

News from DESY.



Eckhard Elsen
Plenary ECFA
Frascati, July 1-2, 2010

DESY 50 – Grand Finale of a series of memorable events

- Representatives from all major institutes
- Chancellor A. Merkel represented by G.Schütte (bmbf)
 - profound commitment to Basic Research



- > XFEL GmbH with 12 partners
- > XFEL treaty has already been signed by

- Denmark, Germany, Hungary, Russia, Sweden, Switzerland and Slovakia



- > Pending

- France, Greece, Italy, Poland and Spain
- China considering
- UK not joining



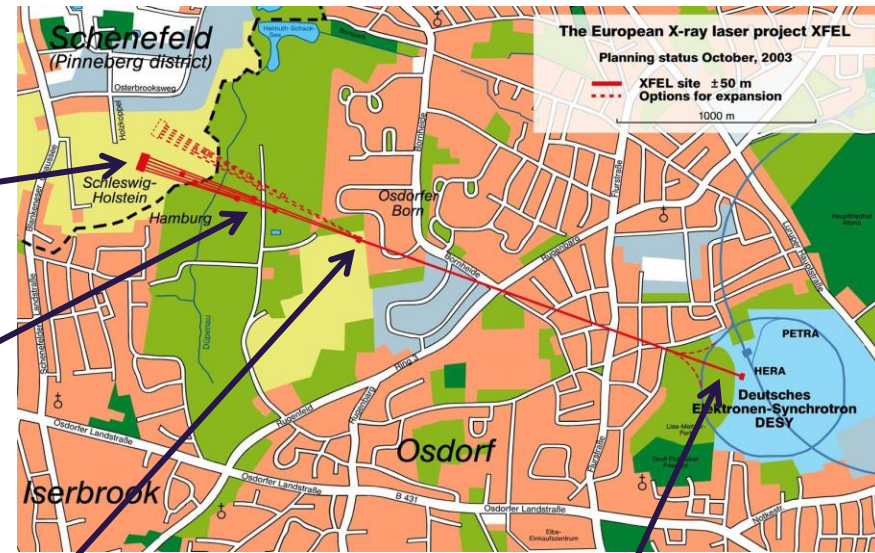
- > Project

- 14 GeV is under discussion as the new baseline
- maintain cw-option at 7 GeV
- some (generous) contingency has been used to counteract funding constraints

Civil construction in full swing



← 3.4km →



First XFEL tunnel borer in place



Arrival in
Hamburg

Lowering
into hall



Christening celebration June 30, 2010



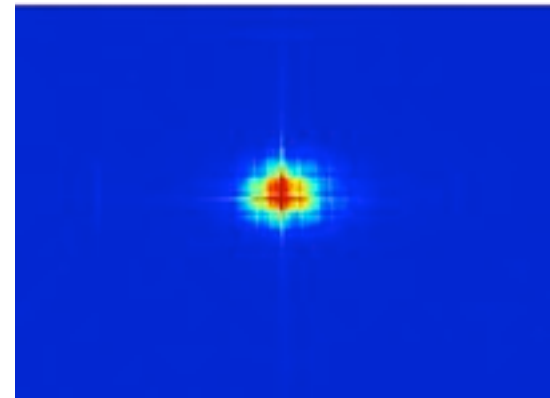
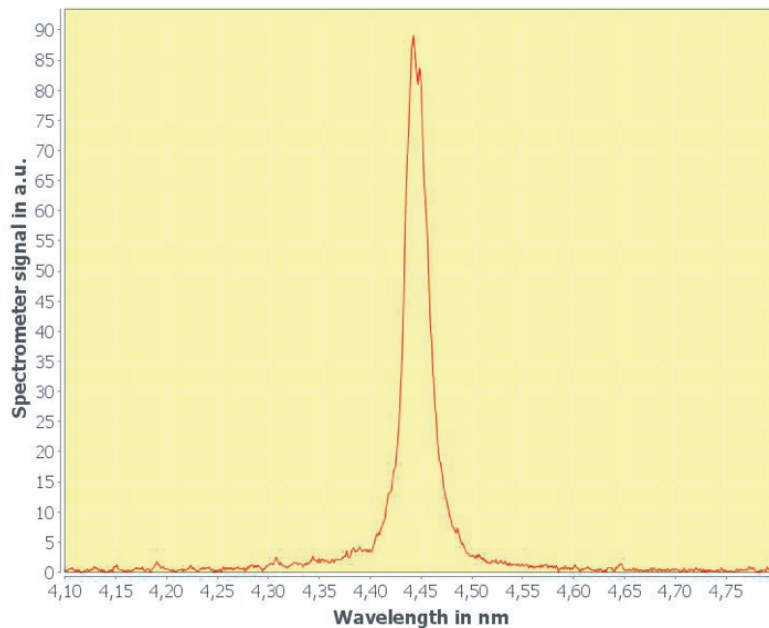
*Two borers will
complete 5.8 km
tunnel length until
2012.
Herlind-Tunnel*

FLASH wavelength record at 4.5 nm

- After 5 months shutdown
- 1.2 GeV energy with module PXFEL1
- FLASH wavelength record of 4.5 nm (was 6.5 nm)
- FLASH doubles peak bunch intensity to 0.3 mJ



Module PXFEL1 in FLASH



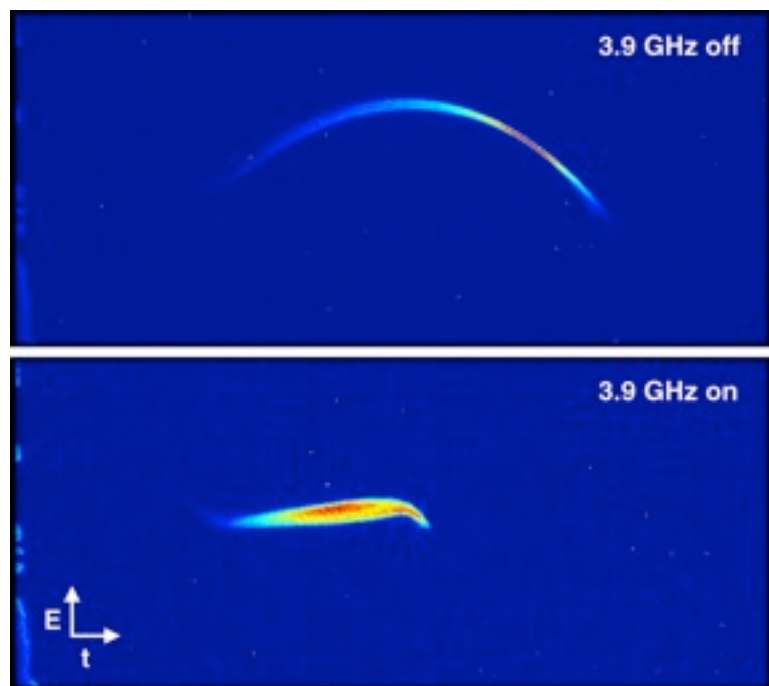
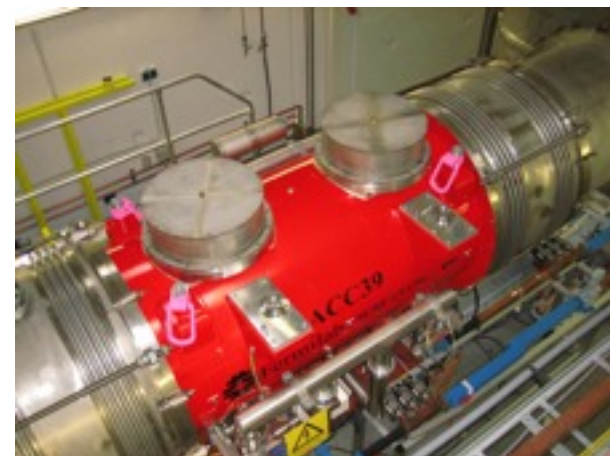
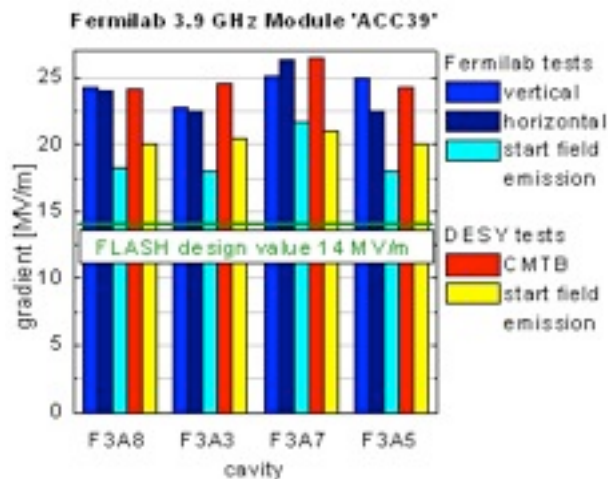
FLASH longitudinal bunch profile

> 3.9 GHz module

- built at Fermilab
- performing well

> 3rd harmonic

- generates flat beam profile



Installation
in FLASH



Effect of
3.9 GHz module

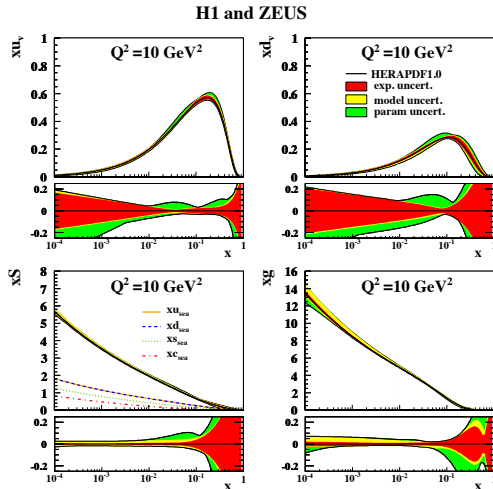
HERA analyses proceeding

- > All three experiments active in analysis
 - H1
 - ZEUS
 - Hermes
 - Good commitment of the participating institutes and DESY
- > Preparing for summer conferences
 - Primary goal is precision
 - Parton distribution functions
 - Highly relevant for LHC
 - Flavour separation provides new constraints
 - Modeling of the hadronization
 - Searches for new physics likely to be concluded first
- > Data preservation seriously pushed
 - Maintain data in state that can be analyzed in the future
 - Regular series of workshop involving all recent HEP experiments

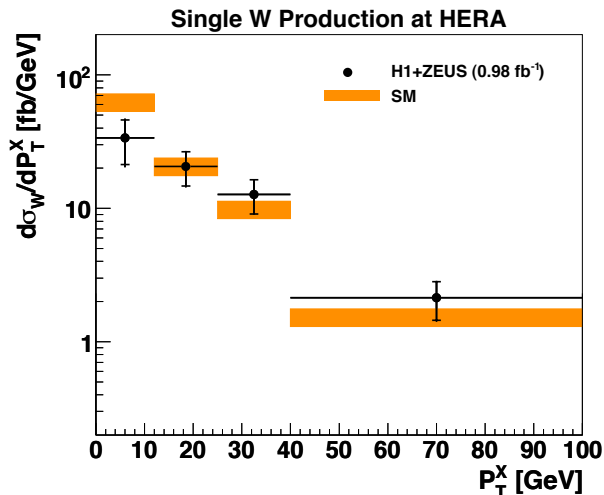


Combination of H1 & ZEUS Analyses

> HERA parton distributions

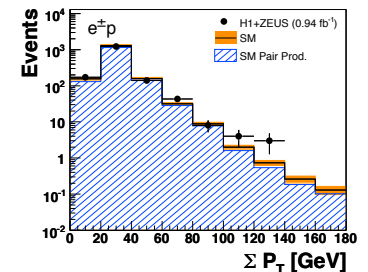
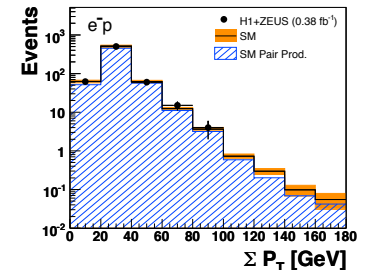
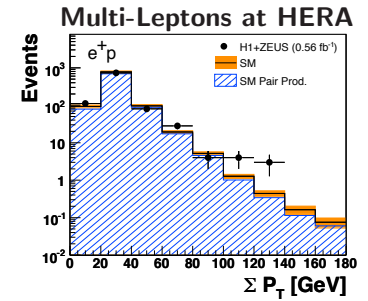


> Single W-Production



> Multi-leptons

- > *Combination of analyses improves precision beyond gain in statistical error*
- > *Systematic uncertainties are considerably different between experiments and hence can be reduced*

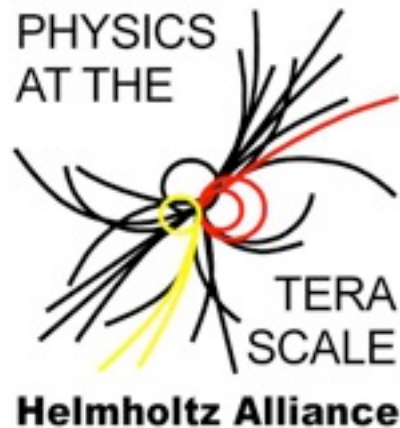




- International conference with first LHC results
- LHC-, Tevatron-, HERA- experiments well represented
- G. Schütte bmbf
 - underlines the importance of HEP in Germany and bmbf commitment



- > DESY contributes to both experiments
- > Significant role in commissioning
 - Remote control centers at DESY
- > Physics analysis carried out in the framework of the Helmholtz Alliance *Physics at the Terascale*



> The Helmholtz Alliance *Physics at the Terascale*

- achieves an efficient collaboration between the leading German HEP groups
- *world-class* results in Terascale physics (at the LHC and beyond)
- Topics

physics analysis
GRID computing
detector R&D
accelerator physics

*Review has been carried out winter
2009/10 by internationally
renowned experts.*

> successfully attracts top researchers (in particular at start of scientific career).

> highly-motivating framework for students

> Recommendations

- continue along the present lines
- Alliance should continue to play a structural role in the future.
- ascertain the future of the Alliance

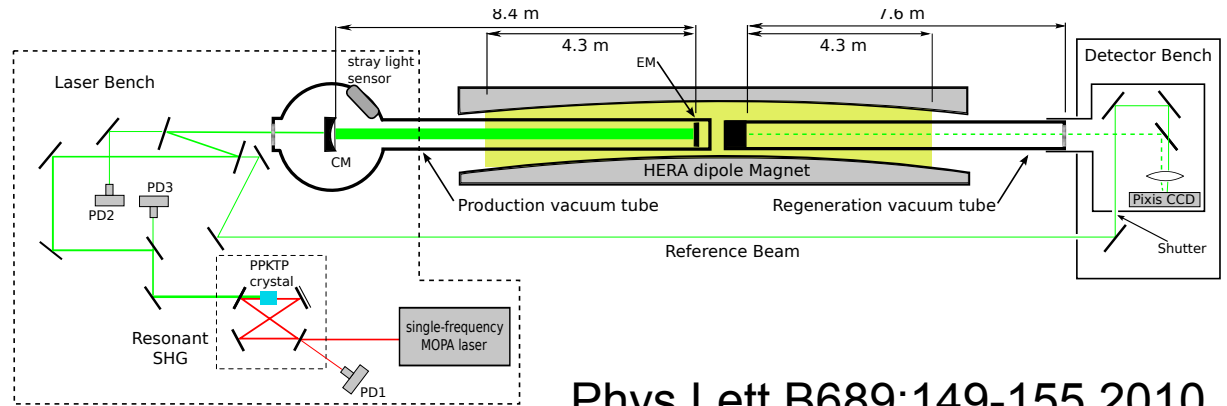
Research Centre ↔ Universities Alliance

Status ALPS

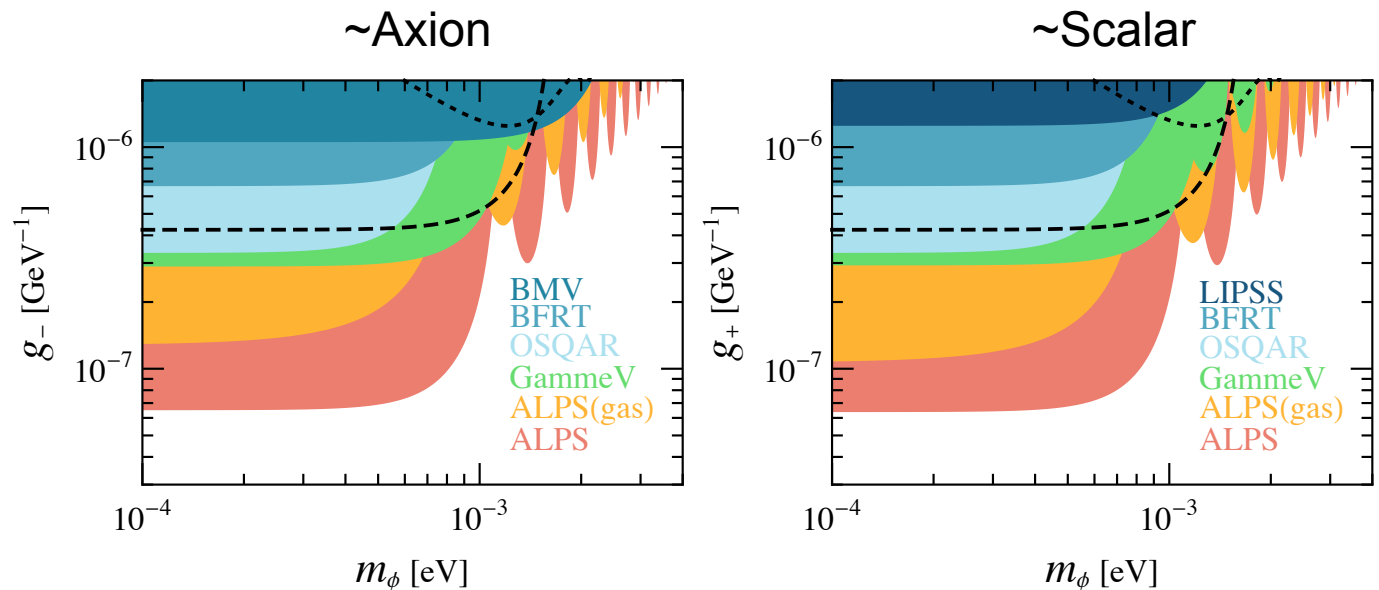
> Most stringent limits for *light through walls* experiments

- Laser intensity increase achieved by resonant power build-up

> meV region effectively covered with Ar data

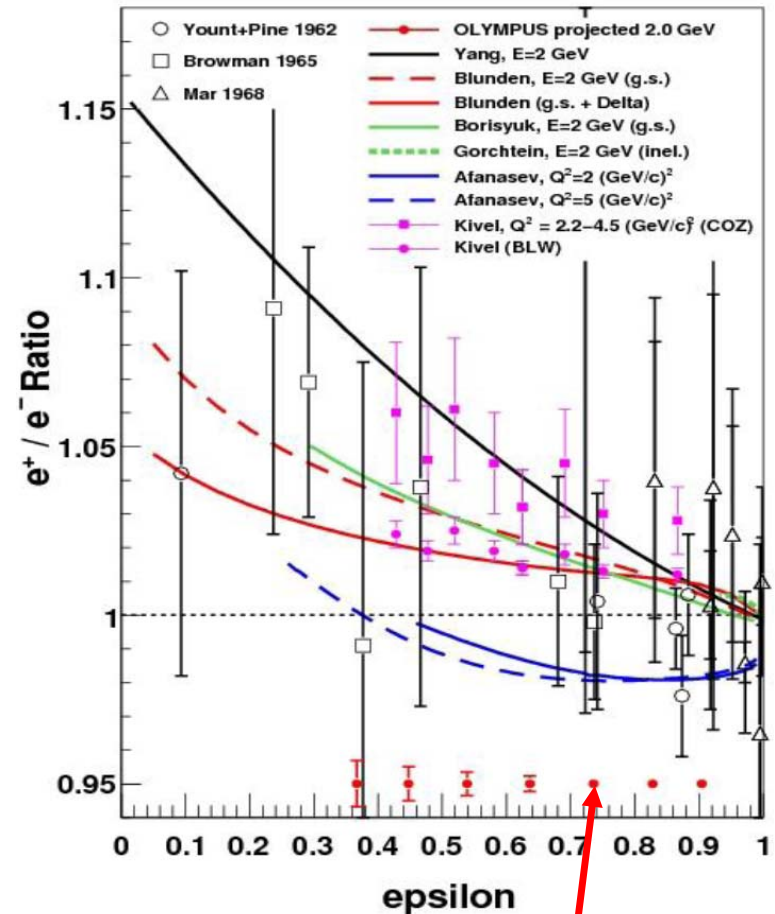
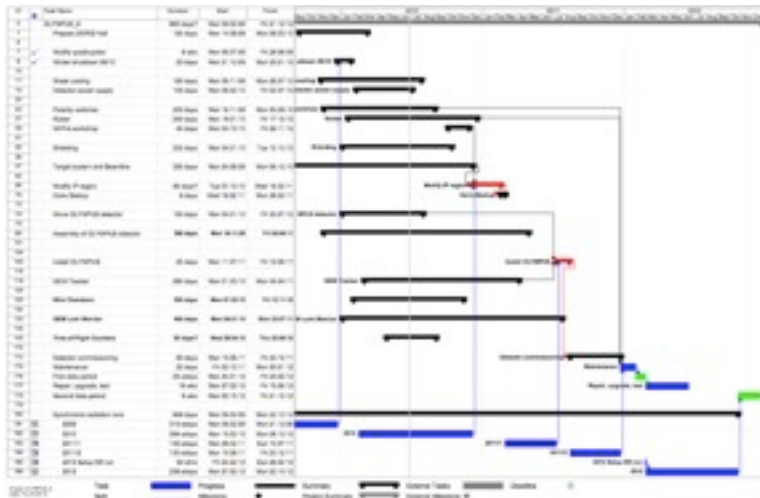


Phys.Lett.B689:149-155,2010



OLYMPUS Physics program

- Resolve p-Form Factor discrepancy
- Measure ratio e^+/e^- with $\sim 1\%$ accuracy
 - Use 100 mA e^+/e^- beam of DORIS
 - Regular change of polarity
- Unpolarised H-target
 - Target cell has to be installed this winter
- Experiment installation July 2011
 - Minimal interference with DORIS operation

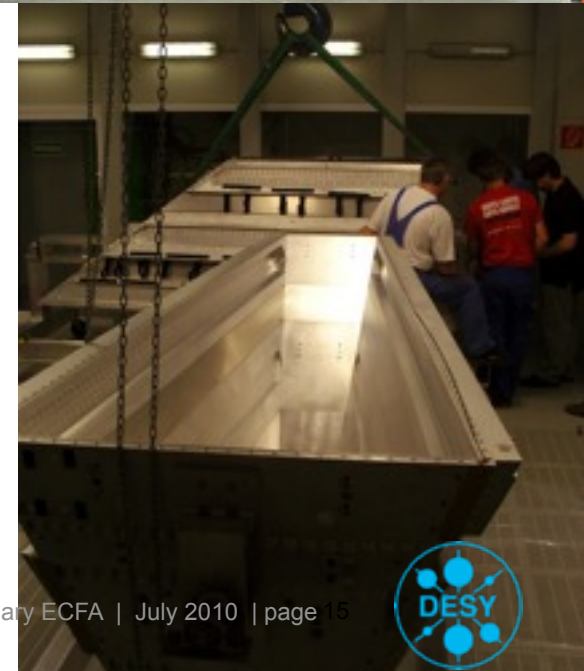
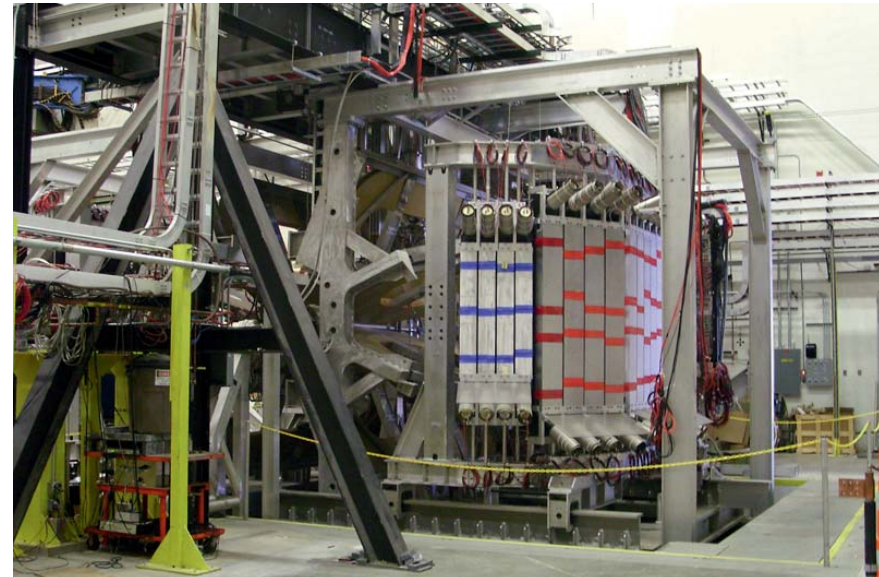


OLYMPUS Sensitivity



Status OLYMPUS

- Reuse BLAST detector
 - BLAST detector has been dismantled at MIT
 - components arriving (4 of 6 shipments in Hamburg)
- Drift chambers being rewired at DESY
- Experimental site: ARGUS removed, pit prepared



Alexander von Humboldt Professorship for Brian Foster

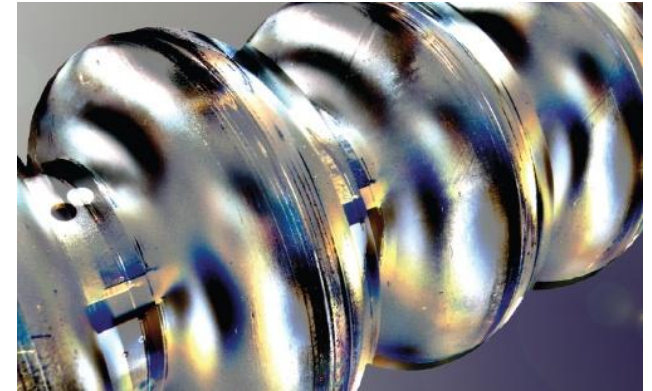
- AvH Professorship has been offered to B Foster (Oxford)
- 5 years generous support for research at DESY and Hamburg University
 - HERA
 - Linear Collider
 - Advanced accelerator concepts
- Starting summer 2011 (provided detailed negotiations converge).



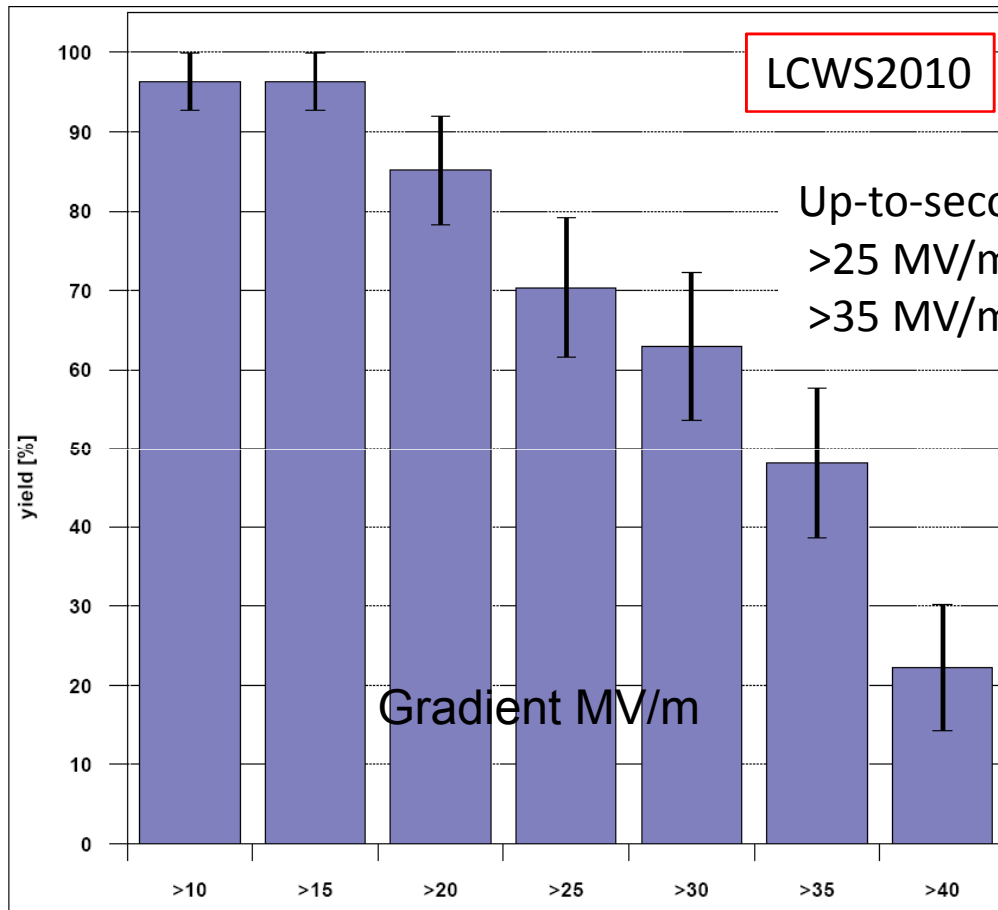
Alexander von Humboldt
Stiftung/Foundation



ILC cavity gradient yield



Cumulative Yield



- Global effort
- considerable improvement of high-gradient cavity yield
- Sample still small ... will change with XFEL batch

SRF Quality Assurance and Failure Mitigation

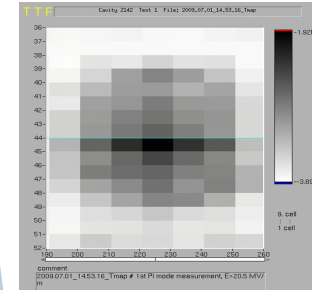
- Package of ILC-HiGrade
- Goals: High-Gradient Cavities
 - Rapid testing
 - Fast feedback to manufacturer
 - High quality standards
- will use industrial production



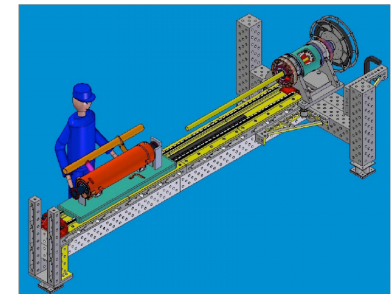
Optical Inspection of 9-cell cavities



Handling of Cavities



Correlations of Temperature Map and Optical Features on the Nb cavity inner surface



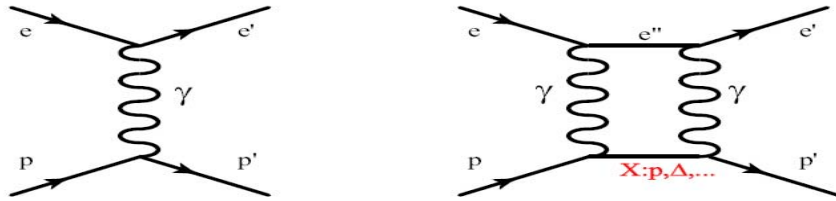
Conclusion

- > XFEL project advancing visibly; industrial phase has started
- > DESY HEP firmly anchored in LHC experiments
 - Builds on the legacy of the HERA experiments and the ongoing analyses
 - DESY acts as a facilitator for physics analyses in Germany through the Terascale Analysis Centre, schools and workshops
- > DESY plays a key role in the management of the ILC; the project is advancing to a TDR in 2012/3 – in phase with strategic decisions in the field
 - DESY is the only place to provide experience of large scale production of SRF cavities
 - ILC-HiGrade is dedicated to pushing the gradient in an industrial framework
- > DESY's infrastructure comes to bear in precision experiments
 - OLYMPUS
 - ALPS

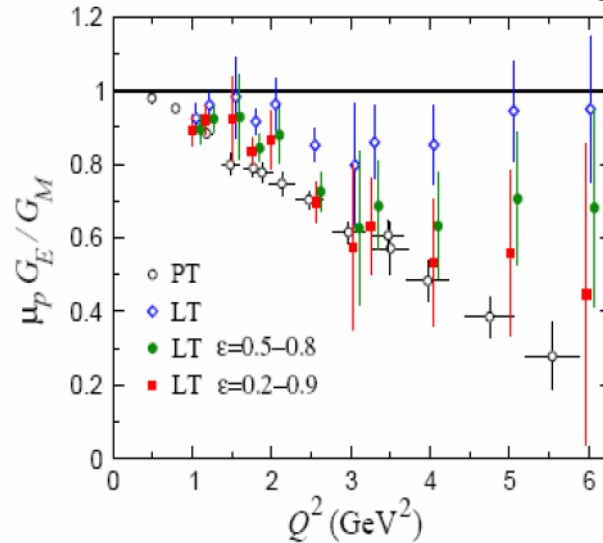
always welcome



Calculation of 2-Photon Exchange



P.G. Blunden et al.



Only experiment can definitively resolve the contributions beyond single photon exchange

→

Measure ratio of positron proton/electron proton cross sections

$$\sigma = (1\gamma)^2\alpha^2 + (1\gamma)(2\gamma)\alpha^3 + \dots$$

$$e^- \leftrightarrow e^+ \Rightarrow \alpha \leftrightarrow -\alpha$$

$$\sigma(\text{electron-proton}) = (1\gamma)^2\alpha^2 - (1\gamma)(2\gamma)\alpha^3 + \dots$$

$$\sigma(\text{positron-proton}) = (1\gamma)^2\alpha^2 + (1\gamma)(2\gamma)\alpha^3 + \dots$$

$$\frac{\sigma(e^+p)}{\sigma(e^-p)} = 1 + (2\alpha)\frac{2\gamma}{1\gamma}$$