



Test Report Serial Number:

45461518 R2.0

Test Report Date:

10 September 2019

Project Number:

1452

EMC Test Report - New Filing

Applicant:



Myriota

Myriota Pty Ltd.
Lot 14
Frome Road
Adelaide, Australia 5000

FCC ID:

2ATKL-SL2-1

Product Model Number / HVIN

SL2-1



Myriota

Myriota Canada Inc.
c/o PwC Law LLP
18 York Street, Suite 2500-C
Toronto, ON, M5J 0B2

IC Registration Number

25148-SL21

Product Name / PMN

Sense&Locate

In Accordance With:

FCC 47 CFR Part 25

Satellite Communications

RSS-GEN, RSS-170 Issue 3

Mobile Earth Stations (MESs) and Ancillary Terrestrial Component (ATC)

Equipment Operating in the Mobile-Satellite Service (MSS) Bands

Approved By:

Ben Hewson, President

Celltech Labs Inc.

21-364 Lougheed Rd.

Kelowna, BC, V1X 7R8

Canada



Test Lab Certificate: 2470.01



**Industry
Canada**

IC Registration 3874A-1



FCC Registration: CA3874

This report shall not be reproduced in any form without the expressed written consent of Celltech Labs Inc.

© 2019 Celltech Labs Inc.

Table of Contents

1.0 DOCUMENT CONTROL.....	5
2.0 CLIENT AND DUT INFORMATION	6
3.0 SCOPE.....	7
4.0 TEST RESULT SUMMARY	8
5.0 NORMATIVE REFERENCES	9
6.0 FACILITIES AND ACCREDITATIONS	10
7.0 CONDUCTED POWER.....	11
8.0 OCCUPIED BANDWIDTH AND EMISSION MASKS	14
9.0 CONDUCTED OUT OF BAND SPURIOUS EMISSIONS	18
10.0 RADIATED SPURIOUS EMISSIONS	27
11.0 FREQUENCY STABILITY.....	37
APPENDIX A – TEST SETUP DRAWINGS AND EQUIPMENT	40
APPENDIX B – EQUIPMENT LIST AND CALIBRATION.....	43
APPENDIX C – MEASUREMENT INSTRUMENT UNCERTAINTY.....	45

Table of Figures

Figure A.1 – Test Setup Conducted Measurements.....	40
Figure A.3 – Test Setup Radiated Emissions Measurements	41
Figure A.4 – Test Setup Frequency Stability Measurements	42

Table of Plots

Plot 7.1 – Conducted Output Power – Channel 1	12
Plot 8.1 – Occupied Bandwidth Channel 1	15
Plot 8.2 – Emissions Mask Channel 1	16
Plot 9.1 – Conducted Out of Band Emissions, Emission Mask, Lower Band Edge.....	19
Plot 9.2 – Conducted Out of Band Emissions, Emission Mask, Upper Band Edge.....	20
Plot 9.3 – Conducted Out of Band Emissions, 30-100MHz, Channel 1	21
Plot 9.4 – Conducted Out of Band Emissions, 100-1000MHz, Channel 1	22
Plot 9.5 – Conducted Out of Band Emissions, 1-3GHz, Channel 1.....	23
Plot 9.6 – Conducted Out of Band Emissions, 3-6GHz, Channel 1.....	24
Plot 9.7 – Conducted Out of Band Emissions, 2 nd Harmonic, Channel 1	25
Plot 10.1 – Radiated Spurious Emissions Pre-Scan, 350 – 1000MHz, Horizontal.....	28
Plot 10.2 – Radiated Spurious Emissions Pre-Scan, 350 – 1000MHz, Vertical	29
Plot 10.3 – Radiated Spurious Emissions, Second Harmonic, Horizontal.....	30
Plot 10.4 – Radiated Spurious Emissions, Second Harmonic, Vertical.....	31
Plot 10.5 – Radiated Spurious Emissions, 1-3GHz, Horizontal.....	32
Plot 10.6 – Radiated Spurious Emissions, 1-3GHz, Vertical	33
Plot 10.7 – Radiated Spurious Emissions, 3-6GHz, Horizontal.....	34
Plot 10.8 – Radiated Spurious Emissions, 3-6GHz, Vertical	35

Table of Tables

Table 7.1 – Summary of Conducted Power Measurements (RMS).....	13
Table 7.2 – Compliance to §2.1033(c)(8)	13
Table 8.1 - Summary of Occupied Bandwidth	17
Table 9.1 – Summary of Conducted Out of Band Emissions	26
Table 10.1 – Summary of Radiated Spurious Emissions	36
Table 11.1 – Summary of Frequency Stability Results, FCC 25§202	38
Table 11.2 – Summary of Frequency Stability Results, RSS-170 5.2	39
Table A.1 – Setup - Conducted Measurements Equipment	40
Table A.2 – Setup - Radiated Emissions Equipment.....	41
Table A.4 – Setup - Frequency Stability Measurement Equipment.....	42

1.0 DOCUMENT CONTROL

Revision History				
Samples Tested By:		Date(s) of Evaluation:		May 31 - June 13, 2019
Report Prepared By:		Report Reviewed By:		Ben Hewson
Report Revision	Description of Revision	Revised Section	Revised By	Revision Date
0.1	Draft Release	n/a	Art Voss	29 August 2019
1.0	Initial Release	n/a	Art Voss	29 August 2019
2.0	Corrected Plot 9.4, pg. 22	9.0	Art Voss	10 September 2019

2.0 CLIENT AND DUT INFORMATION

Client Information	
Applicant Name	Myriota Pty Ltd
Applicant Address (FCC)	Lot 14
	Frome Road
	Adelaide, Australia 5000
Applicant Address (ISED)	Myriota Canada Inc.
	c/o PwC Law LLP
	18 York Street, Suite 2500-C
	Toronto, ON, M5J 0B2
DUT Information	
Device Identifier(s):	FCC ID: 2ATKL-SL2-1
	IC: 25148-SL21
Device Type:	Asset Tracking Device
Equipment Class (FCC):	Licensed Non-Broadcast Station Transmitter (TNB)
Equipment Class (ISED):	Mobile Earth Station
Device Model(s) / HVIN:	SL2-1
Device Marketing Name / PMN:	Sense&Locate
Firmware Version ID Number / FVIN:	n/a
Host Marketing Name / HMN:	n/a
Test Sample Serial No.:	T/A Sample - Identical Prototype
Transmit Frequency Range:	399.907 - 400.043MHz
Number of Channels:	n/a
Manuf. Max. Rated Output Power:	0.5W
Manuf. Max. Rated BW/Data Rate:	7kHz
Antenna Make and Model:	n/a
Antenna Type and Gain:	Dipole - Helical Coil w/ Ground Plane, -2.5dB (UHF)
Modulation:	MSK
Mode:	n/a
Emission Designator:	2K36F1D
DUT Power Source:	3.6VDC Alkaline
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

3.0 SCOPE

This Certification Report was prepared on behalf of:

Myriota Pty Ltd

„(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.

As per FCC 47 CFR Part §2.1091 and §2.1093, an RF Exposure evaluation report is required for this *Equipment* and the results of the RF Exposure evaluation appear in a separate exhibit from this report.

The Receiver of this *Equipment* is subject to Equipment Certification or Supplier's Declaration of Conformity (SDoC) in accordance with 47 CFR Part §15.101. The Receiver was evaluated in accordance with 47 CFR Part §15 Subpart B and ICES-003. A statement of the application of the SDoC procedure appears in a separate exhibit from this report.

Application: This is an application for a new FCC and ISED certification.

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 C63.26-2015	§2.1046 §25.204	RSS-Gen RSS-170 (5.3)	5 June 2019	Complies
8.0	Occupied Bandwidth	ANSI C63.26-2015	§2.1049	RSS-Gen	4 June 2019	Complies
9.0	Conducted TX Spurious Emissions	ANSI C63.26-2015	§2.1051 §25.202(f)	RSS-Gen RSS-170 (5.4.3.1)	5 June 2019	Complies
10.0	Radiated TX Spurious Emissions	ANSI C63.26-2015	§2.1053 §25.202(f)	RSS-Gen RSS-170 (5.4.3.1)	13 June 2019	Complies
11.0	Frequency Stability		§2.1055 §25.202(d)	RSS-Gen RSS-170 (5.2)	5 June 2019	Complies

Test Station Day Log					
Date	Ambient Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Test Station	Tests Performed Section(s)
31 May 2019	28.6	14	101.7	SAC	10
31 May 2019	29.6	13	101.1	OATS	10
3 June 2019	25.1	31	101.1	OATS	10
3 June 2019	23.6	16	101.1	EMC	10
4 June 2019	25.1	15	101.6	EMC	8,9
5 June 2019	23.7	16	101.3	EMC	7,9
5 June 2019	24.1	15	101.3	TC	11
12 June 2019	25.4	18	101.9	OATS	10
13 June 2019	27.0	43	100.7	OATS	10

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

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.

10 September 2019
Date



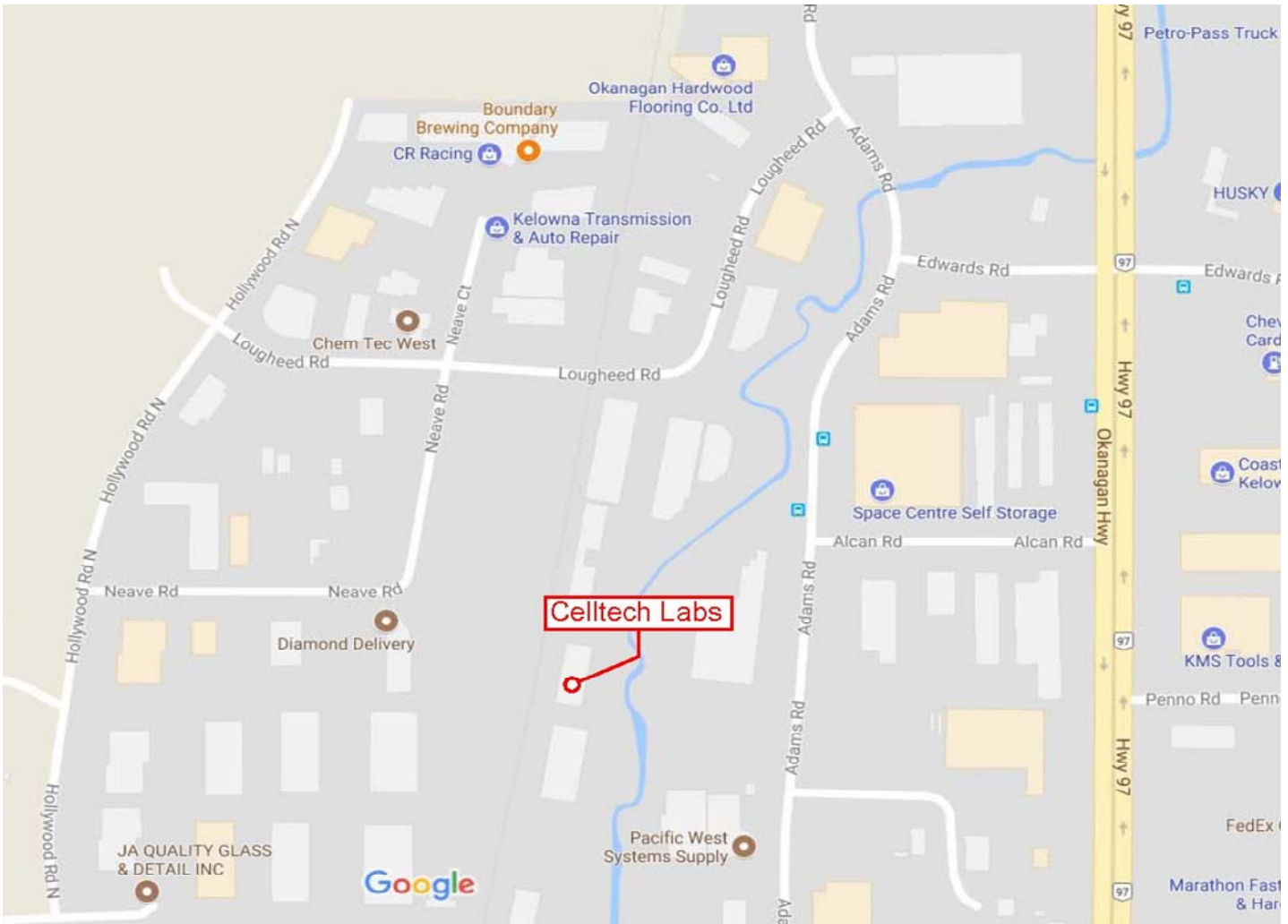
5.0 NORMATIVE REFERENCES

Normative References	
ISO/IEC 17025:2017	General requirements for the competence of testing and calibration laboratories
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
CFR	Code of Federal Regulations Title 47: Telecommunication Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR	Code of Federal Regulations Title 47: Telecommunication Part 25: Satellite Communications
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-170 Issue 3: Mobile Earth Stations (MESS) and Ancillary Terrestrial Component (ATC) Equipment Operating in the Mobile- Satellite Service (MSS) Bands

6.0 FACILITIES AND ACCREDITATIONS

Facility and Accreditation:

The facilities used to evaluate this device outlined in this report are located at 21-364 Loughheed 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 CA3874 and Innovation, Science and Economic Development Canada under Test Site File Number ISED 3874A-1. Celltech is accredited to ISO 17025, through accrediting body A2LA and with certificate 2470.01.



7.0 CONDUCTED POWER

Test Procedure

Normative Reference	FCC 47 CFR §2.1046, §25.204, RSS-Gen (6.12), RSS-170 ANSI C63.26 (5.2.4.4.1)
----------------------------	---

Limits

47 CFR §25.204	40dBW
RSS-170 (5.3.2)	The maximum permissible e.i.r.p. will be the stated e.i.r.p. plus a 2 dB margin

General Procedure

ANSI C63.26	5.2.4.4.1 General Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges.
--------------------	---

Test Setup	Appendix A - Figure A.1
-------------------	--------------------------------

Measurement Procedure

The DUT was connected to a Spectrum Analyzer (SA) via a 30dB attenuator connected to the DUT's antenna port. The SA was configured as above using the Channel Power measurement function. The output power of the DUT was set to the manufacturer's highest output power setting. The DUT was set to transmit at its maximum Duty Cycle.

Plot 7.1 – Conducted Output Power – Channel 1

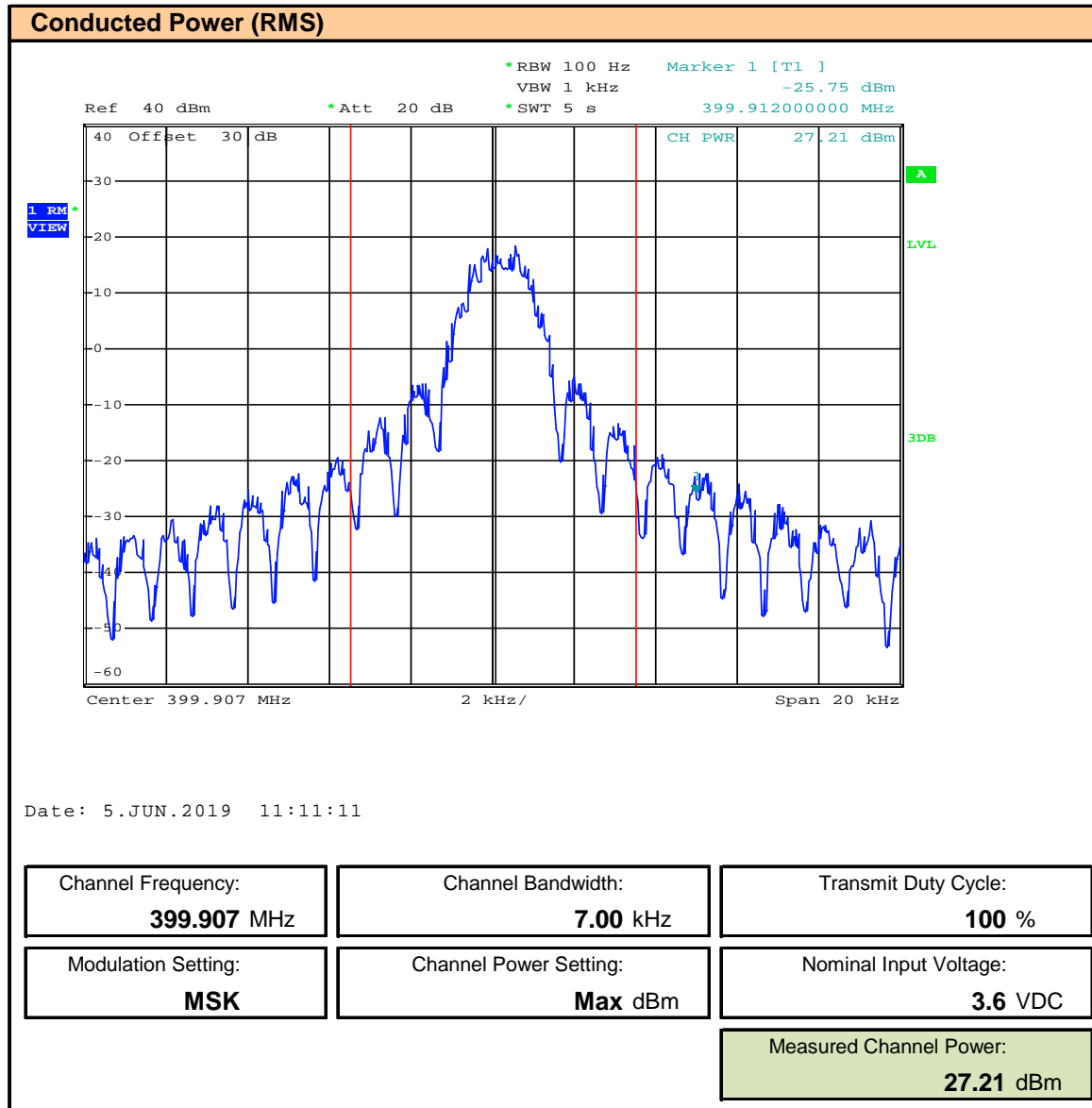


Table 7.1 – Summary of Conducted Power Measurements (RMS)

Channel Output Power (RMS)											
Frequency (MHz)	BW (kHz)	Modulation	Power Setting (dBm)	Supply Voltage (VDC)	Measured Power [E _{Meas}] (dBm)	Antenna Gain [G _T] (dBi)	Cable Loss [L _C] (dB)	e.r.p. (dBm)	e.r.p. (dBW)	Limit (dBW)	Margin (dB)
399.9	7	MSK	Max	3.6	27.21	0.00	0.500	27.710	-2.290	40.0	42.3
Result:									Complies		

$EIRP\ (dBm) = E_{Meas} + G_T + L_C$

Margin = Limit - EIRP in dB

Table 7.2 – Compliance to §2.1033(c)(8)

FCC CFR 47 §2.1033(c)(8): Power to Transmitter:	
Measured Receiver Current:	IRx = 0.01A
Measured Total Current:	ITx = 0.180A
Transmitter Current (ITx - IRx):	IXmitter = 0.170A
Power to Transmitter:	0.612W
Result:	Complies

8.0 OCCUPIED BANDWIDTH AND EMISSION MASKS

Test Conditions

Normative Reference	FCC 47 CFR §2.1049, RSS-Gen (6.7)
	ANSI C63.26 5.4.4

Limits

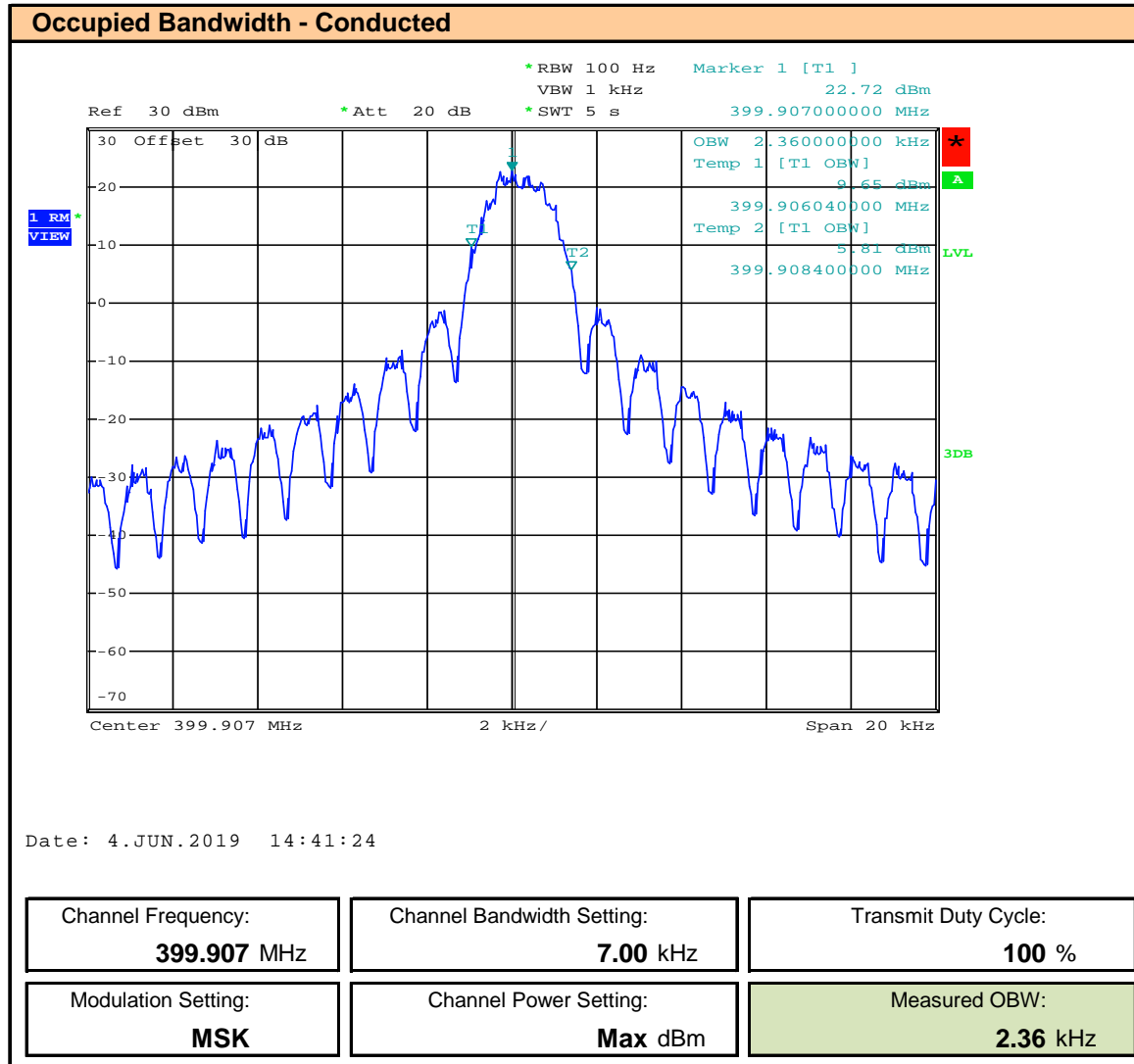
47 CFR §25	n/a
RSS-170	n/a

Measurement Procedure

ANSI C63.26 5.4.4	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.
-------------------	---

Test Setup	Appendix A	Figure A.1
------------	------------	------------

Plot 8.1 – Occupied Bandwidth Channel 1



Plot 8.2 – Emissions Mask Channel 1

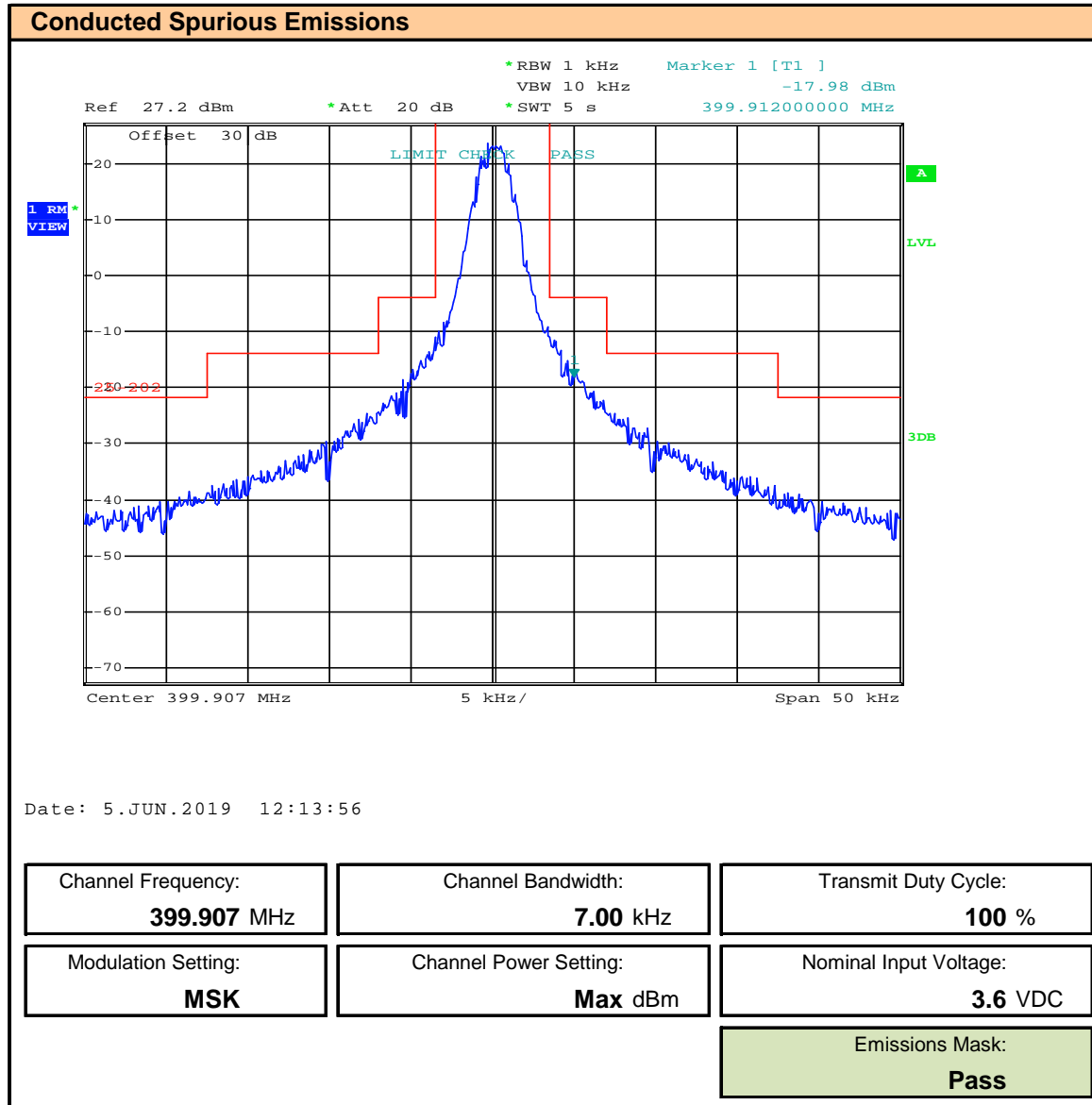


Table 8.1 - Summary of Occupied Bandwidth

Occupied Bandwidth Measurements				
Frequency (MHz)	Bandwidth Setting (MHz)	Modulation	Measured OBW (kHz)	Emission Designator
399.907	Max	MSK	2.36	2K36F1D
Result:				Complies

9.0 CONDUCTED OUT OF BAND SPURIOUS EMISSIONS

Test Conditions

Normative Reference	FCC 47 CFR §2.1051, §25.202(f), RSS-Gen, RSS-170 (5.4.3.1)
	ANSI C63.26 5.7.3

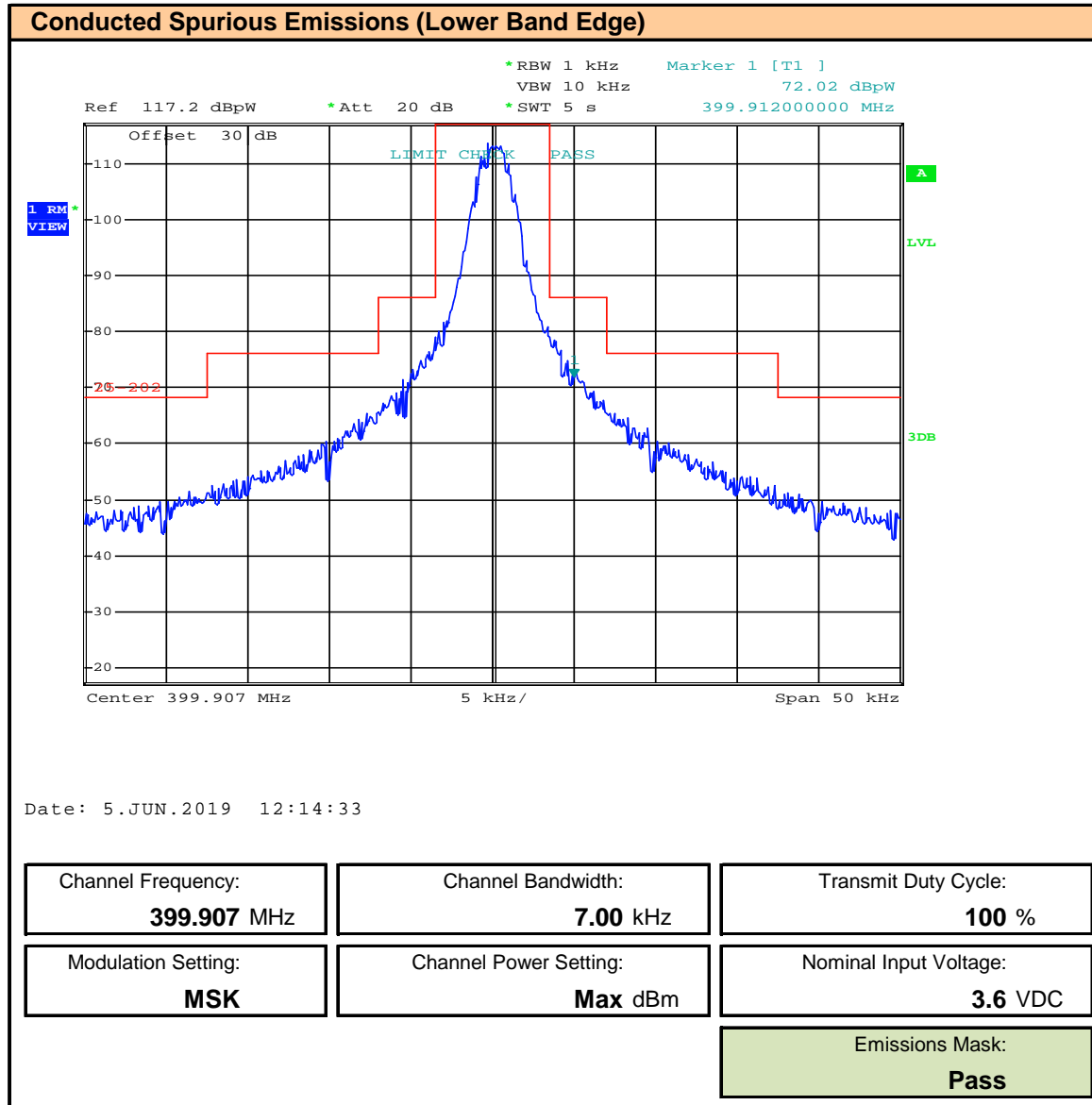
Limits

47 CFR §25	<p>(f) Emission limitations. Except for SDARS terrestrial repeaters and as provided for in paragraph (i), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule set forth in paragraphs (f)(1) through (f)(4) of this section. The out-of-band emissions of SDARS terrestrial repeaters shall be attenuated in accordance with the schedule set forth in paragraph (h) of this section.</p> <p>(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;</p> <p>(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35</p> <p>(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;</p>
RSS-170	<p>5.4.3.1. Mobile Earth Stations in All Frequency Bands</p> <p>The average power of unwanted emissions shall be attenuated below the average output power, P (dBW), of the transmitter, as specified below:</p> <p>(1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the occupied bandwidth or necessary bandwidth, whichever is greater;</p> <p>(2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the occupied bandwidth or necessary bandwidth, whichever is greater; and</p> <p>(3) 43 + 10 log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.</p>

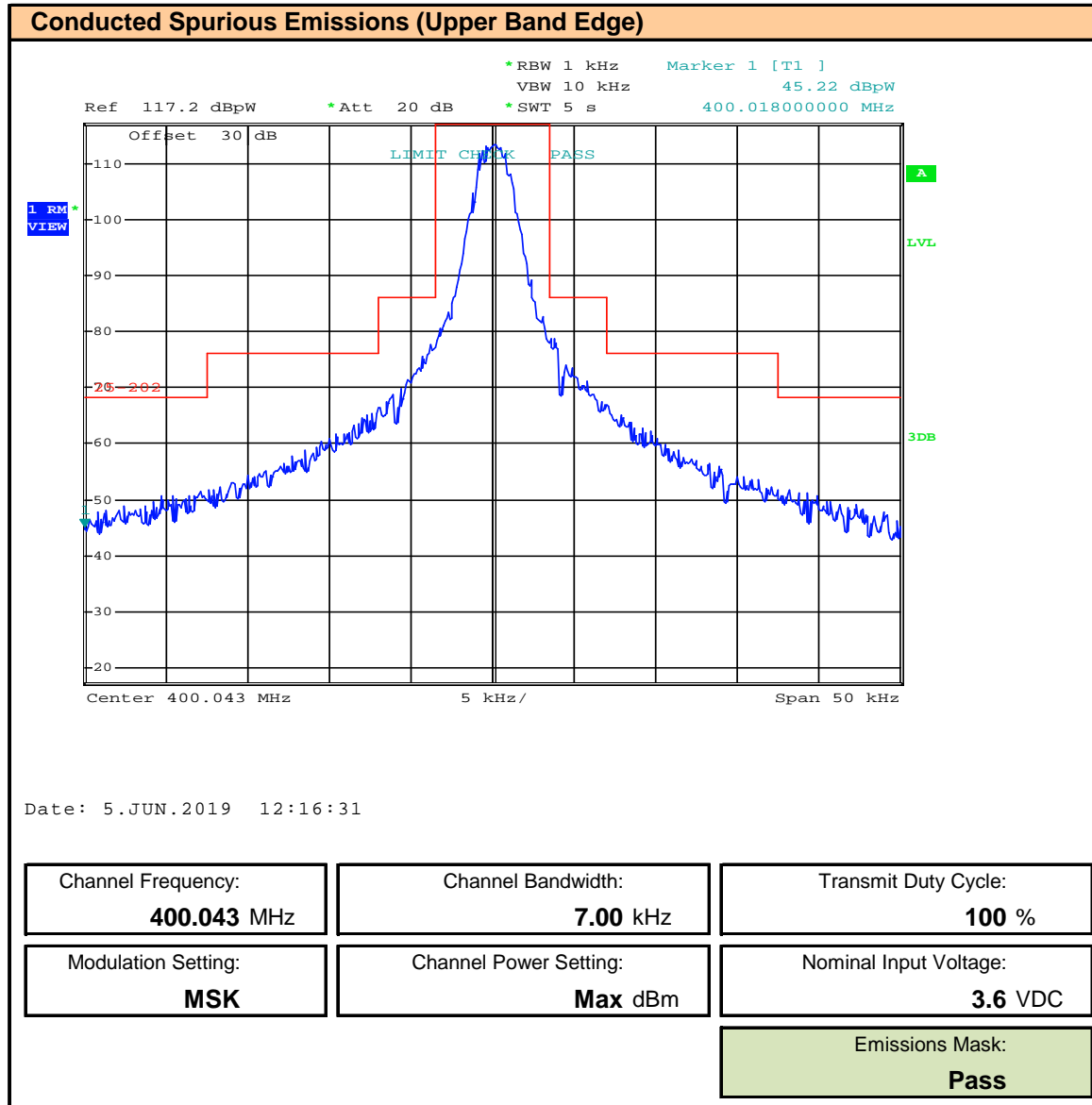
Measurement Procedure

ANSI C63.26 5.7.3	See applicable procedure
Test Setup	Appendix A Figure A.1

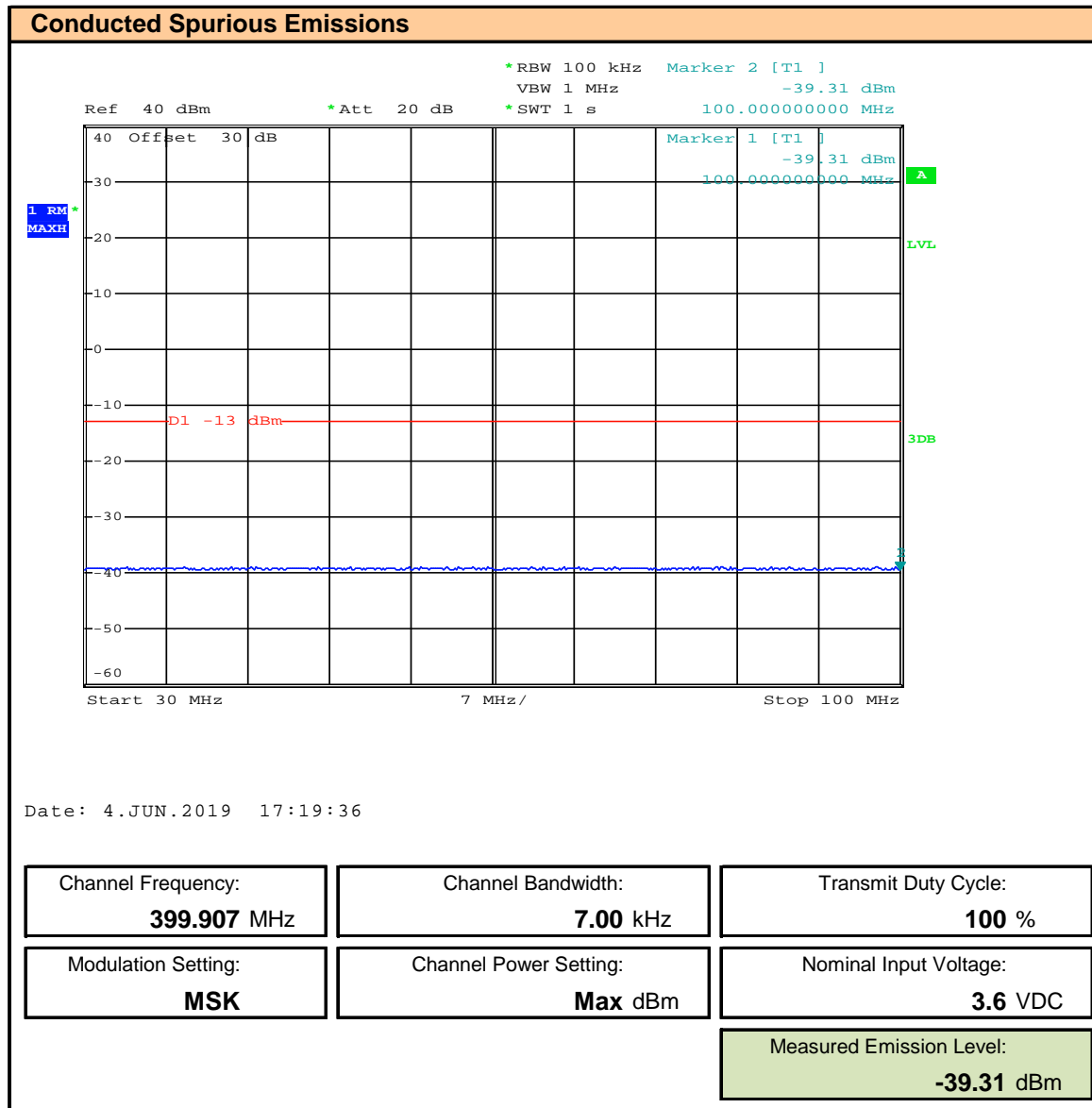
Plot 9.1 – Conducted Out of Band Emissions, Emission Mask, Lower Band Edge



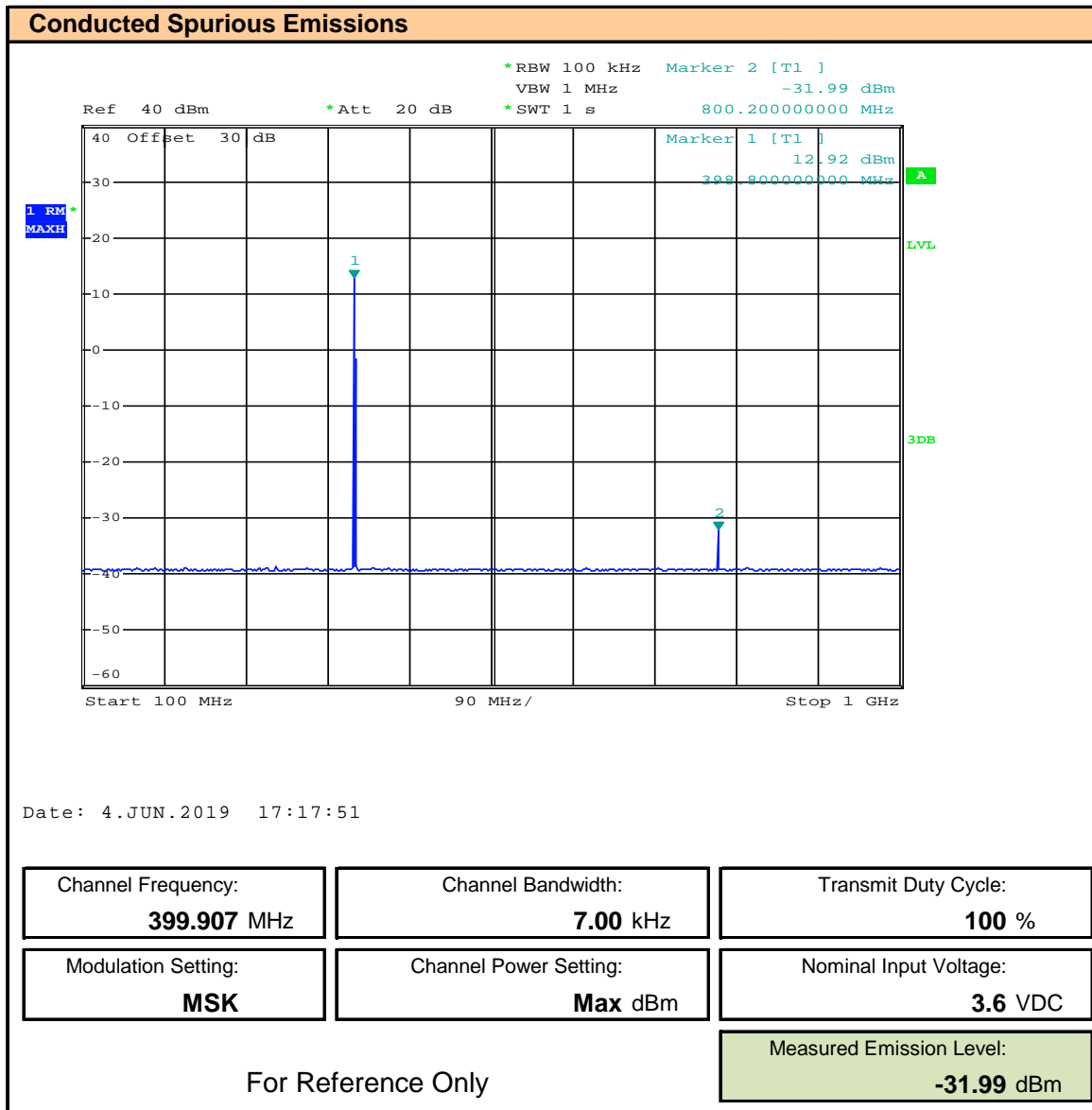
Plot 9.2 – Conducted Out of Band Emissions, Emission Mask, Upper Band Edge



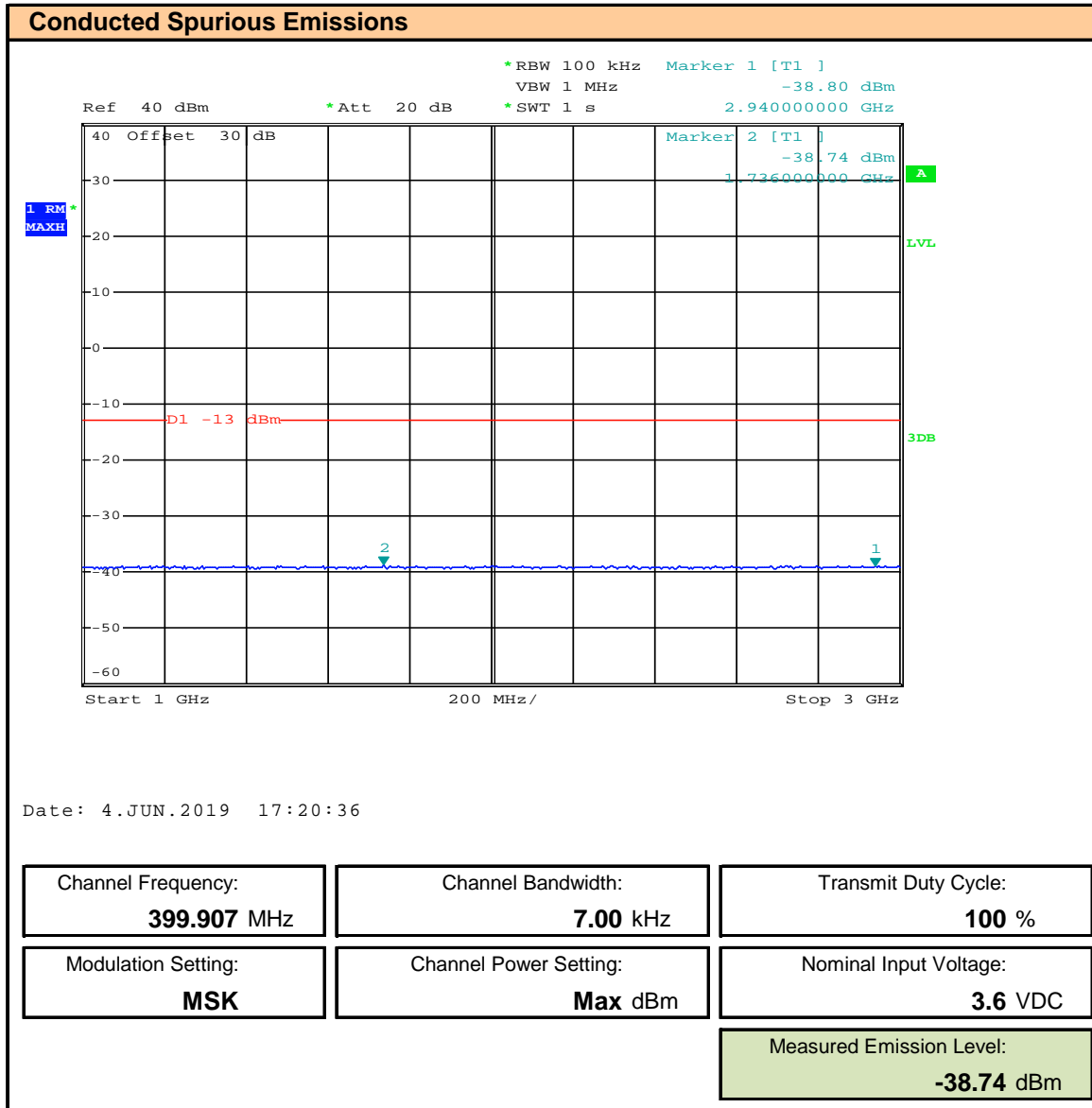
Plot 9.3 – Conducted Out of Band Emissions, 30-100MHz, Channel 1



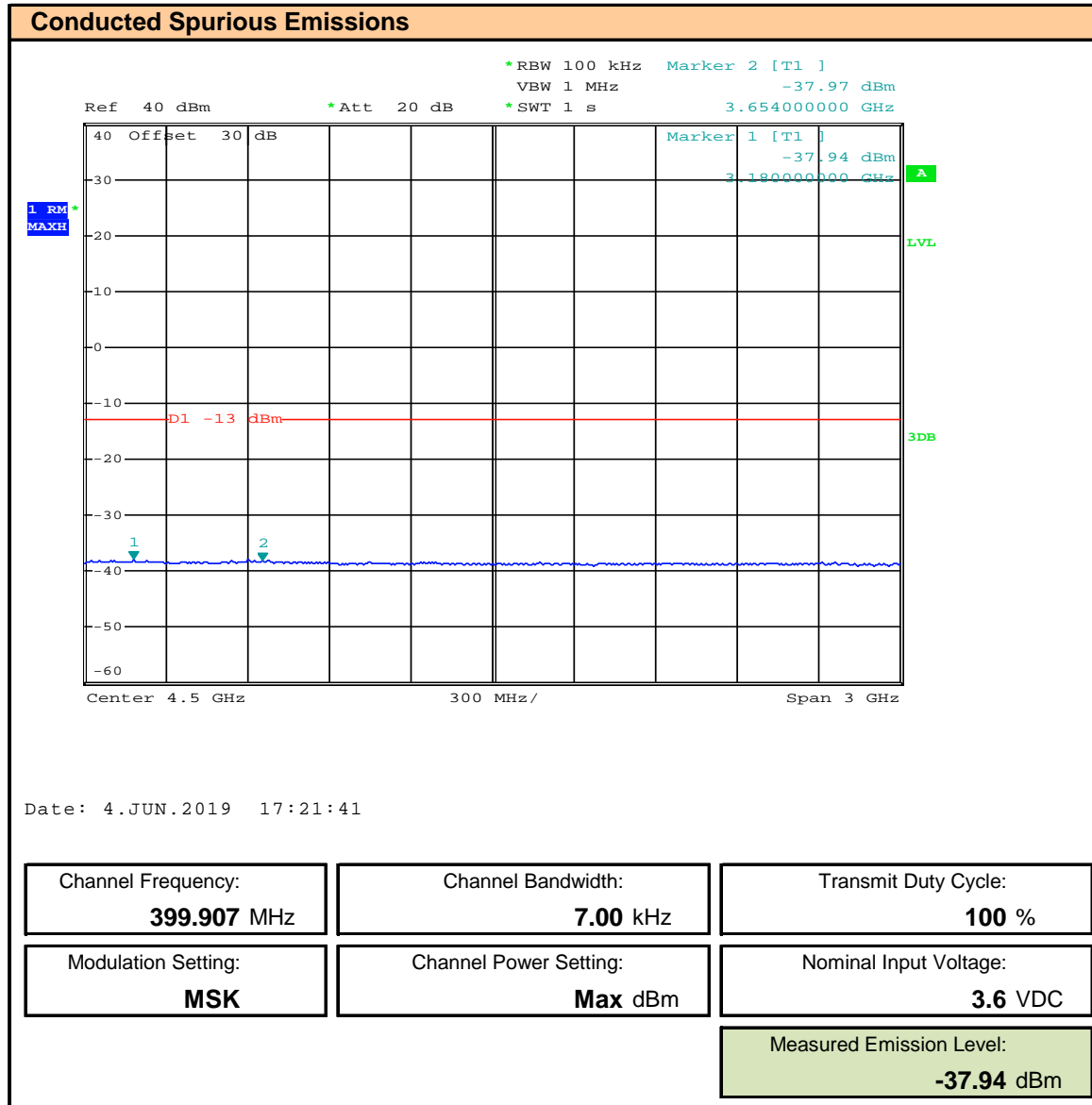
Plot 9.4 – Conducted Out of Band Emissions, 100-1000MHz, Channel 1



Plot 9.5 – Conducted Out of Band Emissions, 1-3GHz, Channel 1



Plot 9.6 – Conducted Out of Band Emissions, 3-6GHz, Channel 1



Plot 9.7 – Conducted Out of Band Emissions, 2nd Harmonic, Channel 1

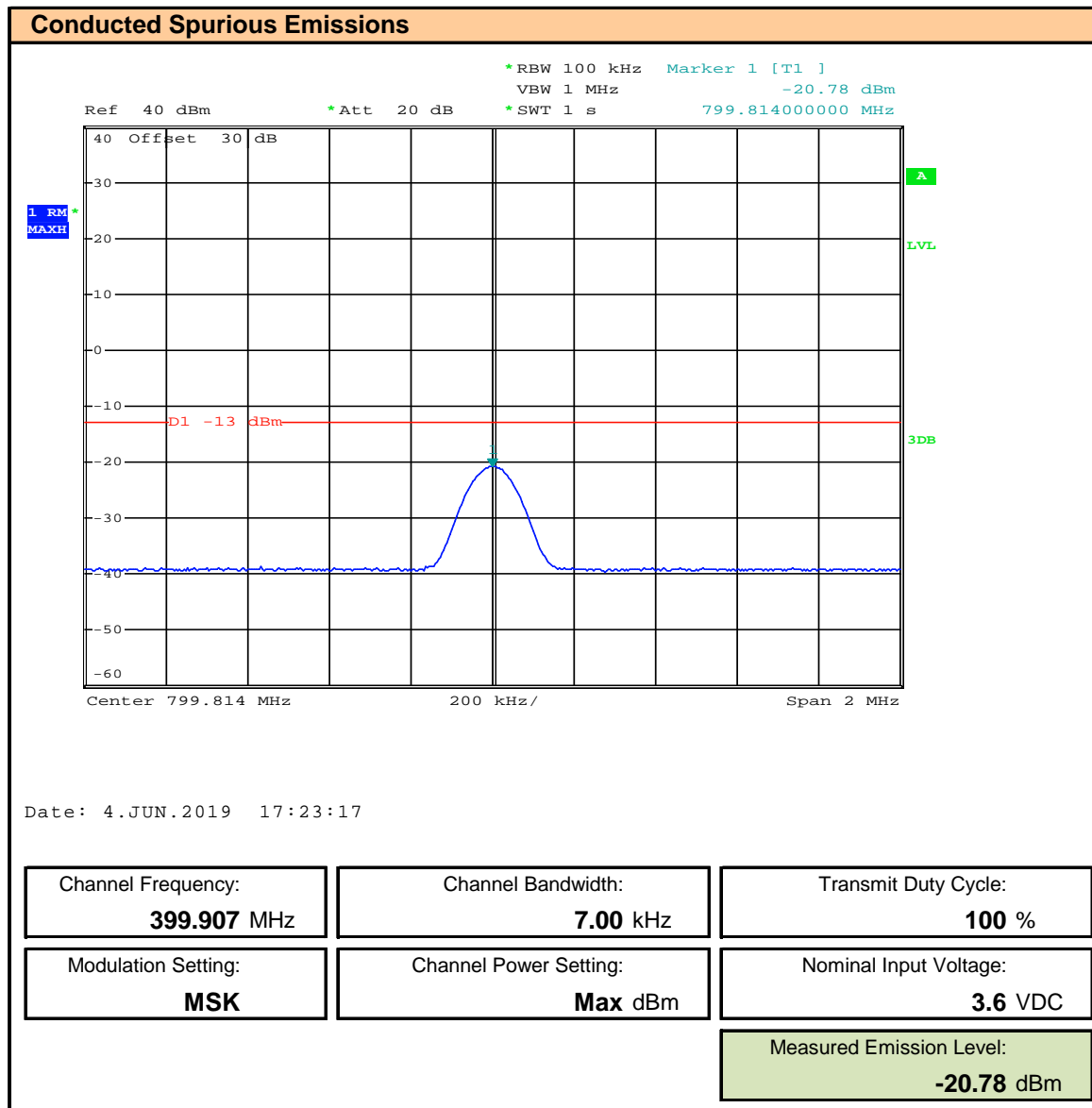


Table 9.1 – Summary of Conducted Out of Band Emissions

Conducted Spurious Emissions									
Emission Frequency (MHz)	BW (kHz)	Modulation	Power Setting (dBm)	Transmit Duty Cycle (%)	Measured Emission (dBm)	Rated Power (dBm)	Attenuation (dBc)	Required Attenuation [A_A] (dBc)	Margin (dBm)
799.8	2.4	MSK	Max	100	-20.78	26.00	46.78	44.00	2.78
Result:								Complies	

No other emissions within 20dB of the limit were observed

10.0 RADIATED SPURIOUS EMISSIONS

Test Conditions

Normative Reference	FCC 47 CFR §2.1051, §25.202(f), RSS-Gen, RSS-170 (5.4.3.1)
	ANSI C63.26 5.7.3

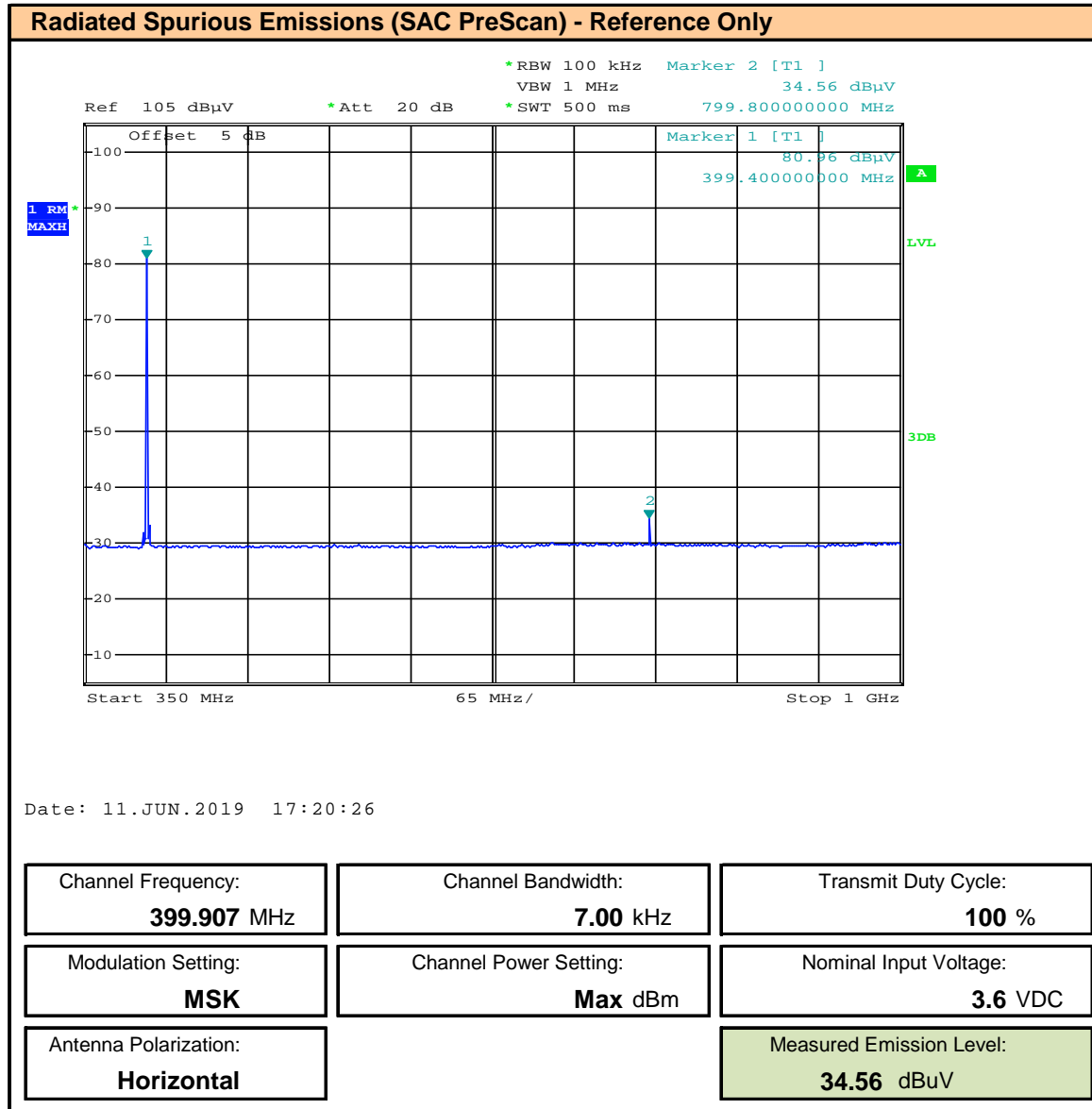
Limits

47 CFR §25	<p>(f) Emission limitations. Except for SDARS terrestrial repeaters and as provided for in paragraph (i), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule set forth in paragraphs (f)(1) through (f)(4) of this section. The out-of-band emissions of SDARS terrestrial repeaters shall be attenuated in accordance with the schedule set forth in paragraph (h) of this section.</p> <p>(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;</p> <p>(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35</p> <p>(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;</p>
RSS-170	<p>5.4.3.1. Mobile Earth Stations in All Frequency Bands</p> <p>The average power of unwanted emissions shall be attenuated below the average output power, P (dBW), of the transmitter, as specified below:</p> <p>(1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the occupied bandwidth or necessary bandwidth, whichever is greater;</p> <p>(2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the occupied bandwidth or necessary bandwidth, whichever is greater; and</p> <p>(3) 43 + 10 log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.</p>

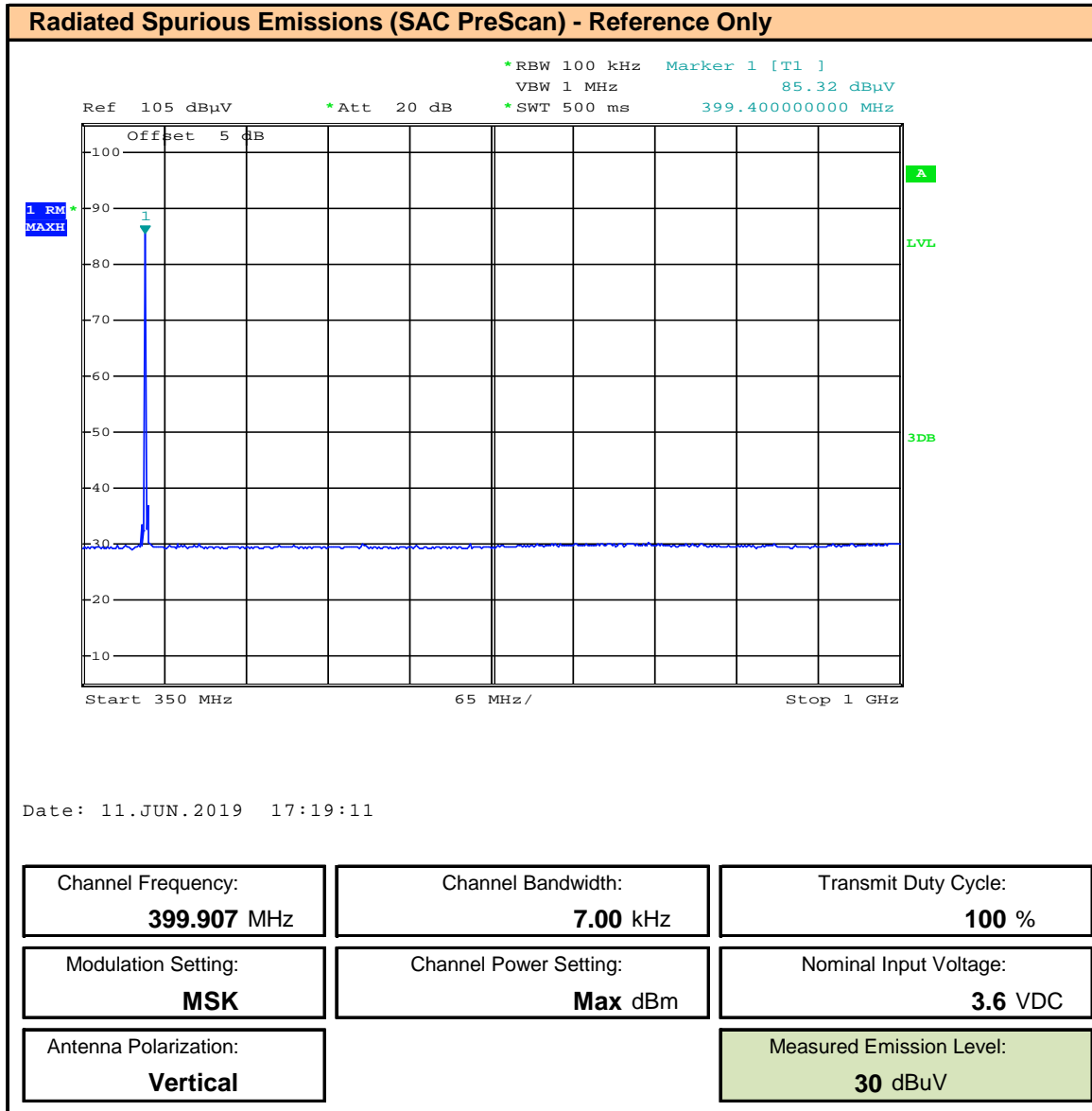
Measurement Procedure

ANSI C63.26 5.7.3	See applicable procedure
Test Setup	Appendix A Figure A.2

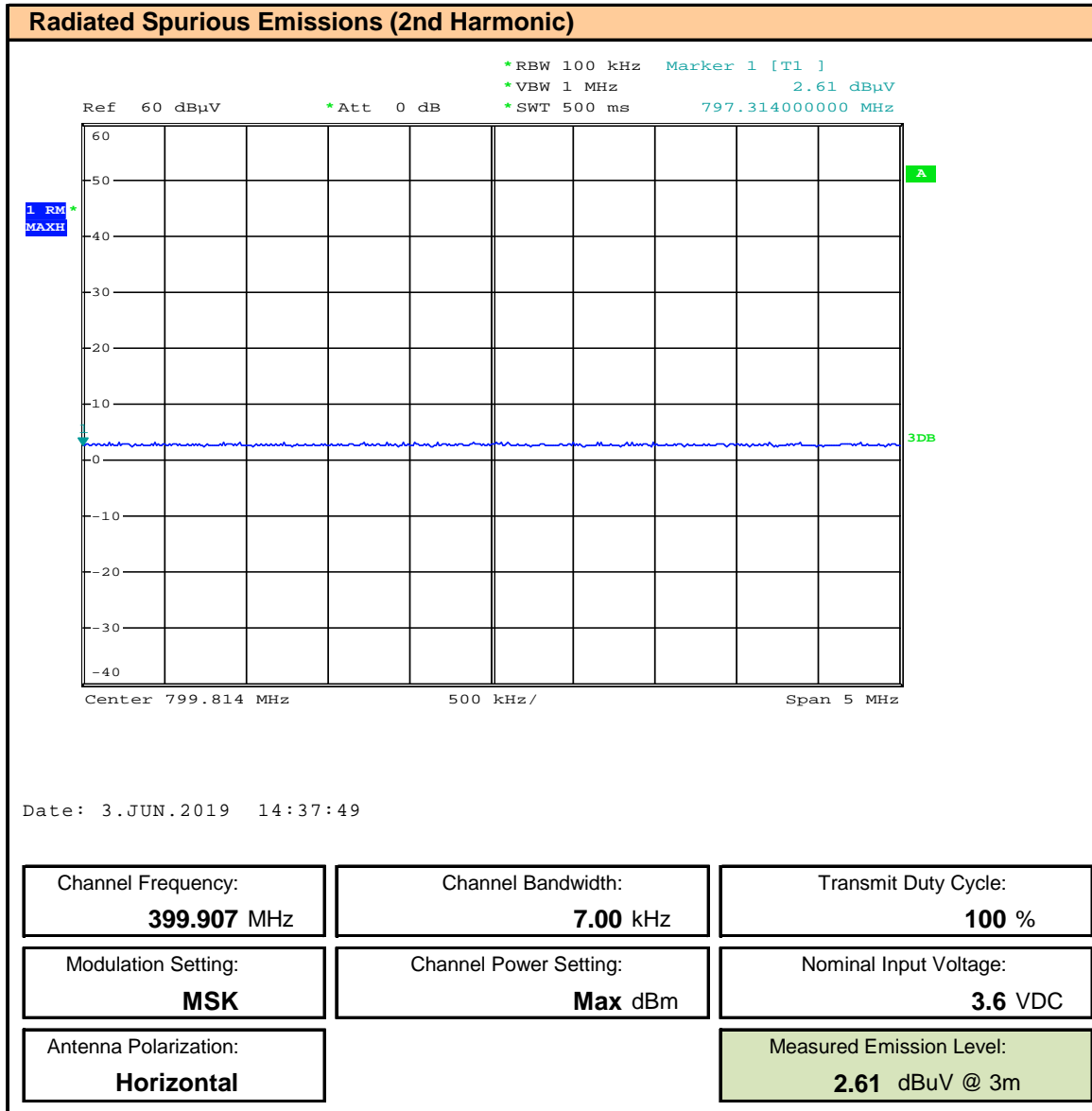
Plot 10.1 – Radiated Spurious Emissions Pre-Scan, 350 – 1000MHz, Horizontal



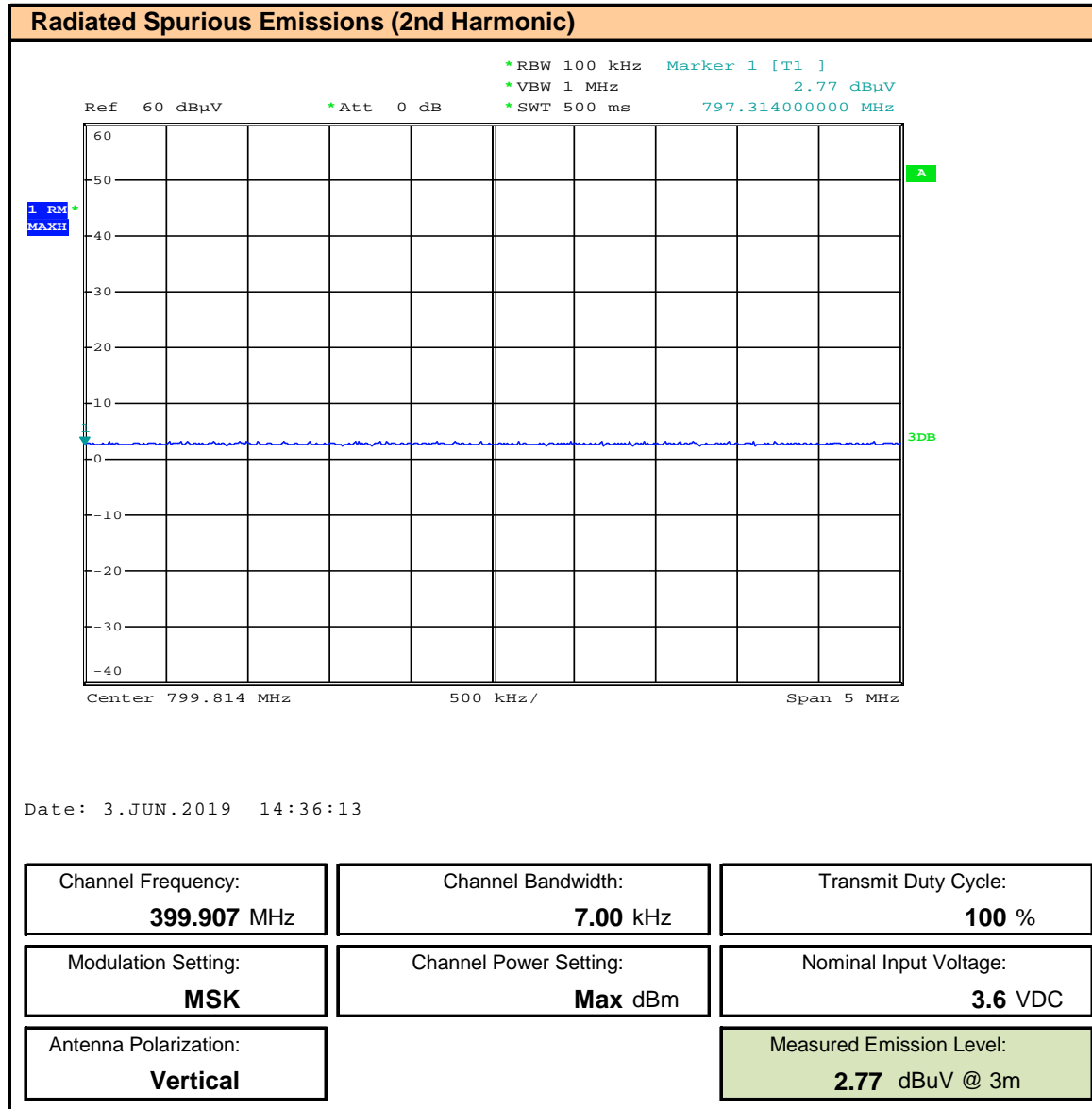
Plot 10.2 – Radiated Spurious Emissions Pre-Scan, 350 – 1000MHz, Vertical



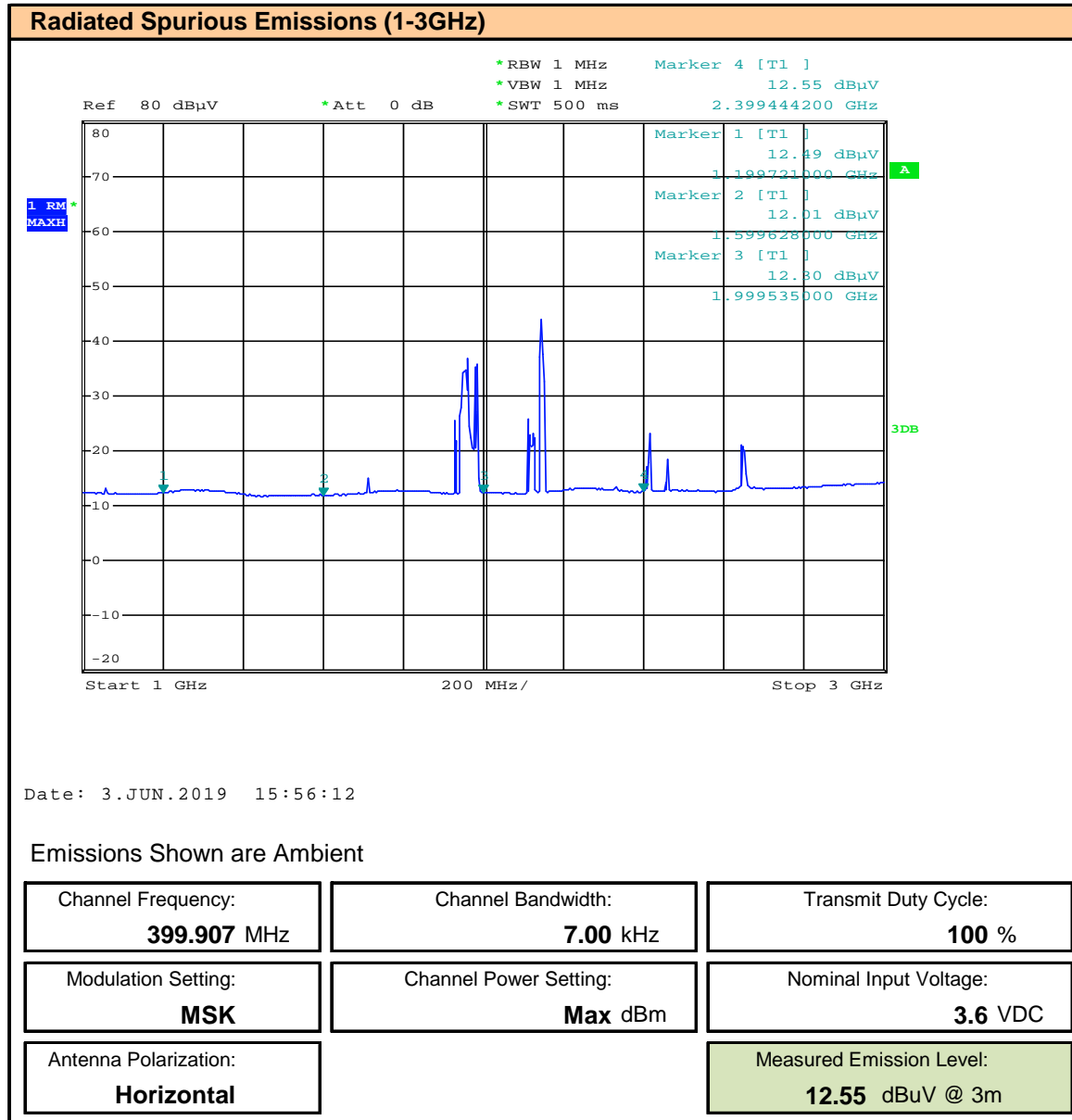
Plot 10.3 – Radiated Spurious Emissions, Second Harmonic, Horizontal



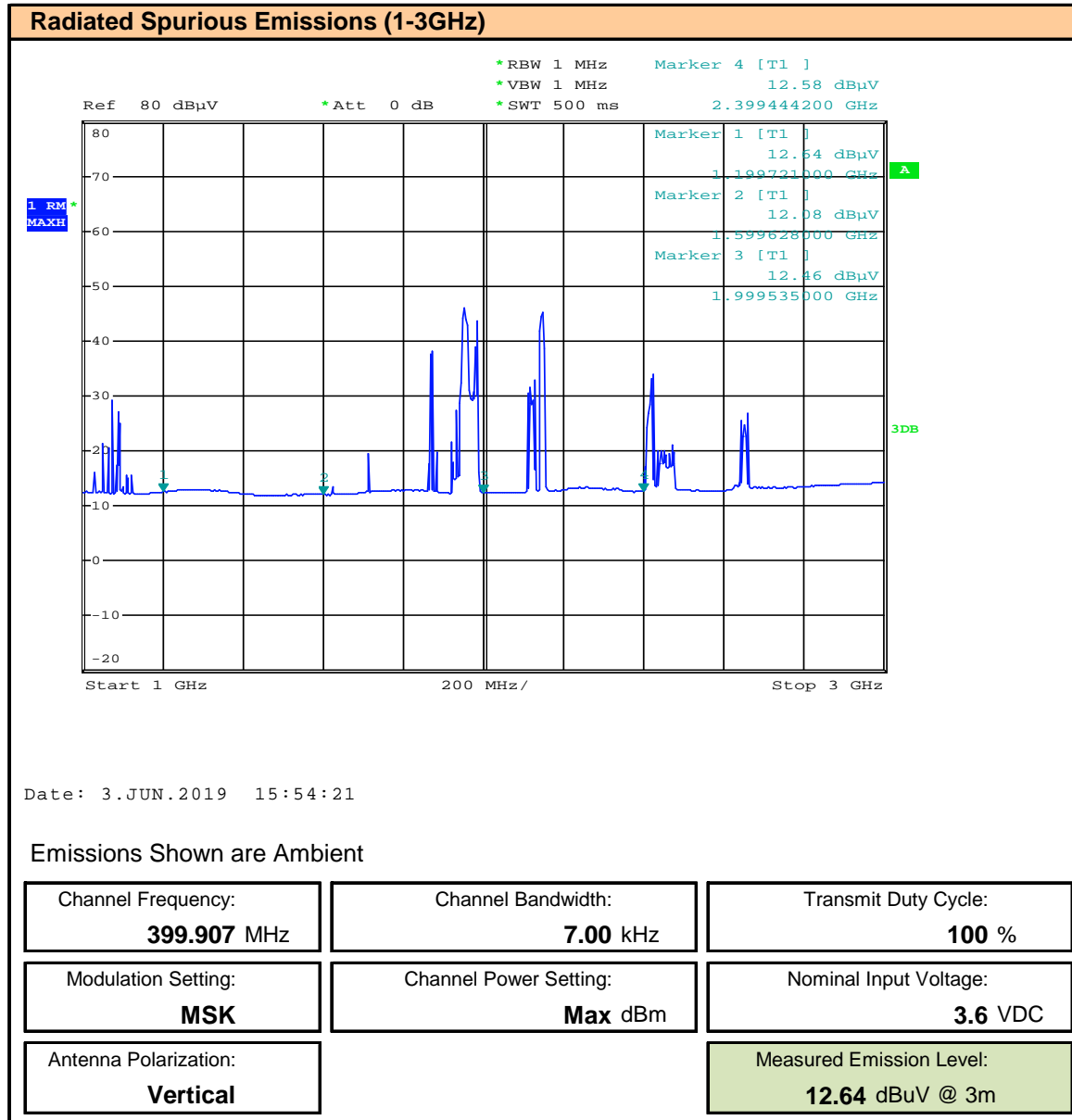
Plot 10.4 – Radiated Spurious Emissions, Second Harmonic, Vertical



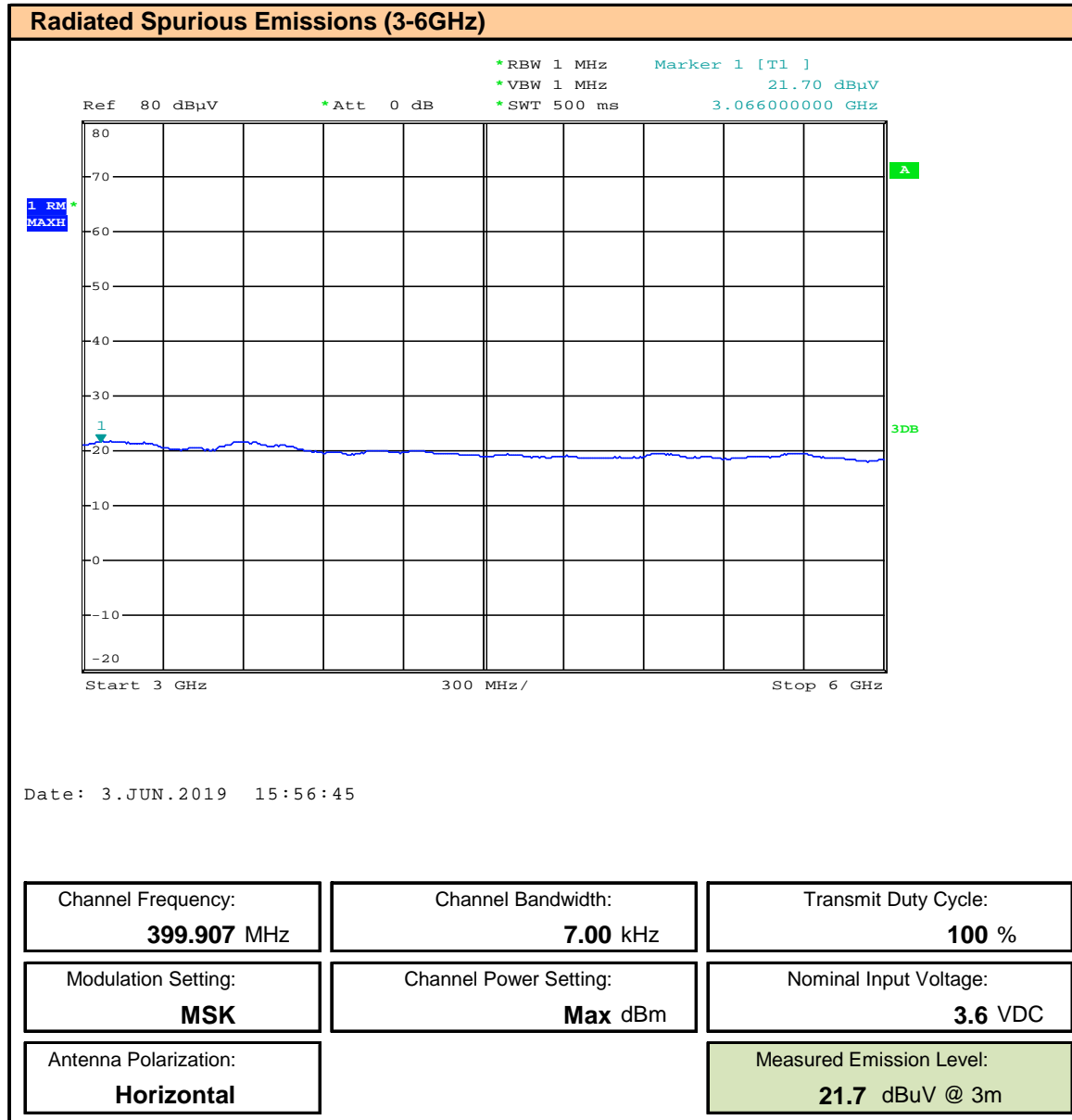
Plot 10.5 – Radiated Spurious Emissions, 1-3GHz, Horizontal



Plot 10.6 – Radiated Spurious Emissions, 1-3GHz, Vertical



Plot 10.7 – Radiated Spurious Emissions, 3-6GHz, Horizontal



Plot 10.8 – Radiated Spurious Emissions, 3-6GHz, Vertical

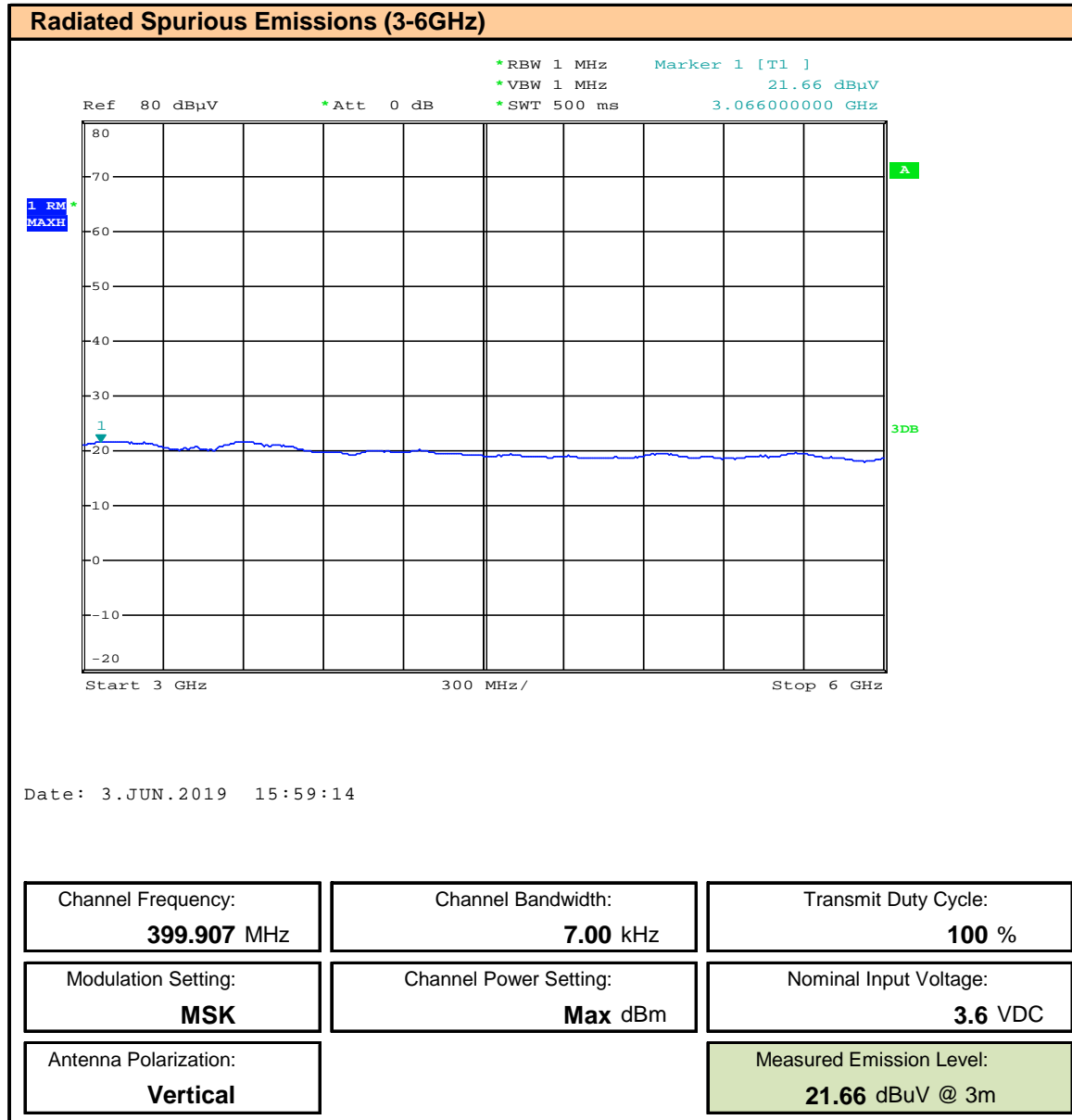


Table 10.1 – Summary of Radiated Spurious Emissions

Conducted Spurious Emissions									
Frequency (MHz)	BW (kHz)	Modulation	Power Setting (dBm)	Transmit Duty Cycle (%)	Polarization	Measured Emission (dBuV @ 3m)	Attenuation (dBc)	Required Attenuation [A _A] (dBc)	Margin (dBm)
399.907	2.4	MSK	Max	100	Horizontal	34.56	46.43	43.00	3.43
Result:								Complies	

No spurious emissions were detected.

11.0 FREQUENCY STABILITY

Test Conditions

Normative Reference	FCC 47 CFR §2.1055, §25.202(d), RSS-Gen, RSS-170 (5.2)
----------------------------	--

Limits

47 CFR §25.202	(d) Frequency tolerance, Earth stations. The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.
RSS-170	5.2. Frequency Stability For mobile earth station equipment, the carrier frequency shall not depart from the reference frequency by more than ± 10 ppm.

Measurement Procedure

47 CFR §2.1055	Frequency Stability (a) The frequency stability shall be measured with variation of ambient temperature as follows: (1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section. (b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. (d) The frequency stability shall be measured with variation of primary supply voltage as follows: (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
----------------	--

Test Setup	Appendix A	Figure A.4
-------------------	-------------------	-------------------

Table 11.1 – Summary of Frequency Stability Results, FCC 25§202

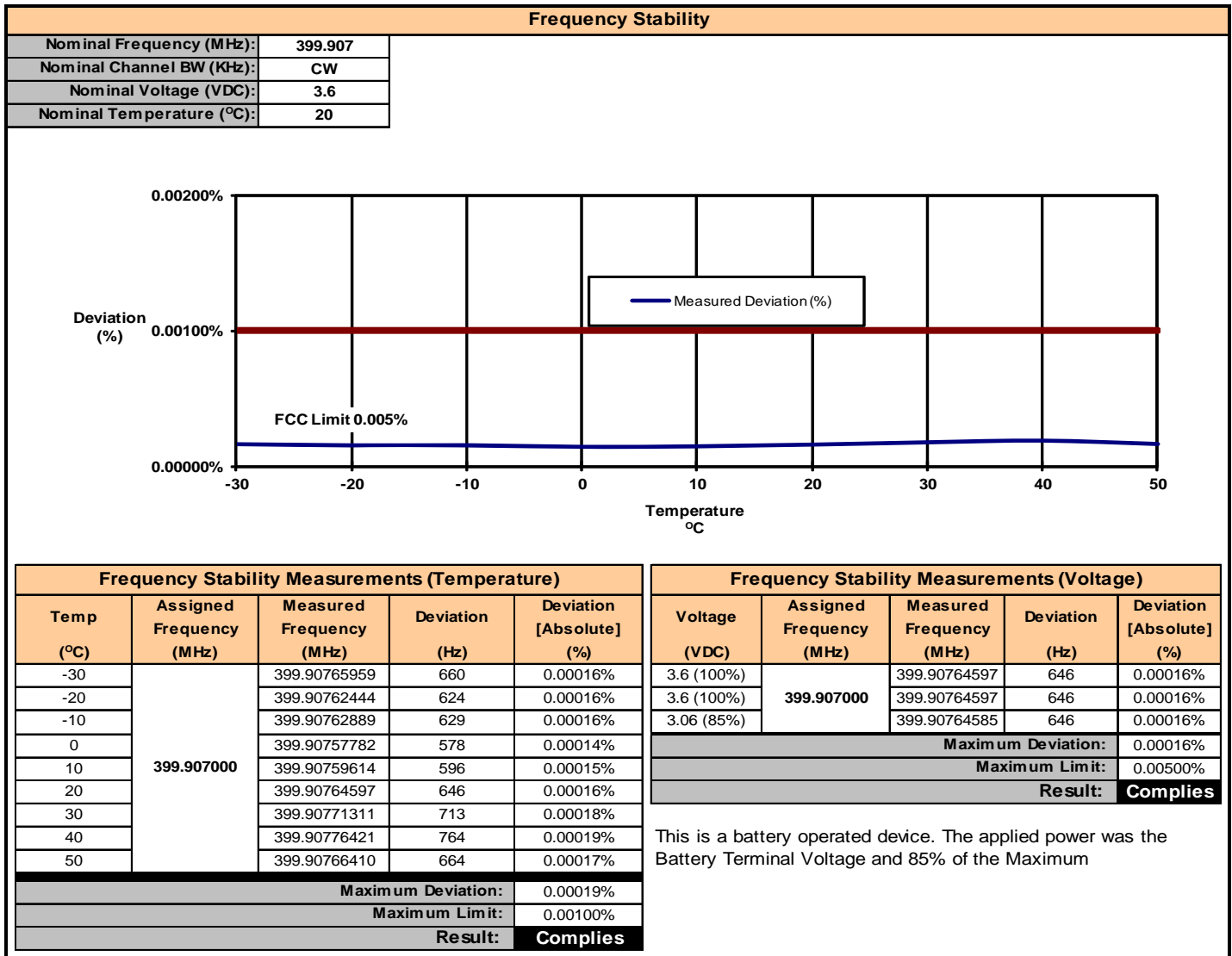
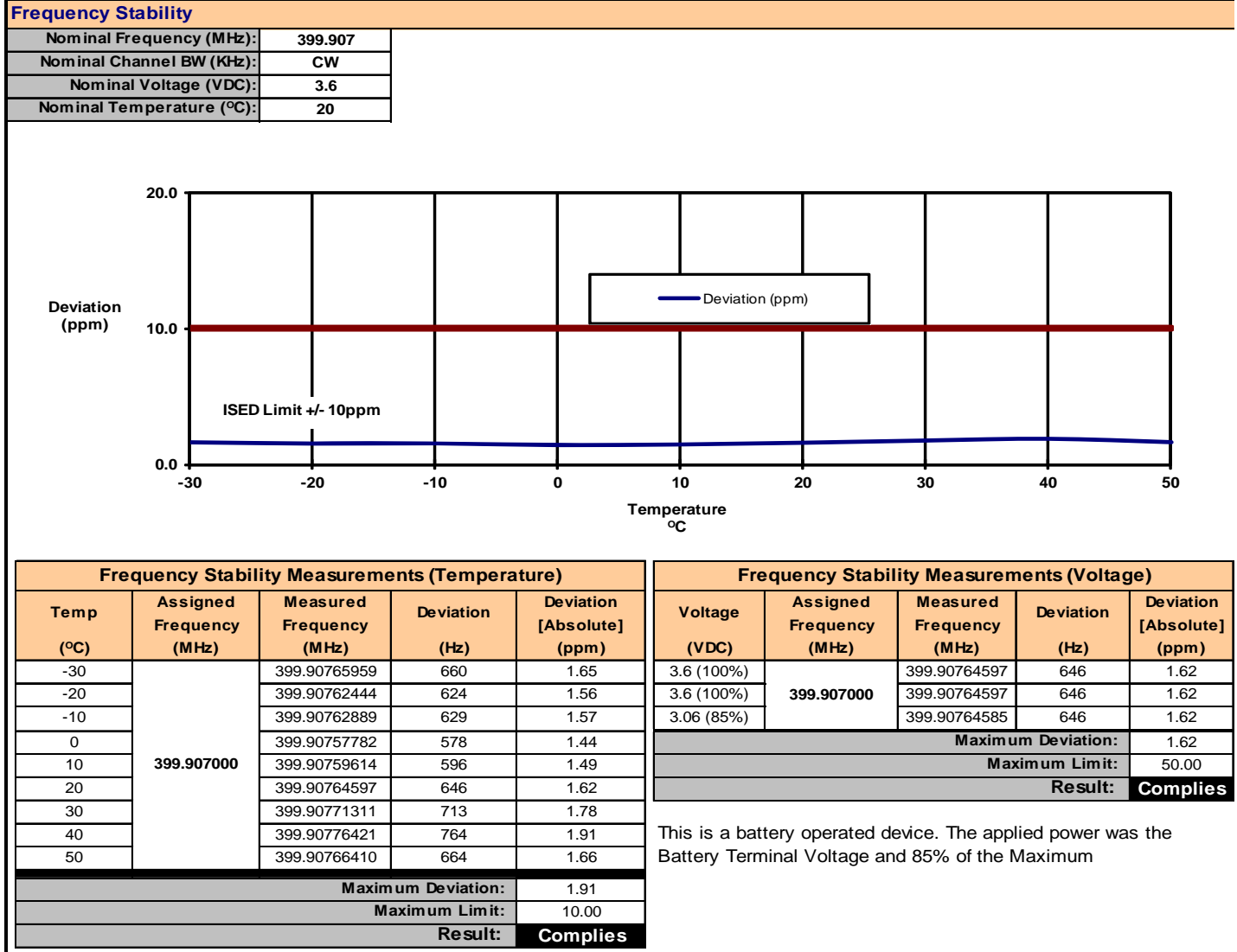


Table 11.2 – Summary of Frequency Stability Results, RSS-170 5.2



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

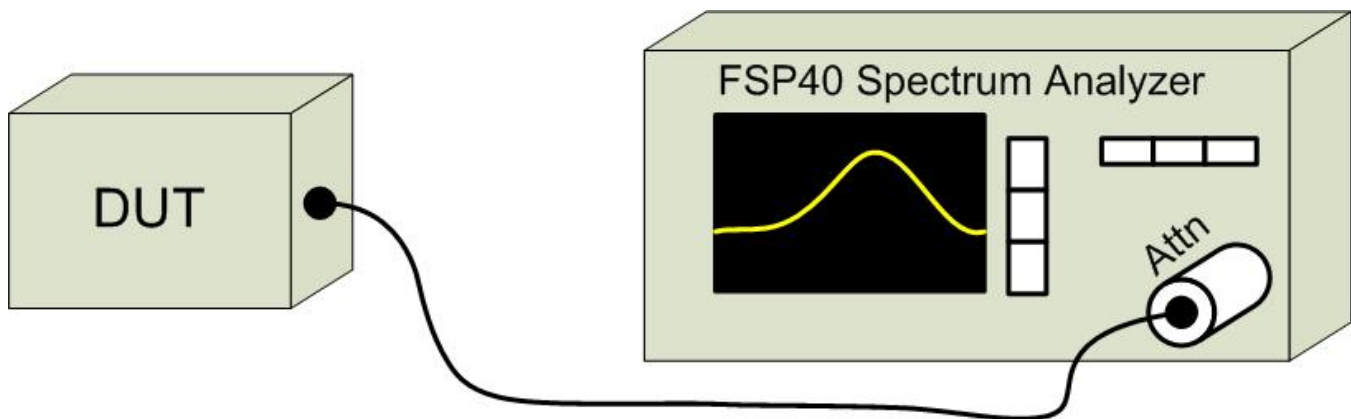


Table A.2 – Setup - Radiated Emissions Equipment

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.3 – Test Setup Radiated Emissions Measurements

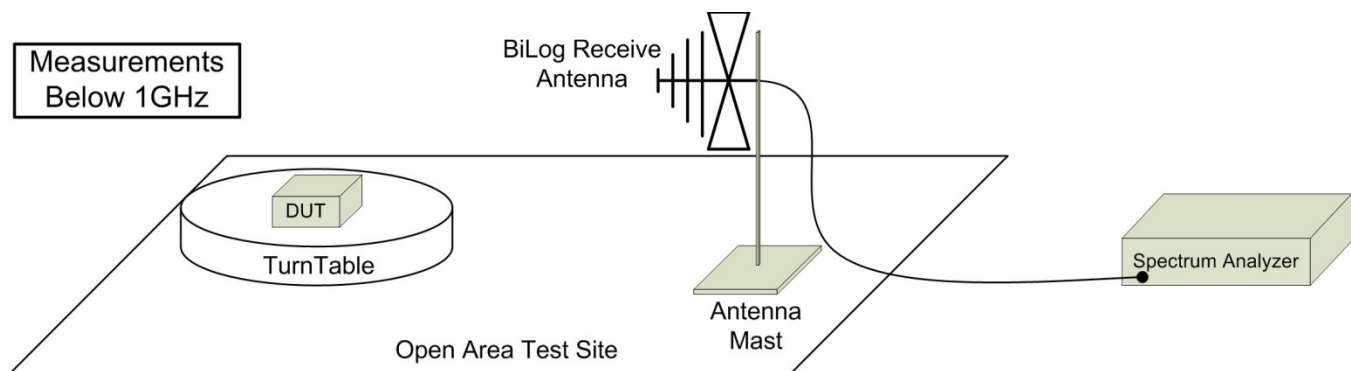
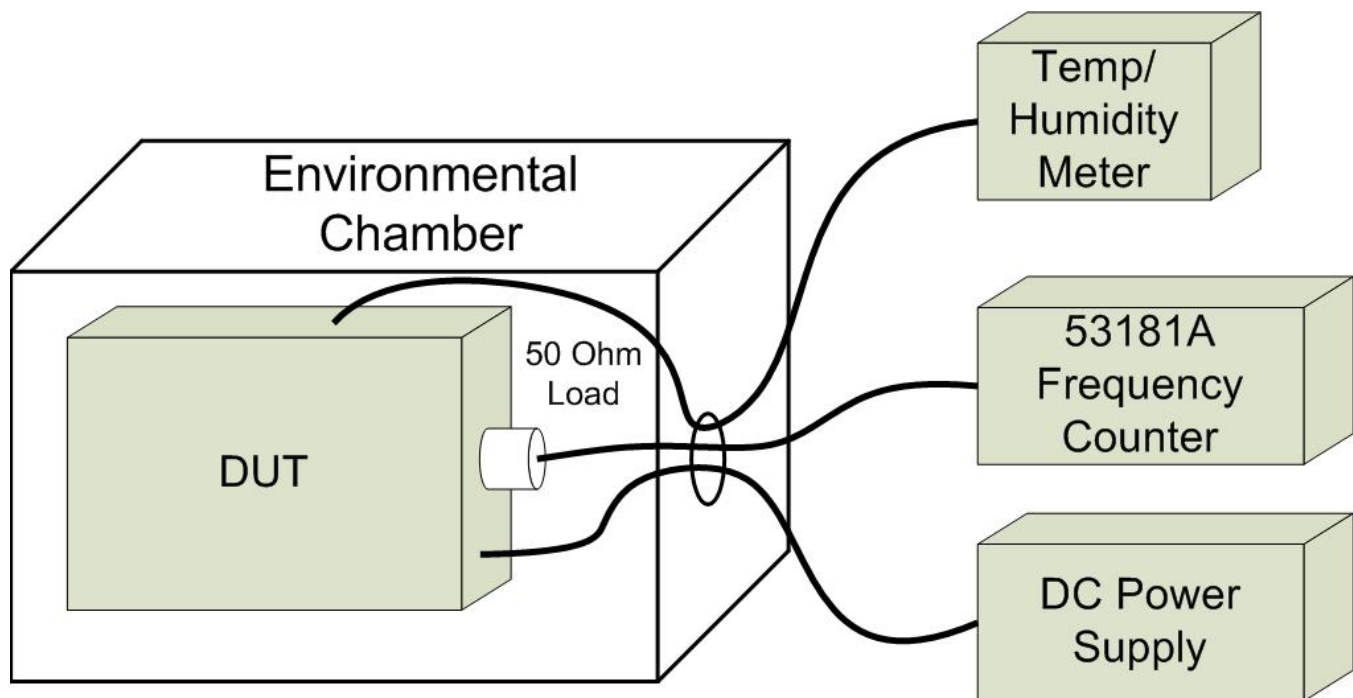


Table A.4 – Setup - Frequency Stability Measurement Equipment

Equipment List			
Asset Number	Manufacturer	Model Number	Description
n/a	ESPEC	ECT-2	Environmental Chamber
00003	HP	53181A	Frequency Counter
n/a	HP	E3611A	Power Supply
00234	VWR	61161-378	Temp/Humidity Meter

Figure A.4 – Test Setup Frequency Stability 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	22 Mar 2019	Triennial	21 Mar 2022
*	00085	EMCO	6502	9203-2724	Loop Antenna	11 Jun 2019	Triennial	11 Jun 2022
*	00161	Waveline Inc.	889		Standard Gain Horn 18-26GHz	NCR	n/a	NCR
	00162	Waveline Inc.	889		Standard Gain Horn 18-26GHz	NCR	n/a	NCR
	00163	Waveline Inc.	1099		Standard Gain Horn 26-40GHz	NCR	n/a	NCR
	00164	Waveline Inc.	1099		Standard Gain Horn 26-40GHz	NCR	n/a	NCR
*	00165	Waveline Inc.	801-KF		Waveguide Adapter 18-26GHz	NCR	n/a	NCR
	00166	Waveline Inc.	801-KF		Waveguide Adapter 18-26GHz	NCR	n/a	NCR
	00167	Waveline Inc.	1001-KF		Waveguide Adapter 26-40GHz	NCR	n/a	NCR
	00168	Waveline Inc.	1001-KF		Waveguide Adapter 26-40GHz	NCR	n/a	NCR
*	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	26 Mar 2019	Triennial	26 Mar 2022
	00237	Gigatronics	80334A	1837001	Power Sensor	26 Mar 2019	Triennial	26 Mar 2022
	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	NCR	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

NCR: No Calibration 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

$$U_{LAB} = 5.14\text{dB} \quad U_{CISPR} = 6.3\text{dB}$$

200MHz - 1000MHz

$$U_{LAB} = 5.90\text{dB} \quad U_{CISPR} = 6.3\text{dB}$$

1GHz - 6GHz

$$U_{LAB} = 4.80\text{dB} \quad U_{CISPR} = 5.2\text{dB}$$

6GHz - 18GHz

$$U_{LAB} = 5.1\text{dB} \quad U_{CISPR} = 5.5\text{dB}$$

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 |