

Test report No:
 NIE: 58026RAN.002

Assessment report

FCC 47 CFR Part 2.1091
 ISED RSS-102 Issue 5:2015
 ISED RSS-102-SPR-002 Issue 1:2016

Identification of item tested	Automotive RF HUB Module
Trademark	STRATTEC
Model and /or type reference	FI2-TR433UDB
Other identification of the product	FCC ID: OHT0077TR IC: 5461A-0077TR HW version: 10 SW version: 4.0
Manufacturer	Aptiv Services US, LLC 2151 E Lincoln Rd, Kokomo, IN 46902, USA
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) RSS-102-SPR-002 Issue 1 (2016-09) – Supplementary Procedure for Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits (3kHz a 10MHz)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
Date of issue	2018-12-05
Report template No	FAN24_01

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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.

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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.
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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.

Uncertainty

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

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.

Usage of samples

Samples under test have been selected by: the Client.

Sample **S/01** is composed of the following elements:

Control N°	Description	Model	Serial number	Reception date
58026B/001	RF HUB Module	FI2-TR433UDB	1T132118246R0009	2018-10-22

Test sample description

The Radio Frequency HUB Module (RFHM) is an integrated receiver (Base Station). The RFHM interfaces with the Remote Keyless Entry (RKE) and FOB/K via both RF and LF. The Radio Frequency HUB Module (RFHM) communicates with the TPM Sensors via RF.

The Radio Frequency HUB Module (RFHM) also interfaces with the vehicle's door handles, trunk/lift-gate and multiple LF antennas for purposes of providing PEKG system functionality.

The Radio Frequency HUB Module (RFHM) communicates on CAN C to the rest of the vehicle modules.

The RFHM communicates to Keyless Ignition Node (KIN) via a dedicated KIN-Line.

Identification of the client

STRATTEC SECURITY CORPORATION

3333 WEST GOOD HOPE ROAD

Testing period

RF Exposure evaluation tests were performed on 2018-11-29 and finished during the same day.

Nerve Stimulation tests were performed on 2018-11-30 and finished during the same day.

The tests have been performed at DEKRA Testing and Certification, S.A.U.

Environmental conditions

The following limits were not exceeded during the tests:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %

Used instrumentation

	Last Cal. date	Cal. due date
1. Narda ELT-400 Exposure Level Tester	2017/10	2019/10
2. Lumiloop GMBH LSProbe 1.2	2017/09	2019/09
3. Low Dielectric Tripod Manfrotto H-491009-01	-	-

General description of the device under evaluation

The product contains a micro, a LF driver and an RF receiver and controls vehicle entry, starting and TPM function.

The equipment will be installed on a vehicle; it has five 125 kHz transmitting antennas, which will be installed into the doors and the lift gate.

According to the manufacturer, once installed, the separation distance between the device and the body of nearby users will be greater than 10 cm. In order to perform the assessment a conservative separation distance of 10 cm has been used for field the measurements.

Assessment summary

Radiofrequency radiation exposure limits			
FCC 47 CFR § 2.1091 & ISED RSS -102 Issue 5:2015			
Band (MHz)	Technology	Band	VERDICT (Pass/Fail)
0.125	125 kHz transmitter	LF Band	Pass

Table 1: Assessment summary

Appendix A: FCC RF Exposure

FCC RF Exposure evaluation

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 Evaluation results

According to KDB 680106 D01, emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m.

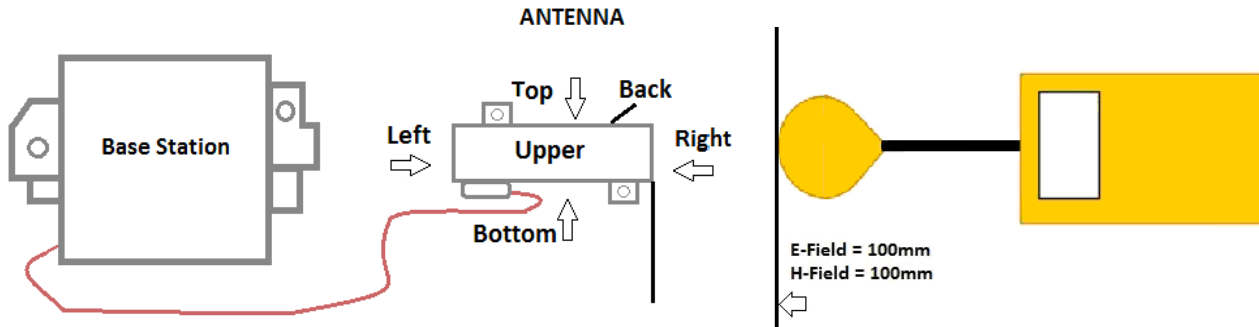


Figure 1: Measurement setup

Measurements at 10 cm test distance were performed using the equipment listed in the “Used Instrumentation” paragraph of this document to compare the measured H-Field and E-Field values with the limits shown on table 1-Limits for Maximum Permissible Exposure (MPE) of FCC §1.1310 Radiofrequency radiation exposure. The measured values are listed in the following tables:

Frequency (kHz)	H-Field measurements [A/m]						Max [A/m]	Limit [A/m]	% Limit	Verdict
	Upper	Back	Left	Right	Top	Bottom				
125	1.20	0.99	1.24	1.03	1.15	1.20	1.24	1.630	76.16	Pass

Table 2: H-field measurement values

Frequency (kHz)	E-Field measurements [V/m]						Max [V/m]	Limit [V/m]	% Limit	Verdict
	Upper	Back	Left	Right	Top	Bottom				
125	9.86	7.70	5.38	3.81	5.52	8.44	9.86	614.0	1.61	Pass

Table 3: E-field measurements values

All H-Field and E-Field values are in compliance to FCC §1.1310 Radiofrequency radiation exposure limits for the frequency range used by the device.

Appendix B: ISED RF Exposure

ISED RF Exposure evaluation

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Health Canada’s RF exposure guideline, Safety code 6:

**Table 4: RF Field Strength Limits for Devices Used by the General Public
 (Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

ISED Evaluation results

Measurements at 10 cm test distance were performed using the equipment listed in the “Used Instrumentation” paragraph of this document to compare the measured H-Field values with the limits shown on table 4 of RSS-102 Issue 5, Paragraph “4.Exposure Limits”, Industry of Canada.

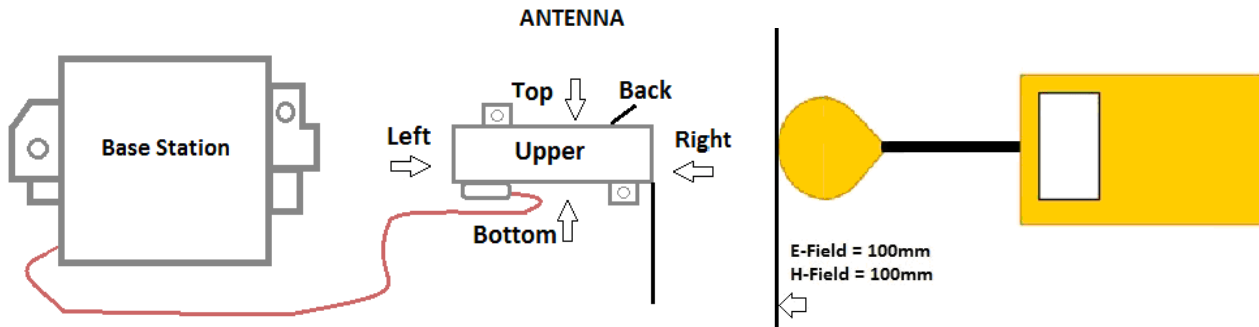


Figure 2: Measurement setup

The H-Field measured values are listed in the following table:

Frequency (kHz)	H-Field measurements [A/m]						Max [A/m]	Limit [A/m]	% Limit	Verdict
	Upper	Back	Left	Right	Top	Bottom				
125	1.20	0.99	1.24	1.03	1.15	1.20	1.24	1.630	76.16	Pass

Table 4: H-field measurement values

H-Field values are in compliance to values shown into “Table 4: RF Field Strength Limits for Devices Used by the General Public” for the frequency range used by the device.

ISED Nerve Stimulation evaluation results

According to RSS-102 Issue 5, Nerve Stimulation exposure limits shall be evaluated for transmission into the frequency range from 0.003 to 10 MHz. Supplementary Procedure SPR-002, Issue 1, for Radio Standards Specification RSS-102 sets out the general test methods to be followed when carrying out an assessment to the nerve stimulation exposure requirements of RSS-102 Issue 5.

This device will be installed on a vehicle door, according to the device type considerations stated on RSS-216-Issue 2, the use will be similar to a Wall-Mounted device; therefore it can be assessed as a table-top device. Following the considerations found in Annex E, the RF exposure shall be evaluated with the client devices charged/powerd by the source device at maximum output power. Additionally, all transmitters, including those not used for wireless power transfer, must be active simultaneously and at maximum power.

Measurements have been performed fixing the device at the edge of an 80 cm tall and non-metallic constructed table, placing the measurement probe at a compliance distance away from the edge of the table of 10 cm from the probe edge to the radiating antenna, as specified into Supplementary Procedure SPR-002, “Annex E – E.1.1. Passively Used Table-Top Devices”, using the equipment listed in the “Used Instrumentation” paragraph of this document, and following the measurement method shown in paragraph 6.6.1.1 of “Supplementary Procedure for Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits SPR-002”:

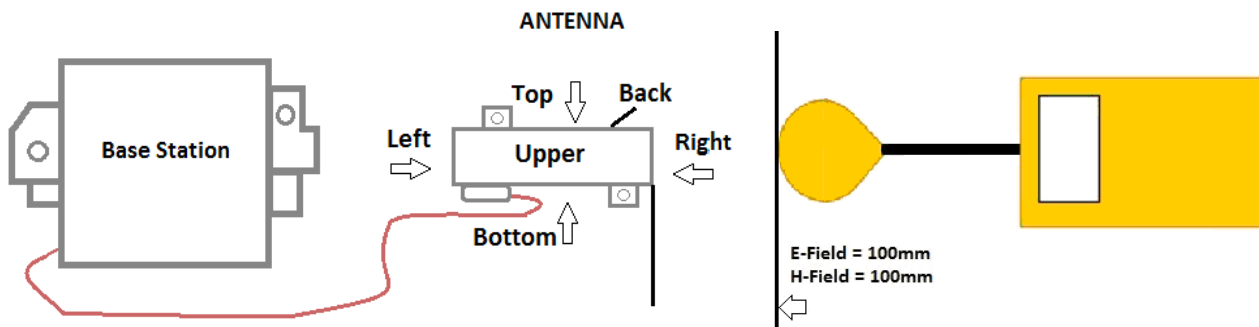


Figure 3: Nerve Stimulation measurement setup

Measured values for each configuration are listed in the following tables:

Frequency (kHz)	H-Field measurements [A/m]						Max [A/m]	Limit [A/m]	% Limit	Verdict
	Upper	Back	Left	Right	Top	Bottom				
125	12.35	11.80	12.62	13.13	11.94	11.67	13.13	90.00	14.59	Pass

Table 5: H-field measurement values and ISED limit for Nerve Stimulation

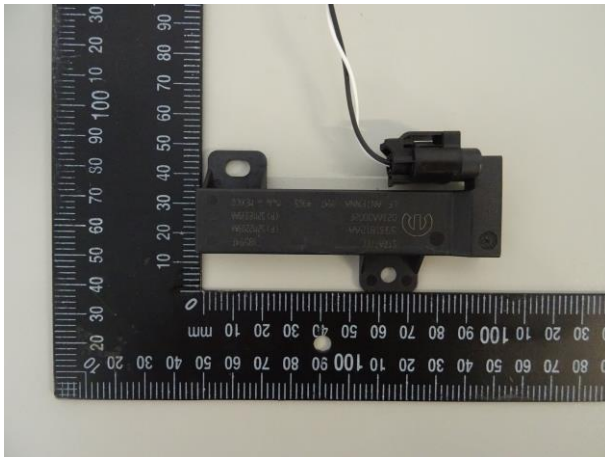
Frequency (kHz)	E-Field measurements [V/m]						Max [V/m]	Limit [V/m]	% Limit	Verdict
	Upper	Back	Left	Right	Top	Bottom				
125	74.10	62.30	43.30	37.50	53.30	61.70	74.10	83.00	89.28	Pass

Table 6: E-field measurements values and ISED limit for Nerve Stimulation

All H-Field and E-Field values are in compliance to values shown into “Table 4: RF Field Strength Limits for Devices Used by the General Public” for the frequency range used by the device.

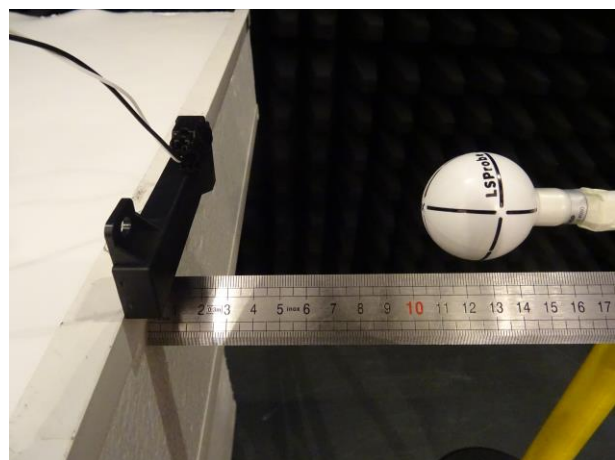
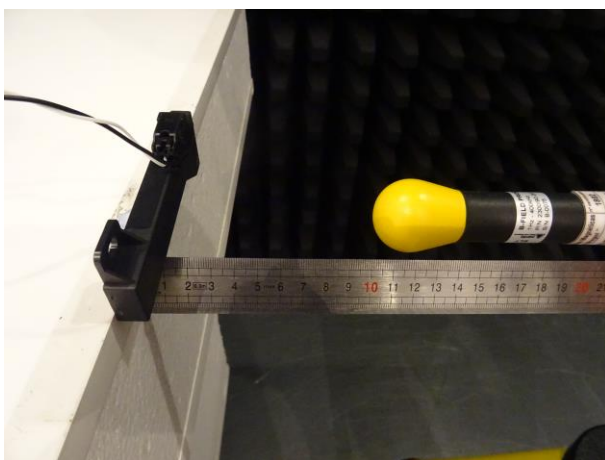
Appendix C: Photographs

Equipment view

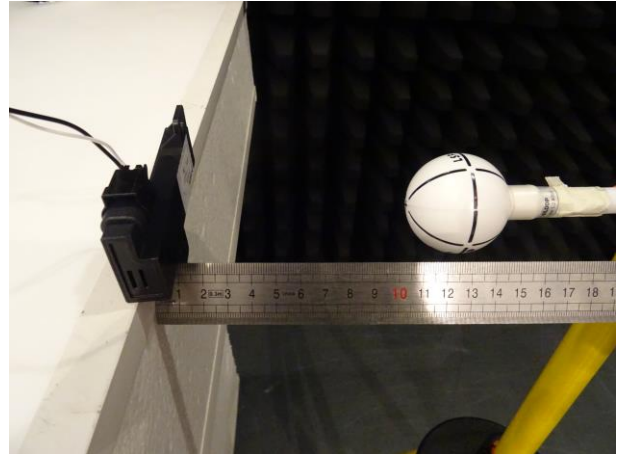
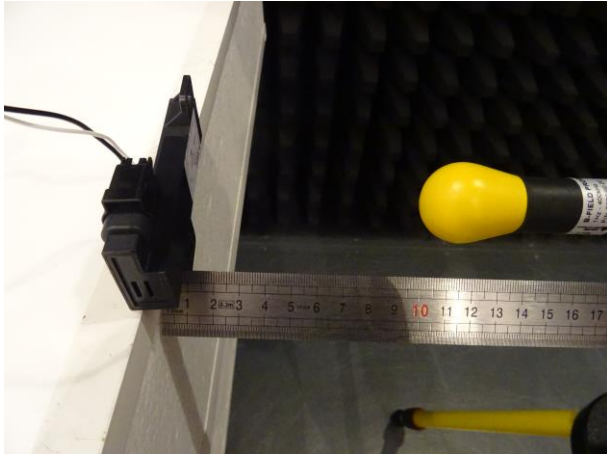


Mobile Exposure / Nerve Stimulation H-Field and E-Field measurement setup views

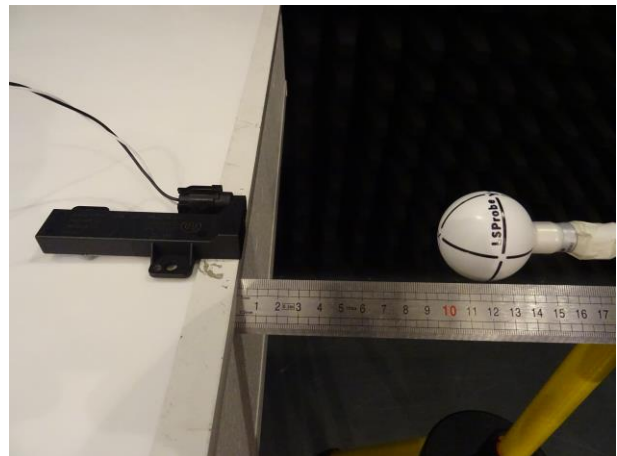
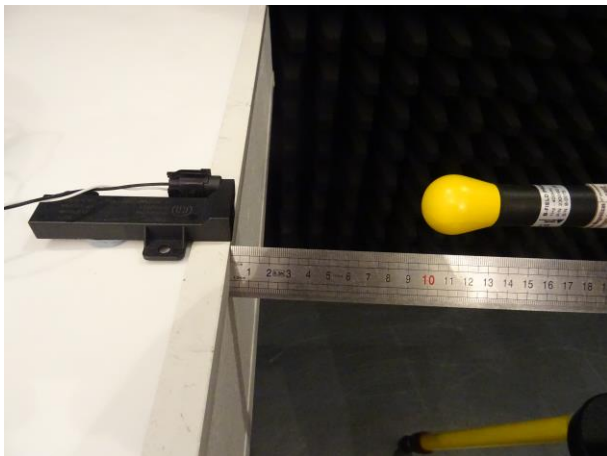
Upper



Back



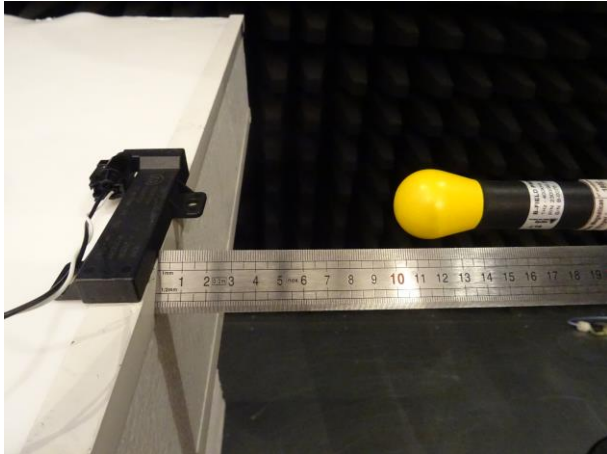
Left



Right



Top



Bottom

