

Accelerator Projects at DESY.

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DIPAC Hamburg, May 2011



Hamburg.



Zeuthen.

Member of the Helmholtz Association



Research centers: 17

Employees: ~ 33,000

Budget (B€) ~ 3,3

Research Areas:

Health

Energy

Earth and Environment

Key Technologies

Structure of Matter

Aeronautics, Space and Transport



Figures and facts

Budget ~ 180 Mio/year

- ♦ **Research with Photons** **156 Mio**
- ♦ **Particle and Astroparticle Physics** **24 Mio**

Research cooperations with worldwide leading laboratories
Interdisciplinary international research platform

(particle physics, biology, chemistry, geology, material science, physics,...)

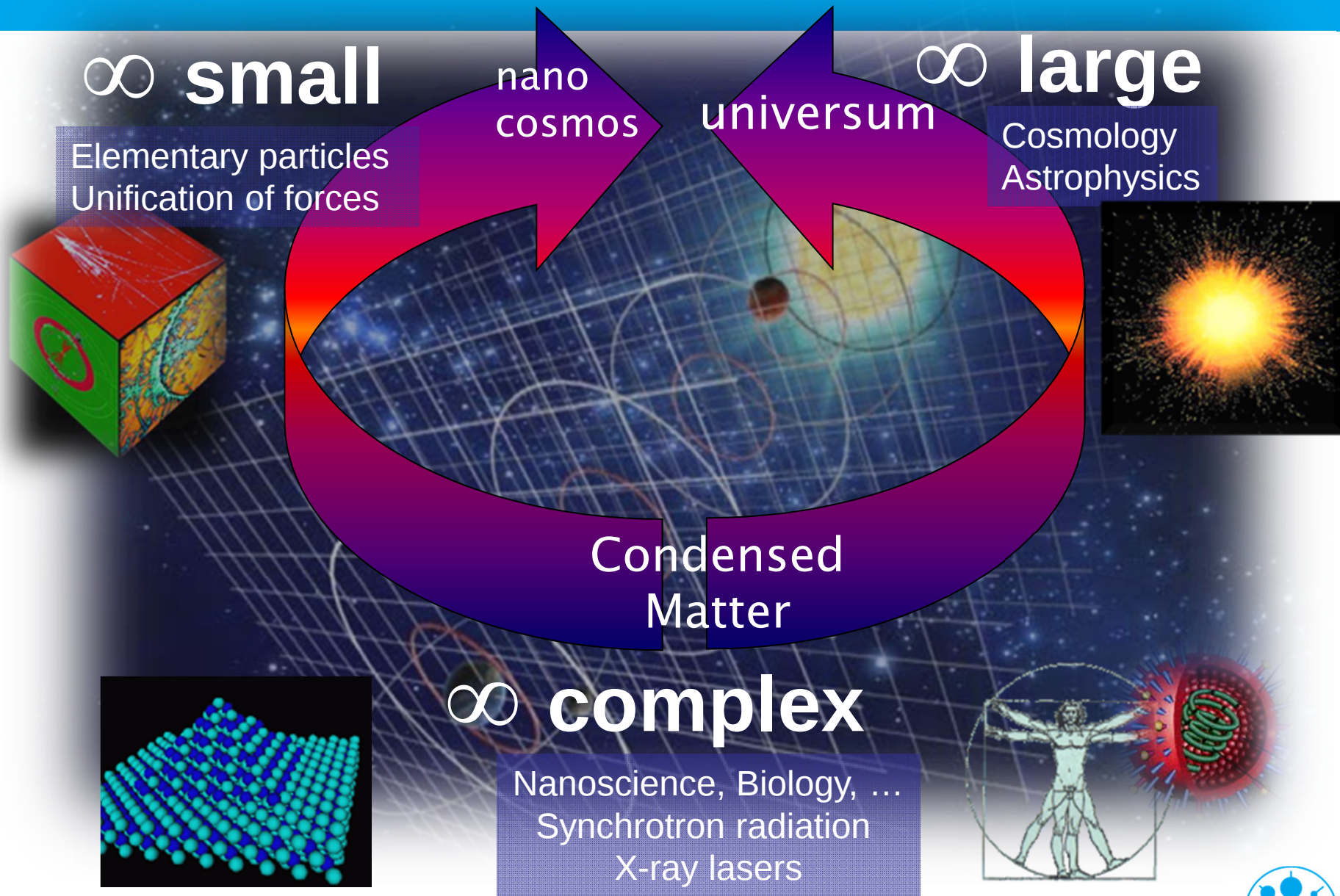
Employees ~ 2,000

Large infrastructures: DORIS-III, FLASH, PETRA-III, XFEL, TIER-2

Ext. users: ~ 2000/y (research with Photons)
~ 900/y (particle physics)
from 45 countries



DESY research



Accelerators and Research with Photons



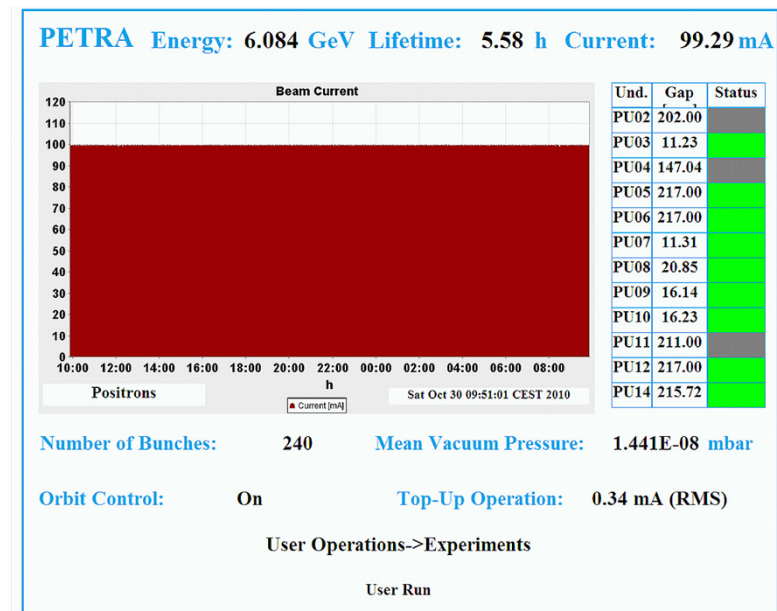
PETRA-III: 1st beam April/09, user operation 2010



Parameters: Lowest emittance source to date

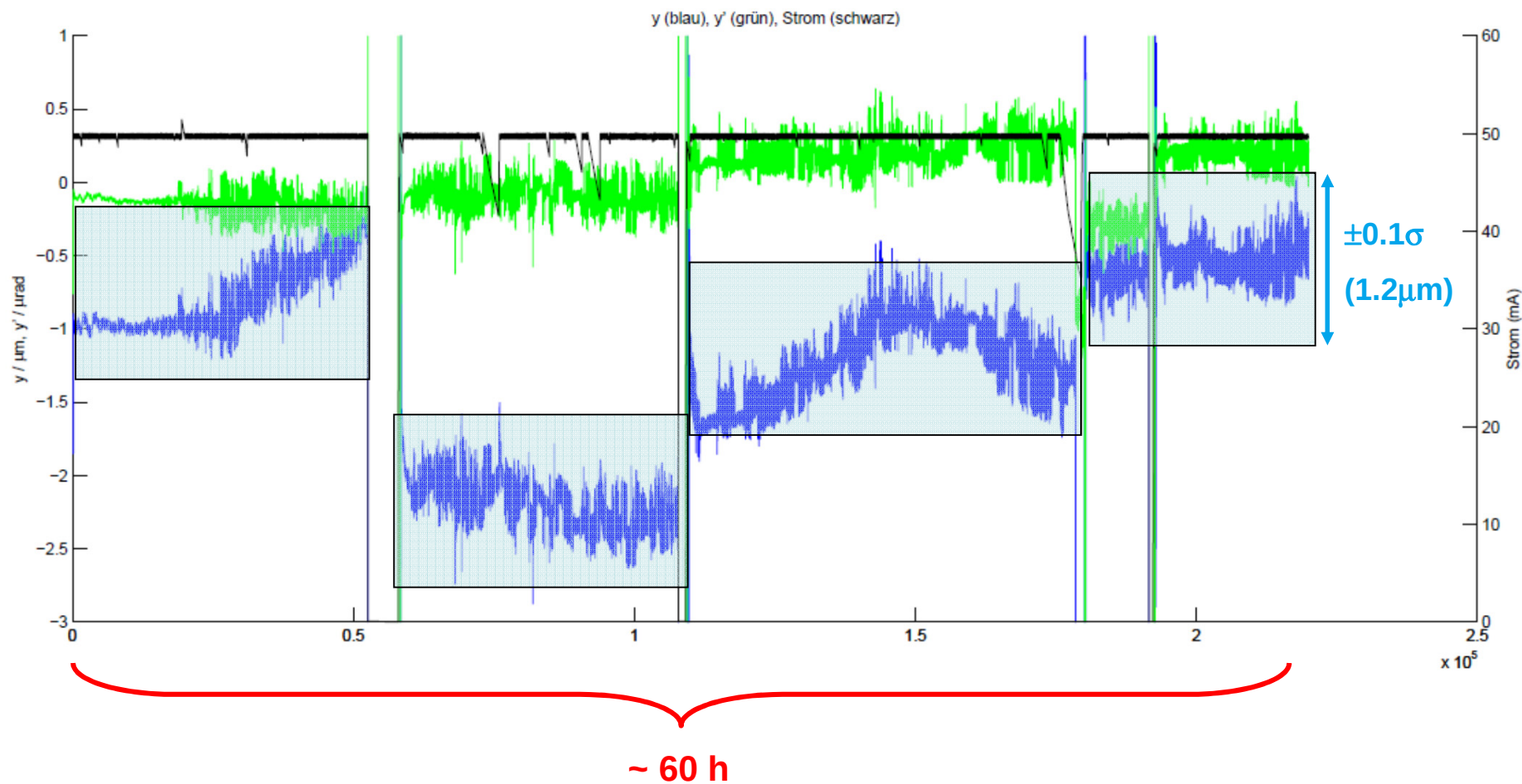
	ESRF	SPring 8	APS	PETRA III
E/GeV	6	8	7	6
C/m	844	1434	1104	2304
ϵ_x/nm	4	3	3	1
ϵ_y/ϵ_x	0.1 – 0.2%	0.2%	0.3 - 1%	~1%
$I_{\text{beam}}/\text{mA}$	200	100	100 – 300	100

- > All design objectives achieved
- > Top-up mode with beam intensity variation <1%
- > Most of 14 undulator beam lines operational



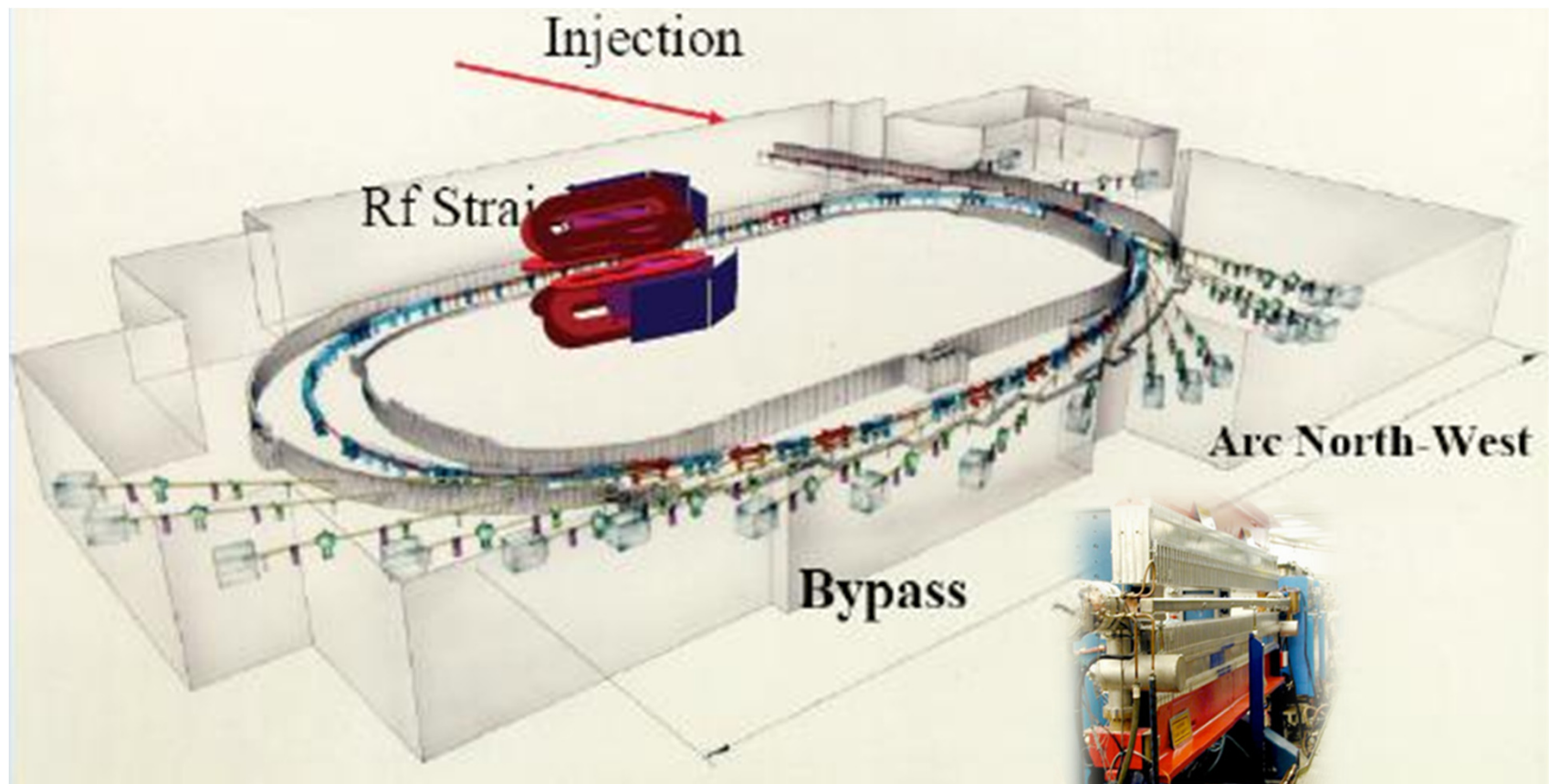
Excellent orbit stability

Orbit drift < 1 μm over several hours

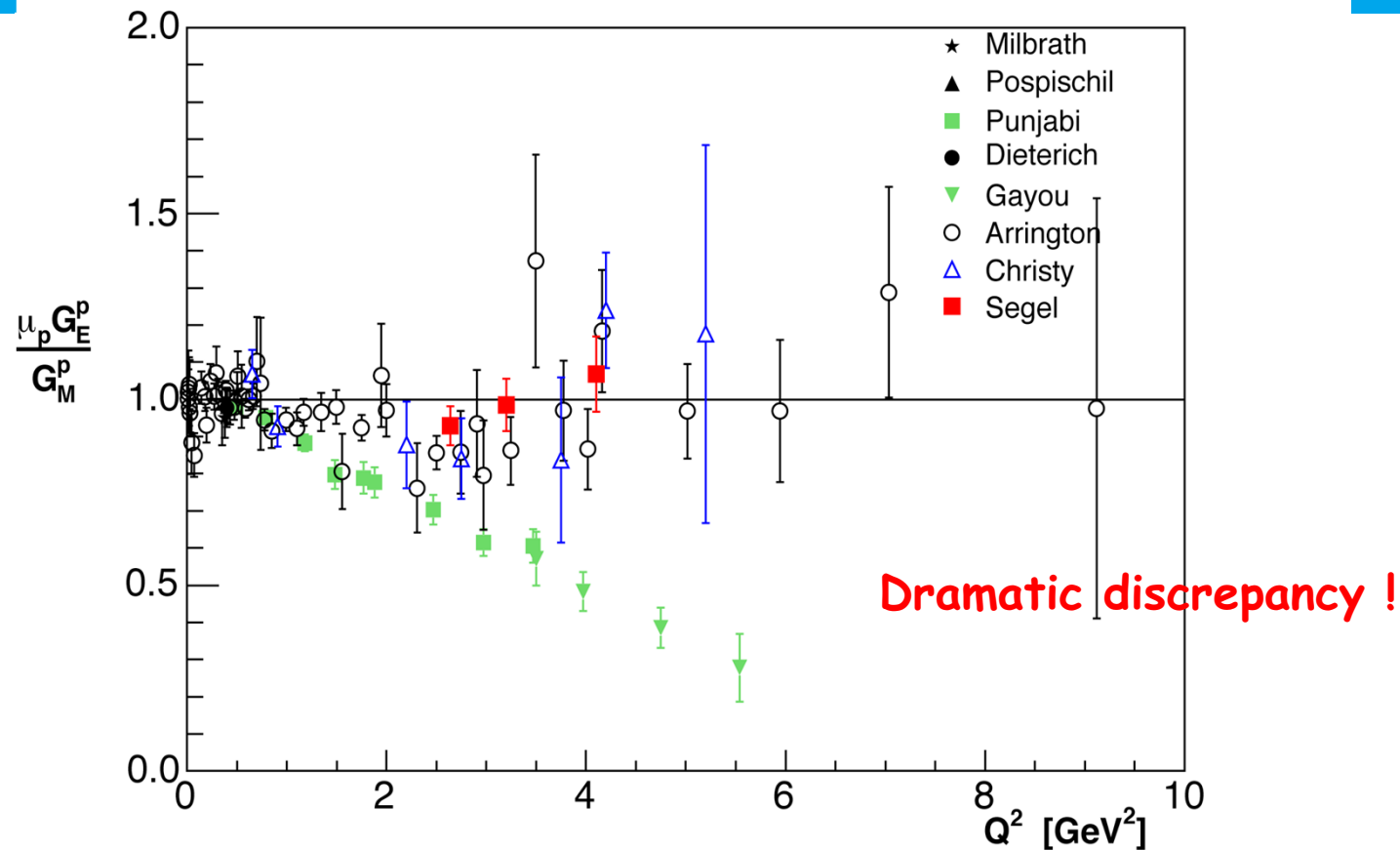


DORIS-III

- > Reliable operation as synch rad „work horse“
- > Preparation for installation of OLYMPUS experiment ongoing
- > After OLYMPUS run, end of operation beginning of 2013



Discrepancy in Elektron- vs. Positron-Proton Scattering



- All Rosenbluth data from SLAC and Jlab in agreement.
- Dramatic discrepancy between Rosenbluth and recoil polarization technique
- Discrepancy explained as effect of two photon exchange (TPE)

FLASH

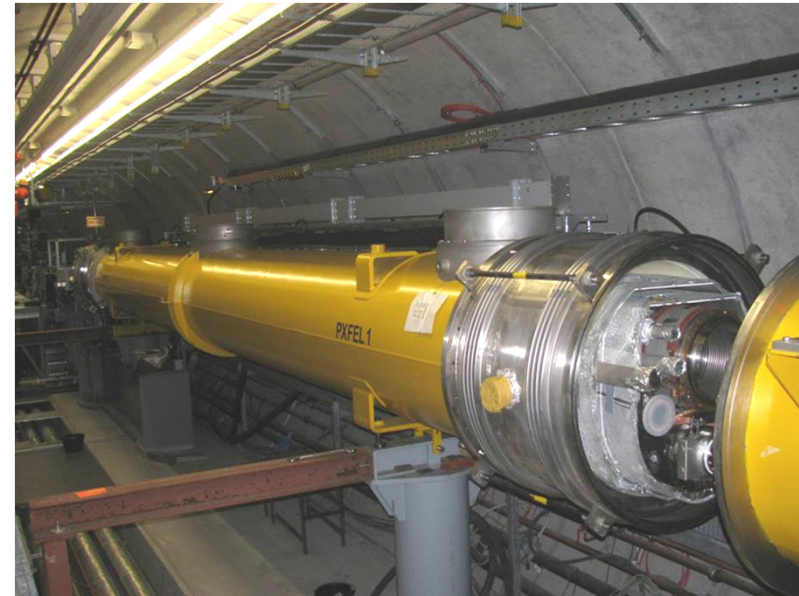


FLASH upgrade

- > Substantial upgrade programme during shutdown autumn 2009-spring 2010



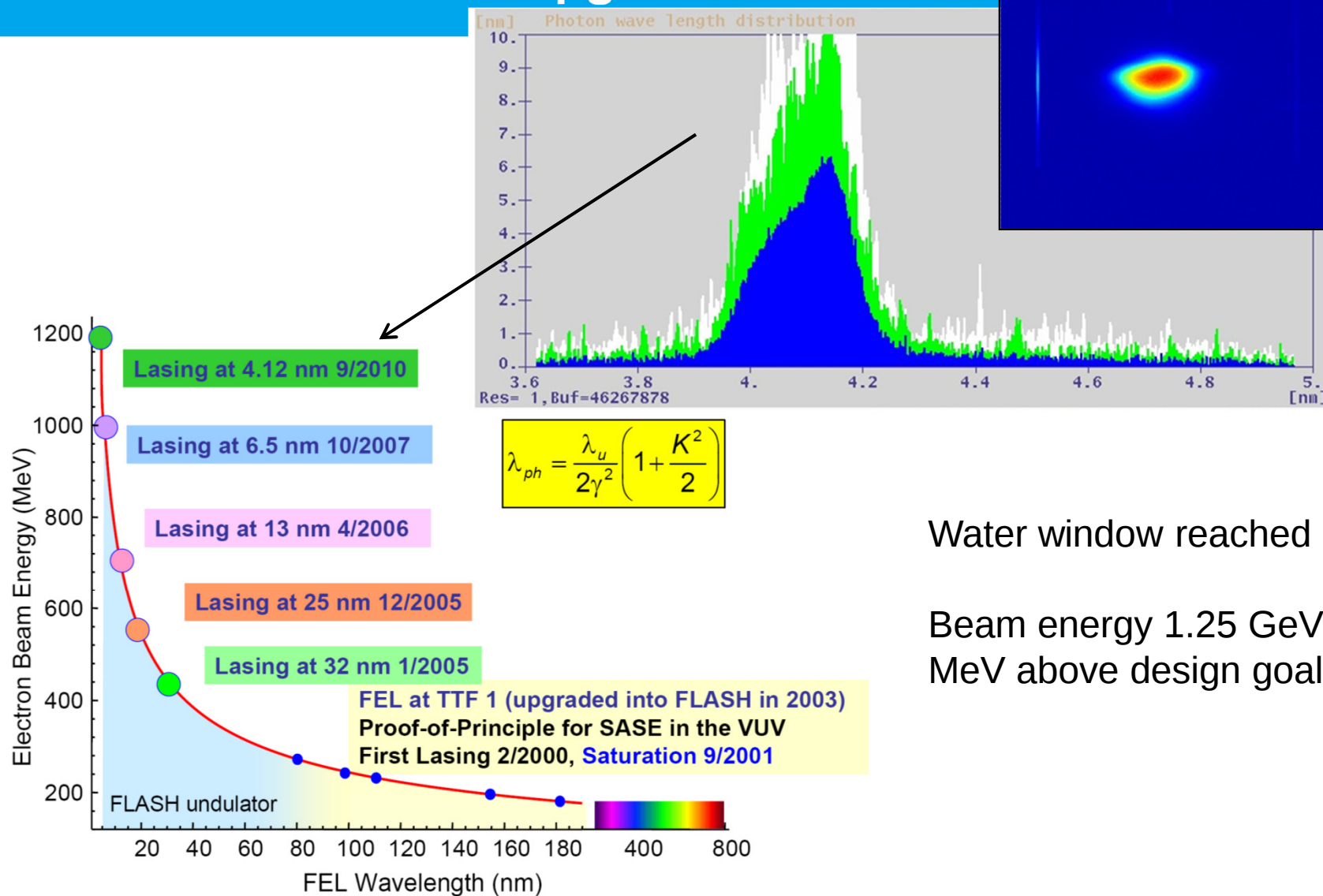
*installation 3.9GHz System →
improvement of beam dynamics
& bunch compression*



*Installation 7th accelerator
module → higher energy >1.2
GeV → shorter FEL wavelength*

And many other things...

Brilliant results with upgraded FLASH!

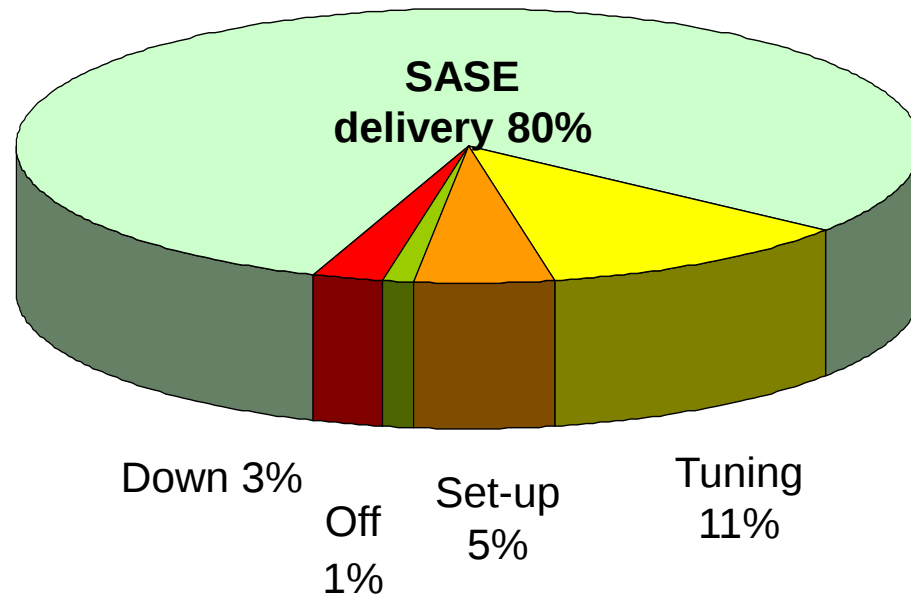


Water window reached

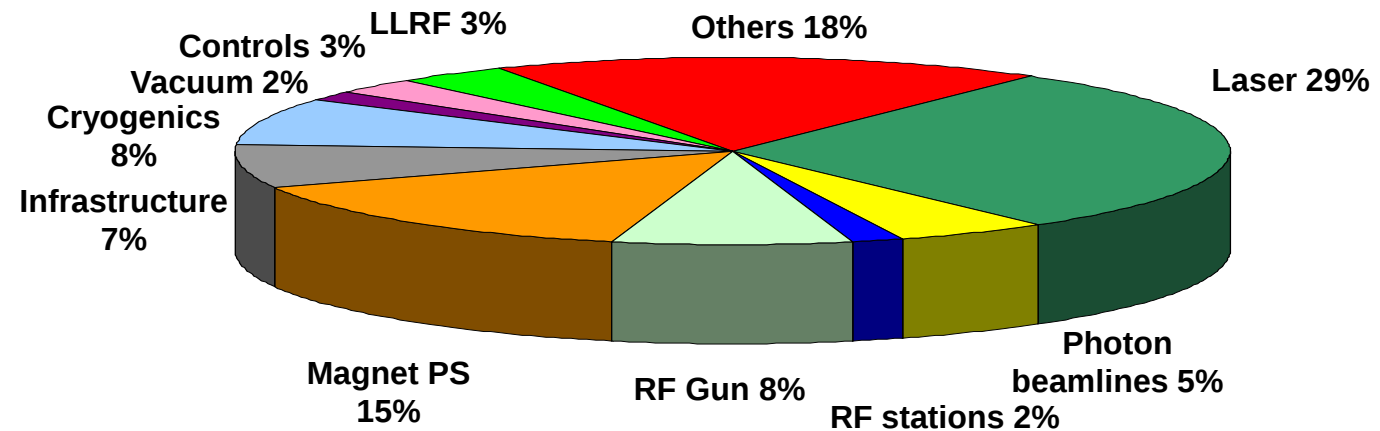
Beam energy 1.25 GeV (50 MeV above design goal)

Excellent availability/reliability

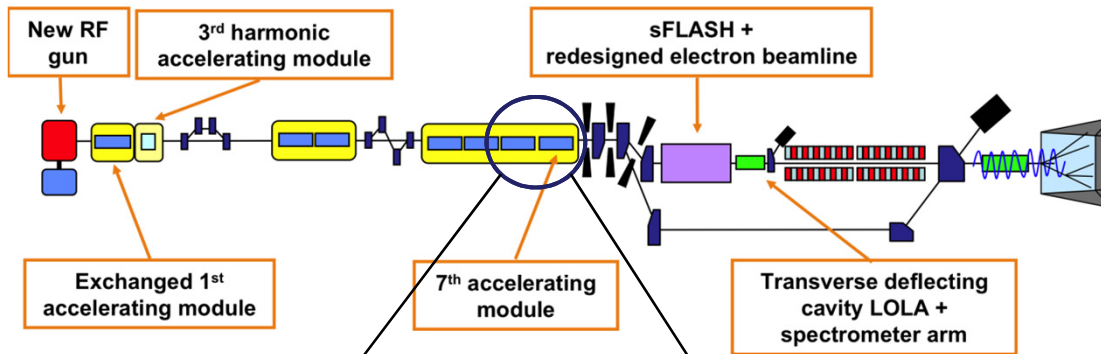
FLASH Run Statistics autumn 2010



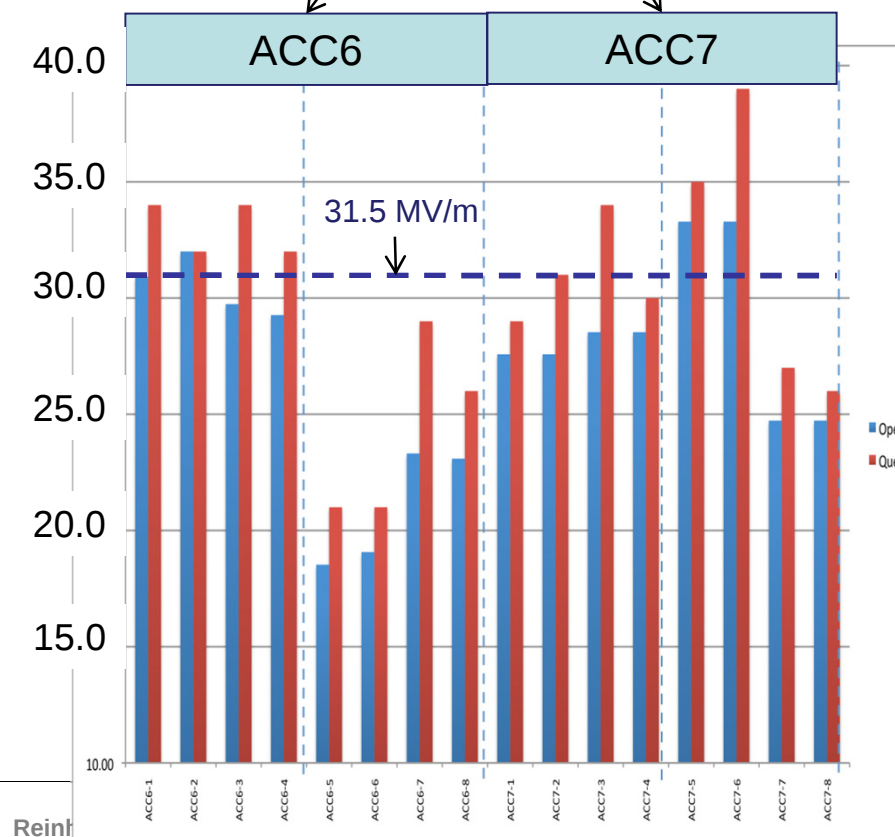
Distribution of 3% downtime:



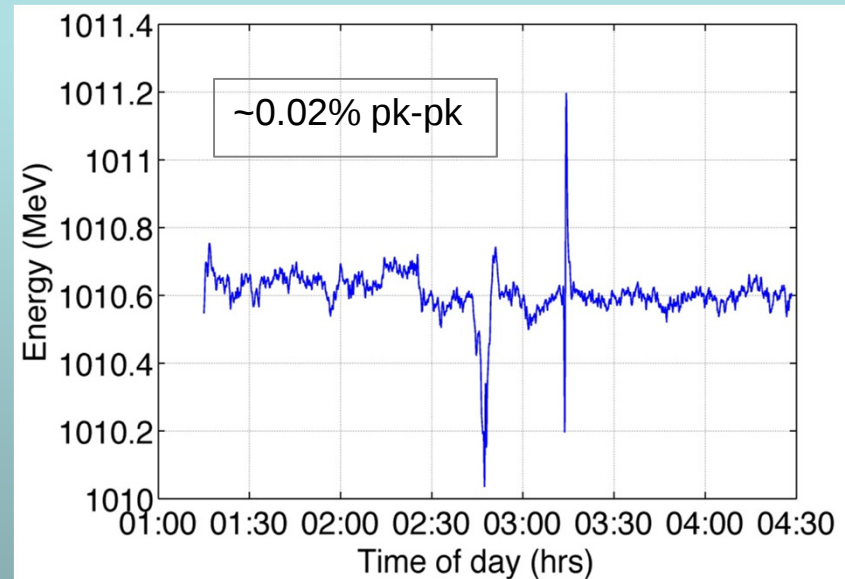
FLASH-ILC-XFEL Synergy



- > Long bunch trains with high current
- > Accurate LLRF stabilisation for excellent energy stability



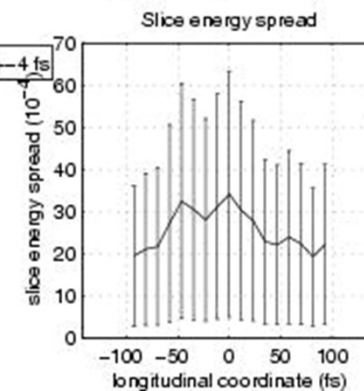
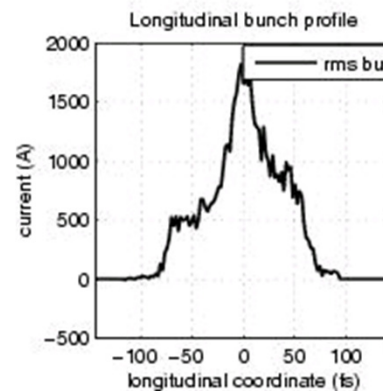
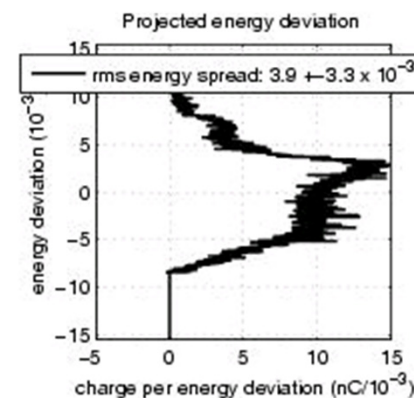
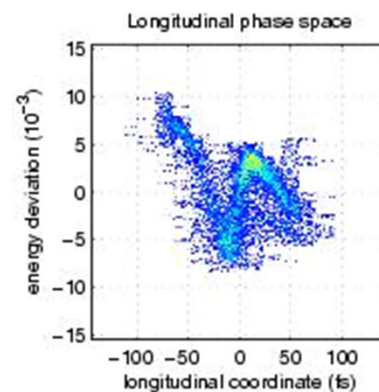
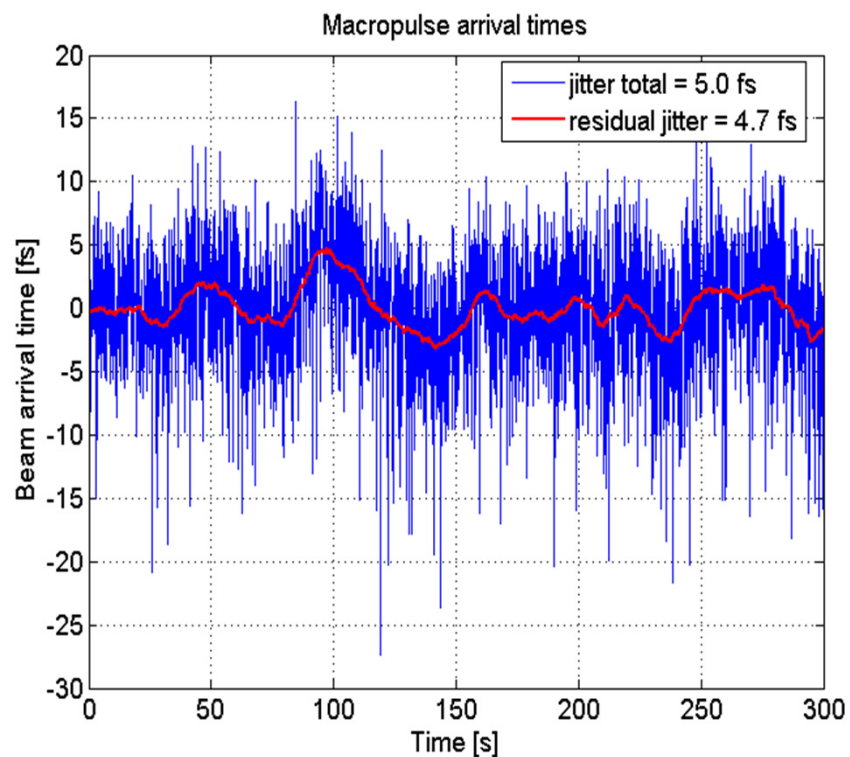
Energy stability over 3hrs with 4.5mA 9 Feb 2011



A challenge for FELs: fs-diagnostics & instrumentation

With Beam Based Feedback
running in ACC1 and ACC39

rms = 5 fs

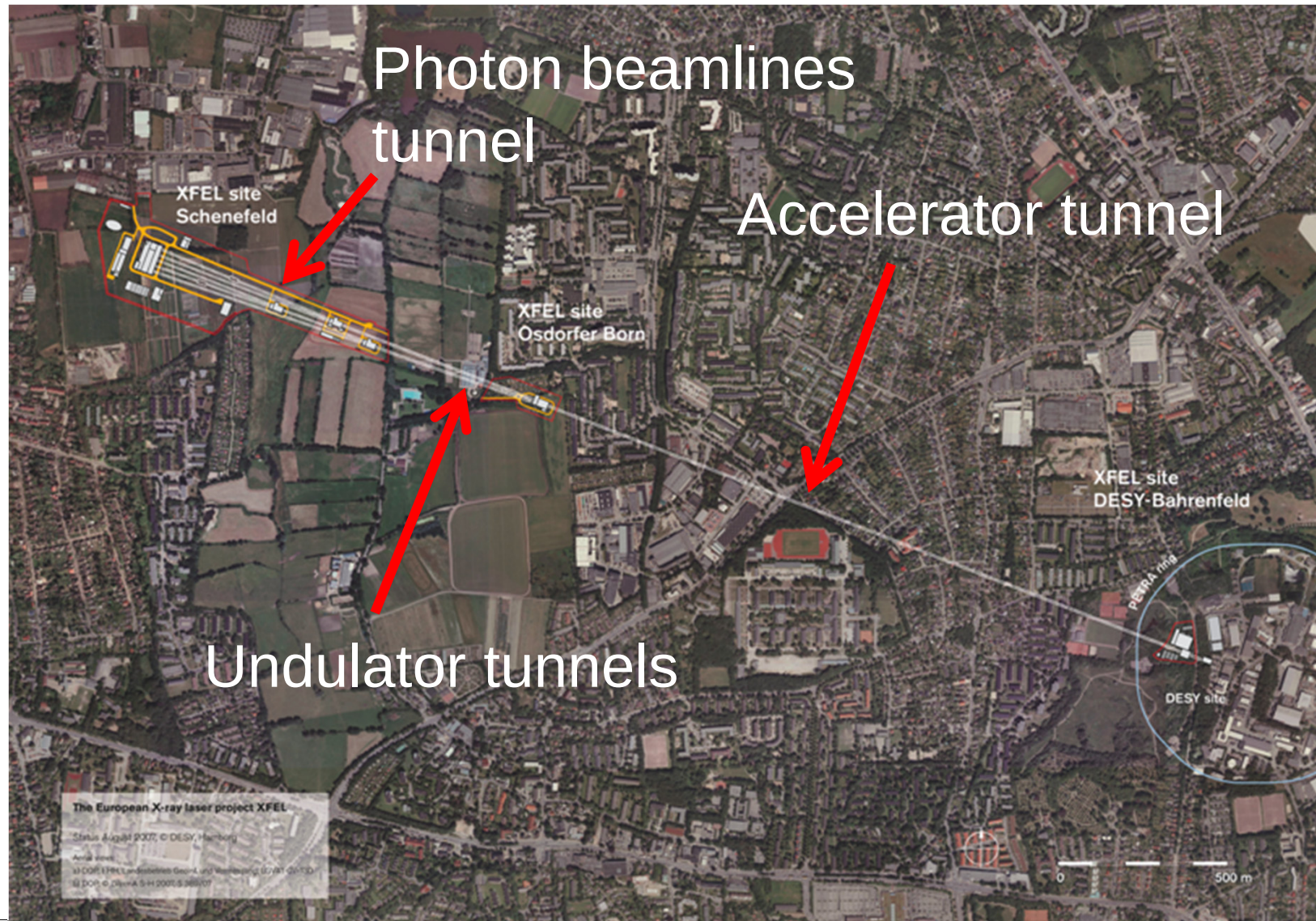


REGAE (*relativistic electron diffraction experiment*)

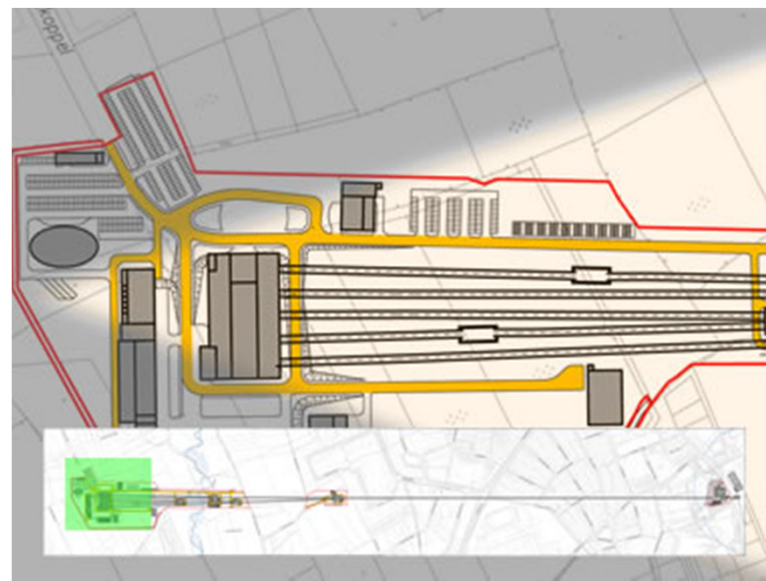
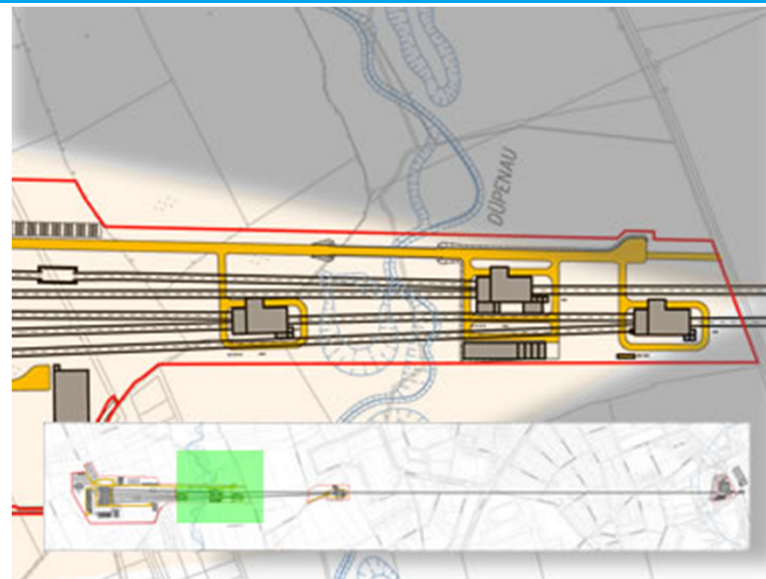
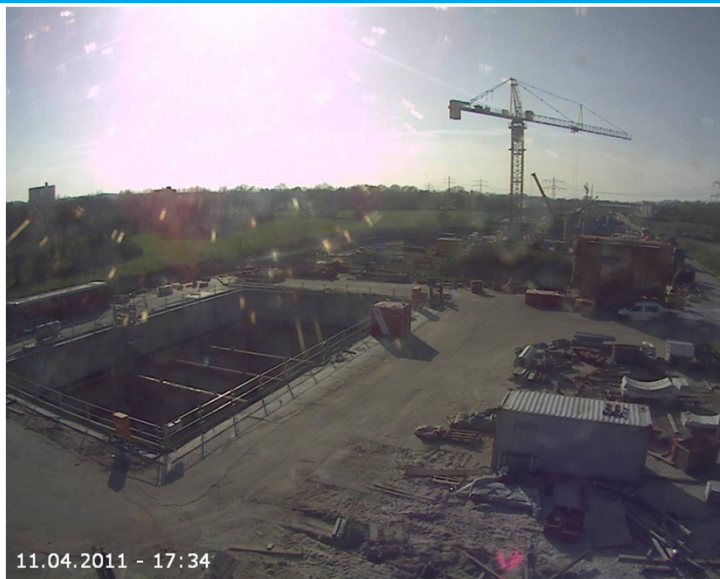
- Photocathode 3 GHz RF-gun with extremely small emittance and fs bunch length at very low charge $<1\text{pC}$
- Joint project with MPG-Group D. Miller/CFEL
- Housed in former 150 MeV electron linac building



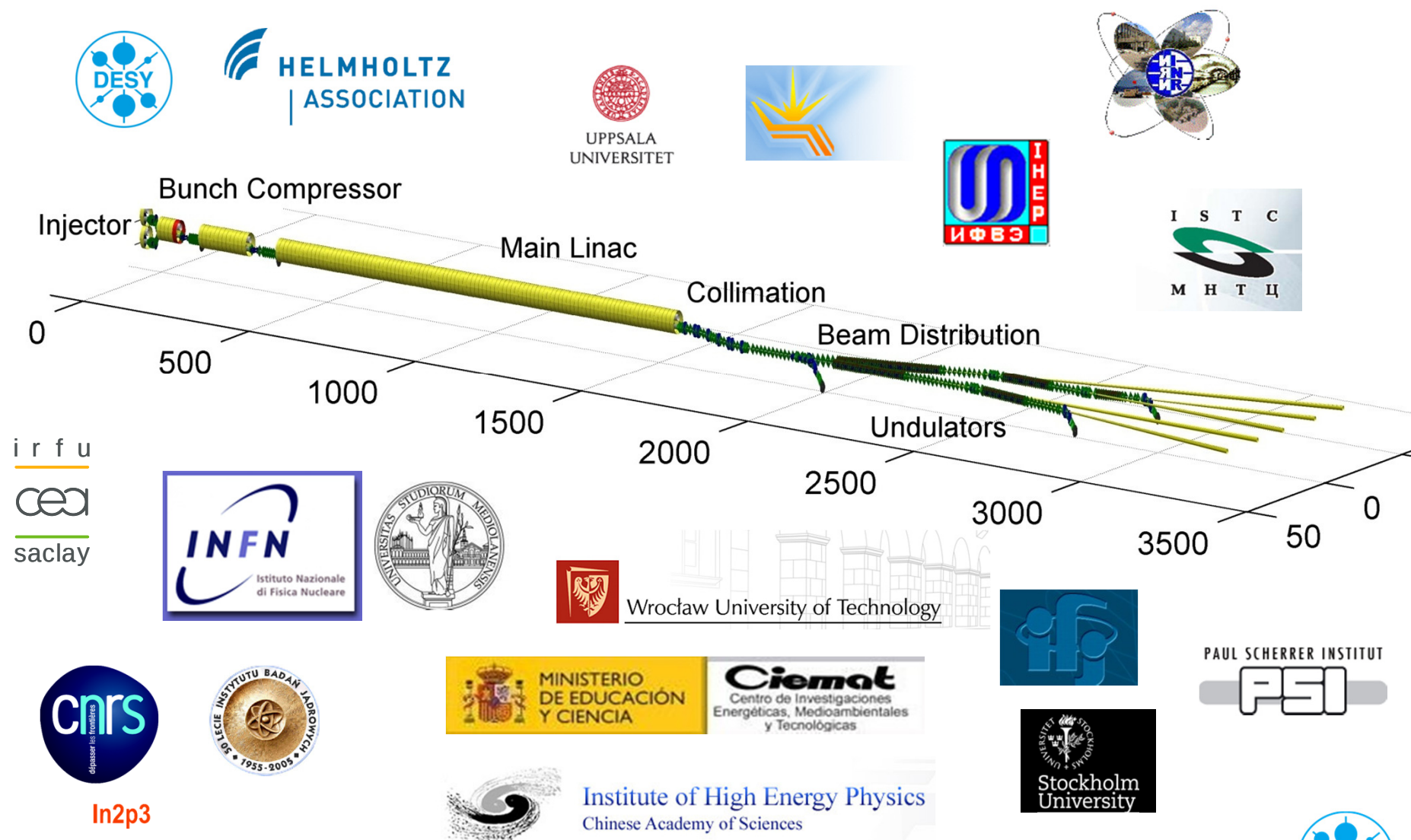
European XFEL



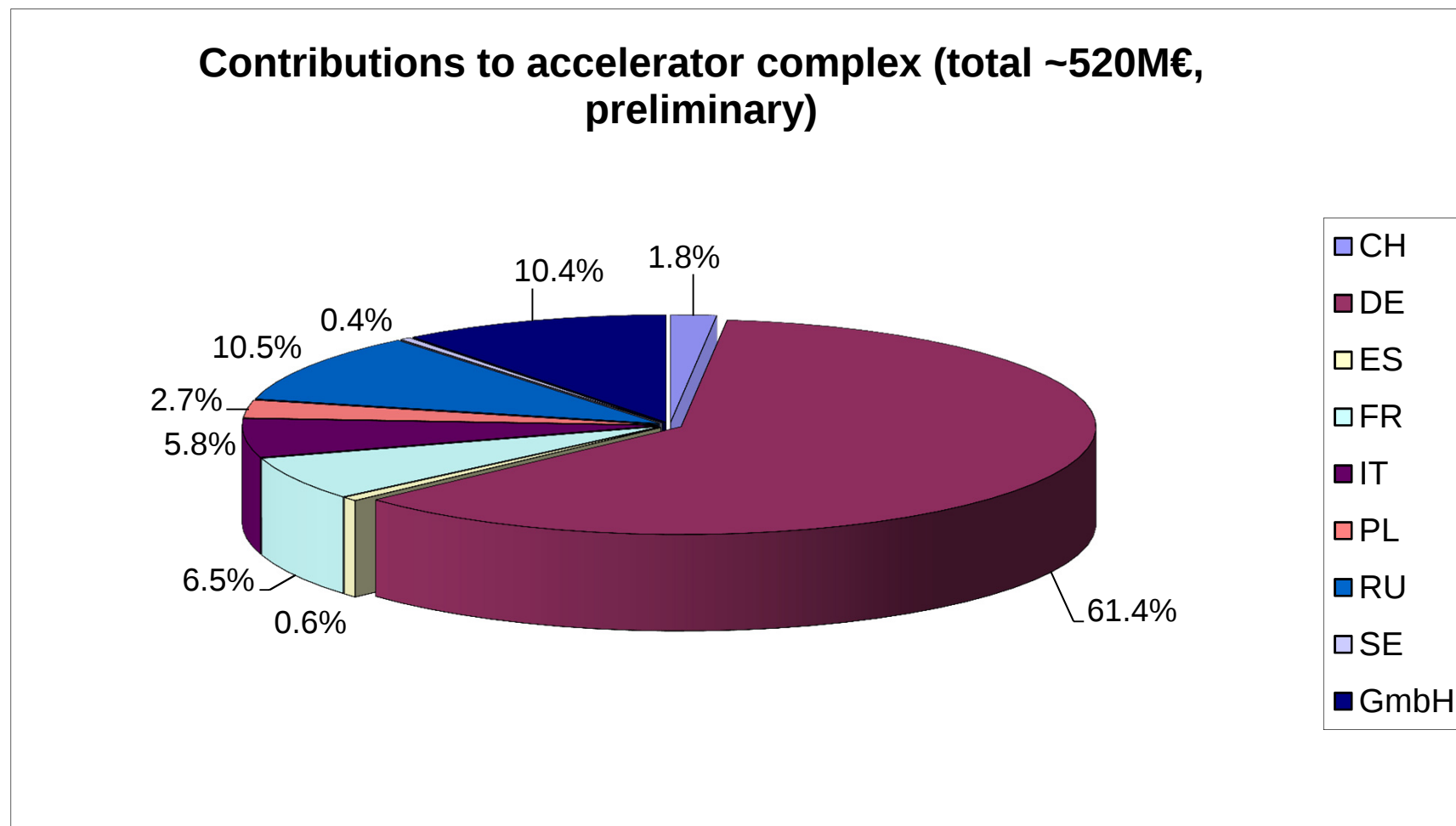
Approx 50% of underground civil construction completed



DESY coordinates the accelerator consortium



In-kind contributions to the accelerator complex



One of many DESY activities for XFEL...

AMTF Hall spring 2010



Feb 2011: Test stands under construction



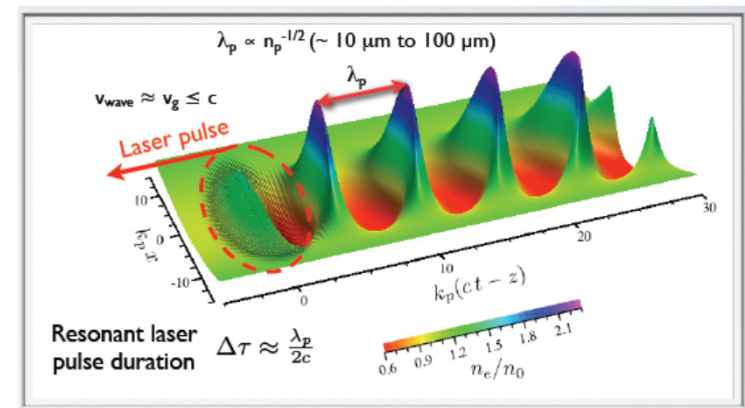
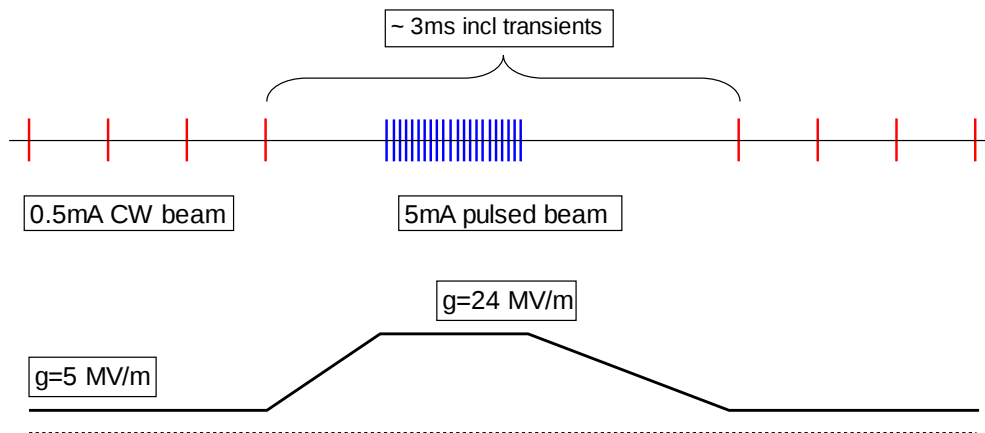
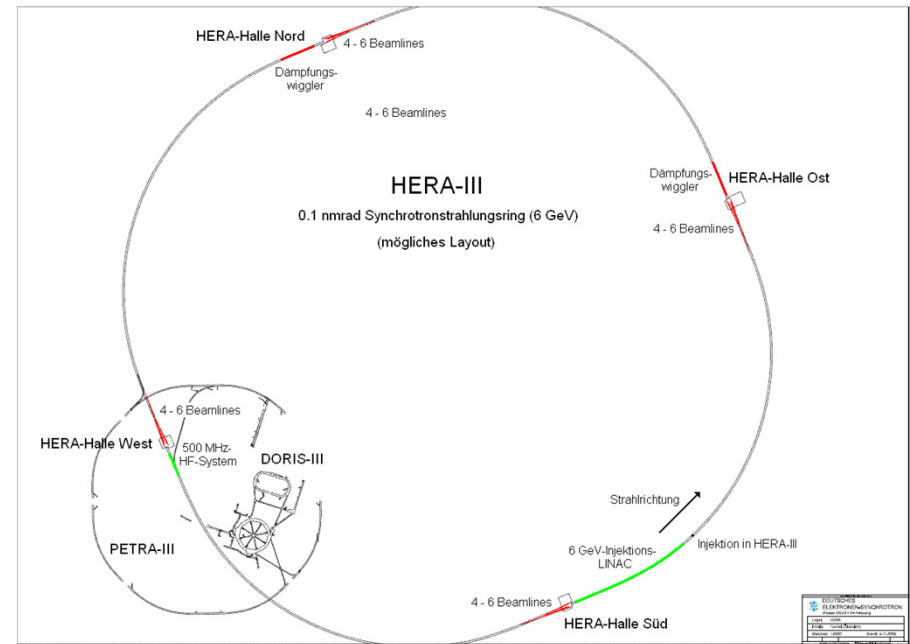
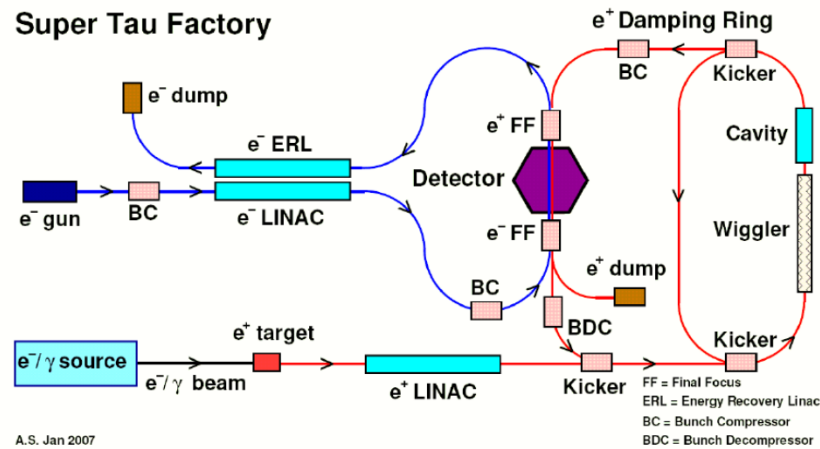
Helium compressors installed



*Area for RF
component
assembly*

Ideas market accelerators – a new “experiment” at DESY

Super Tau Factory

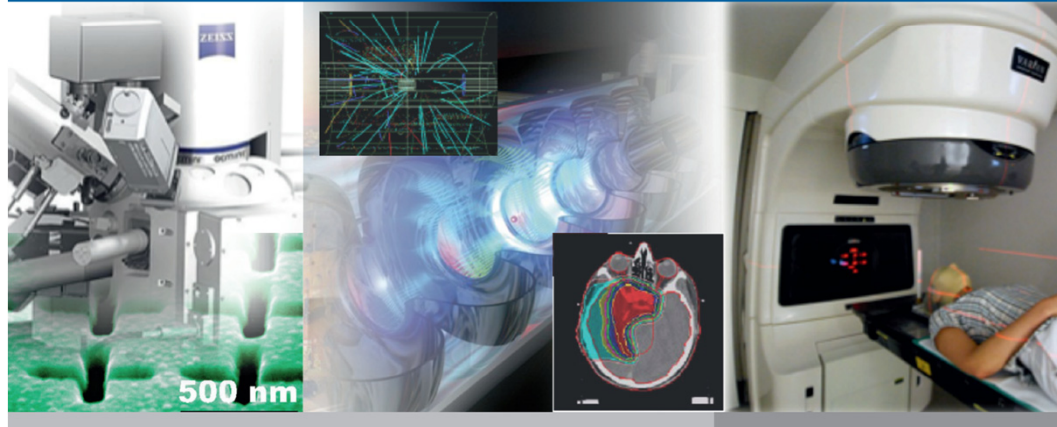


Initiative for accelerator research in the HGF



ARD Accelerator Research and Development

Accelerators – Motors for Discovery and Innovation



DESY focus on CW-SRF, ultra-brilliant fs-beams, laser-electron interaction, plasma acceleration

→ *New funding expected 2nd half 2011*



Thank you for your attention!
**Enjoy the conference and your stay in
Hamburg!**

