DEKRA Certification, Inc.
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Sterling, VA 20164
United States of America

FCC LISTED, REGISTRATION NUMBER: 2764.01

ISED LISTED REGISTRATION NUMBER: 23595-1

Test report No:
3750ERM.001

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-20 Edition)
&
ICES-003 ISSUE 7 – October (2020)

(*) Identification of item tested	Battery Radiofrequency Module
(*) Trademark	Visteon
(*) Model and /or type reference tested	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 (10-1-20 Edition) ICES-003 ISSUE 7 – October (2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2022.08.11 21:59:17 -04'00'
Date of issue	8/11/2022
Report template No	FDT08_23 (*) "Data provided by the client"

Index

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.

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 DUT is 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 test have been selected by **The Client.**

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
3621/01	BRFMS (MTF Radiated)	24049820001	1122075EM4550049	05/02/2022

Following Accessory items were used with Sample S/01 to perform testing:

Control Nº	Description	Model	Serial Nº
3183/12	isoSPI 2 Wire Serial Interface	Demo circuit 1941D	-
3183/06	GM BRFM test Board	-	-

1. Sample S/01 was used for the following test(s): All tests indicated in the appendix A

Test sample description

Ports…….. :	Port name and description	Cable				
		Specified length [m]	Attached during test	Shielded	Coupled to patient	
	Main connector/harness	60cm	☐	☐	N/A	
			☐	☐	N/A	
			☐	☐	N/A	
			☐	☐	N/A	
Supplementary information to the ports…….. :	No Data Provided					
Rated power supply ..... :	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 5.4 V					
	☐	DC:					
Rated Power..... :	Current in normal mode: 0.5 mA						
Clock frequencies..... :	40 MHz						
Other parameters ..... :	No Data Provided						
Software version..... :	SWE101-28371-000R02 / SWE101-28371-000R04						
Hardware version ..... :	VPNAMU-14B115-GL / VPPAMU-14B115-EA						
Dimensions in cm (W x H x D) ... :	No Data Provided						
Mounting position ..... :	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Integrated in-side electric vehicle battery pack.					
Modules/parts..... :	Module/parts of test item	Type	Manufacturer			
	No Data Provided					
Accessories (not part of the test item) ..... :	Description	Type	Manufacturer			
	Harness					
	Main connector					
	Cheetah					
	CMUr					

Documents as provided by the applicant ..... :	Description	File name	Issue date
	Declaration Equipment Data	FDT30_18 Declaration Equipment Data_BRFMS_July 12, 2022.pdf	06/12/2022
Copy of marking plate:			
No Marking plate found.			

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)	07-08-2022
Date (finish)	07-08-2022

Document history

Report number	Date	Description
3750ERM.001	8/11/2022	First release

Environmental conditions

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

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

In the semi-anechoic chamber, the following limits were not exceeded during the test.

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

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

1. The tests have been performed by the technical personnel: Koji Nishimoto, Nasir Khan and Lourdes Valverde.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

Emission Test			
Report Section	**Requirement – Test case**	**Verdict**	**Remark**
A.1	Radiated emission test (30 MHz – 1000 MHz)	P	N/A
A.1	Radiated emission test (1 GHz – 18 GHz)	P	N/A
-	Radiated emission test (18 GHz – 40 GHz)	N/A	Refer 1
-	Conducted emission test (150 kHz to 30 MHz)	N/A	Refer 2

Supplementary information and remarks:

1) 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.

2) Device is a Vehicular unit and get power from Vehicular battery.
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.

List of equipment used during the test

Radiated Emission Equipment

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
0981	RF pre-amplifier 1-18 GHz	Bonn Elektronik	BLMA 0118-2A	2020/11	2022/11
1012	EMI Test Receiver	Rohde & Schwarz	ESR26	2022/04	2024/04
1058	Horn Antenna	ETS Lindgren	3115	2020/05	2023/05
1065	Biconical log Antenna	ETS Lindgren	3142E	2020/08	2023/08
1108	Ethernet SNMP Thermometer- CR Room	HW Group	HWg-STE Plain	2020/08	2022/08
1111	Ethernet SNMP Thermometer- SAC	HW Group	HWg-STE Plain	2020/08	2022/08
1179	Semi-Anechoic Chamber	Frankonia	SAC 3plus 'L'	N/A	N/A
1217	Transparent Test Table 1	Frankonia	FFT-Square	N/A	N/A
1314	Wireless measurement software EMC 32	Rohde & Schwarz	-	N/A	N/A

Appendix A: Test results

Appendix A Content

DESCRIPTION OF THE OPERATION MODES

The operation modes described in this paragraph represent functionalities of the sample under test.

The following operation modes of the samples were used during the test executions:

OPERATION MODE	DESCRIPTION
OM#01*	DUT ON. DC power supply 5.4 V. • 2.4 GHz proprietary Protocol in IDLE mode.

* Worst case observed

A.1. RADIATED EMISSION ELECTROMAGNETIC FIELD

LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart B (10-1-20 Edition), Secs. 15.109 & ICES-003 Issue 7 – October (2020)
	Test standard:	FCC CFR 47, Part 15, Subpart B (10-1-20 Edition), Secs. 15.109 & ICES-003 Issue 7 – October (2020); ANSI C63.4 (2014)

Limits of interference Class B
The applied limit for radiated emissions, 3 m distance, in the frequency range 30 MHz to 40 GHz for class B equipment, according with the requirements of:

FCC Rules and Regulations 47 CFR Part 15, Subpart B, Secs. 15.109 (a) (10-01-20 Edition).

Frequency range (MHz)	QP Limit for 3 m	
	(μV/m)	(dBμV/m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46
Above 960	500	54

Frequency range (MHz)	AVG Limit for 3 m		PK Limit for 3 m (1)
	(μV/m)	(dBμV/m)	(dBμV/m)
Above 1000	500	54	74

(1) Frequencies above 1 GHz, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test, as per §15.35(b)

ICES-003 Issue 7, Secs 3.2.2, table 2 & 4 (October 2020).

Frequency range (MHz)	QP Limit for 3 m	
	(μV/m)	(dBμV/m)
30 to 88	100	40
88 to 216	150	43.5
216 to 230	200	46
230 to 960	224	47
Above 960	500	54

Frequency range (MHz)	AVG Limit for 3 m		PK Limit for 3 m (1)
	(μV/m)	(dBμV/m)	(dBμV/m)
Above 1000	500	54	74

TEST SETUP	

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 30-100 MHz (Bilog 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 360º 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.

TEST SETUP (CONT.)	

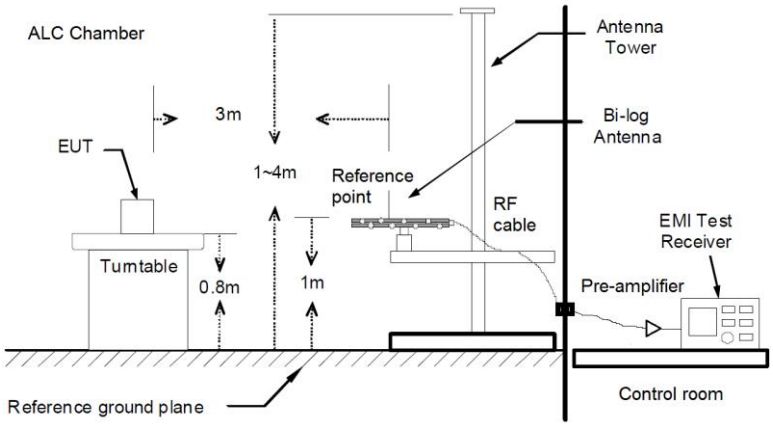


Fig A1: Generic setup for measurements from 30 to 1000MHz

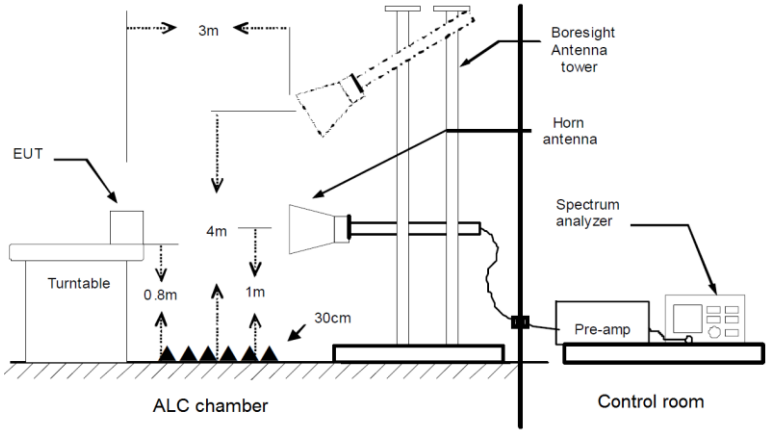
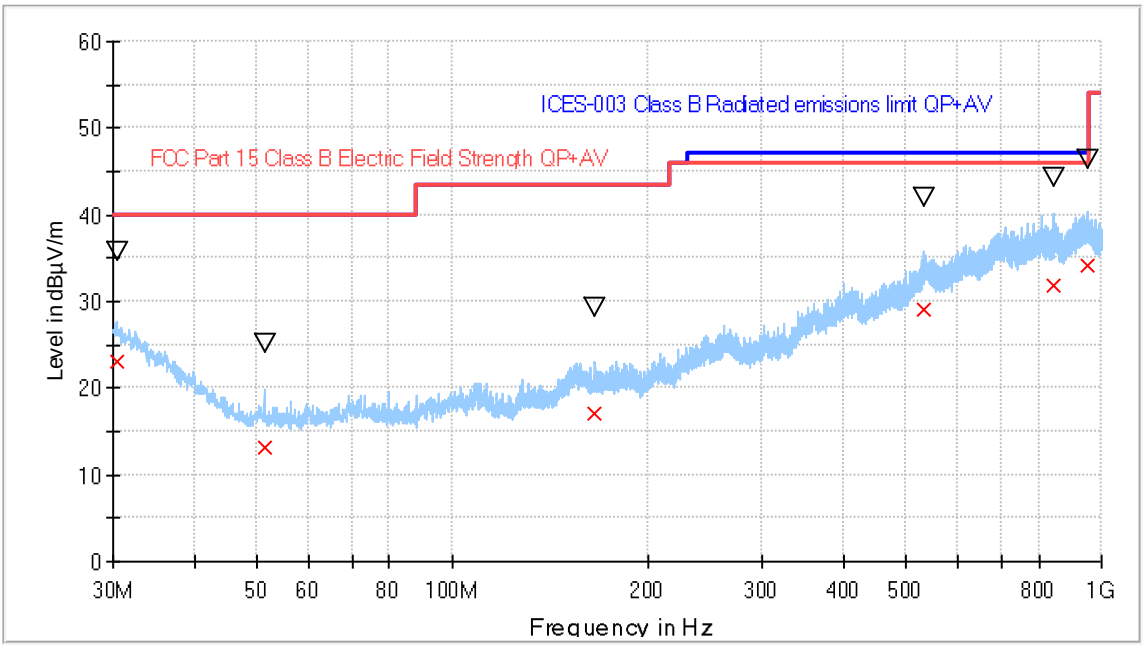


Fig A2: Generic setup for measurements from 1 to 18GHz

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	OM#01
TEST RESULTS:	CRmmnnxx: CR: Radiation Condition, mm: Sample number, nn: Operation mode, xx: Frequency Range

CRmmnnxx	Description	Result
CR0101LR	Range: 30 MHz - 1000 MHz Horizontal and Vertical Polarization	P
CR0101HR	Range: 1GHz - 18 GHz Horizontal and Vertical Polarization	P

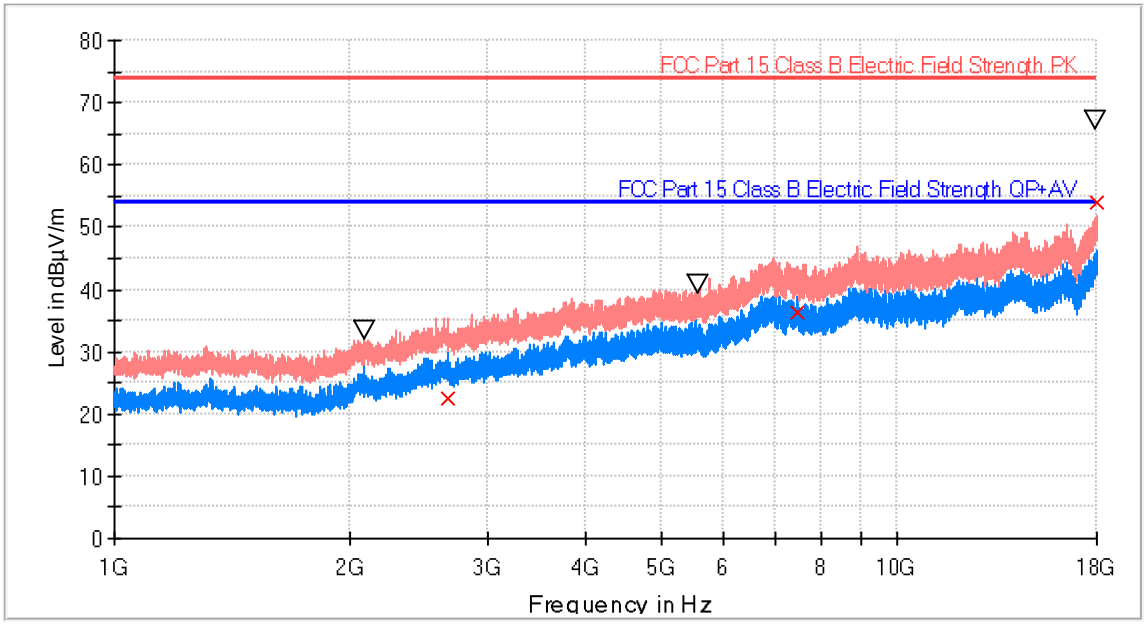
TEST RESULTS (Cont.):	CR0101LR



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

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
30.340353	23.02	35.73	40.00	16.98	H
51.243919	13.05	25.09	43.50	26.95	V
165.994578	17.17	29.20	40.00	26.33	V
533.575611	29.02	42.04	46.00	16.98	H
844.799957	31.83	44.39	46.00	16.17	V
950.141671	34.18	46.36	46.00	11.82	V

TEST RESULTS (Cont.):	CR0101HR



Preview Result 2-AVG
Preview Result 1-PK+
FCC Part 15 Class B Electric Field Strength PK
FCC Part 15 Class B Electric Field Strength QP+AV
Final_Result PK+
Final_Result AVG

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol
2084.900000	33.30	---	73.90	40.60	H
2662.200000	---	22.38	53.90	31.52	V
5546.300000	40.66	---	73.90	33.24	H
7448.700000	---	36.18	53.90	17.72	V
17946.100000	67.29	---	73.90	6.61	V
17998.100000	---	54.08	53.90	-0.18	V