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# European Regional Program

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# Overview

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- **General outline of ILC-related collaboration in Europe.**
- **Specific examples of ongoing work from collaborations and major countries**
- **Summary**



# Euro Collaborations

- TESLA (wider than Europe alone)



- **European XFEL**

- Coordinated Accelerator Research in Europe



- EuroTeV - LC research programme

- UK Linear Collider Accelerator & Beam Delivery  
LCABD – PPARC & CCLRC-funded

Other  
funding  
via national  
agencies



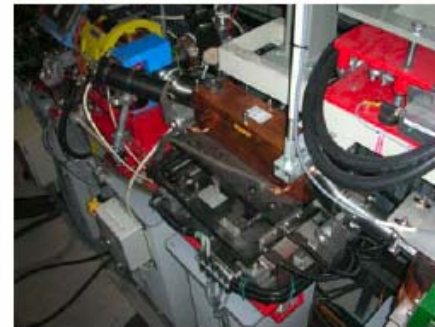
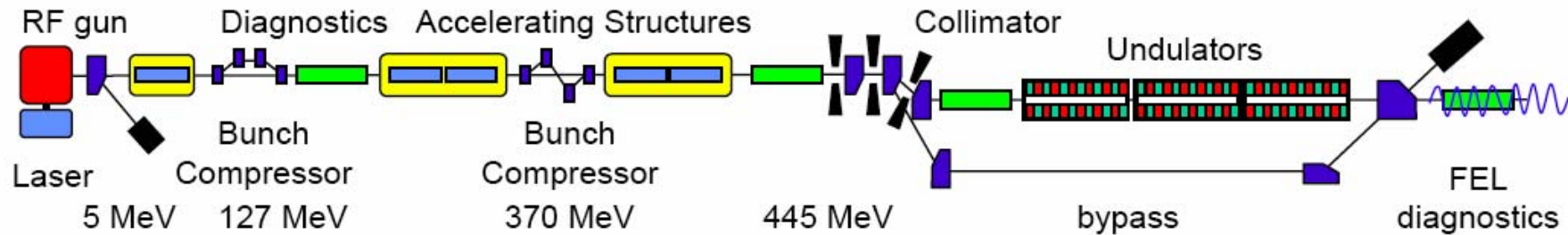
# TESLA

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- **55 Institutes in 12 countries  
(43 institutes 9 countries in Europe).** 
- Successful (ever growing) collaboration for over a decade.
- **Responsible for developing SCRF to the point where it is a viable option for a Linear Collider.**
- **TESLA Technology Collaboration now:**
  - no longer a collaboration focused on ILC;
  - many institutes interested in ‘technology’ (for light sources, ERL etc.);
  - ‘mission’ now to advance SCRF technology (main customers: XFEL, ILC, Proton Driver...)



# VUV-FEL Status



← 250 m →



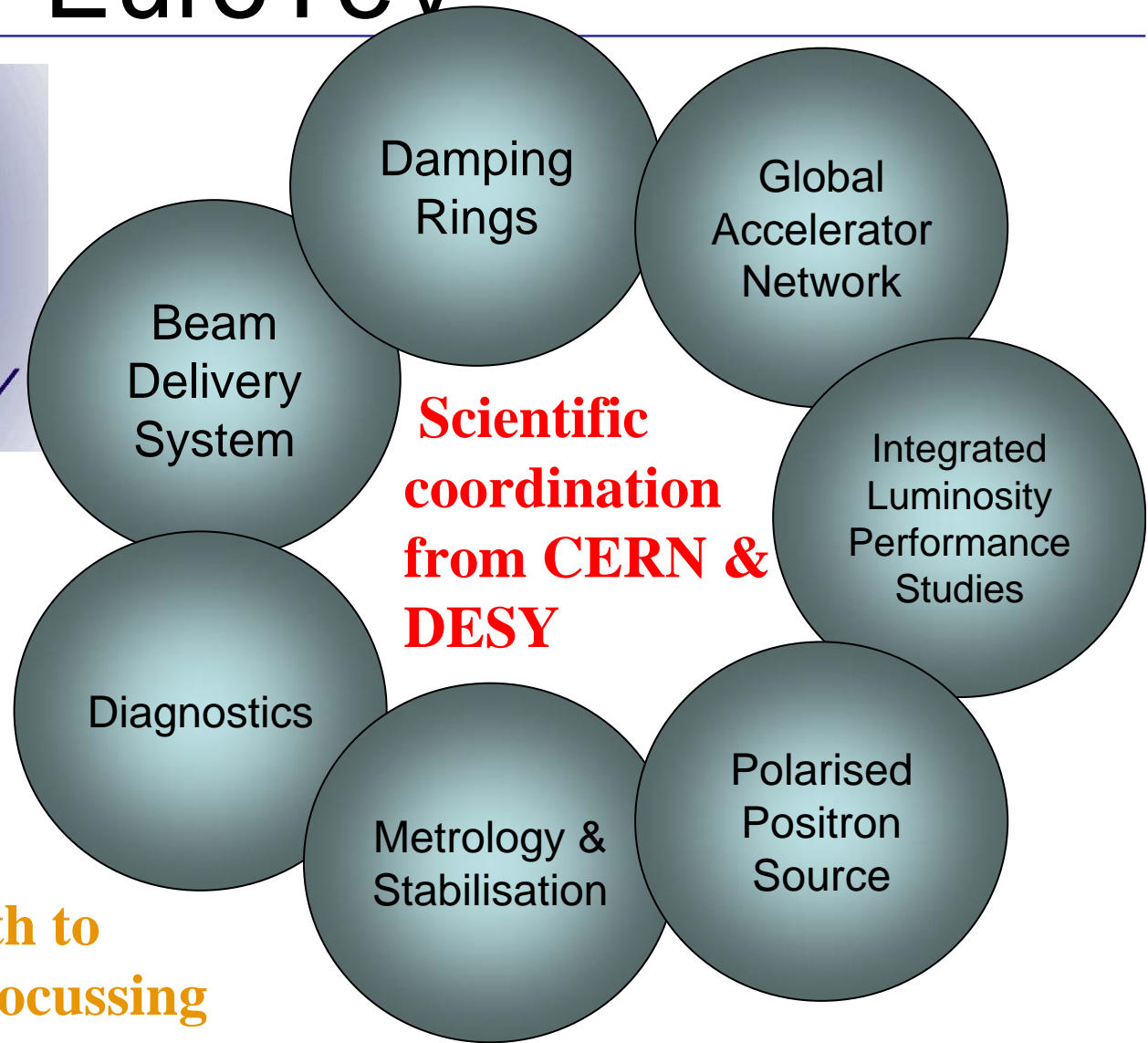
# CARE

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- **CARE is EU FP6-funded programme on Coordinated Accelerator Research in Europe. It is a very broad programme, incorporating e.g. work on SC high-intensity proton linacs, high-field magnet development, etc. Here we are concerned only with those elements directly related to ILC.**
- **The most relevant workpackage is on SCRF. Here there are 11 institutions involved: DESY, CEA/DSM/DAPNIA, CNRS-IN2P3-Orsay, INFN Legnaro, Milano, Roma2, Frascati, Paul Scherrer Institute, Technical University of Lodz, Warsaw University of Technology, IPJ Swierk.**
- **Budget is 19 M€ over 4 years, incorporating ~44 FTE. There is significant overlap with TESLA / TTF / XFEL.**



- **EuroTeV programme also EU FP6 funded. It is purely concerned with LC – generic matters of use both to ILC and CLIC. Focussing on ITRP R2 items. Part of European Design Team.**





# EuroTeV

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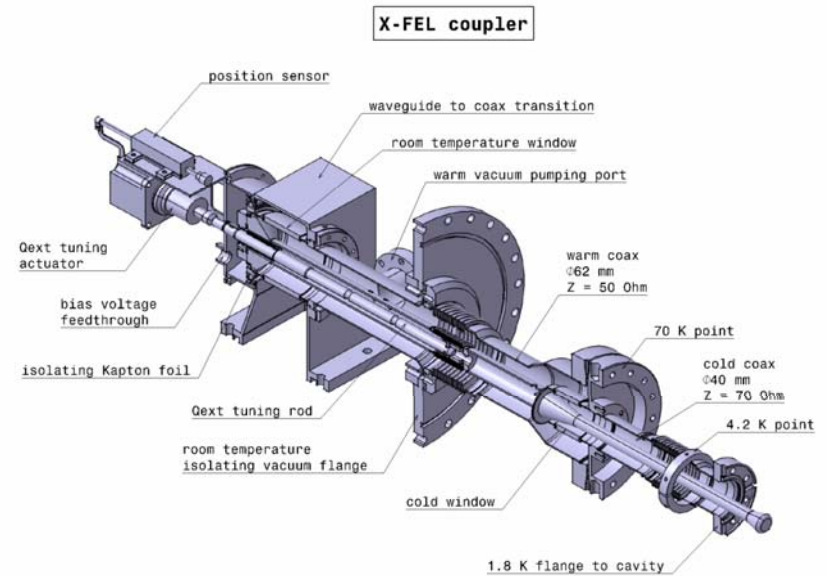
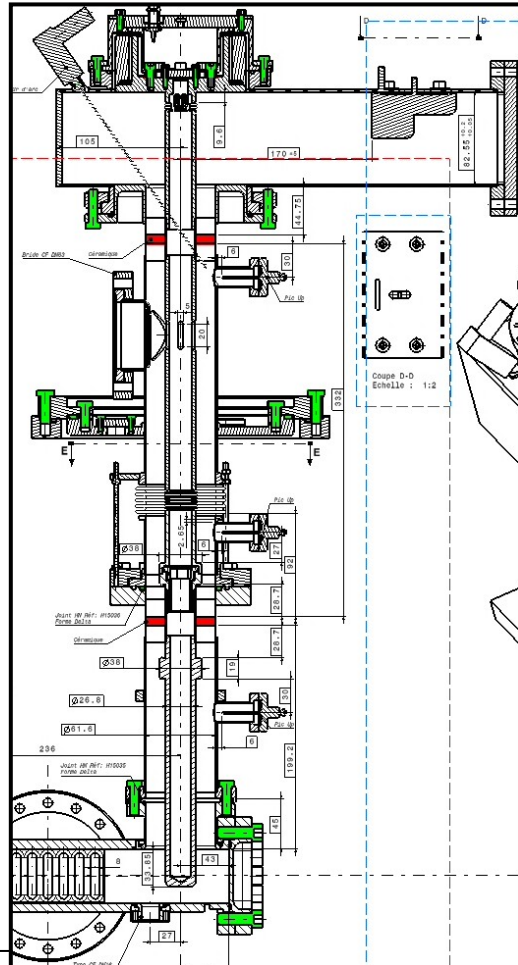
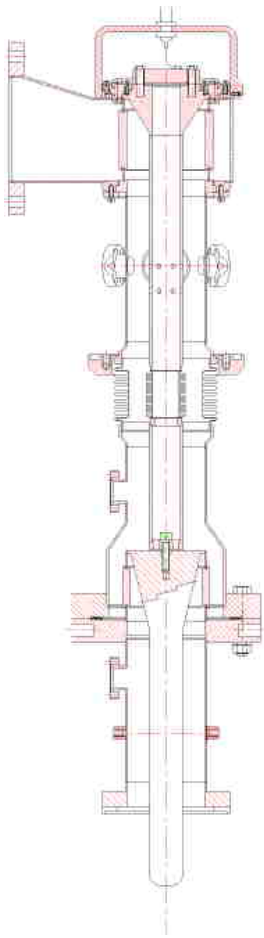
- **27 institutes participate: HU Berlin, Birmingham, Bristol, Cambridge, CCLRC, CEA, CERN, Darmstadt, DESY, Elettra, FHI-IGD, GSI, LAL, INFN-Frascati, Lancaster, LAPP, Liverpool, Manchester, Mannheim, Oxford, PSI, QMUL, RHUL, Rostock, UCL, Udine, Uppsala**
- **Total Budget is 27.6 M€, of which EU contribution is 9 M€ Funds 110 FTE, of which 30 are new posts funded by EU.**
- **Mostly Accelerator-Physics-related R&D.  
Little effort included for major engineering – i.e. actually building a major accelerator facility.**





# Recent Progress

- Selected recent progress on CARE SCRF:  
3 new prototype designs of power couplers from LAL-Orsay:



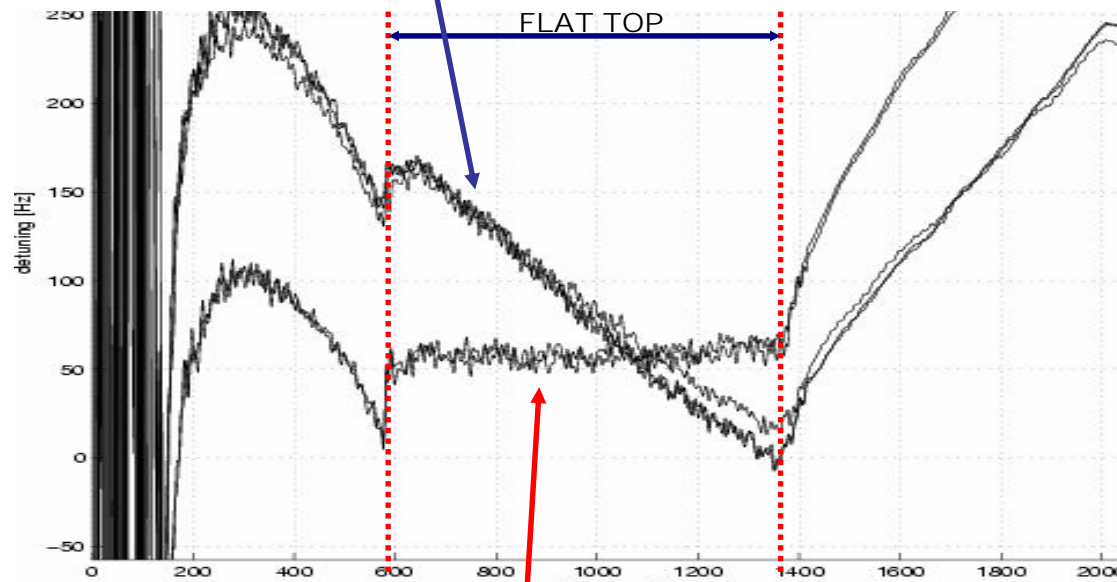
**To be built in industry  
and tested in 2006.**



# Recent Progress

- **Tuners:** (CEA, DESY, INFN-Milan, IPN-Orsay, TU-Lodz) fast tuner development based on piezo-electric or magnetostrictive elements. Several devices either under test or will be ready within next few months.

**Detuning without piezo compensation  $\approx$  180Hz**



**Detuning with piezo compensation  $<$  10Hz**



# Recent Progress

- **Test facility in CARE: CryHoLab developed @ Saclay and being used in tests; e.g. cold tuning system & piezo actuators warm & cold test.**

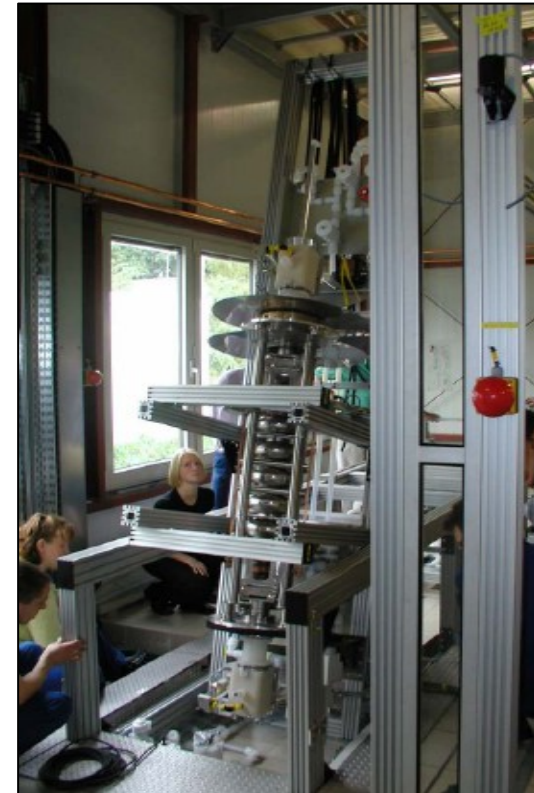
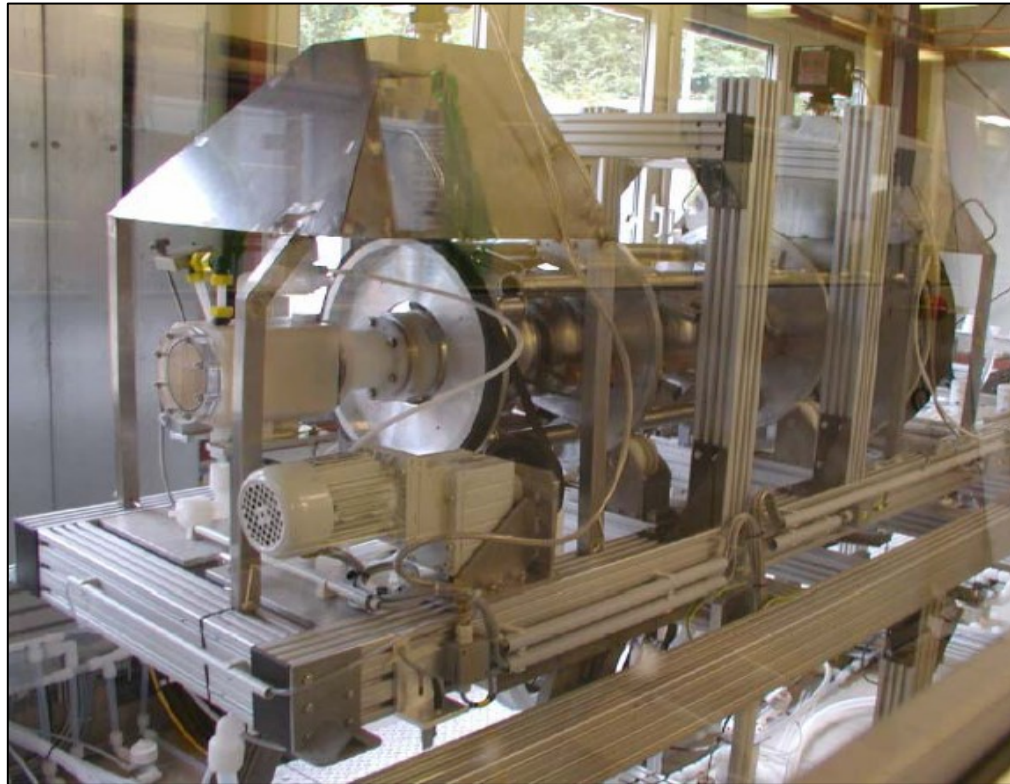


- **CryHoLab will be dismantled, improved & reinstalled over first half of year ready for another series of tests. .**



# Cavity Preparation

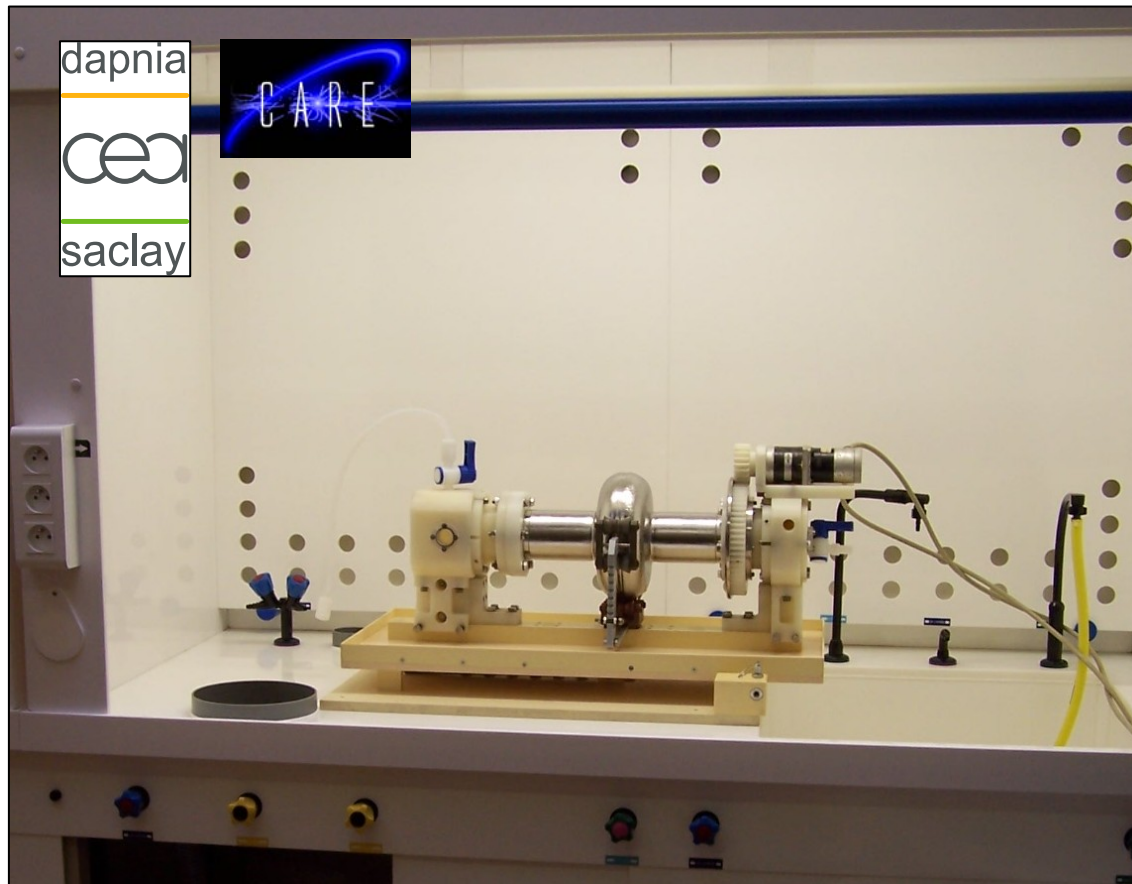
- **Electropolishing studies continuing @ DESY**





# Cavity Preparation

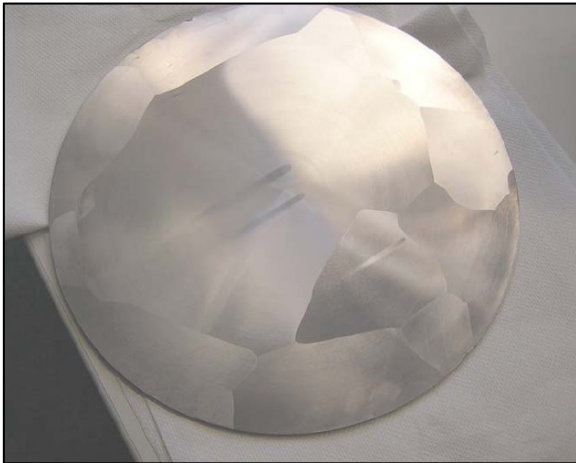
- **Optimisation of the electropolishing technique:**





# Cavity Preparation

- **Investigation of large-grain cavities @ DESY - electropolished and then baked:**



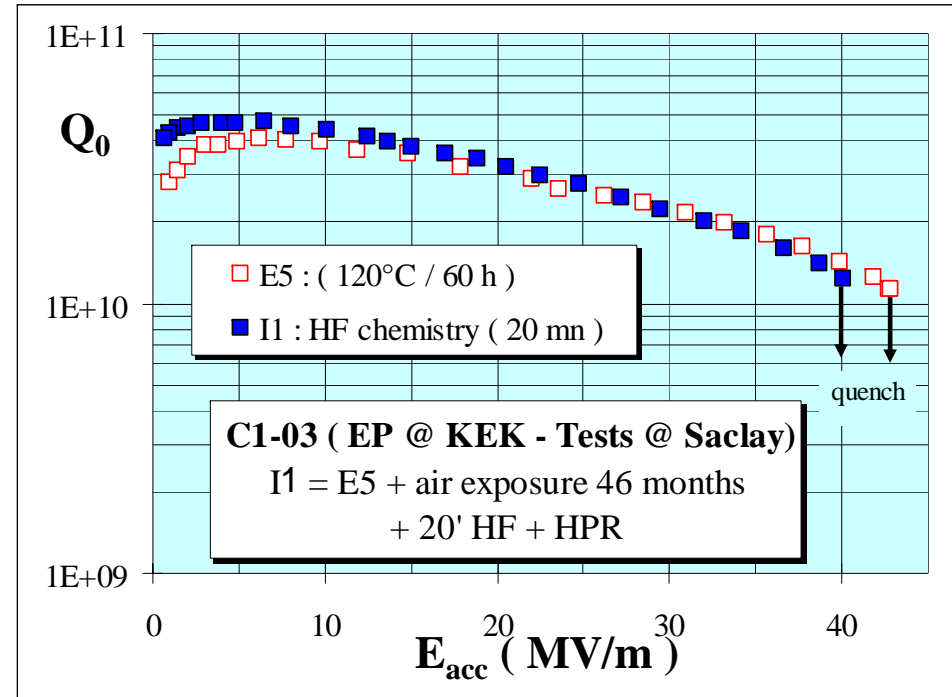
- **Baking effective irrespective of the type of cavity or how it has been chemically treated.**



# Cavity Preparation

- **Baking seems to have permanent good effect:**

*Air exposure  
- for 4 years -  
without any particular  
precautions*



- **Now seem to be gaining some theoretical understanding of what is going on in terms of diffusion of interstitial oxygen**

# Euro XFEL

- **German government Feb. 2003 gave go-ahead for XFEL as European project, ~ 40% required from European partners.**



- **Planfeststellungsverfahren**
- **TDR preparation, including a detailed cost study**
- **Administrative issues advancing**
- **International involvement progressing**
- **German Government Coalition agreement**
- **13 countries have signed MoU for preparatory phase**





# Euro XFEL

Industrial study module assembly (M6)

Superferric magnet (CIEMAT)



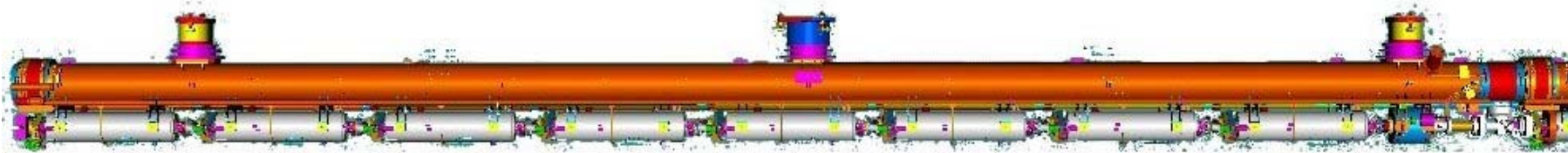
2 more cryostats (TTF3/INFN) ordered



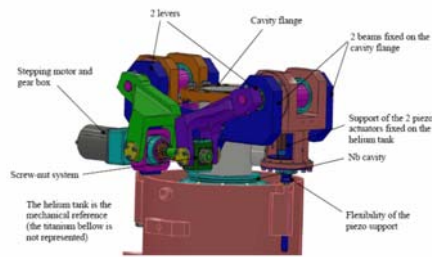
BPM (Saclay)



Integrated HOM absorber



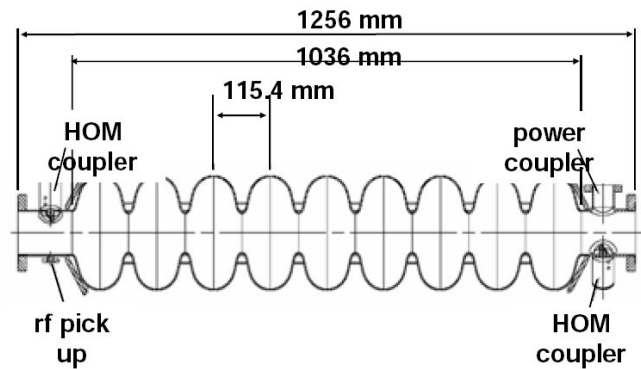
Length quantized  $n \cdot \lambda/2$  (possibility of ERL)



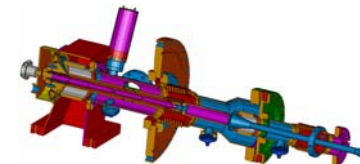
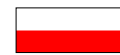
Tuner w/piezo (Saclay)



Industrialization in preparation



LLRF development (collab. Warsaw/Lodz)



TTF3-type coupler

Industrialization launched (Orsay)





# UK LCABD

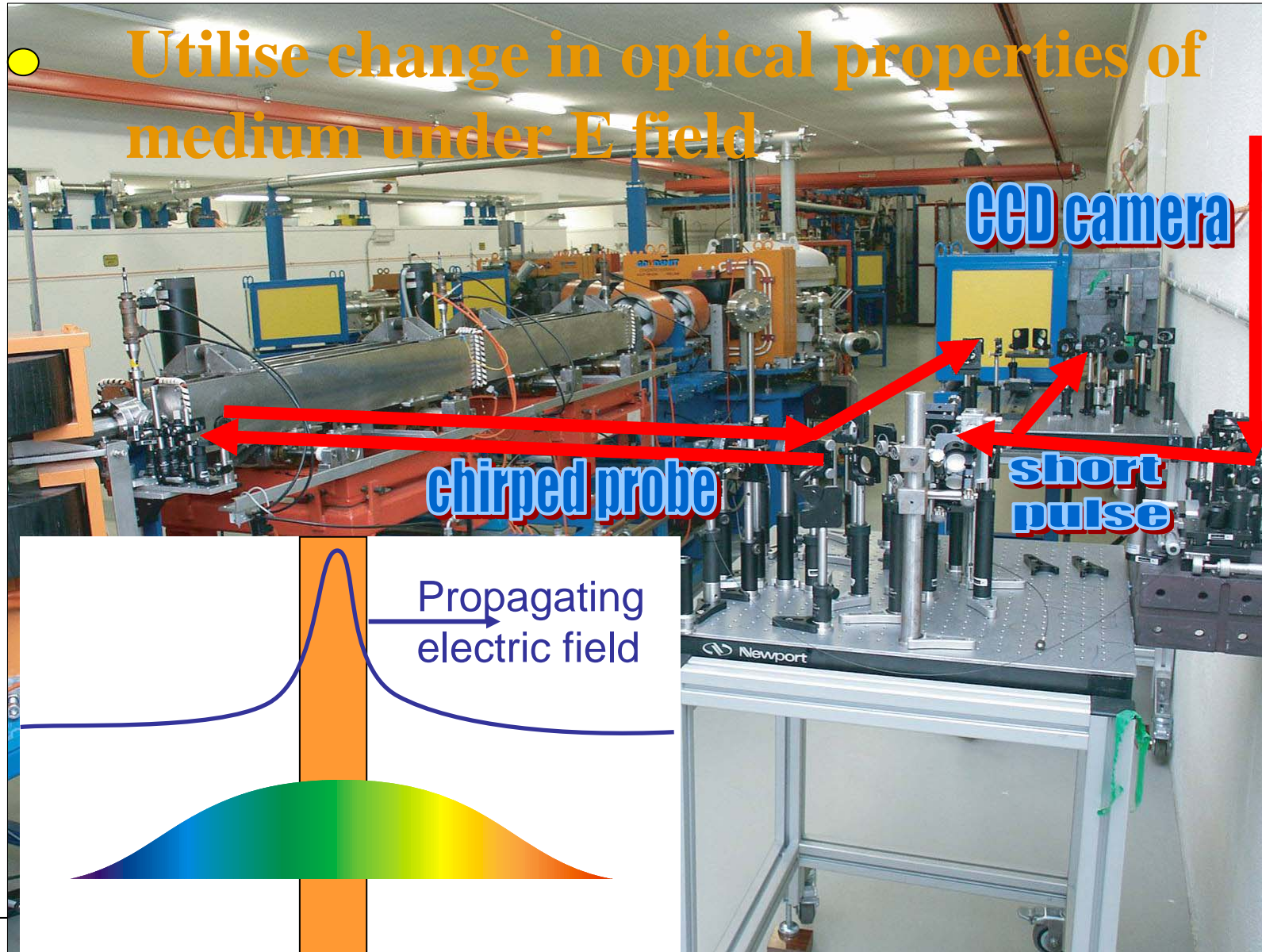
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- **B'ham, Bristol, Cambridge, CCLRC(DL & RAL), Dundee, Durham, Lancaster, Liverpool, Manchester, Oxford, QMUL, RHUL, UCL working on coordinated beam-delivery system project. Also two new Accelerator Institutes, Cockcroft & Adams, playing major role.**
- **Three-year programme; 41 post-doc physicists + technical staff + graduate students + 23 new posts. 15 M€ programme; significant overlap with EuroTeV – ~ 2/3 of staff in EuroTeV – to which UK is biggest contributor.**



# Electro-optic Z-profile

- Utilise change in optical properties of medium under E field



Global Design Error



# France in ILC

- LAL effort on TTF couplers**

Class 10 clean room



Klystron/modulator



Vacuum furnace



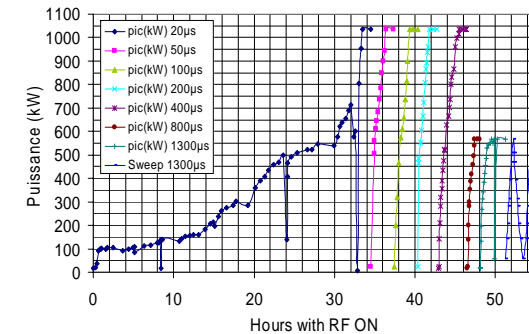
Ultra-pure water production



Reception, cleaning, mounting  
Conditioning and tests => Diagnostics



Power increase with time during RF Conditioning

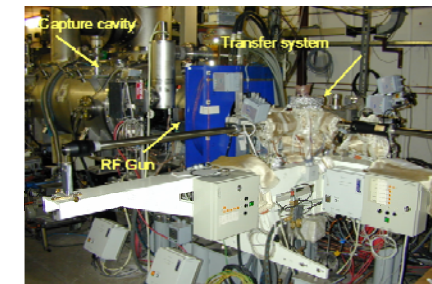
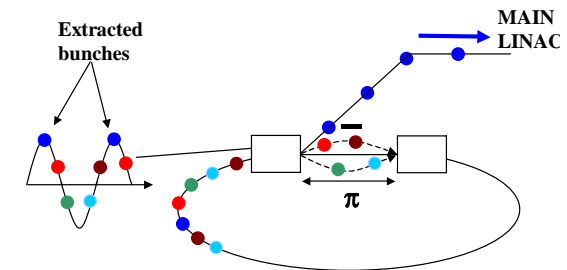
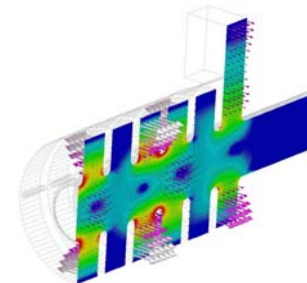
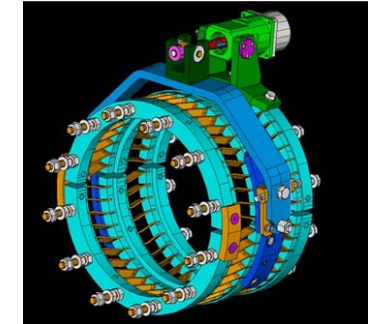


- Manufacture of 30 TTF-III couplers in industry**



# Italy in ILC

- Cryomodules, Cavities and Ancillaries R&D, Construction and Commissioning  
Cost Optimization and Industrial Studies
- Damping Rings - Layout and Engineering Design  
Cost Optimization and Industrial Studies  
Ultra-fast Multi-frequency RF Kickers
- Beam Diagnostics: OTR, DF, Bunch Length
- Photocathode preparation and handling





# Russia in ILC

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- **Russia major source of expertise in all aspects of accelerator R&D.**
- **BF visited Russia last week to discuss increased involvement from labs and individuals - positive response.**
- **In particular JINR are enthusiastic and wish to be considered as a possible ILC site.**



# CERN in ILC

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- **CERN major players in CARE, EuroTeV, ELAN.**
- **Lots of common projects/synergy with CLIC developments.**
- **Civil engineering studies for the possibility of CERN as an ILC site.**
- **Cryogenic plant expertise carries over directly from the LHC experience.**



# Future Plans

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- **National programmes expected to continue beyond current end-dates although without major ramp-up.**
- **Calls for proposals for Framework VII within the EU will be coming up around end of '06.**
- **Preparatory thinking going on involving GDE, TESLA, EuroTeV and other interested parties.**
- **Proposal for EU has to build on FP6 and be qualitatively more advanced. Infrastructure based at CERN for cavity R&D/test currently preferred. LoI → CERN Strategy Group.**





# Future Plans

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- **Other, smaller and more specific programmes will “cluster” around this.**
- **Coordination with GDE R&D board to minimise wasteful duplication of efforts.**
- **Maximise synergy and what we can learn, particularly about industrialisation, from the European XFEL.**



# Summary

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- **The European R&D effort continues to be very large and diverse, supported by a number of EU initiatives and strong national programmes. Excluding XFEL synergies, European programme ~ 250 FTEs & 21 MEuro.**
- **A great deal of progress is being made, and almost all of the European milestones are being met on time.**
- **For the future, we need to extract at least as many resources from EU in FP7 as we did as in FP6. This requires listening to Brussels and tailoring our proposals to what we think has best chance of success. At same time, we need to optimise use of resources world-wide.**