



Test report No:
22C0153R-RF-US-P20V01

FCC Exposure TEST REPORT

Product Name	SENSOR ASM-TIRE PRESS IND
Trademark	SGMW
Model and /or type reference	TPMS-00-01
FCC ID	2AVYX-TMSS6A4
Applicant's name / address	SAIC GM WULING AUTOMOBILE COMPANY LIMITED 18th,Hexi Road,Liuzhou City, Guangxi Zhuang Autonomous Region, China
Test method requested, standard	FCC 47CFR §2.1091
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao/ Project Engineer 
Approved by (name / position & signature)	Jack Zhang/ Manager 
Date of issue	2023-04-06
Report Version	V1.1
Report template No	Template_FCC-MPE-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA 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 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 in 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 Test 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

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Dec. 08, 2022
Date (start test)	Dec. 20, 2022
Date (finish test)	Feb. 03, 2023

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.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
22C0153R-RF-US-P20V01	V1.0	Initial issue of report.	2023-03-14
22C0153R-RF-US-P20V01	V1.1	Modify the power density and EIRP calculation method. V1.0 has expired.	2023-04-06

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s). These test results on a sample of the device are for the purpose of demonstrating Compliance with FCC 47CFR §2.1091.
2. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result, unless the specification, standard or customer have special requirements
3. The test results relate only to the samples tested.
4. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
5. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Information;
 - Chapter 1.3 Channel List.

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name..... :	SENSOR ASM-TIRE PRESS IND
Model No. :	TPMS-00-01
FCC ID :	2AVYX-TMSS6A4
Software Version :	V1.3
Hardware Version :	V1.0
Manufacturer :	SAIC GM WULING AUTOMOBILE COMPANY LIMITED
Manufacturer Address..... :	18 th ,Hexi Road,Liuzhou City, Guangxi Zhuang Autonomous Region, China
Factory :	SHANGHAI BAOLONG SALES CO.,LTD
Factory Address..... :	5500,Shenzhuan Road,Songjiang,Shanghai201619,China

Wireless specification :	N/A
Operating frequency range(s)..... :	433.92MHz
Type of Modulation :	FSK
Number of channel..... :	1

Rated power supply :	Voltage and Frequency	
	<input type="checkbox"/>	AC: 220 - 240 V, 50/60 Hz
	<input type="checkbox"/>	AC: 100 - 240 V, 50/60 Hz
	<input type="checkbox"/>	DC: 3 Vdc
	<input checked="" type="checkbox"/>	Battery: 3 V
	<input type="checkbox"/>	Adapter:
Brand of adapter..... :	N/A	
Adapter model :	N/A	
Mounting position..... :	<input type="checkbox"/>	Table top equipment
	<input type="checkbox"/>	Wall/Ceiling mounted equipment
	<input type="checkbox"/>	Floor standing equipment
	<input type="checkbox"/>	Hand-held equipment
	<input checked="" type="checkbox"/>	Other:Vehicle-Munted quipent

1.2 Antenna Information

Antenna Delivery	<input checked="" type="checkbox"/>	1TX + 1RX	
	<input type="checkbox"/>	2TX + 2RX	
	<input type="checkbox"/>	Others:.....	
Antenna technology	<input checked="" type="checkbox"/>	SISO	
	<input type="checkbox"/>	MIMO	<input type="checkbox"/> CDD
			<input type="checkbox"/> Beam-forming
Antenna Type	<input type="checkbox"/>	External	<input type="checkbox"/> Dipole
			<input type="checkbox"/> Sectorized
			<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/> PCB	
	<input type="checkbox"/>	<input type="checkbox"/> Metal Monopole Antenna	
	<input type="checkbox"/>	<input type="checkbox"/> Ceramic chip	
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Others:.....

2 RF EXPOSURE EVALUATION

2.1 Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	30
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

2.3 Test Result of RF Exposure Evaluation

Product	:	SENSOR ASM-TIRE PRESS IND
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-6

Power Density:

Predication of MPE limit at a given distance

Equation from page 19 of OET Bulletin 65, Edition 97-01

$$S = \frac{EIRP}{4\pi R^2}$$

where:

S = power density (in appropriate units, e.g. mW/cm²)

EIRP = equivalent (or effective) isotropically radiated power (in appropriate units, e.g., mW)

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna is 2dBi, the RF power density can be obtained. So, the worst result is below:

$$EIRP = p_t \times g_t = (E \times d)^2/30$$

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^{((dBuV/m)/20)/10⁶},

d = measurement distance in meters (m)--- 3m.

Field strength = 84.38 dBuV/m @3m

$$\text{So } EIRP = (E \times d)^2/30 = \{[10^{(84.38/20)}/10^6 \times 3]^2/30\} \times 1000 \text{mW} = \underline{0.08 \text{mW}}$$

$$\text{So, } S = \frac{EIRP}{4\pi R^2} = \frac{0.08}{4\pi \times 20^2} = \underline{0.000016 \text{mW/cm}^2} < 0.29 \text{ mW/cm}^2$$

Frequency (MHz)	Maximum Power (dBuV/m)	E.I.R.P. (mW)	Power Density at R = 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)
433.92	84.38	0.08	0.000016	0.29

The maximum power density is 0.000016mW/cm² for SENSOR ASM-TIRE PRESS IND without any other radio equipment.

_____ The End _____