

**COMPLIANCE WORLDWIDE INC.
TEST REPORT 137-25RF**

**In Accordance with the Requirements of
Federal Communications Commission CFR Title 47 Part 2.1091:2020
Radio Frequency Exposure Evaluation: Mobile Devices**

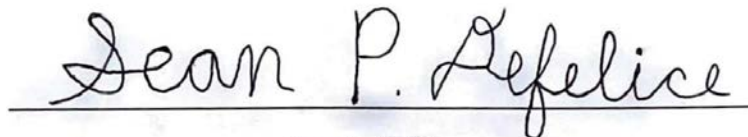
**Issued to
Westell, Inc.
750 North Commons Drive
Aurora, IL 60504**

**for the
ProtectLink BDA 2.5 Watt
Public Safety Bi-Directional Amplifier
Model: CS45-734-834-A0**

FCC ID: CH8734834

Report Issued on May 1, 2025

Tested by



Sean P. Defelice

Reviewed by



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1. Scope

This test report certifies that the Westell ProtectLink BDA 2.5 Watt Public Safety Bi-directional Amplifier Model CS45-734-834-A0, as tested, meets the FCC Part 2.1091 requirements exempting the device from a SAR Evaluation.

The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

2. Product Details

2.1. Manufacturer:	Westell, Inc.
2.2. Model Numbers:	CS45-734-834-A0
2.3. Serial Numbers:	24RF12100001
2.4. Description:	The ProtectLink BDA 2.5 Watt Public Safety Bi-directional amplifier was developed for use in enclosed structures where signals from local public safety towers to operate mobile units are poor or unavailable. The downlink and uplink paths support maximum gains of up to 90 dB and 80 dB, respectively. Gain can be adjusted in 1 dB steps, from 60 to 90 dB DL and from 50 to 80 dB UL. The ProtectLink BDA supports uplink bands of 799-805 / 806-824 MHz and downlink bands of 769-775 / 851-869 MHz.
2.5. Power Source:	120 VAC, 60 Hz
2.6. Hardware Revision:	0.1
2.7. Software Revision:	N/A
2.8. Modulation Type:	Gaussian frequency shift keying
2.9. Operating Frequencies:	799-805 / 806-824 MHz, 769-775 / 851-869 MHz
2.10. EMC Modifications:	None

3. Product Configuration

3.1. Support Equipment

Device	Manufacturer	Model	Serial No.	Comment
Power Supply / Battery	Westell	CS45-BBU-004	24B4117659	Power and Battery Backup
Laptop / Notebook PC	Lenovo	P50	PC0MHJ8Y	For configuring the EUT

3.2. Cables

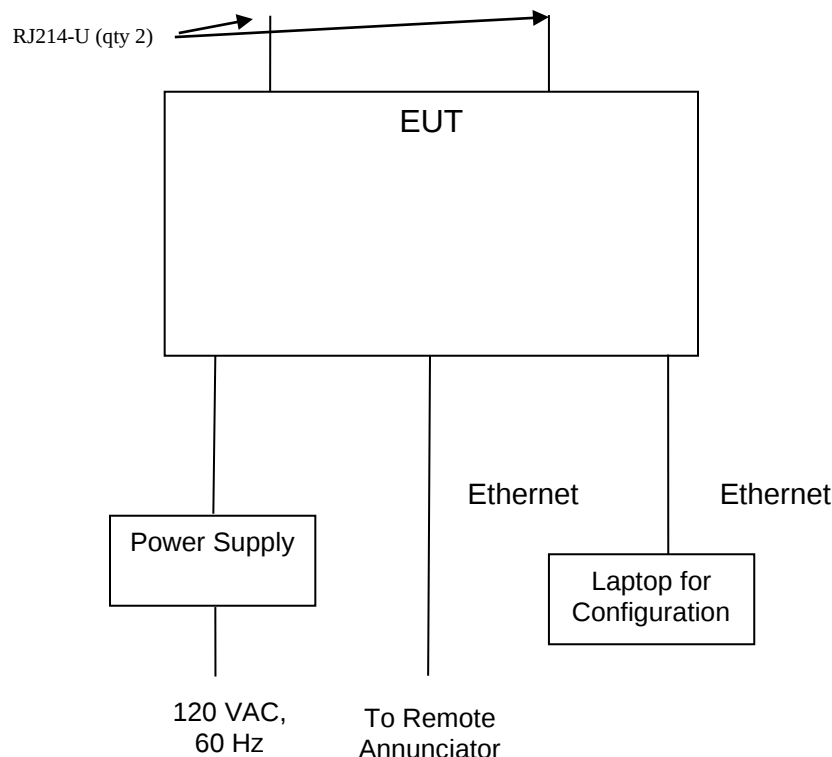
Cable Type	Length	Shield	From	To
RF, 50 Ω , N male – N male	1M	Yes	EUT	Signal Generator
RF, 50 Ω , N male – N male	1M	Yes	EUT	Spectrum Analyzer
Power Supply	2M + 2M	Yes	EUT	120 VAC, 60 Hz
Ethernet	2M	No	EUT	Notebook PC
Ethernet	2M	No	EUT	Remote Annunciator

3. Product Configuration (continued)

3.3. Operational Characteristics & Software

- (1) The unit was allowed to power up normally and go through its configuration cycle.
- (2) Using an RF Signal Generator on the Input and a Spectrum Analyzer on the output Downlink or Uplink frequencies a signal was generated over the intended bandwidth of operation.
- (3) The signal generator was configured to provide CW, 6.25, 12.5 and 25 kHz FM modulated, CPAO P25 Phase 1 and Phase 2 signals to the input of the amplifier across the public safety bands to be used by the product. Additionally, 12 Carriers of a P25 Phase 1 signal was used for the device's 150 kHz BW capability.
- (4) The units internal AGC threshold was determined by applying an input signal until a 1 dB increase in input signal did not cause a 1 dB in output signal for each of the Uplink and Downlink frequencies.

3.4. Block Diagram



4. Measurements Parameters

4.1. Measurement Equipment and Software Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
Spectrum Analyzer 20 Hz – 40 GHz ¹	Rohde & Schwarz	FSV40	100899	6/27/2025	1 Year
RF Signal Generator 5kHz to 6 GHz	Rohde & Schwarz	SMIQ06B	10090	7/23/2025	1 Year
Barometric Pressure/Humidity & Temp Datalogger	Extech Instruments	SD700	Q590483	4/4/2026	2 Years

¹ FSV40 Firmware revision: V2.30 SP4, Date installed: 05/04/2016 Previous V2.30 SP1, installed 10/22/2014.

4.2. Software Used to Perform Test

Manufacturer	Software Description	Title or Model #	Rev.	Report Sections
Compliance Worldwide	Test Report Generation Software	Test Report Generator	1.0	Used to process conducted emissions data

4. Measurements Parameters (continued)

4.3 Measurement & Equipment Setup

Test Dates:	3/13/2025, 3/28/2025, 3/31/2025, 4/25/2025, 5/1/2025
Test Engineer:	Sean Defelice
Site Temperature (°C):	24
Relative Humidity (%RH):	33
Frequency Range:	769 to 869 MHz
EMI Receiver IF Bandwidth:	100 kHz
EMI Receiver Avg Bandwidth:	$\geq 3 * \text{RBW or IF(BW)}$
Detector Functions:	Peak, Quasi-Peak and Average

4.4 Test Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 90 & Subpart R, Subpart S and Part 20.

The test methods used to generate the data in this test report are in accordance with ANSI C63.26:2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services, FCC OET KDB 935210 D05 Indus Booster Basic Meas v01r04, dated 4-3-2020, FCC OET KDB 935210 D02 Signal Boosters Certification v04r03 Dated 11-20-2024, Measurements Guidance for Industrial and Non-Consumer Signal Booster, Repeater and Amplifier Devices, FCC OET KDB 971168 D01 Power Meas License Digital Systems v03r01, dated 4-9-2018 and ANSI/TIA-102.CAAA-D-2013, Digital C4FM/CQPSK Transceiver Measurement Methods.

Measurements were also made in accordance with ANSI/TIA-603-D 2010 Land Mobile FM or PM Communications Equipment Measurement and Performance Standard.

In addition, FCC KDB 447498 D01 General RF Exposure Guidance v06, October 23, 2015 are referenced for the testing and requirements detailed in this report.

5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542

Requirement: The transmitter output power of mobile and control transmitters operating in the 758 to 768 MHz, 769 to 775 MHz, 788 to 798 MHz and 799 to 805 MHz bands must not exceed 30 Watts.

The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

Measurement of AGC Threshold

Test Method: KDB 935210 Section 4.2 & KDB 971168 Section 5.2

5.1.1. Mean Transmitter Output Power, Transmitter Only

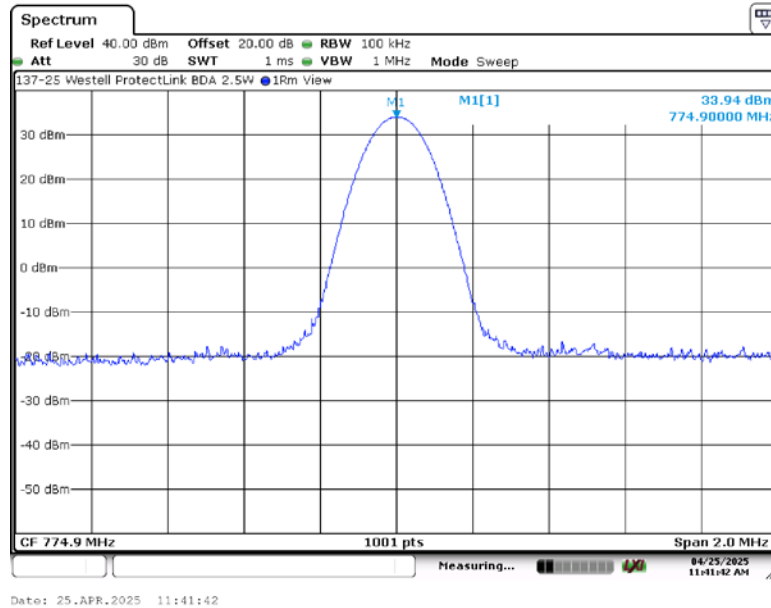
Modulation Type	Center Frequency	Output Power		Input Power (dBm)	Result
	(MHz)	(dBm)	(Watts)		
FM Modulation	774.9	33.94	2.477	-57.17	Compliant
CW	774.9	33.96	2.489	-57.18	Compliant
C4FM Modulation	774.9	33.94	2.477	-57.10	Compliant
$\pi/4$ -DQPSK Modulation	774.9	33.83	2.415	-57.75	Compliant
FM Modulation	803.6	27.63	0.579	-51.55	Compliant
CW	803.6	27.63	0.579	-51.54	Compliant
C4FM Modulation	803.6	27.62	0.578	-51.53	Compliant
$\pi/4$ -DQPSK Modulation	803.6	28.77	0.753	-50.50	Compliant

Note: Input Power is at the 1 dB AGC threshold Level

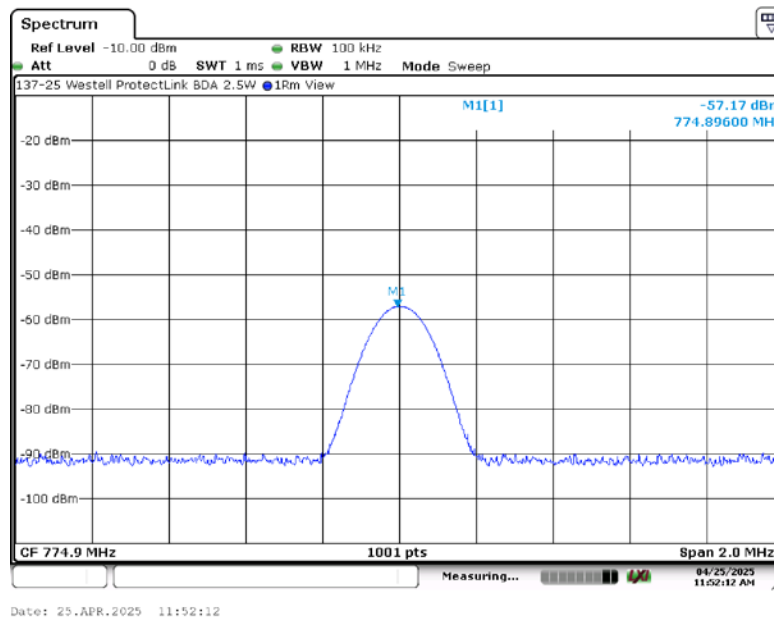
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.2. Mean Transmitter Output Power, 774.9 MHz, FM Modulation



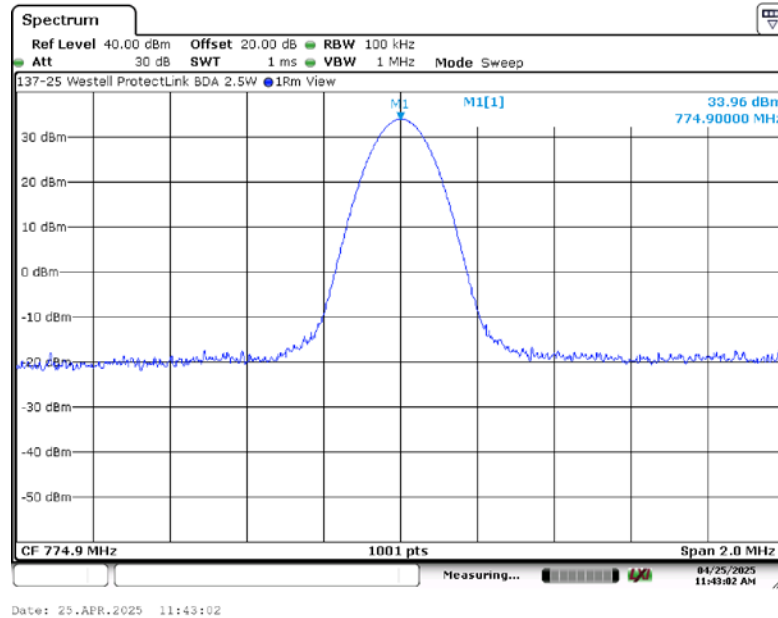
5.1.3. Mean Transmitter Input Power, 774.9 MHz, FM Modulation



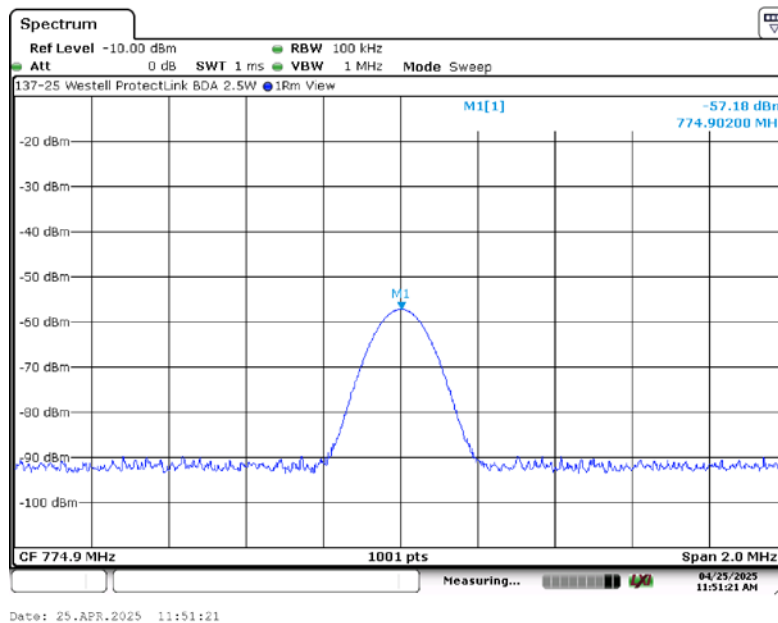
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.4. Mean Transmitter Output Power, 774.9 MHz, CW Signal



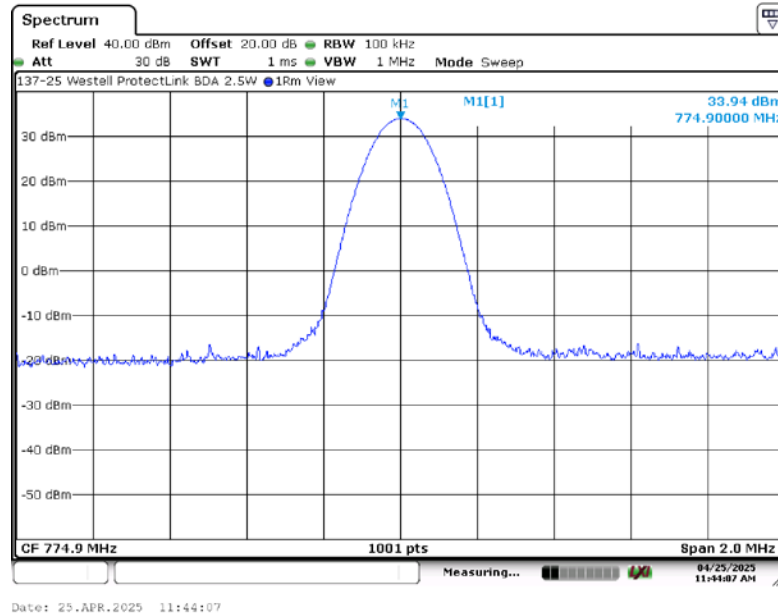
5.1.5. Mean Transmitter Input Power, 774.9 MHz, CW Signal



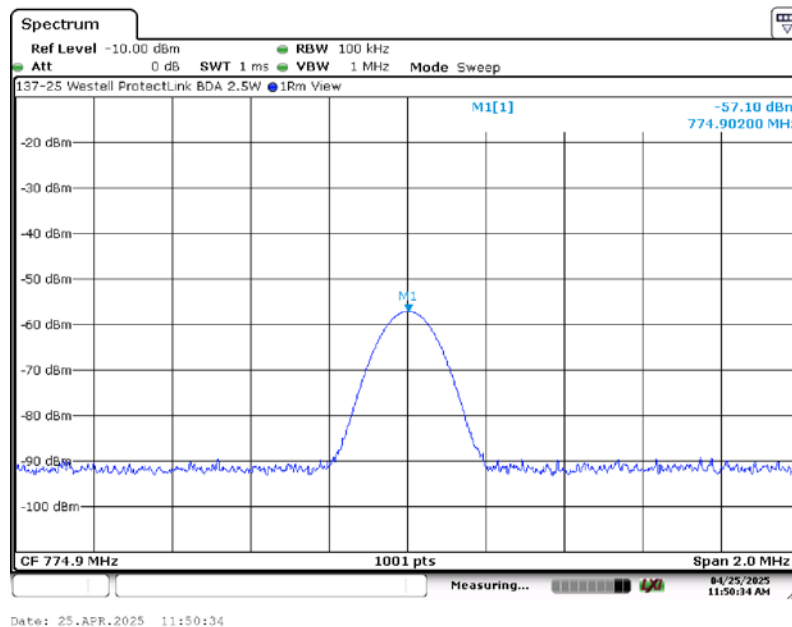
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.6. Mean Transmitter Output Power, 774.9 MHz, C4FM Modulation



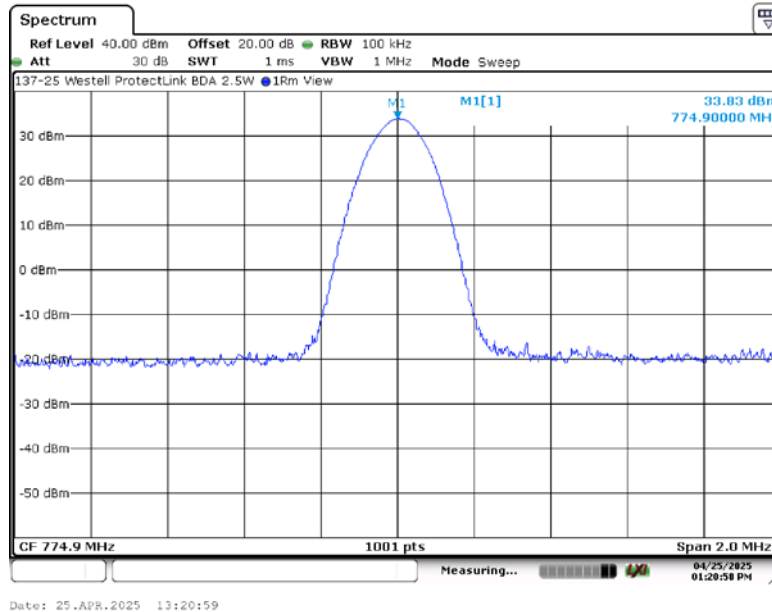
5.1.7. Mean Transmitter Input Power, 774.9 MHz, C4FM Modulation



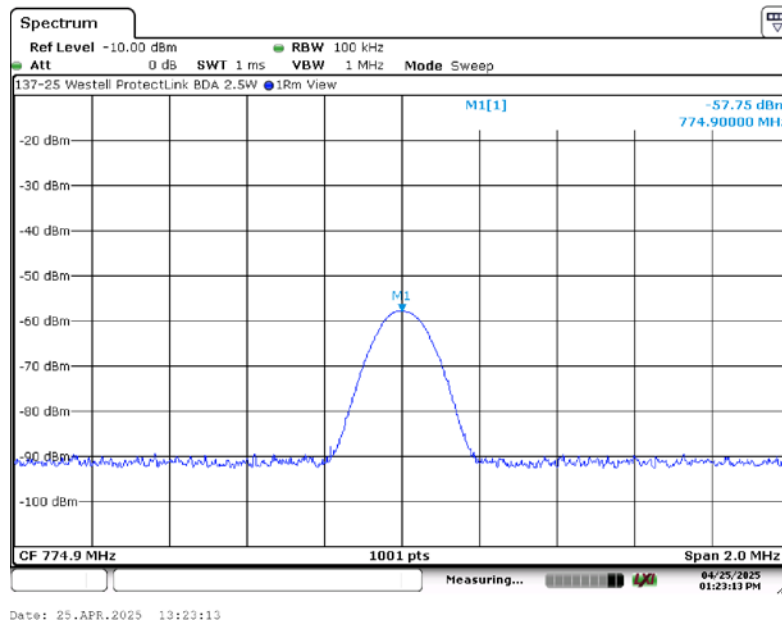
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.8. Mean Transmitter Output Power, 774.9 MHz, $\pi/4$ -DQPSK Modulation



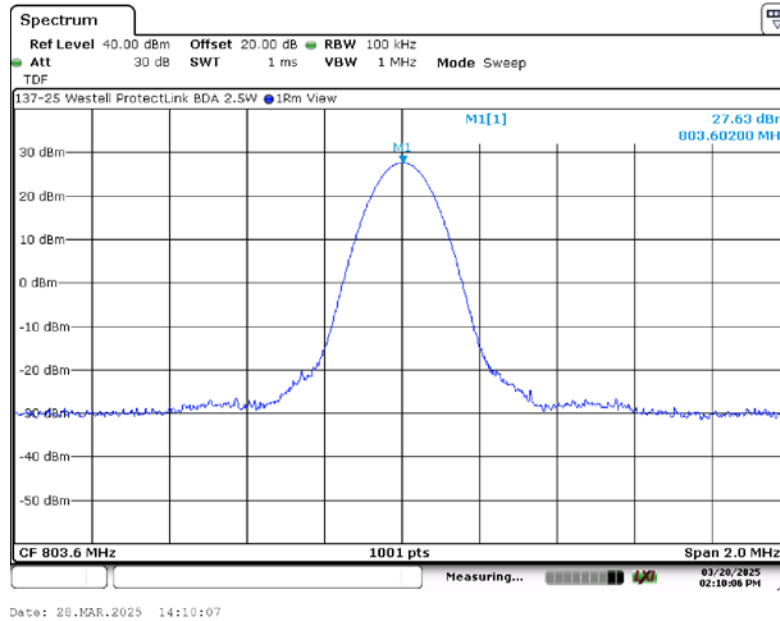
5.1.9. Mean Transmitter Input Power, 774.9 MHz, $\pi/4$ -DQPSK Modulation



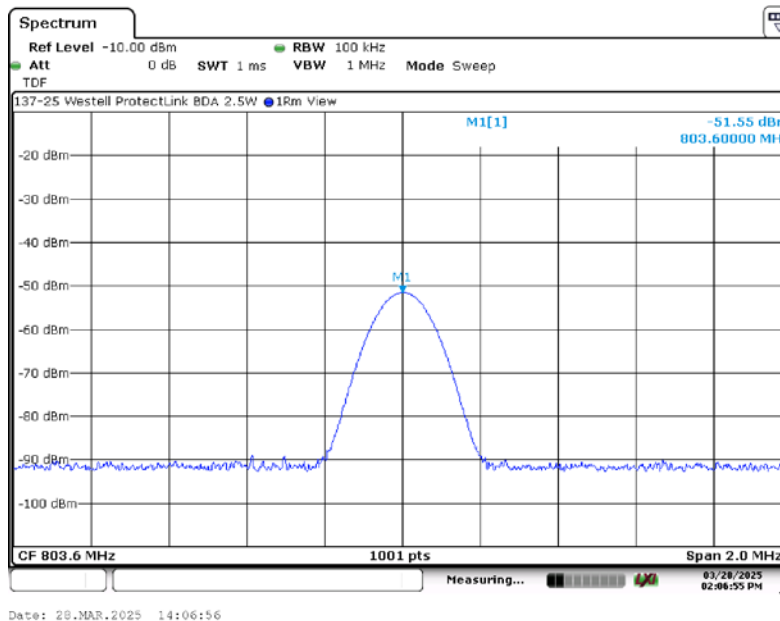
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.10. Mean Transmitter Output Power, 803.6 MHz, FM Modulation



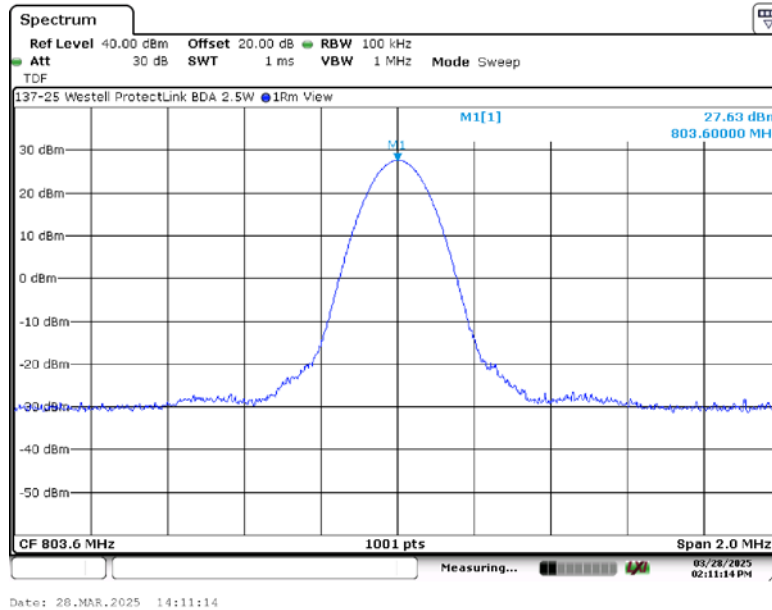
5.1.11. Mean Transmitter Input Power, 803.6 MHz, FM Modulation



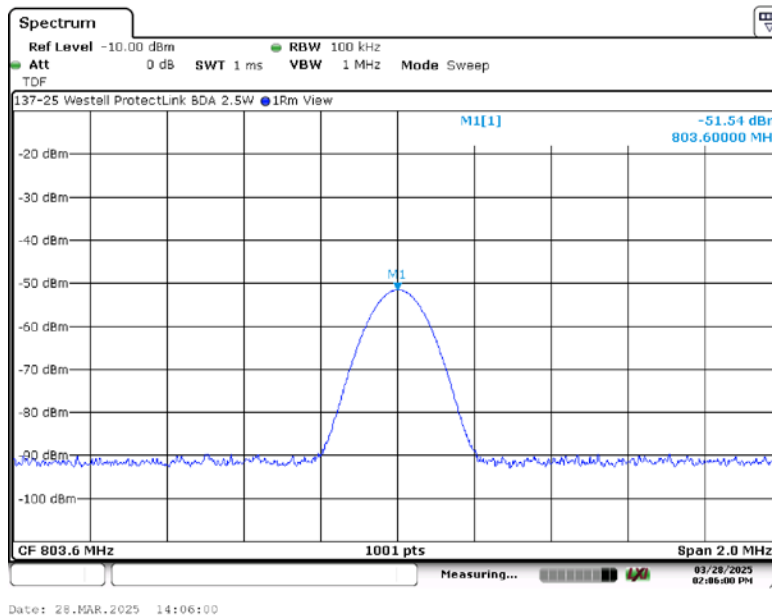
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.12. Mean Transmitter Output Power, 803.6 MHz, CW Signal



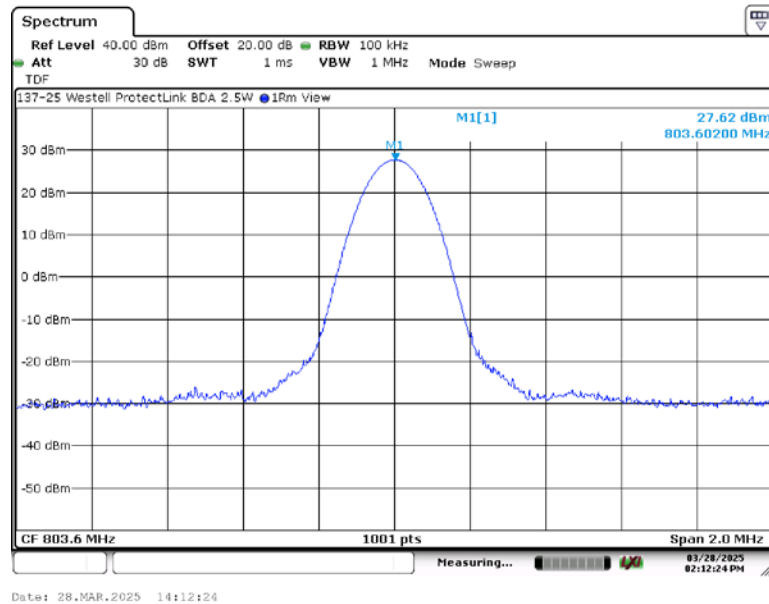
5.1.13. Mean Transmitter Input Power, 803.6 MHz, CW Signal



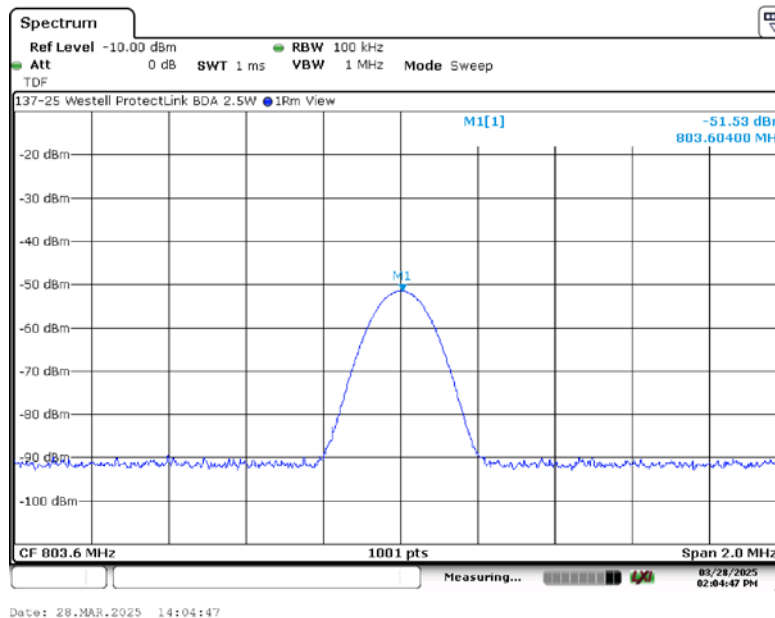
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.14. Mean Transmitter Output Power, 803.6 MHz, C4FM Modulation



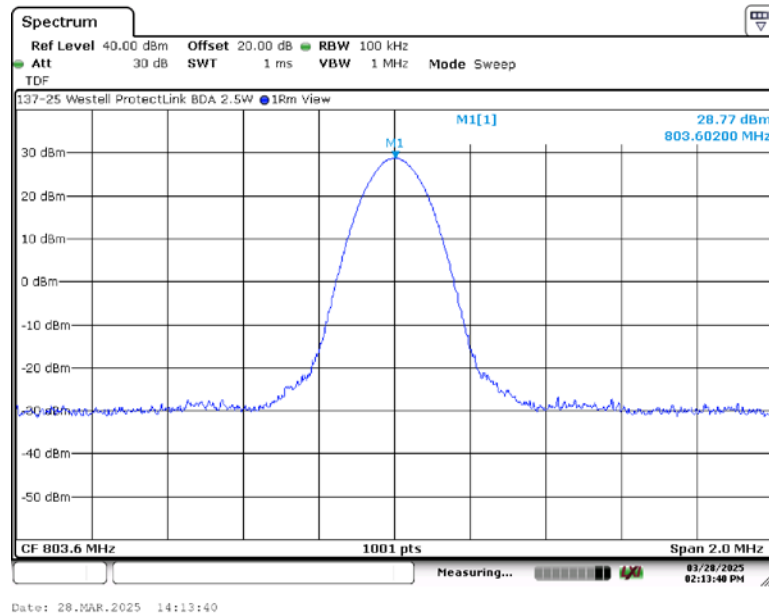
5.1.15. Mean Transmitter Input Power, 803.6 MHz, C4FM Modulation



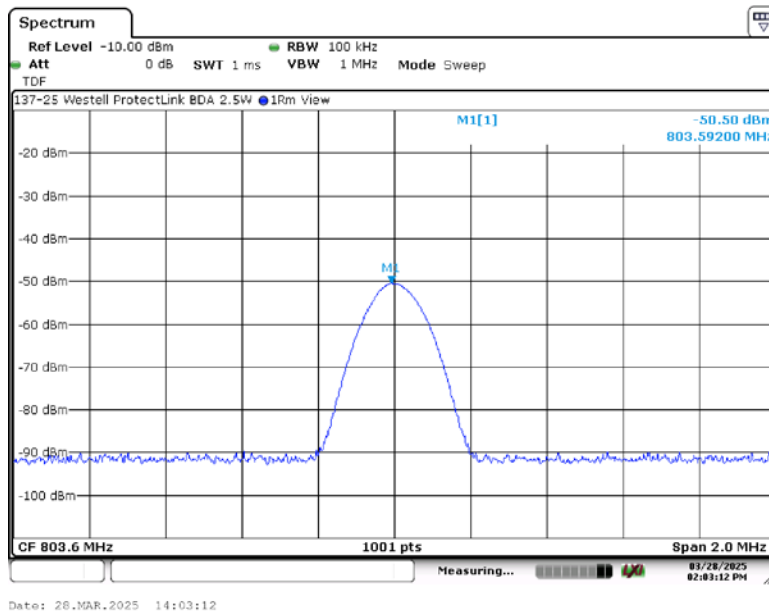
5. Measurement Data

5.1. Broadband Transmitting Power Limits 90.219(e)(1), 90.541, 90.542 (cont)

5.1.16. Mean Transmitter Output Power, 803.6 MHz, $\pi/4$ -DQPSK Modulation



5.1.17. Mean Transmitter Input Power, 803.6 MHz, $\pi/4$ -DQPSK Modulation



5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635

Requirement: The transmitter output power of mobile and control transmitters operating in the 806 to 824 MHz, 851 to 869 MHz, 896 to 901 MHz and 935 to 940 MHz bands must not exceed 1 kilowatt (30 dBw) and 304 meters (1,000 ft) above average terrain.

The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

Measurement of AGC Threshold

Test Method: KDB 935210 Section 4.2 & KDB 971168 Section 5.2

5.2.1. Mean Transmitter Output Power, Transmitter Only

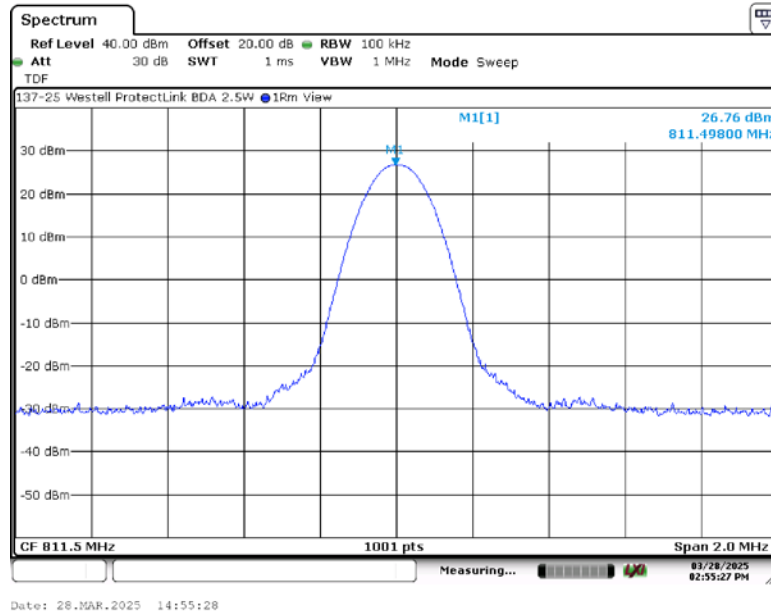
Modulation Type	Center Frequency	Output Power		Input Power (dBm)	Result
	(MHz)	(dBm)	(Watts)		
FM Modulation	811.5	26.76	0.474	-52.55	Compliant
CW	811.5	26.75	0.473	-52.56	Compliant
C4FM Modulation	811.5	26.76	0.474	-52.55	Compliant
$\pi/4$ -DQPSK Modulation	811.5	27.61	0.577	-51.87	Compliant
GSM	820.0	27.14	0.518	-49.27	Compliant
AWGN	820.0	27.25	0.531	-49.09	Compliant
FM Modulation	856.6	34.07	2.553	-57.87	Compliant
CW	856.6	34.04	2.535	-57.86	Compliant
C4FM Modulation	856.6	34.05	2.541	-57.93	Compliant
$\pi/4$ -DQPSK Modulation	856.6	34.00	2.512	-57.99	Compliant
GSM	865.0	33.76	2.377	-55.68	Compliant
AWGN	865.0	33.73	2.360	-57.64	Compliant

Note: Input Power is at the 1 dB AGC threshold Level

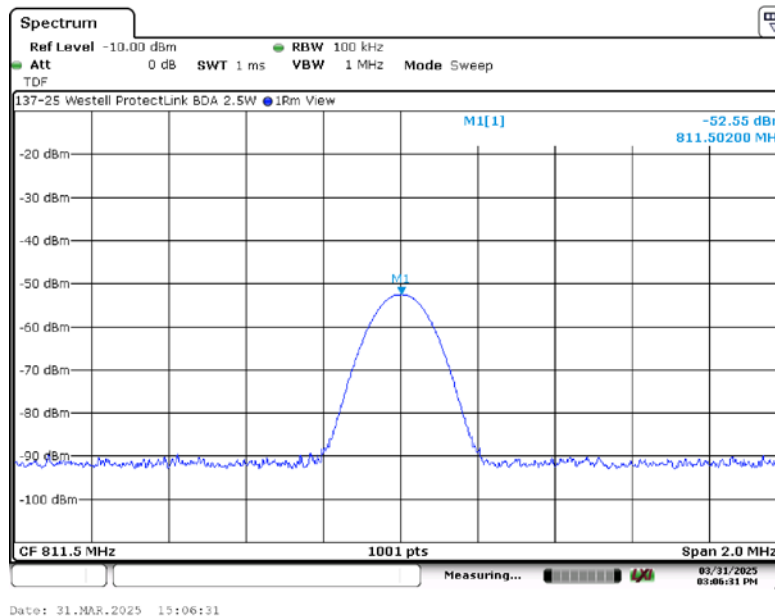
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.2. Mean Transmitter Output Power, 811.5 MHz, FM Modulation



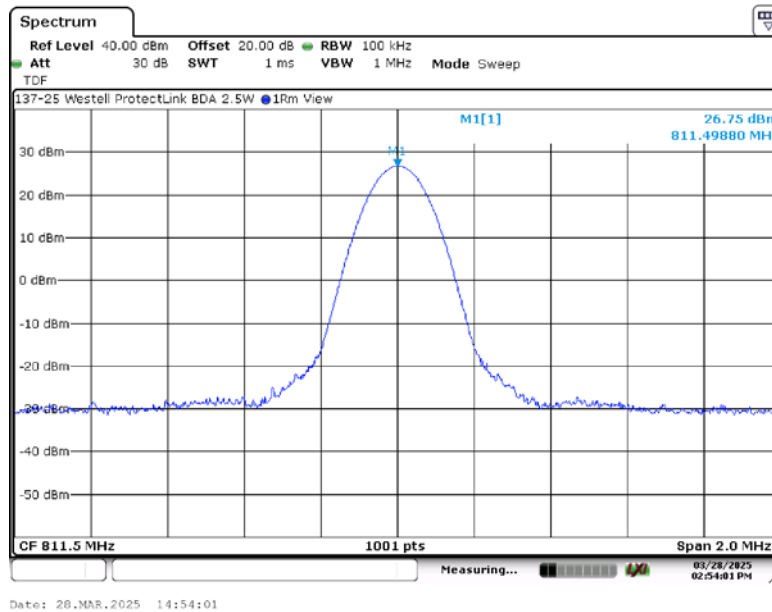
5.2.3. Mean Transmitter Input Power, 811.5 MHz, FM Modulation



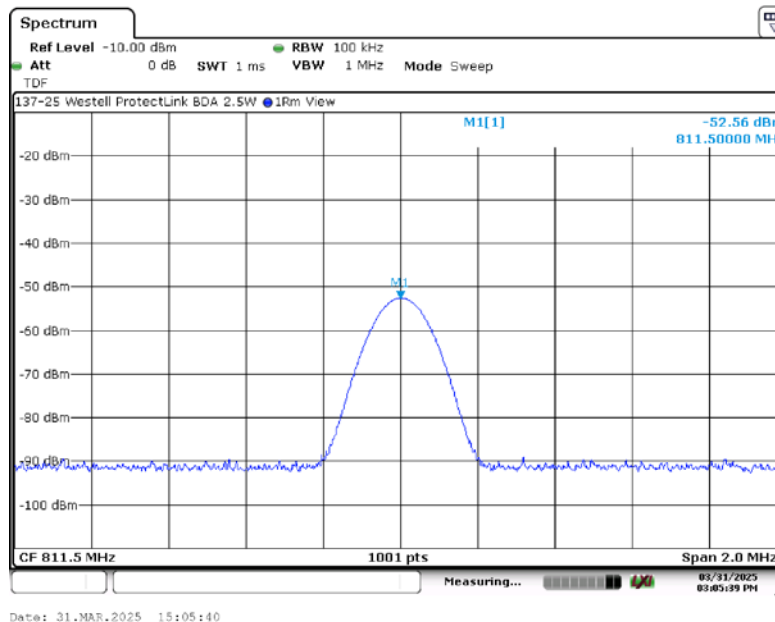
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.4. Mean Transmitter Output Power, 811.5 MHz, CW Signal



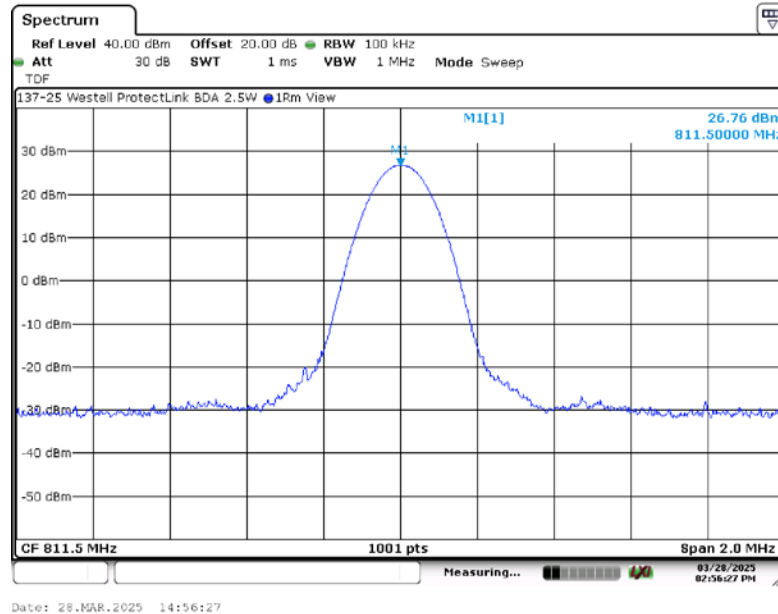
5.2.5. Mean Transmitter Input Power, 811.5 MHz, CW Signal



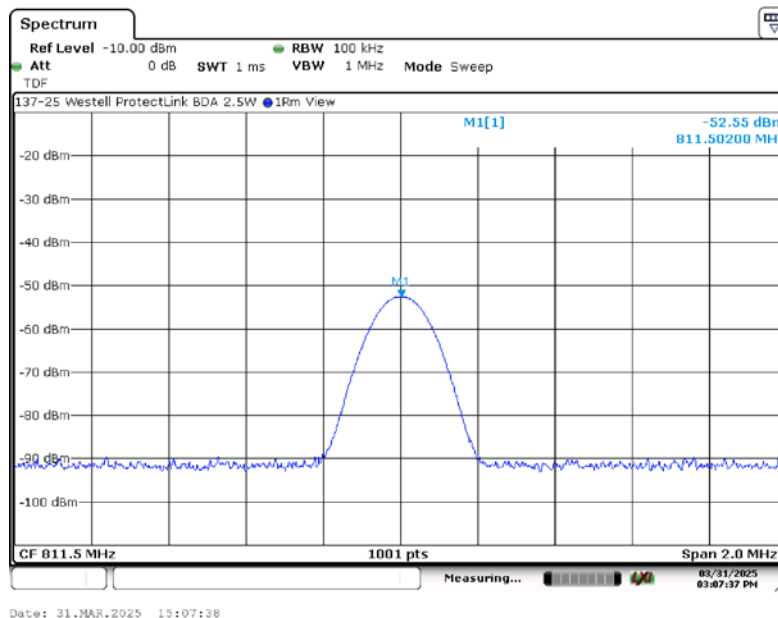
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.6. Mean Transmitter Output Power, 811.5 MHz, C4FM Modulation



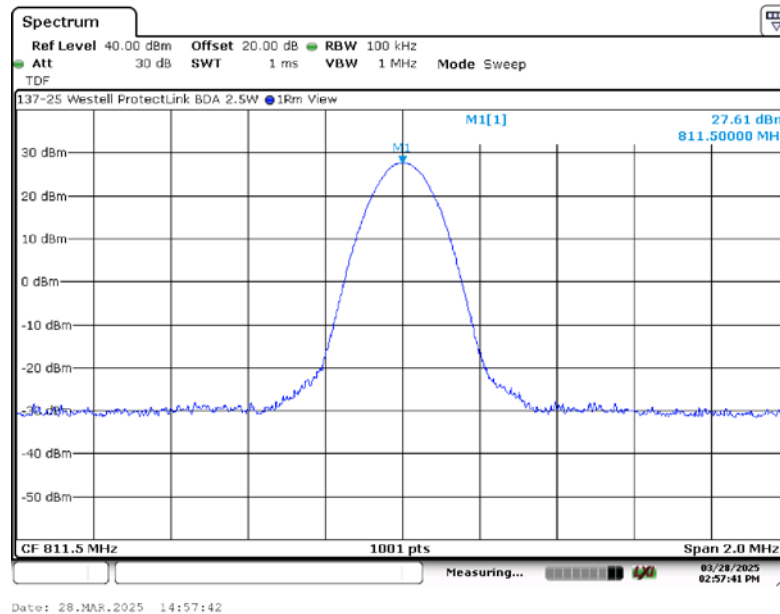
5.2.7. Mean Transmitter Input Power, 811.5 MHz, C4FM Modulation



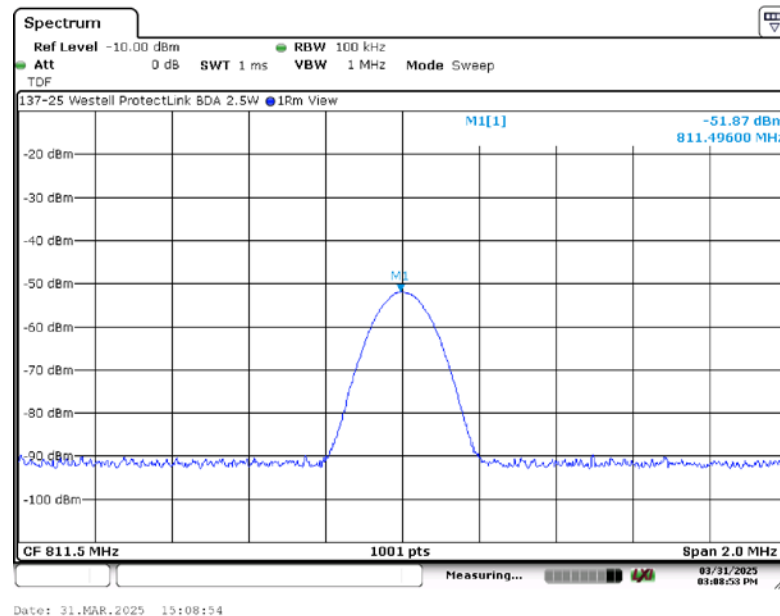
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.8. Mean Transmitter Output Power, 811.5 MHz, $\pi/4$ -DQPSK Modulation



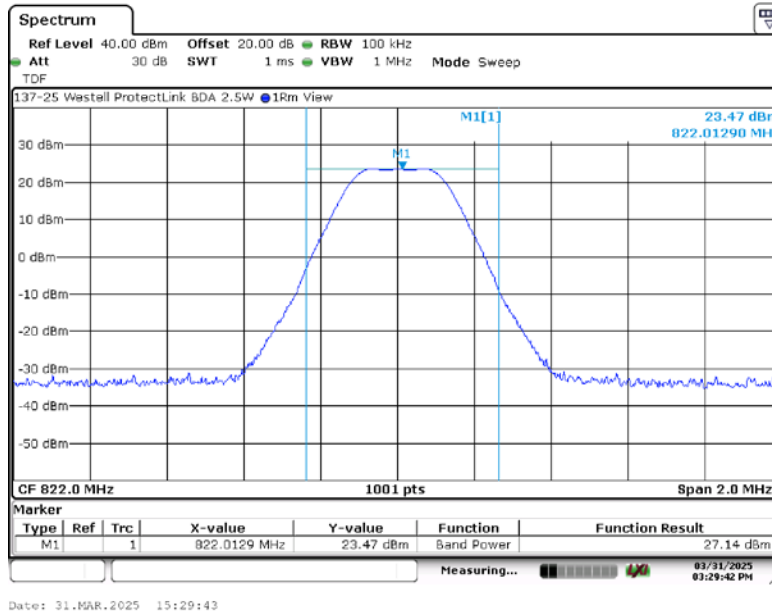
5.2.9. Mean Transmitter Input Power, 811.5 MHz, $\pi/4$ -DQPSK Modulation



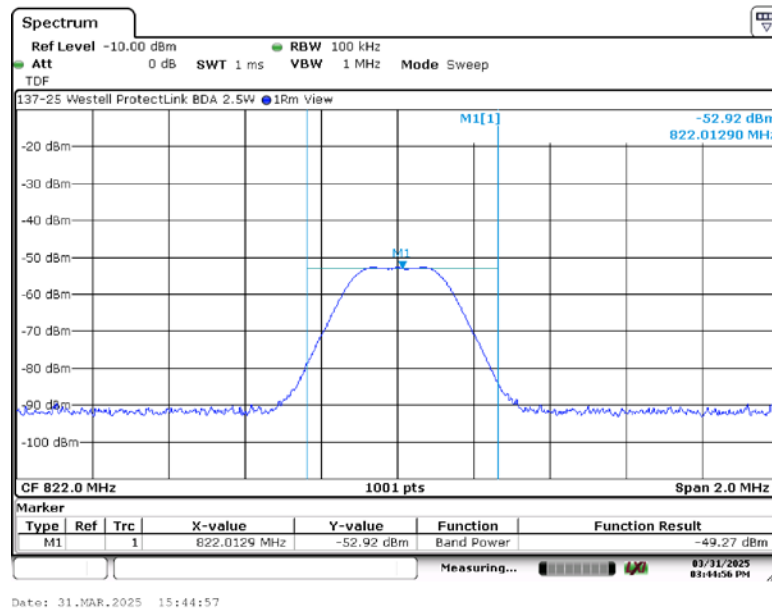
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.10. Mean Transmitter Output Power, 820.0 MHz, GSM Modulation



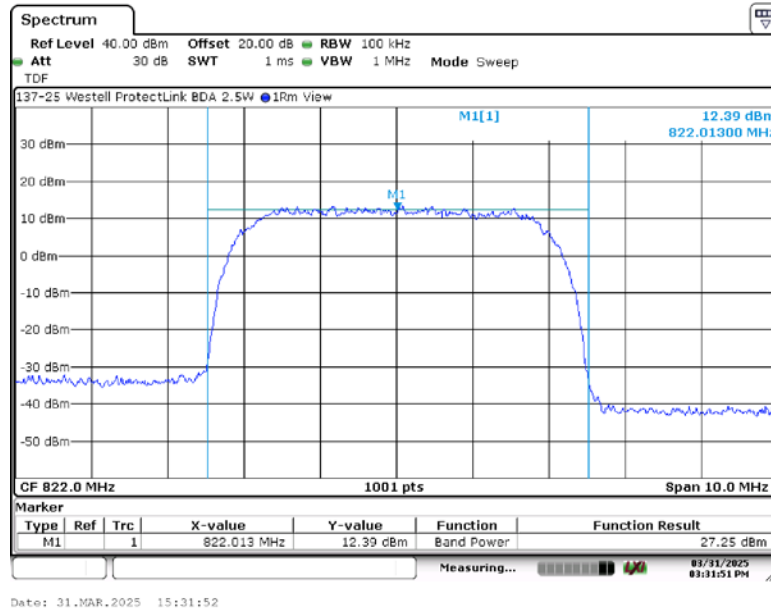
5.2.11. Mean Transmitter Input Power, 820.0 MHz, GSM Modulation



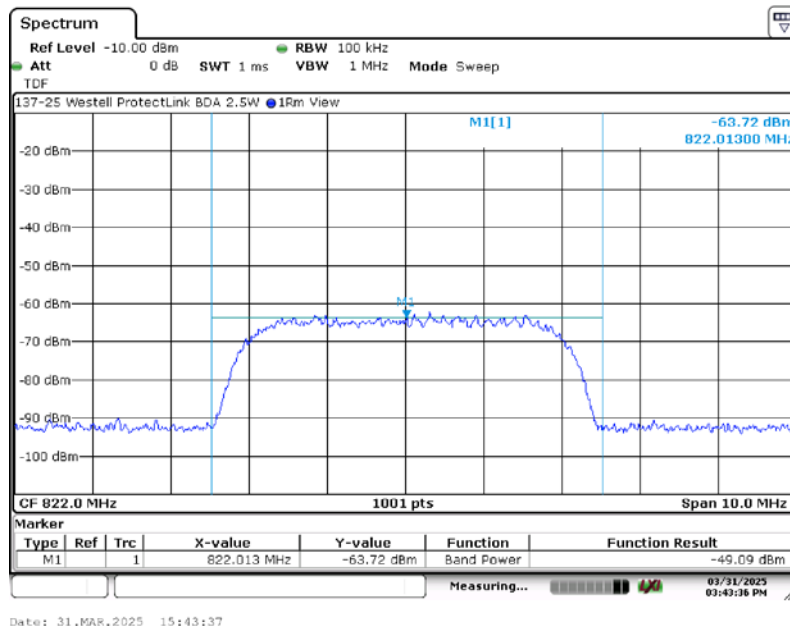
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.12. Mean Transmitter Output Power, 820.0 MHz, AWGN Modulation



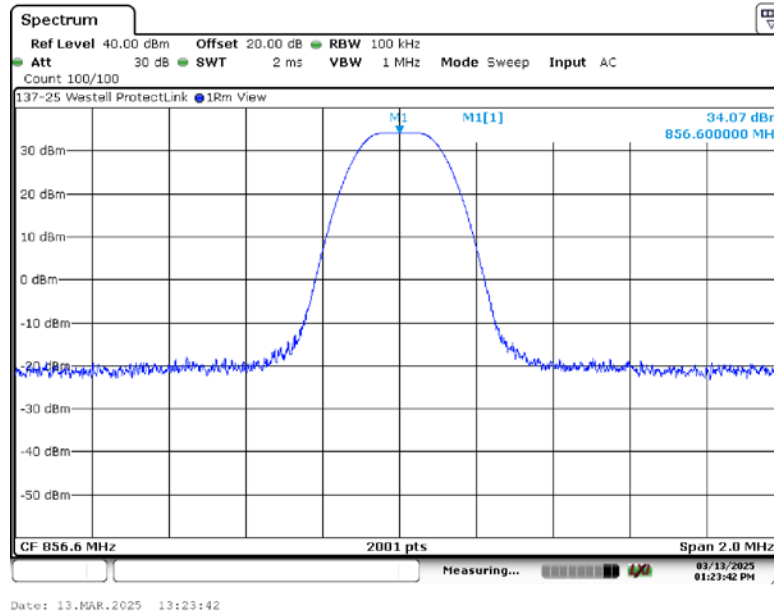
5.2.13. Mean Transmitter Input Power, 820.0 MHz, AWGN Modulation



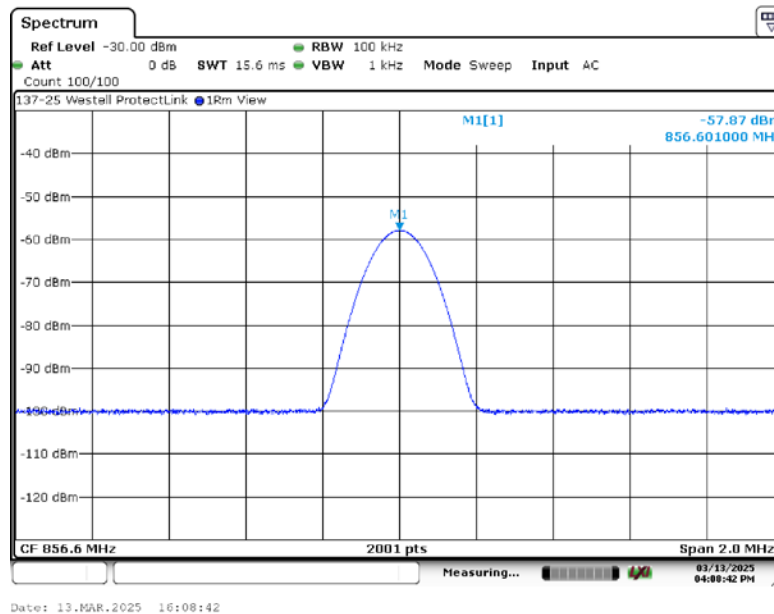
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.14. Mean Transmitter Output Power, 856.6 MHz, FM Modulation



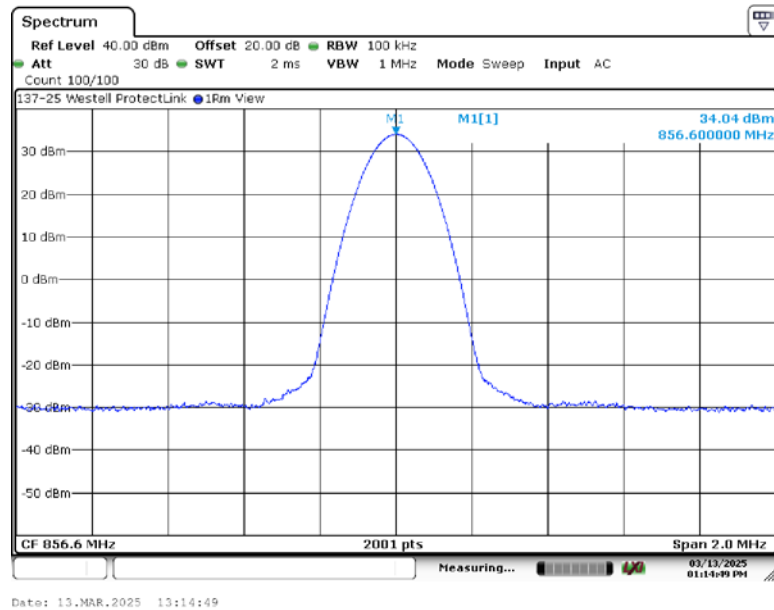
5.2.15. Mean Transmitter Input Power, 856.6 MHz, FM Modulation



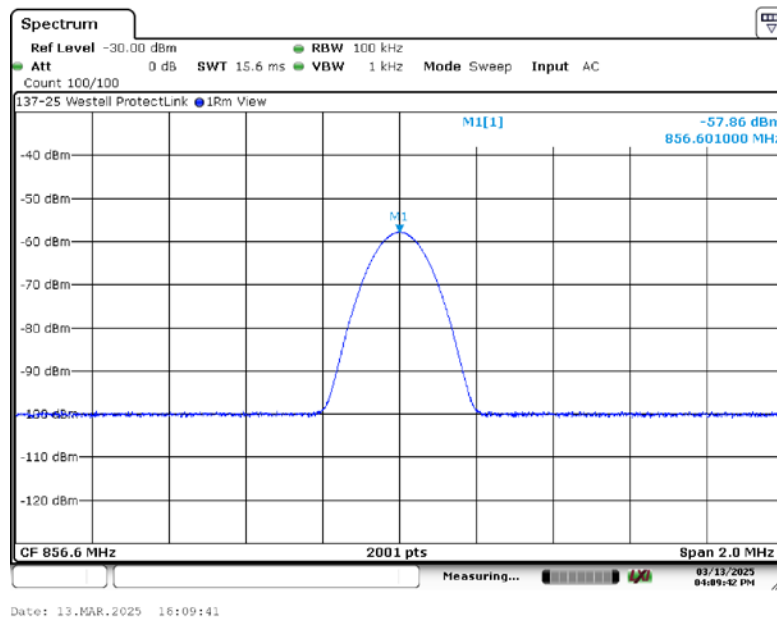
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.16. Mean Transmitter Output Power, 856.6 MHz, CW Signal



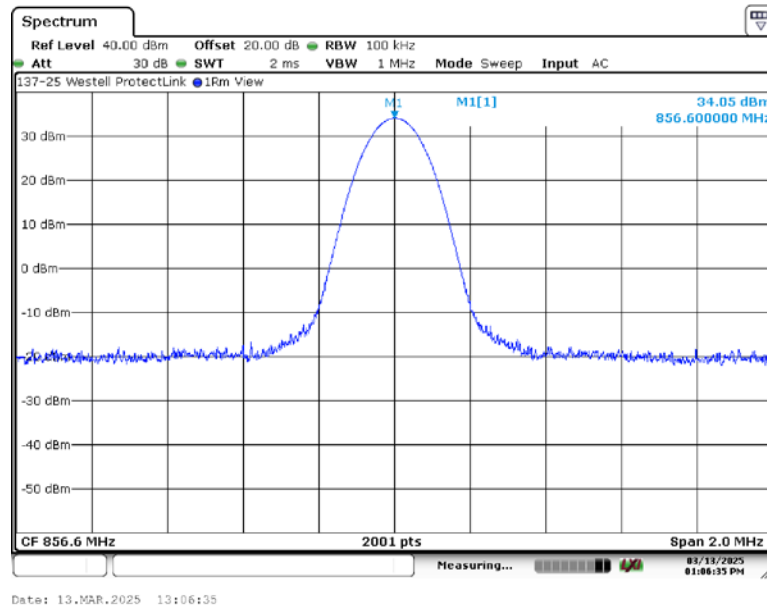
5.2.17. Mean Transmitter Input Power, 856.6 MHz, CW Signal



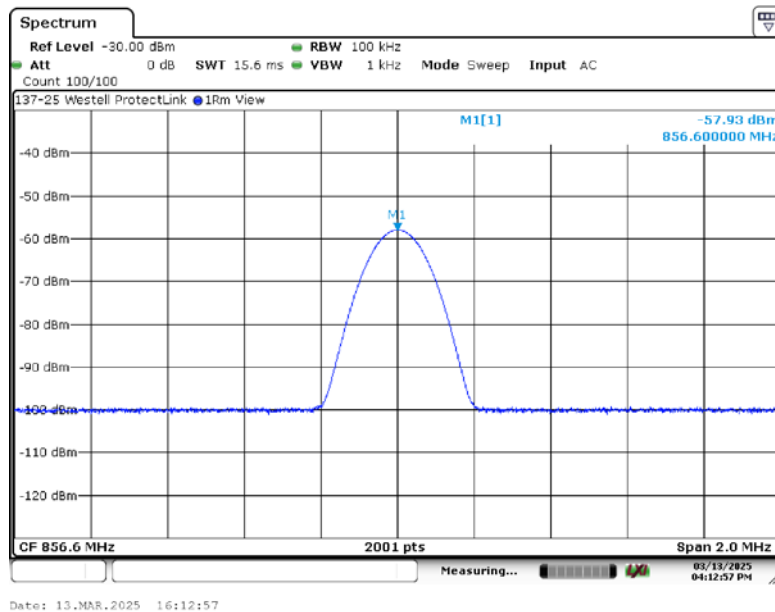
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.18. Mean Transmitter Output Power, 856.6 MHz, C4FM Modulation



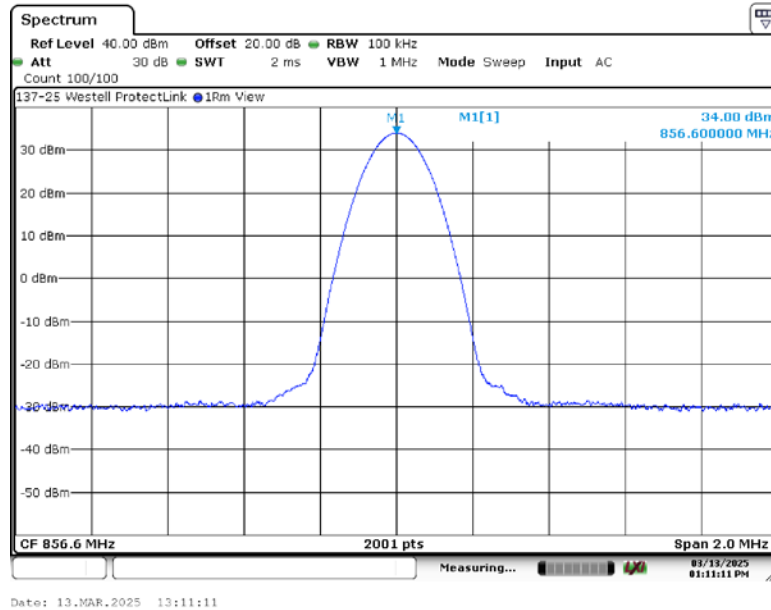
5.2.19. Mean Transmitter Input Power, 856.6 MHz, C4FM Modulation



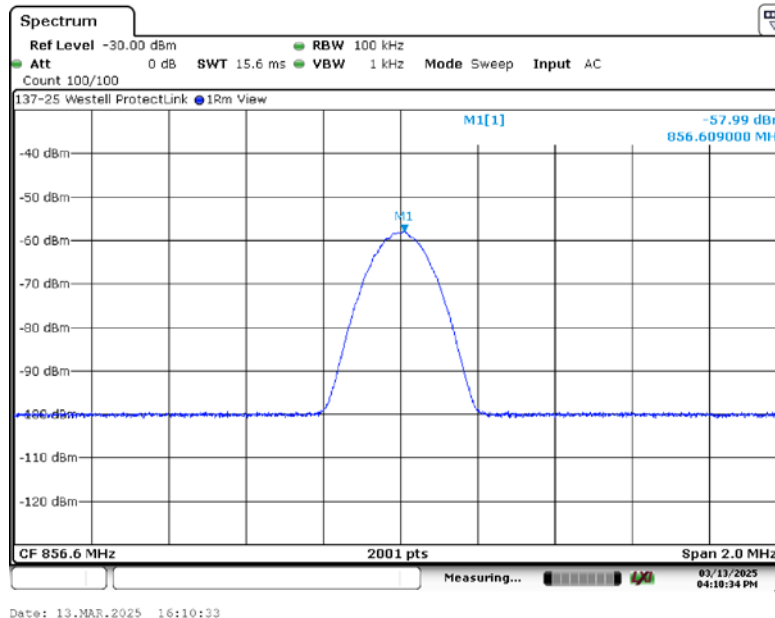
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.20. Mean Transmitter Output Power, 856.6 MHz, $\pi/4$ -DQPSK Modulation



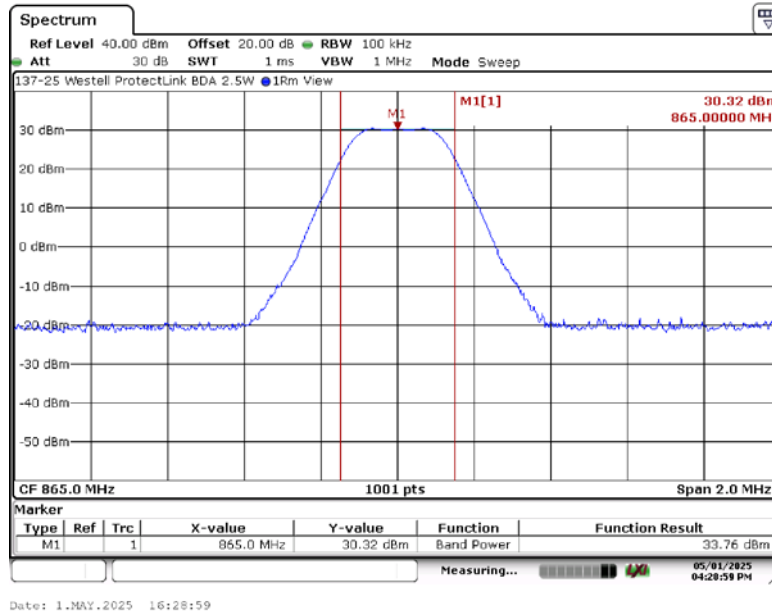
5.2.21. Mean Transmitter Input Power, 856.6 MHz, $\pi/4$ -DQPSK Modulation



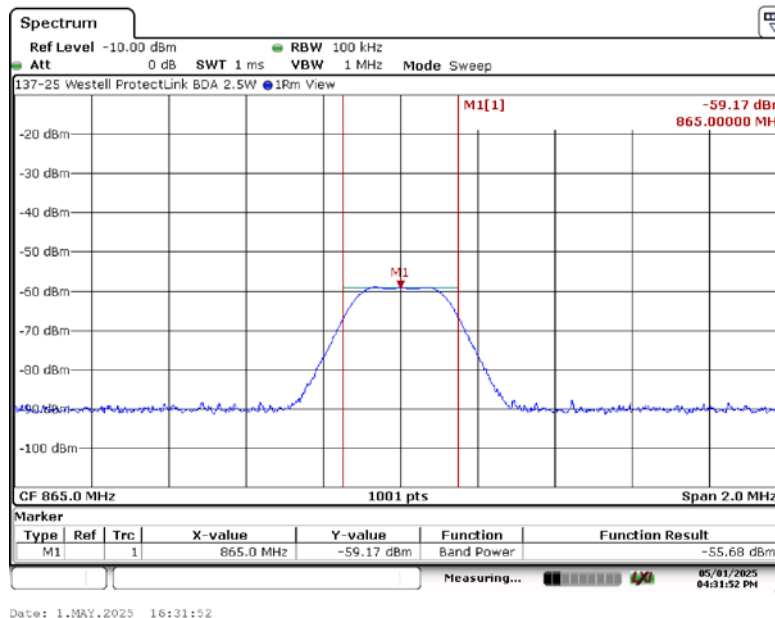
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.22. Mean Transmitter Output Power, 865.0 MHz, GSM Modulation



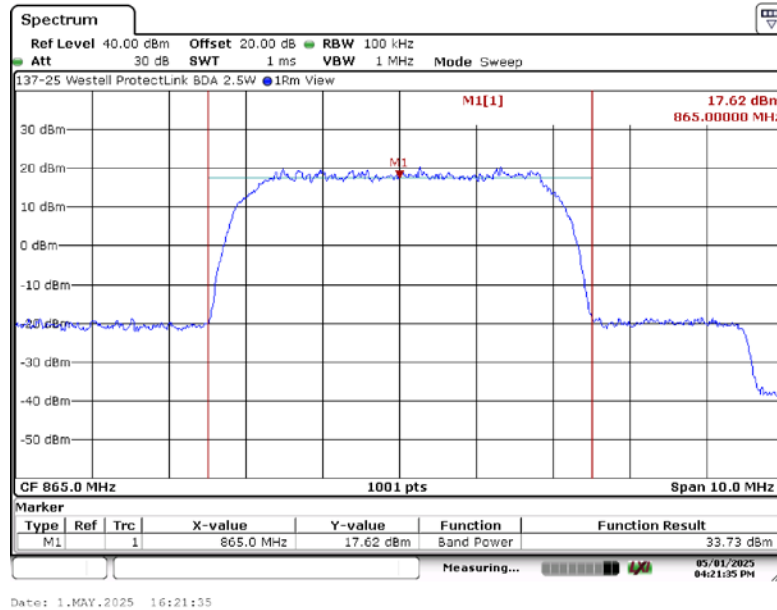
5.2.23. Mean Transmitter Input Power, 865.0 MHz, GSM Modulation



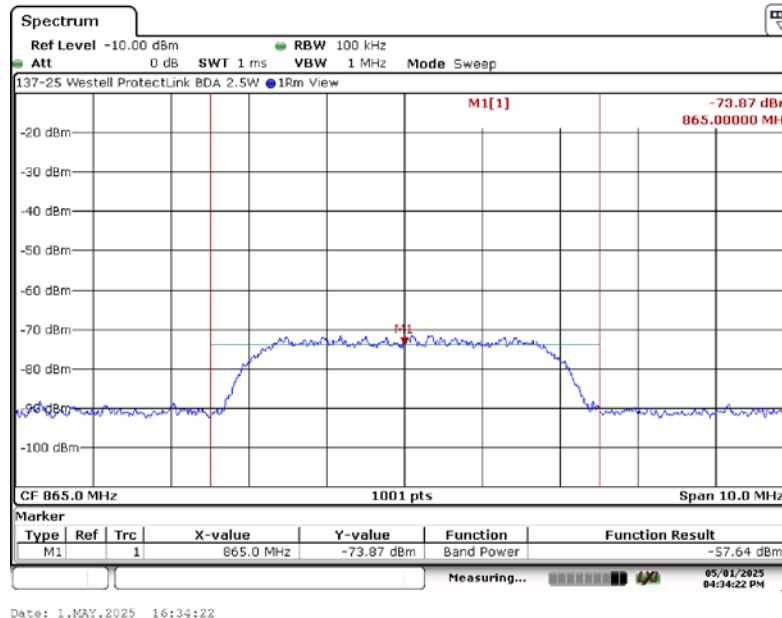
5. Measurement Data

5.2. Limitations on power and antenna height 90.219(e)(1), 90.635 (cont)

5.2.24. Mean Transmitter Output Power, 865.0 MHz, AWGN Modulation



5.2.25. Mean Transmitter Input Power, 865.0 MHz, AWGN Modulation



5. Measurement Data (continued)

5.3. Public Exposure to Radio Frequency Energy Levels 1.1307 (b)(1)

Center Frequency (MHz)	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm ²)	Result
				(mW/cm ²)	(W/m ²)		
	(1)	(2)	(3)	(4)		(5)	
774.9	28.0	33.94	3.00	0.5017346	5.0173463	0.52	Compliant
774.9	28.0	33.96	3.00	0.5040505	5.0405053	0.52	Compliant
774.9	28.0	33.94	3.00	0.5017346	5.0173463	0.52	Compliant
774.9	28.0	33.83	3.00	0.4891861	4.8918606	0.52	Compliant
803.6	20.0	27.63	3.00	0.2300012	2.3000122	0.54	Compliant
803.6	20.0	27.63	3.00	0.2300012	2.3000122	0.54	Compliant
803.6	20.0	27.62	3.00	0.2294722	2.2947223	0.54	Compliant
803.6	20.0	28.77	3.00	0.2990406	2.9904059	0.54	Compliant

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

1. Reference CFR 2.1091: For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.
2. Section 6.1.2 of this test report. Note that the value has been adjusted to include the cable insertion loss.
3. Data supplied by the client for combination of cable loss and antenna gain.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure. $f/1500$ where f is in MHz

5. Measurement Data (continued)

5.3. Public Exposure to Radio Frequency Energy Levels 1.1307 (b)(1) continued

Center Frequency (MHz)	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm ²)	Result
				(mW/cm ²)	(W/m ²)		
	(1)	(2)	(3)	(4)		(5)	
811.5	20.0	26.76	3.00	0.1882479	1.8824790	0.54	Compliant
811.5	20.0	26.75	3.00	0.1878149	1.8781494	0.54	Compliant
811.5	20.0	26.76	3.00	0.1882479	1.8824790	0.54	Compliant
811.5	20.0	27.61	3.00	0.2289445	2.2894446	0.54	Compliant
820.0	20.0	27.14	3.00	0.2054614	2.0546135	0.55	Compliant
820.0	20.0	27.25	3.00	0.2107318	2.1073183	0.55	Compliant
856.6	27.0	34.07	3.00	0.5559844	5.5598440	0.57	Compliant
856.6	27.0	34.04	3.00	0.5521570	5.5215703	0.57	Compliant
856.6	27.0	34.05	3.00	0.5534299	5.5342989	0.57	Compliant
856.6	27.0	34.00	3.00	0.5470948	5.4709483	0.57	Compliant
865.0	26.0	33.76	3.00	0.5582689	5.5826891	0.58	Compliant
865.0	26.0	33.73	3.00	0.5544258	5.5442581	0.58	Compliant

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

1. Reference CFR 2.1091: For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.
2. Section 6.1.2 of this test report. Note that the value has been adjusted to include the cable insertion loss.
3. Data supplied by the client for combination of cable loss and antenna gain.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.. f/1500 where f is in MHz

6. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with the Federal Communications Commission (FCC) and Industry Canada standards. Through our American Association for Laboratory Accreditation (A2LA) ISO Guide 17025 Accreditation our test sites are designated with the FCC (designation number **US1091**) and Industry Canada (file number **IC 3023A-1**)

Compliance Worldwide is also designated as a Phase 1 CAB under APEC-MRA (US0132) for Australia/New Zealand AS/NZS CISPR 11, AS/NZS CISPR 14-1, AS/NZS CISPR 15, AS/NZS CISPR 32, Chinese-Taipei (Taiwan) BSMI CNS 15936 and Korea (RRA) KS C 9811, KS C 9814-1, KS C 9815, KS C 9832, KS C 9610-6-3 & KS C 9610-6-4.

The radiated emissions test site is a 3- and 10-meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane. A second conducted emissions site is also located in the basement of the OATS site with a 2.3 x 2.5-meter ground plane and a 2.4 x 2.4-meter vertical wall.

The radiated emissions test site for measurements above 1GHz is a 3 Meter open area test site (OATS) with a 3.6 by 3.6-meter anechoic absorber floor patch to achieve a quasi-free space measurement environment per ANSI C63.4/C63.10 and CISPR 16-1-4 standards.

The sites are designed to test products or systems 1.5 meters W x 1.5 meters L x 2.0 meters H, floor standing or tabletop.

7. Test Setup Photographs

7.1 Antenna Port Conducted Emissions

