

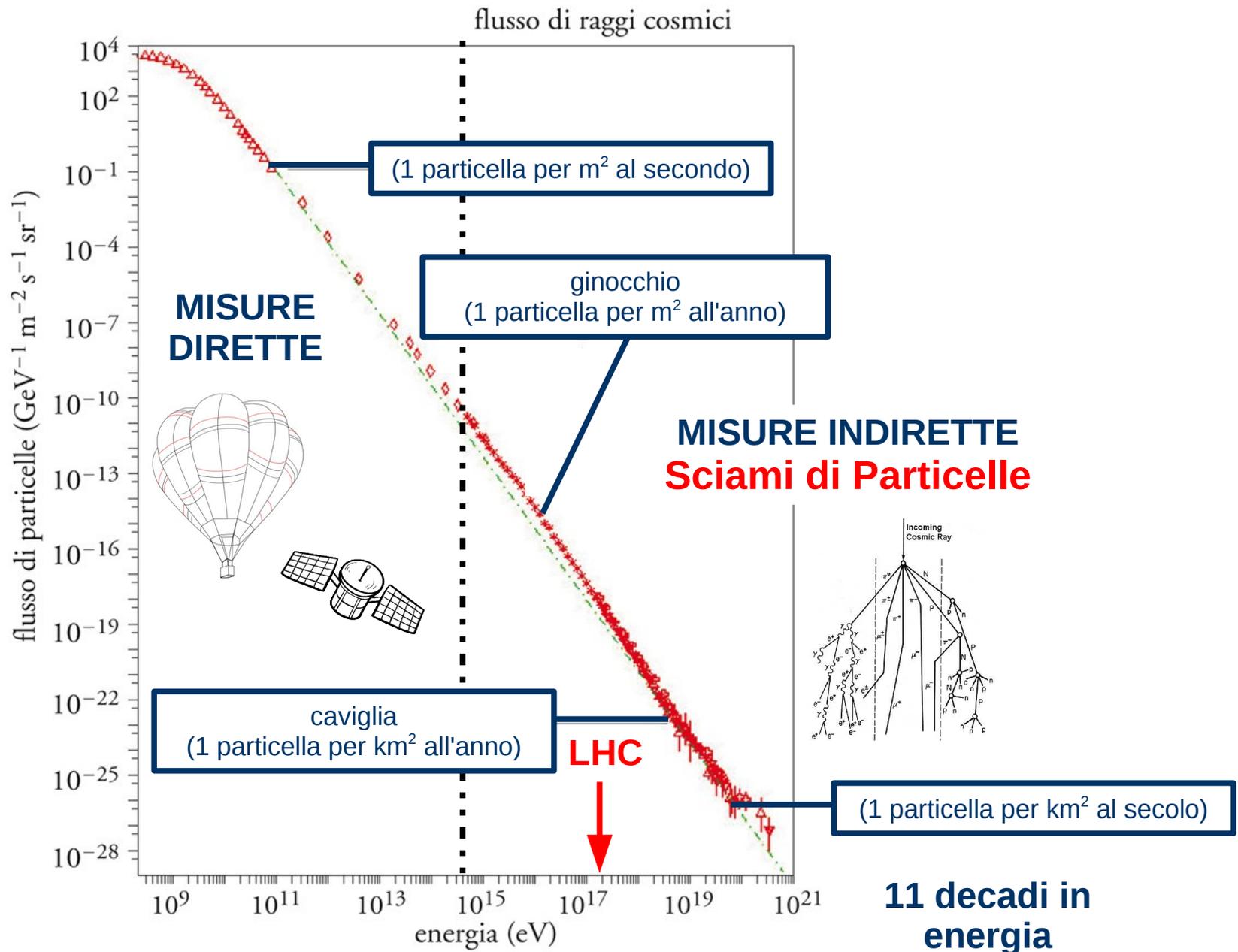
La Rivelazione Indiretta degli UHECR



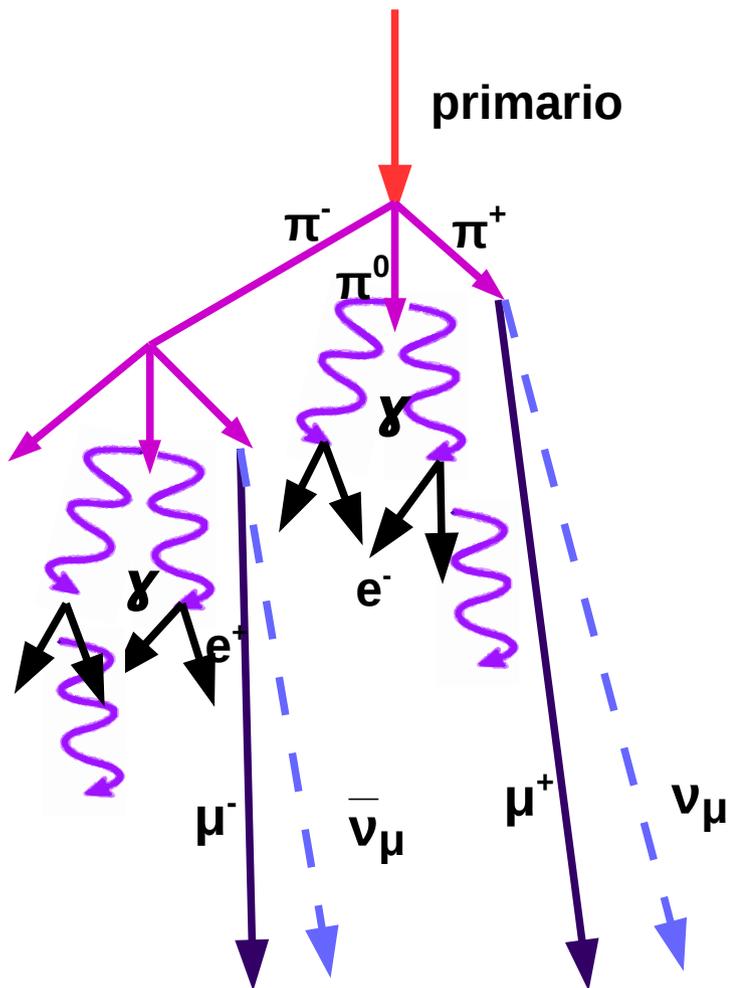
Roberta Colalillo, INFN Napoli
International Cosmic Day, 29 Novembre 2018

Lo Spettro dei Raggi Cosmici

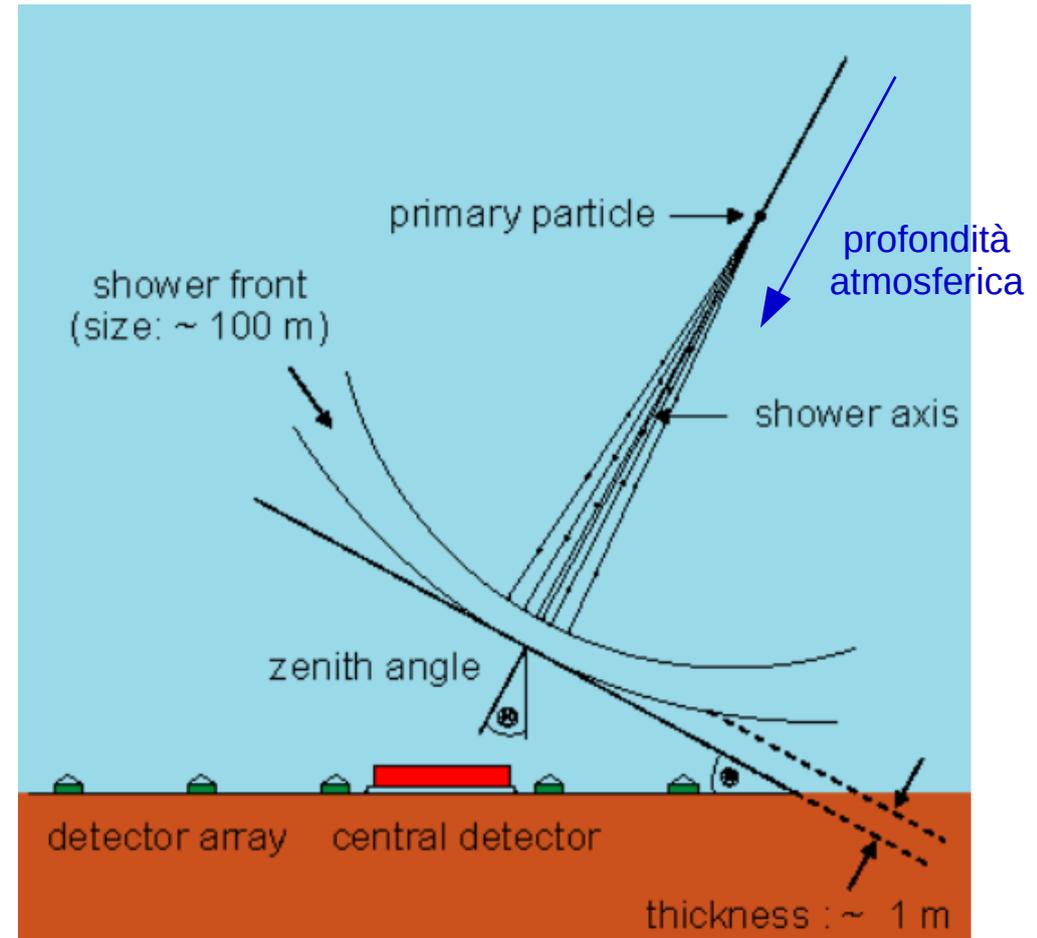
32 decenni in intensità



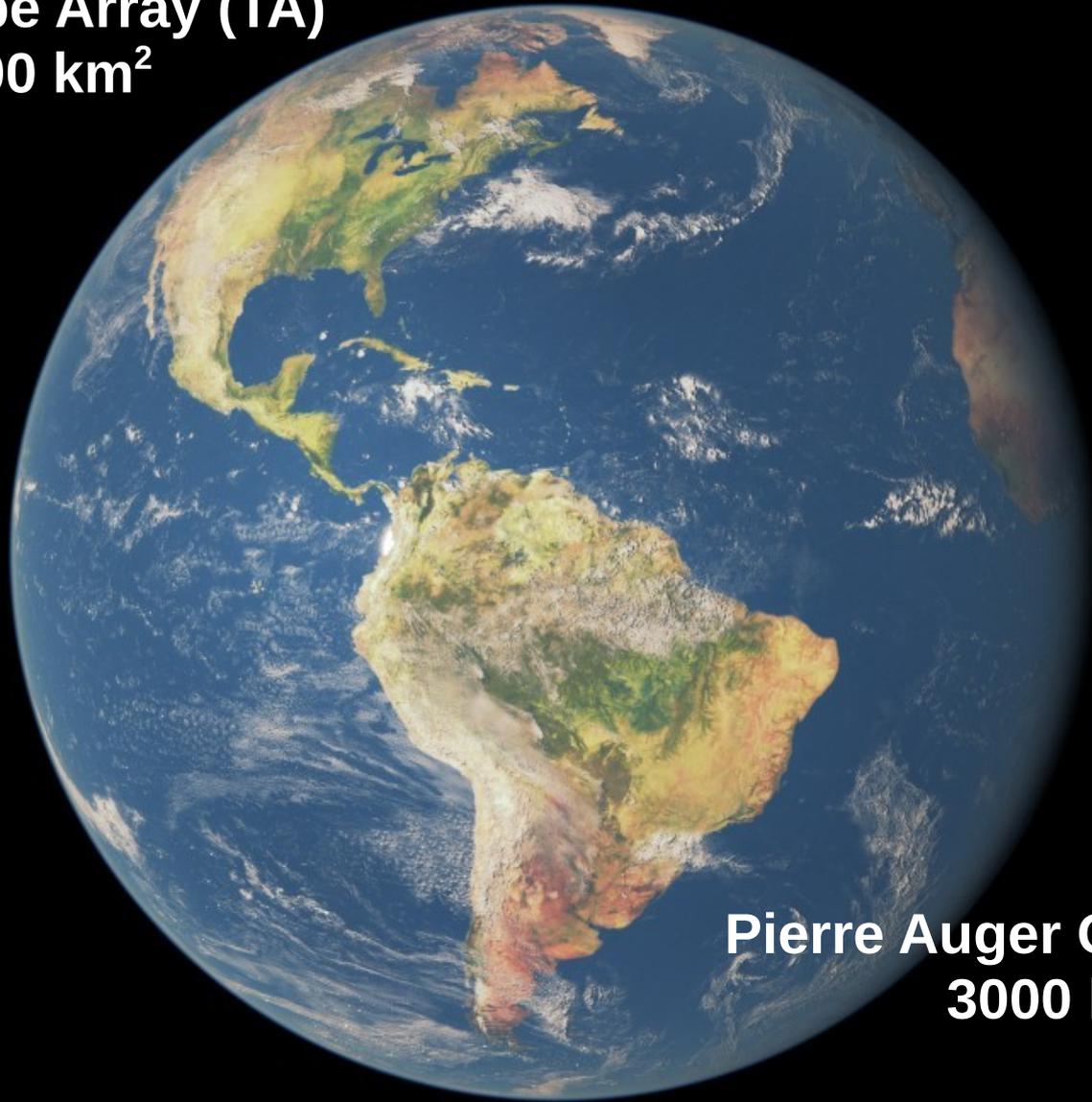
Caratteristiche di uno Sciame Atmosferico Esteso



Componente Adronica;
Componente Elettromagnetica;
Componente Muonica.



Telescope Array (TA)
700 km²



Pierre Auger Observatory
3000 km²

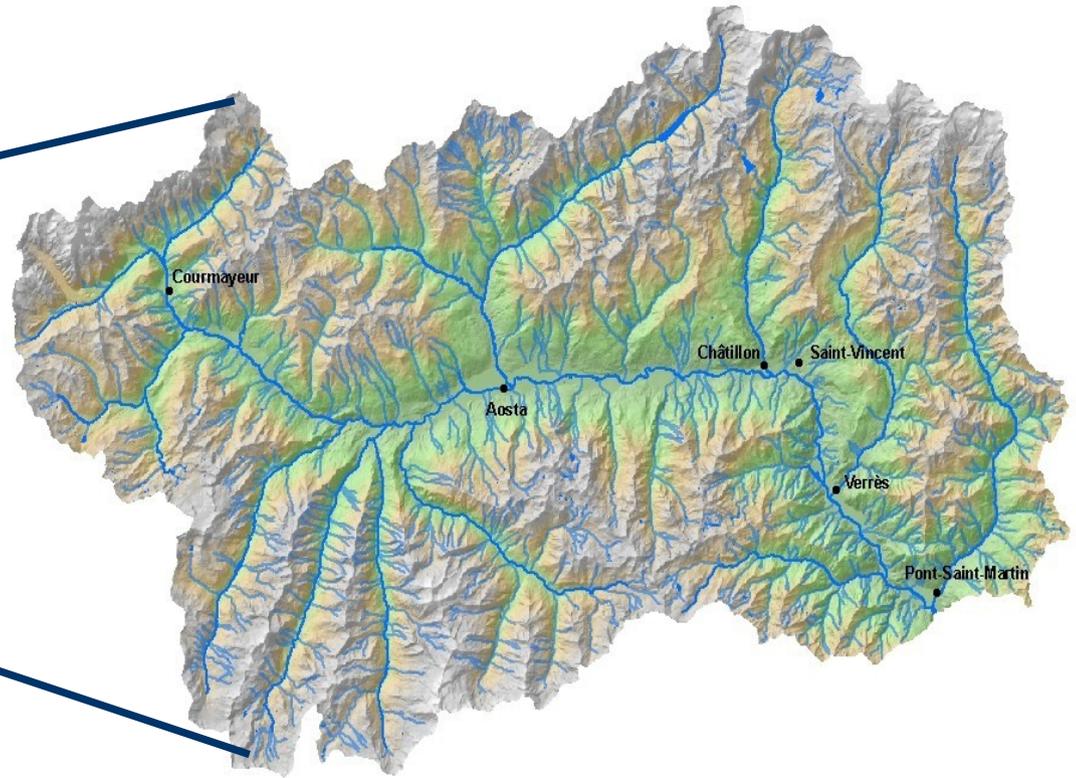
Nel cuore della Pampa



Nel cuore della Pampa

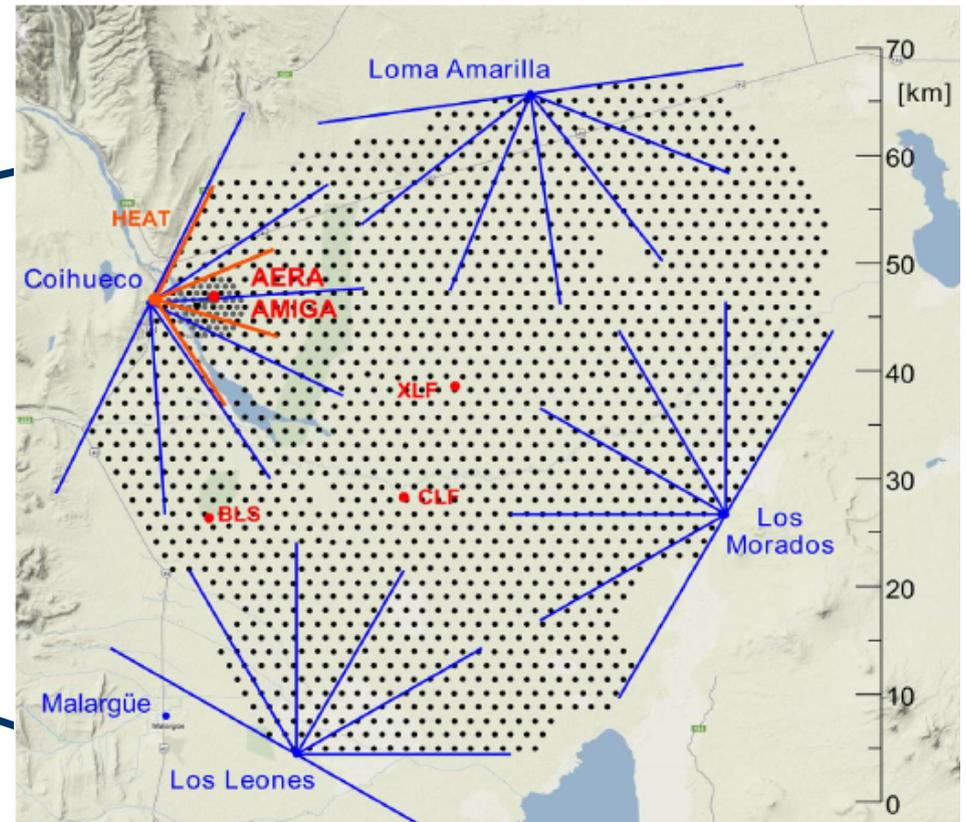


VALLE D'AOSTA

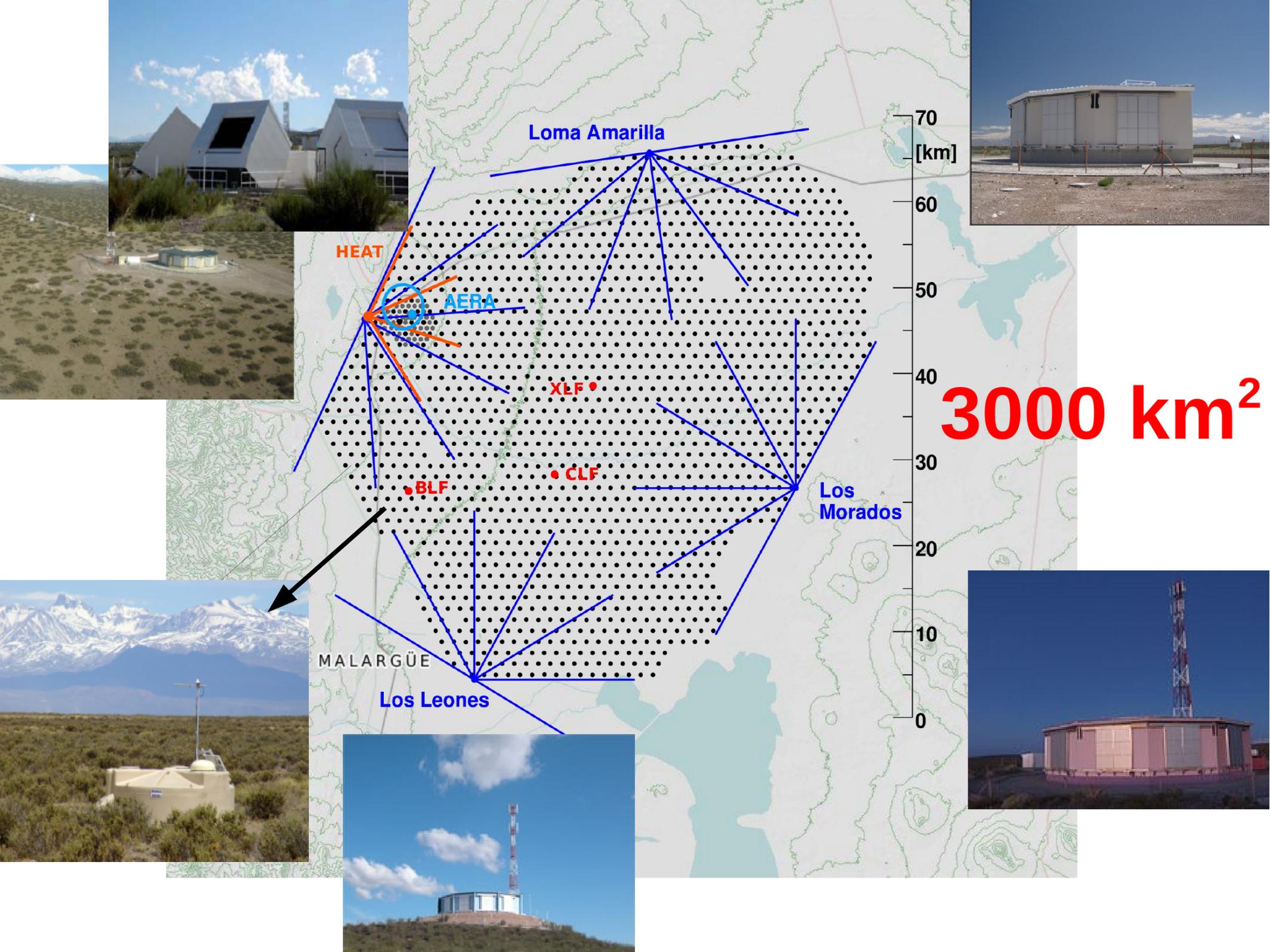


3260 km²

L'Osservatorio Pierre Auger

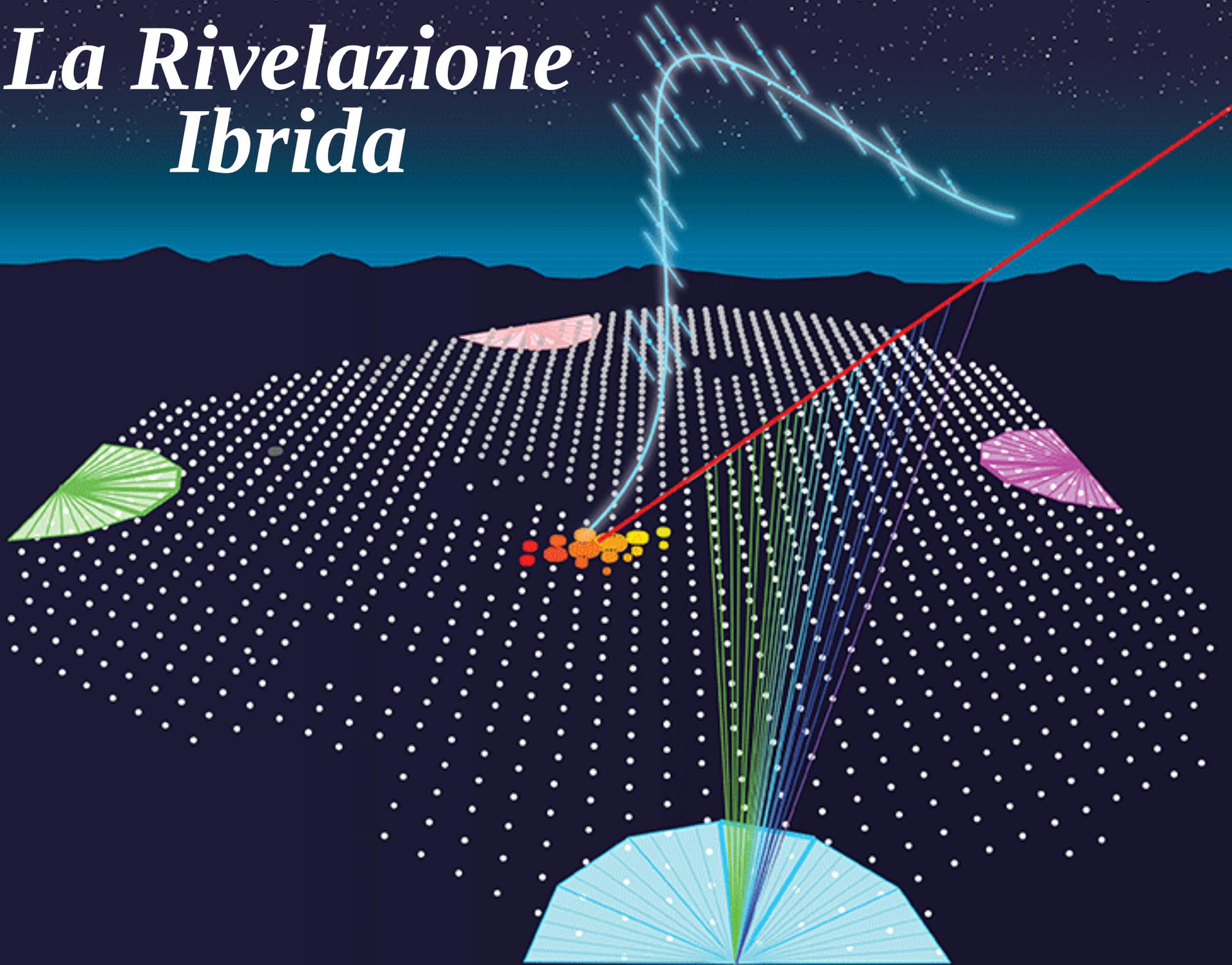


~3000 km²

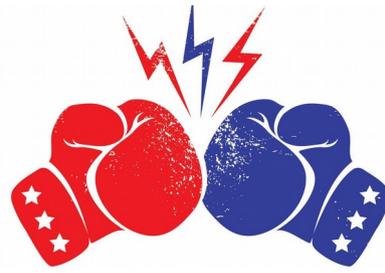




La Rivellazione Ibrida



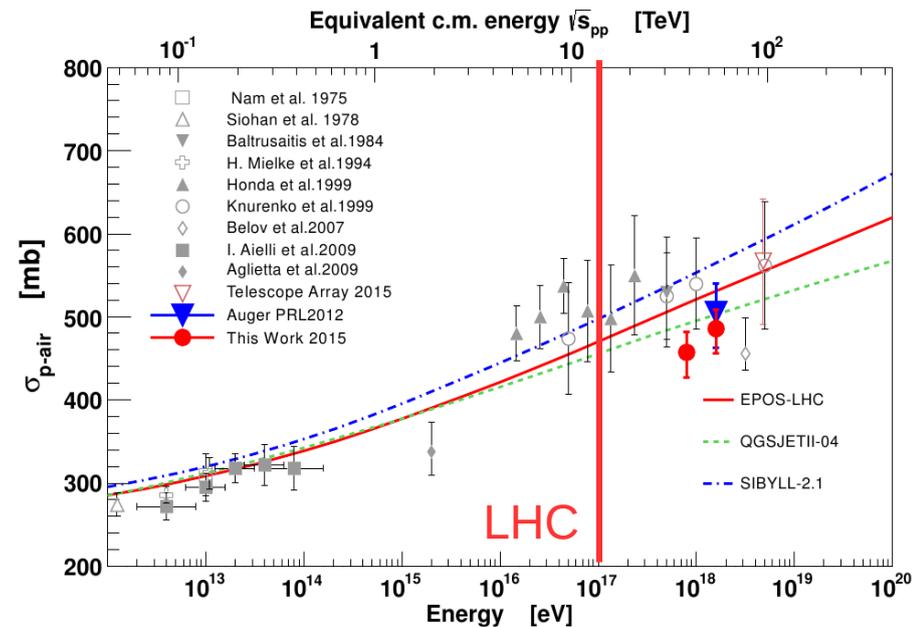
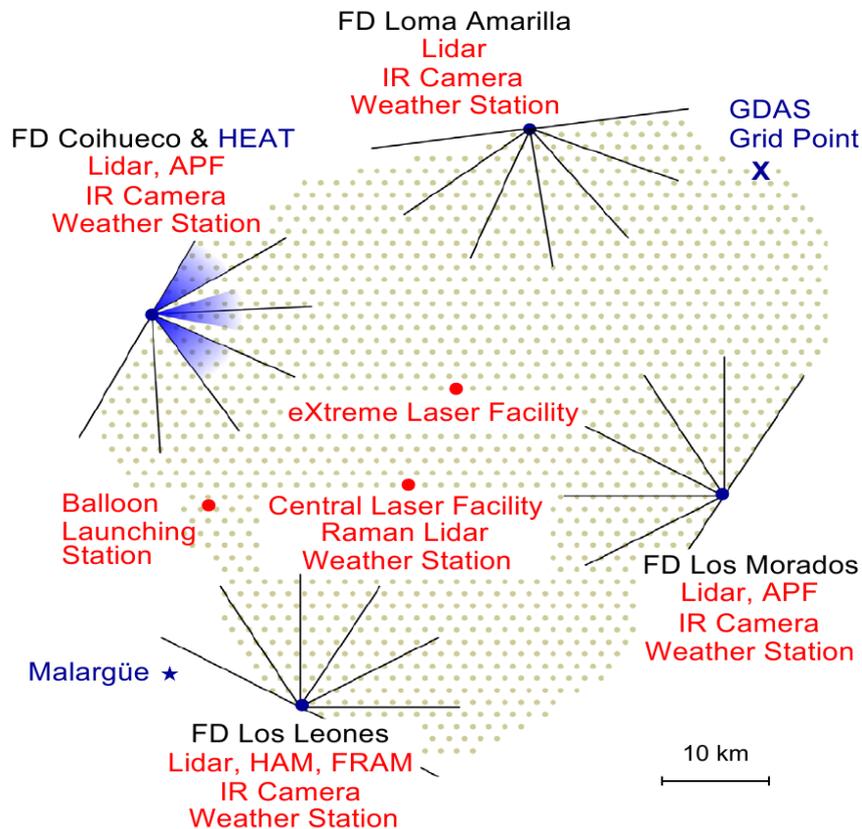
Fluorescence Detector



Surface Detector

- ★ Duty Cycle: 15%
- ★ Misura calorimetrica dell'energia

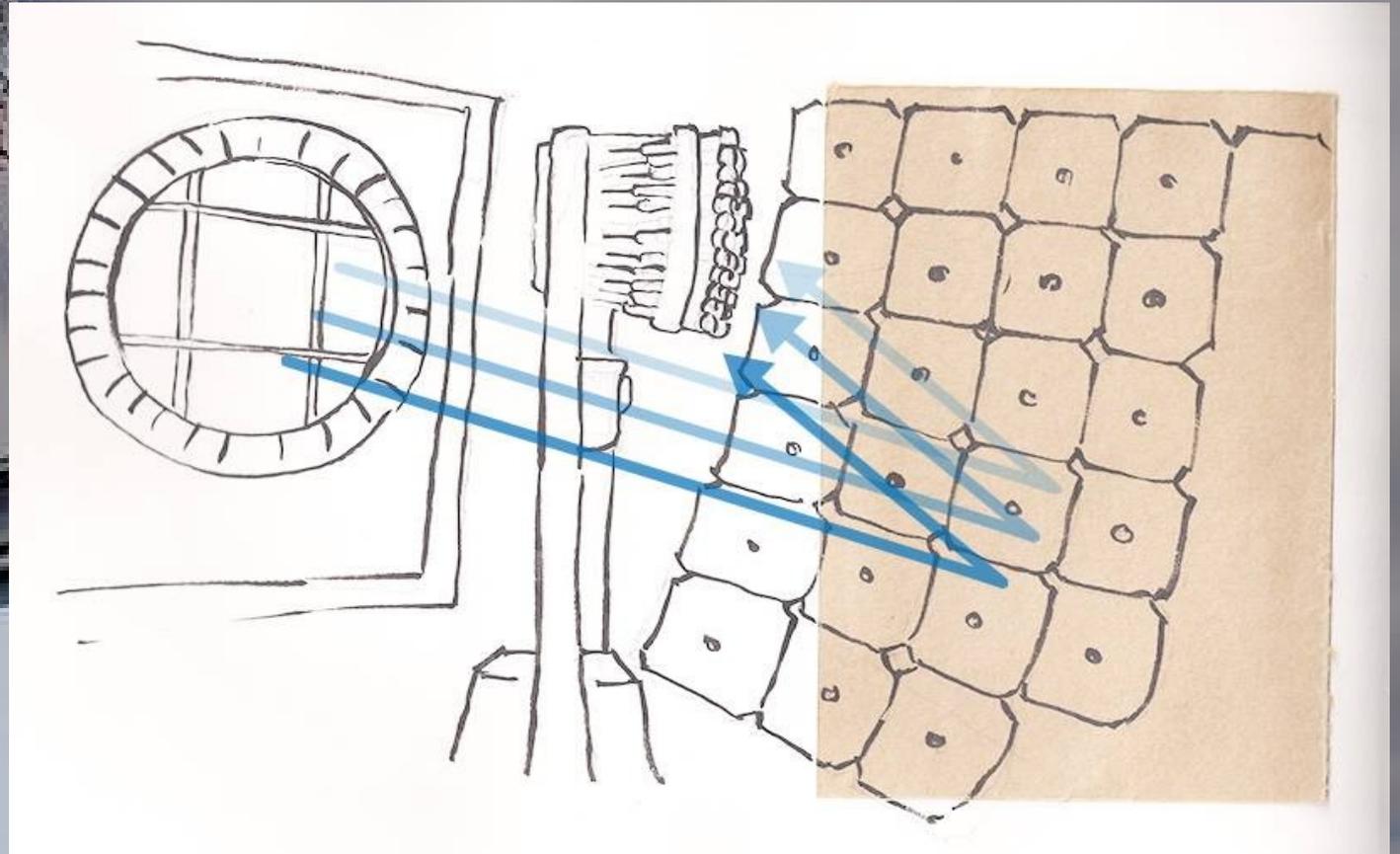
- ★ Duty Cycle 100%
- ★ Stima dell'energia dipendente dai modelli d'interazione



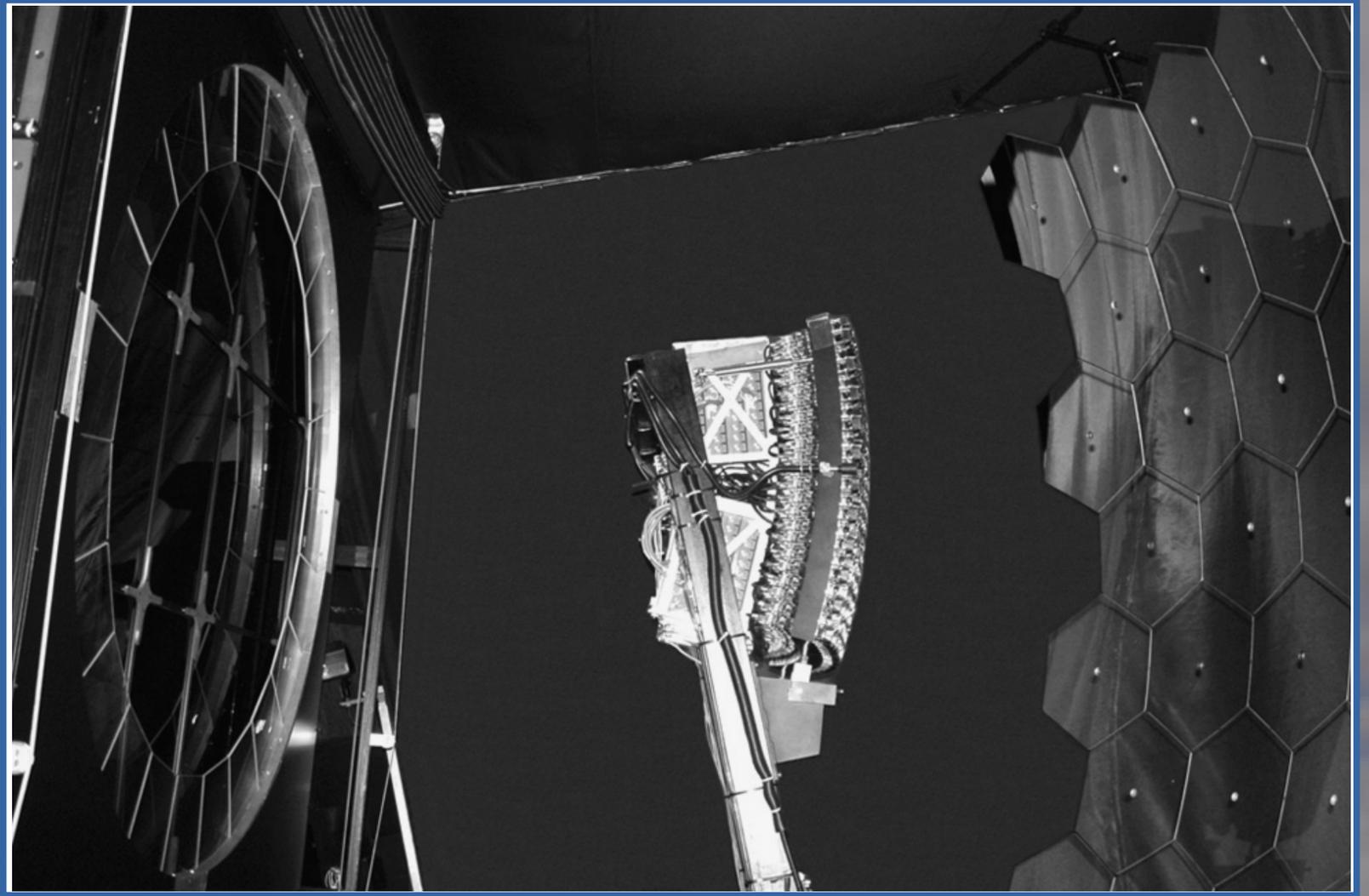
Il Rivelatore di Fluorescenza



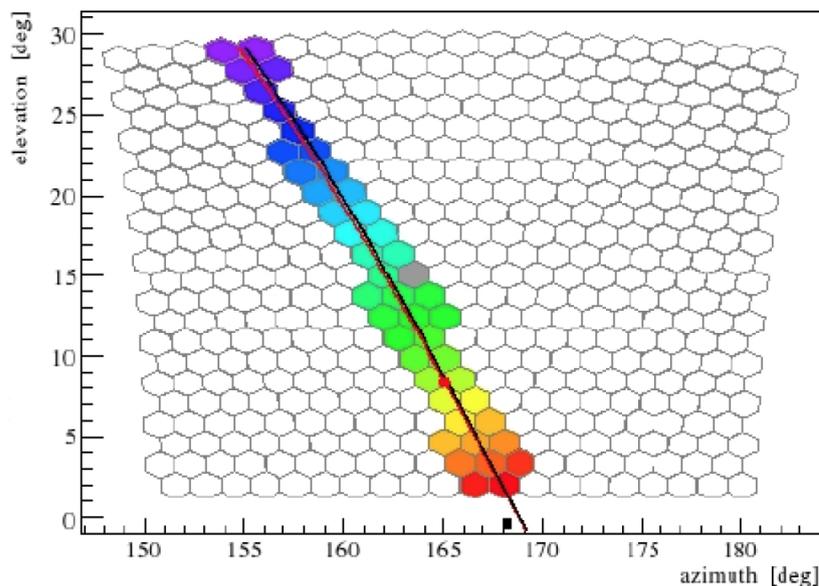
Come funziona?



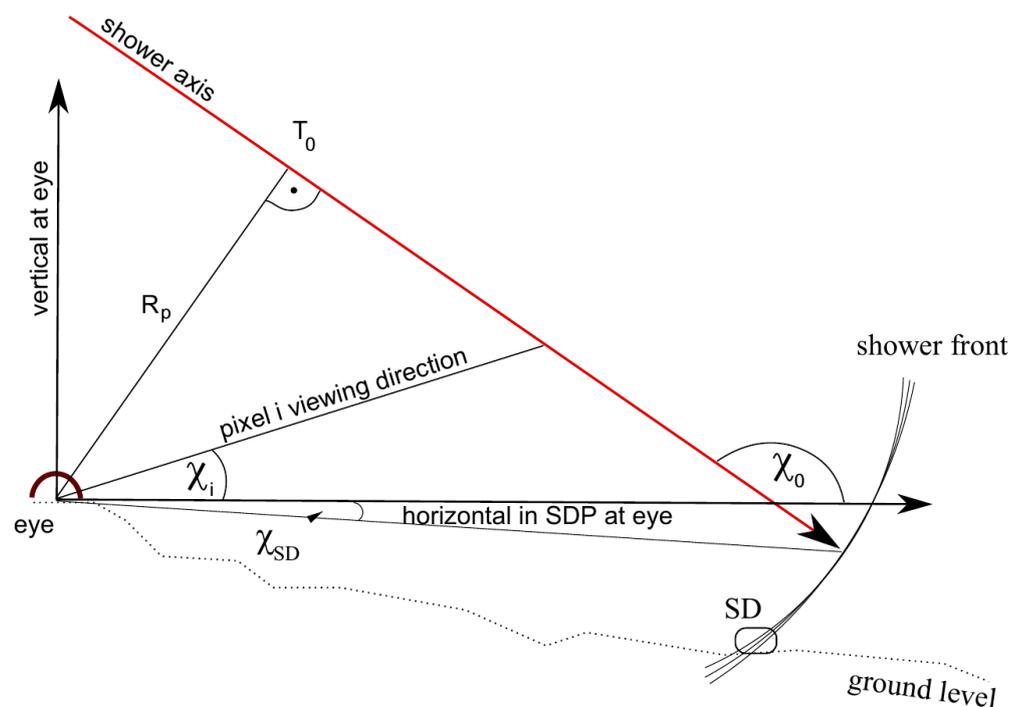
Come funziona?



Ricostruzione Geometria dello Sciame



Traccia di uno sciame sulla camera:
matrice di 440 PMT



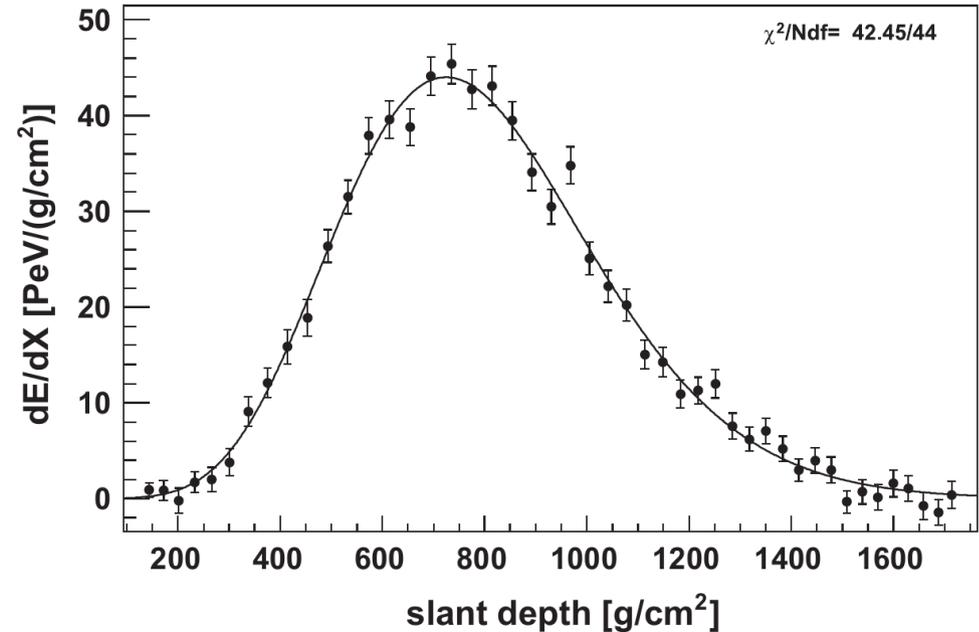
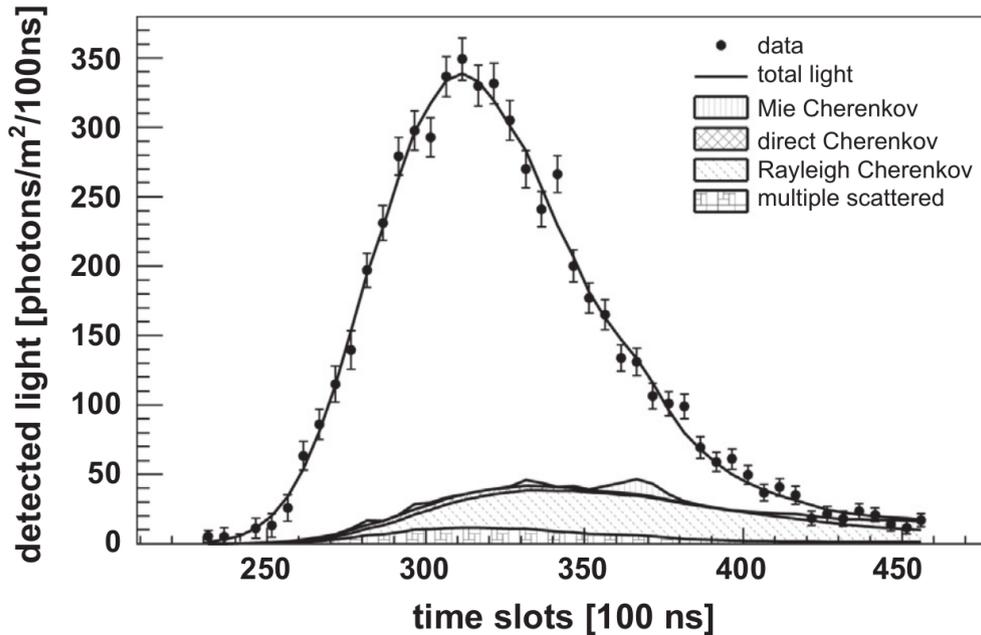
SDP (Shower Detector Plane):
piano contenente l'asse dello sciame e il telescopio di fluorescenza.
La proiezione di uno sciame sulla camera evolve lungo lo SDP
→ in questo piano, conoscendo i tempi di arrivo del segnale in ciascun pixel, ricostruiamo l'asse dello sciame.

Profilo Longitudinale e Misura di Energia

Da luce (numero di fotoni)
raccolta in funzione del tempo

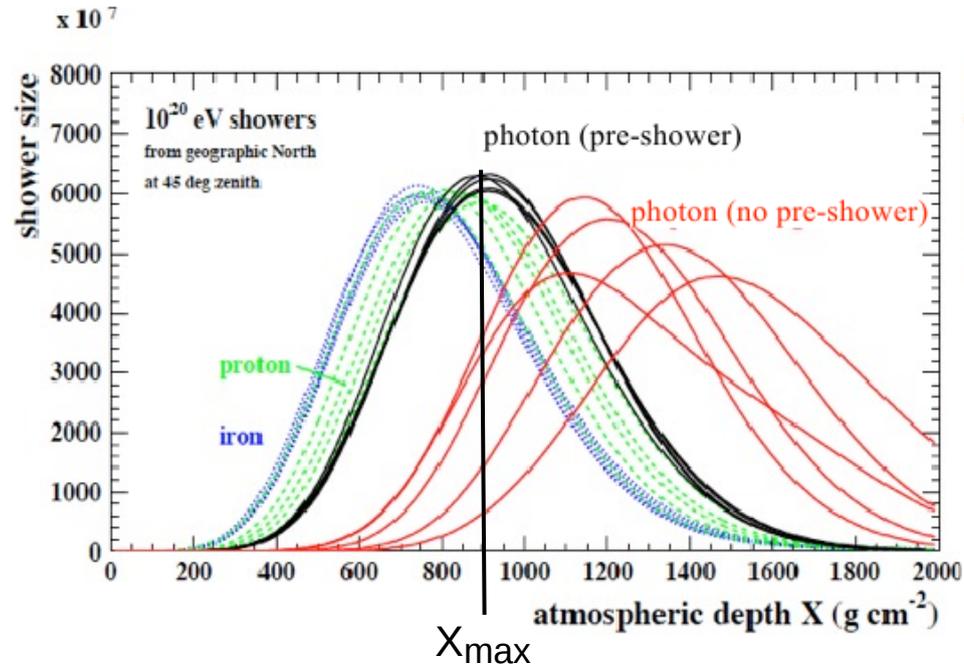


A energia depositata da uno
sciame in funzione della
profondità atmosferica.

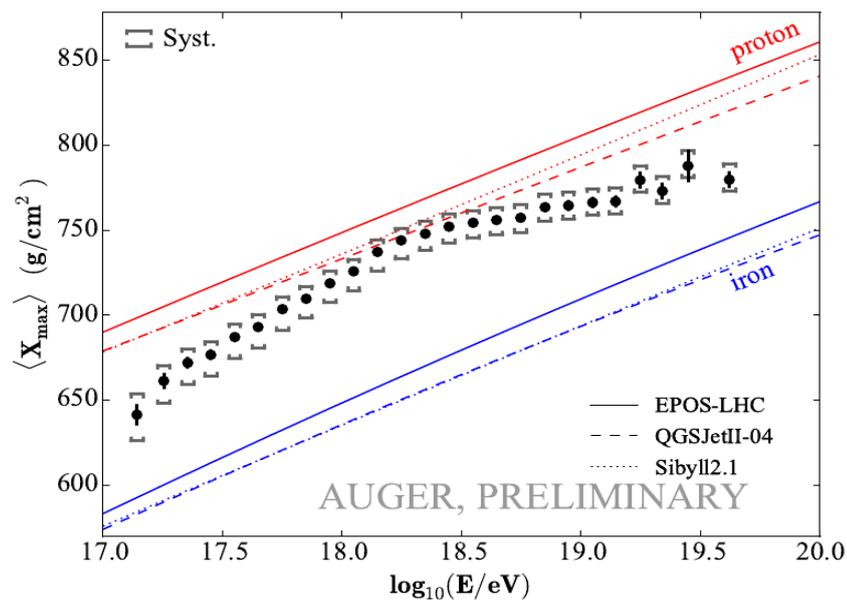


Dal fit di questo profilo, otteniamo
l'energia del primario.

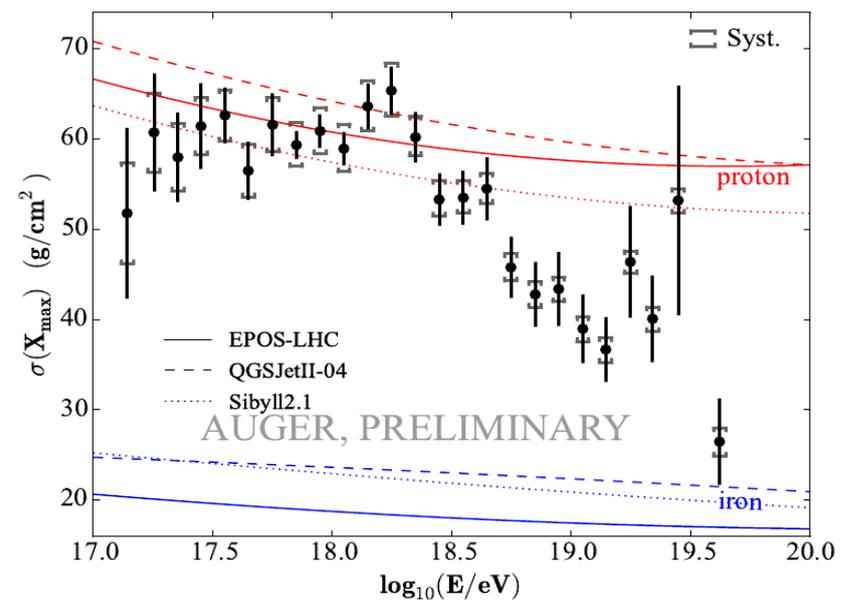
Misura di Composizione Chimica



Average of X_{max}



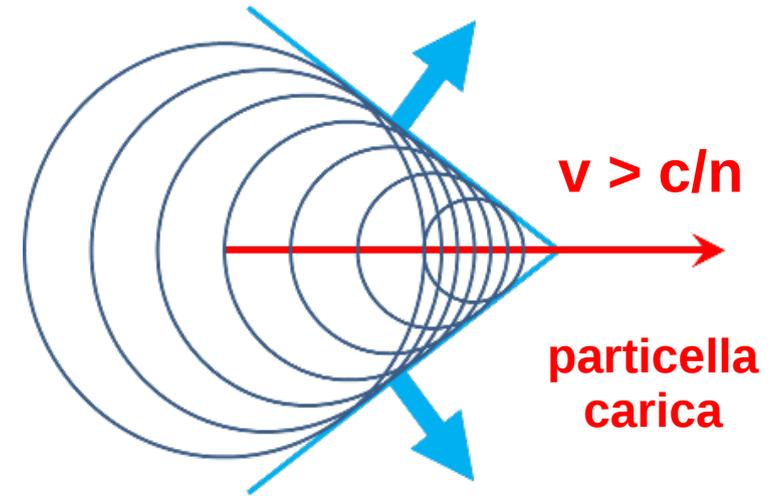
Std. Deviation of X_{max}



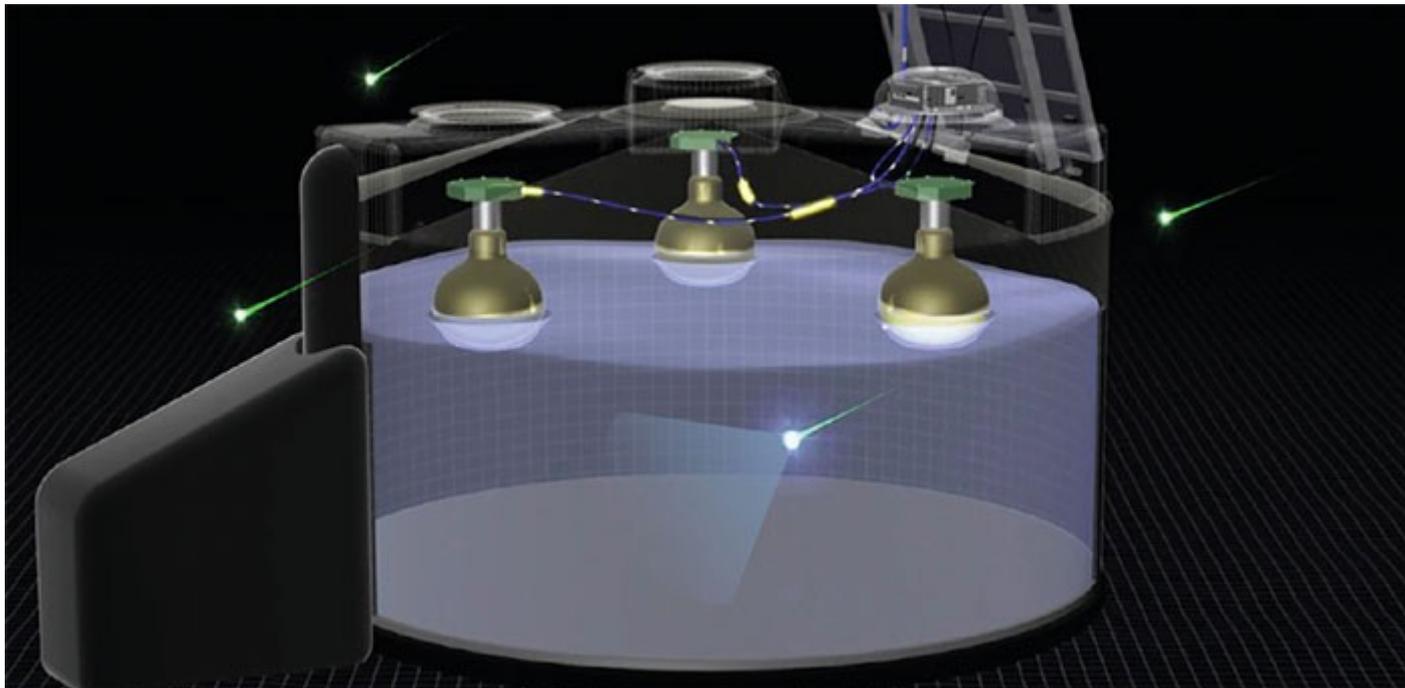
Il Rivelatore di Superficie



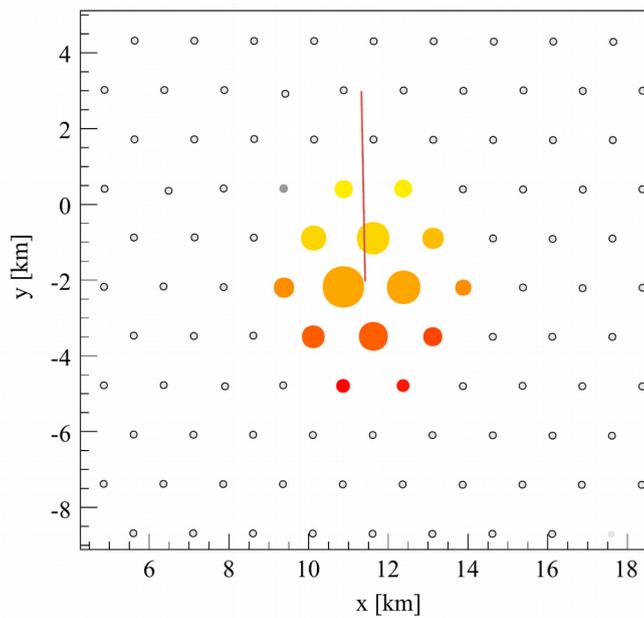
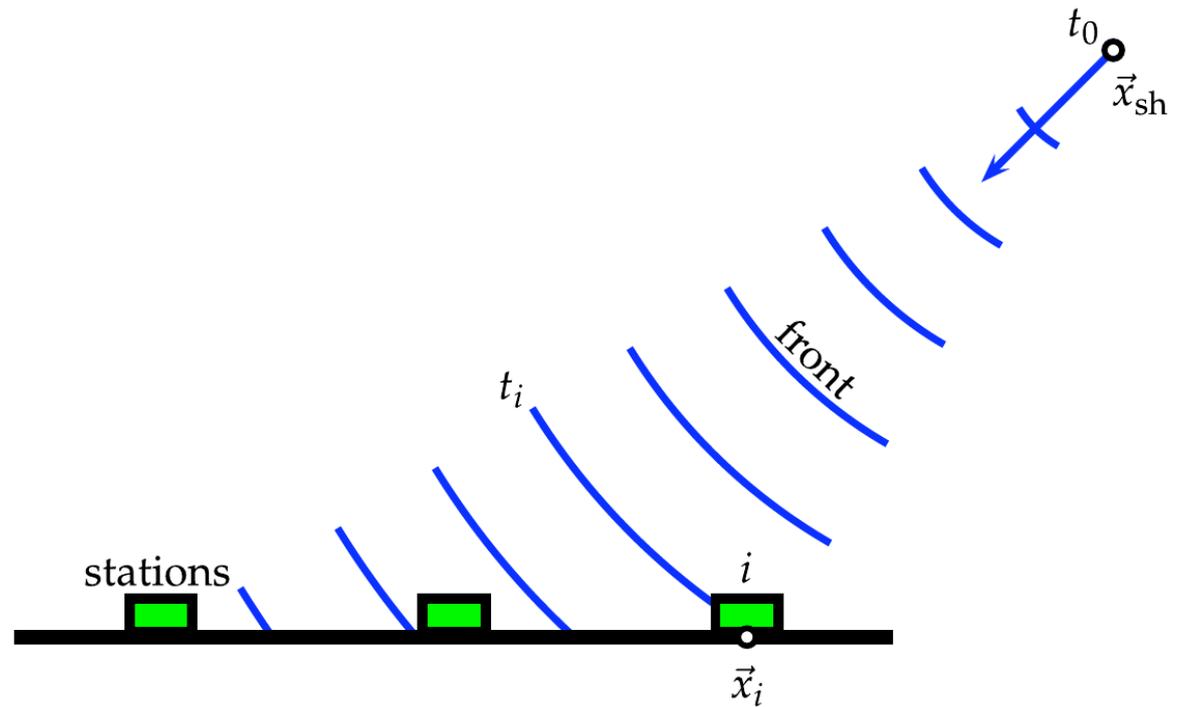
Il Rivelatore di Superficie



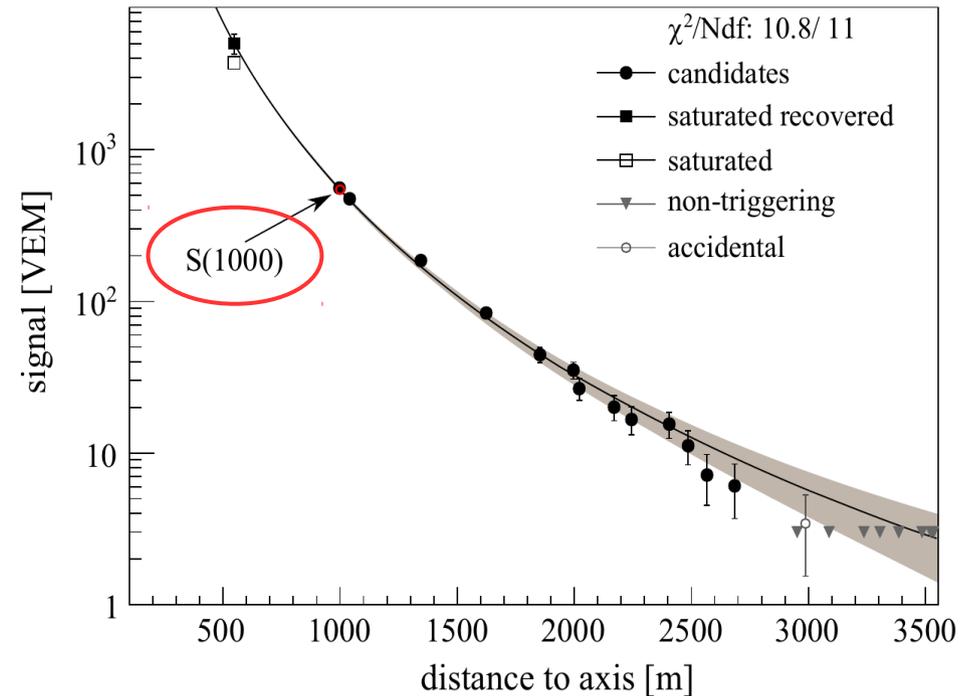
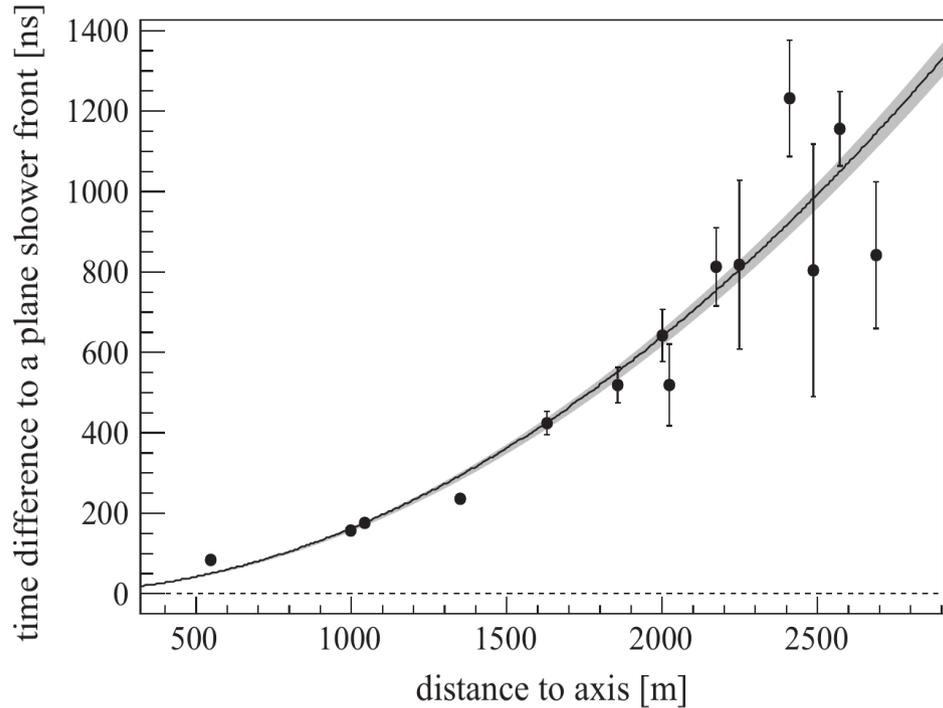
LUCE CHERENKOV



Impronta dello Sciame a Terra

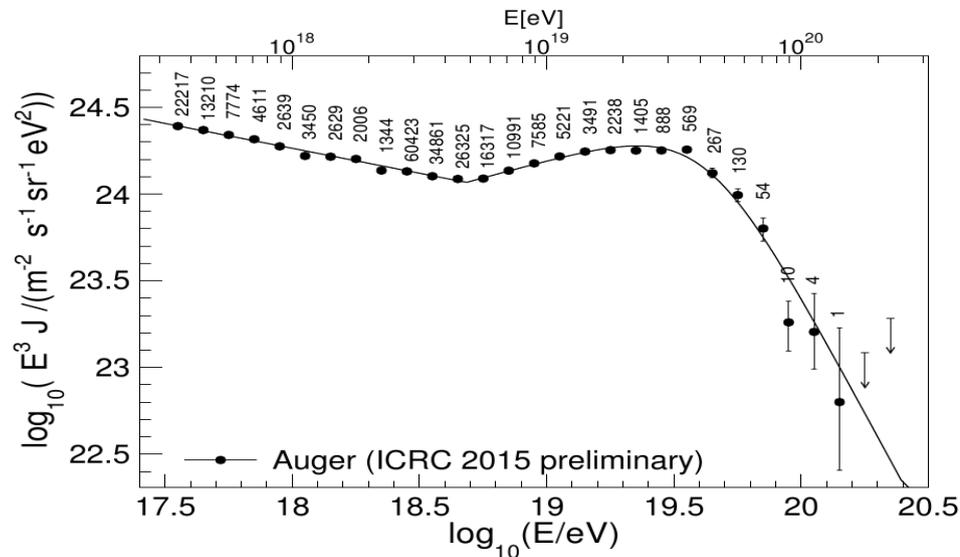
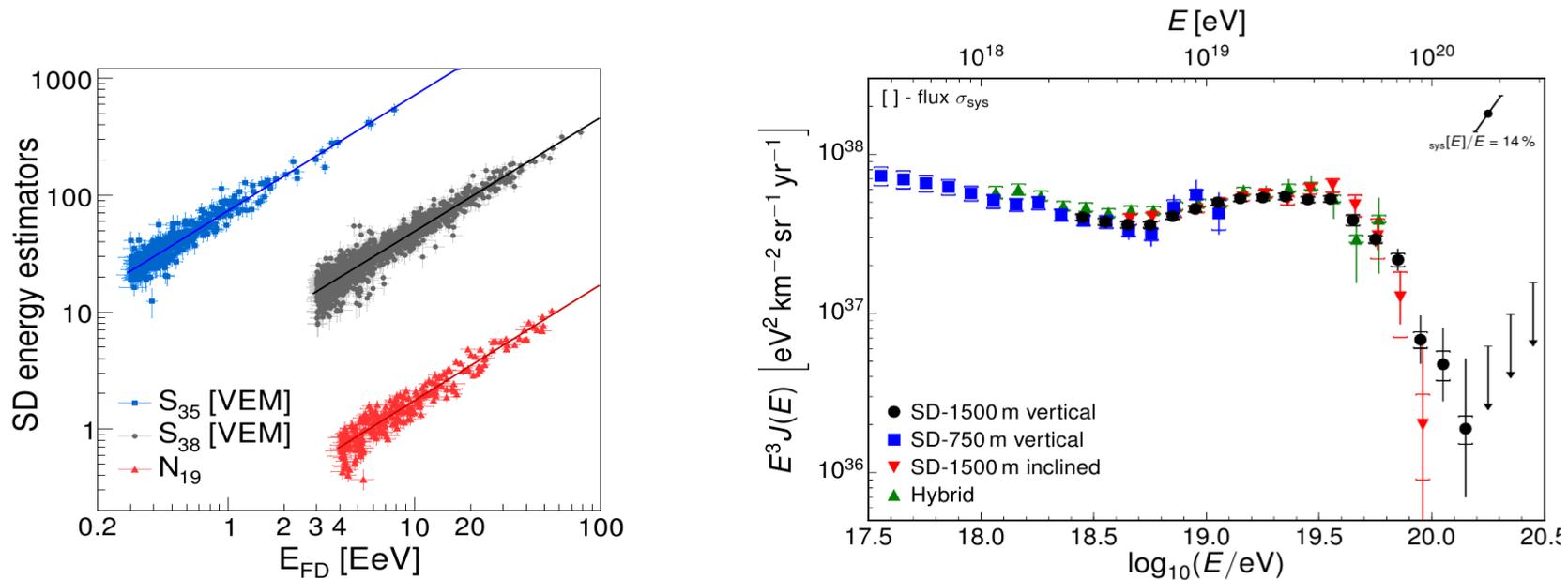


Profilo Trasversale

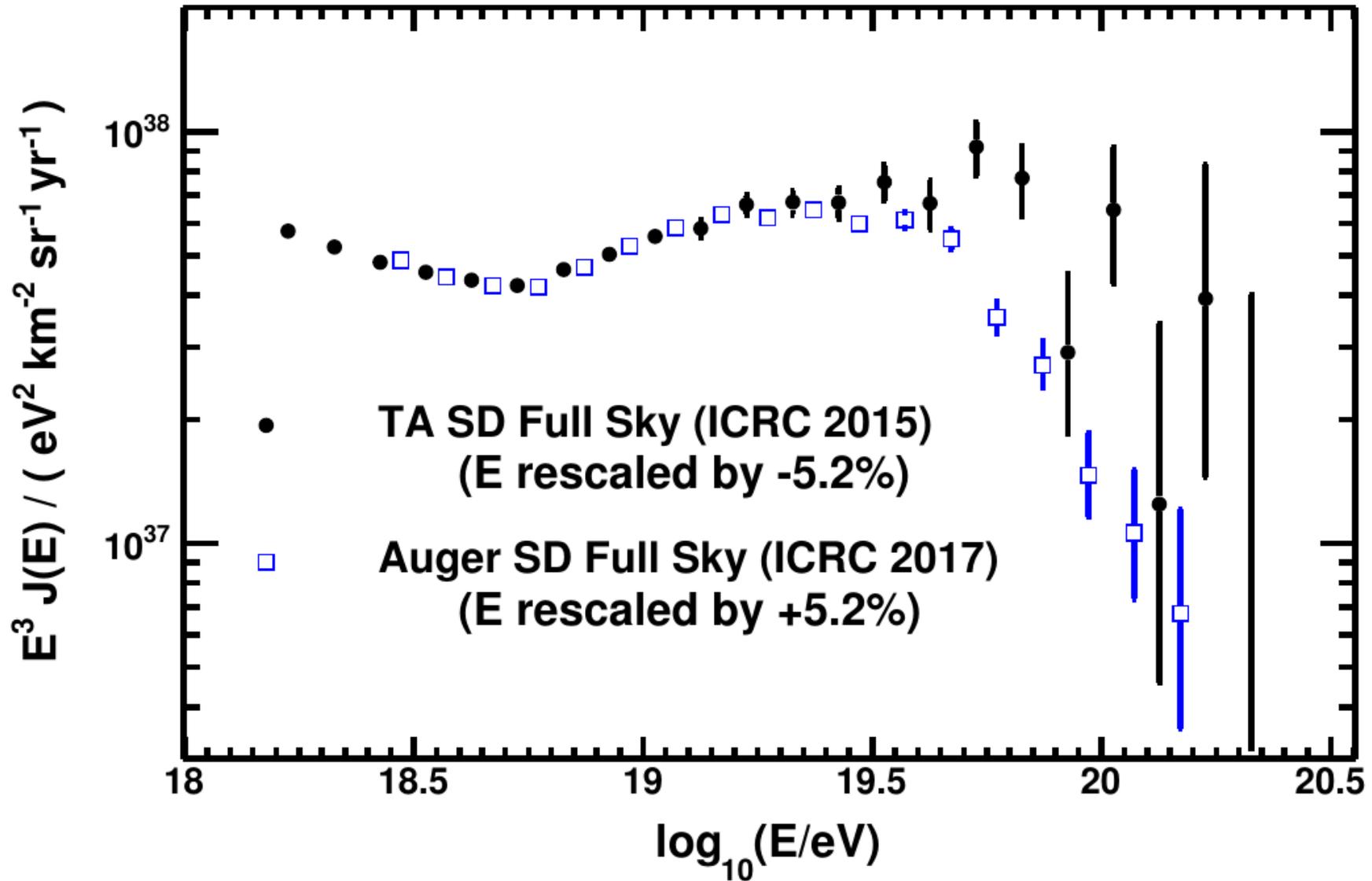


Stima dell'energia ottenuta col rivelatore di superficie legata ai modelli adronici.

Rivelazione Ibrida: Intercalibrazione + Spettro

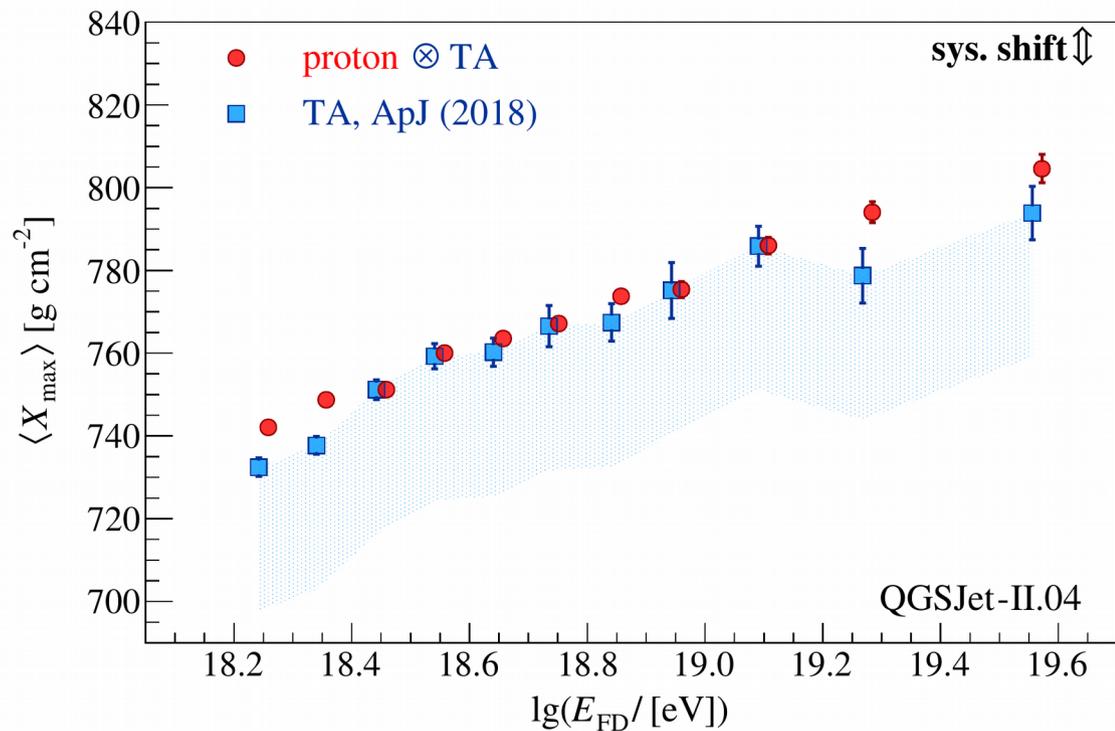
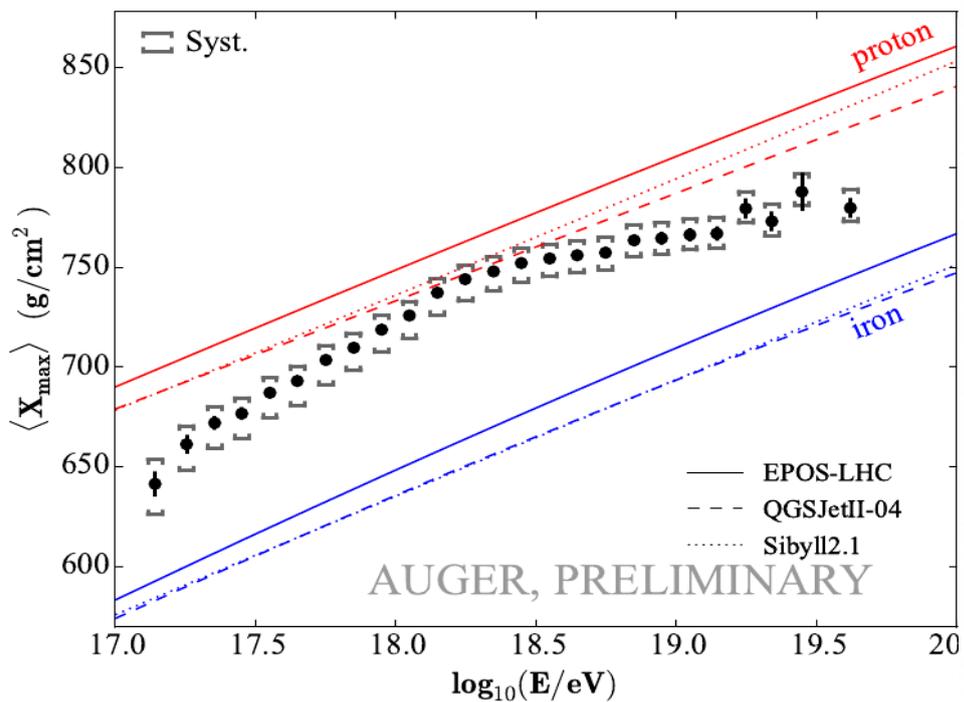


Auger vs TA



Auger vs TA

Average of X_{\max}





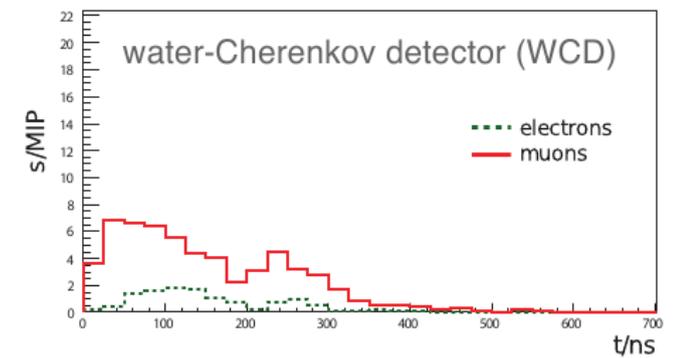
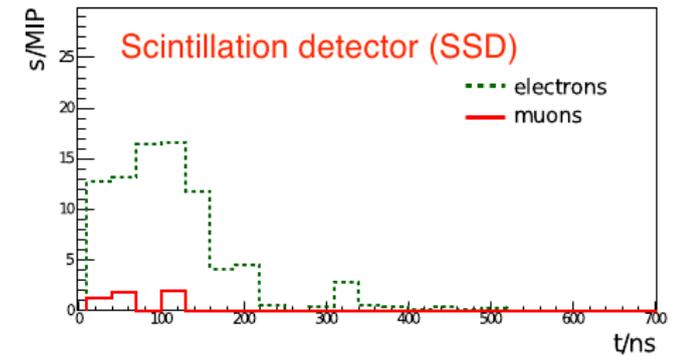
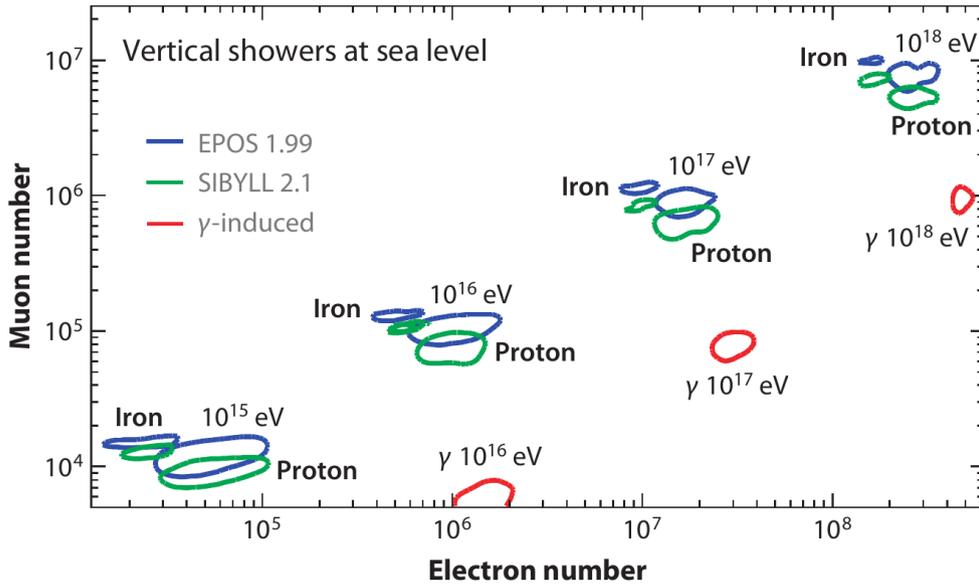
Signature Ceremony of International Agreement
for the Pierre Auger Observatory

E non finisce qui ...

Malargüe, 16 November 2015

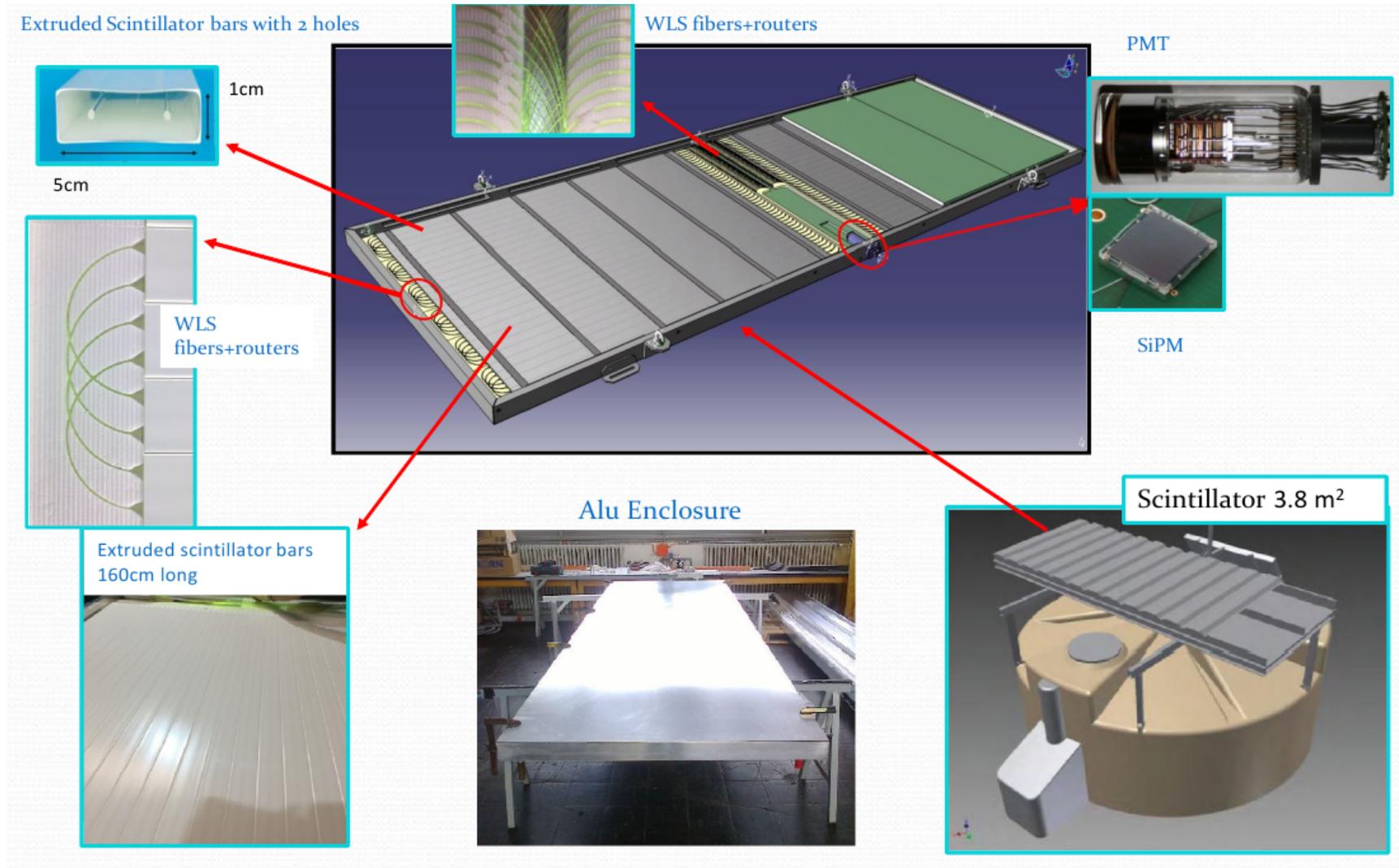


AugerPrime



$$S_{\mu, \text{WCD}} = a S_{\text{WCD}} + b S_{\text{SSD}}$$

SSD (Surface Scintillator Detector)



Primo Prototipo di SSD Installato



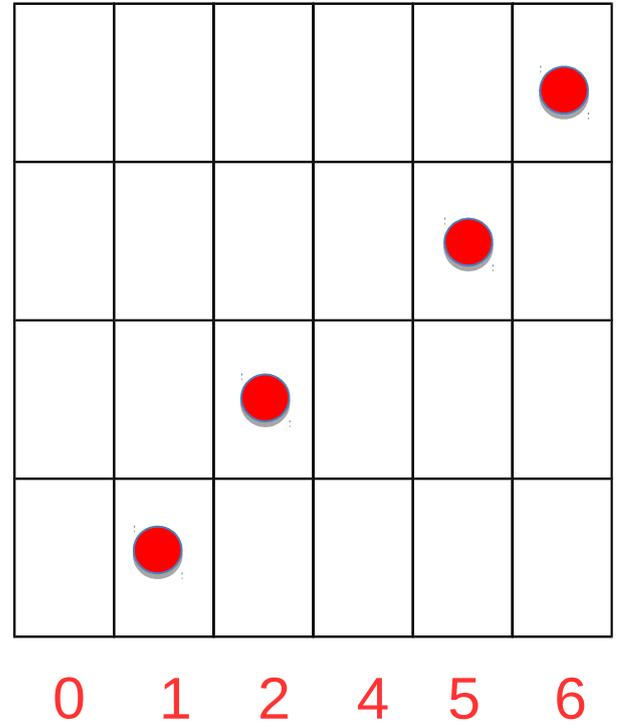
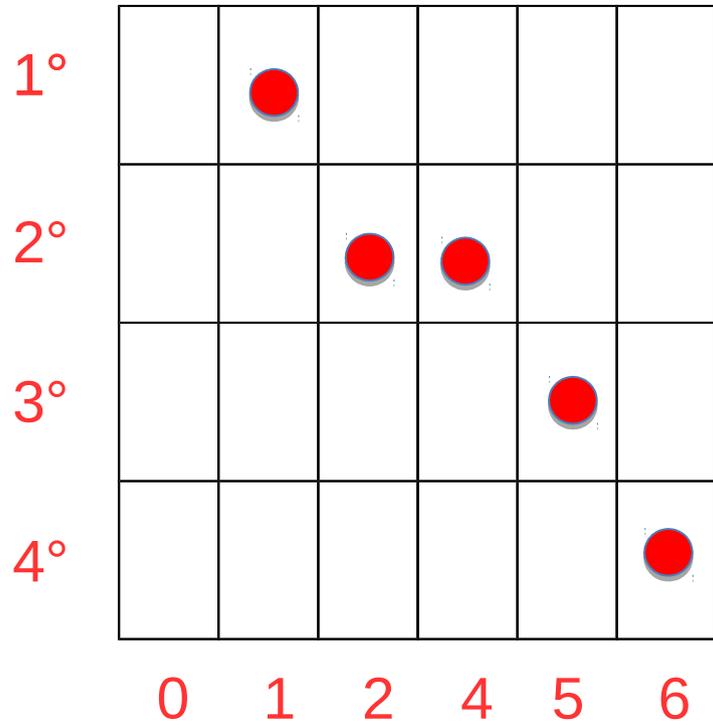
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

Scheda Master

Asse x

Scheda Slave

Asse y



evento n. 1163

x: 100C0201

y: 01020810

Primo piano
 Secondo piano
 Terzo piano
 Quarto piano

10 hex= 0001 0000
 0C hex= 0000 1100
 02 hex= 0000 0010
 01 hex= 0000 0001

01 hex= 0000 0001
 02 hex= 0000 0010
 08 hex= 0000 1000
 10 hex= 0001 0000

canale 01 2345

01 2345

	x	y
1° piano		
2° piano		
3° piano		
4° piano		

