

The European XFEL Project: An Introduction

14 September 2010

International Workshop on Accelerator Alignment 2010

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Press & Public Relation
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The European X-ray free-electron laser

European XFEL



- **XFEL = X-ray free-electron laser**
- 3.4 km long research facility in the Metropolitan Region of Hamburg, Germany
- European XFEL GmbH (non-profit organization with shareholders)
- Construction started in 2009, start of commissioning is planned for 2014
- Construction costs (incl. commissioning): 1082 million Euro
11 international partners incl. Germany 54 % and Russia 23 %
- Later research campus in Schenefeld (Schleswig-Holstein)
- Close cooperation with DESY



DESY...

- ...developed initial plans for the European XFEL
- ...initiated the plan approval procedure
- ...is the awarding authority for civil and underground engineering work
- ...is constructing the superconducting accelerator (accelerator consortium)
- ...is the main shareholder (>50%)
- ...operates FLASH (Free-electron LASer in Hamburg) since 2005



- **Foundation of a non-profit limited liability company under German law (30 November 2009)**

- **Organs:**

- Council (shareholders' assembly)
- Management Board
- Scientific Advisory Committee (SAC)
- Machine Advisory Committee (MAC)
- In-kind Review Committee (IKRC)

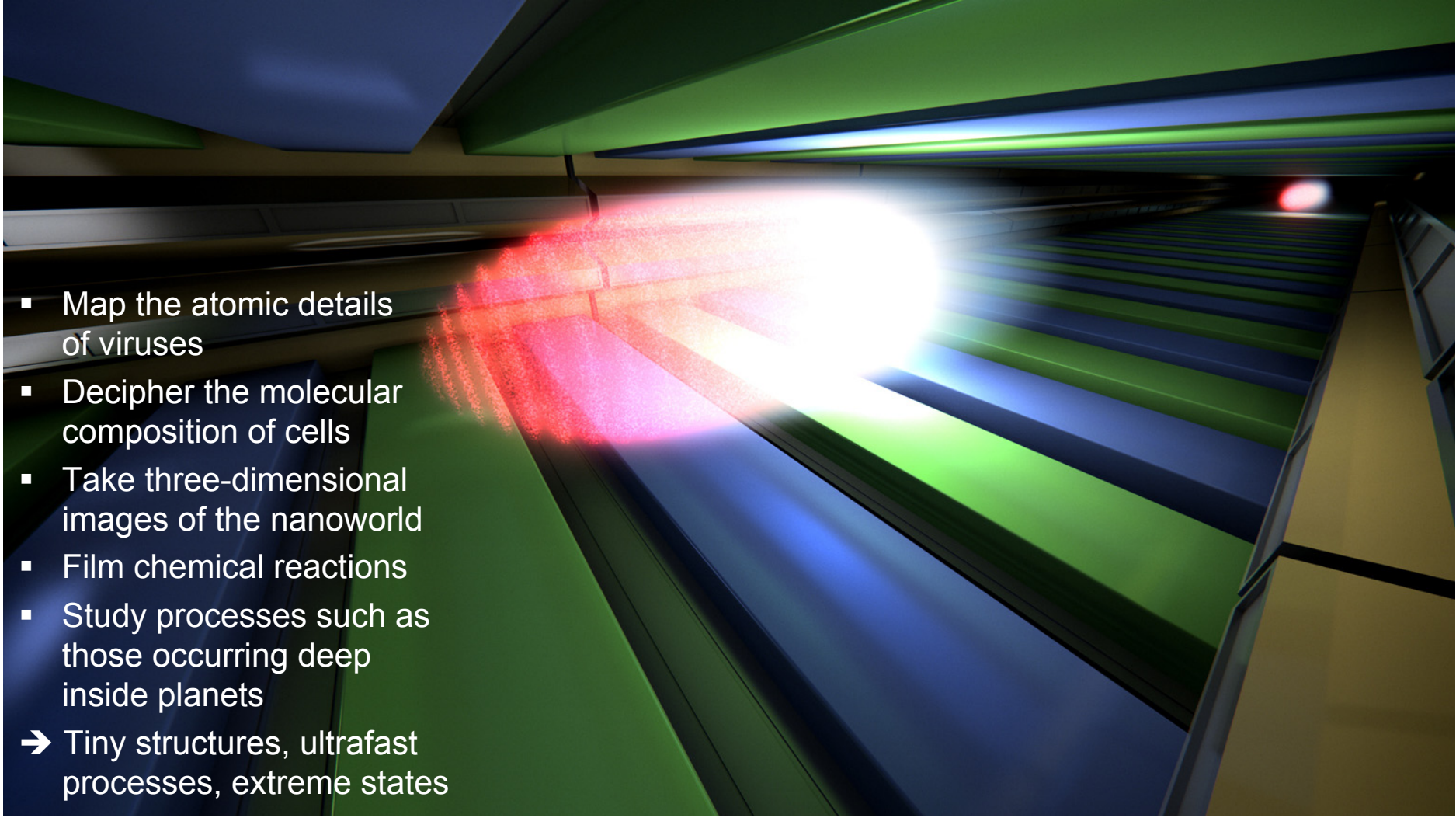
- **8 shareholders at present :**

- DASTI (Denmark)
- DESY (Germany)
- NKTH (Hungary)
- IPJ (Poland)
- RUSNANO (Russia)
- Slovak Republic/Ministry of Education (Slovakia)
- Swedish Research Council (Sweden)
- Swiss Confederation/ Staatssekretariat für Bildung und Forschung (Switzerland)

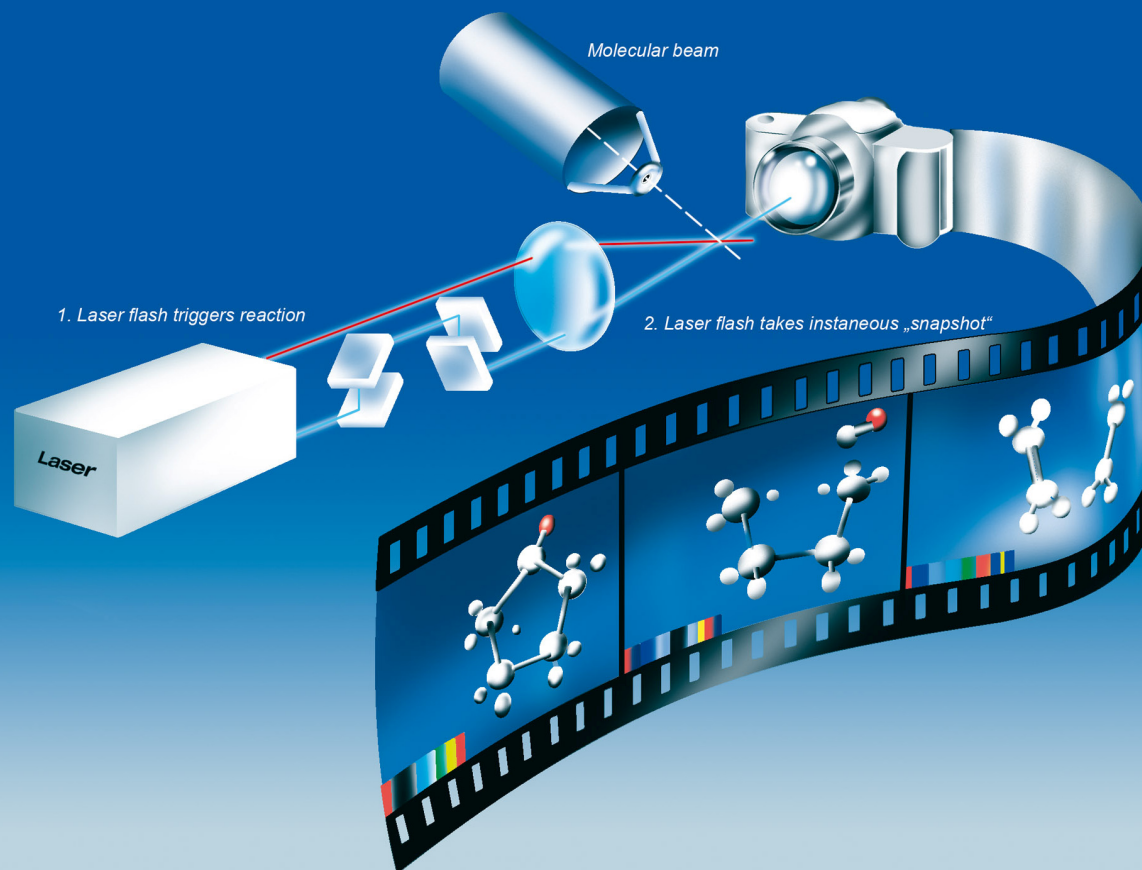


Basic research using X-ray flashes

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- 
- Map the atomic details of viruses
 - Decipher the molecular composition of cells
 - Take three-dimensional images of the nanoworld
 - Film chemical reactions
 - Study processes such as those occurring deep inside planets
 - ➔ Tiny structures, ultrafast processes, extreme states

Properties of X-ray flashes



Flashes per second:
27 000

Wavelengths:
0.1 to 6 nm

Duration:
< 100 femtoseconds

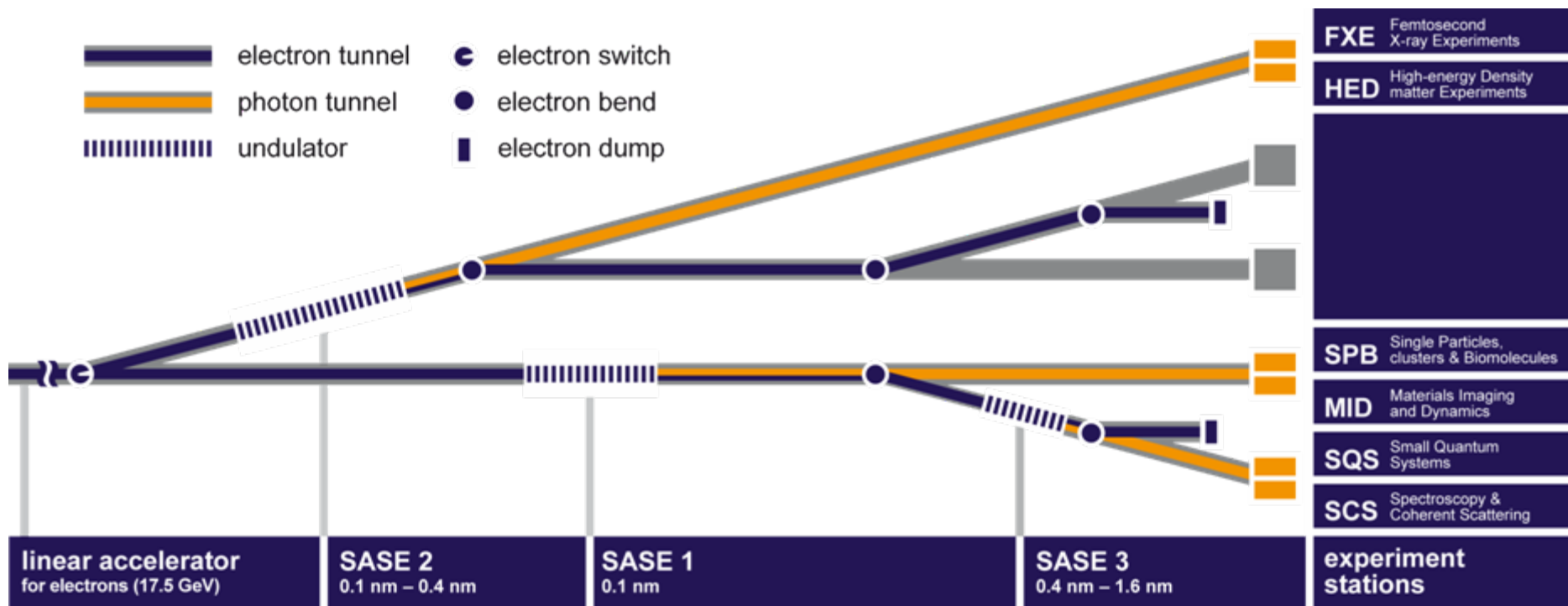
Peak brilliance:
 5×10^{33} photons/s
/mm²/mrad²/0.1%
bandwidth

Coherence:
yes

Beamline layout & experiment stations



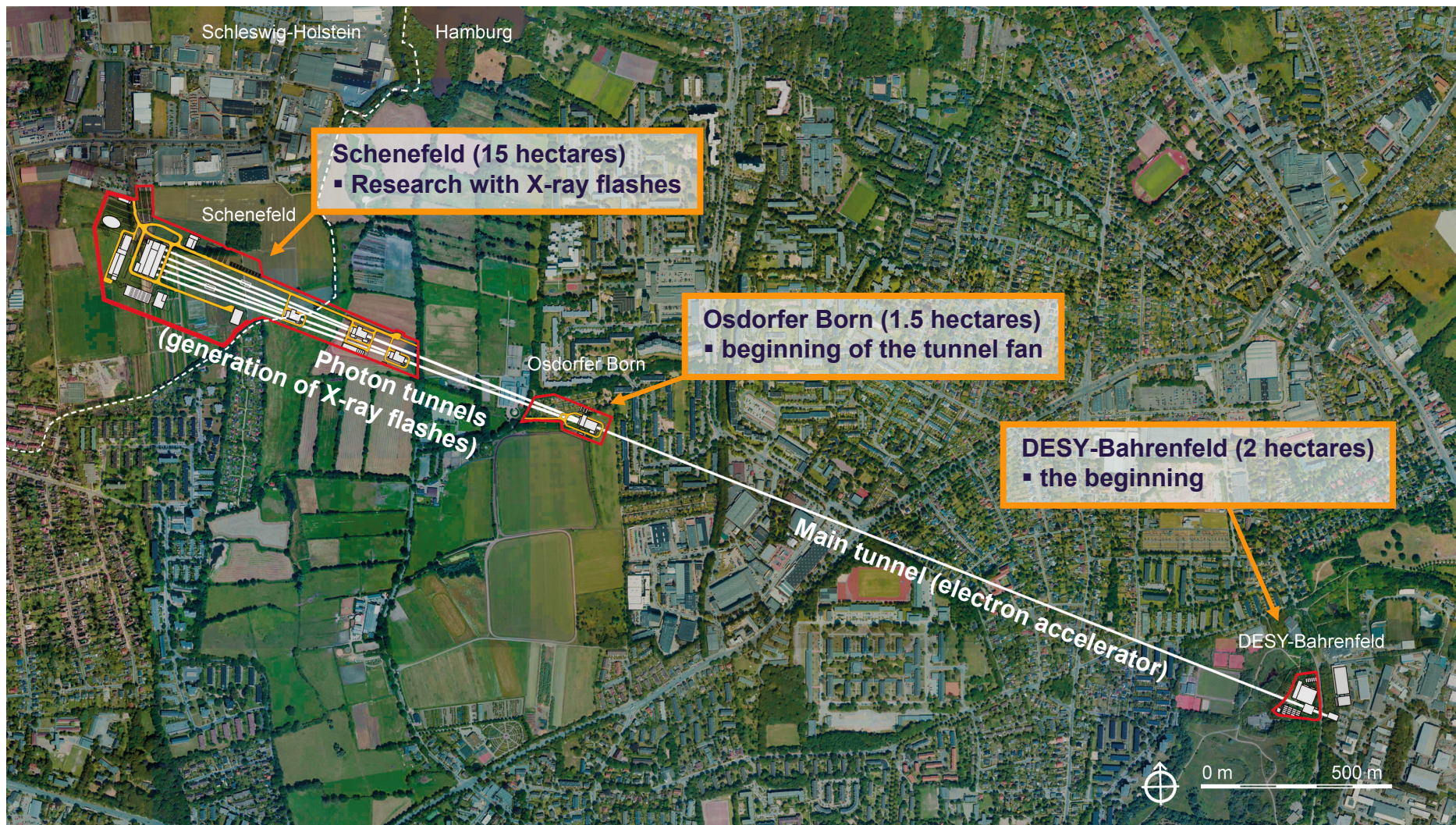
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The facility in overview

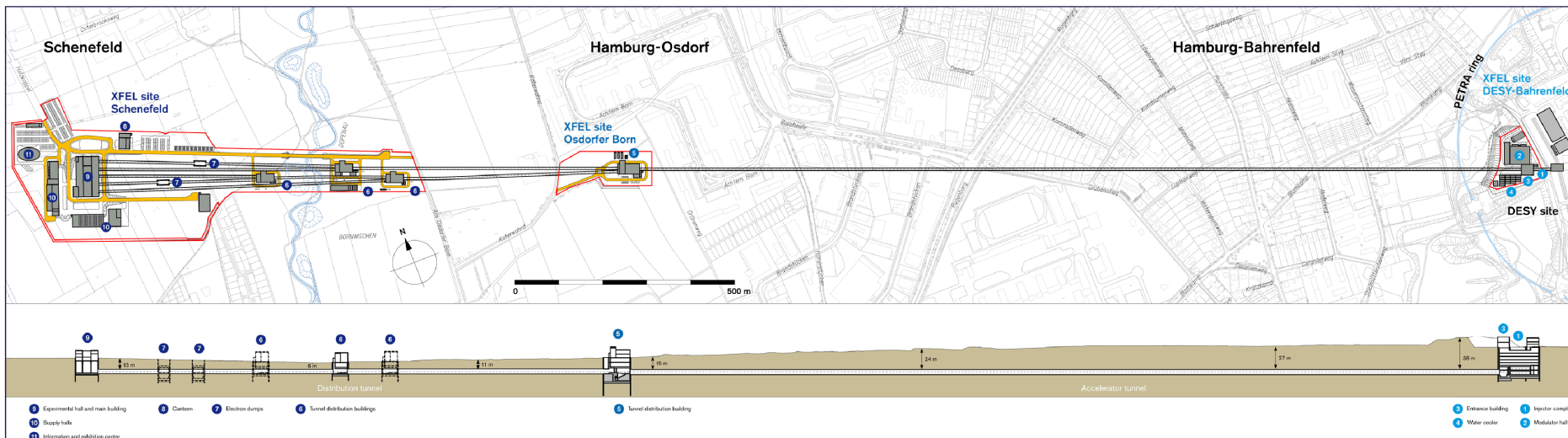


The facility in overview



Height above the tunnels

10



13m

6m

11m

15m

24m

27m

38m

DESY-Bahrenfeld – Diaphragm walls



13 March 2009

DESY-Bahrenfeld – Injector complex building pit



17 May 2010

Construction site DESY-Bahrenfeld

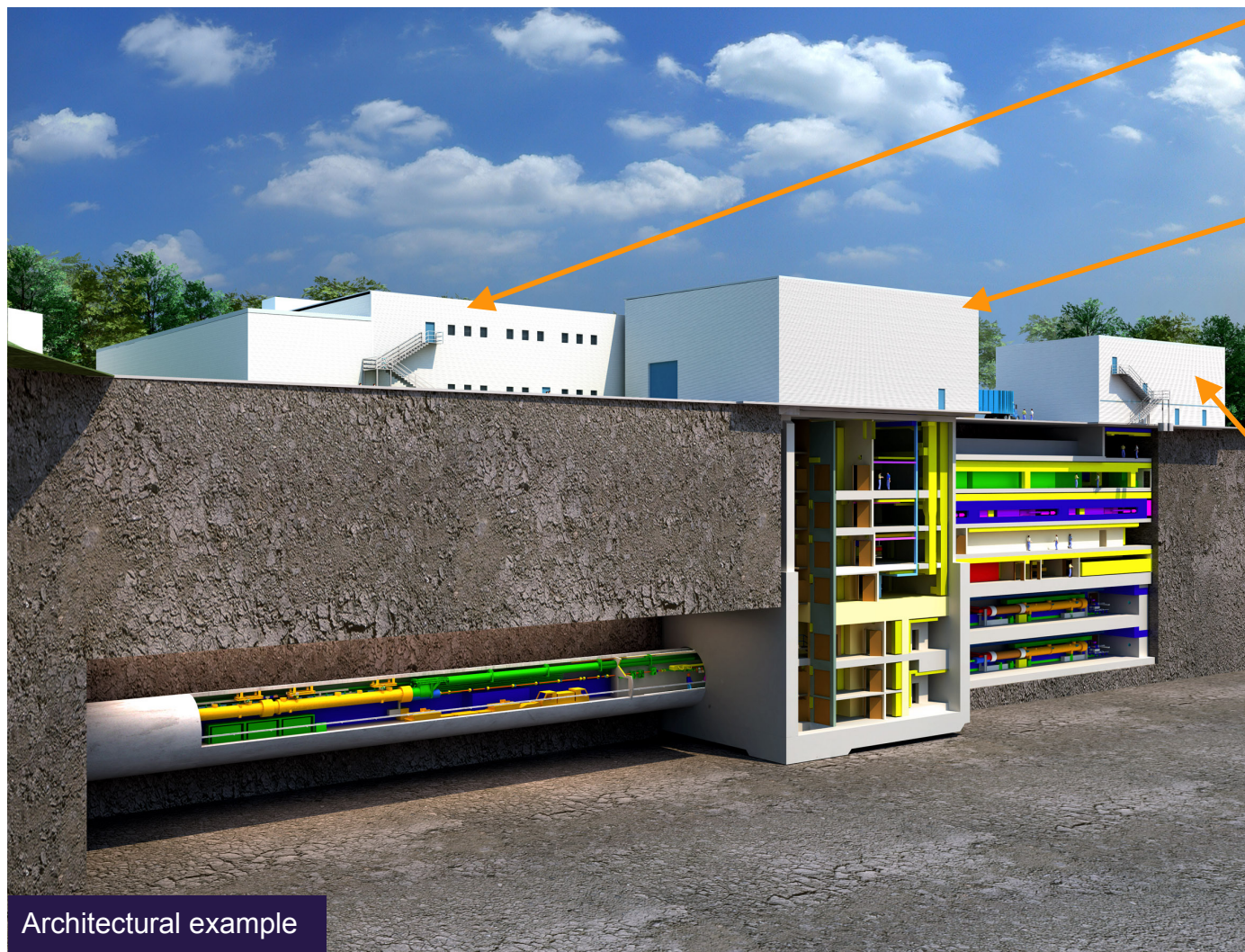


11 September 2009

Site DESY-Bahrenfeld – 2014



Injector complex DESY-Bahrenfeld – 2014



Modulator hall

Area: 46 x 41 m
Height: 10 m

Main entrance building

Area: 27 x 24 m
Height: 13 m
Depth: 38 m

Injector entrance building

Area: 28 x 16 m
Height: 11 m
Depth: 32 m

➔ Injector complex
Length: 95 m
Depth: 38 and 32 m

Architectural example

Construction sites Osdorfer Born & Schenefeld



17 June 2009

Construction site Osdorfer Born



09 September 2009

Site Osdorfer Born – 2014



Tunnel distribution Osdorfer Born – 2014



Tunnel distribution building

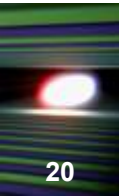
Area: 49 x 21 m

Height: 9 and 12 m

Depth: 19 and 27 m

Architectural example

Construction site Schenefeld



09 September 2009

Research campus Schenefeld – 2014



Main building Schenefeld – 2014



- Offices, laboratories, library, seminar rooms etc.
- From 2014/2015: scientific operation with 300-350 persons
- Above the underground experimental hall

Architectural example

Experimental hall and main building



Main building

Height: 12 m
U-shape, 3 floors

Experimental hall
with connection to 5
tunnels for X-ray flashes

Area: 90 x 50 m
Depth: 14 m

Architectural example

Construction site webcams 24 August 2010

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DESY-Bahrenfeld



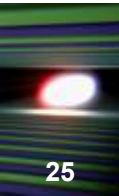
Schenefeld East



Osdorfer Born



Schenefeld West

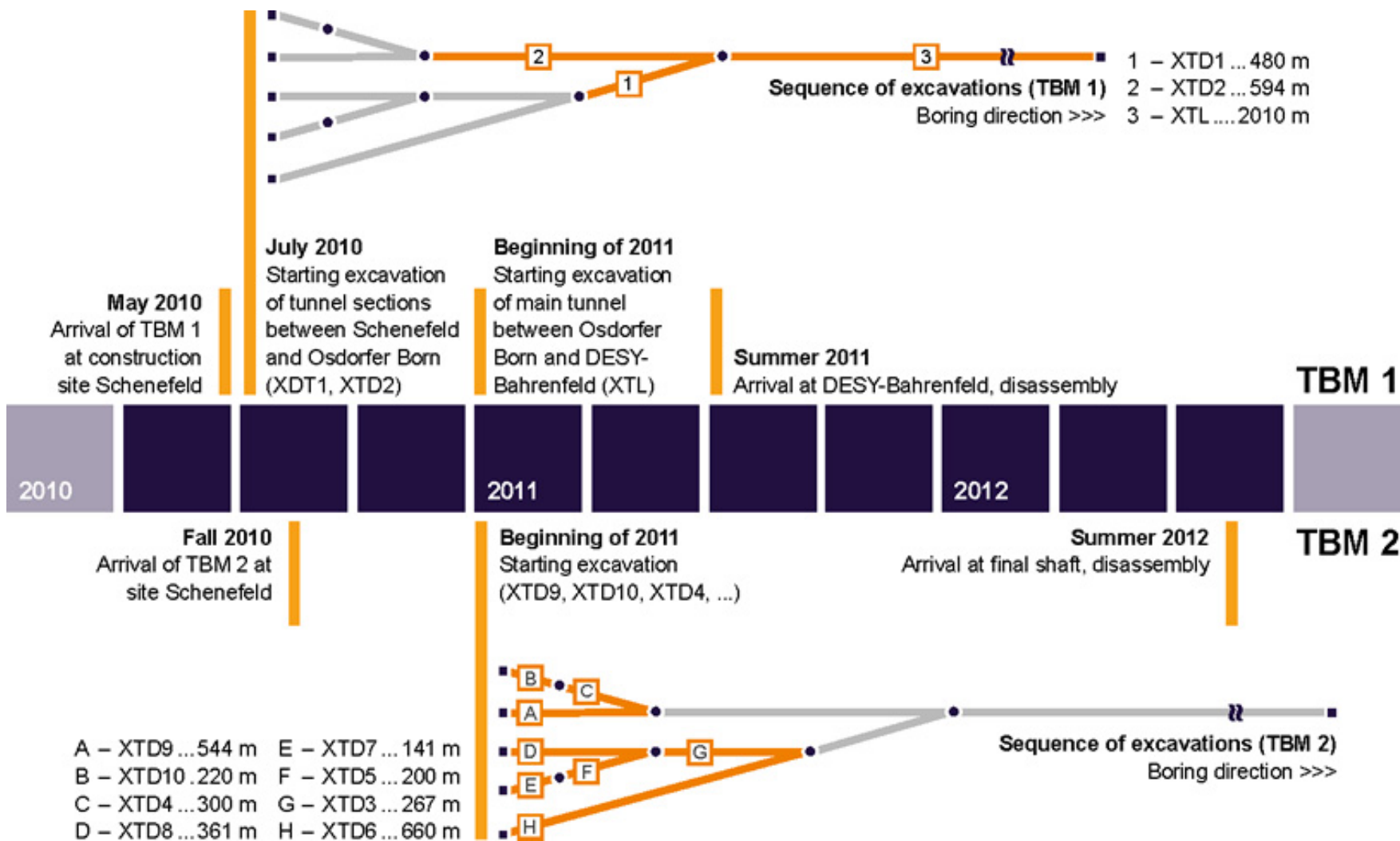


- Schenefeld ⇒ Osdorfer Born
- Osdorfer Born ⇒ DESY-Bahrenfeld (Linac, arrival TBM in June 2011)
- „Fan“ with 5 tunnels under Schenefeld area

- 5777 m of tunnels in total, depths: 6 m – 38 m

- 2 tunnel boring machines:
 - TBM 1 (6,17 m outer Ø - 5,30 m tunnel inner Ø)
 - TBM 2 (5,48 m outer Ø - 4,60 m tunnel inner Ø)

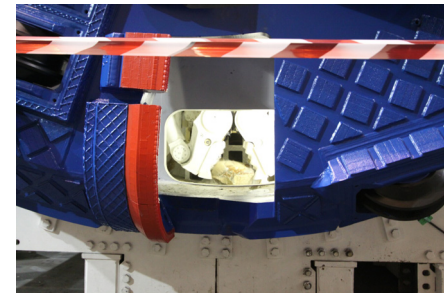
Tunnel construction progress



TBM S-544 – Technical approval in factory



February 2010



TBM S-544 – Arrival at Hamburg port



29 March 2010

TBM S-544 – Transport to Schenefeld



19 May 2010

TBM S-544 – Installation in start shaft



26 May 2010

„TULA“ – Christening ceremony



30 June 2010

„TULA” in action after 100 m



View to the end of the tunnel boring machine on 27 July 2010

1st through-cut of „TULA”



03 September 2010

- Overview
- Research
- Organization
- Construction Project
- News
- Events
- Job offers
- Media database
- Construction sites webcams
- German/English

The screenshot displays the European XFEL website interface. At the top, there's a navigation bar with 'Home', 'Contacts', and a search bar. Below this, a 'TUNNEL BORING PROGRESS' section shows a bar chart with TBM1 at 10.6%, TBM2 at 0%, and a TOTAL of 8.4%. The main content area features a large banner for 'ENLIGHTENING SCIENCE' with a video player. Below the banner are sections for 'NEWS' (listing dates from 2010), 'EVENTS' (listing dates from 2010), and 'STRONG PARTNERS' (featuring DESY). A 'WEBCAMS' section shows live feeds from construction sites. At the bottom, a detailed navigation menu lists categories like 'Overview', 'Research', 'Organization', 'Construction Project', 'News, events, ...', and 'Information for ...'. The footer includes flags of participating countries and the text 'Participating countries'.

■ Have a good construction site visitation in Schenefeld!

