RF Exposure Exemption Report

PervasID
Models: SRM 9380 (8-port Master)
SRM 9380 (8-port Slave)

In accordance with FCC CFR 47 Pt 1.1307

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EXECUTIVE SUMMARY
The wireless devices described within this report are compliant with the exemption criteria related to human exposure to electromagnetic fields laid out in FCC CFR Title 47 Part 1.1307.

TÜV SÜD

Contents

1   Report Summary

1.1   Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	14-July-2023

Table 1

1.2   Introduction

Applicant	PervasID Limited
Manufacturer	PervasID Limited
Model Number(s)	SRM 9380 (8-port Master) and SRM 9380 (8-port Slave)
Hardware Version(s)	Motherboard v6.5.4; FR-DB v1.0 (Slave only); Sync-DB v0.2
Software Version(s)	Software: SR-0.1.0.4; Radio FW: 3.9.0.1; FR-DB FW: 1.0.2 (Slave only)
Specification/Issue/Date	FCC 47 CFR Part 1.1307: 2021
Order Number	PO-0774
Date	31 Jan 2023
Related Document(s)	KDB 447498 D04 v01

1.3 Brief Summary of Results

The wireless devices described within this report are compliant with the exemption criteria related to human exposure to electromagnetic fields laid out in FCC CFR Title 47 Part 1.1307.

The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

1.4 Product Information

1.4.1 Technical Description

UHF RFID Distributed Antenna System - intended use detection and monitoring of UHF RFID tags.

1.4.2 Transmitter Description

The following radio access technologies and frequency bands are supported by the equipment under test.

Radio Access Technology	Antenna Port	Frequency Band (MHz)	Minimum Frequency (MHz)	Output Power (dBm)	Duty Cycle (%)
UHF RFID	1-8	902.75 – 927.25	902.75	29.65 Note 1	100.0
Note 1: PervasID Limited confirmed the power output as 2 W ERP (effective radiated power) or 33 dBm. ERP is given by;					
ERP = Po x Gd where Po is the conducted output power and Gd is the antenna gain relative to a half wave dipole.					
The exposure calculation described in Section **Error! Reference source not found.** requires in part the EIRP (equvalent isotropic radiated power) given by; EIRP = Po x Gi where Po is the conducted output power and Gi is the antenna gain relative to an isotropic antenna.					
In order to convert ERP to EIRP, the result is multiplied by the gain of a half wave dipole relative to isotropic that is 1.64 or 2.15 dBi.					
Therefore EIRP = ERP x 1.64 or in dB;					
EIRP dBm = ERP dBm + 2.15					
EIRP dBm = 33 + 2.15 = 35.15 dBm					
dBi = dBic – 3 dB, therefore antenna gain in dBi is 8.5 – 3.0 = 5.5 dBi					
Therefore Po the conducted power output is found by subtracting the antenna gain GdBi;					
Po dBm = EIRP dBm – G dBic = 35.15 – 5.5 = 29.65 dBm.					

Table 2 – Transmitter Description

Note: Transmitter power includes upper bounds of uncertainty therefore maximum values are used in accordance with Section **Error! Reference source not found.**.

1.4.3 Antenna Description

The following antennas are supported by the equipment under test.

Radio Access Technology	Antenna Model	Gain (dBi)	Antenna length (cm)	Minimum Separation Distance <if specified otherwise delete> (cm)
UHF RFID	Circular polarised Directional	5.5	95.82	42

Table 3 – Antenna Description

In the case of more than one type of antenna being supported by the equipment, the calculation is based on the maximum of the antenna gains. If other antennas can be used that have greater gains, the minimum separation distances will need to be recalculated.

Note: Antenna gain includes upper bounds of uncertainty therefore maximum values are used.

1.4.4   Equipment Configuration

Single transmitter

Note – This product uses Distributed Antenna System. This means that whilst it can simultaneously transmit from multiple ports, no two ports are connected to the same antenna beam. Therefore the exposure is calculated on the basis of a single port with it's antenna

2 Assessment Details

2.1 Single RF Source options for determination of exemption.

Option	Reference	RF Exposure Test Exemptions for Single Source
A (1-mW Test Exemption)	FCC 1.1307(b)(3)(i)(A)	The available maximum time averaged power is no more than 1 mW, regardless of separation distance.
B (SAR-Based Exemption)	FCC 1.1307(b)(3)(i)(B)	The available maximum timeaveraged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by: $$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \leq 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \leq 40\ \text{cm} \end{cases}$$ Where $$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$ and $$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \leq f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \leq f \leq 6\ \text{GHz} \end{cases}$$ d = the separation distance (cm);
C (MPE-Based Exemption)	FCC 1.1307(b)(3)(i)(C)	Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value). TABLE 1 TO § 1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION **RF Source frequency (MHz)** / **Threshold ERP (watts)** 0.3–1.34 : 1,920 R². 1.34–30 : 3,450 R²/f². 30–300 : 3.83 R². 300–1,500 : 0.0128 R²f. 1,500–100,000 : 19.2R².

2.2 Multiple RF Sources options for determination of exemption.

Option	Reference	
A 1-mW Test Exemption for Multiple Sources	FCC 1.1307(b)(3)(ii)(A)	The available maximum time averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).
B Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions	FCC 1.1307(b)(3)(ii)(B)	in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation. $$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

2.3 Individual Antenna Port Exposure Results

2.3.1 Single Source Calculation of Exposure at Specified Separation Distance FCC 1.1307(b)(3)(i)(C) 'Option C' (MPE Based Exemption)

RAT	Frequency (MHz)	Conducted Power Output (mW)	Duty Cycle %	Time Average Conducted Power Output (mW)	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Minimum separation distance for MPE evaluation λ/2 π mm	Actual Distance (mm)	Threshold ERP (mW)	1.1307(b)(3)(i)(C) Exemption (Yes/No) (300 kHz to 100 GHz)
UHF RFiD	902.75	922.571	100	922.571	3.548	3273.283	1995.90	52.9	420	2038.3	Yes

Table 4 –Transmitter Result

The calculations show that the individual transmitters comply with FCC 1.1307(b)(3)(i)(C) MPE-based exception at a minimum distance of 42 cm.