00 – 26000.0	1000	-13	-47.15	-34.15
			0	100	1910.00 – 26000.0	1000	-13	-47.1	-34.1

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 54 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
18900	1880	20	0	1	0.009 – 0.150	1	-13	-48.69	-35.69
			0	100	0.009 – 0.150	1	-13	-48.77	-35.77
			0	1	0.150 – 30.00	10	-13	-65.31	-52.31
			0	100	0.150 – 30.00	10	-13	-65.47	-52.47
			0	1	30.00 – 1000.00	100	-13	-64.64	-51.64
			0	100	30.00 – 1000.00	100	-13	-64.52	-51.52
			0	1	1000.00 – 1850.0	1000	-13	-54.51	-41.51
			0	100	1000.00 – 1850.0	1000	-13	-35.46	-22.46
			0	1	1910.00 – 26000.0	1000	-13	-47.15	-34.15
			0	100	1910.00 – 26000.0	1000	-13	-41.52	-28.52

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 55 of 128

Equipment Configuration for Out Of Band Emissions

Band:	2	Duty Cycle (%):	99.00
Modulation:	QPSK	Antenna Gain (dBi):	Not Applicable
Temperature (°C):	+20.0	Beam Forming Gain (Y)(dB):	Not Applicable
Voltage (Vac):	110.0	Tested By:	CC
Engineering Test Notes:	None		

Channel #	Test Frequency (MHz)	Bandwidth (MHz)	RB (Starting)	RB #	Frequency Range (MHz)	Limit dBm	Amplitude dBm	Margin dB	Pass/Fail
19100	1900	20	0	1	0.009 – 0.150	1	-13	-48.76	-35.76
			0	100	0.009 – 0.150	1	-13	-48.8	-35.8
			0	1	0.150 – 30.00	10	-13	-65	-52
			0	100	0.150 – 30.00	10	-13	-65.47	-52.47
			0	1	30.00 – 1000.00	100	-13	-64.61	-51.61
			0	100	30.00 – 1000.00	100	-13	-64.57	-51.57
			0	1	1000.00 – 1850.0	1000	-13	-54.88	-41.88
			0	100	1000.00 – 1850.0	1000	-13	-44.78	-31.78
			0	1	1909.00 - 1911.00	160	-13	-60.45	-47.45
			0	100	1909.00 - 1911.00	160	-13	-20.95	-7.95
			0	1	1910.00 – 26000.0	1000	-13	-47.17	-34.17
			0	100	1910.00 – 26000.0	1000	-13	-20.25	-7.25

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 56 of 128

9.5.1 Radiated Out of Band Emissions

FCC 24E: §24.238 Emission limitations for Broadband PCS equipment.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

Equipment Configuration for Radiated Spurious Emissions

Antenna:	50 Ohm Term	Variant:	5 MHz
Antenna Gain (dBi):	Not Applicable	Modulation:	QPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99.00
Channel Frequency (MHz):	1885.00	Data Rate:	Not Applicable
Power Setting:	Default	Tested By:	JMH

Test Measurement Results

1000.00 - 18000.00 MHz														
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail		
#1	1906.22	65.25	2.50	-13.03	54.72	Fundamental	Vertical	100	0	--	--			
#2	7600.01	61.42	4.39	-6.99	58.82	Max Peak	Vertical	196	78	82.2	-23.5	Pass		
#3	7600.01	54.40	4.39	-6.99	51.80	Max Avg	Vertical	196	78	82.2	-30.5	Pass		

Test Notes: EUT powered up and originating call with Anritsu outside chamber, $43 - 10 \log(P)$ Transmitter spurious limit = -13 dBm or 82.23 dB μ V/m at 3 meters

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

9.6. Receiver Spurious Emissions

Conducted Test Conditions for Receiver Spurious Emissions			
Standard:	IC RSS-133	Ambient Temp. (°C):	20.0 - 24.5
Test Heading:	Frequency Stability	Rel. Humidity (%):	32 - 45
Standard Section(s):	RSS-133: 6.6	Pressure (mBars):	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Receiver Spurious Emissions

With reference to the test configuration identified in Section 8.1 Conducted Test Setup the EUT was set to transmit on the appropriate center frequency of the selected frequency band and bandwidth. Out of Band emissions was tested under QPSK.

Testing was performed under ambient conditions.

Limits Receiver Spurious Emissions

RSS-133: Receiver spurious emissions shall comply with the limits specified in RSS-Gen.



Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 58 of 128

Receiver Spurious Limit

Equipment Configuration for Radiated Receiver Spurious Emissions

Antenna:	50 Ohm Term	Variant:	
Antenna Gain (dBi):	Not Applicable	Modulation:	
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	
Channel Frequency (MHz):	1885.00	Data Rate:	
Power Setting:	Default	Tested By:	JMH

Test Measurement Results

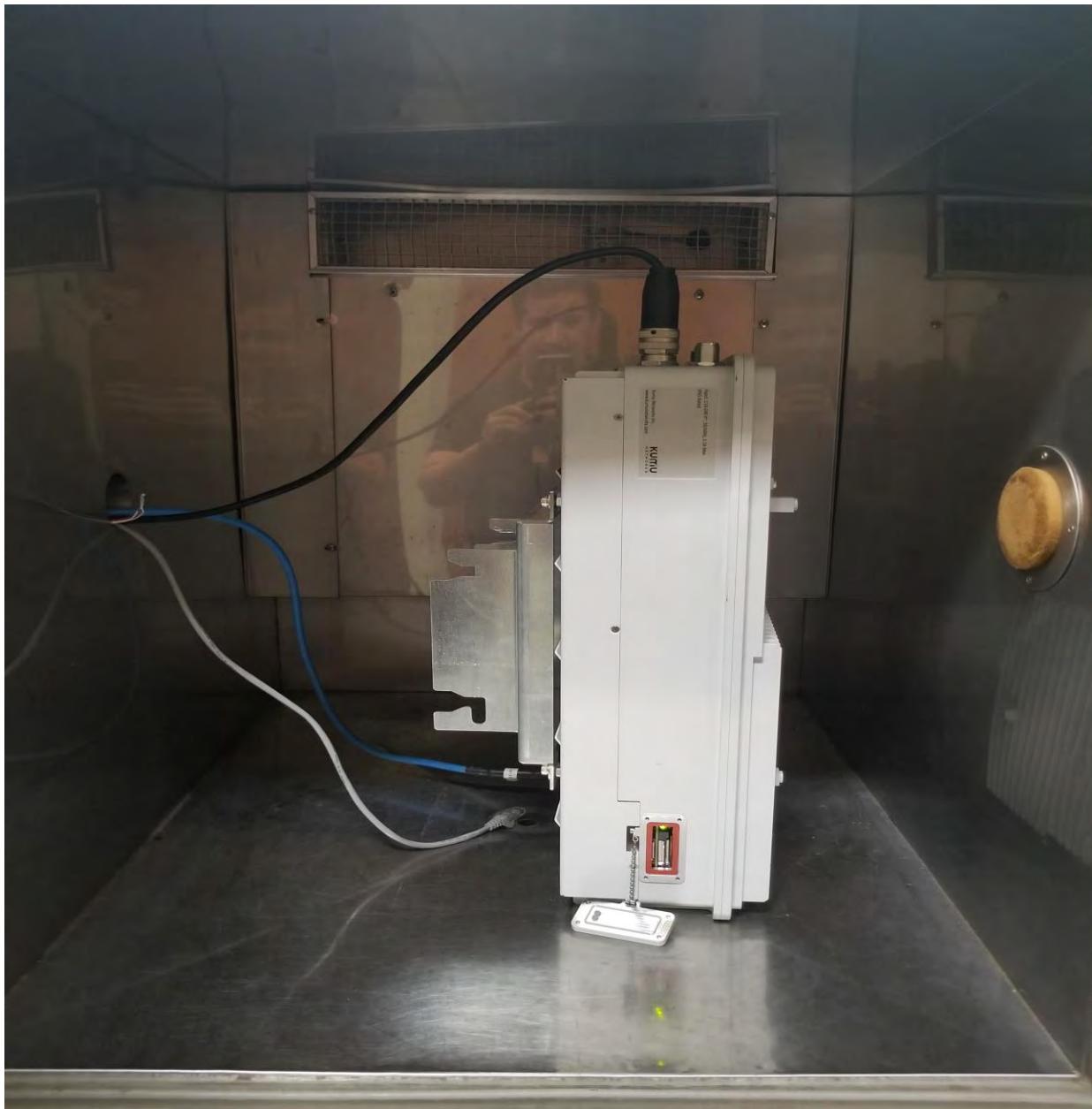
1000.00 - 18000.00 MHz														
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail		
#1	1906.22	65.25	2.50	-13.03	54.72	Fundamental	Vertical	100	0	--	--			
#2	7600.01	61.42	4.39	-6.99	58.82	Max Peak	Vertical	196	78	74.0	-15.2	Pass		
#3	7600.01	54.40	4.39	-6.99	51.80	Max Avg	Vertical	196	78	54.0	-3.2	Pass		

Test Notes: EUT powered up and originating call with Anritsu outside chamber

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

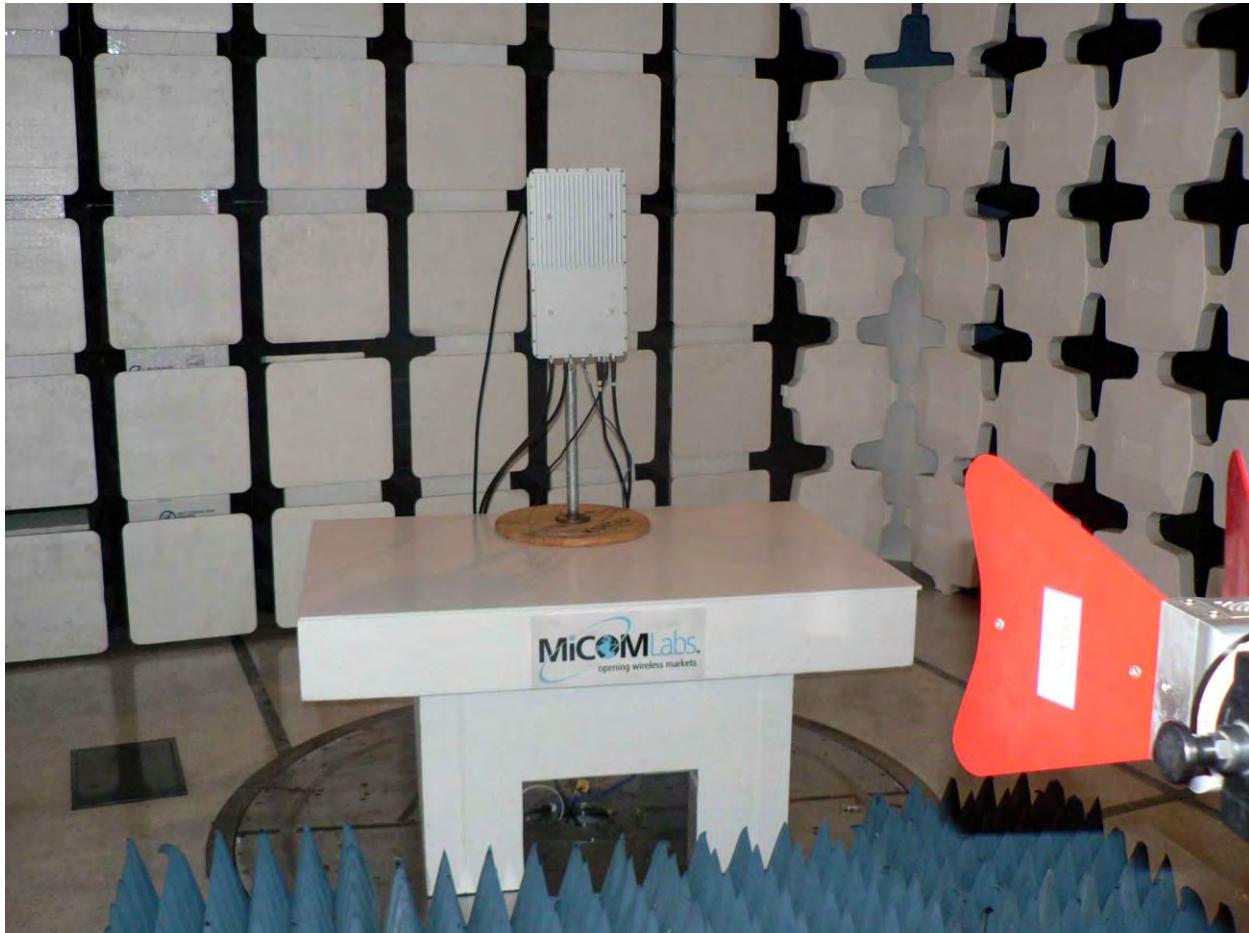
10. PHOTOGRAPHS

10.1. Conducted



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

10.2. Radiated



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



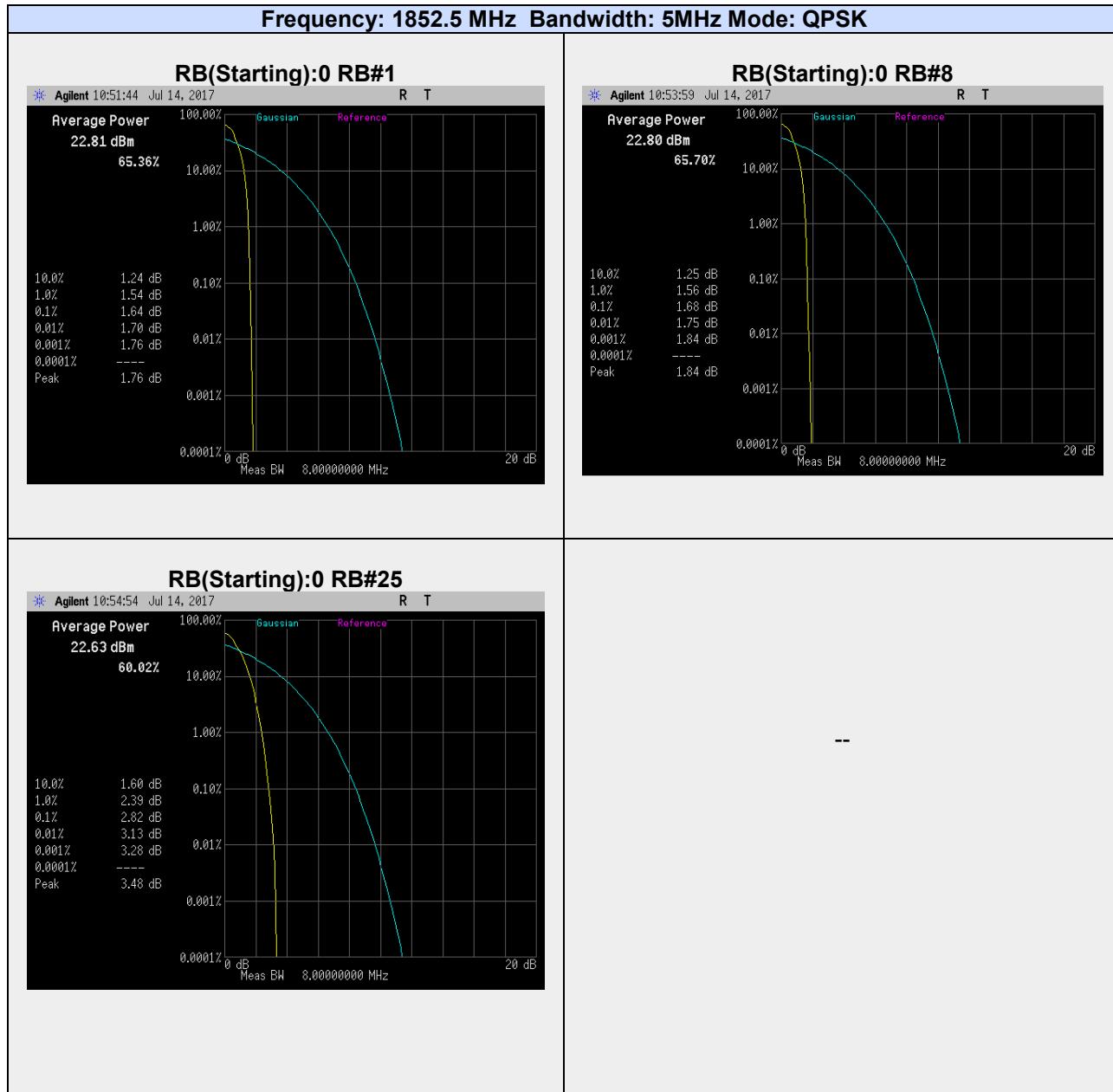
Title: Kumu Networks KU5B01LTE02-US
To: FCC Part 24E & IC RSS-133 Issue 6
Serial #: KUMU03-U4 Rev A
Issue Date: 17th August 2017
Page: 61 of 128

APPENDIX

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

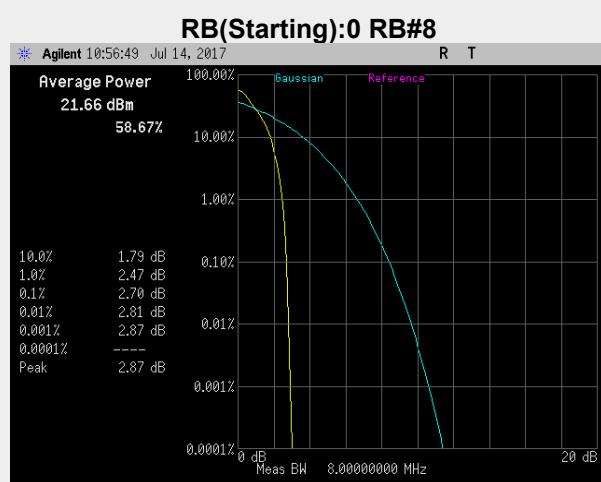
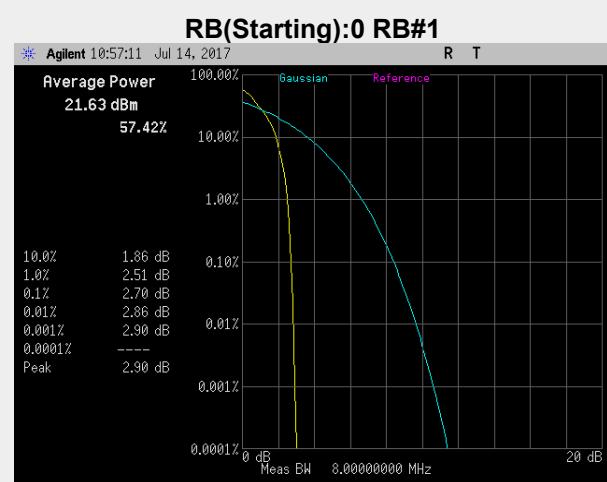
A.1. CONDUCTED TEST PLOTS

A.1.1. Peak-to-average power ratio



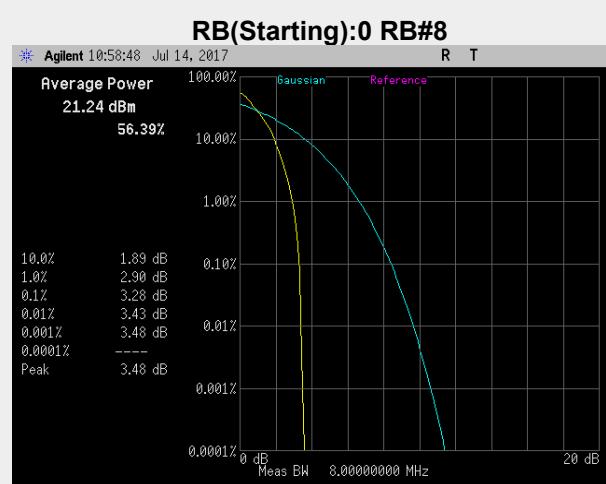
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 5MHz Mode: QPSK



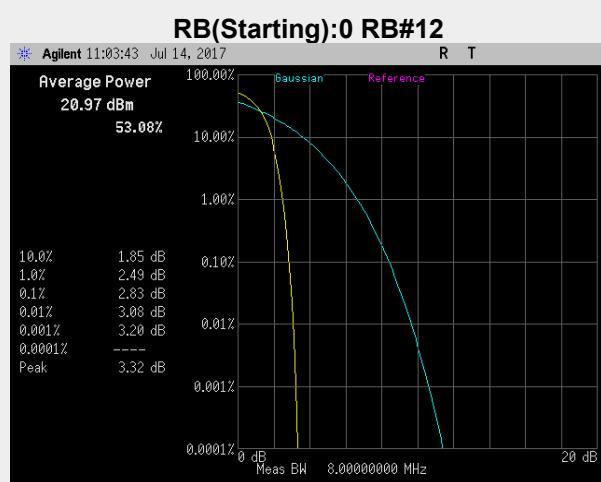
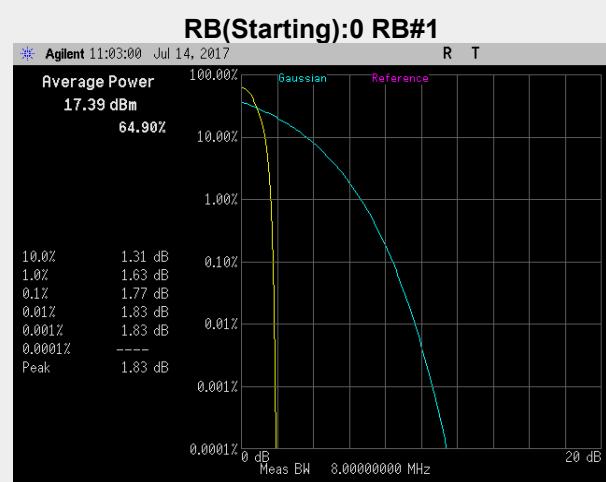
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1907.5 MHz Bandwidth: 5MHz Mode: QPSK



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

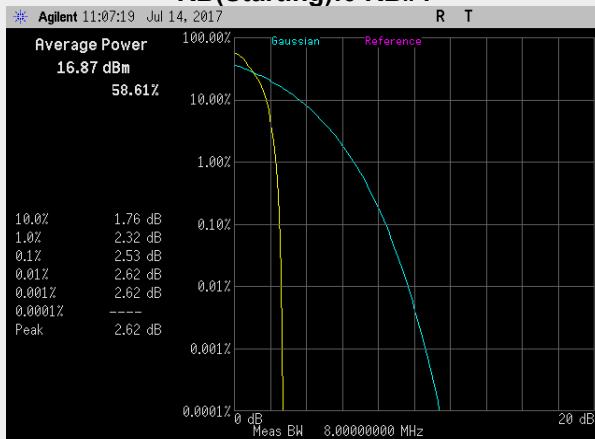
Frequency: 1855.0 MHz Bandwidth: 10MHz Mode: QPSK



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 10MHz Mode: QPSK

RB(Starting):0 RB#1



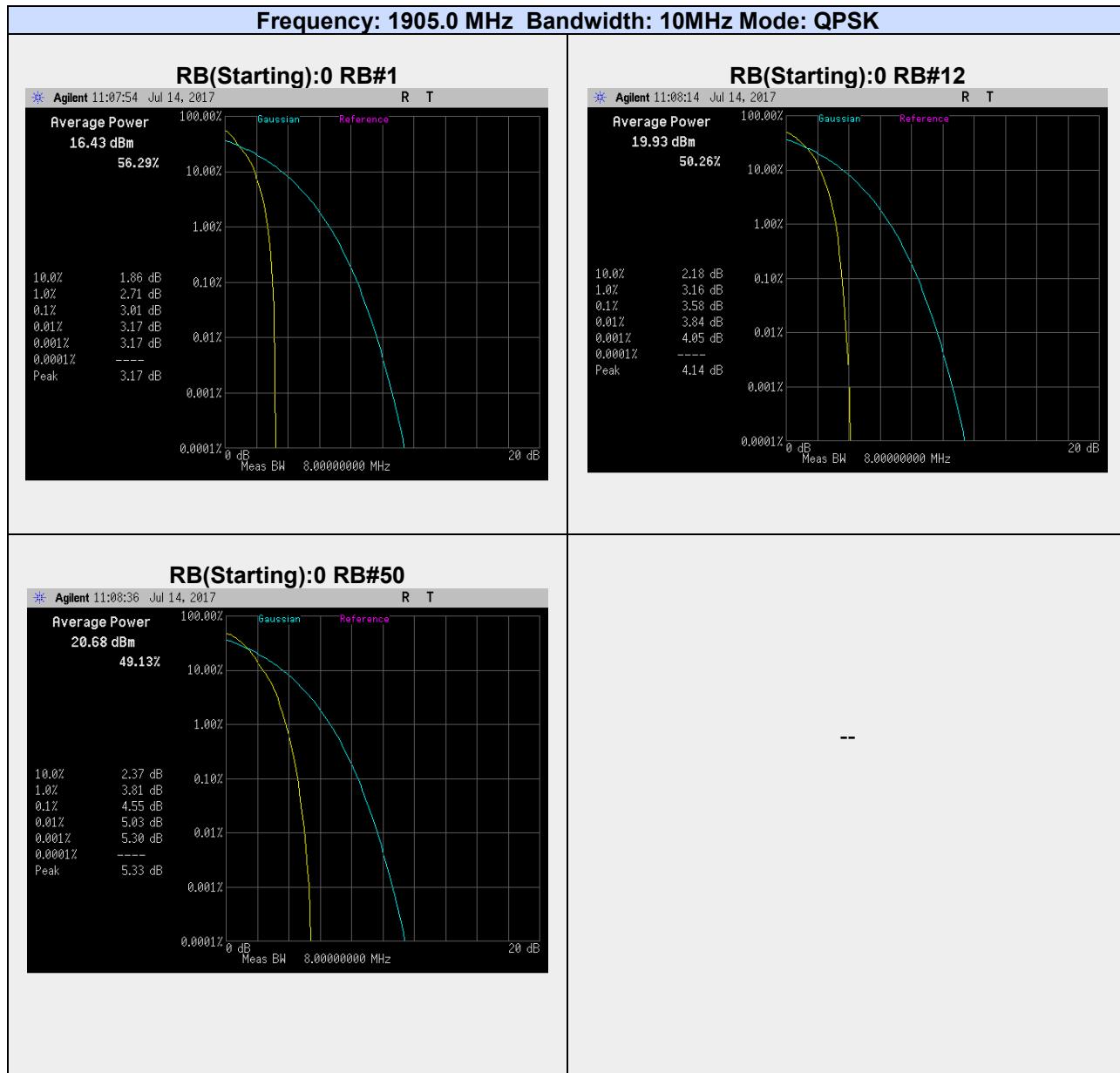
RB(Starting):0 RB#12



RB(Starting):0 RB#50



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



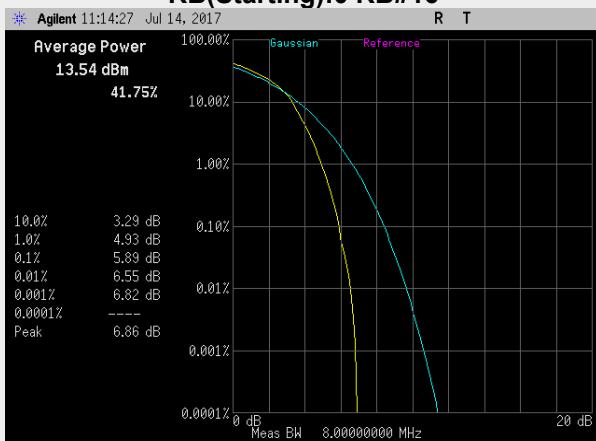
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1857.5 MHz Bandwidth: 15MHz Mode: QPSK

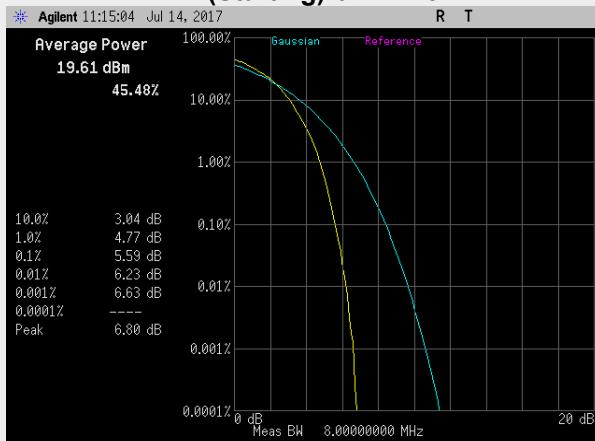
RB(Starting):0 RB#1



RB(Starting):0 RB#16

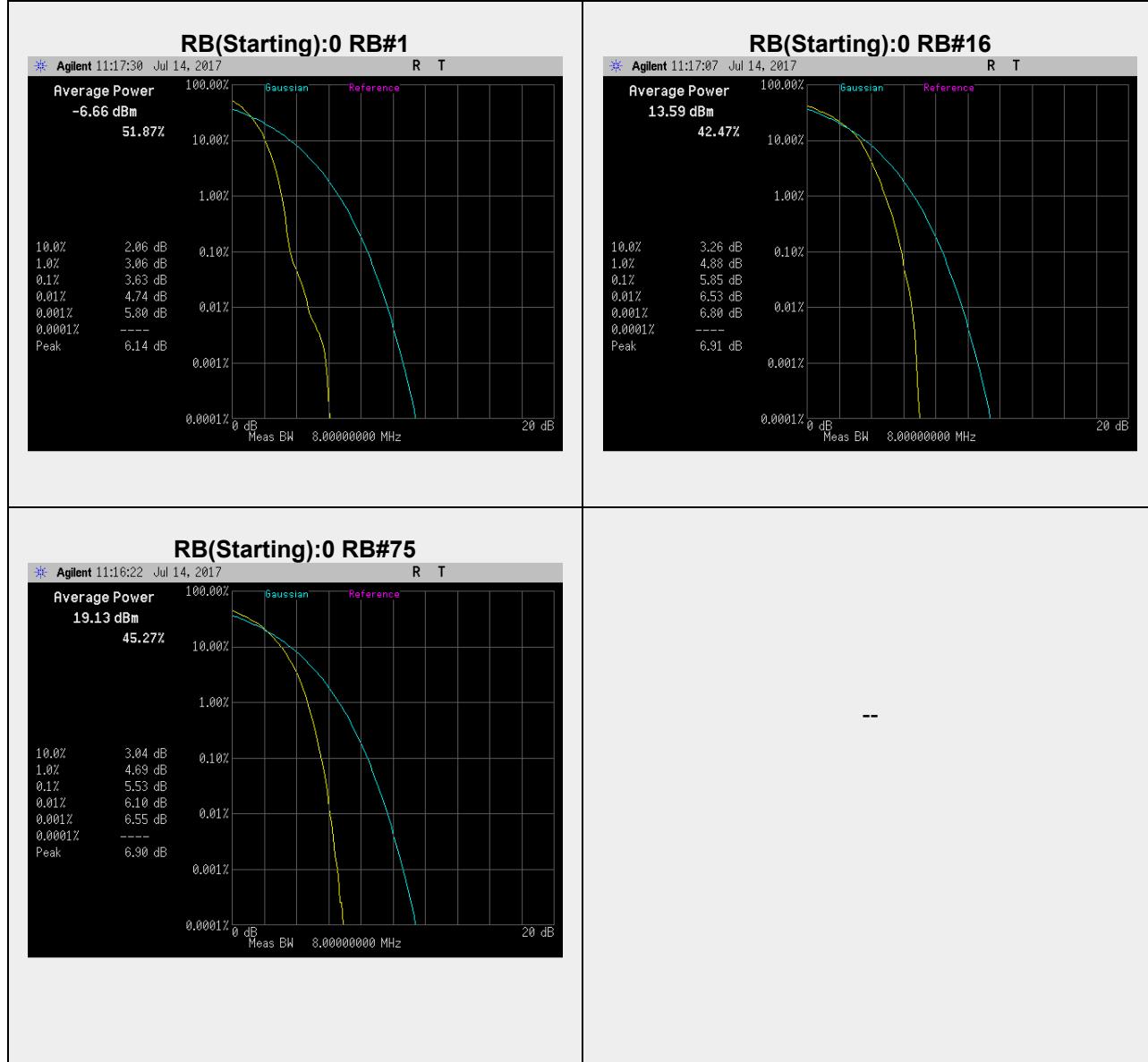


RB(Starting):0 RB#75



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

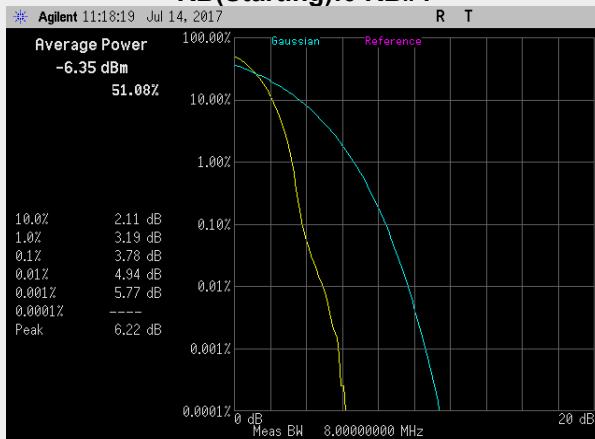
Frequency: 1880.0 MHz Bandwidth: 15MHz Mode: QPSK



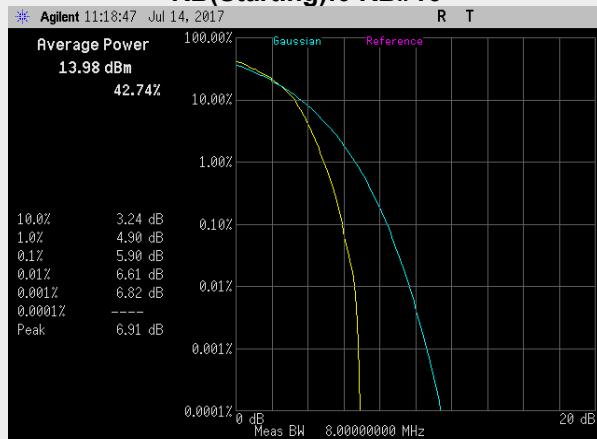
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1902.5 MHz Bandwidth: 15MHz Mode: QPSK

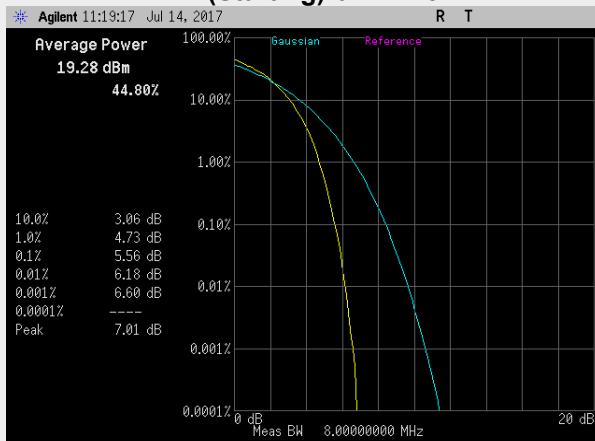
RB(Starting):0 RB#1



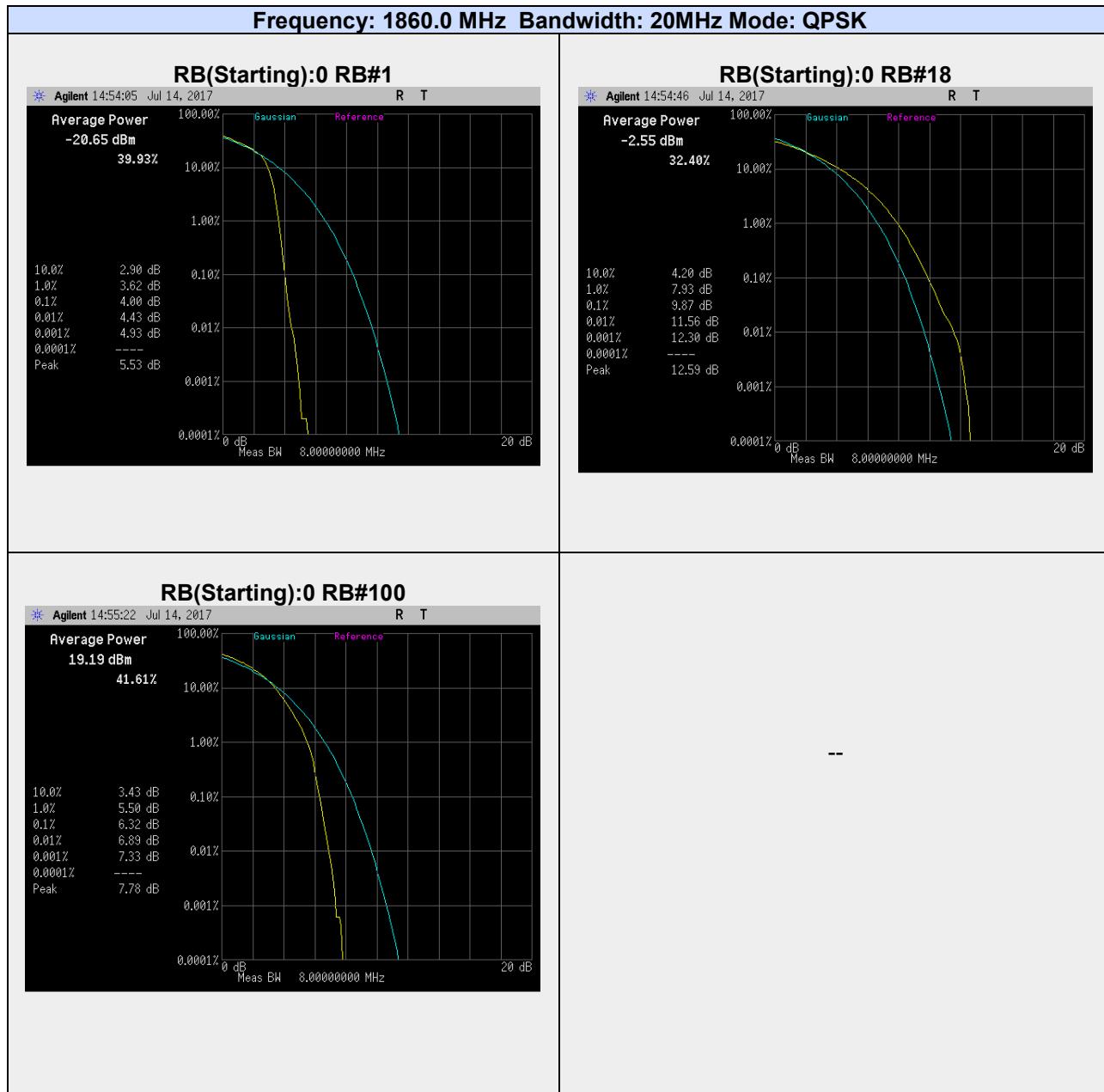
RB(Starting):0 RB#16



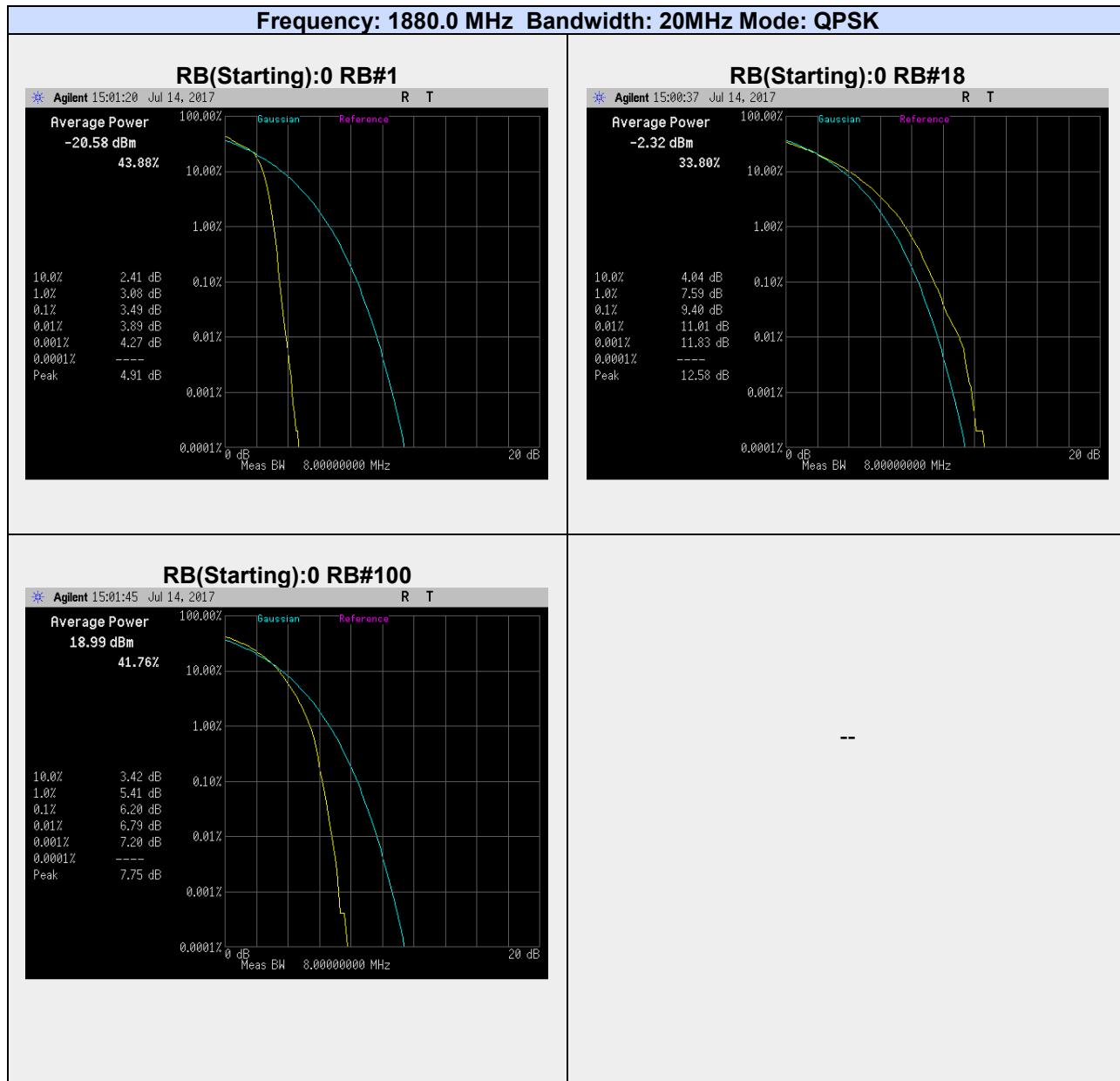
RB(Starting):0 RB#75



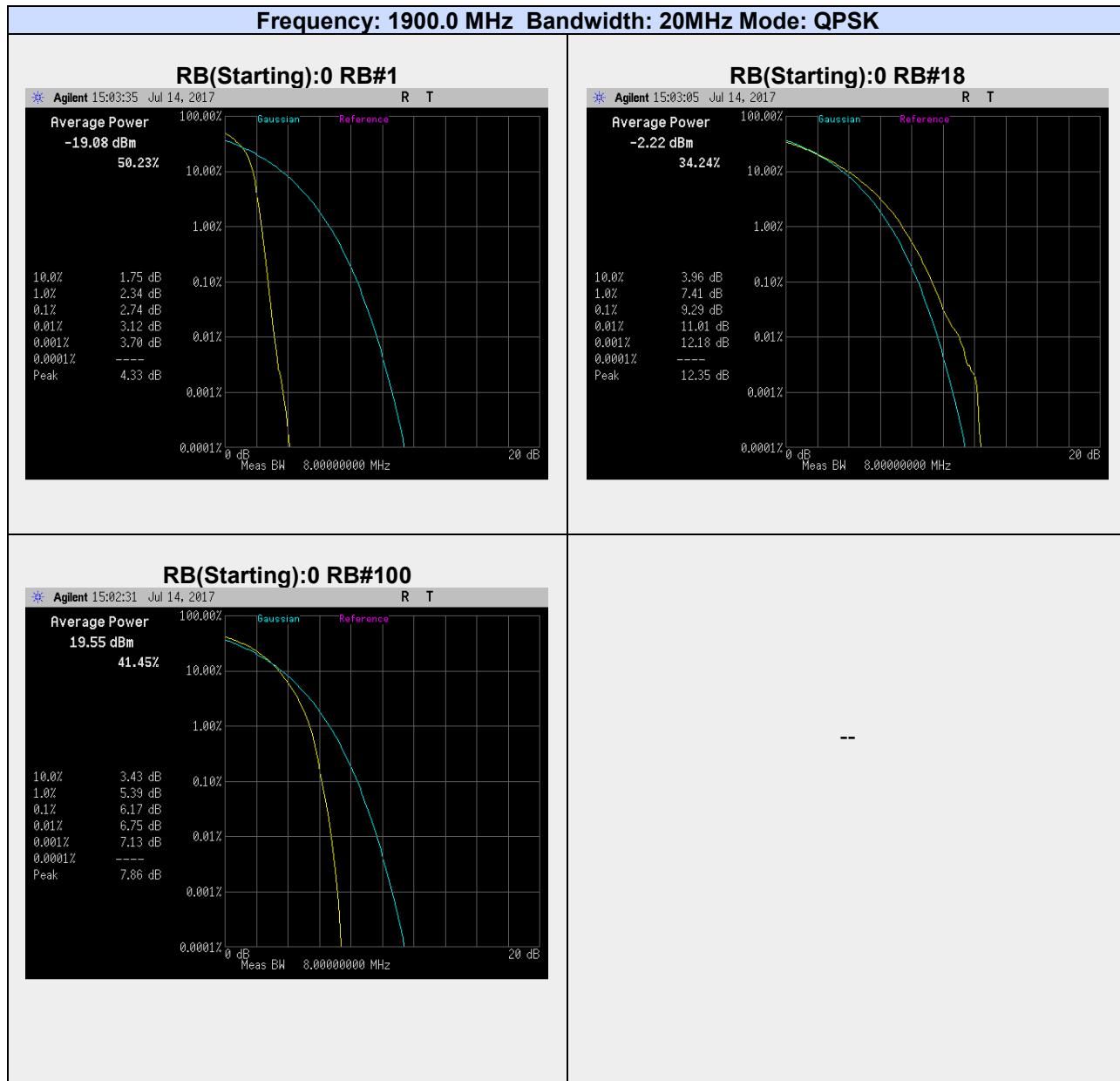
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1852.5 MHz Bandwidth: 5MHz Mode: 16 QAM

RB(Starting):0 RB#1



RB(Starting):0 RB#8



RB(Starting):0 RB#25



--

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 5MHz Mode: 16 QAM

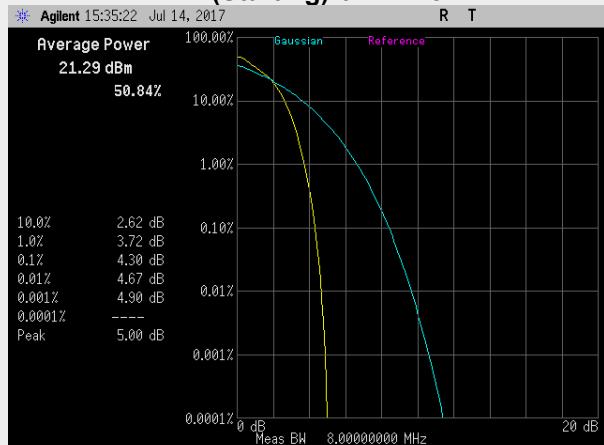
RB(Starting):0 RB#1



RB(Starting):0 RB#8



RB(Starting):0 RB#25



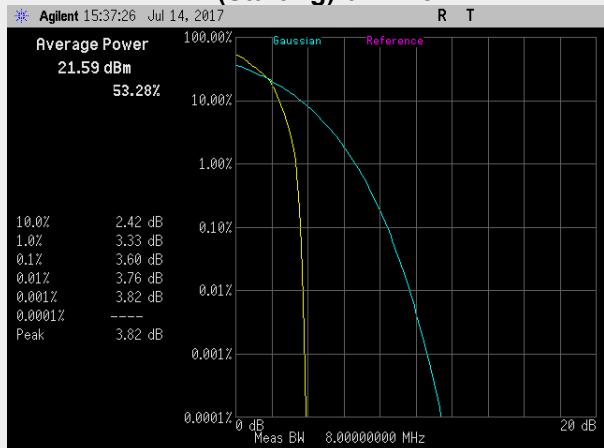
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1907.5 MHz Bandwidth: 5MHz Mode: 16 QAM

RB(Starting):0 RB#1



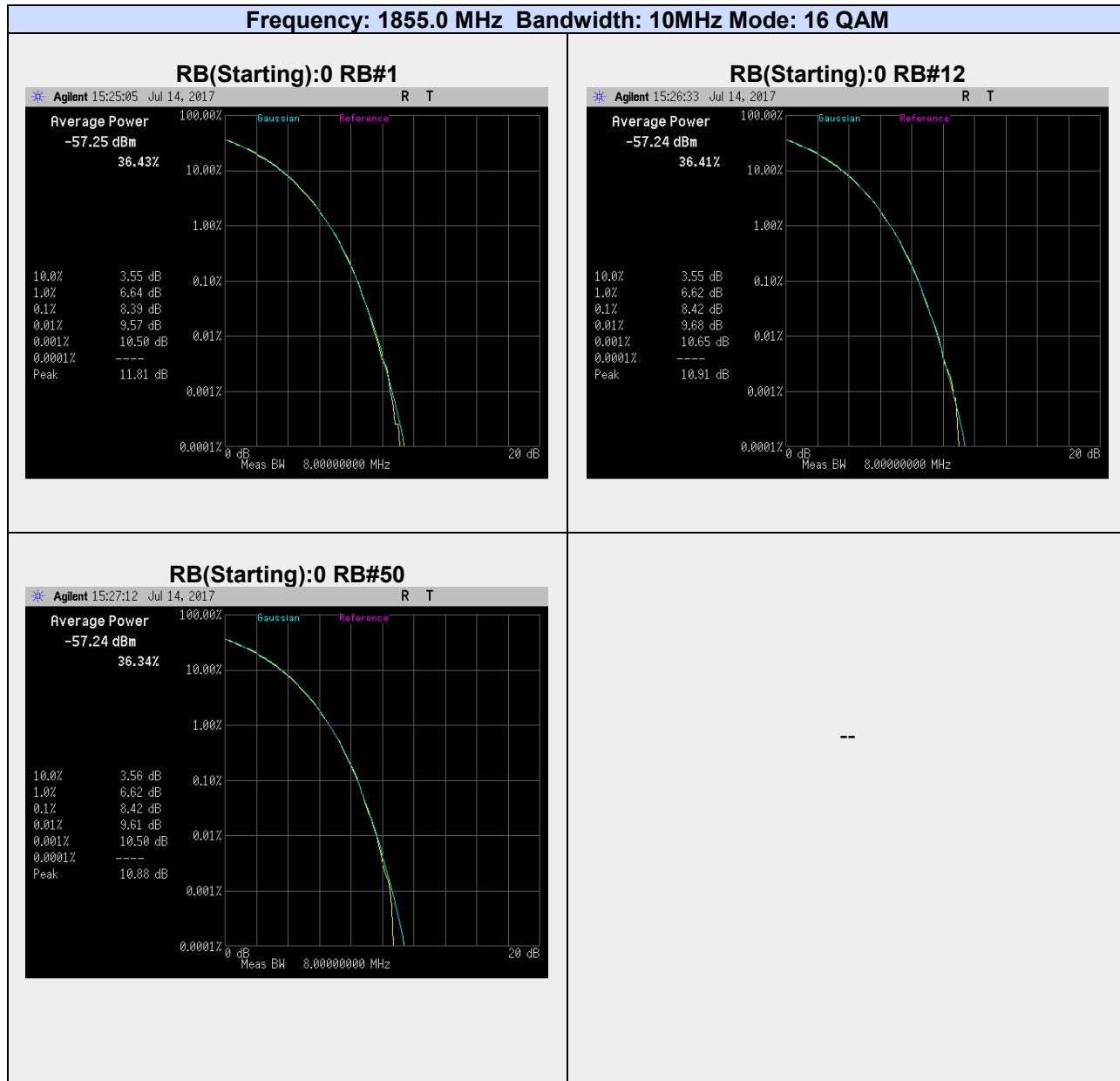
RB(Starting):0 RB#8



RB(Starting):0 RB#25



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 10MHz Mode: 16 QAM

RB(Starting):0 RB#1



RB(Starting):0 RB#12



RB(Starting):0 RB#50



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1905.0 MHz Bandwidth: 10MHz Mode: 16 QAM

RB(Starting):0 RB#1



RB(Starting):0 RB#12



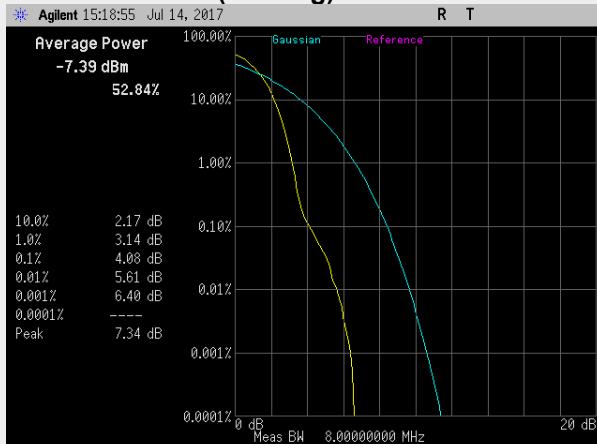
RB(Starting):0 RB#50



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1857.5 MHz Bandwidth: 15MHz Mode: 16 QAM

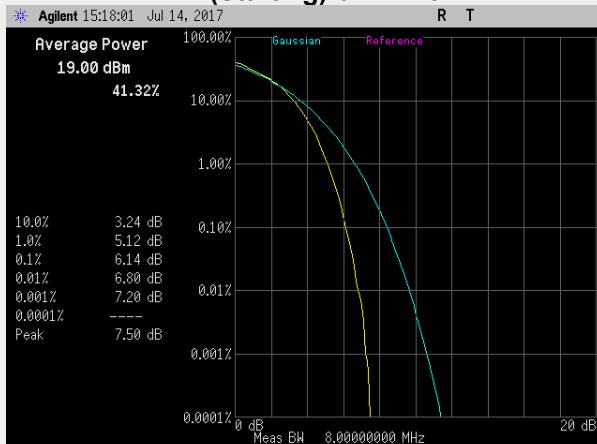
RB(Starting):0 RB#1



RB(Starting):0 RB#16



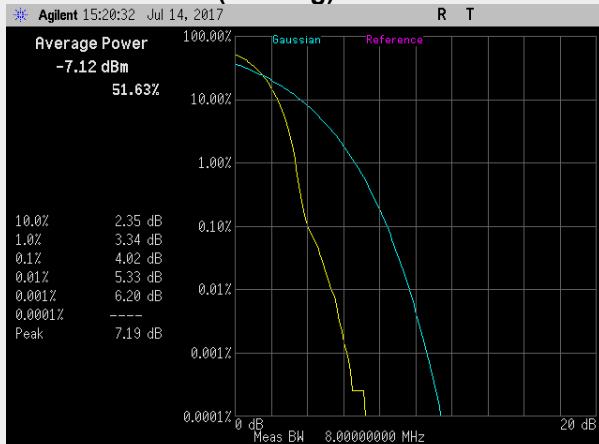
RB(Starting):0 RB#75



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 15MHz Mode: 16 QAM

RB(Starting):0 RB#1



RB(Starting):0 RB#16



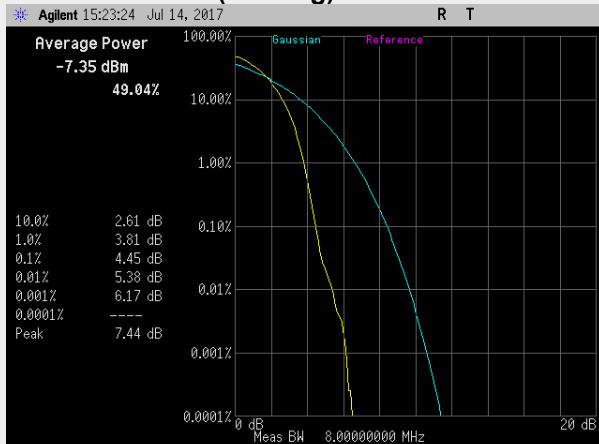
RB(Starting):0 RB#75



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1902.5 MHz Bandwidth: 15MHz Mode: 16 QAM

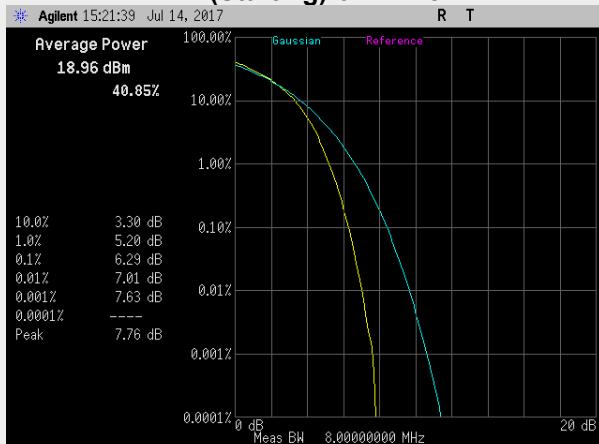
RB(Starting):0 RB#1



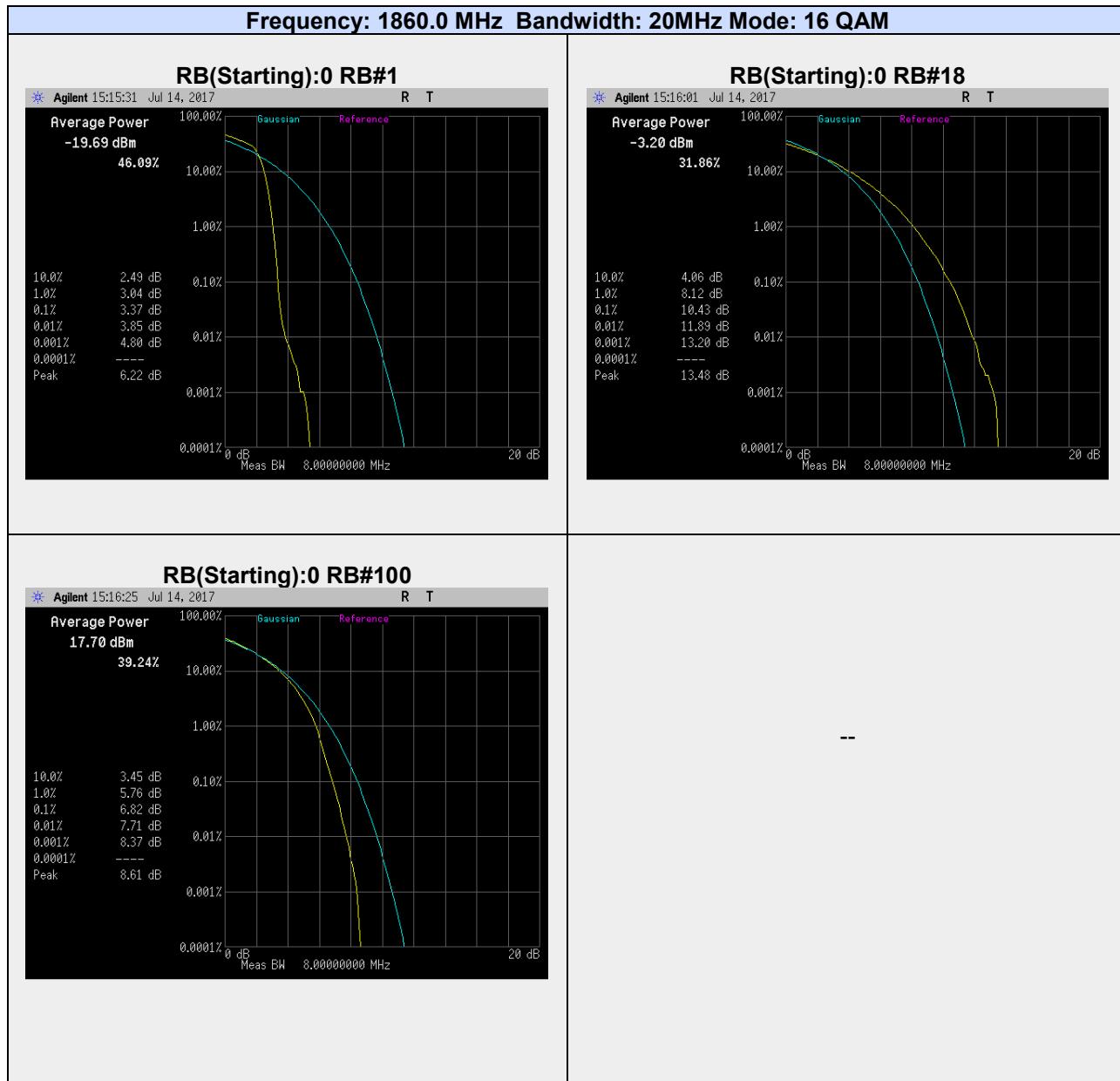
RB(Starting):0 RB#16



RB(Starting):0 RB#75



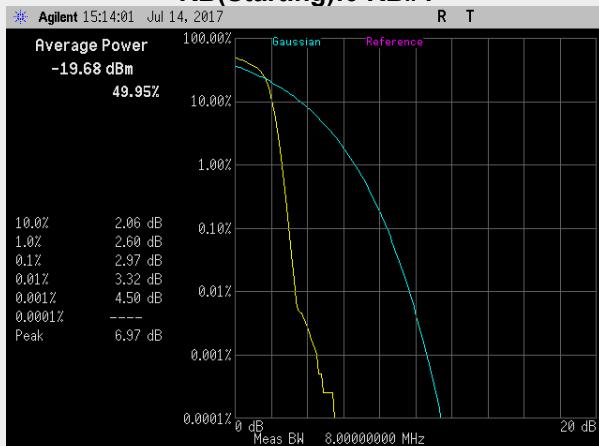
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



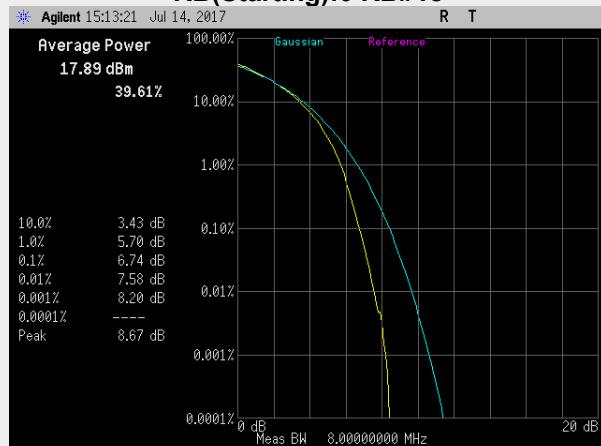
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 20MHz Mode: 16 QAM

RB(Starting):0 RB#1



RB(Starting):0 RB#18

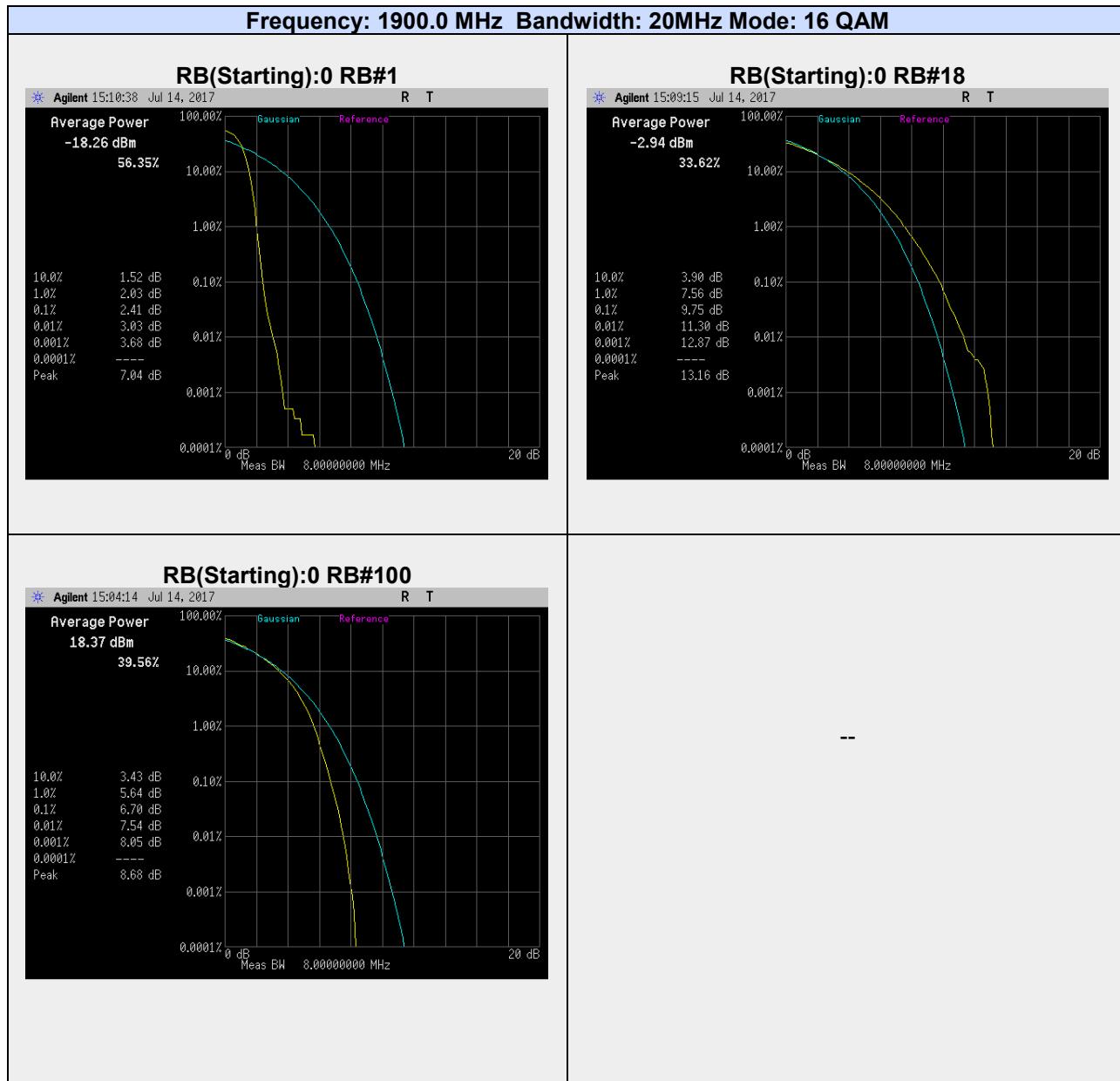


RB(Starting):0 RB#100



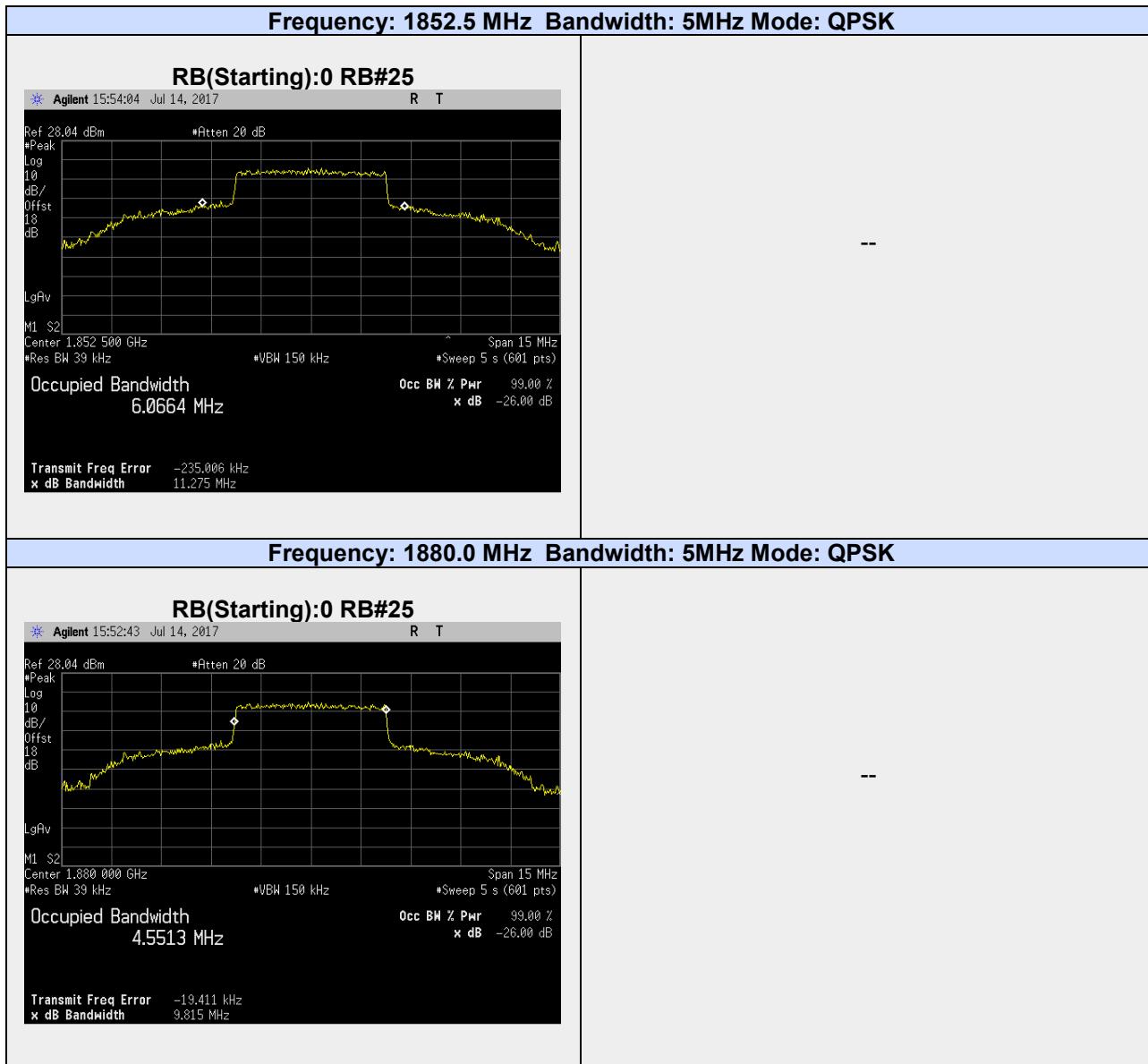
--

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

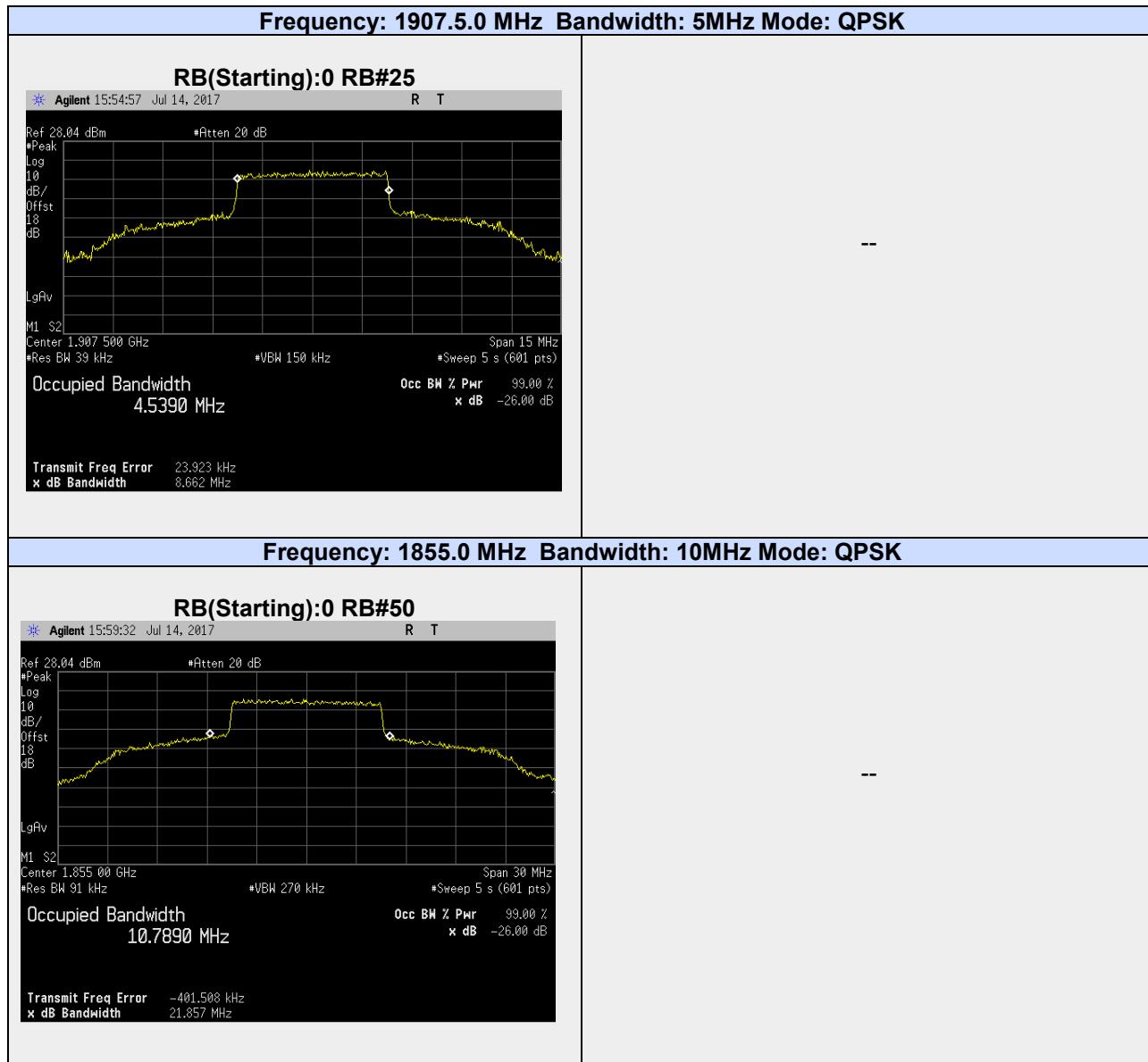


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

A.1.2. Emissions Bandwidth

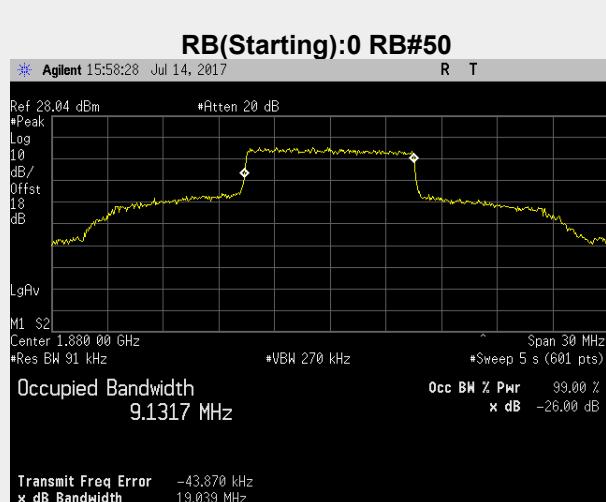


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

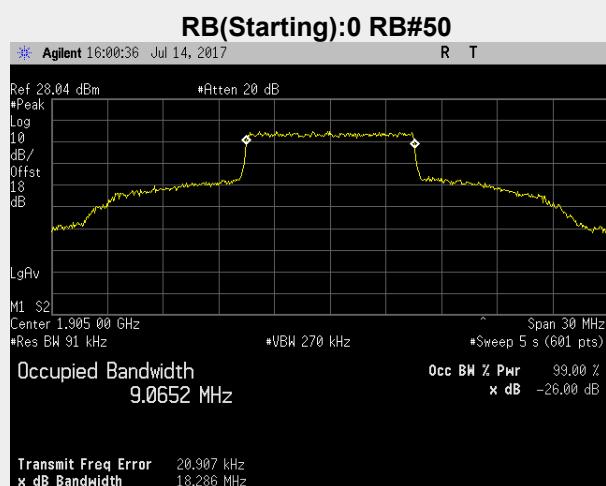


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 10MHz Mode: QPSK

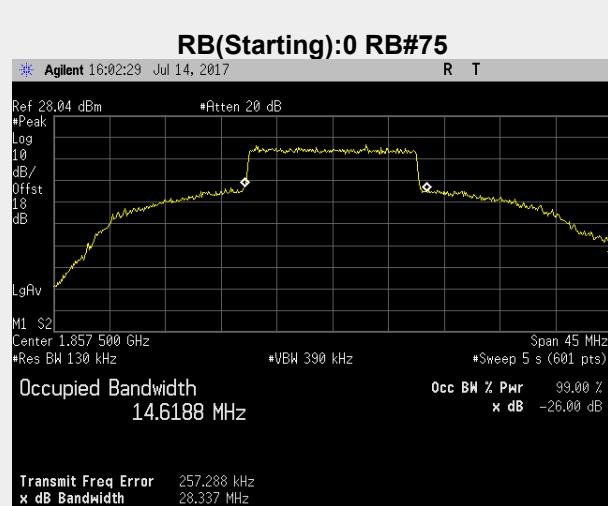


Frequency: 1905.0 MHz Bandwidth: 10MHz Mode: QPSK

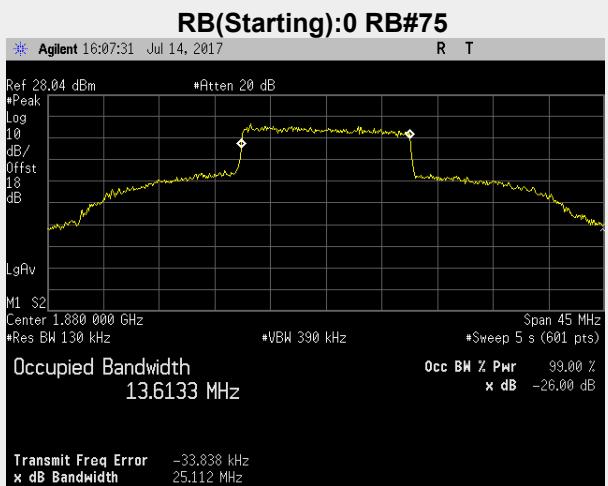


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

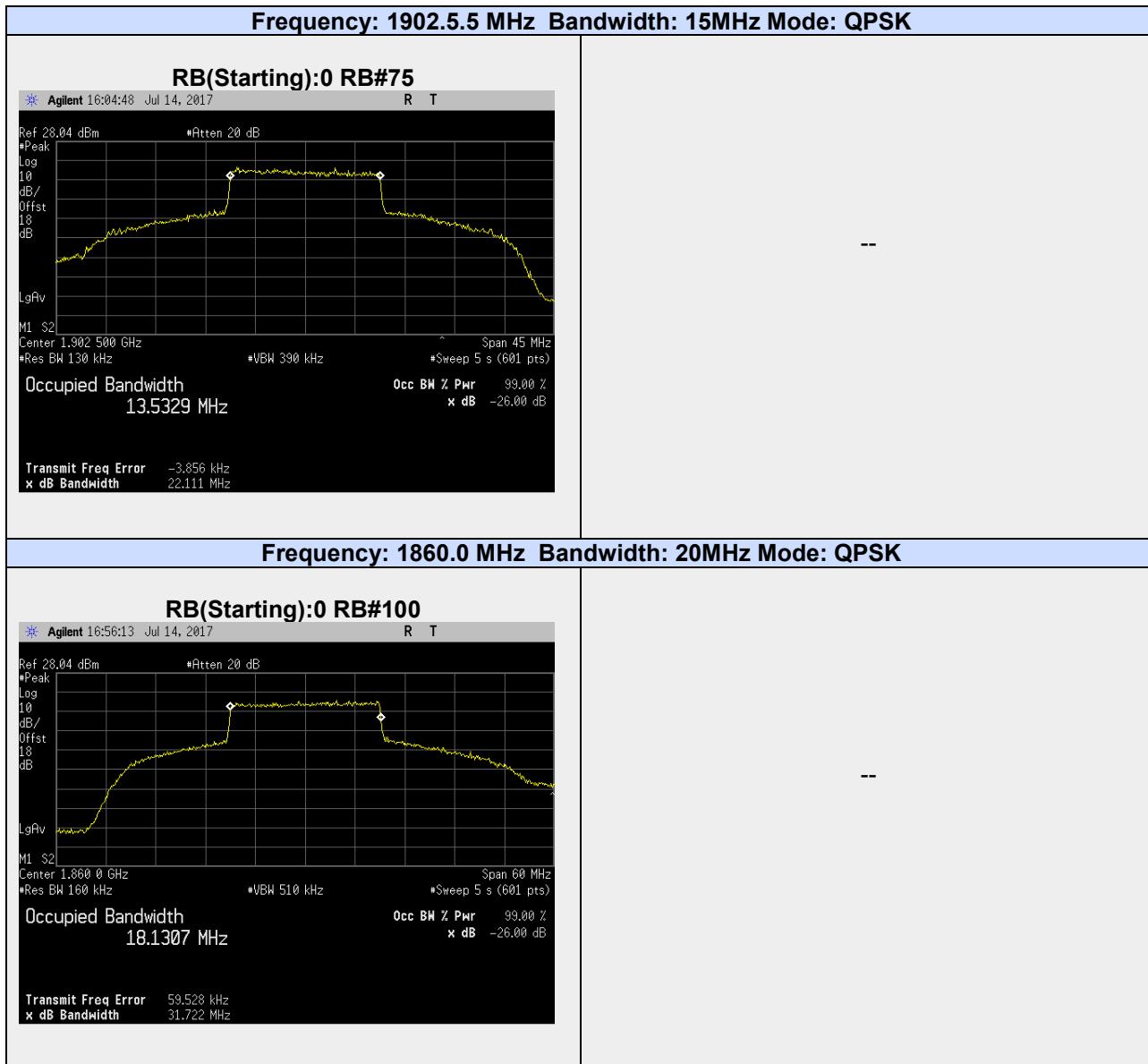
Frequency: 1857.5 MHz Bandwidth: 15MHz Mode: QPSK



Frequency: 1880.0 MHz Bandwidth: 15MHz Mode: QPSK

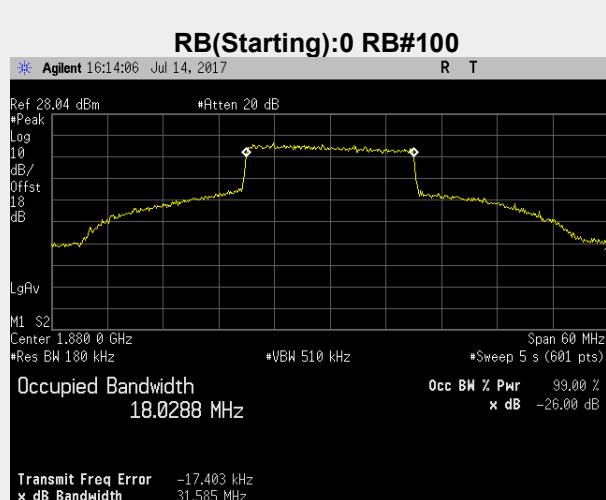


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

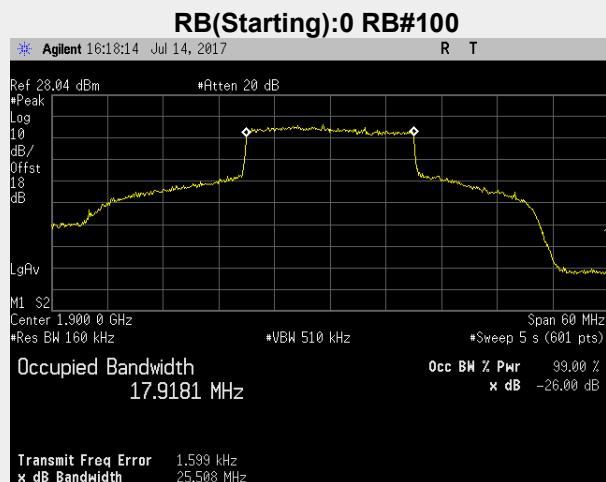


This test report may be reproduced in full only. The document may only be updated by MICOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 20MHz Mode: QPSK

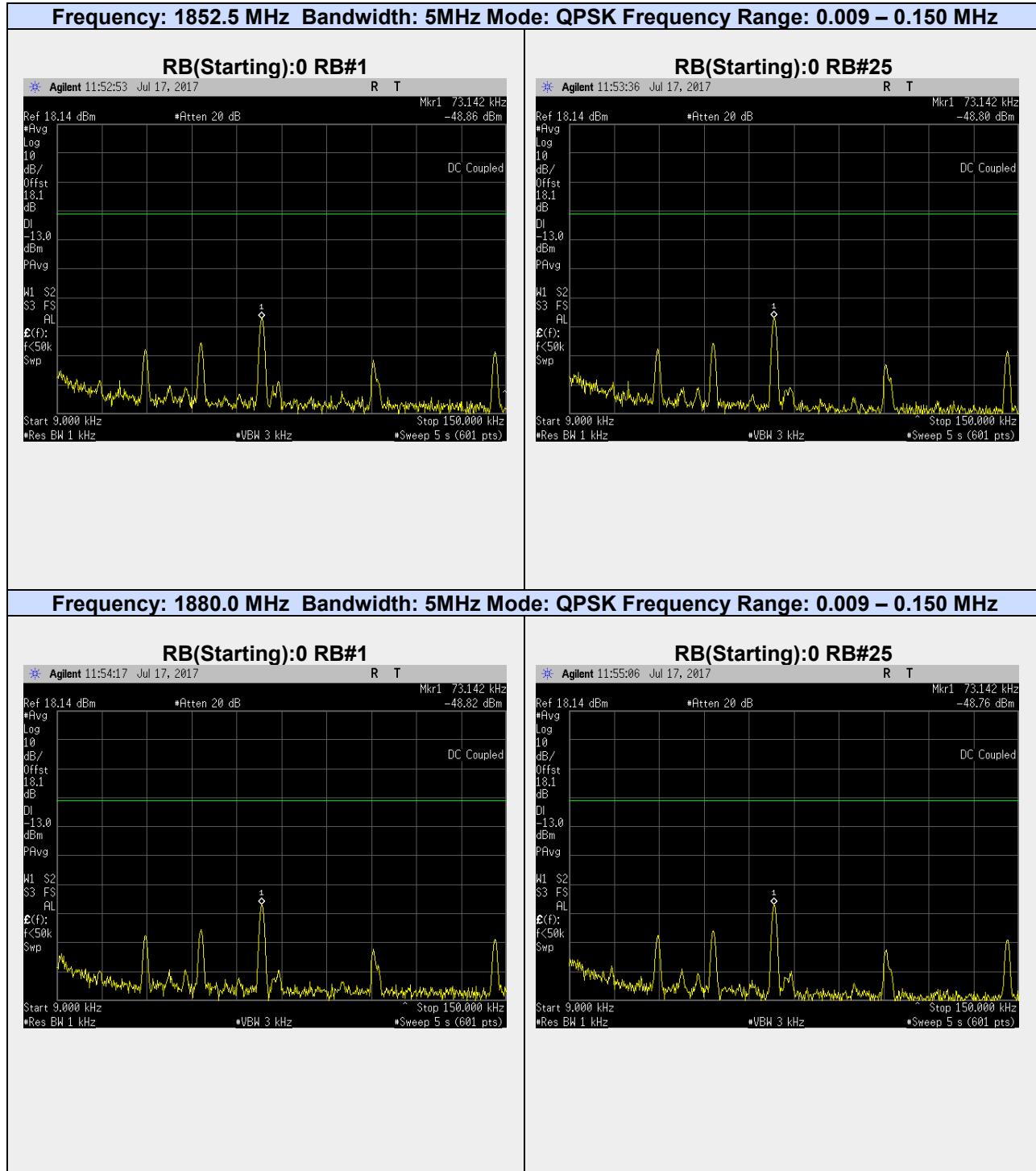


Frequency: 1900.0 MHz Bandwidth: 20MHz Mode: QPSK



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

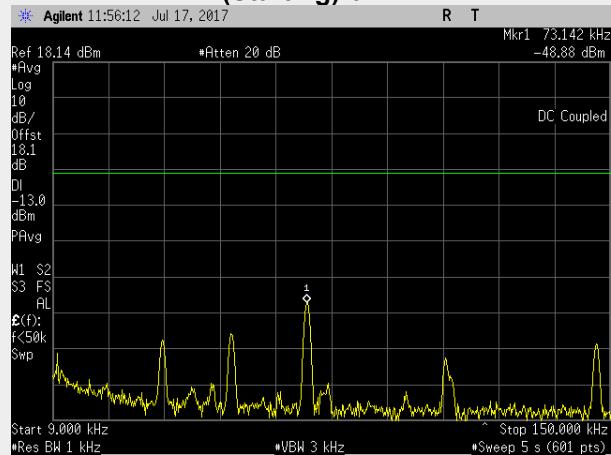
A.1.3. Out of Band Emissions



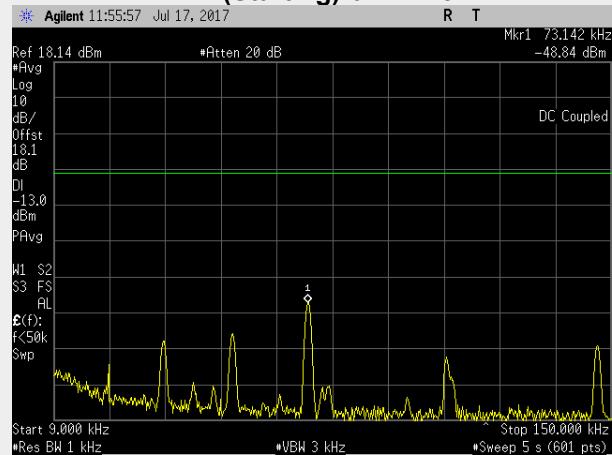
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1907.5 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 0.009 – 0.150 MHz

RB(Starting):0 RB#1

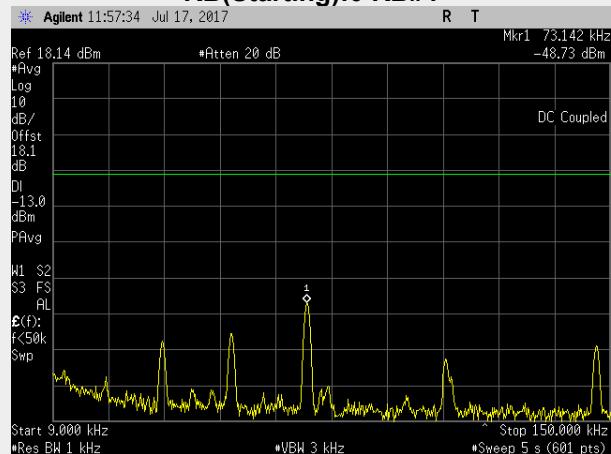


RB(Starting):0 RB#25

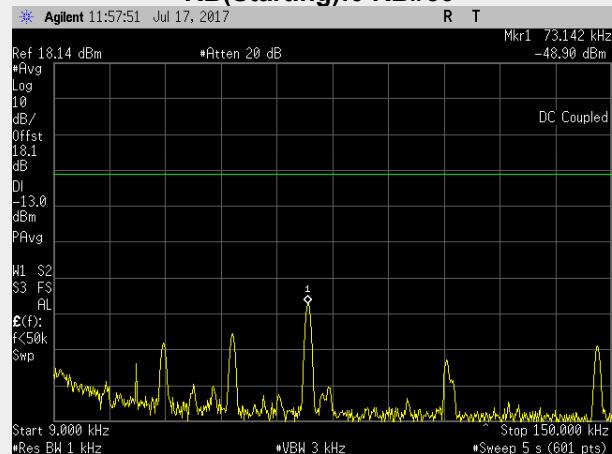


Frequency: 1855.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 0.009 – 0.150 MHz

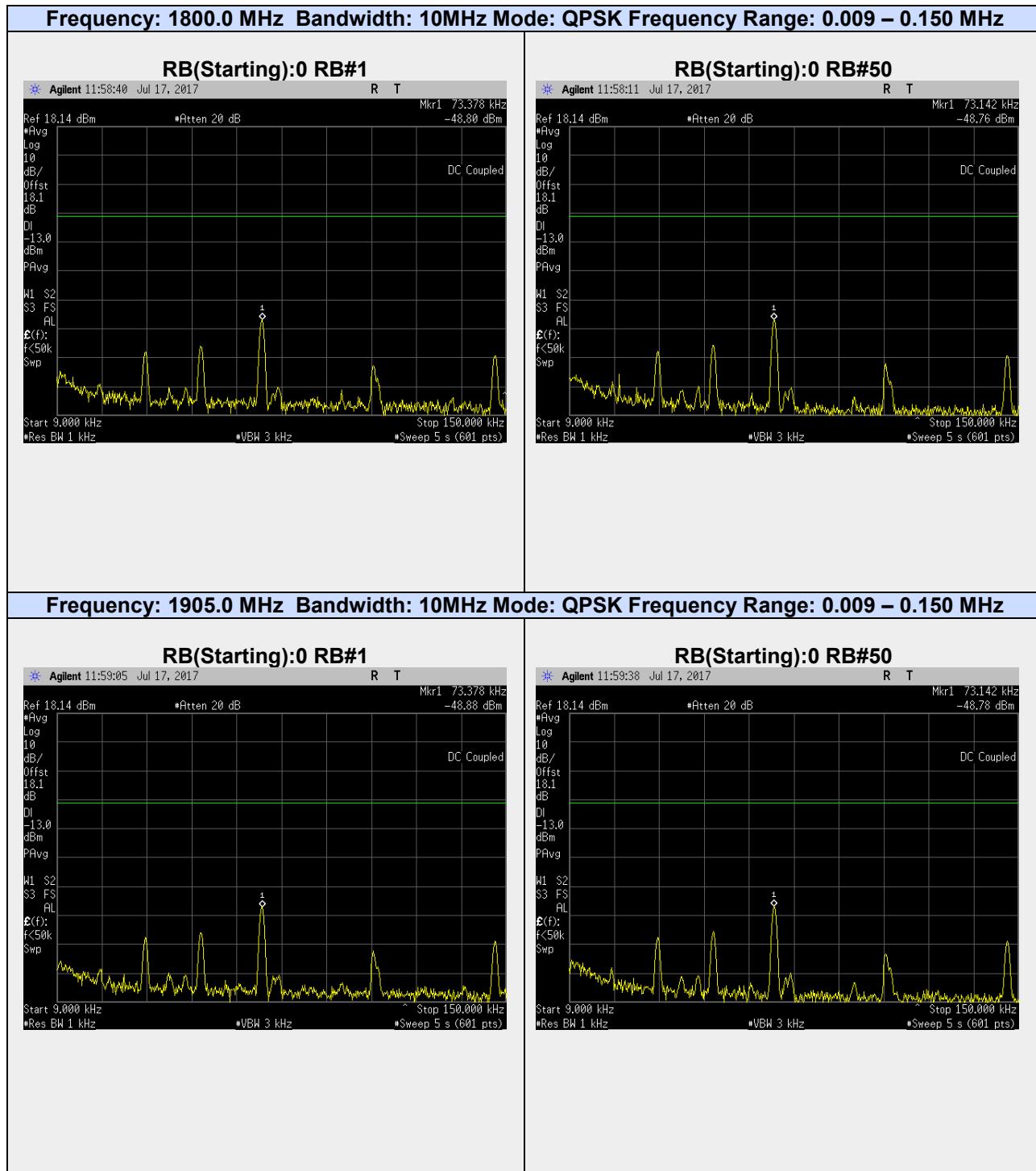
RB(Starting):0 RB#1



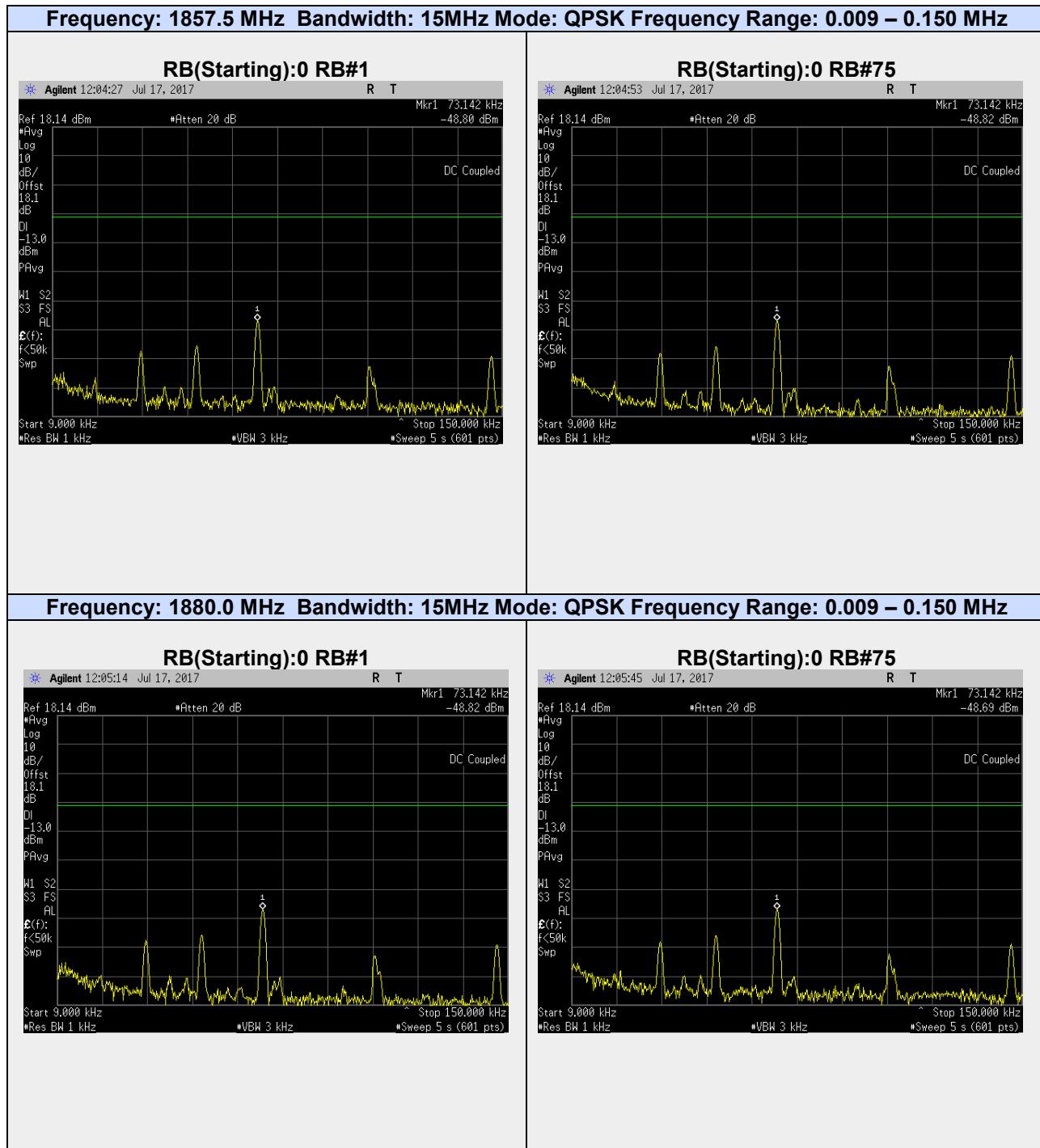
RB(Starting):0 RB#50



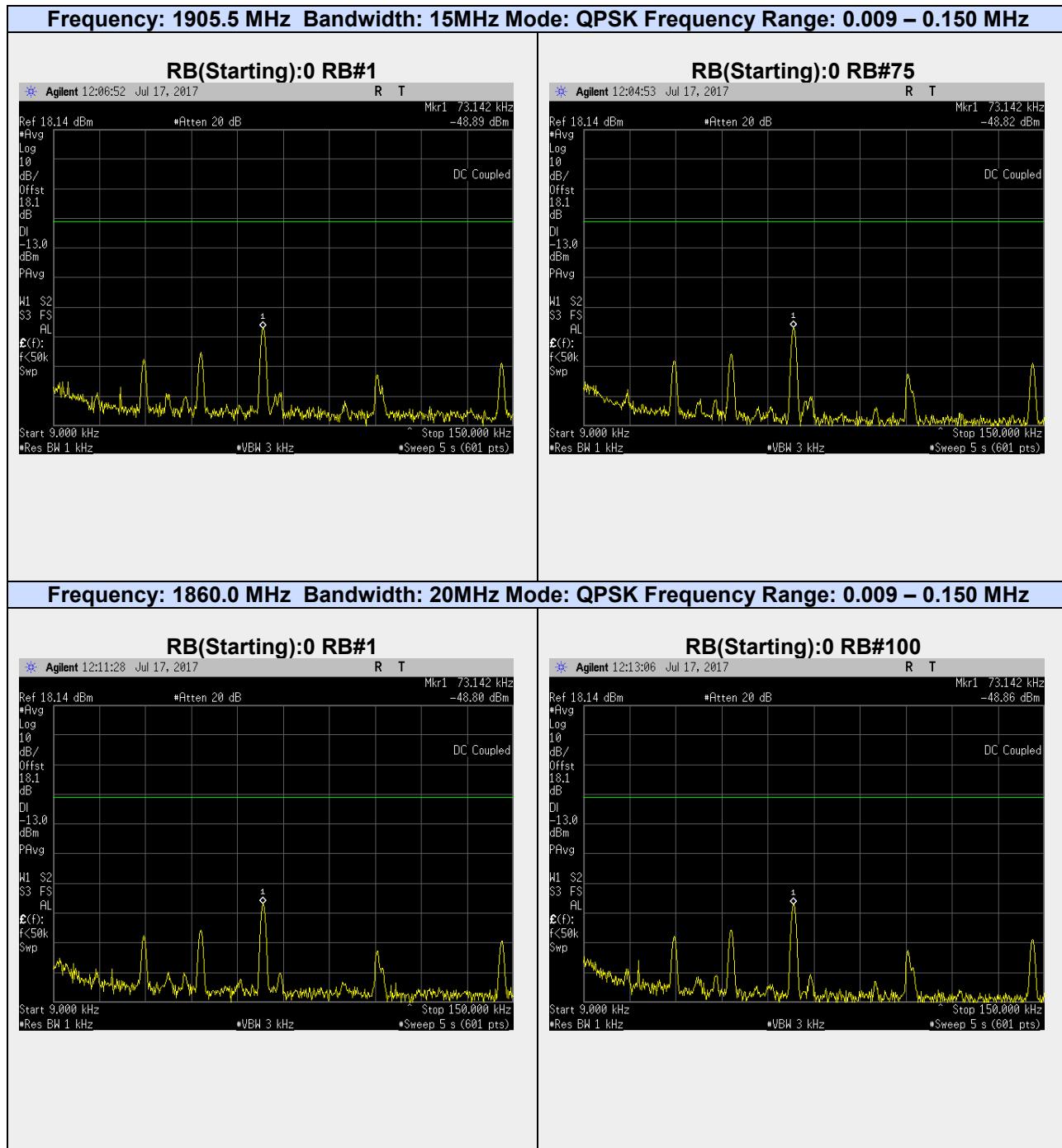
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



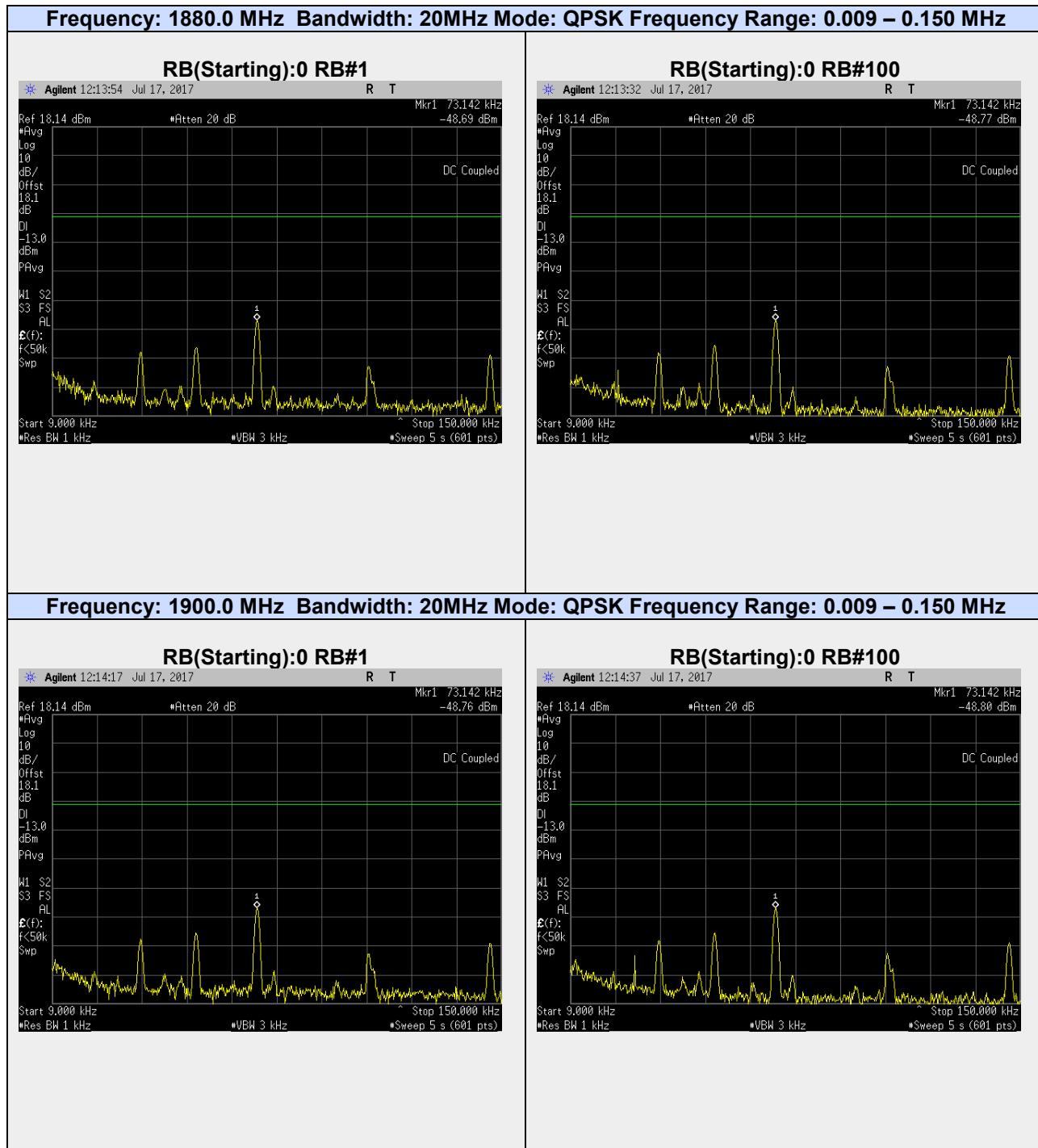
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



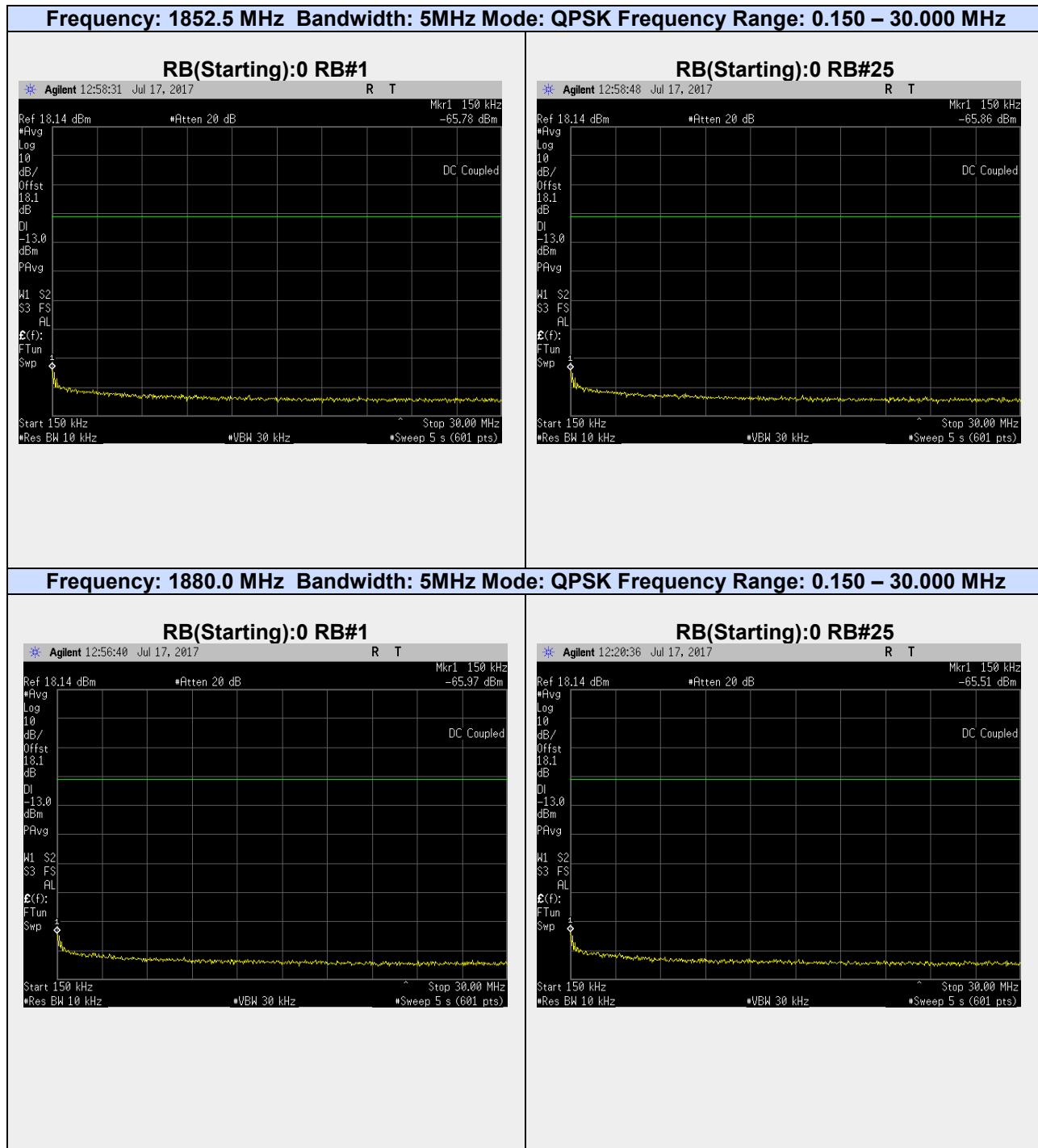
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



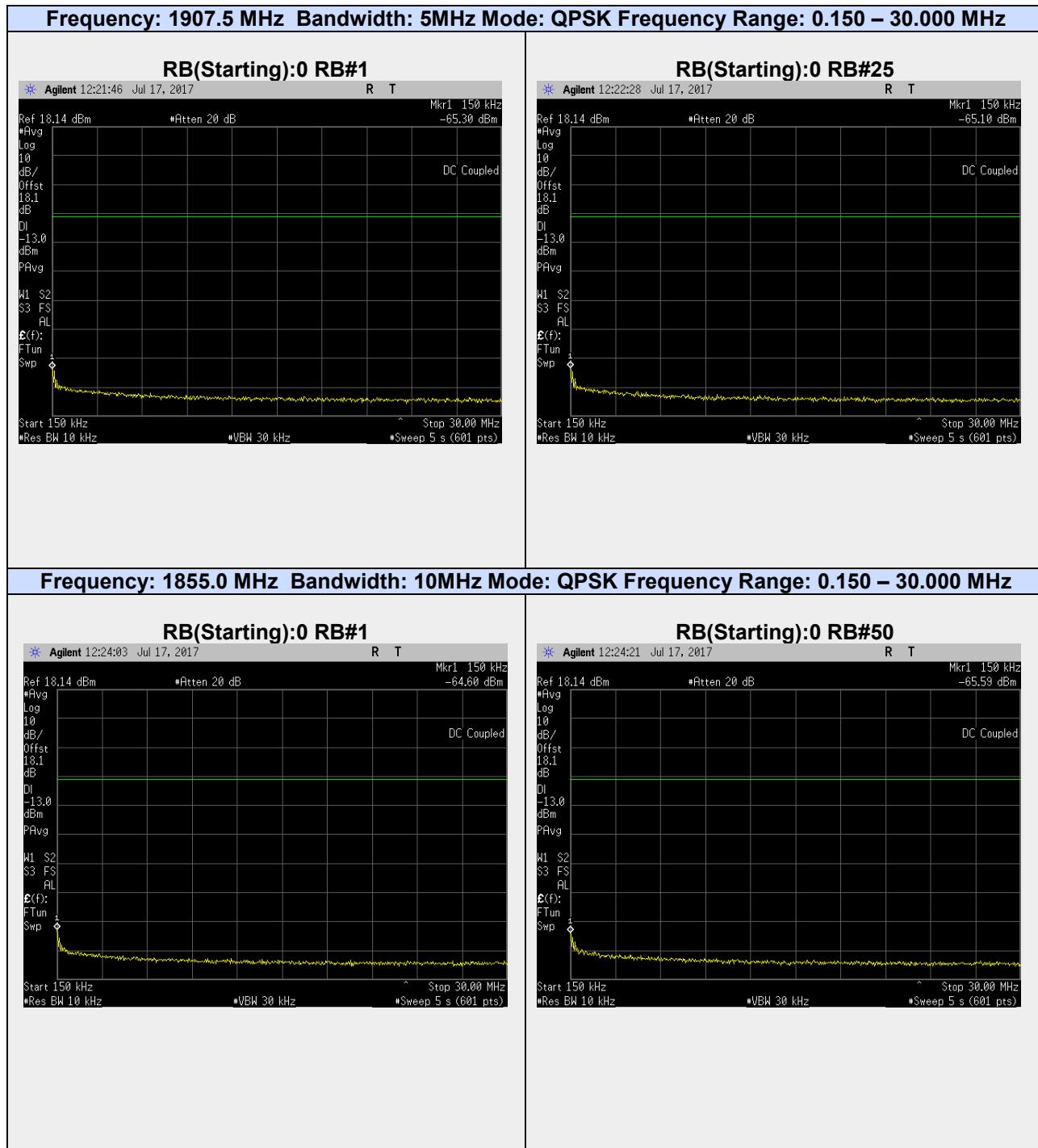
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



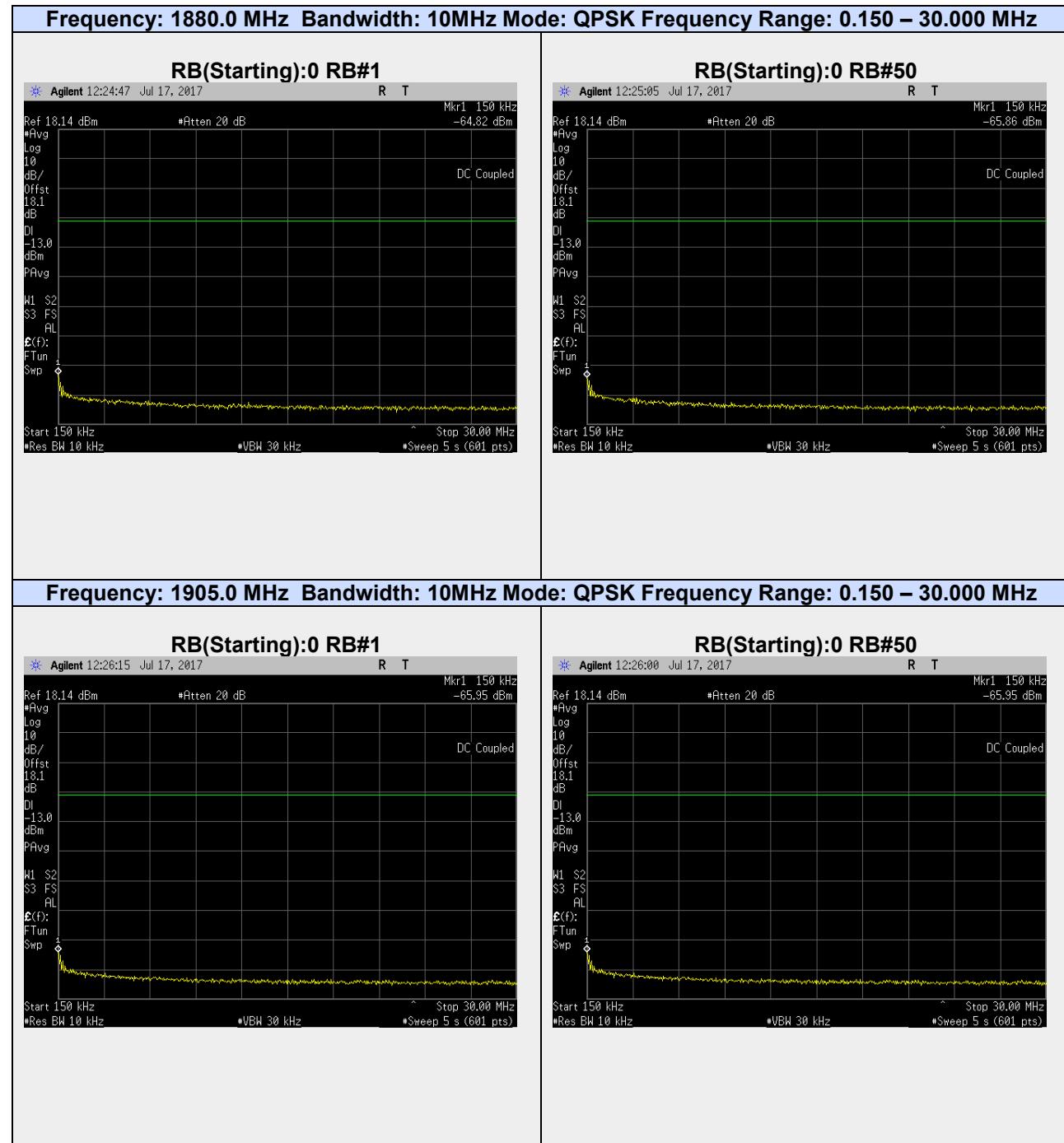
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



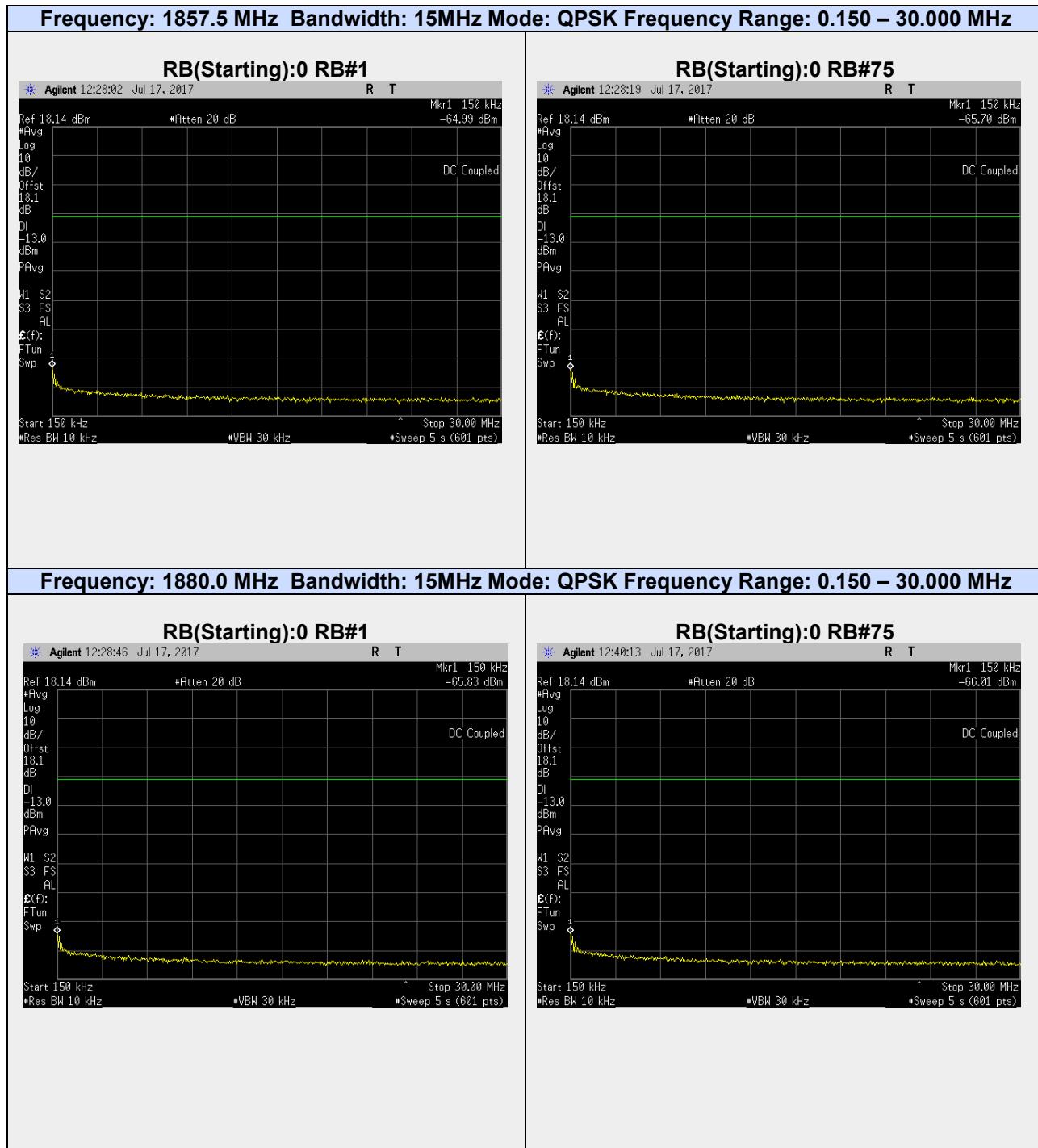
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



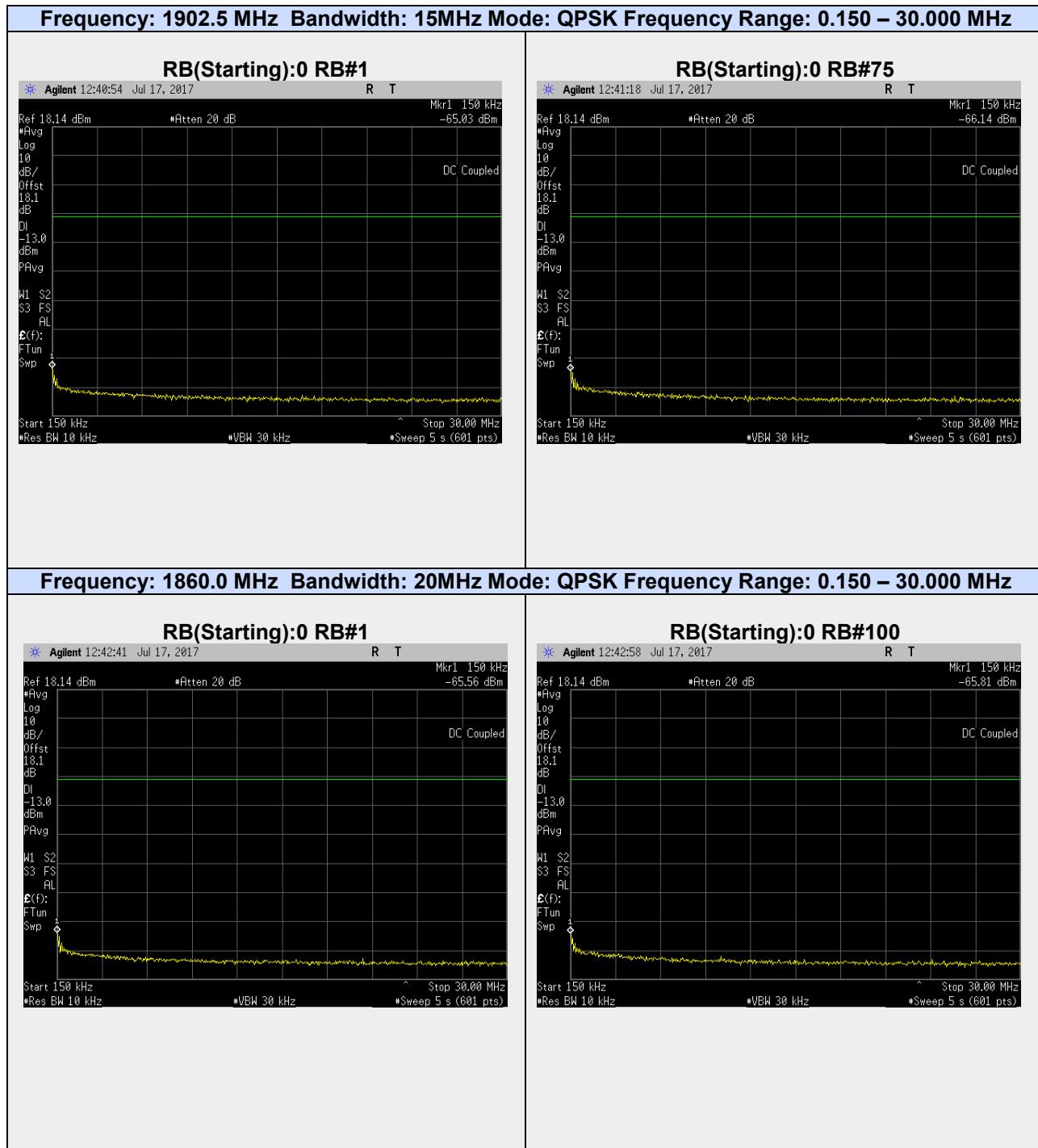
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



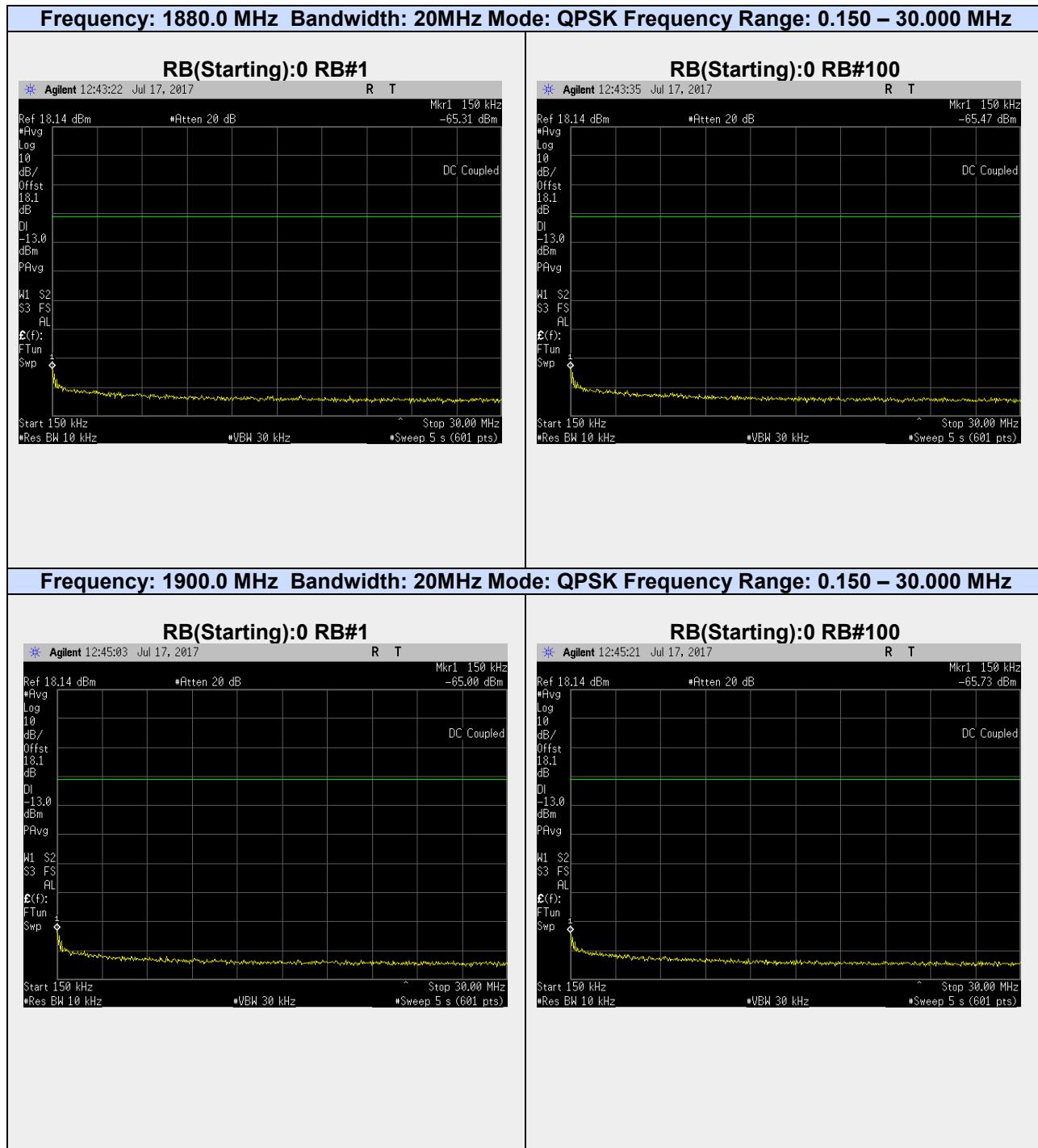
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



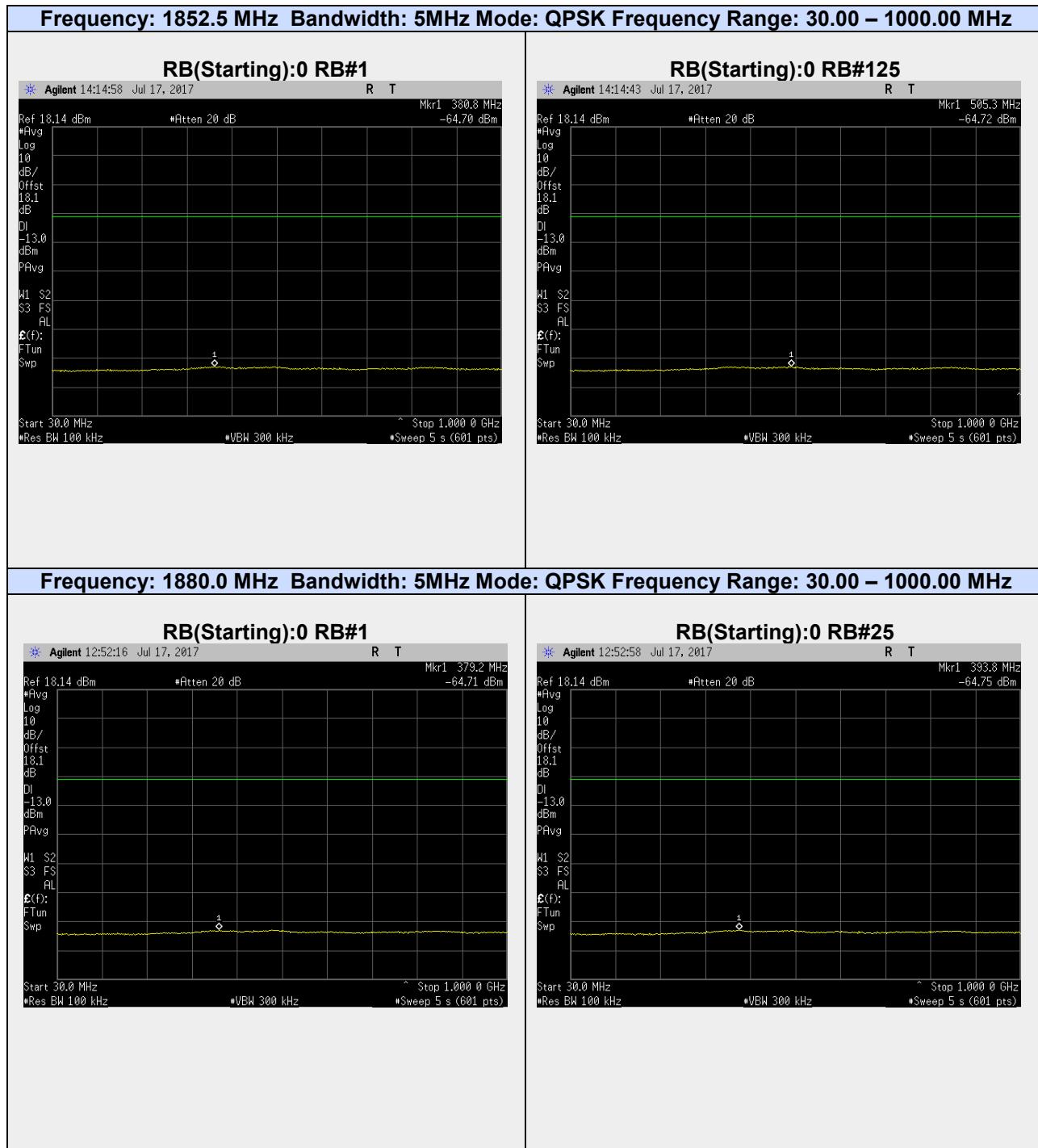
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



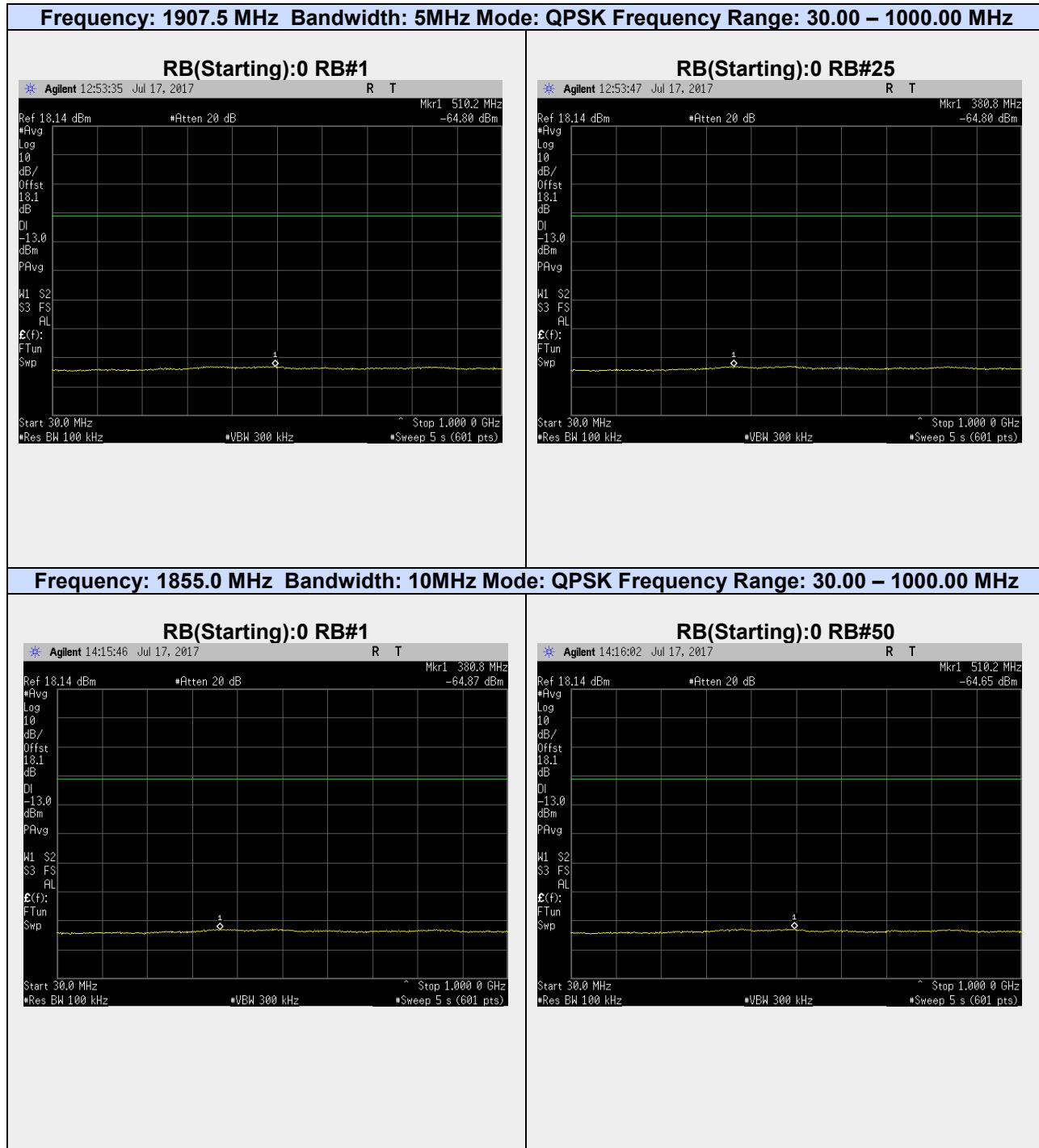
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



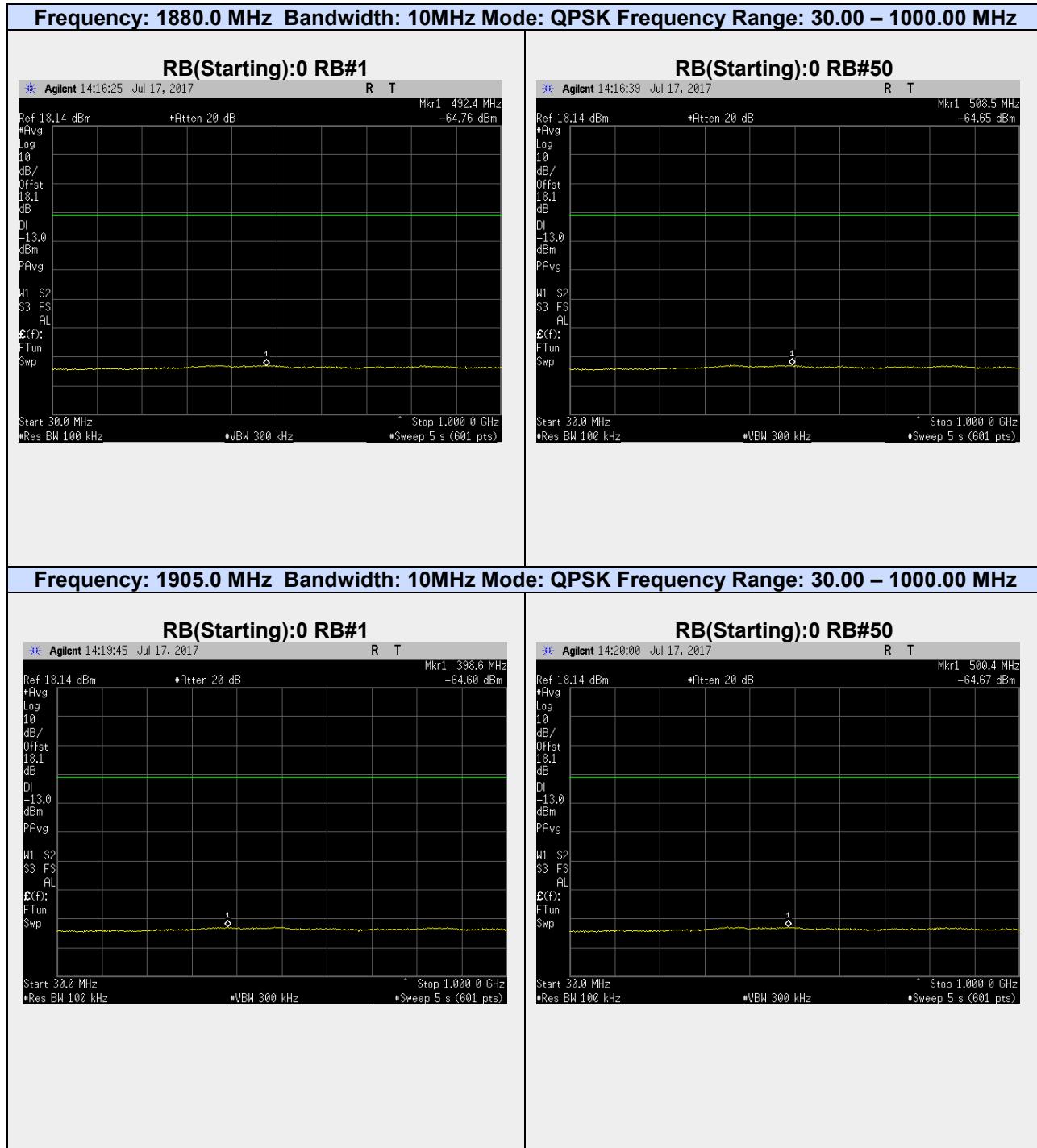
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

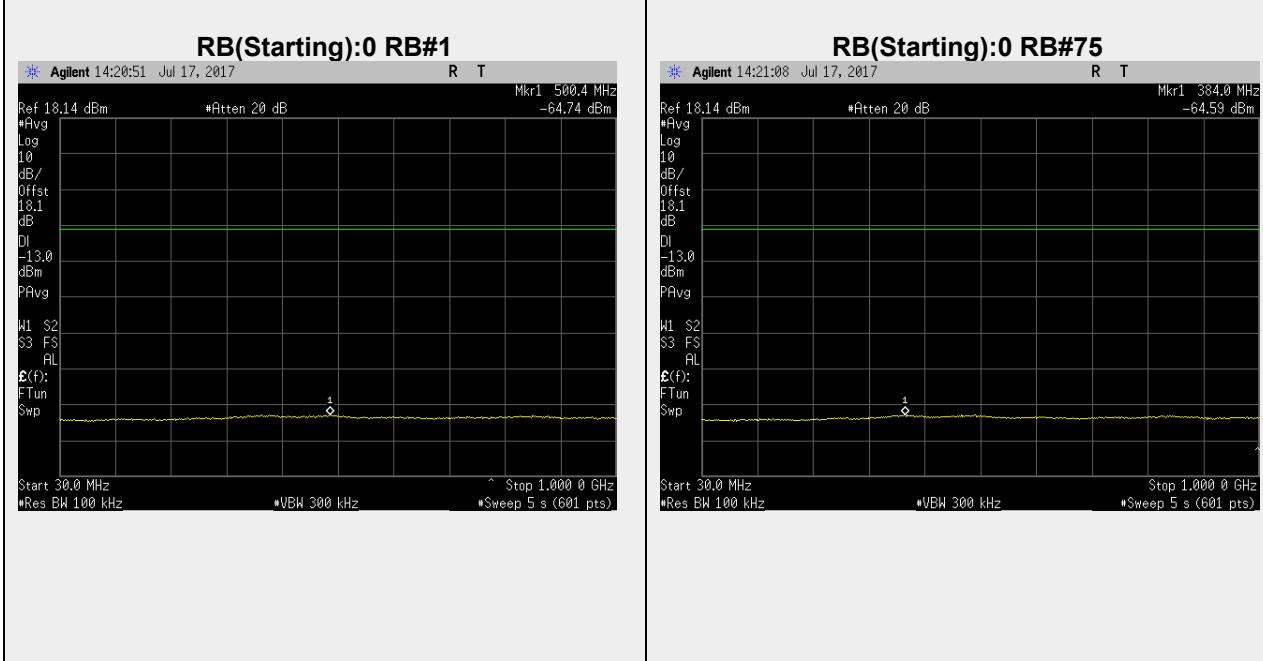


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

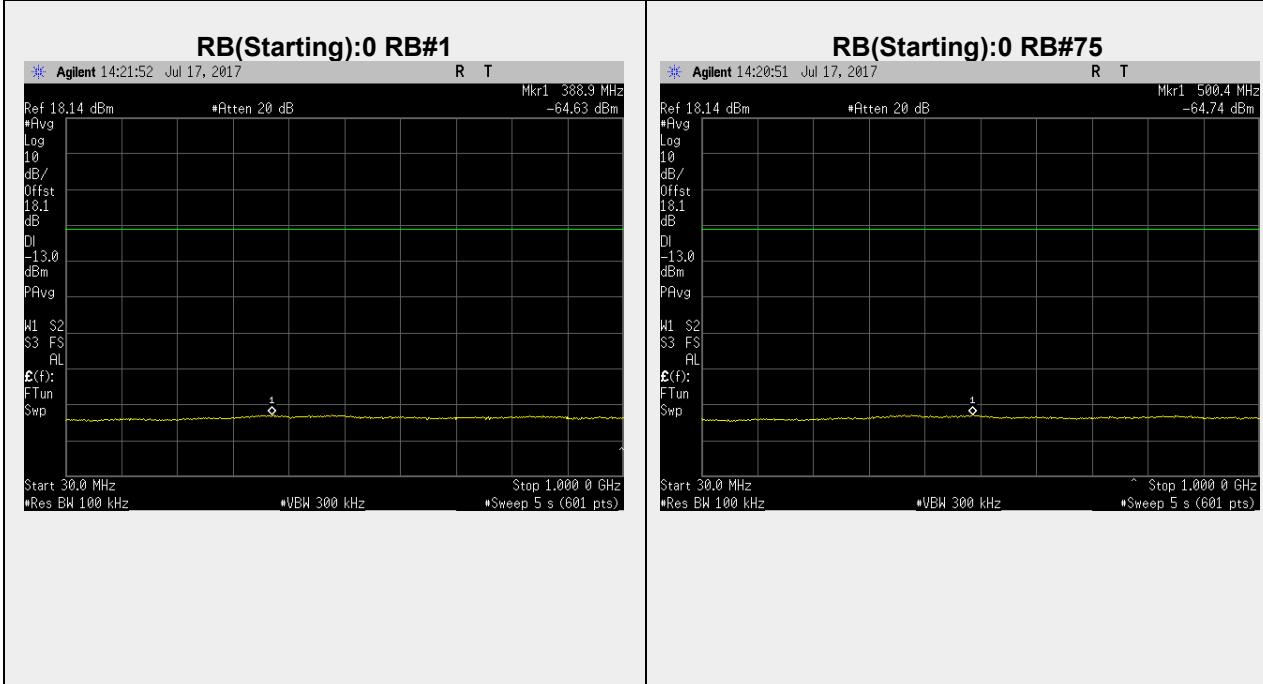


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1857.5.0 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 30.00 – 1000.00 MHz

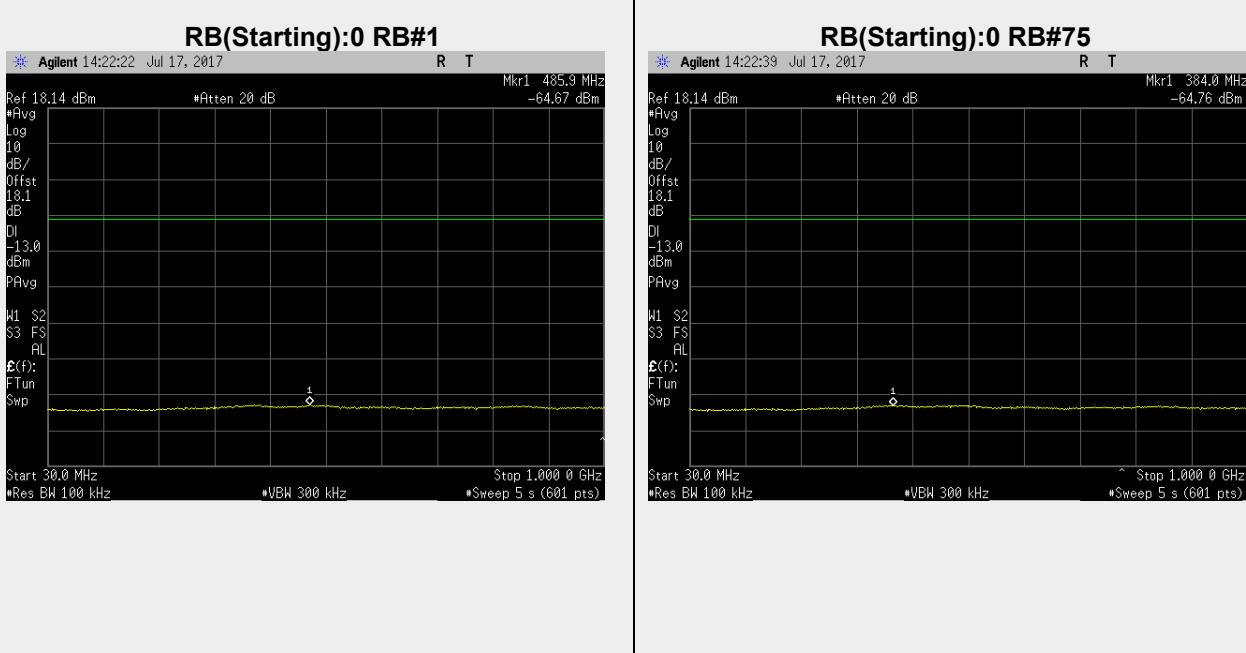


Frequency: 1880.0 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 30.00 – 1000.00 MHz

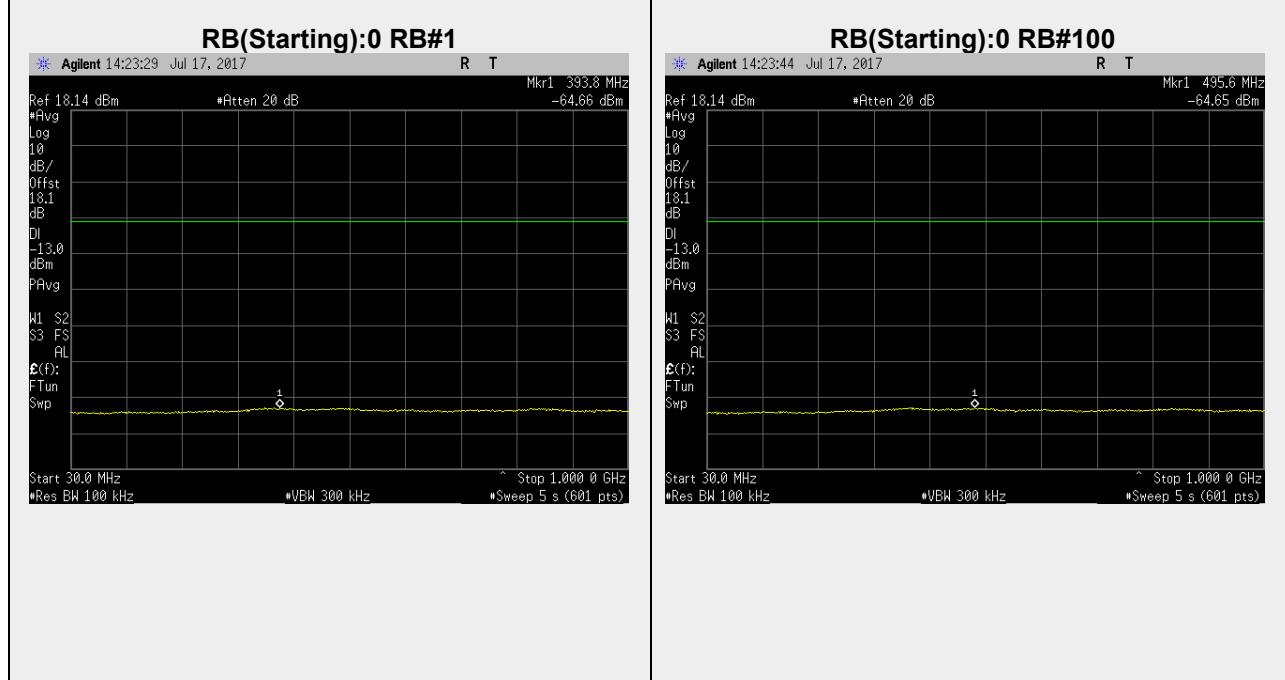


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1902.5.0 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 30.00 – 1000.00 MHz

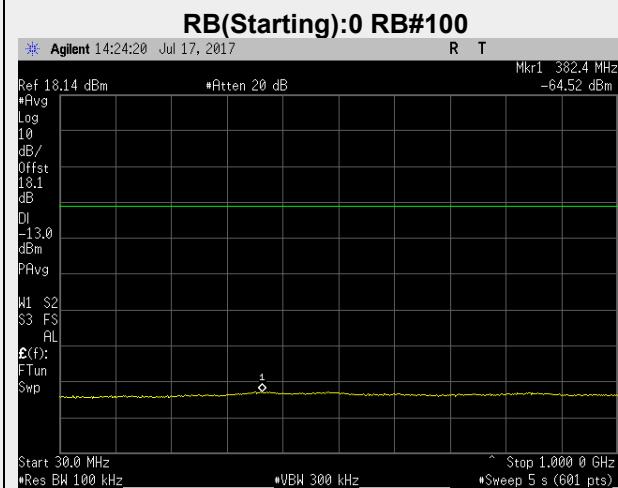
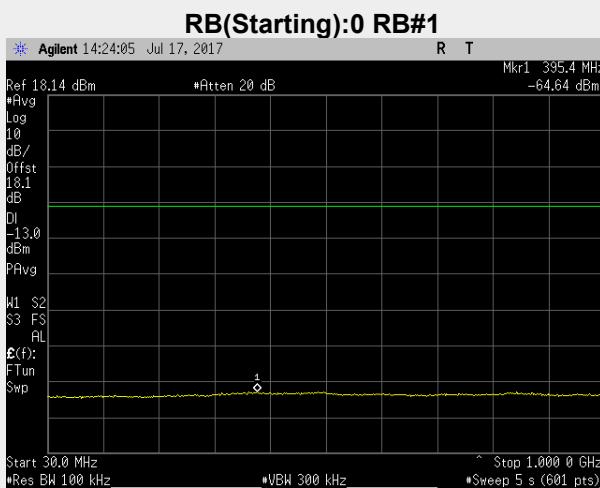


Frequency: 1860.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 30.00 – 1000.00 MHz

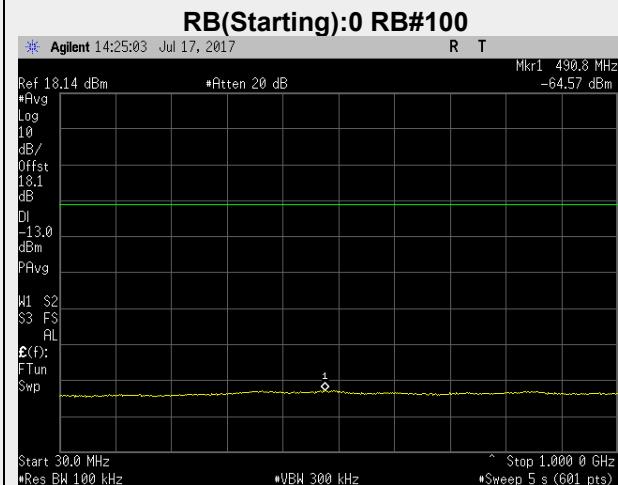
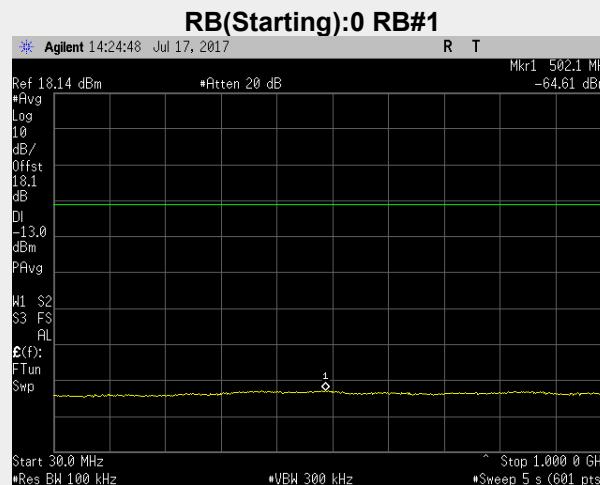


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.00 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 30.00 – 1000.00 MHz

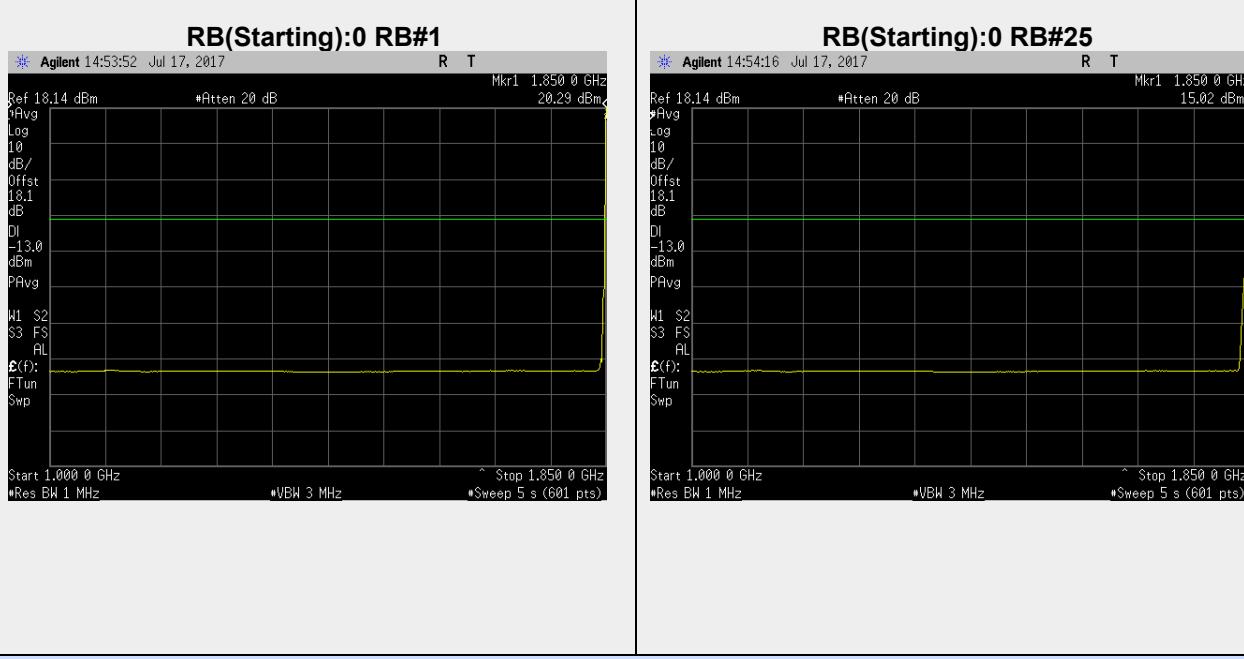


Frequency: 1900.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 30.00 – 1000.00 MHz

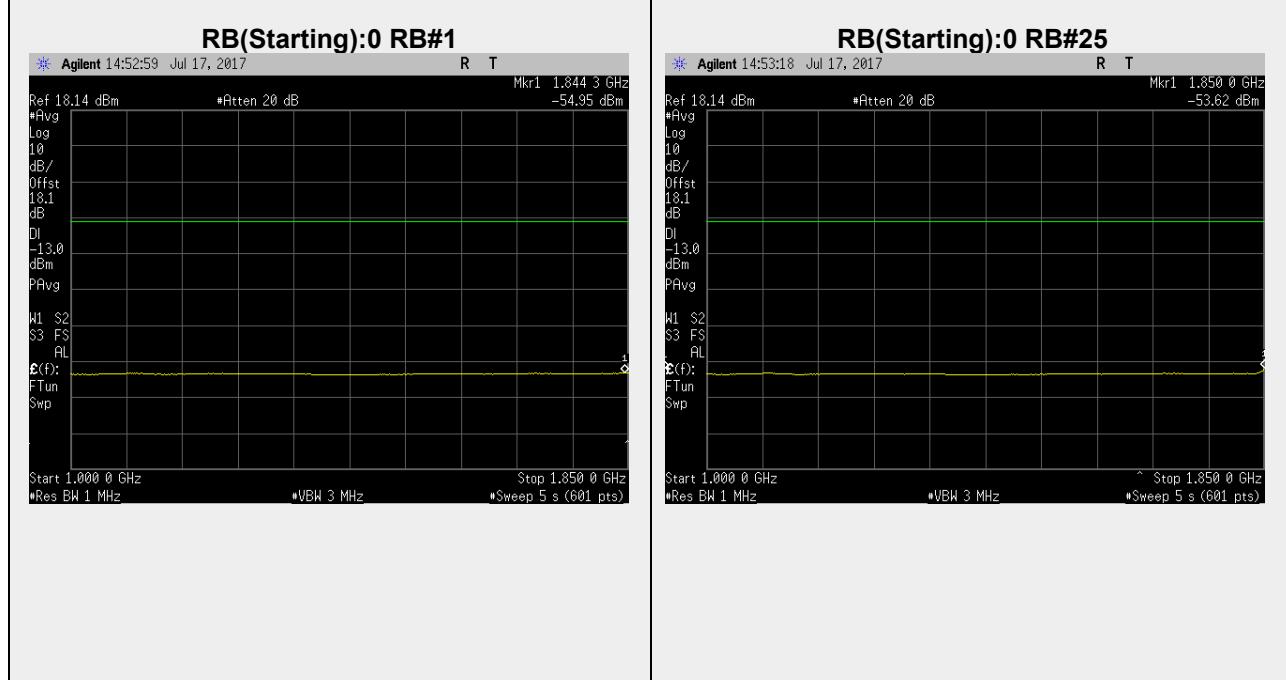


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1852.5 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz



Frequency: 1880.0 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

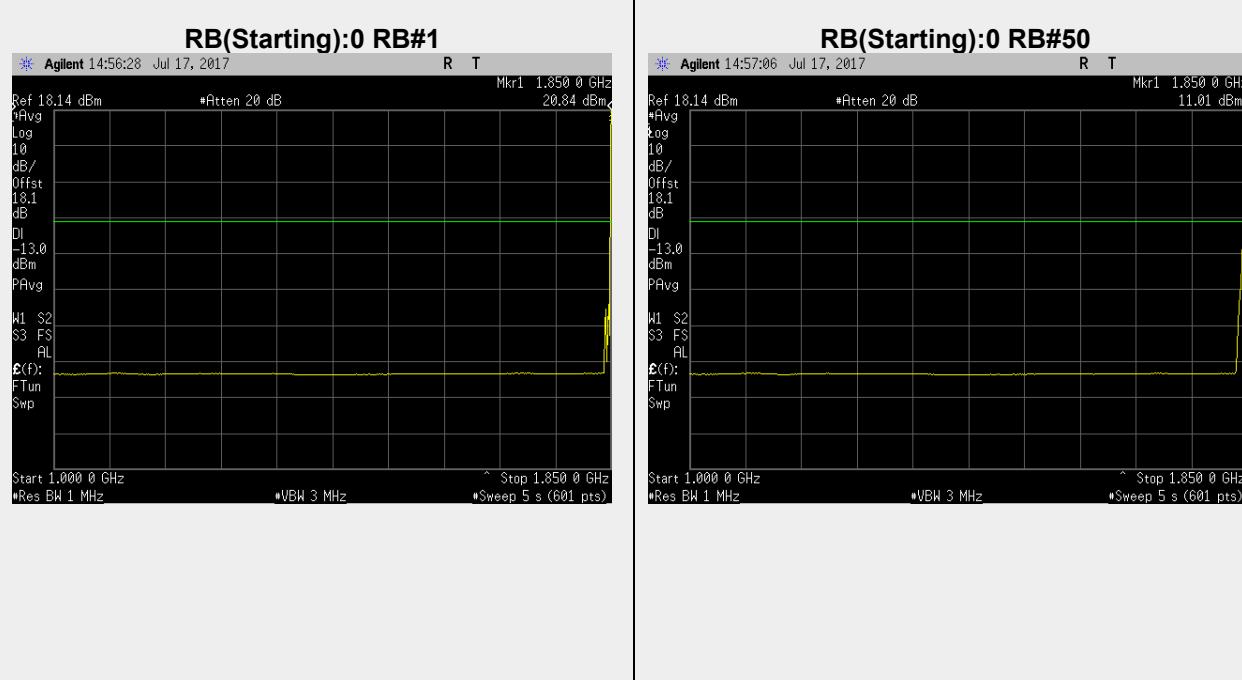


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1907.5 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

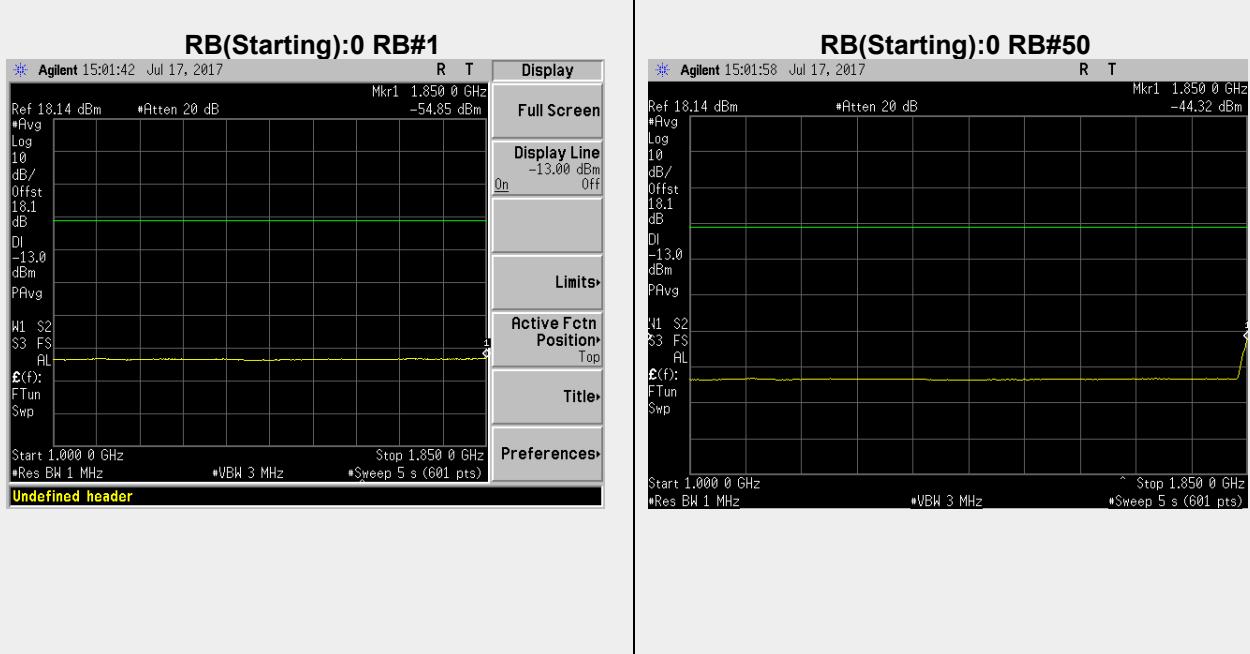


Frequency: 1855.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

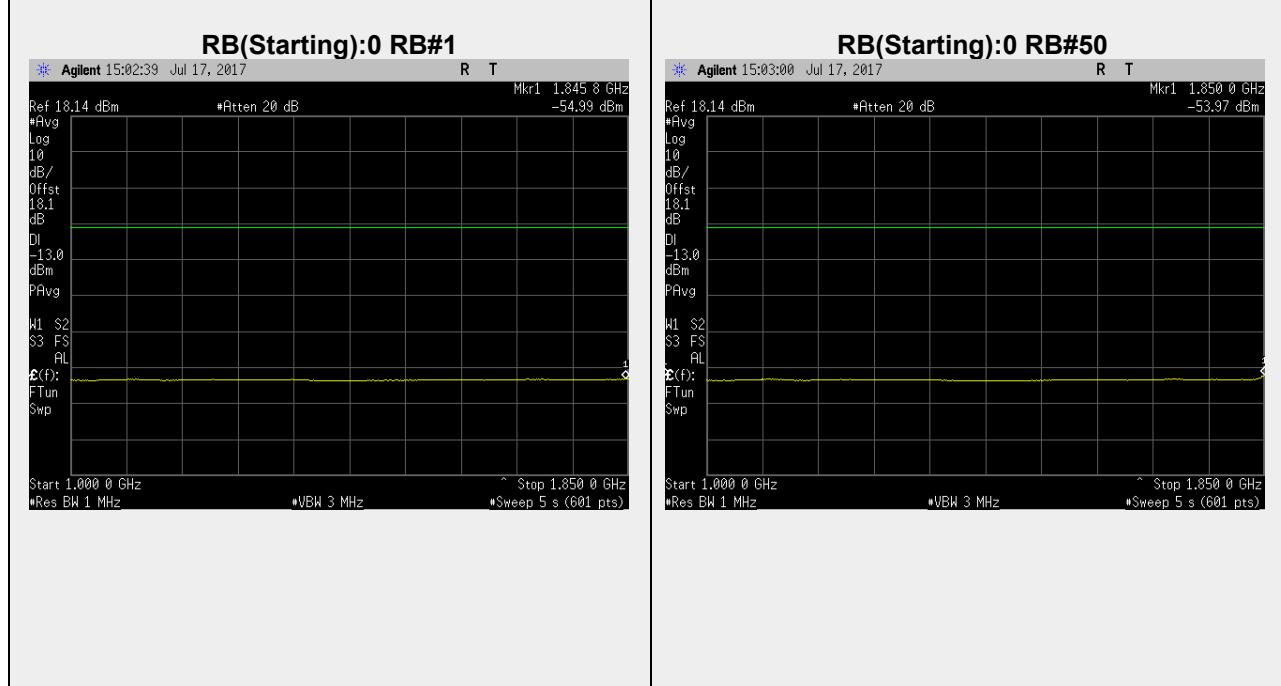


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

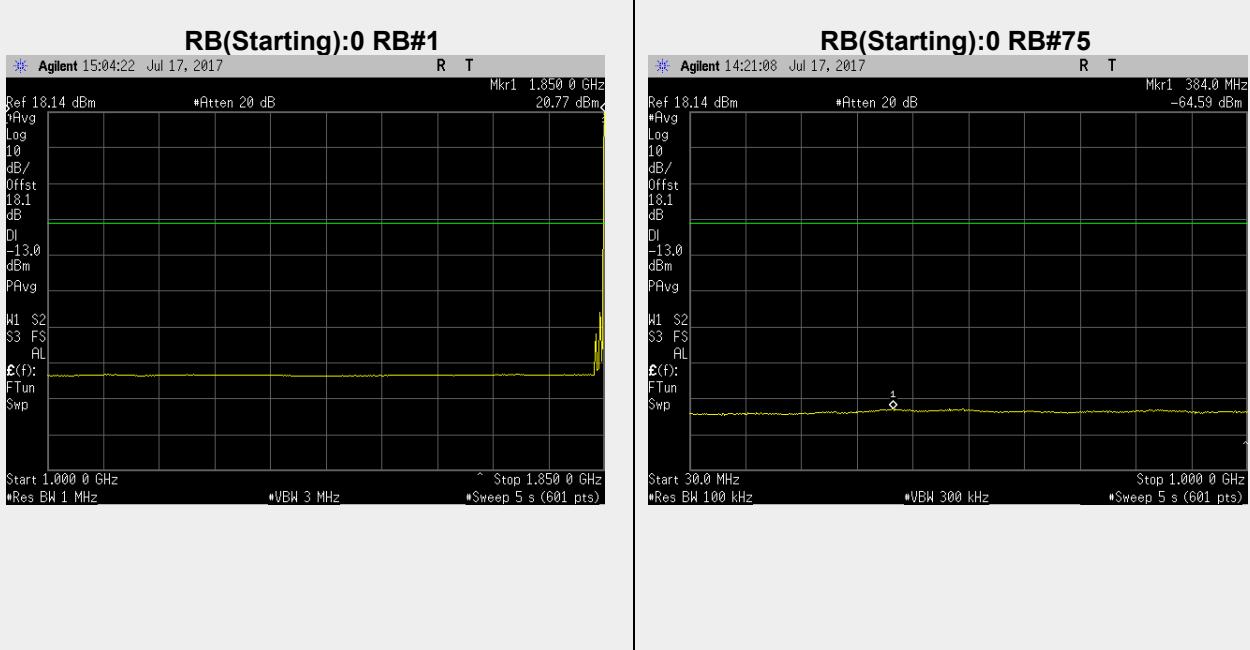


Frequency: 1905.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

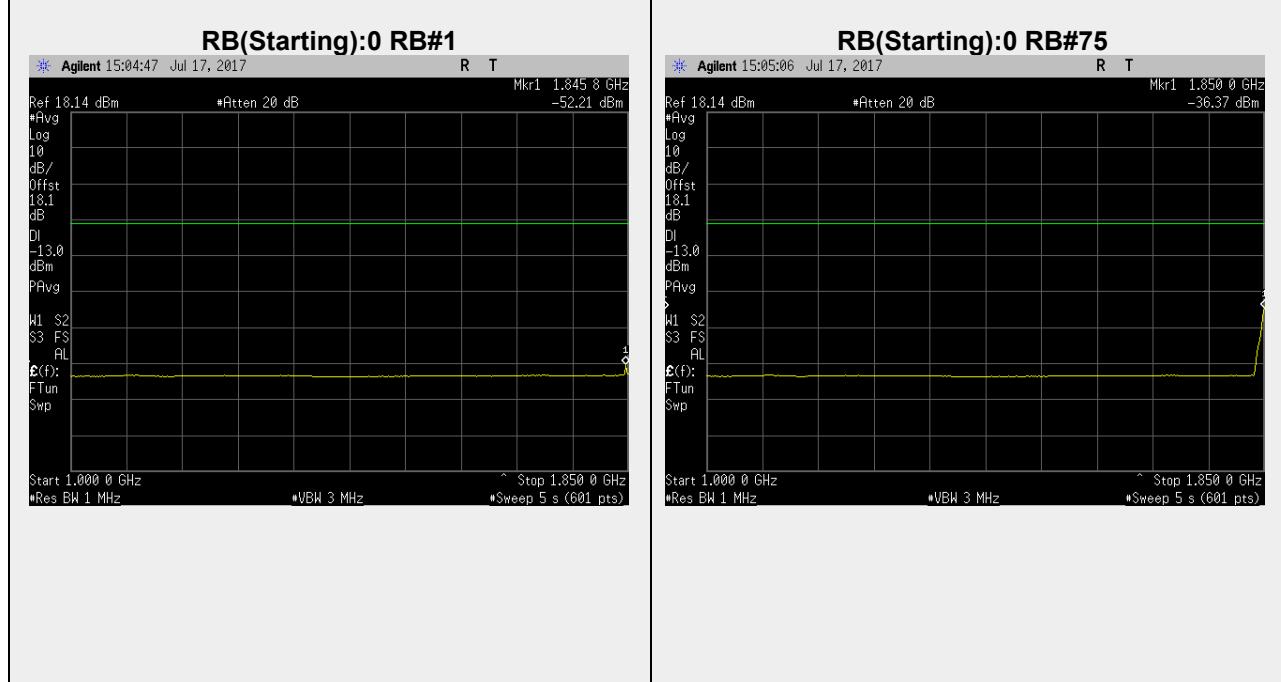


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1857.5 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

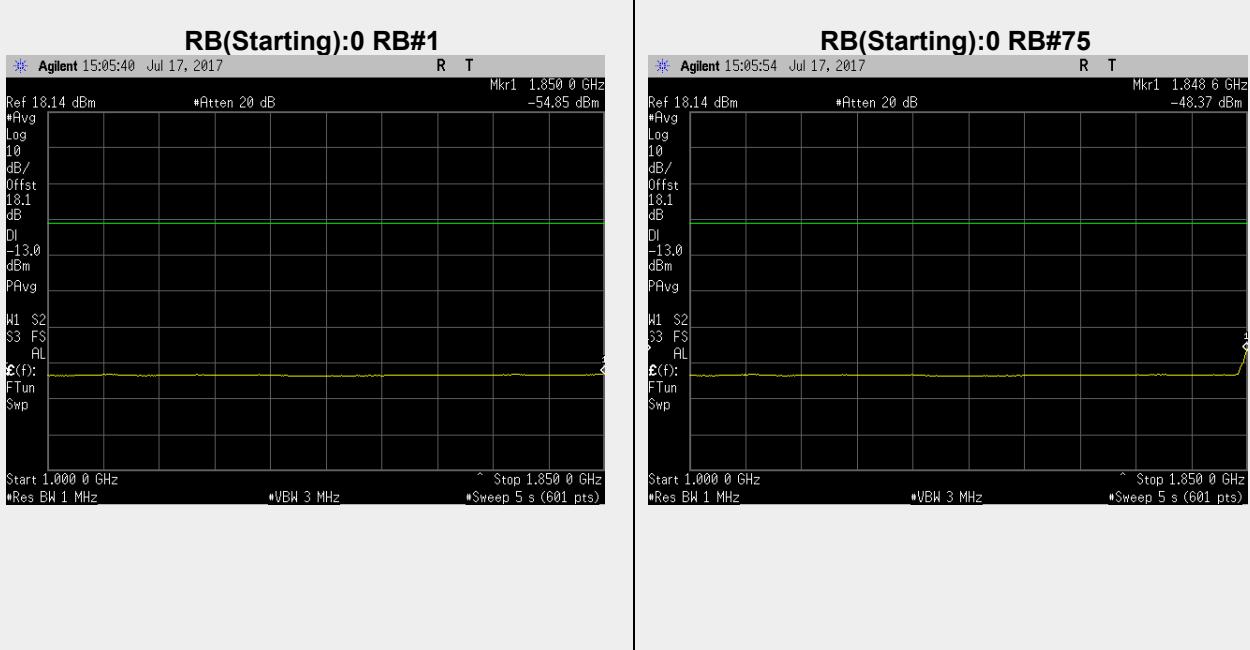


Frequency: 1880.0 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

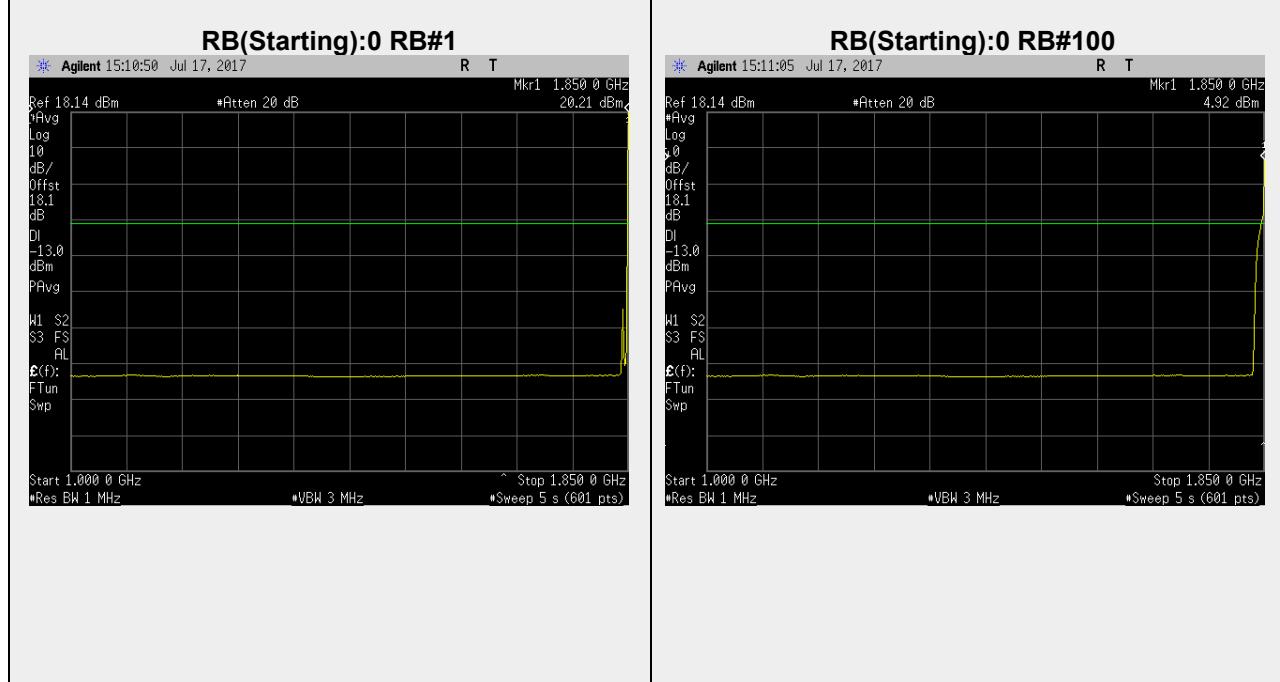


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1902.5 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz



Frequency: 1860.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

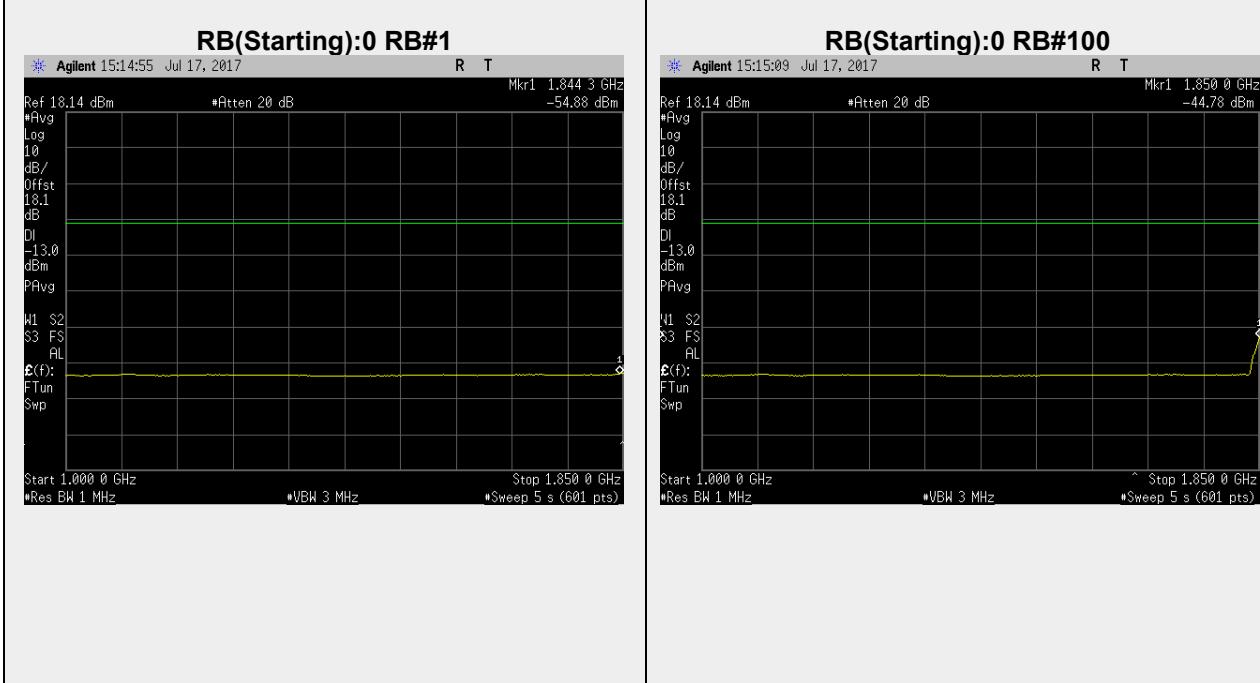


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

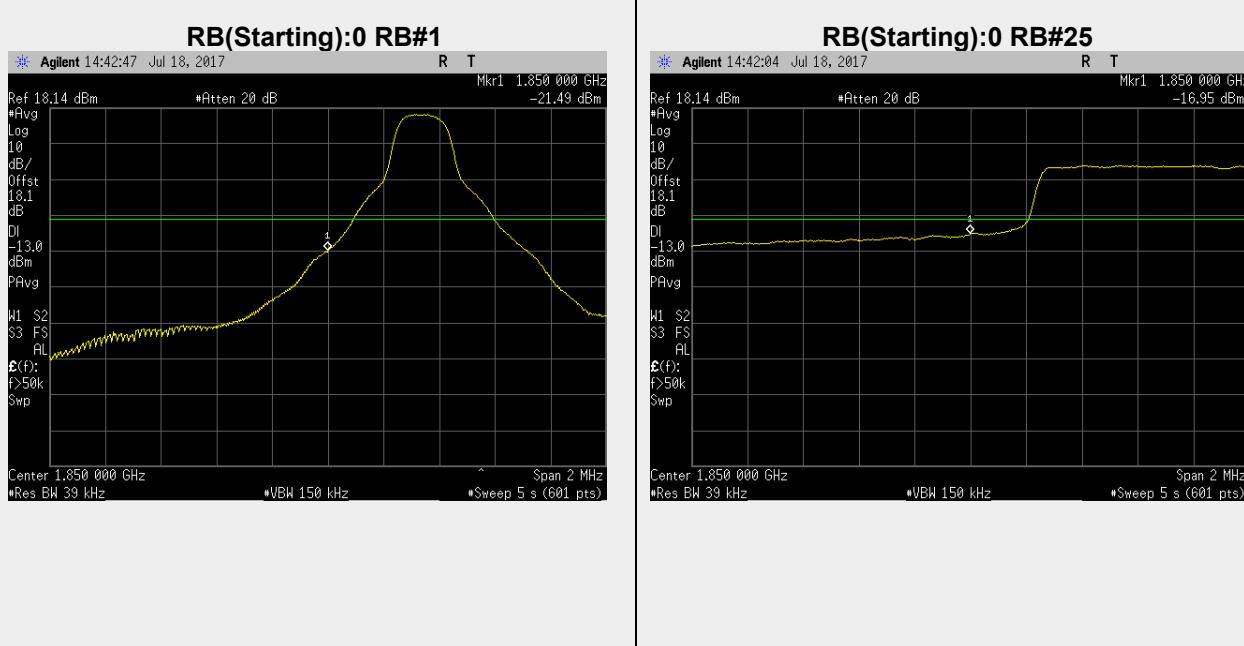


Frequency: 1900.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1000.00 – 1850.00 MHz

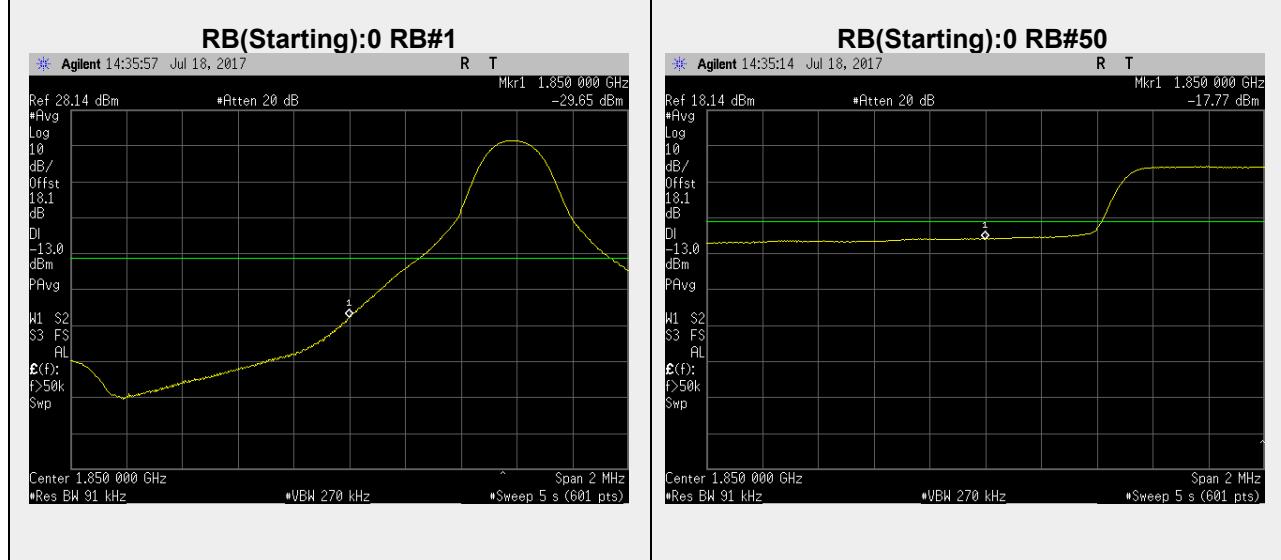


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1852.5 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1849.00 – 1851.00 MHz

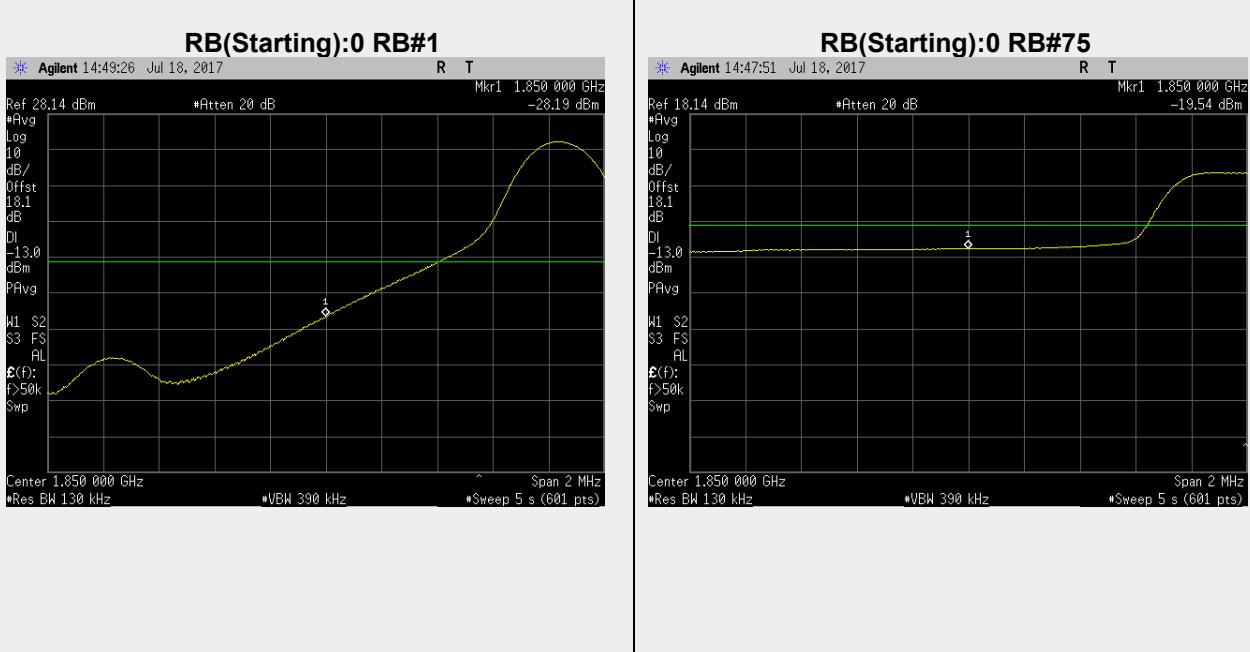


Frequency: 1855.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1849.00 – 1851.00 MHz

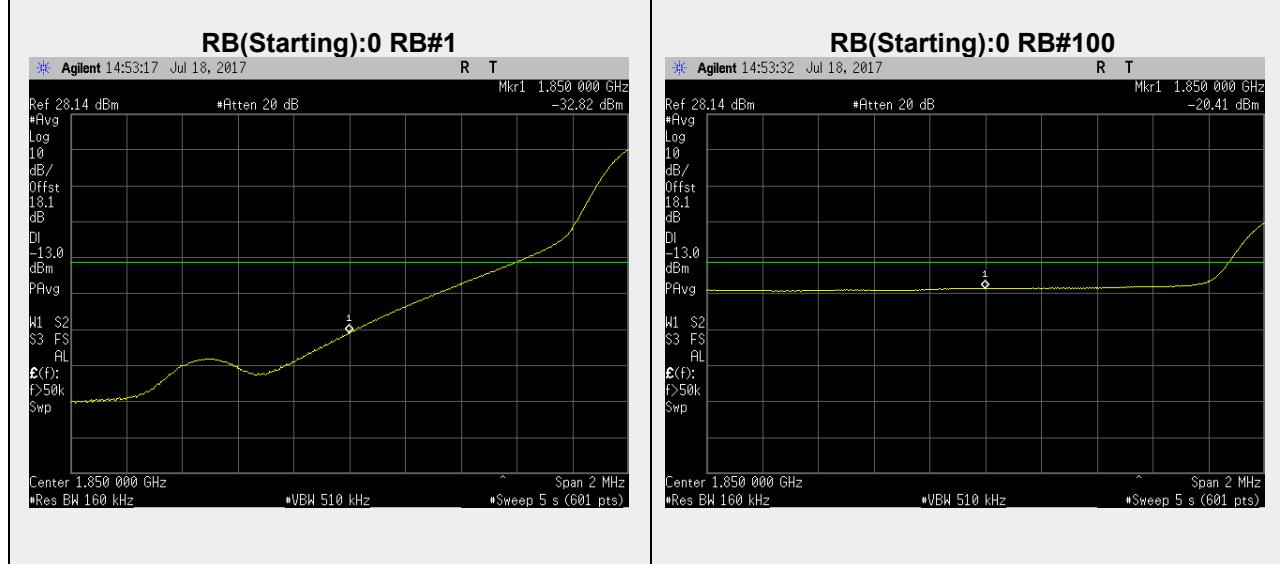


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1857.5 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1849.00 – 1851.00 MHz

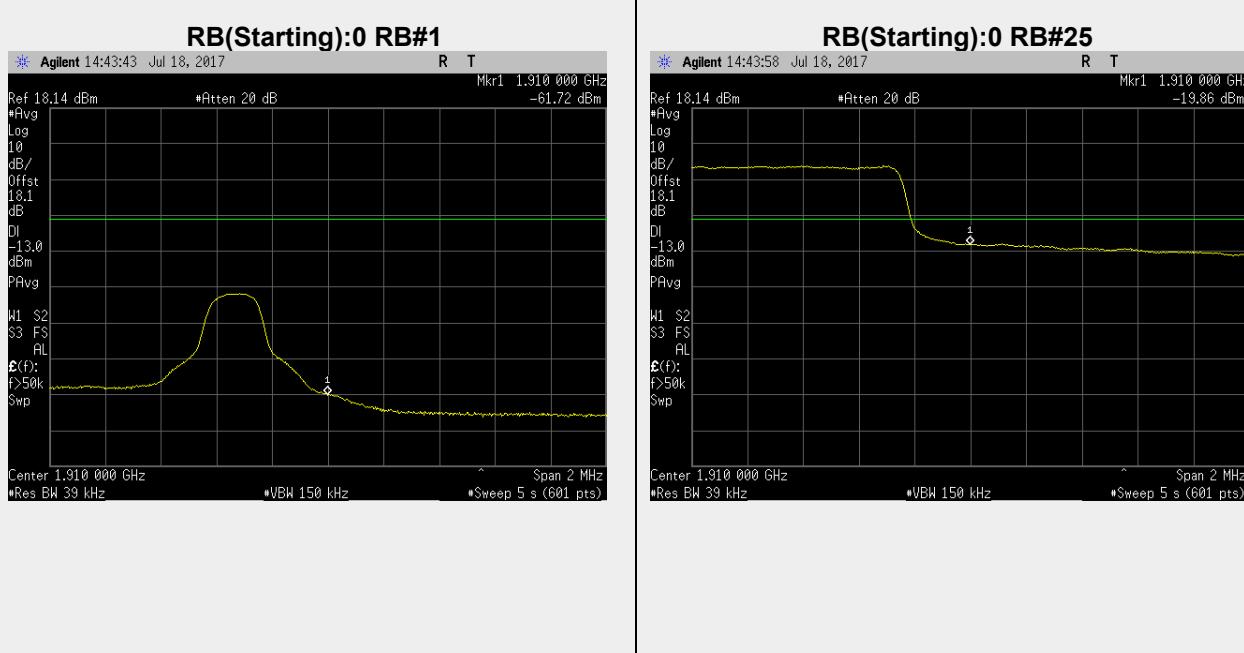


Frequency: 1860.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1849.00 – 1851.00 MHz



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1907.5 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1909.00 – 1911.00 MHz

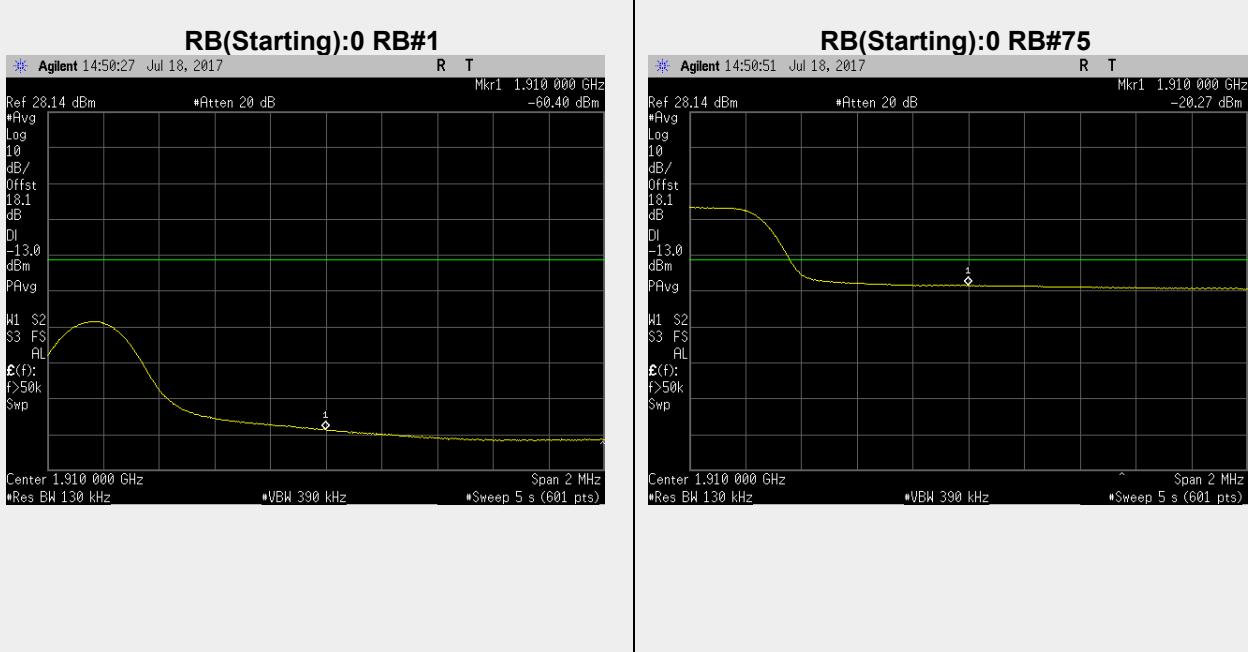


Frequency: 1905.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1909.00 – 1911.00 MHz

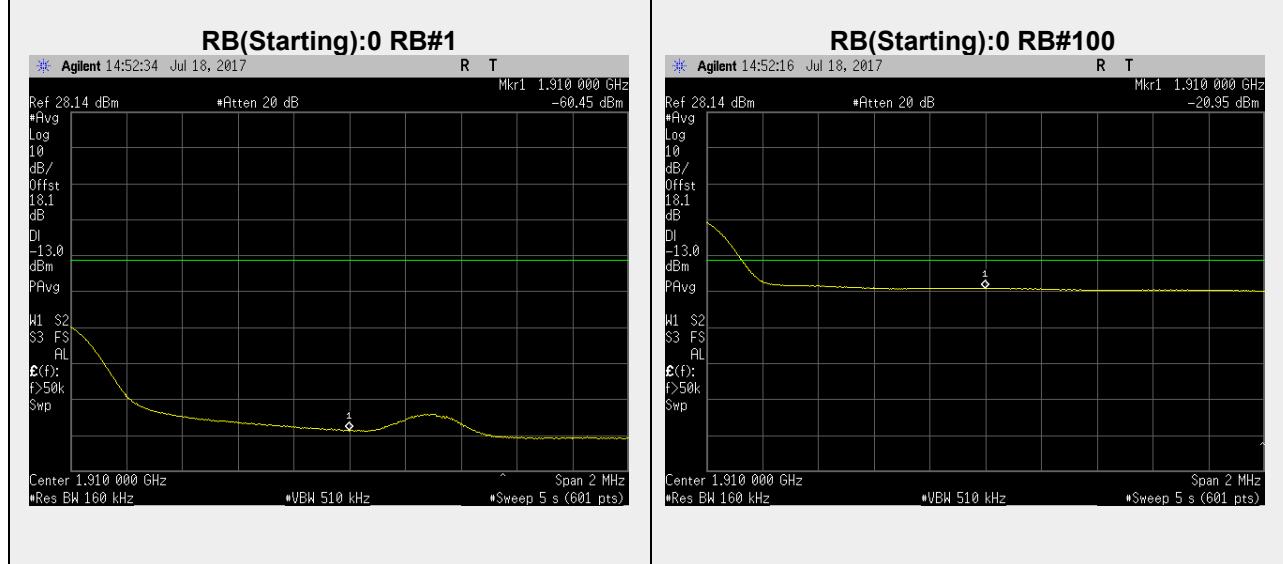


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1902.5 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1909.00 – 1911.00 MHz

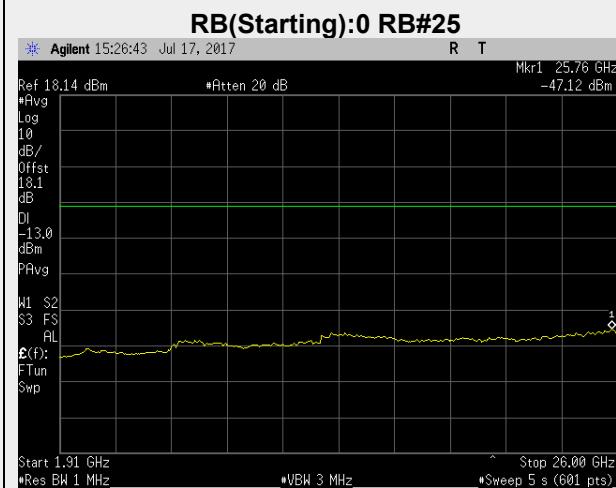


Frequency: 1900.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1909.00 – 1911.00 MHz



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1852.5 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

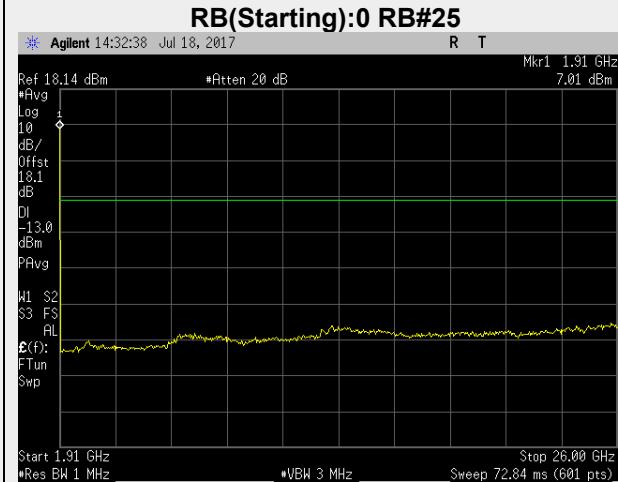
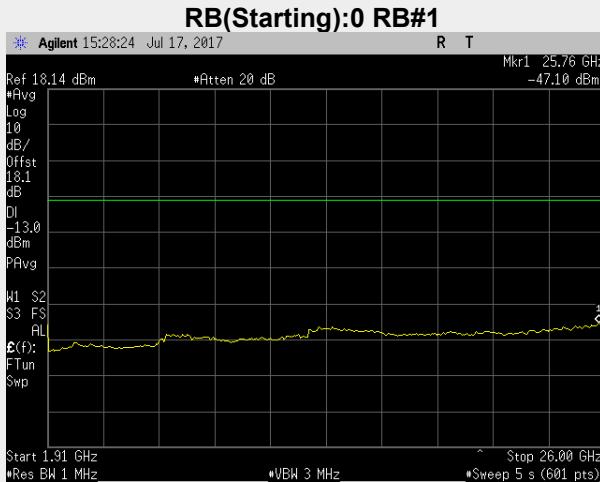


Frequency: 1880.0 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

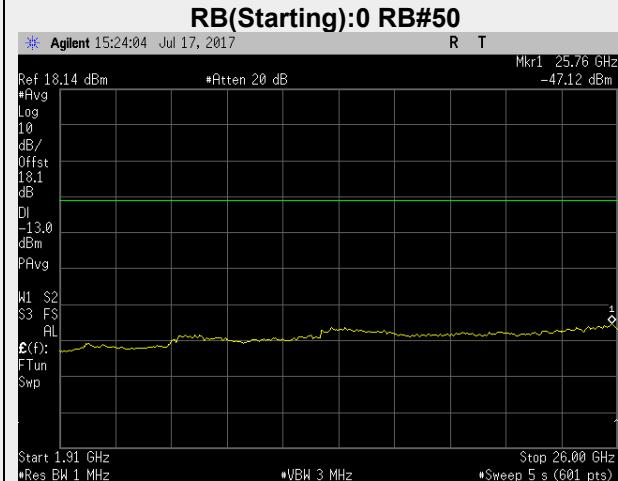


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1907.5 MHz Bandwidth: 5MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

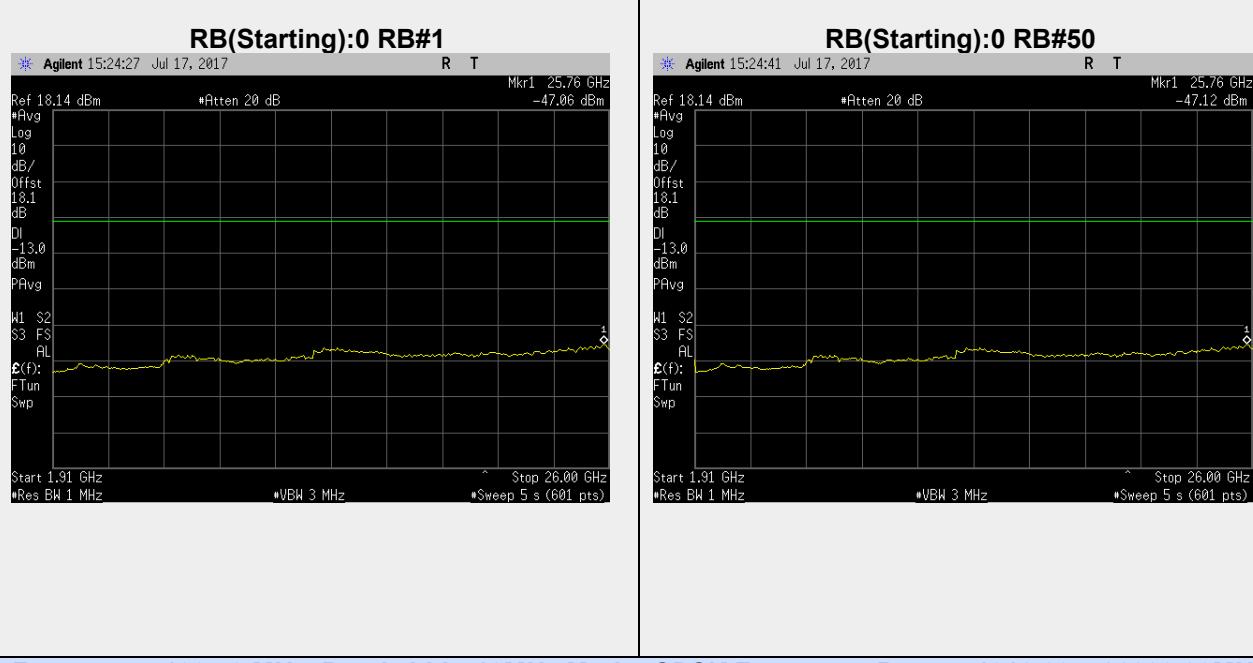


Frequency: 1855.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

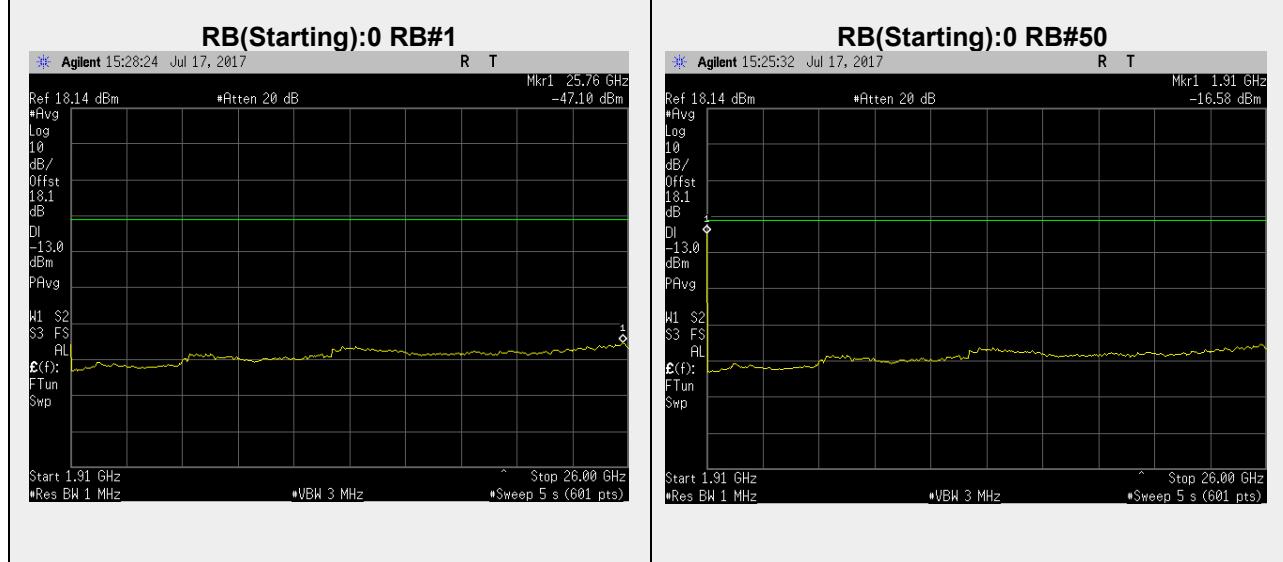


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

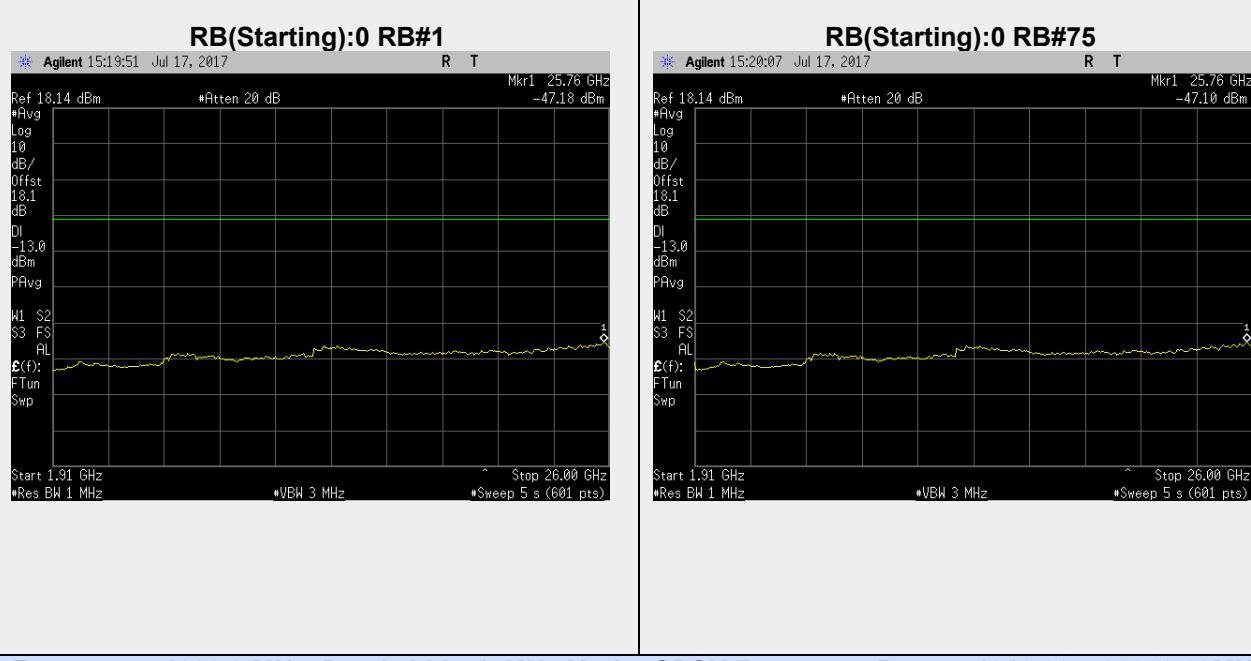


Frequency: 1905.0 MHz Bandwidth: 10MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

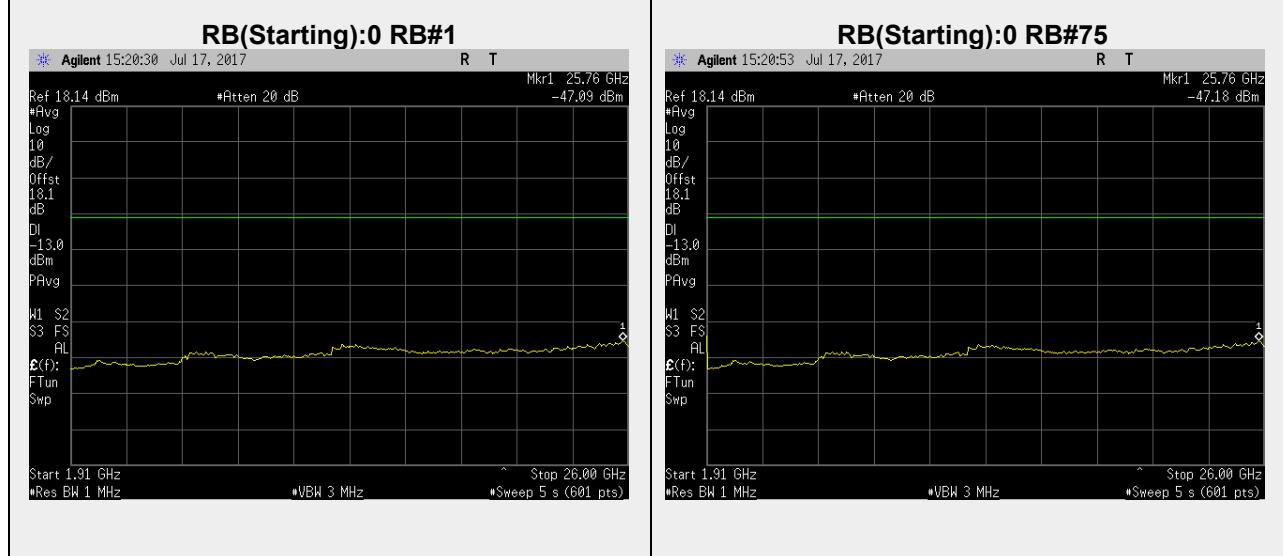


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1857.5 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

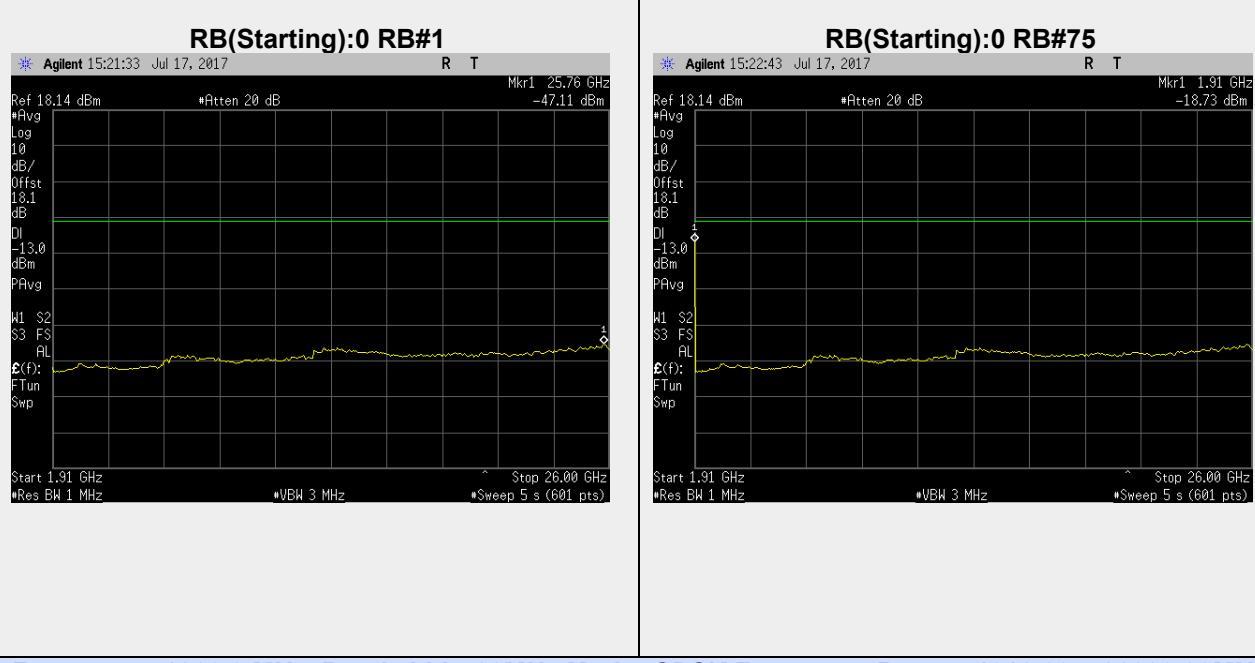


Frequency: 1880.0 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

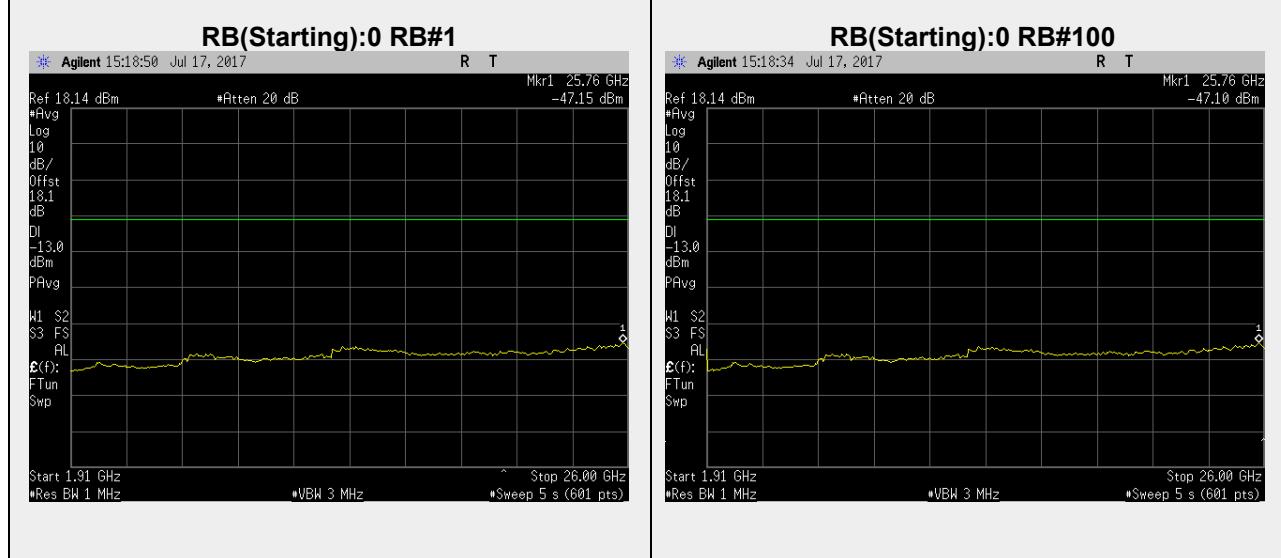


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1902.5 MHz Bandwidth: 15MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz



Frequency: 1860.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

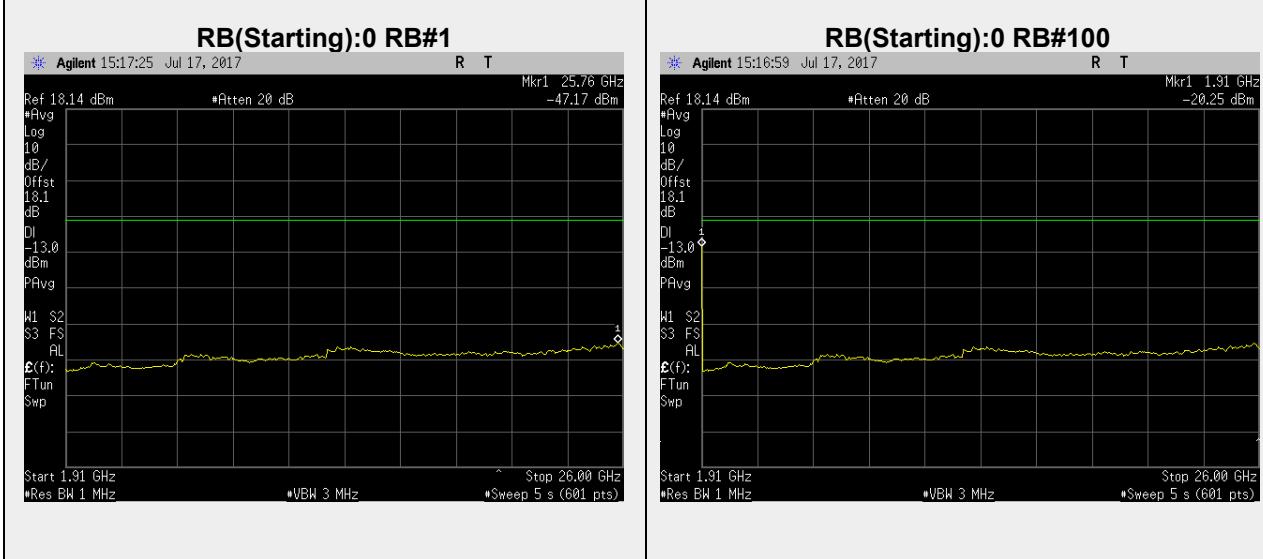


This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Frequency: 1880.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz

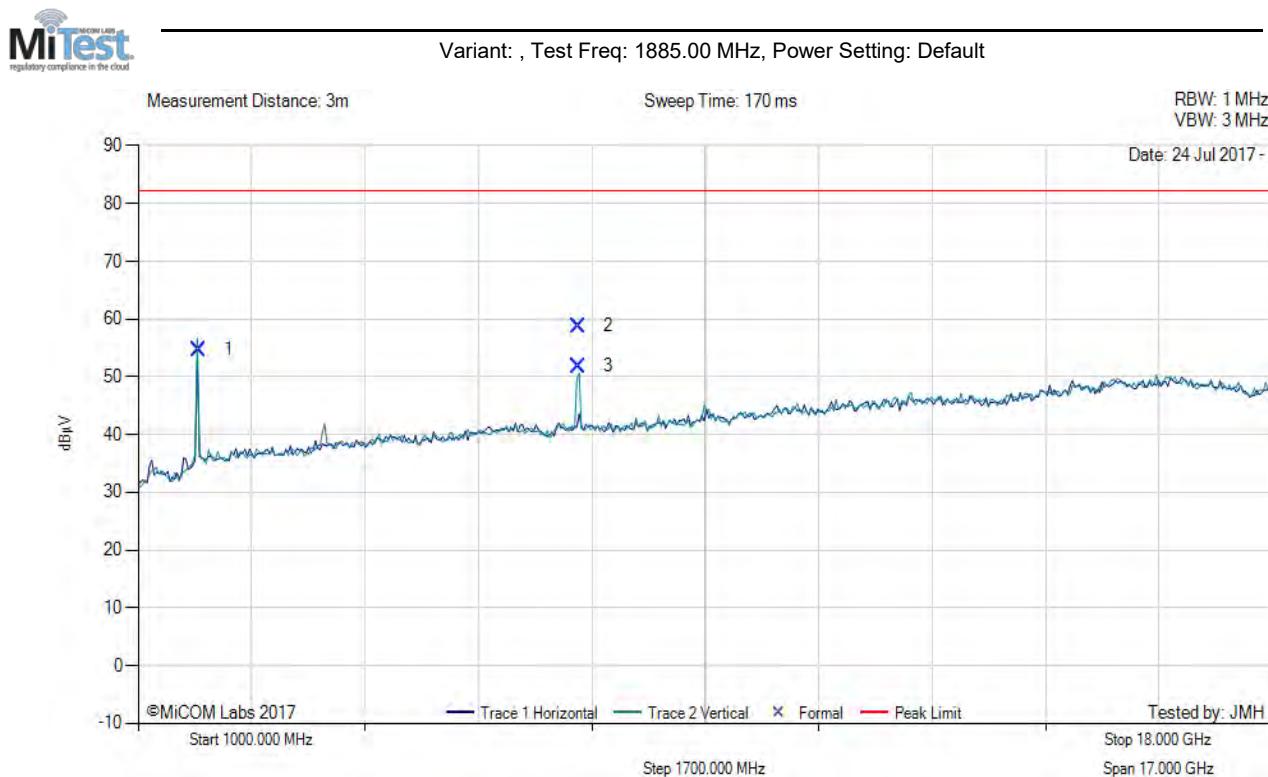


Frequency: 1900.0 MHz Bandwidth: 20MHz Mode: QPSK Frequency Range: 1910.00 – 26000.00MHz



This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

A.1.4. Radiated Spurious Out of Band Emissions

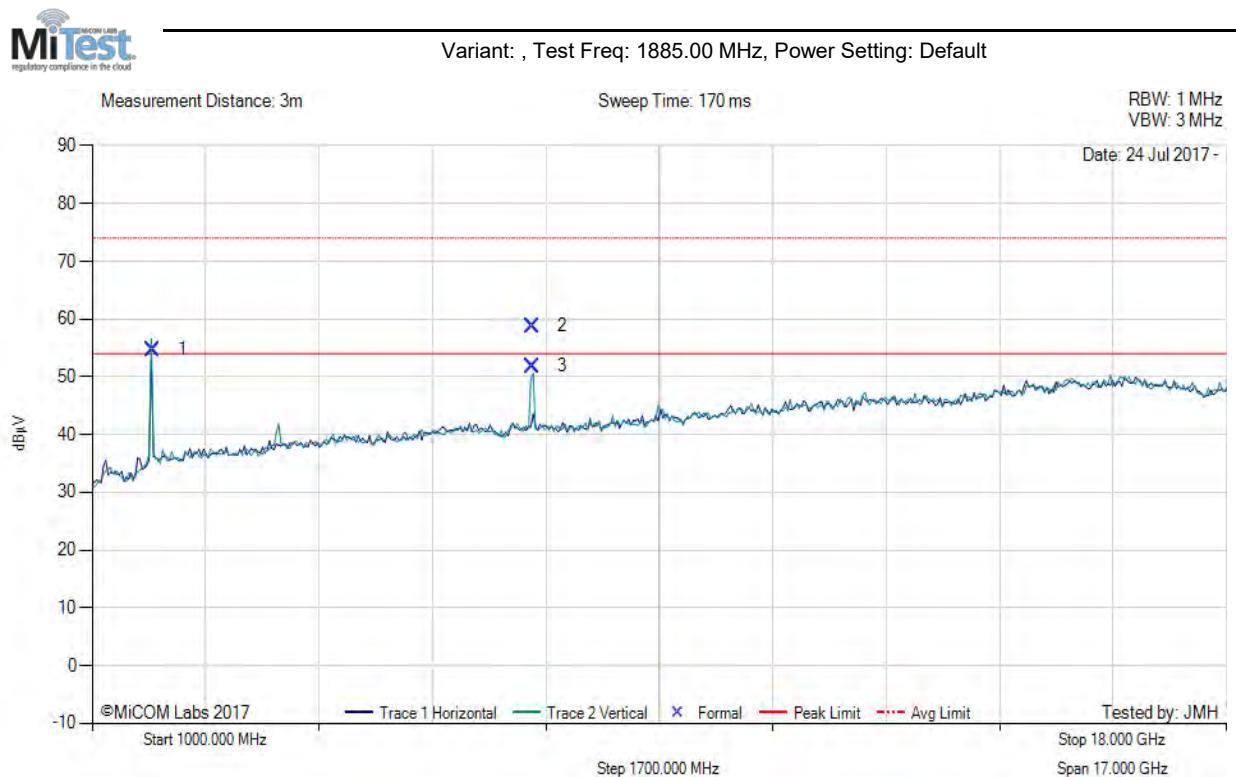


1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dB μ V	Cable Loss dB	AF dB	Level dB μ V/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dB μ V/m	Margin dB	Pass /Fail	
1	1906.22	65.25	2.50	-13.03	54.72	Fundamental	Vertical	100	0	--	--		
2	7600.01	61.42	4.39	-6.99	58.82	Max Peak	Vertical	196	78	82.2	-23.5	Pass	
3	7600.01	54.40	4.39	-6.99	51.80	Max Avg	Vertical	196	78	82.2	-30.5	Pass	

Test Notes: EUT powered up and originating call with Anritsu outside chamber, 43 – 10 LOG(P) Transmitter spurious limit = -13 dBm or 82.23 dB μ V/m at 3 meters

[back to matrix](#)

A.1.5. Radiated Receiver Emissions



1000.00 - 18000.00 MHz													
Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
1	1906.22	65.25	2.50	-13.03	54.72	Fundamental	Vertical	100	0	--	--		
2	7600.01	61.42	4.39	-6.99	58.82	Max Peak	Vertical	196	78	74.0	-15.2	Pass	
3	7600.01	54.40	4.39	-6.99	51.80	Max Avg	Vertical	196	78	54.0	-3.2	Pass	

Test Notes: EUT powered up and originating call with Anritsu outside chamber

[back to matrix](#)



575 Boulder Court
Pleasanton, California 94566, USA
Tel: +1 (925) 462 0304
Fax: +1 (925) 462 0306
www.micomlabs.com