RF EXPOSURE EVALUATION

KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies v06.

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

EUT Specification

FCC ID	2A6HJ-CT9E
EUT	CRYSTAL TOUCH KEYPAD TERMINAL
Frequency band (Operating)	☒ BT: 2.402GHz ~ 2.480GH ☒ WLAN: 2.412GHz ~ 2.462GHz ☐ RLAN: 5.180GHz ~ 5.240GHz ☐ RLAN: 5.260GHz ~ 5.320GHz ☐ RLAN: 5.500GHz ~ 5.700GHz ☐ RLAN: 5.745GHz ~ 5.825GHz ☒ Others: 125kHz; 13.56MHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others ___
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm2) ☒ General Population/Uncontrolled exposure (S=1mW/cm2)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Antenna gain (Max)	BLE: 3.16dBi WiFi 2.4G: 3.16dBi
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
1.34-30	824/f	2.19/f	*(180/f²)	30
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: Pd=(Pout*G)\(4*pi*R2)

Where

Pd= Power density in mW/cm²

Pout=output power to antenna in Mw

G= gain of antenna in linear scale

Pi=3.1416

R= distance between observation point and center of the radiator in cm

Pd the limit of MPE, 1mW/cm2. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Max Measurement Result

Channel Frequency (GHz)	Max Electric field strength (dBuV/@3m)	Max Electric field strength (dBuV/@0.2m)	Max Electric field strength ((V/m@0.2m)	Electric field strength Limits ((V/m@0.2m)
0.01356	52.09	99.13	0.0905	60.767

Operating Mode	Measured Power	Tune up tolerance	Max. Tune up Power	Max. Tune up Power	Antenna Gain	Antenna Gain in linear	Power density at 20cm	Power density Limits
	(dBm)	(dBm)	(dBm)	(mW)	(dBi)	(Numerical value)	(mW/ cm^2)	(mW/cm^2)
BLE	0.52	0.52 ±1	1.52	1.4191	3.16	2.0701	0.0006	1
WiFi 2.4G	14.24	14.24 ±1	15.24	33.4195	3.16	2.0701	0.0138	1
125kHz	-31.348	-31.348 ±1	-30.348	0.0009	/	1.0000	0.00000018	1

$$E = EIRP - 20\log D + 104.8$$

where:

E = electric field strength in dBμV/m,

$EIRP$ = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

$EIRP = E - 104.8 + 20\log D = 63.91 \quad -104.8 + 20\log 3 = \quad -31.348$ dBm

No.	Applicable Simultaneous Transmission
1.	BLE+WiFi 2.4G+NFC
2.	BLE+WiFi 2.4G+125kHz

The Maximum simultaneous transmission for BLE+WiFi 2.4G+NFC:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$= S_{BLE}/S_{limit} + S_{WiFi\ 2.4G}/S_{limit} + S_{NFC}/S_{limit}$

$= 0.0006/1 + 0.0138/1 + 0.0905/60.767$

$= 0.01589$

< 1.0

Result: No Standalone SAR test is required.

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