Accelerators R&D at IFIC

"Reunión de Electrónicos", May 2010

Group of Accelerator Physics,
on behalf of GAP members:
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S. Verdú, J. Alabau, C. Belver and
J. V. Civera (Mechanics Unit col.)

Main ongoing projects

➢ *ILC and its Test Facility ATF-ATF2*:

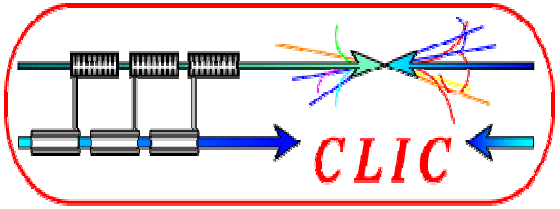
Beam dynamic studies and commissioning of the ATF EXT line (LAL, KEK, SLAC)

Multi-OTR system for ATF2 (SLAC, KEK)

BPM supports with micromovers for FONT4 in (KEK, JAI)

BDS instrumentation studies

➢ *CLIC and its Test Facility CTF3*:



BPM's for the TBL in CTF3 (UPC, CERN, Applied Physics-UV)

Drive Beam BPM's for CLIC module (CERN)

➢ *Medical Physics*

BPM's for protontherapy (LLR)
Cyclinacs (TERA, CERN)

ILC & CLIC

No Circular Colliders, no losses.

¿

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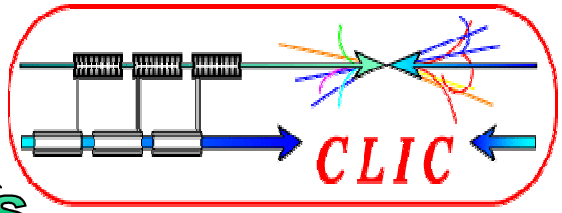
Linear Colliders will need lots of RF Power



Future Linear Colliders

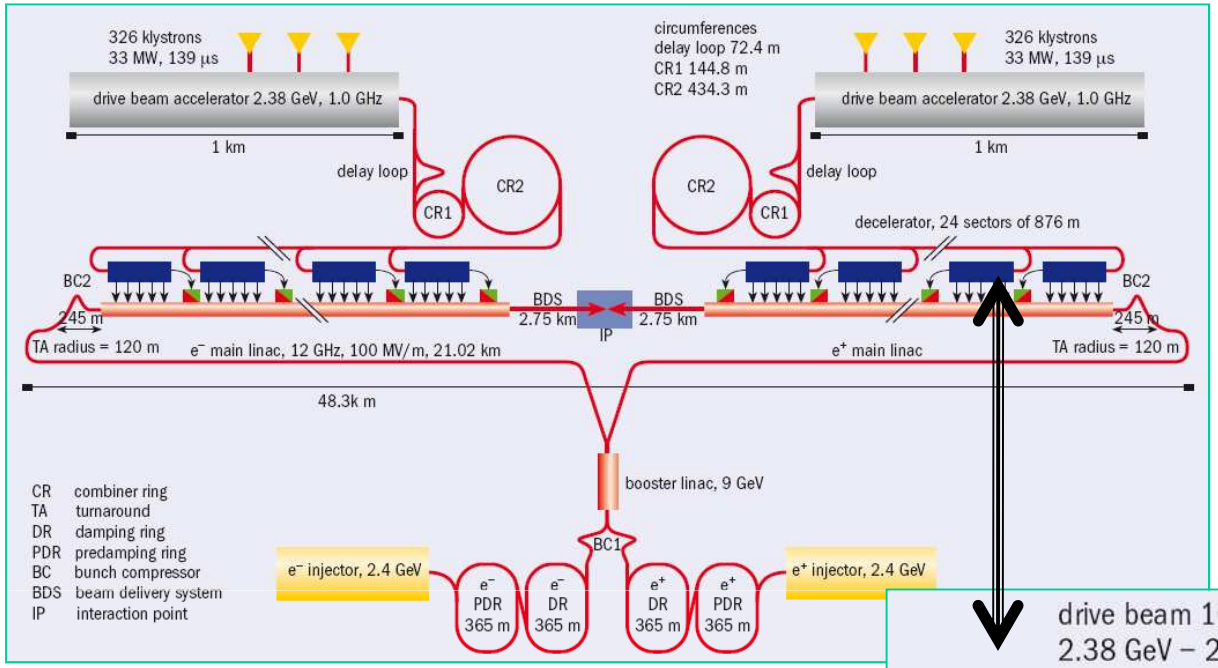
This study is based on an RF system using superconducting cavities for acceleration, with a nominal accelerating field of 31.5 MV/m and a total length of 31 km for a colliding-beam energy of 500 GeV.

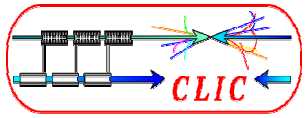
Feasible

The CLIC scheme is based on normal conducting travelling-wave accelerating structures, operating at a frequency of 12 GHz and with very high electric fields of 100 MV/m to keep the total length to about 48 km for a colliding-beam energy of 3 TeV.

Proof of Principle

CLIC: The Compact LInear Collider

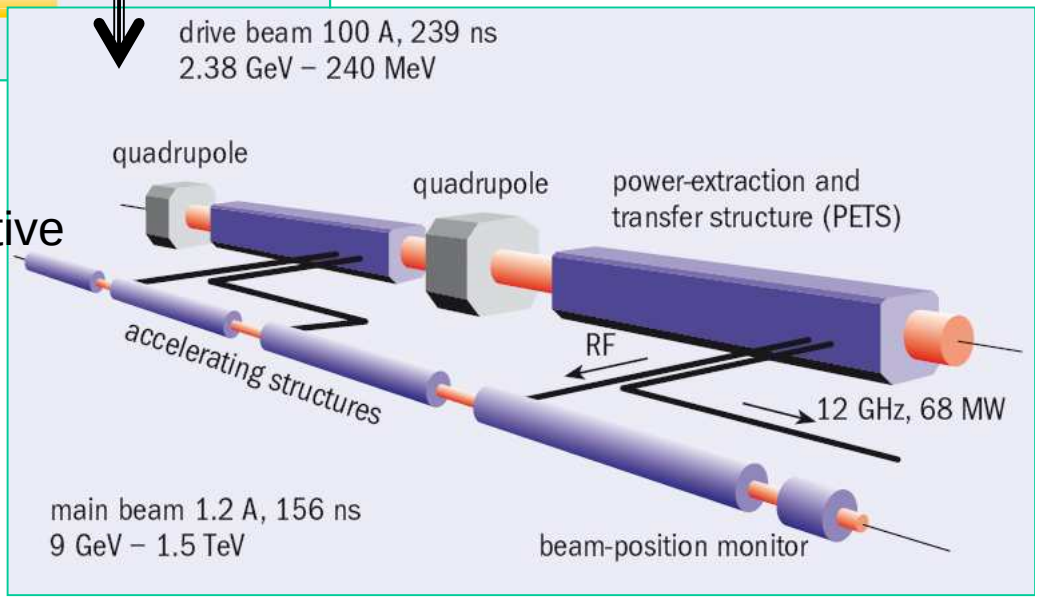




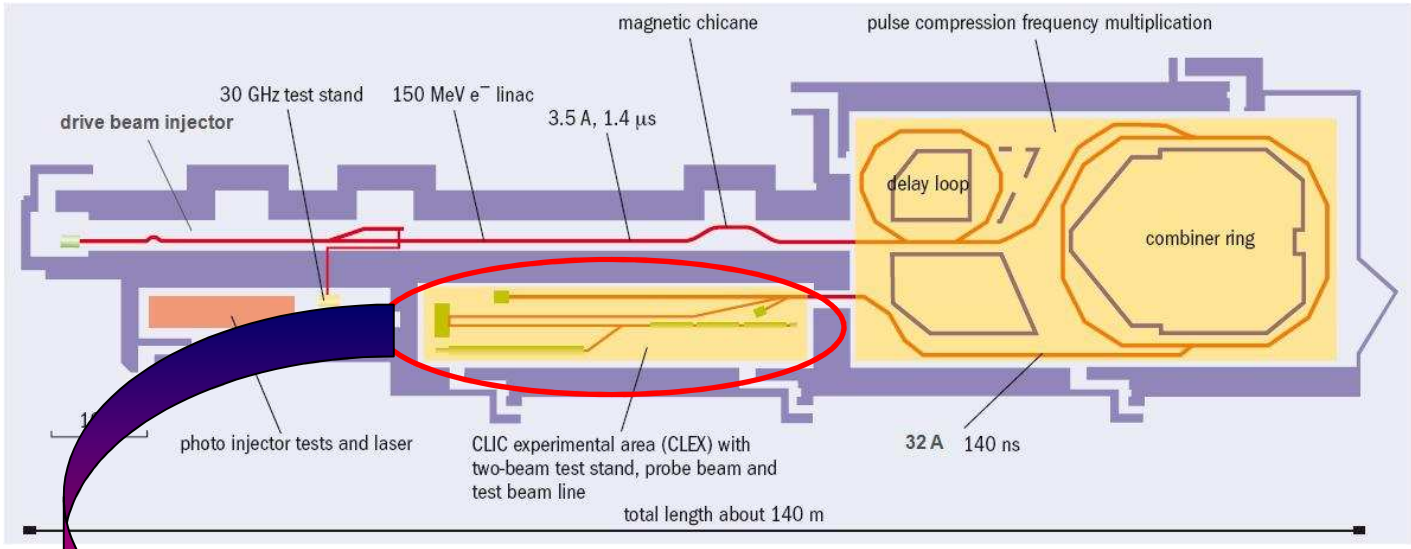
Each sub-system pushes the state-of-the art in accelerator design

The peak RF power required to reach the electric fields of 100 MV/m amounts to about 275 MW per active meter of accelerating structure. Not possible with klystrons.

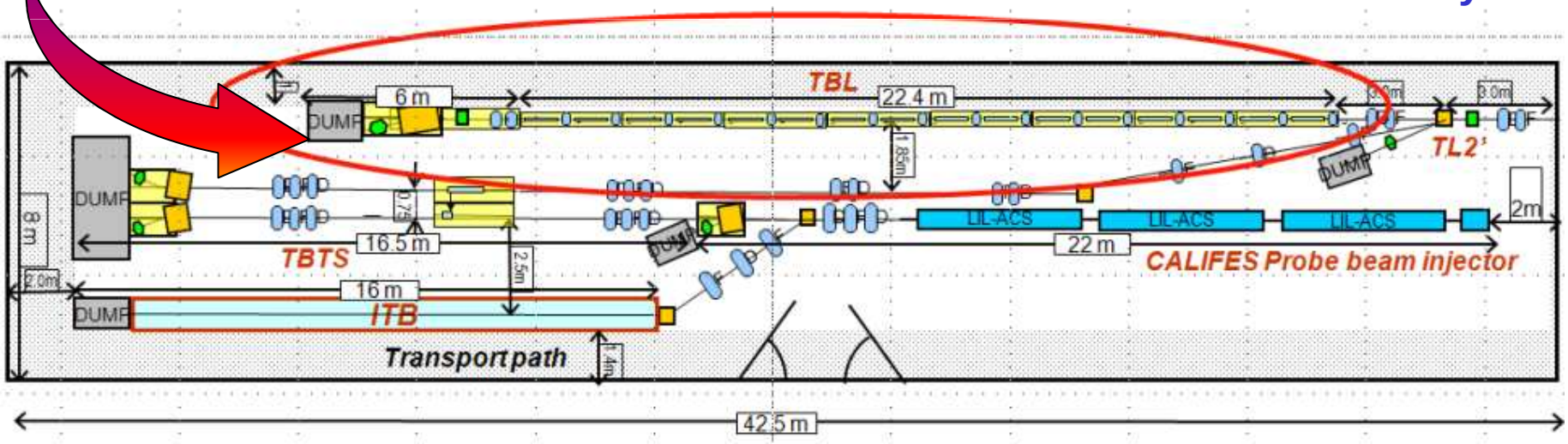
Hence a novel power source, an innovative two-beam acceleration system, in which another beam, the drive beam, supplies energy to the main accelerating beam.



CTF3: The CLIC Test Facility 3

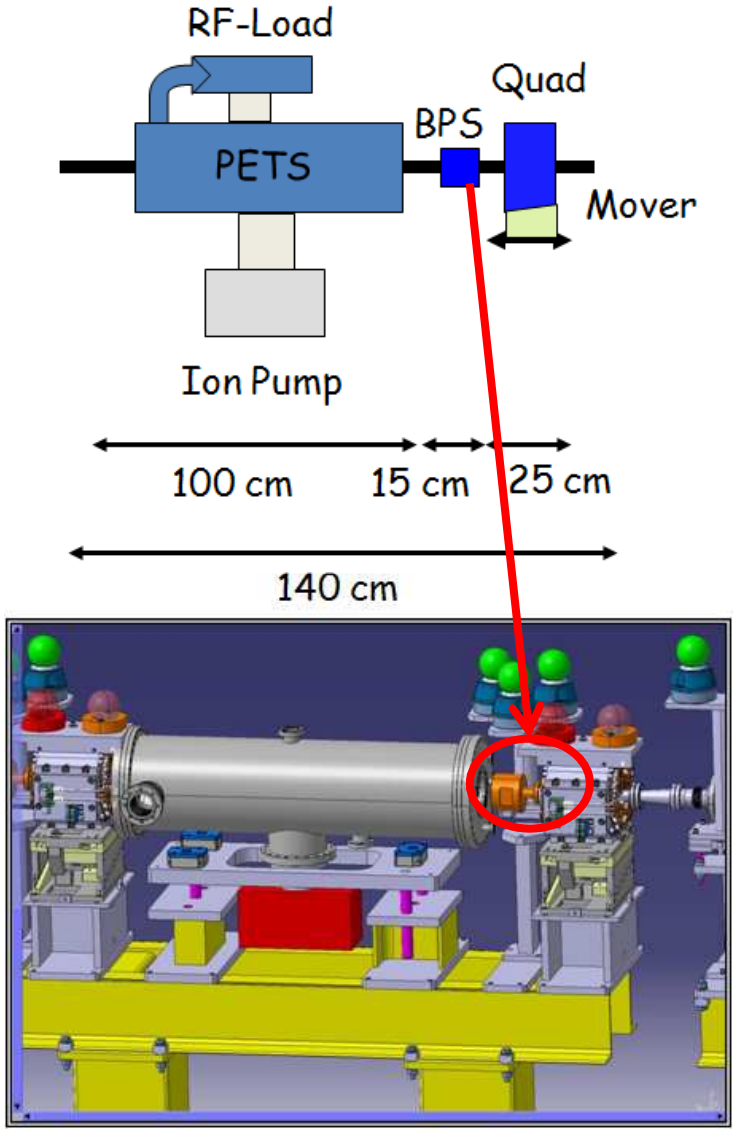


- **To demonstrate the Two-beam acceleration scheme.**
- **A scaled facility for one branch of the Drive Beam Generation System**

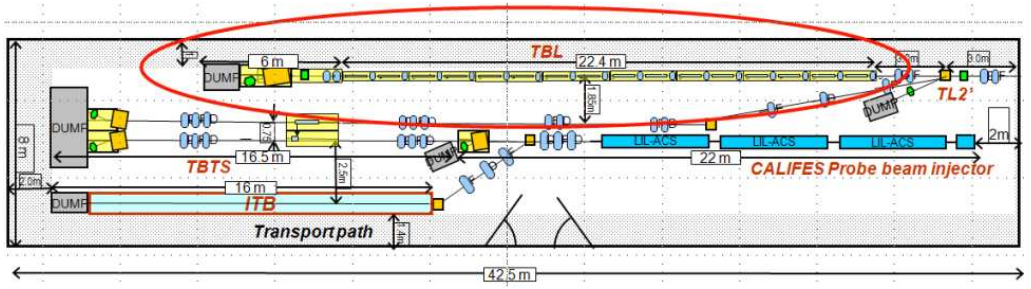


Layout of the CLIC EXperimental area (CLEX) building with TBL

TBL: The Test Beam Line



16 TBL Cells



The main aims of the TBL:

❑ Study and demonstrate the technical feasibility and the operability a drive beam decelerator (including beam losses), with the extraction of as much beam energy as possible. Producing the technology of power generation needed for the two-beam acceleration scheme.

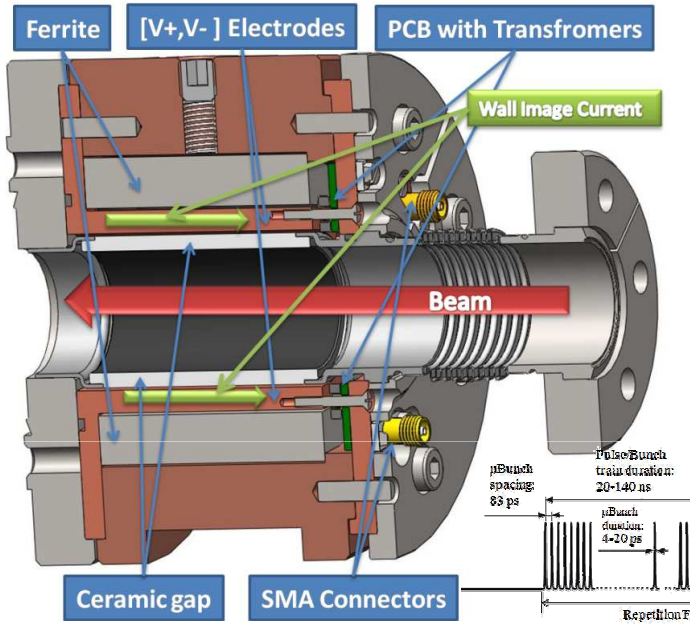
❑ Demonstrate the stability of the decelerated beam and the produced RF power by the PETS.

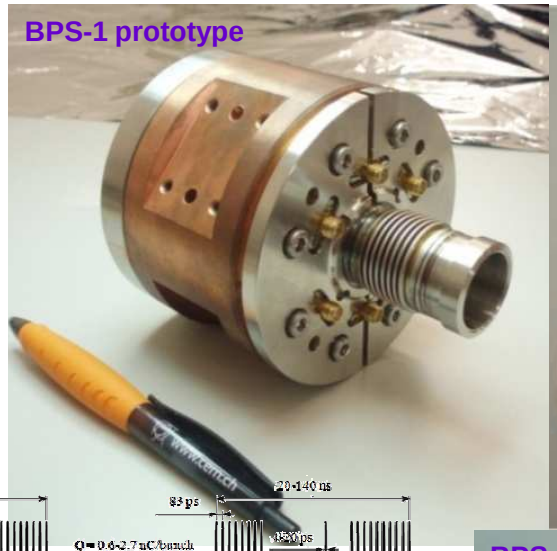
❑ Benchmark the simulation tools in order to validate the corresponding systems in the CLIC nominal scheme.

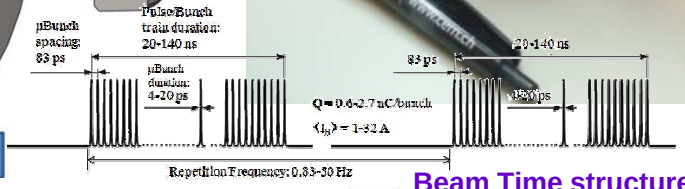
Beam Position Monitors (BPS) for TBL

The BPS is an Inductive Pick-Up BPM

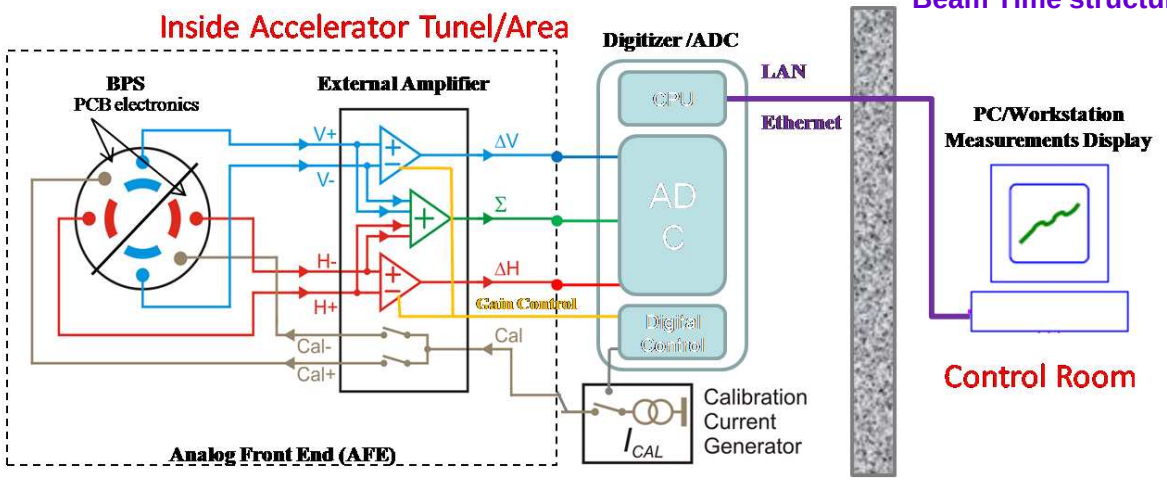
BPS first prototype parts and design

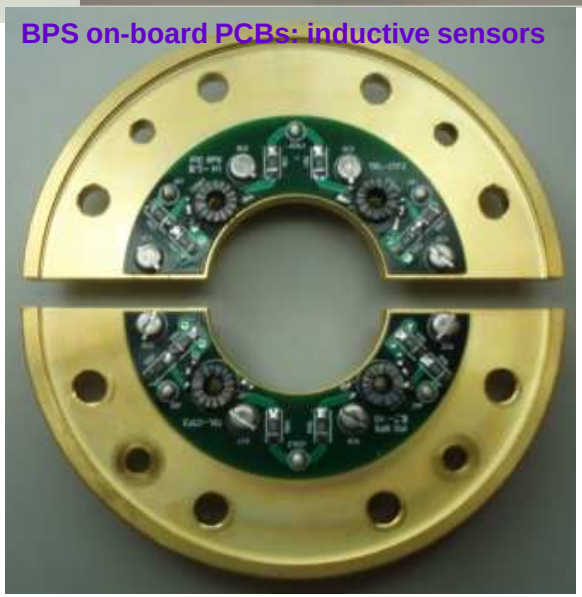






Beam Time structure

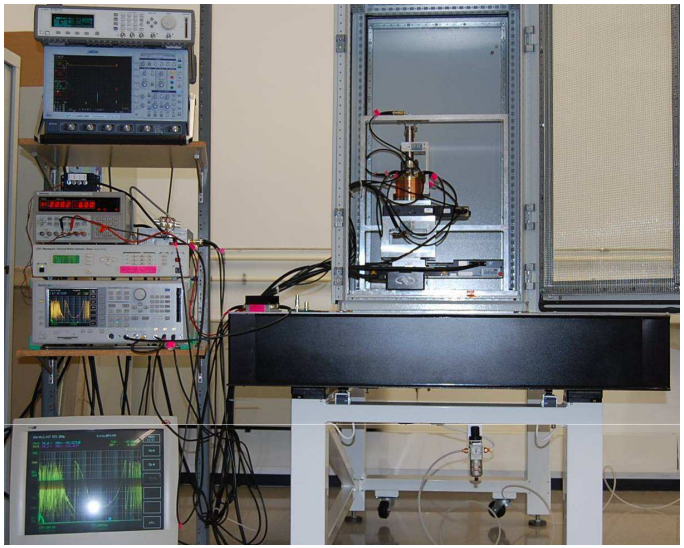




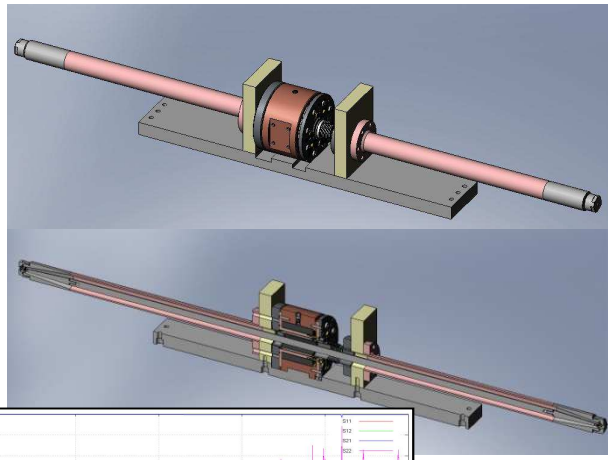
Beam Position Monitors (BPS) for TBL

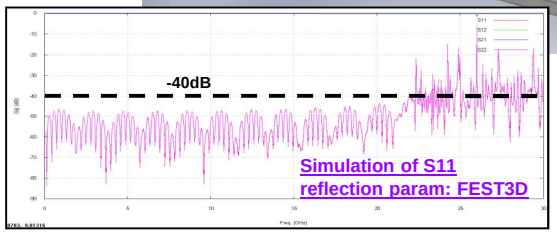
The BPS Series Characterization Tests

The Wire-Method Test Stand

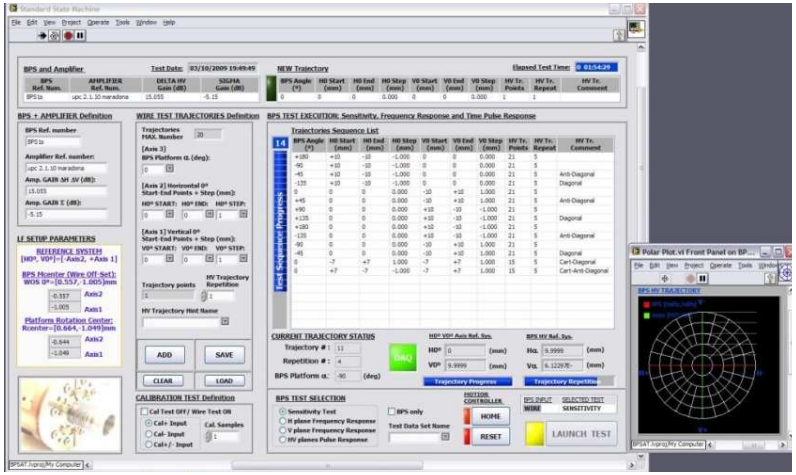


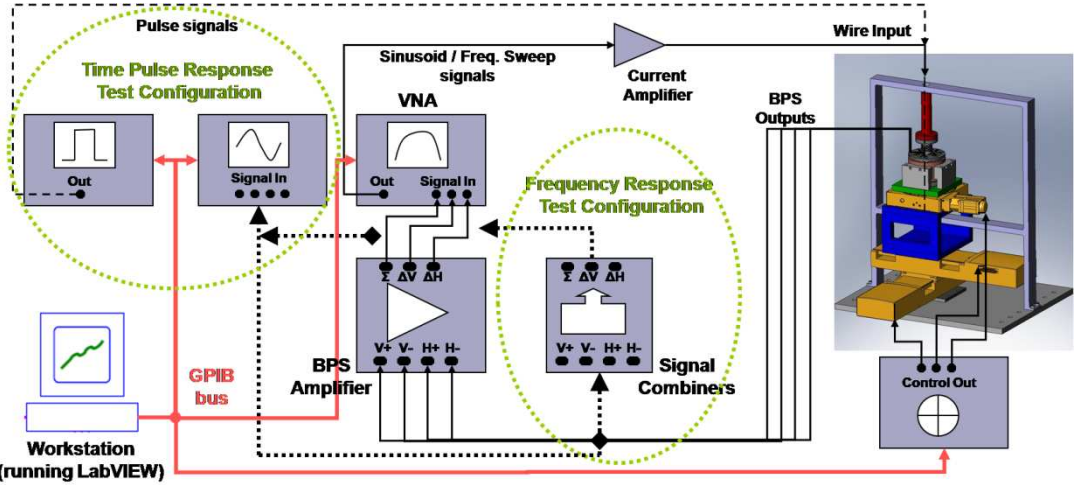
The HF CoaxialTest Bench





[DC-30GHz] measures of the BPS longitudinal coupling impedance

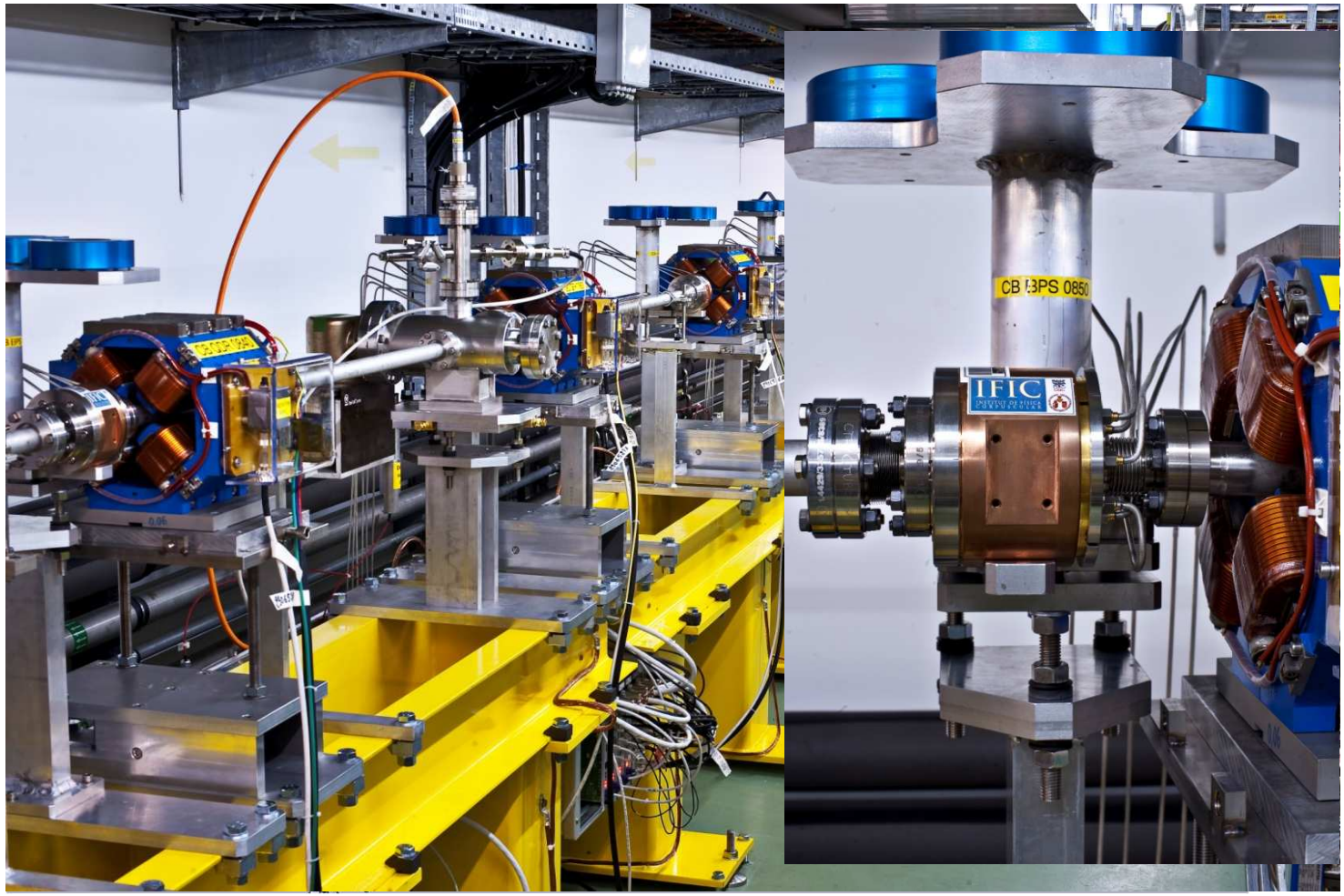




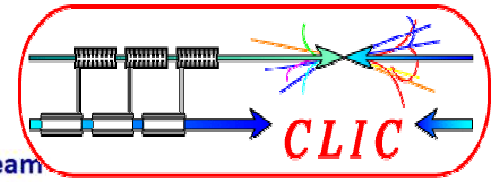
The BPS series Test Stand and SensAT-v1.0 Control &DAQ app

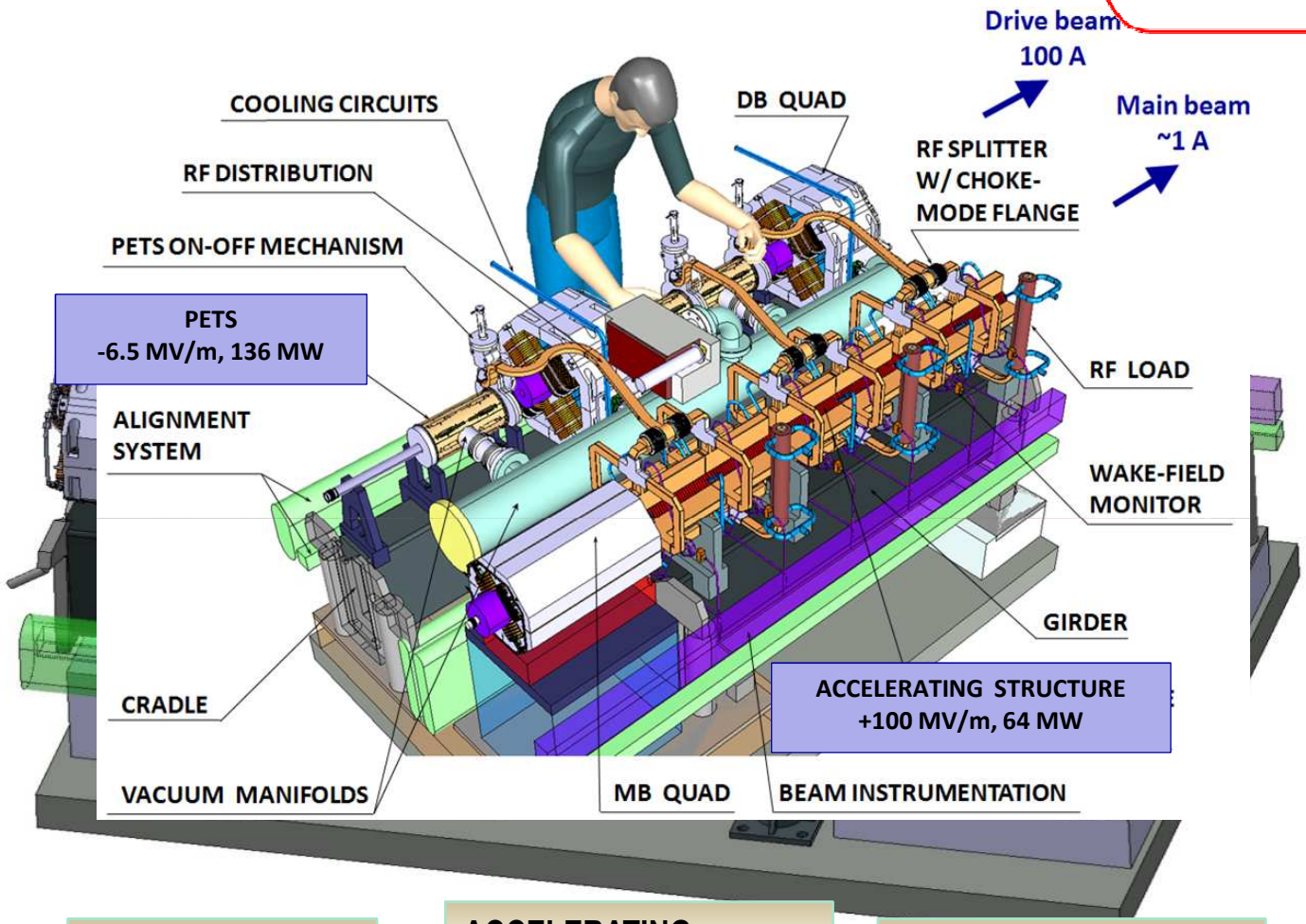
Beam Position Monitors (BPS) for TBL

16 BPS installed in CTF3 at TBL (CLEX bdg. 2010, CERN)



Drive Beam BPM for CLIC Module





NUMBER OF CLIC MODULES 20924

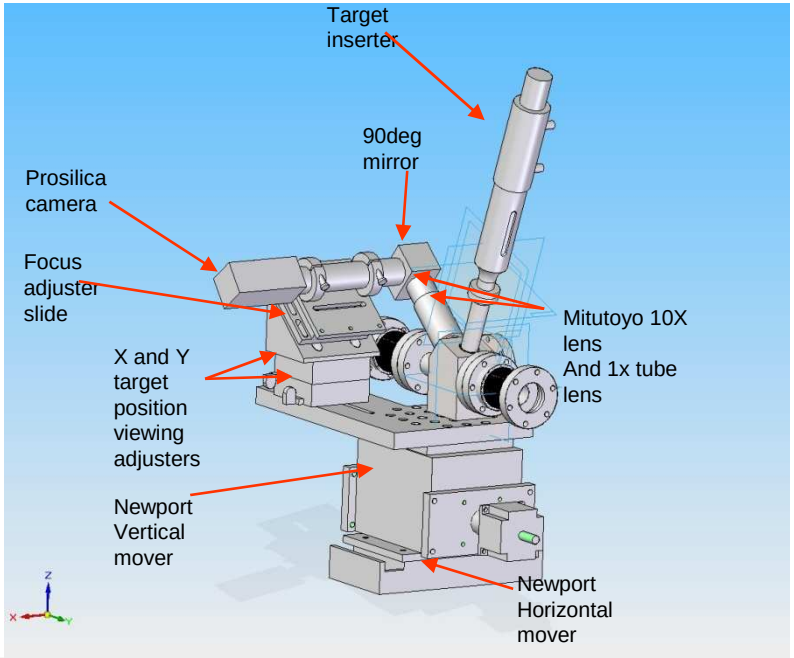
ACCELERATING STRUCTURES - 142812

PETS - 71406

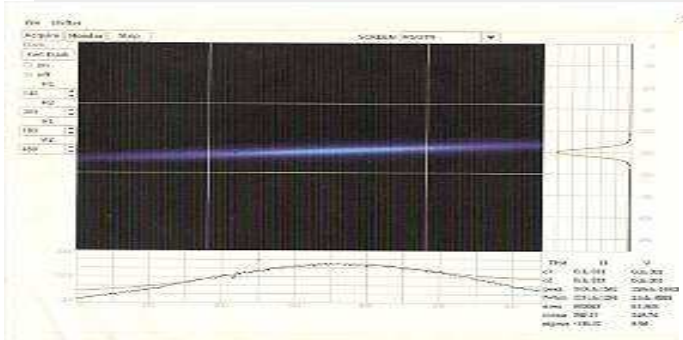
QUADRUPOLES:
Main Beam – 3992
Drive Beam – 41848

ILC and ATF-ATF2 Projects

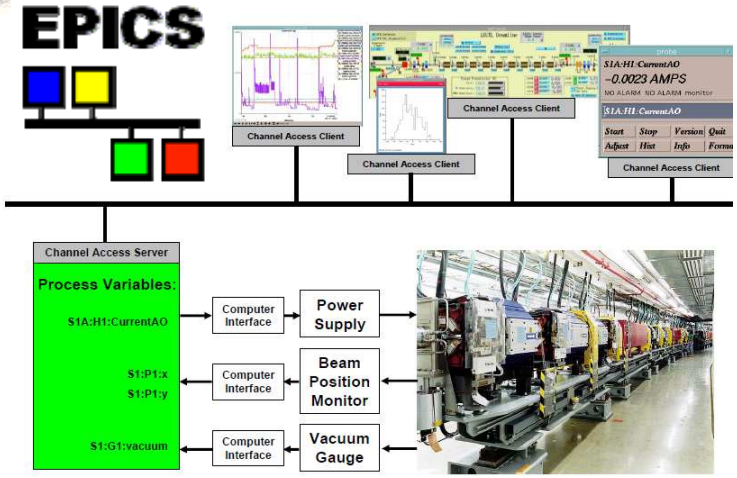
New Optical Transition-Radiation (OTR) Profile Monitor design for muli-OTR system



Multi OTRs being assembled at KEK-ATF2 (Tsukuba, Japan)



Developing a MATLAB GUI for EPICS control system architecture to control and DAQ the mOTR monitors [Beam spot measurements]

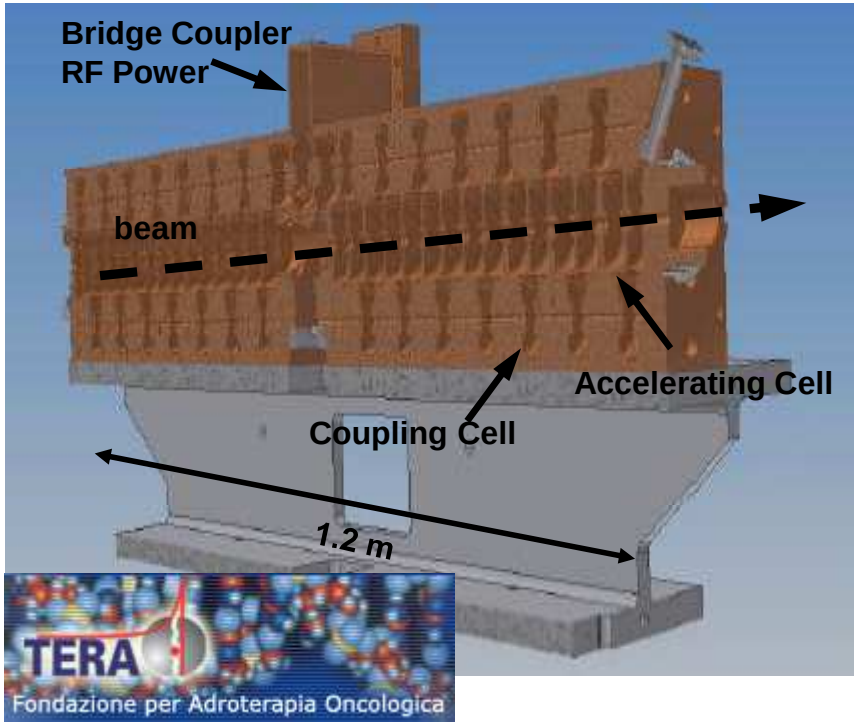


FONT4 movers

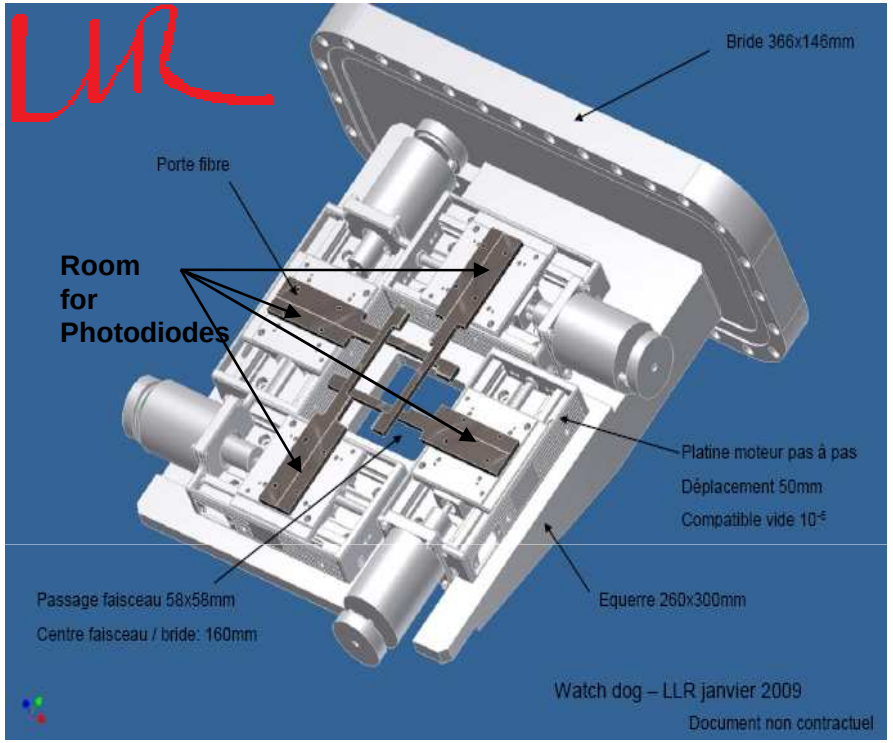
Installed at KEK-ATF2

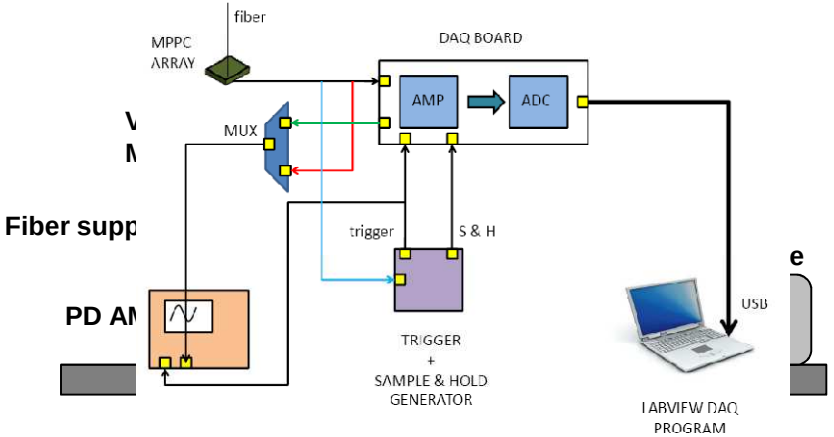
Medical Physics Projects

CABOTO:Carbon Booster for Therapy in Oncology
[Power RF Superfish Simulations]



Watchdog BPM for protontherapy





Schemes of the proposed test stand to validate the WD-BPM photodiodes technology.

Needs of GAP from the IFIC Electronic Unit

- PCBs fabrication (always):
  - prototyping scale (few units but many tries)
  - small scale productions (≤100, depending on complexity)

- PCB layout design (sometimes):
  - Help in the layout design with new CAD tools
  - Request for full layout design in case of simple PCBs

- Equipment and electronic tools lending (always):
  - General purpose equipments (Power supplies, scopes, waveform generators, multimeters, soldering stations…)
  - Electronic components: RLCs, diodes, transistors, connectors, wires,…

- Consult and seeking advice (always):
  - Extended to all the IFIC electronic people
  - More than usually, our different application fields have common electronic concerns → Colaboration is cool!!!

Remember!
We are the ELECTRONIC

Muchas Gracias