TRITEL measurements on board the International Space Station

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The TRITEL 3D Silicon Detector Telescope

- 3 x 2 Canberra FD PIPS det.
- $r = 8.4$ mm
- $p = 8.9$ mm
- $w = 300 \, \mu$m

$\Delta E$ meas. + trigger

$\text{trigger}$

$\text{trigger}$
The TRITEL 3D Silicon Detector Telescope

- ΔE measurements: 60 keV – 83 MeV (quasi logarithmic spectra; total and coincidence)
  → LET: 0.2 keV/μm – 120 keV/μm in water

- ΔE spectra every 10 minutes
  → 90-min and daily spectra are stored

- Time spectra (total and coincidence); 1-min resolution
  - Contribution from SAA crossings → collected separately
TRITEL on board Columbus

The **TRITEL-SURE experiment** is co-funded by the EC project SURE, contract number RITA-CT-2006-026069 and by the Government of Hungary through ESA Contracts 98057 and 4000108072/13/NL/KML under the PECS (Plan for European Cooperating States).

The view expressed herein can in no way be taken to reflect the official opinion of the European Space Agency.
The TRITEL experiment

- Radiation Detector
- TRITEL Electronic Unit
- Passive Detector Package (PDP)
- Power/Data Cable
- USB Stick
The PDP of TRITEL

- Detectors, 5 mm on each side
- Detectors, 5 mm
- Detector, 1 mm
- Detector, 1 mm
- Carbon slices, 9.33 mm thick
TRITEL on board Columbus

Picture: NASA
TRITEL on board Columbus

The European Physiological Module (EPM rack)

Figure: ESA/NASA
TRITEL on board Columbus

TRITEL axes: -X; -Y; +Z

Photo: ESA/NASA
TRITEL time spectra

Period: ≈92 minutes

Count rate (cps)

GMT (hh:mm)

Y axis
TRITEL time spectra

- Period: ≈ 24 h
- SAA crossings

Count rate (cps)

Y axis

Date YYYY.MM.DD

Geomagnetic (350km Apex) Latitudes
Some preliminary results

Example: Nov 8, 2012

• Contribution of SAA crossings:
  – X: 130 μGy/d ± 10 μGy/d
  – Y: 130 μGy/d ± 10 μGy/d
  – Z: 117 μGy/d ± 10 μGy/d

• Contribution outside SAA:
  – X: 123 μGy/d ± 10 μGy/d
  – Y: 148 μGy/d ± 8 μGy/d
  – Z: 124 μGy/d ± 4 μGy/d

• Total:
  – X: 253 μGy/d
  – Y: 278 μGy/d
  – Z: 241 μGy/d

• Quality factors:
  – Outside SAA:
    – X: 3.5 ± 0.4
    – Y: 3.6 ± 0.1
    – Z: 4.3 ± 0.2
Intercomparisons planned

- DOSTEL (DOSIS)
- ALTEA-Shield
- Radi-N2
...
Red lines show the identical orientations of the TRITEL-SURE and DOSIS-3D-2 TLD detectors.
Comparison of TRITEL-SURE and DOSIS-3D-2 dose rate data obtained by TLDs

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<th>µGy/d</th>
<th>MTS-7</th>
<th>SD</th>
<th>MTS-6</th>
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TRITEL in the Russian SM

TRITEL-RS (in the frame of Matroshka-R) was developed in cooperation with the Institute of Biomedical Problems, Moscow and with the former financial support of the Hungarian Space Office.
TRITEL in the Russian SM

Location: CM 221 and CM222 panels

Preliminary results from on-board calculations for some periods:

Apr 5 – May 16, 2013:
320 μGy/d; 862 μSv/d → Q_{av}: 2.7

June 11 – June 12, 2013:
298 μGy/d; 809 μSv/d → Q_{av}: 2.7

Photo: IBMP/Roscosmos/Energia
TRITEL on board ISS

TRITEL-RS, Zvezda
April 5, 2013 - …

TRITEL-SURE, Columbus
Nov 9, 2012 – May 10, 2013

transfer
July 2013

Figure: NASA; Photos: Energia/Roscosmos/IMBP and ESA/NASA
Thank you for your attention!