

Lecce group

		2023
Paolo Bernardini	staff Unisalento	50 %
Antonio Surdo	staff INFN	40 %
Daniele Montanino	staff Unisalento	30 %
Antonio Leaci	staff Unisalento	50 %
Luigi Martina	staff Unisalento	20 %
Rosella Cataldo	staff Unisalento	50 %
Giovanni De Matteis	assegnista PRIN	50 %
Maria Paola Panetta	assegnista INFN	40 %
Servizio Elettronica		4 mesi uomo
CAD + Officina Meccanica		4 mesi uomo
Totale		3.30 FTE

Alessandro Corvaglia
Alessandro Miccoli

tecnico elettronico (fisico)
tecnico meccanico (ingegnere)

Carlo Pinto
Massimo Corrado
Giorgio Rizzo

tecnico
tecnico
tecnico

Activities (present and future)

□ SAND

- Reconstruction algorithms
- Background estimate and removal

□ GRAIN

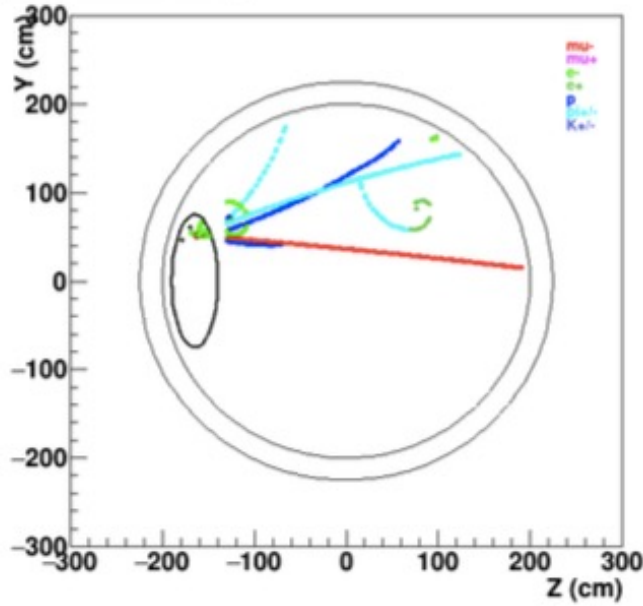
- Theory of coded masks
- Reconstruction algorithms (masks and lenses)
- **Partecipation in prototype measurements**

□ ECAL

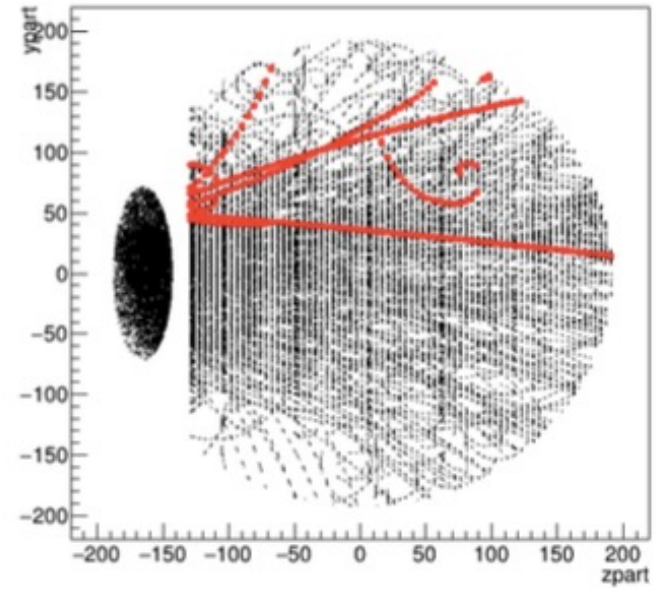
- SiPM-vs-PMT test
- Removal of the KLOE drift chamber
- KLOE dismounting
- **Partecipation in test and refurbshiment**

Algorithms to reconstruction SAND events (applied to FLUKA simulated events)

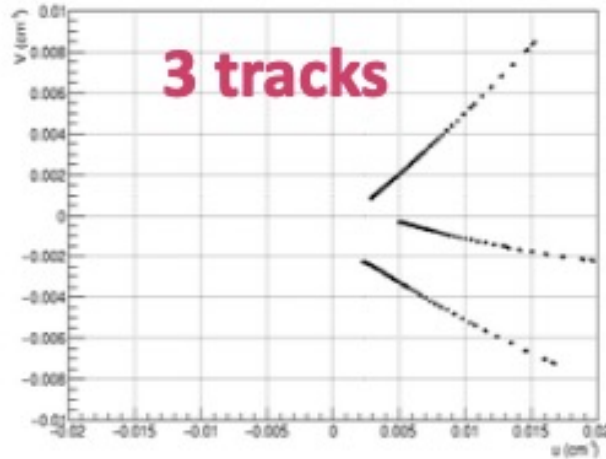
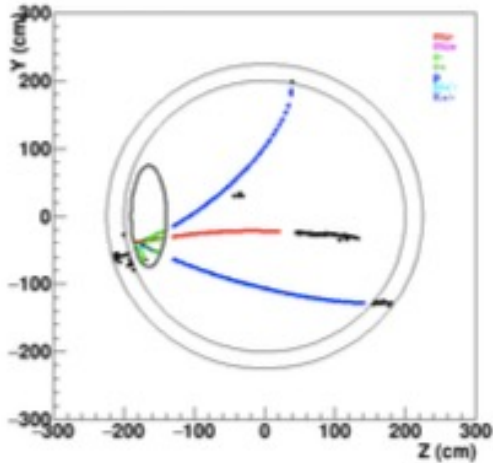
Side view (Z-Y)



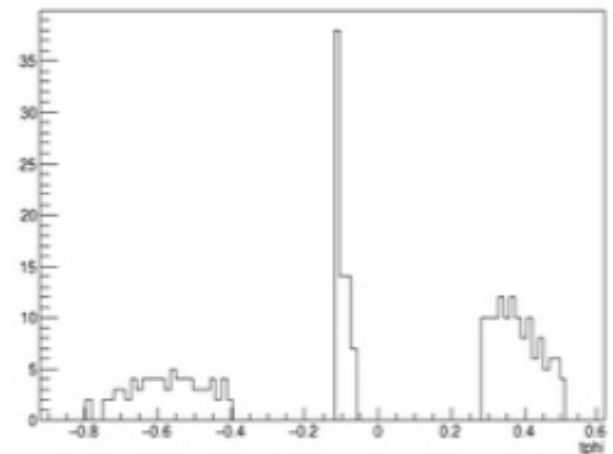
ypart:zpart {Nev<100}



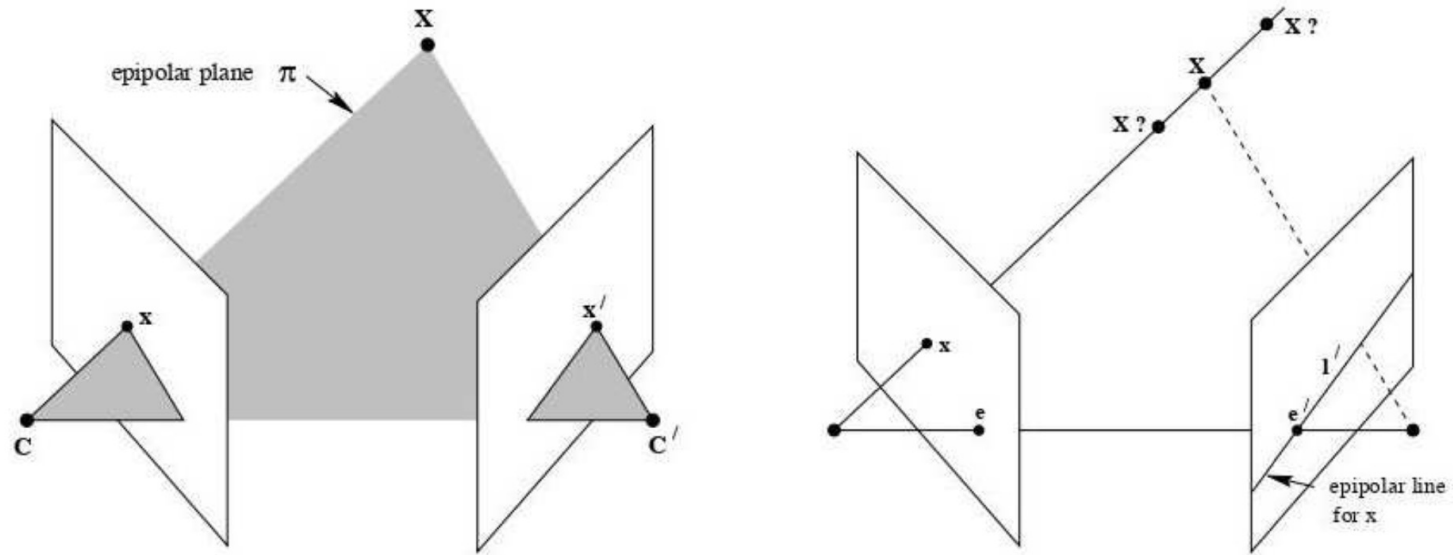
Side view (Z-Y)



tphi {tNev==8}



3-D reconstruction using devices (masks or lenses)



$$\mathbf{x} = \mathbf{P}\mathbf{X}$$

$$\mathbf{x}' = \mathbf{P}'\mathbf{X}$$

\mathbf{X} : source point, \mathbf{x} : reconstructed image on the first image plane

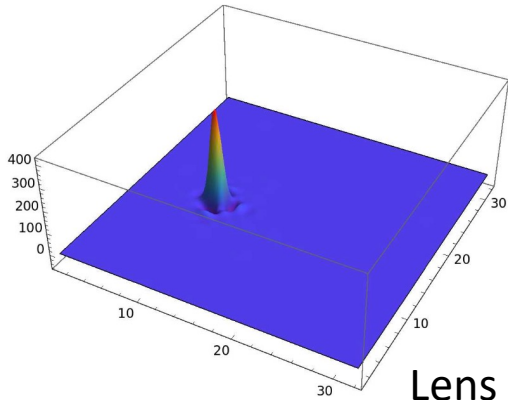
\mathbf{x}' : reconstructed image on the second image plane

\mathbf{P} and \mathbf{P}' projection matrices

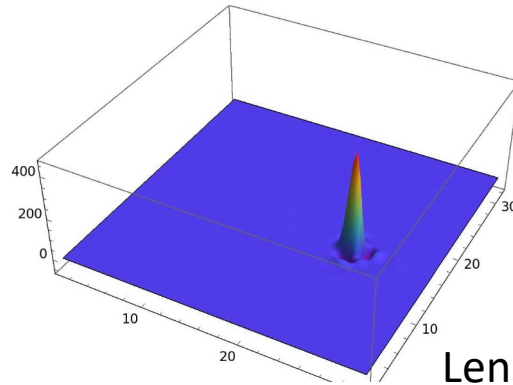
Use of projective coordinates

Generalization of the formulas in the paper on coded masks

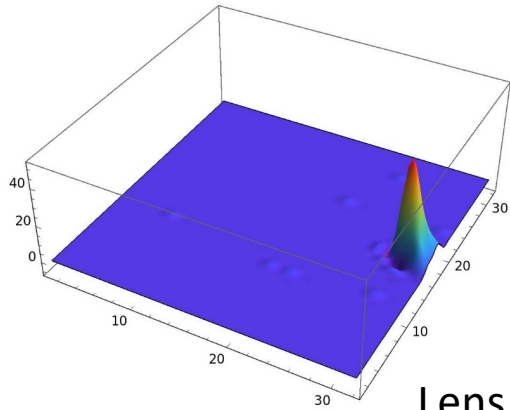
LENSES - 3-D reconstruction of light-points (simulation by M. Vicenzi)



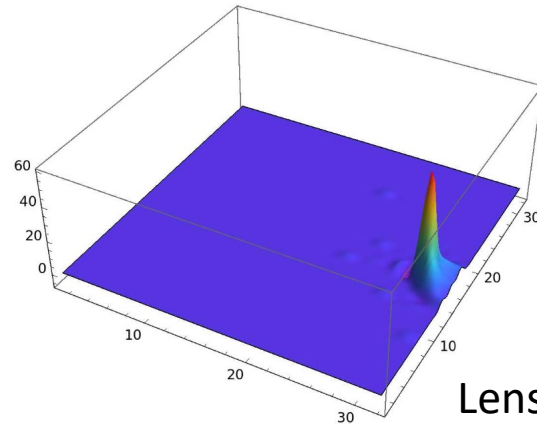
Lens 13



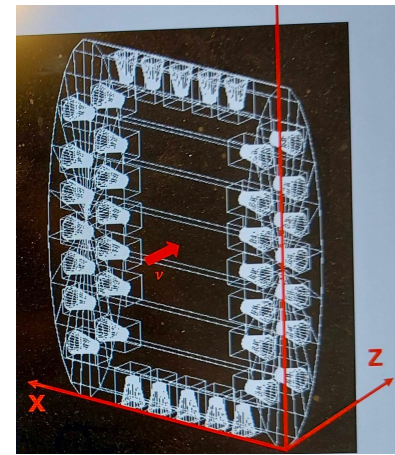
Lens 14



Lens 33



Lens 34



	X (cm)	Y (cm)	Z (cm)
Truth	1.02	-1.03	-16.42
Lenses 13-14		-1.11	-16.61
Lenses 33-34	1.14		-16.55

F matrix to calibrate a couple of optical devices

$\mathbf{F} = \{f_{ij}\}$ is a 9-component vector

8 point-sources (known position) must be reconstructed and used to calculate the matrix \mathbf{A}

Then $\mathbf{A}\mathbf{F} = 0$

The \mathbf{F} matrix must be used to check the association of reconstructed light-points

The Fundamental Matrix

$$\mathbf{F} = [\mathbf{P}'C]_{\times} \mathbf{P}'\mathbf{P}^{+}$$

$$\det\mathbf{F} = 0$$

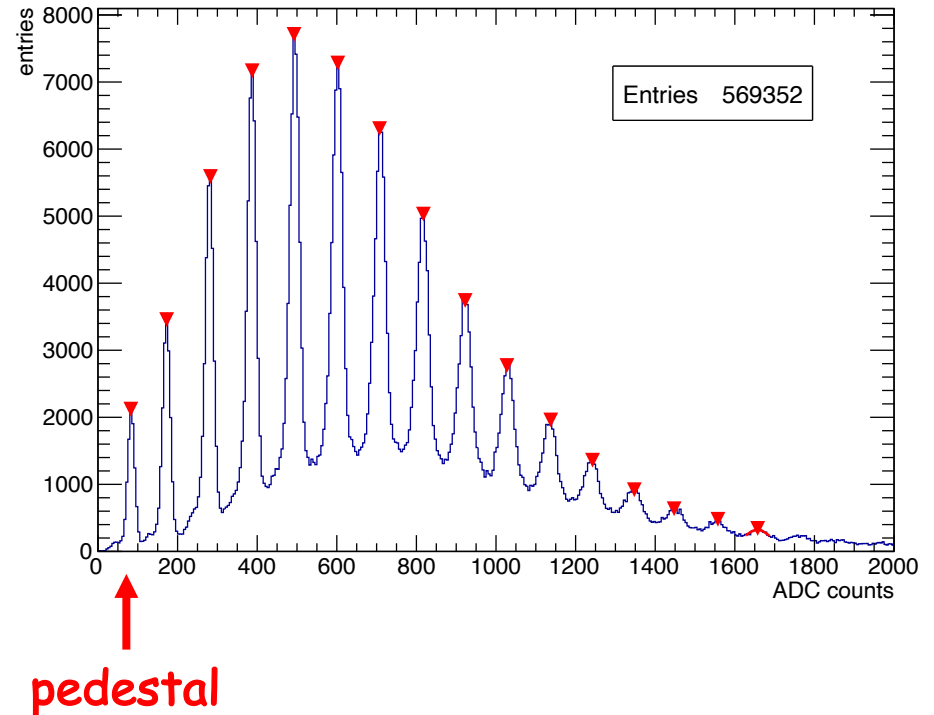
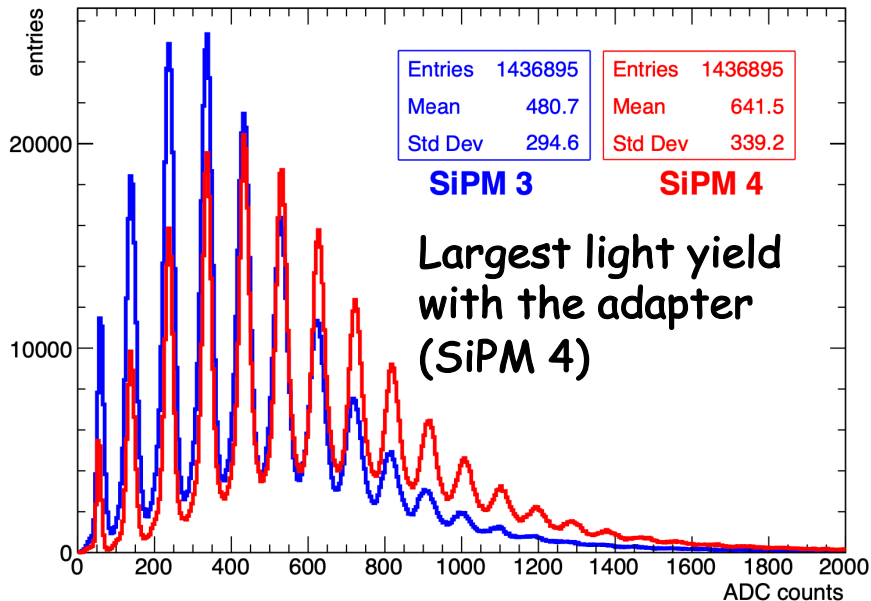
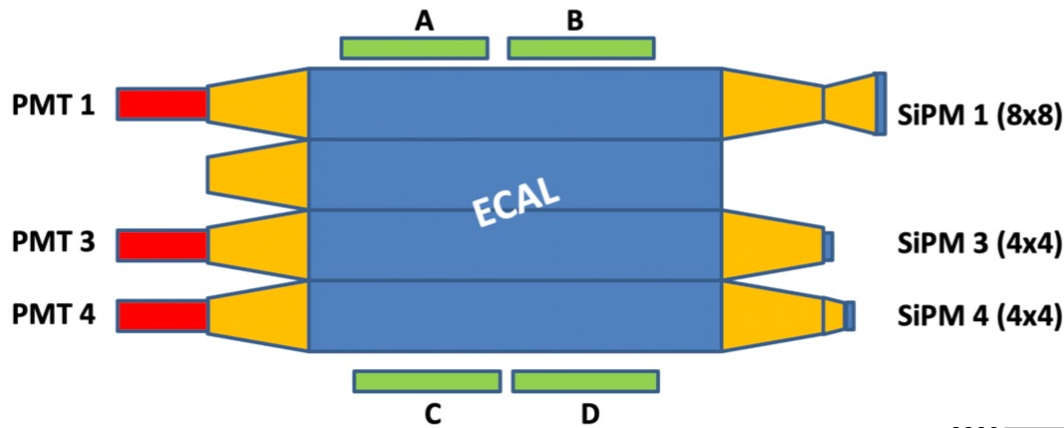
Compatibility Condition

$$\mathbf{x}'^T \cdot \mathbf{F}\mathbf{x} = 0$$

KLOE -> SAND

SiPM-vs-PMT

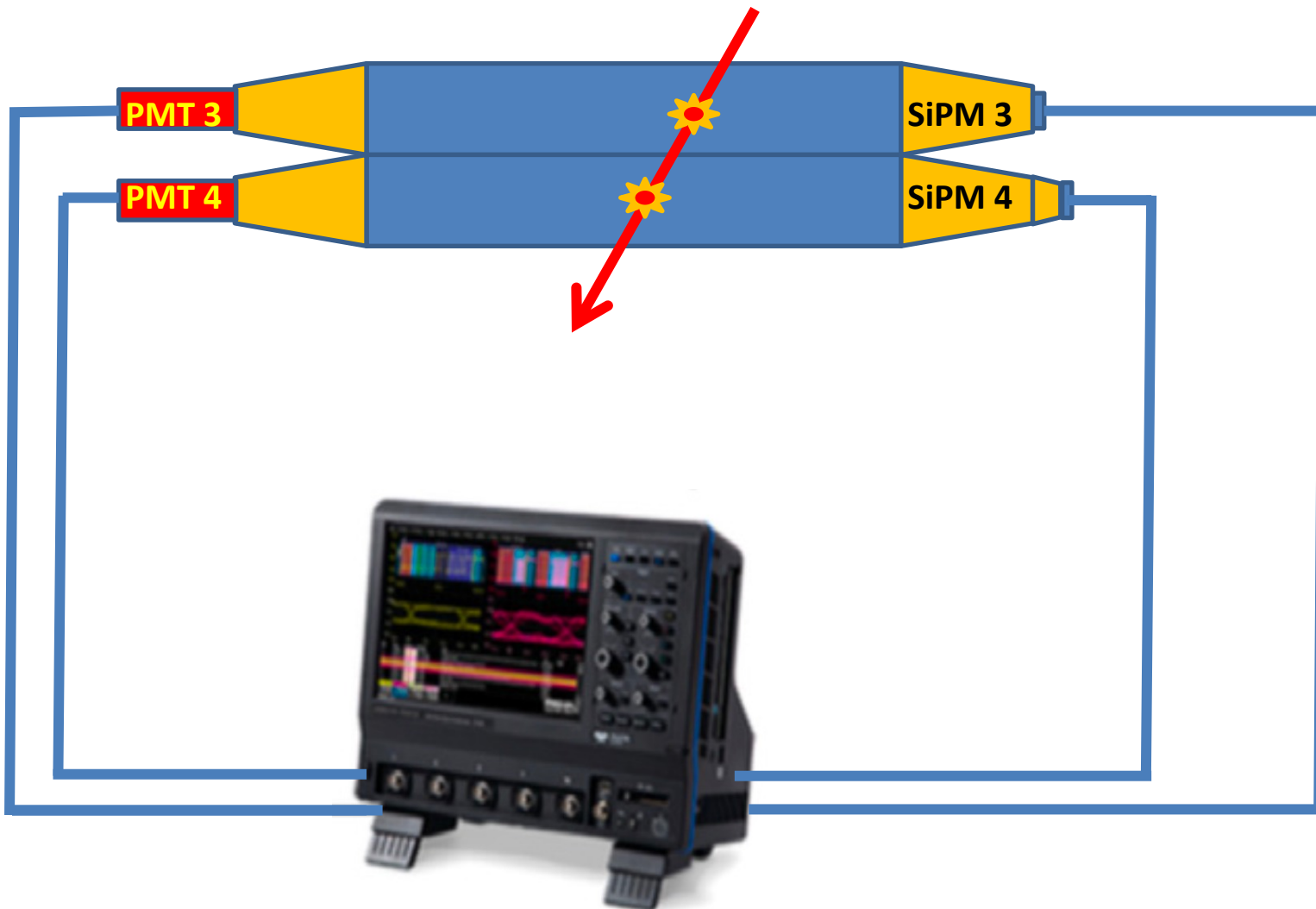
Experimental setup (not in scale):
 yellow -> light guides
 green -> external trigger



Time analysis

$$\Delta t = t_3^{50\%} - t_4^{50\%}$$

constant fraction method



Time - duration & resolution

*very
preliminary*

	PMT	SiPM
signal duration (ns)	~ 20	~ 65
time resolution (ps)	~ 150	~ 250

Long signal duration can be a problem for event pile-up

Efficiency measurement

*very
preliminary*

	PMT efficiency (%)	SiPM efficiency (%)
ECAL BAR 3	90.1 ± 2.1	90.7 ± 2.1
ECAL BAR 4	88.4 ± 2.5	89.2 ± 2.1

SiPM-vs-PMT summary

Done

- mechanical setup
- assembling of experimental setup
- understanding of SiPM work conditions
- time and efficiency measurement

To do

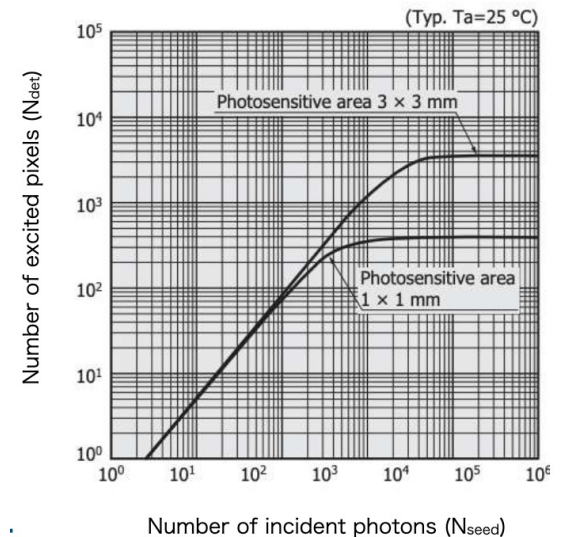
- larger statistics is necessary
- estimate of the linearity limit

Presently the SiPM option is disadvantaged

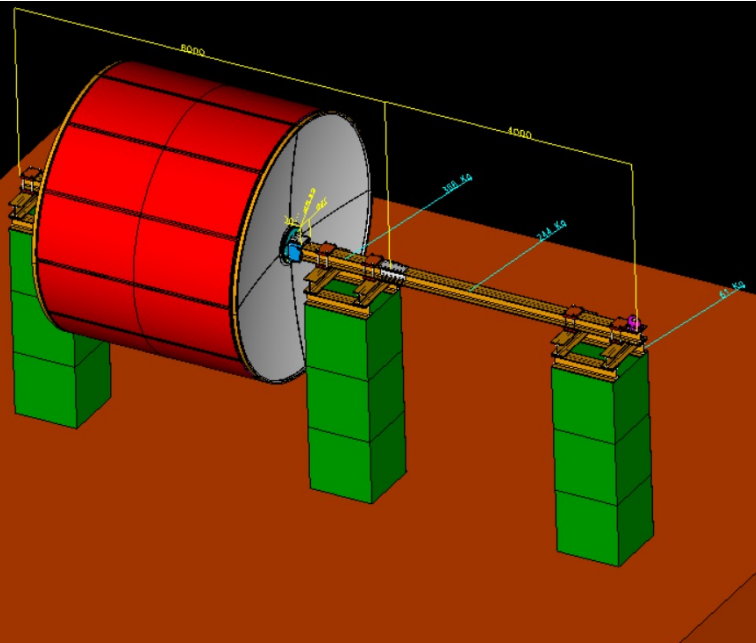
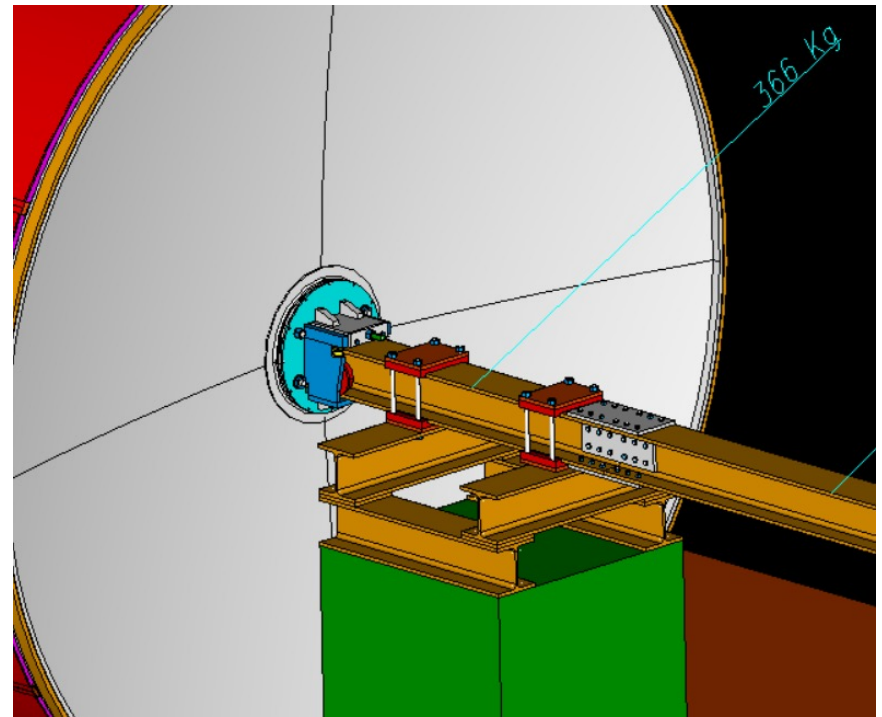
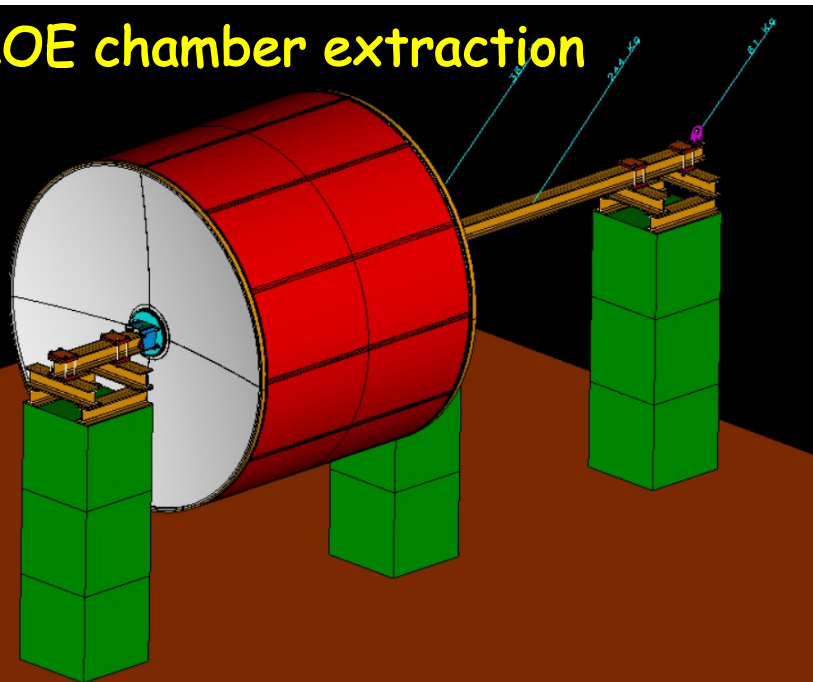
Deadline : December 2022

A report on this activity shall be published

DONE
DONE
DONE
to be completed



KLOE chamber extraction



Tools to extract the wire chamber from KLOE

Extraction shall be completed within 2022

With the support by LNF, Bologna and Ferrara mechanical workshops

Richieste 2023

Apparati - SAND/ECAL/HV (1.2.2)

Moduli CAEN (IVA inclusa) per implementare il software di controllo remote dell'alimentazione dei PMT (moduli da riutilizzare nel setup finale)

Richiesta **7.0 keuro** SY4527, multichannel power supply system
6.0 keuro A7030P, common floating return board

Consumo - SAND/GRAIN/ARTIC (1.2.2.2)

Sistema di trigger e tracciamento su ARTIC (4 scintillatori, ognuno di 50x50 cm² - fibre - lavorazioni meccaniche). SiPM ed elettronica sono recuperabili da precedenti attività. Disponibile offerta per una lastra di scintillatore plastico Saint Gobain Crystals BC404 (50x50x2 cm³): 3780 euro + IVA

Richiesta **25.0 keuro**

Missioni – 9.6 ke = 12 turni di 1 settimana a Frascati (smontaggio KLOE e test coi cosmici);
4.0 ke = 2 persone al meeting negli USA;
4.0 ke = 4 persone al meeting al CERN;
2.4 ke = 4 trasferte a Genova per misure sul prototipo.

Richiesta **20.0 keuro**

Seminari –

Richiesta **1.0 keuro**

Trasporti – SAND/ECAL (1.2.2) – trasporti a LNF

Richiesta **1.0 keuro**

Trasporti – SAND/GRAIN/ARTIC (1.2.2.2) – trasporti a Genova

Richiesta **1.5 keuro**