SAR evaluation

FCC ID: 2AACS-ALU210

MPE Calculation Method

$E\ (V/m) = (30*P*G)^{0.5}/d$

Power Density: $Pd\ (W/m2) = E^2/377$

E = Electric Field (V/m)

P = Peak RF output Power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$Pd = (30*P*G) / (377*d^2)$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

Calculated WIFI Result and Limit (WORSE CASE IS AS BELOW)

Antenna Gain (Numeric)	Peak Output Power (mW)	Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)	Test Result
4.63 （2.904dBi）	107.15 （20.30dBm）	0.0619	1	Compiles

Note:

Antenna Gain: 1.62dBi (2.4G Band)

Assembly Antenna Gain: 4.63dBi

Assembly Antenna Gain (Numeric): 2.904dBi

ERP=20.30+4.63-2.15=22.78dBm(189.67mW)

WIFI 2.4G band and 5G band cannot transmit Simultaneously

Calculated Bluetooth Result and Limit (WORSE CASE IS AS BELOW)

$eirp = pt \times gt = (EXd)^2/30$

where:

pt = transmitter output power in watts,

gt = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m, --- $10^{((dBuV/m)/20)}/10^6$

d = measurement distance in meters (m)---3m

So $pt = (EXd)^2/(30 \times gt)$

Ant gain =1.48dBi so Ant numeric gain= 1.406

Field strength =86.72dBμV/m @3m@2402MHz

So Pt={[$10^{(86.72/20)}$/10^6 x3]^2/(30x1.406)}x1000 mW = 0.1003mW

Antenna Gain (Numeric)	Peak Output Power (mW)	Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)	Test Result
1.48（1.406dBi）	0.1003 （-9.99dBm）	0.00003	1	Compiles

Note:
Antenna Gain: 1.48dBi (2.4G Band)
Assembly Antenna Gain (Numeric): 1.406dBi
ERP=-9.99-2.15=-12.14dBm(0.06mW)
BT BDR/EDR and BLE cannot transmit Simultaneously

$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}}$ =107.15/3060 +0.1003/3060=0.03505

$\sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}}$ =(189.67+0.06)/3060 =0.06200

$\sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k}$ =（0.0619+0.00003）/1=0.06193

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

0.03505+0.06200+0.06193=0.15898<1