

## RF EXPOSURE EVALUATION

### 1. PRODUCT INFORMATION

Product Description	HUB
Model Name	HUB 3.0
FCC ID	2ALNV-HUB30

### 2. EVALUATION METHOD AND LIMIT

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons.

#### LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE

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

\*Note:

1. f= Frequency in MHz \* Plane-wave Equivalent Power Density
2. The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirement for mobile and portable transmitters.

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

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

### 3. CALCULATION

A minimum test separation distance  $\geq 25$  cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 25 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated.

#### GPRS 850

Test Mode	Frequency ( MHz)	Output Power ( dBm)	Output Power ( mW)	Antenna Gain (dBi)	Antenna Gain (Linear)	Power Density ( mW/cm <sup>2</sup> )	Power Density Limit ( mW/cm <sup>2</sup> )
GPRS 850	824.2	32.03	1595.88	2.0	1.58	0.3222	0.5495
	836.6	32.12	1629.30	2.0	1.58	0.3290	0.5577
	848.8	<b>32.14</b>	1636.82	2.0	1.58	0.3305	0.5659

#### GPRS 1900

Test Mode	Frequency ( MHz)	Output Power ( dBm)	Output Power ( mW)	Antenna Gain (dBi)	Antenna Gain (Linear)	Power Density ( mW/cm <sup>2</sup> )	Power Density Limit ( mW/cm <sup>2</sup> )
GPRS 850	1850.2	31.44	1393.16	2.0	1.58	0.2813	1.0
	1880	<b>31.65</b>	1462.18	2.0	1.58	0.2952	1.0
	1909.8	31.47	1402.81	2.0	1.58	0.2832	1.0

### UMTS Band V

Test Mode	Frequency ( MHz)	Output Power ( dBm)	Output Power ( mW)	Antenna Gain (dBi)	Antenna Gain (Linear)	Power Density ( mW/cm <sup>2</sup> )	Power Density Limit ( mW/cm <sup>2</sup> )
WCDMA850 AMR	826.4	<b>23.07</b>	202.77	2	1.58	0.0409	0.5509
	836.4	22.54	179.47	2	1.58	0.0362	0.5576
	846.6	22.26	168.27	2	1.58	0.0340	0.5644

### UMTS Band II`

Test Mode	Frequency ( MHz)	Output Power ( dBm)	Output Power ( mW)	Antenna Gain (dBi)	Antenna Gain (Linear)	Power Density ( mW/cm <sup>2</sup> )	Power Density Limit ( mW/cm <sup>2</sup> )
WCDMA1900 AMR	1852.4	23.05	201.84	2	1.58	0.0408	1.0
	1880	23.64	231.21	2	1.58	0.0467	1.0
	1907.6	<b>23.69</b>	233.88	2	1.58	0.0472	1.0

### WIFI

Test Mode	Frequency ( MHz)	Output Power ( dBm)	Output Power ( mW)	Antenna Gain (dBi)	Antenna Gain (Linear)	Power Density ( mW/cm <sup>2</sup> )	Power Density Limit ( mW/cm <sup>2</sup> )
802.11b	2462	17.61	57.68	2	1.58	0.0116	1.0
802.11g	2437	17.46	55.72	2	1.58	0.0112	1.0
802.11n20	2437	17.32	53.95	2	1.58	0.0109	1.0
802.11n40	2452	14.59	28.77	2	1.58	0.0091	1.0

Simultaneous transmission of 802.11b(2462MHz) and GPRS 850 (848.8MHz):

	Numeric	Output power (mW)	Power Density ( mW/cm <sup>2</sup> )	Power Density Limit ( mW/cm <sup>2</sup> )
GRPS (848.8MHz)	1.58	1636.82	0.3305	0.5659
802.11 b (2462MHz)	1.58	57.68	0.0116	1.0

GPRS Antenna Gain:2.0dBi(Numeric 1.58) ,  $\pi=3.14$

WIFI 802.11b(2462MHz) Antenna Gain:2.0dBi(Numeric 1.58),  $\pi=3.14$

We can calculate the power density is  $0.3305 \text{ mW/cm}^2 < 0.5659 \text{ mW/cm}^2$

Note:

1. Only the worst case was recorded in the test report.