

Test report No:
3943ERM.019A2

Assessment report

RF EXPOSURE REPORT ACCORDING TO

FCC 47 CFR Part 2.1093
FCC 47 CFR Part 1.1307

(*) Identification of item under evaluation	Sense Line Assembly (SLA)
(*) Trademark	Visteon
(*) Model and /or type reference	SLAP2X9
(*) Other identification of the product	FCC ID: NT8-SLAP2X9 HVIN: 1.6 FVIN: 1.0 Hw version: VPRAMU-14B115-BB Sw version: SWO100-28685-001F00
(*) Features	Cell Monitoring Unit in Wireless Battery Management
(*) Manufacturer	Visteon Corporation One Village Center Drive, Van Buren Township, MI 48111, USA
Test method requested, standard	FCC 47 CFR Part 2.1093. Radiofrequency radiation exposure evaluation: portable devices. FCC 47 CFR Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	06-01-2023
Report template No	FAN24_02 (*) "Data provided by the client"

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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 under evaluation", "Trademark", "Model and/or type reference", "General description of the device," "Other identification of the product").
2. Maximum antenna gain and use distance information.
3. The device under evaluation consists of an Electronic module intended to monitor battery module cell groups voltages and module temperatures from the High Voltage battery bus in addition to activate cell balancing to improve battery cells life.

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

Identification of the client

Visteon Corporation

One Village Center Drive, Van Buren Township, MI 48111, USA.

Document history

Report number	Date	Description
3943ERM.019	04-25-2023	First release
3943ERM.019	04-25-2023	Second release
3943ERM.019A2	06-01-2023	Third release. Updated Simultaneous transmission statement to show more detailed information. The modification of the test report cancels and replaces the test report no. 3943ERM.019A1.

Appendix A: FCC RF Exposure assessment result

General description of the device under evaluation

The device under evaluation consists of an Electronic module intended to monitor battery module cell groups voltages and module temperatures from the High Voltage battery bus in addition to activate cell balancing to improve battery cells life.

According to the manufacturer, during its normal use, the separation distance between the radiating structures of the device and nearby users will be greater than 5.67 cm respect to the extremities and greater than 30 cm respect to the body or head. In order to perform a conservative evaluation, a distance of 5.67 cm for extremities has been used.

As stated into DEKRA Certification Inc. test report num. 3943ERM.002, 3943ERM.006, 3943ERM.010, 3943ERM.014, 3943ERM.018 and 3751ERM.002A1 (detailed description in table below), the maximum measured output power levels for each supported technology are shown in table 1.

Test report No.	Description	FCC ID	IC ID	HVIN
3943ERM.002	CMUp 3X12	NT8-SLAP3X12	3043A-SLAP3X12	1.3
3943ERM.006	CMUp 3X6	NT8-SLAP3X6	3043A-SLAP3X6	1.5
3943ERM.010	CMUp 2X6	NT8-SLAP2X6	3043A-SLAP2X6	1.4
3943ERM.014	CMUp 1X12	NT8-SLAP1X12	3043A-SLAP1X12	1.2
3943ERM.018	CMUp 2X9	NT8-SLAP2X9	3043A-SLAP2X9	1.6
3751ERM.002A1	BRFM DUAL (Port 1 and Port 2)	NT8-BRFM	3043A-BRFM	1.0

Technology / Mode	Frequency under evaluation (MHz)	Maximum Conducted Output Power (dBm)	Duty Cycle (%)	Time Averaged Conducted Power (dBm)	Antenna peak gain (dBi)	Maximum Averaged E.R.P (dBm)	Maximum Averaged E.R.P (mW)	Maximum Averaged E.I.R.P (dBm)	Maximum Averaged E.I.R.P (mW)
Proprietary BRFM Port 1	2405 - 2480	11.20	27.00	5.51	2.60	5.96	3.95	8.11	6.48
Proprietary BRFM Port 2	2405 - 2480	10.60	27.00	4.91	2.60	5.36	3.44	7.51	5.64
Proprietary CMUp 2X9 ⁽¹⁾	2405 - 2480	8.00	3.81	-6.19	2.60	-5.74	0.27	-3.59	0.44
Proprietary CMUp 1X12 ⁽²⁾	2405 - 2480	8.90	3.81	-5.29	2.60	-4.84	0.33	-2.69	0.54
Proprietary CMUp 3X12 Port 1 ⁽³⁾	2405 - 2480	9.40	3.81	-4.79	2.60	-4.34	0.37	-2.19	0.60
Proprietary CMUp 3X12 Port 2 ⁽⁴⁾	2405 - 2480	10.00	3.81	-4.19	2.60	-3.74	0.42	-1.59	0.69
Proprietary CMUp 3X6 ⁽⁵⁾	2405 - 2480	9.10	3.81	-5.09	2.60	-4.64	0.34	-2.49	0.56
Proprietary CMUp 2X6 ⁽⁶⁾	2405 - 2480	9.40	3.81	-4.79	2.60	-4.34	0.37	-2.19	0.60

Table 1: Equipment specifications

1. The Proprietary CMUp information provided in the Table 1 is for 1 2X9 CMUp device, the information is same for all the 8 2X9 CMUp devices.
2. The Proprietary CMUp information provided in the Table 1 is for 1 1X12 CMUp device, the information is same for all the 2 1X12 CMUp devices.

3. The Proprietary CMUp information provided in the Table 1 is for 1 3X12 CMUp device port 1, the information is same for all the 2 3X12 CMUp devices port 1.
4. The Proprietary CMUp information provided in the Table 1 is for 1 3X12 CMUp device port 2, the information is same for all the 2 3X12 CMUp devices port 2.
5. The Proprietary CMUp information provided in the Table 1 is for 1 3X6 CMUp device, the information is same for all the 2 3X6 CMUp devices.
6. The Proprietary CMUp information provided in the Table 1 is for 1 2X6 CMUp device, the information is same for all the 2 2X6 CMUp devices.

Evaluation Results

Determination of Exemption according to FCC 47 CFR Part 1.1307:

The evaluation according to the minimum intended use distance of 5.67cm will be as follow:

Technology / Mode	Frequency under evaluation (MHz)	Distance (cm)	Maximum Averaged E.R.P (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	Verdict
Proprietary CMUp 2X9 ⁽¹⁾	2405 - 2480	5.67	0.27	61.73	Pass

Table 2: FCC Exemption Evaluation Result

1. The Proprietary CMUp information provided in the Table 2 is for 1 2X9 CMUp device, the information is same for all the 8 2X9 CMUp devices.

The computed value(s) are below the exemption limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1307.

Simultaneous transmission assessment:

As per manufacturer request, the evaluation of the RF exposure has been done following a most conservative approach taking into account the simultaneous transmission of the device within the system in the final installation at a vehicle level; using Proprietary 2.4GHz 8 CMUp 2X9, 2 CMUp 3X12 Port 1, 2 CMUp 3X12 Port 2, 2 CMUp 1X12, 2 CMUp 3X6, 2 CMUp 2X6 and Proprietary 2.4 GHz BRFM Port 1 and Port 2 transmitters.

Simultaneous technologies and modes	Result (\sum of P_{out}/P_{max} ratios)	Verdict ($\sum \leq 1$)
Proprietary BRFM Port 1 2.4 GHz + Proprietary BRFM Port 2 2.4 GHz + 8 Proprietary CMUp 2X9 2.4 GHz + 2 Proprietary CMUp 1X12 2.4 GHz + 2 Proprietary CMUp 3X12 Port 1 2.4 GHz + 2 Proprietary CMUp 3X12 Port 2 2.4 GHz + 2 Proprietary CMUp 3X6 2.4 GHz + 2 Proprietary CMUp 2X6 2.4 GHz	0.21	Pass

Table 3: Simultaneous Result

Appendix B: FCC RF Exposure information

RF Exposure determination of exemption

According to FCC 47 CFR §1.1307 (b)(3) Determination of exemption:

(i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2), a single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

TABLE 1 TO §1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.

(ii) For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for Pth, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

Pi = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

Pth,i = the exemption threshold power (Pth) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERPj = the ERP of fixed, mobile, or portable RF source j.

ERPth,j = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least $\lambda/2\pi$ according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated,k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit,k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.