

TRITEL measurements in the Russian Service Module (April – July 2013)

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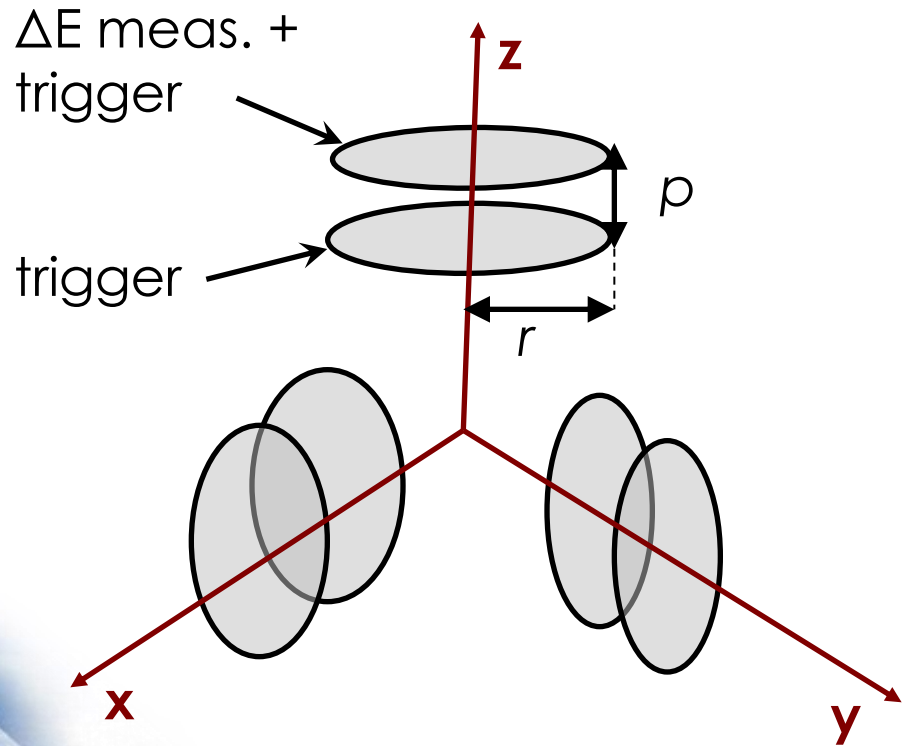
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Content

- The TRITEL-RS system
- TRITEL-RS on the ISS
- From the results of April 2013 – July 2013

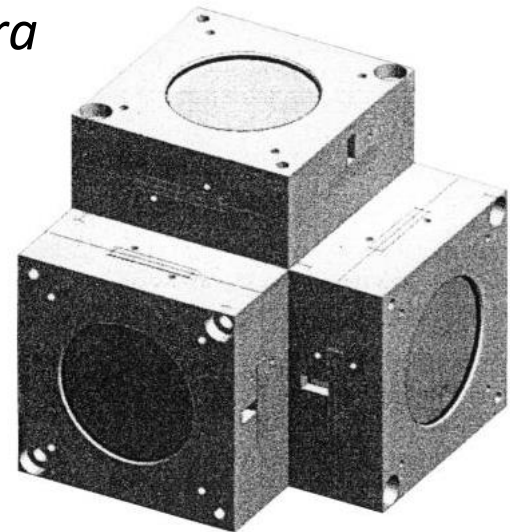


The TRITEL 3D Silicon Detector Telescope

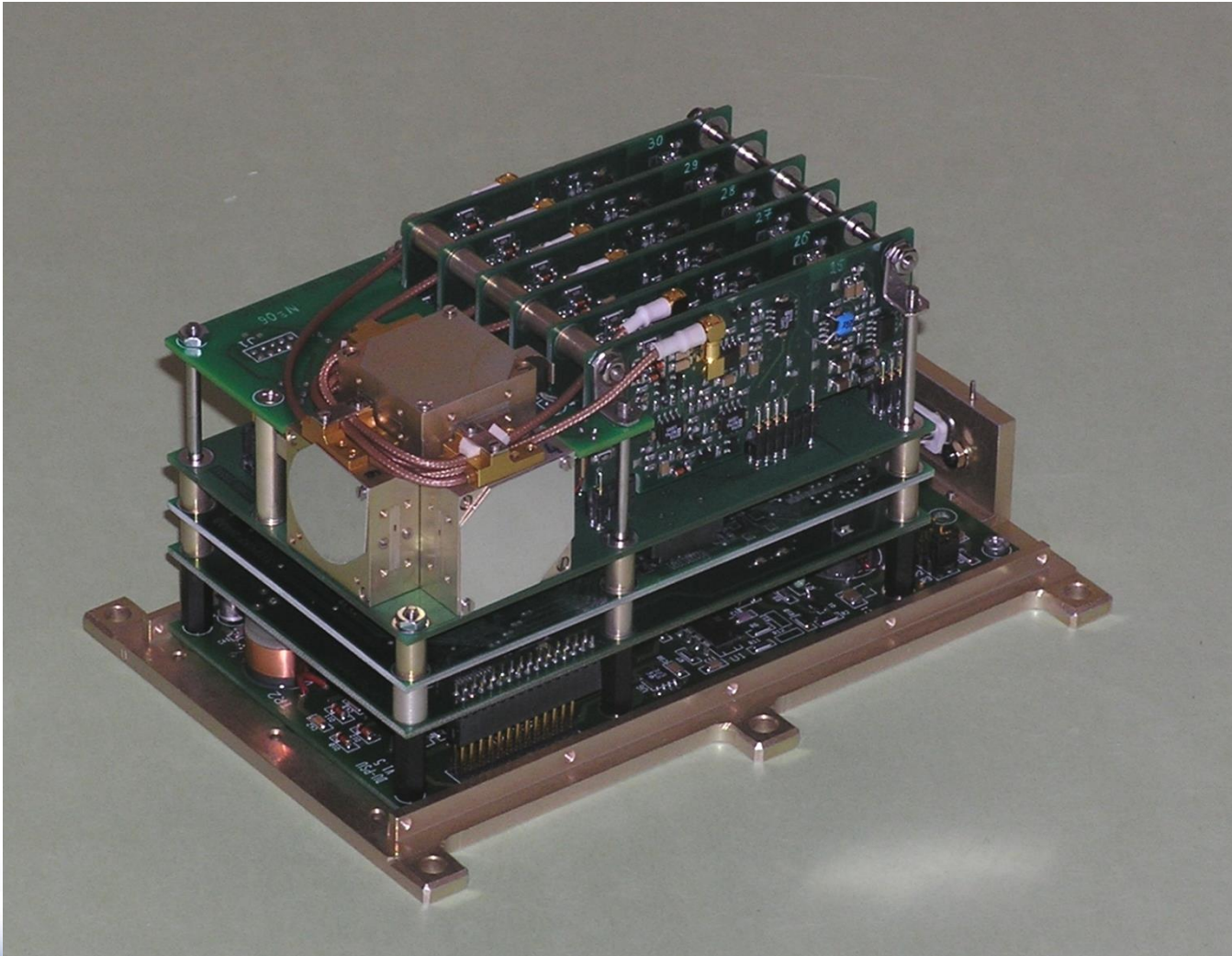


- „ ΔE - ΔE ” detector
- $\Sigma \Delta E \rightarrow \sim D$
- $\Delta E / x_{\text{avg}} \approx \text{LET}_{\text{Si}}$

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



TRITEL (interior)



The TRITEL 3D Silicon Detector Telescope

- ΔE measurements: 60 keV – 83 MeV (nominal)
(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



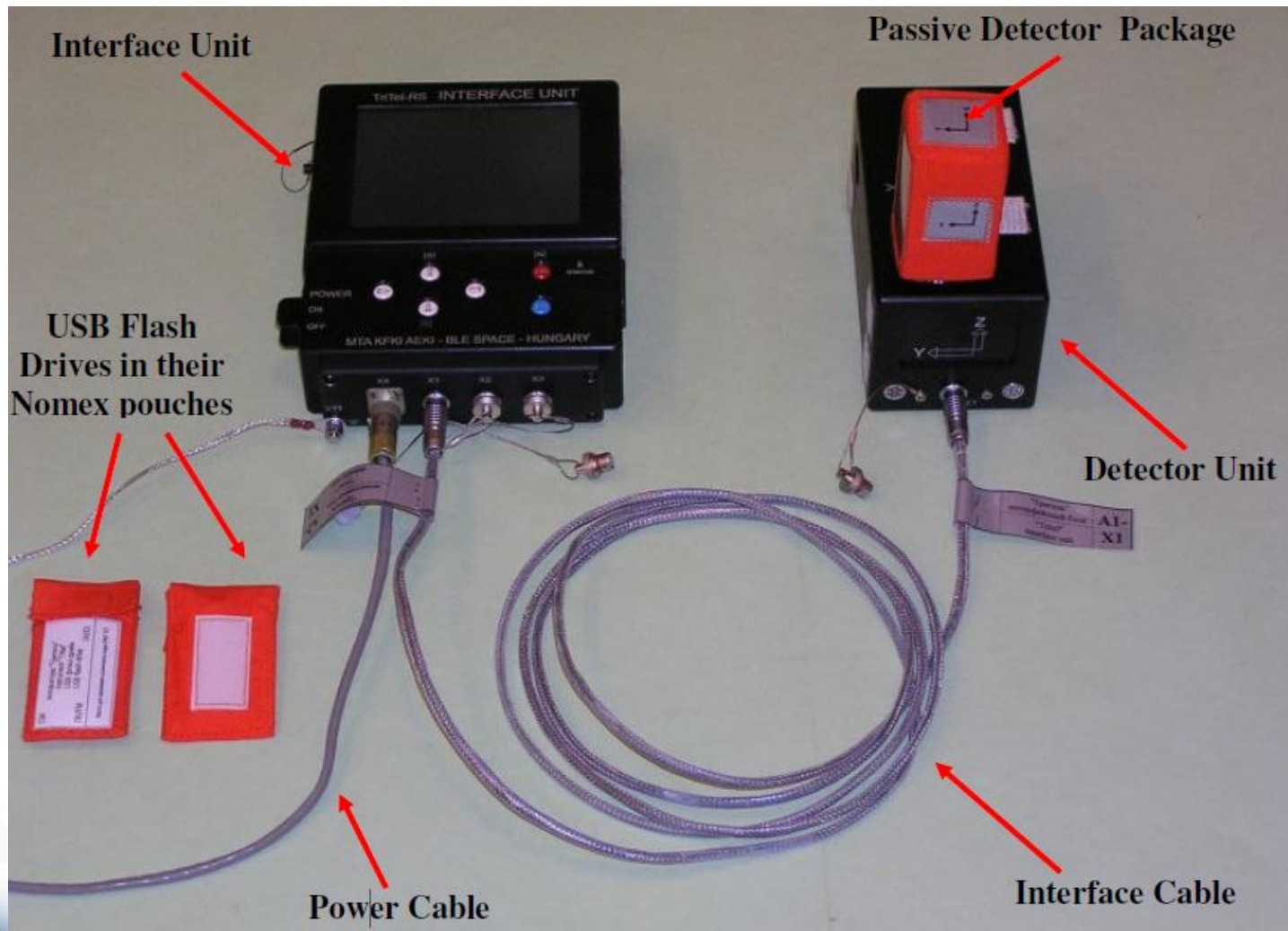
TRITEL in the Russian SM of the ISS



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 of the ISS



TRITEL in the Russian SM of the ISS

Location: CM 221 and CM222 panels

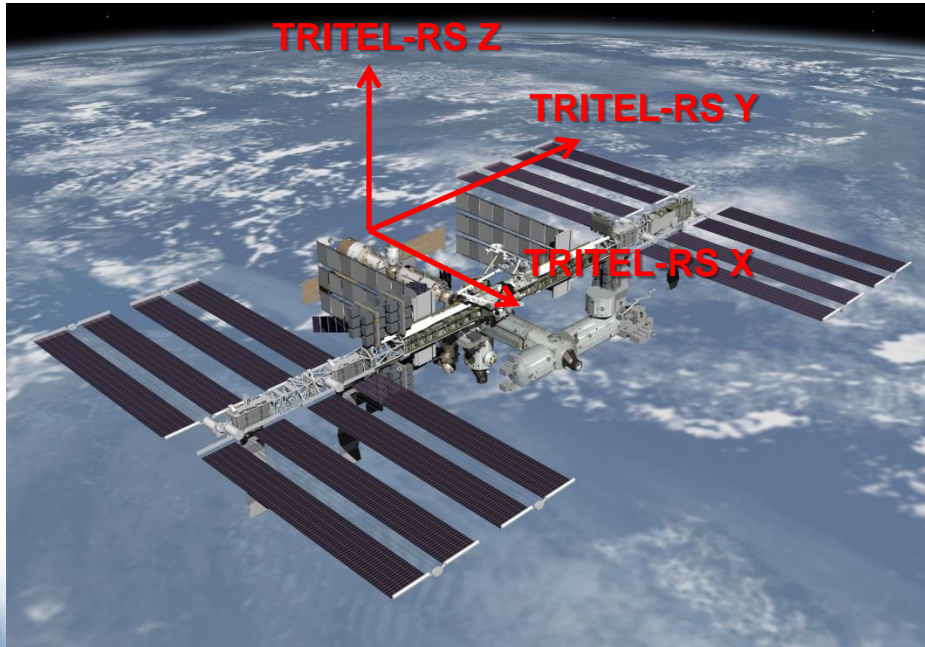


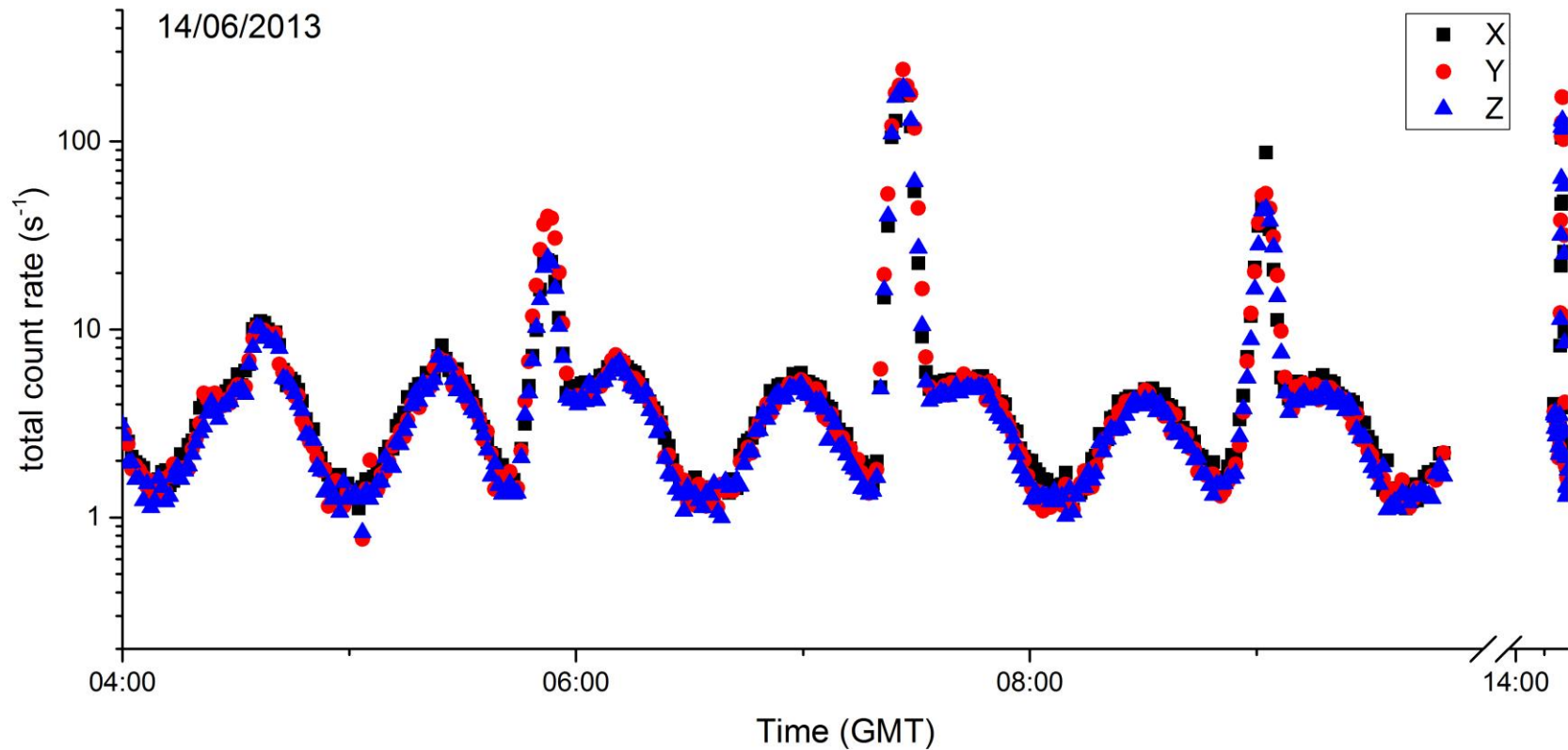
Photo: NASA



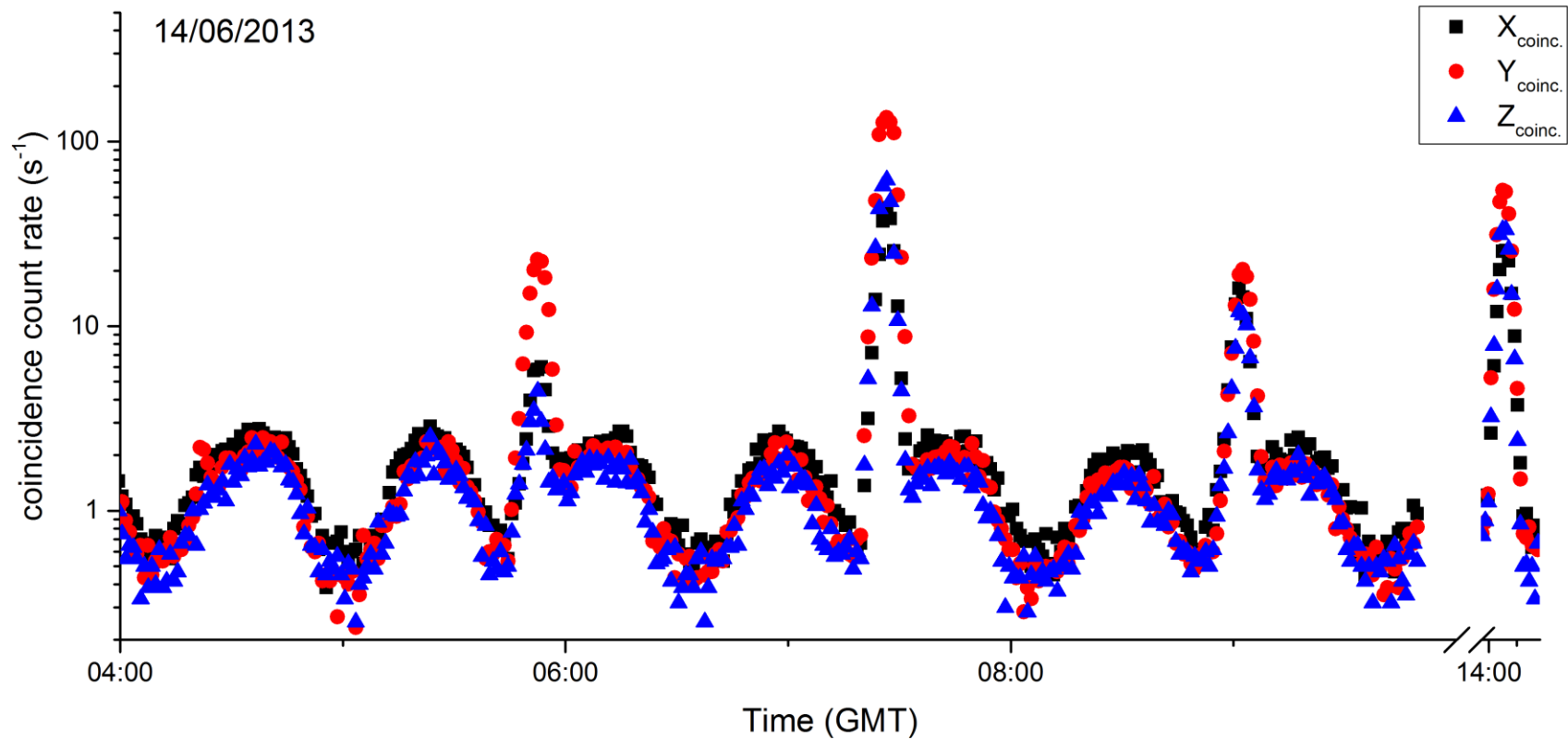
Photo: IBMP/Roscosmos/Energia



Time spectra - anisotropy

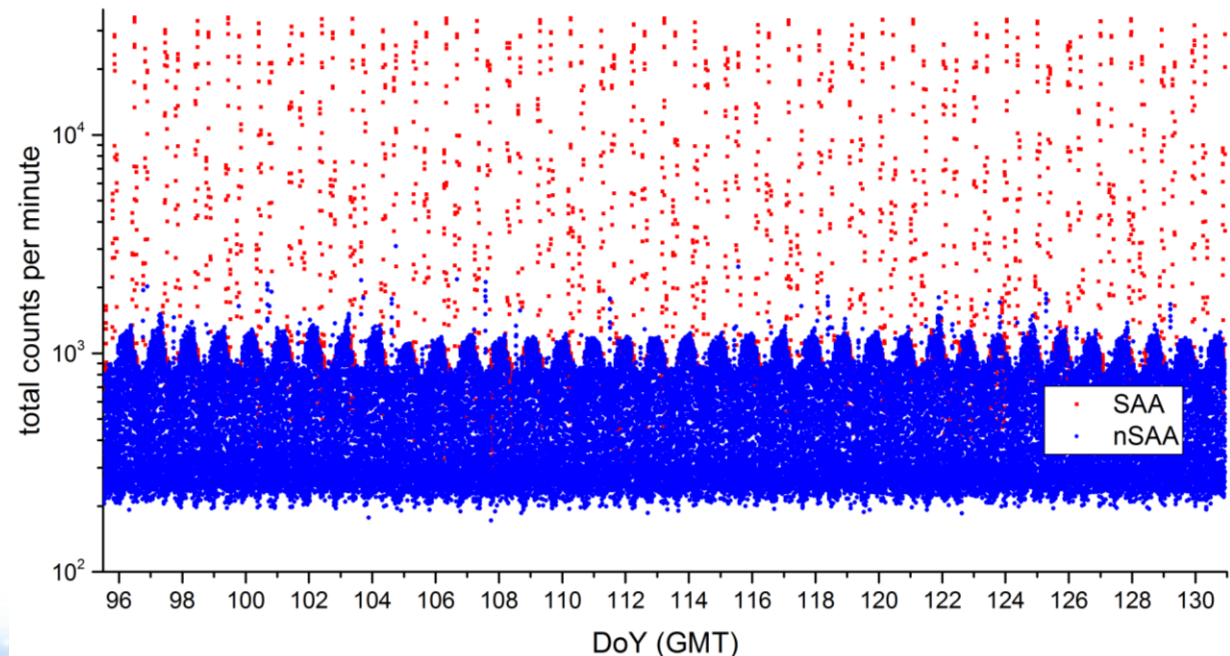


Time spectra - anisotropy

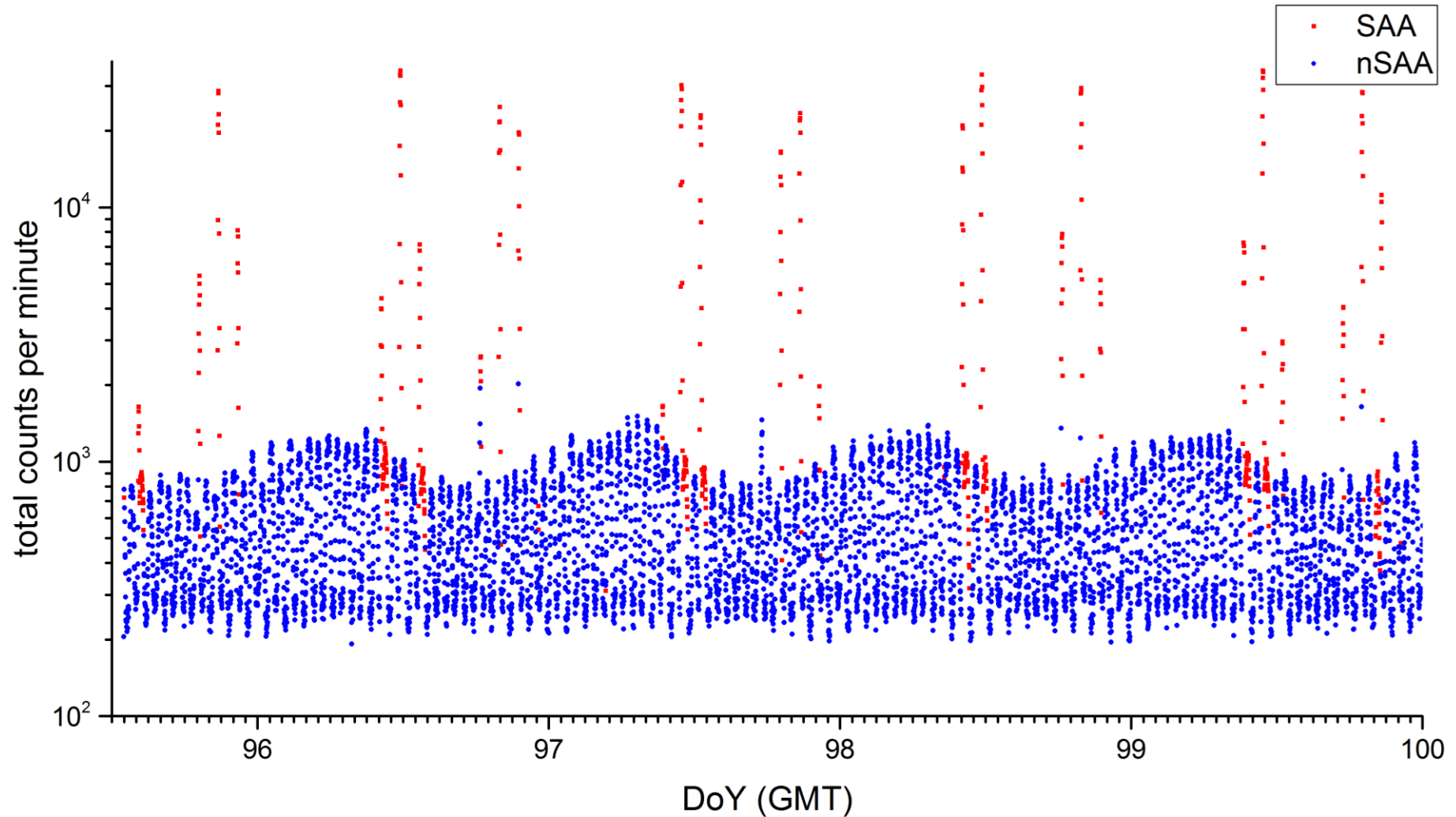


Switching to “SAA” spectra

- Based on time spectra
- Criterion on the relative change in total number of counts
→ 1 parameter (δ)
- Systematic error → switching realized one minute later
- Value of the parameter ($\delta_{\text{flight}} = 17$) → optimized based on earlier DOSTEL time spectra in different missions



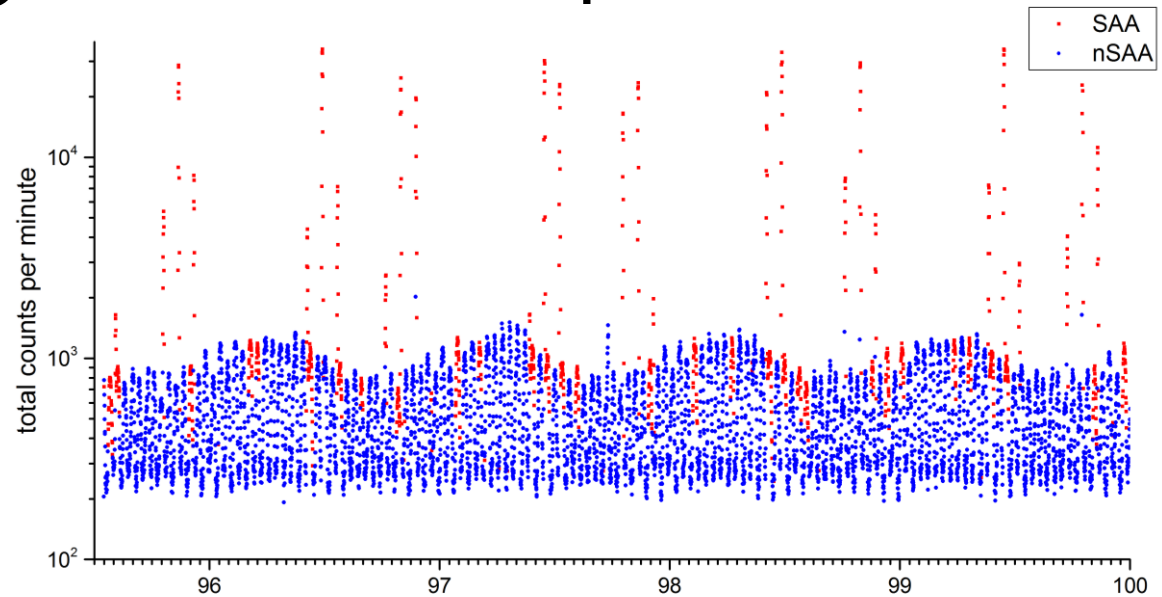
Switching to “SAA” spectra



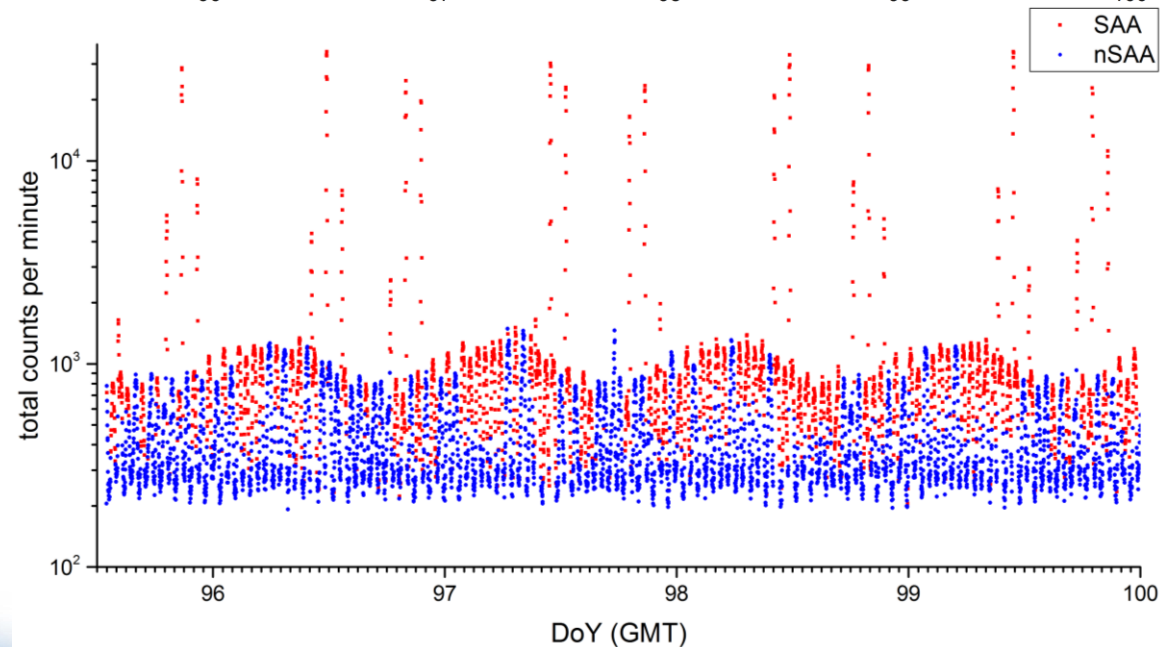
$\delta_{\text{flight}} = 17$

Switching to “SAA” spectra

$$\delta_{\text{test},1} = 14$$

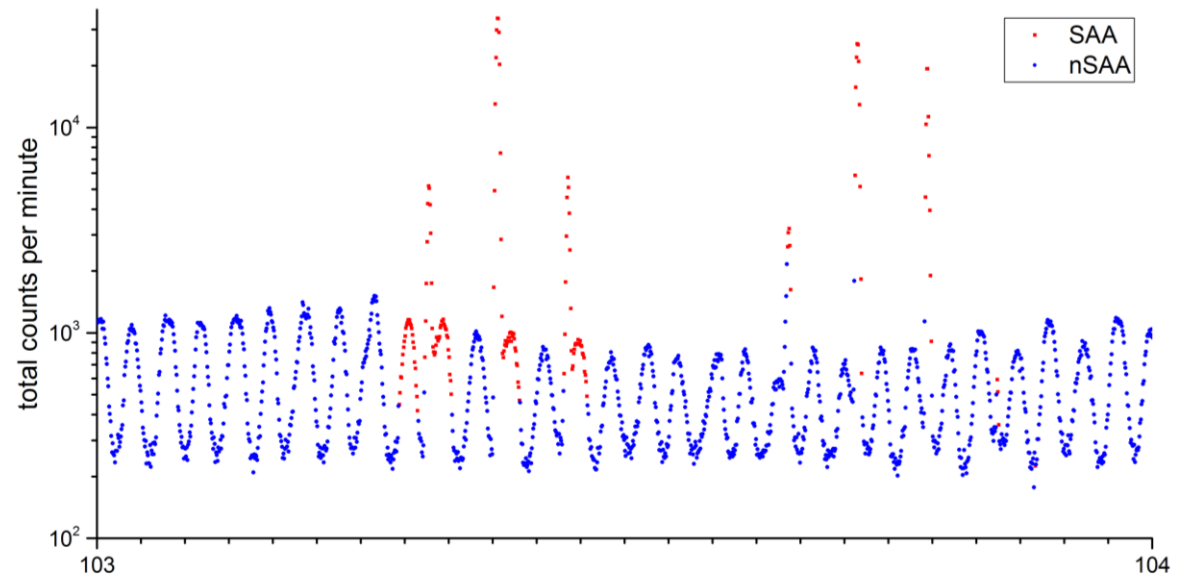


$$\delta_{\text{test},2} = 10$$

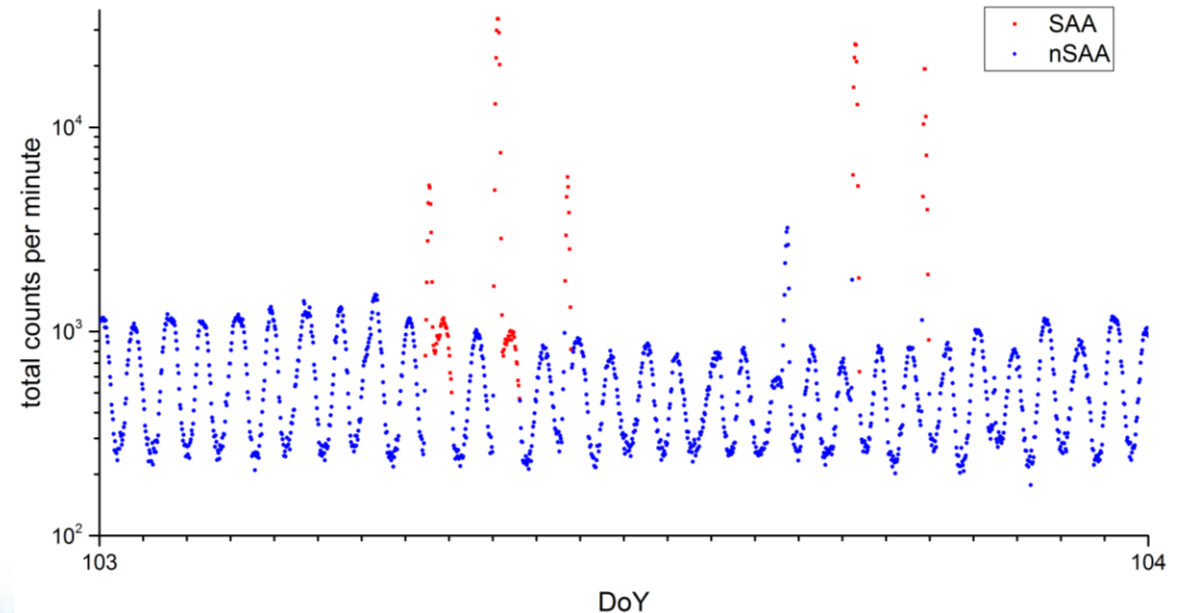


Switching to “SAA” spectra

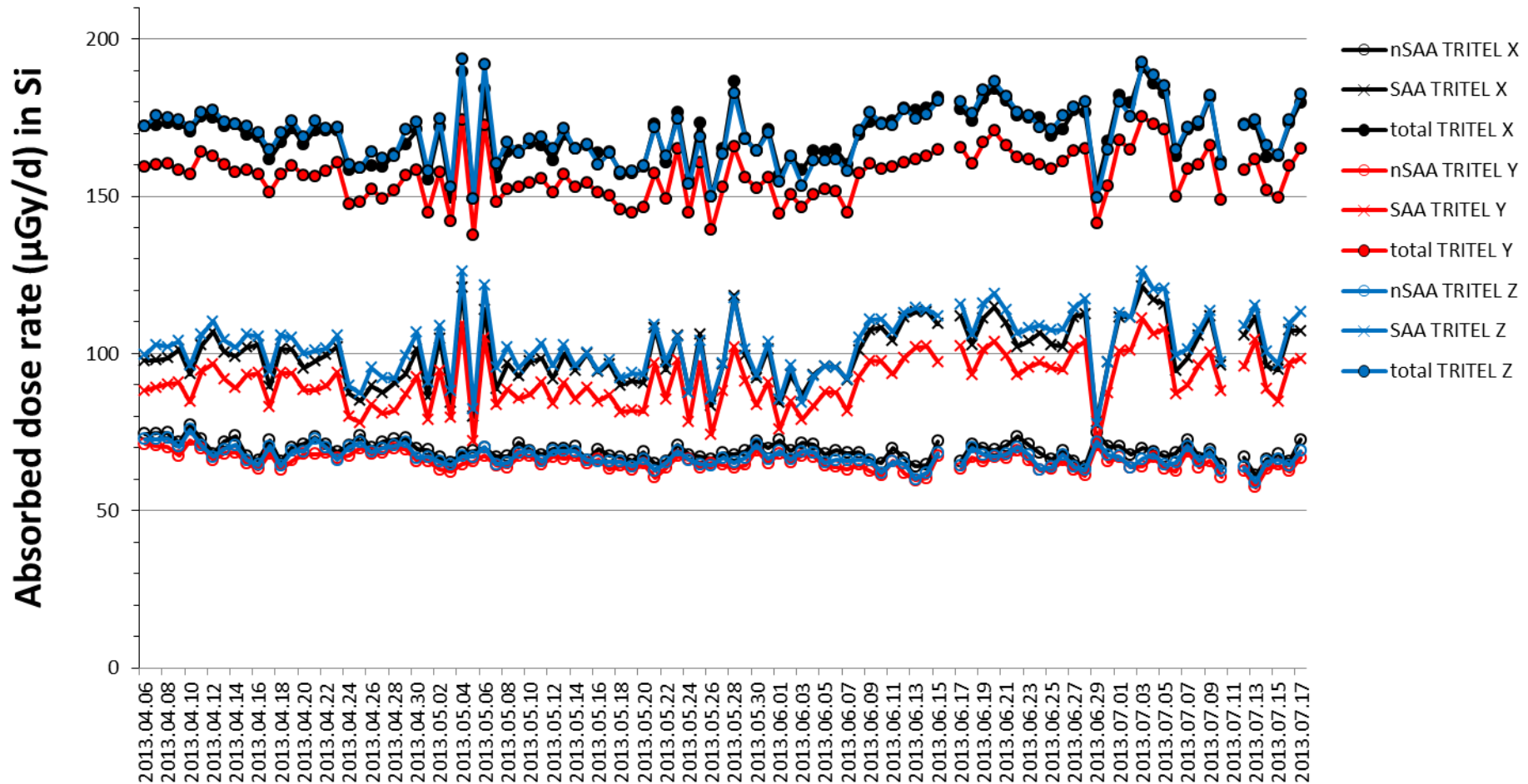
$\delta_{\text{flight}} = 17$



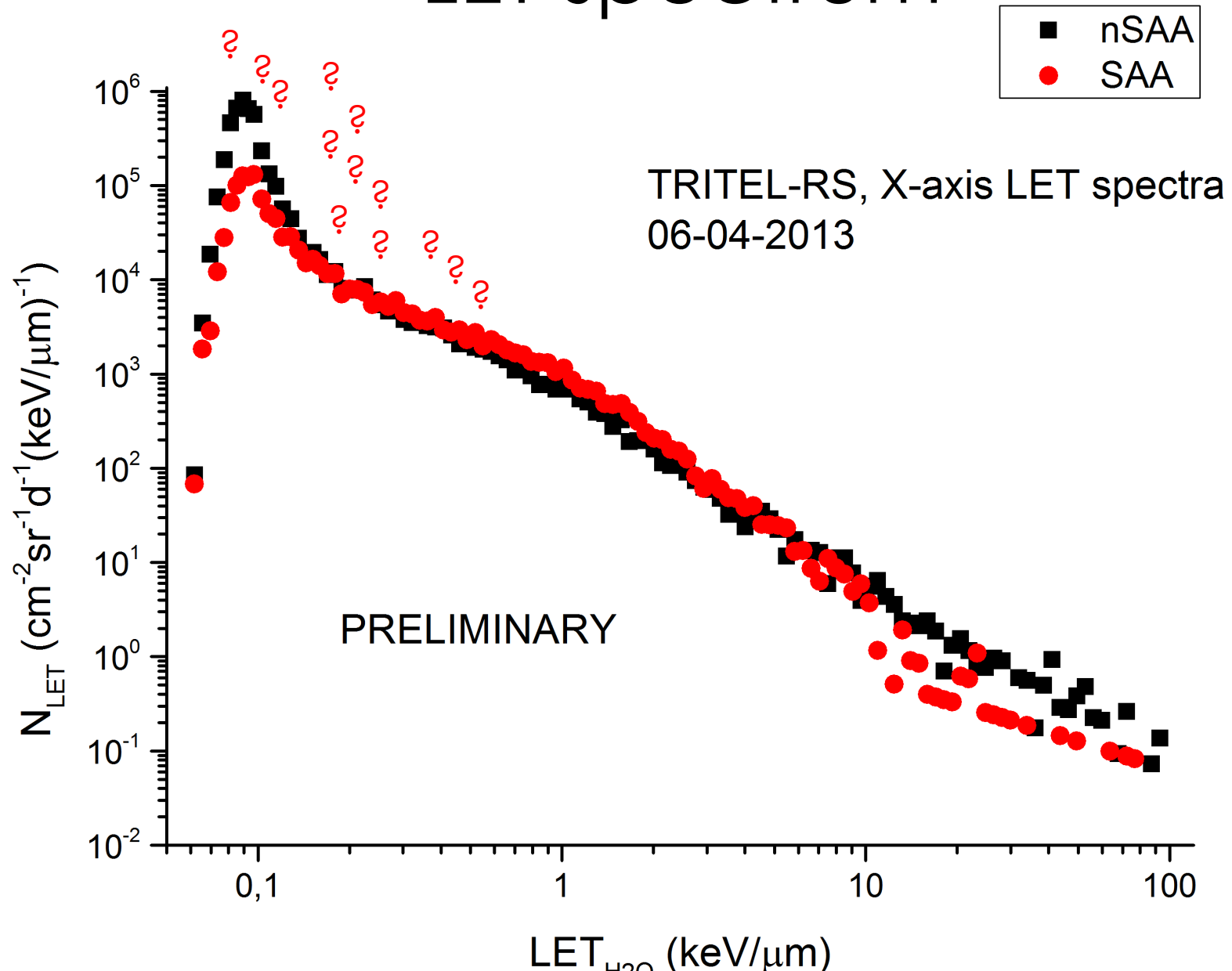
$\delta_{\text{test},3} = 26$



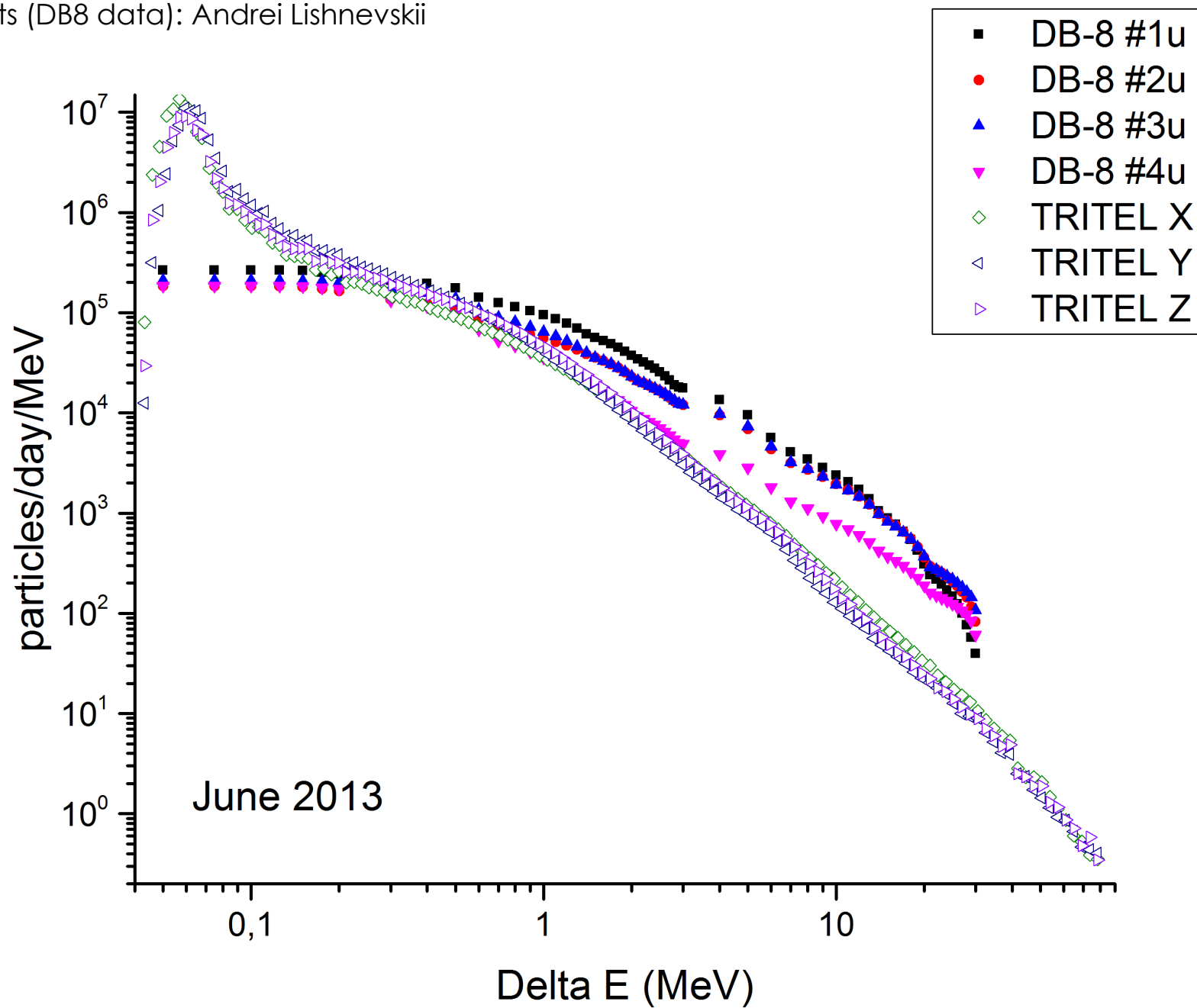
TRITEL-RS daily abs. dose rates



LET spectrum



Credits (DB8 data): Andrei Lishnevskii



TRITEL-RS IU failure

- Soft error in the operating system
 - **data corrupted after 17/07/2013**
 - possible SEE due to HZE particle?
- Error **detected**: in **September 2013** (in downloaded data)
- Switch-off and **restart attempt** by cosmonauts on **14/11/2013**
 - stuck reboot process...
- **Returned** on Soyuz-TMA-11M in **May 2014**
- Tests showed: soft failure in the **CF card** (used for OS and data storage)
- CF card changed to more reliable version
- **Return** of the unit planned with **Progress M-27M...**




Failed delivery to ISS

- Cargo:
Progress M-27M
- Injection to proper orbit:
Failed ☹️



Soyuz-TMA-08M
Launched: 28/03/2013

A photograph of a Soyuz-TMA-08M rocket launching from the Baikonur Cosmodrome. The rocket is ascending vertically, leaving a large, bright orange and yellow plume of fire and white smoke. The launch pad is visible at the base, with several tall service towers on either side. The background is a clear blue sky.

Thank you for your attention

Credits: RSC Energia

