

ANGULAR DISTRIBUTION OF COSMIC RAYS

LICEO STATALE REGINA MARGHERITA
SALERNO, ITALY



The **Liceo Statale Regina Margherita** (public high school) in Salerno is an institutional body that has for over fifty years represented an important resource of cultural and personal growth for its students. The institute is a centre for students to attain skills in applied research in both Science and other subjects. The research methodology of the institute is completely free of any prejudice and allows students to build their personal development to progress to university or further education. The institute is a hub for the region, involving hundreds of students, offering high school courses in the following areas, Social Science, Linguistics, Science with the option of Applied Science and Social Economics.

The diploma that students achieve will give them opportunity to enter university, to continue their diploma or to apply for work in the production and the service industries.

The institute offers educational development in every subject, in particular, students attending the third year of Applied Science have been able to participate in the EEE Project – Science in School. This project offers the study of cosmic muons and widespread showers emitted by primary cosmic rays. The EEE Project provides work placement activities for the students of the Institute. The students have been able to work with scientists at CERN to build a telescope that reveals and measures muons. The students have been taught practical and operational skills in recording the muons and maintaining the project in the area of Particle Physics.

The team of students and the teacher involved in the EEE Project have participated in various national and international events, including the ICD on the 30 November 2017. The students have had the opportunity to participate and learn skills and approaches to science in new and stimulating environments.

The EEE Project representative and the ASL school's tutor Marilena Loia



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Abstract

On the 30 November 2017, the Regina Margherita High School of Salerno participated in the ICD at the University of Salerno with a team of 25 students and two teachers. Dr D De-Gruttola made a valuable presentation of the programme for the day. This was followed by an interesting seminar from Dr.s P. La Rocca and M. Trimarchi on cosmic rays and a methodology on measuring the angular distribution of secondary cosmic rays, taken by the telescopes of the EEE Project. After this seminar the attendees had to do an exercise where they had to measure, analyse and present their results in a video conference.

Experimental Setup

We divided our 25 students into 5 groups and each group had to elaborate and examine the data measured by the SA-01 telescope on a specific day in November 2017. The days that the five groups examined data were the 10th, 11th, 12th, 13th and 14th of November. In group 3 the students subdivided into two groups, each sub group examined the data for the same day so they could compare their results.

The groups followed the instructions, given to them by the tutor, which they had already practised the previous day. The students of the Regina Margherita High School worked effectively within their own group and with the other schools, showing collaboration, initiative and communication.

Results

The results of each group are shown in the graphs of following pages.

Conclusions

Each group arrived at the following conclusion, that the experimental data responded to the simulated data. This is evidenced in the examination of the first two graphs of the overall study, it can be seen by looking at the curve of the angular distribution, which is similar, and also by the examination of the exact data (shown in the third graph of each study) based on the functional analysis of $\cos^2 \Theta$. The exact data has been obtained using the ratio between experimental data and simulated data, based on the functional analysis of Θ . Groups 2, 3, 4 and 5 have also followed the linear measurements of the data, comparing this ratio in relation to the functional analysis of \cos^2 of Θ . This has demonstrated more clearly the closeness between the experimental data and the simulated data.

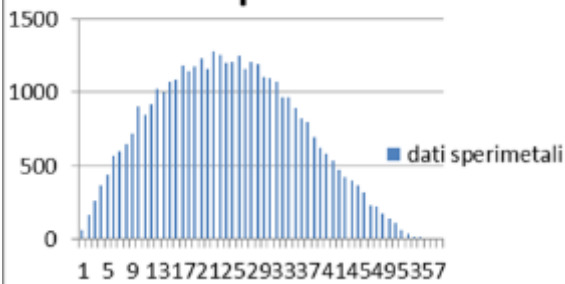
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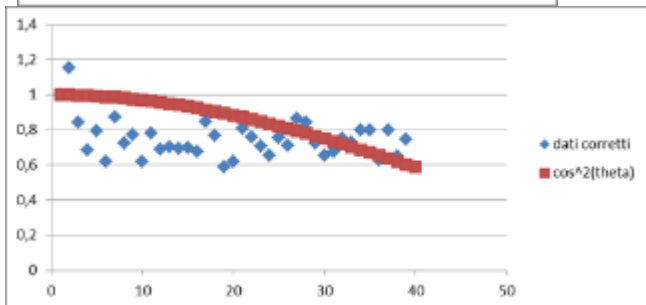
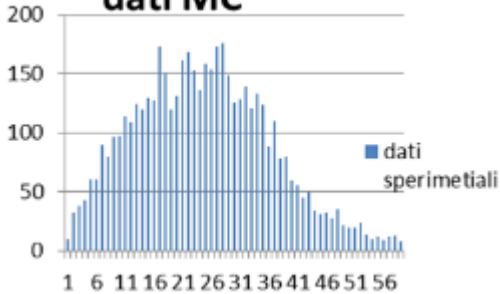
Results Group 1

GROUP 1: Data of 10/11/2017 SA-01

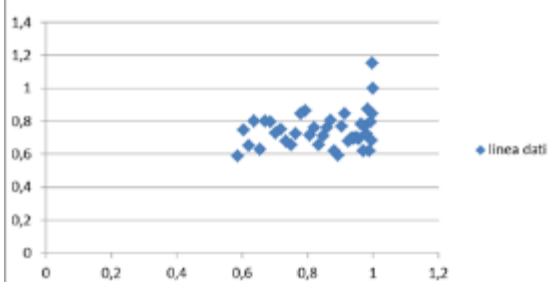
dati sperimentali



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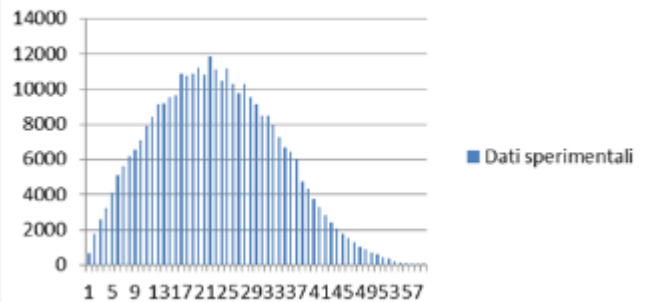
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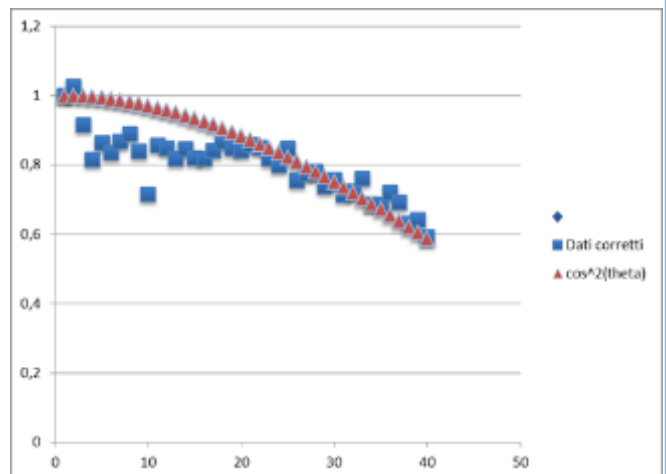
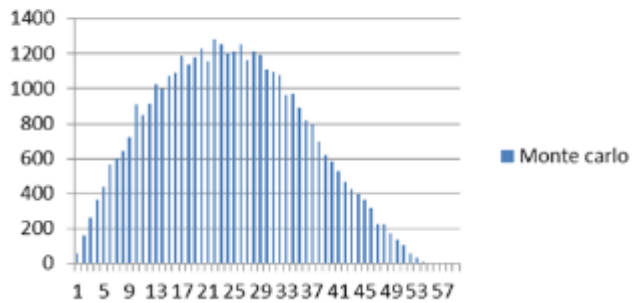
Results Group 2

Group 2: Data of 11/11/2017 SA-01

Dati sperimentali



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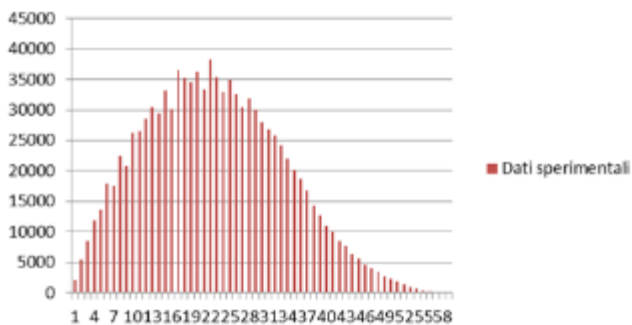
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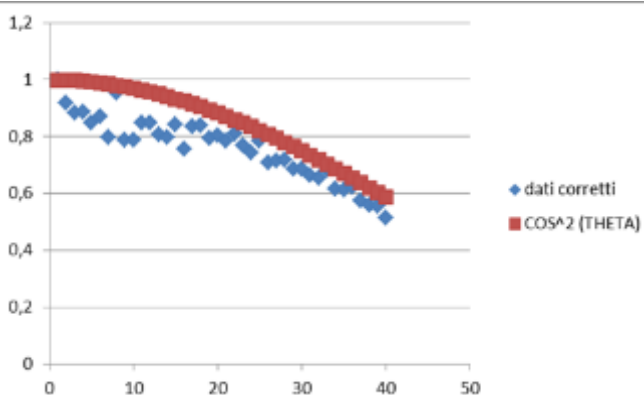
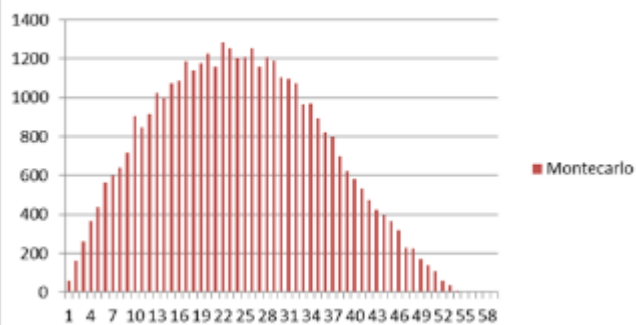
Results Group 3

Group 3A: Data of 12/11/17 SA-01

Dati sperimentali



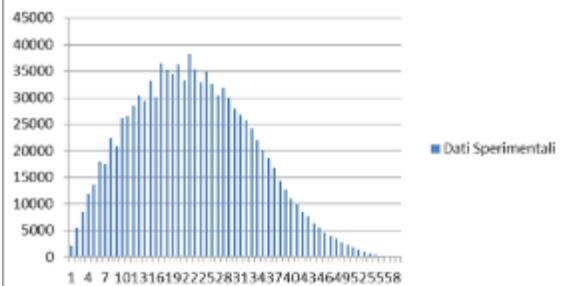
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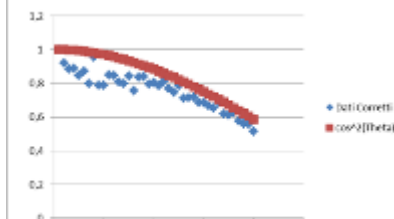
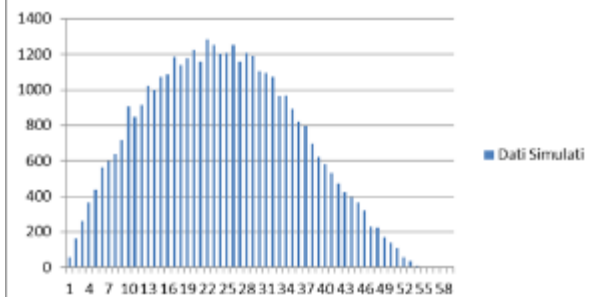
Results Group 3

Group 3B: Data of 12/11/2017 SA-01

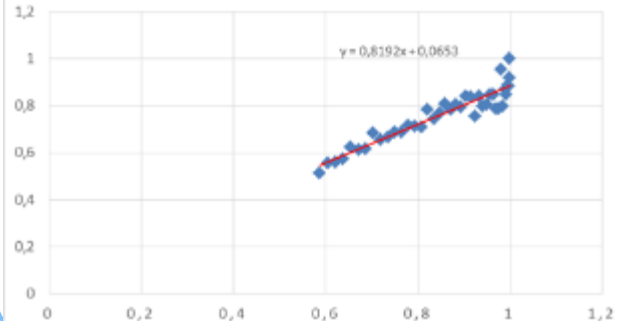
Dati Sperimentali



Dati Simulati



DATI CORRETTI



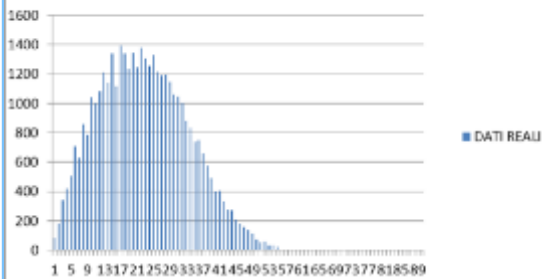
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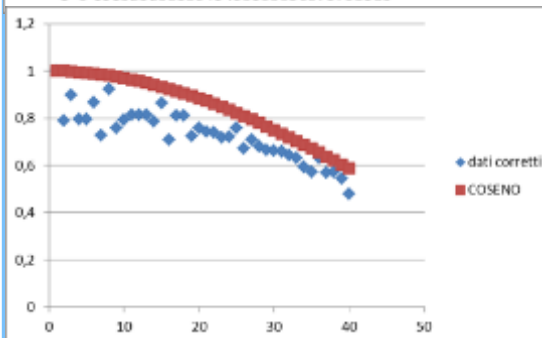
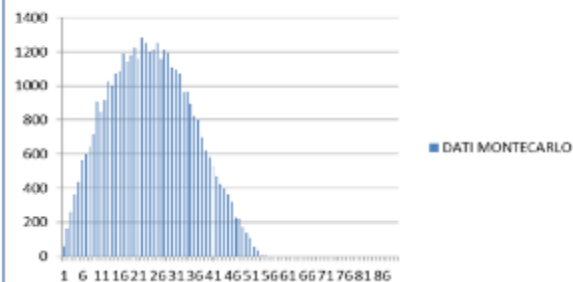
Results Group 4

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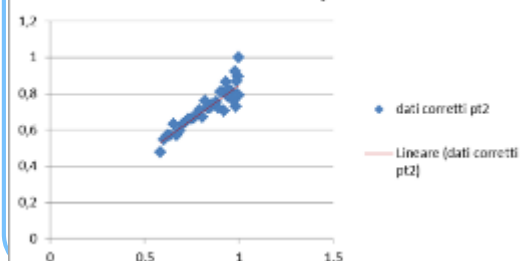
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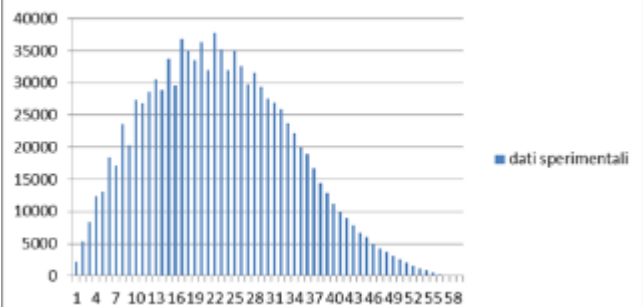
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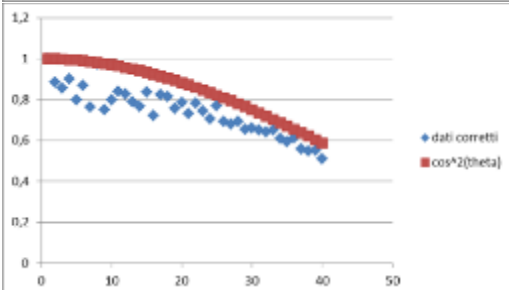
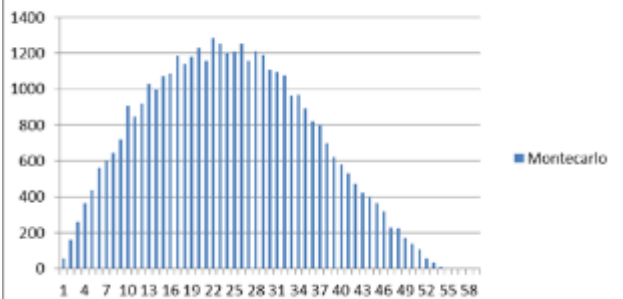
Results Group 5

Group 5 : Data of 14/11/2017 SA-01

dati sperimentali



Montecarlo



Linea dati

