38th INTERNATIONAL CONFERENCE on HIGH ENERGY PHYSICS

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The NUCLEON space experiment status: $10^{11} < E < 4*10^{14}$ eV

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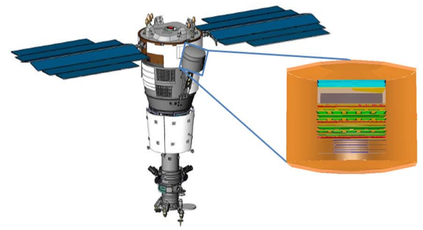
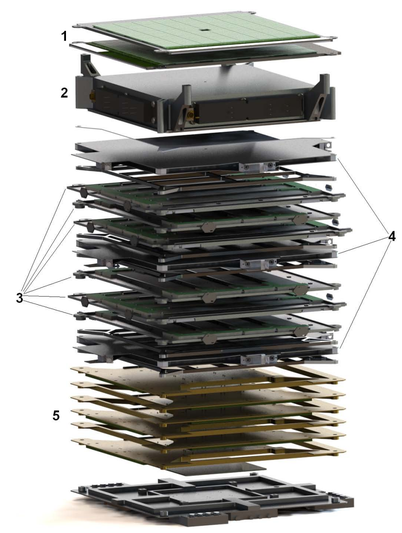
NUCLEON apparatus

- NUCLEON detector is a monoblock inside of pressure container,
- Special **telemetry** system inside of separate container,
- Antenna-fider system,
- Mechanical support interface of the connection with base satellite system.



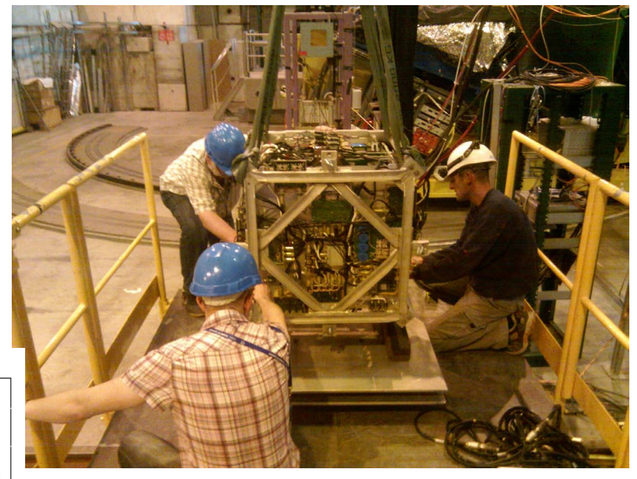
Main NUCLEON parameters:

-Total weight ~ 360 kg (for detector ~165 kg),
- Power cunsumtion~150 W (detectors ~120 W),
-Telemetry ~10 GB/day,
- Circle solar-synchronize orbit at 475 km latitude and 47° inclination
- Data taking period ≥5 years.

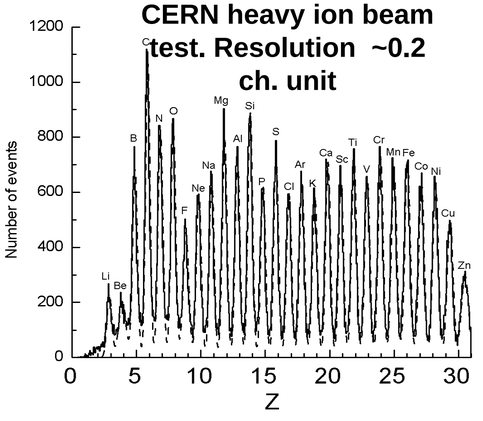


The NUCLEON apparatus includes the charge measurement system (1) consisting of the 4 pad silicon detectors layers (2048 channels), the KLEM energy measurement system of the carbon target (2) and the six layers of silicon microstrip detectors (6912 channels) divided by six thin tungsten layers (3), the trigger system (4) of the six scintillator layers (108 channels) and six layers (5) of the silicon-tungsten calorimeter (1536 channels). Total - 10604 channels, failure rate is 0.6% Active area – 0.50x0.50 m (for calorimeter – 0.25x0.25 m) Total depth ~ 16 radiation lengths E-resolution: P-60%, Fe-30-50%, e-8% Ch-resolution: 0.2 ch.unit

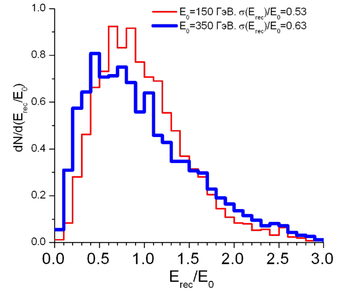
The orbital NUCLEON experiment is designed to measure Cosmic Ray (CR) energy spectrum and charge composition at 100 GeV – 1000 TeV and Z = 1-30 respectively. The NUCLEON apparatus structure, methods of primary CR charge and energy measurements are described. The possible systematic uncertainty sources are discussed. Preliminary CR energy spectra and charge composition are presented from the first one and a half year of data taking from orbit.



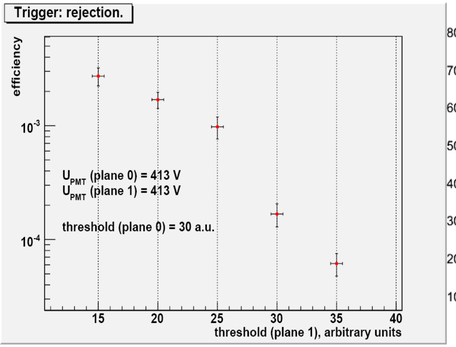
The charge distribution obtained at the SPS CERN heavy ion beam test. Resolution ~0.2 ch. unit

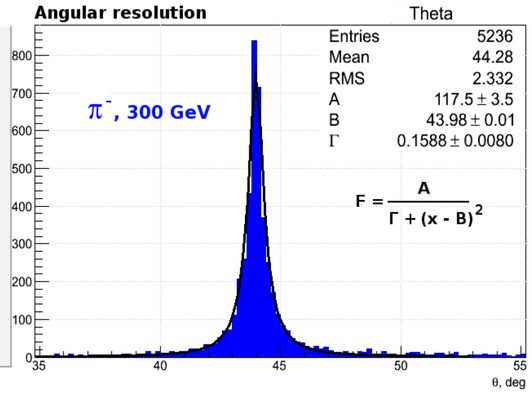


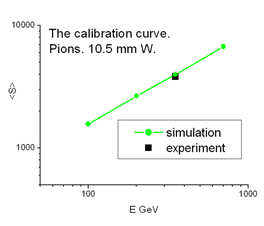
Normalized reconstructed energy distributions for pion beams of 150 GeV and 350 GeV (KLEM technique) RMS~60%

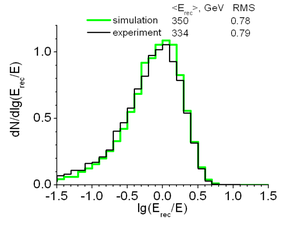


NUCLEON detector was tested many times with electron, hadron and heavy ion beams at SPS of CERN

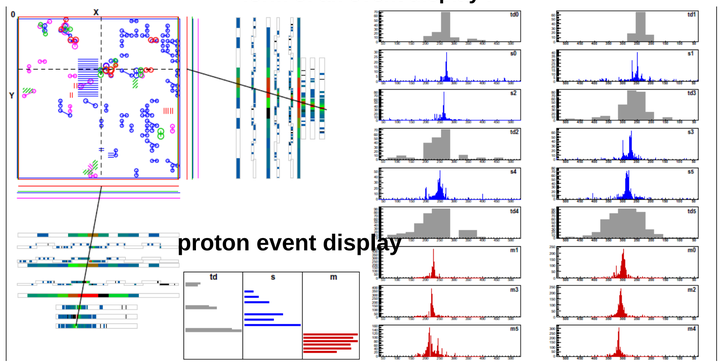




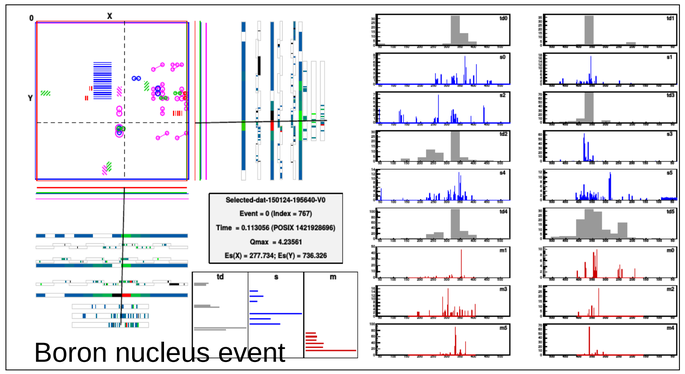




The set of data obtained by all detectors can be presented in the form of an event display .

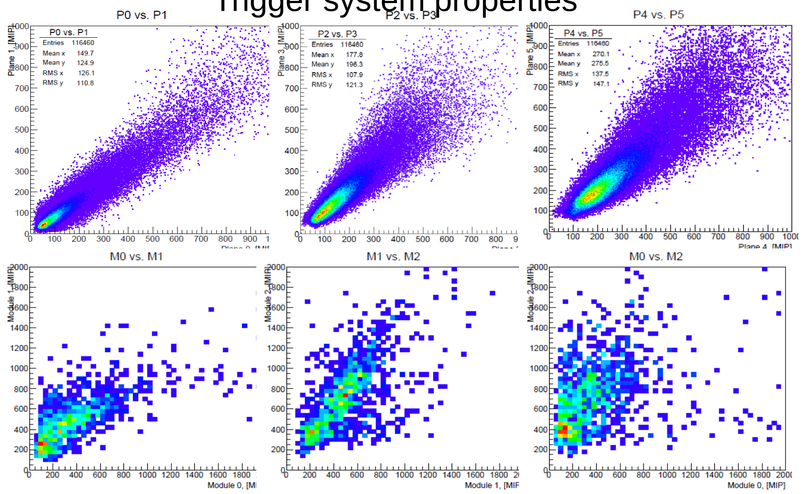


proton event display

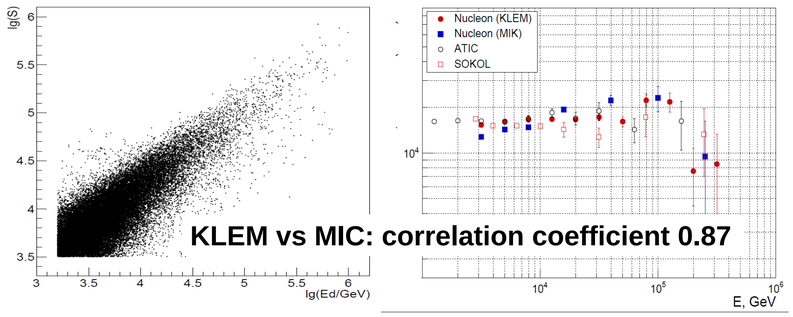


Boron nucleus event

Trigger system properties

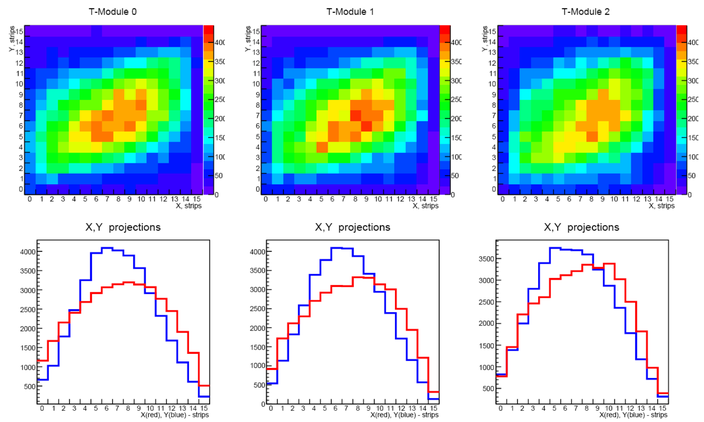


Experiment	e^++e^-	CR	UHGCR	gamma	Type	Launch
NUCLEON	100 GeV-3 TeV	Z= 1-30 100 GeV-1 PeV			SAT	Dec. 26th 2014
CALET	1 GeV-10 TeV	p-Fe 10 GeV-1 PeV	26<Z≤40 ~GeV/n	10 GeV-10 TeV X-ray 7-20 MeV	ISS	Aug. 16th 2015
ISS-CREAM	100 GeV-10 TeV	p-Fe 1 TeV-1 PeV			ISS	2016
DAMPE	5 GeV-10 TeV	Z=1-20 100 GeV-100 TeV		5 GeV-10 TeV	SAT	Dec. 2015

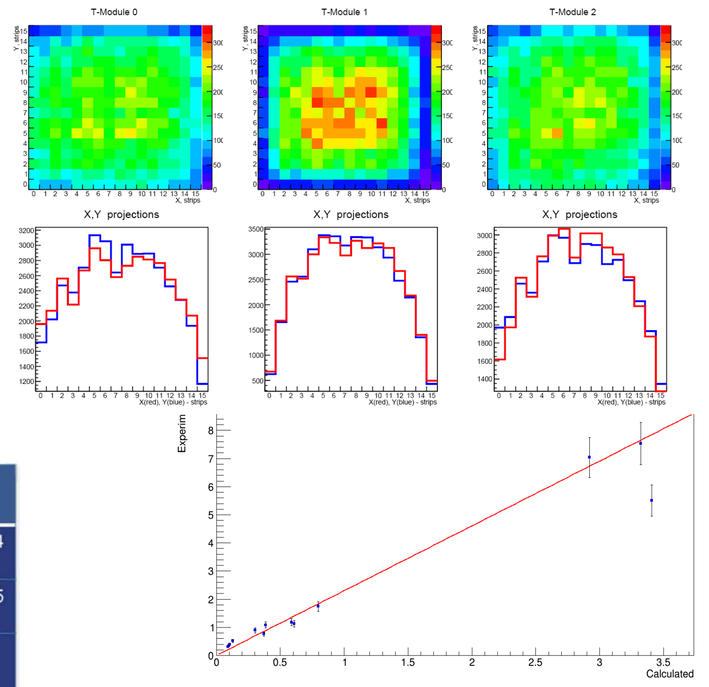


KLEM vs MIC: correlation coefficient 0.87

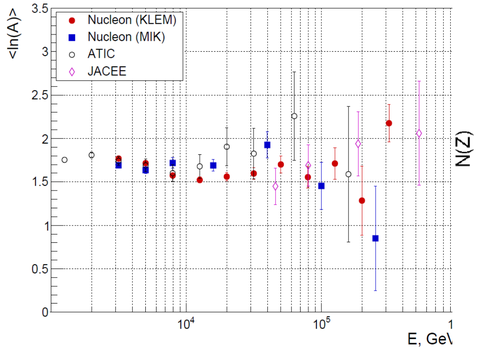
Simulation 100 Gev protons: asymmetry

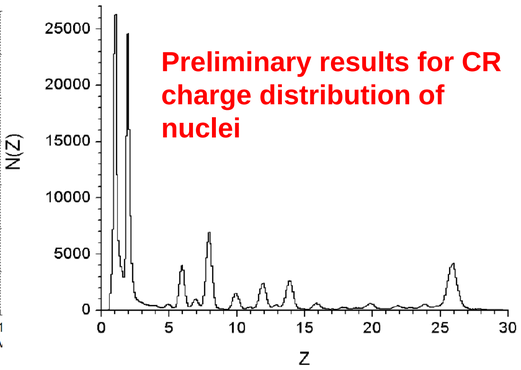


Simulation 100 Gev muons: no asymmetry



Comparison of the trigger rates: simulation - X-axis, data – Y-axis

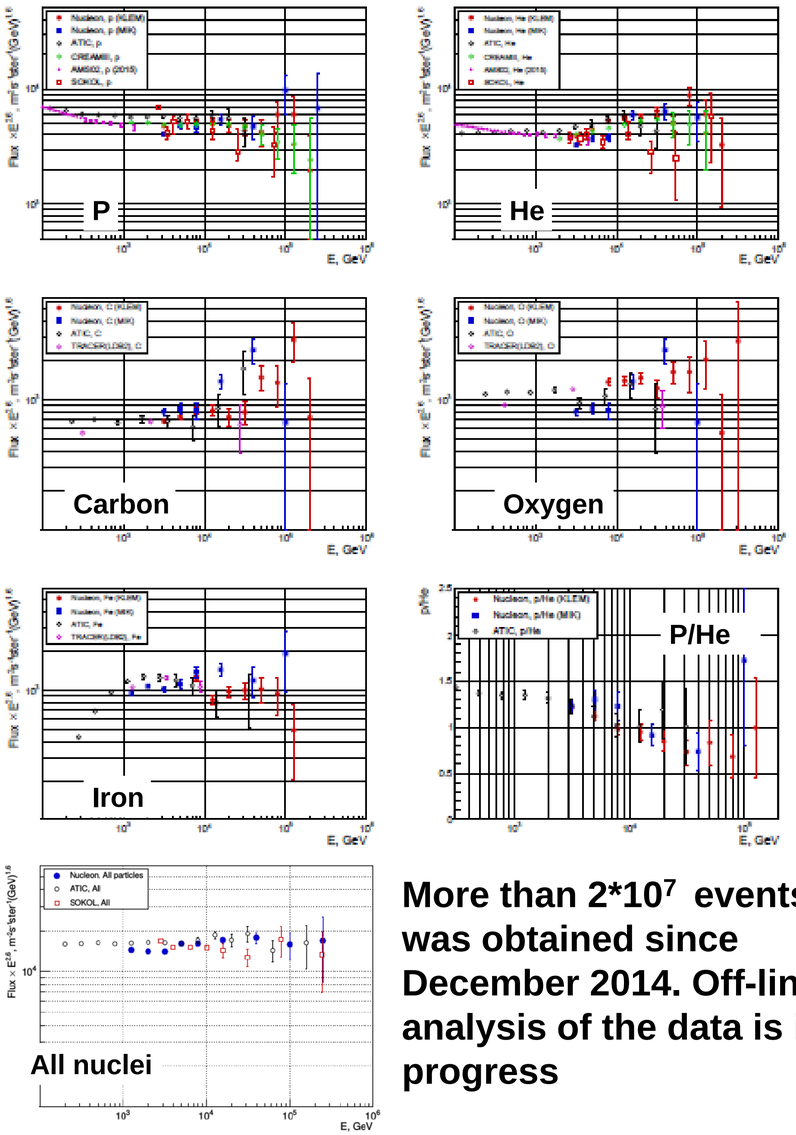




Preliminary results for CR charge distribution of nuclei

Preliminary results for spectra of CR nuclei

$$I(E) = \frac{N(E, \Delta E)}{T_l \times \Omega \times \Delta E \times R(E) \times t(E_d) \times C(E) \times q(E)}$$



More than 2*10^7 events was obtained since December 2014. Off-line analysis of the data is in progress