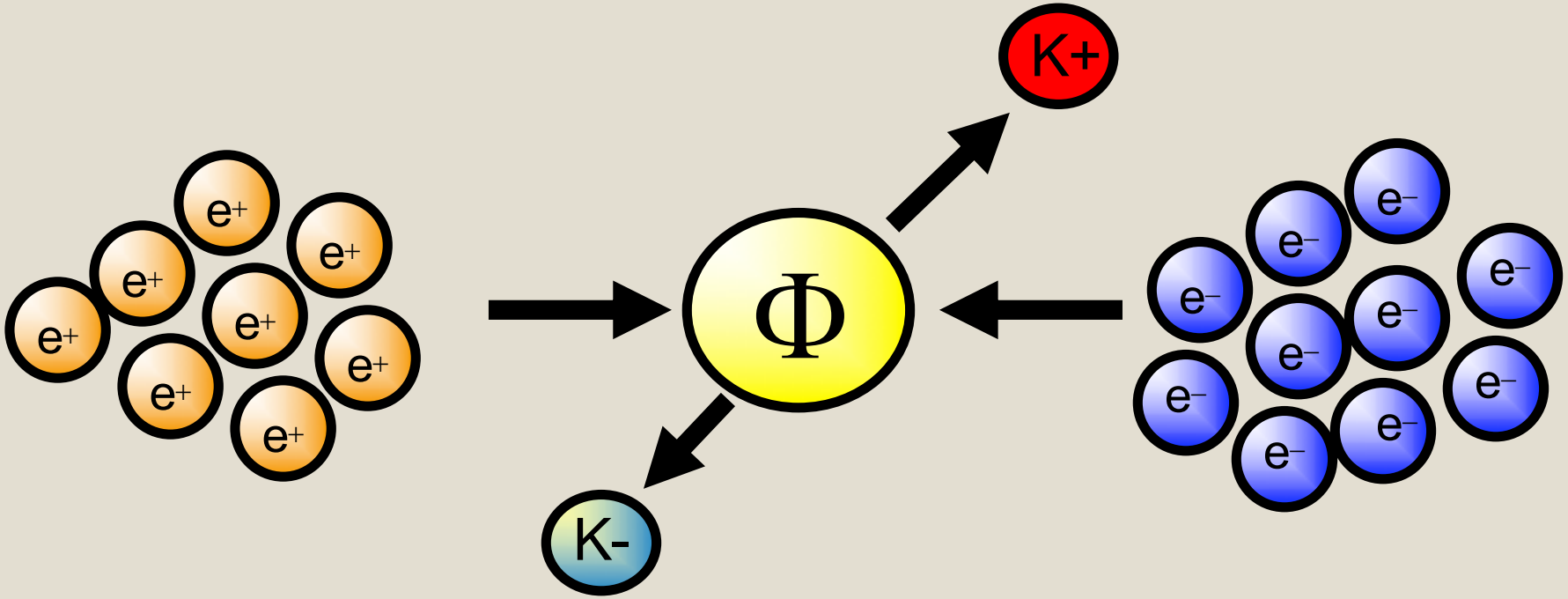
SIDDHARTA 2

Corso
«Operazione di Acceleratori di elettroni e positroni»
LNGS 21-22 Giugno 2018

S I D D H A R T A

La Sorgente di Mesoni K

DAΦNE come sorgente di K^+ K^-



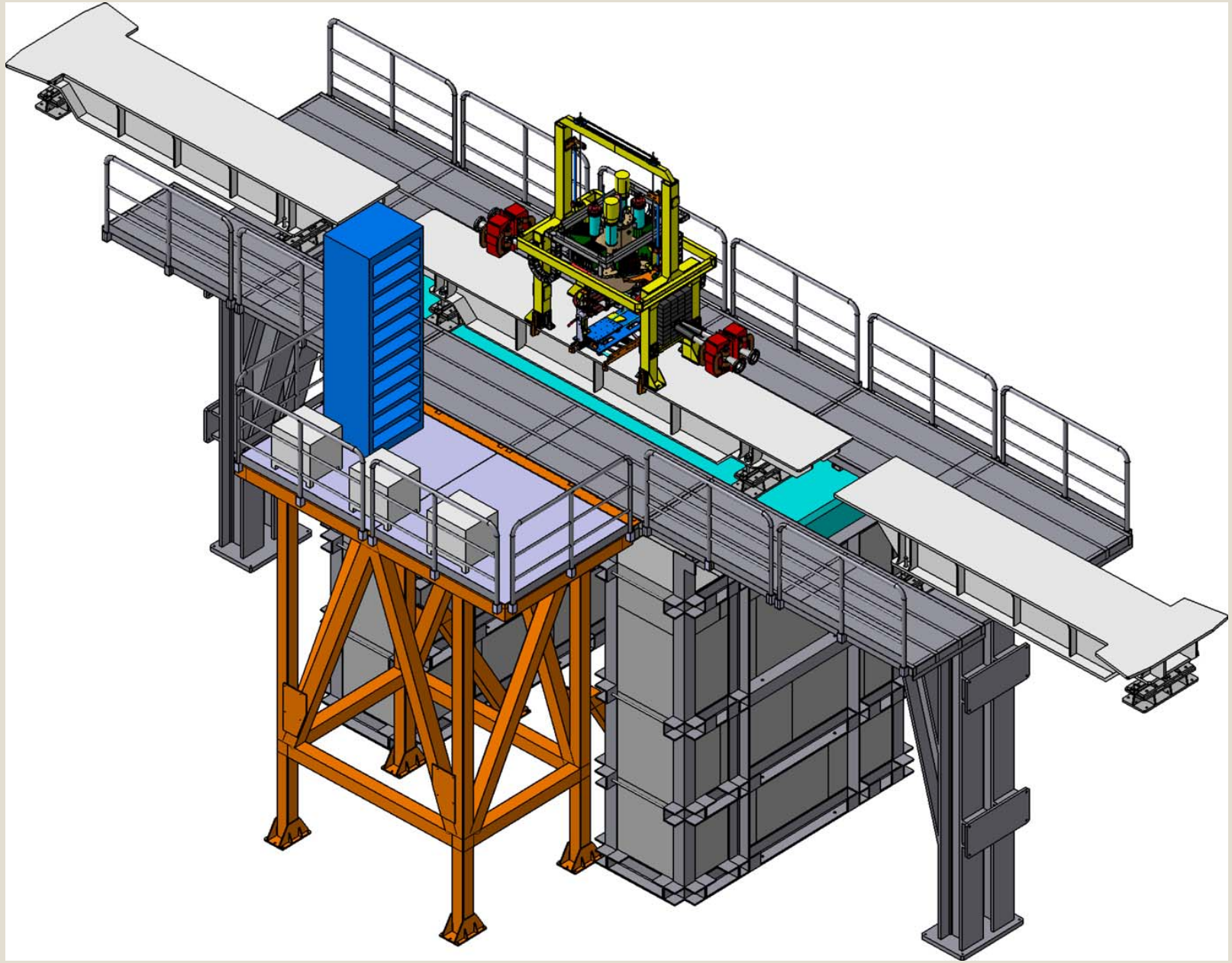
Flusso di Kaoni prodotti: circa 1000/s

DAΦNE come sorgente di K^+ K^-

- $\Phi \rightarrow K^- K^+$ Branching Ratio = 49.1%
- Mesoni K- Monocromatici e a Bassa Energia (~127MeV/c)
- Background Adronico Ridotto rispetto a quello ottenibile a KEK/JPARC, ad esempio

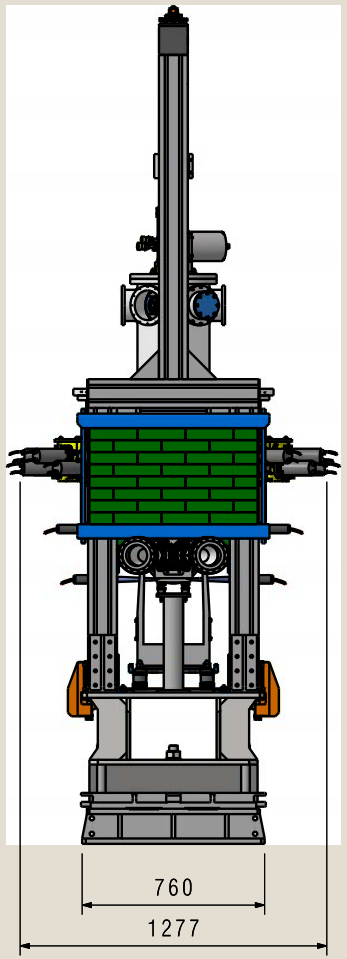
- Particolarmente adatti allo studio della Fisica dei Mesoni K a Bassa Energia:
  - Atomi Kaonici
  - Studio delle Interazioni Kaone – Nucleo/Nucleoni

Il Setup Sperimentale

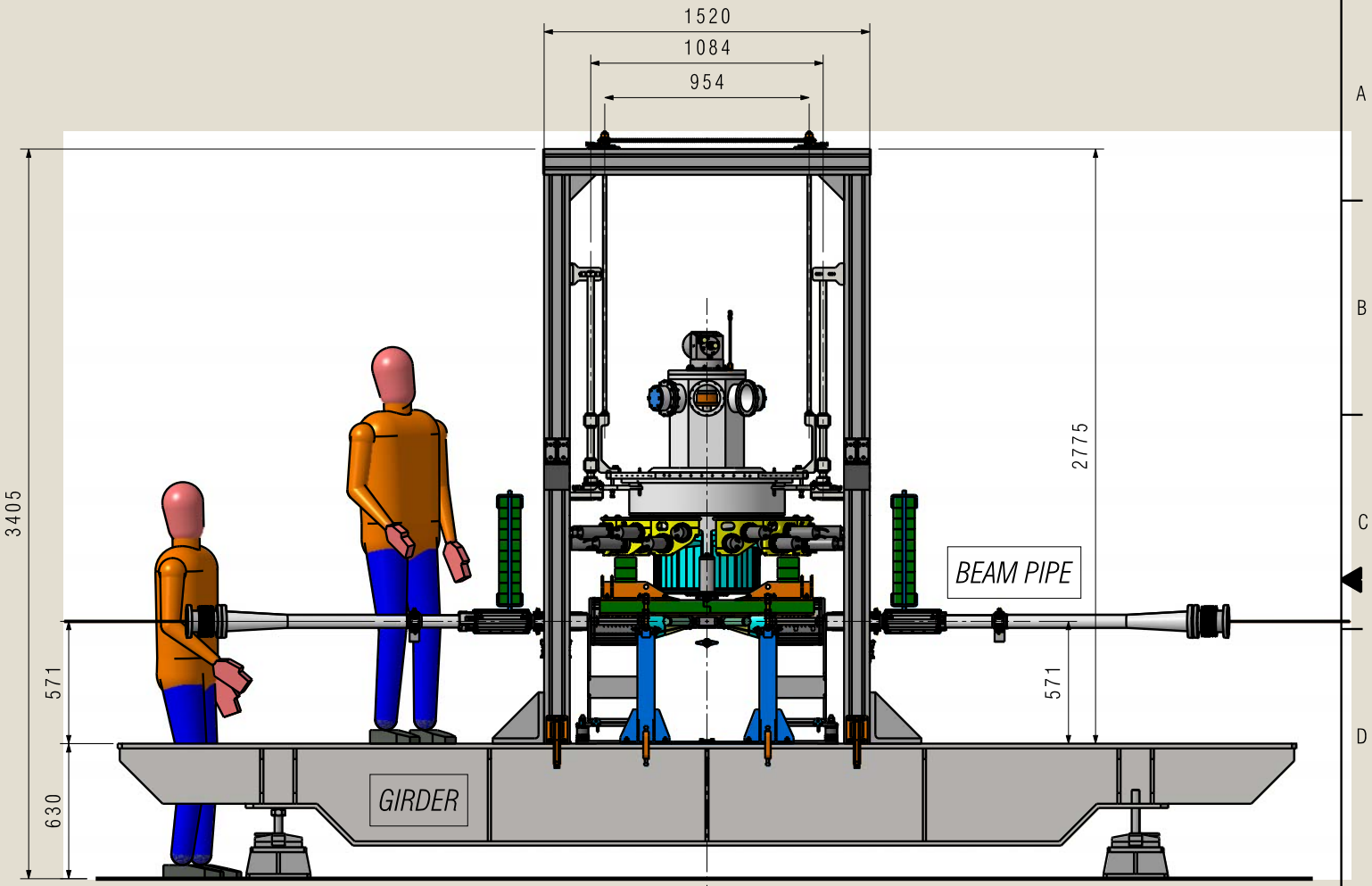


Isometric view
Scale: 1:35

SIDDHARTA II
GENERAL SETUP



Right view
Scale: 1:20



Front view
Scale: 1:20

General tolerance ISO 2768-mK-E	Geometrical tolerance ISO 8015-E	Roughness ISO 1302

NATIONAL INSTITUTE FOR NUCLEAR PHISYCS
FRASCATI NATIONAL LAB
S.P.A.S

SIZE A3

PROJECTION

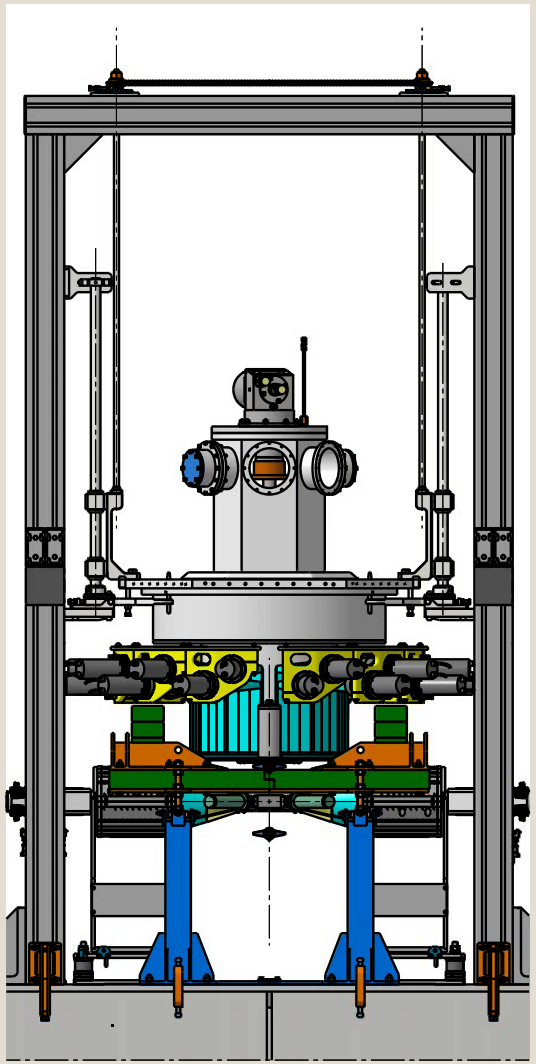
REVISION		DATE	NAME
	.	DATE : .	NAME : .
	.	DATE : .	NAME : .
	.	DATE : .	NAME : .

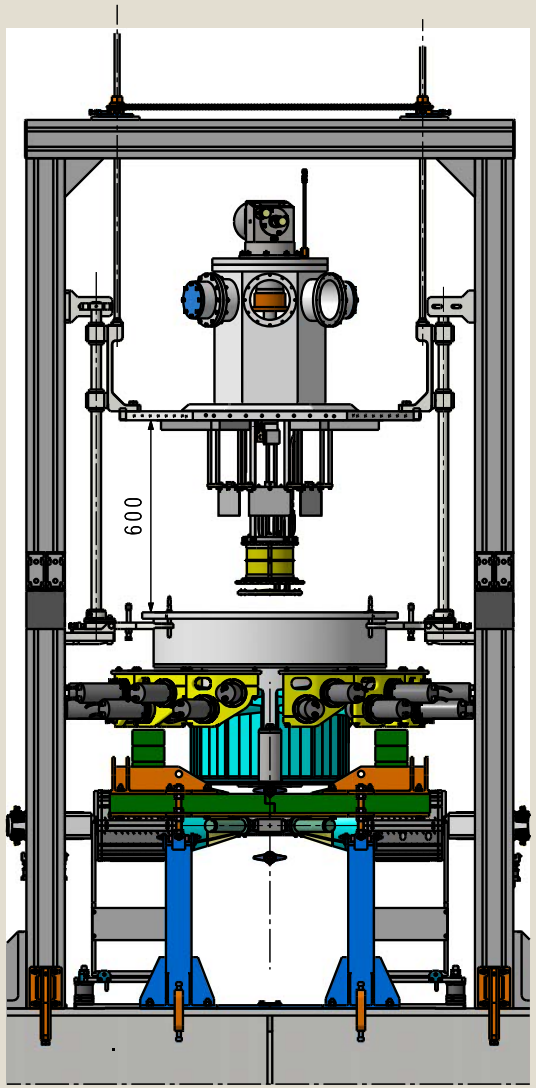
TOTAL WEIGHT (Kg)	DATE	DRAWN
..	11/05/2018	C.Capoccia
SCALE	DATE	CHECKED
1:20	.	.
SHEET	DATE	APPROVED
1/1	.	.

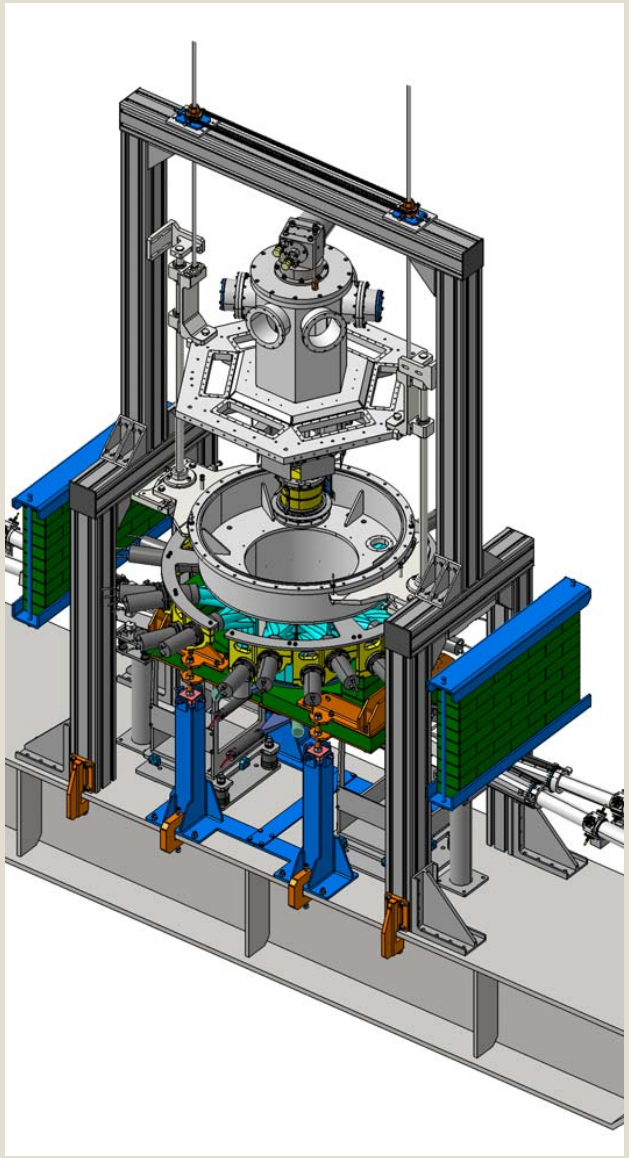
SIDDHARTA II EXPERIMENT
GENERAL SETUP
SCHEME OF GENERAL SETUP IN A3 FORMAT

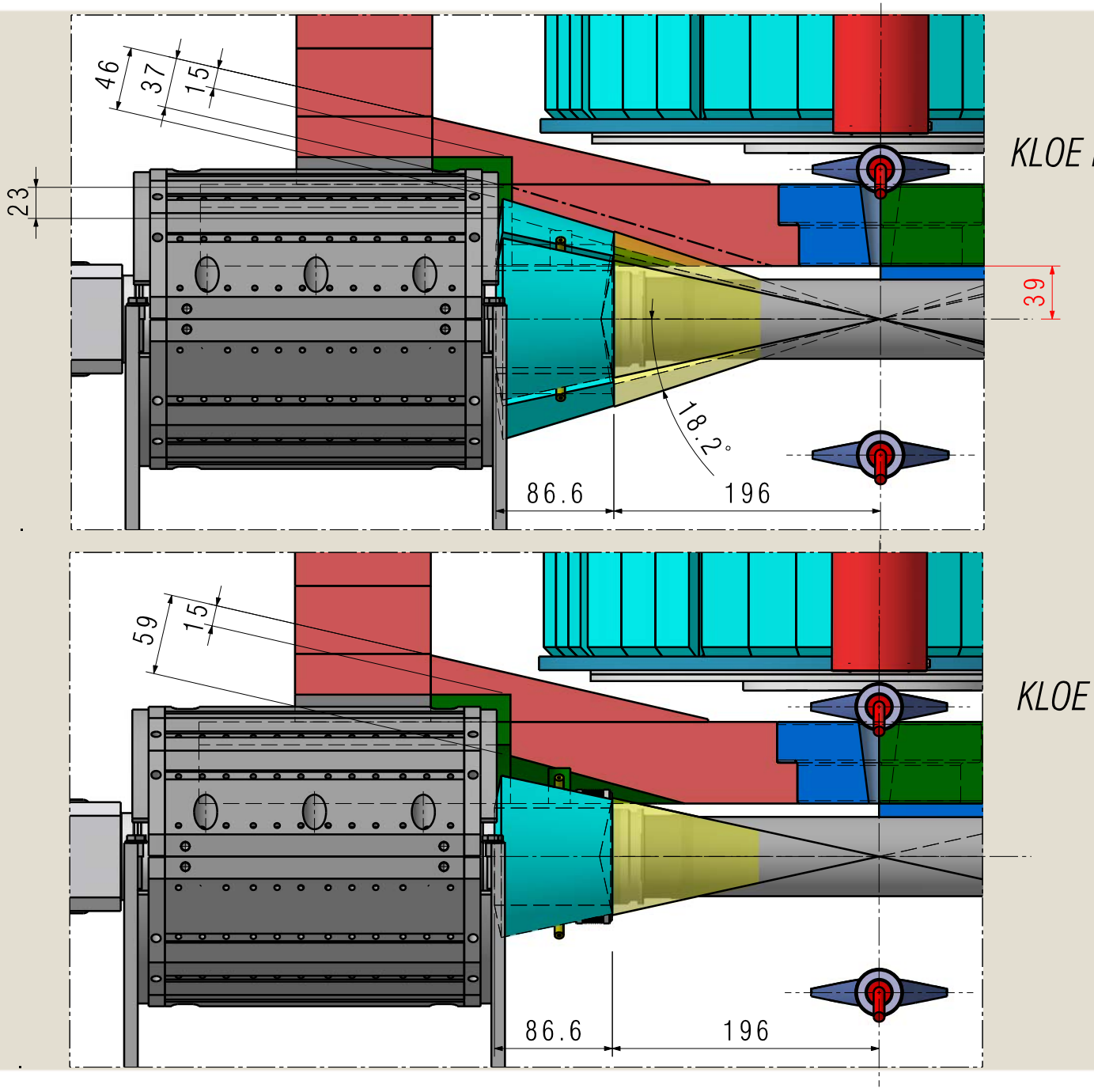
00

1 10 100 mm




600

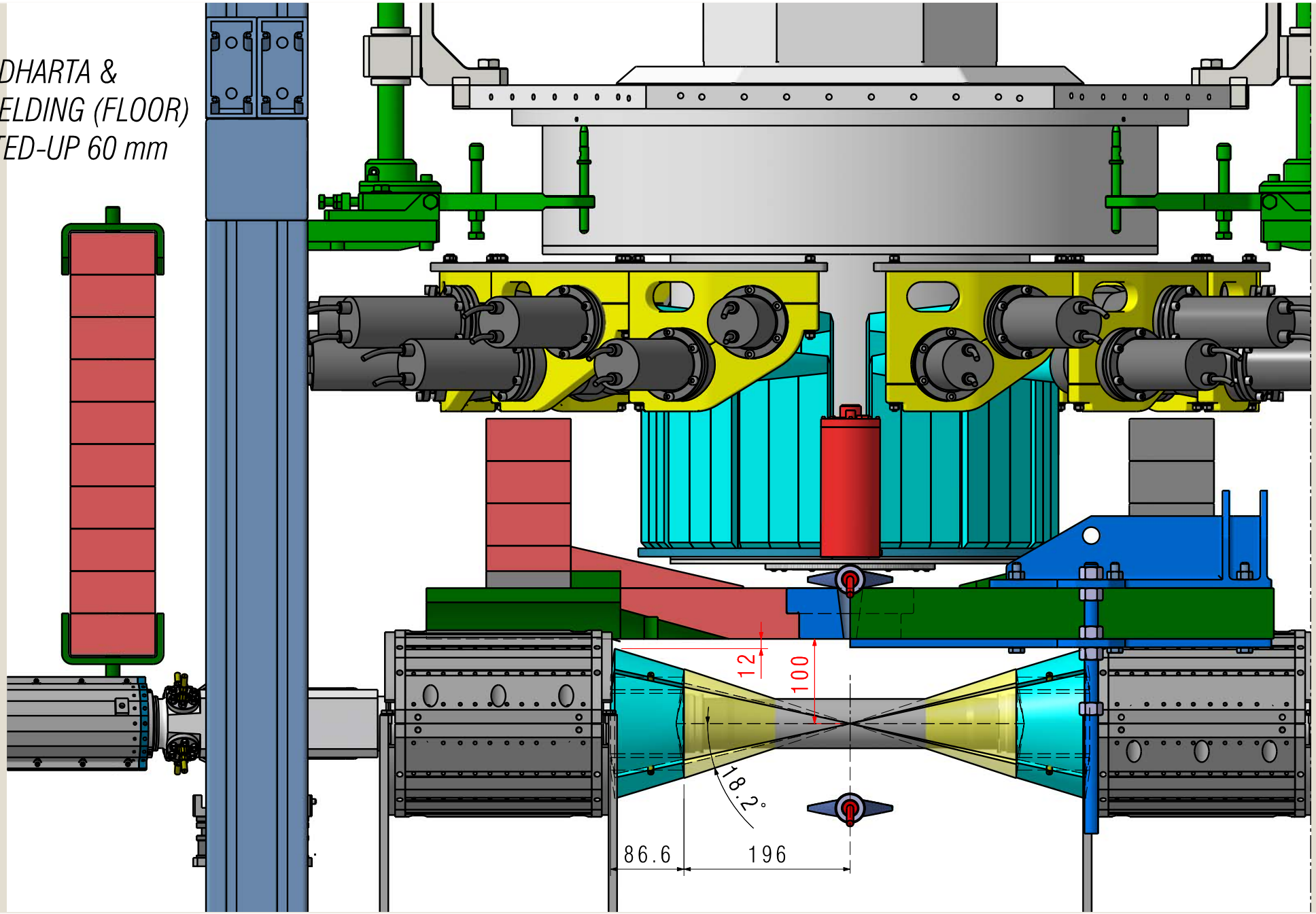




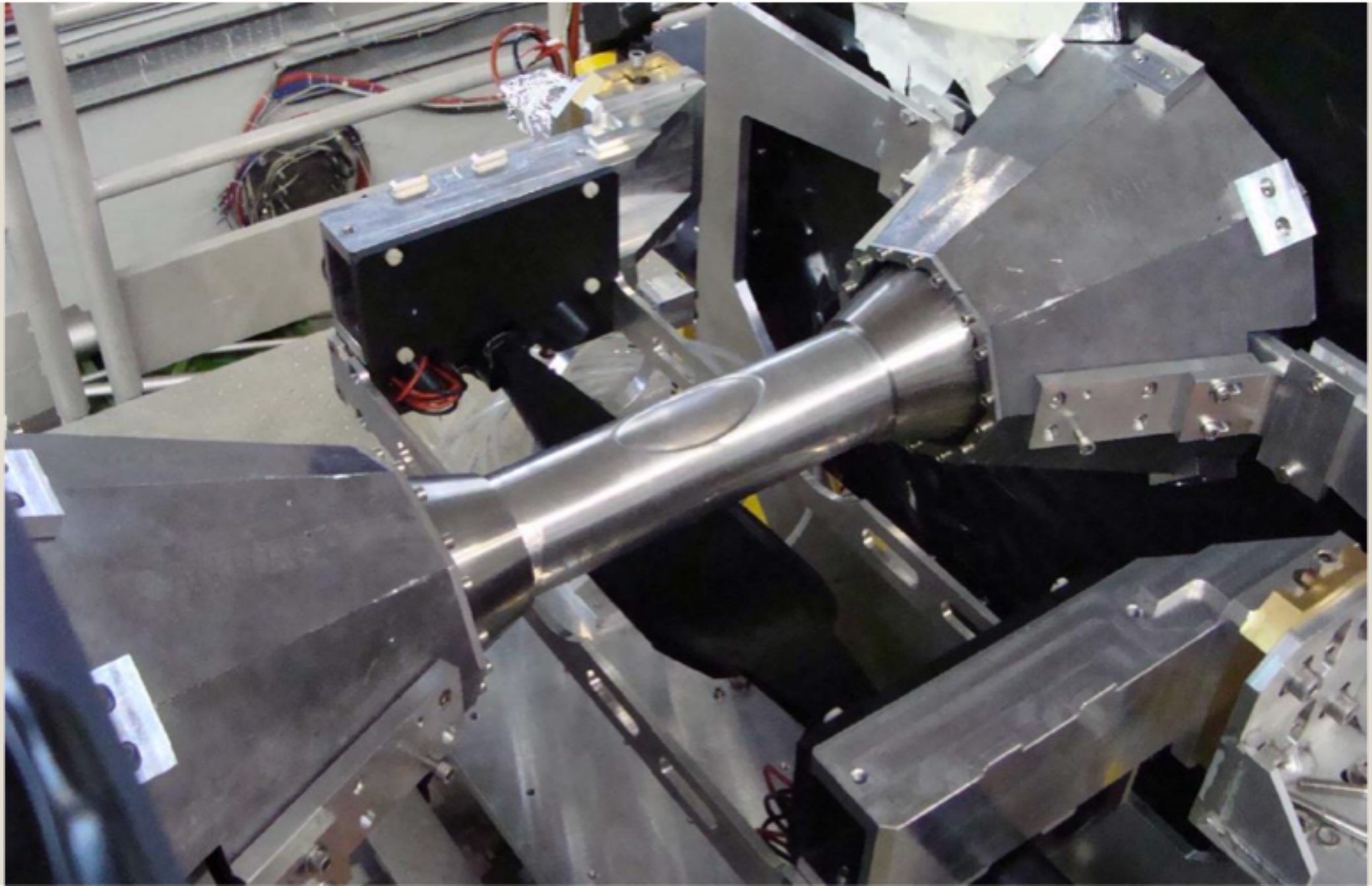
KLOE LUMINOMETER 4/4

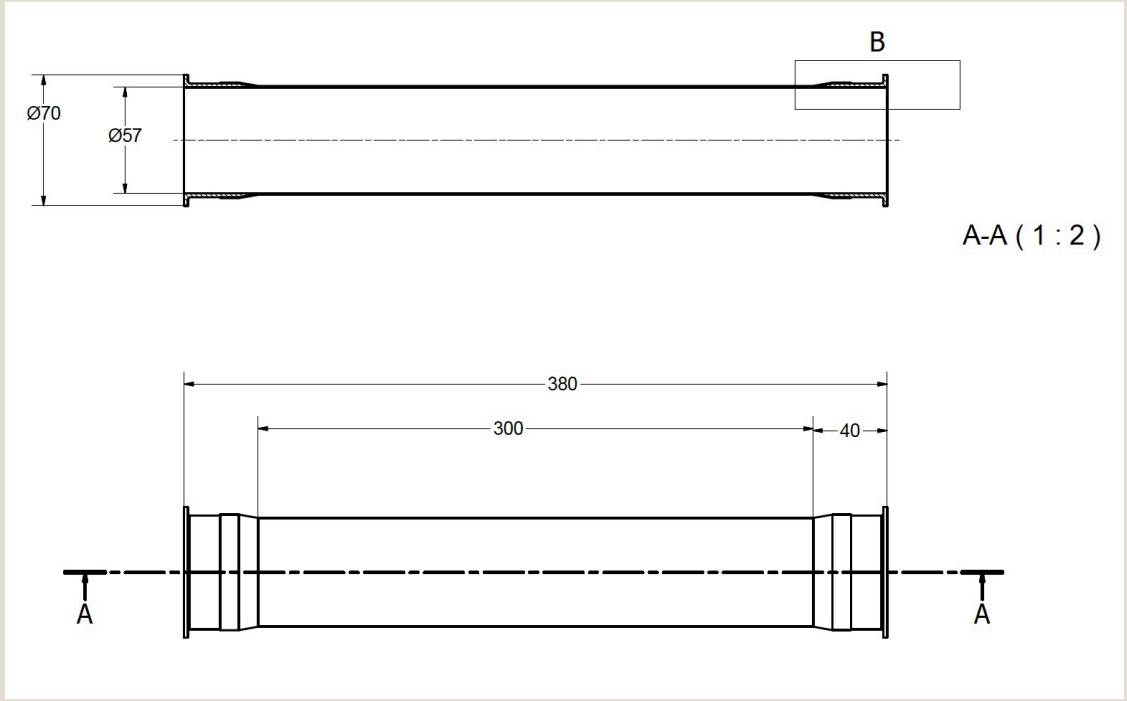
KLOE LUMINOMETER 2/4

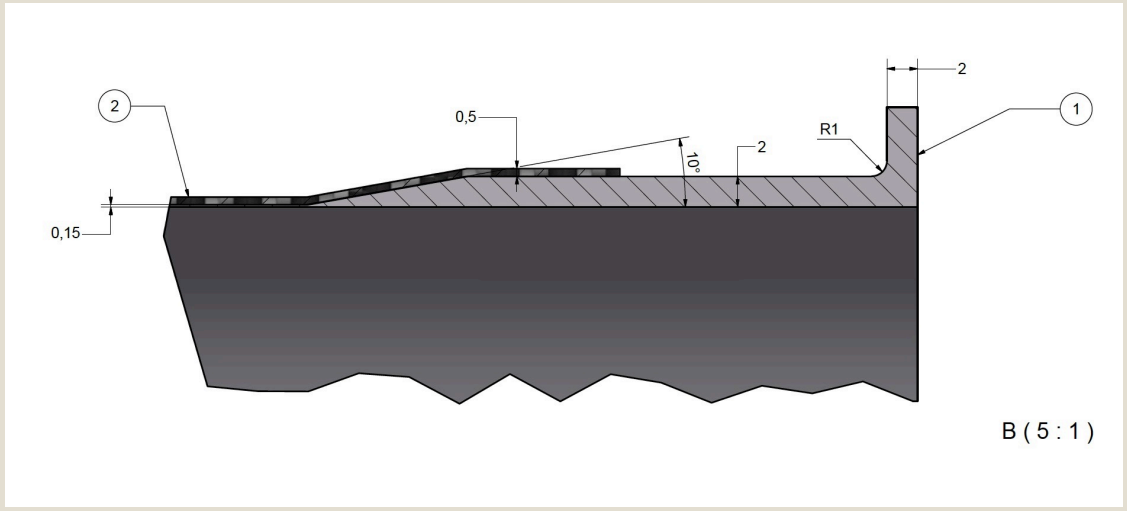
SIDDHARTA &
SHIELDING (FLOOR)
LIFTED-UP 60 mm

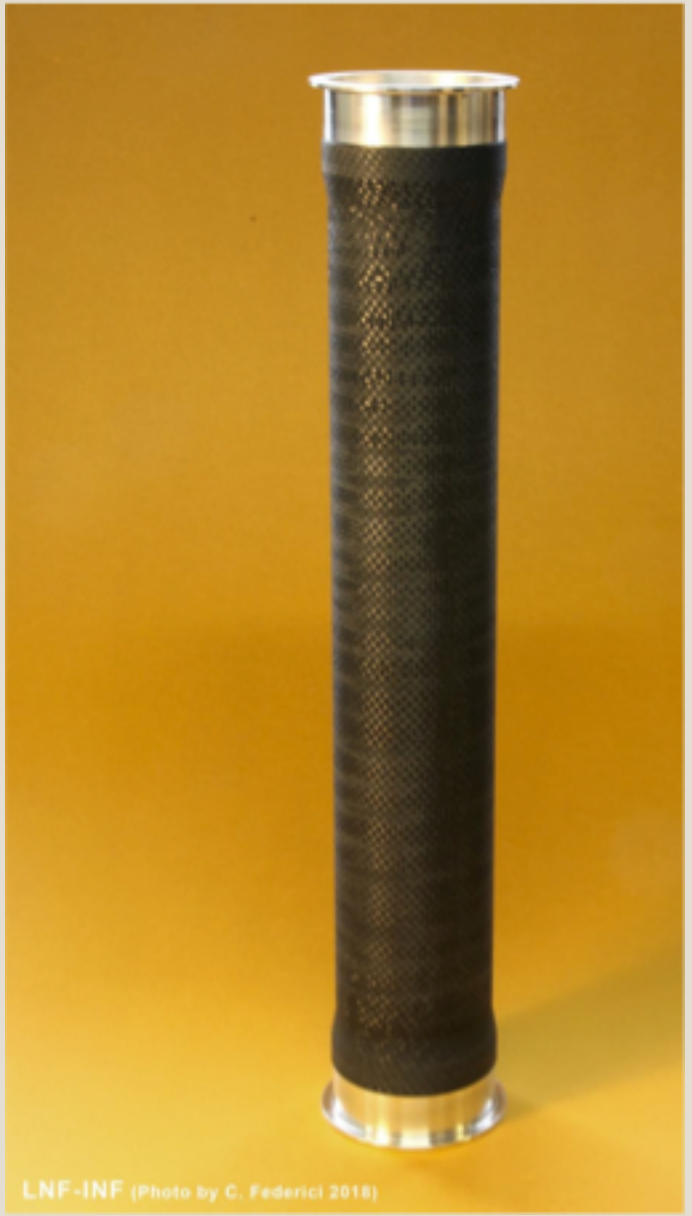


Nuova IR Beam Pipe

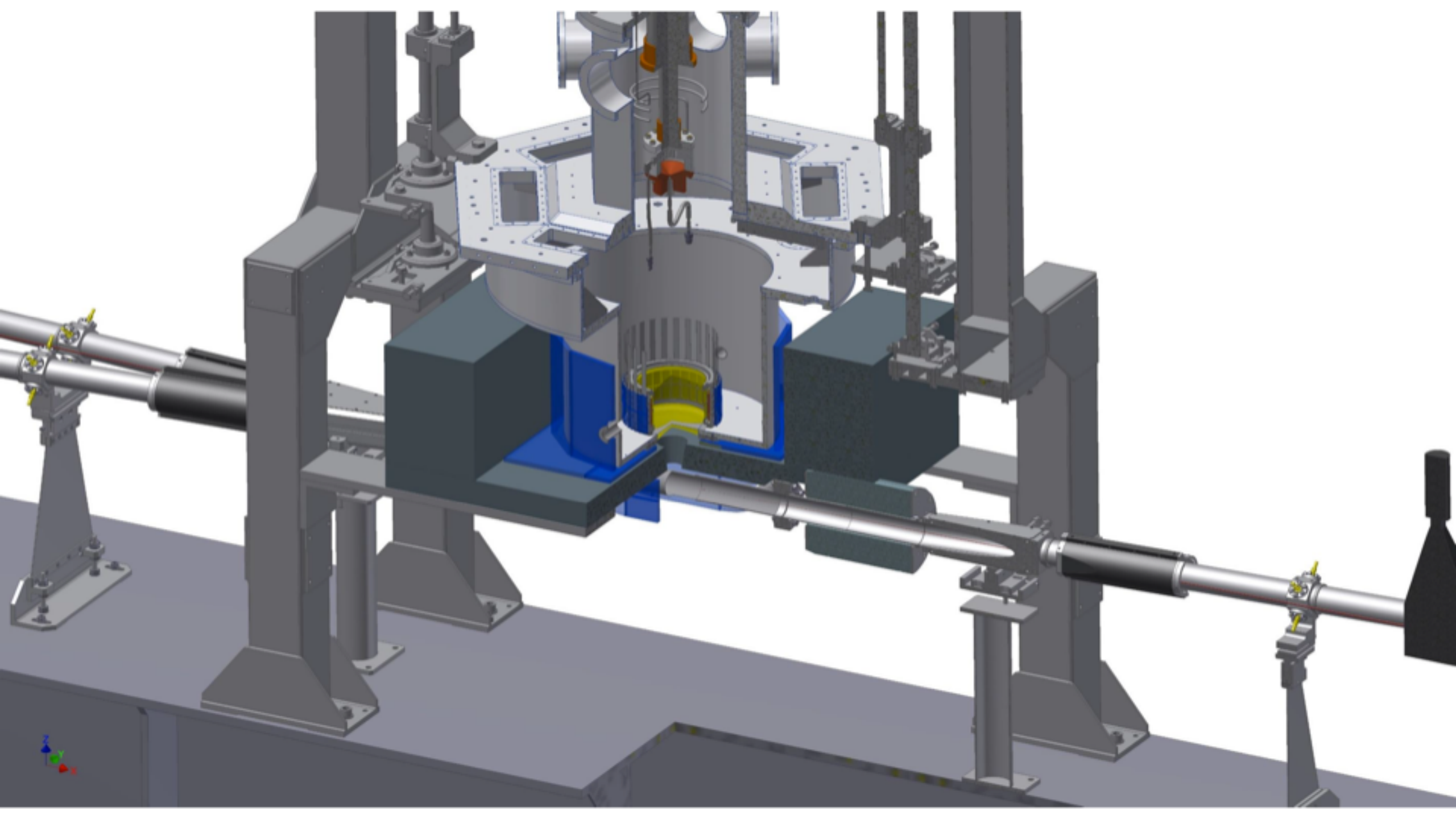



B
Ø70
Ø57
A-A (1 : 2)
380
300
40
A
A

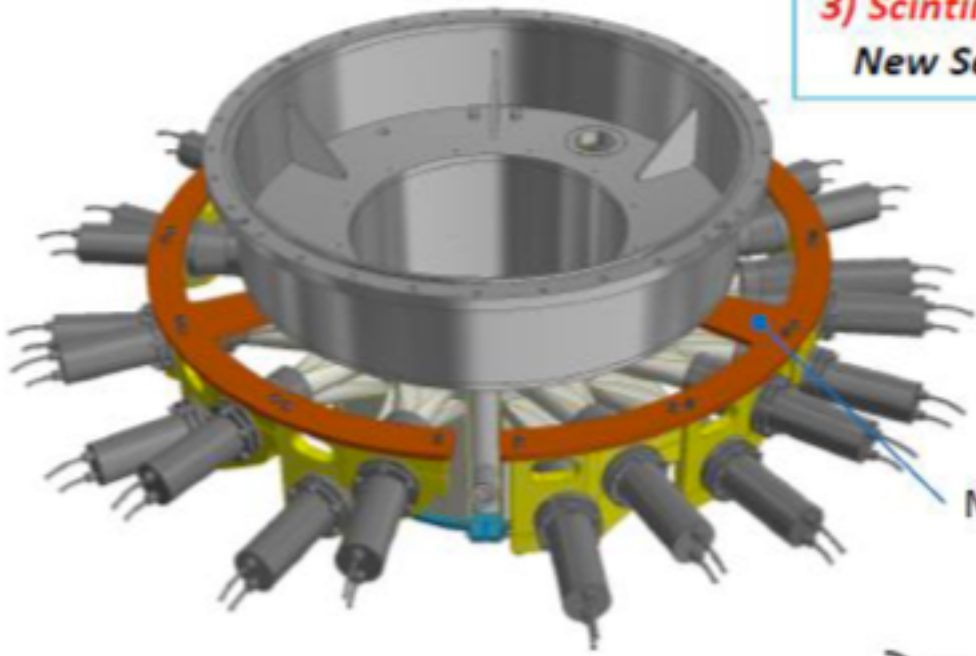

2
0,5
10°
2
R1
1
0,15
B (5 : 1)

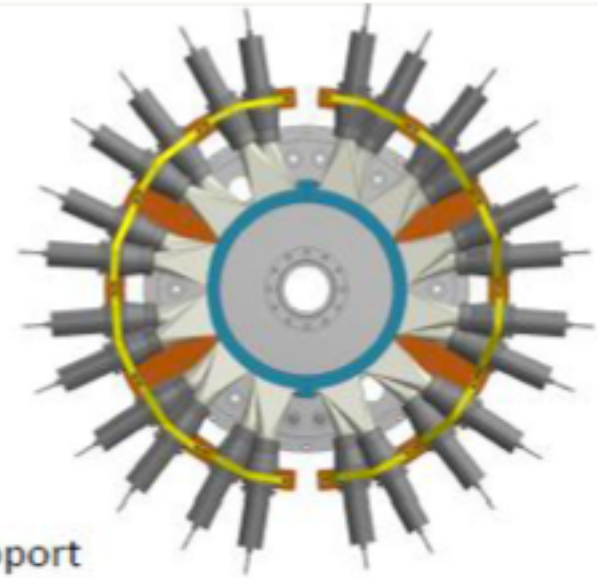

LNF-INF (Photo by C. Federici 2018)

Problema del BACKGROUND

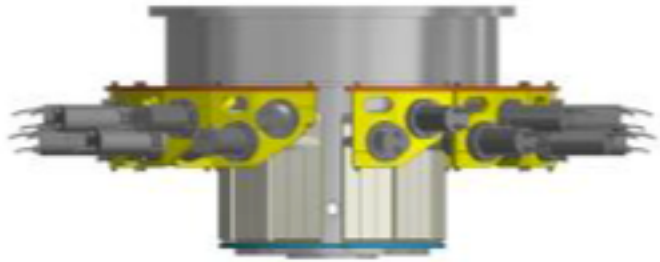


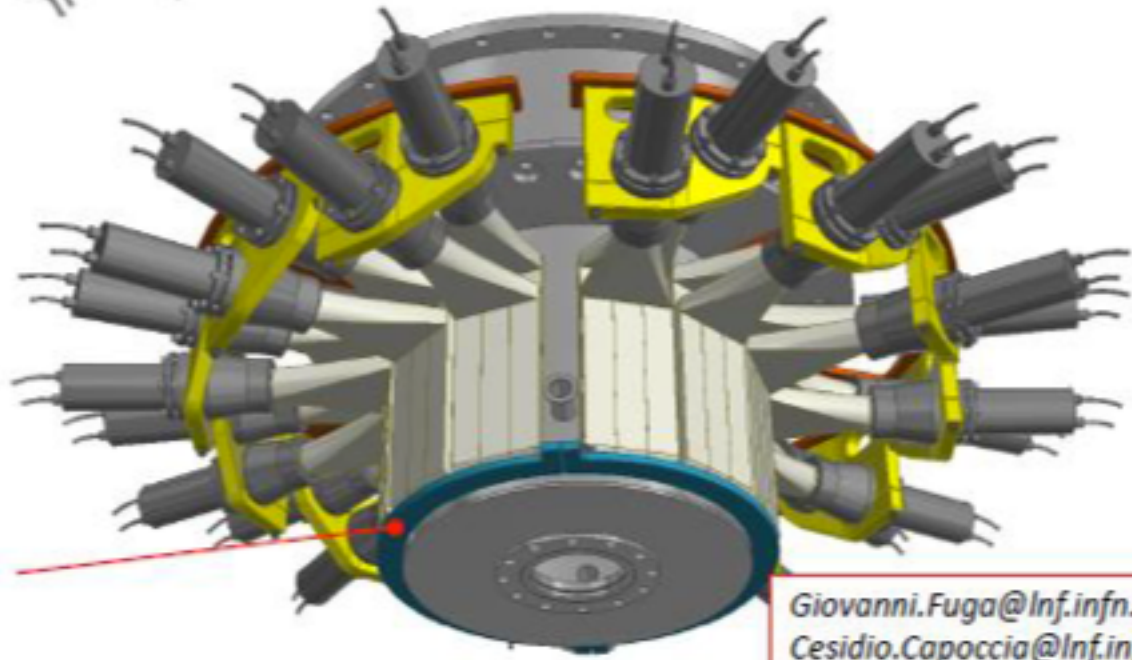
3) Scintillators
New Setup





Main Support





Protection/Support plastic ring

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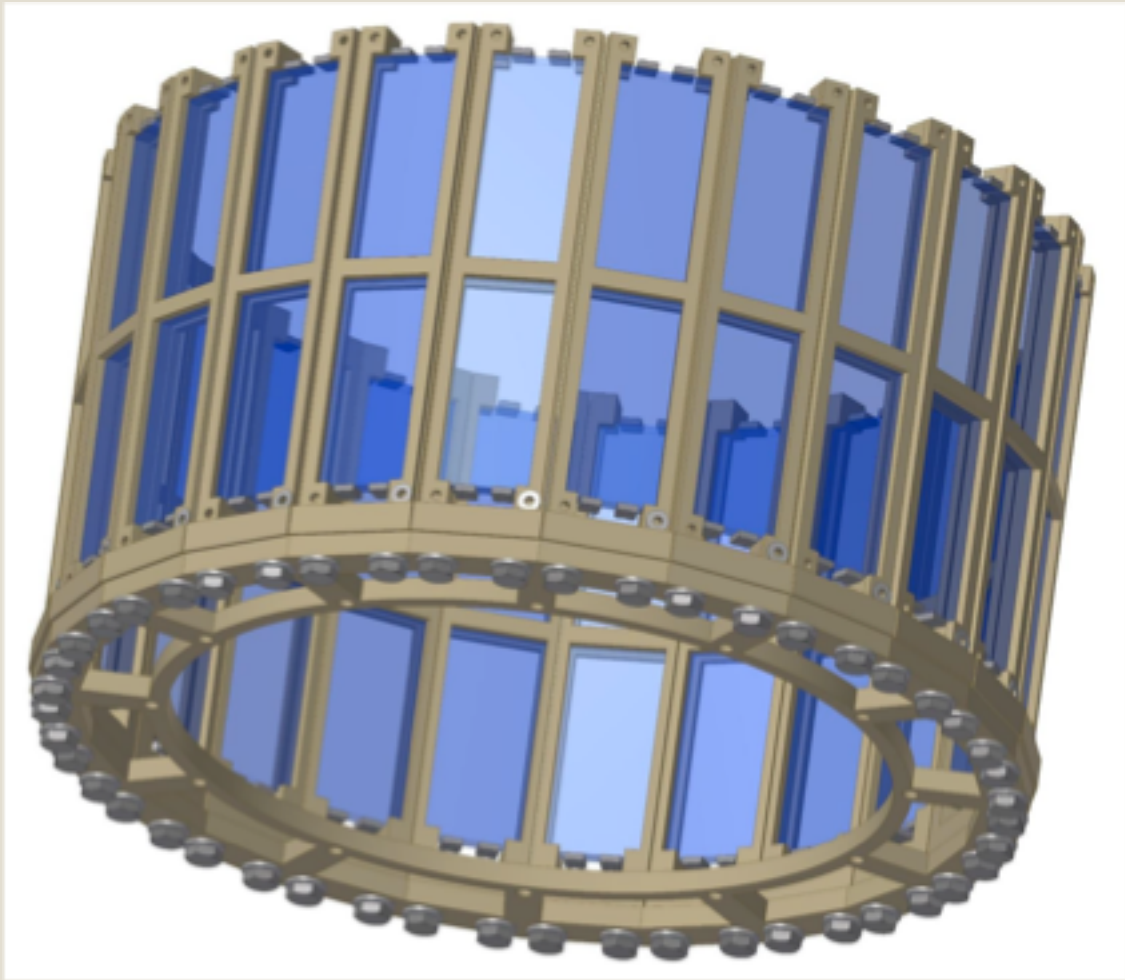
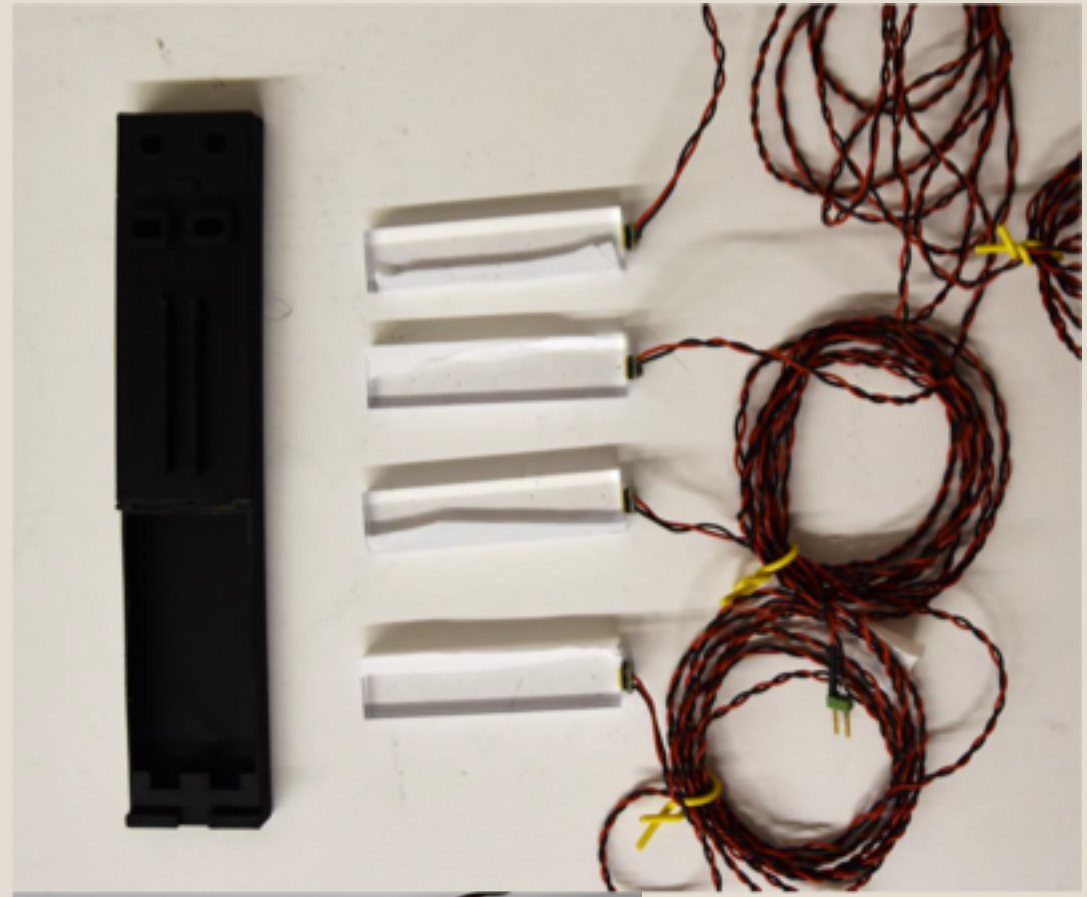
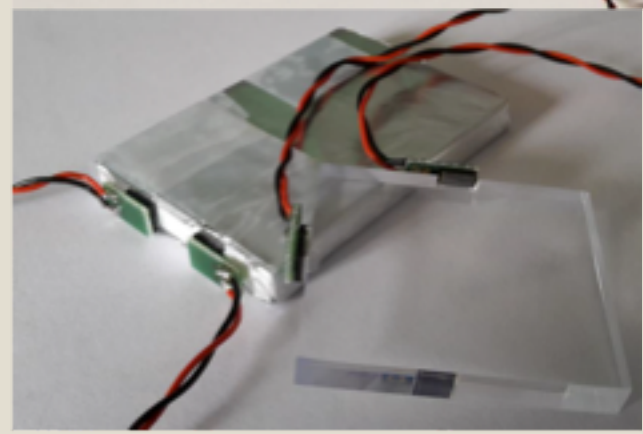
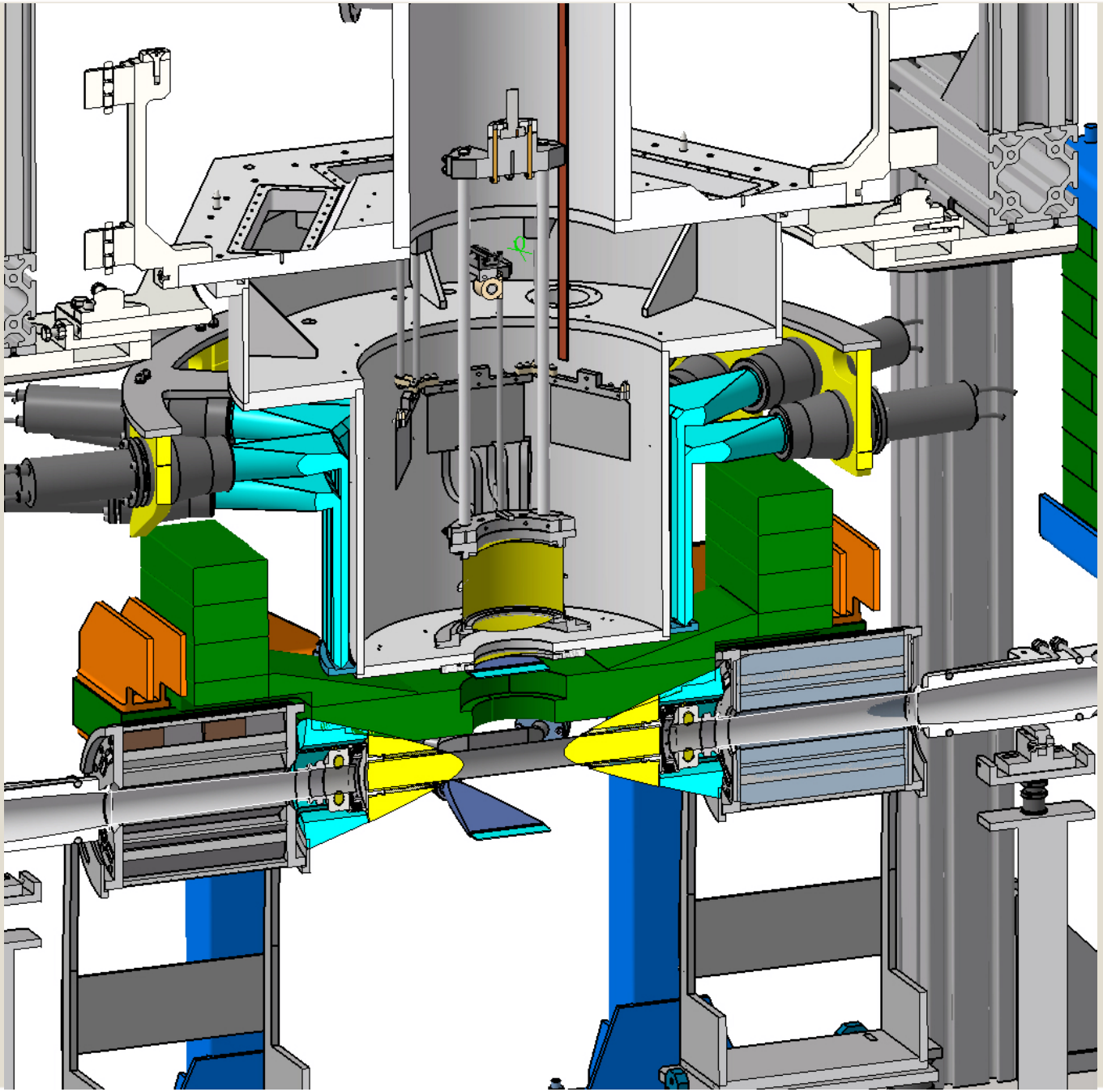
Cesidio.Capoccia@Inf.infn.it

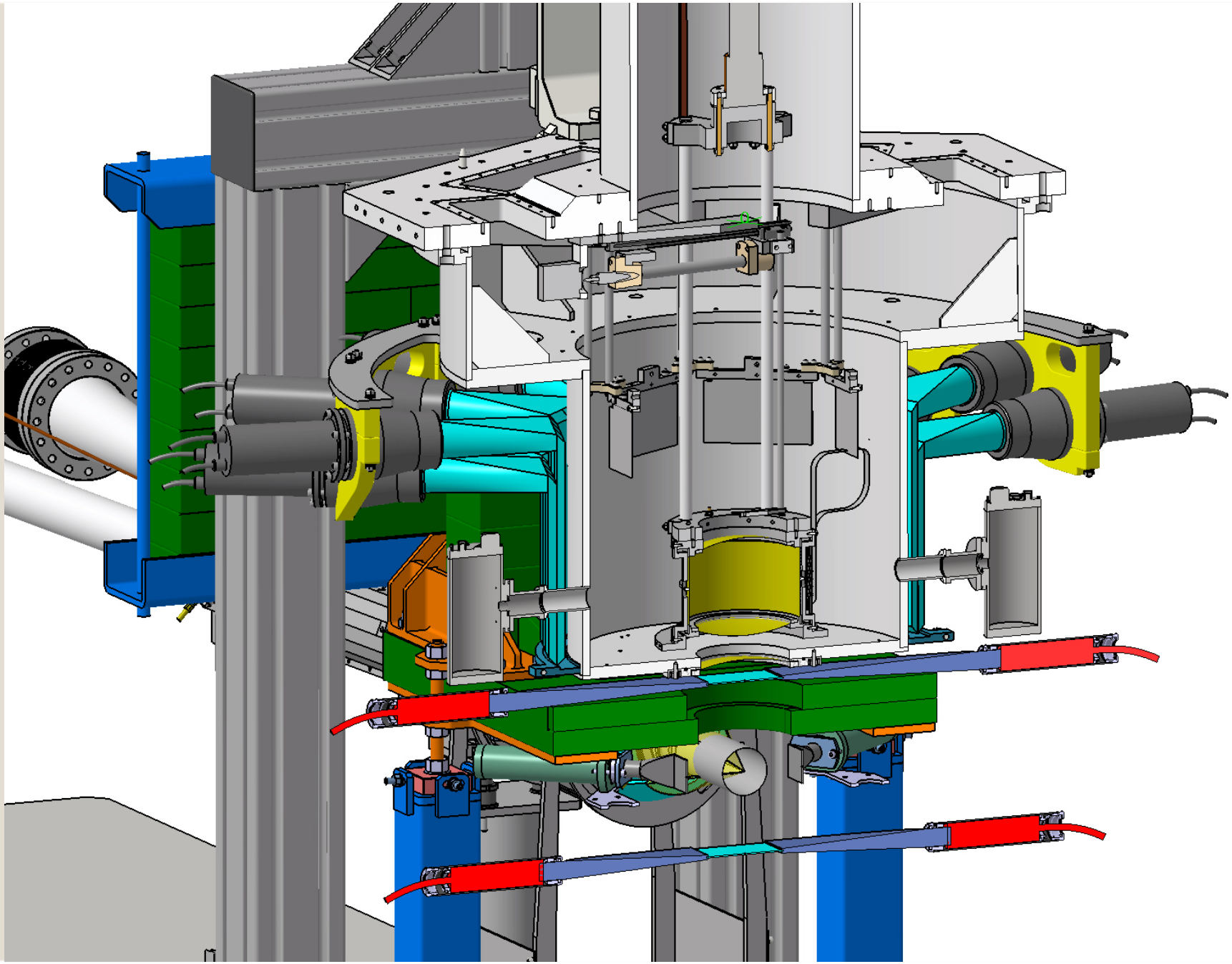




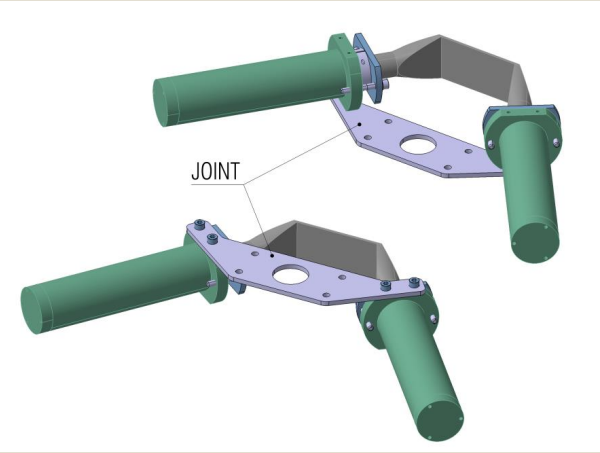


Kaon Trigger & Luminometro



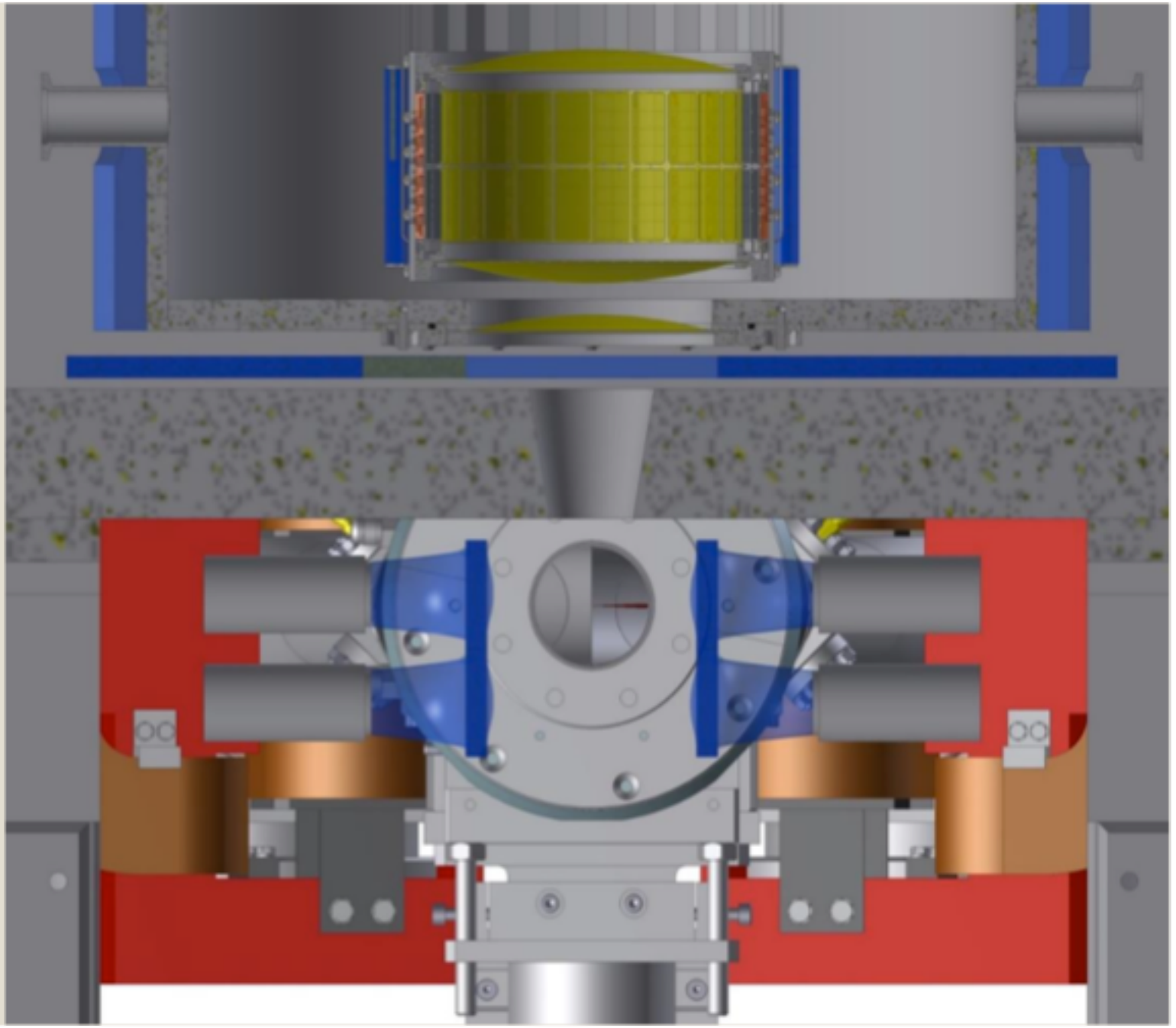


Monitor di Luminosità
Basato su conteggio
Coincidenze K^+ K^-

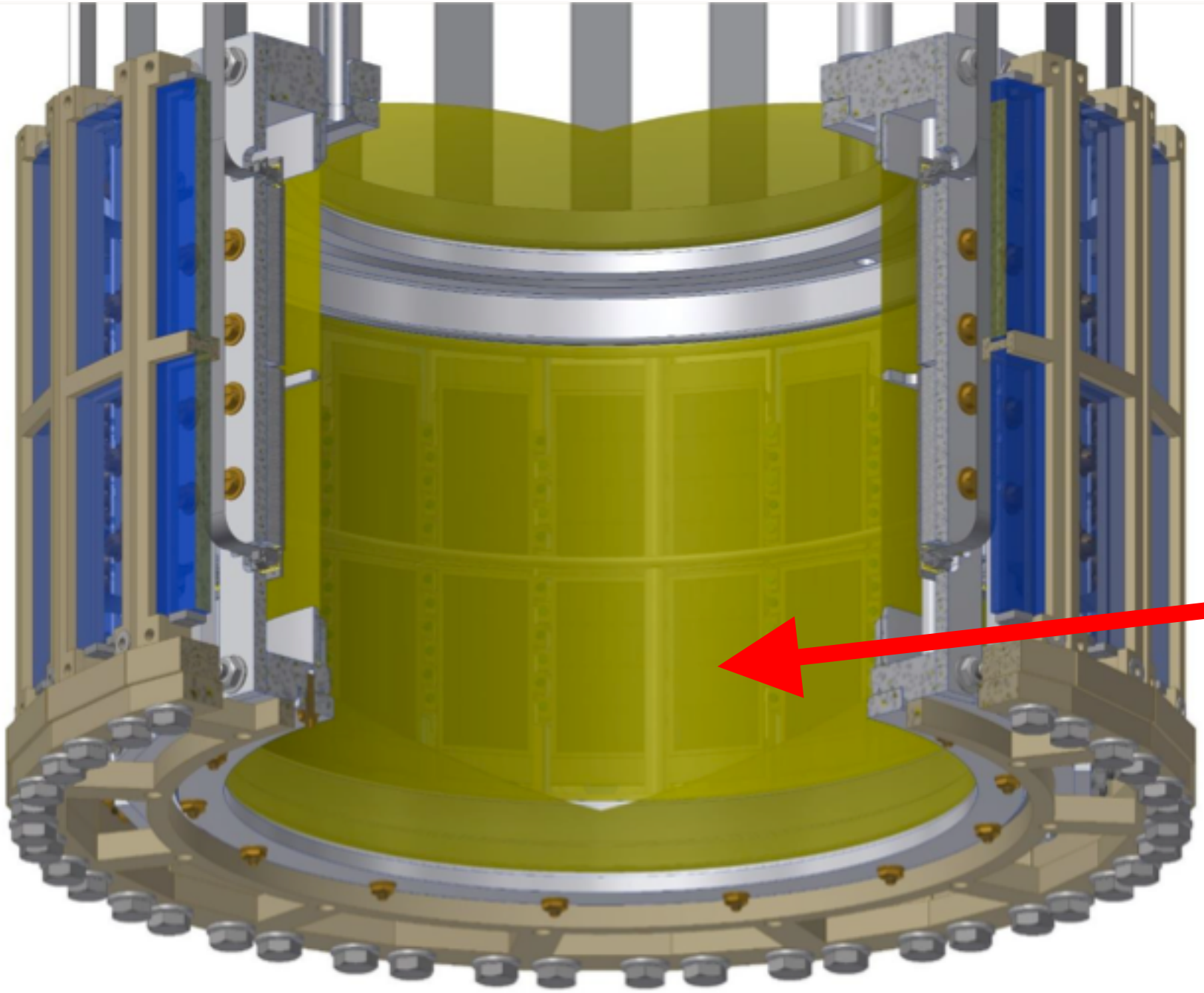


@ $L=10^{32}$
f~60Hz

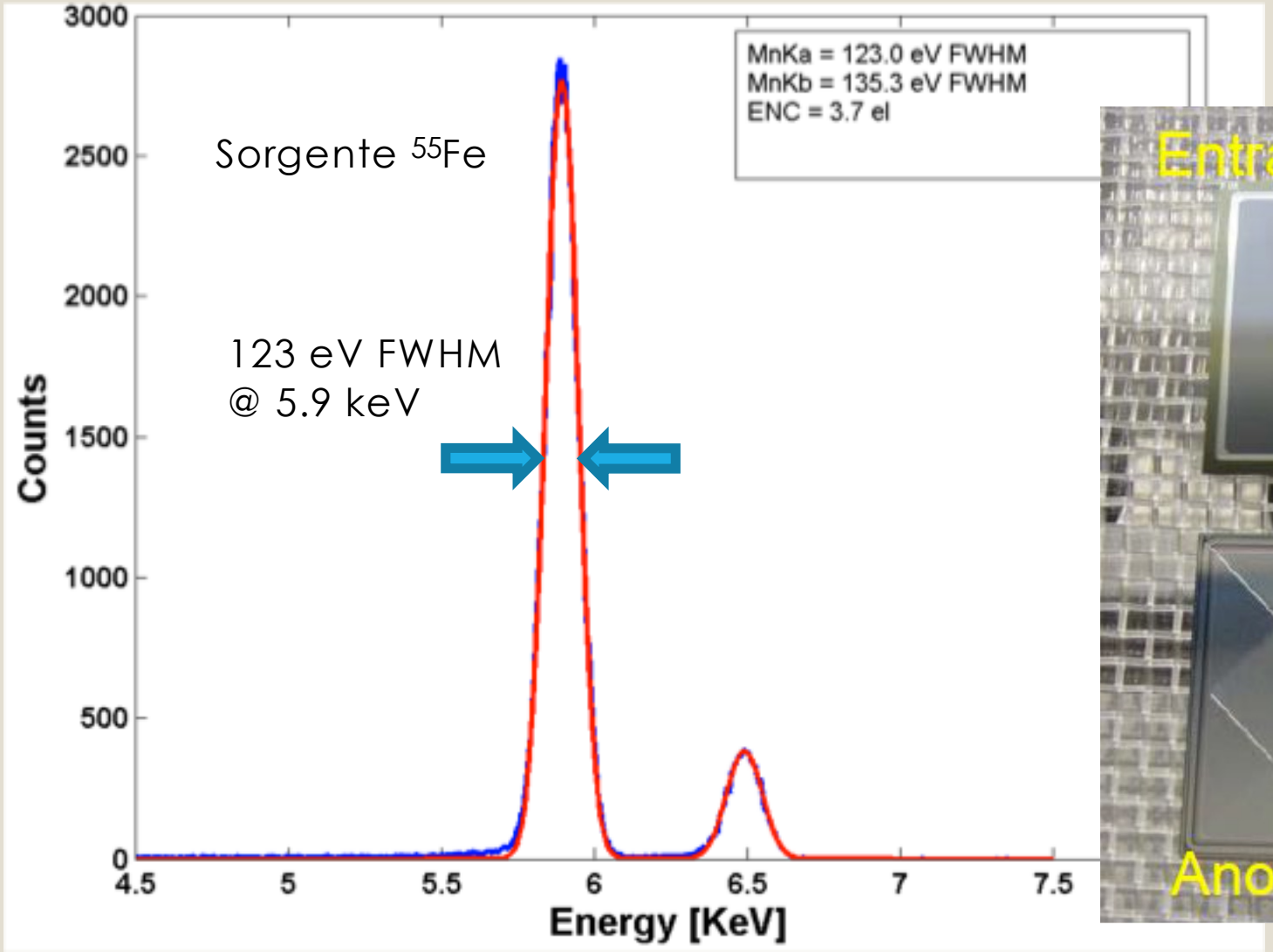
In 5 s
310 conteggi
Errore ~6%

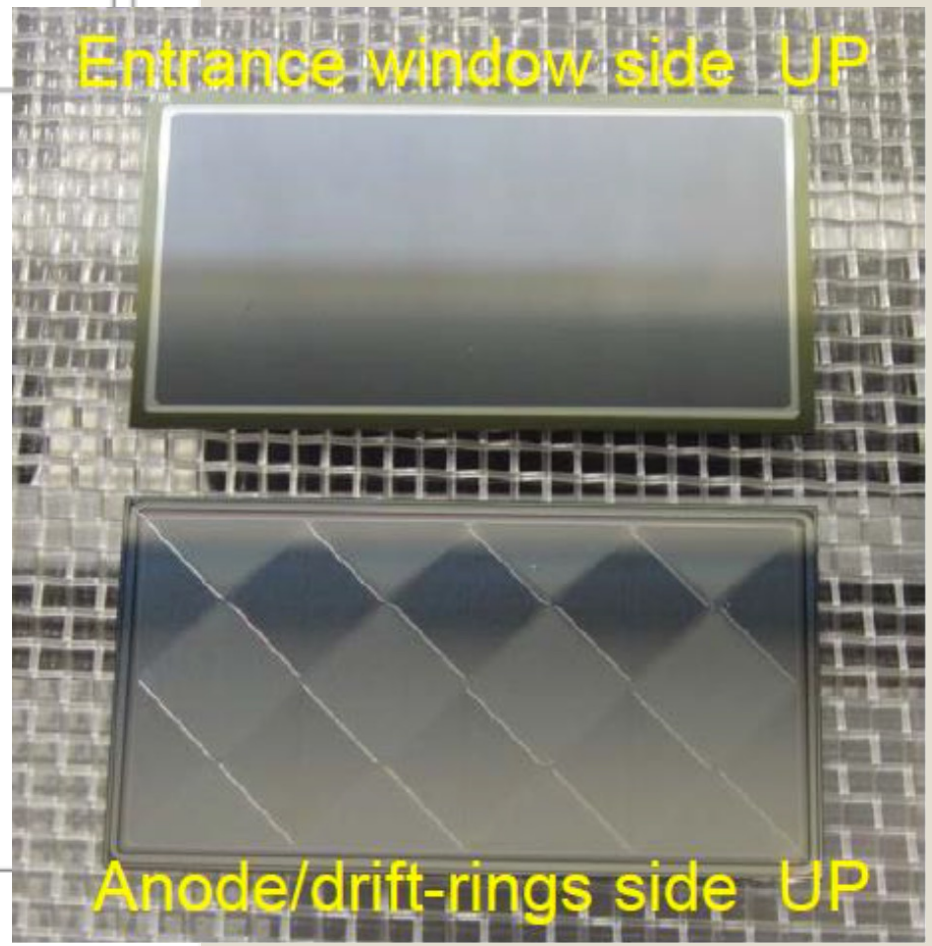


Il Rivelatore



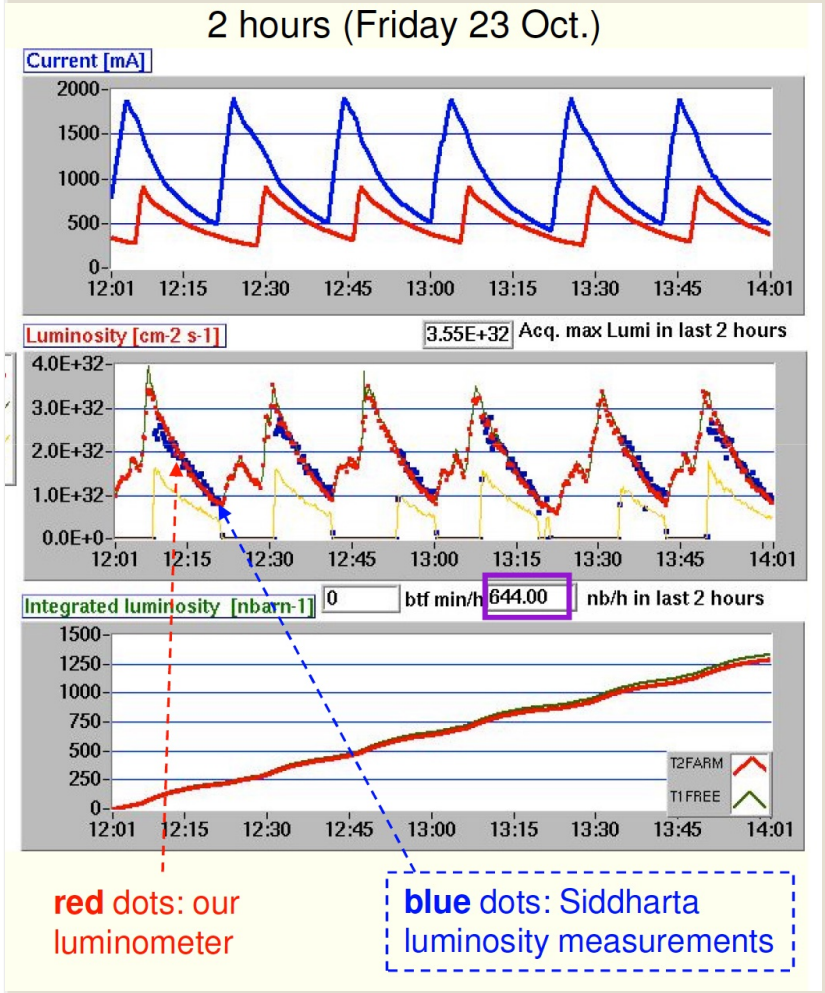
Matrice 2x4 SDD


MnKa = 123.0 eV FWHM
MnKb = 135.3 eV FWHM
ENC = 3.7 el
Sorgente ^{55}Fe
123 eV FWHM
@ 5.9 keV
Counts
Energy [KeV]
3000
2500
2000
1500
1000
500
0
4.5
5
5.5
6
6.5
7
7.5

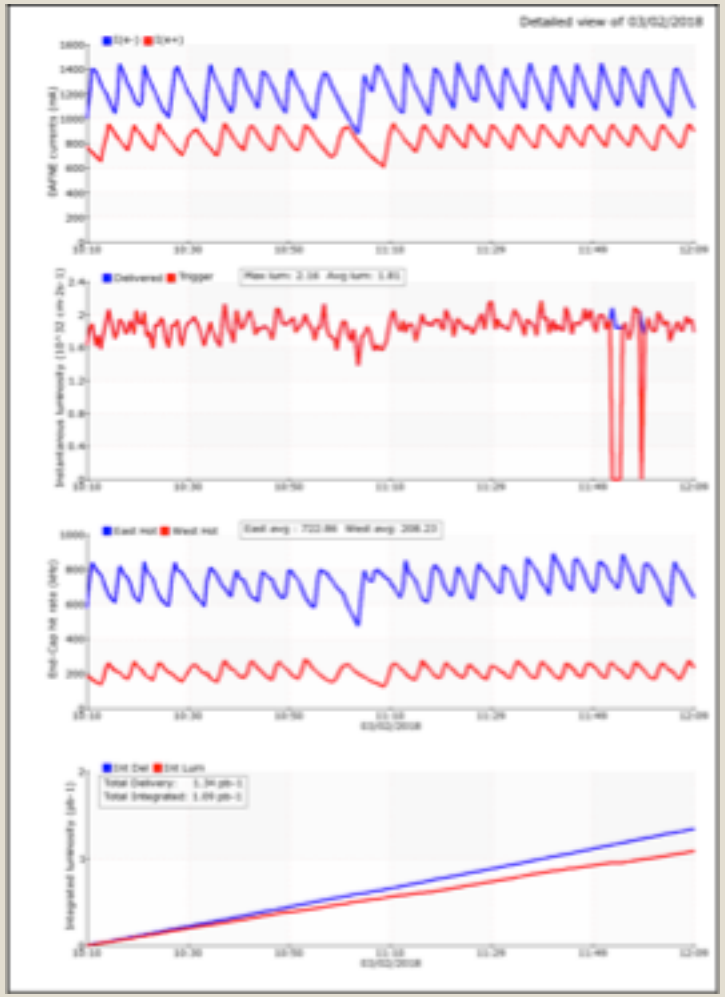

Entrance window side UP
Anode/drift-rings side UP

DAΦNE: Modalità di Operazione

SIDDHARTA



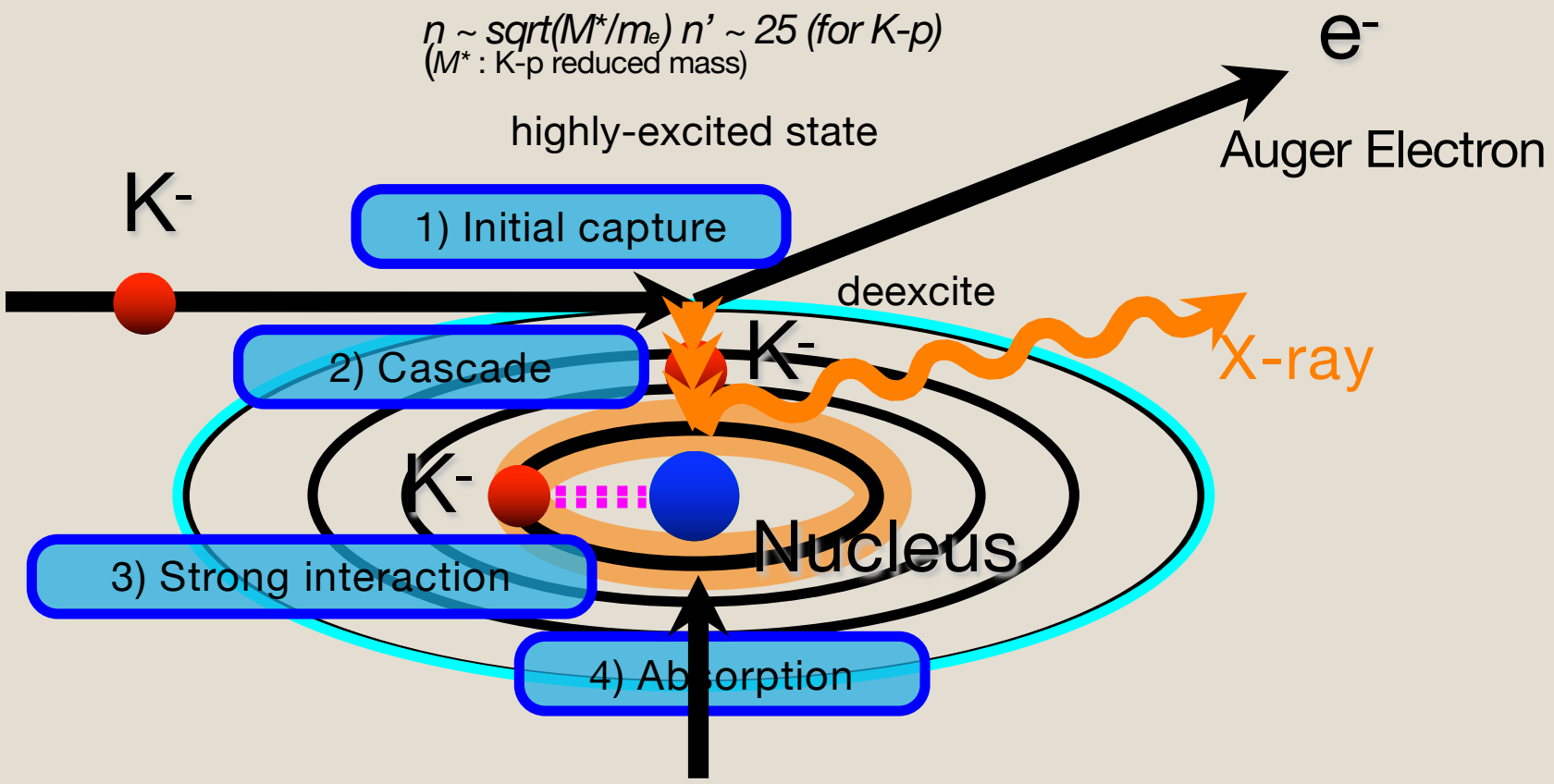
KLOE

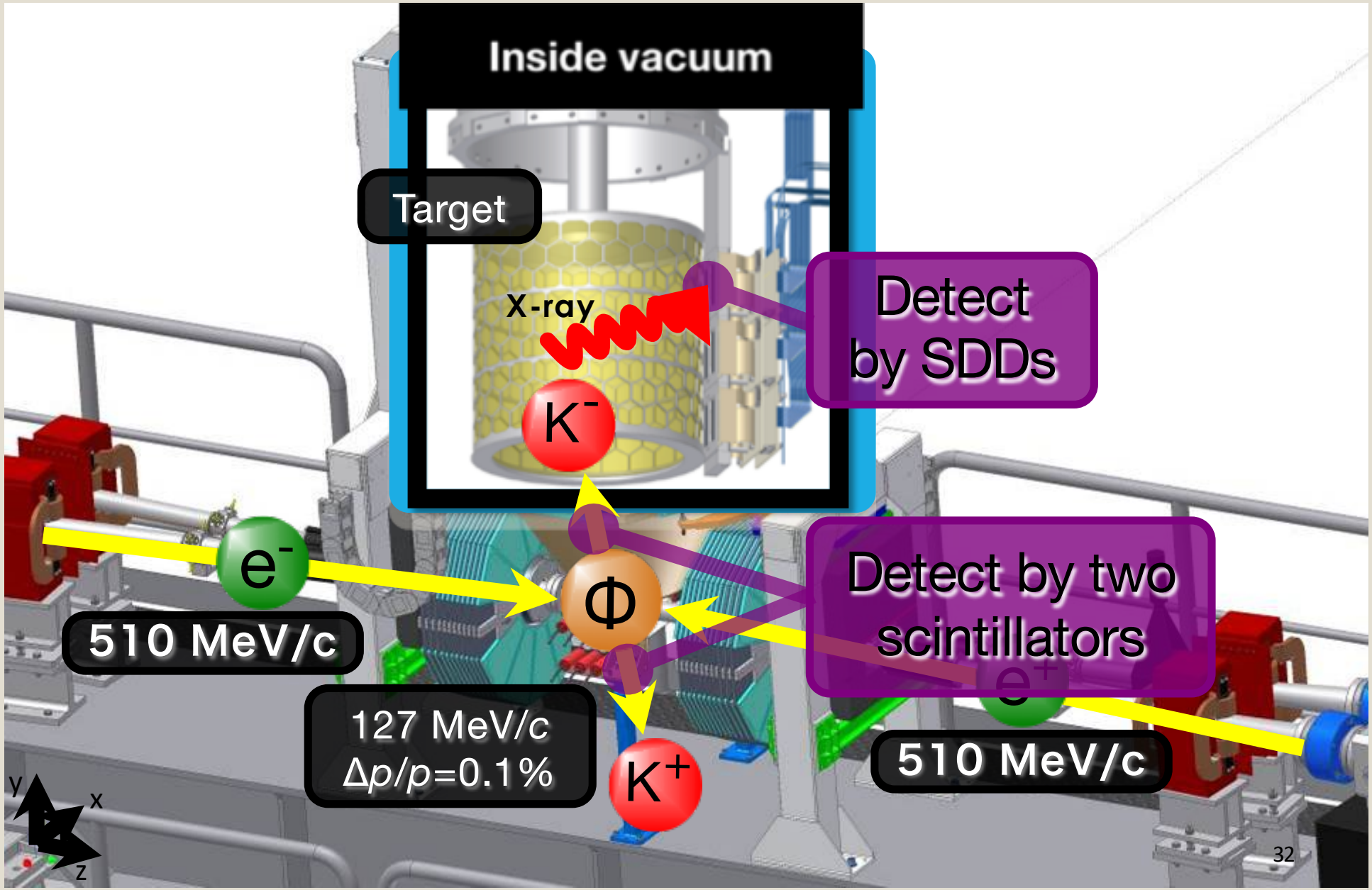


SIDDHARTA2

Cosa Misuriamo

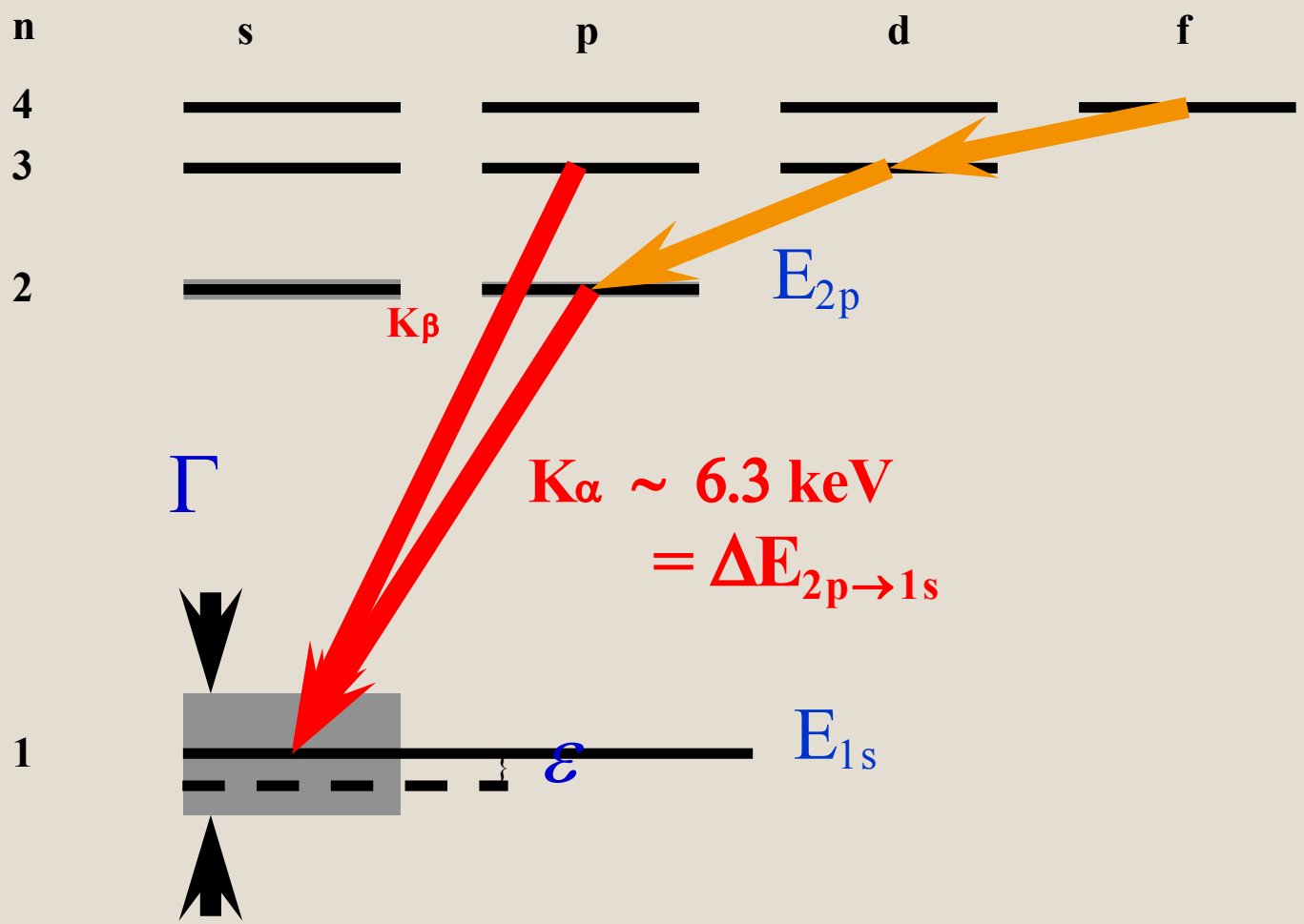
Formazione Atomo Kaonico

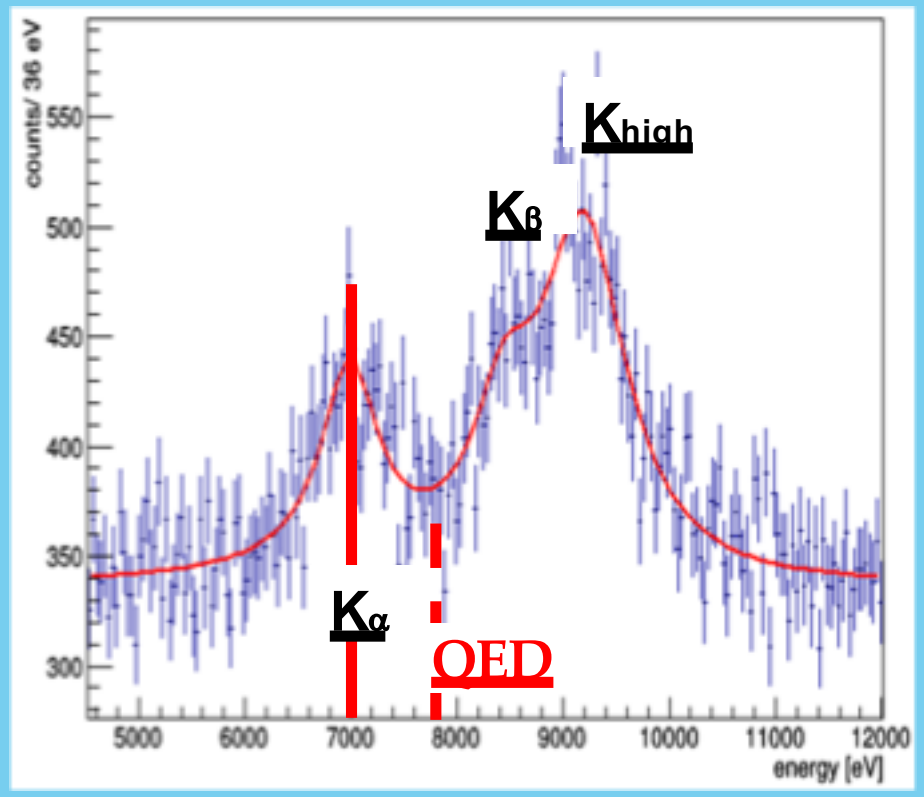



Inside vacuum
Target
X-ray
K^-
Detect by SDDs
e^-
510 MeV/c
Φ
Detect by two scintillators
127 MeV/c
Δp/p=0.1%
K^+
e^+
510 MeV/c
y
x
z

Perché?

Cascata Kaonica - Interazione Forte





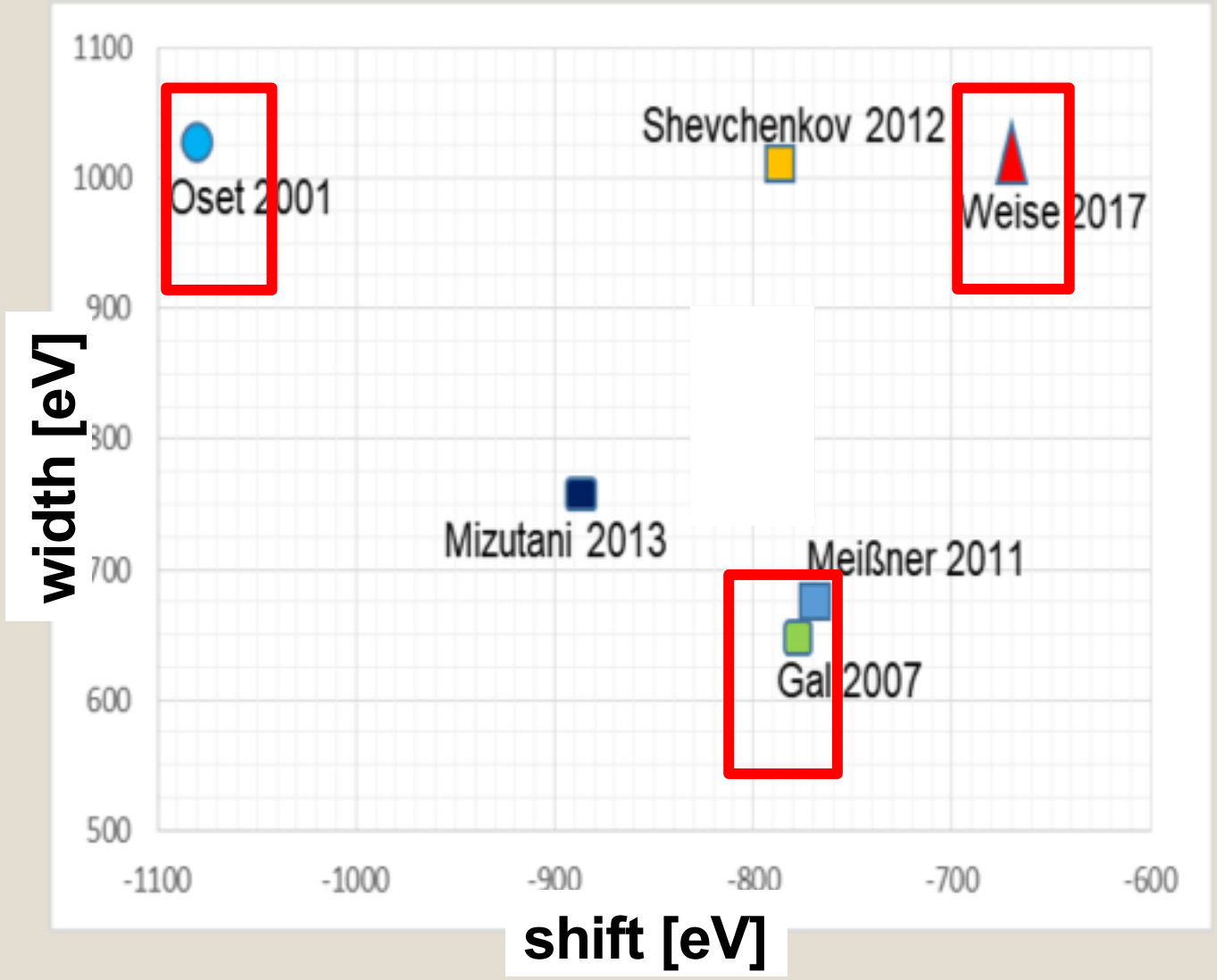
SIDDHARTA2 K-D

2019: Deuterio Kaonico

800 pb^{-1} è il requisito per la prima misura dello scostamento in energia e

dell'allargamento delle righe delle transizioni atomiche dovute

all'interazione forte del K^- col nucleo del Deuterio Kaonico


1100
1000
900
800
700
600
500
-1100
-1000
-900
-800
-700
-600
Oset 2001
Shevchenkov 2012
Weise 2017
Mizutani 2013
Meißner 2011
Gal 2007
width [eV]
shift [eV]

A che serve?

- K^- : ūs
- Stelle di neutroni
- Spiegazione della massa dei corpi
  - Protone : uud
  - Massa di u+u+d ~ 2% Massa protone
  - Il restante 98% ?
- …


That's all Folks!