RF EXPOSURE EVALUATION

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 KDB 447498 D01 V06 and §1.1307(b)
CFR Title 47 §2.1091(b): (b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC ID: **2ABC5-E0129**

EUT Specification

EUT	**Smart Digital Calendar**
Frequency band (Operating)	☒WLAN: 2.412GHz ~ 2.462GHz ☒WLAN: 5.18GHz ~ 5.24GHz ☒WLAN: 5.745GHz ~ 5.825GHz ☒Others: 2.402GHz~2.480GHz BT ☐NFC: 13.56MHz ☐RFID: 125kHz
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
Evaluation applied	☒MPE Evaluation ☐SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

TABLE 1 TO § 1.1310(E)(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)
(I) 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
(II) 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.*

Note: Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m.AKDB inquiry is required to determine the applicable exposure limits below 100 kHz.

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

Where
Pd= Power density in mW/cm^2
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.

Measurement Result

BT worst case:

Operating Mode	Channel Frequency (MHz)	Measured Power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
GFSK	2480	8.24	8.24±1	9.24	1.76	0.0025	1

BLE worst case:

Operating Mode	Channel Frequency (MHz)	Measured Power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
2M	2402	-0.19	-0.19±1	0.81	1.76	0.0004	1

2.4GHz WiFi worst case:

Operating Mode	Channel Frequency (MHz)	Measured Power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
802.11ax (HEW20)	2462	14.65	14.65±1	15.65	1.76	0.0110	1

5.1GHz WiFi worst case:

Operating Mode	Channel Frequency (MHz)	Measured Power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
802.11ac (VHT40)	5190	10.65	10.65±1	11.65	2.24	0.0049	1

5.8GHz WiFi worst case:

Operating Mode	Channel Frequency (MHz)	Measured Power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
802.11ax (HEW20)	5825	9.66	9.66±1	10.66	2.24	0.0039	1

Evaluate the condition of different modules work simultaneously

The requirement of Simultaneous Transmission evaluation has also been considered and has complied with the following conditions of the worst case:

MPE1/Limit1 + MPE2/Limit2 +…… ≤ 1

Thus,

0.0025/1 + 0.0110/1 + 0.0049/1 + 0.0039/1

(BT/BLE) (2.4G WiFi) (5.1G WiFi) (5.8G WiFi)

= 0.0223 ≤ 1

The worst-case situation is 0.0789, which is less than “1”. This confirmed that the device comply with KDB 447498 D01 V06 Power limit.