

TEST REPORT

of

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

FCC ID: TQ8-ADB40S2AN

Equipment Under Test : DISPLAY CAR SYSTEM
Model Name : ADB40S2AN
Applicant : Hyundai Mobis Co., Ltd.
Manufacturer : AUTONICS Co., Ltd.
Date of Receipt : 2017.10.17
Date of Test(s) : 2017.11.08 ~ 2017.11.14
Date of Issue : 2017.11.15

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

Tested By:



Date:

2017.11.15

Jinhyoung Cho

Technical
Manager:



Date:

2017.11.15

Jungmin Yang

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SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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, 15807

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, 06141, Republic of Korea

Contact Person : Kwon, Heung-chul

Phone No. : +82 31 260 2714

1.3. Details of manufacturer

Company : AUTONICS Co., Ltd.

Address : 69-23, Hansam-ro, Deoksan-myeon, Jincheon-gun, Chungcheongbuk-do, 27850, Republic of Korea

1.4. Description of EUT

Kind of Product	DISPLAY CAR SYSTEM
Model Name	ADB40S2AN
Power Supply	DC 14.4 V
Frequency Range	2 402 MHz ~ 2 480 MHz (Bluetooth)
Modulation Technique	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79 channels
Antenna Type	Dielectric Chip Antenna
Antenna Gain	-0.10 dB i

1.5. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL012002	2017.11.15	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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where P_d = power density in mW/cm^2

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, $1 mW/cm^2$. 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

Bluetooth

- Maximum tune up tolerance

Operating Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 402 ~ 2 480	4	-0.10	0.000 488	1

CDMA - BC0

- Maximum tune up tolerance

Operating Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
824 ~ 849	26	5.22	0.263 469	0.55

CDMA - BC1

- Maximum tune up tolerance

Operating Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
1 850 ~ 1 910	26	3.14	0.163 204	1

LTE - Band 4

- Maximum tune up tolerance

Operating Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
1 710 ~ 1 755	25	-0.99	0.050 088	1

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LTE - Band 13
- Maximum tune up tolerance

Operating Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
777 ~ 787	25	1.59	0.090 726	0.52

Remark;

- The output average power is set as max. power from tune-up procedure.

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/cm².
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 cm between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dB i and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.

Simultaneous transmission of MPE test exclusion for worst case configuration.

Bluetooth: the ratio is 0.000 488 / 1

CDMA – BC0: the ratio is 0.263 469 / 0.55

LTE – Band 13: the ratio is 0.090 726 / 0.52

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

Bluetooth + CDMA + LTE: $(0.000\ 488 / 1) + (0.263\ 469 / 0.55) + (0.090\ 726 / 0.52) = 0.653\ 996 \leq 1.0$

So this device meets the KDB447498 D01 v06 section 7.2 requirement of "Simultaneous transmission MPE test exclusion"

- End of the Test Report -

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RTT5041-19(2017.07.10)(0)

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A4(210 mm x 297 mm)