The initial plans for a fast timing array at DESPEC

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Initial considerations:

- Best time resolution
- Maximum FEP effeciency for gamma-rays in 100 to 1000 keV

- These conditions are mutually contradictory

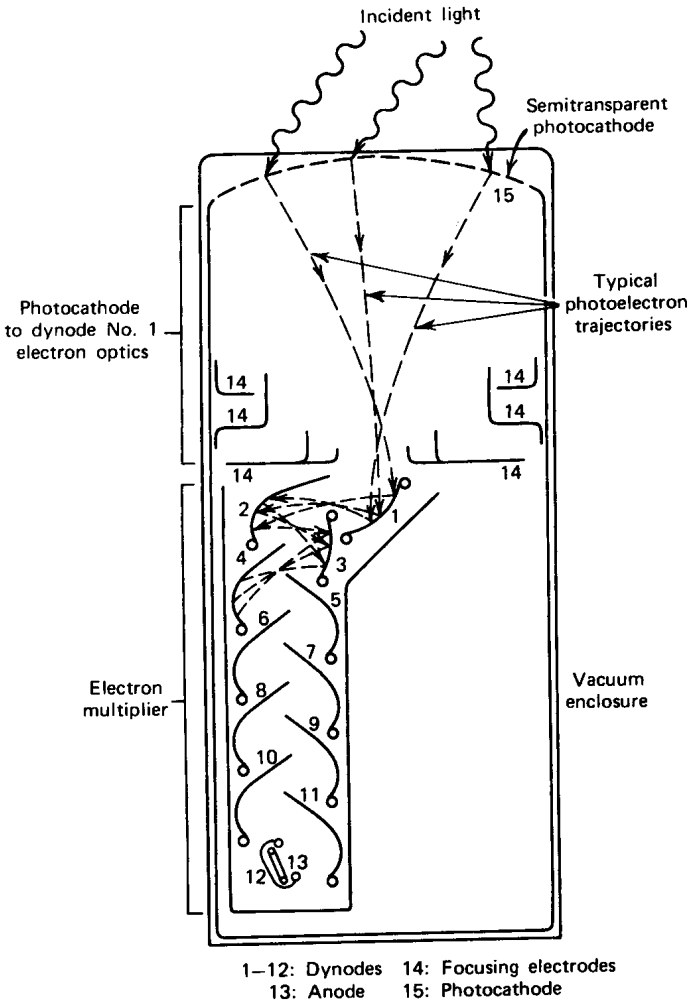
Note the trade off:

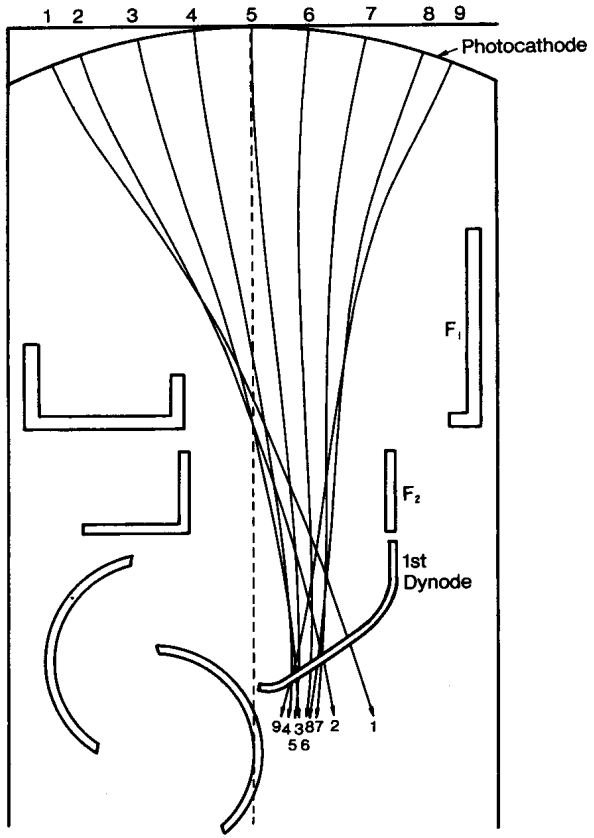
Precision = time resolution (FWHM) / SQRT(Number of counts)

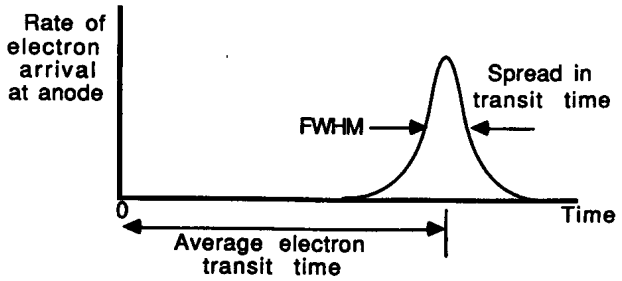
Consequences:

- ff you have 2x worse resolution you need to have 4x higher statistics.
- In practice the statistics has to be much, much higher

Key aspects of fast response phototubes

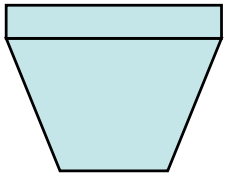






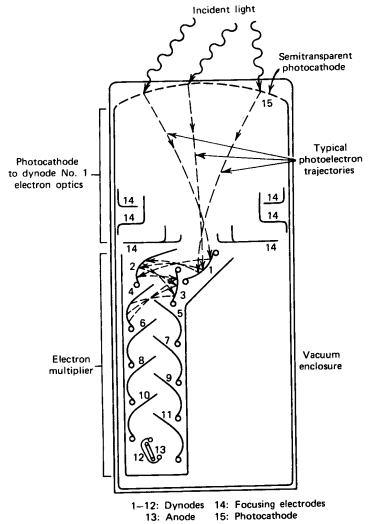
Phototubes:

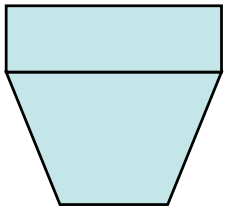
- Best time response phototubes were 2’’ tubes
- Their effective diameter is about 44-46 mm
- That is good if we want to use Pb-Cu shielding



Crystals:

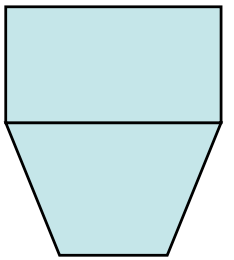
- BaF2
- Diameter 44-46 mm at the base
- As small as possible
- Truncated cones
- Length?





Crystal Length:

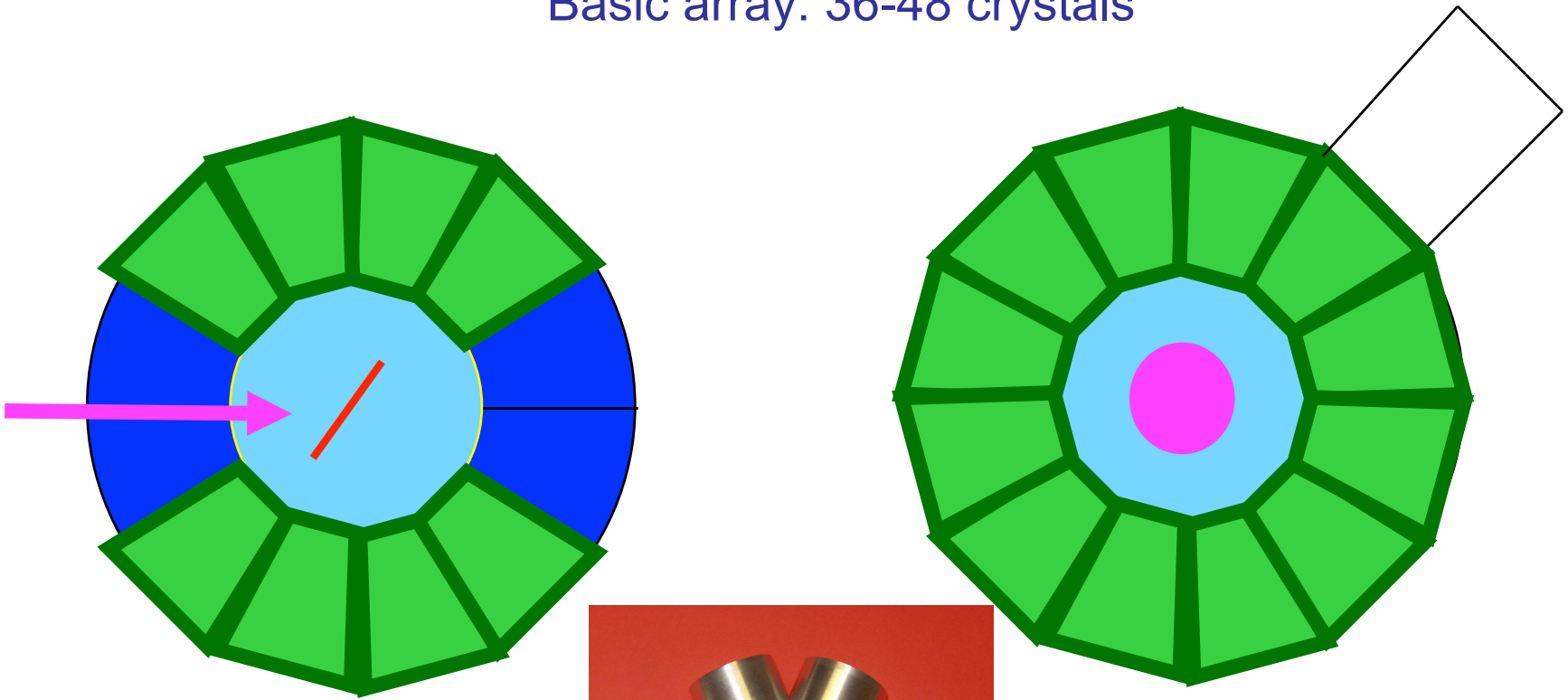
- We had used by then ‘’large’’ crystals with 3 different length
- The shape with the longest stem was adopted
- Crystals with longer stem were not considered




SCIONIX HOLLAND
S5U662

Fast Timing Array at FAIR

Basic array: 36-48 crystals



Geometry:

- 3 rings x16 detectors in each
- 4 rings x12 detectors in each

- detectors mounted in a cluster of 4
- Modular form is the most flexible to be used at GSI or other facility
- BaF2 array would need to be mixed with Ge array
- LaBr3 may not be mixed

- Easy way to increase the inner diameter
- The inner diameter of 12-14 cm

- The beam diameter best at about 10 cm
- The beam is shaped to be narrower, by cutting less intense wings

Fast timing experiment rather as a stand-alone experiment.

Early Status of Crystals and Phototubes:

The crystals, phototubes, CFD and HV power supplies were **standardized** and kept by a few groups occasionally for a common use.

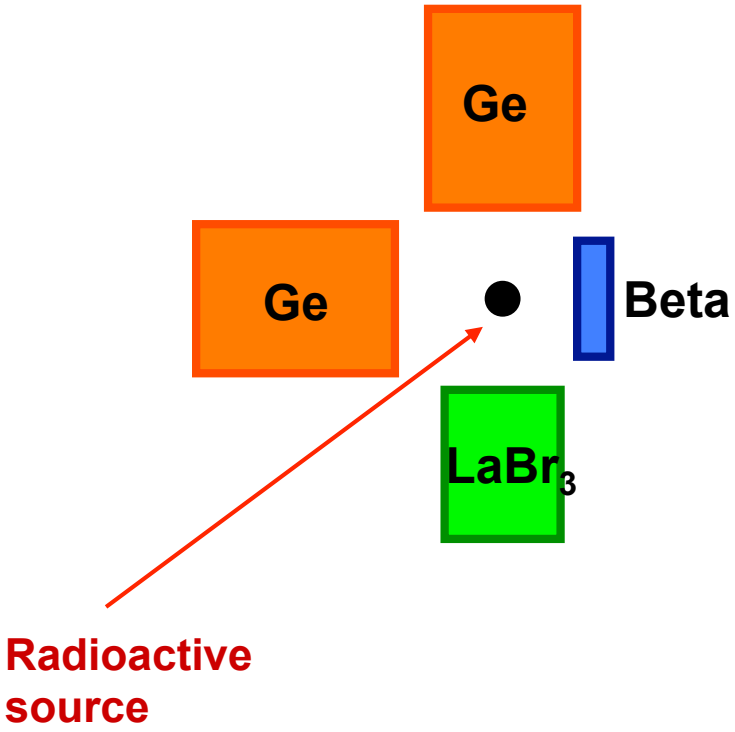
- 8 units Studsvik
- 4 ILL
- 4 Surrey
- 4 Oak Ridge

Together 20 detectors plus 5 CFD (ORTEC 935) and several HV power supplies (recommended Canberra 3002D)

Fast timing experiment was rather foreseen as a stand-alone experiment.

Mid 2005 we have switched to LaBr3 as the standard crystal.

Basic components of a timing setup



- Double coincidences between beta- and gamma-rays, Beta-Ge, Beta-$LaBr_3$ or $LaBr_3$-$LaBr_3$ detectors
- Triple coincidences of the beta-gamma-gamma type involving beta-Ge-Ge and Beta-Ge-$LaBr_3$ and Beta-$LaBr_3$-$LaBr_3$ detectors.

Initially, no special considerations were given to the Beta detector