FCC RF Exposure Evaluation

1. Product Information

Product name	:	Three-mode mechanical keyboard Attended
Test Model	:	MKBi83
Additional Model No.	:	MKBa83, MKBc83, MKBd83, MKBe83, MKBf83, MKBg83, MKBh83, MKBj83, MKBk83
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Power Supply	:	Input: DC 5V, 1A DC 3.7V by Rechargeable Li-ion Battery, 3000mAh
Hardware Version	:	V1.0
Software Version	:	V105
Bluetooth Frequency Range	:	2402MHz~2480MHz
Channel Number	:	79 channels for Bluetooth V5.2 (DSS) 40 channels for Bluetooth V5.2 (DTS)
Channel Spacing	:	1MHz for Bluetooth V5.2 (DSS) 2MHz for Bluetooth V5.2 (DTS)
Modulation Type	:	GFSK for Bluetooth V5.2(DSS) GFSK for Bluetooth V5.2 (DTS)
Bluetooth Version	:	V5.2
Antenna Description	:	PCB Antenna, 1.58dBi(Max.)
2.4G Frequency Range	:	2402MHz~2479MHz
Channel Number	:	78 channels
Modulation Type	:	GFSK
Antenna Description	:	PCB Antenna, 1.58dBi(Max.)
Exposure category	:	General population/uncontrolled environment
EUT Type	:	Production Unit
Device Type	:	Portable Device

2. Evaluation method and Limit

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1 Standalone SAR test exclusion considerations: “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, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.22 The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform

requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.“

[(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
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

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 according to f) in section 4.1 is applied to determine SAR test exclusion.

When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.

a) The [∑ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + [∑ of MPE ratios] is ≤ 1.0.

b)The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04, and the [∑ of MPE ratios] is ≤ 1.0.

3. Refer Evaluation Method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

FCC KDB publication 447498 D01 General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.

FCC CFR 47 part2 2.1093: Radiofrequency radiation exposure evaluation: portable devices

4. Conducted Power Results

<BT>

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	3.96
	39	2441	4.28
	78	2480	3.52

<BT LE>

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	0	2402	2.95
	19	2440	3.31
	39	2480	2.51

<2.4G>

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK	1	2402	1.98
	45	2446	2.13
	78	2479	1.58

5. Manufacturing Tolerance

<BT>

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	3.0	4.0	3.0
Tolerance ±(dB)	1.0	1.0	1.0

<BT LE>

GFSK (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	2.0	3.0	2.0
Tolerance ±(dB)	1.0	1.0	1.0

<2.4G>

GFSK (Peak)			
Channel	Channel 1	Channel 45	Channel 78
Target (dBm)	1.0	2.0	1.0
Tolerance ±(dB)	1.0	1.0	1.0

6. Evaluation Results

6.1 Standalone Evaluation

Band/Mode		Frequency (GHz)	Antenna Distance (mm)	RF output power		SAR Test Exclusion Threshold	SAR Test Exclusion
				dBm	mW		
BT	GFSK	2.441	5	5.0	3.1623	0.9881< 3.0	Yes
BT LE	GFSK	2.440	5	4.0	2.5119	0.7847< 3.0	Yes
2.4G	GFSK	2.446	5	3.0	1.9953	0.6241< 3.0	Yes

Remark:

1. Output power including tune up tolerance;

2. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.

6.2 Simultaneous Transmission for SAR Exclusion

The sample support one modular and Comes with 3 functions, but they can't fire at the same time. No need consider simultaneous transmission.

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

.....THE END OF REPORT.....