

# Collaboration brings results on microwave amplifiers

Today's mobile information society needs higher microwave carrier frequencies and the possibilities to fully exploit available bandwidth. This requires special signals that can only be handled by microwave power amplifiers combining efficiency and linearity

Europe is renowned for its excellence in the field of microwave amplifiers for broadband wireless access, but research has been fragmented. Collaboration must be intensified among several highly specialised companies ranging from semiconductor foundries to system manufacturers and pockets of expertise in academic institutions if Europe is to break into the lead in this field. This issue is being addressed by the EC-funded project TARGET (Top Amplifier Research Groups in a European Team).

TARGET is a three year old 'Network of Excellence' that aims to create a new culture of cooperation and synergy within microwave power amplifier research in Europe. Its objectives are to create a durable co-operative network, establish a virtual centre of excellence and to stimulate and co-ordinate world-class research.

The expected benefits include greater efficiency, efficiencies of scale through avoiding duplication, and the achievement of a large critical mass.

With an EC grant of eight million euros for a period of four years and 49 members all over Europe (plus 21 associated members), TARGET is the biggest network in its field, possibly the largest ever international research cooperation in microwave engineering, and it has made considerable progress. In an interview with Professor Gottfried Magerl, Scientific Co-ordinator of TARGET, he describes the project's goals and achievements so far.

## eS: What is TARGET's scientific challenge?

**Gottfried Magerl:** The rapidly increasing number and variety of wireless services creates quite challenging demands for the enabling technology. In particular, power amplifiers in wireless systems play a key

role. They have to fulfil two basically contradicting requirements: efficiency and linearity. These conflicting specifications are the source of intense research and technological development.

## eS: What are TARGET's achievements so far?

**Magerl:** Our goal to establish co-operation and co-ordination between project partners has already been achieved by creating a common electronic platform. This has enabled us to establish pools of shared data and software tools, create a common virtual lab infrastructure, and

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launch our first research projects. At the end of TARGET's third year, an appreciable amount of research has been documented in international journals and at the top conferences in the field of microwave engineering. The strength of the network is drawn from partners' accumulated knowledge and skills.

The cooperation has resulted in the development of record-breaking power transistors, both in Silicon and wide band-gap technology, in the non-linear characterisation and modelling of power devices which enable wireless infrastructure designers to develop cost-effective, highly efficient amplifiers for mobile services. In addition, TARGET has accumulated extensive know-how in the design and linearisation of power amplifiers. In these activities, the in-depth knowledge of communications system architecture plays a decisive role.

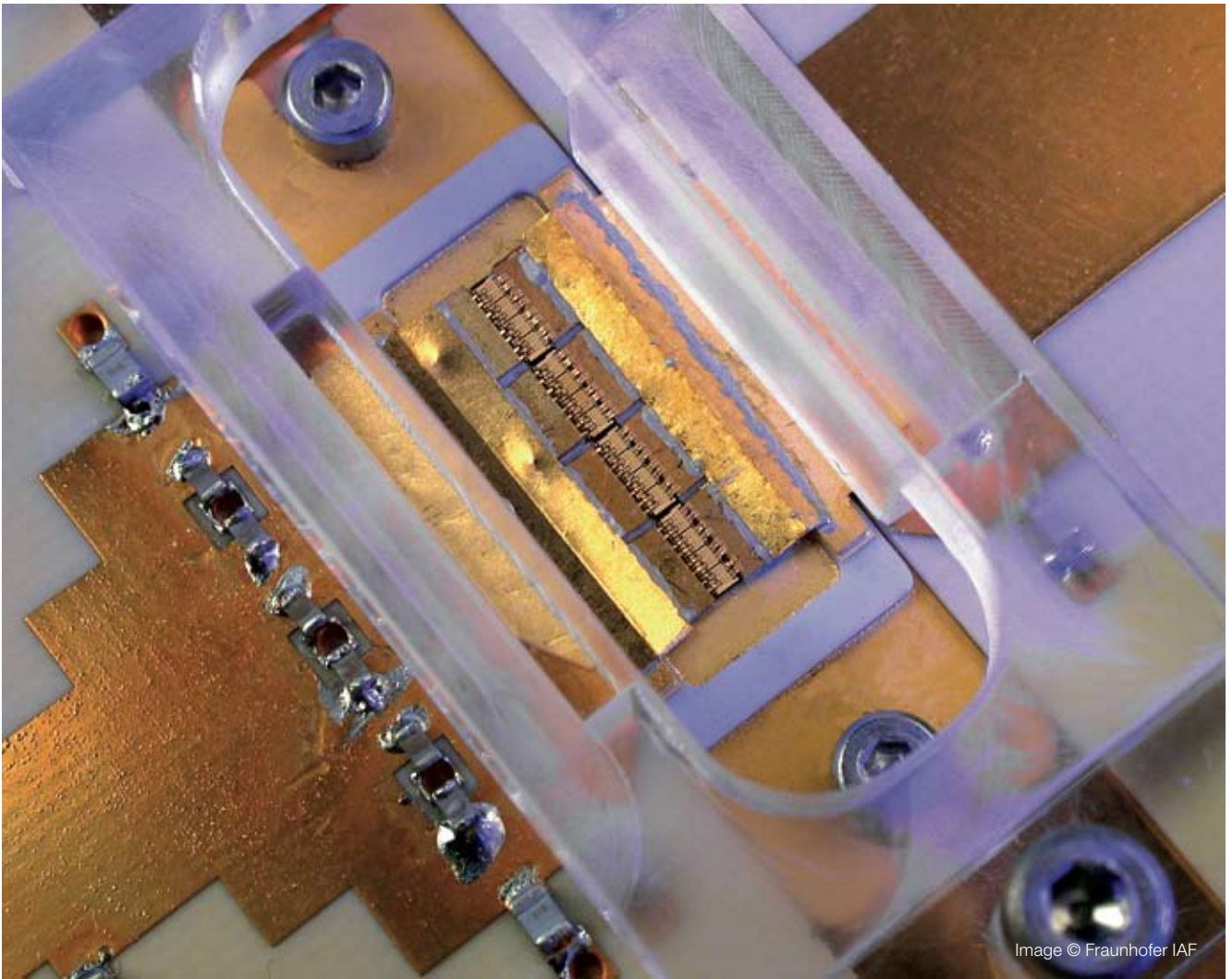
## eS: What are the benefits of such a network?

**Magerl:** Due to our joint research programme, there is of course a dramatic increase in collaborative research of organisations that did not team up before. We can also see that there is cooperation between project partners that goes beyond TARGET. Among others, the internal Exchange programme naturally helps to tie these knots as young researchers can visit partner organisations for several weeks in order to learn new scientific methods and techniques and to get familiar with working in changing teams.

## eS: Are there also benefits for non-members, for example for the industry?

**Magerl:** TARGET possesses an abundance of knowledge that is also transferred to the scientific community. We organise one summer and one winter school per year which are open to the public. TARGET also offers high-level training courses for the industry which can be tailored according to the special needs of our customers, and we will offer courses that are open to individuals in the near future.

A third benefit comes in the form of measurement and characterisation services. This expertise includes unique academic and intellectual capabilities in terms of metrology and semiconductor device physics which are combined to create modelling capabilities and a wide range of supporting software



tools. Our partner labs represent some of the best equipped labs in the world of microwave device characterisation. The by-line for these virtual laboratory services is 'CREATE FASTER'. It is TARGET's aim to help client companies to be more creative and to bring their creations to market more quickly. To do this, TARGET virtual labs will be able to generate models which have the correct level of accuracy for the required level of design. The engineer can be confident in the accuracy of the results and a better design should be possible. This reduced uncertainty about predicted performance allows the designer to explore different architectures for the system or circuit and unlock their creative potential.

The core feature of 'CREATE FASTER' is the ability to experiment with new concepts and embed those concepts in

new products that create value for our clients and their customers. All of this is possible with the additional benefits of shortened design cycles. By using TARGET's 'CREATE FASTER' approach, our clients can build on their existing reputation for better performance circuits with improved efficiency, lower heat dissipation, increased reliability, and better quality.

**eS: What are TARGET's future plans?**

**Magerl:** In order to promote our goal of durable integration TARGET will become a legal entity. On top of this we will propose a re-shaped and streamlined network TARGET.NEW aiming at even increased coherence and excellence within FP7. **eS**

[www.target-net.org](http://www.target-net.org)



**G**ottfried Magerl received his Dipl.-Ing. and Dr.techn. degrees from the Vienna University of Technology, Austria, in 1972 and 1975, respectively. His current research interests concentrate on the development of highly efficient linear microwave power amplifiers for mobile communications. He is the scientific co-ordinator of the European FP6 network of excellence called TARGET.