EUROPEAN SPALLATION SOURCE

Building the Science Program at ESS

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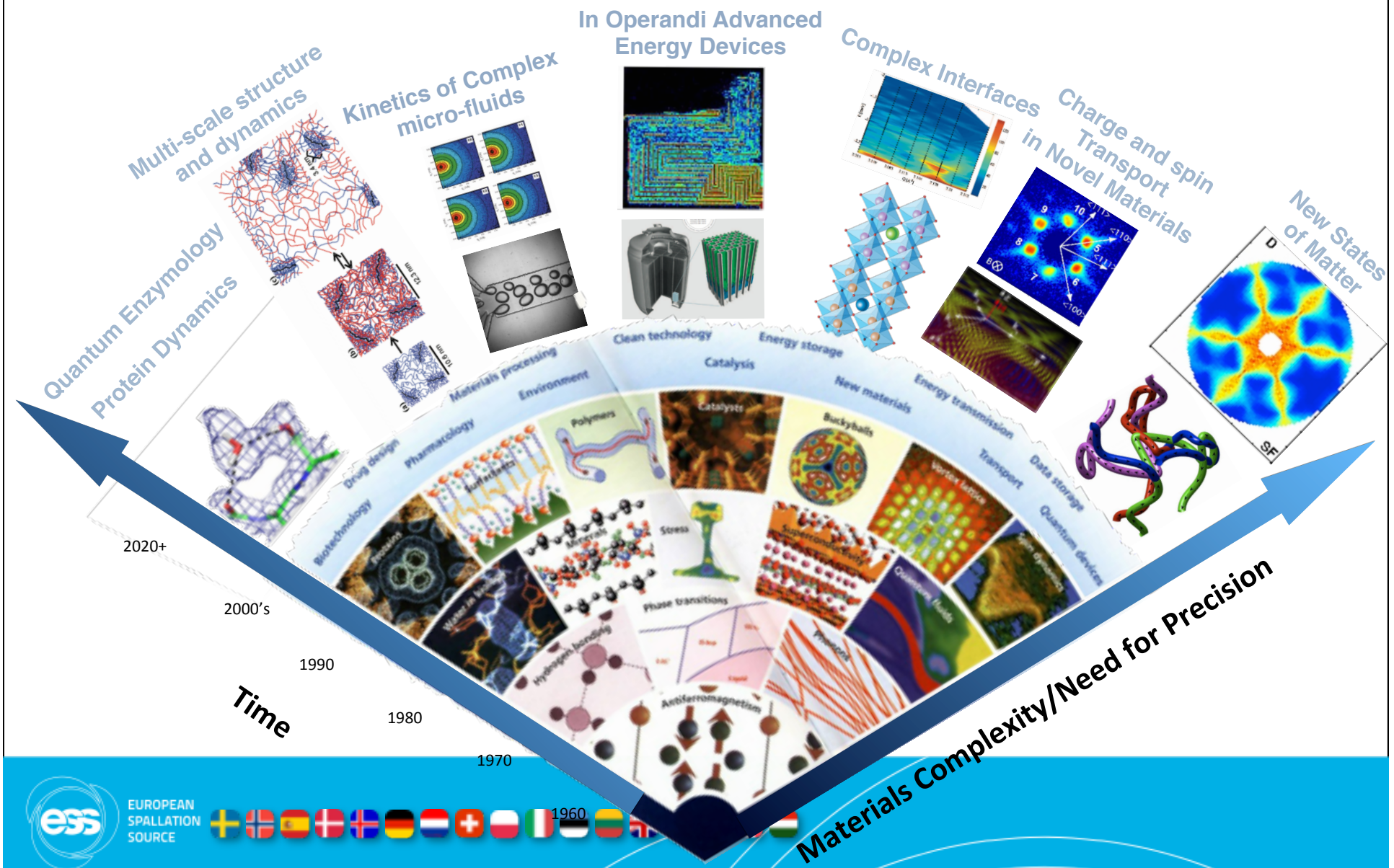
Science with Neutrons
Past-Present and Future

EUROPEAN SPALLATION SOURCE

Science with Neutrons
Past-Present and Future



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

+

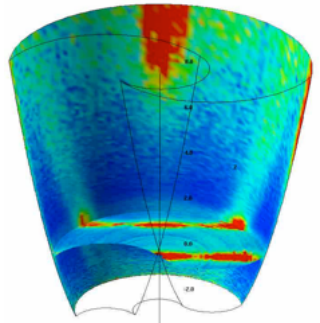
Sample Environment

+

Science Support Laboratories

+

Analysis and Visualisation Software



An Early Science Success Strategy for ESS

ESS will be judged early !

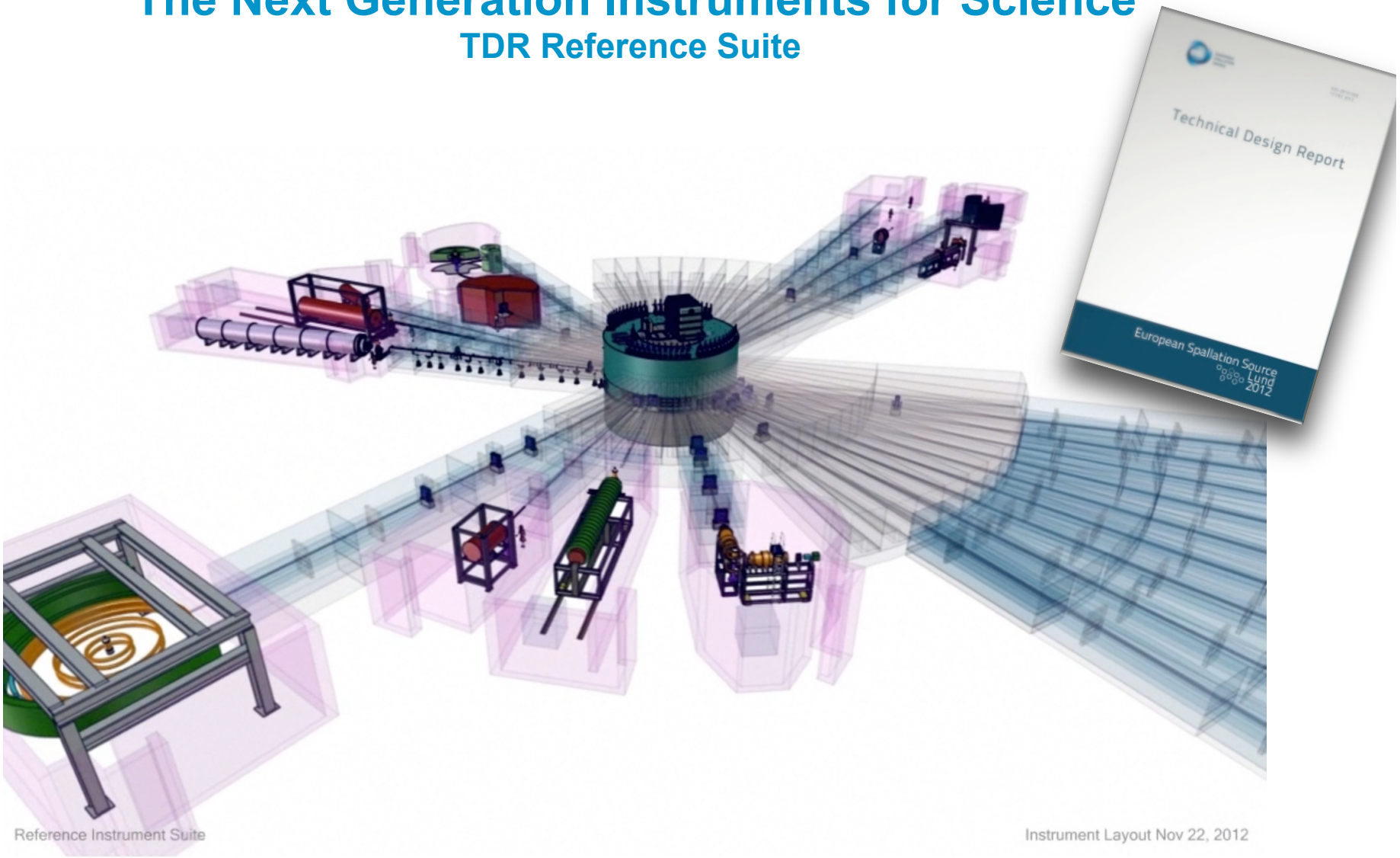
- An early success strategy aims to deliver a scientifically operational facility in the early years of ESS (2019-2023).
  - Careful choice of “first” instruments (build an instrument portfolio and prioritise)
  - Attract a wide user community.
  - High quality user service (Software, sample environment,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

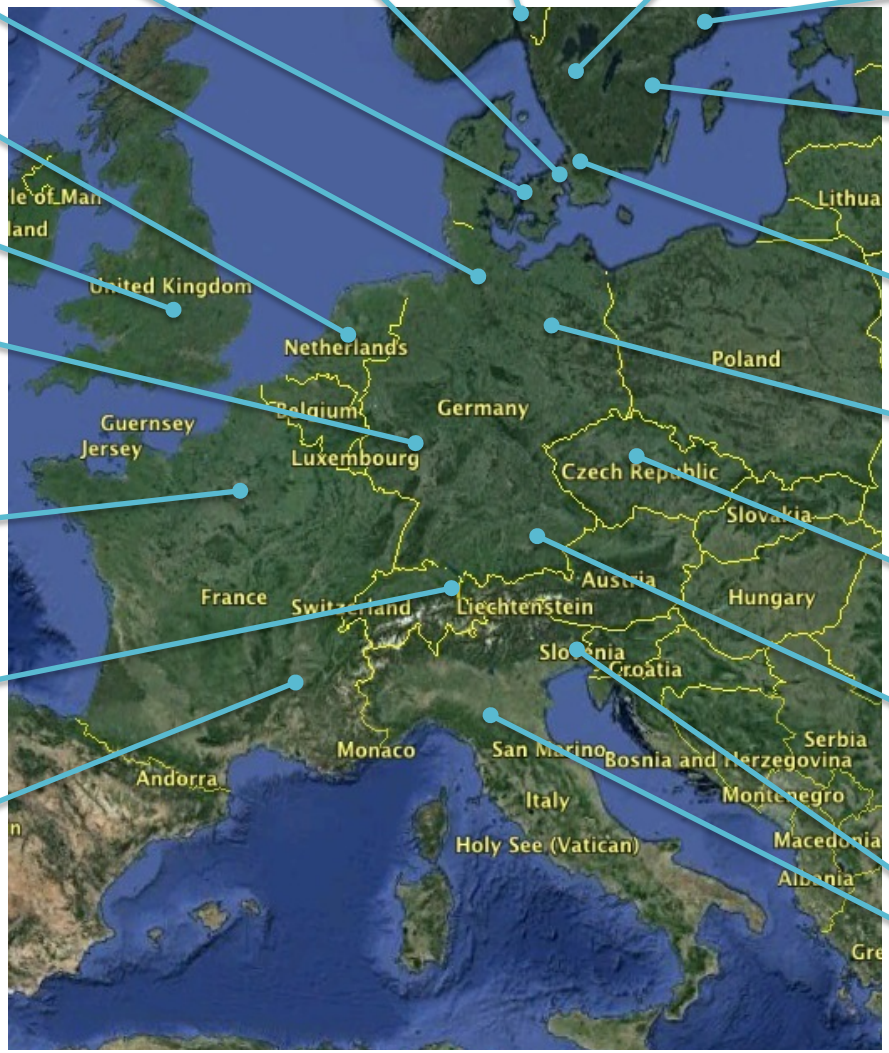
Realising the ESS Science Program (NSS)

- 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

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DTU

IFE

UPPSALA UNIVERSITET

TU Delft
Technische Universiteit Delft

LINKÖPINGS UNIVERSITET

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LUND UNIVERSITY
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HZB Helmholtz Zentrum Berlin

Orphée
Laboratoire Léon Brillouin

Nuclear Physics Institute of the ASCR
public research institution

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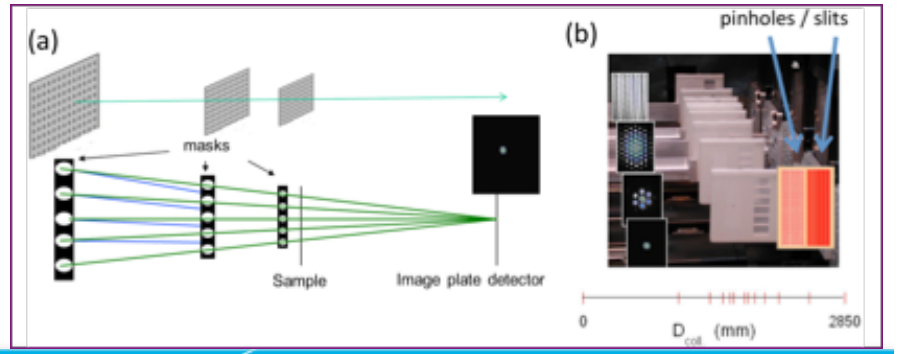
Developing a European Wide Collaboration

- 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.

French Participation in the ESS-Instruments Program

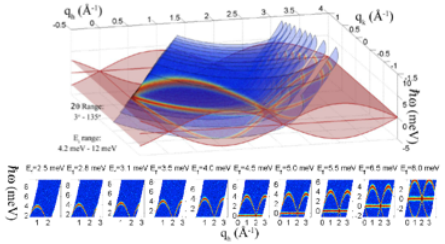
- V-SANS – GI-SANS add-on
  - co-proposers of SKADI SANS instrument (led by FZJ)
  - participation in construction, if accepted
- Development of Magnetism Single-Crystal Diffractometer
  - Exciting instrument anticipated by user community
  - construction proposal to be submitted in October 2014
- C-SPEC co-proposer
  - participation in construction, if accepted
  - development of sample environment

V-SANS development

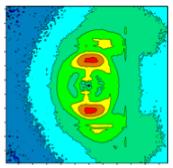


16 Instrument Concepts were Submitted on Oct 2013

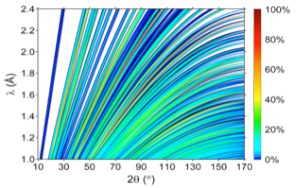
Spectroscopy



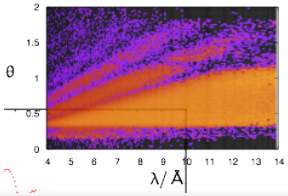
SANS



Diffraction

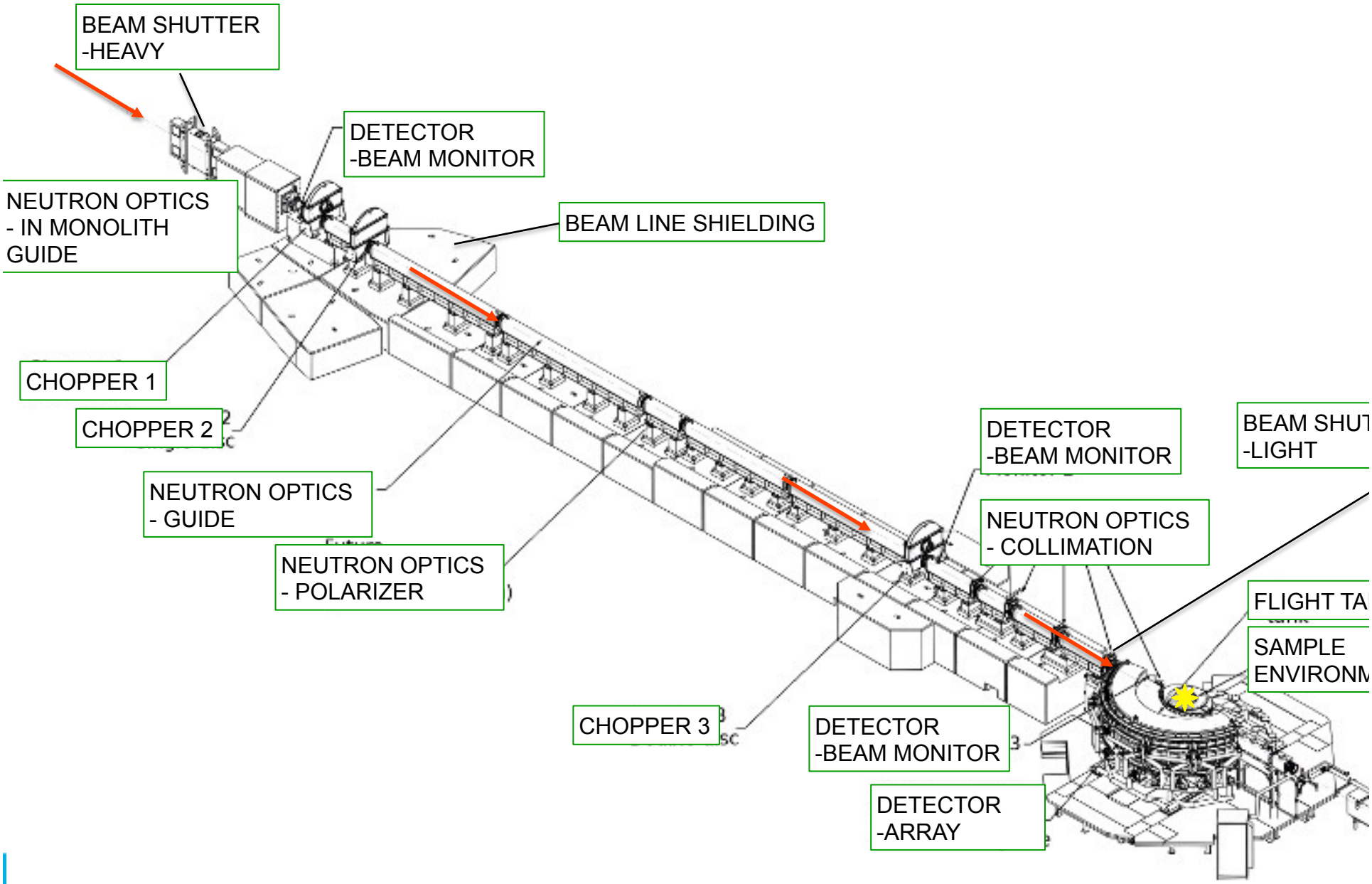


Reflectometry



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
SKADI	High Intensity SANS
Compact-SANS	SANS Biology & Materials Science
BEER	Engineering Diffractometer
MODI	Monochromatic Diffractometer
HEIMDAL	Thermal Powder Diffractometer
POWHOW	Bi-Spectral Powder Diffractometer
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

EUROPEAN SPALLATION SOURCE

- 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