



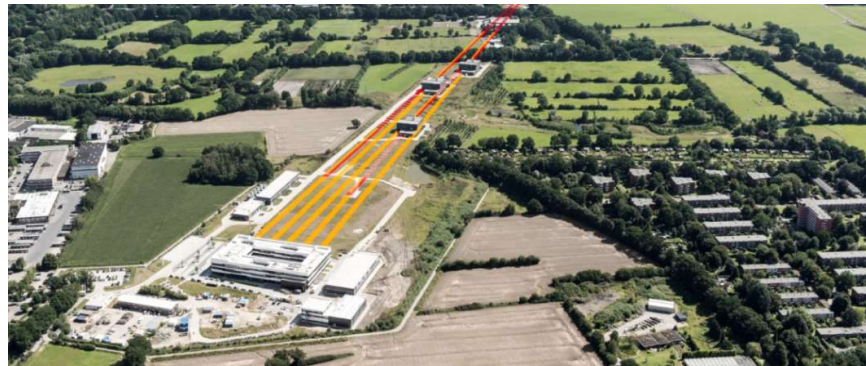
# European XFEL

Prof. Robert Feidenhans'l  
Chairman of the European XFEL Management Board



## ***Welcome to the 2022 Users' Meeting***

*More than 2000 registered participants (incl DESY UM) and 262 posters*



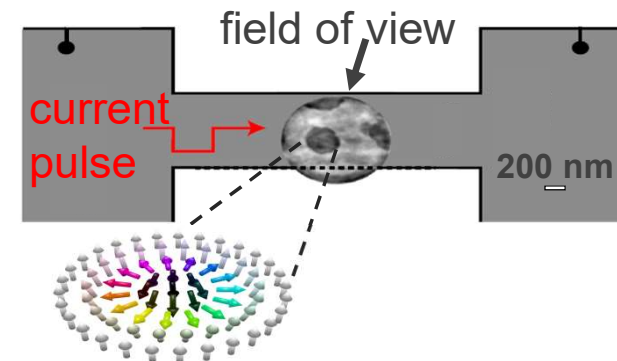
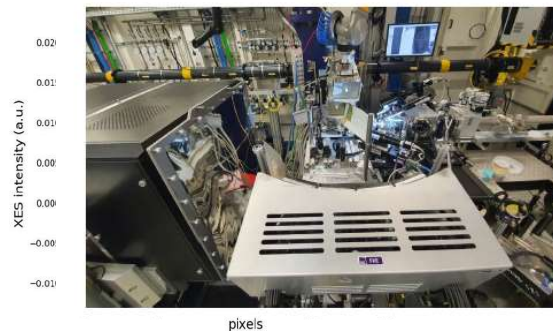
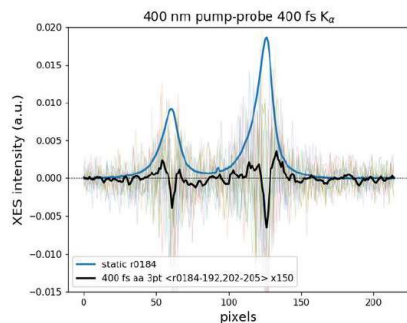
**Management Board and Council Chair**

## Outline

- Flash back on the year 2021
- New developments and capabilities
- Outlook to the user runs in 2022
- A view into the development of our new strategy – research for a better future

## Status of the User Programme for 2021

- The User programme for 2021 went much better than anticipated given the COVID-19 restrictions in Europe
  - 220 users were on site and the fall 2021 in particular went very well
- Postponed start of regular user operations
  - COVID 19 related experiments (*see talk by Orville later today*)
- The user experiments scheduled for 2021-1 (Run 6) were rescheduled and also spread into 2021-2.
  - All proposals originally scheduled for beamtime got beamtime in 2021–2022.
- A range of high level experiments have been performed last year
  - *see user talks (including satellite meetings) and posters later today and tomorrow*



### Feedback:

Great support of our beam time in all aspects. Cannot be done in a better way. This was great experience!

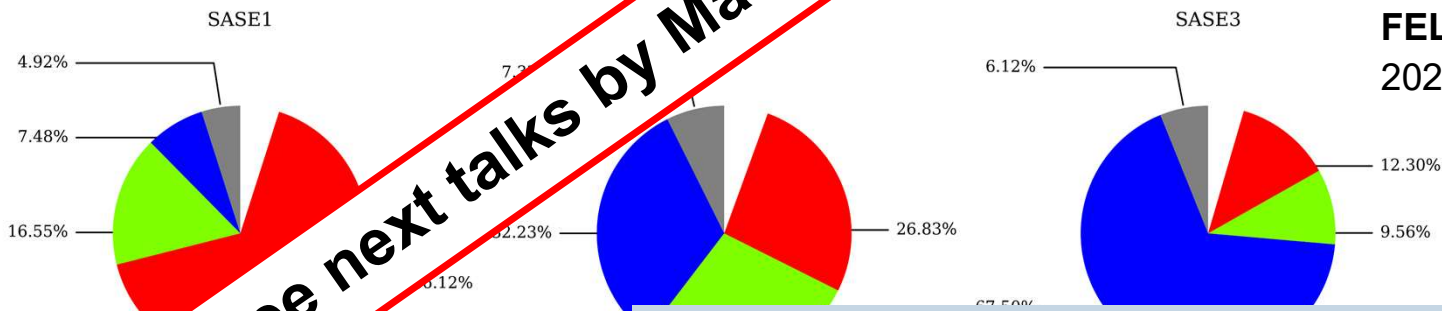
## Accelerator operation

### Accelerator runs very well

Operational envelope is being extended:

- Provision of hard x-ray photons ( $>9$  keV)  $\rightarrow$  several 100  $\mu$ J
- Provision of single-fs pulse duration
- Provision of two pulses of different color with time-delay

See next talks by Matthias Scholz and Shan Liu



FEL pulse delivery (pulse energy)  
2021-II (Jul - Nov)

Source	Energy Range	Energy
SA1	5-9.3 keV	2 mJ +/- 20%
	>9.3-14 keV	1 mJ +/- 20%

European XFEL

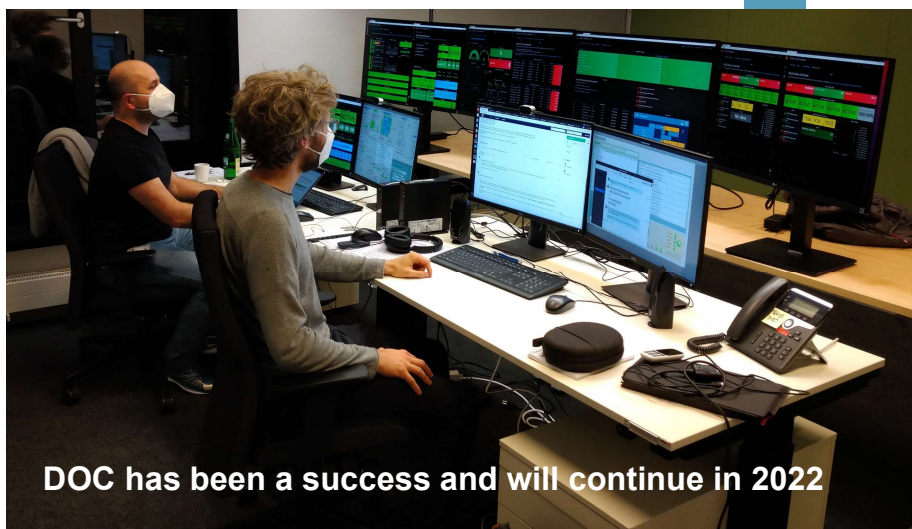
### Outstanding issues

- Photon beam (horizontal) stability
- Complex coupling between soft and hard X-rays in terms of scheduling and determining the electron energy

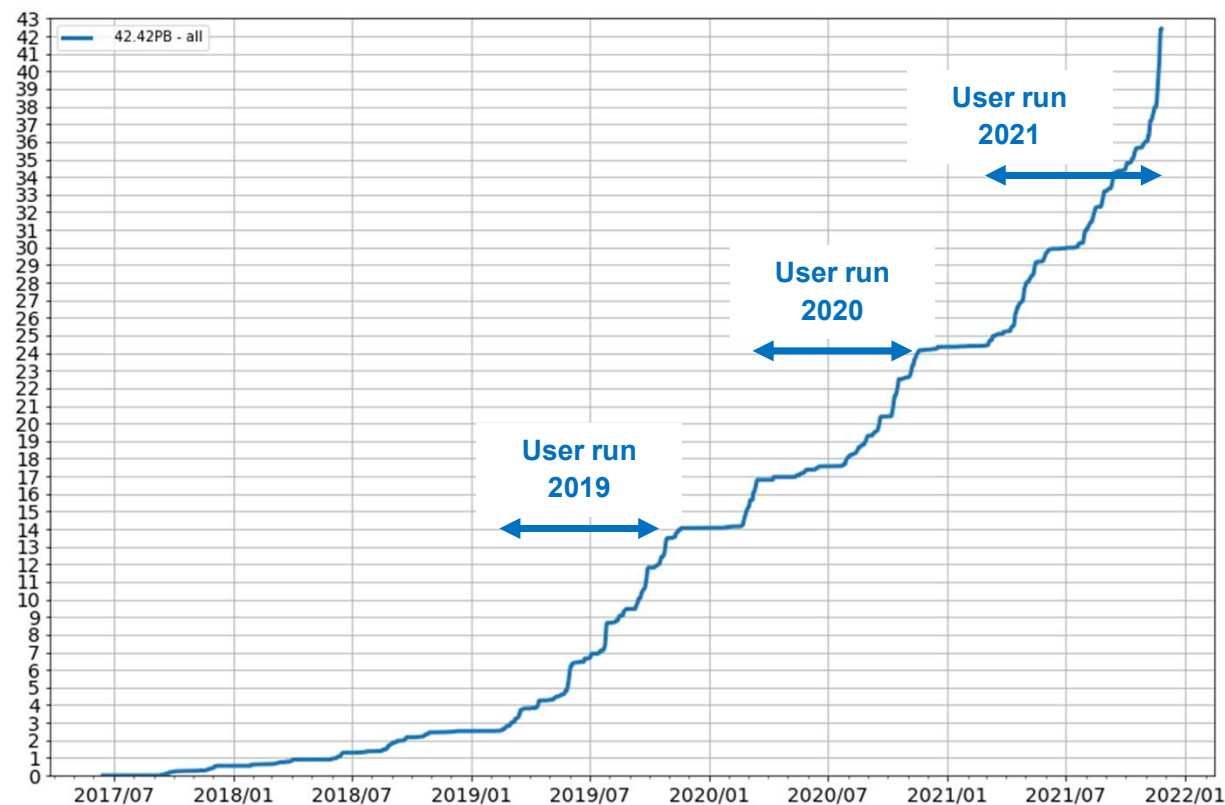


# DATA: Significant amount of RAW data accumulated in 2022

- 42.5 PB of raw data collected  
(26/Nov/2021)
- Within the plan



*Maturing Systems 7 PB in 7 days 17<sup>th</sup> Nov. to 23<sup>rd</sup> Nov.*



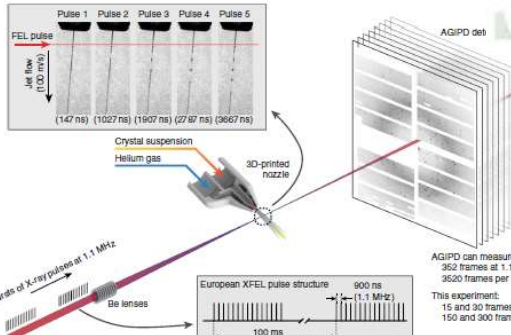


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DOI: 10.1038/s41467-018-06156-7 OPEN

### Megahertz serial crystallography

Max O. Wiedorn et al.

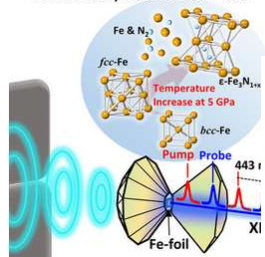


nature methods

AR <https://doi.org/10.1038/s41533-019-0059-3>

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### X-ray Free Electron Laser-Induced Synthesis of $\epsilon$ -Iron Nitride at High Pressures

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THE JOURNAL OF PHYSICAL CHEMISTRY LETTERS

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J. Phys. Chem. Lett. 2020. XXXX. XXX. XXX-XXX



### Megahertz x-ray microscopy at x-ray free-electron laser and synchrotron sources



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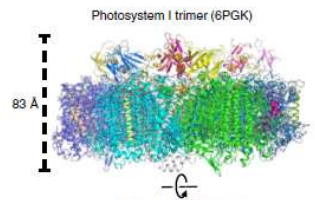
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<https://doi.org/10.1038/s41467-018-01298-3> OPEN

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Science

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### Attosecond time-resolved x-ray spectroscopy: Expanding the view of nonlinear x-ray physics

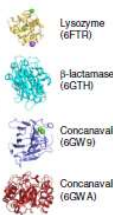
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Structural Dynamics





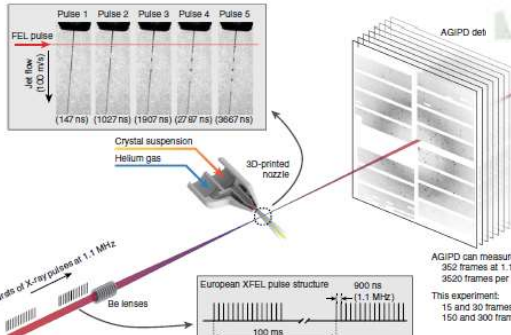


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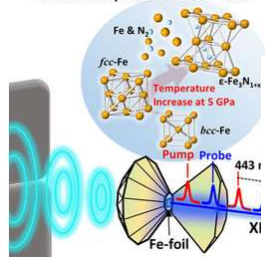


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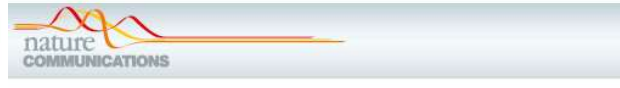
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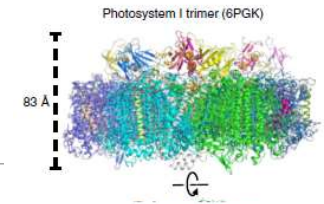
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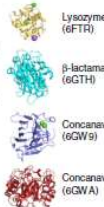
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## User publications until 31 December 2021

37 user publications (most in 2020 and 2021)

16 were high impact (I.F. larger than 8)

All 6 instruments have user publications

41 co-authors on average

All shareholder countries have user publications

18 months on average from experiment to publication

European XFEL is co-author on all publications

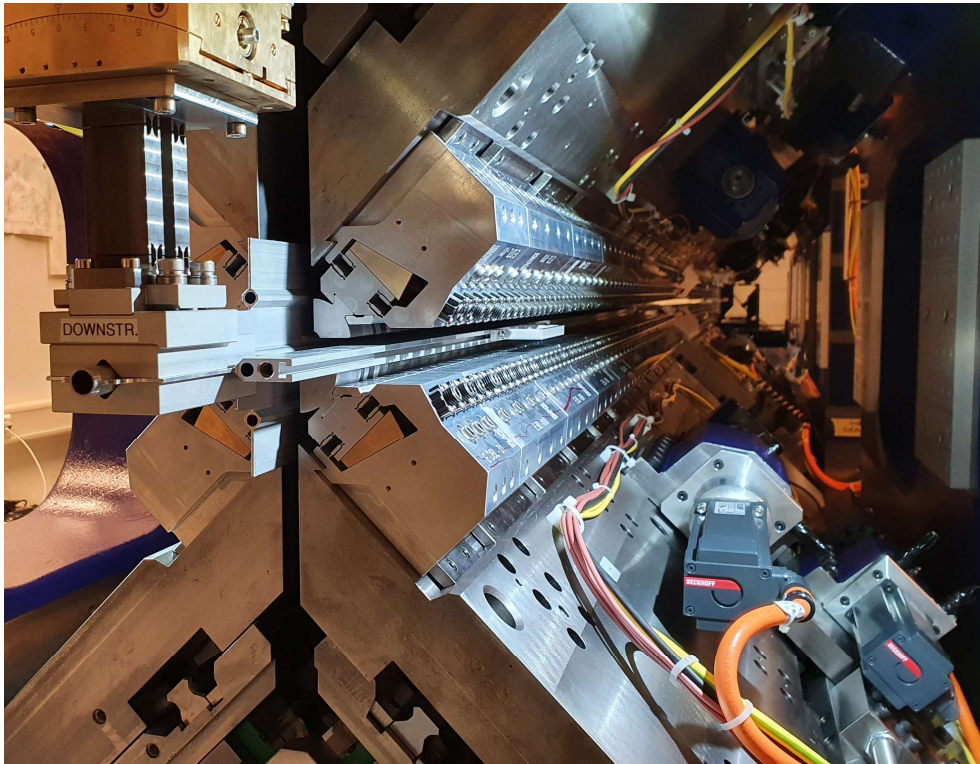
*More cover pages encouraged*





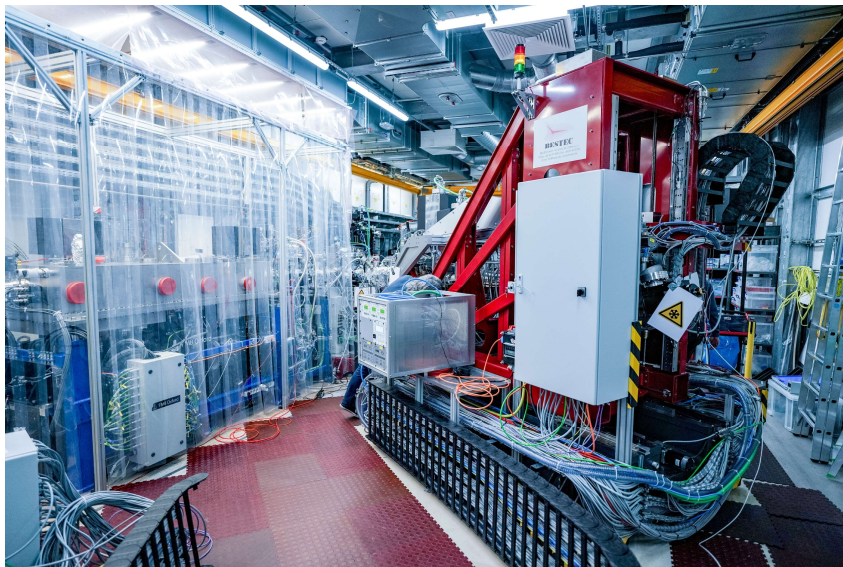
# SASE3: Helical Undulator APPLE X installed

■ Technical commissioning with the electron beam: first half of 2022



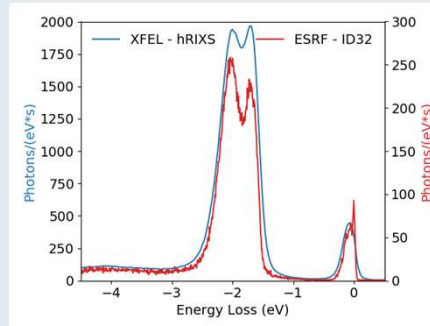


# Heisenberg RIXS Spectrometer at the SCS instrument: Commissioning and first RIXS data in Spring 2021

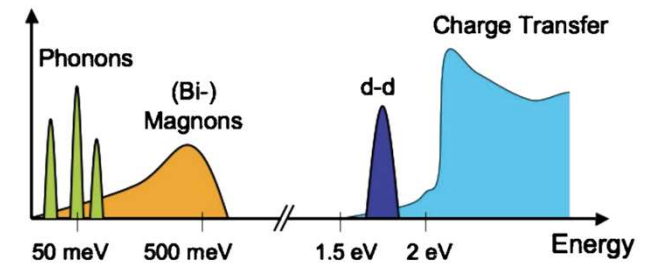
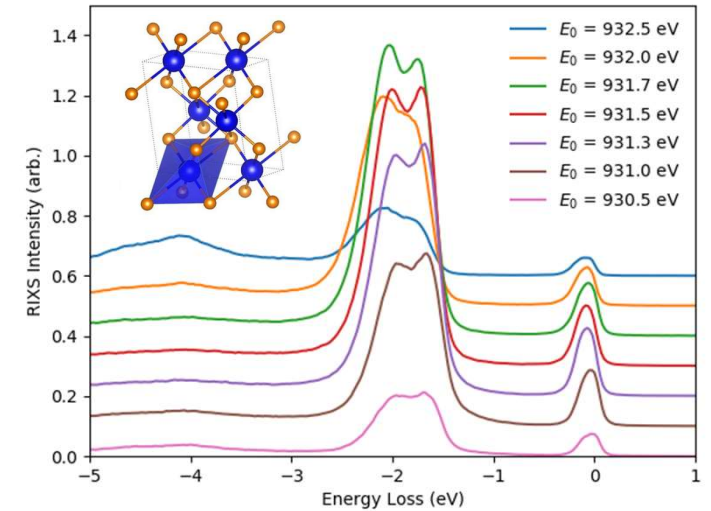


EuXFEL vs. ESRF  
competitive with synchrotrons  
offers time-resolution at  
femtosecond time scales

Measurement Count Rates  
Incident Beam  $1.3 \times 10^{13}$  ph/s



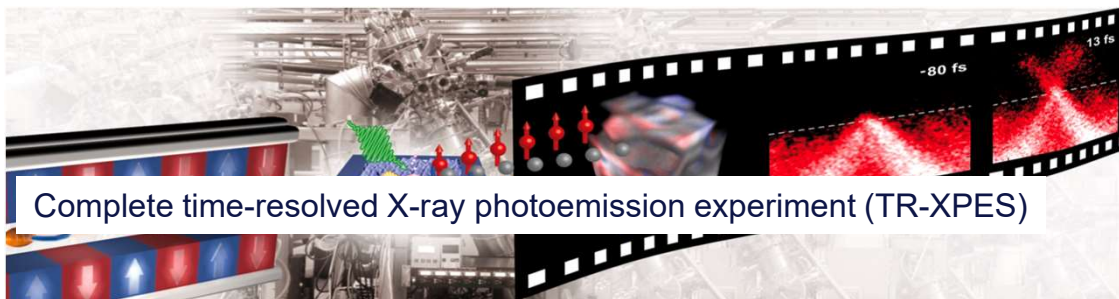
Cu L-edge RIXS: CuO





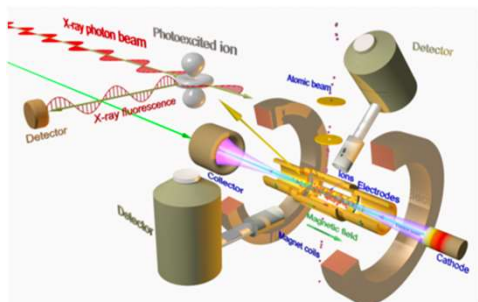
# Status : the SXP instrument at SASE 3

(with contribution of TR-XPES UC)

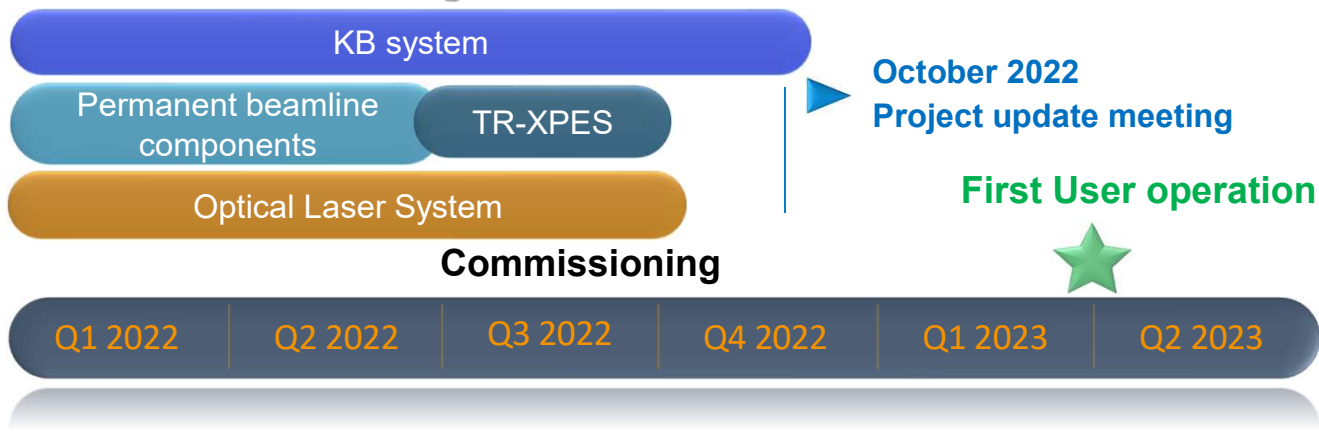
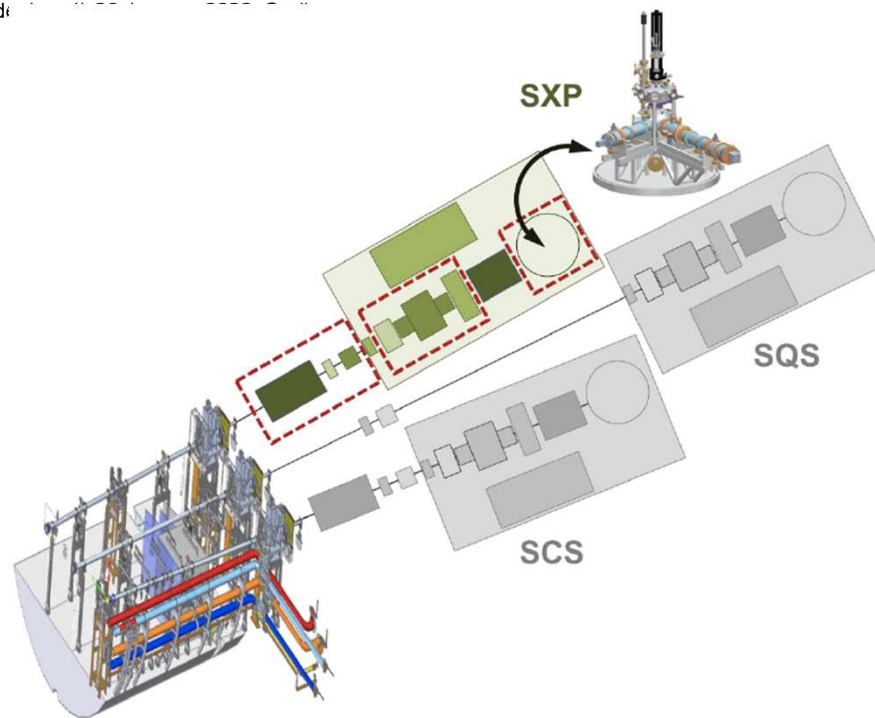
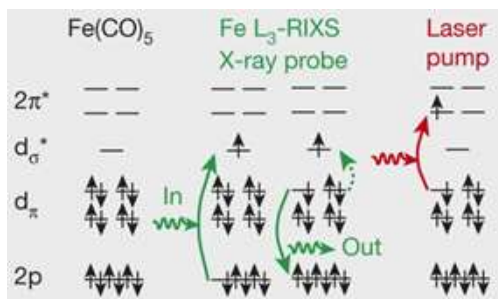


Complete time-resolved X-ray photoemission experiment (TR-XPES)

Laboratory for astrophysics, atomic physics, research with highly charged ions



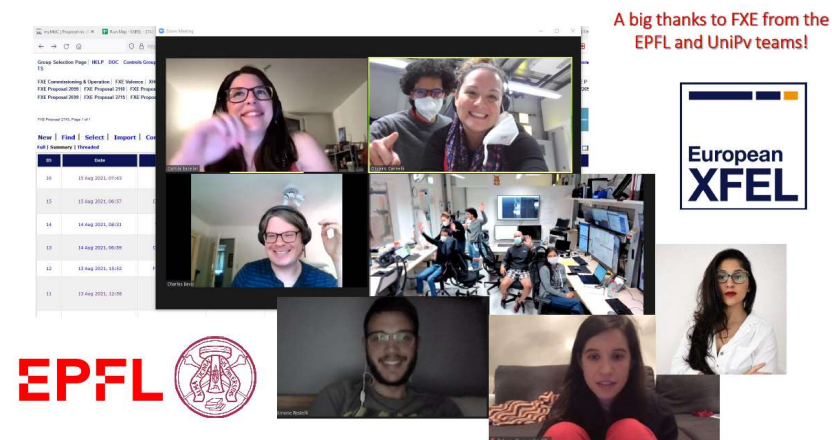
Catalysis and biochemistry



## 7<sup>th</sup> call for proposals (originally planned for 2021-2): Allocation for 2022-1

<b>Call 7 (deadline Dec 2020)</b>	
Total proposals submitted	168
Withdrawn after deadline	2
Allocated in 2021	3
Allocated in 2022-1 (Feb.–Jun. 2022)	54

## Happy users from run 2021-1

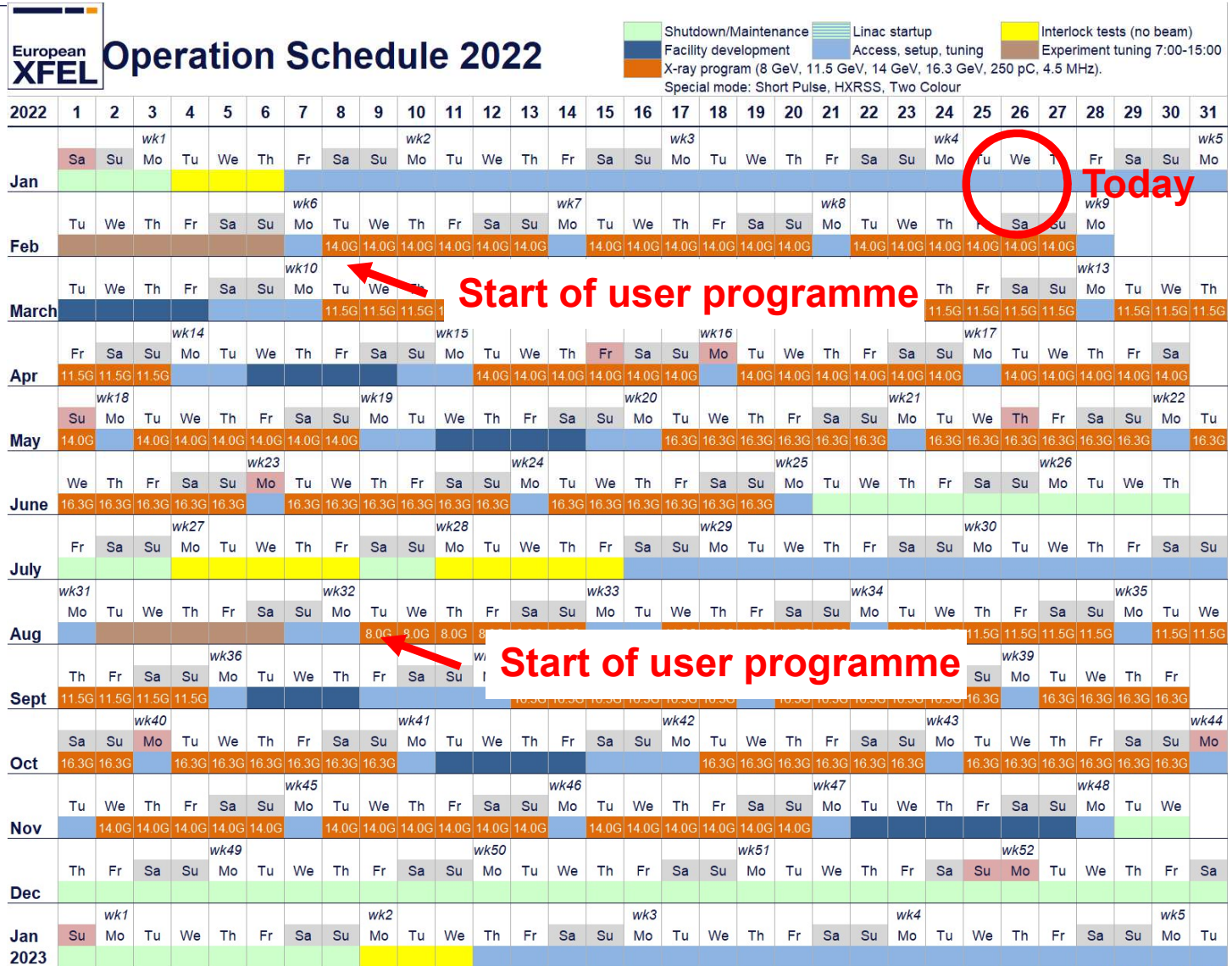


**Successrate: 34%**

## Increase in the amount of user experiments / user beamtime

	2018 (FXE/SBP/SCS/ SQS only)	2019	2020	2021	2022-01 (estimate for first ½ year)
Hours	1 356	3 348	1 908	4664	<b>4 940 h</b>
No. of proposals	25	60	23	44	<b>54</b>

■ 4 940 hours per half year is close to our mid-term target





**European XFEL Operation Schedule 2022**

- Shutdown/Maintenance
- Facility development
- X-ray program (8 GeV, 11.5 GeV, 14 GeV, 16.3 GeV, 250 pC, 4.5 MHz). Special mode: Short Pulse, HXRSS, Two Colour
- Linac startup
- Access, setup, tuning
- Interlock tests (no beam)
- Experiment tuning 7:00-15:00

2022	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo
Jan																															
Feb																															



- 2022-1 : 16 weeks of with user programme
  - Very challenging, it will require a fantastic effort by our staff to succeed
  - Corona might lead to unforeseen difficulties due to sickness among staff
  - We will do our best to run as planned
  - Users are welcome on-site
- 2022-2 : 13 weeks of X-ray delivery
  - Schedule ready about end of April/early May

Nov	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	
Dec	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa
Jan 2023	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu

## COVID-19 : User access in run 2022-01 (*as of today*)

- Beamtime participation in person restricted and subject to approval: ~ 6 users on-site per experiment
  - Authorization on a case-by-case basis (complexity of the experiment)
  - “2G+” rule – on-site participation only for fully vaccinated or recovered users + negative PCR test result
  - Mandatory antigen daily self-tests
  
- Changing situation:
  - PCR test requirement may evolve in next few weeks
  - The User Office contacts user groups to confirm actual conditions for their beamtime closer to start date
  - Guest House: similar rules as for on-site users

Details on our homepage



FACILITY

ORGANIZATION

SCIENCE

NEWS AND EVENTS

USERS

COVID-19 User Operation



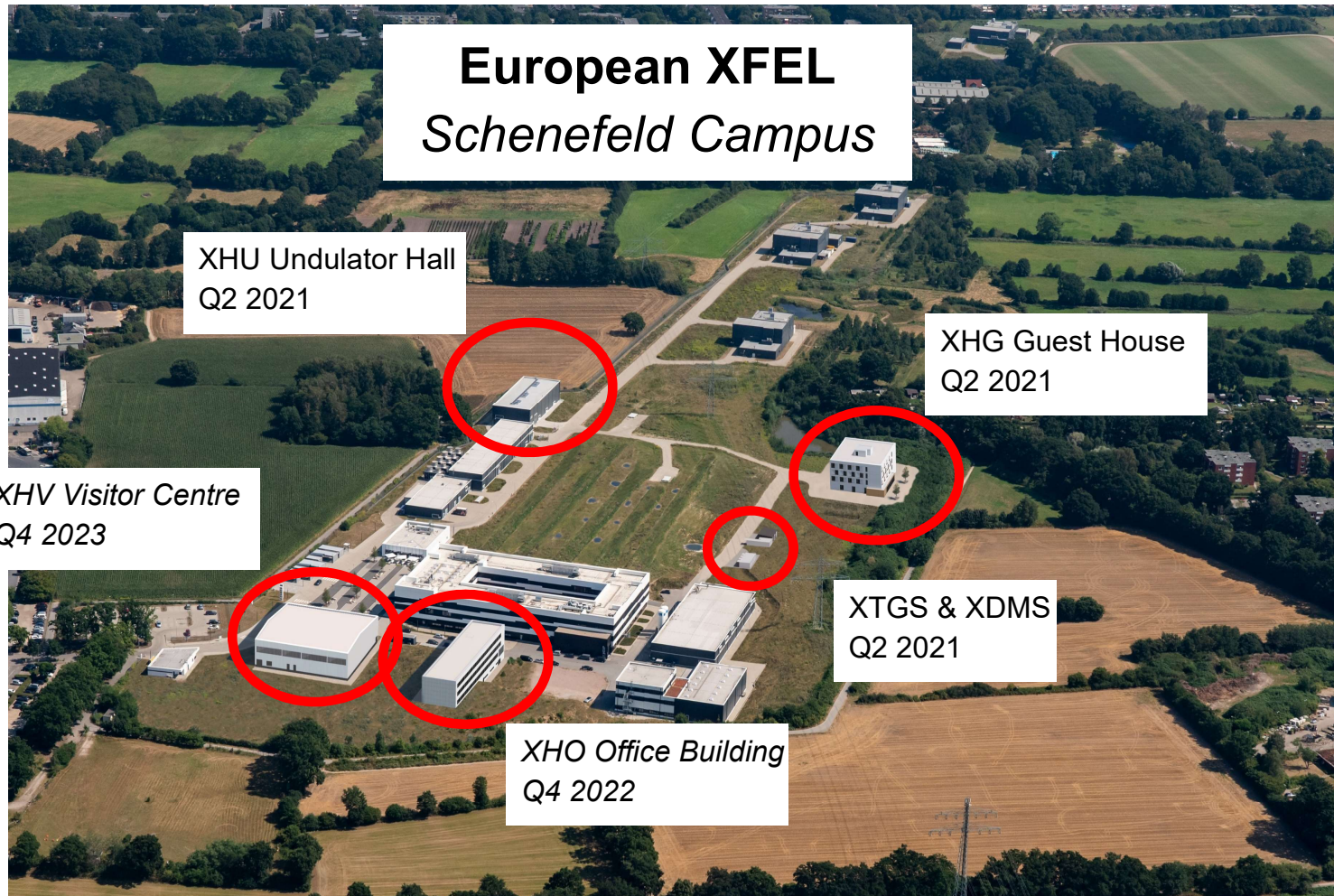
## Statistics of submission of Proposals for call 7 and call 8 : Beamtime in 2022-1 and 2022-2

Instruments	Call 7	Call 8
FXE	32	29
SPB/SFX	26	21
SPB/SFX Protein Crystal Screening		7
HED	27	27
MID	33	24
SCS	18	29
SQS	32	30
Total submitted	168	167

- Call 8 for proposals for beamtime in 2022-2 is closed and under evaluation
- It included a call for screening beamtime
- Expressions of interest was launched for long-term proposals and are under evaluation
- A call for expressions of interest will be launched end of February for Molecular H<sub>2</sub>O research as basis for proposals to be submitted later in Call 9

## Important dates for user access

15-16 Feb 2022	Proposal Review Panel Meetings Call 8
2 <sup>nd</sup> half Feb 2022	<ul style="list-style-type: none"> <li>• <b>Outcome of Long Term Proposal Eol</b></li> <li>• <b>Call Eol on H<sub>2</sub>O Research</b></li> </ul>
3 March	CMWS Water Days: Session on H <sub>2</sub> O call
Early April	Deadline H <sub>2</sub> O Eol call
End April	<ul style="list-style-type: none"> <li>• Outcome of H<sub>2</sub>O Eol call</li> <li>• Schedule and feedback on beamtime allocation Call 8 / 2022-02</li> </ul>
5 May	Opening Call 9 (regular proposals, protein crystal screening proposals, long-term proposals, H <sub>2</sub> O call)
22 June	<b>Deadline Call 9</b>
Aug-Nov 2022	User run 2022-02
8-9 September 2022	Proposal Review Panel Meetings
By end October	Schedule and feedback on allocation Call 9 / 2023-01
February-June 2023	User run 2023-01



## ■ XHG – The Guest House is ready for you also in 2022

- Official inauguration: 21 June 2021
- Occupancy: 177 guests stayed in the guest house
- Fully booked beginning November 2021





# Strategy 2030+

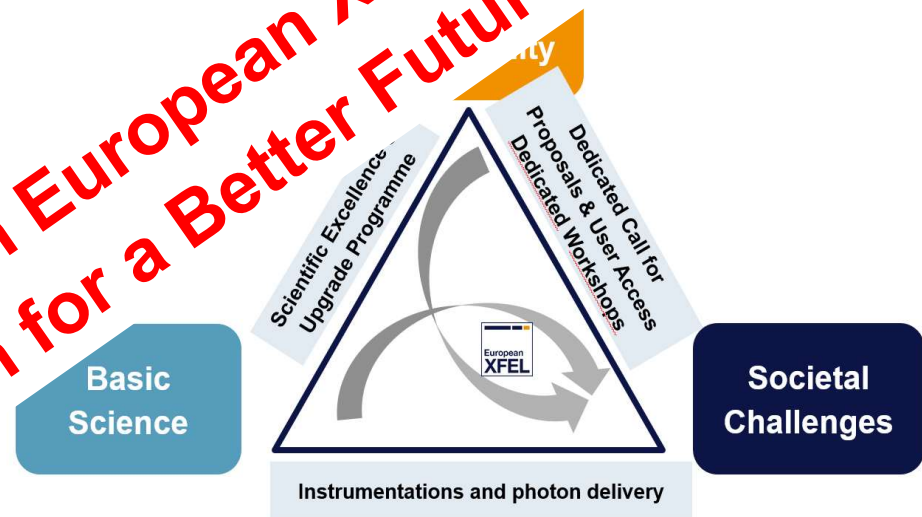
- We operate a world-leading X-ray facility that enables scientific discoveries for the benefit of society
- We contribute to knowledge: understand and combat a wide range of societal challenges, including our society today and in the future.

## ■ Focus areas for largest impact

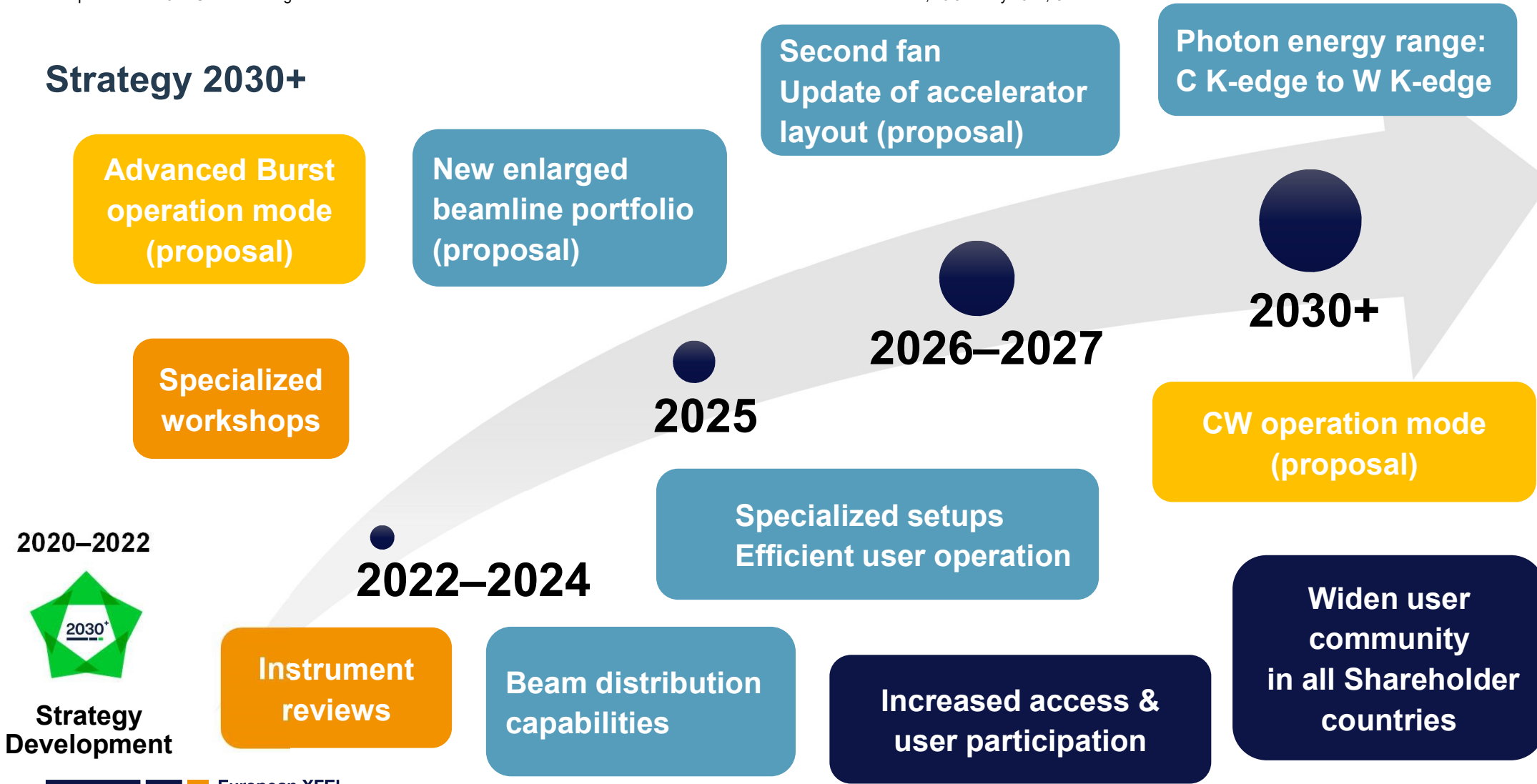
- Climate Change
- Circular Economy
- Digitalization/data deluge
- Global Health

- This can be achieved by:
  - further strengthening our unique capabilities
  - increasing capacity, with specialized and exploratory instruments

**Joint Declaration European XFEL-DESY  
Research for a Better Future**



# Strategy 2030+





## The European XFEL values – important for our user operation

- Our values are at the heart of our mission and will help us to build a supportive and highly motivated staff community across European XFEL.

- Our values guide us on “how we should act with each other, our users and our stakeholders”

**"The UOEC** supports the values of excellence, transparency, collaboration and trust. We were happy to see that these values were identified in a bottom-up process by a representative cross-section of European XFEL staff, and we appreciate that the user community will be informed and involved at an early stage."



### COMMUNITY

We value collaboration at all levels.

### EXCELLENCE

We aim to be excellent where it matters.



### TRANSPARENCY

We value transparent processes and decisions.



### TRUST

We value trust-based relationships that respect the expertise and roles of our staff.

## Thank you for your attention

1. We see the dramatic effects of climate change and the global threat of pathogens as great challenges of our time.
2. We are convinced that our research and our innovation strategies play an essential role in protecting our planet and humanity.
3. Our unique large-scale research facilities, operated by our highly skilled staff together with the international research community, enable unprecedented insights into nanostructures, advanced materials, biological systems and biochemical processes for the design of environmentally friendly materials and better drugs and vaccines.
4. We have the bold ambition to further develop in the Hamburg metropolitan area an international centre of excellence in structural research that will boost discovery-driven science and attract the best minds to find solutions for the great challenges of today and tomorrow.

