

**Advanced Manufacturing Technology mapping**

	Advanced Manufacturing Technologies	Name of the company	Overlapping (>=2)	Lacking
Additive Manufacturing	Laser Metal Deposition			
	Selective Laser Melting (SLM)			
	Stereo-lithography			
	Multijet modelling			
	Selective Laser Sintering (SLS)			
	Additive Manufacturing - Thermoforming			
Semiconductor Processing Technologies	Electronic system integration			
	Power electronic devices (SiC)			
	Silicon Devices			
	MEMS			
	Semiconductor devices characterization			
	Silicon Batch Processing			
	Compound semiconductor devices			
Structuring Technologies	High Resolution Laser Sintering			
	R2R Hot Embossing			
	Hot Embossing			
	Roll-to-roll (R2R) Nanoimprint Lithography (NIL)			
	Batch NIL			
	E-Beam Lithography			
	R2R Flex-Foil Patterning			
Thick film deposition	Printed microstructures / electronics			
	Aerosol Jet			
	Screen Printing			
	Ink Jet			
	Printed R2R electronics			
Thin film deposition technologies	PVD, PA-CVD			
	Pulsed Laser Deposition (PLD)			
	Coating of inner tube walls			
Generative process for polymers	Composite processing			
	Rapid Transfer Molding			
	BAST Fibres			
	Thermoforming			
	Micro injection molding			
-	Ionic liquid			
Joining technologies	Laser / welding /alloying			
	Adhesives			
	Self Pierced Riveting			
	Multi Material Joining			
	Remote Fibre Laser Welding			
-	Molded Interconnect devices (MID) Technologies			
-	3D components assembly			
Robotics	Software & communications			

	Smart Robotics (programming)			
Metrology	Magnetic nanoparticle characterisation			
	High precision distance sensing (TRL6)			
	Optics & optoelectronics			
	High Speed Laser Scanning			
	Accoustic Sensing			
	Machine Vision, Computer Vision			
Modeling & Simulation	Modeling & Simulation			
	Electro-mechanical-thermal-fluidic Simulation of Processes and Microsystems			
Design	Microelectronics system design (ASIC)			
	Industrial design & engineering			
	Applied Materials Engineering			
	Products & Process Engineering			
	Electronic Engineering			
Monitoring & Process Control	Industrial Analytics			
	Future Industrial Service Management Systems (software)			
	Bio & bio-chemical sensors			
	Sensors for Process Control in Harsch Environment			
	UV-IR-sensors for process control			
	Fiber optics sensors			
	Optical fibres with special functionalities			
	Sensors for environmental monitoring			
	X-ray detectors			
	Sortering metals at recycling plants			
	Sortering magnetic components for electronic recycling			
	RFID techniques for back tracing and tracking			
Machining	High Speed cryogenic machining			
	High Speed ultrasound machining			
	Hybrid machining: Laser Cladding / CNC machining			

## Nanotechnology Mapping

	Nanotechnologies	Name of the company	Overlapping (>=2)	Lacking
	Nanofiber membranes (env, PPE, Battery, etc.)			
	Electrospinning			
Nanoparticles	Nanoparticles synthesis			
	Integration in materials			
	Sol-Gel Formation			
	Encapsulation			
	Nanomedicine			
	Dispersion			
	Nanoparticles ink			
	Ink synthesis (for printed electronics)			
	Printed electronics with nanoparticles in the inks			
	Applications of nanoparticles in lab on chip systems			
	Surface modifictaion			
Nanocomposites	-			
Semiconductor-based nanomaterials	Compound semiconductor Quantum-Wells & Quantum-Dots			
	Nanowire / Nanoribbons			
Labelling	Fluorescent labels and indicators			
-	Biokinetics			
	Biofunctionalisation			
Deposition & nanostructuring technologies	R2R Hot Embossing			
	High resolution Laser Lithography (TPA, Grey Scale Litho, UV-Photolitho)			
	PVD, PA-CVD			
	Pulsed Laser Deposition (PLD)			
	Roll-to-roll (R2R) Nanoimprint Lithography (NIL)			
	Batch NIL			
Sensors	Biosensors			
-	Nano-liter dosage			
Characterization	Nanomaterial characterization (UV-Vis, BET, Zeta potential, SEM, TEM, FT-IP, EDX, TGA, ICP-MS, DLS)			
	Magnetical nanoparticle analysis			
	AFM, Profilometry			
Simulation	Optical Simulation (Ray tracing, FDTD, for photonic applications)			
-	Scale-up Processes			
	Production			
-	Toxicity & Ecotoxycity			
	Exposure / Risk Assessment			
	Fate			
	GLP (Good Laboratoy Practices) Lab.			

Release			
Life Cycle Assessment (LCA)			

## Industrial Biotechnology

	Industrial Biotechnology	Name of the company	Overlapping ( $\geq 2$ )	Lacking
Waste Valorisation	Biodegradable Semiconductors			
	Chemical modification			
	Lignocellulosic conversion			
	Waste Valorisation - energy - anaerobic digestion / MFC			
	Surface modification			
	Bio-based materials			
	Renewable chemicals from biomass			
	Protein Hydrolysates			
	Alternative raw materials of feedstock / bio-product production			
	Bioprocessing -> Bio-Products: bioplastic / biosurfactants / biopesticide / others			
	Fermentation + Bioseparation Technology			
	Bioelectrochemical reactors (design, operation)			
	Fermentation IL-300L			
	Waste Management			
Biorefinery				
<b>Assisting Technologies</b>				
Enabling Technologies	Large-scale monitoring / industrial processes environment			
	High-precision distance sensing			
Sensors & Sensor Systems	Optical probes			
	Optical sensors UV, IR, X-Rays			
	Gas sensors			
	T-PH pressure sensors			
	Flow sensors			
	Spectral analysis of fluids -> integrated systems -> low cost carriers + systems			
	Smart Chip Encapsulation for fluid handling and analysis			
	Sensors and Sensor-Systems - Food, Water, Soil, Air			
	Components for in vitro Diagnostics			
	In Vitro Diagnostics			
Fluorescent labels	-			
Characterization	Spectroscopic-fluorescence SNOM, Raman, STM, SEM, TEM, etc.			

## Advanced Materials

	Advanced Materials	Name of the company	Overlapping ( $\geq 2$ )	Lacking
Semi-Conductors	Nanostructured Semiconduction Materials (III - V) / Quantum wells / embedded Q-dots			
	Materials for color conversion			
	Biodegradable Semiconductors			
Printing inks	Electrically conducting plastic foils and electrolytes / conductive low-cost inks			
	Ink Synthesis			
	Polymers for inkjet			
	Screen Printing			
	Pad Printing			
	Ink Jet Printing			
Materials for electrical / mechanical contracts	Conductive coating and inks			
	Laser alloying			
	Additive Manufacturing - Plasma transferred are alloys, metals			
Sensor Materials	Additive manufacturing materials			
Sensor Materials	-			
Smart Textile Materials	-			
Materials for the function of sensors	-			
Materials for NIL	-			
Ceramics ALM: 3DP, smart pump, medical bone, scaffolds	Metamaterials - "cloaking devices"			
Energy Storage	Battery Chemistries Lipo, Li-ion, Titanates ETL, lab -> cell -> pack			
	Battery Chemistry Li-S, Li-Ain, lab -> cell			
Composites	Composites: Thermoplastic, Thermoset, Biocomposites - Nat. Fibre			
	Synthesis of new polymers and biopolymers			
	Polymer extrusion			
	VARTM composites			
	Polymer mold injection			
	Injection blow molding			
	Concretes inorganic composites			
	Mortars inorganic composites			
	Smart composite materials with integrated sensors			
Stabilised inorganic composites				
Coating	Green solvents for coatings			
	Spin coating			
	Spraying			
	Bar coating			
	Scraper			
	Dip coating			

Nanomaterials	Nanocomposites (Metal Matrix, Polymer Matrix, Ceramics)			
	Nanoparticles/fibres/clays			
	Biomembranes, electrospinning of biomaterials + polymers			
	Nanomaterials functionalisation			
	Electrospinning			
Microencapsulation	-			
<b>Assisting Technologies</b>				
Testing + Analysis	Microstructural analysis, CAT/Xray scanning			
	Certified testing for automotive, textile, energy			
	Failure Analysis (SEM, Temperature, Stress)			
	Jetting & Printing / Micro molding / Assembly technology / Electrochemical deposition			
	Material testing for adv. Manufacturing & application development			
Metals	Metals Processing - Extrusion Press - 800T for making ingots			
	Metals Processing / Rolling mill / 5-axis CNC / Laser welding			
	Metals ALM: DMLS EOS M280 (Laser Sintering)			
	Direct Laser Melting			
	Laser ablation			
Application and Implementation to Sensors	-			
Electrodeposition / Electrospinning / Carbonisation / etc. Processes	-			
Plastics	Recycled Materials: Testing, Characterisation, LCA			
	Plastics Processing: Injection Moulding, Extrusion, 60T, 140T, 5T / Twin Screw X 4			
	Plastic ALM: Fortus 400mc FDM multi-set modelling inkjet (3D)			
Composites	Composites Processing: 1700T Engel Press / RTM, Thermosets / 800T Stamp Forming / Thermoplastics			
Battery	Battery Processing: Full Scale-Up Line; Cell/Pack Manufacturing			

## Photonics

	Photonics	Name of the company	Overlapping (>=2)	Lacking
Optoelectronic Components	Optoelectronic devices: Electroabsorptionmodulator, Detectors, Light sources			
	All fiber modulators			
	LEDs Epitaxy			
	Imaging detectors IR; UV; X-rays; THz			
	Pyroelectric Detectors			
	Quantum Dots App. - Imaging sensors			
	III-V materials (Gas sensing)			
	LED Packaging			
	LED Reliability Technology			
	Optical Waveguides			
Fibre Optics	Specialty optical fibres : Design, Fabrication & Characterization			
	Poling of optical fibres			
	Optical fiber sensors			
	Optical fiber devices			
	Optical fiber probes			
	Advanced fiber splicing ex. multicore fibers			
	High Temperature Fiber Bragg Gratings (FBG)			
	Structuring of optical fibres			
Monitoring Spectroscopy & Optical Analysis (use of...)	Optical Microscopy			
	Assessment - Spectroscopy UV, VIS, RAMAN			
	Assessment: SEM. + EDS + EBDS / XPS.			
	Spectroscopy (Absorption, Reflexion, Transmission, Fluoreszenz)			
	Ellipsometry			
	Radio- and Photometry (Goniometry, Integration Sphere)			
	Directional Optical Measurements: BDR / BRDF			
	XRD			
Application	Fiber optics for smart textiles and smart structures			
	Minimal invasive/embedded sensors for medical & industrial application			
	Optical chemical sensors for process control			
	Optical physical sensors for process control			
	Solar thermal energy			
	Free-space optical communication			
	App. Life Science Invasion sensing and actuation with fiber optics.			
	Flow Cytometer			

Signal Processing	Image analysis			
	Image-based remote sensing + environmental monitoring			
	Image-based industrial metrology			
	Optical metrology interferometric			
	Optical Signal Processing			
Photonic Materials	Optical thin film coatings			
Up- and Down-Conversion of Luminescence	-			
	Metamaterials			
Photovoltaics	Concentrated Photovoltaics			
	Organic Photovoltaics			
	Photodiodes			
	Light Management for Photovoltaics			
	P.V. Devices			
Optoelectronic Systems	Optical Databases for Automotive			
	Spectroscopy: Absorption, Fluorescence, Raman, LIBS			
	Electroluminescent Displays			
	Microwave photonics			
	Optofluidics fibers			
Optical Microintegration (of systems)	-			
	System Integration of Fibres, Lenses, Light Guides			
Photonics Design	-			
	Ray Tracing			
	Diffraction & Refractive Components			
	Optical Simulation (Raytracing, FDTD)			
Test + Evaluation	Strainrate Measurements (low-high temperature)			
	CT Scanning			
	Opto Fibre Sensing			
	Biomedical Imaging			
	Environmental Testing			
	PV characterization in Lab: - Electrical Measurements - Assembly in new products - Standards in Textile/Packaging; BIPV; Automotive;			
	Laser Scanning (Metrology)			
	Portable Laser Scanning			
	Lighting: - Integration Textile - Standards in Textile; Automotive; Packaging			
	PV Cell & modules: - Field Monitoring - Outdoor Station			
3D Powerwall Visualisation				
Manufacturing of Optical	I.J. Opto Devices (PV, EL)			
	Injection Molding of Optical Components			



Components	Ultra-Precision-Machining of Optical Components			
	Micro-Optics (also Gratings,...)			
Manufacturing with Optical Systems	Laser Patterning			
	(Remote) Laser Welding Joining			
	Laser-Lithography (UV-greyscale, TPA)			
	Silicon Carbide Lithography			
	Laser Alloying			
	Laser Ablation			
	Laser Activation for selective metallization			
	3D Printing (UV ALM)			
	Laser Welding Robotics (-> Robotics)			
	Micro-Tool Making			
	Direct Laser Melting (-> Additive Manufacturing)			
	Robotics			

## Micro- and Nano-Electronics

	Micro- and Nano-Electronics	Name of the company	Overlapping (>=2)	Lacking
Silicon MEMS	-			
	Layouts			
	Simulation + Test			
	Medical MEMS			
	Single Chip COMBO sensors			
Wafer Processing Technologies	MEMS - Desig - Manufacturing - Simulation Tools - Commercial fab design rules, libraries			
	-			
	Wafer Bonding			
	One piece flow			
	Design Support			
	Manufacturing - Prototypes - Pilot Lines - Series			
	Rapid Prototyping			
Si & SOI Technologies	LPCVD poly-Si on glass			
	Thin Layer Techniques CVD, PVD, oxidation + PE-CVD and alike			
	Lithography			
	Dry etching & wet etching (e.g. RIE, KOH, ...)			
	TSV (Through Silicon Via)			
MEMS Assembly	Nano-Silicon Group Epitaxy			
	-			
	Packaging			
System Design Sensor / Power / Communication / FPGA / Firmware	Wire Bonding			
	Flip-Chip			
	System Integration			
	Assembly			
Sensor Systems	Test & Qualification			
	Reliability Modelling			
	-			
	Actuator Systems			
	Thermal Sensors			
	MEMS Inertial Sensor Design Characterization, Calibration			
	Multi-Axial Inertial Sensors			
	Piezoresistive Sensors			
	Capacitive Sensors			
Energy	Sensor Fusion			
	Piezoelectric Flexible Sensors			
	Bio-sensors			

Autonomous Systems	Modelling & Design			
	Inductive Harvester			
	Piezo Harvester			
	CMOS compatible processing for $\mu$ -fuel cells			
	MEMS Energy harvesting			
Low Power Systems	-			
	LP $\Delta\Sigma$ -AD Converters			
	Mixed signal ASIC Design tools "Europractice"			
	Mixed Signal Systems			
	Sensor Read Out			
	Sub Threshold Operation			
	Antenna Design			
	Communication (wireless)			
	Visualization			
Microelectronic Systems	-			
	Simulation & Modelling			
	Power Supply			
	EDA Tools			
	Pulsed Synchronous Charge Extractors			
Embedded Systems	-			
	Embedded Software			
	App Programming			
	Cyber Physical Systems			
	Autonomous Networks			
Power Electronics	-			
	SiC			
	SiC - Power/Simulation			
	SiC - Epitaxy			
	SiC - Device design			
	SiC - Manufacturing			
	Power Electronics System Design			
	Silicon Carbide Power Devices			
Manufacturing Lines	Full operational process lines (clean room) for nano & microelectronics			
	Nano-Imprint Lithography			
	RLR processing of Organic Electronics (OLAE)			
	e-beam Lithography			
	X-FAB HO35 Process			
Characterization	Ellipsometry			
	SEM			
	XPS/UPS for Surface Analysis			
	Probstations for devices on wafer-level			
	Devices Electrical & Elektrochemical Characterization			
	Non-Invasive Fault Analysis SEM			
	CT Scanning			

	Network analyzes and Probestation for <85GHz			
On Chip T. Electric Cooling for Electronics	-			
Optical Simulation for Silicon Photonics	-			
Battery Management Systems	-			
Organic & Inorganic Materials & Components	Q-dots based sensors for high-performance IR detection			
	Quantum well-based detectors III - V materials			
	Nanowire-based sensors for biodetection (bacteria-proteins, etc.)			
	Device fabrication / Neutral Semiconductors (Indigo...)			
	Graphene-based devices			
	Hybrid Integration (Org./Inorg.)			
	Carbon Nanotubes & Graphene			
	Bio-Electronics			
	OTFTs, OFETs and Circuits			