COMMERCIAL-IN-CONFIDENCE

SAR EXCLUSION DOCUMENT

Document 75939449-04 Issue 01

RFID 13.56 MHz Transmitter:

FCC Standalone SAR Test Exclusion Considerations (KDB 447498 D01) Section 4.3.1 c)

<100 MHz – Separation Distance ≤50 mm or Separation Distance >50 mm and <200 mm

The 1g head or body SAR test exclusion thresholds for <100 MHz are determined by the following steps:

Step a) Threshold result from Formula in Section 4.3.1 a);

[(max power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1g SAR.

- $f_{(GHz)}$ 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
- When the maximum test separation distance is < 5 mm, a distance of 5 mm is applied.

Step b) requires formula to be re-arranged to give power allowed at numeric threshold at 50 mm test separation distance and Step c) requires $f_{(GHz)}$ to be set to 100 MHz (0.1 GHz) giving:

Step a) Power threshold = (3 * 50) / ($\sqrt{0.1}$) = 474.3 mW

Step b) Threshold result from Formula in Section 4.3.1 b) 1);

{[Power allowed at numeric threshold for 50 mm {Formula Step A}]} + [(test separation distance – 50 mm)·($f_{(MHz)}$/150)]} mW

- f_{MHz} is the RF channel transmit frequency in MHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison

Power threshold = 474.3 mW + [(test separation distance – 50 mm)·($f_{(MHz)}$/150)]} mW

Step c) requires $f_{(MHz)}$ to be set to 100 MHz giving:

Step b) Power threshold = 474.3 mW + [(test separation distance – 50 mm)·(100)/150)] mW

Approved by -----------------------------------   **Date** 12 November 2018 ....

Matt Russell
Authorised Signatory

DOCUMENT   75939499-04 Issue 01   CONTINUATION PAGE

Step c) 1) Threshold result from Formula in Section 4.3.1 c) 1); >50 mm and <200 mm

Threshold result from Formula in Section 4.3.1 b) 1) is multiplied by $[1+\log(100/f_{MHz})]$

Power threshold = $[474.3 \text{ mW} + (\text{test separation distance} – 50 \text{ mm})\cdot (100)/150)] * [1+\log(100/f_{MHz})]$ mW

- f_{MHz} is the RF channel transmit frequency in MHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison

SAR Exclusion Result (1 g Head or Body)

Frequency (MHz)	Maximum Power (Tune up Value) * (mW)	Test Separation Distance (mm)	SAR Exclusion Power Threshold Section 4.3.1 c) (mW)	SAR Test Exclusion (Yes/No)
13.56	0.0022	199	1071	Yes

*Tune-up value is the maximum declared output power of the device derived from FCC Determination of the Equivalent Isotropically Radiated Power (EIRP) given in the measurement and calculations overleaf.

The SAR exclusion threshold has been evaluated using the formula described above from information supplied by the manufacturer below. Based on the calculation above, the EUT is categorically excluded from SAR testing

DOCUMENT   75939499-04 Issue 01   CONTINUATION PAGE

FCC Determination of the Equivalent Isotropically Radiated Power (EIRP) of an RF Transmitting System (KDB 412172)

Section 2.2 Direct calculation from the DUT power measured in a radiated test configuration

Section 2.2. states: When the DUT power is measured using a radiated test configuration, the eirp can be directly determined using the field strength (linear) approach by applying Equation:

$$EIRP = P_t \times G_t = (E \times d)^2/30$$

- EIRP is the equivalent isotropically radiated power in watts.
- P_t transmitter output power in watts (not required)
- G_t numeric gain of the transmitting antenna (unitless) (not required)
- E electric field strength in V/m
- D measurement distance in meters (m)

Measure the electric field strength E at test distance d m. (From manufacturers data).

Calculate the EIRP using the equation above. Increase the eirp to include any declared tune-up tolerance value to give the maximum output power.

The result is the Maximum Power (Tune up Value) required in the SAR exclusion assessment.

Frequency kHz	Electric Field Strength (dBµV/m)	Electric Field Strength (V/m)	Test Distance (m)	EIRP (W)	EIRP (mW)	Tune-up Tolerance (%)	Maximum Power (Tune up Value) (mW)
13.56	68.61	0.0027	3	2.1783E-06	0.0022	0	0.0022

Product Service

DOCUMENT 75939499-04 Issue 01 CONTINUATION PAGE

Manufacturer's Declaration of Product information (extract):

Product Description:	Quality Management Module - Dual RF ID System
Model number:	EPT038882

Frequency Band : **13.553 – 13.567MHz**

Antenna length (cm):	6.1 x 5.1 - 3 turn PCB trace	Centimetres (cm)
Frequency range:		
Bottom frequency:	13.553	MHz
Middle frequency:	13.56	MHz
Top frequency:	13.567	MHz
Maximum power (input to the antenna):	68.61dBuV/m at 3m measured peak radiated power from antenna. -26.62 dBm or 1.32uW ERP	dBm
Antenna gain (or maximum gain allowed):	See above.	dBi
Separation distance from antenna (if greater than 20cm)	A User is at a minimum of 25cm away from the RFiD unit	cm
Duty Cycle:	Each antenna transmits every 50mS for 21mS. (42% duty) Transmissions are interleaved between antenna. There is a 4mS gap between antenna 1 and antenna 2 transmissions. (Tags present)	%