

Status of NUSTAR

...as viewed by the Resource Coordinator

Alexander Herlert
FAIR

NUSTAR Annual Meeting 2014



Finland



France



Germany



India



Poland



Romania



Russia



Slovenia

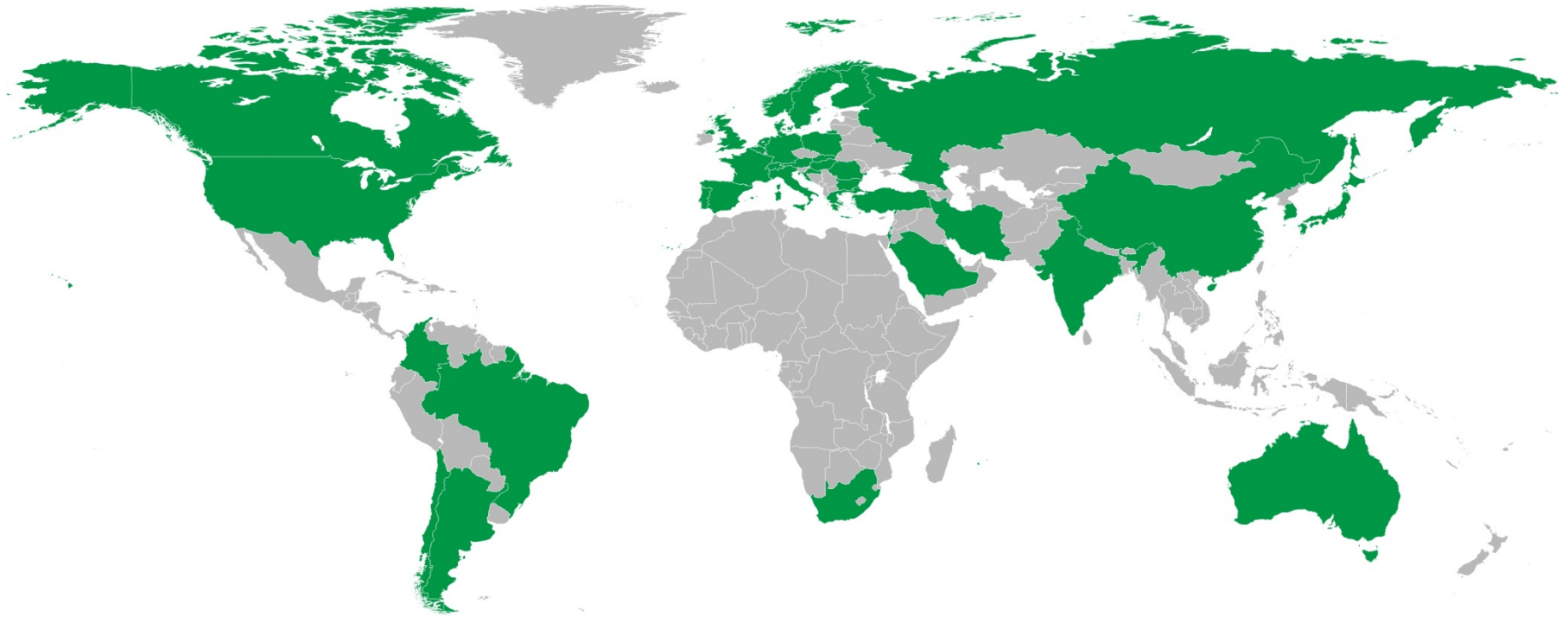


Sweden



UK





>800 registered NUSTAR members

38 countries

182 institutes



Election of new Board members...



Dolores
Cortina



Ari
Jokinen



Thomas
Aumann



Alison
Bruce



Nasser
Kalantar

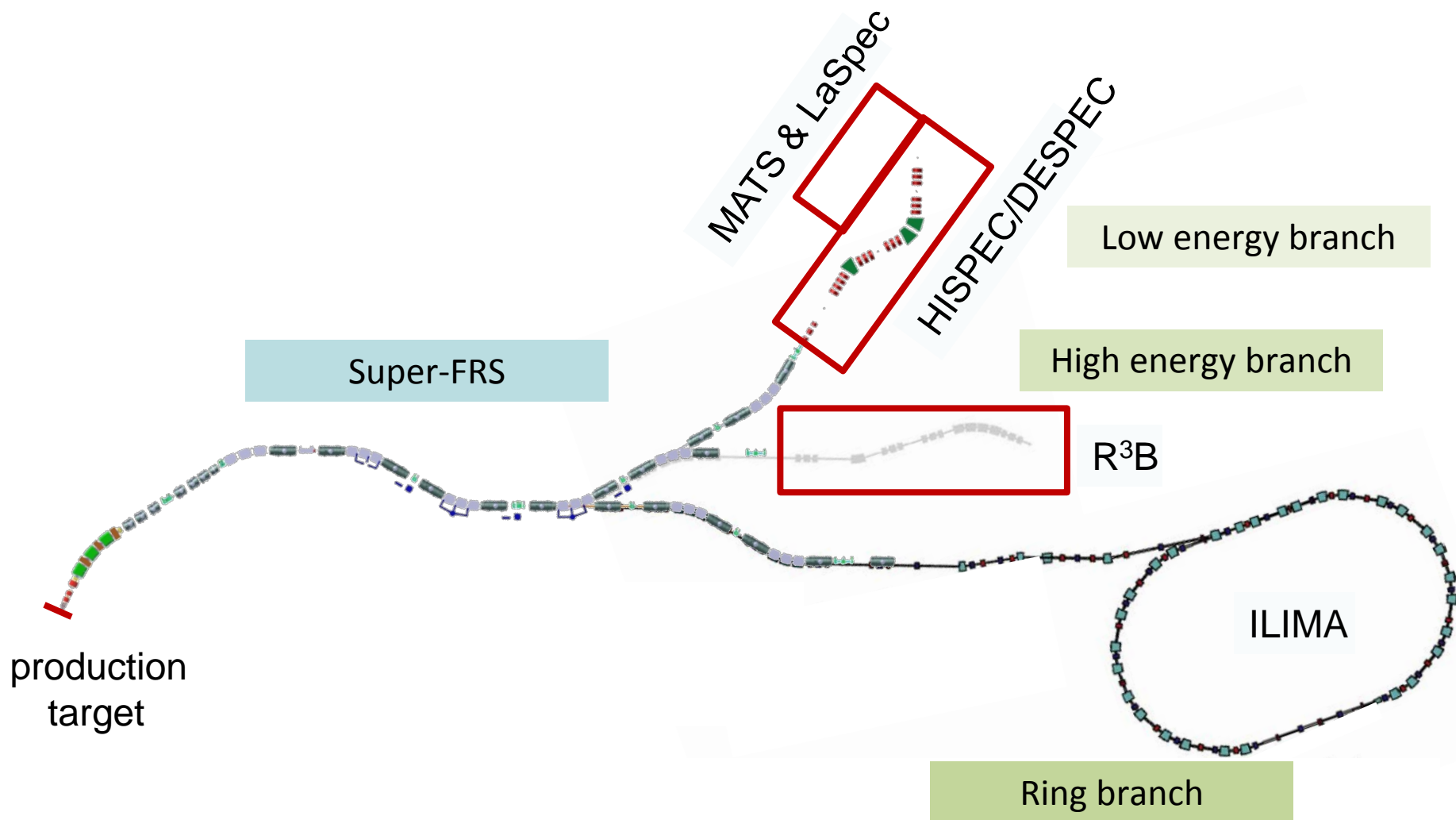
... and end of term

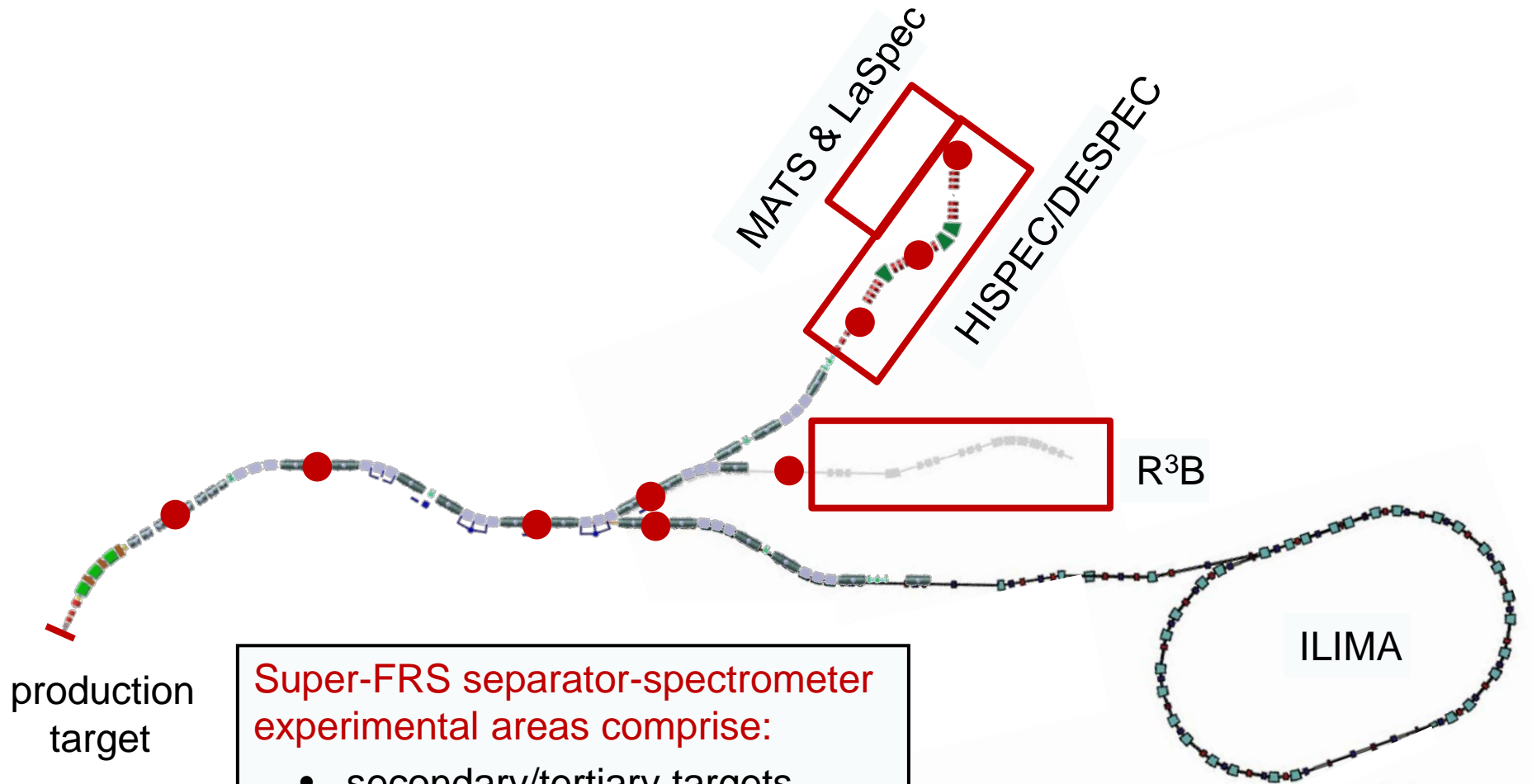


Thomas
Nilsson



Berta
Rubio





Super-FRS separator-spectrometer experimental areas comprise:

- secondary/tertiary targets
- degrader stations
- ancillary detectors

See talk: Super-FRS Collaboration
Isao Tanihata, Wednesday

HISPEC/DESPEC: PreSPEC-AGATA

FRS-detector suite yields A and Z of incoming beam and provides x,y tracking

See talks:
Norbert Pietralla and
Michael Reese,
Thursday

HECTOR+



Large BaF_2 and LaBr_3 detectors
for high-energy γ rays

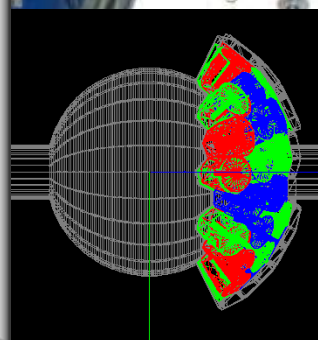
Advanced Gamma-ray
Tracking Array (AGATA)

up to $5 \times 2 + 10 \times 3 = 40$
segmented HP Ge-crystals

$d \sim 20$ cm

$\epsilon_{\text{ph}} \approx 17\%$

$\Delta E \approx 0.4\%$



Lund-York-Cologne
CALorimeter (LYCCA)

A and Z particle-ID after
secondary target by means of

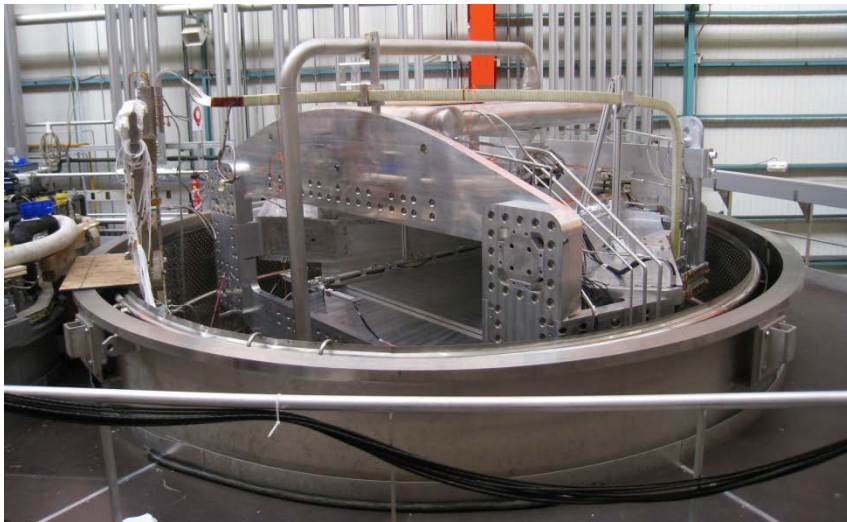
- x,y tracking
- $\Delta E-E$ (Si-CsI)
- Time-of-flight (plastic)



TDR approved 2008

Commissioned, upgraded and
used in PreSPEC physics
experiments **since 2011!**

Successful test of GLAD dipole magnet



Test cryostat setup built at the CEA/Saclay:
cold mass in the test cryostat.

To be delivered to GSI in Q3-2014

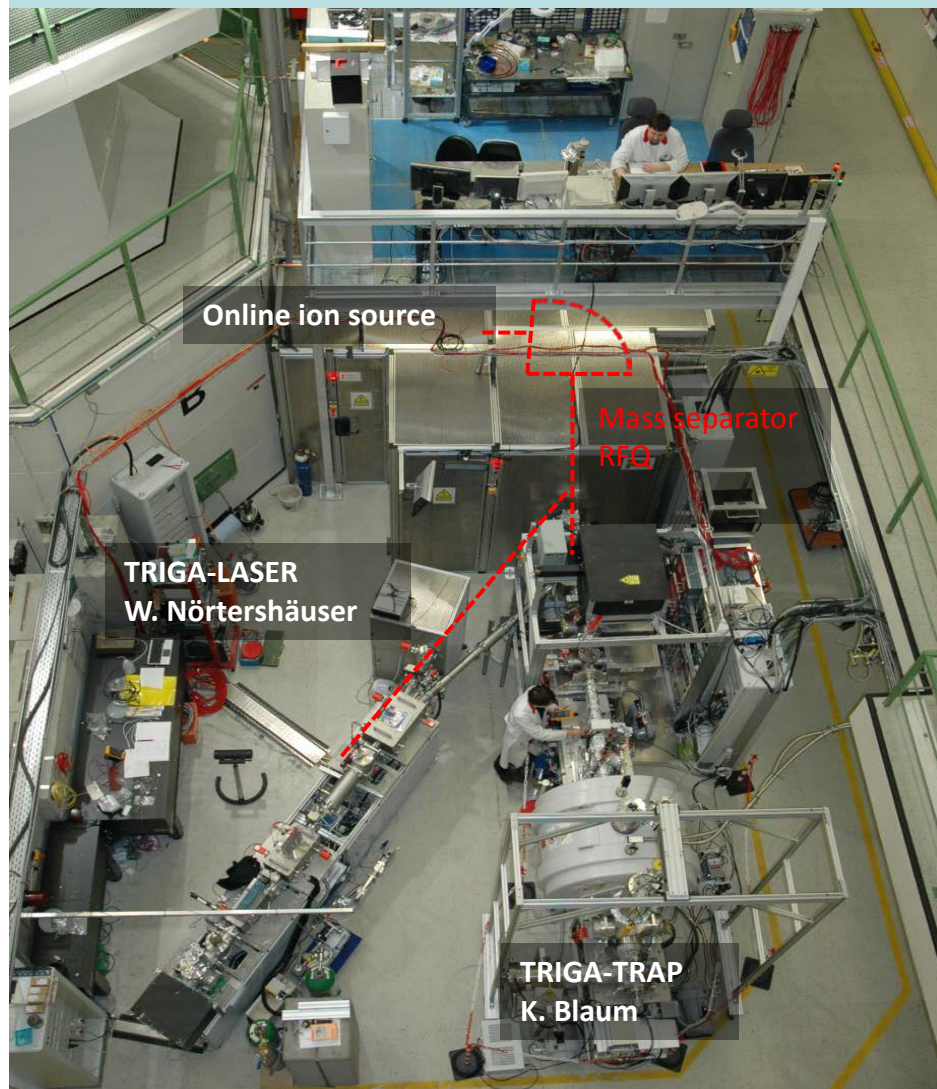


NeuLAND

- In July 2013 the first double-plane has been built
- In Nov 2013 2nd and 3rd double planes have also been built
- Buildup of the 4th plane started (Dec 2013)

See talk: Heiko Scheit, Wednesday

project start @ TRIGA: 01/2008
start data taking: 05/2009



TRIGA-Laser

serving as a prototype for



LaSpec
Laser Spectroscopy of short-lived nuclei at FAIR

TRIGA-TRAP

serving as a prototype for

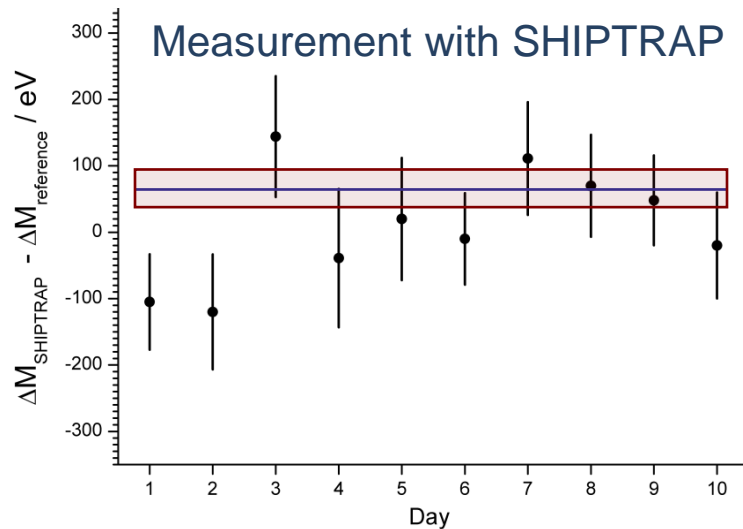
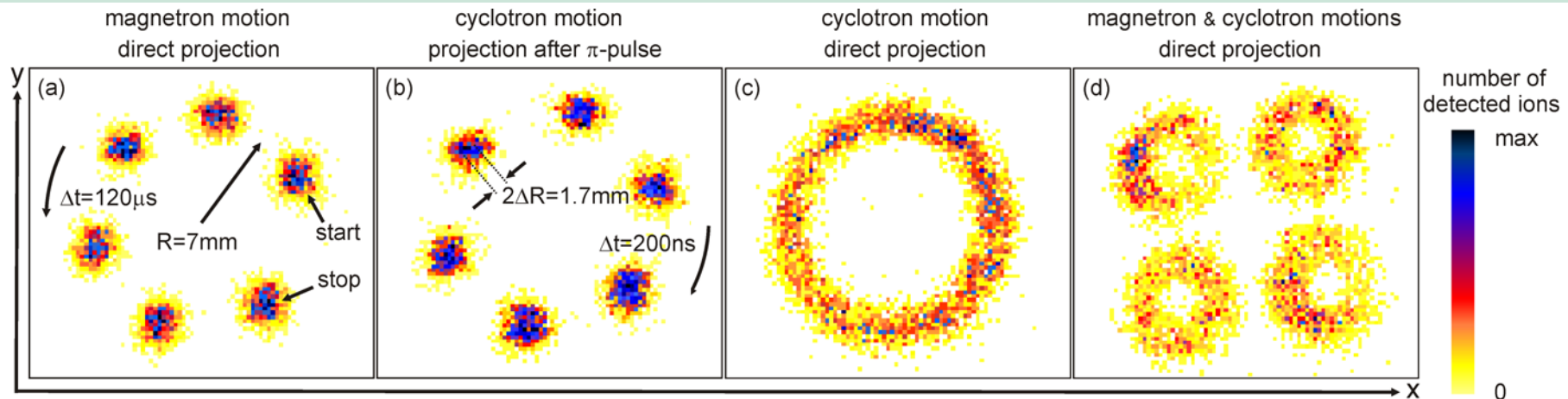


MATS
Precision Measurements of very short-lived nuclei
using an Advanced Trapping System

See talk:
Martin Eibach, Wednesday

New development: Phase-imaging technique

The mass of a nuclide is determined via a measurement of its radial frequencies ν_+ and ν_- in a Penning trap by imaging the ion motion with a position-sensitive detector



Proof of principle:

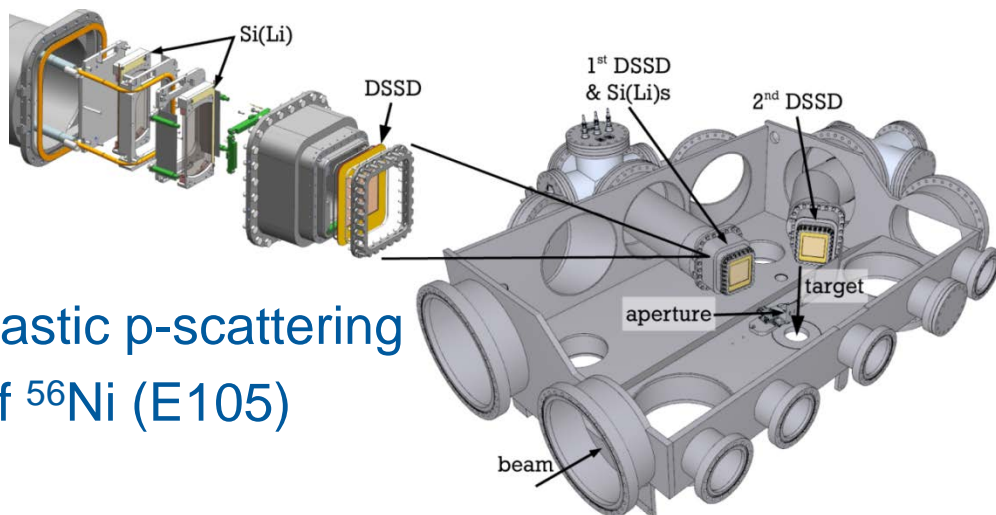
Measurement of mass difference DM of ^{132}Xe and ^{131}Xe and comparison with the precisely known AME2012 value

First ever measurement of mass difference of singly charged medium-heavy non-doublets with a relative accuracy of $2 \cdot 10^{-10}$!!!

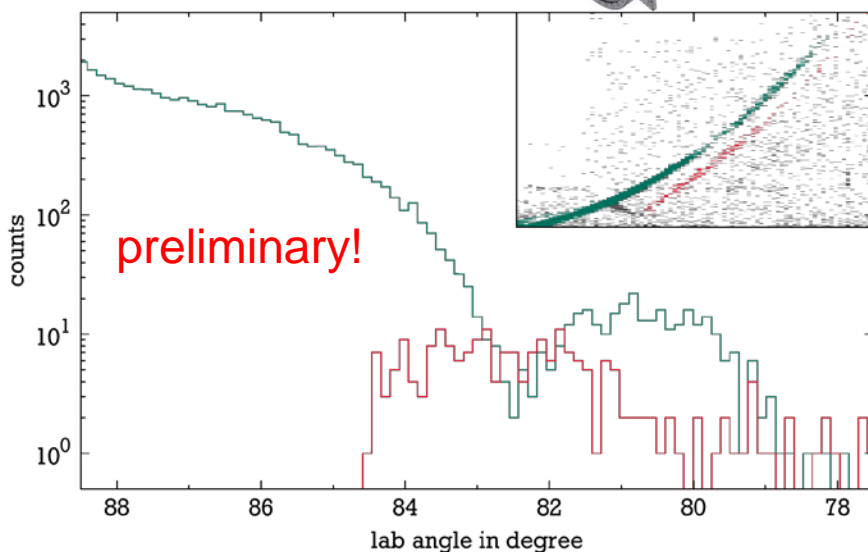
S. Eliseev et al. PRL110 (2013) 082501

See talk: Sergey Eliseev, Wednesday

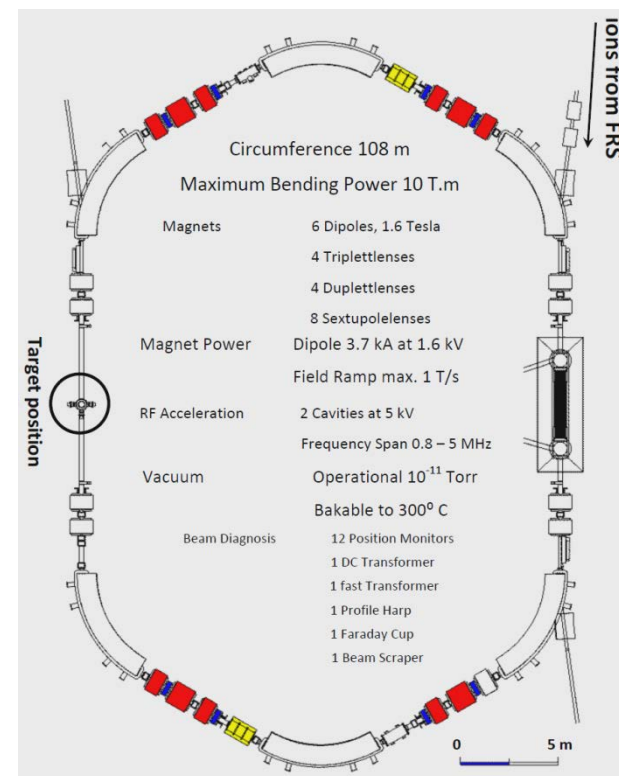
Intermediate storage ring activities @ ESR



Elastic p-scattering off ^{56}Ni (E105)



Storage-ring Task Force (APPA and NUSTAR): CR -> ESR
 See talk: Nasser Kalantar, Thursday



Modularized Start Version (MSV)

1.2.1 LEB Super-FRS

1.2.2 HISPEC/DESPEC

1.2.3 MATS

1.2.4 LaSpec

1.2.5 R³B

1.2.6 ILIMA

Beyond MSV

1.2.8 ELISe

1.2.9 EXL

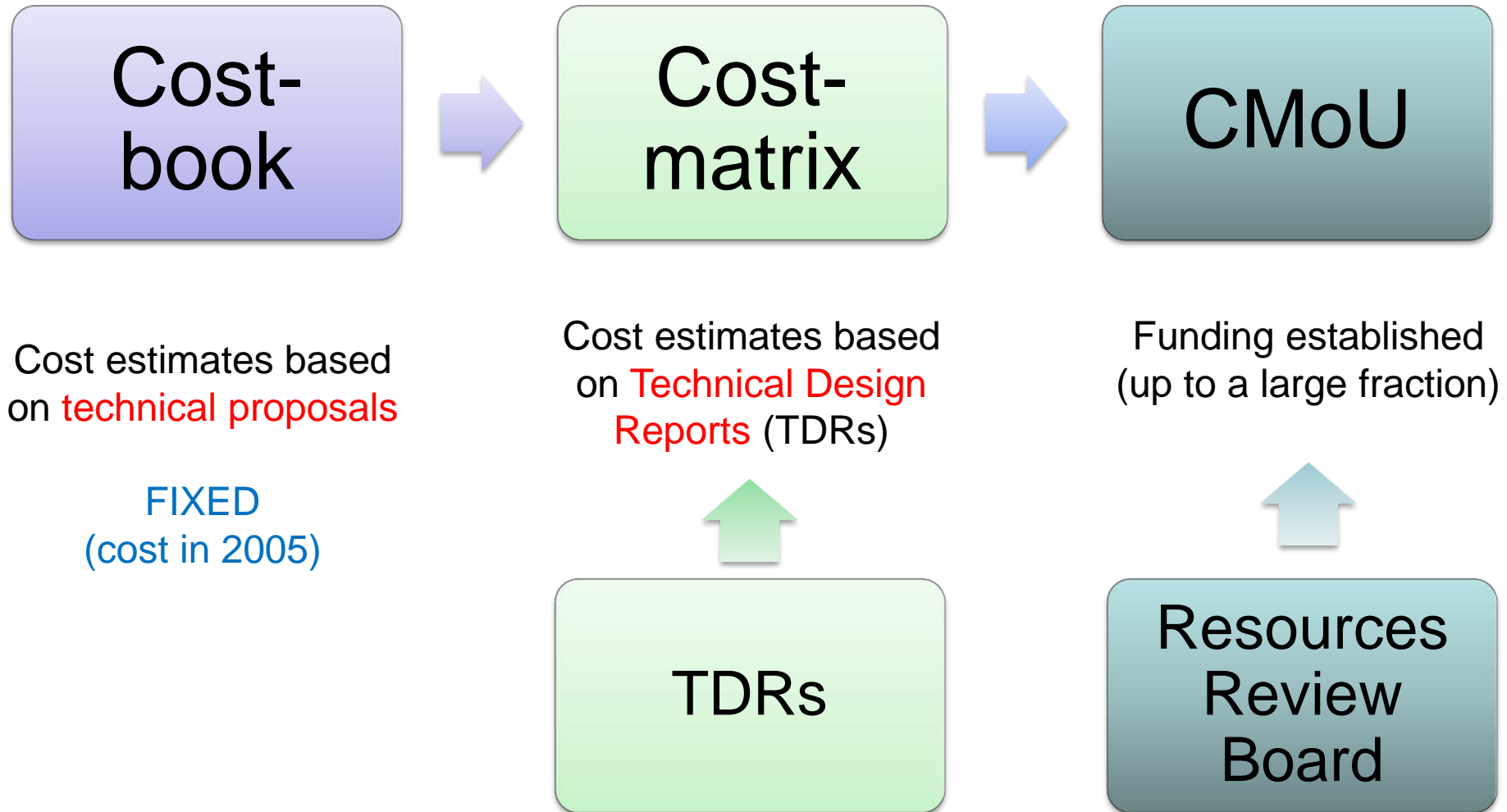
New experiments

1.2.10 Super-FRS physics

1.2 NUSTAR

NESR required –
alternative/intermediate „operation“
within MSV under discussion

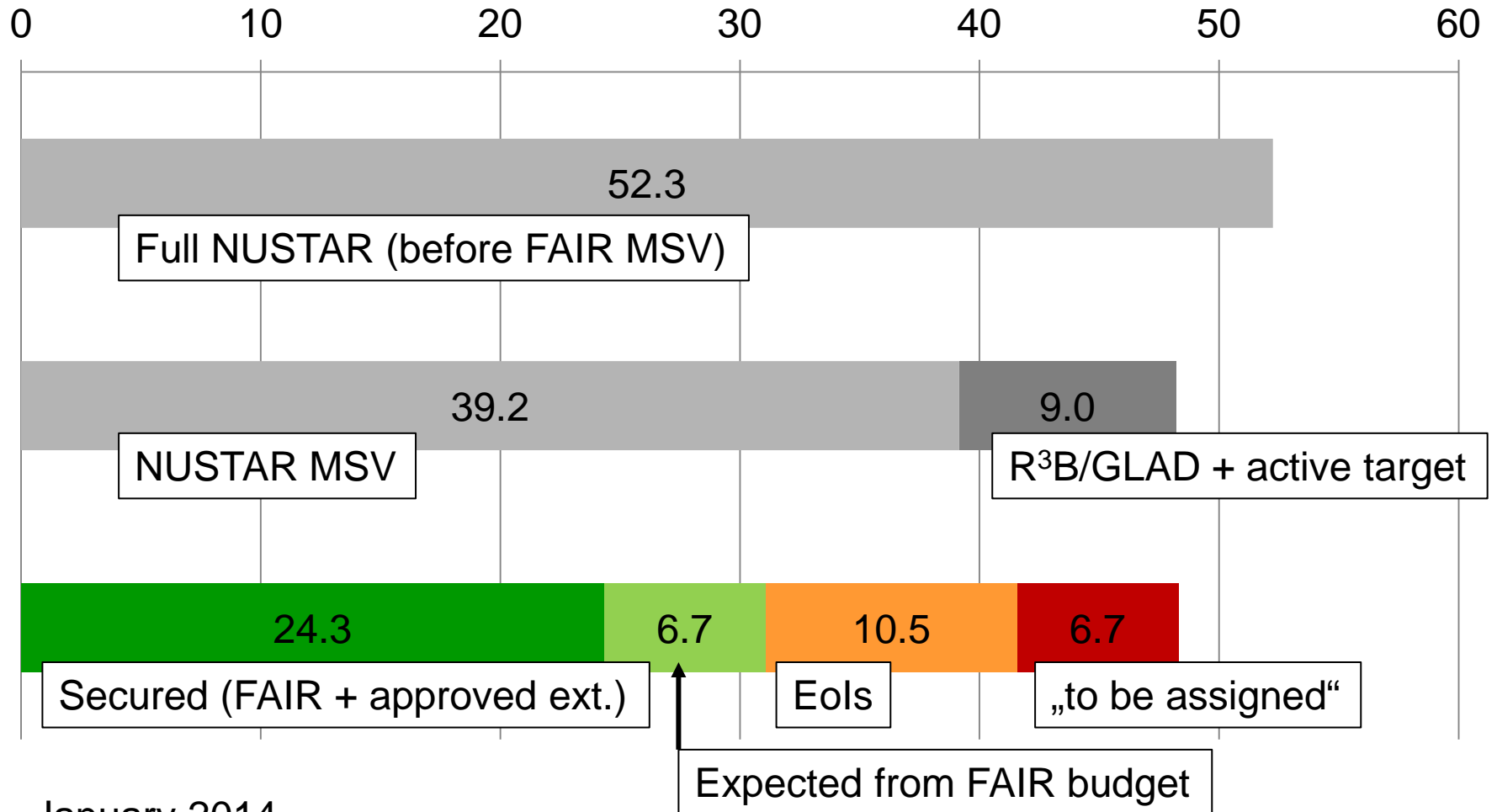
**Physics program to be evaluated
by Expert Committee Experiments**

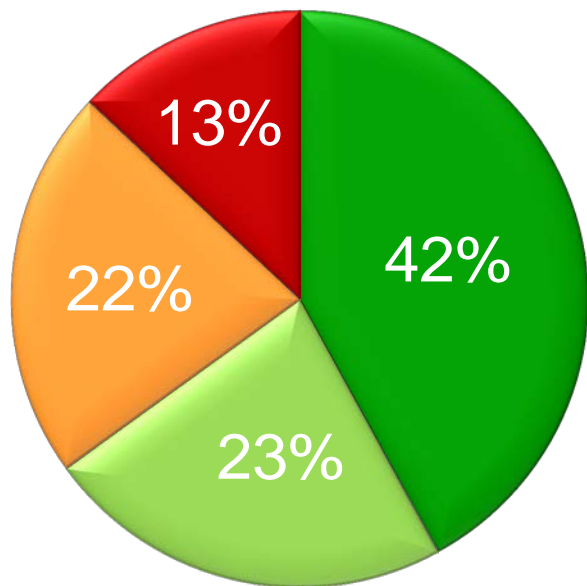


Evolution of NUSTAR project funding



Cost estimate (MEUR 2005)





- Secured (FAIR budget + expected from FAIR)
- Secured (external)
- Eol
- to be assigned

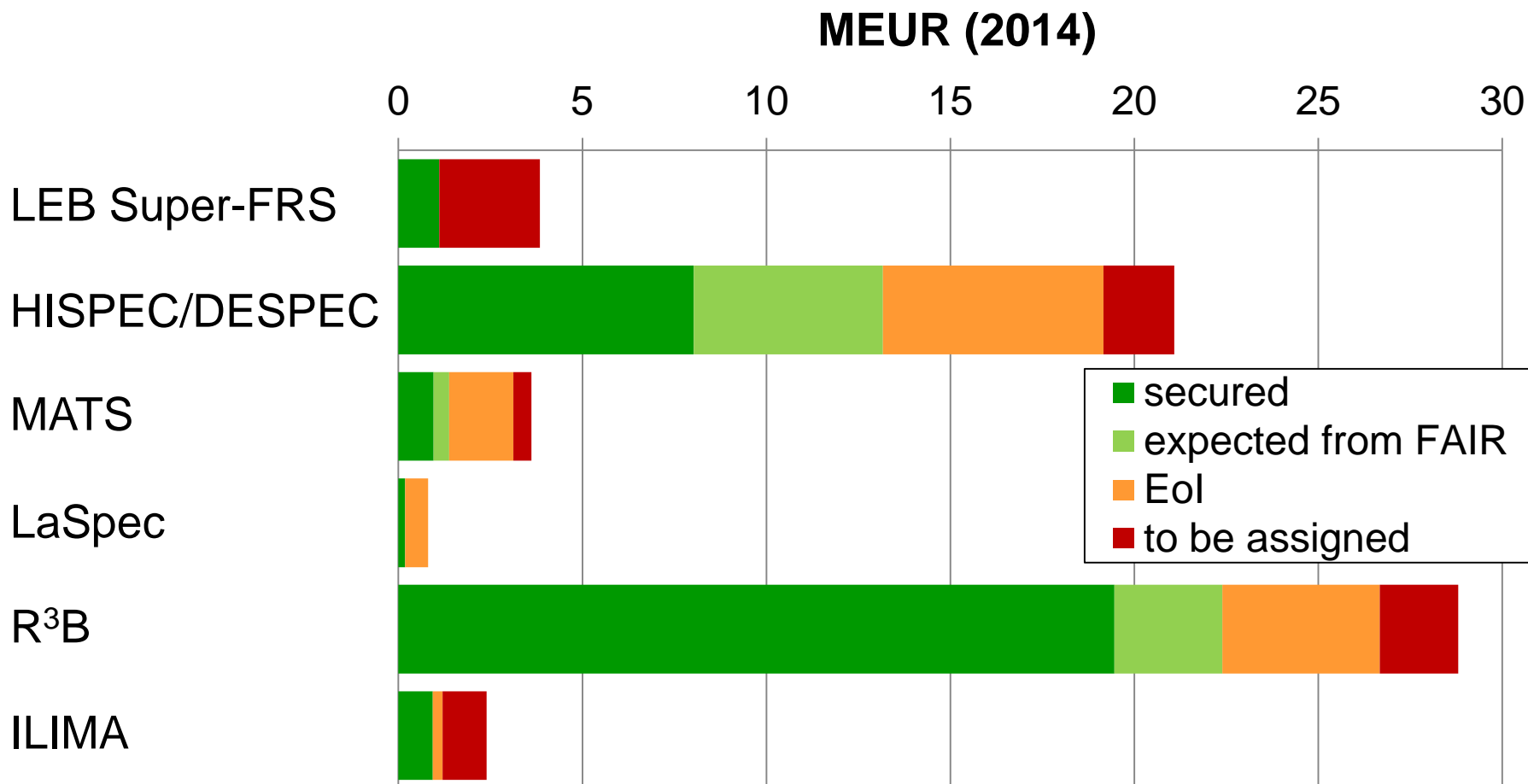
- FAIR shareholders and associates

- Finland (only external)
- France (only external)
- Germany
- India
- Poland
- Romania
- Russia
- Sweden
- UK

- Additional funding/Eols from:

- Belgium
- Bulgaria
- Hungary
- Israel
- Italy
- Japan
- Spain

Status of NUSTAR experiment funding



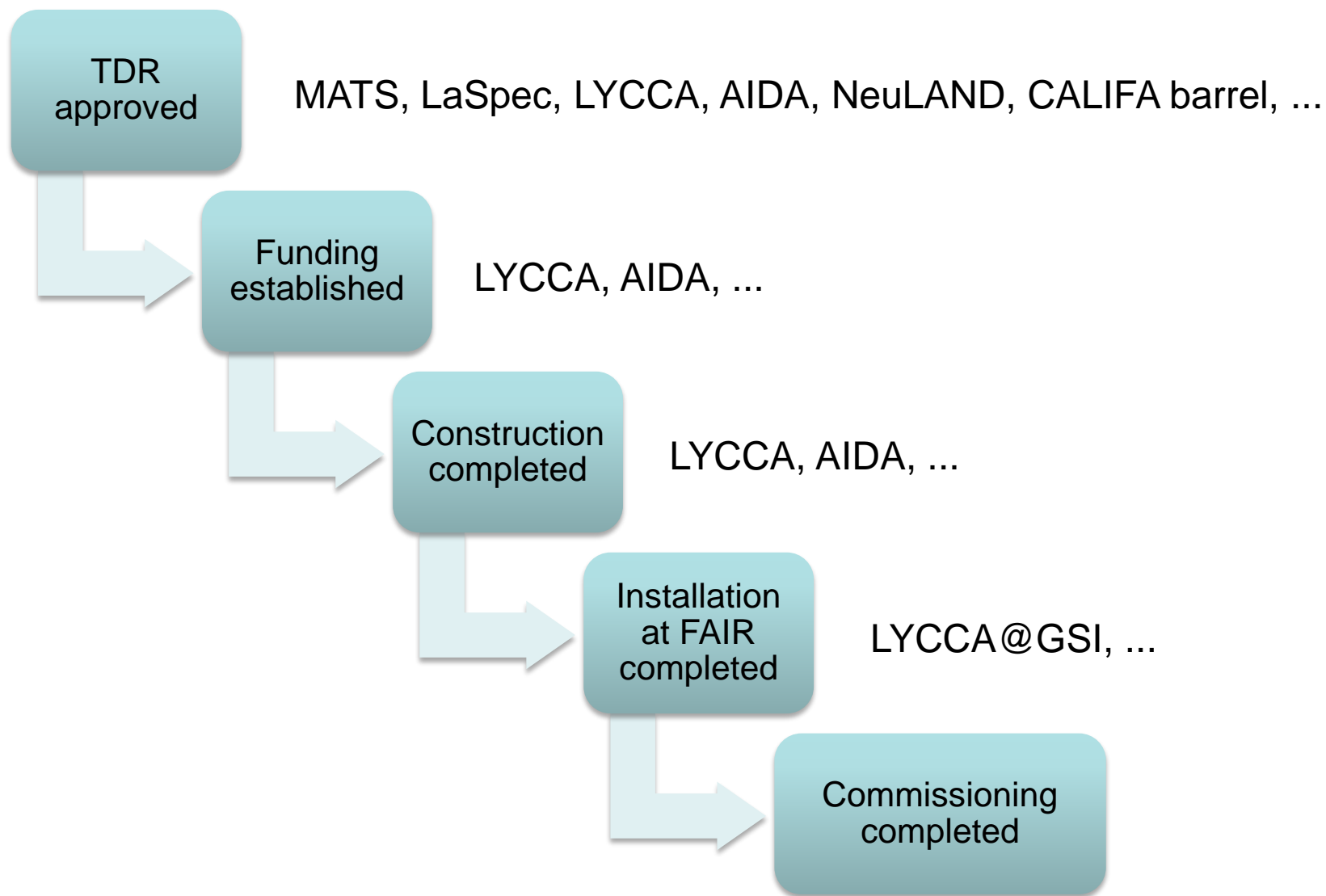
- Approved TDRs:
 - MATS (all subsystems)
 - LaSPEC (all subsystems – except LD-RIS: no action)
 - HISPEC/DESPEC (LYCCA, DTAS, AIDA)
 - R³B (NeuLAND, CALIFA-barrel)
- Final review:
 - HISPEC/DESPEC (MONSTER)
- Submitted:
 - HISPEC/DESPEC (BELEN)
 - R³B (GLAD)

TDR submission Profile				
2014	2015	2016	2017	2018
16	12	3	0	0

TDR status: Example from HISPEC/DESPEC



PSP-Code	Description	Responsible	TDR subm	TDR appr	status	MM/YY exp/subm	MM/YY appr	Comment
1.2.2	HISPEC/DESPEC							
1.2.2.1	Beam tracking and identification detectors	Plamen Boutachkov	N	N	x	12/2015		
1.2.2.2	HISPEC/DESPEC Beamline	Magda Gorska	N	N	x	12/2015		combine TDRs: 1.2.2.2+3+5+6
1.2.2.3	Mechanics (rails, support, etc) + installation	Magda Gorska	N	N	x	12/2015		combine TDRs: 1.2.2.2+3+5+6
1.2.2.4	Common EDAQ	Stephane Pietri	N	N	x	12/2015		
1.2.2.5	Safety	Magda Gorska	N	N	x	12/2015		combine TDRs: 1.2.2.2+3+5+6
1.2.2.6	Cabling and related (HISPEC/AGATA)	Magda Gorska	N	N	x	12/2015		combine TDRs: 1.2.2.2+3+5+6
1.2.2.7	Active targets (HISPEC)							
1.2.2.7.1	Active target (MINOS)	Alexandre Obertelli	N	N	x	01/2015		
1.2.2.7.2	Active target (India)	Samit Mandal	N	N	x	01/2015		
1.2.2.8	AGATA							
1.2.2.9	HYDE charged particle detectors for reaction studies (HISPEC)	Ismael Martel	N	N	x	06/2014		
1.2.2.10	LYCCA charged particle detector (50-200 MeV/u) (HISPEC)	Dirk Rudolph	Y	Y	✓	06/2008	09/2008	
1.2.2.11	Plunger (HISPEC)	Nicu Marginean	N	N	x	03/2014		
1.2.2.12	Magnetic Spectrometer (ALADIN and new design) (HISPEC)							
1.2.2.13	DSSD implantation and decay detector (AIDA) (DESPEC)	Tom Davinson	Y	Y	✓	08/2008	03/2013	
1.2.2.14	DESPEC high resolution g-detector	Rudrajyoti Palit	N	N	x	02/2014		
1.2.2.15	Fast timing (FATIMA)	Luis Fraile	N	N	x	12/2014		
1.2.2.16	Neutron detectors							
1.2.2.16.1	BELEN (DESPEC)	Guillem Cortes	N	N	○	01/2014		
1.2.2.16.2	MONSTER	Daniel Cano Ott	Y	N	○	02/2013		
1.2.2.16.3	NEDA	Johan Nyberg	N	N	x	10/2014		
1.2.2.17	Total absorption spectrometer (DTAS) (DESPEC)	Jose Luis Tain	Y	Y	✓	04/2012	01/2013	
1.2.2.18	Isomeric moments (DESPEC)	Theodoros Mertzimekis	N	N	x	06/2015		



First step – rough time plans

FAIR-Experiment: NUSTAR (1.2)
 Sub-collaboration: HISPEC/DESPEC (1.2.2)

Status: August 19, 2013

Project plan (staged commissioning and experiments)

	2012	2013	2014	2015	2016	2017	2018	2019
Commissioning of stage 0	█							
Experiments/tests stage 0		█						
Commissioning of stage 1		█	█	█				
Experiments/tests stage 1				█	█			

Status of main components

Component		2012	2013	2014	2015	2016	2017	2018	2019
PSP code	Description								
1.2.2.1	Beam tracking and identification	█	█	█	█	█	█	█	█
1.2.2.4	Common EDAQ	█	█	█	█	█	█	█	█
1.2.2.7	Active targets	█	█	█	█	█	█	█	█
1.2.2.8	AGATA	█	█	█	█	█	█	█	█
1.2.2.9	HYDE	█	█	█	█	█	█	█	█
1.2.2.10	LYCCA	█	█	█	█	█	█	█	█
1.2.2.11	Plunger	█	█	█	█	█	█	█	█
1.2.2.13	AIDA	█	█	█	█	█	█	█	█
1.2.2.14	DESPEC gamma detector	█	█	█	█	█	█	█	█
1.2.2.15	FATIMA	█	█	█	█	█	█	█	█
1.2.2.16.1	BELEN	█	█	█	█	█	█	█	█
1.2.2.16.2	MONSTER	█	█	█	█	█	█	█	█
1.2.2.16.3	NEDA	█	█	█	█	█	█	█	█
1.2.2.17	DTAS	█	█	█	█	█	█	█	█
1.2.2.18	Isomeric moments	█	█	█	█	█	█	█	█

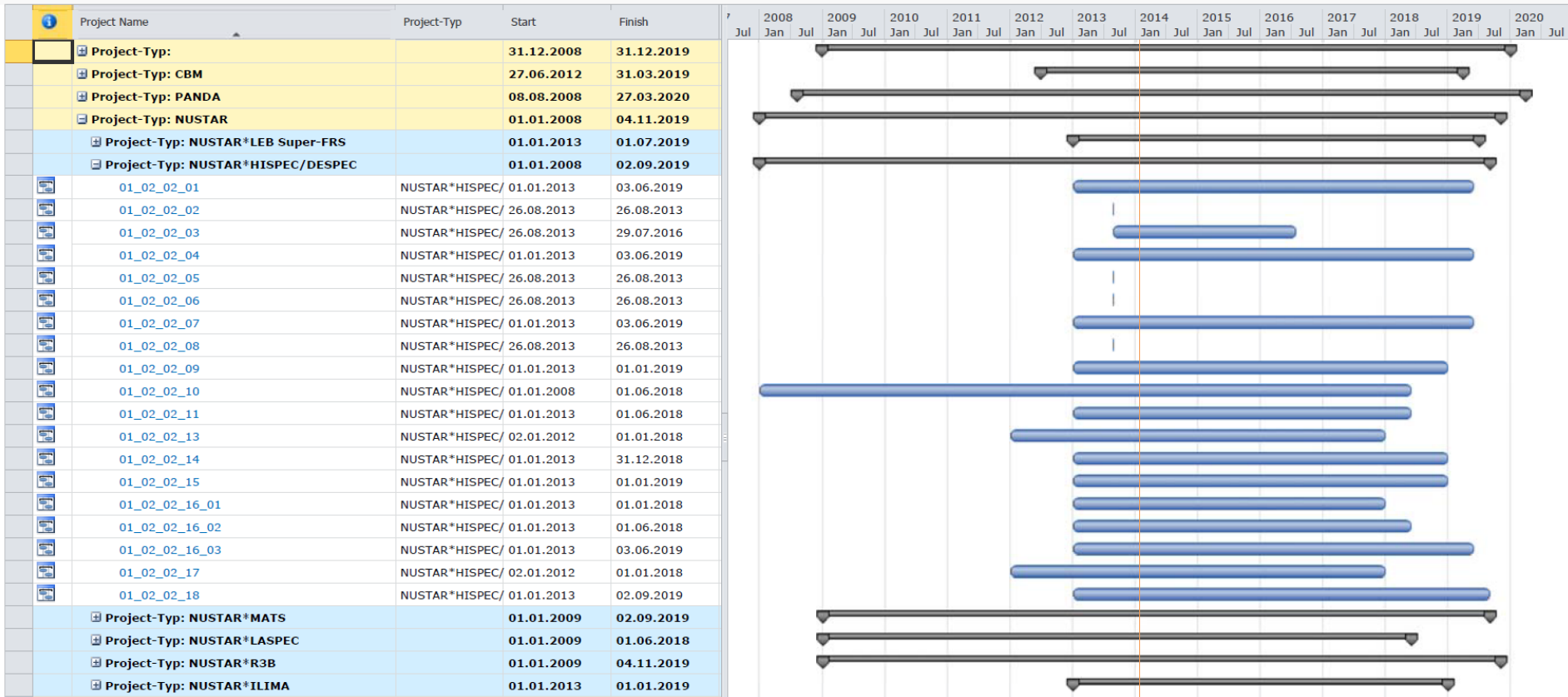
Not ready █ Prototype available █ Significant fraction of component ready █ 100% of component ready █

First draft project plans on FAIR Project Server



Project Web App * Project Center

Informationen zu den Projekten anzeigen, für die Sie Zugriffsberechtigungen besitzen. Sie können Projekte darüber hinaus erstellen oder bearbeiten.



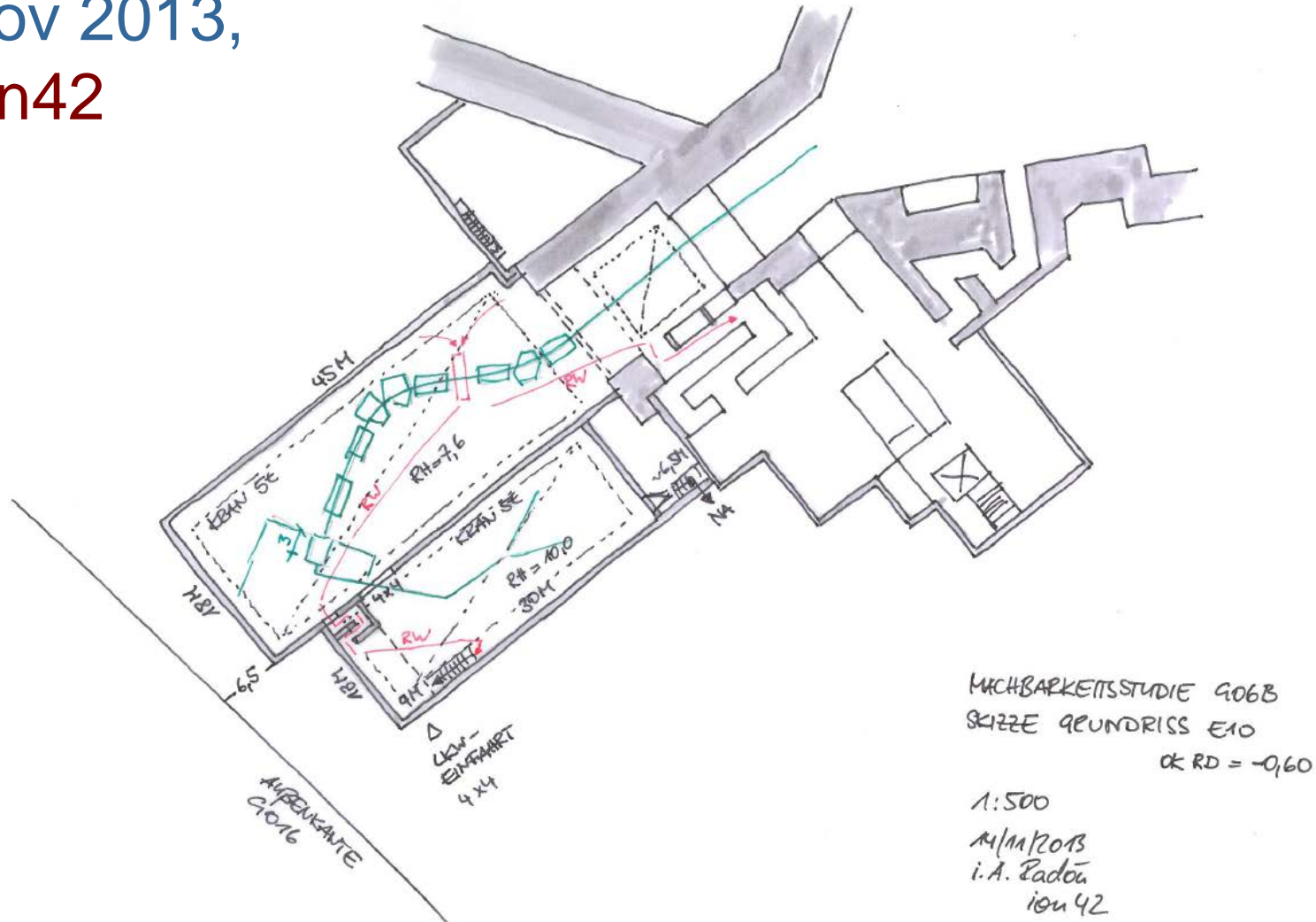
57 project plans (+ EXL and Super-FRS physics)

- Work on detailed project plans (for all work packages)
 - Major milestone plan for each experiment
 - “Hard-linked” milestones (from sub-work packages)
 - “Soft-link” to accelerator schedule
 - “Soft-link” to site&buildings schedule
 - Adding information on funding
 - Country, funding agency, FAIR estimated cost, ...
 - Risk management
 - Risk register done
 - Implementation of mitigating actions pending
- **Resource-loaded schedule**

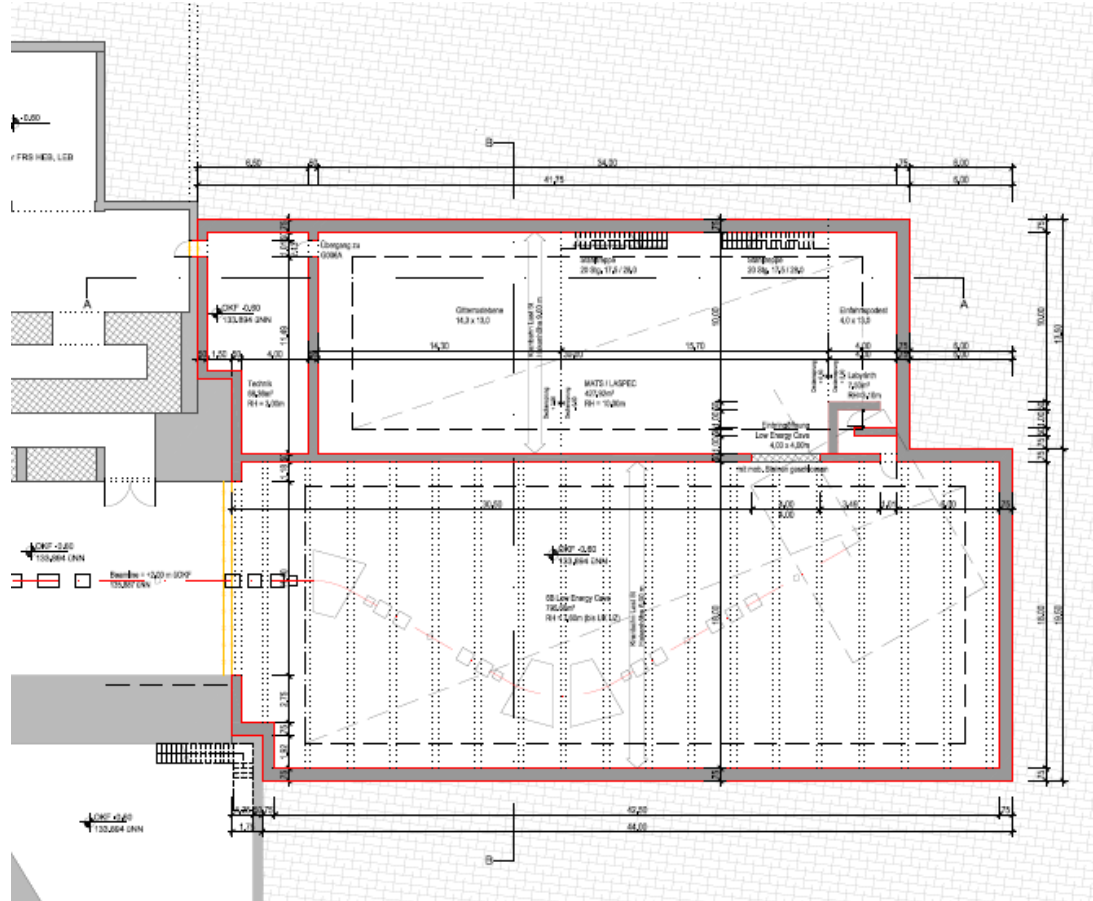
- Proposed time line for preparation
 - Resource Coordinator prepares together with NUSTAR Resource Board members a final draft version of the NUSTAR MoU
 - Draft version expected mid-2014
 - Submission to and discussion with funding agencies to make changes according to national regulations
 - Approval and/or further corrections at subsequent RRB meeting(s)
 - Final version end of 2014 or beginning of 2015 (ready for signature)

Sketch of new LEB building layout

Nov 2013,
ion42



Draft design from architect study



Final version of study received in February 2014

Architect study:

- Final version received in February 2014 – distributed to RB members
- 8.3MEUR total cost estimate (in 2014 cost)

Discussion on funding scenarios:

- Report given at 2nd FAIR-NUSTAR RRB
- Sweden reserved 350kEUR for LEB building
- Start fund raising now ...

World-unique - Synchrotron-based RIB production for:

- **High-energy Radioactive Beams (≤ 1.5 GeV/u)**
 - Efficient production, separation, transmission and detection aided by Lorentz boost
 - Access to also the heaviest nuclei without charge-state ambiguities
 - Large range of attainable reaction mechanisms
- **Storage rings**
 - Mass measurements and beam preparation/manipulation
 - Isomeric beams
 - Novel experimental tools (beyond MSV/with CRYRING)

Combined with:

- **Wide range of state-of-the-art instrumentation – *not monolithic!***
 - Strong evolution from existing programmes
 - Dynamic progress in terms of TDRs/construction/operation
 - **Project plan**