

Analysis Report

Report No.: 21090422HKG-001

The Equipment Under Test (EUT) is a Bluetooth controlled mobile POS device. It supports reading EMV smart credit card, tape credit card and NFC credit card. It can be paired with smartphone and operated by mobile APP through Bluetooth link. The EMV smart card interface is for reading EMV smart credit card data. The magnetic tape head is for reading tape credit card. The 13.56MHz NFC reader is for reading NFC credit card. The EUT is powered by 3.7V internal rechargeable battery. The internal battery can be charged by USB socket (5VDC). The USB port in EUT is for this charging purpose and does not contain PC connectivity as declared by applicant.

Bluetooth portion

Antenna Type: Internal, Internal

Antenna Gain: 0dBi

RF conducted power range: -6dBm to +4dBm

According to the KDB 447498:

Conducted Power (maximum)

= 4 dBm (2.51 mW)

The SAR Exclusion Threshold Level:

= $3.0 * (\text{min. test separation distance, mm}) / \text{sqrt}(\text{freq. in GHz})$

= $3.0 * 5 / \text{sqrt}(2.480)$ mW

= 9.53 mW

Since the above conducted output power is well below the SAR Exclusion threshold level, so the EUT is considered to comply with SAR requirement without testing.

13.56MHz NFC portion (single channel)

Antenna Type: Internal, Integral

Antenna Gain: 0dBi

RF conducted power range: -40dBm to 0dBm

Conducted Power (maximum)

= 0 dBm (1.00 mW)

The SAR Exclusion Threshold Level for 13.56MHz when minimum test separation distance < 50 mm:

= $[474 * (1 + \log_{10}(f(\text{MHz})))]/2$

= 442.7 mW

Since the above conducted output power is well below the SAR Exclusion threshold level, so the EUT is considered to comply with SAR requirement without testing.

Simultaneous Transmission SAR exclusion considerations

Since the NFC 13.56MHz and Bluetooth transmitters of this device may operate simultaneously, simultaneous transmission analysis is required. Per KDB 447498, simultaneous transmission SAR test exclusion can be applied when the sum of 1-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit ($\leq 1.6\text{W/kg}$). When the standalone SAR test exclusion is applied, the standalone 1-g SAR must be estimated according to the following equation,

$$\text{Estimated SAR} = (\sqrt{F(\text{GHz})} / 7.5) \times (P_{\text{max}} / TD)$$

where

$F(\text{GHz})$ is the RF channel transmit frequency in GHz

P_{max} is the max. power of channel, including tune-up tolerance, mW

TD is the min. test separation distance, mm

For NFC operation,

Maximum Time-averaged Conducted Power of this device = **1 mW**

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned} \text{Estimated SAR} &= (\sqrt{F(\text{GHz})} / 7.5) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.00311 \text{ W/kg}} \end{aligned}$$

where $P_{\text{max}} = 1 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 0.01356 \text{ GHz}$

For Bluetooth operation,

Maximum Time-averaged Conducted Power of this device = **2.51 mW**

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned} \text{Estimated SAR} &= (\sqrt{F(\text{GHz})} / 7.5) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.105 \text{ W/kg}} \end{aligned}$$

where $P_{\text{max}} = 2.51 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.480 \text{ GHz}$

Simultaneous Transmission Analysis

NFC SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simultaneous SAR Required
0.00311	0.105	0.108	No

Conclusion

Since the above summed SAR result for all simultaneous transmission conditions were below the SAR limit (1.6 W/kg), SAR evaluation for simultaneous transmission configuration are not required.