RF Exposure Evaluation for HL7518 Wireless Module as a Mobile Device

In this application we seek modular approval to the HL7518 wireless module for use in mobile configuration. We have concluded that the HL7518 wireless module will comply with the FCC rules on RF exposure for mobile devices if the antenna gain does not exceed 6 dBi in LTE Band 4 and 9 dBi in LTE Band 13. The following analysis will demonstrate such compliance.

1. RF Exposure Limits and Equations

RF Exposure Limits:

According to FCC OET Bulletin 65 Supplement C, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1307.

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (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

Table 1 : Limits for Maximum Permissible Exposure (MPE)

Equations:

Power density is given by :

S = EIRP / (4 * Pi * D^2)

where

S = Power density (mW/cm^2)
EIRP = Equivalent Isotropic Radiated Power (mW)
D = Separation distance (cm)

2. Power Density Calculations

The power density calculations for HL7518 at an exposure minimum separation distance of 20cm are shown in Table 2.

For frequency dependent limit, the lowest transmitter frequency was used to represent the lowest MPE limit in this analysis (eg. @777MHz Power Density Limit = 777/1500 = 0.518mW/cm^2)

Frequency (MHz)	**Maximum Conducted Power (dBm)**	**Maximum Antenna Gain (dBi)**	**Duty Cycle**	**Average EIRP (dBm)**	**Average EIRP (mW)**	**Power Density @ 20cm (mW/cm^2)**	**FCC MPE Limit (mW/cm^2)**
777 - 787	24.0	9.0	1.0	33.0	1995.262	**0.397**	0.518
1710 - 1755	24.0	6.0	1.0	30.0	1000.000	**0.199**	1.000

Table 2 : Power Density Calculation Results at 20cm Separation Distance

The calculation above demonstrates that power density at 20cm separation distance is below the FCC MPE limits.