

## PRODUCT DATASHEET

# TECHDOSE – Advanced Cosmic Radiation and Dosimetric Measurement System for Stratospheric Balloon and Aeroplane Research

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# 1 Purpose and Scope

The present document provides detailed technical information about the TECHDOSE Advanced Cosmic Radiation and Dosimetric Measurement System for Stratospheric Balloon and Aeroplane Research applications.

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

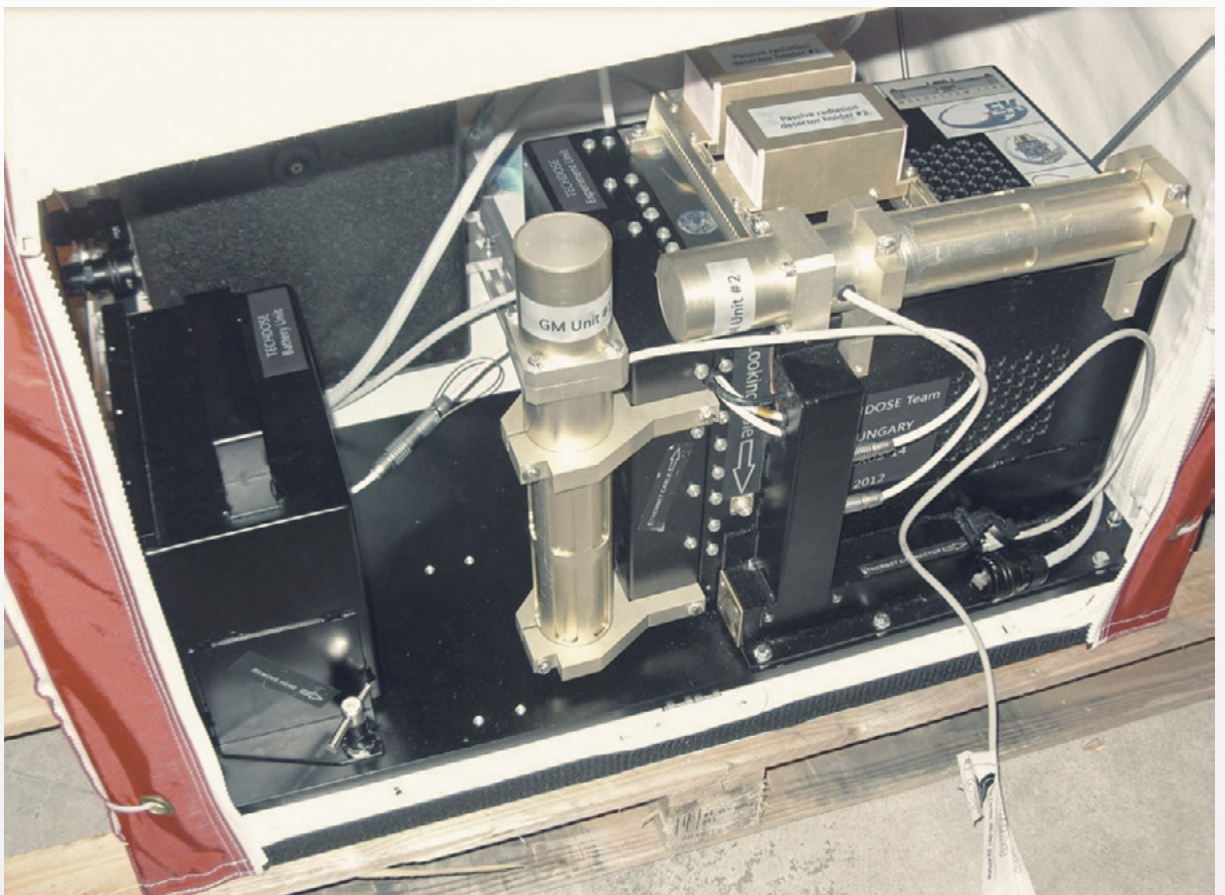


Figure 1 – TECHDOSE System

## 2 Application and Key Features

### 2.1 APPLICATION

- ✓ **Cosmic Ray & Space Weather Research**
  - Proven cosmic ray and space weather research equipment for stratospheric missions (aeroplanes, ballons)
  - To determine the cosmic ray flux profiles
  - To study shielding effects of the surrounding environment
  - To generate cosmic ray event alerts
- ✓ **Space Dosimetry Research**
  - To map dosimetric environment
  - To study the effects of space weather in the stratosphere
  - To protect humans from radiation

### 2.2 KEY FEATURES

- ✓ **TRITEL silicon detector-based technology with GM-counter extension**
- ✓ **2&3-dimensional sensitive measurement system**
- ✓ **Configurable system**
  - Different type of GM-counters
  - Up to a maximum number of 2 GM-counters
- ✓ **Fully autonomous operation**
- ✓ **Controlled via graphical user interface or TM/TC**
- ✓ **Available detector interfaces: CAN, RS-422**



## 3 Specification

### 3.1 GENERAL SPECIFICATION

Table 1 – General specification

Parameters	Values
Power	2.8 W*
Mass	12.0 kg
Dimensions	760 mm; 335 mm; 250 mm
Operational temperature range	-40°C...+70°C
Non-operational temperature range	-40°C...+85°C
Outgassing rate	<1% TML <0.1% CVCM
Data rate	1 kbit/s

\* The system includes its own battery package (9 pcs of SAFT LSH20 batteries with 13.0 Ah capacity).

### 3.2 ENVIRONMENTAL SPECIFICATION

Table 2 – Environmental specification

Parameters	Values	
Thermal	Temperature environment	-40°C...+85°C
	Pressure environment	Up to 10 <sup>5</sup> Pa
	Humidity environment	20...65%relH
Thermal-vacuum	Temperature environment	-40°C...+85°C
	Vacuum environment	<10 <sup>-3</sup> Pa
	Max. depressurisation rate	5.0 kPa/s
Vibration	Sine vibration environment for 3-axis	10...700 Hz, 4.0 g
	Random vibration environment for 3-axis	5...2000 Hz, 6.0 g <sup>RMS</sup>
	Shock pulse for 3-axis	±20 g, 2.0 ms
EMC	EMC environment	Tailored ECSS-E-ST-20-07C Rev.1 [AD 2]

### 3.3 INTERFACES

Table 3 – Interfaces

Parameters	Values
Input power bus	24.0 V...36.0 V (redundant)
TM/TC interface	CAN Bus / RS-422 (redundant)

### 3.4 MEASUREMENT CAPABILITIES

Table 4 – Measurement capabilities

TRITEL silicon detector	
Particle types	electrons, protons, heavy ions
Flux range (isotropic)	$1.5 \cdot 10^{-1} - 4.5 \cdot 10^4 \text{ cm}^{-2}\text{s}^{-1}$
Count rate range (<10% dead time)	0-50,000 cps
LET in water range	0.2 – 120 keV/ $\mu\text{m}$
Deposited energy range	50 keV – 70 MeV
Minimum absorbed dose rate in water	50 nGy/h
(for relativistic protons with energy deposit of $\approx 100 \text{ keV}$ in Si)	10 mGy/h
Maximum absorbed dose rate in water	0.5 Gy/h
(for relativistic protons with energy deposit of $\approx 100 \text{ keV}$ in Si)	7 Gy/h
GM-tubes	
GM types	Centronic ZP1210, ZP1200
Particle types	photons, charged particles
Dose rate range	1 $\mu\text{Gy}$ ...100 mGy
Counting rate at $10^{-2} \text{ mGy/h}$	28 cps (for ZP1200) 110 cps (for ZP1210)
Dead time	90 $\mu\text{s}$ (for ZP1200) 200 $\mu\text{s}$ (for ZP1210)
Noise level	<0.2 cps (for ZP1200) <1.2 cps (for ZP1210)



## 4 Flight Heritage

Table 5 – Flight heritage

Mission name	Hosting platform	Orbit details	Duration	Remarks
<b>BEXUS-12</b>	CoCoRAD experiment	26 km maximum altitude (N68°)	4 hours	Without GM-tubes
<b>BEXUS-14</b>	TECHDOSE experiment	28 km maximum altitude (N68°)	4 hours	With 2 GM-tubes



## 5 List of Abbreviations

<b>AD</b>	Applicable Documents
<b>ECSS</b>	European Cooperation for Space Standardization
<b>GM</b>	Geiger-Müller counter
<b>RD</b>	Reference Documents
<b>BEXUS</b>	Balloon Experiments for University Students
<b>TC</b>	Telecommand
<b>TM</b>	Telemetry

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## 8 References

### 8.1 APPLICABLE AND NORMATIVE DOCUMENTS

Table 6 – 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

Table 7 – Reference Documents

RD	Title	Reference	Version
[RD 1]	-	-	-