



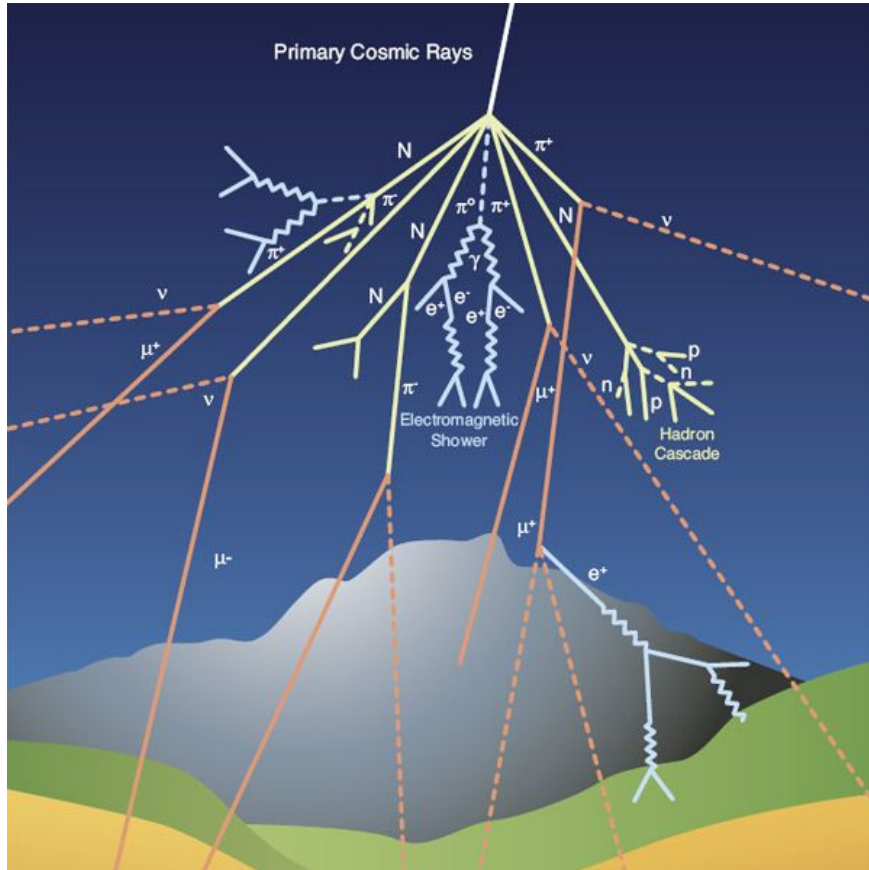
Construcción de un telescopio de muones para hacer muongrafía al volcán cerro machín

J. Perea-Perez, C. Sarmiento-Cano, D.
Castillo-Morales, R. A. Martinez-Rivero, J.
Pisco-Guabave, J. Ruiz-Higuera, D. Sandoval-Galvis,
D. Vasquez-Duran, J. Sanabria-Gomez, L. Nunez

Contenido

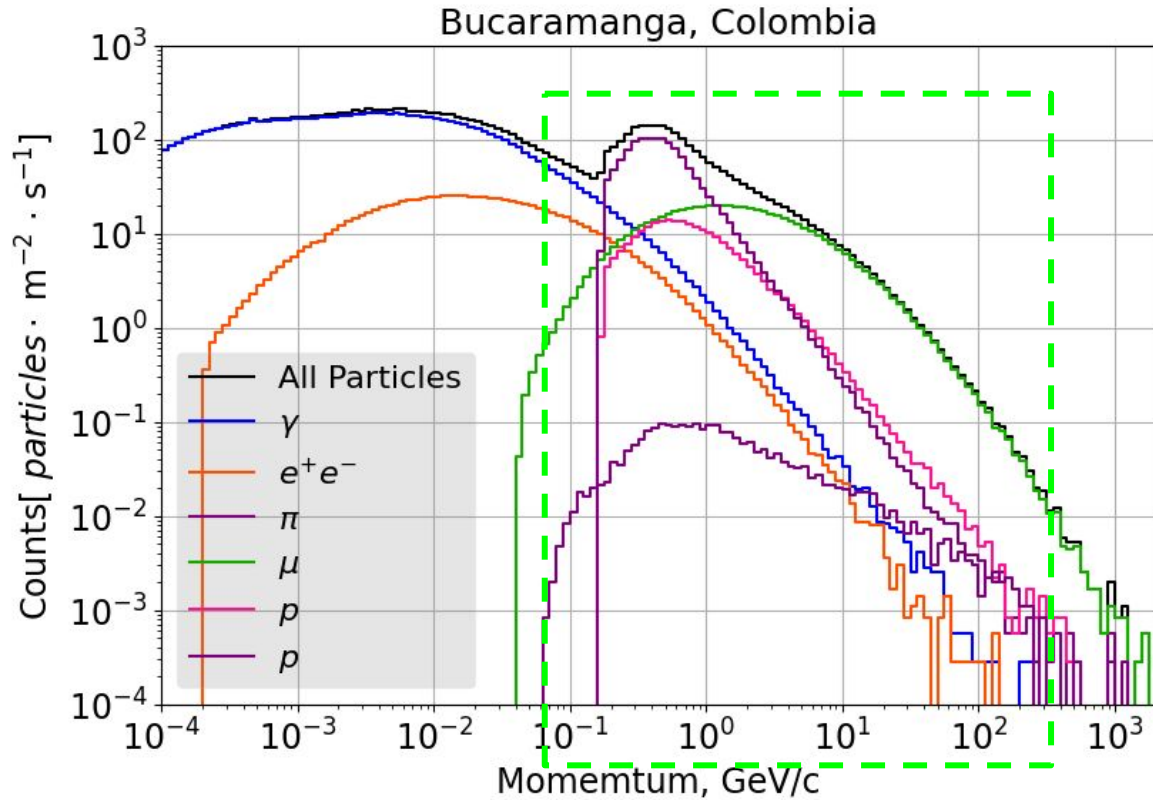
- Muones
- Muongrafia
- Volcan cerro machin
- MuTe 2.0
 - Estructura mecánica
 - Sistema de adquisición
 - Sistema de gestión de datos

Rayos cósmicos

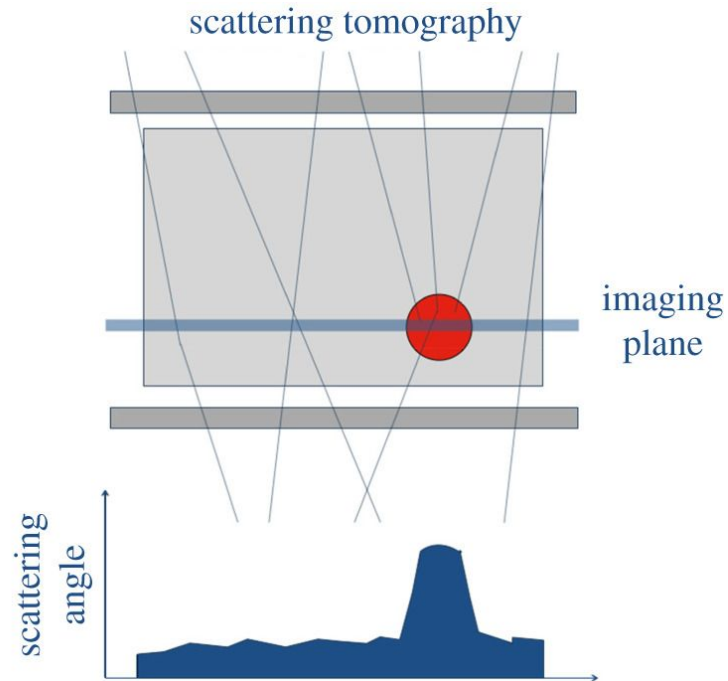
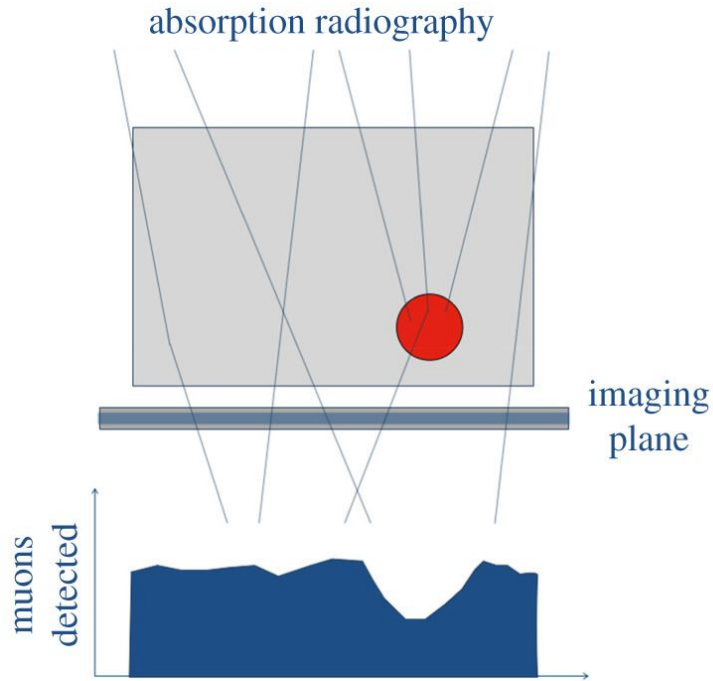


| Particle | charge q | mean life τ | mass m |
|----------|------------|---------------------------|-----------|
| e | -e | $> 6.6 \times 10^{28}$ yr | 0.511 MeV |
| μ | -e | 2.2×10^{-6} s | 105.7 MeV |

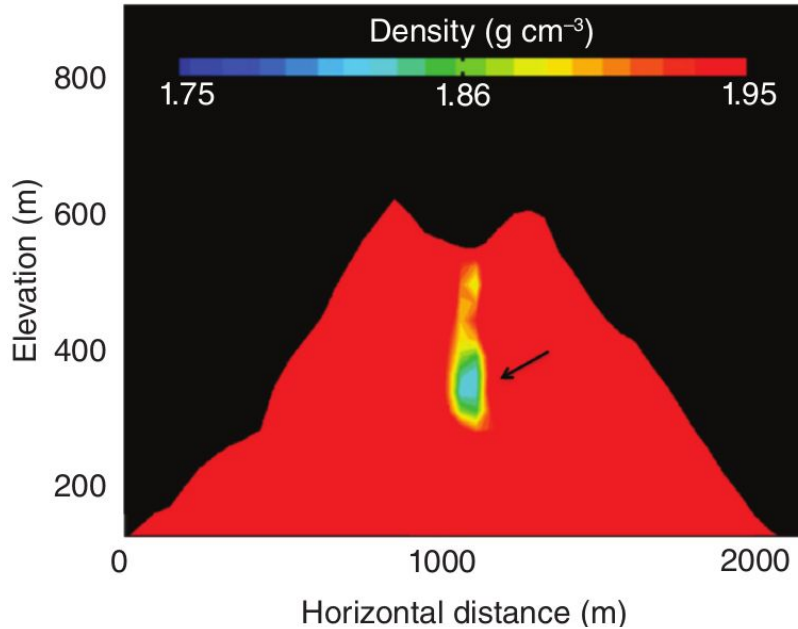
Lluvias aéreas extensas



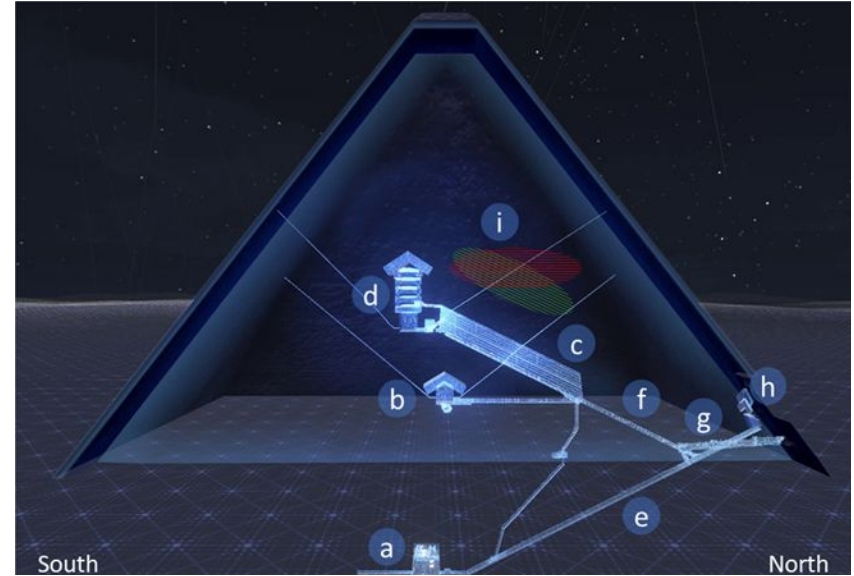
Muongrafia



Casos de uso exitosos de muongrafia

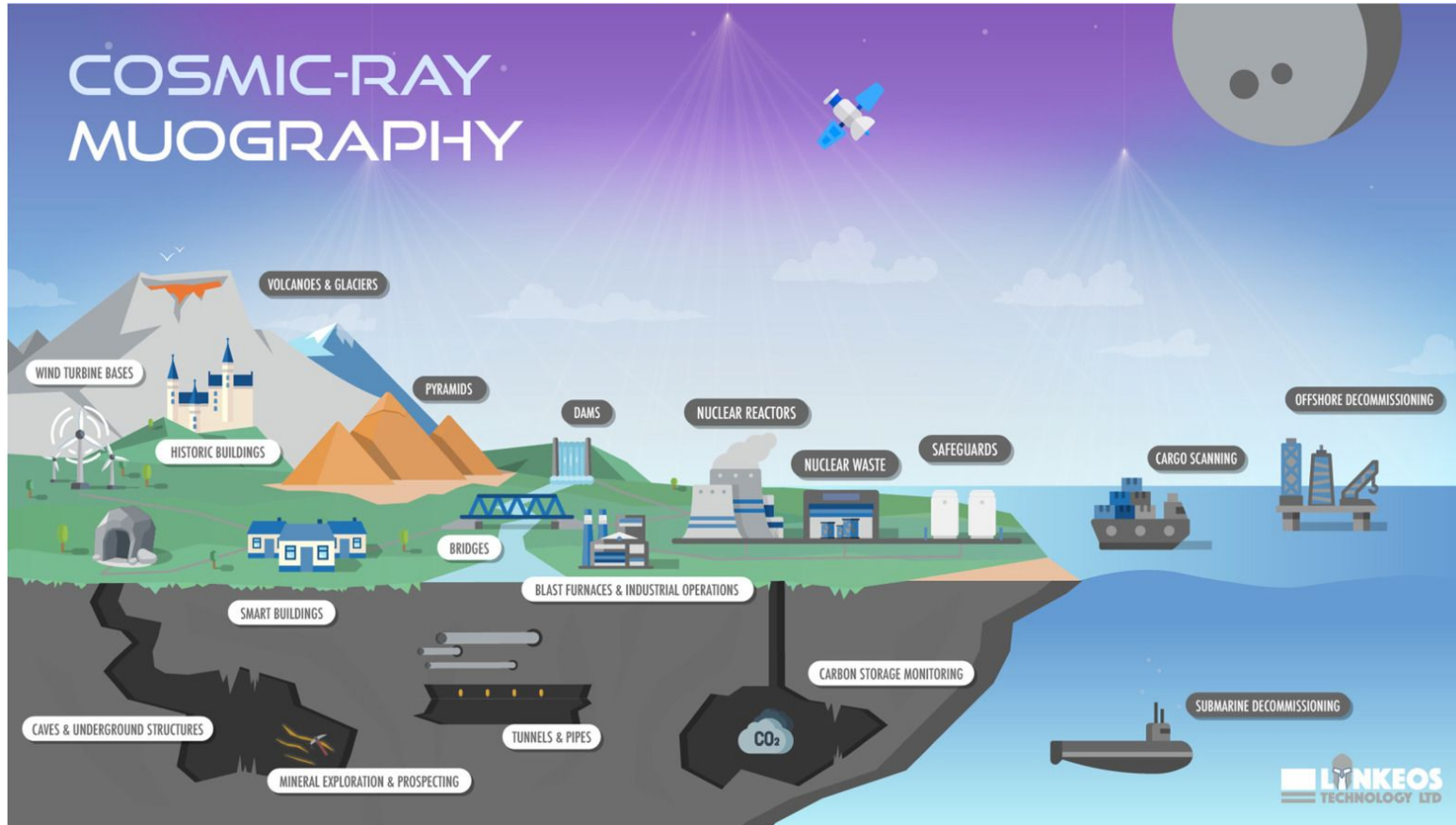


H. Tanaka et al. Japanese volcanoes visualized with muography (2019)

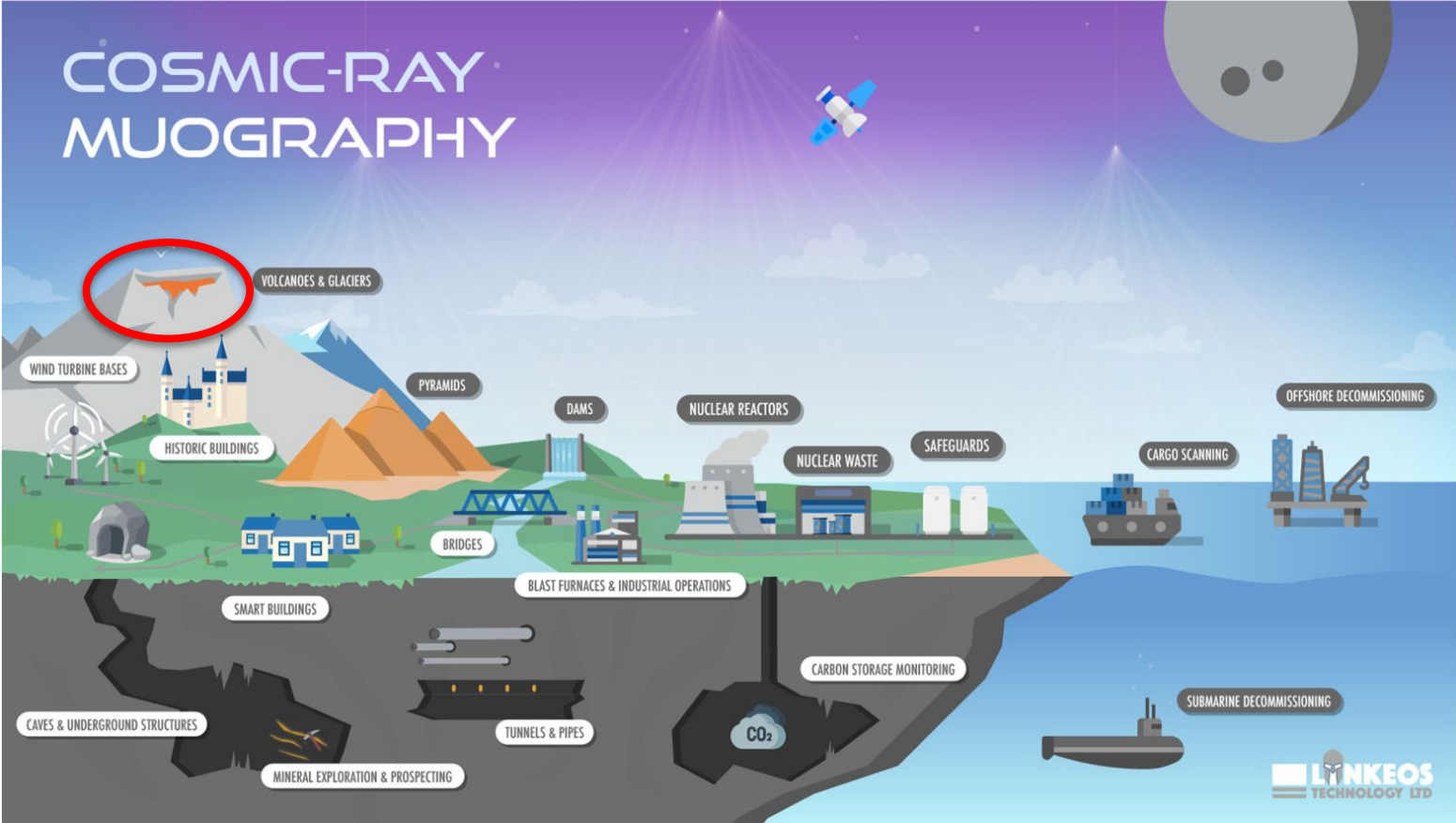


Morishima, K., Kuno, M., Nishio, A. *et al.* Discovery of a big void in Khufu's Pyramid by observation of cosmic-ray muons. *Nature* **552**, 386–390 (2017). <https://doi.org/10.1038/nature24647>

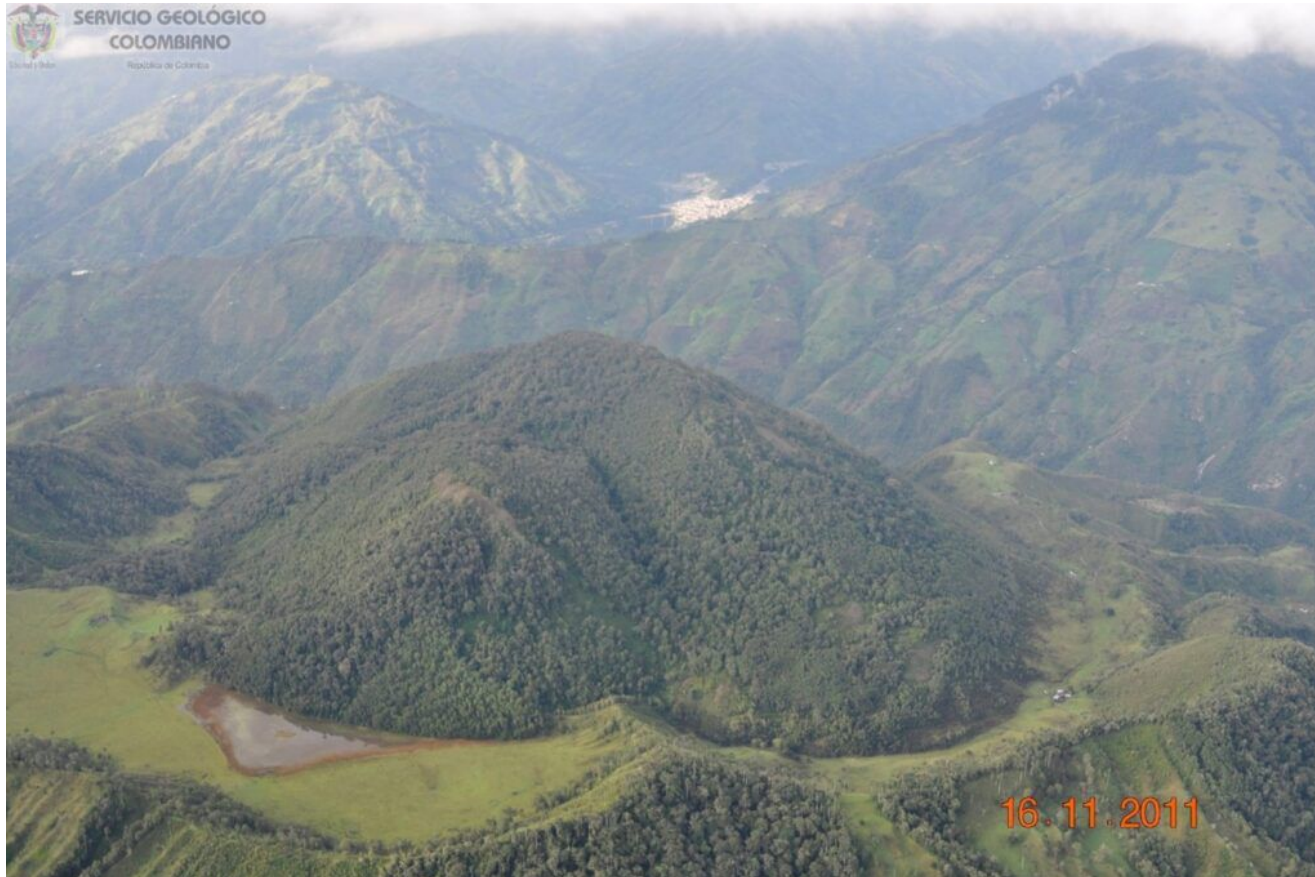
Muongrafia (Aplicaciones)



Muonografia (Aplicaciones)



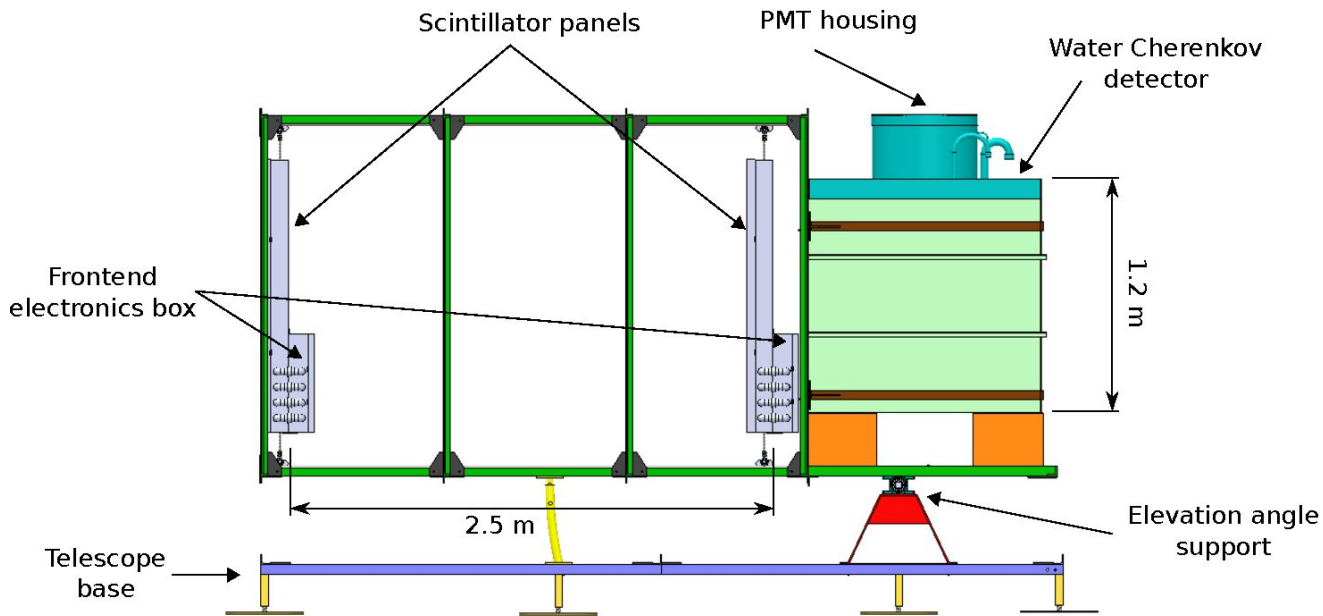
Volcán cerro machín



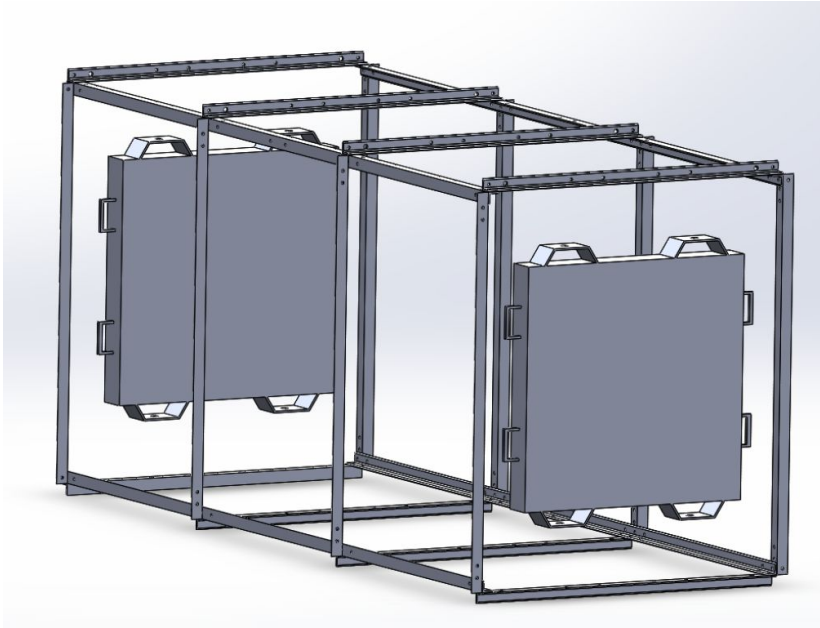


MuTe 1

paralelepipedo de 4.2 m x 2.8 m
x 1.8 m

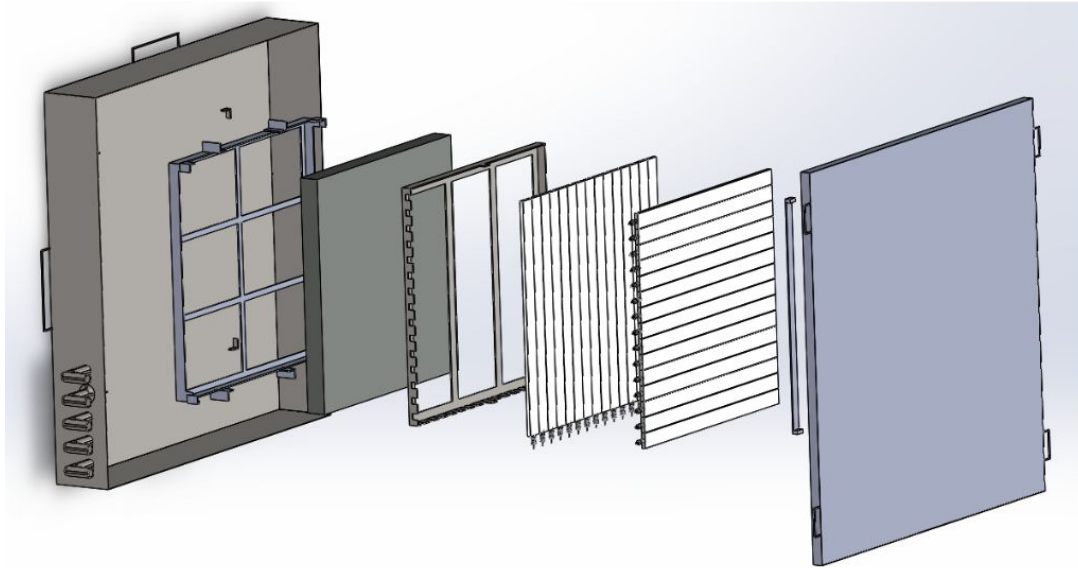


MuTe2.0: Muon Telescope



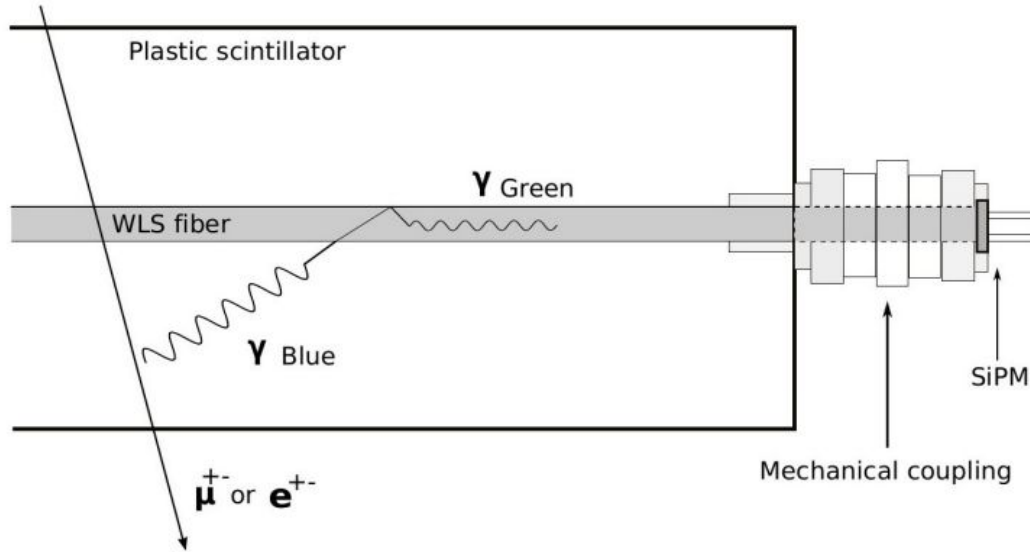
- Paralelepipedo de aproximadamente 1m x1.5mx2.5m
- Dos paneles de barras centelladoras.
- Una caja térmica con la electrónica.

MuTe2.0(panel centellador)



- Contiene dos planos de 15 barras centelladoras c/u.
- Cada panel tiene 225 píxeles c/u.

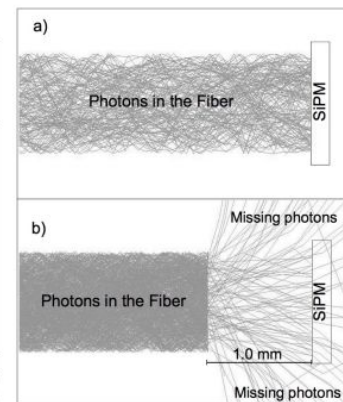
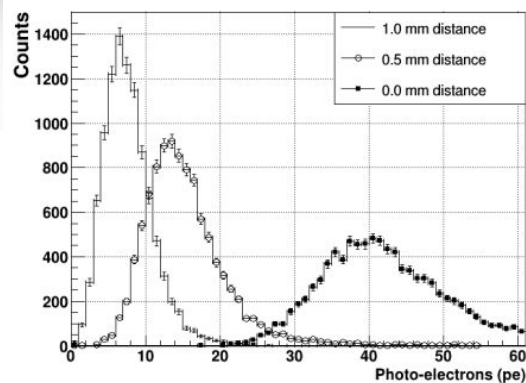
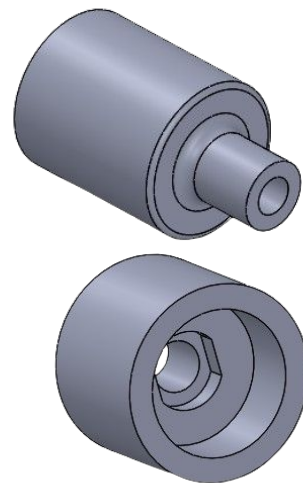
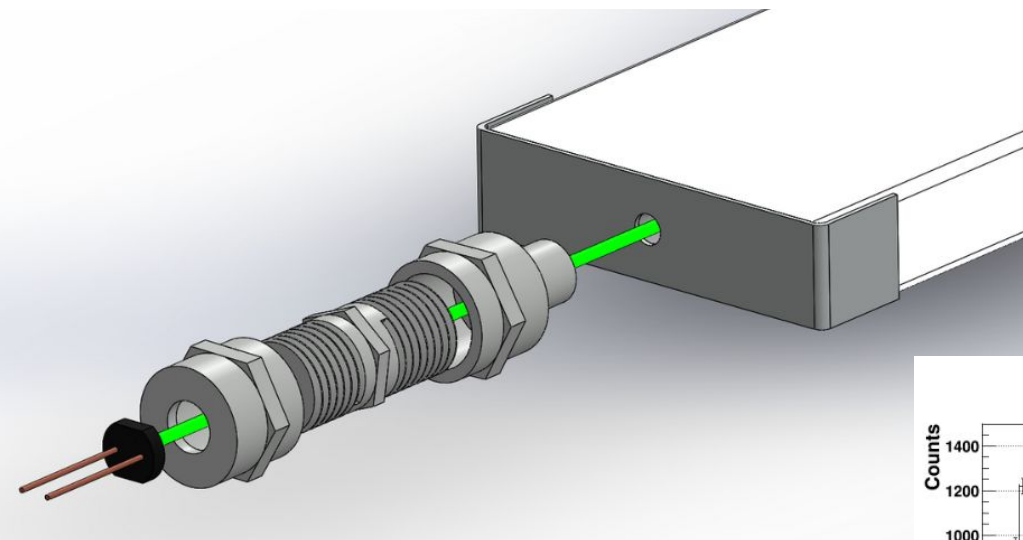
MuTe2.0 (Barras centelladoras)



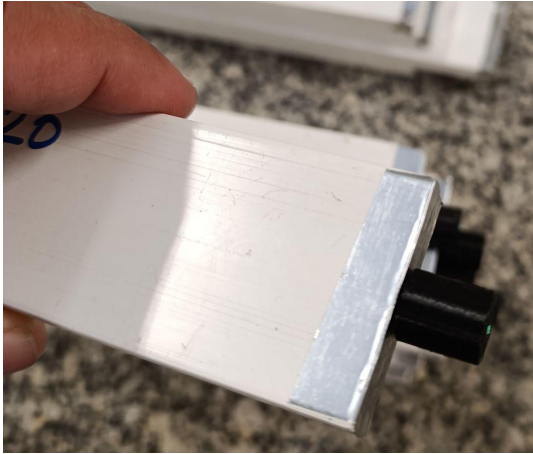
-Cada barra centelladora es de 60cm x 4cm x 1cm.

-Hilo de fibra óptica que transporta luz verde.

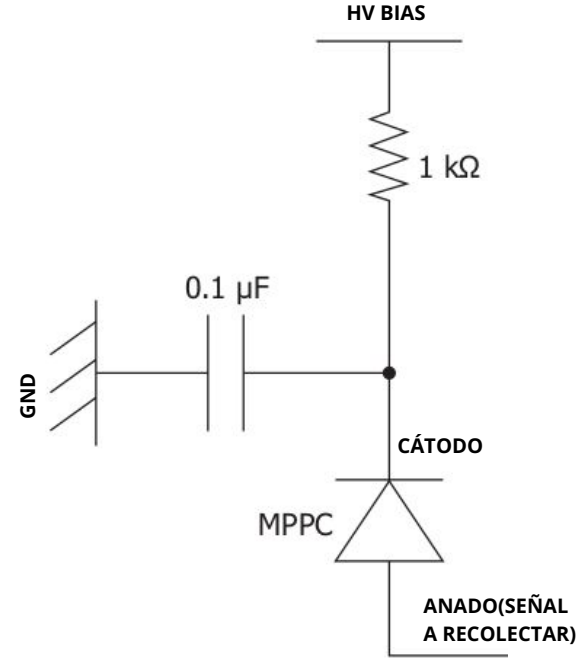
MuTe2.0 (Acouple fibra-SiPM)



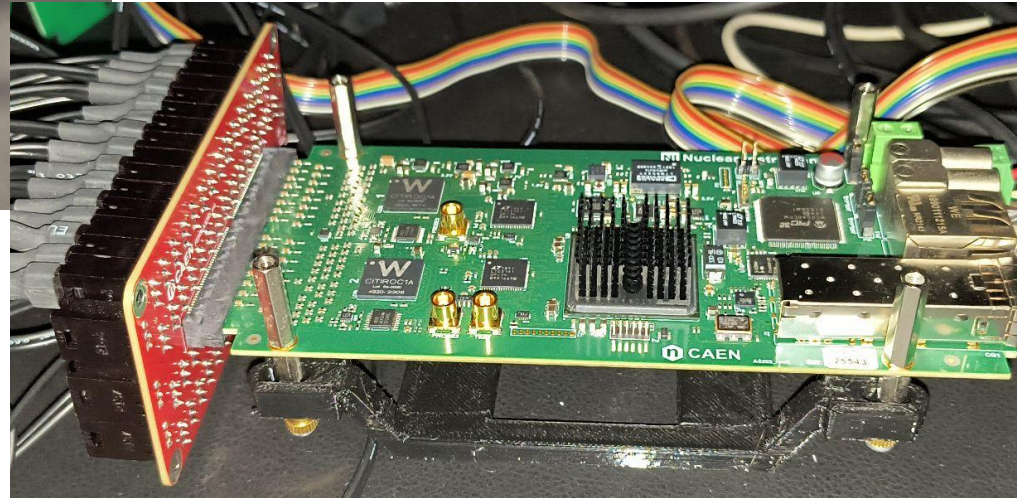
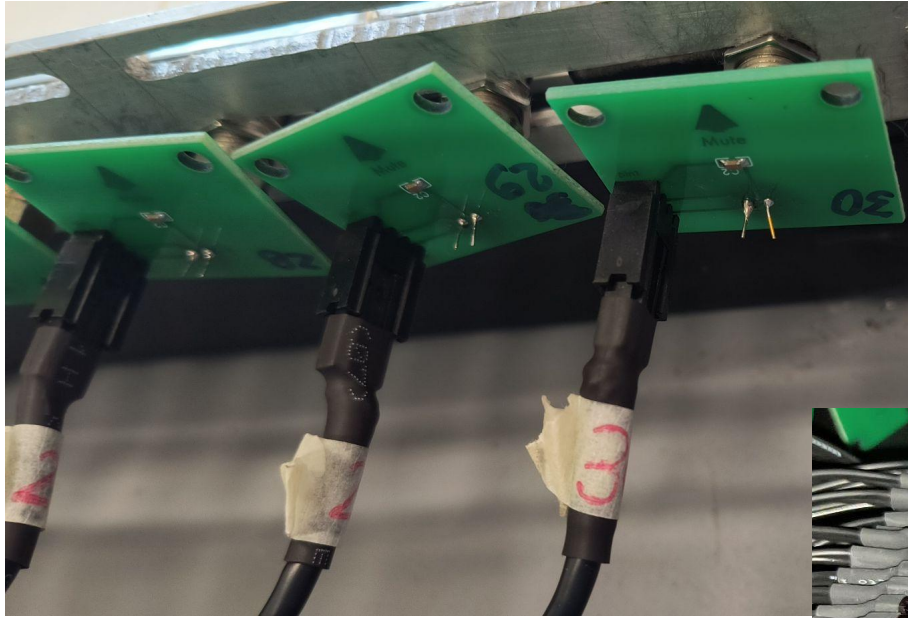
MuTe2.0(Acople Barra-PCB)



SiPm de la serie s13360 de hamamatsu



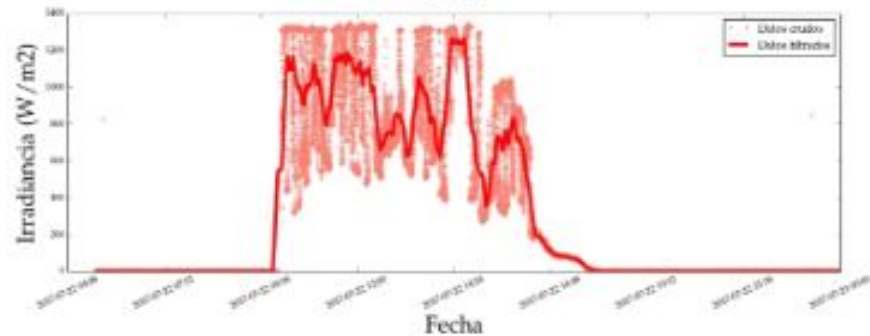
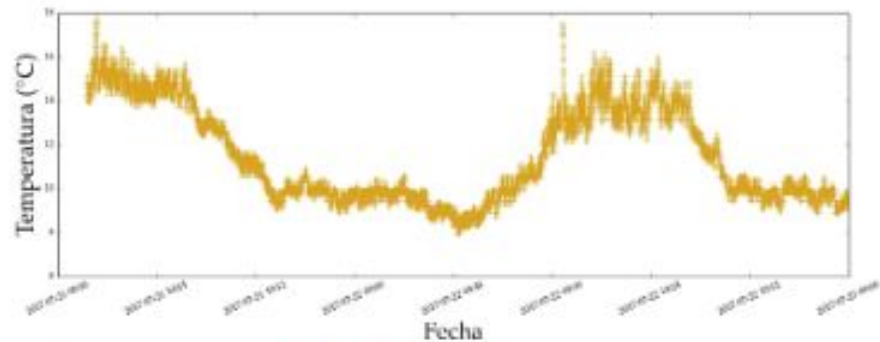
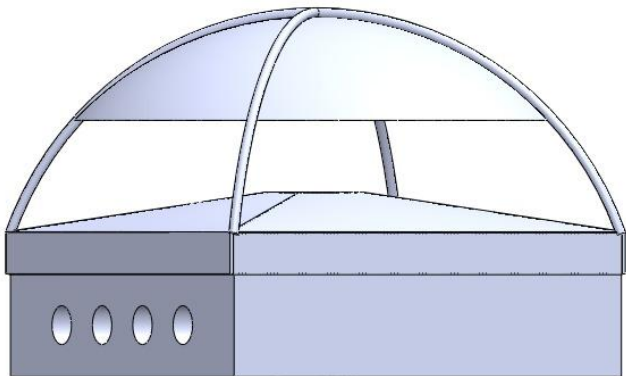
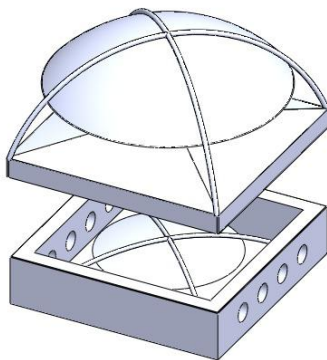
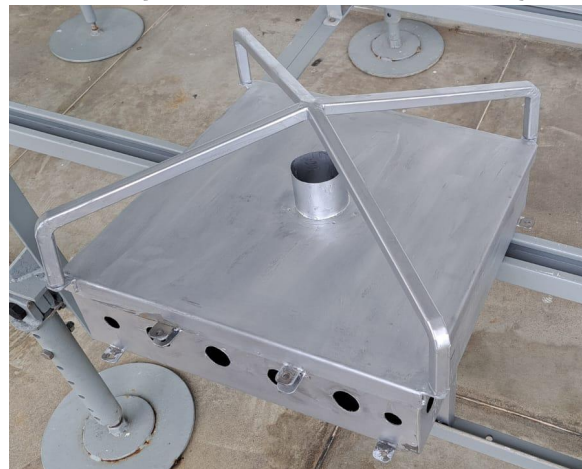
MuTe2.0(DAQ)



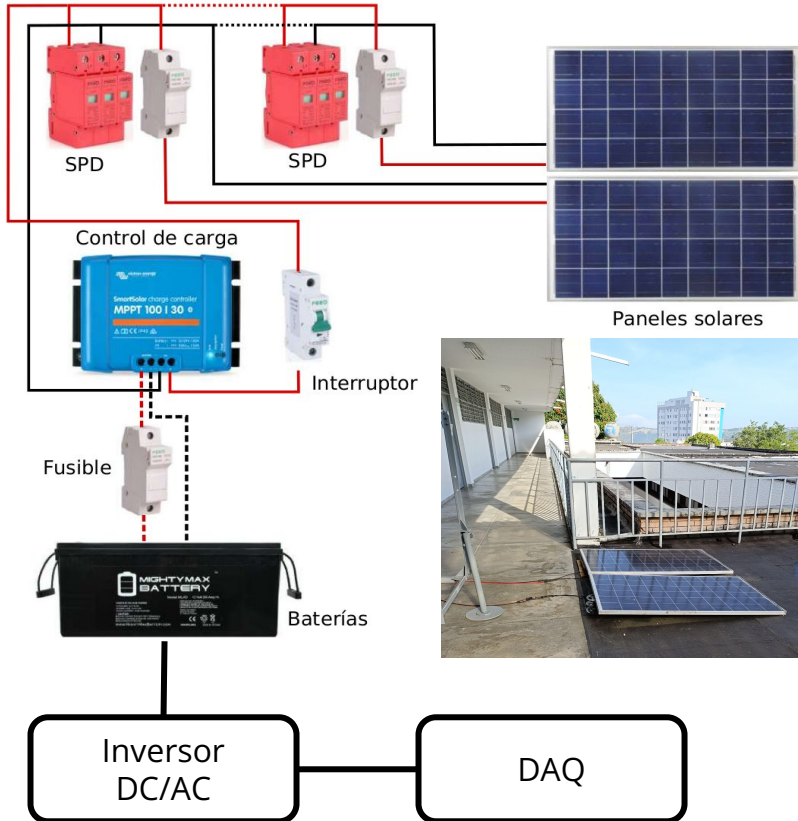
-FERS A5202 de CAEN instruments

- MiniPC

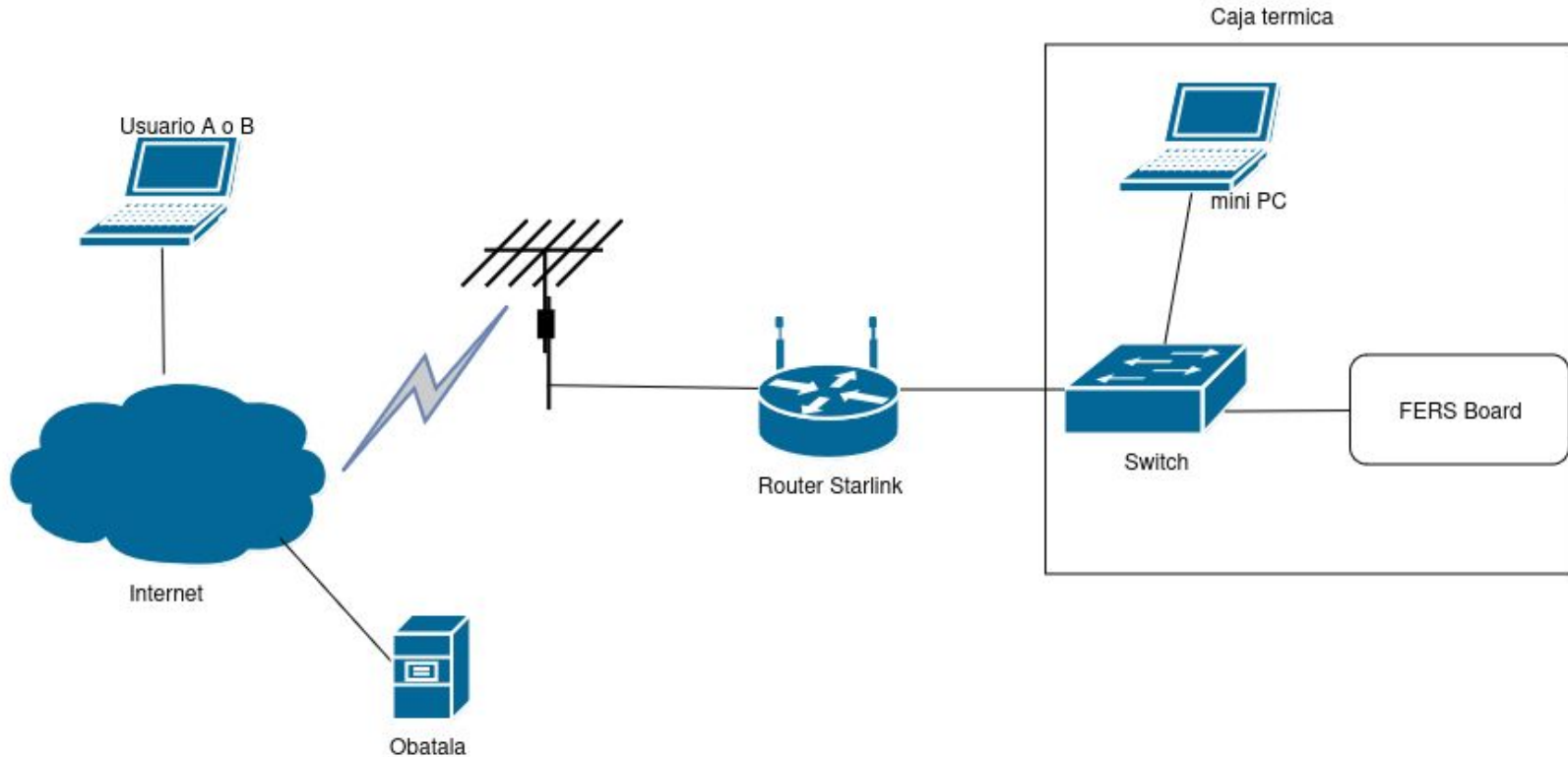
Caja térmica para el DAQ



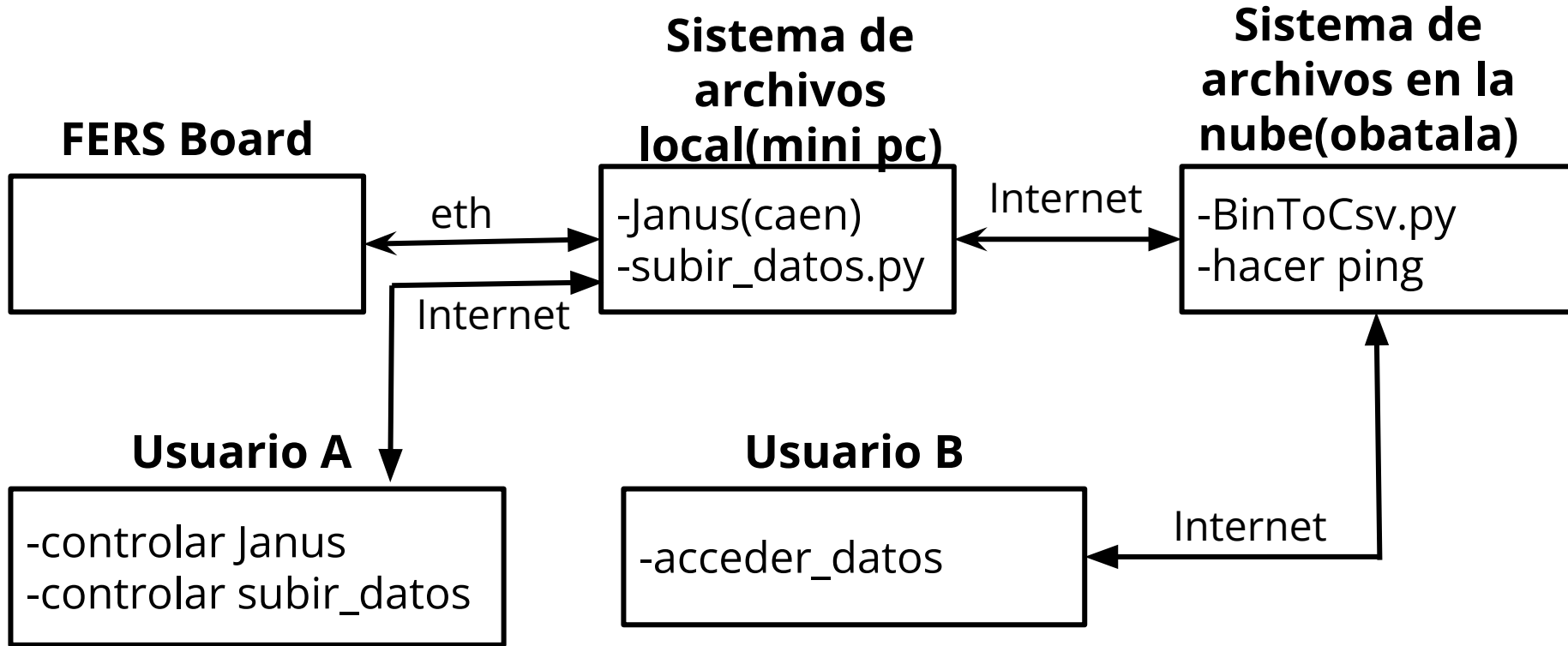
Sistema de alimentación eléctrica de respaldo



Sistema de gestión de datos



Sistema de gestión de datos

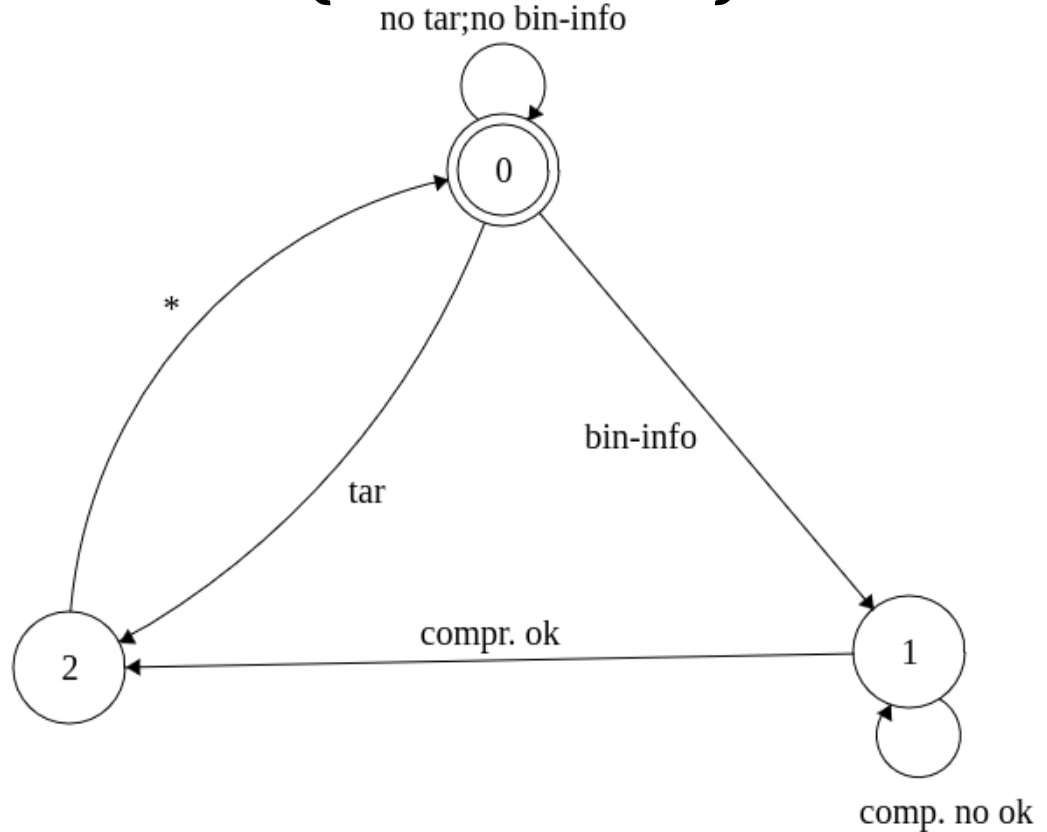


Sistema de gestión de datos(subir datos)

0:revisar folder /entrada.

1:comprimir pareja bin-info
en un tar.

2:subir archivo tar.



Sistema de gestión de datos(traducir datos)

0:revisar folder /entrada.

1:descomprimir tar.

2:mv sobre archivos bin-info.

3:./BinToCsv --bfile Runxx.dat

4: generar mute_csv en /salida.

5:comprimir archivos.

6:borrar caen_csv.

-1:mv a folder /problematic.

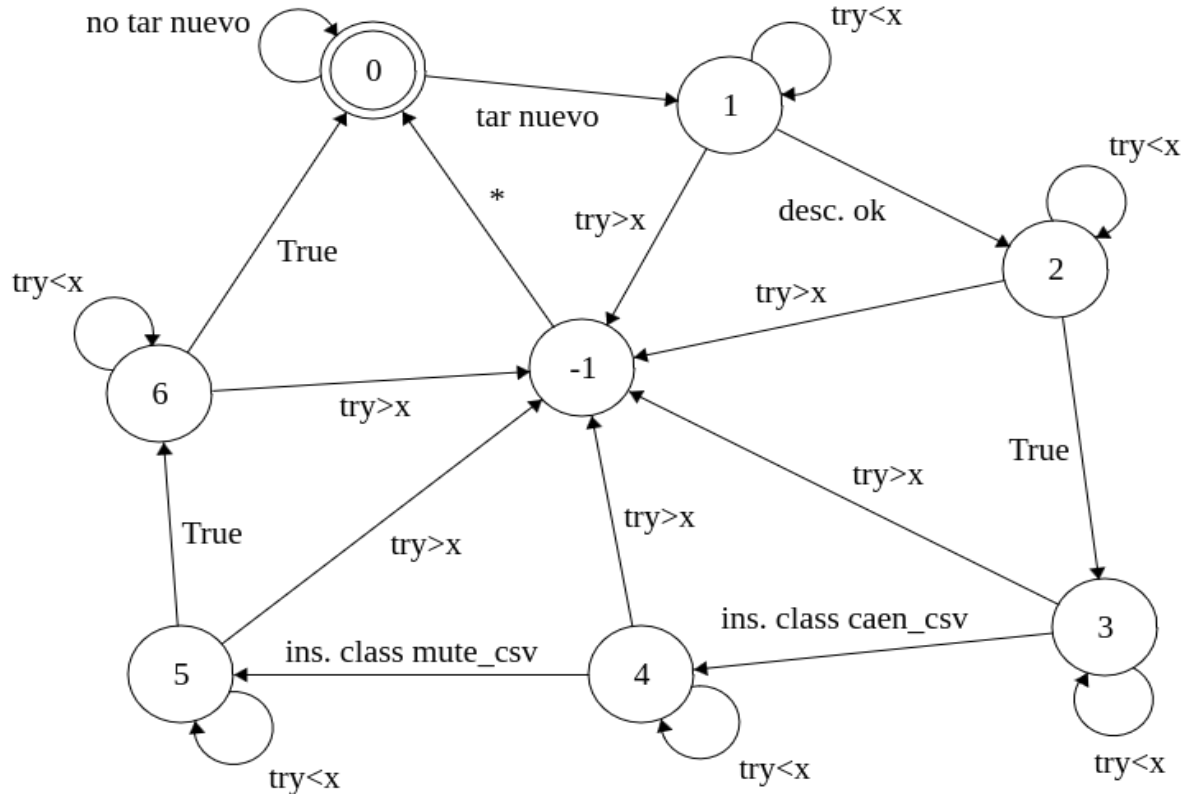




Foto del instrumento armado



¡GRACIAS!

