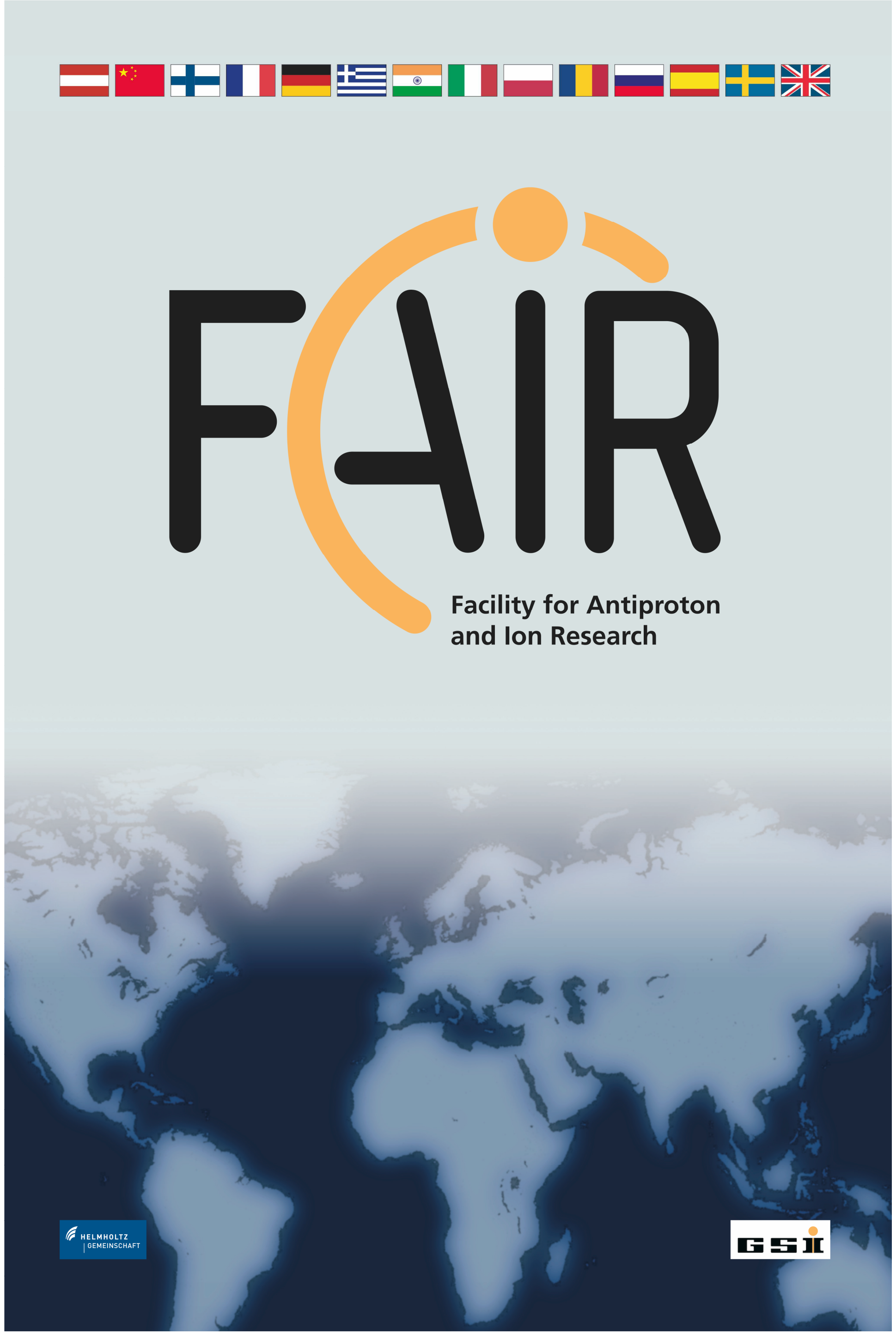
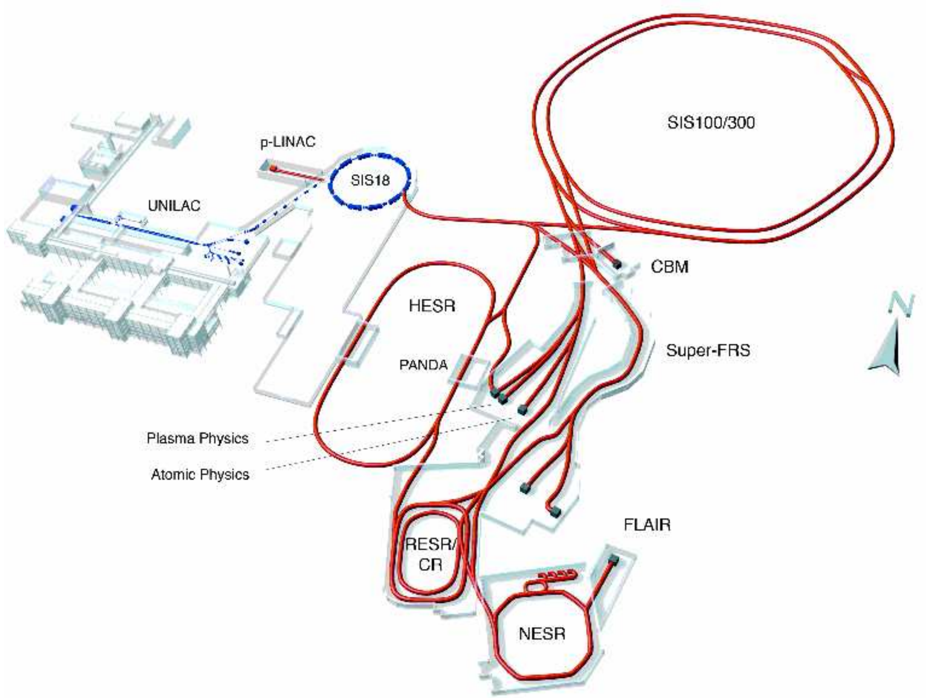




The FAIR Project

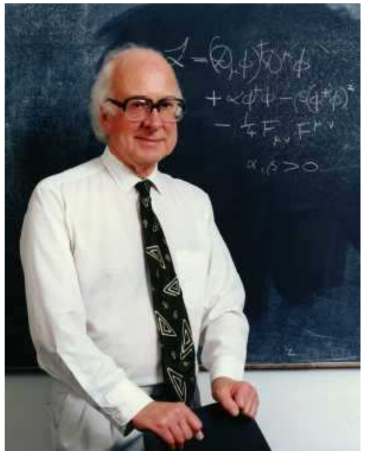
Valencia, March 27, 2007

H.H.Gutbrod, FAIR Team leader

Ca. 2500 authors

http://www.gsi.de/fair/reports/btr.html

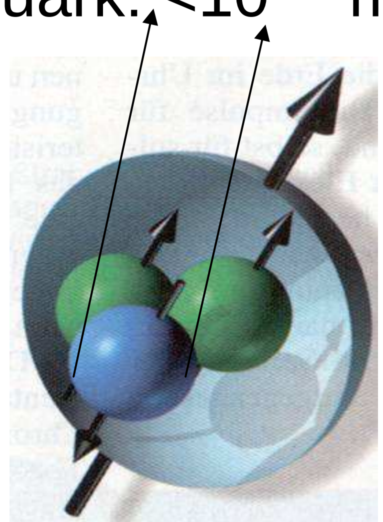
Key questions driving FAIR



Standard Model: Particle mass determined by strength of interaction with Higgs field

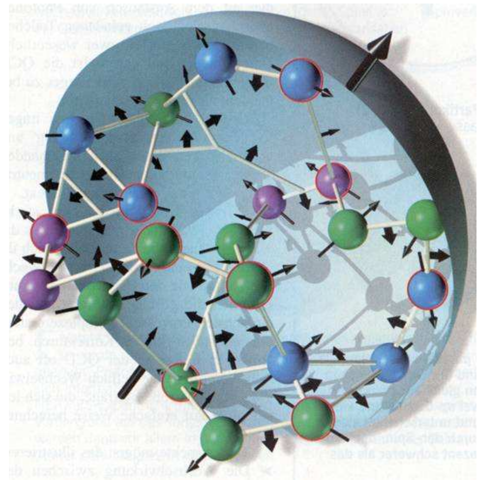
CERN/LHC: **Origin of mass, new particles**

quark: $<10^{-18}$ m



What creates MASS of quarks? ➔ Higgs at LHC

What creates the mass of nucleons/hadrons?



The Proton Mass:

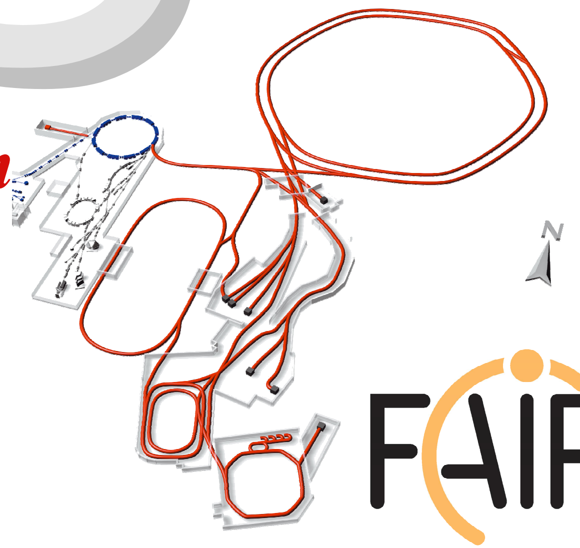
proton (uud) m= 938 MeV

$2m_u \sim 10$ MeV *explained by Higgs--if..*

$m_d \sim 8$ MeV *explained by Higgs ..if..*

Sum = 18 MeV << 938MeV

➔ *FAIR: Study of the Strong Interaction via proton-antiproton annihilation*

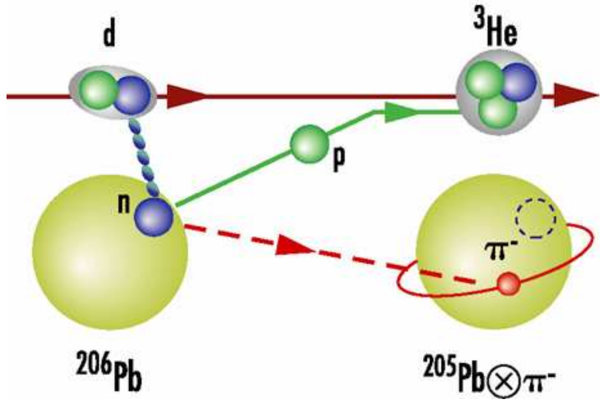


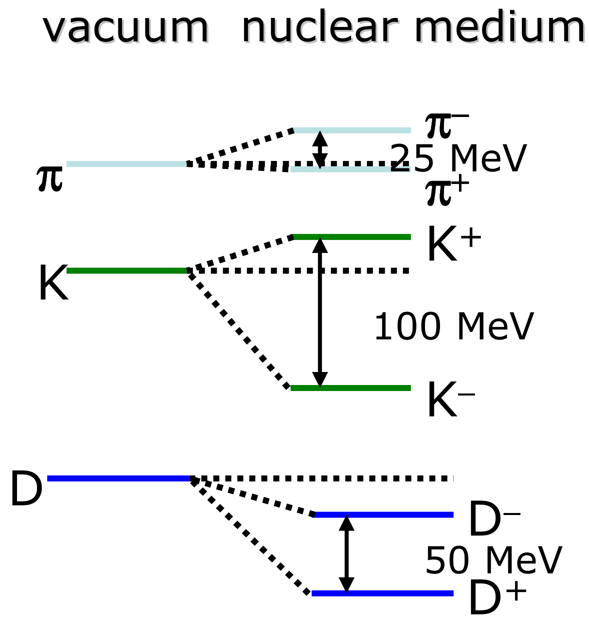
Hadrons in strongly interacting matter:

like, e.g.,

- *nuclear fields, e.g. Pionic atoms,*

  Hyper nuclei





Hayaski, PLB 487 (2000) 96
Morath, Lee, Weise, priv. Comm.

•.....will hadrons change

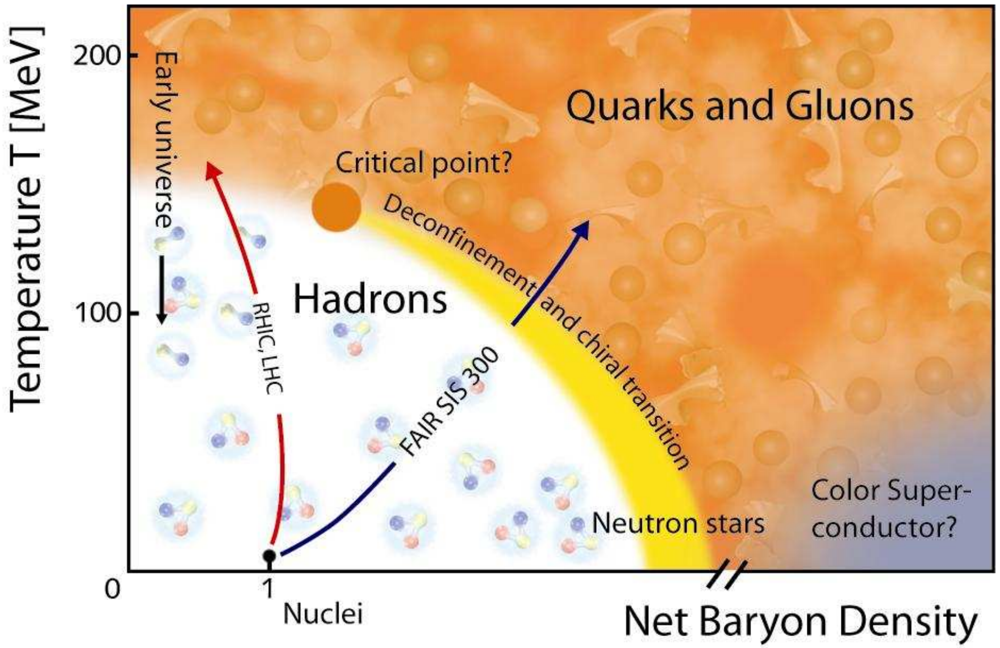
their mass in medium?

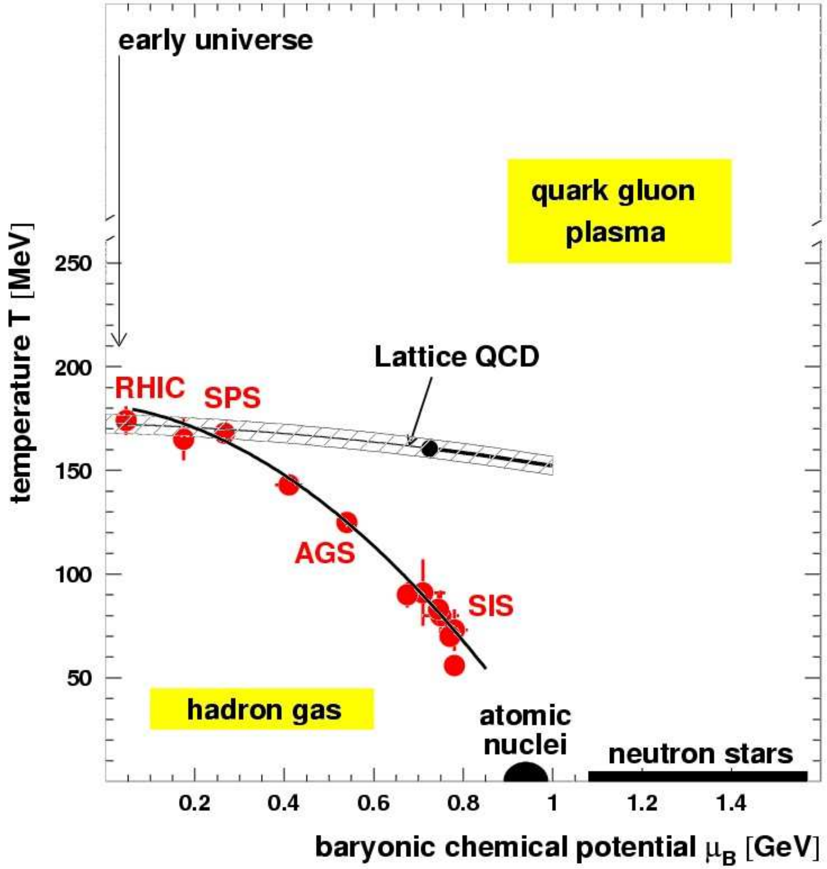
Mapping the QCD phase diagram with heavy-ion collisions

- *the Early Universe*
  - *at* $\mu_B \approx 0$ ***go to LHC AA collisions***

    at 2 x 2.7 ATeV$_{cm}$
  - *at* $\mu_B \gg 0$ ***go to FAIR AA collisions***

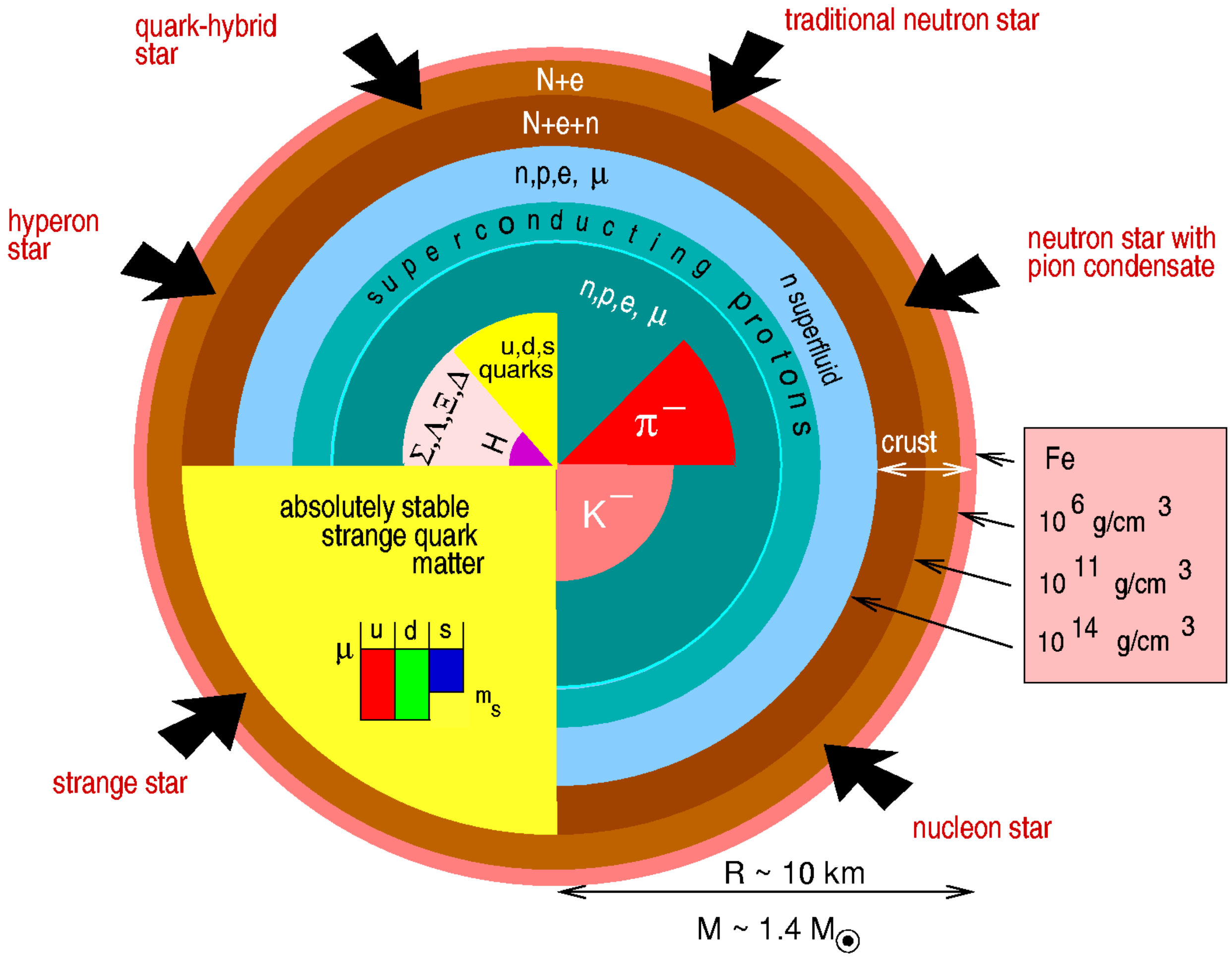
    at 2 - 45 AGeV$_{la}$





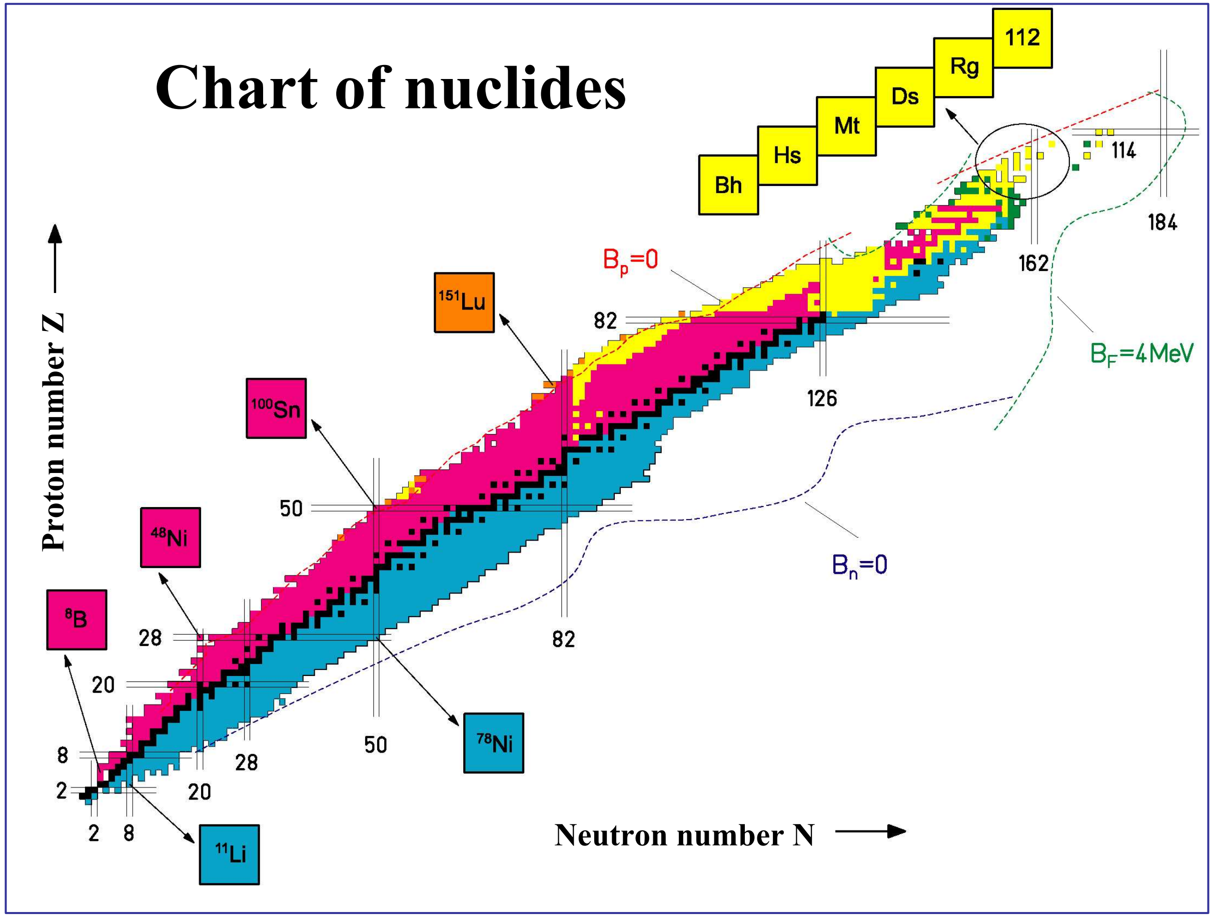
Important: Signals from dense interaction region, e.g. photons or di-leptons

Properties of neutron stars



Nuclear Structure and Astrophysics

Discovery of several hundred new isotopes at GSI



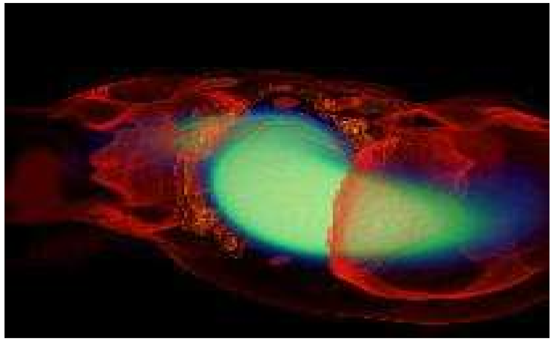
How are heavy elements formed ?

Limits for nuclear structures?

Zur Anzeige wird der QuickTime™
Dekompressor „Cinepak“
benötigt.

e.g. R-Process
in Neutron Star Mergers ?

Ni^{70} imbedded in large neutron flux

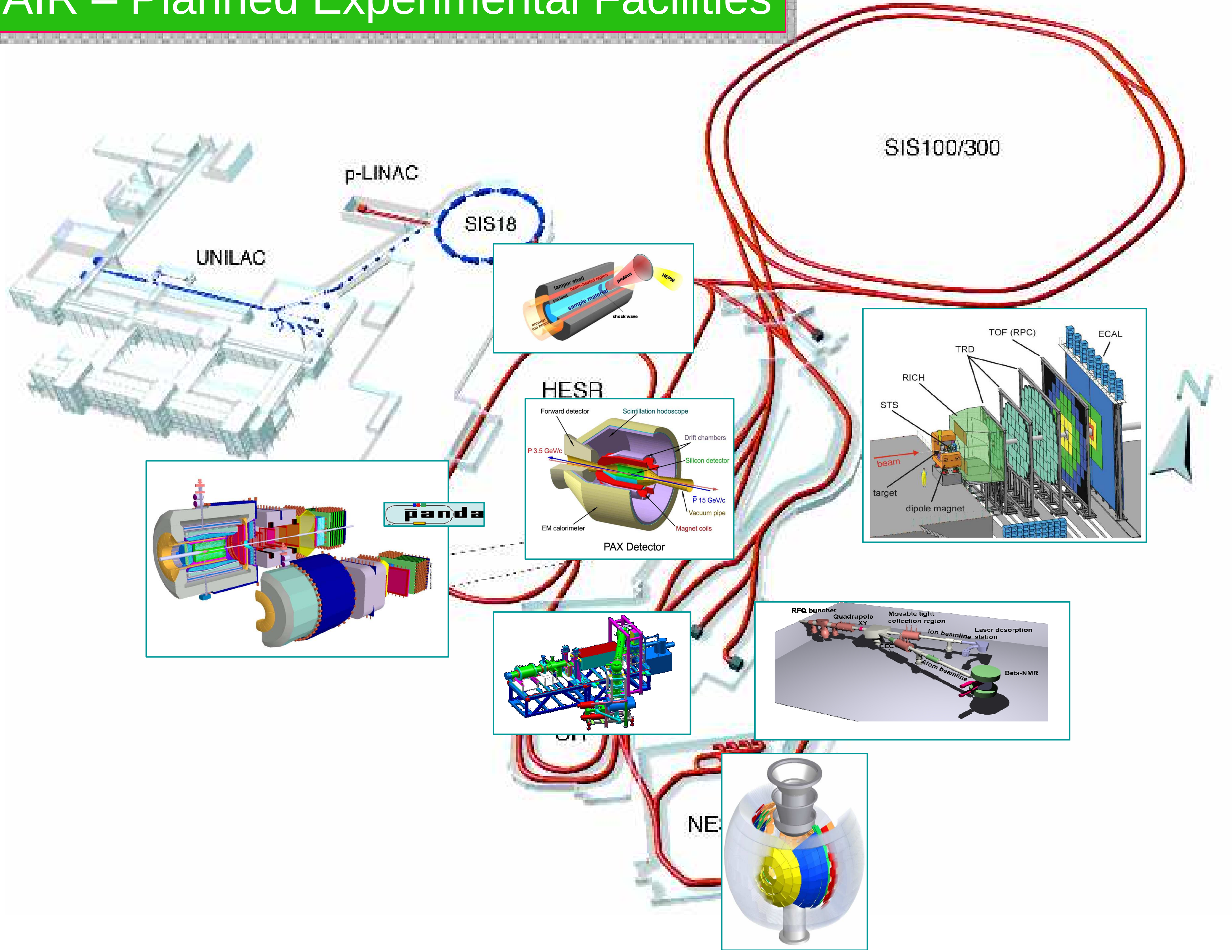


Five scientific pillars and the *key questions*

▪ Hadron Physics with Antiproton Beams	*What is creating the **Mass of nucleons/hadrons**?*
▪ Physics of Nuclear Matter with Relativistic Nuclear Collisions	*What is **Mass in Medium**? Interior of Neutron Stars?*
▪ Nuclear Structure Physics and Nuclear Astrophysics with RIBs	*How are Elements made? Limits of nuclear structures*
▪ Plasma Physics with highly Bunched Beams	*"Physics of Inertial Fusion" and Interior of stars and massive planets*
▪ Atomic Physics and Applied Science	*High Field QED, laws of physics for Anti-Matter*
▪ Accelerator Physics	*Rapid cycling SC magnets? Electron cooling at high energies?*

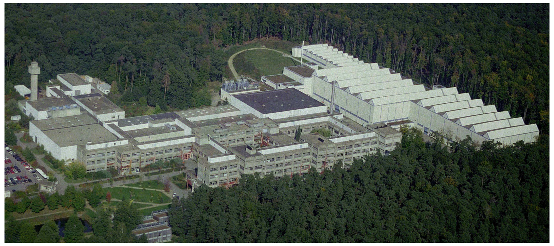
FAIR in competition?

FAIR – Planned Experimental Facilities



Heavy Ion Intensity Frontier

GSI: **1995** ⟶ 2009 ?



Europe

RIKEN: **2009** 2012 ?

Japan

FAIR: **2012** ⟶ 20??

Europe

intensity

⟵

x 1000

Heavy Ion Energy Frontier

CERN SPS: **1985** ⟶ 2005

Europe

RHIC: **1998** ⟶ 2010 ?

USA

CERN LHC: **2008** ⟶ 2020 ?

Europe

Antiproton Facilities *Intensity Frontier*

FNAL: 1983 ⟶ 2009 ?

USA

CERN SPS: 1981 ⟶ 2006

Europe

intensity x 100

FAIR: 2013/4 ⟶ 20??

Europe

Unique features:

e^- cooling

Storage

In-ring experiments

J-PARC

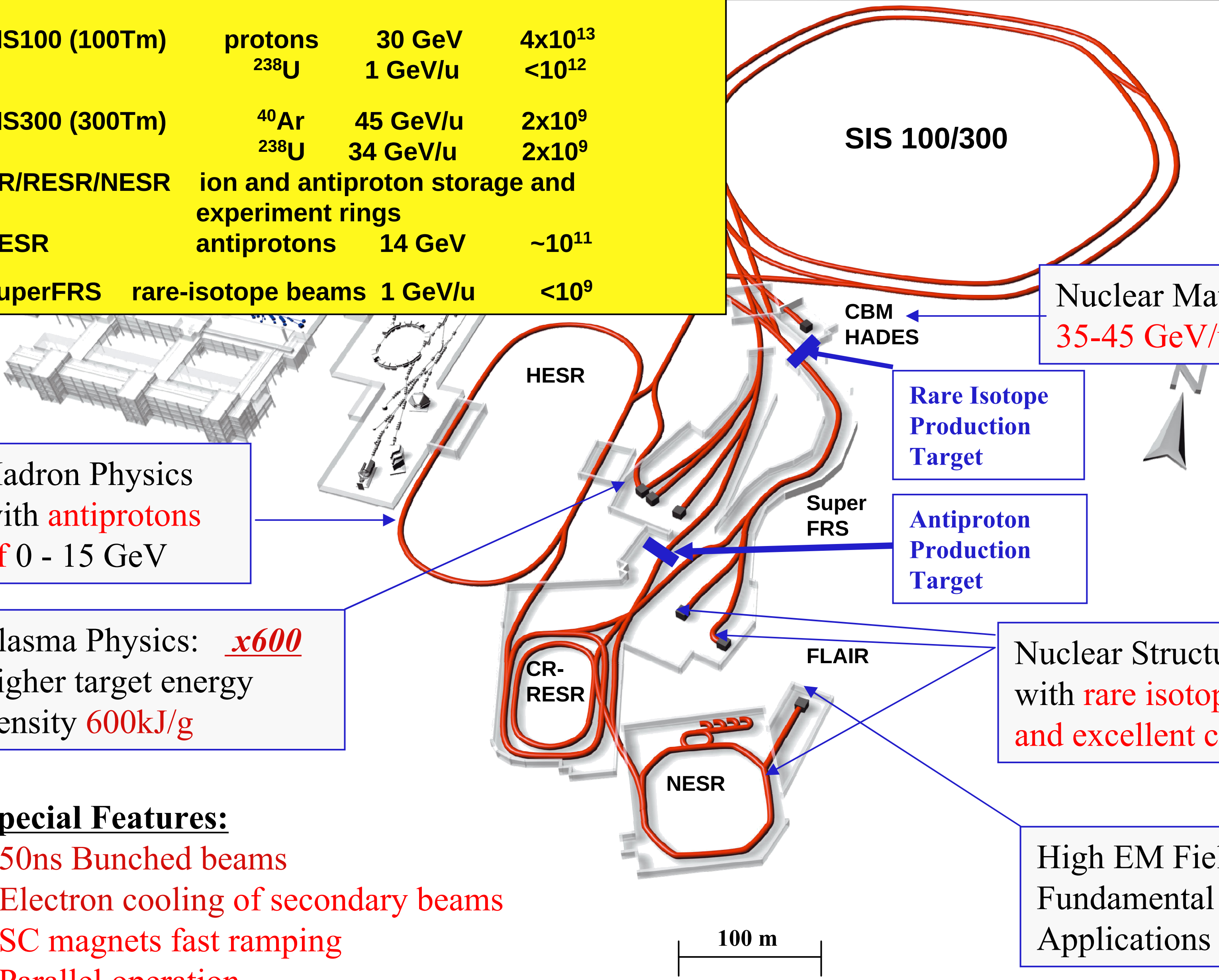
2009 ⟶ 20??

Japan

nunities at FAIR

Accelerator Components & Key Characteristics

Ring/Device	Beam	Energy	Intensity
SIS100 (100Tm)	protons	30 GeV	$4x10^{13}$
	^{238}U	1 GeV/u	$<10^{12}$
SIS300 (300Tm)	^{40}Ar	45 GeV/u	$2x10^{9}$
	^{238}U	34 GeV/u	$2x10^{9}$
CR/RESR/NESR	ion and antiproton storage and experiment rings		
HESR	antiprotons	14 GeV	$\sim10^{11}$
SuperFRS	rare-isotope beams	1 GeV/u	$<10^{9}$



Nuclear Matter Physics with 35-45 GeV/u HI beams, ***x1000***

Rare Isotope Production Target

Antiproton Production Target

Hadron Physics with antiprotons of 0 - 15 GeV

Plasma Physics: ***x600***
higher target energy density 600kJ/g

Nuclear Structure & Astrophysics with rare isotope beams, ***x10 000*** and excellent cooling

High EM Field (HI)
Fundamental Studies (HI & $\bar{p}$)
Applications (HI)

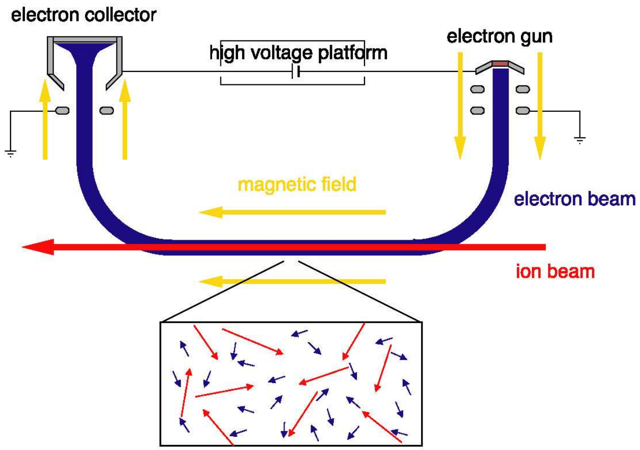
Special Features:

- 50ns Bunched beams
- Electron cooling of secondary beams
- SC magnets fast ramping
- Parallel operation

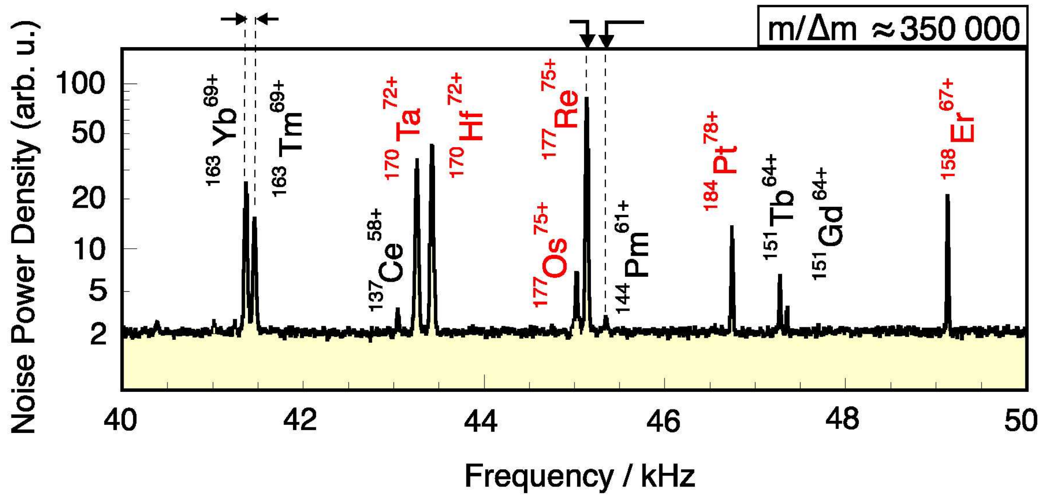
Key Technologies

Electron Cooling of Stored Radioactive Isotope Beams

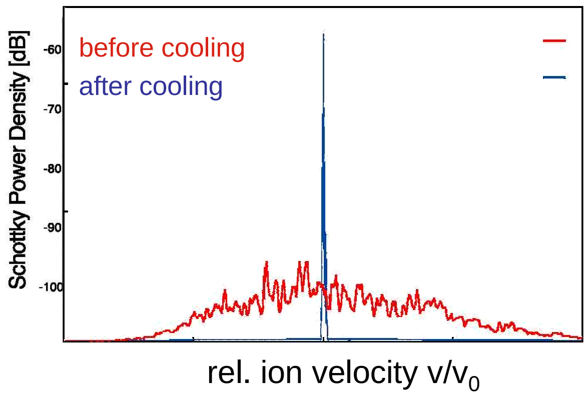
Principle of Electron Cooling



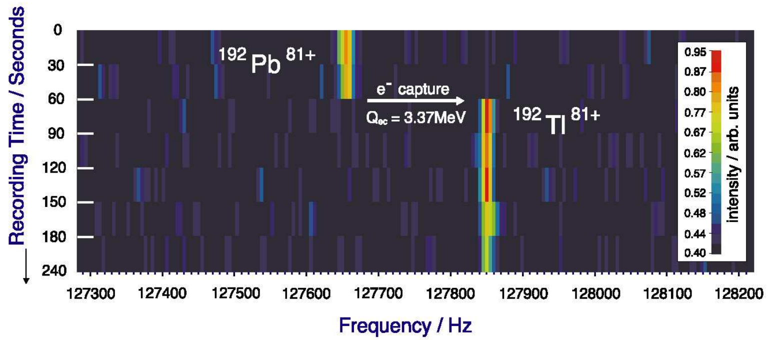
Schottky Mass Spectroscopy



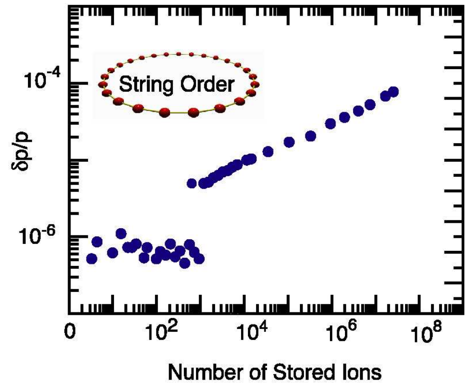
Cooling of Fragment Beams



Decay Spectroscopy of Single Ions



Beam Ordering

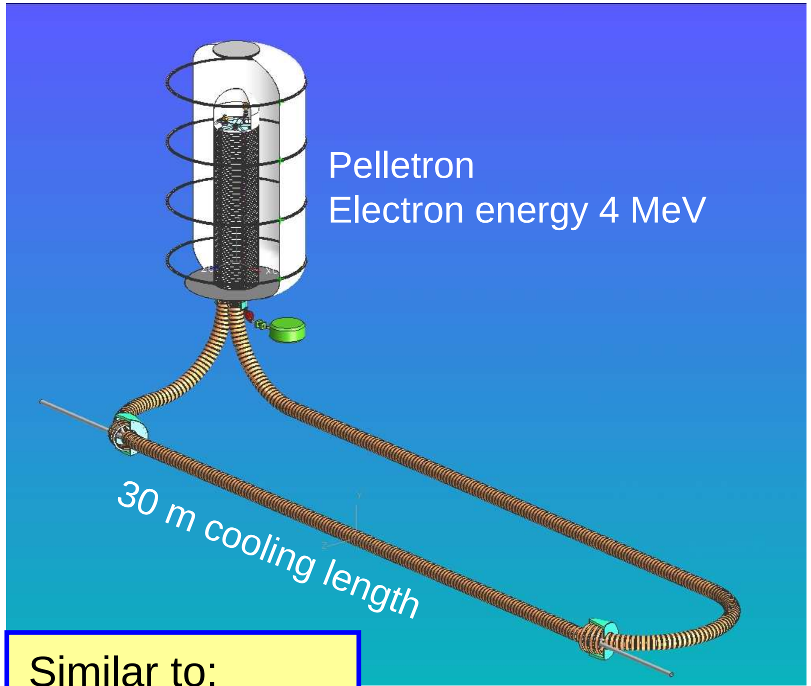


Key technology: Electron Cooling

- Highest Phase Space Density
- Low Momentum Spread

Electron Cooling
500 keV at RESR/NESR
4 000 keV at HESR

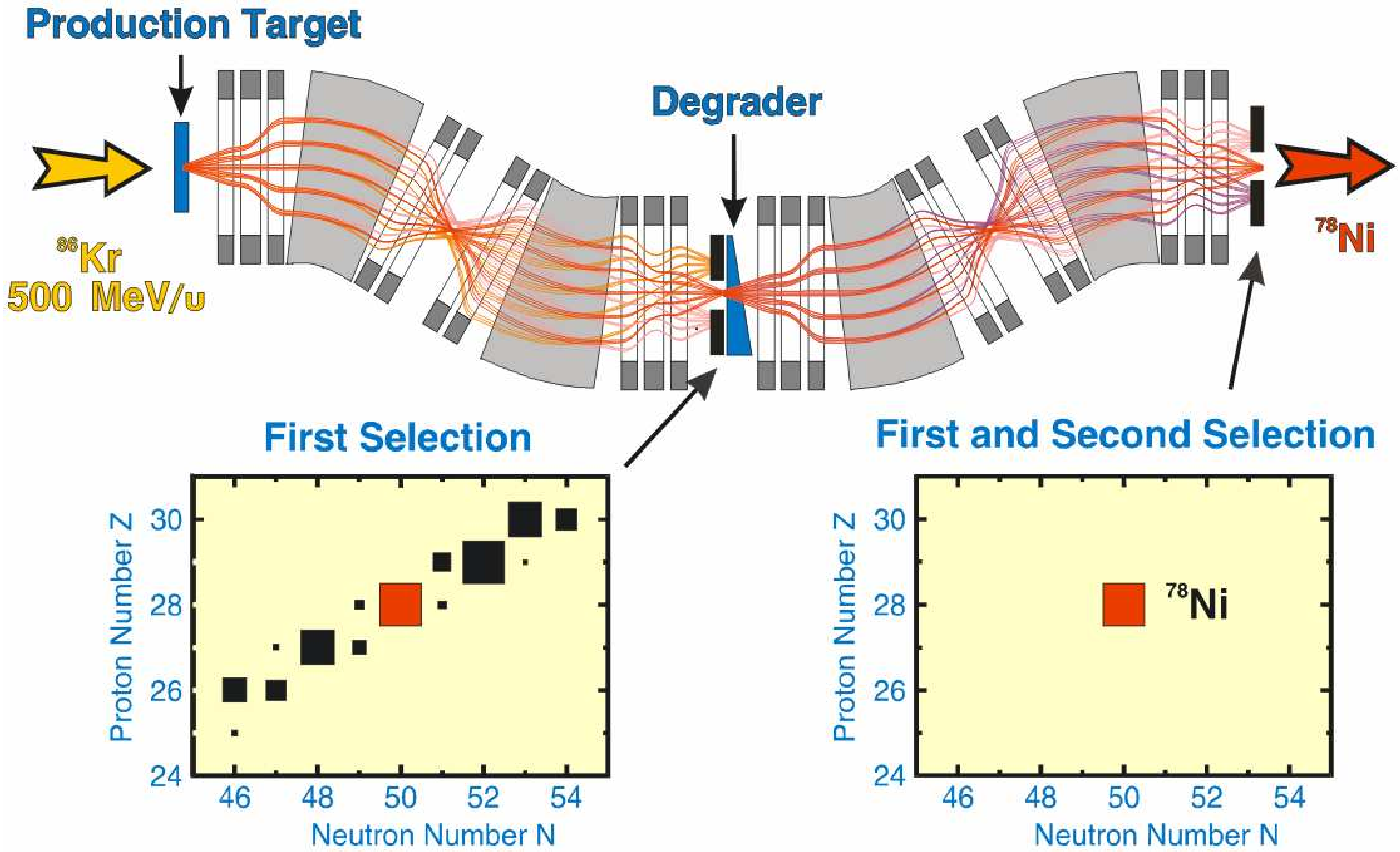
„Standard“ Cooler similar to GSI-ESR Cooler



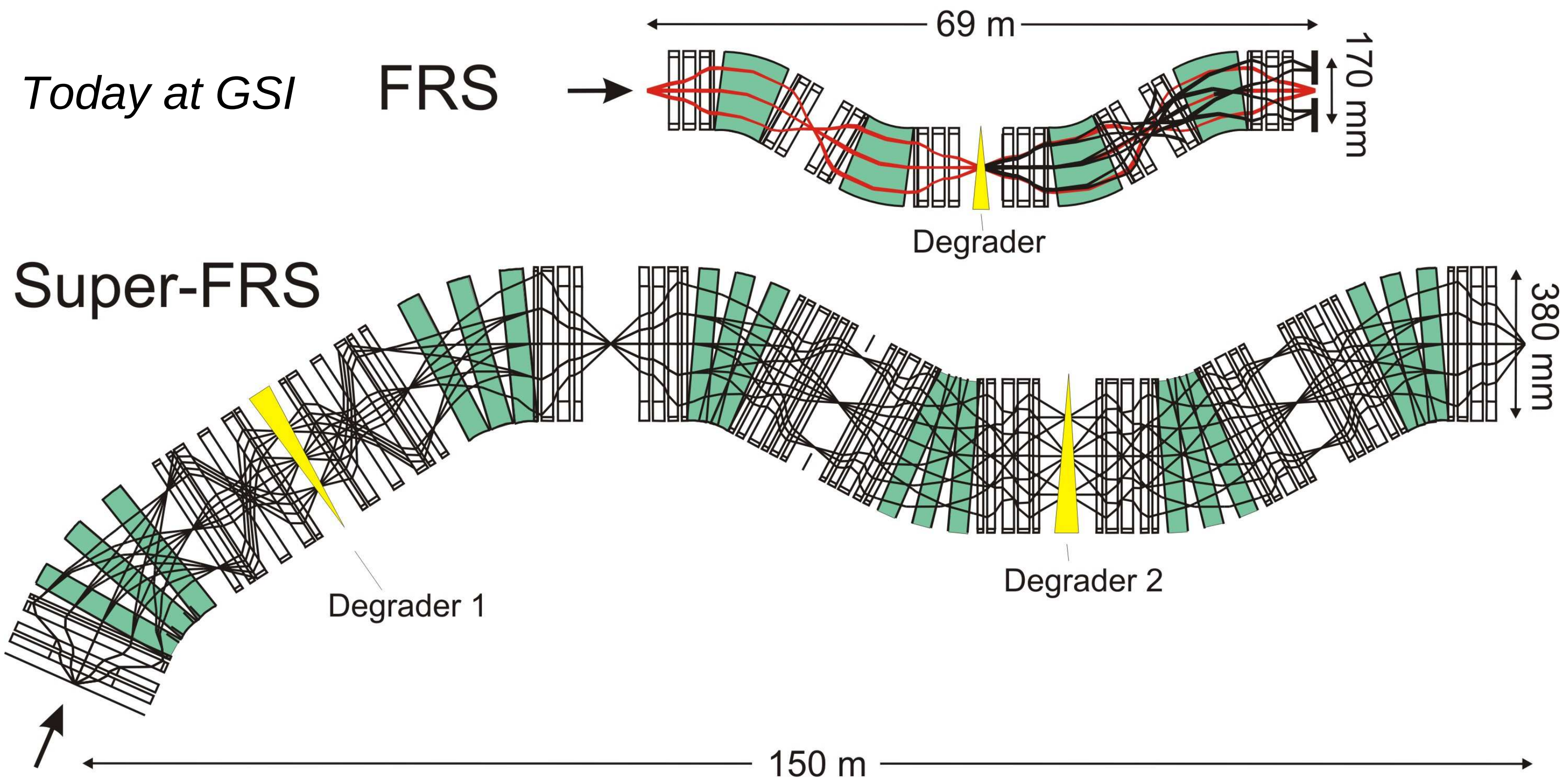
Similar to:
FNAL Recycler
E = 4.3 MeV
I = 2 A
B = 0.01 T
L = 10 m

Bρ-ΔE-Bρ Separation Method

used at RIBLL, FRS, …



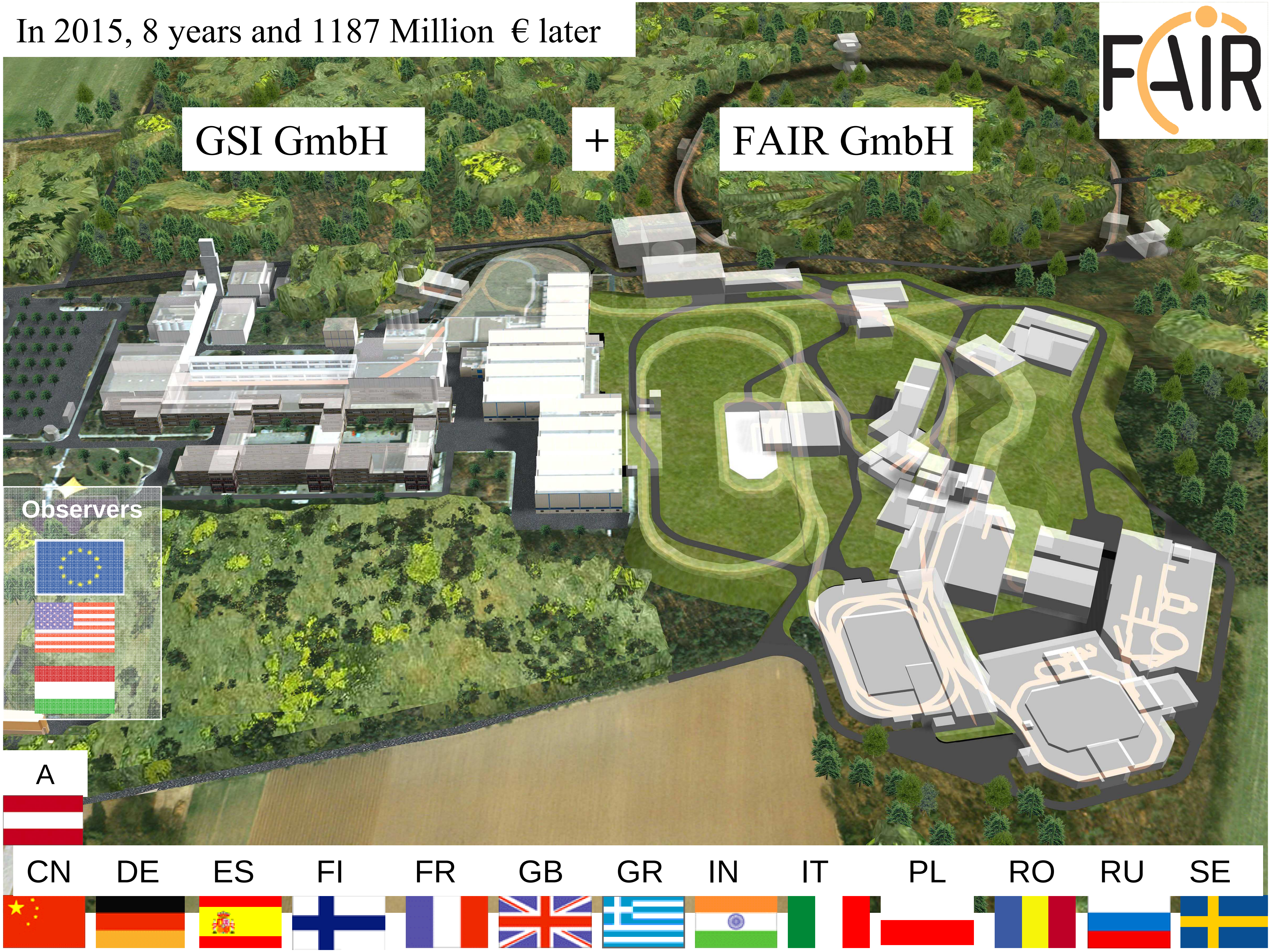
Ion-optical layout of the Super-FRS: High-Energy Branch



	$B\rho_{max}$	$\Delta p/p$	$\Delta\Phi_x$, $\Delta\Phi_y$	resolving power
FRS	18 Tm	±1.0 %	±13, ±13 mrad	1500
Super-FRS	20 Tm	±2.5 %	±40, ±20 mrad	1500

FAIR Accelerator Topics

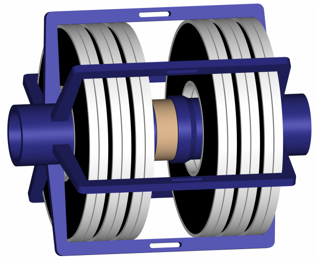
In 2015, 8 years and 1187 Million € later



Accelerator Physics and Key Technologies for FAIR

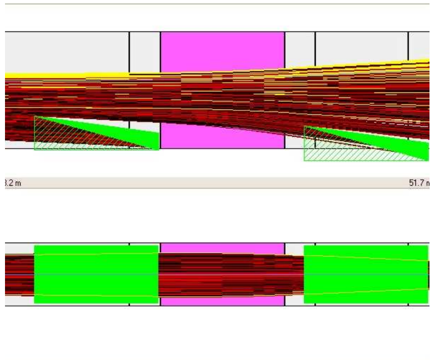
High gradient, low frequency RF cavities

CR compressor cavity



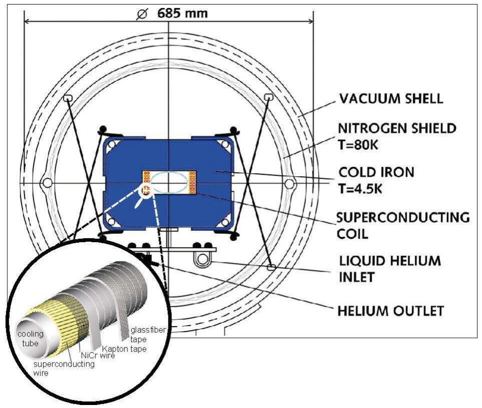
Novel lattice/collimation design: Beam optics studies

control of stripping losses

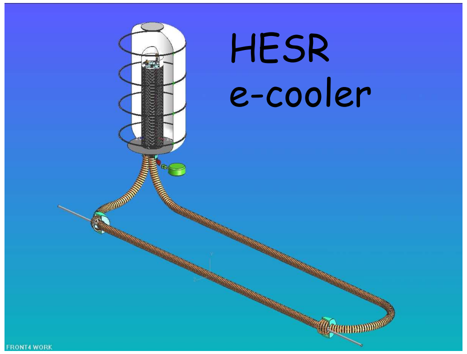


Superconducting, fast ramping synchrotron magnets: 4T/s

SIS 100 dipole magnet



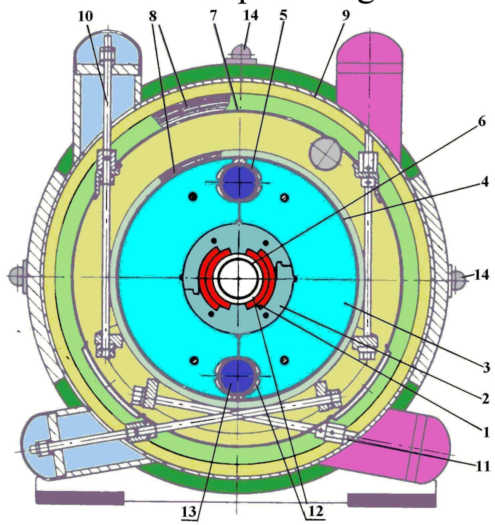
Fast stochastic and electron cooling



Ultra high vacuum for intense beams

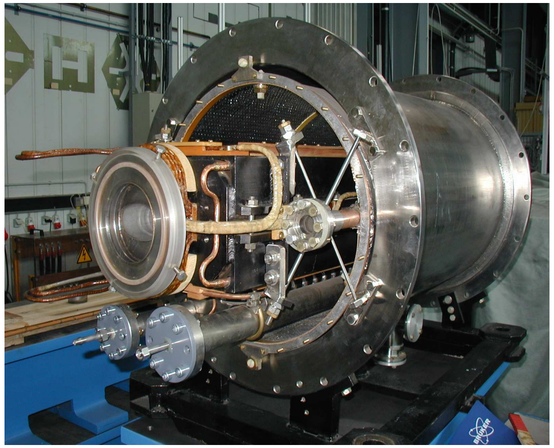
Desorption test-stand

SIS 300 dipole magnet



Key technology: Fast Cycling Synchrotrons

SIS100 magnets: 50 K yoke with superconducting coil (Nucletron JINR Dubna)



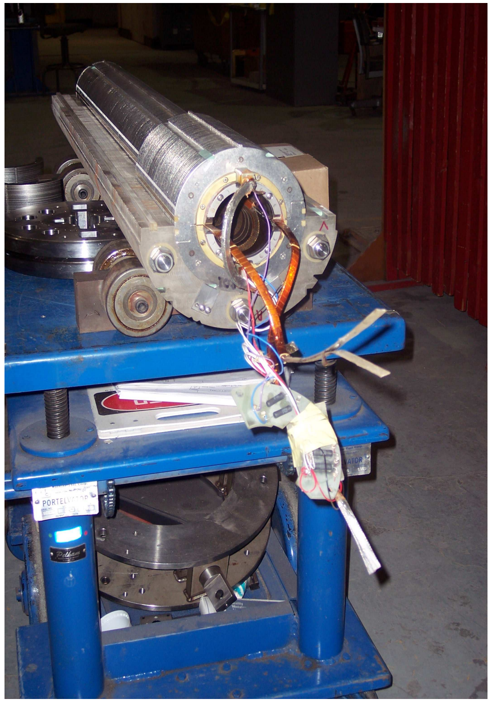
Main R&D goal:
Reduction of AC losses during ramp,
achievements: 40 W/m -> 13 W/m
B_{max}= 2 T, dB/dt = 4T/s, f = 1 Hz

SIS 300 magnets: cosθ - magnet

- **Main R&D goal:**
  Reduction of AC losses during ramping by improved cable and coil design
- **Efficient conductor cooling**

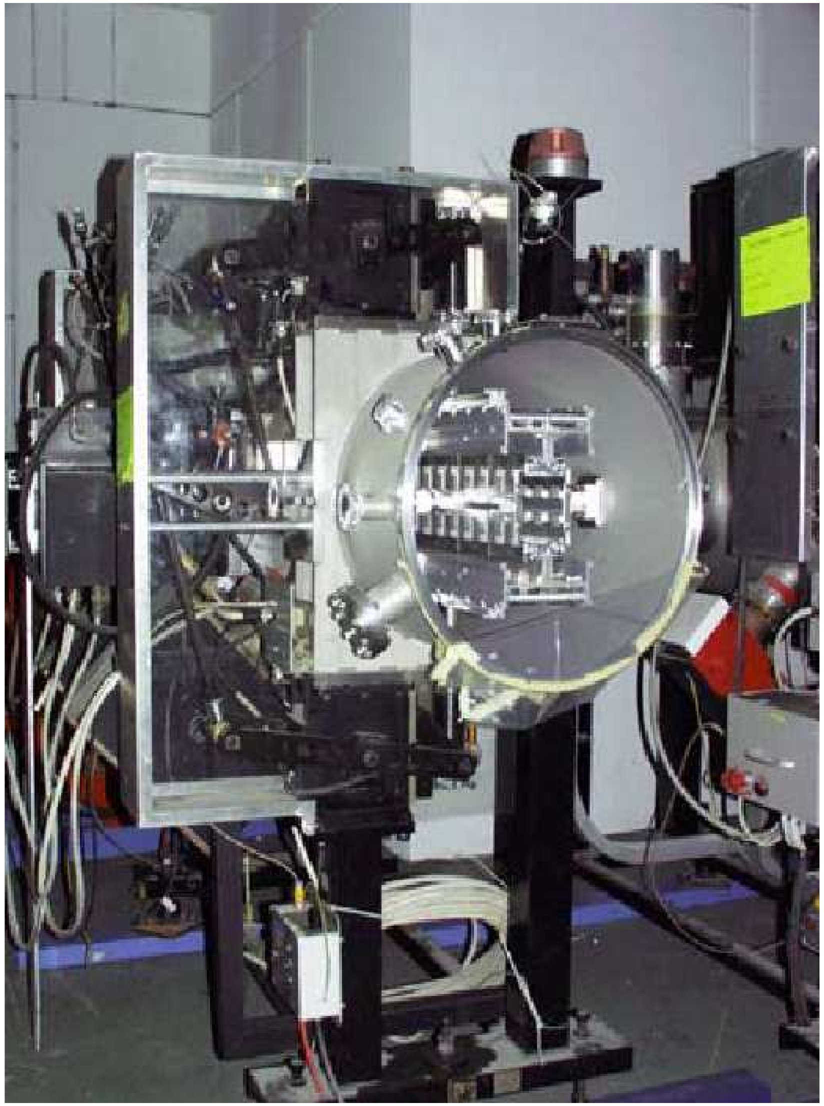
B_{max} = 6 T, dB/dt = 1 T/s

(HERA: 4 mT/s, RHIC: 70 mT/s, LHC: 8 mT/s)



„GSI001“
4 T, 1 T/s
by BNL

Key technology: Stochastic Cooling



CR: cooling of RIB, p-bar
f = 1 – 2 GHz, 9.5 kW
LHe cooled PUs
water cooling (kicker)
No bake-out
Moveable electrodes 120 – 60 mm at 2-5 Hz
4 PU, 3 kicker à 2.4 m

RESR: cooling p-bar
f = 1 – 2 GHz, 2 kW
water cooling (kicker)
UHV, bake-out required for decelerated RIBs
Fixed electrodes
3 PU, 3 kicker à 2.4 m

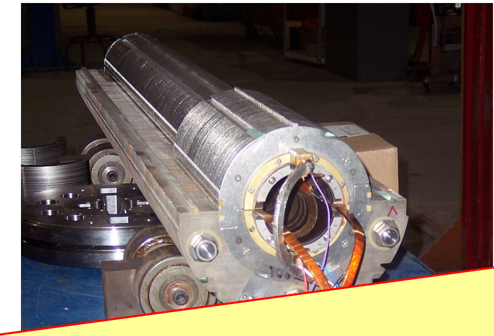
HESR: cooling HI, p-bar
f = 2 – 4 GHz, 200 W
LHe cooled PUs
UHV, bake-out required
Moveable electrodes
3 PU, 3 kicker, à 3 m

Preparatory Phase R&D by GSI & Partner Institutes since 2001

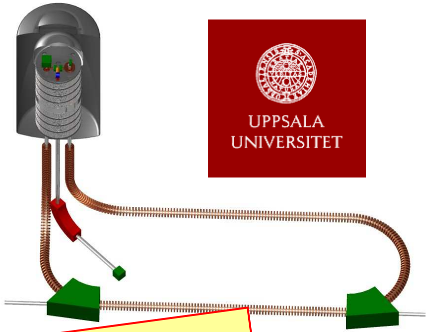
INFN Istituto Nazionale di Fisica Nucleare

BROOKHAVEN NATIONAL LABORATORY

SIS300 magnets



NESR Electron Cooling



UPPSALA UNIVERSITET

Jülich

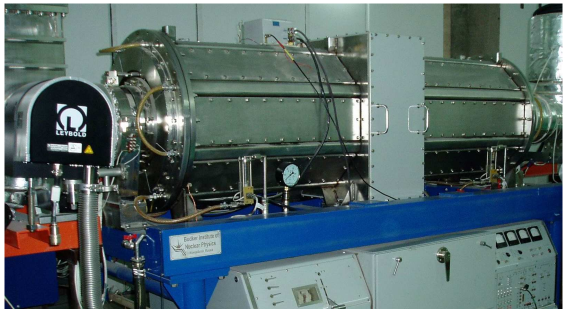
IH

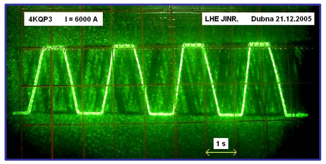
German BMBF provides 60 M€ for FAIR preparatory phase
(for R&D on accelerators, civil engineering and experiments)

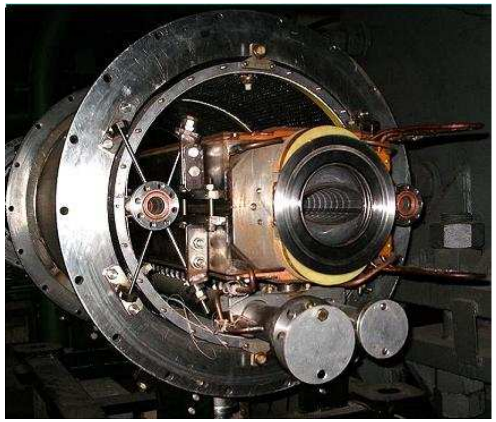
CEA

rapidly cycling sc magnets

equency
Cavities



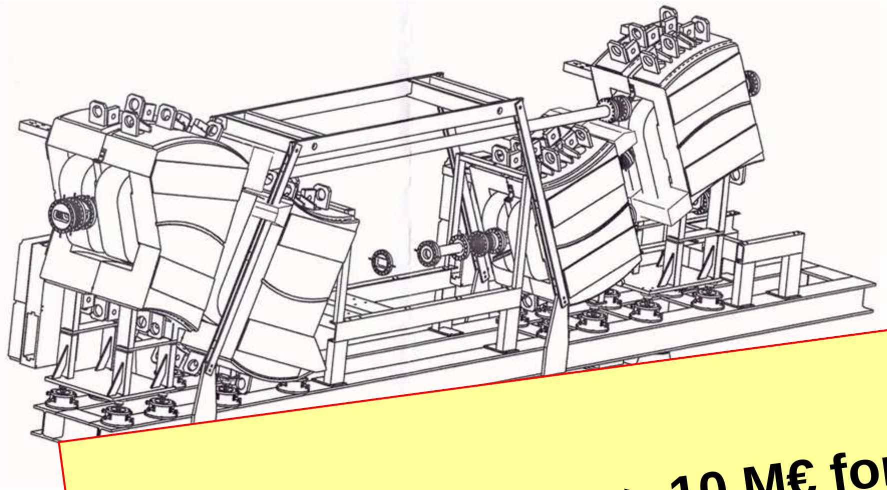




BINP Novosibirsk

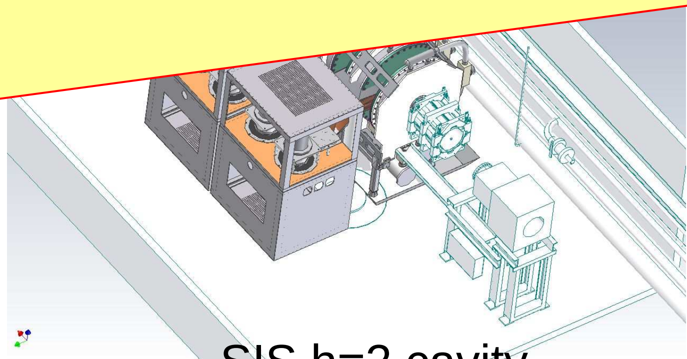
R&D at GSI funded by EU

Projects funded by the European Community
under the "Structuring the European Research Area" Specific Programme
Research Infrastructures action



Ch

EU provides > 10 M€ for FAIR preparatory phase



SIS h=2 cavity

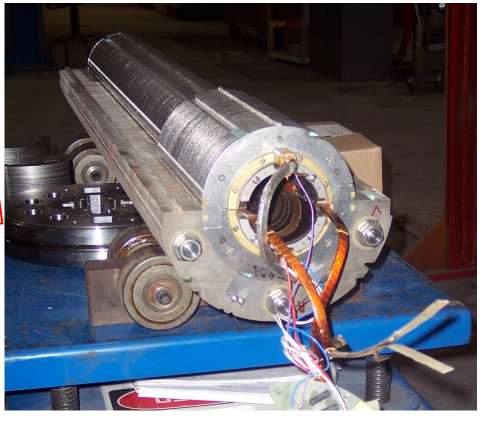
300 kV septum power converter

R&D on SIS 300 by INFN, Italy

Istituto Nazionale di Fisica Nucleare

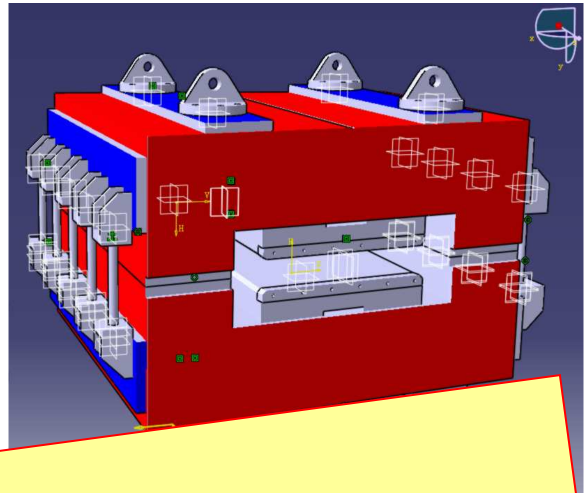
SIS300 lattice types	a)	b)
Number of superperiods	6	6
Number of regular cells	78	78
Dipole Magnets		
Type	Straight, short	Bent, long
Coil	two layer coil	one layer coil
Number of dipole magnets	108	54
Magnetic field [T]	6	4.5
Ramp rate [T/s]	1	1-4
Effective field length [m]	2.908	7.755
Bending radius [m]	50.00	66.667
Bending angle [deg]	3 1/3	6 2/3
Free aperture h / v [mm]	86 (circ.)	78 (circ.)

INFN develops a 4.5 T SIS 300 dipole magnet
Capital cost financing: 3.7 M€ INFN, 1 M€ GSI
40 FTE by INFN



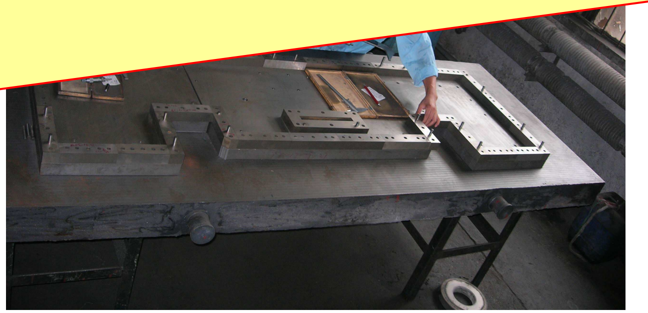
R&D Activities CHINA

on large aperture magnets for FAIR CR / Super FRS

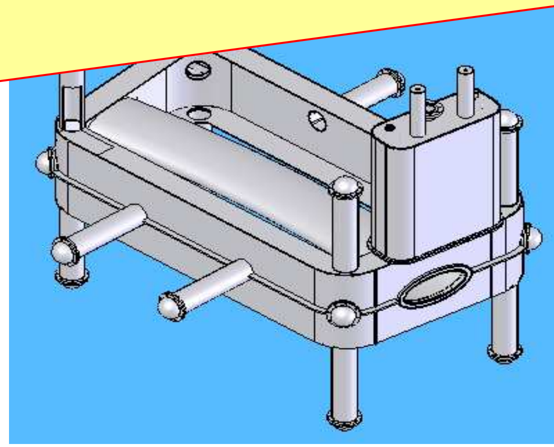


Institute of Modern Physics, CAS (IMP Lanzhou)
Institute of Plasma Physics, CAS (IPP, Hefei)
Institute of Electric Engineering, CAS (IEE, Beijing)

Common R&D financed 50:50 in FAIR preparatory phase



Die ready for stamping of laminations



Cryostat for sc coil

R&D Collaboration Partners Spain and India

Studies on NESR magnets, vacuum system, power converters

Raja Ramanna Centre for Advanced Technology
Indore, India

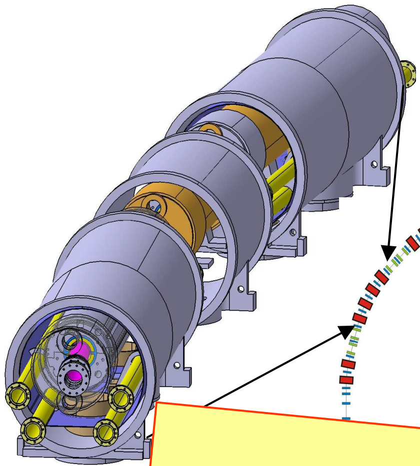
Bhaba Atomic Research Centre
Mumbai, India

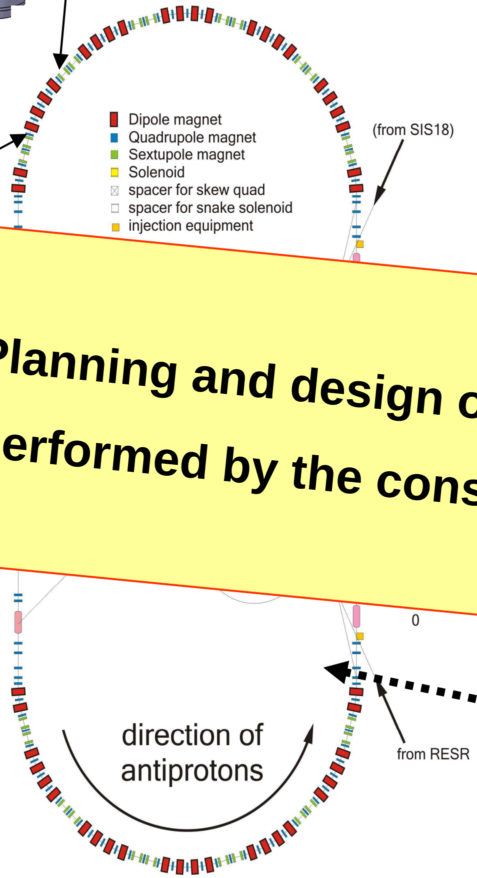
Plans to build Super-FRS energy buncher and high power beam dumps, and proton-linac

List not complete !!

Variable Energy Cyclotron Centre, Kolkata

HESR Consortium FZ Jülich, TSL Sweden



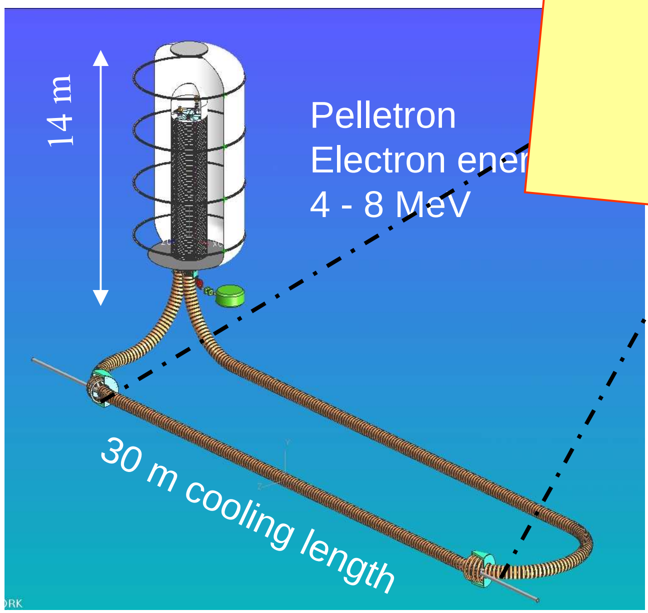


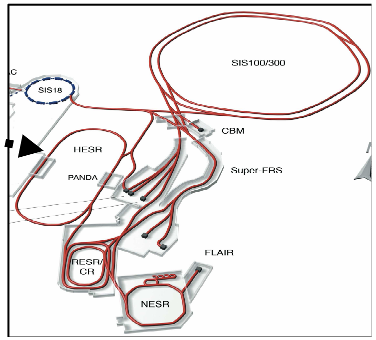
Forschungszentrum Jülich
in der Helmholtz-Gemeinschaft

UPPSALA UNIVERSITET

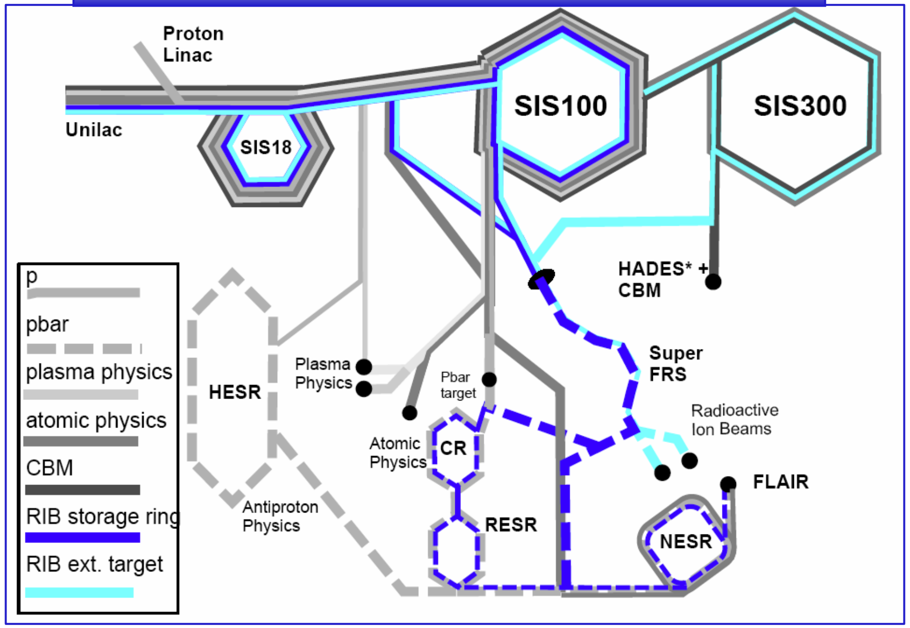
TSL

Planning and design of HESR performed by the consortium

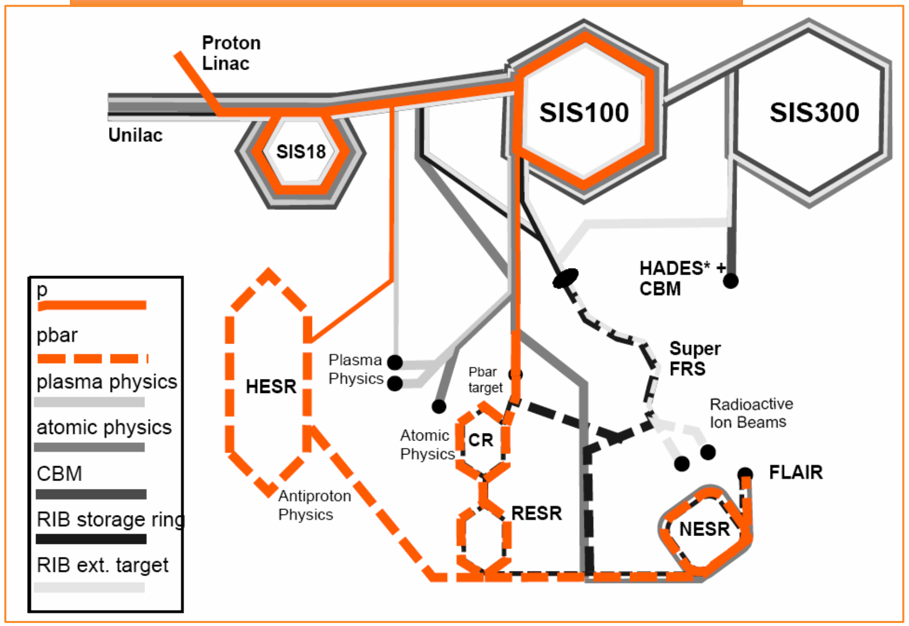




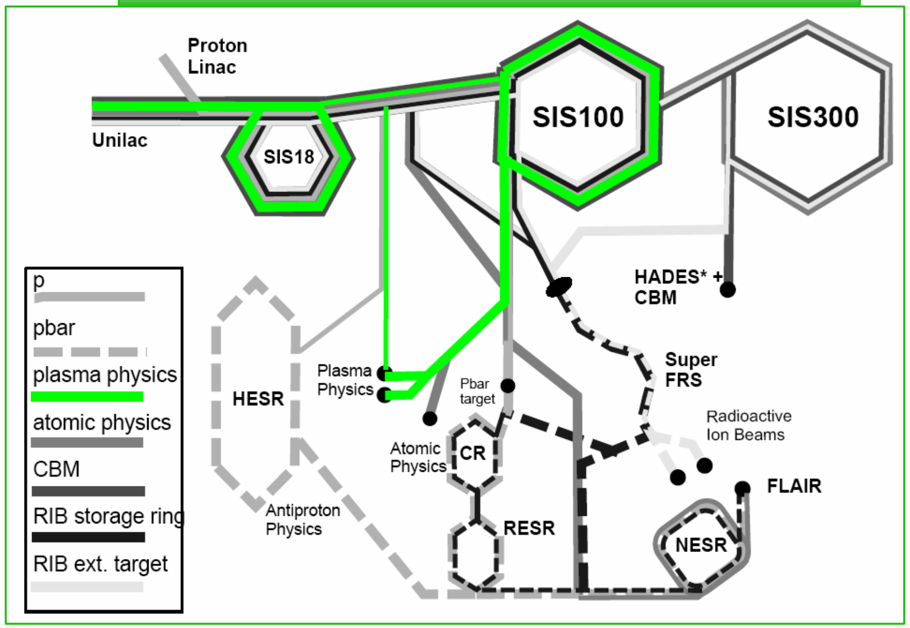
Radioactive Ion Beam Programme



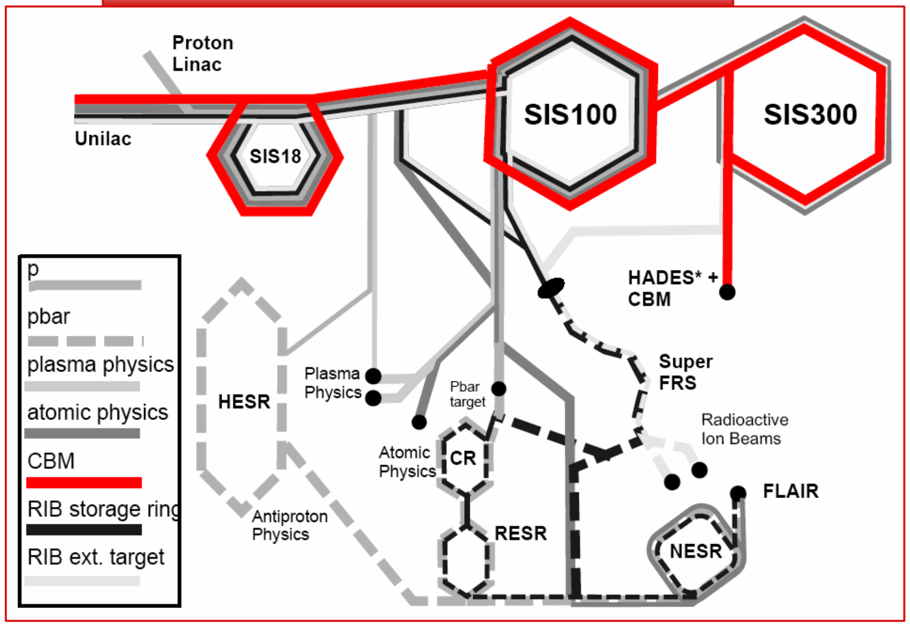
Anti Proton Beam Programme



Plasma Physics Beam Programme



Relat. Ion Beam Programme



Research Programmes

FAIR Baseline Technical Report

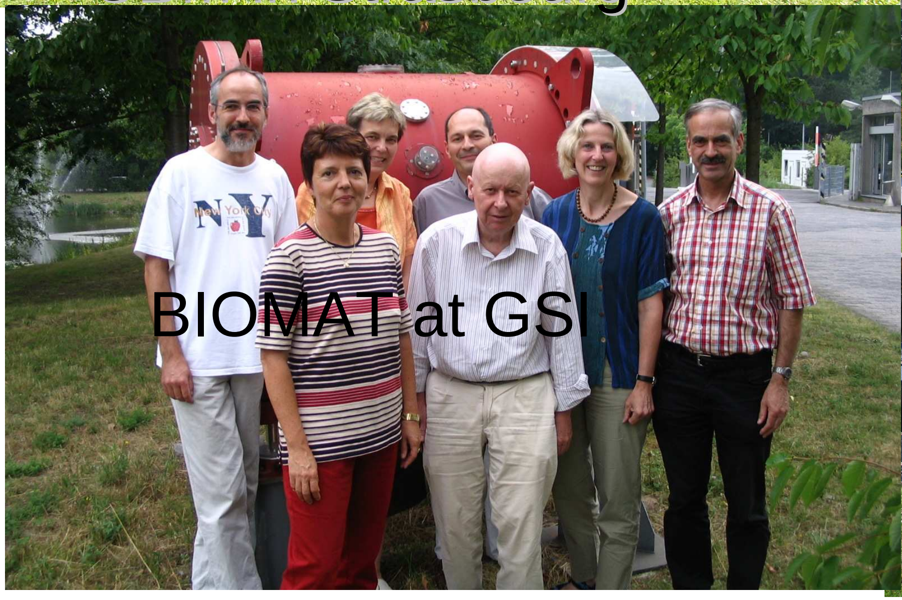
Official project description

6 Volumes with more than **3500** pages and

more than **2600** authors

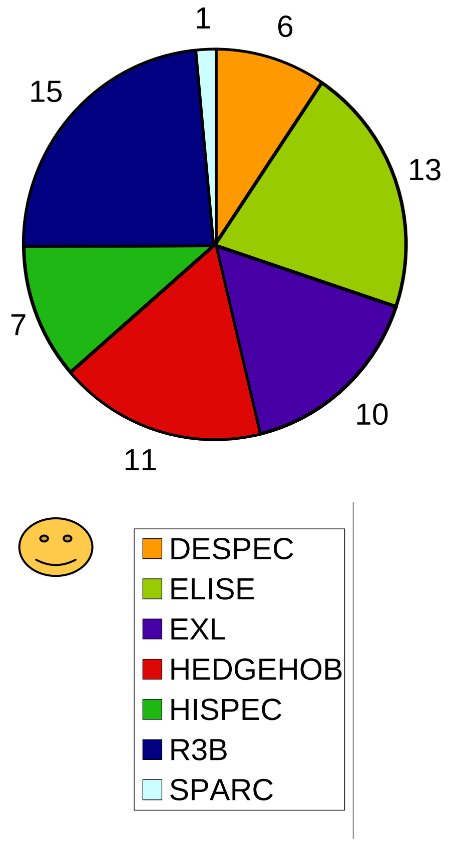
Volume 1	**Executive Summary**
Volume 2	**Accelerator and Scientific Infrastructure**
Volume 3A	**Experiment Proposals on QCD Physics** 3.1 CBM
Volume 3B	**Experiment Proposals on QCD Physics** 3.2 PANDA 3.3 PAX 3.4 ASSIA
Volume 4	**Experiment Proposals on Nuclear Structure & Astro Physics (NUSTAR)** 4.1 LEB-SuperFRS 4.2 HISPEC/DESPEC 4.3 MATS 4.4 LASPEC 4.5 R3B 4.6 ILIMA 4.7 AIC 4.8 ELISe 4.9 EXL
Volume 5	**Experiment Proposals on Atomic, Plasma & Applied Physics (APPA)** 5.1 SPARC 5.2 HEDgeHOB 5.3 WDM 5.4 FLAIR 5.5 BIOMAT
Volume 6	**Civil Construction and Safety**

Some FAIR Collaboration pictures
(more than 50 experiment collaboration meetings in 2006)



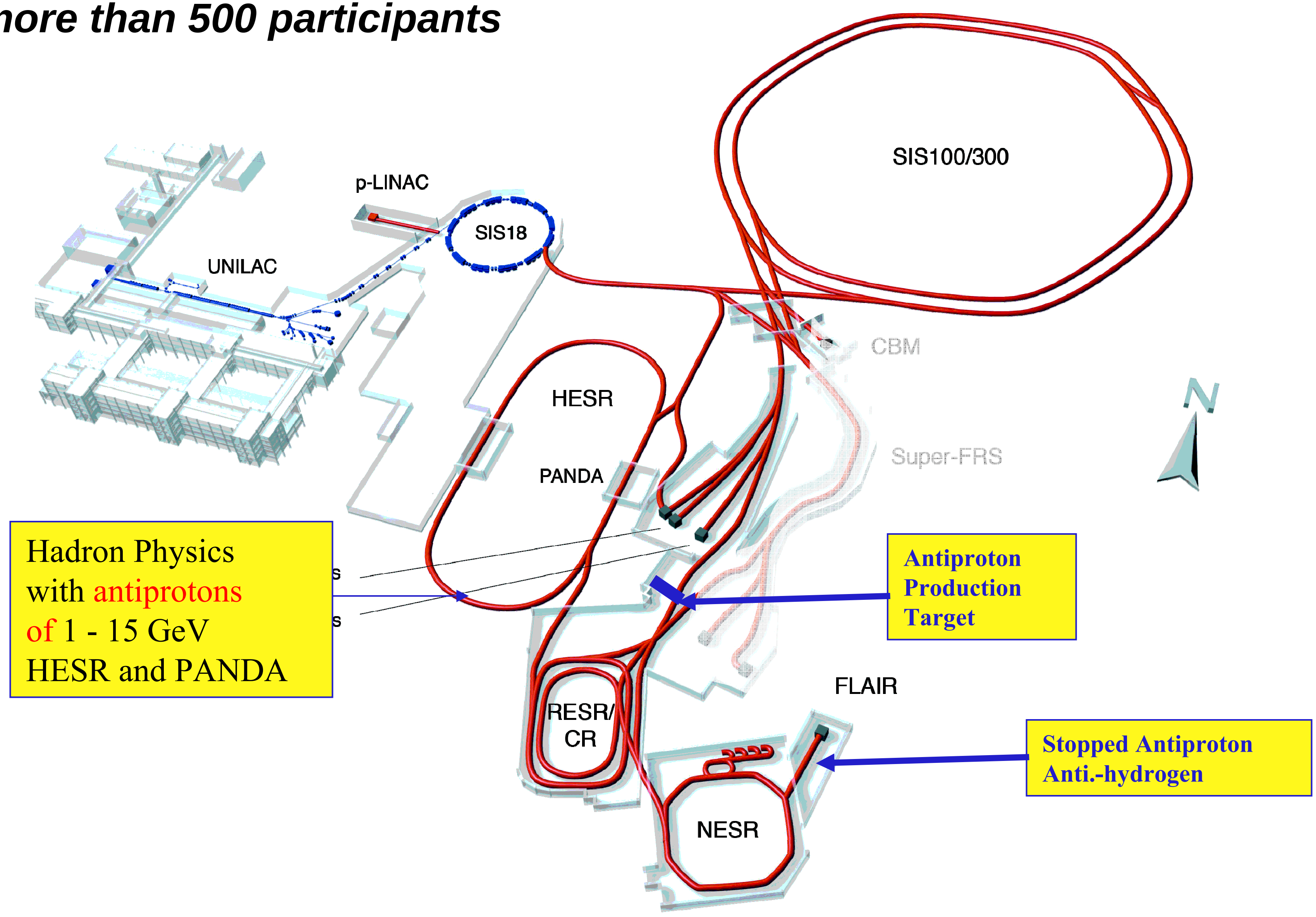
Spanish participation in FAIR

CIEMAT	3
UPC Univ. Politecnica Cataluna	2
Granada University	2
University of Huelva	5
UCLM Universidad de Castilla La Mancha	8
Complutense University of Madrid	2
UAM Univ. Autonoma de Madrid	1
IMAFF-CSIC Madrid	2
IEM CSIC Madrid	6
IFIC CSIC - Univ. Valencia	5
Universidad de Salamanca	1
University of Santiago de Compostela	5
University of Sevilla	3
Polytechnic University of Valencia	3
Universitat de Valencia	1
Sum Participants	**49**



Hadron Community at FAIR

more than 500 participants

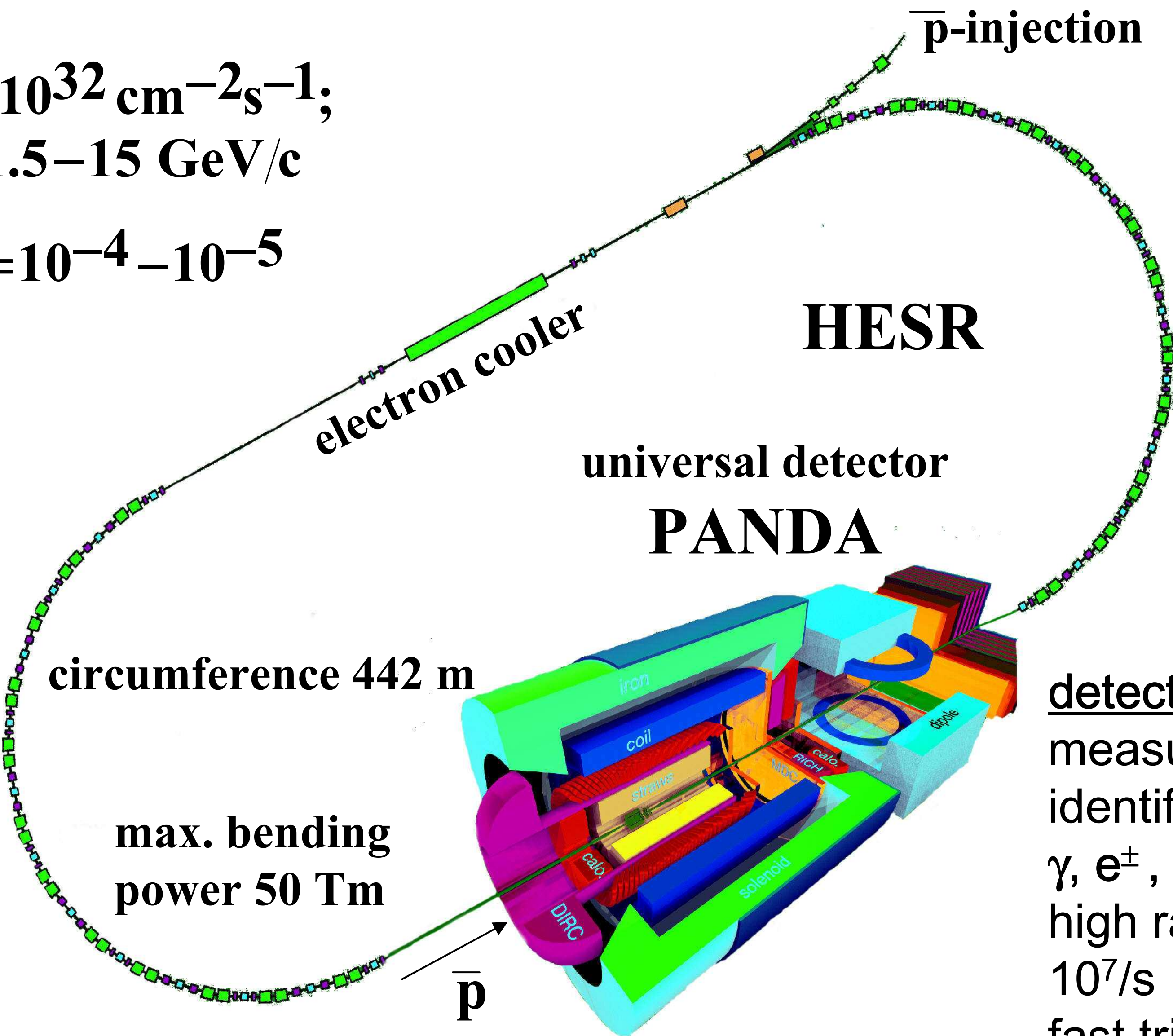


High-Energy Storage & Cooler Ring (HESR) und Detector

$L = 2\cdot 10^{32}\,\mathrm{cm}^{-2}\mathrm{s}^{-1}$;

$p_{\bar{p}} = 1.5 - 15$ GeV/c

$\Delta p/p = 10^{-4} - 10^{-5}$



<u>detector features:</u>

measurement and identification of

γ, $e^{\pm}$, $\mu^{\pm}$, $\pi^{\pm}$, $K^{\pm}$, $\bar{p}$, p

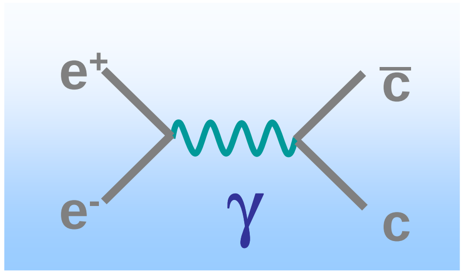
high rate capability

10^7/s interactions

fast trigger scheme

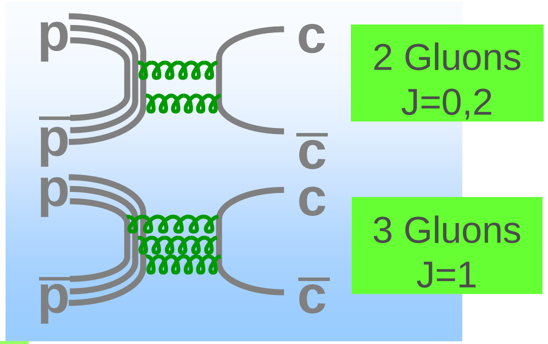
Why $p\,\bar{p}$ in hadron Physics ?

- $e^+e^- \to \bar{c}\,c$ permits only direct production of states with Quantum numbers of the **Photon $J^{PC}=1^{--}$**
- All other states only via □-decay

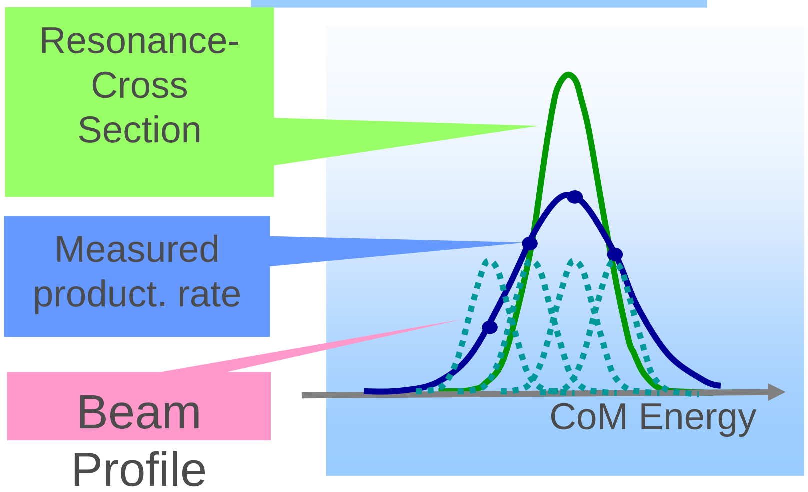


- $\bar{p}p \to \bar{c}c$ allows for direct formation of

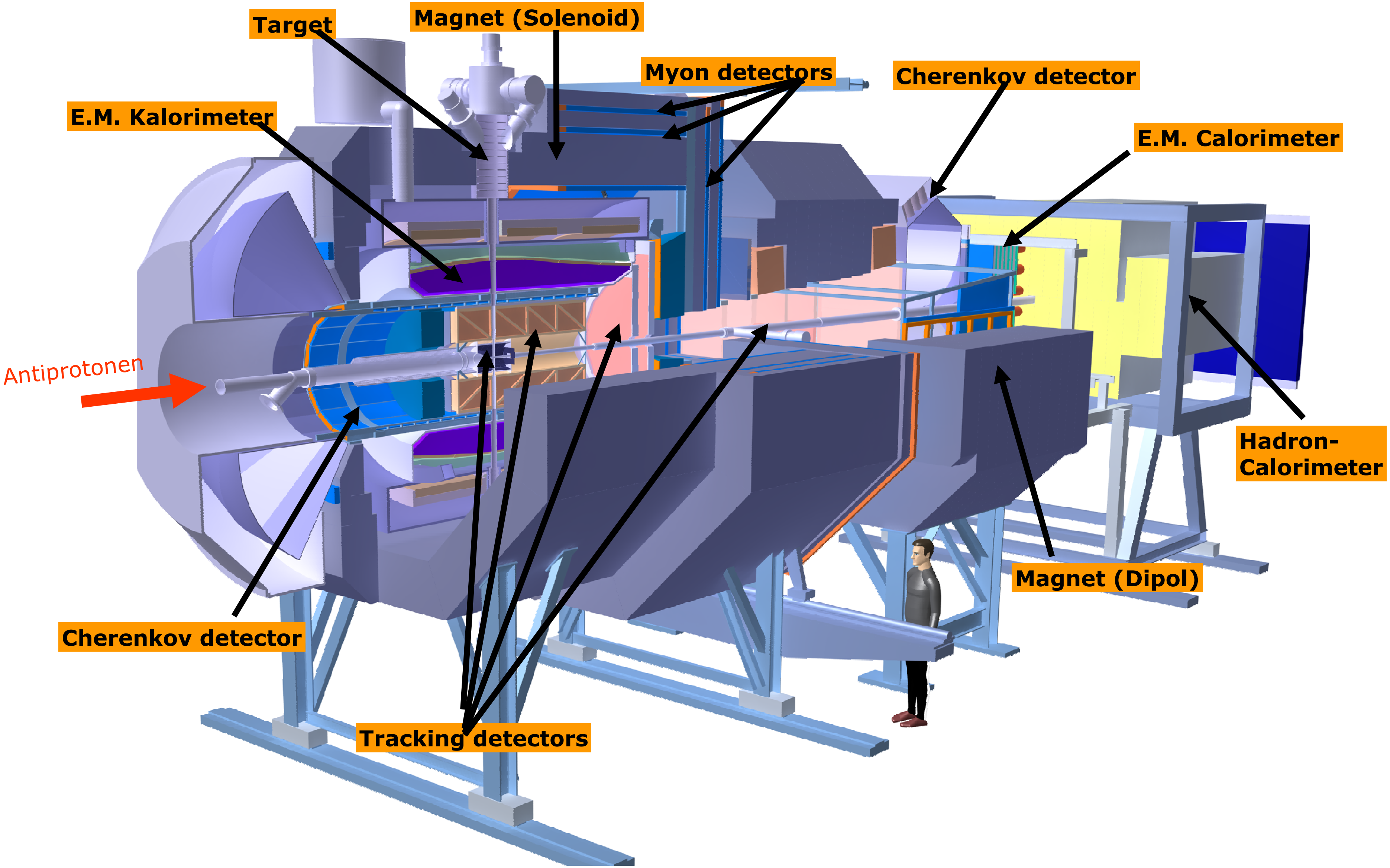
  all States



- Determination of **Mass** und **Width** with high Precision 10^{-5} („Resonance-Scan“)



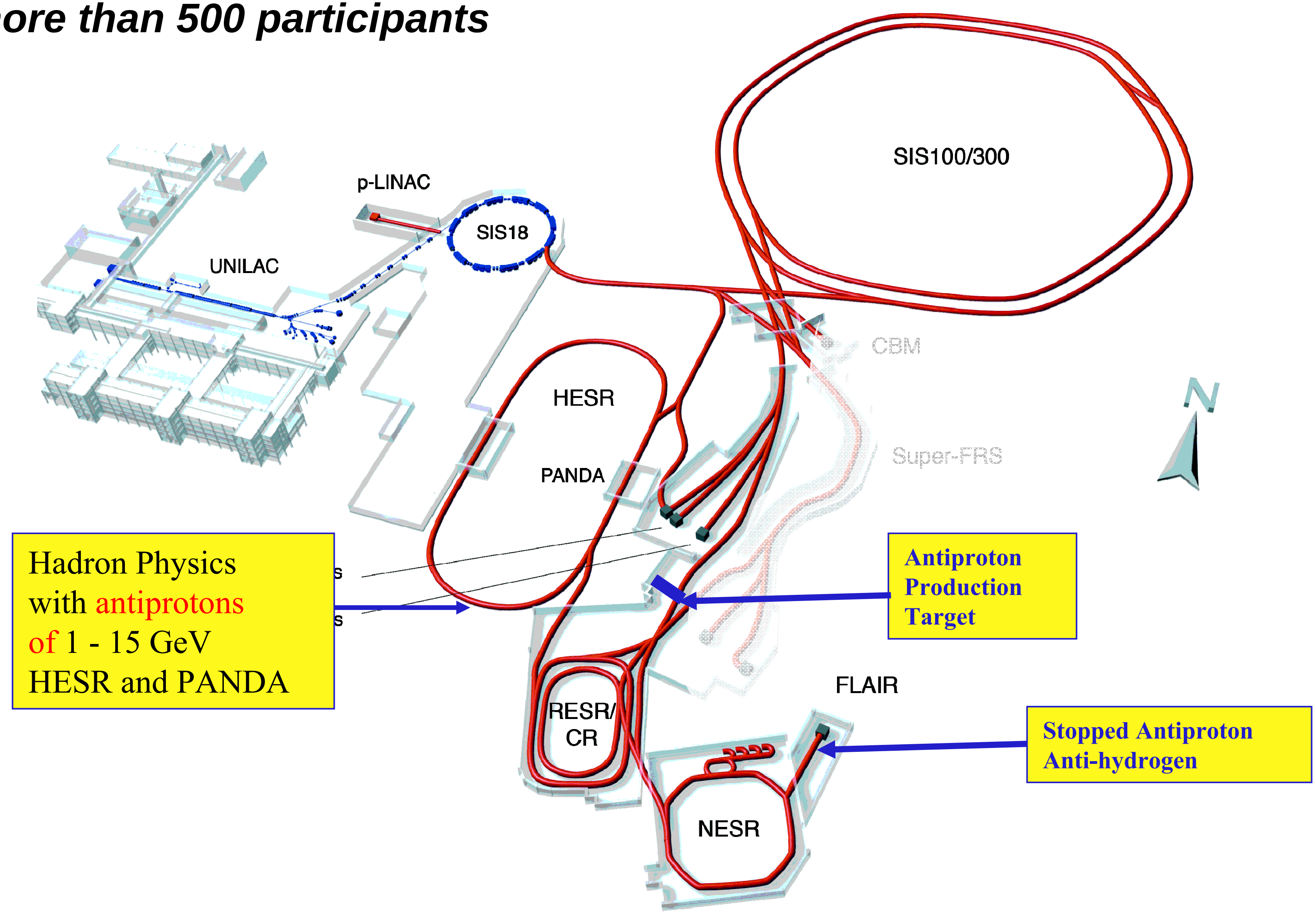
PANDA



Target
Magnet (Solenoid)
Myon detectors
Cherenkov detector
E.M. Kalorimeter
E.M. Calorimeter
Antiprotonen
Hadron-
Calorimeter
Magnet (Dipol)
Cherenkov detector
Tracking detectors

Hadron Community at FAIR

more than 500 participants



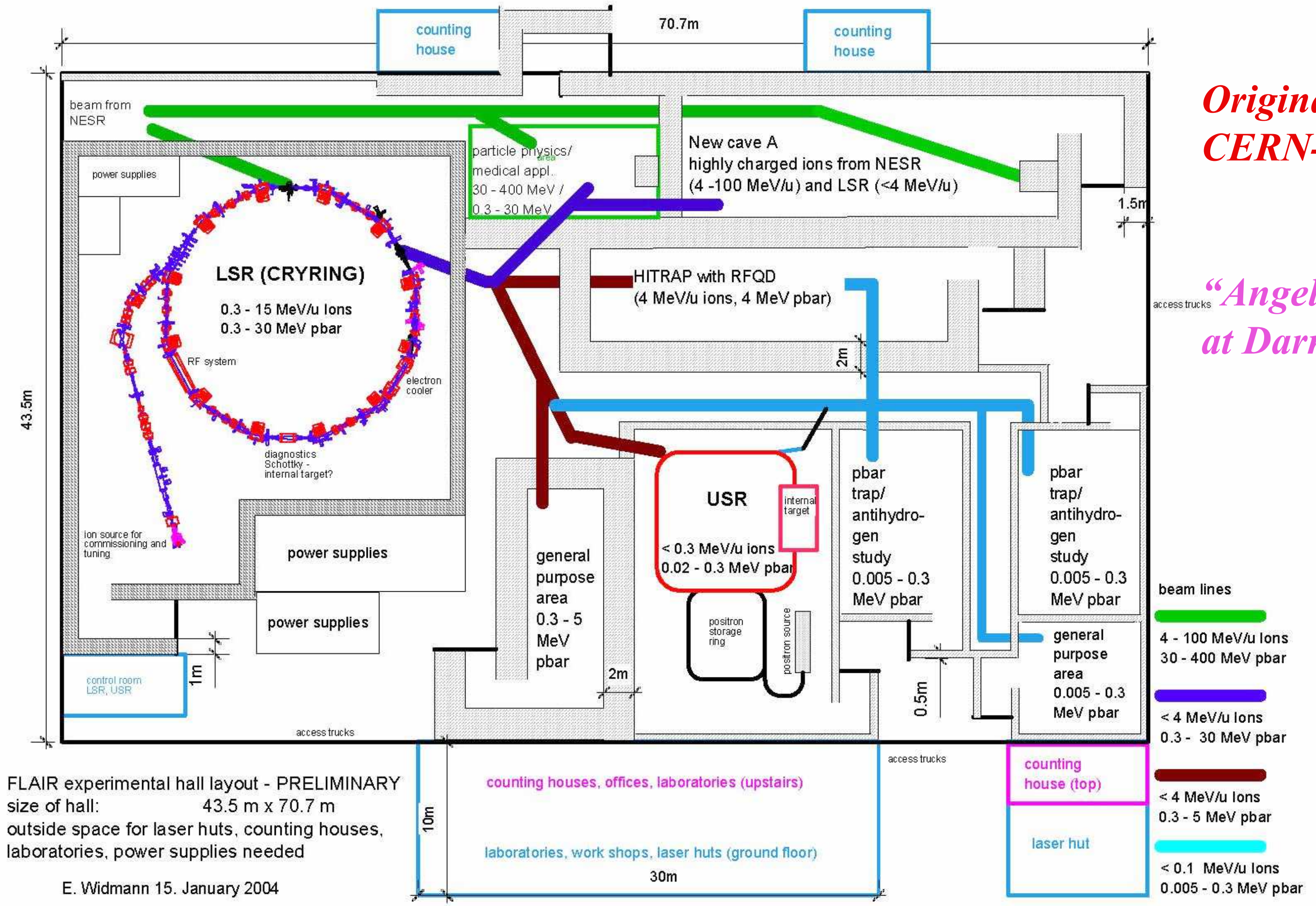
FLAIR@FAIR:

Facility for Low energy Antiprotons and Ion Research

100x more intensity than at CERN AD

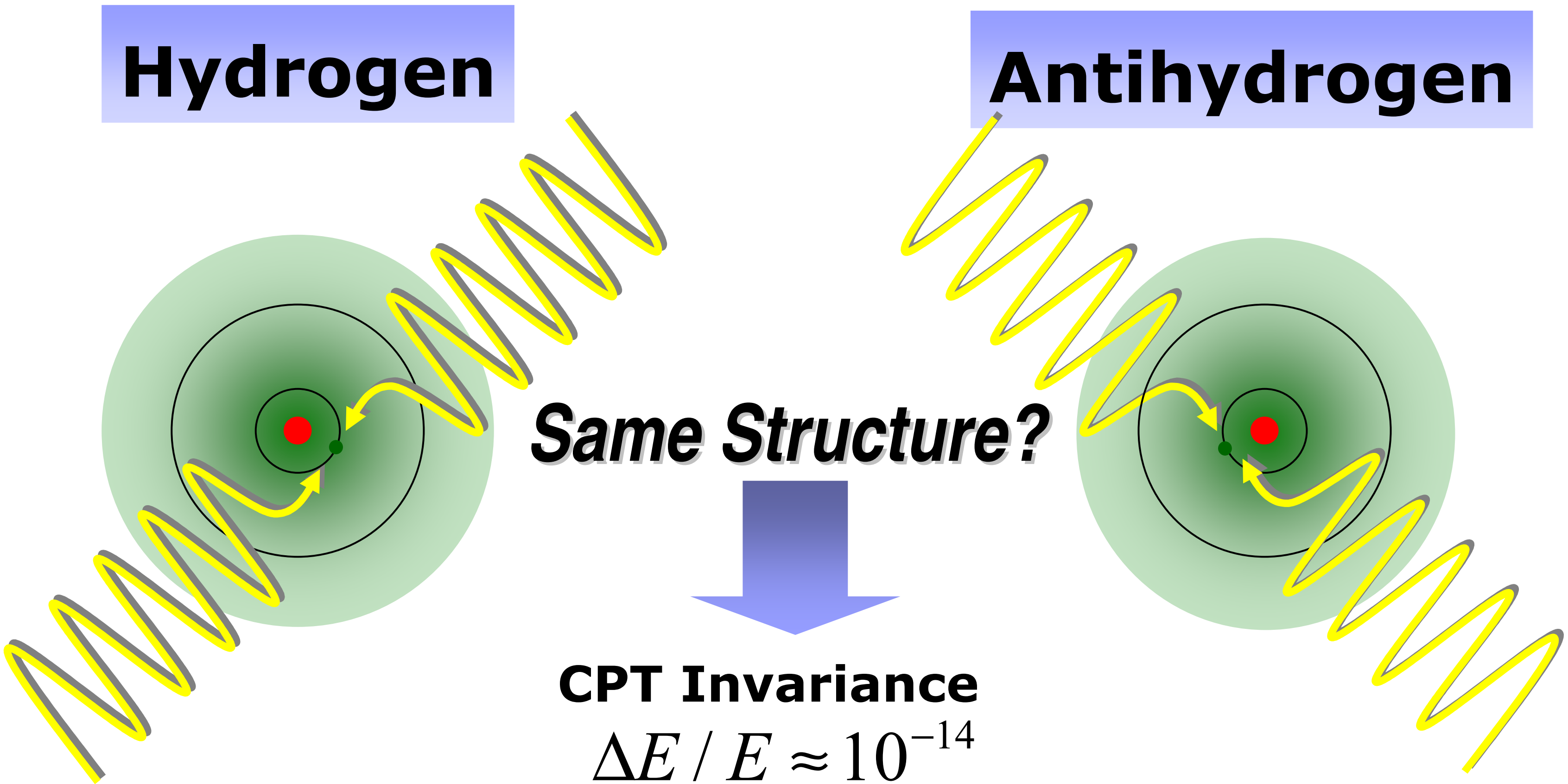
Originates from CERN-AD program

“Angels and Demons” at Darmstadt



Ultracold & Trapped $\bar{p}$

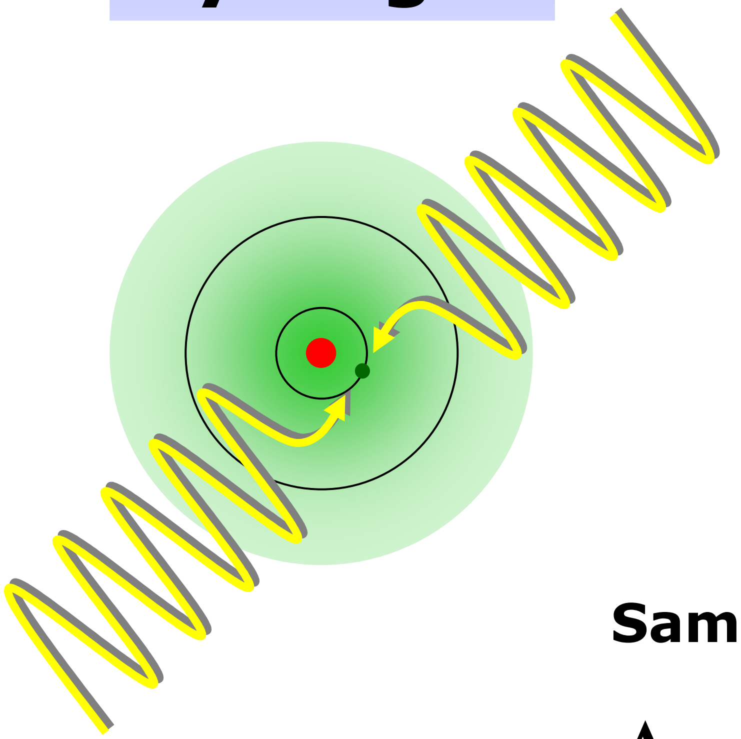
FAIR will provide the most intense source of antiprotons



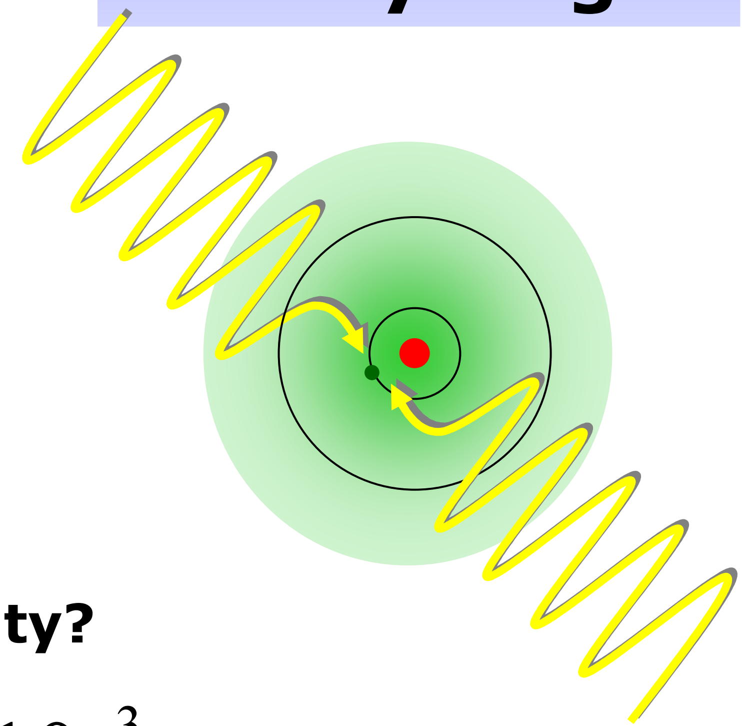
Challenges & Opportunities

Ultra-Slow and Trapped Antiprotons

Hydrogen



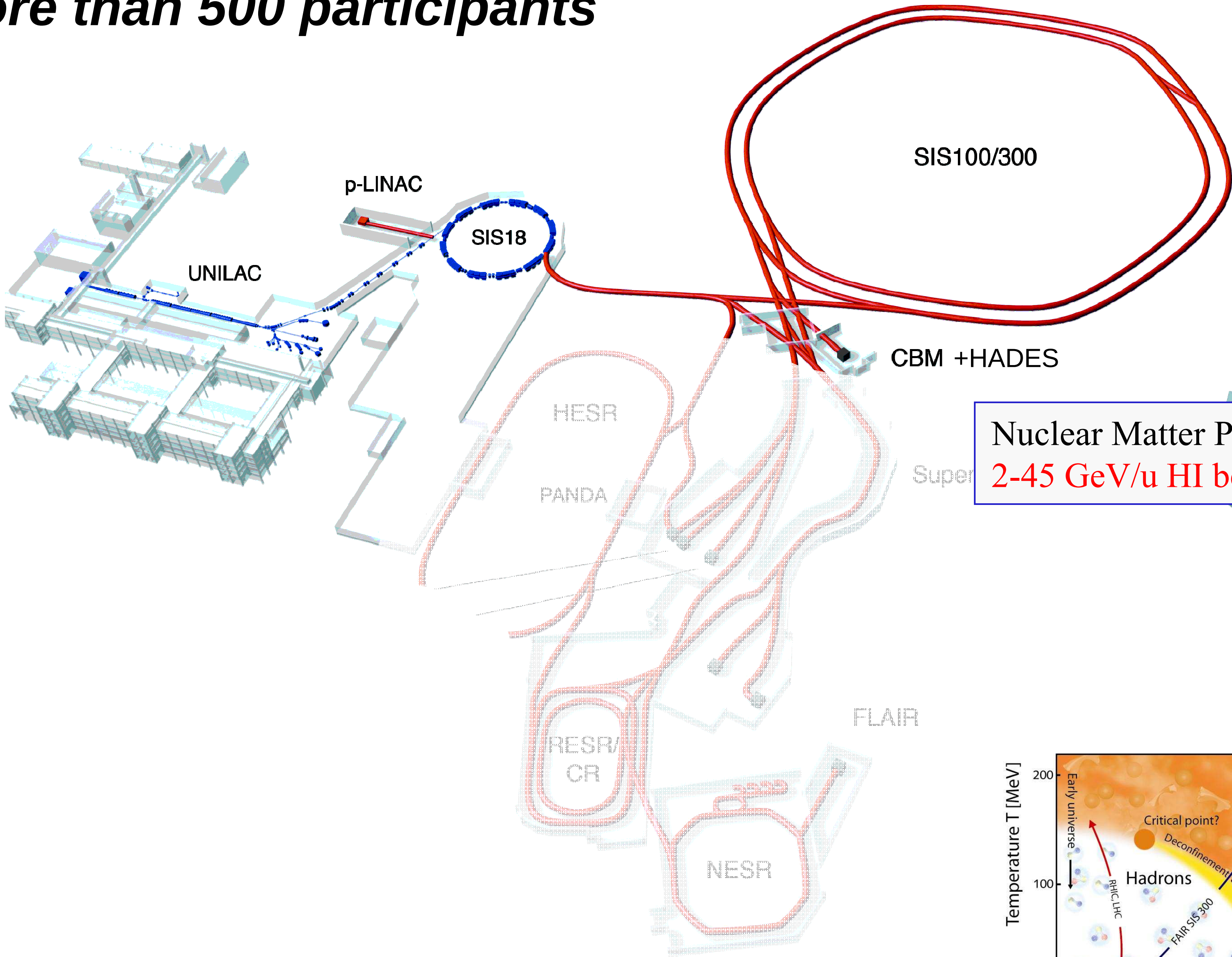
Anti-hydrogen



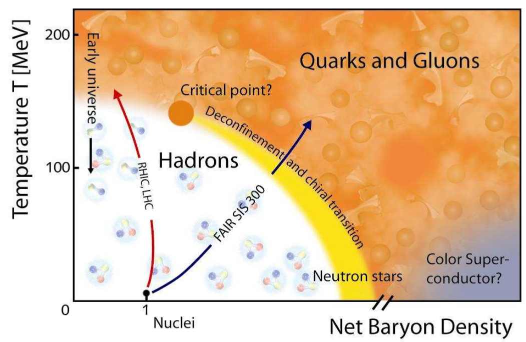
Same Gravity?

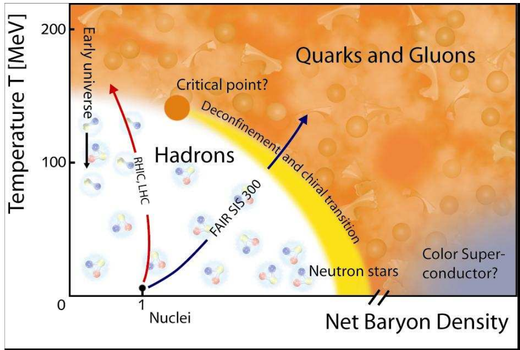
$$\Delta g / g \approx 10^{-3}$$

Relativistic Heavy Ion Community at FAIR
more than 500 participants



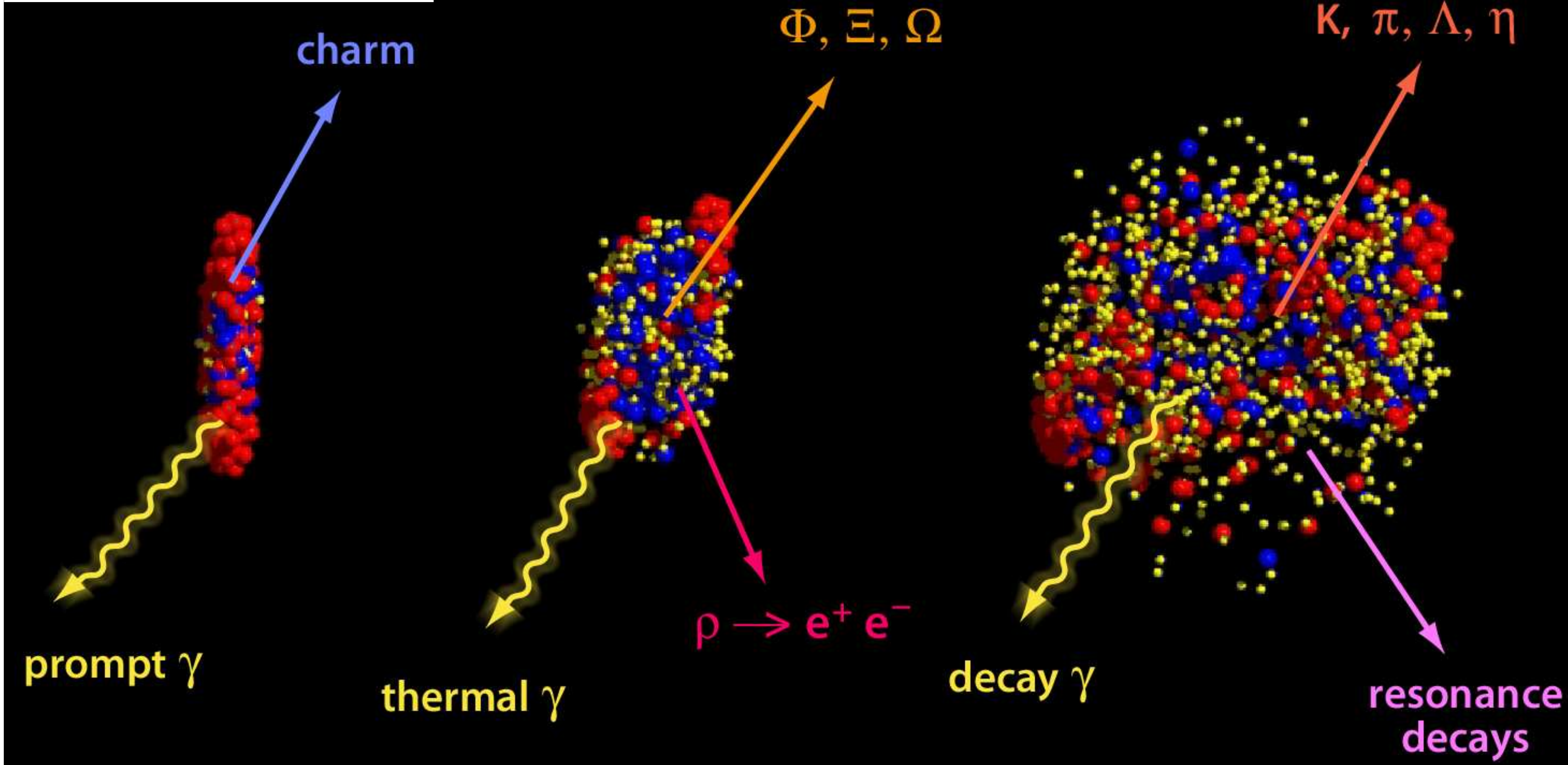
Nuclear Matter Physics with
2-45 GeV/u HI beams, ***x1000***





Diagnostic probes

U+U 23 AGeV

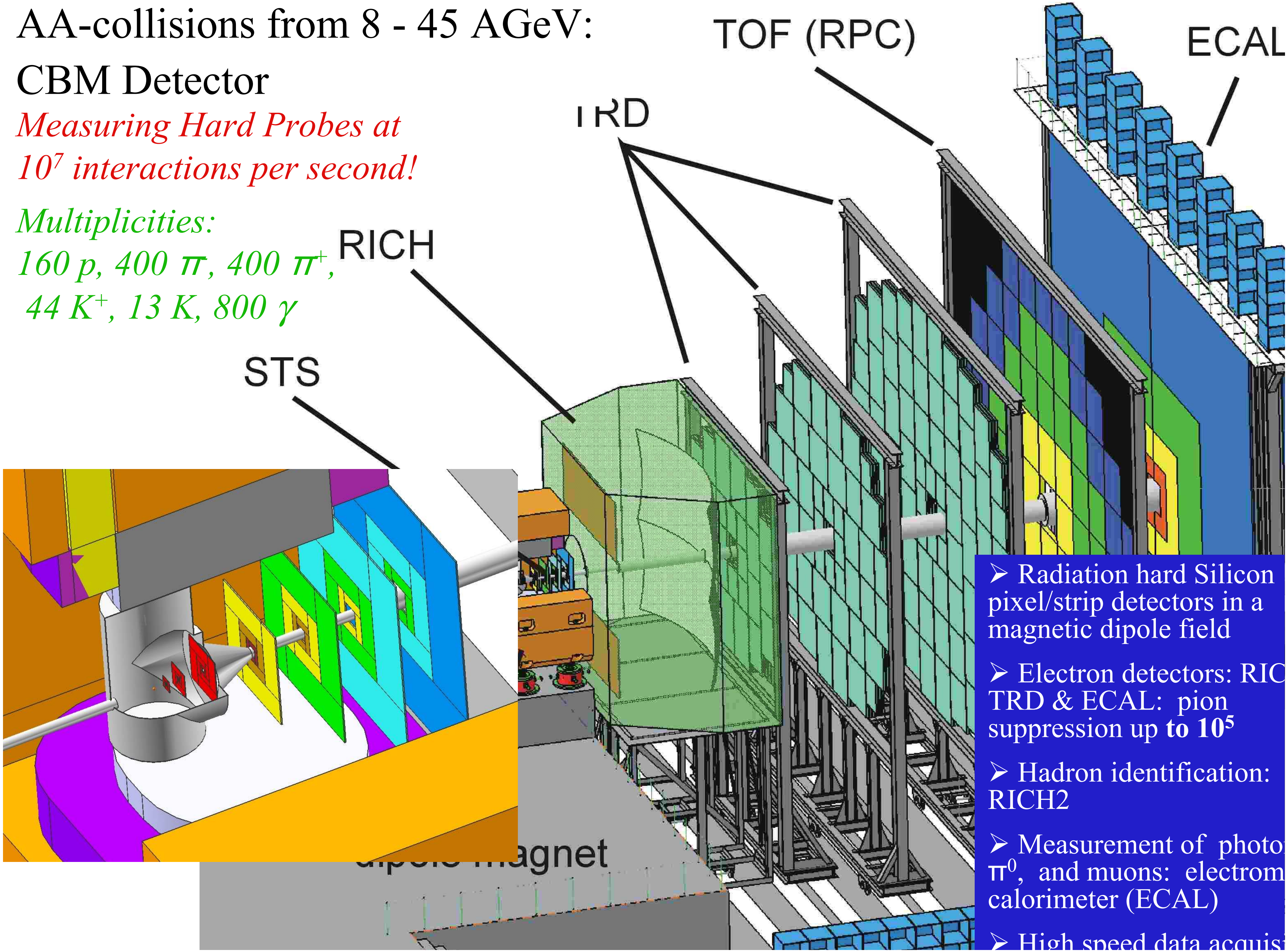


AA-collisions from 8 - 45 AGeV:

CBM Detector

Measuring Hard Probes at
10^7 interactions per second!

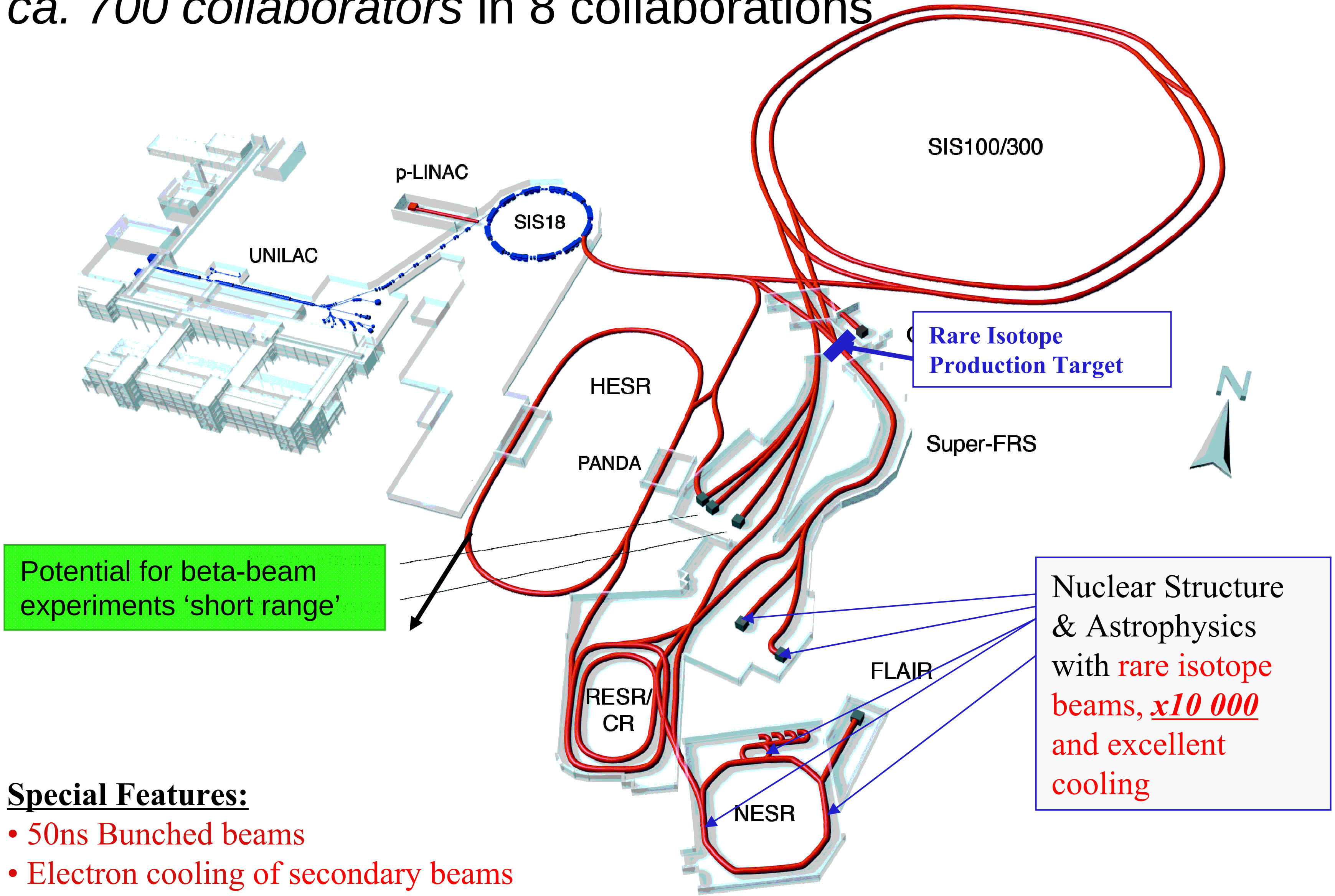
Multiplicities:
160 p, 400 π, 400 π^+, 44 K^+, 13 K, 800 γ



- Radiation hard Silicon pixel/strip detectors in a magnetic dipole field
- Electron detectors: RIC TRD & ECAL: pion suppression up **to 10^5**
- Hadron identification: RICH2
- Measurement of photo π^0, and muons: electrom calorimeter (ECAL)
- High speed data acquisi

Nuclear Structure and Astrophysics at FAIR

ca. 700 collaborators in 8 collaborations



Special Features:

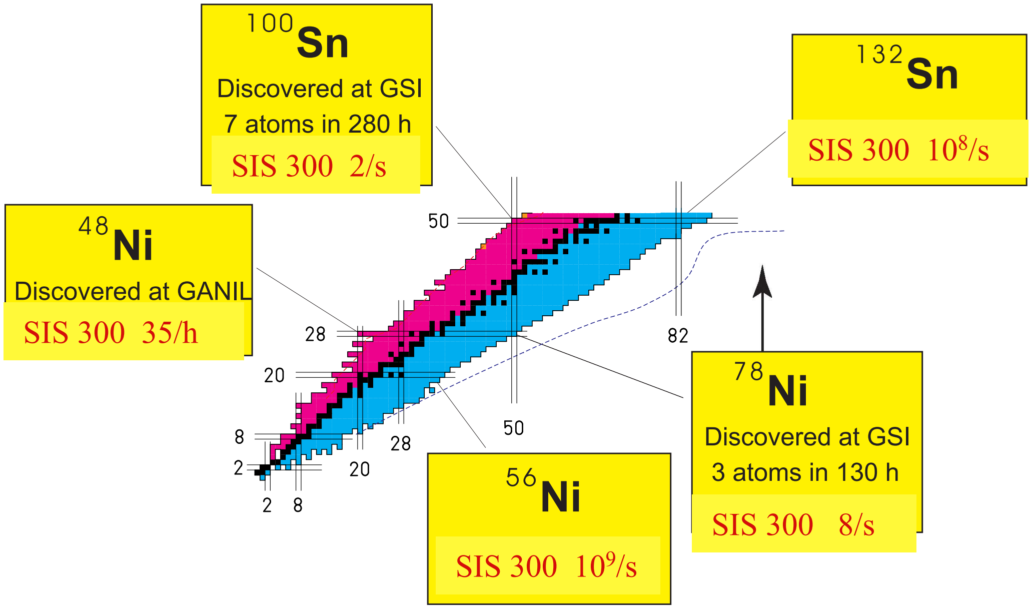
- 50ns Bunched beams
- Electron cooling of secondary beams
- SC magnets fast ramping
- Parallel operation

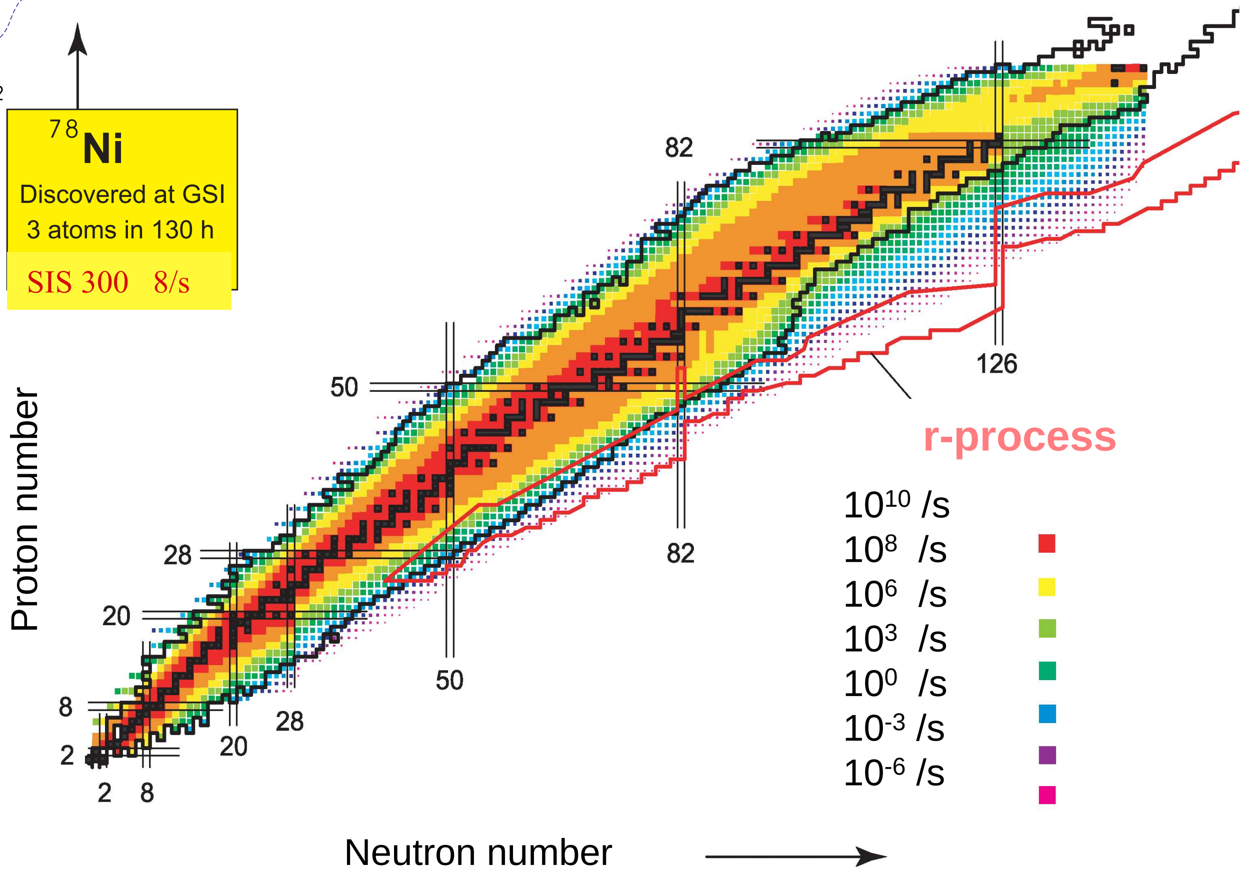
RI Production rate estimates

NEUTRON-rich nuclei from

Fragmentation and In-Flight Fission

Exotic Doubly Magic Nuclei

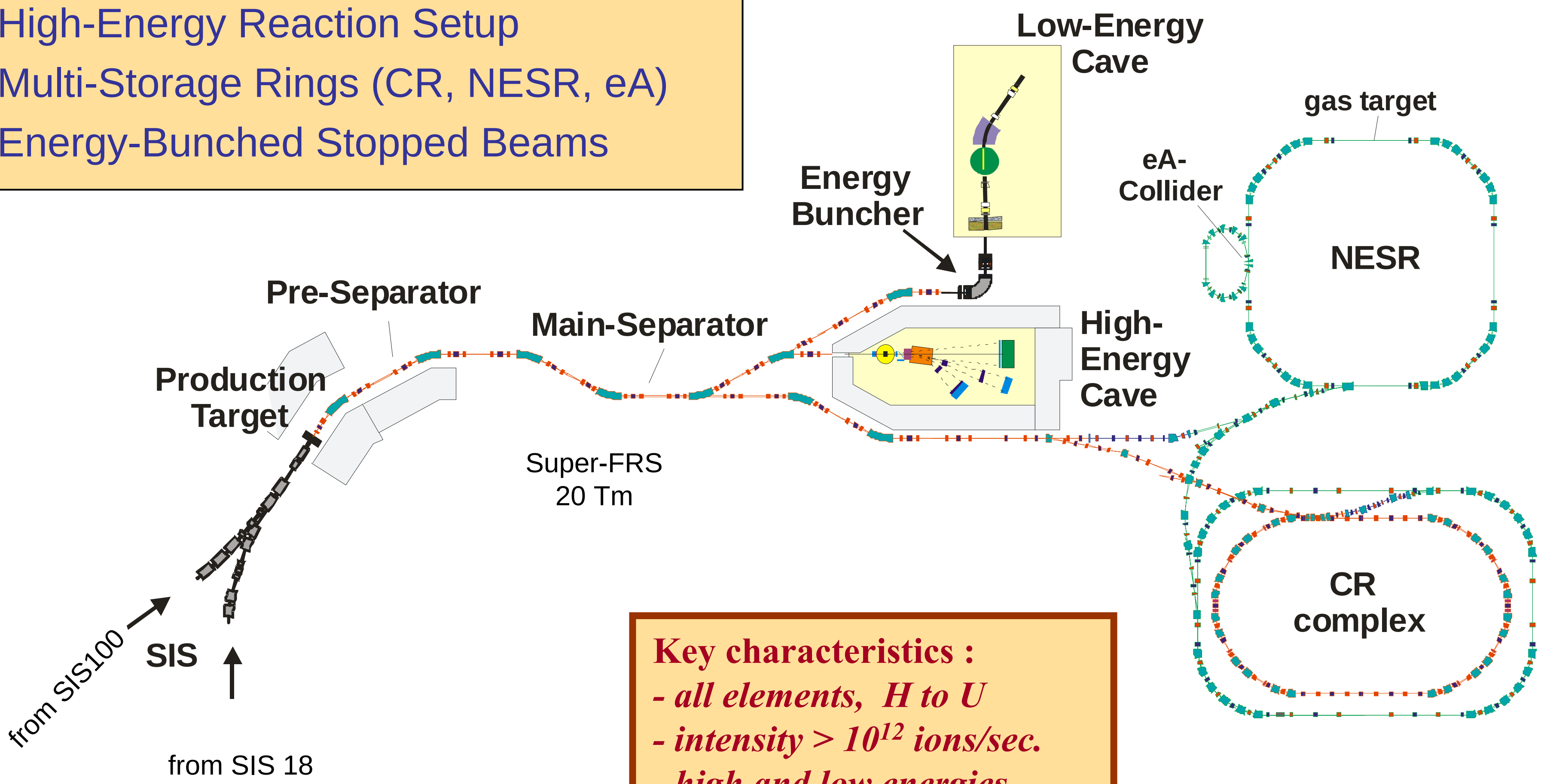




The In-Flight Rare-Isotope Beam Facility 0 - 1500 AMeV

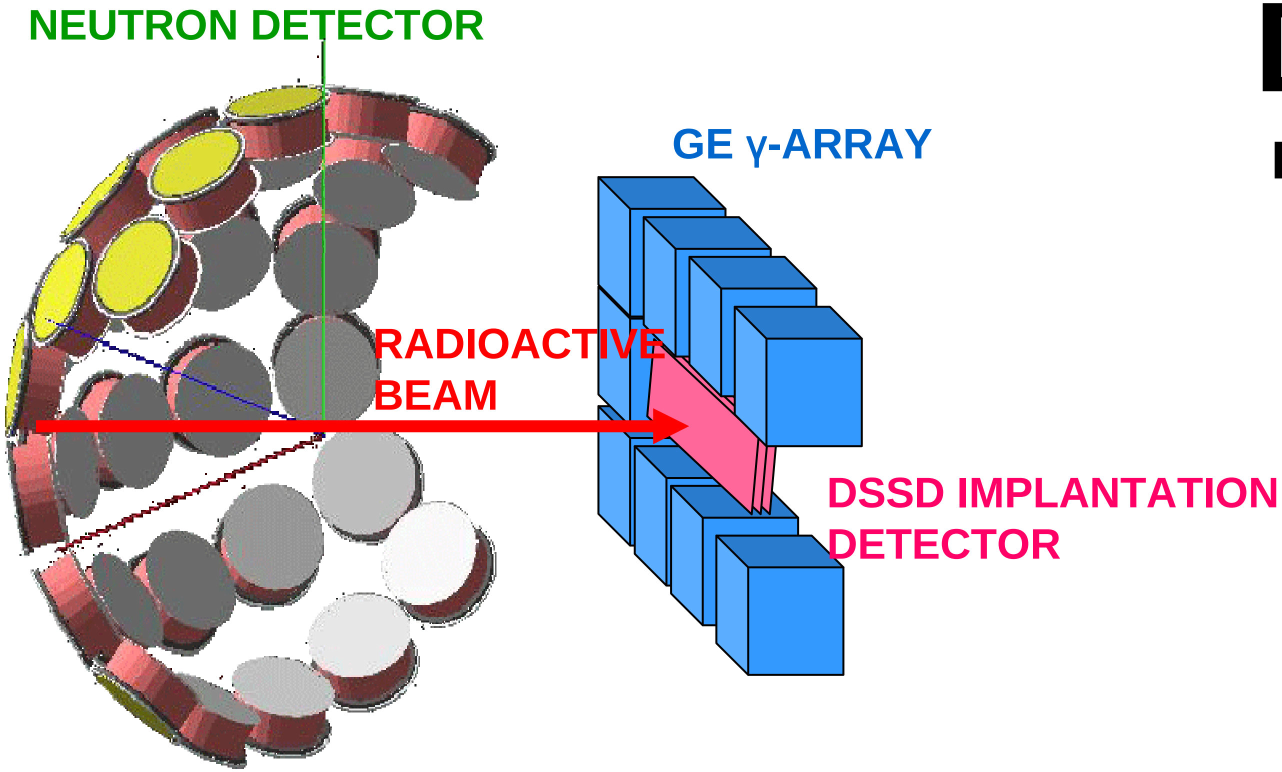
NUSTAR

- Superconducting FRagment Separator
- High-Energy Reaction Setup
- Multi-Storage Rings (CR, NESR, eA)
- Energy-Bunched Stopped Beams



Key characteristics :

- *all elements, H to U*
- *intensity > 10^{12} ions/sec.*
- *high and low energies*
- *pulsed and CW beams*



DESPEC

Decay spectroscopy with implanted Beams at FAIR

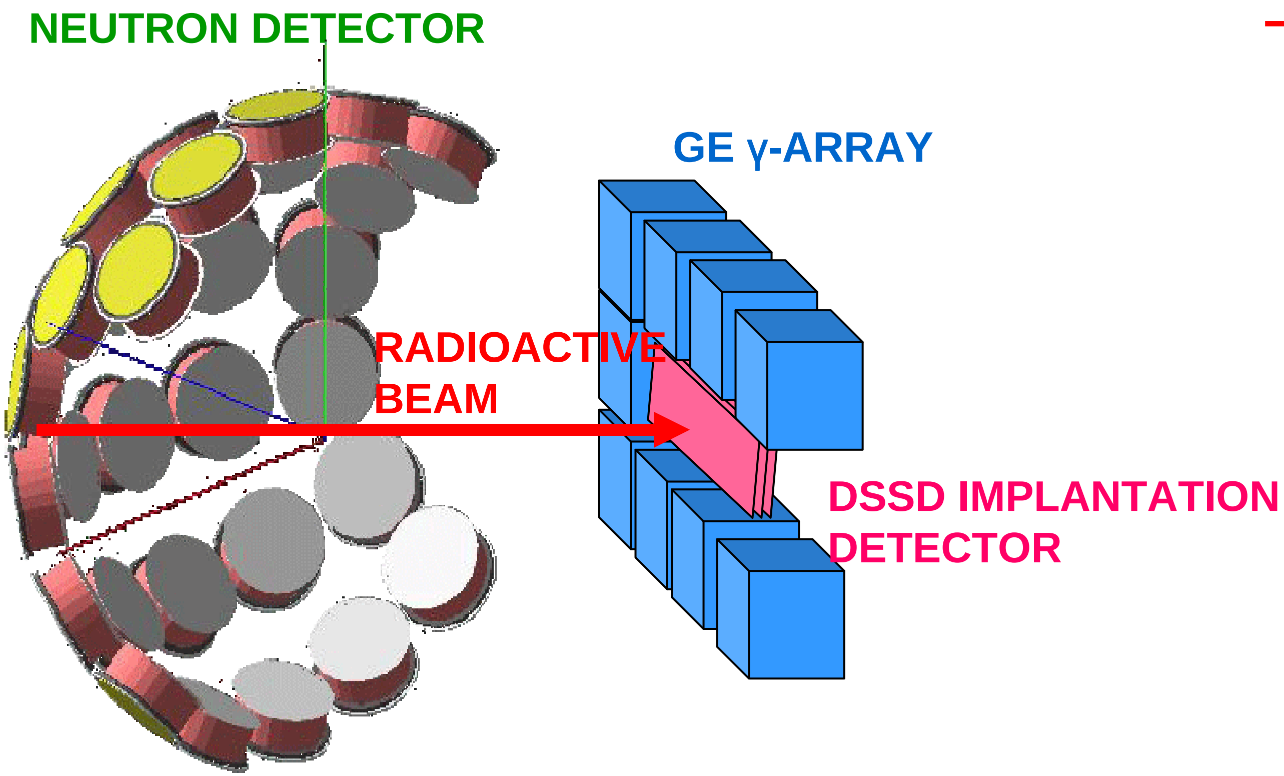
Spokesperson: Berta Rubio (IFIC-CSIC-Uni. Valencia)
Deputy: T. Davinson (Uni. Edinburgh)
Project manager: M. Gorska (GSI Darmstadt)

All the exotic nuclei that survives the ~200ns flight time through the super FRS get implanted into the detector: Followed by Beta and particle decay , Isomeric decay

Measurement: implantation of exotic ion (DSSD),
Charged particle decay (DSSD), neutrons, gammas

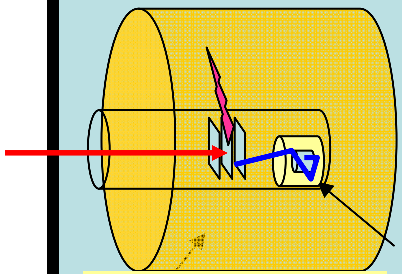
Beta decay defines the frontier of our knowledge of atomic nuclei far from stability in most of the cases.

Core measurements

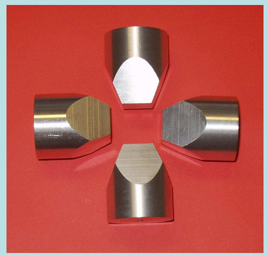


Measurement: implantation of exotic ion (DSSD),
Charged particle decay (DSSD), neutrons, gammas

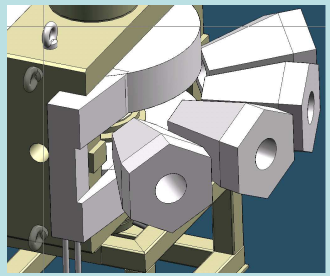
Complementary measurements



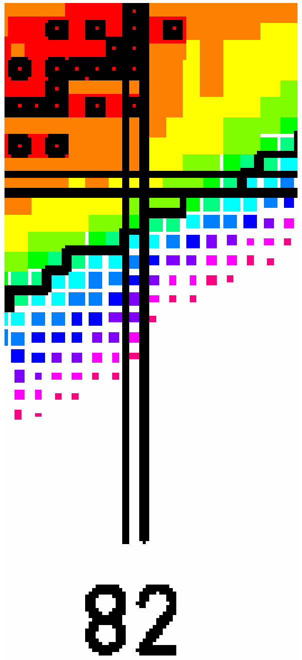
Total Absorption Spectrometer



Fast timming



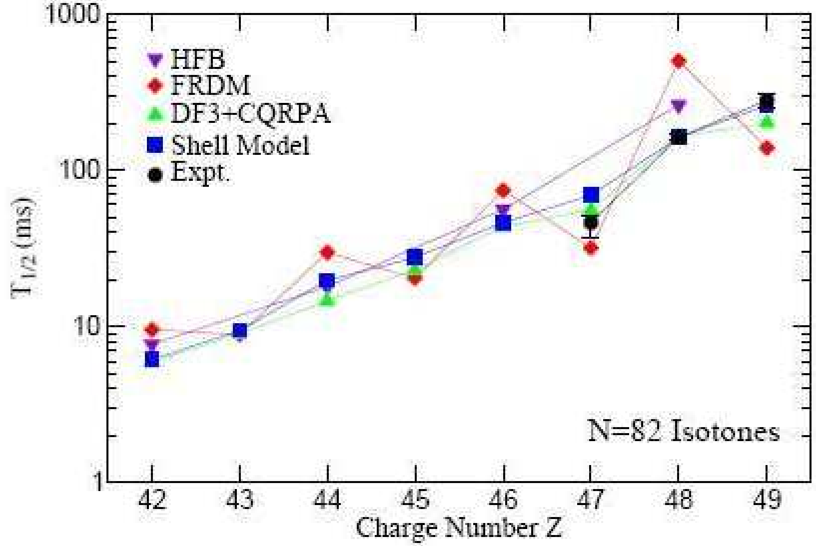
Magnetic moments

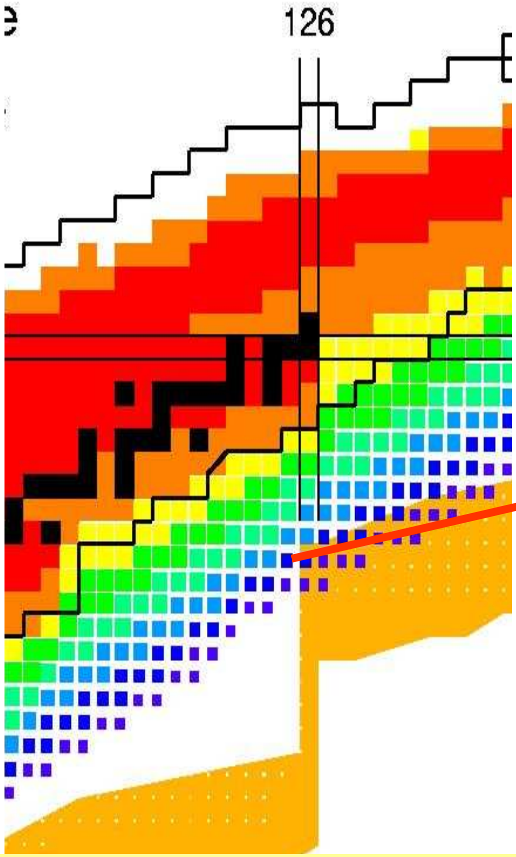


N=82

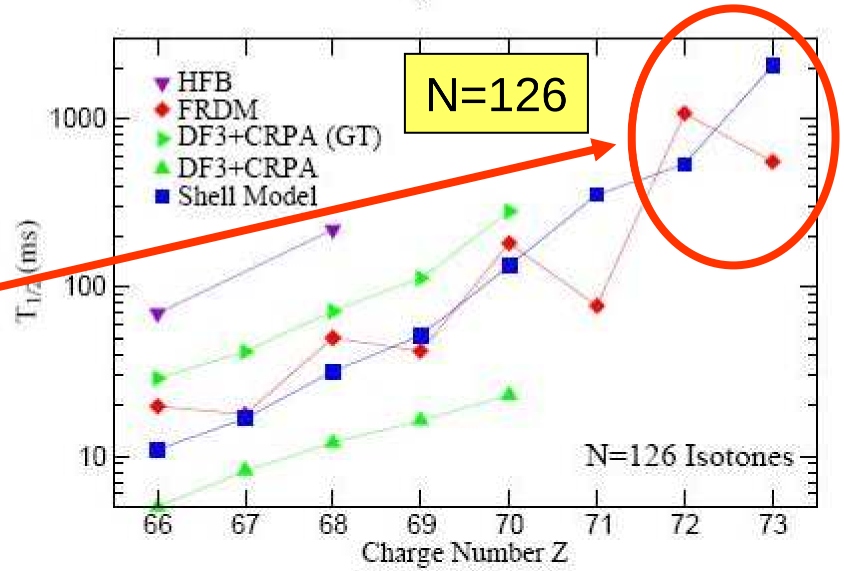
All T1/2 can be measure at FAIR

N=82





N=126

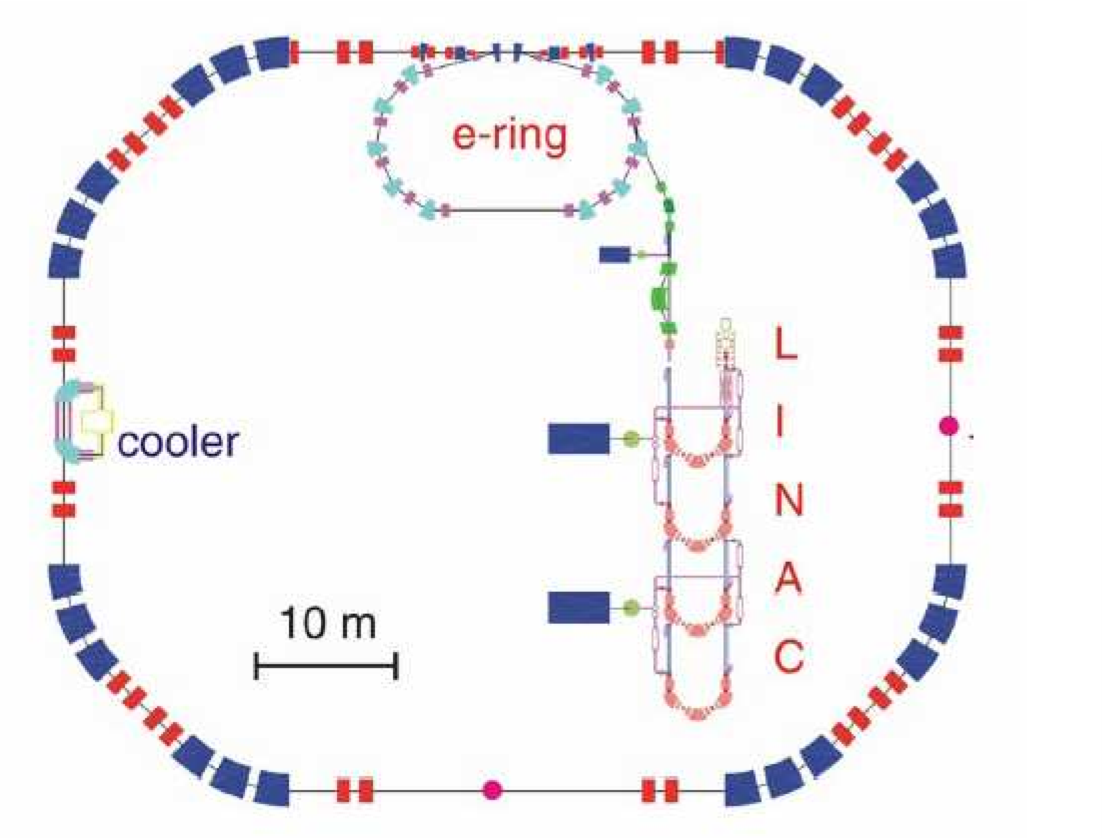


N=126

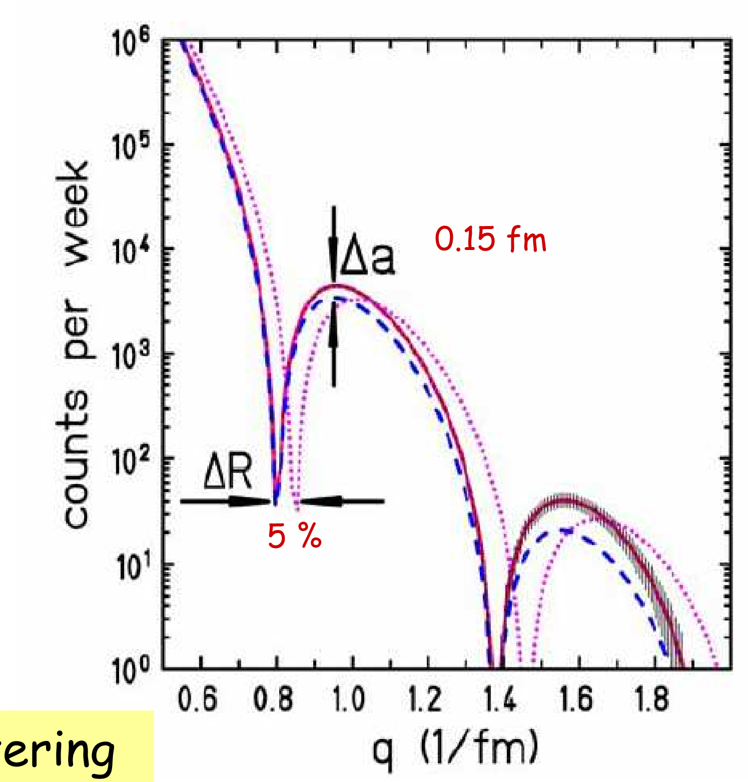
Larger differences (lack of experimental data), fixing these two points will clarify the theory

Electron-Ion scattering in a Storage Ring (eA collider) (ELISe)

Spokesperson: H. Simon



^{132}Sn(e,e)



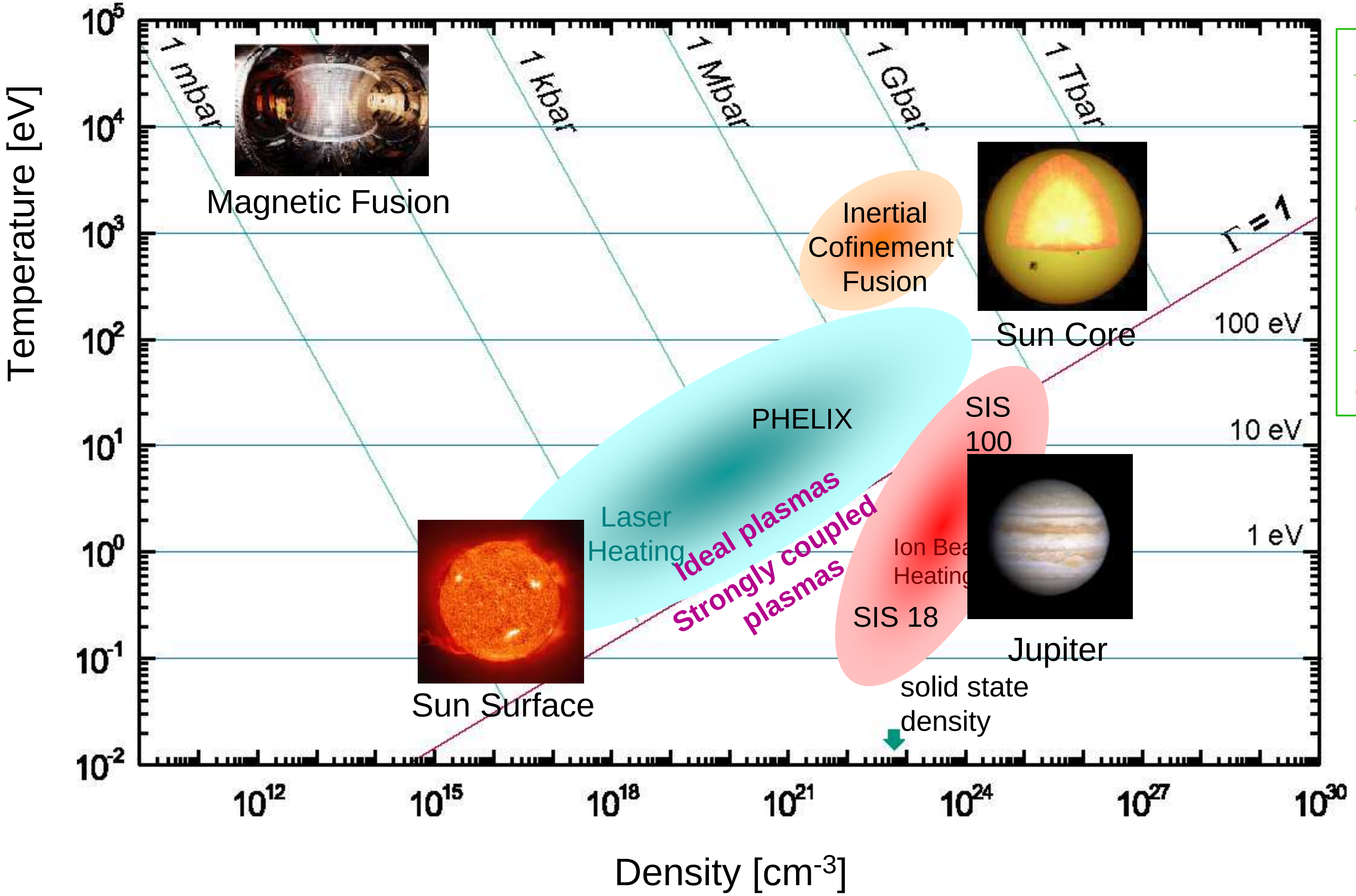
Simulation for 1 week

- charge densities from elastic electron scattering
- collective modes via inelastic electron scattering
- single-particle structure from (e,e'N) reactions

point-like probe + clean interaction $\Rightarrow$ precision studies in exotic nuclei

Plasma Physics with highly Bunched Beams

Bulk matter at very high pressures, densities, and temperatures



Physics of Fast Ignition (another way for clean energy production)

Equation of State of stellar matter

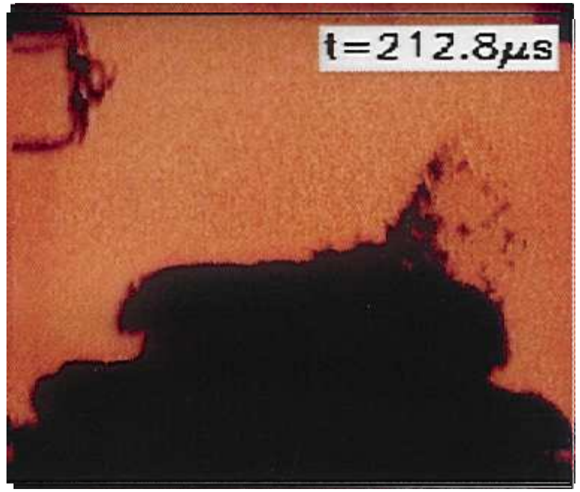
Plasma Physics with highly Bunched Beams

Bulk matter at very high
Pressures, Densities, and Temperatures

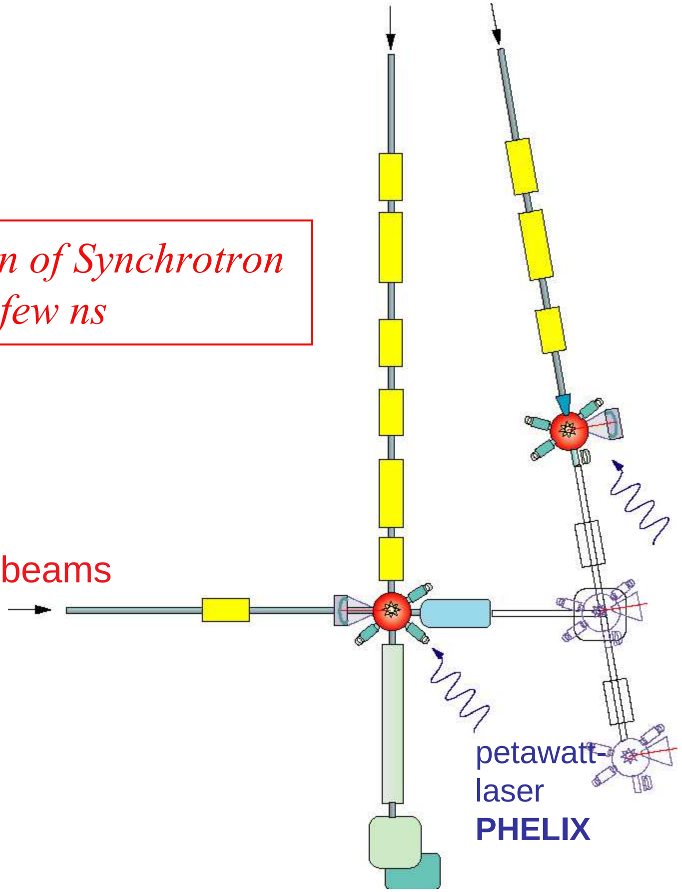
ΔE Energy loss of heavy ions in hot plasma is larger than in cold matter

highly bunched beams
from **SIS 100**

Today:
30mm Xenon Crystal
10^{10} Ne^{10+} -Ions **=>>**



Synchronization of Synchrotron and Laser to a few ns



highly bunched beams
from **SIS 18**

petawatt-
laser **PHELIX**

petawatt-
laser
PHELIX

Expected Beam Parameters

SIS 100 (GSI)

N = 2 x 10^{12} Uran

E_0 = 1 GeV/u

E_{tot} = 80 kJ

τ = 50 ns

Range in solid Pb ≈1.55 cm

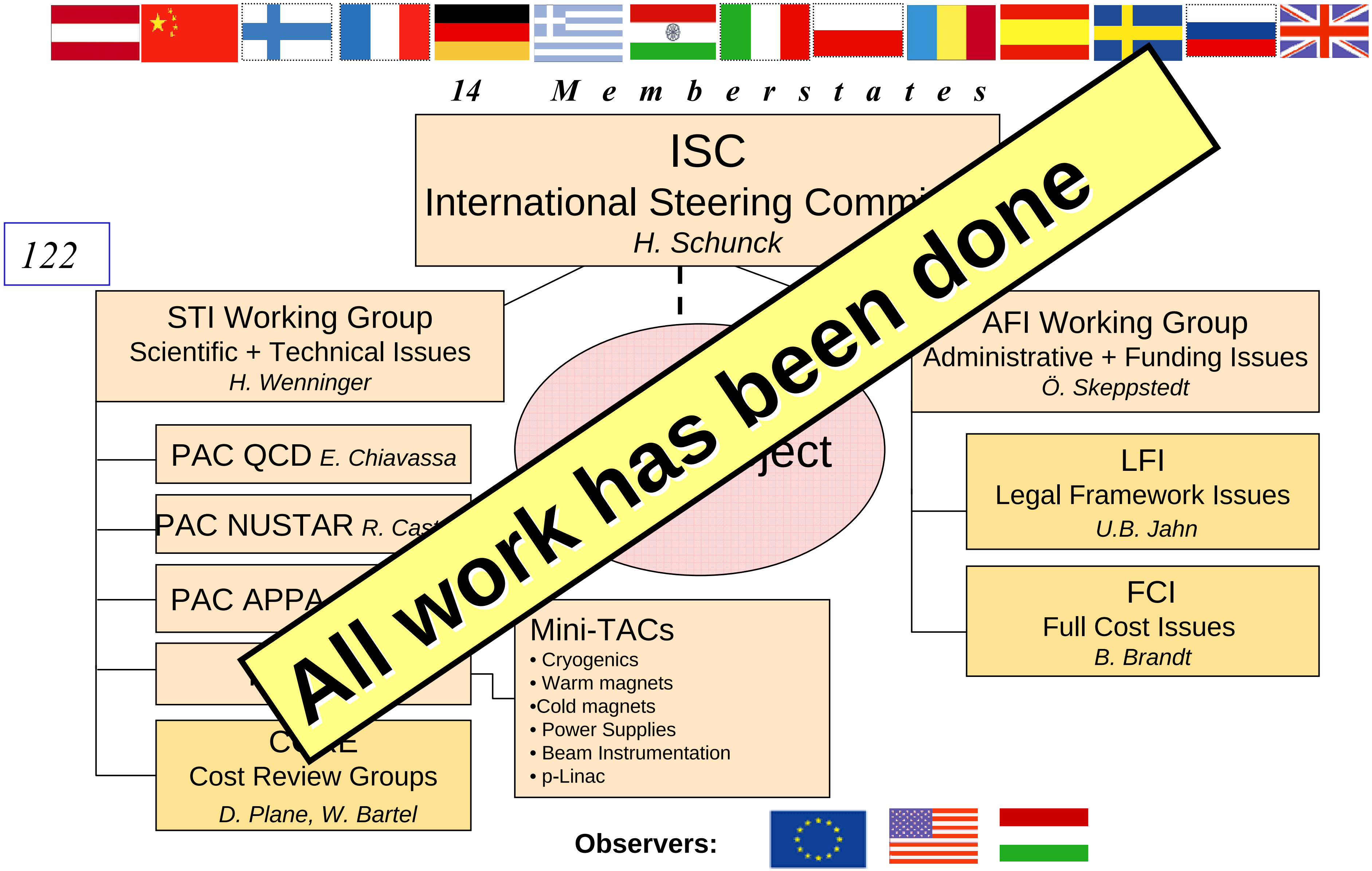
beam radius ≈ 0.05 cm

E_s = 600 kJ/g

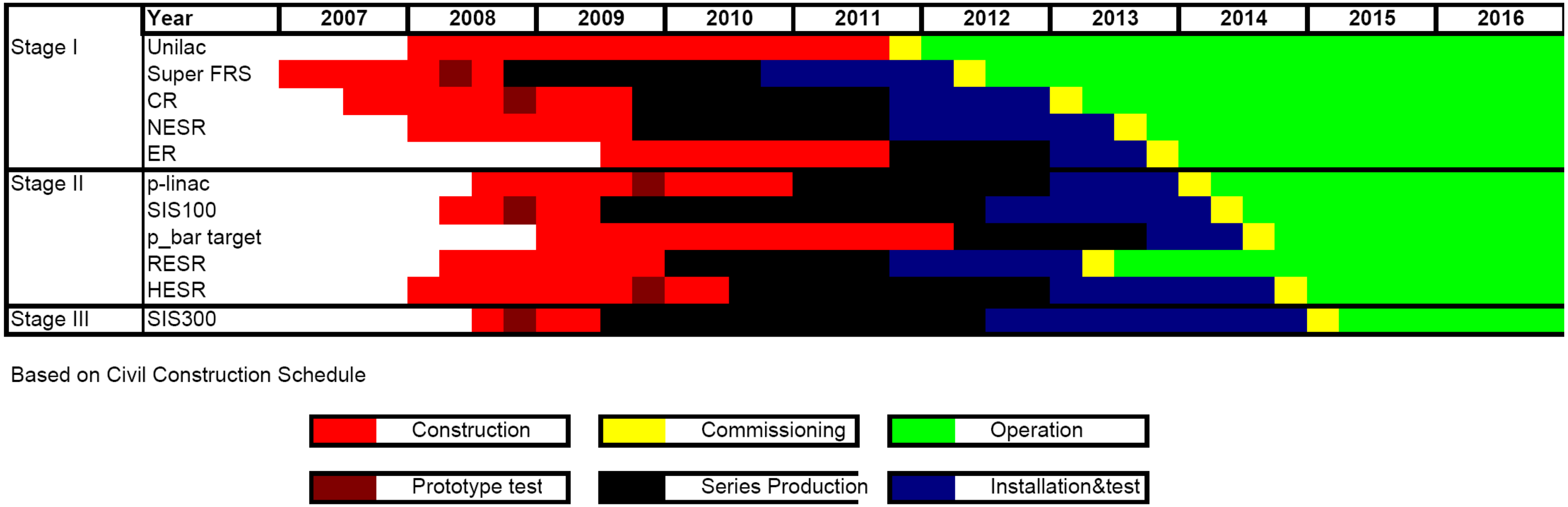
P_s = 12 TW/g

Status of the FAIR project

Structure of the International Project FAIR



Master Schedule *(add 3-6 months due to slow politics)*



Requires in a World wide collaboration:

Optimized timing
Clear Interface definition
Sophisticated QA

Strict sub-project follow-up
Clear Contracts & Specifications
Communication (via EDMS)

Project Costs

Costs ***scrutinized*** by CORE-A/E, TAC, STI and 7 mini-TACs, documented in Costbook

Accelerator investment costs	**533.0 M€**
Civil construction costs	**288.7 M€**
Baseline experimental facilities (incl Super-FRS)	**180.0 M€**
Investment budget	**1001,7 M€**
Manpower (2000 person-years, 400 m-y FAIR GmbH)	**184,8 M€**
Total Construction Costs	**1186,5 M€**
Commissioning Costs	**26,5 M€**
Operation Costs until 2025	**1485,6 M€**
Sum	**2697,6 M€**

At least 25% of investment-cost will be covered by international partners

Operating will be financed by FAIR members

CN DE ES FI FR GB GR IN IT PL RO RU SE

Technical Progress in the FAIR project:

Accelerators:

- SIS100: full scale Mark I dipole ordered at BNN (box type design) in Dec. 06
  SIS100: full scale Mark I dipole ordered at BINP (curved design) in Dec. 06

- SIS300: prototype of curved dipole started by INFN
  (based on MoU INFN-GSI: 4.7 M€ + 40 FTE + 1 M€ GSI contribution) in Dec. 06

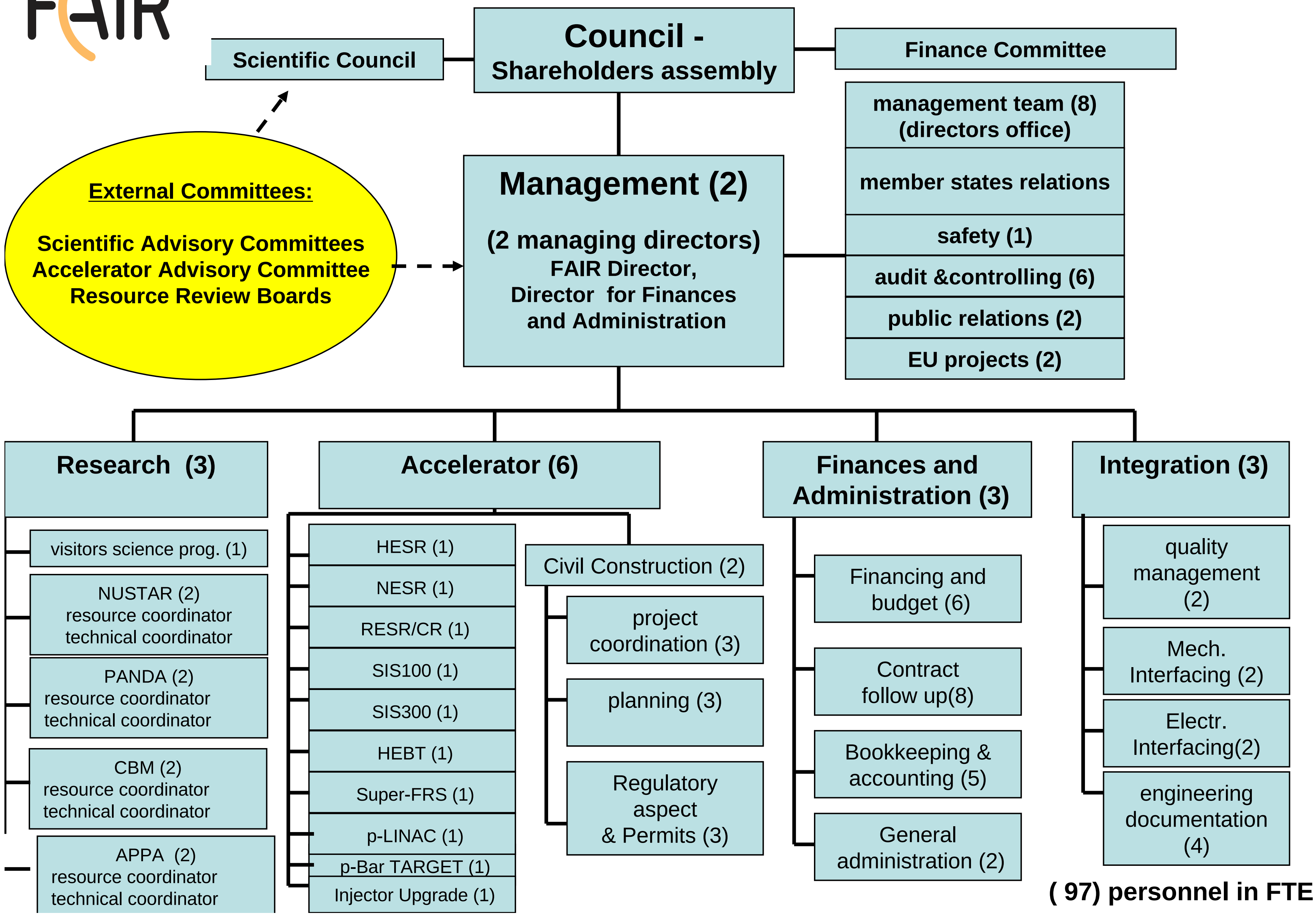
- RF-systems: first 325 MHz klystron ordered at Toshiba

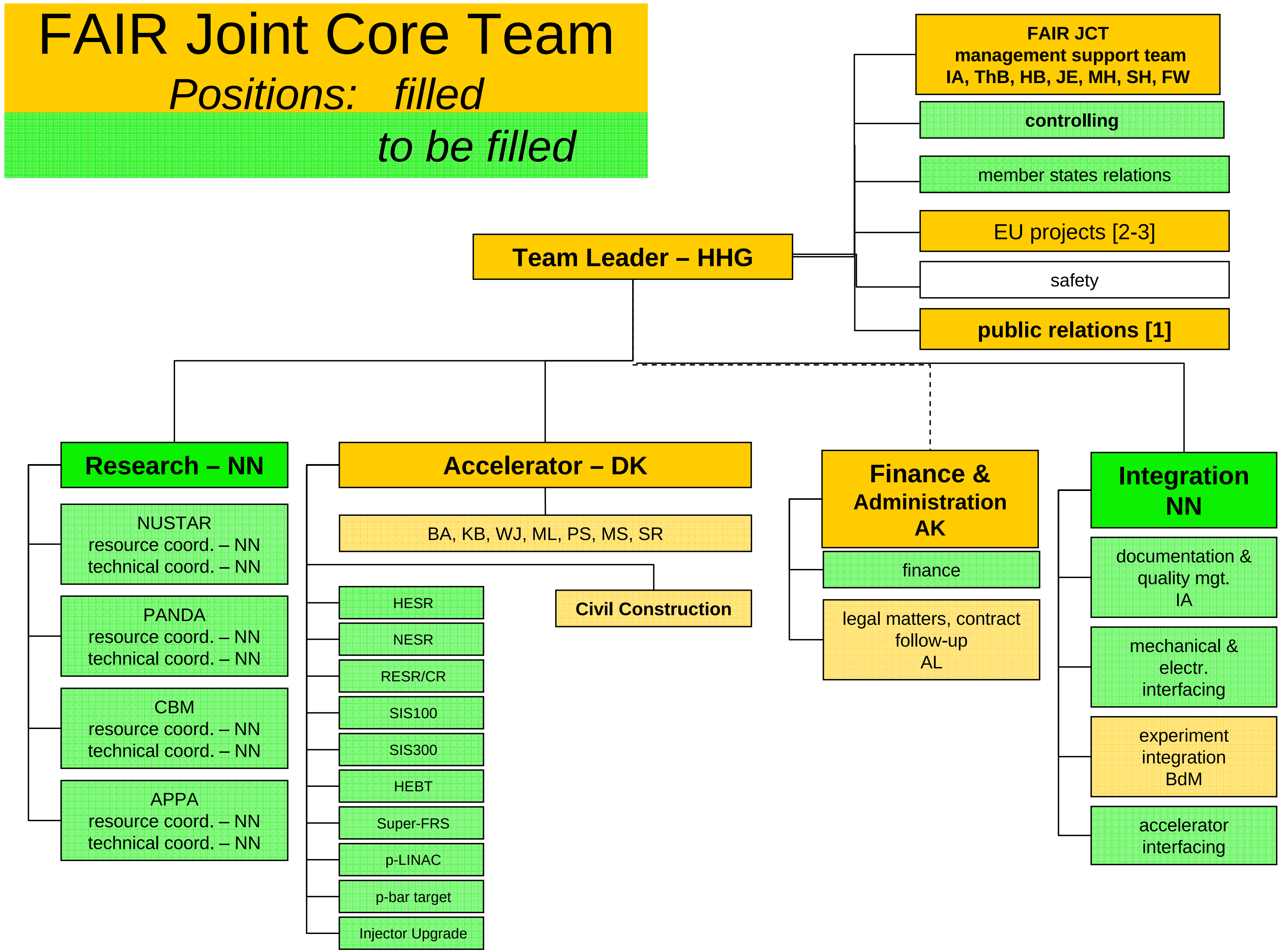
-Signing of MoU in Feb. 07 between Cracow University of Technology (CUT) and GSI concerning scient. and techn. cooperation in the domains of superconducting magnets and interconnections

Civil Construction:

- **EU wide call** for tender for civil construction project steering company started in Nov. 06
- **EU wide call** for tender for civil construction project planning started in Dec. 06
- Draft version of "Antrag auf Einleitung ZBau-Verfahren" handed to BMBF Jan 07
- Meeting on civil construction issues with BMBF and BMVBS Jan. 31. 07
- Technical meeting with TAM (OFD/hbm) Feb. 0

Organization of the FAIR GmbH





FAIR Joint Core Team
Positions: filled
to be filled
FAIR JCT
management support team
IA, ThB, HB, JE, MH, SH, FW
controlling
member states relations
EU projects [2-3]
safety
public relations [1]
Team Leader – HHG
Research – NN
NUSTAR
resource coord. – NN
technical coord. – NN
PANDA
resource coord. – NN
technical coord. – NN
CBM
resource coord. – NN
technical coord. – NN
APPA
resource coord. – NN
technical coord. – NN
Accelerator – DK
BA, KB, WJ, ML, PS, MS, SR
Civil Construction
HESR
NESR
RESR/CR
SIS100
SIS300
HEBT
Super-FRS
p-LINAC
p-bar target
Injector Upgrade
Finance & Administration AK
finance
legal matters, contract follow-up
AL
Integration NN
documentation & quality mgt.
IA
mechanical & electr. interfacing
experiment integration
BdM
accelerator interfacing

Follow the Road Map + 3 months delay:

Now — **September 2007** — **October 2007** — Time →

Nomination of Shareholders + Completion of negotiations

Signature of Convention and Final Act

Signature AoA

Formation FAIR GmbH

Start of Construction

More than 2600 scientists are waiting!

The competition is not waiting!

Thank you for your attention!

24.07.2006

Proposed FAIR – Roadmap: Establishment of FAIR GmbH

	07/06	08	09	10	11	12	01/07	02	03	04	05	06
meetings	**ISC**		**STI** **AFI**	**ISC**	**AFI**	**joint meeting ISC/SH**			**Convention Final Act**	**AoA**		FAIR
Contracting Parties	*Negotiations (ongoing, 'till end of 2006)*					Nomination of Shareholders + Completion of negotiations			**Signature of Convention and Final Act**			
Share-holders								First meeting: start senior staffing		**Signature AoA**	**Formation FAIR GmbH**	Constitutive Meeting of the Council
ISC	Mandate for IKAB			Convention, Final Act, AoA; Joint Core Team		Bylaws, draft FAIR GmbH structure and kick-off staffing						
AFI			Convention, Final Act, AoA; draft Bylaws		Bylaws, draft FAIR structure							
STI	*Monitoring of technical planning and project costs (ongoing process up to the formation of FAIR GmbH)*											
Bylaw Subgroup	*Elaboration of the Bylaws (ongoing)*				Completion of draft Bylaws							
Joint Core-Team				*Technical project decisions (follow up design changes) / FAIR preparation tasks (ongoing process up to the formation of FAIR GmbH)*								
IKAB	*Technical evaluation of potential in-kind contributions (ongoing process up to the formation of FAIR GmbH)*											