

Building networks to design nanotechnology for the market: The example of nano4m

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- The Project **nano4m**
- The Programme **INTERREG IV C**
- The Project Partner **MST.factory dortmund**

The Project

- **nano4m** stands for **»Nanotechnology for Market«**
- aims at improving strategies and building networks to design nano/microtechnology for market
- supported by the INTERREG IV C programme
- co-financed by ERDF
- Total budget: **1.85 Mio. EUR**
- ERDF contribution: **1.38 Mio. EUR**
- Duration of project: **3 years**
- started on: **01 Oct 2008**
- Partnership: **4 EU regions, 12 partners**



Project consortium

- **Regional / local administrations (5)**
 - IDEPA Instituto de Desarrollo Económico del Principado de Asturias/ ES (LP)
 - CEV Circondario Empelese Valdelsa/ IT
 - Conseil Régional de Lorraine/ FR
 - Stadt Dortmund/ DE
 - Technologieförderung Münster/ DE
- **Research & Technology Centres (7)**
 - CINN Centro de Investigación en Nanomateriales y Nanotecnología/ ES
 - Fundación PRODINTEC/ ES
 - TZM / MST.factory dortmund/ DE
 - CeNTech Center for Nanotechnology/ DE
 - ASEV Agenzia per lo Sviluppo Empelese Valdelsa/ IT
 - IJL Institut Jean Lamour/ FR
 - GeorgiaTech Lorraine/ FR



Project consortium



nano4m Partner regions:

- 1 Asturias/ ES
3 partners
- 2 North Rhine Westphalia/ DE
4 partners
- 3 Lorraine/ FR
3 partners
- 4 Tuscany/ IT
2 partners

Project aims

- To improve the regions' capacity to shorten the gap between R&D and market testing new Research-to-Market processes (R2M)
- To strengthen the interregional collaboration by identifying and developing specific research and business opportunities of common interest in the emerging field of nano/microtechnology (NMT)
- To increase competitiveness of innovation infrastructure at regional, national and European level
- To improve the efficiency of regional innovation policies by drawing recommendations and implementing best practices

nano4m is structured in *three phases*:

■ Phase 1

- Creation of maps of research and business activity related to NMT to identify opportunities of common interest.
- Selection and analysis of critical aspects related to technology transfer (TT) processes.

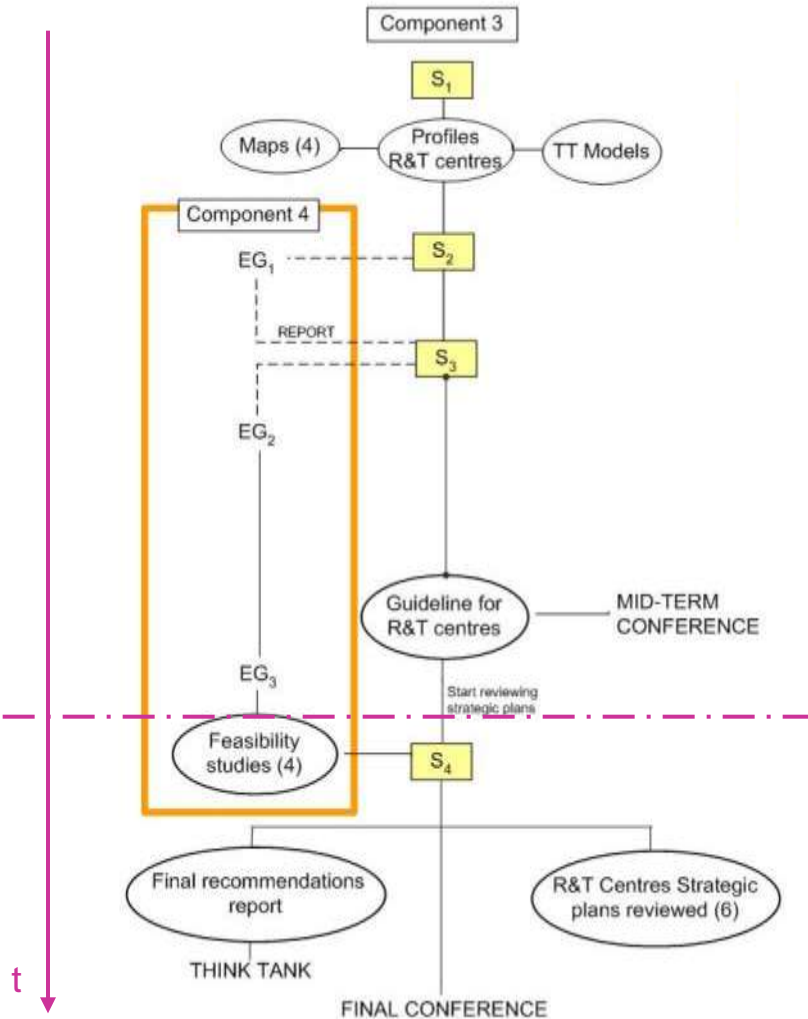
■ Phase 2

- Draft of refinements for the TT strategies of public RTCs, based on studies and expert meetings carried out in the Project.

■ Phase 3

- Recommendations to regional authorities with the goal of improving TT policies and initiatives.
- Exploration of opportunities for future cooperation among regional governments in the domain of TT.

Project roadmap

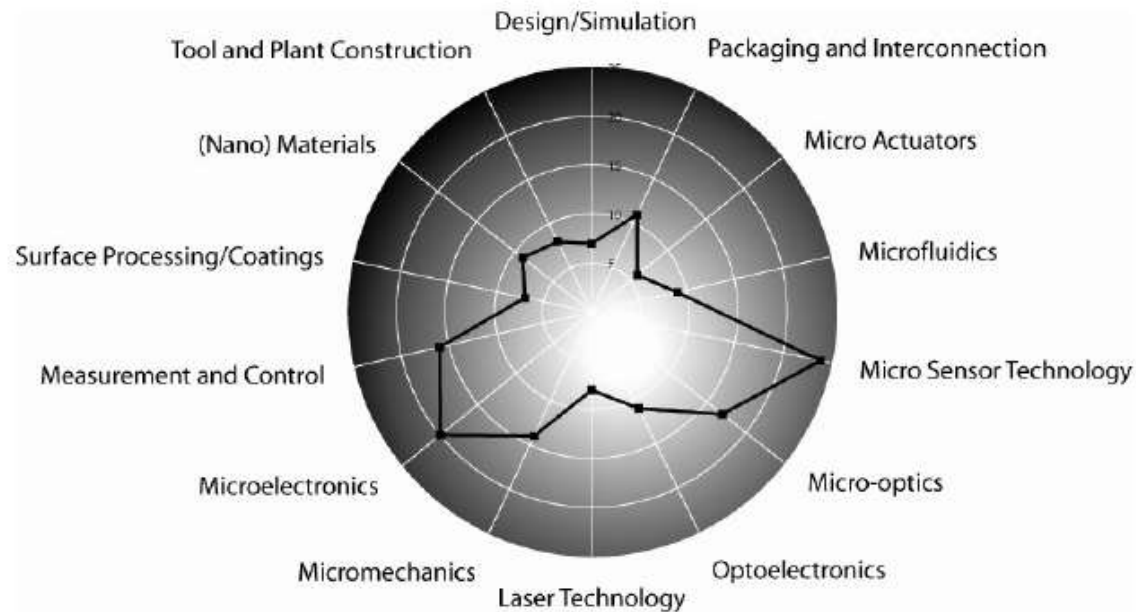


Key work packages of nano4m:

- **C3: Exchange of experience**
 - Regional NMT maps
 - RTC profiles / RTC strategy reviews
 - Guidelines for RTC strategies
 - Recommendations for Regional Policy
- **C4: Implementation**
 - Expert Group works on case studies
 - “Experimental Lab” of C3

Project results (examples)

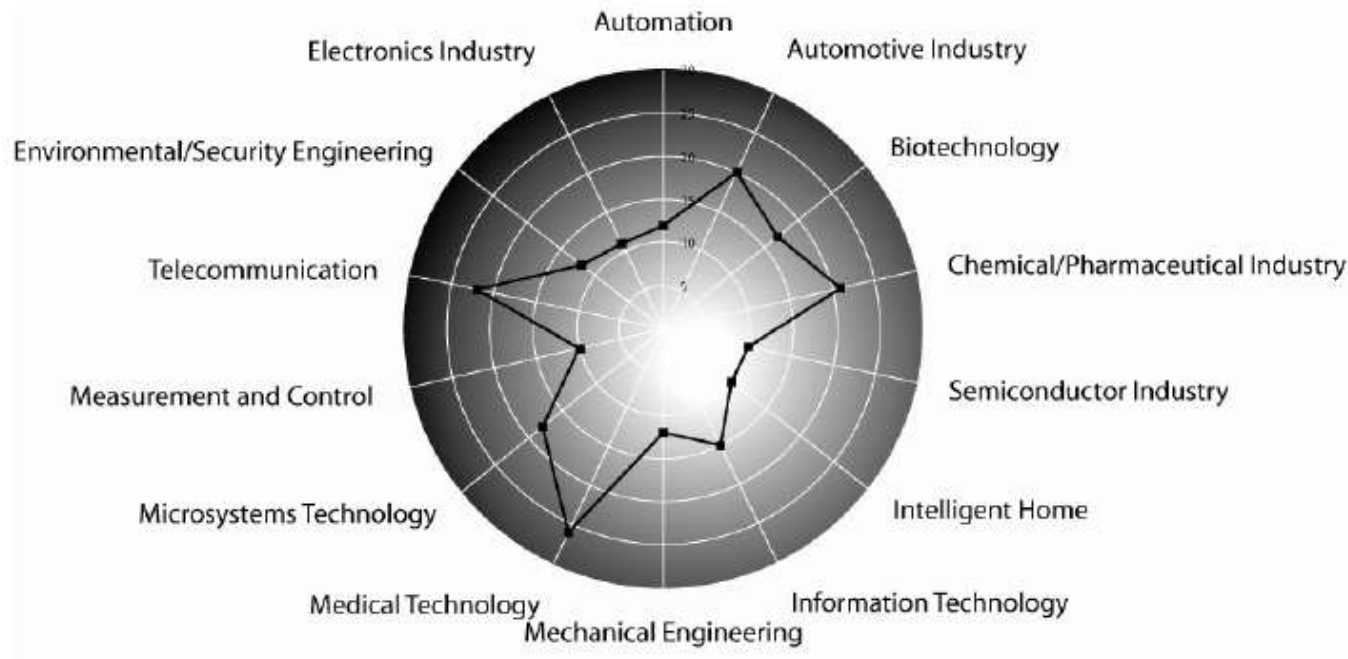
Regional maps of NMT activity: Industrial activity The Dortmund example



Fields of Technology

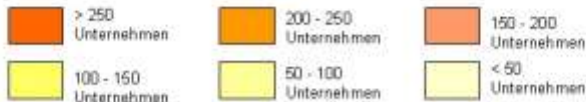
Project results (examples)

Regional maps of NMT activity: Industrial activity The Dortmund example



Target markets

Microtechnology clusters in Germany

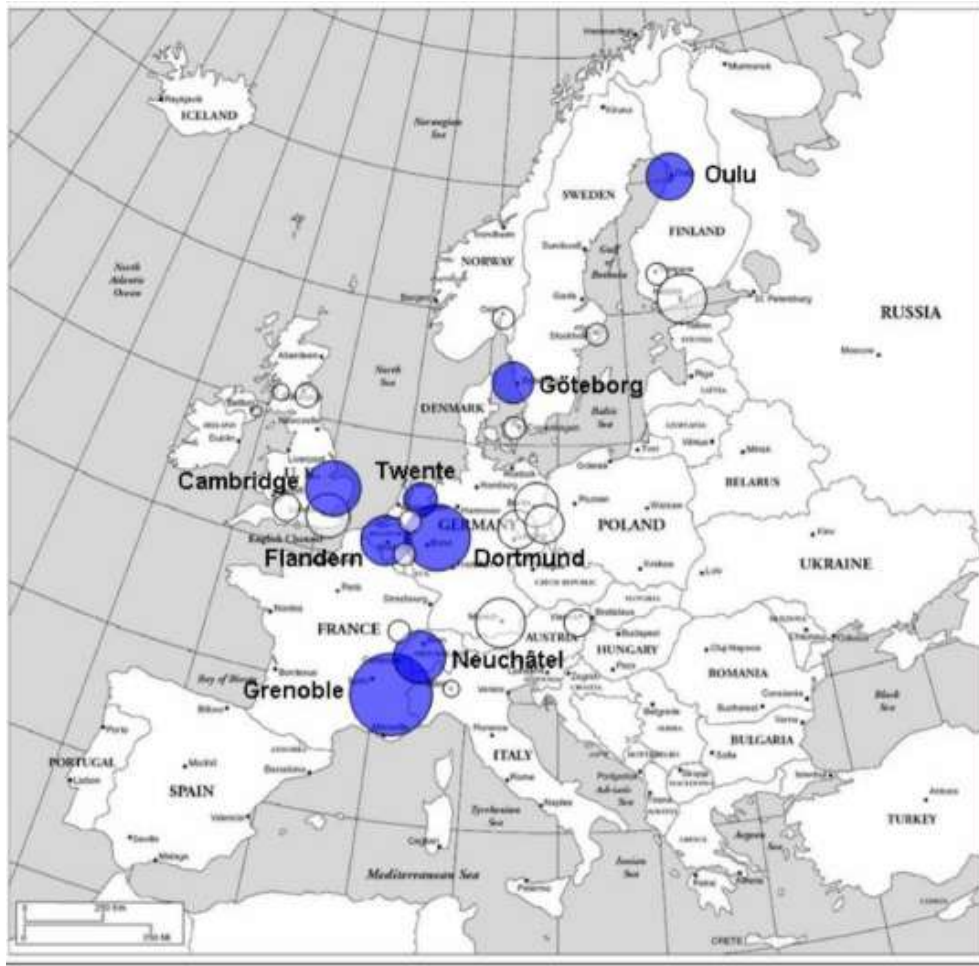


MST-Atlas Deutschland
 Cluster von Unternehmen der Mikro- und Nanotechnik und Neuen Materialien.
 © IVAM Research, Februar 2007

MST-Cluster	Anzahl Unternehmen
Dortmund	38
Jena	36
München	36
Berlin	30
Ruhrgebiet	25
Dresden	22
Stuttgart	13
Erfurt	13
Aachen	12
Mainz	12
Ilmenau	11
Chemnitz	10
Göttingen	10
Karlsruhe	10
Freiburg	9
Saarbrücken	8
Hannover	8
Bremen	7
Hamburg	7
Itzehoe	5

Source: MST Atlas Germany, IVAM Research 2005

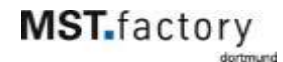
Microtechnology clusters in Europe



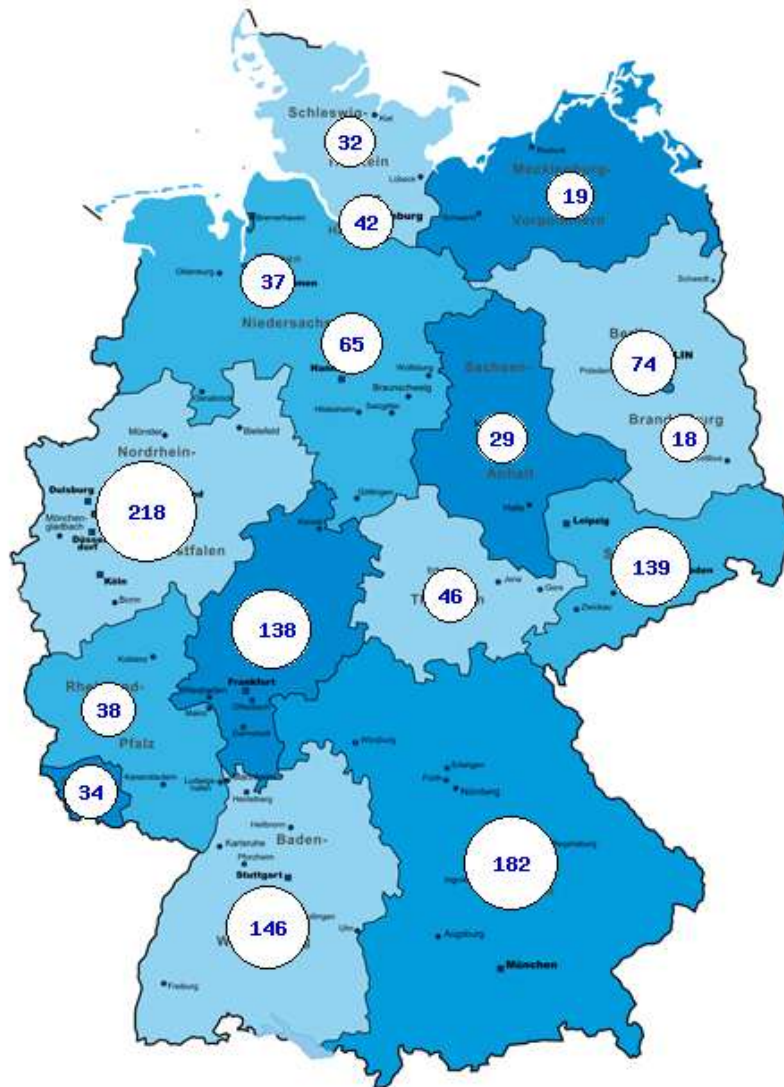
European clusters of excellence in MNT



Source: MST Atlas Europe, IVAM Research, dortmund-project



Number of NT actors in Germany

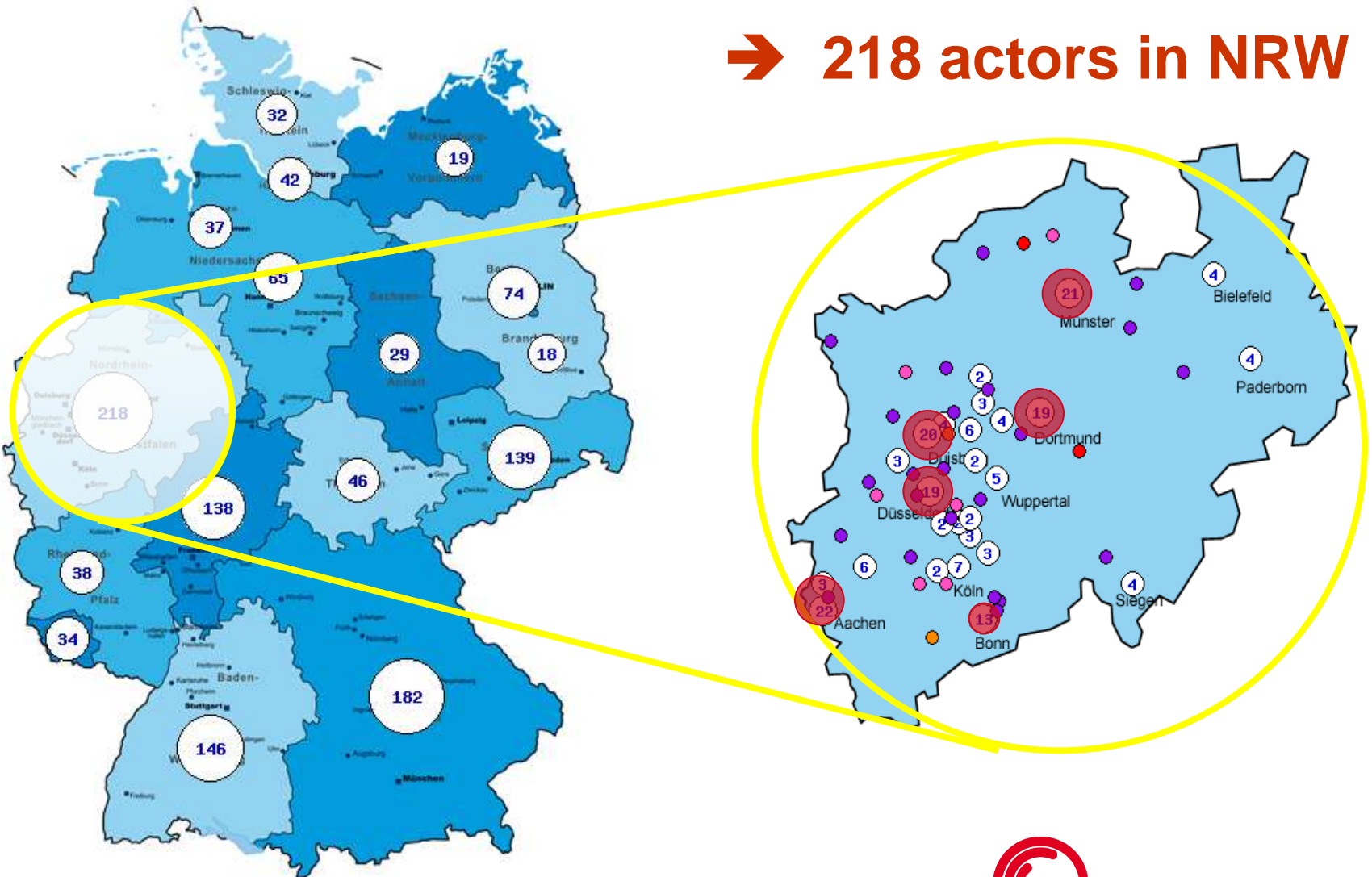


- all application fields
- all technologies
- all kinds of actors

→ **1257 actors in DE**

Number of NT actors in NRW

→ 218 actors in NRW



Key NMT market segments considered in nano4m

- 4 highly perspective Key markets were identified and selected by the nano4m Consortium:

1. **Health:** NMT sensors/ NMT implants
2. **Health:** Drug delivery systems/ Nanocarriers
3. **Energy**
4. **Security/ Defence**

- Selection criteria were:

- Economically attractive markets for NMT applications
- Maximum of common interest and mutual benefit for the Partners
- Core competencies available within the nano4m regions
- Challenges for future interregional co-operation

Case studies considered in nano4m Expert Groups

- based on the key markets identified, the following **Case studies** were evaluated in detail:

1. Health / Dental implants:

- Ceramic dental implants
- Nickel-titanium dental implants

2. Health / Biocidal nanocarriers:

- Nanocarriers for anti-tumour agents
- Anti-Arthritis agents
- Antibiotic-resistant bacteria

3. Energy:

- Photovoltaics

4. Security / Defence:

- Transparent armors

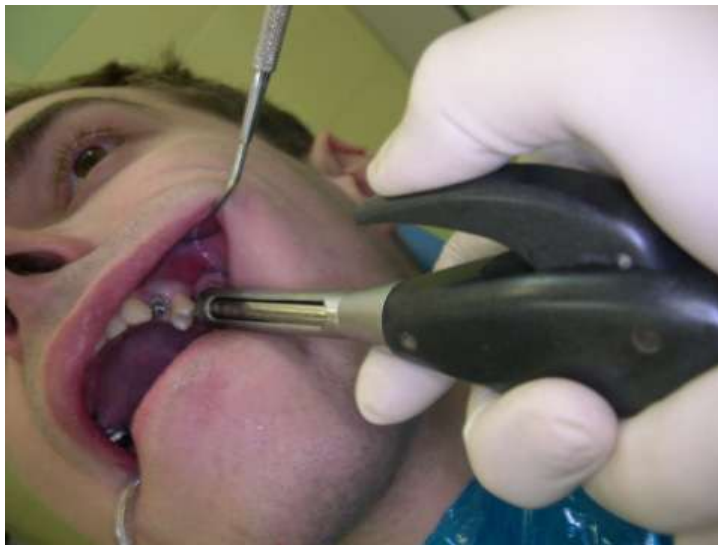
Case study on nickel-titanium dental implants



Nickel-Titanium (Nitinol)

- non-sensitizing, non-irritating, **non-toxic biomaterial**
- resistant to surface corrosion and release of Ni ions
- highly **biofunctional** and **biocompatible** material
- **shape-memory alloy** with martensitic transition and superelastic behaviour

Case study on nickel-titanium dental implants



Innowledgement GmbH

- established in Dortmund in May 2010
 - Spin-off of Moscow-based Kotel'nikov Institute (RAS)
 - tenant of MST.factory dortmund
 - Prize winner of the start2grow business plan competition "New Technologies", Dortmund, December 2009
-
- Innowledgement has developed completely new dental implants based on nickel-titanium shape memory alloys.

Case studies (example)

Case study on nickel-titanium dental implants



Prototypes of nickel-titanium dental implants:

Left: trans-radix implant, center and right: dental implants for absent teeth.

Case study on nickel-titanium dental implants

- The R2M process of NiTi implants was systematically structured by using Basic Configuration Data Files and analysed.
- Typical innovation barriers and critical bottlenecks were identified and tackled in Expert Groups.
- Several expert studies were carried out, relating to:
 - Nanoparticles in the production process,
 - Processing techniques of NiTi,
 - Roadmap for certification of dental implants in the EU.
- As a result, Innnowledgement was enabled to refine (and partly re-define) the R2M process and business plan.
- Innnowledgement further benefited from the interregional nano4m network and launched strategic partnerships for advanced R&D and international marketing.

Guidelines for improvement of market-oriented strategies of RTCs *(in preparation)*

- providing **suggestions for adopting best practices** that have proven to work in RTCs
 - no detailed approaches or toolboxes, but inspirations that allow for further deepening of understanding and concretizing the general concepts found into a level suitable for implementation in a specific RTC
 - covers three main topics:
 - Valorisation and Exploitation
 - Human resources
 - Interaction with the ecosystem
- **Guideline paper** will be made available to a broader public.

General Outcomes *already at the present stage*

- Apart from the direct results and benefits of nano4m, the INTERREG Project has proven to be an excellent tool to
 - Gather valuable information and **benchmarks** of other EU regions, institutions, strategies and policies involved,
 - Strengthen **international networking** activities,
 - Screen potential **synergies** and fields of common interest,
 - Identify possible **co-operation projects** with RTCs, and also SMEs, of other regions,

- as such, can be **highly recommended** !





The Programme

- The INTERREG IVC Programme is part of the **European Territorial Cooperation Objective** of the Structural Fund policies for the period between 2007 and 2013. It is administered by the European Commission through the **European Regional Development Fund (ERDF)**.
- The Programme targets **regional and local authorities**. Other bodies may be involved only if their link with regional and local policies is clearly demonstrated. Only **bodies governed by public law** are eligible.
- In the 1st Call (2008), 41 projects out of 491 applications were approved corresponding to a success rate of 8,4%.



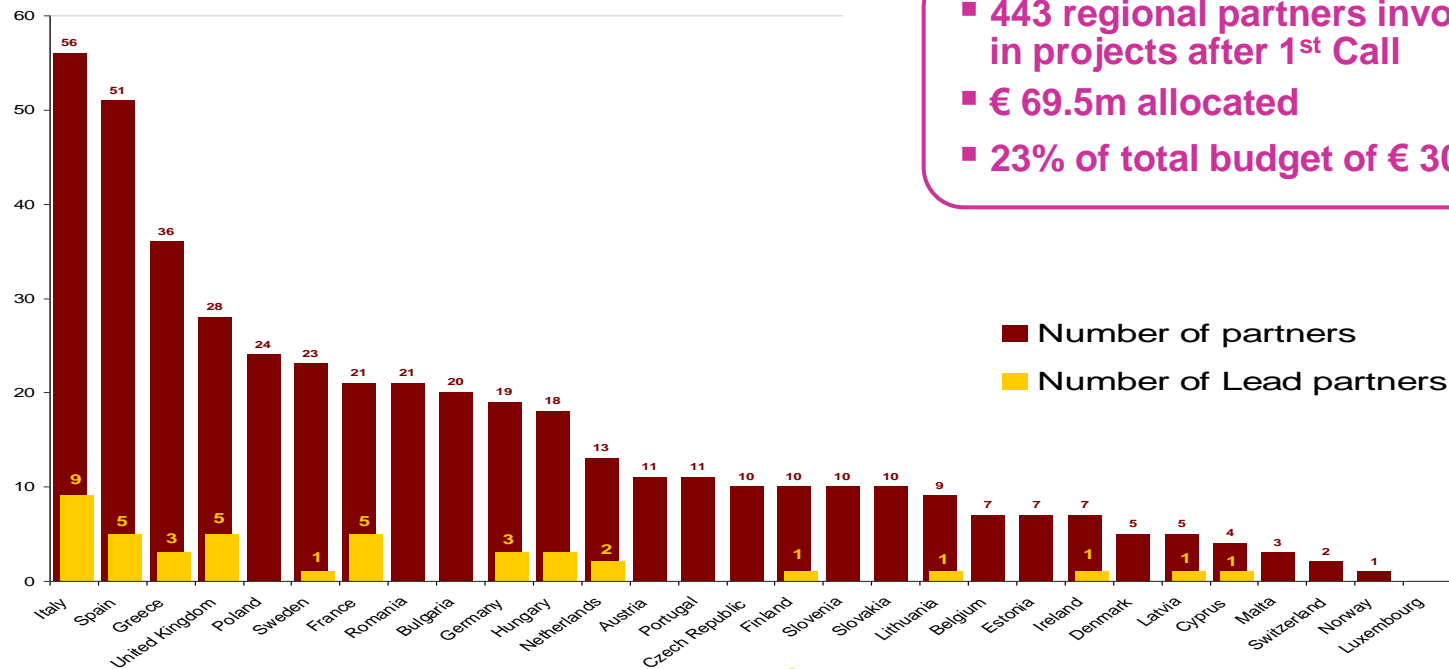
Overall objective of the Programme

- To improve the effectiveness of regional development policies
- To contribute to economic modernisation and increased competitiveness of Europe

by

- Enabling exchange of experiences and knowledge
- Matching less experienced with more advanced regions
- Ensuring transfer of identified good practice into mainstream programmes

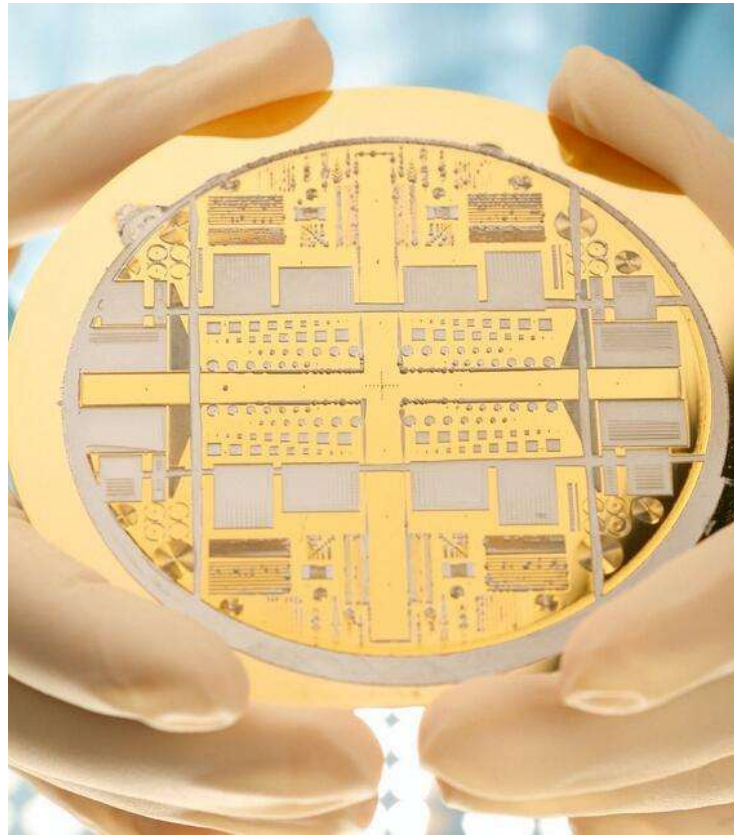
Lead partners and partners of approved projects per country (1st Call 2008)



- 443 regional partners involved in projects after 1st Call
- € 69.5m allocated
- 23% of total budget of € 302m



MST.factory dortmund

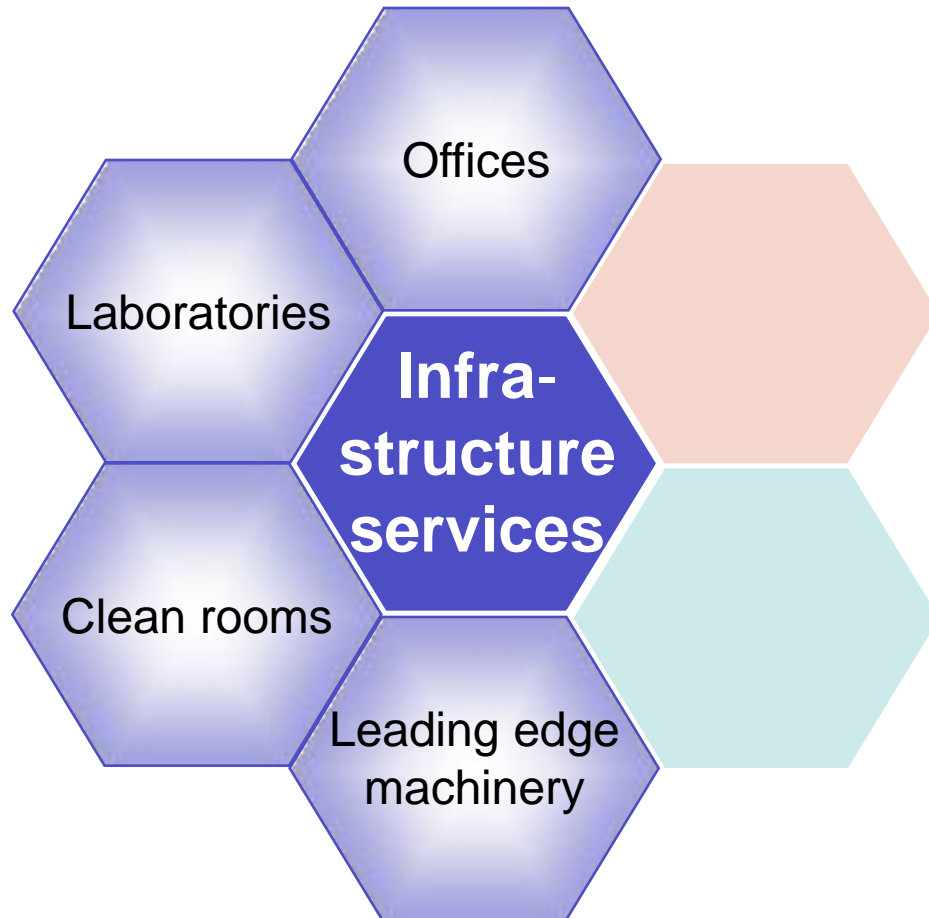


Competence Center for Micro and Nanotechnology

MST.factory dortmund in brief

- Competence center for micro and nanotechnology (MNT)
- 1st European incubator with a restrictive focus on MNT
- Founded in 2002
- Premises at PHOENIX West site since 2005
- Investor / owner: City of Dortmund
- Managed by TZM GmbH
- Total investment of approx. 50 mln EUR
- Co-financed by the State of NRW and the EU

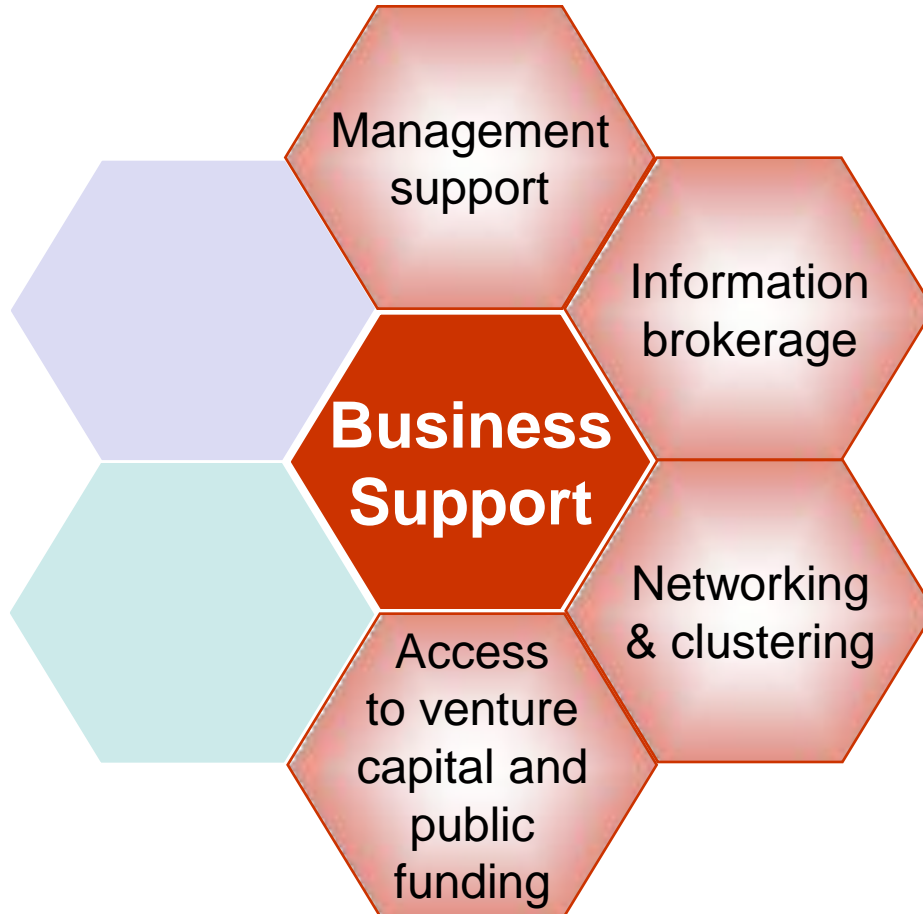
Infrastructure Services



„The Bricks“

- User-specific technical and technological infrastructure
- Attractive business accommodation
- Investments in leading-edge equipment
- Reduction of time, costs and risks

Business Support



„The Brain“

- Coaching & consulting
- Assistance in business development of start-ups
- Fast integration of start-ups into the regional MNT cluster
- One-stop shop:
Services are rendered inhouse / in co-operation with external experts.

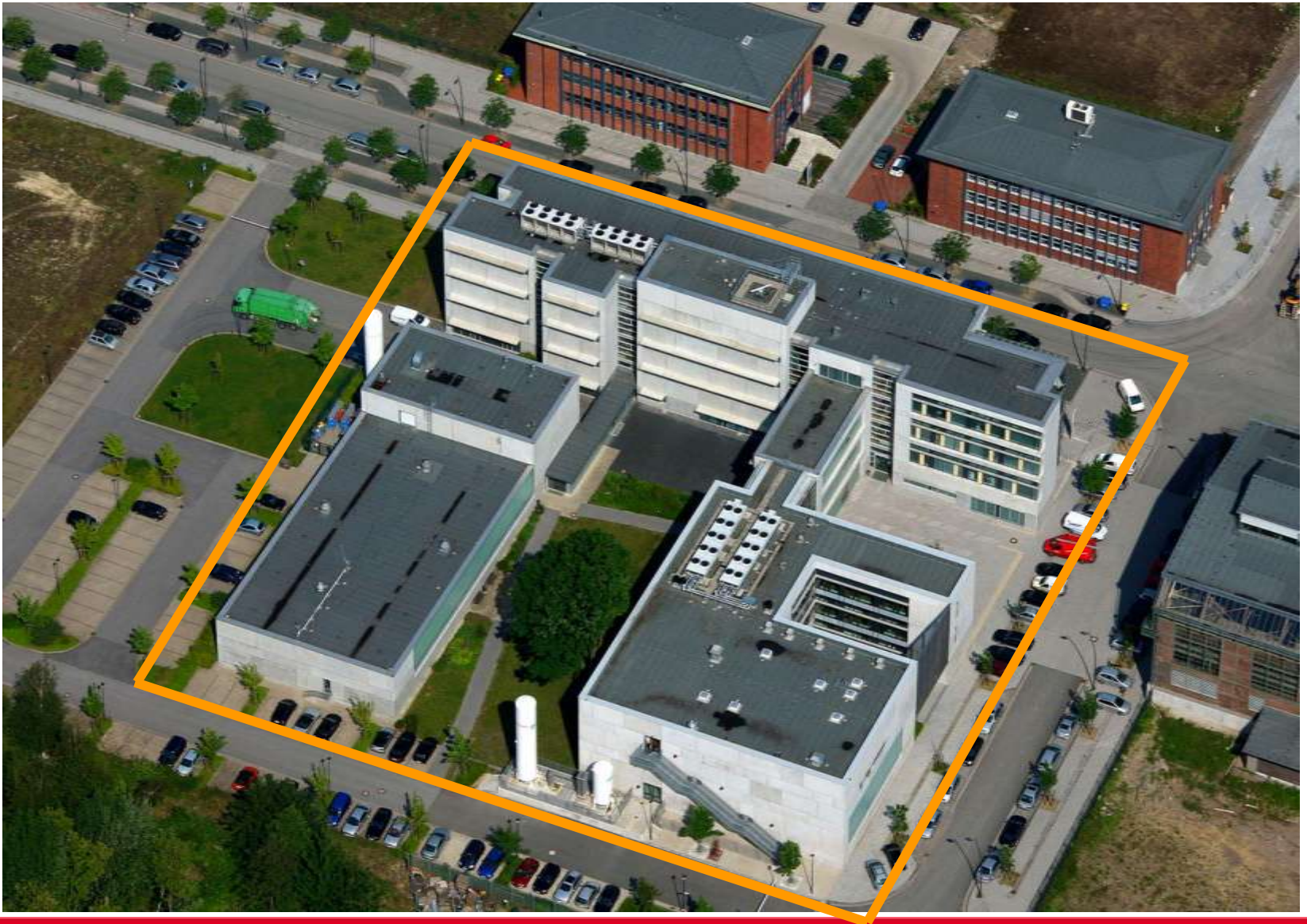
MST.factory dortmund at PHOENIX West



Source: dortmund-project

MST.factory dortmund at PHOENIX West

MST.factory
dortmund



Clean room infrastructure (example)



Clean room infrastructure (example)



View behind the curtains



View behind the curtains



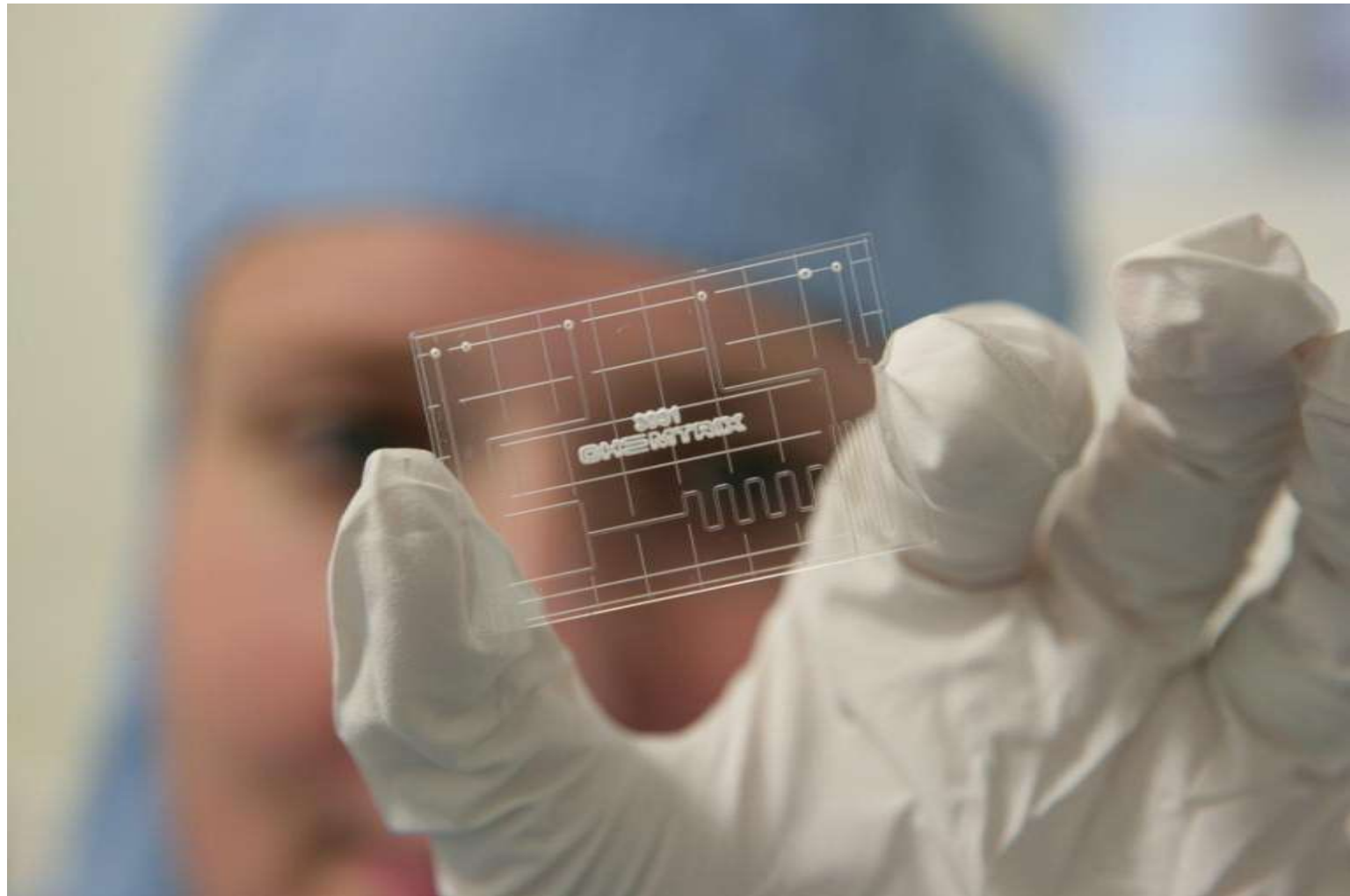
View behind the curtains



View behind the curtains



View behind the curtains



Start-ups in MST.factory dortmund

MST.factory

Innolume



temicon



OPTOGAN

NR
NanoRelief



KLASTECH
KARPUSHKO LASER TECHNOLOGIES

t.metals

adlantis
ortmund

MiNaCon

i/nnowledgement

surcoatec

(Status: April 2011)

Start-ups in MST.factory dortmund

- 13 tenant companies (status: April 2011)
- High occupancy level
- International community of tenants
- Geographic origin of technology:
 - Germany (6)
 - Russia (4)
 - Netherlands (2)
 - Finland (1)
- Main fields of technology:
 - micro / nano optics
 - micro / nano structures
 - microfluidics
 - microsensors

Company profiles

Innolume GmbH

innolume

- established 2002
- „Spin-off“ of the Abraham-Ioffe-Institute, St. Petersburg / Russia
- Offices in Dortmund and Santa Clara (CA)
- A world leader in commercialization of Quantum Dot (QD)-based optoelectronic devices
- Supplier of QD epitaxial wafers (GaAs), laser chips and fiber-coupled modules:
 - high-power lasers
 - superluminescent diodes
 - semiconductor optical amplifiers



Company profiles

OptoGaN GmbH

- established 2005
- Subsidiary of OptoGaN Oy, Finland
- Supplier of epitaxy materials for green, blue and ultraviolet high brightness LEDs on the basis of GaN compound semiconductors
- Target markets:
 - Illumination
 - Back light for flat screens
 - Automotive
 - Signals and large displays



Company profiles

KLASTECH GmbH

- established 2005
- Development, manufacture and sales of single frequency continuous wave DPSS lasers, green/blue, 10 mW ...1 W
- Development of customized products
- Fields of application:
 - repro/ litho/ holography
 - medical applications
 - biochemical analytics
 - confocal microscopy
 - metrology

KLASTECH
KARPUSHKO LASER TECHNOLOGIES



Company profiles

NanoRelief GmbH

- established 2005
- Development, manufacture and sales of innovative light modulators on the basis of polymer layer technology
- Fields of application:
 - projection systems
 - laser TV
 - adaptive optics
 - telecommunication

NR
NanoRelief





BioMedizinZentrumDortmund

Bio Medicine Center at the Dortmund Technology Center

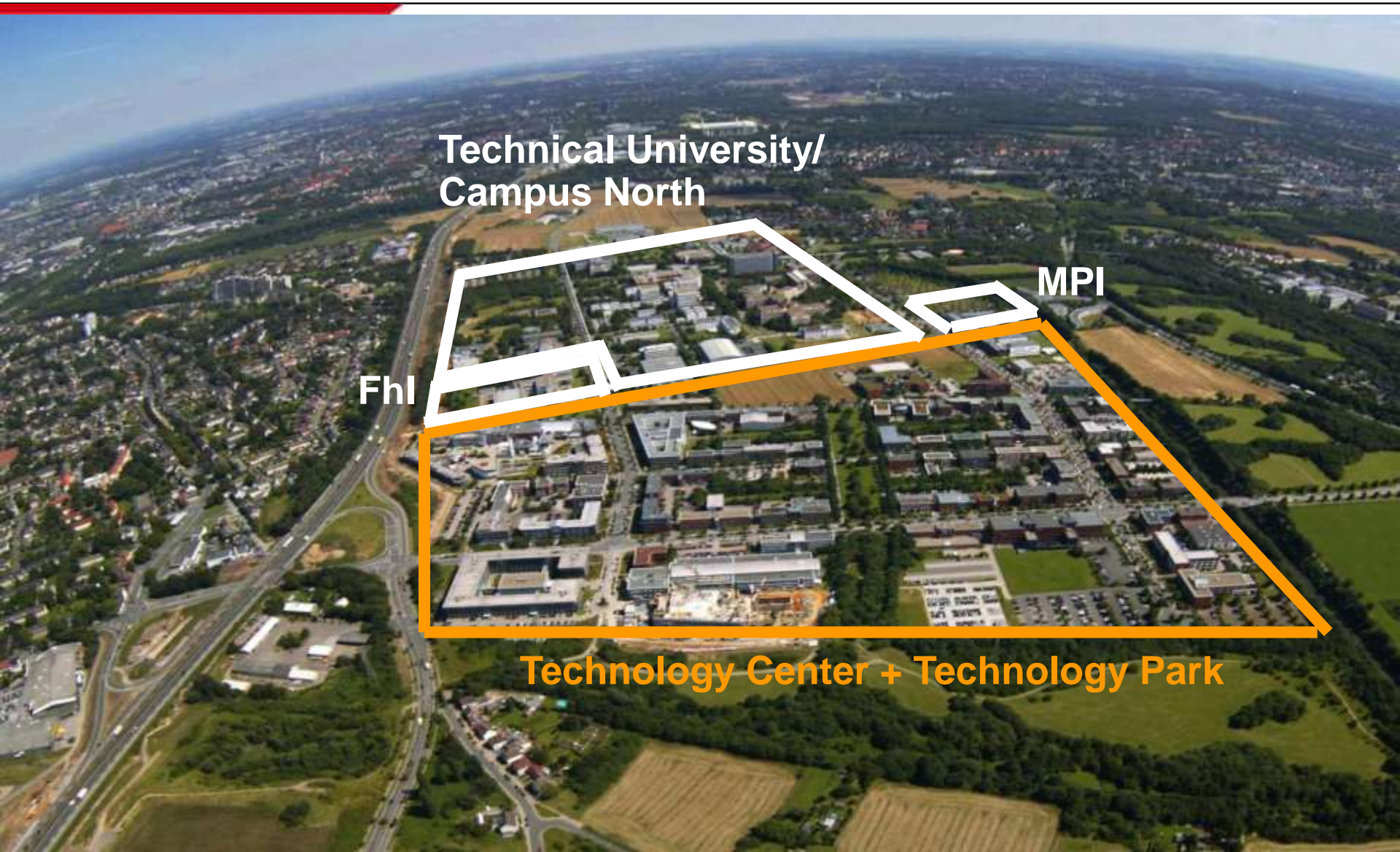
- Biotechnology
- Proteomics
- Bio-IT



Center of Production Technology at PHOENIX West

- Automation & Robotics
- Surface treatment & Materials
- Sensors & Measurement technology

Dortmund **Technology** Center and Dortmund **Technology** Park



Technical University/
Campus North

Fhl

MPI

Technology Center + Technology Park

Dortmund **Technology** Center and Dortmund **Technology** Park



a **TOP 5 business incubator** in Europe

- founded **1984**
- number of tenants in the Center: ca. **180**
- number of companies in the entire Technology Park: ca. **280**
- employees in the Technology Park: ca. **8.200**
- numerous awards for **good practice**

Good practice & International awareness



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