

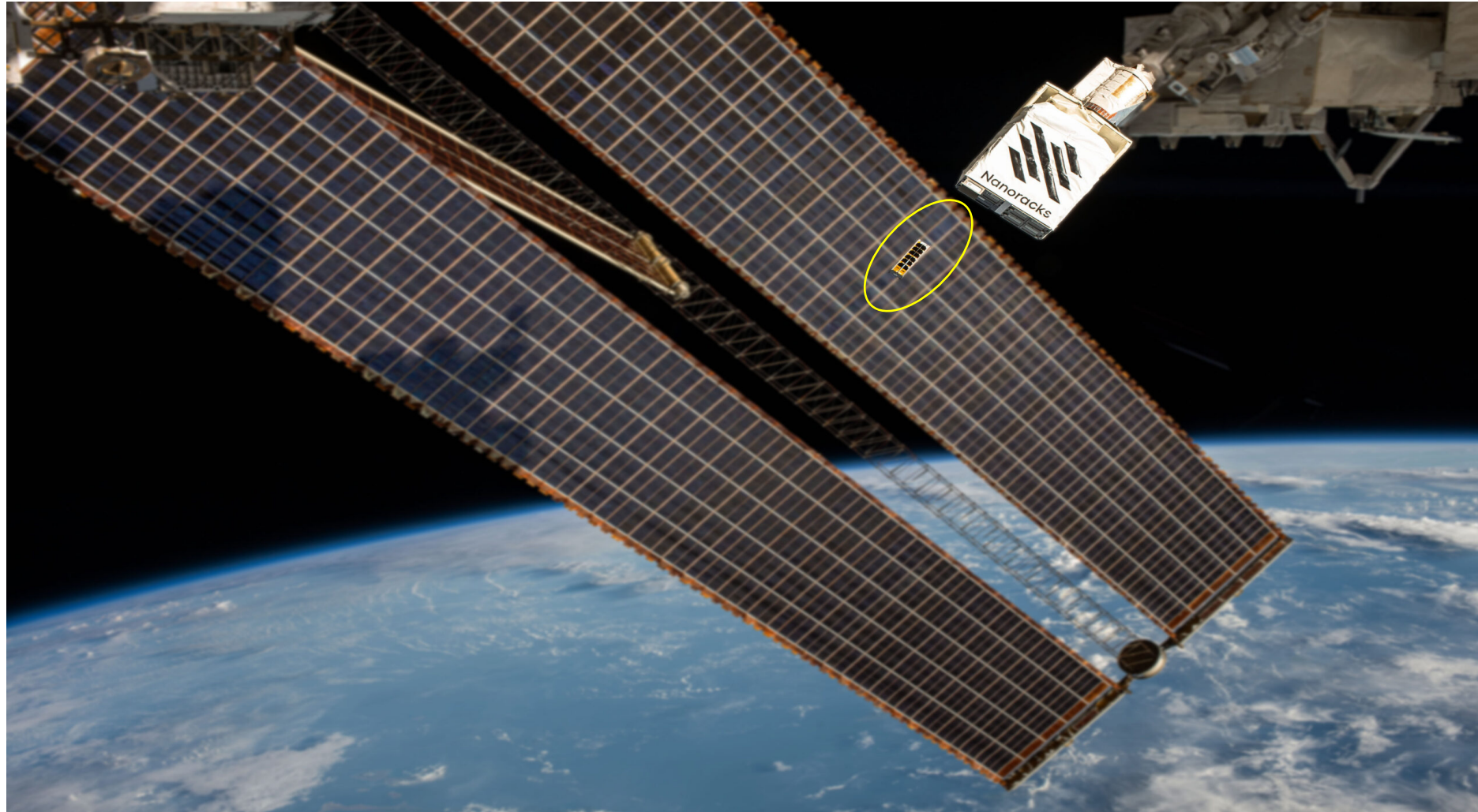
CUBESAT SINGLE-PHOTON DETECTOR MODULE FOR PERFORMING IN-ORBIT LASER ANNEALING TO HEAL RADIATION DAMAGE

Nigar Sultana, Joanna Krynski, Jin Gyu Lim, Vadim
Makarov, Logan M. Power, John Floyd, Michael Lembeck,
Paul Kwiat, and Thomas Jennewein

Presenter: Nigar Sultana



CAPSat (Cool Annealing Payload Satellite)

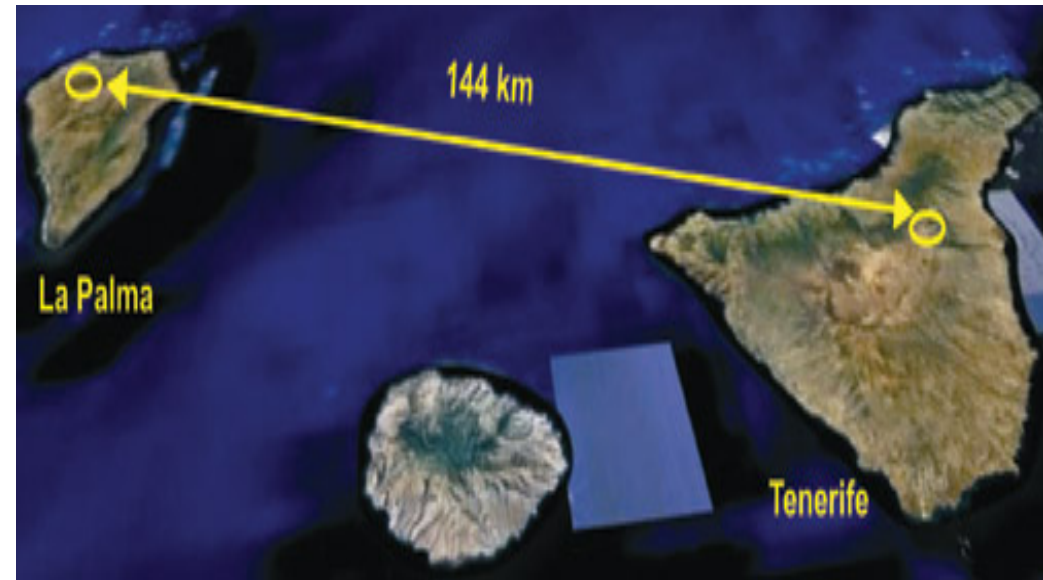


<https://lassiaero.web.illinois.edu/2021/10/12/capsat-deployed/>

Quantum Communications



Fiber optic Link
[1]



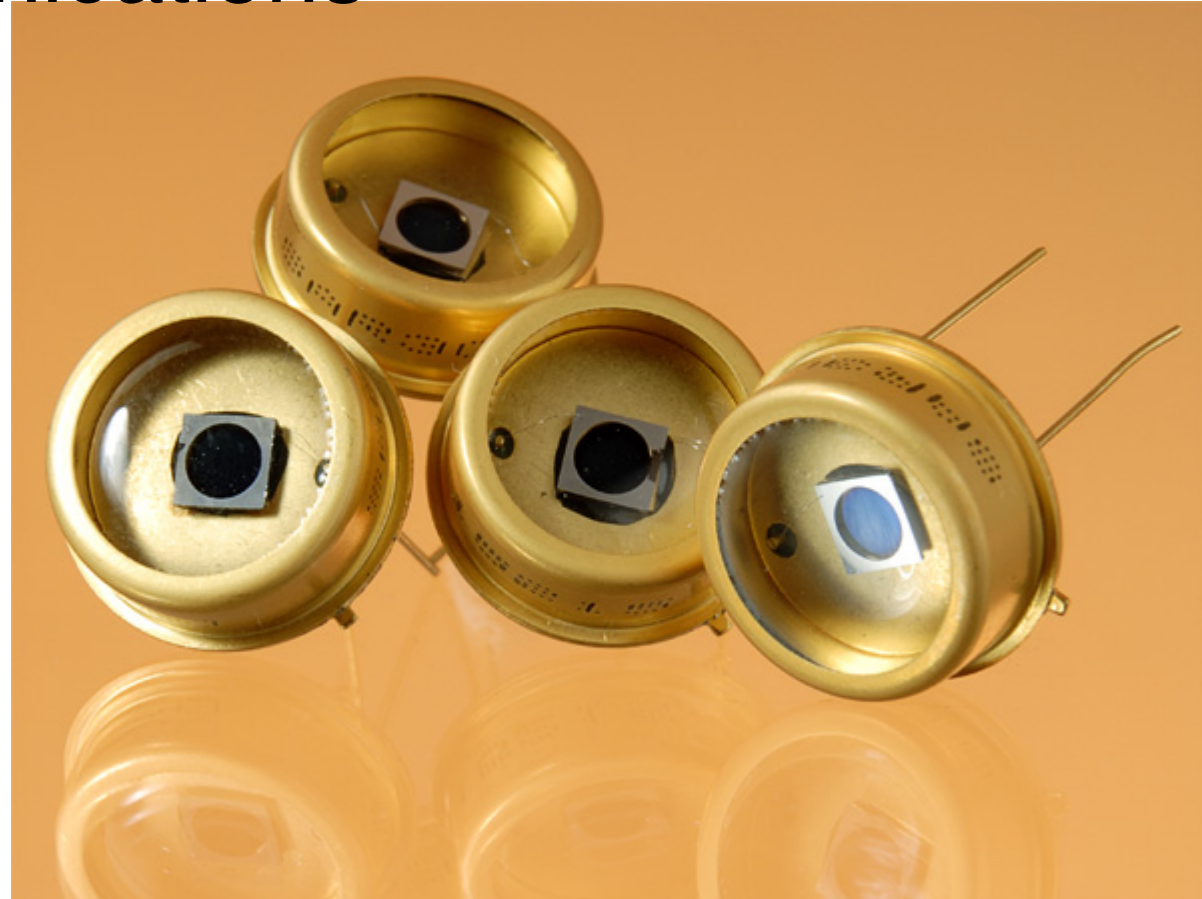
Free-space Link [2]

Satellite Quantum Communications



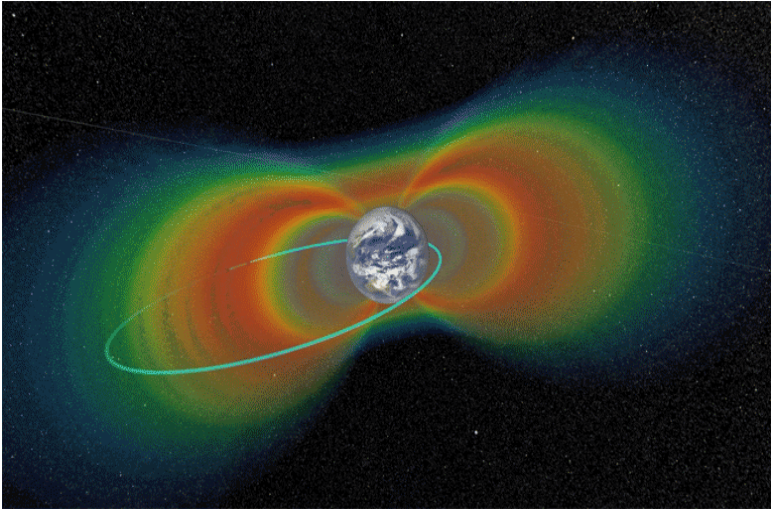
<https://spacenews.com/honeywell-to-build-canadian-quantum-encryption-satellite/>

Si Avalanche Diodes for Satellite Quantum Communications

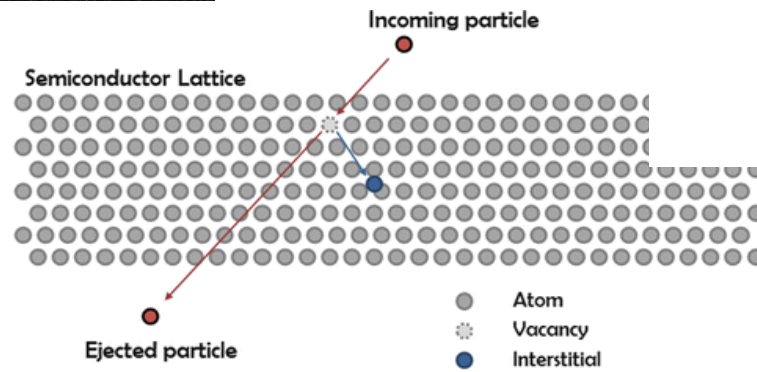


www.lasercomponents.com

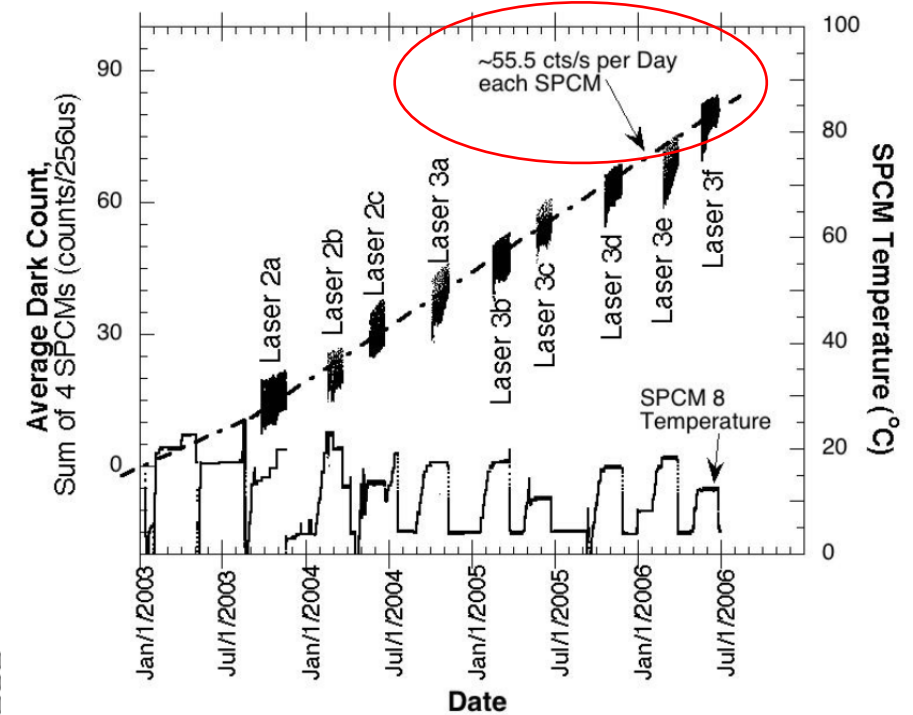
Single-photon Detectors Degrades due to Space Radiation



[1]

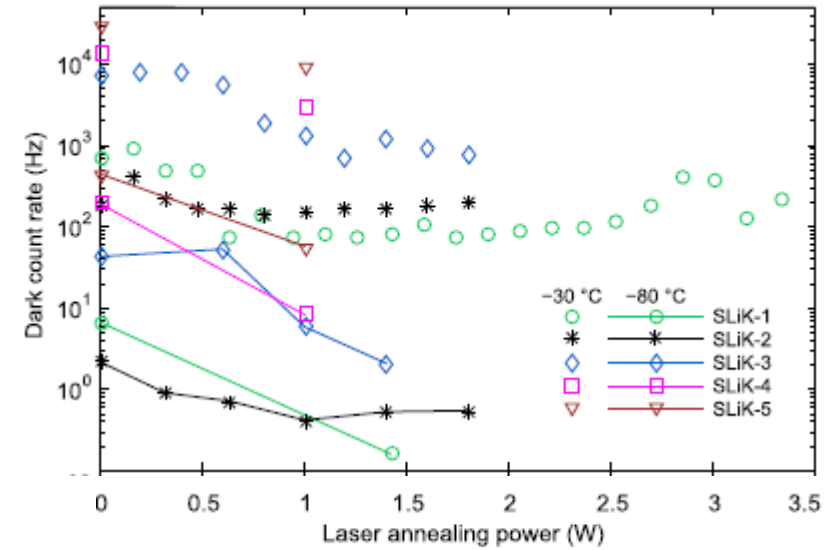
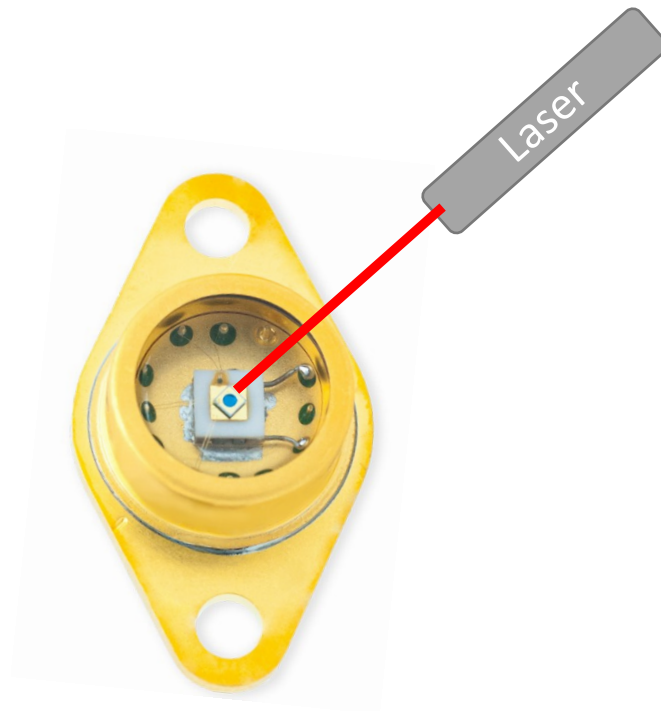


[2]



[3]

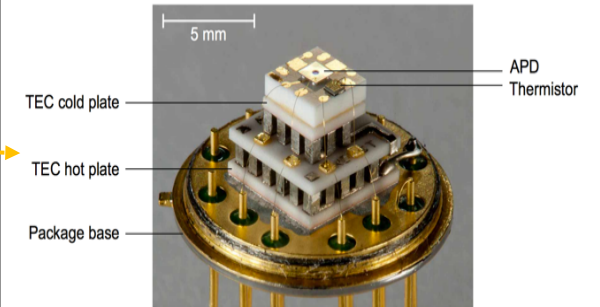
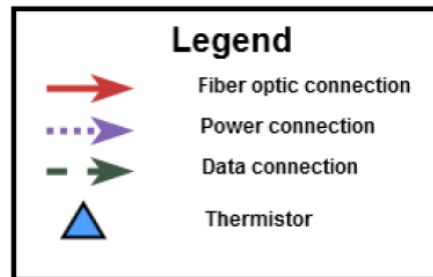
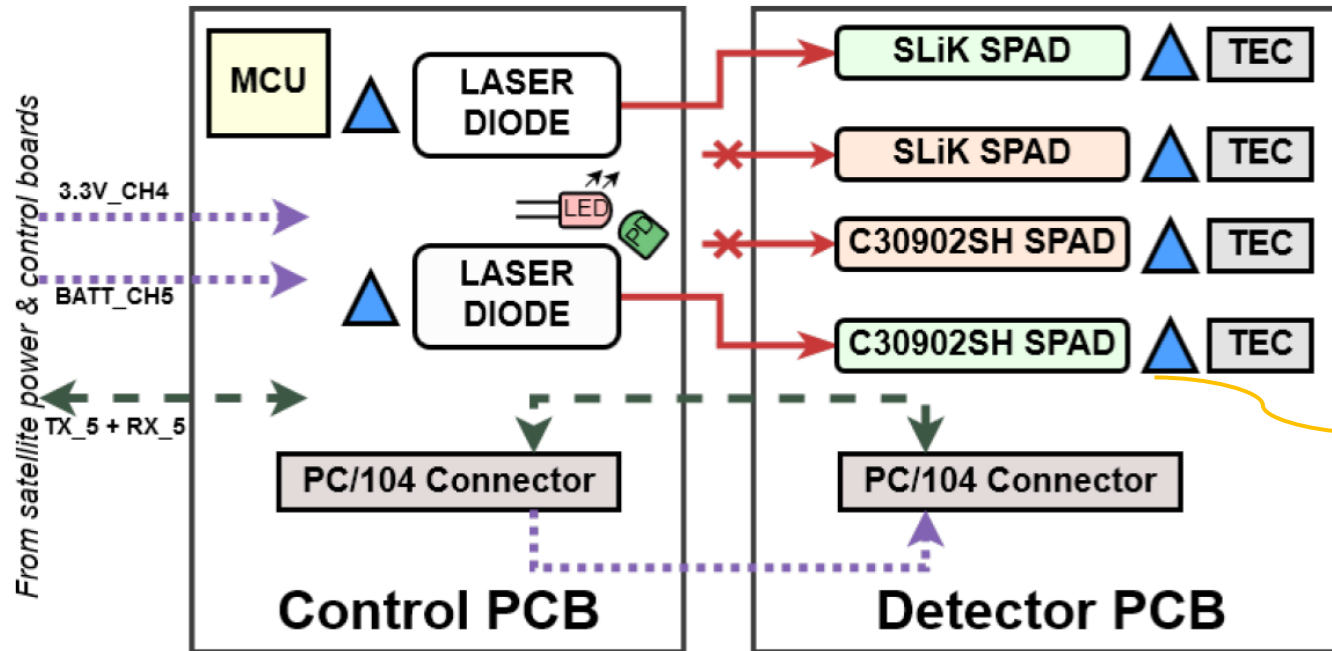
Laser annealing heals radiation damage



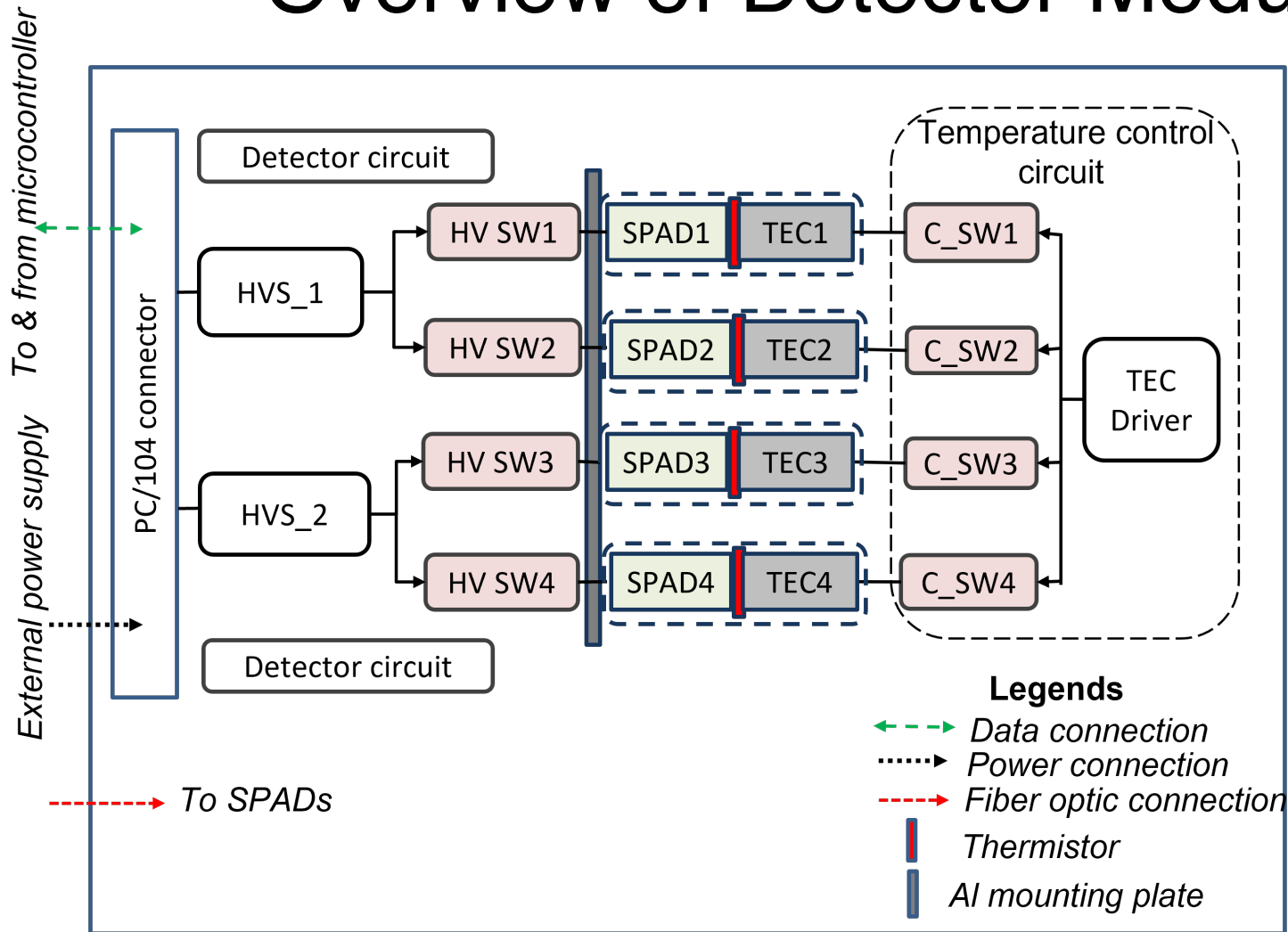
[1].

CAPSat In-orbit Laser Annealing

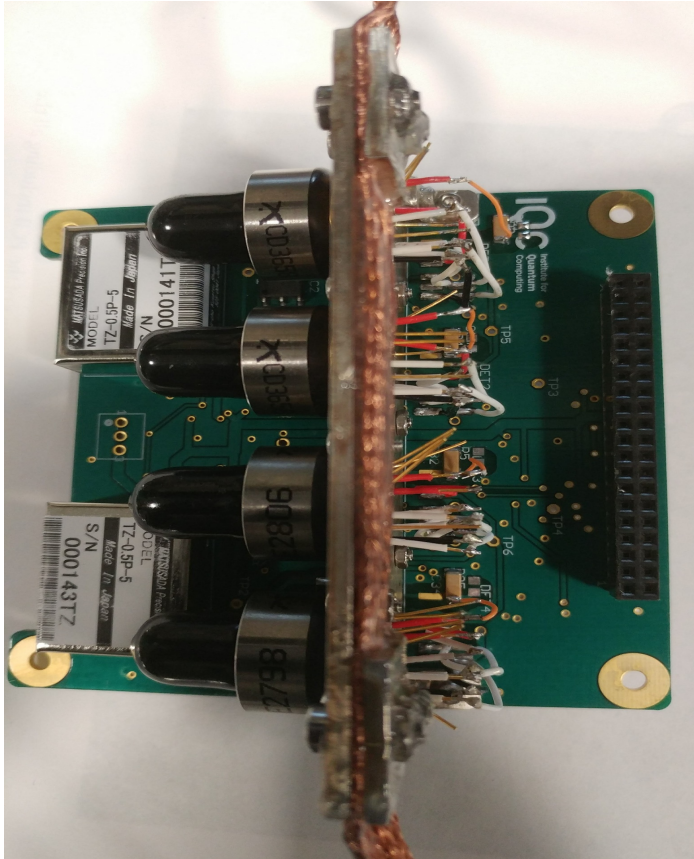
Concept Of Annealing Payload



Overview of Detector Module



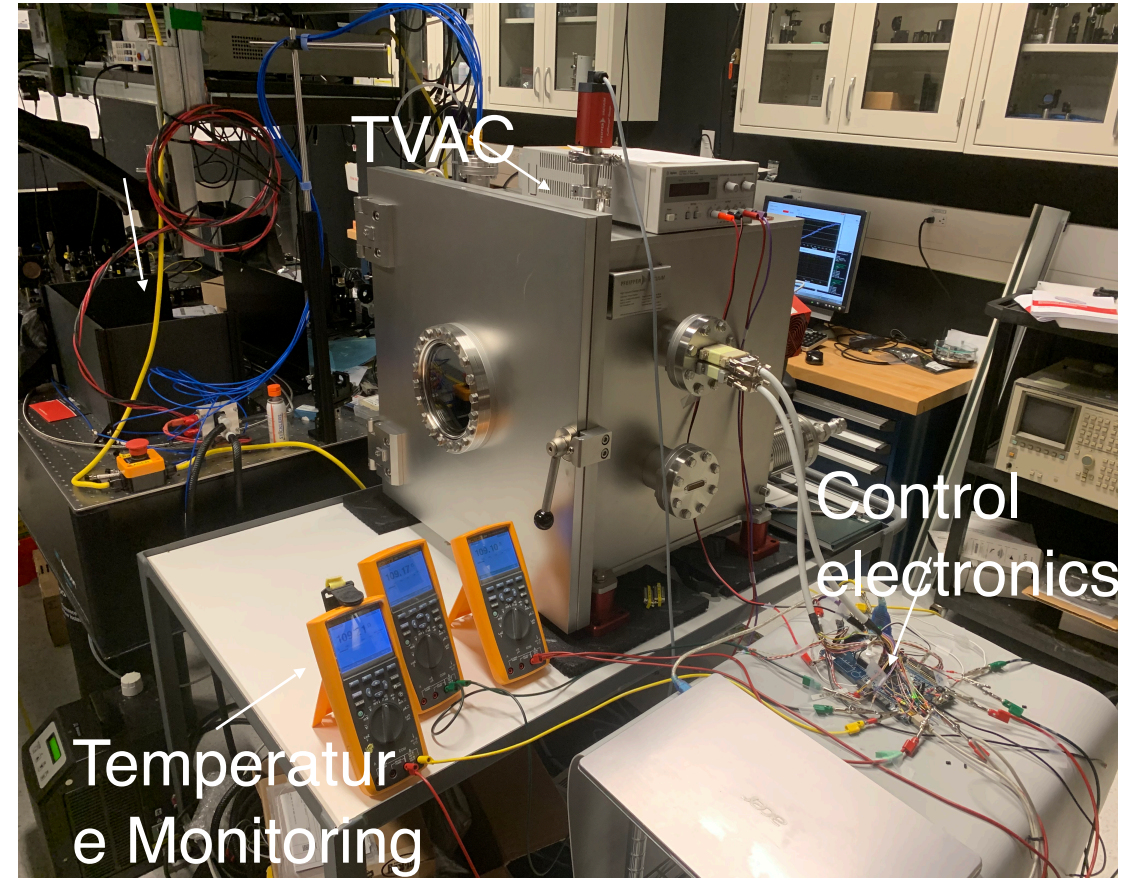
Detector Payload



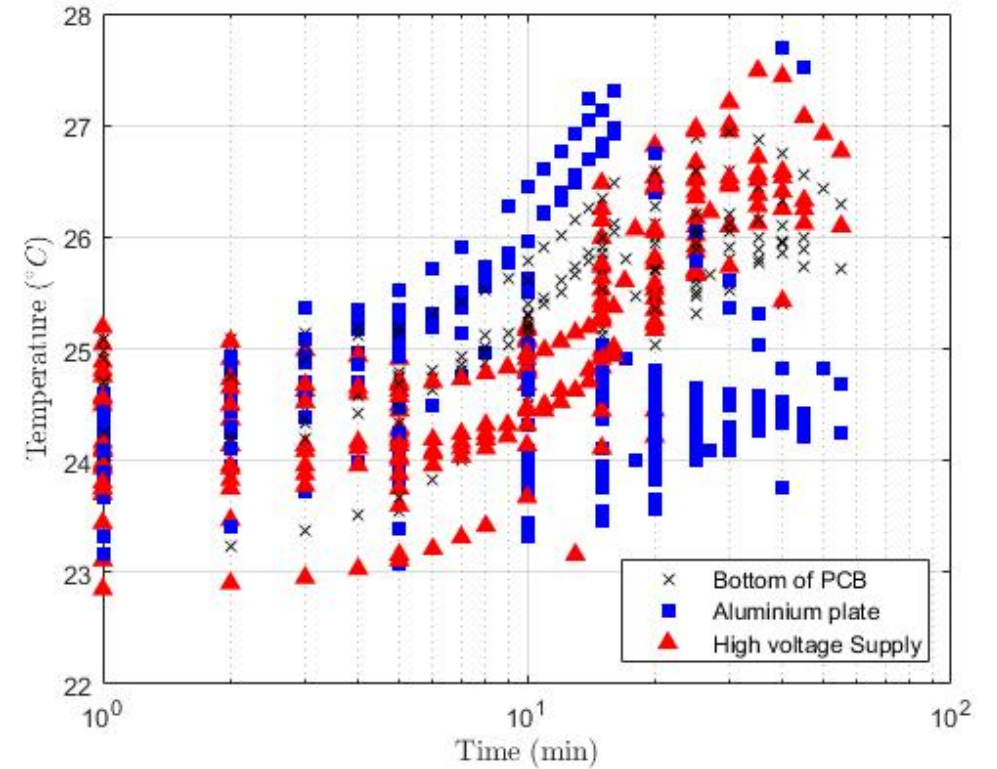
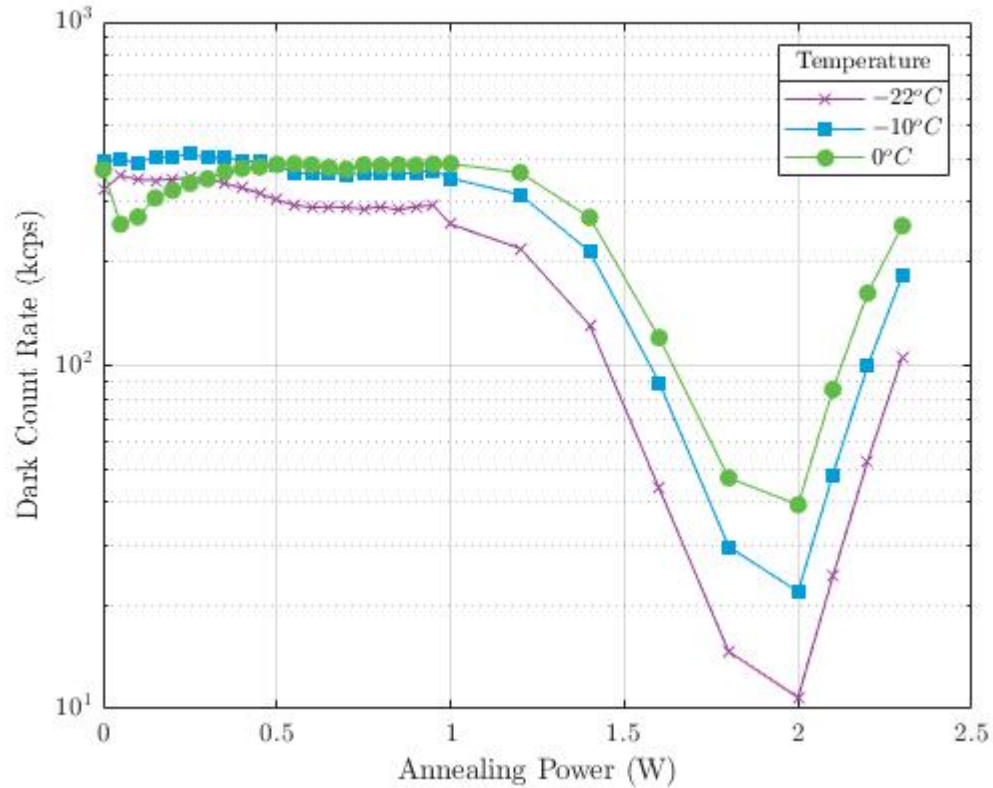
Volume: 90 mm X 90 mm X 52 mm

Power consumption: 1.4W

Mass: 250 g



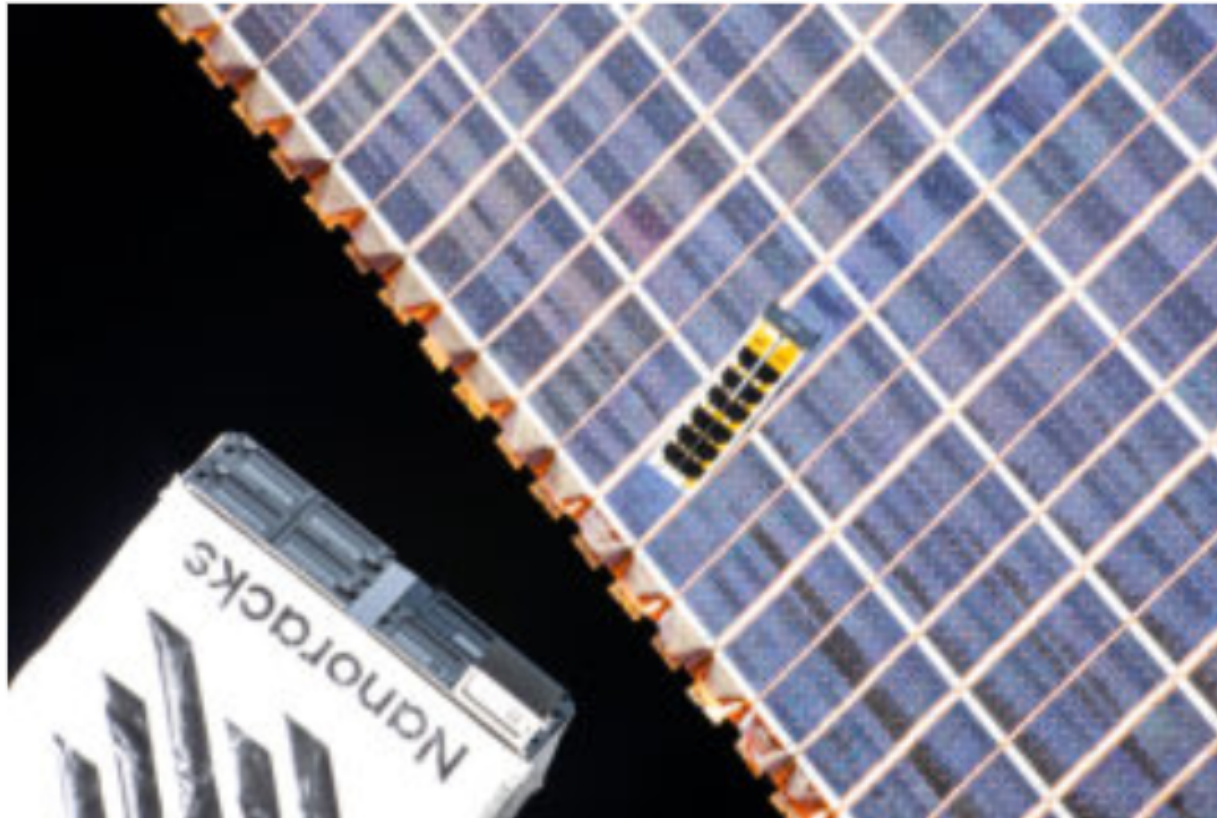
In-house TVAC test of Detector Payload



Capsat Annealing Payload



Capsat Status



Post launch functionality lost

<https://lassiaero.web.illinois.edu/2021/11/02/capsat-2-way-comms-achieved/>

Outcome from CAPSat mission

- We developed a miniaturized detector system suitable for small satellite
- Our detector module works well under thermal-vacuum environment
- Whole program was a great learning opportunities
- This technology is going to be used in the upcoming SEAQUE mission [1]

[1] <https://lassiaero.web.illinois.edu/2022/03/09/seaque-press-release/>