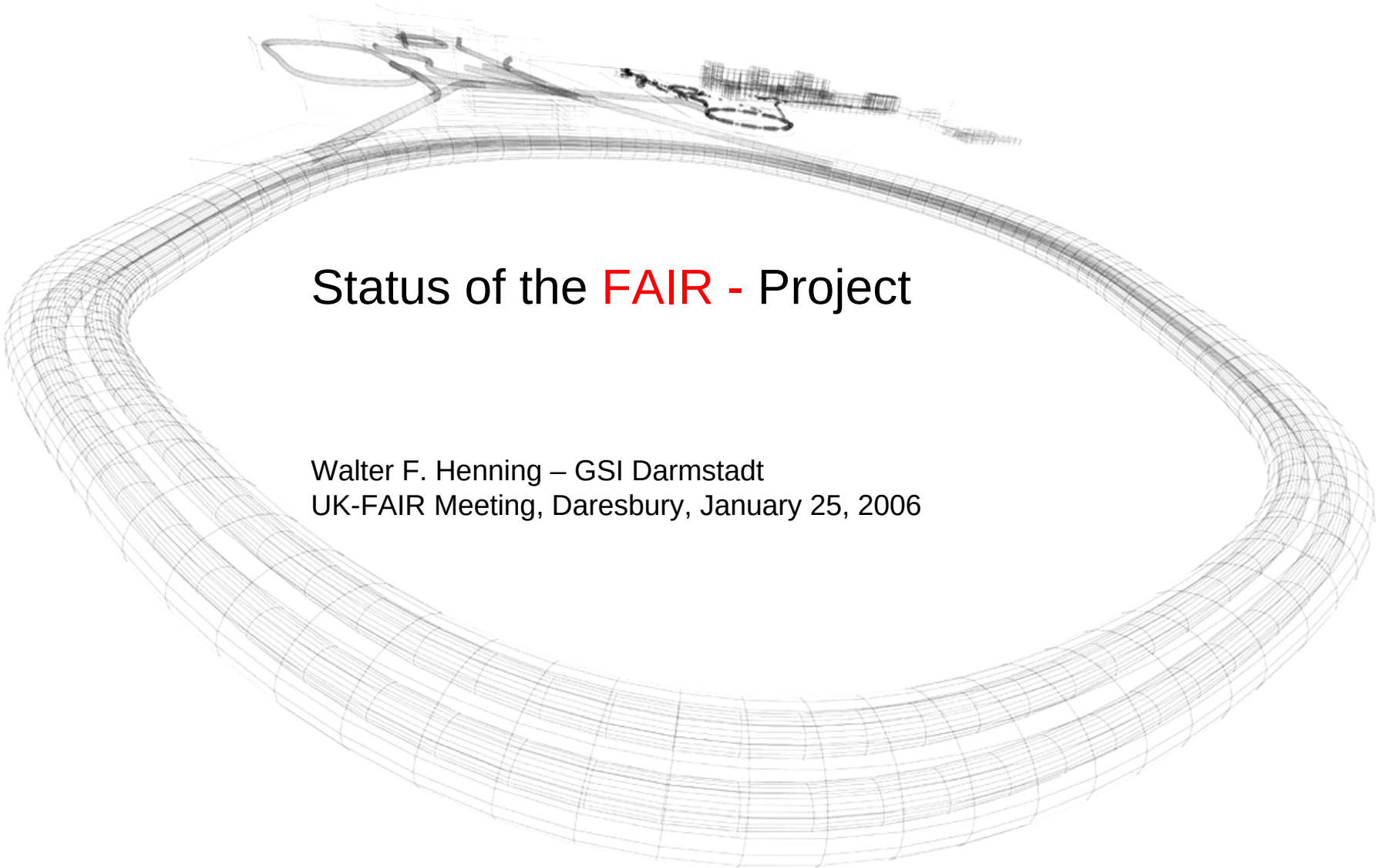

Status of the FAIR - Project

Walter F. Henning – GSI Darmstadt
UK-FAIR Meeting, Daresbury, January 25, 2006

FAIR Technical & Scientific Status – January 2006

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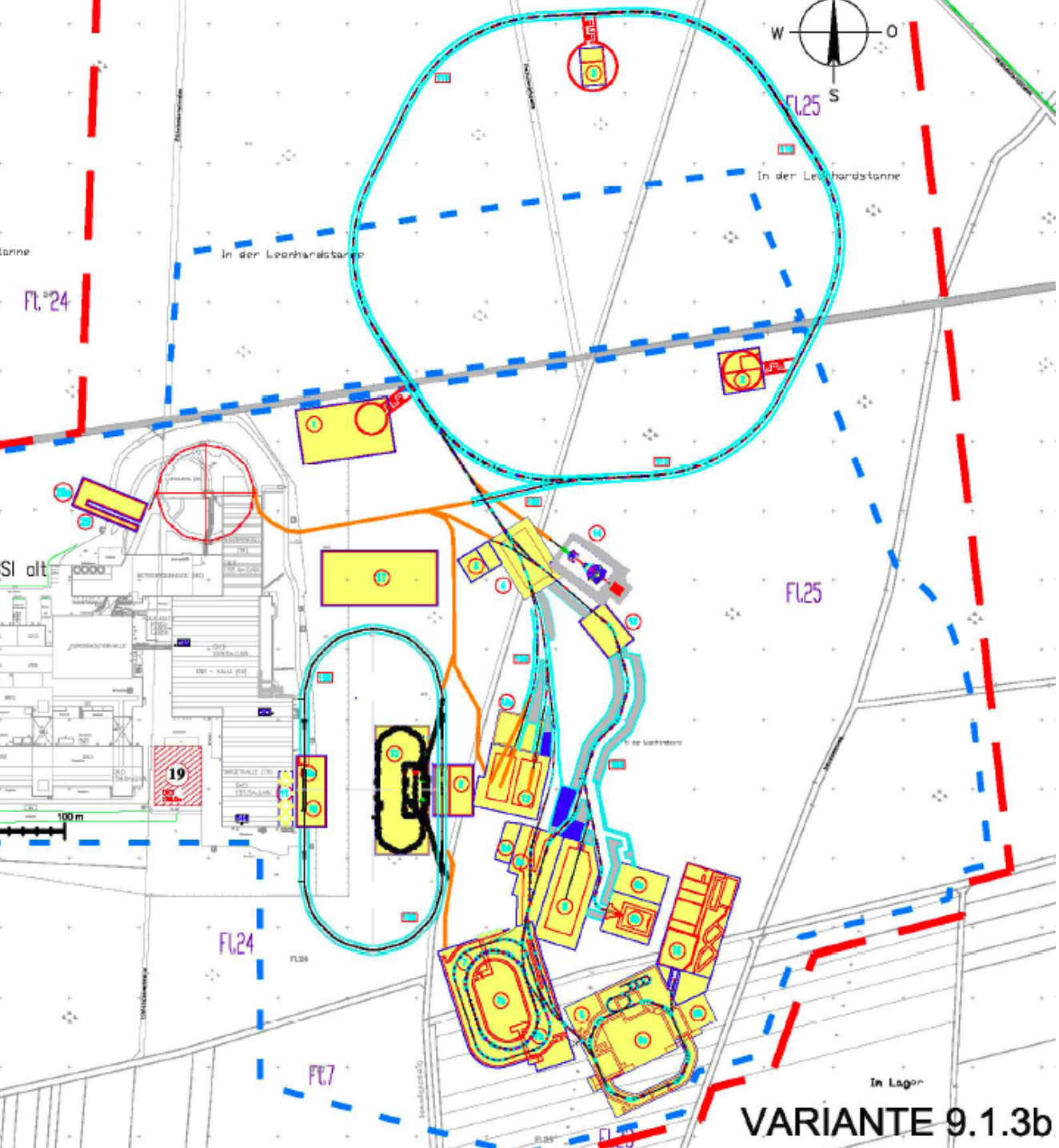
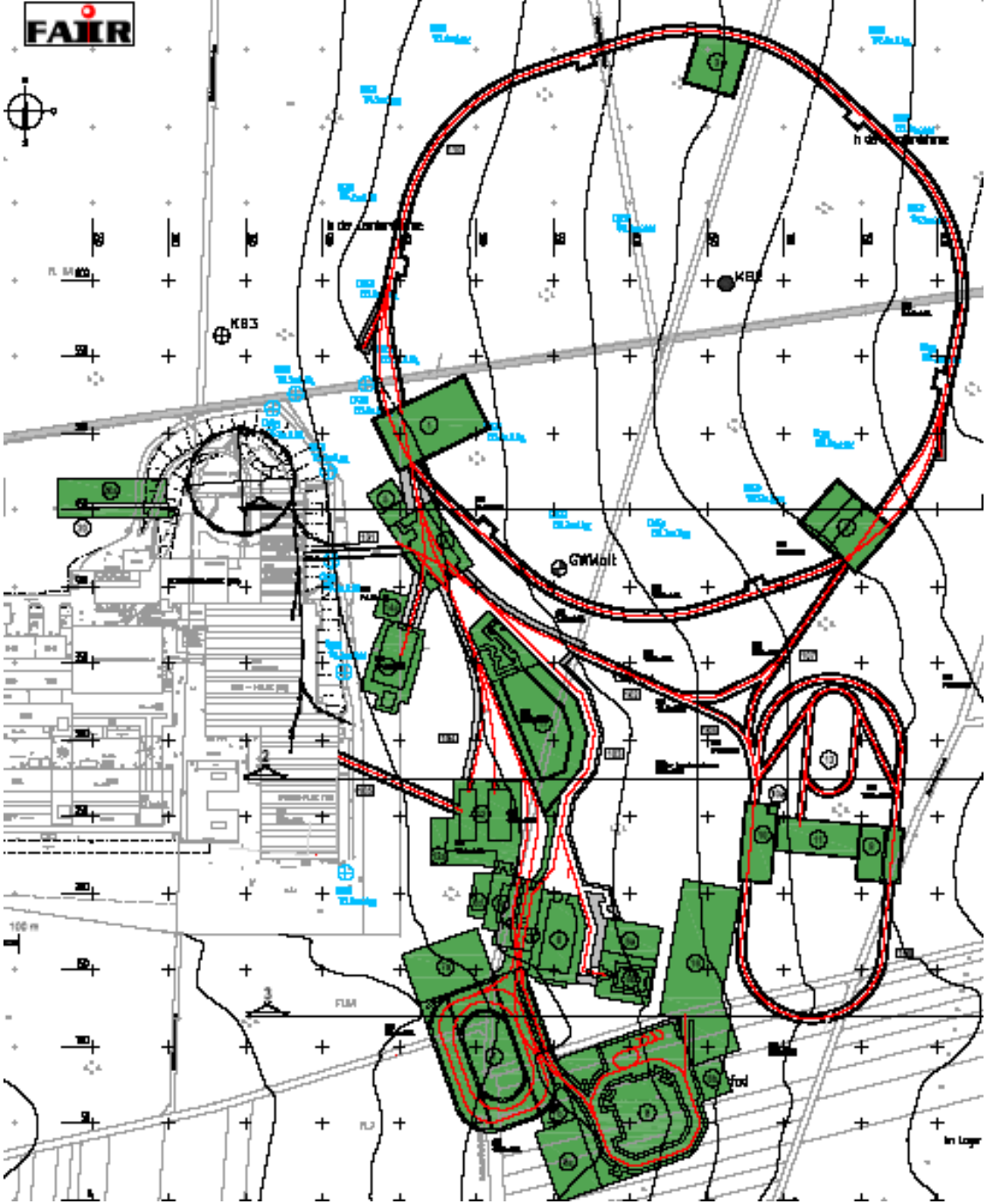


New FAIR Layout

October 2005
(Version 9.1.3b)

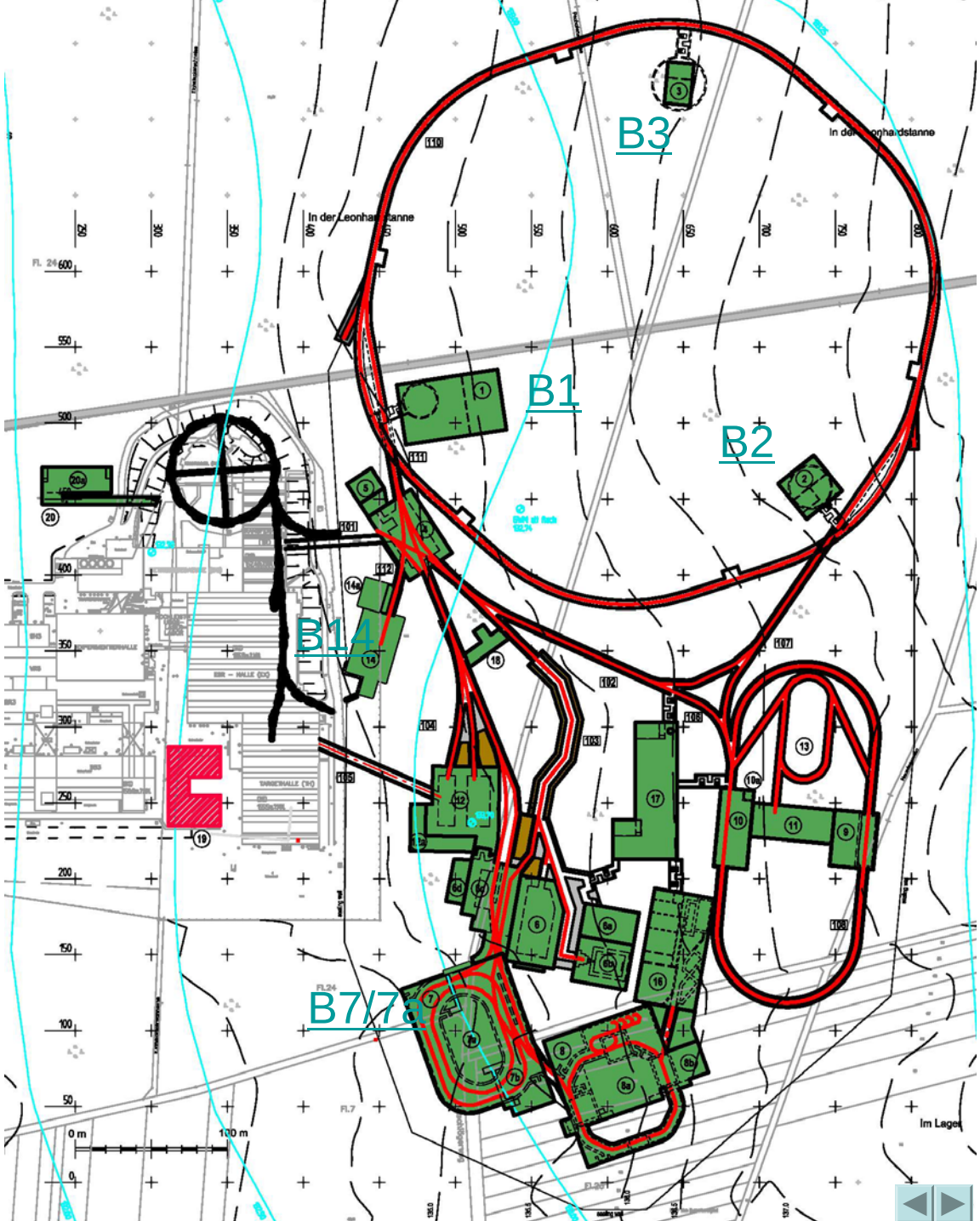
Site Plan Dec.2004



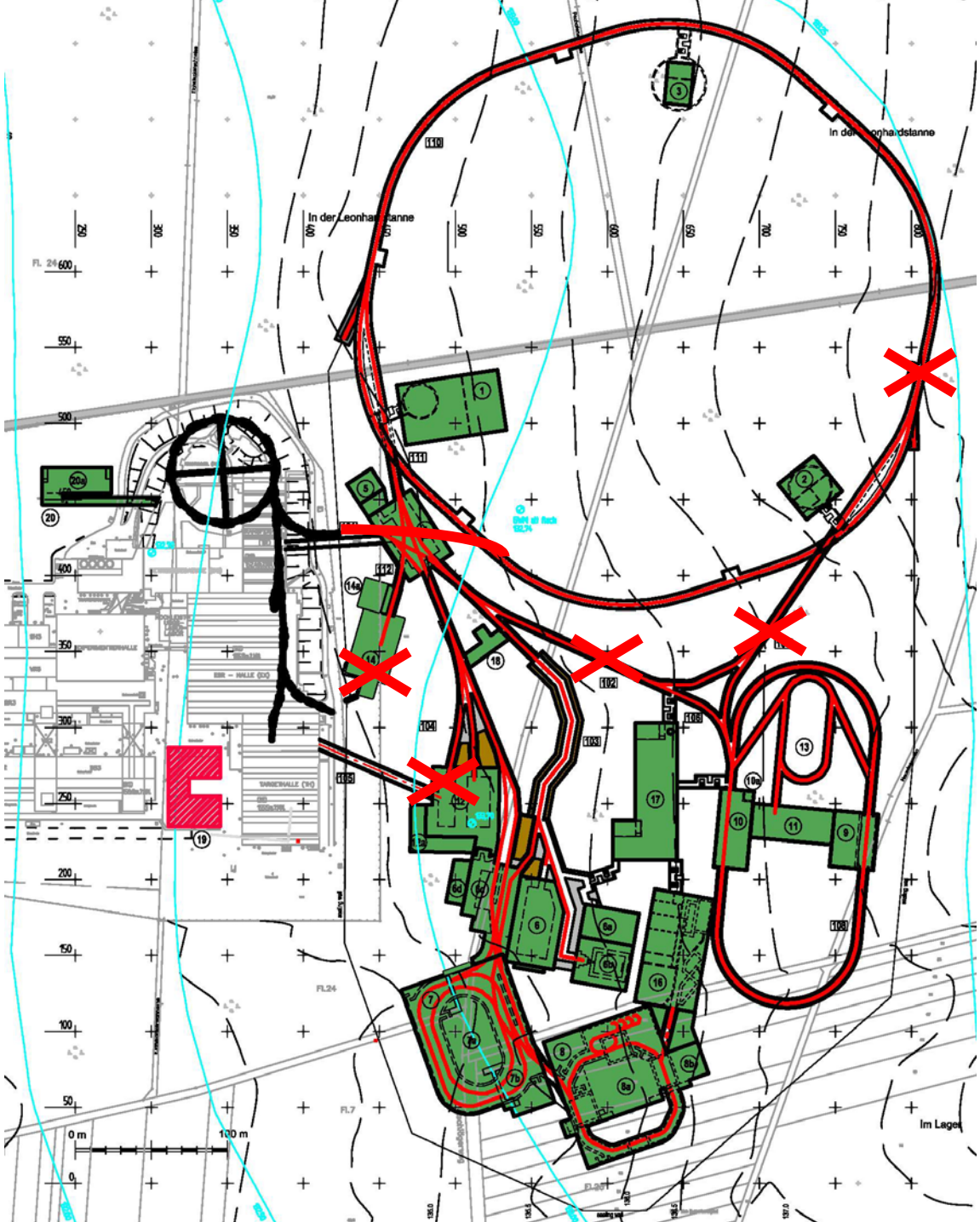
376 M€

Site Plan Feb. 2005

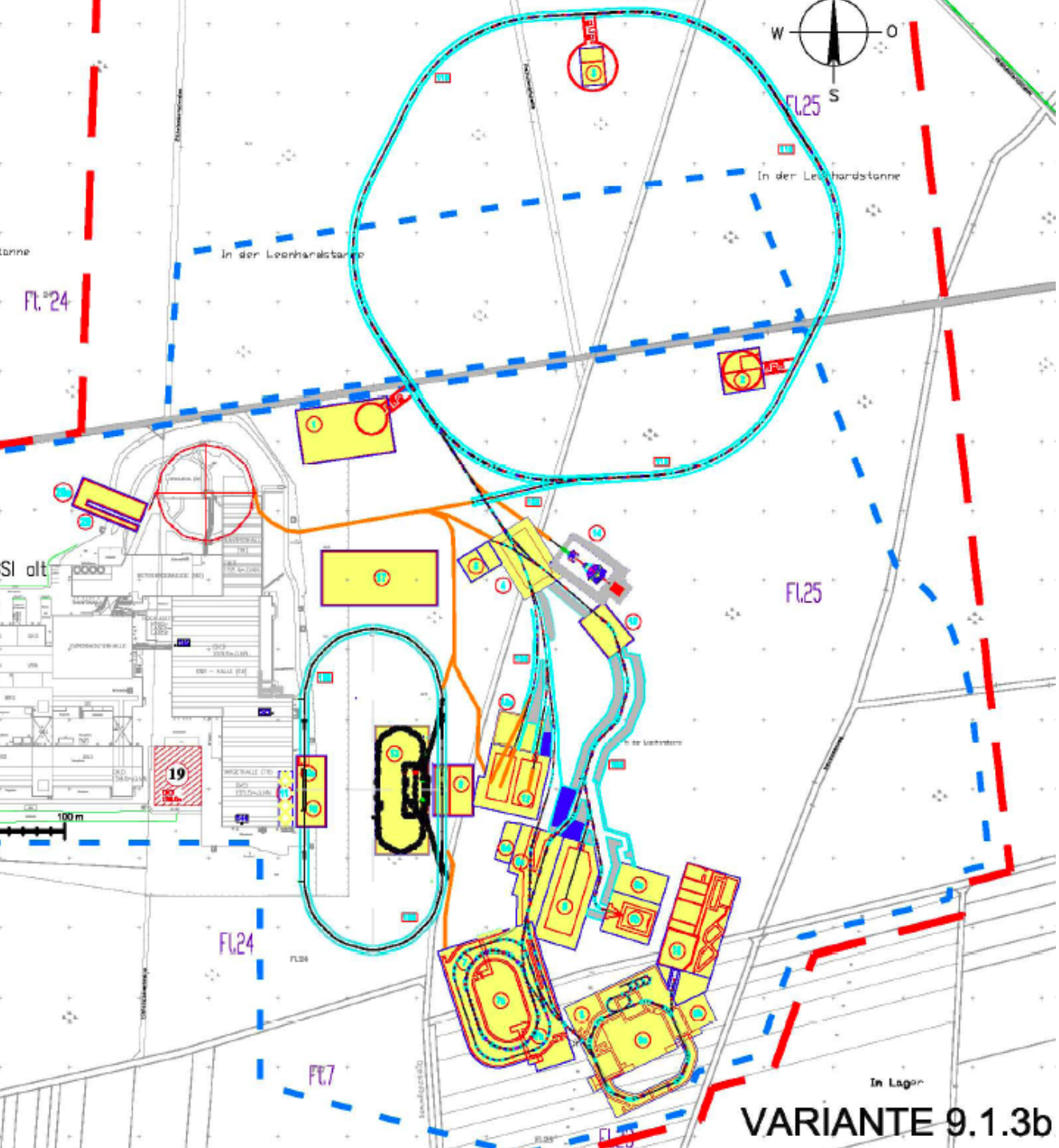
(result of cost optimization)



317 M€



- Change of p_bar operation
- Repositioning of HESR
- Repositioning of FLAIR Cave
- Repositioning of PP, AP, CBM caves



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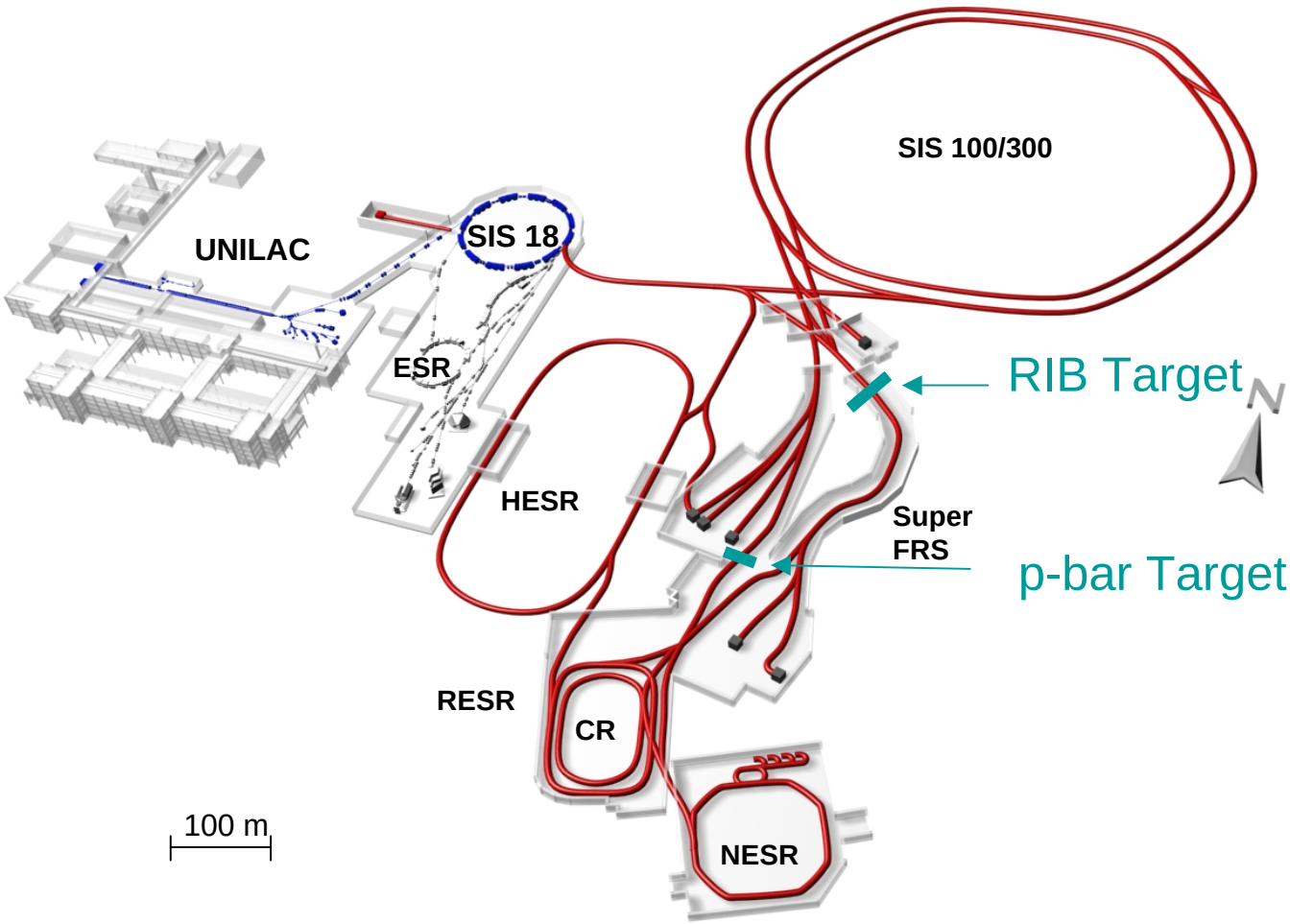
FAIR – Facility for Antiproton and Ion Research

GSI today

Future Facility



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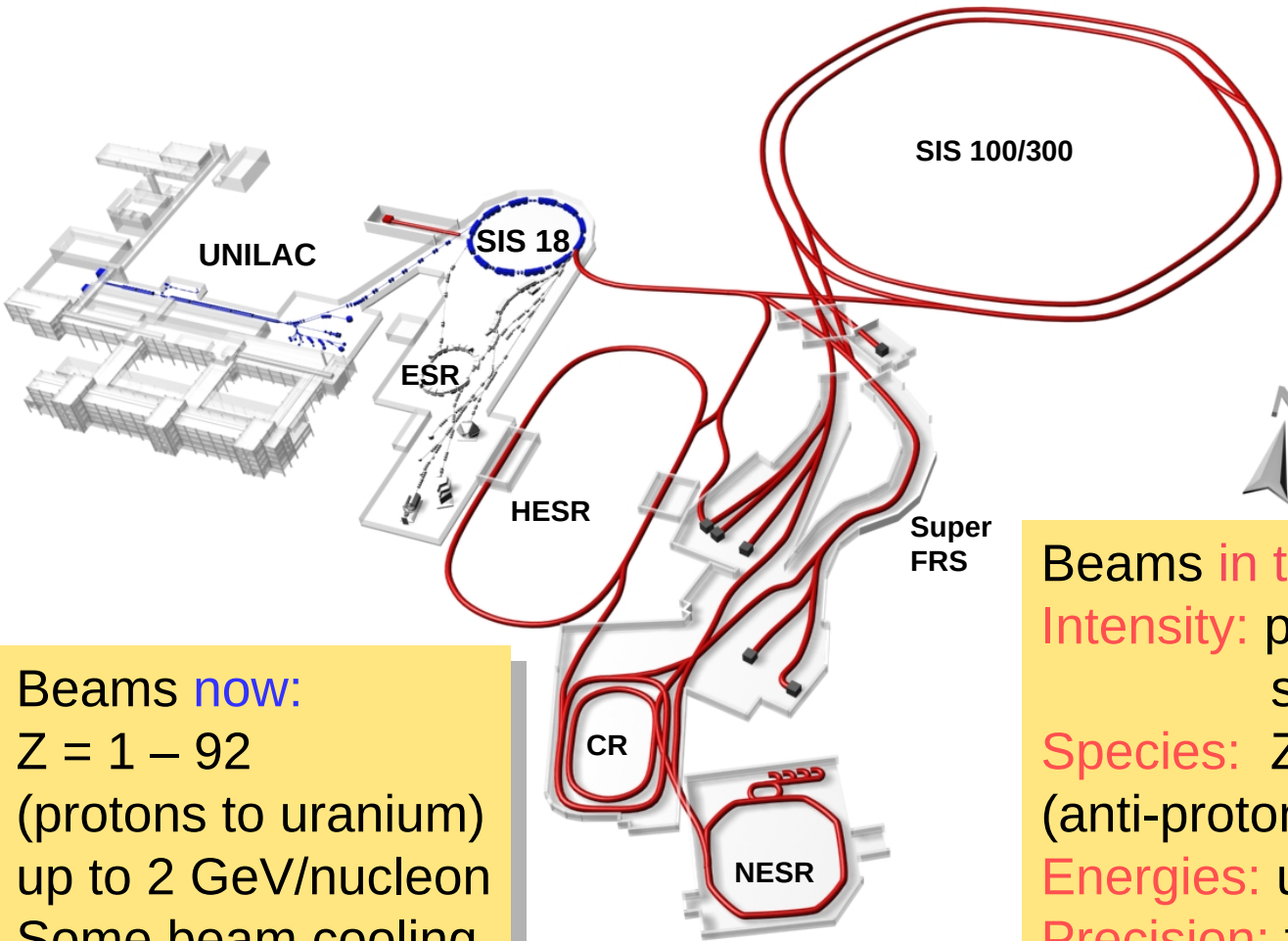


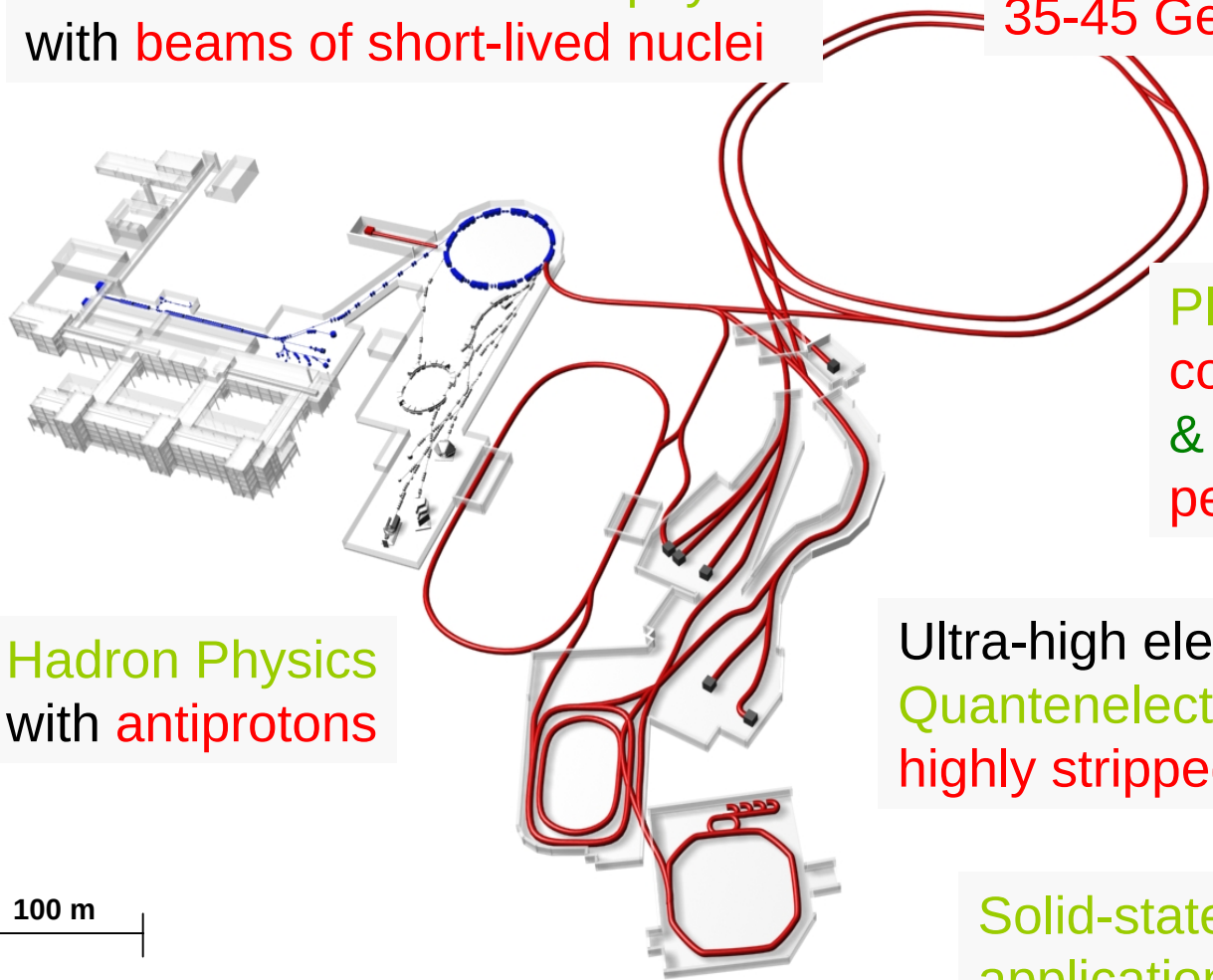
Beams now:
Z = 1 – 92
(protons to uranium)
up to 2 GeV/nucleon
Some beam cooling

Beams in the future:
Intensity: primary 100 fold
secondary 10000 fold
Species: Z = -1 – 92
(anti-protons to uranium)
Energies: up to 35 - 45 GeV/u
Precision: full beam cooling

Five Fields of Research at FAIR

Nuclear Structure & Astrophysics with beams of short-lived nuclei

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



Plasma Physics with compressed ion beams & high-intensity petawatt-laser

Hadron Physics with antiprotons

Ultra-high electro-magnetic fields & Quantenelectrodynamics with highly stripped ions and antimatter

Solid-state and biological applications with ion beams

The International Committee Structure for FAIR

ISC
International. Steering Committee
H.Schunck

STI Working Group
Scientific + Technical Issues
Horst Wenninger

- PAC QCD *E.Chiavassa*
- PAC NUSTAR *R.Casten*
- PAC APPA *D.Schwalm*
- TAC *Yanglai Cho* (plus mini-Tac's)
- Cost Review Groups
  Core-E *D.Plane*
  Core-A *W. Bartel*

FAIR Project

AFI Working Group
Administrative and Funding Issues
H.F.Wagner

- Legal Working Group *U.B. Jahn*
- Full Cost Structure Group *B. Brandt*

Observers:

Technical Proposals

PAC on Nuclear Structure and Nuclear Astrophysics (NUSTAR-PAC):

667 users

1.) Low Energy Branch (LEB)		
High-resolution In-Flight Spectroscopy (HISPEC)/ Decay Spectroscopy with Implanted Ion Beams (DESPEC)	Zs.Podolyak/ + B. Rubio	Surrey Valencia
Precision Measurements of very short-lived Nuclei using an Advanced Trapping System for highly-charged Ions (MATS)	K.Blaum	Mainz
LASER Spectroscopy for the Study of Nuclear Properties (LASPEC)	P. Campbell	Manchester
Neutron Capture Measurements (NCAP)	M.Heil	FZK
Antiprotonic Radioactive Nuclides (Exo+pbar)	M. Wada	Riken
2.) High Energy Branch (R3B)		
A Universal Setup for Kinematical Complete Measurements of Reactions with Relativistic Radioactive Beams (R3B)	T. Aumann	GSI
3.) Ring Branch (STORIB)		
Study of Isomeric Beams, Lifetimes and Masses (ILIMA)	Y .Novikov	SPNPI
Exotic Nuclei Studied in Light-Ion Induced Reactions at the NESR Storage Ring (EXL)	M. Chartier	Liverpool
Electron-Ion Scattering in a Storage Ring (e-A Collider) (ELISe)	H. Simon	GSI
Antiproton-Ion Collider: A Tool for the Measurement of Neutron and Proton rms radii of Stable and Radioactive Nuclei (AIC)	R. Krücken	TUM

Technical Proposals

PAC on Quantum Chromo Dynamics (QCD-PAC):

909 users

ASSIA Study of Spin-dependent Interactions with Antiprotons	R.Bertini	Torino	(90)
CBM Compressed Baryonic Matter Experiment	P.Senger	GSI	(294)
PANDA Strong Interaction Studies with Antiprotons	U.Wiedner	TSL Uppsala	(348)
PAX Antiproton-Proton Scattering Experiments with Polarization	F.Rathmann	FZJ	(177)

PAC on Atomic Physics, Plasma Physics and Applications (APPA-PAC)

578 users

Laser Cooling of Highly Charged Ions at SIS 100/300	U. Schramm	LMU
FLAIR - A Facility for Low-energy Antiproton and Ion Research	E. Wiedman	Tokyo/Vienna
SPARC Stored Particles in Atomic physics Research	R. Schuch	Stockholm
HEDGEHOB: High Energy Density matter Generated by Heavy-iOn Beams(LAPLAS, HIHEX)	D. Varentsov	Darmstadt
BIOMAT Applications of Relativistic Ions in Radiobiology and Space Research/	M. Durante	Napoli
Materials Research with Relativistic Heavy Ion Beams	S. Klaumünzer	HMI
WDM Radiative Properties of Warm Dense Matter	F. B. Rosmej	Marseille

	Description	PAC	Core Experimen-tal Facility	Base Research Program (CDR)	Options	Comments and Recommendations
ASSIA	Study of spin dependent interactions with antiprotons	QCD	no	–	Asked to join PAX.	no proposal, only LoI, presented.
CBM	Compressed baryonic matter experiment	QCD	yes	✓		Approved budget ceiling
PANDA	Strong interaction studies with antiprotons	QCD	yes	✓		Approved budget ceiling
PAX	Antiproton-proton scattering experiments with polarization	QCD	no	–	New APR and CSR should be discussed in TDR	Science highly rated. Only one polarized experiment. Demonstration of beam polarization and luminosity.

	Description	PAC	Core Experimen-tal Facility	Base Research Program (CDR)	Options	Comments
	Low Energy Branch (LEB)					
HISPEC/ DESPEC	High-resolution in-flight spectroscopy and decay spectroscopy with implanted ion beams	NUSTAR	yes	✓		S-FRS + low energy buncher Approved budget ceiling
MATS	Precision measurements of very short-lived nuclei using an advanced trapping system for highly-charged ions	NUSTAR	yes	✓		S-FRS + low energy buncher Approved budget ceiling
LASPEC	Laser spectroscopy for the study of nuclear properties	NUSTAR	yes	✓		S-FRS + low energy buncher Approved budget ceiling
NCAP	Neutron capture measurements	NUSTAR	no	–		Set up will exist soon from other sources
Exo+pbar	Antiprotonic radioactive nuclides	NUSTAR	no	–		Not approved

	Description	PAC	Core Experimen-tal Facility	Base Research Program (CDR)	Options	Comments
	High Energy Branch					
R3B	A universal setup for kinematical complete measurements of reactions with relativistic radioactive beams	NUSTAR	yes	✓		Approved budget ceiling
	Ring Branch (STORIB)	NUSTAR				
ILIMA	study of isomeric beams, lifetimes and masses	NUSTAR	yes	✓		CR + NESR Approved budget ceiling
EXL	Exotic nuclei studied in light-ion induced reactions at the NESR storage ring	NUSTAR	yes	✓		Gas target only Approved budget ceiling substantial R&D required critical issues
ELISe	Electron-ion scattering in a storage Ring (e-A collider)	NUSTAR		✓		e^- ring and linac required sensitivity range of the experiment
AIC	Antiproton-ion collider: measurement of neutron and proton rms radii of stable and radioactive nuclei	NUSTAR	no	–		discuss in TDR Work together with ELISe

	Description	PAC	Core Experimen-tal Facility	Base Research Program	Options	Comments
FLAIR	A facility for low-energy antiproton and ion research	APPA	yes	–		uses core facilities of SPARC
SPARC	Stored particles in atomic physics research	APPA	yes	✓		
WDM	Radiative properties of warm dense matter	APPA	yes	✓		should be under the Plasma Physics umbrella, same as LAPLAS and HIHEX
LAPLAS HIHEX	High energy density matter geenerated by heavy-ion beams	APPA	yes	✓		
BIOMAT	Applications of relativistic ions in radiobiology and space research materials research with relativistic heavy ion beams	APPA	yes	✓		general target stations

CORE-E Group (“E” for Experiments)

- **Wulfrin Bartel, chair (ex DESY)** large experiments
- **H.G. Ritter LBL** detector systems, gaseous detectors electronics
- **J.Simpson CCLRC** gamma ray Detection
- **A.Vacchi INFN Trieste** silicon detectors
- **I.Lazarus CCLRC** detectors, exp.systems
- **H.J.Hilke CERN** experiments, detectors, spectrom.
- **P.Lazeyras CERN** general detector systems

- **Report delivered on most experiment proposals**

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TAC (Technical Advisory Committee for Accelerators)

Name	Institute	Country
Ex-officio members from STI:		
Fabbricatore, Pasquale	**INFN**	**Italy**
Junquera, Tomas	**IN2P3**	**France**
Members:		
Cho, Yanglai(chair)	**ORNL**	**USA**
Garoby, Roland	**Cern**	**Switzerland**
Korten, Wolfram	**CEA, Saclay**	**France**
Ozaki, Satoshi	**BNL-RHIC**	**USA**
Willeke, Ferdinand	**DESY**	**Germany**
Yamazaki, Yoshishige	**KEK**	**Japan**
Nolen, Jerry	**Argonne**	**USA**
Müller, Alex	**Orsay**	**France**
Ageyev, Anatolij	**Protvino**	**Russia**

List of mini-TAC members

Subcommittee on the P-Linac

Haseroth, Helmut	CERN
Cutler, Roy	ORNL
Fuja, Raymond	ORNL

Subcommittee on Power Supplies

Cutler, Roy (chair)	ORNL
Fuja, Raymond	ORNL
Bordry, Frederick	CERN
Fernquist, Gunnar	CERN
Eckoldt, Hans-Jörg	DESY
Jensen, Jens-Peter	DESY

Subcommittee on Cryogenics

Erdt, Wolfgang	CERN
Trant, Ralf	CERN
Wolff, Siegfried	DESY
Petersen, Bernd	DESY
Mulholland, G. T.	ACT/BNL
Rode, Claus	JLAB
Quack, Hans	TU Dresden

Subcommittee on Warm Magnets

Tuozzolo, Joseph	BNL
Muto, Masayuki	KEK
Marks, Neil	CCLRC

Subcommittee on Superconducting Magnets

Bottura, Luca	CERN
Bruzzone, Pierluigi	PSI
Gourlay, Steve	LBL
Kerby, Jim	FNAL
Jacquemet, Marcel	CEA
Fabbricatore, Pasquale	INFN
Taylor, Tom	CORE-A
Scandale, Walter	CERN
Willen, Erich	BNL
Wolf, Rob	CERN

Subcommittee on Beam Diagnostics

Shea ORNL

Schmickler CERN

CORE-A Group (“A” for Accelerators and Infrastructure)

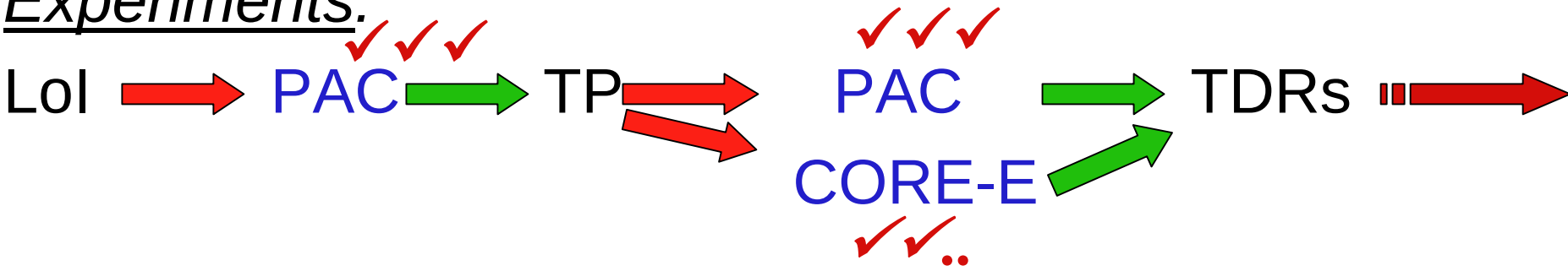
•**David Plane, chair (ex CERN)**	experiments, beam lines, project management
•**Y. Cho, Argonne (ex officio, TAC chair)**	accelerators, costing
•**K. Blasche (ex GSI)**	accelerators
•**T. Taylor (ex CERN)**	magnets, sc magnets
•**E. Weisse (ex CERN)**	accelerator systems, safety, infrastructure
•**G. Stevenson (ex CERN)**	safety, infrastructure
•**W. Erdt (ex CERN)**	cryo systems
•**P. Strubin (CERN)**	vacuum
•**I. Gardner (CCLRC)**	accelerators systems
•**L. Miralles (Synchr. Lab Spain)**	accelerators, ATLAS, engineering
•**D. Krämer (BESSY II)**	Accelerators, infrastructure

Schedule of mini-TAC (and related) meetings

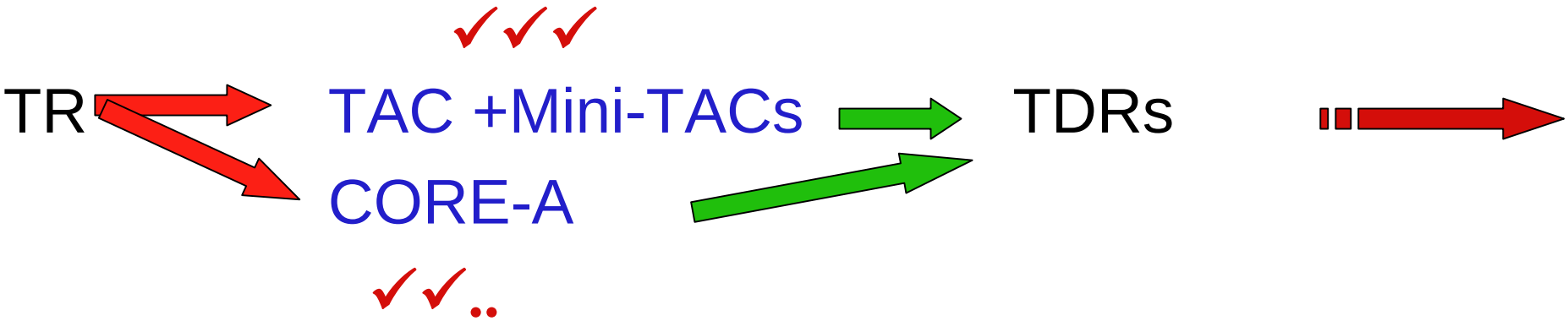
• Sept 7 – 8	beam diagnostics
• Oct 26	p-linac
• Oct 27/28	power supplies
• Oct 31 – Nov 1	cryogenics
• Nov 3	warm magnets
• Nov 7 – 9	TAC
• Nov 9 – 10	CORE-A
• Nov 11	STI
• Nov 14	joint STI-AFI
• Nov 15 – 16	cold magnets

Path of Evaluation (***both investment and operating cost***)

Experiments:



Accelerator + Infrastructure Projects:



Accelerator Consortia / Collaborations / MoU's etc

- HESR Consortium (Jülich, Stockholm, Uppsala, GSI)
- Spain-GSI MoU on NESR s.c. magnet development & prototyping
- 'China-Fair'-GSI MoU on CR s.c. magnet development & prototyping
- Italy(INFN)-GSI MoU on SIS300 s.c. magnet development & prototyping
- France-GSI MoU on s.c. quadrupole magnet development in preparation
- DUBNA-ACCEL-BNN MoU on SIS100 prototypes
- EU 'Design'-Project
- EU 'Construction'-Project
- Groningen-GSI MoU

Darmstädter Echo, Darmstadt

Dienstag 01.11.2005

Nächster Schritt zur GSI-Erweiterung

Bauvorhaben – Planungsunterlagen liegen öffentlich aus – Bürgerabend am Mittwoch

Kletterkünstler: An der Leonhardstanne bauen Heag Südhessische Energie AG (HSE) und GSI eine neue Umspannanlage mit einer Spitzenleistung von 30 Megawatt, um das geplante neue Forschungszentrum mit Strom zu versorgen. Die Fundamente liegen bereits, derzeit feilen HSE-Mitarbeiter an der Verbindung zur schon bestehenden Stromleitung. FOTO: ROMAN GRÖSSER

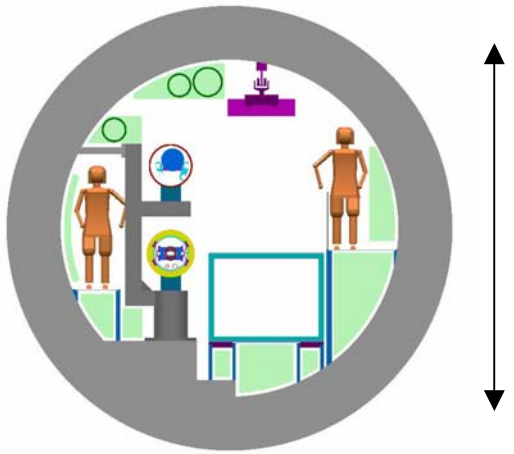
VON BERIT PAFLIK

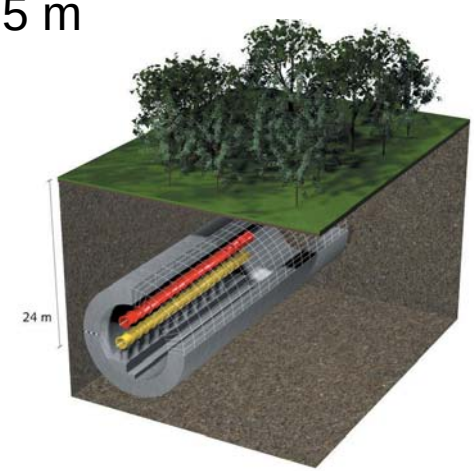
Das rechtliche Fundament für den millionenschweren Ausbau der Gesellschaft für Schwerionenforschung (GSI) in Wixhausen wird stabiler, das Bebauungsverfahren geht in die nächste Runde: Derzeit können die überarbeiteten Planungsunterlagen für das neue Beschleunigerzentrum im Waldgebiet nördlich der GSI von den Bürgern eingesehen werden. Außerdem gibt es am Mittwoch (2.) um 19.30 Uhr eine weitere öffentliche Informationsveranstaltung im Hörsaal der GSI, Planckstraße 1.

Ein Vorentwurf für den Bebauungsplan war im Januar zur ersten Einsicht für die Bürger ausgelegt worden. Auf der Grundlage der Einwendungen wird nun ein überarbeiteter Entwurf vorgelegt. Nach Auskunft von GSI-Sprecher Dr. Ingo Peter hat es dabei nur „kleinere Änderungen" gegeben. Vorgesehen ist ein Baukomplex mit oberirdischen Gebäuden – Experimentierhallen und Büroräume – und einer unterirdischen Beschleunigeranlage. Herzstück ist ein rund 340 Meter durchmessender Doppelring, durch dessen insgesamt etwa 1,1 Kilometer lange Bahnen die Ionen zur Beschleunigung geschossen werden. Mit einem Tunnel, bis zu 20 Meter tief in der Erde, sollen die schon existierenden Anlagen der GSI mit dem neuen Beschleunigerzentrum verbunden werden.

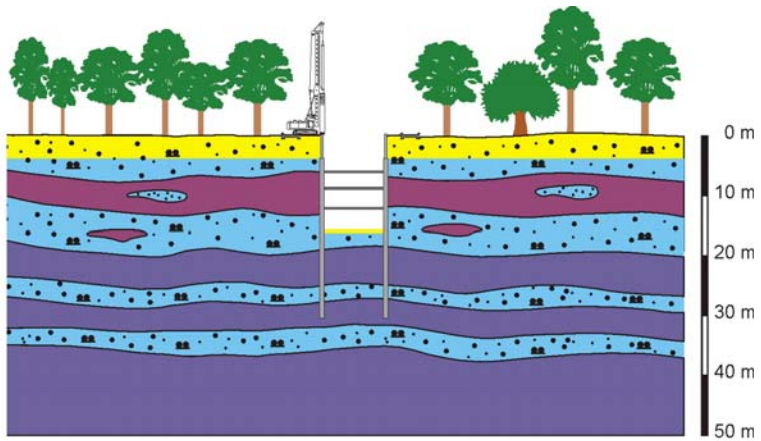
SIS100/300 Underground Tunnel

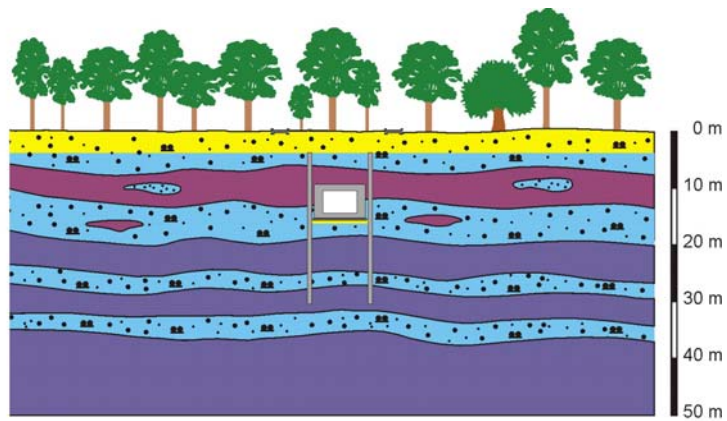
Tunnel Drilling Machine





Tunnel in Open-Pit Construction





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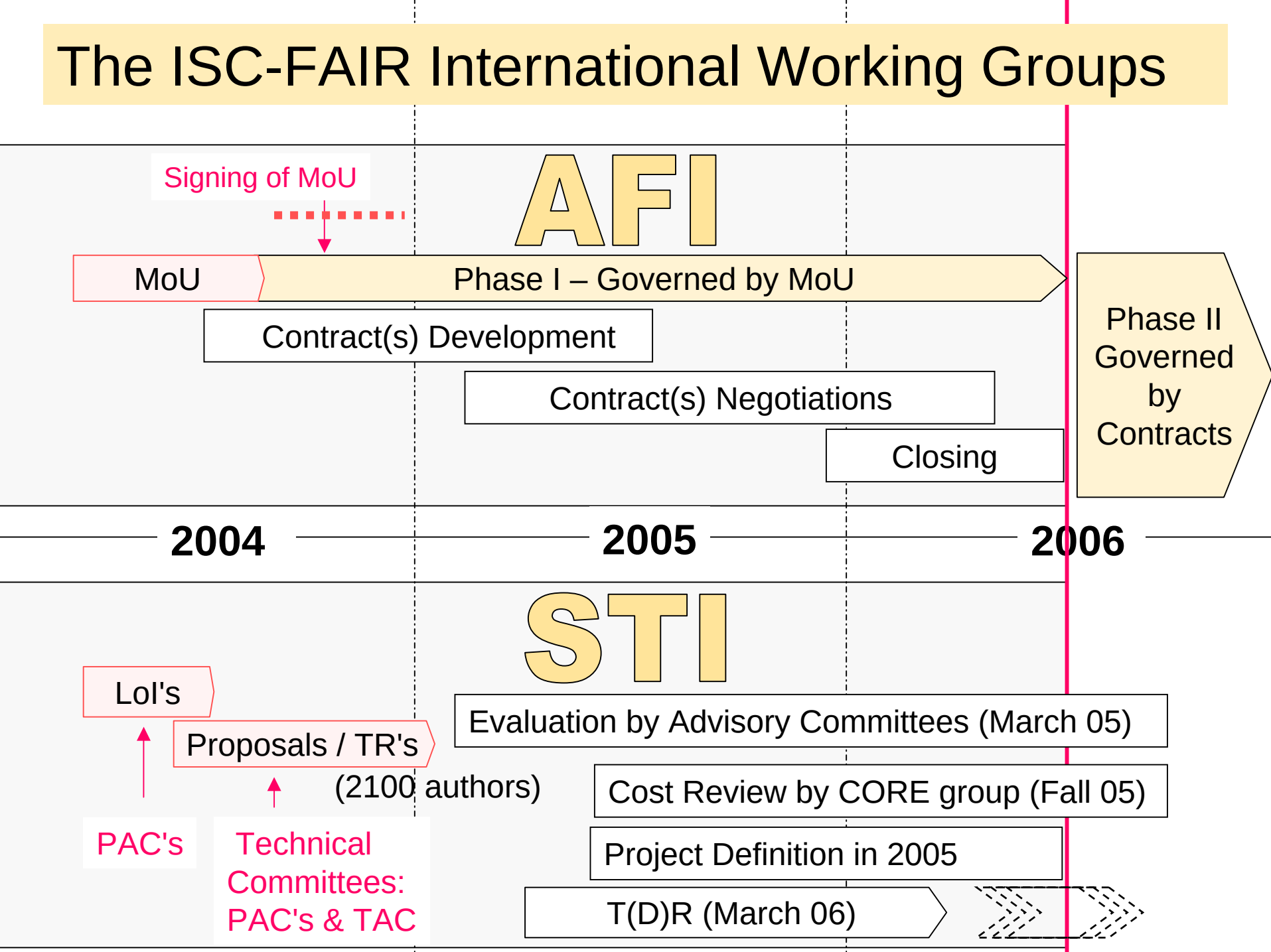
- T(D)R in March 2006, with cost, schedule and overall project definition

The ISC-FAIR International Working Groups



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  STI & PAC/TAC reviews performed (60 international members)

  STI Recommendations completed

- Accelerator development underway (R&D and proto-typing)– Draft Technical Reports / Draft Cost Book available & under evaluation (TAC/miniTAC's und STI); project definition and T(D)R by mid-March 2006; cost reviews by CORE-E & A and mini-TAC's

  3(6) consortia (& bilateral MoUs) for R&D and construction of the accelerators
  2003-2004 ~ 18,9 M€ (national) and ~ 0,8 M€ (international) effort
  2005 ~ 100 FTE (national) und ~ 20 FTE (international)

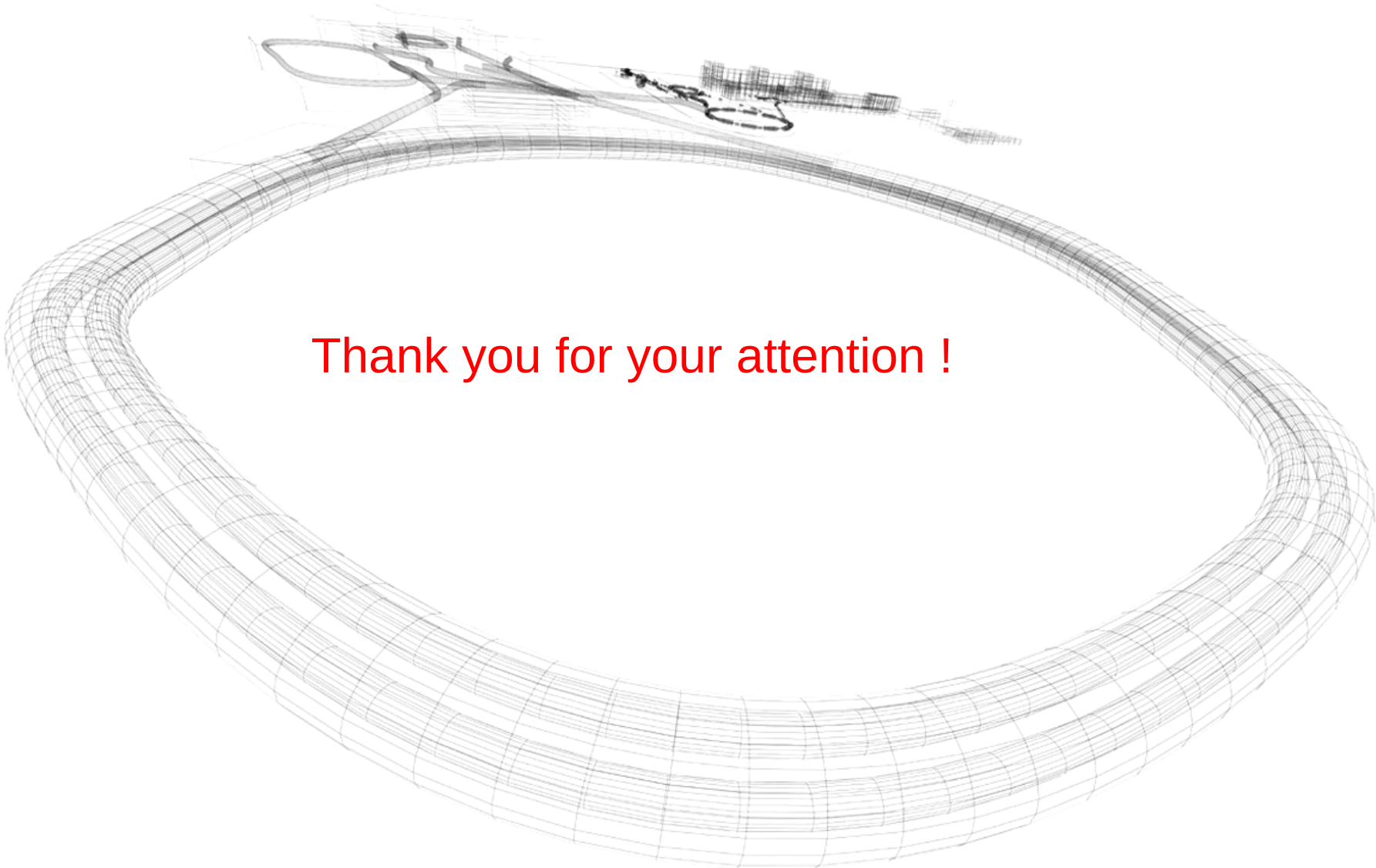
- Comprehensive civil construction and building pre-planing performed (Eng.-Co. BUNG) 'Offenlegung & Bürgerversammlung' of Civil Construction Plan (Nov.3, 2005); recently approved; final version T(D)R underway, based on new layout (and staging)

- Regulatory and legal processes initiated, environmental impact study completed:

  20 regulatory procedures (of these 9 concluded in the meantime)
  8 environmental impact studies (UVS)
  radiation safety study completed and preliminary approval received

- Development of organisational, cost and management structure

- T(D)R in March 2006, with cost, schedule and overall project definition



Thank you for your attention !