ICD Bari

F. de Palma

Comitato Organizzatore & Location

- Dott.sa Elisabetta Bissaldi (elisabetta.bissaldi@ba.infn.it)
- Dott. Leonardo Di Venere (leonardo.divenere@ba.infn.it)
- Dott. Fabio Gargano (fabio.gargano@ba.infn.it)
- Dott. Francesco Loparco (francesco.loparco@ba.infn.it)
- Dott. Mario Nicola Mazziotta (mazziotta@ba.infn.it)
- Dott. Francesco de Palma (francesco.depalma@ba.infn.it)
- Dott.sa Silvia Rainò (silvia.raino@ba.infn.it)

Dipartimento Interateneo di Fisica
Campus Universitario, Via E. Orabona 4, BARI
Room: Aula Multimediale (I piano)

Scuole coinvolte

- Liceo Scientifico “Fermi” - Bari (BA) - 2
- Liceo Scientifico “Scacchi” - Bari (BA) - 6
- Liceo Scientifico “Cafiero” - Barletta (BAT) - 7
- Liceo Scientifico “Amaldi” - Bitetto (BA) - 6
- Liceo Scientifico “Simone” - Conversano (BA) - 4
- Liceo Scientifico “Einstein” - Mottola (TA) - 6

Totale studenti : 31

Si è cercato di seguire un criterio di selezione che massimizzasse il numero di scuole coinvolte.

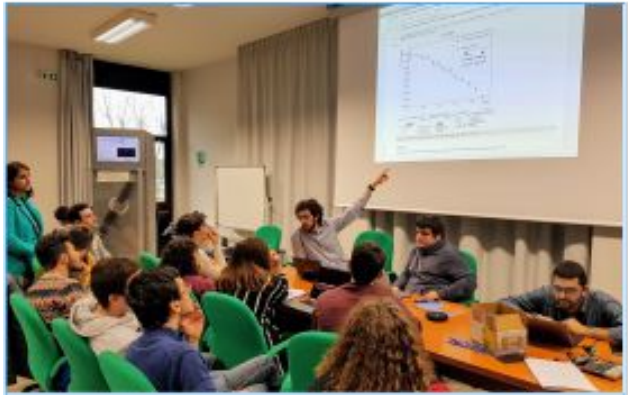
Svolgimento delle attività

La prima parte della mattinata è stata dedicata a 2 seminari

- La fisica dei raggi cosmici
- L’apparato sperimentale e la misura

Nella seconda parte della mattinata i ragazzi hanno eseguito le misure e nel frattempo, divisi in gruppi, hanno collaborato a svolgere l’analisi dati con ROOT, preparato la relazione finale e la presentazione da fare via skype tramite vari file google drive sempre seguiti da qualche ricercatore.

Foto di gruppo



Setup sperimentale

It consists of two identical detectors that can be oriented according to a selected angle by a stepper motor, arranged as shown in picture n°1.

Each detector is composed of a plexiglass scintillator, a plexiglass light guide (picture n°2) and a photomultiplier (picture n°3). The particle passes through the scintillator and it produces a weak flash that passes through the light guide: finally it is detected by the photomultiplier.

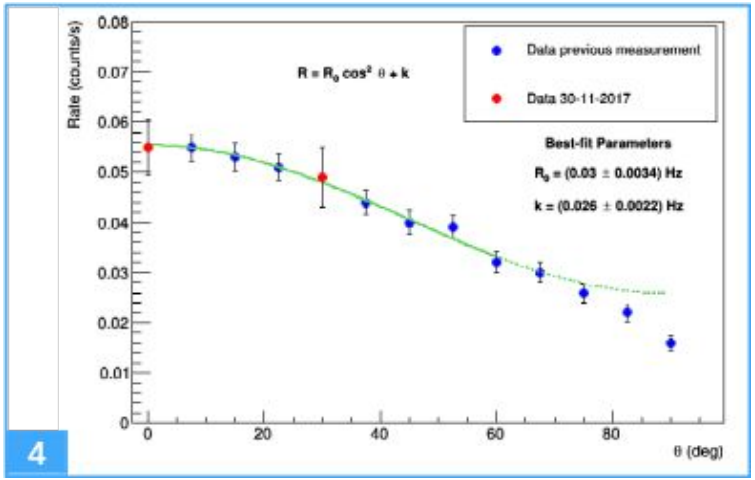
The current pulse is read out by a charge-to-digital converter (QDC).

Dati e fit

Presa dati lunga, i dati raccolti dai ragazzi (in rosso, obs time= 30 min) sono integrati con dati precedenti (in blu, obs time= 120 min

I ragazzi hanno eseguito in fit con root di tutti i punti sino a $\vartheta = 60°$ della funzione:

$$R = R^0 \cos^2\vartheta + k$$



I ragazzi hanno osservato l'accordo tra i dati sperimentali ed il fit.

Booklet

Abstract

We want to study some properties of the hard component of the cosmic radiation at sea level. In particular, we aim to measure the angular dependence of the muon rate by means of two plastic scintillators coupled with photo-multipliers. In the following paragraphs we describe the experimental setup, the measurements and finally our results.

Experimental Setup

The experimental setup allows to study the final direction of secondary cosmic rays at sea level. It consists of two identical detectors that can be oriented according to a selected angle by a stepper motor, arranged as shown in picture n°1.

Each detector is composed of a plexiglass scintillator, a plexiglass light guide (picture n°2) and a photomultiplier (picture n°3). The particle passes through the scintillator and it produces a weak flash that passes through the light guide: finally it is detected by the photomultiplier.

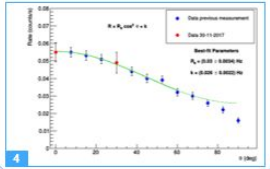
The current pulse is read out by a charge-to-digital converter (QDC).

The measurement

The muon flux is expected to decrease with increasing zenith angles as $\cos^2\vartheta$. Picture n°4 shows the results obtained during the ICD on November 30th, 2017 (red dots) in 30 minutes acquisition and archival data obtained the previous day with 120 minutes acquisition (blue points). We fitted all data points with the following function up to $\vartheta = 60°$:

$$R = R0 \cos^2\vartheta + k$$

The fitted values for R0 and k are given in the picture with their relative errors. We can observe that the data are in good agreement with the expectation.



Conclusions

In order to determine the angular dependence of the cosmic muon rate, we combined both archival and newly acquired measurements covering the interval $0° < \vartheta < 90°$. We observe that the fit to the data confirms our expectations with a muon rate following the $\cos \vartheta^2$ behaviour up to $\vartheta < 60°$.

INTERNATIONAL COSMIC DAY NOVEMBER 30 I 2017

Group description

The group is composed by students of the 4th and 5th years of scientific high schools from Bari and other Apulian towns. They are led by researchers from the Physics Department of the Bari University and INFN - Bari who work in international experiments researching in the field of cosmic ray studies.

Schools involved

The high schools involved are:

- Liceo Scientifico "Fermi" - Bari (BA)
- Liceo Scientifico "Scacchi" - Bari (BA)
- Liceo Scientifico "Cafiero" - Barletta (BAT)
- Liceo Scientifico "Amaldi" - Bitetto (BA)
- Liceo Scientifico "Simone" - Conversano (BA)
- Liceo Scientifico "Einstein" - Mottola (TA)

Local Organisers

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- Dott.sa Silvia Rainò

Group photos

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Osservazioni

Lunga presa dati

Skype call finale migliorabile per renderla più fruibile dagli studenti