

D1. TASCA Focal Plane Detector Setup (Physics)

- first mounting and detector tests

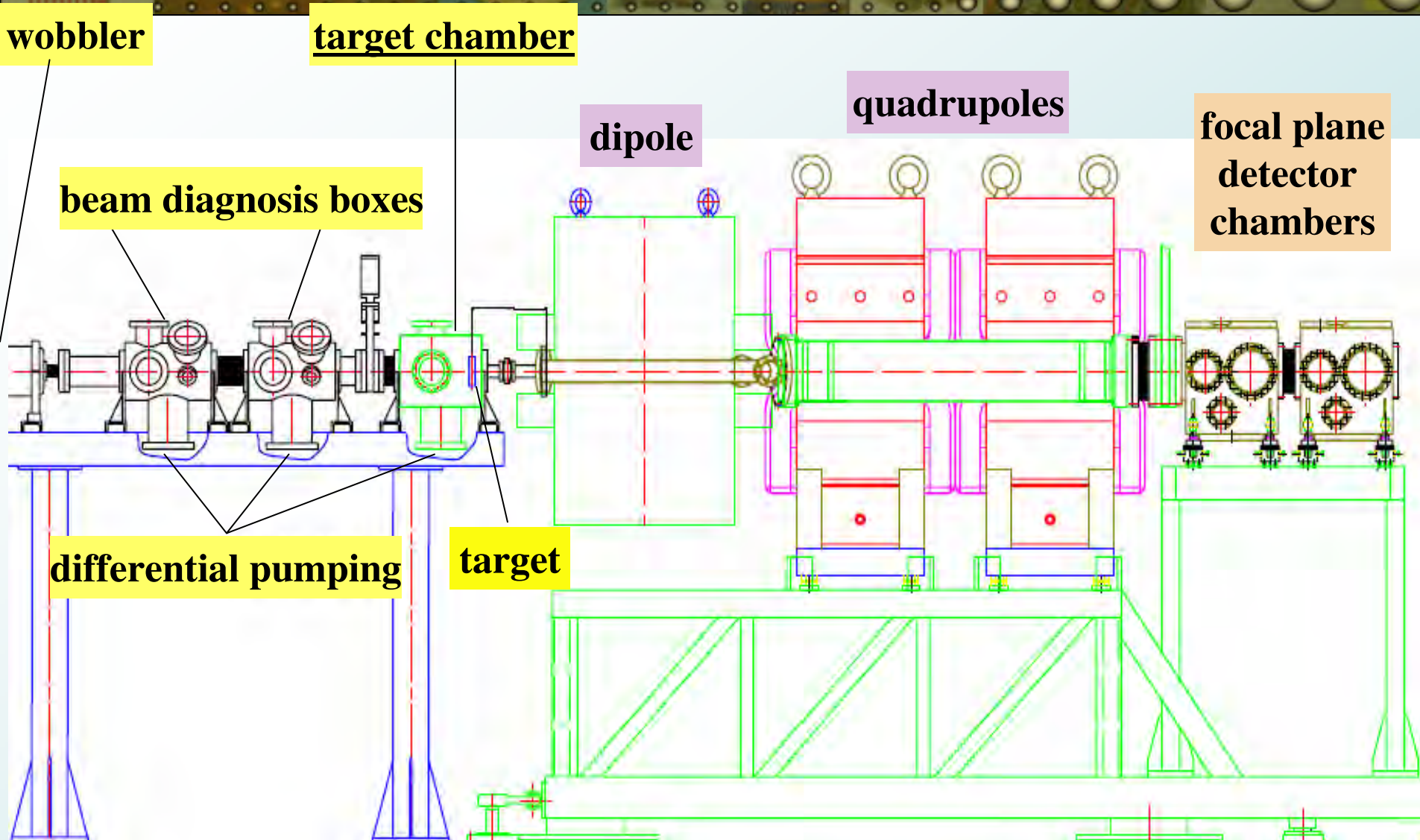
- setup description
- installation of the PC (position check) detector & electronics
- next steps
 - completion of the detector set-up
- further detector development
 - dedicated detector chamber for Ge-array
 - double sided Si strip detector
 - electronics: pulse shape analysis
 - ...
- nuclear structure and SHE synthesis with TASCA
- VISHNu - news

TASCA Working groups

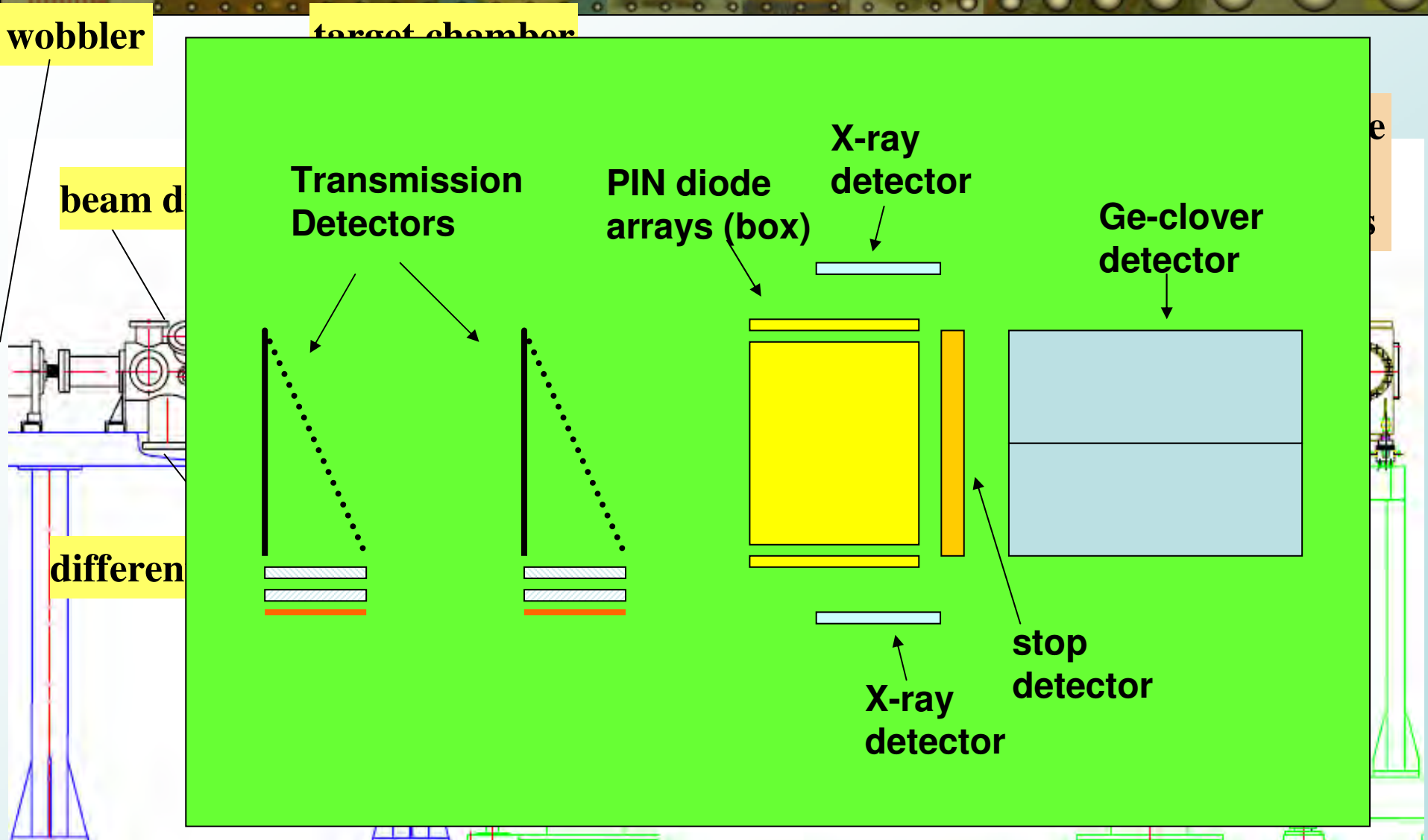
TASCA Task Groups

	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)

TASCA – Detector Set-up Scheme



TASCA – Detector Set-up Scheme

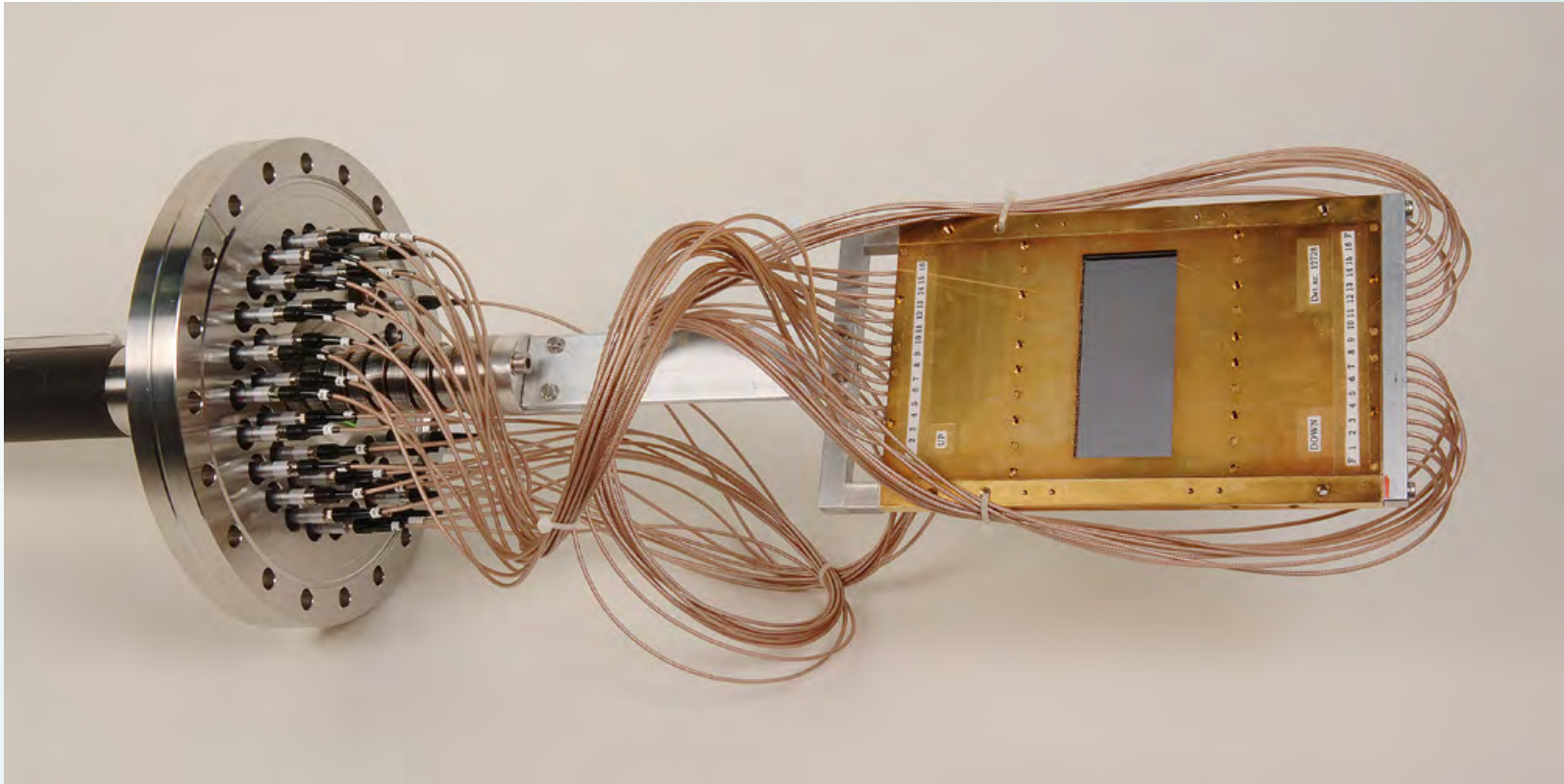


The SHIP STOP Detector

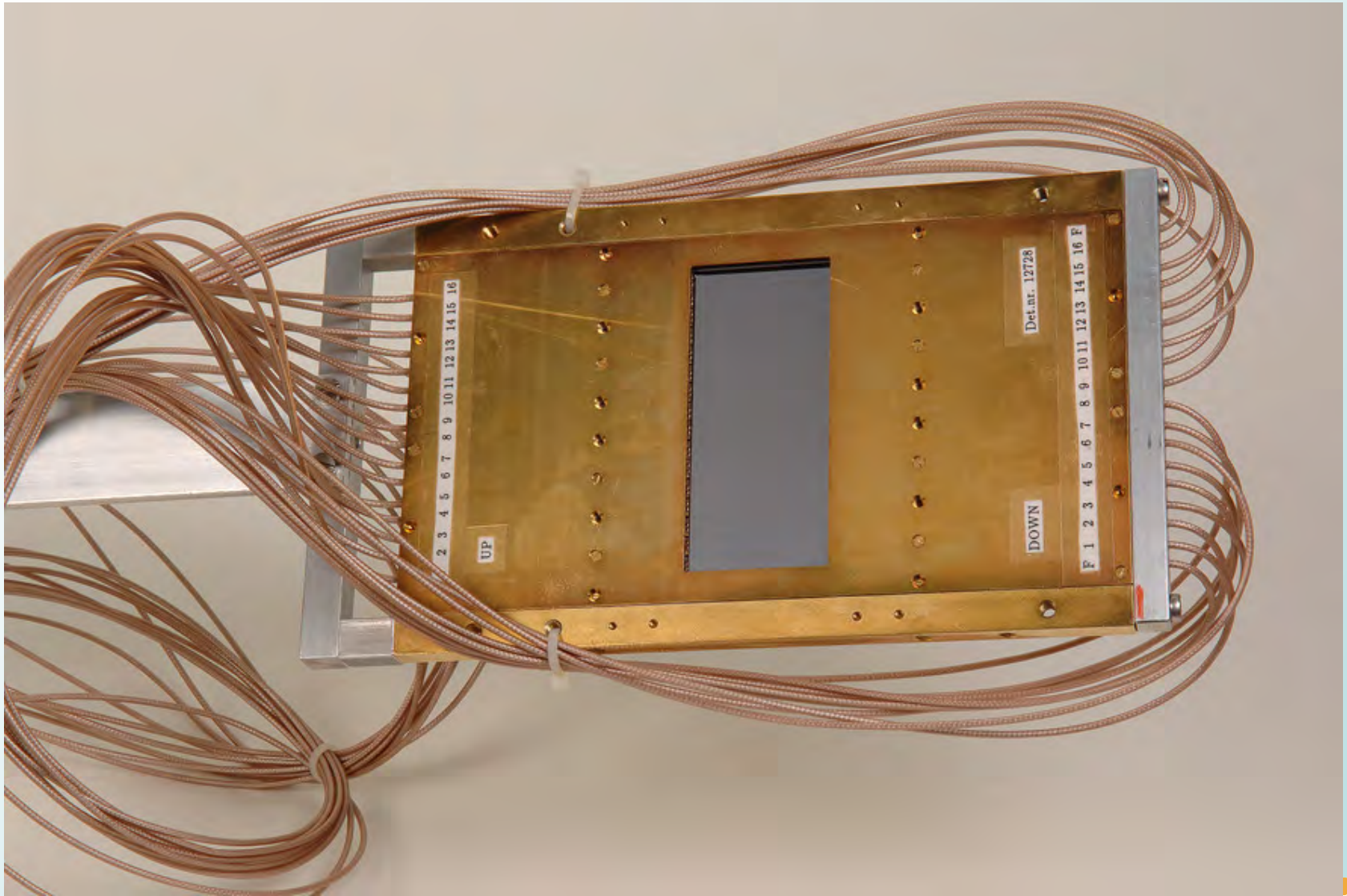
- $(80 \times 35) \text{ mm}^2$ active area
- 16 strips - $(5 \times 35) \text{ mm}^2$ active area
- $300 \text{ }\mu\text{m}$ thickness
- resistive layer
 - position resolution = $200 \text{ }\mu\text{m}$ \Rightarrow total spatial resolution $\approx 1 \text{ mm}^2$
- energy resolution $\Delta E = 18\text{-}20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



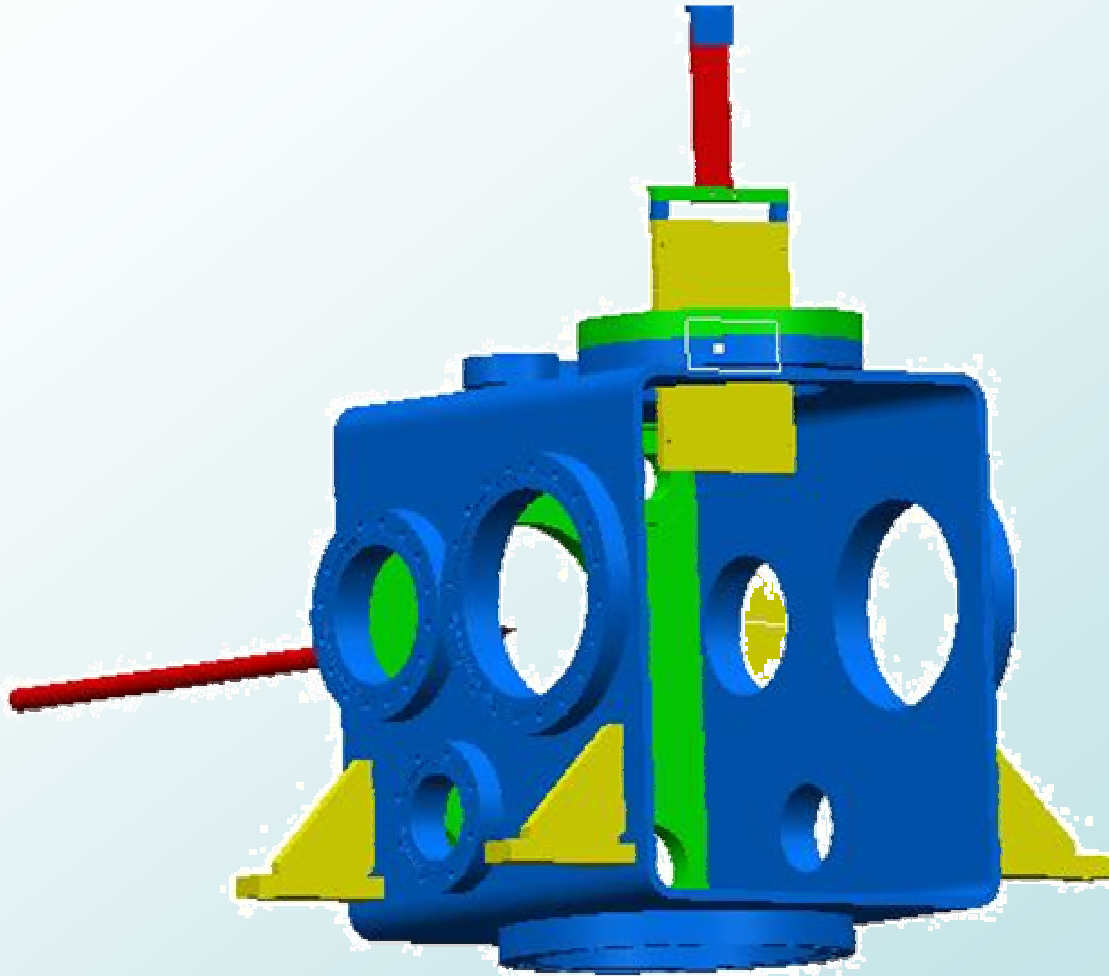
The TASCA Position Check (PC) Detector



The TASCA Position Check (PC) Detector

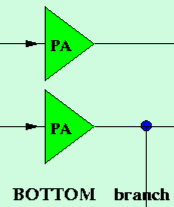


The *TASCA* Position Check (PC) Detector



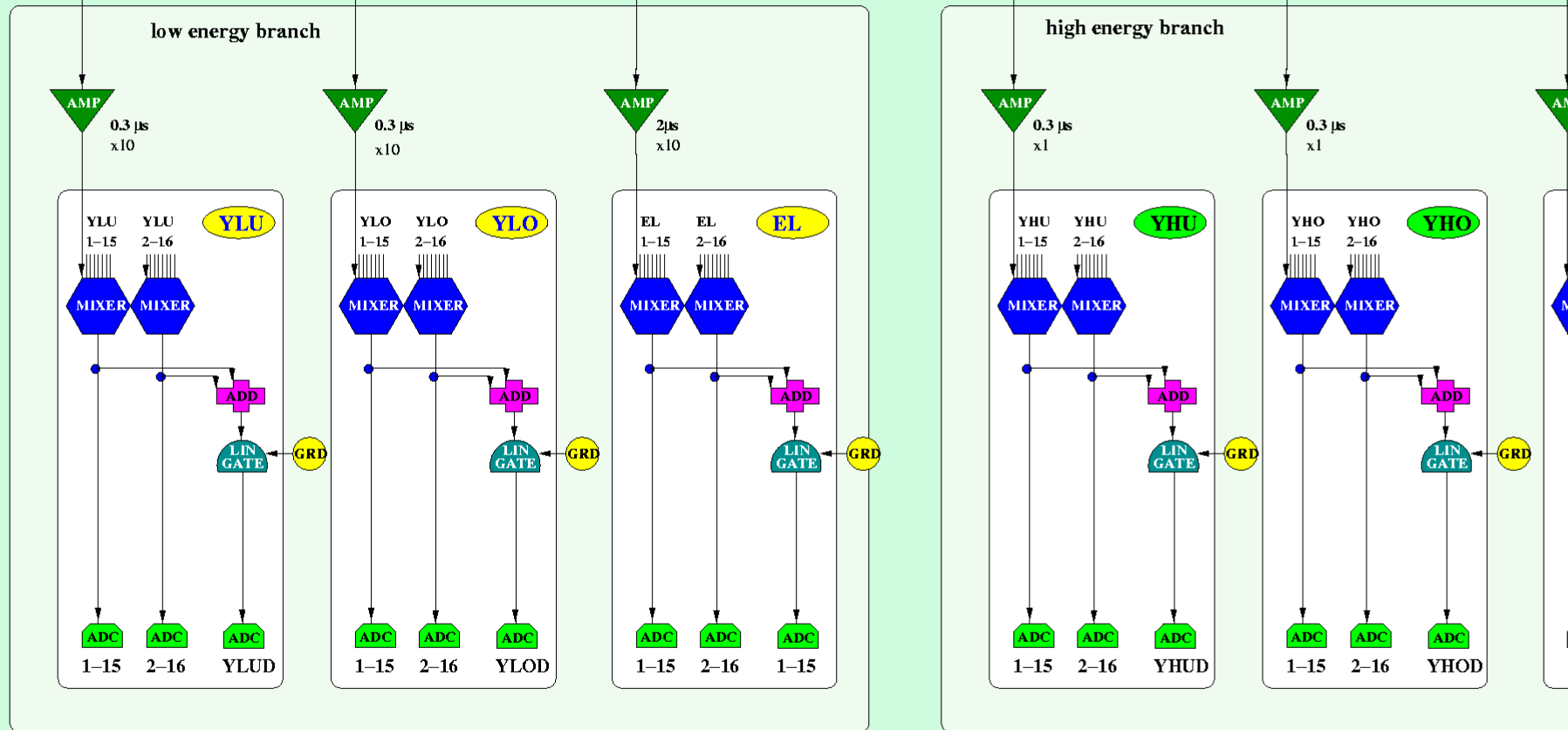
Stop - Detector

TOP branch



low energy branch

high energy branch





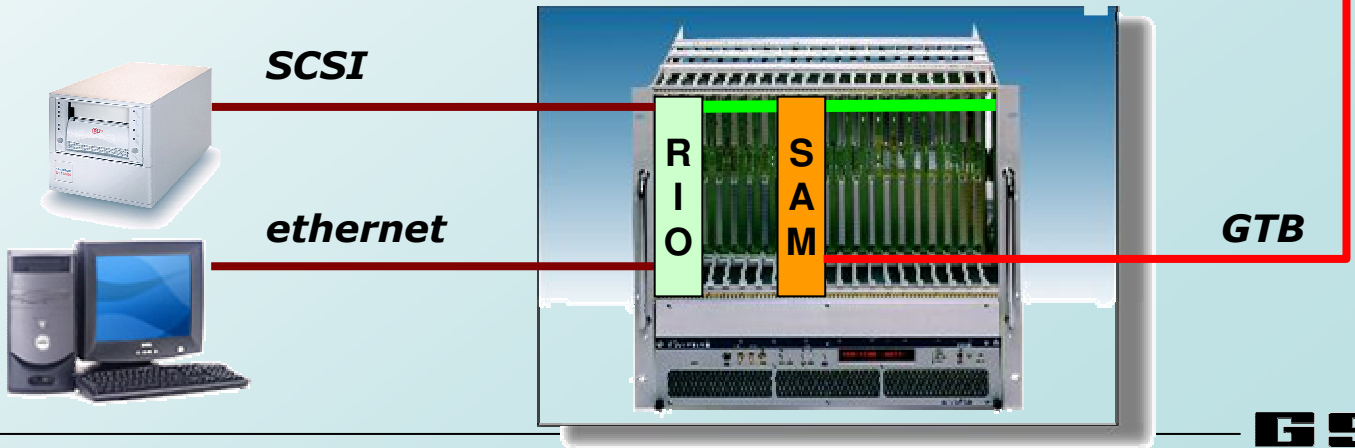
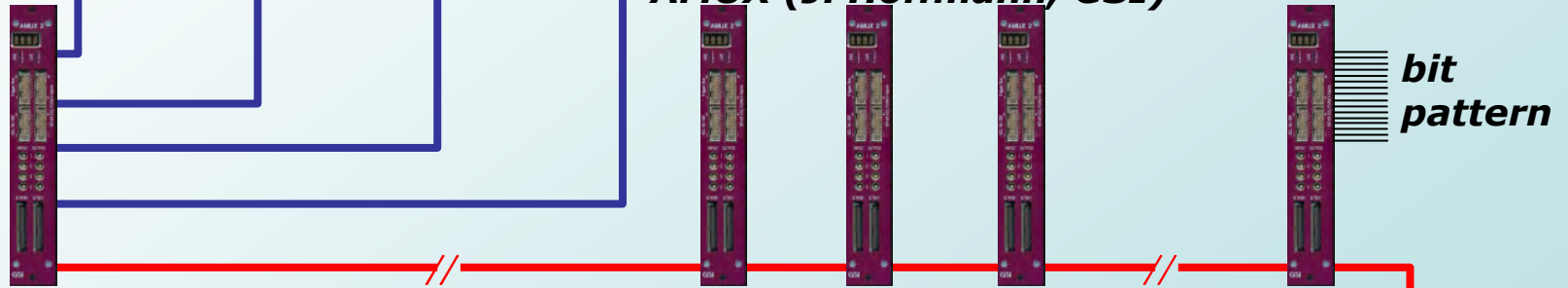
New DAQ SHIP



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

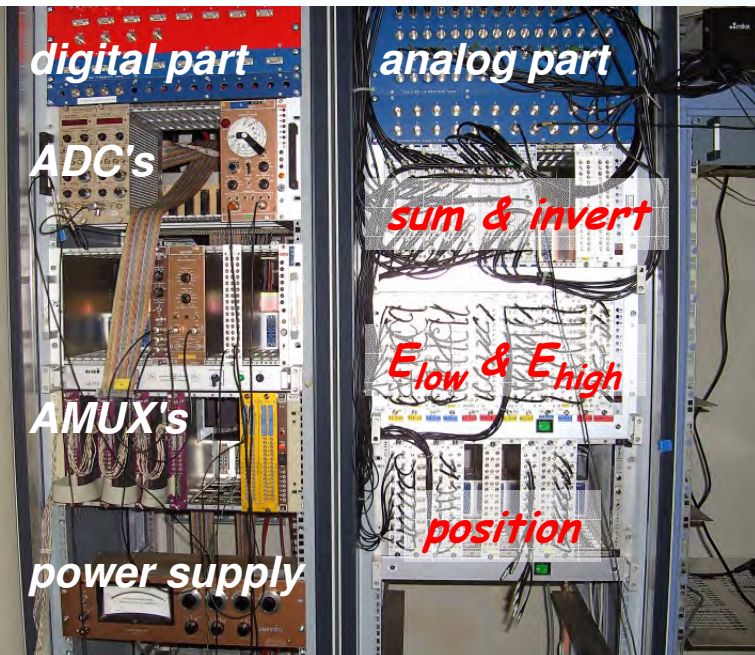
- >> 50 parameters
- max. rate \approx 50 kHz
- random trigger
- real time clock
- dead time 10 μ s

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



AMUX/SHIP like Electronics

- state of roadworks



analog part (modules from JYFL/RITU) complete for:

- 16 strips
- 2 E ranges: E_{low} and E_{high}
- y -position (E_{low} and E_{high})

digital part:

- 12 ADC channels (presently only 6 ADC's)

all components tested and the set-up is almost completed



TASCA Focal Plane Detector Setup (Physics)

- State of the Project

- ✓ *test of X-ray detectors by summer student (Khuyagbaatar, Jadambaa)* *summer 2005*
- ✓ *after/during completion of TASCA* *winter 2005/*
 - *mounting of stop detector for first tests of TASCA* *spring 2006*
 - (✓) *ionoptics*
 - (✓) *transmission*
 - ✓ *first reaction products in the focal plane of TASCA (April 27th 2006)*
 - *electronics set-up*
 - ✓ *analog electronics (from Jyväskylä - Cath Scholes)* *July 2006*
 - (✓) *set up of the DAQ-system* *Sept/Oct 2006*
- *future* *2006-2007*
 - *completion of the set-up*
 - *stop detector arrangement*
 - *PIN diodes*
 - *Ge detectors*
 - *X-ray detectors* → *Thomas Stöhlker GSI/AP*
 - *transmission detectors (PPAC or channelplate/SED (window!))*
 - *first experiments*
 - ... (

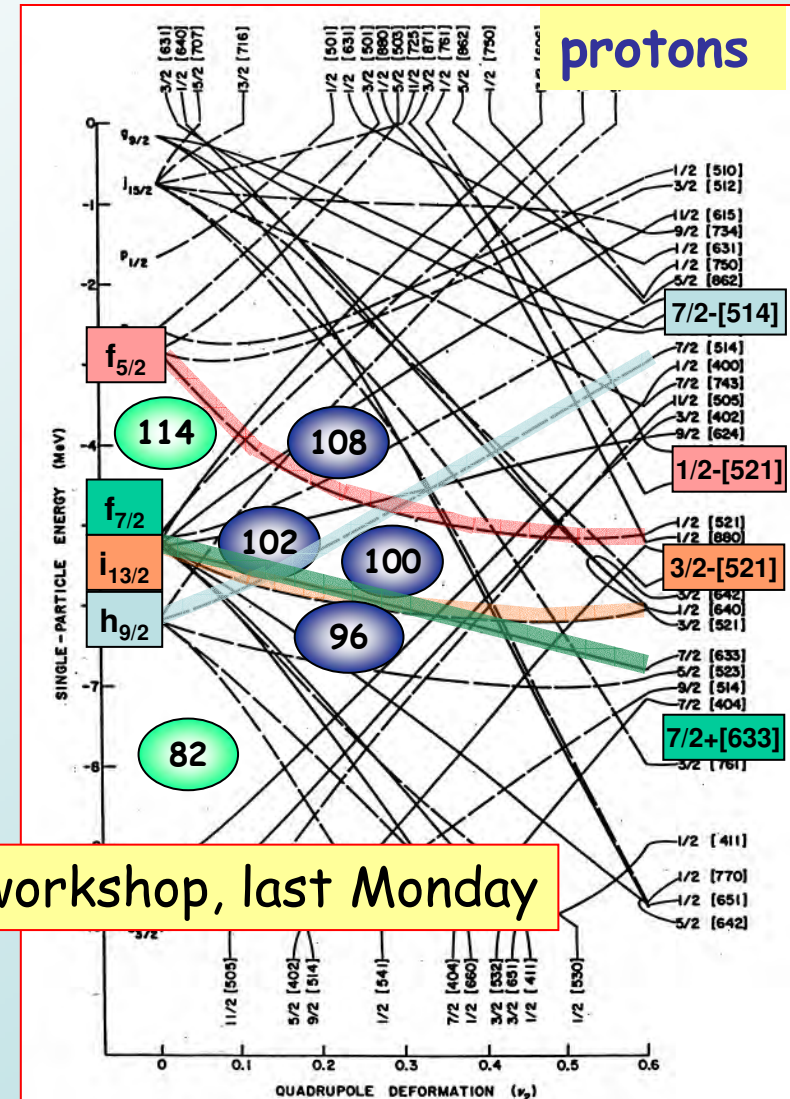
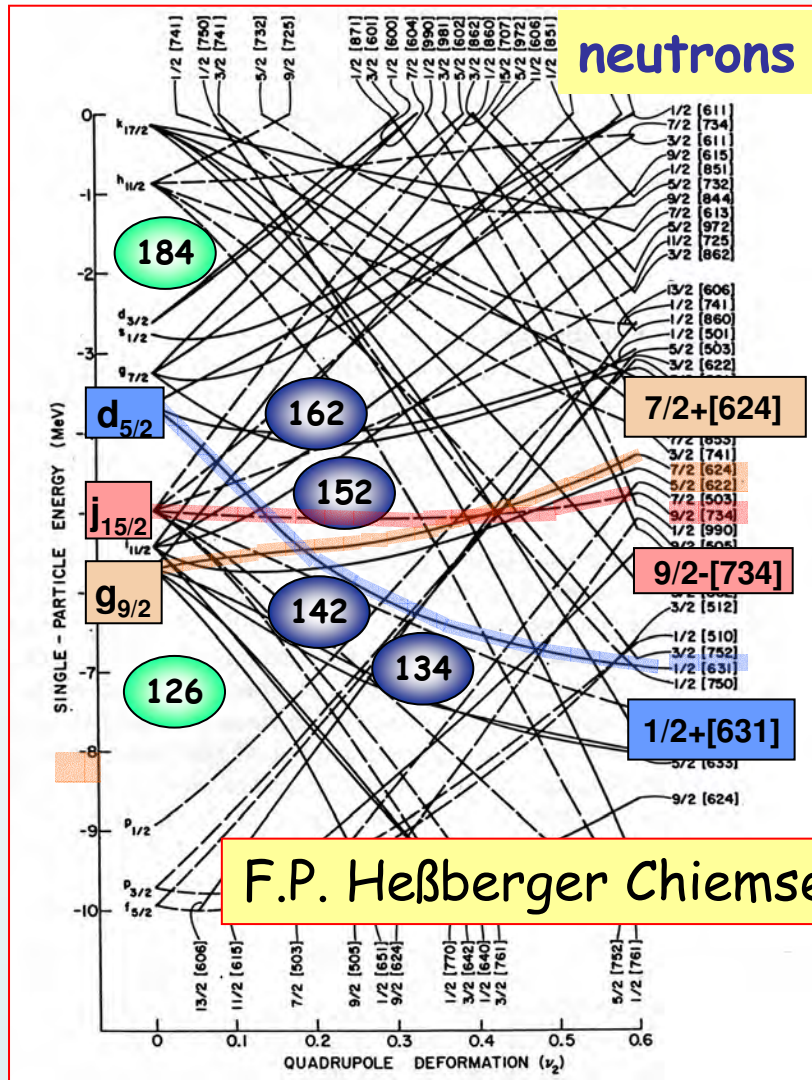
TASCA Focal Plane Detector Setup (Physics)

- State of the Project

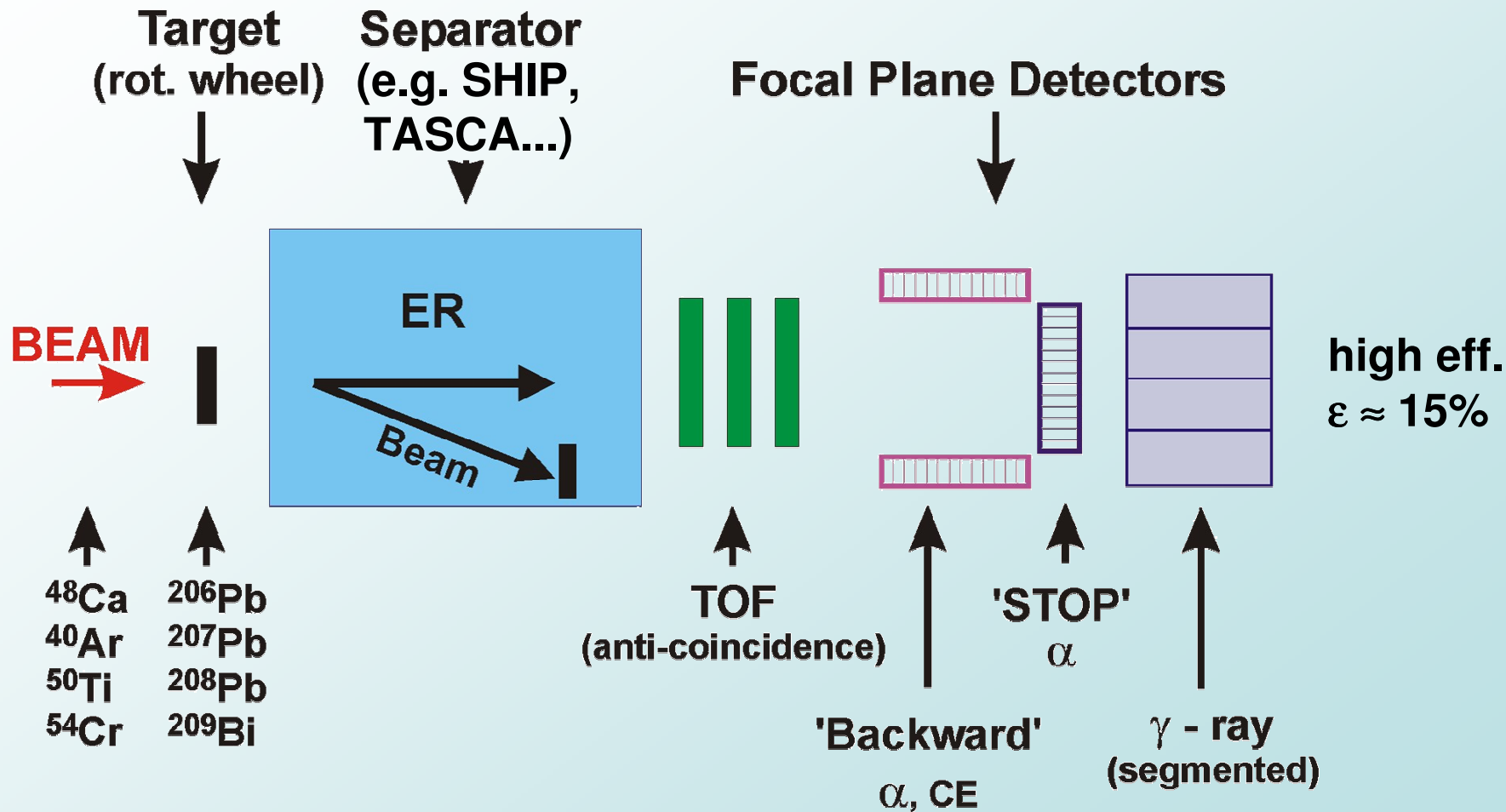
- ✓ test of X-ray detectors by summer student (Khuyagbaatar, Jadamba) summer 2005
- ✓ after/during completion of TASCA winter 2005/
spring 2006
 - mounting of stop detector for first tests of TASCA
 - (✓) ionoptics
 - (✓) transmission
 - ✓ first reaction products in the focal plane of TASCA (April 27th 2006)
 - electronics set-up
 - ✓ analog electronics (from Jyväskylä - Cath Scholes) July 2006
 - (✓) set up of DAQ (A. Türler) Sept/Oct 2006
- future 2006-2007
 - completion of the set-up → €50.000,- (≈10% of request)
 - stop detector arrangement
 - PIN diodes
 - Ge detectors
 - X-ray detectors
 - transmission detectors (PPAC or channelplate/SED (window!))
 - first experiments
 - ... (
 - 1 Ph.D. position → Thomas Stöhlker GSI/AP

Nuclear Structure of Heavy Nuclei

- Single Particle Levels and Deformation



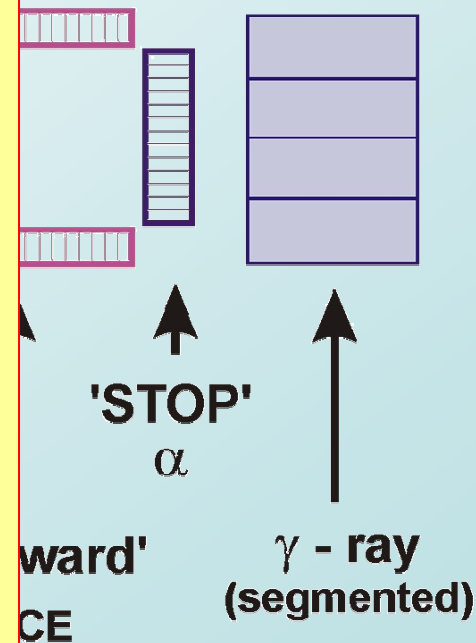
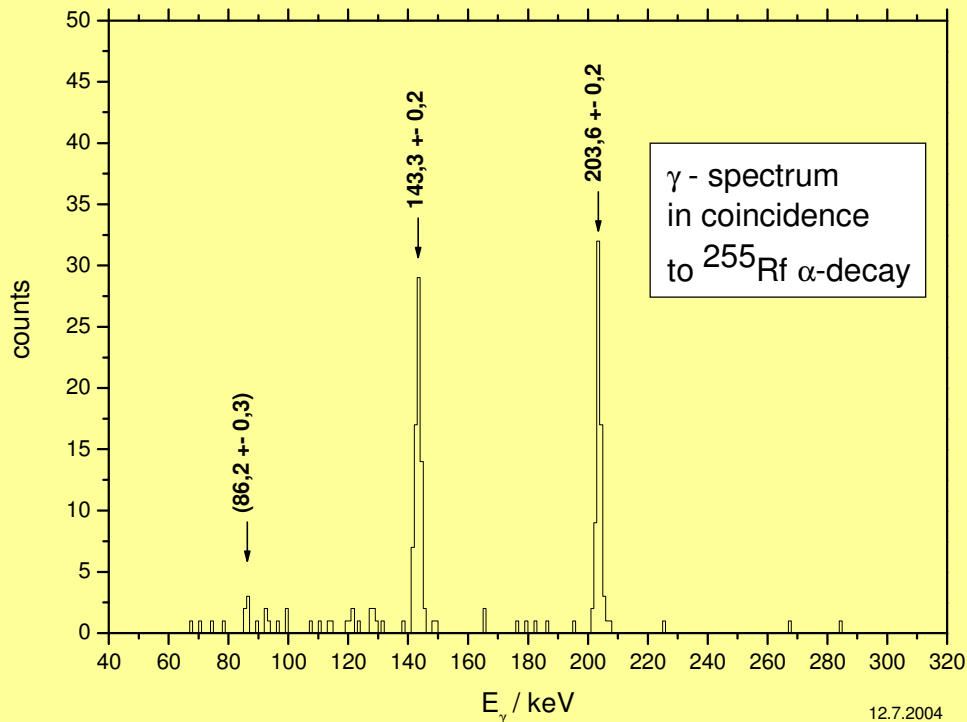
ER- α - γ Spectroscopy after Separation



ER- α - γ Spectroscopy after Separation

Target (rot. wheel) | Separator (e.g. SHIP, TASCA...) | Focal

- highly efficient
- clean
- structure information for SHE
- K-isomers identified in ^{252}No



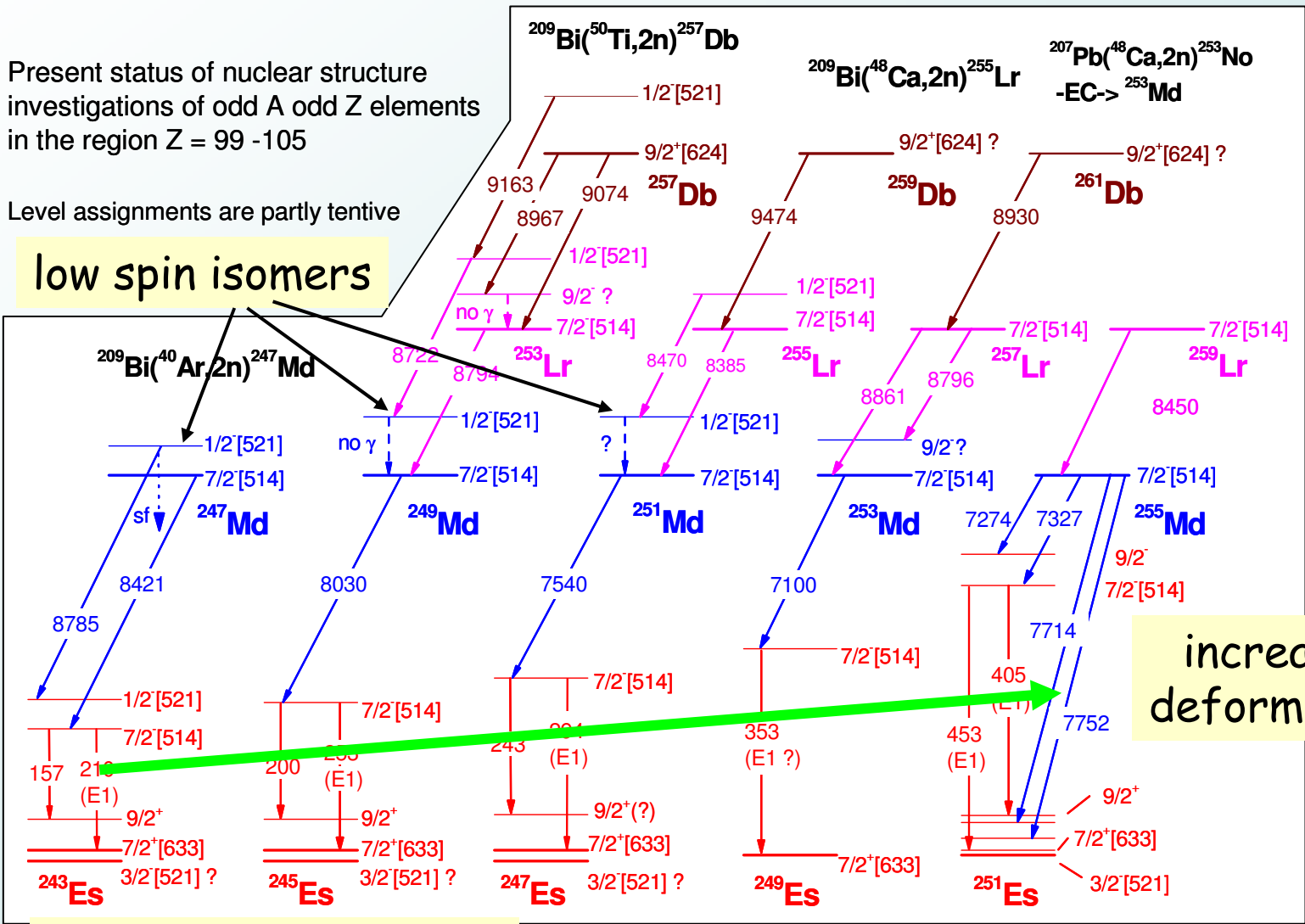
high eff.
 $\epsilon \approx 15\%$

Nuclear Structure of the Heaviest Nuclei: Odd-A odd-Z Isotopes for Z = 99 - 105

Present status of nuclear structure investigations of odd A odd Z elements in the region Z = 99 - 105

Level assignments are partly tentative

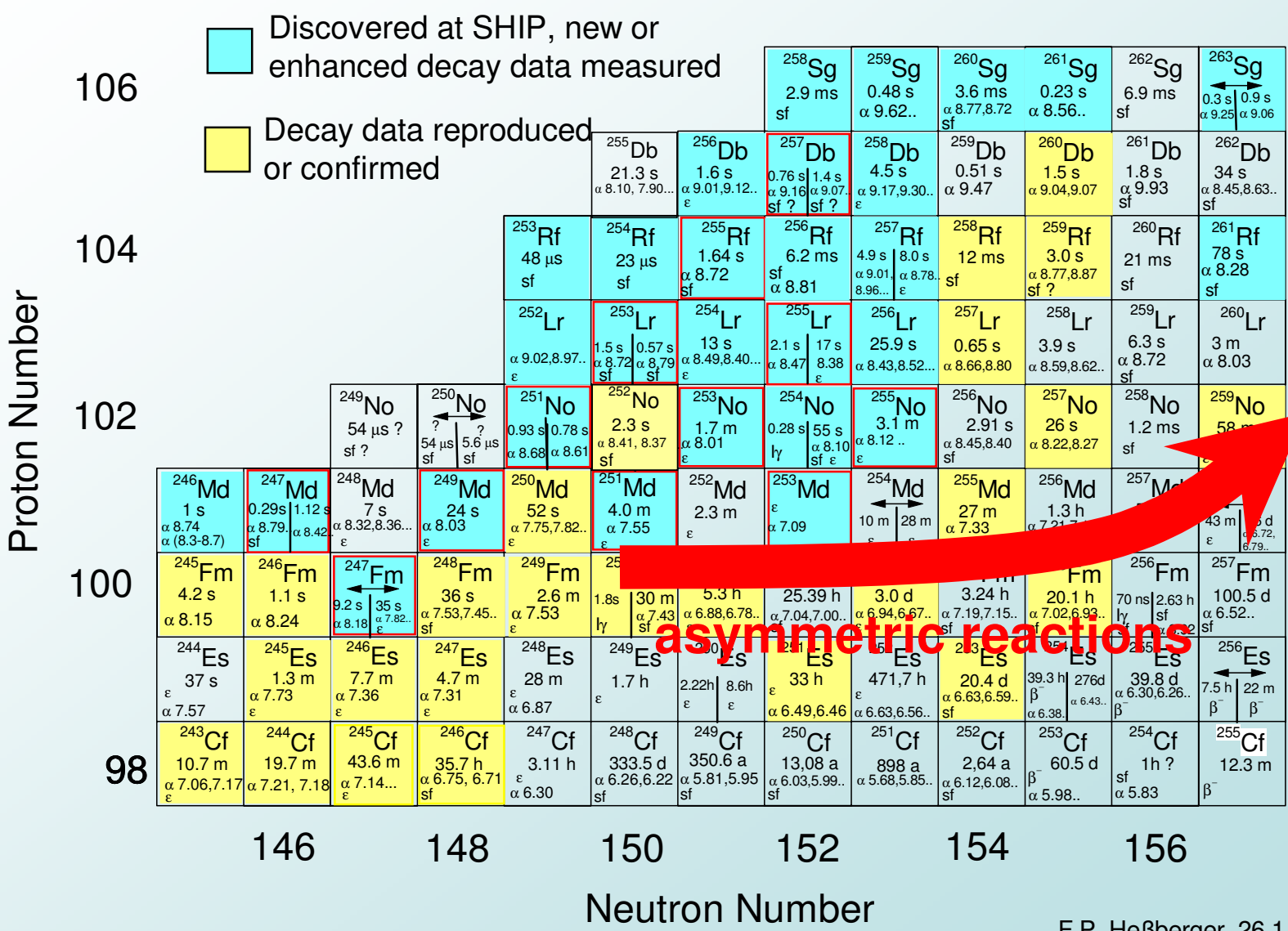
low spin isomers



increasing deformation

g.s. not yet identified

Nuclear Structure of the Heaviest Nuclei: Isotopes explored at SHIP

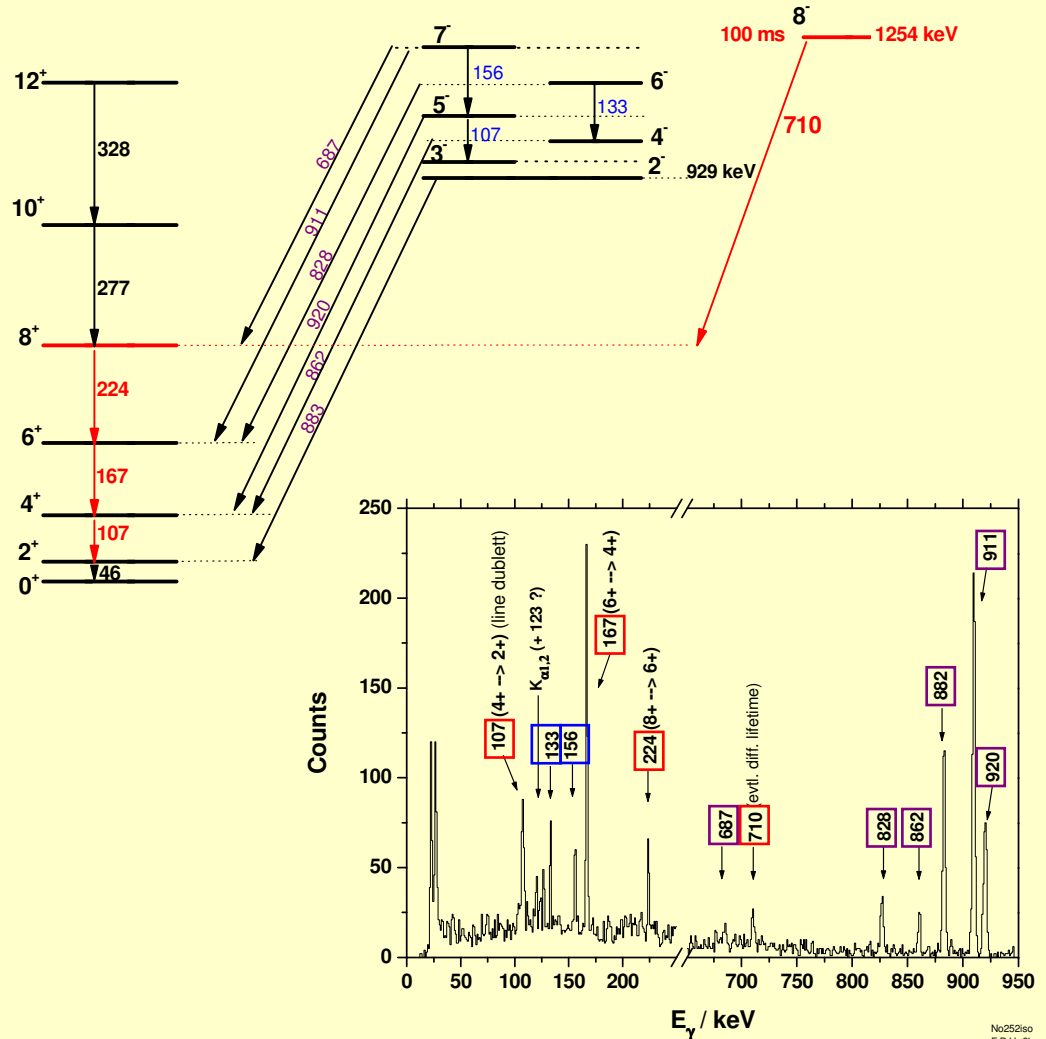
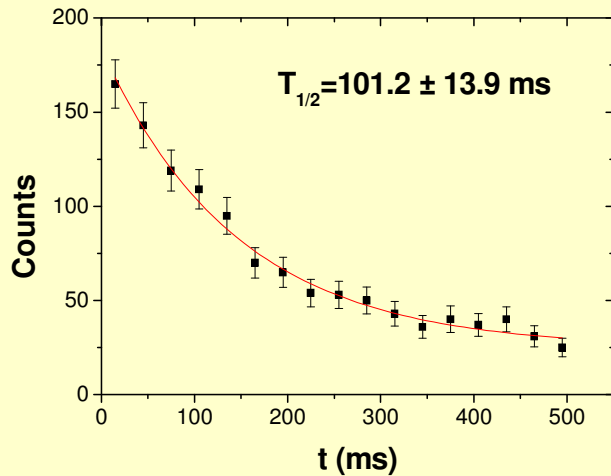


asymmetric reactions

Nuclear Structure of the Heaviest Nuclei: Isomeric states – ^{252}No (Ph.D. Thesis B. Sulignano)



"offspin" from
 $^{48}\text{Ca} + ^{238}\text{U}$



No252iso
F.P. Heßberger 8.6.2006



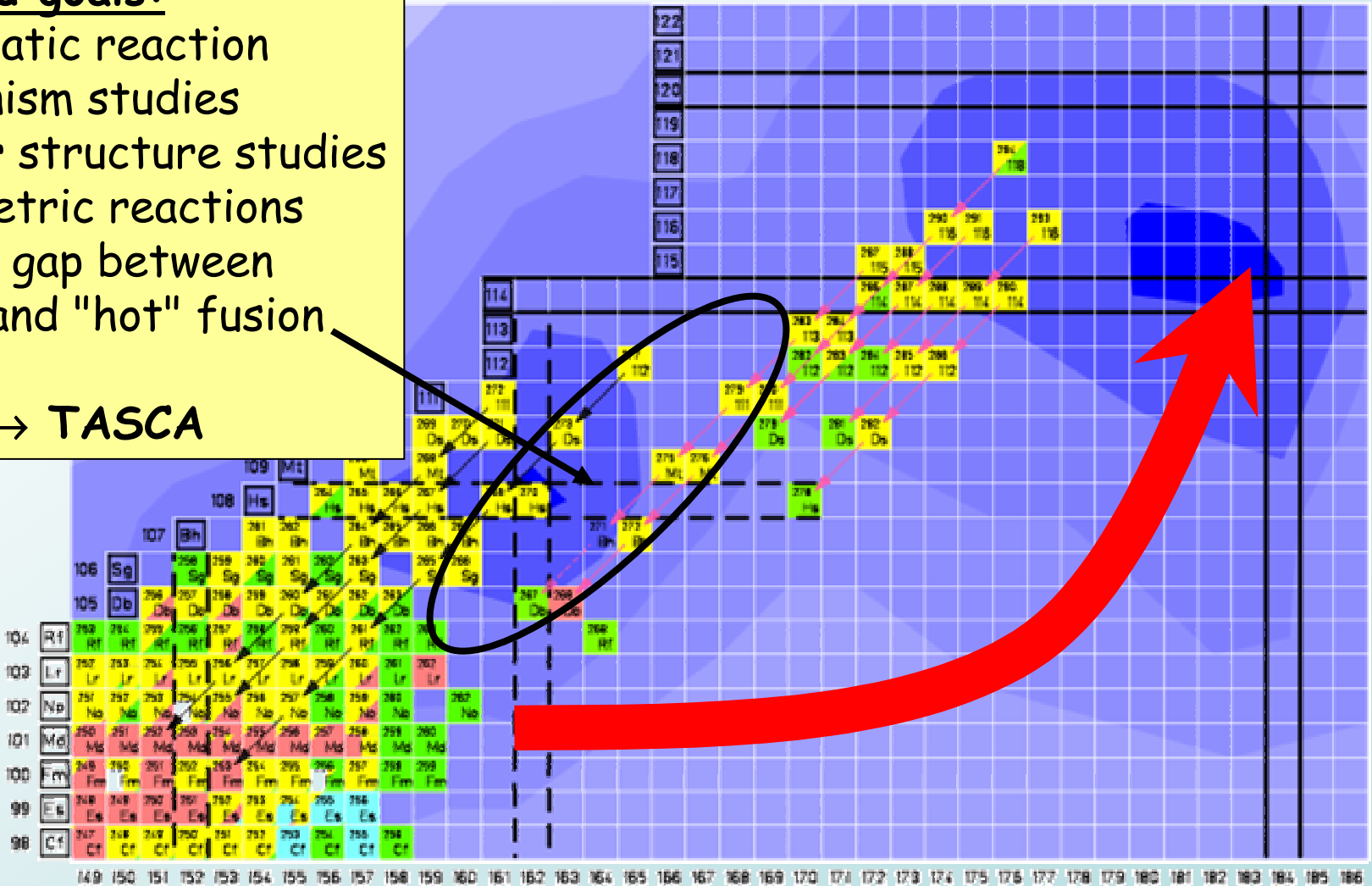
Towards SHE

- Where are we now – where do we aim at?

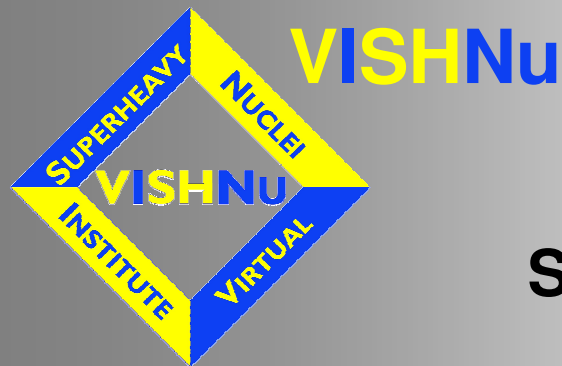
tools and goals:

- systematic reaction mechanism studies
- nuclear structure studies
- asymmetric reactions
- fill the gap between "cold" and "hot" fusion

→ TASCA



Call for "Virtual Institutes" by the HGF - SHE Proposal Selected by the GSI-WD



Virtual Institute SuperHeavy Nuclei



Dr. D. Ackermann
Abteilung KP2-SHIP
GSI Darmstadt
Prof. Dr. J.V. Kratz
Institut für Kernchemie
Johannes Gutenberg-Universität
Mainz

Prof. Dr. N.N.
Institut für Kernchemie
Johannes Gutenberg-Universität
Mainz

Prof. Dr. A. Türler
Institut für Radiochemie
Technische Universität
München

Dr. M. Schädel
Abteilung KP2-Kernchemie
GSI Darmstadt

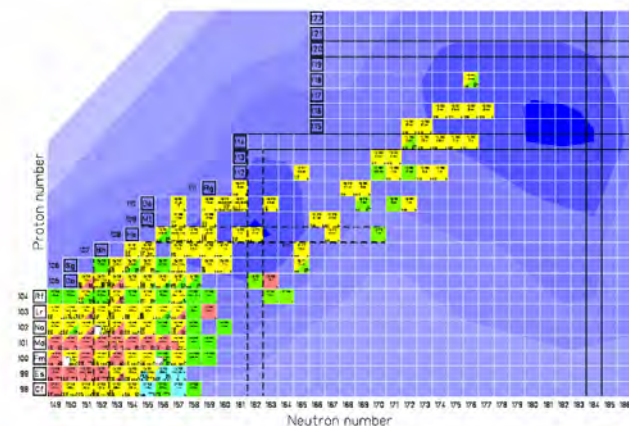
Prof. Dr. H.W. Gäggeler
Dr. R. Eichler
Paul Scherrer Institut -PSI
Villigen
Schweiz

Prof. Dr. R.-D. Herzberg
University of Liverpool
U.K.

Prof. Dr. M. Leino
University of Jyväskylä
Finnland

Prof. J.P. Omtvedt
University of Oslo
Norway

Partner Institutions and Spokespersons



Helmholtz Virtual Institute VISHNu

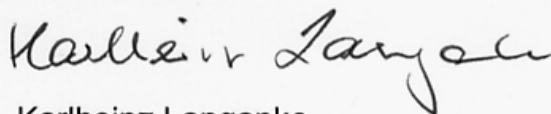
- postponed to next year

Dear Dieter,

without any doubt, the search for superheavies is one of the most successful and prestigious science programs at GSI. Therefore GSI had originally supported your application for a Virtual Institute and has submitted the proposal to the Helmholtz Gemeinschaft, together with 3 other proposals. However, the Helmholtz Gemeinschaft had then instructed the GSI management to reduce the number of applications to maximally two. Following the suggestion of a review committee, the GSI Scientific Directorate decided to propose applications in nuclear astrophysics and biophysics for this year's competition for Helmholtz Virtual Institutes.

Of course, GSI is proud of its superheavy research program and continues to fully support it. As currently the management structure of the experimental nuclear physics program is changing and a new department head for the superheavy research program is expected to be in office by 2007, I would like to encourage you to prepare a renewed proposal for a Helmholtz Virtual Institute for the chemistry and physics of superheavies for next year. This application should then also stress the novel and central aspects of the Virtual Institute program.

With best regards



Karlheinz Langanke