

Tasca Detector Set-up for Physics Experiments D.1

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D.1 Working Group Meeting on the TASCA Detector Set-up for Physics Experiments - 14.07.2005

- **Set-up description**
 - "Stop"-Detector
 - PIN diodes
 - X-ray Detectors first tests
 - γ -ray detector - GE-clover
 - DAQ-system
- **Physics**
 - SHE-synthesis: $^{48}\text{Ca}+^{238}\text{U}$ - see dedicated talk
 - ER- α - γ (- γ) correlations - see J. Uusitalo's talk
 - asymmetric reactions (e.g. vicinity of N=152 closed subshell (P. Bednarczyk))
 - isomers in the ^{100}Sn region - symmetric reactions (eg. $^{46}\text{Ti}+^{58}\text{Ni} \rightarrow ^{98\text{m}}\text{Cd}+\alpha 2\text{n}$)
- **Next steps**
 - funding
 - first configuration and detector tests

TASCA Working groups

TASCA Task Groups

	Task A	Task B	Task C 1.	Task C 2.	Task D 1.	Task D 2.
	Differential pumping, gas control (purity, pressure, exhaust, recycling ...)	Target (preparation, rotation, safety, control, cooling), window, collimator	Separator – Ion optics, magnets, power supplies	Separator – Mechanics (support structures, vacuum chambers, beam dump, ...)	Focal plane – Detectors, data acquisition	Focal plane – RTC, transport
Responsible:	A. Türler (TU München, Garching)	K. Eberhardt (Univ. Mainz)	A. Semchenkov (GSI, Darmstadt)	M. Schädel (GSI, Darmstadt)	D. Ackermann (GSI, Darmstadt)	A. Yakushev (TU München, Garching)
Collaborator:	J. Uusitalo (Univ. of Jyväskylä) M. Schädel (GSI, Darmstadt) K. Morimoto (RIKEN)	B. Lommel, B. Kindler, M. Schädel (GSI, Darmstadt) H.-J. Maier (LMU, München) R. Sudowe (LLNL)	K.E. Gregorich (LBNL, Berkeley) (S. Sytchevsky et al, St. Petersburg)	J. Uusitalo (Univ. of Jyväskylä)	F.P.Heßberger, P. Kuusiniemi (GSI, Darmstadt) T. Fästermann (TU München, Garching) R. Dressler (PSI, Villigen) C. Scholey (Univ. of Jyväskylä)	Ch. Düllmann (LBNL, Berkeley) R. Eichler (PSI, Villigen)
Advisor:	K.E. Gregorich (LBNL, Berkeley) (somebody from Dubna would be highly welcome)	K.E. Gregorich (LBNL, Berkeley)	M. Leino (Univ. of Jyväskylä) A. Popeko (JINR, Dubna)		M. Leino (Univ. of Jyväskylä) S. Hofmann (GSI, Darmstadt) R. Krücken (TU München, Garching)	K.E. Gregorich (LBNL, Berkeley) H.W. Gäggeler (PSI, Villigen) J.V. Kratz (Univ. Mainz)



la Lonja

TASCA

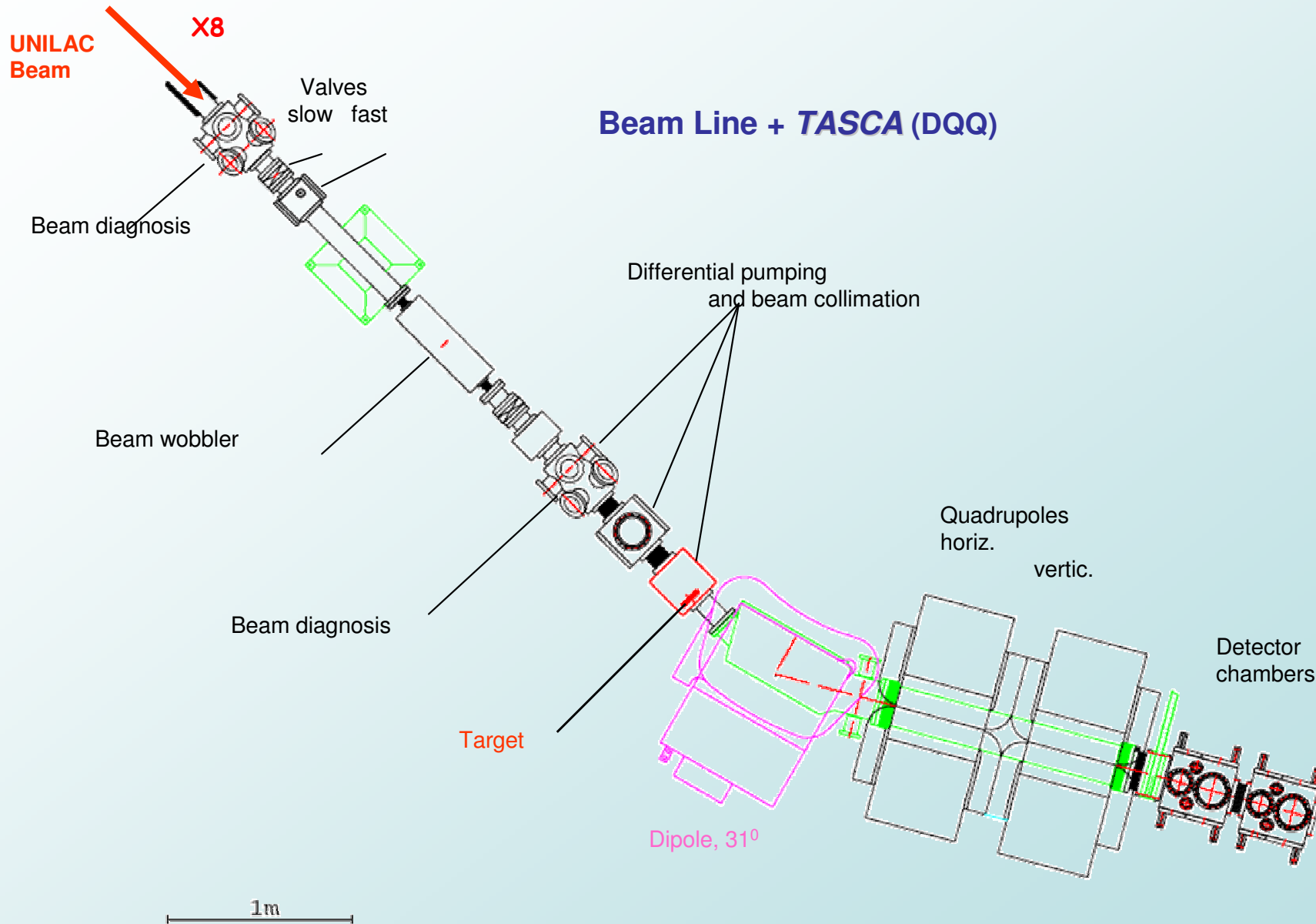
TAPOS
Tapa de jamón
Tapa de queso
Tapa de patatas
Tapa de alcornoque
Tapa de anchoa
Tapa de gambas
Tapa de mejillones
Tapa de calamar
Tapa de boquerones
Tapa de pulpo
Tapa de berberecho
Tapa de setas
Tapa de tomate
Tapa de pepino
Tapa de cebolla
Tapa de pimiento
Tapa de calabacín
Tapa de calabaza
Tapa de zanahoria
Tapa de brócoli
Tapa de espárragos
Tapa de judías
Tapa de lentejas
Tapa de garbanos
Tapa de arroz
Tapa de pasta
Tapa de pan
Tapa de queso
Tapa de jamón
Tapa de chorizo
Tapa de morroxo
Tapa de salchichón
Tapa de chorizo
Tapa de morroxo
Tapa de salchichón

BOCARRO
Bocarro de jamón
Bocarro de queso
Bocarro de patatas
Bocarro de alcornoque
Bocarro de anchoa
Bocarro de gambas
Bocarro de mejillones
Bocarro de calamar
Bocarro de boquerones
Bocarro de pulpo
Bocarro de berberecho
Bocarro de setas
Bocarro de tomate
Bocarro de pepino
Bocarro de cebolla
Bocarro de pimiento
Bocarro de calabacín
Bocarro de calabaza
Bocarro de zanahoria
Bocarro de brócoli
Bocarro de espárragos
Bocarro de judías
Bocarro de lentejas
Bocarro de garbanos
Bocarro de arroz
Bocarro de pasta
Bocarro de pan
Bocarro de queso
Bocarro de jamón
Bocarro de chorizo
Bocarro de morroxo
Bocarro de salchichón
Bocarro de chorizo
Bocarro de morroxo
Bocarro de salchichón

MENÚ 7€
Tapa de jamón
Tapa de queso
Tapa de patatas
Tapa de alcornoque
Tapa de anchoa
Tapa de gambas
Tapa de mejillones
Tapa de calamar
Tapa de boquerones
Tapa de pulpo
Tapa de berberecho
Tapa de setas
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Tapa de chorizo
Tapa de morroxo
Tapa de salchichón
Tapa de chorizo
Tapa de morroxo
Tapa de salchichón



TASCA - Components



TASCA – Detector Set-up Scheme

wobbler

target chamber

beam diagnosis boxes

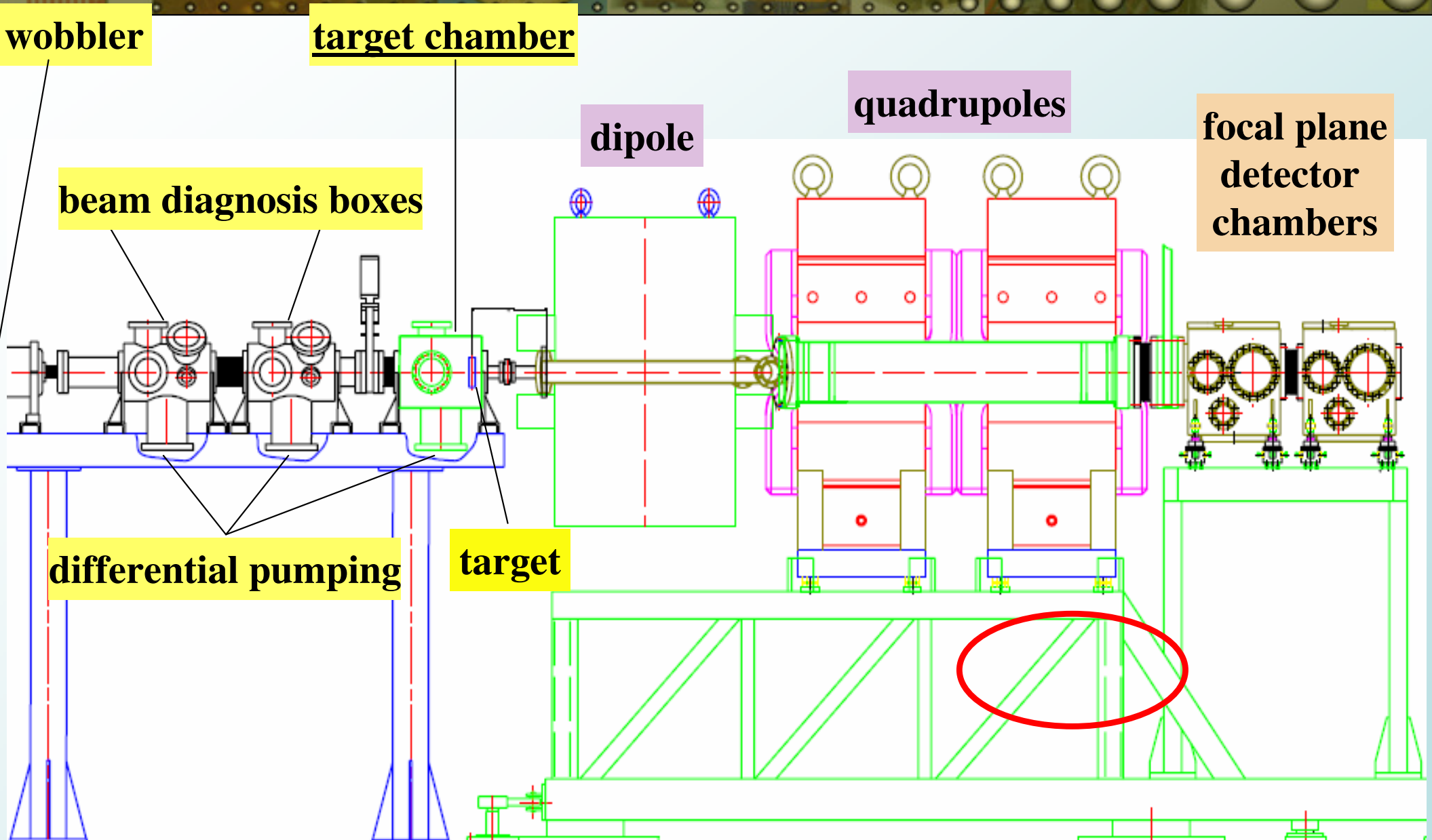
dipole

quadrupoles

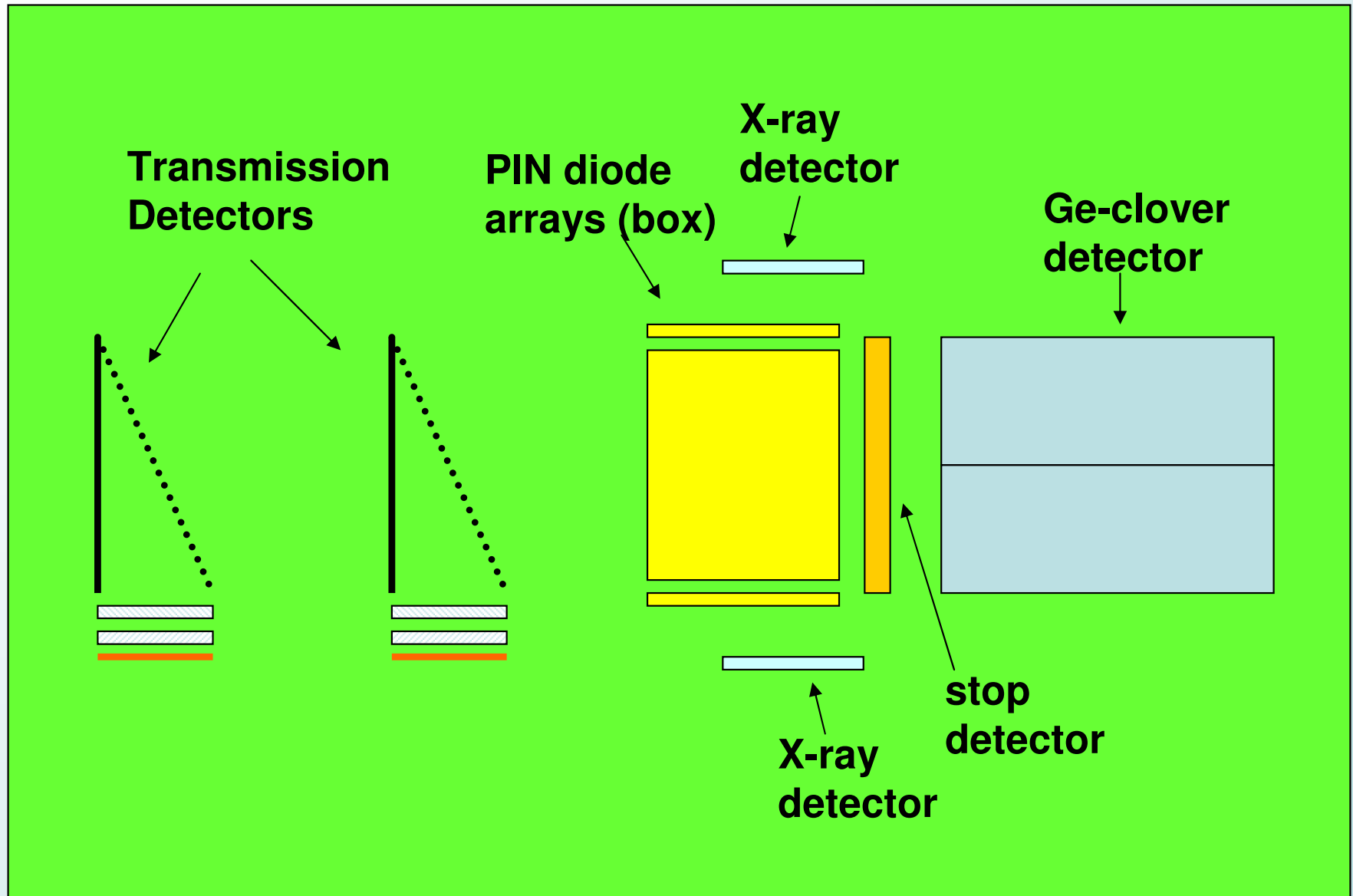
focal plane detector chambers

differential pumping

target



TASCA – Detector Set-up Scheme

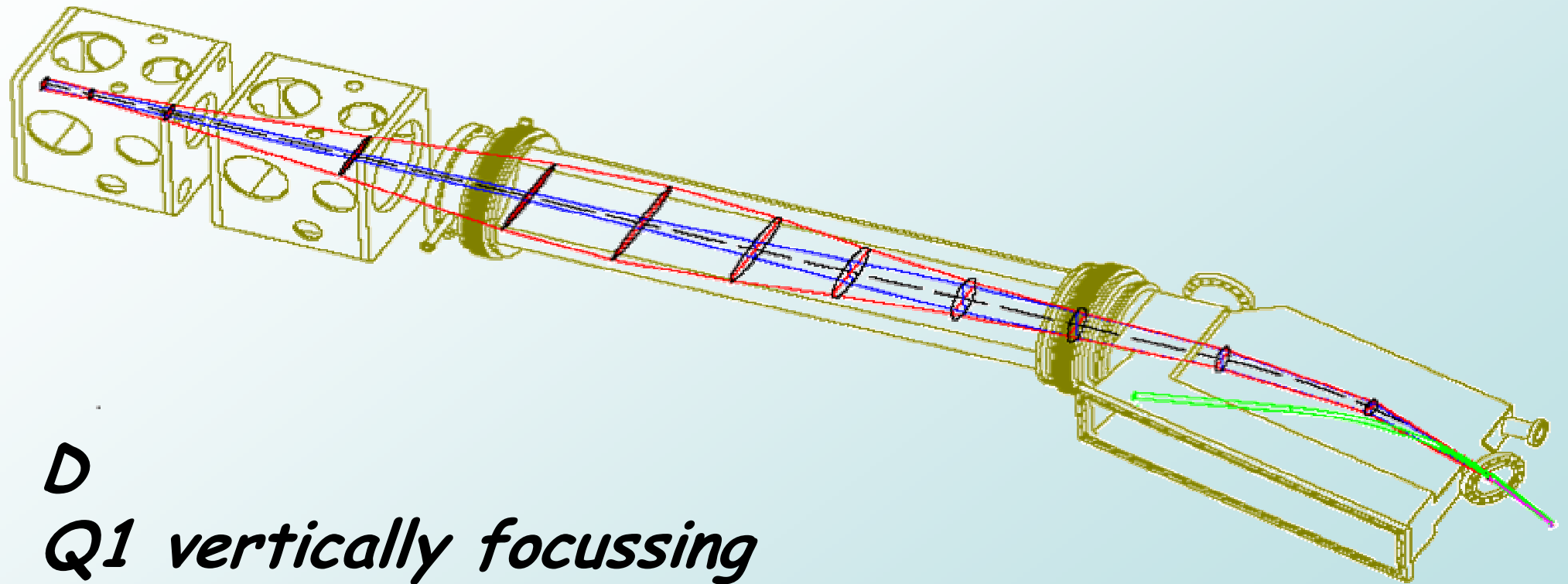


The *STOP* Detector

- **$(80 \times 35) \text{ mm}^2$ active area**
- **16 strips - $(5 \times 35) \text{ mm}^2$ active area**
- **$300 \mu\text{m}$ thickness**
- **resistive layer**
 - **position resolution = $200 \mu\text{m}$ \Rightarrow total spatial resolution $\approx 1 \text{ mm}^2$**
- **energy resolution $\Delta E = 18\text{-}20 \text{ keV}$ @ $E_\alpha > 6 \text{ MeV}$**
- **32 signals**



TASCA Beam Profiles I

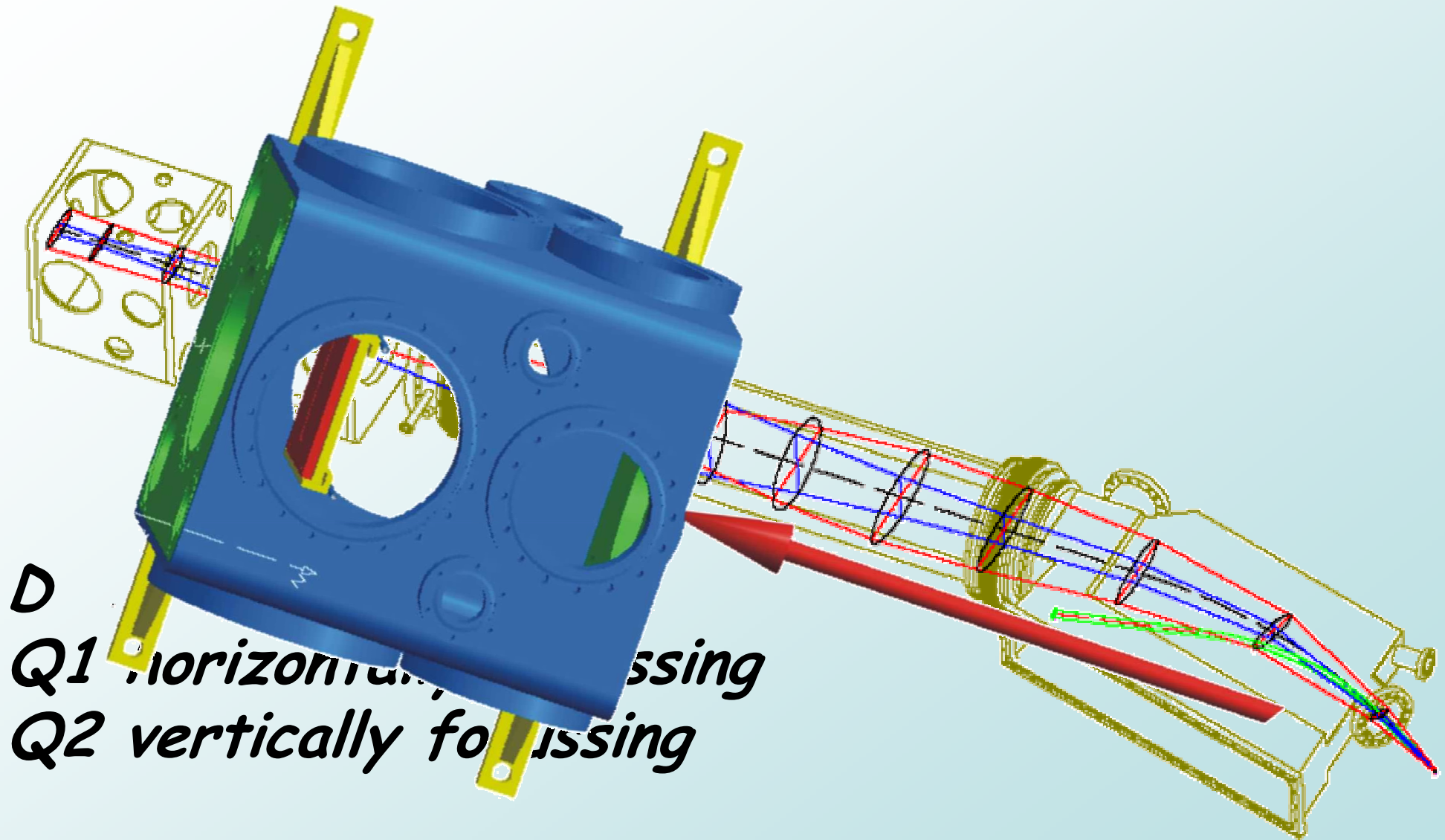


D

Q1 vertically focussing

Q2 horizontally focussing

TASCA Beam Profile II



TASCA – Detector Set-up Scheme

wobbler

target chamber

beam d

Transmission Detectors

PIN diode arrays (box)

X-ray detector

Ge-clover detector

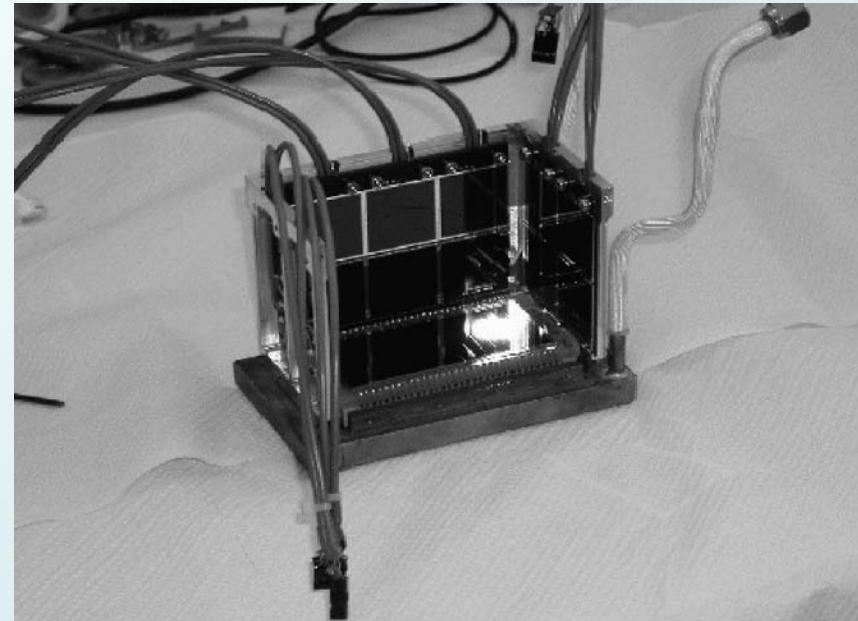
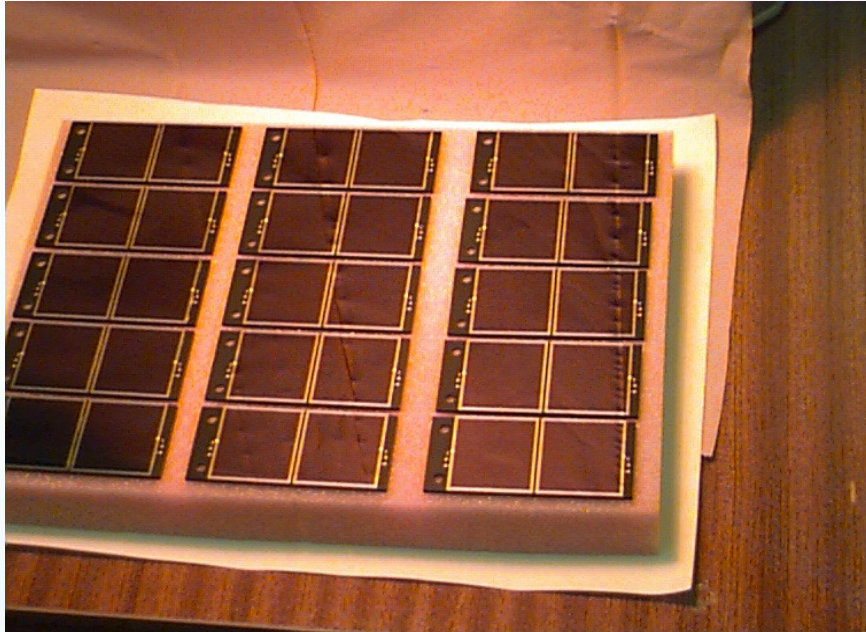
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stop detector

X-ray detector

PIN diodes

- RITU/GREAT



- ***GREAT Pin diode array***
- ***(28x28)mm² active area***
- ***32 elements***
- ***500 μm thickness***
- ***low noise (capacity) → low energy threshold***

TASCA – Detector Set-up Scheme

wobbler

target chamber

beam d

Transmission Detectors

PIN diode arrays (box)

X-ray detector

Ge-clover detector

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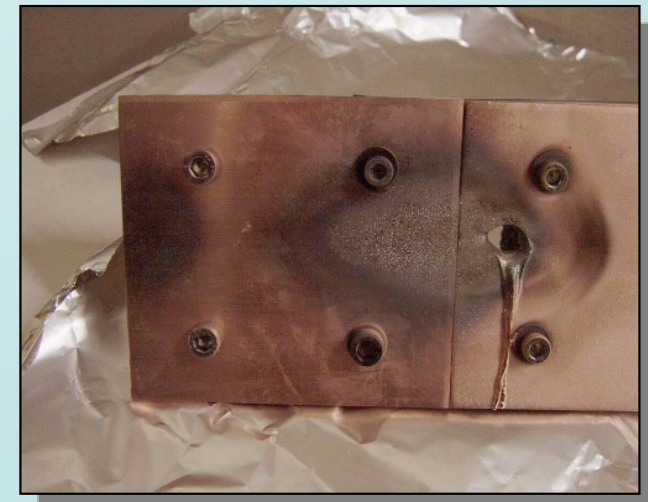
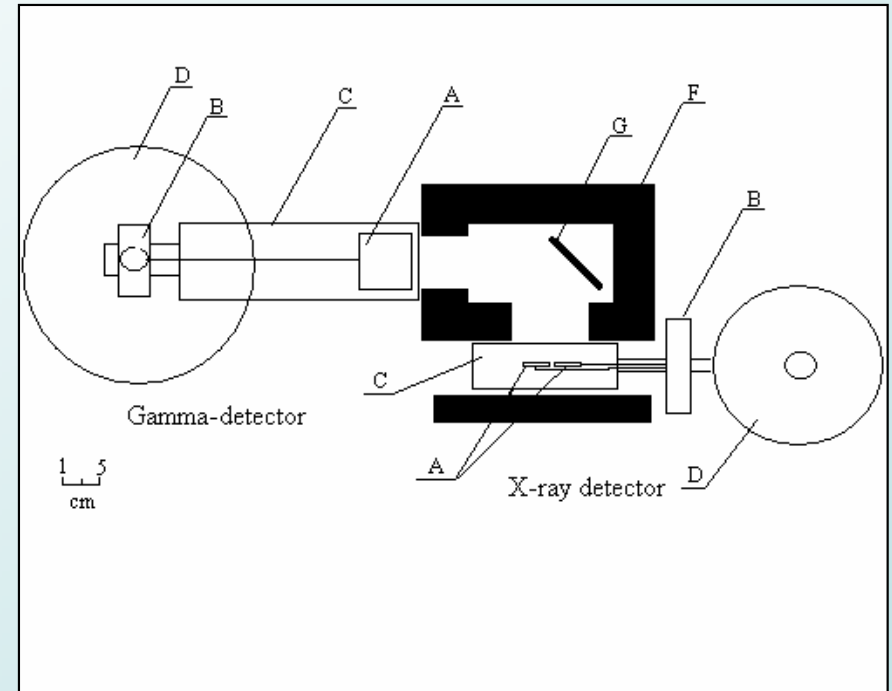
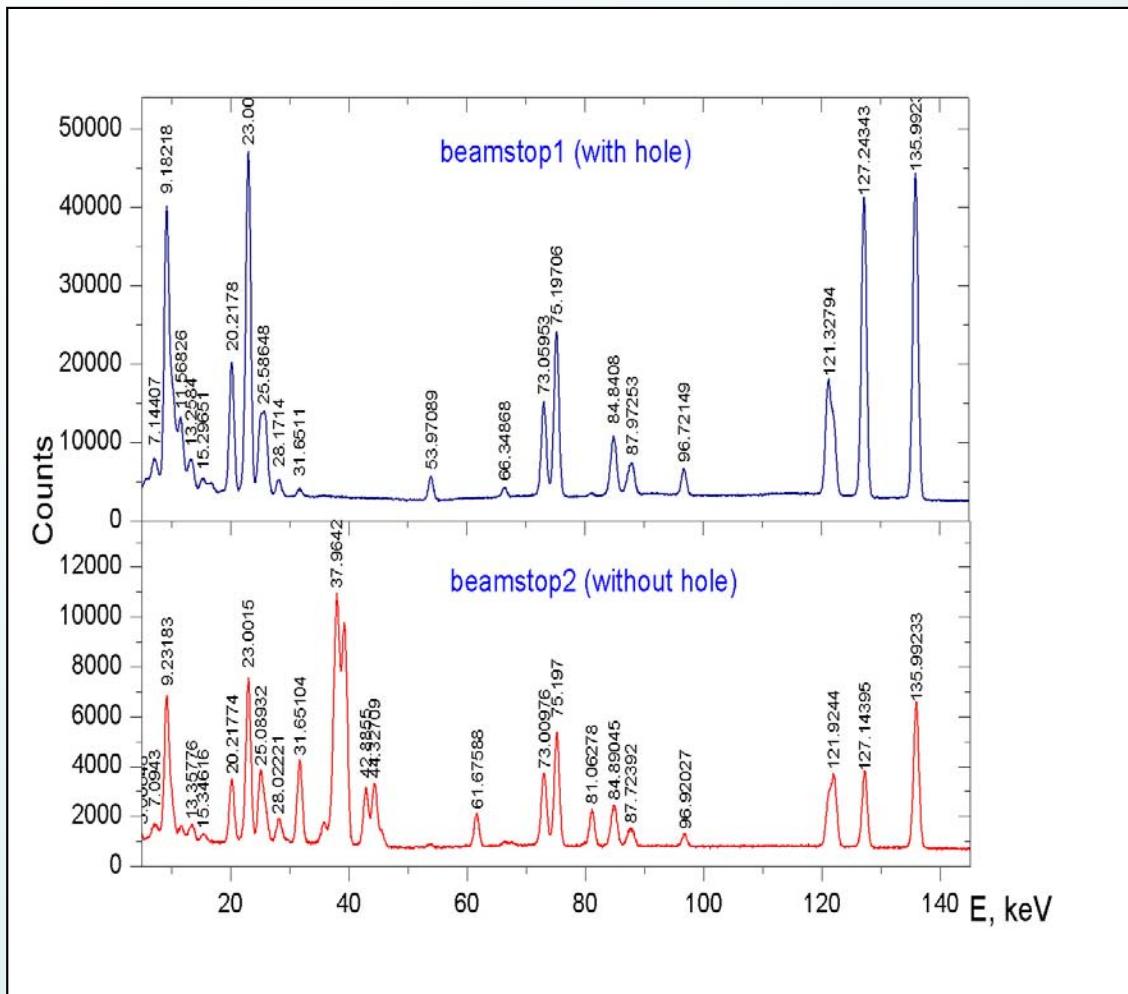
stop detector

X-ray detector

The X-Ray Detectors

tests with sources and an old SHIP beamstop:

- energy resolution ≈ 1 keV at 120 keV (^{52}Eu)



TASCA – Detector Set-up Scheme

wobbler

target chamber

beam d

Transmission Detectors

PIN diode arrays (box)

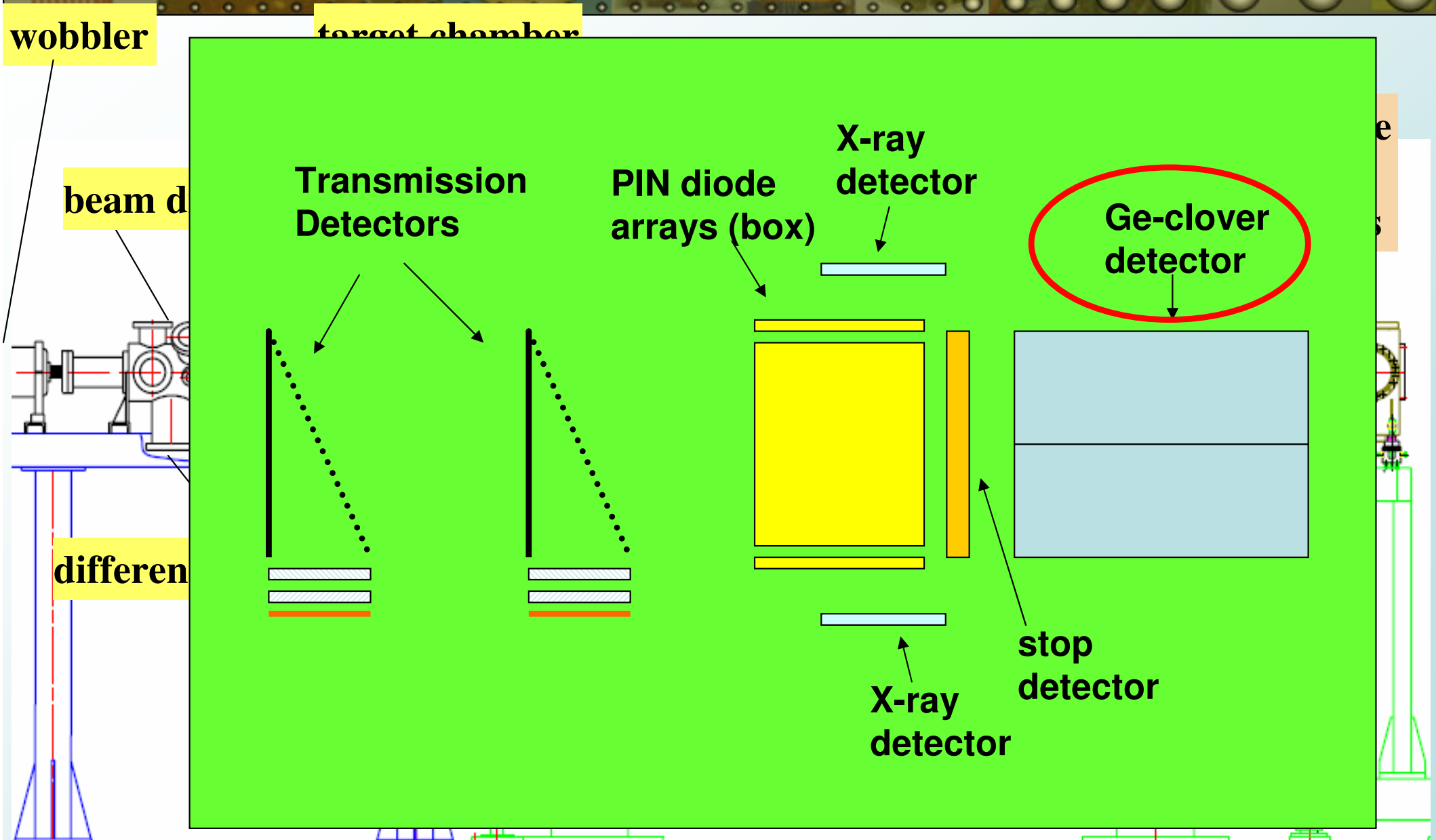
X-ray detector

Ge-clover detector

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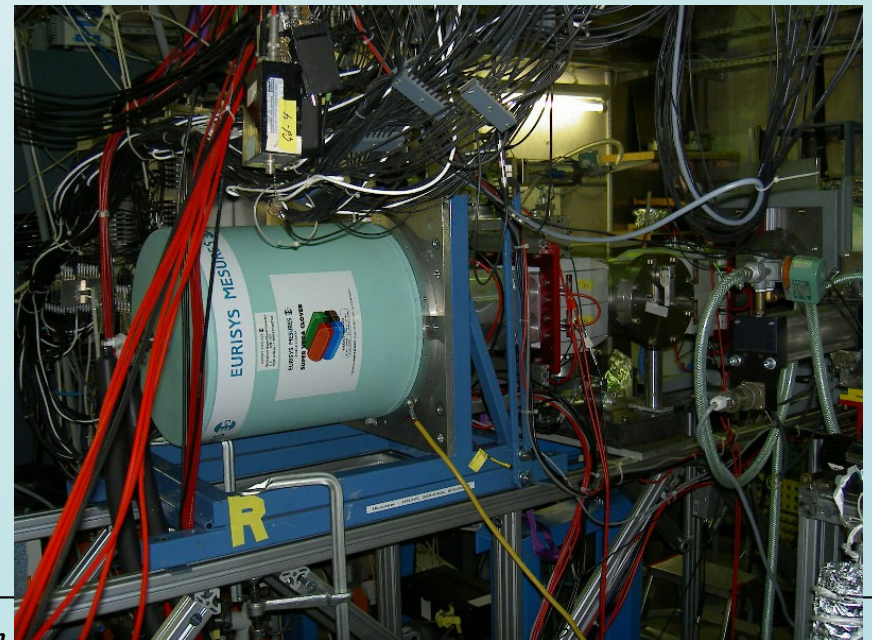
stop detector

X-ray detector



The Ge-Clover detector

- 4 crystals (70x90)mm²
- efficiency per crystal
$$\varepsilon_{\gamma} = 23\% \text{ at } 1.3 \text{ MeV}$$
- <2 cm behind STOP detector
- Al-window 0.5 mm thickness
- total efficiency from α - γ coincidences
$$\varepsilon_{\text{exp}} = 15\% \text{ at } E_{\gamma} = 150 \text{ keV}$$
- alternative: SHIP clover
 - 4 crystals (50x79)mm²
 - efficiency per crystal 20% at 1.3 MeV



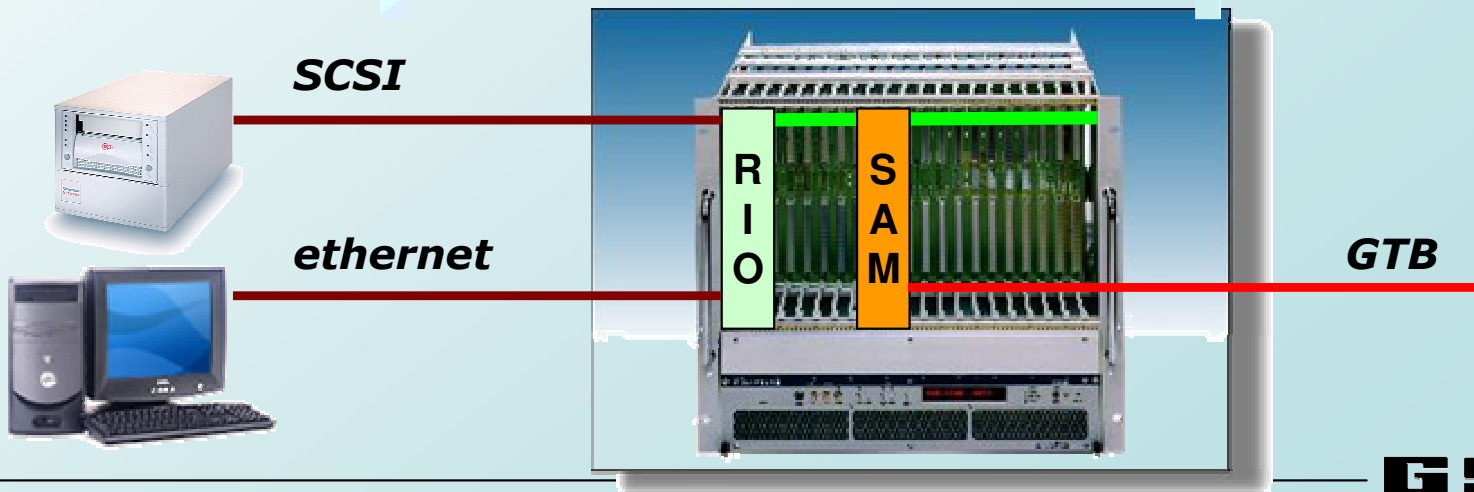
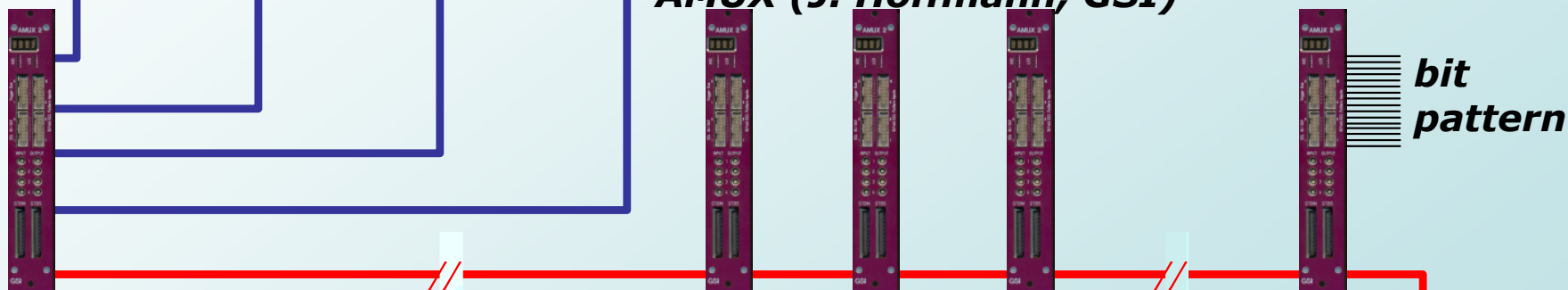
New DAQ SHIP



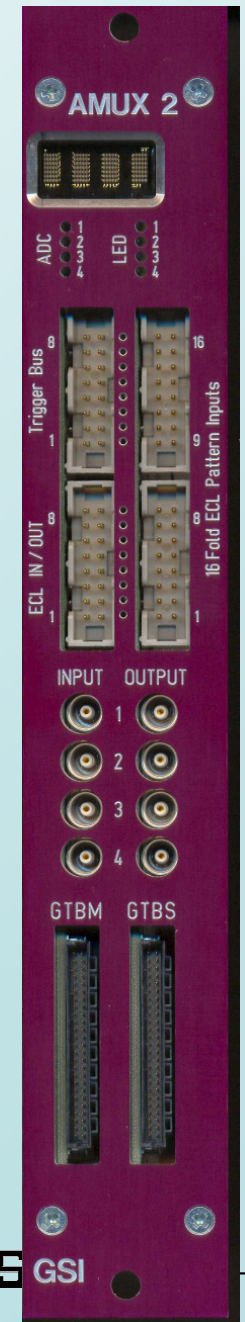
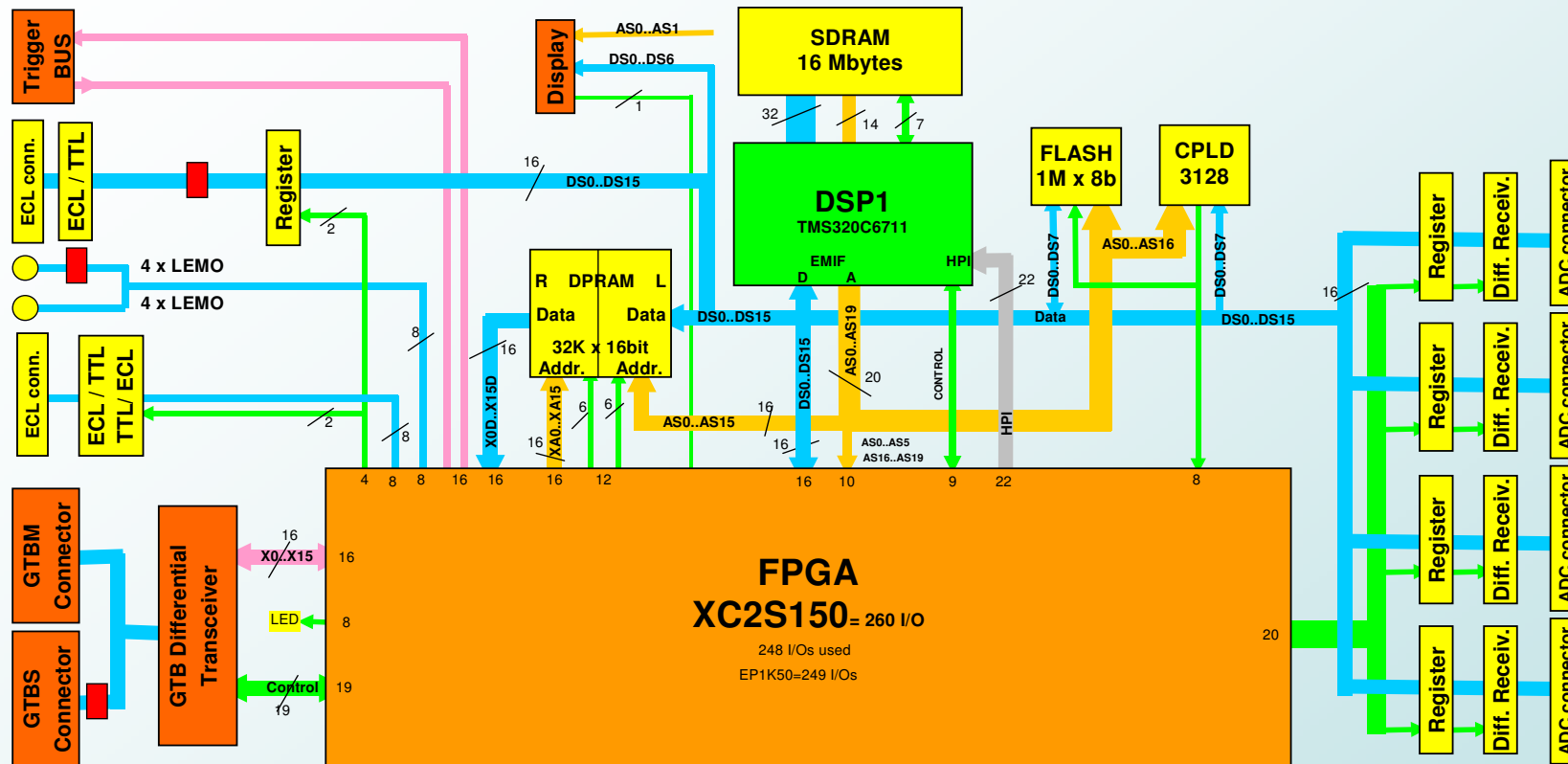
**NIM ADC
Silena 7423
13 bit (8k)**

- >> 50 parameters
- max. rate \approx 50 kHz
- random trigger
- real time clock
- dead time 10 μ s

**NIM ADC multiplexer
AMUX (J. Hoffmann, GSI)**



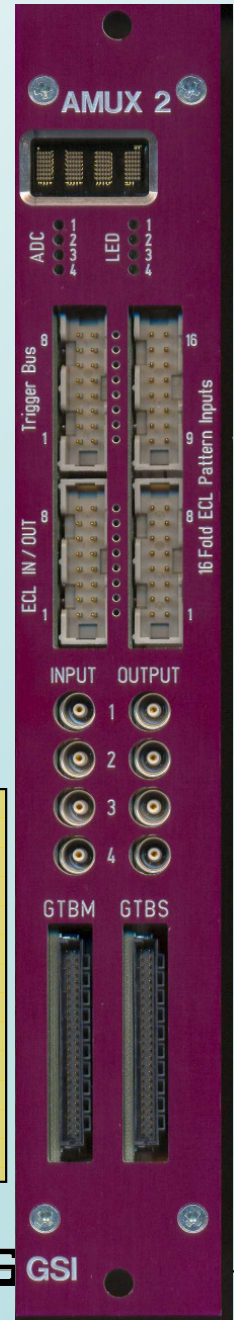
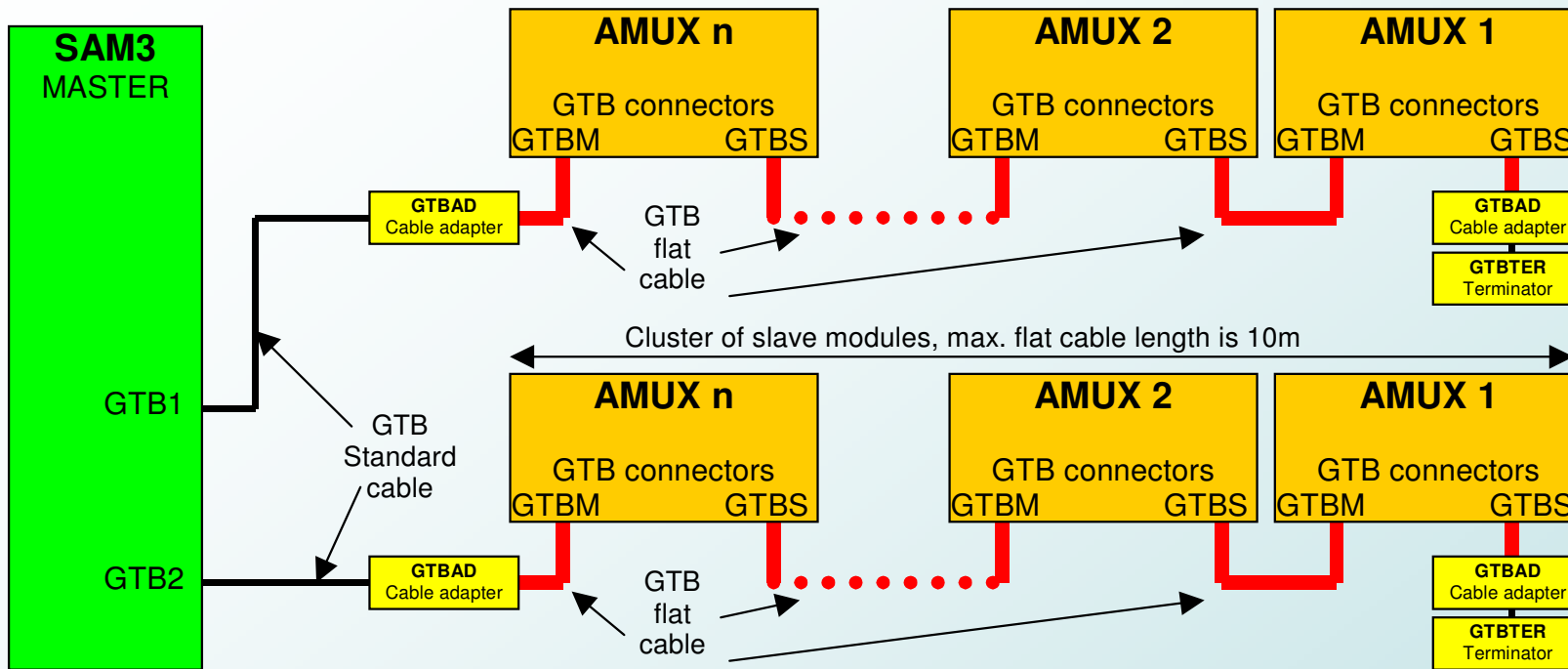
AMUX designed by Jan Hoffmann, GSI



- read and control 4 for 13 bit (8k) ADC's
- scaler function
- pattern unit function
- TDC function/real time clock
- macropuls/target wheel counter
- onboard histogramming possible

16Mb SDRAM (DSP)
 max 10 MHz
 16 bits/channels
 100 ns resolution

AMUX – GTB Interface



- **daisy chain connection to SAM3 (up to 2x15 units) via GTB bus**
- **event building and data transfer to DAQ-CPU by the readout processor SAM3**
- **random trigger (first unit with data triggers readout)**
- **max rate 50 kHz (tested in the lab)**
- **high resolution real time clock**

Next Steps

- first mounting and detector tests

- ✓ *test of X-ray detectors by summer student (Khuyagbaatar, Jadambaa)* *summer 2005*
- *after/during completion of TASCA (mm.200?)* *winter 2005/ spring 2006*
 - *mounting of stop detector for first tests of TASCA*
 - *ionoptics*
 - *transmission*
 - *...*
 - *electronics set-up*
 - *analog electronics*
 - *DAQ-system*
- *future* *end of 2006 beginning 2007*
 - *completion of the set-up*
 - *PIN diodes*
 - *transmission detectors (PPAC or channelplate/SED (window!))*
 - *first experiments* *end of 2006*
 - *... (*