EUROPEAN SPALLATION SOURCE

Building the Science Program at ESS

Dimitri Argyriou
Director for Science
www.europeanspallationsource.se
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Science with Neutrons
Past-Present and Future

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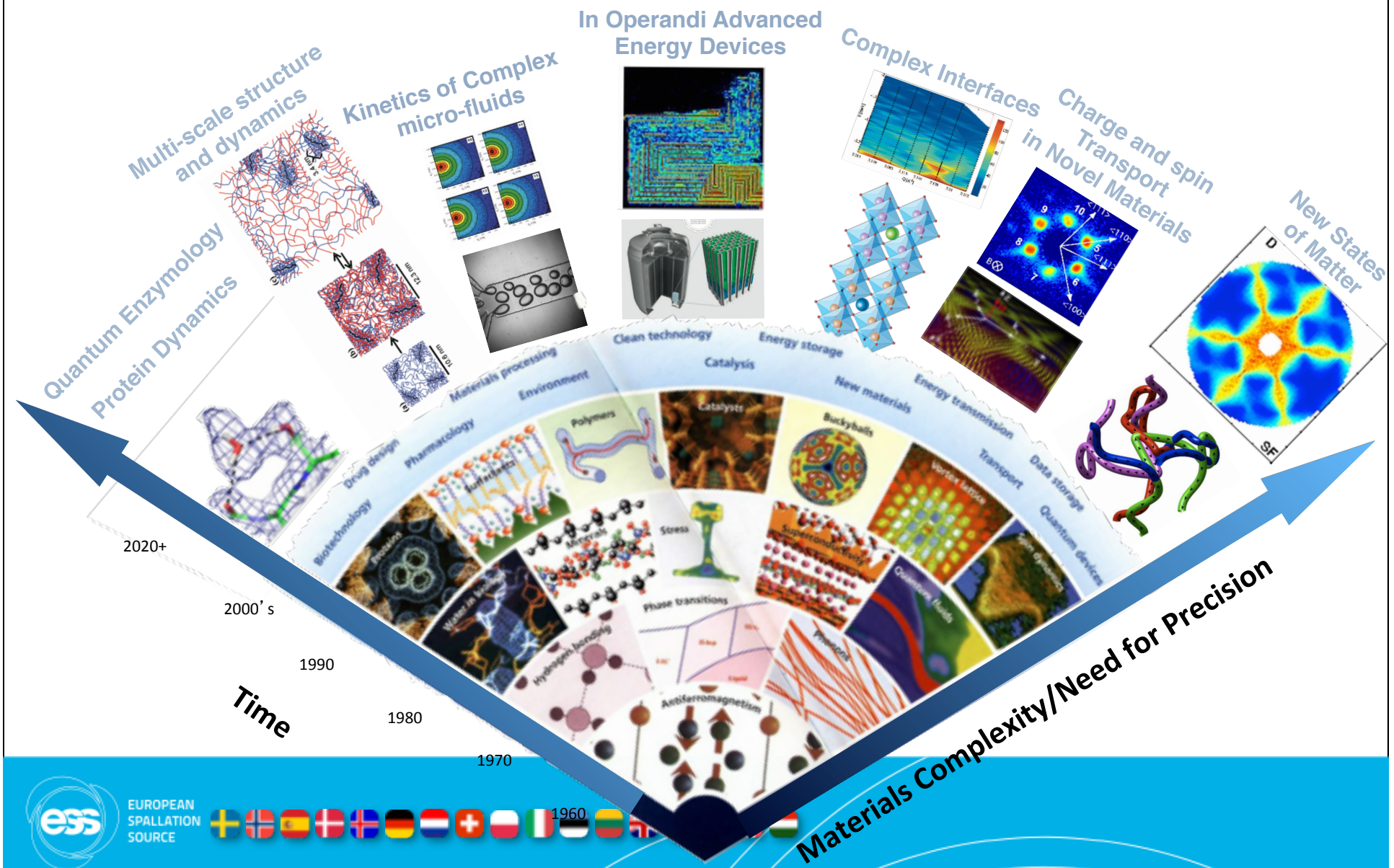
Science with Neutrons
Past-Present and Future



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Neutron Scattering Systems Project Scope

The scope:

Construct the 22 “public” instrument suite of ESS together with a technical and scientific support infrastructure that enables scientific excellence and high quality scientific user service with reliable and sustainable operations.

22 Instruments

+

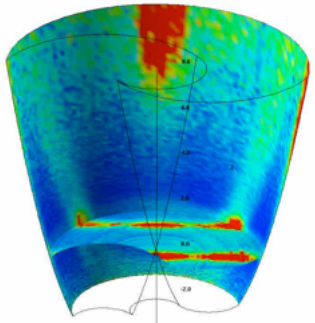
Sample Environment

+

Science Support Laboratories

+

Analysis and Visualisation Software



An Early Science Success Strategy for ESS

ESS will be judged early !

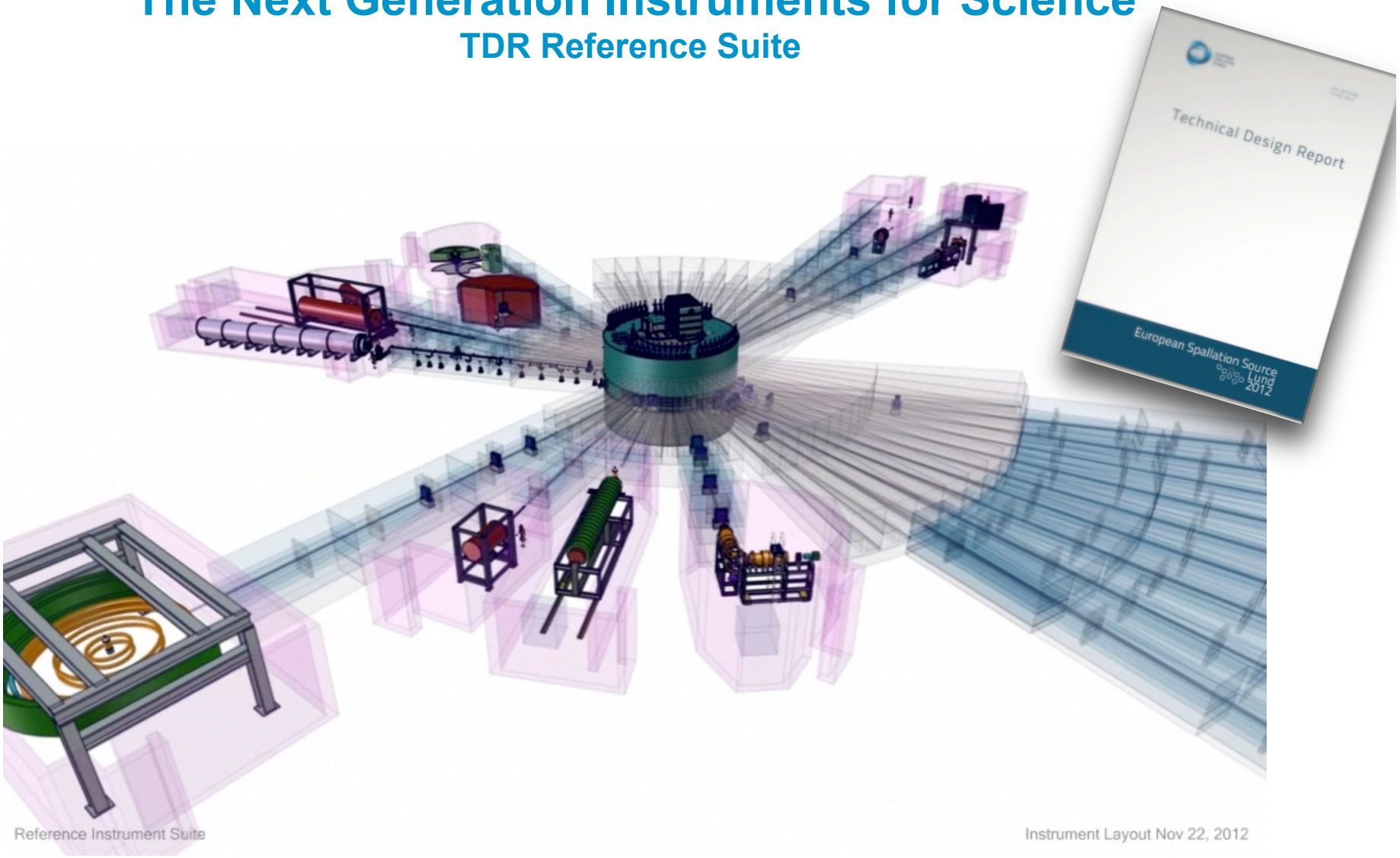
- An early success strategy aims to deliver a scientifically operational facility in the early years of ESS (2019-2023).
  - Careful choice of “first” instruments (build an instrument portfolio and prioritise)
  - Attract a wide user community.
  - High quality user service (Software, sample environment, science support)
  - Enhance potential for scientific impact.
- Build the remaining NSS scope on the foundations of this early success

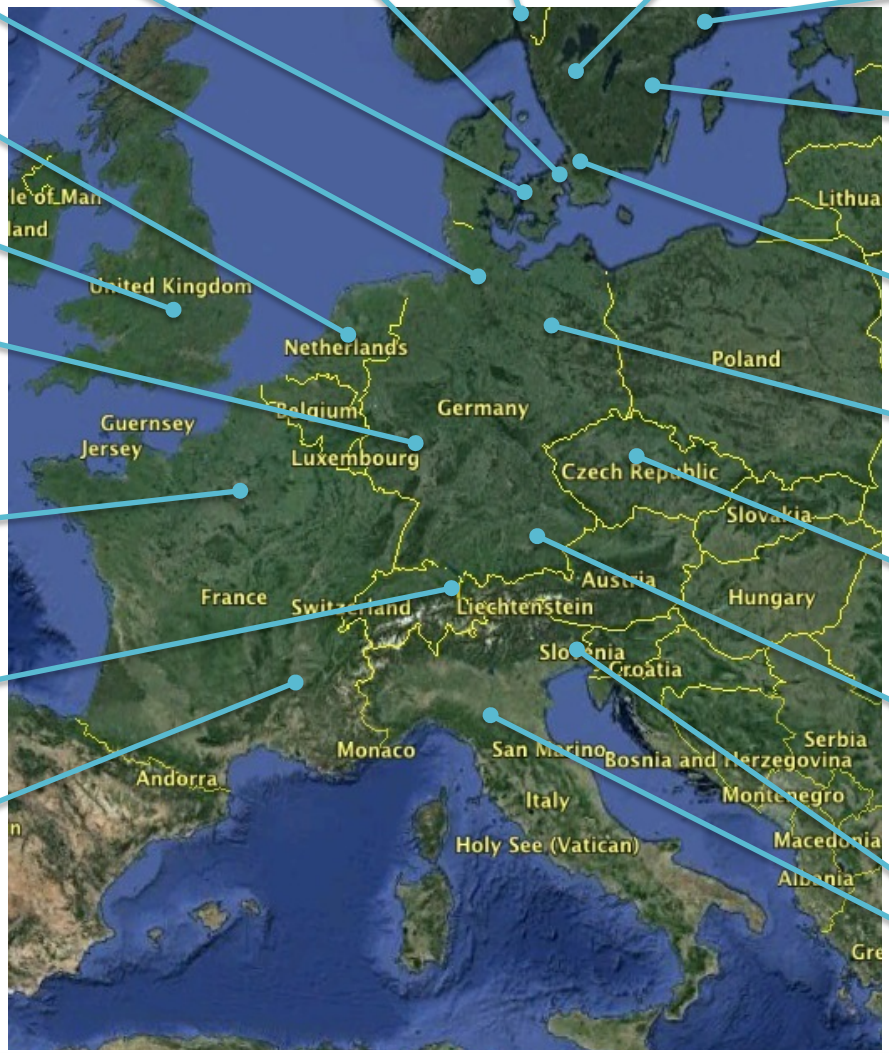
Realising the ESS Science Program (NSS)

- ESS and it's instrument suite can only be realised by harnessing European knowhow and capabilities
- Strong partnerships with European Laboratories and Industry
- European scientific community drives requirements for instruments and science support facilities.
  - ESS Science Symposia Workshops - more than 300 participants
  - IKON collaboration meetings - approx. 120-150 participants bi-annually
  - Science and Technical Advisory Panels - approx. 80 international scientists
  - Science Advisory Committee - 20 eminent international scientists
- Instruments proposed by our partners and science community, reviewed by STAPs and SAC, approved by STC.
  - High quality instrument proposals submitted at a high rate.

The Next Generation Instruments for Science

TDR Reference Suite





Helmholtz-Zentrum Geesthacht

AARHUS UNIVERSITY

DTU

IFE

UPPSALA UNIVERSITET

TU Delft
Technische Universiteit Delft

LINKÖPINGS UNIVERSITET

ISIS

LUND UNIVERSITY
Faculty of Science

JÜLICH
FORSCHUNGSZENTRUM

HZB Helmholtz Zentrum Berlin

Orphée
Laboratoire Léon Brillouin

Nuclear Physics Institute of the ASCR
public research institution

PAUL SCHERRER INSTITUT
PSI

TECHNISCHE UNIVERSITÄT MÜNCHEN

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NEUTRONS FOR SCIENCE

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ess EUROPEAN SPALLATION SOURCE

Developing a European Wide Collaboration

- Our Partners play a leading role in realising ESS;
  - ESS will provide project framework and collaborate to establish responsibilities within partner labs
  - Partner labs will take leadership and responsibility in delivering parts of ESS (instruments, components etc)
  - Integration of partners into the ESS project establishes a distributed Europe-wide ESS-network.
  - ESS will collaboratively define and begin establishment this network in 2014.

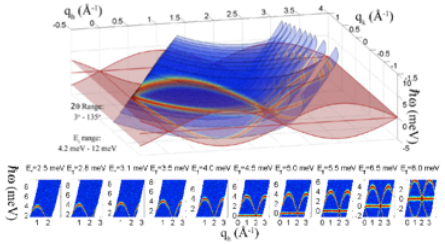
German Contribution to the Pre-Construction Phase

- Overall German ESS project funded by BMBF and participating labs
- Emphasis on Instrument concept development
  - Resulted to 8 Instrument proposals submitted in October 2013 !!!
  - Input and support from the German and international community
  - Wider European participation on these proposals
- Significant contribution to key technologies
  - Choppers, Detectors, simulations
- Construction of a Test-beamline at HZB
  - Experiments planed to test methods

Instrumentierungskonzepte: Workpackages „I“			Kritische Instrumentkomponenten: Workpackages „K“		
I1	TOF Spektroskopie Brückel	FZJ	K1	Chopper Stelzer	FZJ
I2	Spinecho- und Larmorinstrumente Monkenbusch	FZJ	K2	Detektoren Zeitelhack	TUM
I3	Reflektometrie Steitz	HZB	K3	Polarisatoren (^{3}He) Ioffe	FZJ
I4	Kleinwinkelstreuung Willumeit	GKSS	K4	ESS-spezifische Probenumgebung Staron	GKSS
I5	Diffraktometrie Kampmann	GKSS	K5	Testbeamline Strobl	HZB
I6	Neutronenradiographie/ -tomographie Kardjilov	HZB	K6	Kommunikationsplatt-form HDRI Beckmann	GKSS
I7	Alternative Konzepte der Spektroskopie Petry	TUM	K7	Simulationscode-Entwicklung, Helpdesk Lieutenant	HZB
I8	Extreme Environment Prokhnenko	HZB			

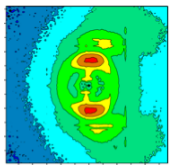
16 Instrument Concepts were Submitted on Oct 2013

Spectroscopy



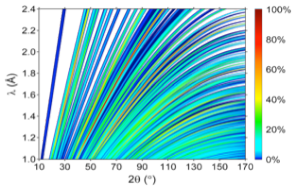
VOR		Wide Bandwidth Spectrometer
T-REX		Bi-Spectral Spectrometer
ESS-CCS		Cold Chopper Spectrometer
Tempus Fugit		Time-Focusing Spectrometer
CAMEA		Indirect Geometry Spectrometer
ESS-NSE		Spin Echo Spectrometer

SANS



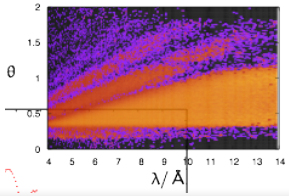
SKADI		High Intensity SANS
Compact-SANS		SANS Biology & Materials Science

Diffraction



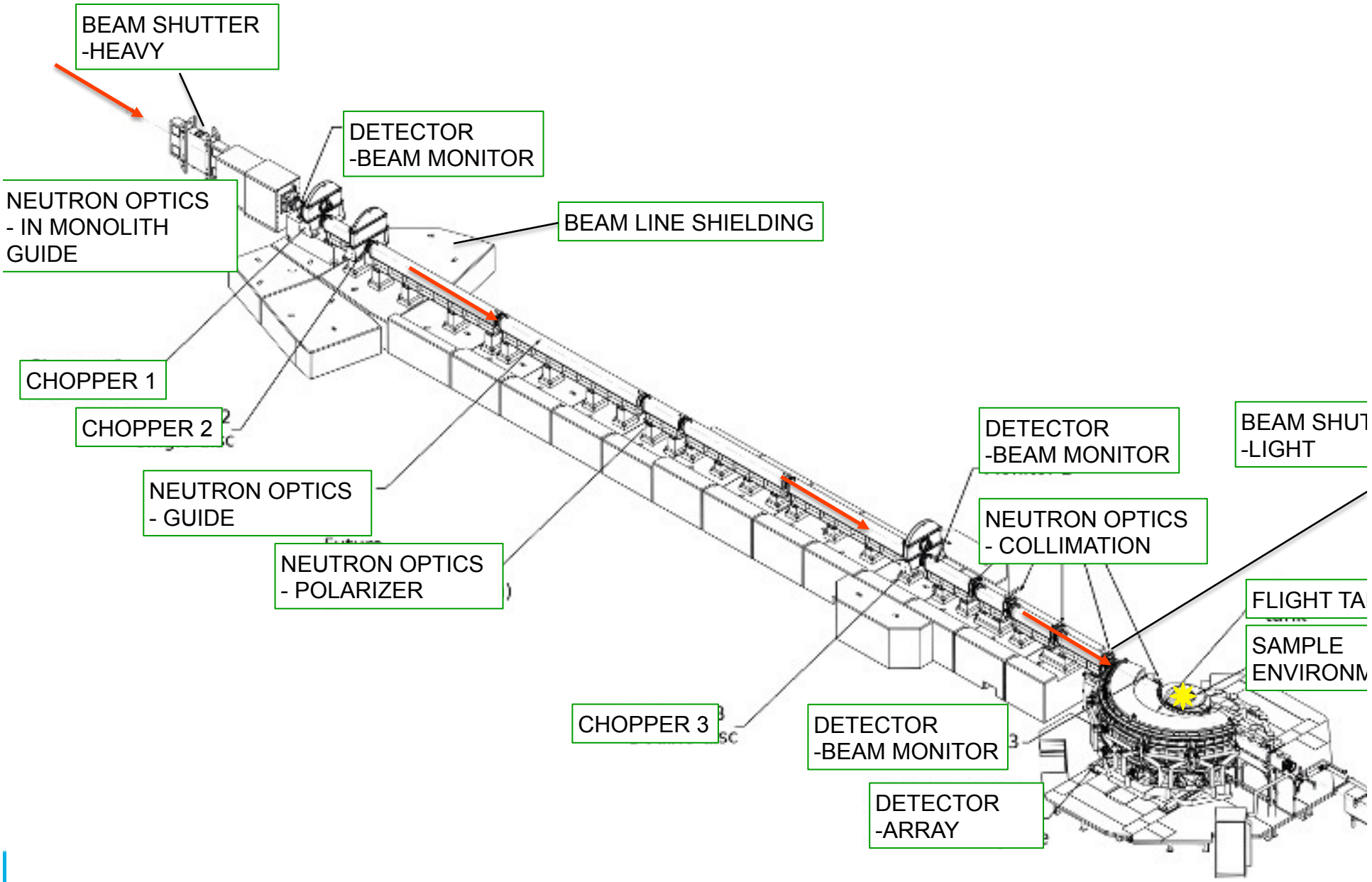
BEER		Engineering Diffractometer
MODI		Monochromatic Diffractometer
HEIMDAL		Thermal Powder Diffractometer
POWHOW		Bi-Spectral Powder Diffractometer

Reflectometry



FREIA		Reflectometer for liquid interfaces
THOR		Horizontal Reflectometer
ESS-PAREF		Polarised Reflectometer
ESTIA		Focusing Reflectometer

1950s


BEAM SHUTTER
-HEAVY
DETECTOR
-BEAM MONITOR
NEUTRON OPTICS
- IN MONOLITH
GUIDE
BEAM LINE SHIELDING
CHOPPER 1
CHOPPER 2
NEUTRON OPTICS
- GUIDE
NEUTRON OPTICS
- POLARIZER
CHOPPER 3
DETECTOR
-BEAM MONITOR
NEUTRON OPTICS
- COLLIMATION
DETECTOR
-BEAM MONITOR
DETECTOR
-ARRAY
BEAM SHUT
-LIGHT
FLIGHT TA
SAMPLE
ENVIRONM

Step change in instrumentation

Meeting the Technical Challenges

General Principles:

- Use existing technology whenever appropriate
- Develop when necessary together with our partners
- Work with our partners to develop and support standards for ESS technologies
  - *Detectors:* Support B10 thin film technology, build detectors together with partners
  - *Data acquisition/motion control:* Use EPICS control systems and draw from partner experience to implement ESS instrument control platform
  - *Choppers:* Wide partner and industry experience, developing standardisation strategy

Conclusions

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- European Scientific Community is mobilised and awaits ESS
- Funding is moving in a direction so that ESS will be realised
  - An exciting time for Science / Instruments are been defined at a rapid rate
  - ESS can only be realised by harnessing European knowhow and capabilities
  - ESS defines project frame-work and management, partners take leadership and responsibility in delivering projects

Choosing ESS Instruments for Early Success

- World-class instruments for the bulk of the user community.
  - Magnetism
  - Soft matter
  - Chemistry
  - Broad science-case instruments

Brings the users

- Instruments for specialist communities with potentially high scientific impact.
  - Fundamental physics
  - High pressure, high magnetic field
  - Structural biology

High science impact

- Instruments that build on the strengths of the ESS source.
  - Cold and bi-spectral (cold/thermal).
  - Using the unique source strengths to enable new science (e.g. kinetics, parametric studies, extreme environments, small samples).

New frontiers