

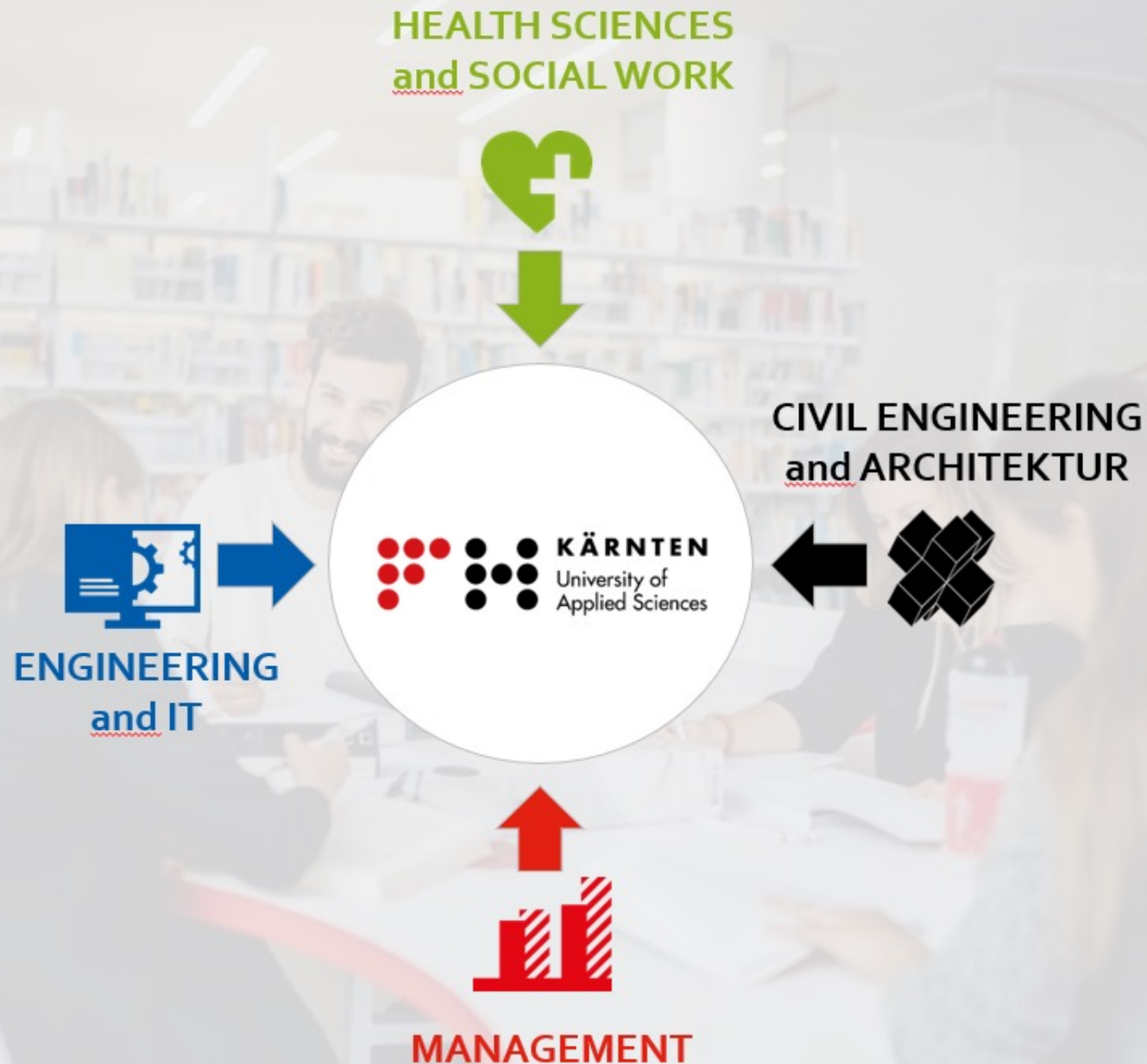


# Carinthia University of Applied Sciences

# Carinthia University of Applied Sciences (CUAS)



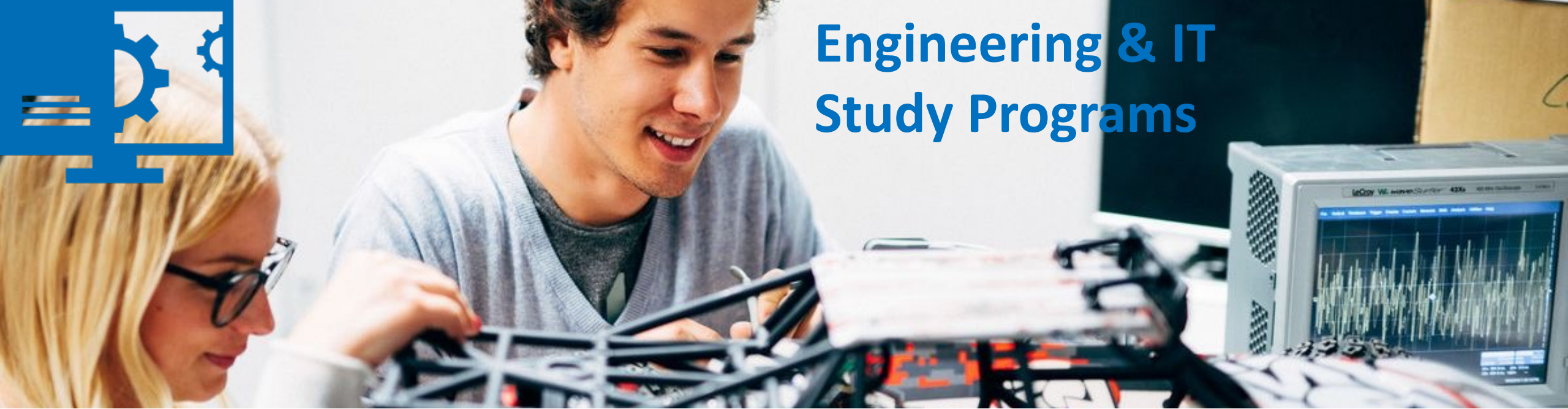
- Founded in 1995
- Budget in 2021: € 42 Mio.
- Research volume: 6,5 Mio €
- Staff
  - 435 professors & full-time lecturers, central services
  - 500 adjunct faculty per semester
- Students
  - 2500 students
  - 10% international students
  - 1100 students at Campus Villach



- Study programs accredited through AQ Austria:
  - 19 Bachelor and 19 Master Degree Programs
  - including 4 **Double Degree Programs** with partners in Finland, Germany and Italy
  - including 7 master and 1 bachelor degree programs **taught completely in English**
- Planned also:
  - European Master on Active Ageing and Age-friendly Society
  - Bachelor in Technologies for Environment and Climate Protection



# Engineering & IT Study Programs



## Bachelor

### Study Program Information Technology

- Geoinformation and Environment
- Medical Engineering
- Multimedia technology
- Network & Communication Engineering

### Study Programs Engineering

- Mechanical Engineering
- Systems Engineering
- Industrial Engineering and Management

## Master

### Master Programs

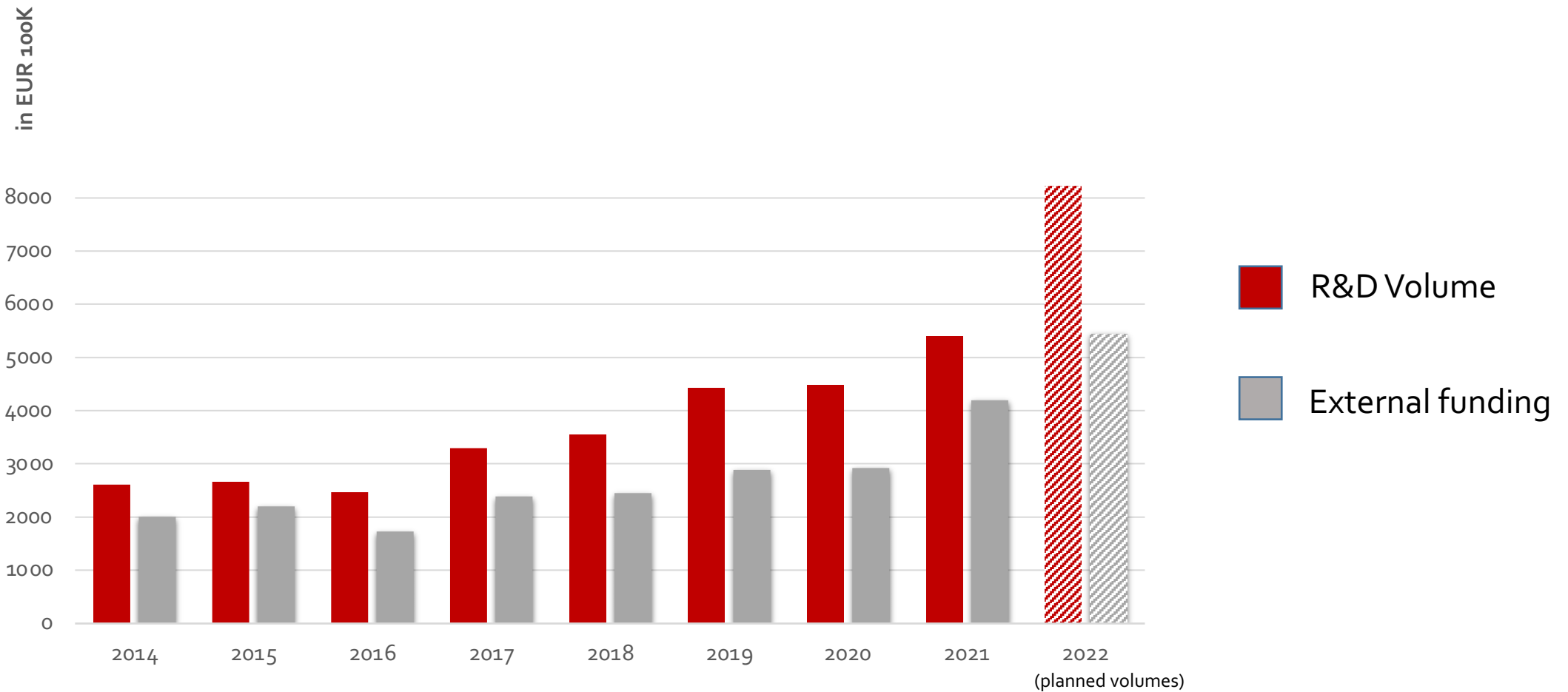
- Applied Data Science 
- Communication Engineering 
- Electrical Energy and Mobility Systems 
- Health Care IT 
- Industrial Engineering and Management
- Industrial Power Electronics 
- Integrated Systems and Circuits Design 
- Light Weight Engineering
- Systems Design 

# Research

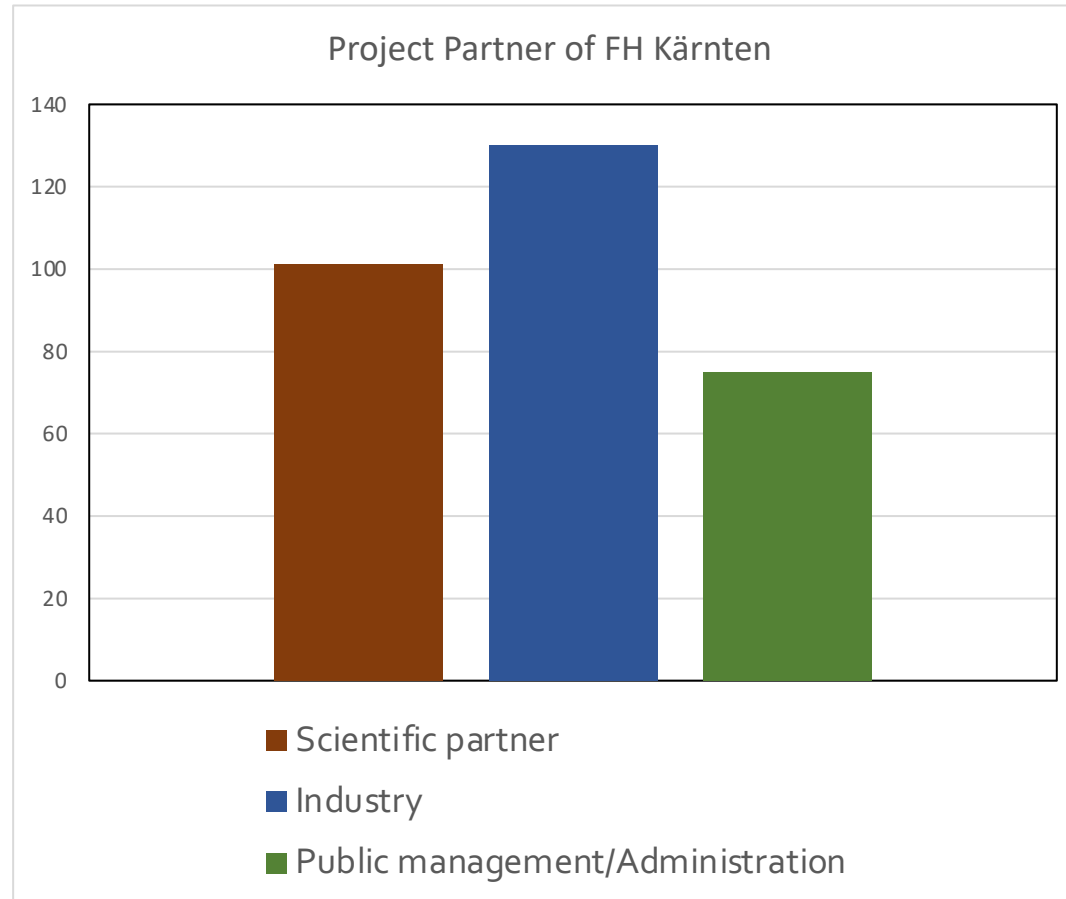


- CUAS is an application-oriented research institution
- Research cooperation with industry, universities and public institutions
- Research in the fields of
  - Architecture & Civil Engineering
  - Engineering & IT
  - Health & Social Sciences
  - Economy & Management

# R&D Volume & Third-Party Funding 2014-22



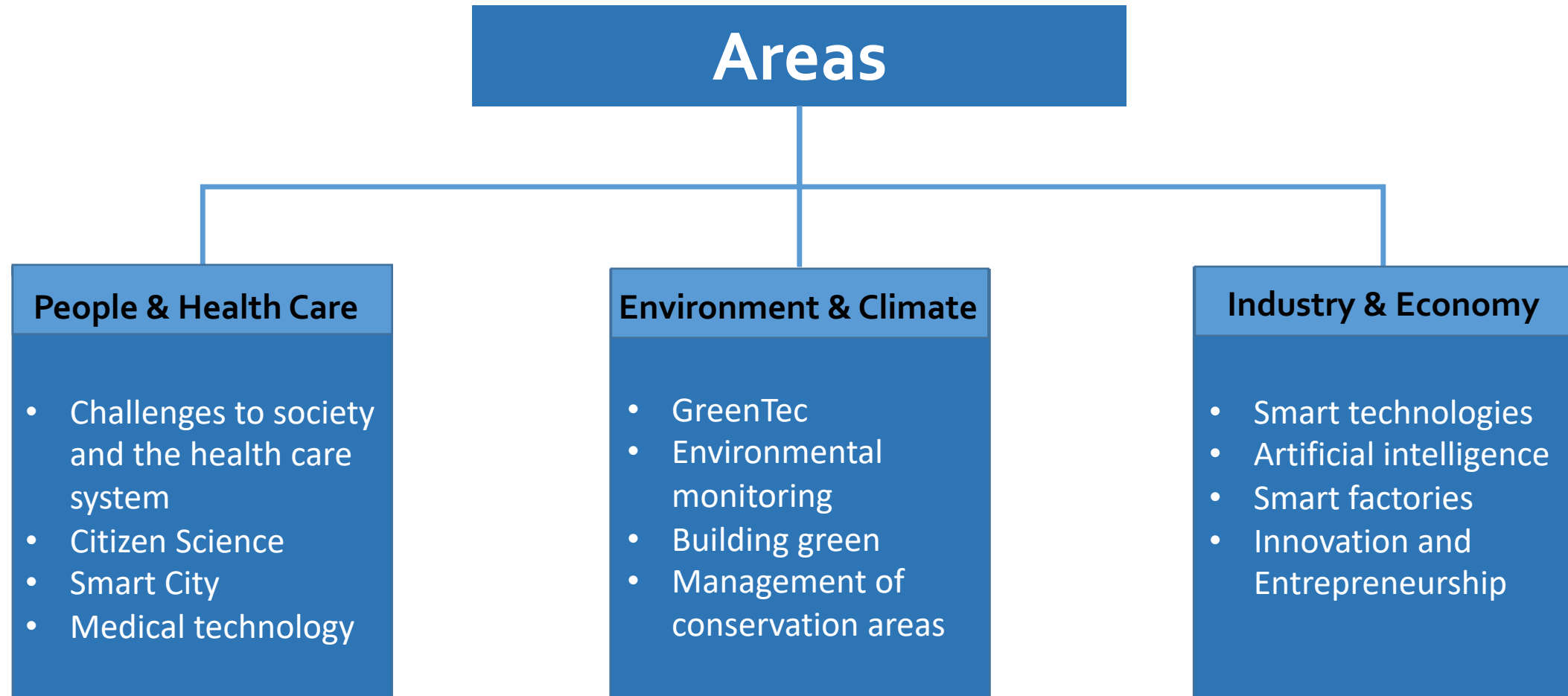
# R&D Projects and Cooperations



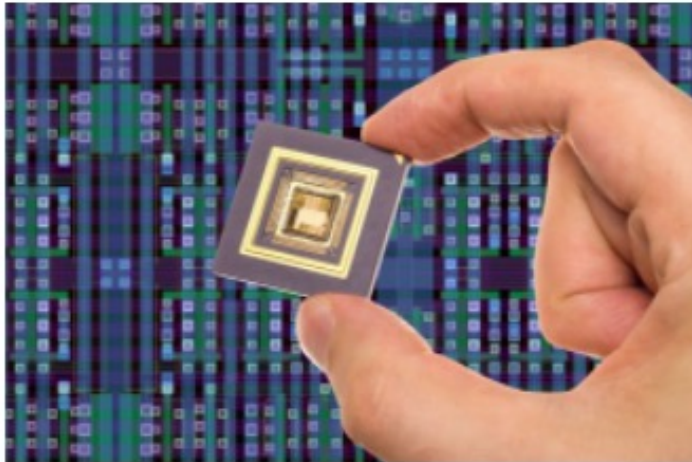
## Research in figures

- Number of research groups: 11
- Research volume: 6,5 Mio €
- Number of research staff: >50
- More than 100 running projects

# Reserach Areas

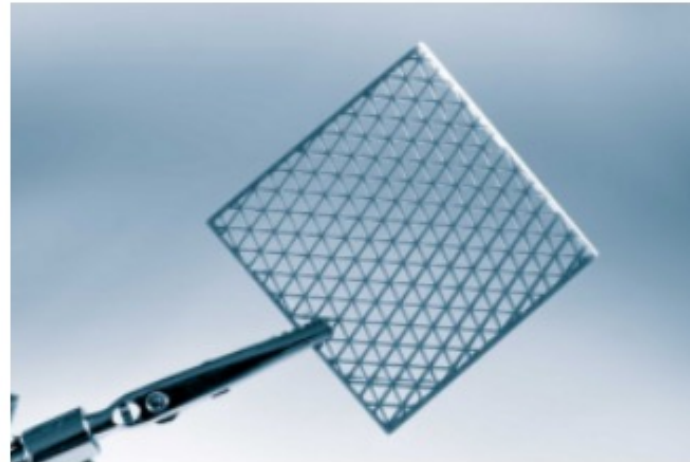


# Research Centers



## CIME

Carinthia Institute for  
Microelectronics



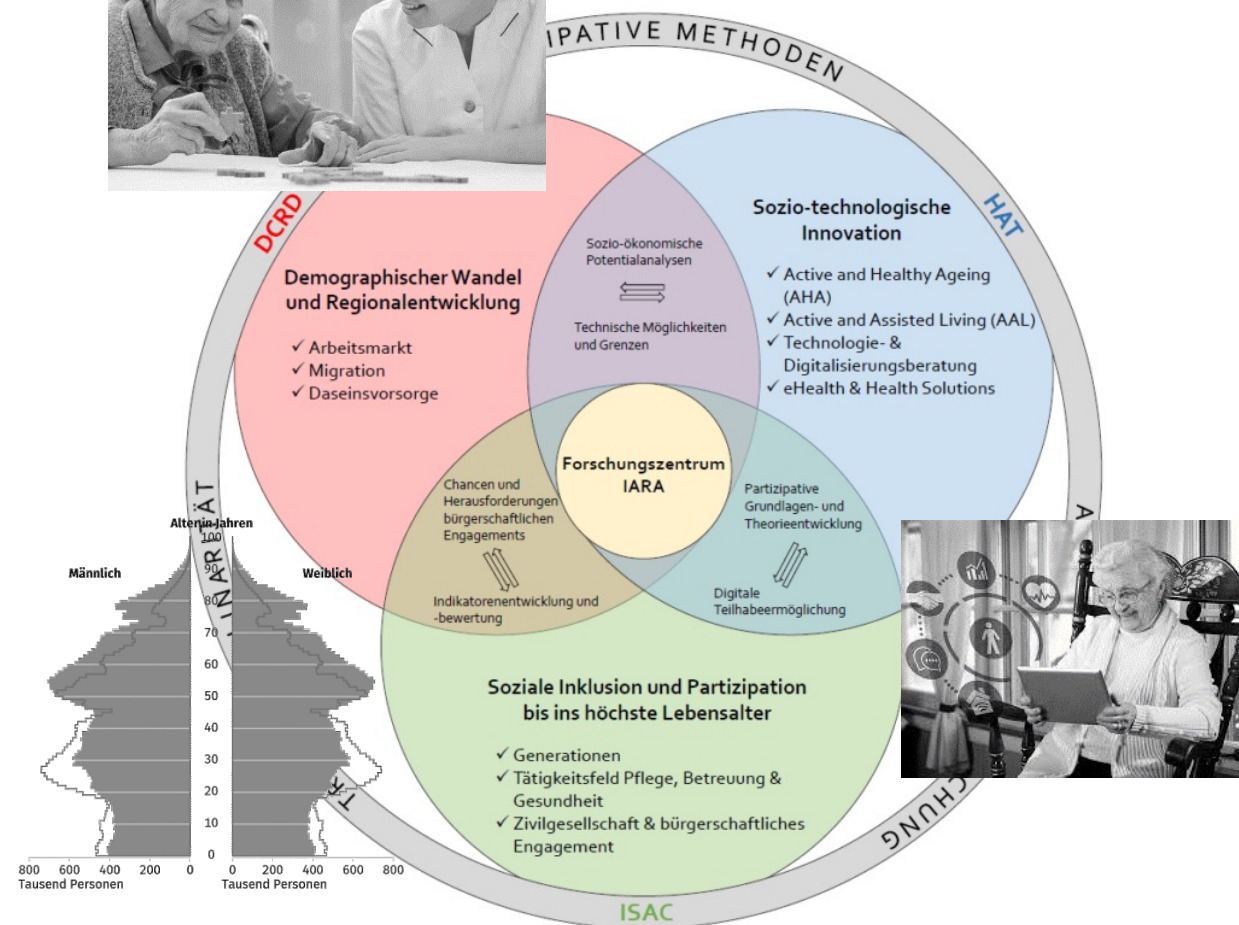
## CisMAT

Carinthia Institute for Smart  
Materials



## IARA

Institute for Applied Research on  
Ageing



## Social sciences, economics and technology development

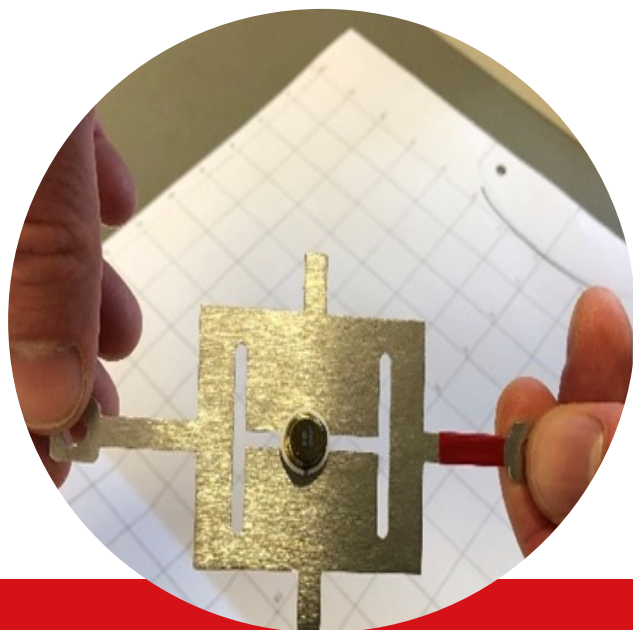
### 3 departments

- approx. 25 researchers
- Technological focus: AAL and health technologies
- Social science focus: Civil society and inclusion
- Economic focus: labor market, consumption and migration

### R&D&I projects

- >20 R&D projects in national (FFG, FWF, FGÖ,..) and international (H2020, AAL JP, Interreg, Erasmus+...) context in the last 5 years ~700 k€ research budget/year

**Green Transition Competence Center** establish to identify the green transition **solutions for society and industry**, define the technological barriers, work on **elegant solutions** (smart materials!) to optimize existing products and/or increase the service life of products, thus saving resources and **reducing the environmental impact** of some major industries, including the construction sector, the automotive industry, the **agricultural industry and the health sector**.



*Surface Acoustic Wave sensors, for SHM applications*



*PCM Lab*



*Acoustic Metasurfaces for lightweight soundproofing*



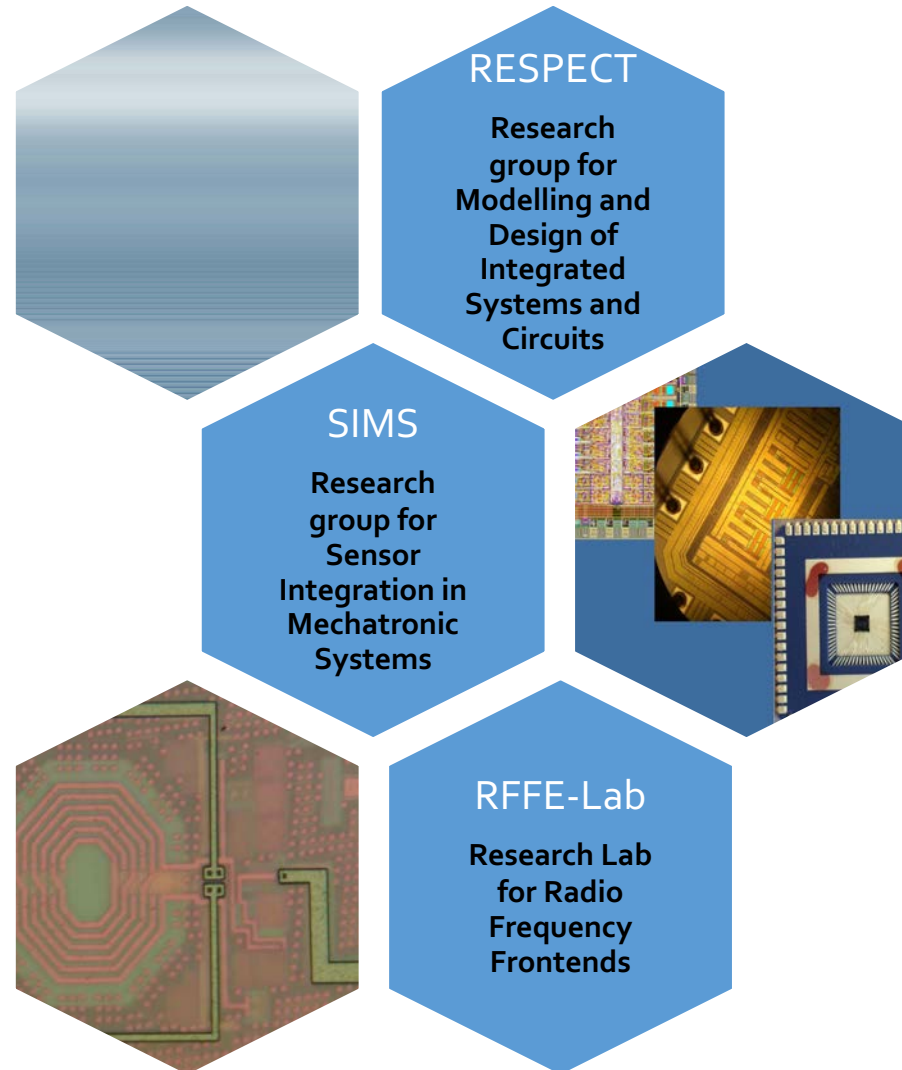
The **Carinthia Institute for Microelectronics** is a pool of experts with the clear passion for leading edge integrated circuit design.

We are a diverse team consisting of young talents, engineers, Post-Doc scientists and “old hands” with decades of industry experience.

Our research focus is on design and modelling of integrated circuits for different fields of applications like integrated sensors or wire-less and wire-line high speed communications.

## **Dr. Johannes Sturm**

Head of Carinthia Institute  
for Microelectronics



## Key facts:



### Staff:

- 5 Key Researcher
- 3 Senior Researcher
- 3 Researcher
- 5-10 Master/PhD Students

### Research Projects:

- > 600k€ / year

### Project partner:

- Infineon Technology
- Joanneum Research
- Silicon Austria Labs
- University of Klagenfurt
- CISC
- ...

# Research Lab for Radio Frequency Frontends

## Research Lab for Radio Frequency Front-Ends

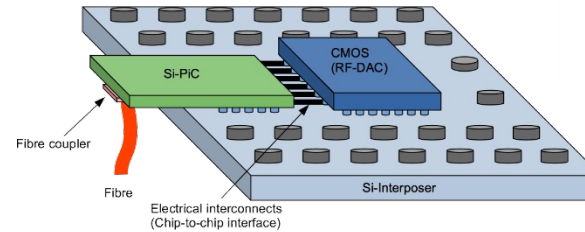
Jointly operated by  
FH-Kärnten and Silicon Austria Labs

<https://research-network.silicon-austria.com/rffe-lab/>

### Key Facts

- Duration:  
01.08.2019 – 31.12.2023
- Overall volume:  
approx. 2 M€. (FH + SAL)
- Staff:
  - FH:
    - 4 Key researcher
    - 1 Senior Researcher
    - 1 PhD
  - SAL:
    - Researcher + Key Researcher
    - 2 PhD's + 1 PhD nn.

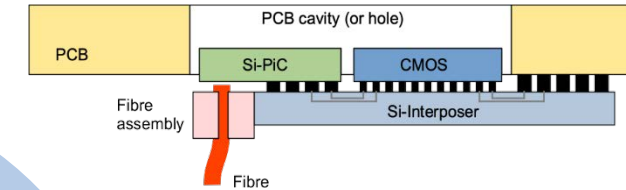
### Photonic – RF module



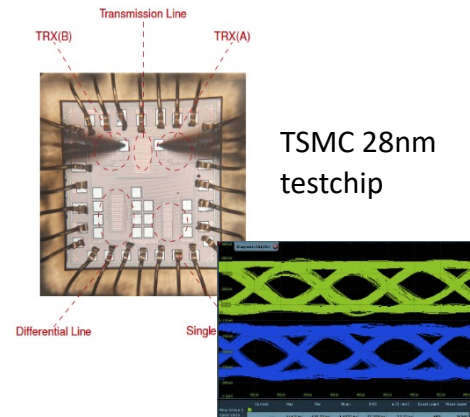
## Research Lab

Radio Frequency Front-Ends

### Si-Interposer integration



### Full-duplex serial interface



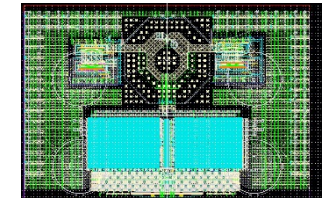
TSMC 28nm testchip

Photonic integrated circuits for wireless and wireline communication

Co-design and co-optimization of RFIC and photonic frontend modules using new integration technologies

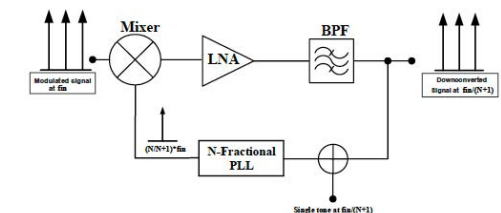
IC Design of analog and RF IP building blocks for wireless and wireline transceivers

### mm Wave RF-DAC digital transmitter



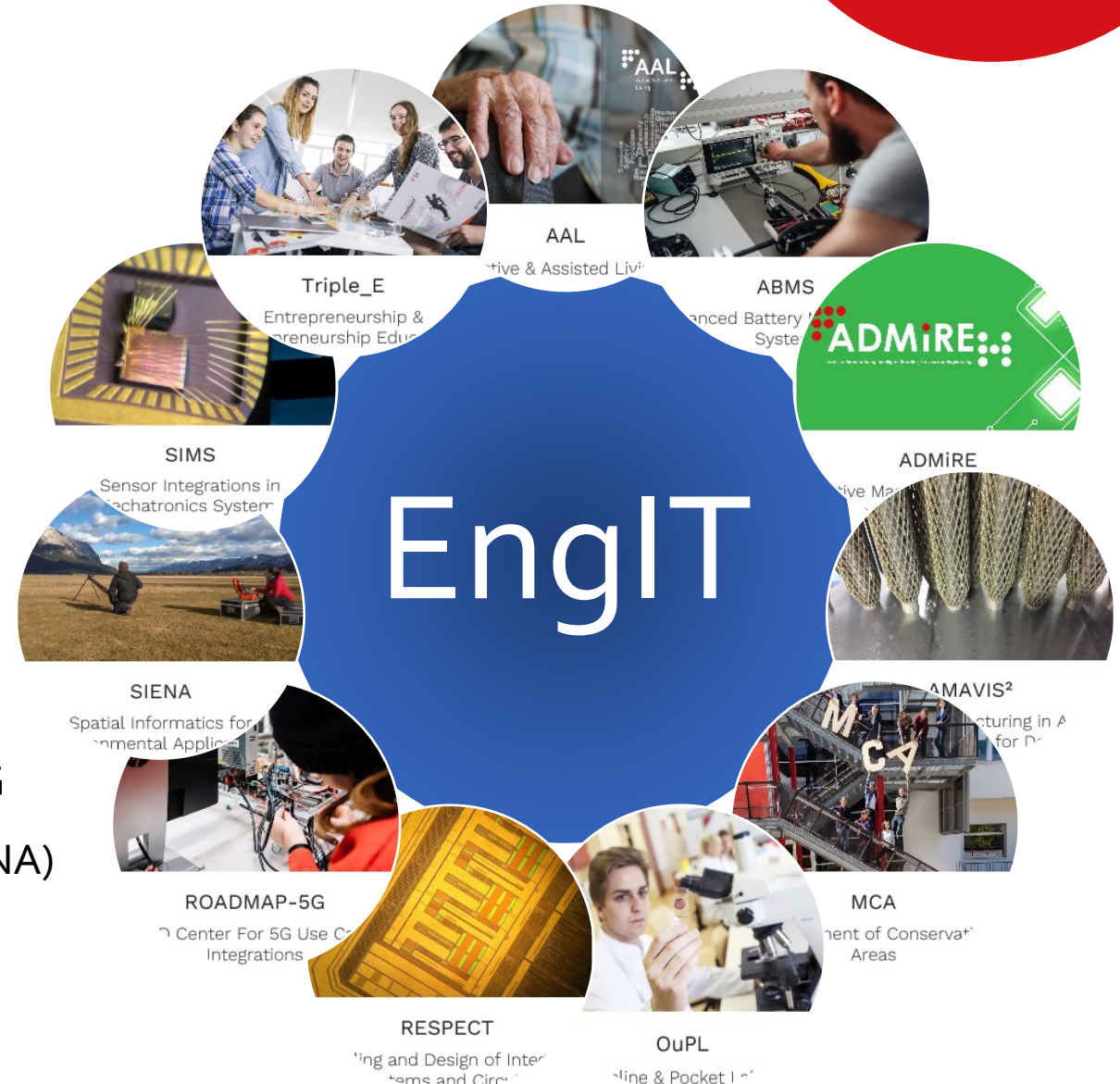
TSMC 28nm testchip

### Harmonic divider receiver



# Research Groups

- Active & Assisted Living AAL
- Advanced Battery Management Systems (ABMS)
- ADMiRE Lab - Additive Manufacturing, intelligent Robotics, Sensors and Engineering
- AMAViS<sup>2</sup> Additive Manufacturing in Agile Virtual Systems for Product & Production Engineering
- Management of Conservation Areas MCA
- Online and Pocket Labs OuPL
- Modelling and Design of Integrated Circuits and Systems
- R&D Center for 5G Use Case Integrations ROADMAP-5G
- Spatial Informatics for Environmental Applications (SIENA)
- Sensor Integration in Mechatronic Systems
- Entrepreneurship & Entrepreneurship Education



# EMC - measuring and testing lab

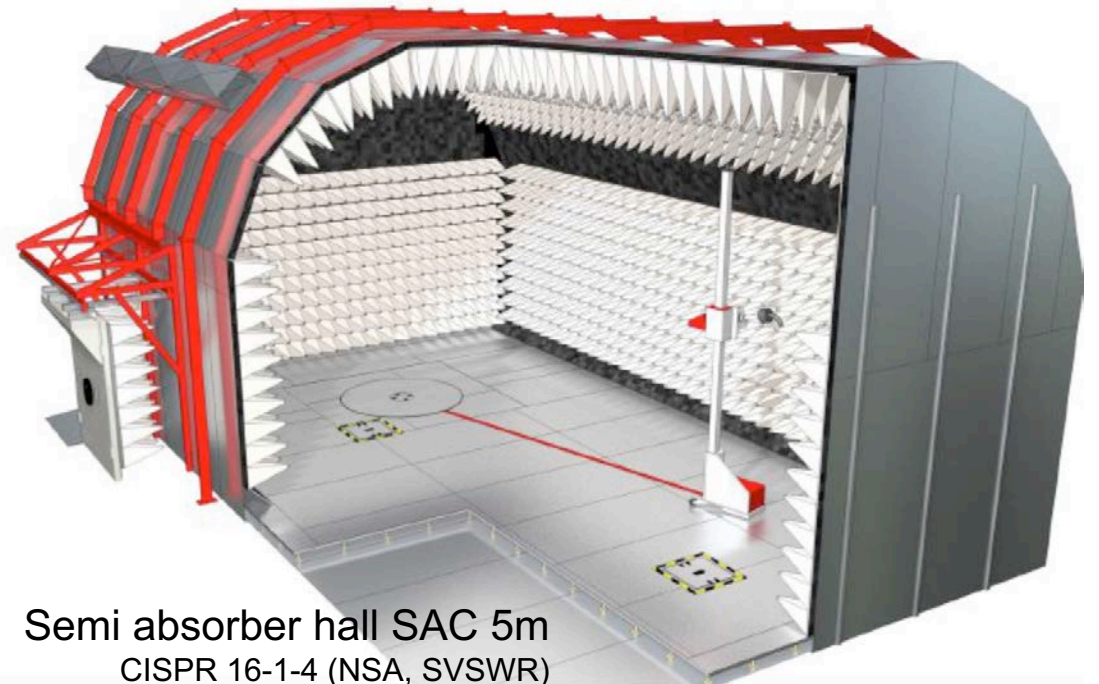
State accredited testing laboratory No. 185 for electromagnetic compatibility

ISO EN 17025:2017

- ➔ 2014/30/EU EMC Directive
- ➔ EN 60601-1-2 Medical electrical equipment (EMC)
- ➔ EN 301489 - x ETSI Series for EMC Standards (RED)
- ➔ EN 62233 EMF measurements

Status 2022:

- ➔ Newly built modern laboratory building with 600 m<sup>2</sup> laboratory space
- ➔ **51** accredited measurement and test methods



Semi absorber hall SAC 5m  
CISPR 16-1-4 (NSA, SVSWR)  
IEC EN 61000-4-3 (FU)  
CISPR 25, ISO 11452  
FCC ANSI C63.4

Full absorber hall FAR 3m  
2 pcs. shielding cabins  
Emission measuring stations

...

# ***CUAS Vision***

***CUAS is a dynamic, dialog-oriented University of Applied Sciences, being regionally rooted and internationally oriented.***

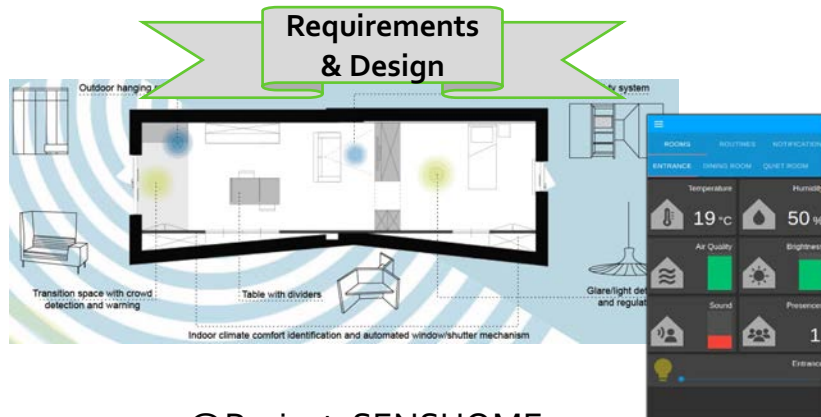
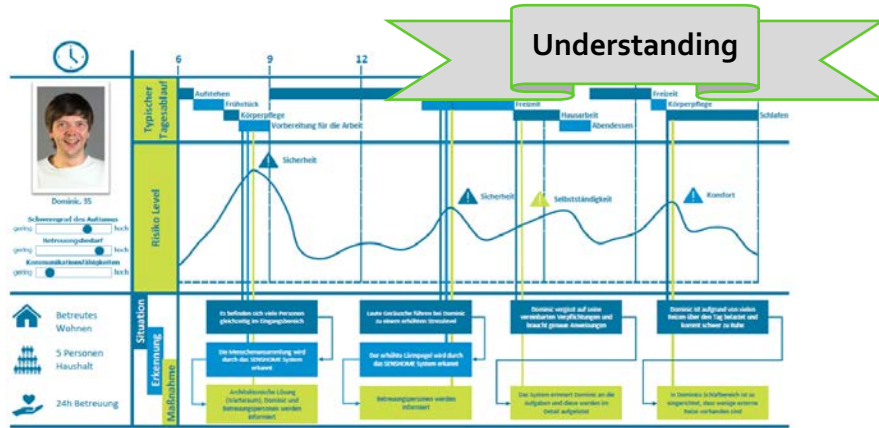
***All staff members and guest lectures from industry contribute to the interdisciplinary and international education and research.***

# Appendix

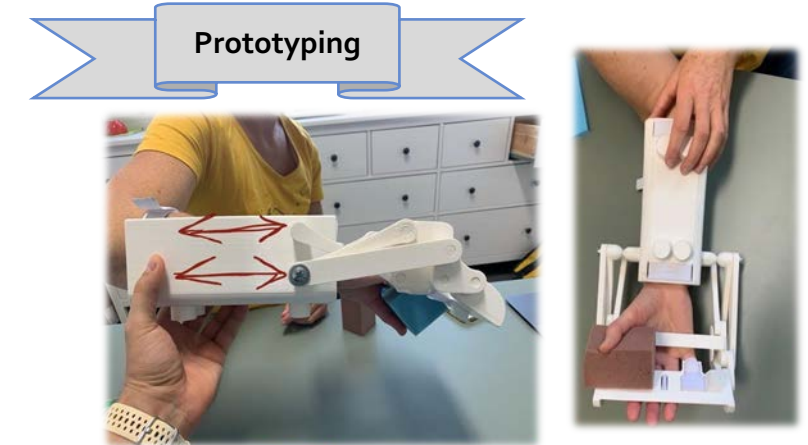
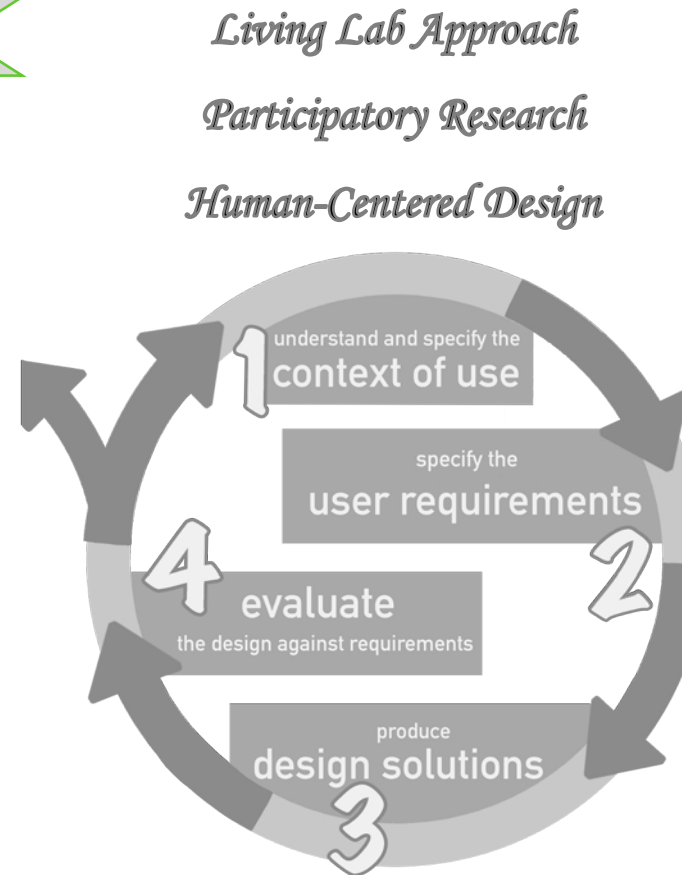
**Smart Home**  
Assistance – Autonomy - Safety

**Smart Interaction**  
Accessibility – Universal Design - UX

**Smart Health**  
Tele-X – Therapy - Prevention



@Project: SENSHOME



@Project: REHA2030

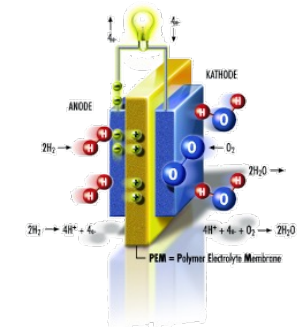
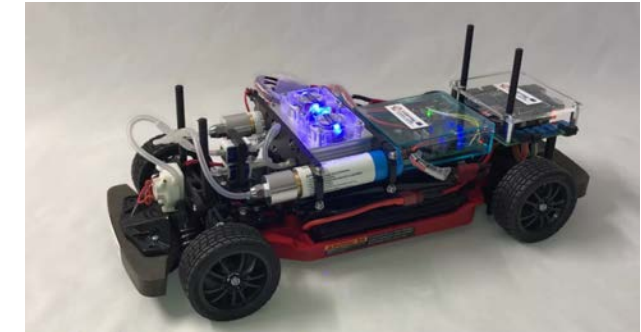
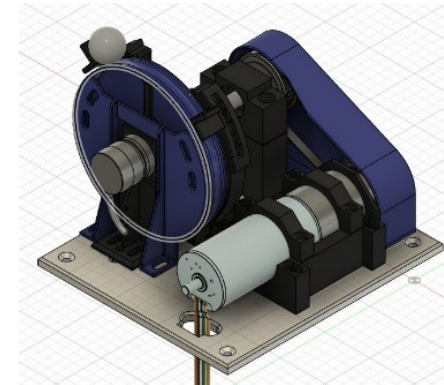
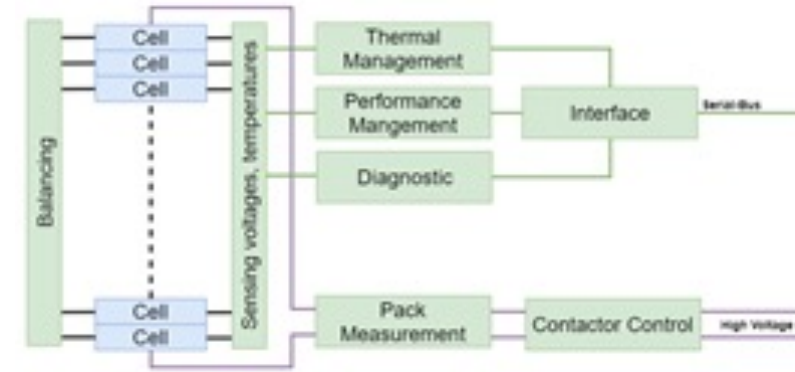
# ABMS – Advanced Battery Management Systems

## Research focus and need

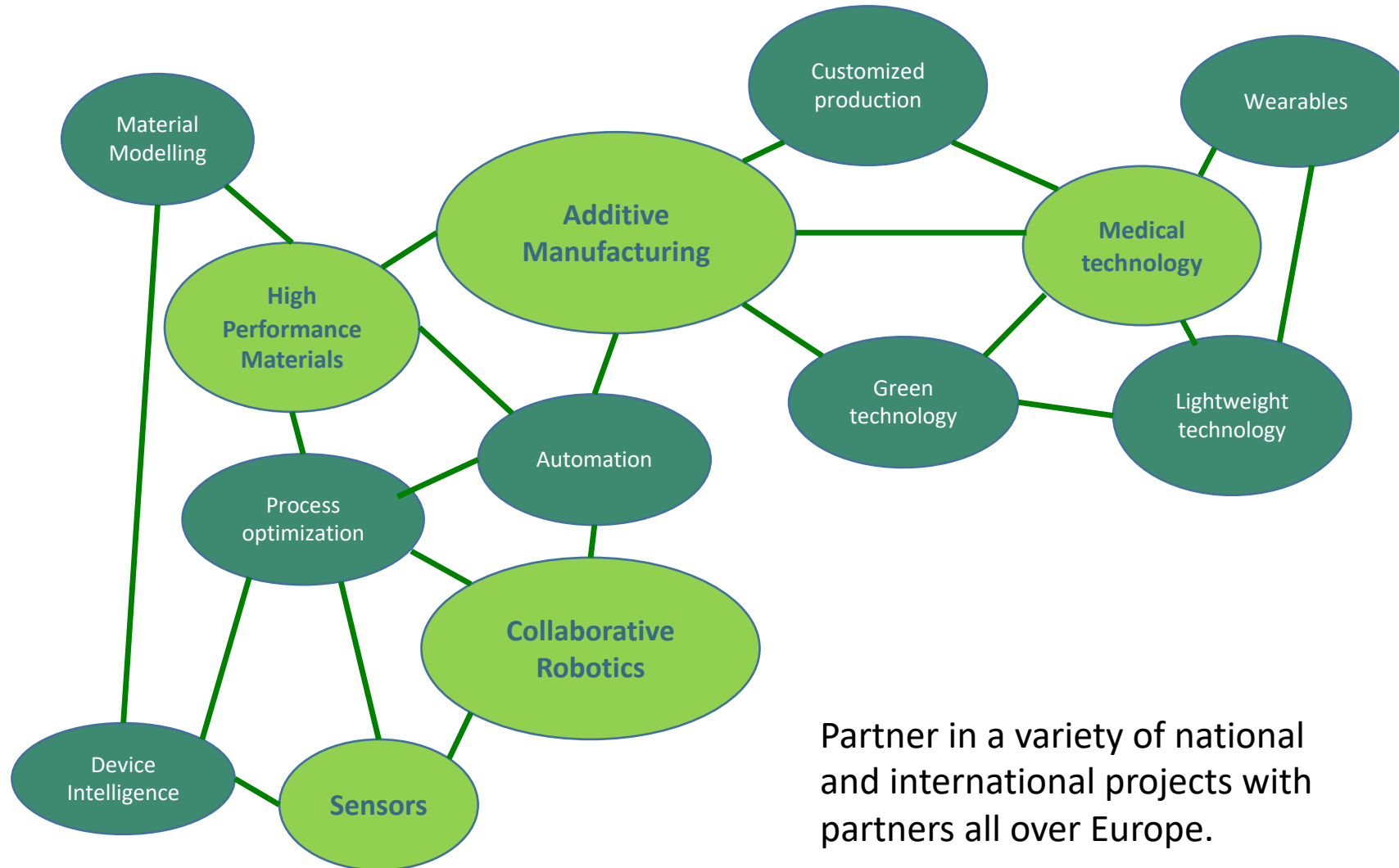
- Control Systems (optimization of Li-cells)
- Industrial Control Applications (H<sub>2</sub>, Power Electronics)
- Smart Education
- Citizen Science – school collaboration (MINT)

## Results

- H<sub>2</sub>GreenTech Project (cross-border research)
- New Lab experiments (control education)
- New educational topics (Hydrogen technologies)
- Robotics 4 pupils (R<sub>4</sub>P)



# ADMIRE Lab - Additive Manufacturing, intelligent Robotics, Sensors and Engineering



Partner in a variety of national and international projects with partners all over Europe.

Research Vol. in 2022: 2 Mio. €

Currently 19 group members:

- 2 full Professors
- 1 endowed Professor (Digital Fabrication)
- 7 PhD Candidates
- 1 Senior Researcher
- 4 Junior Researchers
- 4 Master Students



3 Positions open in additively manufactured sensors.

Internal collaborators:

- 2 associated full Professors

### Capabilities of emerging production techniques

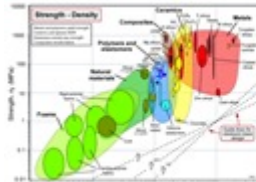


Research on 3d-Printed Hybrid Materials

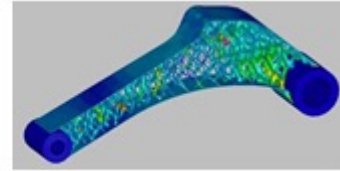


Design Patterns for multi-functional Geometries

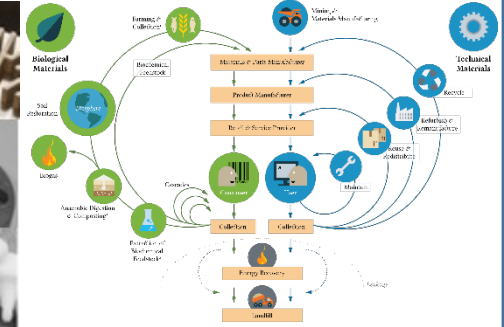
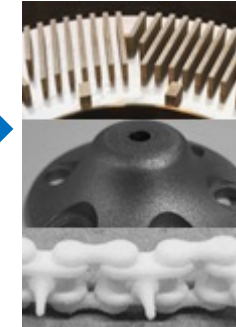
### Concurrent Product & Production Engineering



Selection – Adaptation – Integration of State-of-the-art Software Tools and Engineering Methods  
Recommender Systems for Engineering



### Dissemination



### Team

Amann, Paul

Polymers, Acoustics

Decleva, Monika

Reporting, Event

Willmann, Roland

Lead, Recommender Systems, Data Science

Kastelic, Jörg

Project Management Support, Technical Reporting

Zebedin, Gerald

Virtual Environments, Automation

Zettel, Dominic

Metal-based 3d-Printing, Simulation, Mechanical Engineering

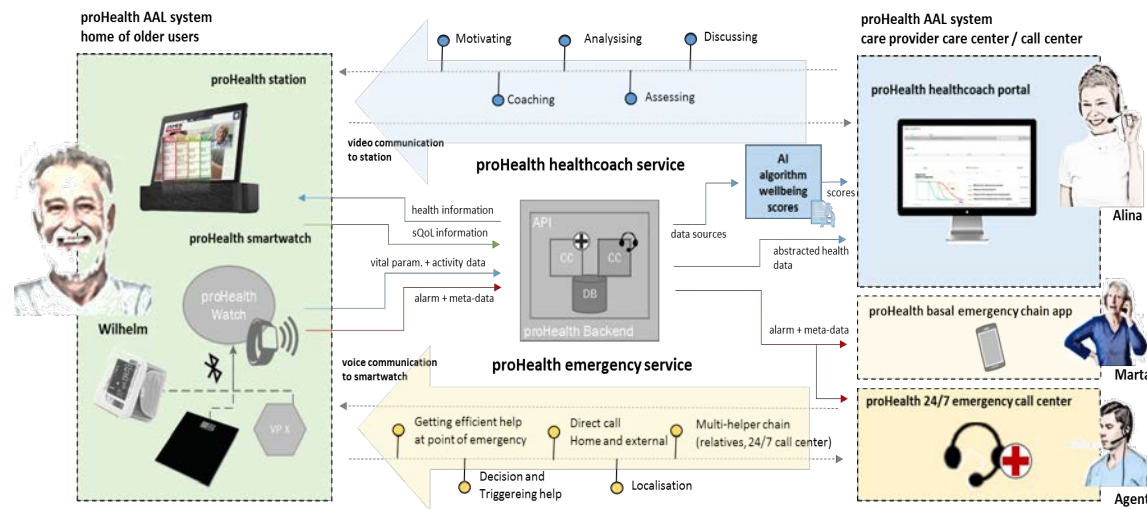
Zwatz, Josef

3d-Printing, Simulation, Mechanical Engineering

### Associated Projects



## R&D&I in the field of AAL and health technology



### Core topics

- Active and Assisted Living (AAL)
- eHealth & eCare Solutions

### Technological focus topics

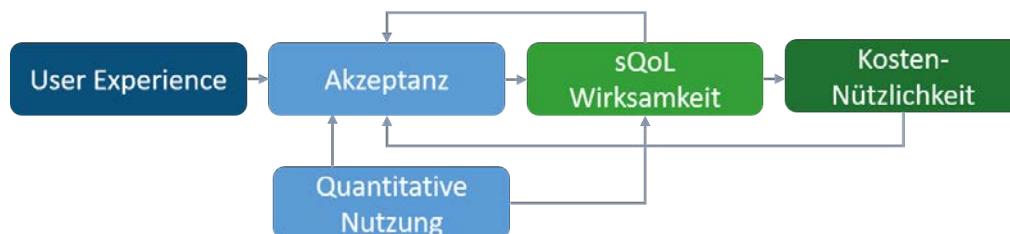
- Internet of Medical Things
- Applied Medical Data Science
- Agile Health & Care Software Implementation

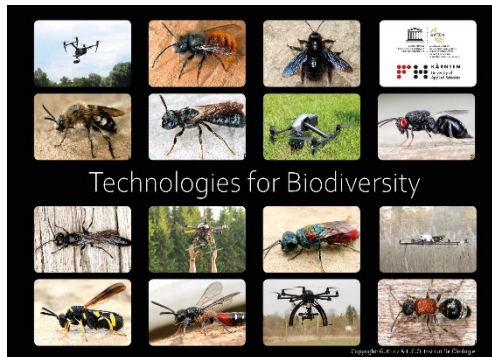
### Research focus

- Participatory Technology Development
- Interdisciplinary Evaluation

### Innovation Focus

- prolida - Professional Living, Innovation and Development Lab for an Ageing Society





## Mission

- To empower and enable personalities, institutions and societies to face present and future challenges in the management of conservation areas (MCA))

## Research focus

- Conversation technologies
- Man and the biosphere
- Transdisciplinary research desgins

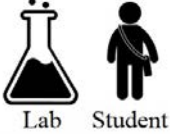
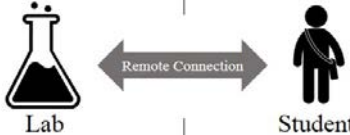
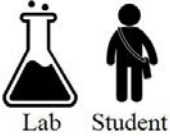
UNESCO recognition

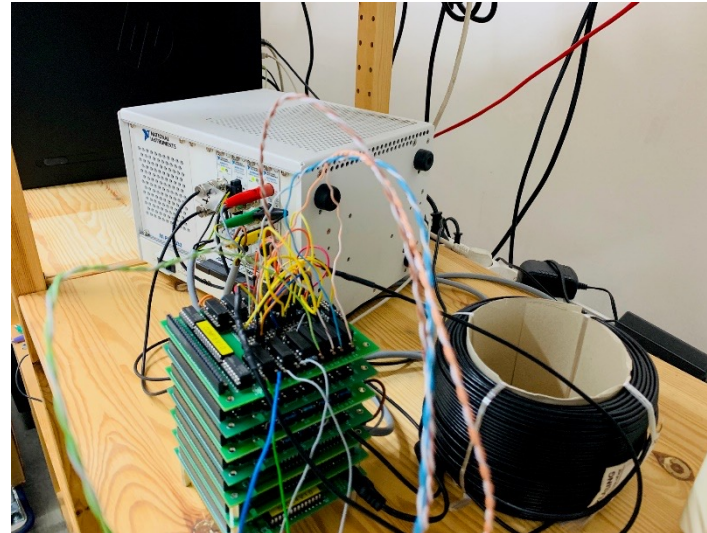


United Nations  
Educational, Scientific and  
Cultural Organization



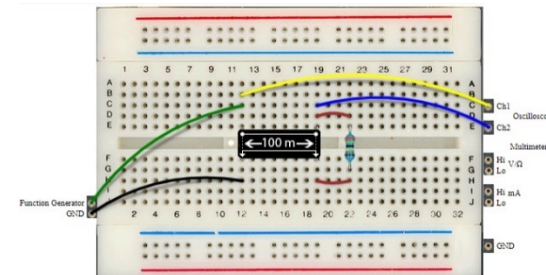
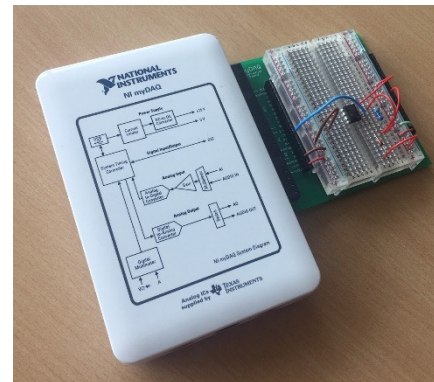
UNESCO Chair on  
Sustainable Management  
of Conservation Areas  
Carinthia University  
of Applied Sciences, Austria

	Fixed Location	Free Location (and Time)
Classic Labs	 Lab Student	
Remote Labs	 Lab Student	
Pocket Labs		 Lab Student



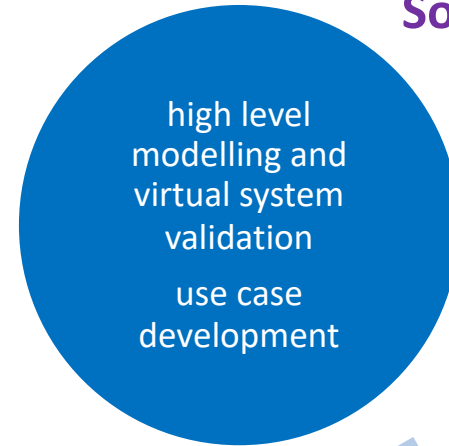
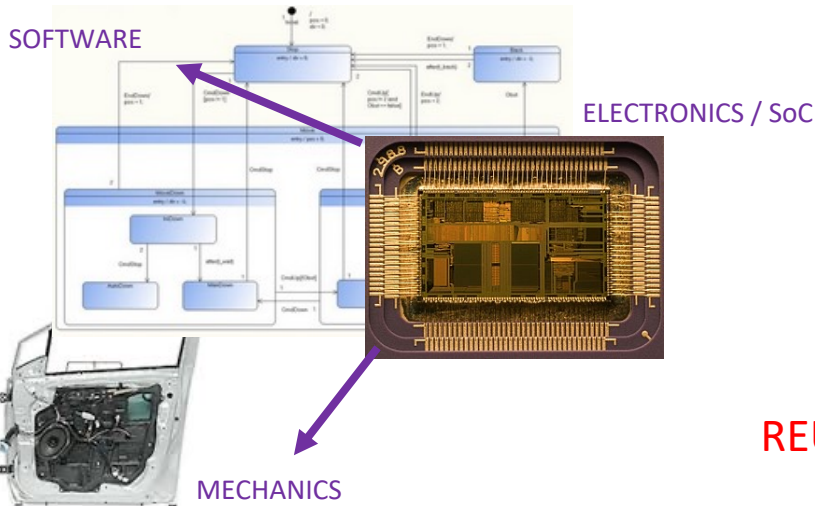
## Research focus

- **Online labs:** enable self-directed, exploratory learning and are available around the clock, anywhere in the world
- **Pocket labs:** small labs that students can carry in their pocket.



# Modelling and Design of Integrated Circuits and Systems

## Overall Product Design Cycle Methodology using Virtualisation and Standardisation



## Solve multi-disciplinary large-scale problems

Goal: “faster-than-real time simulations” to support complex **executable specs** for a quickly growing industry

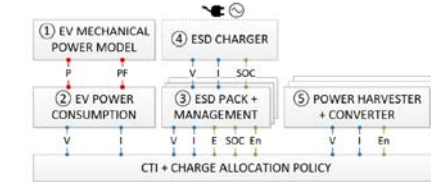
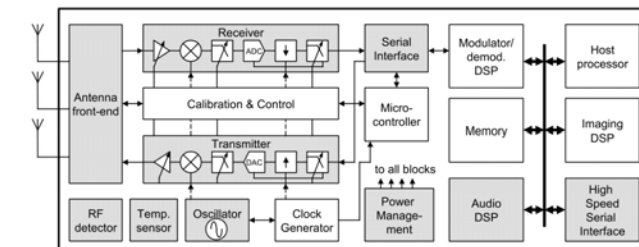


Figure 5. Example of driving route: (a) road traffic information and (b) road slope information.



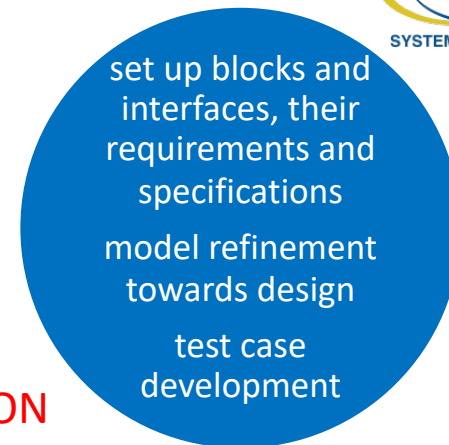
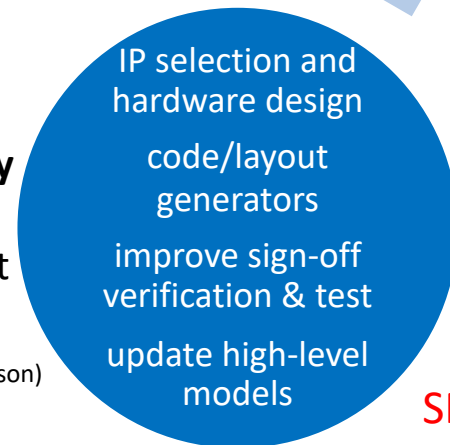
REUSE

PROOF OF CONCEPT



## Specify the right things right

Partition properly to disciplines, domains, subprojects, “**incorporate standards**” to save time and resources for the new stuff”



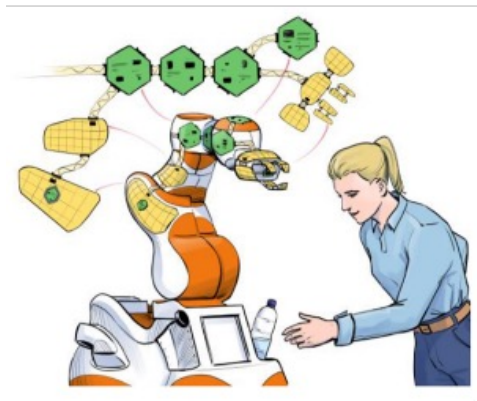
SPECIFICATION  
FREEZE

## Cope with different technologies efficiently

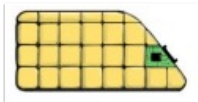
Ensure **high quality & sustainability** with a 1<sup>st</sup> time right product. Also use automation wisely: “implement the common IP fast, but the rare IP correct”. (modified statement from D.A. Patterson)

# Sensor Integration in Mechatronic Systems

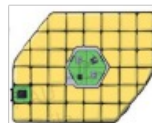
- Our goal is to investigate, develop and integrate complete autonomous sensor modules, based on IC/ASIC chip platform that integrates the following on a single small chip /system-board:
  - Sensor actuation & reading
  - Data conditioning/signal processing
  - RF/wireless communication capability
  - Monolithic sensor integration (eg. photonic sensors, temperature sensors,...)



+



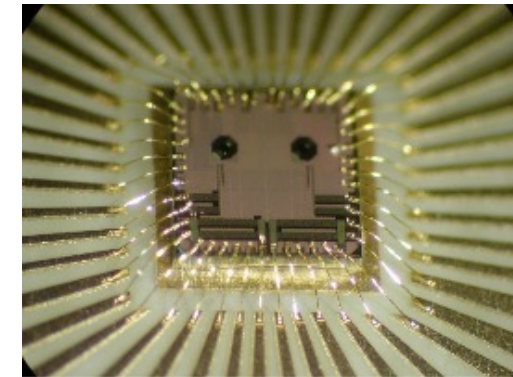
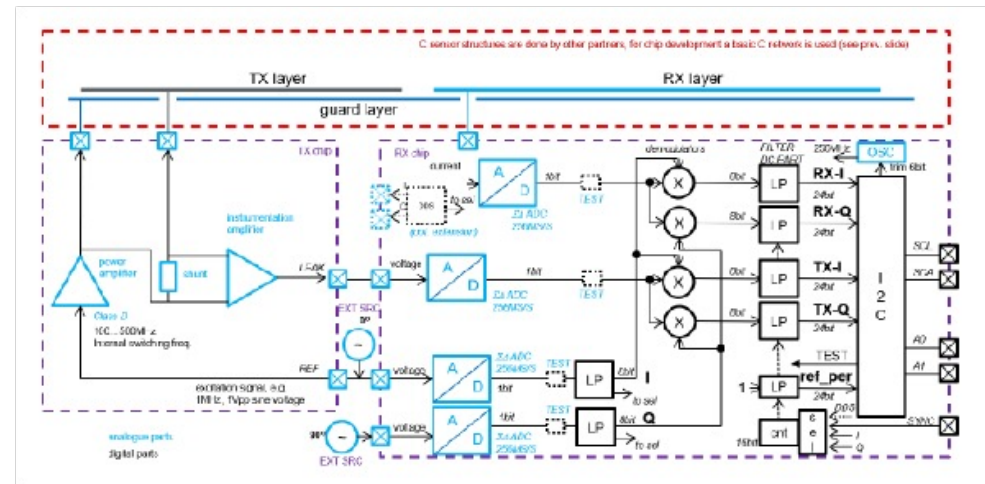
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Mid-Range Sensing

Touch & Proximity Sensing

Multi-Modal Sensing



Flexible Capacitive Sensor integration for collaborative robotics



## „4 Elements“ Applied Environmental Research with Unmanned Aerial Systems (UAS)



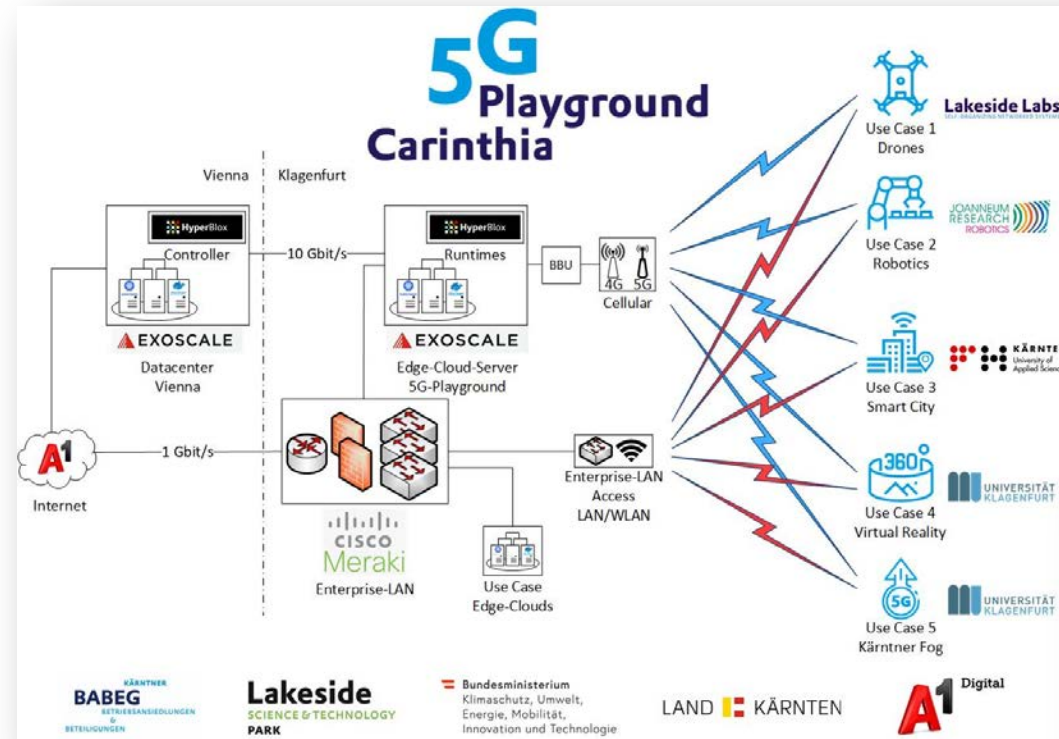
### Research focus

- Multiscale high-resolution Earth Observation for Environmental Monitoring
- Multidimensional spatio-temporal sensor fusion and data integration
- AI/Machine learning algorithms for spatio-temporal analysis, Object and Change detection and dynamic Visualizations

### Application Areas

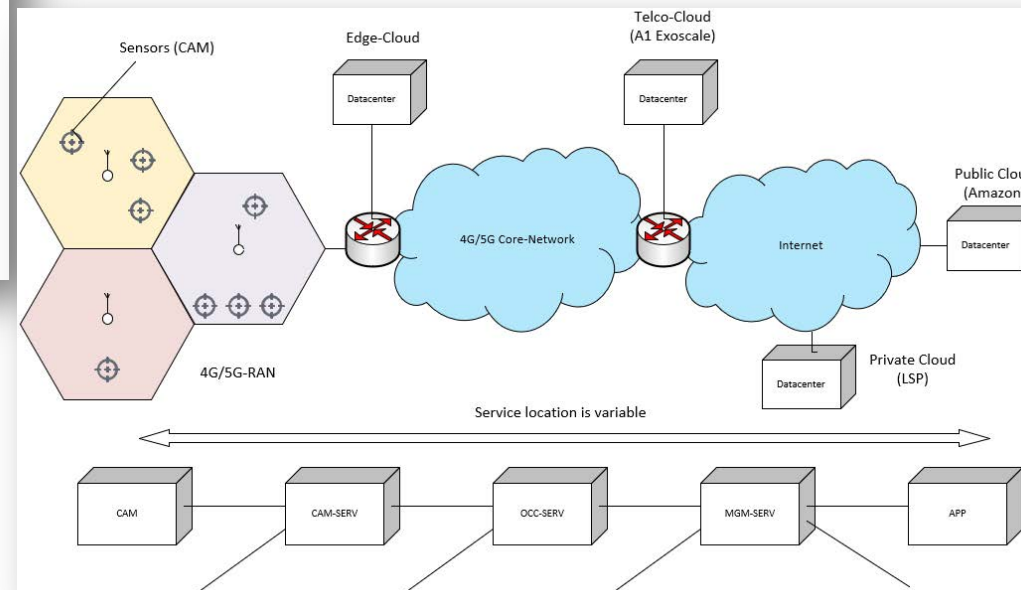
- Water Management of Rivers and Lakes
- High-Precision Viticulture, Agriculture & Forestry
- Animal Recognition and Monitoring
- Risk Assessment of UAS Missions & UTM
- High-resolution Weather Changes
- Natural Hazards Damage Assessment

# R&D Center for 5G Use Case Integrations ROADMAP-5G



Operation and research on flexible 5G networks for a broad variety of Use Cases, e.g. at the 5G Playground Carinthia, as well as research on our own 5G network based on open source technologies.

- We investigate requirements and opportunities that arise from the **adoption of 5G**
- Research group is an **independent link** between network operators and commercial users
- Focus on the **optimal deployment** of 5G technology as well as **Network Slicing**
- Research on **dynamic orchestration** and **discovery of services** in heterogeneous networks
- Use Case research focused on **Smart City applications**
- **Optimization of network parameters** according to Use Case specific requirements
- Development of **automated network test and evaluation** software



Conception and implementation of novel distributed Smart City applications that make use of the capabilities of next-generation networks (enhanced broadband, low latency, and massive IoT).

# Entrepreneurship



## Laboratory for strategy development and innovation management

- Brainstorming
- Strategy development
- Business model
- Business plan
- Concept development

InnovationsWerkstatt  
KÄRNTEN



## Laboratory for prototype parts production

- Product development
- Prototyping
- Feasibility Studies

smart lab  
CARINTHIA  
RAPID PROTOTYPING LAB • FACHHOCHSCHULE KÄRNTEN | VILLACH



## Prototype assembly and testing laboratory

- Prototype assembly
- Setup of test series
- Protection from fraud

gründer garage  
FACHHOCHSCHULE KÄRNTEN