

CORAM (COsmic RAY Mission):

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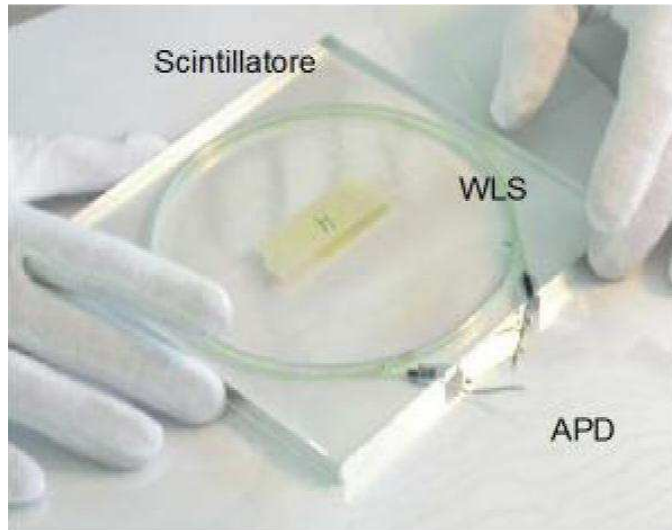


Lecce, 25 giugno 2012

Cosa è CORAM

- Iniziativa di **outreach**, nata da contatti con alcune scuole secondarie di II grado della provincia di Lecce e Brindisi
- Costruzione detector e misura del flusso di raggi cosmici con la quota in occasione del centenario della loro scoperta
- Possibilità volo su pallone stratosferico e/o utilizzo “a terra” per misure, mostre, etc.
- Finanziamento del detector ottenuto dalla Commissione 5, istituzionalmente deputata all’outreach
- Primo prototipo costruito ed utilizzato per campagne di misure in montagna e underground (LNGS)

L'apparato sperimentale



Quattro piani di rivelatore a scintillazione (circa $14,5 \times 14,5 \times 1 \text{ cm}^3$) letti con fibre ottiche e SiPM, intervallati da assorbitori in ferro.

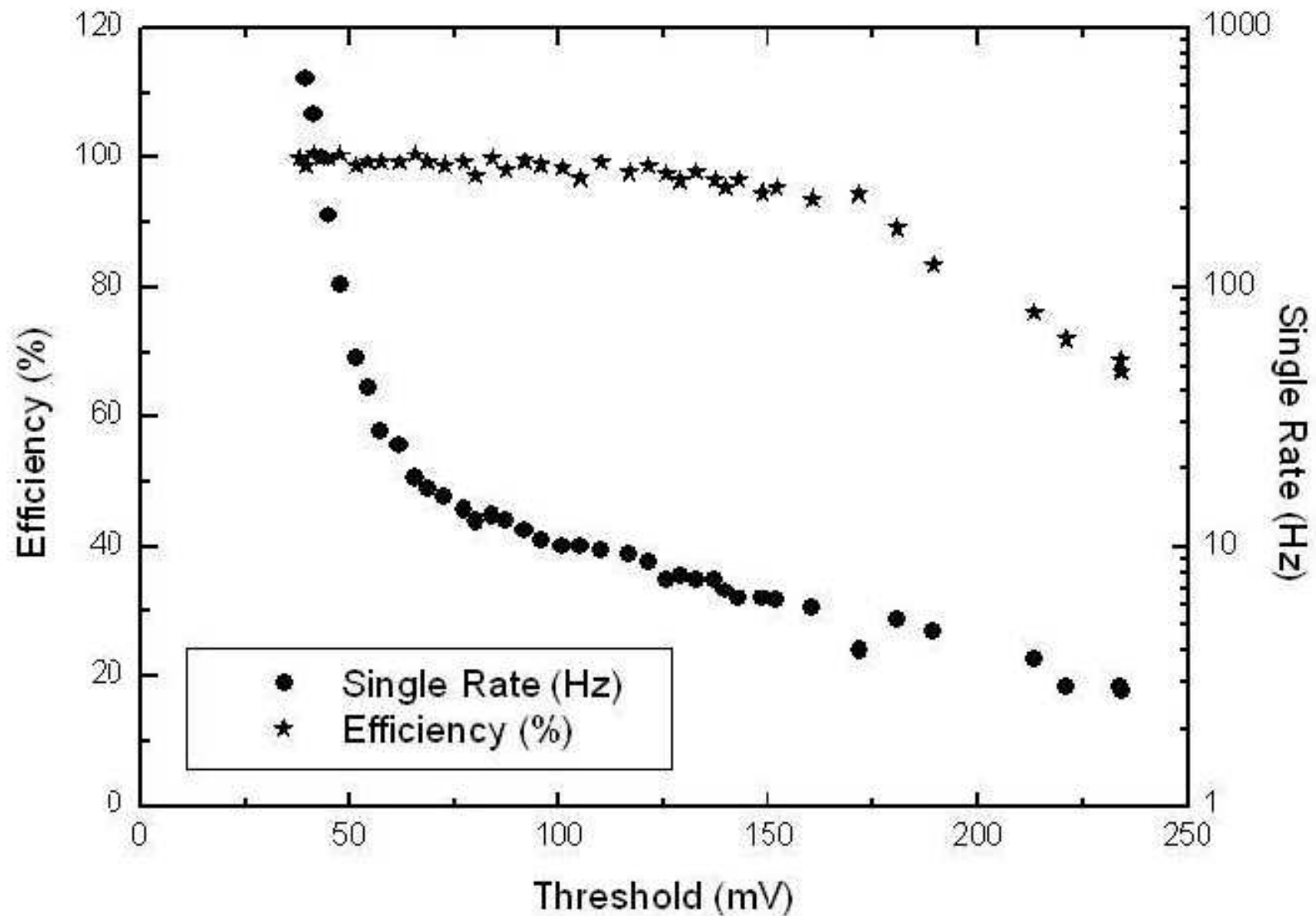
I segnali dei vari detector vengono “formati” a 60ns e messi in coincidenza in intervalli di 80ns.



Ad intervalli regolari di tempo ΔT viene registrato il numero di **singole** e di coincidenze **doppie**, **triple** e **quadruple**.

La rate di coincidenze accidentali e' estremamente bassa dato il valore della rate di fondo del singolo detector ($\approx 1 \text{ Hz}$) e della finestra temporale scelta per le coincidenze.

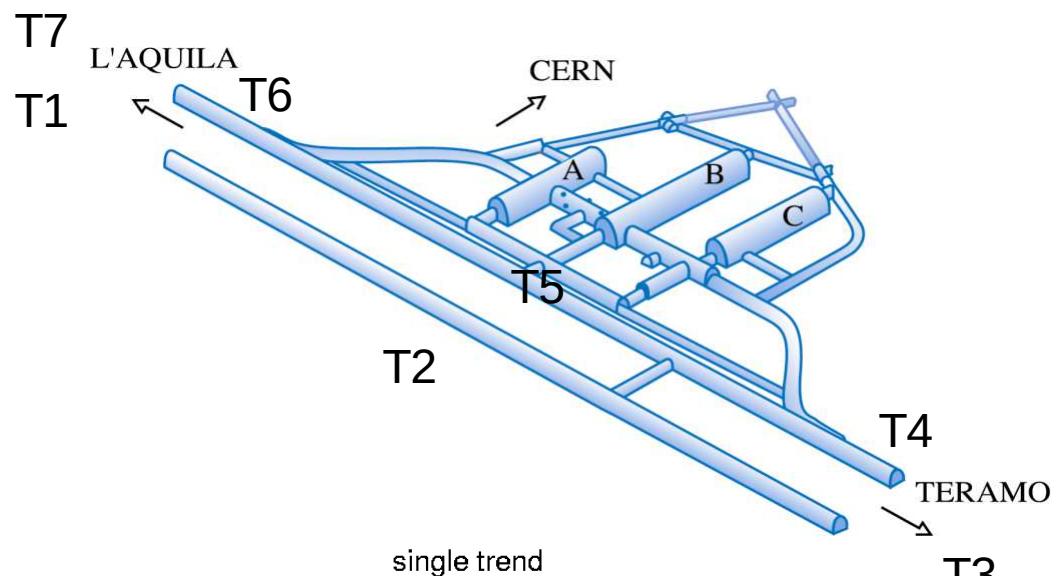
Misure di efficienza (in laboratorio)



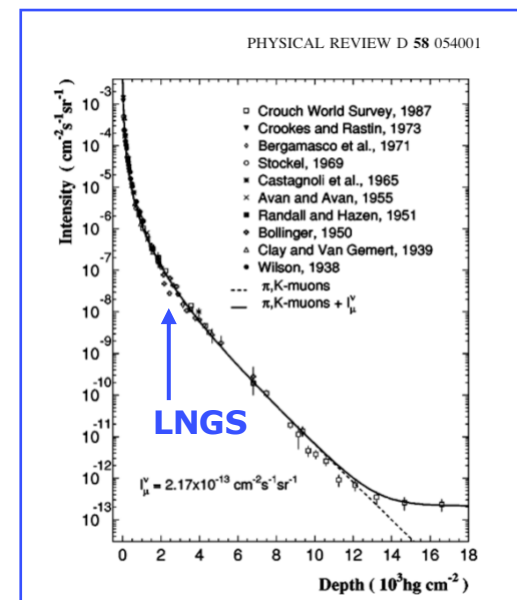
Misure in galleria (LNGS)



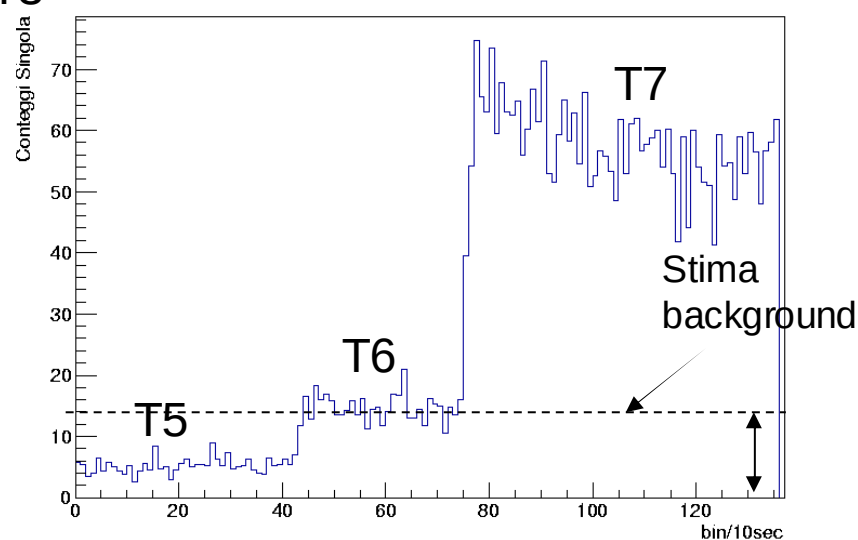
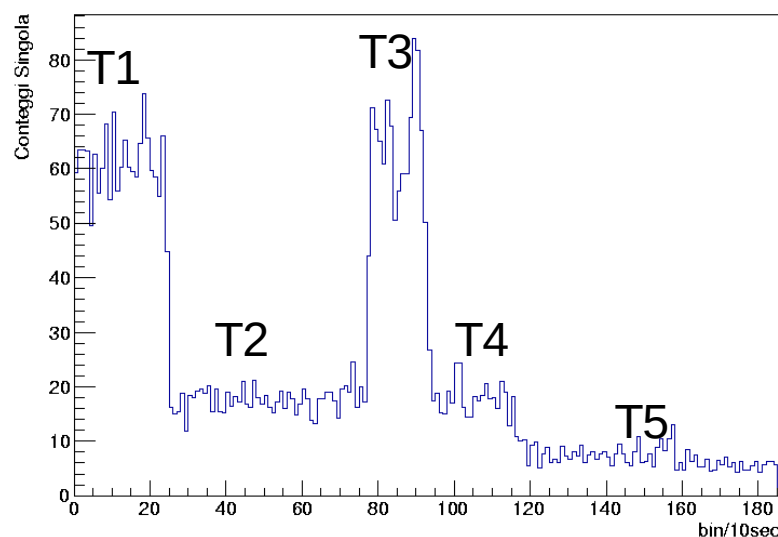
Misure in galleria (LNGS)



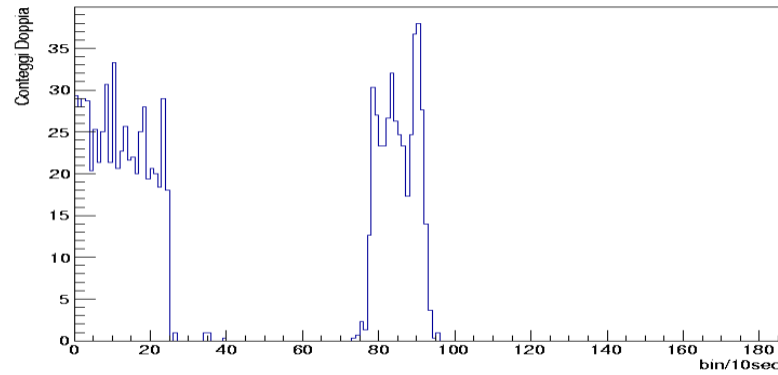
single trend



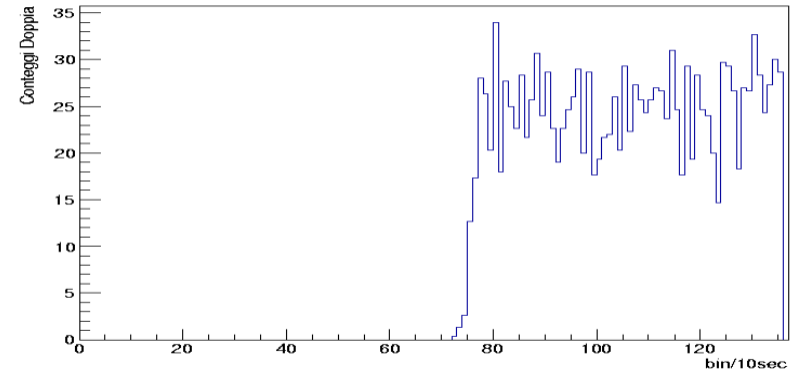
single trend



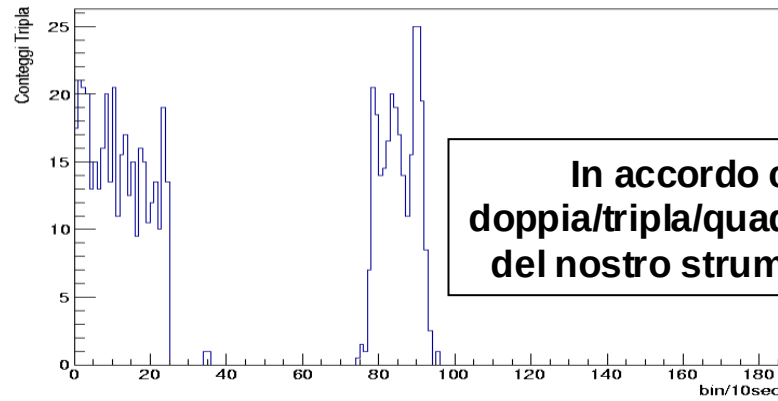
doppie trend



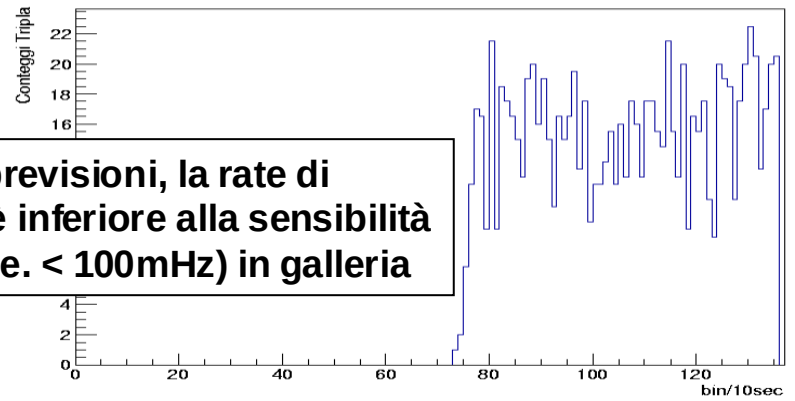
doppie trend



Triple trend

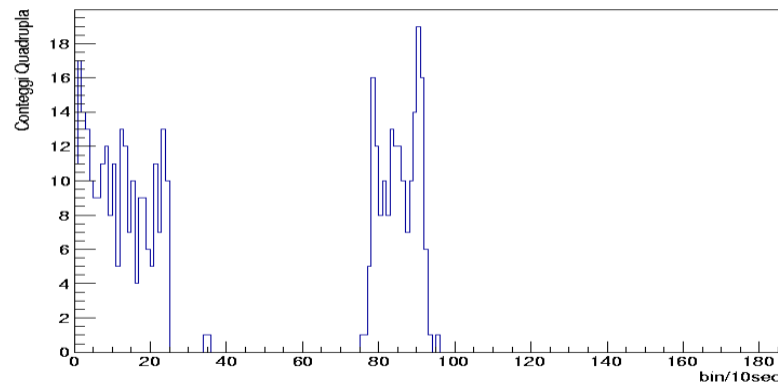


Triple trend

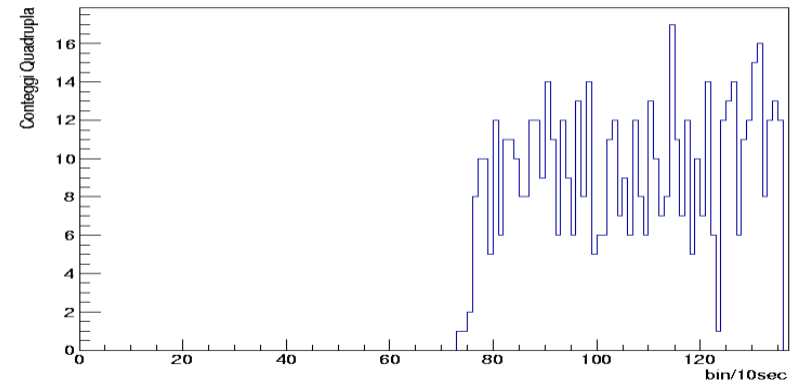


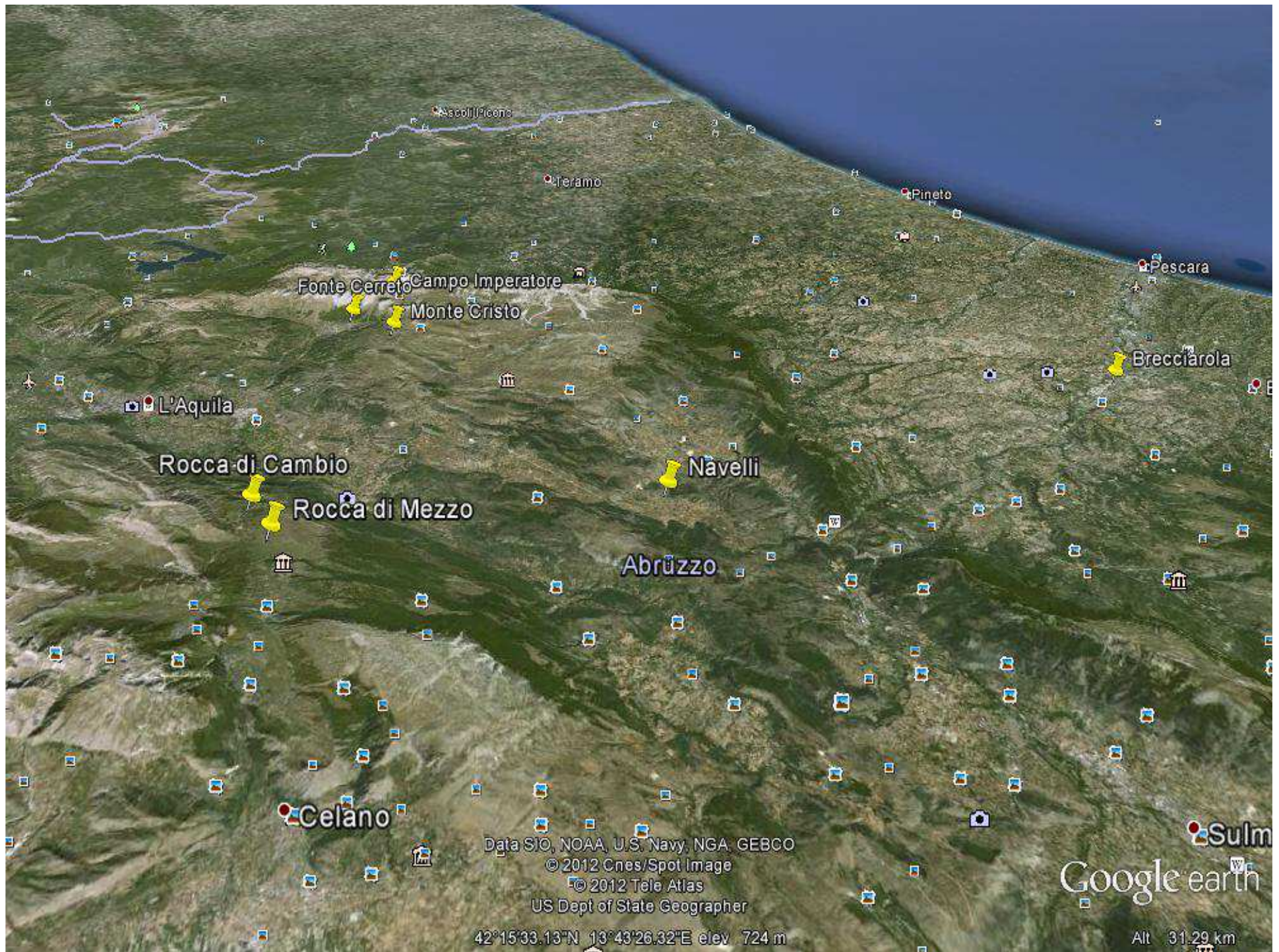
**In accordo con le previsioni, la rate di
doppia/tripla/quadrupla è inferiore alla sensibilità
del nostro strumento (i.e. < 100mHz) in galleria**

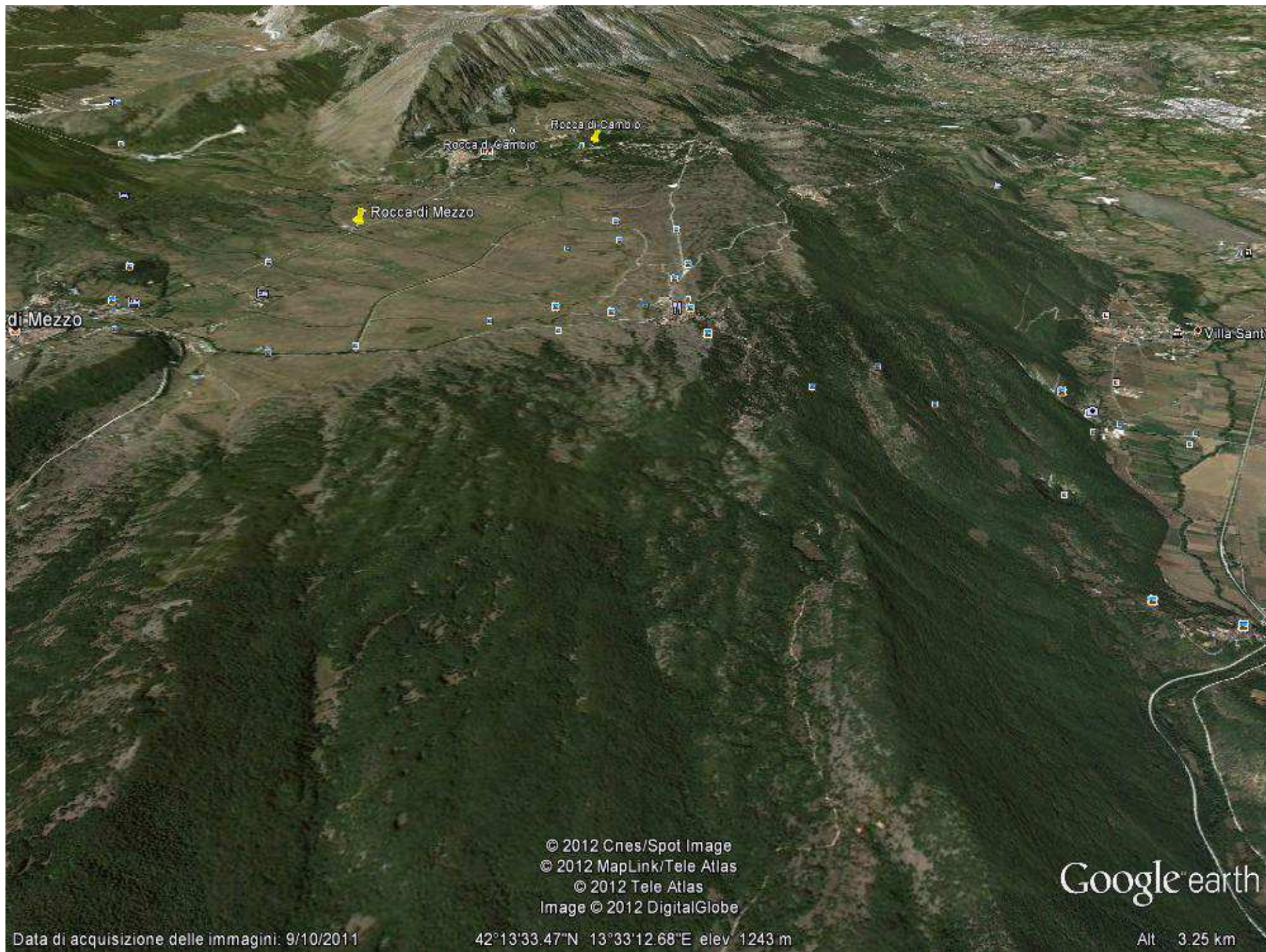
Quadrup trend



Quadrup trend





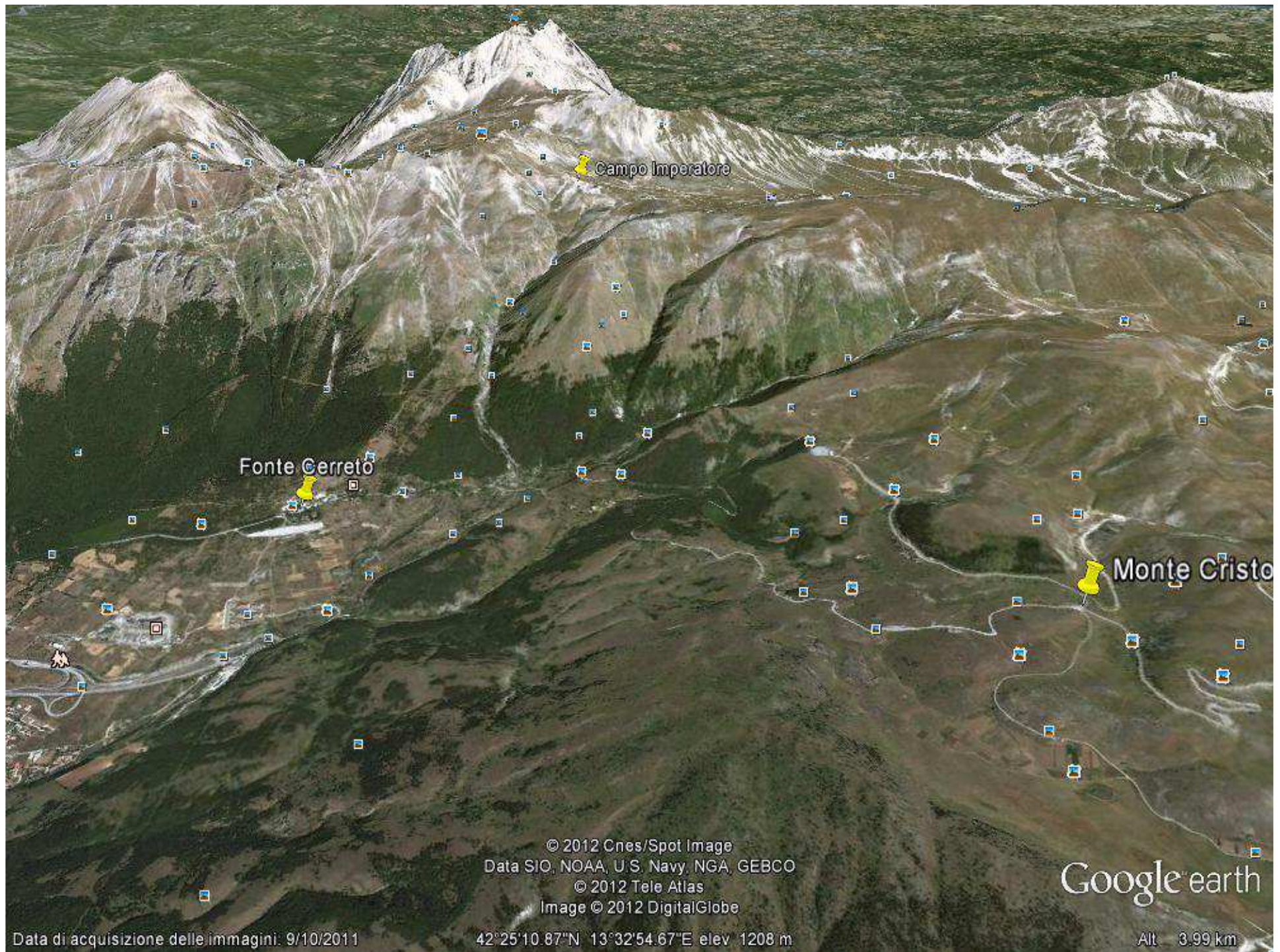


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Data di acquisizione delle immagini: 9/10/2011

42°13'33.47"N 13°33'12.68"E elev. 1243 m

Alt 3.25 km



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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2012 Tele Atlas
Image © 2012 DigitalGlobe

Google earth

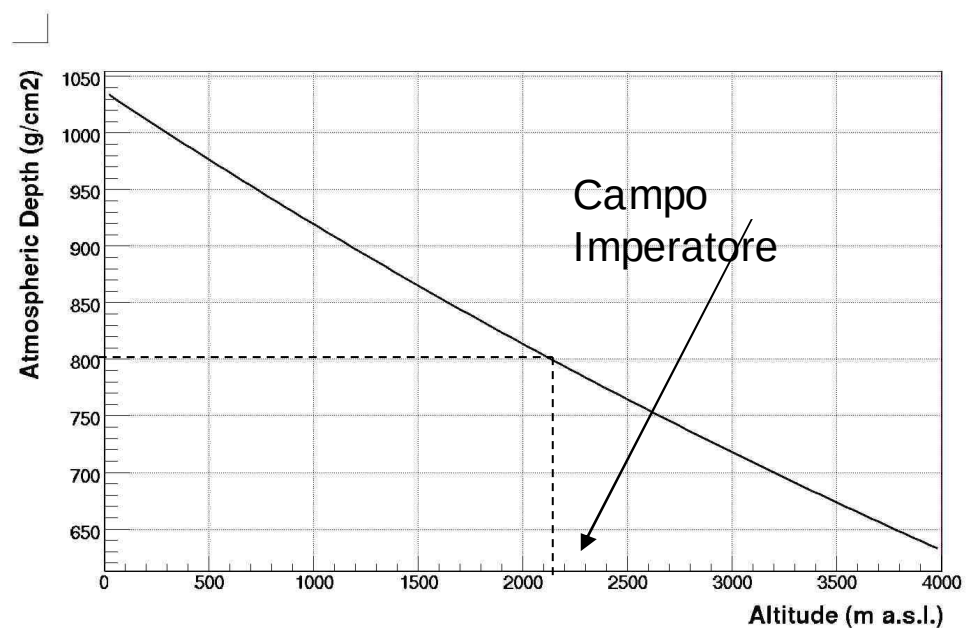
Data di acquisizione delle immagini: 9/10/2011

42°25'10.87"N 13°32'54.67"E elev. 1208 m

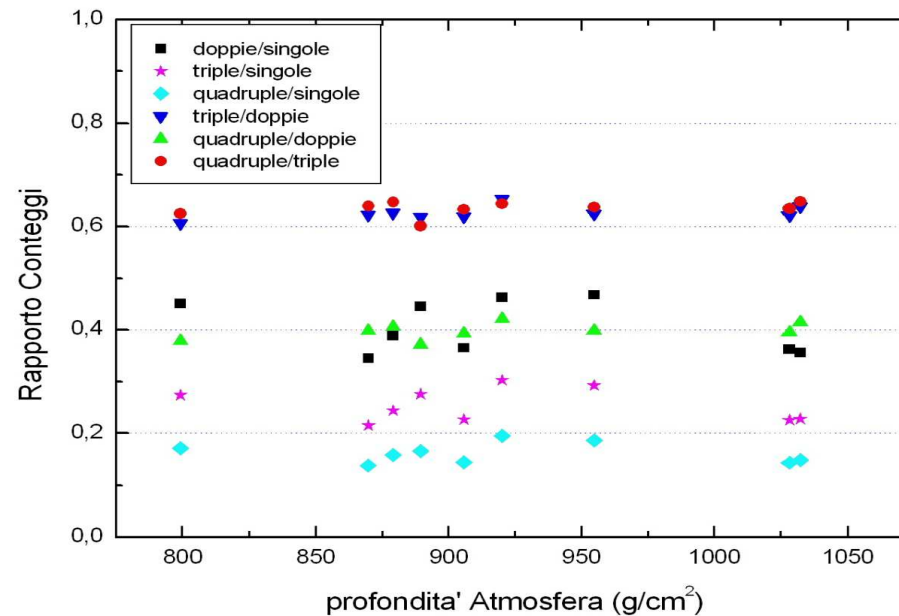
Alt. 3.99 km



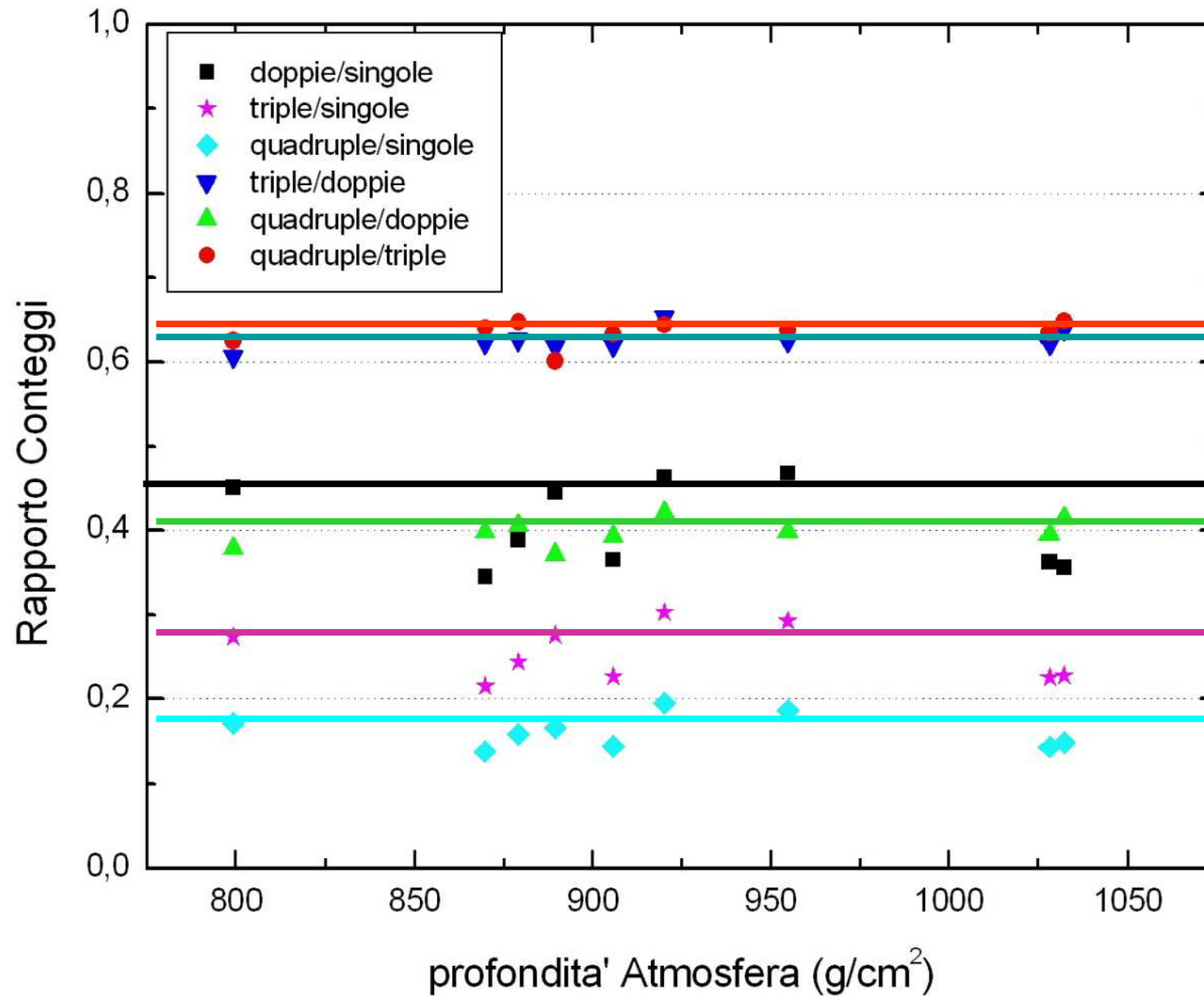
	Quota (m s.l.m.)
Brecciarola	65
Navelli	684
LNGS esterni	990
Rocca di Cambio	1270
Rocca di Mezzo	1366
Fonte Cerreto	1120
Monte Cristo	1453
Campo Imperatore	2140



I rapporti tra le rates (e quindi le efficienze) risultano indipendenti dalla quota.



Assumendo: $\langle \varepsilon \rangle \approx 92\%$ $R^s_{bck} \approx 1.8 \text{ Hz}$



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SECOND SERIES

The Variation of the Hard Component of Cosmic Rays with Height and the Disintegration of Mesotrons

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(Received January 10, 1940)

The vertical intensity of the hard component of cosmic rays was measured at different altitudes with a threefold coincidence counter tube arrangement. Measurements were taken with and without a graphite layer above the counters in order to compare the absorption of the hard component in air and in carbon. The counting rate observed under a given mass of air-plus-carbon was found to be considerably larger than the rate observed under the same mass of air alone. We interpret the difference as due to the spontaneous decay of the mesotrons which form the hard component of cosmic rays.



Bruno Rossi e la moglie Nora Lombroso su Mt. Evans (1939)

Nel 1939, Bruno Rossi effettua una campagna di misure a diverse quote, sulle montagne rocciose, per indagare il fenomeno dell'assorbimento anomalo dei "mesotroni".

L'apparato sperimentale e' costituito da contatori Geiger e assorbitori di piombo e grafite.

Le misure vengono effettuate, a bordo di un bus dell'Università di Chicago, a varie quote sul livello del mare:

Chicago (180 m), Denver (1600m), Echo Lake (3240m), Mt. Evans (4300m)

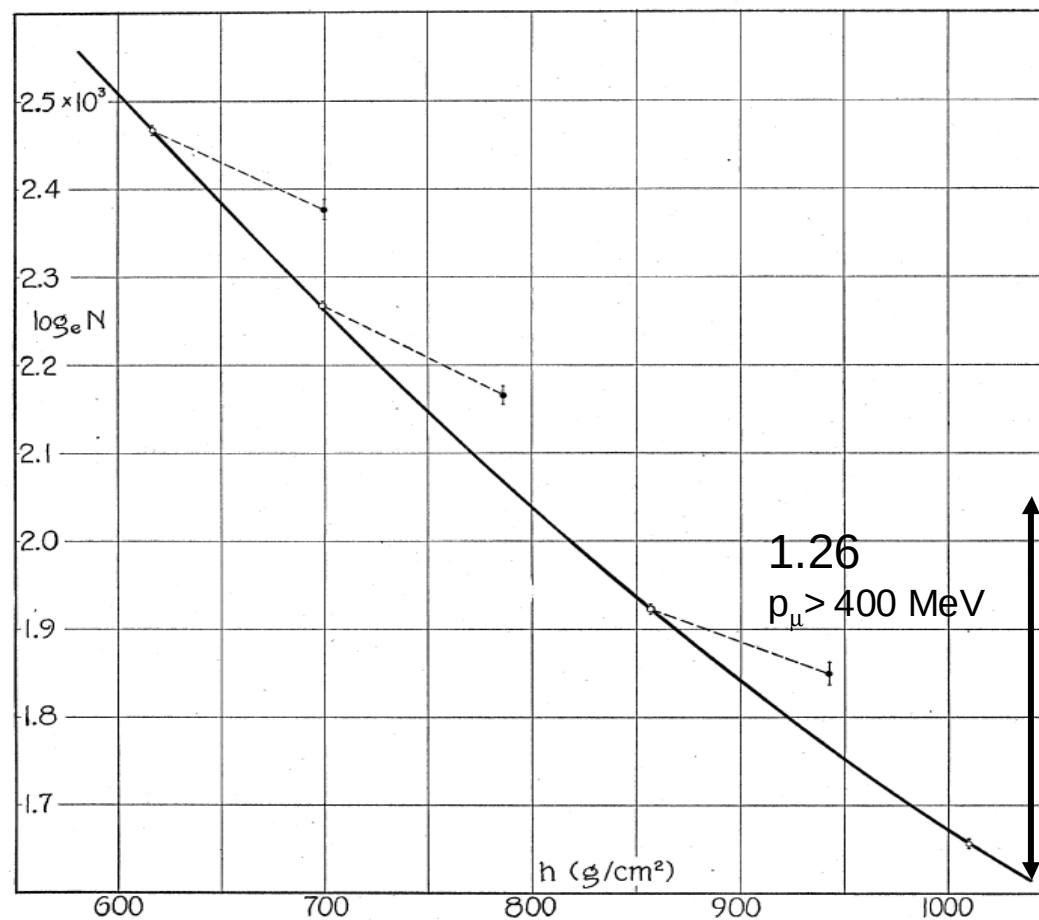
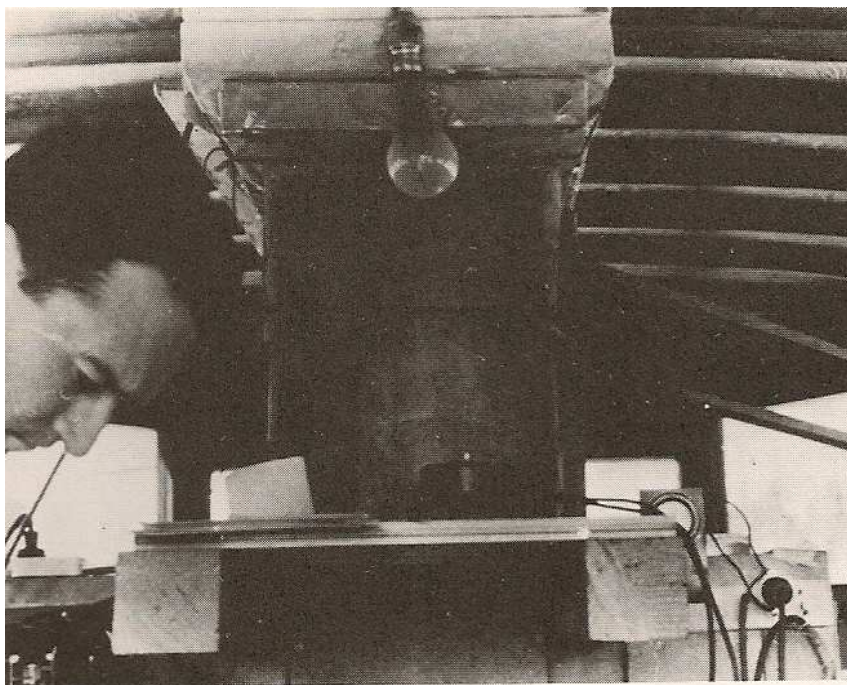
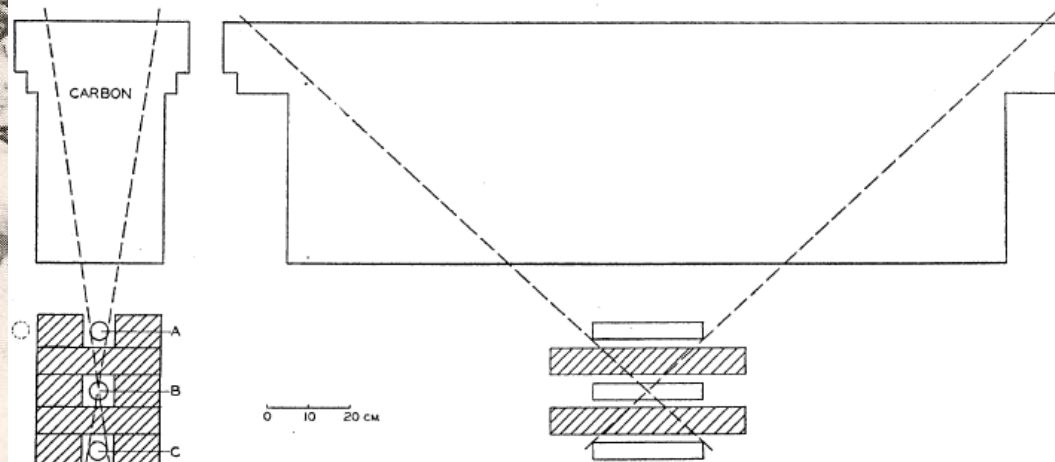
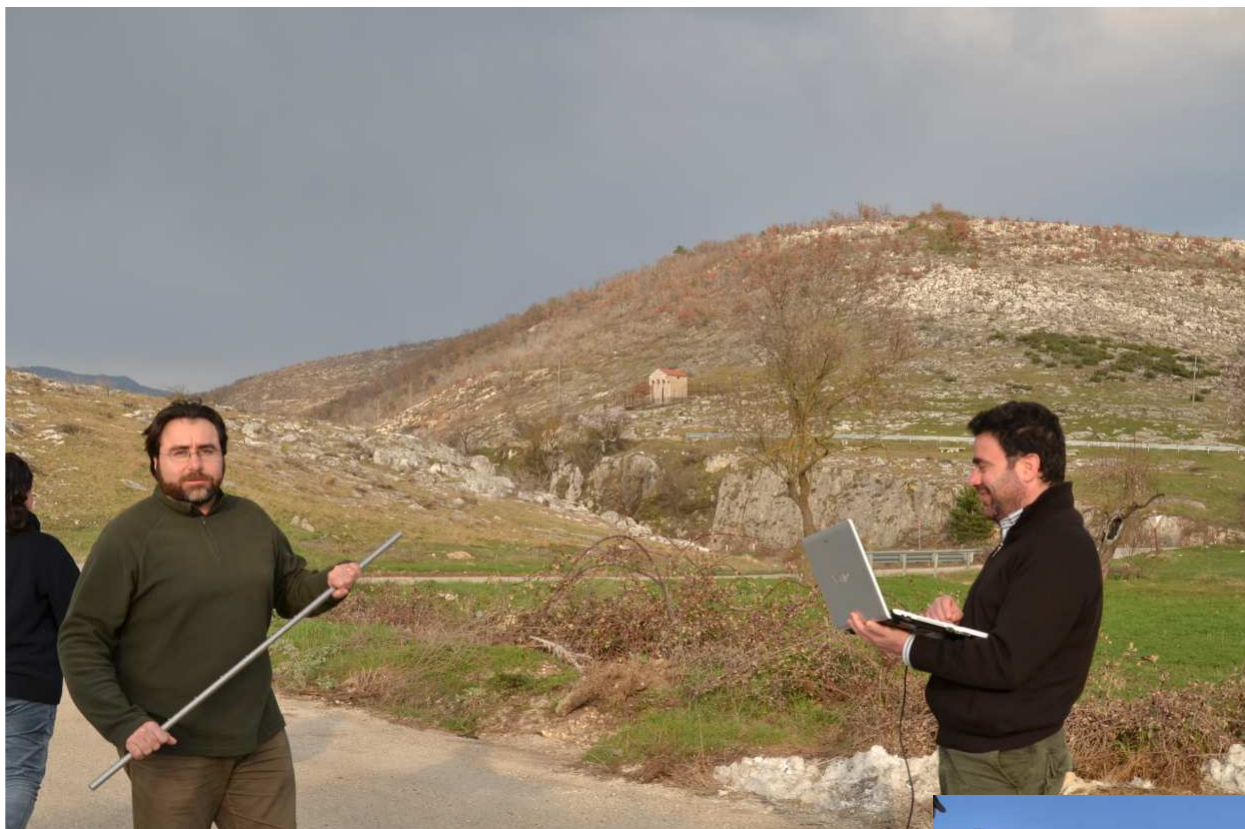
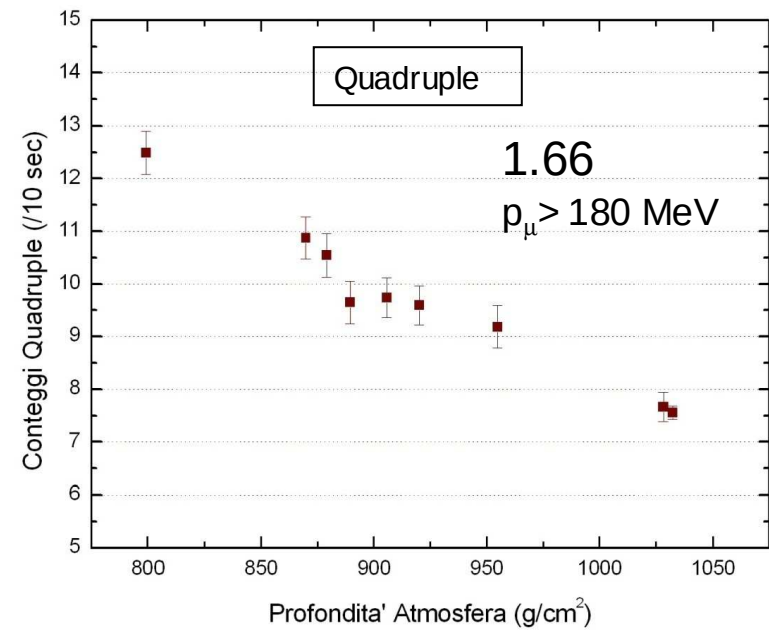
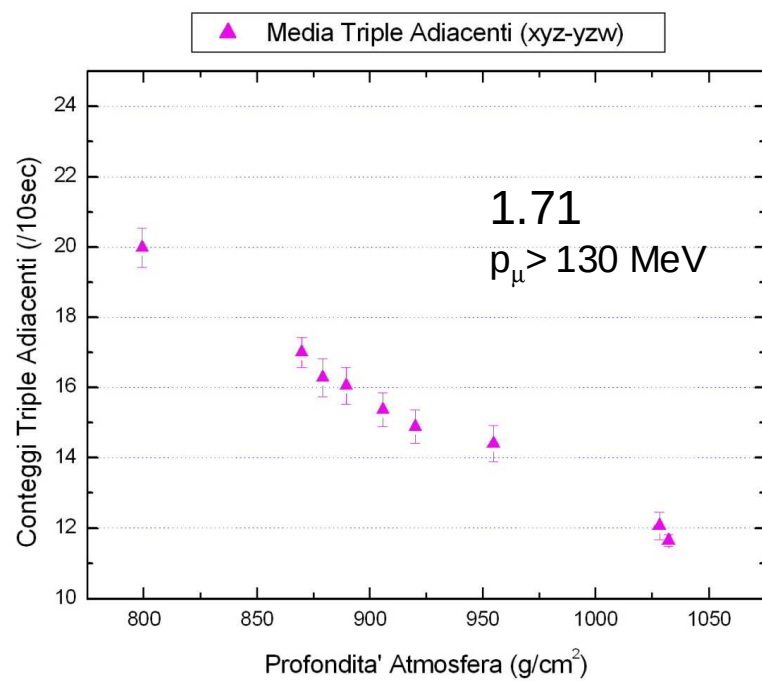
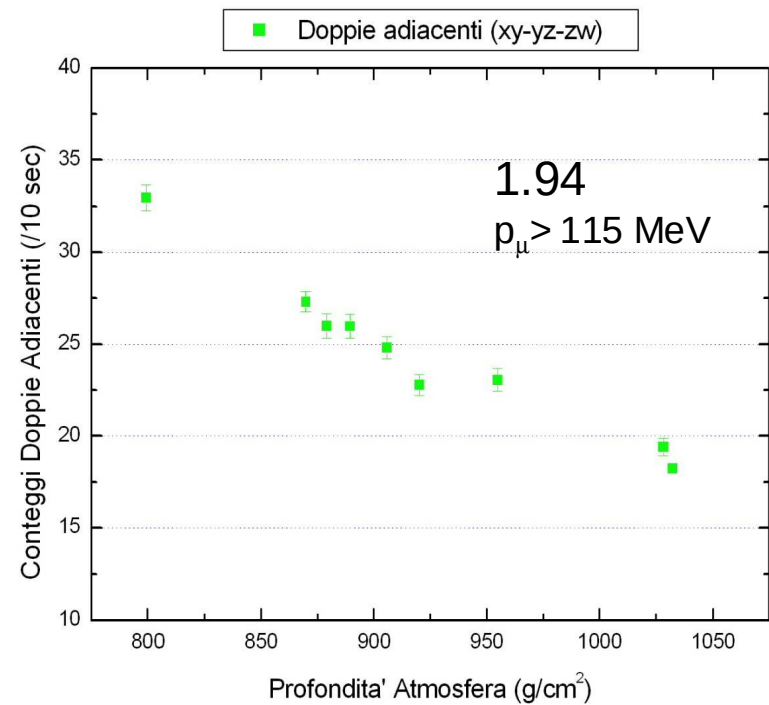
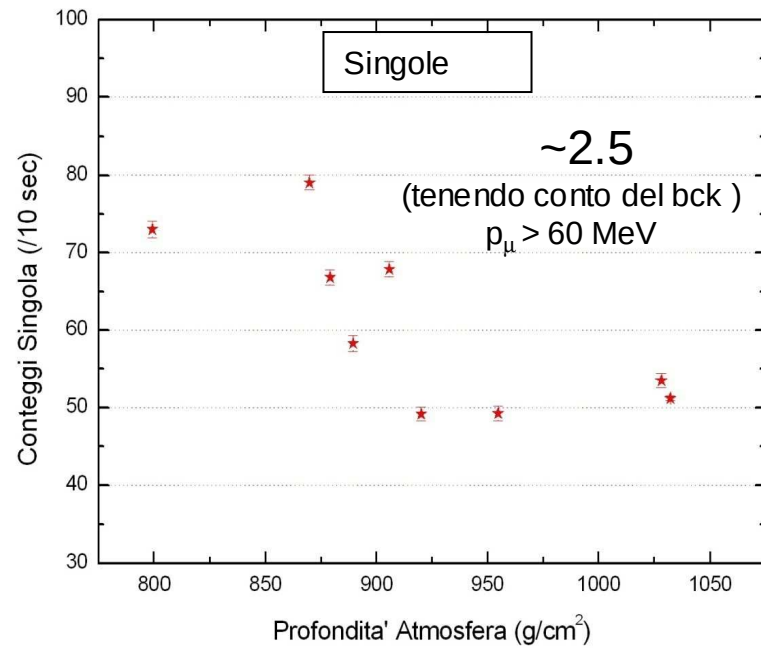


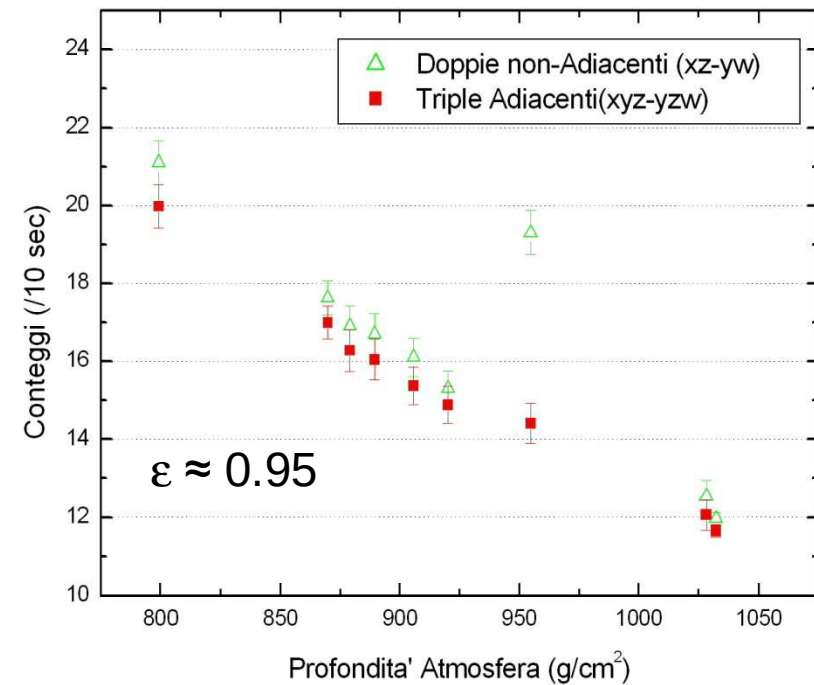
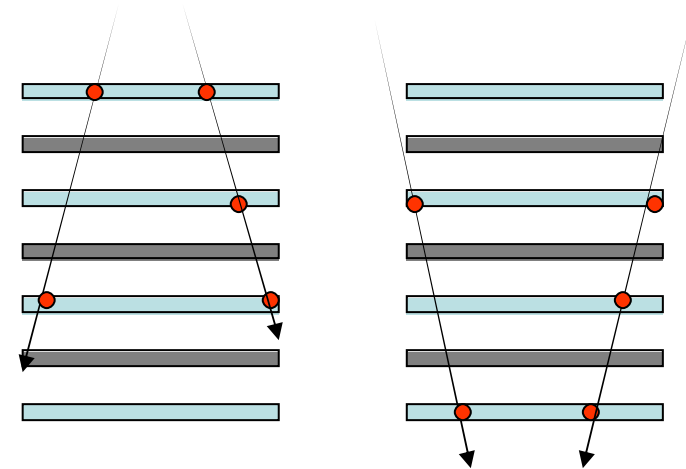
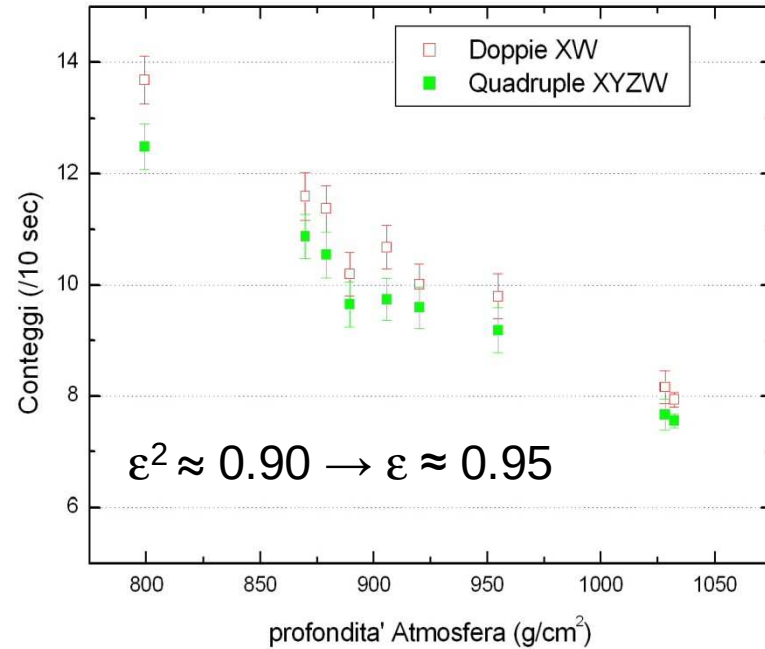
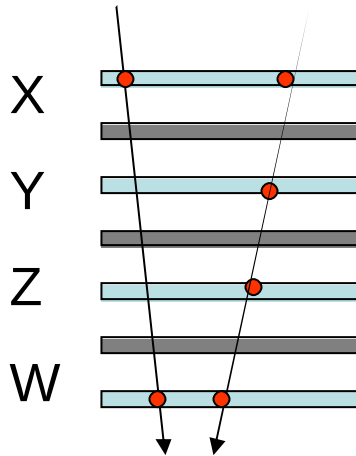
FIG. 3. Intensity of cosmic-ray mesotrons as a function of the depth.







Ulteriori misure di efficienza

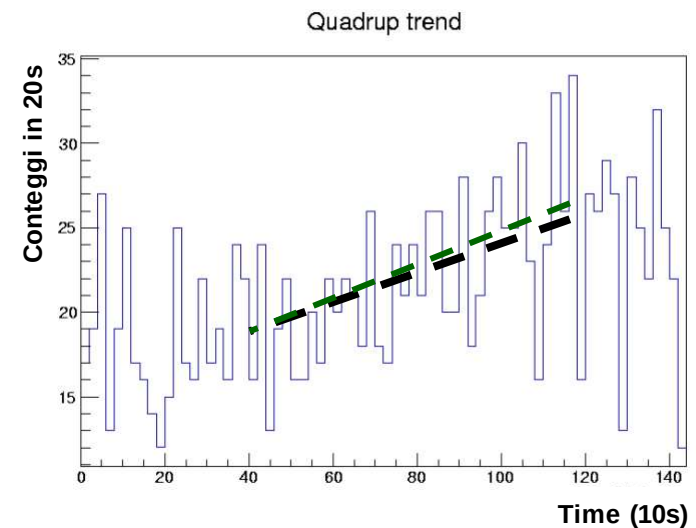
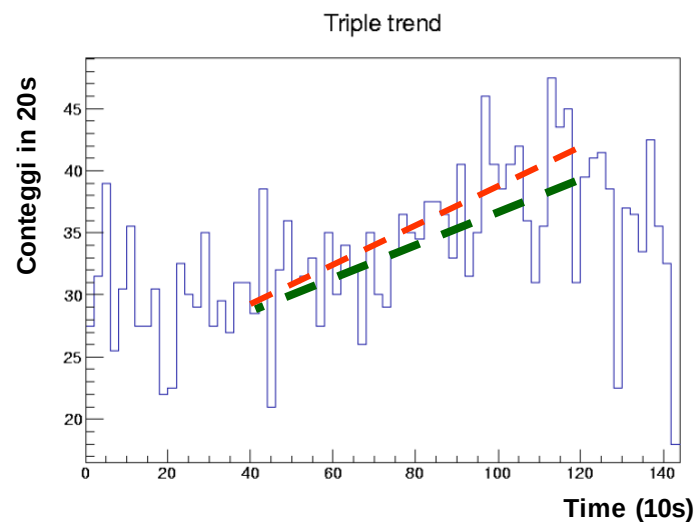
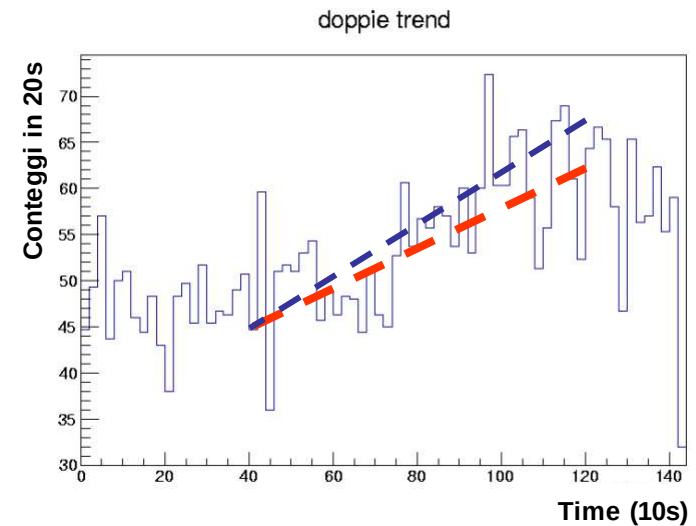
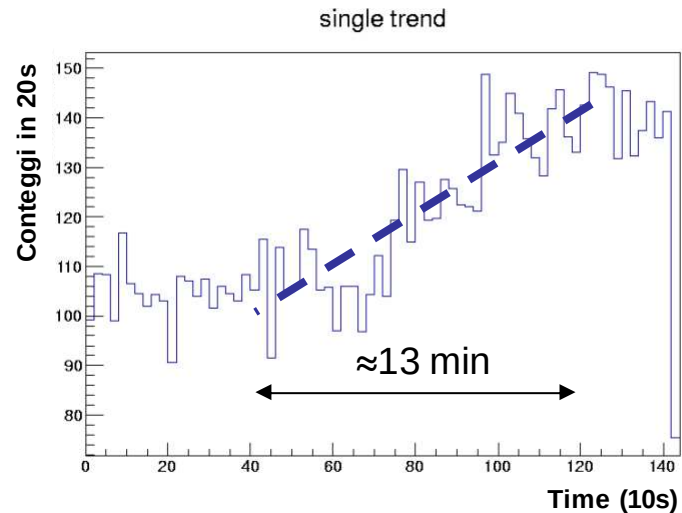


Misure durante la salita in funivia

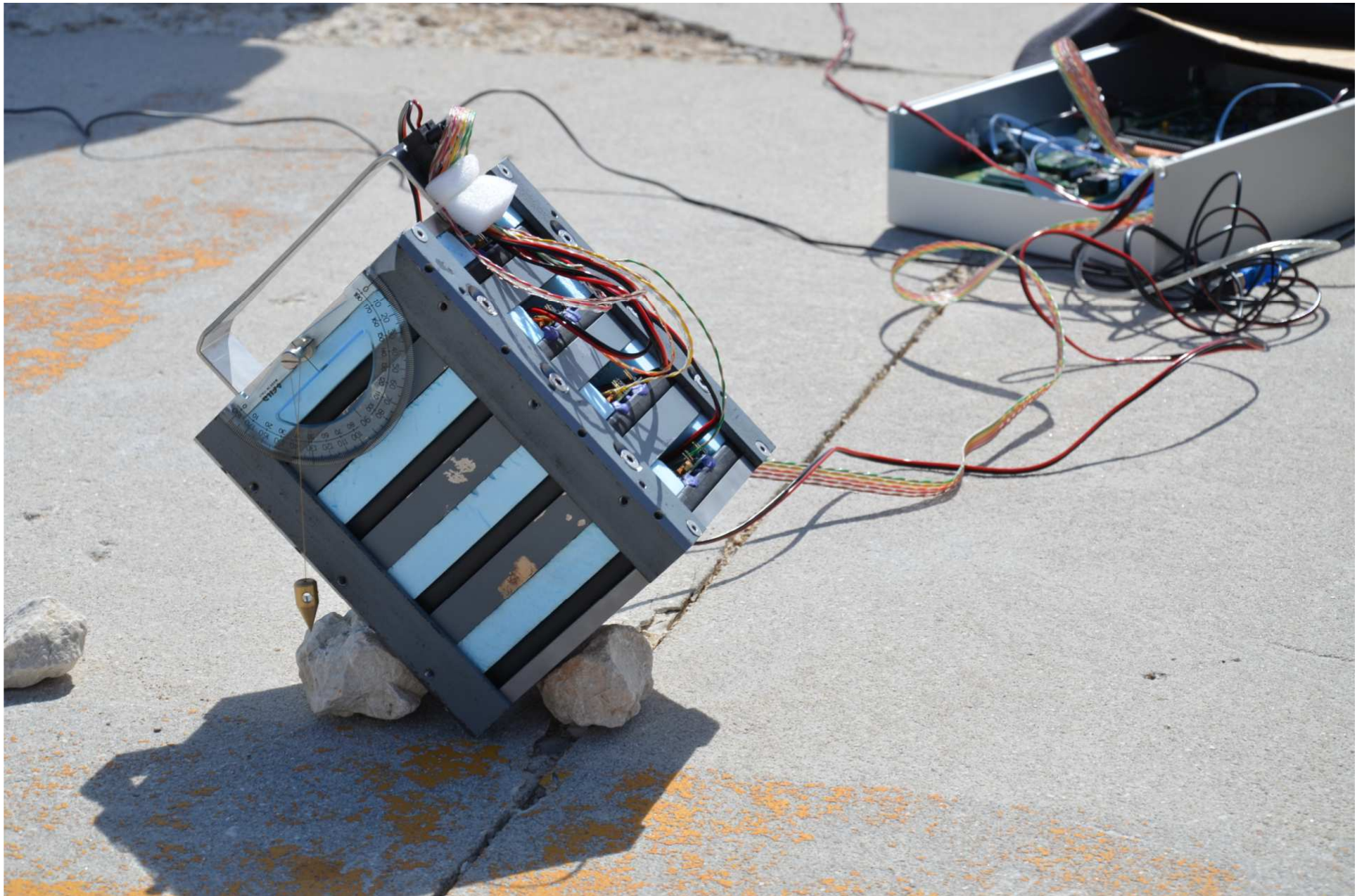


Misure durante la salita in funivia

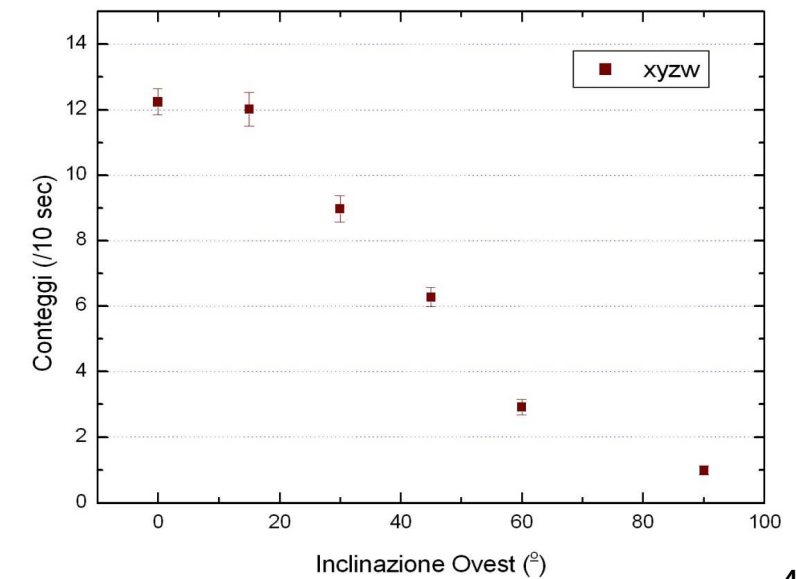
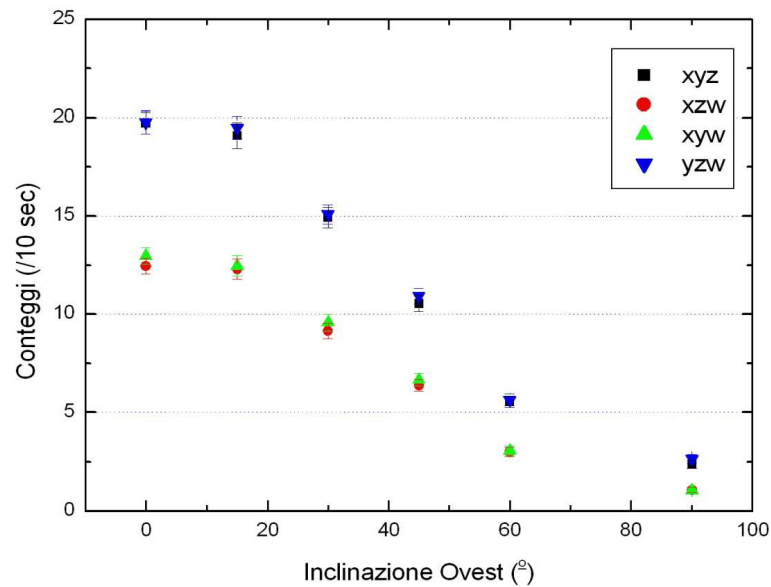
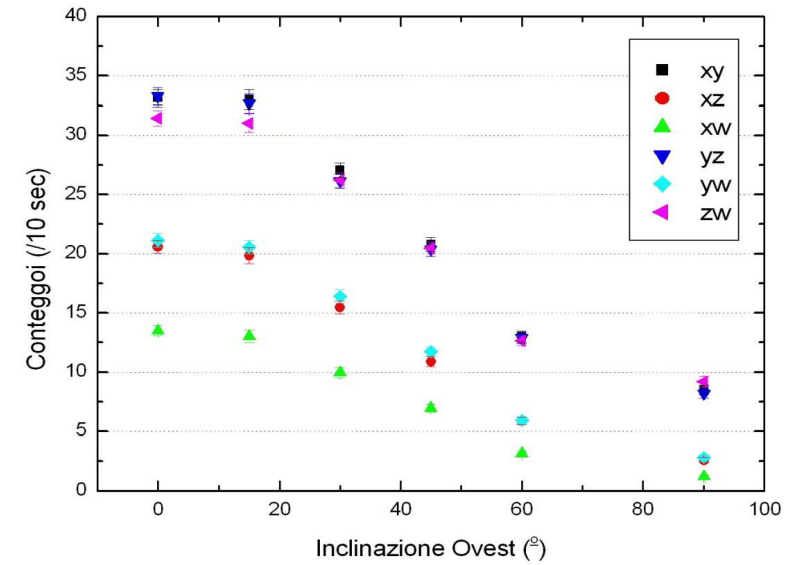
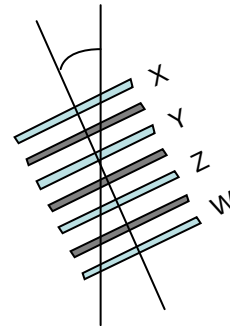
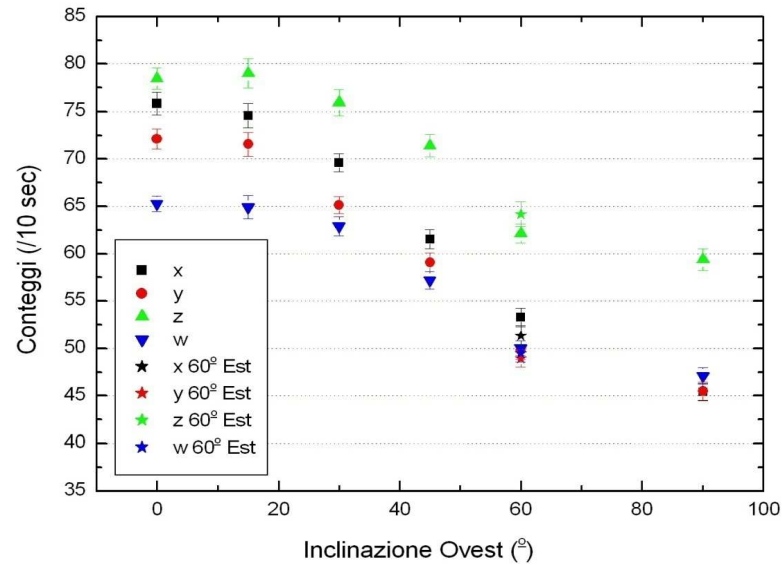
da Fonte Cerreto (1100m) a Campo Imperatore (2100m)



Dipendenza dall'angolo di zenith



Dipendenza dall'angolo di zenith





Futuro:

Analisi dati

Test detector

Upgrade detector

Nuove campagne di misure

Volo su pallone (?)

.....

“Risultati”

- Seminari/incontri per la formazione dei docenti
- Seminari/incontri con gli studenti
- Menzione di merito Congresso SIF 2011 e relativa pubblicazione
- Coinvolgimento/tesi G. Chiarello, studente Ingegneria delle telecomunicazioni
- Campagna di misure in alta quota / visita di LNGS con gli studenti
- Coinvolgimento M.Solters, summer student DOE-INFN
- Premio CAEN per il miglior poster a SciNeGHE 2012
- Coll. con M. Walter , DESY, commissione C4 “Cosmic Rays” della IUPAP
- Partecipazione iniziativa outreach con una rete europea di scuole il 26 settembre
-