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FCC MPE REPORT

Certification

Applicant Name:
GS Instech Co., Ltd.

Address:
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Date of Issue:
June 18, 2019

Location of test lab:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-RF-1905-FC029-R2

FCC ID: **U88-HOME3000**

APPLICANT: **GS Instech Co., Ltd.**

Model: HOME 3000

EUT Type: Cell Phone Signal Booster

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.

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Engineer of telecommunication testing center

Approved by : Jong Seok Lee
Manager of telecommunication testing center

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1905-FC029	May 22, 2019	- First Approval Report
HCT-RF-1905-FC029-R1	June 12, 2019	- Revised the result. - Added explanation and results for Simultaneous Transmission Operations.
HCT-RF-1905-FC029-R2	June 18, 2019	- 'Antenna gain' to 'Coupled gain', and revised the result according to the changed value.

RF Exposure Statement

1. Limit

- According to § 1.1310 RF exposure is calculated.

Table 1 – Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(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
300-1,500			f/1500	30
1,500-100,000			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 MPE calculation for standalone operations

- Lower 700 MHz – Uplink

Max peak output power at antenna input terminal (dBm)	22.000	dBm
Max peak output power at antenna input terminal (mW)	158.489	mW
Prediction distance	40.00	cm
Prediction frequency	709.112	MHz
Coupled gain (typical)	5.804	dB
Coupled gain (numeric)	3.805	-
Power density at prediction frequency	0.0300	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.4727	mW/cm ²

- Lower 700 MHz – Downlink

Max peak output power at antenna input terminal (dBm)	7.000	dBm
Max peak output power at antenna input terminal (mW)	5.012	mW
Prediction distance	20.00	cm
Prediction frequency	743.500	MHz
Coupled gain (typical)	-10.080	dB
Coupled gain (numeric)	0.098	-
Power density at prediction frequency	0.0001	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.4957	mW/cm ²

- Upper 700 MHz – Uplink

Max peak output power at antenna input terminal (dBm)	22.000	dBm
Max peak output power at antenna input terminal (mW)	158.489	mW
Prediction distance	40.00	cm
Prediction frequency	782.974	MHz
Coupled gain (typical)	5.544	dB
Coupled gain (numeric)	3.584	-
Power density at prediction frequency	0.0283	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5220	mW/cm ²

- Upper 700 MHz – Downlink

Max peak output power at antenna input terminal (dBm)	7.000	dBm
Max peak output power at antenna input terminal (mW)	5.012	mW
Prediction distance	20.00	cm
Prediction frequency	748.500	MHz
Coupled gain (typical)	-11.040	dB
Coupled gain (numeric)	0.079	-
Power density at prediction frequency	0.0001	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.4990	mW/cm ²

- Cellular – Uplink

Max peak output power at antenna input terminal (dBm)	22.000	dBm
Max peak output power at antenna input terminal (mW)	158.489	mW
Prediction distance	40.00	cm
Prediction frequency	828.550	MHz
Coupled gain (typical)	5.544	dB
Coupled gain (numeric)	3.584	-
Power density at prediction frequency	0.0283	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5524	mW/cm ²

- Cellular – Downlink

Max peak output power at antenna input terminal (dBm)	7.000	dBm
Max peak output power at antenna input terminal (mW)	5.012	mW
Prediction distance	20.00	cm
Prediction frequency	891.500	MHz
Coupled gain (typical)	-5.400	dB
Coupled gain (numeric)	0.288	-
Power density at prediction frequency	0.0003	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5943	mW/cm ²

- AWS-1 – Uplink

Max peak output power at antenna input terminal (dBm)	22.000	dBm
Max peak output power at antenna input terminal (mW)	158.489	mW
Prediction distance	40.00	cm
Prediction frequency	1721.790	MHz
Coupled gain (typical)	5.745	dB
Coupled gain (numeric)	3.754	-
Power density at prediction frequency	0.0296	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

- AWS-1 – Downlink

Max peak output power at antenna input terminal (dBm)	7.000	dBm
Max peak output power at antenna input terminal (mW)	5.012	mW
Prediction distance	20.00	cm
Prediction frequency	2152.500	MHz
Coupled gain (typical)	-1.090	dB
Coupled gain (numeric)	0.778	-
Power density at prediction frequency	0.0008	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

- Broadband PCS – CDMA_Uplink

Max peak output power at antenna input terminal (dBm)	22.000	dBm
Max peak output power at antenna input terminal (mW)	158.489	mW
Prediction distance	40.00	cm
Prediction frequency	1870.930	MHz
Coupled gain (typical)	5.409	dB
Coupled gain (numeric)	3.475	-
Power density at prediction frequency	0.0274	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

- Broadband PCS – Downlink

Max peak output power at antenna input terminal (dBm)	7.000	dBm
Max peak output power at antenna input terminal (mW)	5.012	mW
Prediction distance	20.00	cm
Prediction frequency	1962.110	MHz
Coupled gain (typical)	0.630	dB
Coupled gain (numeric)	1.156	-
Power density at prediction frequency	0.0012	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

3.2 MPE calculation for simultaneous transmission operations

- Lower 700 MHz – Uplink

Max peak output power at antenna input terminal (dBm)	23.000	dBm
Max peak output power at antenna input terminal (mW)	199.526	mW
Prediction distance	40.00	cm
Prediction frequency	709.112	MHz
Coupled gain (typical)	5.804	dB
Coupled gain (numeric)	3.805	-
Power density at prediction frequency	0.0378	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.4727	mW/cm ²

- Upper 700 MHz – Uplink

Max peak output power at antenna input terminal (dBm)	23.000	dBm
Max peak output power at antenna input terminal (mW)	199.526	mW
Prediction distance	40.00	cm
Prediction frequency	782.974	MHz
Coupled gain (typical)	5.544	dB
Coupled gain (numeric)	3.584	-
Power density at prediction frequency	0.0356	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5220	mW/cm ²

- 700 MHz Band – Downlink

Max peak output power at antenna input terminal (dBm)	5.000	dBm
Max peak output power at antenna input terminal (mW)	3.162	mW
Prediction distance	20.00	cm
Prediction frequency	743.500	MHz
Coupled gain (typical)	-10.080	dB
Coupled gain (numeric)	0.098	-
Power density at prediction frequency	0.0001	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.4957	mW/cm ²

- Cellular – Uplink

Max peak output power at antenna input terminal (dBm)	23.000	dBm
Max peak output power at antenna input terminal (mW)	199.526	mW
Prediction distance	40.00	cm
Prediction frequency	828.550	MHz
Coupled gain (typical)	5.544	dB
Coupled gain (numeric)	3.584	-
Power density at prediction frequency	0.0356	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5524	mW/cm ²

- Cellular – Downlink

Max peak output power at antenna input terminal (dBm)	5.000	dBm
Max peak output power at antenna input terminal (mW)	3.162	mW
Prediction distance	20.00	cm
Prediction frequency	891.500	MHz
Coupled gain (typical)	-5.400	dB
Coupled gain (numeric)	0.288	-
Power density at prediction frequency	0.0002	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	0.5943	mW/cm ²

- AWS-1 – Uplink

Max peak output power at antenna input terminal (dBm)	23.000	dBm
Max peak output power at antenna input terminal (mW)	199.526	mW
Prediction distance	40.00	cm
Prediction frequency	1721.790	MHz
Coupled gain (typical)	5.745	dB
Coupled gain (numeric)	3.754	-
Power density at prediction frequency	0.0373	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

- AWS-1 – Downlink

Max peak output power at antenna input terminal (dBm)	5.000	dBm
Max peak output power at antenna input terminal (mW)	3.162	mW
Prediction distance	20.00	cm
Prediction frequency	2152.500	MHz
Coupled gain (typical)	-1.090	dB
Coupled gain (numeric)	0.778	-
Power density at prediction frequency	0.0005	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

- Broadband PCS – Uplink

Max peak output power at antenna input terminal (dBm)	23.000	dBm
Max peak output power at antenna input terminal (mW)	199.526	mW
Prediction distance	40.00	cm
Prediction frequency	1870.930	MHz
Coupled gain (typical)	5.409	dB
Coupled gain (numeric)	3.475	-
Power density at prediction frequency	0.0345	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

- Broadband PCS – Downlink

Max peak output power at antenna input terminal (dBm)	5.000	dBm
Max peak output power at antenna input terminal (mW)	3.162	mW
Prediction distance	20.00	cm
Prediction frequency	1962.110	MHz
Coupled gain (typical)	0.630	dB
Coupled gain (numeric)	1.156	-
Power density at prediction frequency	0.0007	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm ²

- Uplink

Band	MPE Ratio (Power density / Limit)	Sum of MPE Ratio	
Lower 700 MHz	0.0799	0.2842	≤ 1
Upper 700 MHz	0.0681		
Cellular	0.0644		
Broadband PCS	0.0373		
AWS-1	0.0345		

* Note

1. The result of each band was applied to the worst value.
2. MPE ratios are calculated as

$$[(\text{Power density1} / \text{MPE Limit}) + (\text{Power density2} / \text{MPE Limit}) + \dots] \leq 1$$

- Downlink

Band	MPE Ratio (Power density / Limit)	Sum of MPE Ratio	
700 MHz	0.0001	0.0016	≤ 1
Cellular	0.0003		
Broadband PCS	0.0005		
AWS-1	0.0007		

* Note

1. The result of each band was applied to the worst value.
2. MPE ratios are calculated as

$$[(\text{Power density1} / \text{MPE Limit}) + (\text{Power density2} / \text{MPE Limit}) + \dots] \leq 1$$