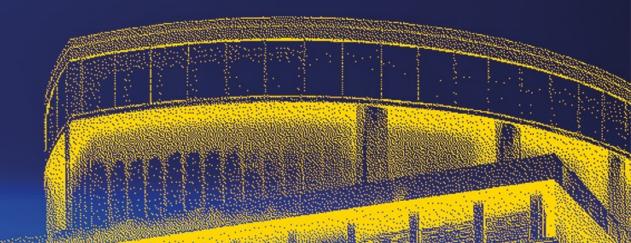


SVEDISH BIGSCIENCE FORUM



SWEDISH BIG SCIENCE FORUM IN LUND

Moderators



Catarina Sahlberg
BIG SCIENCE SWEDEN



Fredrik Engelmark
BIG SCIENCE SWEDEN

INTRODUCTION



Darja Isaksson

Director General

VINNOVA, SWEDEN'S INNOVATION AGENCY

WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

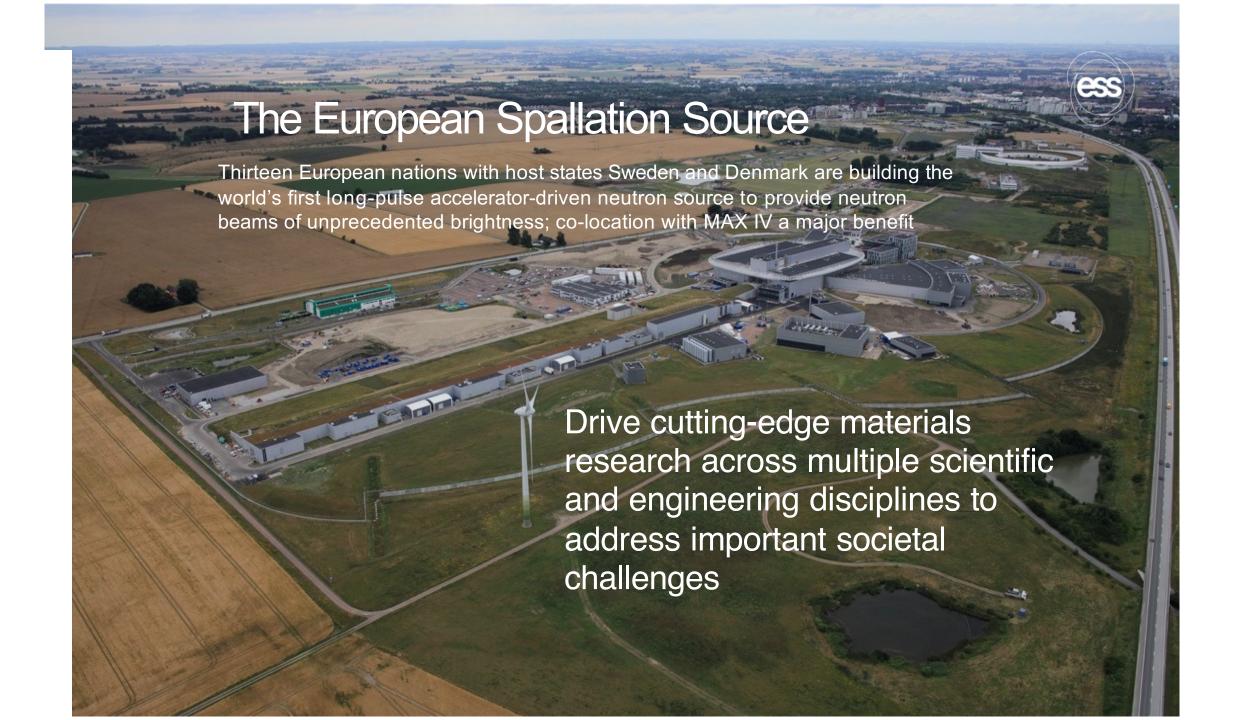
SKA



Adrian
Russell
Director of
Programmes
ESO



EUROPEAN SPALLATION SOURCE



Intensive installation, testing and commissioning of technical equipment is underway 2026 First science

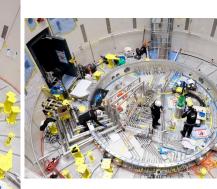


2009 Decision to site ESS | Start of construction in Lund

2014

2024 Today 2027 End of construction

2003 Concept design of ESS presented



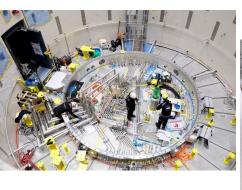
2012 ESS design update phase complete

2021 Civil construction complete

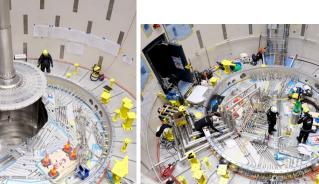
Acquisition of spare



- Deliver the project 15 neutron scattering instruments, 2 MW proton beam power
- Initial call for concepts for 7 more neutron scattering instruments
- components







Future needs





Near Term: 2024-2026

- Engineering and installation support through framework agreements
- Bespoke technical components for sample environments for neutron scattering instruments (e.g. furnaces, pressure cells, magnetic and electrostatic devices, cryogenic environments, superconducting magnets, and combinations thereof
- Build up of smaller spare components for existing systems provided by in-kind partners (e.g. magnets, vacuum pumps, sensors, process control system components, robotics, diagnostic devices, bespoke electronics) – envision "build to print" tenders for certain unique systems

Longer Term: 2027 and beyond

- Technical components for the next 7 neutron scattering instruments (guides, choppers, detectors, sample environment)
- Diversification of supply chain for limited life components such as target wheel and other neutron production system components
- High performance computing and data storage







WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

SKA



Adrian
Russell
Director of
Programmes
ESO





The Universe in the Lab

Jörg Blaurock
Technical Managing Director FAIR GmbH & GSI GmbH

FAIR Key data



- FAIR: Facility for Antiproton and Ion Research in Europe
- 9 international Shareholders









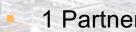












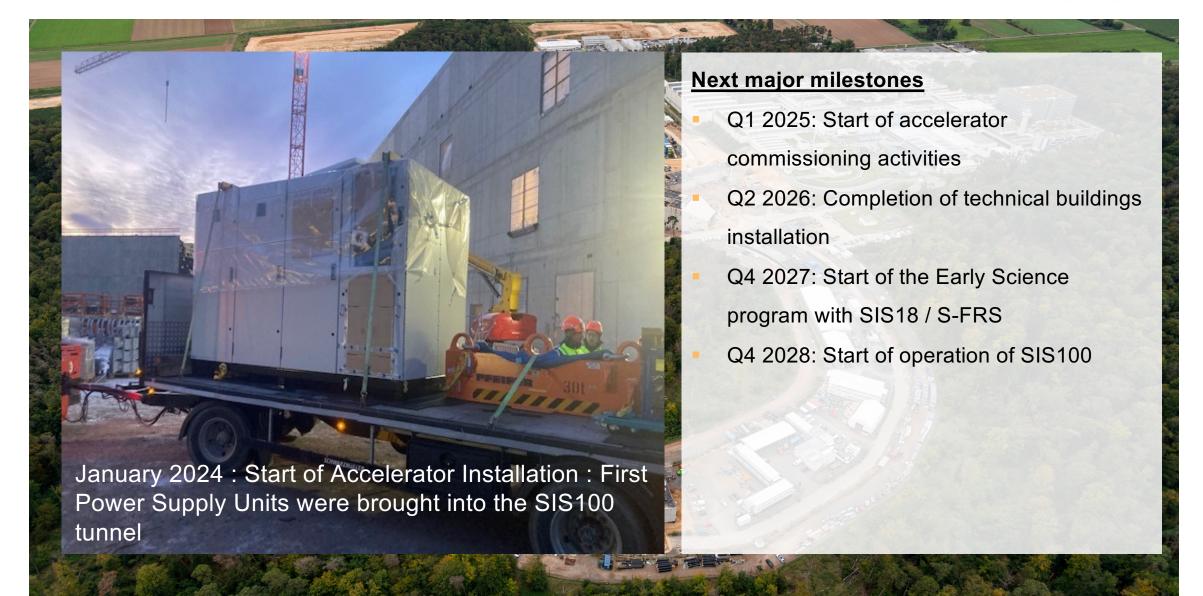




- 25 Accelerator and experimental buildings and laboratories
- Superconducting ring accelerator with a circumference of 1.100 m, Total area of 150.000 m²
- Highest particle itensity, highest precision, highest variety of accelerated ions, high particle energies (corresponding 99 % of the speed of light)
- Parallel operation of up to four experiments
- Milestone in the European research roadmap
- Top priority in the European nuclear physics community
- Participation of 3.000 scientist from all continents
- Current budget for realisation of FAIR FS+: 3,3 Mrd. €

FAIR Current Status





FAIR needs from suppliers



- Technology
 - Cryogenics, vacuum and leak detection technologies
 - Diagnostics and detectors, sensors, optics and instruments
 - Electrical, power electronics, electromechanical and RF systems
 - High precision and large mechanical components
 - Instrumentation, control and CODAC
 - Superconductivity and superconducting magnets
 - Normal conducting magnets
 - Remote handling
- Remaining procurement volume for FAIR Science
 - First Science 80 Mio. € until 2027
 - Full version MSV 150-200 Mio. € from 2027 onwards



WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

SKA



Adrian
Russell
Director of
Programmes
ESO



Mission

- Design, build, and operate advanced ground-based observatories
- Foster international collaboration for astronomy

Operates the VLT, La Sillia & ALMA (with NA and EA) telescopes in Chile

Building the 39.3m ELT (~1.5 BEUR)

HQ in Garching near Munich

~750 Staff (Garching + Chile)





Current status, near-term plans and upgrades



ELT Construction

- Just past 50% point of construction, First light Q3
 2028
 - Vast majority of contracts in place (including Fagerström for M1 washing and stripping)
 - Vibrant Instrumentation Programme in the MS (steady state ~18 MEUR per year + GTO)
 - Uppsala, Stockholm University and Lund (2nd Gen instruments)

ALMA

- Fully operational
- Just starting a major upgrade
 - Wideband Sensitivity Upgrade
 - Chalmers role
 - Led by Martin Zwaan (attending)



VLT/ La Silla

- Fully operational
- Vibrant Instrumentation Programme in the MS (~8 MEUR per year + GTO)

Technology Development Programme

- Secure new technologies for future projects
 - Esp Instrumentation & standards
 - Led by Norbert Hubin (attending)



Integrated Operation Programme

- In definition phase
 - Operate VLT and ELT as a single observatory (remote, sustainable operations)
 - Led by Thomas Klein (Thomas.Klein@eso.org)





What does your facility need from suppliers?

ESO is keen to increase industrial return in SE and increase engagement in instrumentation

ALMA - WSU

- Institutes: Studies mainly focussed on receiver component development for the higher ALMA frequencies
- Industrial procurement opportunities in a 3-4 years?
- See talk from Martin Zwaan this afternoon

Instrumentation/Technology Development

- Technology Development towards instruments (ELT and VLT),
- In situ cleaning of the ELT Primary mirror (also for IoP)
- See talk from Norbert Hubin this afternoon

Integrated Operations Programme

- Advanced warning of industrial opportunities in 1-2 years
 - Digitalisation of existing facilities, remote operations and monitoring





Thank you!

Adrian Russell ESO Director of Programmes arussell@eso.org

- f @ESOAstronomy
- @esoastronomy
- ✓ @ESO
- in european-southern-observatory
- @ESOobservatory



WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

SKA



Adrian
Russell
Director of
Programmes
ESO

WHAT IS IN THE PIPELINE? Anna Hultin Stigenberg **Technical Director**

MAX IV

Swedish National Lab organisationally a part of Lund University

Total staff ~ 300 FTEs

Public procurement

16 beamlines in operation offering tailored methods and techniques

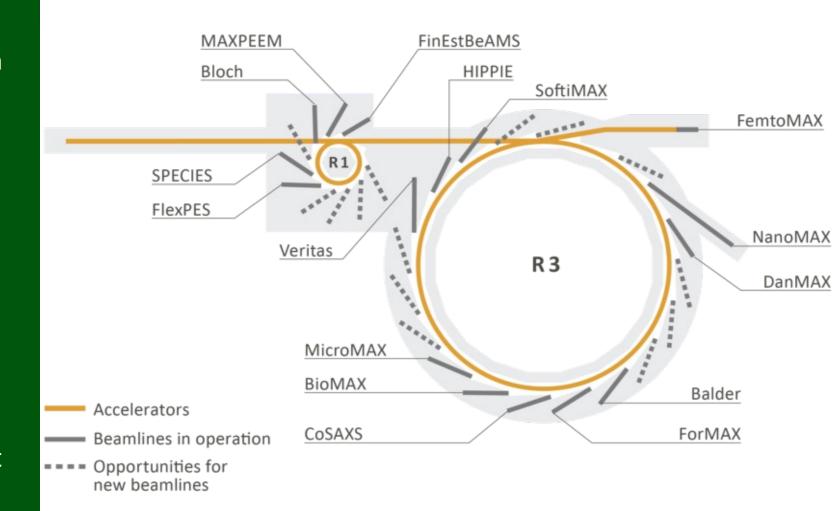
Materials can be studied at sub-atomic levels in unprecedented ways.



Near term plans and upgrades

- Defining a next set of beamlines in collaboration with the scientific community
- MedMAX— a beamline for medical imaging
- CDRs for three beamlines in partnership with WISE
 - Imaging
 - Diffraction
 - Spectroscopy
- MAX 4-U: Accelerator plan
 - Upgrade of 3 GeV Ring
 - Reduce emittance
 - "Surgical intervention", not a conventional upgrade

16 Beamlines in operation and room for 10-12 more





Need from suppliers-Experience, high quality and precision

- Compact, high speed cameras operating at MHz framerates (Imaging BLs)
- Electron analyser endstation (Spectroscopy BL)
- Electronics (hear more in that session!)
- Production (including cleaning and testing) for UHV chamber and parts
- Servicing of vacuum equipment
- High precision machining for very large parts & very small parts
- 3D metal printing
- Motion components such as rail guides, ball screws, bearings, mechanical transmissions, etc... UHV compatible
- Vacuum brazing of large parts
- Thin film coating, such as NEG coating
- Ultrasonic cleaning systems for UHV applications





MEDSI 2025:

13th International Conference on Mechanical Engineering
Design of Synchrotron Radiation Equipment and
Instrumentation

15-19th September 2025 in Lund STADSHALLEN

- Invited/Contributed Talks, Poster & Presentation Sessions, Industrial Exhibitions
- 350+ Delegates from Synchrotron Light Sources Worldwide
- Mechanical Design & Engineering for Synchrotron Instrumentation

medsi2025@maxiv.lu.se



WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

SKA



Adrian
Russell
Director of
Programmes
ESO

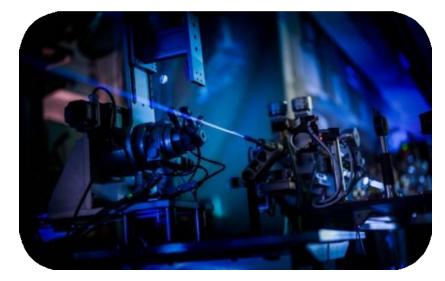


Antonio Bonucci Head of Industrial Liaison Office and In-kind Contributions Supply Chain

antonio.bonucci@xfel.eu



European XFEL—a leading new research facility



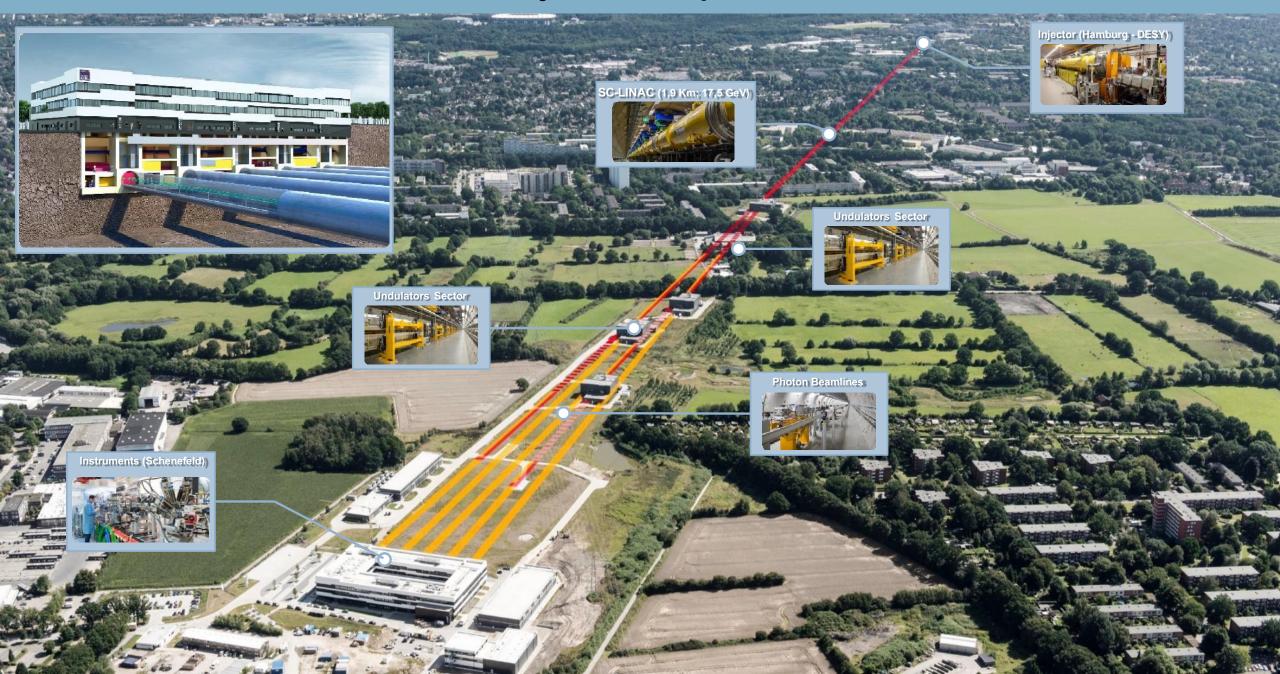
The European XFEL is a new research facility that uses high-intensity X-ray light to study the structure of matter.

- User facility with more than 500 employees (+250 from DESY)
- Location: Hamburg and Schenefeld, Germany

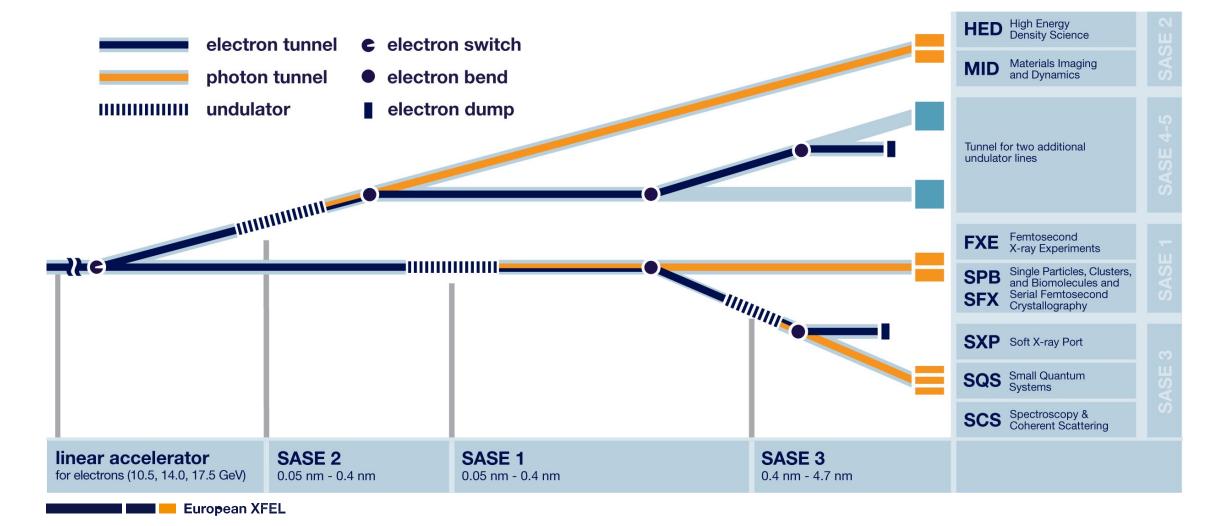




3.4 km from Injector to Experimental Hall.



Beamline layout and experiment stations



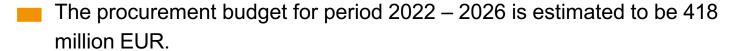
X-ray free-electron lasers worldwide

Antonio Bonucci, Head of Industrial Liaison Office and In-kind Contributions Supply Chain

Project	FLASH	LCLS CuRF (USA)	LCLS-II SCRF (USA)	SACLA (Japan)	European XFEL	SwissFEL (CH)	PAL-XFEL (S. Korea)	SHINE (China)	FERMI (Italy)
Max. electron energy (GeV)	1.35	15	5.0	8.5	17.5	6.2	10	8	1.55 GeV
Wavelength range (nm)	3.4-90	0.05–5.0	0.25–5.0	0.06–0.3 /8-30	0.05–4.7	0.1–7	0.06–5.0	0.05–3.1	4-100 (1.7-4)
Photons/pulse	~1011-1014	5 x 10 ¹³	0.5 - 5 x10 ¹²	~5 x 10 ¹¹	~10 ¹² (typical at 12.4 keV)	5 x 10 ¹¹ (HX) 1.2 x 10 ¹⁴ (SX)	10 ¹¹ –10 ¹³	10 ¹⁰ –10 ¹³	3x10 ¹¹ -10 ¹⁴ (~10 ⁷ -10 ⁸)
Peak brilliance	1 x 10 ³¹	4x10 ³⁴ (measured at 10 keV)	2 x 10 ³³ (simulated at 1.25 keV)	~5 x 10 ³³	3 x 10 ³³ (8.3 keV simulated at saturation without seeding)	1 x 10 ³² –1 x 10 ³³	1.3 x 10 ³³	1 x 10 ³³	2x10 ³²
Average brilliance		5 x 10 ²²	3x10 ²⁵		2 x 10 ²⁴ (8.3 keV simulated at saturation without seeding)				
Pulses/second	8000	120	1 000 000	60	27 000	100	60	1 000 000	50
Experiment Stations (parallel Operation)	7(2)	9	(3)	7 (3)	7 (3)	5 (2)	3 (2) Instruments 7 (2)	10 (3)	6(2)
Date of first beam	2005	2009	2023	2011	2017	2016	2016	2025	2010

Total procurement budget in the period 2022-2026







The campus is still growing and further developed, with additional user infrastructures such as a guesthouse, an additional office building and a visitor's center on the way. There are also two more tunnels (SASE 4 & 5) which are waiting to be equipped for future use. Main procurements:



- Diagnostics, Detectors, Sensors, Optics and Instruments
- Big Data and Artificial Intelligence, User Interfaces
- Instrumentation & Control
- Superconducting Magnets
- Cryogenic technology, Vacuum and leak detection technologies
- Building & Construction
- Interior fittings of the guesthouse (furniture and other equipment's)
- Interior fittings of the Visitors center (incl. laboratories and exhibition)

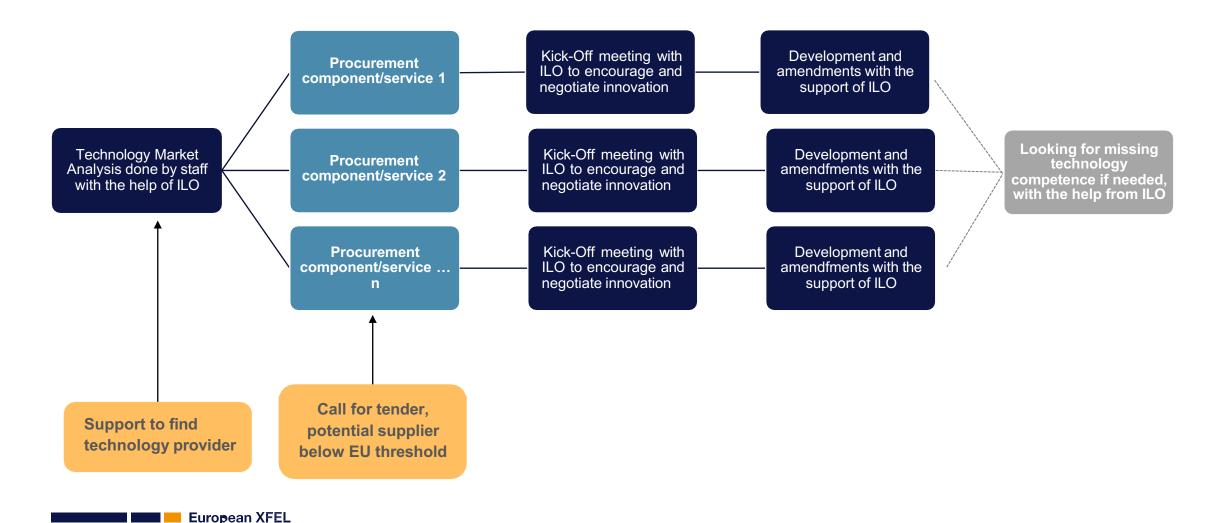




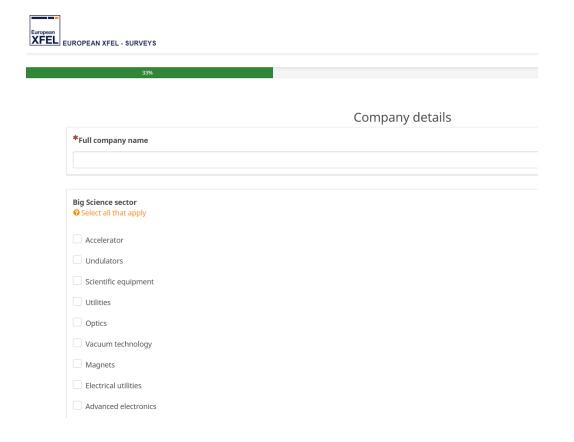


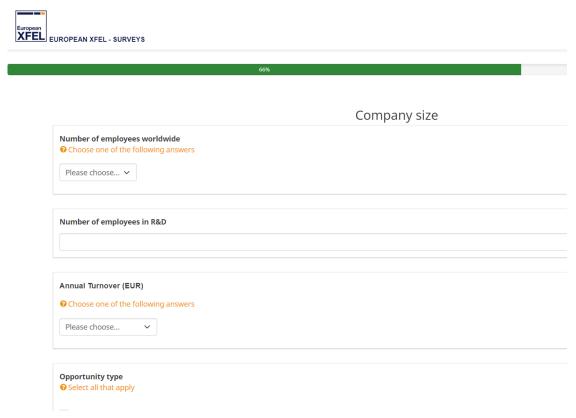


Innovation procurement workflow: National ILO involvement



Register in our supplier database





WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

SKA

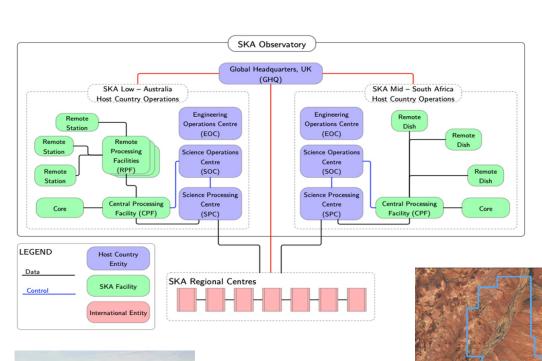


Adrian
Russell
Director of
Programmes
ESO

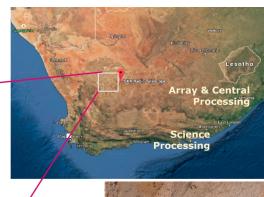




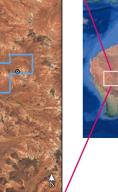
Overview: SKA Observatory















1 Observatory
2 Telescopes
3 Host countries
SKAO Headquarters in
Jodrell Bank (UK)

SKAO Mission

Boolardy Station, Western Australia

"The SKAO's mission is to build and operate cutting-edge radio telescopes to transform our understanding of the Universe and deliver benefits to society through global collaboration and innovation."

Current status and near-term plans and upgrades

Current Status:

Infrastructure construction is ongoing and HW is reaching site







Near- and long-term plans

- Develop the earliest possible working demonstration of the architecture, supply chain, logistics and verification planning (AA0.5).
- Then maintain a continuously working and expanding facility that demonstrates the full performance capabilities of the SKA Design.

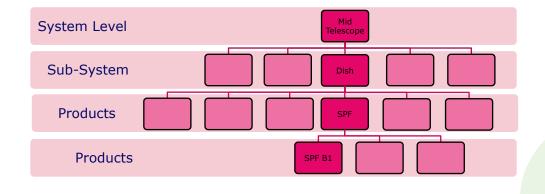
Milestone Event (as of Jan 2024)		SKA-Mid	SKA-Low
Construction Approval		2021 Jul	2021 Jul
AA0.5	4 dishes 6 stations	2025 May	2024 Nov
AA1	8 dishes 18 stations	2026 Apr	2025 Nov
AA2	64 dishes 64 stations	2027 Mar	2026 Oct
AA*	144 dishes 307 stations	2027 Dec	2028 Jan
AA4	197 dishes 512 stations	TBD	TBD
Operations Readiness Review		2028 Apr	2028 Apr
End of Staged Delivery programme		2028 Jul	2028 Jul

Why is the Array Assembly (AA0.5) key?

- System analysis and performance (test and simulation): what does not/might not work?
- Find gaps, check interfaces, develop data models, identify threats: what's missing?
- Investigate alternatives: does are there technologies able to provide a better/cheaper option that can still be implemented with low risk?
- Target important cost and risk drivers: will the system work at full scale?
- Are we deploying the system in the optimum way: is the ramp-up right?

What does SKAO need from the suppliers?

 SKA is a complex project that involves multiple contractors and suppliers around the globe



Scope

Quality

Schedule

Budget



 Challenging deadlines are met only if each contractors, suppliers, partners and institutions deliver on time for integration and verification at telescope level

- Total Cost: ~€2B for construction and operations over 2021 – 2030
- ~680M EUR already placed in running contract in 11 countries (as of Nov' 23)



We recognise and acknowledge the Indigenous peoples and cultures that have traditionally lived on the lands on which our facilities are located.



www.skao.int

WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

SKA



Adrian Russell Director of Programmes ESO



The ITER Project

Swedish Big Science Forum 2024 - Lund, SE

Magnus GÖHRAN 31.01.2024



The ITER mission

To demonstrate the scientific and technological feasibility of fusion power for peaceful purposes at industrial scale

"Burning" plasma

Q ≥ 10

The Challenge: To contain and shape the plasma

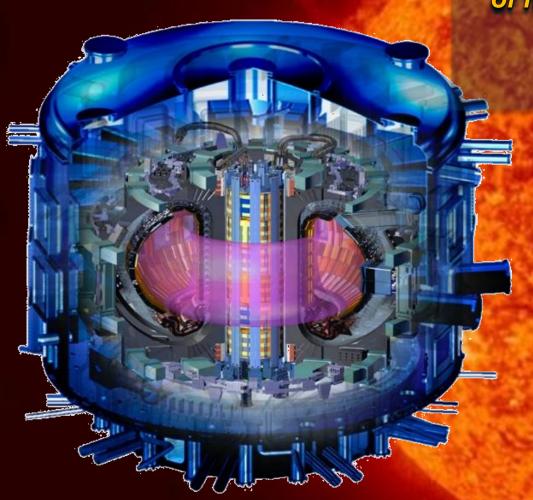
The ITER Tokamak

Vacuum Vessel: ~8000 t.

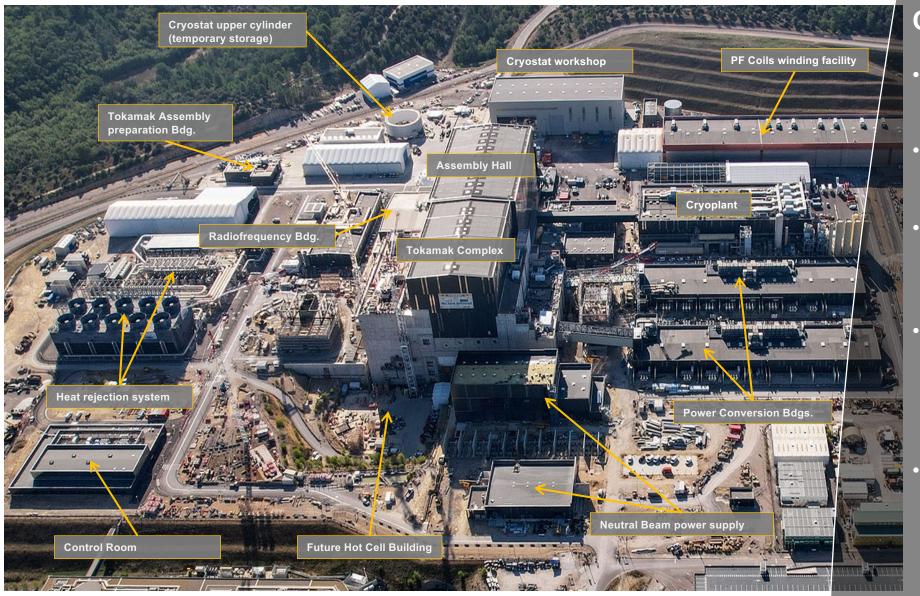
TF Coils: 18 x ~360 t.

Central solenoid: ~1000 t.

Total ~23,000 t.



China EU India Japan Korea Russia USA



Current Status

- Start of Machine Assembly Ceremony 28th July 2020
- Cryostat Base and Lower
 Cylinder installed and welded
- First Magnets Poloidal Field Coil #6 and #5 installed in the Pit
- Re-baseline under planning
 - Staged licensing scheme
 - Updated Operations Baseline
 - Change from Beryllium to Tungsten as first wall material
- Repair work on Thermal Shields and Vacuum Vessel sectors ongoing



Examples of Coming Opportunities and Needs

With the ITER "New Baseline" many opportunities derived from changes and updated planning will arise, primarily within the fields of:

- Engineering Support
- Procurement for Systems / Diagnostics / Heating and Current Drive
 - ✓ Remote Handling, Hot Cell Systems and Radiological Waste Systems will be ramping up the coming years
- Assembly and Installation Efforts

The following is an extract (of about 60 currently listed) of forthcoming ITER Tenders that could be of interest:

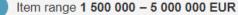
- Port Integration Facility (PIF) Service Operations and Management (D)
- Development of Preliminary Design of 55.GL in-Vessel Lighting (C)
- Manufacturing for ex-vessel and back-end components for erosion monitoring (B)
- Divertor and blanket Rogowski development Contract (B)
- Top Lid Trolley and Rails (A)
- Procurement of rails, dogleg plates, skids, pads for Port Plugs (B)
- Disruption Mitigation System (DMS) Manufacturing and Assembly (D)
- Port Cells rails manufacturing and Supply Contract (C)

Indicative Cost Range:



Item range **4 000 000 – 12 000 000 EUR**









ITER "New Baseline" brings many opportunities



Procurement Portals ITER and F4E:

https://www.iter.org/proc/overview https://fusionforenergy.europa.eu/get-involved/





Thank you!

The ITER Project

Swedish Big Science Forum 2024 – Lund, SE

Magnus GÖHRAN 31.01.2024



WHATISIN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock **Technical** Managing Director **FAIR AND GSI**



Antonio Bonucci Head of Industrial Liaison Office **EUROPEAN XFEL**



Joshua **Davison** Section Leader. Procurement of Supplies CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones Technical Director ESS



Alice Pellegrini Team Leader Specialist

Russell Director of **Engineering Teams** SKA

Adrian

Programmes ESO



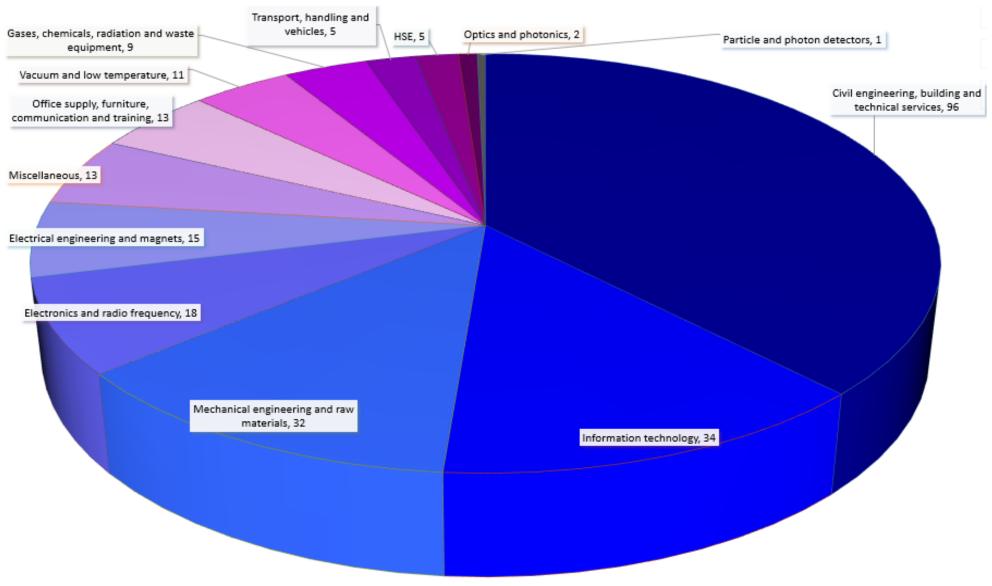


Current project - upgrade of the LHC to High Luminosity





Supplies (254MCHF spent in 2022 – CERN budget only)





WHAT IS IN THE PIPELINE?

Big Science research organisations give an update on their current status and future plans



Jörg Blaurock
Technical
Managing Director
FAIR AND GSI



Antonio
Bonucci
Head of Industrial
Liaison Office
EUROPEAN XFEL



Joshua
Davison
Section Leader,
Procurement of
Supplies
CERN



Magnus Göhran Systems/Analysis Officer ITER



Anna Hultin Stigenberg Technical Director MAX IV



Kevin Jones
Technical Director
ESS



Alice
Pellegrini
Team Leader
Specialist

Specialist
Engineering Teams

SKA



Adrian Russell Director of Programmes ESO