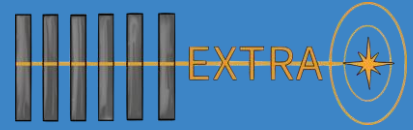




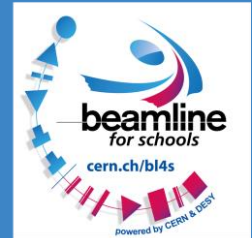
LICEO SCIENTIFICO STATALE
"Arcangelo Scacchi"



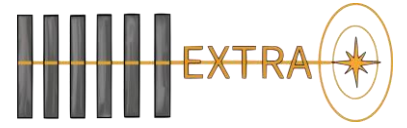
From Bari to Hamburg



Our journey as the EXTRA team



Index



- ▶ ● The EXTRA team
 - ▶ ○ Something about us
- ▶ ● Our city: Bari
 - ▶ ○ Our school
- ▶ ● About the project
 - ▶ ○ Our goals



The EXTRA team



BL4S - EXTRA Team

We all come from the scientific high school "A. Scacchi", we differ in age and class.

However, as a team we value each other, pushing on our strengths and covering for our weaknesses, having created a very strong bond which we are eager to show.





Our passions

Our city: Bari



Known for being a busy commercial centre, Bari is also a crossroad of different cultures.



The greatest example are saint Nicholas' relics, which lead to a great presence of people from the East, especially Russia, during the religious celebration in winter.

Moreover the city is recognised for its culinary specialities, such as Panzerotti, Focaccia barese, Sgagliozze and many others.

Orecchiette in particular represent one of the most famous dishes from the Apulian capitol city, and the making of this kind of pasta can be followed closely in the streets of Bari Vecchia, while admiring the beauty of the old city centre.



There's nothing more Barese than a tasty slice of Focaccia and a cold Peroni!

Bari cannot be just resumed with food and religion: it is a place of art, hosting one of the most important Italian theatres: Teatro Petruzzelli, among with smaller ones, such as Teatro Piccinni and Teatro Margherita. Surely, its history is complex and full of different cultures from each part of Europe and Asia merging in one unique place, as shown by Bari's architecture and customs.



Bari has got two public universities. The Università di Bari (UniBa), founded in 1925, is the most important university in Apulia, and one of the biggest ones in South Italy. The humanistic studies are located in the historical Palazzo Ateneo, in Piazza Umberto I. The Politecnico (PoliBa), instead, was set up in 1990 and hosts the departments of Engineering and Architecture in a more modern, beautiful structure.



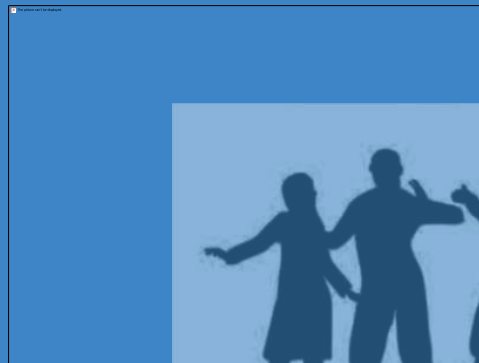
Our school

Born as an aristocratic palace in the late 19th century, the structure now hosts the high school "Scacchi", founded in 1932, and has become a special place to many students.

The school was named after Arcangelo Scacchi, a 19th century apulian mineralogist and volcanologist, mostly known for his studies regarding the Vesuvian soil.

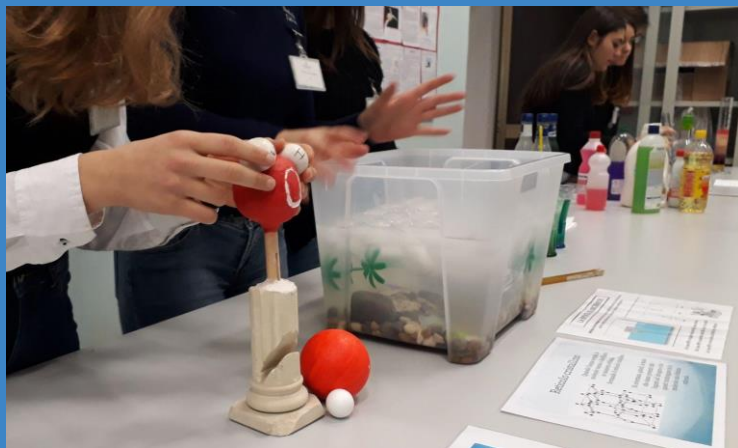


Have a look at our School!



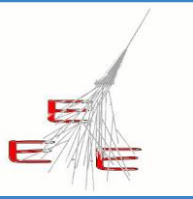
Science in the heart: Open days

In these occasions we introduce future Scacchi students to our reality: through experiments and guided tours of the school, we provide an insight of what our daily routine looks like.



Many members of the EXTRA Team had the opportunity to show younger students how it feels to be part of our big family!

Science in the heart: The EEE project



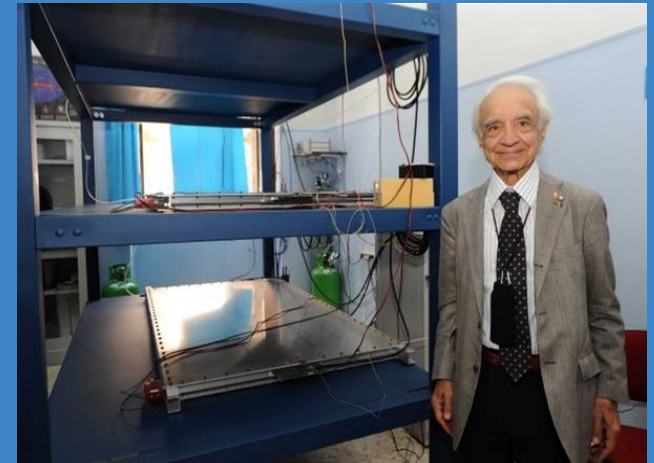
Liceo "Scacchi" takes part in a bigger project in collaboration with Centrofermi, CERN and INFN, called EXTREME ENERGY EVENTS (EEE) - Science inside the Schools. EEE is a special research activity about the origin of cosmic rays.

An array of many detection sites have been placed all over the Italian territory (plus CERN).

- Each site hosts a muon tracking telescope (Multigap Resistive Plate Chamber) The equipment was directly built by Scacchi's students at the CERN facilities.



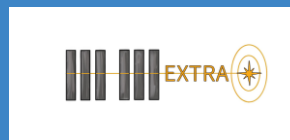
Not even the pandemic could stop us!



EEE Scacchi telescope in 2012 with its Project Leader Professor Antonino Zichichi

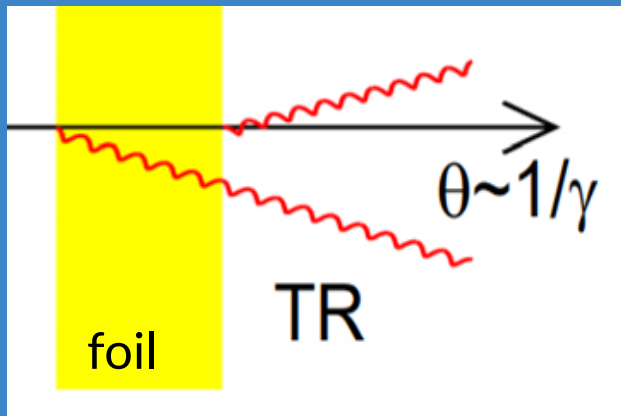
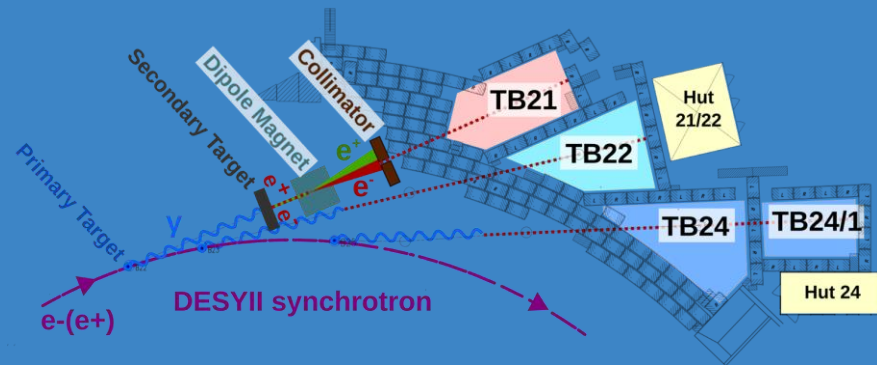
Our proposal

Electron X-ray Transition RAdiation (EXTRA)



Our aim

Our goal is to study the transition radiation (TR) X-rays emitted by fast electrons crossing a multilayer radiator, using the DESY beam line in the TB21 area.



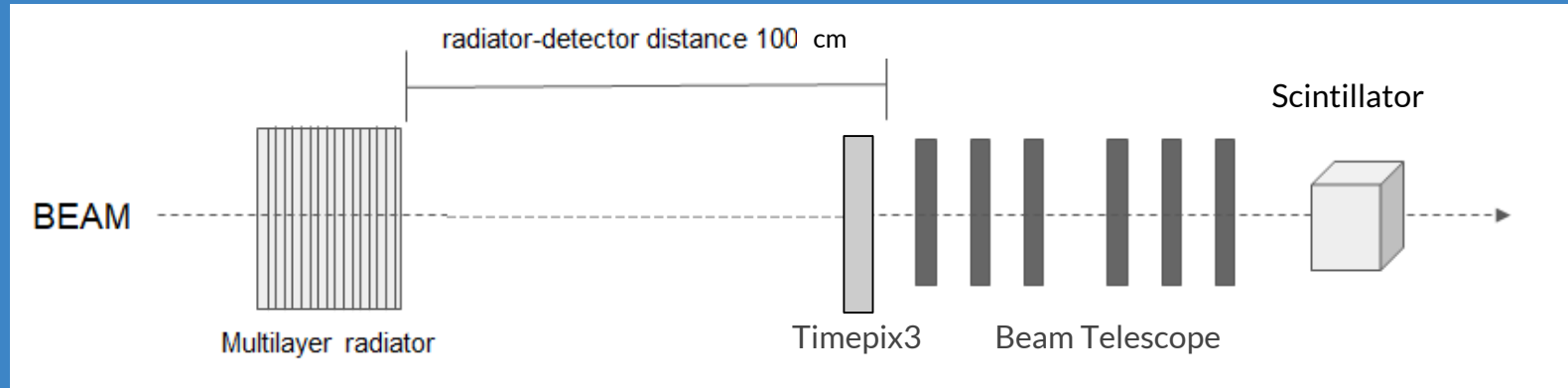
The concept of TR

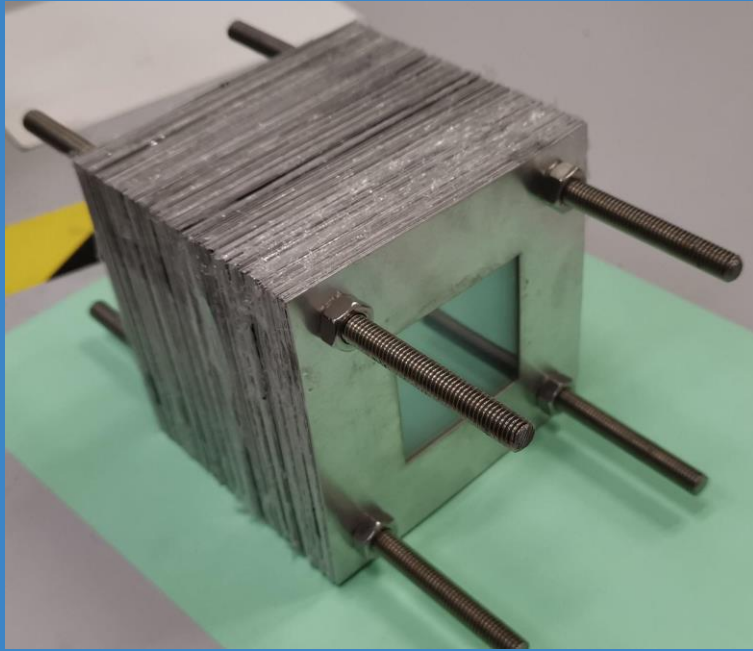
TR are emitted in the X-ray energy range when ultra-relativistic charged particles cross the interface of two media with different dielectric constants.

The experimental set-up

The detectors will trace both the electrons and the TR produced.

To ensure adequate separation between TR X-rays and the electron beam, the detector should be located a few meters downstream the radiator.





Parameters of multilayer radiator:

d_1 and d_2 are the thickness of the foils and of the gaps respectively

N is the number of foils

<i>Foil /gap material</i>	<i>d_1</i>	<i>d_2</i>	<i>N</i>
polyethylene/air	23 μm	500 μm	150

Parameters of detectors:

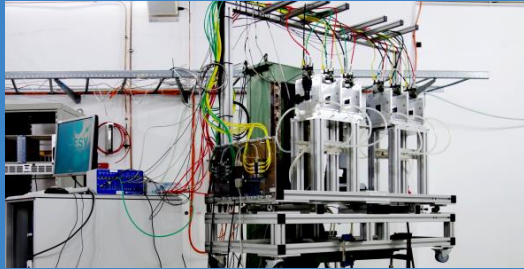


A Silicon detector based on a Timepix3 chip.
300 or 100 μm thick sensor

Pixel pitch (term for the size of each individual pixel) of $55 \times 55 \mu\text{m}$

Pixel matrix consists of 256×256 pixels

to detect both X-rays and primary electrons



A beam telescope - an array of six silicon pixel detectors

Pixel pitch of $29.24 \times 26.88 \mu\text{m}$

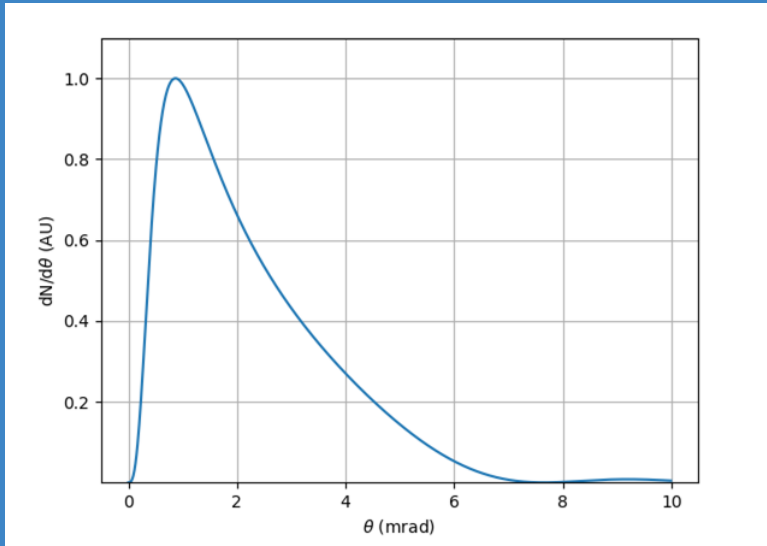
Pixel matrix consists of 1024×512 pixels

For measuring the track of primary electrons

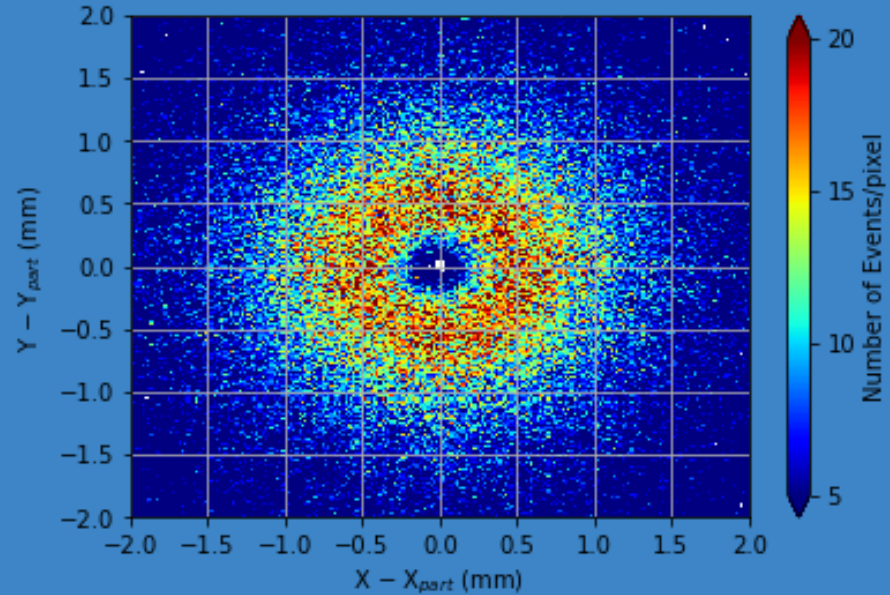
Data analysis

Thanks to Python, we were able to create a simulation of the experiment, in order to acquire some data to compare to the real results.

1. For each chip, we will identify the fired pixels and group adjacent fired pixels into clusters;
1. We will evidence the electron track with a linear fit thanks to the telescope.
1. For each X-ray cluster, we will evaluate its position with respect to the electron beam, and study the distributions of them all.



Theoretical angular distribution of TR X-rays from a single foil.



The relative positions of TR pixel with respect to the electron one. The color scale indicates the number of events detected in each pixel.

Our goals

We are extremely proud of our results, and this occasion proved us that hard work really pays off. As a team, we all feel motivated and encouraged to work together, in order to deepen and strengthen our knowledge about physics.

