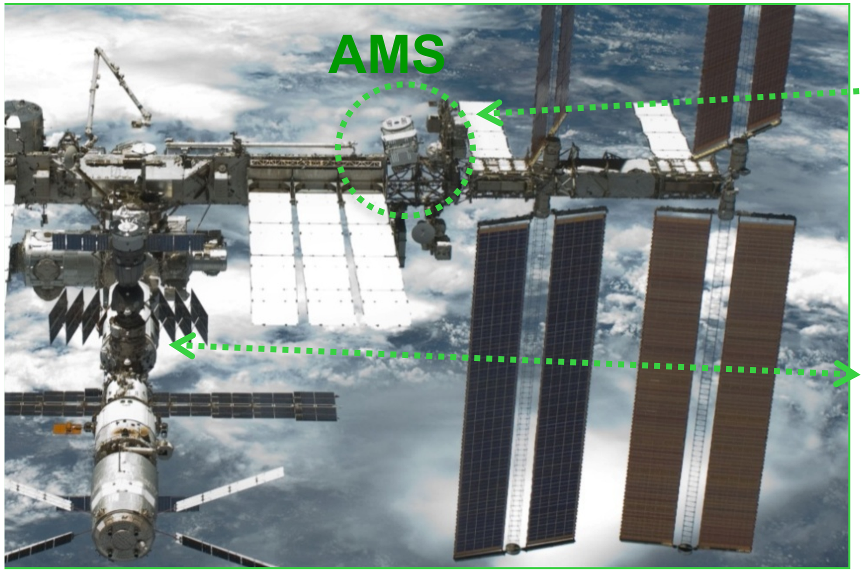
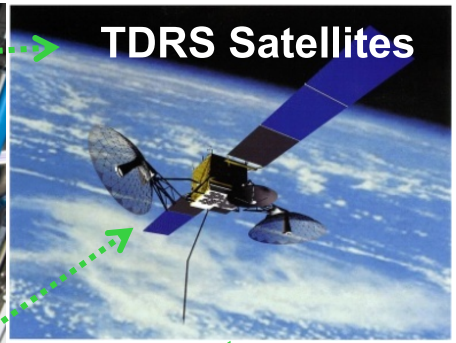
AMS Operations





Flight Operations

Ku-Band
High Rate (down):
Events <10Mbit/s>

Ground Operations

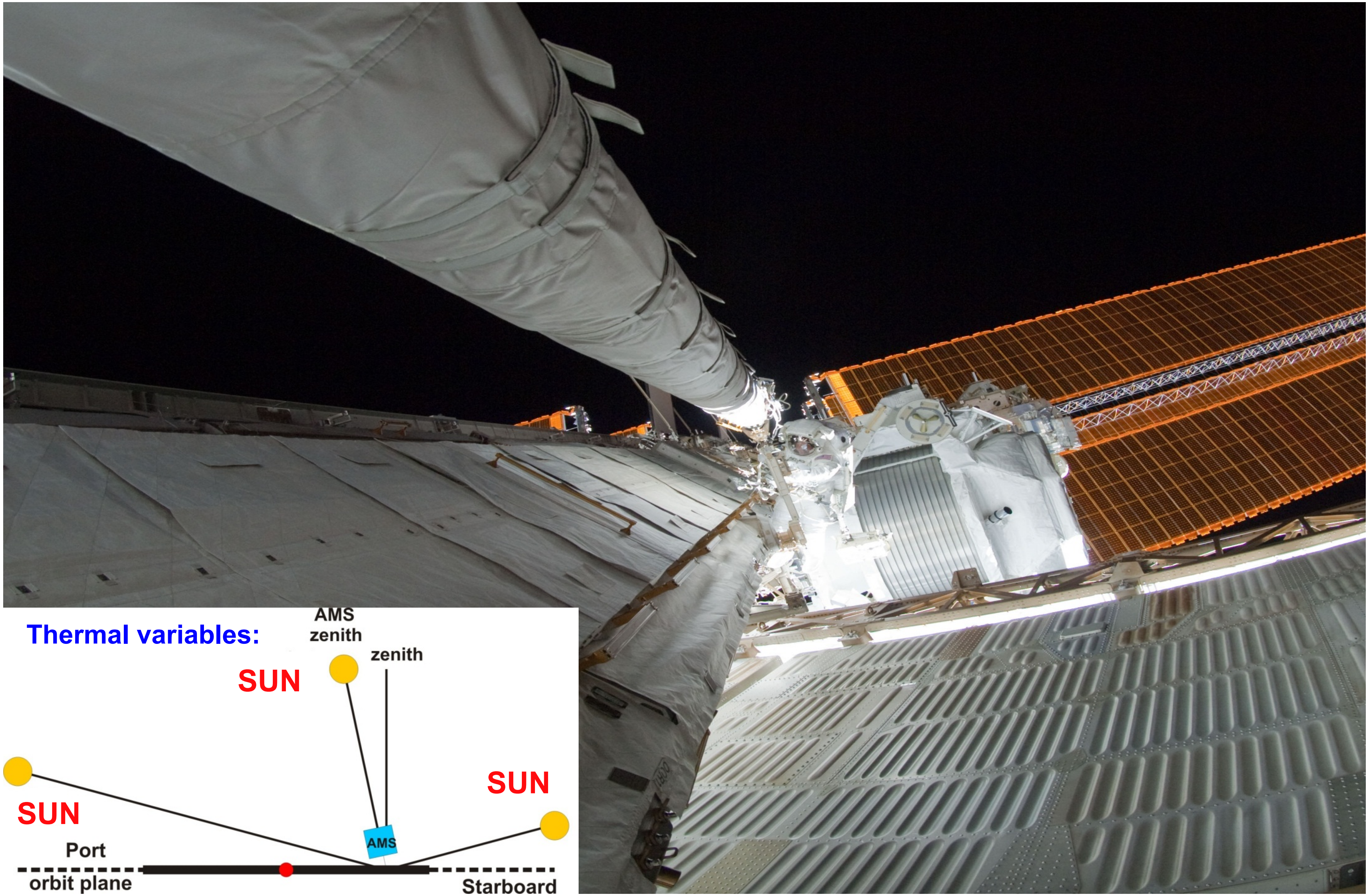
S-Band
Low Rate (up & down):
Commanding: 1 Kbit/s
Monitoring: 30 Kbit/s

AMS Payload Operations Control and Science Operations Centers (POCC, SOC) at CERN

AMS Computers at MSFC, AL

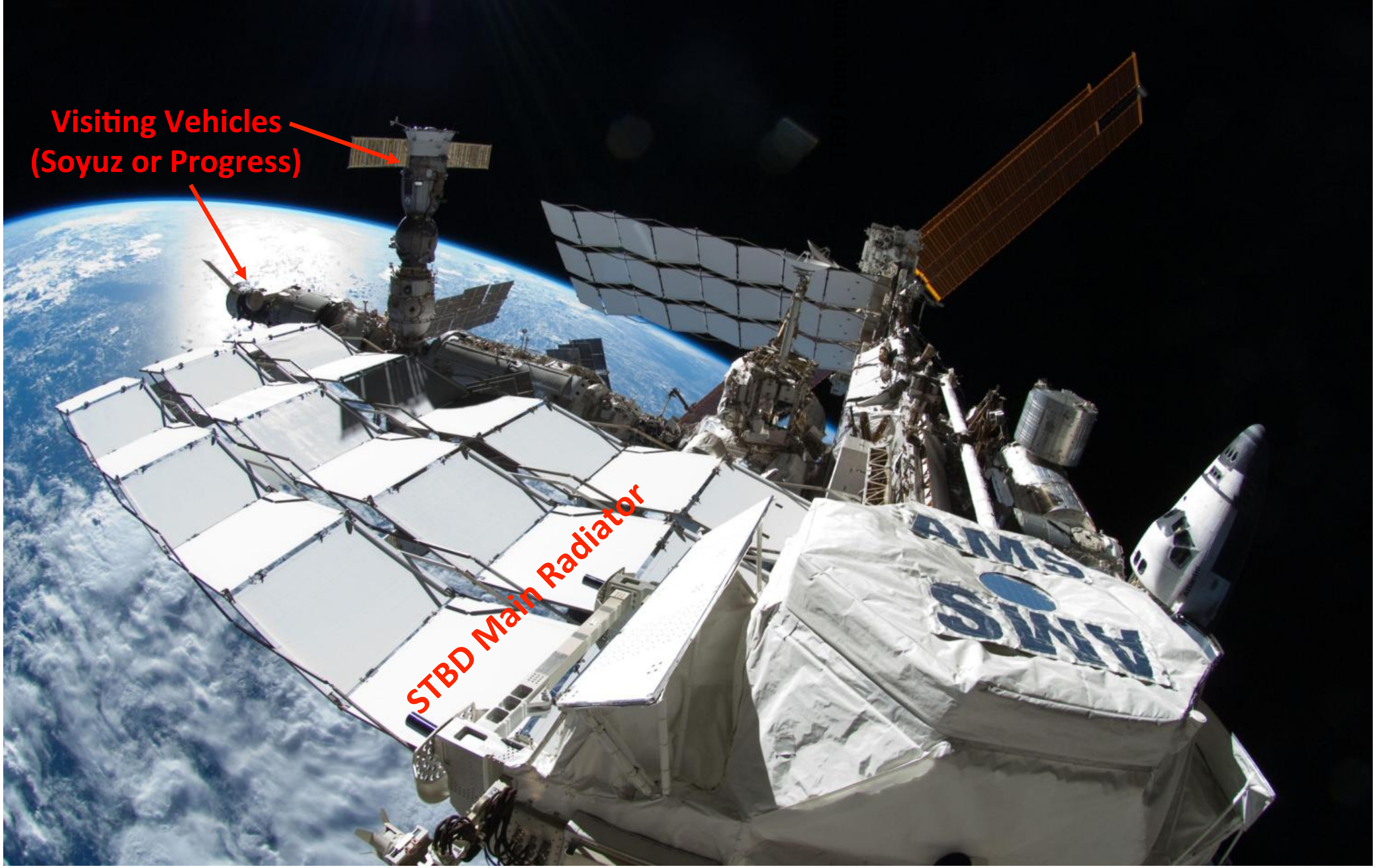
White Sands Ground Terminal, NM

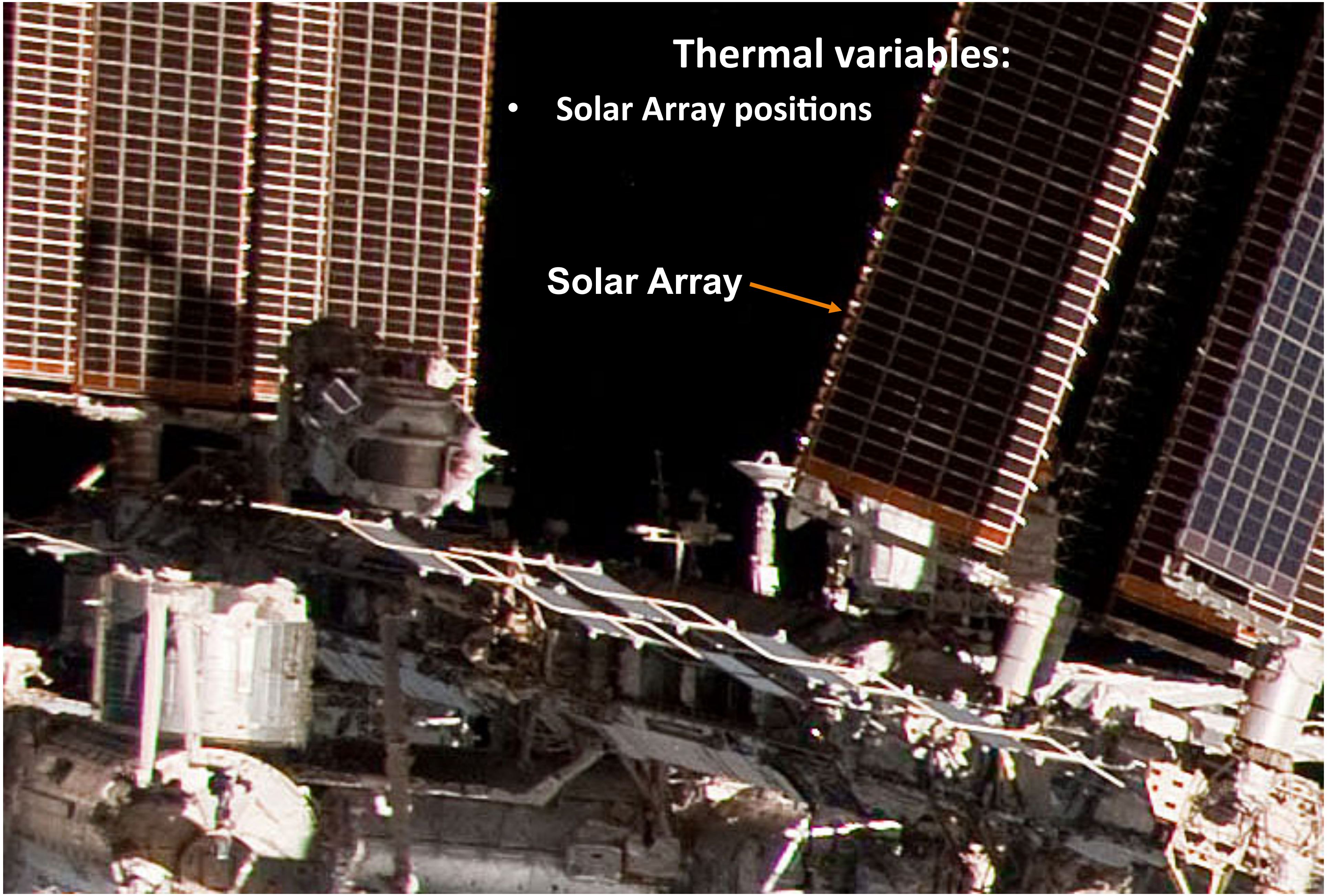
One of the major challenges of operating on the Space Station is the extreme thermal environment to which the experiment is exposed.



Thermal variables:

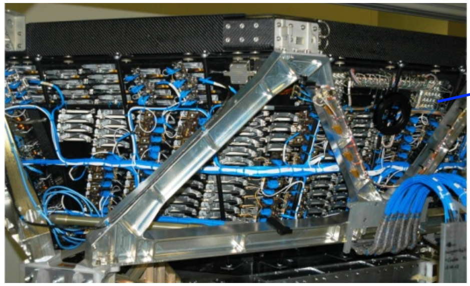
- ISS Radiator positions
- ISS attitude changes (primarily for visiting vehicles)

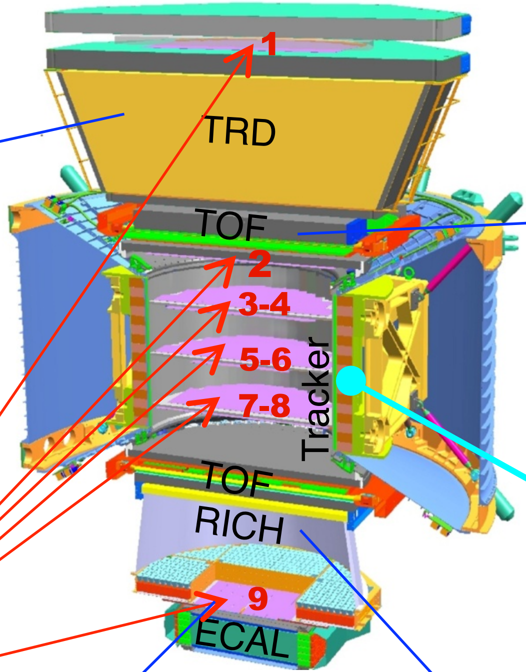



Thermal variables:
• Solar Array positions
Solar Array

AMS Flight Electronics for Thermal Control

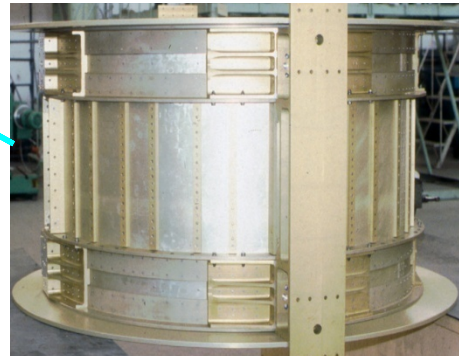
TRD
24 Heaters
8 Pressure Sensors
482 Temperature Sensors



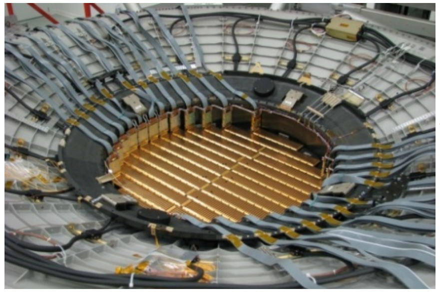


TOF & ACC
64 Temperature Sensors

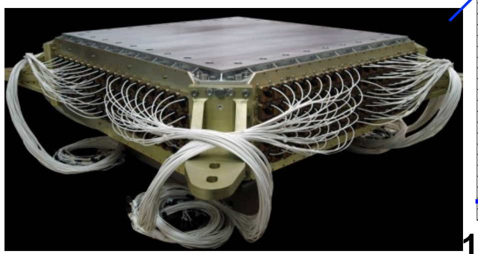
Magnet
68 Temperature Sensors

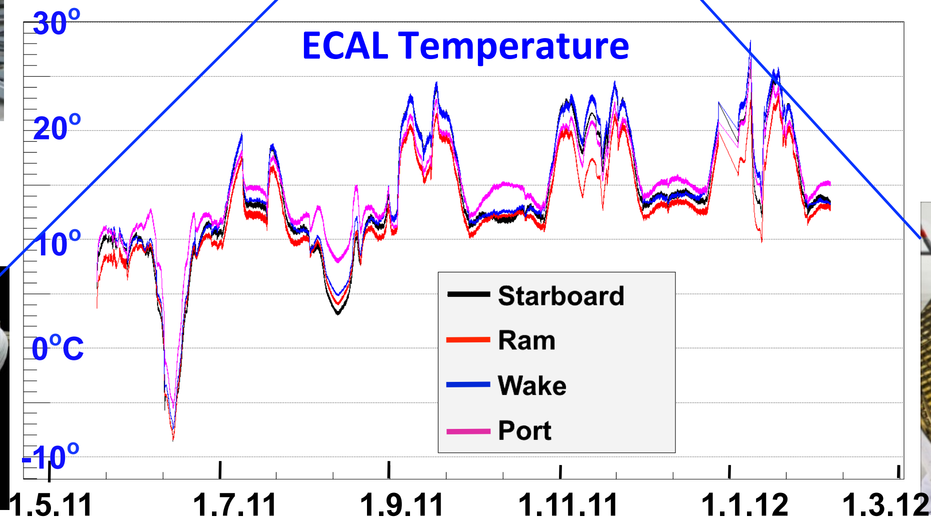


Silicon Tracker
4 -Pressure Sensors
32 Heaters
142 Temperature Sensors

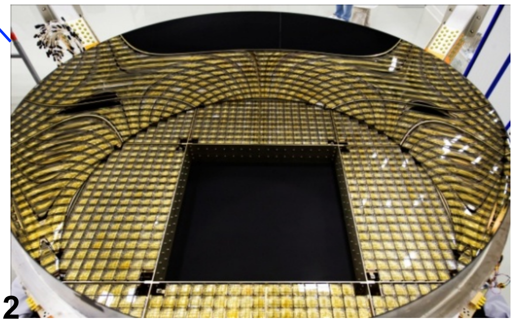


ECAL
80 Temperature Sensors



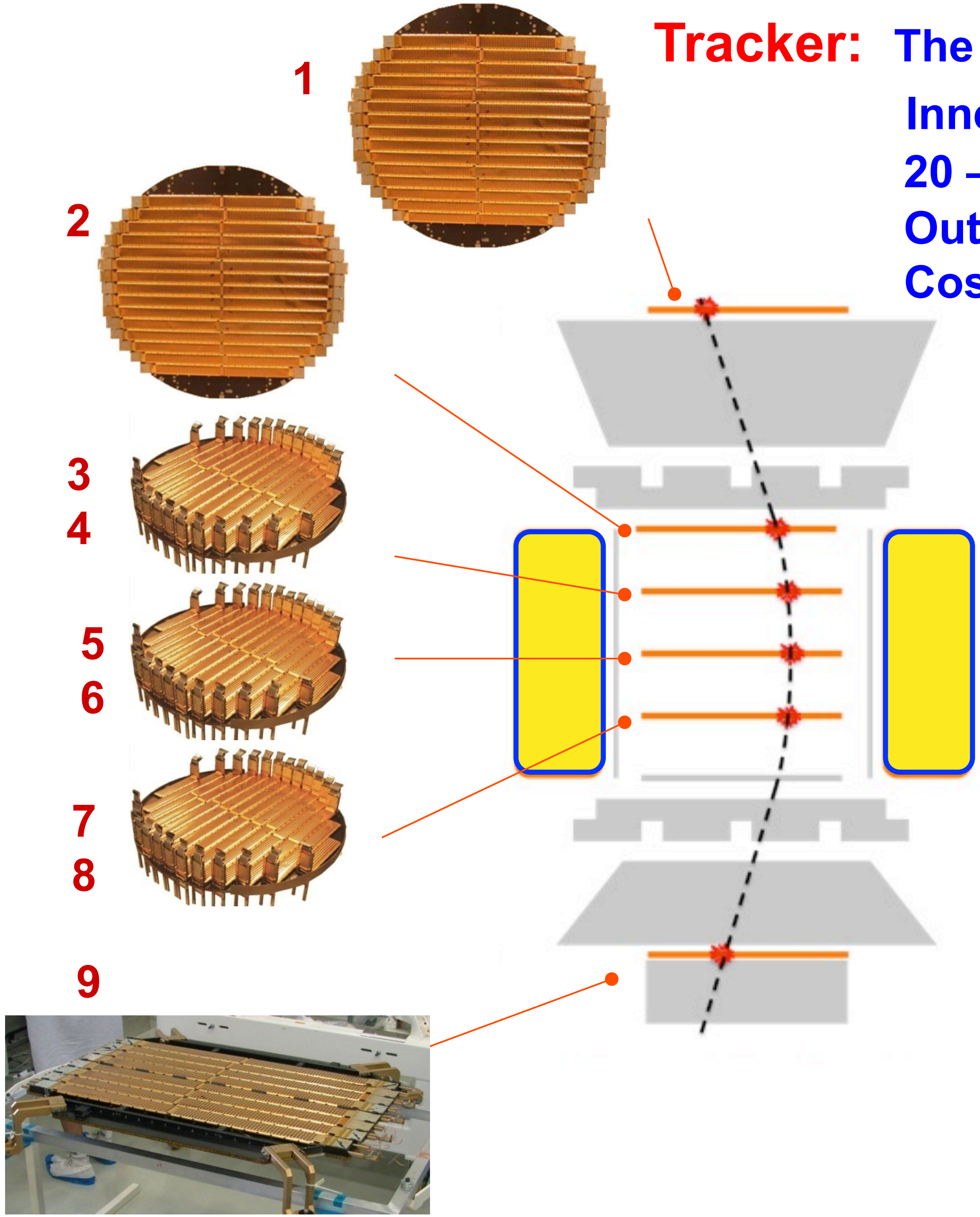


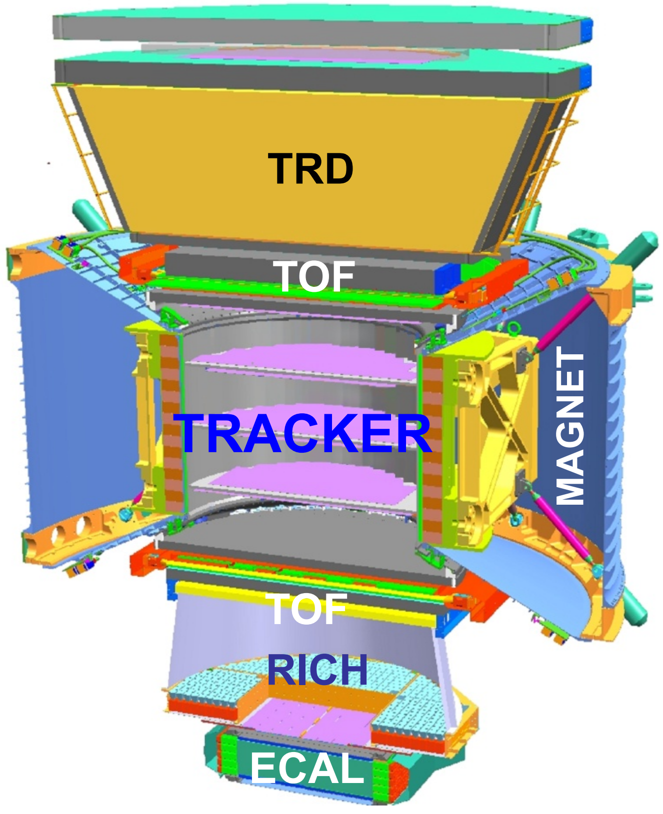
RICH
96 Temperature Sensors



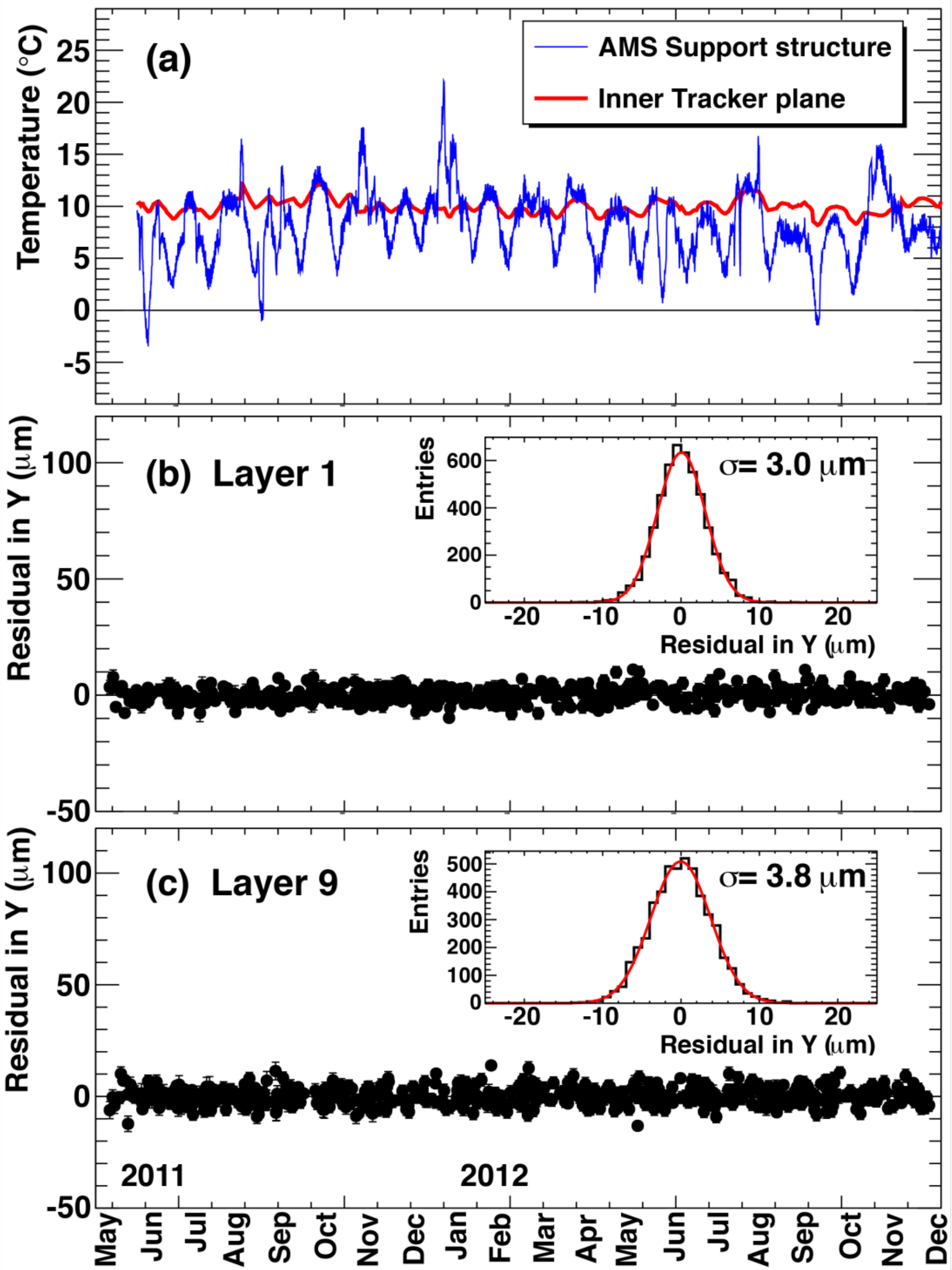
Tracker: The coordinate resolution is 10 μ

Inner Tracker Alignment via
20 –UV Lasers
Outer Tracker Alignment via
Cosmic rays

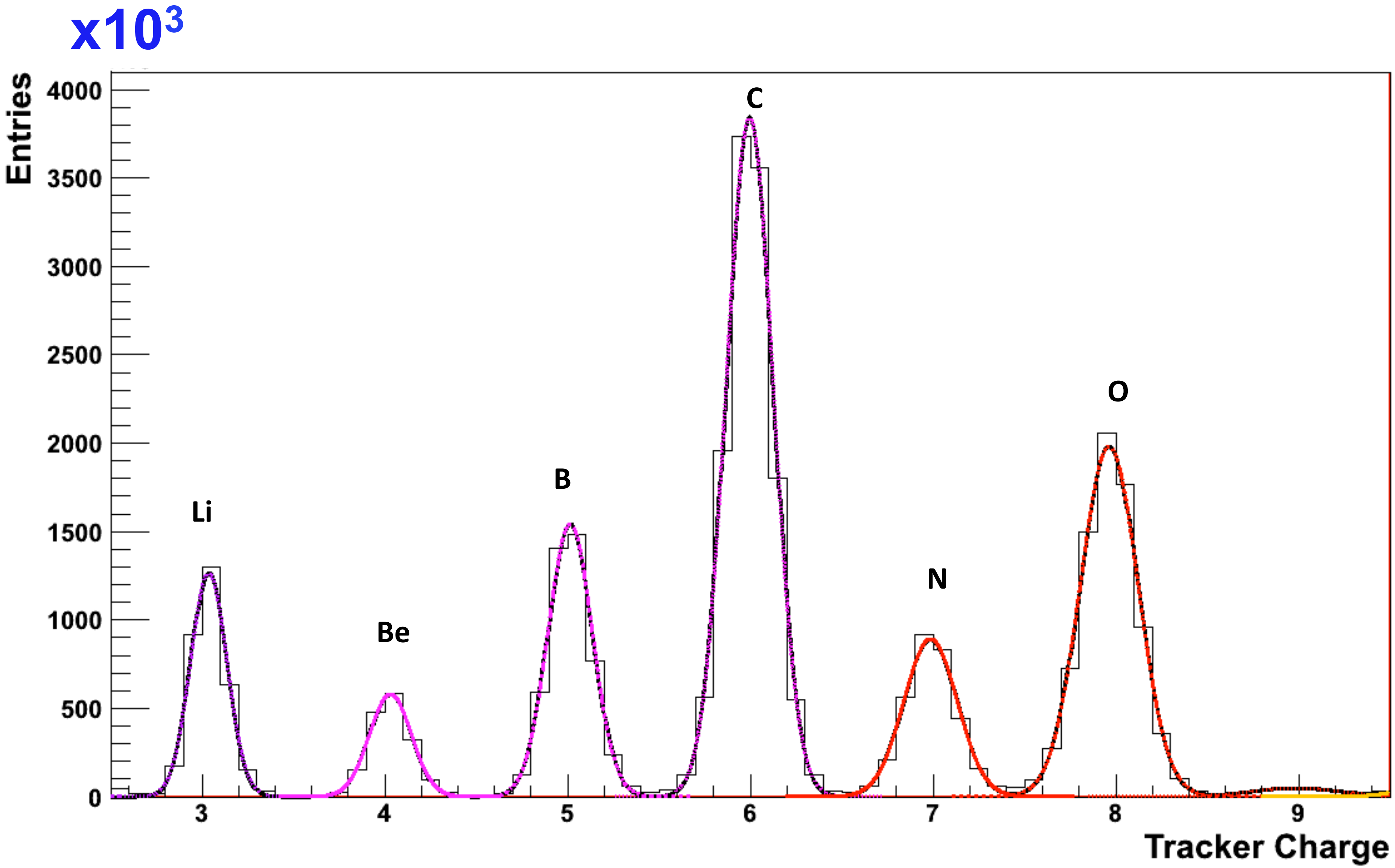




Stability of the alignment on Tracker plane 1 & 9

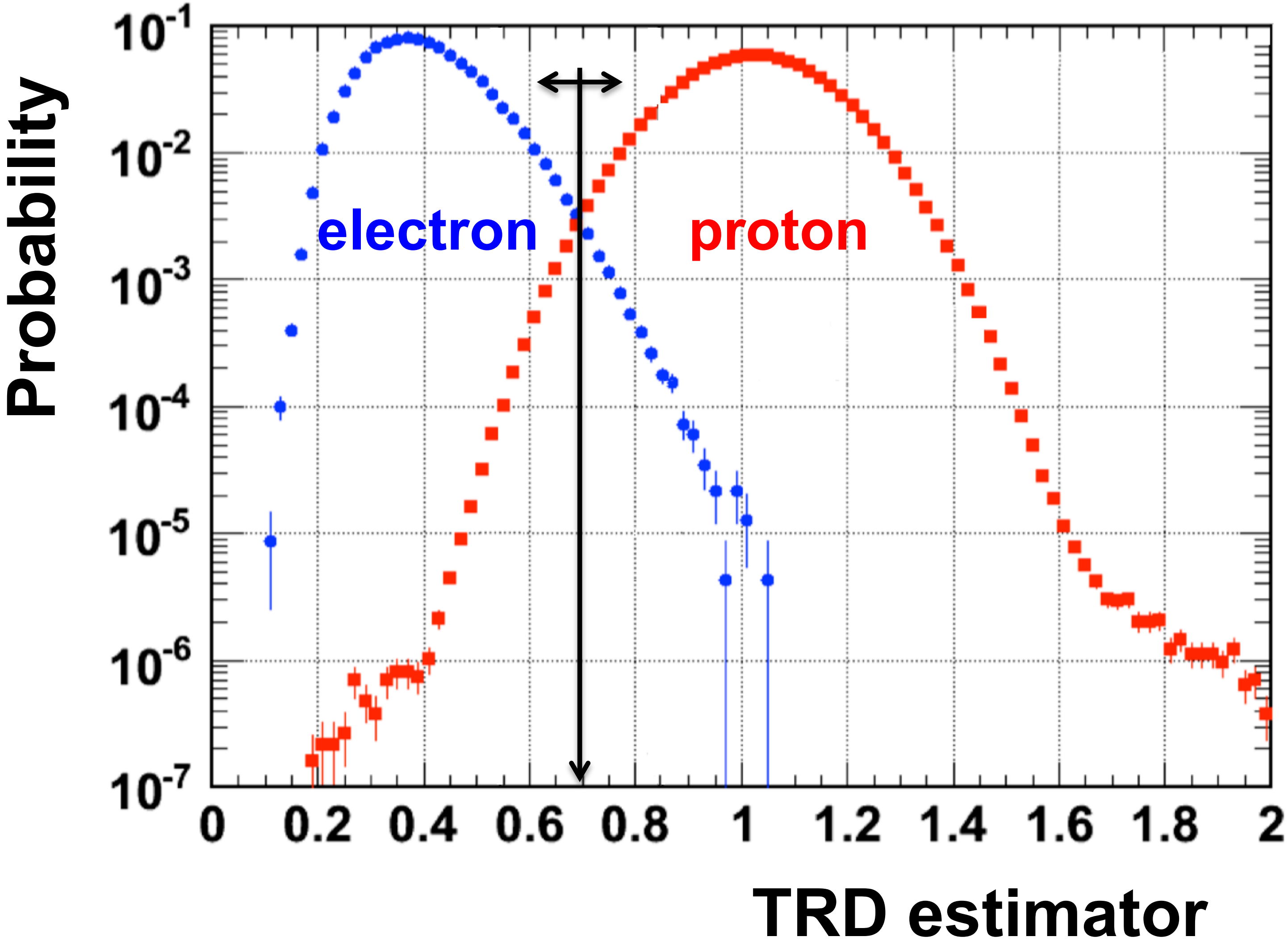


Tracker Charge



TRD performance on ISS

TRD estimator = $-\ln(P_e/(P_e+P_p))$

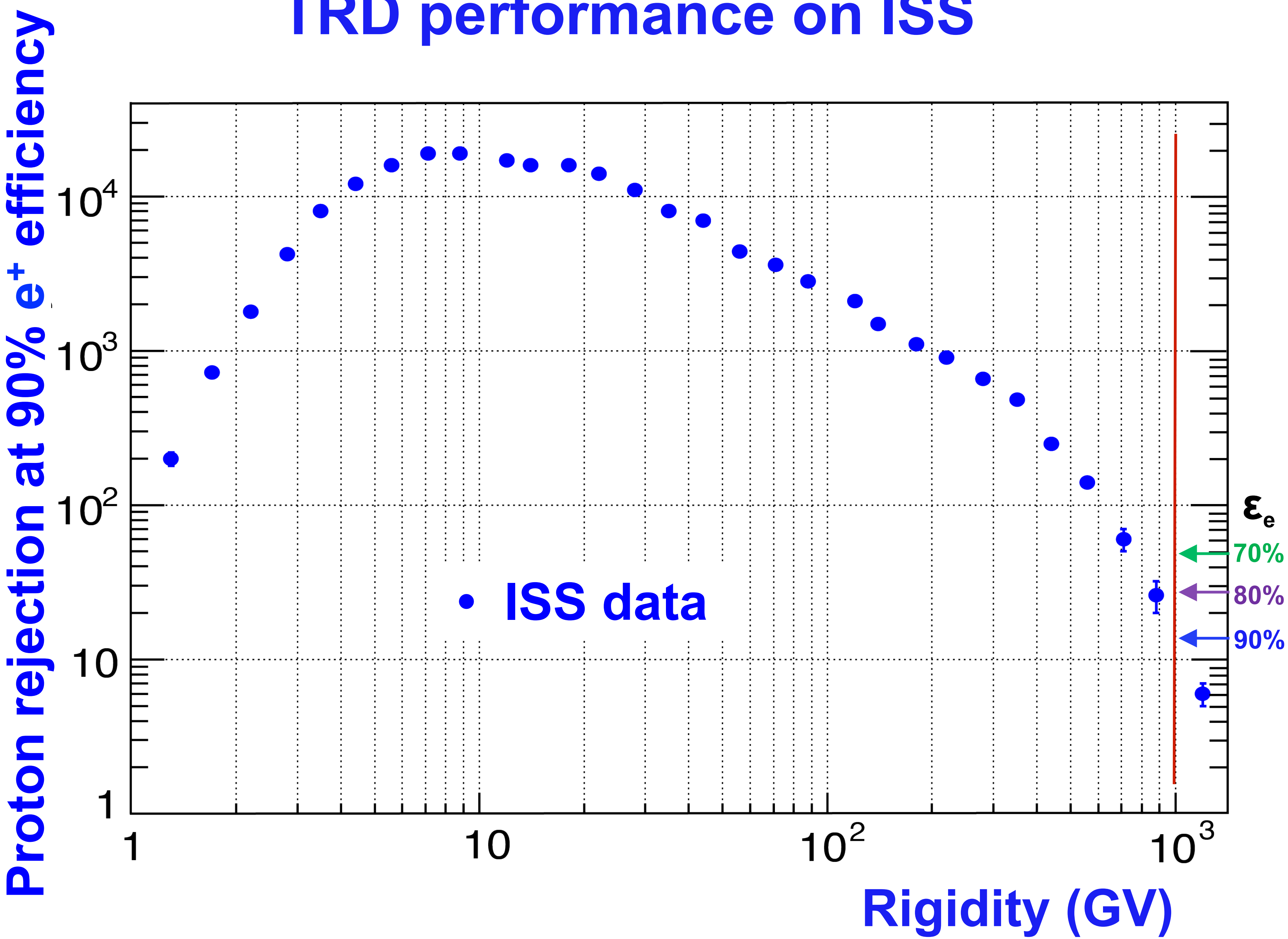


Normalized probabilities P_e and P_p

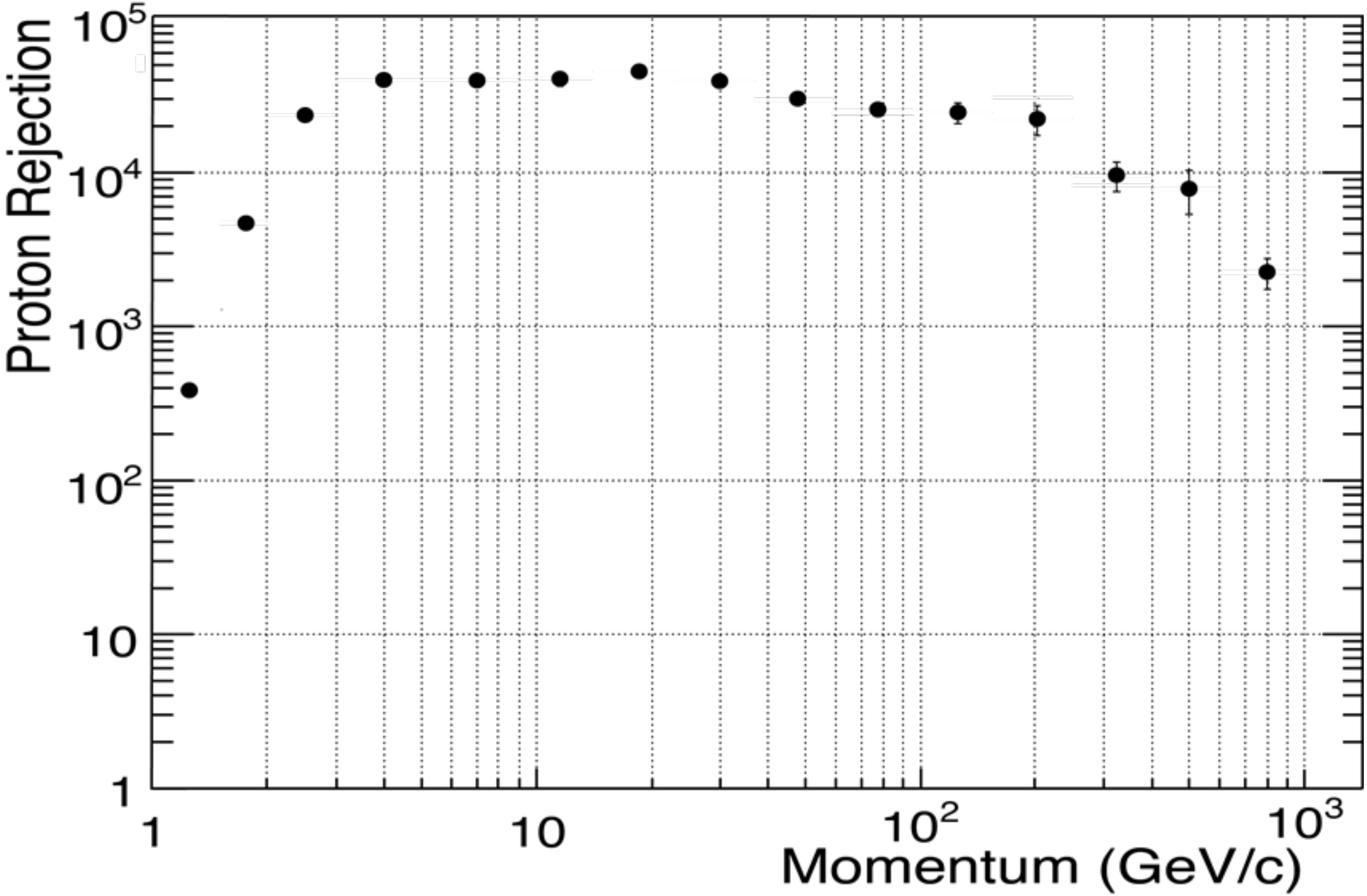
$$P_e = \sqrt[n]{\prod_{i}^{n} P_e^{(i)}(A)}$$

$$P_p = \sqrt[n]{\prod_{i}^{n} P_p^{(i)}(A)}$$

TRD performance on ISS



Data from ISS: Proton rejection using the ECAL



Lessons learned after 22 months of AMS operations on the ISS:

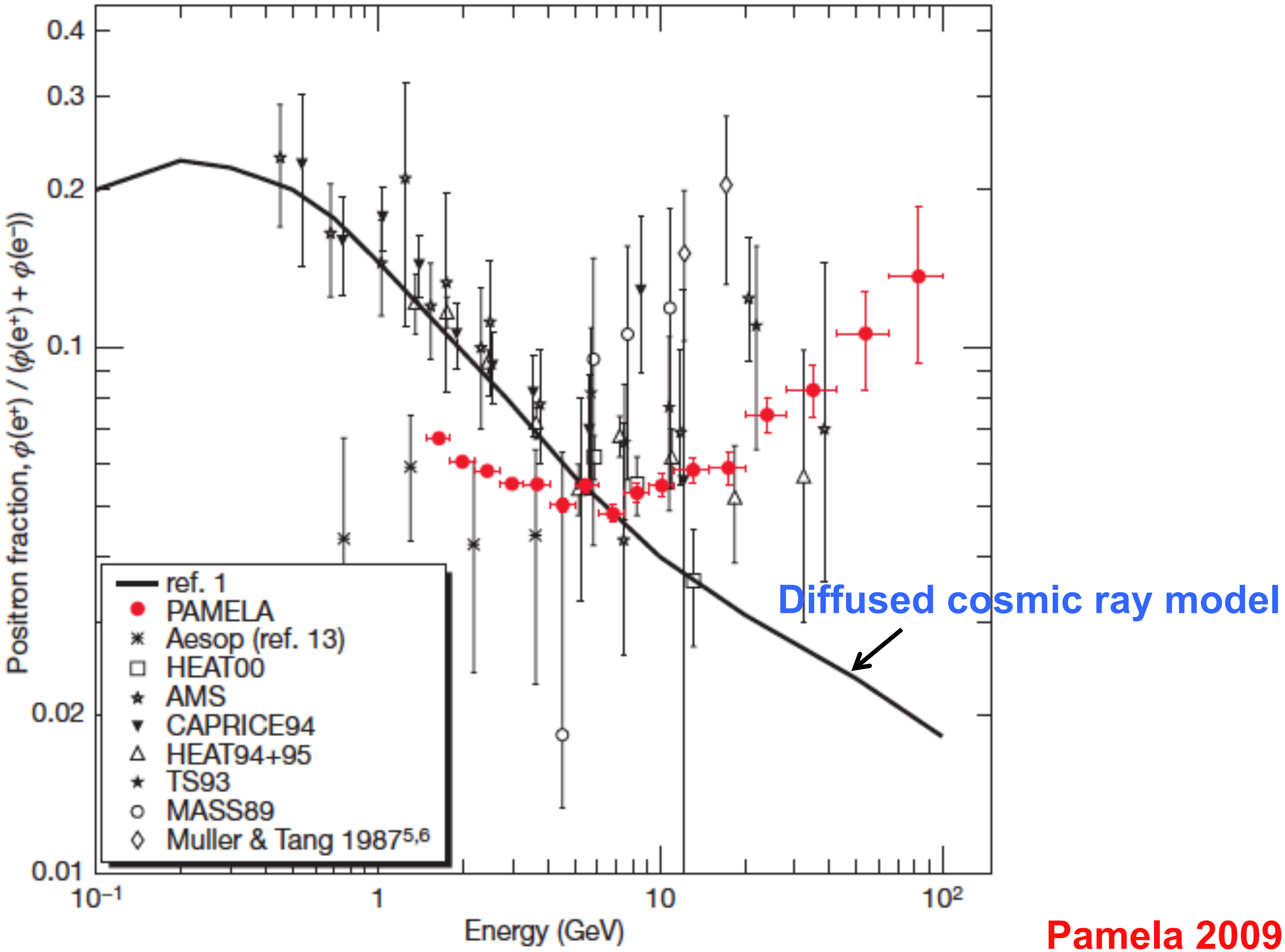
1. Operating a particle physics experiment on the ISS is fundamentally different from operating an experiment in the LHC.

   On the ISS, the thermal conditions can easily destroy AMS unless all electronics components and Station parameters are constantly monitored to avoid exposing the detector to a dangerous condition from which there is no recovery.

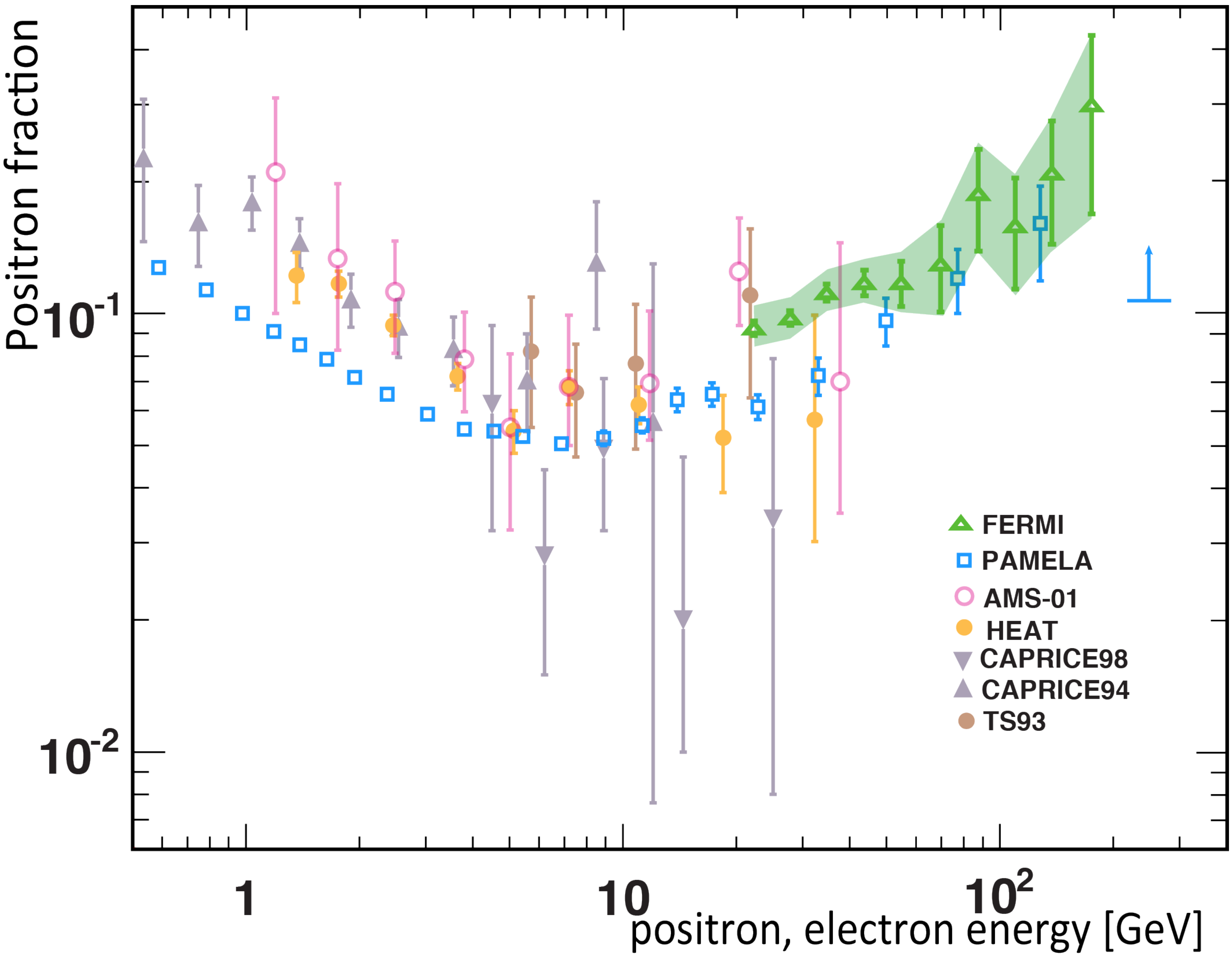
2. Operating AMS on the ISS is also different from operating on a "free flying" satellite because we have no control over the ISS orientation, attitude and beta angle – all of which affect the thermal environment.

e+/e- ratio measurement

Pamela data vs. secondary production model

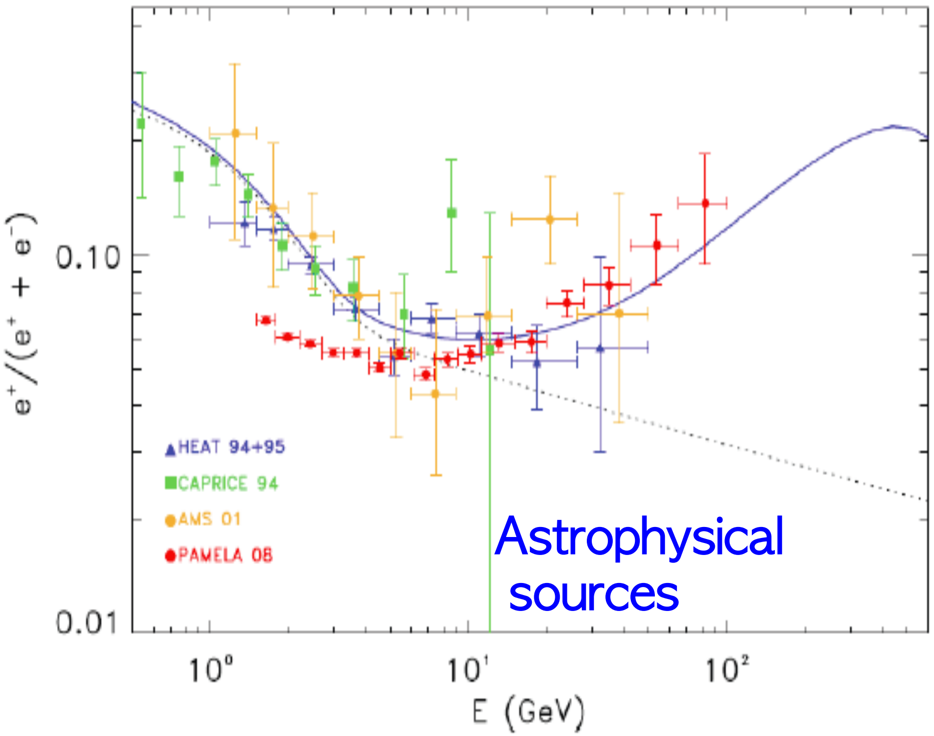


Pamela 2009

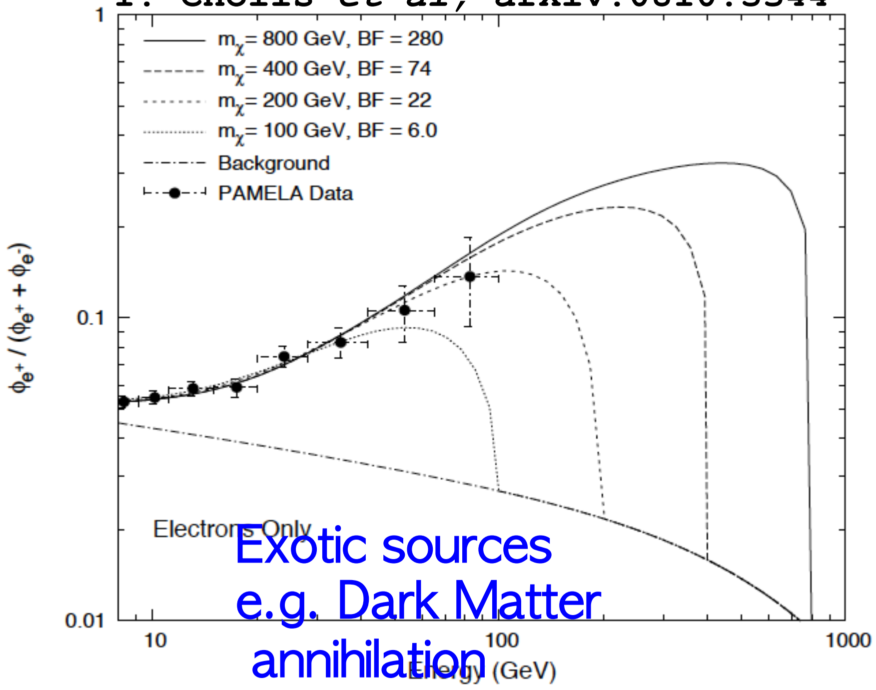

Positron fraction
10^{-1}
10^{-2}
1
10
10^2
positron, electron energy [GeV]
FERMI
PAMELA
AMS-01
HEAT
CAPRICE98
CAPRICE94
TS93

- Present positron fraction measurement seems inconsistent with pure secondary hypothesis.
- Hard to discriminate between astrophysical and exotic interpretation on the basis of the positron fraction only.
- Need to combine anisotropy studies, antiproton studies, B/C ratio, gamma ray astronomy ...

D. Grasso *et al*, arXiv:0905.0636



I. Cholis *et al*, arXiv:0810.5344



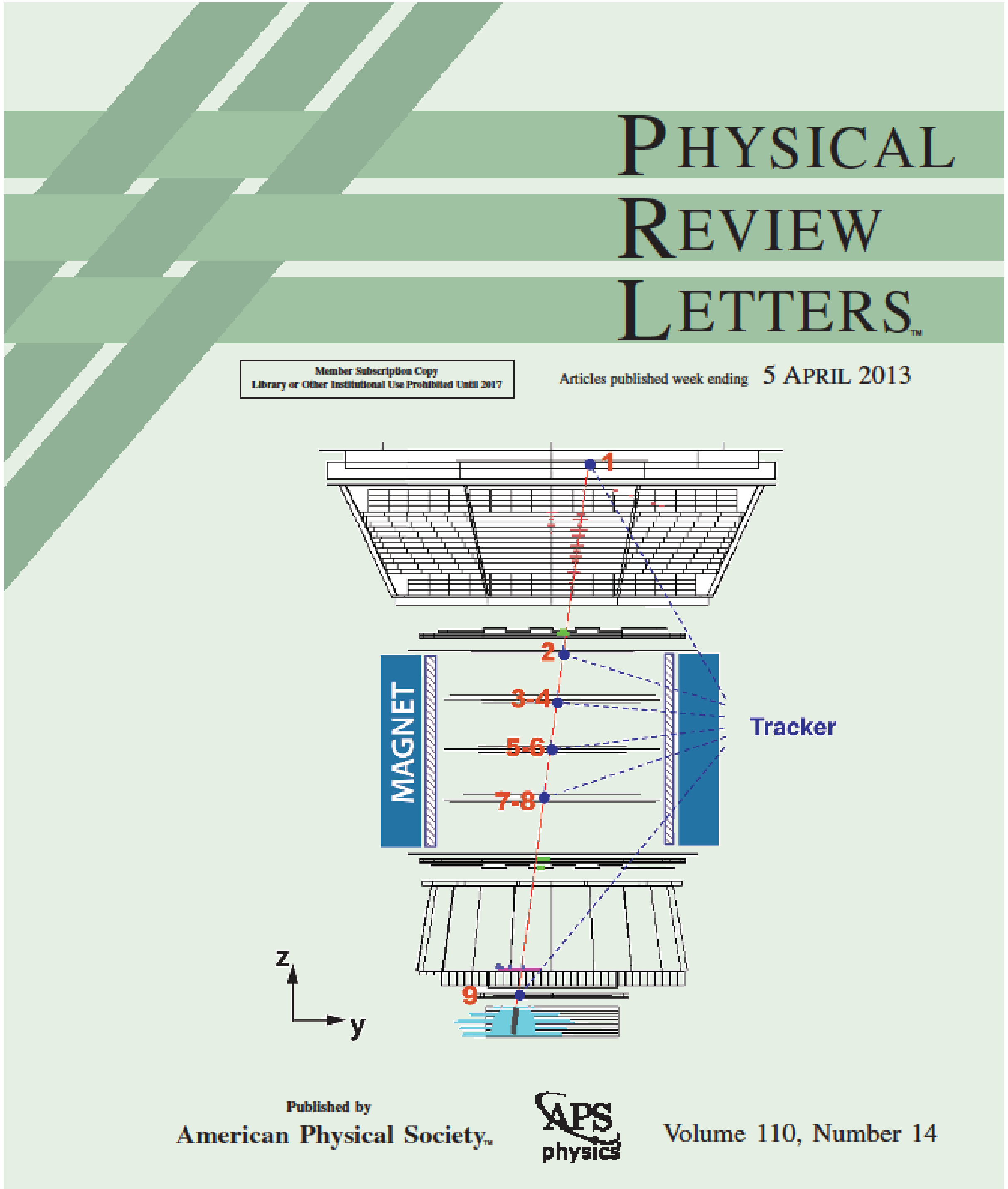
First Data from AMS

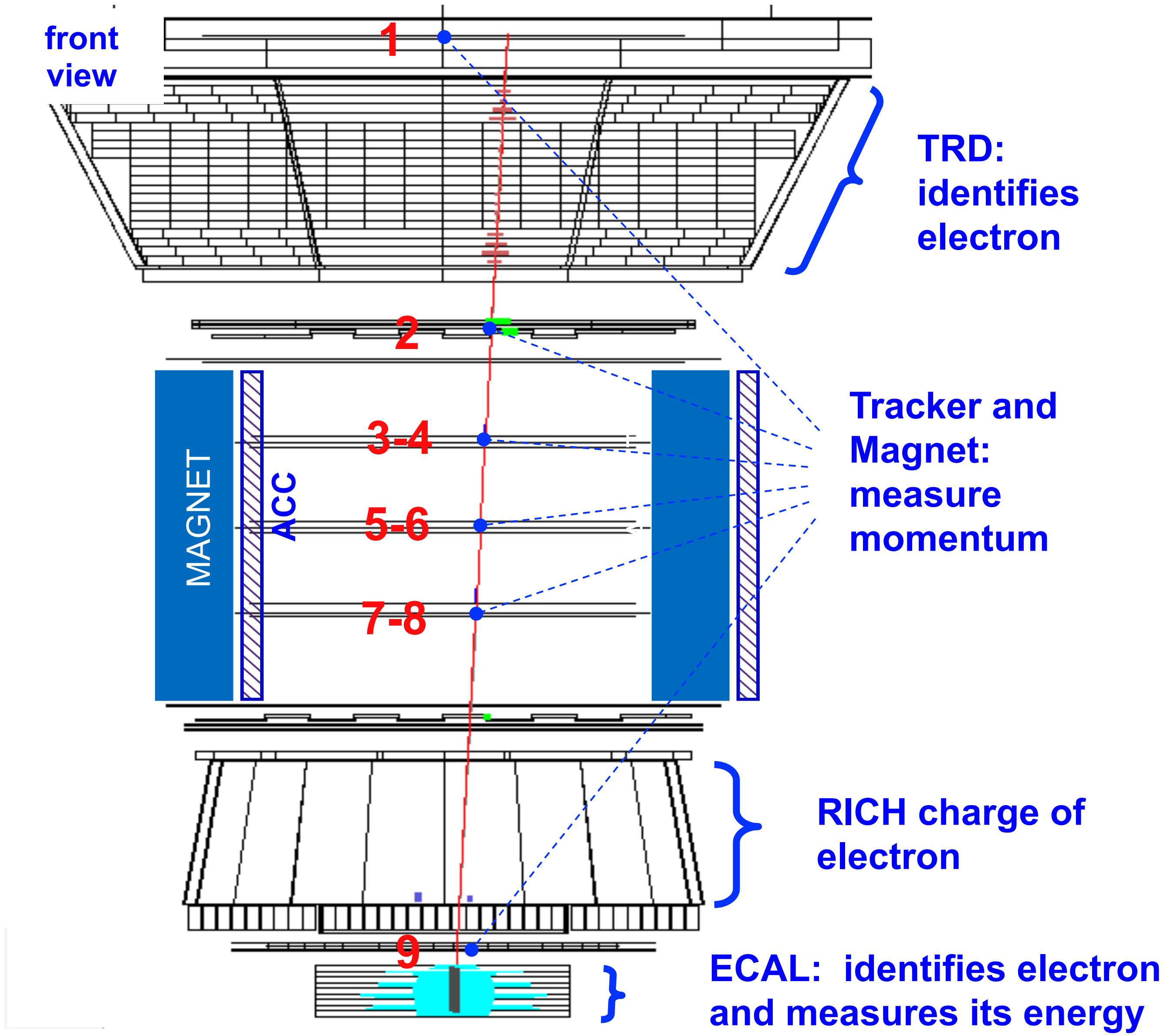
Over the first eighteen months of operations in space,
AMS has collected over 25 billion events.

6.8 million are electrons or positrons.

"First Result from the AMS on the ISS: Precision Measurement of the Positron Fraction in Primary Cosmic Rays of 0.5-350 GeV"

Selected for a Viewpoint in Physics and an Editors' Suggestion [Aguilar,M. et al (AMS Collaboration) Phys. Rev. Lett. 110, 1411xx (2013)]





AMS data on ISS: 424 GeV positron