



Test Report No.:
FCC2024-0020-H

TEST REPORT

FCC ID : 2AEQT-DSTBX003

NAME OF SAMPLE : TELEMATICS MODULE TBOX

APPLICANT : Huizhou Desay SV Automotive Co., Ltd.

CLASSIFICATION OF TEST : N/A

CVC Testing Technology Co., Ltd.

Product Name	TELEMATICS MODULE TBOX		Trade Mark	DESAY SV
Equipment Under Test Type/Model	SGMW-TBOX-04		Sample Status	—
Applicant	Huizhou Desay SV Automotive Co., Ltd.			
Applicant Address	No. 103, Hechang 5th Road West, Zhongkai National Hi-tech Industrial Development Zone,Huizhou City, Guangdong Province, P.R. China			
Manufacturer	Huizhou Desay SV Automotive Co., Ltd.			
Manufacturer Address	No. 103, Hechang 5th Road West, Zhongkai National Hi-tech Industrial Development Zone,Huizhou City, Guangdong Province, P.R. China			
Quantity of sample	1 pcs	Sample Identification	1-1	
Tested According To	FCC Part 2 (Section 2.1091) KDB 447498 D04 IEEE C95.1		Test Item	RF Exposure
Receiving Date	2024.05.17	Date of Testing	2024.07.19	
Test conclusion	The equipment under test was found to comply with the requirements of the standards applied. Seal of CVC <div>Issue Date: 2024.07.19</div>			
Note: This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC.				

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FCC2024-0020-H	Original release	2024.07.19

1. General Product Information

The product main model of this application is SGMW-TBOX-04 and the family model is SGMW-TBOX-06. The TELEMATICS MODULE TBOX, Model No: SGMW-TBOX-04, SGMW-TBOX-06 are identical to each other on PCB layouts, constructions and appearance. The difference are as following:

1. Two models have different type of e-SIM card;
2. Model SGMW-TBOX-04 contains AMP and Codec, while SGMW-TBOX-06 doesn't have;
3. Model SGMW-TBOX-04 contains Steel Antenna, while SGMW-TBOX-06 doesn't have.

All the tests carried out on model SGMW-TBOX-04.

Two models are identical to each other on PCB layouts, constructions and appearance.

Model SGMW-TBOX-04 contains Steel Antenna on the PCB, while SGMW-TBOX-06 doesn't have.

During normal use, the steel antenna doesn't work, both SGMW-TBOX-04 and SGMW-TBOX-06 use external antenna only. Once the external antenna is disconnected by any reason, SGMW-TBOX-04 will switch to steel antenna to meet the needs of making emergency call.

1.1 General information

PRODUCT	TELEMATICS MODULE TBOX		
BRAND	DESAY SV		
MODEL	SGMW-TBOX-04		
ADDITIONAL MODEL	SGMW-TBOX-06		
FCC ID	2AEQT-DSTBX003		
POWER SUPPLY	DC12V 0.6A		
	WCDMA		QPSK, 16QAM
	LTE	UL	QPSK, 16QAM
		DL	QPSK, 16QAM, 64QAM
WCDMA BAND	B5		
LTE BAND	B5 / B7 / B38		
OPERATING FREQUENCY	Band	TX(MHz)	RX(MHz)
	WCDMA B5	824 ~ 849	869 ~ 894
	LTE B5	824 ~ 849	869 ~ 894
	LTE B7	2500 ~ 2570	2620 ~ 2690
	LTE B38	2570 ~ 2620	2570 ~ 2620
MAXIMUM OUTPUT POWER	WCDMA B5: 25.00dBm LTE B5: 25.00dBm,LTE B7: 25.00dBm, LTE B38: 24.50dBm		
ANTENNA TYPE AND GAIN (Remark 4/5)	External Antenna: WCDMA B5:-2.24dBi LTE B5:-2.24dBi, LTE B7:1.72dBi, LTE B38:1.72dBi Internal Antenna: WCDMA B5:-0.839dBi LTE B5:-0.839dBi, LTE B7:5.556dBi, LTE B38:3.747dBi		
HARDWARE VERSION:	HW003		
SOFTWARE VERSION:	DSW03.00		
I/O PORTS	Refer to user’s manual		
Remark:			
1. For more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.			
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.			
3. Please refer to the EUT photo document (Reference No.: FCC2024-0020-EUT) for detailed product photo.			
4. Please refer to the antenna report.			
5. Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, CVC is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.			
6. The Maximum Output Power refer to tune-up of EUT.			

2. Human Exposure Assessment

2.1 RF Exposure Test Exemptions for Single Source

2.1.1 1-mW Test Exemption

The 1 mW Test Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1 mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A).

The 1 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

2.1.2 SAR-Based Exemption

A more comprehensive exemption, considering a variable power threshold that depends on both the *separation distance* and power, is provided in § 1.1307(b)(3)(i)(B). This exemption is applicable to the frequency range between 300 MHz and 6 GHz, with *test separation distances* between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions.

Accordingly, a RF source is considered an *RF exempt device* if its available maximum time averaged (matched conducted) power or its effective radiated power (ERP), whichever is greater, are below a specified threshold. This exemption threshold was derived based on general population 1-g SAR requirements.

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of § 1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 is necessary if the ERP of the device is greater than $ERP_{20\text{cm}}$ in Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)]

TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES
SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	-	1.34	159m	-	35.6m	$1920R^2$
1.34	-	30	35.6m	-	1.6m	$3450R^2/f^2$
30	-	300	1.6m	-	159mm	$3.83R^2$
300	-	1500	159mm	-	31.8mm	$0.0128R^2/f^2$
1500	-	100000	31.8mm	-	0.5mm	$19.2R^2$
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

2.1.3 MPE-Based Exemption

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.¹⁰ For this case, a RF source is an *RF exempt device* if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW). This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$ERP_{20cm}(mW) = \begin{cases} 2040f_{(GHz)} & 0.3GHz \leq f \leq 1.5GHz \\ 3060 & 1.5GHz \leq f \leq 6GHz \end{cases} \quad (B. 1)$$

$$P_{th}(mW) = \begin{cases} ERP_{20cm}(d_{(cm)}/20cm)^x & d \leq 20cm \\ ERP_{20cm} & 20cm < d \leq 40cm \end{cases} \quad (B. 2)$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20cm} \sqrt{f_{(GHz)}}} \right)$$

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).

2.1.4 MPE exposure limits

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. Mobile devices, as defined in § 2.1091 along with their applicable RF exposure limits, are characterized by the requirement of maintaining a minimum *test separation distance* ≥ 20 cm between any radiating structure of the device and nearby persons; to apply only mobile device (MPE) exposure limits. This *test separation distance* requirement must be defined for the most conservative exposure conditions, and must be fully supported for all 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).

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

Where

S: power density in mW/cm^2

P: power input to the antenna in mW

G: power gain of the antenna in the direction of interest relative to an isotropic radiator.

R: distance to the center of radiation of the antenna in cm

Note:

1. Mobile or fixed location transmitters, minimum separation distance is 20 cm, even if calculations indicate MPE distance is less.
2. The Numeric Gain calculated by $10^{(ant.Gain*(dBi)/10)}$.
3. Each band max power which perform MPE of any configurations.

Table 1 to § 1.1310(e)(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)
(i)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
300~1500			f/300	< 6
1500~100000			5	< 6
(ii)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
300~1500			F/1500	< 30
1500~100000			1.0	< 30
f=frequency in MHz; *=Plane wave equivalent power density.				

2.2 RF Exposure Test Exemptions for Simultaneous Transmission Sources

2.2.1 1-mW Test Exemption for Multiple Sources

As discussed in § 1.1307(b)(3)(ii)(A), the 1-mW exemption intended for single transmitters may be also applied to simultaneous transmission conditions, within the same host device, according one of the following criteria:

- a) When maximum available power each individual transmitting antenna within the same time averaging period is ≤ 1 mW, and the nearest parts of the antenna structures of the simultaneously operating transmitters are separated by at least 2 cm.
- b) When the aggregate maximum available power of all transmitting antennas is ≤ 1 mW in the same time-averaging period.

This exemption may not be combined with any other exemption.

2.2.2 Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions

This case is described in detail in § 1.1307(b)(3)(ii)(B) and covers the situations where both SAR-based and MPE-based exemption may be considered for test exemption in fixed, mobile, or portable device exposure conditions. For these cases, a device with multiple RF sources transmitting simultaneously will be considered an *RF exempt device* if the condition of Formula (1) is satisfied.

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance.

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

Where

a is number of fixed, mobile, or portable RF sources claiming exemption using the §1.1307(b)(3)(i)(B) formula for P_{th} , including existing exempt transmitters and those being added.

b is number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula for Threshold ERP, including existing exempt transmitters and those being added.

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

P_i is 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).

$P_{th,i}$ is the exemption threshold power (P_{th}) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source i.

ERP_j is the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j.

$ERP_{th,j}$ is exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least $\lambda/2\pi$, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.

$Evaluated_k$ is 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.

$Exposure Limit_k$ is either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable.

3. CLASSIFICATION

The antenna of this product, under normal use condition, is 20cm away from the body of the user. So, this device is classified as Mobile Device.

Method in name of	calculation method
Method 4	MPE exposure limits

4. Test Results

External Antenna:

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
WCDMA Band 5	-2.24	25.00	22.76	188.80	0.038	0.550
LTE Band 5	-2.24	25.00	22.76	188.80	0.038	0.550
LTE Band 7	1.72	25.00	26.72	469.89	0.094	1.000
LTE Band 38	1.72	24.50	26.22	281.84	0.083	1.000

Note: The MPE was calculated at 20 cm to show compliance with the power density limit.

For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.

Internal Antenna:

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
WCDMA Band 5	-0.839	25.00	24.161	260.68	0.052	0.550
LTE Band 5	-0.839	25.00	24.161	260.68	0.052	0.550
LTE Band 7	5.556	25.00	30.556	1136.58	0.226	1.000
LTE Band 38	3.747	24.50	28.247	667.88	0.133	1.000

Note: The MPE was calculated at 20 cm to show compliance with the power density limit.

For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.

Therefore this device complies with FCC's RF radiation exposure limits for general population without SAR evaluation.

_____ The End _____

Important

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2. Any part photocopies of the test report are forbidden without the written permission from CVC;
3. The test report is invalid without the signatures of Author and Reviewer;
4. The test report is invalid if altered;
5. Objections to the test report must be submitted to CVC within 15 days;
6. Generally, commission test is responsible for the tested samples only;
7. As for the test result, “—” or “ N/A” means “not applicable”, “ / ”means “not testing”, “P” means “pass” and “F” means “fail”.

The test data and test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA symbol is not presented.

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