LTECNC

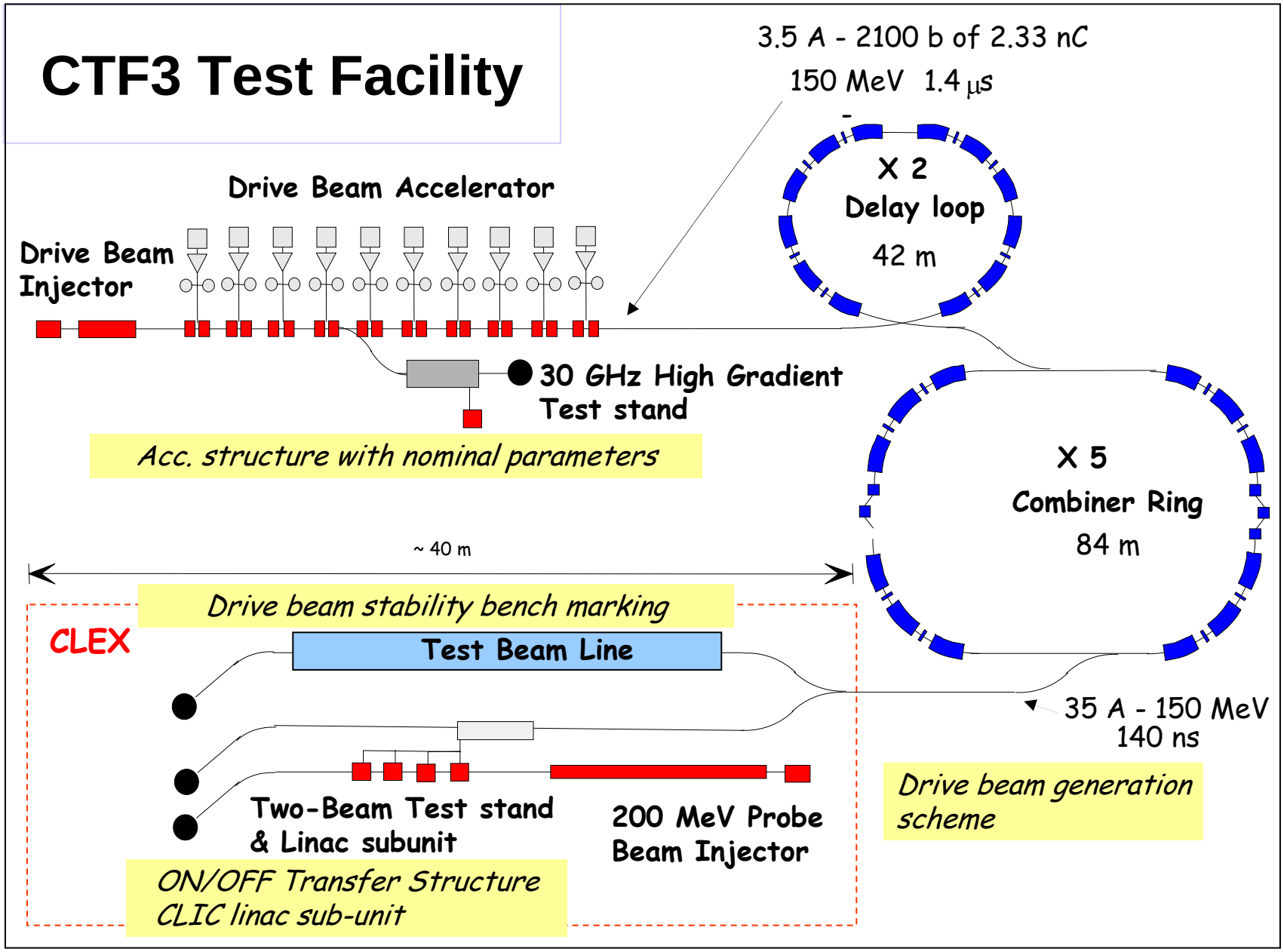
Issues related to NC Linear Colliders

G.Guignard

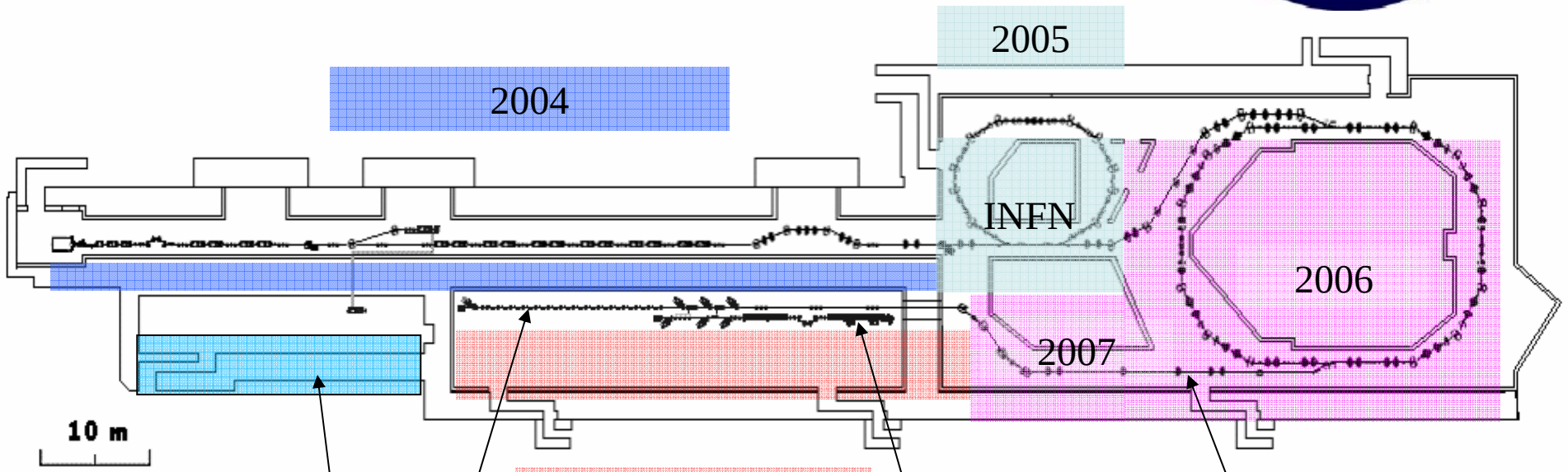
- CTF3 Test Facility
- PHIN Photo-Injector for CTF3
- WIGGLE 2005 Workshop
- Metrology & Stabilization WS
- Positron Source WS

Royal Holloway, London Univ., 20 June 2005

CTF3 Test Facility



CTF3 programme



30 GHz stand and laser room 2005-2009

CLEX 2007-2009

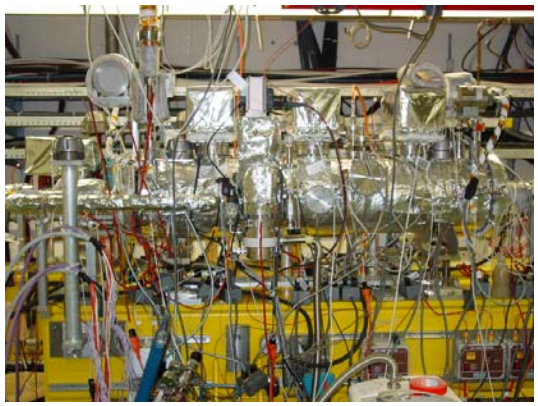
Bench Mark Tests of: Beam stability 2008-2009

Feasibility tests of Drive Beam Generation 2007

Power testing 2005-09 Feasibility test of CLIC structure 2008

Feasibility Tests of: PETS stucture 2007 CLIC linac section 2008

30 GHz power production in CTF3

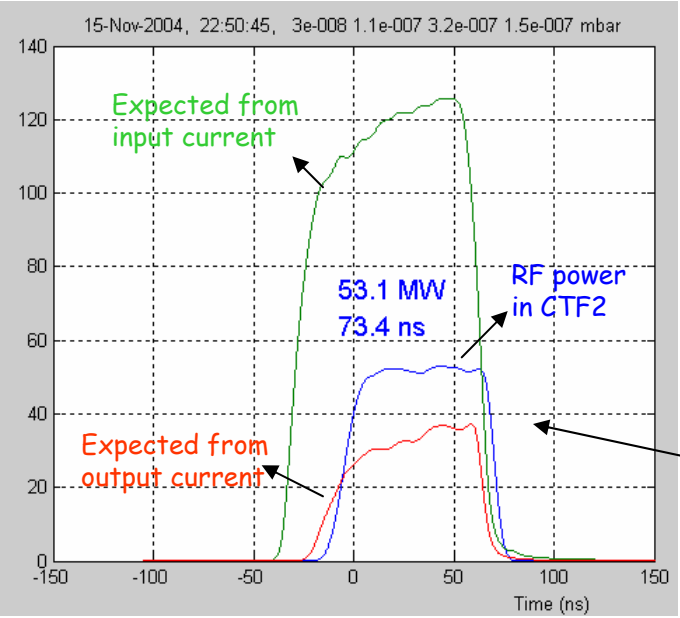


vacuum tanks containing Power Extraction Transfer Structure

17m waveguide with 5 bends but low-loss (85% transmission) (Russian collaboration)

power out – rectangular WR34 to circular (overmoded) H01

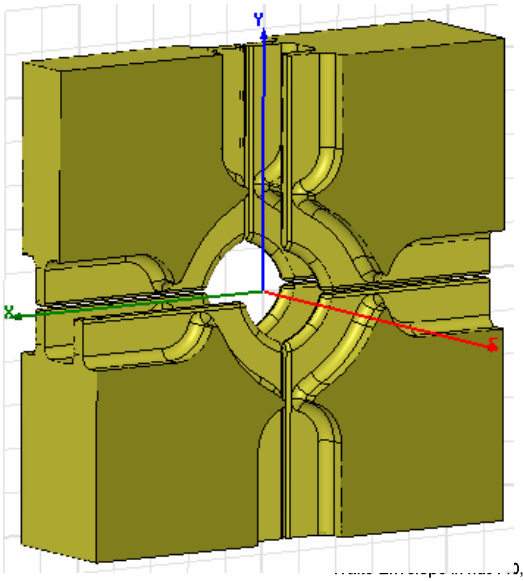
high power load

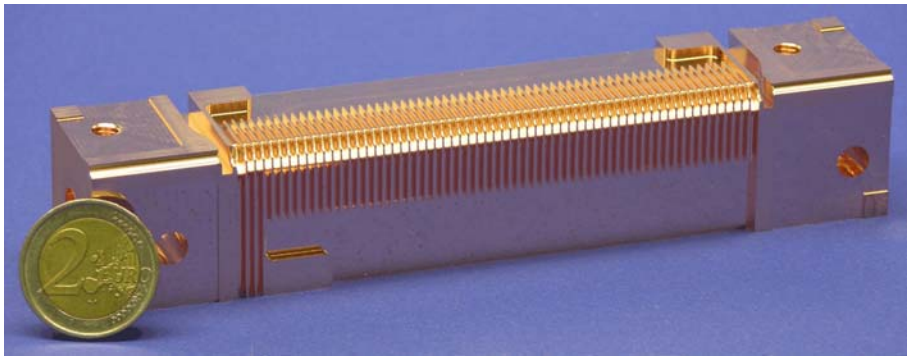


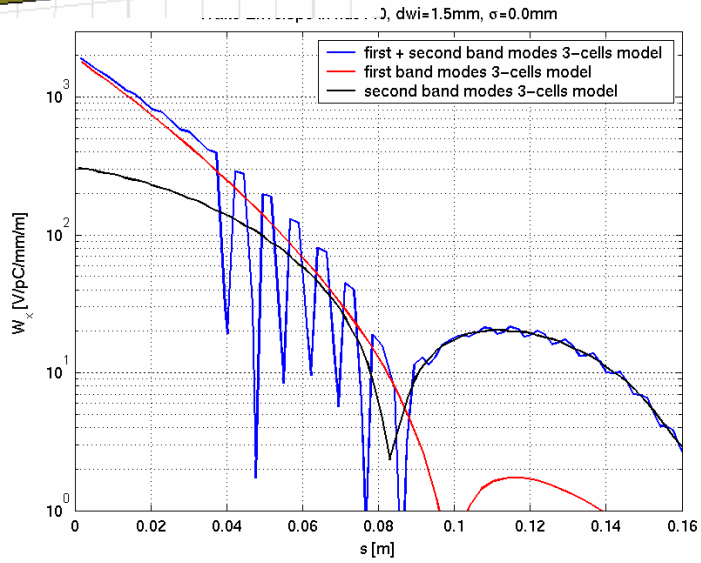
result

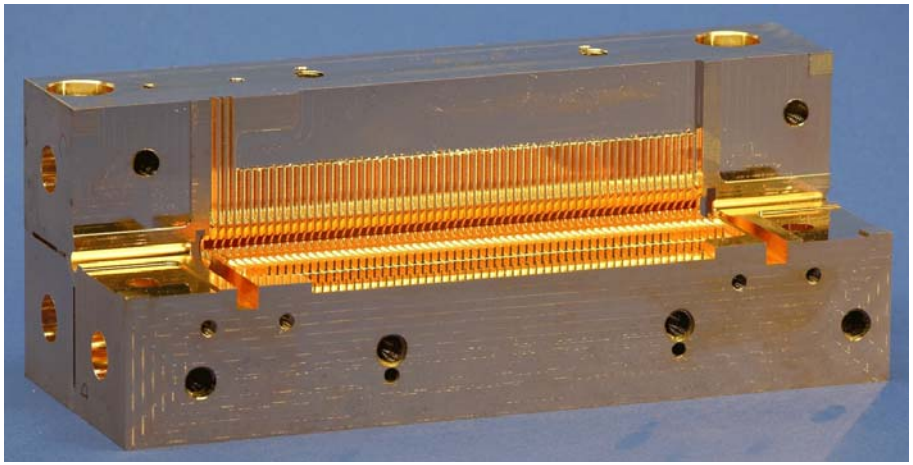
New accelerating structure concept HDS

- ***Damping waveguides + slotted iris for improved wake-field damping***
- ***Geometry optimized to reduced surface electric and magnetic fields***
- ***First high power test foreseen autumn 2005***

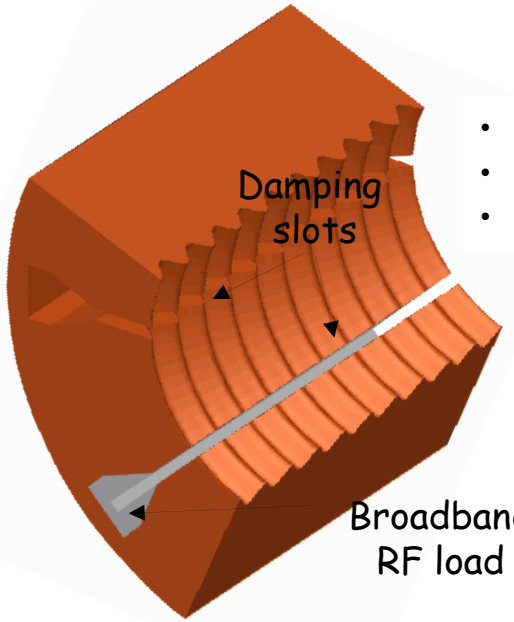






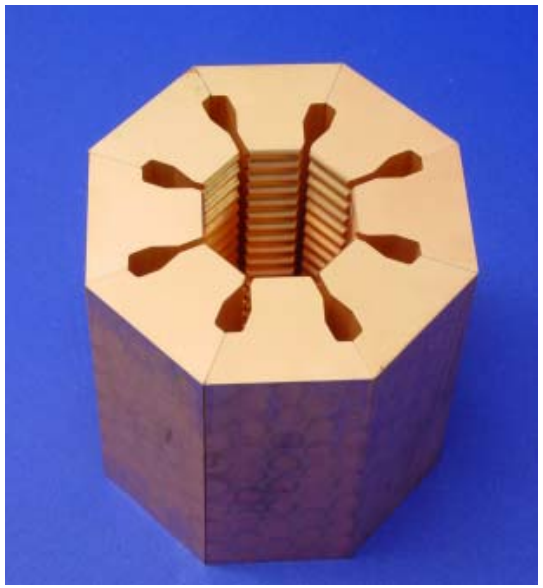


Design and test of damped ON/OFF power extraction structure for drive beam decelerator

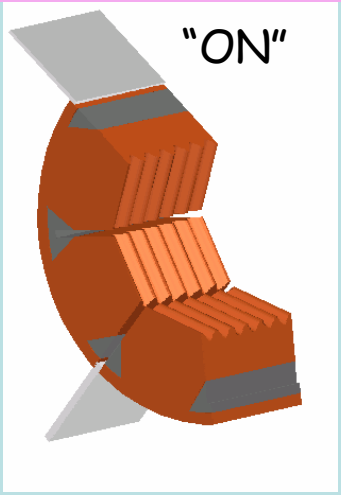


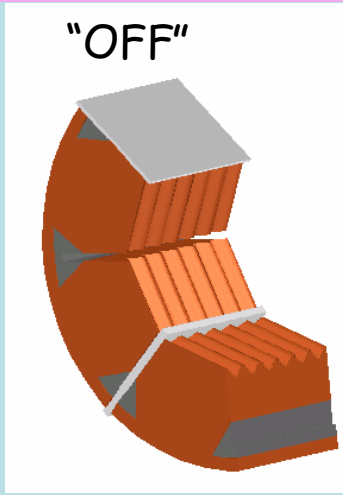
- Large aperture (25 mm)
- Very shallow sinus-type corrugations
- Eight 1 mm-wide damping slots

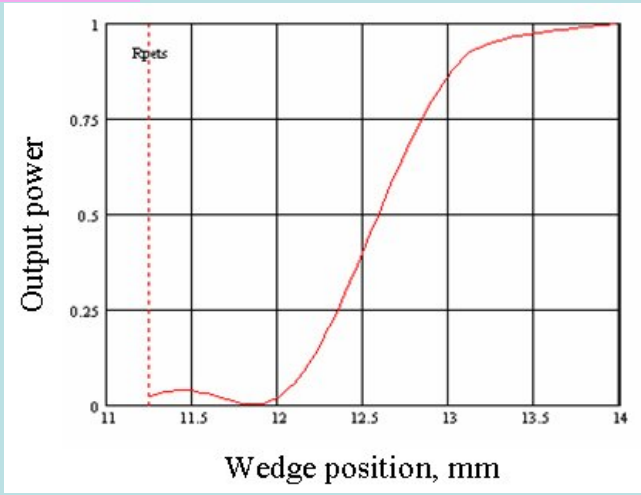
High power tests in CTF3 with beam from 2007 on



By insertion of 4 1.6 mm thick wedges through the damping slots, sufficient PETS frequency detuning can be achieved:







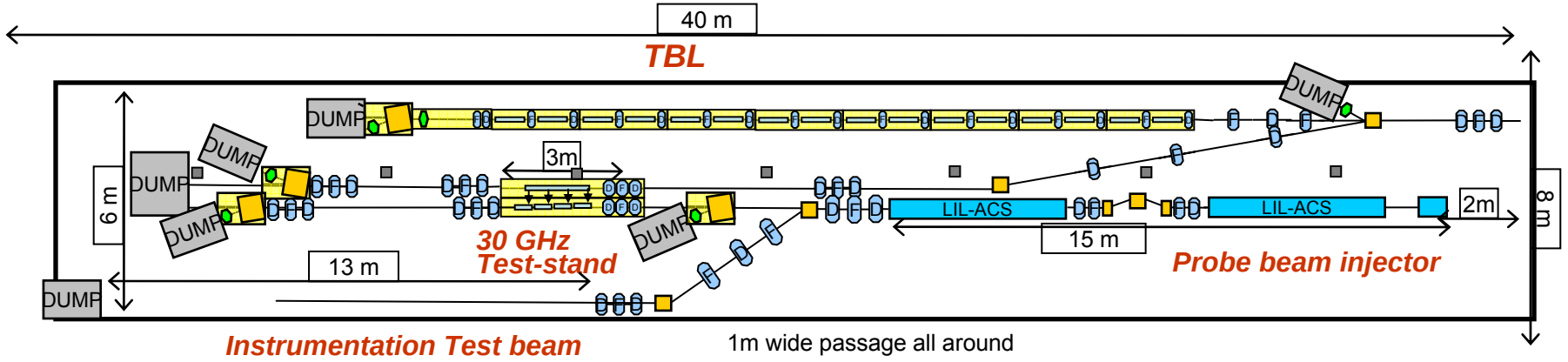
Collaboration Meeting

Meeting at CERN in November 2004, 32 presentations,
All collaborating Institutes participating

Next stages discussed:

- **Combiner ring layout well advanced, critical items ordered**
- **Two-beam test stand design (sub-unit of the linac with beam)**
- **Test beam line (TBL) to study drive beam decelerator dynamics, stability and losses, machine protection system**

First discussion on CLIC Experimental area (CLEX) and TBL,



Layout for CLEX floor space
(new building in 2006)

Status of CTF3 collaborations

LAL: Gun, pre-bunchers
HV for gun, electronics,

SLAC: Gun on loan, Design of Injector, Commissioning

Uppsala University: Operation,
Phase monitor

RAL: Laser for photo injector ,

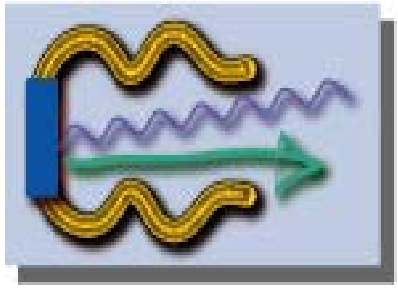
Turkey: Operation

INFN: operation & commissioning
RF deflectors 3 GHz Delay Loop
Bunch length chicane,
longitudinal diagnostics experiment

Northwestern University Illinois:
Drive Beam accelerator structure
Beam loss monitoring

Finnish Industry: One person for CTF3/CLIC

- **Finland**
  RF structure (30 GHz)
- **France**
  Probe Beam, BPM,
  Magnets and Electronics for CR
- **Italy**
  CR: optics, vacuum system,
  path length wiggler
- **Poland**
  Software development
- **Russia**
  Magnet manufacture for CR,
  Software for automatic conditioning
- **Spain**
  Correctors, septum magnets
  Ejection kicker for CR , RF structure
  TBL quads with precision movers
- **Sweden**
- **USA**



PHIN Photo-Injector for CTF3

- Photo-cathodes (CERN)
- RF Gun (LAL)
- Laser (RAL)

PHIN Overview

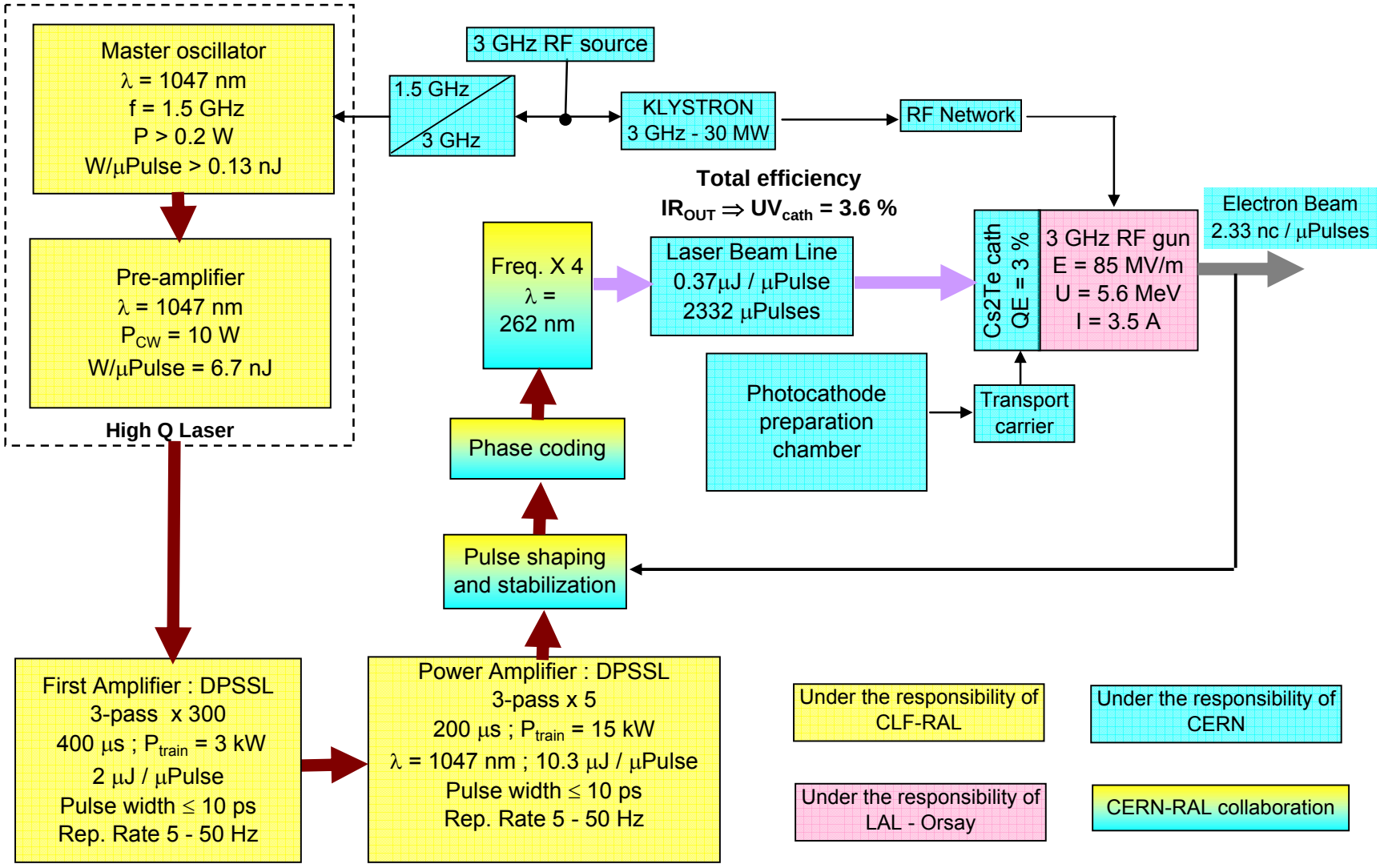
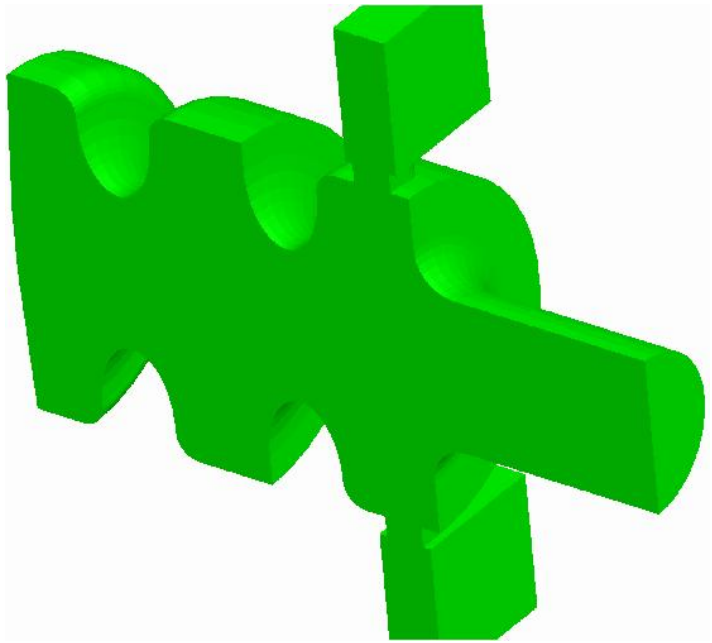


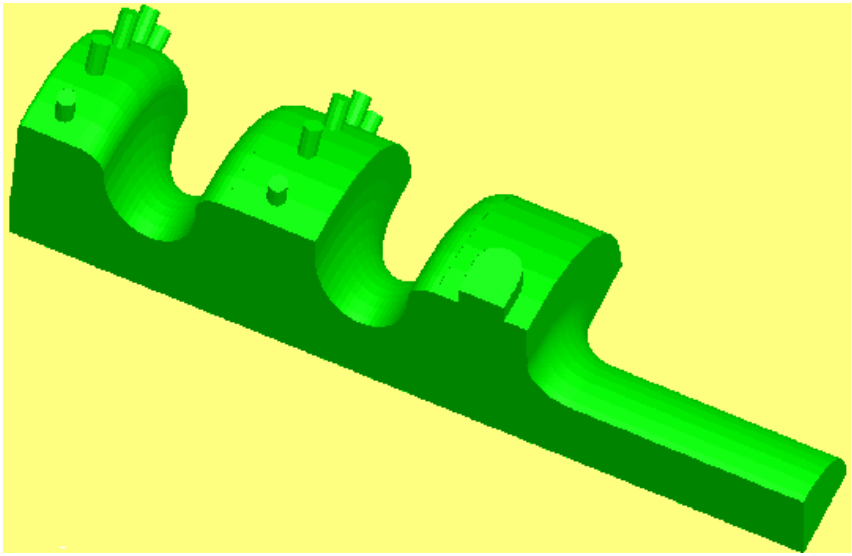
Photo-cathodes

- Rejuvenation of the preparation chamber and the transport carrier DONE
- Measurement line – DC gun – preparation chamber and transport carrier re-alignment DONE
- Improvement of Cs-Te cathode production
- Rest gas analysis by mass spectrum analyzer DONE
- Co-evaporation : thickness calibration ➔ evaporation rate control ➔ ratio control
- R&D for using 2nd harmonic of Nd-crystals (green)

RF Gun

- Design (completed) based on :
  - Overcoupled: match beam (3.5 A) in long pulse (1.5 μs)
  - Beam loading fully compensated
  - Emittance growth by space charge comp. with coils
  - Transverse kicks comp. with symmetric couplers
  - Vacuum improved with High T bake-out and NEG coating close to the cells
- Latest news:
  - Cold model under construction, delivered in June
  - Final Gun: to be ordered in July, available at CERN towards the end of the year.





Elliptical iris

Two symmetric couplers to reduce transverse kick

42 holes in the gun walls

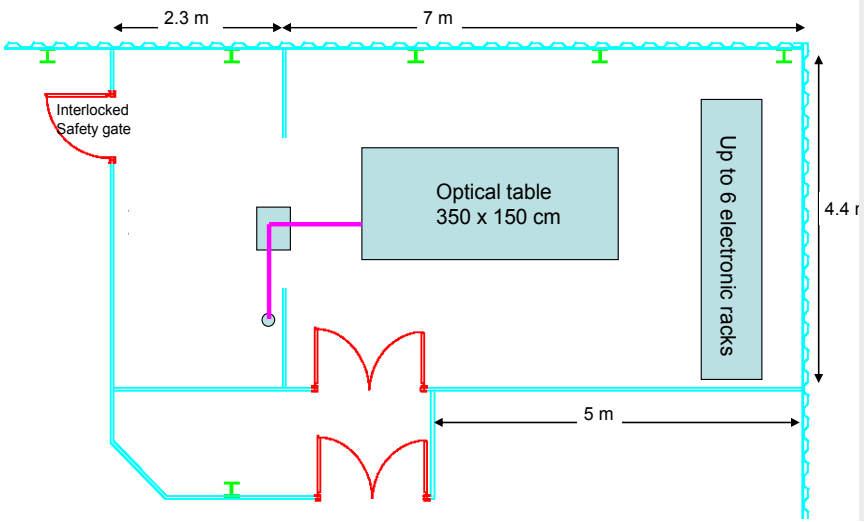
Volume around the holes coated with NEG

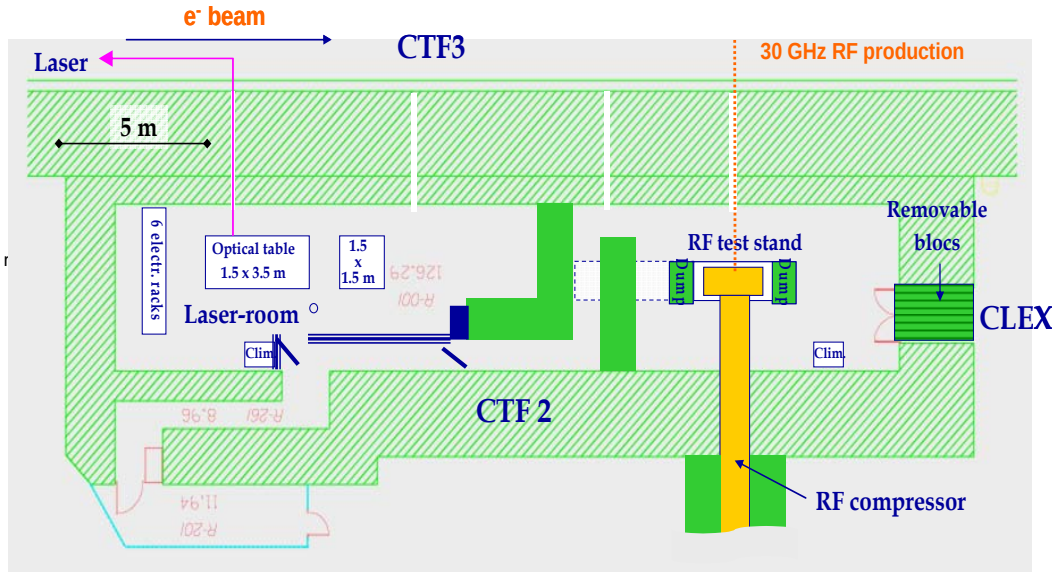
Laser

- Oscillator at 1.5 GHz frequency for controlling pulse-to-pulse jitter, and amplitude stability Tested < 0.25 %
- Oscillator box at RAL for integration in the system Acceptance tests done with success
- Diode Stacks and Nd:Ylf rod for 1st amplifier ordered (available this summer).
- Price Enquiry for Diode Stacks of 2nd amplifier out (Diodes available in the fall)
- Mechanical design for amplifier done.
- Pockels cell driver to be found (switch 5kV in 333 ps)
- Stable driver (<1%) for pumping diodes being built for 100 Amps. New design needs 120 Amps.
- Studies on stabilization feedback and phase coding started at RAL.

Photo-injector installation in 2 steps

2005 – 2006 Photo-injector installation and commissioning	From 2007 After commissioning
• **Photo-injector installed in the former CTF2** • **Laser-room in the former CTF2 laser-room**	• **Photo-injector installed in the CTF3** • **Laser-room in the former CTF2**





WIGGLE 2005 Workshop

INFN, Frascati, It, Feb. 2005, ~35 participants

Tools for Wiggler modeling and DA evaluation are available.
Used and checked in operation.
Code benchmarking using field map and same lattice.

Design possible for a lattice with required DR emittance
and a DA of the order of 10 σ_x

E-cloud effects to be considered in wiggler design
Single- and multi-bunch instabilities might limit the current

DA mainly reduced by field non-uniformity in H-plane.
Good field quality wigglers don't harm performance

Tools + technologies available to design and build wigglers
with characteristics and field quality required

Cost is critical

Metrology & Stabilization Workshop

LAPP, Annecy-le-Vieux, Fr, March 2005, ~20 participants

Automated process for positioning of the components:
- laser tracker LiCAS, rapid transverse surveyor RTRS, active laser-based feedback,
- applications: DESY, XFEL, ATF(?), CTF3(?)

Ground motion measurement and site survey:
- sensor study, needs of smaller ones, B sensitivity
- site comparison with same equipment and data analysis

Structure modeling and vibration control:
- modeling support behavior, vibration reduction,
- finite-element and harmonic analysis of vibration, response to varying force/random excitation, numerical tests
- feedback system to cancel single mechanical resonances

Metrology & Stabilization Workshop

Axes of activities raised:

- modeling, simulation and theory
- development of small and well performing sensors
  in collaboration with industry
- launch R&D work on actuators,
  define where tests could be done (ATF)
- contact the designers of FF quads
  link the actuator work to possible tests.
- development of 2nd generation positioning devices (LiCAS),
  smaller and lighter; possible applications (XFEL, ATL, CTF3).
- create a common set-up for tests
  to compare different positioning systems

Workshop on Positron Sources for the International Linear Collider

CCLRC, Daresbury Laboratory, UK, April 2005, 47 participants

The workshop :

- - discussed the possible positron source options for the ILC that are presently being considered,
- - assessed the outstanding R & D issues that will need to be addressed,
  targets, positron capture, polarization, operation
- - considered how the final selection and design of the ILC positron source should be made.

Positron Source Workshop

Three concepts for e^+ production:

1) Conventional

2) Undulator-based

3) Laser Compton-based

Physics community should specify the arguments and the emphasis for polarized positrons

R&D challenges have been addressed for all technical sessions

This workshop is on critical path to make a choice for the Baseline configuration

(Snowmass meeting in August 2005)