

# International Cosmic Day - Perugia



Università degli Studi di Perugia, Dipartimento di Fisica e Geologia  
INFN Sezione di Perugia



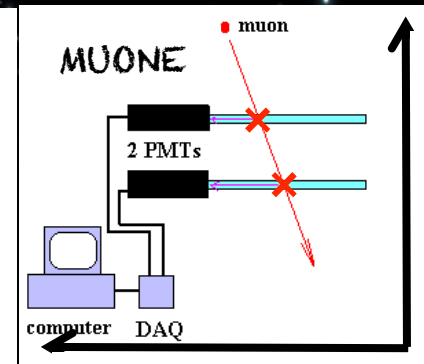
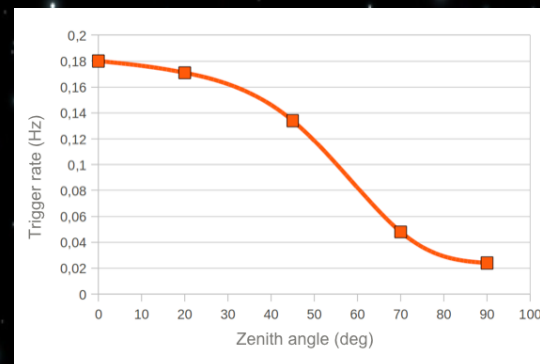
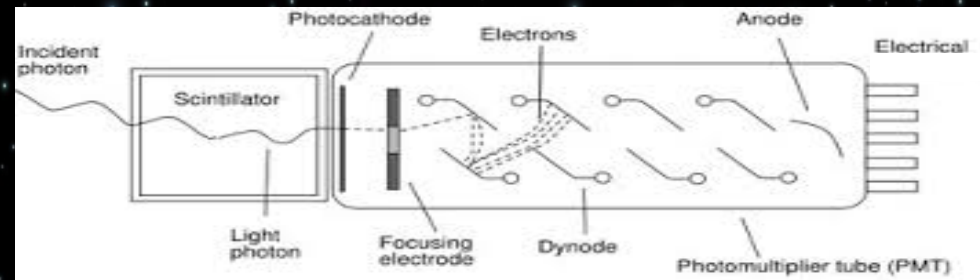
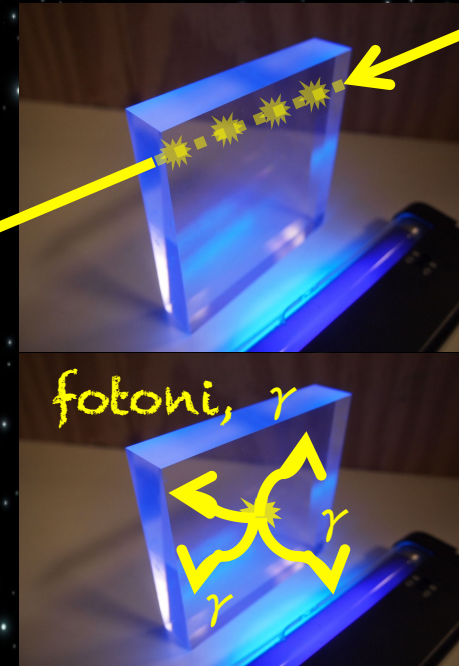
# Partecipanti

- 2-3 (\*) scuole (Media Superiore, preferibilmente 3°-4°-5° anno) della Provincia di Perugia (invito comunque mandato anche alle scuole di Terni)
  - massimo 25-30 ragazzi
- (\*) nel 2017 abbiamo ricevuto la richiesta di partecipazione di 4 scuole (Perugia, Assisi e Città di Castello) e quindi abbiamo introdotto il “doppio turno”
  - in totale sono venuti oltre 50 ragazzi

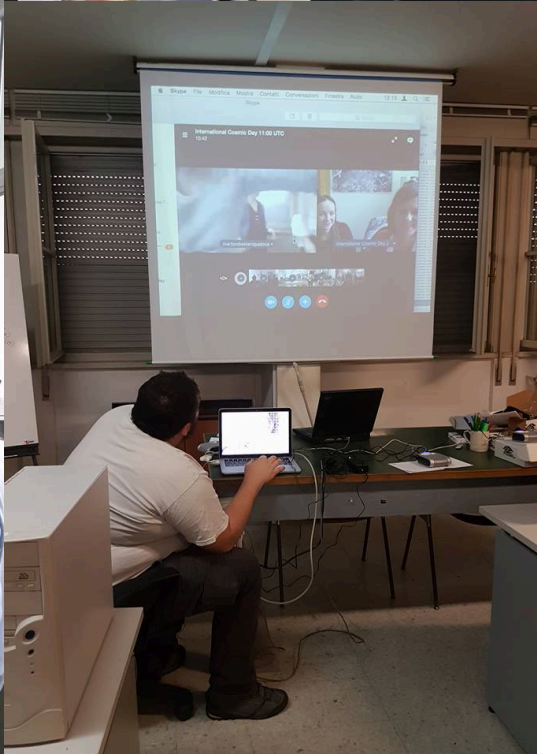
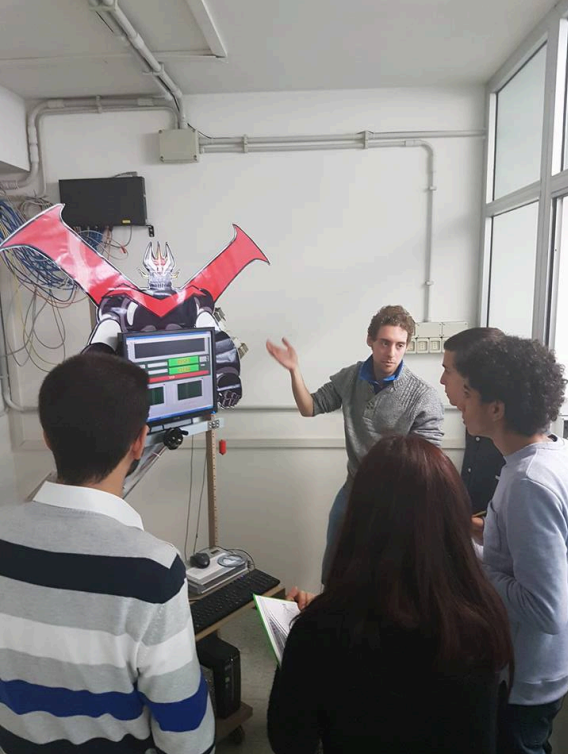


# Attività

- 10-15 minuti di “seminario” introduttivo:
  - cosa sono i RC (2-3 slides)
  - perchè si studiano (mezza slide)
  - come si studiano (scintillatori & PMT)
  - come si studiano a Perugia (AMS & DAMPE: tante foto e video)
  - misura delle dipendenza da  $\theta$
- gruppi da 2-3 ragazzi:
  - 5 minuti di presa dati ad un angolo scelto da loro
  - salvataggio dei rate (singola e coincidenza) su un GoogleDoc condiviso
- analisi individuale dei dati presi usando un GoogleDoc con qualcosa già pronto



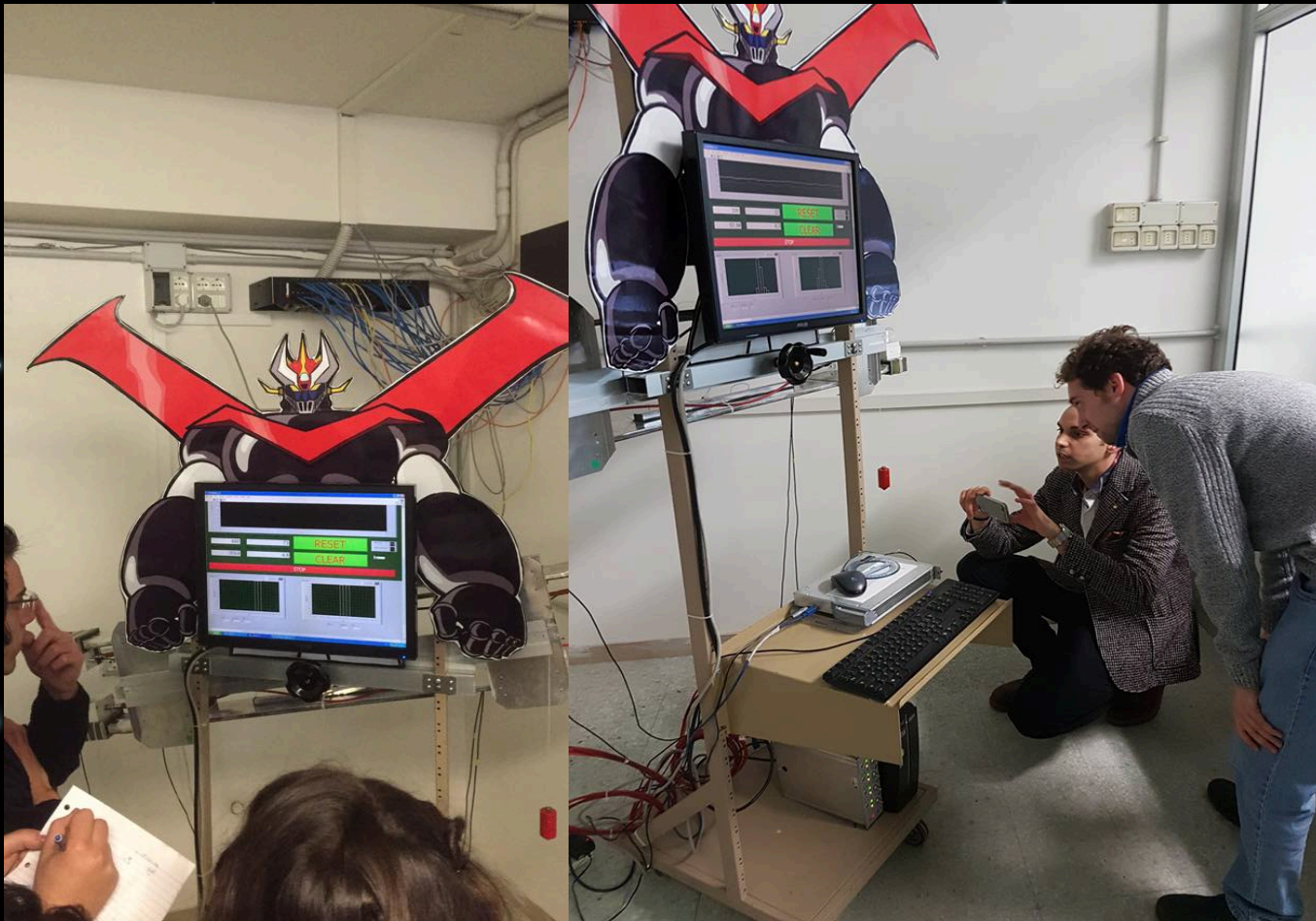
# Foto





# “Maginza”

- 2 scintillatori del TOF di AMS-01, volati con lo Shuttle STS91 nel '98
- elettronica (ADC, scaler, etc...) fatta con un modulo programmabile Wiener
- DAQ fatto in Labview



# Il booklet

## ANGULAR DISTRIBUTION OF COSMIC RAYS

INFN and University of Perugia, Italy

### Abstract

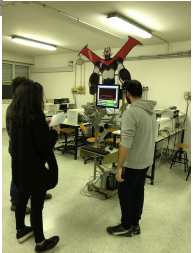
50 high school students (from 4 different schools) come to the Physics Department of the University of Perugia where the researchers of the University and of the INFN helped them to take rate measurements, at different angles with respect to the ground, with the "Mazinga" detector

### Experimental Setup

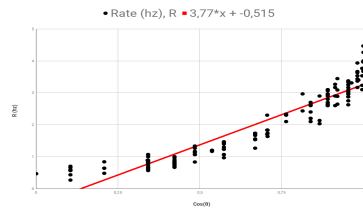


The 50 were divided in groups of 2-3 students. Each group took 5-10 minutes of rate measurement at a given (decided by themselves) angle with respect to the ground, using the "Mazinga" detector. The collected data were "shared" via an online spreadsheet. Each of the 50 students analyzed the collected data using a spreadsheet.

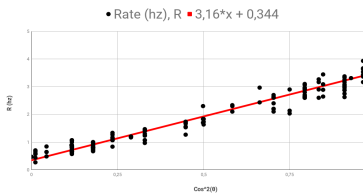
"Mazinga" is a cosmic ray detector made with 2 planes of scintillators flown in space in 1998, on board the Space Shuttle, for the AMS-01 experiment. Each scintillator is read on both sides by 3 PMT's (in OR). The 2 sides are in AND and the 2 planes are in AND. The detector is read by a NIM logic box and a software written in Labview.



### Results



The analysis of the data revealed as the rate of the muons on ground cannot be described very well by a functional form of the type  $\propto \cos\theta$  (figure on the top), while a  $\propto \cos^2\theta$  is fitting the data much better (figure on the bottom)



### Conclusions

The "Mazinga" detector worked quite well and smoothly. All the 50 students were able to perform a set of measurement deciding the angle with respect to the ground and how to organize their 10 minutes of data taking (one "big" measurement vs. many "small" ones). All the students, independently, analyzed all the data collected by all the groups, studying the behaviour of the rate of muons on ground as a function of the incidence angle. They agreed on a dependency of the type  $\propto \cos^2\theta$

Tipicamente preparato da noi:

- a partire dai dati raccolti e condivisi;
- utilizzando lo stesso "template" di spreadsheet fornito ai ragazzi ;

Sarebbe carino fargli fare un'attività di analisi a posteriori, ma solamente se il docente ha voglia di farlo lui (non ci mettiamo certo a prendermi la briga di proporgli di tornare o cose del genere)



State connessi: entusiasmani risultati in arrivo!



**STS-134/ULF6**  
**Alpha Magnetic Spectrometer Team**  
28 February 2011  
**Kennedy Space Center**

