

FCC MPE REPORT

Certification

Applicant Name:
HYUNDAI MOBIS CO., LTD.

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

Date of Issue:
October 24, 2018

Test Site/Location:
HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-RF-1809-FC079-R2

FCC ID: TQ8-ATC40S9AN

APPLICANT: HYUNDAI MOBIS CO., LTD.

Model: ATC40S9AN

EUT Type: Car Audio System

Frequency Range: 2402 MHz - 2480 MHz (Bluetooth)
2412 MHz - 2462 MHz (2.4 GHz Band)
5180 MHz - 5825 MHz (5 GHz Band)

The measurements shown in this report were made in accordance with the procedures specified in §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S.C. 853(a)



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Approved by : Jong Seok Lee
Manager of Telecommunication testing center

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1809-FC079	September 14, 2018	- First Approval Report
HCT-RF-1809-FC079-R1	October 17, 2018	- Revised the results
HCT-RF-1809-FC079-R2	October 24, 2018	- Revised the Simultaneous MPE on page 12.

RF Exposure Statement

1. LIMITS

According to §1.1310 and §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 of 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	4.00	dBm
Average output Power at antenna input terminal	2.512	mW
Prediction distance	20.00	cm
Prediction frequency	2402 - 2480	MHz
Antenna Gain(typical)	0.29	dBi
Antenna Gain(numeric)	1.069	-
Power density at prediction frequency(S)	0.00053	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.00	mW/cm ²

2.1091

EIRP	4.29 (dBm)
ERP	2.14 (dBm)
ERP	0.002 (W)
ERP Limit	3.0 (W)
MARGIN	32.63 (dB)

3-2. WLAN DTS Band (802.11b,g,n)

Average output Power at antenna input terminal	11.00	dBm
Average output Power at antenna input terminal	12.589	mW
Prediction distance	20.00	cm
Prediction frequency	2412 - 2462	MHz
Antenna Gain(typical)	-0.70	dBi
Antenna Gain(numeric)	0.851	-
Power density at prediction frequency(S)	0.00213	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.00	mW/cm ²

2.1091

EIRP	10.30 (dBm)
ERP	8.15 (dBm)
ERP	0.007 (W)
ERP Limit	3.0 (W)
MARGIN	26.62 (dB)

3-3. UNII Band 1(802.11a,n,ac)

Average output Power at antenna input terminal	9.00	dBm
Average output Power at antenna input terminal	7.943	mW
Prediction distance	20.00	cm
Prediction frequency	5180 - 5825	MHz
Antenna Gain(typical)	3.51	dBi
Antenna Gain(numeric)	2.244	-
Power density at prediction frequency(S)	0.00355	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.00	mW/cm ²

2.1091

EIRP	12.51 (dBm)
ERP	10.36 (dBm)
ERP	0.011 (W)
ERP Limit	3.0 (W)
MARGIN	24.41 (dB)

3-4. CDMA BC0

Average output Power at antenna input terminal	26.000	dBm
Average output Power at antenna input terminal	398.107	mW
Prediction distance	20.000	cm
Prediction frequency	824-849	MHz
Cable Loss	-1.71	dB
Antenna Gain(typical)	2.800	dBi
Antenna Gain(numeric)	1.905	-
Power density at prediction frequency(S)	0.1018	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5493	mW/cm ²

2.1091

EIRP	27.090 (dBm)
ERP	24.94 (dBm)
ERP	0.31 (W)
ERP Limit	1.50 (W)
MARGIN	6.82 (dB)

3-5. CDMA BC1

Average output Power at antenna input terminal	26.000	dBm
Average output Power at antenna input terminal	398.107	mW
Prediction distance	20.000	cm
Prediction frequency	1850-1910	MHz
Cable Loss	-3.300	dB
Antenna Gain(typical)	5.230	dB
Antenna Gain(numeric)	3.334	-
Power density at prediction frequency(S)	0.12352	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.000	mW/cm ²

2.1091

EIRP	27.930 (dBm)
ERP	25.78 (dBm)
ERP	0.378 (W)
ERP Limit	3.00 (W)
MARGIN	8.99 (dB)

3-6. LTE B4

Average output Power at antenna input terminal	25.000	dBm
Average output Power at antenna input terminal	316.228	mW
Prediction distance	20.000	cm
Prediction frequency	1710-1755	MHz
Cable Loss	-3.300	dB
Antenna Gain(typical)	3.960	dB
Antenna Gain(numeric)	2.489	-
Power density at prediction frequency(S)	0.07324	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.000	mW/cm ²

2.1091

EIRP	25.660 (dBm)
ERP	23.51 (dBm)
ERP	0.224 (W)
ERP Limit	3.00 (W)
MARGIN	11.26 (dB)

3-7. LTE B13

Average output Power at antenna input terminal	25.000	dBm
Average output Power at antenna input terminal	316.228	mW
Prediction distance	20.000	cm
Prediction frequency	777-787	MHz
Cable Loss	-1.710	dB
Antenna Gain(typical)	1.380	dBi
Antenna Gain(numeric)	1.374	-
Power density at prediction frequency(S)	0.0583	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5180	mW/cm ²

2.1091

EIRP	24.670 (dBm)
ERP	22.52 (dBm)
ERP	0.18 (W)
ERP Limit	1.50 (W)
MARGIN	9.24 (dB)

3-8. LTE B5

Average output Power at antenna input terminal	25.000	dBm
Average output Power at antenna input terminal	316.228	mW
Prediction distance	20.000	cm
Prediction frequency	824-849	MHz
Cable Loss	-1.71	dB
Antenna Gain(typical)	2.8	dBi
Antenna Gain(numeric)	1.905	-
Power density at prediction frequency(S)	0.0809	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5493	mW/cm ²

2.1091

EIRP	26.09 (dBm)
ERP	23.94 (dBm)
ERP	0.25 (W)
ERP Limit	1.5 (W)
MARGIN	7.82 (dB)

3-9. LTE B2

Average output Power at antenna input terminal	25.000	dBm
Average output Power at antenna input terminal	316.228	mW
Prediction distance	20.000	cm
Prediction frequency	1850-1910	MHz
Cable Loss	-3.300	dB
Antenna Gain(typical)	5.23	dBi
Antenna Gain(numeric)	3.334	-
Power density at prediction frequency(S)	0.098114	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.000	mW/cm ²

2.1091

EIRP	26.93 (dBm)
ERP	24.78 (dBm)
ERP	0.301 (W)
ERP Limit	3.00 (W)
MARGIN	9.99 (dB)

-> Worst Case: Simultaneous MPE 20cm is

- 5G WLAN (0.00355) +BT (0.00053) + CDMA BC0 (0.1018/0.5493) + LTE B5 (0.0809/0.5493) = 0.336685 < 1
- 5G WLAN (0.00355) +BT (0.00053) + CDMA BC0 (0.1018/0.5493) + LTE B13 (0.0583/0.5180) = 0.301955 < 1