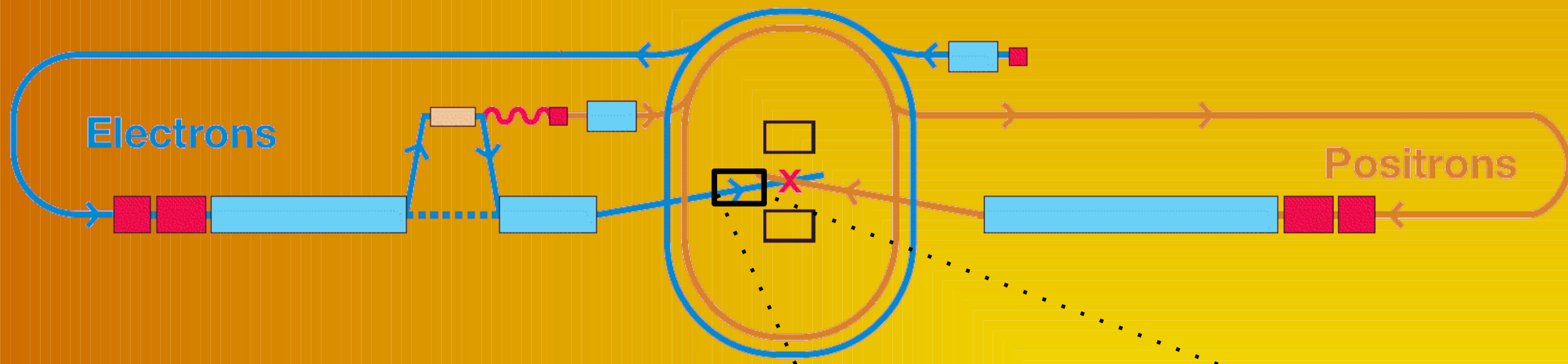


The International Linear Collider Measuring the Beam Energy

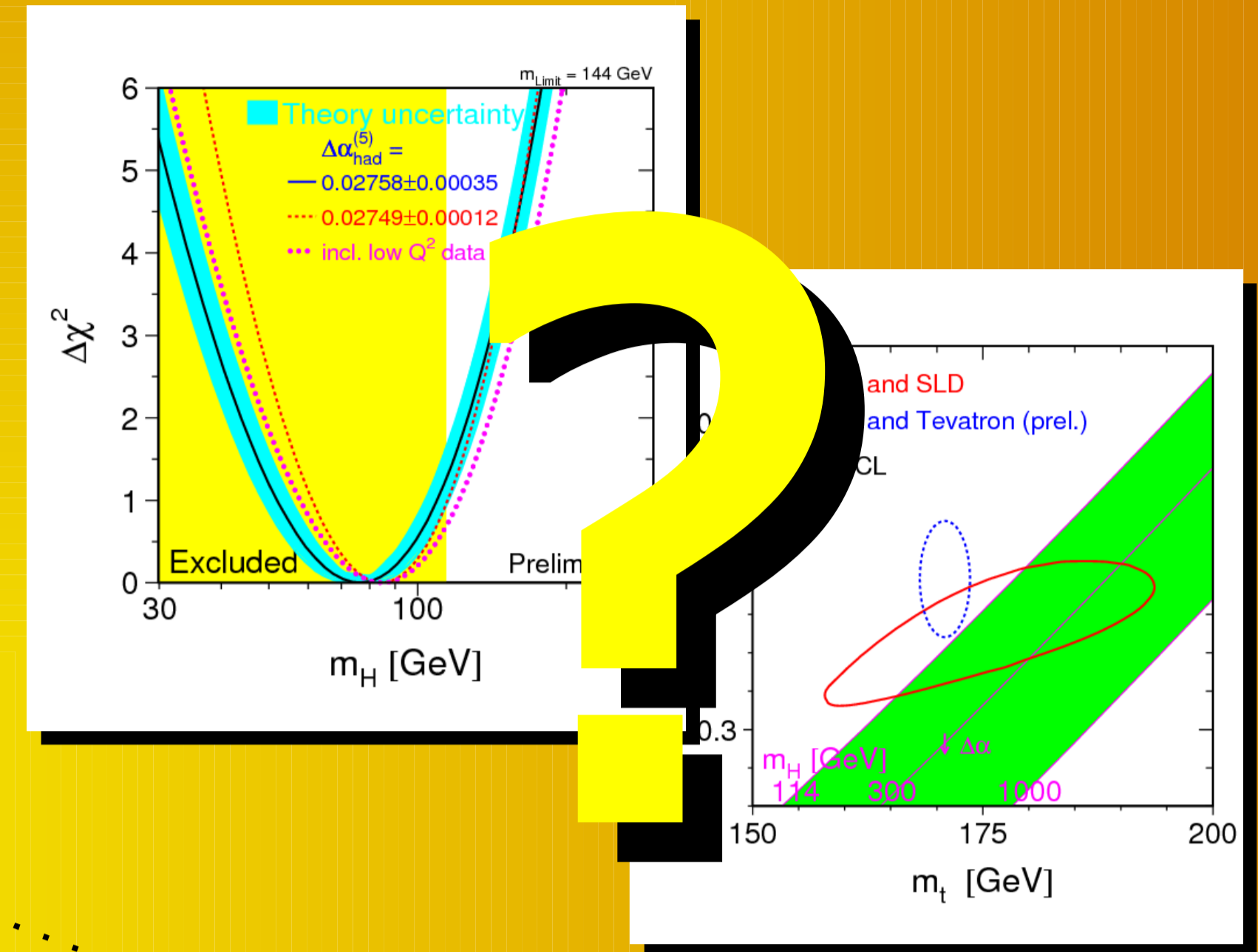


UCL

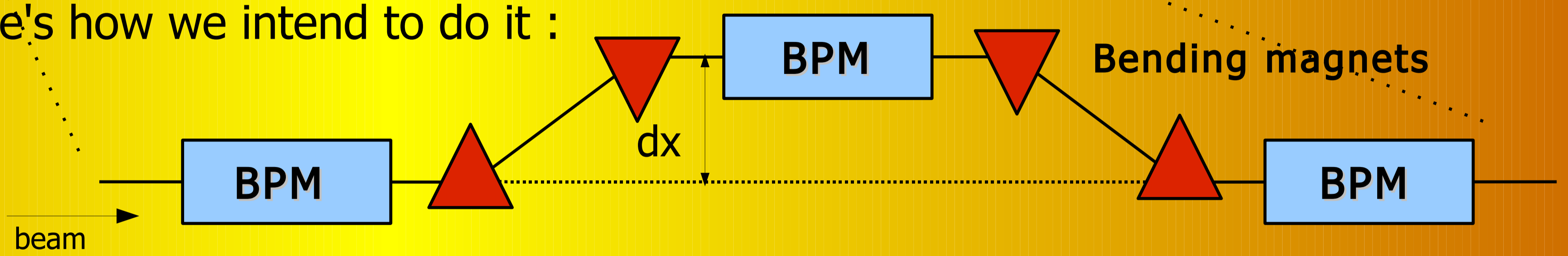
Poster created by Bino Maiheu (bino@hep.ucl.ac.uk), Filimon Gournaris and Alexey Lyapin



At the International Linear Collider, or ILC, electrons and positrons collide head-on with an energy roughly that of a flying mosquito. We however need to know this energy better than 1 part in 10000 if we are to make good physics measurements of e.g. the Higgs boson mass or top quark mass. Since it is a linear machine, we only get one shot to measure this energy as precisely as possible. Here's how we intend to do it :



The energy spectrometer will be part of the beam delivery system, which transports the high energy beam from the accelerator to the interaction region.



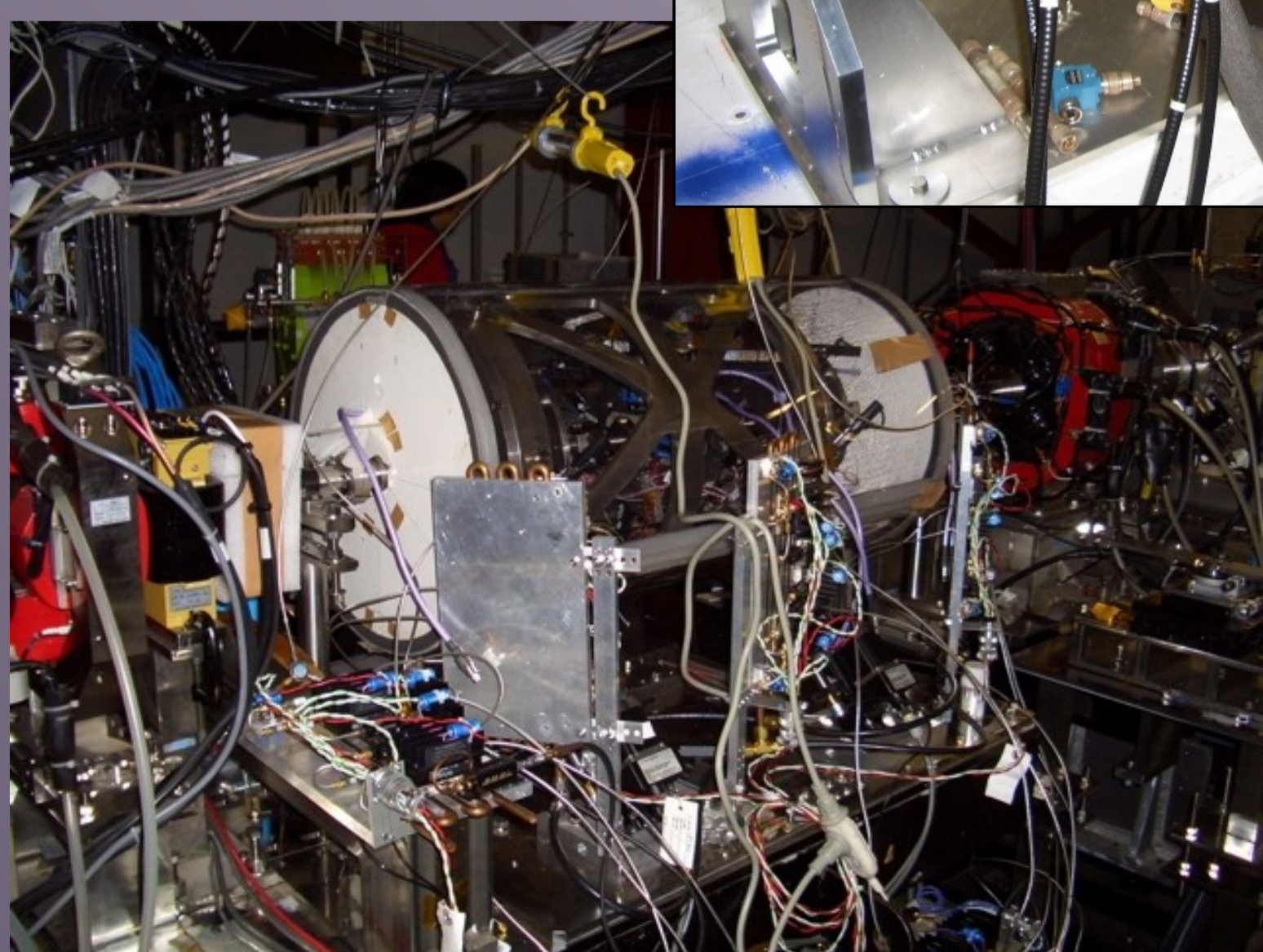
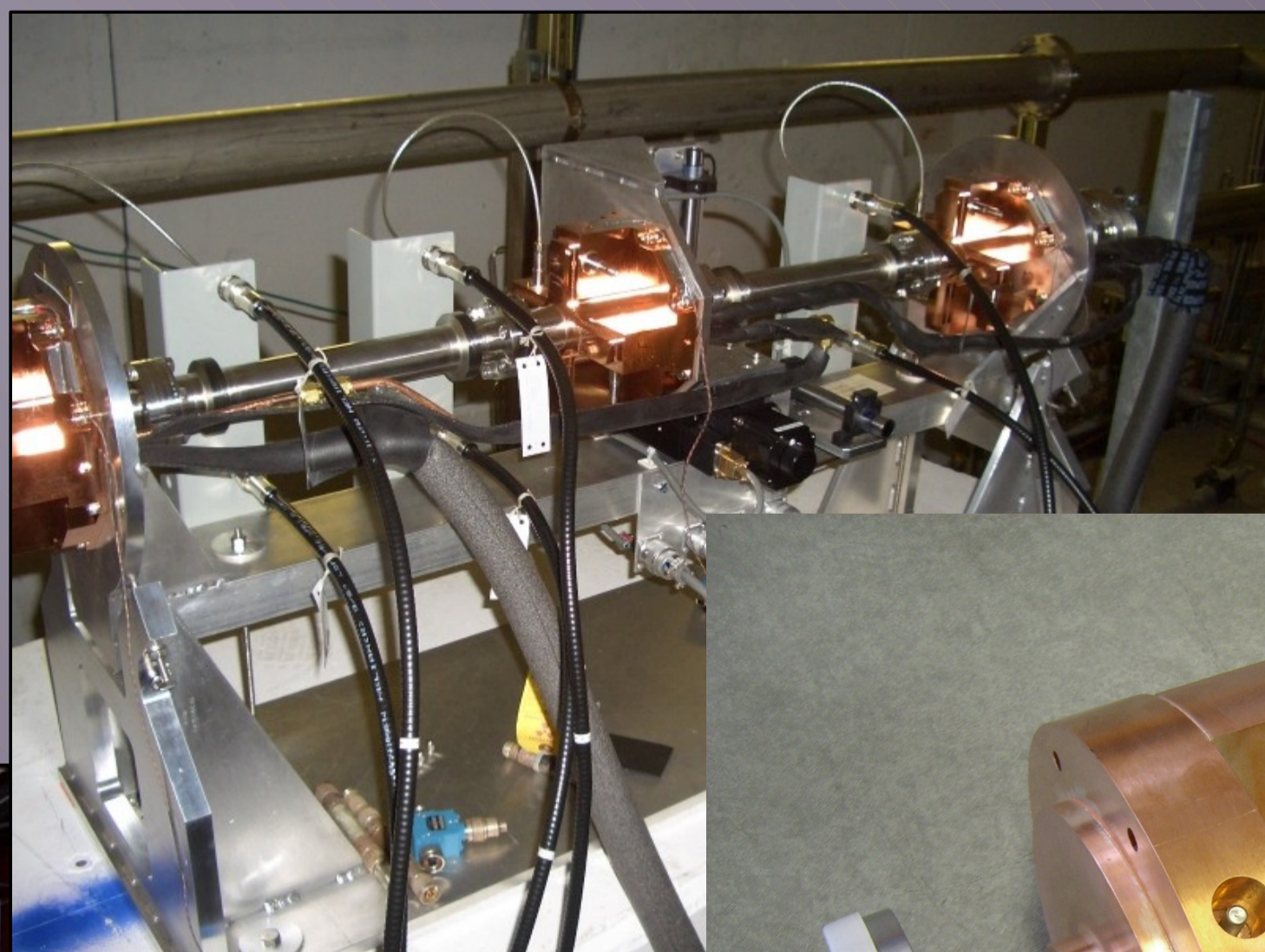
$$dx \propto \frac{q}{E} \int B \cdot dl$$

By sending the electron and positron beams through a magnetic chicane, we offset their trajectory by about 5 mm. The measured beam deflection dx is inversely proportional to the beam energy E (Lorenz Force) ! Various techniques allow us to measure the magnetic field of the bending magnets to a very high accuracy, so if we can measure the beam offset precise enough, we can determine the energy of the beam to the level which is required by the physics goals of the machine.

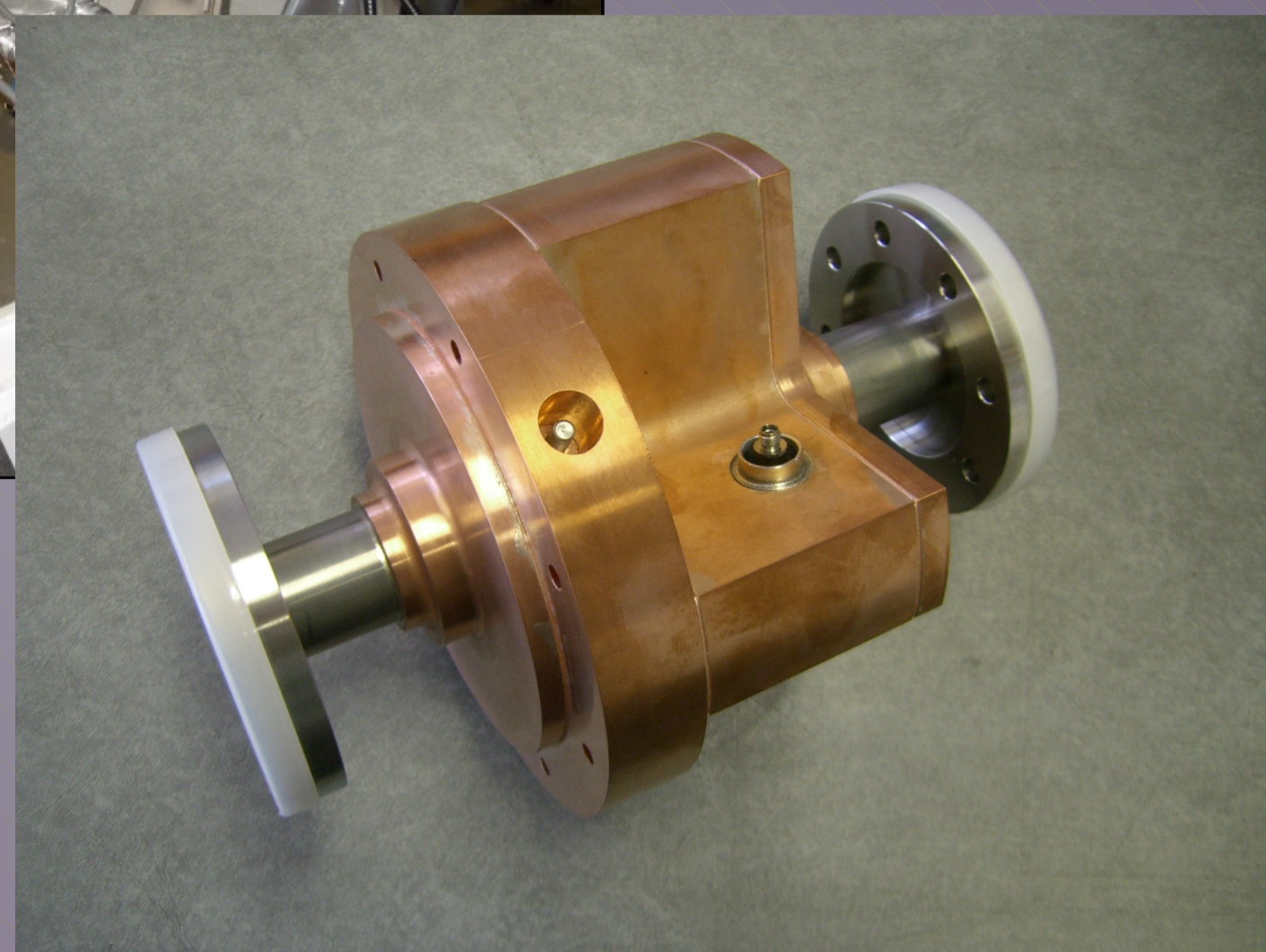
We here in the UK are heavily involved into the development and commissioning of these cavity BPMs :

Cavity BPMs are able to measure the electron beam position to better than 100 nm (that's 1000 times less than the thickness of a piece of paper !!!)

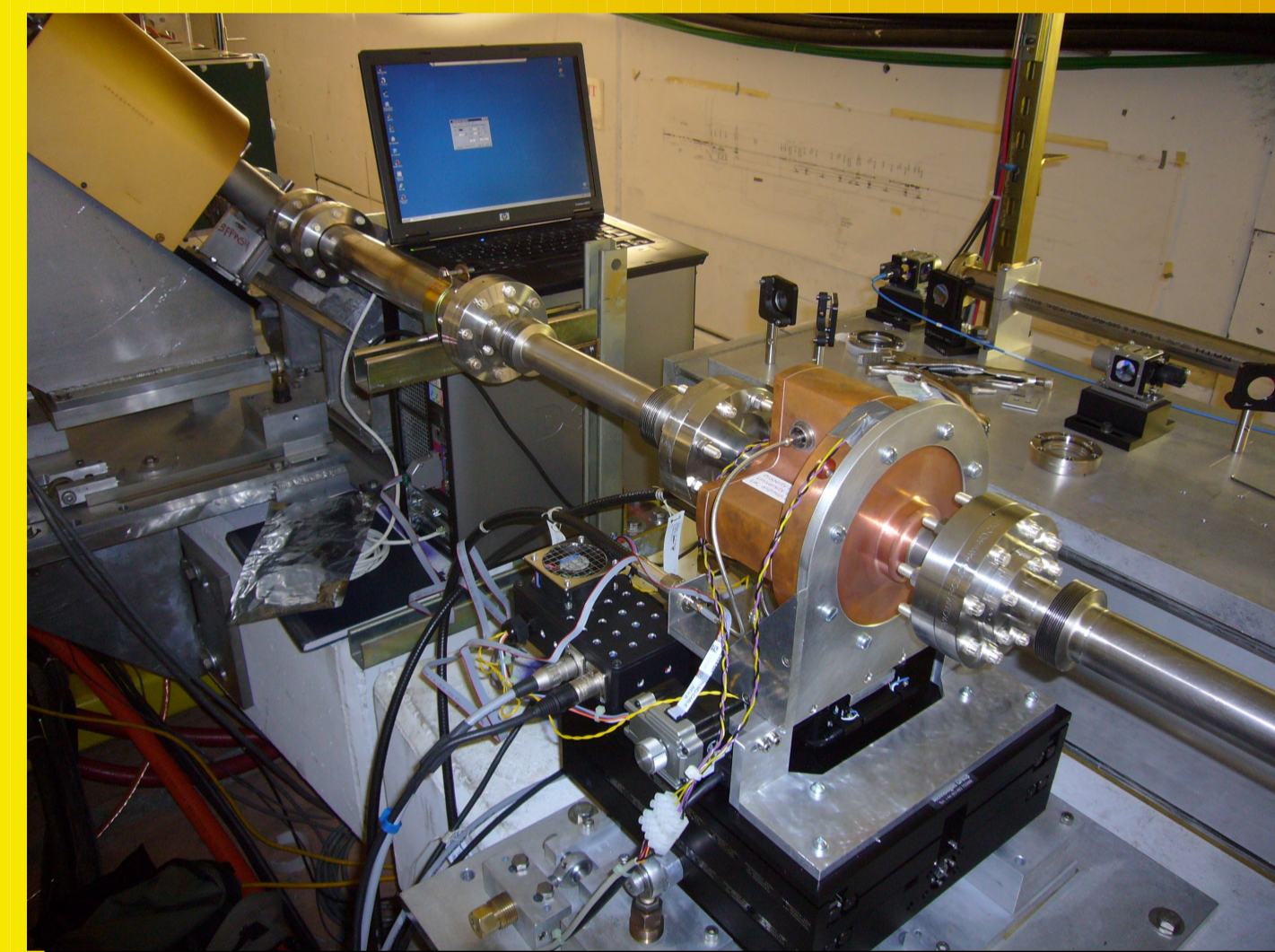
ILC accelerator BPM prototypes at the Stanford Linear Accelerator Center in California



This system at ATF in Japan even measures down to 10 nm !!!



Energy spectrometer BPM prototype, developed at University College London and Royal Holloway University of London



Our BPM prototype installed in the beam line on a 2D mover system.

Our BPM prototype read-out electronics



The UK is a key player in the T474 test experiment at SLAC which developed a prototype energy measurement chicane that serves as a miniature test bench of the future ILC energy spectrometer...

