Analysis Report

Report No.: 18011273HKG-001

The Equipment Under Test (EUT) is QB31 which is a Bluetooth controlled mobile POS device (point of sale device). It supports reading magnetic stripe credit card, EMV smart credit card (Europay, MasterCard, and Visa Card) and NFC credit card. It can be paired with smartphone or tablet and operated by mobile APP. A MSR module (magnetic stripe reader) and EMV smart card interface are used for reading magnetic stripe credit card and EMV smart credit card data respectively. A 13.56MHz (single channel) NFC reader is for reading NFC credit card. The EUT can support both Bluetooth 2.1 and Bluetooth 4.0 BLE. Bluetooth 3.0 occupies a frequency range of 2402MHz to 2480MHz (79 channels with channel spacing of 1MHz) while Bluetooth 4.0 BLE occupies a frequency range of 2402MHz to 2480MHz (40 channels with channel spacing of 2MHz). The EUT is powered by 3.7V internal rechargeable battery and/or USB port (5VDC).

13.56MHz NFC portion (single channel)
Antenna Type: Internal, Integral
Antenna Gain: 0dBi

Nominal field strength: 56 dBμV/m @ 3m
Maximum allowed production tolerance: +3dBm/-6dBm

According to the KDB 447498:

Based on the Maximum allowed field strength of production tolerance was 59 dBμV/m at 3m in frequency 13.56MHz, thus;

The EIRP = [(FS*D) ^2*1000 / 30] = 0.00024 mW

Conducted power = Radiated Power (EIRP) – Antenna Gain
So;

Conducted Power = 0.00024 mW.

The SAR Exclusion Threshold Level for 13.56MHz when minimum test separation distance < 50 mm:
= [474 * (1 + log100/f(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.

Analysis Report

Report No.: 18011273HKG-002

The Equipment Under Test (EUT) is QB31 which is a Bluetooth controlled mobile POS device (point of sale device). It supports reading magnetic stripe credit card, EMV smart credit card (Europay, MasterCard, and Visa Card) and NFC credit card. It can be paired with smartphone or tablet and operated by mobile APP. A MSR module (magnetic stripe reader) and EMV smart card interface are used for reading magnetic stripe credit card and EMV smart credit card data respectively. A 13.56MHz (single channel) NFC reader is for reading NFC credit card. The EUT can support both Bluetooth 2.1 and Bluetooth 4.0 BLE. Bluetooth 3.0 occupies a frequency range of 2402MHz to 2480MHz (79 channels with channel spacing of 1MHz) while Bluetooth 4.0 BLE occupies a frequency range of 2402MHz to 2480MHz (40 channels with channel spacing of 2MHz). The EUT is powered by 3.7V internal rechargeable battery and/or USB port (5VDC).

2.4GHz Bluetooth portion
Antenna Type: Internal, Integral
Antenna Gain: 0dBi

Bluetooth 4.0 BLE
Modulation Type: GFSK
Frequency Range: 2402MHz to 2480MHz, 2MHz channel spacing, 40 channels

Nominal conducted power: 2dBm
Maximum allowed production tolerance: +3dB/-6dB

Bluetooth 2.1
Modulation Type: GFSK
Frequency Range: 2402MHz to 2480MHz, 1MHz channel spacing, 79 channels

Nominal conducted power: 2dBm
Maximum allowed production tolerance: +3dB/-6dB

According to the KDB 447498:

Conducted Power (including production tolerance)
= 2dBm + 3dB = 5dBm = 3.16 mW

The SAR Exclusion Threshold Level:
= 3.0 * (min. test separation distance, mm) / sqrt(freq. in GHz)
= 3.0 * 5 / 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.

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 (≤ 1.6W/kg). When the standalone SAR test exclusion is applied, the standalone 1-g SAR must be estimated according to the following equation,

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

where
F(GHz) is the RF channel transmit frequency in GHz
Pmax 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 = 0.00024 **mW**

Therefore, the Estimated SAR will be determined as follow,

$$\text{Estimated SAR} = (\sqrt{F(GHz)}/7.5)x(P\max/TD)$$
$$= \mathbf{0.00000075\ W/kg}$$

where *Pmax* = 0.00024 mW, *TD* = 5 mm and *F(GHz)* = 0.01356 GHz

For Bluetooth 4.0 BLE operation,

Maximum Time-averaged Conducted Power of this device = **3.16 mW**

Therefore, the Estimated SAR will be determined as follow,

$$\text{Estimated SAR} = (\sqrt{F(GHz)}/7.5)x(P\max/TD)$$
$$= \mathbf{0.133\ W/kg}$$

where *Pmax* = 3.16mW, *TD* = 5 mm and *F(GHz)* = 2.480 GHz

Simultaneous Transmission Analysis

NFC SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simultaneous SAR Required
0.00000075	0.133	0.13300075	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.