

Device Under Test (DUT)

Test Report Serial No.: 220114-

FCC Rule Part(s):

220114-T1283-E-90O

47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited

IC 3874A-1

IC Test Site No.:



Compliance Test	: Report	FCC PART 90			
Test Lab Information	Name	CELLTECH LABS INC.			
Test Lab information	Address	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada			
Tost Site Posistration No.(s)	FCC	Accredited Site (ISO 17025:2005 - A2LA Test Lab Certificate No. 2470.01)			
Test Site Registration No.(s)	IC	3874A-1			
	Name	4RF Limited.			
Applicant Information Welli		26 Glover St. Wellington 6032 New Zealand			
Standard(s) & Procedure(s) FCC 47 CFR		47 CFR Part 2; Part 90			
	ANSI	TIA/EIA-603-C-2004, C63.4-2003			
Device Classification(s)	FCC	Private Land Mobile Radio Services (TNB)			
Application Type(s)	FCC/IC	New Certification			
Device Identifier(s)	FCC ID:	UIPSQ450M140			

This wireless device has demonstrated compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC 47 CFR Rule Parts 2 and Part 90; Industry Canada RSS-119 Issue 11 and RSS-Gen Issue 3; ANSI TIA/EIA-603-C-2004 and ANSI C63.4-2003.

Model # SQ450M140

Aprisa SR+ 12.5 / 25 KHz Channels, Point-to-Multipoint Transmitter, Scada applications.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results and statements contained in this report pertain only to the device(s) evaluated. This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.

Test Report Approved By

Glen Westwell

Lab Manager

Celltech Labs Inc.

Applicant:		4RF Corp. FCC ID:		rp. FCC ID: UIPSQ450M140				
DUT Type:	P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	· 4KF	
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Applicant:		4RF Corp. FCC ID:			40 40 C			
DUT Type:	P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF	
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rest Report Senai No	220114-11203-L-900	Report Revision No.:	Revision 2.0
FCC Rule Part(s):	47 CFR §2. §90	FCC Test Firm Reg. No.:	Accredited
roc Rule Part(s).	47 CFR §2, §90	IC Test Site No.:	IC 3874A-1



GENERAL REMARKS

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SUMMARY

The device under test (DUT) fulfills the general approval requirements as identified in this test report.

REVISION LOG

Revision	Description	Implemented By	Implementation Date
1.0	1st Release	Glen Westwell	1/24/2016
2.0	Emission Designator change	Art Voss	10/3/2016

Test Report Prepared By	Date	QA Review By	Date
Glen Westwell	1/24/2014	Art Voss	1/24/2016
Art Voss	10/3/2016	Ben Hewson	10/3/2016

Applicant:		4RF Corp. FCC ID:		4RF Corp. FCC ID: UIPSQ450M140				
DUT Type:	P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF	
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47 CEP 82 800	FCC Test Firm Reg. No.:	Accredited
	220114-T1283-E-90O	220114-T1283-E-900 Report Revision No.: FCC Test Firm Reg. No.:

IC Test Site No.: IC 3874A-1



SCOPE

This report outlines the results collected during RF radiated and conducted measurements of the 4RF Aprisa SR+ SQ450M150 point-to-multipoint radio. The measurement results were applied against the applicable requirements and limits outlined in the technical rules and regulations set forth in the Federal Communication's Commission Code of Federal Regulations Title 47 Part 2 and Part 90; and Industry Canada Radio Standards Specification RSS-119 and RSS-Gen.

1.0 REFERENCES

1.1 Normative References

ANSI/ISO 17025:2005 General Requirements for competence of testing and calibration laboratories

IEEE/ANSI C63.4:2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic

Equipment in the Range of 9 kHz to 40 GHz

ANSI/TIA/EIA-603-C:2004 Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

CFR Title 47 Part 2 Code of Federal Regulations

Title 47: Telecommunication

Part 2: Frequency Allocations and Radio Treaty Matters;

General Rules and Regulations

CFR Title 47 Part 90 Code of Federal Regulations

Title 47: Telecommunication

Part 90: Private Land Mobile Radio Services

IC Spectrum Management & Radio Standards Specification

Telecommunications Policy RSS-119 – Land Mobile Fixed Services; 27.41-960 MHz

RSS-Gen - General Requirements and Information for the Certification of

Radiocommunication Equipment

2.0 PASS/FAIL CRITERIA

Unless otherwise noted in the Appendices, the pass/fail criteria are the limit set forth in the reference standards. The DUT is considered to have passed the requirements if the data collected during the described measurement procedure is no greater than the specified limits as defined. The pass/fail statements made in this report only apply to the unit tested.

3.0 FACILITIES AND ACCREDITATIONS

The facilities used in collecting the test results outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site conforms to the requirements set forth in ANSI C63.4 and is filed and listed with the FCC as an accredited test facility and Industry Canada under File Number IC 3874A-1.

Applicant:		4RF Corp. FCC ID:			UIPS	40 4 D C		
DUT Type:	P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF	
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Test Report Serial No.: 220114-T128

47 CFR §2, §90

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IC Test Site No.:	IC 3874A-1



4.0 GENERAL INFORMATION

DUT Description & Specifications

Device Description		Q450M150, 12.5 / 25 kHz channels, kHz Point-to-Multipoint Digital Radio		
	•			
Test Sample Serial No.	T/A Sample -	Identical Prototype		
Device Identifier(s)	FCC ID:	UIPSQ450M140		
Model Number(s)	SQ450M140	SQ450M140		
FCC Frequency Band:	421-512 MHz			
Transmit Frequency Range DUT:	450 – 512 MF	Hz (12.5 / 25 KHz Channels)		
Rated TX Power and Modulation	QPSK: +37.0 dBm 16QAM: +35.0 dBm 64QAM: +34.0 dBm			
Spectral Efficiency	Min. = 19,200 bits per second / 25 KHz or 4800 bits per second / 6.25 kHz			
Antenna	Maximum antenna gain = 15dBi.			
Emission Designator	25.0 KHz CH. = 20K0G1D (99% = 18.3 kHz, ABW = 20 kHz) QPSK 25.0 KHz CH. = 20K0D1D (99% = 18.3 kHz, ABW = 20 kHz) QAM 12.5 KHz Ch. = 11K3G1D (99% = 10.1 kHz, ABW = 11.25 kHz) QPSK 12.5 KHz Ch. = 11K3D1D (99% = 10.1 kHz, ABW = 11.25 kHz) QAM			
DUT Power Source	10-30 Vdc			
Type of Equipment	Fixed. Licensed Non-Broadcast Station Transmitter (TNB)			
Deviation(s) from standard/procedure	None			
Modification of DUT	None			
Test Exercise	The DUT was	The DUT was placed in continuous transmit mode and CW mode.		
Applicable Standards	FCC Part 90.			

DUT Function & Test Statements

Spectrum Efficient Technologies Part 90.203(j)(5).
This device complies with the spectrum efficiency requirement of this rule part.

A manufacturer's attestation exhibit has been submitted with this filing.

This device has no voice frequency capability. It uses digital modulation only. Therefore no voice frequency test requirements have been reported.

Applicant:		4RF Corp. FCC ID:		ID: UIPSQ450M140			4 4 D C
DUT Type:		P-to-MP Transmitter		DUT Aprisa SR+ SQ450M140 Freq.: 450-512 MHz		450-512 MHz	·· 4RF
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<u>Section</u>	Description of Test	Procedure Reference	Limit Reference	Result
5	RF Output Power	ANSI/TIA/EIA-603-C	§2.1046, §90.205	Pass
6	Spurious Emissions at the antenna terminals (Conducted)	ANSI/TIA/EIA-603-C	§2.1051, 90.210	Pass
7	Occupied Bandwidth and Emission Mask	ANSI/TIA/EIA-603-C	§2.1049, §90.210	Pass
8	Radiated Spurious Emissions	ANSI C63.4-2003	§2.1053, §90.210	Pass
10	Frequency Stability	ANSI/TIA/EIA-603-C	§2.1055, §90.213	Pass
Section	Description of Test	Procedure Reference	Limit Reference	Result
			Ellille Reservation	IXESUIT
5	Transmitter Output Power	RSS-Gen 4.8	RSS-119, 5.4	Pass
5 6				
	Transmitter Output Power Spurious Emissions at the	RSS-Gen 4.8	RSS-119, 5.4	Pass
6	Transmitter Output Power Spurious Emissions at the antenna terminals (Conducted) Occupied Bandwidth	RSS-Gen 4.8 RSS-Gen 4.9	RSS-119, 5.4 RSS-119, 5.8	Pass Pass

Applicant:		4RF Corp.	UIPSQ450M140				40	
DUT Type:		P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF
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IC Test Site No :	IC 38744-1



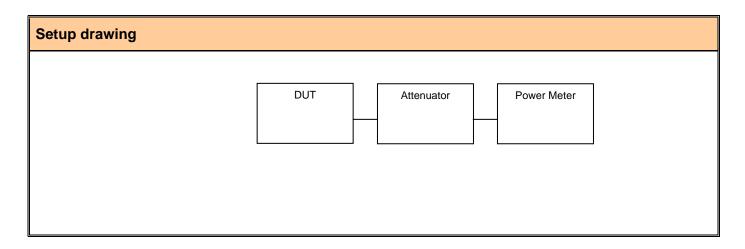
5.0 <u>RF OUTPUT POWER MEASUREMENT</u>

References			
Normative Reference Standard	FCC CFR 47 §2.1046, §90.205; IC RSS-119, 5.4		
Procedure Reference	The RF output power measurements were performed in accordance with ANSI TIA/EIA Standard 603.		

Limits	
FCC CFR 47 §90.279	ERP relative to Effective Antenna Height (EAH), 90.279.
RSS-119, 5.4	The output power shall be within ±1.0 dB of the manufacturers rated power.

Environmental conditions		
Temperature	25 +/- 5 °C	
Humidity	40 +/- 10 %	
Barometric Pressure	101 +/- 3 kPa	

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00007	Gigatronics	8652A	Power Meter	03-May-14
00237	Gigatronics	80334A	Power Sensor	03-May-14



Applicant:		4RF Corp.		40			
DUT Type:	P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4KF
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rest Report Serial No	220114-11203-E-90O	Report Revision No.:	Revision 2.0	
FCC Rule Part(s):	47 CFR §2, §90	FCC Test Firm Reg. No.:	Accredited	
FCC Rule Part(s).	47 CFR 92, 990	FCC Test Firm Reg. No.: Accree IC Test Site No.: IC 387		



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Measured Frequency	Conducted Output Power (dBm)	Conducted Output Power (dBm)	Rated Output Power	
(MHz)	12.5 KHz Ch.	25 KHz Ch.	(dBm)	
QPSK	37.4	36.7	37.0	
16QAM	35.6	35.6	35.0	
64QAM	34.7	34.0	34.0	

Sign-off

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell Lab Manager Celltech Labs Inc.

10/3/2016

Date

Applicant:		4RF Corp. FCC ID			140	400	
DUT Type:	P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF
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IC Test Site No :	IC 38744-1



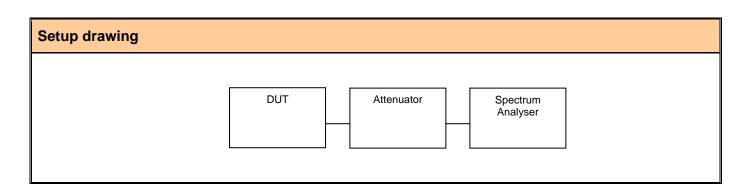
6.0 SPURIOUS EMISSIONS AT THE ANTENNA TERMINAL

References						
Normative Reference Standard	FCC CFR 47 §2.1051, §90.210; IC RSS-119, 5.8					
Procedure Reference	The spurious emissions measurements at the antenna terminal were performed in accordance with ANSI TIA/EIA Standard 603. The emission search was performed across all required ranges. The worst case					
	performance has been presented.					

Limits	Limits							
FCC CFR 47 §90.210	25.0 KHz Ch.= 43 + 10 Log (Po) dB.							
	12.5 KHz CH. = 50 + 10 Log (Po) dB.							

Environmental conditions					
Temperature	25 +/- 5 °C				
Humidity	40 +/- 10 %				
Barometric Pressure	101 +/- 3 kPa				

ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00051	HP	8566B	Spectrum Analyzer RF Section	10-May-2014
00047	HP	85685A	RF Preselector	10-May-2014
00241	R&S	FSU 40	Spectrum Analyzer	09-Apr-2015



Applicant:	4RF Corp. FC		FCC ID:		UIPSQ450M140				
DUT Type:	: P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF		
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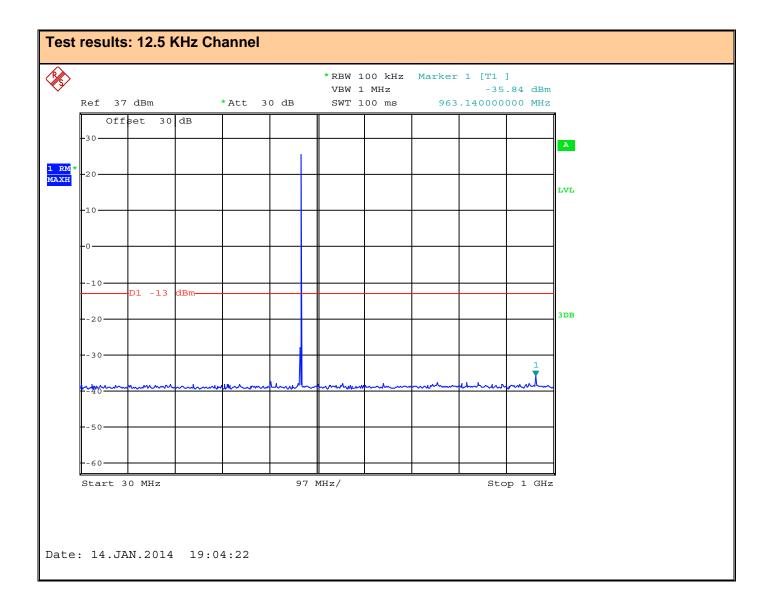
47 CFR §2, §90

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IC Test Site No.: IC 3874A-1

Test Lab Certificate No. 2470.01

Detected Emissions 12.5 KHz Ch.

Emission Frequency	Level	Limit	Margin
[MHz]	[dBm]	[dBm]	[dB]
962.0	-24.2	-20	-4.2



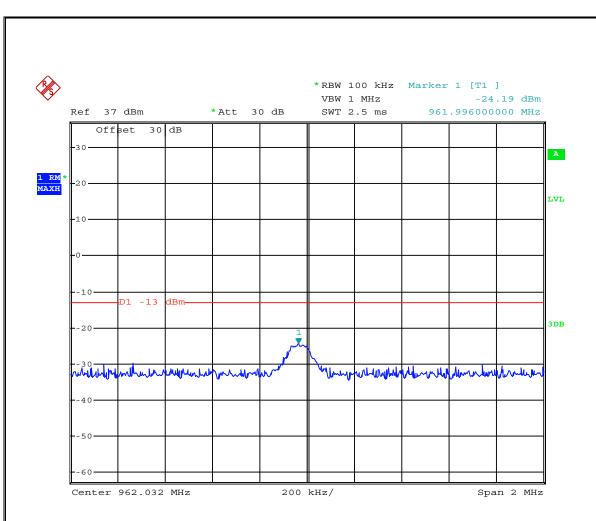
Applicant:		4RF Corp.		UIPS	140	# 4DC		
DUT Type:		P-to-MP Transmitter	DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	· 4KF	
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FCC Rule Part(s):	41 CFR 92, 990	10.7	

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Date: 14.JAN.2014 19:05:27

Applicant:		4RF Corp. FCC ID:			UIPS	140	4 4 D C		
DUT Type:	P-to-MP Transmitter			DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4KF	
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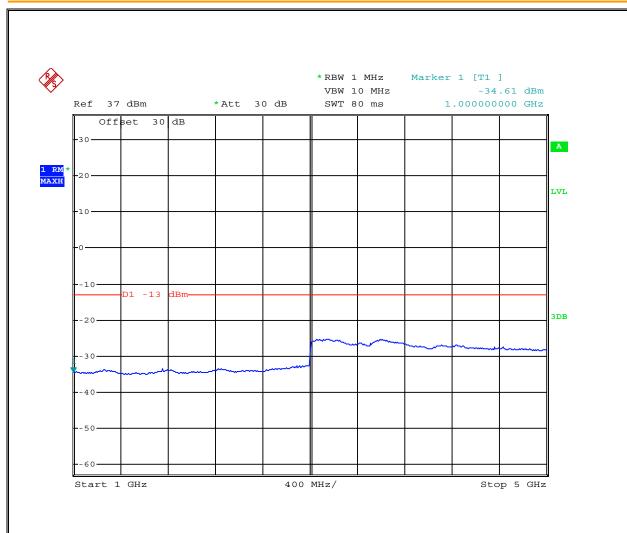


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FCC Rule Part(s): 47 CFR §2, §90

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Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1





Date: 14.JAN.2014 19:06:34

Applicant:		4RF Corp. FCC ID:			UIPS	140	40 4 D C	
DUT Type:		P-to-MP Transmitter	DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4RF	
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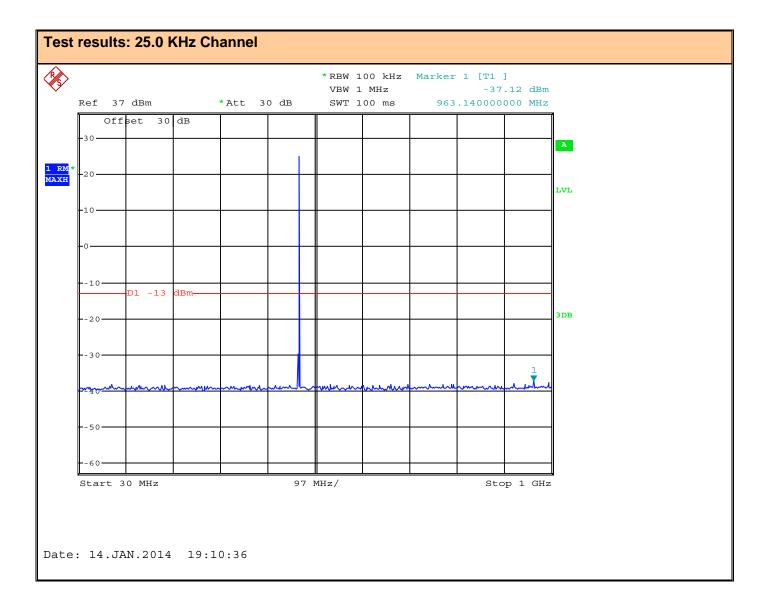
47 CFR §2, §90

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Detected Emissions 25 KHz Ch.

Emission Frequency	Level	Limit	Margin	
[MHz]	[dBm]	[dBm]	[dB]	
962.0	-25.6	-13	-12.6	



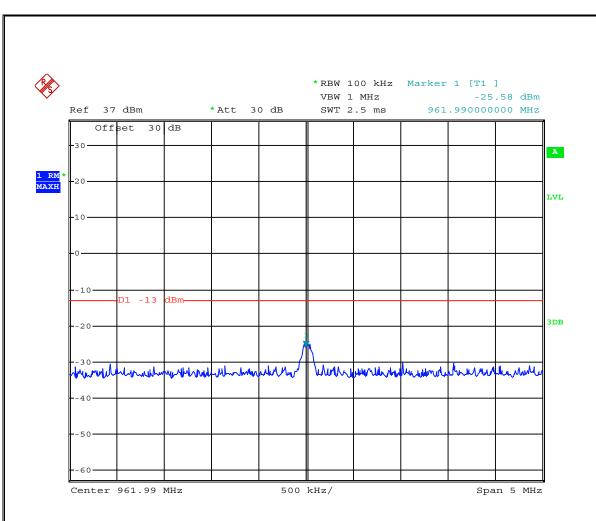
Applicant:		4RF Corp. FCC ID:			UIPS	140	4 4 D C	
DUT Type:		P-to-MP Transmitter		DUT	DUT Aprisa SR+ SQ450M140 Freq.: 450-512 MHz			
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FCC Rule Part(s):	47 CFR §2, §90	FCC Test Firm Reg. No.:	Acc
roo Rule Part(S).	41 011 92, 990	10 T (0) 1	10.0

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Date: 14.JAN.2014 19:11:06

Applicant:		4RF Corp. FCC ID:			UIPS	140	40 456	
DUT Type:		P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	450-512 MHz	4 KF	
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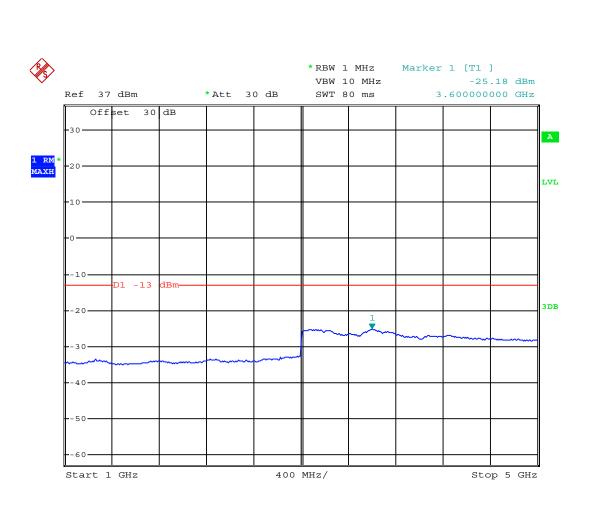


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47 CFR §2, §90

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Date: 14.JAN.2014 19:09:46

Applicant:		4RF Corp. FCC ID:			UIPS	140	40 4 D C	
DUT Type:		P-to-MP Transmitter	DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	· 4RF	
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FCC Rule Part(s).	47 CFR 92, 990	IC Test Site No.:	IC 3874A-1



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I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell. Lab Manager Celltech Labs Inc.

10/3/2016

Date

Applicant:		4RF Corp. FCC ID:			UIPS	40 4 D C	
DUT Type:	pe: P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF
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7.0 OCCUPIED BANDWIDTH AND EMISSION MASK

FCC Rule Part(s):

References					
Normative Reference Standard	FCC CFR 47 §2.1049, §90.210 RSS-119, 5.8				
Procedure Reference / Description	Occupied bandwidth was performed by connecting the output of the DUT to the input of a spectrum analyzer.				

Limits	Limits				
§90.210	Mask B /25 KHz CH. Mask D /12.5 KHz CH.				

Environmental conditions			
Temperature	25 +/- 5 °C		
Humidity	40 +/- 10 %		
Barometric Pressure	101 +/- 3 kPa		

Equipment list							
ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE			
00241	R&S	FSU 40	Spectrum Analyzer	09-Apr-2015			

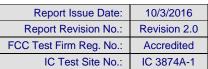
Setup drawing				
	DUT	Standard Load	Spectrum Analyzer	

Applicant:		4RF Corp. FCC ID:			UIPS	140	40 4 D C
DUT Type:	ype: P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF
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47 CFR §2, §90





7.1 Test results - OBW, 12.5 KHz CH.





Date: 14.JAN.2014 18:55:14

Applicant:		4RF Corp. FCC ID:			UIPS	140	4 4 D C	
DUT Type:	e: P-to-MP Transmitter			DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF
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FCC Rule Part(s):

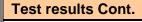
220114-T1283-E-90O

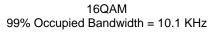
47 CFR §2, §90

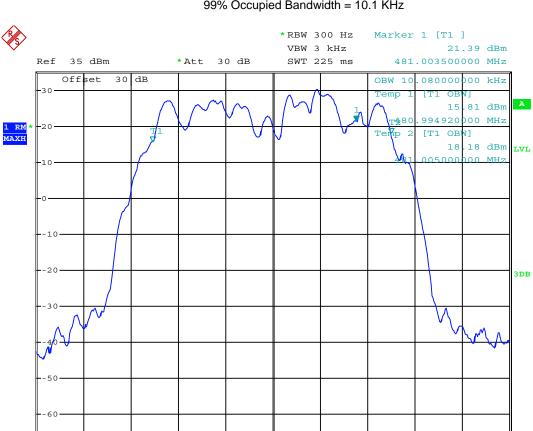
Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1

Span 20 kHz









2 kHz/

Date: 14.JAN.2014 18:57:10

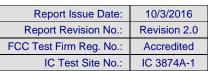
Center 481 MHz

Applicant:		4RF Corp. FCC ID:			UIPSQ450M140				
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF	
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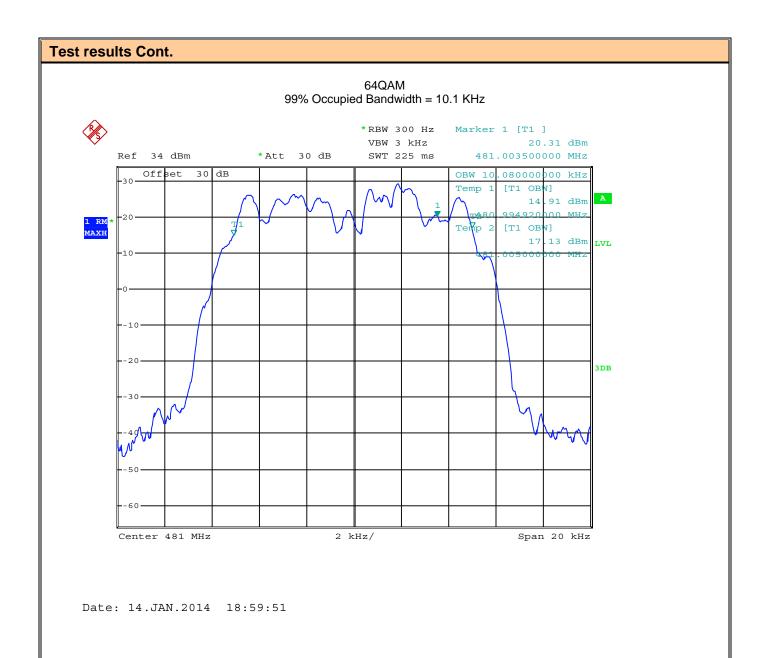


Test Report Serial No.:	220114-T1283-E-90O
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47 CFR §2, §90







Applicant:		4RF Corp.		UIPSQ450M140					
DUT Type:		P-to-MP Transmitter	DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	ii 4KF		
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FCC Rule Part(s):

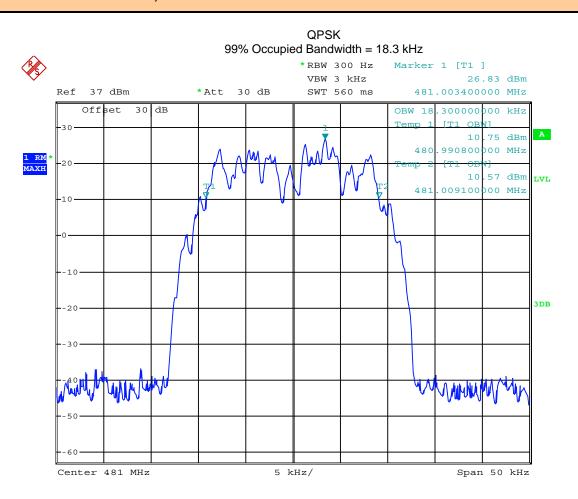
220114-T1283-E-90O

47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1



7.2 Test results - OBW, 25 KHz Ch.



Date: 14.JAN.2014 18:46:53

Applicant:		4RF Corp. FCC ID:			UIPSQ450M140				
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF	
2014 Celltech L	abs Inc.	This document is not to be rep	produced in who	le or in part w	ithout the prior writ	tten perm	nission of Celltech Labs Inc.	Page 21 of 38	



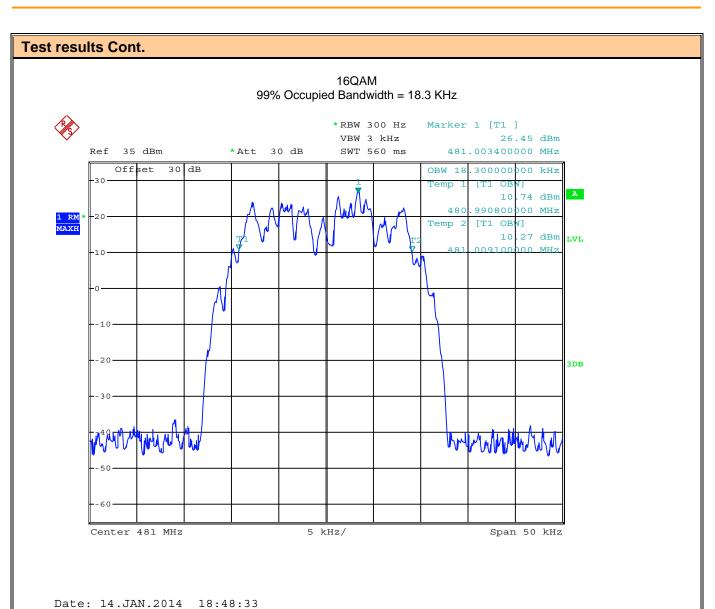
FCC Rule Part(s):

220114-T1283-E-90O

47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1





Applicant:		4RF Corp.	FCC ID:		UIPS	Q450M	140	44 4 D.C.
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4KF
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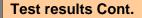
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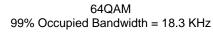
220114-T1283-E-90O

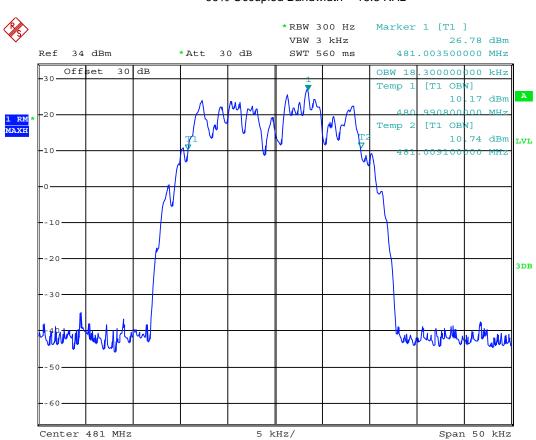
47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1









Date: 14.JAN.2014 18:52:07

Applicant:		4RF Corp. FCC ID:			UIPSQ450M140					
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF		
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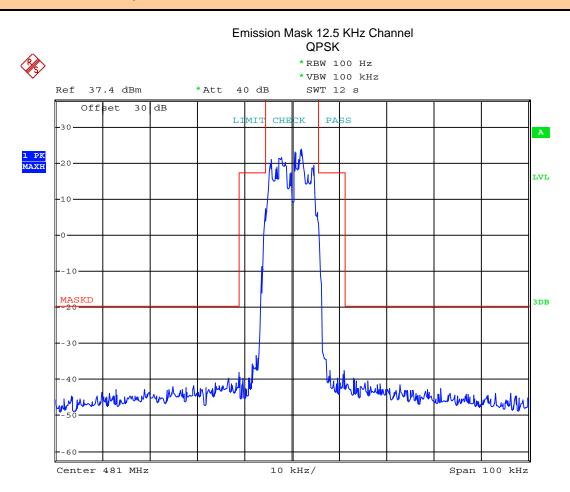
Test Report Serial No.: 220114-T1283-E-900

FCC Rule Part(s): 47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1



7.3 Test results - Spectrum Mask D: 12.5 KHz Ch.



Date: 24.JAN.2014 17:42:19

Applicant:		4RF Corp. FCC ID:			UIPSQ450M140					
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4RF		
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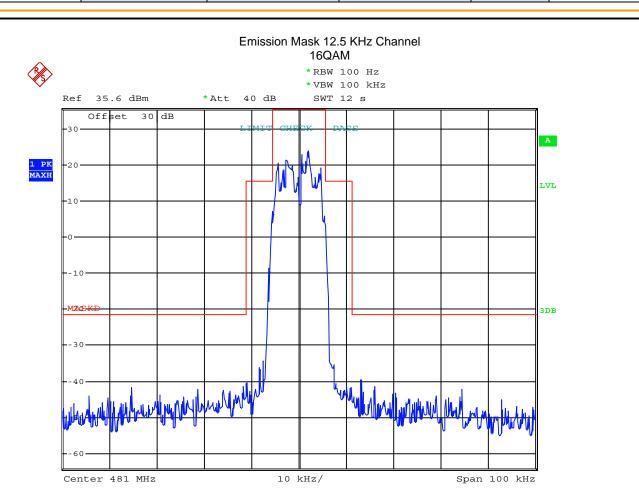
FCC Rule Part(s):

220114-T1283-E-90O

47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1





Date: 24.JAN.2014 17:45:14

Applicant:		4RF Corp.		UIPSQ450M140					
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4RF	
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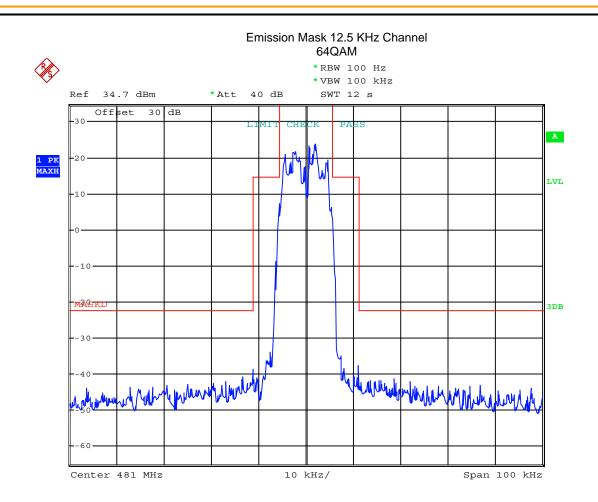
FCC Rule Part(s):

220114-T1283-E-90O

47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1





Date: 24.JAN.2014 17:49:26

Applicant:		4RF Corp.		UIPSQ450M140					
DUT Type:		P-to-MP Transmitter	DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4KF		
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FCC Rule Part(s):

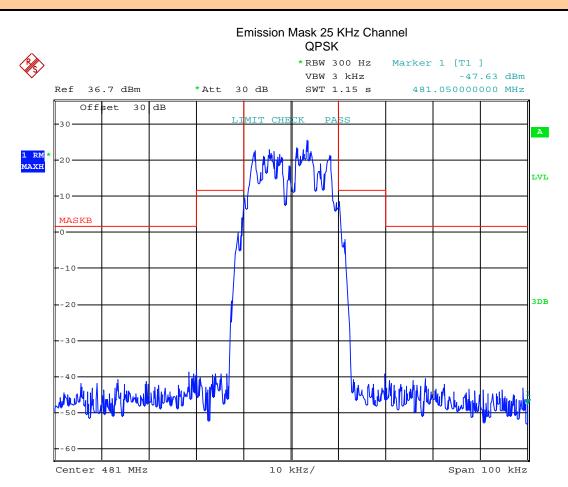
220114-T1283-E-90O

47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1



7.4 Test results - Spectrum Mask B: 25 KHz CH.



Date: 14.JAN.2014 19:16:17

Applica	nt:		4RF Corp. FCC ID:			UIPSQ450M140					
DUT Typ	oe:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF		
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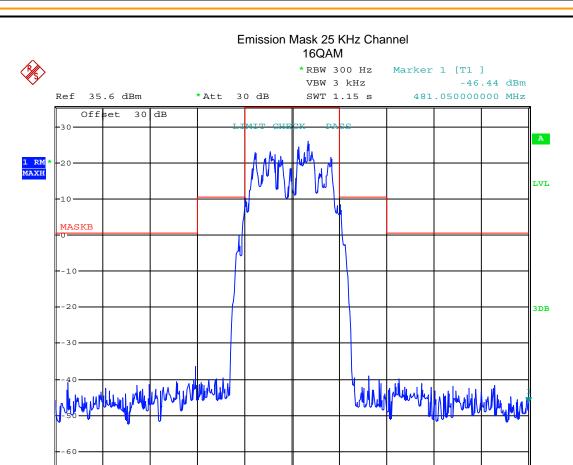
Test Report Serial No.: 220114-T1283-E-900

FCC Rule Part(s): 47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1

Span 100 kHz





10 kHz/

Date: 14.JAN.2014 19:18:21

Center 481 MHz

Applicant:		4RF Corp. FCC ID:			UIPSQ450M140					
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4RF		
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Test Report Serial No.: 220114-T1283-E-900

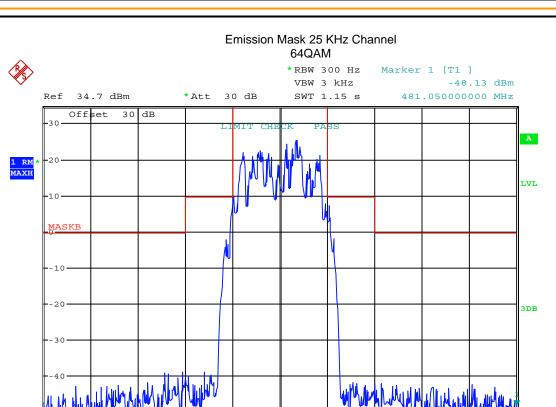
FCC Rule Part(s):

47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1

Span 100 kHz





10 kHz/

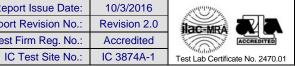
Date: 14.JAN.2014 19:20:43

Center 481 MHz

Applicant:		4RF Corp. FCC ID:			UIPSQ450M140					
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4RF		
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Test Report Serial No.:	220114-T1283-E-90O	Report Issue Date:	10/3/2016
rest Report Serial No	220114-11203-E-90O	Report Revision No.:	Revision 2.0
FCC Rule Part(s):	47 CFR §2, §90	FCC Test Firm Reg. No.:	Accredited
	41 OFR 92, 990	10.7	10.00=11.1



Sign-off	0			- cc
	2	a	n-	OTT

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell. Lab Manager Celltech Labs Inc.

10/3/2016

Date

Applicant:	nt: 4RF Corp. FCC ID: UIPSQ450M140			4 4 D C				
DUT Type:		P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	· 4RF
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Test Report Serial No.:	220114-T1283-E-90O	
FCC Rule Part(s):	47 CFR §2, §90	

Report Issue Date:	10/3/2016
Report Revision No.:	Revision 2.0
FCC Test Firm Reg. No.:	Accredited
IC Test Site No.:	IC 3874A-1



8.0 RADIATED SPURIOUS EMISSIONS - TX (SIGNAL SUBSTITUTION)

References							
Normative Reference Standard	FCC CFR 47 §2.1053; 90.210;IC RSS-119, RSS-GEN						
Measurement Reporting	 The transmitter spurious emissions were measured in accordance with ANSI/TIA-603-C. The spectrum was searched from the lowest frequency generated in the DUT up to the 10th harmonic of the fundamental frequency. The DUT was characterized on 3 orthogonal axis. Detected emissions are reported. 						

Limits	
§90.210, RSS-119,	Emissions must be at least $50 + 10 \log_{10}(P)$ dB below the mean power output of the transmitter.

Environmental conditions				
Temperature	25 +/- 5 °C			
Humidity	40 +/- 10 %			
Barometric Pressure	101 +/- 3 kPa			

Equipment list				
ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE
00072	EMCO	2075	Mini-mast	n/a
00073	EMCO	2080	Turn Table	n/a
00071	EMCO	2090	Multi-Device Controller	n/a
00241	R&S	FSU 40	Spectrum Analyzer	09-Apr-15
00050	Chase	CBL-6111A	Bilog Antenna	07-May-14
00055	EMCO	3121C	Dipole Antenna	07-Mat-14
00034	EMCO	3115	Horn Ant.	06-Dec-14
00035	EMCO	3115	Horn Ant.	06-Dec-14
00239	Miteq	JS4-00102600	LNA	COU
00006	R&S	SMR 20	Signal Generator (10MHz-40GHz)	1-May-14
00007	Gigatronics	8652A	Power Meter	03-May-14
00237	Gigatronics	80334A	Power Sensor	03-May-14

Note: COU = cal on use.

Applicant:	ant: 4RF Corp. FCC ID: UIPSQ450M140			4 4 D C				
DUT Type:		P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF
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Test Report Serial No.:

100 kHz < 1GHz

1 MHz >1 GHz

220114-T1283-E-90O 47 CFR §2, §90

Report Issue Date:	10/3/2016
Report Revision No.:	Revision 2.0
FCC Test Firm Reg. No.:	Accredited
IC Test Site No.:	IC 3874A-1

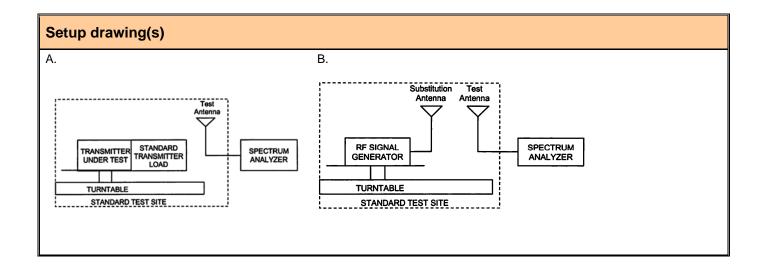


Peak

Measurement equipment setup							
MEASUREMENT EQUIPMENT	the final substitutions, the DUT wa	I strength measurements, the measurement equipment was connected as shown below. For bstitutions, the DUT was replaced with the appropriate antenna and fed from a CW signal cient to replicate the received field strength of the emission being investigated. Worst case is presented.					
CONNECTIONS	Frequency Range	RX Antenna	TX Antenna				
	30 MHz - 1GHz	Bilog	Dipole				
	1 GHz - 18 GHz ETS 3115 Horn		ETS 3115 Horn				
	Measurement Settings.						
MEASUREMENT	RBW	VBW	Detector				
EQUIPMENT SETTINGS	MHz	MHz	Dottotol				

300 kHz < 1 GHz

3 MHz> 1 GHz



Applicant:	4RF Corp. FCC ID:			UIPS	40 4 D C			
DUT Type:	P-to-MP Transmitter		DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	4KF	
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Test Report Serial No.:	220114-T1283-E-90O

47 CFR §2, §90

Report Issue Date:	10/3/2016
Report Revision No.:	Revision 2.0
FCC Test Firm Reg. No.:	Accredited
IC Test Site No.:	IC 3874A-1



Radiated Emissions: Signal Substitution (Fig. A&B)

TX: 481.0 MHz	Ant. Polarity	Emission Level	Substitution Level	Antenna Gain (+)	Cable loss (+)	Amp Gain (-)	Corrected Pwr Level	Limit	Margin
(GHz)		(dBuV)	(dB)	(+dBi)	(dB)	(dB)	(dBm)	(dBm)	(dB)
1.3	V	45.2	-55.2	6.92	4.2	30.2	-36.12	-20.0	-16.2
1.4	V	35.2	-64.4	7.8	4.4	30.2	-46.4	-20.0	-26.4
1.45	V	35.2	-64.0	8.0	4.5	30.2	-46.3	-20.0	-26.3
1.5	V	39.6	-54.3	8.3	5.0	30.4	-37.0	-20.0	-17.0
1.8	Н	37.1	-60.2	8.6	5.0	30.6	-43.2	-20.0	-23.2
1.924	V	28.7	-62.2	8.6	5.2	29.4	-46.6	-20.0	-26.6

Test results:

Complies.

- All detected emissions are reported.
- The worst case emission is 1.3 GHz at -36.12 dBm.
- The spectrum was searched from the lowest frequency generated in the DUT up to the 10th harmonic of the fundamental frequency.
- The DUT was characterized on 3 orthogonal axis.

_						•
S	п	\sim	n	-	^	۰

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell Lab Manager Celltech Labs Inc.

10/3/2016

Date

Applicant:		4RF Corp.		UIPS	44 4 D C			
DUT Type:	P-to-MP Transmitter			DUT	Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF
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Test Report Serial No.:	220114-T1283-E-90O	Report Issue Date:	10/3/2016
rest Report Serial No	220114-11203-E-90O	Report Revision No.:	Revision 2.0
FCC Rule Part(s):	47 CFR §2, §90	FCC Test Firm Reg. No.:	Accredited
roc Rule Part(s).	47 CFR 92, 990	IC Test Site No.:	IC 3874A-1



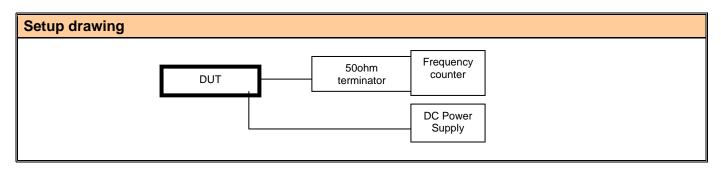
9.0 FREQUENCY STABILITY

References					
Normative Reference Standard	FCC CFR 47 §2.1055, §90.213; IC RSS-119				
Procedure Reference / Description	§2.1055(a)(2) The frequency stability shall be measured with variation of ambient temperature as follows: (1) From -40° to +70° centigrade.				

Limits	
§90.213 & RSS-119	90.213 - 421-512 MHz, 2.5ppm / 25 KHz CH.
	90.213 - 421-512 MHz, 1.5ppm / 12.5 KHz CH.

Environmental conditions	Environmental conditions				
Temperature	25 +/- 5 °C				
Humidity	40 +/- 10 %				
Barometric Pressure	101 +/- 3 kPa				

Equipment list							
ASSET NUMBER	MANUFACTURER	MODEL	DESCRIPTION	CAL DUE			
na	ESPEC	ECT-2	Heater/Refrigerator	na			
0003	HP	53181A	Frequency Counter	02-May-14			
na	HP	E3611A	DC Power Supply	na			
00234	VWR	na	Temperature Humidity Monitor	20-July-14			



Applicant:		4RF Corp.		UIPS	40 4 D C			
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF
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FCC Rule Part(s):

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47 CFR §2, §90

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1



Test results: Complies

Temperature (degrees C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Frequency tolerance (ppm)
-40	481 000 000	480 999 558	442	-0.92
-30	481 000 000	480 999 594	406	-0.84
-20	481 000 000	480 999 614	386	-0.80
-10	481 000 000	480 999 647	353	-0.73
0	481 000 000	480 999 858	142	-0.30
10	481 000 000	480 999 845	155	-0.32
20 -end point	481 000 000	480 999 902	98	-0.20
20	481 000 000	480 999 899	101	-0.21
20 +end point	481 000 000	480 999 899	101	-0.21
30	481 000 000	480 999 881	119	-0.25
40	481 000 000	480 999 774	226	-0.47
50	481 000 000	480 999 768	232	-0.48
60	481 000 000	480 999 722	278	-0.58
70	481 000 000	480 999 655	345	-0.72

Sign-off

I attest to the accuracy of the data. All measurements reported herein were performed by me and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

Glen Westwell Lab Manager Celltech Labs Inc.

Moderal

10/3/2016

Date

Applicant:		4RF Corp. FCC ID:			UIPS	4 4 D C		
DUT Type:		P-to-MP Transmitter		DUT	DUT			
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est Report Serial No.:	220114-T1283-E-900

47 CFR §2, §90

10/3/2016	Report Issue Date:
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Accredited	FCC Test Firm Reg. No.:
IC 3874A-1	IC Test Site No.:



10.0 TEST SET-UP PHOTO'S



Applicant:		4RF Corp.		40 40 C				
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	· 4RF
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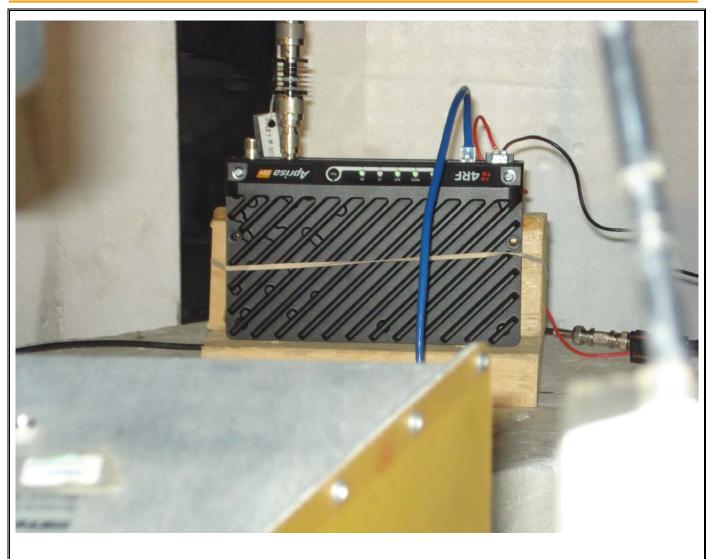


220114-T1283-E-90O

Report Issue Date: 10/3/2016
Report Revision No.: Revision 2.0
FCC Test Firm Reg. No.: Accredited
IC Test Site No.: IC 3874A-1

Test Lab Certificate No. 2470.01





Applicant:		4RF Corp.		4 4DC				
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4KF
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Test Report Serial No.:	220114-T1283-E-90O	Report Issue Date:	10/3/2016		
rest Report Serial No	220114-11203-E-90O	Report Revision No.: Revision 2.0 FCC Test Firm Reg. No.: Accredited			
FCC Rule Part(s):	47 CFR §2, §90	FCC Test Firm Reg. No.:	Accredited		
roc Rule Part(s).	47 CFR 92, 990	IC Test Site No.:	Revision 2.0		



END OF DOCUMENT

Applicant:		4RF Corp.		UIPSQ450M140				
DUT Type:		P-to-MP Transmitter			Aprisa SR+ SQ450M140	Freq.:	450-512 MHz	·· 4RF
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