XFEL DAQ -- Infrastructure & Environment

Photomontage with architectural draft of the main building, planning status April 2005, © DESY

XFEL DAQ -- Infrastructure & Environment

DAQ computer cluster(s) shall be installed close to the experimental stations
> **-> i.e. on the Schenefeld premises**
> **-> preferable in the Exp. Hall or its surface building**
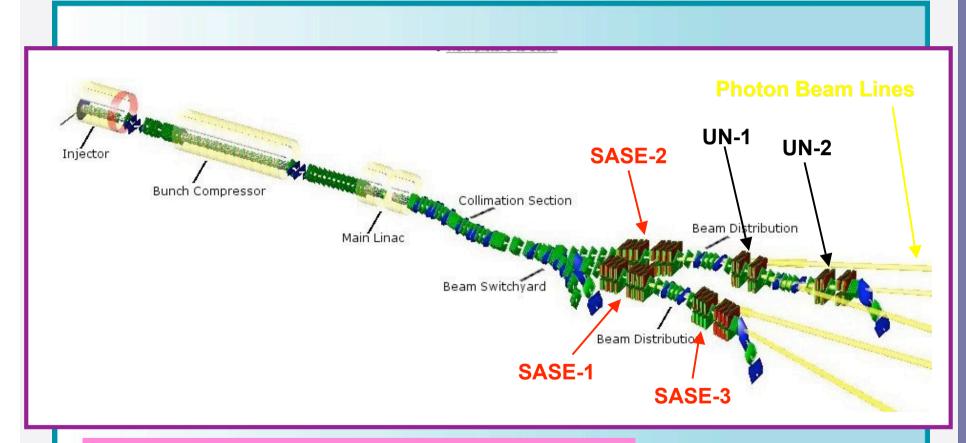
Infrastructure requirements:
- **Space**
- **Power**
- **Air conditioning / water cooling**
- **IT-connection -> cables, glass fibres**
- **Connection to the front end devices -> cables, glass fibres**
- **Radiation protection**
- **Fire protection**
- **Permanently accessible**
- **Protection against unauthorised access**

So far nothing particular is planned. However there are no problems providing the required infrastructure -> Financial frame to be defined!
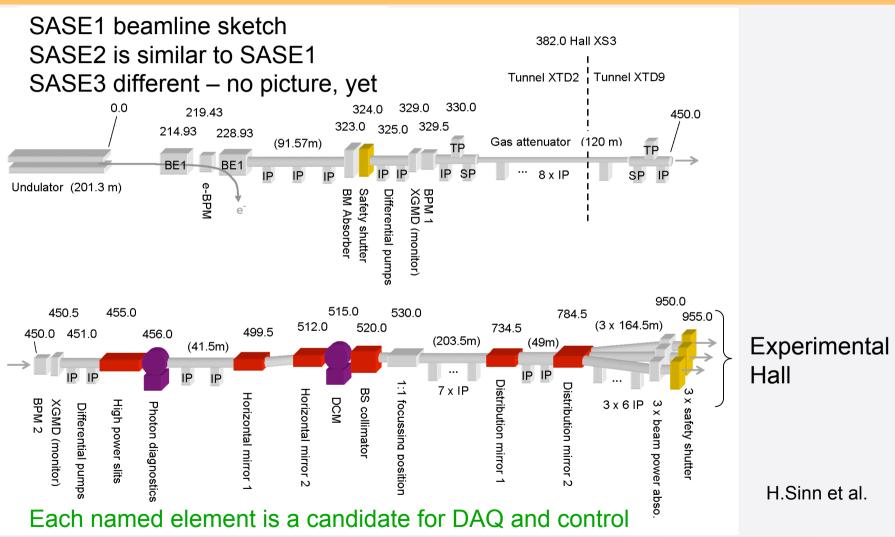
Schenefeld Site

Osdorfer Born Site

DESY Site

Switch Yard

Experimental Hall

Injector Complex

3.4 km

Photon Beam Lines

Undulator Sections

Superconducting Linac

Injector

The XFEL Machine

Photon Beam Lines

UN-1

UN-2

SASE-2

Injector

Bunch Compressor

Collimation Section

Main Linac

Beam Distribution

Beam Switchyard

SASE-1

Beam Distribution

SASE-3

UN1 & UN2 are not part of the first installation stage!
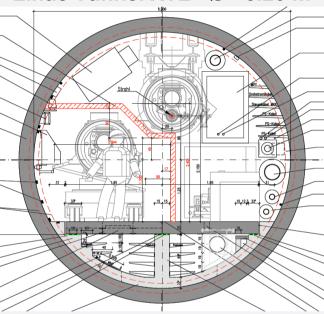
SASE1 beam line instruments

SASE1 beamline sketch
SASE2 is similar to SASE1
SASE3 different – no picture, yet

Each named element is a candidate for DAQ and control

H.Sinn et al.

Tunnel Cross Sections & Installation Times

Linac Tunnel XTL - Ø= 5.20 m

Photon Beam Line Tunnel XTD6 - Ø= 4.50 m

**Much less complex
-> Infrastructure ≈ few (3-6) month
-> Photon beam line ≈ few (~6) month**
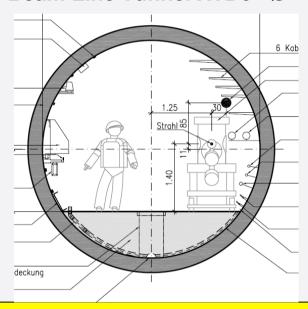
**Infrastructure installation ≈ 57 weeks
Machine installation ≈ 42 weeks**

Accessible for Installation:	
XTL	≈ Apr. 2011
XTD6-10	≈ Feb. 2012
Exp. Hall (undergr.)	≈ May 2012
Exp. Hall (surface)	≈ Dec. 2012

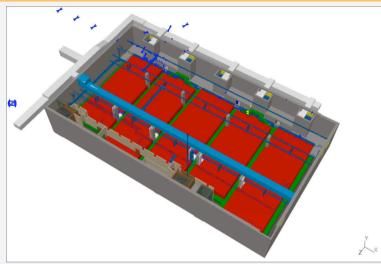**Current "Firsts" Dates:**
- 1st beam in Injector -> end of 2012
- 1st beam in Linac -> end of 2013
- 1st SASE(1) at 0. 2 nm -> end of 2014

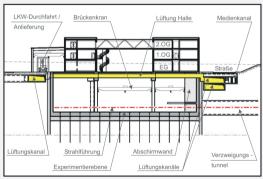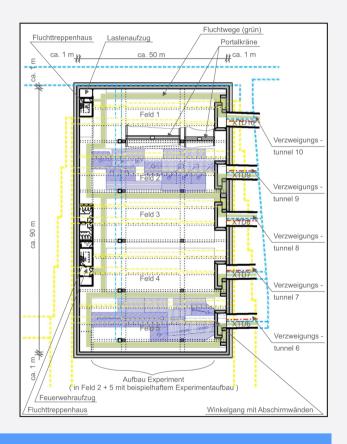# The Experimental Hall -> Underground

Accessible for installation ≈ May 2012

Floor size:

≈ 90 m x 50 m ≈ 4500 m^2

≈ 14 m below surface

Ceiling supported by 8 columns

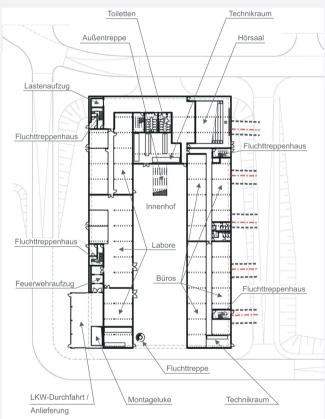**The experimental hall is basically designed in detail**
-> Not yet designed are the instruments/experiments and their proximity infrastructure
-> No space (so far) envisaged for DAQ computer cluster(s)

The Experimental Hall -> Surface Building

Accessible for installation ≈ Dec. 2012

Photomontage with architectural draft of the main building, planning status April 2005, © DESY

**The surface building of the experimental hall is <u>not yet designed in detail</u>
-> Requirements catalogue must be revised soon!**

Glass fibres in the XTL (Linac tunnel)

Requirements
- ≈ 1000 individual fibres
- Distributed over ≈ 50 rack stations along the entire XTL (i.e. ≈ 2100 m)
- Radiation protected
- Vibration protected
- Temperature stabilised
- Exchangeable

Glass fibres installation

Air injection technology

Injection length for different capillaries:

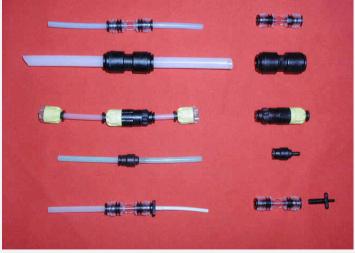$\varnothing_{o/i}$ = 3/2mm -> Single Fibre - Coating -> up to 500 m

$\varnothing_{o/i}$ = 5/3.2mm -> 12 Fibres - Coating -> up to 1.5 km

$\varnothing_{o/i}$ = 10/8mm -> 72 Fibres - sheath -> up to 3 km

Sheath tube with internal capillaries

Distribution fittings
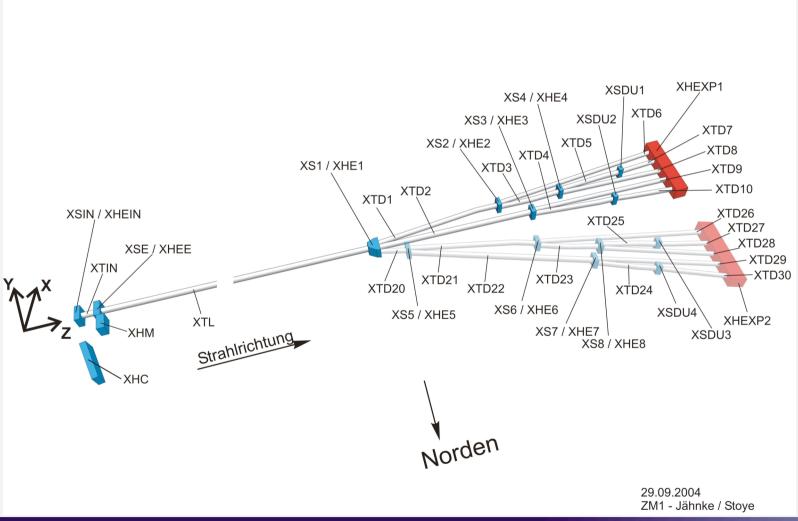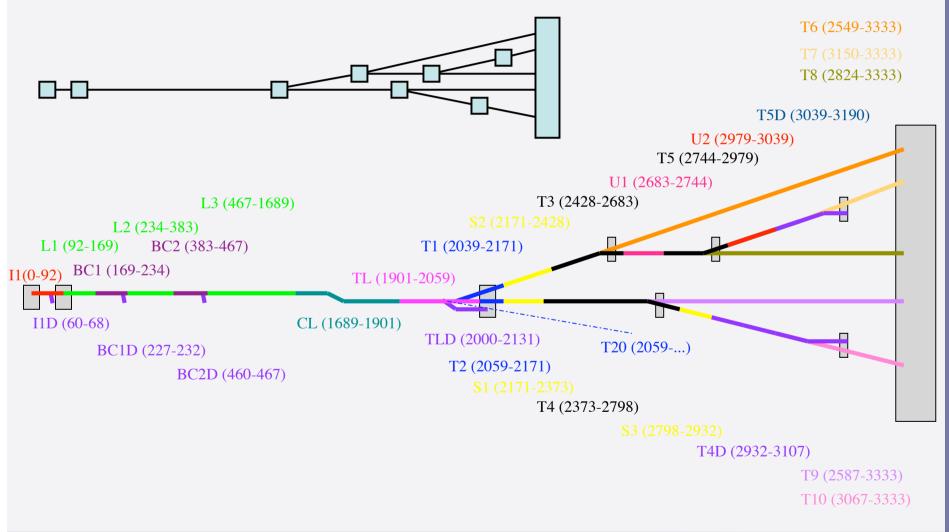
Distribution box

Nomenclature: Building & Tunnels

29.09.2004
ZM1 - Jähnke / Stoye

XFEL - Beam Line Sections Naming Convention

XFEL - Beam Line Sections Naming Convention

The machine proper is a succession/assembly of sections with different functionalities
(e.g. Injector, Bunch Compressor, Main Linac, SASE-x, Dump Lines, Photon Beam Lines ....)

Each functional section gets its own unique name, refering either to:

i) The function of the section:

I1 = Injector 1
I1D = Injector Dump
L1 = Booster Linac 1
BC1 = Bunch Compressor 1
BC1D = Bunch Compressor 1 Dump(Line)
L2 = Booster Linac 2
BC2 = Bunch Compressor 2
B2D = Bunch Compressor 2 Dump(Line)
L3 = Main Linac
CL = Collimation Section
TLD = Main Linac Dump(Line)
S1-3 = SASE Undulator Sections 1-3
U1-2 = Spontaneous Radiation Undulator Sections 1-2
T5D = Main Dump(Line) in XTD5/XSDU1
T5D = Main Dump(Line) in XTD4/XSDU2

XFEL - Beam Line Sections Naming Convention

ii) Or to the tunnel where the section ends:

TL = (straight) e-beam line starting at the end of the collimation section and ending at the T1-T20 switch

T1 = (straight) e-beam line starting at TL-T1 switch, ending in XTD1 at the beginning of SASE-2 section

T2 = (straight) e-beam line starting at T1-T20 switch, ending in XTD2 at the beginning of SASE-1 section

T3 = (bended) e-beam line starting after SASE-2 section, ending in XTD3 at beginning of UN1 section

T4 = (bended) e-beam line starting after SASE-1 section, ending in XTD4 at beginning of UN2 section

 = (bended) e-beam line starting after SASE-3 section in XTD4, ending in XSDU2

T5 = (bended) e-beam line starting after UN1 section, ending in XTD5 at beginning of SASE-3 section

T5D = (bended) e-beam line starting after UN2 section in XTD5, ending in XSDU1

T6 = SASE-2 photon beam line in XTD6, starting at photon/e- separation (in T3 section)

T7 = UN2 photon beam line in XTD7, starting at photon/e- separation (in T5D section)

T8 = UN1 photon beam line in XTD8, starting at photon/e- separation (in T5 section)

T9 = SASE-1 photon beam line in XTD9, starting at photon/e- separation (in T4 section)

T9 = SASE-3 photon beam line in XTD10, starting at photon/e- separation (in T4D section)

Conclusions

Defined and basically not changeable anymore are:
- **Underground buildings**
- **General infrastructure**

Next Steps on 'DAQ side':
- **Detail requirements for power (incl. emergency power, emergency stop & UPS), air conditioning, water and IT**
  -> June 2008
- **Detail requirements for cables and glass fibres, incl. routing**
  -> End of 2008
- **Define budget requirements**
  -> Soon

Current "Firsts" Dates:
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