

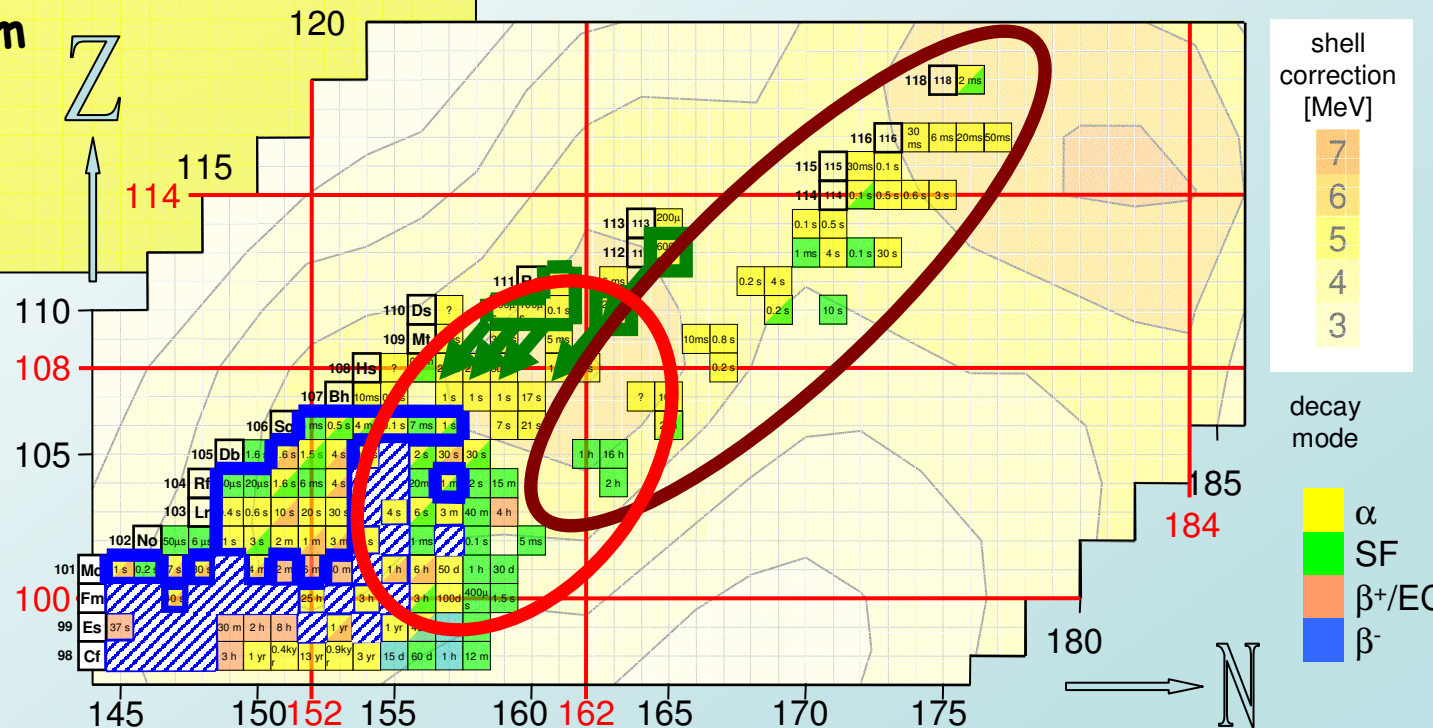
Focal Plane Detector

– Status and Test Results

- **intro – desired set-up**
 - particle detection (DSSD, PIN/PIPS, transmission detectors)
 - photon detection (γ , X-ray detectors)
- **present status – detector/electronics**
 - 16-strip detector ("SHIP"-stop)
 - two types of "standard"-electronics (SHIP/COMPACT)
 - summary TASCA runs T001-T008
 - use of the 16-strip detector (SHIP-"stop")
 - as position check (PC) detector for RTC-measurements
 - for α spectroscopy (see contribution by K. Jadambaa)
 - electronic development (COMPACT/SHIP-like)
- **conclusions for the (near-)future strategy**

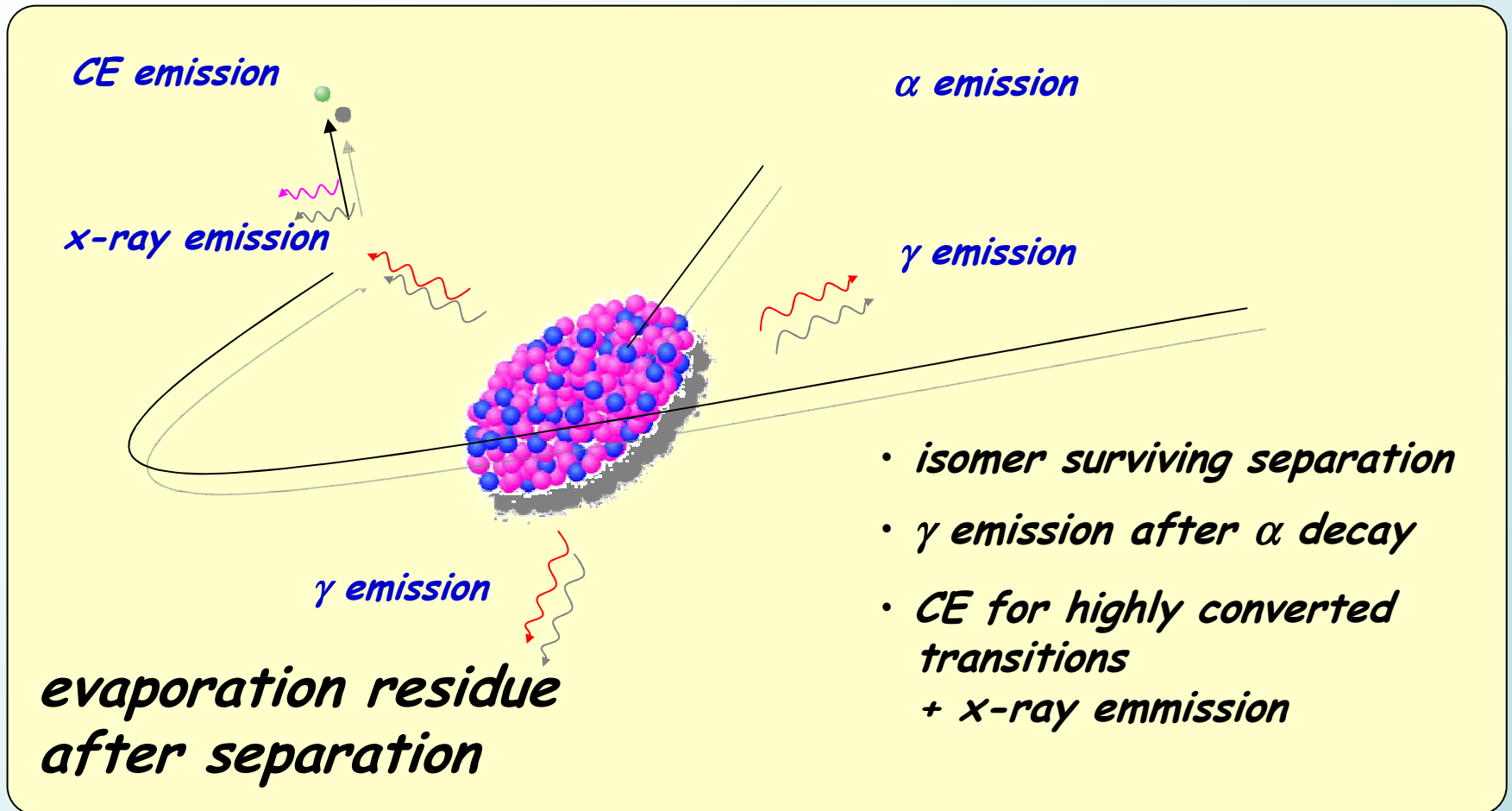
Nuclear Structure of the Heaviest Nuclei: - Status and Plans for SHIP & TASCA

- cold fusion at SHIP
- hot fusion (the "Dubna challenge")
- spectroscopy from transactinides to SHE @ SHIP & TASCA

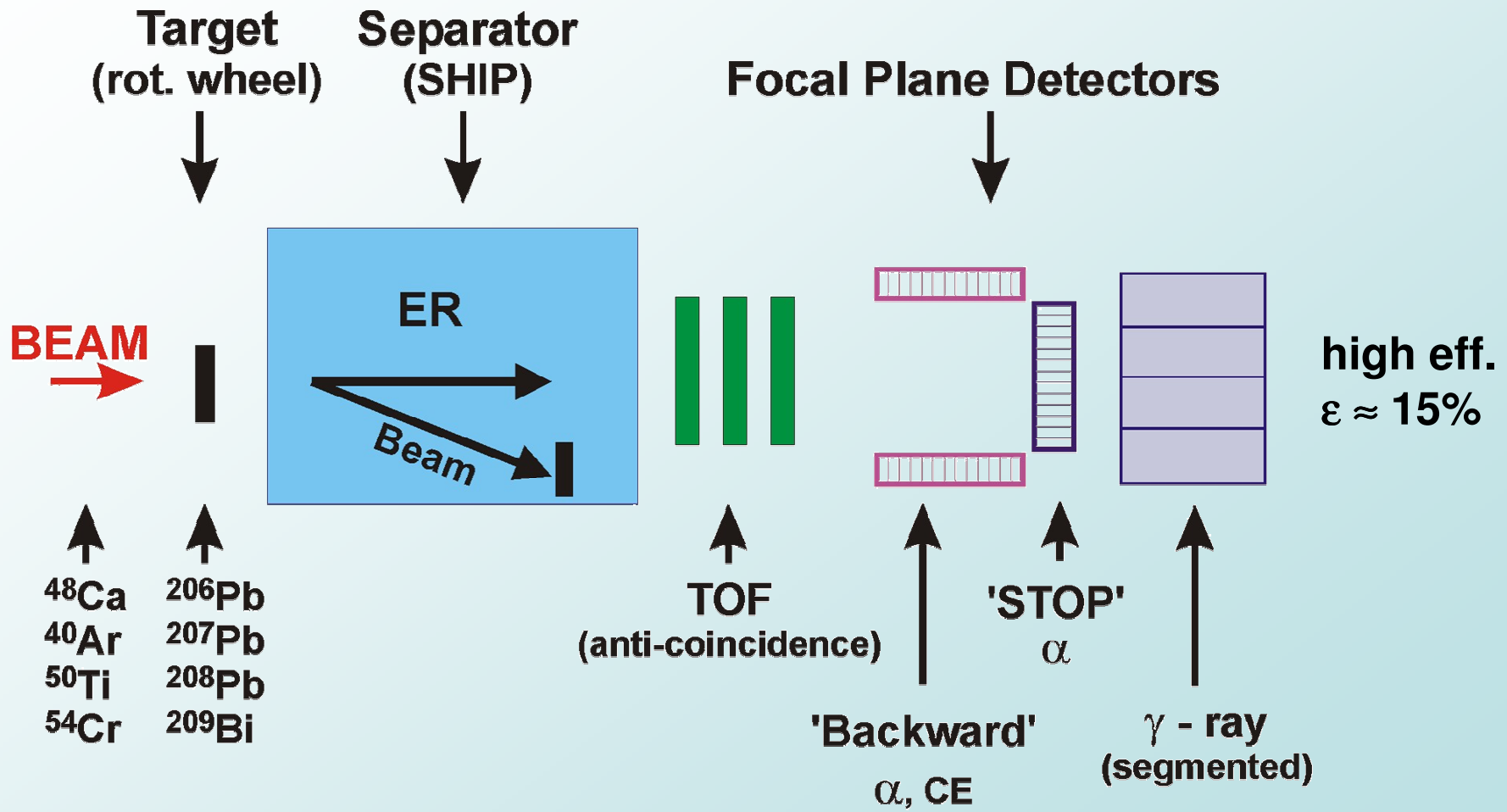


see contribution of R.D. Herzberg

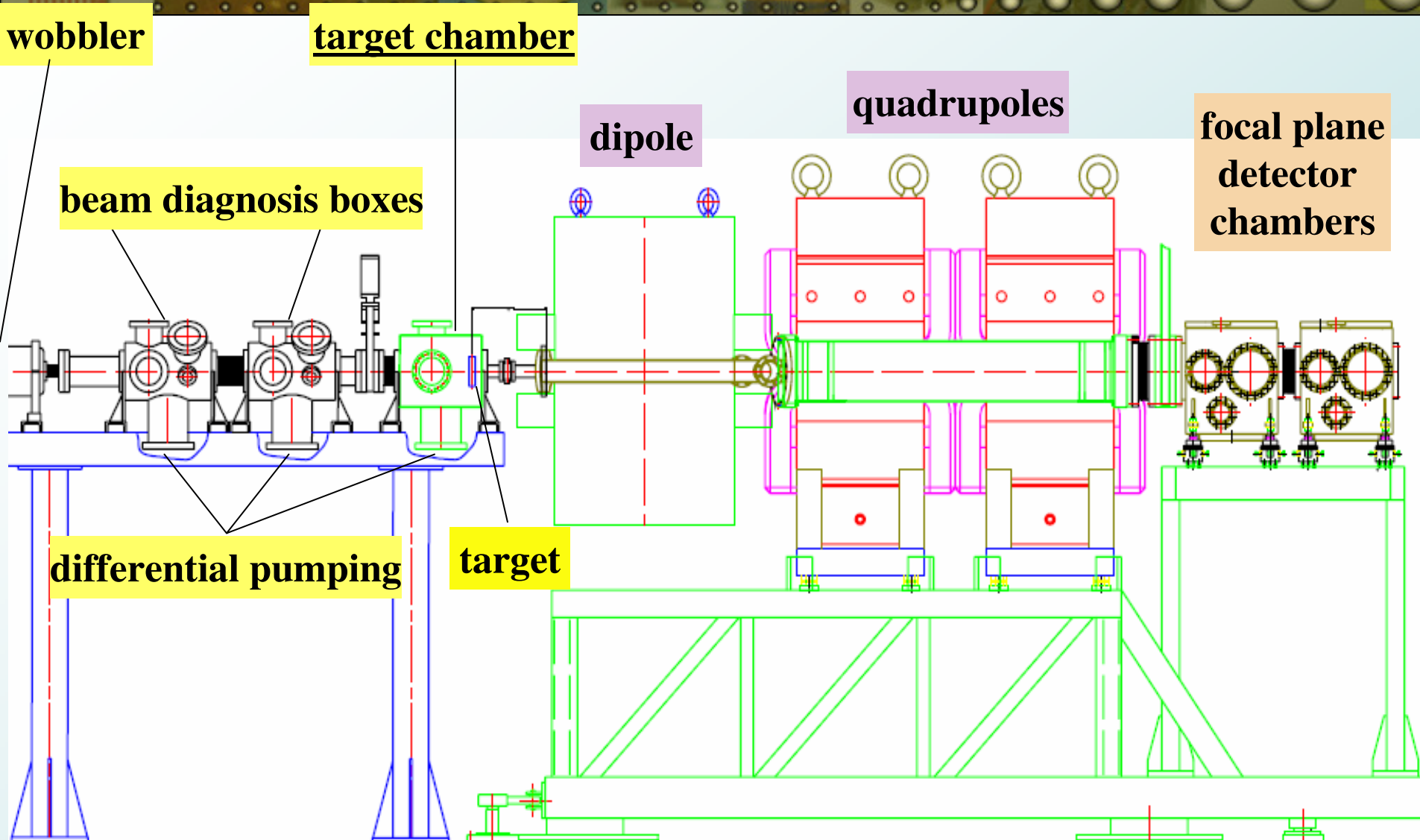
ER- α - γ Spectroscopy after Separation



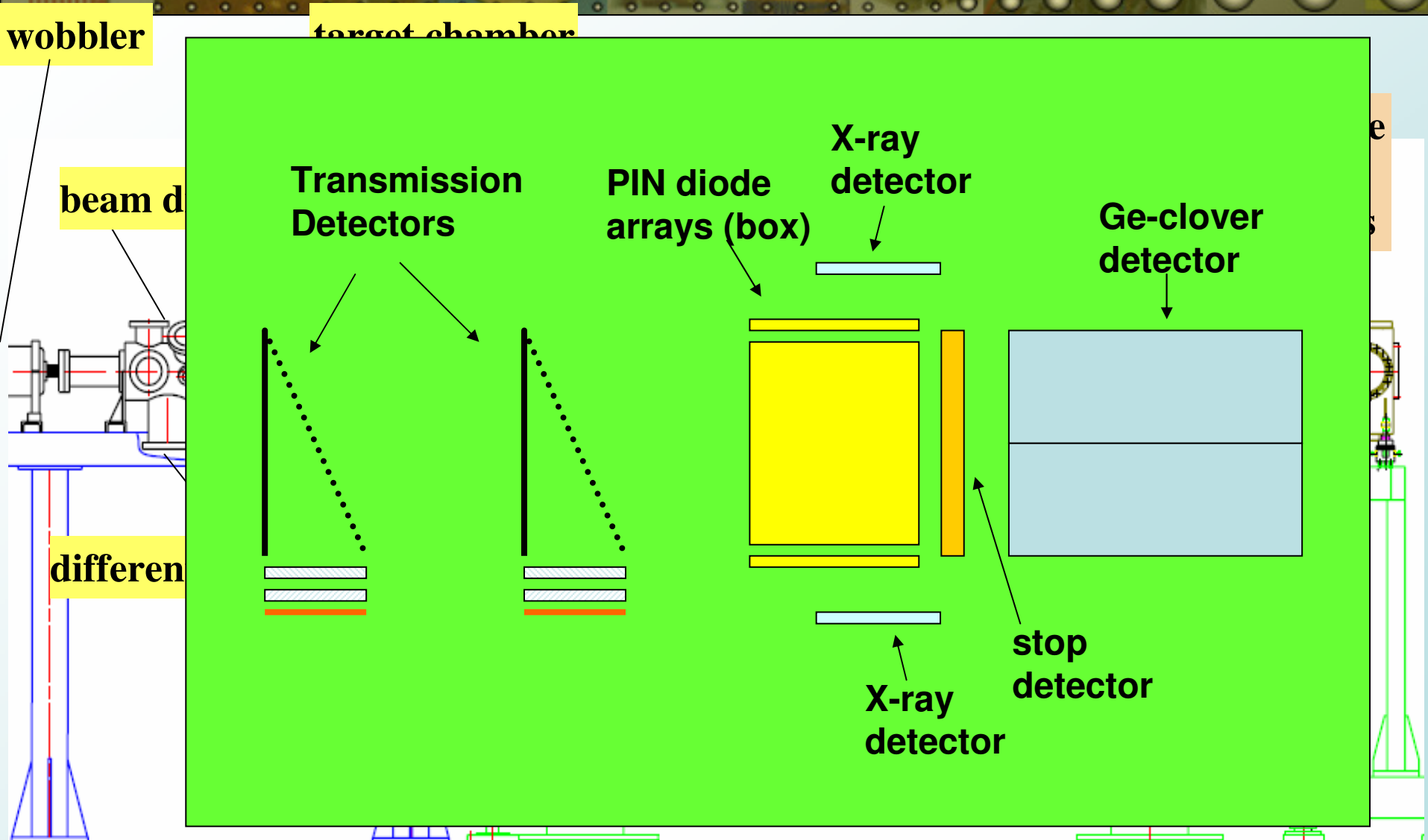
ER- α - γ Spectroscopy after Separation



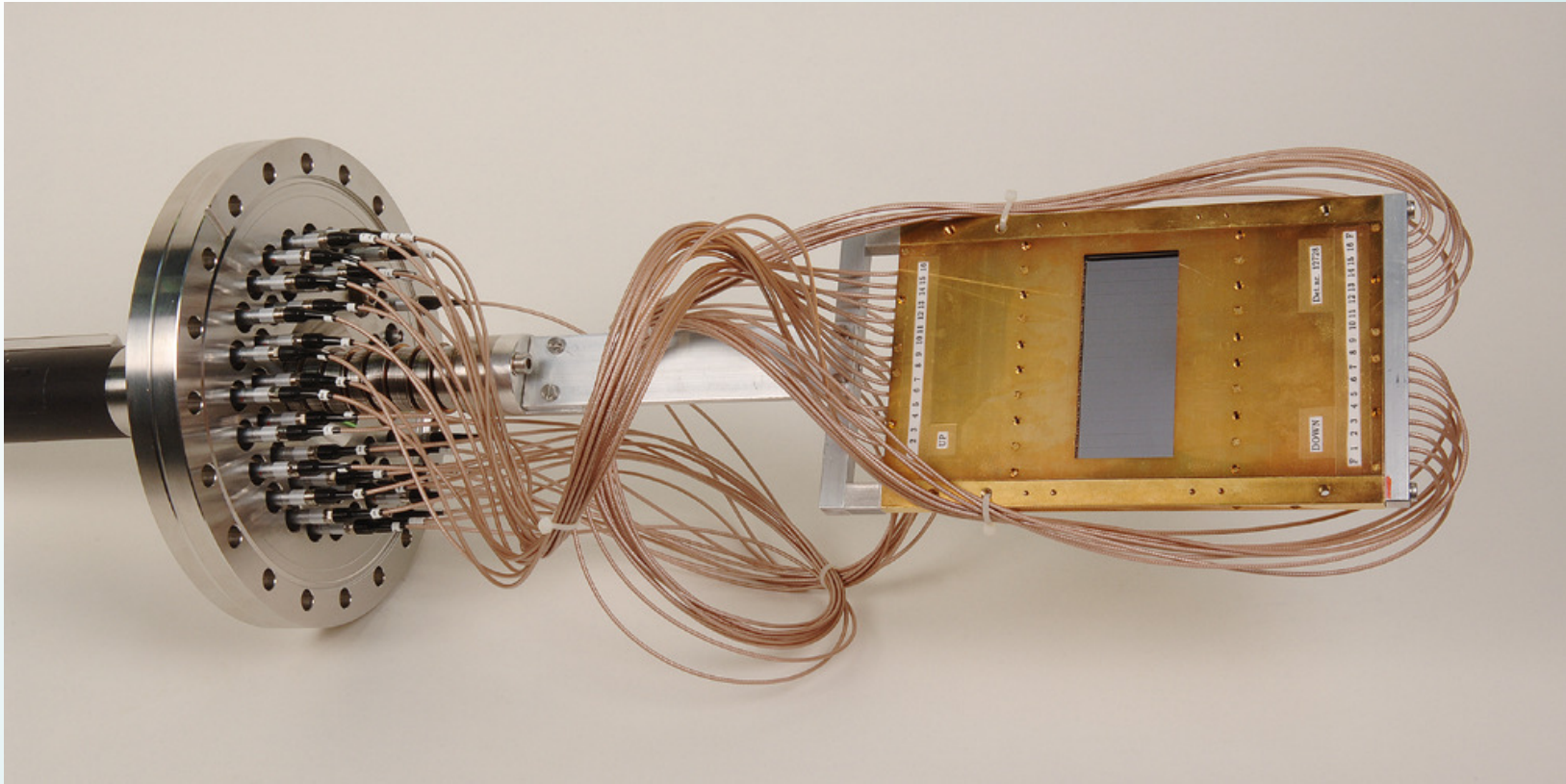
TASCA – Detector Set-up Scheme



TASCA – Detector Set-up Scheme

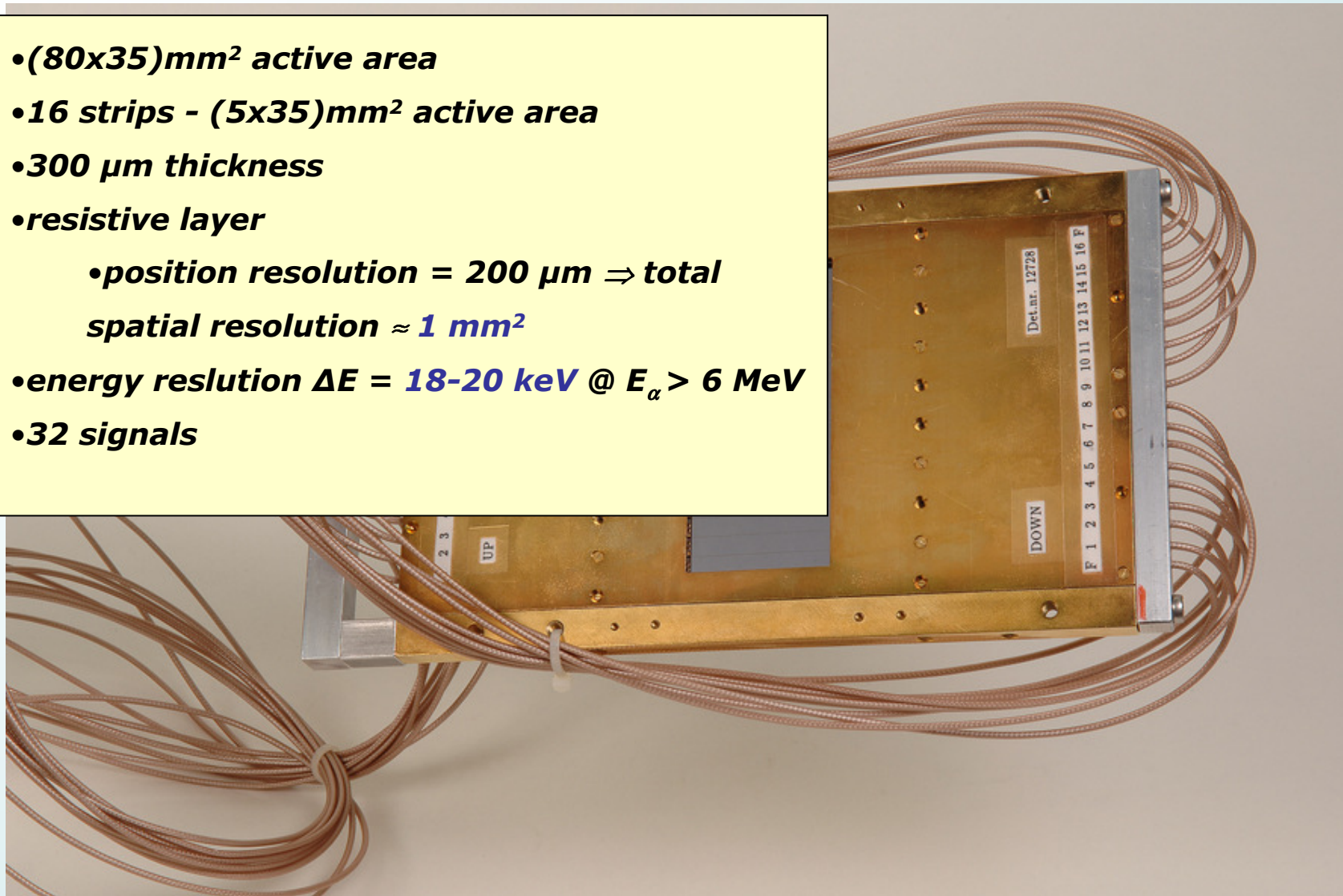


The *TASCA* Position Check (PC) Detector

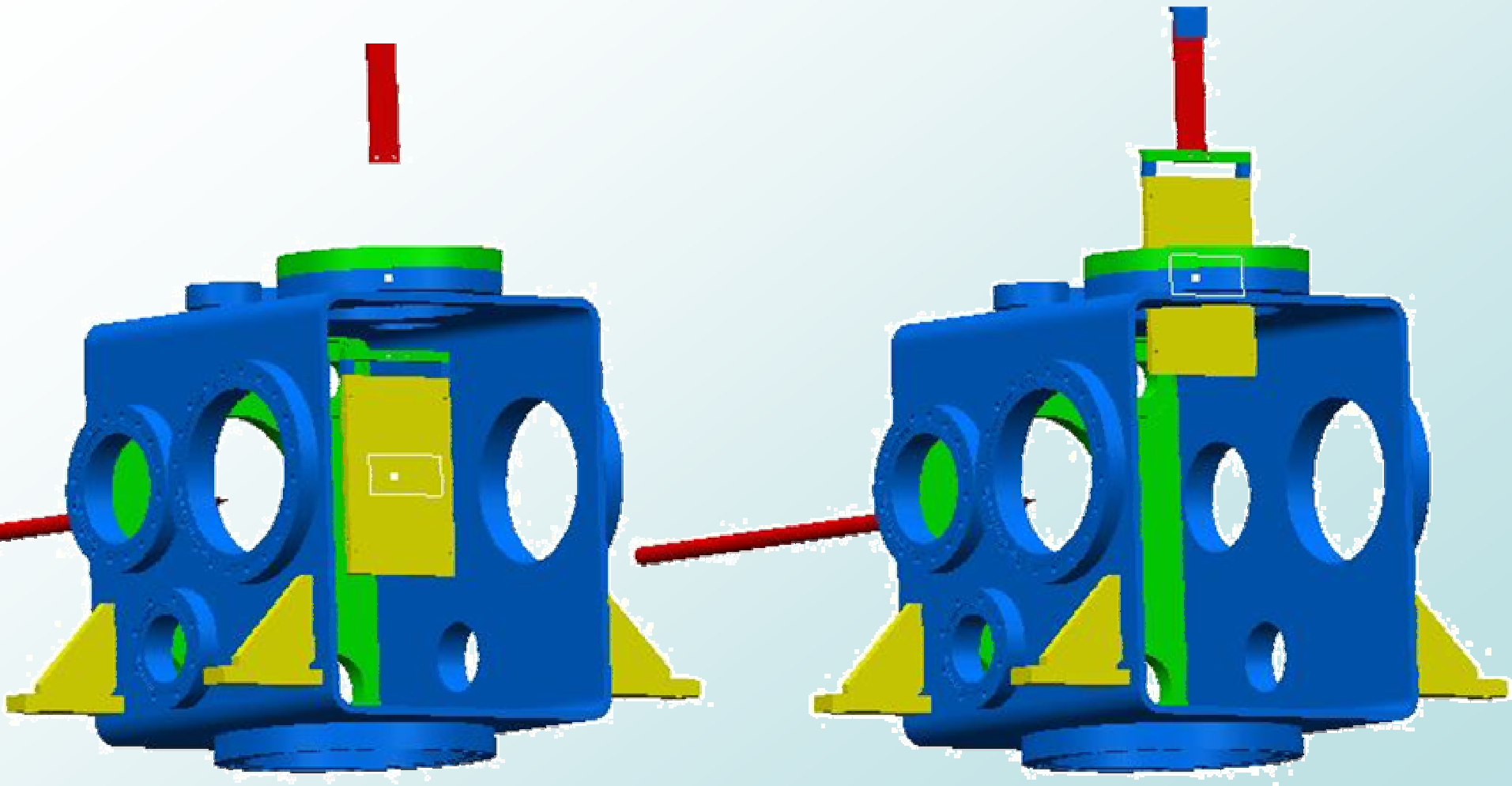


The TASCA Position Check (PC) Detector

- **(80x35)mm² active area**
- **16 strips - (5x35)mm² active area**
- **300 μ m thickness**
- **resistive layer**
 - **position resolution = 200 μ m \Rightarrow total spatial resolution \approx 1 mm²**
- **energy resolution $\Delta E = 18-20$ keV @ $E_{\alpha} > 6$ MeV**
- **32 signals**



The *TASCA* Position Check (PC) Detector



The Ge-Clover detector

- 4 crystals (70x140)mm²

- efficiency per crystal

$$\varepsilon_{\gamma} = 23\% \text{ at } 1.3 \text{ MeV}$$

- <2 cm behind STOP detector

- Al-window 0.5 mm thickness

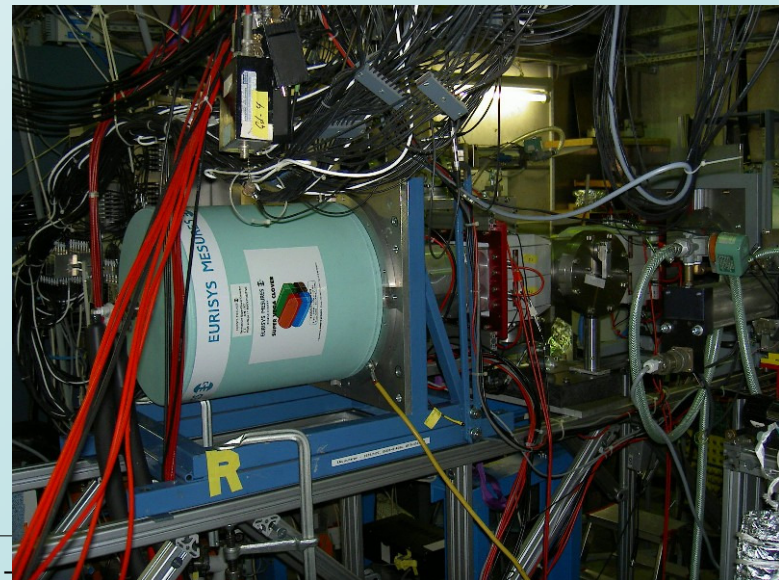
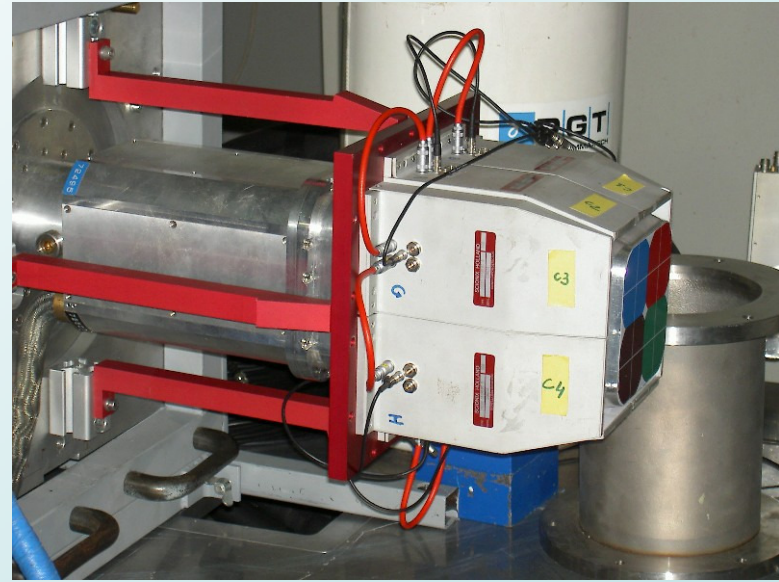
- total efficiency from α - γ coincidences

$$\varepsilon_{\text{exp}} = 15\% \text{ at } E_{\gamma} = 150 \text{ keV}$$

- alternative: SHIP clover

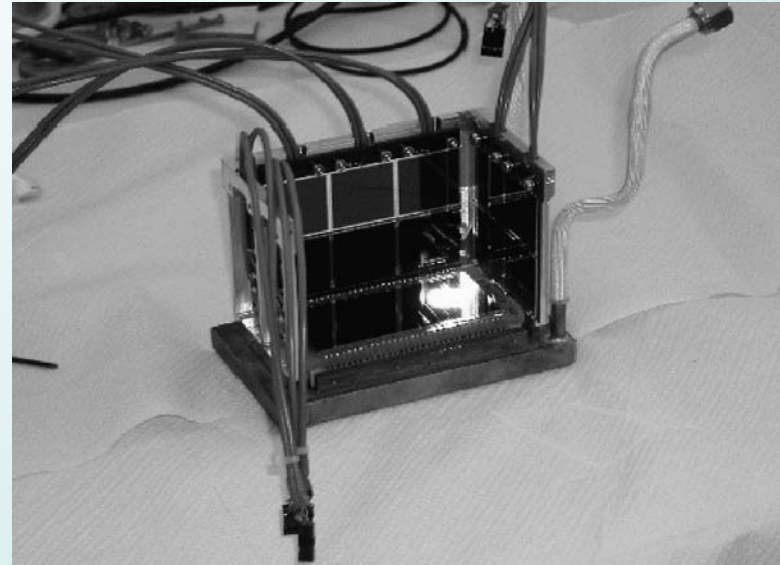
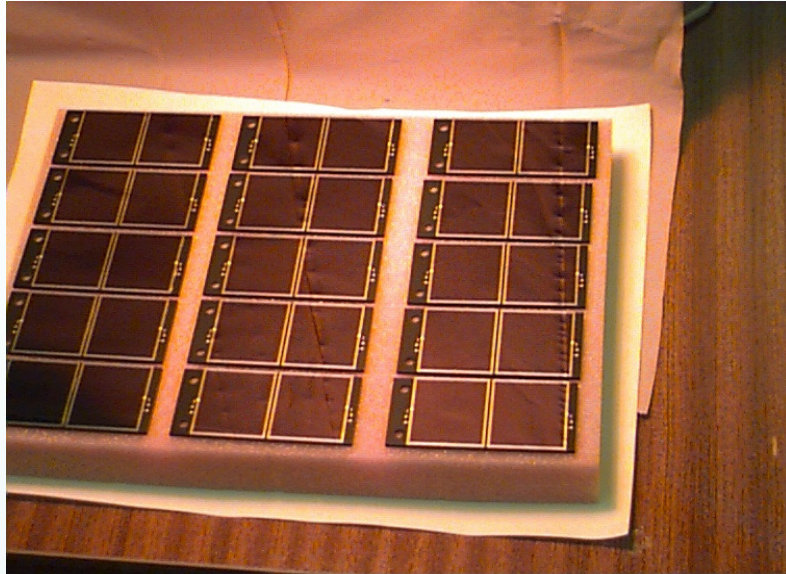
- 4 crystals (50x79)mm²

- efficiency per crystal 20% at 1.3 MeV



PIN diodes

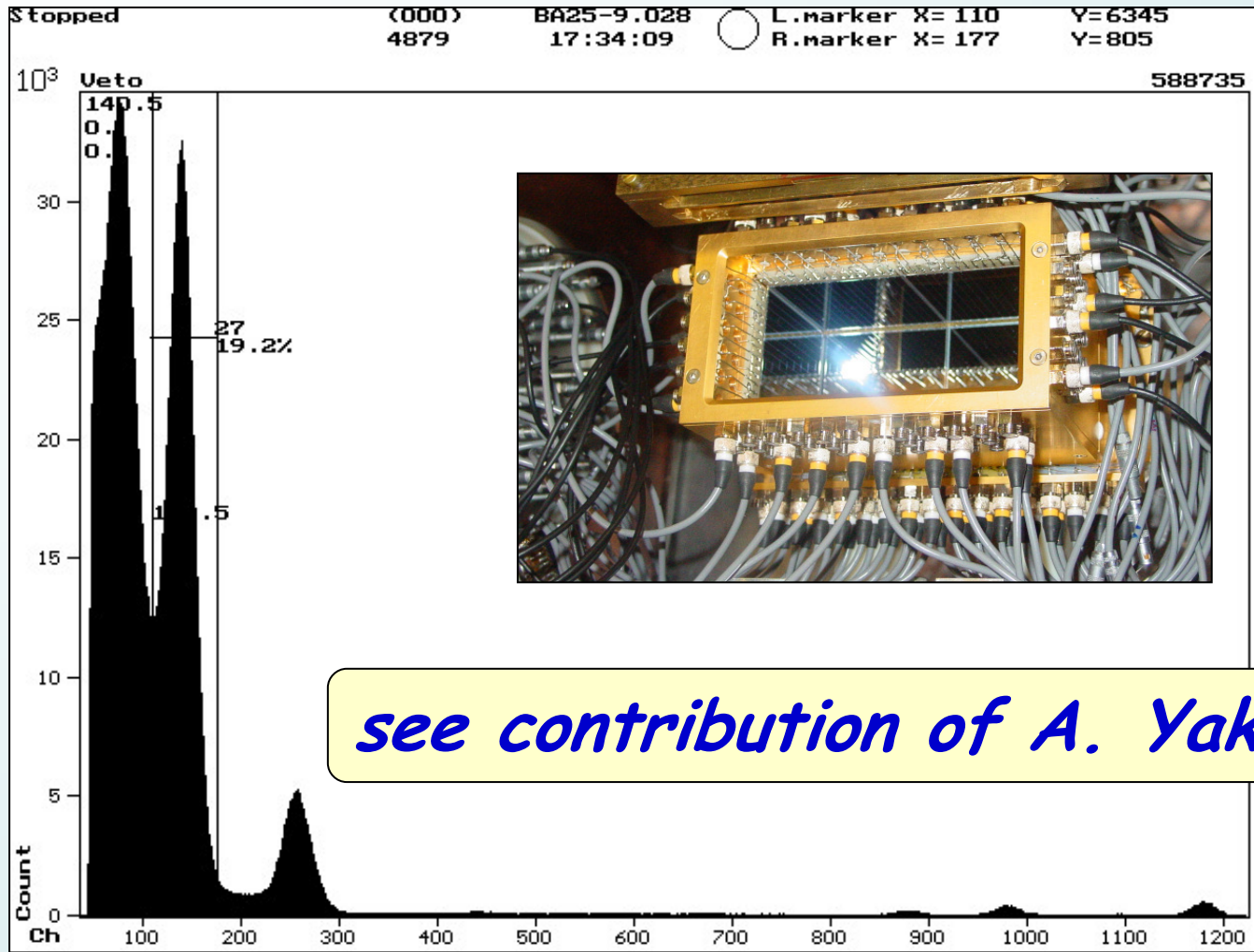
- RITU/GREAT



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

DSSD-Stop and Box Detector Design

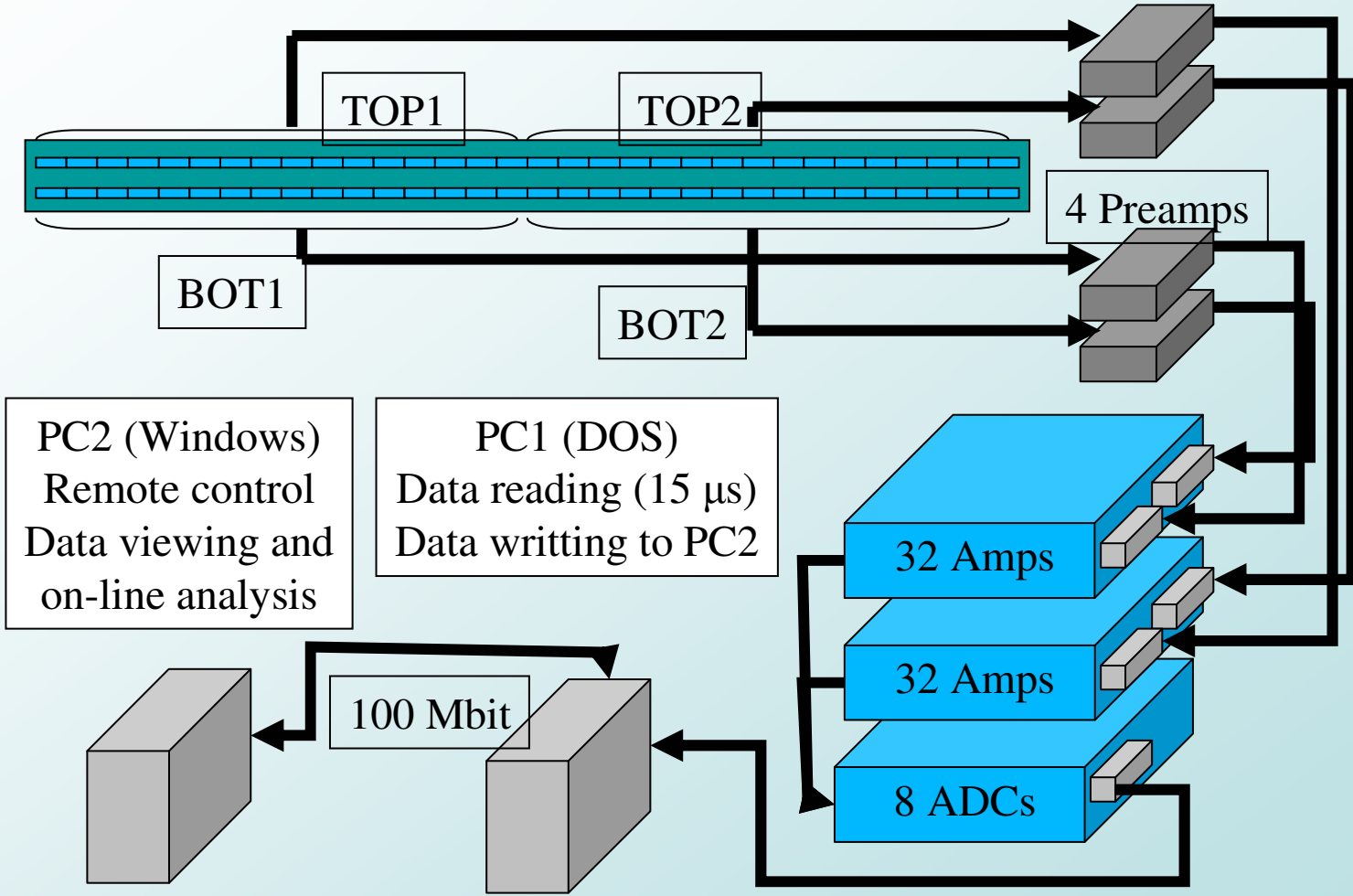
- PIN Diodes vs. SSD Chips

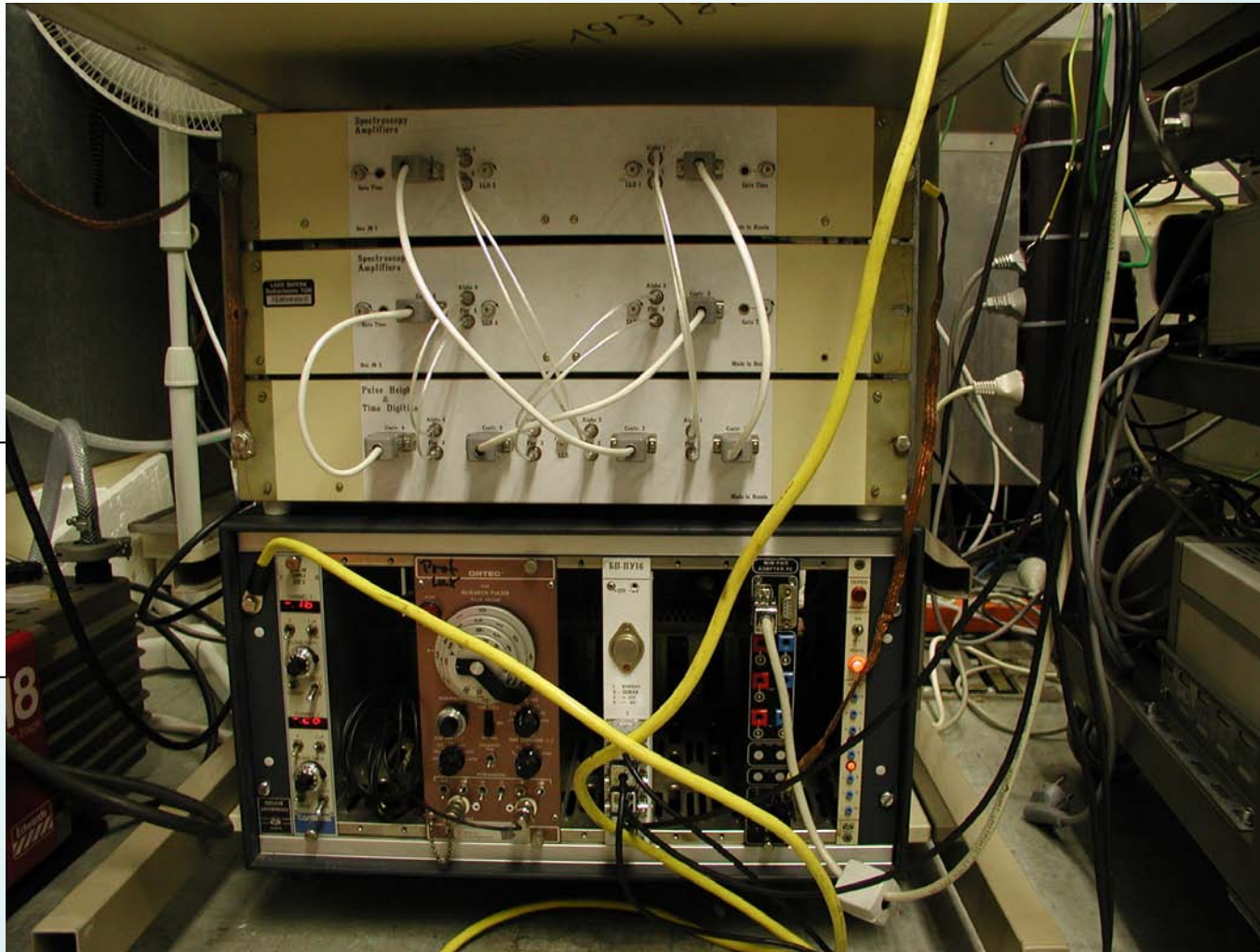


SSD 60x60 mm, 300 μm , 16 strips, made by Canberra. β resolution 13.4 keV (70 KeV).
(courtesy of A. Gorshkov)

COMPACT electronics

- A. Yakushev







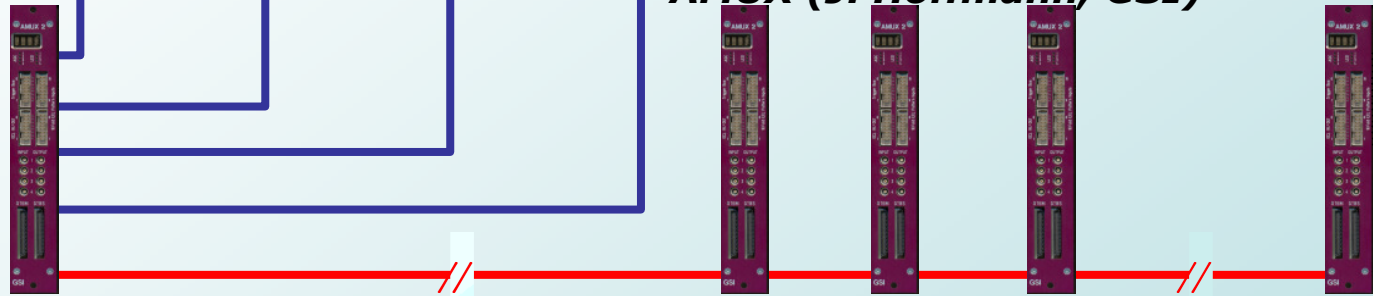
DAQ SHIP



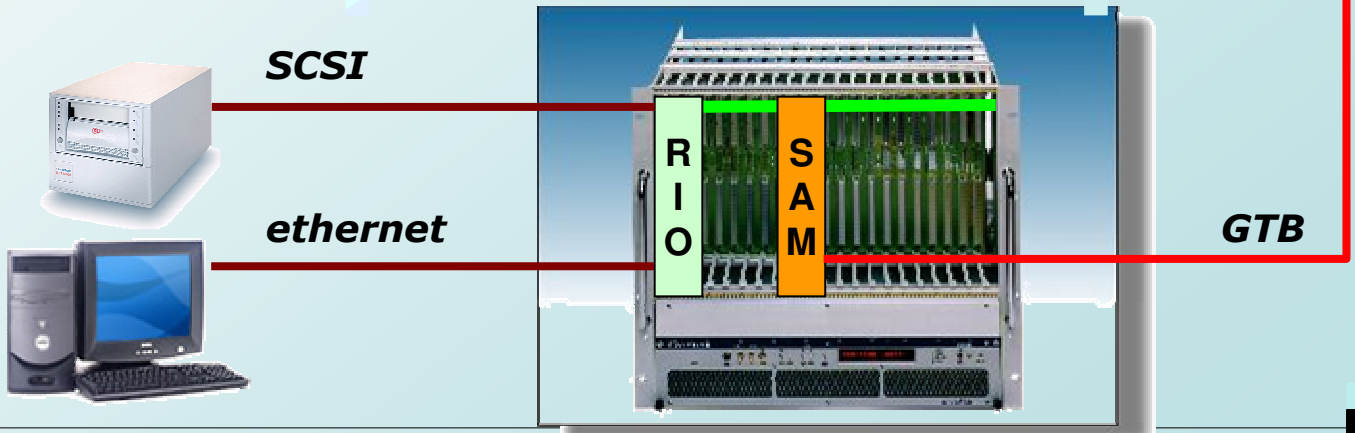
**NIM ADC
Silena 7423
13 bit (8k)**

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

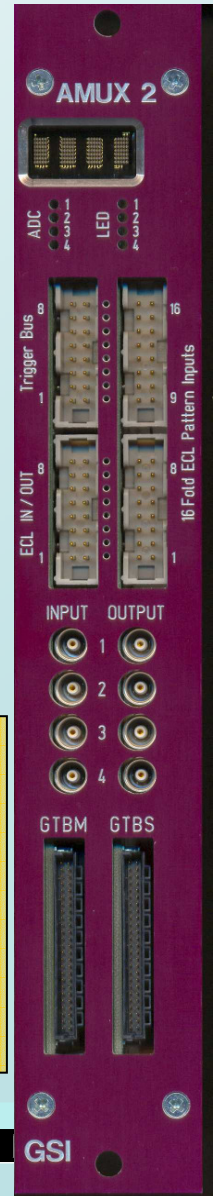
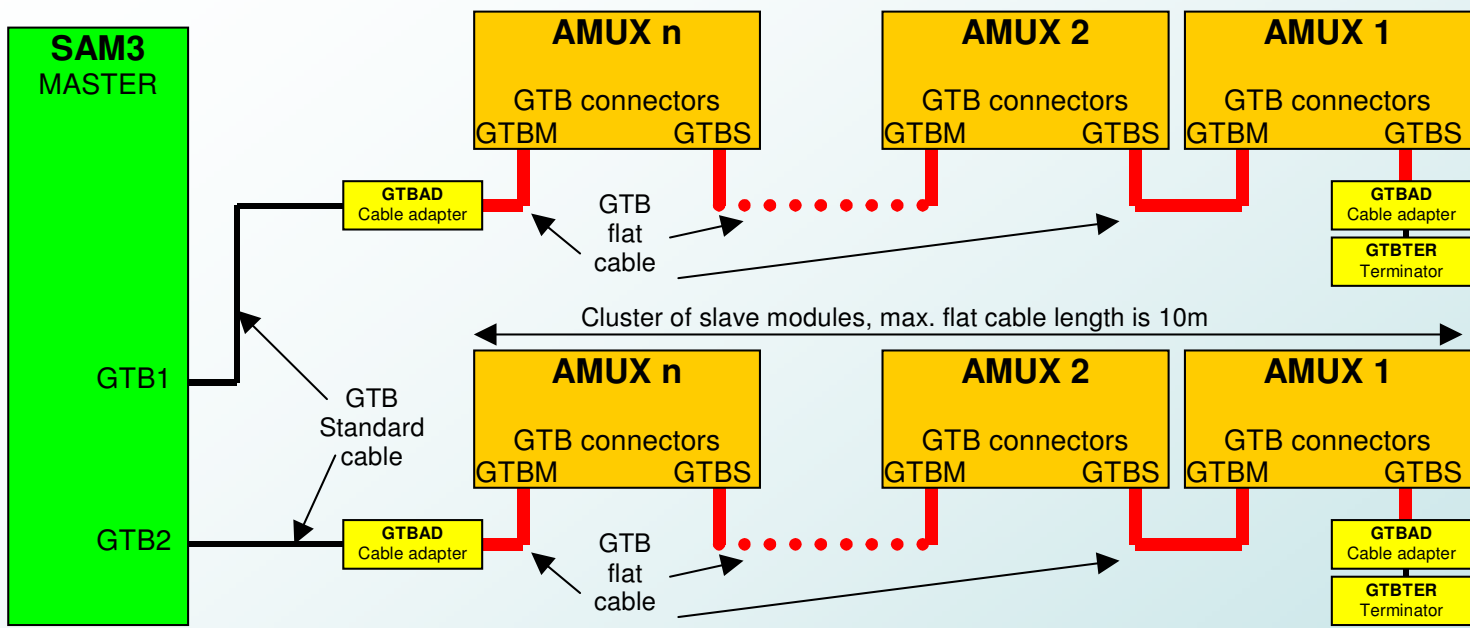
**NIM ADC multiplexer
AMUX (J. Hoffmann, GSI)**



bit
pattern



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**

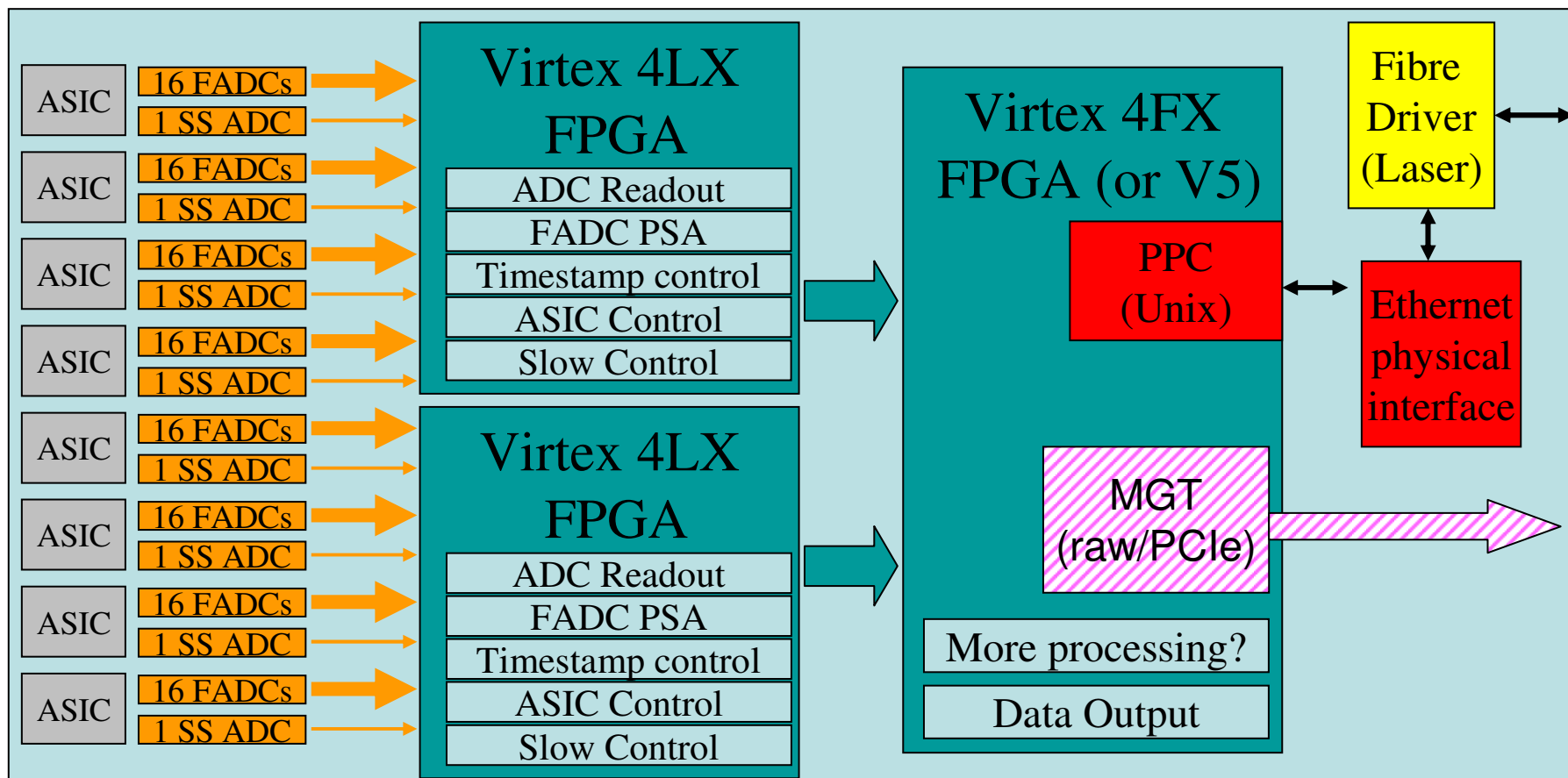
AIDA/LYCCA FEE (NUSTAR)

courtesy of I. Lazarus, Daresbury, U.K.

16 ch
ASIC

16 FADCs (12/14 bit)
1 Sliding Scale ADC
(14bit) per ASIC

128 (64?) detector signals in; 1 data fibre out (max 50Mbytes/sec)
or multiple MGTs with PCIe or point-point 200Mbytes/sec

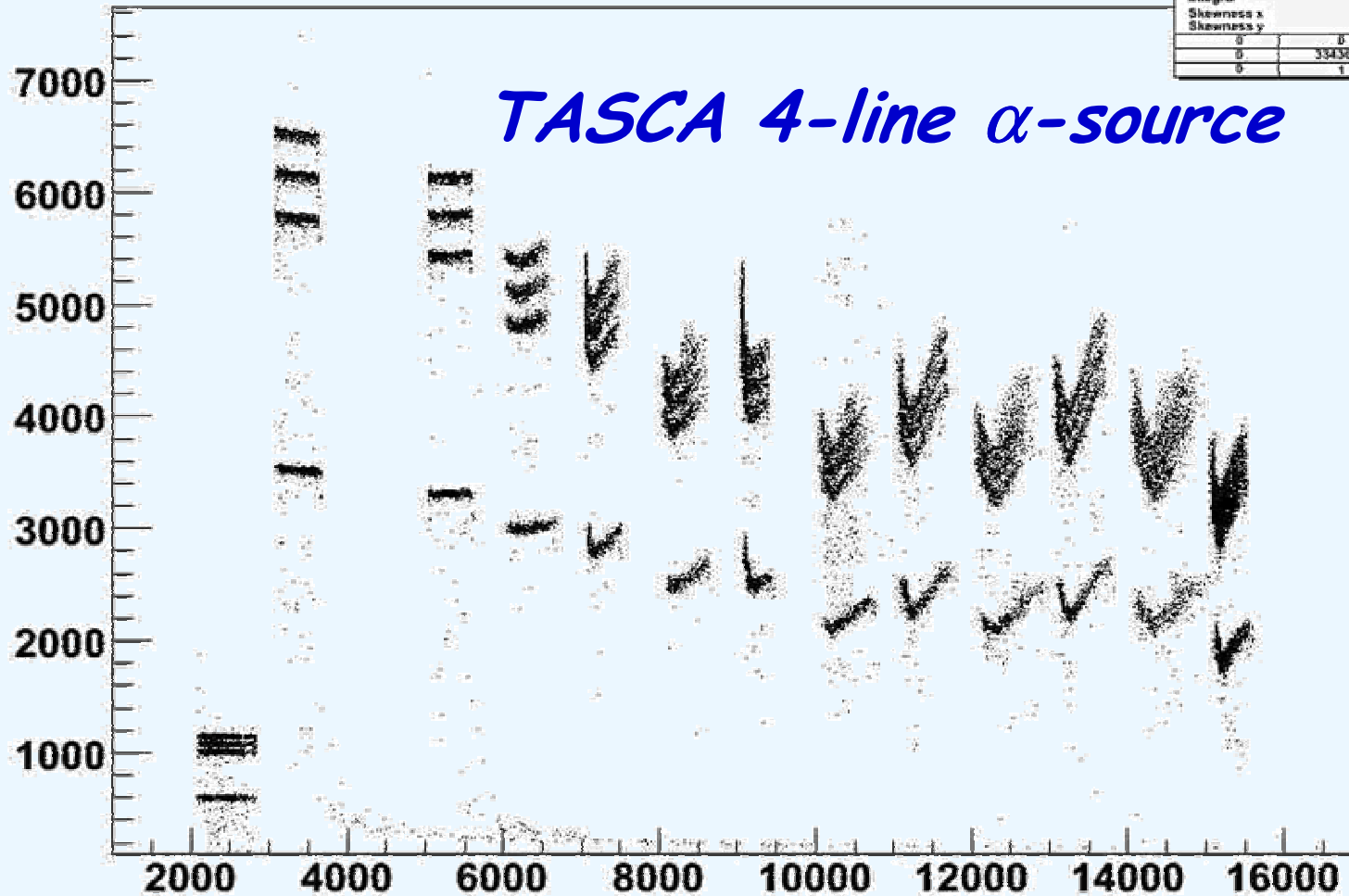


Mistreated 16-strip detector

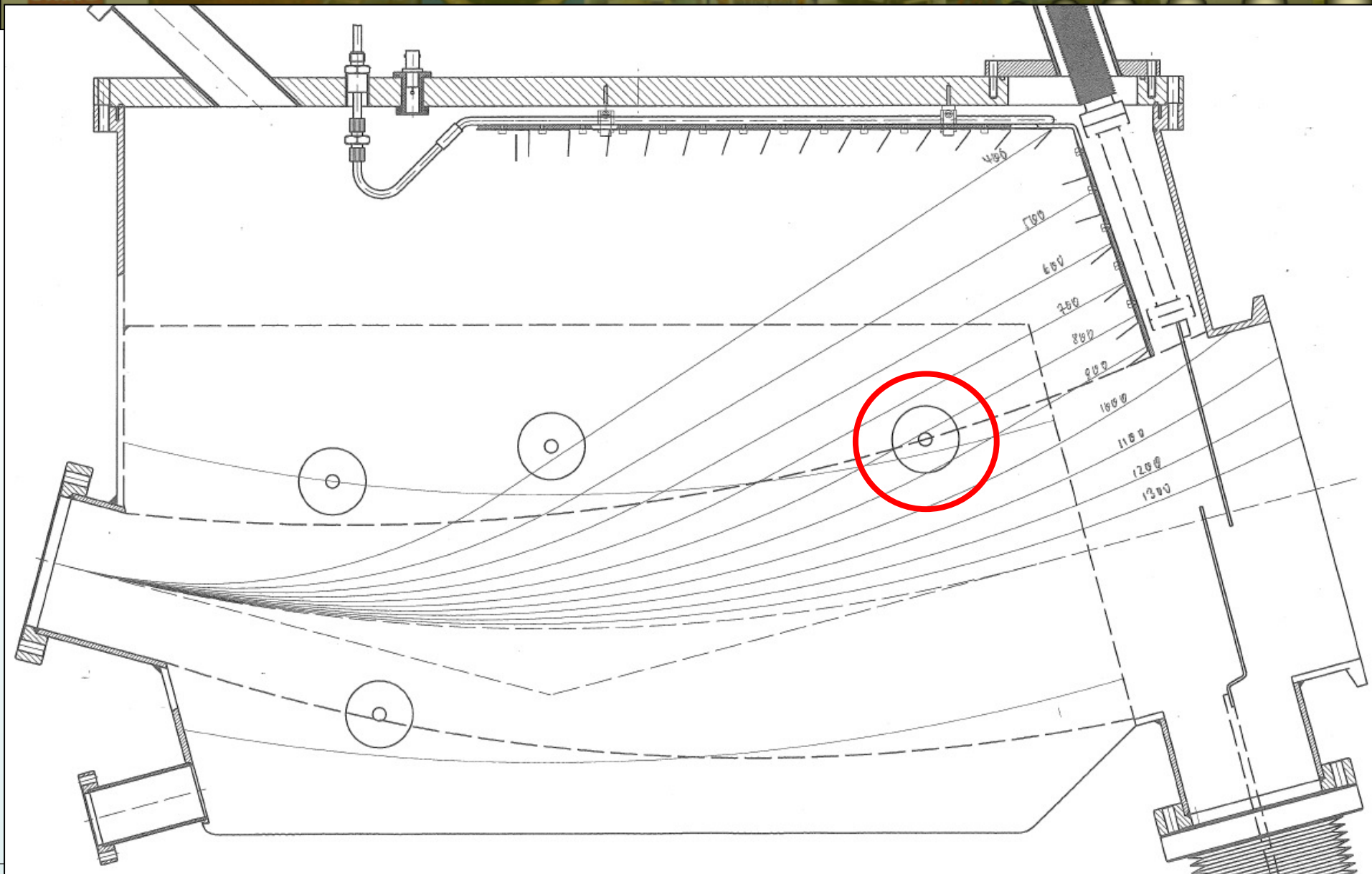
XYLT vs. EKEV 14:23:58

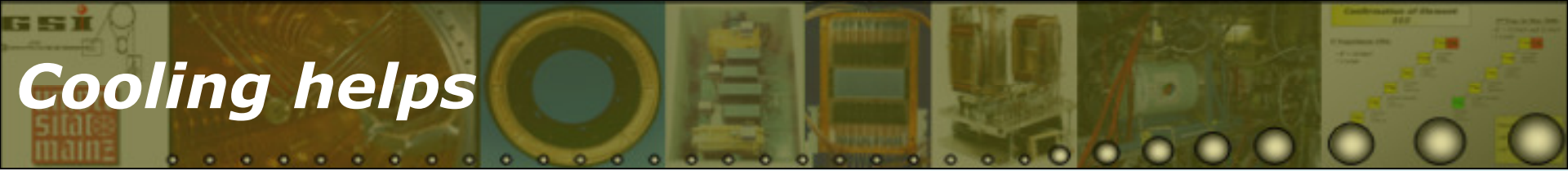
XYLTvsEKEV		
Entries	33464	
Mean x	9141	
Mean y	3487	
RMS x	4413	
RMS y	1466	
Integral	3.344e+04	
Skewness x	nan	
Skewness y	nan	
0	0	0
0	33436	27
0	1	0

TASCA 4-line α -source



Summary TASCA runs T001-T005

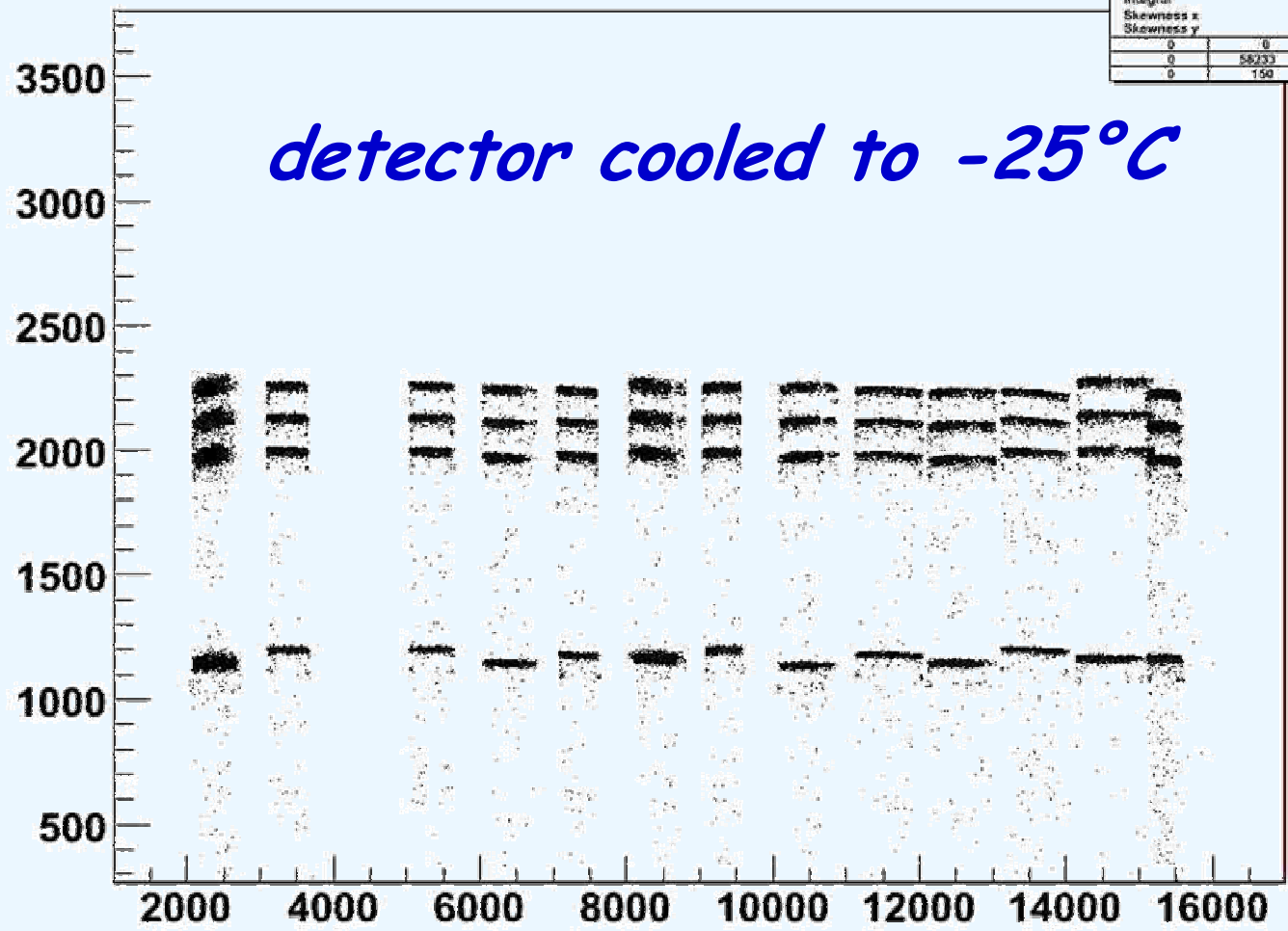




Cooling helps

XYLT vs. EKEV 12:16:17 2007-03-16

XYLT vs EKEV		
Entries		86383
Mean x		9404
Mean y		1858
RMS x		4397
RMS y		429.8
Integral		3.823e+04
Skewness x		nan
Skewness y		2.553e+05
0	0	0
0	58233	8
0	100	0



Summary TASCA runs T001-T005

T001	24.-29.04.06	$^{30}\text{Si}+^{181}\text{Ta}$ $\rightarrow^{205,206}\text{Fr}, ^{206}\text{Rn}$	COMPACT	<ul style="list-style-type: none"> • comparison with SHIP data 	HTM
T002	16./17.05.06	$^{54}\text{Si}+\text{natGd}$ $\rightarrow^{208-211}\text{Ra}$	COMPACT	<ul style="list-style-type: none"> • magnet field optimisation • pressure variation 	SIM
T003	30.10.- 02.11.06	$^{40}\text{Ar}+\dots$		<ul style="list-style-type: none"> • various target and RTC tests • no FPD (background problems) 	
T004	24./25.01.07	$^{48}\text{Ca}+^{144}\text{Sm}$ $\rightarrow^{188}\text{Pb}, \dots$	"SHIP"-like COMPACT	<ul style="list-style-type: none"> • PA's from JYFL installed • serious attack to FPD health 	HTM
T005	20.-22.02.07	$^{40}\text{Ar}+\text{natGd}/^{208}\text{Pb}\rightarrow^1$ $^{88}\text{Pb}, ^{245}\text{Fm}$	"SHIP"-like COMPACT	<ul style="list-style-type: none"> • detector cooling 	HTM/ SIM
T006	22.05- 01.06.07	$^{22}\text{Ne}+^{197}\text{Au}/^{181}\text{Ta}/$ $^{238}\text{U}\rightarrow^{215}\text{Ac}/^{199}\text{Bi}/$ ^{256}No	"SHIP"-like COMPACT	<ul style="list-style-type: none"> • target thickness • pressure dependence (He_2) 	HTM/ SIM
T007	18./24.07.07	$^{40}\text{Ar}+^{144}\text{Sm}/^{152}\text{Gd}/$ $^{208}\text{Pb}\rightarrow^{188}\text{Hg}/^{192}\text{Pb}/$ ^{248}Fm	"SHIP"-like COMPACT	<ul style="list-style-type: none"> • target thickness • $^{245,246}\text{Fm}$ ER \rightarrow K. Jadamba 	HTM/ SIM
T008	30.10.- 02.11.06	$^{48}\text{Ca}+^{144}\text{Sm}/^{206,208}\text{Pb}$ $\rightarrow^{192}\text{Pb}/^{254,256}\text{No}$	"SHIP"-like	<ul style="list-style-type: none"> • various ionoptical properties • $^{252,254}\text{No}$ ER \rightarrow K. Jadamba 	HTM/ SIM

Conclusions for the (near-) Future Strategy

- February 9th 2007

- **electronics development:**
 - parallel solutions
 1. maintain the "SHIP"-like analog electronics
 2. MBS + analog electronics from FLNR Dubna (this set-up will be useful for the chemistry experiments of the Munich group any)
 3. development of digital electronics (GSI electronics lab - J. Hoffmann /Darebury - I. Lazarus)
- **choice of a focal plane detector for TASCA:**
 - 60×60 DSSD detector with 48×48 strips for test from Russia (first tests)
 - new DSSD set-up optimized for the TASCA focal plane
(see contribution of A. Yakushev)
 - maintain the "SHIP"-type 16-strip as PC (position check) detector
- **ToF/transmission detectors:**
 - to be used for relevant reactions
 - have to be developed