In-Kind FAIR

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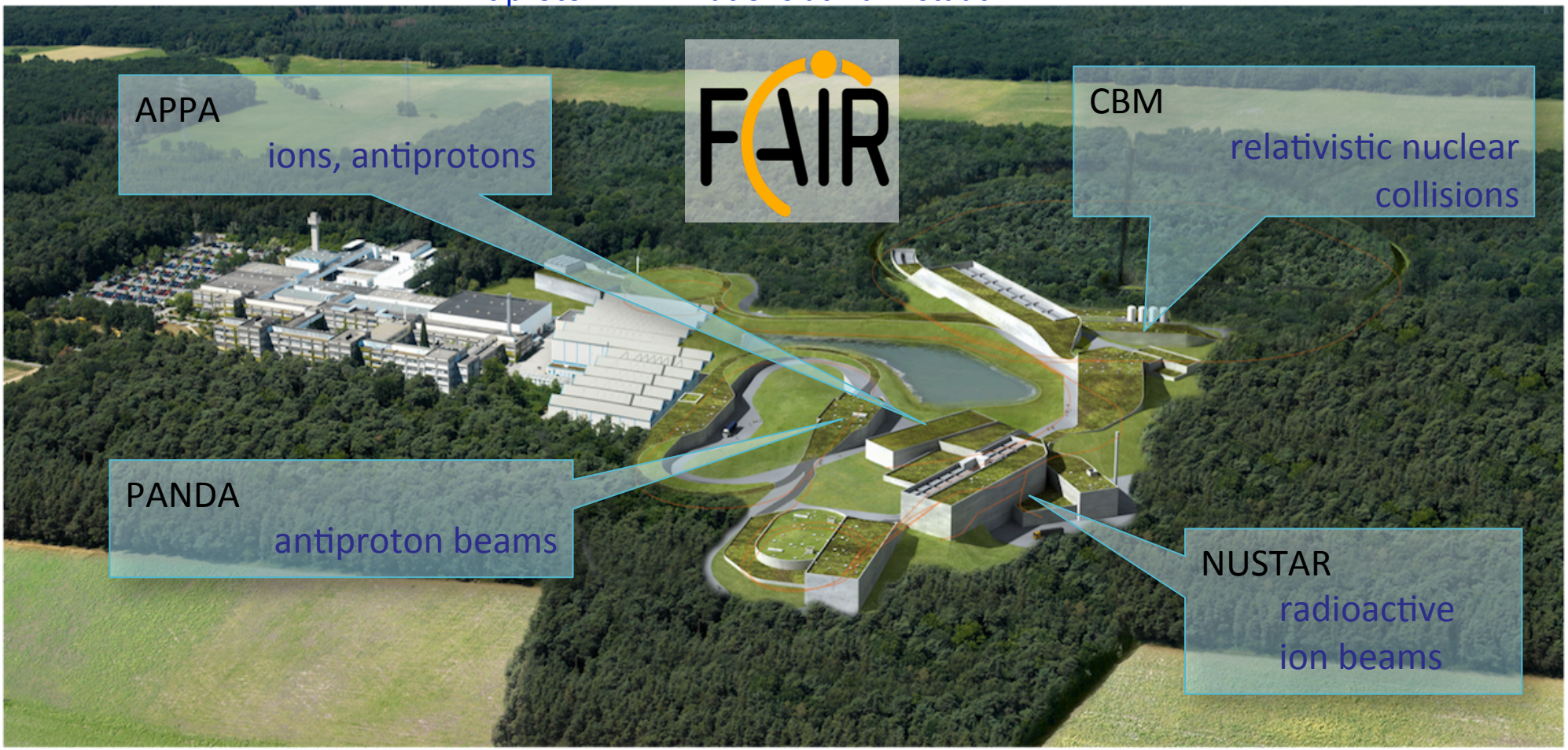
The 4 Scientific Pillars of FAIR

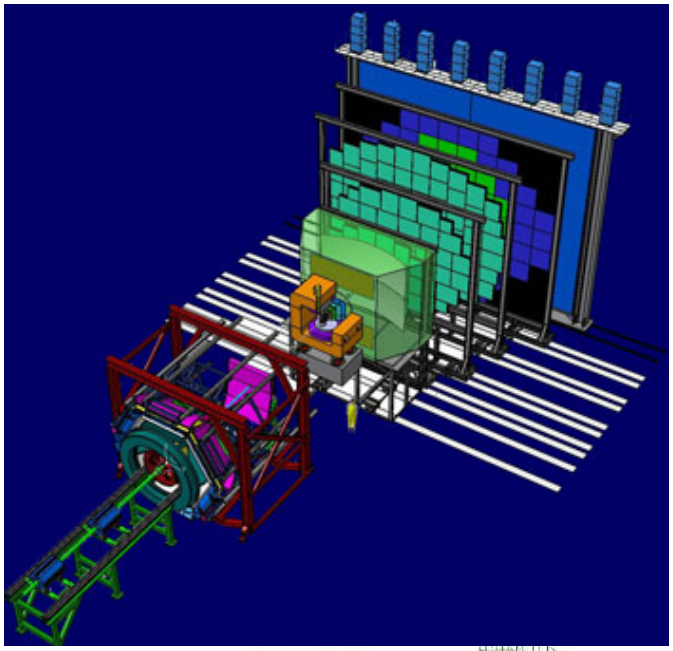
- APPA: Atomic, Plasma Physics and Applications
- CBM: Compressed Baryonic Matter
- NUSTAR: Nuclear Structure, Astrophysics and Reactions
- PANDA: Antiproton Annihilations at Darmstadt

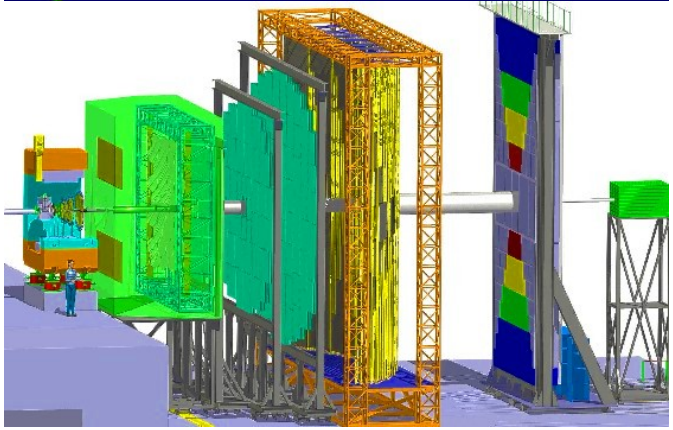


CBM

Compressed Baryonic Matter Experiment

- **The mission**
  - Explore the properties of super-dense nuclear matter.
- **The physics**
  - Fundamental aspects of Quantum-Chromo-Dynamics (QCD) and astrophysics.
- **The challenge**
  - Measure rare and penetrating probes
    - Heavy-ion collisions at rates of up to 10 Million reactions per second.
- **The technique**
  - Tracking and vertex reconstruction
  - Electron identification
  - Muon identification
  - High speed signal processing and data acquisition.
- **Beam**
  - High energy heavy Ions, high flux





APPA - Atomic Physics, Plasma Physics Application

- **BIOMAT** (basic research to **BIO**logial **MAT**erial and medical applications)
  - e.g. Biological effects of heavy ions needed for space exploration
- **SPARC (S**tored **P**articles **A**tomic **R**esearch **C**ollaboration**)**
  - The new instrumentation will permit to investigate the dynamics of multi-electron continua
    - in target and projectile
    - Strong collisions of highly charged heavy ions in ESR and HESR
- **FLAIR (F**acility of **L**ow energy **A**nt**i**proton **R**esearch**)**
  - Access to atomic structure and atomic collision dynamics
    - using CRYRING@ESR
- **Plasma Physic**: 30 Proposed experiments
    - Understanding interior of massive planets like Jupiter
    - Warm and dense plasmas
  - **WDM** (**W**arm **D**ense **M**atter)
    - Radiative Properties of Warm Dense Matter (WDM) produced by intense heavy ion beams
    - Warm and dense plasmas: Equation of State, transport properties, etc.,
    - Fusion: do we understand the basic physics?
  - **HEDgeHOB** (**H**igh **E**nergy **D**ensity Matter **ge**nerated by **H**eavy I**o**n **B**eams)
    - Studying bulk properties of matter in high energy density states

NuSTAR

NUclear STructure, Astrophysics and Reactions

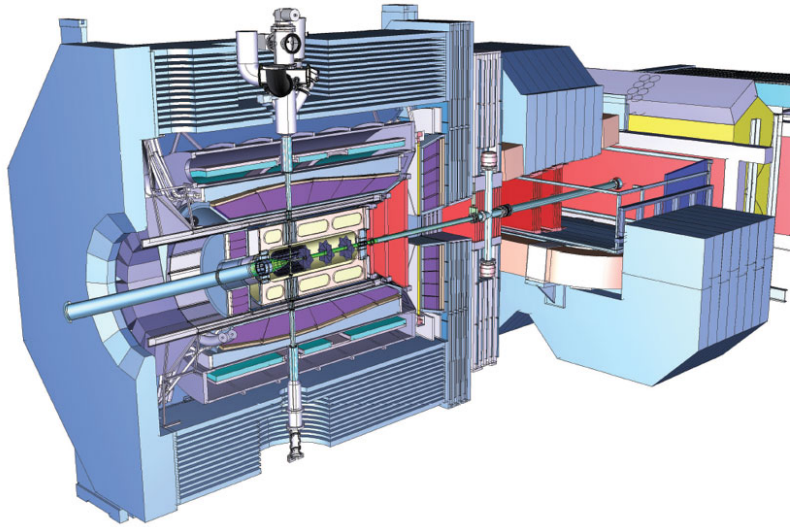
- **The mission**
  - studying nuclear structures, astrophysics and reactions
  - employing radioactive ion beams for exploiting exotic states of matter and investigate:
    - ground state properties and decay properties of exotic isotopes
    - the structure of their excited states and their reaction mechanisms
- **The physics**
  - study the structure of exotic atomic nuclei, to investigate reactions of these nuclei and to apply the results for answering astrophysical questions
- **The challenge**
  - use of Radioactive Ion Beams (RIB's) species separated and identified by the central "instrument" the large-acceptance *S*uperconducting *FR*agment *S*eparator (Super-FRS)
  - several experiments with different aspects
- **Beam**
  - use of RIB's in three branches
    - high energy branch: RIBs at relativistic energies (300-1500 MeV/u)
    - low energy branch: beams in the range of 0-300 MeV/u
    - later: ring branch: cooled and stored beams

Prototyp of NC-magnet from BINP for testing at GSI

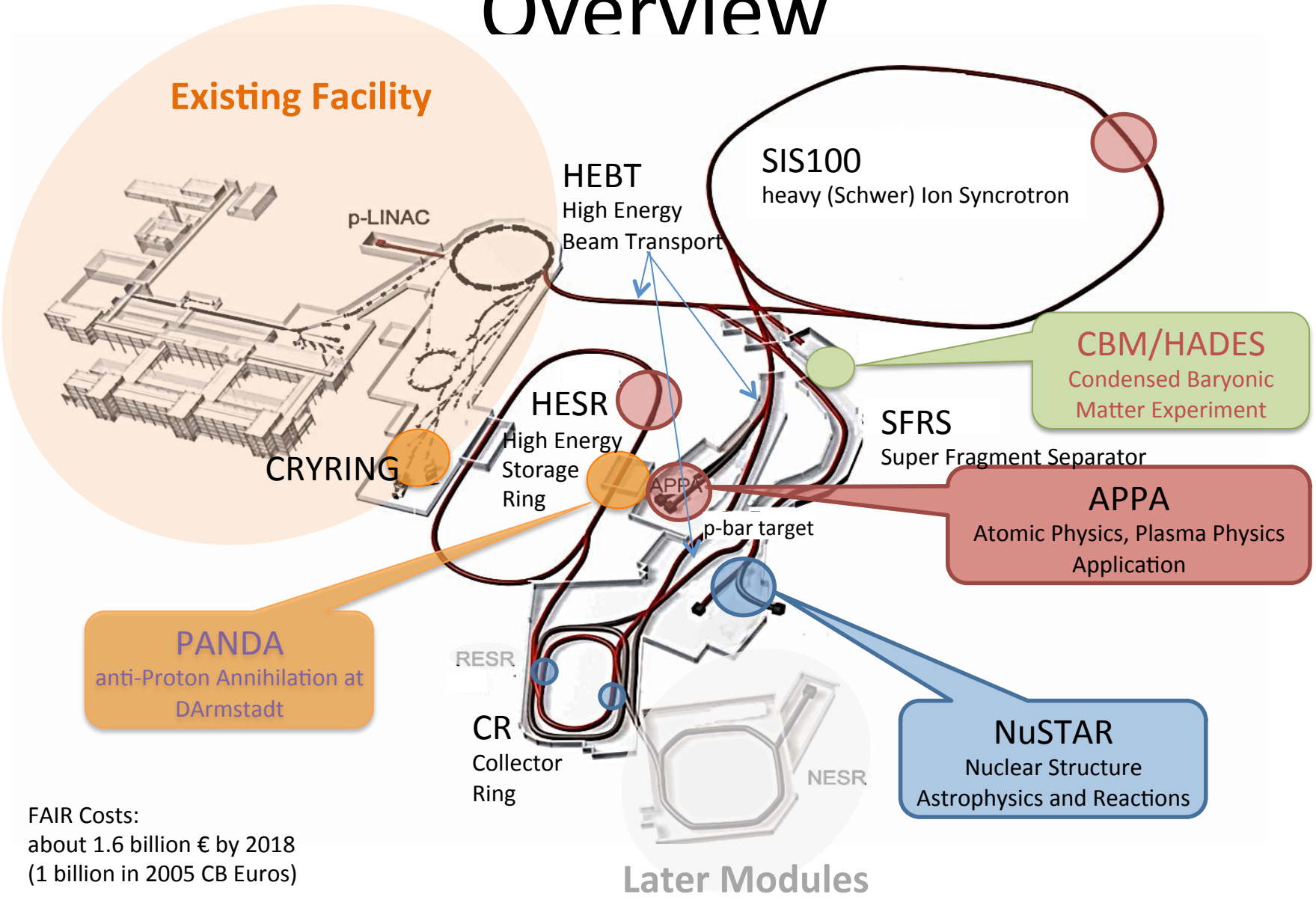
ILIMA LaSpec @ FAIR R3B MATS SPEC for NUSTAR

Panda - "anti-Proton ANnihilation at DArmstadt"

- **The mission**
  - Study precisely how mass is generated by strong interaction acting between the quarks
  - Basic research on weak and strong forces, exotic states of matter and the structure of hadrons
- **The physics**
  - Hadron spectroscopy
- **The challenge**
  - Production of high flux of antiprotons
  - Complexity of data analysis required
    - e.g. by producing glueballs and measure their masses and other properties
  - Large multi-purpose detector, large data rate
- **The technique**
  - full coverage of the solid angle together with good particle identification and high energy and angular resolutions for charged particles and photons:
- **Beam**
  - High energy antiprotons, high flux



Overview



FAIR Costs:
about 1.6 billion € by 2018
(1 billion in 2005 CB Euros)

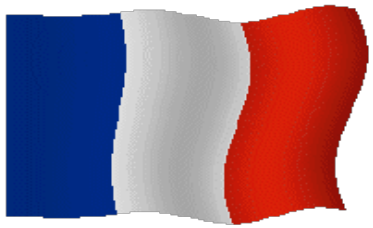
International Collaboration

Slovenia

Sweden

Finland

Germany



France

FAIR

Romania

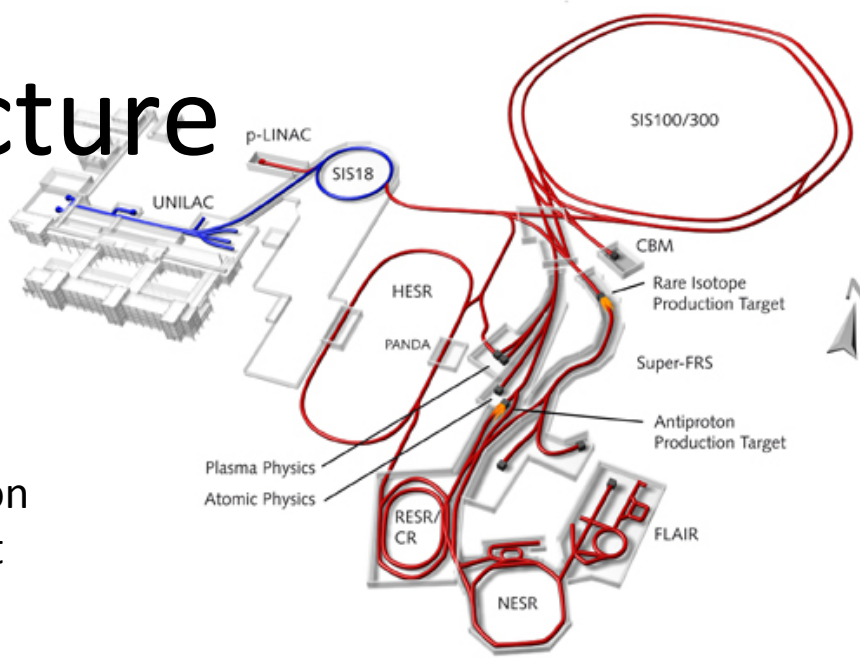
India

Russia

Poland

UK

FAIR Structure



- FAIR GmbH:
  - Steering Company
    - Project Management
    - Management of sub-project Construction
    - Management of sub-project Experiment
- GSI:
  - Existing Facility (operation, maintenance, preparation for FAIR)
  - Overall technical Responsibility for accelerator
  - Management of sub-project Accelerator
  - Technical Responsibility (design, assembly, commissioning) of HEBT, SIS100, HESR, Targets
- FZ Jülich:
  - Technical Responsibility for HESR
- BINP (Budker Institute for Nuclear Physics):
  - Technical Responsibility for CR

Challenges

- Project:
  - Very Complex
    - Many different small to medium size accelerators
    - large number of experiments with diverse user community
    - high activation areas, 2 production target areas
- Politics:
  - 2 Company model
    - Project Management at FAIR GmbH has no line of command for sub-project Accelerator
  - international collaboration
    - transition needed from national laboratory

In-Kind Philosophy

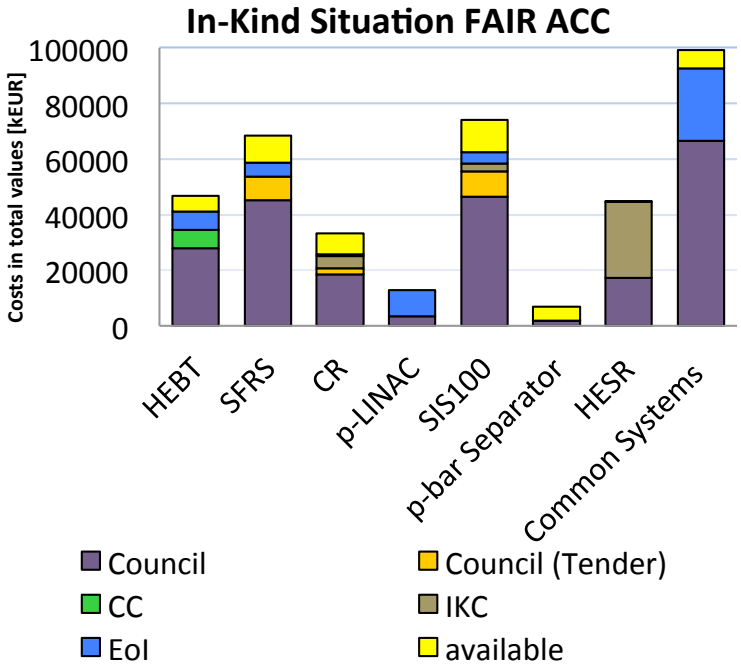
Definition of In-Kind at FAIR:

- Attachment to Convention: Contribution of component with
  - Well defined item (part list)
  - Well defined value (Cost Book)
- Commitment of shareholder:
  - in cash and/or in kind
    - credited for defined value of In-Kind contribution

In-Kind Philosophy

Accelerator:

- Idea: 100% via In-Kind
- Situation Today:
  - **Council Tender**: Items FAIR buys via tender
  - **Available**: no Partner has been found yet



Experiments:

- about 30% via In-Kind
  - rest responsibility of exp. collaborations

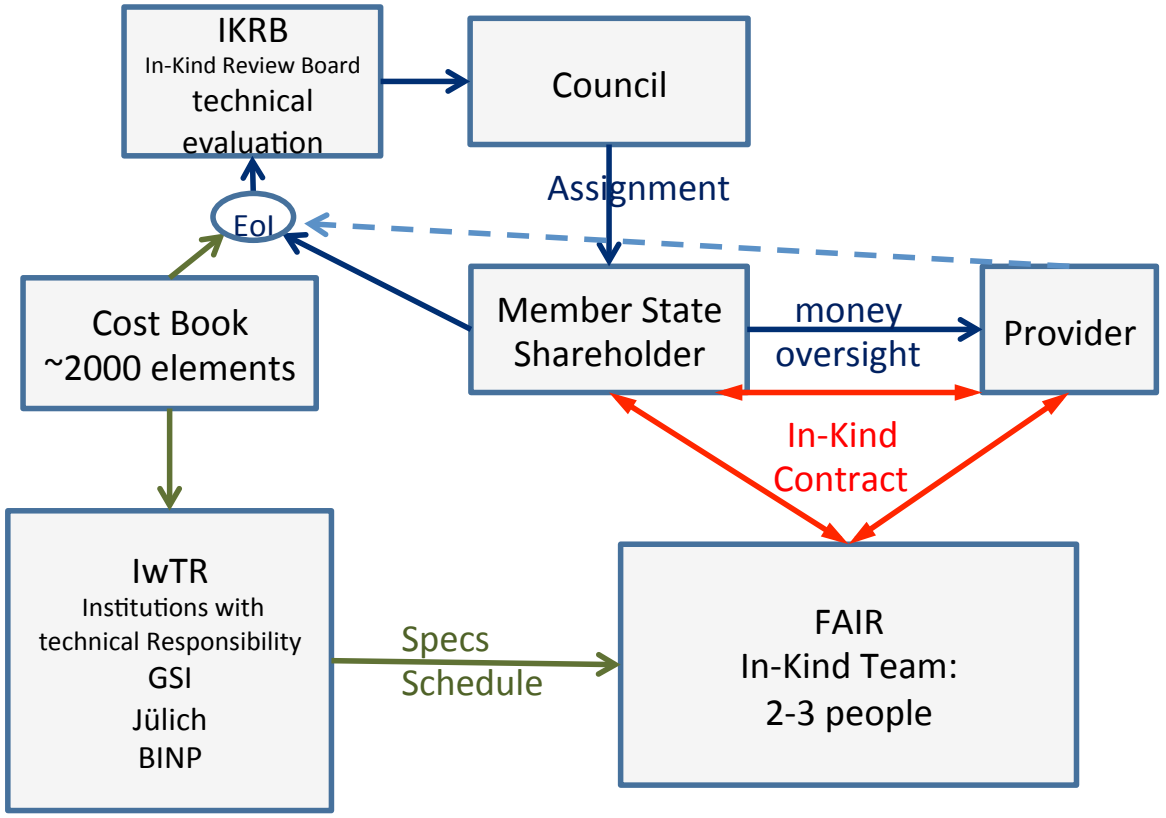
Civil Construction:

- 75% host country.
- 25% other member states (split according to total commitment)

Cost Book:

- 2200 Elements detailing entire accelerator
- every item has cost attached (Fixed at 2005)

IKC (In Kind Contract)



Types of Contracts

IKC: (In-Kind Contract)

- all countries, but Russia (including Germany)
- Only items can be In-Kind contribution, but no manpower
  - exception: manpower needed for functional design, contract follow up and installation by IwTR.

CC: (Collaboration Contract)

- Special agreement with Russia: 100% Contributions in cash
- Collaborating Russian Institutions provide for Cost Book price + inflation where other In-Kind rules apply

FAIR Tender:

- Elements not interesting for contributing partners are tendered by FAIR. Reasons can be:
  - items that are underestimated in the Cost Book
  - nobody wanted the item when it reaches Critical Path

IKC change management

Technical changes:

- Internal procedure of responsible institution: GSI, Jülich, BINP
- FAIR gets involved if monetary issues arise
- Tender, Collaboration Contracts: FAIR negotiates with Providers
- IKC: FAIR mediates between Shareholder, Provider and responsible institution
- Treated on case by case basis

Follow-up during implementation

- Follow-up phase just started
- use Quality Assurance from technical responsible institution
  - Challenge for GSI, which has to establish a QA department that can cope with such a big project
- FAIR provides contract data management system for all contracts
- IKRB (In-Kind Review Board) monitors progress and reports to council

To Do's

Dos: (Things we feel go well)

1. Crediting to shareholder only once full object is delivered and accepted by FAIR.
2. Method of assignment (and reassignment) works well and efficient.
3. Work Breakdown structure of Cost Book:
   - Cost Book, Graphical Representation, administration, schedules use all the same numerical nomenclature

Don'ts: (Things we had problems with)

1. Limit of Collaboration Contract to no more than Cost Book value + inflation correction.
2. Method of resolution who gets an assignment if several partner request same item.
3. Specifications:
   - sometimes late
   - often only functional

THANK YOU FOR YOUR ATTENTION