TRITEL

3-dimensional Space Dosimetry Telescope

Application

Space Dosimetry Monitoring for Manned Missions

- ✓ Proven space dosimetry instrument for manned space missions
- ✓ To determine the absorbed dose and dose equivalent of in real time
- ✓ To study shielding effects of the surrounding environment
- ✓ Operated several times on-board the International Space Station

Space Radiation Research

- ✓ To determine the LET-spectrum of the incoming space radiation
- ✓ To determine the average quality factor of the space radiation
- ✓ To measure long-term radiation flux profiles
- ✓ To obtain space weather related real time data set
- ✓ Operated on-board the ESEO SmallSat

Key Features

- ✓ Space dosimetry instrument for manned space missions to determine the absorbed dose, dose equivalent, LET-spectrum and quality factor in space
- ✓ Detector unit can be used standalone in satellite missions
- ✓ 3-dimensional silicon detector telescope system
- ✓ Central Handling Unit for astronauts
- ✓ Central Handling Unit provides
  - ✓ Graphical user interface for astronauts (via touchscreen)
  - ✓ Visual real-time measurement information for astronauts
- ✓ Configurable system
  - ✓ External Detector Units
  - ✓ Central Handling Unit
  - ✓ Up to a maximum number of 3 Detector Units
- ✓ Fully autonomous operation
- ✓ Controlled via graphical user interface or TM/TC
- ✓ Available detector interfaces: CAN, RS-485, RS-232

General Specification

	Detector Unit	Central Handling Unit
Power	2.6 W	2.9 W (boot: 3.9 W)
Mass	~ 0.9 kg	~ 1.3 kg
Dimensions (H, W, L)	83 mm, 107 mm, 155 mm	215 mm, 160 mm, 52 mm
Input voltage range	17.0…34 V	
Operational temperature range	-40°C…+40°C	-40°C…+70°C
Non-operational temperature range	-40°C…+85°C	
Operational pressure range	10^5 Pa…10^{-4} Pa	10^5 Pa…10^{-4} Pa
Outgassing rate	<1% TML <0.1% CVCM	
Data rate	0.33 MB/day	N/A
Handling environment humidity	40…65% relH	

Environmental Specification

Temperature environment	-40°C…+85°C
Low frequency longitudinal and lateral vibration environment	20…100 Hz, 16.0 g
High frequency random environment for 3-axis	5…2000 Hz, 17.38 g_{RMS}
Shock pulse	100 g, 0.25 ms
Depressurisation rate	5.0 kPa/s

Measurement Capabilities

Particle types	electrons, protons, heavy ions
Flux range (isotropic)	$1.5 \cdot 10^{-1}$ – $4.5 \cdot 10^{4}$ $cm^{-2}s^{-1}$
Count rate range (<10% dead time)	0-50,000 cps
LET in water range	0.2 – 120 keV/µm
Deposited energy range	50 keV – 70 MeV
Minimum absorbed dose rate in water	50 nGy/h
(for relativistic protons with energy deposit of ≈100 keV in Si)	10 mGy/h
Maximum absorbed dose rate in water	0.5 Gy/h
(for relativistic protons with energy deposit of ≈100 keV in Si)	7 Gy/h

3-dimensional Telescope System Specification

Radius of the detectors	8.4 mm
Effective surface of the detectors	222 mm^2
Geometric factor G (for one telescope axis in 4π)	5.1 cm^2sr
Maximum angle of incidence (for one detector pair)	62.1°
Average path length in the detector (assuming an isotropic field)	361 μm
Ratio of the maximum and minimum path lengths	2.14

Flight Heritage

Mission name	Hosting platform	Orbit details	Duration	Remarks
TRITEL-SURE	ISS Columbus module	LEO 300-400 km	6 months	One detector unit and one central handling unit
TRITEL-RS	ISS Zvezda module	LEO 300-400 km	>6 months	One detector unit and one central handling unit
ESEO-TRITEL	ESEO SmallSat	LEO 500-600 km	To be launched in November 2018	One detector unit

Contact us

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