SILICON AUSTRIA LABS

The Austrian Research Center for Electronics-Based Systems (EBS)

Bundesministerium
Klimaschutz, Umwelt,
Energie, Mobilität,
Innovation und Technologie

FFG

Das Land Steiermark

SFG

ZUKUNFTSFONDS STEIERMARK

LAND KÄRNTEN

ober österreich

Member of UAR INNOVATION NETWORK

KEY FACTS & FIGURES

250 ***Researchers***

- *Experienced international team*
- *Multidisciplinary*
- *Industry focused*

15 ***Research Units***

Electronic Sensors *Microsystem Technologies* *Heterogenous Integration* *Photonic Systems* *Sensor Applications*	*Sensor Systems*
Architecture&Topologies *EM Compatibility* *Instrumentation&Testing* *Packaging&Multiphysics*	*Power Electronics*
Trustworthy Adaptive Computing *Collaborative Perception&Learning*	*Embedded Systems*
Wireless Communications *Embedded AI* *Frontend Integrated Circuits&Systems* *mm Wave Technologies*	*Intelligent Wireless Systems*

5 ***Shareholders***

50.1 % Republic of Austria
10 % Styria (SFG)
10 % State of Carinthia
4.95 % Upper Austria (UAR)
24.95 % Industrial Association FEEI

3 ***Locations***

Graz, Villach, Linz

1 ***Vision***

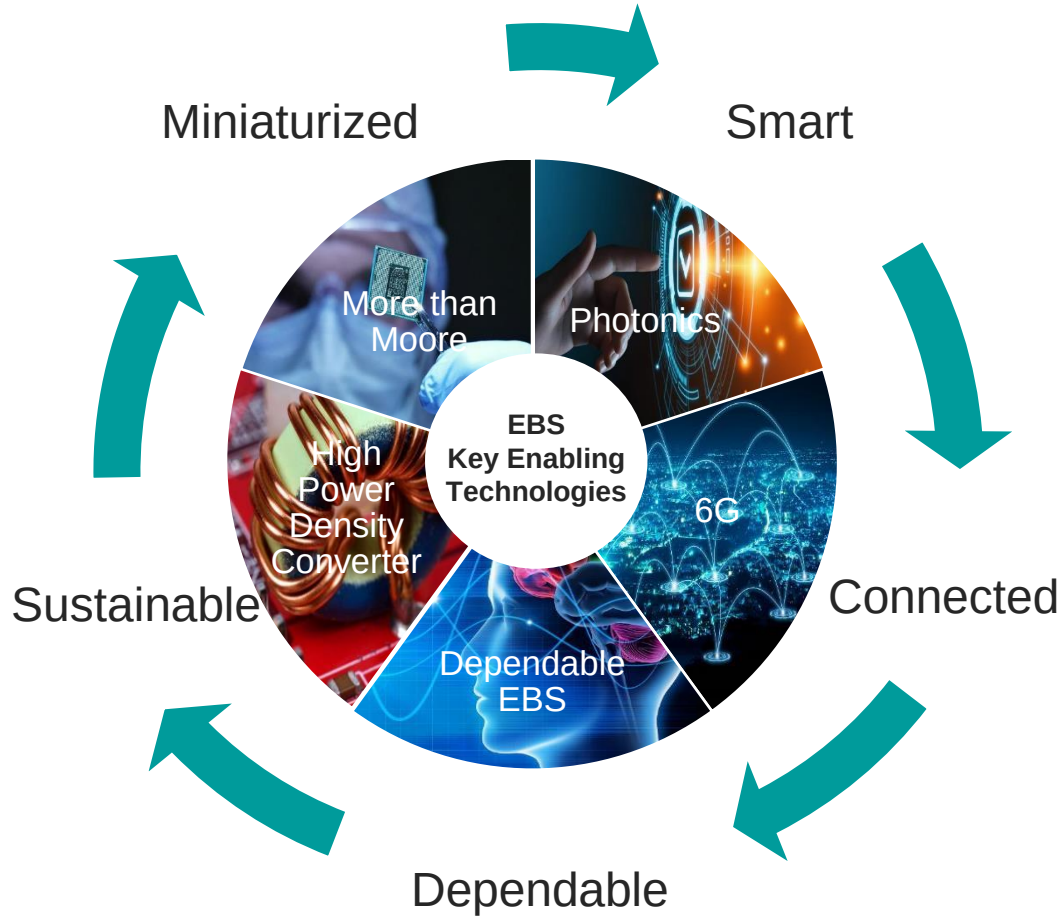
becoming a top player in EBS research in Europe

SILICON AUSTRIA LABS (SAL)

What drives us?

As a **high-level research center** and **pioneer in EBS**, we offer the industry, access to top-class R&D infrastructures & research services to give them the decisive competitive advantage on both domestic and on international soil.

- We provide **EBS Key Enabling Technologies** for Smart, Connected, Dependable, Sustainable and Miniaturized Solutions
- We offer cost-effective research through the lighthouses. **More-than-Moore, Photonics, 6G, High Power Density Converter** and **Dependable EBS**



SAL BENEFITS FOR INDUSTRY

What do we offer?

- **Industry oriented research**
  Our competences and our equipment are aligned with industrial needs

- **We build the bridge between fundamental research and product development**
  We convert the findings of fundamental research into industrially usable results - right up to a functional demonstrator

- **We multiply your effort**
  The SAL finance model for cooperative research extends the radius of your research activities

OUR BUSINESS MODELS

How to work together

SAL Cooperative Research

Purpose:
- Easy accessible cofinancing for R&D projects with SAL
- Long term R&D cooperations (>1year)

Organisational Framework:
- Project Evaluation by SAL
- SAL General Contract Terms
- SAL Project Agreement

Advantages:
- 50% co-financing by SAL
- Bi/multilateral cooperation possible
- No application/proposal process necessary

SAL Contract Research

Purpose:
- Technology Concepts
- Test & Measurement Campaings
- Feasibility Studies
- Proof of Concept Studies
- (Rapid) Prototyping

Organisational Framework:
- Quote – Order Process

Advantages:
- Fast project start
- No further contractual framework necessary
- Fixed price
- Clearly defined deliverables

SAL Funded Research

FFG Forschung wirkt.

ECSEL Joint Undertaking

Horizon 2020 European Union Funding for Research & Innovation

EFRE

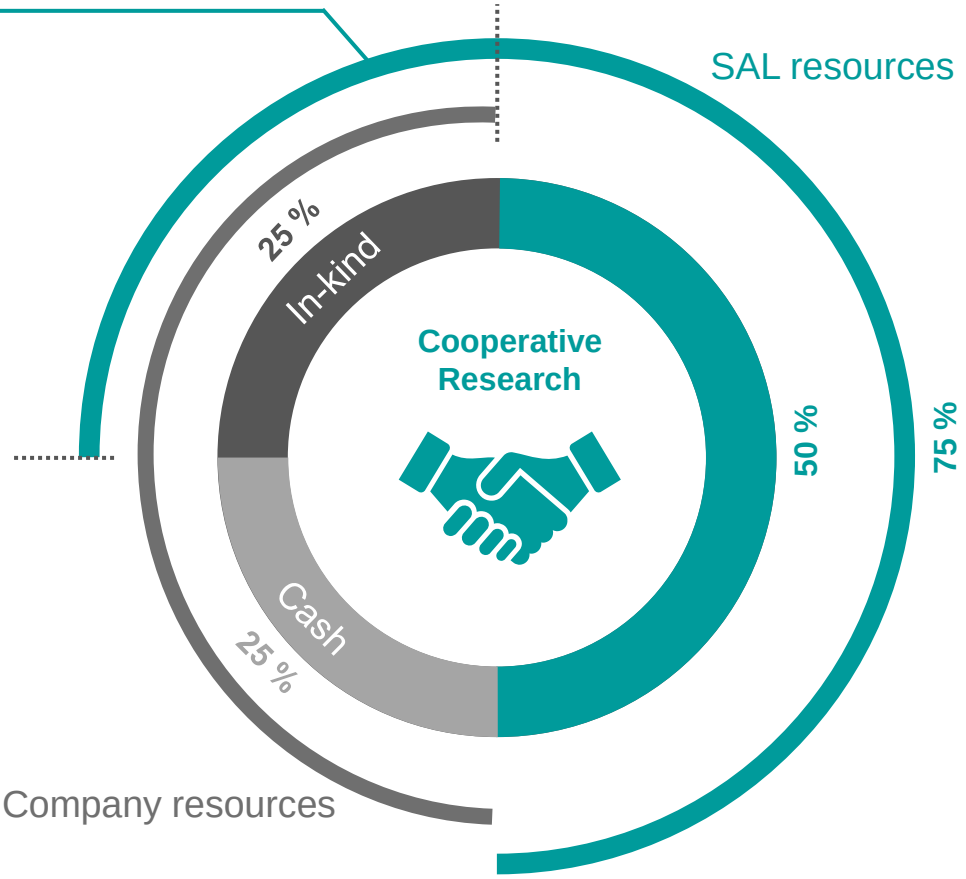
OUR BUSINESS MODELS

Collaboration on a higher level

SAL Cooperative Research

- Applied Research (TRL 3 - 6)
- Multi-firm or single-firm projects customized to company needs
- Optional participations of universities as scientific partners
- 50/50 co-financing
- No funding application needed, no waiting time
- IPR rules compliant to state-aid-laws

€ 300 k expenses on SAL's side amounts to approx. 2,720 personnel hours* at actual costs and € 21,000 direct material costs etc.**



TO PUT IT IN NUMBERS*:

€	100 k	In-kind contributions by company
€	100 k	Cash by the company
€	200 k	Co-financing by SAL (in-kind contributions)
€	**400 k**	**Project Volume**

*400 k project volume as example

OUR PARTNER NETWORK

Range of partners from industry & science


SAL VISION

What do we envision for SAL?

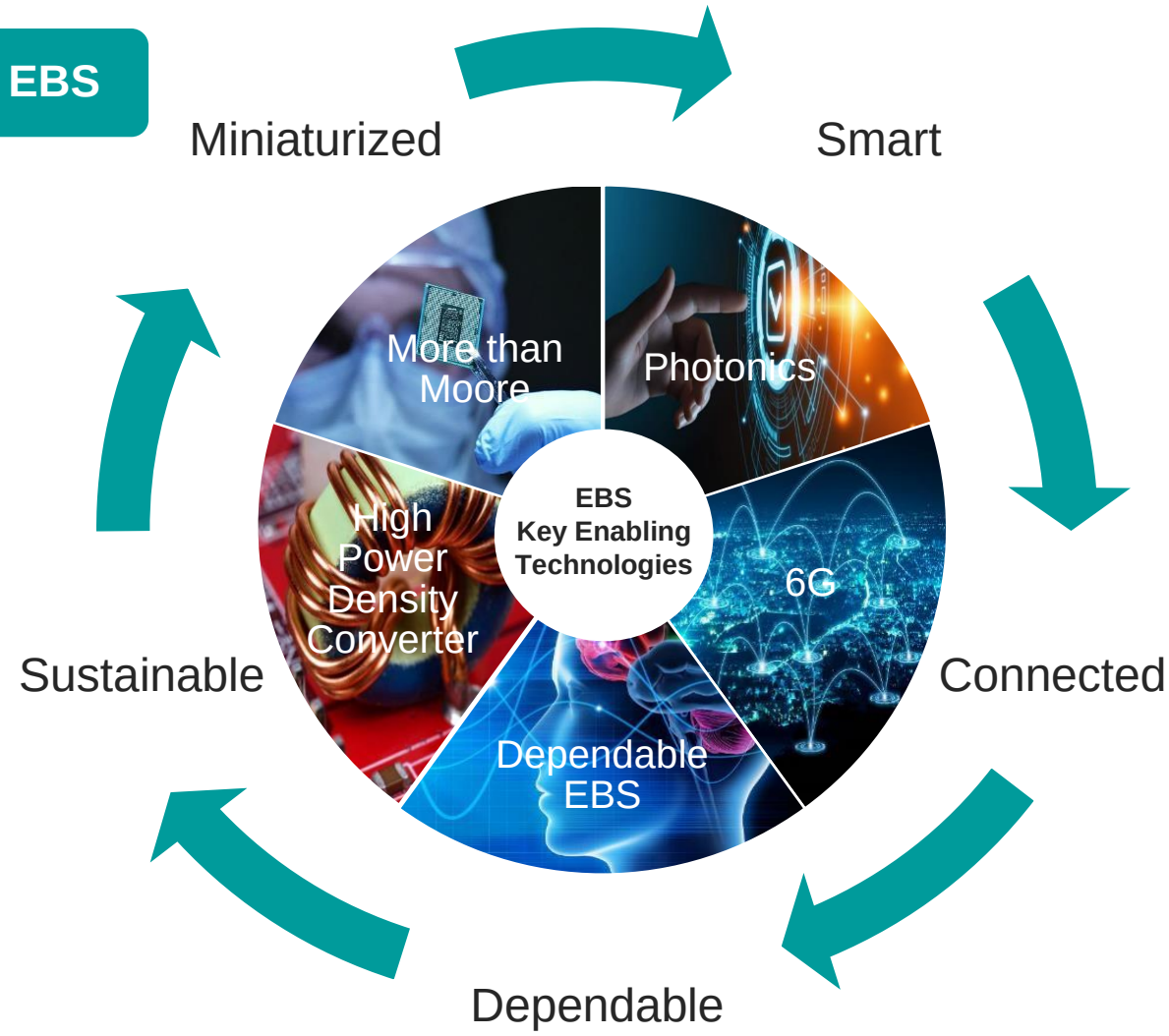
SAL
SILICON AUSTRIA LABS

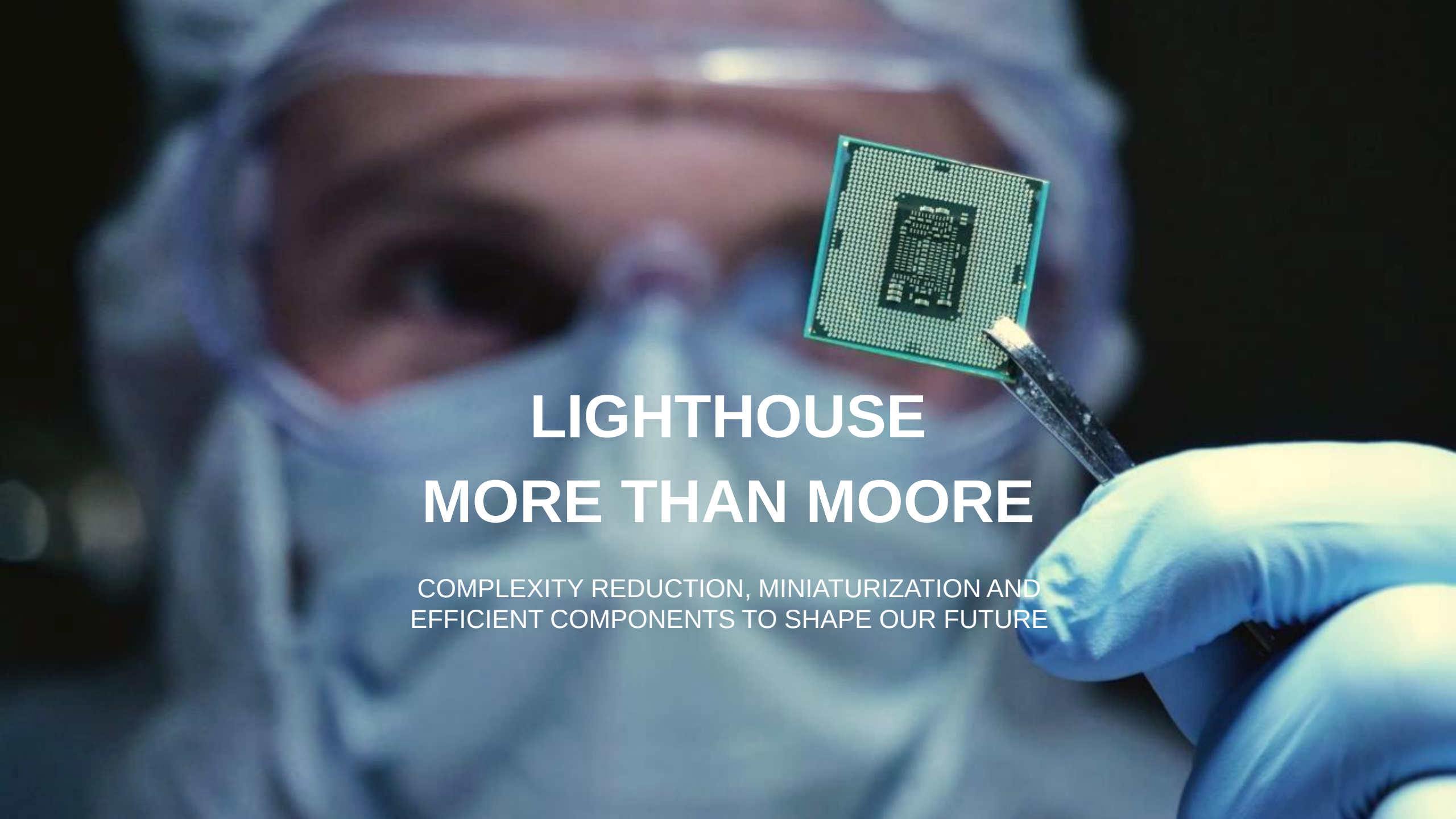
SAL is a world-class research center and pioneer in EBS

Providing EBS Key Enabling Technologies for **Smart, Connected, Dependable, Sustainable** and **Miniaturized** Solutions

Offering cost-effective solutions through the lighthouses. **More-than-Moore, Photonics, 6G, High Power Density Converter** and **Dependable EBS**

EBS one-stop-shop for high-tech industries, innovative SMEs and start-ups enabling **research along the value chain**





LIGHTHOUSE
MORE THAN MOORE

COMPLEXITY REDUCTION, MINIATURIZATION AND
EFFICIENT COMPONENTS TO SHAPE OUR FUTURE

MORE-THAN-MOORE LIGHTHOUSE

While Moore‘s law reaches its saturation (due to its massive capital intensity and ultimately semi-conductor physical limits), a new functional diversification, mixing and matching best suited EBS technologies for the good of ever more compact and performant systems becomes paramount. MEMS and MOEMS devices, RF filters, CMOS, magnetic and sustainable sensors combined with heterogeneous integration will be the new growth drivers in the EBS sector.

Flagship Research Topics

Piezo MEMS advanced piezo thin-film development and innovative piezo MEMS devices for emerging applications

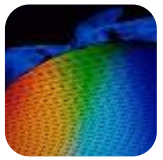
Photonic MEMS integrated silicon photonic MEMS for applications such as miniature sensors, telecommunication, …

Magnetic Sensors material characterization and system & application design for micromagnetic sensor systems

Sustainable Sensorics biodegradable and regenerative materials, resource efficient fabrication methods for flexible and conformable devices

Applicative Packaging dedicated leading edge packaging solutions driven by customer applications

Infrastructure & Services



Complete **process chain for 200 mm** wafers with a focus **high performance thin film tech.**

Bridging **Research** and **prototyping** to **small series** production

Cleanroom access for SAL VIP partners and their **strategic research**

Target Customers / Partners and Value Propositions

Semicon & Microelectr. Ind.

Material, telecom., Automotive, Helathcare,…

Industrial Users

Sustainable electronics and applicative packaging taking solutions a step further

Cleanroom Equipment Vendors

Driving beyond stat-of the-art manufacturing technologies

HTC2 CLEANROOM

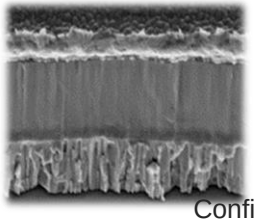
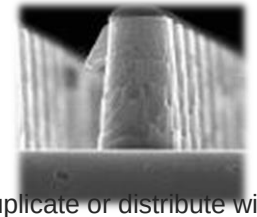
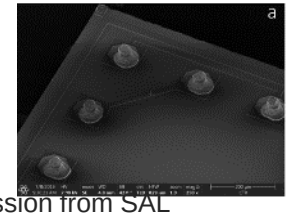
- Space for ~150 employees
- 1000 m^2 cleanroom
- Serving the full value chain of electronic based systems
- Research – Prototyping – Small Series

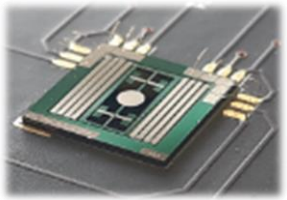






Cleaning | Lithography | Deposition | Etching | Metrology | Chip | Packaging



LIGHTHOUSE PHOTONICS

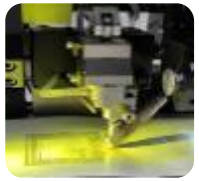
THE AGE OF LIGHT IS STARTING

PHOTONICS LIGHTHOUSE

The **technology of light** will make it possible to overcome the physical limits of micro- and nano-electronics. Defined as a “European Key Enabling Technology”, Photonics pushes the limits of a wide range of applications from sensing and metrology to (quantum-)communication, lighting and photovoltaics. SAL’s comprehensive capabilities from photonic devices to systems, backed by an advanced research infrastructure and long-term experience, is unique in Austria and amongst few in Europe.

Flagship Research Topics

Next Generation Photonic Systems for sensor and metrology solutions.



Advanced Photonic Assembly, key enabling technology for miniaturization, robustness and reliability.

Non-Linear & Quantum Photonics: Bring novel technologies of non-linear spectroscopy and quantum sensing to industrial application.

Infrastructure & Services

Simulate

Multiphysics simulation tool chain with Zemax, Virtual Lab, Comsol

Photonics Lab

400 m² class 4 laser-lab space for fabrication, testing, assembly

Cleanroom

Cleanroom facilities for Photonic MEMS customized for system requirements

Target Customers / Partners and Value Propositions

Semiconductor and Photonic component industry

RD&I for Photonic Components and Systems

Optical System Providers

Holistic Photonic system simulation and optimization including advanced photonic assembly

Application Industry

RD&I from simulation to custom photonic-component based application prototypes

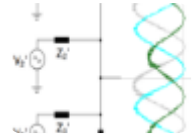

LIGHTHOUSE
HIGH POWER DENSITY
CONVERTERS

HIGH POWER-DENSITY LIGHTHOUSE

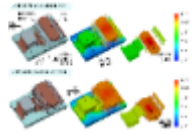
The climate change demands an energy turn-around along with stronger electrification. Modern efficient power converters with highest power density and efficiency are key enablers for that, with an immense range of target applications, replacement markets and hence impact potential.

Flagship Research Topics

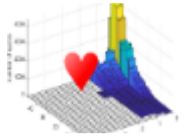
Highly efficient power converters & inverters with focus on resonant topologies aiming for compact hardware designs with high switching frequency exploiting wide-bandgap devices.



Emerging control engineering theory supported by signal processing, AI and high bandwidth controller hardware to enable full system/component utilization and lifetime optimized control.

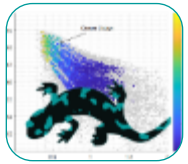


Multiphysics simulation for power electronics optimization & design. Multi-rate, multi-domain simulation for multi-objective, efficiency/lifetime/volume system optimization including EMC.



Power system health monitoring with minimal sensing effort via novel embedded multi-domain state estimators e.g. WBG device junction temperature sensing for lifetime aware systems.

Infrastructure & Services



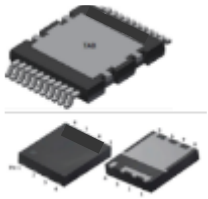
Simulation

"SALamander" multi-domain simulation framework for multi-objective efficiency/lifetime/volume system optimization and design.

Characterization, Test & Prototyping

Rapid Prototyping and Test Infrastructure for precise component & system measurements as well as hardware design.

Target Customers / Partners and Value Propositions



Power semiconductor component and module industry

Multi-physical, component-level measurements and characterization for holistic multi-physics simulation approaches, workflows and methodologies

System integrators and industrial user of power electronics:

Advanced topology, modulation and control aiming for full utilization of power electronic devices, components, and systems





TRUSTWORTHY, RESILIENT, SAFE & SECURE

DEPENDABLE ELECTRONIC BASED SYSTEMS

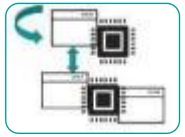
DEPENDABLE EBS LIGHTHOUSE

Our research strives to make your systems dependable –
„trustworthy, resilient, safe and secure“

Flagship Research Topics

Advanced Signal Processing
for integrated digital- & virtual sensors

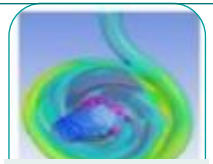
Trustworthy AI
for secure, explainable and verified AI at the edge



Efficient Computation
Dependable HW/SW-codesign and distributed algorithms up to middleware

Testing complex and connected EBS under application relevant conditions

Infrastructure & Services



Simulation & Modeling

Edge Computing Dev. Platforms

EBS Reliability Tests Lab

Edge AI System Test Lab

Target Customers / Partners and Value Propositions

Semiconductor industry
From formal methods to real-world testing on component and system level

Life Sciences & Medical electronics
Trustworthiness for wearables and point-of-care testing

Automotive & CPS
Combining safety, security, reliability into trustworthiness

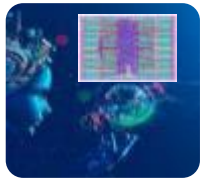

LIGHTHOUSE
6G
PROPEL RESEARCH IN WIRELESS COMMUNICATIONS INTO
SUSTAINABLE CONVERGED NETWORK SERVICES

6G LIGHTHOUSE

6G will enable a “hyper-reality” blurring the boundaries of physical and digital worlds. It will enable ubiquitous connectivity for people, billions of “hyper-connected” machines and services beyond pure communication. 6G will drive the convergence of communication, radar, localization and sensing.

Flagship Research Topics

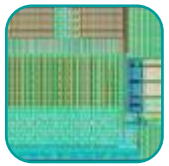
RF- & Analog IC design from mmWave to sub-THz frequency spectrum for convergence of communication, radar, localization and sensing.



Embedded AI for hybrid signal processing and machine learning in hardware.

Wireless time-sensitive networking facilitating real-time and secure wireless communications

Infrastructure & Services



IC Design

Digital-, RF-, Analog- & Neural Network Integrated Circuits Design

RF Test & Measurements

mmWave test- & measurement equipment (up to 500 GHz)

5G Use Case Prototyping

5G/6G research & experimentation testbed for industrial applications

Target Customers / Partners and Value Propositions

Semiconductor and ICT industry

RD&I for Integrated Circuits and Systems for RF, BB & ML for wireless communication and sensing

Industrial user of wireless systems and networks

RD&I for industrial applications of wireless communication and sensing

SMART MASK

SAL Cooperative Research

Measurement of Electrostatic Filter Charge in FFP2 Respiratory Masks

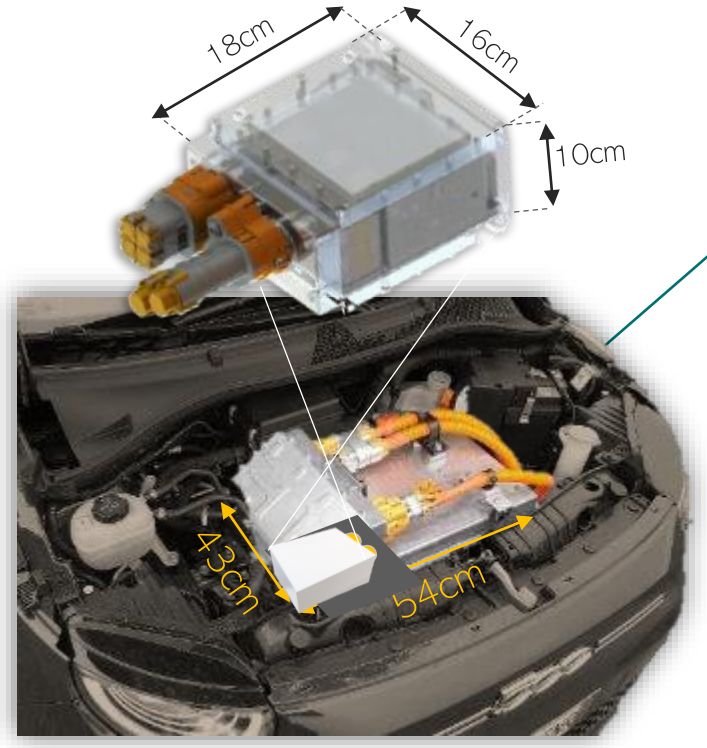
- Development of a compact, wireless sensor probe for electrostatic field measurement in electret filters
- Electrostatic field strength is a measure for the filter efficiency
- Enhancement of the safety of personal protective equipment

Project Facts

- SAL Cooperative Research Project
- 2 Partners: Grabher Group, NXP
- Duration: 15 months
- Total Project Volume: 215 k€

TINY POWER BOX

SAL Cooperative Research



Onboard Charger for Automotive / Industrial Forklift

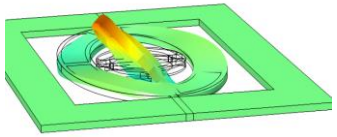
- Development of a small & lightweight onboard charger with the same power density than existing ones
- Overall topology optimization, system design, EMC design, control development & laboratory testing
- Reduction in size 80%, reduction in weight 50%

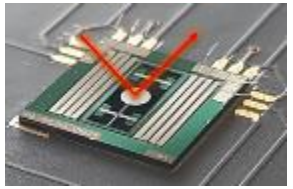
Project Facts

- SAL Cooperative Research Project
- 5 Partners: AVL, AT&S, TDK, Infineon, Fronius
- Duration: 3 years
- Total Project Volume: 3.2 M€

PIEZO MICROMIRROR

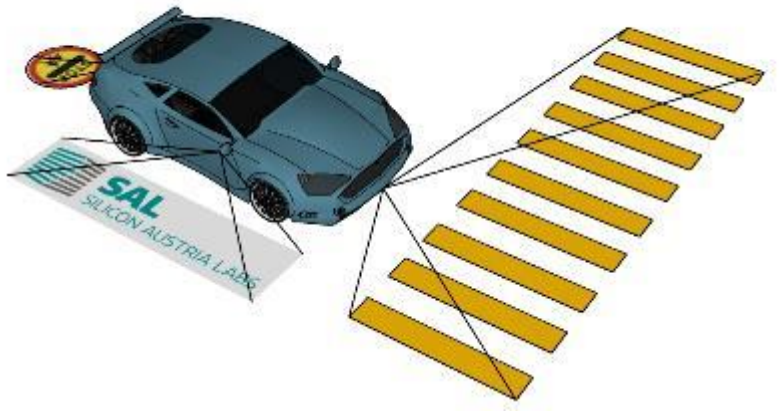
SAL Cooperative Research





Dynamic light projection for road lighting

- 2D micromirror concept, design and modeling
- Development of Piezo materials & microfabrication
- Environmental and Optical Characterization

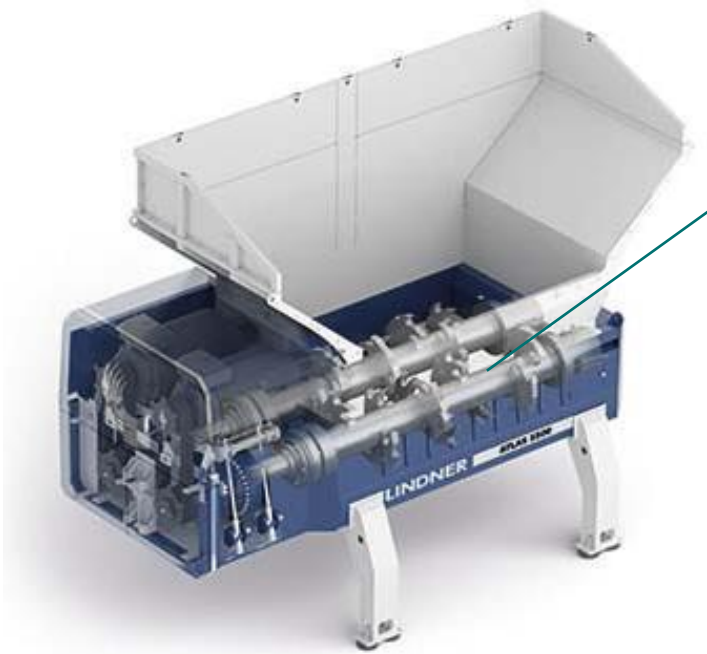


Project Facts

- SAL Cooperative Research Project
- 4 Partners: ZKW, TDK, EVG, Evatec
- Duration: 4 years
- Total Project Volume: 3.6 M€

SHREDIT

Funded Cooperative Research



Optimizung operation of industrial shredders

- Exploring approaches to predict the best time for maintenance or replacement of components
- Modeling of key components that impact costs (energy consumption, downtime) and throughput.
- Simulation used to optimize the operation management

Project Facts

- Funded Cooperative Research Project
- 1 Partner: Lindner Recycling
- Duration: 2 years
- Total Project Volume: 400 k€

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