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Test Report Date:

18 March 2021

Project Number:

1531

EMC Test Report - New Filing

Applicant:



Myriota

Myriota Pty Ltd.
Level 1, McEwin Building
Lot 14, North Terrace
Adelaide, SA 5000
Australia



Myriota

Myriota Canada
260 Holiday Inn Drive
Unit 30, Building B
Cambridge, ON, N3C 4E8

FCC ID:

2ATKL-M2-24

Product Model Number / HVIN

M2-24

IC Registration Number

25148-M224

Product Name / PMN

Myriota Module

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.
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Canada



Test Lab Certificate: 2470.01



**Industry
Canada**

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:		20 Jan - 29 Jan, 2021
Report Prepared By:		Art Voss, P.Eng.	Report Reviewed By:		Ben Hewson
Report Revision	Description of Revision		Revised Section	Revised By	Revision Date
0.1	Draft Release		n/a	Art Voss	2 February 2021
1.0	Final Release		n/a	Art Voss	16 February 2021
2.0	Revised Applicant Address, Antenna Gain		Cover, 2.0,7.0	Art Voss	18 February 2021
3.0	Plot 9.1 Revised Uncertainty Table		9.0 App. C	Art Voss	18 March 2021

2.0 CLIENT AND DUT INFORMATION

Client Information	
Applicant Name	Myriota Pty Ltd
Applicant Address (FCC)	Level 1, McEwin Building
	Lot 14, North Terrace
	Adelaide, SA 5000, Australia
Applicant Address (ISED)	Myriota Canada
	260 Holiday Inn Drive
	Unit 30, Building B
	Cambridge, ON, N3C 4E8
DUT Information	
Device Identifier(s):	FCC ID: 2ATKL-M2-24
	IC: 25148-M224
Device Type:	Satelite Communication Module
Equipment Class (FCC):	Licensed Non-Broadcast Station Transmitter (TNB)
Equipment Class (ISED):	Mobile Earth Station
Device Model(s) / HVIN:	M2-24
Device Marketing Name / PMN:	Myriota Module
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, 27dBm
Manuf. Max. Rated BW/Data Rate:	7kHz
Antenna Make and Model:	n/a
Antenna Type and Gain: *	Monopole Whip, 6dBi
Modulation:	MSK
Mode:	n/a
Emission Designator:	2K36G1D
DUT Power Source:	3.6VDC
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

* Information on Antenna Type and Gain provided by applicant.

3.0 SCOPE

Preface:

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.

Device:

The HVIN: M2-24, PMN: Myriota Module is a Single Limited TNB / Mobile Earth Station (MES) transceiver operating in the Earth-to-Space frequency band of 399.9 to 400.05MHz..

Requirement:

As per FCC 47 CFR Part 2, Subpart J and ISED RSP-100, certification is required in accordance with FCC 47 CFR Part 25 and ISED RSS-170. As per FCC 47 CFR §2.1093 an RF Exposure (SAR) evaluation is required for this *Equipment* and the results of the RF Exposure (SAR) evaluation appear in this report.

Application:

This is an application new certification of a Single Limited Modular Approval.

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)	20 Jan 2021	Pass
7.0	Compliance to §2.1033(c)(8)	ANSI C63.26-2015	§2.1033		20 Jan 2021	Pass
8.0	Occupied Bandwidth	ANSI C63.26-2015	§2.1049	RSS-Gen	20 Jan 2021	Pass
9.0	Conducted Tx Spurious Emissions	ANSI C63.26-2015	§2.1051 §25.202(f)	RSS-Gen RSS-170 (5.4.3.1)	20 Jan 2021	Pass
10.0	Radiated Tx Spurious Emissions	ANSI C63.26-2015	§2.1053 §25.202(f)	RSS-Gen RSS-170 (5.4.3.1)	29 Jan 2021	Pass
11.0	Radiated Rx Spurious Emissions	ANSI C63.26-2015	§2.1053 §25.202(f)	RSS-Gen RSS-170 (5.4.3.1)	29 Jan 2021	Pass
12.0	Frequency Stability		§2.1055 §25.202(d)	RSS-Gen RSS-170 (5.2)	20 Jan 2021	Pass

Test Station Day Log					
Date	Ambient Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Test Station	Tests Performed Section(s)
19 Jan 2021	22.4	16	103.1	EMC	7
20 Jan 2021	21.8	17	102.5	EMC	7, 8, 9
20 Jan 2021	20.5	17	102.5	TC	10, 11
29 Jan 2021	0.0	91	101.1	OATS	12

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.

2 February 2021

Date



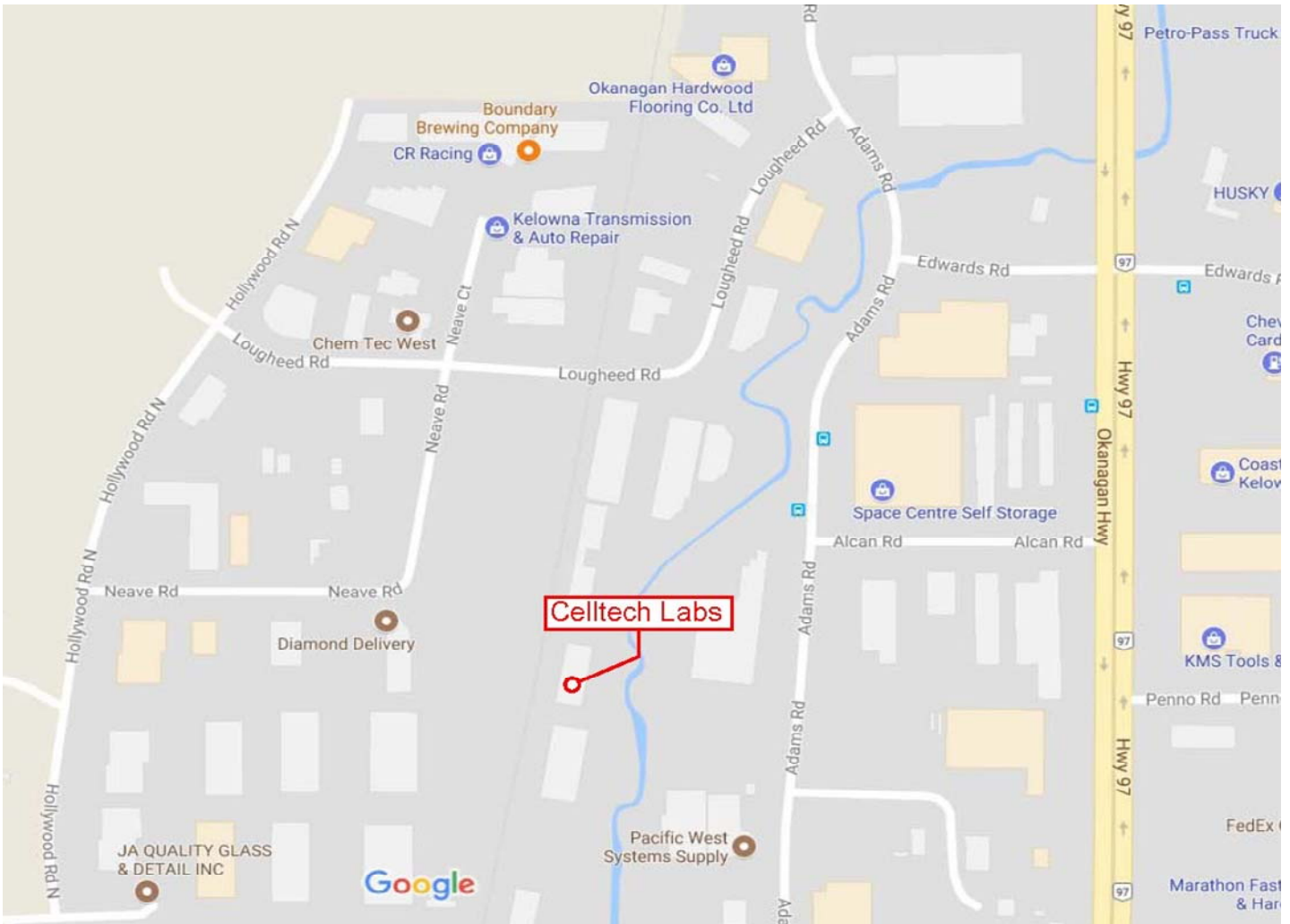
5.0 NORMATIVE REFERENCES

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-107 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 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 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)
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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.
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Test Setup	Appendix A - Figure A.1
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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

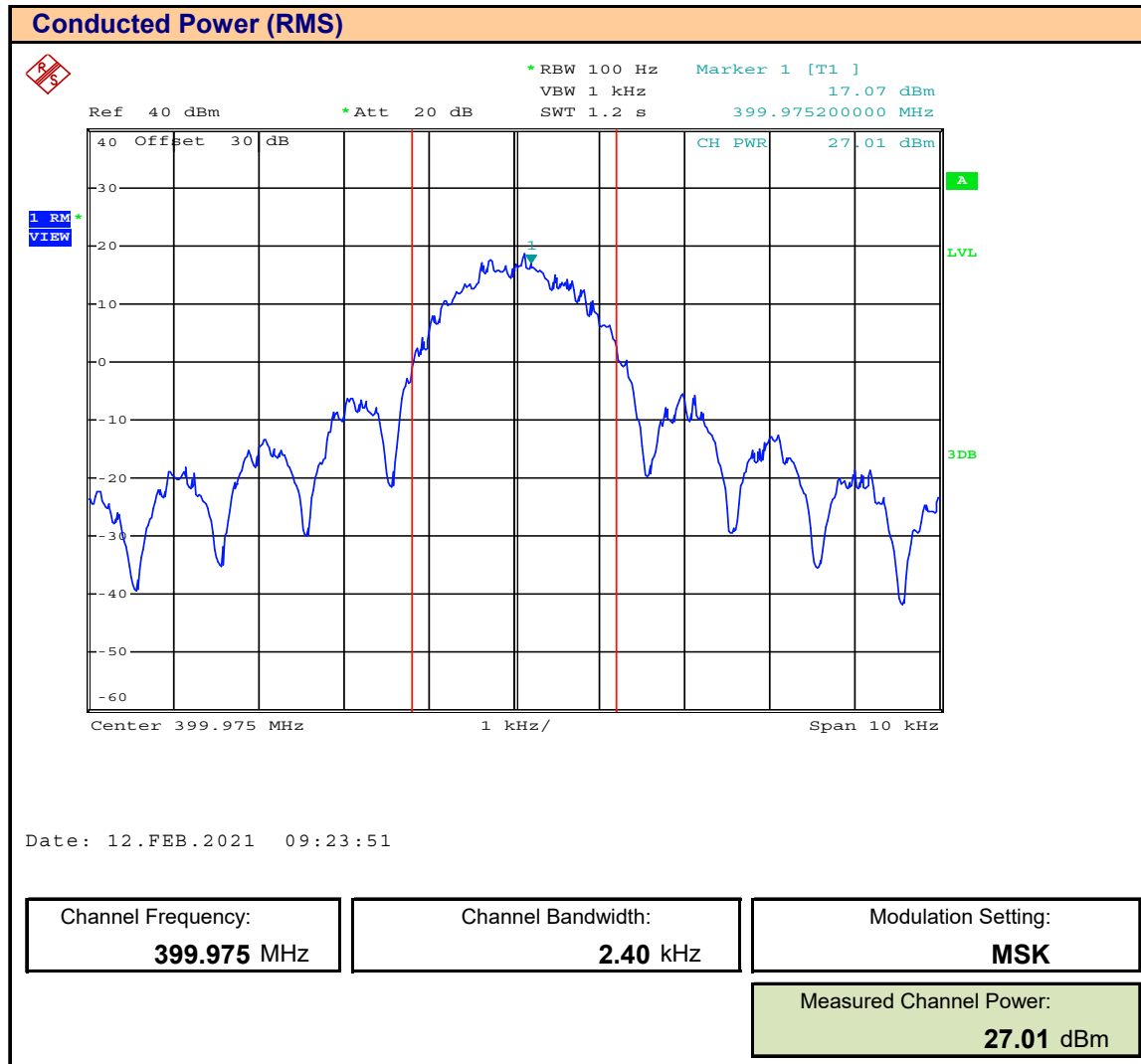


Table 7.1 – Summary of Conducted Power Measurements (RMS)

Channel EIRP (RMS)									
Frequency (MHz)	BW (kHz)	Modulation	Measured Power [E _{Meas}] (dBm)	Antenna Gain (1) [G _T] (dBi)	Cable Loss [L _c] (dB)	EIRP (dBm)	EIRP (dBW)	Limit (dBW)	Margin (dB)
399.975	2.4	MSK	27.01	6	0.5	33.51	3.51	40.0	36.5
Result:								Complies	

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

Margin = Limit - EIRP in dB

(1) Information on Antenna Gain provided by Applicant

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

FCC CFR 47 §2.1033(c)(8): Power to Transmitter:	
Measured Receiver Current:	IRx = 0.03A
Measured Total Current:	ITx = 0.53A
Transmitter Current (ITx - IRx):	IXmitter = 0.5A
Power to Transmitter:	(3.6VDC)(0.5) = 1.8W
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.
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Test Setup	Appendix A	Figure A.1
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Plot 8.1 – Occupied Bandwidth

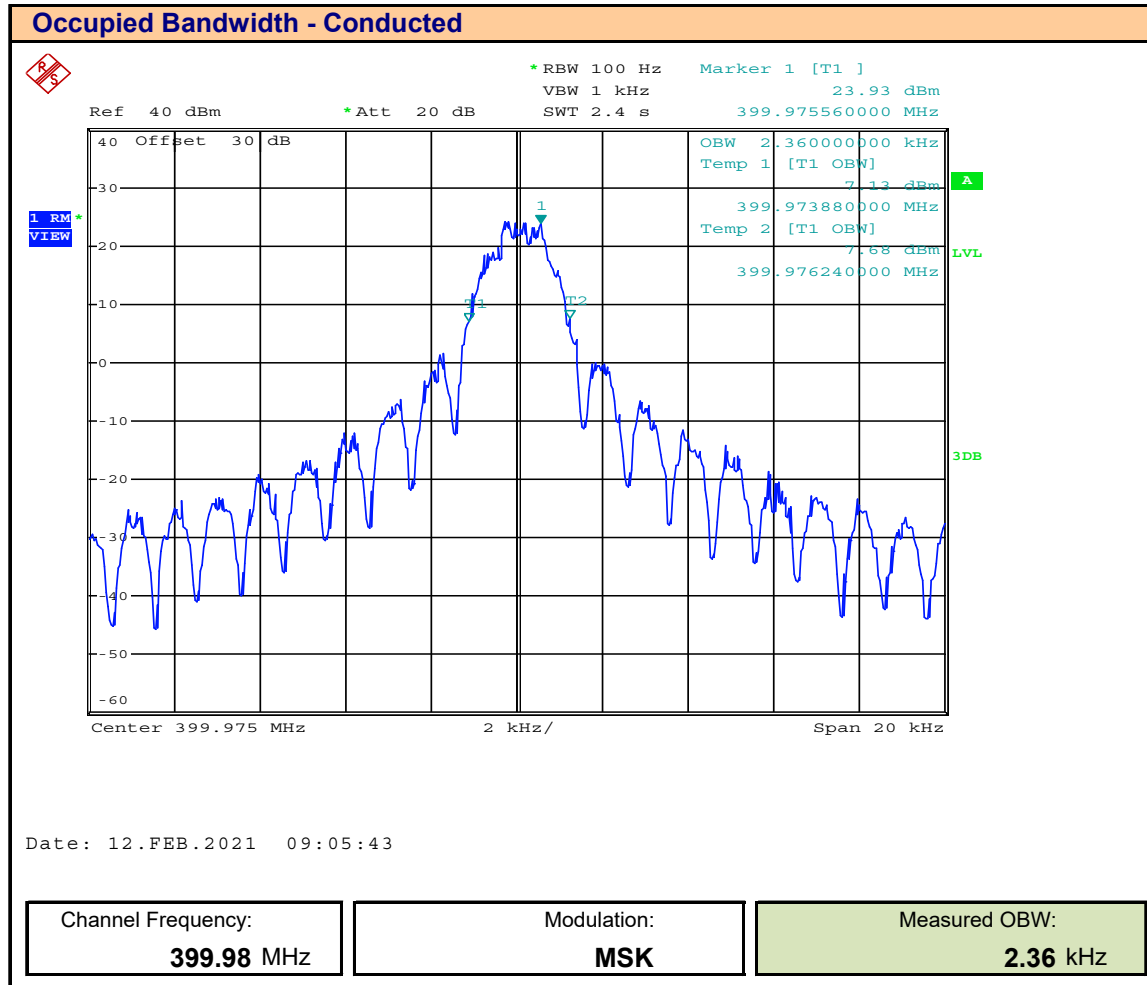


Table 8.1 - Summary of Occupied Bandwidth

Occupied Bandwidth Measurements				
Frequency (MHz)	Bandwidth Setting (MHz)	Modulation	Measured OBW (MHz)	Emission Designator
399.98	Max	MSK	2.36	2K36G1D

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

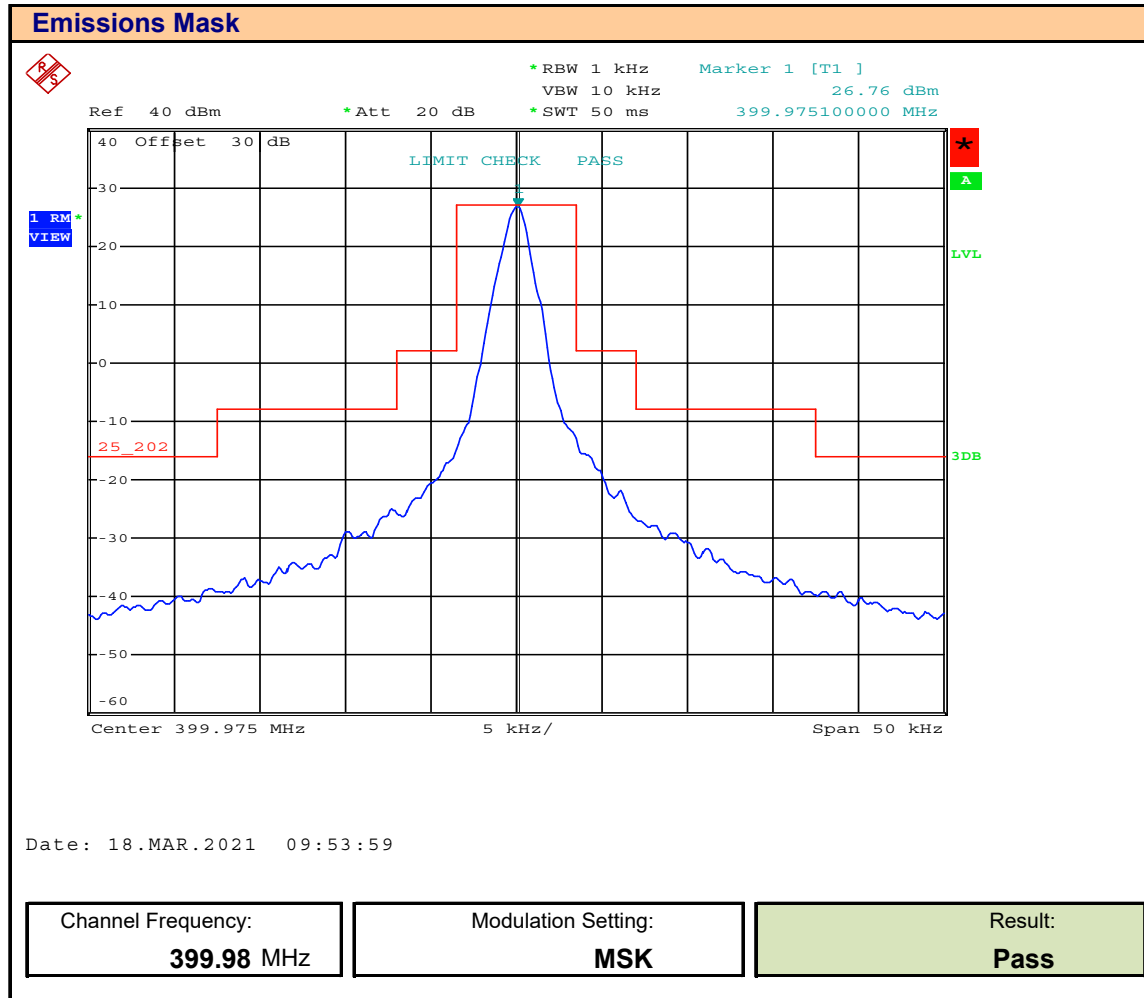
47 CFR §25	(f) Emission limitations. Except for SDARS terrestrial repeaters and as provided for in paragraph (i), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the schedule set forth in paragraphs (f)(1) through (f)(4) of this section. 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. (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; (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 (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;
RSS-170	5.4.3.1. Mobile Earth Stations in All Frequency Bands The average power of unwanted emissions shall be attenuated below the average output power, P (dBW), of the transmitter, as specified below: (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; (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 (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.

Measurement Procedure

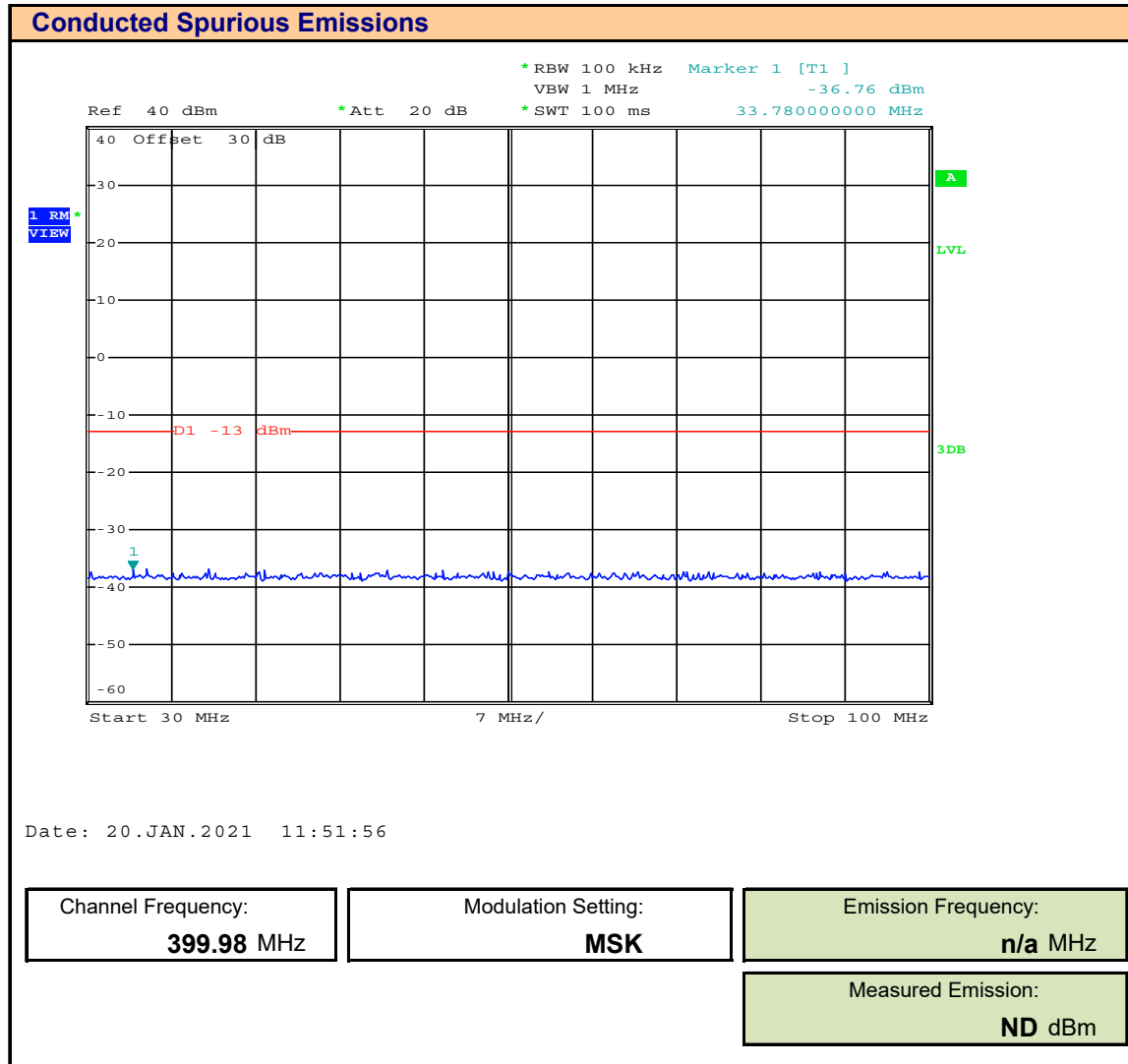
ANSI C63.26 5.7.3	See applicable procedure
--------------------------	---------------------------------

Test Setup	Appendix A	Figure A.1
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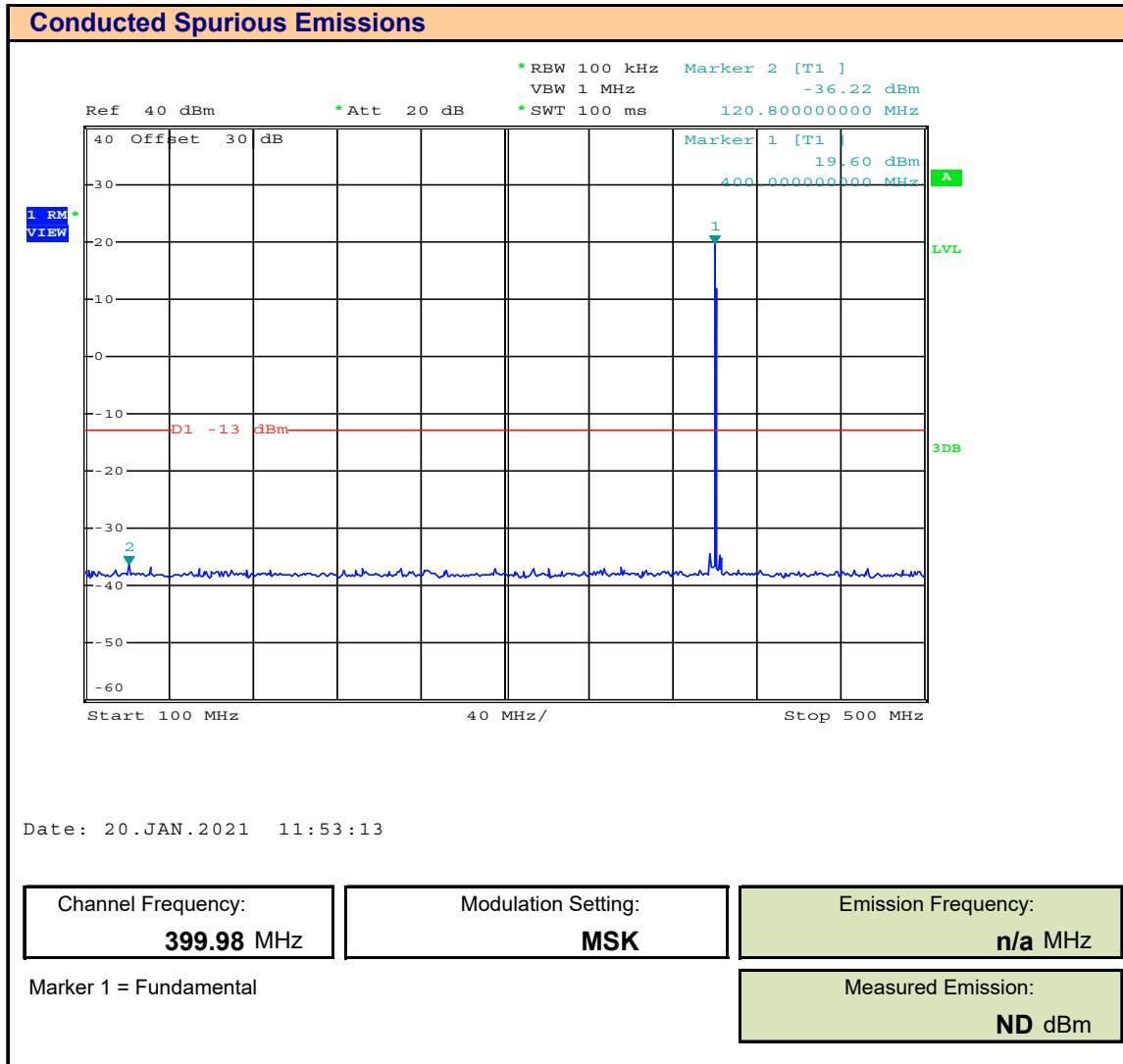
Plot 9.1 – Conducted Out of Band Emissions, Emission Mask



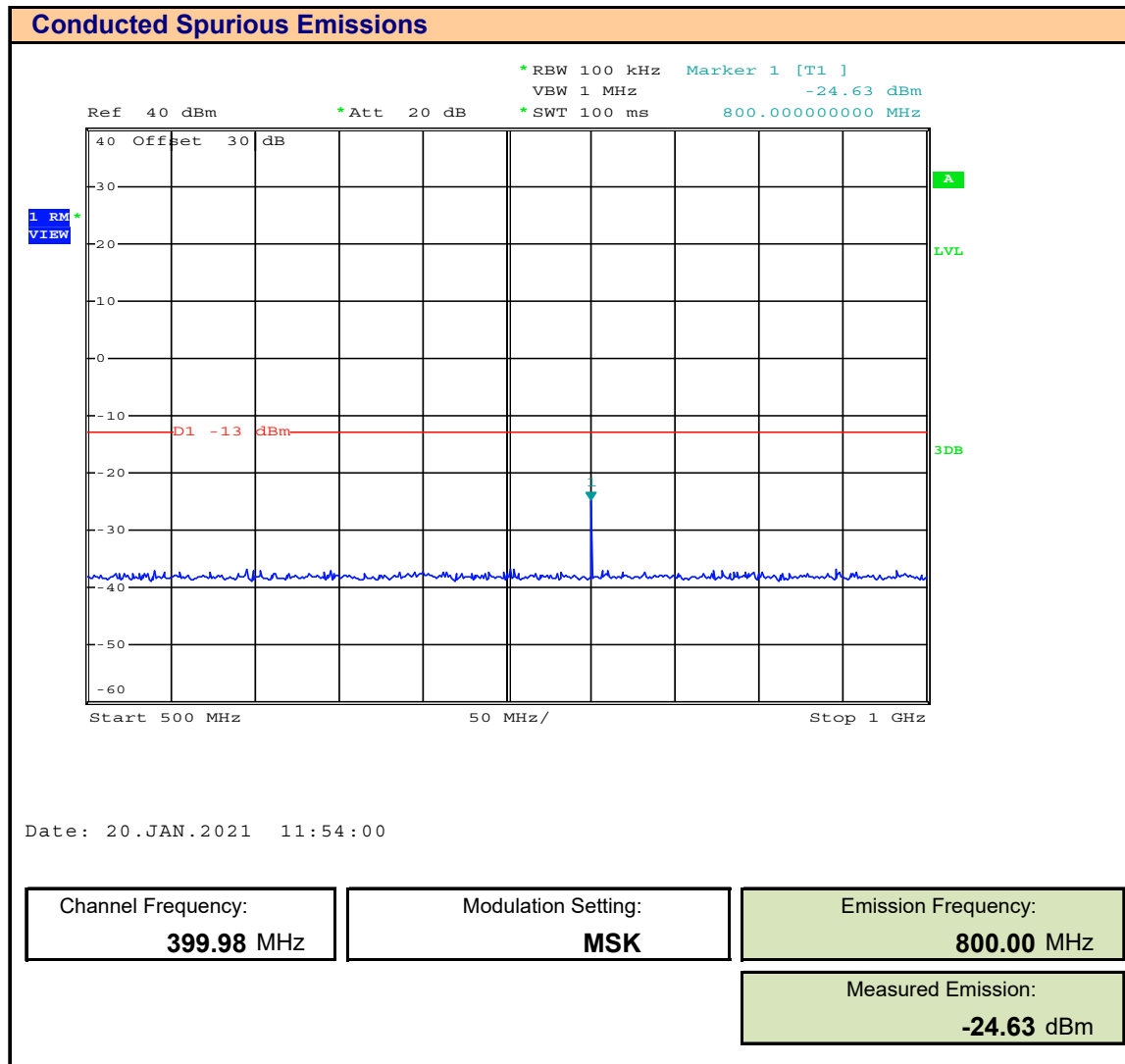
Plot 9.2 – Conducted Out of Band Emissions, 30 – 100MHz



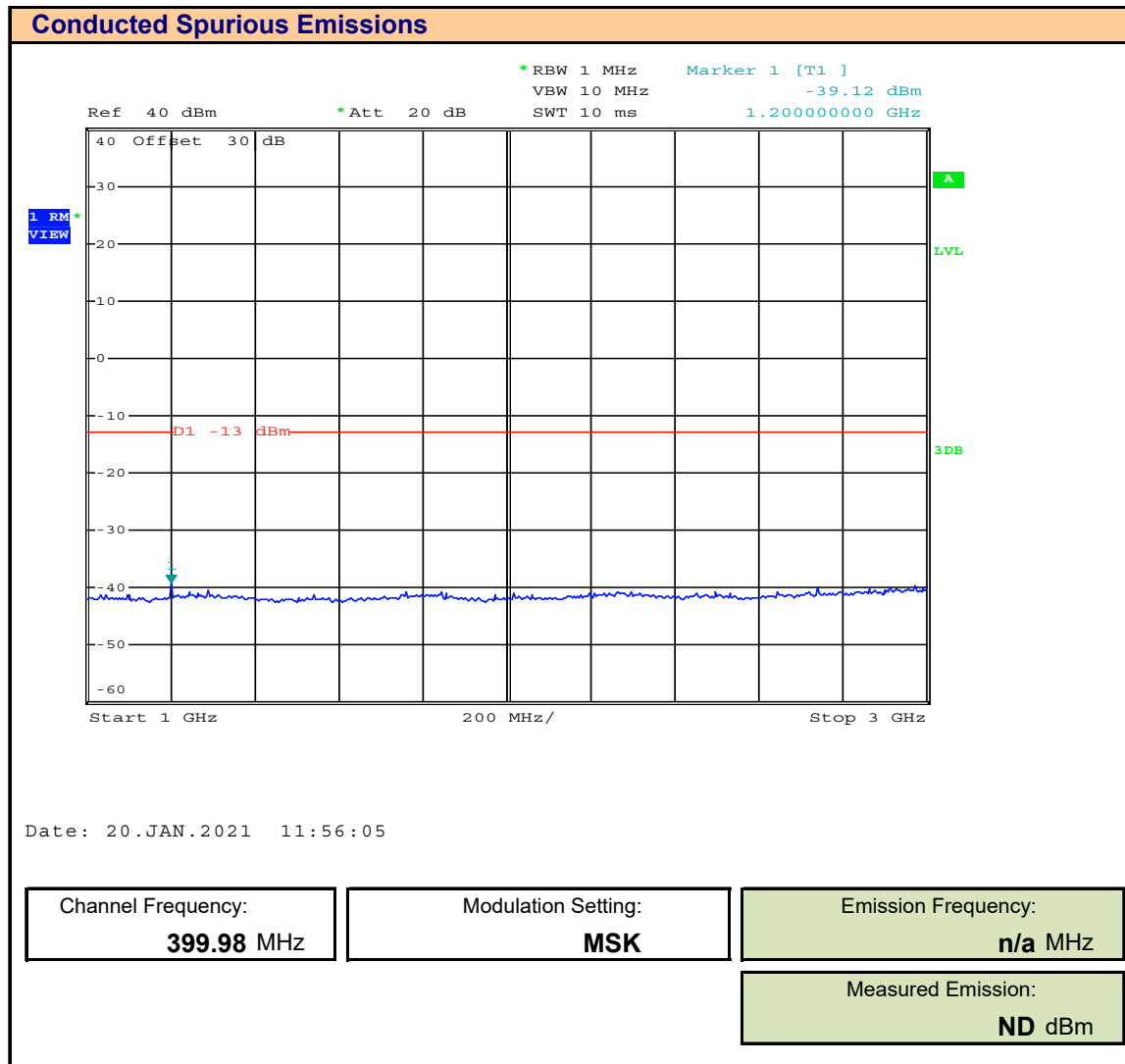
Plot 9.3 – Conducted Out of Band Emissions, 100 – 500MHz



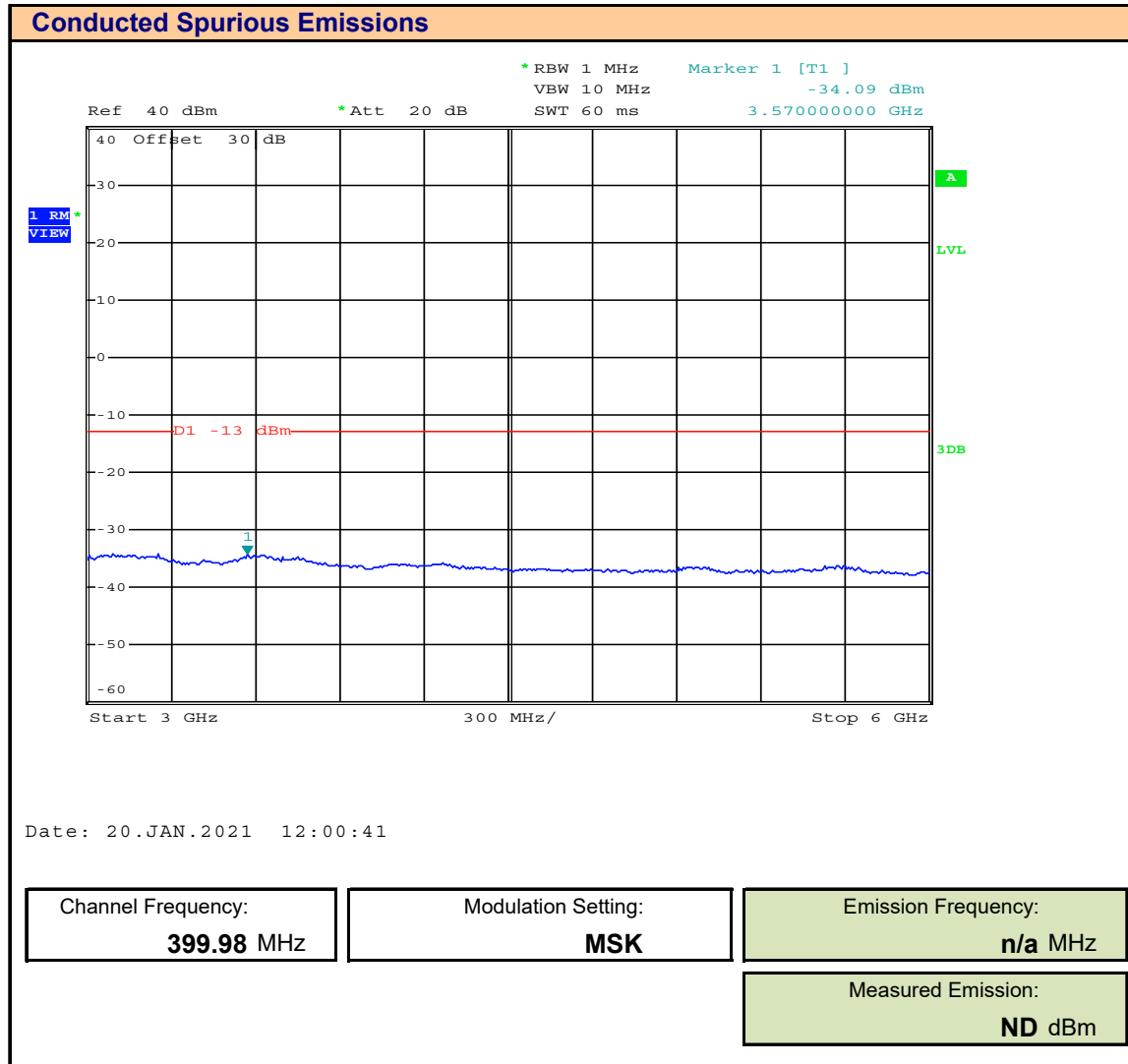
Plot 9.4 – Conducted Out of Band Emissions, 500 - 1000MHz



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



Plot 9.6 – Conducted Out of Band Emissions, 3 - 5GHz



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

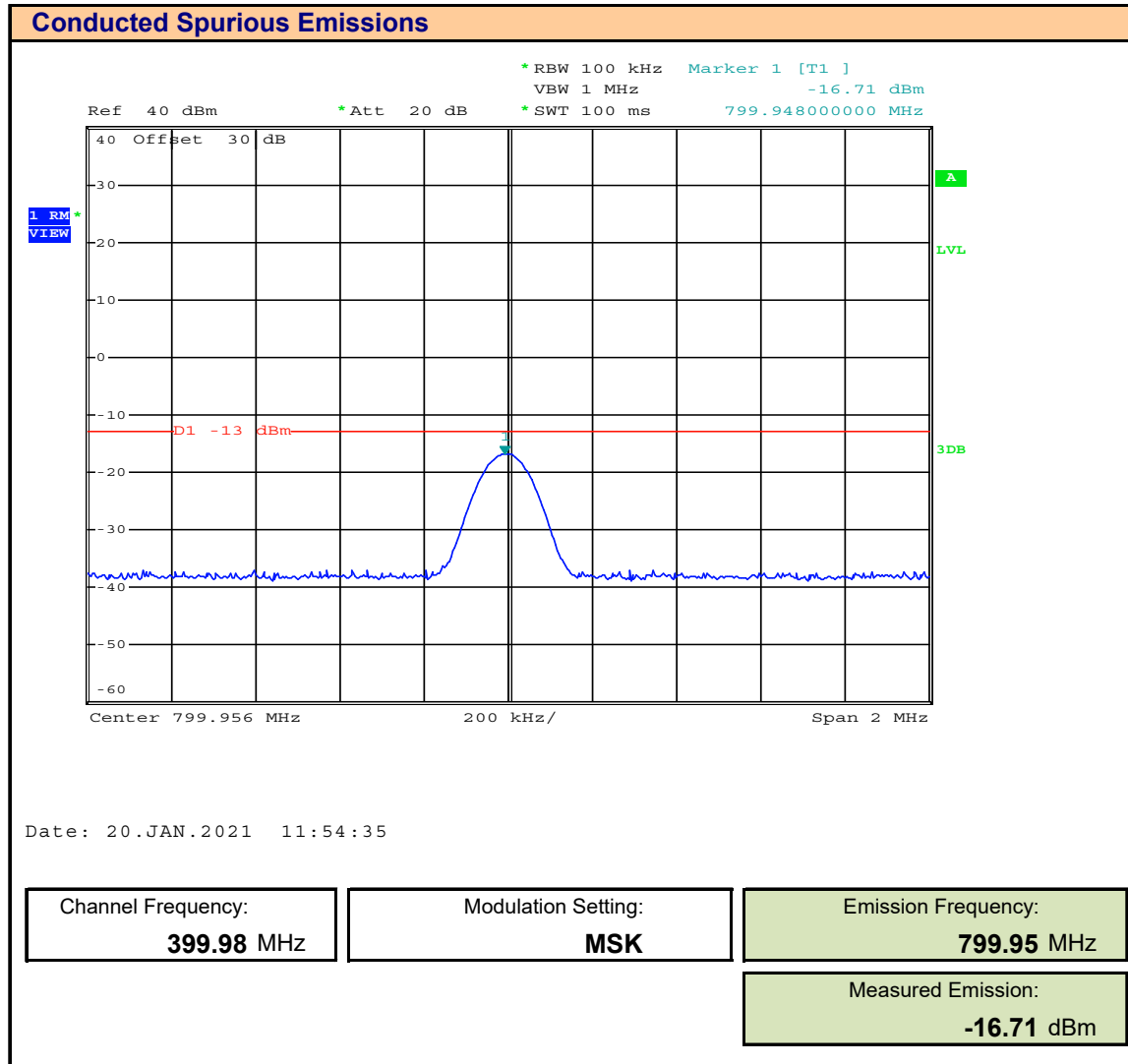


Table 9.1 – Summary of Conducted Out of Band Emissions

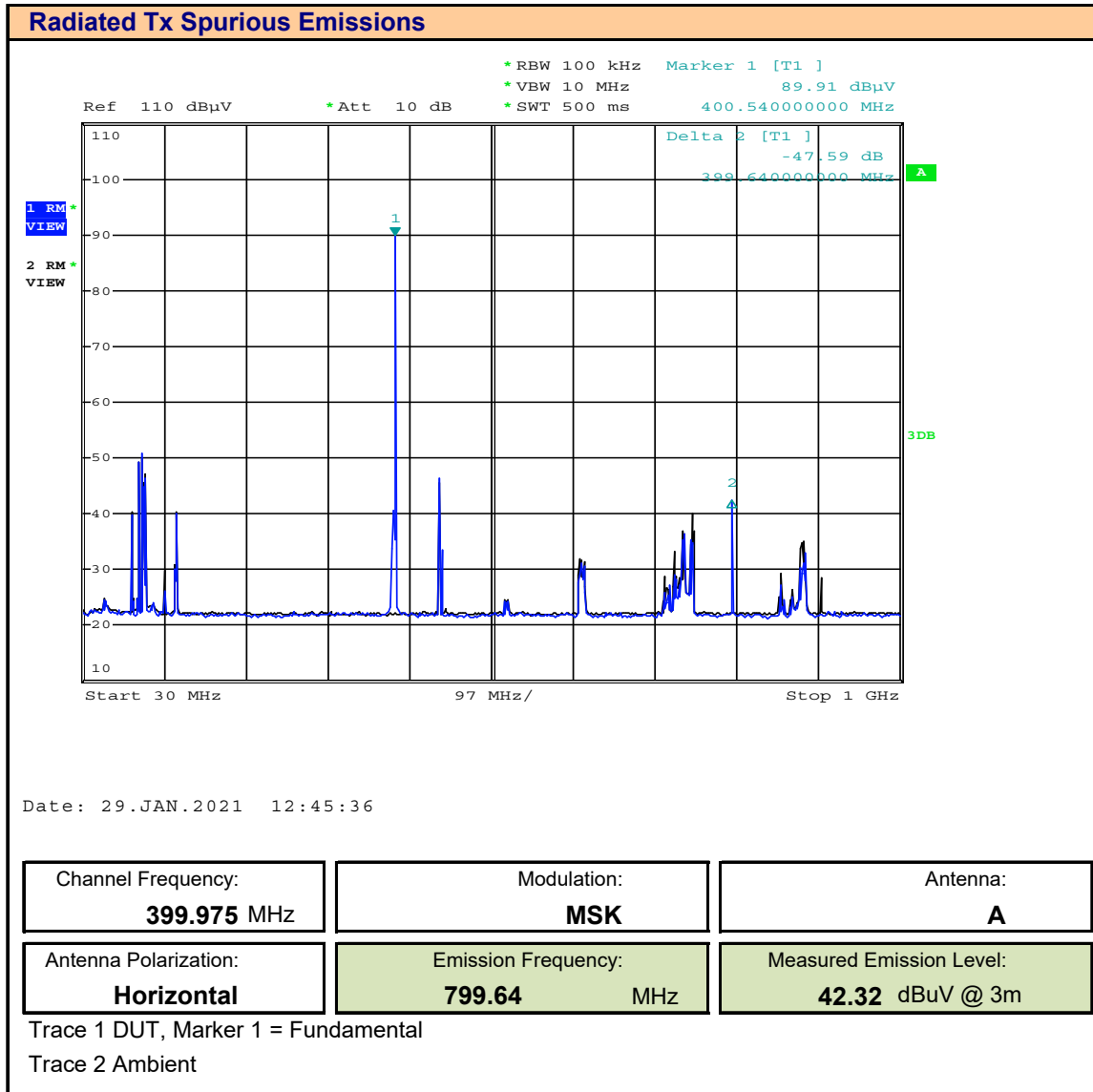
Conducted Spurious Emissions						
Channel Frequency (MHz)	Emission Frequency (MHz)	Modulation	Measured Emission (dBm)	Attenuation (dBc)	Required Attenuation [A_A] (dBc)	Margin (dBm)
399.975	799.95	MSK	-16.71	50.71	43.00	7.71

Negative Margin (-) = Fail

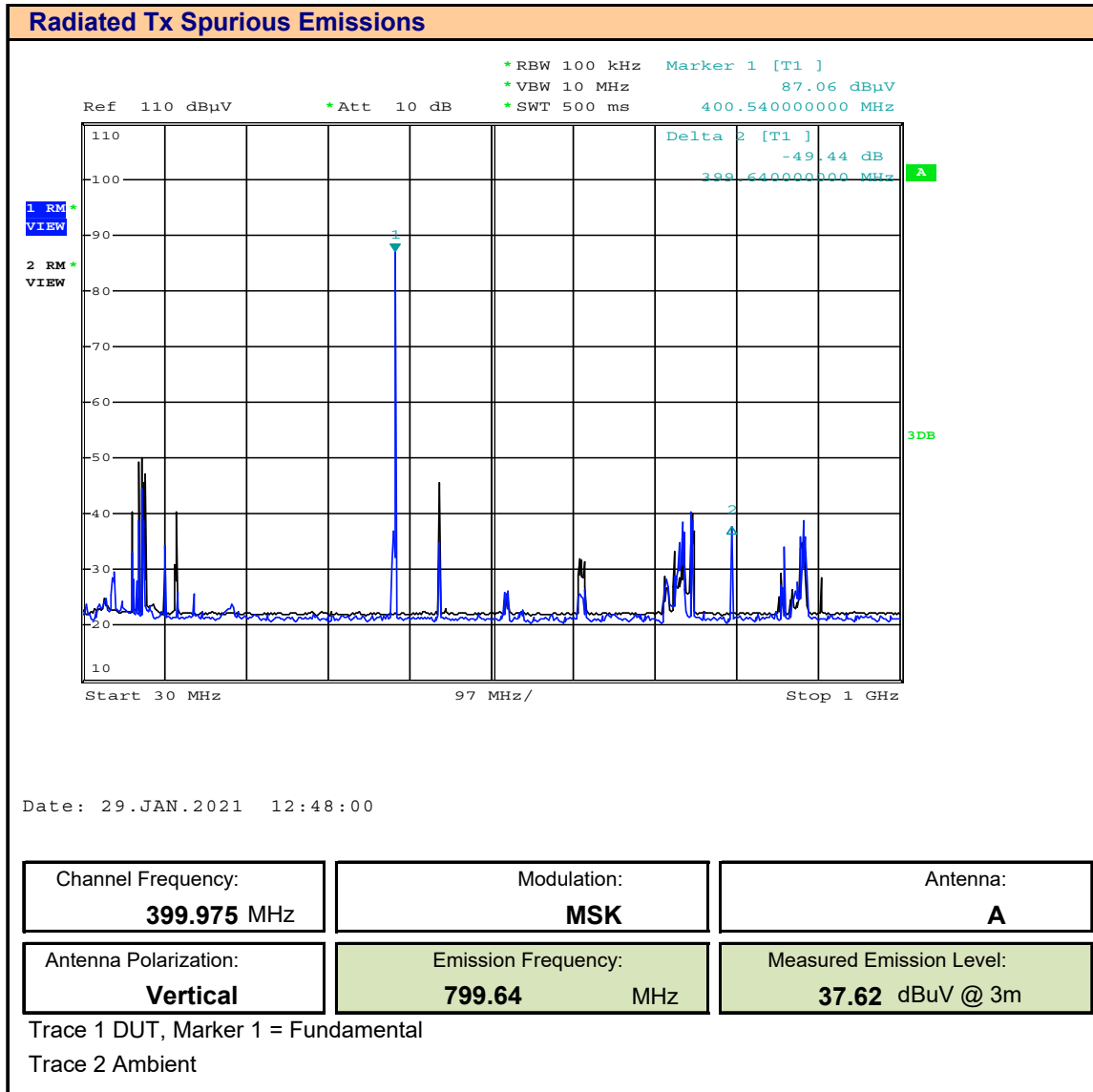
10.0 RADIATED SPURIOUS TX EMISSIONS

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	(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. (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; (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 dB; (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;
RSS-170	5.4.3.1. Mobile Earth Stations in All Frequency Bands The average power of unwanted emissions shall be attenuated below the average output power, P (dBW), of the transmitter, as specified below: (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; (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 (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.
Measurement Procedure	
ANSI C63.26 5.7.3	See applicable procedure
Test Setup	Appendix A Figure A.2 - A.6

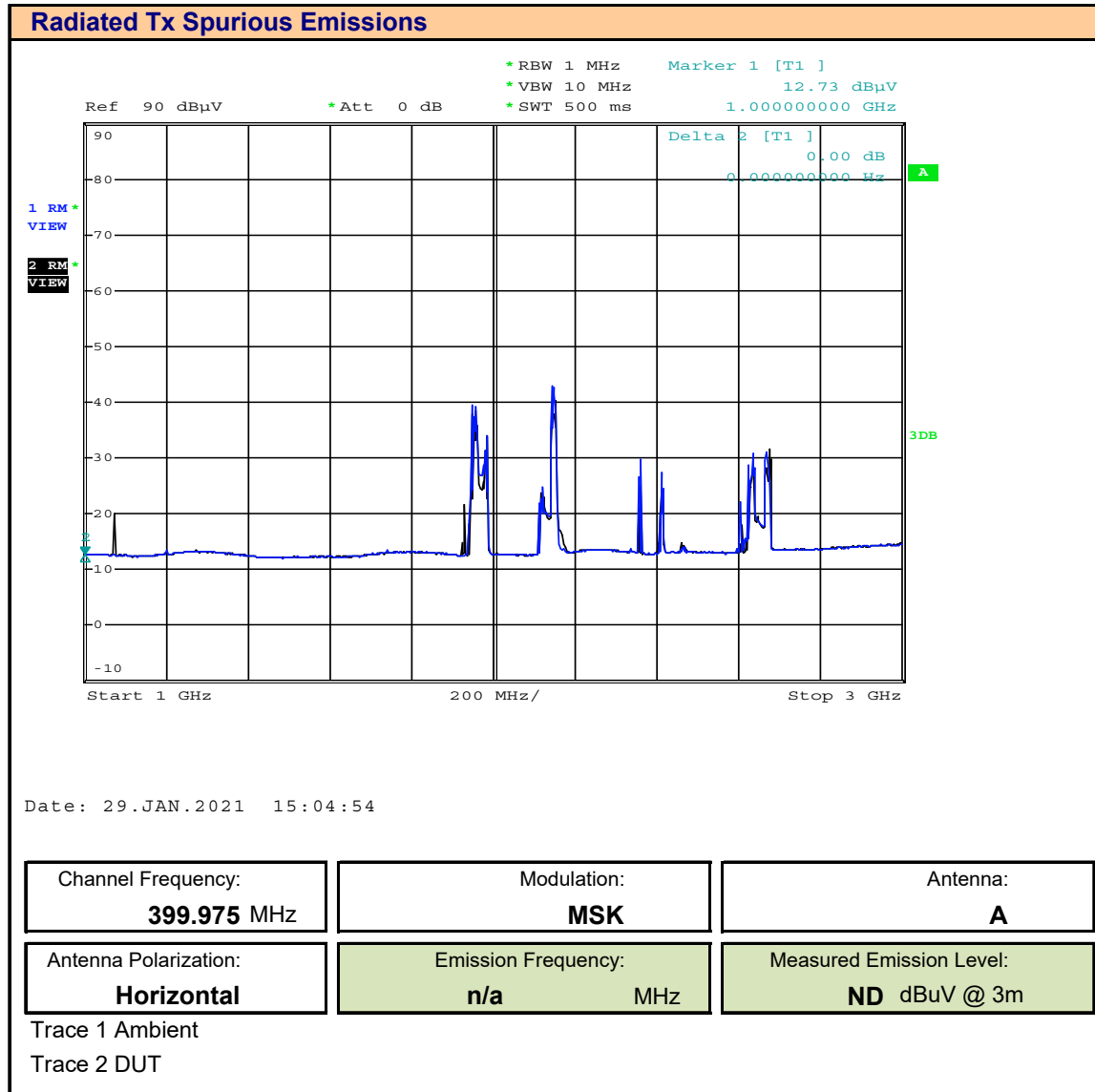
Plot 10.1 – Radiated Spurious Emissions, Antenna A, 30 – 1000MHz, Horizontal



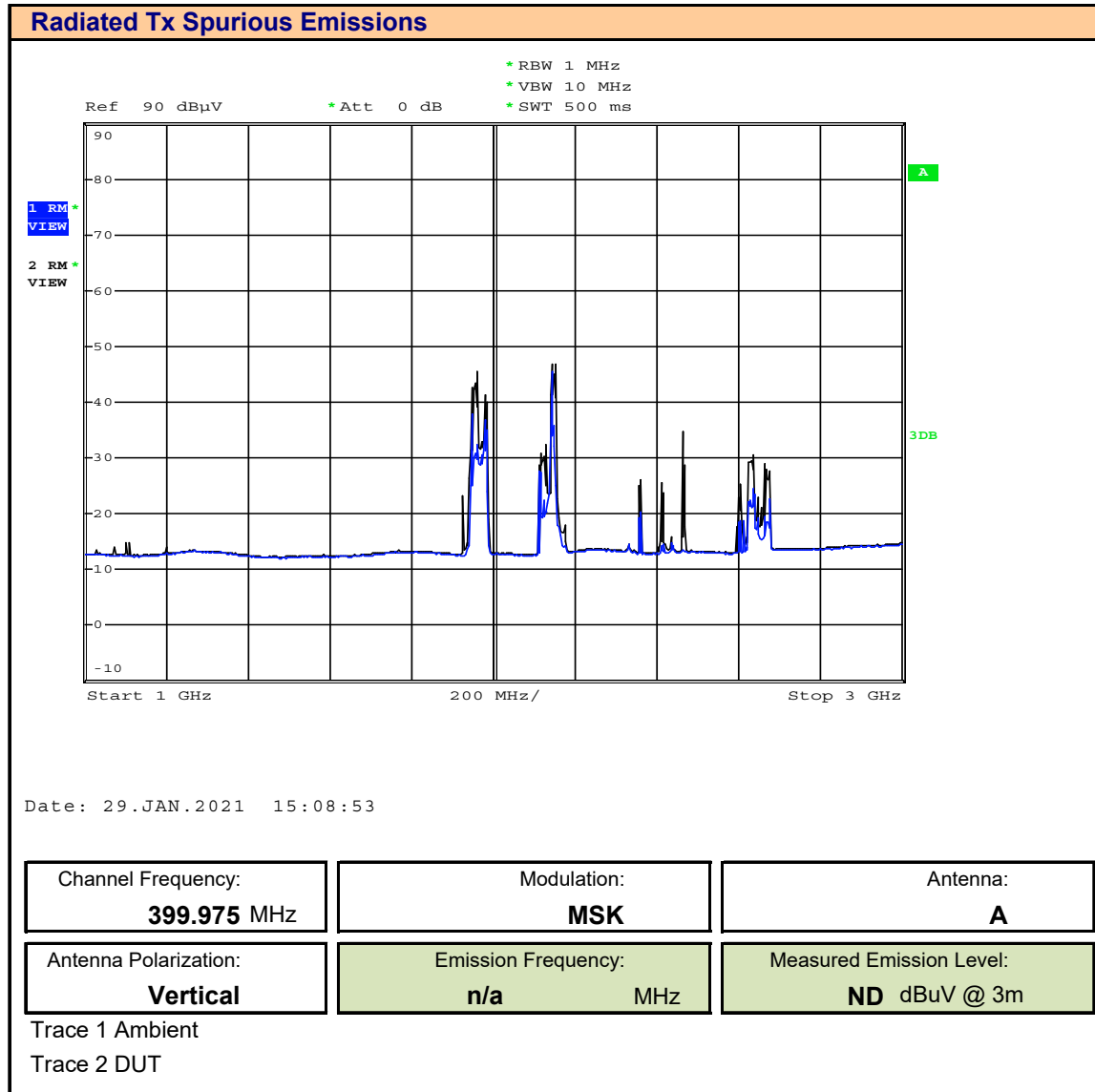
Plot 10.2 – Radiated Spurious Emissions, Antenna A, 30 – 1000MHz, Vertical



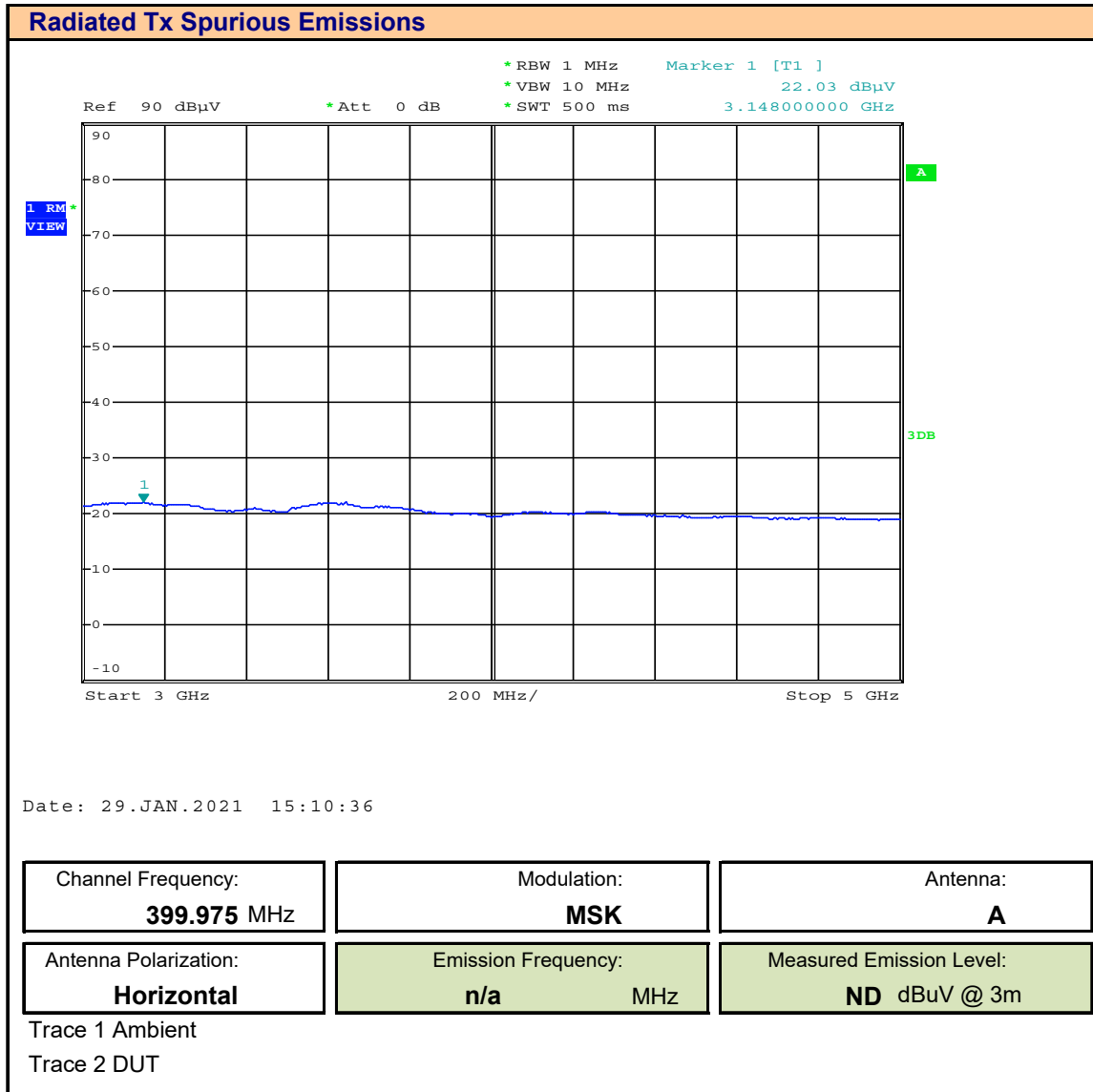
Plot 10.3 – Radiated Spurious Emissions, Antenna A, 1 – 3GHz, Horizontal



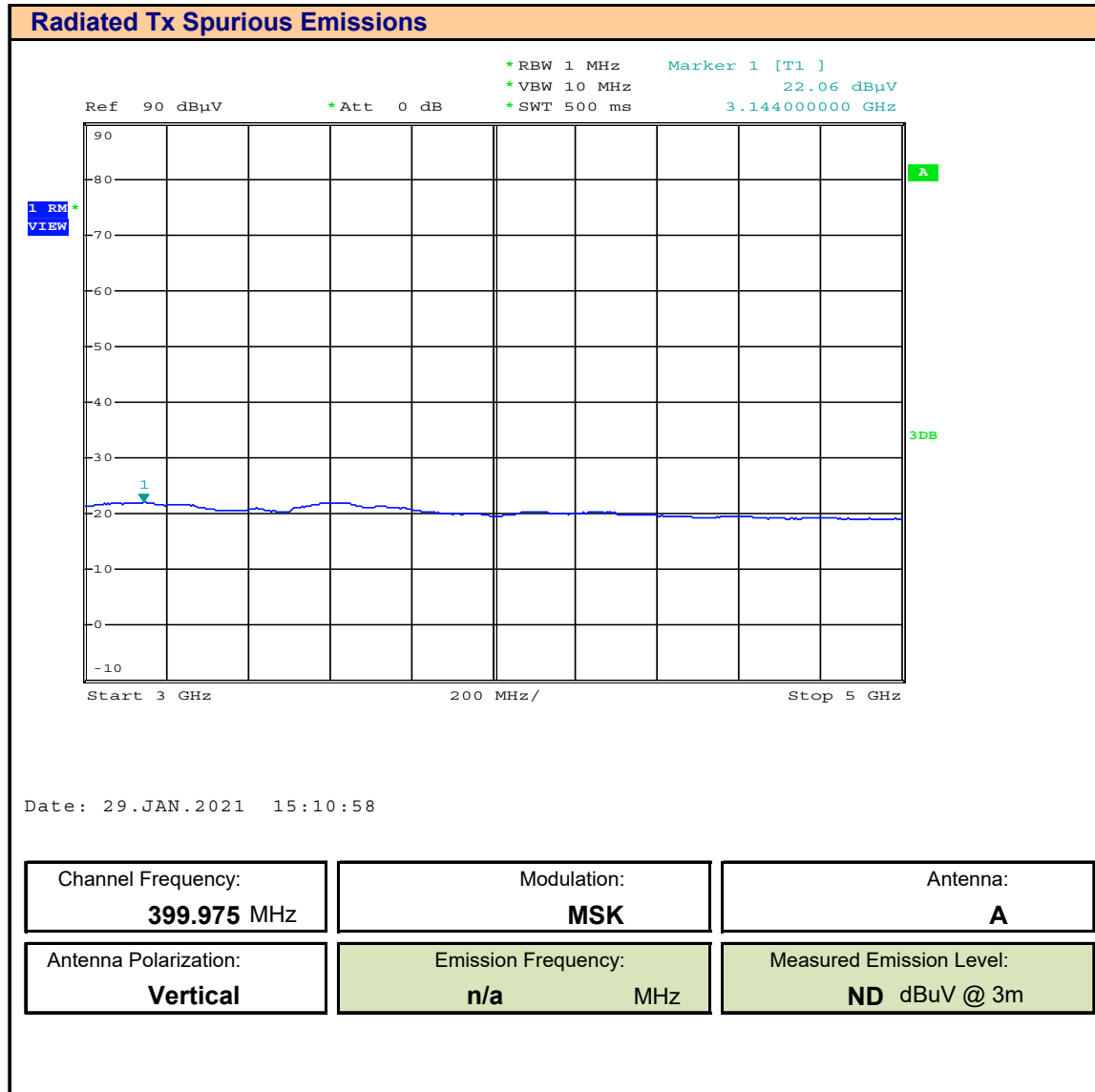
Plot 10.4 – Radiated Spurious Emissions, Antenna A, 1 – 3GHz, Vertical



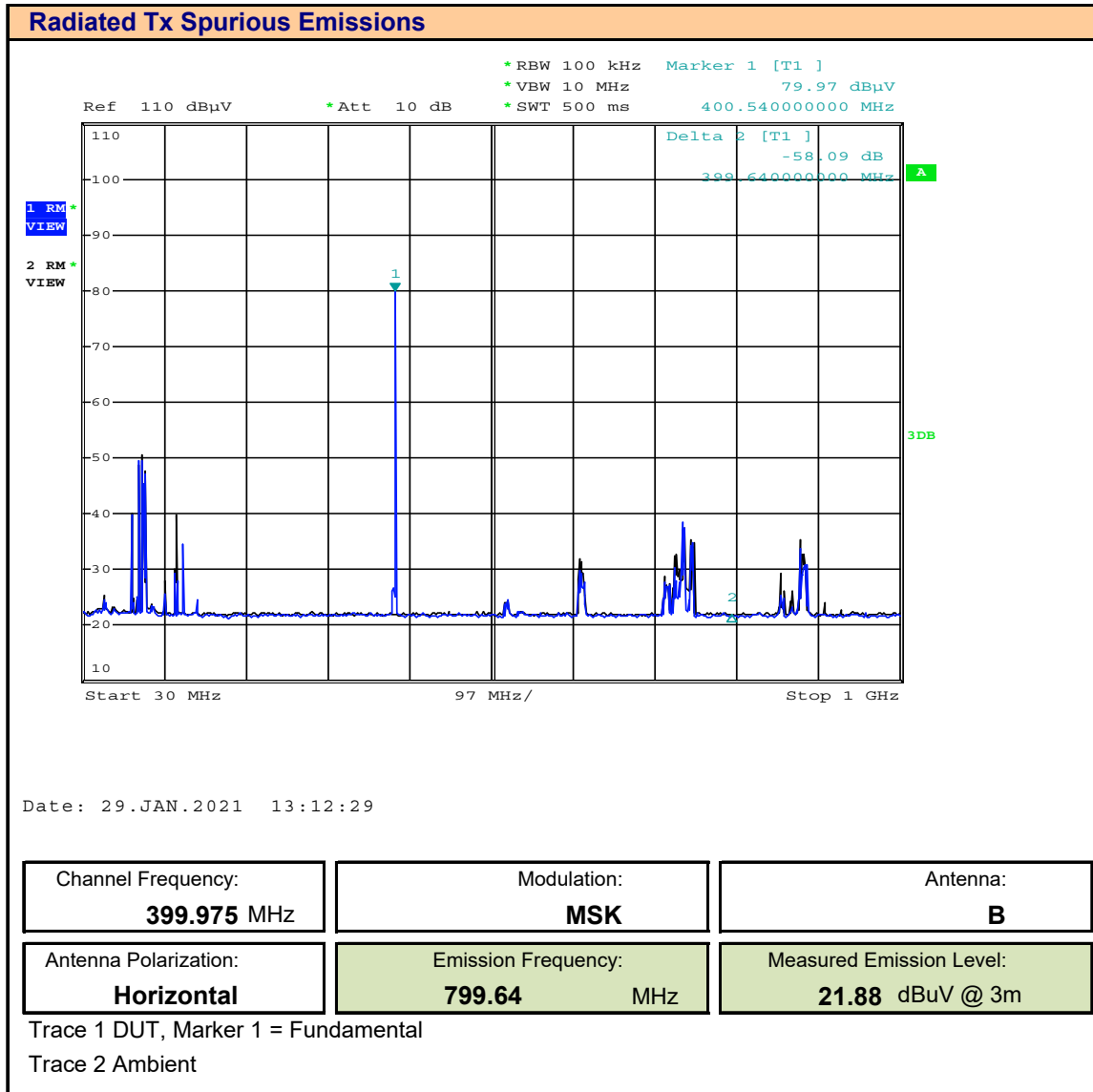
Plot 10.5 – Radiated Spurious Emissions, Antenna A, 3 - 5GHz, Horizontal



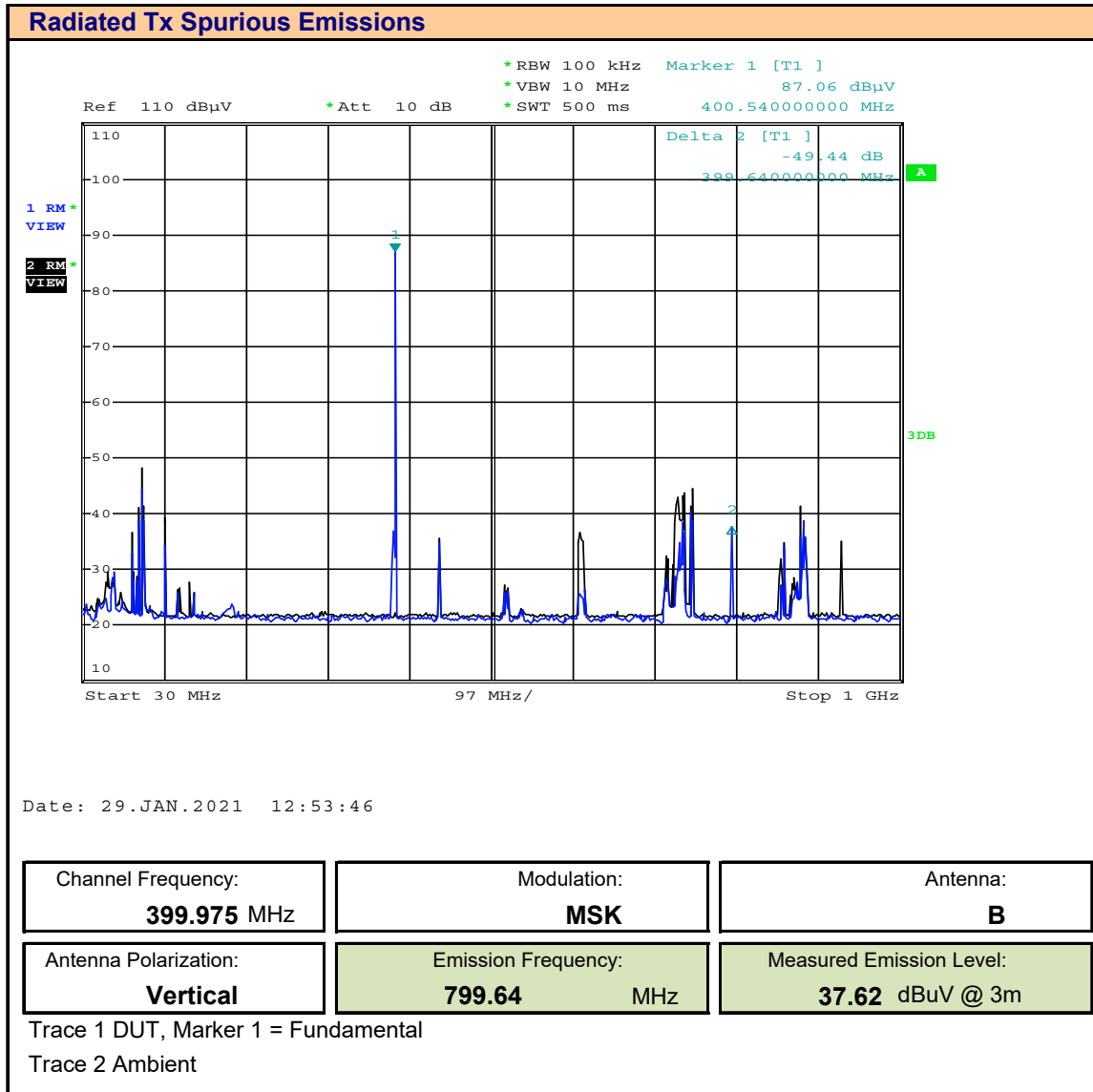
Plot 10.6 – Radiated Spurious Emissions, Antenna A, 3 – 5GHz, Vertical



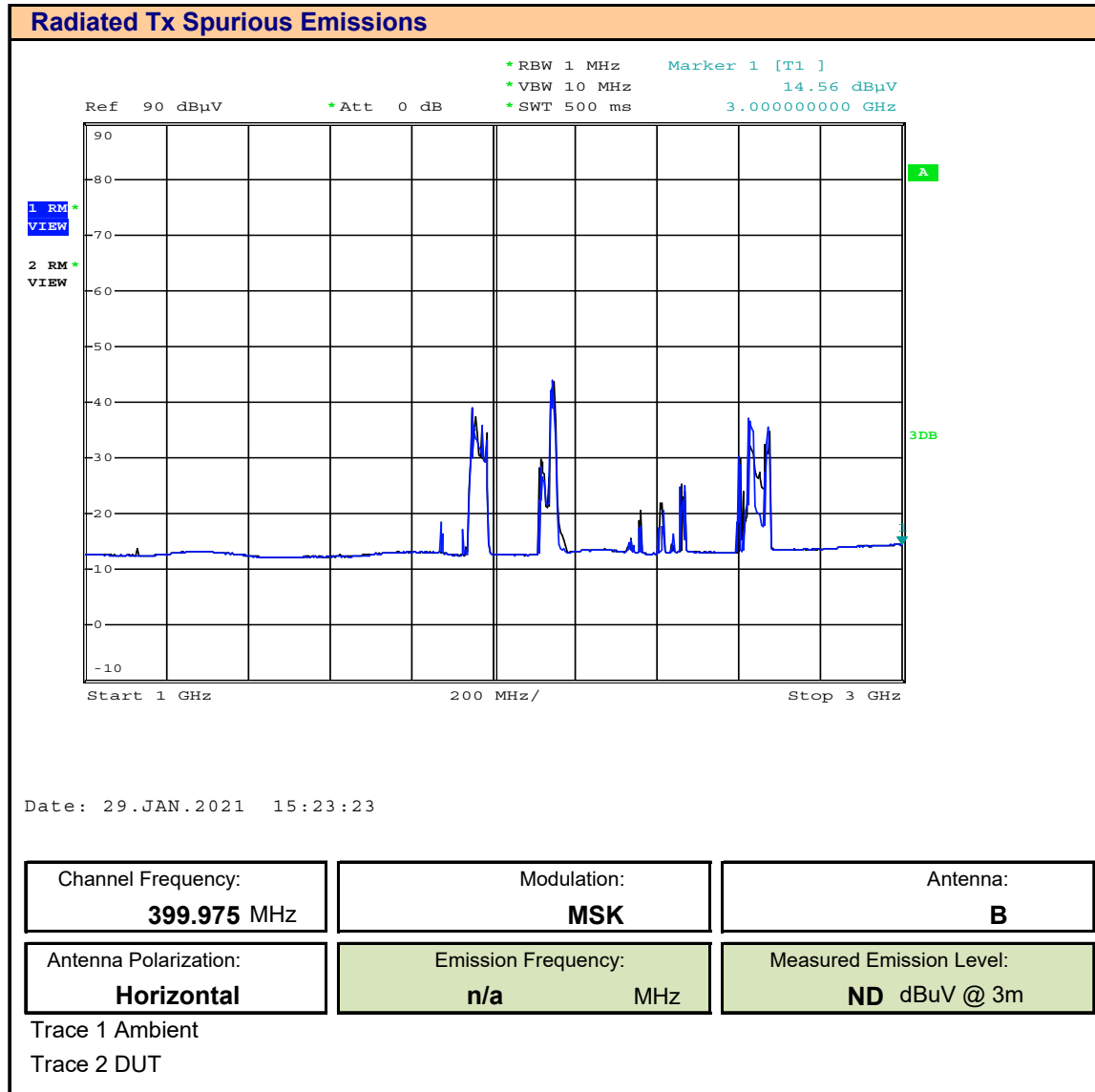
Plot 10.7 – Radiated Spurious Emissions, Antenna B, 30 – 1000MHz, Horizontal



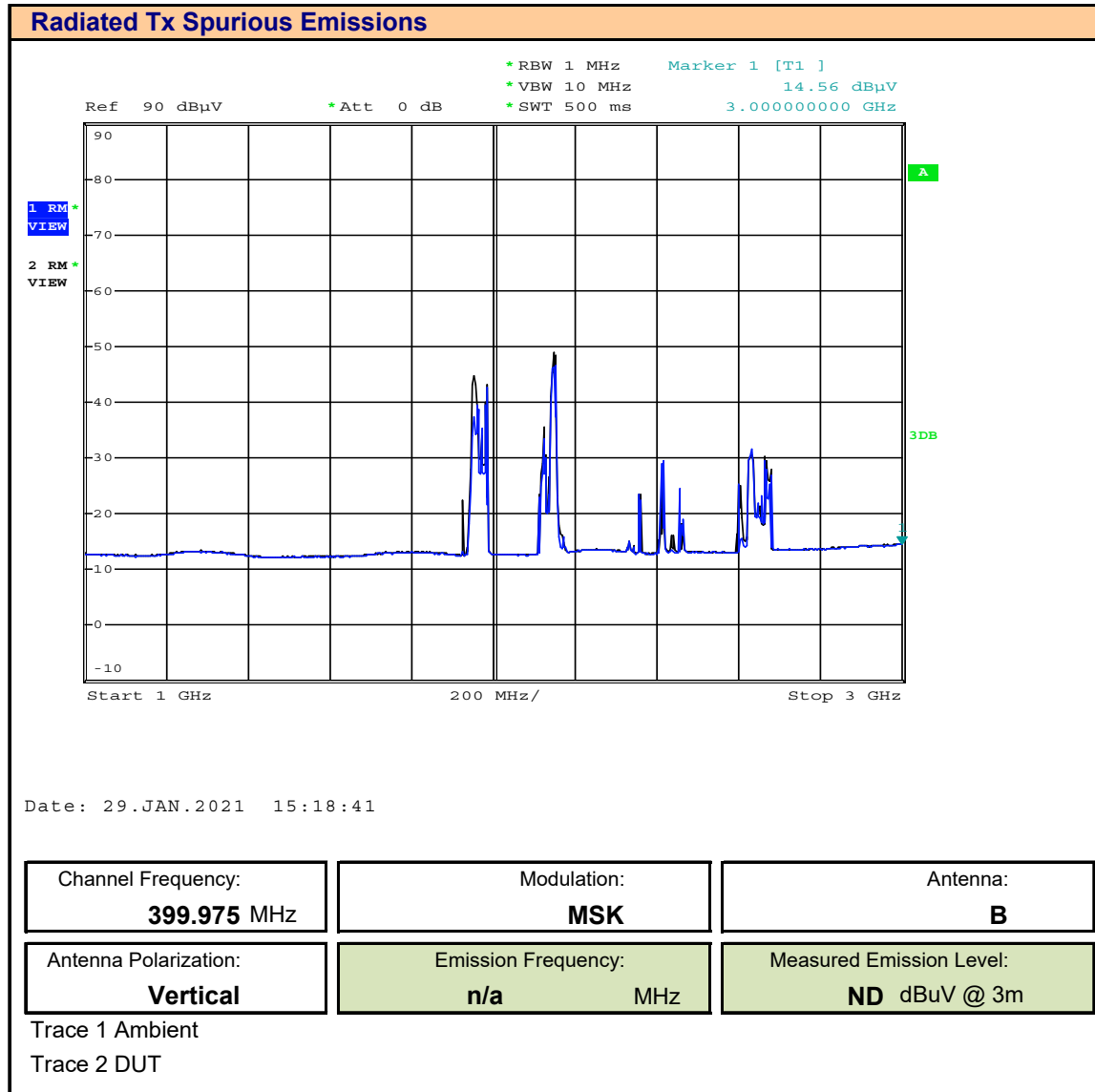
Plot 10.8 – Radiated Spurious Emissions, Antenna B, 30 – 1000MHz, Vertical



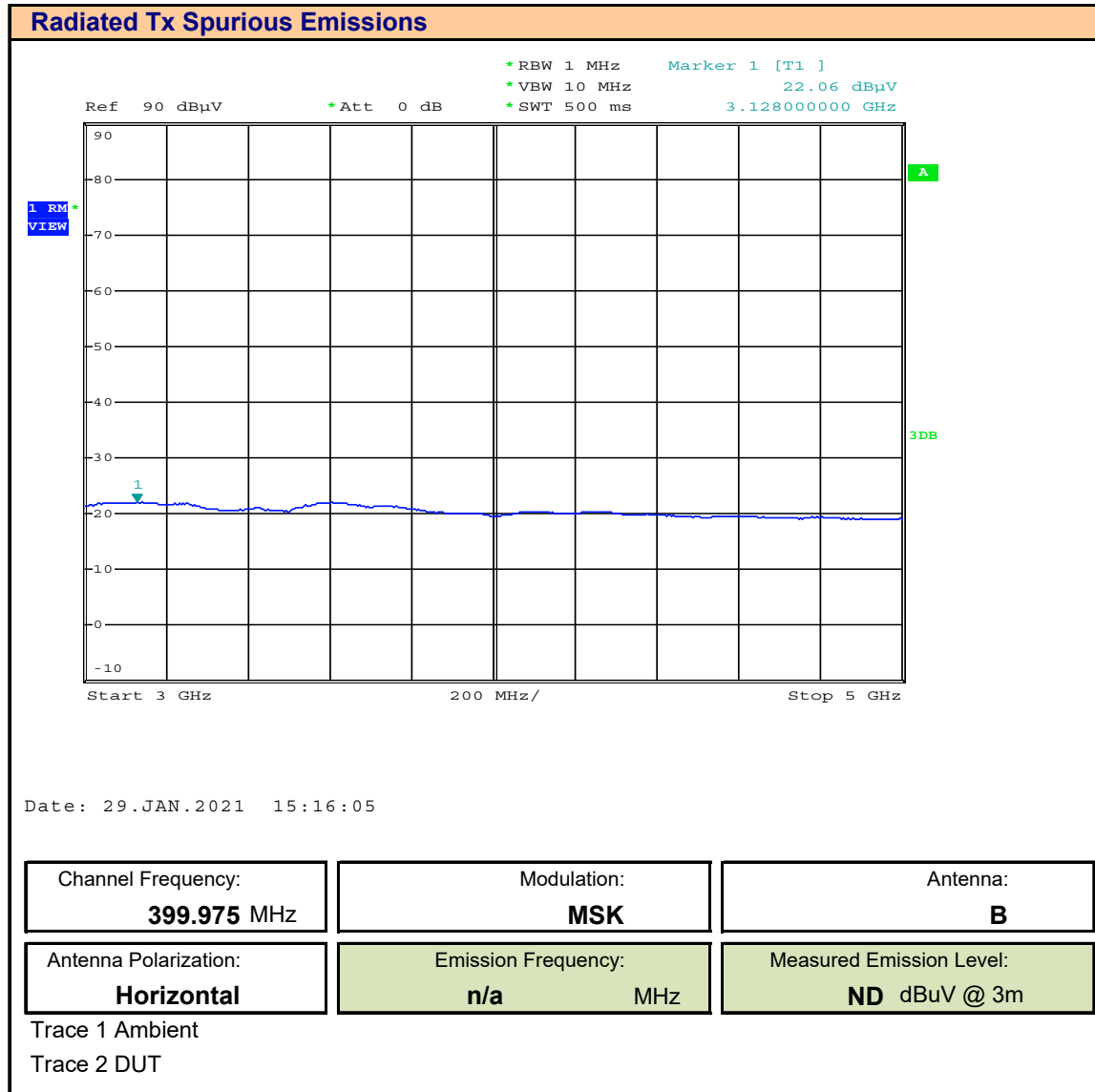
Plot 10.9 – Radiated Spurious Emissions, Antenna B, 1 – 3GHz, Horizontal



Plot 10.10 – Radiated Spurious Emissions, Antenna B, 1 – 3GHz, Vertical



Plot 10.11 – Radiated Spurious Emissions, Antenna B, 3 - 5GHz, Horizontal



Plot 10.12 – Radiated Spurious Emissions, Antenna B, 3 – 5GHz, Vertical

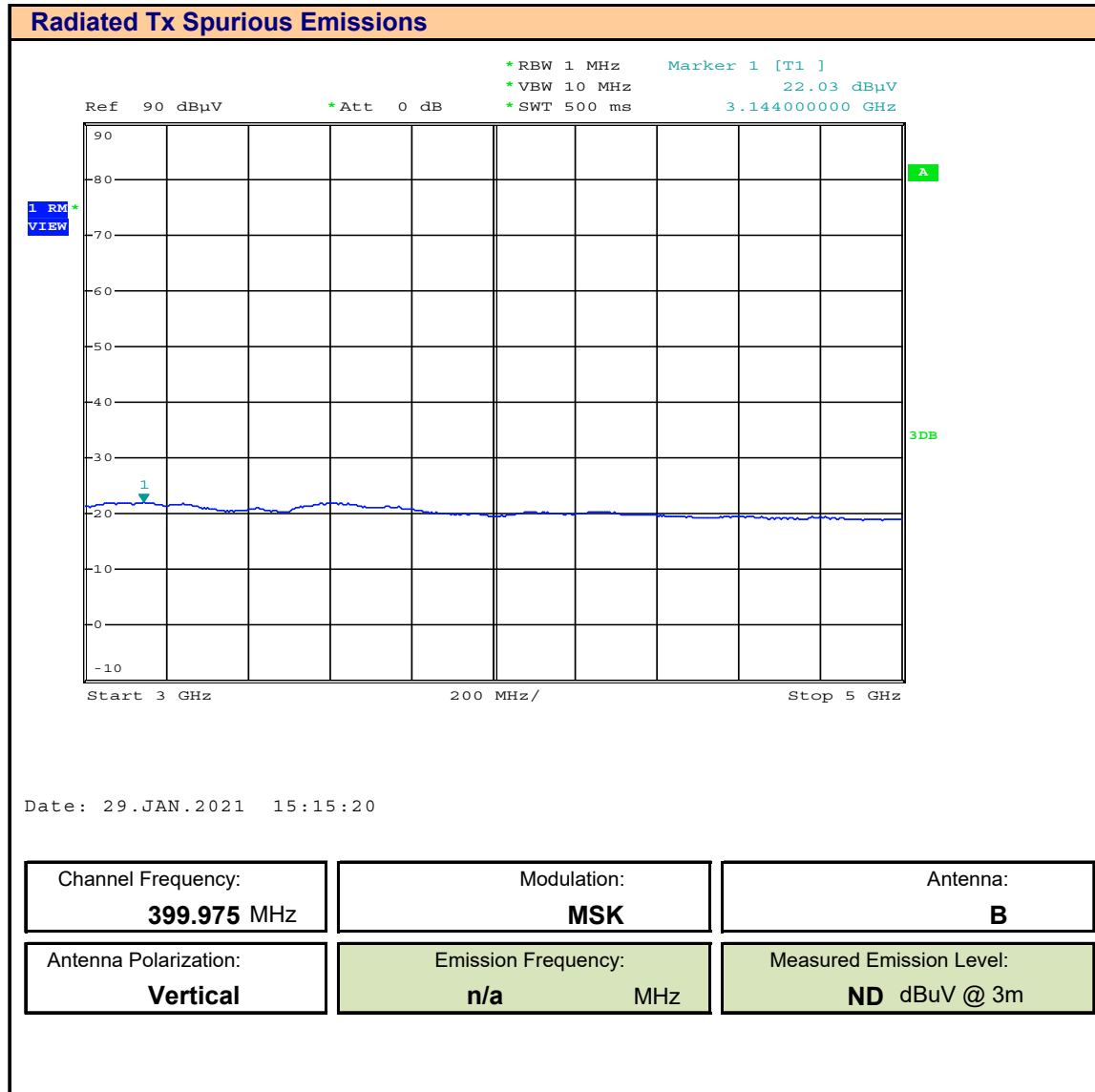


Table 10.1 – Summary of Radiated Spurious Emissions

Radiated Tx Spurious Emissions								
Channel Frequency (MHz)	Emission Frequency (MHz)	Modulation	DUT Antenna	Receive Antenna Polarization	Measured Emission (dBuV)	Attenuation (dBc)	Required Attenuation [A _A] (dBc)	Margin (dBm)
399.975	799.95	MSK	A	Horizontal	42.32	47.59	43.00	4.59
399.975	799.95	MSK	A	Vertica	37.62	49.44	43.00	6.44
399.975	799.95	MSK	B	Horizontal	42.32	58.09	43.00	15.09
399.975	799.95	MSK	B	Vertica	37.62	49.49	43.00	6.49

Negative Margin (-) = Fail

11.0 FREQUENCY STABILITY

Test Conditions

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

Appendix A	Figure A.7
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Table 11.1 – Summary of Frequency Stability Results, FCC §25.202

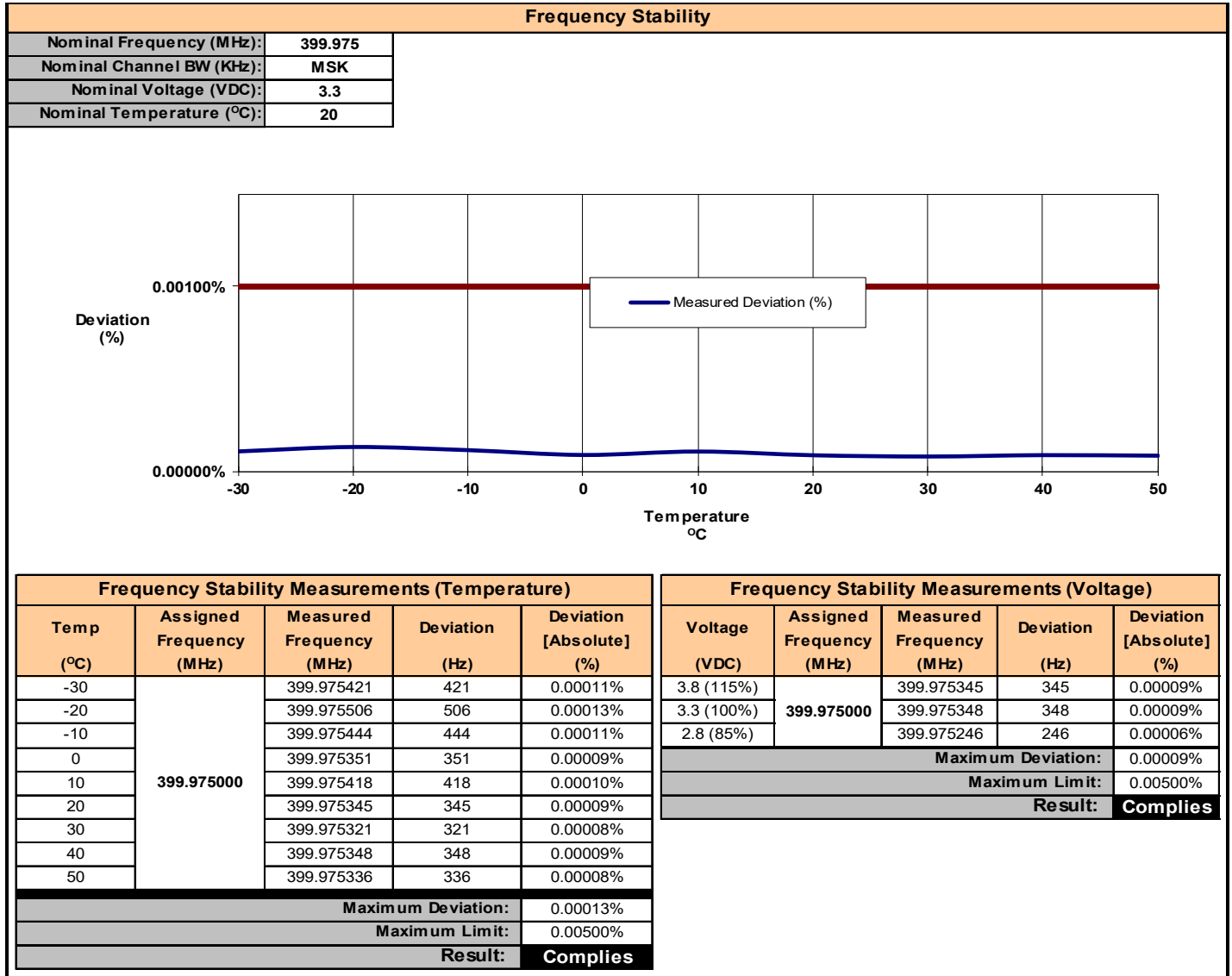
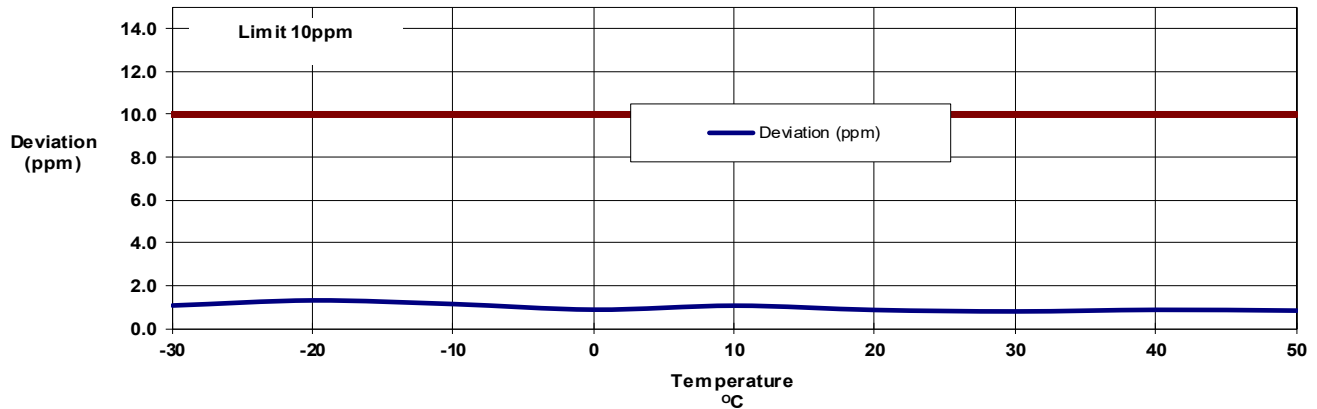


Table 11.2 – Summary of Frequency Stability Results, RSS-170 5.2

Frequency Stability

Nominal Frequency (MHz):	399.975
Nominal Channel BW (KHz):	MSK
Nominal Voltage (VDC):	3.3
Nominal Temperature (°C):	20



Frequency Stability Measurements (Temperature)				
Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation [Absolute] (ppm)
-30	399.975000	399.975421	421	1.05
-20		399.975506	506	1.27
-10		399.975444	444	1.11
0		399.975351	351	0.88
10		399.975418	418	1.05
20		399.975345	345	0.86
30		399.975321	321	0.80
40		399.975348	348	0.87
50		399.975336	336	0.84
Maximum Deviation:				1.27
Maximum Limit:				50.00
Result:				Complies

Frequency Stability Measurements (Voltage)				
Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Deviation (Hz)	Deviation [Absolute] (ppm)
3.8 (115%)	399.975000	399.975345	345	0.86
3.3 (100%)		399.975348	348	0.87
2.8 (85%)		399.975246	246	0.62
Maximum Deviation:				0.87
Maximum Limit:				50.00
Result:				Complies

This is a battery powered device.
Test performed with fully charged battery.

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

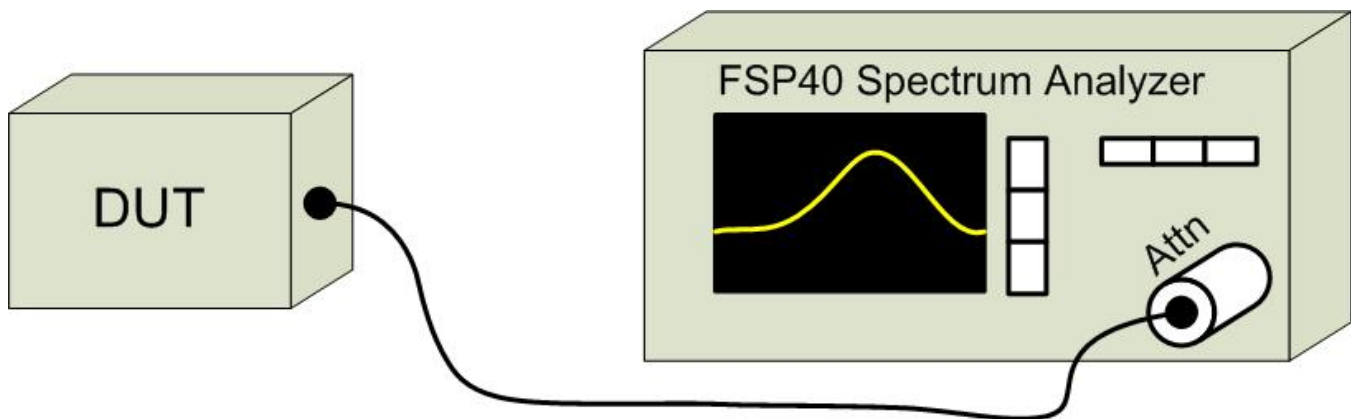


Table A.2 – Setup - Radiated Emissions Equipment

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 9kHz – 30MHz

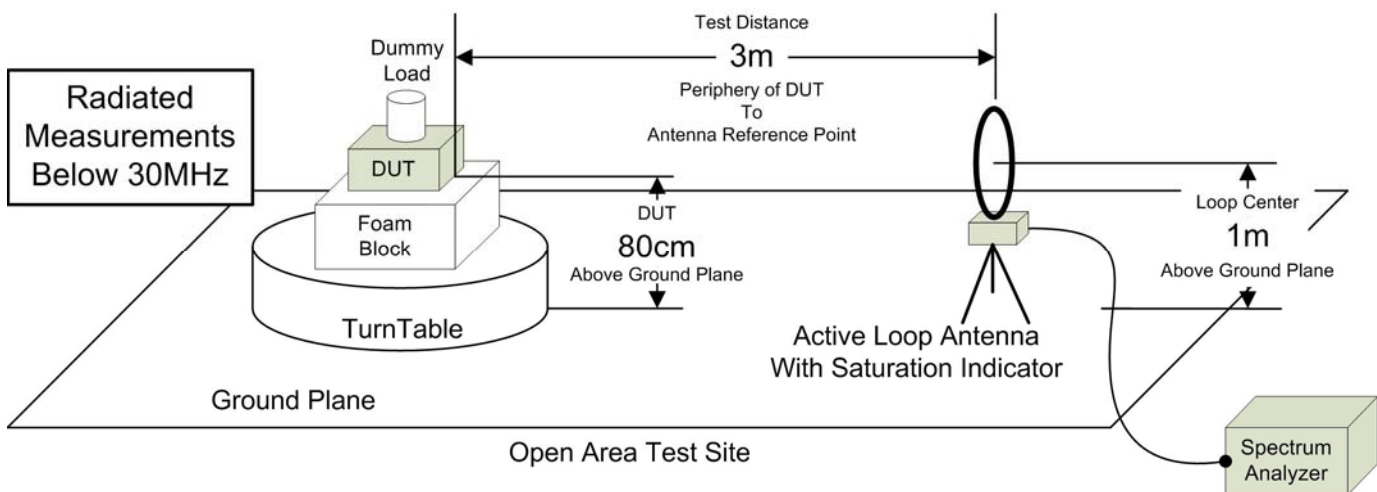


Figure A.3 – Test Setup Radiated Emissions Measurements 30 – 1000MHz

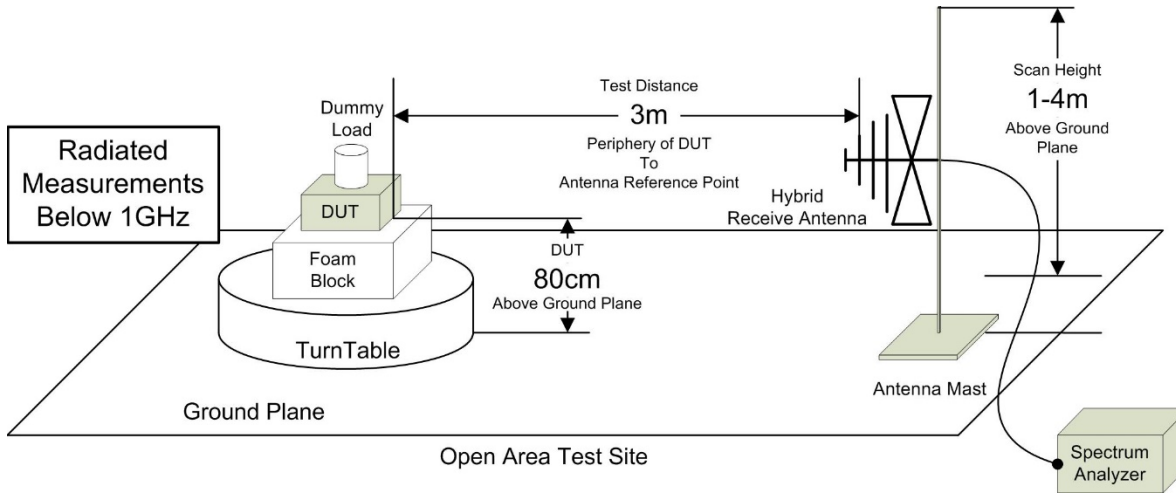


Figure A.4 – Test Setup Radiated Emissions Measurements 30 – 1000MHz w/ Signal Substitution

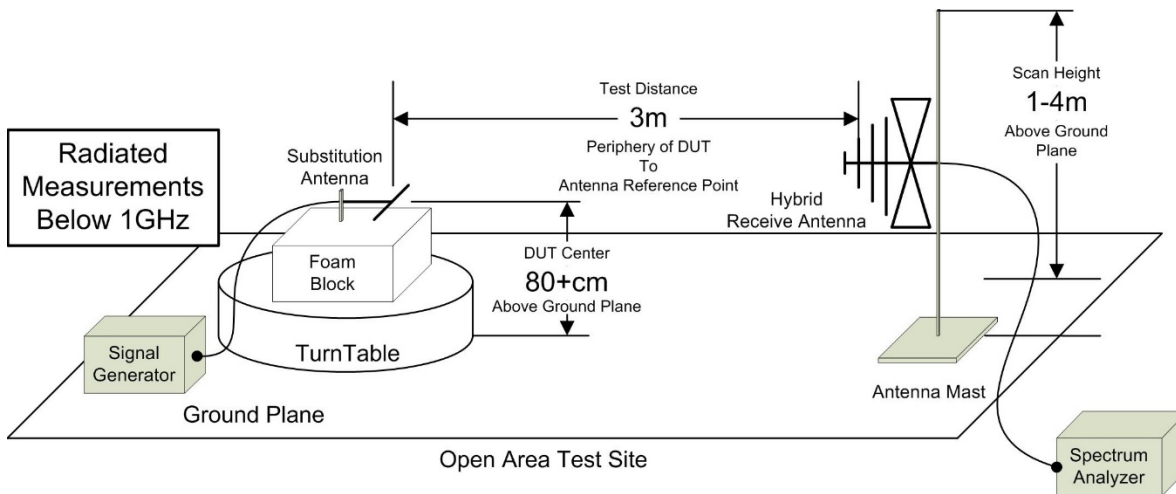


Figure A.5 – Test Setup Radiated Emissions Measurements 1 – 18GHz

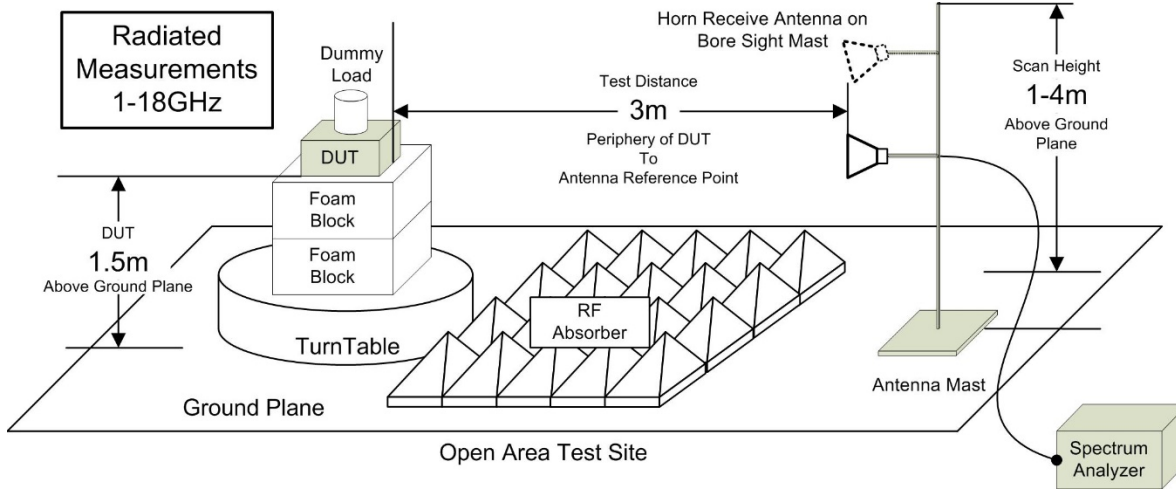


Figure A.6 – Test Setup Radiated Emissions Measurements > 18GHz

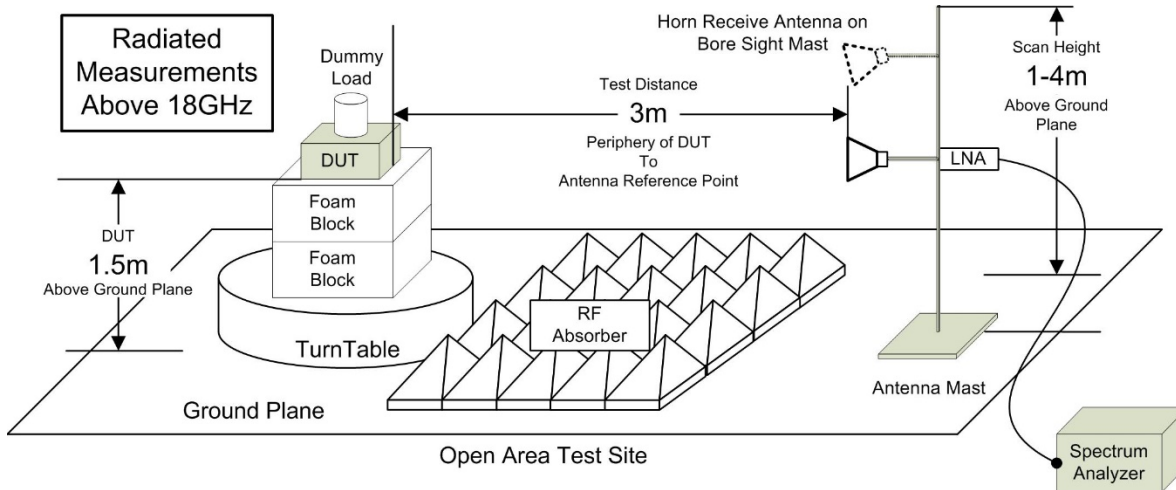
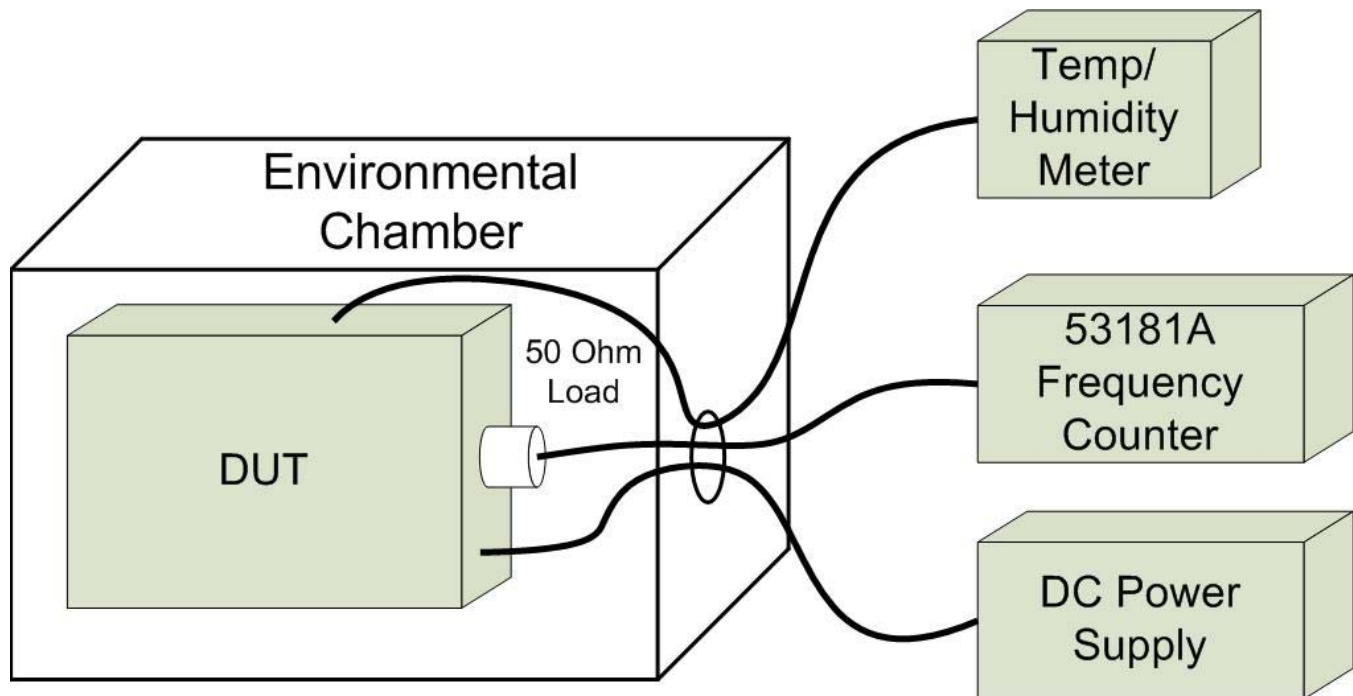


Table A.3 – Setup - Frequency Stability Measurement Equipment

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.7 – 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
00333	HP	85685A	3010A01095	RF Preselector	23 Jun 2020	Triennial	30 Jun 2023
00049	HP	85650A	2043A00162	Quasi-peak Adapter	23 Jun 2020	Triennial	23 Jun 2023
00051	HP	8566B	2747A05510	Spectrum Analyzer	23 Jun 2020	Triennial	23 Jun 2023
00241	R&S	FSU40	100500	Spectrum Analyzer	15 May 2018	Triennial	15 May 2021
00005	HP	8648D	3847A00611	Signal Generator	23 Jun 2020	Triennial	23 Jun 2023
00003	HP	53181A	3736A05175	Frequency Counter	23 Jun 2020	Triennial	23 Jun 2023
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
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
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

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 $k=2$

Radiated Emissions 30MHz - 200MHz

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

Radiated Emissions 200MHz - 1000MHz

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

Radiated Emissions 1GHz - 6GHz

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

Radiated Emissions 6GHz - 18GHz

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

Power Line Conducted Emissions 9kHz to 150kHz

$$U_{LAB} = 2.96\text{dB} \quad U_{CISPR} = 3.8\text{dB}$$

Power Line Conducted Emissions 150kHz to 30MHz

$$U_{LAB} = 3.12\text{dB} \quad U_{CISPR} = 3.4\text{dB}$$

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 |

Other Measurement Uncertainties (U_{LAB})

RF Conducted Emissions 9kHz - 40GHz

$$U_{LAB} = 1.0\text{dB} \quad U_{CISPR} = \text{n/a}$$

Frequency/Bandwidth 9kHz - 40GHz

$$U_{LAB} = 0.1\text{ppm} \quad U_{CISPR} = \text{n/a}$$

Temperature

$$U_{LAB} = 1^{\circ}\text{C} \quad U_{CISPR} = \text{n/a}$$

END OF REPORT