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PRESS INFORMATION

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Customised microwave nanosecond 'kicker' amplifier from TMD successfully tested at Japanese National Accelerator Laboratory by Oxford University and STFC team

- amplifier designed for the proposed International Linear Collider project for investigating and extending our knowledge of the Universe

A special microwave nanosecond 'kicker' power amplifier custom designed and developed by British SME electronics manufacturing company TMD (TMD Technologies Limited) for Oxford University's John Adams Institute for Accelerator Science and the *STFC Accelerator Science and Technology Centre has successfully passed prototype testing at the Japanese National Accelerator Laboratory (KEK) at Tsukuba.

The new TMD PTT4200 very high speed pulse 'kicker' amplifier (see below) is a critical part of an ultra fast feedback system being developed by the Oxford University and STFC team for steering the nano-sized electron and positron beams into collision at the proposed *International Linear Collider (ILC). The project called Feedback On Nanosecond Timescales (FONT) is aimed at designing, building and testing a prototype system that can be incorporated into the ILC Engineering Design that the *Global Design Effort team expects to prepare over the next three to four years.

Exploring the Universe

The main scientific aim of the enormous proposed 30 km long ILC will be to reveal the mechanism for generation of mass in the universe by zooming in on the 'Higgs Boson' or 'God particle', as well as studying 'dark matter', and looking for extra dimensions of space.

Said FONT team leader Professor Philip Burrows: “The feedback system will detect the positions of each of the 3000 bunches of electrons and positrons that will be fired at each other five times every second. Ground motion caused by ‘noise’ from the huge collider facility will conspire to make the beams miss one another unless we actively intervene. FONT will use the first few bunches to figure out by how much the beams miss, and then apply a correcting kick to steer the subsequent bunches into head-on collisions. Without us the ‘luminosity’ (rate of interesting events) at the ILC will be essentially zero. Since the bunches will arrive every couple of hundred nanoseconds,” continued Professor Burrows, “the feedback needs to respond extremely quickly. That is a major technological challenge.”

TMD’s PTT4200 Amplifier Plays Major Role

A key part of the feedback system, the PTT4200 amplifier from TMD drives a stripline kicker to provide the correcting kick to the particle beams in the linear accelerator.

The amplifier features a very high power differential output stage capable of providing +/- 70 amps peak output currents to the kicker with a delay, including risetime and kicker inductance, of only 35 nanoseconds. To do this the amplifier employs multi-parallel output channels, with the input stage isolated to prevent ground loops.

Amplifier power consumption is minimised by de-powering the circuitry outside the pulse period – achieved by using a separate trigger input to enable the amplifier before each pulse. The very compact design greatly simplifies installation in the confined space around the beam tunnel and permits the shortest possible lead distance to the kicker.

Close Liaison

As a result of TMD’s close working relationship with the FONT team, the PTT4200 amplifier passed prototype testing with flying colours recently at the KEK accelerator at Tsukuba in Japan. “The TMD amplifier worked beautifully”, said Professor Burrows, “and I am pleased to say that the successful outcome puts us in a strong position to lead the ILC feedback system design.”

“Developing this new amplifier presented an interesting technical challenge for us” said Howard Smith, TMD's Engineering Director. “However, due to our strong collaboration with the FONT team the development went very smoothly and we were able to finalise the prototype in just sixteen weeks from start to finish. This project represents a good example of TMD's proven expertise in designing cutting edge, technically demanding products to specific requirements and to a short time scale – a capability officially recognised by our recent Queen’s Award to Industry for Innovation”

Faraday Partnership

The kicker amplifier project evolved through the High Power Radio Frequency Faraday Partnership and a *CASE Studentship between TMD and Oxford University. Doug Clunie, Director of the Faraday Partnership commented: “This is a good example of British hard won, world-leading capability in the field of radio frequency systems. Much of our business is in defence and industrial processing, but accelerators offer great potential for scientific and medical research and present great new opportunities for British industry.”

TMD

TMD is a British SME manufacturing company located in West London - close to London Heathrow Airport. All operational functions are within the one location, streamlining the transition between development and production.

The company designs and manufactures specialised transmitters for radar and electronic warfare applications, high voltage power supplies and microwave tubes. It also produces a range of commercial amplifiers for EMC testing, medical and scientific applications.

TMD has won two UK Queen’s Awards for Enterprise – in 2004 for International Trade and in 2005 for Innovation

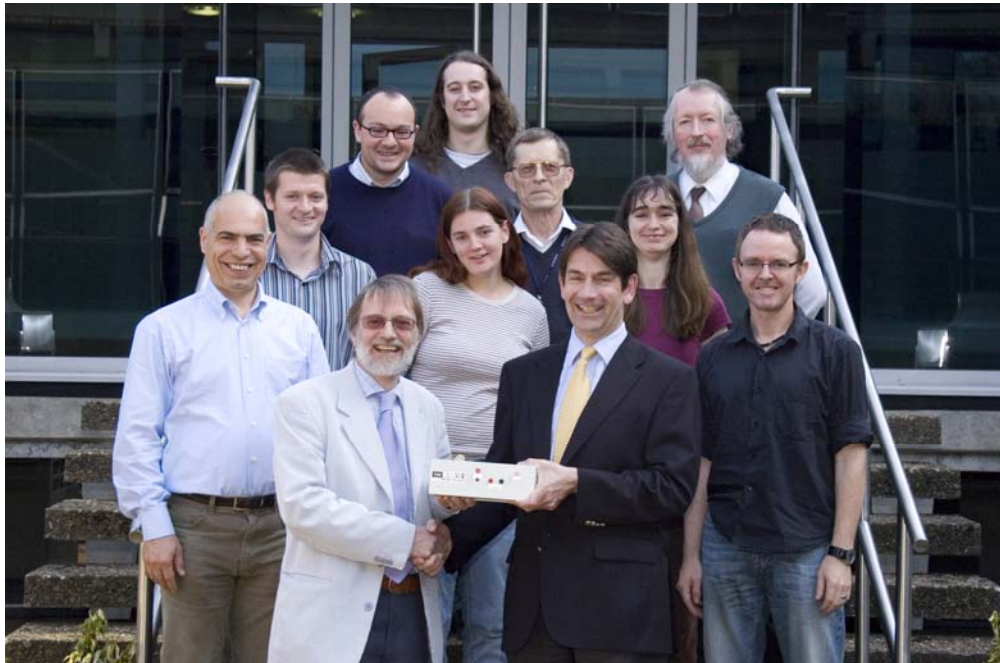
*NOTES FOR EDITORS

STFC stands for Science and Technology Facilities Council, and is a recent amalgamation of two research councils, namely: the PPARC (Particle Physics and Astronomy Research Council) and CCLRC (Council for the Central Laboratory of the Research Councils).

The International Linear Collider (ILC) is a proposed device to collide electrons (-ve charge), accelerated from one end of the machine, with positrons (+ve charge anti-matter electrons) from the other end. The ILC will be about 30 km long, and operate at energies in the range 0.5 - 1 TeV (i.e. accelerated by the voltage equivalent of up to 1,000 billion volts).

The Global Design Effort combines the work of research institutes and universities in many countries to produce a detailed design of the ILC. Countries tend to specialise in particular aspects of the design. For example the UK is involved principally with the 'Beam Delivery System' – hence the kicker amplifier from TMD is part of the final beam delivery system that steers the beams so that they collide.

CASE Awards are awards by British industry to partly fund postgraduates at university. The projects the students work on are agreed between university and industry.



The FONT team, with Howard Smith (left) presenting the TMD amplifier to Professor Philip Burrows.

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Digital images available from Heather Skinner at TMD