PTI Project 22234-15

RACOM s.r.o.
RipEX2-1A

Data Transceiver
135.000 to 175.000 MHz

Wireless Certification Report

FCC Part 90 and IC RSS-119

Prepared for:

RACOM s.r.o.
Mirova cp. 1283
592 31 Nove Mesto na Morave
Czech Republic

By

Professional Testing (EMI), Inc.
1601 North A.W. Grimes Blvd., Suite B
Round Rock, Texas 78665

23 Apr 2021

Reviewed by

Larry Finn
Chief Technical Officer

Written by

Eric Lifsey
EMC Engineer

Revision History

Revision Number	Description	Date
Draft 02	Added RE equipment list; fixed 0463 DMM in other equipment lists.	23 Apr 2021
Final01		14 May 2021

Corrections:

None.

Table of Contents

Certificate of Compliance

FCC MRA Designation Number: US5270
NVLAP Accreditation Number: 200062-0

Applicant	Device & Test Identification	
RACOM s.r.o. Mirova cp. 1283 592 31 Nove Mesto na Morave Czech Republic Certificate Date: 23 Apr 2021	FCC ID: IC ID: Model(s): Laboratory Project ID:	SQT-RIPEX2-1A 24993-RIPEX21A RipEX2-1A 22234-15

The device model(s) listed above were tested utilizing the following documents and found to be in compliance with the required criteria.

USA: 47 CFR FCC Canada: RSS ISED		
Parameter	**FCC Licensed Range: 150 to 170 MHz**	**ISED Licensed Range: 138 MHz to 174 MHz**
Conducted Output Power	90.210, 2.1046	RSS-119 Issue 12, 5.4
Emission Mask (C, D, E)	90.210, 2.1047	RSS-119 Issue 12, 5.8
Conducted Spurious/Harmonic Emissions at Antenna Terminals	90.210, 2.1051	RSS-119 Issue 12, 5.8; RSS-Gen Issue 4
Field Strength of Radiated Spurious/Harmonic Emissions Fundamental to 5 GHz	90.210, 15.209, 2.1053	RSS-119 Issue 12, 5.8
Transient Frequency Behavior	90.214, TIA/EIA-603-E	RSS-119 Issue 12, 5.9
Frequency Stability	90.213, 2.1055	RSS-119 Issue 12, 5.3
Modulation; Frequency Response & Limiting*	2.1047(a), (b)	
Occupied Bandwidth, 20 dB, < 11.5 kHz	90.209, 2.1049	RSS-119 Issue 12, 5.5
Radiated Emissions 30 MHz – 5 GHz	15.109	RSS-Gen Issue 5, ICES-003

*Not applicable to digital modulation.

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above rules and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

NVLAP TESTING
NVLAP LAB CODE 200062-0

Eric Lifsey
EMC Engineer

This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

_____
Representative of Applicant

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of North America.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing. The methods of ANSI C63.26 were applied unless specified otherwise in the associated agency rules and procedures.

1.2 EUT Description

Table 1.2.1 Equipment Under Test	
Manufacturer & Model	**Basic Properties**
RACOM s.r.o. Model RipEX2-1A Serial Numbers: 1901665415, 1901665515	Dimensions 218 x 126 x 68 mm. Typically rack mounted. Requires professional installation. Powered externally 10 to 30 VDC.

Table 1.2.2: EUT RF Specifications	
Power Output to Antenna	+40 dBm Maximum
Frequency Range	135 to 175 MHz, for localized licensed channels.
Channel Bandwidths Supported (kHz)	25, 12.5, 6.25
Modulation Methods Supported	2CPFSK pi/4DQPSK D8PSK 16DEQAM 64QAM 256QAM
Declaration of Minimum Baud Rate for Spectrum Efficiency	This equipment is capable of supporting a minimum data rate of 4800 bits per second per 6.25 kHz of channel bandwidth.

Table 1.2.3 Antenna Description
Antenna system provided at installation time.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

Table 1.3.1 Operating Frequency/Range* (Only for licensed frequencies per localized regulations.)			
Lowest Frequency	**Center Frequency**	**Highest Frequency**	**Total Frequency Range**
135.000 MHz	155.000 MHz	175.000 MHz	40 MHz
The three channels were tested per customary practice for a frequency range exceeding 10 MHz.			

*All references to bottom/low, middle/center/nominal, and top/high channels are from this table unless otherwise specified.

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

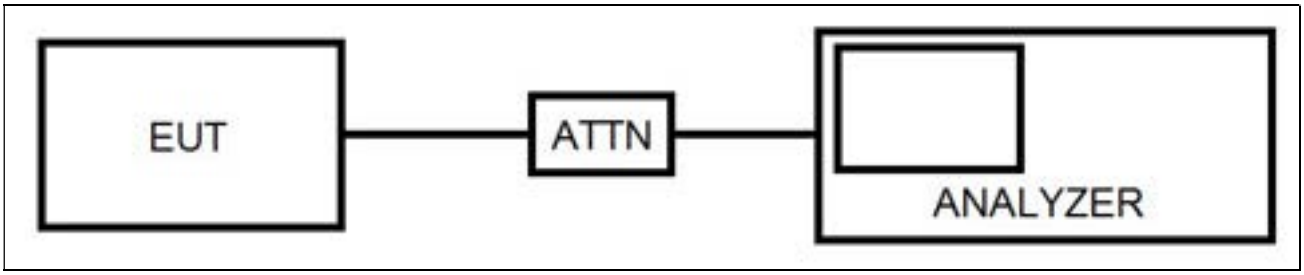
1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-Gen, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

1.6 Applicable Documents

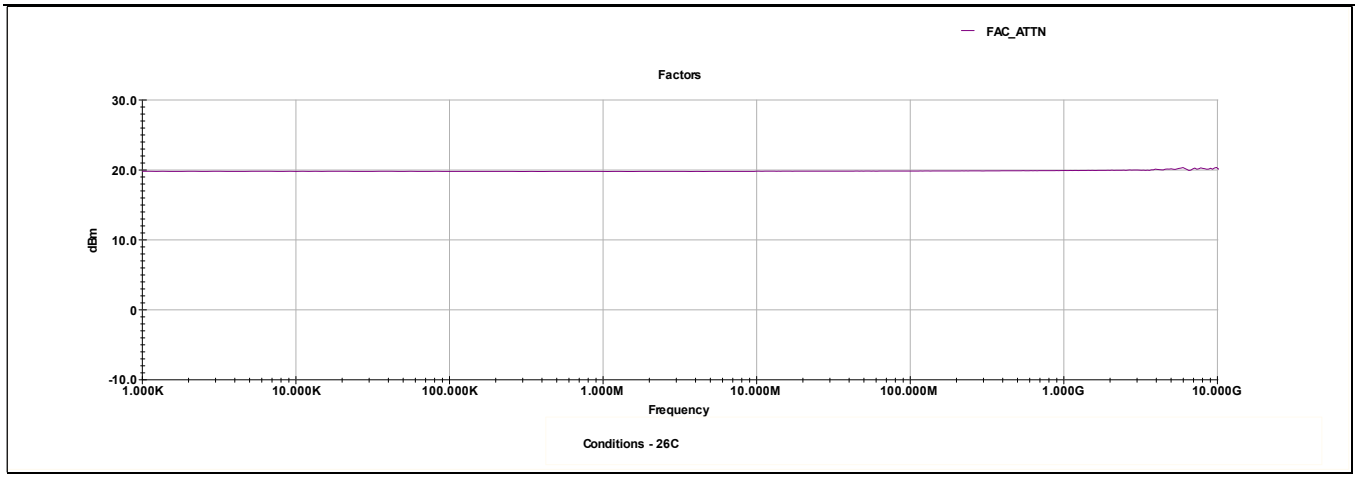
Table 1.6.1: Applicable Documents		
Document #	**Title/Description**	**Date**
47 CFR	FCC Part 90	
IC RSS-119 Issue 12	Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz	2015
IC RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus	2019
TIA/EIA-603-E	Land Mobile FM or PM – Communications Equipment – Measurement and Performance Standards	2016
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services;	2015

1.7 Test Setup Diagram



Setup for Conducted Port Measurements
Power, Mask, Spurious, Bandwidth

External fixed attenuation is employed to protect the spectrum analyzer from overload damage. The attenuation factor is applied automatically in software and is graphically represented by that software below.



Attenuator Factor vs Frequency
Asset Number A105
20 dB 20 W Narda Attenuator

1.8 Emission Designators

The following designators are to be listed on the agency approval grant/certificate.

USA				
Frequency Range (MHz)	**Output Power (Watts)**	**Frequency Tolerance (HZ)**	**Emission Designator**	**Channel Spacing (kHz)**
150 to 170	10	66	19K3G1D, 15K6F1D	25
	10	66	9K63G1D, 7K73F1D	12.5
	10	66	4K86G1D, 3K08F1D	6.25

Canada				
Frequency Range (MHz)	**Output Power (Watts)**	**Frequency Tolerance (HZ)**	**Emission Designator**	**Channel Spacing (kHz)**
138 to 174	10	66	19K3G1D, 15K6F1D	25
	10	66	9K63G1D, 7K73F1D	12.5
	10	66	4K86G1D, 3K08F1D	6.25

Conducted Output Power

1.9 Procedure

The EUT is placed into continuous transmit mode without modulation for peak power measurement.

1.10 Criteria

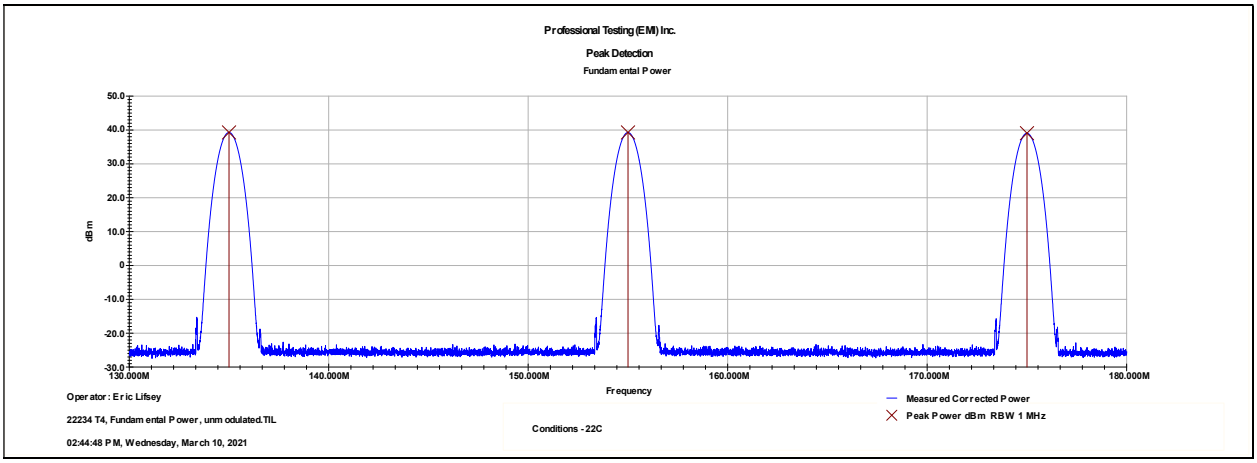
Parameter	Section Reference	Date
Conducted Output Power	90.210, 2.1046 | RSS-119 Issue 12, 5.4	10 Mar 2021

1.11 Results

The EUT satisfied the requirement.

Setup per section 1.7.

Table 2.3.1 Power, Peak, Conducted, Unmodulated		
Frequency (MHz)	**Power (dBm)**	**Power (W)**
135	39.3	8.51
155	39.2	8.32
175	39.0	7.94



Corrected Measured Power

1.12 Calculated Attenuation and Spurious Limits Beyond Authorized Bandwidth

Table 2.4.1 Attenuation and Limits Beyond Authorized Bandwidth Limit(dBm) = Fundamental_Power(dBm) – Attenuation(dB) Fundamental Power = 10 W		
Paragraph/Mask & BW Reference	**Calculated Attenuation dB**	**Calculated Spurious Limit dBm**
90.210(c) 25 kHz	43 + 10 Log_{10}(10 W) = 53 dB	40 – 53 dB = -13
90.210(d) 12.5 kHz	50 + 10 Log_{10}(10 W) = 60 dB	40 – 60 dB = -20
90.210(e) 6.25 kHz	55 + 10 Log_{10}(10 W) = 65 dB	40 – 65 dB = -25

2.0 Emission Mask

2.1 Procedure

Emissions are measured using peak detection with the mask superimposed on the graph.

2.2 Criteria

Parameter	Section Number	Date
Emissions at Antenna Terminals	90.210, 2.1047| RSS-119 Issue 12, 5.8	(4 & 10) Mar 2021

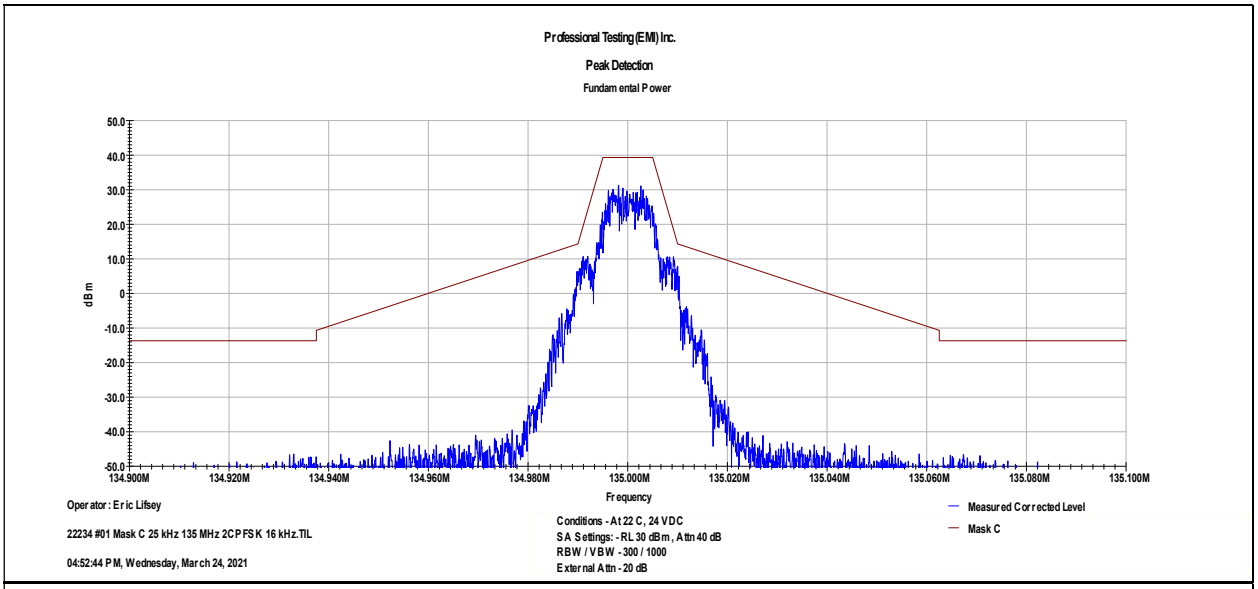
2.3 Results

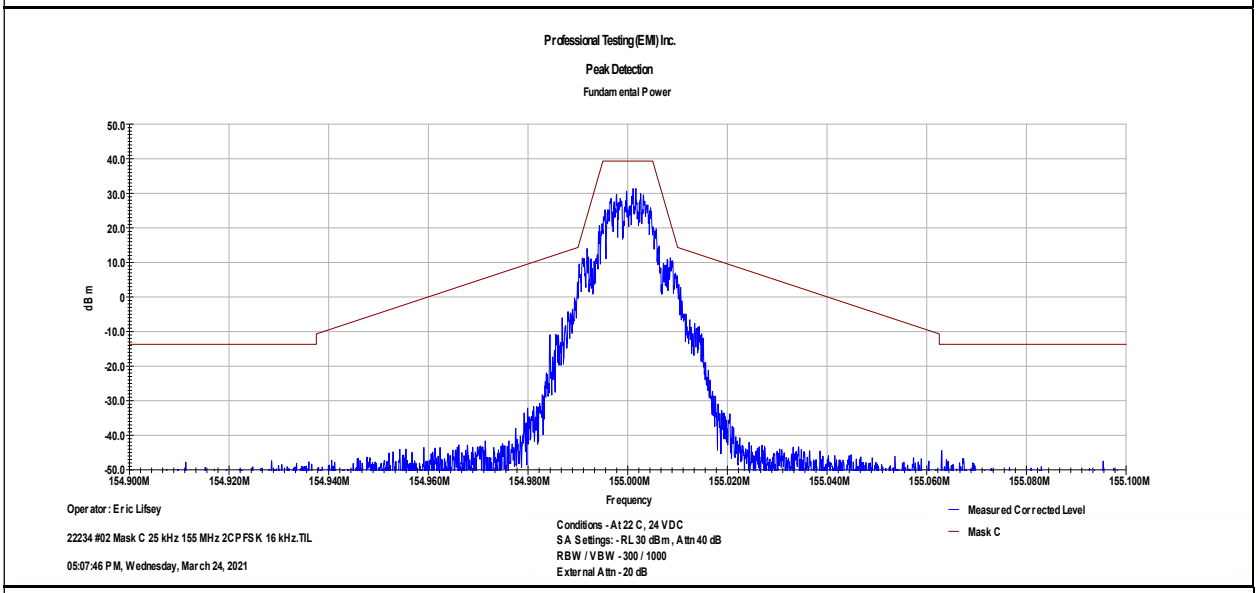
The EUT satisfied the requirement.

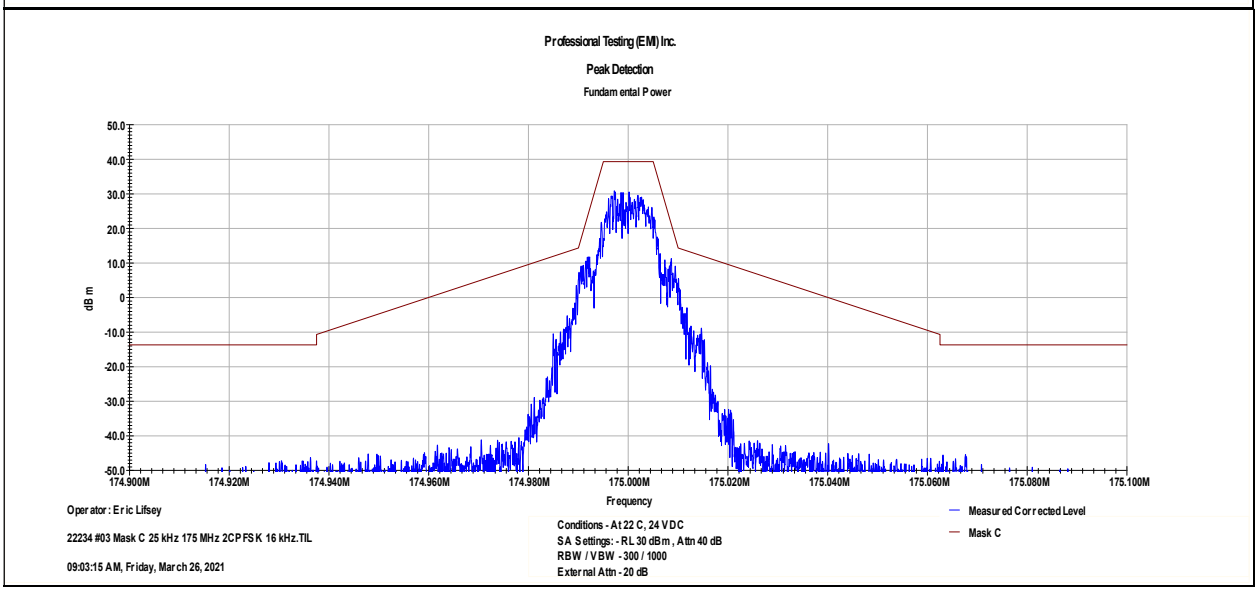
Setup per section 1.7.

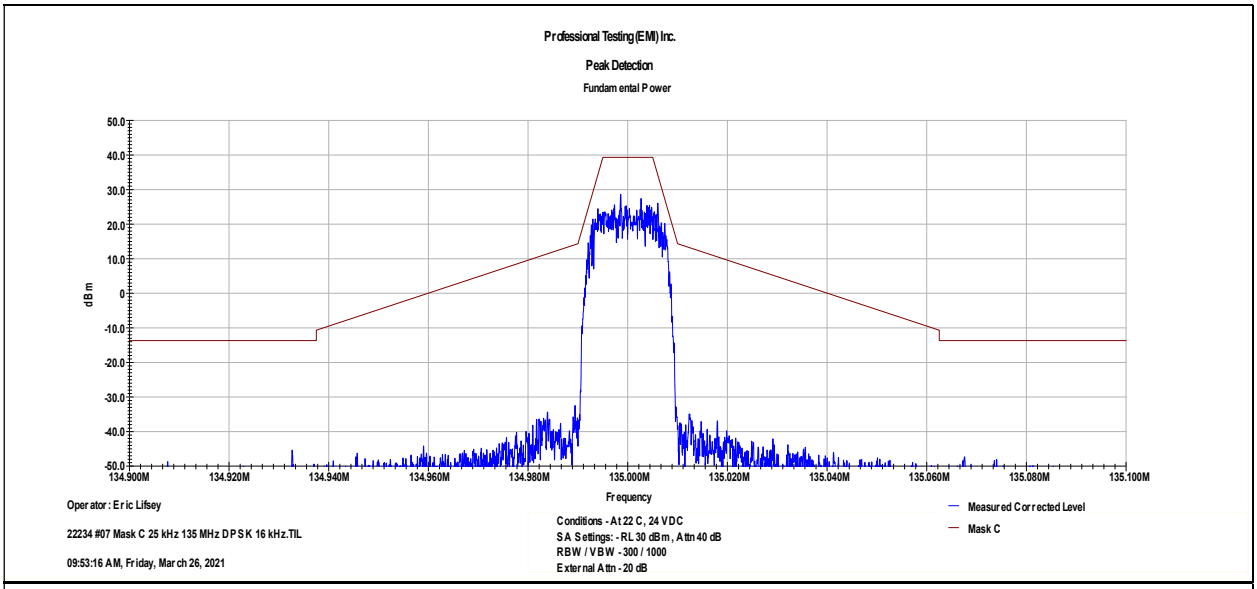
Table 3.3.1 Summary of Modulation Settings As noted on each graph.
2CPFSK
DPSK
pi/4DQPSK
D8PSK
16DEQAM
64QAM
256QAM

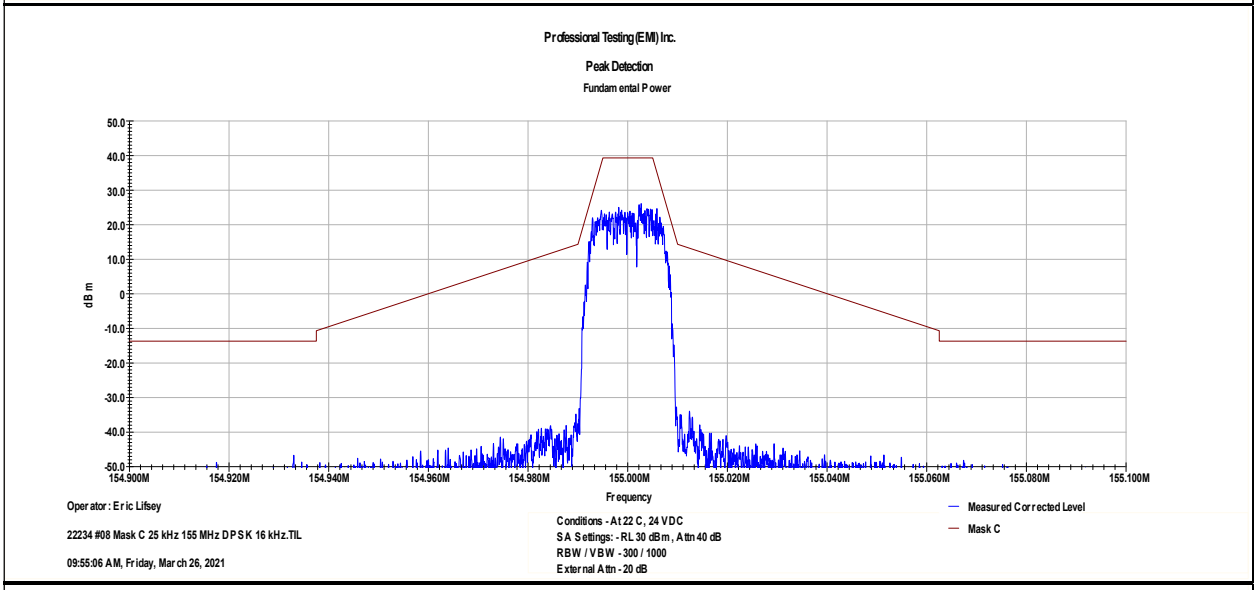
2.3.1 Mask C

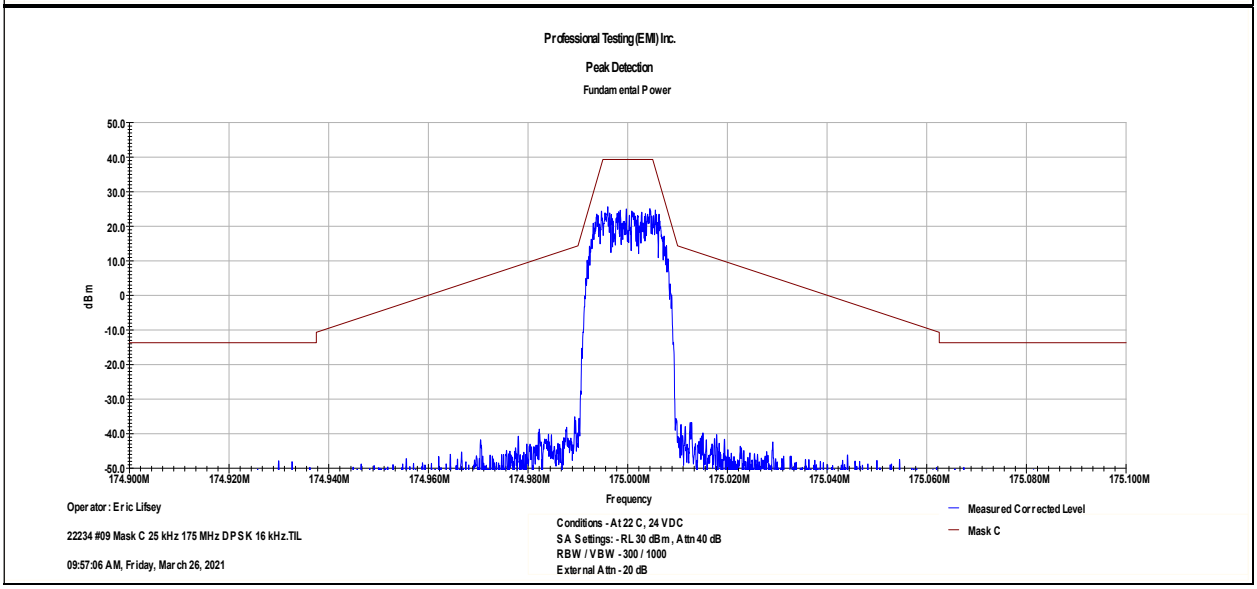

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.900M
134.920M
134.940M
134.960M
134.980M
135.000M
135.020M
135.040M
135.060M
135.080M
135.100M
Frequency
Operator: Eric Lifsey
22234 #01 Mask C 25 kHz 135 MHz 2CPFSK 16 kHz.TIL
04:52:44 PM, Wednesday, March 24, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

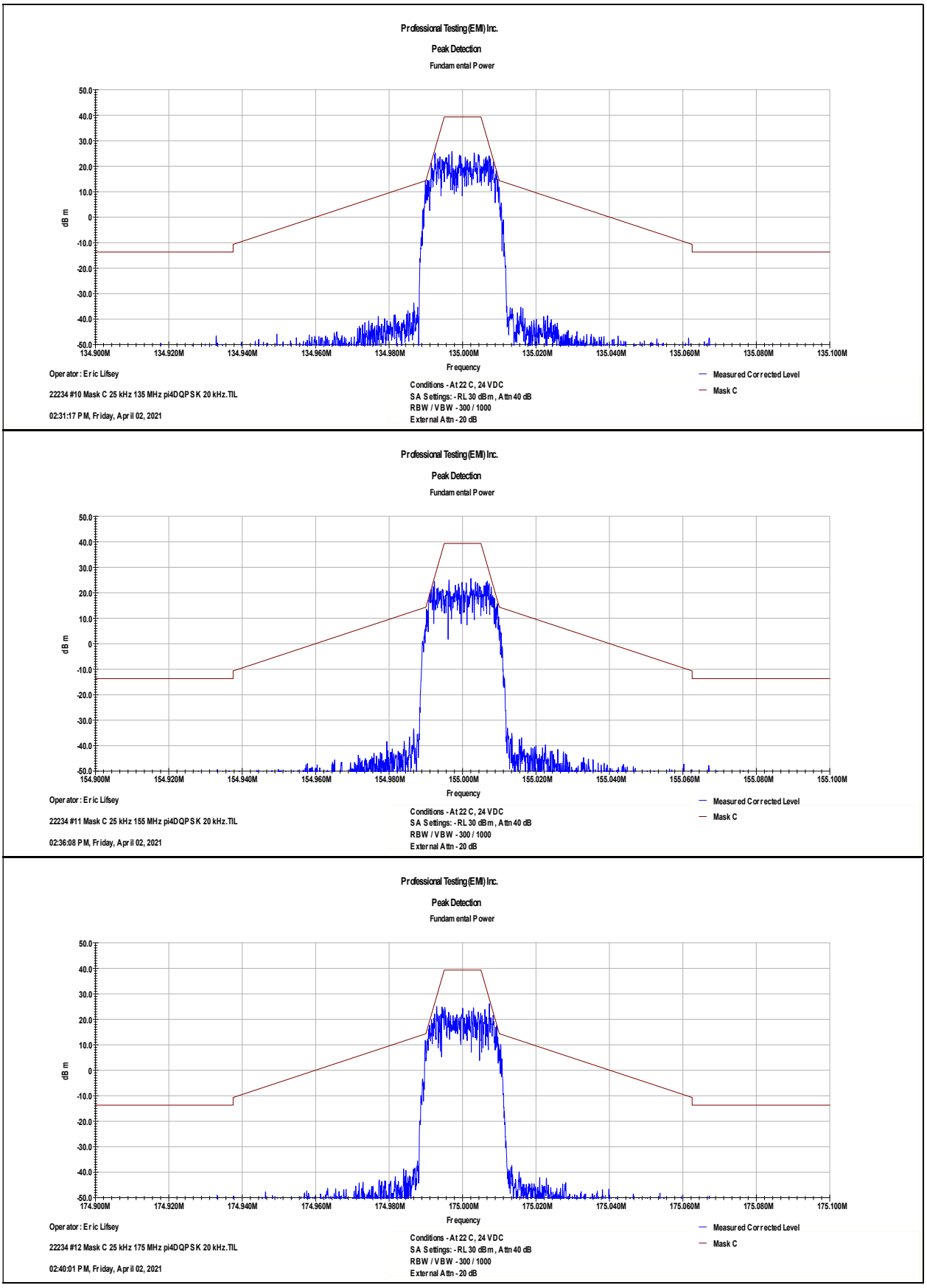

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.900M
154.920M
154.940M
154.960M
154.980M
155.000M
155.020M
155.040M
155.060M
155.080M
155.100M
Frequency
Operator: Eric Lifsey
22234 #02 Mask C 25 kHz 155 MHz 2CPFSK 16 kHz.TIL
05:07:46 PM, Wednesday, March 24, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

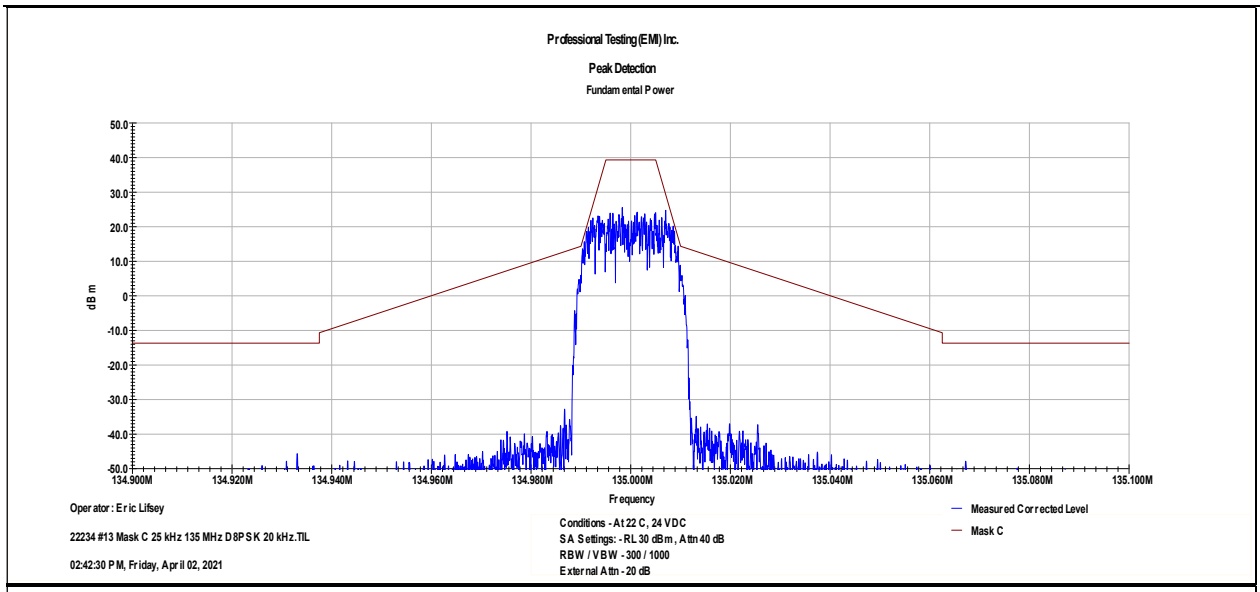

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.900M
174.920M
174.940M
174.960M
174.980M
175.000M
175.020M
175.040M
175.060M
175.080M
175.100M
Frequency
Operator: Eric Lifsey
22234 #03 Mask C 25 kHz 175 MHz 2CPFSK 16 kHz.TIL
09:03:15 AM, Friday, March 26, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.900M
134.920M
134.940M
134.960M
134.980M
135.000M
135.020M
135.040M
135.060M
135.080M
135.100M
Frequency
Operator: Eric Lifsey
22234 #07 Mask C 25 kHz 135 MHz DPSK 16 kHz.TIL
09:53:16 AM, Friday, March 26, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.900M
154.920M
154.940M
154.960M
154.980M
155.000M
155.020M
155.040M
155.060M
155.080M
155.100M
Frequency
Operator: Eric Lifsey
22234 #08 Mask C 25 kHz 155 MHz DPSK 16 kHz.TIL
09:55:06 AM, Friday, March 26, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.900M
174.920M
174.940M
174.960M
174.980M
175.000M
175.020M
175.040M
175.060M
175.080M
175.100M
Frequency
Operator: Eric Lifsey
22234 #09 Mask C 25 kHz 175 MHz DPSK 16 kHz.TIL
09:57:06 AM, Friday, March 26, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.900M
134.920M
134.940M
134.960M
134.980M
135.000M
135.020M
135.040M
135.060M
135.080M
135.100M
Frequency
Operator: Eric Lifsey
22234 #10 Mask C 25 kHz 135 MHz pi4DQPSK 20 kHz.TIL
02:31:17 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C
Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
154.900M
154.920M
154.940M
154.960M
154.980M
155.000M
155.020M
155.040M
155.060M
155.080M
155.100M
Frequency
Operator: Eric Lifsey
22234 #11 Mask C 25 kHz 155 MHz pi4DQPSK 20 kHz.TIL
02:36:08 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C
Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
174.900M
174.920M
174.940M
174.960M
174.980M
175.000M
175.020M
175.040M
175.060M
175.080M
175.100M
Frequency
Operator: Eric Lifsey
22234 #12 Mask C 25 kHz 175 MHz pi4DQPSK 20 kHz.TIL
02:40:01 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
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30.0
20.0
10.0
0
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-30.0
-40.0
-50.0
134.900M
134.920M
134.940M
134.960M
134.980M
135.000M
135.020M
135.040M
135.060M
135.080M
135.100M
Frequency
Operator: Eric Lifsey
22234 #13 Mask C 25 kHz 135 MHz D8PSK 20 kHz.TIL
02:42:30 PM, Friday, April 02, 2021
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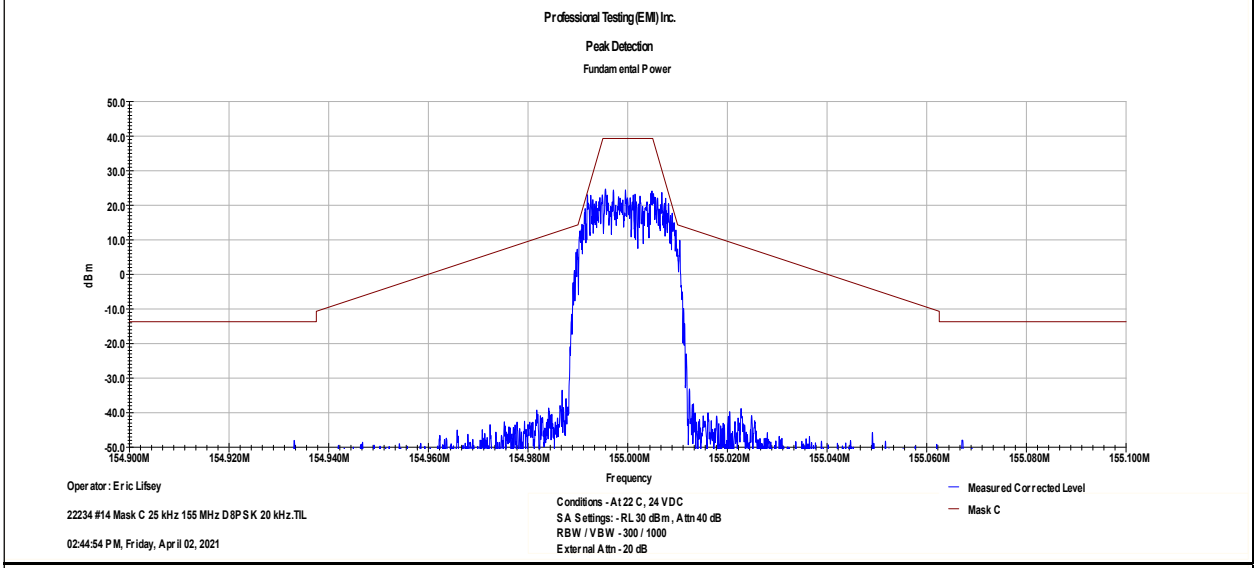
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
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30.0
20.0
10.0
0
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-20.0
-30.0
-40.0
-50.0
154.900M
154.920M
154.940M
154.960M
154.980M
155.000M
155.020M
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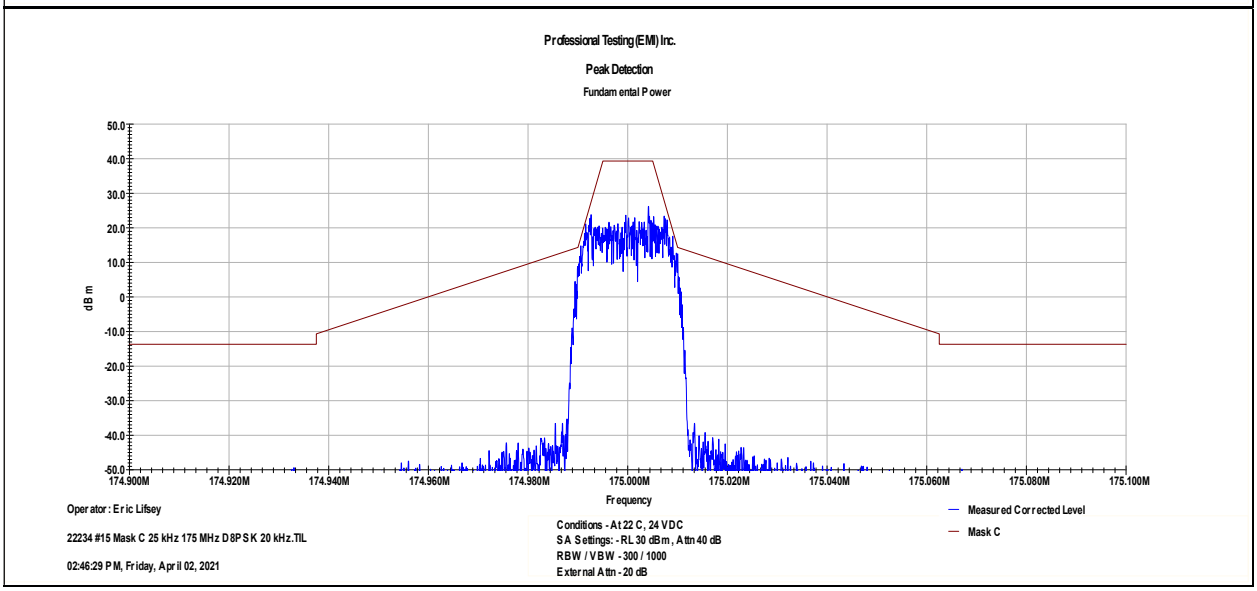
155.060M
155.080M
155.100M
Frequency
Operator: Eric Lifsey
22234 #14 Mask C 25 kHz 155 MHz D8PSK 20 kHz.TIL
02:44:54 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
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174.900M
174.920M
174.940M
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175.000M
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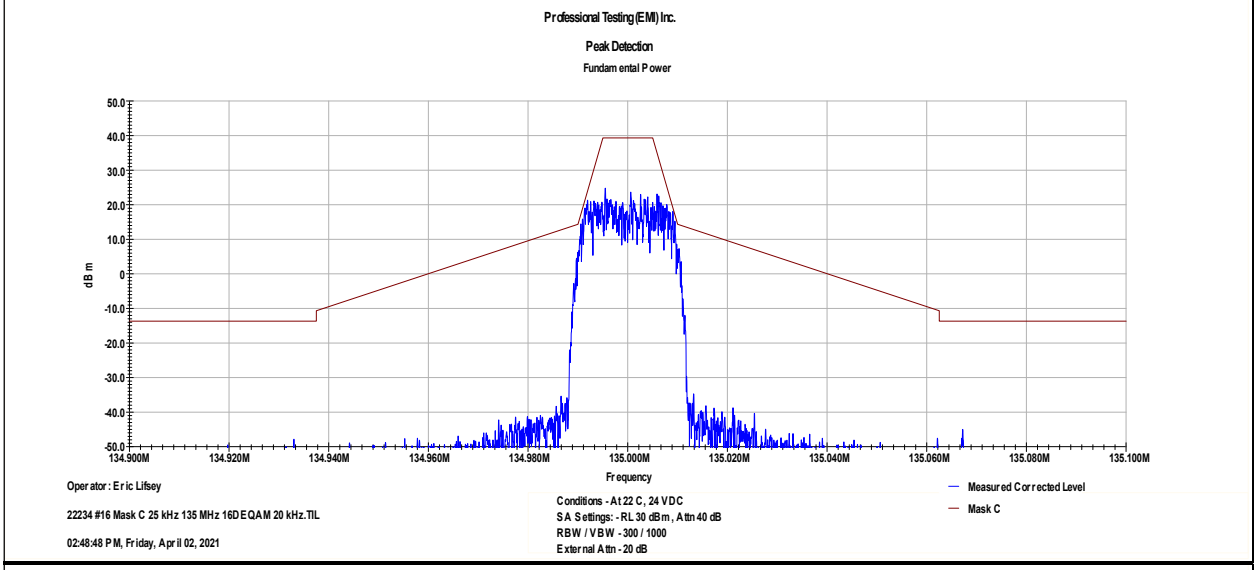
175.080M
175.100M
Frequency
Operator: Eric Lifsey
22234 #15 Mask C 25 kHz 175 MHz D8PSK 20 kHz.TIL
02:46:29 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
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-40.0
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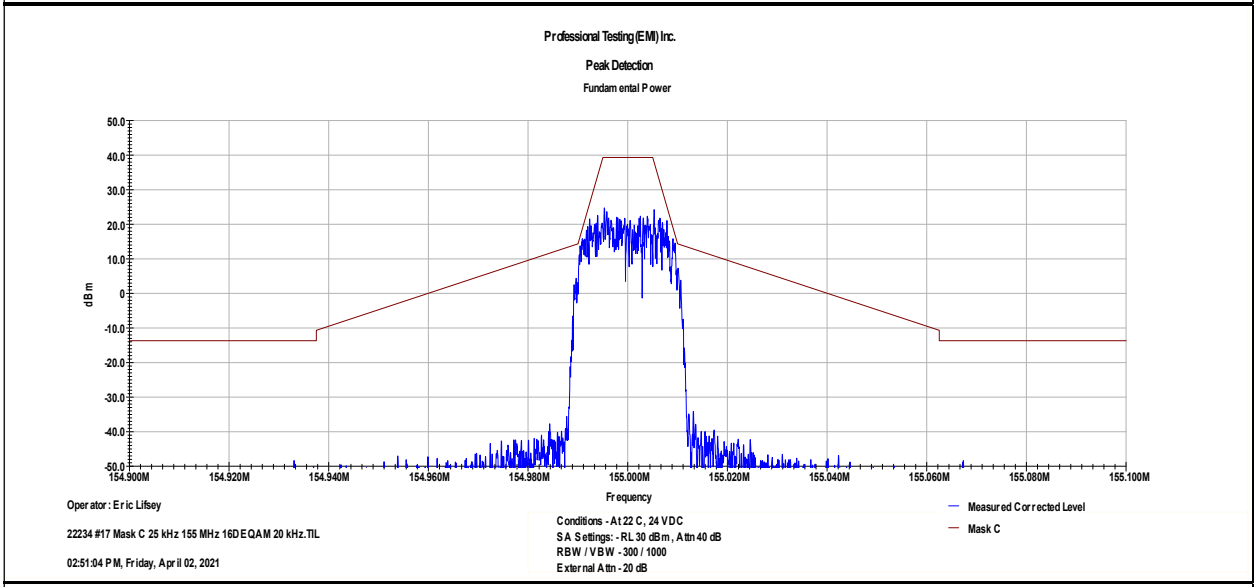
134.900M
134.920M
134.940M
134.960M
134.980M
135.000M
135.020M
135.040M
135.060M
135.080M
135.100M
Frequency
Operator: Eric Lifsey
22234 #16 Mask C 25 kHz 135 MHz 16DEQAM 20 kHz.TIL
02:48:48 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
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-30.0
-40.0
-50.0
154.900M
154.920M
154.940M
154.960M
154.980M
155.000M
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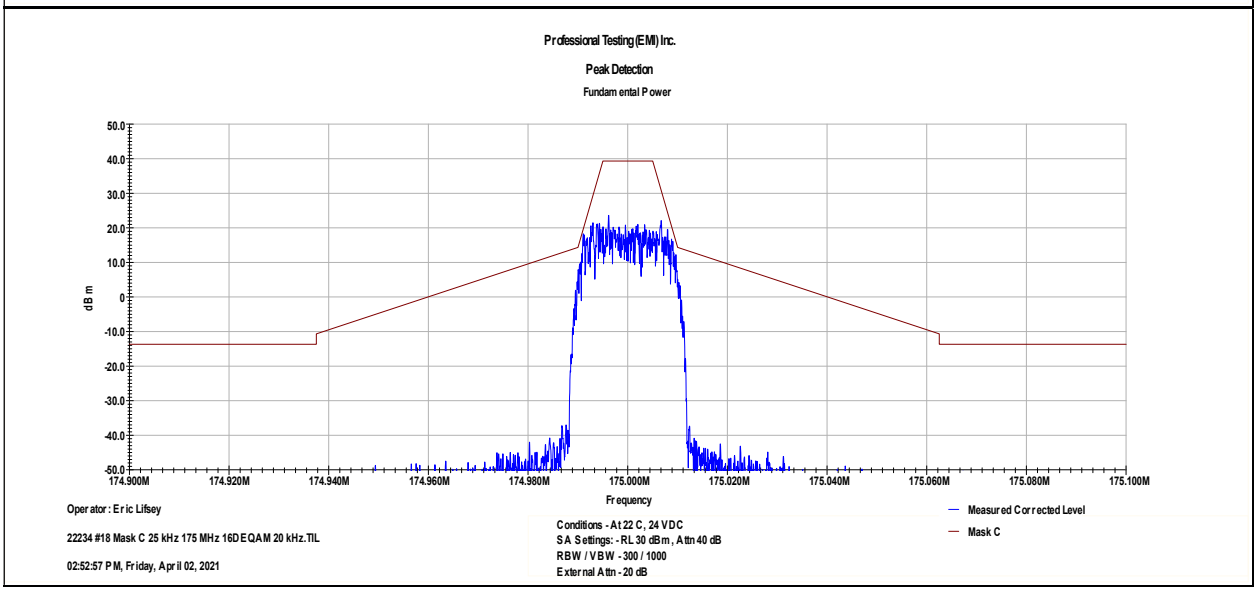
155.060M
155.080M
155.100M
Frequency
Operator: Eric Lifsey
22234 #17 Mask C 25 kHz 155 MHz 16DEQAM 20 kHz.TIL
02:51:04 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
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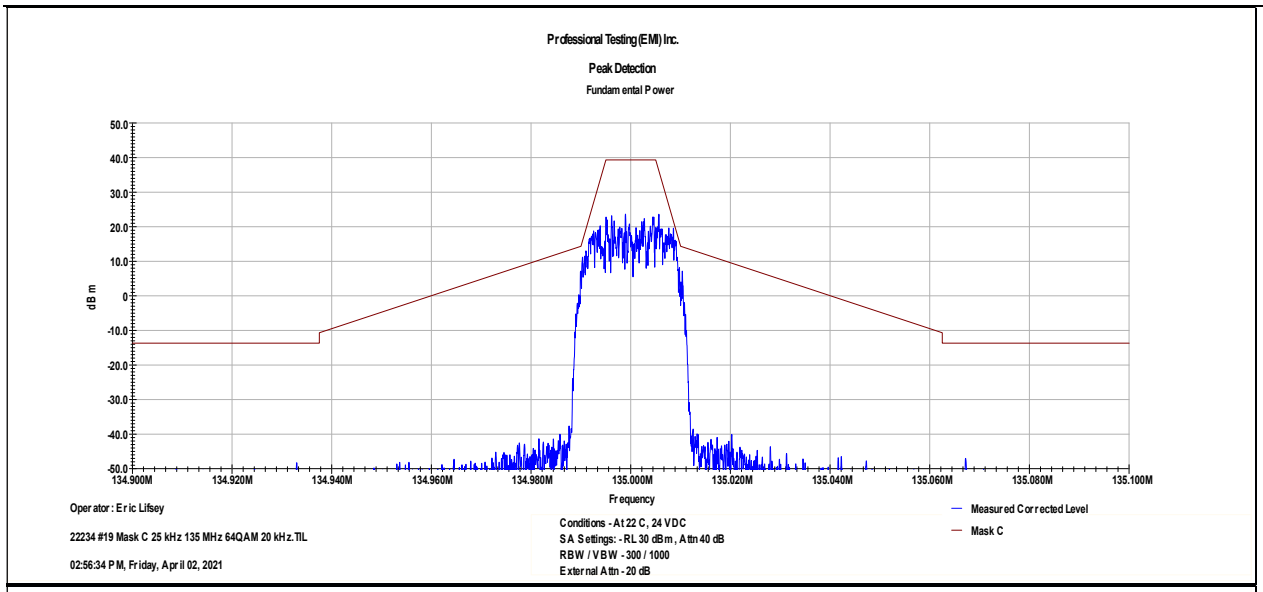
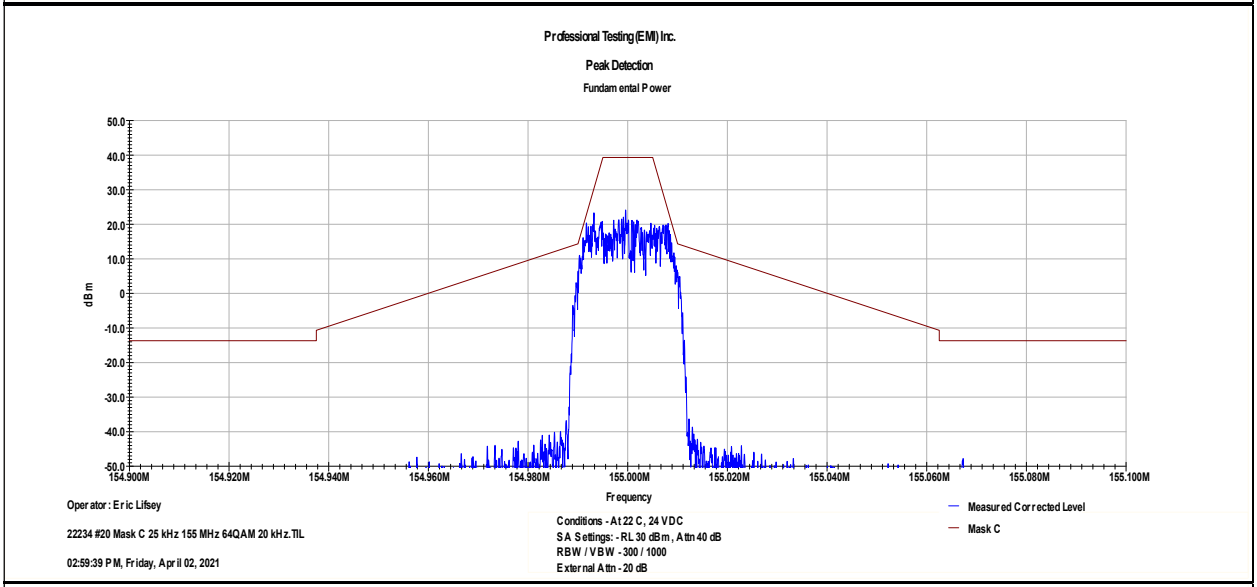
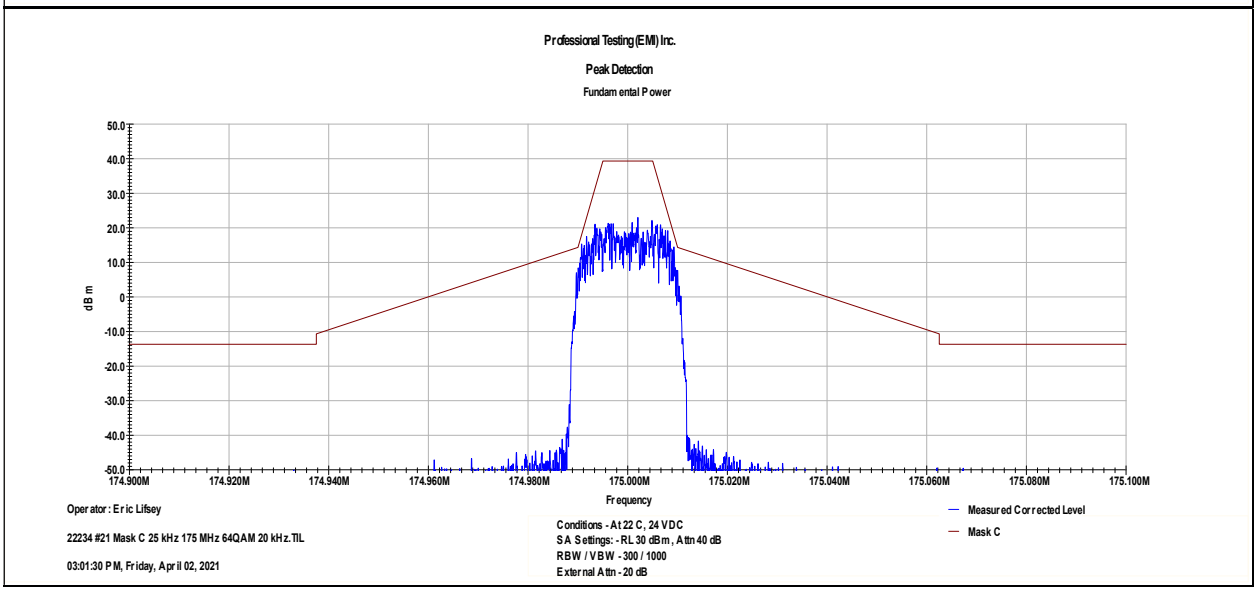
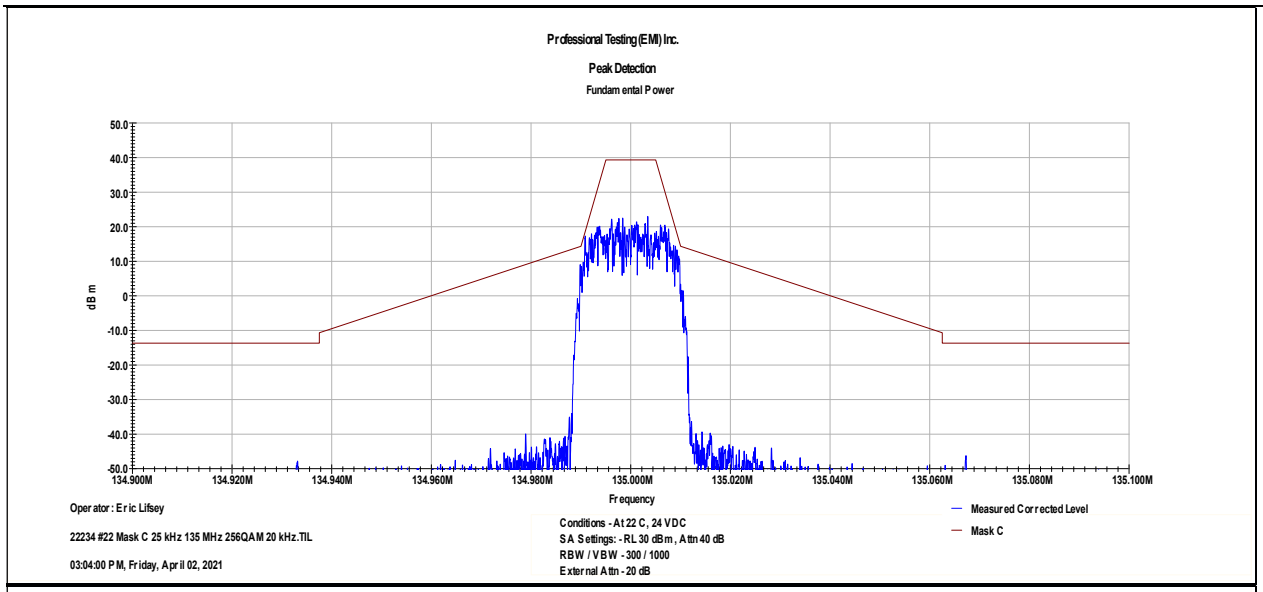
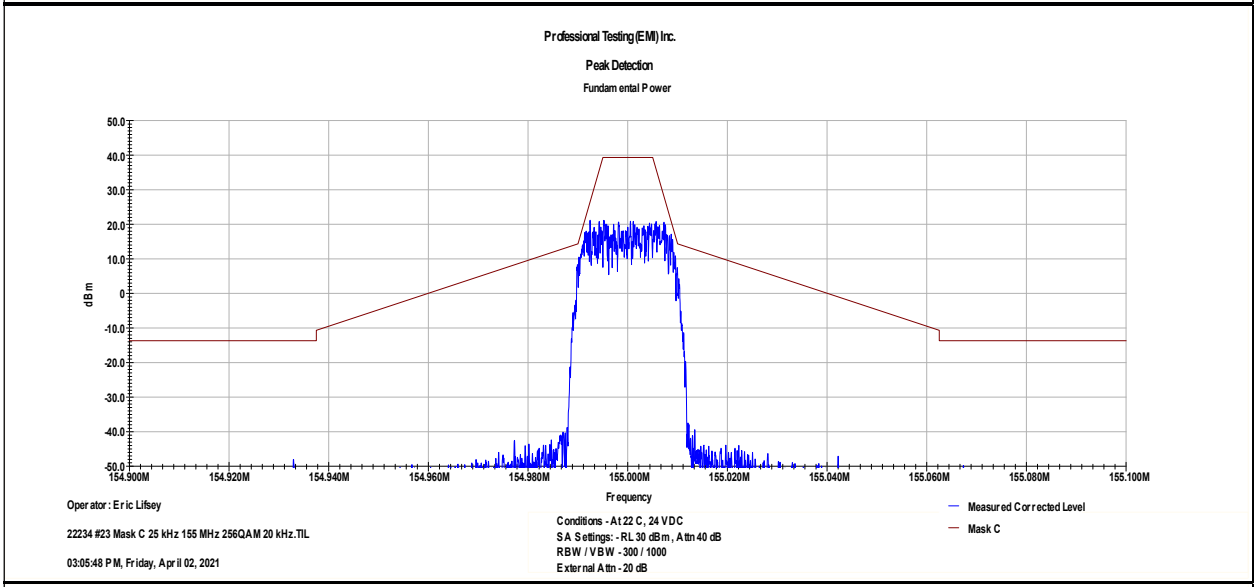
-40.0
-50.0
174.900M
174.920M
174.940M
174.960M
174.980M
175.000M
175.020M
175.040M
175.060M
175.080M
175.100M
Frequency
Operator: Eric Lifsey
22234 #18 Mask C 25 kHz 175 MHz 16DEQAM 20 kHz.TIL
02:52:57 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

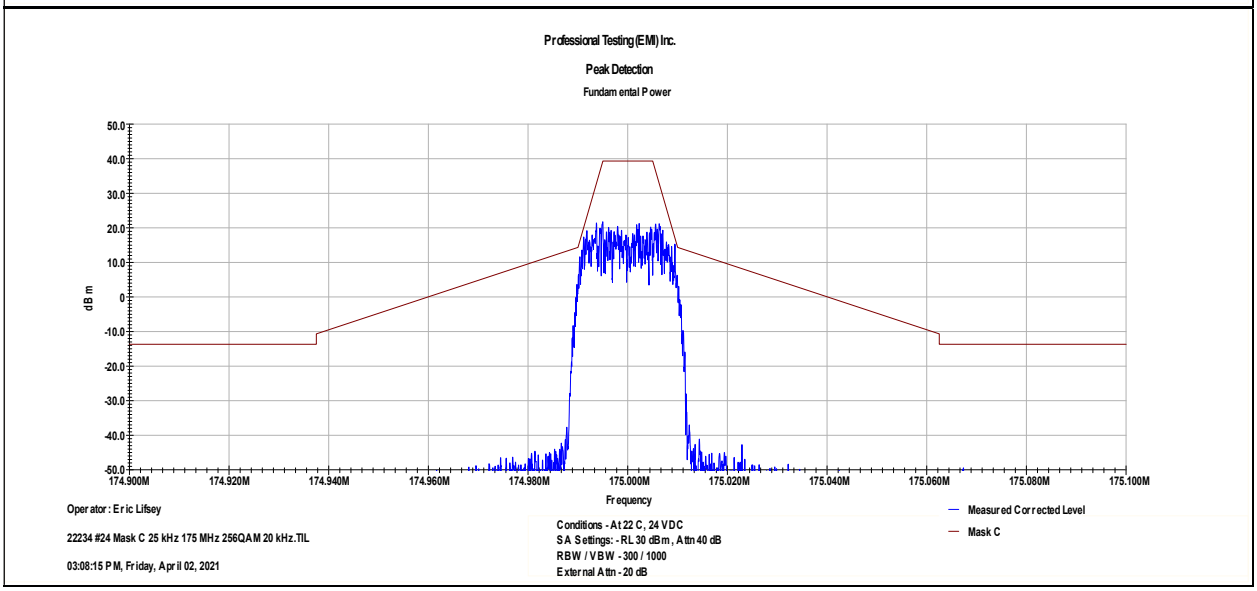

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.900M
134.920M
134.940M
134.960M
134.980M
135.000M
135.020M
135.040M
135.060M
135.080M
135.100M
Frequency
Operator: Eric Lifsey
22234 #19 Mask C 25 kHz 135 MHz 64QAM 20 kHz.TIL
02:56:34 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.900M
154.920M
154.940M
154.960M
154.980M
155.000M
155.020M
155.040M
155.060M
155.080M
155.100M
Frequency
Operator: Eric Lifsey
22234 #20 Mask C 25 kHz 155 MHz 64QAM 20 kHz.TIL
02:59:39 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

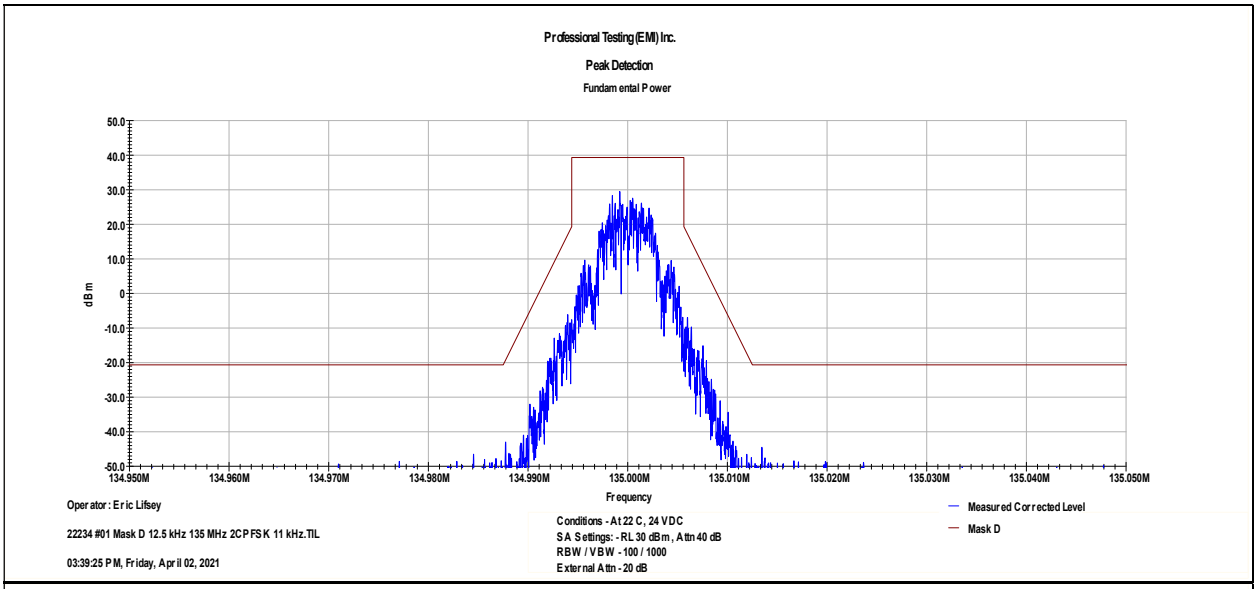

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.900M
174.920M
174.940M
174.960M
174.980M
175.000M
175.020M
175.040M
175.060M
175.080M
175.100M
Frequency
Operator: Eric Lifsey
22234 #21 Mask C 25 kHz 175 MHz 64QAM 20 kHz.TIL
03:01:30 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

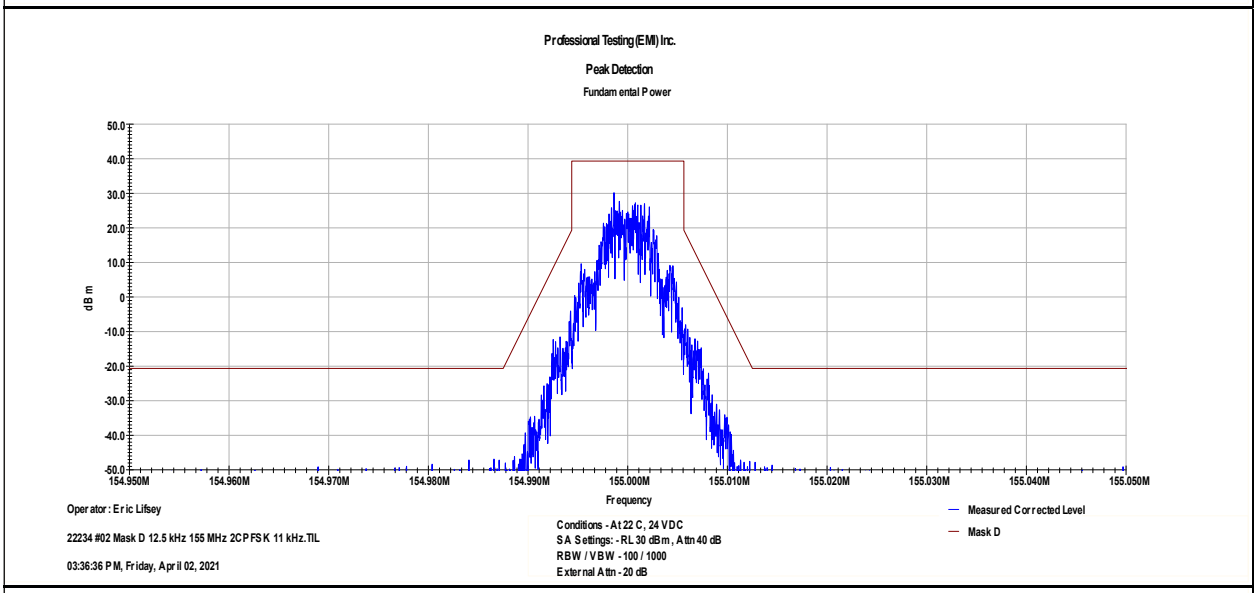

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.900M
134.920M
134.940M
134.960M
134.980M
135.000M
135.020M
135.040M
135.060M
135.080M
135.100M
Frequency
Operator: Eric Lifsey
22234 #22 Mask C 25 kHz 135 MHz 256QAM 20 kHz.TIL
03:04:00 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

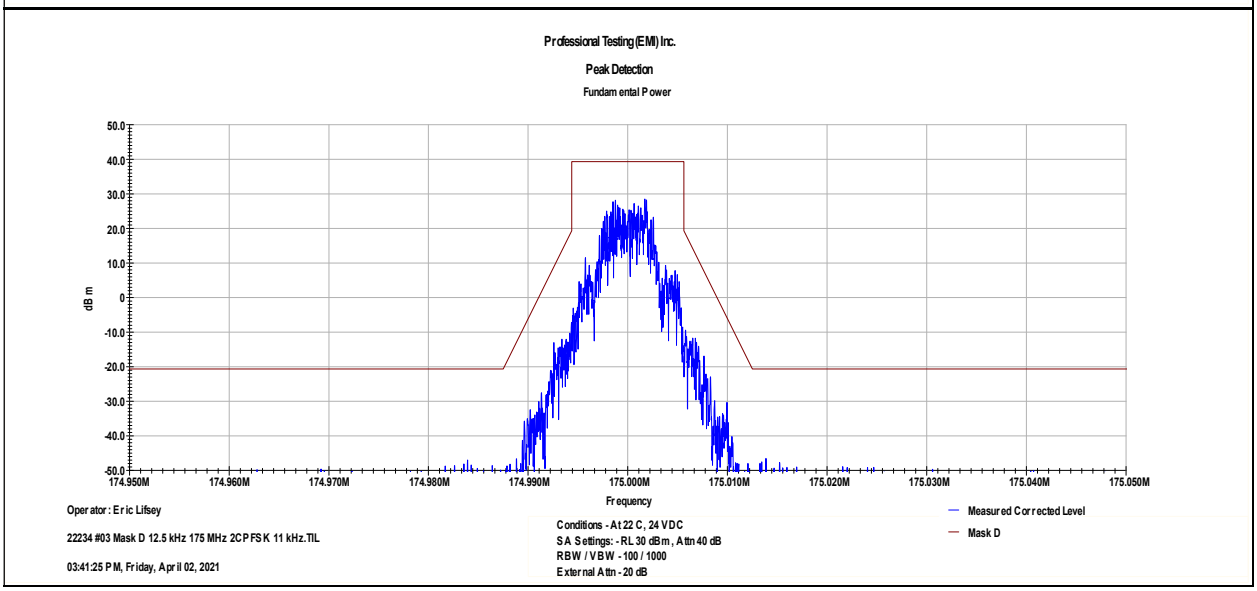

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.900M
154.920M
154.940M
154.960M
154.980M
155.000M
155.020M
155.040M
155.060M
155.080M
155.100M
Frequency
Operator: Eric Lifsey
22234 #23 Mask C 25 kHz 155 MHz 256QAM 20 kHz.TIL
03:05:48 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

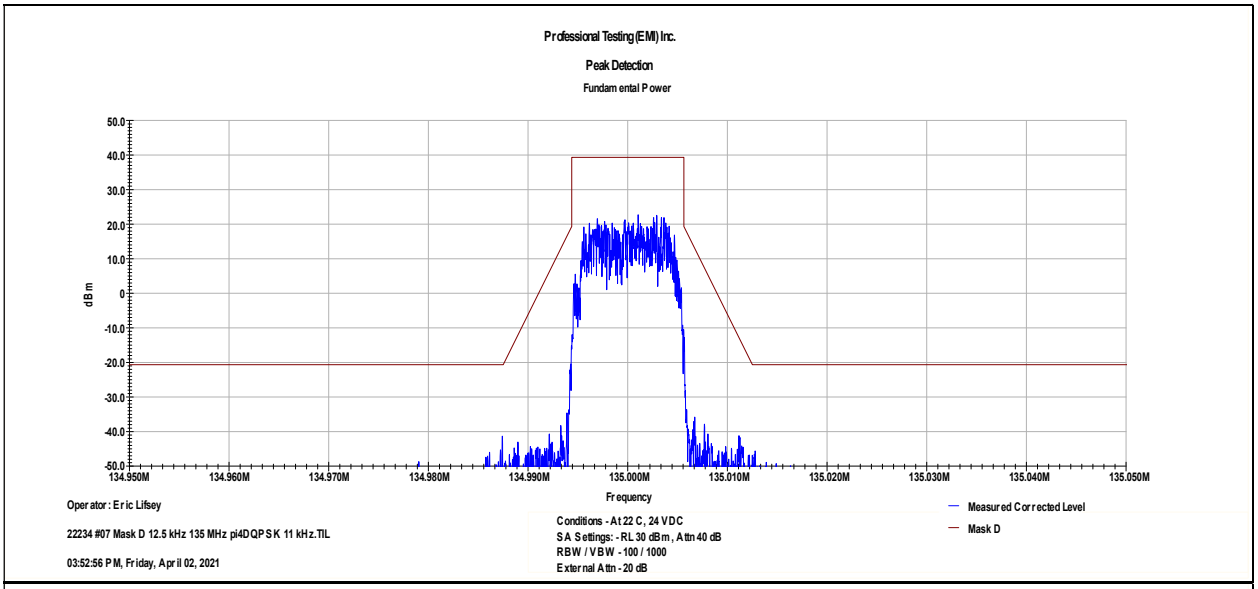

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.900M
174.920M
174.940M
174.960M
174.980M
175.000M
175.020M
175.040M
175.060M
175.080M
175.100M
Frequency
Operator: Eric Lifsey
22234 #24 Mask C 25 kHz 175 MHz 256QAM 20 kHz.TIL
03:08:15 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 300 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask C

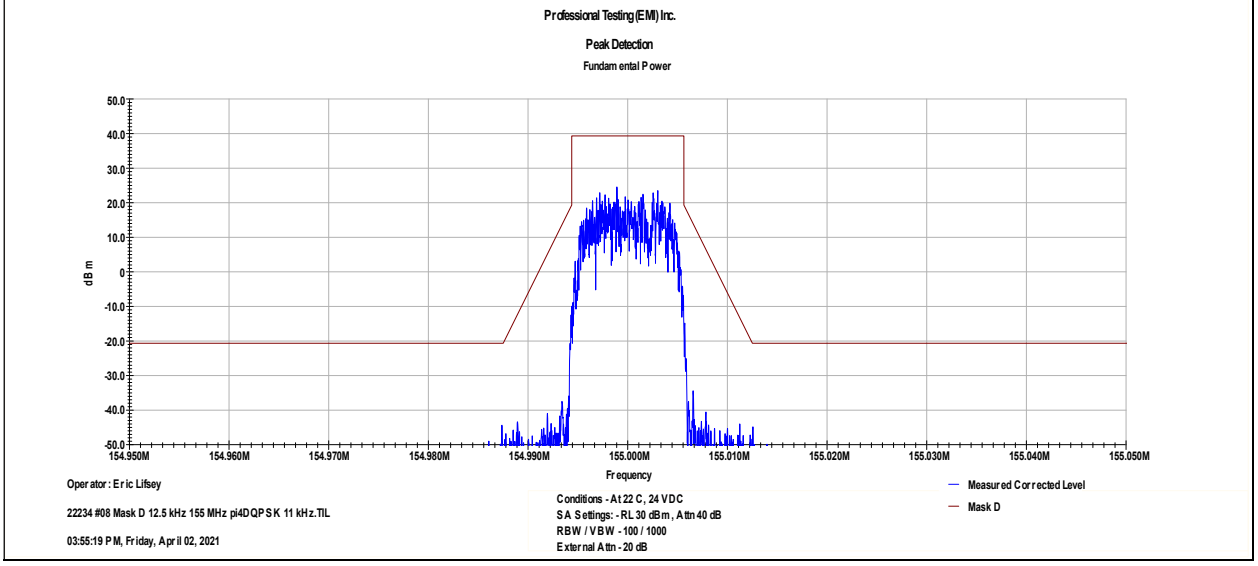
2.3.2 Mask D

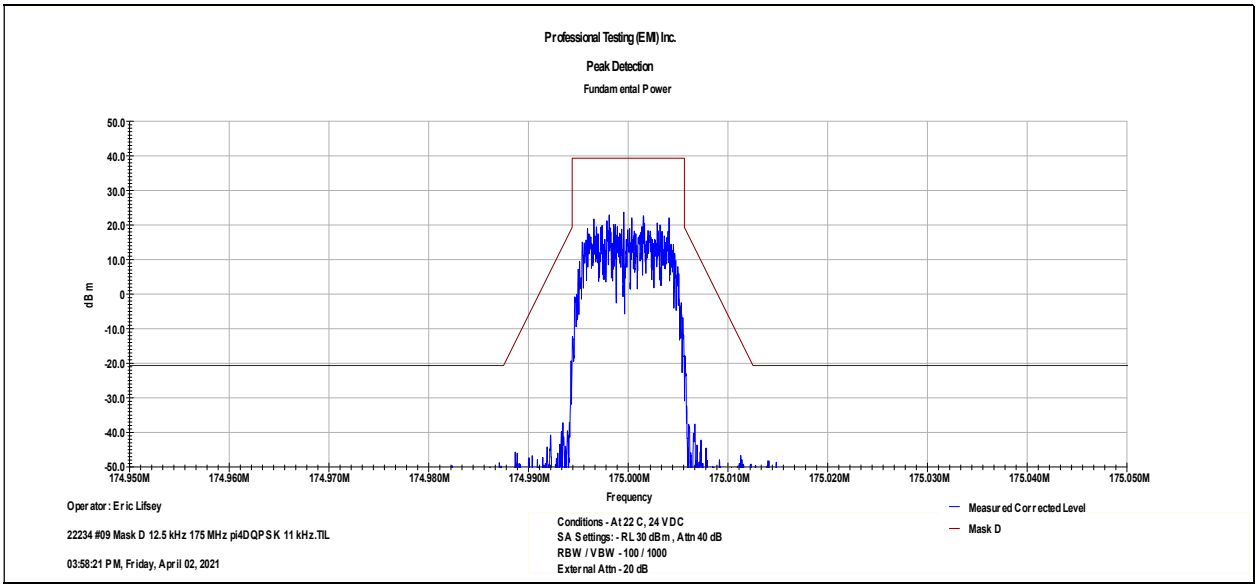

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #01 Mask D 12.5 kHz 135 MHz 2CPFSK 11 kHz.TIL
03:39:25 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

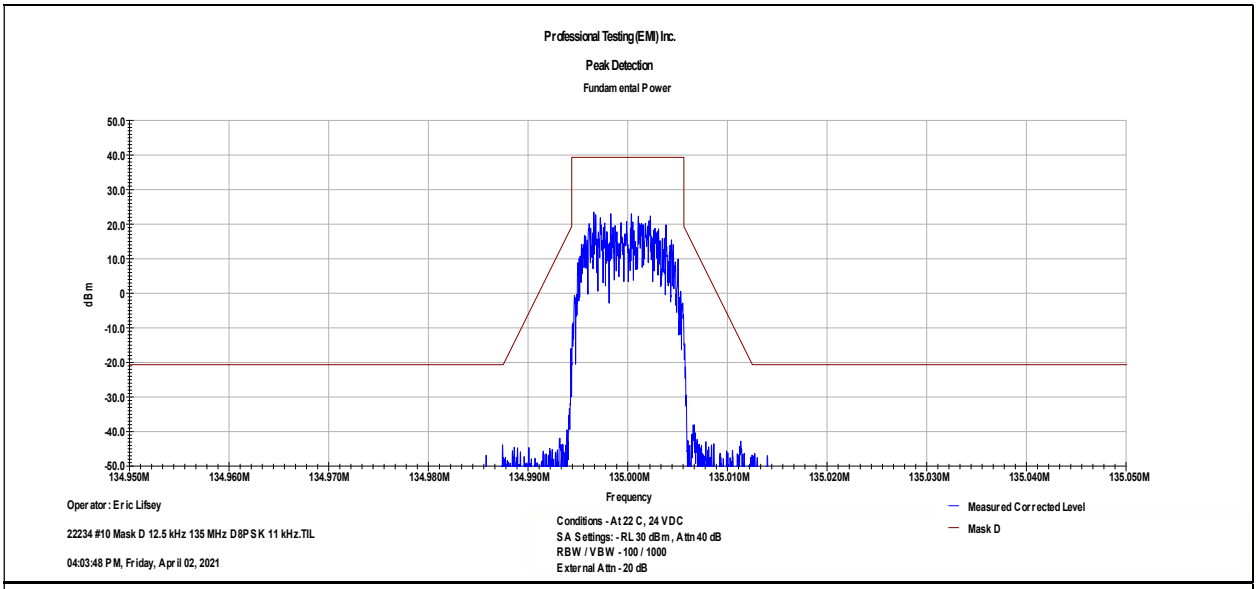

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #02 Mask D 12.5 kHz 155 MHz 2CPFSK 11 kHz.TIL
03:36:36 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

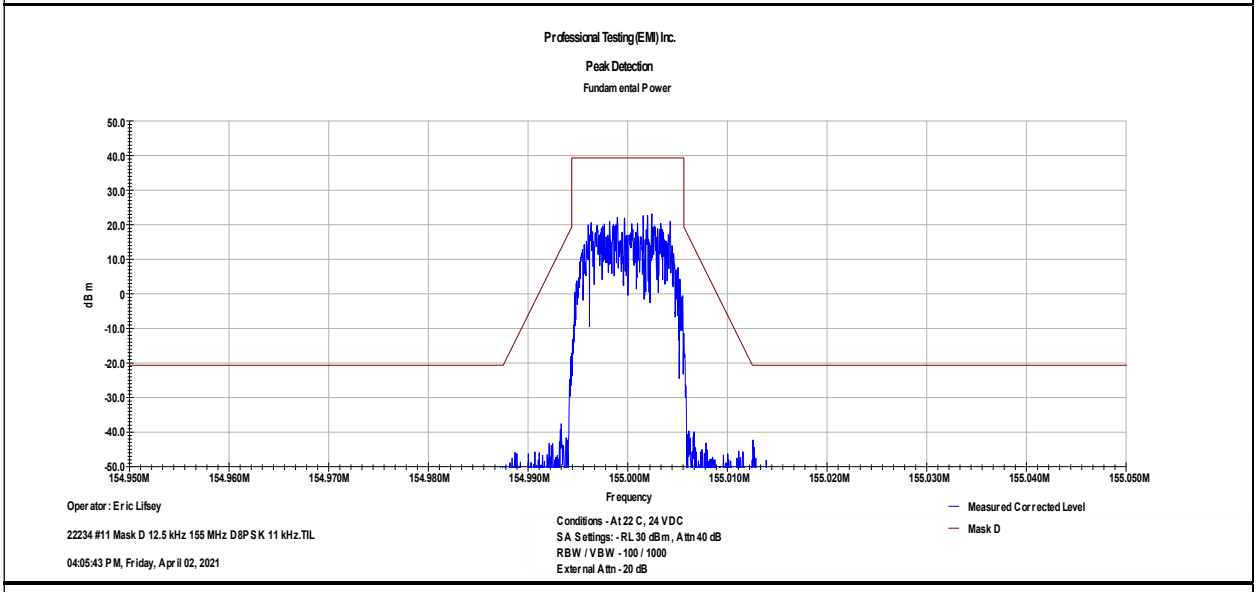

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #03 Mask D 12.5 kHz 175 MHz 2CPFSK 11 kHz.TIL
03:41:25 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

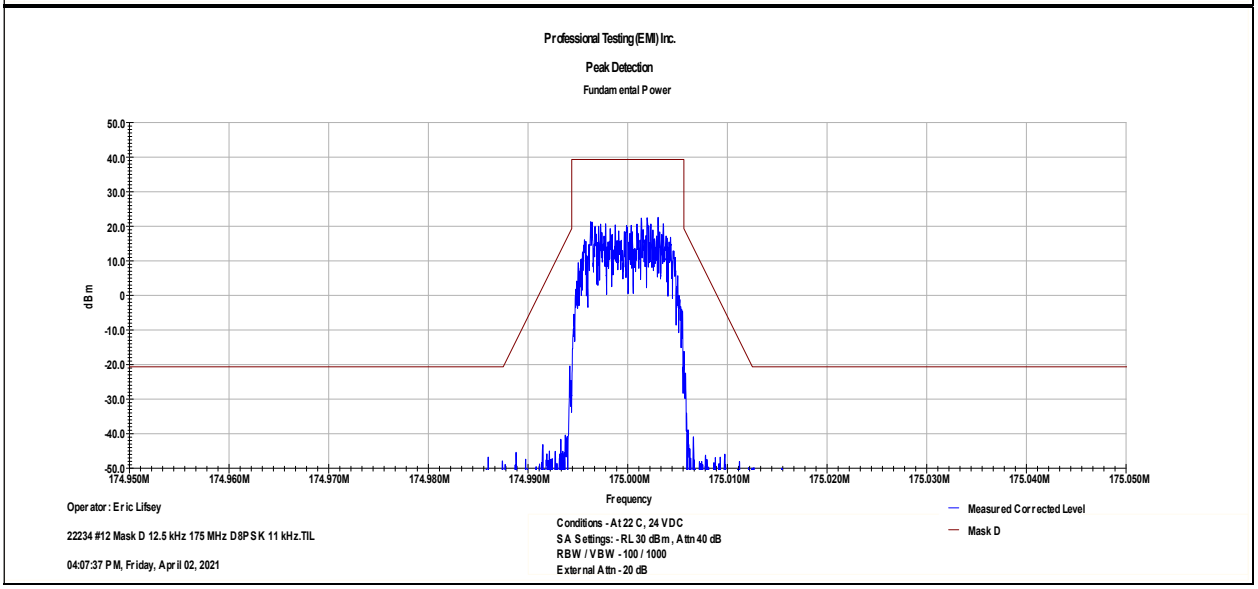

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #07 Mask D 12.5 kHz 135 MHz pi4DQPSK 11 kHz.TIL
03:52:56 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

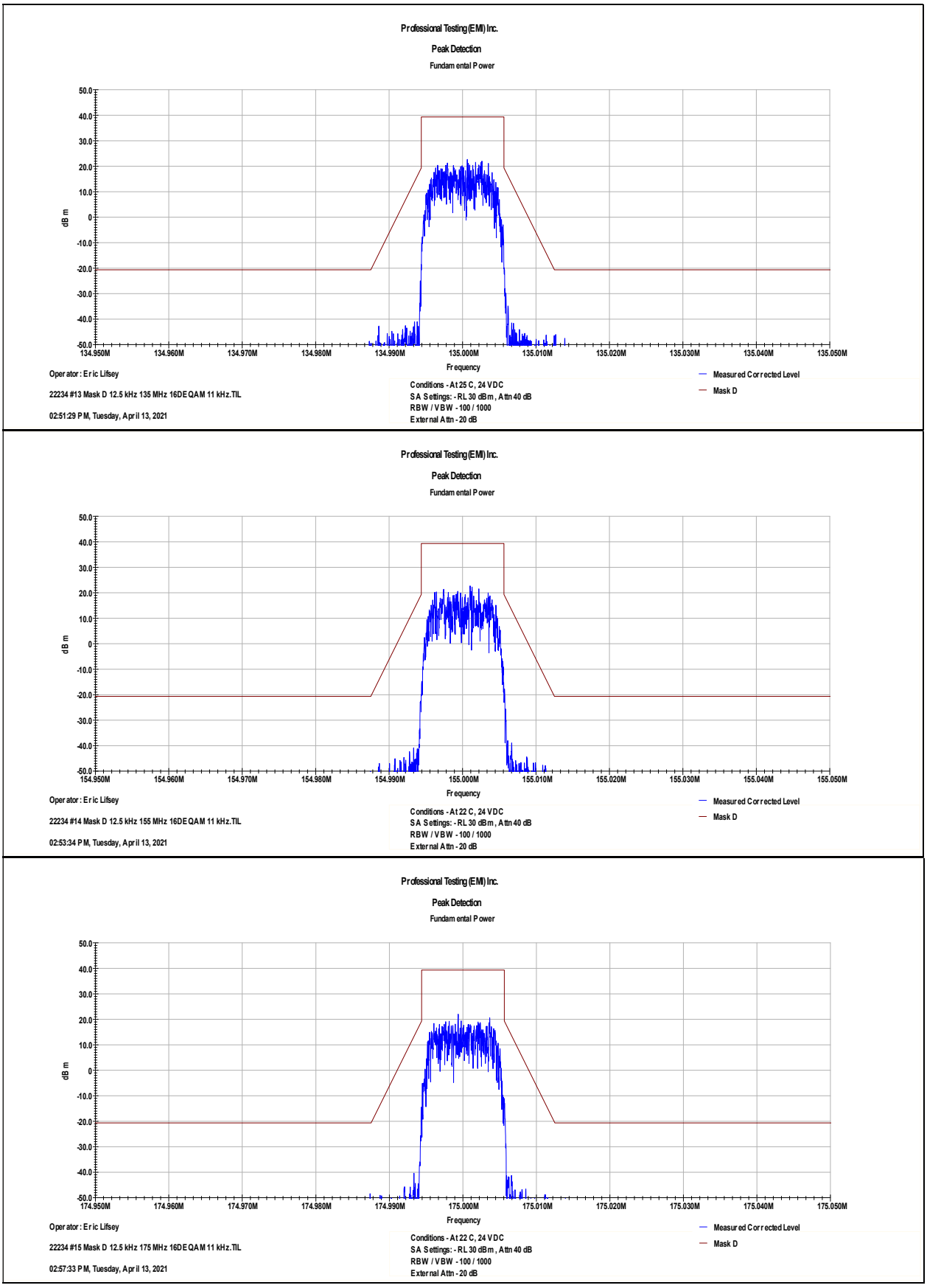

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #08 Mask D 12.5 kHz 155 MHz pi4DQPSK 11 kHz.TIL
03:55:19 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

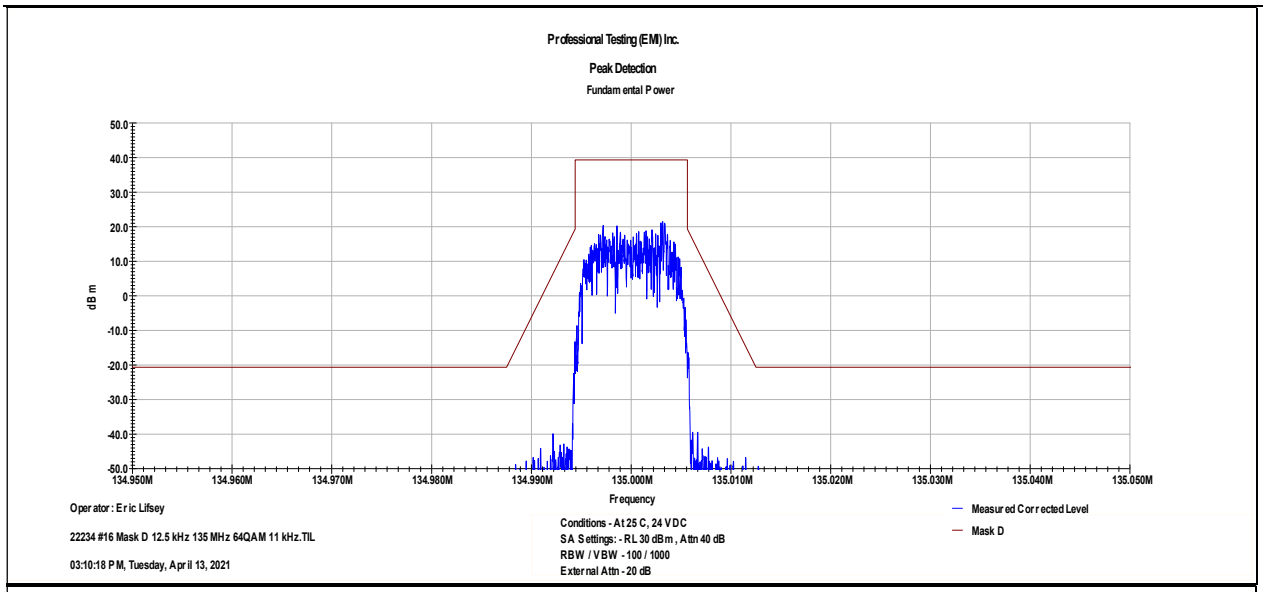

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #09 Mask D 12.5 kHz 175 MHz pi4DQPSK 11 kHz.TIL
03:58:21 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

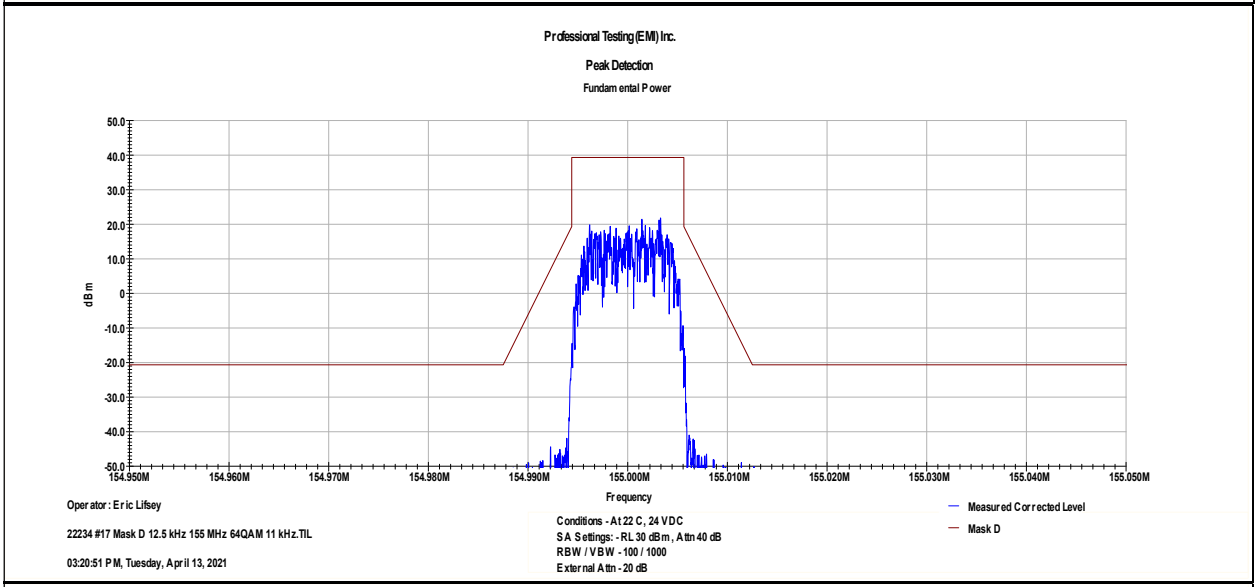

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #10 Mask D 12.5 kHz 135 MHz D8PSK 11 kHz.TIL
04:03:48 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

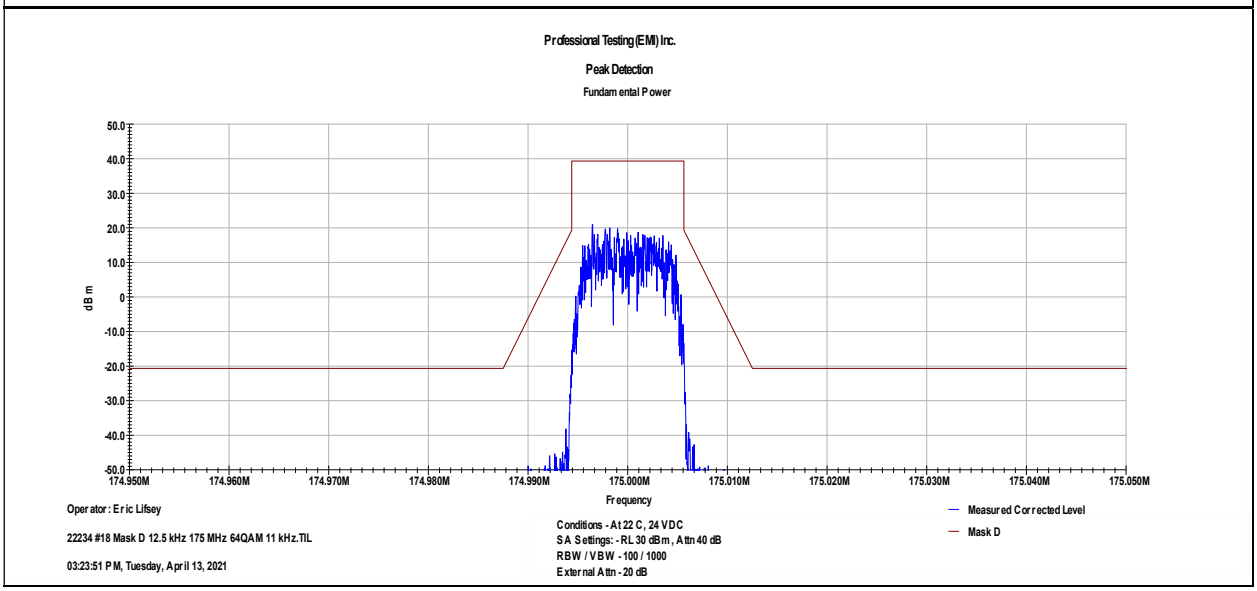

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #11 Mask D 12.5 kHz 155 MHz D8PSK 11 kHz.TIL
04:05:43 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

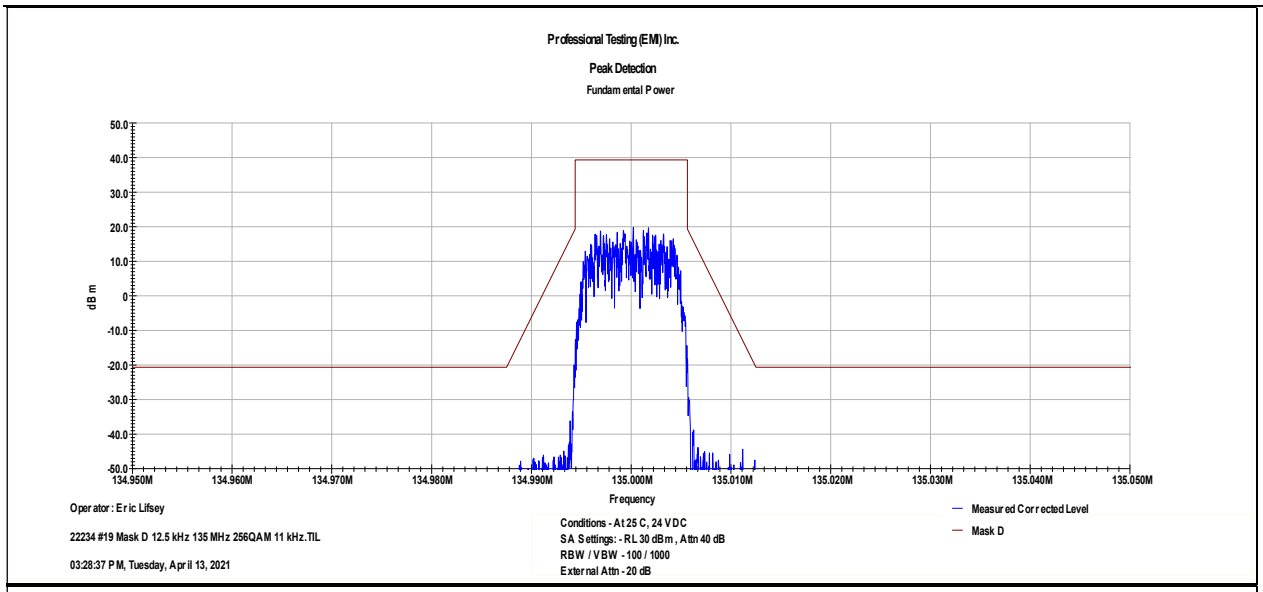

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #12 Mask D 12.5 kHz 175 MHz D8PSK 11 kHz.TIL
04:07:37 PM, Friday, April 02, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

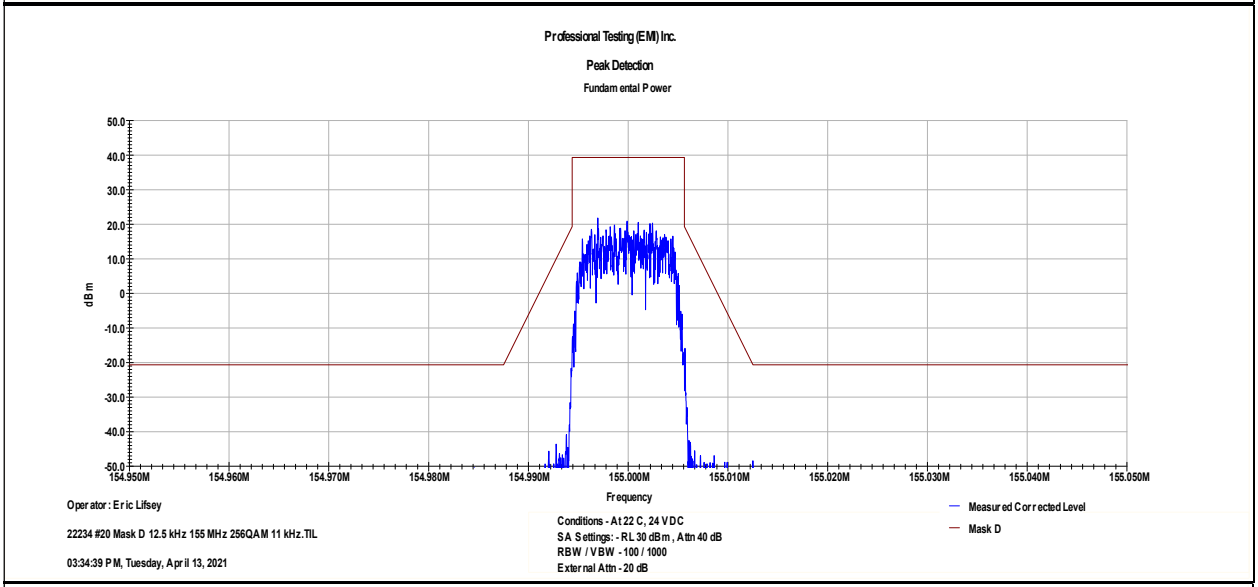

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #13 Mask D 12.5 kHz 135 MHz 16DEQAM 11 kHz.TIL
02:51:29 PM, Tuesday, April 13, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D
Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #14 Mask D 12.5 kHz 155 MHz 16DEQAM 11 kHz.TIL
02:53:34 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D
Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #15 Mask D 12.5 kHz 175 MHz 16DEQAM 11 kHz.TIL
02:57:33 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

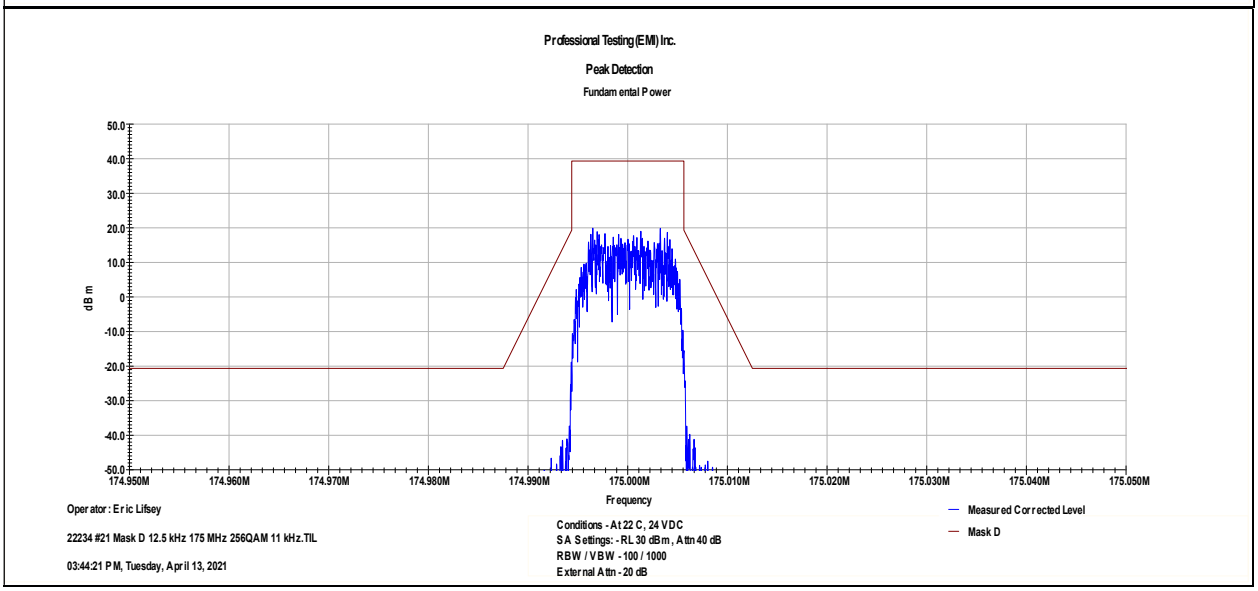

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #16 Mask D 12.5 kHz 135 MHz 64QAM 11 kHz.TIL
03:10:18 PM, Tuesday, April 13, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #17 Mask D 12.5 kHz 155 MHz 64QAM 11 kHz.TIL
03:20:51 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

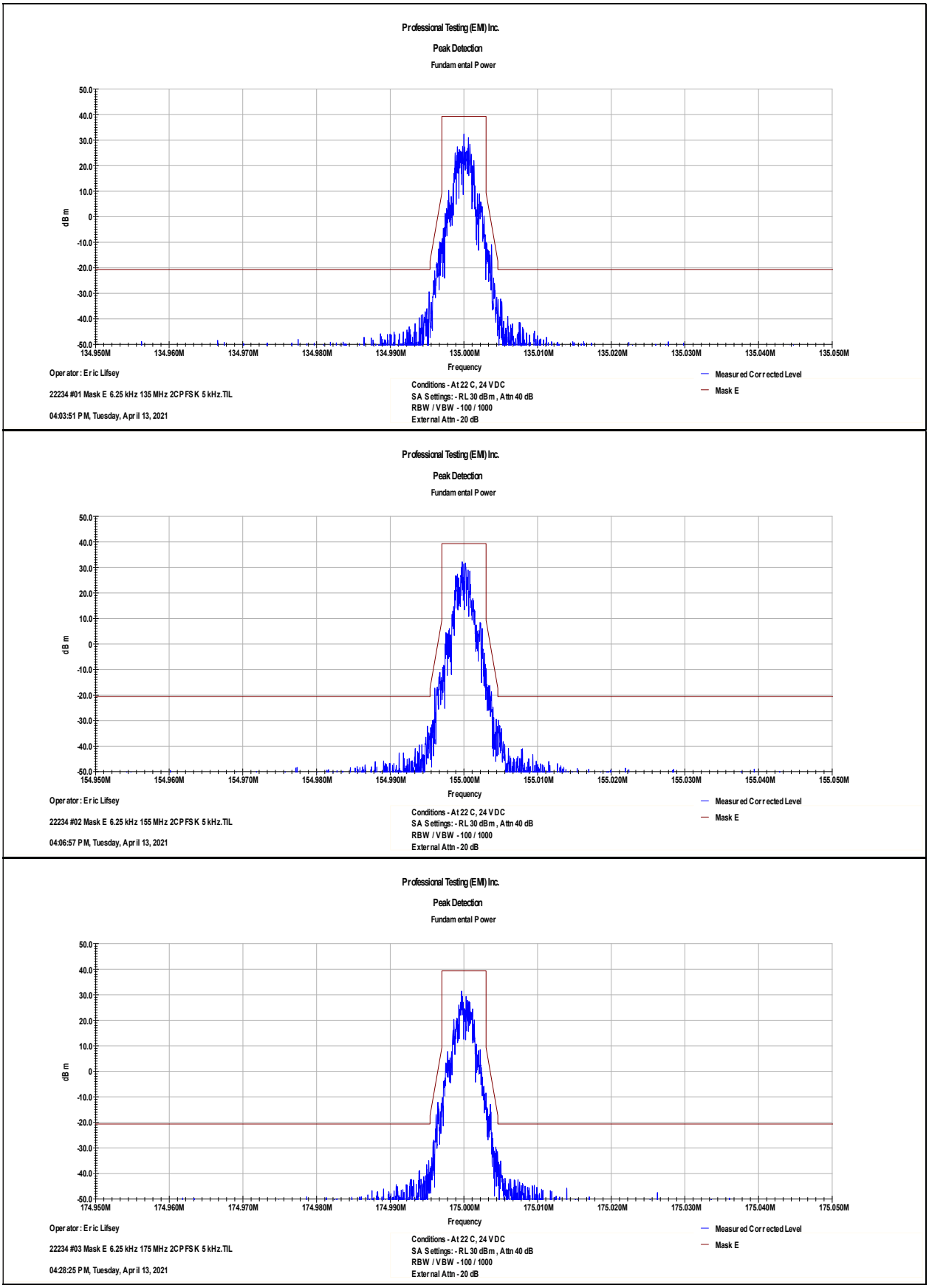

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #18 Mask D 12.5 kHz 175 MHz 64QAM 11 kHz.TIL
03:23:51 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

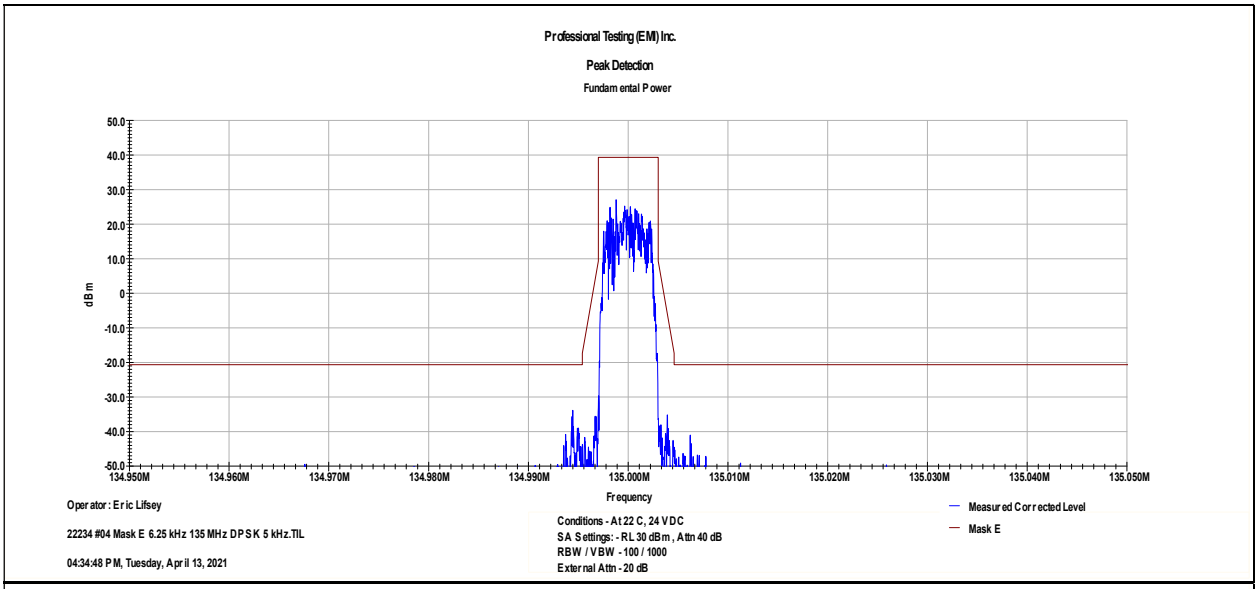

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #19 Mask D 12.5 kHz 135 MHz 256QAM 11 kHz.TIL
03:28:37 PM, Tuesday, April 13, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

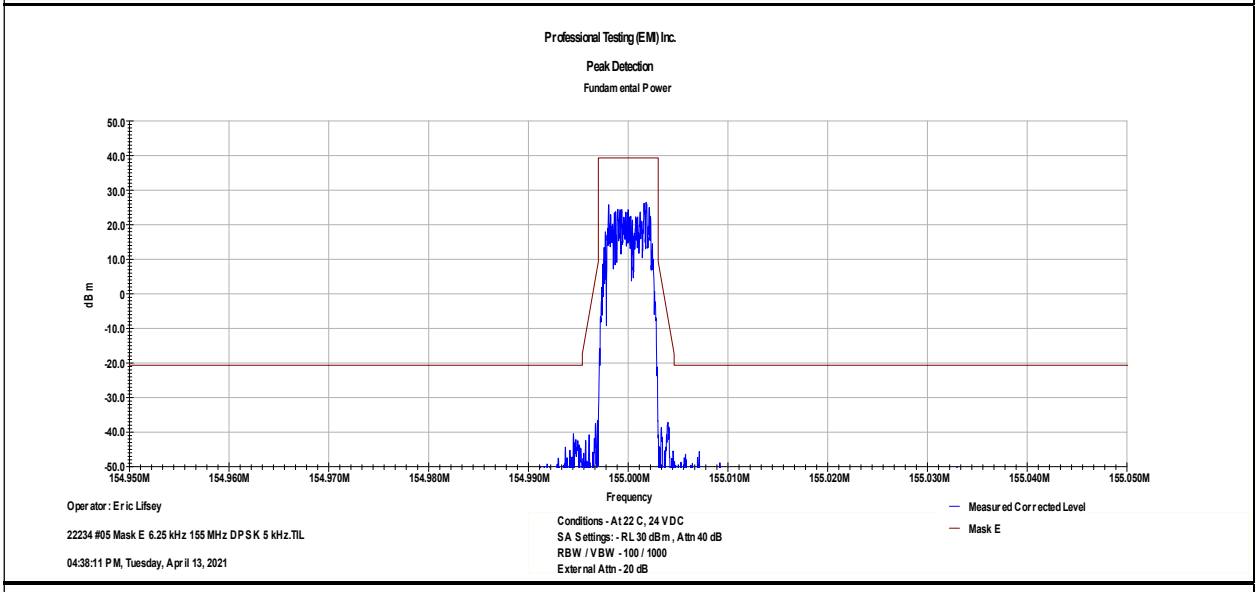

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #20 Mask D 12.5 kHz 155 MHz 256QAM 11 kHz.TIL
03:34:39 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

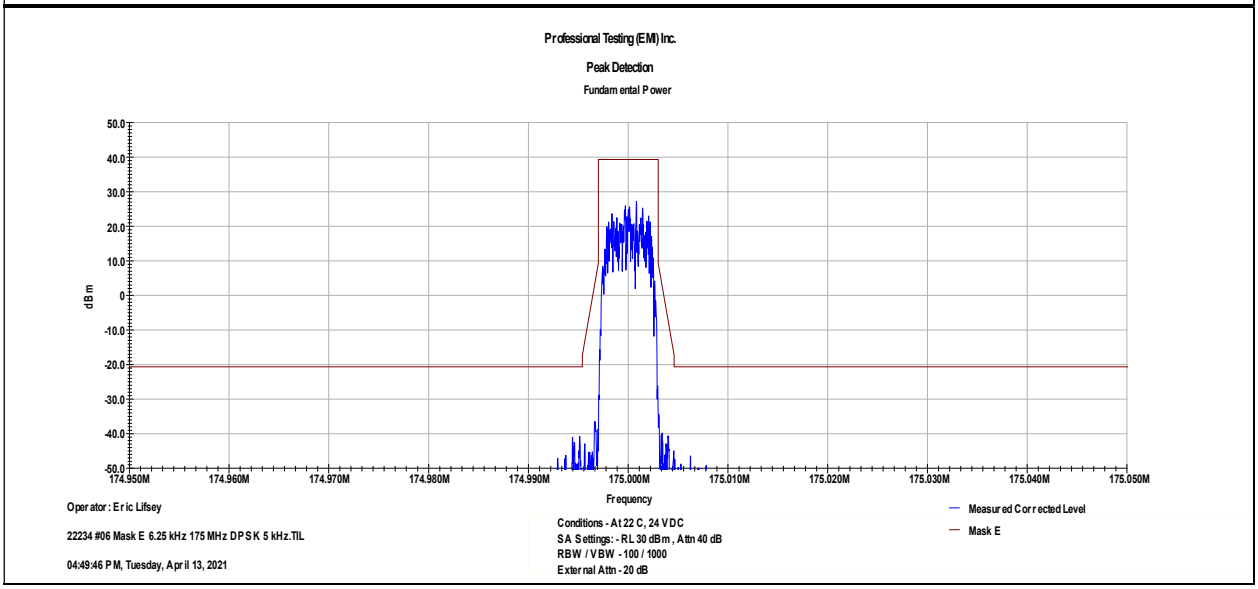

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #21 Mask D 12.5 kHz 175 MHz 256QAM 11 kHz.TIL
03:44:21 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask D

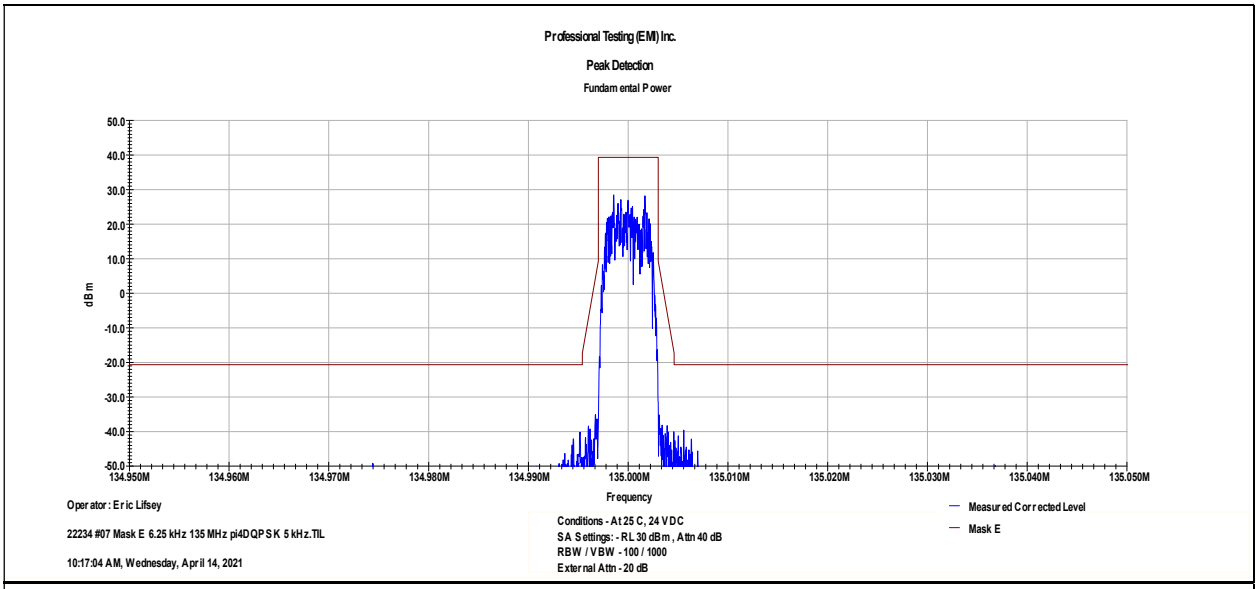
2.3.3 Mask E

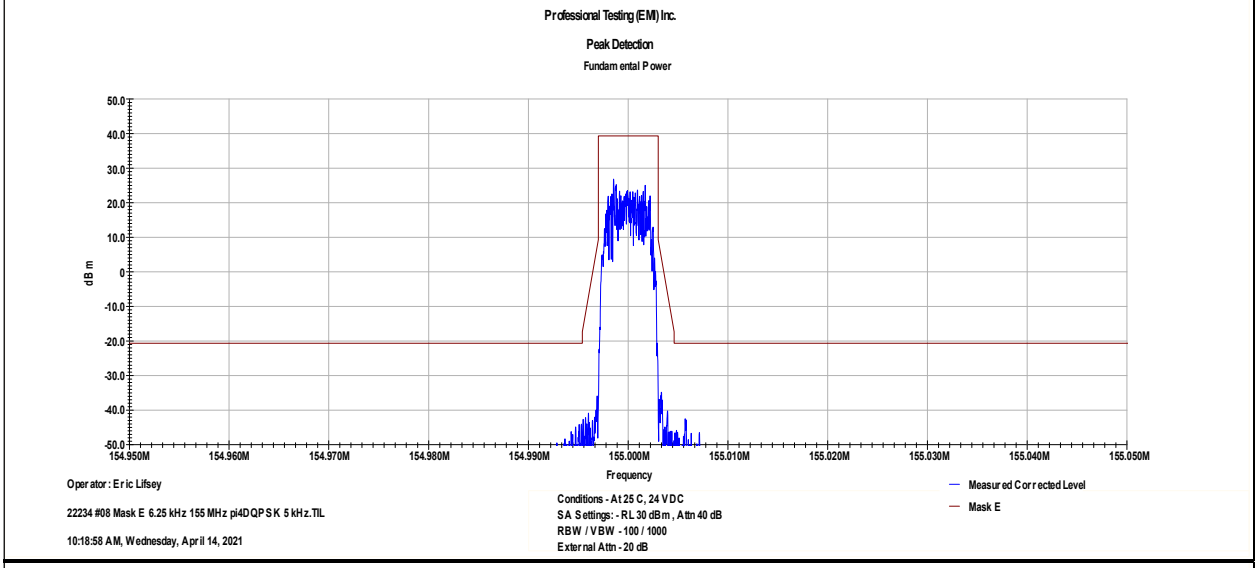

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #01 Mask E 6.25 kHz 135 MHz 2CPFSK 5 kHz.TIL
04:03:51 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E
Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #02 Mask E 6.25 kHz 155 MHz 2CPFSK 5 kHz.TIL
04:06:57 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E
Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #03 Mask E 6.25 kHz 175 MHz 2CPFSK 5 kHz.TIL
04:28:25 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

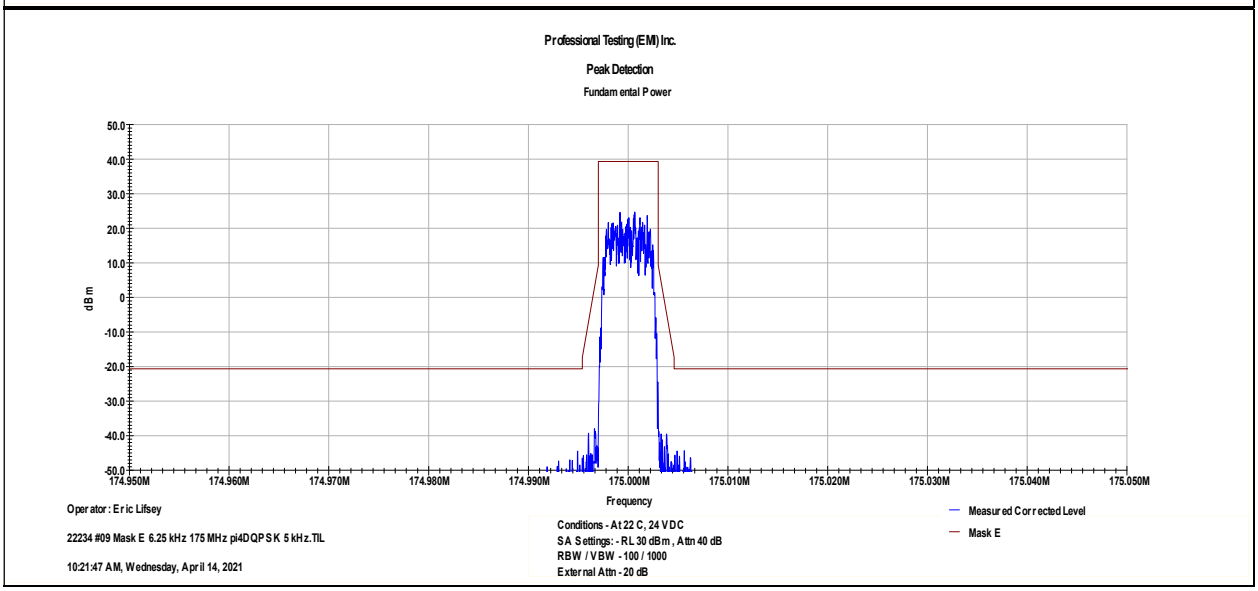

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #04 Mask E 6.25 kHz 135 MHz DPSK 5 kHz.TIL
04:34:48 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

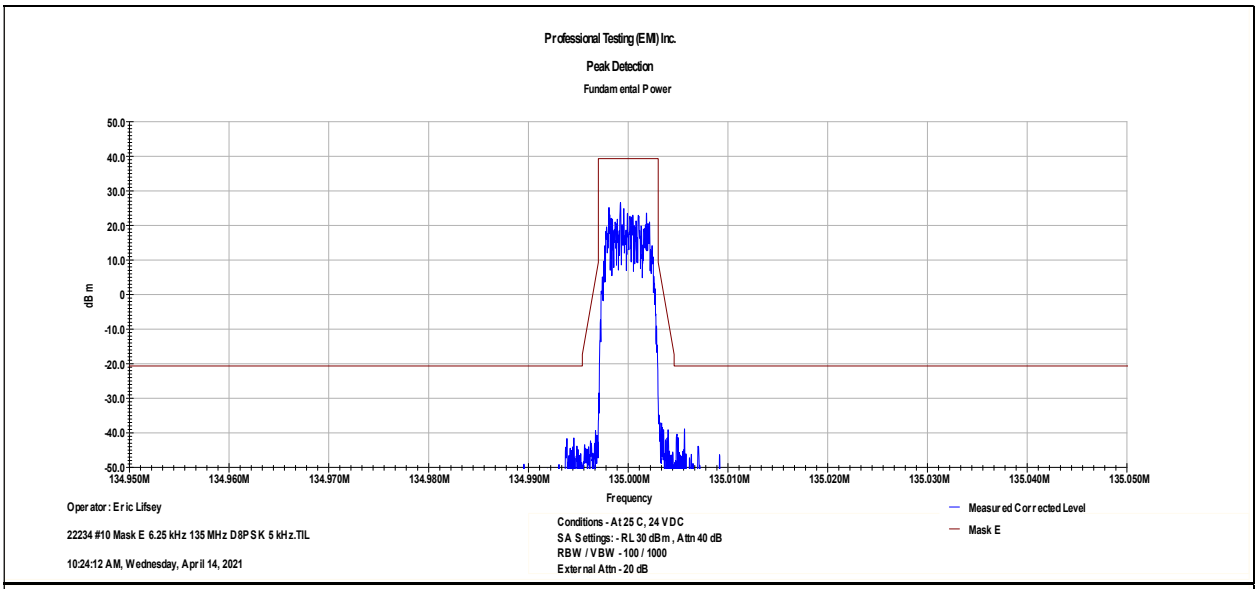

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #05 Mask E 6.25 kHz 155 MHz DPSK 5 kHz.TIL
04:38:11 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

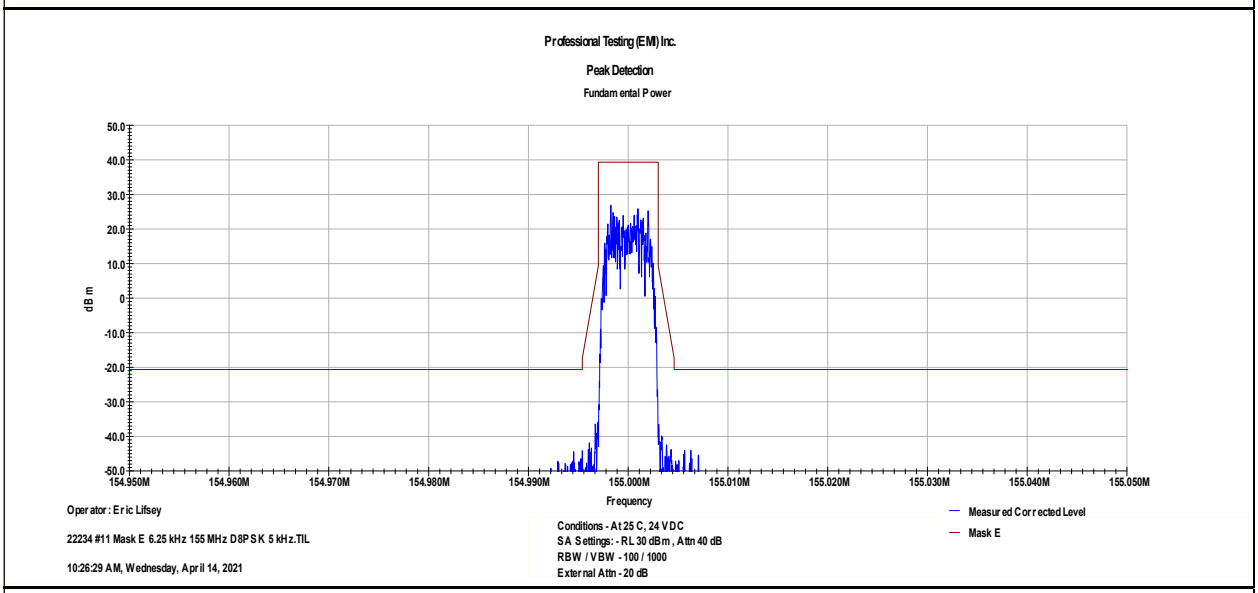

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #06 Mask E 6.25 kHz 175 MHz DPSK 5 kHz.TIL
04:49:46 PM, Tuesday, April 13, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

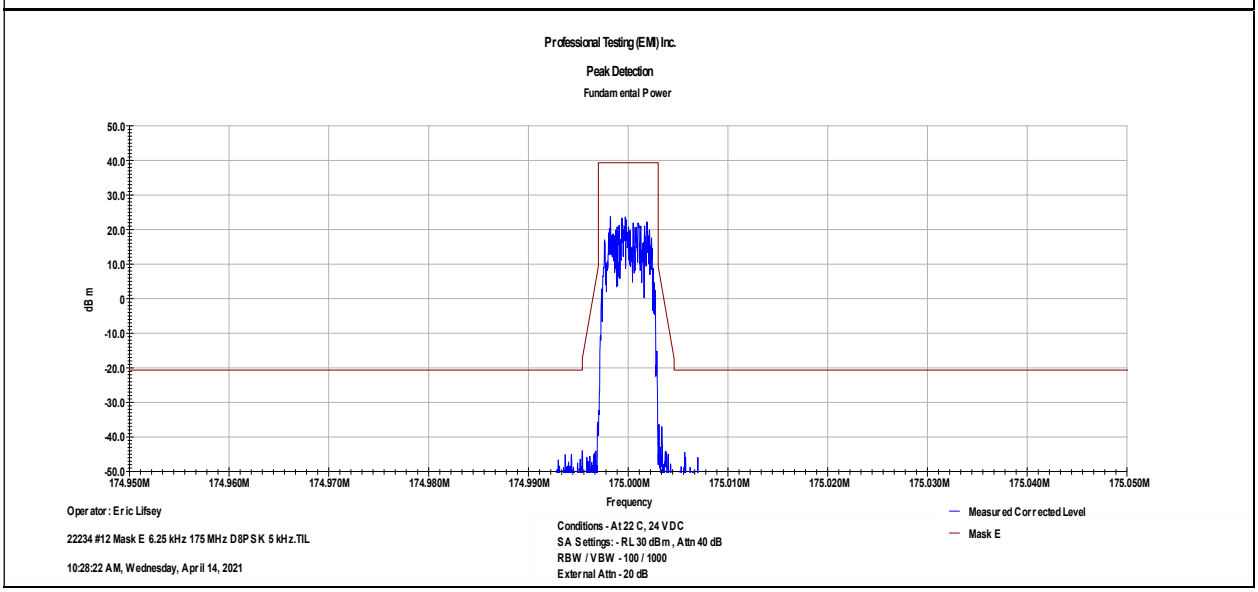

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #07 Mask E 6.25 kHz 135 MHz pi4DQPSK 5 kHz.TIL
10:17:04 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

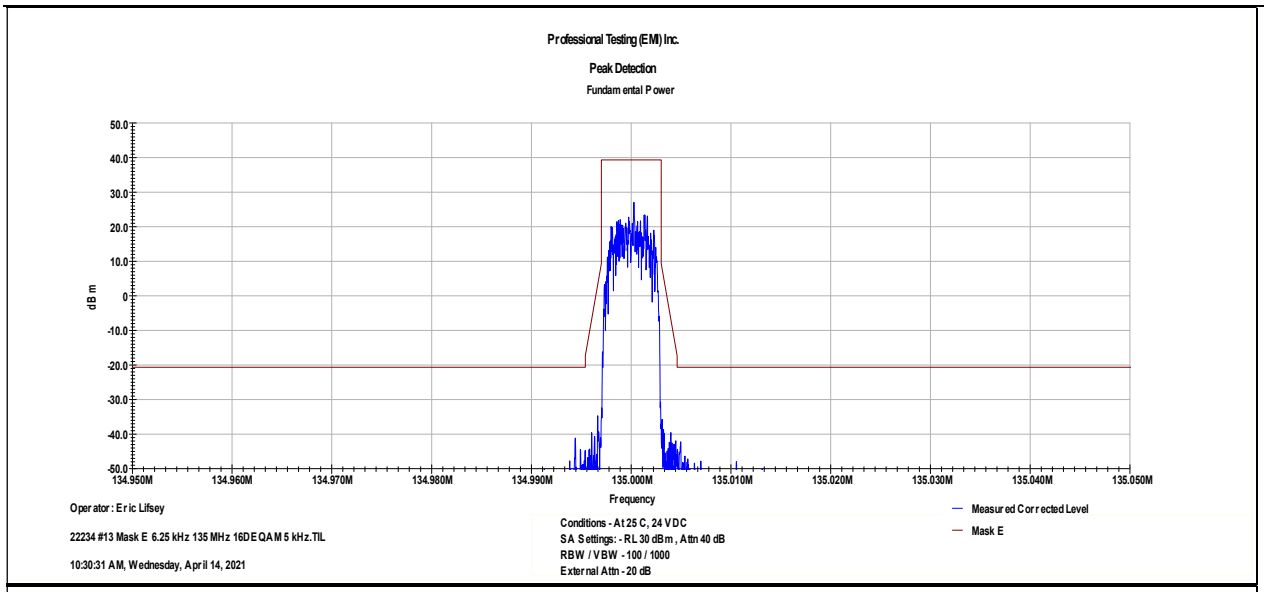

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #08 Mask E 6.25 kHz 155 MHz pi4DQPSK 5 kHz.TIL
10:18:58 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

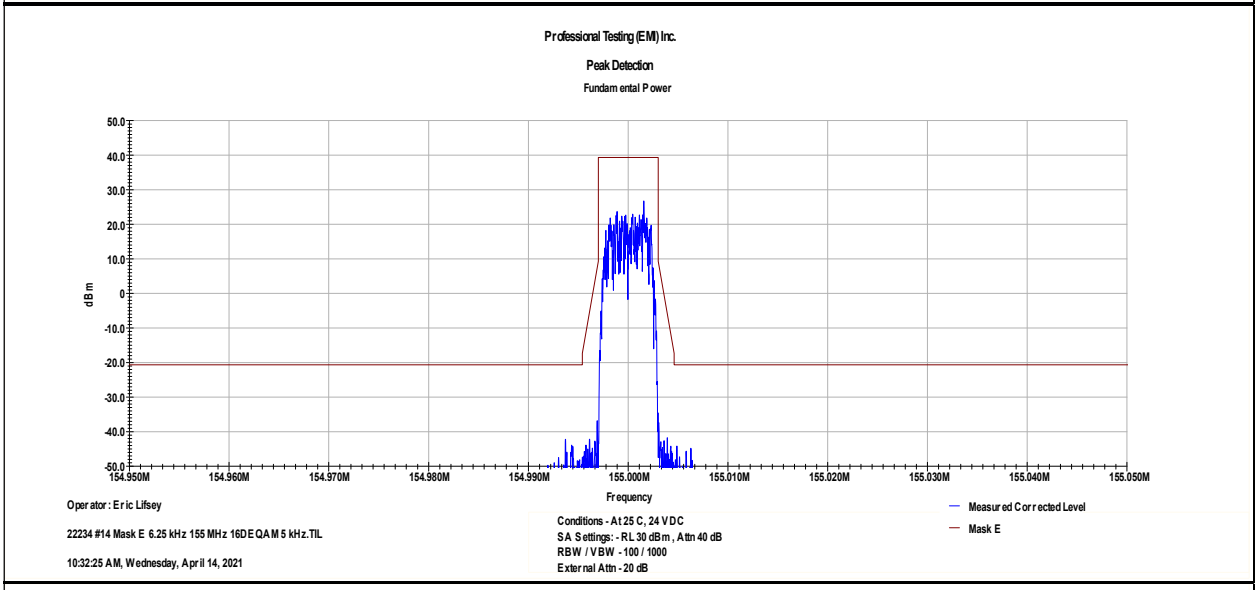

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #09 Mask E 6.25 kHz 175 MHz pi4DQPSK 5 kHz.TIL
10:21:47 AM, Wednesday, April 14, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm, Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

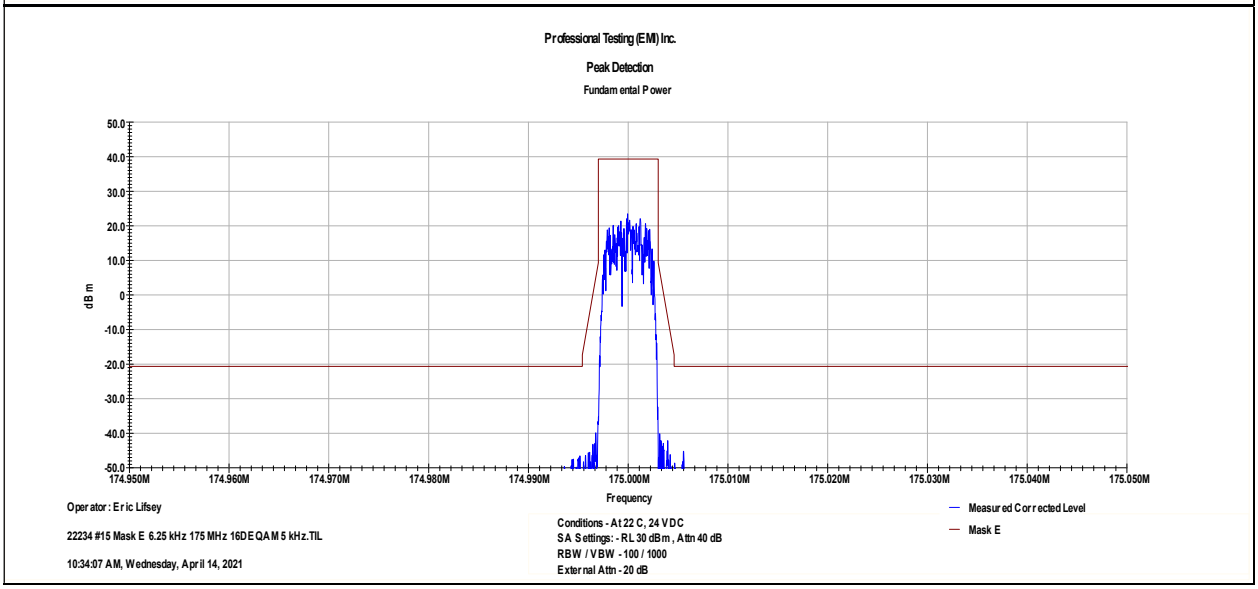

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #10 Mask E 6.25 kHz 135 MHz D8PSK 5 kHz.TIL
10:24:12 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

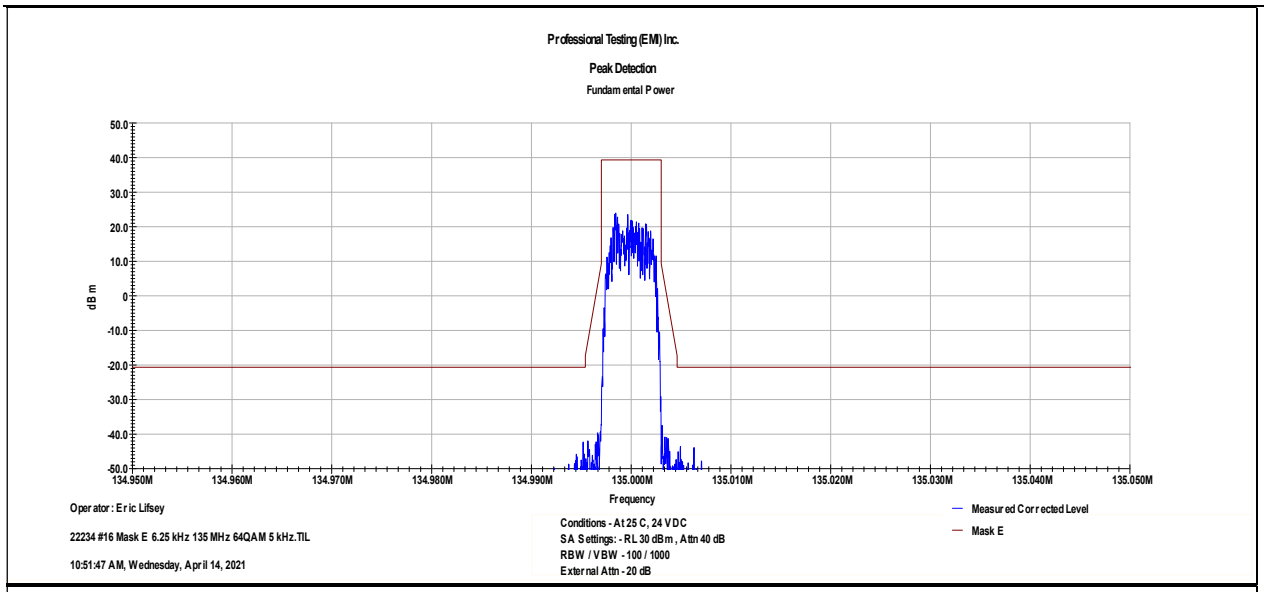

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #11 Mask E 6.25 kHz 155 MHz D8PSK 5 kHz.TIL
10:26:29 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

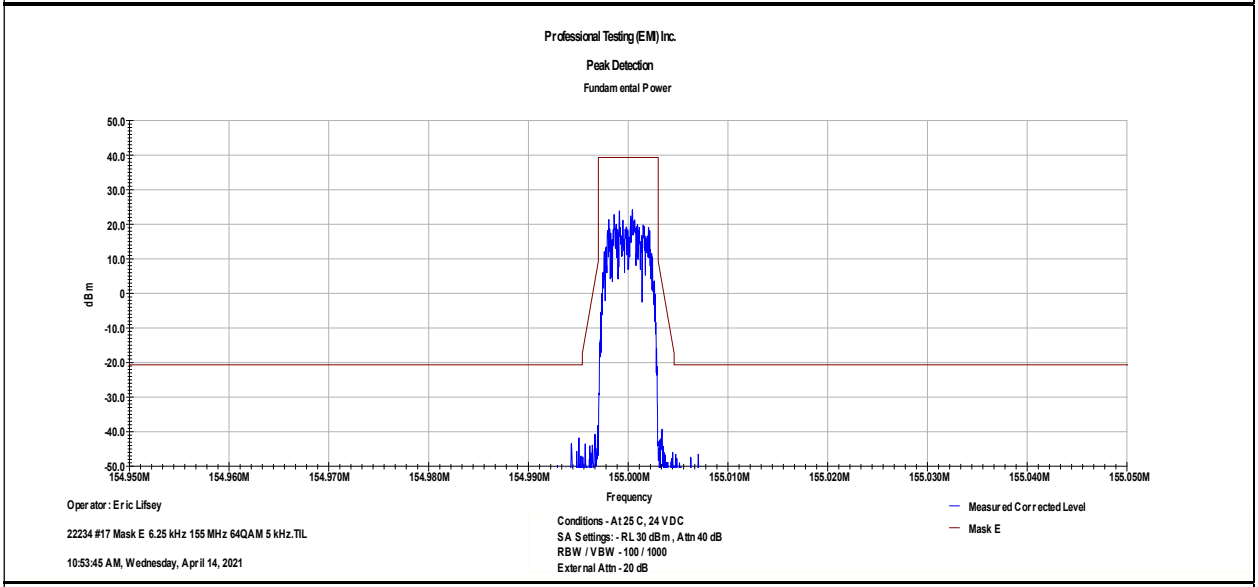

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dB m
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #12 Mask E 6.25 kHz 175 MHz D8PSK 5 kHz.TIL
10:28:22 AM, Wednesday, April 14, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

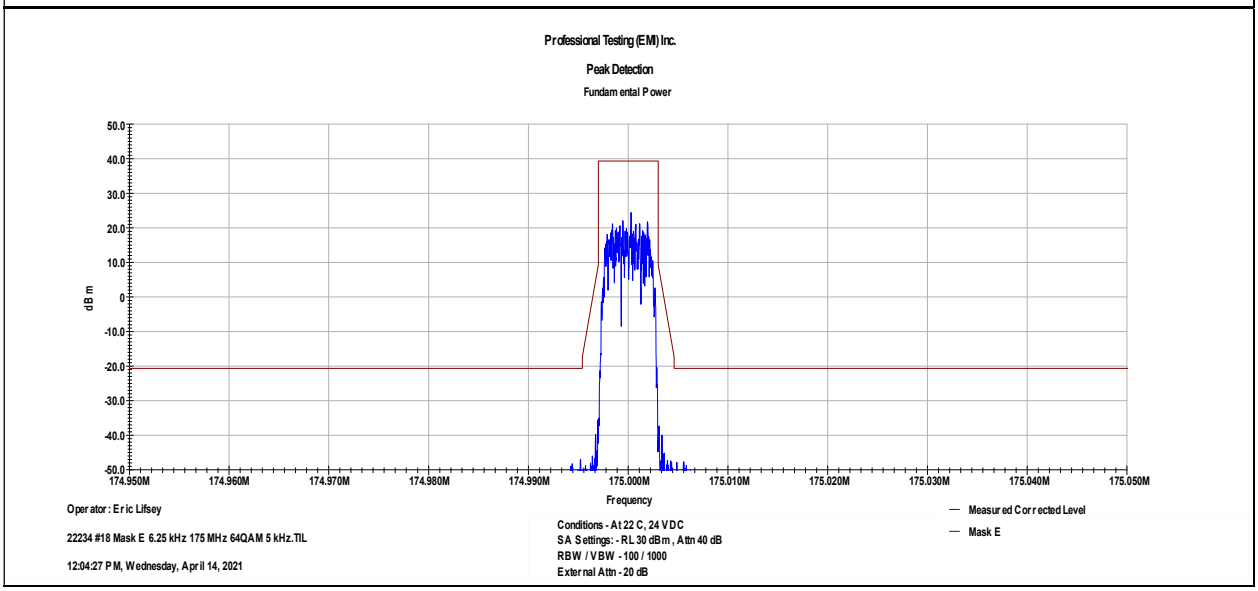

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #13 Mask E 6.25 kHz 135 MHz 16DEQAM 5 kHz.TIL
10:30:31 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

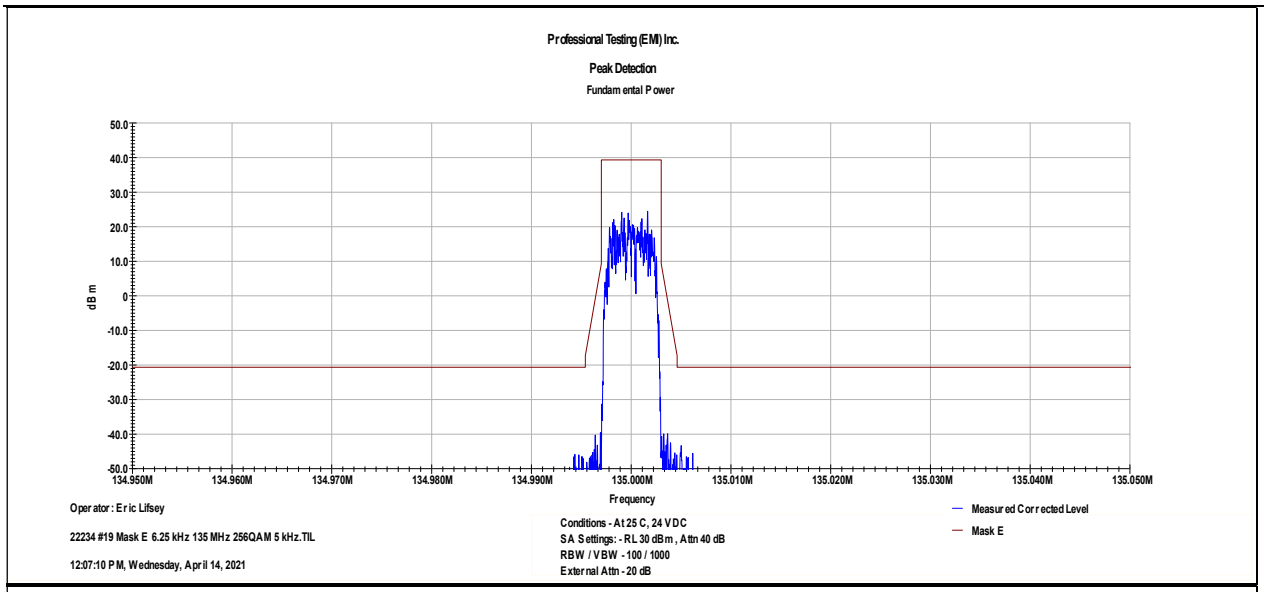

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #14 Mask E 6.25 kHz 155 MHz 16DEQAM 5 kHz.TIL
10:32:25 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

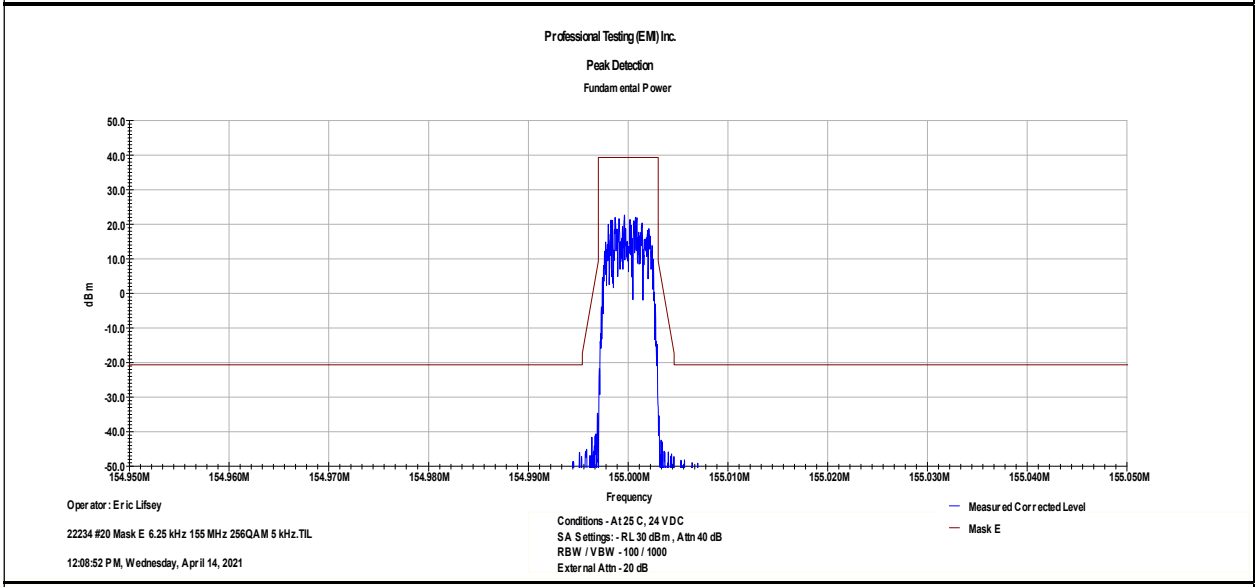

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #15 Mask E 6.25 kHz 175 MHz 16DEQAM 5 kHz.TIL
10:34:07 AM, Wednesday, April 14, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

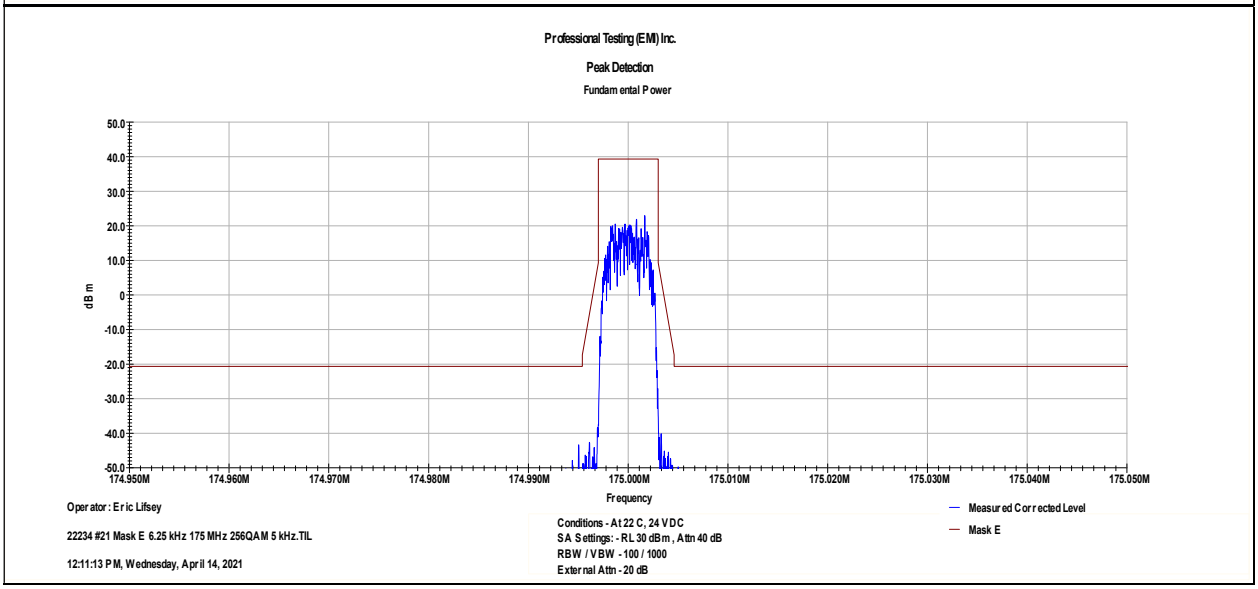

Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #16 Mask E 6.25 kHz 135 MHz 64QAM 5 kHz.TIL
10:51:47 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #17 Mask E 6.25 kHz 155 MHz 64QAM 5 kHz.TIL
10:53:45 AM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #18 Mask E 6.25 kHz 175 MHz 64QAM 5 kHz.TIL
12:04:27 PM, Wednesday, April 14, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
134.950M
134.960M
134.970M
134.980M
134.990M
135.000M
135.010M
135.020M
135.030M
135.040M
135.050M
Frequency
Operator: Eric Lifsey
22234 #19 Mask E 6.25 kHz 135 MHz 256QAM 5 kHz.TIL
12:07:10 PM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
154.950M
154.960M
154.970M
154.980M
154.990M
155.000M
155.010M
155.020M
155.030M
155.040M
155.050M
Frequency
Operator: Eric Lifsey
22234 #20 Mask E 6.25 kHz 155 MHz 256QAM 5 kHz.TIL
12:08:52 PM, Wednesday, April 14, 2021
Conditions - At 25 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E


Professional Testing (EMI) Inc.
Peak Detection
Fundamental Power
dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
174.950M
174.960M
174.970M
174.980M
174.990M
175.000M
175.010M
175.020M
175.030M
175.040M
175.050M
Frequency
Operator: Eric Lifsey
22234 #21 Mask E 6.25 kHz 175 MHz 256QAM 5 kHz.TIL
12:11:13 PM, Wednesday, April 14, 2021
Conditions - At 22 C, 24 VDC
SA Settings: - RL 30 dBm , Attn 40 dB
RBW / VBW - 100 / 1000
External Attn - 20 dB
Measured Corrected Level
Mask E

3.0 Spurious Emissions at Antenna Terminals

3.1 Procedure

The EUT antenna port is coupled through a power attenuator to a spectrum analyzer and then is placed into continuous transmit mode. The connection is otherwise direct and no cables are used. Spurious signals are then measured directly with attenuator loss applied. Emissions are measured with a peak detector from 9 kHz to 5 GHz to include the tenth harmonic.

3.2 Criteria

Parameter	Section Number	Date
Emissions at Antenna Terminals	90.210, 2.1047| RSS-119 Issue 12, 5.8	22 Mar 2021

Limit is determined in section 2.4 for emissions beyond the authorized bandwidth.

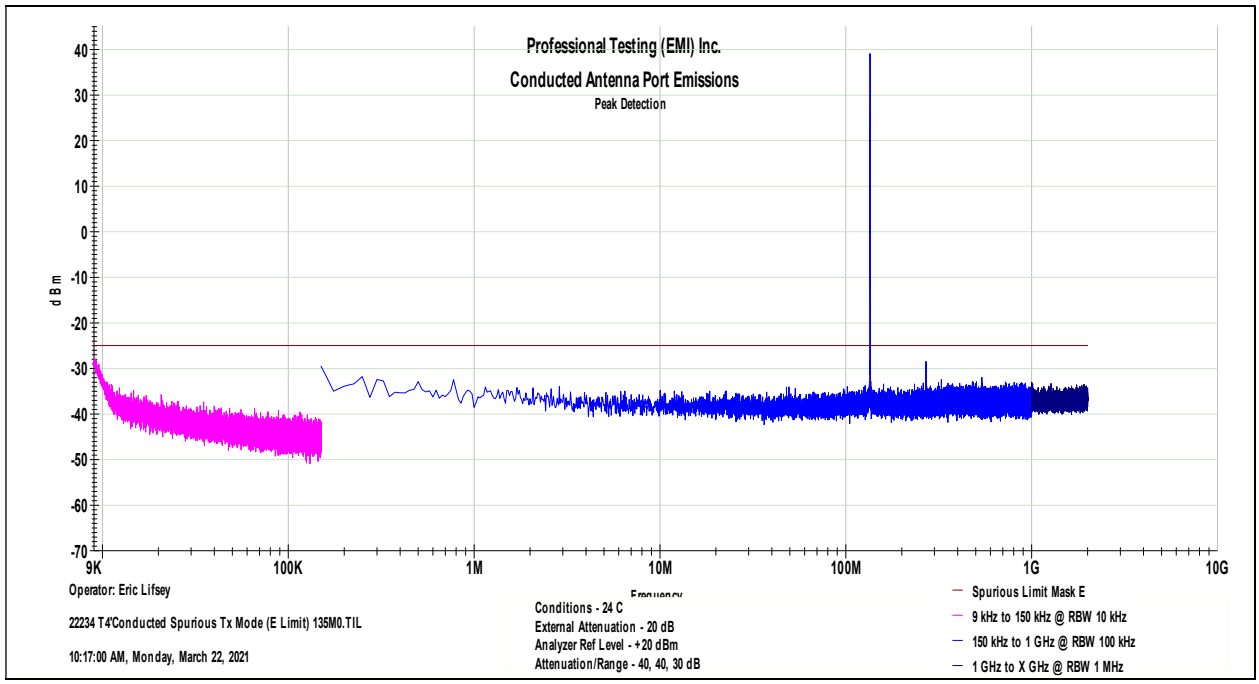
3.3 Results

The EUT satisfied the requirement.

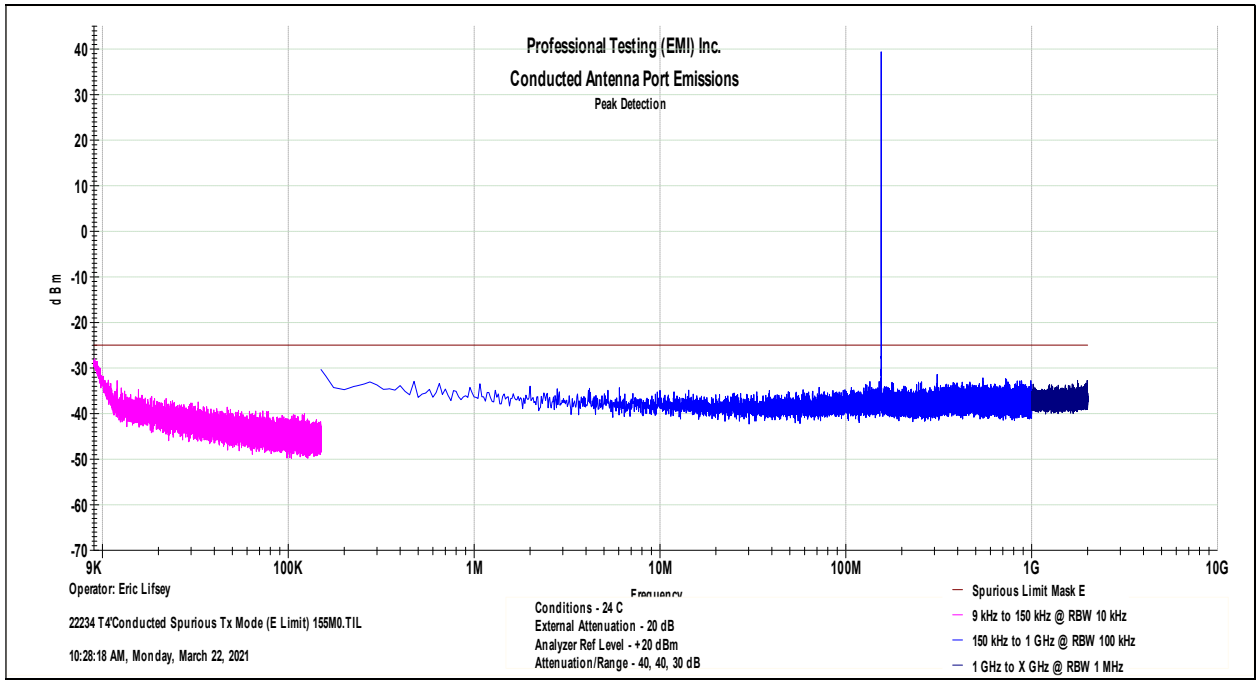
Setup per section 1.7.

Table 4.3.1 Highest Recorded Spurious; Antenna Terminal		
Operating Channel MHz	**Measured Frequency MHz**	**Measured Corrected Level dBm**
135	269.9645	-28.5
155	310.0285	-31.5
175	350.0225	-33.0

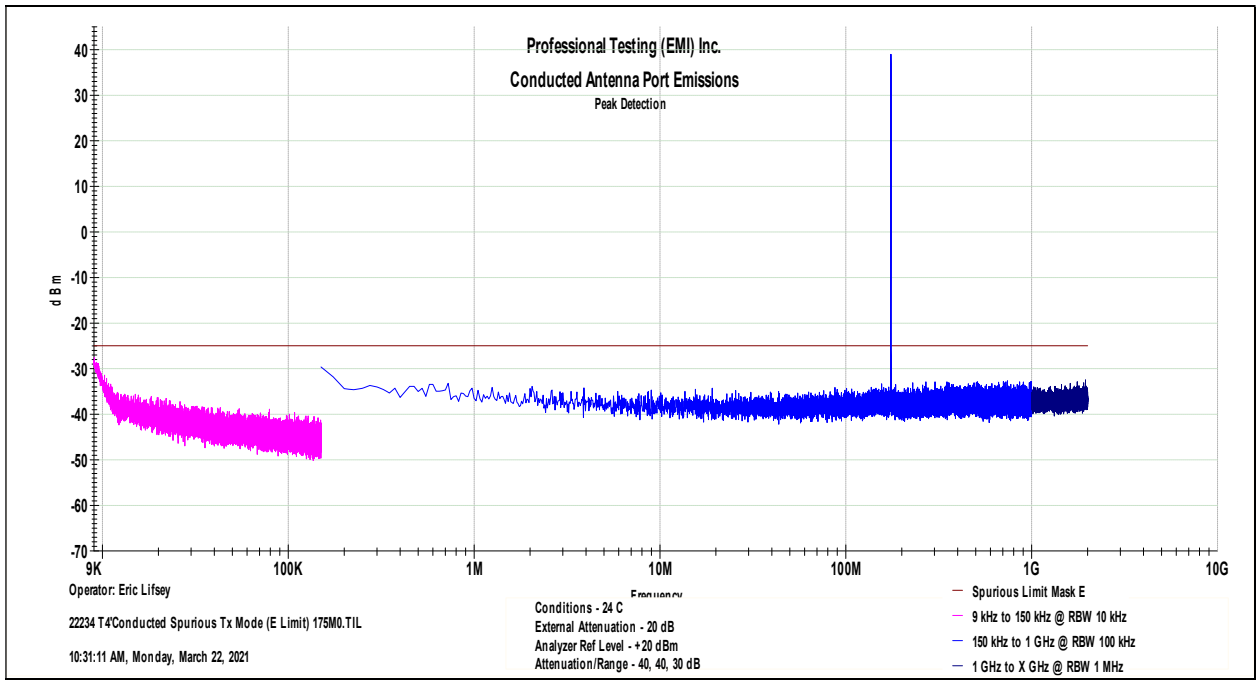
3.3.1 Transmit Mode, Bottom Channel



3.3.2 Transmit Mode, Middle Channel



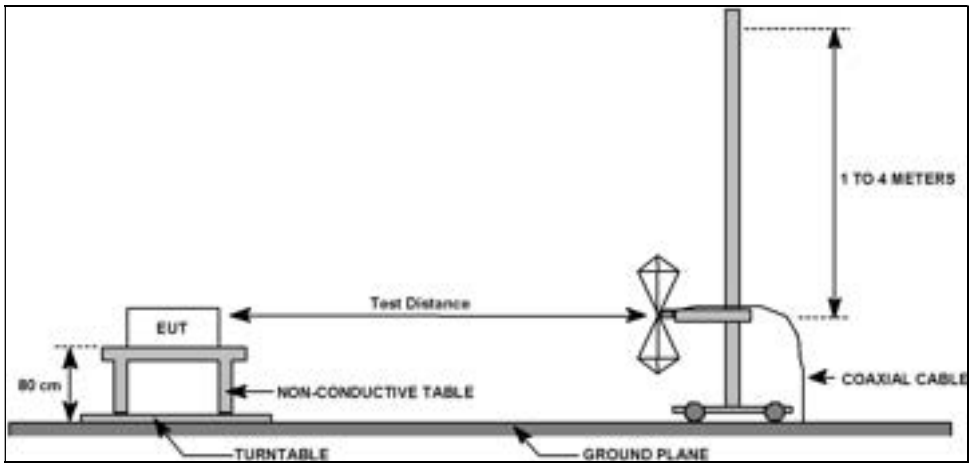
3.3.3 Transmit Mode, Top Channel



4.0 Field Strength of Radiated Spurious Emissions

4.1 Procedure

The EUT was placed on a non-conductive table above the ground plane. The table was centered on a rotating turntable at a distance of 10 meters from the measurement antenna. The EUT was placed into transmit mode with the antenna removed and a resistive terminator substituted. Height above the ground plane was 80 cm below 1 GHz and 150 cm above 1 GHz.



Field Strength of Radiated Emissions Test Setup

4.2 Criteria

Parameter	Section Number	Date
Field Strength of Radiated Emissions 30 MHz to 2 GHz	90.210, 15.209, 2.1053| RSS-119 Issue 12, 5.8; RSS-Gen Issue 5	21 Apr 2021

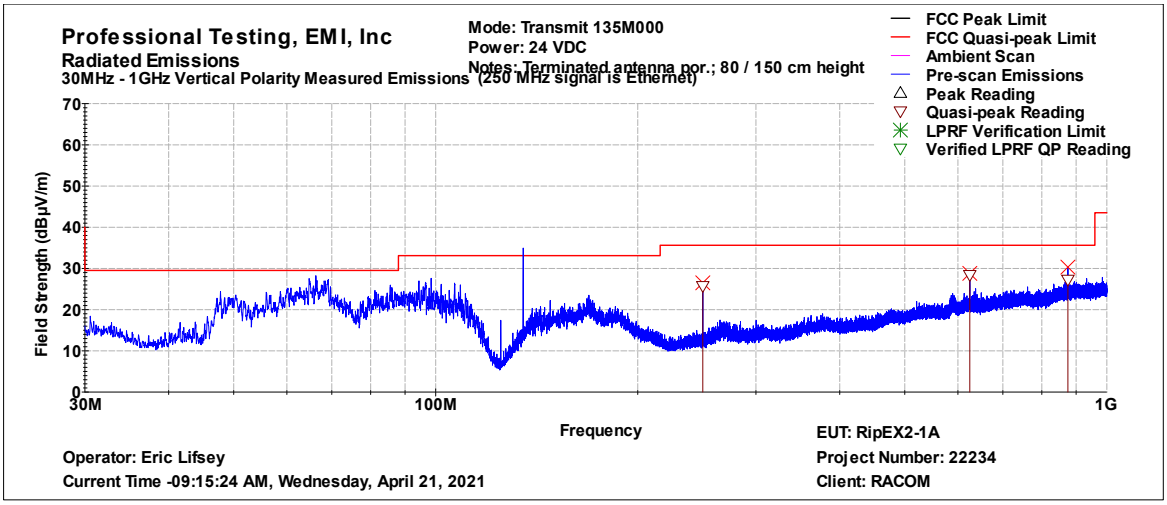
4.3 Results

The EUT satisfied the requirement. The EUT antenna port was terminated in a resistive load.

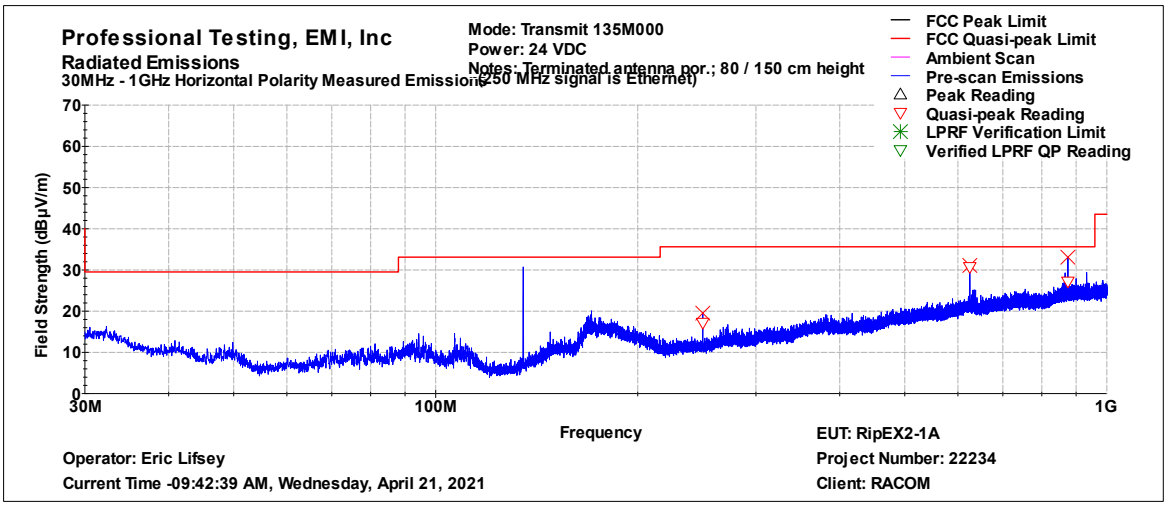
The general emissions limit (in red) is displayed. The EUT satisfied those limits. Conducted limit for Part 90.210(e) is -25 dBm; this is 59.8 dBuV/m @ 10 meters. Part 90 limit not displayed as the general emission limit was satisfied.

Table 5.3.1 Highest Recorded Spurious; Radiated			
Operating Channel MHz	**Measured Frequency MHz**	**Polarity / Distance**	**Measured Corrected Level dBµV/m**
135	625.008	H / 10 m	30.7
155	625.005	H / 10 m	29.3
175	874.972	H / 10 m	30.4

4.3.1 Transmit Mode, Below 1 GHz, Bottom Channel

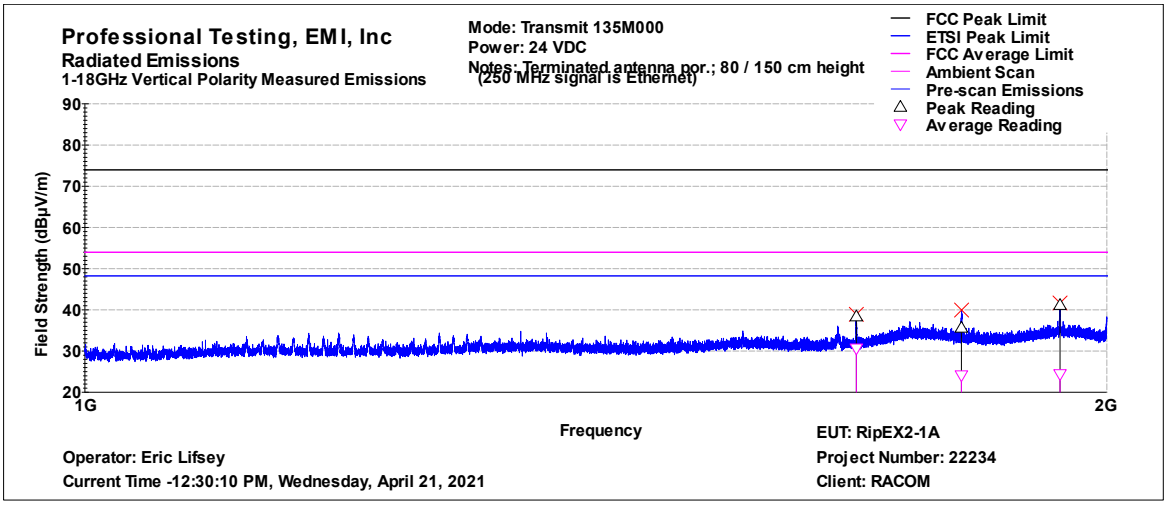


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	QP ((dBµV))	QP Limit ((dBµV))	QP Margin ((dB))	QP Results ((P/F))
249.995 MHz	32.000	129.000	25.698	35.600	-9.902	PASS
624.992 MHz	340.000	127.000	28.389	35.600	-7.211	PASS
874.989 MHz	17.000	272.000	27.223	35.600	-8.377	PASS

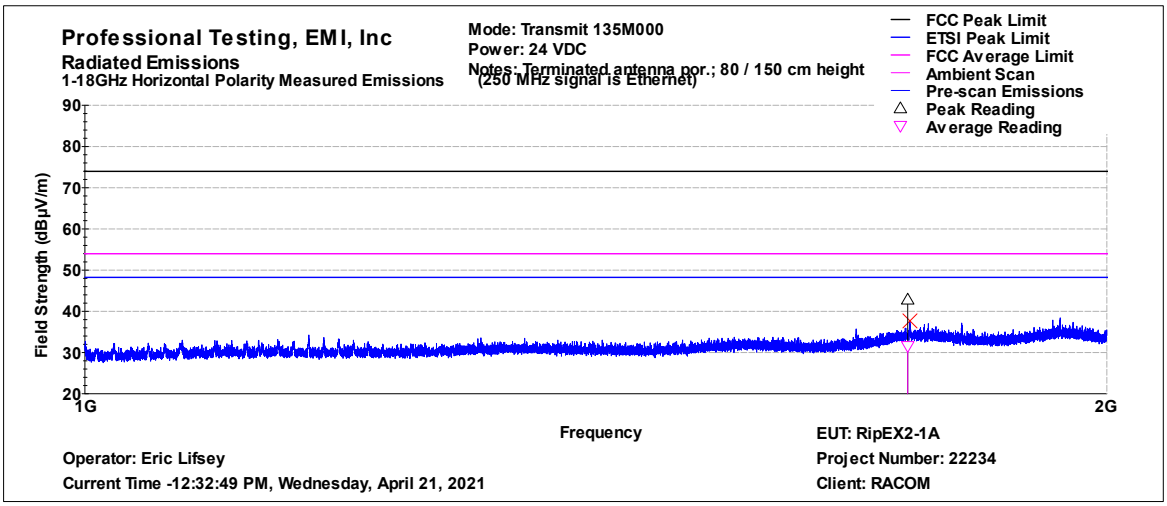


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	QP ((dBµV))	QP Limit ((dBµV))	QP Margin ((dB))	QP Results ((P/F))
250.001 MHz	49.000	373.000	17.157	35.600	-18.443	PASS
625.008 MHz	96.000	143.000	30.673	35.600	-4.927	PASS
874.988 MHz	2.000	288.000	27.146	35.600	-8.454	PASS

4.3.2 Transmit Mode, Above 1 GHz, Bottom Channel

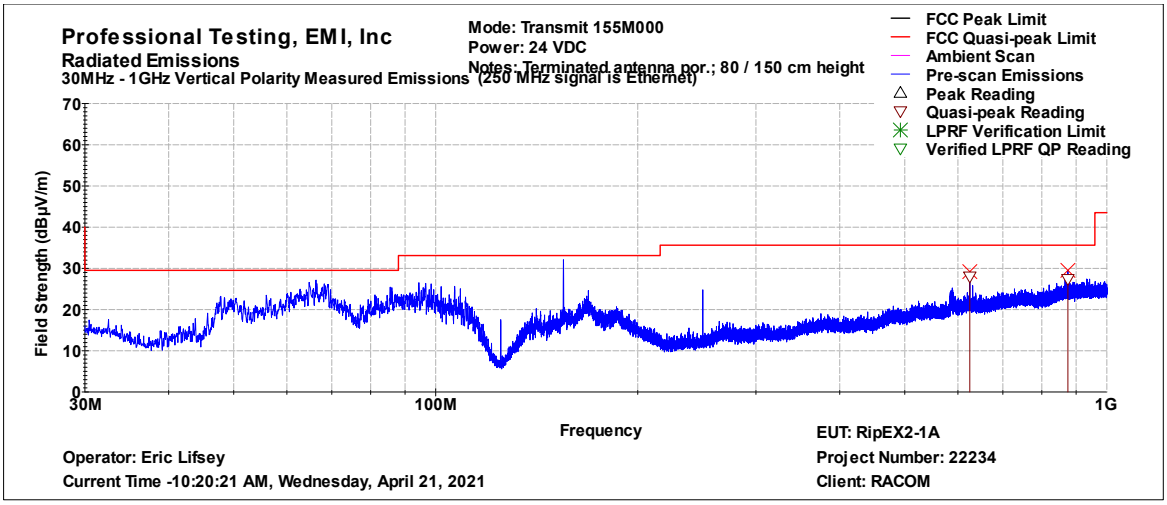


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	Peak ((dBuV))	Peak Limit ((dBuV))	Peak Margin ((dB))	Peak Results ((P/F))	Avg ((dBuV))	Avg Limit ((dBuV))	Avg Margin ((dB))	Avg Results ((P/F))
1687.51 MHz	220	271	38.422	73.958	-35.536	PASS	30.590	53.958	-23.368	PASS
1812.14 MHz	357	201	35.686	73.958	-38.272	PASS	24.078	53.958	-29.880	PASS
1937.50 MHz	218	226	41.191	73.958	-32.767	PASS	24.358	53.958	-29.600	PASS

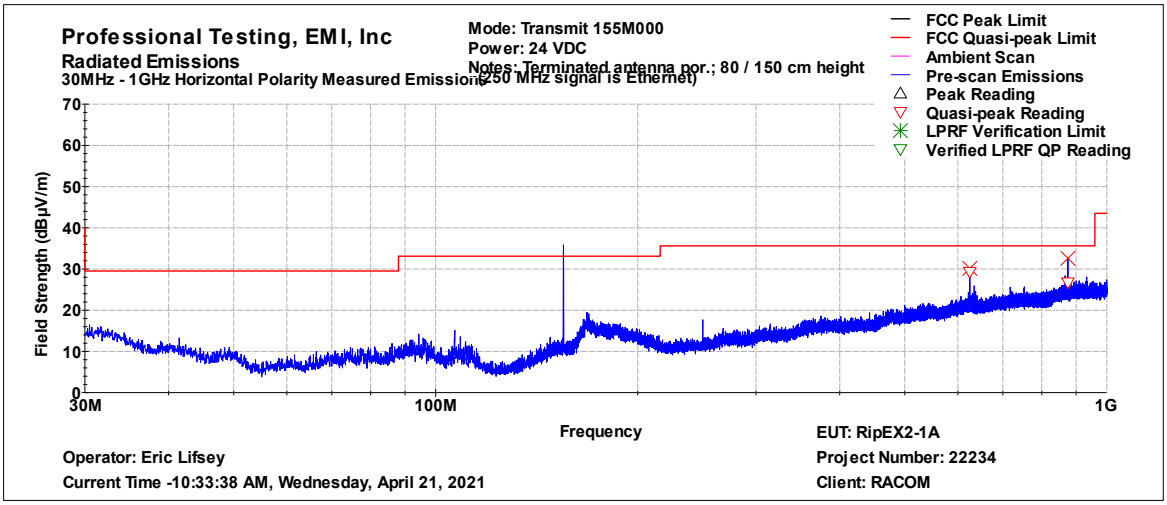


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	Peak ((dBuV))	Peak Limit ((dBuV))	Peak Margin ((dB))	Peak Results ((P/F))	Avg ((dBuV))	Avg Limit ((dBuV))	Avg Margin ((dB))	Avg Results ((P/F))
1747.37 MHz	12	290	42.855	73.958	-31.103	PASS	31.553	53.958	-22.405	PASS

4.3.3 Transmit Mode, Below 1 GHz, Middle Channel

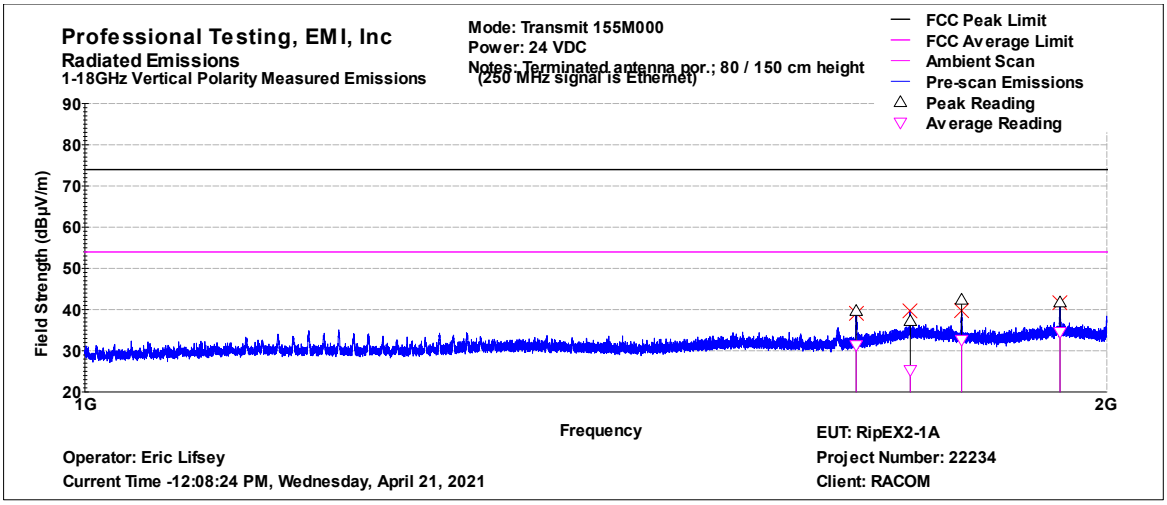


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	QP ((dBµV))	QP Limit ((dBµV))	QP Margin ((dB))	QP Results ((P/F))
624.982 MHz	338.000	128.000	27.985	35.600	-7.615	PASS
874.999 MHz	16.000	244.000	27.392	35.600	-8.208	PASS

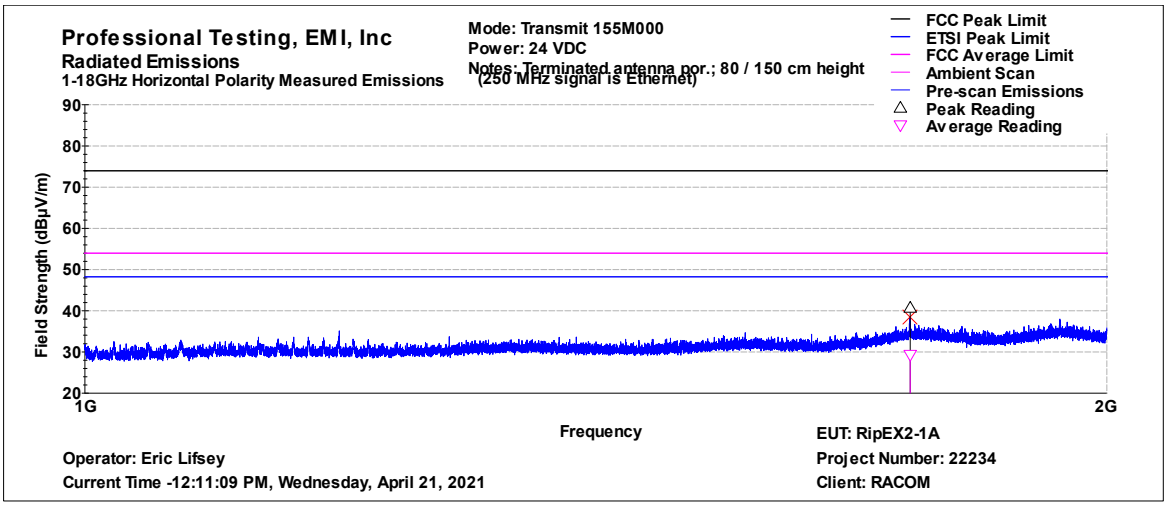


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	QP ((dBµV))	QP Limit ((dBµV))	QP Margin ((dB))	QP Results ((P/F))
625.005 MHz	95.000	102.000	29.256	35.600	-6.344	PASS
875.010 MHz	2.000	302.000	26.722	35.600	-8.878	PASS

4.3.4 Transmit Mode, Above 1 GHz, Middle Channel

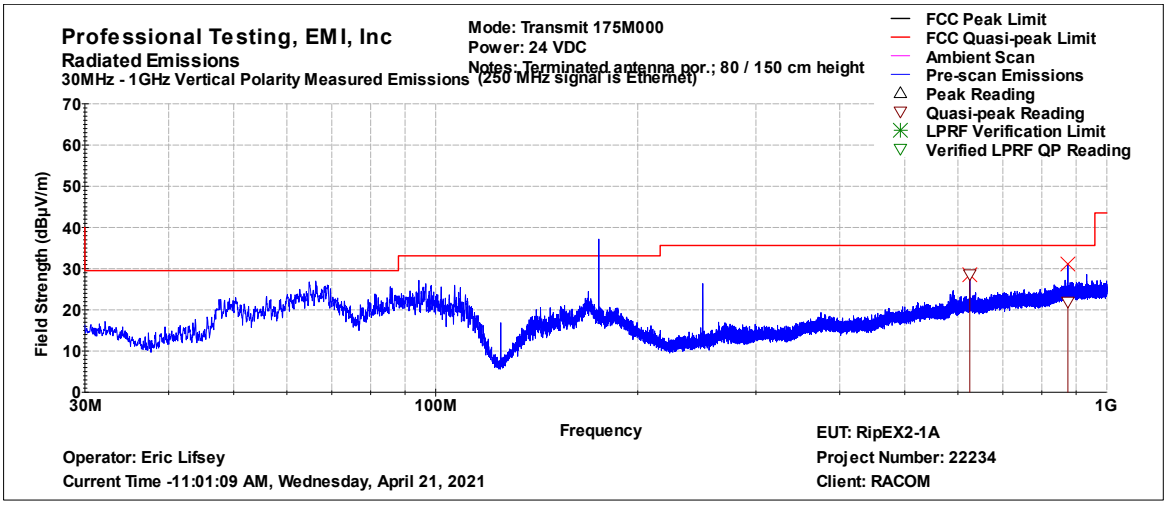


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	Peak ((dBuV))	Peak Limit ((dBuV))	Peak Margin ((dB))	Peak Results ((P/F))	Avg ((dBuV))	Avg Limit ((dBuV))	Avg Margin ((dB))	Avg Results ((P/F))
1687.40 MHz	245	279	39.676	73.958	-34.282	PASS	31.320	53.958	-22.638	PASS
1750.42 MHz	357	363	37.234	73.958	-36.724	PASS	25.280	53.958	-28.678	PASS
1812.42 MHz	235	171	42.405	73.958	-31.553	PASS	32.623	53.958	-21.335	PASS
1937.57 MHz	214	187	41.752	73.958	-32.206	PASS	34.540	53.958	-19.418	PASS

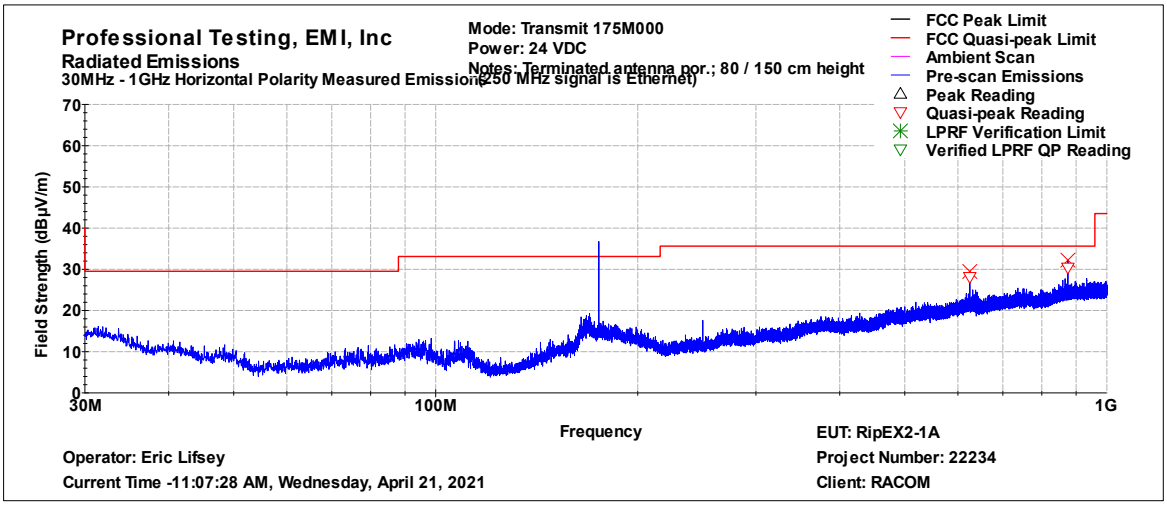


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	Peak ((dBuV))	Peak Limit ((dBuV))	Peak Margin ((dB))	Peak Results ((P/F))	Avg ((dBuV))	Avg Limit ((dBuV))	Avg Margin ((dB))	Avg Results ((P/F))
1750.31 MHz	16	304	40.744	73.958	-33.214	PASS	29.275	53.958	-24.683	PASS

4.3.5 Transmit Mode, Below 1 GHz, Top Channel

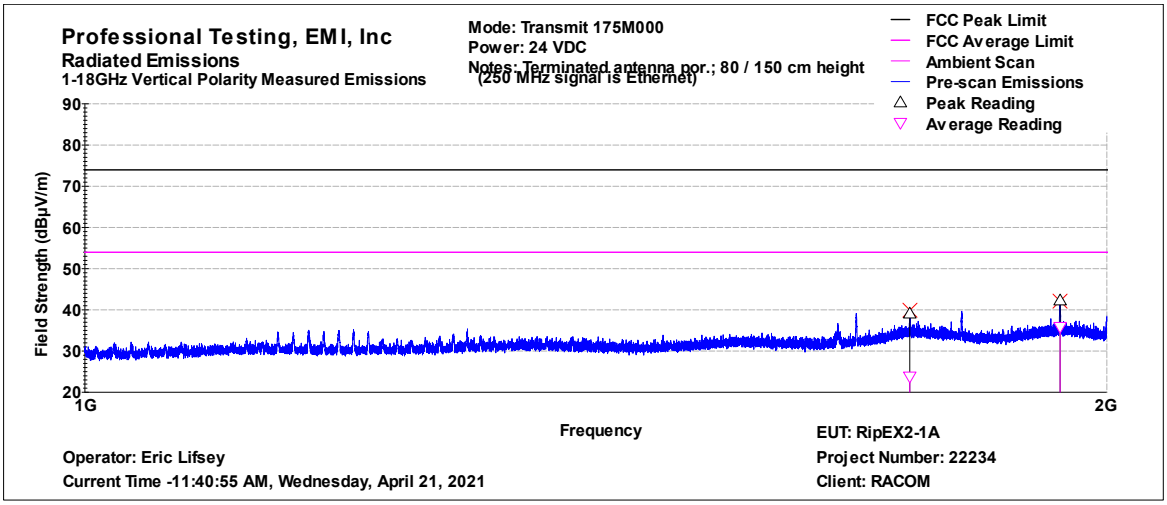


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	QP ((dBµV))	QP Limit ((dBµV))	QP Margin ((dB))	QP Results ((P/F))
624.989 MHz	342.000	128.000	28.603	35.600	-6.997	PASS
875.056 MHz	306.000	126.000	21.962	35.600	-13.638	PASS

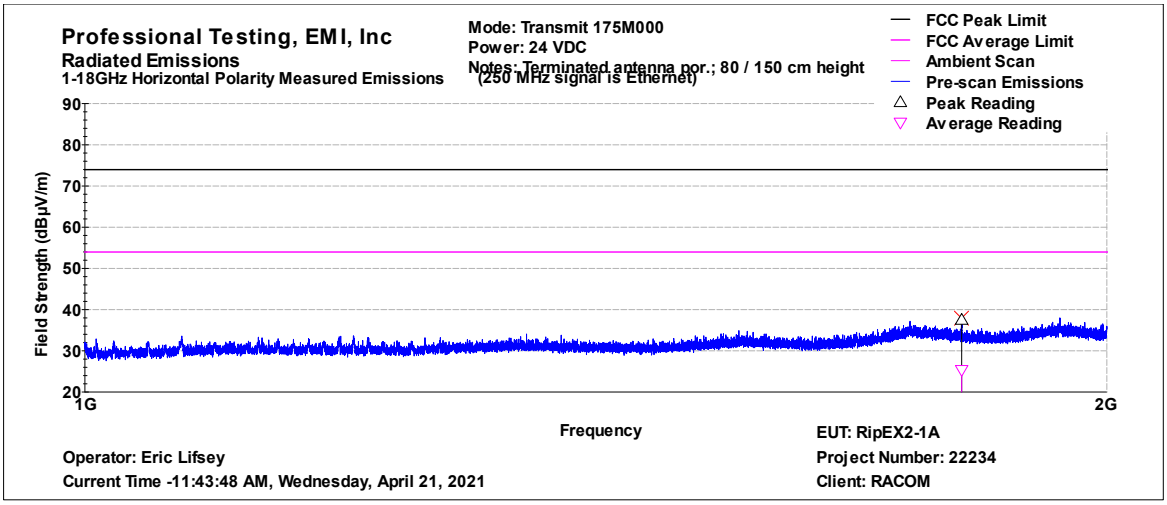


Frequency (MHz)	Azimuth ((deg))	Height ((cm))	QP ((dBµV))	QP Limit ((dBµV))	QP Margin ((dB))	QP Results ((P/F))
624.983 MHz	100.000	126.000	28.096	35.600	-7.504	PASS
874.972 MHz	24.000	126.000	30.375	35.600	-5.225	PASS

4.3.6 Transmit Mode, Above 1 GHz, Top Channel



Frequency (MHz)	Azimuth ((deg))	Height ((cm))	Peak ((dBuV))	Peak Limit ((dBuV))	Peak Margin ((dB))	Peak Results ((P/F))	Avg ((dBuV))	Avg Limit ((dBuV))	Avg Margin ((dB))	Avg Results ((P/F))
1749.79 MHz	225	177	39.124	73.958	-34.834	PASS	23.783	53.958	-30.175	PASS
1937.66 MHz	234	214	42.298	73.958	-31.660	PASS	35.834	53.958	-18.124	PASS



Frequency (MHz)	Azimuth ((deg))	Height ((cm))	Peak ((dBuV))	Peak Limit ((dBuV))	Peak Margin ((dB))	Peak Results ((P/F))	Avg ((dBuV))	Avg Limit ((dBuV))	Avg Margin ((dB))	Avg Results ((P/F))
1812.52 MHz	204	376	37.541	73.958	-36.417	PASS	25.316	53.958	-28.642	PASS

5.0 Frequency Stability

5.1 Procedure

The EUT is placed into a temperature chamber with a cable coupling the transmitted signal to a spectrum analyzer. On reaching each set point temperature, the EUT is allowed to soak at least 10 minutes without power applied. After soak time was satisfied, the EUT is powered on in transmit mode and the frequency is observed until it becomes stable; then the measurement of frequency is taken.

5.2 Criteria

Parameter	Section Number	Date
Frequency Stability	90.213 | RSS-119 Issue 12, 5.3	22 Mar 2021

Table 6.2.1 Frequency Tolerance
1 ppm (Base station criteria.) for smallest channel spacing mode of 6.25 kHz: 135 MHz * 1.0 = +/- 135.0 Hz 155 MHz * 1.0 = +/- 155.0 Hz 175 MHz * 1.0 = +/- 175.0 Hz

Table 6.2.2 Operating Voltages		
Low	Nominal	High
10	24	30

The operating frequency shall remain within the required tolerance.

5.3 Results

Setup per section 1.7 with a cable added to reach the EUT in the chamber. As this is a frequency measurement the cable losses were ignored. Frequency was read directly from spectrum analyzer using RBW 10 Hz in span of 170 Hz. EUT was in unmodulated mode.

The widest deviation from center frequency observed was +66 Hz on middle channel.

The EUT satisfied the requirement.

5.3.1 Bottom Channel, Temperature

Condition	Frequency		Deviation
Temperature (C)	Reference Center Frequency (MHz)	Measured Frequency (MHz)	Calculated Deviation (Hz)
-30	135.000000	135.000040	40
-20	135.000000	135.000031	31
-10	135.000000	135.000039	39
0	135.000000	135.000050	50
10	135.000000	135.000049	49
20	135.000000	135.000028	28
30	135.000000	135.000015	15
40	135.000000	134.999999	-1
50	135.000000	134.999999	-1

Max Deviation (Hz)	50
Min Deviation (Hz)	-1

5.3.2 Bottom Channel, Operating Voltage

Condition	Voltage	Frequency		
Voltage Extreme	Voltage (V DC)	Reference Frequency (MHz)	Measured Frequency (MHz)	Calculated Deviation (Hz)
Low	10.0	135.000000	135.000020	20
Nominal	24.0	135.000000	135.000021	21
High	30.0	135.000000	135.000020	20

5.3.3 Middle Channel, Temperature

Condition	Frequency		Deviation
Temperature (C)	Reference Center Frequency (MHz)	Measured Frequency (MHz)	Calculated Deviation (Hz)
-30	155.000000	155.000047	47
-20	155.000000	155.000037	37
-10	155.000000	155.000044	44
0	155.000000	155.000058	58
10	155.000000	155.000057	57
20	155.000000	155.000032	32
30	155.000000	155.000017	17
40	155.000000	154.999999	-1
50	155.000000	155.000000	0

Max Deviation (Hz)	58
Min Deviation (Hz)	-1

5.3.4 Middle Channel, Operating Voltage

Condition	Voltage	Frequency		
Voltage Extreme	Voltage (V DC)	Reference Frequency (MHz)	Measured Frequency (MHz)	Calculated Deviation (Hz)
Low	10.0	155.000000	155.000022	22
Nominal	24.0	155.000000	155.000023	23
High	30.0	155.000000	155.000024	24

5.3.5 Top Channel, Temperature

Condition	Frequency		Deviation
Temperature (C)	Reference Center Frequency (MHz)	Measured Frequency (MHz)	Calculated Deviation (Hz)
-30	175.000000	175.000055	55
-20	175.000000	175.000042	42
-10	175.000000	175.000050	50
0	175.000000	175.000066	66
10	175.000000	175.000064	64
20	175.000000	175.000037	37
30	175.000000	175.000018	18
40	175.000000	175.000000	0
50	175.000000	175.000000	0

Max Deviation (Hz)	66
Min Deviation (Hz)	0

5.3.6 Top Channel, Operating Voltage

Condition	Voltage	Frequency		
Voltage Extreme	Voltage (V DC)	Reference Frequency (MHz)	Measured Frequency (MHz)	Calculated Deviation (Hz)
Low	10.0	175.000000	175.000025	25
Nominal	24.0	175.000000	175.000024	24
High	30.0	175.000000	175.000024	24

6.0 Transient Frequency Behavior

The EUT was tested for transient frequency behavior using the test method outlined in TIA/EIA-603-E paragraph 2.2.19.3 Alternate Method of Measurement (Using a Test Receiver).

The EUT is terminated with a suitable resistive attenuator with the output connected to a forward power coupler. The coupler forward output (-10 dB) is run through a detector diode then to the trigger input port of a digital oscilloscope. The RF pass-through output of the coupler is then run to a 3 port resistive power combining network; the #2 port of the combiner is connected to the output of a RF signal generator, the #3 port is used as output and connected to a test receiver (modulation analyzer). The detected output of the modulation analyzer is connected to the vertical input of the digital oscilloscope.

The RF generator is set to the fundamental operating frequency, set to modulate with a 1 kHz tone at +/- 25 kHz FM deviation, and at a relatively low but usable level where the modulation analyzer is able to demodulate the signal. The modulation analyzer is configured to use the high and low pass filter settings as called out in the TIA-603-C procedure. The modulation analyzer is then dialed via front panel keypad to the fundamental operating frequency for best sensitivity.

The transmitter is keyed as needed and adjustments are made to the instruments to trigger appropriately and render the measurement as required by the TIA-603-C standard. The essential technique is the signal generator provides a reference frequency captured by the modulation analyzer. When the EUT is keyed, at many dB above the signal generator level, the modulation analyzer locks to the EUT signal and deviation from center frequency can be observed and recorded on the digital oscilloscope.

6.1 Criteria

Parameter	Section Reference	Date
Transient Frequency Behavior	90.214 | RSS-119 Issue 12, 5.9 Procedure: TIA-603-E	20 Apr 2021

Table 7.1.1 Transient Frequency Limits

Time intervals[1,2]	Maximum frequency difference[3]	Frequency Range	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1[4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3[4]	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1[4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3[4]	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1[4]	±6.25 kHz	5.0 ms	10.0 ms
t_2	±3.125 kHz	20.0 ms	25.0 ms
t_3[4]	±6.25 kHz	5.0 ms	10.0 ms

[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on}.

t_2 is the time period immediately following t_1.

t_3 is the time period from the instant when the transmitter is turned off until t_{off}.

t_{off} is the instant when the 1 kHz test signal starts to rise.

[2]During the time from the end of $t_2$to the beginning of t_3, the frequency difference must not exceed the limits specified in §90.213.

[3]Difference between the actual transmitter frequency and the assigned transmitter frequency.

[4]If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

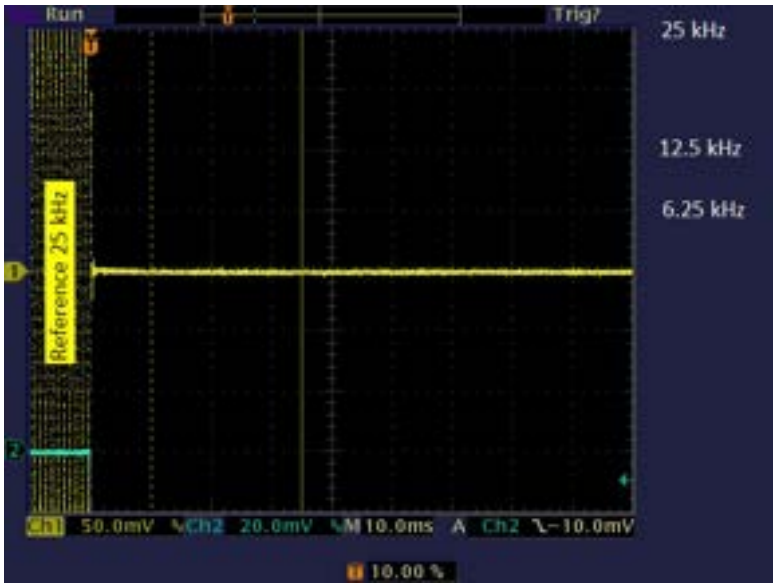
The measurement is performed for the lowest, middle, and highest operating frequency.

6.2 Results

The EUT satisfied the requirement.

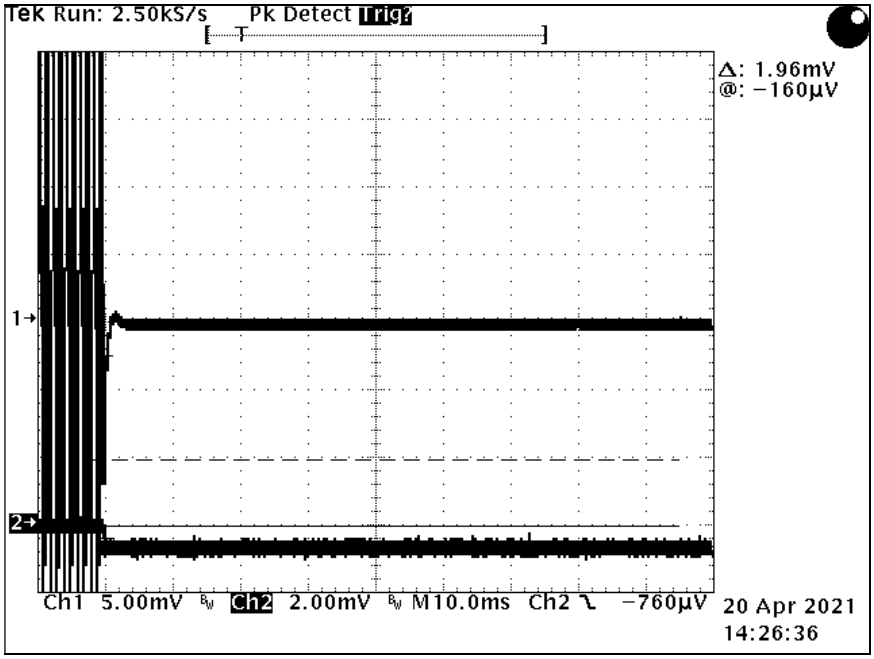
The frequency synthesis circuitry is identical for all channel spacing modes so the worst-case mode (25 kHz channel spacing) was measured to show compliance for all modes.

The limits were not superimposed on the plots as the transmitter performance was clearly in compliance for all of the supported channel schemes.

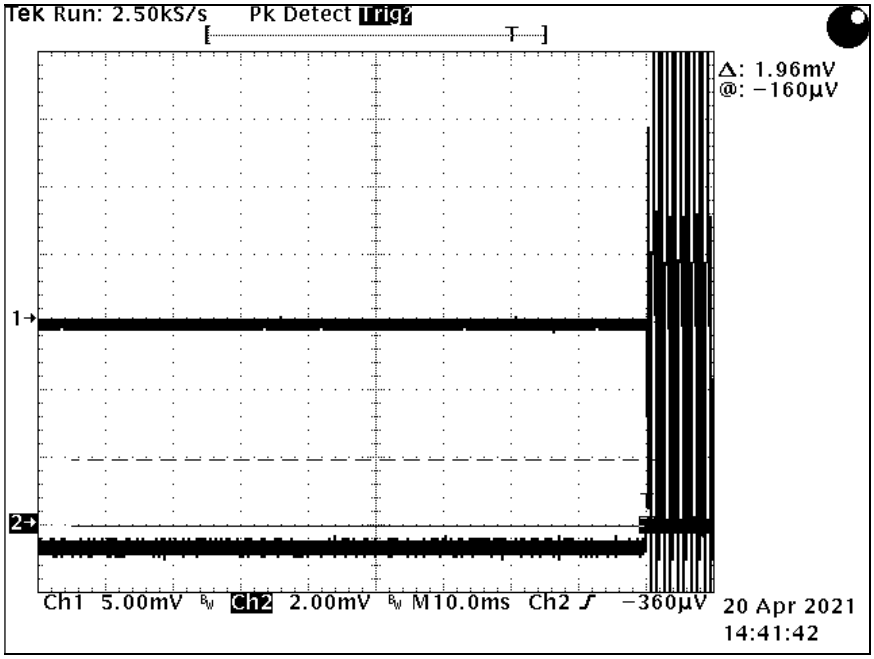


Annotated Calibration

6.2.1 Bottom Channel

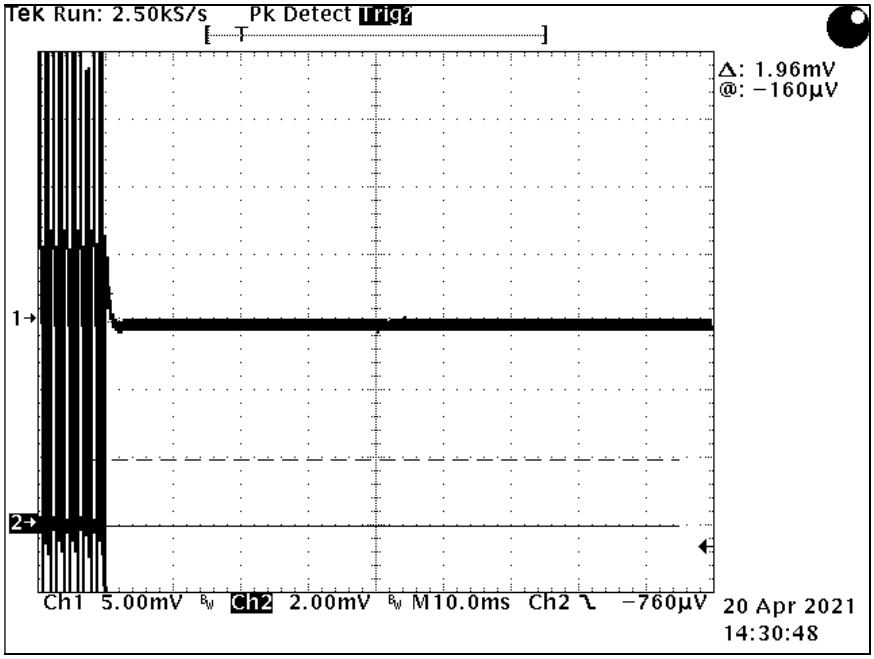


Start

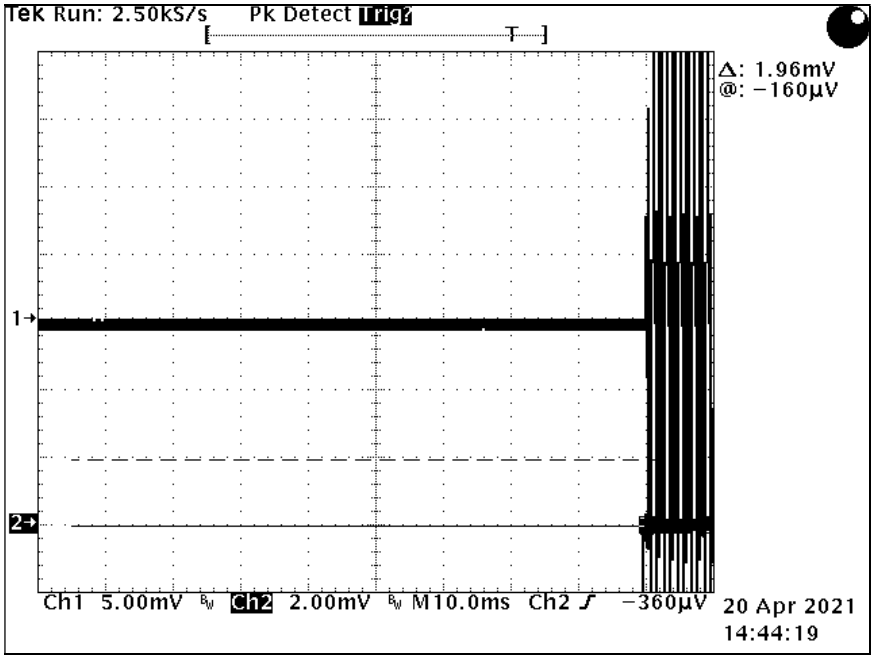


Stop

6.2.2 Middle Channel

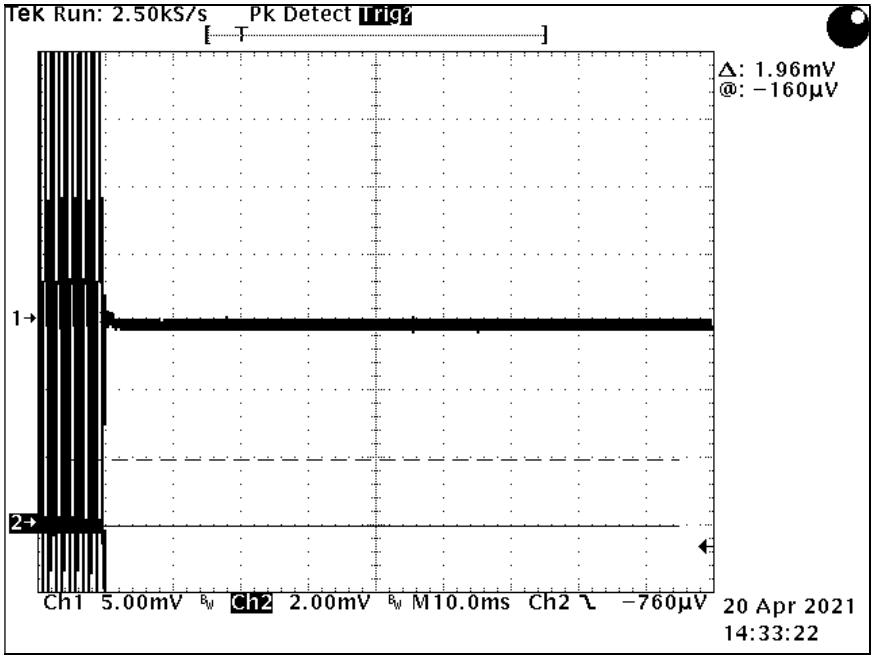


Start

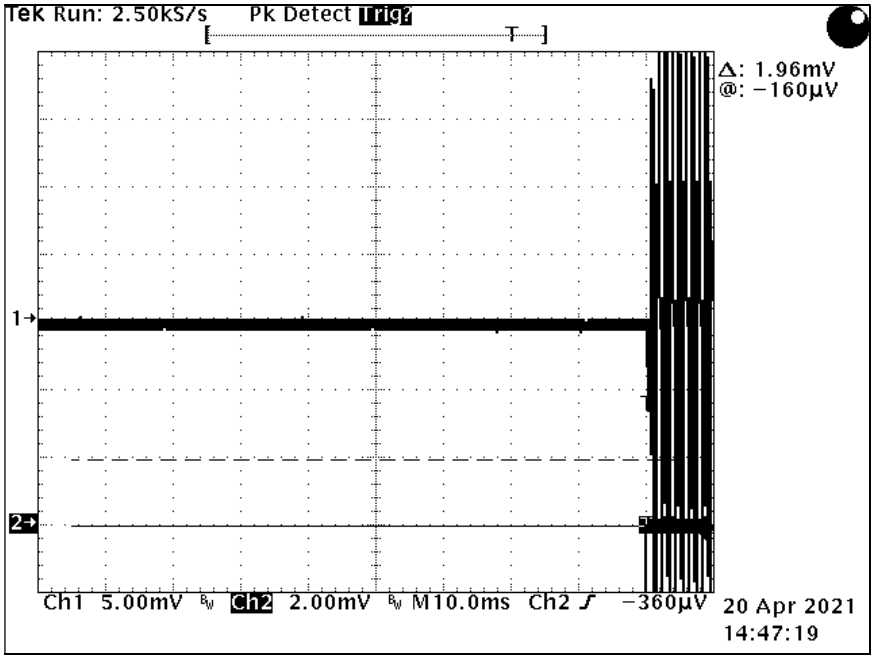


Stop

6.2.3 Top Channel



Start



Stop

7.0 Emission Bandwidth

7.1 Procedure

The EUT antenna port is coupled to a spectrum analyzer for measurement.

7.2 Criteria

Parameter	Section Number	Date
99% Bandwidth for Reporting	90.210, 90.203(j)(3), 2.1049 | RSS-119 Issue 12, 5.5	20 Apr 2021

7.3 Results

The EUT satisfied the requirement.

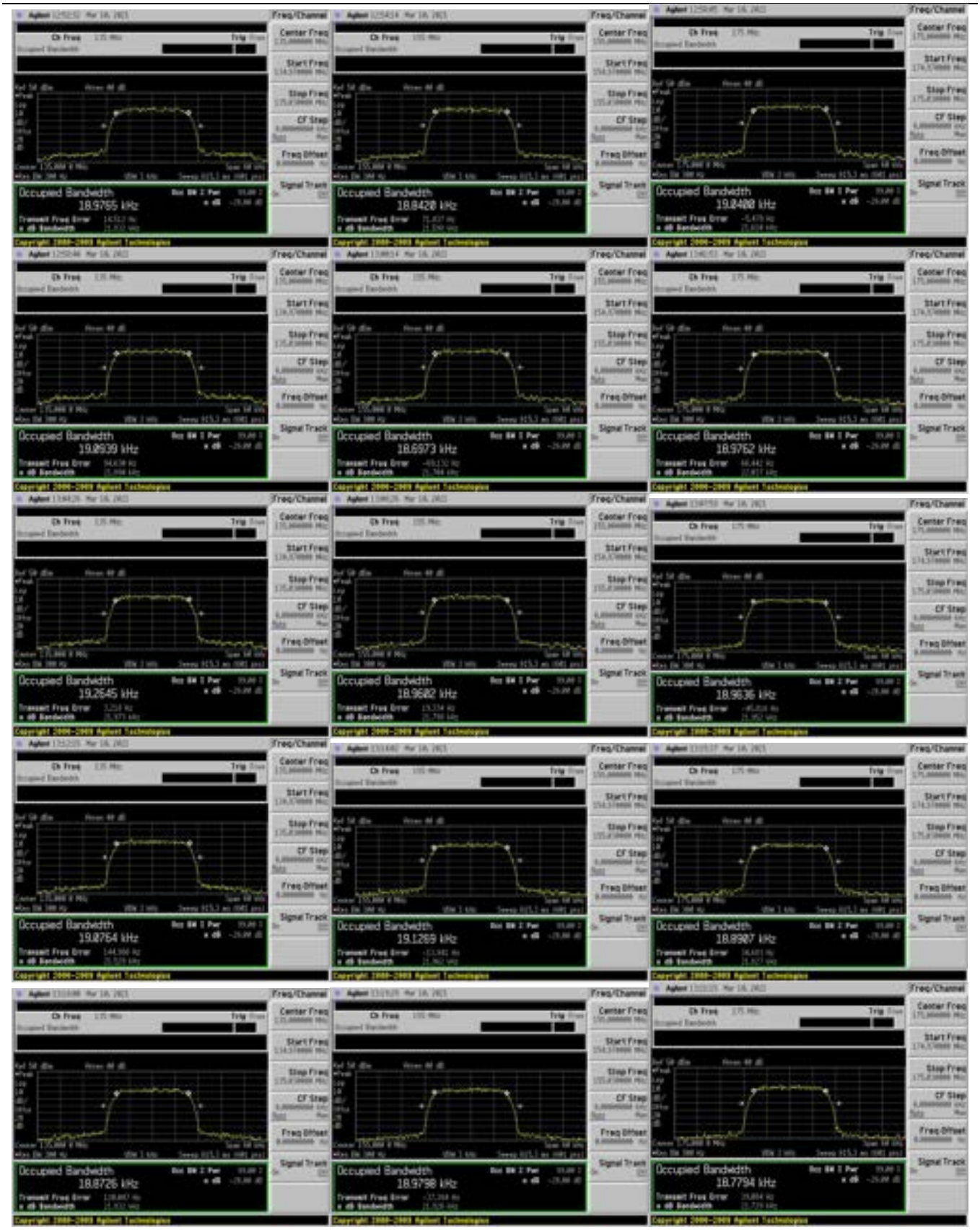
Setup is per section 1.7.

Video bandwidth is 1 kHz in all cases. Resolution bandwidth as noted in tabular data and plots. Measurement rounded to 3 significant digits in tables.

Table 8.3.1 Summary of Modulation Settings As noted on each graph.
2CPFSK
DPSK
pi/4DQPSK
D8PSK
16DEQAM
64QAM
256QAM

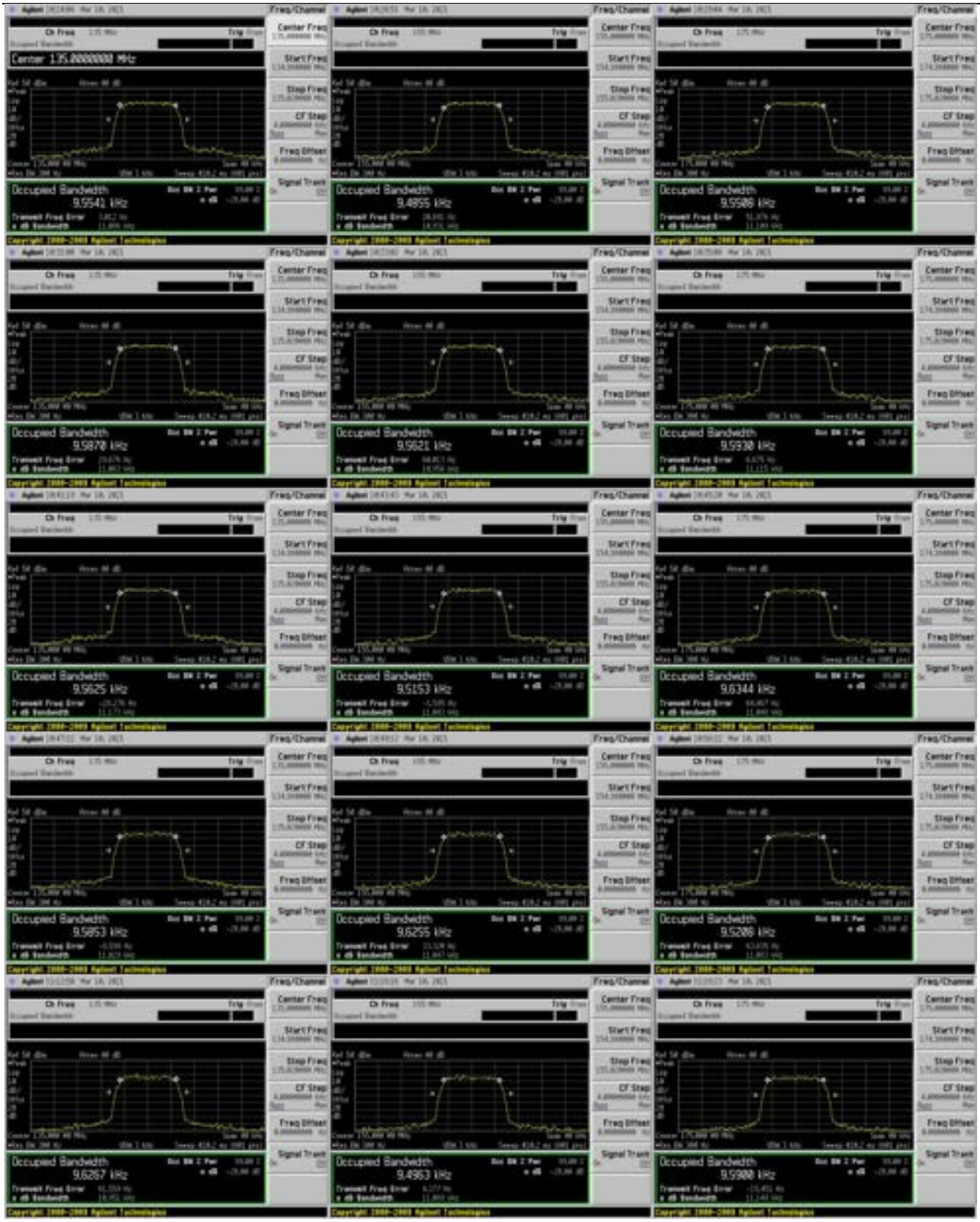
7.3.1 Channel Width 25.0 kHz

Bandwidth Measurement, 25.0 kHz using 300 Hz RBW		
Channel Frequency MHz	**Modulation Method**	**Measured OBW 99% kHz**
135	2CPFSK	15.0
155	2CPFSK	15.6
175	2CPFSK	14.8
135	DPSK	19.2
155	DPSK	19.0
175	DPSK	19.0
135	pi/4DQPSK	19.0
155	pi/4DQPSK	18.8
175	pi/4DQPSK	19.0
135	D8PSK	19.1
155	D8PSK	18.7
175	D8PSK	19.0
135	16DEQAM	19.3
155	16DEQAM	19.0
175	16DEQAM	19.0
135	64QAM	19.1
155	64QAM	19.1
175	64QAM	18.9
135	256QAM	18.9
155	256QAM	19.0
175	256QAM	18.8


Occupied Bandwidth
18.9765 kHz
Occupied Bandwidth
18.8420 kHz
Occupied Bandwidth
19.8420 kHz
Occupied Bandwidth
19.0939 kHz
Occupied Bandwidth
18.6973 kHz
Occupied Bandwidth
18.9762 kHz
Occupied Bandwidth
19.2645 kHz
Occupied Bandwidth
18.9682 kHz
Occupied Bandwidth
18.9636 kHz
Occupied Bandwidth
19.0764 kHz
Occupied Bandwidth
19.1269 kHz
Occupied Bandwidth
18.8907 kHz
Occupied Bandwidth
18.8726 kHz
Occupied Bandwidth
18.9798 kHz
Occupied Bandwidth
18.7794 kHz

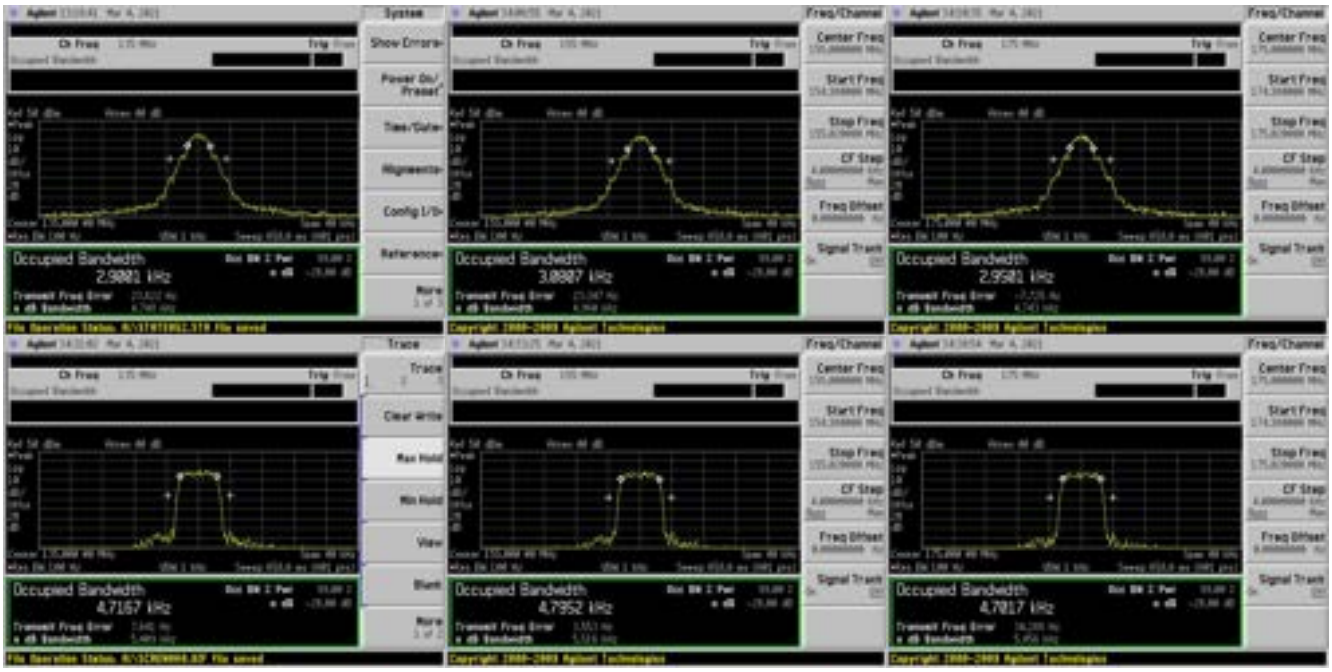
7.3.2 Channel Width 12.5 kHz

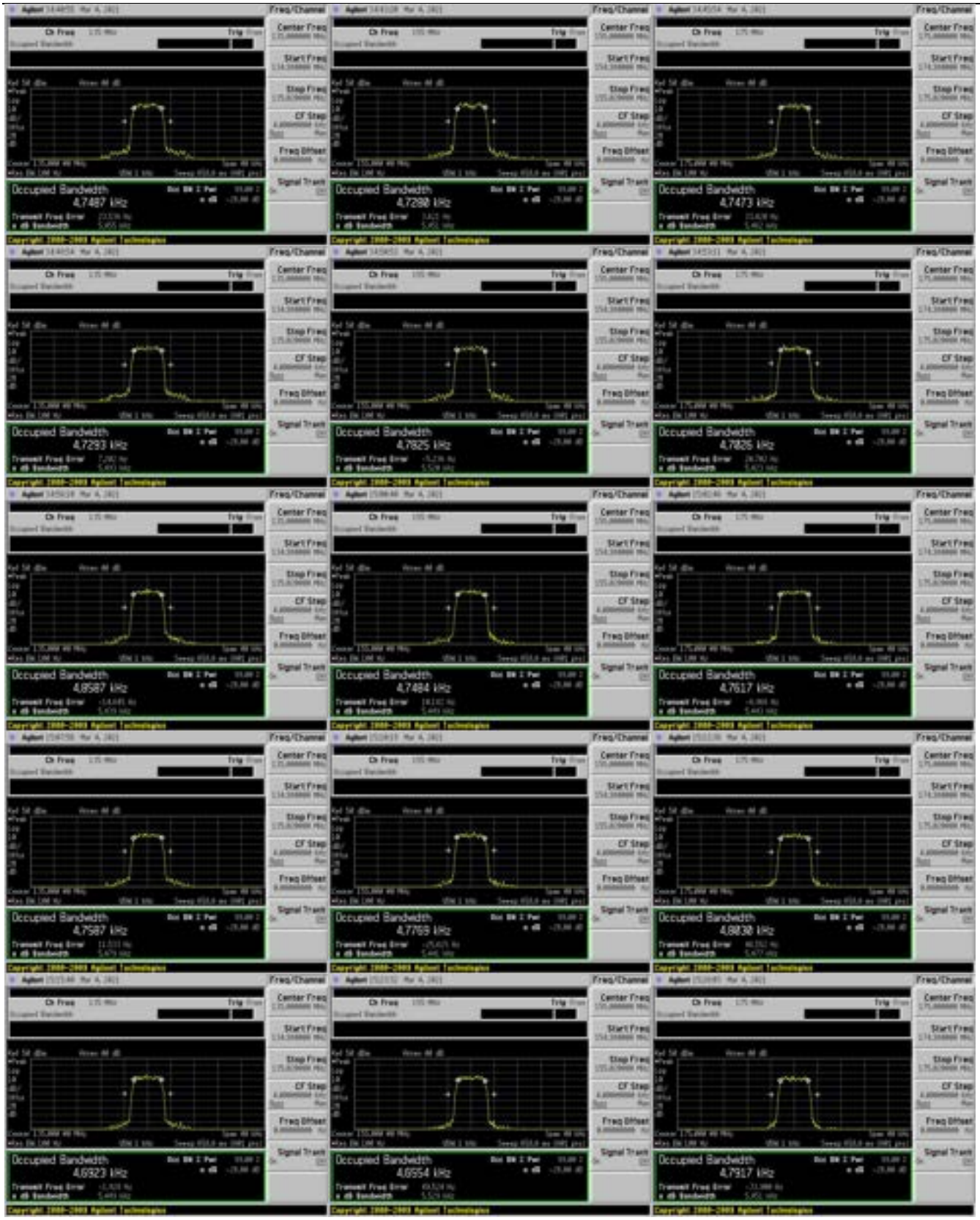
Bandwidth Measurement, 12.5 kHz using 300 Hz RBW		
Channel Frequency MHz	**Modulation Method**	**Measured OBW 99% kHz**
135	2CPFSK	7.56
155	2CPFSK	7.48
175	2CPFSK	7.73
135	DPSK	9.48
155	DPSK	9.60
175	DPSK	9.43
135	pi/4DQPSK	9.55
155	pi/4DQPSK	9.49
175	pi/4DQPSK	9.55
135	D8PSK	9.59
155	D8PSK	9.56
175	D8PSK	9.59
135	16DEQAM	9.56
155	16DEQAM	9.52
175	16DEQAM	9.63
135	64QAM	9.59
155	64QAM	9.63
175	64QAM	9.52
135	256QAM	9.63
155	256QAM	9.50
175	256QAM	9.59


Center 175.0000000 MHz
Occupied Bandwidth
9.5541 kHz
Occupied Bandwidth
9.4855 kHz
Occupied Bandwidth
9.5586 kHz
Occupied Bandwidth
9.5870 kHz
Occupied Bandwidth
9.5621 kHz
Occupied Bandwidth
9.5930 kHz
Occupied Bandwidth
9.5625 kHz
Occupied Bandwidth
9.5153 kHz
Occupied Bandwidth
9.6344 kHz
Occupied Bandwidth
9.5853 kHz
Occupied Bandwidth
9.6255 kHz
Occupied Bandwidth
9.5286 kHz
Occupied Bandwidth
9.6267 kHz
Occupied Bandwidth
9.4963 kHz
Occupied Bandwidth
9.5980 kHz

7.3.1 Channel Width 6.25 kHz

Bandwidth Measurement, 6.25 kHz using 100 Hz RBW		
Channel Frequency MHz	**Modulation Method**	**Measured OBW 99% kHz**
135	2CPFSK	2.90
155	2CPFSK	3.08
175	2CPFSK	2.95
135	DPSK	4.72
155	DPSK	4.80
175	DPSK	4.70
135	pi/4DQPSK	4.75
155	pi/4DQPSK	4.73
175	pi/4DQPSK	4.75
135	D8PSK	4.73
155	D8PSK	4.78
175	D8PSK	4.70
135	16DEQAM	4.86
155	16DEQAM	4.75
175	16DEQAM	4.76
135	64QAM	4.76
155	64QAM	4.78
175	64QAM	4.80
135	256QAM	4.69
155	256QAM	4.66
175	256QAM	4.79




Occupied Bandwidth
4.7487 kHz
Occupied Bandwidth
4.7288 kHz
Occupied Bandwidth
4.7473 kHz
Occupied Bandwidth
4.7293 kHz
Occupied Bandwidth
4.7825 kHz
Occupied Bandwidth
4.8587 kHz
Occupied Bandwidth
4.7484 kHz
Occupied Bandwidth
4.7617 kHz
Occupied Bandwidth
4.7587 kHz
Occupied Bandwidth
4.7769 kHz
Occupied Bandwidth
4.8838 kHz
Occupied Bandwidth
4.6923 kHz
Occupied Bandwidth
4.6554 kHz
Occupied Bandwidth
4.7917 kHz

8.0 Equipment Lists

8.1 Conducted Power, Conducted Spurious, Mask, and Bandwidth

Asset #	Manufacturer	Model #	Description	Calibration Due
1937	Agilent	E4440A	Spectrum Analyzer	11 Nov 2021
A105	Narda	768A-20	20 dB Attenuator, 20 Watt	29 Sep 2022
0463	Fluke	077A	DMM	13 Jul 2021
1831	HP	6622A	DC Power Supply	CIU

8.2 Frequency Stability

Asset #	Manufacturer	Model #	Description	Calibration Due
1937	Agilent	E4440A	Spectrum Analyzer	11 Nov 2021
A105	Narda	768A-20	N-N, Attenuator, 20 dB, 20 Watt	29 Sep 2022
2134	Tenny	TPS T2C	Temperature Chamber	15 Oct 2021
C355	Pasternack	RG type	Coaxial Cable, double shielded	CNR
0463	Fluke	077A	DMM	13 Jul 2021
1831	HP	6622A	DC Power Supply	CIU

8.3 Frequency Behavior

Asset #	Manufacturer	Model #	Description	Calibration Due
A105	Narda	768A-20	N-N attenuator, 20 dB, 20 Watt	29 Sep 2022
0836	Narda	3293-1	Broadband Directional Coupler	CNR
0475	Tektronix	TDS680B	Oscilloscope, Digital	5 May 2021
1816	Agilent	N5181A	Signal Generator	13 Nov 2021
0742	HP	355C	Step Attenuator, 0 to 12 dB	CNR
0856	Narda	702-60	Step Attenuator, 0 to 60 dB	CNR
2351	HP	8901B	Modulation Analyzer	7 Nov 2021
None	Mini-Circuits	ZFRSC-43	3 Port Resistive Divider/Combiner SMA	CNR
A100	Narda	94455-1	Diode Detector	CNR
2201	Agilent	E3632A	Adjustable DC Power Supply	CIU
None	Various	None	RG Type coaxial cables	CNR
None	Various	Unknown	SMA-SMA attenuators, 1 each of: 20 dB	CNR

8.4 Radiated Emissions

Radiated Emissions Test Equipment List					
Tile! Software Version:			**Version: 7.1.2.17 (Jan 08, 2016 - 02:12:48 PM) or 4.1.A.0, April 14, 2009, 11:01:00PM**		
Test Profile:			**2020_RE_Unintentional_TILE7_v2.7.til**		
Asset #	**Manufacturer**	**Model**	**Equipment Nomenclature**	**Serial Number**	**Calibration Due Date**
1509A	Braden	TDK 10M	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	9/17/2021
1890	HP	8447F-H64	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	1/9/2022
2295	Keysight	E4440A-AYZ	PSA Spectrum Analyzer	MY46186204	11/10/2021
2172	ETS-Lindgren	3142C	Antenna, Biconilog, 26 MHz-3GHz	49383	3/11/2023
C027	none	RG214	Cable Coax, N-N, 25m, 25MHz - 1GHz	None	9/8/2021
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
1509B	Braden	TDK 10M	TDK 10M Chamber,sVSWR > 1 GHz	DAC-012915-005	9/21/2021
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, 100MHz-18GHz	None	1/9/2022
C030	none	none	Cable Coax, N-N, 30m, 1 - 18GHz	None	9/8/2021
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
819	EMCO	3115	Antenna, Horn, DRG, 1-18GHz	113	9/11/2022

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

End of Report