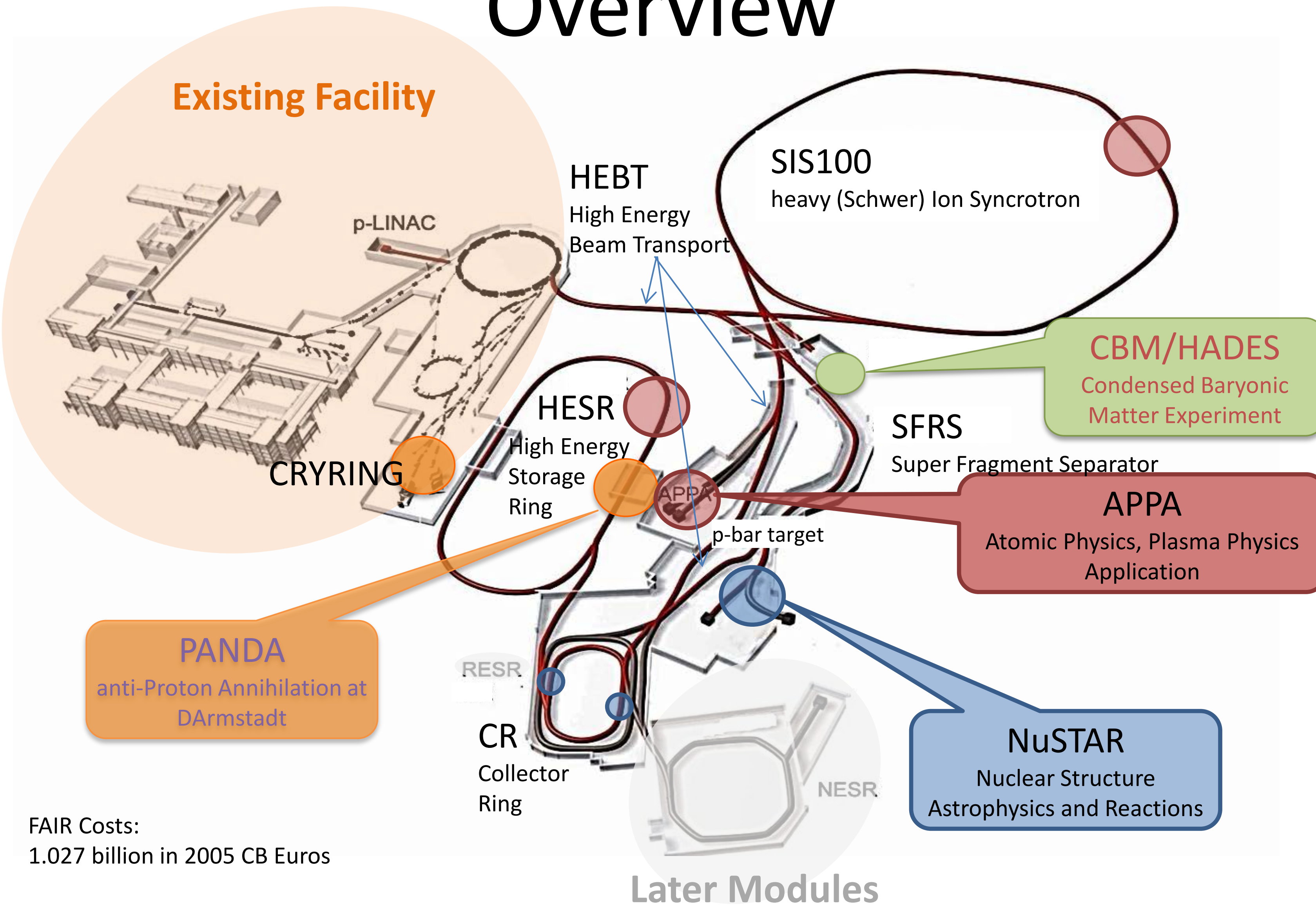
In-Kind
FAIR

David Urner

Overview



FAIR Costs:
1.027 billion in 2005 CB Euros

International Collaboration

Slovenia

Sweden

Finland

Germany

France

Romania

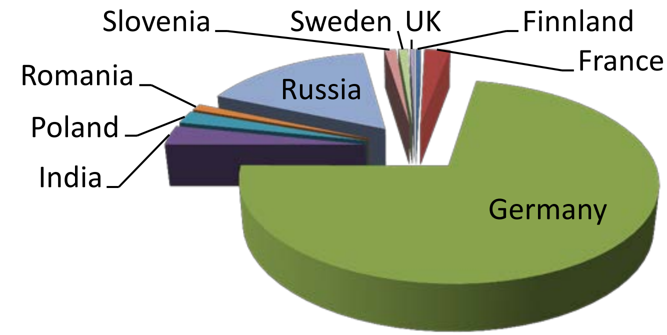
India

Russia

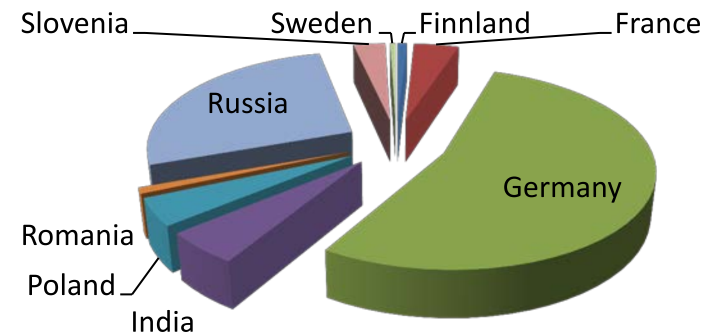
Poland

UK

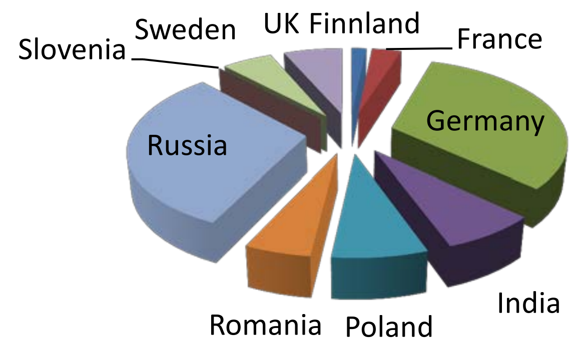
FAIR-Convention



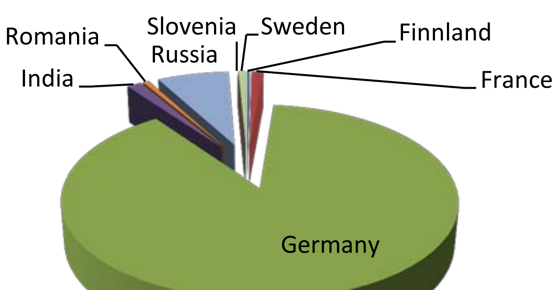
- Contributions to FAIR:
  - Total cost: 1027 M€ (2005)



- Contribution to accelerator:
  - total cost: 386M€ (FAIR Council)
  - Oversubscribed
  - Costbook: first com first served



- Contribution to experiments:
  - Total cost: ~200 M€
  - Limited to 78 M€ by FAIR Council Decision
  - Undersubscribed
  - Rest responsibility of Collaborations



- Civil Construction

FAIR-Convention

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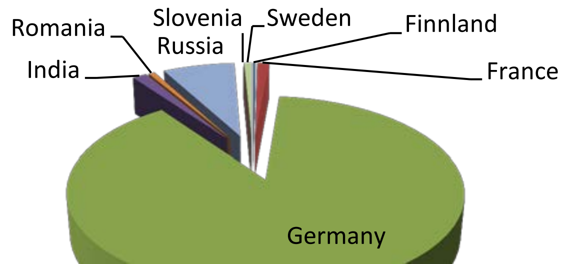
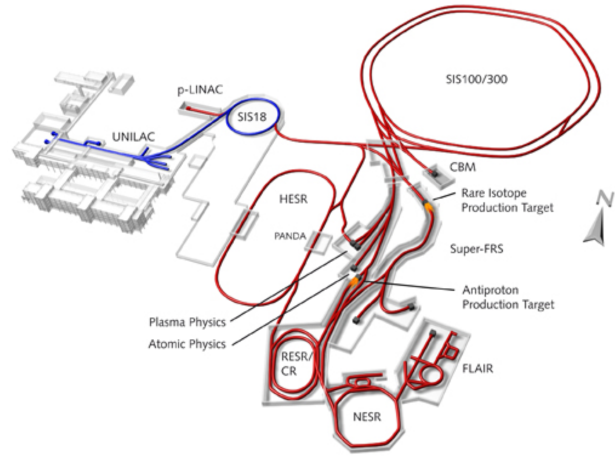


Further rules established by Council:

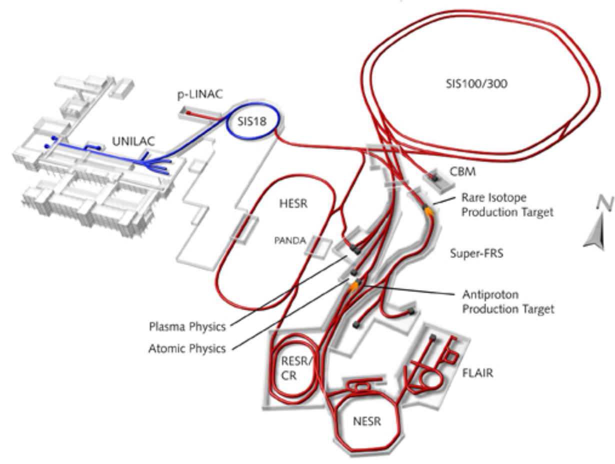
- Every country must contribute 25% to Civil Construction unless
  - >75% contribution to accelerator
- Accelerator Elements that are not picked up by any country:
  - FAIR Tender
  - Reduces total acc. in-kind contributions
    - Currently ~20 M€
  - Money that cannot be contributed by in-kind needs to be paid in cash, inflation corrected
    (e.g. civil construction)

FAIR Structure



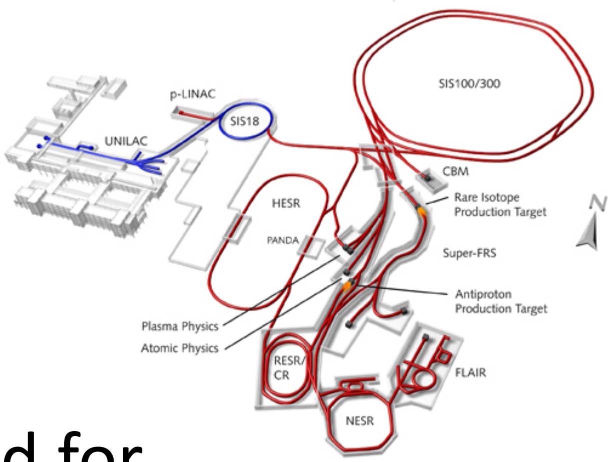
- FAIR GmbH:
  - Steering Company
    - Project Management
    - Management of sub-project Construction
    - Management of sub-project Experiment
- GSI:
  - Existing Facility (operation, maintenance, preparation for FAIR)
  - Overall technical Responsibility for accelerator
  - Management of sub-project Accelerator
  - Technical Responsibility (design, assembly, commissioning) of HEBT, SIS100, Targets, p-Linac
  - Follow up of procurement and Quality Assurance
  - Acceptance tests
  - Coordination of assembly and Comissioning
- 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 (design and implementation)
    - Current Developments
      - Merger underway, but needs international treaty
      - Effective Merger by common Management and Project management
  - international collaboration
    - transition needed from national laboratory

Accelerator



- Costbook:
  - Should contain all elements needed for Accelerator
  - >2000 items
  - Each item (PSP number) has a value (2005) and number of pieces required.
  - Experience with valuation:
    - Fairly good for items similar to existing items at GSI
    - Insuficient funds planned for superconducting magnets
      - In particular underestimation of costs of testing

Shareholders

- Each country needs to name one or several shareholders, who are responsible to
  - Request items from Costbook
  - Find a Provider
  - Supply enough funds to the Provider to finish in-kind item
    - This usually requires to deal with funding agencies of the respective country.
  - Supply item to FAIR.
  - Install item in tunnel.
  - Finally get credit for item delivered in-kind

Assigning Item to a Shareholder

- Usually Shareholder makes Expression of Interest (EoI) to reserve item and sets out to find Provider
- Once situation is clarified Shareholder will request item via In-Kind Review Board (IKRB)
- IKRB will
  - Check suitability of proposed Provider
    - unless a tender is foreseen
  - Resolve conflicts between requests
  - Recommend assignments to Council
  - Follow up assignments
    - Current process is to transform IKRB to do mostly this task
- Council will assign item to Shareholder
  - About 87% in value of the Costbook is assigned

Special Situation Russia:

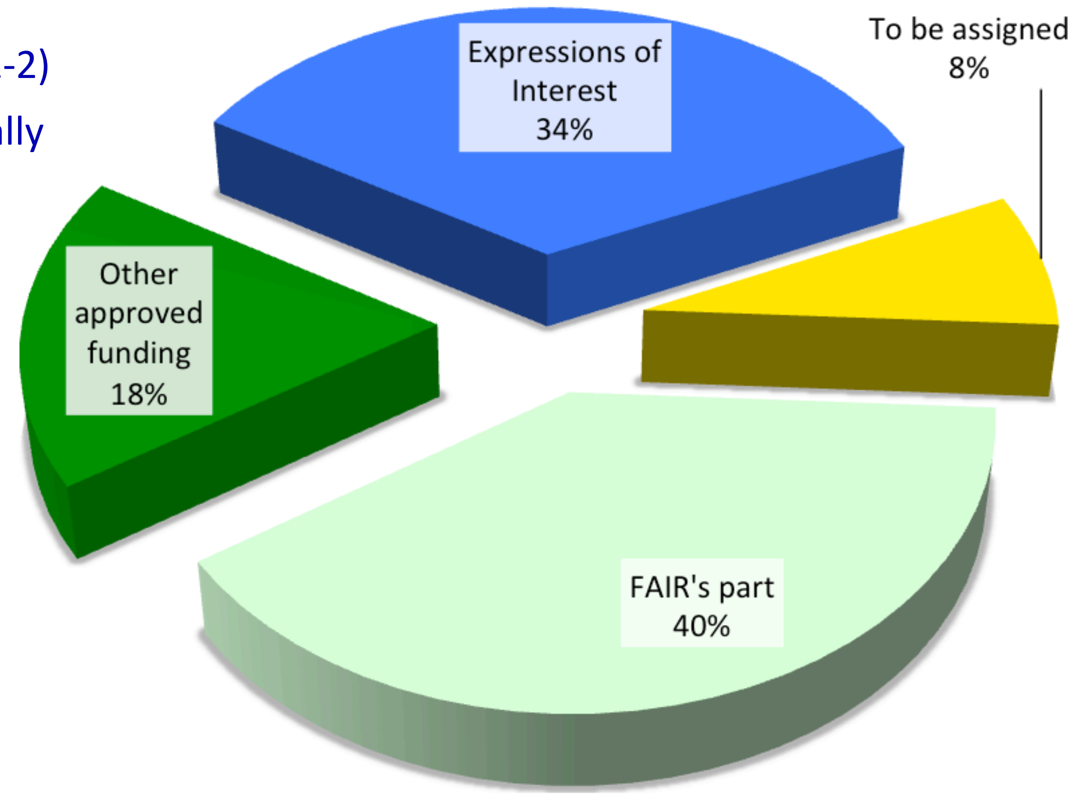
- Russia decided to contribute all in cash.
- With the understanding that
  - Russian institutions can request items in a similar procedure as used with the in-kind assignments.
  - The Russian institution will be payed by FAIR and will receive the inflation corrected Costbook value.
- Effect:
  - Safety for Russian partner in terms of Cost
  - Relatively few requests by Russian institutions
    - Danger that smaller than expected amount of money will be spend in Russia.
  - Once contract is closed, the fact that FAIR pays gives additional measure of control.

In-Kind Contracts

- 3 Party Contracts
  - Shareholder
  - Provider
  - FAIR
- Specifications from GSI
  - Not party in the contract!
  - GSI has limited number of designers
    - FAIR consists of many smaller accelerators > large design effort!
- Shareholder often only now realises the fine print
  - Funds needed are often larger than CB + inflation
  - Only with specifications the real requirement of funds becomes clear
- In-kind Coordination task:
  - Negotiate with Shareholder to supply enough funds
  - Negotiate with Provider to supply at minimal cost
  - Negotiate with GSI to minimize requirements for item
  - Rule out technical and commercial issues
- Currently about 35% of CB value is contracted.

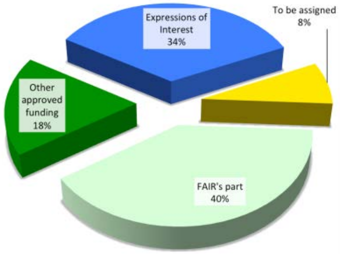
Experiments’ Costs (4th RRBs, 16th Council)

- Cost estimate Jan 2015, Collaborations’ input to 4th meetings of the Resources Review Boards (RRBs)
  - 245 M€ (2015 prices) = **196 M€** (2005 prices)
- Funds foreseen (2005 prices)
  - 78 M€ in FAIR budget (cf. Council Dec. II.15.5, XVI.12.1-2)
  - Remainder to be sought externally
- Breakdown (2005 prices)
  - FAIR’s part: 78 M€
  - Other approved funding: 35 M€
  - Expressions of Interest: 68 M€
  - To be assigned: 15 M€



In-Kind for Experiments

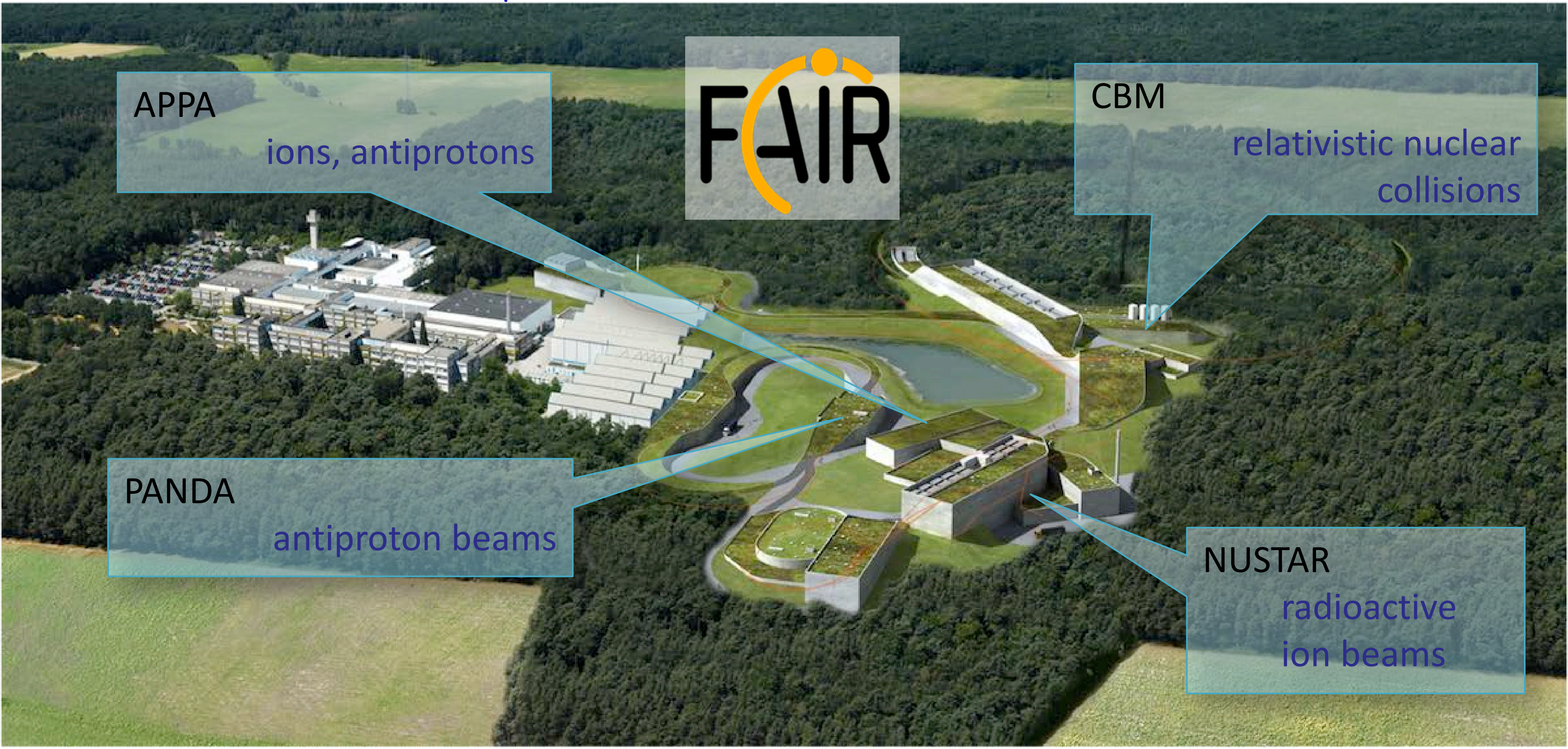
- Only 40% provided by FAIR.
  - Each Country decides which Collaboration will get how much and what it is used for.
- Experimental Costbook:
  - Only listed items can be assigned as FAIR contribution
- Each experimental component is assessed by the Expert Committee Experiment (ECE) and approved in form of a TDR.
- Upon request of the collaboration and Shareholder the Scientific director will submit a component to the Council for assignment as a FAIR contribution.
- The collaboration is responsible to supply the specification to FAIR
- FAIR will then conclude a contract between
  - FAIR, Shareholder, Provider
  - Collaborations are not party of contracts!



THANK YOU FOR YOUR ATTENTION

The 4 Scientific Pillars of FAIR

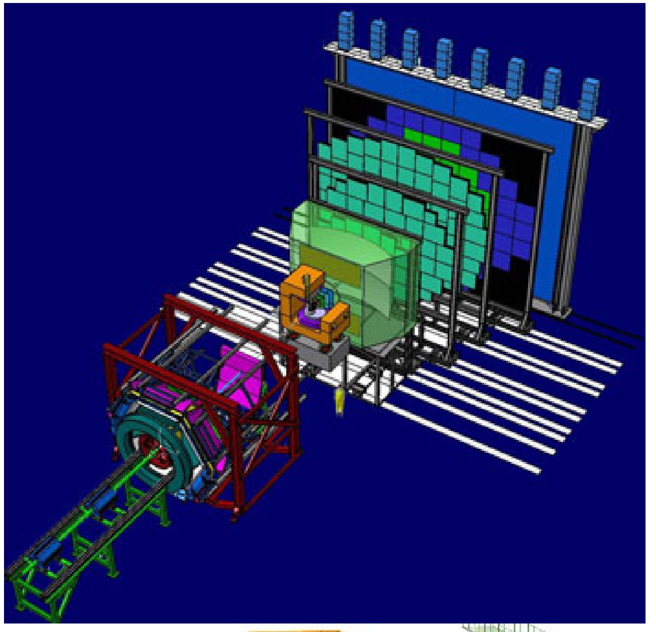
- APPA: Atomic, Plasma Physics and Applications
- CBM: Compressed Baryonic Matter
- NUSTAR: Nuclear Structure, Astrophysics and Reactions
- PANDA: Antiproton Annihilations at Darmstadt

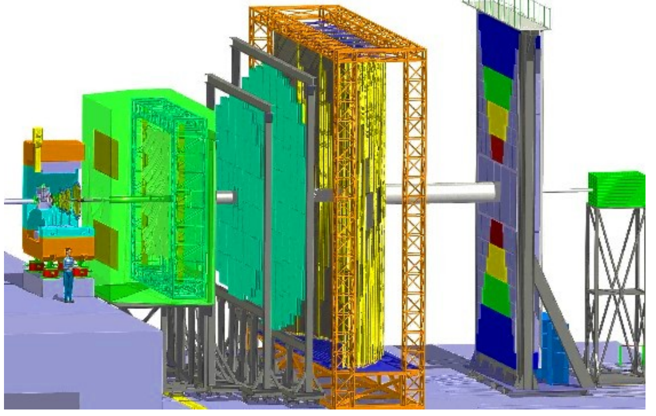


CBM

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**nti**p**roton **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

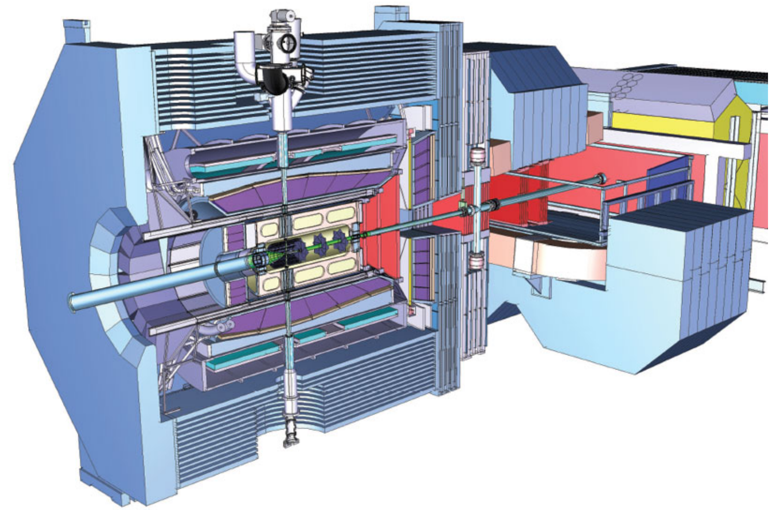
R3B

MATS

PRE HI DE 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