

TEST REPORT

FCC MPE Test for VT230SNAN

APPLICANT
HYUNDAI MOBIS CO., LTD.

REPORT NO.
HCT-RF-2007-FI009-R1

DATE OF ISSUE
12 August 2020

Tested by
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**TEST
REPORT**

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VT230SNAN

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Additional Model

-

Applicant

HYUNDAI MOBIS CO., LTD.

203, Teheran-ro, Gangnam-gu, Seoul, 135-977, South Korea

**Eut Type
Model Name**

Car Audio System
VT230SNAN

FCC ID

TQ8-VT230SNAN

Frequency range

2 402 MHz ~ 2 480 MHz (Bluetooth)
2 412 MHz ~ 2 462 MHz (WLAN)
5 180 MHz ~ 5 825 MHz (UNII)

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.



REVISION HISTORY

The revision history for this test report is shown in table.

| Revision No. | Date of Issue | Description |
|--------------|-----------------|--|
| 0 | July 24, 2020 | Initial Release |
| 1 | August 12, 2020 | Licensed Band MPE Revised.(On Page 8~13) |

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

* The report shall not be reproduced except in full(only partly) without approval of the laboratory.



RF Exposure Statement

1. Limit

According to § 1.1310, § 2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

| Frequency range (MHz) | Electric field Strength (V/m) | Magnetic field Strength (A/m) | Power density (mW/cm ²) | Averaging time (minutes) |
|--------------------------|----------------------------------|----------------------------------|--|-----------------------------|
| 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 |
| 300 - 1500..... | | | f/1500 | 30 |
| 1500 - 100.000..... | | | 1.0 | 30 |

F = frequency in MHz

* = Plane-wave equivalent power density

2. Maximum Permissible Exposure Prediction

Prediction of MPE limit at a given distance

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

S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

3. RESULTS

3-1. Bluetooth

| | | |
|---|-------------|--------------------|
| Average output Power at antenna input terminal | 4.000 | dBm |
| Average output Power at antenna input terminal | 2.512 | mW |
| Prediction distance | 20.00 | cm |
| Prediction frequency | 2402 – 2480 | MHz |
| Antenna Gain(typical) | 0.17 | dBi |
| Antenna Gain(numeric) | 1.040 | - |
| Power density at prediction frequency(S) | 0.0005 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 1.0000 | mW/cm ² |

2.1091

| | |
|-----------|------------|
| EIRP | 4.17 (dBm) |
| ERP | 2.02 (dBm) |
| ERP | 0.002 (W) |
| ERP Limit | 3.00 (W) |
| MARGIN | 32.75 (dB) |

3-2. DTS

| | | |
|---|-------------|--------------------|
| Average output Power at antenna input terminal | 10.00 | dBm |
| Average output Power at antenna input terminal | 10.000 | mW |
| Prediction distance | 20.00 | cm |
| Prediction frequency | 2412 – 2462 | MHz |
| Antenna Gain(typical) | 0.83 | dBi |
| Antenna Gain(numeric) | 1.211 | - |
| Power density at prediction frequency(S) | 0.0024 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 1.0000 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 10.83 (dBm) |
| ERP | 8.68 (dBm) |
| ERP | 0.007 (W) |
| ERP Limit | 3.00 (W) |
| MARGIN | 26.09 (dB) |

3-3. UNII

| | | |
|---|-------------|--------------------|
| Average output Power at antenna input terminal | 10.00 | dBm |
| Average output Power at antenna input terminal | 10.000 | mW |
| Prediction distance | 20.00 | cm |
| Prediction frequency | 5180 - 5825 | MHz |
| Antenna Gain(typical) | 2.05 | dBi |
| Antenna Gain(numeric) | 1.603 | - |
| Power density at prediction frequency(S) | 0.0032 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 1.0000 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 12.05 (dBm) |
| ERP | 9.90 (dBm) |
| ERP | 0.010 (W) |
| ERP Limit | 3.00 (W) |
| MARGIN | 24.87 (dB) |

3-4. CDMA BC0

| | | |
|---|---------|--------------------|
| Average output Power at antenna input terminal | 25.70 | dBm |
| Average output Power at antenna input terminal | 371.54 | mW |
| Prediction distance | 20.000 | cm |
| Prediction frequency | 824-849 | MHz |
| Cable Loss | -1.71 | dB |
| Antenna Gain(typical) | 2.80 | dBi |
| Antenna Gain(final : Cable Loss + Antenna Gain) | 1.09 | dBi |
| Antenna Gain(numeric) | 1.285 | - |
| Power density at prediction frequency(S) | 0.0950 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 0.5493 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 26.79 (dBm) |
| ERP | 24.64 (dBm) |
| ERP | 0.29 (W) |
| ERP Limit | 1.50 (W) |
| MARGIN | 7.12 (dB) |



3-5. CDMA BC1

| | | |
|---|-----------|--------------------|
| Average output Power at antenna input terminal | 25.70 | dBm |
| Average output Power at antenna input terminal | 371.54 | mW |
| Prediction distance | 20.000 | cm |
| Prediction frequency | 1850-1910 | MHz |
| Cable Loss | -3.300 | dB |
| Antenna Gain(typical) | 5.23 | dBi |
| Antenna Gain(final : Cable Loss + Antenna Gain) | 1.93 | dBi |
| Antenna Gain(numeric) | 1.560 | - |
| Power density at prediction frequency(S) | 0.1153 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 1.0000 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 27.63 (dBm) |
| ERP | 25.48 (dBm) |
| ERP | 0.353 (W) |
| ERP Limit | 3.00 (W) |
| MARGIN | 9.29 (dB) |

3-6. LTE B4

| | | |
|---|-----------|--------------------|
| Average output Power at antenna input terminal | 25.70 | dBm |
| Average output Power at antenna input terminal | 371.54 | mW |
| Prediction distance | 20.000 | cm |
| Prediction frequency | 1710-1755 | MHz |
| Cable Loss | -3.300 | dB |
| Antenna Gain(typical) | 3.96 | dBi |
| Antenna Gain(final : Cable Loss + Antenna Gain) | 0.66 | dBi |
| Antenna Gain(numeric) | 1.164 | - |
| Power density at prediction frequency(S) | 0.0860 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 1.0000 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 26.36 (dBm) |
| ERP | 24.21 (dBm) |
| ERP | 0.264 (W) |
| ERP Limit | 3.00 (W) |
| MARGIN | 10.56 (dB) |

3-7. LTE B13

| | | |
|---|---------|--------------------|
| Average output Power at antenna input terminal | 25.70 | dBm |
| Average output Power at antenna input terminal | 371.54 | mW |
| Prediction distance | 20.000 | cm |
| Prediction frequency | 777-787 | MHz |
| Cable Loss | -1.71 | dB |
| Antenna Gain(typical) | 1.38 | dBi |
| Antenna Gain(final : Cable Loss + Antenna Gain) | -0.33 | dBi |
| Antenna Gain(numeric) | 0.927 | - |
| Power density at prediction frequency(S) | 0.0685 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 0.5180 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 25.37 (dBm) |
| ERP | 23.22 (dBm) |
| ERP | 0.21 (W) |
| ERP Limit | 1.50 (W) |
| MARGIN | 8.54 (dB) |

3-8. LTE B5

| | | |
|---|---------|--------------------|
| Average output Power at antenna input terminal | 25.70 | dBm |
| Average output Power at antenna input terminal | 371.54 | mW |
| Prediction distance | 20.000 | cm |
| Prediction frequency | 824-849 | MHz |
| Cable Loss | -1.71 | dB |
| Antenna Gain(typical) | 2.80 | dBi |
| Antenna Gain(final : Cable Loss + Antenna Gain) | 1.09 | dBi |
| Antenna Gain(numeric) | 1.285 | - |
| Power density at prediction frequency(S) | 0.0950 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 0.5493 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 26.79 (dBm) |
| ERP | 24.64 (dBm) |
| ERP | 0.29 (W) |
| ERP Limit | 1.50 (W) |
| MARGIN | 7.12 (dB) |

3-9. LTE B2

| | | |
|---|-----------|--------------------|
| Average output Power at antenna input terminal | 25.70 | dBm |
| Average output Power at antenna input terminal | 371.54 | mW |
| Prediction distance | 20.000 | cm |
| Prediction frequency | 1850-1910 | MHz |
| Cable Loss | -3.300 | dB |
| Antenna Gain(typical) | 5.23 | dBi |
| Antenna Gain(final : Cable Loss + Antenna Gain) | 1.93 | dBi |
| Antenna Gain(numeric) | 1.560 | - |
| Power density at prediction frequency(S) | 0.1153 | mW/cm ² |
| MPE limit for uncontrolled exposure at prediction frequency | 1.0000 | mW/cm ² |

2.1091

| | |
|-----------|-------------|
| EIRP | 27.63 (dBm) |
| ERP | 25.48 (dBm) |
| ERP | 0.353 (W) |
| ERP Limit | 3.00 (W) |
| MARGIN | 9.29 (dB) |

Worst Case: Simultaneous MPE 20cm is

$$5G\ WLAN\ (0.0032) + CDMA\ BC0\ (0.095/0.5493) = 0.1761 < 1$$

$$5G\ WLAN\ (0.0032) + LTE\ B5\ (0.095/0.5493) = 0.1761 < 1$$