

# MPE TEST REPORT

of

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

FCC ID : TQ8-AN240HGAN

Equipment Under Test : DIGITAL CAR AVN SYSTEM

Model Name : AN240HGAN

Applicant : HYUNDAI MOBIS CO., LTD.

Manufacturer : HYUNDAI MOBIS CO., LTD.

Date of Test(s) : 2014.03.27

Date of Issue : 2014.04.11

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

Tested By:



Harim Lee

Date:

2014.04.11

Approved By:



Feel Jeong

Date:

2014.04.11

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## 1. General Information

### 1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 3FL, 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 435-040

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 31 428 5700

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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-Hun

Phone No. : +82 31 260 0098

### 1.3. Description of EUT

Kind of Product	DIGITAL CAR AVN SYSTEM
Model Name	AN240HGAN
Power Supply	DC 14.4 V (Vehicle Battery)
Frequency Range	824.70 MHz ~ 848.31 MHz (CDMA850) 1 851.25 MHz ~ 1 908.75 MHz (CDMA1900) 2 402 MHz ~ 2 480 MHz (BT) 2 412 MHz ~ 2 462 MHz (11b/g/n_HT20)
Antenna Gain	824.70 MHz ~ 848.31 MHz : 3.70 dB i, 1 851.25 MHz ~ 1 908.75 MHz : 6.12 dB i, 2 402 MHz ~ 2 480 MHz : -3.15 dB i, 2 412 MHz ~ 2 462 MHz : 3.11 dB i

### 1.4. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007519	Initial
1	F690501/RF-RTL007519-1	Revised EUT antenna gain (CDMA & WLAN)

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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

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 <sup>2</sup> )	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
<b>300 – 1 500</b>	--	--	<b>F/1500</b>	<b>30</b>
<b>1 500 – 100 000</b>	--	--	<b>1</b>	<b>30</b>

#### 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/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

G = gain of antenna in linear scale

$\pi$  = 3.1416

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

$P_d$  the limit of MPE, 1 mW/cm<sup>2</sup>. 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.

## 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: CDMA850 1xRTT

Channel	Channel Frequency (MHz)	Measured E.R.P. (dB m)	Duty Cycle (%)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	824.70	24.61	100	0.094 347	0.549 80
Middle	836.52	26.00	100	0.129 936	0.557 68
High	848.31	29.21	100	0.272 100	0.565 54

Mode	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Maximum tune up tolerance	848.31	25.50	3.70	0.165 474	0.565 54

Mode: CDMA1 900 1xRTT

Channel	Channel Frequency (MHz)	Measured E.I.R.P. (dB m)	Duty Cycle (%)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	1 851.25	25.04	100	0.063 493	1
Middle	1 880.00	22.84	100	0.038 259	1
High	1 908.75	24.87	100	0.061 056	1

Mode	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Maximum tune up tolerance	1 851.25	25.50	6.12	0.288 888	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 .

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**Mode: CDMA850 1xEV-DO**

Channel	Channel Frequency (MHz)	Measured E.R.P. (dB m)	Duty Cycle (%)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	824.70	24.47	100	0.091 354	0.549 80
Middle	836.52	25.75	100	0.122 667	0.557 68
High	848.31	28.86	100	0.251 032	0.565 54

Mode	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Maximum tune up tolerance	848.31	25.50	3.70	0.165 474	0.565 54

**Mode: CDMA1900 1xEV-DO**

Channel	Channel Frequency (MHz)	Measured E.I.R.P. (dB m)	Duty Cycle (%)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	1 851.25	24.76	100	0.059 529	1
Middle	1 880.00	22.46	100	0.035 053	1
High	1 908.75	24.94	100	0.062 048	1

Mode	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Maximum tune up tolerance	1 908.75	25.50	6.12	0.288 888	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 .

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## WLAN

### 11b mode

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	2 412	14.83	3.11	0.012 380	1
Middle	2 437	14.95	3.11	0.012 727	1
High	2 462	15.22	3.11	0.013 543	1
Maximum tune up tolerance	2 462	18.00	3.11	0.025 688	1

### 11g mode

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	2 412	10.46	3.11	0.004 526	1
Middle	2 437	10.57	3.11	0.004 642	1
High	2 462	10.75	3.11	0.004 839	1
Maximum tune up tolerance	2 462	14.00	3.11	0.010 227	1

### 11n mode

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	2 412	10.31	3.11	0.004 373	1
Middle	2 437	10.31	3.11	0.004 373	1
High	2 462	10.58	3.11	0.004 653	1
Maximum tune up tolerance	2 462	14.00	3.11	0.010 227	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/cm<sup>2</sup>.

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## BT

### GFSK

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	2 402	0.56	-3.15	0.000 110	1
Middle	2 441	0.04	-3.15	0.000 097	1
High	2 480	0.63	-3.15	0.000 111	1
Maximum tune up tolerance	2 480	4.00	-3.15	0.000 242	1

### $\pi/4$ DQPSK

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	2 402	-0.48	-3.15	0.000 086	1
Middle	2 441	-0.67	-3.15	0.000 083	1
High	2 480	-0.26	-3.15	0.000 091	1
Maximum tune up tolerance	2 480	4.00	-3.15	0.000 242	1

### 8DPSK

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm <sup>2</sup> )	LIMITS (mW/cm <sup>2</sup> )
Low	2 402	-0.61	-3.15	0.000 084	1
Middle	2 441	-0.82	-3.15	0.000 080	1
High	2 480	-0.25	-3.15	0.000 091	1
Maximum tune up tolerance	2 480	4.00	-3.15	0.000 242	1

Note :

- 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/cm<sup>2</sup>.

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