



TEST REPORT

FCC PART 2.1091

Report Reference No.: CTL1610188601-WI

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| | |
|-----------------------------------|--|
| Product Name | Audio infotainment unit |
| Model/Type reference | 2DF |
| List Model(s) | N/A |
| Trade Mark | N/A |
| FCC ID | 2ACRL2DF |
| Applicant's name | Harman Automotive Electronic Systems (Suzhou) Co., Ltd |
| Address of applicant | No125 Fangzhou Rd, Suzhou SIP, Jiangsu, China |
| Test Firm | Shenzhen CTL Testing Technology Co., Ltd. |
| Address of Test Firm | Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055 |
| Test specification | 47 CFR FCC Part 2 §2.1091 |
| Standard | KDB447498 D01 KDB865664 D02 |
| TRF Originator | Shenzhen CTL Testing Technology Co., Ltd. |
| Master TRF | Dated 2011-01 |
| Date of Receipt | Sep. 19, 2016 |
| Date of Test Date | Sep. 26, 2016–Oct. 10, 2016 |
| Data of Issue | Oct. 10, 2016 |
| Result | PASS |

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TEST REPORT

| | |
|---|--------------------------------|
| Test Report No. : CTL1610188601-WI | Oct. 10, 2016 Date of issue |
|---|--------------------------------|

Equipment under Test : **Audio infotainment unit**

Model /Type : 2DF

Listed Models : N/A

Applicant : **Harman Automotive Electronic Systems (Suzhou) Co., Ltd**

Address : No125 Fangzhou Rd, Suzhou SIP, Jiangsu, China

Manufacturer : **Harman Automotive Electronic Systems (Suzhou) Co., Ltd**

Address : No125 Fangzhou Rd, Suzhou SIP, Jiangsu, China

| | |
|--------------------|---------------|
| Test result | Pass * |
|--------------------|---------------|

*In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

**** Modified History ****

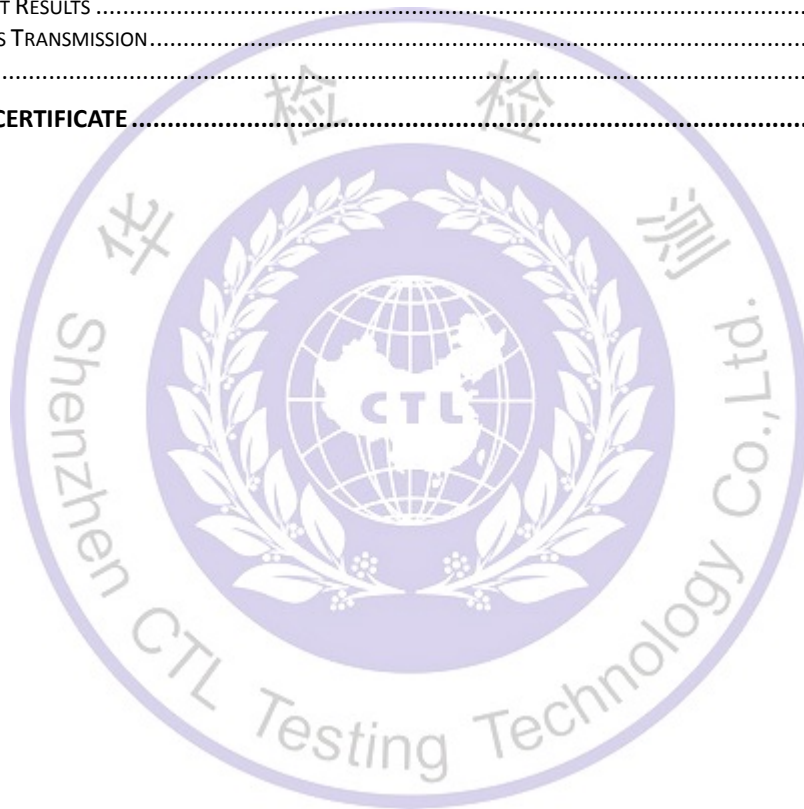
| Revisions | Description | Issued Data | Report No. | Remark |
|-------------|-----------------------------|-------------|------------------|----------|
| Version 1.0 | Initial Test Report Release | 2016-10-18 | CTL1610188601-WF | Tracy Qi |
| | | | | |
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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

[KDB447498 D01 General RF Exposure Guidance v06 \(October 23, 2015\)](#): Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

[FCC Part 2.1091 Radiofrequency Radiation Exposure Evaluation](#): Mobile Devices

[KDB865664 D02 RF Exposure Reporting \(October 23, 2015\)](#): RF Exposure Compliance Reporting and Documentation Considerations

1.2. General Description of EUT

| | |
|----------------------------|---|
| Product Name | Audio infotainment unit |
| Model/Type reference | 2DF |
| Power supply | DC 12.0V from battery |
| Hardware Version | PV Sample |
| Software Version | R10 |
| Product Type | End Product |
| Exposure category | General population/uncontrolled environment |
| Device Type | Mobile Device |
| Bluetooth : | |
| Version: | Bluetooth Core Version 2.1 + EDR |
| Modulation: | GFSK, $\pi/4$ DQPSK, 8DPSK |
| Operation frequency: | 2402MHz~2480MHz |
| Channel number: | 79 |
| Channel separation: | 1MHz |
| Antenna type: | Internal antenna |
| Maximum antenna peak gain: | 0dBi |

Note: For more details, please refer to the user's manual of the EUT.

1.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software (BIOS Control) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and typical mode (hopping mode) for test; we choose Channel 0 / 39 / 78 as default channels.

Operation Frequency :

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 0 | 2402 | 40 | 2442 |
| 1 | 2403 | 41 | 2443 |
| 2 | 2404 | 42 | 2444 |
| 3 | 2405 | 43 | 2445 |
| 4 | 2406 | 44 | 2446 |
| 5 | 2407 | 45 | 2447 |
| 6 | 2408 | 46 | 2448 |
| 7 | 2409 | 47 | 2449 |
| 8 | 2410 | 48 | 2450 |
| 9 | 2411 | 49 | 2451 |
| 10 | 2412 | 50 | 2452 |
| 11 | 2413 | 51 | 2453 |
| 12 | 2414 | 52 | 2454 |
| 13 | 2415 | 53 | 2455 |
| 14 | 2416 | 54 | 2456 |
| 15 | 2417 | 55 | 2457 |
| 16 | 2418 | 56 | 2458 |

| | | | |
|-----------|-------------|-----------|-------------|
| 17 | 2419 | 57 | 2459 |
| 18 | 2420 | 58 | 2460 |
| 19 | 2421 | 59 | 2461 |
| 20 | 2422 | 60 | 2462 |
| 21 | 2423 | 61 | 2463 |
| 22 | 2424 | 62 | 2464 |
| 23 | 2425 | 63 | 2465 |
| 24 | 2426 | 64 | 2466 |
| 25 | 2427 | 65 | 2467 |
| 26 | 2428 | 66 | 2468 |
| 27 | 2429 | 67 | 2469 |
| 28 | 2430 | 68 | 2470 |
| 29 | 2431 | 69 | 2471 |
| 30 | 2432 | 70 | 2472 |
| 31 | 2433 | 71 | 2473 |
| 32 | 2434 | 72 | 2474 |
| 33 | 2435 | 73 | 2475 |
| 34 | 2436 | 74 | 2476 |
| 35 | 2437 | 75 | 2477 |
| 36 | 2438 | 76 | 2478 |
| 37 | 2439 | 77 | 2479 |
| 38 | 2440 | 78 | 2480 |
| 39 | 2441 | | |

1.4. Modifications

No modifications were implemented to meet testing criteria.

1.5. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---------------------|---------|
| Normal Temperature: | 25°C |
| Relative Humidity: | 55 % |
| Air Pressure: | 101 kPa |

1.6. Test Facility

1.6.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and one line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4: 2014, CISPR 22/EN 55022 and CISPR16-1-4 SVSWR requirements.

1.6.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

1.7. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

| Test | Measurement Uncertainty | Notes |
|---|-------------------------|-------|
| Transmitter power conducted | 0.57 dB | (1) |
| Transmitter power Radiated | 2.20 dB | (1) |
| Conducted spurious emission 9KHz-40 GHz | 2.20 dB | (1) |
| Occupied Bandwidth | 0.01ppm | (1) |
| Radiated Emission 30~1000MHz | 4.10dB | (1) |
| Radiated Emission Above 1GHz | 4.32dB | (1) |
| Conducted Disturbance0.15~30MHz | 3.20dB | (1) |

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. MPE Evaluation

2.1. Evaluation method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

2.2. Limits for Population/Uncontrolled Exposure

(B) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm ²) | Averaging Time E ² , H ² or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|---|--|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | F/1500 | 30 |
| 1500-100,000 | | | 1.0 | 30 |

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.3. Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

From the peak EUT RF output power, the minimum mobile separation distance, $d=0.2m$, as well as the maximum gain of the used antenna is 0dBi, the RF power density can be obtained.

2.4. Conducted Power Results

| Test Mode | Channel | Frequency (MHz) | Measured Output Peak Power (dBm) |
|---------------|---------|-----------------|----------------------------------|
| GFSK | 0 | 2402 | 2.328 |
| | 39 | 2441 | 3.151 |
| | 41 | 2480 | 3.519 |
| $\pi/4$ DQPSK | 0 | 2402 | 1.148 |
| | 39 | 2441 | 1.972 |
| | 41 | 2480 | 2.116 |
| 8DPSK | 0 | 2402 | 1.269 |
| | 39 | 2441 | 2.314 |
| | 41 | 2480 | 2.516 |

2.5. Manufacturing tolerance

| GFSK (Peak Power) | | | |
|----------------------------|------|------|------|
| Frequency (MHz) | 2402 | 2441 | 2480 |
| Target (dBm) | 3.0 | 3.0 | 3.0 |
| Tolerance \pm (dB) | 1.0 | 1.0 | 1.0 |
| $\pi/4$ DQPSK (Peak Power) | | | |
| Frequency (MHz) | 2402 | 2441 | 2480 |
| Target (dBm) | 2.0 | 2.0 | 2.0 |
| Tolerance \pm (dB) | 1.0 | 1.0 | 1.0 |
| 8DPSK (Peak Power) | | | |
| Frequency (MHz) | 2402 | 2441 | 2480 |
| Target (dBm) | 2.0 | 2.0 | 2.0 |
| Tolerance \pm (dB) | 1.0 | 1.0 | 1.0 |

2.6. Measurement Results

| Mode | Frequency (MHz) | Output power (Including tune-up tolerance) (dBm) | Output power (mW) | Antenna Gain (dBi) | Antenna Gain (linear) | MPE (mW/cm ²) | MPE Limits (mW/cm ²) |
|---------------|-----------------|--|-------------------|--------------------|-----------------------|---------------------------|----------------------------------|
| GFSK | 2402 | 4.0000 | 2.5119 | 0.0 | 1.0000 | 0.0005 | 1.0000 |
| | 2441 | 4.0000 | 2.5119 | 0.0 | 1.0000 | 0.0005 | 1.0000 |
| | 2480 | 4.0000 | 2.5119 | 0.0 | 1.0000 | 0.0005 | 1.0000 |
| $\pi/4$ DQPSK | 2402 | 3.0000 | 1.9953 | 0.0 | 1.0000 | 0.0004 | 1.0000 |
| | 2441 | 3.0000 | 1.9953 | 0.0 | 1.0000 | 0.0004 | 1.0000 |
| | 2480 | 3.0000 | 1.9953 | 0.0 | 1.0000 | 0.0004 | 1.0000 |
| 8DPSK | 2402 | 3.0000 | 1.9953 | 0.0 | 1.0000 | 0.0004 | 1.0000 |
| | 2441 | 3.0000 | 1.9953 | 0.0 | 1.0000 | 0.0004 | 1.0000 |
| | 2480 | 3.0000 | 1.9953 | 0.0 | 1.0000 | 0.0004 | 1.0000 |

2.7. Simultaneous Transmission

As the sample only with one Bluetooth transmitter modular and only one transmitter antenna, no need consider simultaneous transmit.

2.8. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.



3. Accreditation Certificate



**China National Accreditation Service for Conformity Assessment
LABORATORY ACCREDITATION CERTIFICATE**

(Registration No. CNAS L7497)

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan
District, Shenzhen, Guangdong, China

is accredited in accordance with ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence to undertake the service described in the schedule attached to this certificate.

The scope of accreditation is detailed in the attached schedule bearing the same registration number as above. The schedule form an integral part of this certificate.

Date of Issue: 2016-04-05
Date of Expiry: 2018-02-14
Date of Initial Accreditation: 2015-02-15

Signed on behalf of China National Accreditation Service for Conformity Assessment 

China National Accreditation Service for Conformity Assessment(CNAS) is authorized by Certification and Accreditation Administration of the People' s Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is a signatory of the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) and the Asia Pacific Laboratory Accreditation Cooperation Mutual Recognition Arrangement (APLAC MRA). The validity of the certificate can be checked on CNAS website at <http://www.cnas.org.cn/english/findanaccreditedbody/index.shtml>