



FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test report No:
2225ERM.002

Test report

USA FCC Part 15.209,
CANADA RSS-Gen Issue 5

Identification of item tested	Automotive RF HUB Module
Trademark	STRATTEC
Model and /or type reference	F12-TR433UDB
Other identification of the product	FCC ID: OHT0077TR IC: 5461A-0077TR
Features	Transmit at 125 kHz and receive at 433.92 MHz
Manufacturer	Aptiv Services US, LLC 2151 E Lincoln Rd, Kokomo, IN 46902, USA
Test method requested, standard	USA FCC Part 15.209, 10-1-17 Edition: Radiated emission limits; general requirements. CANADA RSS-Gen Issue 5 (April 2018). Transmitter Emission Limits for License-Exempt Radio Apparatus. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	11-13-2018
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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.
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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
0,009 - 30	2.69	dB
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB

Data provided by the client

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 and the Immobilizer transponder Key via LF, if so equipped. 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.

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 undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2225.50	RF HUB Conducted (TX)	F12-TR433UDB	1T132118290R0010	09/27/2018

1. Sample S/01 has undergone following test(s)

All conducted tests indicated in appendix A

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2225.17	DT RF HUB Radiated Sample	F12-TR433UDB	1T131918261R0024	09/27/2018
2225.04	Harness cable	N/A	N/A	09/27/2018
2225.06	LF Antenna 1	N/A	N/A	09/27/2018
2225.07	LF Antenna 2	N/A	N/A	09/27/2018
2225.08	LF Antenna 3	N/A	N/A	09/27/2018
2225.09	LF Antenna 4	N/A	N/A	09/27/2018
2225.46	433 MHz External Antenna	N/A	N/A	10/18/2018

1. Sample S/02 has undergone following test(s)

All radiated tests indicated in appendix A.

Test sample description

Ports..... :	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
	<i>Not provided data</i>			☐	☐		
			☐	☐			
Supplementary information to the ports..... :	<i>Not provided data</i>						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC: 230Vac / 50Hz.	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 9-16 Vdc					
☐	DC: 4.3 (Battery)						
Rated Power	<i>Not provided data</i>						
Clock frequencies	<i>Not provided data</i>						
Other parameters..... :	<i>Not provided data</i>						
Software version	4.0						
Hardware version..... :	10						
Dimensions in cm (L x W x D)	<i>Not provided data</i>						
Mounting position..... :	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other:					
Modules/parts	Module/parts of test item		Type	Manufacturer			
	<i>Not provided data</i>						
Accessories (not part of the test item)	Description		Type	Manufacturer			
	<i>Not provided data</i>						
Documents as provided by the applicant..... :	Description		File name	Issue date			
	<i>Not provided data</i>						

Copy of marking plate:



Identification of the client

STRATTEC SECURTY CORPORATION
3333 West Good Hope Road, Milwaukee, WI, 53209

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	10-30-2018
Date (finish)	11-06-2018

Document history

Report number	Date	Description
2225ERM.002	11-13-2018	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. = 860 mbar Max. = 1060 mbar

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. = 860 mbar Max. = 1060 mbar

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. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Divya Adusumilli and Koji Nishimoto.

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH					
Section	15.209 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
A.1		RSS-Gen 6.7	Occupied Bandwidth	N/A	Note 1
A.2	§ 15.209	RSS-Gen 8.9 & 8.10.	Emission Limitations radiated (Transmitter)	P	N/A
Supplementary information and remarks:					
Note 1: For reporting only					

List of equipment used during the test

Conducted Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1039	Signal analyzer Rohde & Schwarz FSV40	2017/03	2019/03

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1179	Semi anechoic Absorber Lined Chamber Frankonia SAC 3 plus "L"	N/A	N/A
1065	BiconicalLog antenna ETS LINDGREN 3142E	2017/03	2020/03
1012	EMI Test Receiver, Rohde & Schwartz ESR26	2017/03	2019/03
1062	Active Loop Antenna ETS LINDGREN 6502	2017/02	2019/02
1017,	Rohde & Schwarz EMC32 software	N/A	N/A

Appendix A: Test results

Appendix A Content

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PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	Manchester ASK at 3.906 Kbps
Operating Frequencies	125 KHz transmit 433.92 MHz receiver
Operating Channel Bandwidth	125 KHz +/- 500 Hz
Extreme operating conditions	
- Temperature range	-40 °C to +85 °C
Antenna type	Integral antenna
Antenna gain	-11 dBi
Nominal Voltage	
- Supply Voltage	9 - 16 Vdc
- Type of power source	DC voltage

Test modes available:

- Operating Frequency at 125 KHz

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01	<u>Power supply (V):</u> $V_{\text{nominal}} = 9 - 16 \text{ Vdc}$ <u>Type of power supply:</u> DC voltage. <u>Temperature (°C):</u> $T_{\text{nom}} = +15 \text{ to } +35$ $T_{\text{min}} = -40 (*)$ $T_{\text{max}} = +85 (*)$ The subscript nom indicates normal test conditions. The subscripts min and max indicate extreme test conditions (minimum and maximum respectively). N/A: Not Applicable. (*) Declared by applicant. <u>Test Frequencies for Conducted and Radiated tests:</u> 125 KHz

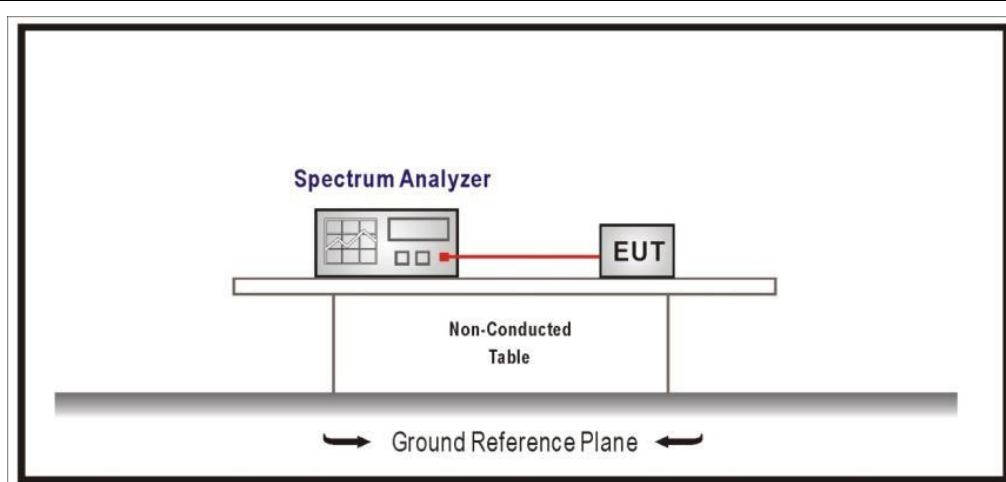
TEST A.1: 99% OCCUPIED BANDWIDTH

LIMITS:	Product standard:	RSS-Gen
	Test standard:	RSS-Gen 6.7

LIMITS

The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs

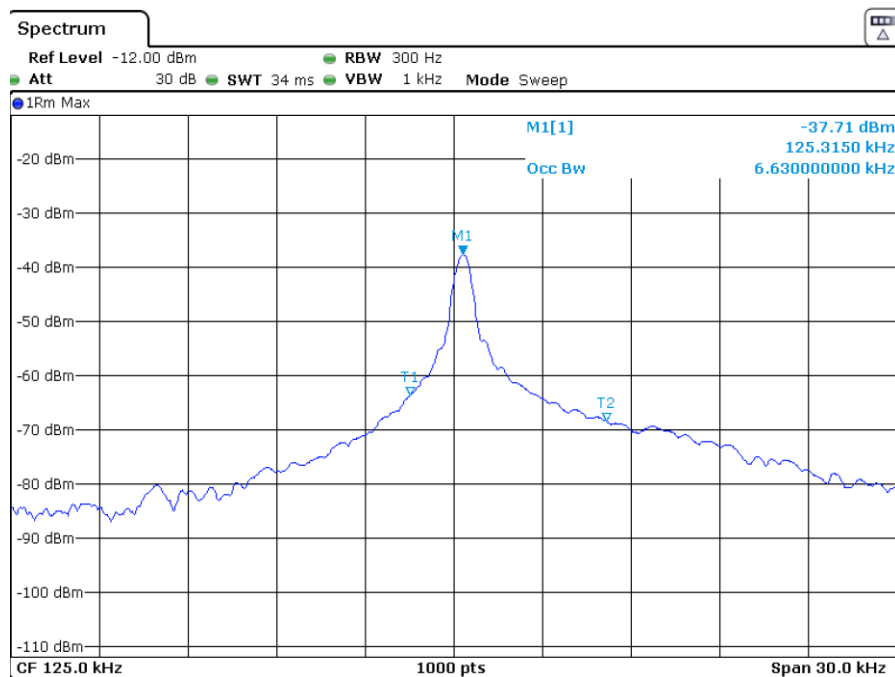
TEST SETUP



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

99% bandwidth (KHz)	125.315
Measurement uncertainty (kHz)	<± 8.33

TEST RESULTS (Cont.):



TEST A.2: EMISSION LIMITATIONS RADIATED (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.209
	Test standard:	Part 15 Subpart C §15.209(a) and RSS-Gen 8.9

LIMITS

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) / RSS-Gen):

Frequency Range (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required

TEST SETUP

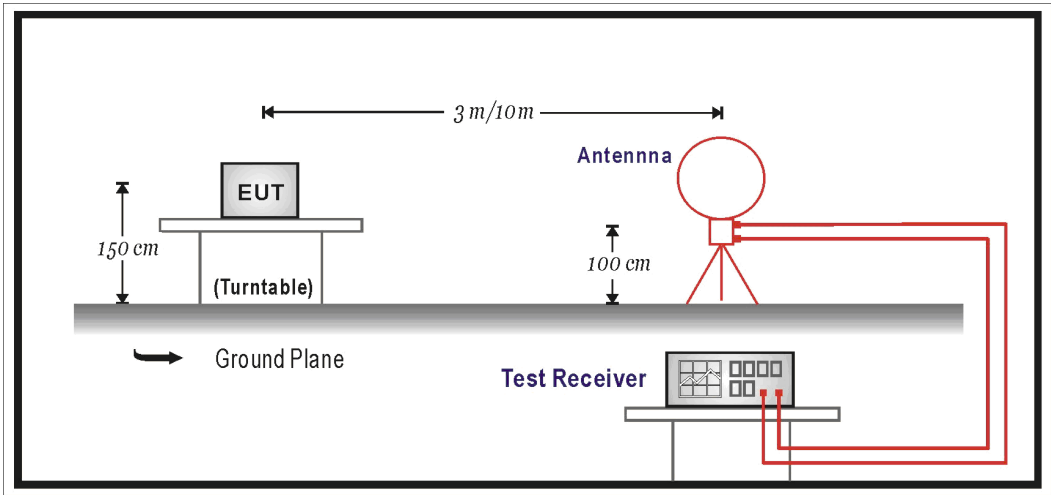
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 9 KHz – 30 MHz (Loop Antenna).

The spectrum was inspected from 9 kHz to 30 MHz searching for spurious signals.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor and cable loss.

TEST SETUP (CONT.)

Radiated measurements Setup $f < 30$ MHz



TESTED SAMPLES:

S/02

TESTED CONDITIONS MODES:

TC#01

TEST RESULTS:

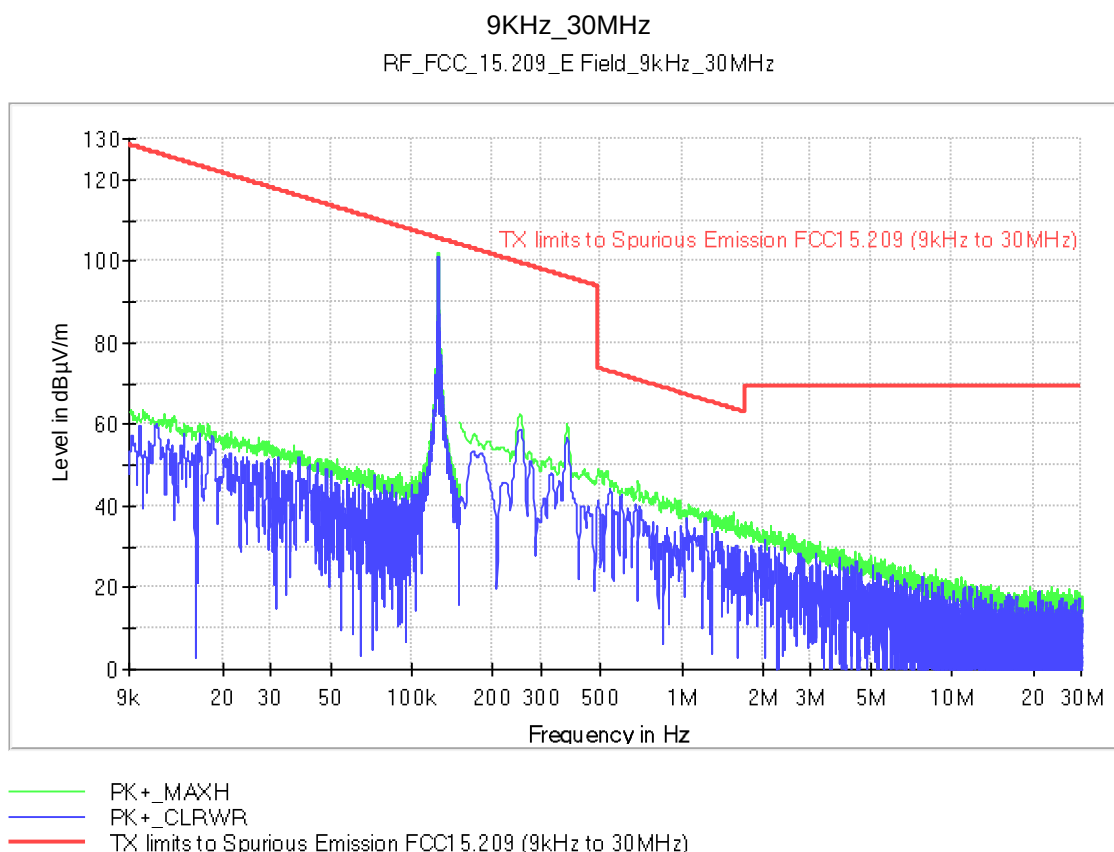
PASS

Frequency range 9 KHz – 30 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.
 The Spurious Signals were shown in the below plot.

TEST RESULTS (Cont.):

9 kHz-30 MHz



Maximizations

Frequency (MHz)	PK+ CLRWR (dBµV/m)	PK+ MAXH (dBµV/m)	Azimuth (deg)	Comment
0.125353	101.03	102.11	158.0	Fundamental
0.251490	58.94	62.79	-69.0	
0.374870	56.98	59.90	180.0	
5.026495	19.75	27.90	-116.0	
10.791525	11.54	22.53	17.0	
19.539565	10.50	20.01	87.0	