

# TEST REPORT

of

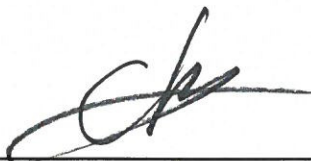
FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: TQ8-ADBB0A9AN

Equipment Under Test : DISPLAY CAR SYSTEM  
Model Name : ADBB0A9AN  
Variant Model Name : ADBB1A9AN  
Applicant : Hyundai MOBIS Co., Ltd.  
Manufacturer : Hyundai MOBIS Co., Ltd.  
Date of Test(s) : 2016.03.31 ~ 2016.04.18  
Date of Issue : 2016.04.21

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

Tested By:

  
\_\_\_\_\_  
Jinhyoung Cho

Date:

2016.04.21

Approved By:

  
\_\_\_\_\_  
Hyunchae You

Date:

2016.04.21

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

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

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

# INDEX

| <u>Table of Contents</u>        | Page |
|---------------------------------|------|
| 1. General Information -----    | 3    |
| 2. RF Exposure Evaluation ----- | 5    |

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

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

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 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>.

Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

### 1.2. Details of applicant

Applicant : Hyundai MOBIS Co., Ltd.

Address : 203, Teheran-ro, Gangnam-gu, Seoul, 06141, Korea

Contact Person : Kwon, Heung-Chul

Phone No. : +82 31 260 2714

### 1.3. Description of EUT

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kind of Product      | DISPLAY CAR SYSTEM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Model Name           | ADBB0A9AN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Variant Model Name   | ADBB1A9AN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Power Supply         | DC 14.4 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Frequency Range      | 2 402 MHz ~ 2 480 MHz (Bluetooth),<br>2 412 MHz ~ 2 462 MHz (11b/g/n_HT20),<br>5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20),<br>5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40),<br>5 775 MHz (Band 3: 11ac_VHT80),<br>5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20),<br>5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40),<br>5 210 MHz (Band 1: 11ac_VHT80),<br>5 260 MHz ~ 5 320 MHz (Band 2A: 11a/n_HT20, 11ac_VHT20),<br>5 270 MHz ~ 5 310 MHz (Band 2A: 11n_HT40, 11ac_VHT40),<br>5 290 MHz (Band 2A: 11ac_VHT80),<br>5 500 MHz ~ 5 720 MHz (Band 2C: 11a/n_HT20, 11ac_VHT20),<br>5 510 MHz ~ 5 710 MHz (Band 2C: 11n_HT40, 11ac_VHT40),<br>5 530 MHz ~ 5 690 MHz (Band 2C: 11ac_VHT80) |
| Modulation Technique | DSSS, OFDM, GFSK, $\pi/4$ DQPSK, 8DPSK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Number of Channels   | 79 channel (Bluetooth), 11 channel (11b/g/n_HT20),<br>5 channel (Band 3: 11a/n_HT20, 11ac_VHT20),<br>2 channel (Band 3: 11n_HT40, 11ac_VHT40), 1 channel (Band 3: 11ac_VHT80),<br>4 channel (Band 1: 11a/n_HT20, 11ac_VHT20),<br>2 channel (Band 1: 11n_HT40, 11ac_VHT40), 1 channel (Band 1: 11ac_VHT80),<br>4 channel (Band 2A: 11a/n_HT20, 11ac_VHT20),<br>2 channel (Band 2A: 11n_HT40, 11ac_VHT40), 1 channel (Band 2A: 11ac_VHT80),<br>9 channel (Band 2C: 11a/n_HT20, 11ac_VHT20),<br>4 channel (Band 2C: 11n_HT40, 11ac_VHT40), 2 channel (Band 2C: 11ac_VHT80)                                                                                                                                                  |
| Antenna Type         | Chip Antenna (Bluetooth), PCB Antenna (WLAN)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Antenna Gain         | 2 402 MHz ~ 2 480 MHz: 2.29 dB i,<br>2 412 MHz ~ 2 462 MHz: -0.50 dB i,<br>5 180 MHz ~ 5 320 MHz: 2.89 dB i,<br>5 500 MHz ~ 5 720 MHz: 2.51 dB i,<br>5 745 MHz ~ 5 825 MHz: 5.78 dB i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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

#### 1.4. Information of Variant Model

| Model Name          | Bluetooth | WIFI | TMU |
|---------------------|-----------|------|-----|
| ADBB0A9AN (Basic)   | O         | O    | O   |
| ADBB1A9AN (Variant) | O         | O    | X   |

#### 1.5. Test report revision

| Revision | Report number        | Date of Issue | Description |
|----------|----------------------|---------------|-------------|
| 0        | F690501/RF-RTL009720 | 2016.04.21    | Initial     |

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

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

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 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<br>(MHz)                                | Electric Field<br>Strength(V/m) | Magnetic Field<br>Strength<br>(A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | 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 <sup>2</sup>                    | 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 <sup>2</sup>                    | 30           |
| 30 - 300                                                | 27.5                            | 0.073                               | 0.2                                    | 30           |
| 300 – 1 500                                             | -                               | -                                   | f/1500                                 | 30           |
| <b>1 500 – 100 000</b>                                  | -                               | -                                   | <b>1.0</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.

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

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

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## 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

BT

- Maximum tune up tolerance

| Frequency<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power<br>Density<br>at 20 cm (mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 2 402 – 2 480      | 4                                            | 2.29                      | 0.000 847                                          | 1                               |

WLAN (2.4G)

- Maximum tune up tolerance

| Frequency<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power<br>Density<br>at 20 cm (mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 2 412 – 2 462      | 18                                           | -0.50                     | 0.011 187                                          | 1                               |

WLAN (5G)

- Maximum tune up tolerance

| Frequency<br>(MHz) | Output Average<br>Power to Antenna<br>(dB m) | Antenna<br>Gain<br>(dB i) | Power<br>Density<br>at 20 cm (mW/cm <sup>2</sup> ) | Limits<br>(mW/cm <sup>2</sup> ) |
|--------------------|----------------------------------------------|---------------------------|----------------------------------------------------|---------------------------------|
| 5 180 – 5 320      | 14                                           | 2.89                      | 0.009 721                                          | 1                               |
| 5 500 – 5 720      | 14                                           | 2.51                      | 0.008 907                                          | 1                               |
| 5 745 – 5 825      | 14                                           | 5.78                      | 0.018 912                                          | 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>.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

---

**Simultaneous transmission MPE test exclusion**

BT: the ratio is 0.000 847 / 1

WLAN: the ratio is 0.018 912 / 1

Confirm the sum result of individual MPEs ratio is  $\leq 1.0$ ;

$$(0.000\ 847 / 1) + (0.018\ 912 / 1) = 0.019\ 759 \leq 1.0$$

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

---

*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

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

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)