

Publishable executive summary

The acronym TARGET stands for “Top Amplifier Research Groups in a European Team.” It is a Network of Excellence within FP6 that brings together 49 research groups consisting of about 230 researchers and 50 doctoral students coming from 15 EU member countries and 1 associated country. The aim of TARGET is to overcome the fragmentation of European research in the field of microwave power amplifiers for broadband wireless access by creating progressive and durable integration of research capacities of the network partners. Ultimately, European technology and research in the fields of active power devices beyond CMOS, of the characterisation and simulation of materials and devices, of amplifier design and linearisation, and in the field of broadband transmitter system design shall attain a leading role in the world. This integration is pursued with the aim to

- Create a durable co-operative network
- Establish a virtual centre of excellence
- Stimulate and co-ordinate world-class research.

These general project goals were broken down to more tangible project objectives. These objectives are listed in the left half of Fig. 1-1 and they are met by the joint programme of activities, where each objective corresponds to one work package or to one work package group. Furthermore, these work packages can be mapped on the three strands of activities of the joint programme of activities, namely “integration,” “dissemination,” and “jointly executed research programme,” as illustrated by Fig. 1-1, too.

PROJECT OBJECTIVE	→	WORK PACKAGE			
1.2 Internal discussion forum	➔	WP 1.4 TARGET TUTORIALS		Integration	
		WP 1.6 TARGET MEETINGS			
1.3 Exchange programme	➔	WP 1.5 TARGET EXCHANGE			
2.1 Software pool	➔	WP 1.2 TARGET POOLS			
2.2 Virtual lab	➔	WP 1.3.2 TARGET LAB EXTENSION			
	➔	WP 1.3.3 TARGET LAB FUTURE			
1.1 Electronic platform	➔	WP 1.1 TARGET INTERNET			
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	➔	WP 3.3 TARGET ONLINE & PR		Dissemination	
2.3 Summer schools	➔	WP 3.2 TARGET SUMMER SCHOOLS			
2.4 Tutorials	➔	WP 3.1 TARGET SPECIAL EVENTS			
2.5 IPRs	➔	WP 3.5 TARGET TRANSFER and R&D SERVICES			
3.4 Links to groups outside Europe	➔	WP 3.4 TARGET LIAISON			
3.1 Common research programme	➔	WP 2.2 TARGET CLASSIC	<div style="border: 1px solid black; padding: 2px;"> Technology Roadmap Thermal Measurement Techniques 2 Modelling Overview Model Verification Protocol Model and Simulator Interface PA Characterisation Criteria Amplifier Modelling Transmitter Architecture </div>	Jointly executed research programme	
3.2 Co-ordinate research efforts	➔	WP 2.3 TARGET FUTURE			
	➔	WP 2.4 TARGET STRATEGY			
3.5 Review and quality assessment	➔	WP 2.5 TARGET SCIENTIFIC CO-ORDINATION	<div style="border: 1px solid black; padding: 2px;"> WiselPAs MUTATIS </div>		
	➔	WP 4.1 TARGET CO-ORDINATION			Management
Management	➔	WP 4.2 TARGET NET-ADMIN			

Fig. 1-1: Project objectives and corresponding work packages

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The TARGET network maps the needs of microwave power amplifier and transmitter design seamlessly onto its consortium of 49 regular and 22 associated members. The consortium consists of 19 semiconductor foundries, of 43 academic labs and research institutions, and of 9 system manufacturers, where the industrial partners are mostly associated members. It is exactly this combination of top players in the field of broadband wireless access which will generate decisive impulses to European research and the development of technology.

During the third year of TARGET a total of 26 work packages in the fields of integration, joint research, dissemination of knowledge, and of network management were active.

The figures given in Table 1-1 were defined as the main indicators of success for creating a co-operative network and the figures in Table 1-2 are the main indicators of success for creating a virtual centre of excellence, respectively.

Table 1-1: Indicators of success for creating a co-operative network

CRITERION	Months 1 – 36 planned	Months 1 – 36 achieved
Intranet downloads (software, data...)	60	128
Number of internal workshops by all WPs	50	82
Number of tutorials	16	22
Number of exchange visits	50	38

Table 1-2: Indicators of success for creating a virtual centre of excellence

CRITERION	Months 1 – 36 planned	Months 1 – 36 achieved
Software tools shared and improved	12	9
Number of joint (virtual) labs	9	9
Offer of external services	9	16
Summer and winter schools	3	5
Special events at international conferences	5	20

TARGET follows a well-designed methodology to integrate research in the field of microwave power amplifiers for broadband wireless access. As a general principle, it uses *research* itself for the purpose of achieving a *desire to integrate* among the participants. In the following only a few highlights are presented to illustrate the scientific progress achieved in year 3 of TARGET.

Within the “Technology Roadmap” activities it could be observed that European foundries are rapidly catching up with their US and Japanese competitors. This is particularly true for GaN power devices where a doubling of output power from a single device was achieved within the last two years by TARGET partners IAF and FBH. Considerable progress was made in the thermal characterisation of microwave power transistors and amplifiers as well. Partner TUW succeeded in developing a method for determining the temperature distribution inside an operating power transistor by transient interferometric mapping (TIM). By interferometrically observing the minute temperature induced geometric dilatation of the semiconductor material it is even possible to look “through” metallization layers. In addition, this method has the advantage of high temporal and spatial resolution.

One of the most prominent strengths of TARGET is non-linear modelling of microwave power devices and amplifiers. Consequently, in year 3 a series of inter-related work packages on “Modelling

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Overview," "Model Verification Protocol," and "Model and Simulator Interconnection" were active. The results of the work package mentioned first are regarded as such valuable and of special interest to the scientific community that TARGET intends to publish a book on this topic. The same is true for the work done in "Amplifier Modelling," a work package with joint contributions from 16 TARGET partners. In that case we have already an agreement with Cambridge University Press to publish the corresponding book late in 2007.

In year 3 TARGET moved from integrating its partners along their fields of special interest towards integration in a "horizontal" way. Work packages were defined that bring together specialists ranging from the fields of semiconductor devices, characterisation, modelling, PA design, and linearisation up to the system level. One of these activities, called "Transmitter Architecture for Broadband Wireless Access" had a first MMIC run of passive and active test structures fabricated by TARGET associated partner IHP. A photograph of this test structure can be seen in Fig. 1-2.

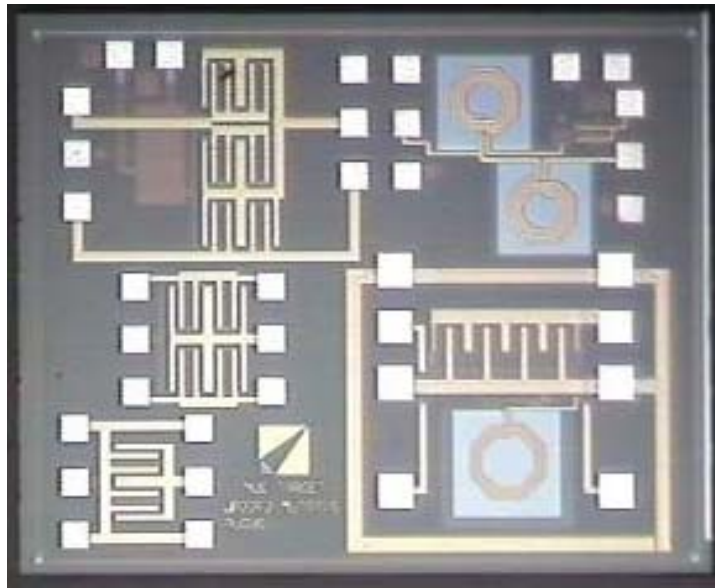


Fig. 1-2: Result of first TARGET MMIC test run

During year 3 TARGET developed a set of services offered to industry: Our customers can choose from 7 different courses highlighting the whole spectrum of the TARGET partners' expertise and 9 specialised measurement and modelling services taking advantage of the TARGET virtual lab infrastructure. In addition, the TARGET Design Lab and Foundry Interface (DeLFI) activity offers expert assistance in PA design and provides an interface to microwave semiconductor foundries.

Spreading of knowledge undoubtedly is one of the main goals of a NoE. After year 3 this goal was mainly achieved by publishing 1 book, 50 joint TARGET journal papers, and 170 conference contributions. TARGET was well presented at all three major microwave conferences, i.e. at the 2006 IEEE MTT-S International Microwave Symposium in San Francisco, CA, the European Microwave Week in Manchester, UK, and a few contributions were presented at the Asia-Pacific Microwave Conference in Yokohama, Japan.

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