

# In Focus

THE MAGAZINE FOR THE CUSTOMERS OF TMD

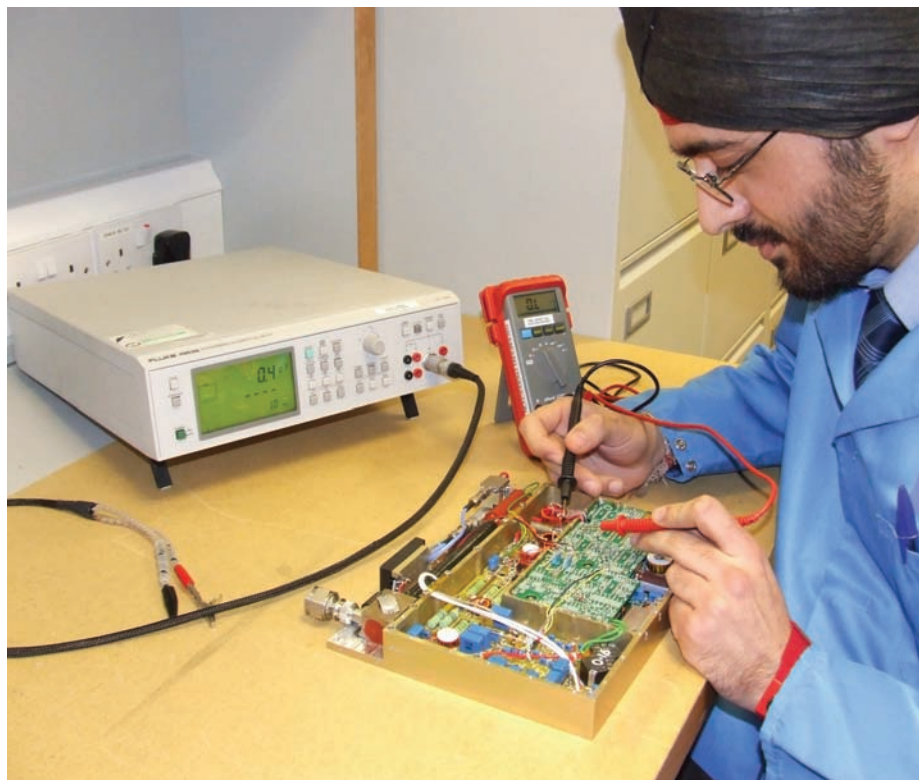
## TMD Introduces New PTX8000 Family of Ultra Compact MPMs

**TMD (TMD Technologies Limited) has launched a new family of versatile ultra compact microwave power modules (MPMs) for a variety of applications ranging from high PRF, low noise pulsed radars (both ground based and airborne) to CW electronic counter measures (ECM) and SATCOM. The ability to use a wide range of travelling wave tubes (TWTs) allows the MPMs to provide optimal performance for each application.**

Offering many user benefits, the new PTX8000 family integrates a 'Super Mini' TWT, solid state preamplifier, and optimised high density switched mode power supply to form a single small, low weight 'drop-in' microwave amplifier block. The reduction in size (dimensions typically only 250 x 200 x 32 mm) plus the elimination of TWT interconnections not only simplifies system design and installation but also increases reliability and minimises safety hazards. The MPMs also feature excellent thermal management - with the inherent high electrical efficiency resulting in reduced thermal dissipation to further increase reliability over a wide range of operating temperatures. Performance is factory set, obviating the need for any user adjustments in the field and if necessary permitting easy field replacement of the complete unit.

The first three members of the family to be launched, the PTX8100, PTX8200 and PTX8310, between them offer a maximum power output of 100W CW at frequencies ranging from 2-18 GHz. The MPMs have been designed with built-in flexibility, allowing different power outputs and frequencies to be specified to meet particular customer requirements.

The MPM features low broadband noise, attained by the use of a low gain TWT



*TMD's new MPMs offer many user benefits for ECM, radar and SATCOM applications.*

together with a low noise solid state preamplifier. A high speed focus electrode modulator permits operation at high PRFs (e.g. 100 kHz on the PTX8100 and PTX8200), making the MPM ideal for pulsed applications such as ECM and radars. The use of a fully encapsulated high voltage section allows the MPM to be used at high altitudes and in high humidity.

*First order - see overleaf.*



### TMD's High Power Pulsed TWTAs for HIRF Testing

TMD has achieved major developments in its high power pulsed compact commercial amplifier range covering 1-40 GHz - in particular, two new products which achieve over 6 kW at L band frequencies.

These developments have generated considerable interest in the marketplace, and major contracts have already been received from Europe and the USA.

*See overleaf for main article.*

## TMD's Instrumentation Amplifiers Deliver High Power at L Band!

TMD first began developing its range of laboratory instrumentation microwave amplifiers for EMC testing, scientific and medical applications in the 1990s. The technology grew from TMD's strength in high power military radar amplifiers and provided the marketplace with units of equal reliability and high performance, but re-packaged for less demanding physical environments into compact, affordable 19 inch rack mountable units.

Since then, TMD's instrumentation amplifiers, which cover the range 1-40 GHz, have gained a worldwide reputation for design innovation, offering many unusual and unique products unobtainable elsewhere.

This innovation is driven by the needs of the market. In particular, changing EMC testing regulations continue to offer many new challenges which we have to meet.

The latest amplifier developments, for example, have been driven by Aerospace EMC testing programmes related to the RTCA DO160 standards - particularly affecting new aircraft such as the Airbus 380 and Boeing 787. Due to the increasing use of carbon fibre in the structures, these aircraft are more susceptible to microwave radiation than the older style passenger aircraft with all-metal structures.

In particular, there is a need for the microwave amplifiers used in HIRF testing to deliver a peak power of more than 5 kW at L band frequencies, in order to achieve the necessary field strength requirements.

This is a technically challenging area for amplifier design in which TMD has succeeded. In 2002 TMD had already successfully developed a very special high pulsed power amplifier delivering a minimum of 20 kW from 1.1-1.5 GHz. This was for a specific programme run by the Swedish National Testing and Research Institute for susceptibility testing of vehicles - emulating the conditions generated by high power L band airport surveillance radars.

TMD has now further developed its capability with two new compact lightweight amplifiers, which together achieve a peak power of more than 6 kW from 1.0 to 2.0 GHz - at a size of only 4 U and without the need for water cooling:



TMD's instrumentation amplifiers have gained a worldwide reputation for design innovation.

PTC6704 1.0 to 1.5 GHz 10 kW at 1% duty

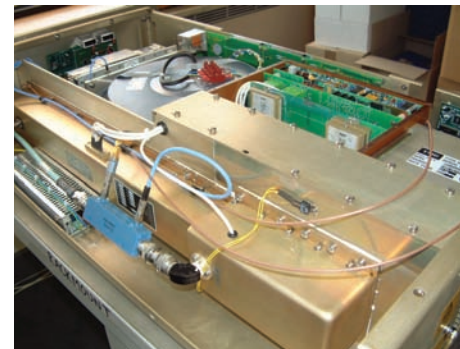
PTC6706 1.5 to 2.0 GHz 6 kW at 1% duty

For further information and quotation, please contact **Guy Howard** (International Sales Manager, Commercial Microwave Amplifiers) to discuss your requirements.

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## First MPM Order Already Received

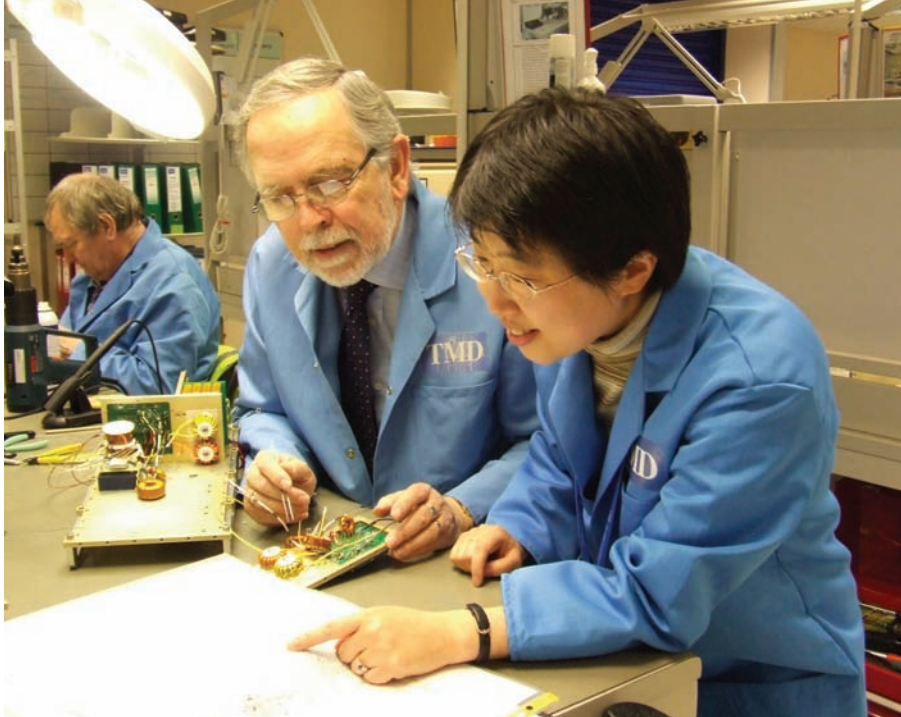
TMD has already received its first order for new products from the PTX8000 family of MPMs for ECM, radar and SATCOM (see front page).

A new customer has selected the TMD MPM for use on an airborne SAR demonstrator for ground mapping.

This customer is a world leader in the design and manufacture of satellite systems. The company's activities cover complete civil and military telecommunications and earth observation systems, science and navigation programmes, together with avionics and a wide range of space equipment and associated ground infrastructure.

## Evaluation of Lead Free Solder Alternatives

- by Richard Patrick; Manager, Equipment Division



*Dr Shubo Gao (right) supervises TMD's transition to environmentally friendly lead free soldering.*

As many of you will be aware the EU has introduced legislation that restricts the use of a number of hazardous substances - commonly known as RoHS (Removal of Hazardous Substances). The main part of this legislation, which came into force in July of this year, affects TMD's industry (i.e. electronics) and is aimed at removing lead (Pb) from products. Similar legislation is also likely to affect a number of other major markets for consumer goods such as Japan, South Korea, China and some states in the USA.

As a supplier of military and aerospace products, TMD and most of its customers are currently exempt from the legislation as its principal aim is to prevent the hazardous substances from polluting the environment via the consumer goods route. What is not immediately apparent is that this development will nevertheless affect exempt suppliers such as TMD by dramatically changing their component supply chain.

To appreciate this effect it is necessary to understand the make-up of a typical electronic component supplier's customer base. A typical electronic component supplier will have

no more than four main customers, spread across the mobile telephone or computer OEM markets - accounting for more than 98% of output - and these customers will be bound by the new legislation on RoHS. The remaining customers will require components at relatively low volume, and a small proportion of them, such as TMD, will be military/aerospace companies who are currently exempt from the legislation. Consequently, component suppliers will be converting their products and processes to lead free. In the course of doing this, the status of the older products will also be reviewed to see if it is worth converting them, and inevitably some of the lower volume products will be judged to be no longer commercially viable.

This rationalisation and change has two clear consequences: firstly leaded (Pb) components will become increasingly unavailable and thus commercially disadvantaged; secondly component obsolescence will accelerate rapidly. In fact, many component suppliers have been lead free manufacturing for some years and have claimed all products RoHS compliant by July 2006. Others, that can still supply lead-

containing components on special demand beyond July of this year, are currently rationalising the changeover to full lead free production, and will then cease the supply of lead-containing components when the majority of their customers request lead free.

It should be noted that the use of lead free solder in military/aerospace applications is not without complications. Recent problems experienced by the USAF have highlighted the capability of high tin content surfaces to produce unwanted 'Tin Whiskers' which is a frequently observed but not well understood phenomenon. This has resulted in the US DoD issuing a 'No Lead Free' edict. Other areas of concern are with the compatibility of lead free solders/fluxes and surface finishes of components and PCB pads, including solderability and long term reliability issues (military/aerospace equipment has a much longer life span than consumer goods and often any unreliability has much more serious consequences).

TMD recognised that the issues discussed were complex and serious and has taken action to mitigate them both in the short and long term. With reference to the lead free situation, TMD has established a Knowledge Transfer Partnership (KTP) between TMD and CRDM Research (Centre for Rapid Design & Manufacture), a Department of the Faculty of Technology, Buckinghamshire Chiltern University College (BCUC). The programme is partially funded by the Department of Trade and Industry, and the aim is to ensure that TMD's future PCB assembly processes will be compatible with lead free as well as lead-containing production.

The in-house programme will include the re-training of relevant TMD personnel in all aspects of lead free soldering technology. Dr Shubo Gao, who has a degree in Electronics Engineering and 10 years of industrial experience in electronics assembly, is responsible for the detailed planning and execution of the project, and is based at TMD's facility in Hayes, West London. She is working under the

# Product Reliability - continuous improvement programme

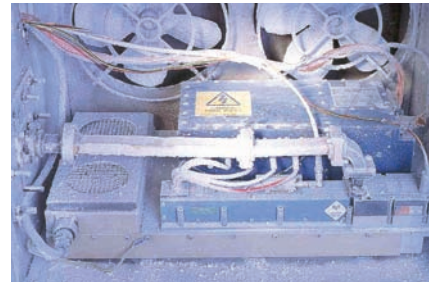
In this newsletter, two issues ago, we reported on TMD's new HALT programme (Highly Accelerated Life Testing) or 'being beastly to our products'.

To recap, HALT testing involves high speed temperature cycling combined with multi-axis vibration to excite and uncover any potential failure modes, whether they are problems in design or production. TMD has now applied this process to many of our well established as well as new product lines, and we have found this approach more effective than traditional reliability growth

programmes. Potential problems are now exposed much earlier and solved more cost effectively.

In order to help measure reliability faster and more objectively, the QA department has developed a special database to quickly analyse the reliability of each component in every product line, using data from testing, repairs and returns. This procedure has shown that we are achieving a steady increase in reliability across most product lines.

Moreover, this finding is supported by feedback from our largest customer indicating, for example, that whilst our



Tube and power supply at -55°C in one of TMD's environmental chambers.

older equipment is achieving over 2500 hours MTBF on rotary wing platforms, our newer equipment is achieving over 5000 hours on similar platforms!

## Evaluation of Lead Free Solder Alternatives (Continued from Page 3)

guidance of both TMD and David Jacobson, Professor of Materials at CRDM Research, BCUC, who is responsible for overall supervision of the programme.

"We are at present making and evaluating prototype assemblies", said Dr Shubo Gao. "An exhaustive test schedule has been devised in an effort to expose any problems with lead free soldering processes at an early stage; these tests will follow the recently published JEDEC/iNEMI Test Standards on Tin Whiskers in conjunction with TMD's HALT/HASS test specifications. The investigation also includes evaluation of the popular brands of lead free solders and PCB pad finishes for hand soldering production".

The first batch of lead free PCB assemblies has now been completed. Prototypes are being tested for Tin Whisker growth and will be compared with lead-tin soldered ones. A selection of components with different terminal finishes is also under evaluation. If we do encounter a Tin Whisker problem, and can understand and rectify it, this will generate considerable customer confidence in our processes.

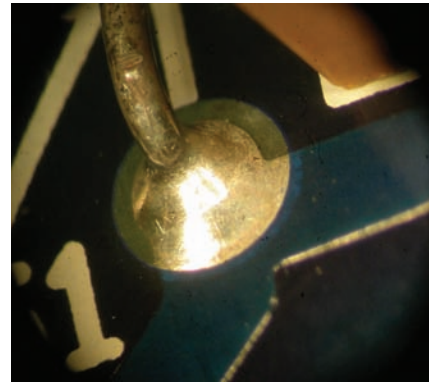
After thoroughly testing all potential choices of lead free PCB assemblies, the results will be compared for reliability, ease of assembly, quality and cost. Based on these findings, recommendations will be made for the future assembly process.

With reference to component obsolescence, TMD maintains a background programme to identify and

*'...Component obsolescence will never become an issue with our Customers'*

manage such component obsolescence so that it will never become an issue with our customers. So far this procedure has been entirely successful in maintaining TMD's capability to deliver highly reliable products despite the rapidly changing electronic component supply marketplace.

**A question:  
What are your other suppliers doing about lead free?**



Close views of lead free PCB assemblies.

**TMD**

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