Test Report Serial Number:	**45461492 R1.0**
Test Report Date:	**1 April 2019**
Project Number:	**1446**

EMC Test Report - Class II Permissive Change

Applicant:

4RF Limited
PO Box 13-506
Wellington 6440, New Zealand

4RF Limited
26 Glover St.
Ngauranga, PO Box 13-506
Wellington 6440, New Zealand

FCC ID:	IC Registration Number
UIPSQ896M141	**6772A-SQ896M141**
Product Model Number / HVIN	Product Name / PMN
SQ896M141	**Aprisa SR+**

In Accordance With:

FCC 47 CFR Part 24 - Subpart D - Narrowband PCS
Licensed Non-Broadcast Station Transmitter (TNB)

ISED RSS-134 - 900MHz Narrowband Personal Communication Servide
PCS Narrowband (901–902 MHz, 930-931 MHz and 940–941 MHz)

Approved By:

Ben Hewson, President
Celltech Labs Inc.
21-364 Lougheed Rd.
Kelowna, BC, V1X 7R8
Canada

Test Lab Certificate: 2470.01 **IC Registration 3874A-1** **FCC Registration: CA3874**

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1.0 DOCUMENT CONTROL

Revision History					
Samples Tested By:	Art Voss, P.Eng.		**Date(s) of Evaluation:**		15 Mar - 27 Mar, 2019
Report Prepared By:	Art Voss, P.Eng.		**Report Reviewed By:**		Ben Hewson
Report Revision	**Description of Revision**		**Revised Section**	**Revised By**	**Revision Date**
1.0	Initial Release		n/a	Art Voss	1 April 2019

2.0 CLIENT AND DUT INFORMATION

Client Information	
Applicant Name	**4RF Limited**
Applicant Address (FCC)	PO Box 13-506 Wellington 6440, New Zealand
Applicant Address (ISED)	26 Glover St. Ngauranga, PO Box 13-506 Wellington 6440, New Zealand
DUT Information	
Device Identifier(s):	**FCC ID:** **UIPSQ896M141** **ISED ID:** **6772A-SQ896M141**
Equipment Class (FCC):	TNB - Licensed Non-Broadcast Station Transmitter
Equipment Class (ISED):	PCS Narrowband (901–902 MHz, 930-931 MHz and 940–941 MHz)
Device Type:	Digital Radio
Device Model(s) / HVIN:	SQ896M141
Device Marketing Name / PMN:	Aprisa SR+
Firmware Version ID Number / FVIN:	-
Host Marketing Name / HMN:	-
Test Sample Serial No.:	T/A Sample - Identical Prototype
Transmit Frequency Range:	901-902MHz, 930-931MHz, 940-941MHz
Test Channels:	Programmable
Manuf. Max. Rated Output Power:	QPSK: 37dBm 16 QAM: 35dBm 64 QAM: 34dBm
Manuf. Max. Rated BW/Data Rate:	12.5kHz, 25kHz, 50kHz, 100kHz
Antenna Make and Model:	n/a
Antenna Type and Gain:	28dBi Max.
Modulation:	QPSK, 16QAM, 64QAM
Mode:	Half Duplex
Emission Designator:	See Section 8.0
DUT Power Source:	10-30VDC, 13.8 VDC External (Nominal)
DUT Dimensions [HxWxD] (mm)	90 x 432 x 280
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

Class II Permissive Change: Reference Section 3.0 Scope

3.0 SCOPE

This Certification Report was prepared on behalf of:

4RF Limited

,(the '*Applicant*"), in accordance with the applicable Federal Communications Commission (FCC) CFR 47 and Innovation, Scientific and Economic Development (ISED) Canada rules parts and regulations (the '*Rules*'). The scope of this investigation was limited to only the equipment, devices and accessories (the '*Equipment*') supplied by the *Applicant*. The tests and measurements performed on this *Equipment* were only those set forth in the applicable *Rules* and/or the Test and Measurement Standards they reference. The *Rules* applied and the Test and Measurement Standards used during this evaluation appear in the Normative References section of this report. The limits set forth in the technical requirements of the applicable *Rules* were applied to the measurement results obtained during this evaluation and ,unless otherwise noted, these limits were used as the Pass/Fail criteria. The Pass/Fail statements made in this report apply to only the tests and measurements performed on only the *Equipment* tested during this evaluation. Where applicable and permissible, information including test and measurement data and/or results from previous evaluations of same or similar equipment, devices and/or accessories may be cited in this report.

Application: Class II Permissive Change

This is a Class II Permissive Change to add 100kHz channel bandwidths operating in 901-902, 930-931 and 940-941MHz bands, under 47 CFR §24 Subpart D and ISED RSS-134 (SRSP-509). Channel aggregation of two 50kHz adjacent channels are permitted per 47 CFR §24.131 and ISED RSS-134 §4.1. The authorized bandwidth is 5kHz less than the total aggregated channel bandwidth, or 95kHz. This changes involves modification of the firmware only, there are no physical changes to the circuit design, PCB layout or bill of material and there are no changes to the transmitter output power.

The scope of this investigation includes:

Measurement of the transmitter output power and compare to the original filing.
Measurement of the occupied bandwidth and evaluate for compliance.
Measurement of the conducted spurious transmitter emissions and evaluate for compliance.
Measurement of the radiated spurious transmitter emissions and compare to the original filing.

I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.	Art Voss, P.Eng. Technical Manager Celltech Labs Inc. 1 April 2019 Date

4.0 TEST RESULT SUMMARY

TEST SUMMARY						
Section	Description of Test	Procedure Reference	Applicable Rule Part(s) FCC	Applicable Rule Part(s) ISED	Test Date	Result
7.0	Conducted Power (Fundamental)	ANSI C63.10 2013 (DTS) ANSI C63.26 2015	§2.1046 §24.132	RSS-Gen RSS-134 §4.3	21 Mar 2019	Complies
8.0	Occupied Bandwidth	ANSI C63.10 2013 (DTS) ANSI C63.26 2015	§2.1049 §24.131	RSS-Gen RSS-134 §4.1	21 Mar 2019	Complies
9.0	Emission Mask	ANSI C63.10 2013 (DTS) ANSI C63.26 2015	§2.1051 §24.133(a)(1)	RSS-Gen RSS-134 §4.4.1	22 Mar 2019	Complies
10.0	Conducted TX Spurious Emissions	ANSI C63.10 2013 (DTS) ANSI C63.26 2015	§2.1051 §24.133(a)(1)	RSS-Gen RSS-134 §4.4.1	22 Mar 2019	Complies
11.0	Radiated TX Spurious Emissions (Pre-Scan Only)	ANSI C63.4 2014	§2.1053	RSS-Gen	28 Mar 2019	Complies

Test Station Day Log					
Date	Ambient Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Test Station	Tests Performed Section(s)
21 Mar 2019	22.6	15	101.6	**EMC**	**7, 8**
22 Mar 2019	22.4	15	101.0	**EMC**	**9, 10**
27 Mar 2019	20.8	17	102.0	**SAC**	**11**
28 Mar 2019	21.4	17	102.0	**SAC**	**11**

EMC - EMC Test Bench
OATS - Open Area Test Site
LISN - LISN Test Area
IMM - Immunity Test Area
SAC - Semi-Anechoic Chamber
TC - Temperature Chamber
ESD - ESD Test Bench
RI - Radiated Immunity Chamber

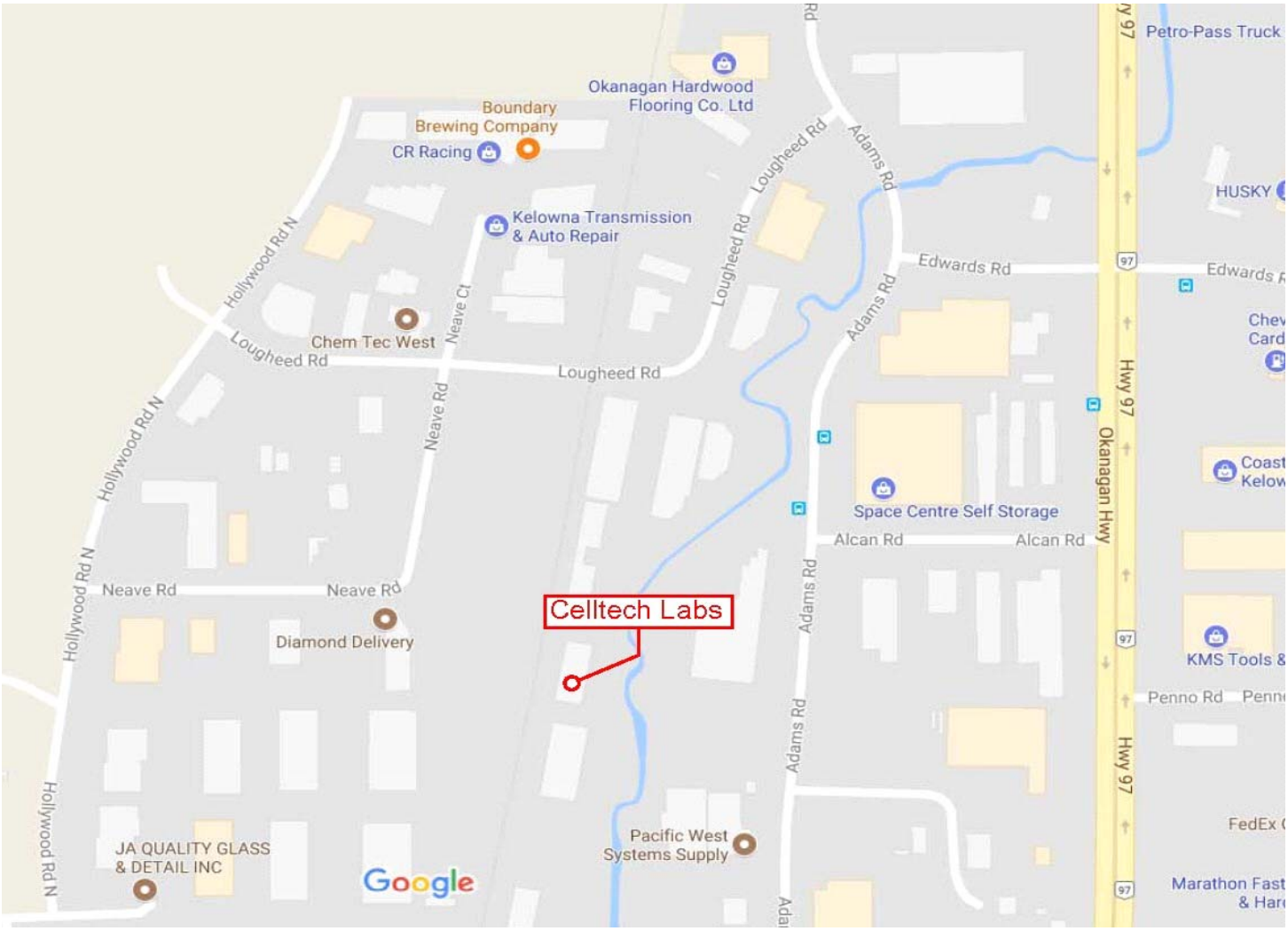
5.0 NORMATIVE REFERENCES

Normative References	
ANSI / ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices Procedure for Testing DTS Devices
ANSI C63.26:2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
CFR Title 47	Code of Federal Regulations Title 47: Telecommunication Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR Title 47	Code of Federal Regulations Title 47: Telecommunication Part 24: Personal Communication Services Subpart D: Narrowband PCS
ISED	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification RSS-Gen Issue 5: General Requirements and Information for the Certification of Radiocommunication Equipment
ISED	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification RSS-134 Issue 2: 900MHz Narrowband Personal Communication Service
ISED	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification SRSP-509 Issue 1: Technical Requirements for Narrowband Personal Communications Services in the Bands 901-902 MHz, 930-931 MHz and 940-941 MHz

6.0 FACILITIES AND ACCREDITATIONS

Facility and Accreditation:

The facilities used to evaluate this device outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site (OATS) conforms to the requirements set forth in ANSI C63.4 and is filed and listed with the FCC under Test Firm Registration Number CA3874A-1 and Industry Canada under Test Site File Number IC 3874A-1. Celltech is accredited to ISO 17025, through accrediting body A2LA and with certificate 2470.01.



7.0 CONDUCTED OUTPUT POWER

Test Procedure	
Normative Reference	FCC 47 CFR §2.1046, §2.1033(c)(8), §24.132, RSS-134 ANSI C63.26

Limits	
47 CFR §24	**§24.132 Power and antenna height limits.** (a) Stations transmitting in the 901-902 MHz band are limited to 7 watts e.r.p. (c) Base stations transmitting in the 930-931 MHz and 940-941 MHz bands are limited to 3500 watts e.r.p. per authorized channel
RSS-134	**4.3 Typical Output Power** (a) Stations transmitting in the 901-902 MHz band and all mobile stations in the 930-931 MHz and 940-941 MHz bands are limited to 7 watts effective radiated power (ERP) (11.5 watts effective isotropic radiated power (EIRP)). (b) Base stations transmitting in the 930-931 MHz and 940-941 MHz bands can be certified to any manufacturer's rated power that respects the ERP restrictions of SRSP- 509.

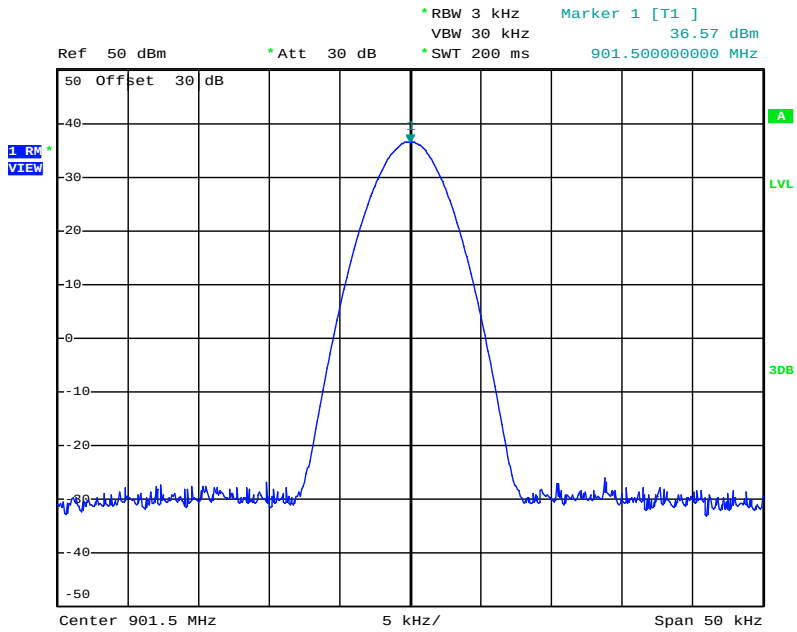
General Procedure	
C63.26	**5.2.1 RF power measurement instrumentation considerations** The DUT fundamental output power indicated in the original filing was obtained using the DUT's CW transmit mode. For the purpose of comparison, the output power was measured while the DUT was transmitting in the CW mode.

Test Setup	Appendix A - Figure A.1

Measurement Procedure
The DUT was connected to a Spectrum Analyzer via a 30dB attenuator connected to the DUT's antenna port. The SA was set to measure RMS power. The output power of the DUT was set to the manufacturer's highest output power setting at the Mid channel of each channel band. The DUT was set to transmit unmodulated. The DUT power source was set to the DUT's minimum, nominal and maximum input supply voltage. The SA was set to Max Hold and the output power was measured using Marker Peak. The output power was measure at each input power setting in each channel band.

Plot 7.1 – Conducted Power – 901.5MHz, 10VDC

Conducted Power

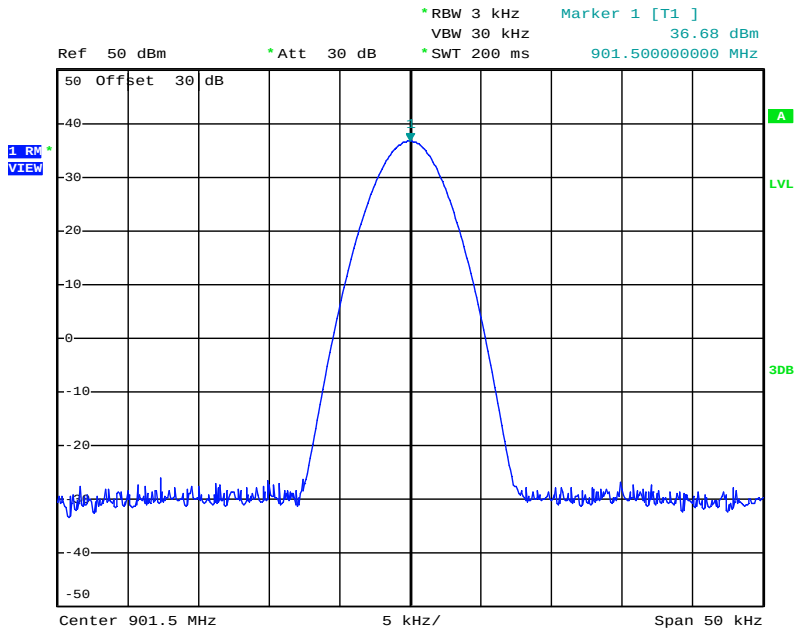


Date: 21.MAR.2019 15:27:01

Channel Frequency:	Output Power Setting	
901.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**10.0** VDC	**36.57** dBm

Plot 7.2 – Conducted Power – 901.5MHz, 13.8VDC

Conducted Power

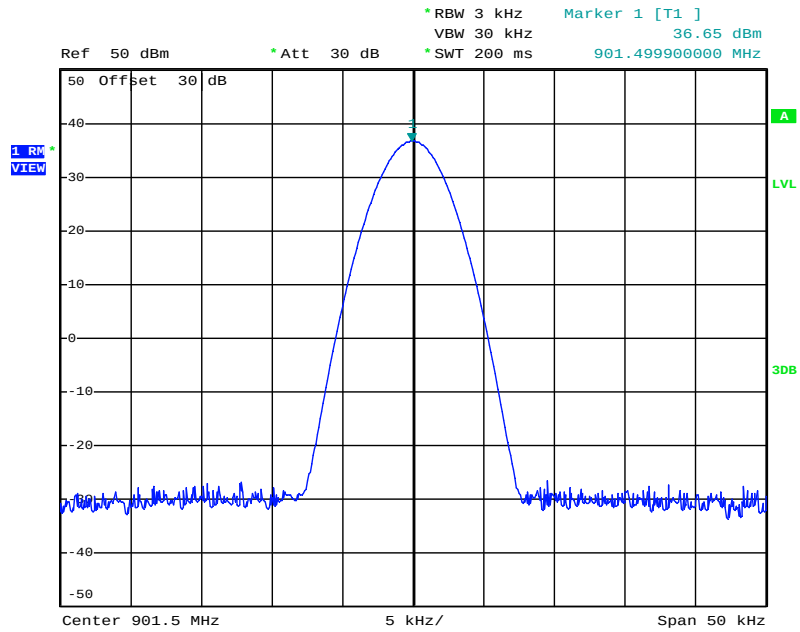


Date: 21.MAR.2019 15:25:54

Channel Frequency:	Output Power Setting	
901.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**13.8** VDC	**36.68** dBm

Plot 7.3 – Conducted Power – 901.5MHz, 30VDC

Conducted Power

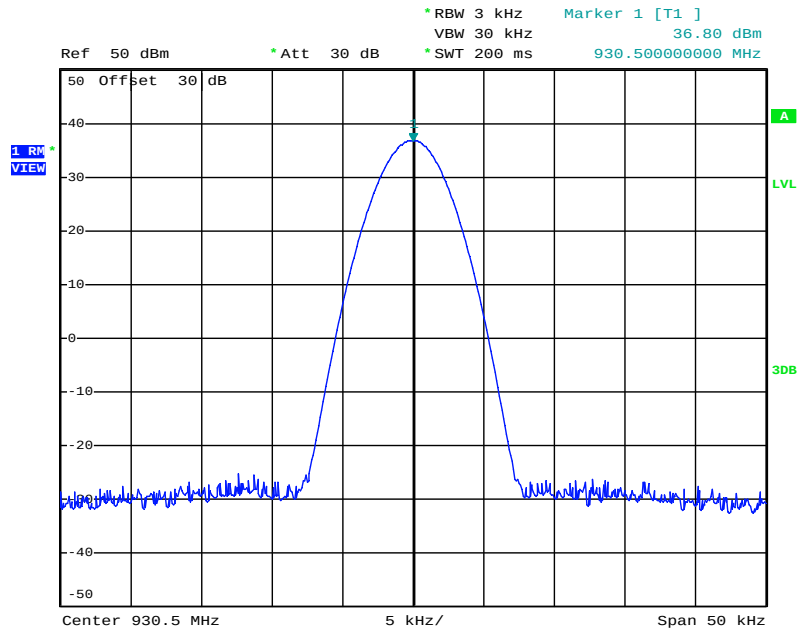


Date: 21.MAR.2019 15:24:44

Channel Frequency:	Output Power Setting	
901.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**30.0** VDC	**36.65** dBm

Plot 7.4 – Conducted Power – 930.5MHz, 10VDC

Conducted Power

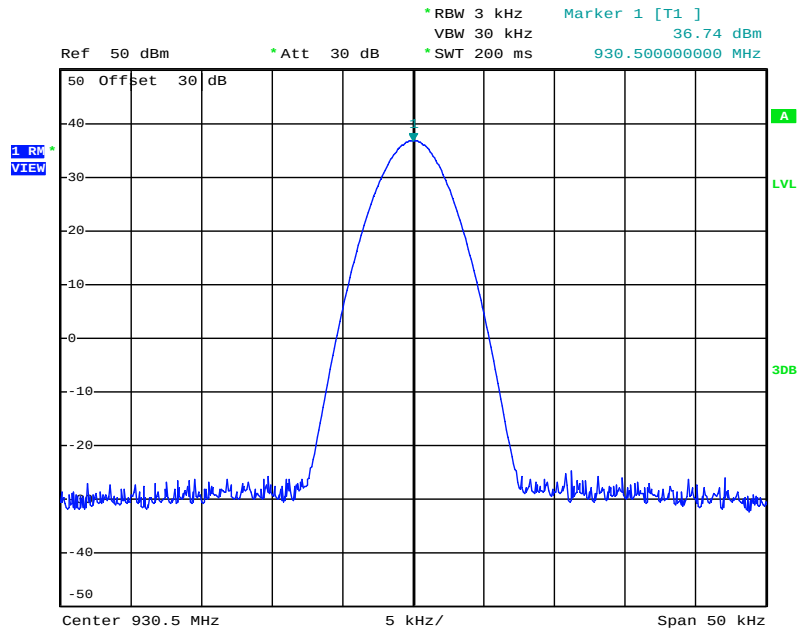


Date: 21.MAR.2019 15:28:22

Channel Frequency:	Output Power Setting	
930.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**10.0** VDC	**36.80** dBm

Plot 7.5 – Conducted Power – 930.5MHz, 13.8VDC

Conducted Power

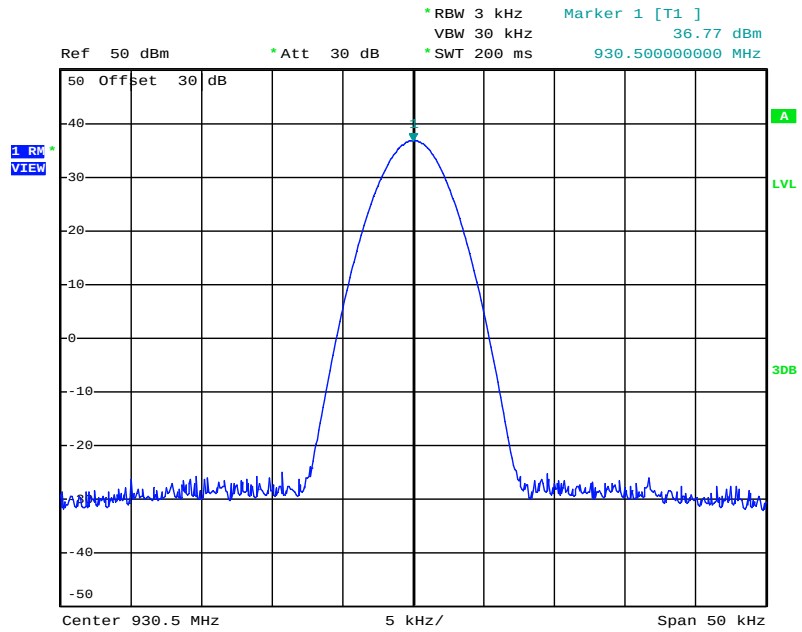


Date: 21.MAR.2019 15:29:46

Channel Frequency:	Output Power Setting	
930.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**13.8** VDC	**36.74** dBm

Plot 7.6 – Conducted Power – 930.5MHz, 30VDC

Conducted Power

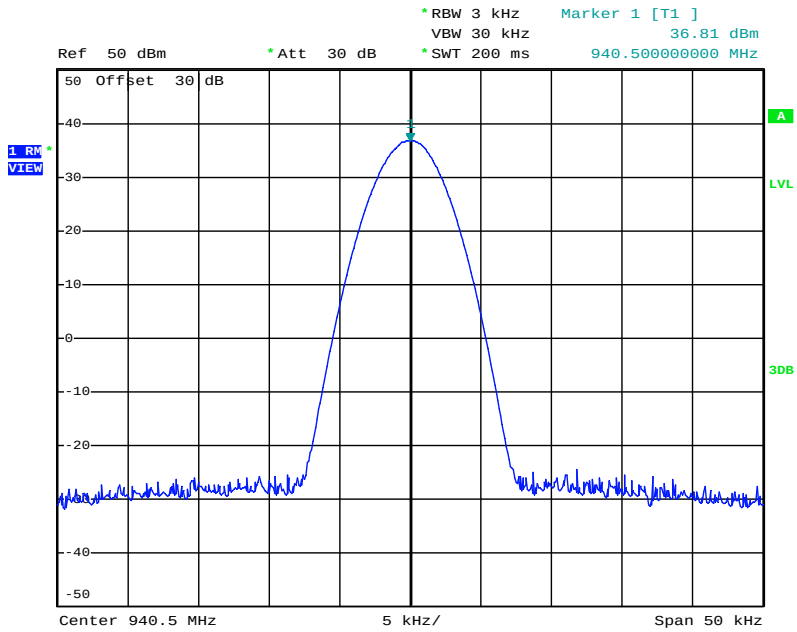


Date: 21.MAR.2019 15:30:59

Channel Frequency:	Output Power Setting	
930.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**30.0** VDC	**36.77** dBm

Plot 7.7 – Conducted Power – 940.5MHz, 10VDC

Conducted Power

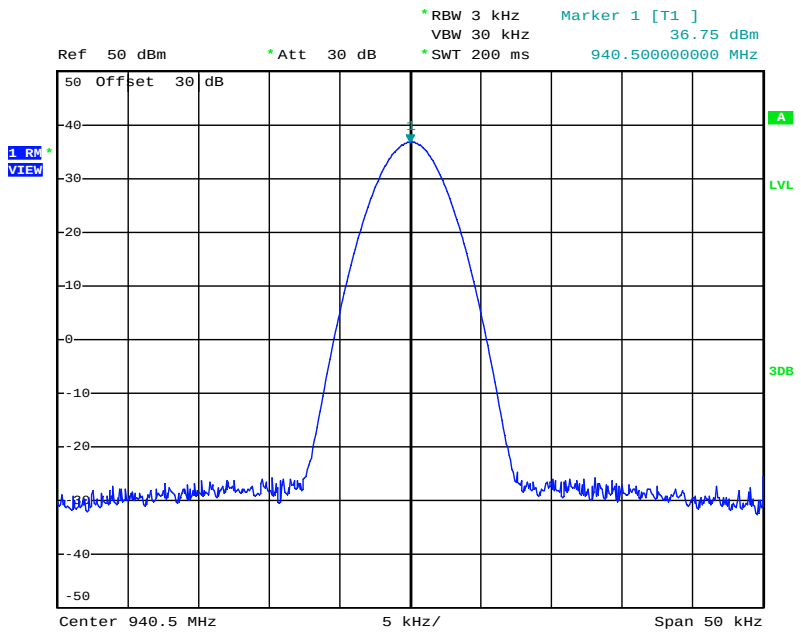


Date: 21.MAR.2019 15:38:29

Channel Frequency:	Output Power Setting	
940.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**10.0** VDC	**36.81** dBm

Plot 7.8 – Conducted Power – 940.5MHz, 13.8VDC

Conducted Power

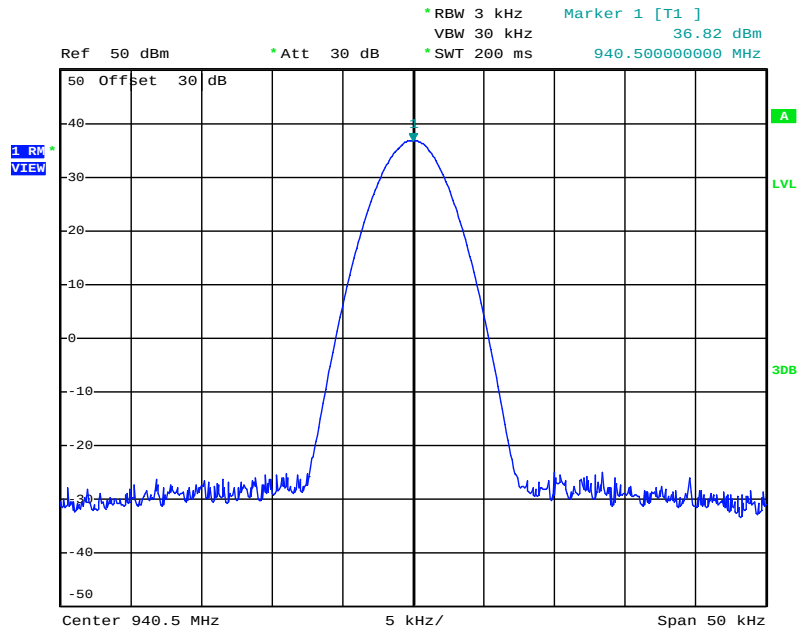


Date: 21.MAR.2019 15:33:38

Channel Frequency:	Output Power Setting	
940.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**13.8** VDC	**36.75** dBm

Plot 7.9 – Conducted Power – 940.5MHz, 30VDC

Conducted Power



Date: 21.MAR.2019 15:32:30

Channel Frequency:	Output Power Setting	
940.500 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Output Power:
CW	**30.0** VDC	**36.82** dBm

Table 7.1 - Summary of Conduct Power Measurements

Conducted Power Measurement Results							
Frequency (MHz)	Modulation	Nominal Input Voltage (VDC)	Power Setting (dBm)	Measured Power [E_{Meas}] (dBm)	Measure. Power [E_{Meas}] (W)	Original Filing (dBm)	Difference (dB)
901.500	CW	10	37	36.57	4.54	36.8	**-0.2**
		13.8		36.68	4.66	36.9	**-0.2**
		30		36.65	4.62	36.9	**-0.3**
930.500		10		36.80	4.79	36.8	**0.0**
		13.8		36.74	4.72	36.9	**-0.2**
		30		36.77	4.75	36.9	**-0.1**
940.500		10		36.81	4.80	36.8	**0.0**
		13.8		36.75	4.73	36.9	**-0.1**
		30		36.82	4.81	36.9	**-0.1**
						Complies	

8.0 OCCUPIED BANDWIDTH

Test Procedure	
Normative Reference	FCC 47 CFR §2.1049, §24.131, RSS-134 ANSI C63.26

Limits	
47 CFR §24	**§24.132 Power and antenna height limits.** The authorized bandwidth of narrowband PCS channels will be 10 kHz for 12.5 kHz channels and 45 kHz for 50 kHz channels. For aggregated adjacent channels, a maximum authorized bandwidth of 5 kHz less than the total aggregated channel width is permitted.
RSS-134	**4.1 Channel Spacings and Authorized Bandwidths** The standard channel spacings are 12.5 and 50 kHz. The authorized bandwidth is 10 kHz for 12.5 kHz spaced channels and 45 kHz bandwidth for 50 kHz spaced channels. Channel aggregation using adjacent channels is also permitted provided that it is shown in the equipment certification application that frequency spectrum efficiency is maintained by such aggregation. For aggregated channels, the authorized bandwidth is 5 kHz less than the total aggregated channel width.

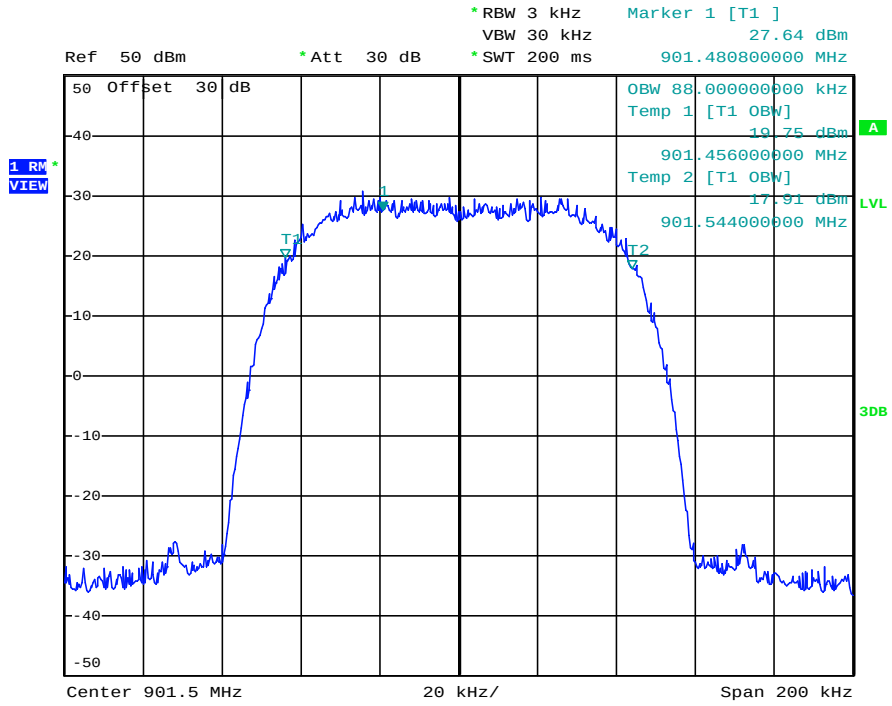
General Procedure	
C63.26	**5.4.4 Occupied bandwidth—Power bandwidth (99%) measurement procedure** The OBW is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring (99%) power bandwidth: a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient). b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be ≥ 3 × RBW. c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. d) Set the detection mode to peak, and the trace mode to max-hold.

Test Setup	Appendix A - Figure A.1

Measurement Procedure
The DUT was connected to a Spectrum Analyzer via a 30dB attenuator connected to the DUT's antenna port. The SA was set to RMS Detector. The output power of the DUT was set to the manufacturer's highest output power setting at the Mid channel of each channel band. The DUT was set to transmit QPSK, 16QAM and 64QAM. The SA was set to Max Hold and set to measure the 99% Occupied Bandwidth. NOTE: The DUT automatically adjusts the transmitter output power depending on the modulation. 37dBm: QPSK, 35dBm: 16QAM, 34dBm: 64QAM.

Plot 8.1 – Occupied Bandwidth – 901.5MHz, 100kHz BW, QPSK

Occupied Bandwidth



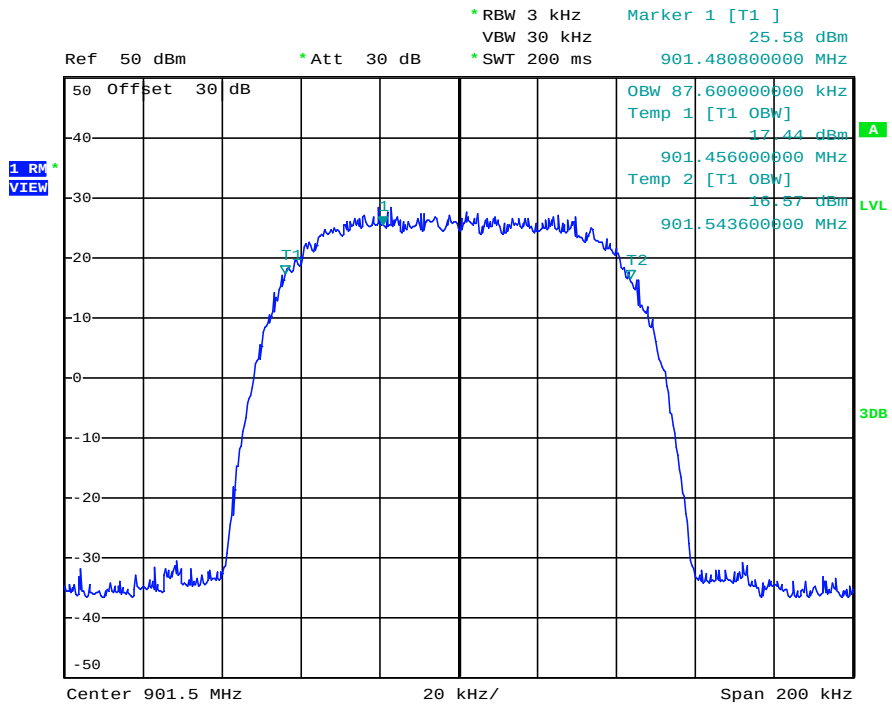
Date: 21.MAR.2019 15:45:33

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
901.50 MHz	**37** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
QPSK	**13.80** VDC	**88.00** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.2 – Occupied Bandwidth – 901.5MHz, 100kHz BW, 16QAM

Occupied Bandwidth



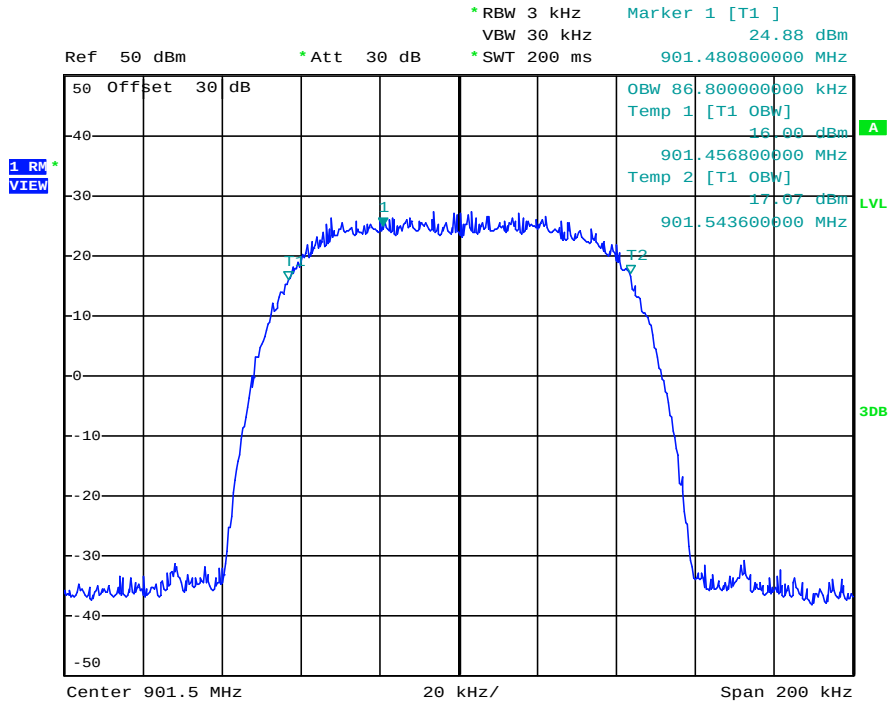
Date: 21.MAR.2019 15:46:51

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
901.50 MHz	**35** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
16QAM	**13.80** VDC	**87.60** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.3 – Occupied Bandwidth – 901.5MHz, 100kHz BW, 64QAM

Occupied Bandwidth



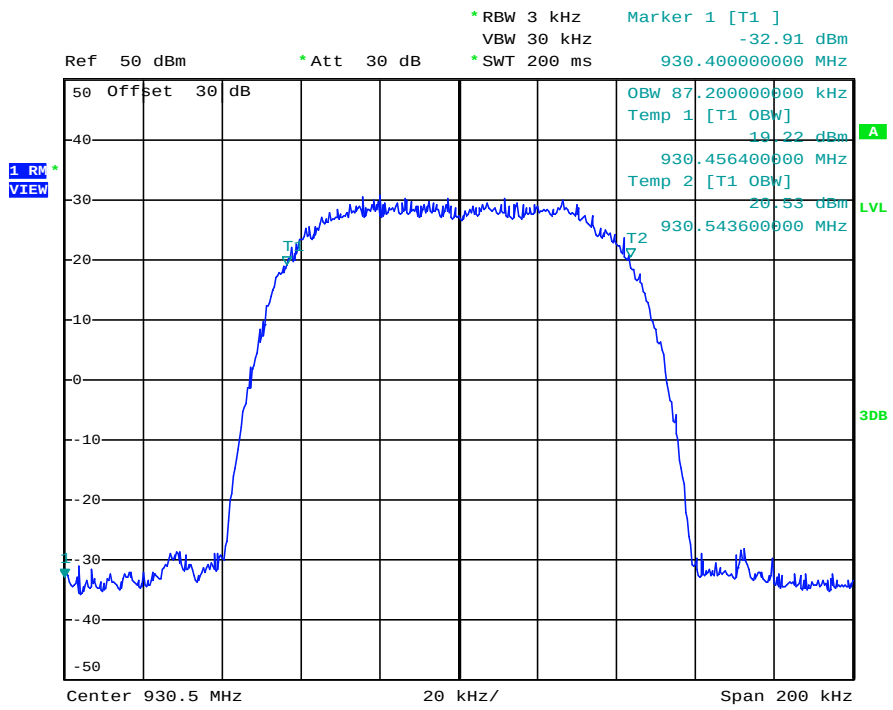
Date: 21.MAR.2019 15:48:20

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
901.50 MHz	**34** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
64QAM	**13.80** VDC	**86.80** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.4 – Occupied Bandwidth – 930.5MHz, 100kHz BW, QPSK

Occupied Bandwidth



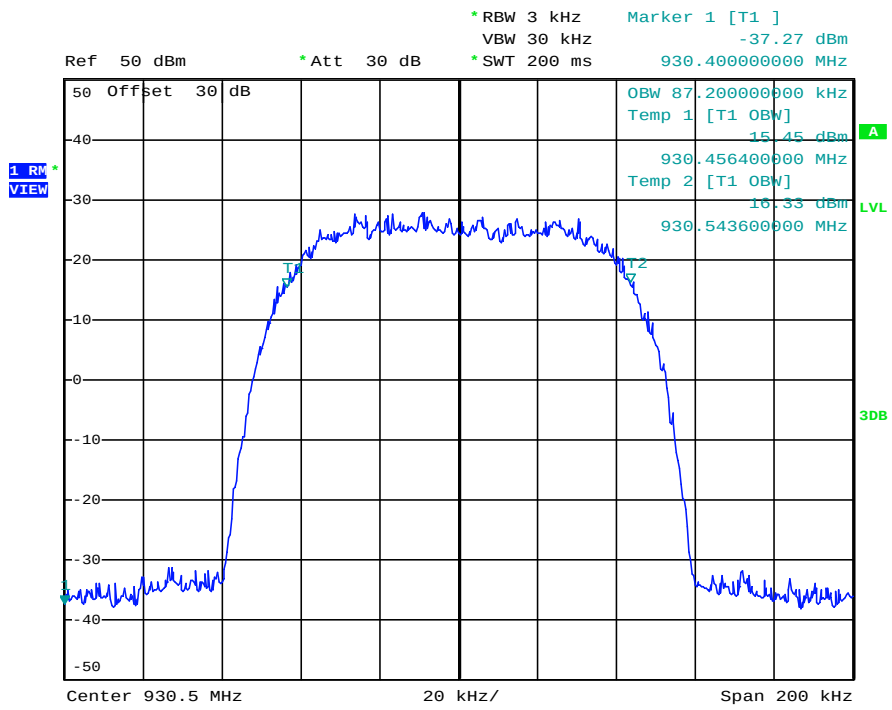
Date: 21.MAR.2019 15:58:07

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
930.50 MHz	**37** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
QPSK	**13.80** VDC	**87.20** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.5 – Occupied Bandwidth – 930.5MHz, 100kHz BW, 16QAM

Occupied Bandwidth



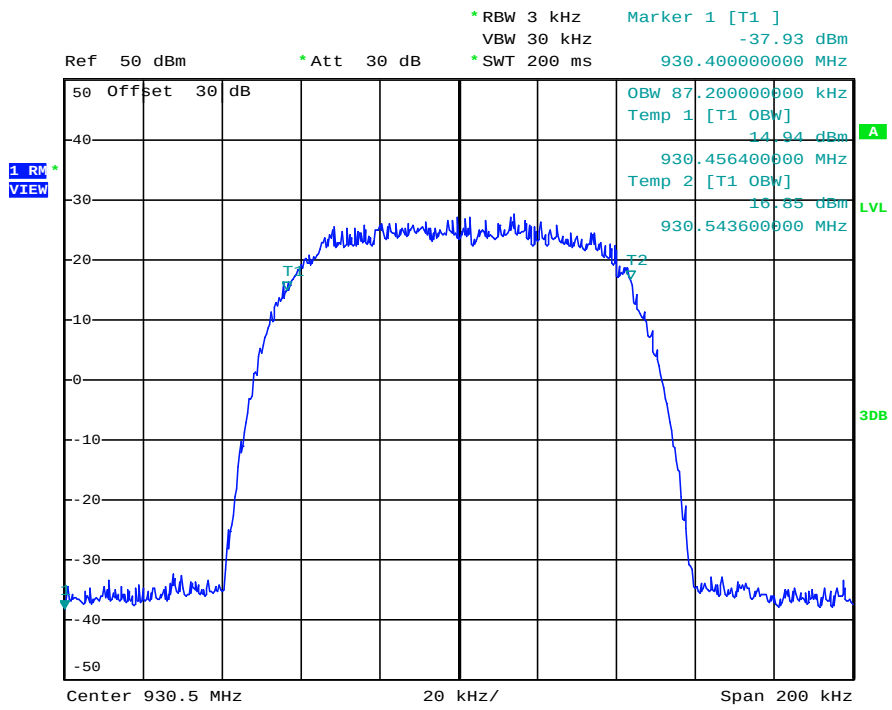
Date: 21.MAR.2019 15:59:21

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
930.50 MHz	**35** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
16QAM	**13.80** VDC	**87.20** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.6 – Occupied Bandwidth – 930.5MHz, 100kHz BW, 64QAM

Occupied Bandwidth



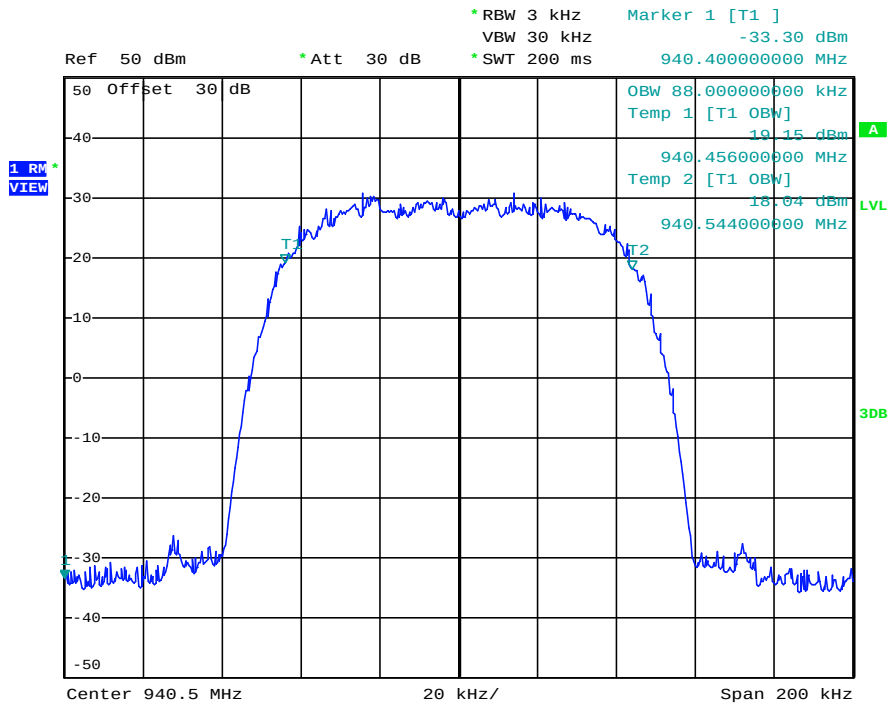
Date: 21.MAR.2019 16:00:31

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
930.50 MHz	**34** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
64QAM	**13.80** VDC	**87.20** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.7 – Occupied Bandwidth – 940.5MHz, 100kHz BW, QPSK

Occupied Bandwidth



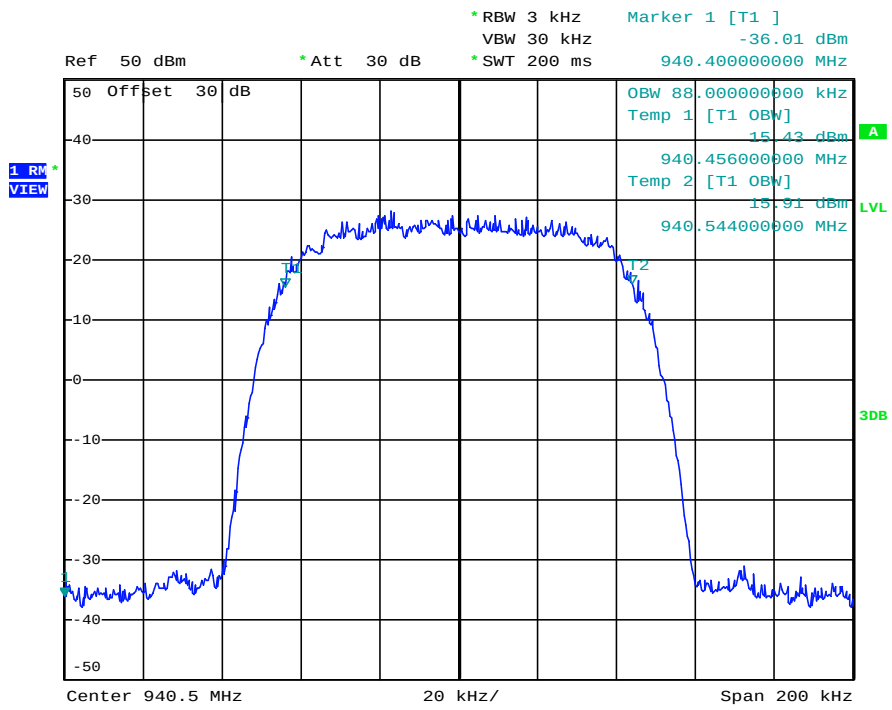
Date: 21.MAR.2019 16:02:08

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
940.50 MHz	**37** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
QPSK	**13.80** VDC	**88.00** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.8 – Occupied Bandwidth – 940.5MHz, 100kHz BW, 16QAM

Occupied Bandwidth



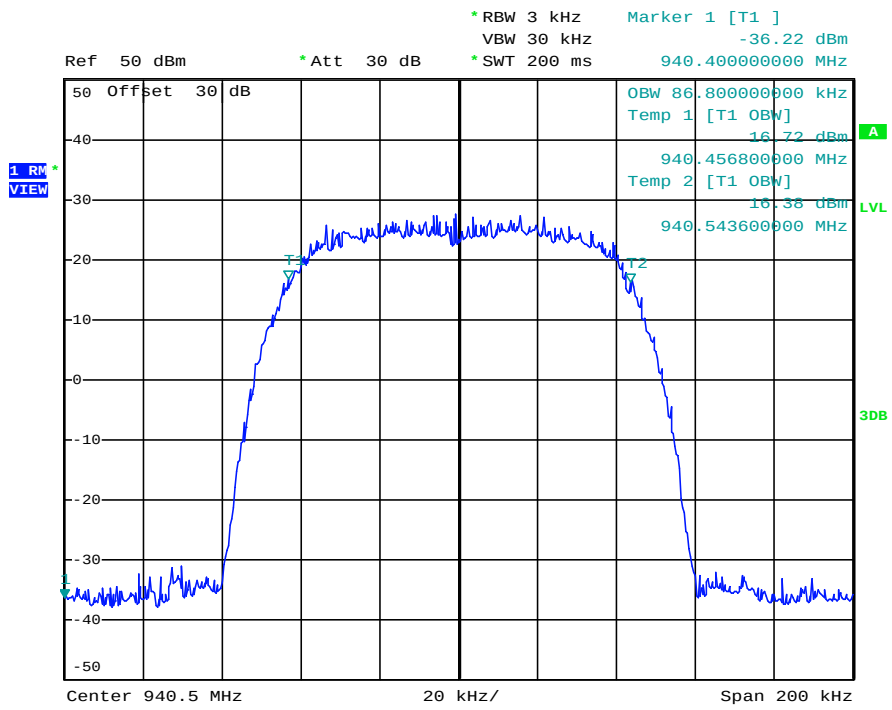
Date: 21.MAR.2019 16:03:10

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
940.50 MHz	**35** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
16QAM	**13.80** VDC	**88.00** kHz

* The DUT automatically adjusts the transmit power based on modulation

Plot 8.9 – Occupied Bandwidth – 940.5MHz, 100kHz BW, 64QAM

Occupied Bandwidth



Date: 21.MAR.2019 16:04:28

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
940.50 MHz	**34** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	**Nominal Supply Voltage**	**Measured Occupied Bandwidth:**
64QAM	**13.80** VDC	**86.80** kHz

* The DUT automatically adjusts the transmit power based on modulation

Table 8.1 - Summary of Occupied Bandwidth Measurements

Occupied Bandwidth Measurement Results							
Frequency (MHz)	DUT Modulation	Power Setting (dBm)	Measured Occupied Bandwidth (kHz)	Authorized Bandwidth (kHz)	Margin (kHz)	Emission Mask*	Emission Designator
901.5	QPSK	37	88.0	95.0	7.0	PASS	88K0G1D
	16QAM	35	87.6		7.4	PASS	87K6D1D
	64QAM	34	86.8		8.2	PASS	86K8D1D
930.5	QPSK	37	87.2		7.8	PASS	87K2G1D
	16QAM	35	87.2		7.8	PASS	87K2D1D
	64QAM	34	87.2		7.8	PASS	87K2D1D
940.5	QPSK	37	88.0		7.0	PASS	88K0G1D
	16QAM	35	88.0		7.0	PASS	88K0D1D
	64QAM	34	86.8		8.2	PASS	86K8D1D
Margin = Authorized BW - Measured BW							
						Complies	

See Section 9.0 For Emission Mask Data

9.0 CONDUCTED SPURIOUS EMISSIONS – EMISSIONS MASK

Test Procedure	
Normative Reference	FCC 47 CFR §2.1051, §24.133, RSS-134

Limits	
47 CFR §24	**§24.133 Emission Limits.** (a) The power of any emission shall be attenuated below the transmitter power (P), as measured in accordance with §24.132(f), in accordance with the following schedule: (1) For transmitters authorized a bandwidth greater than 10 kHz: (i) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of up to and including 40 kHz: at least 116 Log10 ((f_d + 10)/6.1) decibels or 50 plus 10 Log10 (P) decibels or 70 decibels, whichever is the lesser attenuation; (ii) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 40 kHz: at least 43 + 10 Log10 (P) decibels or 80 decibels, whichever is the lesser attenuation. (b) The measurements of emission power can be expressed in peak or average values provided they are expressed in the same parameters as the transmitter power. d) The following minimum spectrum analyzer resolution bandwidth settings will be used: 300 Hz when showing compliance with paragraphs (a)(1)(i) and (a)(2)(i) of this section; and 30 kHz when showing compliance with paragraphs (a)(1) (ii) and (a)(2)(ii) of this section.
RSS-134	**4.4 Transmitter Unwanted Emissions** **4.4.1 Minimum Standard for Spacings Exceeding 4.4.1 12.5 kHz (Bandwidth > 10 kHz)** The power of emissions from the transmitter with modulated carrier shall be attenuated below the transmitter power (P) in accordance with the following schedule (where the displacement frequency f_d measured in kHz starts from the edge of the authorized bandwidth): (a) For f_d up to and including 40 kHz: at least 116 log10((f_d+10)/6.1) dB, or 50+10log10 (P) dB, or 70 dB, whichever is less stringent, using a spectrum analyzer of 300 Hz resolution bandwidth; (b) For f_d of more than 40 kHz: at least 43+10 log10 (P) dB, or 80 dB, whichever is less stringent, using a spectrum analyzer of 30 kHz resolution bandwidth.

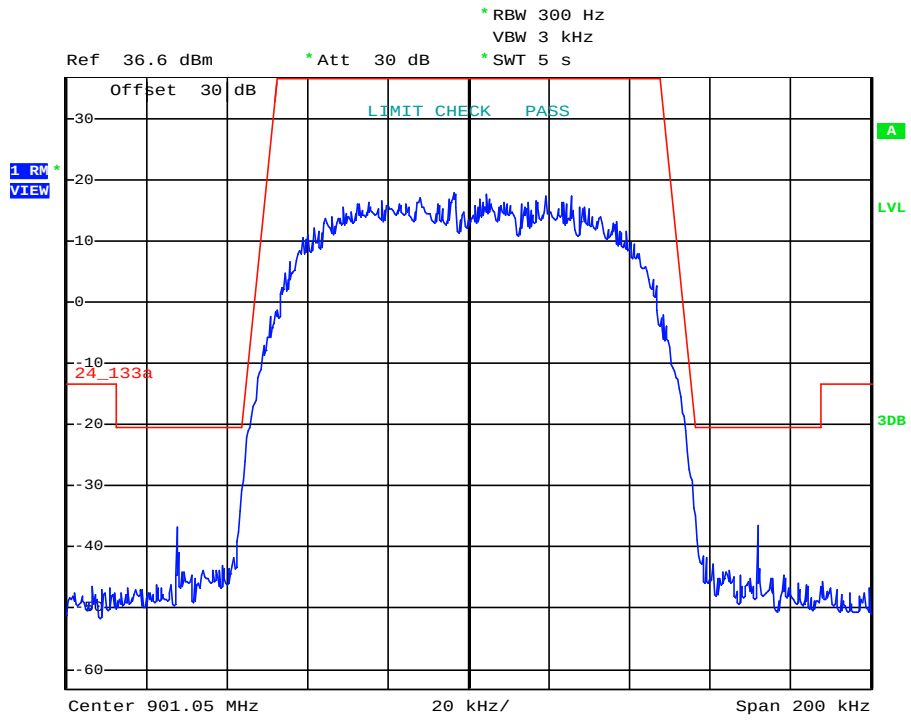
Test Setup	Appendix A - Figure A.1

Measurement Procedure

The DUT was connected to a Spectrum Analyzer via a 30dB attenuator connected to the DUT's antenna port. The SA was set to RMS Detector. The output power of the DUT was set to the manufacturer's highest output power setting at the Lower, Mid and Upper channel of each channel band. The DUT was set to transmit QPSK, 16QAM and 64QAM. An emissions masks was set to the limits described above. The SA was set to Max Hold with Limit Check on. NOTE: The DUT automatically adjusts the transmitter output power depending on the modulation. QPSK: 37dBm, 16QAM: 35dBm, 64QAM: 34dBm.

Plot 9.1 – Emissions Mask – 901.05, 100kHz BW, QPSK

Emissions Mask



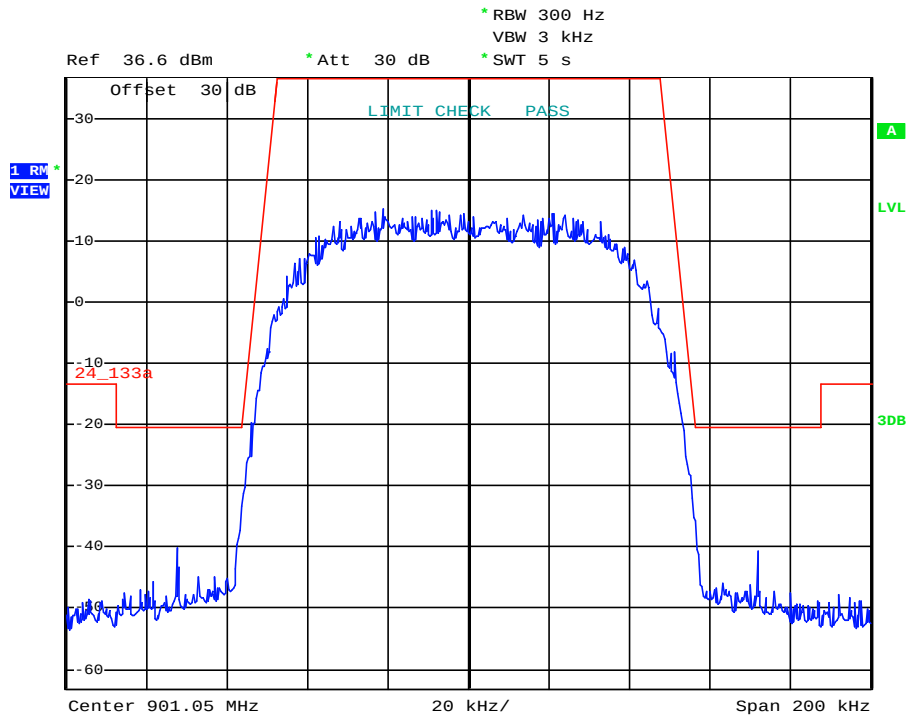
Date: 22.MAR.2019 09:56:33

Channel Frequency: **901.05** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.2 – Emissions Mask – 901.05, 100kHz BW, 16QAM

Emissions Mask



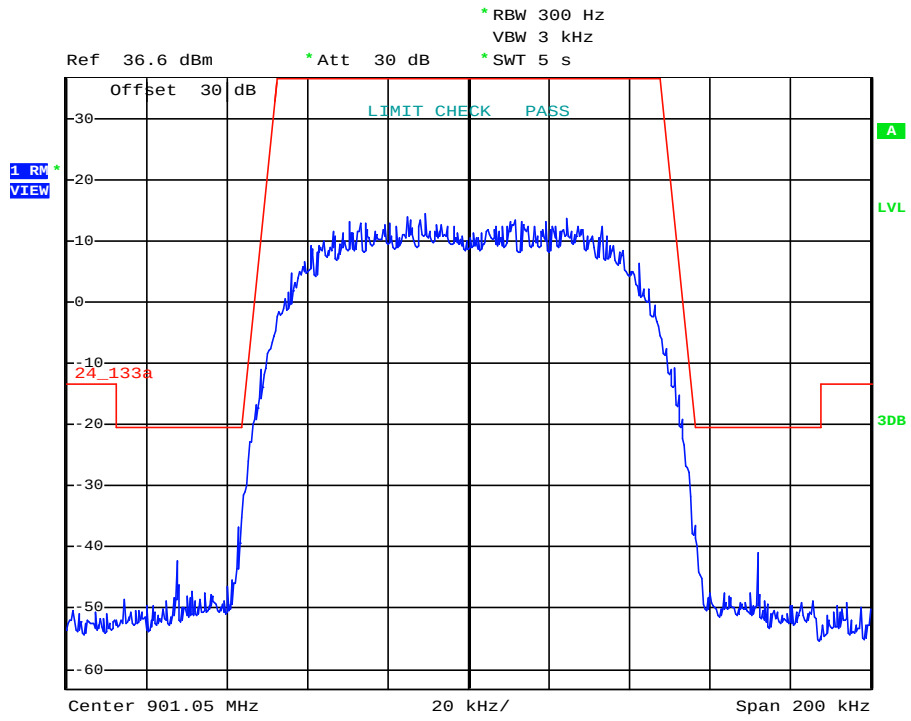
Date: 22.MAR.2019 09:58:01

Channel Frequency: **901.05** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.3 – Emissions Mask – 901.05, 100kHz BW, 64QAM

Emissions Mask



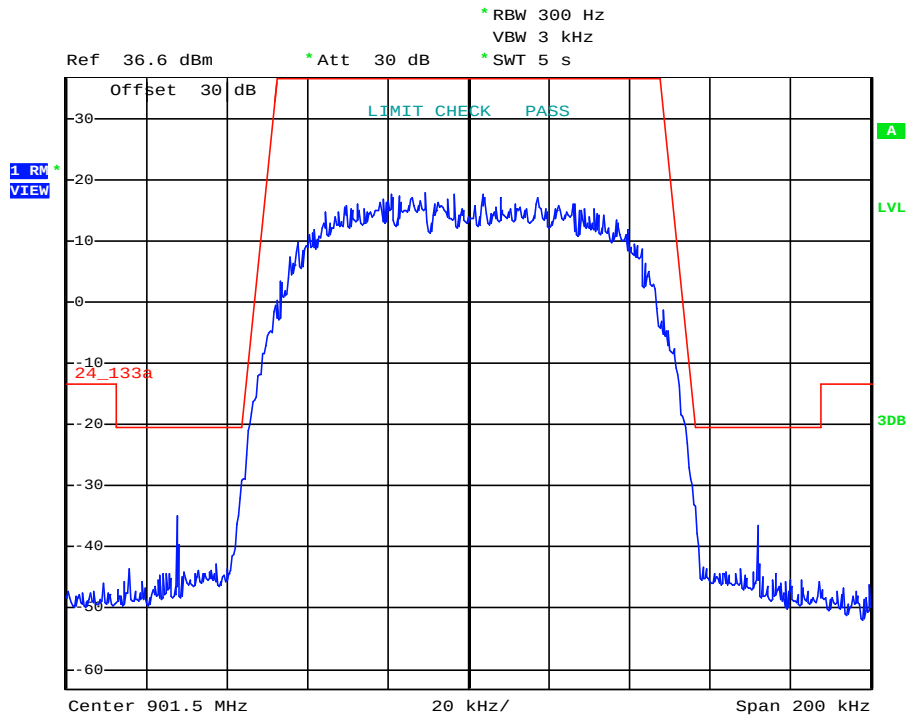
Date: 22.MAR.2019 09:59:16

Channel Frequency: **901.05** MHz	Output Power Setting*: **34** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **64QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.4 – Emissions Mask – 901.5, 100kHz BW, QPSK

Emissions Mask



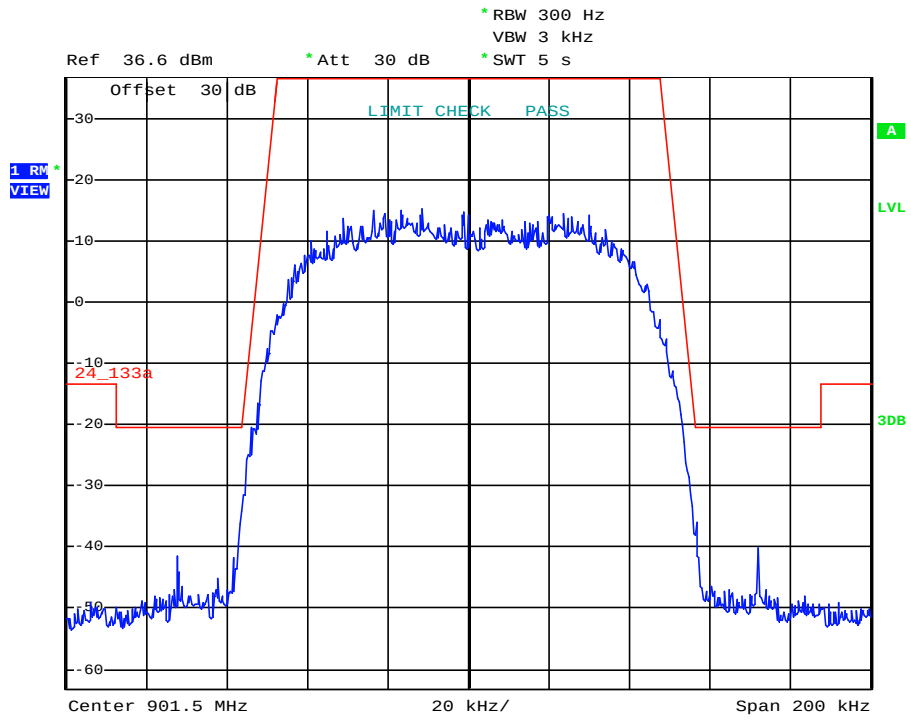
Date: 22.MAR.2019 10:02:59

Channel Frequency: **901.50** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.5 – Emissions Mask – 901.5, 100kHz BW, 16QAM

Emissions Mask



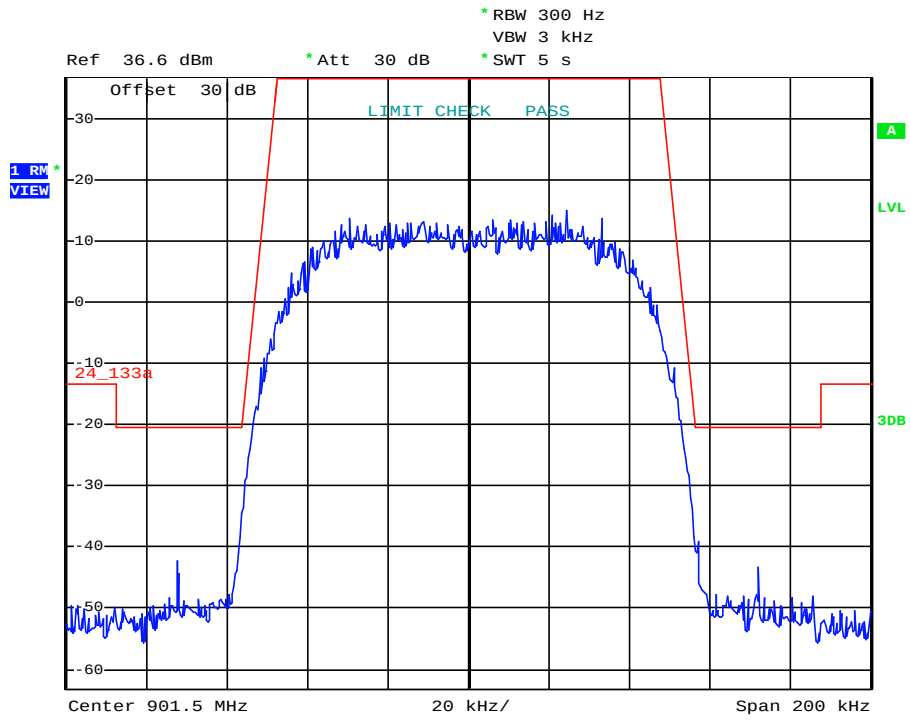
Date: 22.MAR.2019 10:04:27

Channel Frequency: **901.50** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.6 – Emissions Mask – 901.5, 100kHz BW, 64QAM

Emissions Mask



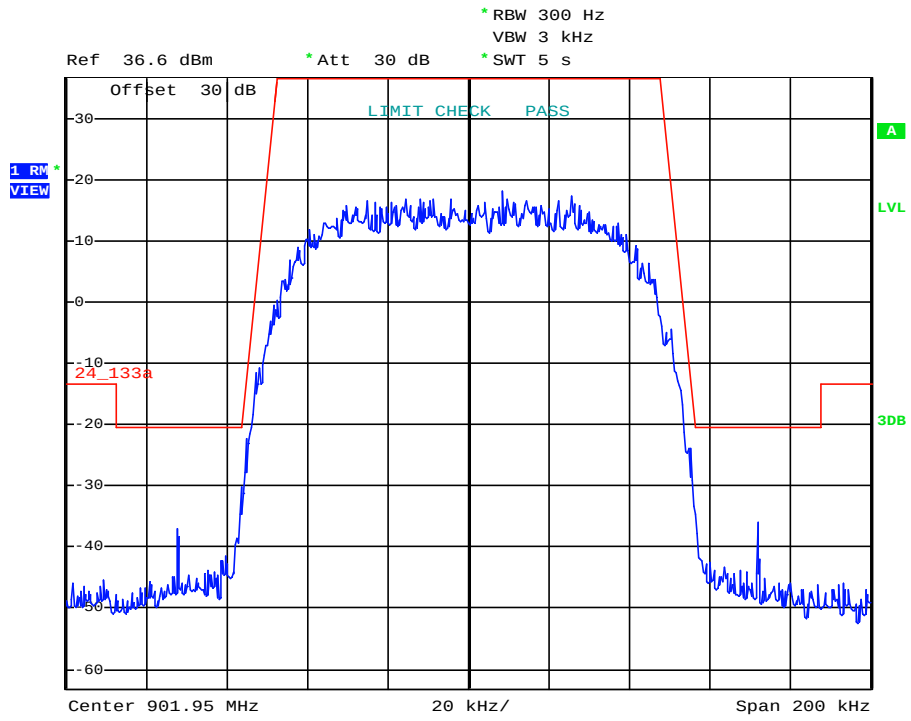
Date: 22.MAR.2019 10:05:55

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
901.50 MHz	**34** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	Nominal Supply Voltage	Limit Check:
64QAM	**13.80** VDC	**PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.7 – Emissions Mask – 901.95, 100kHz BW, QPSK

Emissions Mask



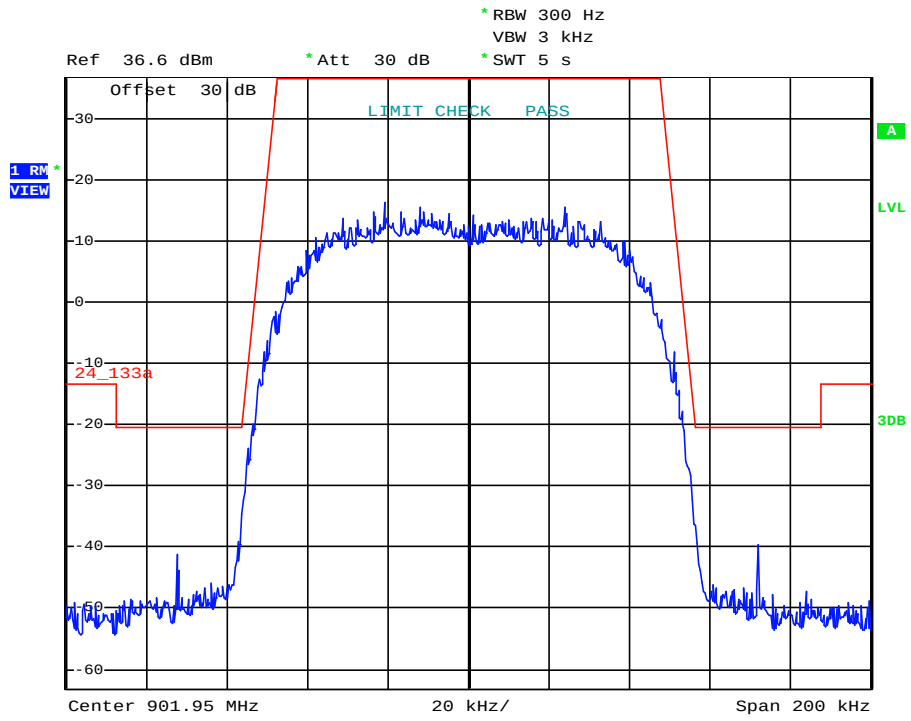
Date: 22.MAR.2019 10:09:31

Channel Frequency: **901.95** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.8 – Emissions Mask – 901.95, 100kHz BW, 16QAM

Emissions Mask



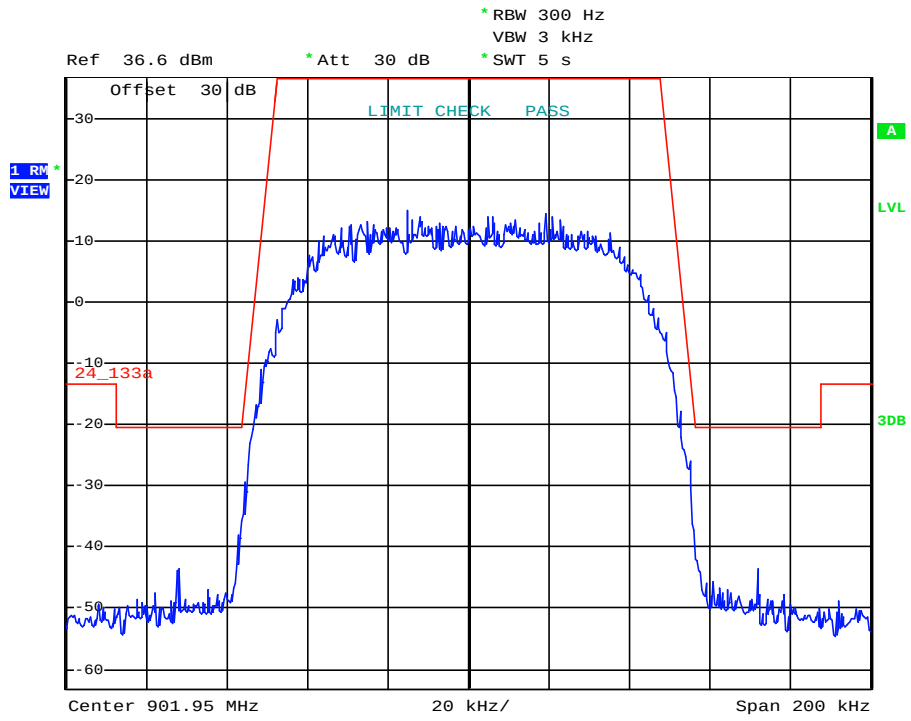
Date: 22.MAR.2019 10:11:39

Channel Frequency: **901.95** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.9 – Emissions Mask – 901.95, 100kHz BW, 64QAM

Emissions Mask



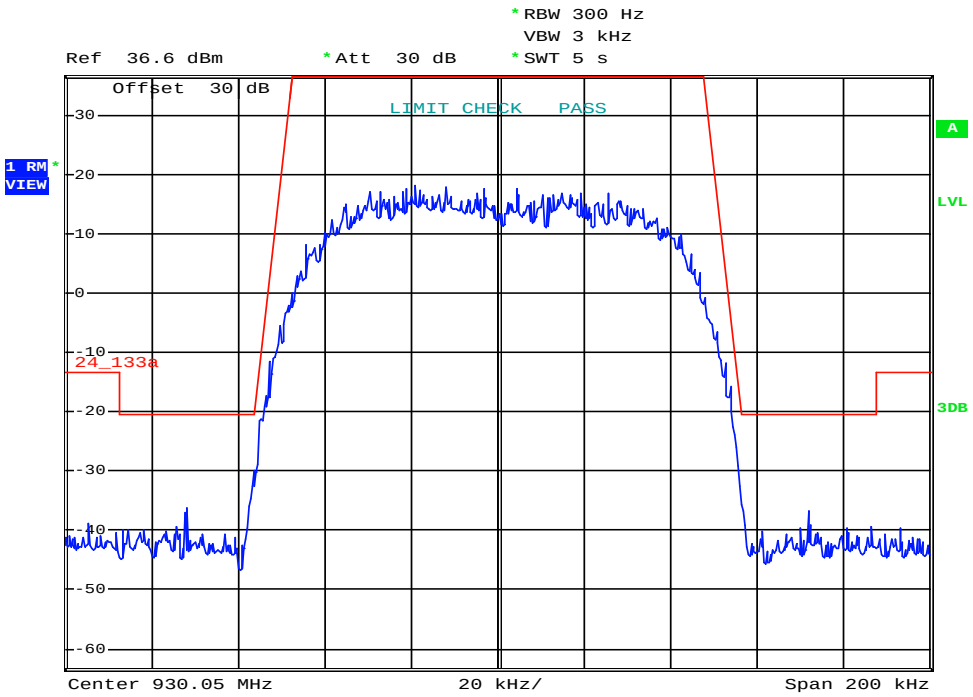
Date: 22.MAR.2019 10:13:04

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
901.95 MHz	**34** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	Nominal Supply Voltage	Limit Check:
64QAM	**13.80** VDC	**PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.10 – Emissions Mask – 930.05, 100kHz BW, QPSK

Emissions Mask



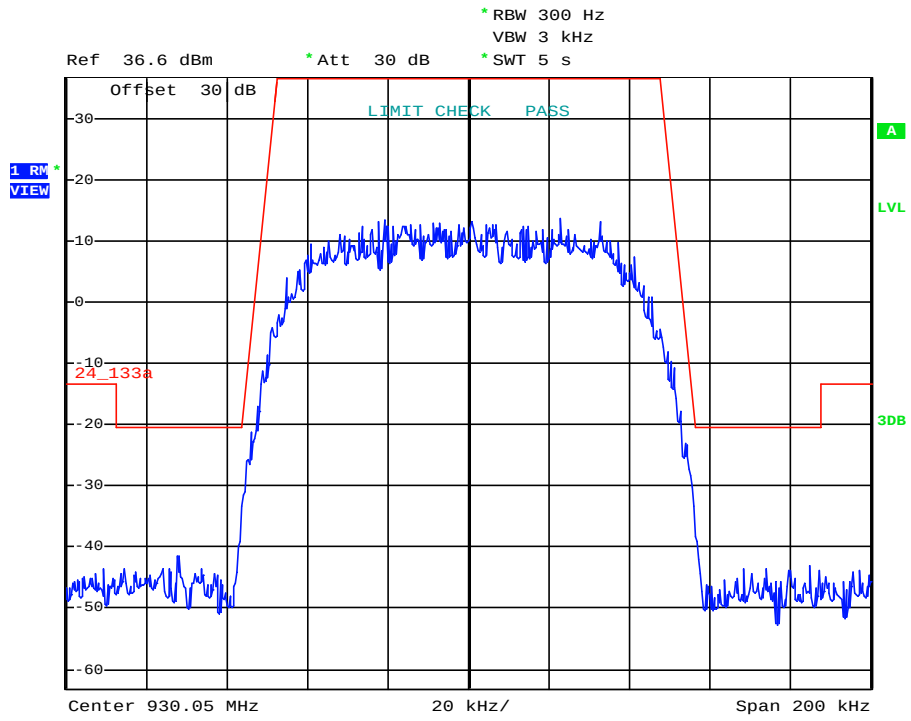
Date: 22.MAR.2019 11:43:57

Channel Frequency: **930.05** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.11 – Emissions Mask – 930.05, 100kHz BW, 16QAM

Emissions Mask



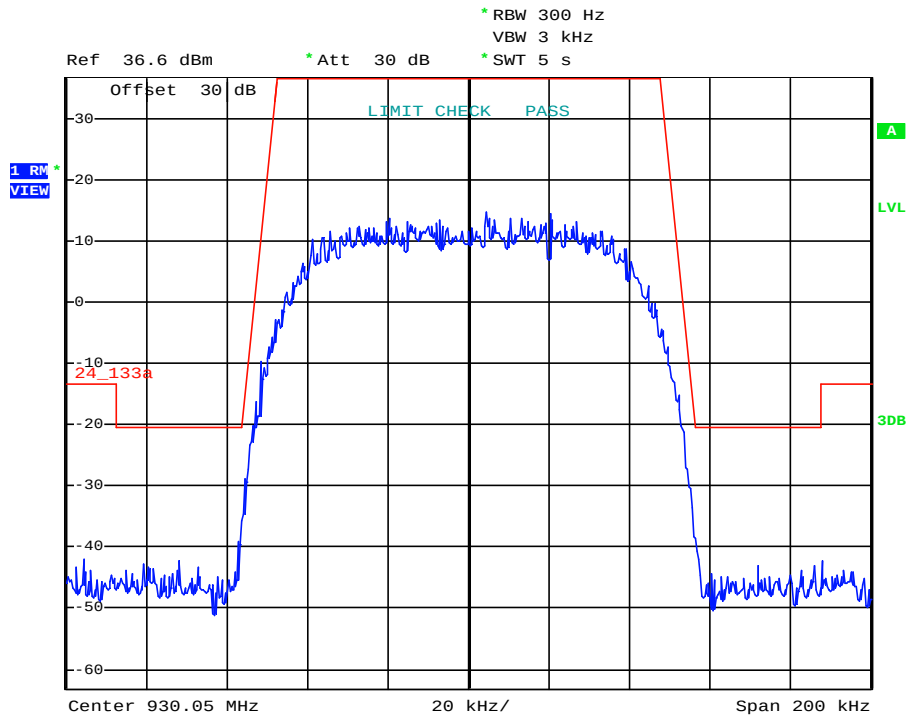
Date: 22.MAR.2019 11:45:51

Channel Frequency: **930.05** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.12 – Emissions Mask – 930.05, 100kHz BW, 64QAM

Emissions Mask



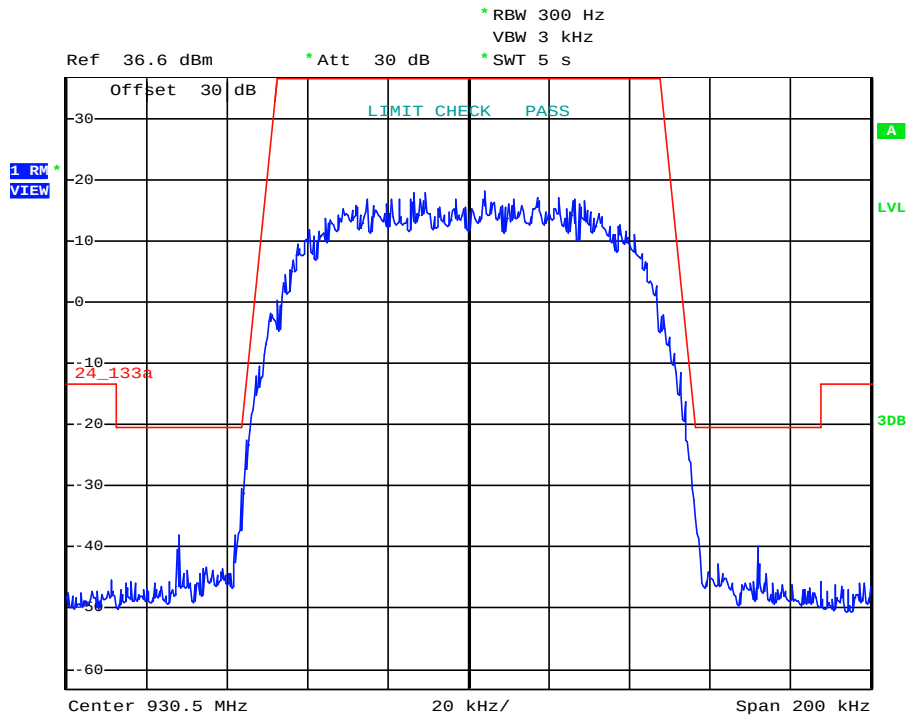
Date: 22.MAR.2019 11:47:45

Channel Frequency: **930.05** MHz	Output Power Setting*: **34** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **64QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.13 – Emissions Mask – 930.5, 100kHz BW, QPSK

Emissions Mask



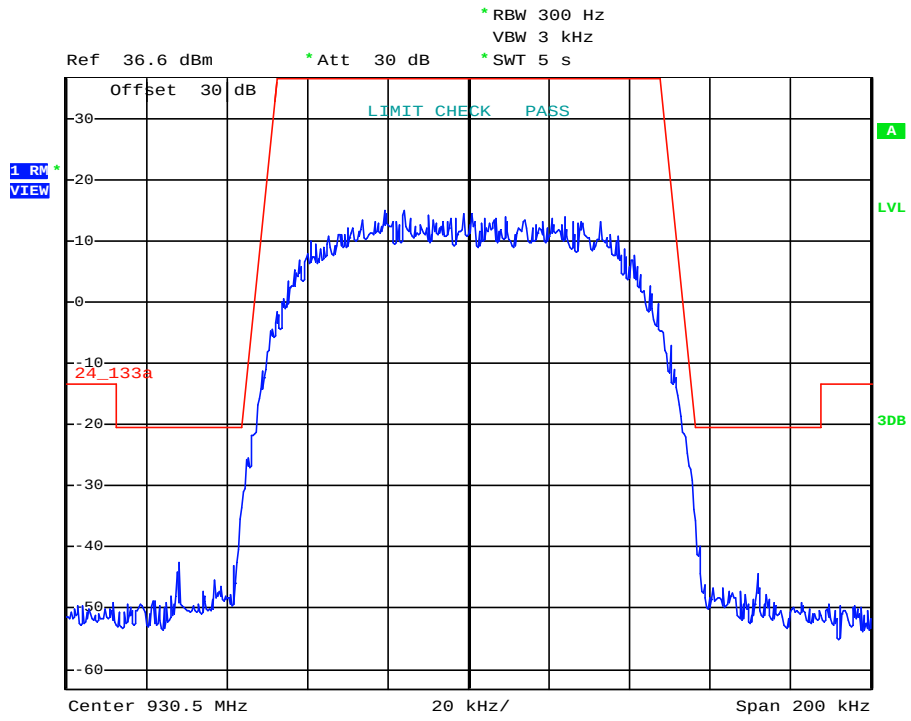
Date: 22.MAR.2019 11:49:37

Channel Frequency: **930.50** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.14 – Emissions Mask – 930.5, 100kHz BW, 16QAM

Emissions Mask



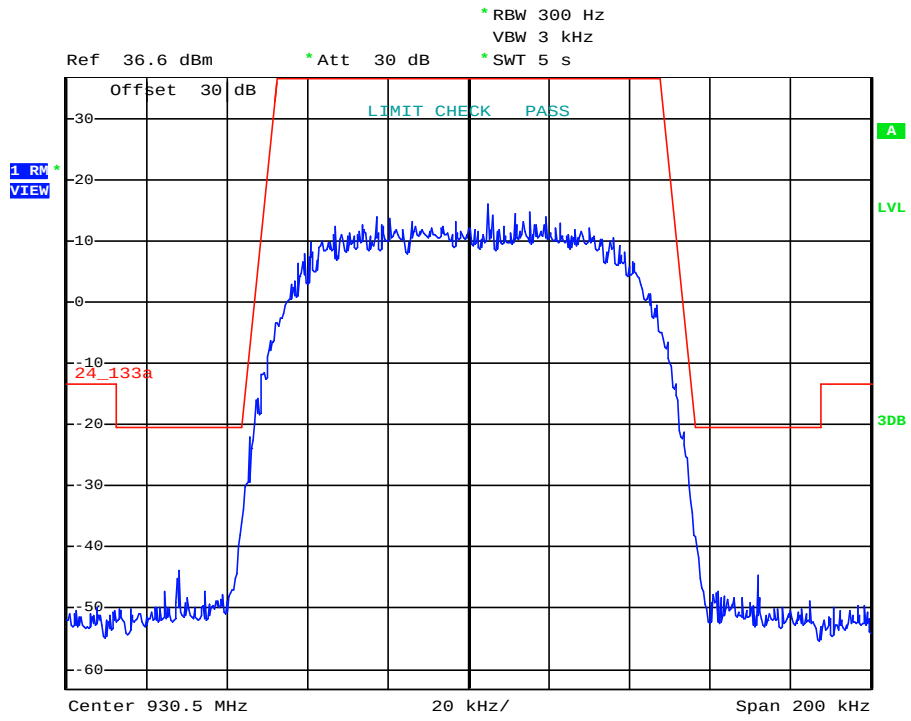
Date: 22.MAR.2019 11:52:00

Channel Frequency: **930.50** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.15 – Emissions Mask – 930.5, 100kHz BW, 64QAM

Emissions Mask



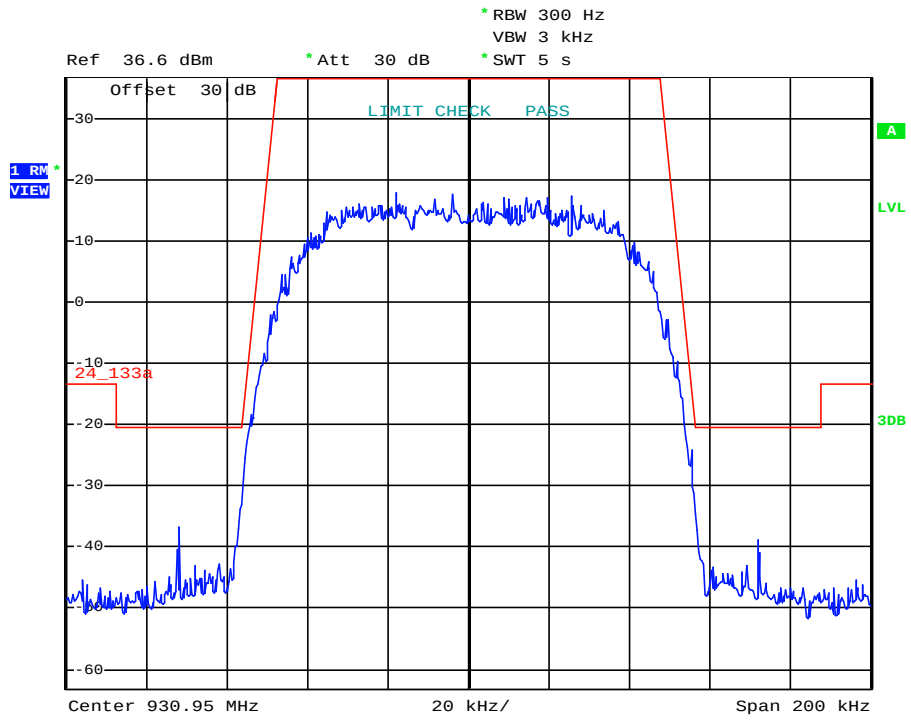
Date: 22.MAR.2019 11:53:49

Channel Frequency: **930.50** MHz	Output Power Setting*: **34** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **64QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.16 – Emissions Mask – 930.95, 100kHz BW, QPSK

Emissions Mask



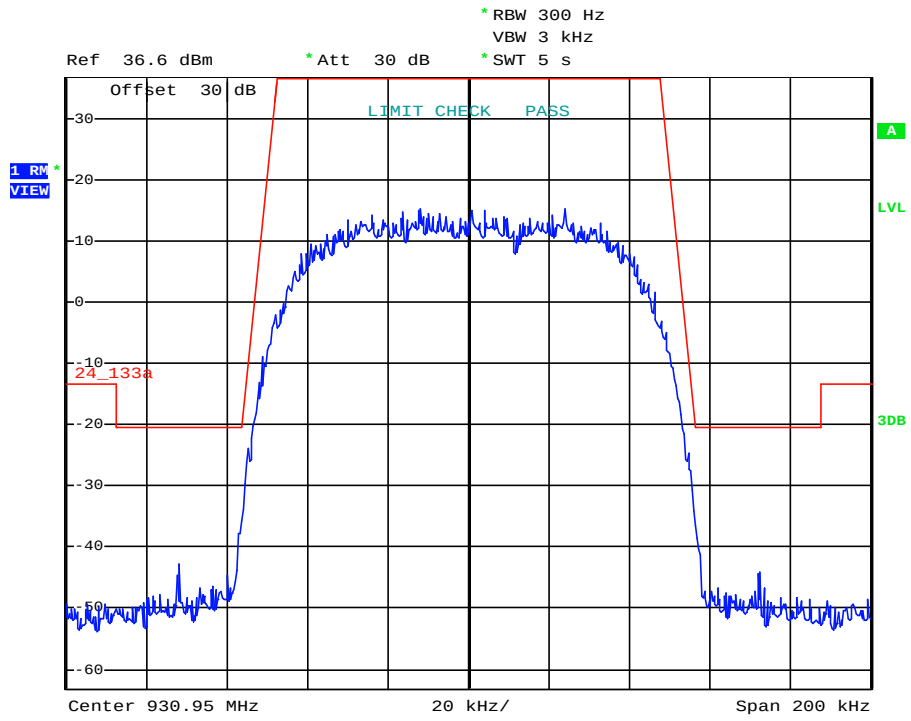
Date: 22.MAR.2019 11:55:49

Channel Frequency: **930.95** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.17 – Emissions Mask – 930.95, 100kHz BW, 16QAM

Emissions Mask



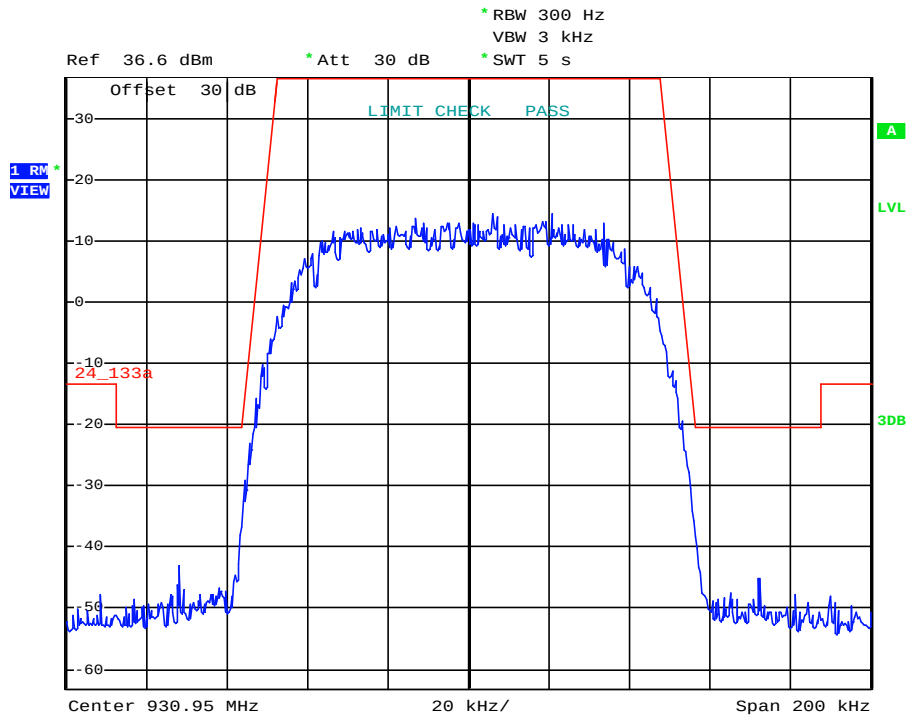
Date: 22.MAR.2019 11:57:28

Channel Frequency: **930.95** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.18 – Emissions Mask – 930.95, 100kHz BW, 64QAM

Emissions Mask



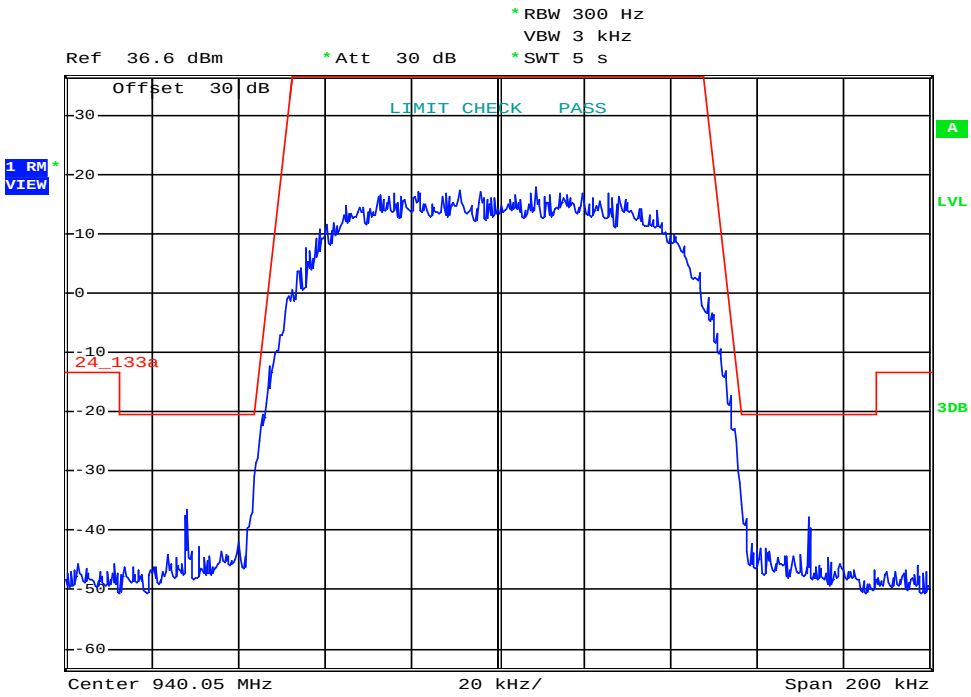
Date: 22.MAR.2019 11:59:22

Channel Frequency: **930.95** MHz	Output Power Setting*: **34** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **64QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.19 – Emissions Mask – 940.05, 100kHz BW, QPSK

Emissions Mask



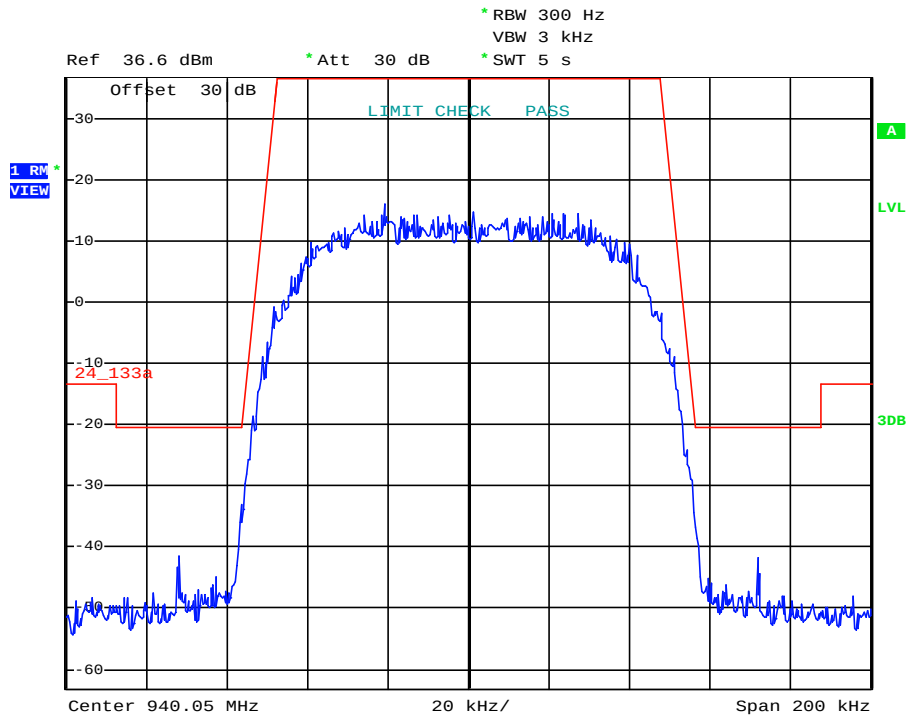
Date: 22.MAR.2019 12:01:37

Channel Frequency: **940.05** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.20 – Emissions Mask – 940.05, 100kHz BW, 16QAM

Emissions Mask



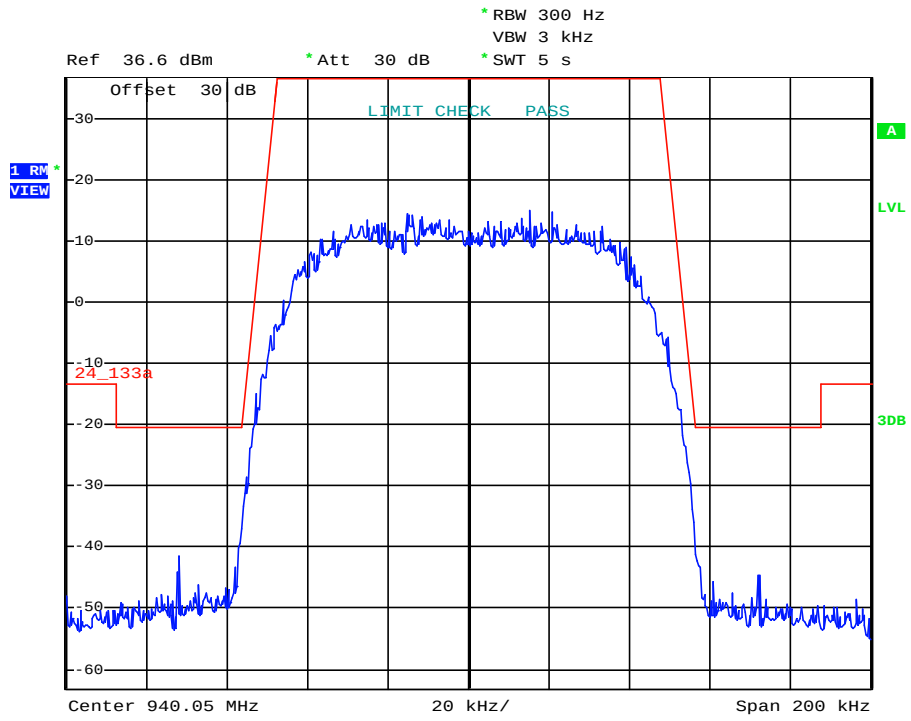
Date: 22.MAR.2019 12:04:19

Channel Frequency: **940.05** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.21 – Emissions Mask – 940.05, 100kHz BW, 64QAM

Emissions Mask



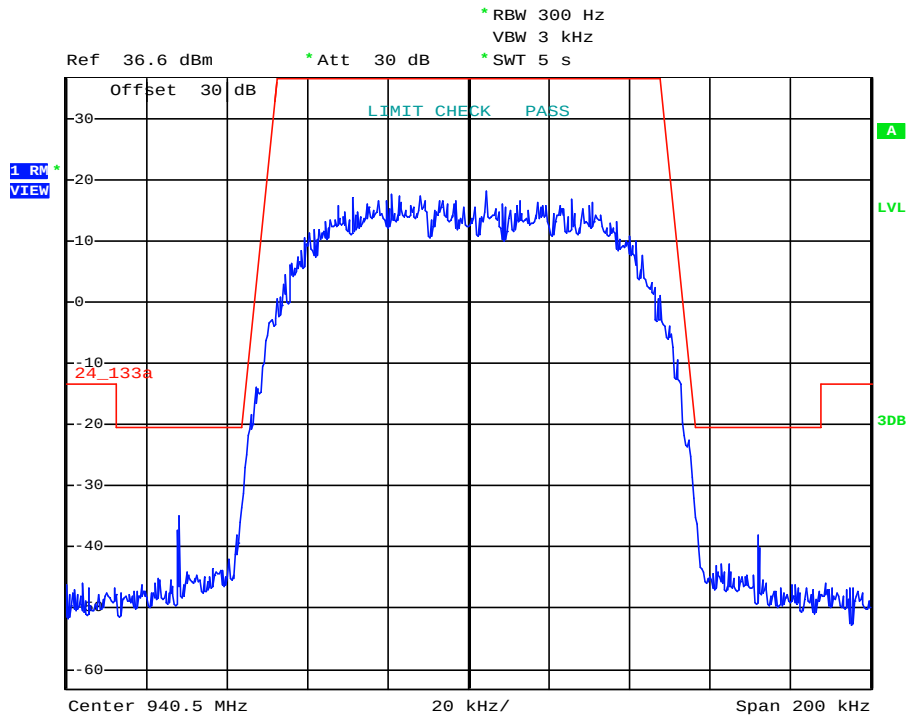
Date: 22.MAR.2019 12:06:53

Channel Frequency: **940.05** MHz	Output Power Setting*: **34** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **64QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.22 – Emissions Mask – 940.5, 100kHz BW, QPSK

Emissions Mask



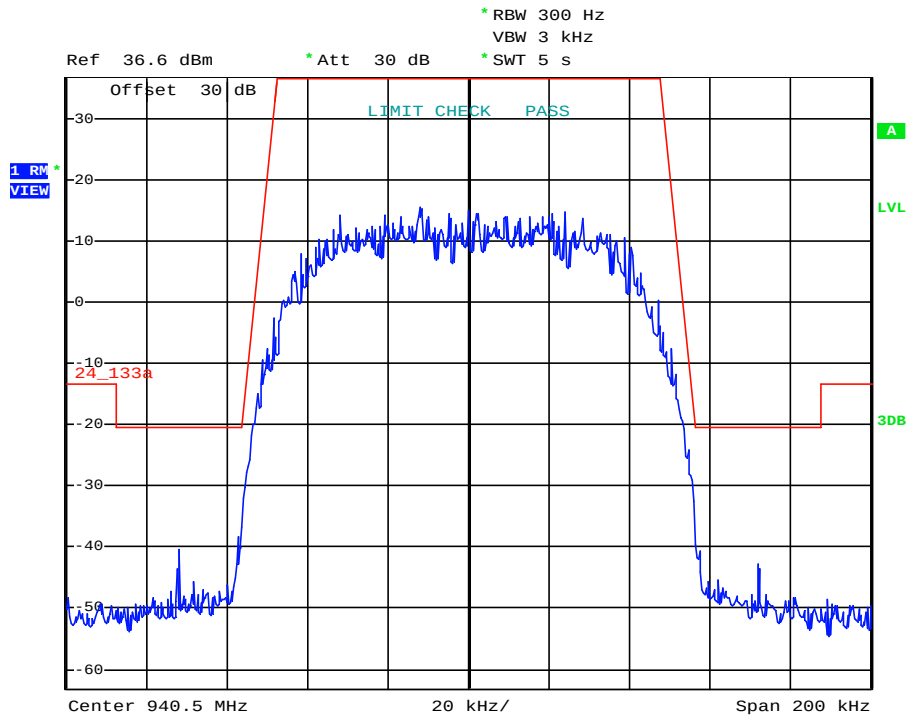
Date: 22.MAR.2019 13:25:41

Channel Frequency: **940.50** MHz	Output Power Setting*: **37** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **QPSK**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.23 – Emissions Mask – 940.5, 100kHz BW, 16QAM

Emissions Mask



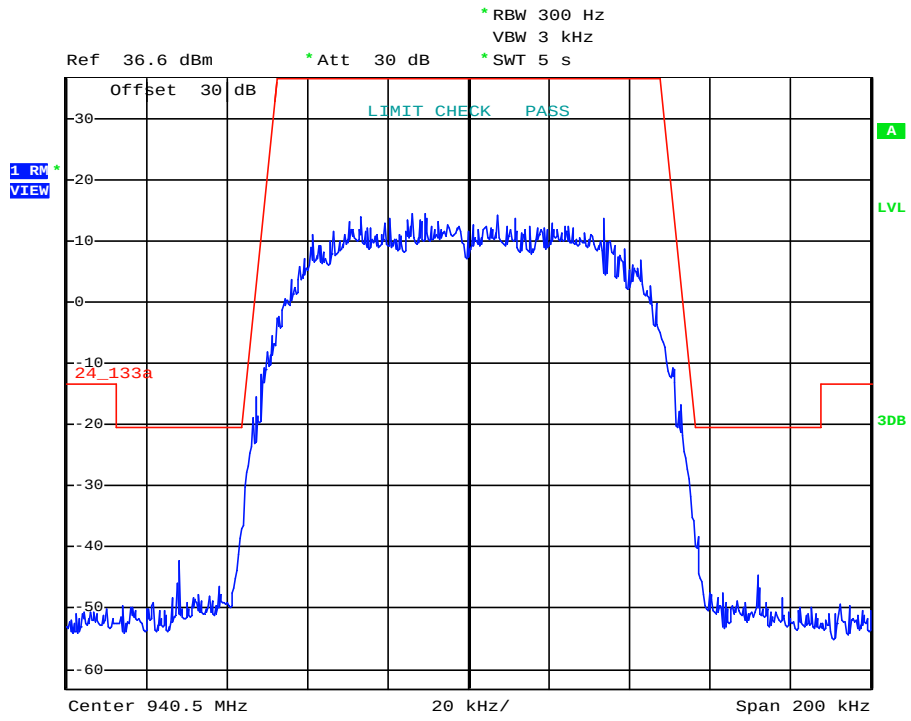
Date: 22.MAR.2019 13:27:24

Channel Frequency: **940.50** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.24 – Emissions Mask – 940.5, 100kHz BW, 64QAM

Emissions Mask



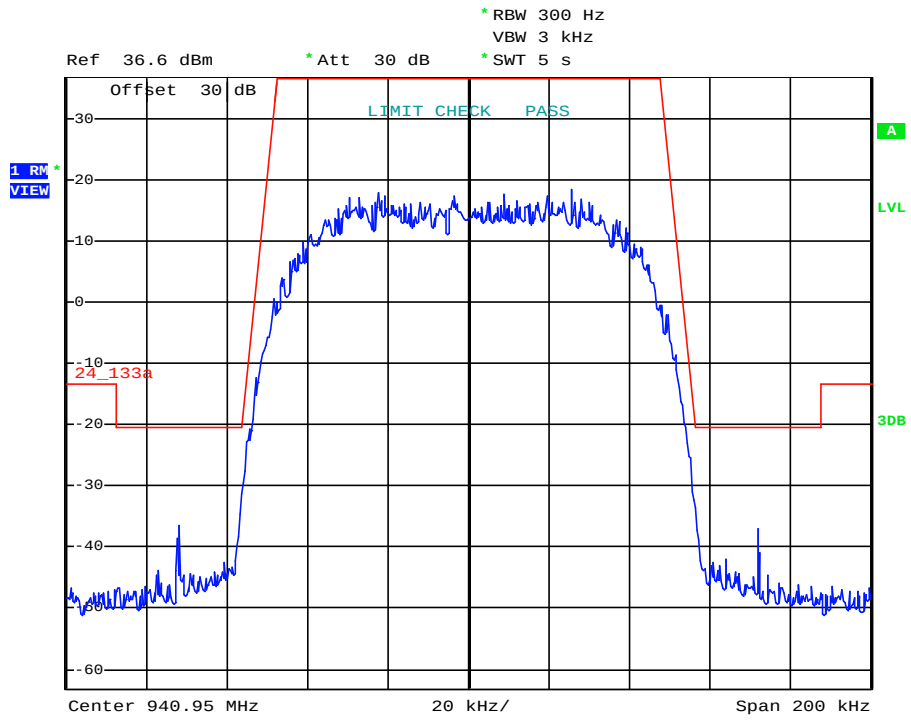
Date: 22.MAR.2019 13:31:36

Channel Frequency: **940.50** MHz	Output Power Setting*: **34** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **64QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.25 – Emissions Mask – 940.95, 100kHz BW, QPSK

Emissions Mask



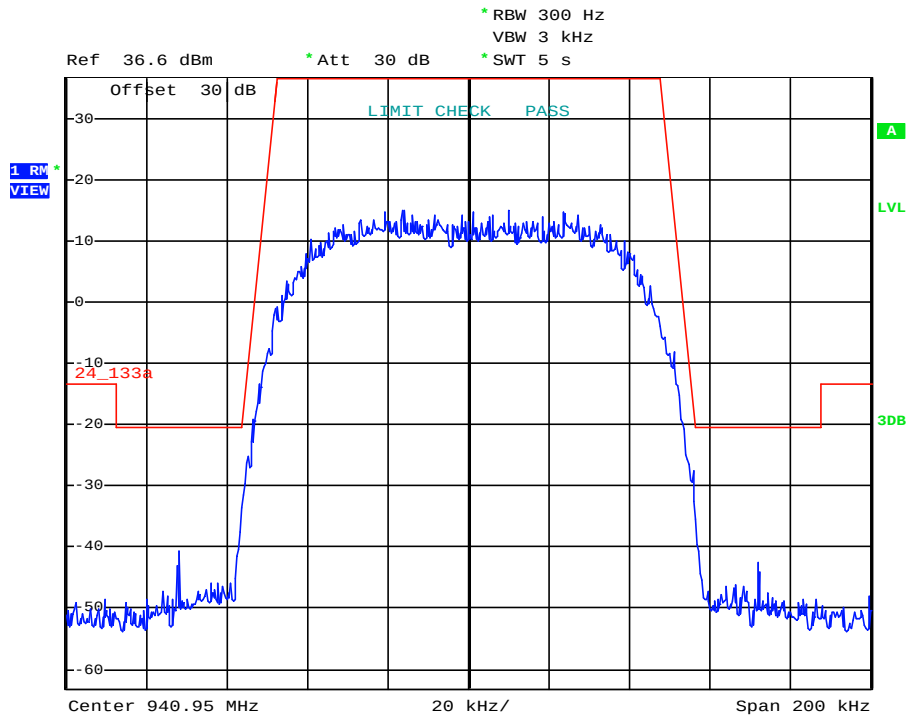
Date: 22.MAR.2019 13:33:50

Channel Frequency:	Output Power Setting*:	Channel Bandwidth Setting
940.95 MHz	**37** dBm	50kHz + 50kHz **100** kHz
DUT Modulation:	Nominal Supply Voltage	Limit Check:
QPSK	**13.80** VDC	**PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.26 – Emissions Mask – 940.95, 100kHz BW, 16QAM

Emissions Mask



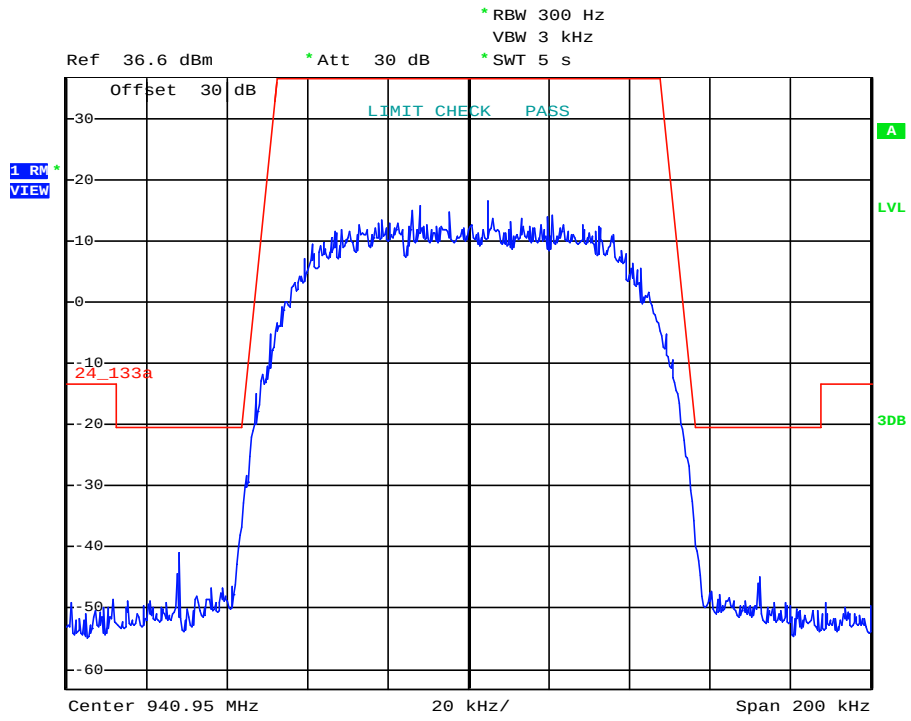
Date: 22.MAR.2019 13:34:59

Channel Frequency: **940.95** MHz	Output Power Setting*: **35** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **16QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

Plot 9.27 – Emissions Mask – 940.95, 100kHz BW, 64QAM

Emissions Mask



Date: 22.MAR.2019 13:36:01

Channel Frequency: **940.95** MHz	Output Power Setting*: **34** dBm	Channel Bandwidth Setting 50kHz + 50kHz **100** kHz
DUT Modulation: **64QAM**	Nominal Supply Voltage **13.80** VDC	Limit Check: **PASS**

* The DUT automatically adjusts the transmit power based on modulation
QPSK: 37dBm, 16QAM: 35dBm, 64QAM:, 34dBm

10.0 CONDUCTED SPURIOUS EMISSIONS TO 10TH HARMONIC

Test Procedure	
Normative Reference	FCC 47 CFR §2.1051, §24.133, RSS-134

Limits	
47 CFR §24	**§24.133 Emission Limits.** (a) The power of any emission shall be attenuated below the transmitter power (P), as measured in accordance with §24.132(f), in accordance with the following schedule: (1) For transmitters authorized a bandwidth greater than 10 kHz: (i) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of up to and including 40 kHz: at least 116 Log10 ((f_d + 10)/6.1) decibels or 50 plus 10 Log10 (P) decibels or 70 decibels, whichever is the lesser attenuation; (ii) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 40 kHz: at least 43 + 10 Log10 (P) decibels or 80 decibels, whichever is the lesser attenuation. (b) The measurements of emission power can be expressed in peak or average values provided they are expressed in the same parameters as the transmitter power. d) The following minimum spectrum analyzer resolution bandwidth settings will be used: 300 Hz when showing compliance with paragraphs (a)(1)(i) and (a)(2)(i) of this section; and 30 kHz when showing compliance with paragraphs (a)(1) (ii) and (a)(2)(ii) of this section.
RSS-134	**4.4 Transmitter Unwanted Emissions** **4.4.1 Minimum Standard for Spacings Exceeding 4.4.1 12.5 kHz (Bandwidth > 10 kHz)** The power of emissions from the transmitter with modulated carrier shall be attenuated below the transmitter power (P) in accordance with the following schedule (where the displacement frequency f_d measured in kHz starts from the edge of the authorized bandwidth): (a) For f_d up to and including 40 kHz: at least 116 log10((f_d+10)/6.1) dB, or 50+10log10 (P) dB, or 70 dB, whichever is less stringent, using a spectrum analyzer of 300 Hz resolution bandwidth; (b) For f_d of more than 40 kHz: at least 43+10 log10 (P) dB, or 80 dB, whichever is less stringent, using a spectrum analyzer of 30 kHz resolution bandwidth.

Test Setup	Appendix A - Figure A.1

Measurement Procedure

The DUT was connected to a Spectrum Analyzer via a 30dB attenuator connected to the DUT's antenna port. The SA was set to RMS Detector. The output power of the DUT was set to the manufacturer's highest output power setting at the Mid and channel of each channel band. The DUT was set to transmit CW. An emissions limit line of -13dBm was set and the SA was set to Max Hold. The emissions level was measured using the Marker Peak function. Spurious emissions were evaluated to the 10th harmonic.

Plot 10.1 – Conducted Spurious Emissions 901.5MHz Channel, 1 – 3GHz

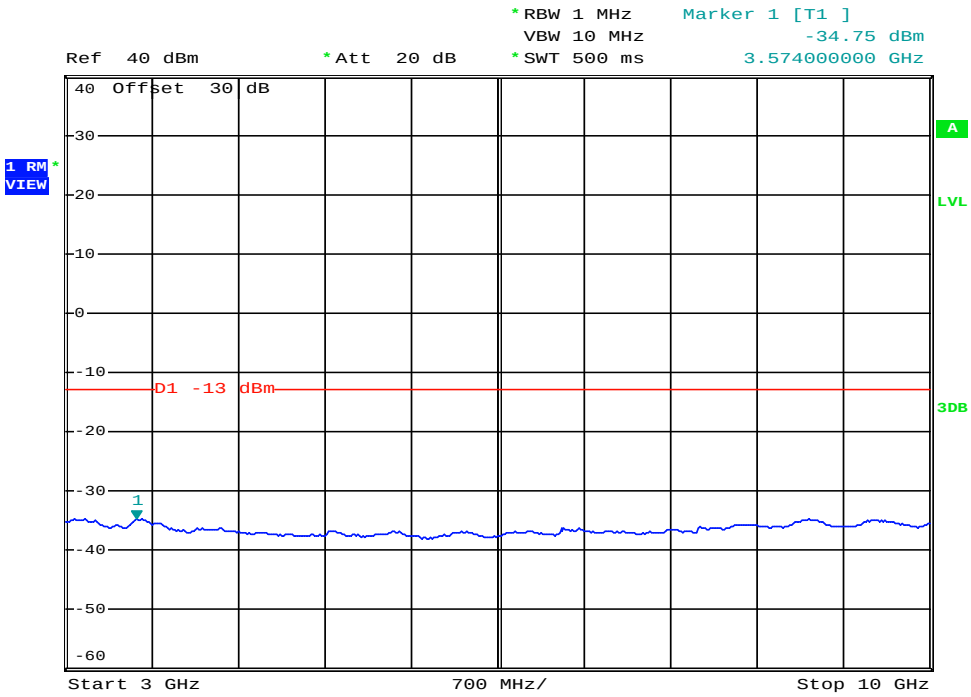
Conducted Spurious Emissions 1 - 3 GHz

Date: 22.MAR.2019 13:42:51

Channel Frequency:	Output Power Setting	
901.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-38.11** dBm

Plot 10.2 – Conducted Spurious Emissions 901.5MHz Channel, 3 – 10GHz

Conducted Spurious Emissions 3 - 10 GHz

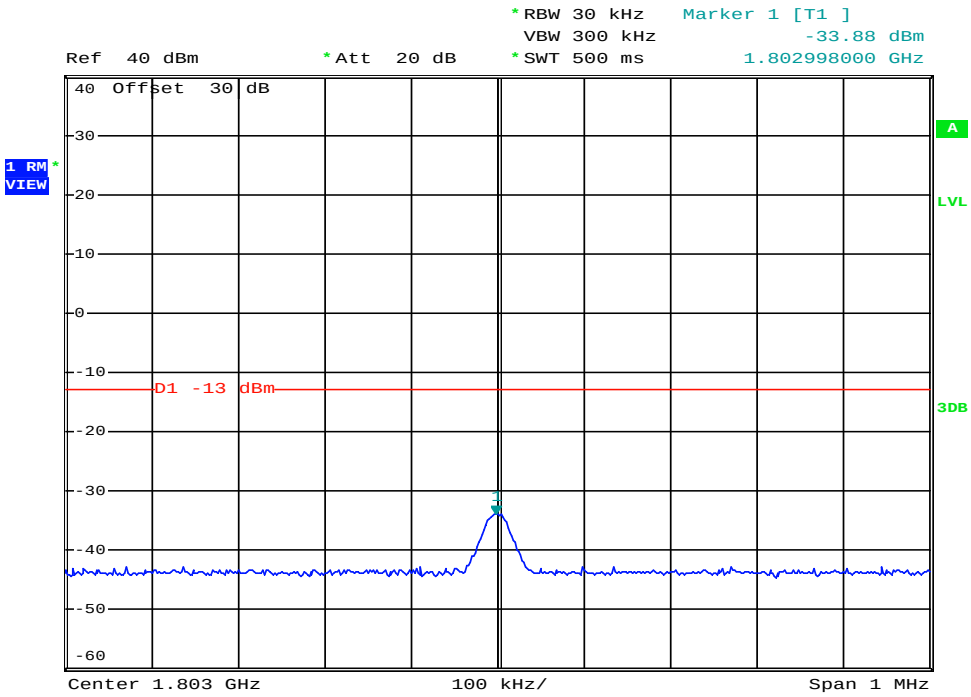


Date: 22.MAR.2019 13:44:02

Channel Frequency:	Output Power Setting	
901.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-34.75** dBm

Plot 10.3 – Conducted Spurious Emissions 901.5MHz Channel, 2nd Harmonic

Conducted Spurious Emissions 2nd Harmonic

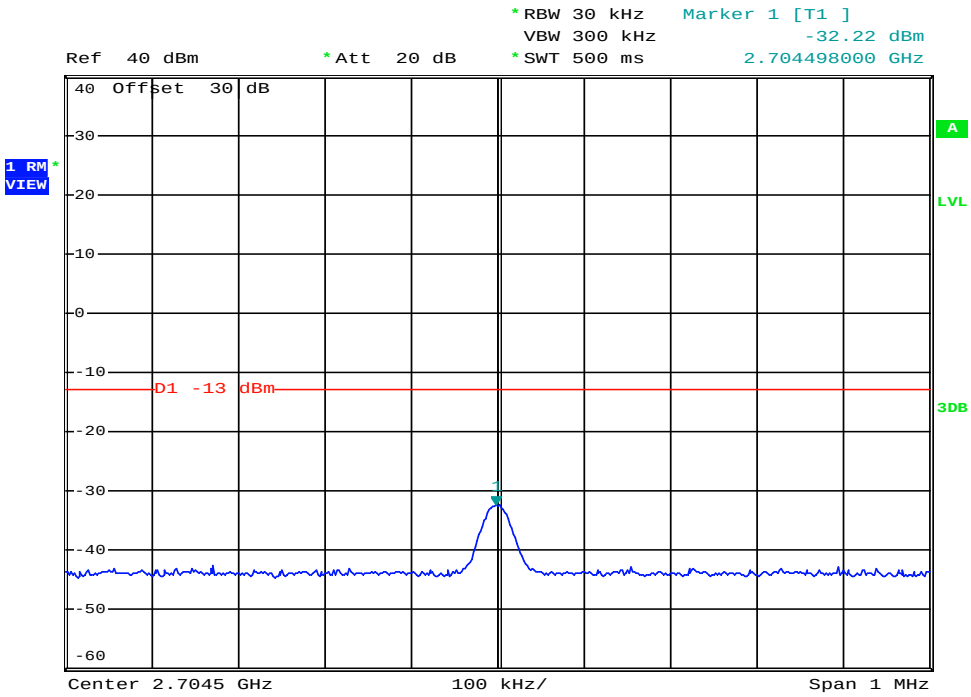


Date: 22.MAR.2019 13:52:42

Channel Frequency:	Output Power Setting	
901.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-33.88** dBm

Plot 10.4 – Conducted Spurious Emissions 901.5MHz Channel, 3rd Harmonic

Conducted Spurious Emissions 3rd Harmonic

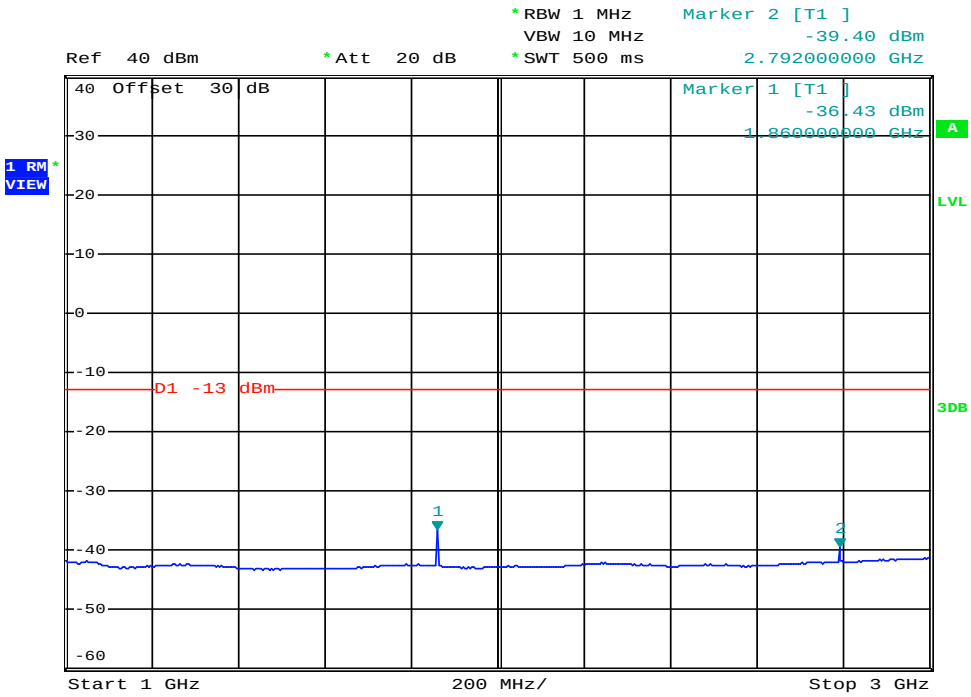


Date: 22.MAR.2019 13:53:19

Channel Frequency:	Output Power Setting	
901.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-32.22** dBm

Plot 10.5 – Conducted Spurious Emissions 930.5MHz Channel, 1 – 3GHz

Conducted Spurious Emissions 1 - 3 GHz

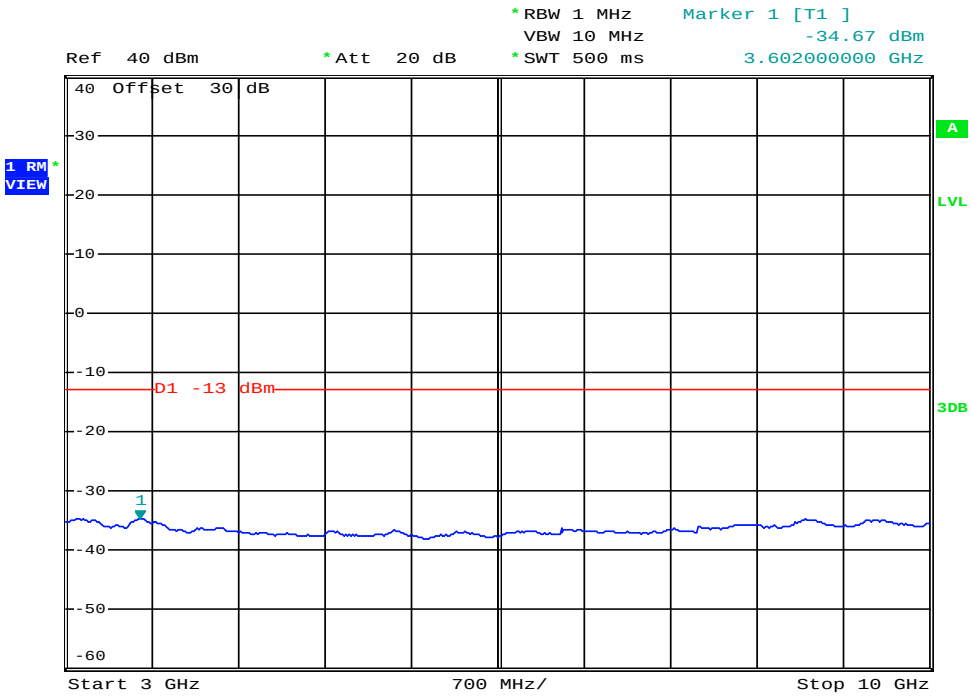


Date: 22.MAR.2019 13:49:41

Channel Frequency:	Output Power Setting	
930.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-36.43** dBm

Plot 10.6 – Conducted Spurious Emissions 930.5MHz Channel, 3 – 10GHz

Conducted Spurious Emissions 3 - 10 GHz

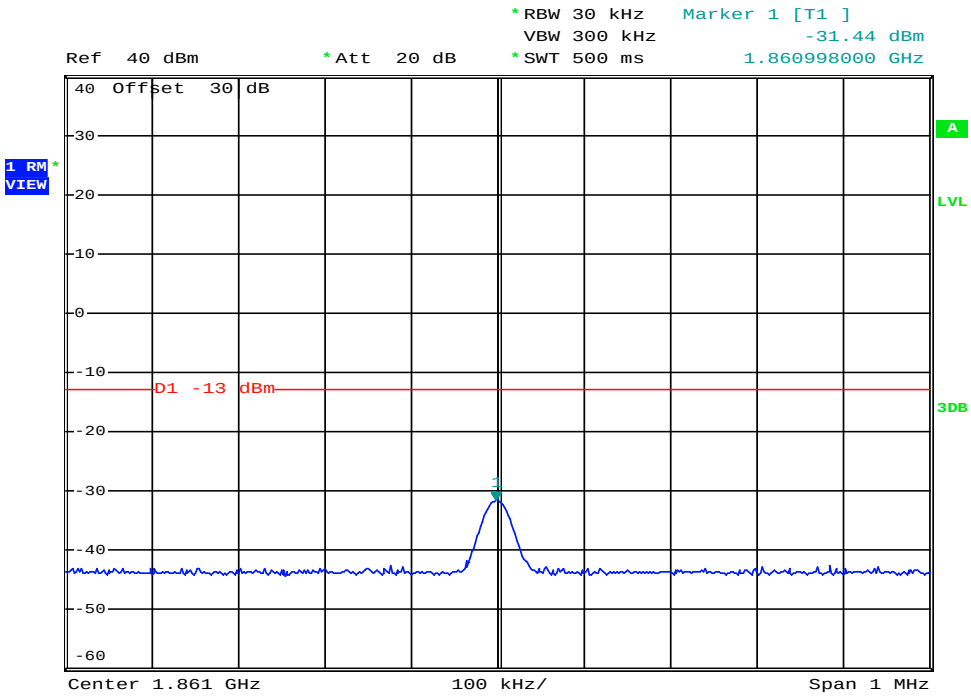


Date: 22.MAR.2019 13:45:06

Channel Frequency:	Output Power Setting	
930.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-34.67** dBm

Plot 10.7 – Conducted Spurious Emissions 930.5MHz Channel, 2nd Harmonic

Conducted Spurious Emissions 2nd Harmonic

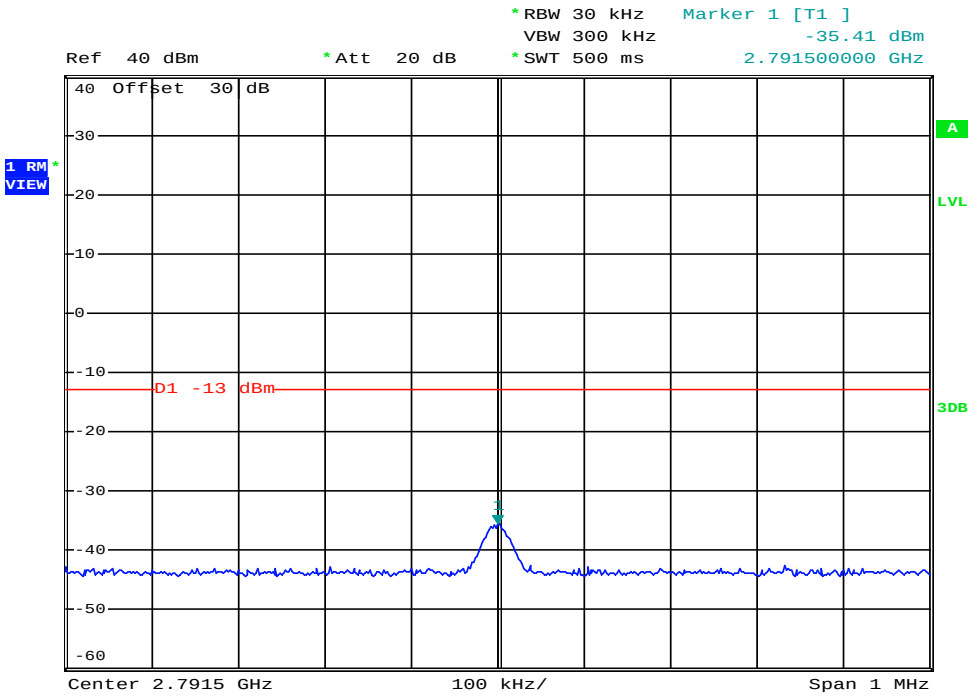


Date: 22.MAR.2019 13:54:49

Channel Frequency:	Output Power Setting	
930.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-31.44** dBm

Plot 10.8 – Conducted Spurious Emissions 930.5MHz Channel, 3rd Harmonic

Conducted Spurious Emissions 3rd Harmonic

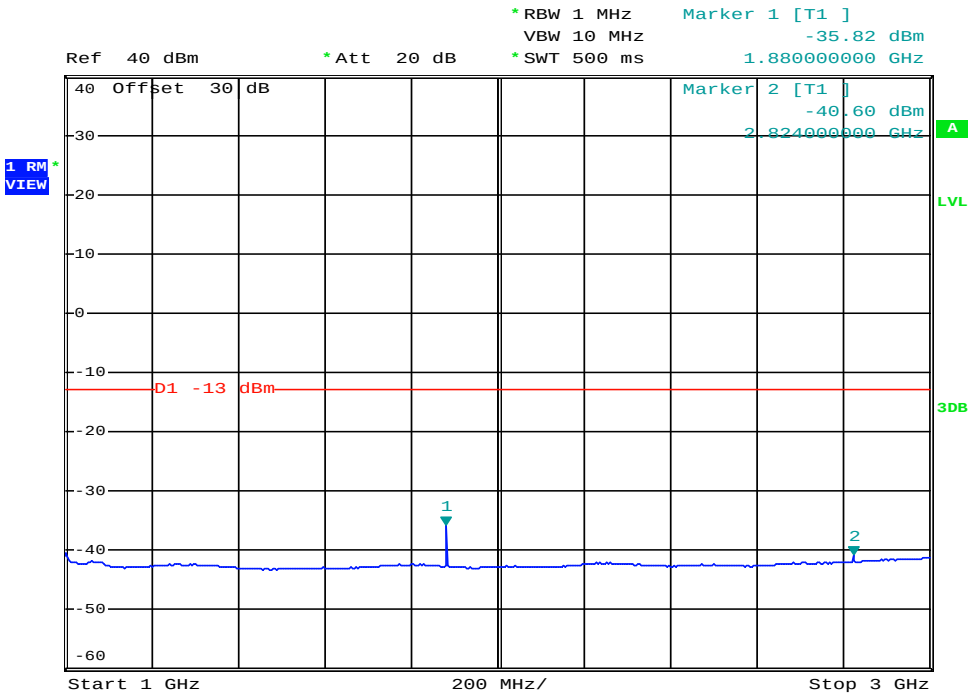


Date: 22.MAR.2019 13:55:24

Channel Frequency:	Output Power Setting	
930.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-35.41** dBm

Plot 10.9 – Conducted Spurious Emissions 940.5MHz Channel, 1 – 3GHz

Conducted Spurious Emissions 1 - 3 GHz

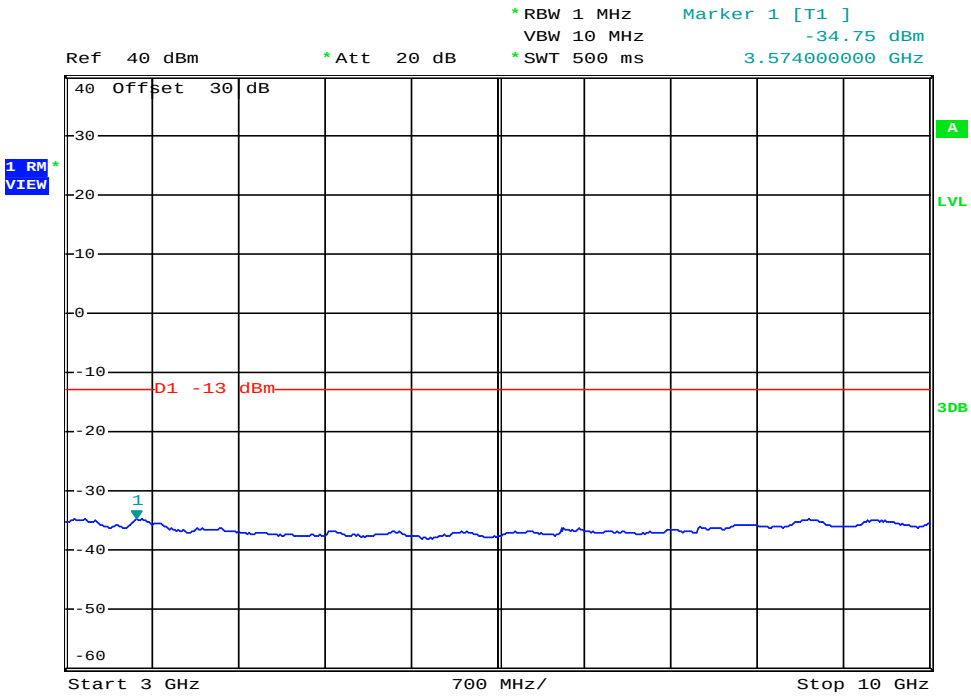


Date: 22.MAR.2019 13:47:36

Channel Frequency:	Output Power Setting	
940.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-35.82** dBm

Plot 10.10 – Conducted Spurious Emissions 940.5MHz Channel, 3 – 10GHz

Conducted Spurious Emissions 3 - 10 GHz

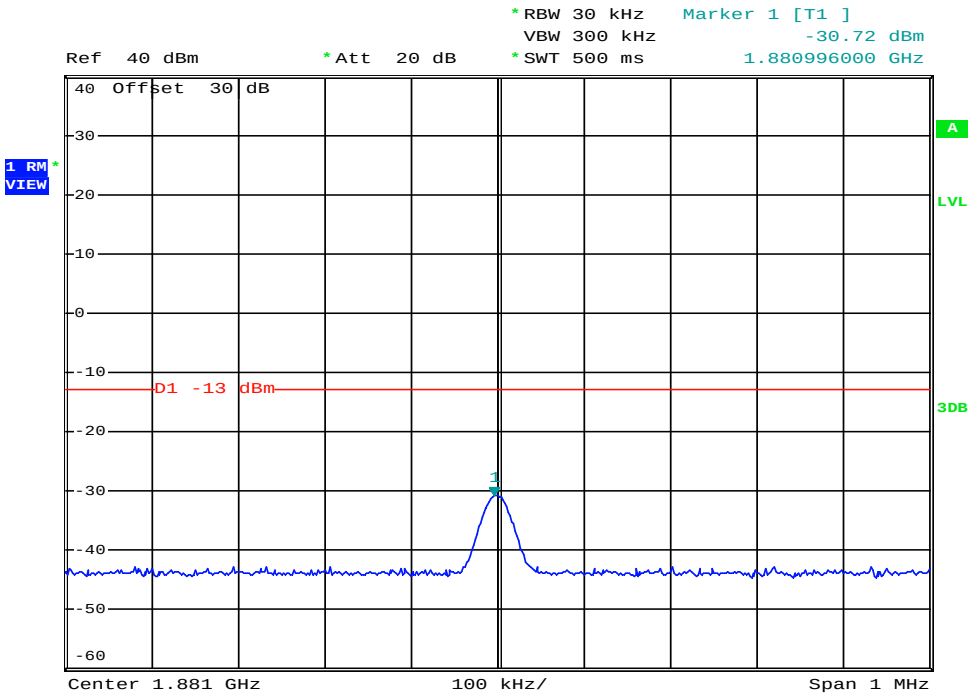


Date: 22.MAR.2019 13:44:02

Channel Frequency:	Output Power Setting	
940.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-34.75** dBm

Plot 10.11 – Conducted Spurious Emissions 940.5MHz Channel, 2nd Harmonic

Conducted Spurious Emissions 2nd Harmonic

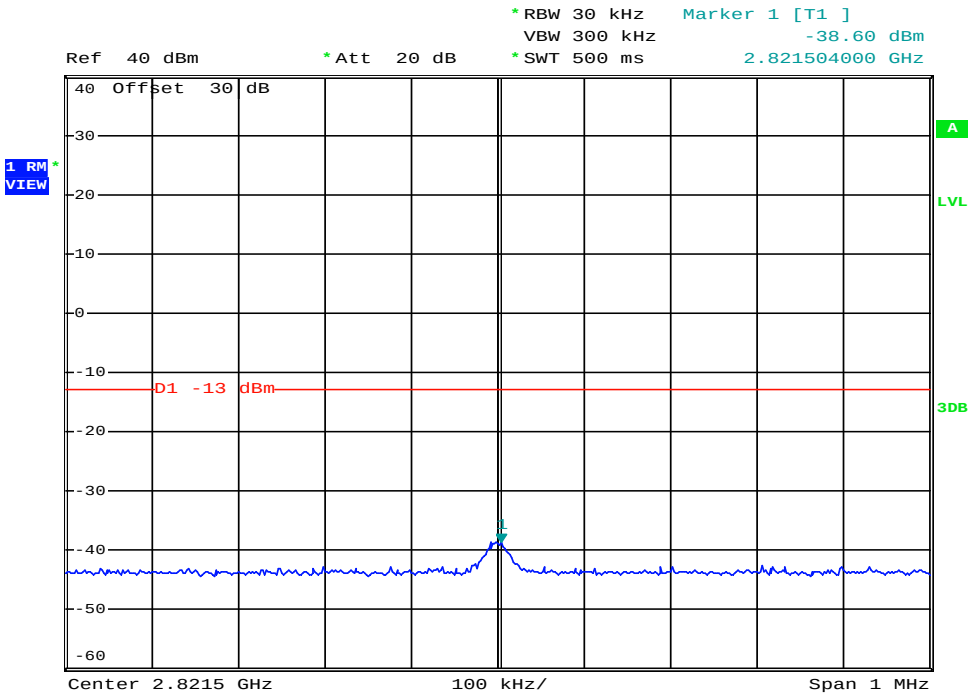


Date: 22.MAR.2019 13:56:43

Channel Frequency:	Output Power Setting	
940.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-30.72** dBm

Plot 10.12 – Conducted Spurious Emissions 940.5MHz Channel, 3rd Harmonic

Conducted Spurious Emissions 3rd Harmonic



Date: 22.MAR.2019 13:57:18

Channel Frequency:	Output Power Setting	
940.50 MHz	**37** dBm	
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**-38.60** dBm

Table 10 - Summary of Conducted Spurious Emissions Measurements

Conducted Spurious Emissions							
Channel Frequency ***(MHz)***	**Emission Frequency** ***(MHz)***	**DUT Modulation**	**Fundamental Power [P]** ***(dBm)***	**Out of Band Emission [P_E]** ***(dBm)***	**Attenuation** ***[dB]***	**Limit** ***(dB)***	**Margin** ***(dB)***
901.5	1803	CW	36.68	-33.9	70.6	43.0	27.56
	2705		36.68	-32.2	68.9		25.90
930.5	1861		36.80	-31.4	68.2		25.24
	2791		36.80	-35.4	72.2		29.21
940.5	1881		36.82	-30.7	67.5		24.54
	2821		36.82	-38.6	75.4		32.42
Attenuation = P - P_E Margin = Limit - Attenuation							
					Result:	**Complies**	
Data for fundamental and spurious emissions presented using an RMS detector.							

11.0 RADIATED OUT OF BAND SPURIOUS EMISSIONS

Test Procedure	
Normative Reference	FCC 47 CFR §2.1053, §24.133, RSS-134

Limits	
47 CFR §24	**§24.133 Emission Limits.** (a) The power of any emission shall be attenuated below the transmitter power (P), as measured in accordance with §24.132(f), in accordance with the following schedule: (1) For transmitters authorized a bandwidth greater than 10 kHz: (i) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of up to and including 40 kHz: at least 116 Log10 ((f_d + 10)/6.1) decibels or 50 plus 10 Log10 (P) decibels or 70 decibels, whichever is the lesser attenuation; (ii) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 40 kHz: at least 43 + 10 Log10 (P) decibels or 80 decibels, whichever is the lesser attenuation. (b) The measurements of emission power can be expressed in peak or average values provided they are expressed in the same parameters as the transmitter power. d) The following minimum spectrum analyzer resolution bandwidth settings will be used: 300 Hz when showing compliance with paragraphs (a)(1)(i) and (a)(2)(i) of this section; and 30 kHz when showing compliance with paragraphs (a)(1) (ii) and (a)(2)(ii) of this section.
RSS-134	**4.4 Transmitter Unwanted Emissions** **4.4.1 Minimum Standard for Spacings Exceeding 4.4.1 12.5 kHz (Bandwidth > 10 kHz)** The power of emissions from the transmitter with modulated carrier shall be attenuated below the transmitter power (P) in accordance with the following schedule (where the displacement frequency f_d measured in kHz starts from the edge of the authorized bandwidth): (a) For f_d up to and including 40 kHz: at least 116 log10((f_d+10)/6.1) dB, or 50+10log10 (P) dB, or 70 dB, whichever is less stringent, using a spectrum analyzer of 300 Hz resolution bandwidth; (b) For f_d of more than 40 kHz: at least 43+10 log10 (P) dB, or 80 dB, whichever is less stringent, using a spectrum analyzer of 30 kHz resolution bandwidth.

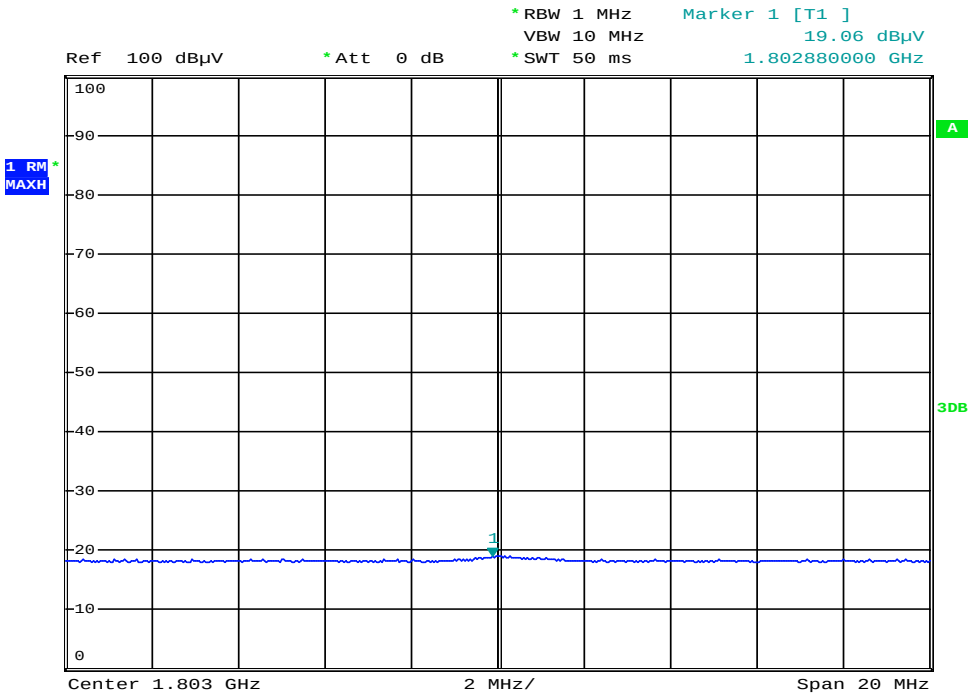
Test Setup	Appendix A - Figure A.2

Measurement Procedure

The DUT was placed in a semi-anechoic chamber. The SA was set to RMS Detector. The output power of the DUT was set to the manufacturer's highest output power setting at the Mid and channel of each channel band. The DUT was set to transmit CW. An emissions limit line of -13dBm was set and the SA was set to Max Hold. The emissions level was measured using the Marker Peak function. Spurious emissions were evaluated to the 10th harmonic.

Plot 11.1 – Radiated Out of Band Emissions, 901.5MHz Channel, 2nd Harmonic

Conducted Spurious Emissions 2nd Harmonic



Date: 28.MAR.2019 10:07:03

Channel Frequency:	Output Power Setting	Antenna Polarization
901.50 MHz	**37** dBm	**Vertcal**
DUT Modulation:	Nominal Supply Voltage	Measured Spurious Emission:
CW	**13.80** VDC	**19.06** dBuV/m

Table 11.1 – Summary of Radiated Out of Band Emissions Measurements

Conducted Spurious Emissions							
Channel Frequency ***(MHz)***	**Emission Frequency** ***(MHz)***	**DUT Modulation**	**Fundamental Power [P]** ***(dBm)***	**Out of Band Emission [P_E]** ***(dBm)***	**Attenuation** ***[dB]***	**Limit** ***(dB)***	**Margin** ***(dB)***
No Emissions Detected Attenuation = P - P_E Margin = Limit - Attenuation							
					Result:	**Complies**	
Data for fundamental and spurious emissions presented using an RMS detector.							

APPENDIX A – TEST SETUP DRAWINGS AND EQUIPMENT

Table A.1 – Setup - Conducted Measurements Equipment

Equipment List			
Asset Number	Manufacturer	Model Number	Description
00241	R&S	FSU40	Spectrum Analyzer

Figure A.1 – Test Setup Conducted Measurements

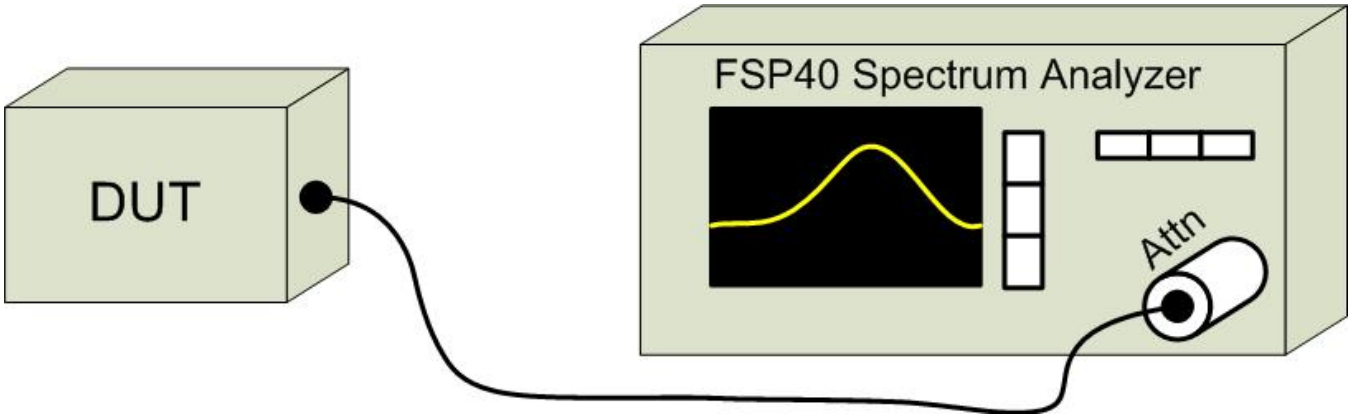
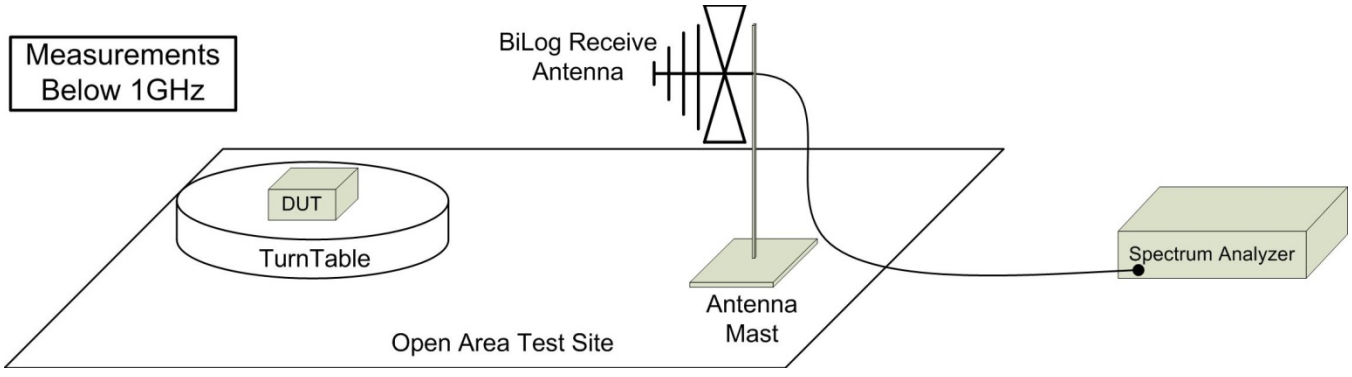


Table A.2 – Setup - Radiated Emissions Equipment

Equipment List			
Asset Number	**Manufacturer**	**Model Number**	**Description**
00051	HP	8566B	Spectrum Analyzer
00049	HP	85650A	Quasi-peak Adapter
00047	HP	85685A	RF Preselector
00072	EMCO	2075	Mini-mast
00073	EMCO	2080	Turn Table
00071	EMCO	2090	Multi-Device Controller
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier
00241	R&S	FSU40	Spectrum Analyzer
00050	Chase	CBL-6111A	Bilog Antenna
00275	Coaxis	LMR400	25m Cable
00276	Coaxis	LMR400	4m Cable
00278	TILE	34G3	TILE Test Software
00034	ETS	3115	Double Ridged Guide Horn

CNR: Calibration Not Required
COU: Calibrate On Use

Figure A.2 – Test Setup Radiated Emissions Measurements



APPENDIX B – EQUIPMENT LIST AND CALIBRATION

Equipment List

(*)	Asset Number	Manufacturer	Model Number	Serial Number	Description	Last Calibrated	Calibration Interval	Calibration Due
*	00050	Chase	CBL-6111A	1607	Bilog Antenna	3 Jan 2019	Triennial	3 Jan 2022
*	00034	ETS	3115	6267	Double Ridged Guide Horn	26 Nov 2018	Triennial	26 Nov 2021
	00035	ETS	3115	6276	Double Ridged Guide Horn	2 Dec 2015	Triennial	2 Dec 2018
	00085	EMCO	6502	9203-2724	Loop Antenna	8 Jun 2016	Triennial	8 Jun 2019
	00047	HP	85685A	2837A00826	RF Preselector	23 Jun 2017	Triennial	23 Jun 2020
	00049	HP	85650A	2043A00162	Quasi-peak Adapter	23 Jun 2017	Triennial	23 Jun 2020
	00051	HP	8566B	2747A05510	Spectrum Analyzer	23 Jun 2017	Triennial	23 Jun 2020
	00223	HP	8901A	3749A07154	Modulation Analyzer	27 Dec 2017	Triennial	27 Dec 2020
	00224	HP	8903B	3729A18691	Audio Analyzer	28 Dec 2017	Triennial	28 Dec 2020
*	00241	R&S	FSU40	100500	Spectrum Analyzer	15 May 2018	Triennial	15 May 2021
*	00005	HP	8648D	3847A00611	Signal Generator	21 Jun 2017	Triennial	21 Jun 2020
	00006	R&S	SMR20	100104	Signal Generator	29 May 2017	Triennial	29 May 2020
	00243	Rigol	DS1102E	DS1ET150502164	Oscilloscope	7 Nov 2017	Triennial	7 Nov 2020
	00254	LeCroy	WM8600A	532	Oscilloscope	NCR	n/a	NCR
	00110	Gigatronics	8652A	1875801	Power Meter	29 Feb 2016	Triennial	29 Feb 2019
	00237	Gigatronics	80334A	1837001	Power Sensor	23 Jun 2014	Triennial	23 Jun 2017
	00232	ETS Lindgren	HI-6005	91440	Isotropic E-Field Probe	18 Dec 2017	Triennial	18 Dec 2020
	00003	HP	53181A	3736A05175	Frequency Counter	21 Jun 2017	Triennial	21 Jun 2020
	00257	Com-Power	LI-215A	191934	LISN	5 Jan 2018	Triennial	5 Jan 2021
	00041	AR	10W1000C	27887	Power Amplifier	NCR	n/a	NCR
	00106	AR	5SIG4	26235	Power Amplifier	NCR	n/a	NCR
	00280	AR	25A250AM6	22702	Power Amplifier	NCR	n/a	NCR
	00265	Miteq	JS32-00104000-58-5P	1939850	Microwave L/N Amplifier	COU	n/a	COU
	00071	EMCO	2090	9912-1484	Multi-Device Controller	n/a	n/a	n/a
	00072	EMCO	2075	0001-2277	Mini-mast	n/a	n/a	n/a
	00073	EMCO	2080	0002-1002	Turn Table	n/a	n/a	n/a
	00081	ESPEC	ECT-2	0510154-B	Environmental Chamber	CNR	n/a	CNR
	00234	VWR	61161-378	140320430	Temp/Humidity Meter	New	Triennial	New
	00236	Nokia	-	236	ESD Table	NCR	n/a	NCR
	00255	Expert ESD	A4001	A4001-155	ESD Target	COU	n/a	COU
	00064	NARDA	3020A	n/a	Bi-Directional Coupler	COU	n/a	COU
	00263	Koaxis	KP10-1.00M-TD	263	1m Armoured Cable	COU	n/a	COU
*	00263B	Koaxis	KP10-1.00M-TD	263B	1m Armoured Cable	COU	n/a	COU
*	00264	Koaxis	KP10-7.00M-TD	264	7m Armoured Cable	COU	n/a	COU
	00275	TMS	LMR400	n/a	25m Cable	COU	n/a	COU
	00276	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
	00277	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
*	00278	TILE	34G3	n/a	TILE Test Software	NCR	n/a	NCR
Rented Equipment								

* Used during the course of this investigation
CNR: Calibration Not Required
COU: Calibrate On Use

APPENDIX C – MEASUREMENT INSTRUMENT UNCERTAINTY

CISPR 16-4 Measurement Uncertainty (U_{LAB})	
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence interval using a coverage factor of k=2	
30MHz - 200MHz	
U_{LAB} = 5.14dB U_{CISPR} = 6.3dB	
200MHz - 1000MHz	
U_{LAB} = 5.90dB U_{CISPR} = 6.3dB	
1GHz - 6GHz	
U_{LAB} = 4.80dB U_{CISPR} = 5.2dB	
6GHz - 18GHz	
U_{LAB} = 5.1dB U_{CISPR} = 5.5dB	
If the calculated uncertainty U_{lab} is **less** than U_{CISPR} then:	
1	Compliance is deemed to occur if **NO** measured disturbance exceeds the disturbance limit
2	Non-Compliance is deemed to occur if **ANY** measured disturbance **EXCEEDS** the disturbance limit
If the calculated uncertainty U_{lab} is **greater** than U_{CISPR} then:	
3	Compliance is deemed to occur if **NO** measured disturbance, increased by (U_{lab} - U_{CISPR}), exceeds the disturbance limit
4	Non-Compliance is deemed to occur if **ANY** measured disturbance, increased by (U_{lab} - U_{CISPR}), **EXCEEDS** the disturbance limit

