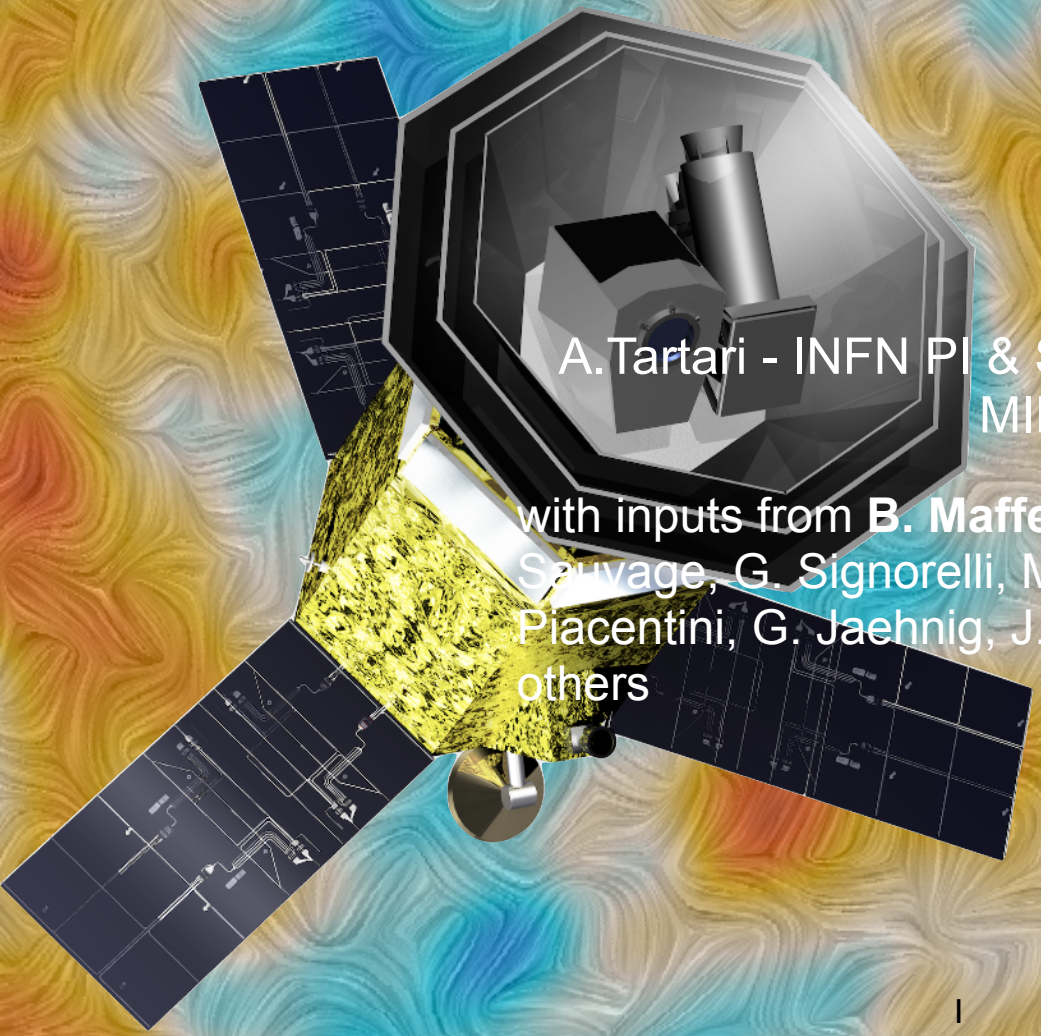
Workshop LiteBIRD-Italia 2023 @ INFN-LNF

Cosmic ray effects and detector test on beamline



A.Tartari - INFN PI & S. Della Torre INFN-MIB

with inputs from **B. Maffei**, S. Stever, V. Sauvage, G. Signorelli, M.Zannoni, F. Piacentini, G. Jaehnig, J. Hubmayr and many others

statement of the problem

- Cosmic Ray hits could seriously threaten a space mission success (P. de Bernardis' talk, S. della Torre's talk)
- What does radiation dose do on devices that have not been previously operated in a space environment?

Activities: overall view

➡ Mitigation strategies require several coordinated activities:

- Test of devices on accelerators beams
- Test with radioactive sources (e.g. Am)
- Simulation of glitches on the focal plane: detector direct hits, focal plane temperature instabilities, etc. A full simulation pipeline for LFT presented in S.Stever et al. JCAP-> S. della Torre's talk.
- Provide a feedback for detector modelling (e.g.: G=>tau)

➡ Ageing and total dose effects requires irradiation facilities. TES and SQUIDs never used in L2. TES never used in space.

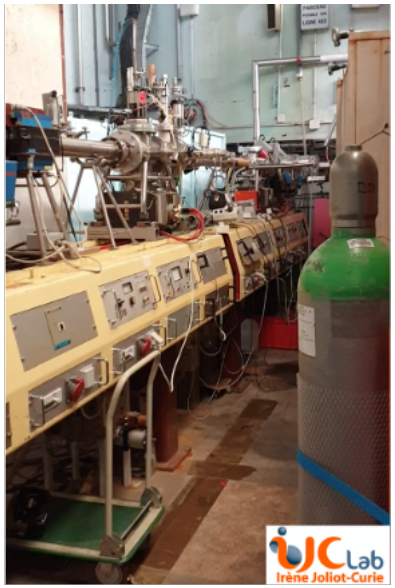
Scheduled activities

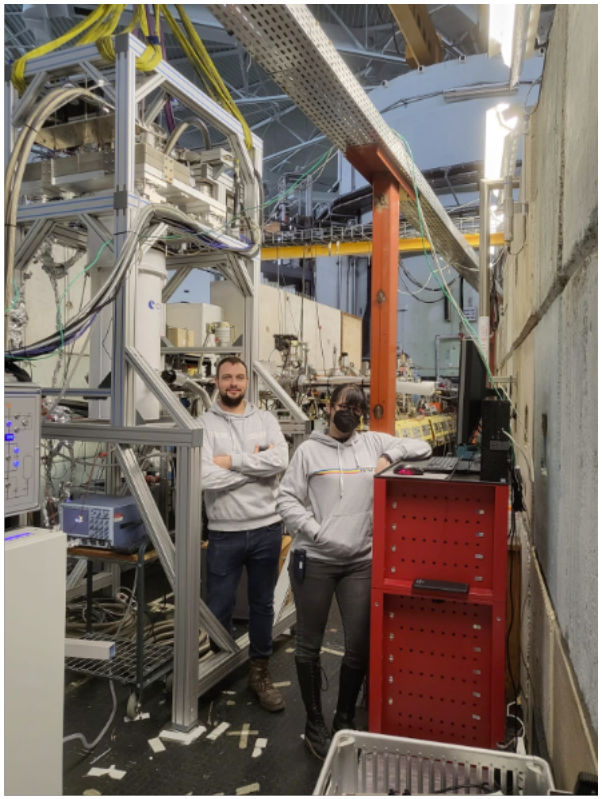
- Modelling already started for HFT at UniMiB/INFN-MiB (Stefano's talk). S. Stever ready to run in Okayama the thermal part of the simulation.

- A team lead by B.Maffei already obtained beam time at ALTO (Orsay). HFT TES produced by G.Jaenhig and J.Hubmayr already at IAS, ready for packaging. INFN-PI will provide expertise and hardware for TES SQUID-based readout (and manpower). No MUX. Test expected in late 2023/early 2024.

Beam test at ALTO

- IAS Dilution fridge already installed on the accelerator beam in September 2022. Successful test. Ok with the environment. No thermal/ vacuum/electrical issues.
- Test for different detector temperatures: 100 mK, 300 mK. Protons from 100 keV to 25 MeV. Ions.





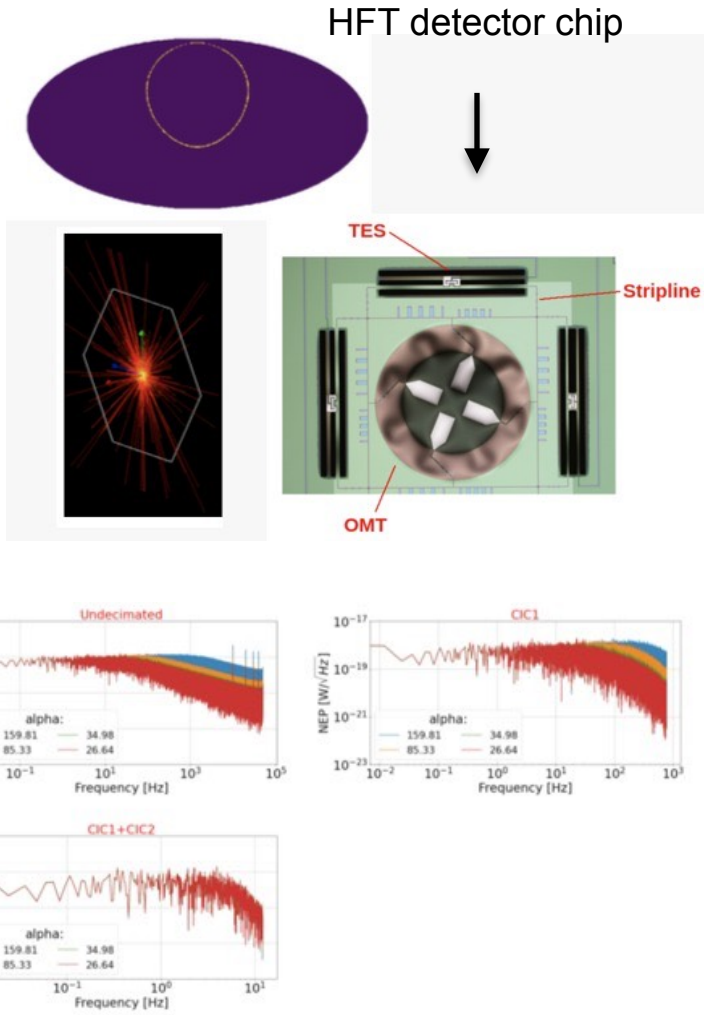
IAS Orsay

The A team

With special guest:
Samantha Stever, Okayama Univ.

Beam test at ALTO

- We will contribute actively to this campaign. First visit of Bruno and Samantha at INFN-PI in mid-June, to test some electronics and make plans for next months (including HFT CR hit modelling).
- Define the number of devices under test - data acquisition scheme.
- Identify ancillary measurements: e.g. Kapitza resistance, so strongly impacting focal plane thermalisation.
- Participate to the future campaign (6-8 months timescale from now), and analyse data.
- Once the outcomes are reliable, feed simulations.



Future tasks

- Tests of CR glitches with radioactive sources: can “we” commit with this? Certainly feasible within current and allocated resources. Worth doing with the full detection chain. TBD.

- Total Dose Effects. Needed? Is it enough to expose bare chips mounted on a test fixture at room temperature, in between series of cold tests? Could this be a task for “us”? Worth to ask for beam time at LNF?

- End simulation pipeline for MHFT (early results before end of phase A2).