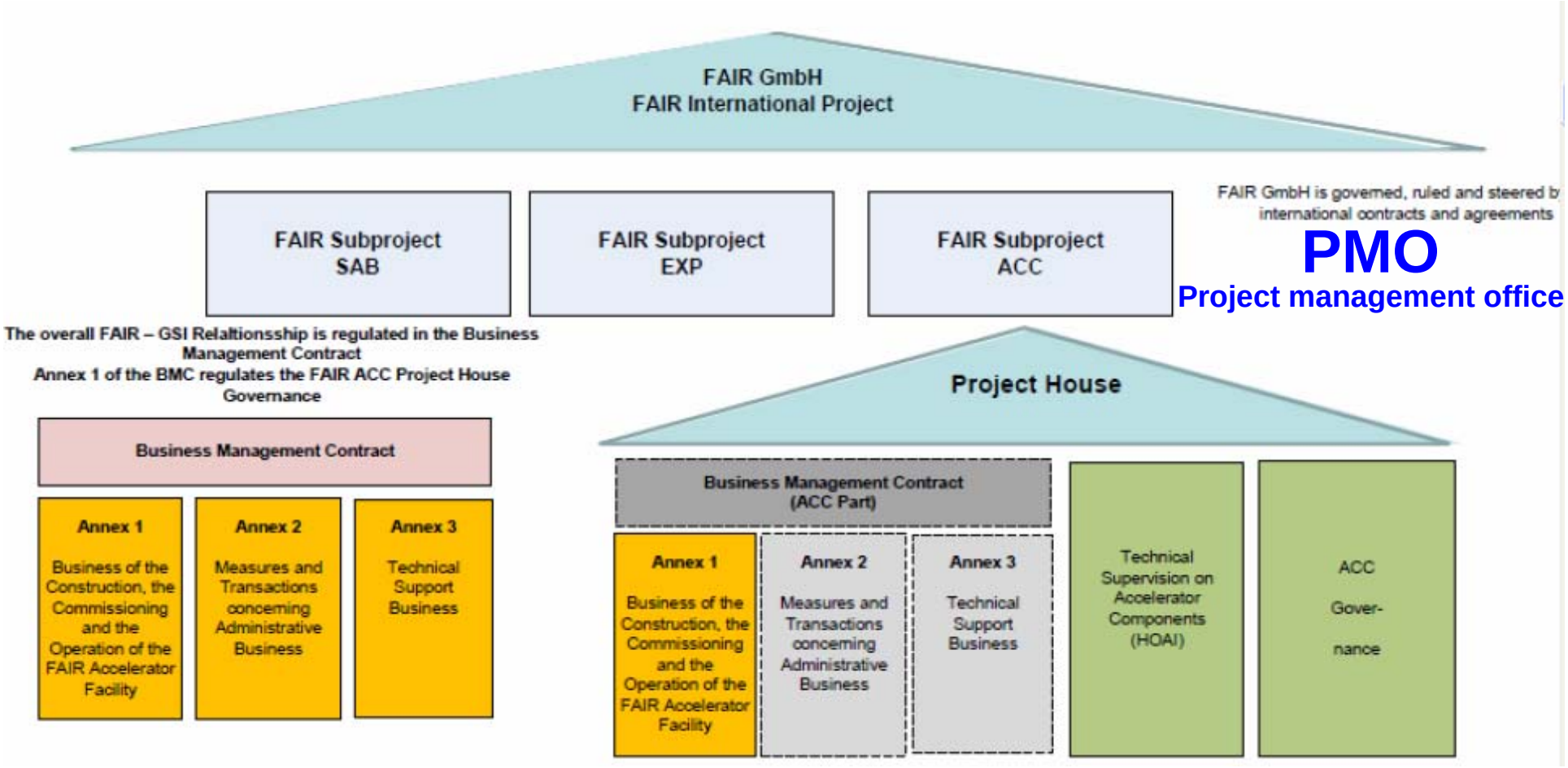
# ILIMA Status Report

Helmut Weick, GSI

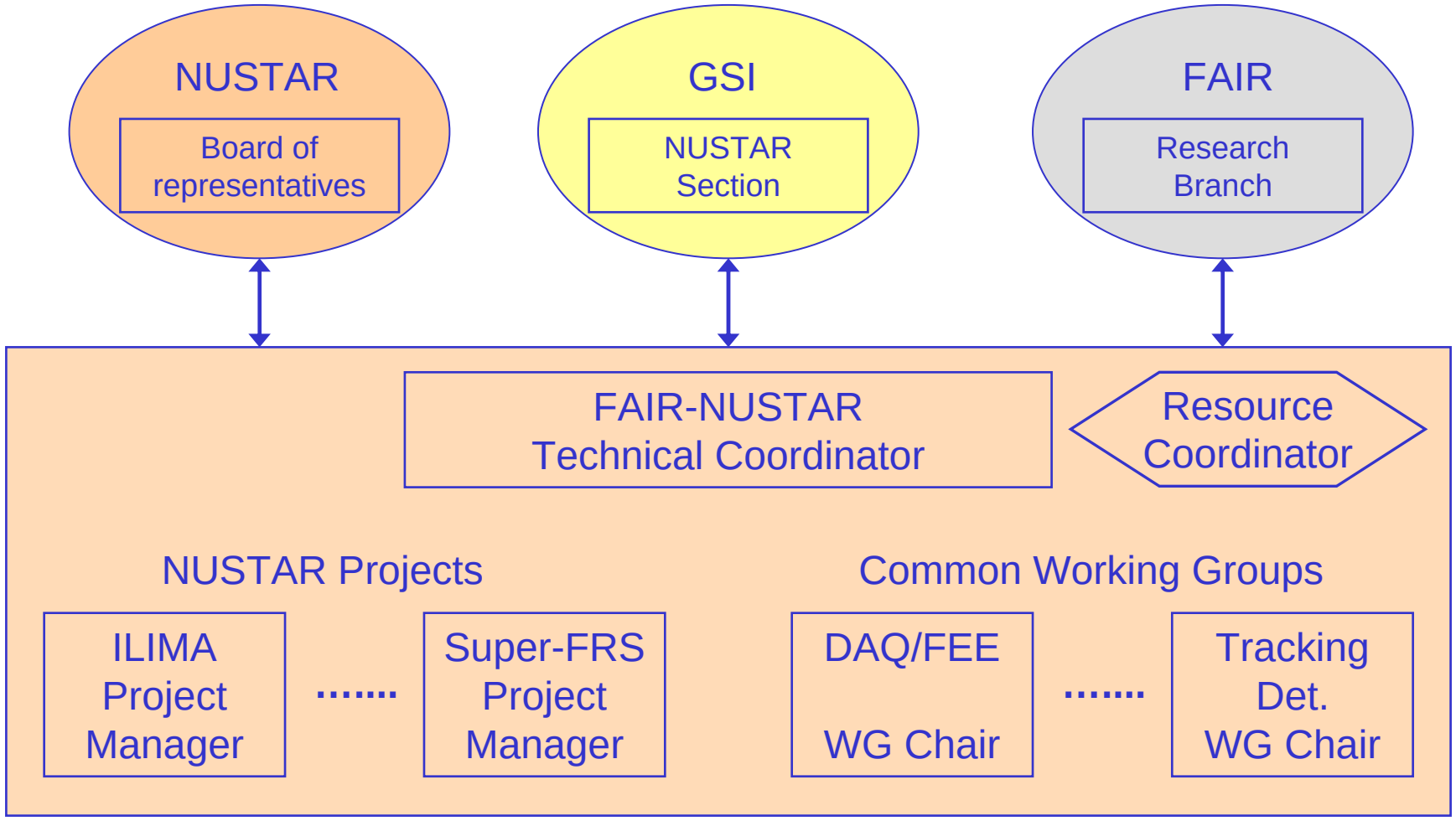
Darmstadt, 1st March 2011

- **FAIR Organization**
- **Working Groups**
- **New CR68**
- **TDRs**

# FAIR GmbH Structure



# NUSTAR/FAIR Project Management

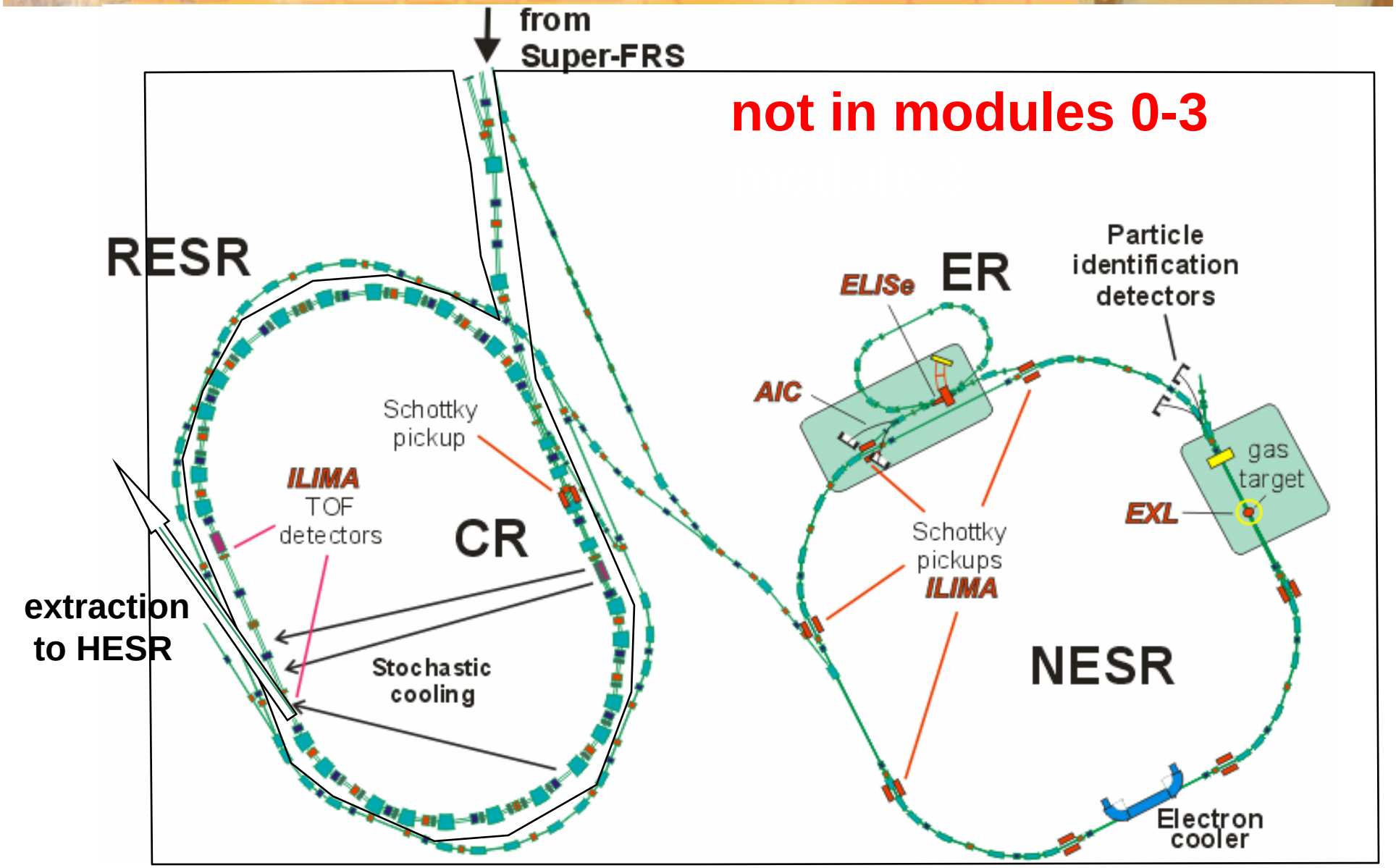


# Working Groups

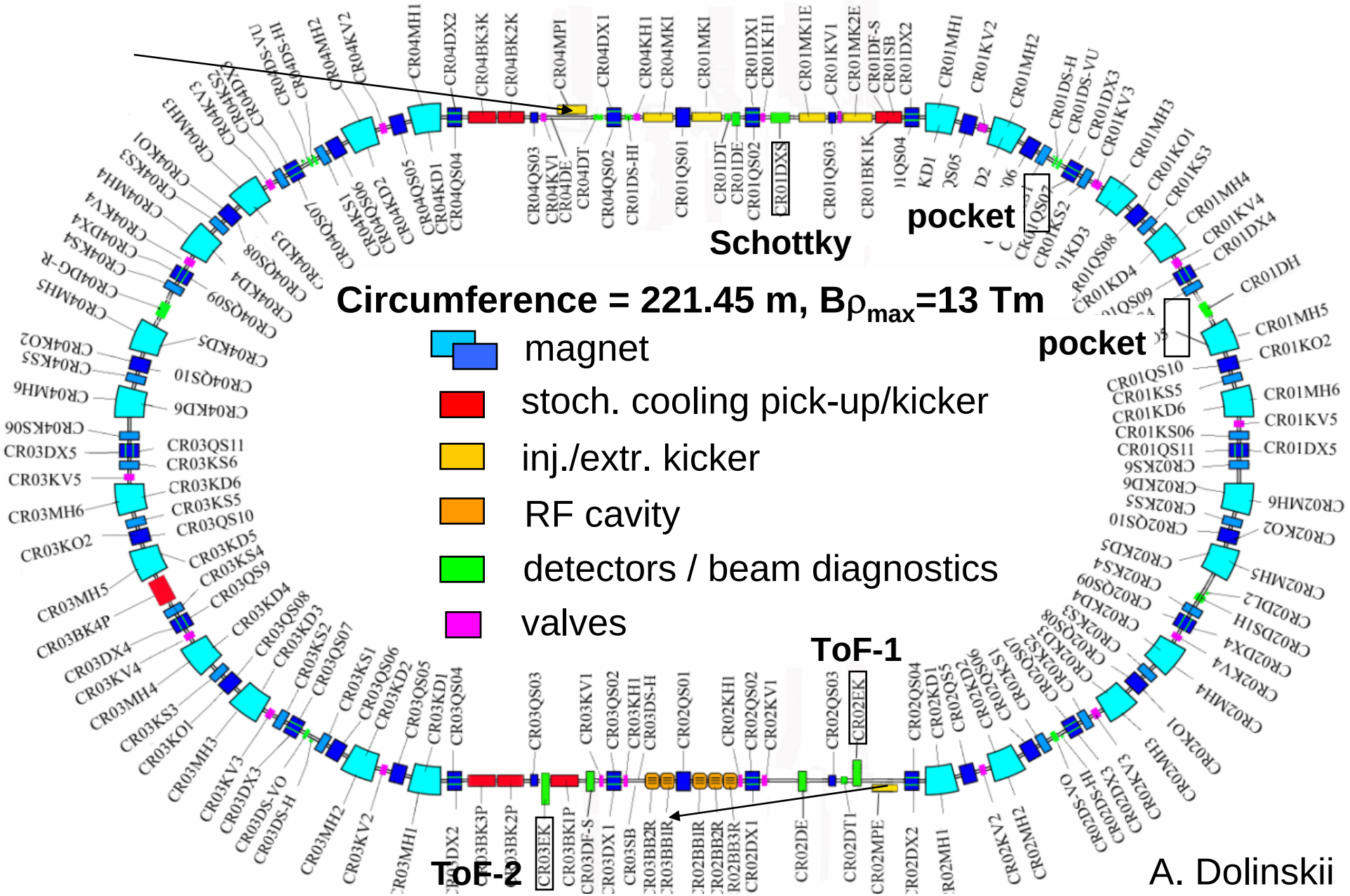
ILIMA Working Groups / Technical Board

| Sub-Project | Group Leader | | Institute |
|---|---|---|---|
| **Project Manager, Chair** | **H** | **Weick** | GSI, Darmstadt |
| Simulation and Beam Handling | H | Weick | GSI, Darmstadt |
| Evaluation Software | Yu | Litvinov | GSI, Darmstadt |
| Physics and Theory Programs | Z | Patyk | Soltan Inst + Univ. Warsaw |
| ToF Detectors | W | Plaß | GSI + Univ. Giessen |
| Schottky Detectors | C | Kozhuharov | GSI, Darmstadt |
| Other Detectors | I | Dillmann | Univ. Giessen |
| *Spokesperson* | P | Walker | Uni. Surrey |
| *Deputy-spokesperson* | Yu | Litvinov | GSI, Darmstadt |

# Rings Overview



# CR68: new layout with increased circumference




A. Dolinskii

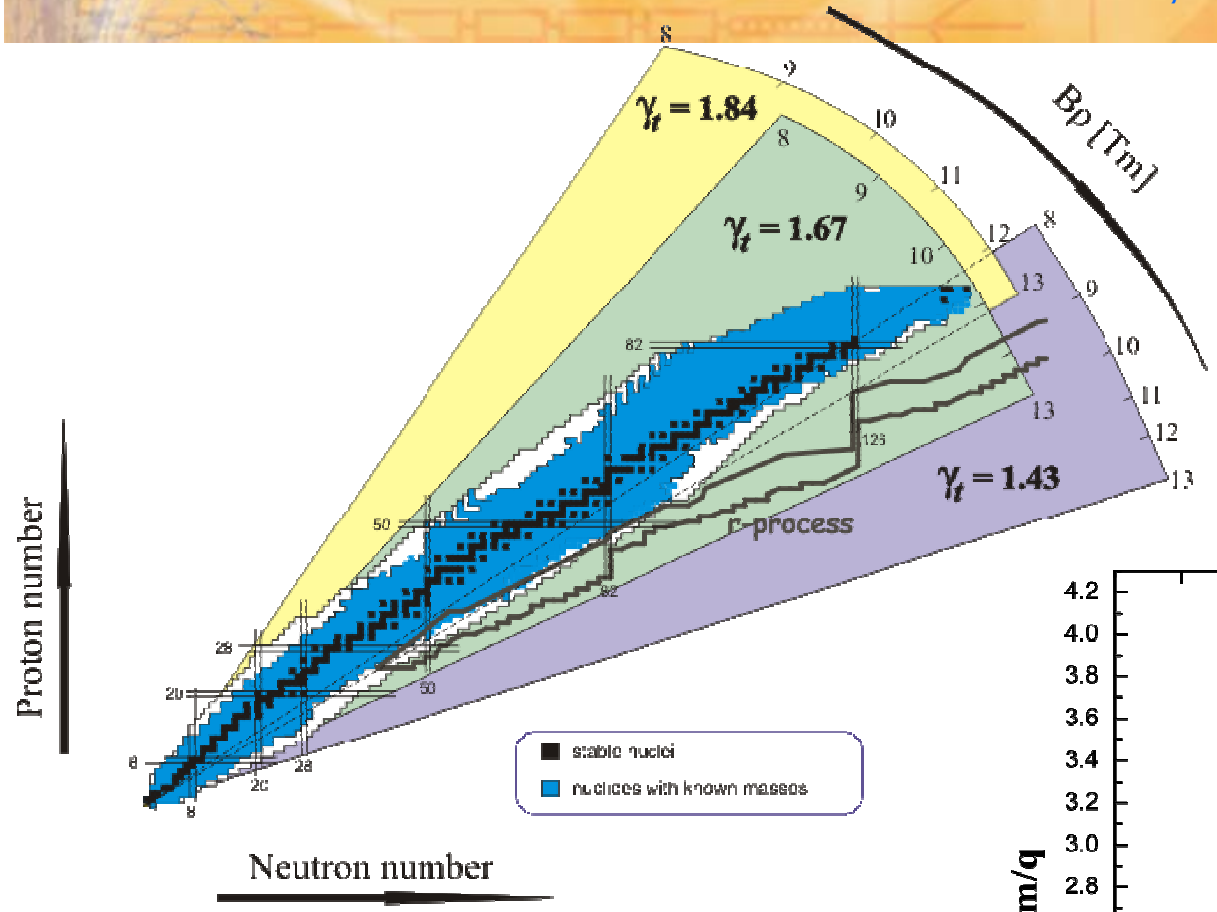
# CR68: new isochronous mode

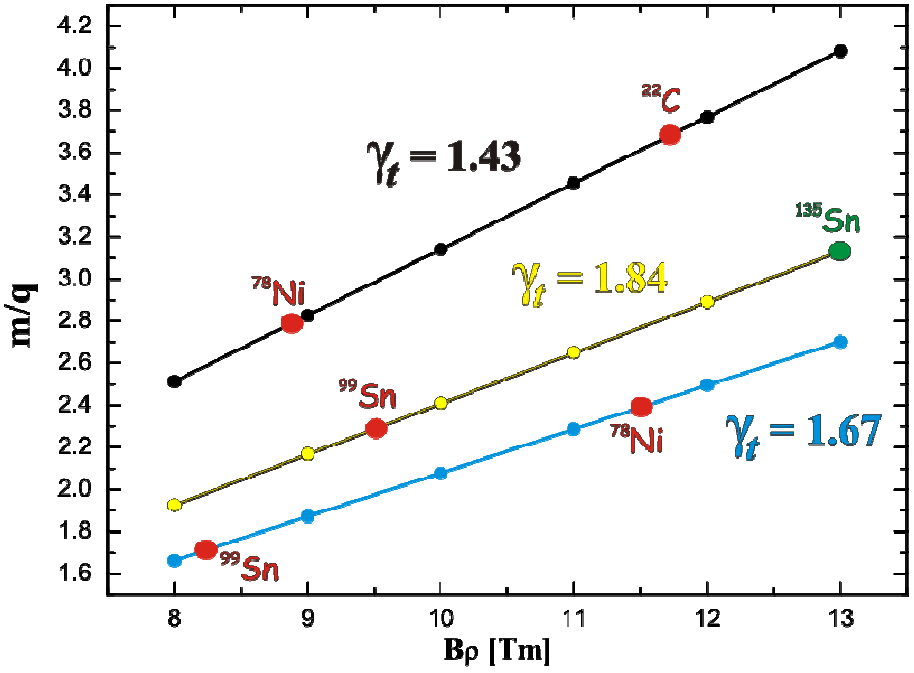
## lower and higher $\gamma_t$,

$\gamma_t = \gamma = 1.84$ ($E = 782.5$ MeV/u)

$\gamma_t = \gamma = 1.67$ ($E = 624.1$ MeV/u)

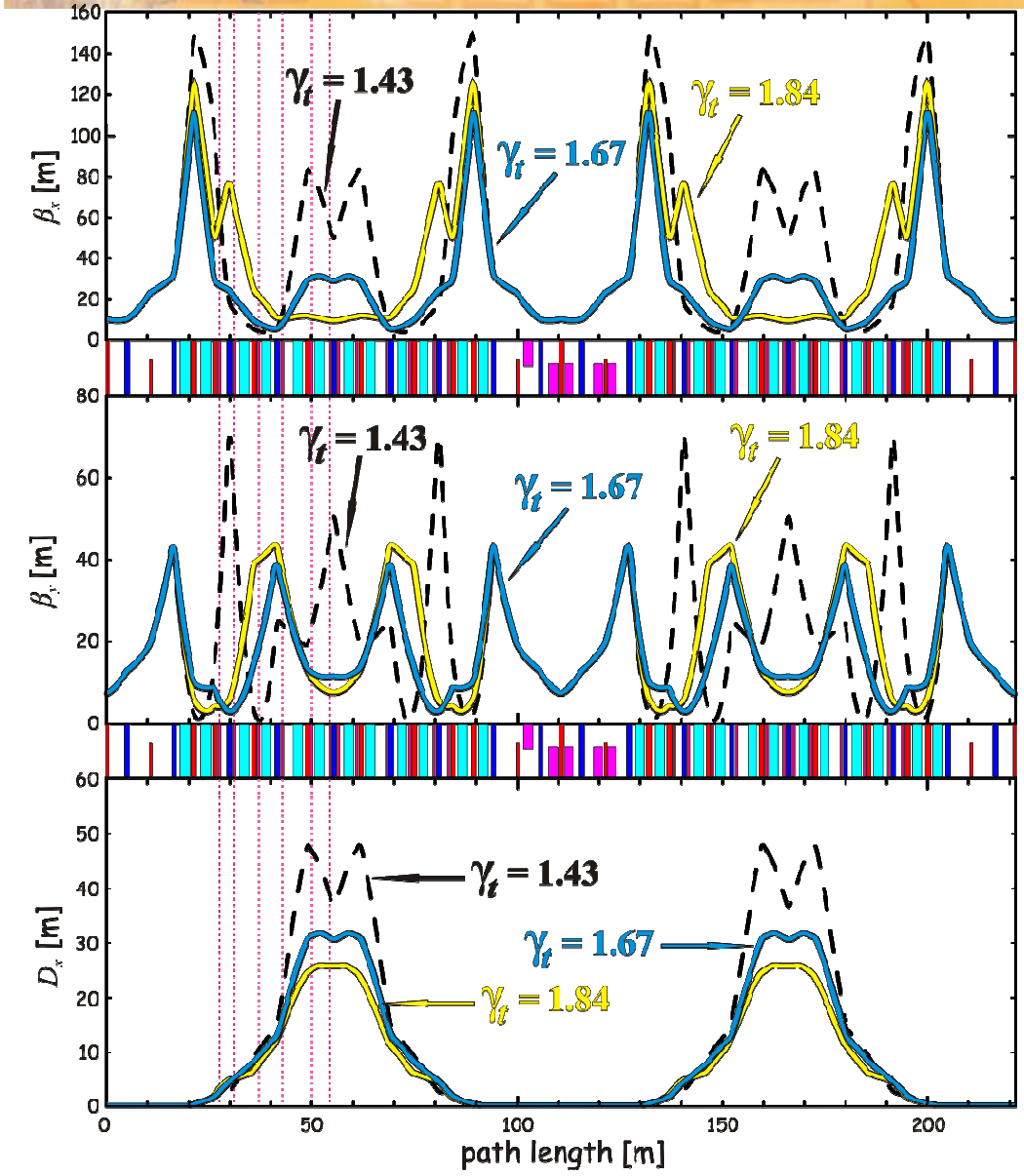
$\gamma_t = \gamma = 1.43$ ($E = 400.5$ MeV/u)




Sergey Litvinov

# CR68: different isochronous modes




| $\gamma_t$ | | 1.43 | 1.67 | 1.84 |
|---|---|---|---|---|
| $Q_x$ | | 2.28 | 2.15 | 1.93 |
| $Q_y$ | | 4.62 | 3.19 | 3.29 |
| $\Delta p/p$ | % | $\pm$ 0.2 | $\pm$ 0.4 | $\pm$ 0.6 |
| $\varepsilon_x, \varepsilon_y$ | mm mrad | 100 | 100 | 100 |
| $\lvert k^{max}_{quads.} \rvert$ | [T/m] | 4.02 | 2.58 | 2.96 |
| $\lvert k^{max}_{scx.} \rvert$ | [T/m$^2$] | 1.6 | 1.0 | 0.6 |

**works also in new injection scheme with 2 kickers**

Sergey Litvinov

# WG: Simulation, Beam Handling

**CR: Further ideas to improve isochronicity for larger emittance**

- **Achromatic condition is essential, for isochronicity with respect to the transverse momentum spread (phase space).**

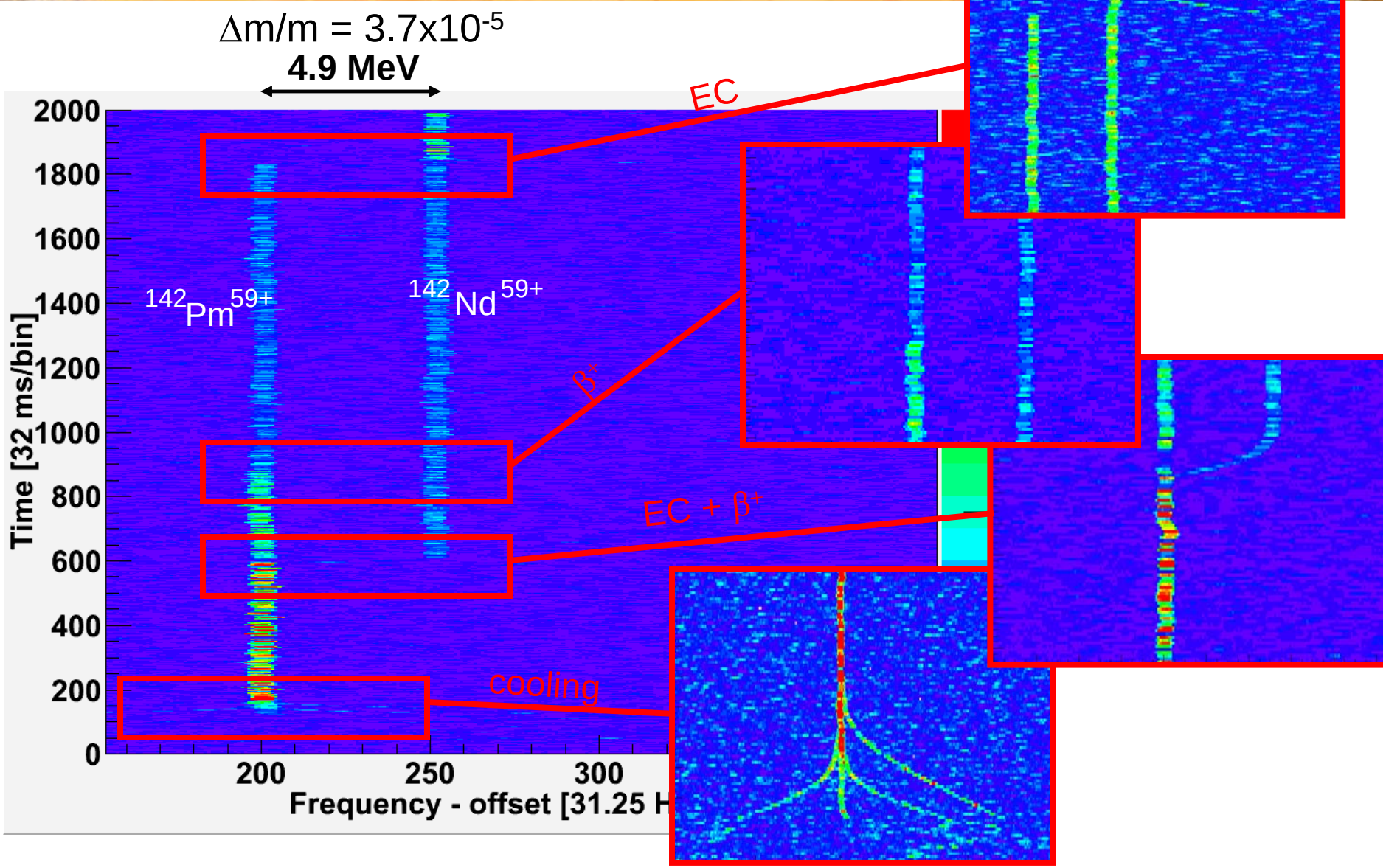
- **In ESR not even fulfilled to first order.**
  **In CR possible up to second order with hexapoles.**

- **Power supply stability (short and long term)**
  **$\Delta I/I > \Delta m/m$, but only a bit ?**

# WG: Schottky

**see talk by Fritz Nolden**

# EC decay in ESR
# cooling, 2 EC and 2 $\beta^+$ -decays



# ToF Detector

- Faster DAQ, already now we can get spills at 2 Hz frequency.
  Last beamtime unfortunately ToF detector failure,
  but new LeCroy oscilloscope was tested with fast storage
  ~300 MB/s for new 7 or 20 GHz scope

- Test analysis with second ToF detector.
  Possible in CSRe at Lanzhou ?
  Do tracking and velocity measurement in non-isochronous ESR.

- Detector improvements see talk by Ronja Knöbel

# WG: Particle Detectors

**Get more experience with particle counting in addition to Schottky for lifetime measurements. Experiment E073 on alpha-decay, when?**

**Larger interest for more particle detectors in ring.**

- **(p,$\gamma$), ($\alpha$,$\gamma$) reaction experiment**
- **experiment on $^{19}$Ne alpha decay of Phil Woods**
- **EXL new detector pockets –> mounting before April 2011**

**One goal is detector on inside of dipole, charge pickup, $\beta^-$ decay for ions with Z<50.**

**DSSDs counters as well as MWPCs + scintillators.**

# FAIR Time Schedule

## Roadmap

- Start of construction activities 2010/11
- Schedule is driven by **civil construction**
- Aim for earliest commissioning of accelerators and respective experiments

| Module | Construction time (months) | Ready for installation |
|---|---|---|
| 0 | 72 | 2015 / 16 |
| 1 | 28 | 2015 / 16 |
| 2 | 60 | 2016 |
| 3 | 60 | 2016 |

B. Sharkov

***"The actual digging will start in 2012 after cutting the trees in 2011/2012."***

# Time Plans

R&D
Prototyping
Engineering design, Specification
Contracting
Manufacturing, Construction
Test, Transport
Installation, Commissioning
Operation

## FAIR Gmbh asks for time plans

**More serious than before**
**TDR ? NESR ?**

| Name | Responsible | its | | 2010 Q1 Q2 Q3 Q4 | 2011 Q1 Q2 Q3 Q4 | 2012 Q1 Q2 Q3 Q4 | 2013 Q1 Q2 Q3 Q4 | 2014 Q1 Q2 Q3 Q4 | 2015 Q1 Q2 Q3 Q4 | 2016 Q1 Q2 Q3 Q4 | 2017 Q1 Q2 Q3 Q4 | 2018 Q1 Q2 Q3 Q4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELISE | H. Simon | | NESR | | | | | | | | | |
| EXL | P. Egelhof | | NESR | R&D and feasibility studies | | step by step completion of the ESR set-up to a 10% version of the EXL recoil detector | | | TDR ready, produce roadmap for further procedure until 2020 | | | |
| | | | ESR | ign of a prototype setup at the I | | | feasibility studies and first experiments with radioactive beams at the ESR | | | | | |
| ILIMA | H. Weick | | CR | R&D | | | Eng. design | Construction | | Installation and comm. | | |
| | | | NESR | | R&D | | | Eng. design | Construction | | Installation and comm. | |
| HISPEC/DESPEC | Gerl / M. Gorska | | LEB | R&D | Prototyping | | Contracting | Construction | | Test | Installation and comm. | |
| | | | FRS-S4 | PRESPEC experiments at FRS-S4 employing HISPEC/DESPEC components as soon as available | | | | | | | | |
| LASPEC | Ch. Geppert | | LEB | R&D | | Eng. design | Construction | | | Installation | Comm. | |
| MATS | F. Herfurth | | LEB | R&D | | Eng. Design | Construction | | | Installation | Comm. | |
| R3B | R. Lemmon | | HEB | | | | | | | | | |
| | | | Cave-C | | | | | | | | | |

**Similar plan for accelerators but backward from 2016**

# Status TDR Schottky

**TDR includes:** only res. Schottky in CR
mixer, cables
text of NIM article submitted

**Open points:** position in CR

**People:** Fritz Nolden, Shahab Sanjari,
Peter Hülsmann, Yuri Litvinov

**Timeline:** 2011

A Fast and Sensitive Resonant Schottky Pick-up for Heavy Ion Storage Rings

F. Nolden[a,*], P. Hülsmann[a], Yu. A. Litvinov[a,b], P. Moritz[a], C. Peschke[a], P. Petri[a], M. S. Sanjari[a,c], M. Steck[a], H. Weick[a], J. X. Wu[d], Y. D. Zang[d], S. H. Zhang[d], T. C. Zhao[d]

[a] *Gesellschaft für Schwerionenforschung, Darmstadt, Germany*
[b] *Max-Planck-Institut für Kernphysik, Heidelberg, Germany*
[c] *Goethe-Universität, Frankfurt am Main, Germany*
[d] *Institute of Modern Physics, Lanzhou, China*

# Status TDR ToF-Detector

**TDR includes:** detector with HV electrodes, MCP, anode and cables
magnet
vacuum system
DAQ / oscilloscope

**Open points:** foil/MCP size – acceptance of CR
stray field shielding from quadrupoles
mounting in CR
analysis with two detectors
position resolution (no ?)

**People:** Wolfgang Plaß, Natalia Kuzminchuk,
Marcel (master student),
Helmut, Analysis working group
FAIR storage ring group at GSI

**Timeline** ¼ year until writing can start, if open points are solved

# ILIMA Cost Table

## only investments are counted, 2005 prices

| | costs | no. | costs | |
|---|---|---|---|---|
| **TOF detector** | | | | |
| new vacuum chamber for detector positi | 60 | 1 | 60 | |
| vacuum chamber for pos2, parts reused | 20 | 1 | 20 | |
| magnets | 5 | 2 | 10 | |
| vacuum pumps, valves controllers | 90 | 1 | 90 | |
| detector, MCP | 25 | 2 | 50 | |
| Electronics, power supplies | 25 | 2 | 50 | |
| slow control of HV and step motor | 2 | 2 | 4 | |
| scaffolding with adjustment | 2 | 2 | 4 | |
| cables for signals and control | 2 | 1 | 2 | |
| **DAQ** | | | | |
| DAQ(Oscilloscopes) | 60 | 2 | 120 | |
| data storage | 15 | 1 | 15 | |
| | | | **425** | k€ |
| **Decay detectors** | | | | |
| vacuum pockets | 20 | 4 | 80 | |
| detectors with individual readout | 54 | 2 | 108 | |
| **DAQ** | | | | |
| DAQ(VME crate + controller) | 20 | 1 | 20 | |
| | | | **208** | k€ |

| | costs | no. | costs | |
|---|---|---|---|---|
| **Storage ring development** | | | 0 | |
| **Schottky** | | | | |
| Pick-ups CR | 25 | 4 | 100 | |
| Pick-ups NESR | 25 | 8 | 200 | |
| Cavity couplings | 10 | 12 | 120 | |
| Cavity closings, incl. control | 15 | 12 | 180 | |
| Low-noise, broad-band amplifiers | 25 | 12 | 300 | |
| **DAQ** | | | | |
| Amplifiers | 1 | 12 | 12 | |
| Remotely controlled tunable mixe | 10 | 12 | 120 | |
| Remotely controlled tunable LO | 10 | 12 | 120 | |
| Data acquisition, VME crate | 10 | 2 | 20 | |
| ADCs | 1 | 72 | 72 | |
| Cables, connectors, and such | 5 | 2 | 10 | |
| data storage | 15 | 1 | 15 | |
| | | | **1269** | k€ |
| | | **sum:** | **1902** | k€ |

**As approved by CORE and as in our IMoU.**
**But for experiments only 78 M€ in total in start version.**
**Nustar cost book 54.5 M€ -> 22 M€ in start version.**