

Case Study of a Royal Society/JSPS Bilateral Project “Development of electron beam size monitor using laser wire”

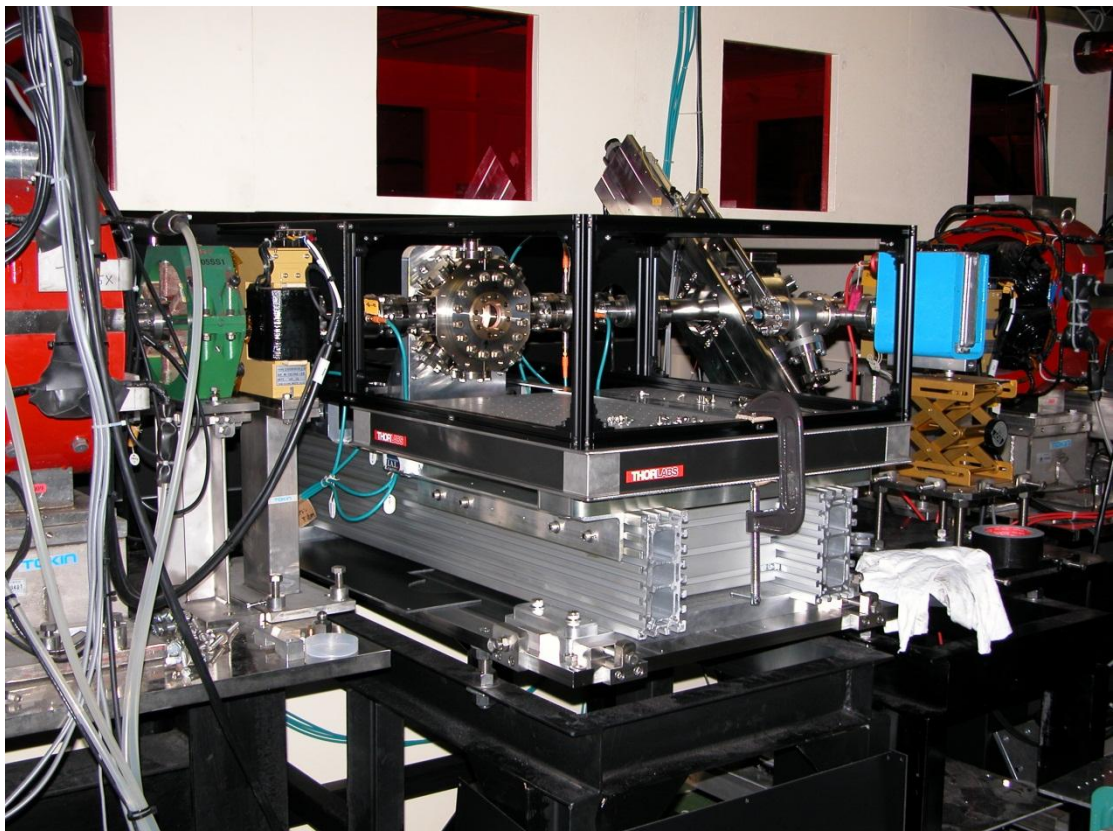
The aim of the project was to produce a prototype fast-scanning “laser-wire” device for measuring the transverse beam sizes of the next generation of electron accelerators and to train young physicists from the UK and Japan in accelerator beam diagnostics. A laser-wire works by scanning a finely focused laser beam across the electron beam and by counting the rate photon-electron (Compton) scattering as a function of relative position of laser and electron beam. The main challenges are to achieve very small (micron scale) laser spot sizes that can be controlled and scanned in an accelerator environment.

The project involved the Department of Physics at Royal Holloway, University of London (RHUL) and the Accelerator Test Facility (ATF) at KEK, the Japanese laboratory for high-energy physics in Tsukuba. The collaboration arose in the context of accelerator beam diagnostics needs for a future electron-positron linear collider, where the project leaders had met and discussed the research and development needs. The award was for £12k over three years to enable researchers, including younger ones, to travel to KEK and work on the ATF. The ATF is one of the most appropriate facilities worldwide for studies of very high quality electron beams and the UK partners benefitted greatly by direct access to it. The Japanese partners benefitted from UK researchers working at their accelerator facility and from the new diagnostics possibilities opened up by a functioning laser-wire system.

Additional projects and ideas have arisen from this project and a JSPS fellowship and additional funding has subsequently been awarded. Crucially, a new generation of researchers has been trained and has collaborated successfully in Japan and strong productive links have been established, which will last.



Dr. Lawrence Deacon on the ATF beam-line next to the laser-wire detector system



Early laser-wire beam line (before full installation), main vacuum chamber can be seen at the centre, with beamline magnets etc. either side