

SAR test exclusion evaluation compliance requirement

Model no.: SPM-228-PAD

1. KDB 447498 D01 v06 requirement

Standalone SAR test exclusion considerations:

The transmission frequencies of the device are between 100 MHz and 6 GHz. The worst case test separation distance is **5mm**. The Max Conducted Output Power and SAR Test Exclusion Threshold (mW) are listed below:

BLE:

| Transmit frequency (GHz) | Max Conducted Output Power (mW) | SAR Test Exclusion Threshold (mW) |
|--------------------------|---------------------------------|-----------------------------------|
| 2.480 | 3.52 | 23.81 |

2.4GHz WIFI:

| Transmit Frequency (GHz) | Output power (mW) | SAR Test Exclusion Threshold (mW) |
|--------------------------|-------------------|-----------------------------------|
| 2.462 | 8.04 | 23.90 |

5GHz WIFI:

| Transmit Frequency (GHz) | Output power (mW) | SAR Test Exclusion Threshold (mW) |
|--------------------------|-------------------|-----------------------------------|
| 5.825 | 5.81 | 15.54 |

The SAR Test Exclusion Threshold is calculated from:

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

- $f(\text{GHz})$ 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

Simultaneous transmission SAR test exclusion considerations:

KDB 447498 (D01):

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

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

W/kg, for test separation distances ≤ 50 mm;

where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

To determine simultaneous transmission SAR test exclusion, the min. test separation is 5 mm, $x=18.75$ for 10-g SAR:

The estimated 10-g SAR value of BLE is: 0.0592 W/kg

The estimated 10-g SAR value of 2.4GHz WIFI is: 0.1345 W/kg

The estimated 10-g SAR value of 5GHz WIFI is: 0.1495 W/kg

The simultaneously transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion. The ratio is determined by $(\text{SAR}_1 + \text{SAR}_2)^{1.5}/R_i$, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion. When 10-g SAR applies, the ratio must be ≤ 0.10 . SAR1 and SAR2 are the highest reported or estimated SAR values for each antenna in the pair, and R_i is the separation distance in mm between the peak SAR locations for the antenna pair.

For BLE + 2.4GHz WIFI

$$(\text{SAR}_1 + \text{SAR}_2)^{1.5}/R_i = (0.0592+0.1345)^{1.5}/5 = 0.017 < 0.1 \quad (R_i = 5\text{mm})$$

For BLE + 5GHz WIFI

$$(\text{SAR}_1 + \text{SAR}_2)^{1.5}/R_i = (0.0592+0.1495)^{1.5}/5 = 0.019 < 0.1 \quad (R_i = 5\text{mm})$$

According to SAR Exclusion Threshold in KDB 447498 (D01) General RF Exposure Guidance v06, the SAR report is not required.

Test Location:

Intertek Testing Services Shenzhen Ltd. Guangzhou Branch

All tests were performed at:

Room102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China