SAR test exclusion evaluation compliance requirement

Model no.: Identity

1. KDB 447498 D01 v06 requirement

Standalone SAR test exclusion considerations:

NFC:

E (V/m)=$(30*P*G)^{0.5}/d$
E=Electric Field (V/m)
Remark: $E(V/m)=10X^{(dBUV/m)/20}*10^{-6}$
P=Peak RF output Power (W)
G=EUT Antenna numeric gain (numeric)
d= Separation distance between radiator and human body (m)
in the formula above:
(d=3m, 49.5dBuV/m (max described by client),
so EIRP= 0.00002692mW);

The transmission frequencies of the device are below 100 MHz.

In KDB 447498 D01 v06: 4.3.1 Standalone SAR test exclusion considerations:

a) 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*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,[30] where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz

- Power and distance are rounded to the nearest mW and mm before calculation[31]
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds* in step b) 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 4.1 f) is applied to determine SAR test exclusion.

b) 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 (also illustrated in Appendix B):[32]
   1) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·($f_{(MHz)}$/150)]} mW, for 100 MHz to 1500 MHz
   2) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):[33]
   1) For *test separation distances* > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by [1 + log(100/$f_{(MHz)}$)]
   2) For *test separation distances* ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by ½
   3) SAR measurement procedures are not established below 100 MHz.

Formulas as below:

$P \le (3 \times m)/\sqrt{f_{(GHz)}}$ a)

P is the max. power of channel, including tune-up tolerance, mW

m is min.test separation distance, mm

$f_{(GHZ)}$ is the RF channel transmit frequency in GHz

$P \le (3 \times 50)/\sqrt{f_{(GHZ)}} + (m-50) \times f_{(MHZ)}/150$ b)1)

$P \le [(3x50)/\sqrt{0.1} + (m-50)x100/150] \times [1+lg(100/f_{(MHZ)})]$ c)1)

$P \le \{[(3x50)/\sqrt{0.1} + (50-50)x100/150] \times (1+lg100/100)\} \times 1/2$ c)2)

$P \le 442.7mW = ½ \times 474 \times [1+ \log (100/13.56)]$

The Max Conducted Output Power and SAR Test Exclusion Threshold (mW) are listed below:

Transmit frequency (MHz)	Max Output Power (mW)	SAR Test Exclusion Threshold (mW)
13.56	0.00002692mW	442.7

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

Bluetooth:

The product belongs to **standalone portable device** base the FCC rule part 2.1091&2.1093. 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:

Transmit frequency (MHz)	Max Conducted Output Power (mW)	SAR Test Exclusion Threshold (mW)
2402-2480	0.494	9.5

Remark: peak output power were declared by applicant.

The SAR Test Exclusion Threshold is calculated from:

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

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation17

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:

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

The max. power of NFC and Bluetooth are 0.00002692mW, 0.494mW respectively as declared by client, min. test separation is 5 mm, x=7.5 for 1-g SAR:

The estimated 1-g SAR1 value of NFC is: 0.00000008W/kg

The estimated 1-g SAR2 value of Bluetooth is: 0.0207 W/kg

SAR1+ SAR2= 0.02070008W/kg

The EUT estimated 1-g SAR value, the sum result is 0.02070008W/kg, it is lower than 1.6W/kg.

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