

# In Focus

THE MAGAZINE FOR THE CUSTOMERS OF TMD

## TMD Enhances S Band ATC Transmitter Design

**In August 2005 TMD (TMD Technologies Limited) reported on the development of an S band transmitter for Air Traffic Control. In the last year we have evolved the design to improve its features and benefits - based on direct feedback from the market and key customers.**

The enhanced design PTX7602 transmitter is now built up of a series of in-service replaceable LRUs. (Line Replaceable Units). Unlike most previous TWT-based ATC systems this new design minimises the potential exposure to EHT, providing a safe and user friendly environment for the operator. Using techniques derived from TMD's extensive experience in developing and manufacturing high performance transmitters for aerospace applications within limited space, each LRU has been designed to be compact and is self contained within a standard 19 inch rack.

TMD's PTX7602 transmitter incorporates well established, existing components with world beating performance. The design provides excellent low phase noise which enables enhanced radar performance and range. The control interface of the system has been optimised and provides remote operation and status monitoring, offering a number of diagnostic outputs for test purposes.



Capacitor Module, part of the PTX7602

At the heart of the transmitter is TMD's PT6055 S band TWT which, with its high efficiency, reliability and long life has proved a great success in Watchman Radars. The TWT also offers the advantages of predictable managed power with reliable through life support and reduced total life cycle costs over solid state alternatives.



To support the new PTX7602 product generation, TMD has established a fully contained, dedicated production facility within its headquarters at Hayes, West London where the TWT and LRUs are built, integrated and 100 percent tested.

Earlier this year TMD reached an agreement with NATS-NSL to provide the new transmitter as a basis for NATS

Air Traffic Radar solutions. We have received our first order for transmitters from NATS-NSL for a new UK based radar installation due to be completed in December this year.

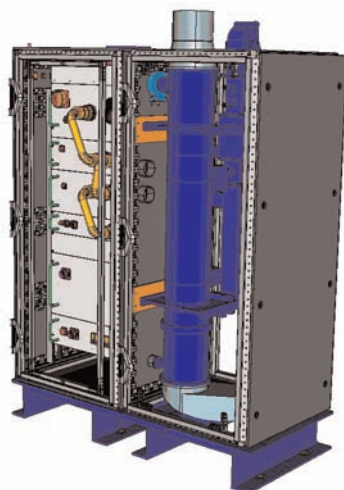
The system is being built at Kincardine near Edinburgh in order to mitigate the effects of Scottish Power's Whitelee Wind Farm on the ATC at Glasgow International Airport, by providing an additional data feed. This will become a reference site for future UK and international installations and the significant improvements in performance expected are already proving of considerable interest to the overall market.

Andy Shrubsole  
Sales Manager for ATC Radar

### Breaking News

#### From Russia With Love

TMD is pleased to announce its very first order from Russia - for instrumentation amplifiers. This order highlights the continued expansion of this part of our business worldwide.

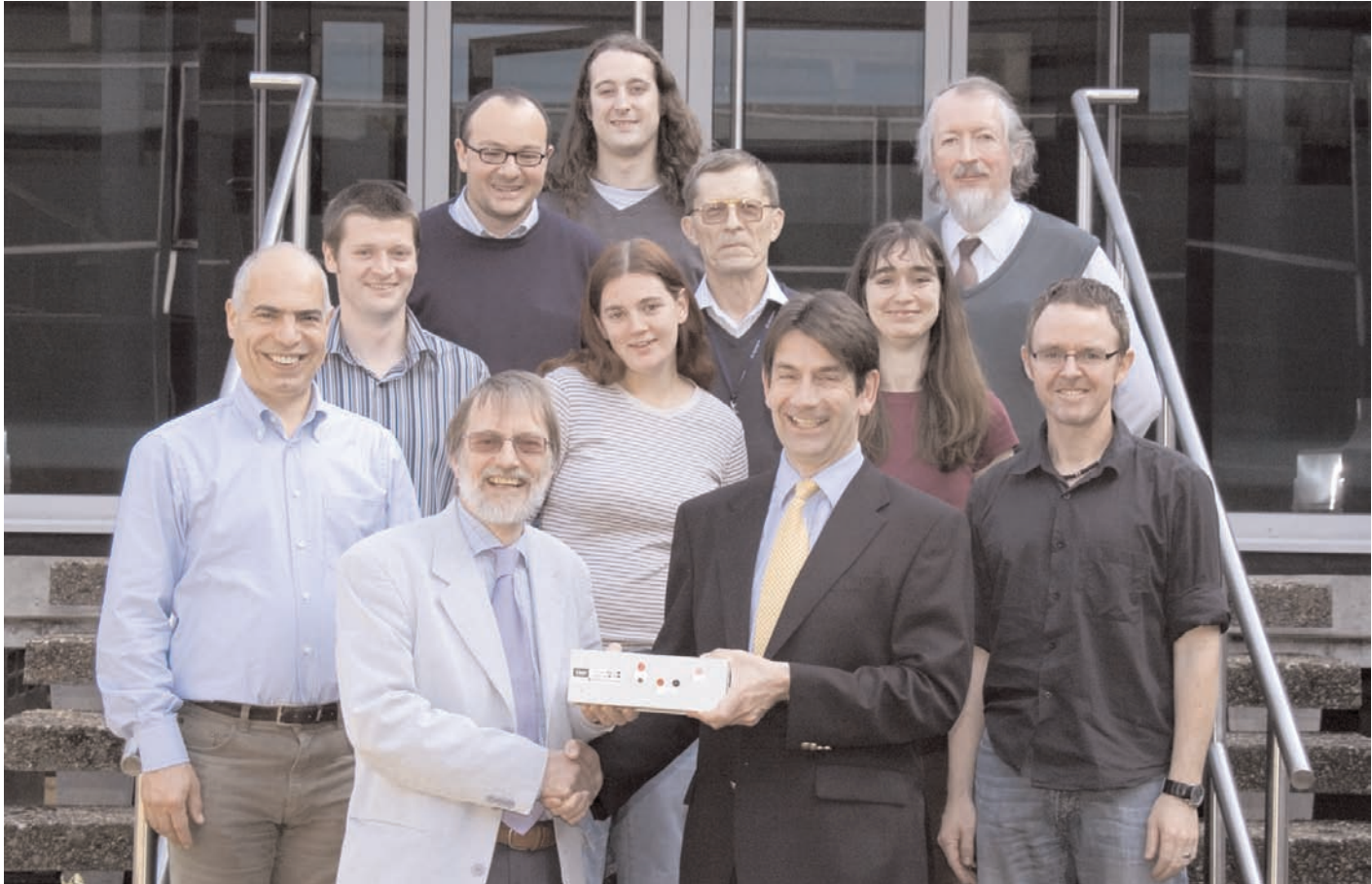


CAD representation of PTX7602 transmitter

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## INNOVATION

# TMD Helps Extend Our Knowl



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

A special microwave nanosecond 'kicker' power amplifier custom designed and developed by TMD 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 opposite) 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

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## Knowledge of the Universe

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 earlier this year 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."

### \*Notes

**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.

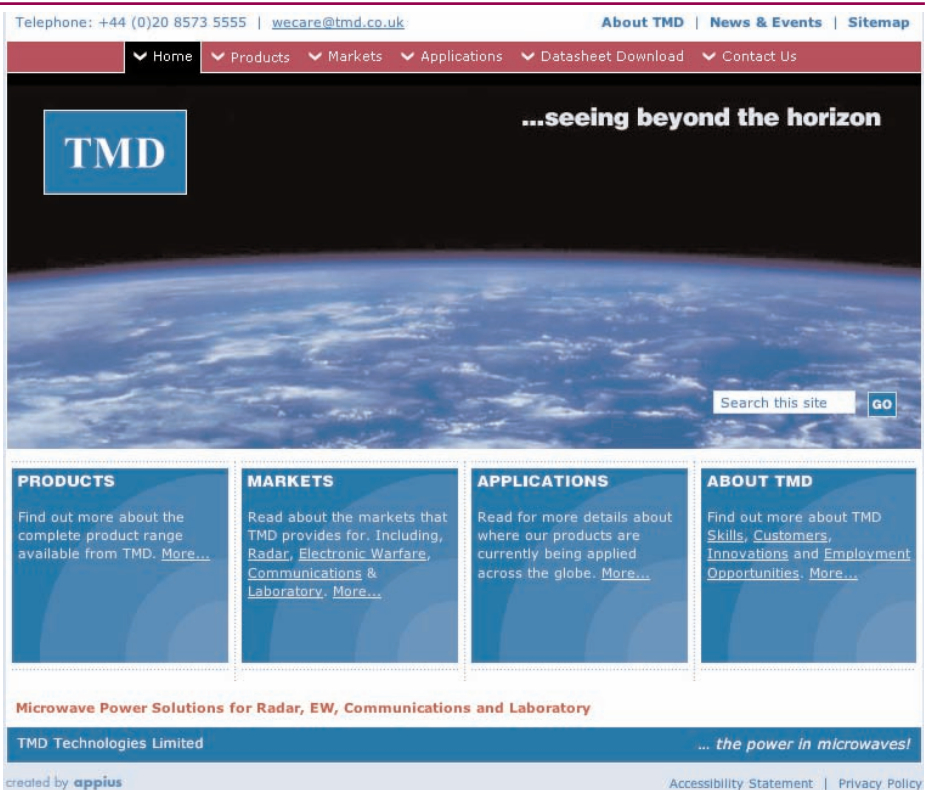
**CASE Awards** are awards by British industry to partly fund postgraduates at university. The projects the students work on are agreed between university and industry.

## New Website

TMD recently decided that it was again time to make major changes to its website. [www.tmd.co.uk](http://www.tmd.co.uk)

The reasons for this were several-fold. We partly wanted a refreshing new look but, of equal importance, we wanted a website which would be accessible to a wide range of different users, including engineers primarily interested in product details, buyers interested in product summaries and applications, and senior executives who require background information and reassurance that we have an understanding of their markets.

Web design experts Appius E Business analysed all these possible user journeys for us and designed and built the new site in close collaboration with Heather Skinner, TMD's Publicity Manager. As a result we have added many new products for engineers and also improved the datasheet download interface. For the less technically minded there is more information about the markets and applications we are involved with.



We hope everyone will find the enquiry mechanism and overall navigation quick and easy to use.

The new site is now live and we would welcome your constructive feedback to: [wecare@tmd.co.uk](mailto:wecare@tmd.co.uk)

# TMD on Show

## Paris Air Show 18-24 June 2007

Once again several key members of TMD's sales team visited the Paris Air Show, Le Bourget, in June to meet up with existing customers and develop new opportunities for the company's expanding avionics market.

Commented Stuart Love, TMD's Sales Executive for Radar: "Despite the changeable weather the event was well attended and the mood of the visitors and exhibitors was enthusiastic and upbeat. The star of the show was, of course, the Airbus A380. Immense, yet supremely elegant, this advanced new aircraft set the scene for a buoyant and positive future for the industry".



Airbus A380 at the Paris Air Show

## NVEC Conference 3-5 July 2007

TMD was a Gold Sponsor for the National Vacuum Electronics Conference 2007, promoted and managed by the Faraday Partnership on High Power RF Engineering and held at the University of Surrey in July. The event was supported by the Institution of Engineering & Technology and the Institute of Physics.

The conference format highlighted the applications for high power microwave devices, as well as presenting the state of the art technology in vacuum electronics.

TMD gave several papers under the general headings of Modelling, Systems Engineering, and Device Technology.

## Forthcoming Events

### European Microwave Week 2007 8-12 October

TMD will have a presence on Nucletron's (TMD's German representative) Stand **1010** at the International Congress Centre, Munich.

We look forward to seeing you there.

### EMCUK 2007 16-17 October

This event is dedicated to the EMC industry, and will be held at Newbury Racecourse. TMD will be demonstrating its range of amplifiers for EMC testing - in particular High Intensity RF (HIRF) testing to the latest RTCA/DO160-D category K specifications.

We will be sharing Stand **15** with antenna specialists Q-par Angus, with whom we have provided systems offering impressive field strengths ( $> 3 \text{ kV/m}$  @ 1 metre). We welcome your visit to discuss your requirements.

### AOC Symposium & Convention 2007 28-31 October

At this specialist electronic warfare event, to be held at the Caribe Royale, Orlando Florida, TMD will be showing a range of microwave products comprising mainly power supplies and MPMs (Microwave Power Modules) for naval, airborne, and ground based ECM electronic warfare applications.

Come and see us on Stand **307**

### TMD Technologies Limited

Swallowfield Way, Hayes, Middlesex UB3 1DQ UK  
Telephone: 020 8573 5555 or  
44 (0)20 8573 5555 (international)  
Fax: 020 8569 1839  
Web: www.tmd.co.uk

**Customer Care**  
wecare@tmd.co.uk

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