

Standalone SAR test exclusion considerations(Bluetooth-Module 0)

March 27, 2018

- Device category = ☒ Portable device ☐ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 2441 MHz
- Min. test separation distance = 30 mm
- Max. Antenna Gain = 0.3 dBi
- Max. power with turn-up tolerance = 10.00 dBm = 10.0 mW (Typical Power = Max. 10.00 dBm)

Note. The minimum separation distance between antenna and user is 30mm.

Exact antenna dimensions and separation distances are shown in the "Attestation letter" in the FCC filing.

Please refer to the operation descriptoin for Max.tune-up power.

KDB 447498 D01 clasue 4.3.1 Step 1) SAR test exclusion thresholds for 100MHz to 6GHz at test separationn distances ≤ 50 mm

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1g SAR and ≤ 7.5 for 10g extremity SAR

$$= [(10\text{mW} / 30\text{mm})] \times [\sqrt{2.441\text{GHz}}] = 0.521$$

Note. The calculation result was rounded to one decimal place for comparison.

→ *SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.*

Standalone SAR test exclusion considerations(BLE-Module 0)

March 27, 2018

- Device category = ☒ Portable device ☐ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 2441 MHz
- Min. test separation distance = 30 mm
- Max. Antenna Gain = 0.3 dBi
- Max. power with turn-up tolerance = 3.00 dBm = 2.0 mW (Typical Power = Max. 3.00 dBm)

Note. The minimum separation distance between antenna and user is 30mm.

Exact antenna dimensions and separation distances are shown in the "Attestation letter" in the FCC filing.

Please refer to the operation descriptoin for Max.tune-up power.

KDB 447498 D01 clasue 4.3.1 Step 1) SAR test exclusion thresholds for 100MHz to 6GHz at test separationnn distances ≤ 50 mm

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1g SAR and } \leq 7.5 \text{ for 10g extremity SAR}$$

$$= [(2\text{mW} / 30\text{mm})] \times [\sqrt{2.441\text{GHz}}] = 0.104$$

Note. The calculation result was rounded to one decimal place for comparison.

→ *SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.*

Standalone SAR test exclusion considerations(Bluetooth-Module 1)

March 27, 2018

- Device category = ☒ Portable device ☐ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 2441 MHz
- Min. test separation distance = 30 mm
- Max. Antenna Gain = 0.52 dBi
- Max. power with turn-up tolerance = 17.50 dBm = 56.3 mW (Typical Power = Max. 17.50 dBm)

Note. The minimum separation distance between antenna and user is 30mm.

Exact antenna dimensions and separation distances are shown in the "Attestation letter" in the FCC filing.

Please refer to the operation descriptoin for Max.tune-up power.

KDB 447498 D01 clasue 4.3.1 Step 1) SAR test exclusion thresholds for 100MHz to 6GHz at test separationn distances ≤ 50 mm

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1g SAR and ≤ 7.5 for 10g extremity SAR

$$= [(56.3\text{mW} / 30\text{mm})] \times [\sqrt{2.441\text{GHz}}] = 2.932$$

Note. The calculation result was rounded to one decimal place for comparison.

→ *SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.*

Standalone SAR test exclusion considerations(BLE-Module 1)

March 27, 2018

- Device category = ☒ Portable device ☐ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 2480 MHz
- Min. test separation distance = 30 mm
- Max. Antenna Gain = 0.52 dBi
- Max. power with turn-up tolerance = 3.00 dBm = 2.0 mW (Typical Power = Max. 3.00 dBm)

Note. The minimum separation distance between antenna and user is 30mm.

Exact antenna dimensions and separation distances are shown in the "Attestation letter" in the FCC filing.

Please refer to the operation descriptoin for Max.tune-up power.

KDB 447498 D01 clasue 4.3.1 Step 1) SAR test exclusion thresholds for 100MHz to 6GHz at test separationn distances ≤ 50 mm

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1g SAR and } \leq 7.5 \text{ for 10g extremity SAR}$$

$$= [(2\text{mW} / 30\text{mm})] \times [\sqrt{2.48\text{GHz}}] = 0.105$$

Note. The calculation result was rounded to one decimal place for comparison.

→ SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

• Configurations for simultaneous operations

- Configuration 1: Module 0 (BT) + Module 1 (BT) * The worst case

- Configuration 2: Module 0 (BT) + Module 1 (LE)

- Configuration 3: Module 0 (LE) + Module 1 (BT)

- Configuration 4: Module 0 (LE) + Module 1 (LE)

RF feature	Mode	Transmitting Frequency(MHz)	Test separation distance (mm)	ANT Gain (dBi)	Max. power with tune-up tolerance (dBm)	Max. power with tune-up tolerance (mW)	Standalone SAR value(W/kg)	Sum of SAR value(W/kg)	Requirement (W/kg)
Module 0 (BT)	1Mbps	2441.00	30.0	0.30	10.00	10.0000	0.07	0.46	1.60
Module 1 (BT)	1Mbps	2441.00	30.0	0.52	17.50	56.2341	0.39		

Note. The measurement results comply with the limit per Part 2.1093.

KDB 447498 D01 clause 4.3.2

b) When an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

1) $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$,

for test separation distances $\leq 50 \text{ mm}$; where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distance is $> 50 \text{ mm}$.

Sample Calculation

Standalone SAR value(W/kg)= $[(10\text{mW} / 30\text{mm})] \times [\sqrt{2.441\text{GHz}} / 7.5] = 0.07$

Sum of SAR value(W/kg)= $0.07 + 0.39 = 0.46$

Conclusion : SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required