

MPE TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: TQ8-AT240DPAN

Equipment Under Test : DIGITAL CAR AVNT SYSTEM
Model Name : AT240DPAN
Applicant : Hyundai MOBIS Co., Ltd.
Manufacturer : Hyundai MOBIS Co., Ltd.
Date of Test(s) : 2015.03.28 ~ 2015.04.26
Date of Issue : 2015.04.27

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Youngmin Park

Date:

2015.04.27

Approved By:



Hyunchoe You

Date:

2015.04.27

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INDEX

<u>Table of Contents</u>	Page
1. General Information -----	3
2. RF Exposure Evaluation -----	4

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

-Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 435-837

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Telephone : + 82 31 688 0901

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1.2. Details of applicant

Applicant : Hyundai MOBIS Co., Ltd.

Address : 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, Korea

Contact Person : Choi, Seung-Hoon

Phone No. : + 82 31 260 0098

1.3. Description of EUT

Kind of Product	DIGITAL CAR AVNT SYSTEM
Model Name	AT240DPAN
Power Supply	DC 14.4 V (Vehicle Battery)
Frequency Range	CDMA 850: 824.70 MHz ~ 848.31 MHz, CDMA 1 900 : 1 851.25 MHz ~ 1 908.75 MHz, LTE Band 4 (1.4 MHz) : 1 710.7 MHz ~ 1 754.3 MHz, LTE Band 4 (3 MHz) : 1 711.5 MHz ~ 1 753.5 MHz, LTE Band 4 (5 MHz) : 1 712.5 MHz ~ 1 752.5 MHz, LTE Band 4 (10 MHz) : 1 715.0 MHz ~ 1 750.0 MHz, LTE Band 4 (15 MHz) : 1 717.5 MHz ~ 1 747.5 MHz, LTE Band 4 (20 MHz) : 1 720.0 MHz ~ 1 745.0 MHz, LTE Band 13 (5 MHz) : 779.5 MHz ~ 784.5 MHz, LTE Band 13 (10 MHz) : 782 MHz, BT : 2 402 MHz ~ 2 480 MHz, WLAN : 2 412 MHz ~ 2 462 MHz
Antenna Gain	824.70 MHz ~ 848.31 MHz : 2.35 dB d, 1 851.25 MHz ~ 1 908.75 MHz : 5.22 dB i, 1 710.7 MHz ~ 1 754.3 MHz : 2.92 dB i, 779.5 MHz ~ 784.5 MHz : 0.68 dB d, 2 402 MHz ~ 2 480 MHz : 1.83 dB i, 2 412 MHz ~ 2 472 MHz : 2.73 dB i

1.4. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL008669	2015.04.27	Initial

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2. RF Exposure Evaluation

2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

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
(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
<u>300 – 1 500</u>	-	-	<u>f/1500</u>	<u>30</u>
<u>1 500 – 100 000</u>	-	-	<u>1.0</u>	<u>30</u>

2.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

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 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 where the MPE limit is reached.

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2.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

2.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

Mode: CDMA 850_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB d)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
1013	824.70	25.5	2.35	0.121 264	0.549 800

Mode: CDMA 1 900_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
25	1 851.25	25.5	5.22	0.234 817	1

Mode: LTE Band 4_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
20175	1 710.7	25.7	2.92	0.144 787	1

Mode: LTE Band 13_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB d)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
23205	779.5	25.7	0.68	0.086 443	0.519 667

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit .

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Mode: BT (GFSK)_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
0	2 402	4	1.83	0.000 762	1

Mode: BT (8DPSK)_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
0	2 402	1	1.83	0.000 382	1

Mode : WLAN (11b)_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
1	2 412	18	2.73	0.023 536	1

Mode : WLAN (11g)_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
1	2 412	14	2.73	0.009 370	1

Mode : WLAN (11n)_Maximum tune up tolerance

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
1	2 412	14	2.73	0.009 370	1

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm².

Simultaneous transmission MPE test exclusion

CDMA 850 : the ratio is 0.121 264 / 0.549 80

LTE Band 13 : the ratio is 0.086 443 / 0.519 67

BT : the ratio is 0.000 762 / 1

WLAN 802.11b : the ratio is 0.023 536 / 1

Confirm the sum result of individual MPEs ratio is ≤ 1.0 ;

$$(0.121\ 264 / 0.549\ 80) + (0.086\ 443 / 0.519\ 67) + (0.000\ 762 / 1) + (0.023\ 536 / 1) = 0.411\ 200 \leq 1.0$$

So this device meets the KDB447498 D01 v05r02 section 7.2 requirement of "Simultaneous transmission MPE test exclusion".