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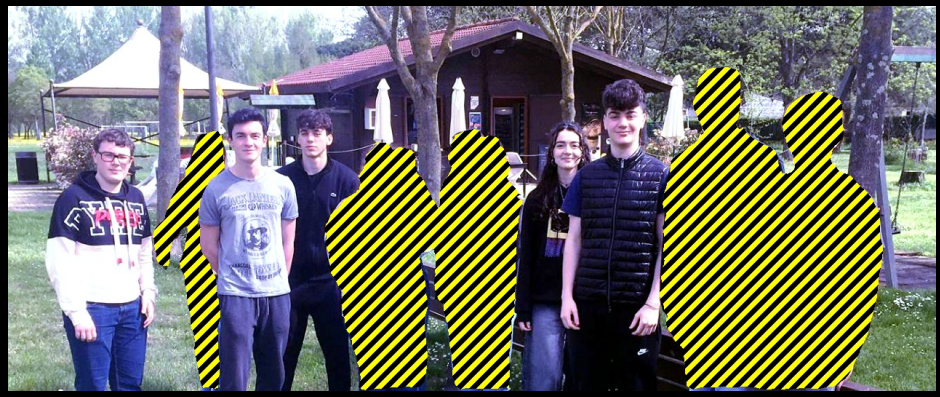
schedule of the Pontedera EEE group activities for the current school year (2024-25)

– group enforcement (... see picture below ...)	[Sept.-Oct.2024]
– run meetings of the EEE Collaboration	[full period]
– ICD2024	[Nov.2024]
– introduction to root for data analysis	[Sept.-Dec.2024]
– reproduction of the Conversi-Pancini-Piccioni experiment *(we plan to submit the results of this activity for the Cosmic Box Contest)*	[full period]

some of our "collegues" succeded in the final exam last year and we are inviting newcomers

Pontedera eee group 2023-24



Pontedera eee group 2024-25 (as of now...)

October 2024

EEE Marconi - Pontedera (Pisa)

reproduction of the Conversi-Piccioni-Pancini experiment

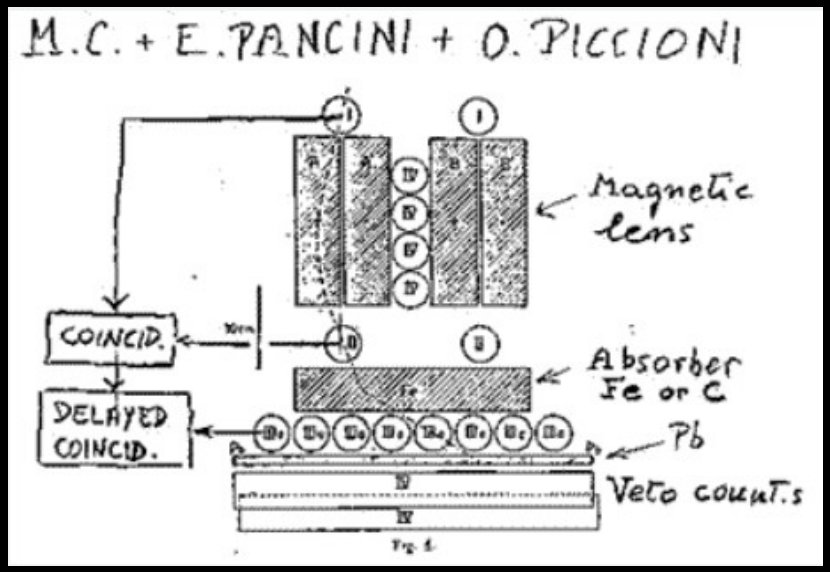
The Conversi-Piccioni-Pancini experiment started in 1942 and was completed in 1946 *(see next slide)*
It provided one of the main evidences that disproved the Tomonaga-Araki hypotesis.
For Tomonaga and Araki the muon was instead the Yukawa meson (not yet discovered at that time)

– STEP1 –

We plan to reproduce a simplified version of the experiment without magnetic lenses (absorber only)

with 0.6 cm iron absorber we expect to measure ~67% of delayed coincidences
with 0.7 cm graphite absorber we expect to measure ~36% of delayed coincidences

we don't have precise timing but we hope to see this rate difference comparing different combinations of coincidences rates: above/across/below the absorber



Original setup of the experiment (with magnetic lenses)

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reproduction of the Conversi-Piccioni-Pancini experiment

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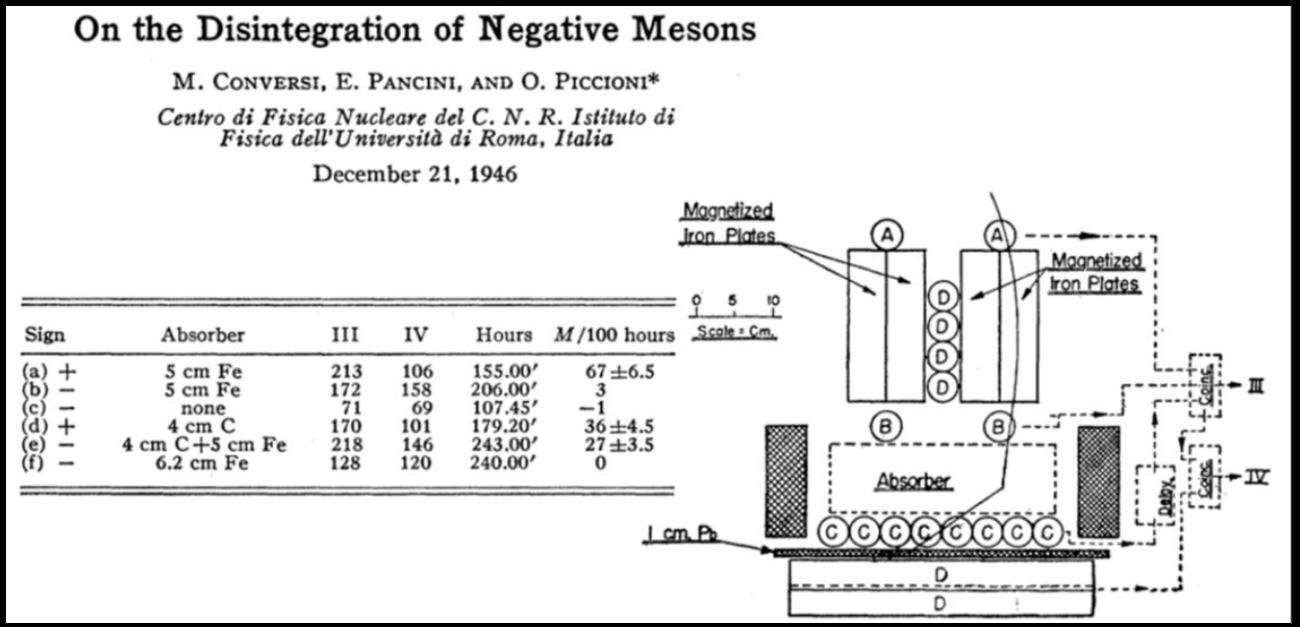
– STEP2 –

We add the magnetic lenses realized with pieces o iron magnetized by strong niodium magnets

We build some small affordable electron sensors based on photodiodes to add the timing and measure the muon lifetime



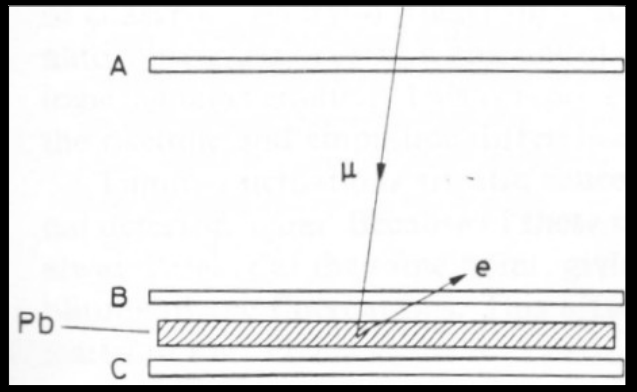
On the Disintegration of Negative Mesons

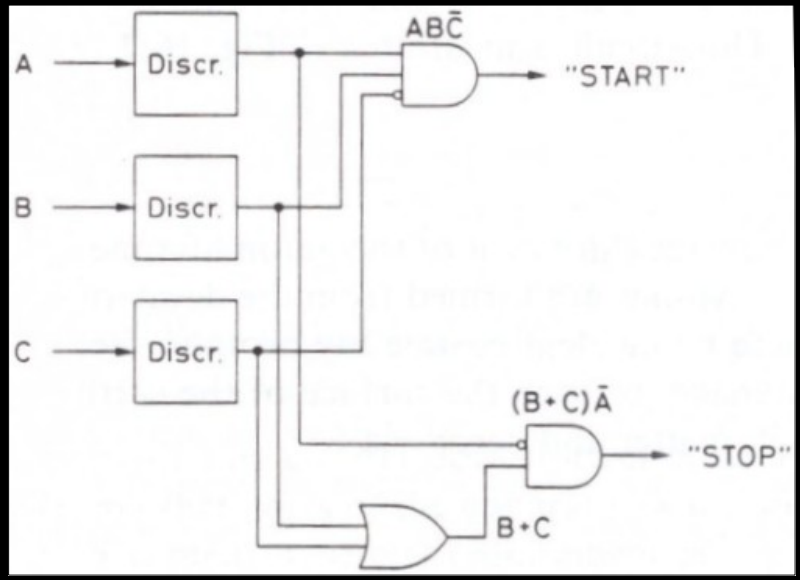
M. Conversi, E. Pancini, and O. Piccioni*

Centro di Fisica Nucleare del C. N. R. Istituto di Fisica dell'Università di Roma, Italia

December 21, 1946

Sign	Absorber	III	IV	Hours	M/100 hours
(a) +	5 cm Fe	213	106	155.00′	67 ±6.5
(b) −	5 cm Fe	172	158	206.00′	3
(c) −	none	71	69	107.45′	−1
(d) +	4 cm C	170	101	179.20′	36 ±4.5
(e) −	4 cm C+5 cm Fe	218	146	243.00′	27 ±3.5
(f) −	6.2 cm Fe	128	120	240.00′	0





Setup for delayed coincidence and trigger logic to measure also the muon lifetime

October 2024

additional motivations in reproducing the Conversi-Piccioni-Pancini experiment

in the context of the final exam discussion:
illustrating the Conversi-Piccioni-Pancini experiment is a way to link the world war II historical events .

mainly because:
– the experiment goes on for all the duration of the world war II
– the experiment had to be displaced in a safer location after the june 1943 bombing of S.Lorenzo (more then 80 bombs over the university of Rome).
– Pancini was included in the group when he came back from the partisan fight against nazifascist.

[References]:

William R. Leo
Techniques for nuclear and particle physics
Ed.Springer-Verlag

Description of the Conversi-Piccioni-Pancini experiment
Anno 19 numero 36 (04.2024) of the INFN periodic "Asimmetrie"
https://www.aif.it/fisico/lesperimento-conversi-pancini-piccioni/

NB:
for muon traks counting we could eventually build 3 DIY Particle Detector as documented in:
DIY Particle Detector
https://scoollab.web.cern.ch/diy-particle-detector
https://github.com/ozel/DIY_particle_detector

Thanks !