

SPACEDOS

an open-source PIN diode dosimeter for applications in Space

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5 Universal Scientific Technologies Ltd., U Jatek 19/III, Soběslav 392 01, Czechia

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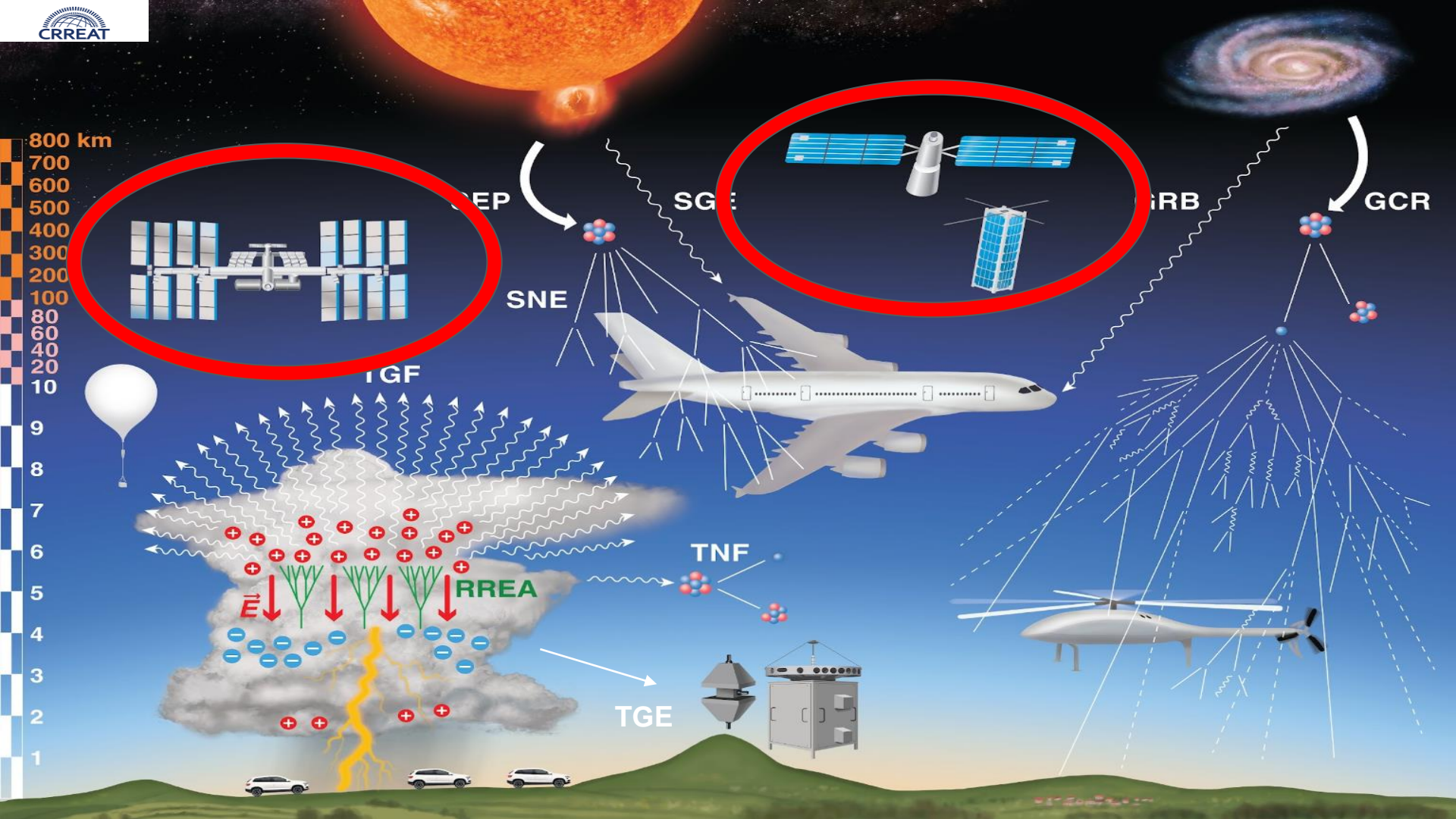
7 Institute of Experimental Physics of the Slovak Academy of Sciences, Watsonova 47, Košice 040 01, Slovak Republic

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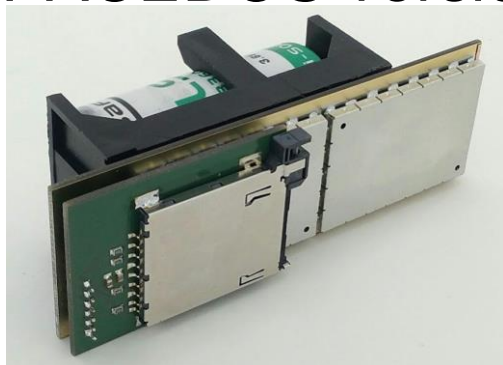
This work was supported by EU Operational Program Research, Development, and Education in project CRREAT (CZ.02.1.01/0.0/0.0/15_003/0000481).

Measurements were carried out at CANAM infrastructure of the NPI CAS Rez and at HIMAC, Japan in frame of project

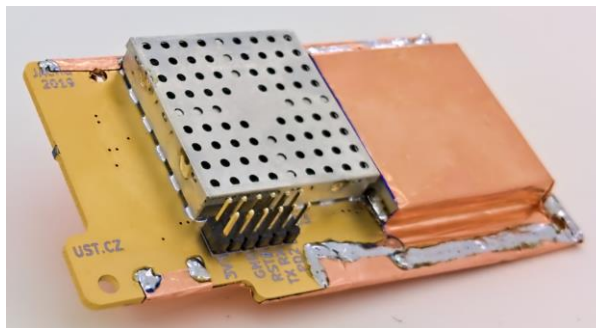




SPACEDOS versions



SPACEDOS 02 A - pressurised cabin



SPACEDOS 01 B - vacuum environment



- Silicon PIN diode detector
(10 mm x 20 mm x 0.3 mm / 5 mm x 5 mm x 0.3 mm)
- Number of energy channels - 240
- Deposited energy range from 200 keV to 8.5 MeV
- Energy measurement resolution < 50 keV/channel
- Power supply 3.3 V / 3 mA (**4 months of operation** on battery)
- Integration time 15 s (customisable in wide range)
- Interface - UART / Industry-grade SLC SD card
- H x W x L - 15 mm x 41 mm x 94 mm (nanosatellite version)
- Weight **130 g / 33 g**
- **Open-source**

<https://github.com/ODZ-UJF-AV-CR/SPACEDOS01>

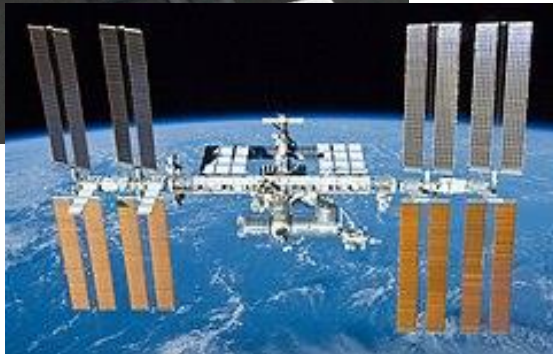
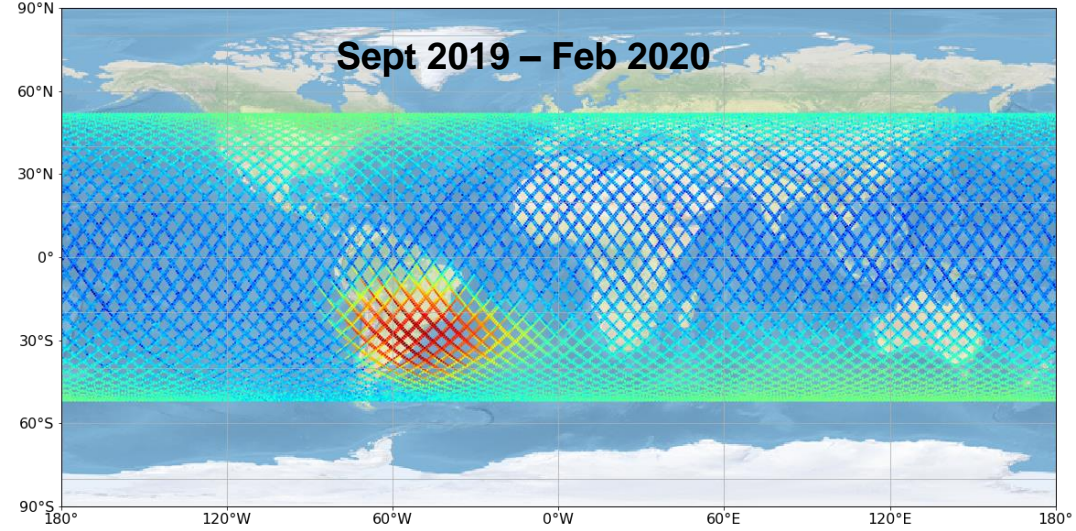
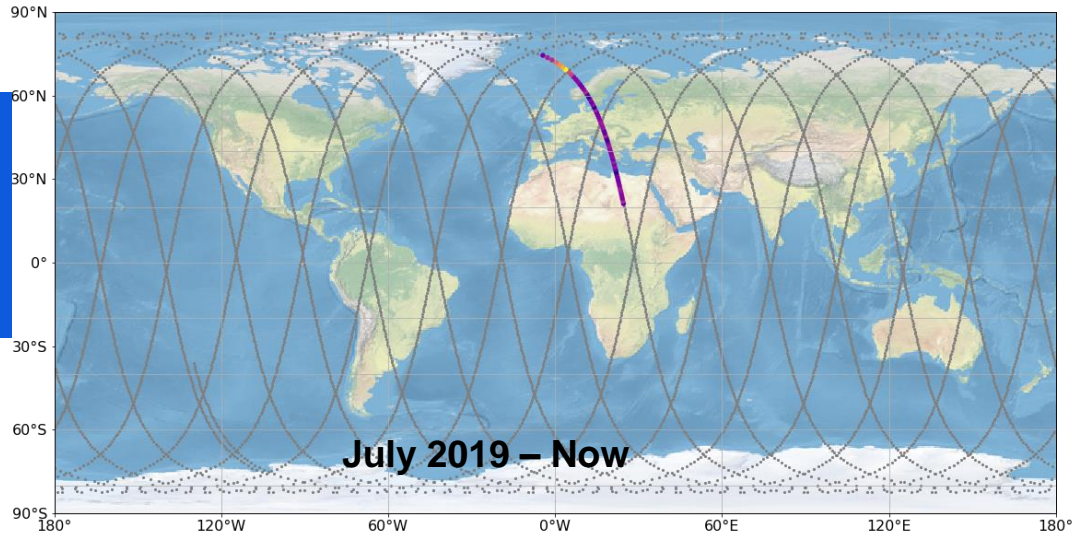
<https://github.com/UniversalScientificTechnologies/SPACEDOS02>



LABDOS01 – new aircraft version 3

Missions

Sokrat-R
(NORADID44404)
3U cubesat
Launch 2019
orbit 500 km



SPACEDOS: AN OPEN-SOURCE PIN DIODE DOSEMETER FOR APPLICATIONS IN SPACE

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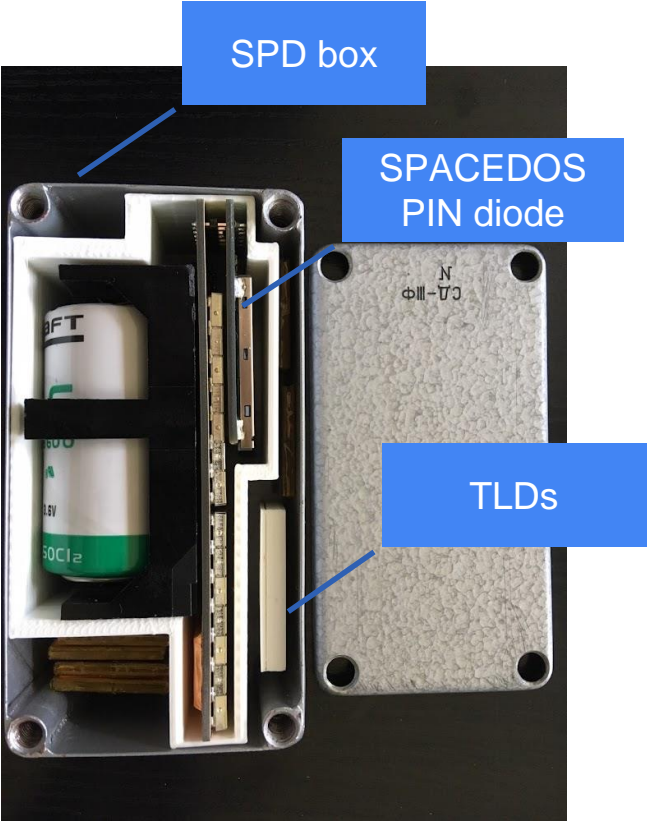
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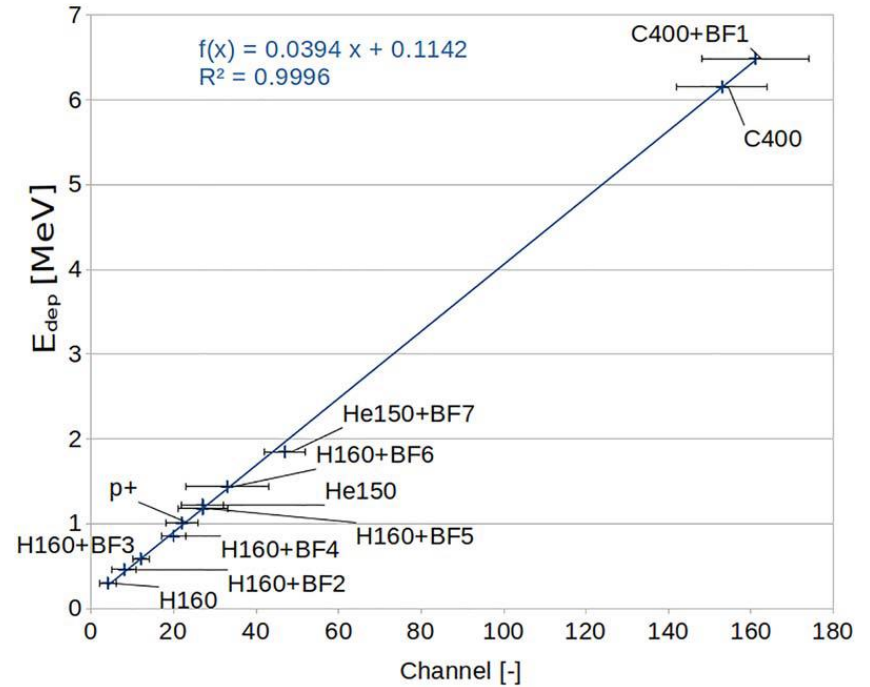
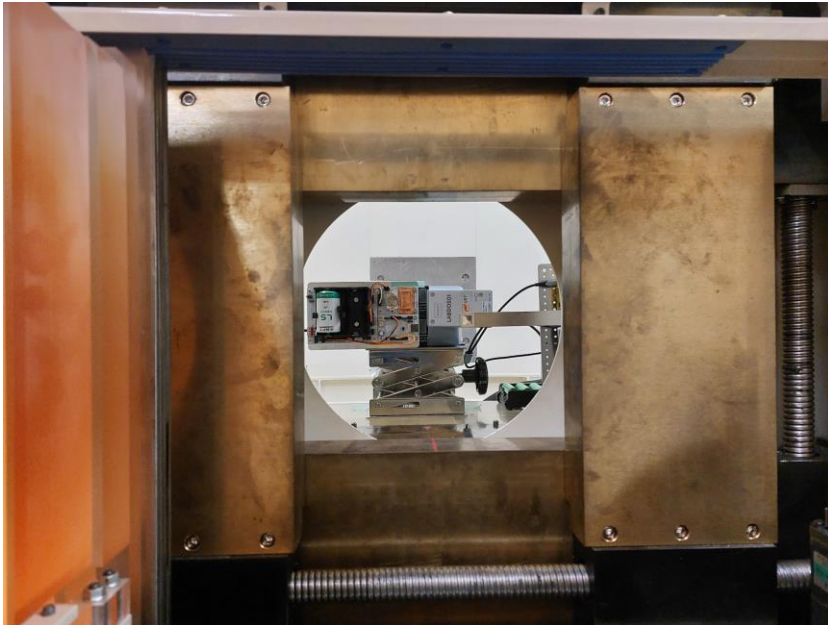
⁵Universal Scientific Technologies s.r.o., U Jatek 19/III, 392 01 Soběslav, Czech Republic

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Deployment in ISS

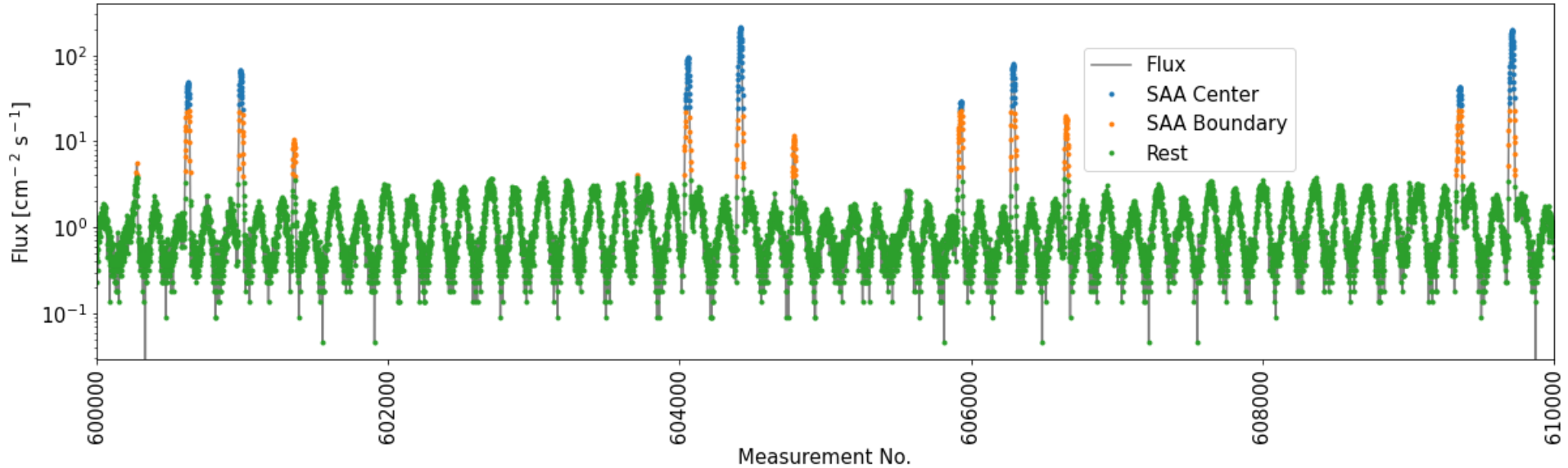


Calibrations



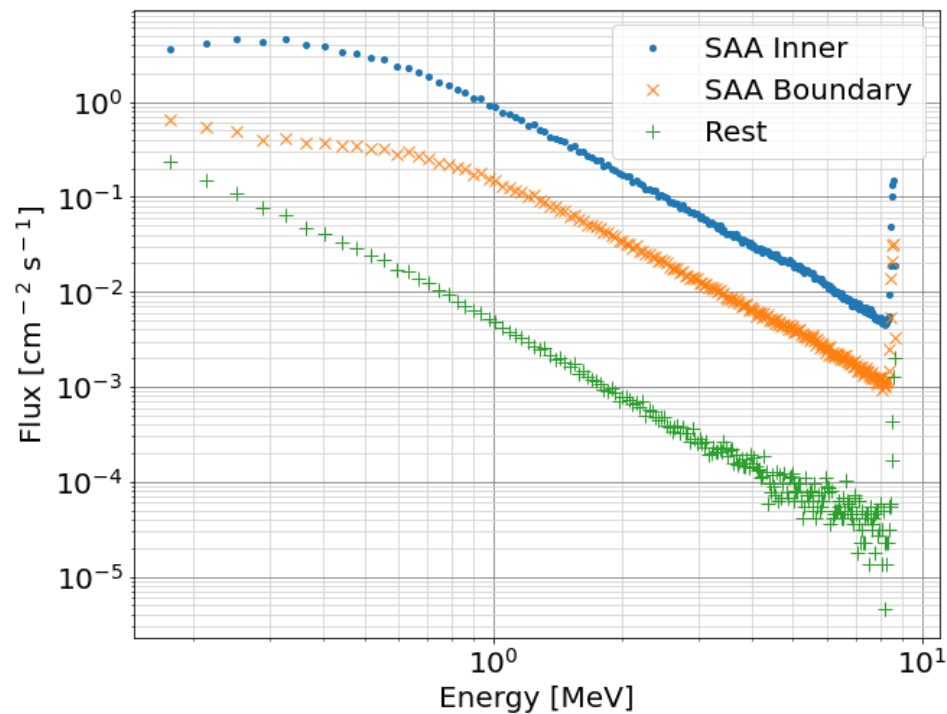
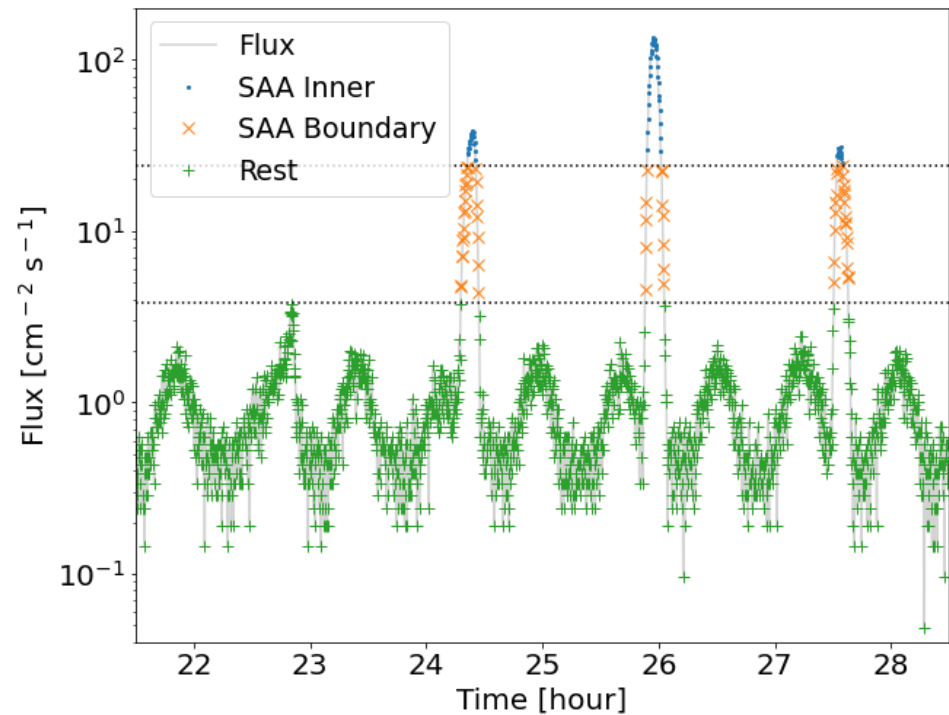
HIMAC and NPI's cyclotron, absorbed dose in Si was evaluated

Example of time series data from ISS



Assessment of SAA contribution to dose based on flux threshold.

Spatial energy distribution

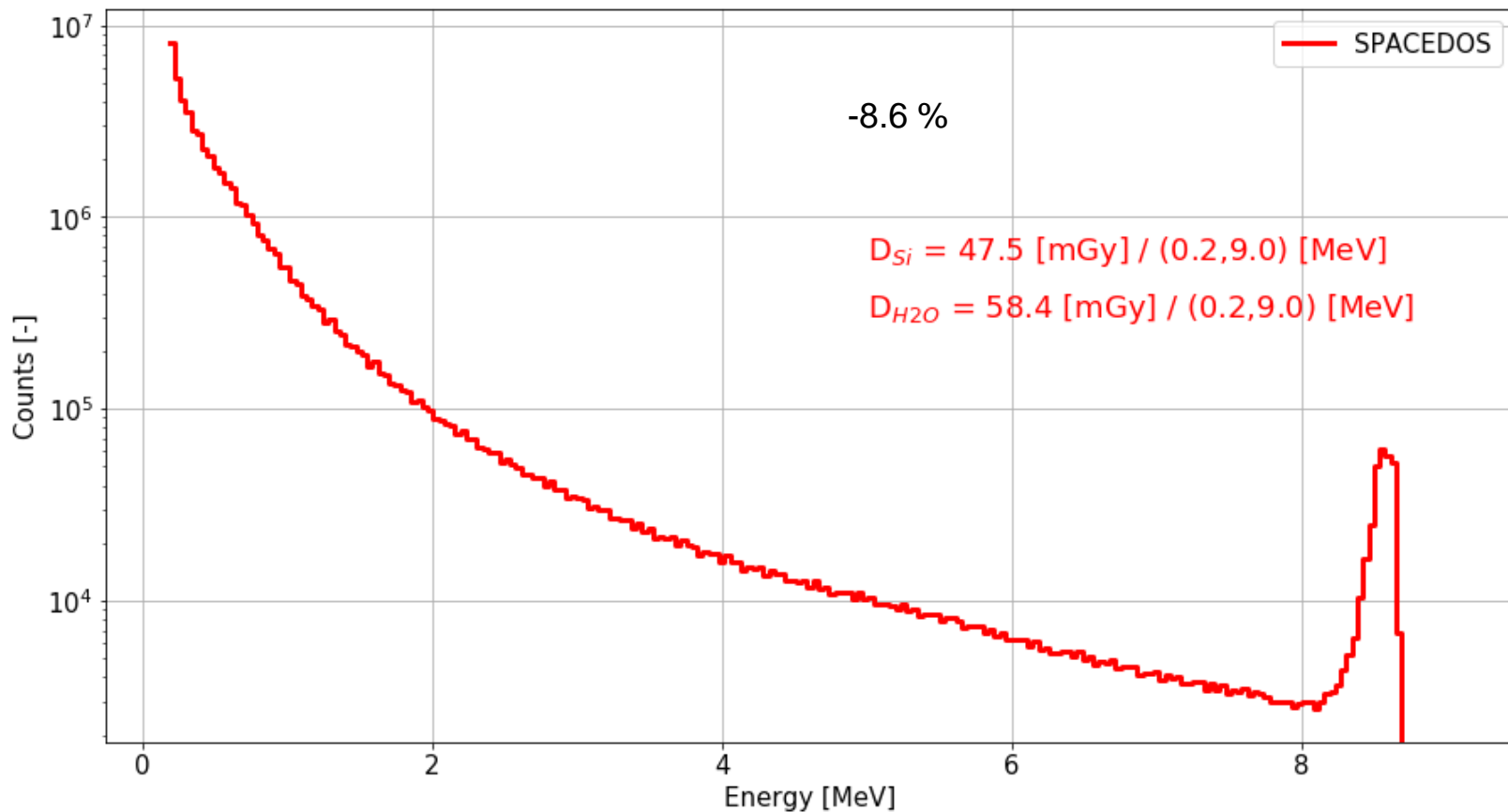


Results – comparison with TLDs

CaSO₄:Dy,Tm

63.9 ± 0.4 mGy

(background 1.20 ± 0.05 subtracted)

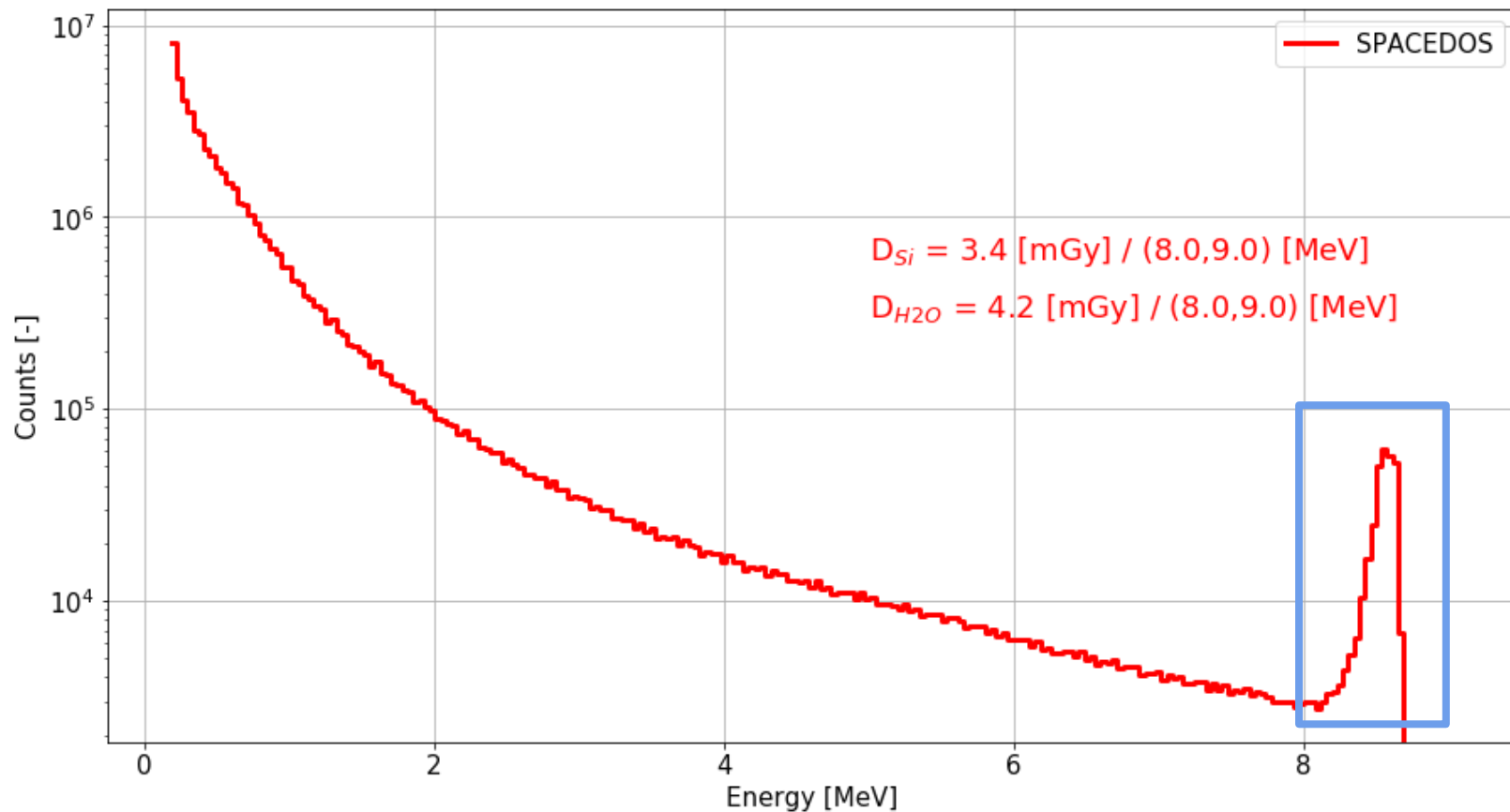


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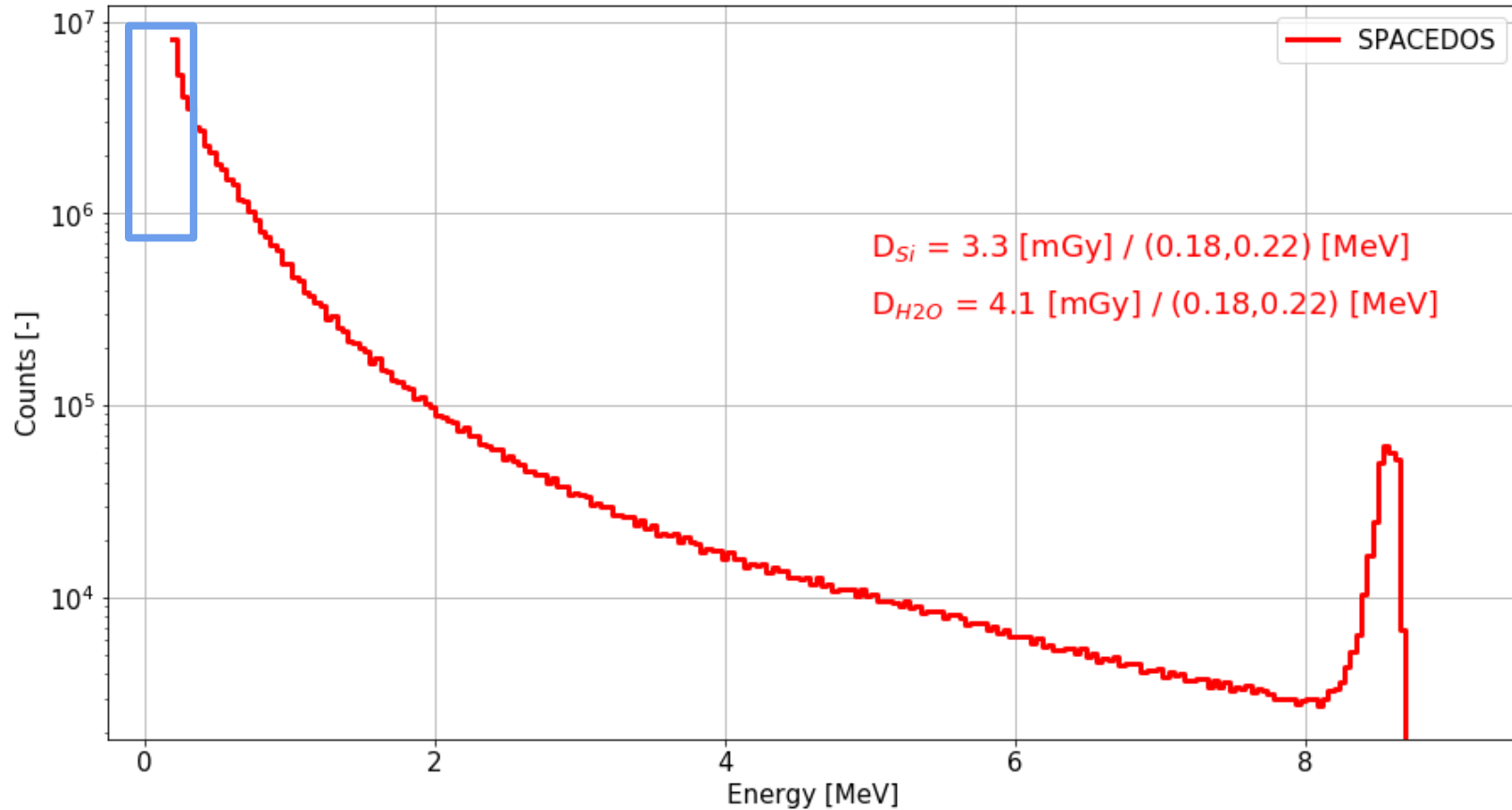


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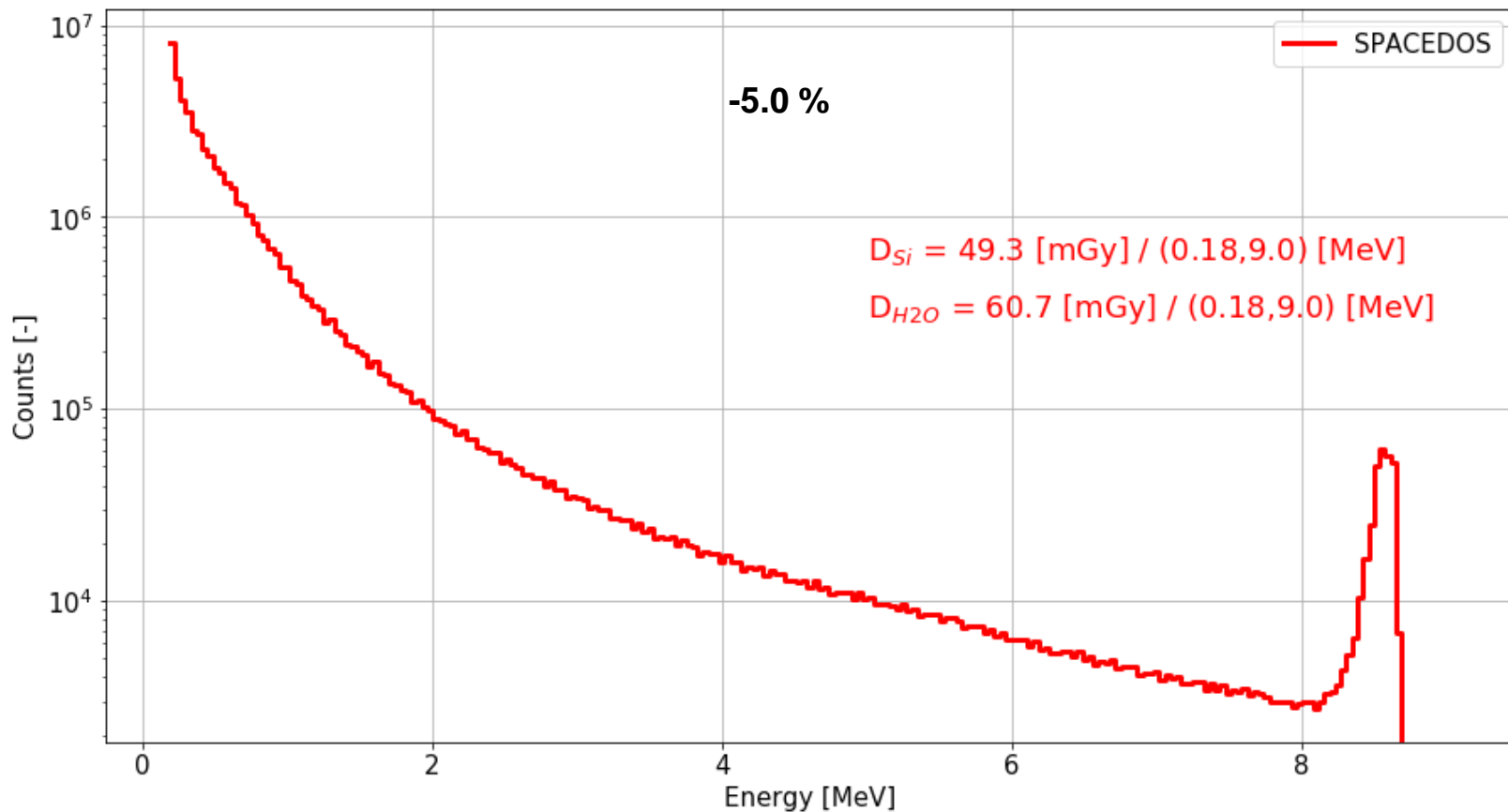


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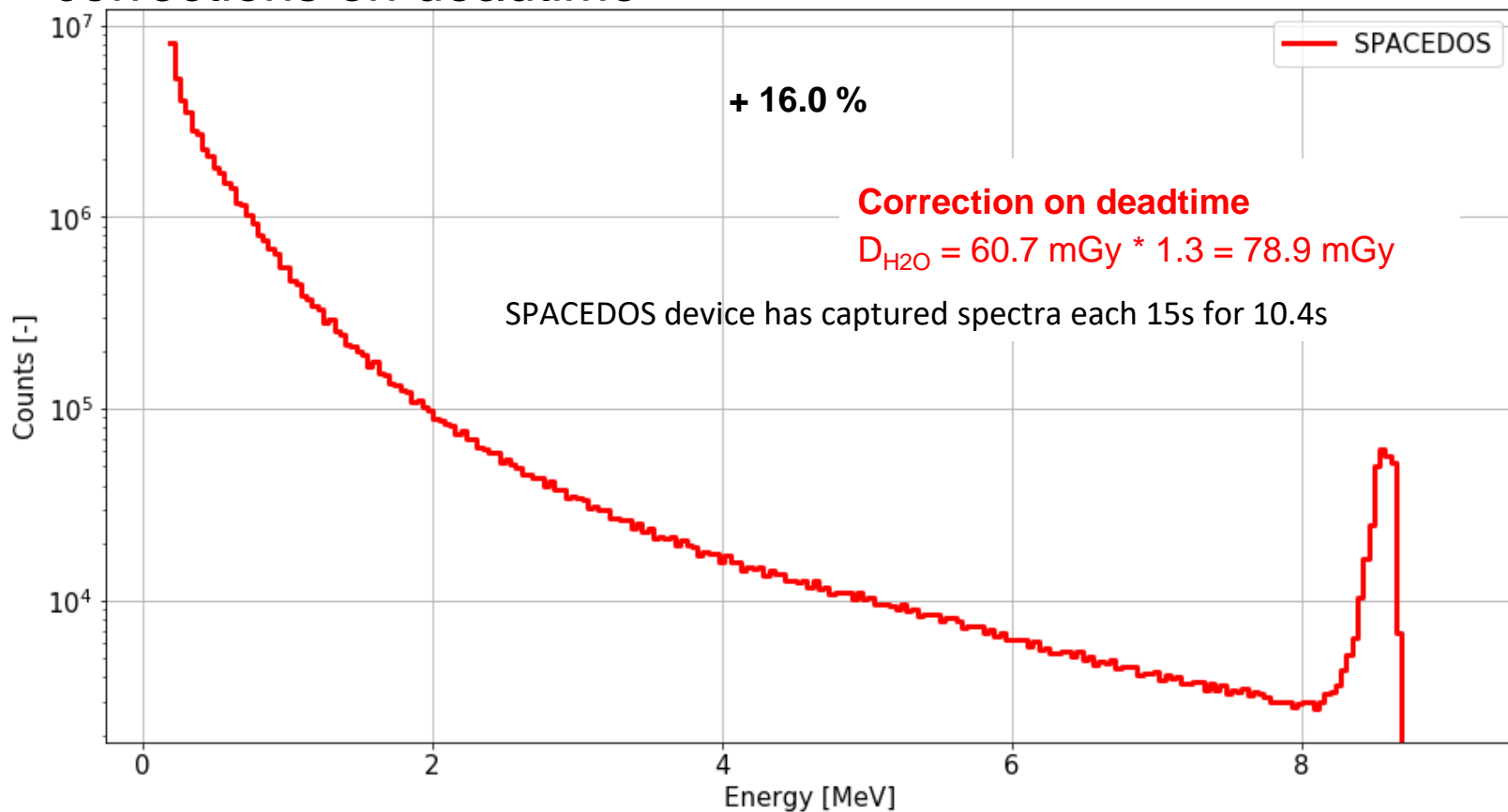
Results – comparison with TLDs

corrections on deadtime

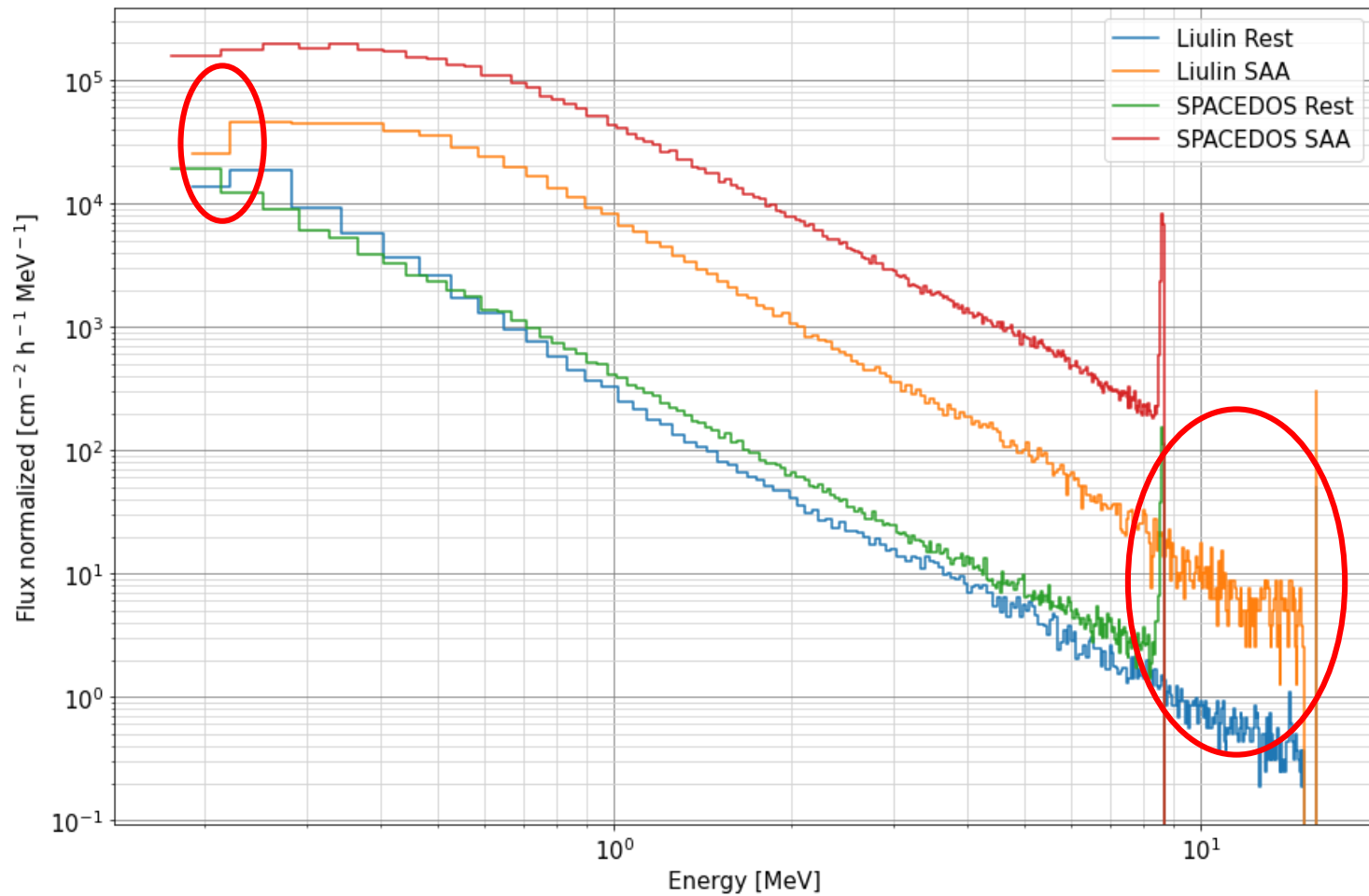
CaSO₄:Dy,Tm

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(background 1.20 ± 0.05 subtracted)



Comparison of
SPACEDOS
(2019 – 2020)
with **Liulin**
(2001)
archive data
courtesy of
Tsvetan
Dachev



Current / future missions with SPACEDOS



- Shielding experiment on ISS
 - In operation since May, 2023

- Czech ambitious space missions supported by ESA
 - **LVICE²** - LUNAR VICINITY COMPLEX ENVIRONMENTAL EXPLORER
 - 1st mission of a Czech space probe to the cislunar space
 - For radiation: SPACEDOS, PARDAL²
 - **SOVA** - Satellite Observation of waVes in the Atmosphere
 - to study processes in the middle and upper atmosphere (60 - 300km) on a global scale, that need to be understood for better climate prediction.
 - For radiation: SPACEDOS, SpacePix

