May 28, 2025

CalAmp
Imad Rizk
2200 Faraday Ave, Suite 220
Carlsbad, CA 92008

Dear Imad Rizk,

Enclosed is the Electromagnetic Compatibility for the CalAmp, ATU1650MB, tested to the requirements of:

- FCC Part 22H, 24E and 27

Thank you for using the services of Eurofins E&E Testing NA, LLC. Please contact me if you have any questions regarding these results or if Eurofins E&E can be of further service to you.

Sincerely,

Rheine Nguyen

Documentation Department
Eurofins E&E Testing NA, LLC.

Reference: EMCS135823-FCC Part 22H, 24E and 27 Rev. 2

A2LA ACCREDITED
TESTING CERT #0591.02

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	April 24, 2025	Initial Issue.
1	May 15, 2025	Added FCC ID and IC ID.
2	May 28, 2025	Transferred all photos to Photo File.

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1.0 Testing Summary

The CalAmp, ATU1650MB was found to be compliant to the following specification(s).

- FCC Part 22H, 24E & 27 and KDB 996369 D04 Module Integration Guide v02

Chin Ming Lui
WIR Laboratory Engineer

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements.

Ollie Moyrong
EMC Laboratory Manager, California

2.0 Overview

Eurofins E&E Testing NA, LLC. was contracted by CalAmp to perform testing on the ATU1650MB, under purchase order number 412315.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of CalAmp, ATU1650MB.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	ATU1650MB

2.1 Test Site

All testing was performed at Eurofins E&E Testing NA, LLC., 3162 Belick St. Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology. Eurofins E&E Testing NA, LLC. has been accredited by the American Association for Laboratory Accreditation (A2LA) (Certificate #: 0591.02) in accordance with ISO/IEC 17025:2017.

2.2 FCC ID

FCC ID: ATU-1650MB
IC: 5843C-1650MB

2.3 Equipment Overview and Test Configuration

The PTCRB request serves as the EUT configuration form for the equipment overview and test configuration section.

Antenna Gain	?

Antenna information was provided by the client. Eurofins E&E Testing NA, LLC did not test or verify the accuracy of the antenna information.

2.4 Modifications to the EUT

No modifications were made to the EUT.

2.5 Modifications to the Standard

No modifications were made to the Test Standard.

2.6 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electromagnetic Compatibility Lab for testing was returned to CalAmp upon completion of testing.

3.0 Electromagnetic Compatibility Criteria for Intentional Radiators

3.1 Radiated Spurious Emissions

Test Method: ANSI C63.26:2015; FCC KDB 996369 D04 Module Integration Guide v02

Test Requirement(s): The following standards specified below are covered in the scope of this section of the test report:

- FCC Part 22H, 24E & 27 and KDB 996369 D04 Module Integration Guide v02

22.917(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

24.238(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

27.53(c)(1) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

27.53(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

27.53(h)(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

Sample Calculation for Distance Correction factor (DCF) measurement:

$$F_d = 20*LOG_{10}(D_m/D_s)$$

where:

F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

Sample formula for calculating the Corrected Data for the Radiated Emissions Measurements:

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBµV)	ACF (dB/m) (+)	Pre Amp Gain (dB)(-)	CBL (dB) (+)	DCF (dB) (+)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
249.99	V	359.9	240.7	55.46	11.4	28.335	0	0	***38.505***	47	-8.495

Corrected Amplitude (dBµV/m) = Uncorrected Amplitude (dBµV) +ACF (dB/m) - Preamp Gain (dB) + CBL (dB) +DCF (dB) = 55.46 + 11.4 - 28.335 + 0 + 0 = ***38.505***

Test Procedure:

The method of testing, test conditions, and test procedures of ANSI C63.26:2015 were used in addition to FCC KDB 996369 D04 Module Integration Guide. Any measured frequency that exhibits a margin of compliance that is less than 3 dB below the specification limit is marked. Eurofins E&E recommends that every emission measured has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

For emissions between 30 MHz and 1000 MHz, the EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber a biconilog antenna was located 10m from the EUT on an adjustable mast. A pre-scan was first performed to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated, and the antenna height was varied between 1 m and 4 m to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz resolution bandwidth.

For emissions between 1 GHz and 18 GHz, a double ridged guide horn was located 3 m from the EUT on an adjustable mast. The EUT was placed on a non-metallic table 150 cm above the ground plane inside a semi-anechoic chamber. A pre-scan was performed and used to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated, and the antenna height was varied depending on the geometry of the EUT. To ensure maximized emissions, the horn antenna was positioned both vertically and horizontally. Unless otherwise specified, measurements were made using a peak and average detector with a 1 MHz resolution bandwidth.

For emission between 18 GHz and 20 GHz, a high frequency standard gain horn antenna was located 3 m from the EUT on an adjustable mast. The EUT was placed on a non-metallic table 150 cm above the ground plane inside a semi-anechoic chamber. A pre-scan was performed and used to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated, and the antenna height was varied depending on the geometry of the EUT. To ensure maximized emissions, the horn antenna was positioned both vertically and horizontally. Unless otherwise specified, measurements were made using a peak and average detector with a 1 MHz resolution bandwidth.

Due to the size of the EUT, pre-liminary measurements were performed with the EUT rotated on different axis (X, Y, Z). The worst-case data is presented in this report.

Test Software Used: Nexio BAT-EMC MSSQL Version: V2023.0.5.0 was used to perform this test.

Test Results:

Test Standard:	FCC Part 22H, 24E and 27 (Per FCC KDB 996369 D04 Module Integration Guide v02; ANSI C63.26:2015)
Test Name	Radiated Spurious Emissions
Test Dates:	04/04/2025 – 04/08/2025
Laboratory	Eurofins E&E Testing NA, LLC.
Test Engineer:	Chin Ming Lui
Test Results:	Compliant

Test Data (KDB 996369 D04 – LTE CAT-M1 Simultaneous Transmission with BLE)

FCC Part 22

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
549.997	RMS (PASS)	-37.049	-13	-24.049	2.145	166	Horizontal	100000	0.1	34.721
649.989	RMS (PASS)	-37.325	-13	-24.325	2.031	288	Vertical	100000	0.1	36.314

Table 1. Radiated Spurious Emissions, CAT-M1 Band 5 transmission with BLE (30 MHz – 1 GHz) Test Results

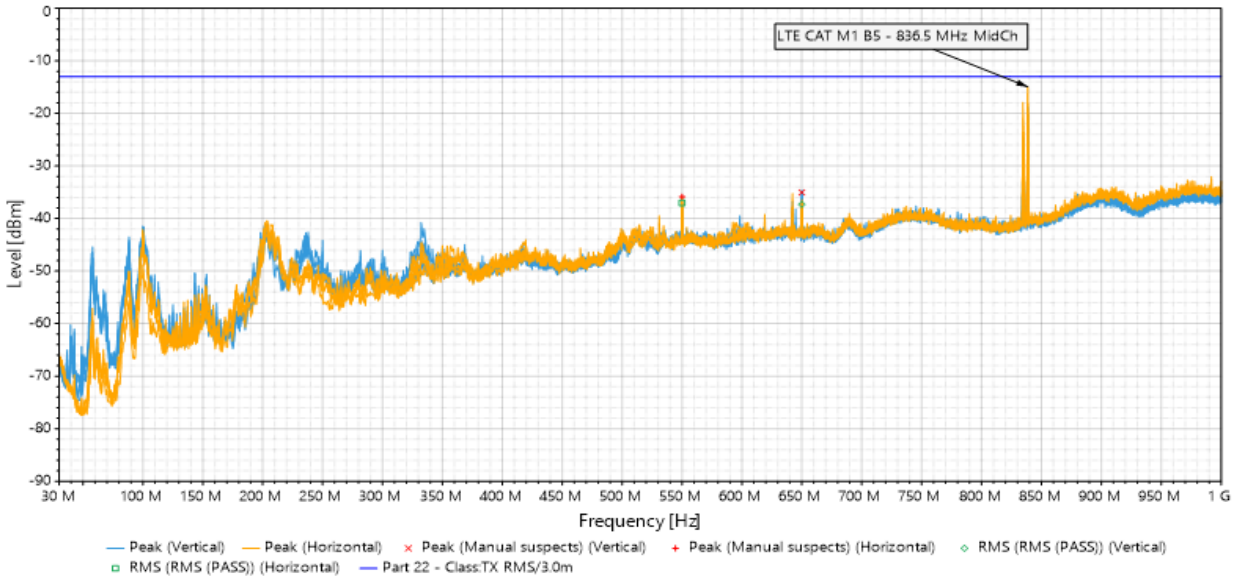

Figure 1. Radiated Spurious Emissions, CAT-M1 Band 5 transmission with BLE (30 MHz – 1 GHz) Plot

Frequency (MHz)	Source	Peak (dBm)	Lim.RMS (dBm)	Height (m)	Azimuth (°)	Polarization	Correction (dB)
2514.7	Manual suspects	-43.982	-13	1	243	Horizontal	17.706
2800	Manual suspects	-42.878	-13	1.5	252	Vertical	18.89

Table 2. Radiated Spurious Emissions, CAT-M1 Band 5 transmission with BLE (1 – 10 GHz) Test Results

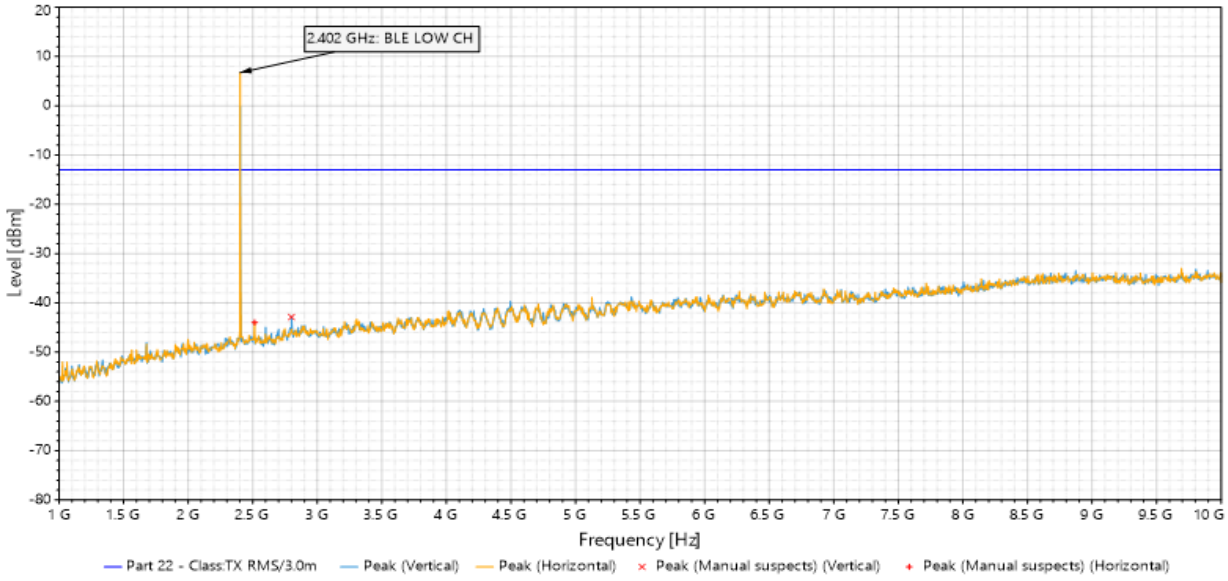

Figure 2. Radiated Spurious Emissions, CAT-M1 Band 5 transmission with BLE (1 – 10 GHz) Plot

FCC Part 24

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
649.994	RMS (PASS)	-34.728	-13	-21.728	2.584	292	Vertical	100000	0.1	36.314
849.993	RMS (PASS)	-34.478	-13	-21.478	1.246	132	Horizontal	100000	0.1	41.17

Table 3. Radiated Spurious Emissions, CAT-M1 Band 2 transmission with BLE (30 MHz – 1 GHz) Test Results

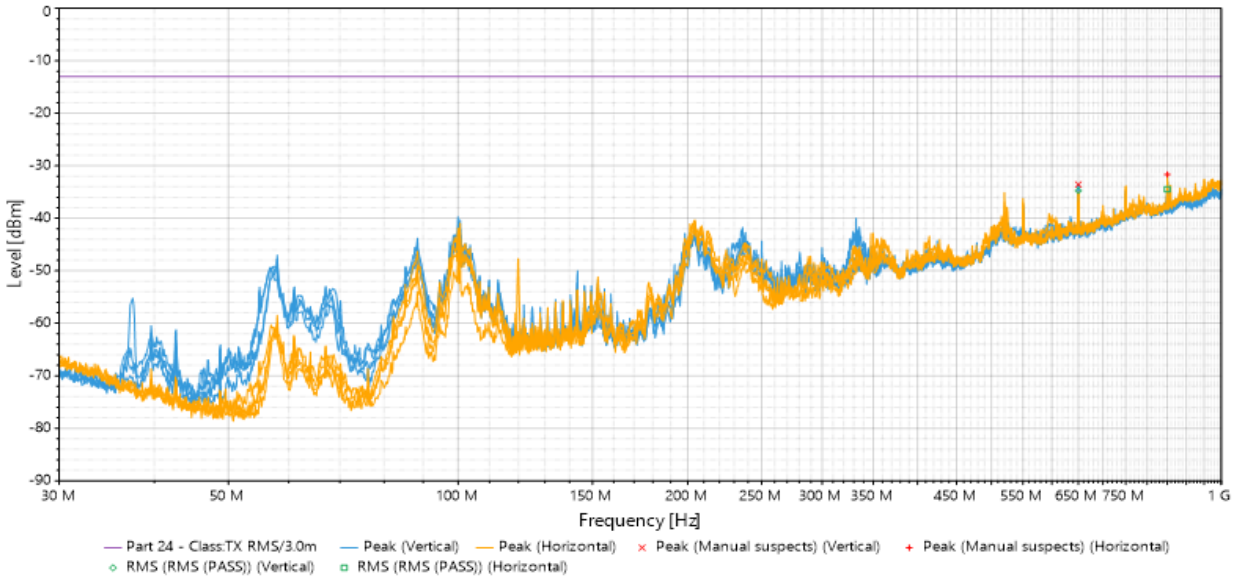

Figure 3. Radiated Spurious Emissions, CAT-M1 Band 2 transmission with BLE (30 MHz – 1 GHz) Plot

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
1523.1	RMS (PASS)	-52.615	-13	-39.615	1.033	99	Horizontal	1000000	0.1	13.259
1641.7	RMS (PASS)	-61.601	-13	-48.601	1.244	324	Vertical	1000000	0.1	13.909
2925.7	RMS (PASS)	-55.958	-13	-42.958	1.136	185	Vertical	1000000	0.1	19.304
2925.8	RMS (PASS)	-54.697	-13	-41.697	1.469	121	Horizontal	1000000	0.1	19.305

Table 4. Radiated Spurious Emissions, CAT-M1 Band 2 transmission with BLE (1 – 18 GHz) Test Results

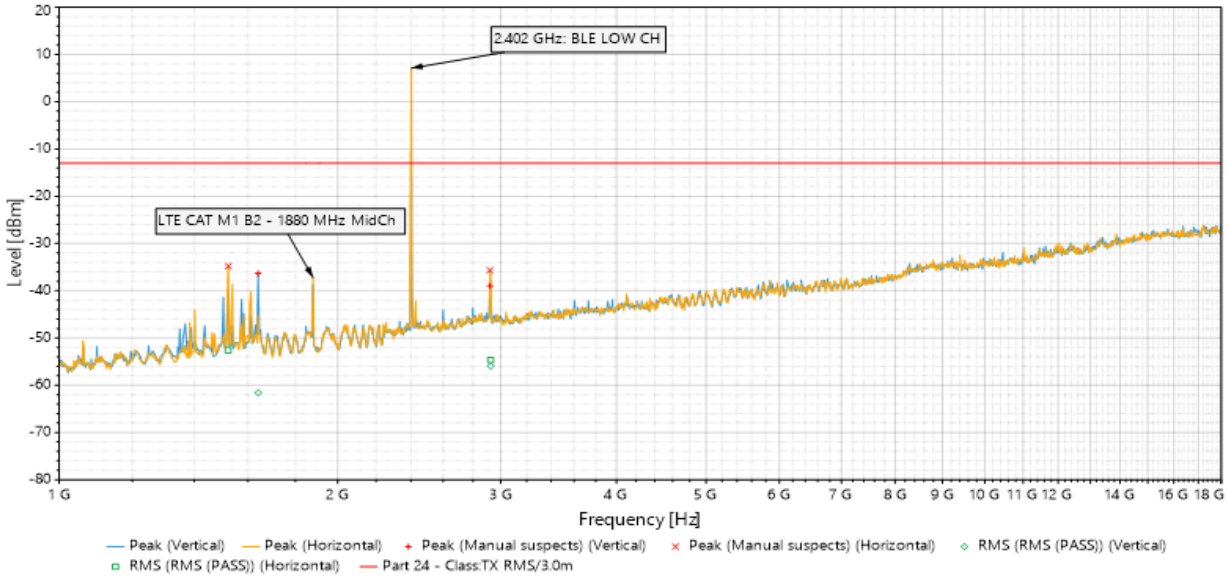

Figure 4. Radiated Spurious Emissions, CAT-M1 Band 2 transmission with BLE (1 – 18 GHz) Plot

Frequency (MHz)	Source	Peak (dBm)	Lim.RMS (dBm)	Height (m)	Azimuth (°)	Polarization	Correction (dB)
21552.8	Manual suspects	-59.974	-13	2.5	113	Horizontal	-2.463
23639.2	Manual suspects	-59.727	-13	2.5	5	Vertical	-2.006

Table 5. Radiated Spurious Emissions, CAT-M1 Band 2 transmission with BLE (18 – 20 GHz) Test Results

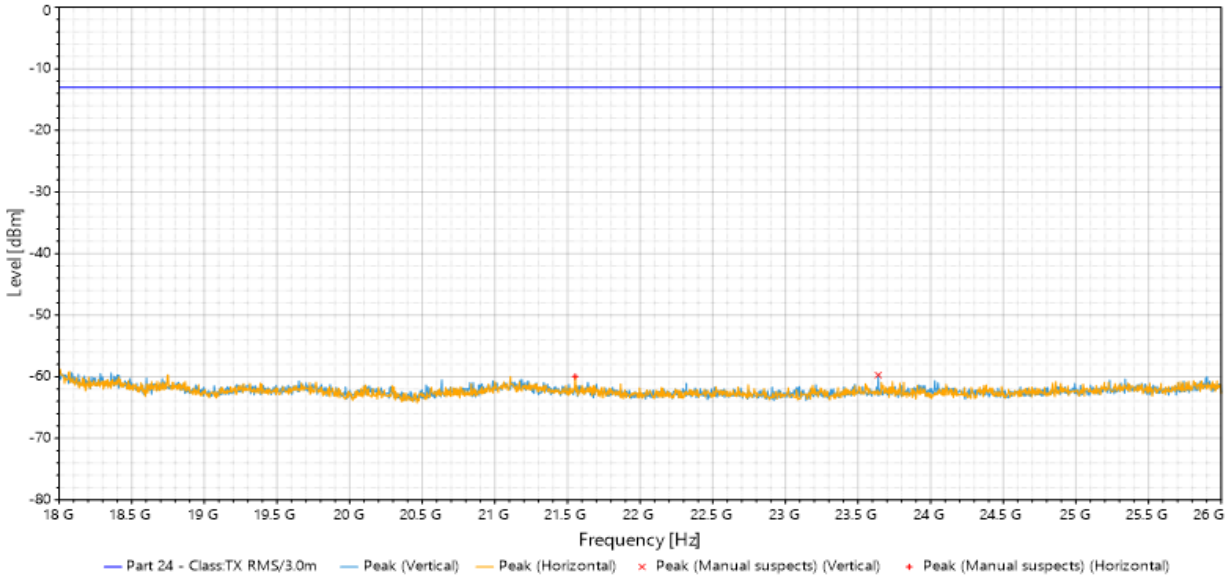

Figure 5. Radiated Spurious Emissions, CAT-M1 Band 2 transmission with BLE (18 – 20 GHz) Plot

FCC Part 27

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
649.979	RMS (PASS)	-35.887	-13	-22.887	1.911	287	Vertical	100000	0.1	36.314
671.223	RMS (PASS)	-43.237	-13	-30.237	1	244	Horizontal	100000	0.1	36.988

Table 6. Radiated Spurious Emissions, CAT-M1 Band 4 transmission with BLE (30 MHz – 1 GHz) Test Results

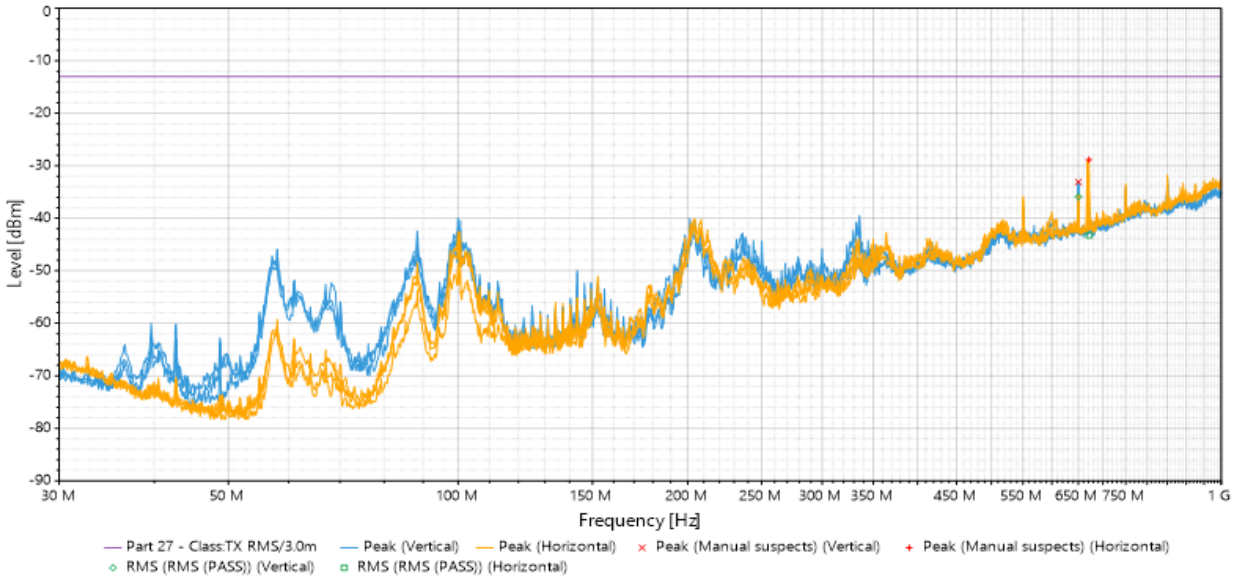

Figure 6. Radiated Spurious Emissions, CAT-M1 Band 4 transmission with BLE (30 MHz – 1 GHz) Plot

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
1579.8	RMS (PASS)	-46.762	-13	-33.762	1.351	67	Horizontal	1000000	0.1	13.614
1579.9	RMS (PASS)	-49.875	-13	-36.875	1.693	333	Vertical	1000000	0.1	13.614
3460.8	RMS (PASS)	-56.092	-13	-43.092	3.486	339	Vertical	1000000	0.1	20.938
3460.8	RMS (PASS)	-55.1	-13	-42.1	1.923	63	Horizontal	1000000	0.1	20.938

Table 7. Radiated Spurious Emissions, CAT-M1 Band 4 transmission with BLE (1 – 18 GHz) Test Results

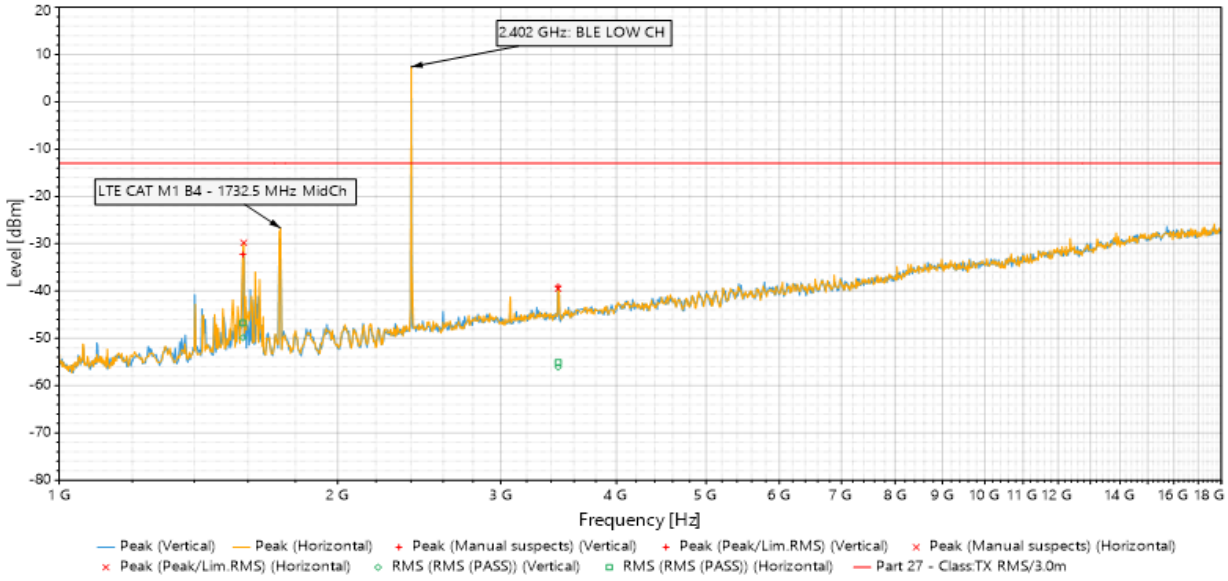

Figure 7. Radiated Spurious Emissions, CAT-M1 Band 4 transmission with BLE (1 – 18 GHz) Plot

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
549.997	RMS (PASS)	-41.168	-13	-28.168	3.866	225	Vertical	100000	0.1	35.221
654.645	RMS (PASS)	-54.339	-13	-41.339	2.023	167	Horizontal	100000	0.1	36.625

Table 8. Radiated Spurious Emissions, CAT-M1 Band 12 transmission with BLE (30 MHz – 1 GHz) Test Results

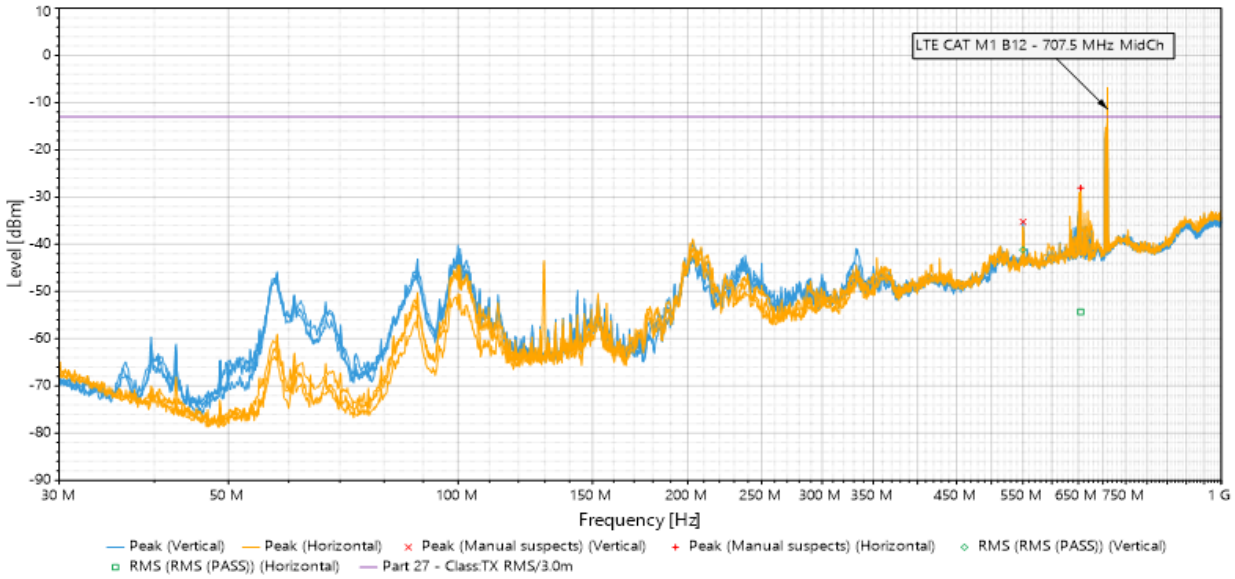

Figure 8. Radiated Spurious Emissions, CAT-M1 Band 12 transmission with BLE (30 MHz – 1 GHz) Plot

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
2115.9	RMS (PASS)	-56.615	-13	-43.615	1.134	254	Horizontal	1000000	0.1	16.08
2116.1	RMS (PASS)	-55.528	-13	-42.528	1.246	51	Vertical	1000000	0.1	16.08
2127.7	RMS (PASS)	-46.461	-13	-33.461	1.576	251	Horizontal	1000000	0.1	16.11
2127.8	RMS (PASS)	-49.654	-13	-36.654	1.465	353	Vertical	1000000	0.1	16.11

Table 9. Radiated Spurious Emissions, CAT-M1 Band 12 transmission with BLE (1 – 18 GHz) Test Results

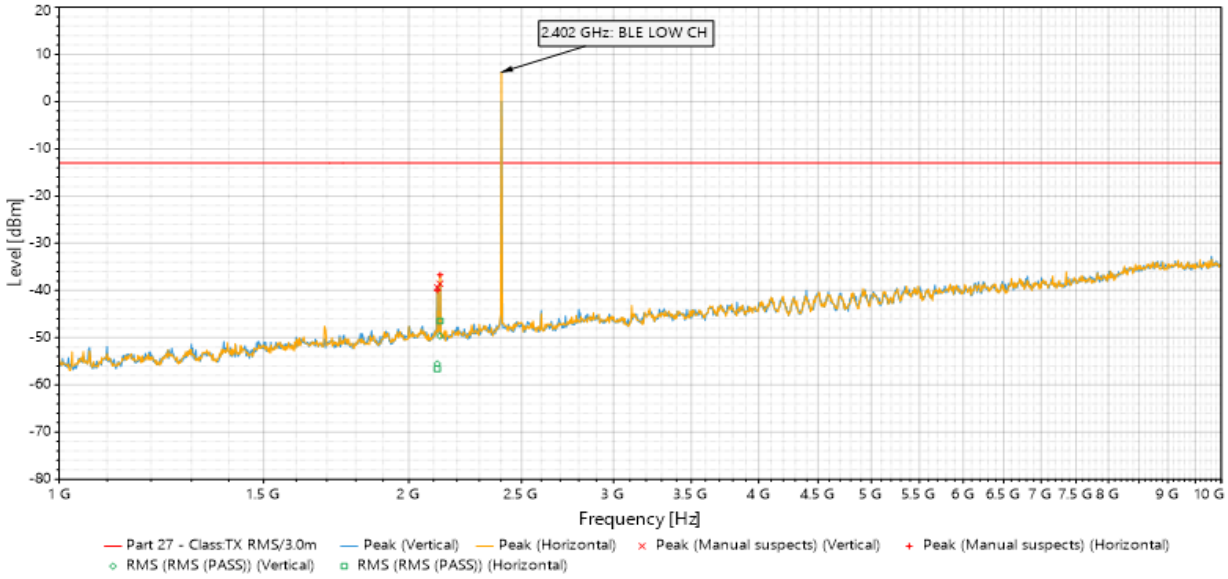

Figure 9. Radiated Spurious Emissions, CAT-M1 Band 12 transmission with BLE (1 – 18 GHz) Plot

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
240.005	RMS (PASS)	-26.087	-13	-13.087	1.245	248	Horizontal	100000	0.1	20.35
480.113	RMS (PASS)	-45.352	-13	-32.352	1	112	Horizontal	100000	0.1	31.323
959.946	RMS (PASS)	-24.418	-13	-11.418	1	220	Horizontal	100000	0.1	45.073

Table 10. Radiated Spurious Emissions, CAT-M1 Band 13 transmission with BLE (30 MHz – 1 GHz) Test Results

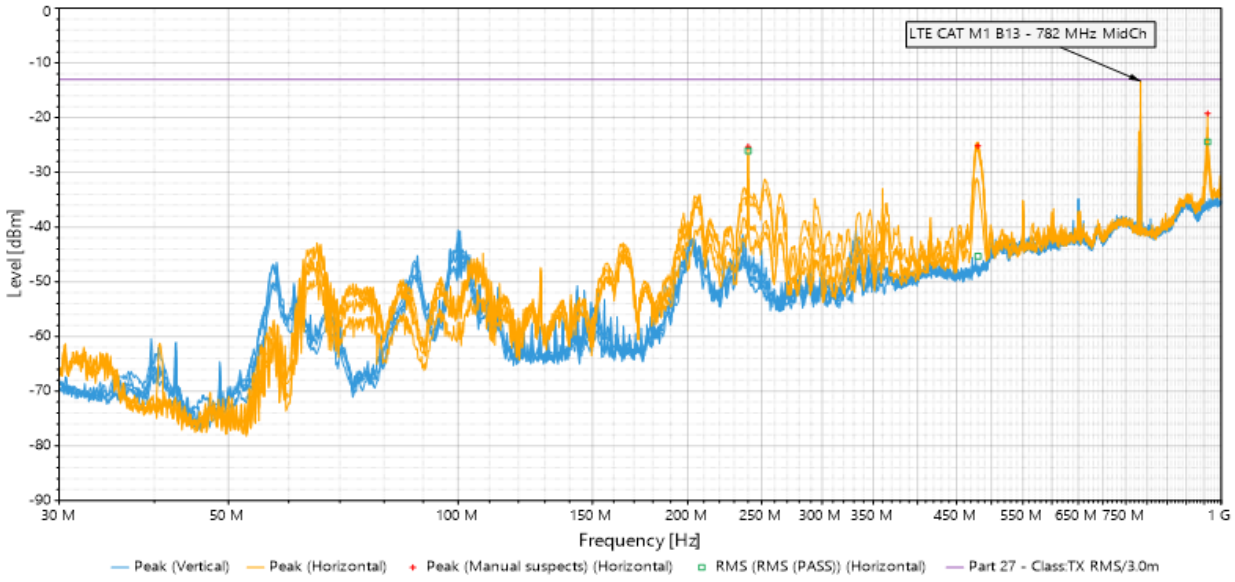

Figure 10. Radiated Spurious Emissions, CAT-M1 Band 13 transmission with BLE (30 MHz – 1 GHz) Plot

Frequency (MHz)	Source	RMS (dBm)	RMS Limit (dBm)	Margin (dB)	Height (m)	Azimuth (°)	Pol.	RBW (Hz)	Meas. Time (s)	Correction (dB)
1559.6	RMS (PASS)	-61.45	-13	-48.45	1.126	58	Horizontal	1000000	0.1	13.497
2339.35	RMS (PASS)	-56.96	-13	-43.96	1.465	240	Horizontal	1000000	0.1	17.104
2339.4	RMS (PASS)	-58.452	-13	-45.452	1	64	Vertical	1000000	0.1	17.105

Table 11. Radiated Spurious Emissions, CAT-M1 Band 13 transmission with BLE (1 – 18 GHz) Test Results

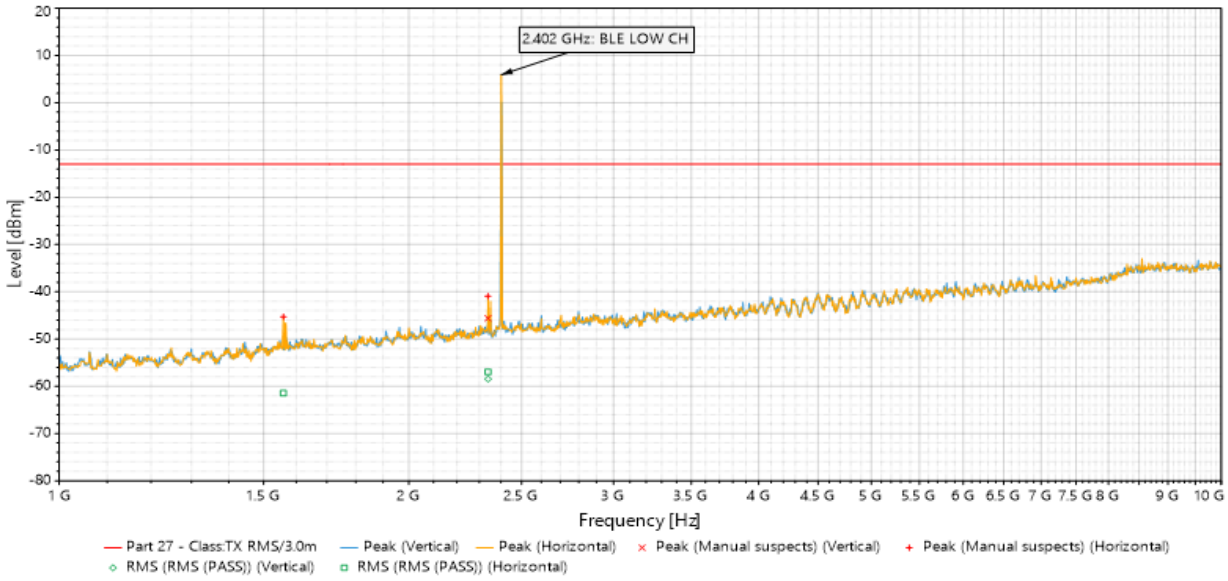

Figure 11. Radiated Spurious Emissions, CAT-M1 Band 13 transmission with BLE (1 – 18 GHz) Plot

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

Test Name: KDB 996369 D04 RSE			**Test Date(s):** 04/04/2025 – 04/08/2025		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2399	Turntable Controller	Sunol Sciences	SC99V	See Note 1	
1S4856	Antenna Positioning Tower	ETS-Lindgren	2171B	See Note 1	
1S2482	5 Meter Chamber	Panashield - ETS	5 Meter Semi-Anechoic Chamber	See Note 2	
1S4852	Radio Communicator Analyzer	Anritsu	MT8821C	N/A	
1S4804	EMI Test Receiver	Rohde & Schwarz	ESW44	08/07/2024	08/07/2025
1S2600	Bilog Antenna	Teseq	CBL6112D	04/19/2023	04/19/2025
1S2435	Horn Antenna	ETS-Lindgren	3117	03/17/2025	03/17/2027
1S3818	DRG Horn Antenna	A.H. Systems, Inc.	SAS-574	05/24/2023	05/24/2025
1S2668	Pre-Amplifier	Sonoma Instruments	310 N	03/18/2025	03/18/2027
1S4802	Pre-Amplifier	EMC Instruments Corporation	EMC118A45SE	See Note 1	
1S3865	Table Top Amplifier	MITEQ	TTA1840-35-HG	See Note 1	
Note 1: Functionally tested equipment is verified using calibrated instrumentation at the time of testing. **Note 2:** Latest NSA and VSWR data available upon request.					

Table 12. Radiated Spurious Emissions, Test Equipment

END OF REPORT