RFID and Bluetooth collocation

Technology Solutions UK Ltd
Suite C
Loughborough Technology
Centre
Epinal Way
Loughborough
Leicestershire
LE11 3GE
United Kingdom
Tel: +44 (0) 1509 238248
Fax: +44 (0) 1509 220020
Email: enquiries@tsl.uk.com

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History

Version	Date	Modifications
1.0	19/06/07	Document Creation
1.1	12/07/07	Added FCC ID of Handscanner

1 Introduction

The 1062 Hand Scanner products (FCC ID S6J1062) include a 13.56MHz RFID interface and a Bluetooth transceiver. There is no provision for an external antenna interface.

2 Calculation of the effect of collocated transmitters

2.1 Basic requirement

Σ[P(n)/T(n)] ≤ 1 must be satisfied in order to be exempt from SAR evaluation, where;

P(n) is the higher of the maximum source-based time-averaged radiated (EIRP) or conducted output of the individual transmitter "n"

T(n) is the applicable low threshold for the transmitter "n", based on its operating frequency and it is defined as follows;

T(n) = 60/f(GHz) in **mW** for general population. (Portable exposure category d < 2.5cm)

2.2 Bluetooth (n = 1)

T(1) = 60/2.48 = 24.19mW (taking the highest frequency to give the most restrictive power level).

From the test report as submitted to FCC as part of the application for FCC ID PI401B (number RFI/MPTE1/RP47077JD03A) the EIRP is greater that the conducted output power because the antenna has gain. Using the EIRP:

P(1) = 4.2dBm = 2.63mW

P(1)/T(1) = 0.109

2.3 RFID (n = 2) FCC ID S6J1062

T(2) = 60/0.01356 = 4424.78mW

The EIRP of the RFID section can be estimated from the measured value of field strength. From KTL test report (number 6G9939GUS1) the maximum field strength was 27.8dBμV/m at 30m.

The loop antenna used by the RFID section has very small dimensions relative to the wavelength; therefore it will approach an isotropic radiator. Field strength (E) at a given distance (R) is related to the EIRP (P_T) by:

$E = (30 \times P_T)^{0.5} / R$

For E = 24.5μV/m and R = 30m, P_T = 18nW

The conducted RF power was measured as 19.3dBm (85mW). The reason for the large difference between conducted and radiated power is that a loop

antenna is used to provide good H field coupling between reader and transponder. A small loop antenna is a very inefficient radiator.

Using the conducted RF power:

P(2)/T(2) = 0.019

2.4 SAR calculation

{P(1) / T(1)} + {P(2) / T(2)} = 0.109 + 0.019 = 0.128

Since this is less than 1 then the Hand Scanner complies with FCC's RF radiation exposure limits for a portable device intended for general population/uncontrolled exposure.