

DDAp - ITeDA+KIT

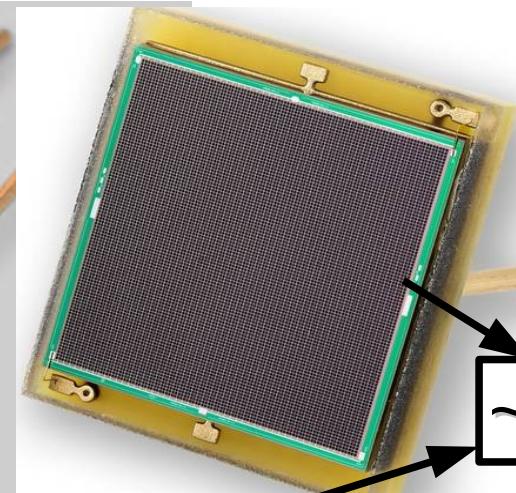
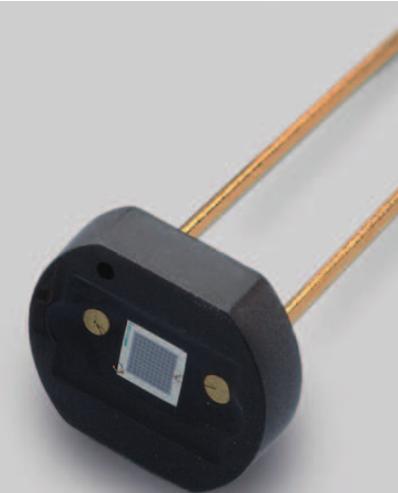
Física de Astropartículas - 2017

- **Unidad** 03 – Técnicas de detección
- **Clase** U03-c
- **Cont** Detectores
- **Cátedra** Asorey
- **Web** <https://github.com/asoreyh/astroparticulas>



Otras Técnicas:
Centelladores
Resistive Plate Chambers (RPC)
Multi-wire proportional chambers (MWPC)

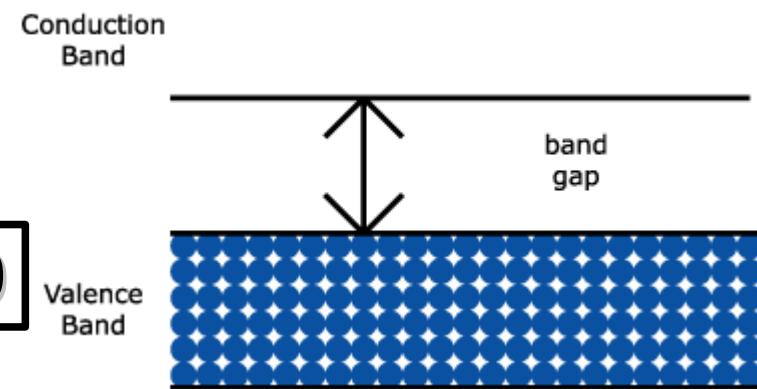
Silicon PhotoMultiplier (SiPM)



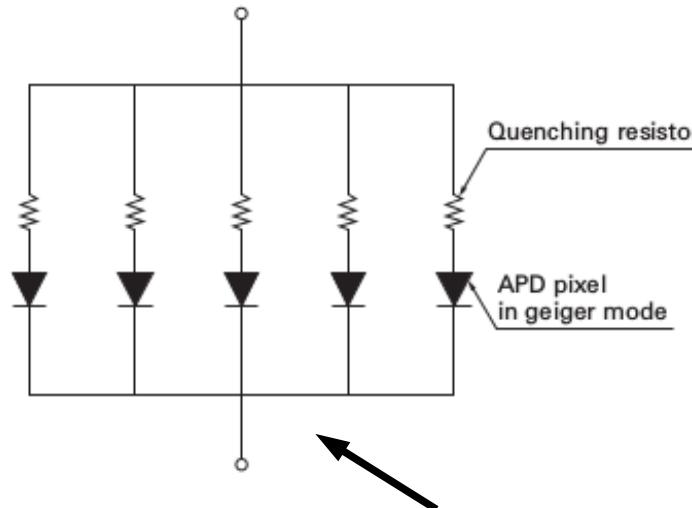
- Muchas celdas

(50 μ m)

- Semiconductor



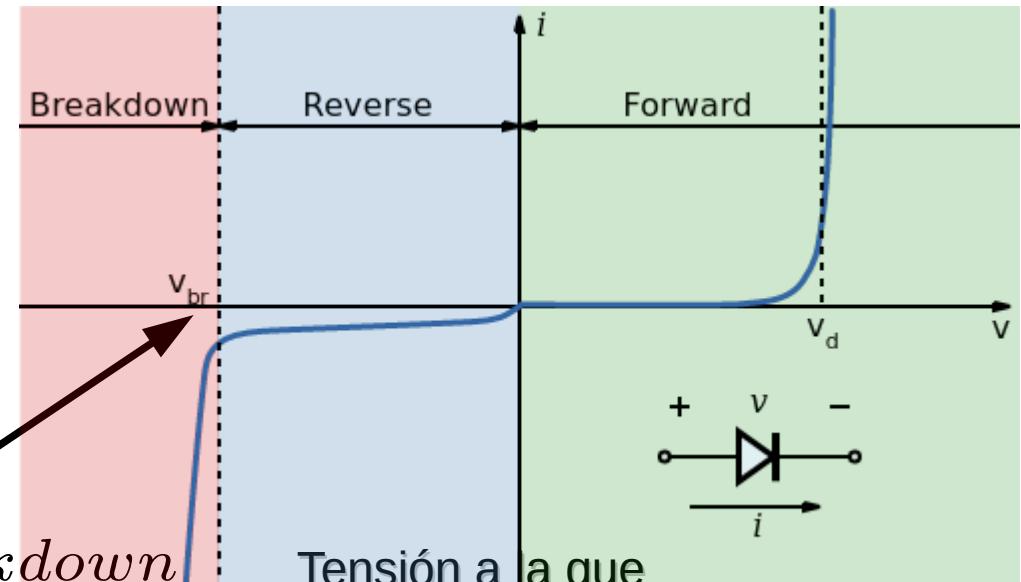
- Diodo polarizado en inversa



$v_{overvoltage} \equiv v_{bias}$
Tensión aplicada al SiPM

$v_{breakdown}$
Asorey - AP - UO3 Detectores

Tensión a la que
empieza a conducir

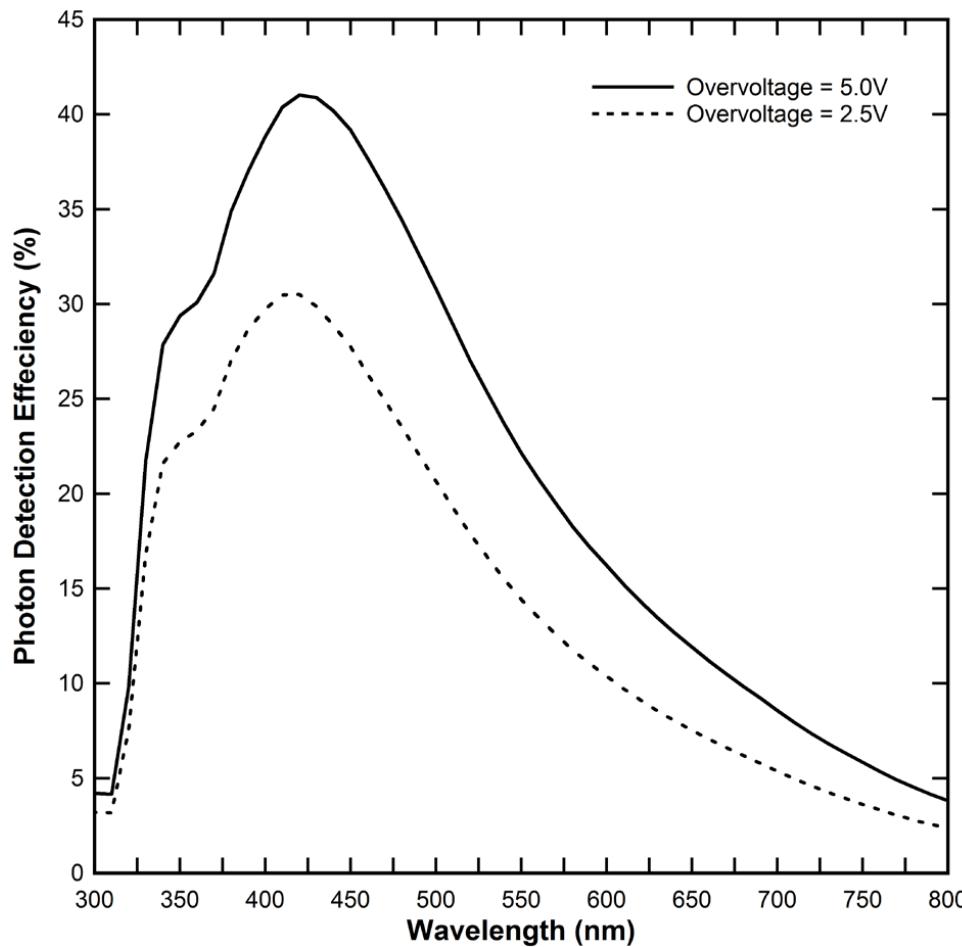


Características

$$PDE(\lambda, V_{ov}) = QE_{Si}(\lambda) \varepsilon_{av}(V_{br}) F$$

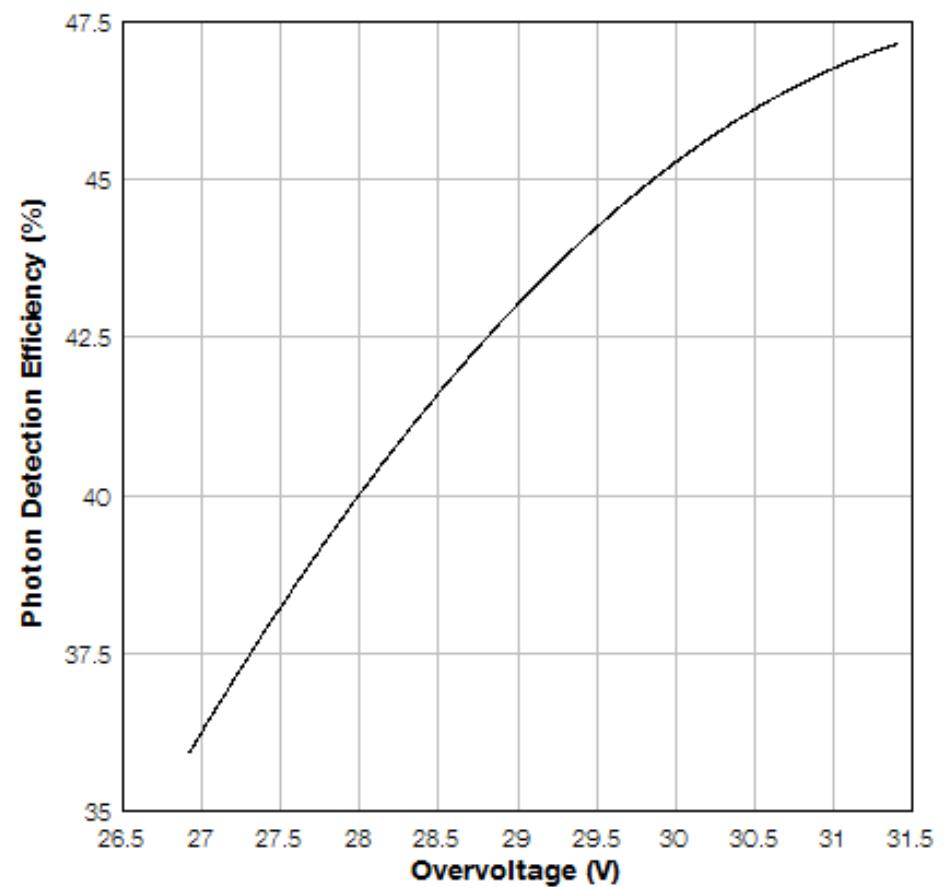
PDE versus Wavelength

MicroFC-30035-SMT



PDE at 420nm versus Voltage

MicroFJ-60035-TSV

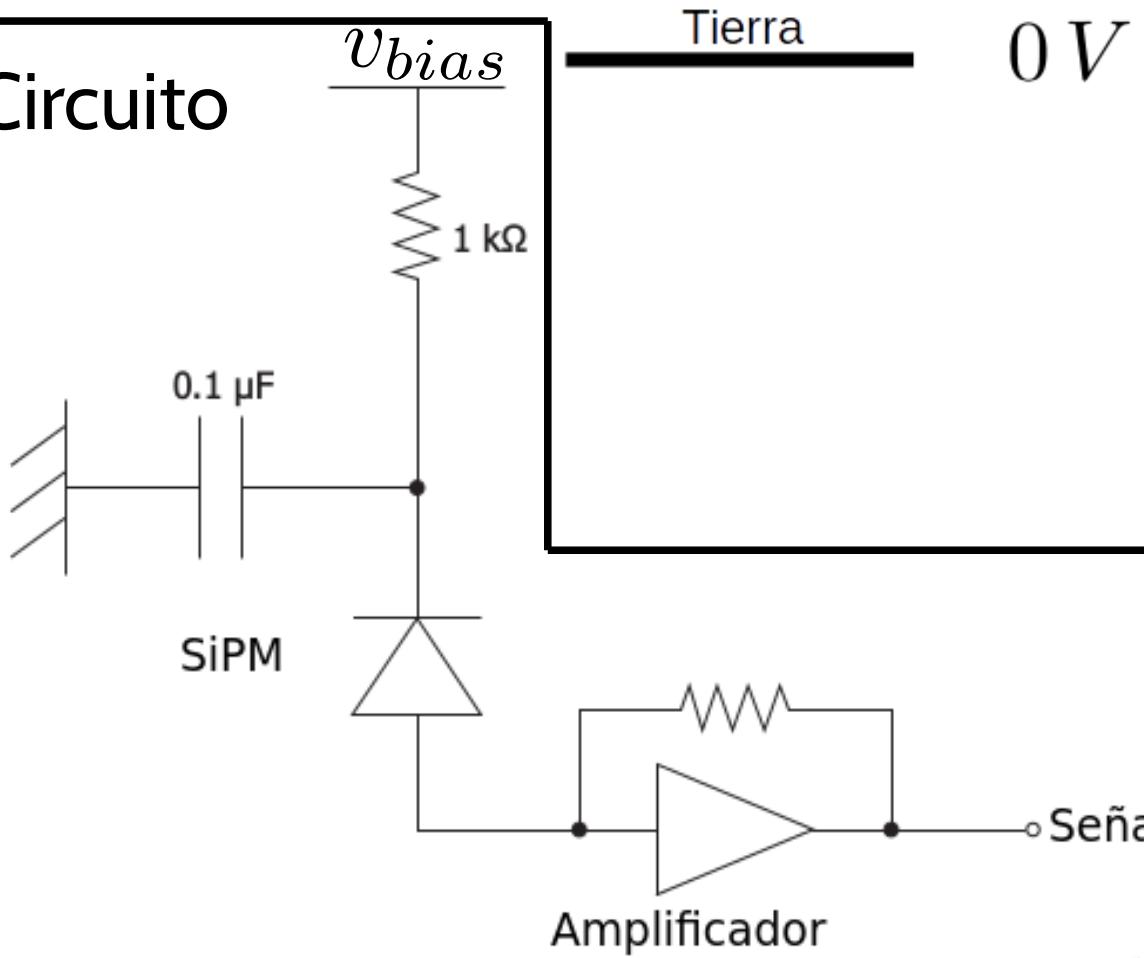


Electrónica

Aplicada
Conduce

$$v_{bias} \sim 60 V \\ v_{bd} \sim 55 V \quad } v_{ov} \sim 5 V$$

Circuito

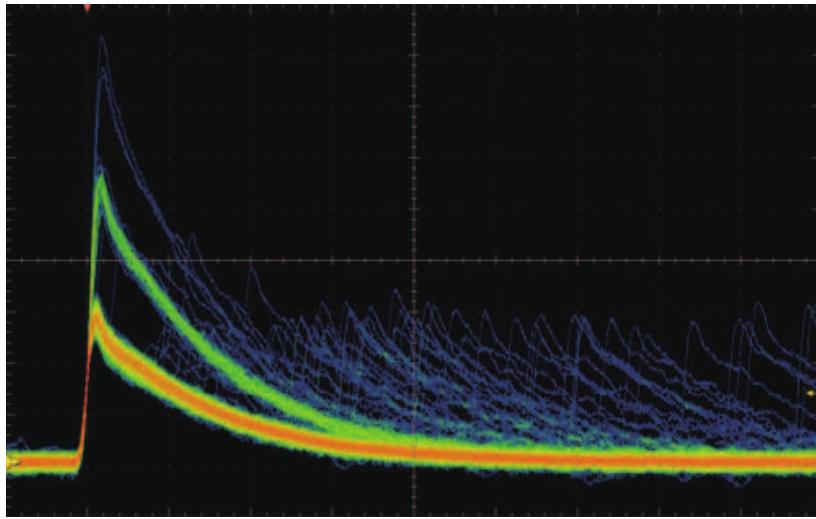


ctores



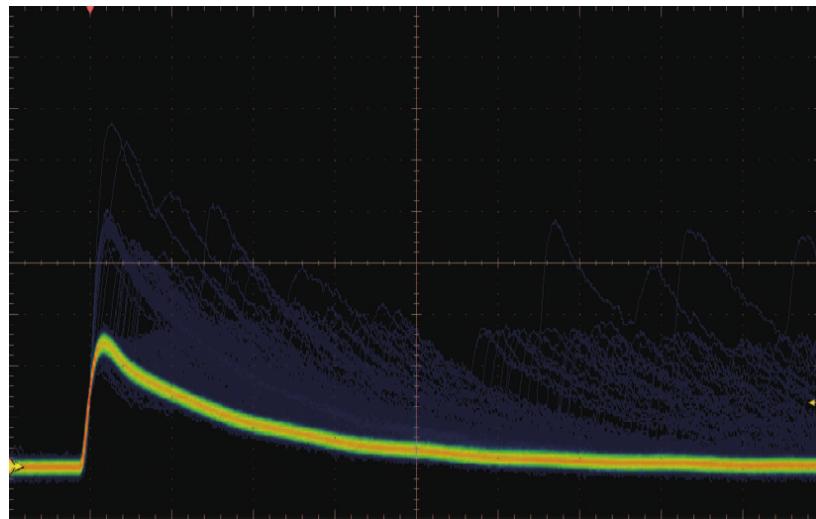
Output: Pulsos

- S11



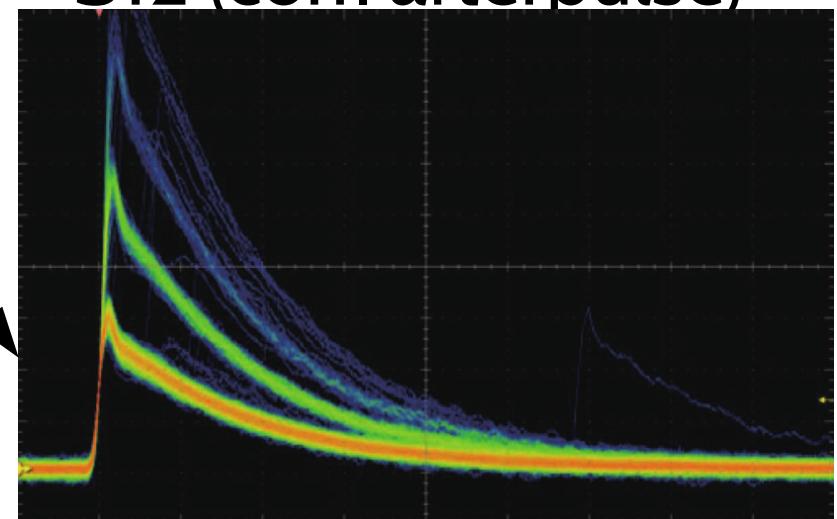
Datasheet

- S13 (corr. crosstalk)

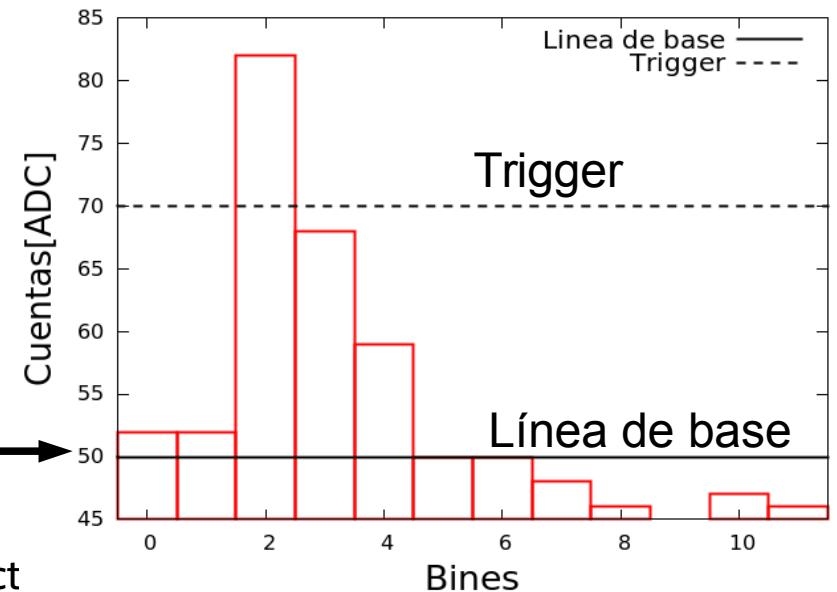


Datos

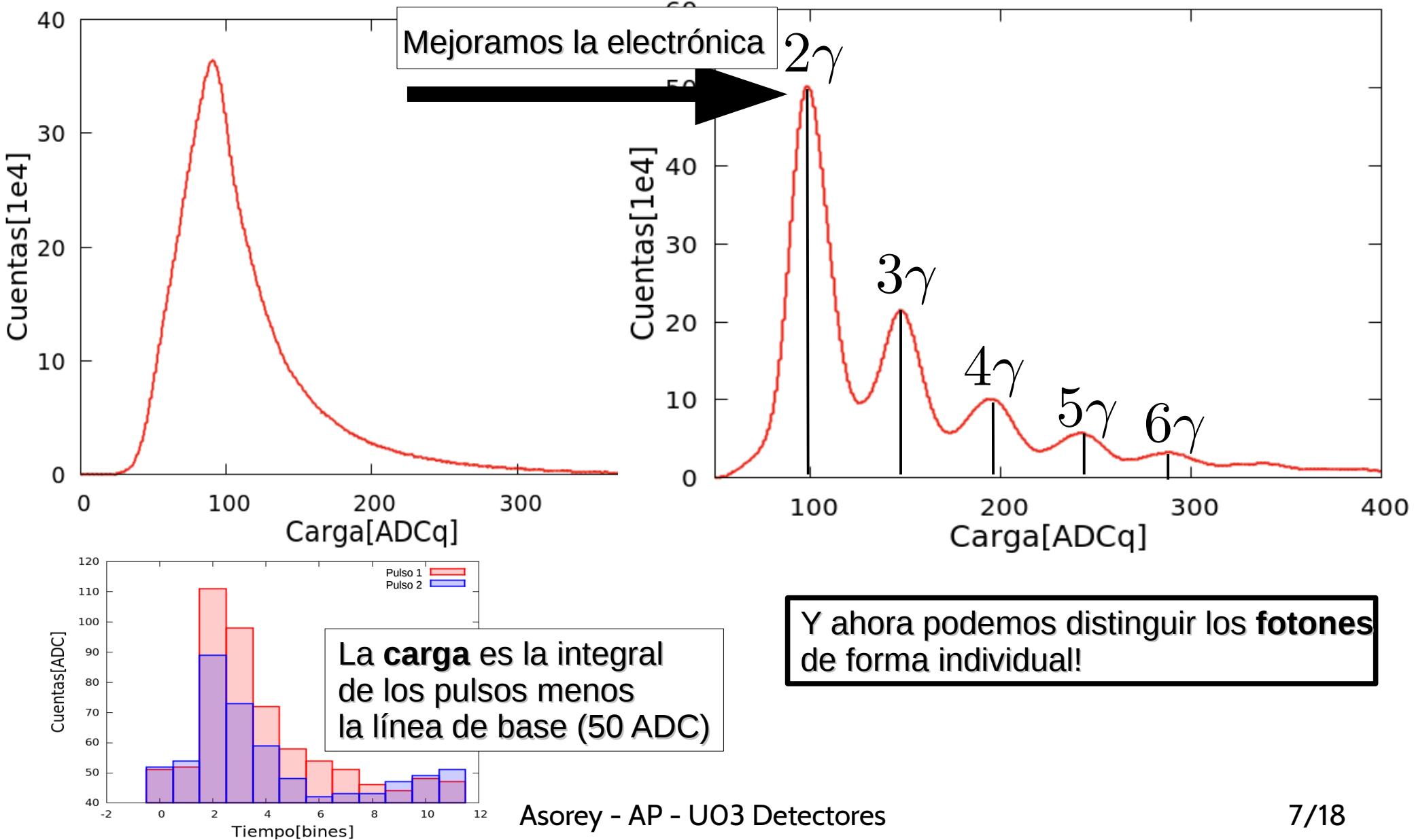
- S12 (corr. afterpulse)



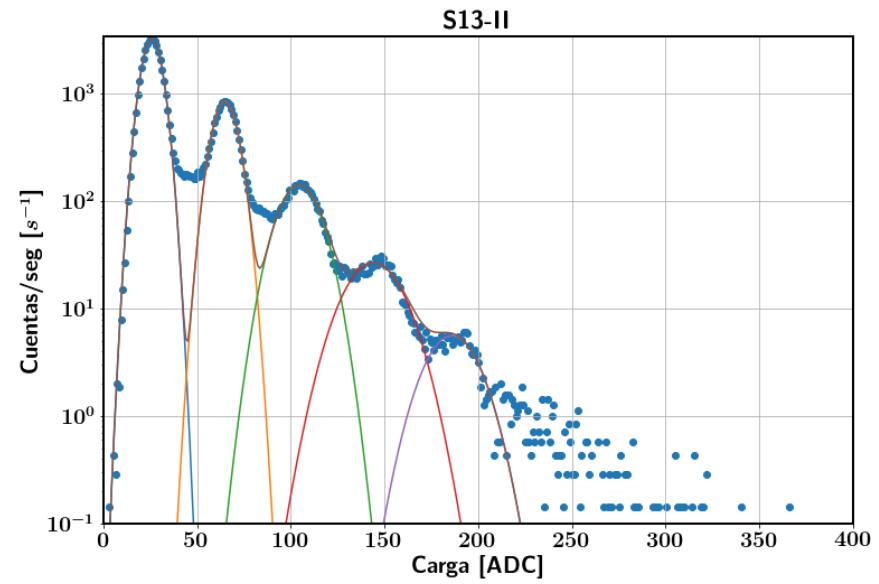
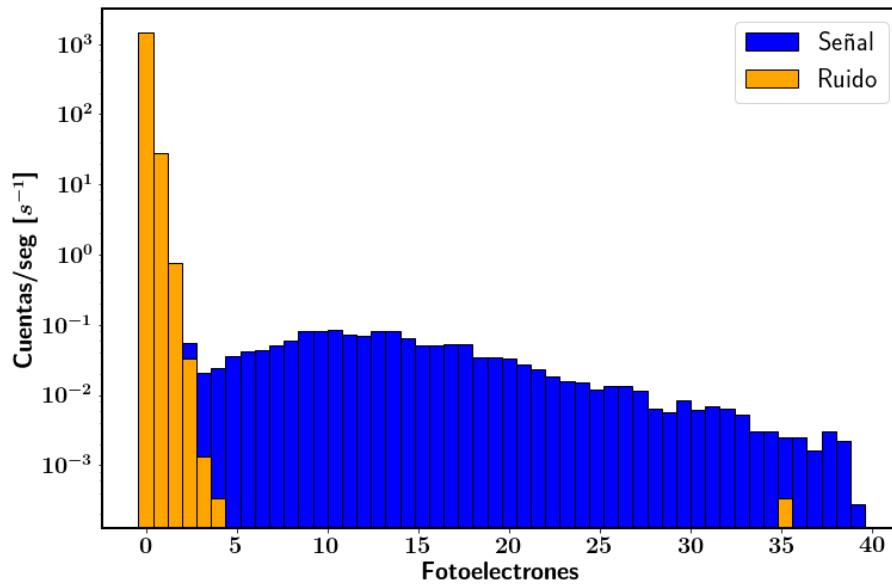
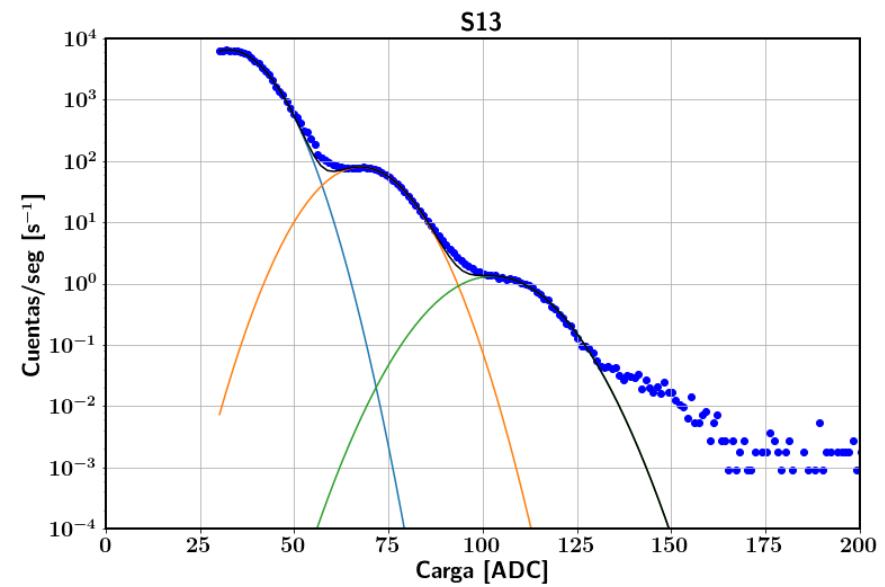
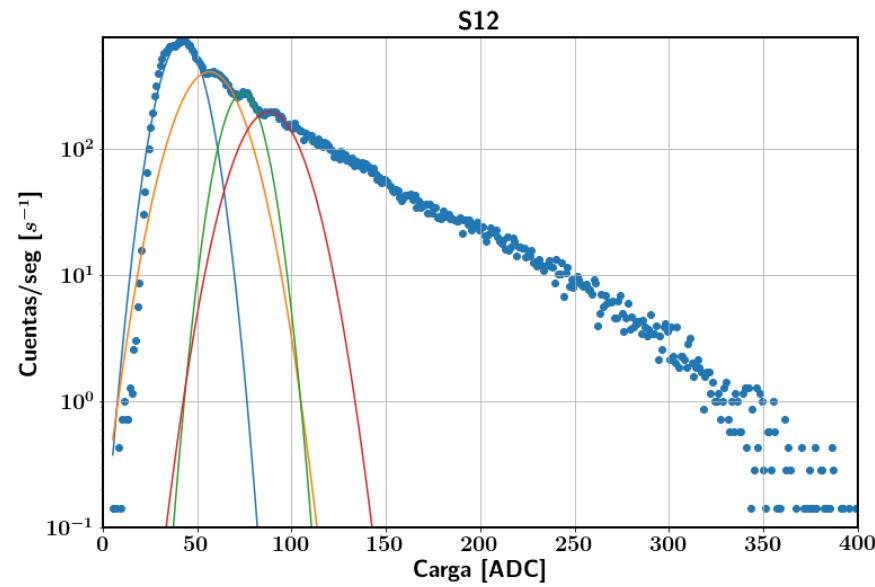
- Discretizado



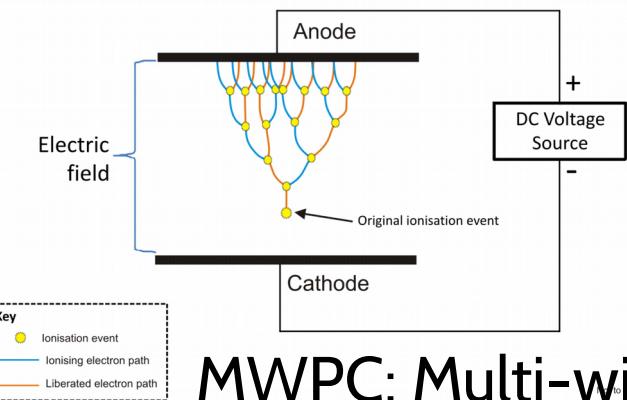
Histogramas de carga: Serie S12



S12571-100C, S13360-1325CS, S13-II

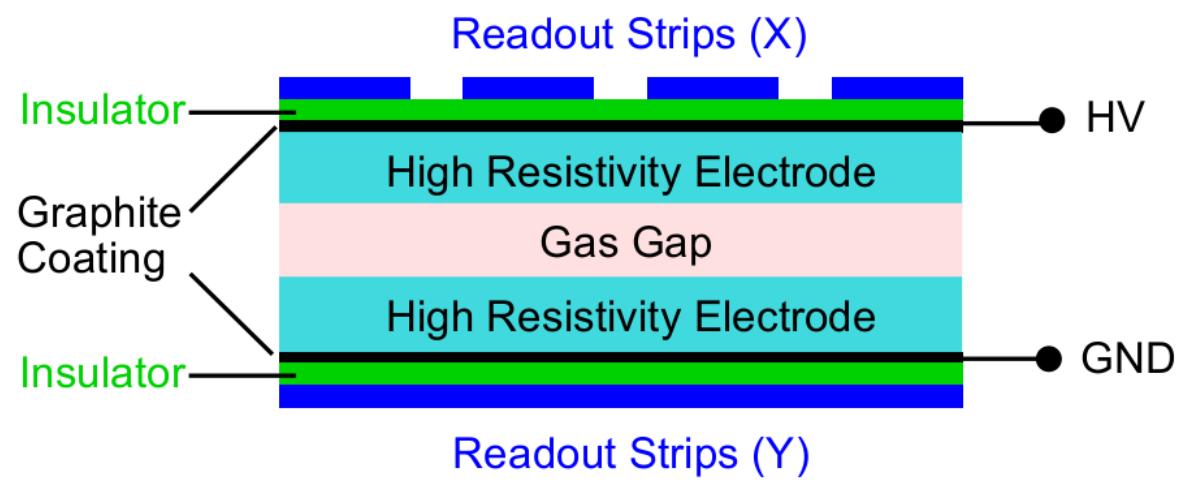
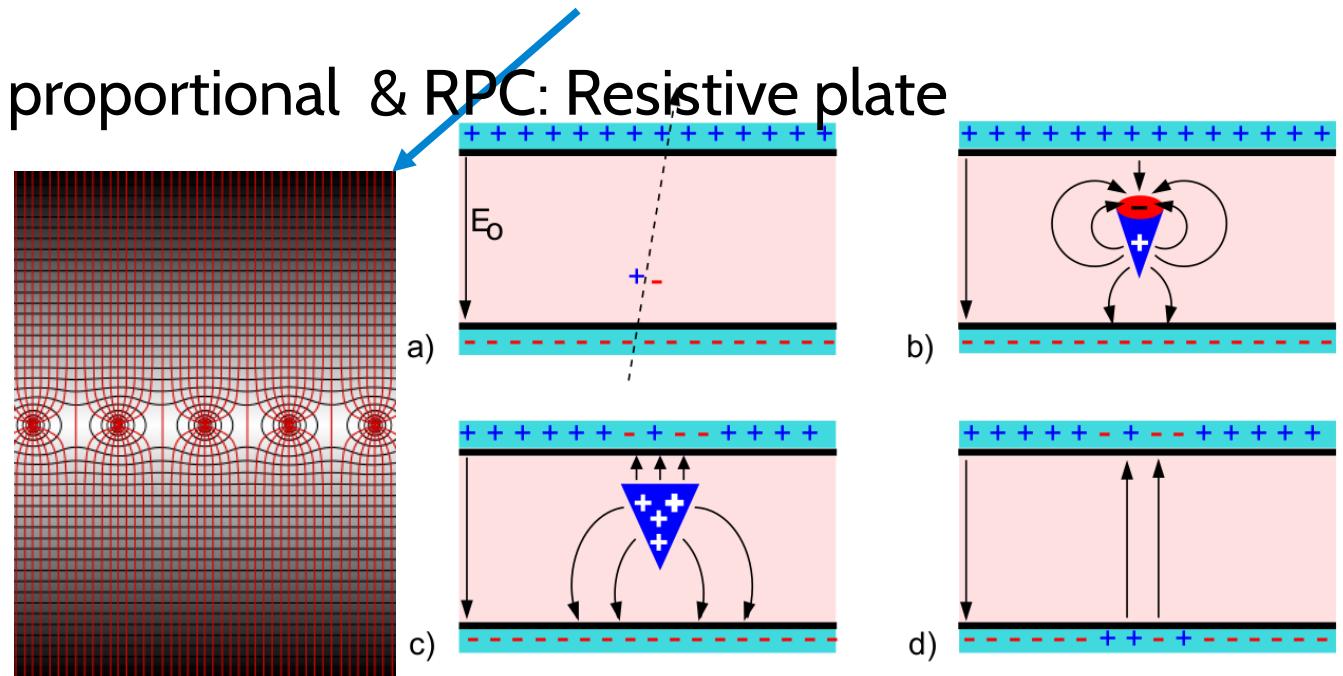
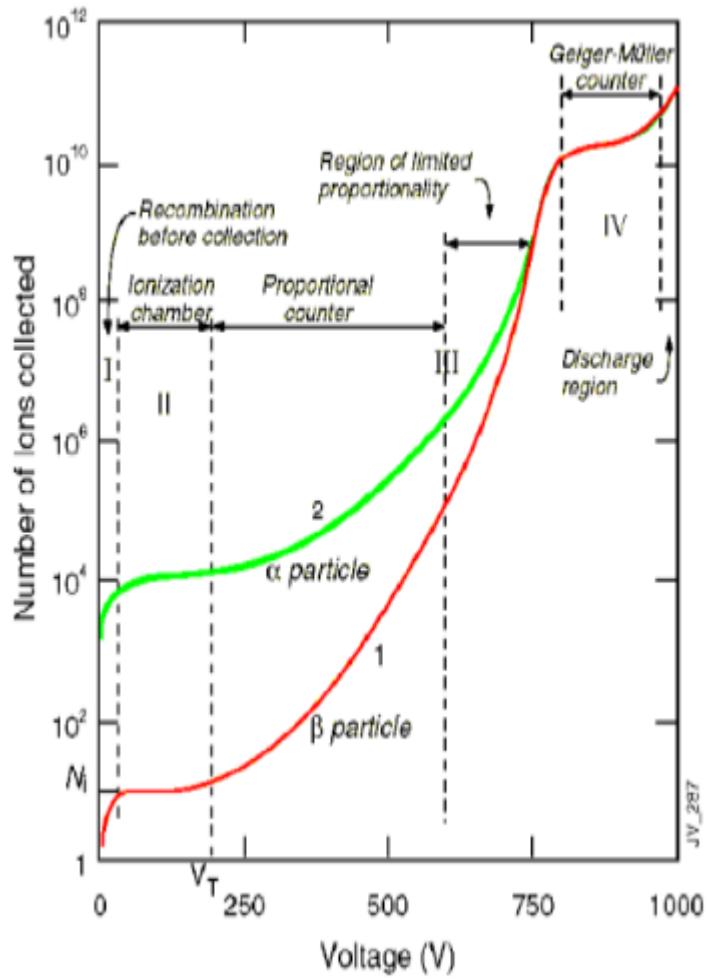


Visualisation of a Townsend Avalanche



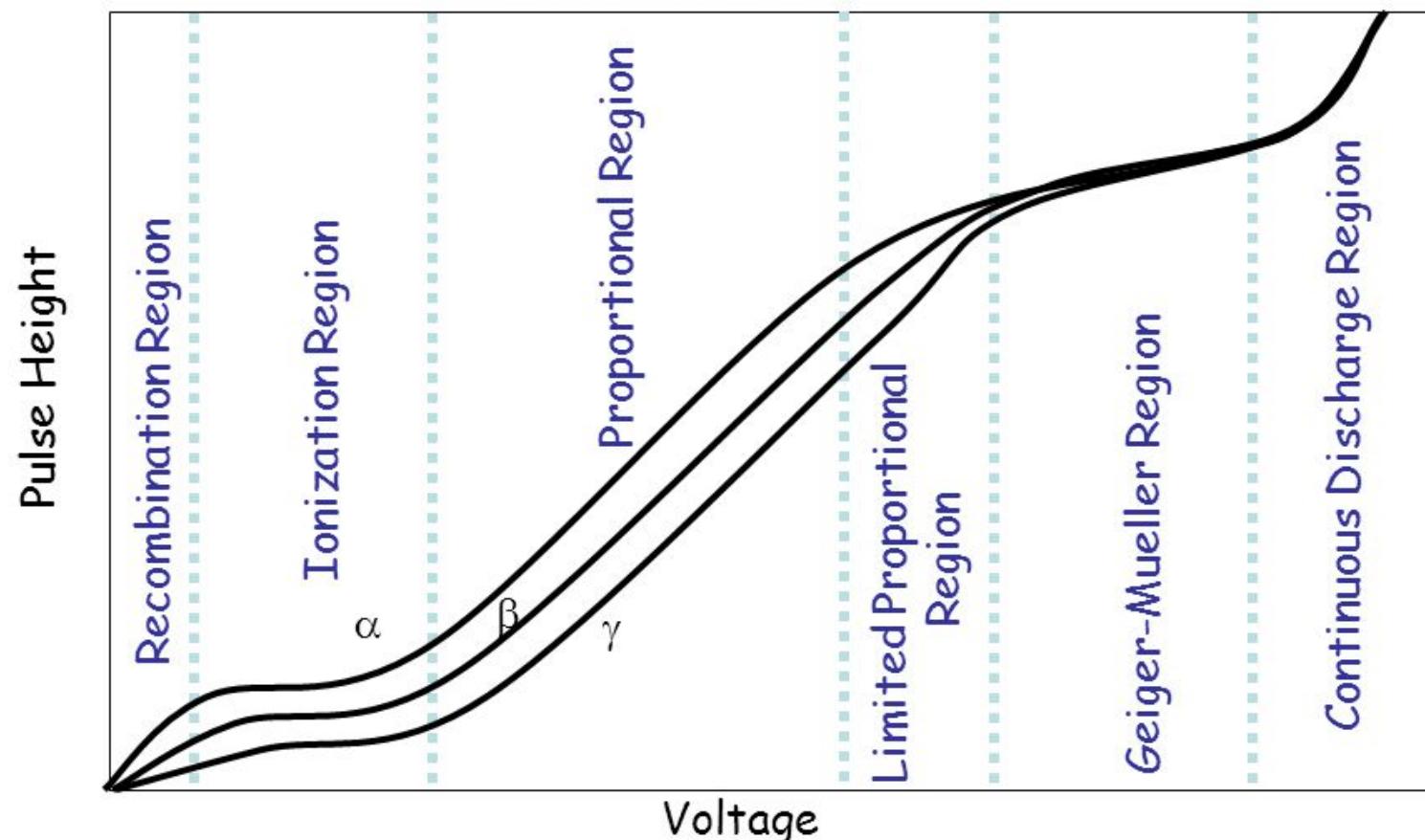
Chambers Knoll cap. 5, 6 y 7

MWPC: Multi-wire proportional & RPC: Resistive plate



Ionización, reonización, avalancha

Operating Regions of Gas-Filled Detectors



Centelladores plásticos Knoll cap. 8 y 10

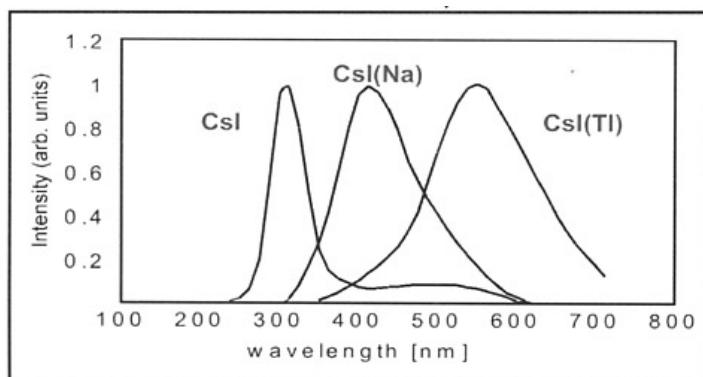
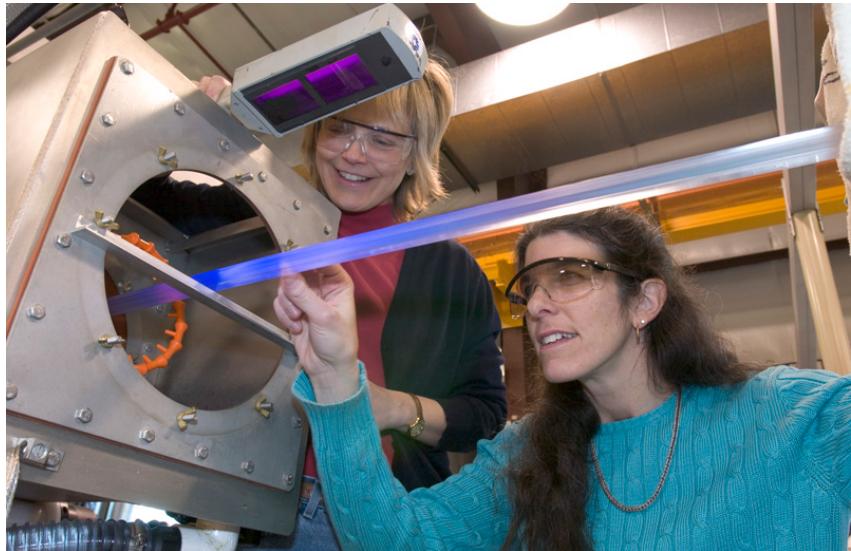
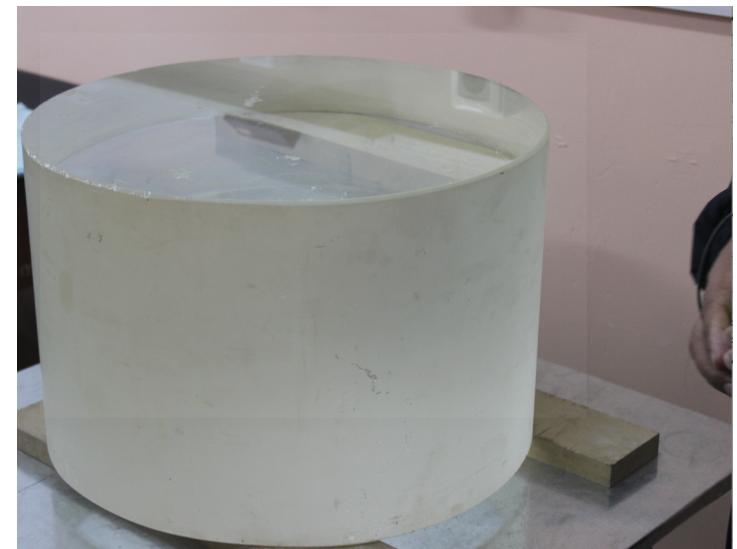
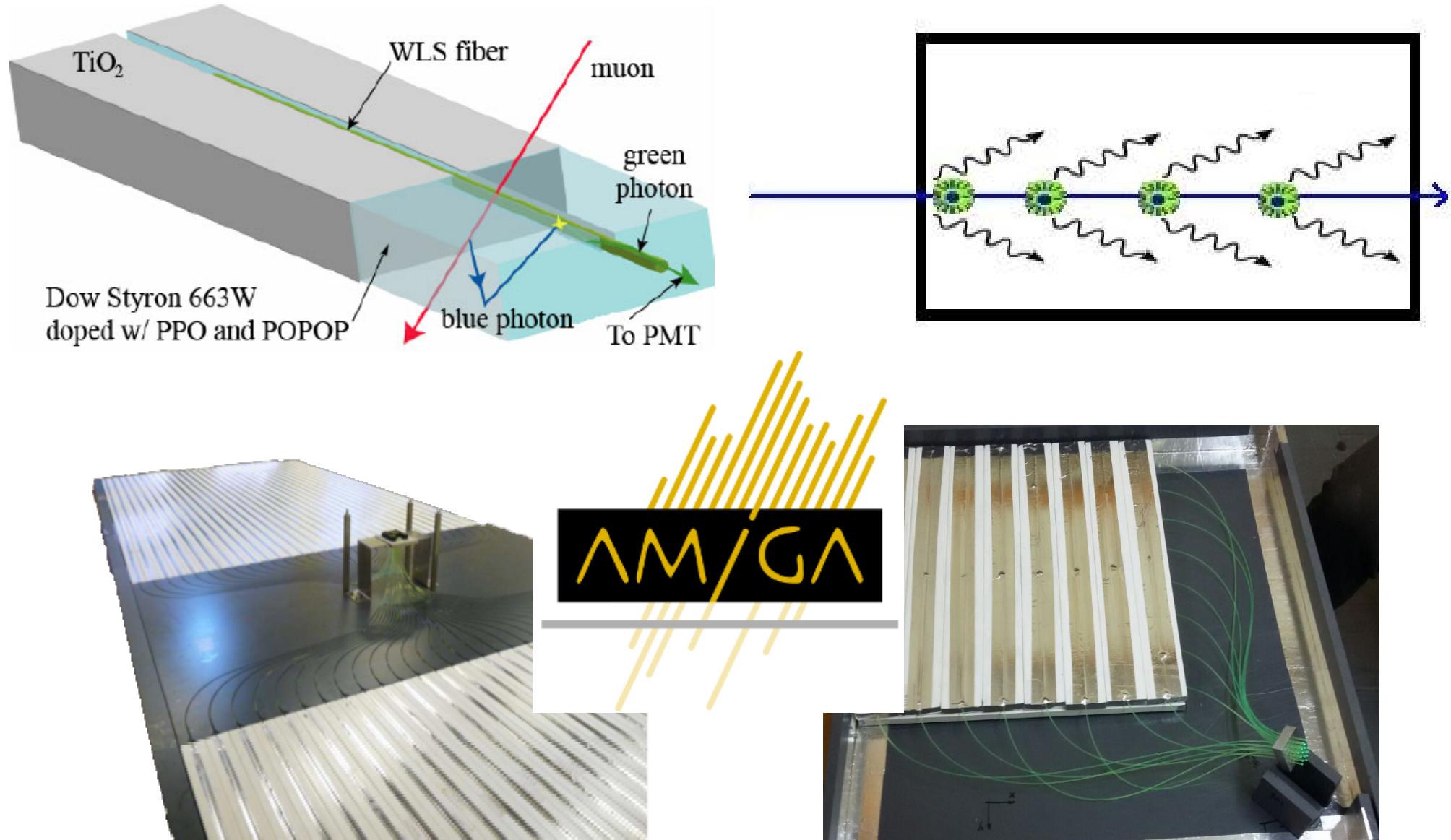


Fig. 3.2 Emission spectra of CsI, CsI(Na) and CsI(Tl) scaled on maximum emission intensity. Also a typical quantum efficiency curve of a bialkali photocathode is shown.

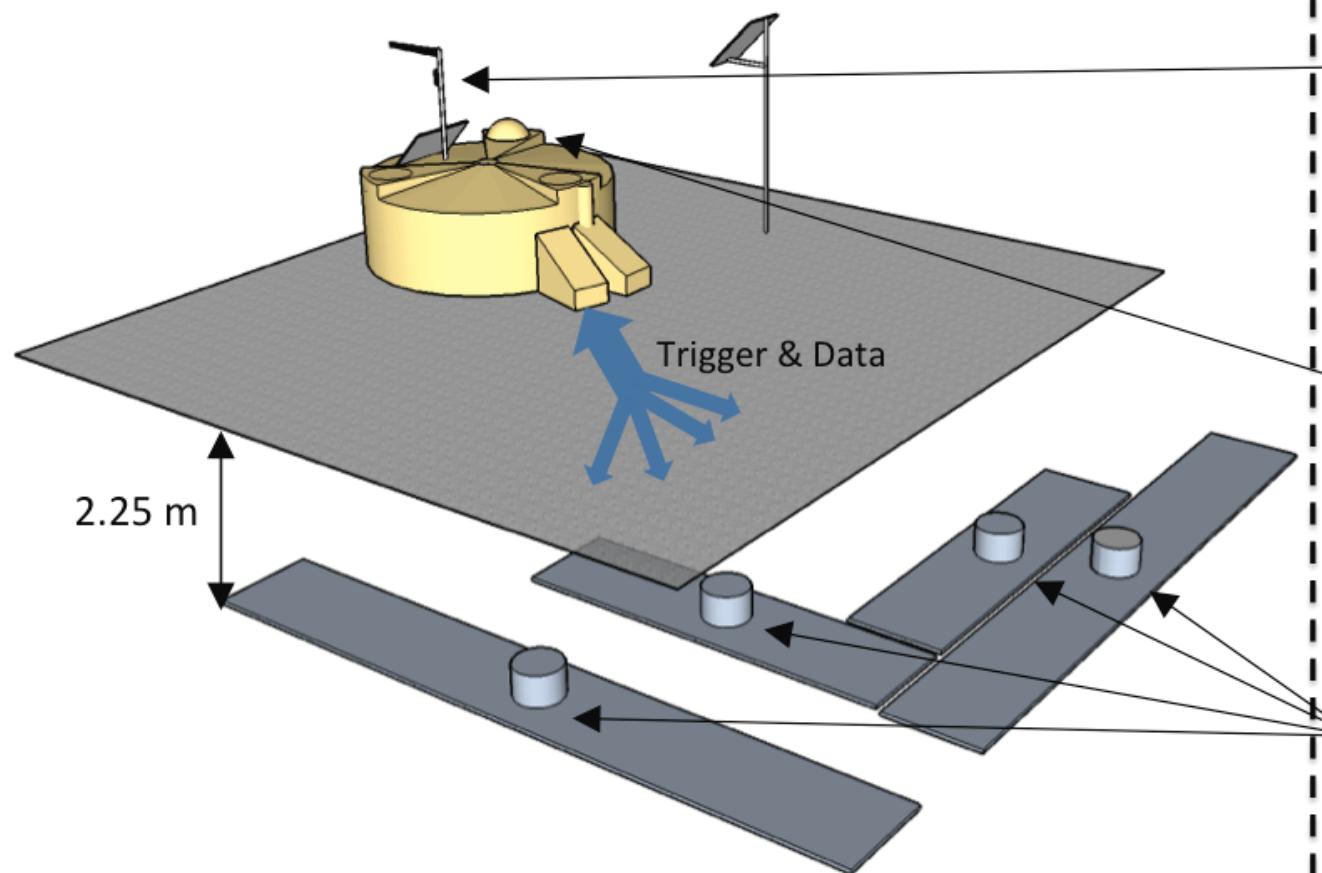


Centelladores plásticos

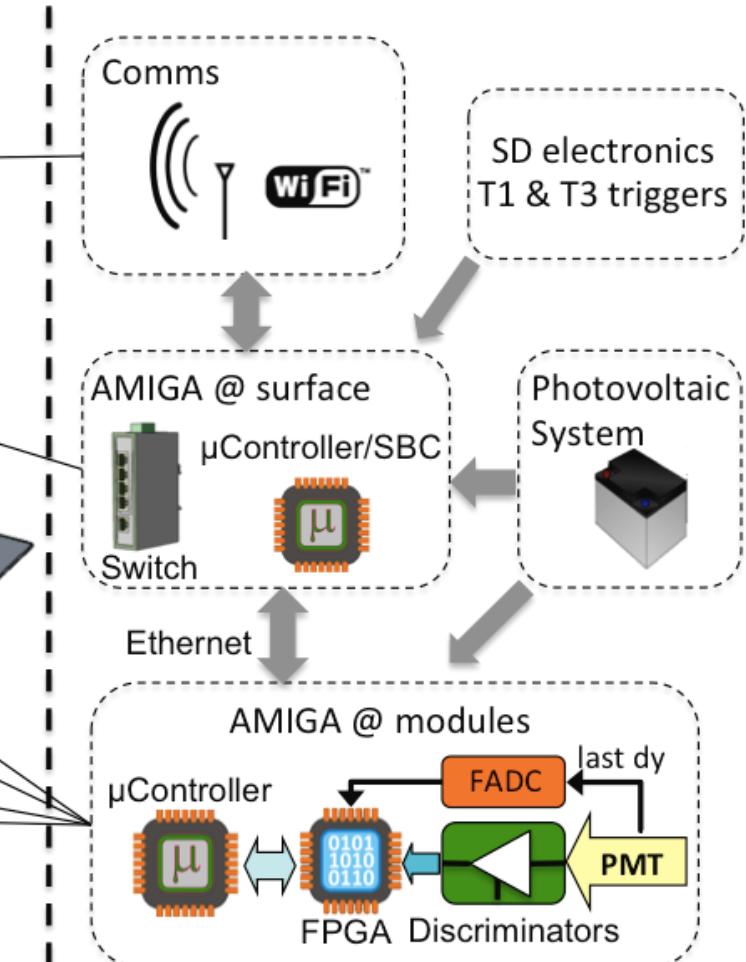


Auger Muons and Infill for the Ground Array

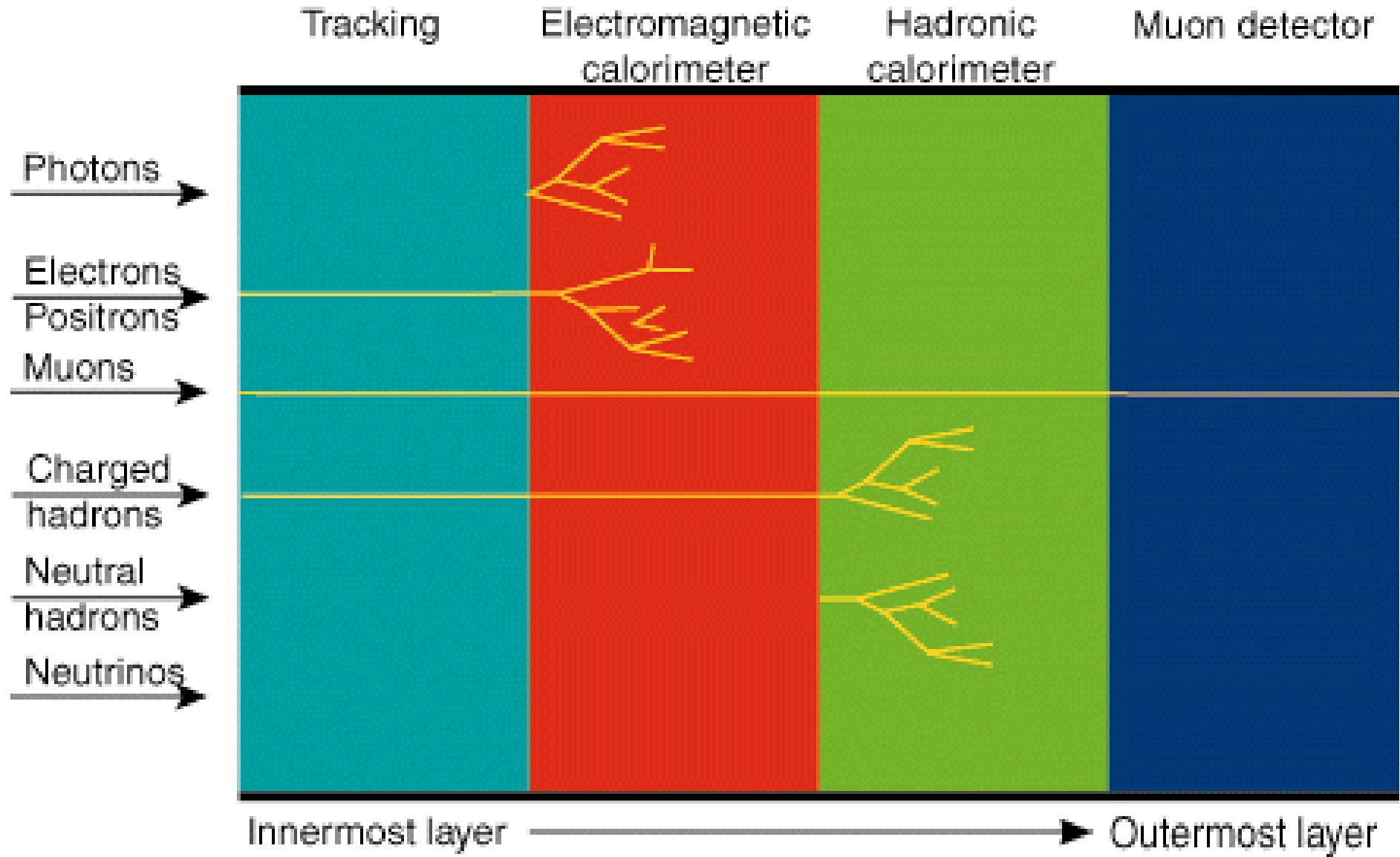
UC muon counter station



AMIGA electronics



calorímetros





KASCADE



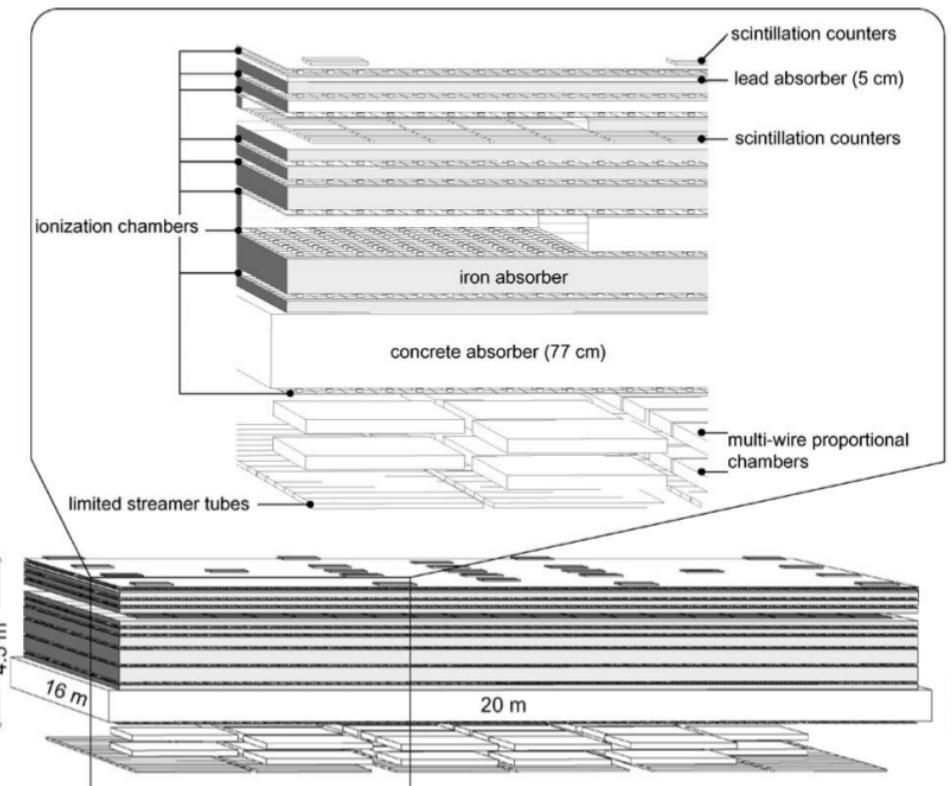
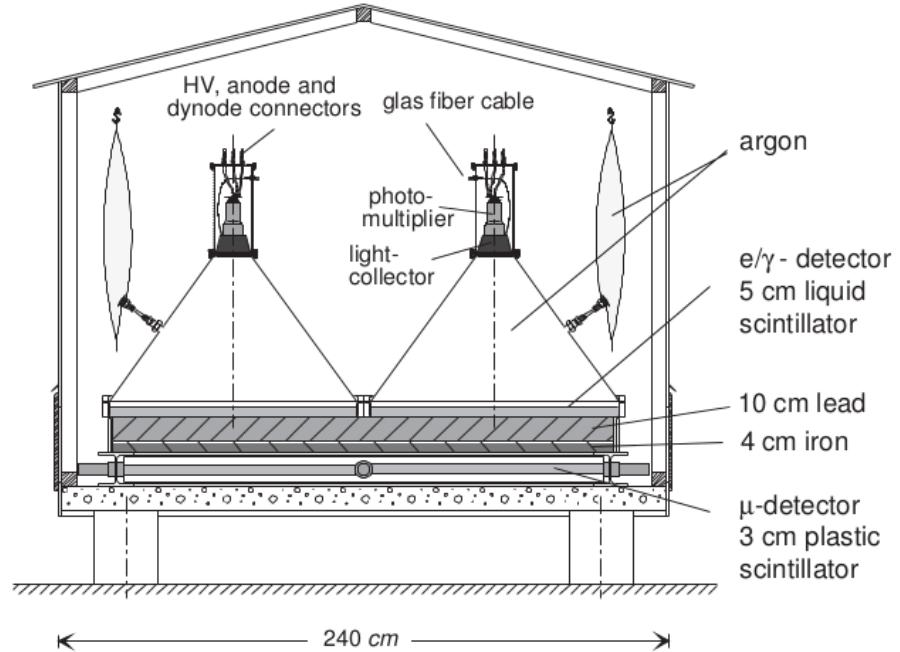
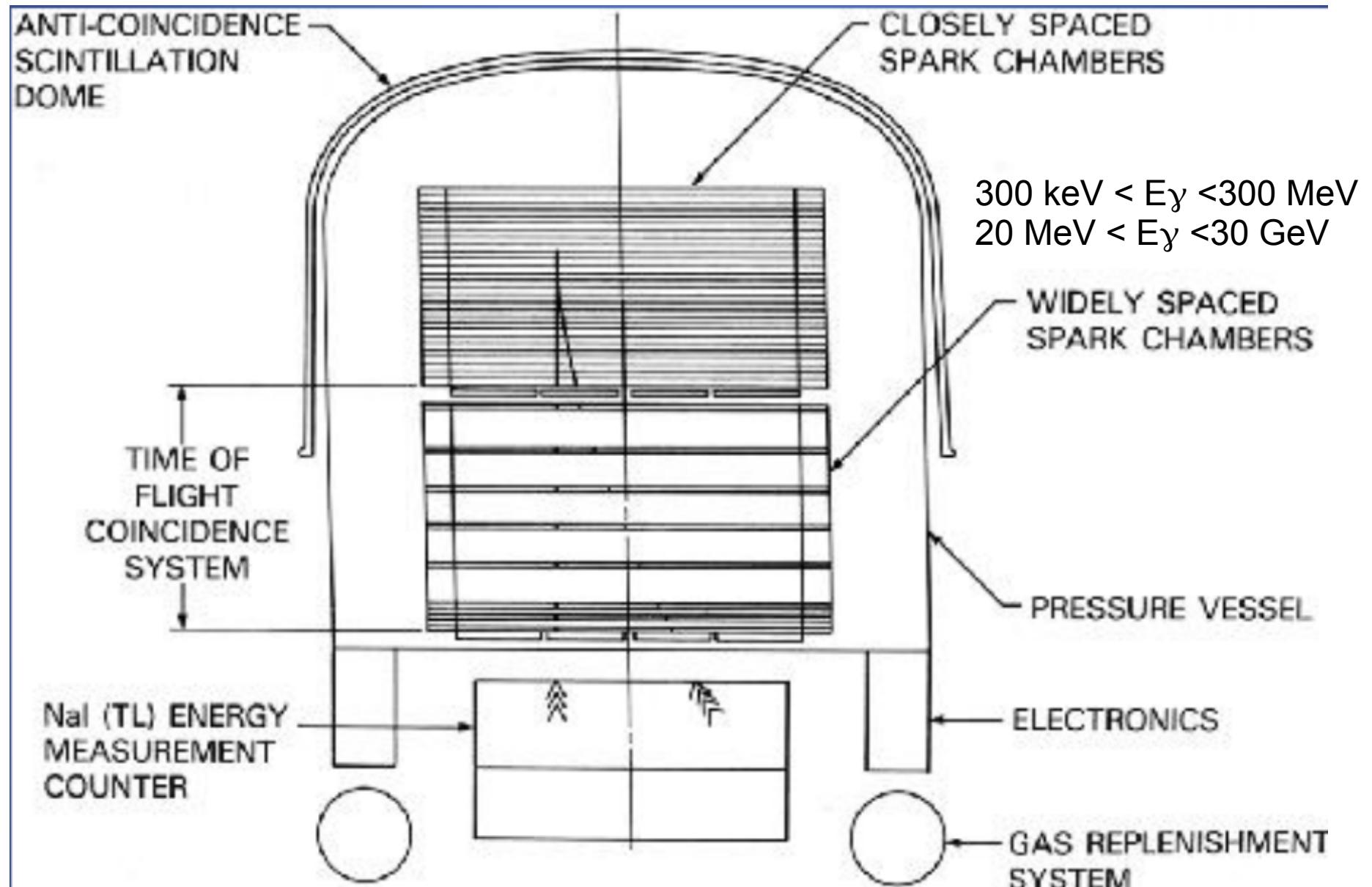
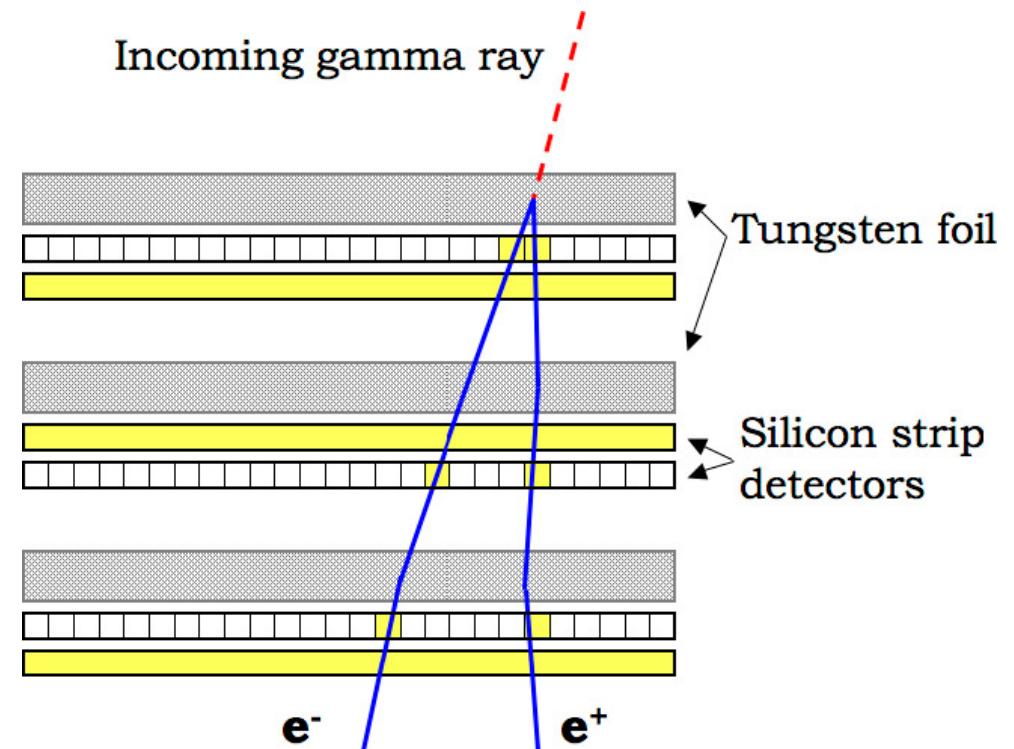
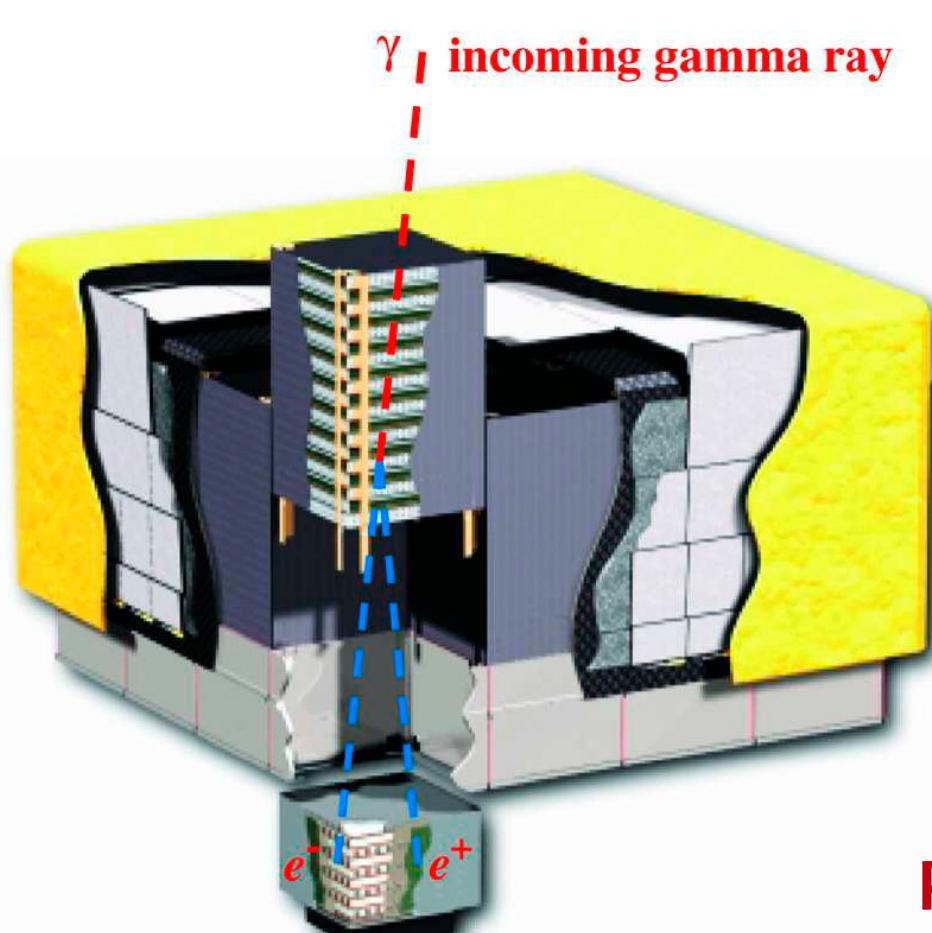


Table 1
Detector components of KASCADE, their total sensitive area and threshold for vertical particles

Detector	Particle	Total area (m^2)	Threshold
Array, liquid scintillators	e/ γ	490	5 MeV
Array, plastic scintillators	μ	622	230 MeV
Muon tracking detector, streamer tubes	μ	128×4 layers	800 MeV
central detector:			
Calorimeter, liquid ionization chambers	h	304×8 layers	50 GeV
Trigger layer, plastic scintillators	μ	208	490 MeV
Top cluster, plastic scintillators	e/ γ	23	5 MeV
Top layer, liquid ionization chambers	e/ γ	304	5 MeV
Multi-wire proportional chambers	μ	129×2 layers	2.4 GeV
Limited streamer tubes	μ	250	2.4 GeV

EGRET: Detección directa





PSF (point spread function)
**68% de los gamma en un cono de
 3° a 100 MeV y 0.04° a 100 GeV**