Exhibit: RF Exposure – FCC

FCC ID: 2AF3K-SPC1

RF Exposure – FCC

The device can be used for portable applications. The radiating structure is within 20cm from the body of the user. SAR evaluation is applied.

General SAR test exclusion guidance for BLE:

As per FCC KDB 447498 Section 4.3.1 a), the 1-g extremity SAR Test Exclusion Threshold for 100 MHz to 6 GHz at test separation distances ≤ 50 mm is determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] $[\sqrt{f_{(GHz)}}]$ ≤ 3 for 1g SAR

Where:

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

When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied.

SAR Calculations

The EUT transmits in the 2400 - 2483.5 MHz frequency range
The EUT will be evaluated using a separation distance of < 5 mm.

Max. power of channel = 4.17 dBm ≈ **2.61 mW**
Separation distance = **5 mm**
$f_{(GHz)}$ = **2.480 GHz** (worst case frequency)

$[(2.61)/(5)][\sqrt{2.480}]$ = **0.8220 ≈ 0.8 < 3**

Numeric threshold for 1g SAR is met for the 2.4 GHz transmitter.

General SAR test exclusion guidance for NFC:

As per FCC KDB 447498 Section 4.3.1 c) 2), the 1-g extremity SAR Test Exclusion Threshold for frequencies below 100 MHz at test separation distances ≤ 50 mm is determined by:

A)

The power threshold determined by the equation in Section 4.3.1 c) 1) at Distance = 50 mm, and Frequency = 100 MHz multiplied by 0.5.

B)

The power threshold in Section 4.3.1 c) 1) is determined by Power threshold in Section 4.3.1 b) multiplied by [1+log(100/f(MHz))]
Where f(MHz) = 13.56 MHz

C)

The power threshold in Section 4.3.1 b) for frequencies 100 MHz – 1500 MHz is:
[Power allowed at numeric threshold for 50 mm in Section 4.3.1 a)]
+ [Test separation distance – 50mm] x [f(MHz)/150]

D)

Power allowed at a numeric threshold of 3.0 (for 1-g SAR) at 50 mm in Section 4.3.1 a)] is:
[(3.0)/((f(GHz)^0.5)] x [Test separation distance]

SAR Calculations

The EUT transmits at 13.56 MHz frequency.
Therefore, solving the above in reverse sequence:

D)

[3.0/(0.1GHz^0.5)] x [50 mm] = *474.3416 mW*

C)

474.3416 mW + [(50 mm – 50 mm) x (13.56 MHz/150)] = *474.3416 mW*

B)

[474.3416 mW] x [1+log(100/13.56 MHz)] = *885.9470 mW*

A)

$$(885.9470 \text{ mW}) \times (0.5) = \textbf{442.974 mW}$$

The power threshold for 13.56 MHz SAR test exclusion is therefore **443.0 mW**.

The 13.56 MHz power level is -20.46 dBm = 0.009 mW

SAR test exclusion applies for the 13.56 MHz transmitter.

SAR test exclusion guidance for Simultaneous Transmission

As per FCC KDB 447498 Section 4.3.2, SAR test exclusion applies when the sum of the 1-g or 10-g SAR of all simultaneously transmitting antenna are within the SAR limit. When the sum is greater than the SAR limit, the SAR to peak location separation ratio procedure of FCC KDB 447498 Section 4.3.2 c) applies to determine if SAR test exclusion applies.

As per FCC 1.1310 c), the SAR limits for general population/uncontrolled exposure are **0.08 W/kg** for 1-g SAR, and **4 W/kg** for 10-g SAR.

As per FCC KDB 447498 Section 4.3.2 b), when the antennas qualify for standalone SAR test exclusion (demonstrated above), and also transmits simultaneously with other antennas, the standalone SAR value can be estimated (conservatively) according the following formula in FCC KDB 447498 Section 4.3.2 b) 1) for test separation distances ≤ 50 mm. Note that when SAR is estimated, the peak SAR location is assumed to be at the smaller of the feed-point or geometric center of the antenna,.

Estimated SAR
$$= [(\text{max power of channel in mW})/(\text{min test separation distance in mm})]*[((f_{(GHz)})^{0.5})/x]$$

Where x = 7.5 for 1-g SAR, and 18.75 for 10-g SAR

Estimated SAR for BLE

The worst case SAR estimation for BLE occurs using the following parameters. The thickness of the EUT enclosure is used as the minimum test separation distance for worst case calculations:

Max power of channel = 2.61 mW

Min test separation distance = 1.3 mm (thickness of EUT enclosure)

$f_{(GHz)/}$ = 2.4835 GHz

x = 7.5 for 1-g SAR

Estimated SAR for BLE = [(2.61 mW)/(1.3 mm)]*[((2.4835 GHz)$^{0.5}$)/7.5] = **0.422 W/kg**

Estimated SAR for NFC

The worst case SAR estimation for NFC occurs using the following parameters The thickness of the EUT enclosure is used as the minimum test separation distance for worst case calculations:

Max power of channel = 0.00893 mW

Min test separation distance = 1.3 mm (thickness of EUT enclosure)

$f_{(GHz)/}$ = 0.01356 GHz

x = 7.5 for 1-g SAR

Estimated SAR for NFC = [(0.00893 mW)/(1.3 mm)]*[((0.01356 GHz)$^{0.5}$)/7.5)
= **0.000107 W/kg**

Client	Square Inc.	
Product	Wireless card reader model SPC1	
Standard(s)	FCC Part 15 Subpart 15.247:2016 FCC KDB 447498:2015	

Peak Location Separation Ratio Procedure

As the sum of the Estimated SAR values are > the 1-g SAR limit, the peak location separation ratio procedure of FCC KDB 447498 Section 4.3.2 c) must be applied.

If the peak location separation ratio (rounded to 2 decimal digits) for all antenna pairs is ≤ 0.04, 1-g SAR test exclusion applies. If ≤ 0.1, 10-g SAR exclusion applies.

As per FCC KDB 447498 Section 4.3.2 c) the peak location separation ratio is determined by:

$$\text{Peak location separation ratio} = [(SAR_1 + SAR_2)^{1.5}]/[R_i]$$

Where

SAR_1 = estimated SAR values for BLE antenna = 0.422 W/kg

SAR_2 = estimated SAR values for NFC antenna = 0.000107 W/kg

R_i = separation distance between peak SAR locations for antenna pair in mm
= 38.2 mm

Therefore

Peak location separation ratio = $[(0.422 \text{ W/kg} + 0.000107 \text{ W/kg})^{1.5}]/[38.2\text{mm}]$
= **0.007179 ≈ 0.01 < 0.04**.

Therefore 1-g SAR test exclusion applies.