TEST REPORT

of

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

FCC ID: TQ8-AT140C2AN

Equipment Under Test	:	DISPLAY AUDIO SYSTEM
Model Name	:	AT140C2AN
Applicant	:	Hyundai MOBIS Co., Ltd.
Manufacturer	:	Hyundai MOBIS Co., Ltd.
Date of Test(s)	:	2015.03.02 ~ 2015.03.04
Date of Issue	:	2015.03.04

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

Tested By: **Jungmin Yang** **Date:** **2015.03.04**

Approved By: **Hyunchae You** **Date:** **2015.03.04**

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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.
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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	DISPLAY AUDIO SYSTEM
Model Name	AT140C2AN
Power Supply	DC 14.4 V (Vehicle Battery)
Frequency Range	824.70 ㎒ ~ 848.31 ㎒ (CDMA850), 1 851.25 ㎒ ~ 1 908.75 ㎒ (CDMA1 900), 1 710.7 ㎒ ~ 1 754.3 ㎒ (LTE BAND 4_1.4 ㎒), 1 711.5 ㎒ ~ 1 753.5 ㎒ (LTE BAND 4_3 ㎒), 1 712.5 ㎒ ~ 1 752.5 ㎒ (LTE BAND 4_5 ㎒), 1 715.0 ㎒ ~ 1 750.0 ㎒ (LTE BAND 4_10 ㎒), 1 717.5 ㎒ ~ 1 747.5 ㎒ (LTE BAND 4_15 ㎒), 1 720.0 ㎒ ~ 1 745.0 ㎒ (LTE BAND 4_20 ㎒), 779.5 ㎒ ~ 784.5 ㎒ (LTE BAND 13_5 ㎒), 782 ㎒ (LTE BAND 13_10 ㎒), 2 402 ㎒ ~ 2 480 ㎒ (BT), 2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20), 5 745 ㎒ ~ 5 825 ㎒ (Band 3: 11a/n_HT20, 11ac_VHT20), 5 755 ㎒ ~ 5 795 ㎒ (Band 3: 11n_HT40, 11ac_VHT40), 5 775 ㎒ (Band 3: 11ac_VHT80), 5 180 ㎒ ~ 5 240 ㎒ (Band 1: 11a/n_HT20, 11ac_VHT20), 5 190 ㎒ ~ 5 230 ㎒ (Band 1: 11n_HT40, 11ac_VHT40), 5 210 ㎒ (Band 1: 11ac_VHT80), 5 260 ㎒ ~ 5 320 ㎒ (Band 2A: 11a/n_HT20, 11ac_VHT20), 5 270 ㎒ ~ 5 310 ㎒ (Band 2A: 11n_HT40, 11ac_VHT40), 5 290 ㎒ (Band 2A: 11ac_VHT80), 5 500 ㎒ ~ 5 700 ㎒ (Band 2C: 11a/n_HT20, 11ac_VHT20), 5 510 ㎒ ~ 5 670 ㎒ (Band 2C: 11n_HT40, 11ac_VHT40), 5 530 ㎒ (Band 2C: 11ac_VHT80)
Antenna Gain	824.70 ㎒ ~ 848.31 ㎒ : 4.75 ㏈i, 1 851.25 ㎒ ~ 1 908.75 ㎒ : 5.68 ㏈i, 1 710.7 ㎒ ~ 1 754.3 ㎒ : 3.27 ㏈i, 779.5 ㎒ ~ 784.5 ㎒ : 2.90 ㏈i, 2 402 ㎒ ~ 2 480 ㎒: 2.29 ㏈i, 2 412 ㎒ ~ 2 472 ㎒: -0.09 ㏈i, 5 180 ㎒ ~ 5 320 ㎒: 4.77 ㏈i, 5 500 ㎒ ~ 5 700 ㎒: 1.68 ㏈i, 5 745 ㎒ ~ 5 805 ㎒: 2.78 ㏈i

1.4. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL008471	2015.03.04	Initial

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 (㎒)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (㎽/㎠)	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
300 – 1 500	-	-	**f/1500**	**30**
1 500 – 100 000	-	-	**1.0**	**30**

2.1.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R^2)

Where Pd = power density in ㎽/㎠

Pout = output power to antenna in ㎽

G = gain of antenna in linear scale

Pi = 3.1416

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

Pd the limit of MPE, 1 ㎽/㎠. 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_Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	LIMITS (㎽/㎠)
1013	824.70	26	4.75	100	0.236 445	0.549 80

Mode: CDMA1 900_Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	LIMITS (㎽/㎠)
25	1 851.25	26	5.68	100	0.292 907	1

Mode: LTE Band 4_Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	LIMITS (㎽/㎠)
20175	1 732.5	25	3.27	100	0.133 577	1

Mode: LTE Band 13_Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	LIMITS (㎽/㎠)
23205	779.5	25	2.90	100	0.122 668	0.519 67

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

BT

- Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
0	2 402	4	2.29	77	0.001 100	1

WLAN (2.4G)

- Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
1	2 412	18	-0.09	99	0.012 419	1

WLAN (5G)

- Maximum tune up tolerance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
36	5 180	14	4.77	93	0.016 116	1

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

Simultaneous transmission MPE test exclusion

CDMA850: the ratio is 0.236 445 / 0.549 80

LTE band13: the ratio is 0.122 668 / 0.519 67

WLAN: the ratio is 0.016 116 / 1

BT: the ratio is 0.001 100 / 1

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

(0.236 445 / 0.549 80) + (0.122 668 / 0.519 67) + (0.016 116 / 1) + (0.001 100 / 1) = 0.683 322 ≤ 1.0

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