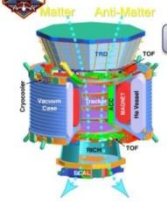
AMS-02 Experiment on ISS

An Improved Version of AMS-01



Antimatter

Astrophysics, Dark Matter

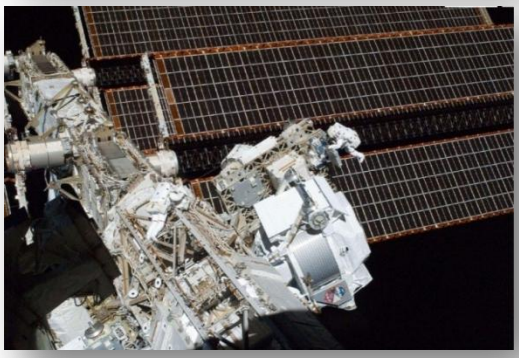
Value	AMS-01	AMS-02
Mission lenght	10 days	10 years
MDR	150 GV	1 TV
He Statistics	2.86×10^6	$> 10^9$
$E_{max}\,(e^-)$	~ 30 GeV	1.4 TeV
$E_{max}\,(e^+)$	~ 3 GeV	350 GeV
$E_{max}\,(\bar{p})$	~ 3 GeV	450 GeV

The TOF system provides:
- the fast trigger to the whole AMS;
- the measurement of the time of flight (Δt – better than 180 ps), for the determination of the particle velocity (β), with a resolution of few %;
- the distinction from upward and downward going particles at a level of 10^{-9} necessary to distinguish between matter and antimatter;
- the measurement of the absolute particle charge up to Z =15.

Lower TOF pre-integration (CERN, Geneva, Switzerland)

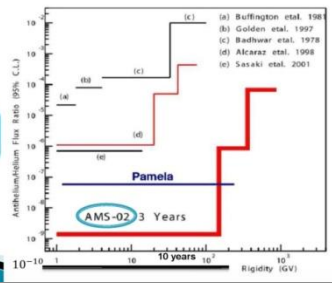
Go baby go!

IL LANCIO DI AMS-02 IN DIRETTA
Lunedì 16 Maggio ore 14.45
Sala Riunioni Piano 2 – Berti Pichat
Inizio diretta ore 12.00 – con la presenza del gruppo AMS-TOF, INFN Sezione di Bologna

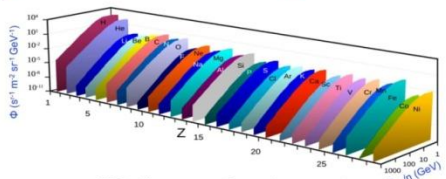


Expected Goal for Antinuclei Search

Antihelium/ Helium Flux



Cosmic Rays



AMS will measure of cosmic ray spectra for nuclei, for energies from 100 MeV to 2 TeV with 1% accuracy continuously over the solar cycle.

The isotopic composition of the CR is correlated with their propagation mechanisms

New Physics: Strangelets

There are six types of Quarks found in accelerators (u, d, s, c, b, t).
All matter on Earth is made out of only two types (u, d) of quarks.
"Strangelets" are new types of matter composed of three types of quarks (u, d, s) which should exist in the cosmos.

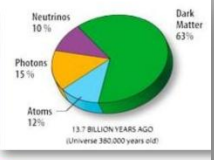
Carbon Nucleus Z/A ~ 0.5

Strangelet Z/A ~ 0.1

Non barionic DM candidates

• WIMP (Weakly Interacting Massive Particles): $Q_{em} = 0$, $Q_S = 0$, stable ($\tau > 1/H_0$), ρ_{relic} compatible ($\Omega \lesssim 0.3$), which can only interact via weak or gravitational force, preferably minimal (scalar or Majorana-like), foundamental, cold (non relativistic)

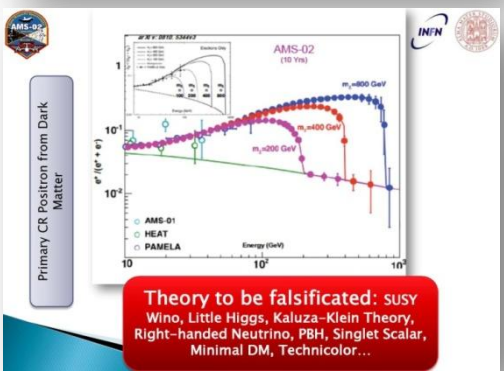
❖Lightest supersymmetric particles (LSP).



Neutralino χ

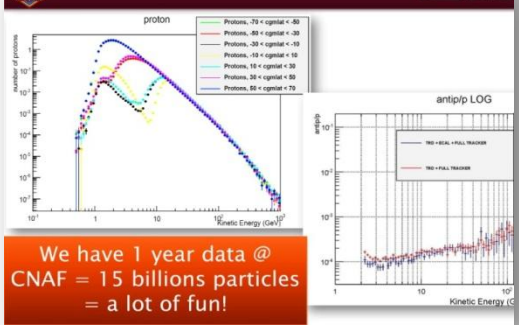
WIMP Mass Region: 100 GeV÷10 TeV

Indirect detection with AMS – products of the annihilation of DM particles: the signal can consists of photons, neutrinos and antimatter (positrons, antiprotons and antideuterons)



Theory to be falsificated: susy
Wino, Little Higgs, Kaluza-Klein Theory, Right-handed Neutrino, PBH, Singlet Scalar, Minimal DM, Technicolor…

Facenda…



We have 1 year data @ CNAF = 15 billions particles = a lot of fun!