

TEST REPORT

of

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

FCC ID: TQ8-ATC41A8AN

Equipment Under Test : DIGITAL CAR AVN SYSTEM
Model Name : ATC41A8AN
Variant Model Names : AVC41D5AN, ATC40A8AN, ATC43A8AN, ATC44A8AN
Applicant : Hyundai Mobis Co., Ltd.
Manufacturer : Hyundai Mobis Co., Ltd.
Date of Receipt : 2018.01.02
Date of Test(s) : 2018.02.03 ~ 2018.02.07
Date of Issue : 2018.02.09

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

Tested By:



Jinhyoung Cho

Date:

2018.02.09

Technical
Manager:



Jungmin Yang

Date:

2018.02.09

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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>

RTT5041-19(2017.07.10)(0)

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

A4(210 mm x 297 mm)

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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, 15807

-Designation number: KR0150

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

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1.2. Details of Applicant

Applicant : Hyundai Mobis Co., Ltd.

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

Contact Person : Choe, Seung-Hoon

Phone No. : +82 31 260 0098

1.3. Details of manufacturer

Company : Same as applicant

Address : Same as applicant

1.4. Description of EUT

| | |
|----------------------|--|
| Kind of Product | DIGITAL CAR AVN SYSTEM |
| Model Name | ATC41A8AN |
| Variant Model Names | AVC41D5AN, ATC40A8AN, ATC43A8AN, ATC44A8AN |
| 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 dBi |

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1.5. Information of Variant Models

| Model name | | H/W difference |
|----------------|-----------|---------------------|
| Basic model | ATC41A8AN | Basic + OBC WAKE UP |
| Variant models | AVC41D5AN | Basic |
| | ATC40A8AN | Basic |
| | ATC43A8AN | Basic |
| | ATC44A8AN | Basic + OBC WAKE UP |

1.6. Test report revision

| Revision | Report number | Date of Issue | Description |
|----------|----------------------|---------------|-------------|
| 0 | F690501/RF-RTL012355 | 2018.02.09 | 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

Bluetooth

- Maximum tune up tolerance

| 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

| 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 | 25 | 0.89 | 0.077 220 | 0.55 |

CDMA - BC1

- Maximum tune up tolerance

| 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 | 25 | 3.20 | 0.131 441 | 1 |

LTE - Band 4

- Maximum tune up tolerance

| 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 | 25.70 | 1.43 | 0.102 738 | 1 |

LTE - Band 13

- Maximum tune up tolerance

| 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 | 25.70 | 1.48 | 0.103 927 | 0.52 |

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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 dBi 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

LTE Band 13: the ratio is 0.103 927 / 0.52

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

Bluetooth + LTE: $(0.000\ 488 / 1) + (0.103\ 927 / 0.52) = 0.200\ 348 \leq 1.0$

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

Note:

- Between CDMA and LTE, LTE is chosen as worst case.
- CDMA and LTE do not transmit simultaneously.

- End of the Test Report -

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