RF exposure calculation

M260SE Handheld Terminal
PEPPERL+FUCHS RFID
Version: 1.01

Inhaltsübersicht

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1 Description of the product:

The product is a handheld RFID reader, which is available in two versions:

Model: M260SE HF FCC ID: O2FM260SEHF	HF-RFID: 13,56 MHz
Model: M260SE FCC ID: O2FM260SE	LF-RFID: 125 kHz

The product also includes a pre certified WiFi module (FCC ID: O2F-MSD30AG) and a pre certified Bluetooth module (FCC ID: O2FBT830). The product is intended to be used in storages by trained personal only. The product is battery supplied.

2 RF exposure calculation HF-RFID

Calculation of EIRP level

The calculation of the EIRP level of the fundamental frequency of the EuT is done according to KDB 412172 D01 sub clause 1.3.1 formula (1). The used field strength is taken from test report T41434-00-00JP issued by CSA Group.
Values according to report subclause 5.1.4 a):
Fieldstrength: 60.2 dBµV/m at a test distance of 3m

Used formula:	$EIRP = (E \times d)^2 / 30$
Where:	EIRP = equivalent isotropically radiated power in wats E = electrical field strength in V/m d = measurement distance in meters
Calculation:	$EIRP = (1023.293 \times 10^{-6} \times 3)^2 / 30 = 314.139 \times 10^{-9}$
Result:	EIRP = 0.000314 mW

Threshold limits according to KDB447498
According to Appendix C:

For 50MHz and testdistance <50mm a threshold of 308 mW is listed. Compared with the transmitting power of the EuT in RFID mode with 0.000314 mW.

3   RF exposure calculation LF-RFID

Calculation of EIRP level

The calculation of the EIRP level of the fundamental frequency of the EuT is done according to KDB 412172 D01 sub clause 1.3.1 formula (1). The used field strength is taken from test report T41434-00-01JP issued by CSA Group.
Values according to report subclause 5.1.4 a):
Fieldstrength: 75.9 dBµV/m at a test distance of 3m

Used formula:	$EIRP = (E \times d)^2 / 30$
Where:	EIRP = equivalent isotropically radiated power in wats E = electrical field strength in V/m d = measurement distance in meters
Calculation:	$EIRP = (6237.348 \times 10^{-6} \times 3)^2 / 30 = 11671.353 \times 10^{-9}$
Result:	$EIRP = 0.011671$ mW

Threshold limits according to KDB447498
According to Appendix C:

For 1MHz and testdistance <50mm a threshold of 711 mW is listed. Compared with the transmitting power of the EuT in RFID mode with 0.011671 mW.

4 RF exposure calculation WiFi

The values of the transmit power are taken from the RF exposure calculation of the original certification file FCC ID: TWG-SDCMSD30AG. The manufacturer defines test distance as 50mm; please refer to document "Test distance definition".

Transmit power levels taken from RF exposure calculation of TWG-SDCMSD30AG:

Operation mode	Frequency [MHz]	Power [mW]
802.11b	2412	55,0
	2437	53,7
	2462	46,8
802.11g	2412	114,8
	2437	123,0
	2462	117,5
802.11a	5745	11,2
	5785	14,1
	5805	14,1

Used formula according to KDB447498 sub clause 4.3.1 a):

$$\text{(Power of channel in mW) / (Test distance in mm)} \times \sqrt{f} \ in \ GHz \leq 7,5$$

7,5 is used due to handheld use of the product, without belt clip or any kind of holster which indicates body worn use.

Calculation:

Operation mode	Frequency [MHz]	Power [mW]	Test distance [mm]	Result	Limit
802.11b	2412	55,0	42	2,1	7,5
	2437	53,7	42	2,0	7,5
	2462	46,8	42	1,8	7,5
802.11g	2412	114,8	42	4,3	7,5
	2437	123,0	42	4,6	7,5
	2462	117,5	42	4,4	7,5
802.11a	5745	11,2	42	0,7	7,5
	5785	14,1	42	0,9	7,5
	5805	14,1	42	0,9	7,5

5   RF exposure calculation Bluetooth

The values of the transmit power are taken from the RF exposure calculation of the original certification file FCC ID: SQGBT830 . The manufacturer defines test distance as 50mm; please refer to document "Test distance definition".

Transmit power levels taken from RF exposure calculation of SQGBT830:

Operation mode	Frequency [MHz]	Power [mW]
BT830-SA	2480 (BT EDR)	5,57
	2480 (BT LE)	5,38

Used formula according to KDB447498 sub clause 4.3.1 a):

$$\text{(Power of channel in mW) / (Test distance in mm) x } \sqrt{f} \text{ in } GHz \leq 7{,}5$$

7,5 is used due to handheld use of the product, without belt clip or any kind of holster which indicates body worn use.

Calculation:

Operation mode	Frequency [MHz]	Power [mW]	Test distance [mm]	Result	Limit
BT830-SA (BT EDR)	2480	5,57	42	0,3	7,5
BT830-SA (BT LE)	2480	5,38	42	0,3	7,5

6 Simultaneous transmission of RFID,WiFi and Bluetooth

Due the relative low power of the RFID transmitter, the influence of the RFID transmission is marginal. To show compliance the worst case of WiFi transmission is taken (802.11g on 2437MHz), Bluetooth transmission is taken (BT-EDR on 2480MHz) and the transmitting power of the RFID is simply calculated with 0.1. This should symbolize the absolute worst case.

Operation mode	Frequency [MHz]	Power [mW]	Test distance [mm]	Result	Limit
BT830-SA (BT EDR)	2480	5.57	42	0.3	7.5
802.11g	2437	123.0	42	4.6	7.5
HF-RFID	13,56	0.000314	50	< 0.1	7.5
LF-RFID	0.125	0.011671	50	< 0.1	7.5
			Total:	**5.0**	**7.5**