



Test Report

For:
Visteon Corporation

Brand:
Visteon

Marketing Name:
Battery Pack Control Module

Model Name:
BPCMFx

Product Description:
Battery Pack Control Module

FCC ID: NT8-BPCMFx
IC: 3043A-BPCMFx

Applied Rules and Standards:
47 CFR Part 15B
ICES-003 Issue 7

REPORT #: EMC_VISTE_002_23001_FCC15B_ICES003_BPCMFx

DATE: 2024-06-03



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1 Assessment

The following equipment (as further described in section 3 of this report) was evaluated against the applicable criteria specified in the Code of Federal Regulations Title 47 CFR Part 15B, and the relevant Canada standard ICES-003 Issue 7.

Radiated and conducted Emission tests are carried out to show that the EUT complies with FCC 15.107; FCC 15.109 (a) and ICES-003, §3.2.1; §3.2.2 limits for Class B device.

No deficiencies were ascertained.

Company	Description	Model #
Visteon Corporation	Battery Pack Control Module	BPCMF

Responsible for the Report:

2024-06-03	Compliance	Guangcheng Huang (Senior EMC Test Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Ghanma, Issa
Project Manager:	Baskaran, Akanksha

2.2 Identification of the Client

Client's Name:	Visteon Corporation
Street Address:	One Village Center Drive
City/Zip Code	Van Buren Township, MI/48111
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	Same as Client
City/Zip Code	Same as Client
Country	Same as Client

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	BPCMF
Marketing Name:	Battery Pack Control Module
HW Version :	VPRE1F-12A650-MA
SW Version :	SWE201-28418-000F01
FCC ID :	NT8-BPCMF
IC :	3043A-BPCMF
FWIN:	N/A
HVIN:	BPCMF
PMN:	Battery Pack Control Module
Product Description:	Battery Pack Control Module
Power Supply / Rated operating Voltage Range:	Min. 8 V, Nom 13.5 V, Max. 16 V powered by the vehicle battery power system
Operating Temperature Range	-40°C to +85°C
Sample Revision	Production
EUT Dimensions	12.4 cm X 40.86 cm X 0+ 3.47 cm
Note: All information provided by the client.	

3.2 Radio Specifications

Embedded Radio Technologies	Integrating 2 ADI Proprietary Protocol: 1.- ADRF8951 chipset 2.- ADRF8951 chipset
Frequency Range / number of channels:	1.- ADRF8951 chipset: Low Power 2.4 GHz wBMS radio Frequency Range: 2405 - 2480 MHz Channels: 0-15 2.- ADRF8951 chipset: Low Power 2.4 GHz wBMS radio Frequency Range: 2405 - 2480 MHz Channels: 0-15
Rated max. EIRP	1.- ADRF8951 chipset: 12 dBm 2.- ADRF8951 chipset: 12 dBm
Tested radio technology	Integrating 2 ADI Proprietary Protocol
Antenna Type / Gain	1. Part No. 1001013 Product: 2.4 GHz FR4 Antenna 2. Part No. 1001013 Product: 2.4 GHz FR4 Antenna
Modes of Operation	1.- ADRF8951 chipset: Proprietary Protocol: 802.15.4 2400 MHz - 2483.5 MHz ISM Band Modulation: GFSK Nominal Channel Bandwidth: 5 MHz Duty Cycle: 27% 2.- ADRF8951 chipset: Proprietary Protocol: 802.15.4 2400 MHz - 2483.5 MHz ISM Band Modulation: GFSK Nominal Channel Bandwidth: 5 MHz Duty Cycle: 27%
Note: All information provided by the client.	

3.3 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	N/A	VPRE1F-12A650-MA	SWE201-28418-000F01	Radiated EUT

3.4 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	USB-Dongle	PL2303TA	HiLetgo	NA
2	Harness cables	Power ON cables	NA	NA

Note: all AEs are only used for setup the test mode. They are disconnected before the test.

3.5 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1	Radiated EUT

3.6 Mode of Operation

Mode #	Mode of Operation	Comments
1	TX	The EUT is operating with the TX turn off.

3.7 Justification for Worst Case Mode of Operation

For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in chapter 1.

4.1 Date of Testing:

4/26/2024

4.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=2.

Measurement System	EMC 1	EMC 2
Conducted emissions (mains port)	1.12 dB	0.46 dB
Radiated emissions (< 30 MHz)	3.66 dB	3.88 dB
(30 MHz – 1GHz)	3.17 dB	3.34 dB
(1 GHz – 3 GHz)	5.01 dB	4.45 dB
(>3 GHz)	4.0 dB	4.79 dB

4.3 Environmental Conditions during Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25 °C
- Relative humidity: 40-60%

Deviating test conditions are indicated at individual test description where applicable.

4.1 Decision Rule:

Cetecom advanced follows ILAC G8:2019 chapter 4.2.1 (Simple Acceptance Rule).

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3. The measurement uncertainty is mentioned in this test report, See chapter 9, but is not taken into account – neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong.

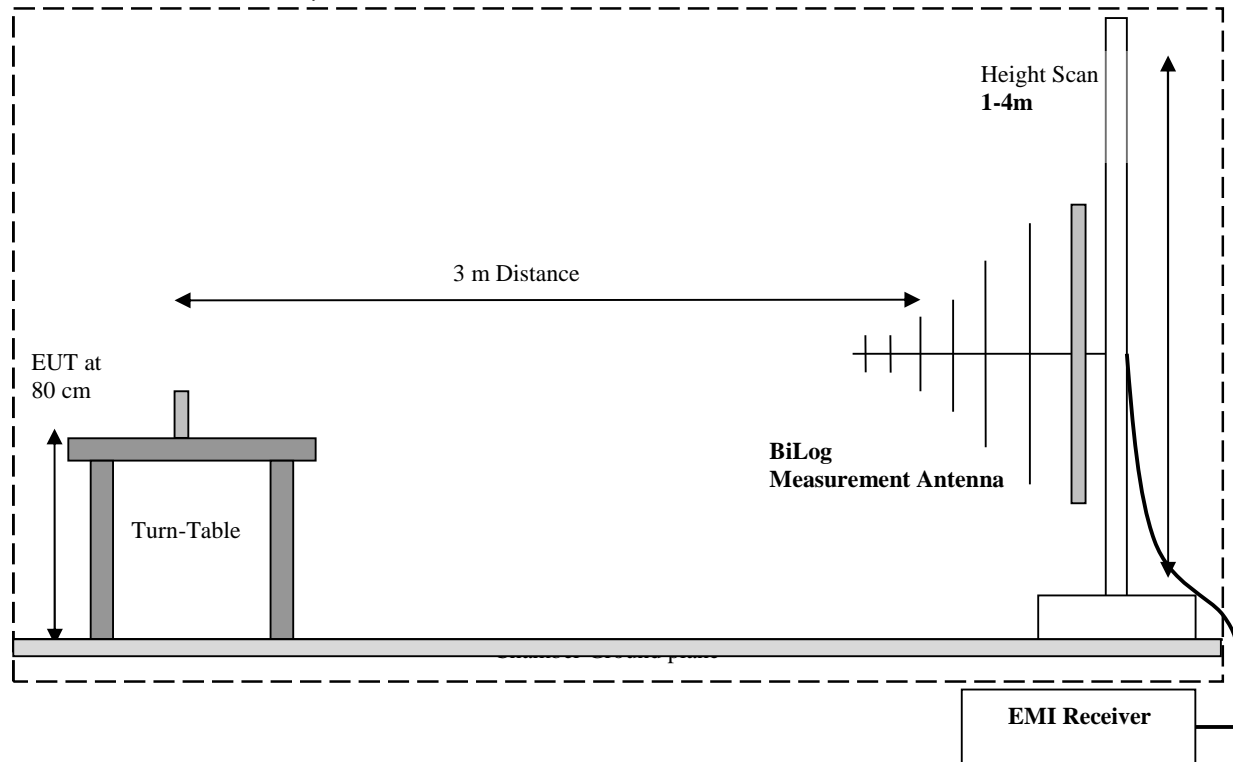
5 **Measurement Procedures**

Testing is performed according to the guidelines provided in ANSI C63.4-2014 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 30 MHz to 40 GHz

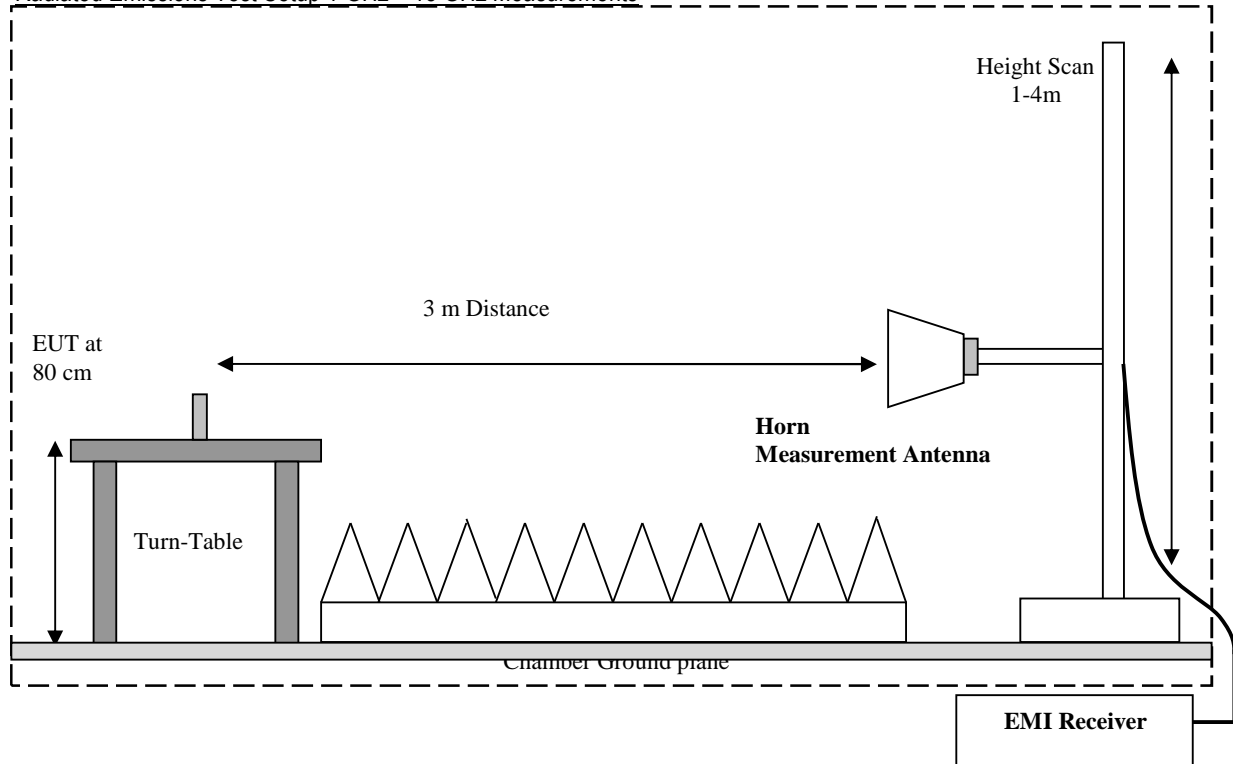
5.1 **Radiated Measurement**

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 360 ° continuous measurement of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90 deg range of the turntable, fine search in frequency domain and height scan between 1 m and 4 m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

Radiated Emissions Test Setup 30 MHz – 1 GHz Measurements



Radiated Emissions Test Setup 1 GHz – 18 GHz Measurements



5.2 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

- Measured reading in dB μ V
- Cable Loss between the receiving antenna and SA in dB and
- Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

6 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
FCC §15.109 ICES-003, §3.2.2	Radiated Emissions	Nominal	RX Mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
FCC §15.107 ICES-003, §3.2.1	Conducted Emissions	Nominal	RX Mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Note *

NA= Not Applicable; NP= Not Performed.

Note *: The EUT is a battery-powered vehicular device and is not designed to utilize power from AC public mains. Therefore, this test is not applicable.

7 Test Result Data

7.1 Radiated Emissions Measurement according to CFR 47 Part 15.109 and ICES-003 3.2.2

Spectrum Analyzer settings		
Sweep Frequency Range	30 MHz – 1 GHz	1 GHz – 40 GHz
Resolution Bandwidth	120 kHz	1 MHz
Detector (Exploratory Measurements)	Peak	Peak, Average
Detector (Final Measurements)	Quasi-Peak	Peak, Average
Trace Mode	Max Hold	Max Hold
Step Size	40 kHz	800 kHz
Measurement Time (Exploratory Measurements)	2 ms	2 ms
Measurement Time (Final Measurements)	100 ms	100 ms

7.1.1 Limits:

Class A Limits		
Frequency of emission (MHz)	Field Strength @ 10 m (μV/m)	Field Strength @ 3 m (dBμV/m)
30-88	90	49.5
88-216	150	54
216-960	210	56.9
Above 960	300	60

Class B Limits		
Frequency of emission (MHz)	Field Strength @ 3 m (μV/m)	Field Strength @ 3 m (dBμV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Note: For measurements below 1 GHz, the limits above use a quasi-peak detector. For measurements above 1 GHz, the limits above use an average detector.

7.1.2 Test Summary:

Environmental Conditions	
Ambient Temperature:	23 °C
Relative Humidity:	42%
Atmospheric Pressure:	1010 mbar

Test Results					
Plot #	EUT Set-Up #	EUT operating mode	Scan Frequency	Lowest margin	Result
1 – 3	1	Op. 1	30 MHz – 18 GHz	19.08 dB	Pass

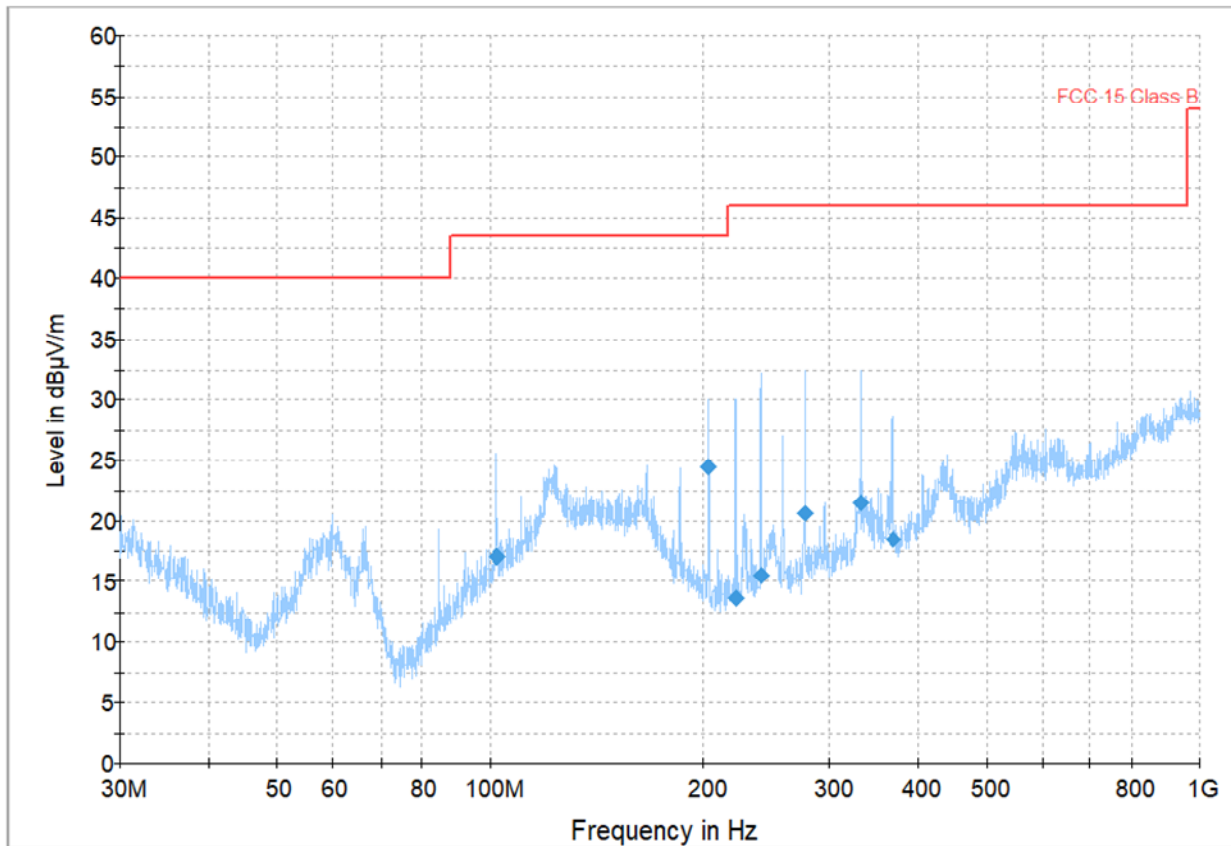
7.1.3 Measurement Plots:

Plot # 1

30 MHz – 1GHz

Final Result

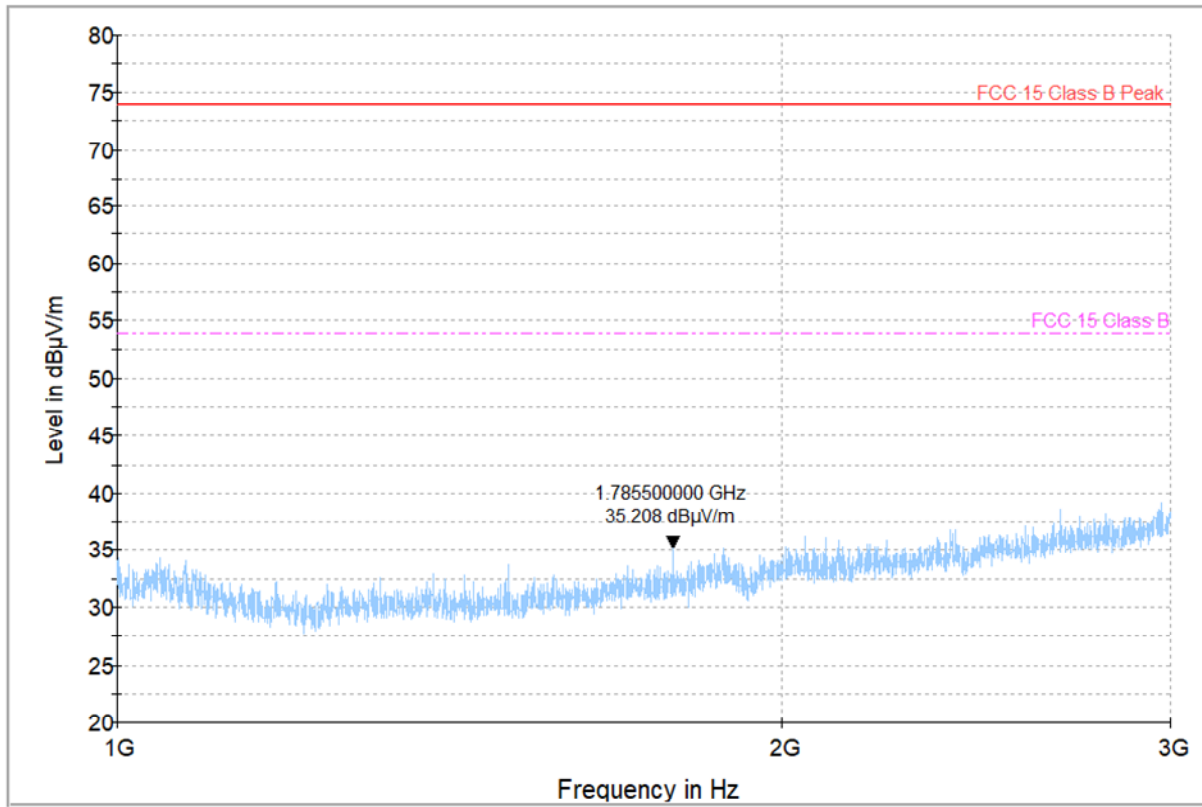
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamplifier (dB)	Trd Corr. (dB/m)	Raw Rec (dBμV)
101.932	17.110	43.52	26.41	500.0	120.000	396.	V	60.0	-13.8	-35.0	0.0	21.1	30.9
202.721	24.443	43.52	19.08	500.0	120.000	117.	H	200.0	-16.5	-34.5	0.0	18.0	40.9
221.575	13.602	46.02	32.42	500.0	120.000	100.	V	299.0	-16.0	-34.4	0.0	18.4	29.6
240.217	15.522	46.02	30.50	500.0	120.000	125.	H	286.0	-14.8	-34.3	0.0	19.5	30.3
276.774	20.642	46.02	25.38	500.0	120.000	100.	H	92.0	-14.7	-34.2	0.0	19.5	35.3
332.064	21.576	46.02	24.44	500.0	120.000	100.	H	106.0	-13.1	-34.0	0.0	20.9	34.7
368.742	18.505	46.02	27.52	500.0	120.000	141.	V	9.0	-12.9	-33.9	0.0	21.0	31.4



— Preview Result 1-PK+ — FCC 15 Class B ◆ Final_Result QPK

Plot # 2

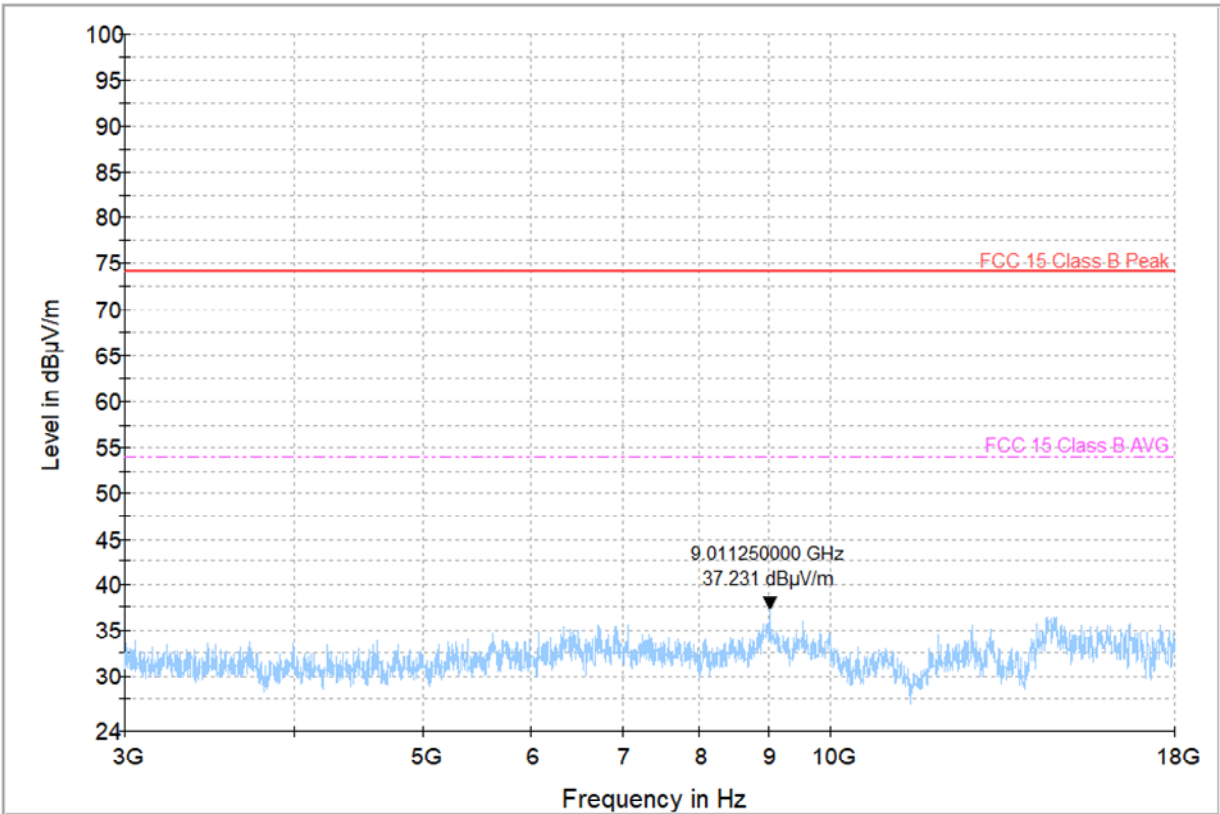
1 – 3GHz



Preview Result 1-PK+ * Critical_Freqs PK+ FCC 15 Class B Peak
FCC 15 Class B Final_Result PK+ Final_Result RMS

Plot # 3

3 – 18GHz



Preview Result 1-PK+ Critical_Freqs PK+ FCC 15 Class B Peak
FCC 15 Class B AVG Final_Result PK+ Final_Result RMS

8 Test Setup Photos

Setup photos are included in supporting file name:

"EMC_VISTE_002_23001_FCC15B_ICES003_BPCMF_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Item Name	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
LOOP ANTENNA	ETS LINDGREN	6512	00164698	3 YEARS	6/9/2023
BICONILOG ANTENNA	AH-Systems	BiLA2G	569	3 YEARS	10/30/2023
HORN ANTENNA	ETS LINDGREN	3115	00035111	3 YEARS	10/26/2023
HORN ANTENNA	ETS LINDGREN	3117-PA	167061	3 YEARS	9/25/2023
HORN ANTENNA	ETS LINDGREN	3116C-PA	00169535	3 YEARS	10/26/2023
EMI RECEIVER	R&S	ESW44	101715	3 YEARS	10/24/2023
DIGITAL THERMOMETER	CONTROL COMPANY	36934-164	191871986	3 YEARS	10/18/2023

Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.

Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for calibration status either do not specifically require calibration or is internally characterized before use.

10 Revision History

Date	Report Name	Changes to report	Report prepared by
2024-06-03	EMC_VISTE_002_23001_FCC15B_ICES003_BPCMF_Photos	Initial version	Huang, Guangcheng [CETECOM]

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