

Title: RML-RAD Space Radiation Monitor Datasheet

Company: REMRED Space Technologies Ltd.

Department: Business Development | MB |

Contact: W: remred.space

Issue: 01\_00

Ref. PRO2021-RR-PQA-DS-2001

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#### PRODUCT DATASHEET

# RML-RAD – Space Radiation Monitor

1st generation

PROJECT TITLE

PROJECT REF. PRO2021

PREPARED BY REMRED Space Technologies Ltd.

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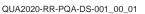
TYPE Product Datasheet, Non-Confidential

REFERENCE PRO2021-RR-PQA-DS-2001

CUSTOMER(S) CONTRACT REF. CUSTOMER ID. -

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### **APROVAL**

logue	Date -	Signatures		
Issue		Author(s)	Reviewed by	Approved by
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## **CHANGE LOG**

Reference	Date	Issue	Revision
PRO2021-RR-PQA-DS-2001	01/11/2021	01_00	1

## **CHANGE RECORD**

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Reason for change	Date	Page	Paragraph(s)
N/A (initial release).	01/11/2021	All	All







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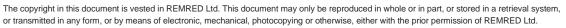
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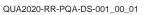
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# **Purpose and Scope**

The present document provides detailed technical information about RML-RAD Space Radiation Monitor.

The definitions and glossary of terms from ECSS-S-ST-00-01C [AD 1] apply to this document.



1. Figure – RML-RAD Space Radiation Monitor (1st generation)







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# 2 Application and Key Features

#### 2.1 APPLICATION

- √ Cosmic Ray and Space Weather Research & Forecast (Service)
  - Space Radiation and Space Weather research and service provision
    - Research
    - Service data production
    - Forecast
    - Data models validation
  - Measuring space weather related space radiation data products as defined by the European Space Agency (ESA)
    - Protons
    - Electrons
    - Heavy lons
  - Measuring long-term cosmic ray flux profiles
    - Energy distribution
    - Flux dynamics

## 2.2 KEY FEATURES

- √ Space radiation and space weather research and forecast
  - Cost and time effective monitoring solution for constellations
  - Extremely low budgets with relatively high performance
  - Real-time space weather alarm function capability for the hosting spacecraft
- √ High performance measurement specification
  - Utilising silicon detector telescope system called RADTEL
  - Specification following the data product definitions of ESA
- √ Possibility for optional extension with magnetometer and additional interface units
- √ Fully autonomous operation
- √ Controlled via TM/TC
- ✓ Available interfaces: CAN, M-LVDS, RS-422





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# 3 Specification

## 3.1 GENERAL SPECIFICATION

#### 1. Table – General specification

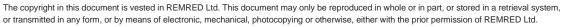
Parameters	Values
Power	1.5 W
Mass	0.9 kg
Dimensions (H,W,L)	84 mm, 81 mm, 104 mm
Operational temperature range	-40°C+40°C (+65°C)
Non-operational temperature range	-40°C+85°C
Operational pressure range	10 <sup>5</sup> Pa…10 <sup>-4</sup> Pa
Outgassing rate	<1% TML <0.1% CVCM
Data range	1.5 MB/day
Handling environment humidity	2065% relH

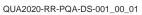
## 3.2 ENVIRONMENTAL SPECIFICATION

#### 2. Table - Environmental specification

	Values
Temperature environment	-40°C+85°C
Vacuum environment	<10 <sup>-3</sup> Pa
Max. depressurization rate	5.0 kPa/s
Sine vibration environment for 3-axis	20100 Hz, 16.0 g
Random vibration environment for 3-axis	52000Hz, 17.0g <sup>RMS</sup>
Shock pulse for 3 axis	100 g, 0.25 ms
EMC anvironment	Tailored ECSS-E-ST-20-07C
EMC environment	Rev.1 [AD 2]
Used components	COTS
Proven lifetime	Min. 7 years at LEO
	Vacuum environment  Max. depressurization rate  Sine vibration environment for 3-axis  Random vibration environment for 3-axis  Shock pulse for 3 axis  EMC environment  Used components













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## 3.3 INTERFACES

#### 3. Table - Interfaces

Parameters	Values
Input power bus	5V regulated (±5%) 12V unregulated (9.0 V20.0 V)
TM/TC interface	CAN Bus / M-LVDS / RS-422/485/232

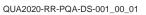
## 3.4 MEASUREMENT CAPABILITIES

#### 4. Table - Measurement capabilities

Particle types  Count rate range (<10% dead time)	electrons, protons, heavy ions
	0-50,000 cps
Time resolution (cadence) range for energy spectra	10-600 s
Minimum electron energy	250 keV
Electron energy range	0.33.9 MeV (5 quasi log channels)
Minimum proton energy	1 MeV
Proton energy range	3 MeV – 500 MeV (11 quasi log channels)
Dynamic range of proton flux measurements based on Sapphire 1-in 10-year model (maximum fluxes).  Min fluxes are by 1.0E+05 lower per channel	3-6 MeV bin: 2·10 <sup>5</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 6-10 MeV bin: 5·10 <sup>4</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 10-16 MeV bin: 2·10 <sup>4</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 16-25 MeV bin: 4·10 <sup>3</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 25-40 MeV bin: 7·10 <sup>2</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 40-63 MeV bin: 6·10 <sup>2</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 63-100 MeV bin: 1·10 <sup>2</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 100-160 MeV bin: 2·10 <sup>1</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 160-250 MeV bin: 5·10 <sup>0</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup> 250-500 MeV bin: 6·10 <sup>-1</sup> cm <sup>2</sup> s <sup>-1</sup> MeV <sup>-1</sup>
Heavy ion energy range (He ion group (He-3, He-4), CNO ion group(C-12, N-14, O-16), Fe ion group (Si-28, Ne-20, Fe-56, Ni-58))	1 MeV/n500 MeV/n (11 quasi log channels for He and CNO, 5 quasi log channels for Fe)
Spectra contamination	<10%
Min. field of view (half-angle)	20°
Max. field of view (half-angle)	60°
Orthogonal telescope directions	1 (can be extended up to 2)



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# 4 Flight Heritage

#### 5. Table - Flight heritage

Mission name	Hosting platform	Orbit details	Duration	Remarks
Under selection	SmallSat	LEO	7+ years	planned



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## 5 List of Abbreviations

AD Applicable Documents
Astorika Astorika Sp. z.o.o.

COTS Commercial Off-The-Shelf

**ECSS** European Cooperation for Space Standardization

ESA European Space Agency
ICL Imperial College London

LEO Low Earth Orbit

LET Linear Energy Transfer RD Reference Documents

TC Telecommand
TID Total Ionising Dose

TM Telemetry



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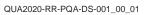
# **6 List of Figures**

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# 8 References

## 8.1 APPLICABLE AND NORMATIVE DOCUMENTS

#### 6. Table – Applicable and Normative Documents

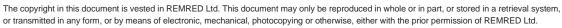
AD	Title	Reference	Version
[AD 1]	ECSS system - Glossary of terms	ECSS-S-ST-00-01C	1 Oct 2012
[AD 2]	Space engineering – Electromagnetic compatibility	ECSS-E-ST-20-07C Rev.1	7 Feb 2012

## 8.2 REFERENCE DOCUMENTS

#### 7. Table - Reference Documents

RD	Title	Reference	Version
[RD 1]	-	-	-













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