RF Exposure Evaluation

1. RF EXPOSURE EVALUATION METHOD

According to KDB 447498 D01 General RF Exposure Guidance v06, unless specifically required by the *published RF exposure KDB procedures*, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding *SAR Test Exclusion Threshold* condition(s), listed below, is (are) satisfied.

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)]

≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, where

f(GHz) is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation

The result is rounded to one decimal place for comparison

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

EUT	Electronic bicycle derailleur
Frequency band (Operating)	☒ BLE(1M):2402-2480MHz (FCC Part 15.247); ☐ Other:
Device category	☒ Portable (<20cm separation) ☐ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure(S=1mW/cm^2)
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power	BLE(1M): -0.16dBm
Antenna gain (Max)	5.6dBi
Evaluation applied	☐ MPE Evaluation ☒ SAR Evaluation

2. SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,where
f(GHz) is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison
The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

3. Conducted & Radiated Power Result

3.1 15.247 BLE Mode – Conducted Power (for Reference)

BLE (1M)					
Mode	Frequency	Measured Conducted output power	Target power		Max Tune-up Power
	(MHz)	(dBm)	(dBm)	(dB)	(dBm)
GFSK 1M	2402	-1.59	-1	± 1	0
	2440	-0.77	0	± 1	1
	2480	-0.16	0	± 1	1

4. SAR Exclusion Evaluation

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR.

BLE Mode (FCC Part 15.247)

Mode	Frequency	Max Tune-up Power	Max Tune-up Power	min. test separation distance	[√f(GHz)]	Result	Limit
	(MHz)	(dBm)	(mW)	(mm)			
BLE GFSK (1M)	2480	1	1.259	5	1.575	0.397	3.0

Conclusion: SAR test is not required.

----------*End of RF Exposure Evaluation* ----------