PHOENIX TESTLAB

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FCC RF Exposure Evaluation

Report Number:

F222063E3

Equipment under Test (EUT):

WWAN Module inside dedicated/specific host device "Hino Telematics control unit 1"

Applicant:

Hino Motors Sales U.S.A., Inc

Manufacturer:

Hino Motors Sales U.S.A., Inc

ilac-MRA

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-17186-01-00

References

CFR 47 Rule part 1 Practice and Procedure

CFR 47Rule part 2 Frequency Allocations and Radio Treaty Matters; General Rules and Regulations

KDB 447498 D01 General RF Exposure Guidance v06

Assessed and written by:	Mohamed Yassine Khalek 21.03.2024	Signature
Reviewed and approved by:	Manuel BASTERT 22.03.2024	Signature

This test report is only valid in its original form.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

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1. Identification

1.1. Applicant

Name:	Hino Motors Sales U.S.A., Inc
Address:	45501 Twelve Mile Road, Novi, MI 48377
Country:	United States of America
Name for contact purposes:	Anthony Luttman
Phone:	248-221-9683
eMail address:	Luttman@hino.com
Applicant represented during the test by the following person:	None

1.2. Manufacturer

Name:	Hino Motors Sales U.S.A., Inc
Address:	45501 Twelve Mile Road, Novi, MI 48377
Country:	United States of America
Name for contact purposes:	Anthony Luttman
Phone:	248-221-9683
eMail address:	Luttman@hino.com
Manufacturer represented during the test by the following person:	None

1.3. Test Laboratory

The tests were carried out by:

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Germany

Accredited by *Deutsche Akkreditierungsstelle GmbH* in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-06.

1.4. EUT (Equipment under Test)

Type of equipment: *	WWAN Module
Type / PMN: *	TOBY-L3
Product number: *	TOBY-L3414-50A-00-00
FCC ID: *	2AXKDTOBYL3414
IC certification number: *	26600-TOBYL3414
HVIN (Hardware Version Identification Number): *	TOBY-L3414
FVIN (Firmware Version Identification Number): *	N/A
HMN (Host Marketing Name)	HINO TELEMATICS CONTROL UNIT 1
EUT marking:	N/A

* Declared by the applicant

Manufacturer:	Hino Motors Sales U.S.A., Inc					
Model name: *	TOBY-L3414					
Power supply module: *	by host					
Supply voltage module: *	U_{nom} =	n.a.	U_{min} =	n.a.	U_{max} =	n.a.
Serial Number: *	n.a.					
IMEI: *	864884060002542					
Supported bands: *	2G: PCS 1900 MHz		3G: 2 (1900 MHz) 4 (1700 MHz)		4G: FDD: 2 (1900 MHz) 4 (1700 MHz) 7 (2600 MHz) 12 (700 MHz) 13 (700 MHz) 66 (1700 MHz) 71(600 MHz) TDD: 41 (2500 MHz)	
Max. output power: *	PCS 1900: Power Class 1 (30 dBm) UMTS/HSDPA/HSUPA: Power Class 3 (24 dBm) LTE: Power Class 3 (23 dBm)					
Antenna type: *	4-in-1 internal antenna for use on vehicles					
Antenna name: *	PP407087 by TAOGLAS					
Antenna S/N	08/20-00xx					
Antenna connector: *	FAKRA					
Antenna gain: *	Cellular: 6 dBi (Max. peak gain @ 1710 - 2170 MHz) 0 dBi (Min. peak gain @ 699 - 746 MHz) 1.5 dBi (Peak gain @756 -777 MHz) 2 dBi (Peak gain @ 814 – 894 MHz) 3.5 dBi (Peak gain @ 2500-2690 MHz)					

* Declared by the applicant

1.5. Technical Data of Equipment

General			
Power supply EUT: *	DC		
Supply voltage EUT: *	U_{nom} = 12 V	U_{min} = 8 V	U_{max} = 16 V
Temperature range: *	-40°C to 70°C		
Highest internal frequency: *	2600 MHz		

* Declared by the applicant

2. Subject of Investigation

According to the CFR47 §2.1091 the device as declared by the applicant is a mobile device which is used at least at 20 cm separation distance between the device and the users.

This document includes the RF-Exposure evaluation for the cellular module TOBY-L3 (FCC ID: 2AXKDTOBYL3414) integrated in the host device “HINO TELEMATICS CONTROL UNIT 1” and used with a new antenna as described in 1.4.

3. MPE evaluation limits

3.1. Stand-alone MPE evaluation limits

The human exposure to RF emissions from such devices could be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and / or power density. The limits for General Population / Uncontrolled Exposure are given in the following table from §1.1310(e)1:

Frequency Range [MHz]	Electric Field Strength (E) [V/m]	Magnetic Field Strength (H) [A/m]	Power Density (S) [mW/cm²]	Averaging Time $\|E\|^2$,$\|H\|^2$ or S [min]
0.3 – 1.34	614	1.63	(100)*	30
1.34 – 30	824/f	2.19/f	(180/f)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	-	-	f/1500	30
1500 – 100,000	-	-	1.0	-

Limits for General Population / Uncontrolled Exposure.
Note: f = frequency in MHz; * Plane – wave equivalent power density

3.2. Simultaneous transmission MPE requirements

According to the RF exposure KDB 447498 D01 General RF Exposure Guidance v06 in chapter 7.2:
For mobile exposure host platform devices to qualify for simultaneous transmission MPE test exclusion, all transmitters and antennas in the host must either be evaluated for MPE compliance, by measurement or computational modelling, or qualify for the standalone MPE test exclusion in 7.1.

When modular transmitters are used, the minimum test separation distance required for each simultaneously transmitting antenna installed in the host device must satisfy MPE compliance for both standalone and simultaneous transmission operations. When simultaneous transmission MPE test exclusion applies, transmitter modules may be incorporated in host devices according to Class I permissive change requirements to document the test exclusion conditions.

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is
≤ 1.0, according to calculated/estimated, numerically modelled, or measured field strengths or power density. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to the MPE limit at the test frequency.

4. MPE evaluation

The power density is calculated as follows:

$$Power\ density = \frac{P \cdot G}{4 \cdot \pi \cdot R^2}$$

Where:

P: Conducted power

G: Antenna gain (linear)

R: Minimum separation distance from antenna to the user

4.1. Stand-alone MPE results

Band	Frequency [MHz]	Highest RF conducted output power [dBm]	Power + Tune up tol. [dBm]	Duty cycle [dB]	Antenna Gain [dBi]	Distance [cm]	Power Density [mW/cm²]	Limit of Power Density [mW/cm²]	Reference
Bluetooth classic	2402	4	4	0	4	20	0.00126	1	Technical passport
Bluetooth LE	2402	4	4	0	4	20	0.00126	1	Technical passport
WLAN 2.4 GHz	2412	15.7	15.7	0	4	20	0.01857	1	Technical passport
UMTS Bd 4	1710	24.01	25	0	6	20	0.25046	1	Module report *1
UMTS Bd 2	1850	23.03	25	0	6	20	0.25046	1	Module report *1
LTE Bd 5	663	24.39	25	0	0	20	0.06291	0.442	Module report *2
LTE Bd 26	699	24.85	25	0	0	20	0.06291	0.466	Module report *2
LTE Bd 2	777	24.9	25	0	1.5	20	0.08887	0.518	Module report *2
LTE Bd 25	1710	24.41	25	0	6	20	0.25046	1	Module report *2
LTE Bd 4	1850	24.33	25	0	6	20	0.25046	1	Module report *2
LTE Bd 7	2500	24.56	25	0	3.5	20	0.14085	1	Module report *2

*1 Module report FCC022022-05502RF12(b) issued by Beijing TIRT Technology Service Co., Ltd Shenzhen, 2022-11-03

*2 Module report FCC022022-05502RF12(a) issued by Beijing TIRT Technology Service Co., Ltd Shenzhen, 2022-10-20

4.2. Simultaneous MPE results

The worst case MPE ratios of the stand-alone modules are calculated in the following:

For the Bluetooth module:

$BT_{ratio} = \frac{0.00126\ mW/cm^2}{1.0\ mW/cm^2} = 0.00126$

For the WLAN 2.4 GHz module:

$WLAN2.4GHz_{ratio} = \frac{0.01857\ mW/cm^2}{1.0\ mW/cm^2} = 0.01857$

For the Cellular module:

$Cellular_{ratio} = \frac{0.25046\ mW/cm^2}{1.0\ mW/cm^2} = 0.25046$

The Sum of the MPE ratios for the simultaneous transmission is:

Sum = 0.25046 + 0.01857+ 0.00126

Sum = 0.27 < 1.0

5. Conclusion

The EUT complies with the stand-alone MPE limits from §1.1310(e)1.

As the sum of the MPE rations is less than 1.0, it is excluded from the simultaneous transmission MPE test.

A safety statement concerning the minimum separation distance from enclosure of the device has to be integrated in the user´s manual to provide end-users with transmitter operating conditions for satisfying RF exposure compliance.

6. Report History

Report Number	Date	Comment
F222063E3	21.03.2024	Initial Test Report
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-	-	-