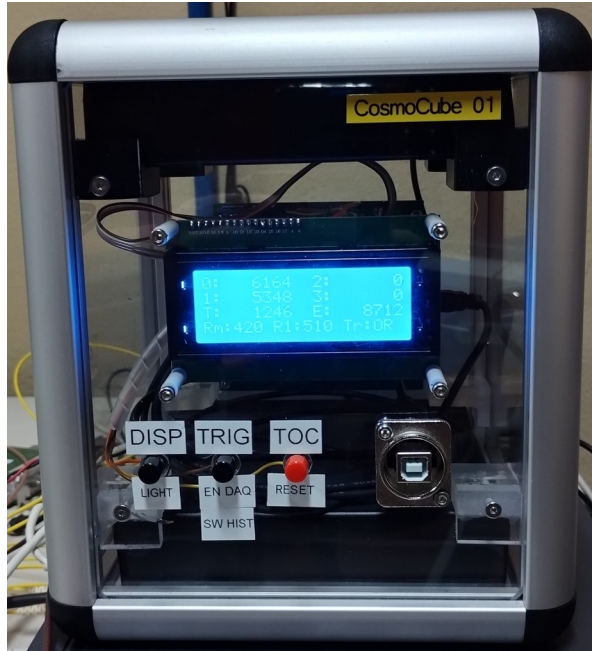




Raggi cosmici: una misura in aula

Cosa faremo oggi:

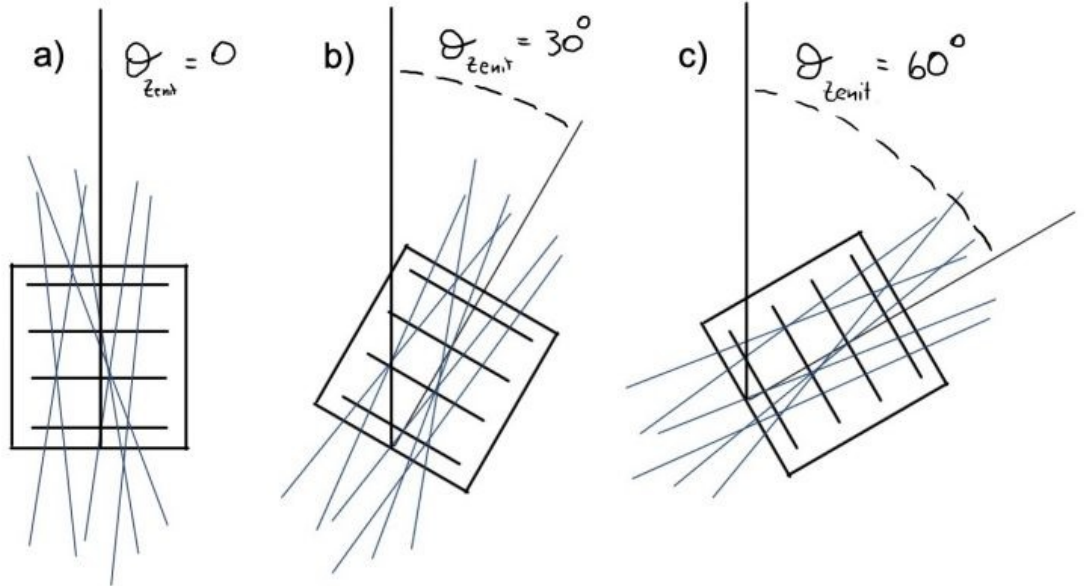
Misurare il flusso di muoni in funzione dell'angolo di zenita



- Prendo dati per un tempo T

- Conto il numero di particelle registrate C

- Calcolo il rate R delle particelle come: $R = C / T$ (part/min)



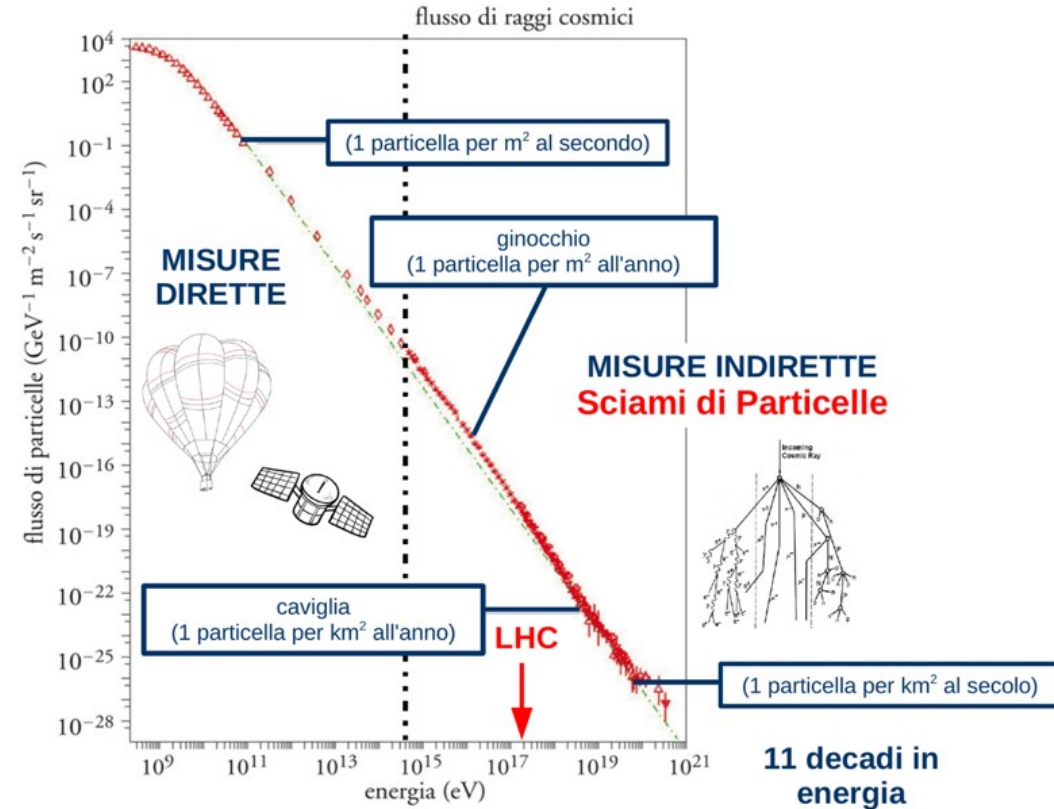
Flusso di raggi cosmici:

Che tipo di particelle sono
e qual è la sua abbondanza?

Qual è la sua energia?

Da dove vengono?

32 decadi in
intensità



Flusso di raggi cosmici:

Che tipo di particelle sono
e qual è la sua abbondanza?

- ~90% protoni,
- ~9% nuclei di elio,
- ~1% da tutti gli altri nuclei
insieme a e^-e^+

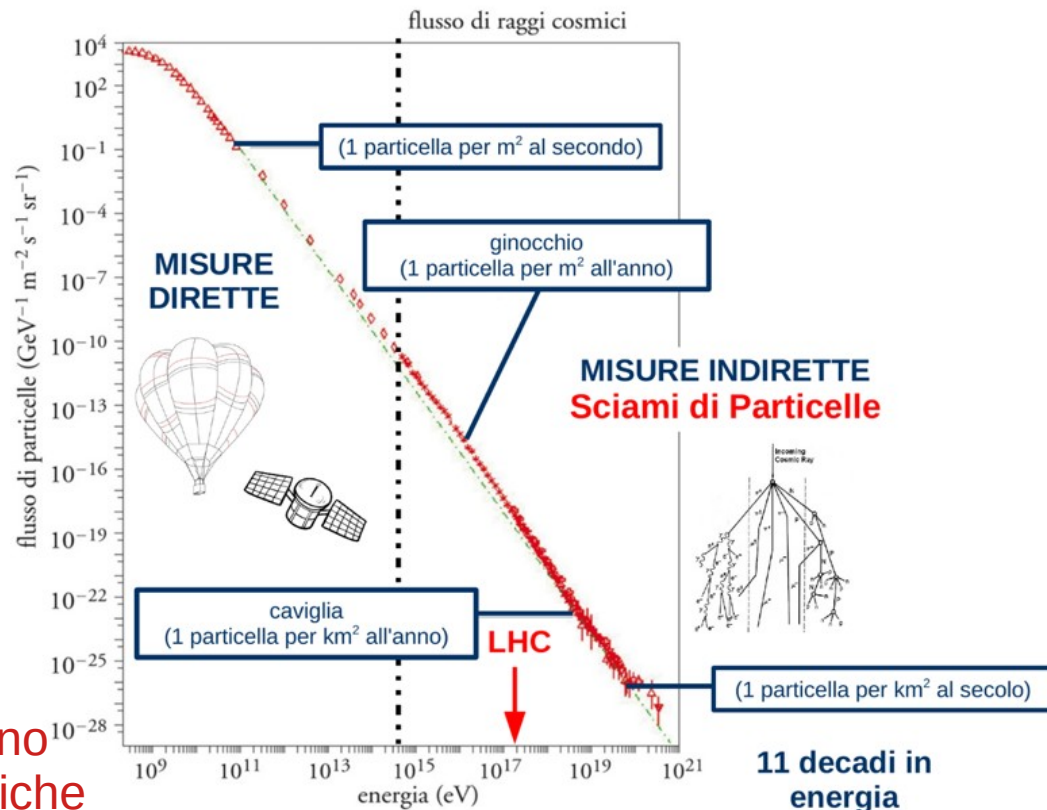
32 decadi in
intensità

Qual è la sua energia?

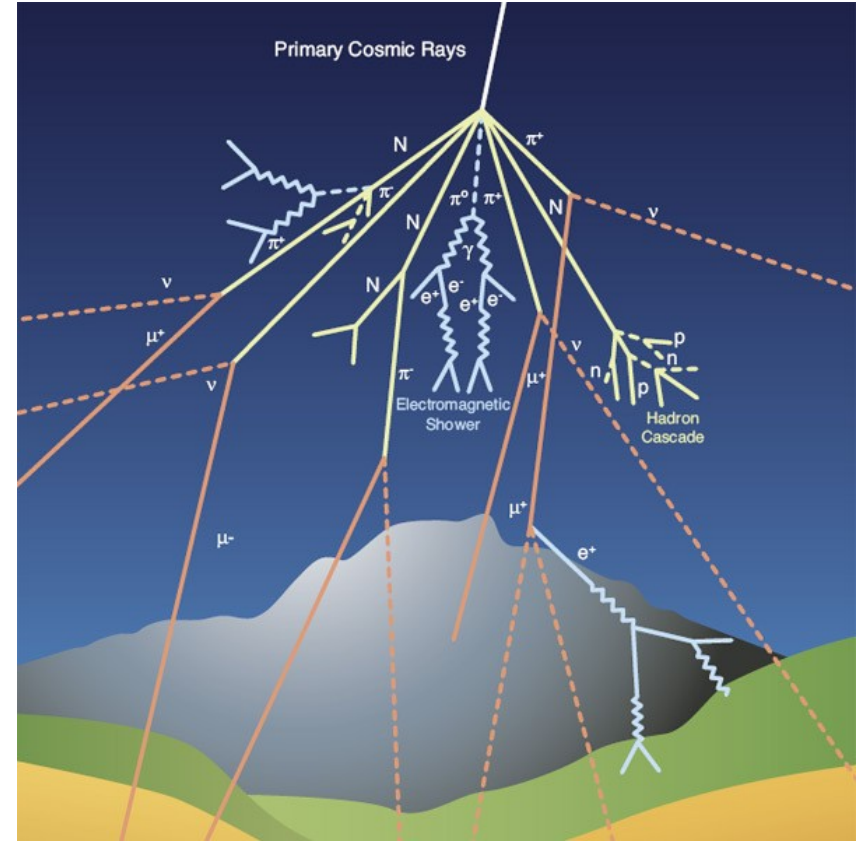
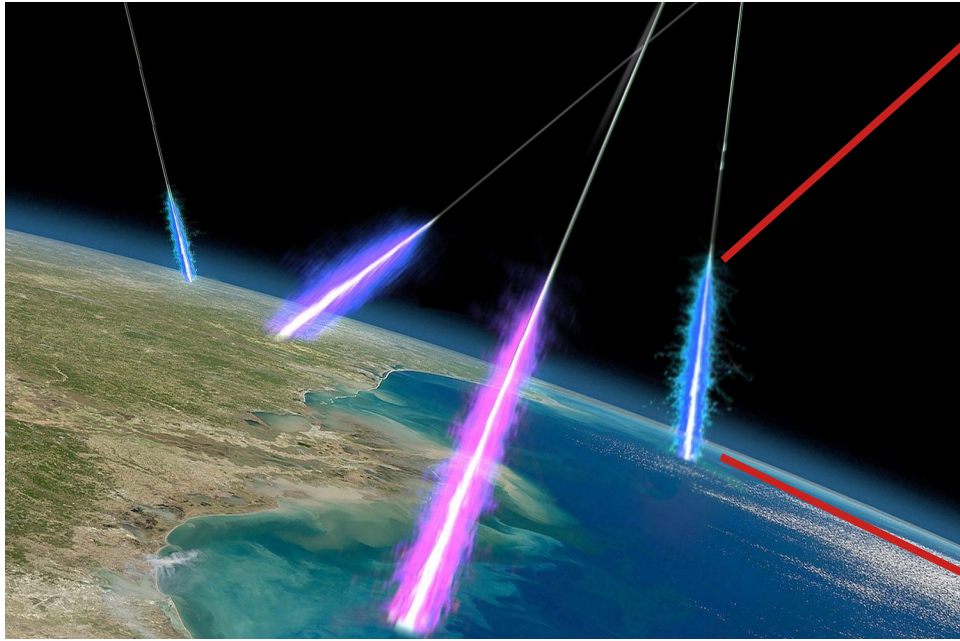


Da dove vengono?

Le sorgenti dei raggi cosmici possono
essere sia galattiche sia extra-galattiche

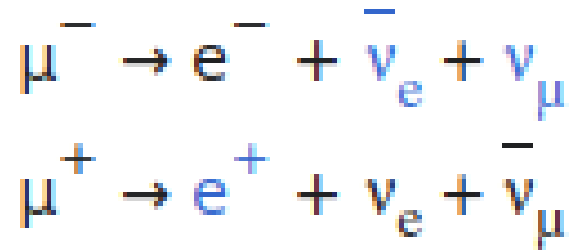


Flusso di raggi cosmici: Extensive Air Showers



Caratteristiche dei muoni:

μ^- , μ^+ Particola elementare
 $m = 105.658 \text{ MeV}/c^2$
vita media = $2.2 \times 10^{-6} \text{ s}$
spin $\frac{1}{2}$



e^- , e^+ Particola elementare
 $m = 0.511 \text{ MeV}/c^2$
vita media = Inf
spin $\frac{1}{2}$

Caratteristiche dei muoni:

μ^- , μ^+ Particola elementare
 $m = 105.658 \text{ MeV}/c^2$
vita media = $2.2 \times 10^{-6} \text{ s}$
spin $\frac{1}{2}$

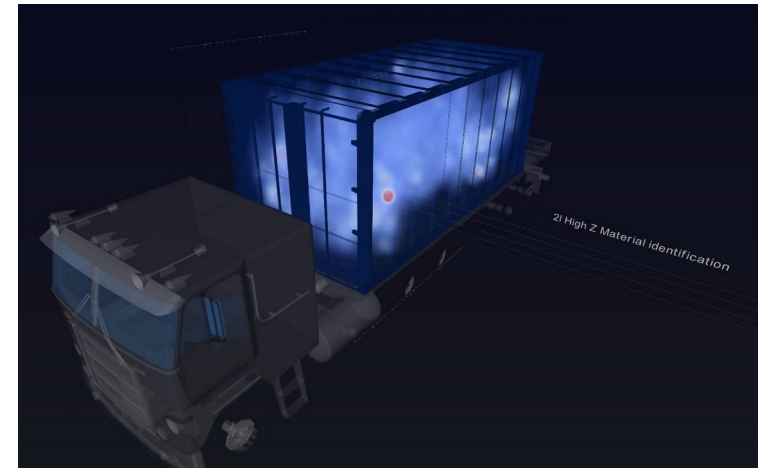
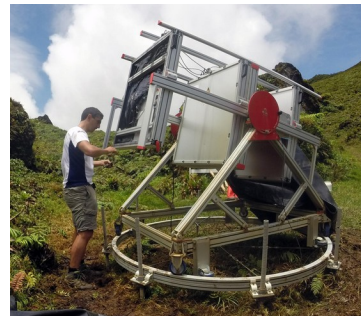
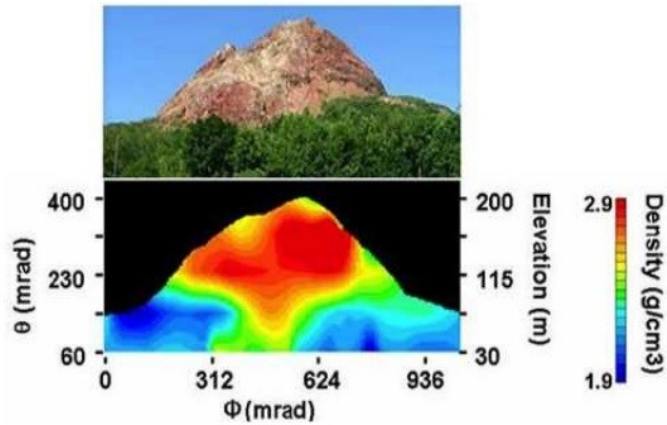
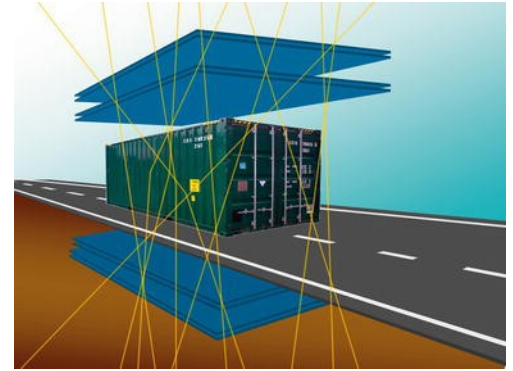
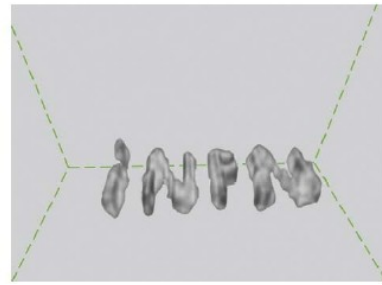
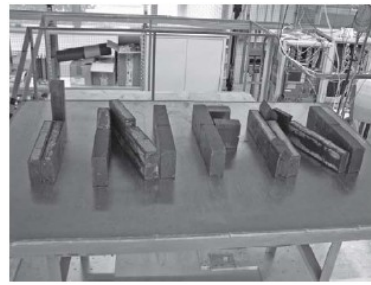
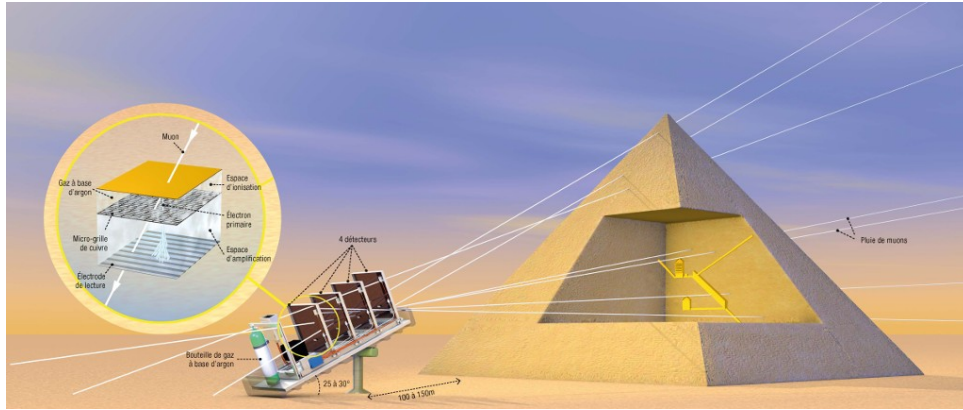
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vita media = Inf
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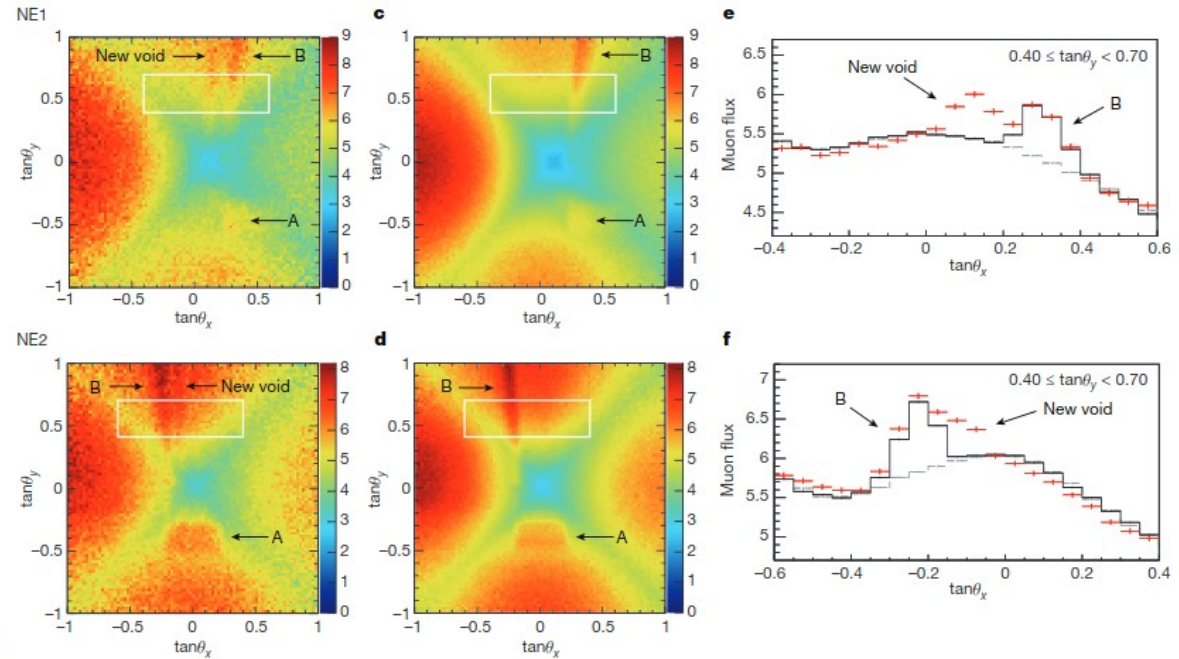
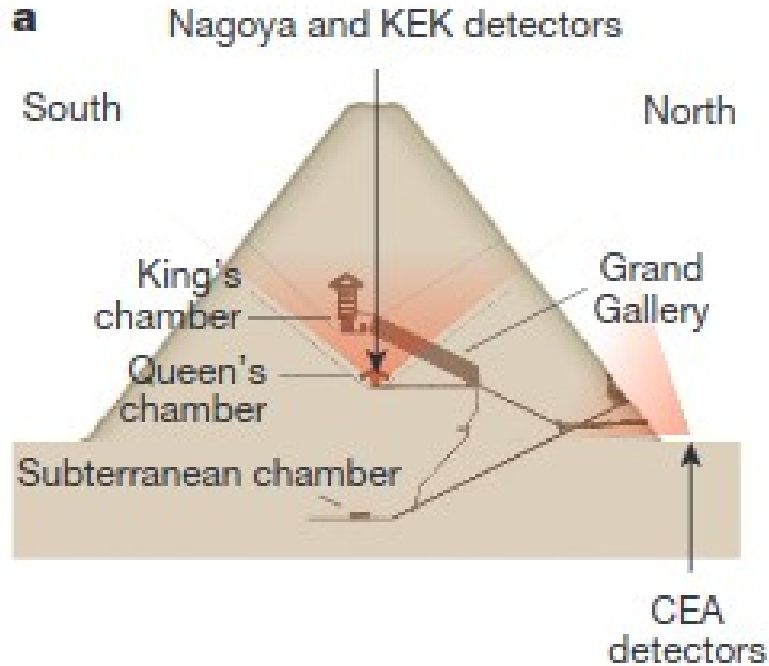
Viaggiano praticamente in linea retta

**attraversano materiali poco densi (come le pareti degli edifici e i nostri corpi)
perdendo poca energia**

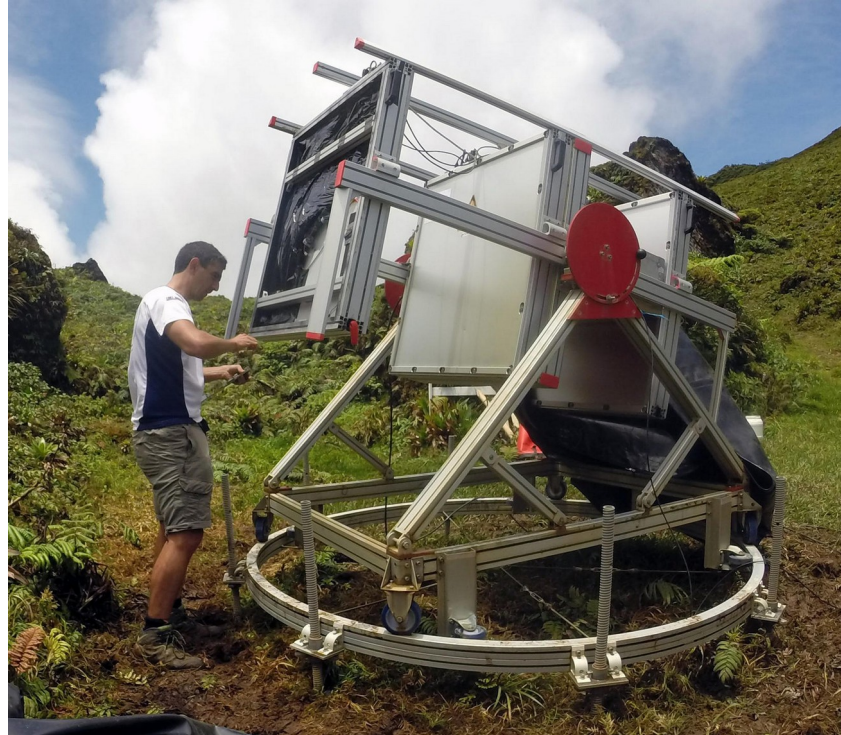
Applicazioni: muon tomography



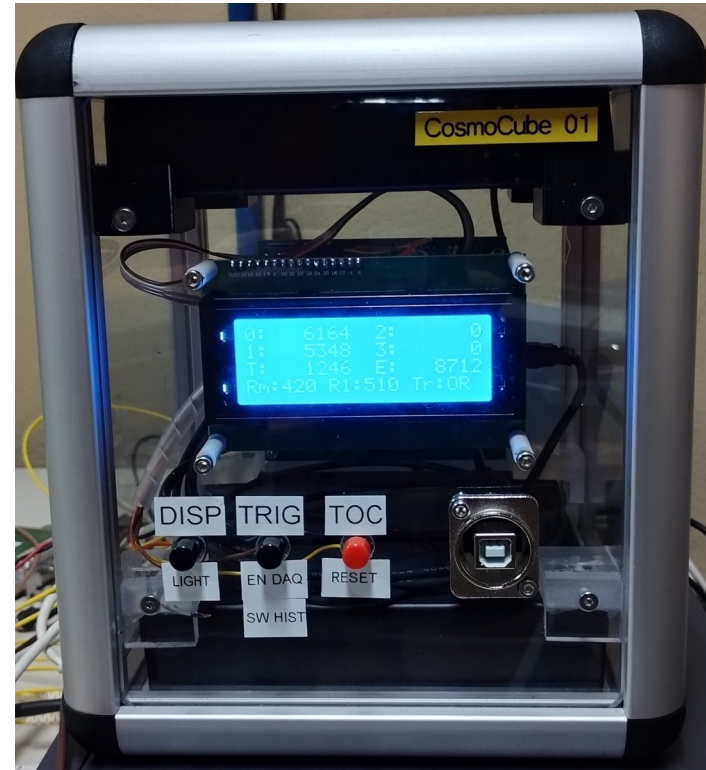
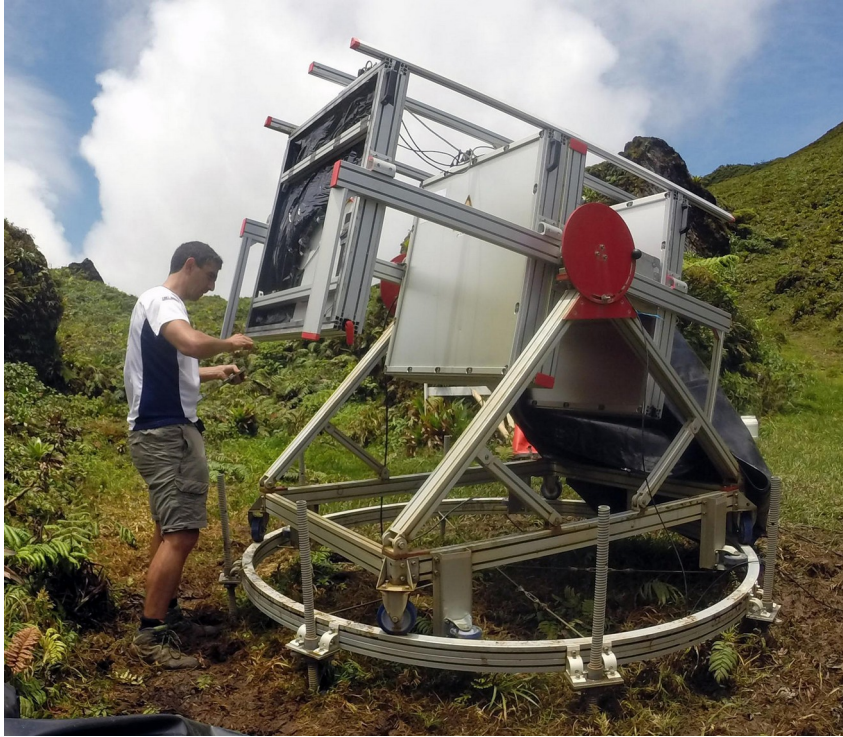
Applicazioni: muon tomography



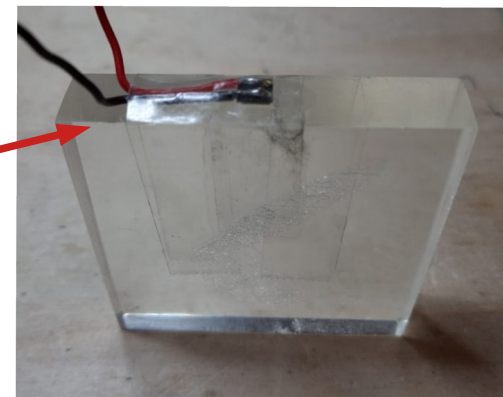
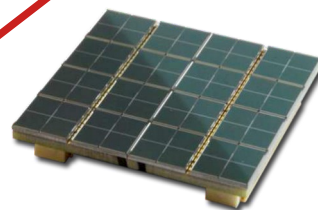
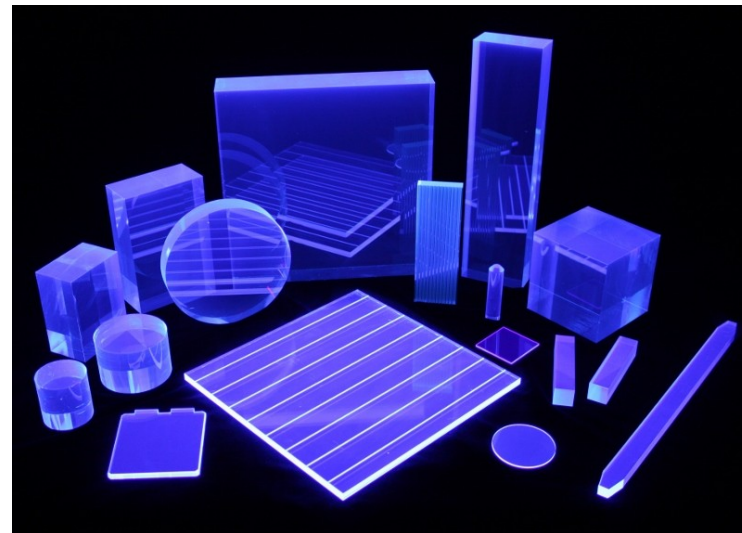
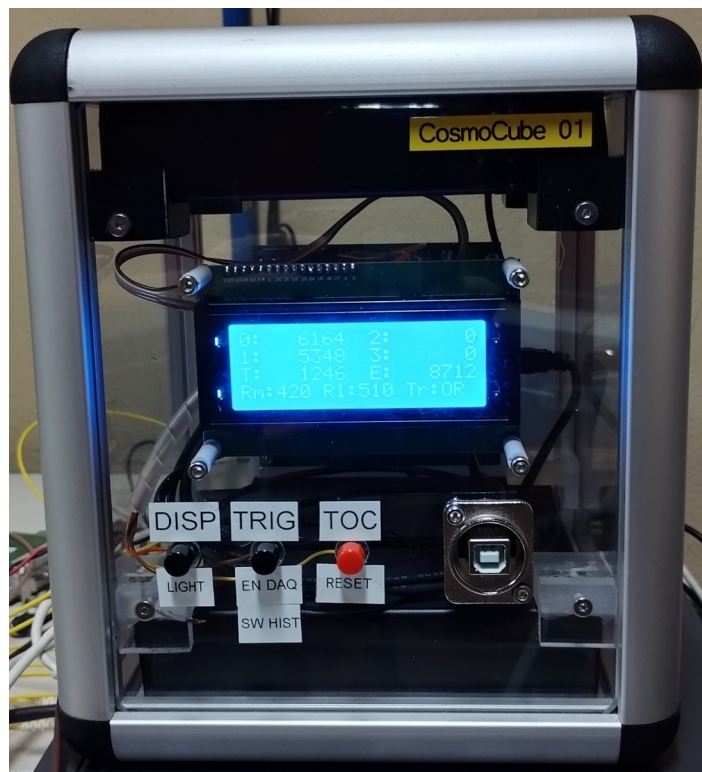
muon telescope:



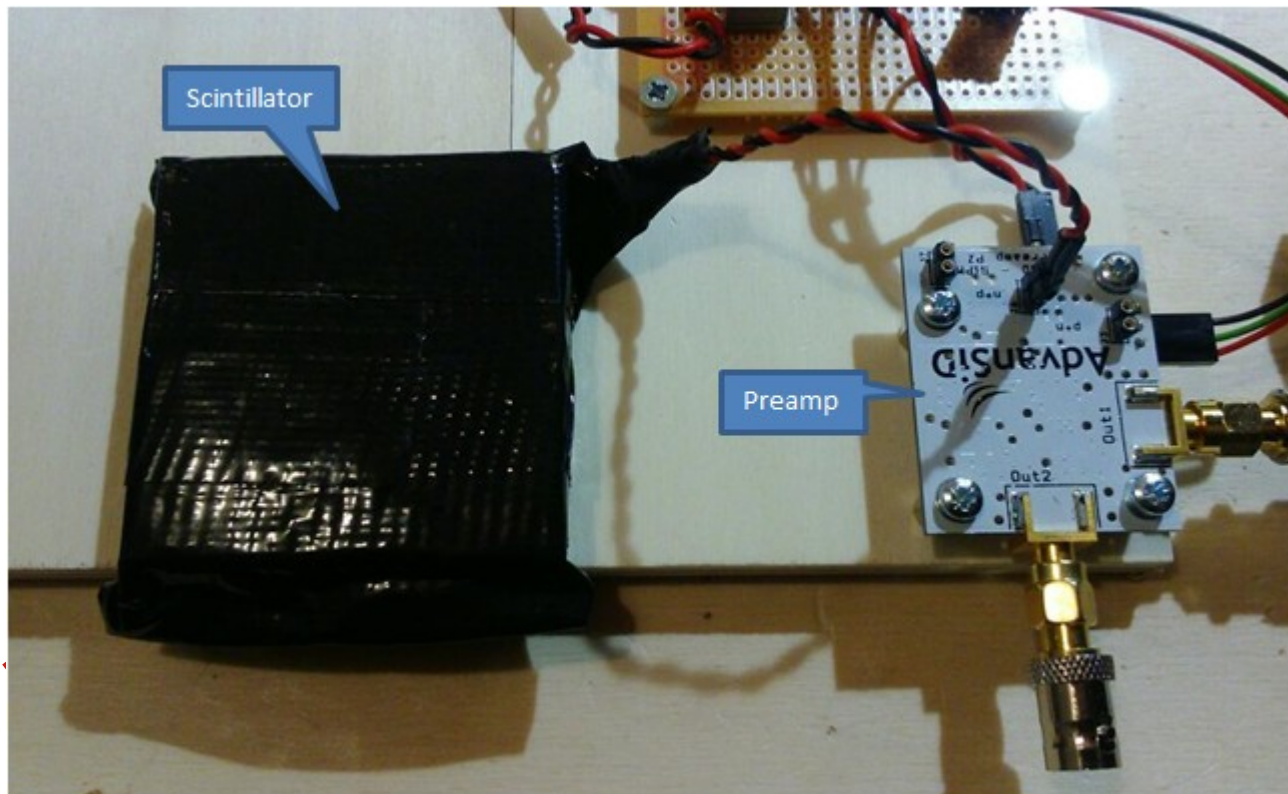
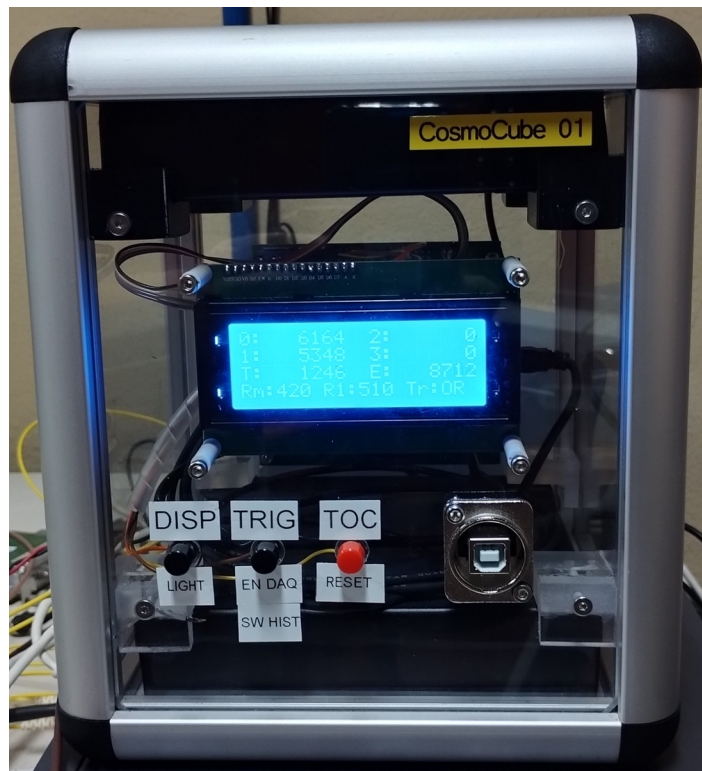
muon telescope:



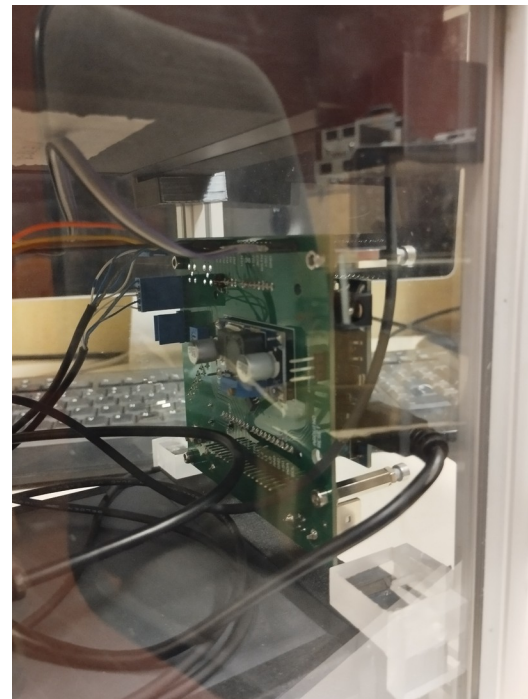
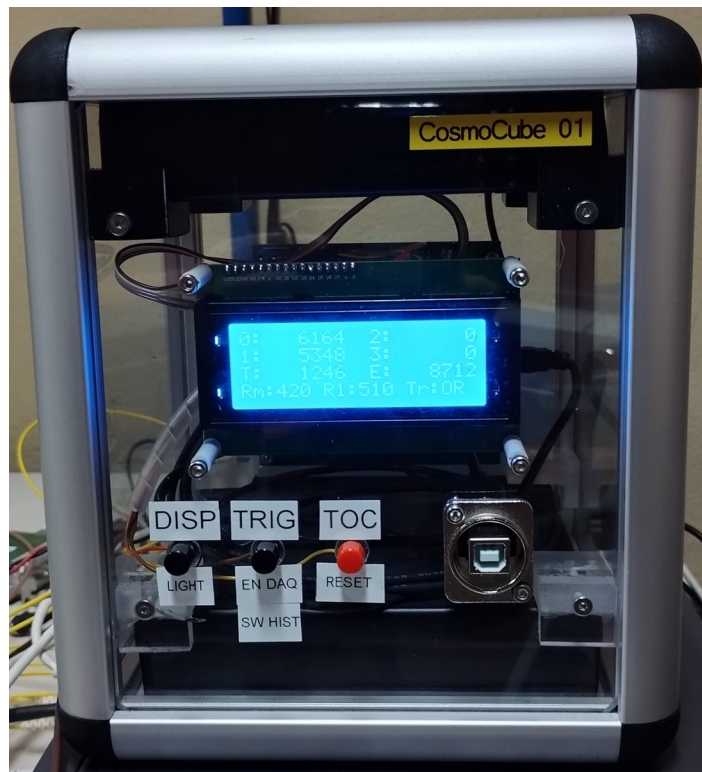
Il nostro CosmoCube:



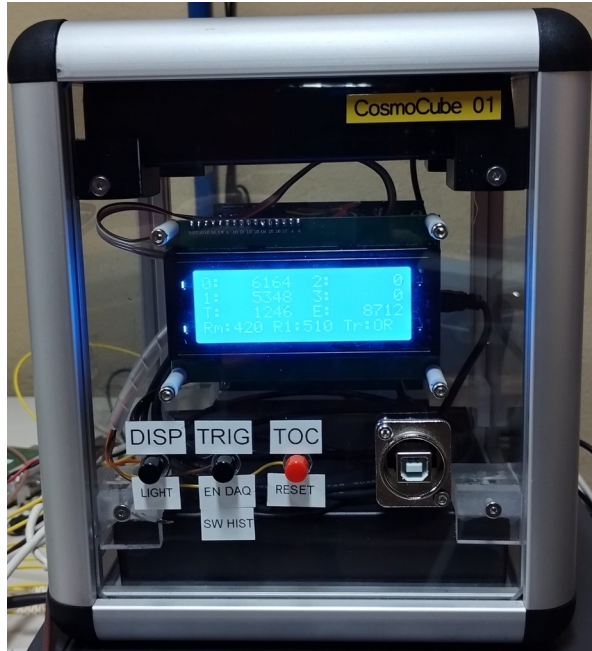
Il nostro CosmoCube:



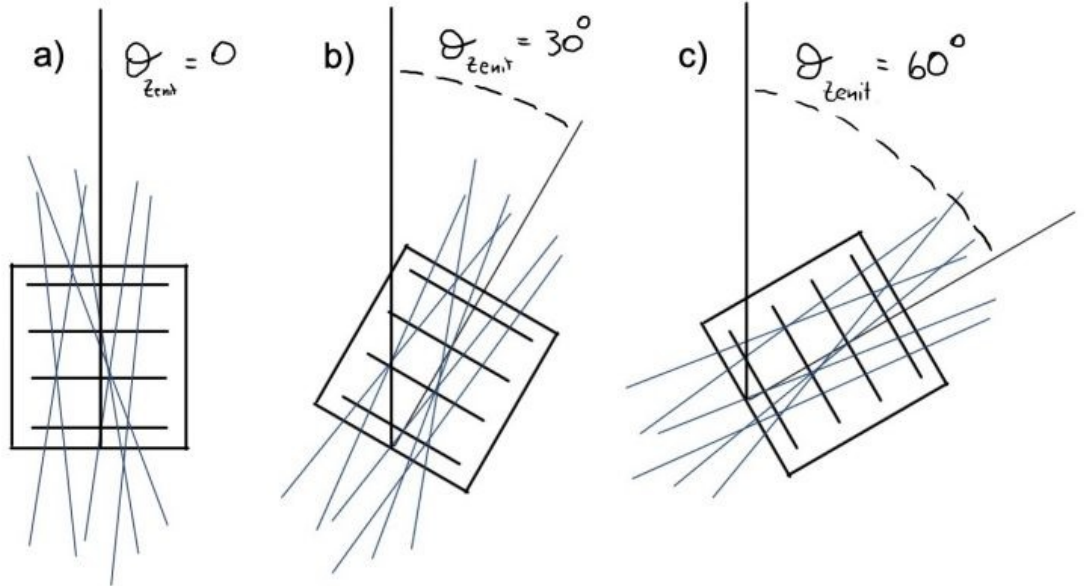
Il nostro CosmoCube:



Misurare il flusso di muoni in funzione dell'angolo di zenital



- Prendo dati per un tempo T
- Conto il numero di particelle registrate C
- Calcolo il rate R delle particelle come: $R = C / T$ (part/min)



Misurare il flusso di muoni in funzione dell'angolo di zenital

Angolo (gradi)	Tempo (secondi)	conteggi	Rate (cont/min)
0			
30			
60			
90			

Misurare il flusso di muoni in funzione dell'angolo di zenital

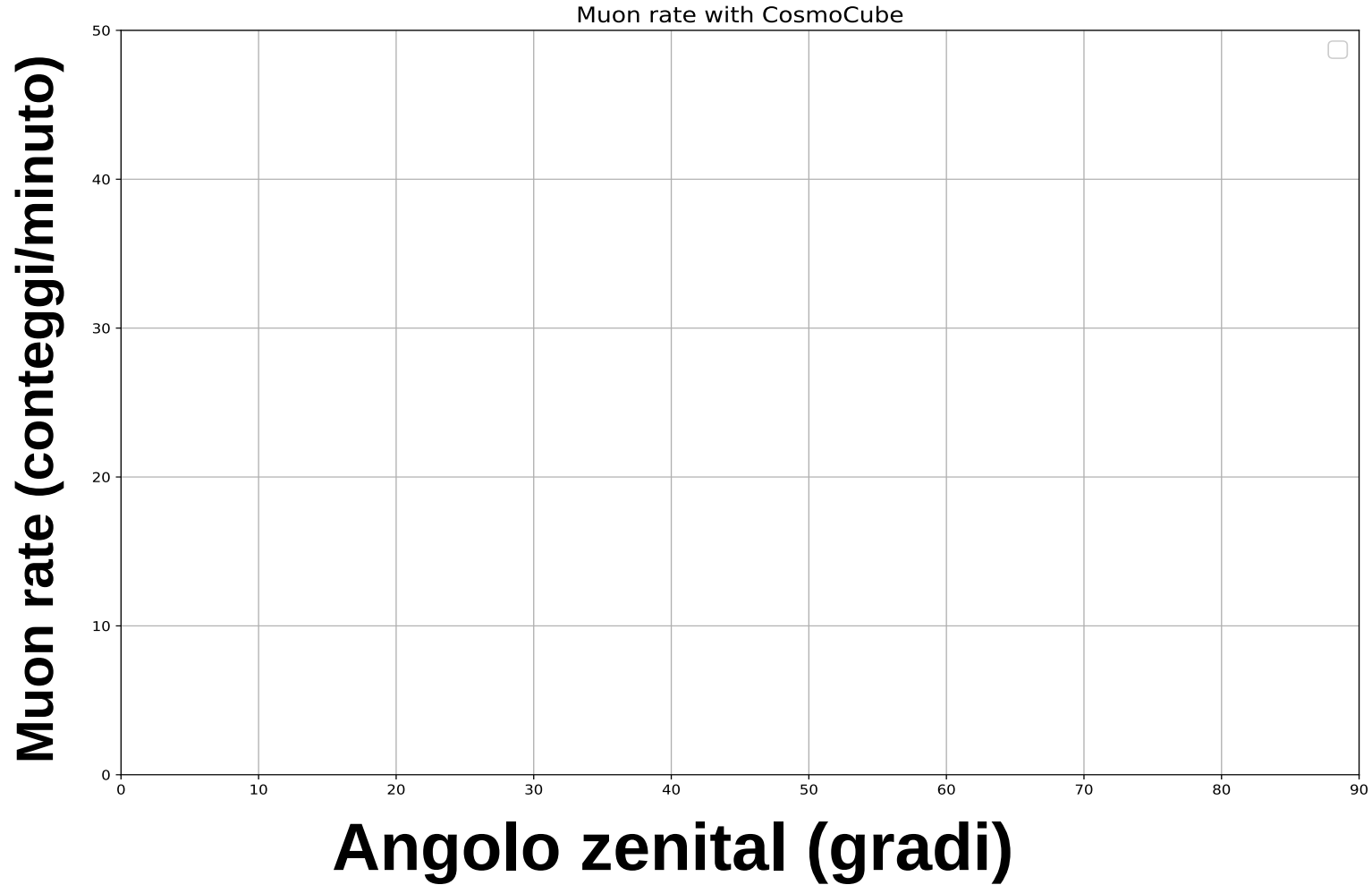
Angolo (gradi)	Tempo (secondi)	conteggi	Rate (cont/min)
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Esercizio:

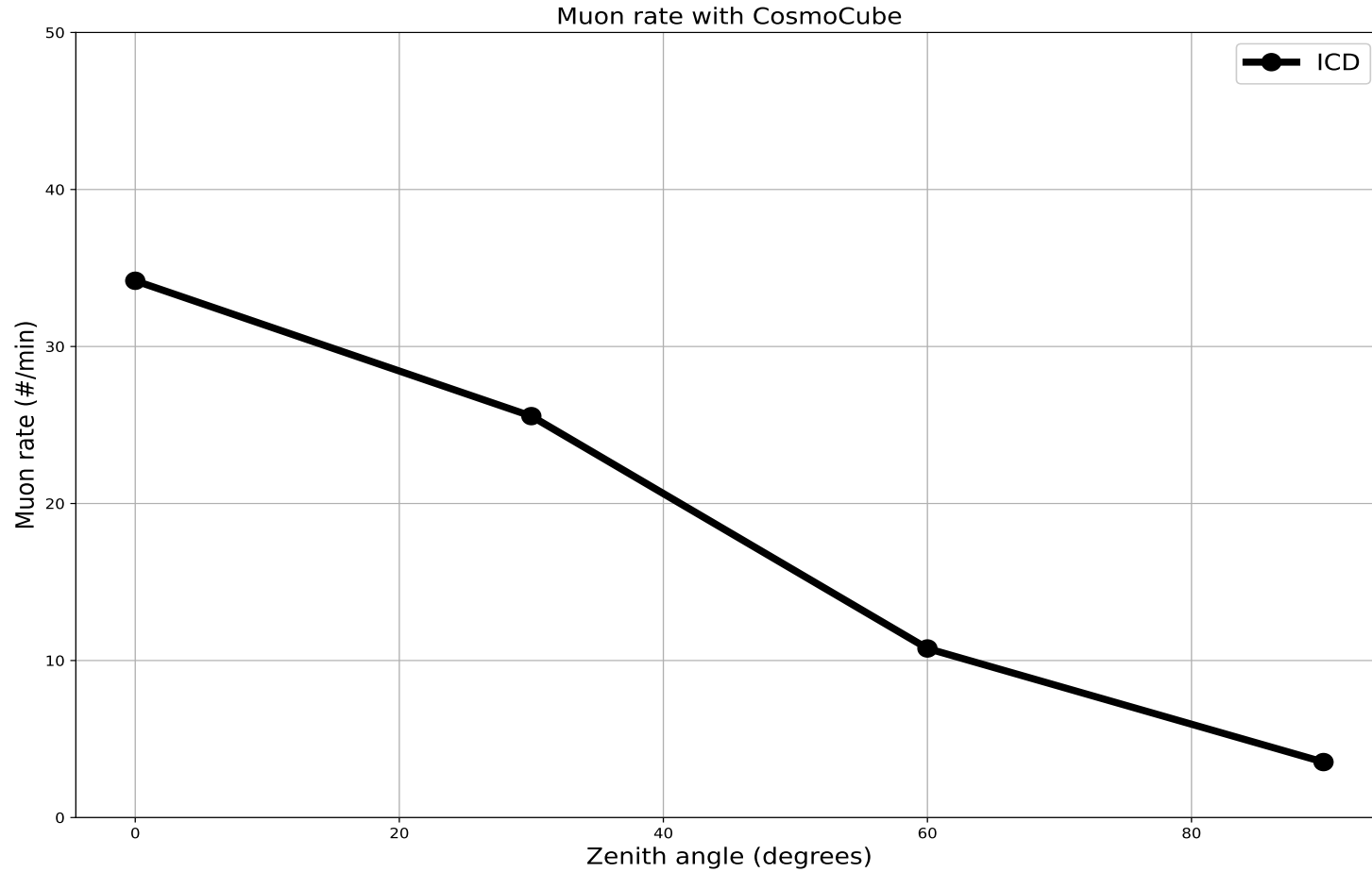
Fare un grafico sulla foglio di carta a quadretti:

Rate (conteggi/min) VERSUS Angolo zenital (gradi)

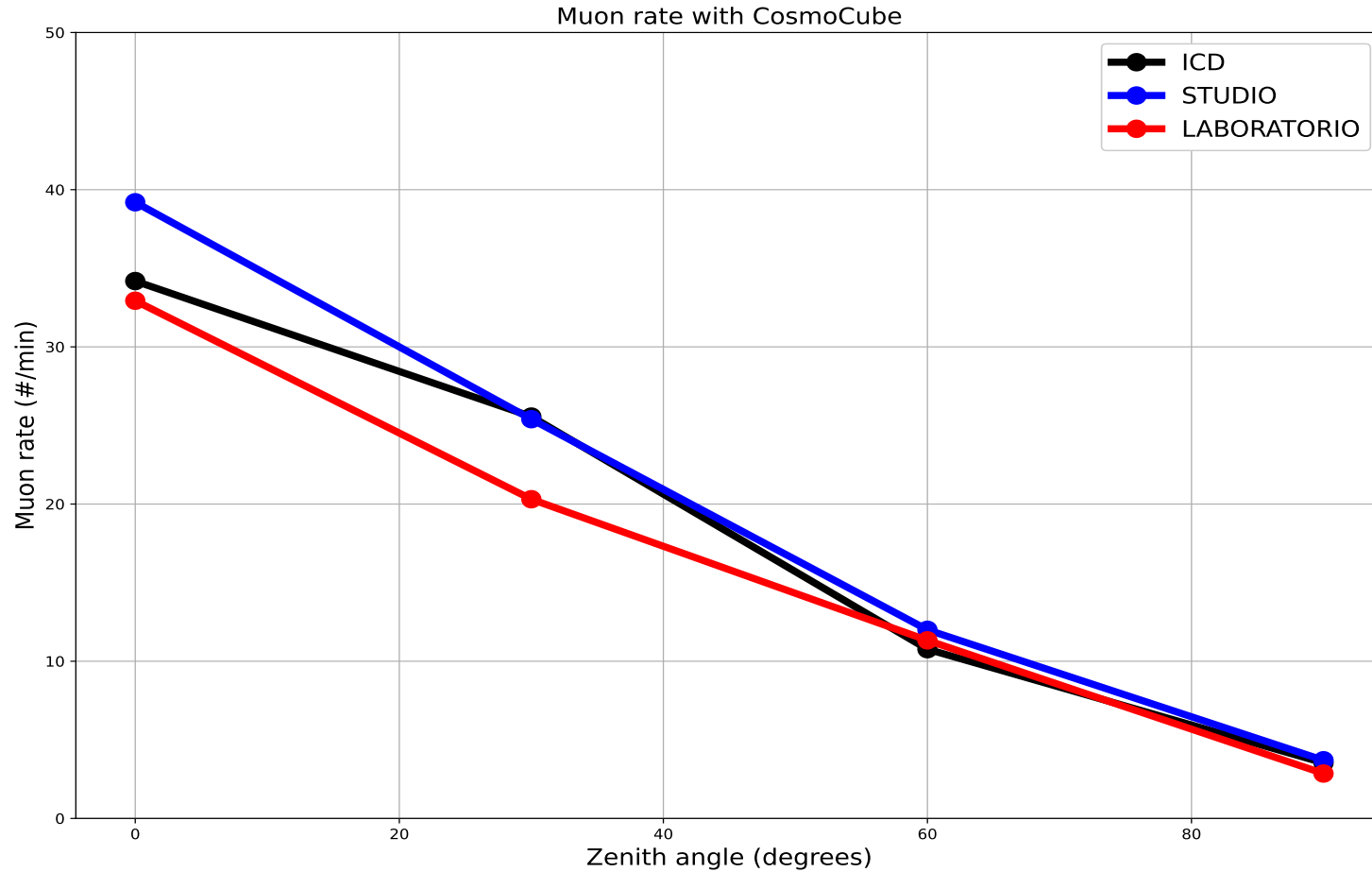
Dati presi con CosmoCube:



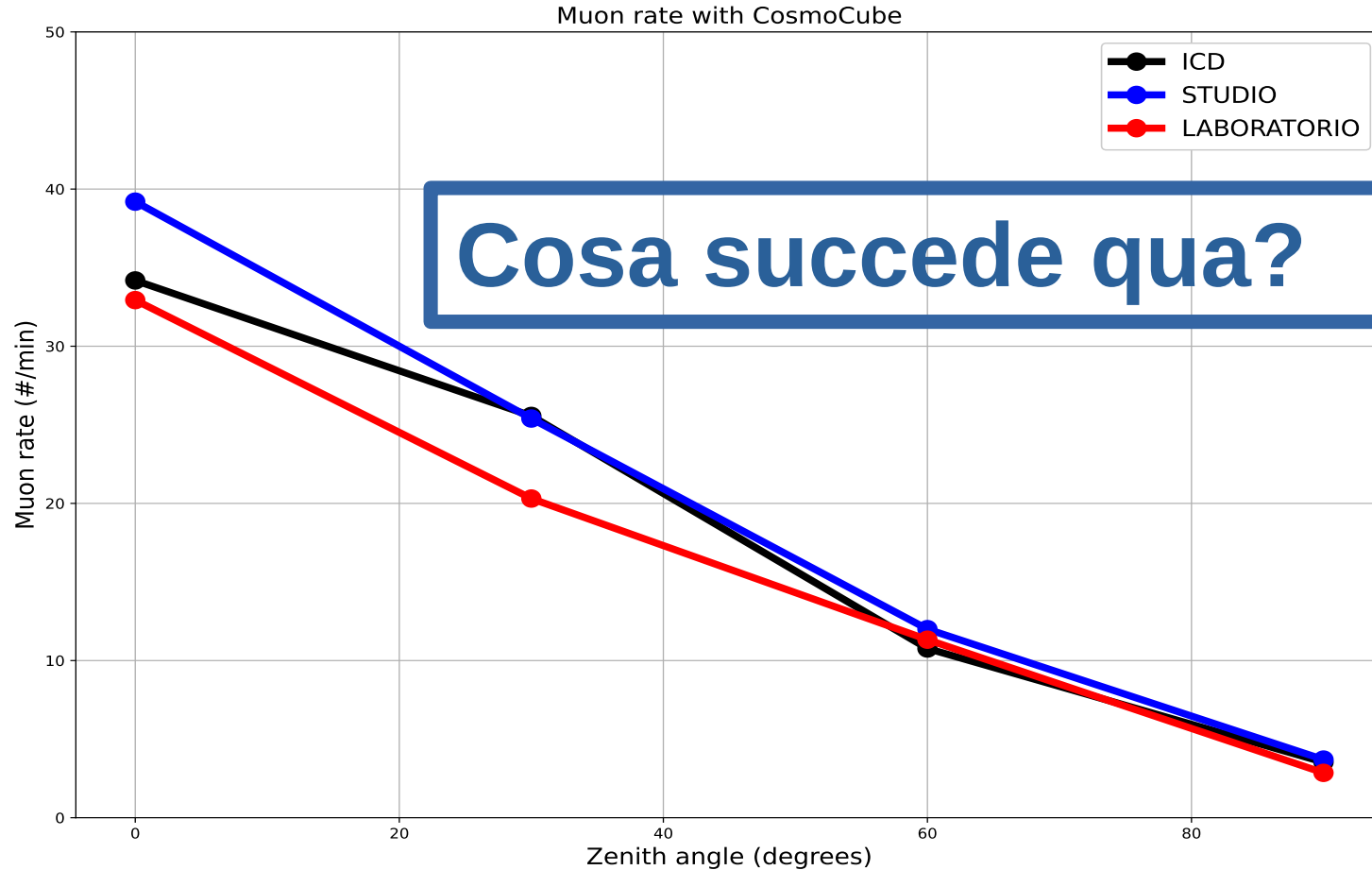
Dati presi con CosmoCube:



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Dati pressi con CosmoCube:

