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Dear Hilton

Class 2 Permissive Change – EHASMC46

Please find detailed the MPE calculations to support the application for a permissive change to the EHASMC46, Intermec 700C with MC46 module to allow co-location with RFID, EHARFID915PCC-6.

Yours sincerely

Roger Clements
Senior Consultant

Intermec: Maximum Permitted Exposure (MPE) Calculations:

rfc/17.12.2004

1. Reference Document:

The Reference Document for the MPE limits has been taken as the Supplement C to OET Bulletin 65 (Edition 97-01).

2. Applicable Limits:

'Appendix A' details the relevant exposure criteria in the above FCC Document. For the purposes of calculations on the Intermec System the limits have been used which are applicable to General Population/Uncontrolled Exposure. See values detailed below:

The following limits are applicable:

Over the 300 – 1500MHz range	f/1500 mW/sq.cm
Over the 1500MHz – 100GHz range	1.00mW/sq.cm

This equates to the following maximum permissible power density levels:

Operation at frequency 850MHz:	0.566mW/sq.cm
Operation at frequency 915MHz:	0.610mW/sq.cm
Operation at frequency 1900MHz:	1.00mW/sq.cm

Note:
These limits are only applicable to operation of equipment in the far field.
Far field is defined as $\lambda /2\pi$

At frequency 850MHz $\lambda = (3 \times 10^8) / (850 \times 10^6)$ m.

ie. $\lambda = 35.294$ cm.

so $\lambda /2\pi = 5.62$ cm.

At frequency 1900MHz $\lambda = (3 \times 10^8) / (1900 \times 10^6)$ m.

ie. $\lambda = 15.789$ cm.

so, $\lambda /2\pi = 2.51$ cm.

Calculations therefore show that at frequency of 850MHz the far field is beyond a distance of 5.62cm, and at 1900MHz beyond a distance of 2.51cm.
For operation at 915MHz, this distance calculates to be 5.22cm.
Therefore, the proposed operational separation distance of 20cm is well into the far field.

3. Calculation of radiated power density:

The RF power density at an operational distance R from the antenna is calculated by the following expression $S = (P.G) / 4.\ \pi.R^2$

where S = power density in mW/sq.cm
P = power output in mW
G = antenna gain (numeric gain value)
R = operating distance from antenna in cm

3.1 SMC46: Transmitting only at 850MHz.

Transmitted power 1.995W
Antenna gain 1.413 (+3dBi)

RF power density at 20cm from the antenna $S = (1995 \times 1.413) / 4.\pi.20^2$ mW/sq.cm

ie. RF power density at 20cm from the antenna = 0.56 mW/sq.cm

The FCC limit is 0.566 mW/sq.cm

3.2 SMC46: Transmitting only at 1900MHz.

Transmitted power 933mW
Antenna gain 1.413 (+3dBi)

RF power density at 20cm from the antenna $S = (933 \times 1.413) / 4.\ \pi.\ 20^2$ mW/sq.cm

ie. RF power density at 20cm from the antenna = 0.262 mW/sq.cm

The FCC limit is 1.00 mW/sq.cm at 1900MHz

3.3 Co-locational operation

RFID transmitting at 915MHz. and SMC46 transmitting at 1900MHz.

For the RFID transmitting at 915MHz:
Transmitted power 1000mW
Antenna gain 1.333 (+2.5dBi)
RF power density at 20cm from the antenna S= (1000 x 1.333) / 4.π. 20^2 mW/sq.cm
= 0.265 mW/sq.cm

The maximum possible combined transmitted power is the sum of the 2 power densities,

SMC46 transmitting at 1900MHz (ref. para 3.2) + RFID transmitting at 915MHz

ie. 0.262 + 0.265mW/sq.cm. = 0.527 mW/sq.cm.

<u>A maximum possible co-location output of 0.527 mW/sq.cm.</u>

The applicable FCC Specification Limit is 0.610 mW/sq.cm