



FCC LISTED, REGISTRATION
 NUMBER: 2764.01

ISED LISTED REGISTRATION
 NUMBER: 23595-1

Test report No:
 4241ERM.001

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (2018) & ICES-003 Issue 7 (October 2020)

(*) Identification of item tested	Battery Radiofrequency Module
(*) Trademark	Visteon
(*) Model and /or type reference	BRFMS
Other identification of the product	FCC ID: NT8-BRFMS IC: 3043A-BRFMS
(*) Features	Wireless Battery Management
Manufacturer	Visteon Corporation One Village Center Drive, Van Buren Township, MI 48111, USA
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (2018) ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	12-11-2023
Report template No	FDT08_23 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
Code	EMC Test Code
Freq Rng	Frequency Range
MP	Measurement Point
OM	Operation Mode
S/	Sample
V	Verdict

Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

	Frequency (MHz)	U (k=2)	Units
Radiated emission	30 - 1000	5.94	dB
	1000-18000	5.89	dB

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a Module intended to aggregate individual cell voltages and module temperatures from the HV battery in addition to pack voltage and current and communicate them to the VICM3.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples used for the test have been selected by: The client.

The sample(s) is composed of the following elements, accessories and auxiliary equipment:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	4241/09	BRFMS Radiated	BRFMS	112330000063533	2023-11-10	Element Under Test
S/01	4241/21	isoSPI 2 Wire Serial Interface	Demo circuit 1941D		2023-11-10	Accessory
S/01	4241/22	GM BRM test Board	Cheetah		2023-11-10	Accessory
S/01	1482	Laptop	V14 G2 ITL	PF3QAFFH		Auxiliary Element

Notes referenced to samples during the project:

Id	Type	Note
S/01	Commercial	Sample S/01 was used for: All test(s) indicated in appendix A.

Test sample description

Test Sample description (compulsory information for EMC and RF testing services)

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Main connector/harness		60 cm	[]	[]	[]	
	[]	[]	[]	
	[]	[]	[]	
	[]	[]	[]	
	[]	[]	[]	
Supplementary information to the ports..... :	.....					
Rated power supply :	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[]	AC:	[]	[]	[]	[]	[]
	[]	AC:	[]	[]	[]	[]	[]
	[X]	DC: 5.4 V					
[]	DC:						
Rated Power	Current in normal mode: 0,5 A						
Clock frequencies	40 MHz						
Other parameters..... :	.....					
Software version	SWE101-28371-000R09						
Hardware version..... :	VPPAMU-14B115-ED						
Dimensions in cm (W x H x D)..... :	.....					
Mounting position..... :	[]	Table top equipment					
	[]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					
	[]	Hand-held equipment					
	[X]	Other: Integrated in-side electric vehicle battery pack.					
Modules/parts :	Module/parts of test item		Type	Manufacturer			
			
			
			
			
Accessories (not part of the test item) :	Description		Type	Manufacturer			
	Harness		.....	.....	
	Main connector		.....	.....	
	Cheetah		.....	.....	
	Test Board		.....	.....	
			

Documents as provided by the applicant	Description	File name	Issue date
	Declaration Equipment Data	.....	11/22/2023

⁽³⁾ Only for Medical Equipment

Identification of the client

Visteon Corporation
 One Village Center Drive,
 Van Buren Township,
 MI 48111,
 USA

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	2023-11-13
Date (finish)	2023-11-14

Document history

Report number	Date	Description
4241ERM.001	12-11-2023	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

Remarks and comments

The tests have been performed by the technical personnel: Qi Zhang, Yuqi Wang, Koji Nishimoto, and Victor Albrecht.

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P
Partial Passed	P*

Summary

Test Specification	Requirement – Test case	Verdict	Remark
FCC Rules and Regulations CFR 47, Part 15, Subpart B (2018) & ICES-003 Issue 7 (October 2020)	Continuous conducted emission on Power leads - Unintentional radiators	N/A	(1), (2)
	Radiated emission electromagnetic field – Unintentional radiators	P	(3)
<p>Supplementary information and remarks:</p> <p>(1) According with the requirements of FCC Rules and Regulations, title 47, Chapter I, Subchapter A, Part 15, Subpart B, §15.107 Conducted limits, (d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation, and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.</p> <p>(2) Exemptions from the scope of ICES-003, clause 1.5.1 ICES-003 does not apply to the following types of equipment (a) ITE or digital apparatus factory-installed in vehicles, boats or devices equipped with internal combustion engines, traction batteries or both (subject to ICES-002). ITE or digital apparatus not factory-installed in vehicles, boats or devices equipped with internal combustion engines, traction batteries or both do not qualify for this exemption.</p> <p>(3) According with the requirements of FCC Rules and Regulations, title 47, Chapter I, Subchapter A, Part 15, Subpart A, §15.33 Frequency range of radiated measurements, (b) for unintentional radiators, (1) due to The Highest frequency generated or used in the device above 1000MHz, The Upper frequency of measurement range is up to 5th harmonic of the highest frequency or 40GHz, whichever is lower.</p>			

List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
1012	ESR26 EMI TEST RECEIVER	ESR26	ROHDE & SCHWARZ	2025-03-10
1014	FSV40 SIGNAL ANALYZER 40GHZ	FSV40	RHODE & SCHWARZ	2024-08-01
1057	3115 DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA (750 MHz-18 GHz)	3115	ETS LINDGREN	2026-07-18
1064	3142E BICONILOG ANTENNA	3142E	ETS LINDGREN	2024-12-13
1108	ETHERNET SNMP THERMOMETER	HWg-STE Plain	HW GROUP	2024-10-17
1110	ETHERNET SNMP THERMOMETER	HWg-STE Plain	HW GROUP	2024-10-17
1111	ETHERNET SNMP THERMOMETER	HWg-STE Plain	HW GROUP	2024-10-18
1179	SEMI-ANECHOIC CHAMBER	SAC 3plus 'L'	FRANKONIA	--
1217	FRANKONIA TRANSPARENT TEST TABLE 1	FFT-Square	FRANKONIA	--
1314	WIRELESS MEASUREMENT SOFTWARE R&S EMC32	--	RHODE & SCHWARZ	--
1461	LOW NOISE PREAMPLIFIER (1-18GHz)	BLMA0118-4A	BONN ELEKTRONIK	2024-06-01

Appendix A: Test results

Appendix A content

DESCRIPTION OF THE OPERATION MODES	12
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Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself. The operation modes used by the samples to which the present report refers, are shown in the following table:

Id	Description
OM/01	DUT ON. Device in Standby mode. Power supply 5.4 Vdc

Test standards version applied

The product standards and test standards applied for each test cases are shown in the following table:

Product Test Standard	Test standard	Requirement – Test case
FCC CFR 47, Part 15, Subpart B (2018) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	Continuous conducted emission on Power leads - Unintentional radiators
	ANSI C63.4 (2014)	Radiated emission electromagnetic field – Unintentional radiators

Test Conditions

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30-1000 MHz (Bi-log antenna) and 1-18 GHz (Double ridge horn antenna).

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

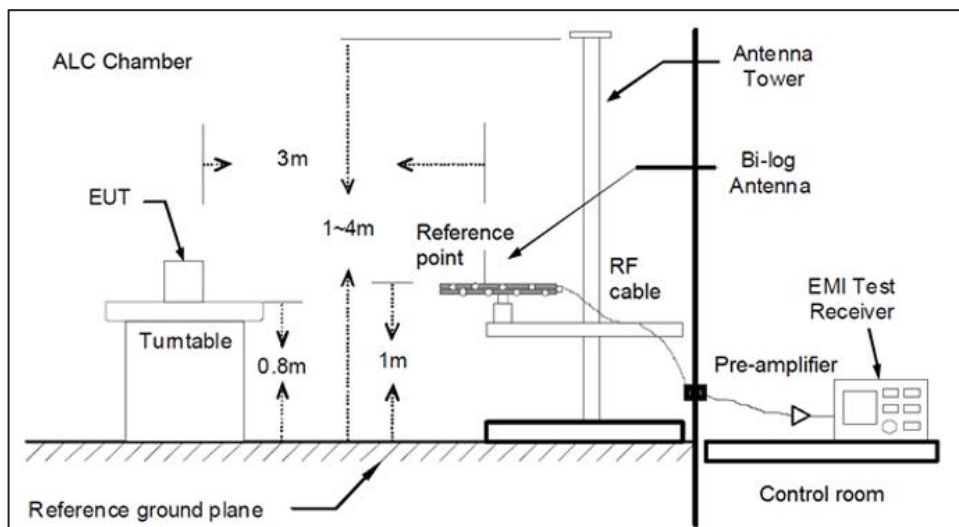


Fig A1: Generic setup for measurements from 30 to 1000 MHz

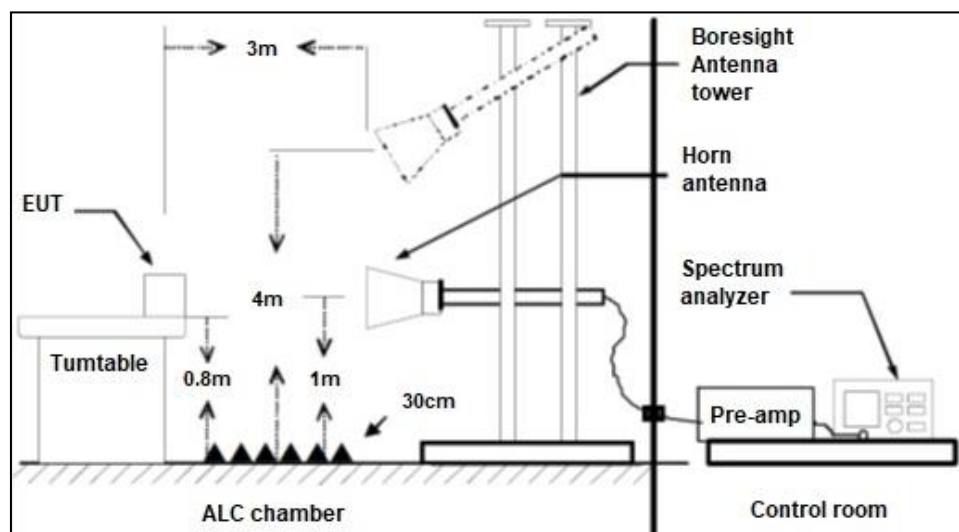


Fig A2: Generic setup for measurements from 1 to 18 GHz

Test Cases Details

Radiated emission electromagnetic field – Unintentional radiators

Limits

Limits of interference Class B

The applied limit for radiated emissions, according to the requirements of:

- **FCC Rules and Regulations 47 CFR Part 15, Subpart B, Secs. 15.109 (a):** [54 FR 17714, Apr. 25, 1989, as amended at 56 FR 373, Jan. 4, 1991; 58 FR 51249, Oct. 1, 1993; 66 FR 19098, Apr. 13, 2001; 67 FR 48993, July 29, 2002; 69 FR 2849, Jan. 21, 2004; 80 FR 33447, June 12, 2015].
- **ICES-003 Issue 7, Secs 3.2.2, table 2 & 4 (October 2020).**

Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	(μ V/m)	(dB μ V/m)	(μ V/m)	(dB μ V/m)	(dB μ V/m)	(dB μ V/m)
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46	---	---
230 to 960	200	46	224	47		
960 to 1000	500	54	500	54	---	---
Above 1000	---	---	---	---	74	54

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

Code: REmmnnRR

- RE: Radiated Emission,
 - mm: Sample number,
 - nn: Operation mode,
 - RR: Frequency range
- Low Range = LR: [30, 1000];
 High Range = HR: [1000, 18000]

Results

S/	OM	Code	Freq Rng (MHz)	V
01	OM/01	RE0101LR	[30, 1000]	P
01	OM/01	RE0101HR	[1000, 18000]	P

Verdict

Pass

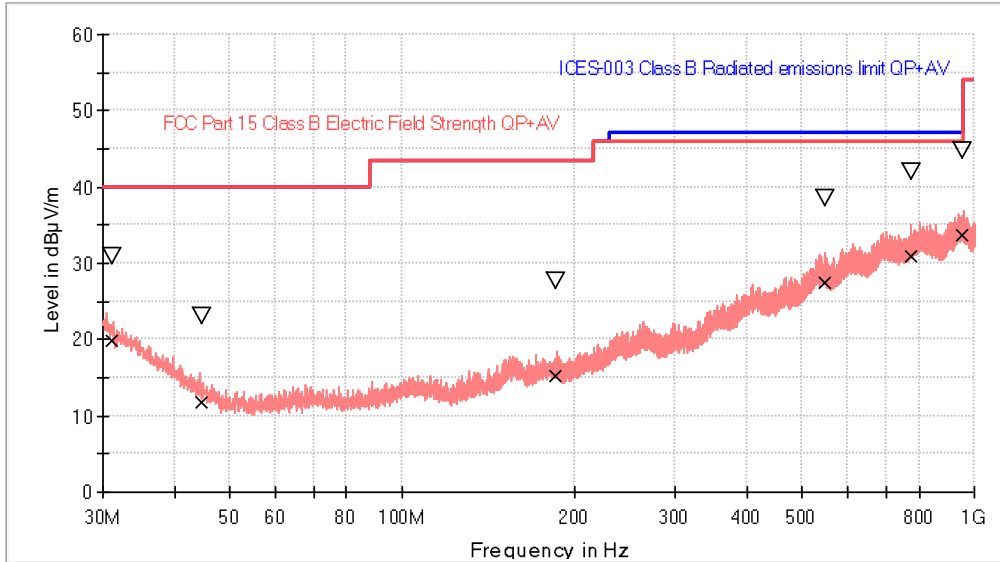
Attachments

EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/01. DUT ON. Device in Standby mode. Power supply 5.4 Vdc

Images:



- ICES-003 Class B Radiated emissions limit QP+AV
- Preview Result 1-PK+
- FCC Part 15 Class B Electric Field Strength QP+AV
- x Final_Result QPK
- ∇ Final_Result PK+

Tables:

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	PoI	Azimuth (deg)
31.184169	19.89	30.83	40.00	20.11	H	-171.0
44.471240	11.79	23.10	40.00	28.21	H	-159.0
185.615547	15.26	27.65	43.50	28.24	H	16.0
546.289290	27.47	38.53	46.00	18.53	V	165.0
774.709575	30.98	42.07	46.00	15.02	H	-118.0
954.340666	33.69	44.66	46.00	12.31	V	-20.0

Spectrum Analyzer Parameters

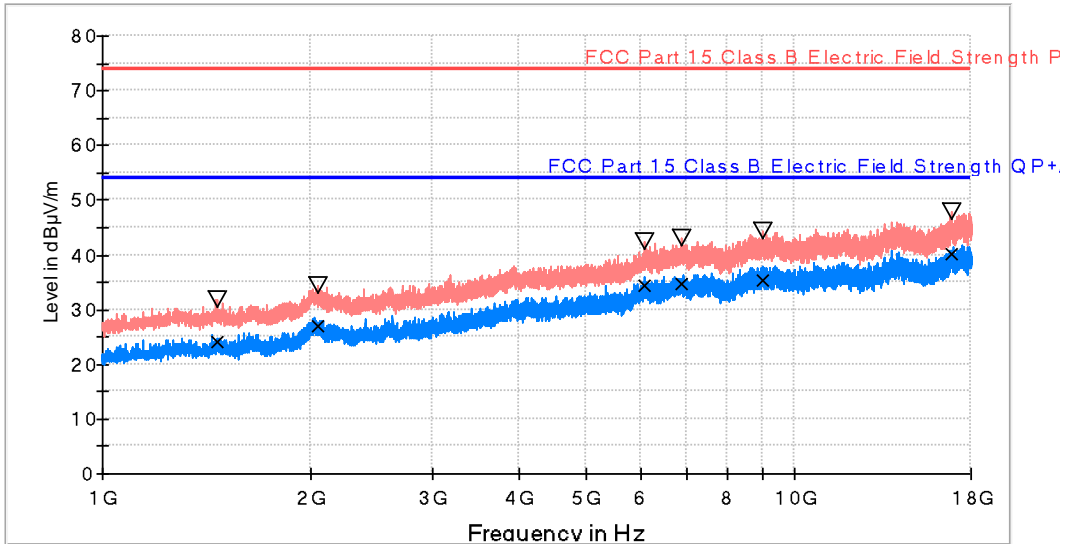
Subrange	Step Size	Detectors	Bandwidth	Sweep Time
30 MHz - 1 GHz	48.5 kHz	PK+	100 kHz	1 s

EMC Test Code = RE0101HR Frequency Range MHz = [1000, 18000]

Sample ID: S/01

Operation Mode: OM/01. DUT ON. Device in Standby mode. Power supply 5.4 Vdc

Images:



- AVG_MAXH
- PK+_MAXH
- FCC Part 15 Class B Electric Field Strength PK
- x AVG_MAXH_Single
- FCC Part 15 Class B Electric Field Strength QP+AV
- ▽ PK+_MAXH(1)_single

Tables:

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1462.1875	31.70	---	73.90	42.20
1462.1875	---	24.20	53.90	29.70
2049.21875	34.50	---	73.90	39.40
2049.21875	---	27.10	53.90	26.80
6071.84375	42.30	---	73.90	31.60
6071.84375	---	34.50	53.90	19.40
6855.4375	43.00	---	73.90	30.90
6855.4375	---	34.80	53.90	19.10
8977.78125	44.20	---	73.90	29.70
8977.78125	---	35.30	53.90	18.70
16882.7813	47.90	---	73.09	26.00
16882.7813	---	40.20	53.90	13.70

Spectrum Analyzer Parameters

Subrange	Step Size	Detectors	Bandwidth	Sweep Time
1 GHz - 18 GHz	500 kHz	PK+ ; AVG	1 MHz	1 s