Innovative Electronics

Design and Development Services
Company Overview

- **Established 1999**
  - spin-off (ETH Zurich)
  - privately owned (100%)
  - 13 employees

- **Electronic design, development & miniaturisation**
  - medical devices and active implants
  - data communication & security electronics
  - space-flight applications and other extreme environments where exceptional reliability is required

- **Quality**
  - ISO9001 and ISO13485 (medical)
  - development according to GAMP
Core Expertise

- System miniaturisation
- Analogue and digital electronics
- Low power electronics
- Power management
- Cryptography and data security
- High and low level embedded software
- High reliability
- Harsh environments
- Standard and special technologies
  - SMD, HDP, 3D-MID
  - chip size packages, chip-on-chip
  - bare dies with wire bonding
  - flip-chip, TAB
Design & Consultancy Services

- Research & technology studies
- Review services
  - design review
  - second opinion
  - troubleshooting
- HW and SW system development
- Production set-up and support
- Support for start-up companies
- Support for universities
Typical Applications

Data Communications & Data Security
Industrial
Medical Devices & Active Implants
Optoelectronics
Space
High Reliability & Harsh Environments
Data Communications

- **Wireless communication**
  - ISM 433 MHz, 868 MHz 2.4 & 5 GHz
  - GSM, GPRS, LTE
  - Bluetooth, Bluetooth LE
  - RFID, NFC, WLAN
  - Satellite up to 12 GHz, 77 GHz (terrestrial)

- **Wired Communication**
  - Data over Supply (DoS)
  - Ethernet, USB
  - Field-Bus, Profi-Bus, M-Bus, HART
Data Security

- Uni-directional Network Link
  - authentication, authorisation
  - privacy (encryption)

- Secure USB Stick
  - encryption on stick
  - smart card and password
  - small embedded processor
  - strong encryption algorithm
Industrial

- General purpose voltage amplifier
- Optical temperature measurement
- High EMV environment
- Power modules
- Solderable Memory Module (SMM)
  - high vibration environment
Industrial (Internet of Things)

- Optical reader for water meter
  - IP65 water meter with 2 cameras
  - RFID-Reader for Label Data

- Washing machine meter-switch
  - user interface via card reader
  - switches meter to correct user meter
Medical Devices

- Medical camera system
  - high resolution digital imaging with illumination

- Wearable device(s)
  - pulse, skin temperature, ECG
  - movement (and helplessness)
  - blood glucose, blood pressure, SpO2
  - wireless data transfer, alarm button, GSM
Active Medical Implants

- **Ascites suction pump**
  - pressure, temperature & motion sensors
  - wireless data transfer & re-charging
  - fully sterilisable
  - <100 grams

- **Long Bone Lengthening Device**
  - fully encapsulated motorised part
  - totally biocompatible mobile systems
  - bi-directional transmission of data
  - wireless power transfer from control box to implant
Optoelectronics

- 3D-MID camera system

- Industrial
  - IP65 water meter, 2 cameras
  - RFID reader for label data

- Consumer
  - 360° panoramic ball camera
  - 36 cameras, simultaneous trigger
Space: **NETLANDER™**

- **Mars Landing Probe (2001)**
  - Network of four identical landers performing simultaneous measurements to study the internal structure of Mars, its sub-surface and its atmosphere
  - Two SEISmometers to study tremors on Mars and locate reservoirs of water or ice
    - very broad band (2-axis), short period (3-axis)
Space: NETLANDER™ - SEIS

- SEISmometer Electronics
  - Feasibility study and technology evaluation of main and auxiliary controllers and motor drive electronics

- SEIS-MC and SEIS-AC modules
  - system analysis & critical properties review
  - evaluate high density packaging technologies
  - identify ASIC technology for (digital) circuits
  - review miniaturisation potential
  - check availability of components
  - analyse FM development & qualification costs
Space: POLAR (launched 15th September 2016)

- Detection of Gamma Ray Bursts (GRBs)
- Highly sensitive detector using Compton Scattering Effect to measure polarisation of incoming photons
- Concept to FM (2008 - 2014)
  - Swiss experiment (ISDC, Univ. of Geneva)
  - scheduled for two to three years operation
  - only non-Chinese experiment on Tiangong-2
Space: POLAR (launched 15th September 2016)

- Feasibility Study
  - evaluate design of front-end electronics
  - identify design errors or weaknesses
  - recommendations to increase reliability

- High Voltage Power Supply (HVPS)
  - system reverse engineering & re-design
  - design, development and manufacture
  - 26 settable power sources (on 3 prints)
  - 300 - 500 components per board

- Low Voltage Power Supply (LVPS)
  - feasibility study, design, development and manufacture
  - 82 switchable power sources (2 prints)
  - 800 - 1’300 components per board
Space: POLAR (launched 15th September 2016)
Space: STIX (launch 2019)

- **Solar Orbiter**
  - explore how sun creates & influences heliosphere
  - understand risks caused by space weather

- **Spectrometer Telescope Imaging X-rays**
  - Swiss experiment (FHNW)
  - create images & spectra
    - thermal & non-thermal x-rays
    - time, location, intensity & spectra
      - accelerated electrons
      - high temperature plasma (>10 million degrees)
Space: STIX (launch 2019)
Space: 3D-MID4space (ARTES 5.1)

- Characterise suitability of 3D-MID technologies, manufacturing techniques, processes and materials for space telecom applications... target TRL5

- Identify critical issues, recommendations, or modifications that may be required, lessons learned and conclusions

- Propose possible follow on activities and road map to increase TRL
Space: 3D-MID4space (ARTES 5.1)

- **High functional integration density**
  - mechanical, electronic and thermal functions
  - optimal space utilisation: miniaturisation, significant weight savings
  - defined angles between components, stacking and precision placement of components
  - high level of precision into the ultra-fine conductor range
  - reduction of assemblies through reduction of conventional interconnect devices (e.g., strip conductors directly in the enclosure)

- **MID designs allow more efficient AIT**
  - rationalisation and overall system simplification via reduction of process steps, number of parts and mounting time
  - increase in manufacturing reliability due to fewer mechanical parts and processes
  - full three-dimensionality with through plating allows complex 3-dimensional interconnect devices
  - production with high variance and short changeover times, layout change of conductor network needs no tools, just a change of CAD layout data
High Reliability & Harsh Environments

Underwater

On top of mountains

In space

Inside the human body