



T A R G E T
TOP AMPLIFIER RESEARCH GROUPS
IN A EUROPEAN TEAM

TARGET

Top Amplifier Research Groups in a European Team

EU Network of Excellence

TARGET-IST-1-507893-NoE

[Sue Ivan, ftw.
Gottfried Magerl, TU Wien]



What is a Network of Excellence ?

New instrument in the 6th framework programme of the EC

The objectives of a Network of Excellence are ...

- To strengthen scientific and technological excellence on a given research topic
- To structure European research by integrating research capacities across Europe
- To overcome the fragmentation of European research
- To act as a “Virtual Centre of Excellence”
- To spread excellence beyond the partners



- Spring 2002: First ideas about TARGET
- May 28, 2002: EU Workshop in Brussels
- Summer 2002: Consortium definition
- Dec. 2002: FP6 Meetings 1 and 2 in Noordwijk
- March 17, 2003: First TARGET Plenary Meeting
 - Consortium
 - Steering Committee
 - Work Package Structure
 - Rough Budget
- Spring 2003: Writing of proposal
- April 07, 2003: TARGET presentation in Brussels
- April 23, 2003: Submission of TARGET proposal



- June 04, 2003: Hearing in Brussels
- July 17/18, 2003: Contract non-negotiations in Brussels
- Summer 2003: Preparation of
 - EC contract and
 - TARGET consortium agreement
- Aug. 08, 2003: Invitation to contract negotiations
- Sept. 18, 2003: Contract negotiations in Brussels
- Sept. 26, 2003: First Steering Committee Meeting
- Fall 2003: Fine tuning of contract and of CA
- Dec. 16, 2003: TARGET accession form signed
- Jan. 01, 2004: Start of project



TARGET goals & technical aims

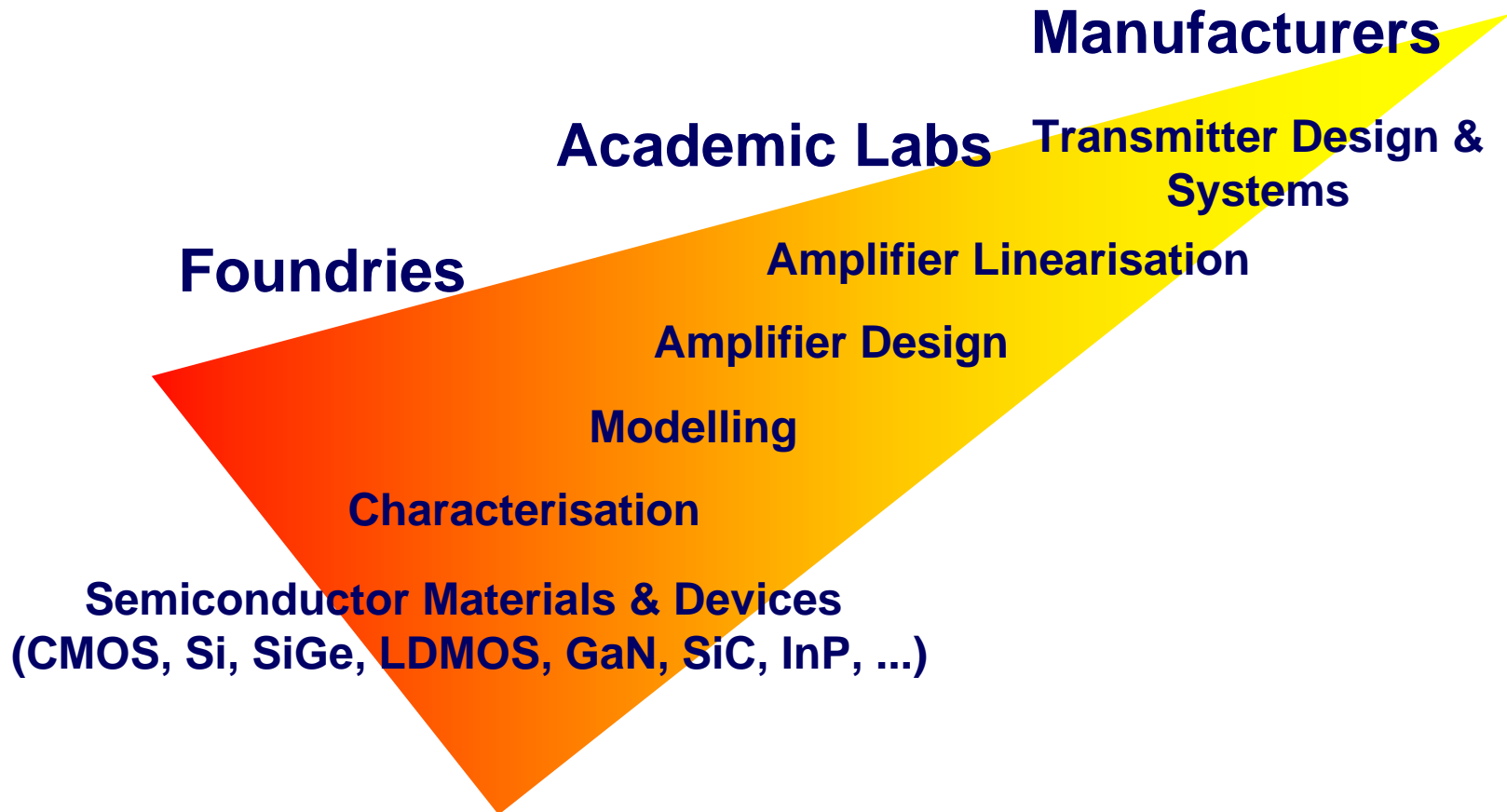
- Create a **durable** co-operative network.
- Establish a virtual centre of excellence.
- Stimulate and co-ordinate world-class research.

In the areas of amplifiers and microwave research



TARGET at a glance

- 8 Mio € Grant from EC
- 4 Years of Funding
- 49 Core Members
- 23 Associate Members
- 225 Scientists
- 59 Students
- 16 Countries





T A R G E T
TOP AMPLIFIER RESEARCH GROUPS
IN A EUROPEAN TEAM

Academic Labs & Research Entities

Foundries

- SELEX Sistemi Integrati, Italy
- Chalmers Univ., Sweden
- Ferdinand Braun Inst., Germany
- FORTH, Greece
- Fraunhofer Gesellschaft, Germany
- Universität Jena, Germany
- Micro GaN, Germany
- Sabancı University, Turkey
- Uppsala Universität, Sweden
- TU Darmstadt, Germany
- Filtronic, UK
- Infineon, Germany
- Motorola, USA
- Freescale, France
- QinetiQ, UK
- RWTH Aachen, Germany
- Thales Research Center, France
- UMS, Germany
- IHP, Germany

Co-ordinated by ftw., Vienna.

TARGET Consortium

- ftw., Austria
- TU Wien, Austria
- University of Cardiff, UK
- CNRS, France
- Czech Technical Uni, Czech Republic
- INESC Porto, Portugal
- Inst. de Telecomunicacoes, Portugal
- Katholieke Uni Leuven, Belgium
- MIDRA, Italy
- ICCS-NTU Athens, Greece
- University College Dublin, Ireland
- NTNU, Norway
- Politecnico di Torino, Italy
- TU Crete, Greece
- Universidad del Pais Vasco, Spain
- Universidad de Cantabria, Spain
- Universidad de Málaga, Spain
- Universidad de Vigo, Spain
- Università di Ferrara, Italy
- Università di Bologna, Italy
- Università di Perugia, Italy
- Università di Roma "Tor Vergata", Italy
- Università di Roma "La Sapienza", Italy
- Universität Kassel, Germany
- Universitat Politecnica de Catalunya, Spain
- Universität Stuttgart, Germany
- Universität Ulm, Germany
- University of Limerick, Ireland
- Vrije Universiteit Brussel, Belgium
- Warsaw University of Technology, Poland
- Université de Lille, France
- Université de Limoges, France
- Jan Verspecht, Belgium
- TDF, France
- Slovak Academy of Sciences, Slovakia
- A.G. Franz Associates, USA
- Technische Universität Dresden, Germany
- Technische Universität Ilmenau, Germany
- Technical University of Denmark, Denmark
- University of Oulu, Finland
- University Stellenbosch, South Africa
- University of Calgary, Canada
- NPL, UK
- De Montfort University, UK

Manufacturers

- APLAC Solutions, Finland
- CORITEL, Italy
- IMST, Germany
- Lucent Technologies, Germany
- NMDG Engineering, Belgium
- Helic, Greece
- AC Microwave, Germany
- Alcatel Space, France
- Thales Air Defence, France

- Core Members
- Associated Members

TARGET - NoE



TARGET
TOP AMPLIFIER RESEARCH GROUPS
IN A EUROPEAN TEAM

TARGET Consortium

TARGET members:

	Forschungszentrum Telekommunikation Wien Betriebs-GmbH		Technische Universität Wien		SELEX Sistemi Integrati a Finmeccanica Company		SELEX SI		APLAC Solutions Corp. An AWR Company
	Cardiff University		Centre National de la Recherche Scientifique		Chalmers University of Technology, School of Microtechnology		CORITEL Consorzio di Ricerca sulle Telecomunicazioni		Fraunhofer Institut Angewandte Festkörperphysik
	Czech Technical University in Prague		Ferdinand-Braun-Institut für Hochfrequenztechnik		Foundation For Research And Technology-Hellas		Fraunhofer Gesellschaft für Angewandte Forschung		United Monolithic Semiconductors
	Friedrich-Schiller-Universität Jena		IMST GmbH		Instituto de Engenharia de Sistemas e Computadores do Porto		Instituto de Telecomunicações		TDF - Télédiffusion de France
	Katholieke Universiteit Leuven		Lucent Technologies Network Systems GmbH		Micro GaN GmbH		Multidisciplinary Institute for Development Research and Applications		Technische Universität Ilmenau
	National Technical University of Athens - ICSS		National University of Ireland, Dublin		NMDG Engineering bvba		Norwegian University of Science and Technology		
	Politecnico di Torino - CERCOM Laboratory		Sabanci University		Technical University of Crete		Technische Universität Darmstadt		
	Universidad del País Vasco		Universidad de Cantabria		Universidad de Málaga		Universidad de Vigo		
	Università degli Studi di Ferrara		Università di Bologna		Università di Perugia		Università di Roma "Tor Vergata"		
	Università La Sapienza Roma - Dipartimento di Ingegneria Elettronica		Universität Kassel		Universität Politcnica de Catalunya		Universität Stuttgart		
	Universität Ulm		University of Limerick		Uppsala University		Vrije Universiteit Brussel - Vakgroep ELEC		
	Warsaw University of Technology		Université des Sciences et Technologies de Lille		Université de Limoges		Jan Verspecht bvba		
	HELIC S.A.								

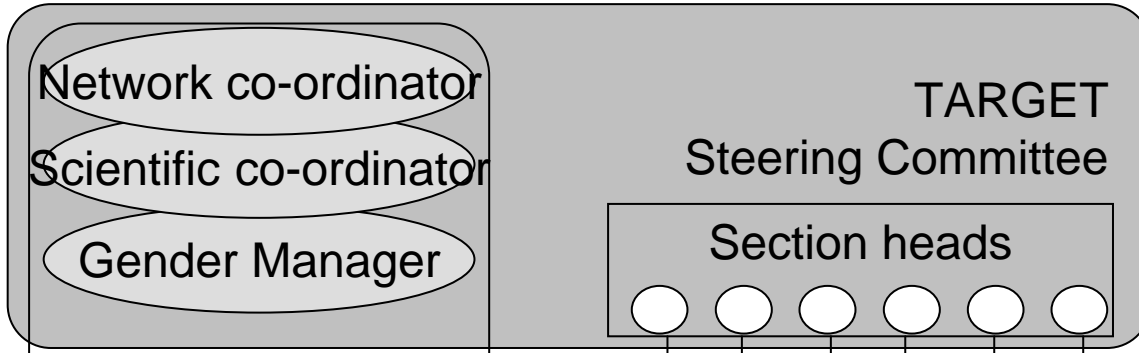
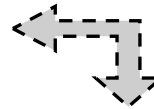
TARGET associated members:

	AC Microwave GmbH		Alcatel Space Industries BOCRHE		Filtronix Co.		Infineon, CPR HF
	QinetiQ Ltd.		RWTH Aachen, Institut für Theoretische Elektrotechnik		THALES Air Defence		THALES Research Center
	United Monolithic Semiconductors		A. G. Franz Associates, LLC		Institute of Electrical Engineering, Slovak Academy of Sciences		Technische Universität Dresden
	TDF - Télédiffusion de France		Freescale Semiconductor Inc.		Motorola, Inc.		University of Oulu, Dept. of electrical and information engineering
	Technische Universität Ilmenau		Technical University of Denmark		University of Stellenbosch		

TARGET is a Network of Excellence under the 6th Framework Programme of the European Commission



TARGET Strategy

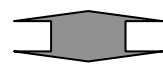


Management group

TARGET	A	B	C	D	E	F
Theory and Future Trends	Specialized Materials & Active Devices	Device Characterization	Device Modelling	Amplifier Design	Linearization	Transmitter Design for Broadband Wireless Systems
1	Theory and Future Trends	Theory and Future Trends	Theory and Future Trends	Theory and Future Trends	Theory and Future Trends	Theory and Future Trends
2	Architecture Concepts Device Types (DHEMT, MESFET, MOSET, HBT, ...)	Architecture (Single Signal Measurement System, High Level Signal Measurement, Memory Issues, Noise, ...) Collaborative Workshop	Concepts (Equivalent Circuit, Block Set, General, Algorithms, Neural Networks, Behavioral, ...)	Architecture (Behavioral, Control, Modeling, Combining Concepts, ...)	Concepts (Analog, Digital, HW, SW)	Transmitter Architecture, Link to Standardization Bodies
3	Modelling (Physical, Electrical, Thermal, Mechanical, ...)		Model Development (Temp, Effect, Trapping, Noise, ...)		Modelling (Behavioral, Memory Issues, ...)	
4	Simulation (Electrical, Mechanical, Thermal, ...) Simulation Tools	Simulation (Acoustic, Sensitivity, System, ...)	Model Fitting (Automated Fitting Tools, ...)	Simulation (Component Level, ...) Simulation Tools	Simulation (Component Level, System Level, ...) Simulation Tools	Simulation (System Level, ...) Simulation Tools
5	Material Design (Silicon based and compound semiconductors) Device Design (Silicon and Compound Semiconductors) Optimum Performance, Mechanical Cost, Manufacture, Noise, Reliability, ...) CAD Design Tools	Design of Measurement Systems (On-Wafer, On-Chip, Probe, ...) LeadSource Pulling System Passive Device (Filter, Coupler, Multiplexer, Coupler, Dip-Ts, ...) Reliability		Design (Design Flow, Amplifier Circuit and Layout, LeadSource Pulling (Active, Passive), Passive Devices (Filter, Coupler, Multiplexer, Coupler, Dip-Ts, ...), CAD Design Tools	Design Algorithms, HW, SW Signal Processing	Subsystems (Filter, Filter, Duplexer, Chipsets, Modules, ...) Systems
6	Process Development, Device Manufacturing, Packaging (Electrical, Mechanical, Thermal, Manufacturing Issues)	Measurement System Manufacturing		Technology (ITCC, ThinFilm, LowLoss, MMIC, Packaging (Bonding, Attachment and Thermal Issues, ...)	Technology (ITCC, ThinFilm, LowLoss, MMIC, Embedded Systems)	Manufacturing
7	Characterization and Verification	Characterization and Verification		Characterization and Verification (Test Signals, Standard Test Methods, Conformity to Standards, ...)		

TARGET Board

Core Members



Associated members



Planning for success

1. WP LEADERS

2. WP DESCRIPTION

- “Who does what when?”

3. WP MEETINGS

- Bimonthly, 2x in person

4. REPORTING

- Bimonthly progress reports to WP leader
- Bimonthly effort reports
- Bimonthly report on task(s) assigned by WP leader
- Yearly WP report as a part of a DELIVERABLE



Report for: Workpackage
 Workpackage: 2.2.A.1 - CLASSIC - A: Technology Evaluation Maps Refresh

General Information

No. 2.2.A.1
 Title CLASSIC - A: Technology Evaluation Maps
 Begin Date 01.01.04
 End Date 30.06.05
 Responsible Partner Friedrich-Schiller-Universita
 Leader Wolfgang Richter
 Estimated PM 37

Costs per category*

	2004	2005
Personnel Effort	157.305,09	91.888
Travel	10.811,24	6.331
Othercost	7.519,27	3.171
Total	175.635,60	101.391

Costs per Partner*

	2004	2005
	15.992,30	2.002
	7.998,00	5.259
	14.999,88	7.209
	16.884,40	16.108
	7.823,98	16.259
	6.596,29	11.593
	34.302,55	10.764
	18.730,00	1.501
	4.704,00	5.241
	22.083,80	7.495
	25.520,40	17.955
Total	175.635,60	101.391

Person-months per Partner

	2004	2005
	4,09	0,917
	0,929	0,554
	1,065	0,457
	3,842	2,959
	2,086	0,261
	0,791	0,822
	7,422	2,222
	1,099	0,061
	10,03	2,085
	4	1,23
	7,255	4,705
Total	42,609	18,494

	4.704,00	5.241,60	0,00	0,00	9.945,60
	22.083,80	7.495,73	0,00	0,00	29.579,53
	25.520,40	17.955,60	0,00	0,00	43.476,00
Total	175.635,60	101.391,96	428,10	0,00	277.455,66

Person-months per Partner

	2004	2005	2006	2007	Total
	4,09	0,917	0	0	5,007
	0,929	0,554	0	0	1,483
	1,065	0,457	0	0	1,522
	3,842	2,959	0,261	0	7,062
	2,086	2,482	0	0	4,568
	0,791	0,822	0	0	1,613
	7,422	2,222	0	0	9,644
	1,099	0,061	0	0	1,16
	10,03	2,085	0	0	12,115
	4	1,23	0	0	5,23
	7,255	4,705	0	0	11,96
Total	42,609	18,494	0,261	0	61,364

Details for year 2004*

	COSTS A.	COSTS P.	ST	PM A.	PM P.	ST	NE PM A.
01.2004-02.2004	12.960,96	20.000,00	■	0,823	4,111	■	1,757
03.2004-04.2004	10.066,63	20.000,00	■	0,905	4,111	■	1,621
05.2004-06.2004	17.201,05	20.000,00	■	4,625	4,111	■	1,217
07.2004-08.2004	45.127,42	20.000,00	■	8,933	4,111	■	1,717
09.2004-10.2004	52.257,47	20.000,00	■	9,725	4,111	■	1,83
11.2004-12.2004	38.022,07	20.000,00	■	7,842	4,111	■	1,614
01.2004-12.2004	175.635,60	120.000,00	■	32,853	24,667	■	9,756

Details for year 2005*

	COSTS A.	COSTS P.	ST	PM A.	PM P.	ST	NE PM A.
01.2005-02.2005	25.110,04	20.000,00	■	3,488	3	■	1,169
03.2005-04.2005	21.951,60	20.000,00	■	2,957	3	■	0,749
05.2005-06.2005	40.819,95	20.000,00	■	6,311	3	■	1,201
07.2005-08.2005	4.584,71	0,00	N/A	0,622	0	N/A	0,26
09.2005-10.2005	8.699,33	0,00	N/A	0,771	0	N/A	0,25
11.2005-12.2005	226,32	0,00	N/A	0	0	N/A	0,716
01.2005-12.2005	101.391,96	60.000,00	■	14,149	9	■	4,345



TARGET goals & technical aims

Integration

- PROJECT OBJECTIVE ⇒ WORK PACKAGE
- 1.1 Electronic platform ⇒ TARGET INTERNET
- 1.2 Internal discussion forum ⇒ TARGET TUTORIALS
- 1.3 Exchange programme ⇒ TARGET EXCHANGE
- 2.1 Software pool ⇒ TARGET POOLS
- 2.2 Virtual lab ⇒ TARGET LAB

Dissem.

- 2.3 Summer schools ⇒ TARGET SUMMER SCHOOLS
- 2.4 Tutorials ⇒ TARGET SPECIAL EVENTS
- 2.5 IPRs ⇒ TARGET TRANSFER and R&D Services
- 3.4 Close links to groups outside Europe ⇒ TARGET LIAISON

JRP

- 3.1 Common research programme ⇒ TARGET QUICKSHOT
- 3.2 Co-ordinate research efforts ⇒ TARGET CLASSIC
- 3.3 Cross topical barriers ⇒ TARGET FUTURE
- 3.5 Review and quality assessment ⇒ TARGET STRATEGY

→ Short Term Prototyping
→ Modelling

→ Semiconductor
→ Characterisation
→ Modelling
→ Amplifier Design
→ Linearisation
→ Transmitter Design



The Joint Programme of Activities

Management

Integration:

- Sharing of
 - tools
 - facilities
 - ...
- Staff mobility
- Electronic communication

Joint Research Activities:

- Common research prog.
- Co-ordinated research effort
- Review and quality assessment

Dissemination:

- Training
- Dissemination
- Technology transfer
- Links to industry

Joint Programme of Activities



6 TASKS

- **TARGET INTERNET**
Electronic platform for data exchange
- **TARGET POOLS**
Sharing of software tools
- **TARGET LAB**
Sharing and integration of measurement systems
- **TARGET TUTORIALS**
Sharing of (internal) knowledge
- **TARGET EXCHANGE**
Exchange visits for researchers and students
- **TARGET MEETINGS**
Organisation of meetings



5 TASKS

(integration through research)

- TARGET QUICK SHOT ⇒
→ Short Term Prototyping
→ Modelling
- TARGET CLASSIC ⇒
→ Semiconductor
→ Characterisation
→ Modelling
→ Amplifier Design
→ Linearisation
→ Transmitter Design
- TARGET FUTURE
- TARGET STRATEGY
- TARGET SCIENTIFIC CO-ORDINATION



5 TASKS

- **TARGET SPECIAL EVENTS**
Work shops, short courses etc. at conferences
- **TARGET SUMMER SCHOOLS**
Tutorials and training for (doctoral) students
- **TARGET ONLINE & PR**
Electronic newsletter and public relations
- **TARGET LIAISON**
Links to the U.S. and Japan
- **TARGET TRANSFER and R&D Services**
IPRs, business models, sharing of profits ...



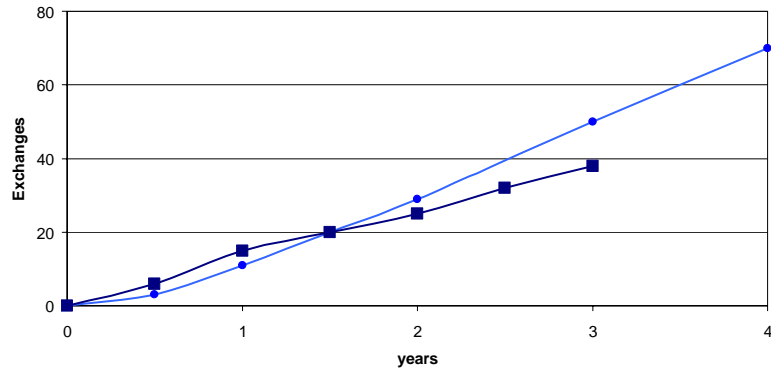
- Quantitative indicators
 - Number of joint publications, exchange visits, tutorials...
 - Software tools, services offered...
 - Development of RF device technologies and output power levels achieved

- Qualitative aspects
 - Willingness to share knowledge and resources
 - Quality of joint publications
 - Value of TARGET in the “outside” world

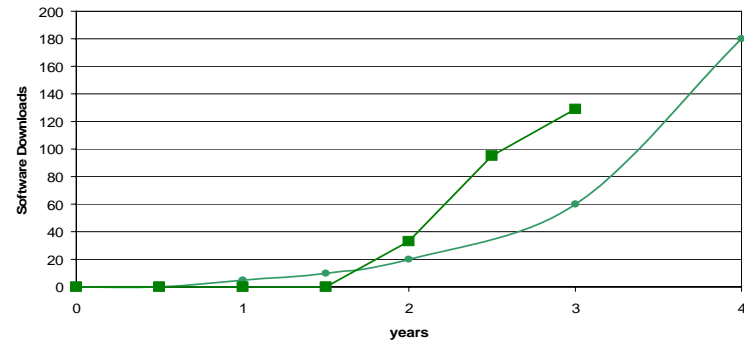


Success indicators: co-operative network

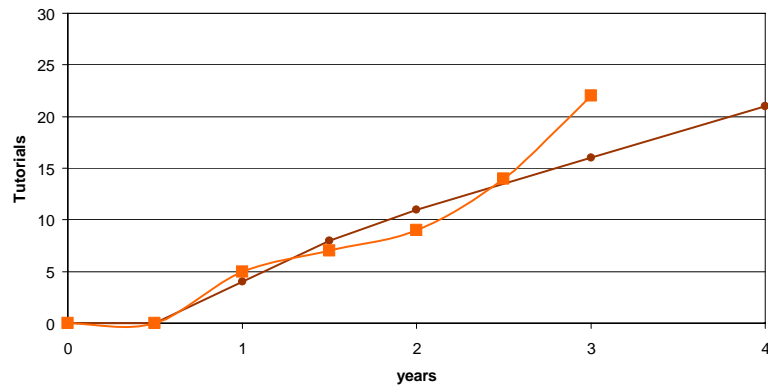
Exchange Visits



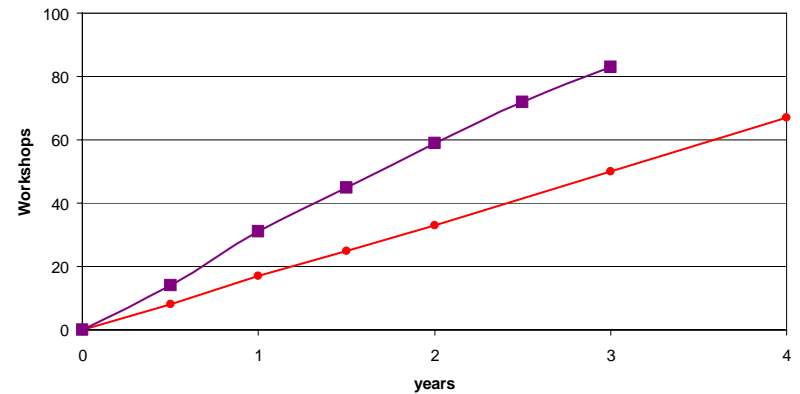
Downloads of Shared Software Tools



Tutorials

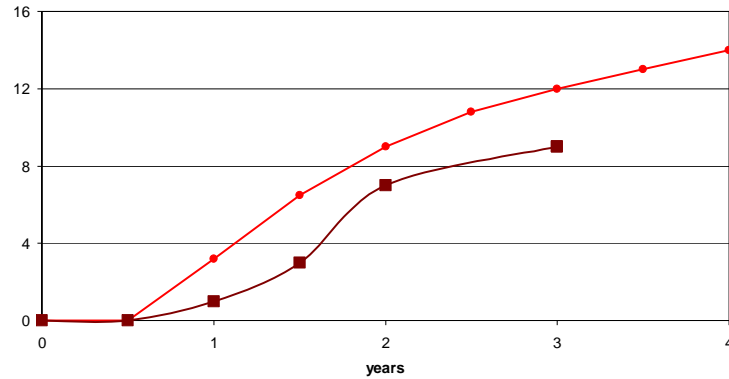


Internal Workshops

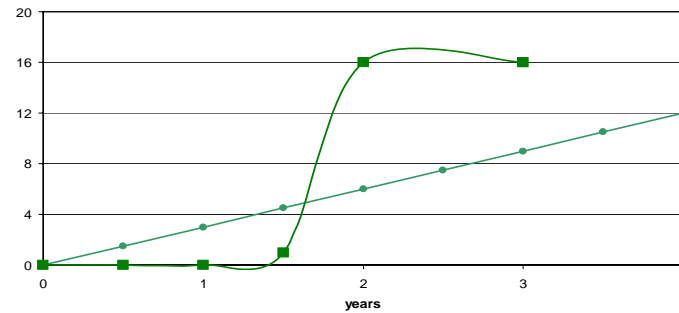




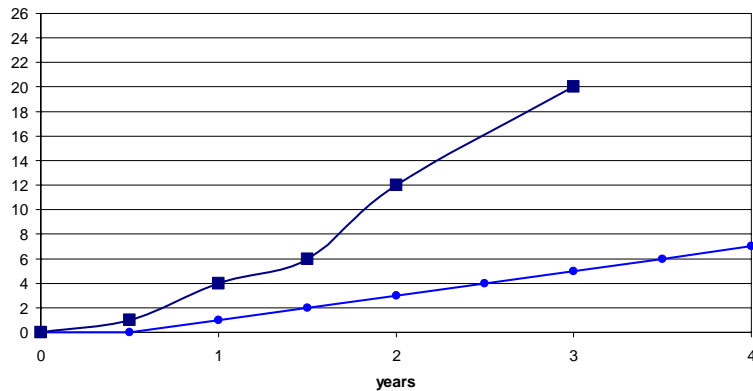
Software Tools



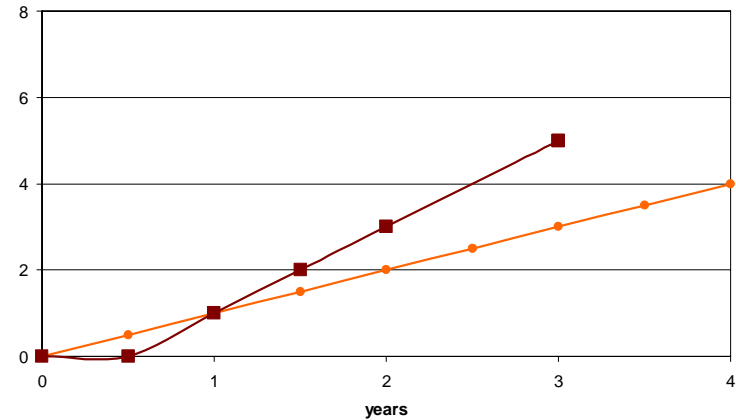
External Services



Special Events



Summer Schools





- Stimulate and co-ordinate world-class research:
 - 22 scientific work packages were active
 - 13 Final Reports were written
 - Scientific highlights were achieved
 - 1 + 2 TARGET books
 - 1 + 1 Special Issue of Int. J. RF&MWCAE
 - Cover feature of IEEE Microwave Magazine, April 2006
 - 50 TARGET journal papers
 - 170 TARGET conference contributions
 - Scientific collaborations started within TARGET
 - 30 research grants and applications
 - 10 Mio EUROS



- TARGET Special Events
 - Big success of joint TARGET/MTT-S workshop at IMS 2005, USA
 - TARGET focused session at GAAS 2005 in Paris
 - TARGET workshop on LSNA at GAAS 2005 in Paris
 - LSNA users' forum at EuMW 2005 in Paris
 - TARGET presentation at APMC-2005 in Suzhou, China
 - TARGET presence at IMS 2006 in San Francisco
 - 6 TARGET Special Events at EuMW 2006 in Manchester

- TARGET Summer Schools
 - 6 summer / winter schools so far

- TARGET Online & PR
 - Strongly increased interest in TARGET
 - 21 associated members!



TARGET offers Services to the Industry

- Courses and trainings in the fields of
 - RF Device Modelling
 - Device-Level Linearization Techniques
 - Modelling for TX System Level Analysis
 - RF Semiconductor Materials and Devices
 - Microwave Power Amplifier Design
 - Microwave Power Amplifier Linearisation Techniques
 - RF Device Characterisation

- Measurement and Fabrication services
 - Available through our virtual labs (= different labs participating in TARGET that are dedicated to a certain measurement or fabrication topic)

- More information under www.target-net.org/services



- Your project has to fully convince yourself!
- Carefully read EC material and guidelines
- Clearly define project goals
- Project plan should be a logical consequence of goals
- Define clear project structures and responsibilities
- Look for professional help – in the case of TARGET:
 - Writing of proposal: eutema
 - Project management: ftw.
 - Keep your national contact point informed
 - Keep close contact with EC officers



- ICT Work Programme 2007-08
 - ftp://ftp.cordis.lu/pub/fp7/ict/docs/ict-wp-2007-08_en.pdf

- Guide(s) for applicants (downloads)
 - http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.CooperationDetailsCallPage&call_id=11



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Job offers

A [postdoc. position](#) is offered within the area of microwave circuit design and signal processing (with emphasis on modeling, design and control of power amplifiers with high efficiency and linearity). The post.doc is offered at the Department of electronics and telecommunications (<http://www.iet.ntnu.no/>) in the Faculty of Information Technology, Mathematics and Electrical Engineering, the **Norwegian University of Science and Technology**.
(10/04/2006)

The TARGET project partner **NMDG Engineering** is a young high-tech start-up company, active in the high-frequency electronics market for test and measurement. NMDG Engineering is extending its team in Belgium with a [R&D](#) and [Application engineer](#).

For more information, please visit the [NMDG website](#).
(29/03/2006)

Events

IEE-Workshop on "High Efficiency Power Amplifier Design for Next Generation Wireless Applications"
23rd May 2006, Cambridge University, UK

- Topics:
- ✦ Introduction to FP6 NoE TARGET
 - ✦ Advanced techniques in power amplifier design with respect to
 - ✦ Semiconductor material and device development

LATEST NEWS:

Measurement and Fabrication services
TARGET now offers Measurement and Fabrication services to the industry,
[read more](#)



Project Coordinator

- Sue Ivan
ftw. Telecommunication Research Center

Scientific Coordinator

- Gottfried Magerl
TU Wien, EMST

Contact

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