

High energy cosmic-ray proton and helium spectra

Alexander Karelin

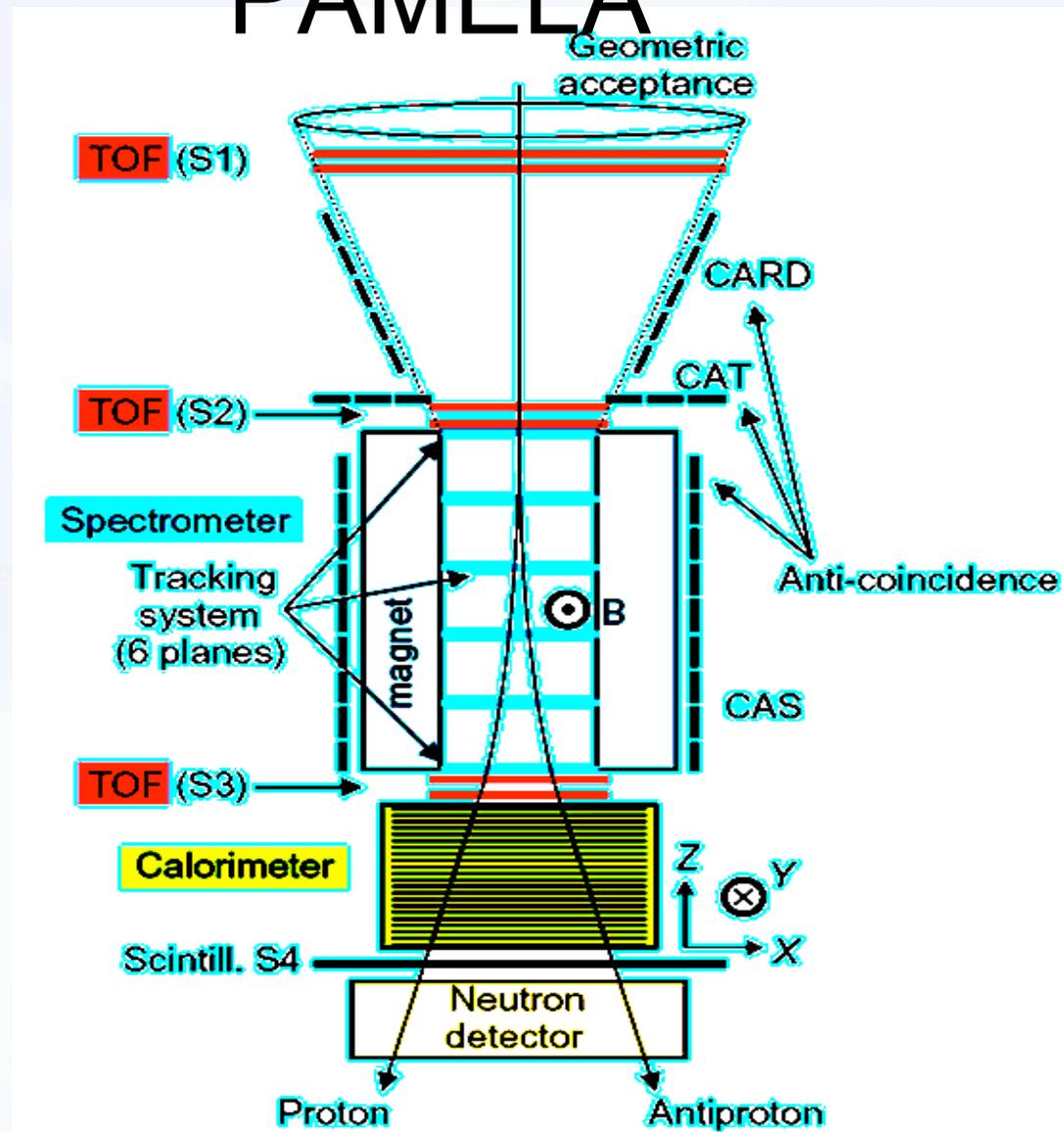
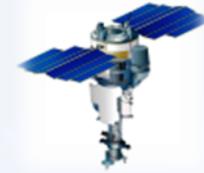
on behalf of the PAMELA collaboration



22-ND EUROPEAN COSMIC RAY SYMPOSIUM

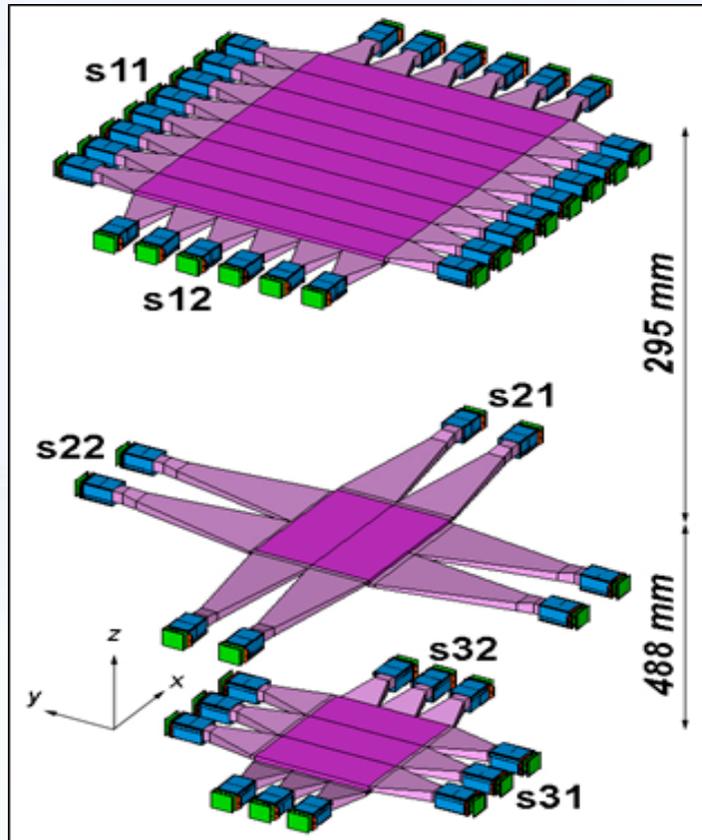
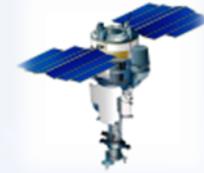
August 3-6, 2010, Turku, Finland

Schematic overview of the PAMELA

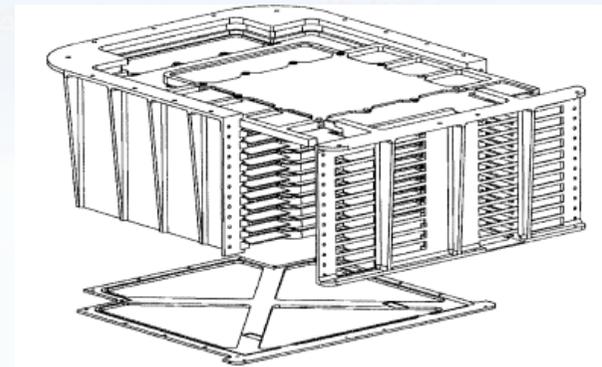
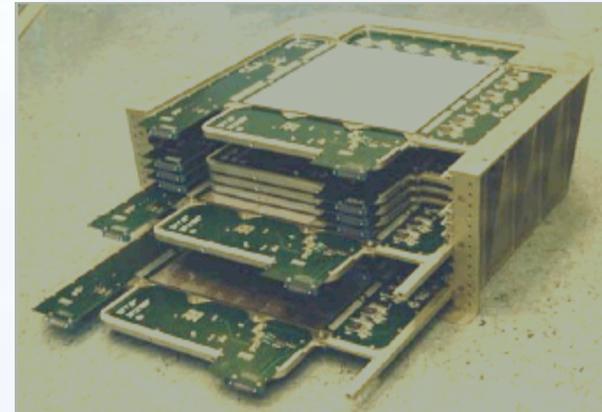


[P. Picozza et al. Astrophysics Astroparticle Physics. 2007. V. 27. P. 296-315.]

Schematic of the calorimeter and ToF structure

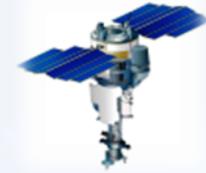


- S1, S2, S3; double layers, x-y
- plastic scintillator (8mm)
- ToF resolution 300 ps (S1-3 ToF >3 ns)

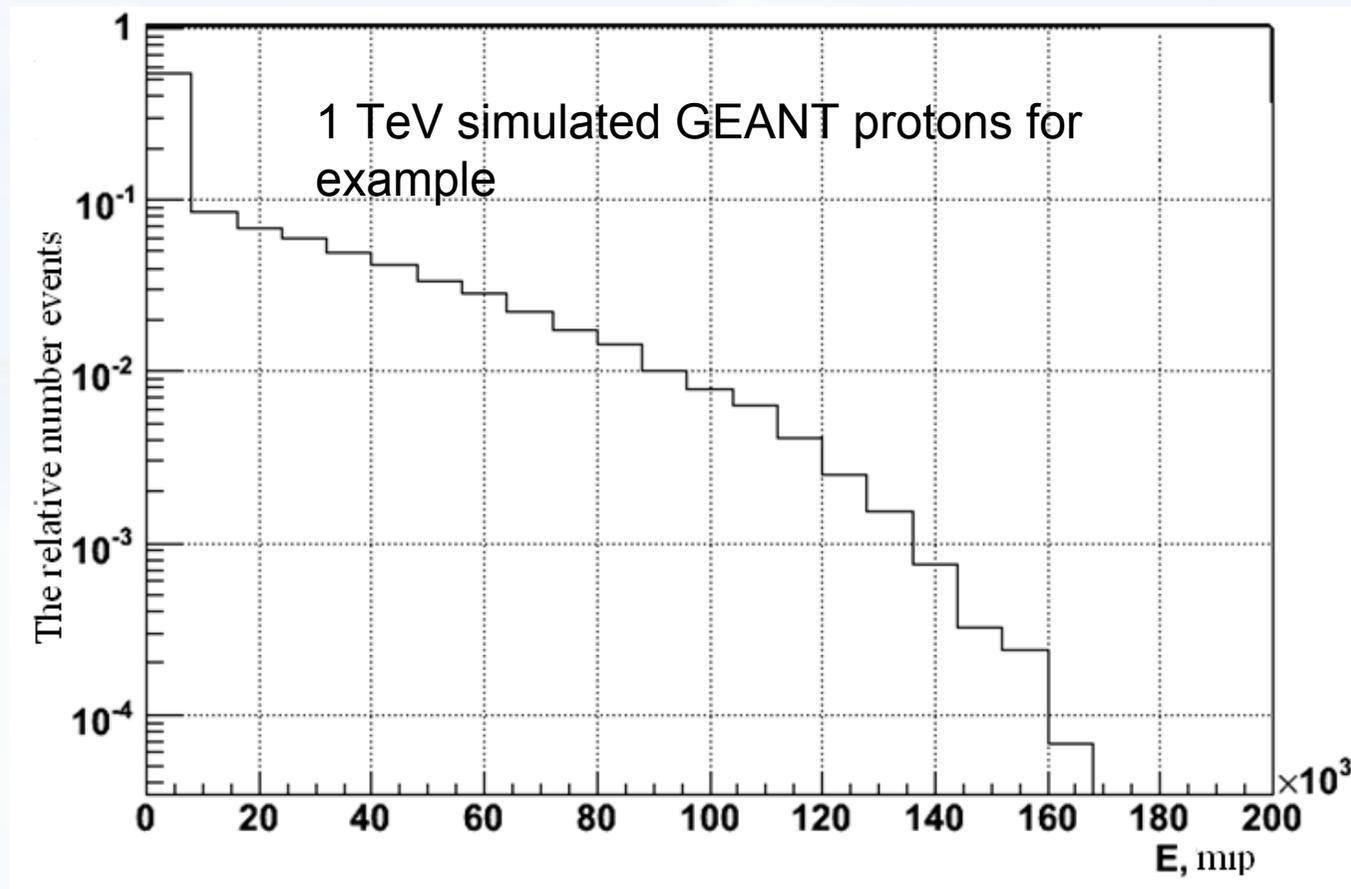


- 44 Si-x / W / Si-y planes (380)
- 16.3 X0 / 0.6 L
- dE/E ~5.5 % (10 - 300 GeV)

Proton analysis

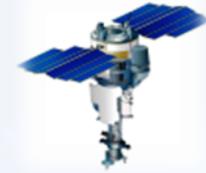


1. The total energy deposit distribution



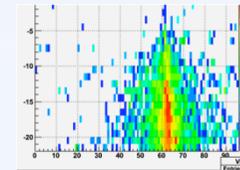
Without any selection

Proton analysis

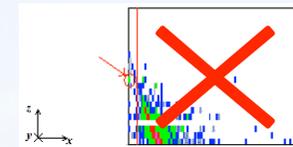


Selection criteria

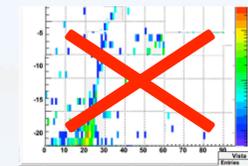
1. High energy shower inside calorimeter



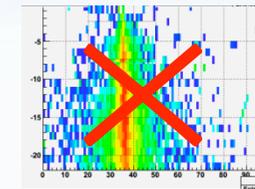
2. A shower axis line is inside an aperture



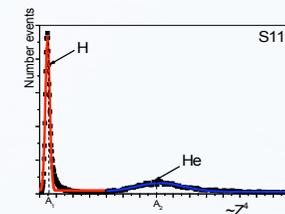
3. A starting point of shower out of 12-22 calorimeter layer



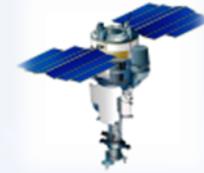
4. To cut electron events showers initiated in firsts layers of calorimeter were rejected



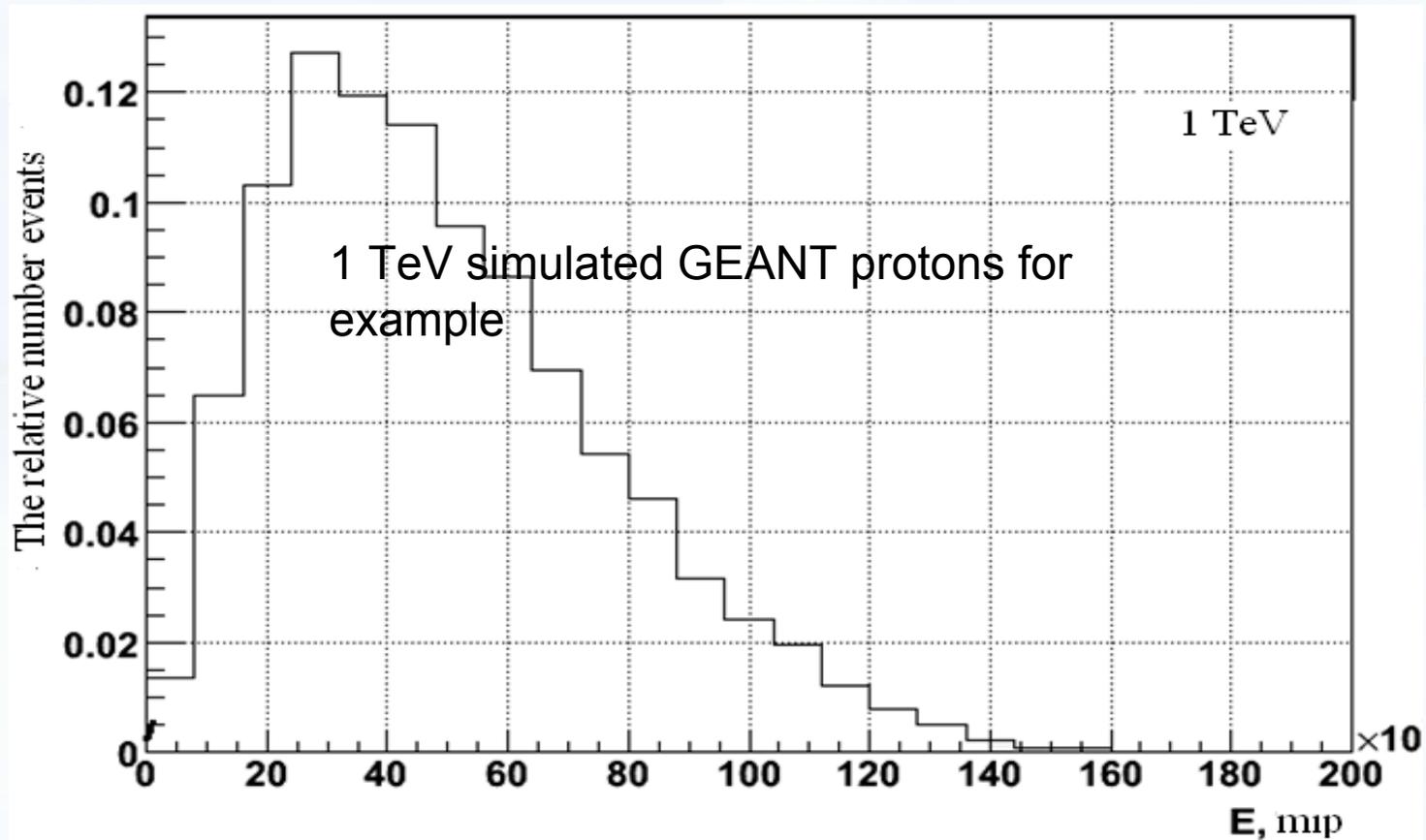
5. To cut He events ionization losses in ToF scintillators were using



Proton analysis

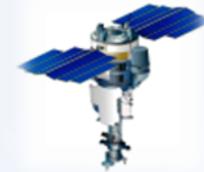


2. The total energy deposit distribution

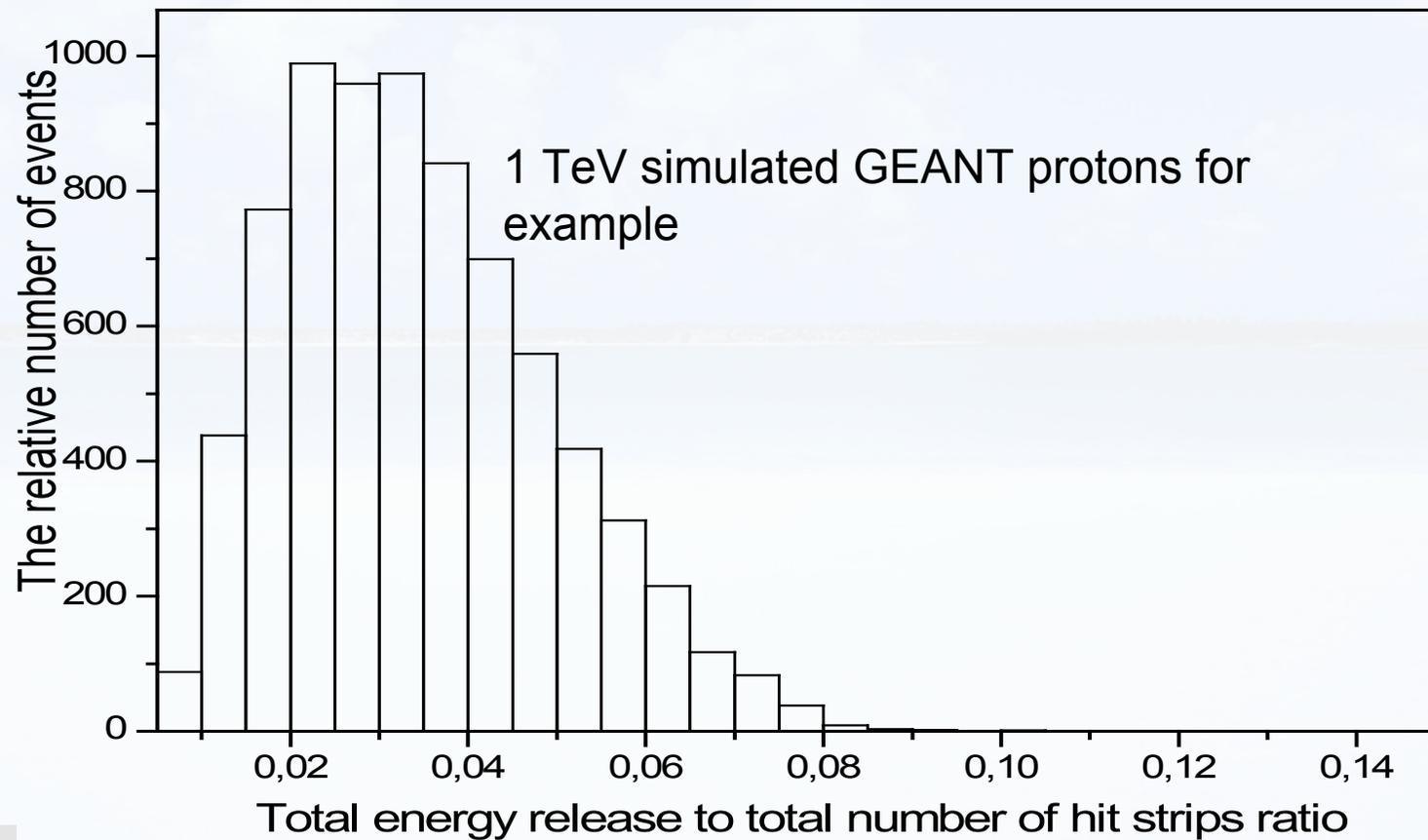


After selection

Proton analysis

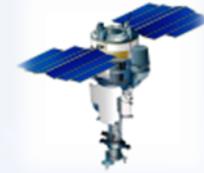


3. The Etot/Nhit distribution

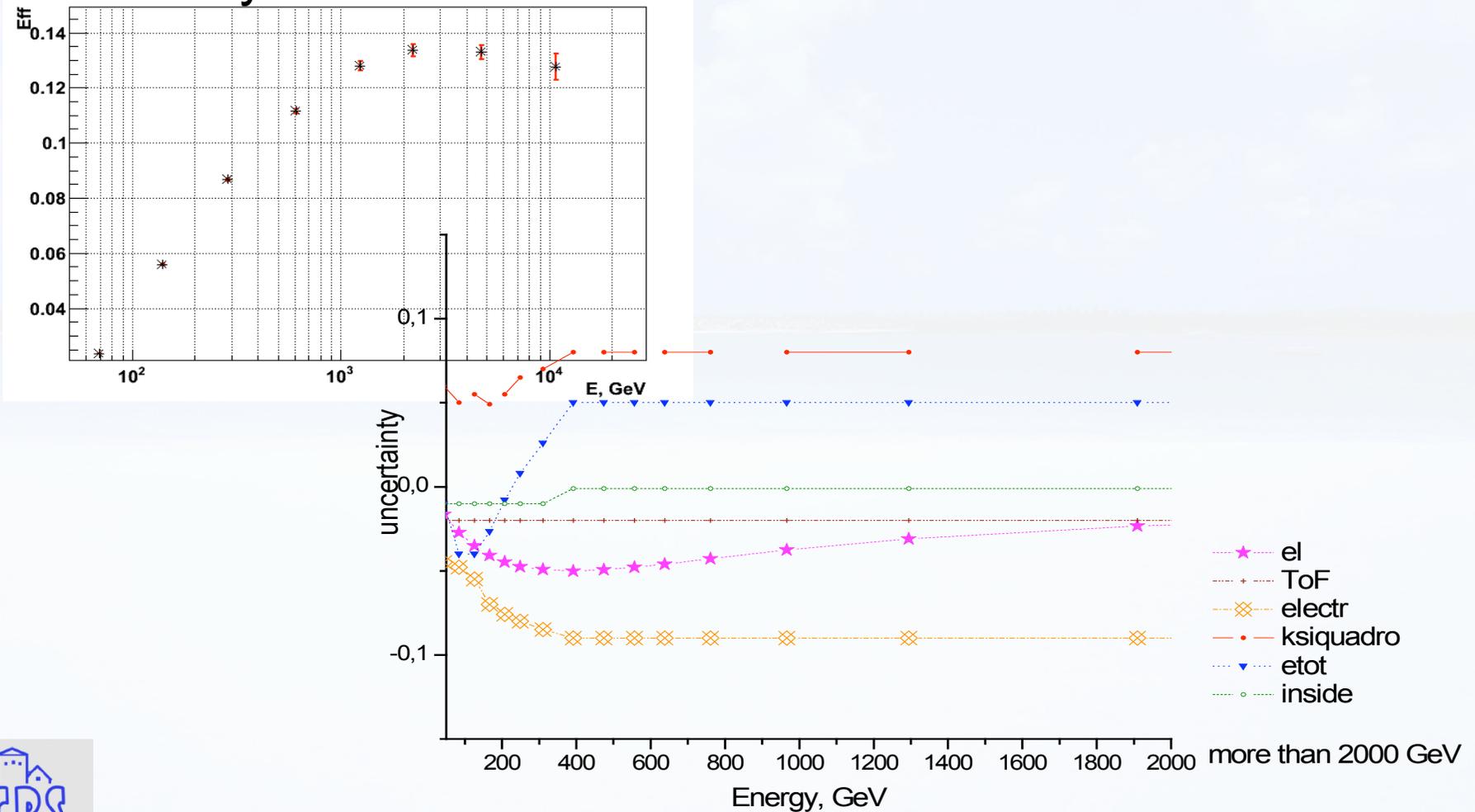


After selection

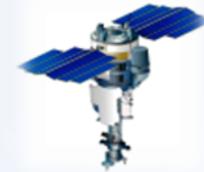
Proton analysis



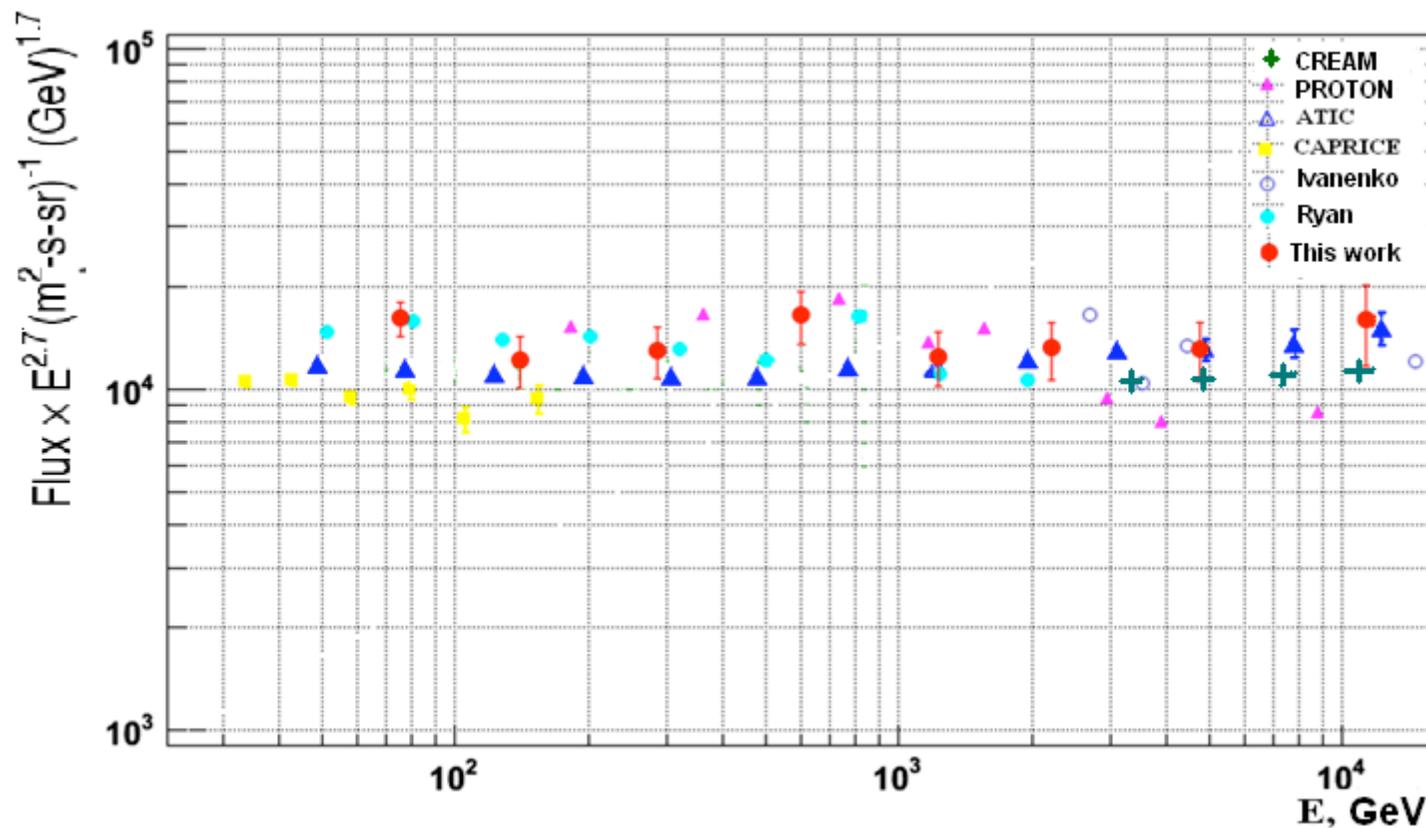
The selection efficiency by simulated data and its uncertainty



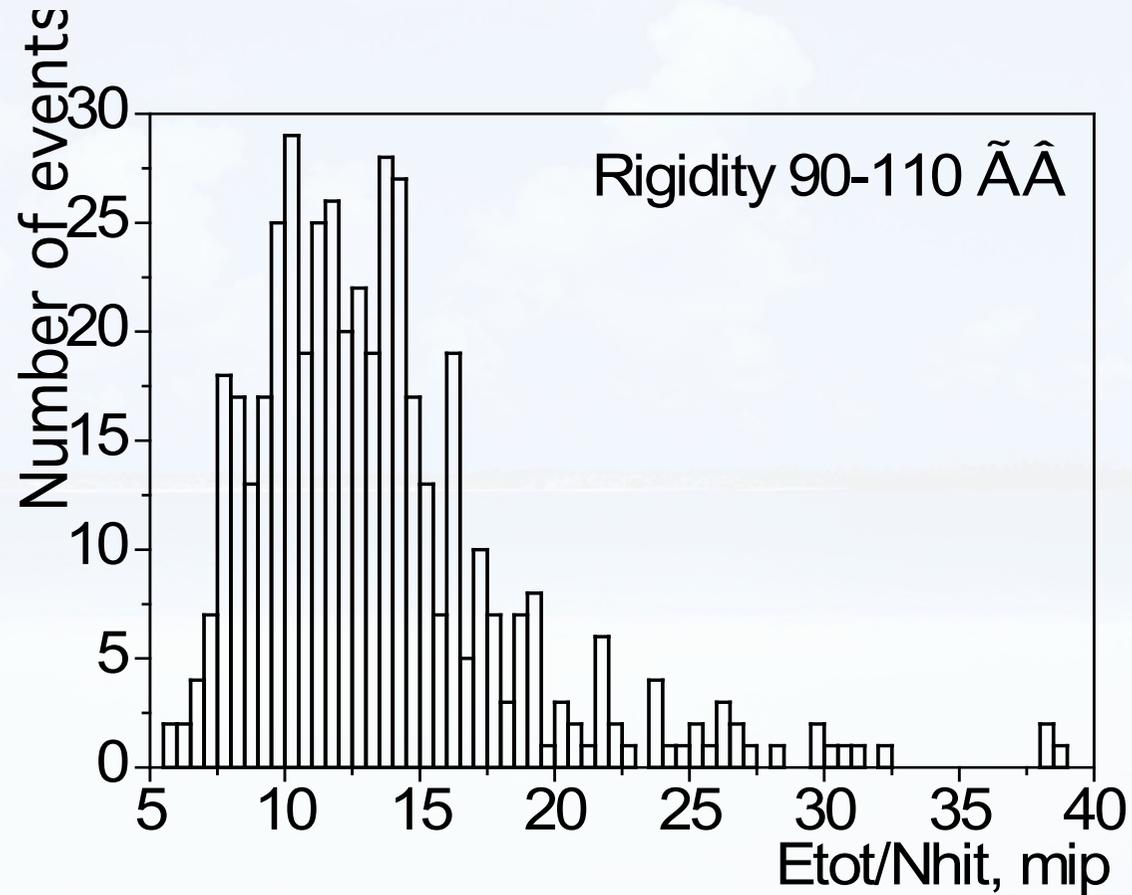
Proton analysis



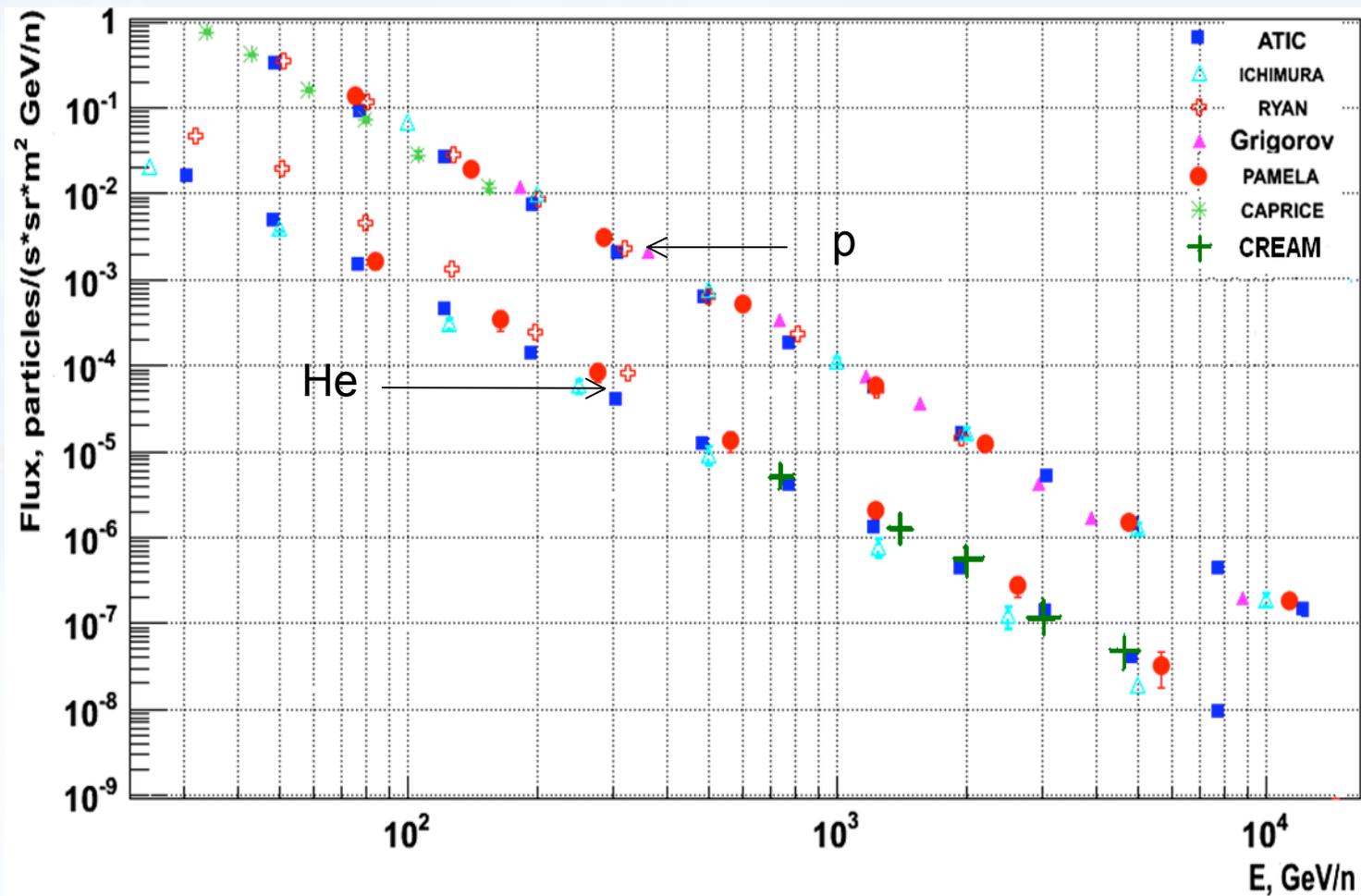
The measured proton spectrum



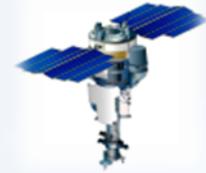
Helium analysis



Measured proton and helium spectra



Conclusion



1. The method of measurement high energy proton and helium cosmic ray spectra based on PAMELA calorimeter signal has been developed
2. New results for 100 GeV-15 TeV energy range with 3 years statistics have been obtained