DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

Test report No:
NIE: 57623RAN.002

Assessment report
RF EXPOSURE REPORT ACCORDING TO
FCC 47 CFR Part 2.1091

Identification of item tested	SDCM
Trademark	Valeo
Model and /or type reference	SD1A
Other identification of the product	FCC ID: N5F-SD1A
Features	Not provided data
Manufacturer	VALEO COMFORT & DRIVING ASSISTANCE SYSTEMS, SAS. 76, Rue Auguste Perret, 94046 Créteil CEDEX, FRANCE.
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager  MIGUEL LACAVE GARCÍA 2018.11.07 12:47:06 +01'00'
Date of issue	2018-11-07
Report template No	FAN36_00

Index

Competences and guarantees

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

DEKRA 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 at the time of performance of the test.

DEKRA 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 Assessment Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

General conditions

1. This report is only referred to the item that has undergone the assessment.
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.
4. This assessment report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA and the Accreditation Bodies.

Data provided by the client

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

Identification of the client

VALEO COMFORT & DRIVING ASSISTANCE SYSTEMS, SAS.

76, Rue Auguste Perret, 94046 Créteil CEDEX, FRANCE.

General description of the device under evaluation

The device under evaluation consists of a smart ECU for keyless car access and start, which supports transmission features at 125 kHz and Bluetooth Low Energy.

The device will be installed on a vehicle, and according to the manufacturer, the minimum separation distance between the antenna and the driver, or anyone inside the vehicle, will be greater than 20 cm. In order to perform the assessment a conservative separation distance of 20 cm has been used.

As stated into DEKRA Testing and Certification, S.A.U. test report 57623RRF.002 the maximum measured field strength for the 125 kHz operating frequency is:

Frequency (kHz)	Maximum E-field strength (dBµV/m) measured at 3 m	Maximum field strength (dBµV/m) extrapolated to 300 m (40 dB/decade)
125.400	86.60	6.60

Table 1: 125 kHz Measurement Results

Using Field Strength Approach formula (linear terms), this E-Field measured value corresponds to an output power of -48.63 dBm, or 0.000014 mW:

$E.I.R.P = P_t \times G_t = (E \times d)^2/30$

Where:
P_t = transmitter output power in watts
G_t = numeric gain of the transmitting antenna (unitless)
E = electric field strength in V/m = $10^{((dB\mu V/m)/20)}/10^6$
d = distance in meters (m) = 300m

So $P_t = (E \times d)^2/(30 \times G_t)$
Field strength = 6.60 dBµV/m @300m
Antenna gain =0.0 dBi, so numeric gain=1.0
Therefore
$P_t = \{[10^{(6.60/20)}/10^6 x300]^2/(30x1.0)\}x1000$ mW = 0.000014 mW = -48.63 dBm

The device has two Bluetooth antennas but is only able to transmit using one of them. According to the maximum declared output power and antenna gain values of -2 dBi (antenna 1) and -1.5 dBi (antenna 2) respectively, the maximum E.I.R.P. values will be:

Band (MHz)	Technology	RF output power (dBm)	Max. Antenna gain (dBi)	Maximum E.I.R.P. (dBm)
2402-2480	Bluetooth (antenna 1)	1.0	-2.0	-1.0
2402-2480	Bluetooth (antenna 2)	1.0	-1.5	-0.5

Table 2: Maximum E.I.R.P. values

As the device can transmit only using one antenna, the worst-case E.I.R.P values (antenna 2) will be used for the assessment calculation.

Assessment summary

Radiofrequency radiation exposure limits			
FCC 47 CFR § 2.1091			
Assessment	**Band (MHz)**	**Technology**	**VERDICT (Pass/Fail)**
1	0.125	RF Tx	Pass
2	2450	Bluetooth	Pass

Table 3: Assessment summary

Appendix A: FCC RF Exposure

FCC RF Exposure evaluation for mobile devices

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	*100	6
3.0–30	1842/f	4.89/f	$*900/f^2$	6
30–300	61.4	0.163	1.0	6
300–1,500	.....	.....	f/300	6
1,500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*100	30
1.34–30	824/f	2.19/f	$*180/f^2$	30
30–300	27.5	0.073	0.2	30
300–1,500	.....	.....	f/1500	30
1,500–100,000	.....	.....	1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

FCC MPE Evaluation Results

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

Power density: $S[mW/cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\Pi R[cm]^2}$

Minimum compliance distance: $R_{\min}[cm] = \sqrt{\frac{P_{E.I.R.P.}[mW]}{4\Pi S[mW/cm^2]}}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$ = distance to the center of radiation of the antenna

Assessment 1 – RF Transmission 125 kHz

Maximum output power (dBm):	-48.63
Maximum antenna Gain (dBi):	0.0
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	0.1254
Maximum EIRP (dBm):	-48.63
Maximum EIRP (mW):	0.000014
General population - Power density limit (mW/cm^2):	100.0

Power density at minimum use distance:

Power density (mW/cm^2):	0.0000000027
General population - Power density limit (mW/cm^2):	100.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	0.0001
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Assessment 2 – Bluetooth 2.45 GHz Band

Maximum output power (dBm):	1.0
Maximum antenna Gain (dBi):	-1.5
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2402.0
Maximum EIRP (dBm):	-0.5
Maximum EIRP (mW):	0.89
General population - Power density limit (mW/cm^2):	1.0

Power density at minimum use distance:

Power density (mW/cm^2):	0.00018
General population - Power density limit (mW/cm^2):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	0.27
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} < 1$$

Where
S_i is the power flux density of each source;
MPE_i is the power flux density basic restriction of each source.

The device under evaluation is able to transmit simultaneously using the 125 kHz and the Bluetooth transmitter, therefore the multiple frequencies calculation will be as follow:

$$\frac{0.0000000027}{100} + \frac{0.00018}{1} = \quad 0.00018 < 1 \text{ Limit}$$