

Test report No:  
 NIE: 55234RAN.004

## Assessment report

### RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091 ISED RSS-102 Issue 5:2015

Identification of item tested	Electronic Reader Series including all mechanical variants
Trademark	XS4 Wall Reader 2.0
Model and /or type reference	WRD0B, WRD0J, WRD0S (type reference: P1619)
Other identification of the product	FCC ID: UKCW RD0B IC: 10088A-WRD0B Hw version: 1.0 Sw version: WRD0B: 0152 (Control Firmware) + 0136 (BGM111 Firmware) WRD0J: 0153 (Control Firmware) + 0136 (BGM111 Firmware) WRD0S: 0130 (Control Firmware)
Features	WRD0B and WRD0J contain a certified Bluetooth module (BGM111) WRD0S contains a certified Bluetooth module (DirectKey)
Manufacturer	SALTO Systems, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun, Gipuzkoa, SPAIN
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
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## Competences and guarantees

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## Identification of the client

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SALTO Systems, S.L.

Arkotz 9, Polígono Lanbarren

20180, Oiartzun, Gipuzkoa, SPAIN

## General description of the device under evaluation

The device under evaluation consists of an electronic reader series XS4 Wall Reader 2.0, with Bluetooth smart (BGM111 module for models WRD0B and WRD0J and DirectKey for model WRD0S) and ISO14443A & ISO15693 standard based technology.

During its normal use the separation distance between the antenna and the user will be greater than 20 cm.

Model	Supported Features			
	NFC ISO 14443-A	NFC ISO 15693	Bluetooth module BGM111	Bluetooth module DirectKey
WRD0B	Yes	Yes	Yes	No
WRD0J	Yes	Yes	Yes	No
WRD0S	Yes	Yes	No	Yes

**Table 1:** Equipment variants and supported features

The equipment specifications declared by the manufacturer for each supported feature are:

Band (MHz)	Technology	Maximum RF output power (dBm)	Maximum antenna gain (dBi)	Maximum radiated power (E.I.R.P.) (dBm)
13.553-13.567	NFC	25.0	N/A	25.0
2402.0-2480.0	Bluetooth BGM111	8.0	1.0	9.0
2402.0-2480.0	Bluetooth DirectKey	2.8	0.5	3.3

**Table 2:** Equipment specifications

## Assessment summary

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Radiofrequency radiation exposure limits			
FCC 47 CFR § 2.1091 & ISED RSS-102 Issue 5 (2015-03)			
Assessment	Band (MHz)	Technology	VERDICT (Pass/Fail)
1	13.5	NFC	Pass
2	2450	Bluetooth BGM111	Pass
3	2450	Bluetooth DirectKey	Pass

**Table 3:** Assessment summary

## Appendix A: FCC RF Exposure

## FCC RF Exposure evaluation for mobile devices

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance  $\geq 20$  cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3–3.0 .....	614	1.63	* 100	6
3.0–30 .....	1842/f	4.89/f	*900/f <sup>2</sup>	6
30–300 .....	61.4	0.163	1.0	6
300–1,500 .....	.....	.....	f/300	6
1,500–100,000 .....	.....	.....	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34 .....	614	1.63	* 100	30
1.34–30 .....	824/f	2.19/f	*180/f <sup>2</sup>	30
30–300 .....	27.5	0.073	0.2	30
300–1,500 .....	.....	.....	f/1500	30
1,500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz \* = Plane-wave equivalent power density

## FCC MPE Evaluation Results

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Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

$$\text{Power density: } S[mW / cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\pi R[cm]^2}$$

$$\text{Minimum compliance distance: } R_{\min}[cm] = \sqrt{\frac{P_{E.I.R.P.}[mW]}{4\pi S[mW / cm^2]}}$$

Where:

$S$  = power density

$P_{E.I.R.P.}$  = Equivalent isotropically radiated power

$R$  = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$  = distance to the center of radiation of the antenna



### **Assessment 1 – NFC – 13.5 MHz Band**

Maximum output power (dBm):	25.0
Maximum antenna Gain (dBi):	N/A
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	13.56
Maximum EIRP (dBm):	25.0
Maximum EIRP (mW):	316.23
General population - Power density limit (mW/cm <sup>2</sup> ):	0.98

### **Power density at minimum use distance:**

Power density (mW/cm <sup>2</sup> ):	0.063
General population - Power density limit (mW/cm <sup>2</sup> ):	0.98
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

### **Minimum compliance distance for this technology:**

Minimum compliance distance for general population (cm):	5.07
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

**Assessment 2 – Bluetooth BGM111 – 2450 MHz Band**

Maximum output power (dBm):	8.0
Maximum antenna Gain (dBi):	1.0
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2402.0
Maximum EIRP (dBm):	9.0
Maximum EIRP (mW):	7.94
General population - Power density limit (mW/cm <sup>2</sup> ):	1.0

**Power density at minimum use distance:**

Power density (mW/cm <sup>2</sup> ):	0.0016
General population - Power density limit (mW/cm <sup>2</sup> ):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

**Minimum compliance distance for this technology:**

Minimum compliance distance for general population (cm):	0.80
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

### **Assessment 3 – Bluetooth DirectKey – 2450 MHz Band**

Maximum output power (dBm):	2.8
Maximum antenna gain (dBi):	0.5
Minimum use distance (m):	0.20
Worst Case Frequency (MHz):	2402.0
Maximum E.I.R.P (dBm):	3.3
Maximum E.I.R.P (W):	0.0021
Power density reference level (W/m <sup>2</sup> ):	10.0

#### **Power density at minimum use distance:**

Power density (W/m <sup>2</sup> ):	0.00425
Power density reference level (W/m <sup>2</sup> ):	10.0
Verdict:	PASS

The power density level for this transmission mode is below power density reference level.

#### **Minimum compliance distance for this technology:**

Minimum compliance distance to meet reference level (m):	0.0041
Minimum use distance (m):	0.20
Verdict:	PASS

The minimum use distance for the device is greater than minimum compliance distance to meet the reference level.

### **Multiple frequencies assessment**

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^n \frac{S_i}{MPE_i} < 1$$

Where

$S_i$  is the power density of each source;

$MPE_i$  is the power density basic restriction of each source.

The worst case of simultaneous transmission for all model variants is found for the WRD0B and WRD0J models. These models are able to transmit simultaneously using NFC and Bluetooth module BGM111. The multiple frequencies calculation will be as follow:

$$\frac{0.063}{0.98} + \frac{0.002}{1} = 0.064 + 0.002 = 0.066 < 1 \text{ Limit}$$

## Appendix B: ISED RF Exposure

## ISED RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Health Canada’s RF exposure guideline, Safety code 6:

**Table 4: RF Field Strength Limits for Devices Used by the General Public  
 (Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>-21</sup>	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> <sup>0.5</sup>	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> <sup>0.25</sup>	0.1540/ <i>f</i> <sup>0.25</sup>	8.944/ <i>f</i> <sup>0.5</sup>	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> <sup>0.3417</sup>	0.008335 <i>f</i> <sup>0.3417</sup>	0.02619 <i>f</i> <sup>0.6834</sup>	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> <sup>1.2</sup>
150000-300000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616000/ <i>f</i> <sup>1.2</sup>
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

## ISED MPE Evaluation Results

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Each supported transmission technology will be evaluated to determine if it is in compliance with RSS-102 Issue 5, RF Field Strength Limits for devices used by the General Public.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

$$\text{Power density: } S[W/m^2] = \frac{P_{E.I.R.P.}[W]}{4\pi R[m]^2}$$

$$\text{Minimum compliance distance: } R_{\min}[m] = \sqrt{\frac{P_{E.I.R.P.}[W]}{4\pi S[W/m^2]}}$$

Where:

$S$  = power density

$P_{E.I.R.P.}$  = Equivalent isotropically radiated power

$R$  = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$  = distance to the center of radiation of the antenna

### **Assessment 1 – NFC – 13.5 MHz Band**

Maximum output power (dBm):	25.0
Maximum antenna gain (dBi):	N/A
Minimum use distance (m):	0.2
Worst Case Frequency (MHz):	13.56
Maximum EIRP (dBm):	25.0
Maximum EIRP (W):	0.32
General public - Power density limit (W/m <sup>2</sup> ):	2.0

### **Power density at minimum use distance:**

Power density (W/m <sup>2</sup> ):	0.63
General public - Power density limit (W/m <sup>2</sup> ):	2.0
Verdict for general public:	PASS

The power density level for this transmission mode is below general public power density limit.

### **Minimum compliance distance for this technology:**

Minimum compliance distance for general public (m):	0.112
Minimum use distance (m):	0.2
Verdict for general public:	PASS

The minimum use distance is greater than general public minimum compliance distance.



### **Assessment 2 – Bluetooth BGM111 – 2450 MHz Band**

Maximum output power (dBm):	8.0
Maximum antenna gain (dBi):	1.0
Minimum use distance (m):	0.2
Worst Case Frequency (MHz):	2402.0
Maximum EIRP (dBm):	9.0
Maximum EIRP (W):	0.01
General public - Power density limit (W/m <sup>2</sup> ):	5.35

### **Power density at minimum use distance:**

Power density (W/m <sup>2</sup> ):	0.016
General public - Power density limit (W/m <sup>2</sup> ):	5.35
Verdict for general public:	PASS

The power density level for this transmission mode is below general public power density limit.

### **Minimum compliance distance for this technology:**

Minimum compliance distance for general public (m):	0.011
Minimum use distance (m):	0.2
Verdict for general public:	PASS

The minimum use distance is greater than general public minimum compliance distance.

### **Assessment 3 – Bluetooth DirectKey – 2450 MHz Band**

Maximum output power (dBm):	2.8
Maximum antenna gain (dBi):	0.5
Minimum use distance (m):	0.20
Worst Case Frequency (MHz):	2402.0
Maximum E.I.R.P (dBm):	3.3
Maximum E.I.R.P (W):	0.0021
Power density reference level (W/m <sup>2</sup> ):	10.0

#### **Power density at minimum use distance:**

Power density (W/m <sup>2</sup> ):	0.00425
Power density reference level (W/m <sup>2</sup> ):	10.0
Verdict:	PASS

The power density level for this transmission mode is below power density reference level.

#### **Minimum compliance distance for this technology:**

Minimum compliance distance to meet reference level (m):	0.0041
Minimum use distance (m):	0.20
Verdict:	PASS

The minimum use distance for the device is greater than minimum compliance distance to meet the reference level.

### **Multiple frequencies assessment**

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^n \frac{S_i}{MPE_i} < 1$$

Where

$S_i$  is the power density of each source;

$MPE_i$  is the power density basic restriction of each source.

The worst case of simultaneous transmission for all model variants is found for the WRD0B and WRD0J models. These models are able to transmit simultaneously using NFC and Bluetooth module BGM111. The multiple frequencies calculation will be as follow:

$$\frac{0.63}{2} + \frac{0.016}{5.35} = 0.315 + 0.003 = 0.318 < 1 \text{ Limit}$$