

RF Exposure Assessment

Report Reference: MDE_VIS_1916_MPE_01

on

In Vehicle Infotainment

SMART CRONY IVI

FCC ID: NT8-SMARTCRONYIVI

Test Laboratory:

7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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Summary

Type of Report

RF Exposure calculation for the In Vehicle Infotainment SMART CRONY IVI

Applicable FCC and ISED Rules

For RF Exposure:

OET Bulletin 65 Edition 97-01 August 1997
FCC 47 CFR §1.1307
FCC 47 CFR §1.1310

| Report version control | | | |
|------------------------|--------------|-----------------|------------------|
| Rev Version | Release date | Changes | Version validity |
| - | 27.09.2021 | Initial version | Valid |



(responsible for report)

Mr. Imad Hjije

REPORT REFERENCE:

MDE_VIS_1916_MPE_01

Administrative Data:

Testing Laboratory

Company Name: 7layers GmbH
Address: Borsigstr. 11
40880 Ratingen
Germany

Report Template Version: 2018-03-13

Project Data

Responsible for report: Mr. Imad Hjije
Date of Report: 2021-09-27
Testing Period: - (please see referenced test reports)

Applicant Data

Company Name: Visteon Corporation
Address: One Village Center Drive
Van Buren Township, MI, 48111,
U.S.A
Contact Person: Heidi Sepanik, Corporate Secretary

Manufacturer Data

Company Name: please see Applicant data
Address: -
-
-
Contact Person: -

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Test object Data

General Description of Radio Device

| | |
|---|---|
| Kind of Device product description | This system consists of 10.25" TFT display with capacitive touch screen. RF features FM/AM, USB, BT, WiFi, in built GPS Navigation, RVC modes. It consists of a Class AB power amplifier and a DSP tuner for media & radio entertainment. |
| Product name | In Vehicle Infotainment |
| Type | SMART CRONY IVI |
| Declared EUT data by the supplier | |
| Voltage Type | Car battery |
| Voltage Level | 13.5 V DC |
| Antenna / Gain | BT:3.2 dBi / WLAN: 3.5 dBi |
| Tested Modulation Type | BT: GFSK Modulation, 1-DHx packets π/4 DQPSK Modulation, 2-DHx packets 8-DPSK Modulation, 3-DHx packets WLAN: OFDM, BPSK |
| Specific product description for the EUT | SMART CRONY IVI In-vehicle infotainment system that combines entertainment and information delivery for driver and passengers. This system consists of features like AM/FM Radio, GPS, RVC, USB, & BT/WiFi interfaces with 10.25 Inch TFT & Touch screen interface. This Infotainment can allow a driver to perform a number of tasks, such as standard radio and listen to music over USB flash drive or Bluetooth, hands-free phone connections to make phone calls, vehicle voice commands and other types of Interactive audio or video. Heart of the IVI is NXP I.MX8 application is the automotive processor (SOC) and Hero DSP TEF6635 Digital Signal Processor (DSP).DSP acts as an AM/FM receiver and tone control unit. Communication between DSP and SOC is done through I2C, I2S interfaces. |
| EUT ports (connected cables during testing): | Cable Harness including DC USB AM/FM GPS |
| Tested datarates | 1 Mbps, 2 Mbps, 3 Mbps |
| Special software used for testing | VMF Analyser software provided by the Applicant |

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Assessed Radio Devices

| Sample Name | Sample Code | Description |
|------------------|------------------------------|-----------------|
| EUT A | DE1105011aa01 | Radiated Sample |
| Sample Parameter | Value | |
| Serial No. | - | |
| HW Version | 25761 | |
| SW Version | 4.62 | |
| Comment | Sample with integral Antenna | |

| Sample Name | Sample Code | Description |
|------------------|--|------------------|
| EUT F | DE1105011af01 | Conducted Sample |
| Sample Parameter | Value | |
| Serial No. | - | |
| HW Version | 25761 | |
| SW Version | 4.62 | |
| Comment | Sample with temporary external Antenna connector | |

Documents used for assessment supplied to applicant

| Radio technology | Details | Description |
|------------------------|--|--|
| Bluetooth & WLAN 5 GHz | 88W8887A: Marvell chipset supporting IEEE802.11 a/b/g/n/ac + Bluetooth 4.2 | - FCC 15.247 Test report: max. 9.0 dBm conducted - FCC 15.407 Test report: max. 9.5 dBm conducted |

Measured RF Output Power

BT:

Ambient temperature: 25 °C
 Air Pressure: 900 hPa
 Humidity: 40 %
 BT GFSK (1-DH1)

| Band | Channel No. | Frequency [MHz] | Peak Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 0 | 2402 | 8.6 | 21.0 | 12.4 | 11.8 |
| | 39 | 2441 | 8.4 | 21.0 | 12.6 | 11.6 |
| | 78 | 2480 | 8.2 | 21.0 | 12.8 | 11.4 |

BT n/4 DQPSK (2-DH1)

| Band | Channel No. | Frequency [MHz] | Peak Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 0 | 2402 | 9.0 | 21.0 | 12.0 | 12.2 |
| | 39 | 2441 | 8.9 | 21.0 | 12.1 | 12.1 |
| | 78 | 2480 | 7.8 | 21.0 | 13.2 | 11.0 |

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BT 8-DPSK (3-DH1)

| Band | Channel No. | Frequency [MHz] | Peak Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 0 | 2402 | 9.0 | 21.0 | 12.0 | 12.2 |
| | 39 | 2441 | 8.2 | 21.0 | 12.8 | 11.4 |
| | 78 | 2480 | 7.9 | 21.0 | 13.1 | 11.1 |

WLAN:

Ambient temperature: 25 °C
 Air Pressure: 990 hPa
 Humidity: 43 %
 WLAN a-Mode; 20 MHz; 6 Mbit/s

| U-NII-Subband | Ch. No. | Freq. [MHz] | Cond. Power [dBm] | EIRP [dBm] | FCC Cond. Limit [dBm] | Margin [dB] | IC Cond. Limit [dBm] | Margin [dB] | IC EIRP Limit [dBm] | Margin [dB] |
|---------------|---------|-------------|-------------------|------------|-----------------------|-------------|----------------------|-------------|---------------------|-------------|
| 3 | 149 | 5745 | 9.4 | 12.9 | 30.0 | 20.6 | 30.0 | 20.6 | 36.0 | 23.1 |
| | 157 | 5785 | 9.2 | 12.7 | 30.0 | 20.8 | 30.0 | 20.8 | 36.0 | 23.3 |
| | 165 | 5825 | 9.1 | 12.6 | 30.0 | 20.9 | 30.0 | 20.9 | 36.0 | 23.4 |

WLAN n-Mode; 20 MHz; MCS0; SISO

| U-NII-Subband | Ch. No. | Freq. [MHz] | Cond. Power [dBm] | EIRP [dBm] | FCC Cond. Limit [dBm] | Margin [dB] | IC Cond. Limit [dBm] | Margin [dB] | IC EIRP Limit [dBm] | Margin [dB] |
|---------------|---------|-------------|-------------------|------------|-----------------------|-------------|----------------------|-------------|---------------------|-------------|
| 3 | 149 | 5745 | 9.4 | 12.9 | 30.0 | 20.6 | 30.0 | 20.6 | 36.0 | 23.1 |
| | 157 | 5785 | 9.5 | 13.0 | 30.0 | 20.5 | 30.0 | 20.5 | 36.0 | 23.0 |
| | 165 | 5825 | 9.0 | 12.5 | 30.0 | 21.0 | 30.0 | 21.0 | 36.0 | 23.5 |

WLAN n-Mode; 40 MHz; MCS0; SISO

| U-NII-Subband | Ch. No. | Freq. [MHz] | Cond. Power [dBm] | EIRP [dBm] | FCC Cond. Limit [dBm] | Margin [dB] | IC Cond. Limit [dBm] | Margin [dB] | IC EIRP Limit [dBm] | Margin [dB] |
|---------------|---------|-------------|-------------------|------------|-----------------------|-------------|----------------------|-------------|---------------------|-------------|
| 3 | 151 | 5755 | 8.5 | 12.0 | 30.0 | 21.5 | 30.0 | 21.5 | 36.0 | 24.0 |
| | 159 | 5795 | 8.4 | 11.9 | 30.0 | 21.6 | 30.0 | 21.6 | 36.0 | 24.1 |

WLAN ac-Mode; 80 MHz; MCS8; SISO

| U-NII-Subband | Ch. No. | Freq. [MHz] | Cond. Power [dBm] | EIRP [dBm] | FCC Cond. Limit [dBm] | Margin [dB] | IC Cond. Limit [dBm] | Margin [dB] | IC EIRP Limit [dBm] | Margin [dB] |
|---------------|---------|-------------|-------------------|------------|-----------------------|-------------|----------------------|-------------|---------------------|-------------|
| 3 | 155 | 5775 | 2.9 | 6.4 | 30.0 | 27.1 | 30.0 | 27.1 | 36.0 | 29.6 |

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RF Exposure Evaluation

| Standards |
|---|
| OET Bulletin 65 Edition 97-01 August 1997 |

Test limits

As specified in Table 1B of 47 CFR 1.1310 – Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure.

| Frequency range (MHz) | Power density (mW/cm ²) |
|-----------------------|-------------------------------------|
| 300 – 1,500 | f/1500 |
| 1,500 – 100,000 | 1.0 |

Equation OET bulletin 65, page 18, edition 97-01:
$$S = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where:

S = power density

P = power input to the antenna

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

R = distance to the centre of radiation of the antenna

Test Protocol

| Operational Bands | Frequency (MHz) | Antenna Gain (dBi) | G | | | | P | | | S | |
|--------------------|-----------------|--------------------|--|--------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------|---------------------------------|---|---|
| | | | Antenna Gain -numeric- (mW/cm ²) | Output Power -conducted- (dBm) | Duty Cycle correction factor | Max. mean output power (dBm) | Output Power -conducted- (mW) | Output Power (EIRP) (mW) | FCC Limit (mW/cm ²) | Power Density value (mW/cm ²) | Margin to FCC Limit (mW/cm ²) |
| WLAN n-Mode 20 MHz | 5785 | 3.5 | 2.2387 | 9.50 | 0 | 9.50 | 8.91 | 19.95 | 1.0000 | 0.0040 | 0.9960 |
| Bluetooth | 2402 | 3.2 | 2.0893 | 9.00 | 0 | 9.00 | 7.94 | 16.60 | 1.0000 | 0.0033 | 0.9967 |

Considering a Tune up values of max +/- 1dB, the final calculation would be:

| Operational Bands | Frequency (MHz) | Antenna Gain (dBi) | G | | | | P | | | S | |
|--------------------|-----------------|--------------------|--|--------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------|---------------------------------|---|---|
| | | | Antenna Gain -numeric- (mW/cm ²) | Output Power -conducted- (dBm) | Duty Cycle correction factor | Max. mean output power (dBm) | Output Power -conducted- (mW) | Output Power (EIRP) (mW) | FCC Limit (mW/cm ²) | Power Density value (mW/cm ²) | Margin to FCC Limit (mW/cm ²) |
| WLAN n-Mode 20 MHz | 5785 | 3.5 | 2.2387 | 9.50 | 0 | 10.50 | 11.22 | 19.95 | 1.0000 | 0.0050 | 0.9950 |
| Bluetooth | 2402 | 3.2 | 2.0893 | 9.00 | 0 | 10.00 | 10.00 | 16.60 | 1.0000 | 0.0042 | 0.9958 |

<End of Assessment>