SSC20-WP2-24

NEUDOSE: NEUtron DOSimetry & Exploration

A CubeSat for Dosimetry of Charged and Neutral Particles

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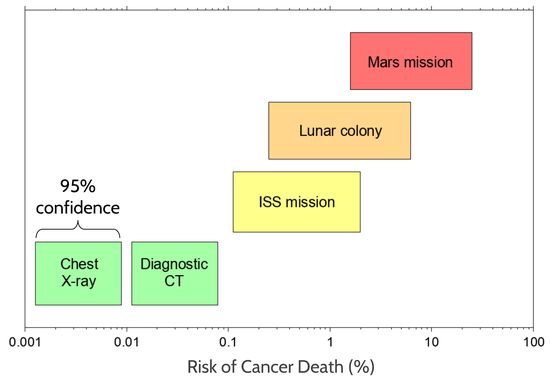
I. Mission Motivation

Radiation hazard is a major concern for astronauts, especially as we look beyond LEO

We require a method for real-time measurements of both charged and neutral radiation for personal dosimetry

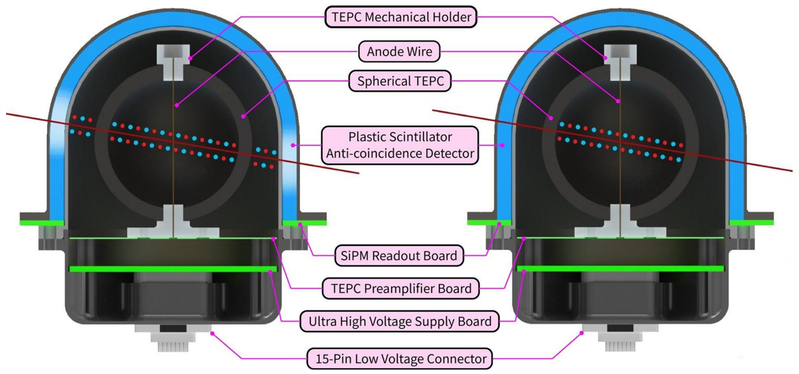


Large uncertainties in current data mostly due to radiation quality and dose-rate effects

II. Scientific Payload

The Charged and Neutral Particle Tissue Equivalent Proportional Counter (CNP-TEPC) can differentiate radiation in real time and in a form factor ideal for personal dosimetry

McMaster NEUDOSE Mission will launch the CNP-TEPC into an ISS orbit as part of the Canadian CubeSat Project



Charged interaction triggers a scintillation **and** TEPC pulse (Coincidence)

Neutral interaction triggers a scintillation **or** TEPC pulse (Anti-coincidence)

III. The Spacecraft

Bus Stack: 1

- Includes a custom, radiation tolerant OBC as secondary payload
- Custom UHF/VHF radio
- COTS NanoAvionics EPS & GOMSpace primary OBC

ADCS: 2

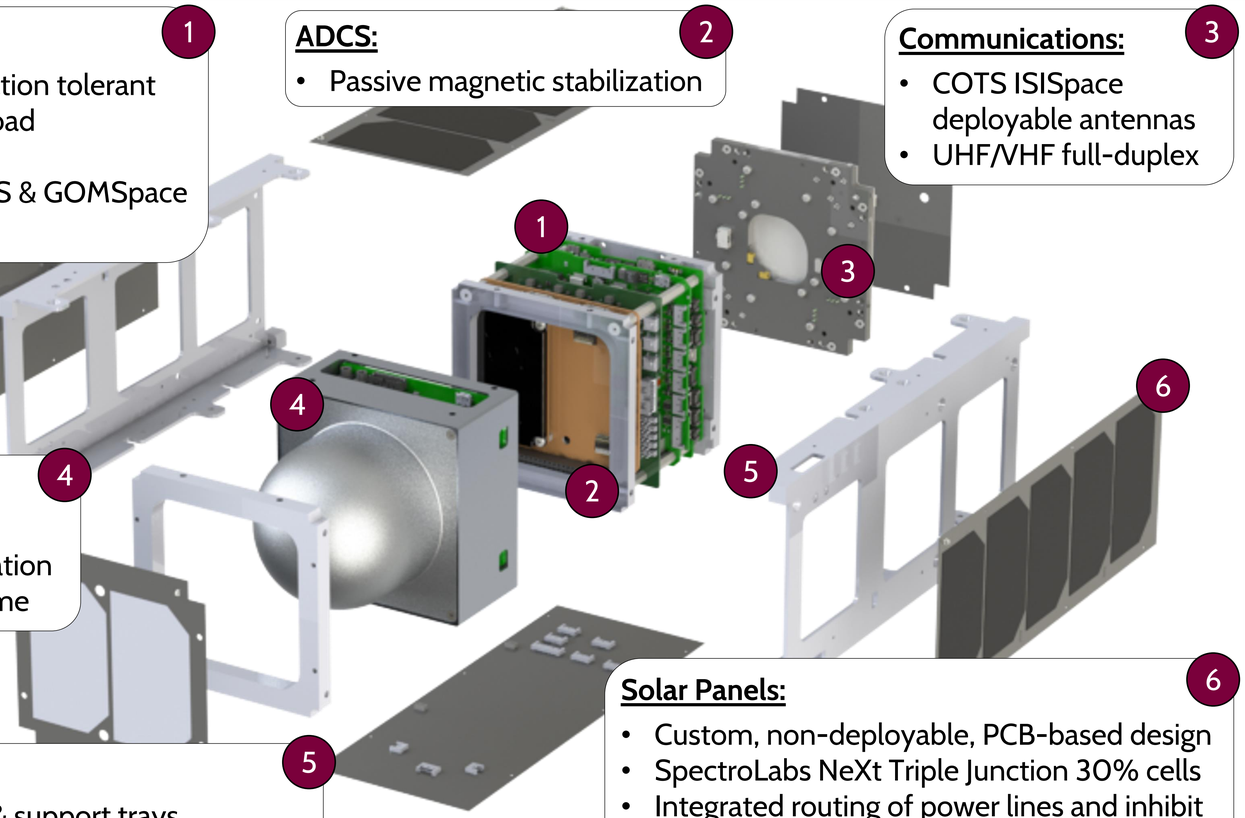
- Passive magnetic stabilization

Communications: 3

- COTS ISISpace deployable antennas
- UHF/VHF full-duplex

CNP-TEPC: 4

- Self-contained payload for independent qualification
- 1U (half) of internal volume



Mechanical Structure: 5

- Custom symmetric rails & support trays
- Modular design developed with assembly in mind

Solar Panels: 6

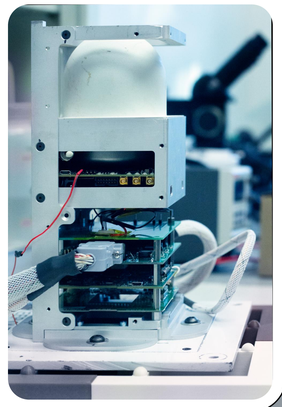
- Custom, non-deployable, PCB-based design
- SpectroLabs NeXt Triple Junction 30% cells
- Integrated routing of power lines and inhibit circuitry to reduce internal cabling

IV. Development Status

NEUDOSE has completed preliminary design and demonstrated several subsystems on NASA's High-Altitude Student Platform (right)

Next steps include:

- SEDS Stratospheric Balloon Experiment for prototyping/testing
- Critical design review with Canadian Space Agency in Q1 2021
- Launch in Q2 2022



References

[1] Hanu et al. *Radiation research* 187, no. 1 (2017)

[2] Durante et al. *Nature Reviews Cancer* 8, no. 6 (2008)

Acknowledgements

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