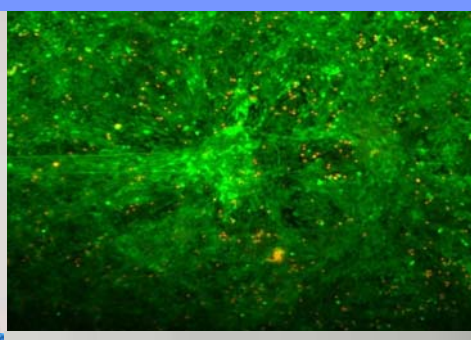
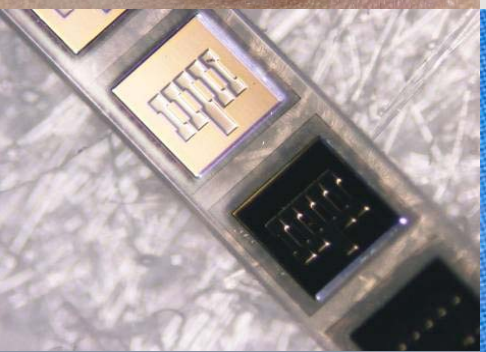
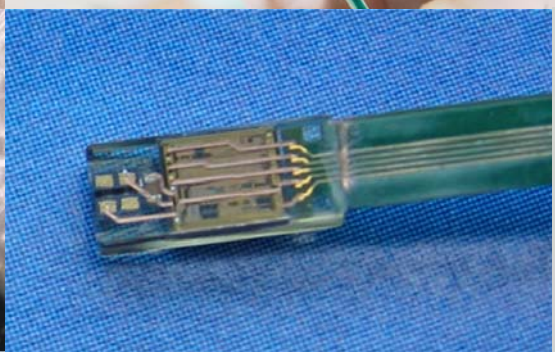
Healthy Aims

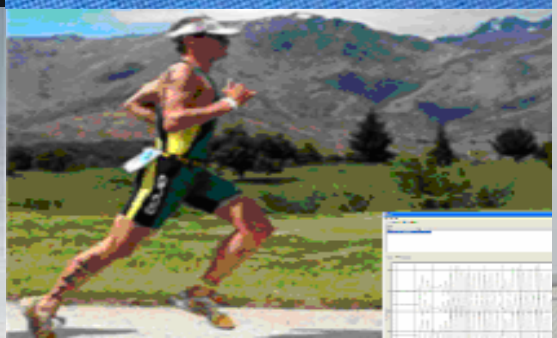
Implantable micro-sensors and micro-systems for ambulatory measurement and control in medical products

Catalogue

Medical systems and underlying technologies developed by Healthy Aims partners



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Introduction

This document consolidates the results of the 4-year EU funded project “Healthy Aims”. Partners have summarised their achievements and knowledge gained from the project, and offer these to the public for further, additional exploitation. The information is provided in data sheet format, grouped into products, technologies, clinical services and management services. Contact details are given at the end of each sheet, so that interested parties can contact the relevant partner directly.

About Healthy Aims:

This Framework 6 project has been developing medical implants and ambulatory measurement systems, integrating a range of underpinning micro-, bio- and nano-technologies and wireless communications. The project goals chosen were medical implants focusing on nerve stimulation, and diagnostic equipment based on strain gauge technology:

- Functional Electrical Stimulation (FES) systems for restoration of upper limb movement, bladder and bowel control
- Sphincter sensor for monitoring bladder pressure
- Retinal implant for restoration of sight
- Glaucoma sensor for diagnosing glaucoma
- Cochlear implant for restoration of hearing
- Intra-cranial pressure sensor system (ICP) for monitoring brain pressure
- Activity monitor and ‘Out of the Gait Lab’ system for accurate interpretation of human motion

These utilise core technologies, which were developed in parallel with the products:

- RF Communications suitable for implanting into the human
- Micro-electrodes
- Implantable power source- Secondary cell or Biofuel cell
- Biocompatible encapsulation materials.

The 4 year, 26 partner, project started on December 1st 2003. The Healthy Aims Team includes:

- Research Groups in micro and nano technology
- Biomaterials experts
- RF Communications experts
- Power sources experts
- Design teams
- Medical Device manufacturers
- Surgeons and
- Clinical teams, including ethics

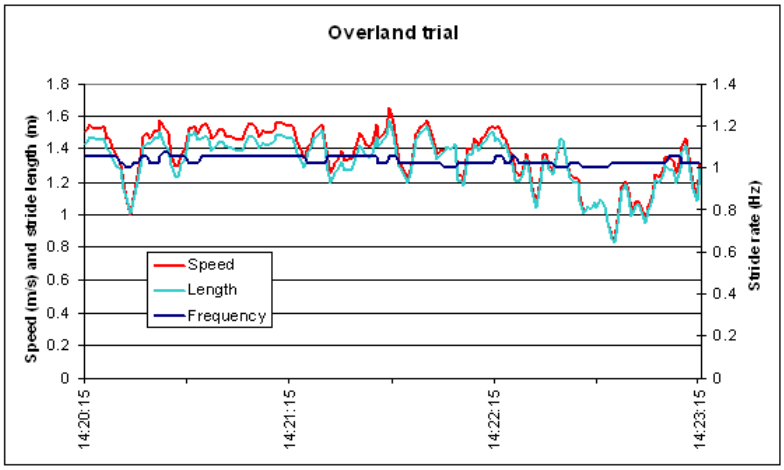
Healthy Aims Partners

Partner Name	Abbreviation	Country
Assuta Medical Centers Ltd	Assuta	Israel
Campus Micro Technologies mbH	CMT	Germany
CEA/Liten	CEA	France
Cochlear Europe Ltd	CTC	Belgium
DINAMIC Technology Innovation Centre	DINAMIC	Spain
Ecole Polytechnique Federal de Lausanne	EPFL	Switzerland
European Technology for Business Ltd	ETB	UK
Finetech Medical Ltd	FTM	UK
HSG-IMIT	IMIT	Germany
IMI-Intelligent Medical Implants GmbH	IMI	Germany
Institute of Electron Technology	IET	Poland
Interuniversitaire Micro-Elektronica Centrum vzw	IMEC	Belgium
Jagellonian Institute	JAG	Poland
Medical University of Graz	MUG	Austria
Mediplus Ltd	Mediplus	UK
microTEC Gesellschaft für Microtechnologie mbH	microTEC	Germany
North Bristol NHS Trust	NBNHST	UK
Queen Mary and Westfield College University of London	QMUL	UK
Saft	SAFT	France
Salisbury District Hospital	SDH	UK
University College London	UCL	UK
University of Freiburg	IMTEK	Germany
University of Newcastle	INEX	UK
University of Salford	USAL	UK
Zarlink Semiconductor Ltd	Zarlink	UK

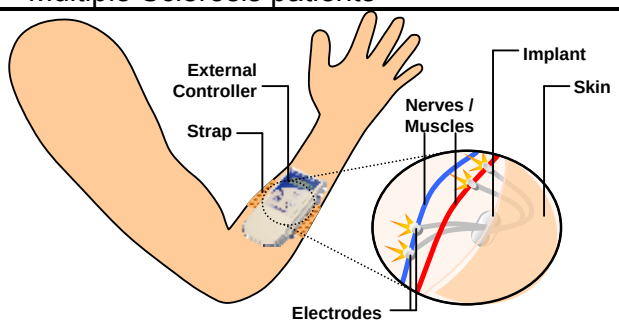
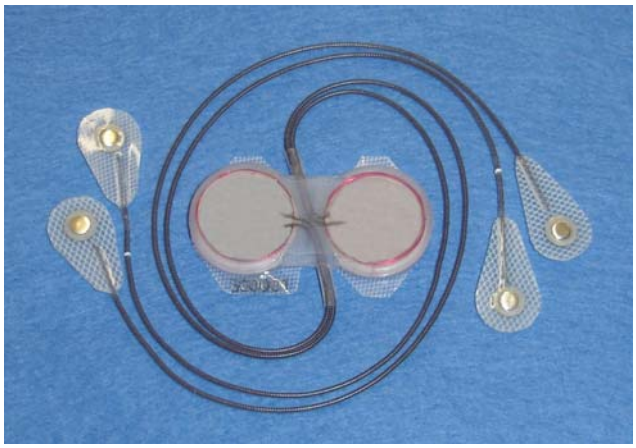
Solution	Wireless intra-cranial pressure (ICP) sensor
Markets	Medical companies and associated neurosurgical clinics
Picture	***Wireless ICP implant***   ***Placement of the ICP unit on an anatomical model***
Brief description	The ICP sensor system is primarily designed for the following applications: ▪ Continuous monitoring of ICP of hydrocephalus patients ▪ Monitoring of conditions causing high ICP, e.g. in clinical management of severe head injuries ▪ Alternative to conventional tip transducers with vast increase in application time ▪ In-vivo monitoring of shunt performance ▪ Therapy optimization Clinical and microsystems expertise was combined to develop a highly miniaturised sensor implant suitable for minimal invasive delivery with wireless data and power transmission based on state-of-the-art RFID technology and coating technologies.
Key features	ICP sensor implant: ▪ Fully implantable absolute pressure sensor ▪ Wireless & battery-less operation ▪ Superior (zero) drift behaviour, Ultra-low-power consumption ▪ Total weight 5 grams (implant) ▪ Fully biocompatible through advanced coating ▪ MRI compatible and safe ▪ Electrically and mechanically long term stable, lifespan > 10 years
Main characteristics	ICP monitoring system consist of an ICP sensor implant and an external RF (radio frequency) reader (ISO 14443, 13.56 MHz) with clinical application software ▪ Mobile reader with direct data logging capability on standard MMC card ▪ PC software communicates with RF reader via ZigBee or USB interface ▪ Powered by Li ion battery, Rechargeable via USB & external power adapter (+5V) ▪ Internal barometric reference sensor ▪ On-board real time clock, Automatic time synchronisation with host computer
Contact	Campus Micro Technologies GmbH Universitätsallee 29 28359 Bremen, Germany **Office:** +49 (421) 2020-783 **Fax:** +49 (421) 2020-950 **e-mail:** info@campus-micro-technologies.de **Web:** www.campus-micro-technologies.de campus MICRO TECHNOLOGIES

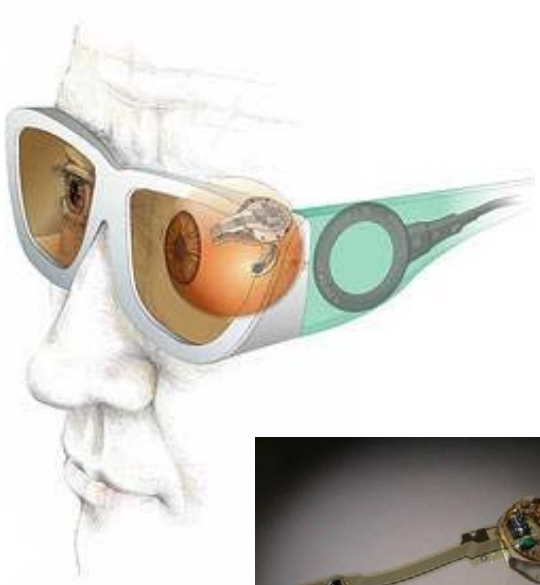
Solution	Glaucoma sensor
Markets	Ophthalmology: Intra Ocular Pressure Monitoring
Picture	
Brief description	Intra Ocular Pressure monitoring over long periods (up to 24 hours) is of importance for the early diagnostic of glaucoma. The Glaucoma sensor system is a soft contact lens in which a sensor, antenna and wireless telemetry micro-chip are embedded to perform this task. The data measured are transmitted in a wireless manner to a pair of glasses, and then stored in a portable unit. The accumulated data can be later transmitted by Bluetooth to the ophthalmologist computer for analysis.
Key features	• Intraocular pressure monitoring over long periods • Minimally invasive • Wireless data communication between system components
Main characteristics	System components: • Soft contact lens containing a microfabricated strain gauge sensor and antenna connected to a telemetry microprocessor. • Reader unit composed of a pair of glasses containing emitter/receiver coils and connected with a wire to a small storage unit. Bluetooth connection is implemented in the reader unit to send data to the ophthalmologist computer for analysis. • Software program that allows to chose the reader unit working parameters and analyse the measured data.
Contact	EPFL STI-LMIS4 BM 3.124 Station 17 1015 Lausanne, Switzerland **Name:** Arnaud Bertsch **Office:** +41 21 693 66 06 **Fax:** +41 21 693 59 50 **e-mail:** arnaud.bertsch@epfl.ch **Web:** www.epfl.ch / www.sensimed.ch

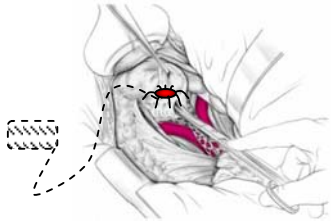
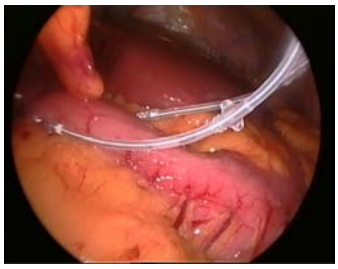
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

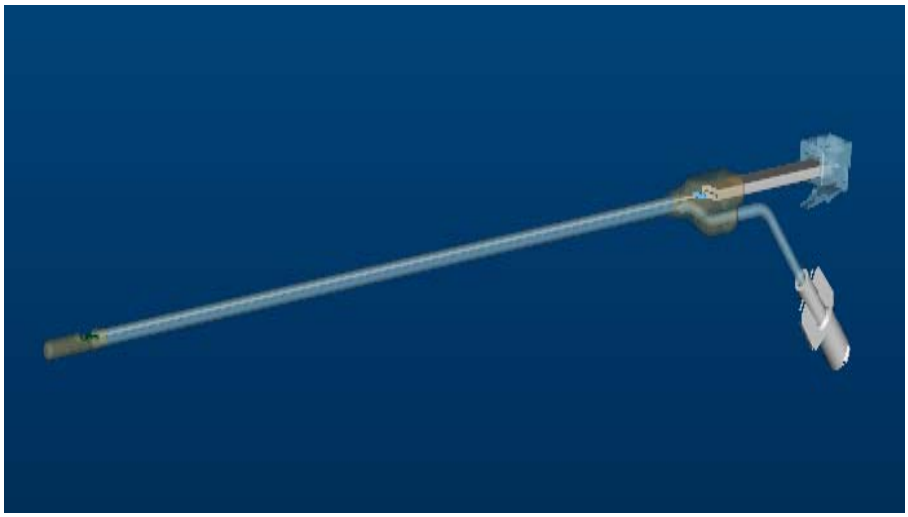
Solution	PEGASUS - Innovative stride characteristics analysis
Markets	Olympic athletes
Picture	  
Brief description	There are two units (see picture). The Pegasus-G fits around the waist or ankle. Pegasus-S fits on to any other convenient position, either on the arm or on the head. A single button press is all that's needed to start and stop recording on each module, and you can create records of activities throughout the day. When you have finished your training, simply press the button on each unit to stop recording. The supplied Poseidon software and ETB's own algorithms produce your stride characteristics during the trial.
Key features	You will gain a greater understanding of your own stride characteristics during a training period and be able to measure the effect physiotherapy, diet, shoes and terrain have on your performance. **Athletes:** Determine changes in stride length and rate throughout a training run. **Trainers:** Record athlete's stride characteristics for different conditions to determine where improvements can be made. Monitor the stride frequency and stride length to improve competitiveness. Ascertain the athlete's ability to modify stride length and frequency at different points along a race.
Main characteristics	• Stride characteristics of the athlete: Stride Rate, Stride Length, Speed, Time • Up to 6 hours recording of data
Contact	European Technology for Business Codicote Innovation Centre St. Albans Road, Codicote, Herts, SG4 8WH **Office:** +44 (0) 1438 822820 / +44 (0) 1438 822811 **e-mail:** sales@etb.co.uk **Web:** www.etb.co.uk

Solution	LIBRA – Motion sensing with 3-axis accelerometer
Markets	Medical, sports
Picture	 
Brief description	The “plug and play” Libra system is an ideal development tool for various applications, e.g., Training aids for sports, Motion sickness or deep vein thrombosis, Physiotherapists monitoring conditions such as knee osteoarthritis, Gait analysis, Sports equipment analysis and development (rowing machines, treadmills), Motion liable to give rise to industrial injuries such as repetitive strain injury, Analysis of a golf swing
Key features	• Compact and light (41 x 30 x 14mm, 15 gram) • Connects to USB port on PC (USB powered) • Senses acceleration in x, y and z axes (+/-5g range), plus temperature • Sends up to 200 sets of readings per second to the host PC via USB cable • Acceleration can be viewed in real time on the host PC • Data recorded on host PC in standard form for analysis • Senses gravity (can be used as a inclinometer), enabling easy calibration • Multiple Libra units can be used with a USB hub
Main characteristics	Dimensions (width, length, height) 30x41x14 mm Mass 15 gram Measurement range (sensor full scale) +/-5 g Resolution nominal (typical) 12.2 milli-g Current consumption (nominal) 46 mA Temperature Range (operational) -10 to +60 °C
Contact	European Technology for Business Codicote Innovation Centre St. Albans Road, Codicote, Herts, SG4 8WH **Office:** +44 (0) 1438 822820 / +44 (0) 1438 822811 **e-mail:** sales@etb.co.uk **Web:** www.etb.co.uk

Solution	2-channel implantable muscle stimulator
Markets	• Stroke patients • Spinal cord injury patients • Cerebral Palsy patients • Multiple Sclerosis patients
Picture	 ***System Concept***  ***Electrodes***
Brief Description	The STIMuGRIP® System is a two channel implantable muscle stimulator designed to restore control of the wrist extension and hand opening actions.
Main characteristics	An External Controller is worn on the forearm over the site of the implanted internal parts. The Controller provides a simple interface for the user to select the appropriate routines. The internal parts receive power and control signals through the skin from the External Controller. The internal parts of the system include an Implant Receiver and permanently implanted Electrodes.
Contact	FineTech Medical Ltd., 13 Tewin Court, Welwyn Garden City, Hertfordshire, United Kingdom. AL7 1AU. **Name:** John Spensley **Office:** +44 (1707) 330942 **Fax:** +44 (1707) 334143 **e-mail:** john.spensley@finetech-medical.co.uk **Web:** www.finetech-medical.co.uk FINETECH MEDICAL LTD

Solution	Intelligent retinal implant system™ (IRIS)
Markets	Europe and the USA
Picture	 
Brief description	The ***Intelligent Retinal Implant System™*** replaces the signal processing functions of the healthy retina and provides the input to the retinal nerve cells (the ganglion cells) which in turn provide the input to the optic nerve which carries the stimulation to the brain. The IMI system includes an implant, the **Retinal Stimulator**, containing an electrode array and is surgically placed into the eye of a patient. The patient wears a pair of spectacles containing an integrated mini-camera and wireless transmitter components - the **Visual Interface**. Via a cable, the spectacles are connected to the **Pocket Processor** worn at the patient's waist. This device replaces the information-processing function of the formerly healthy retina through the use of a high-speed digital signal processor and tuneable software.
Key Features	Provides visual perception to patients who were previously blind
Contact	IMI Intelligent Medical Implants GmbH Niebuhrstrasse 1a, D-53113 Bonn, Germany **Name:** Hans-Jürgen Tiedtke, Managing Director **Office:** +49 228 969 55 0 **Fax:** +49 228 969 55 22 **e-mail:** tiedtke@intmedimplants.de **Web:** www.intmedimplants.de Intelligent Medical Implants

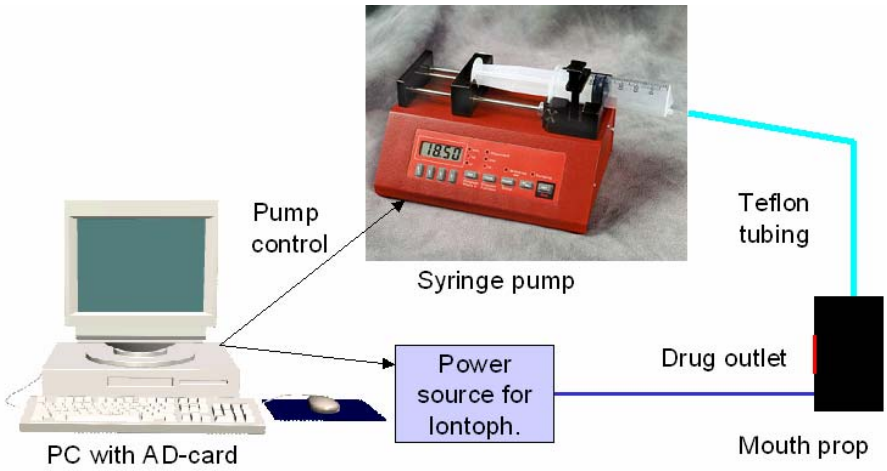
Solution	Implantable device for electroneuromodulation of pelvic nerves
Markets	Departments of surgery, departments of urology
Picture	   
Brief description	The SPIDER device is a splanchnic Implantable device for electroneuromodulation of pelvic nerves. It allows the stimulation of the autonomic nervous system which supply pelvic organs. According to experiments we had done so far, we observed improved GI motility, urinary bladder detrusor activation and erection. Further experiments are scheduled to develop appropriate technique for human use. Clinical studies have to be organized to confirm clinical utility of the SPIDER device for respective pathologies.
Key Features	Autonomic nervous system, pelvic nerves, electric stimulation, constipation, IBS, urinary incontinence, impotence
Main characteristics	A neurostimulator is implanted under the skin. By means of specially developed lead, pelvic plexus neurostimulation is supplied, to control function of large bowel and urinary bladder and erection. The procedure is performed by laparoscopy and last about 25 minutes. Estimated recovery of a human patients is 24 hours.
Contact	3rd Department of General and GI Surgery ul.Pradnicka 35, 31-202 Krakow POLAND **e-mail:** jsobocki@cm-uj.krakow.pl **Web:** www.cm-uj.krakow.pl/index_en.php Jagiellonian University Medical College

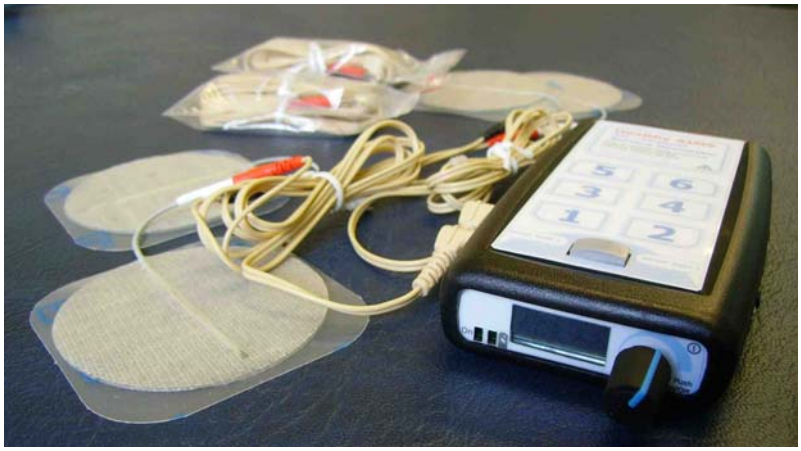
Solution	Low cost disposable electronic catheter system
Markets	Healthcare - Urodynamics, Gastroenterology and other areas where pressure monitoring is required
Picture	
Brief Description	A Low Cost, bespoke gauge developed to measure pressures in the human body to diagnose Lower Urinary Tract Symptoms and also Gastrointestinal abnormalities
Key features	• Low cost • Disposable – prevents cross-contamination • Easy to use and set-up • Can be used for ambulatory studies
Contact	Mediplus Ltd. Unit 7, The Gateway Centre, Coronation Road, Cressex Business Park, High Wycombe, Bucks, HP12 3SU.
Name: **Office:** **Fax:** **Web:**	James Urie, Sales & Marketing Director +44 (0) 1494 551200 +44 (0) 1494 536333 www.mediplus.co.uk

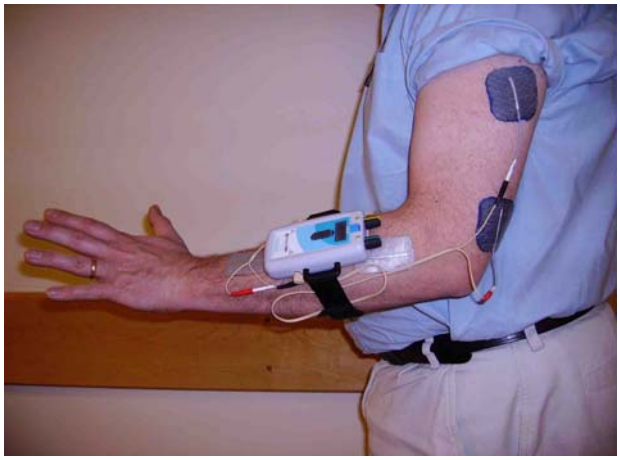
Solution	An implant to prevent incontinence and restore function
Markets	Medical device
Picture	 ***The implant Controller may be worn on the belt, hung round the neck or kept on the seat of a wheelchair***
Brief description	The device is intended for suppressing reflex bladder contractions that cause incontinence events. The range of stimulus intensity of nerve fibres can also activate the bladder muscle, so the bladder can be emptied at will. The Controller (picture) is used by the patient to send commands to the implant and it provides information about bladder activity and the implant itself. Neuromodulation to suppress bladder contractions may either be triggered by the patient, or by a sensor linked via a wireless system, or from the naturally-occurring nerve activity.
Key features	• Four electrically-isolated stimulation channels • Implant powered by a rechargeable lithium battery • Re-charge of battery at night while the patient is in bed without intervention from the patient • An amplifier on one channel that allows potentials from mV down to µV levels to be recorded. The gain and pass-band can be selected remotely and either instantaneous potential or amplitude can be selected as the signal • Stimulation of both somatic and parasympathetic nerve fibres • Two stimulator configurations: (i) four tripoles with recording for one of them; (ii) seven monopolar cathodes with a common anode, one dipole can be used for stimulation or recording
Main characteristics	Implanted device for treating patients disabled by spinal cord injury or other conditions. For restoring urinary bladder function, or stimulating up to eight muscles for hand grasp or other FES applications.
Contact	University College London Gower Street London WC1E 6BT
Name: **Office:** **Fax:** **e-mail:** **Web:**	Professor Nick Donaldson +44 207 679 0265 +44 207 679 0255 nickd@medphys.ucl.ac.uk www.ucl.ac.uk

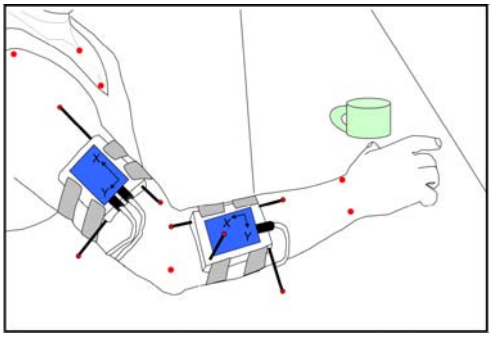
Solution	Artificial Vision Centre
Markets	Clinical or company diagnostic projects, health care enterprises
Picture	
Brief description	Medical University of Graz has established an Artificial Vision Centre, where patients with retinal implant systems creating artificial vision can be tested to measure the visual acuity and function and taught how to use this new perception. It can be also used to measure visual impairment and disability in people with very low vision.
Main characteristics	• **Mobility test:** artificial labyrinth with various obstacles, first visual function test for repeated assessment of disability in standardized conditions for persons with reduced visual field and visual acuity. • **Table scanning test:** To locate and identify standardized objects presented on a table. Visual function test. • **Grating test:** black and white bars of same width projected on a white screen, size of the bars is reduced in a logarithmic scale over time. Standardized test to measure visual acuity in very low vision. • **People Tracking System with Trajectory Projection:** Precise documentation of the head and feet movement demonstrate the scanning movements of the head and orientation losses or hand movements used as an additional assessment of behavioural changes in the mobility test and table test. • **Computerized evaluation method:** Data analyses derived from the People Tracking System to establish parameters for orientation losses and screening behaviour for reorientation.
Contact	Artificial Vision Center, Univ.-Augenklinik Auenbruggerplatz , A-8010Graz, AUSTRIA **Name:** Univ.-Prof. Dr. Michaela Velikay-Parel **Office:** +43 316 72712 **Fax:** +43 316 3261 **e-mail:** avc@meduni-graz.at **Web:** www.avc-europe.com

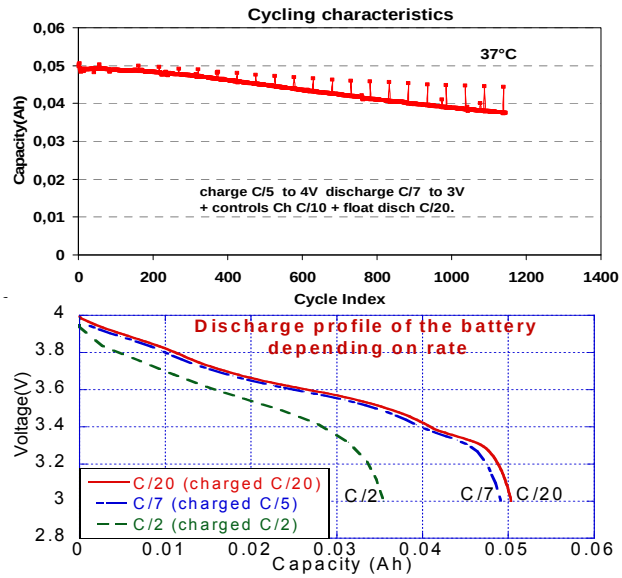
Solution	In vivo evaluation of intracranial pressure monitor
Markets	Companies developing sensors and digital communication strategies applicable to intracranial pressure monitoring.
Picture	
Brief description	Trials were conducted and results are compared to that from a 'gold-standard' pressure monitoring system, consisting of a ventricular access device whose catheter tip lies within the cerebrospinal fluid in the ventricle.
Key features	• Intraventricular haemorrhage is induced. This leads to dilatation of the cerebral ventricles allowing the ventricular catheter of the ventricular access device to be positioned accurately within the ventricle. • The ventricular access device, as well as the intracranial pressure sensor to be tested, is implanted once mild to moderate ventricular dilatation has occurred. • To monitor the intracranial pressure, a butterfly needle is inserted into the ventricular access device and connected to a pressure transducer. This is in turn connected to a patient monitor. An intracranial pressure trace is then obtained. This is compared to the trace obtained by the intracranial pressure sensor undergoing testing. • Both streams of data can be fed into appropriate software in order to evaluate the characteristics of the traces • Pressure monitoring can be undertaken frequently with minimal risk. Manoeuvres known to alter intracranial pressure, such as jugular compression or head tilt, are used to obtain changes in the baseline reading.
Contact	Department of Neurosurgery, Frenchay Hospital, Bristol, BS16 1LE, United Kingdom. **Name:** Mr Richard Edwards FRCS(Neurosurg.), Consultant neurosurgeon **Office:** 0117 975 2185 **Fax:** 0117 970 1161 **e-mail:** richard.edwards@nbt.nhs.uk North Bristol NHS Trust NHS

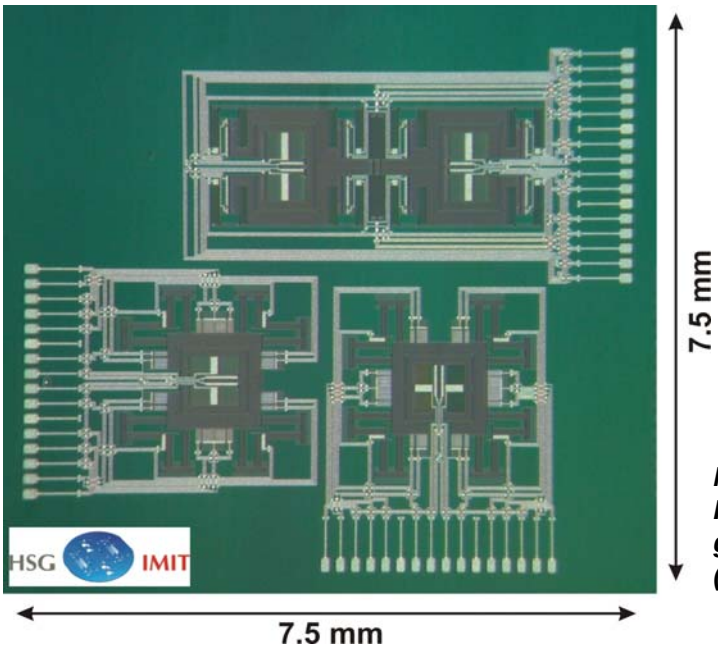
Solution	Clinical trials for medical device tests
Markets	Medical devices, projects or companies
Picture	
Brief description	Implementation of porcine model for testing a variety of medical devices under controlled conditions, such as the development of a sphincter sensor for the Healthy Aims project.
Key features	The porcine model has long been used to perform clinical studies before using human subjects.
Main characteristics	Healthy Aims project took upon itself to develop a sphincter sensor measuring the internal urethra-bladder pressure. The developed device should be tested *in vivo* to proof its efficiency and durability in a real living environment. The porcine model provided by Assuta is instrumental to test the newly developed device vs. a 'gold standard' and to measure its performance in varying conditions of the bladder. The physiological condition is modulated by a variety of drugs that can e.g. increase/ decrease blood pressure gradually or instantly. The present system (developed jointly by Assuta and HSG-IMIT) administers the modulating drugs in a completely controlled manner. The picture above shows the schematic of the complete system.
Contact	Assuta Medical Centers Jabotinsky 62, Tel Aviv 62748, Israel
Name: **Office:** **Cell:** **Fax:** **e-mail:** **Web:**	Dr. Andy Wolff +972 9 746 1630 +972 50 880 1852 +972 9 746 3083 awolff@zahav.net.il, www.assuta.com

Solution	Healthy Aims six channel surface stimulator training aid
Markets	Healthcare
Picture	
Brief description	The Healthy Aims Six Channel Stimulator is a compact and very versatile FES (Functional Electrical Stimulation) device designed to enable multiple training regimes both within the clinical setting and patients own environment. The device can be controlled by an internal timer for basic exercises or by an external driver such as the Salford University Clinical Set-up Tool. **Main applications:** • A clinical investigation tool to allow planning of applications and pre-surgical training for the Healthy Aims implanted stimulator • Retraining of hand arm and shoulder function following stroke • Gait assistance following stroke, multiple sclerosis, incomplete spinal cord injury, cerebral palsy, head injury and hereditary spastic paraparesis • FES rowing and cycling for paraplegics and tetraplegics • R&D into the application of FES and its physiological effects
Key features	• Compact design enabling practical body warn applications • Software easily adaptable for future applications • Unique flexible current waveform phase control
Main characteristics	• Current intensity 0-110mA • Pulse width 0 – 350µs • Waveform asymmetrical biphasic or variable phase symmetrical biphasic • Frequency 1 – 80Hz • External control via SPI bus
Contact	The National Clinical FES Centre, Department of Clinical Science, Salisbury District Hospital, Salisbury, Wiltshire, SP2 8BJ, UK **Office:** +44 (0)1722 429 065 **Fax:** +044 (0)1722 425 263 **e-mail:** enquiries@salisburyfes.com Salisbury Health Care NHS

Solution	Odstock 2-channel stimulator (O2PS) training aid
Markets	Healthcare
Picture	 ***O2PS in use***
Brief description	The **O**dstock **2**-channel **P**rogrammable **S**timulator is a compact **F**unctional **E**lectrical **S**timulation device to enable training of hand and arm function following stroke. Users of the O2PS not only demonstrate significant increase in the ability to perform activities of daily living after 12 weeks of use but continue to improve their ability 12 weeks after the intervention is removed In the application tested, wrist, finger and thumb extensors are stimulated together with elbow extensors to assist hand opening and reach. The main applications for the device are: • A clinical investigation tool to allow planning of applications and pre-surgical training for the Healthy Aims implanted 2-channel stimulator - STIMuGRIP • Retraining of hand arm and shoulder function following stroke • Gait assistance following stroke, multiple sclerosis, incomplete spinal cord injury, cerebral palsy, head injury and hereditary spastic paraparesis
Key features	• Device control by an internal accelerometer • Compact design enabling practical body warn applications • Software design enabling easy development of future applications • Unique flexible current waveform phase control
Main characteristics	Current intensity: 0-110mA; Pulse width: 0 – 350µs, Waveform asymmetrical biphasic or variable phase symmetrical biphasic, Frequency: 1 – 80Hz, Internal accelerometer for control, External control via USB
Contact	The National Clinical FES Centre, Department of Clinical Science, Salisbury District Hospital, Salisbury, Wiltshire, SP2 8BJ, UK **Office:** +44 (0)1722 429 065 **Fax:** +44 (0)1722 425 263 **e-mail:** enquiries@salisburyfes.com Salisbury Health Care NHS

Solution	Human performance analysis
Markets	Rehabilitation or assistive device companies
Picture	 ***One of three human performance laboratories at USAL***  ***Experimental setup for data collection***
Brief description	The University of Salford houses 3 dedicated human performance laboratories equipped with state of the art equipment (Vicon and Qualysis optical motion capture, Xsens inertial measurement units, AMTI force plates, treadmills, Noraxon EMG, static/portable gas analysis, ultrasound). Members of the research Centre (CRHPR) are, e.g., health professionals (physiotherapists, prosthetists, …), engineers, computer scientists etc. They perform rapid technical developments, focused on clinical needs and constraints. Particular areas of expertise include: • Upper and lower limb Functional Electrical Stimulation • Foot and ankle biomechanics • External prosthetics • Orthotics • Stroke rehabilitation
Main characteristics	USAL have developed and evaluated a control system for upper limb functional electrical stimulation. The system is designed to assist with the grasping and releasing of objects for people whose hand function is impaired following a stroke. The project involved the development of an experimental protocol, ethical approval, subject recruitment, software development and statistical analysis of the data.
Contact	CRHPR, Brian Blatchford building, University of Salford, Salford. M6 6PU **Name:** Dr Laurence Kenney, **Office:** +44-161-295-2289 **Fax:** +44-161-295-2668 **e-mail:** l.p.j.kenney@salford.ac.uk **Web:** www.ihscr.salford.ac.uk/CRHPR/

Solution	Implantable, rechargeable lithium-ion battery
Markets	Non- vital medical devices, Cochlear implant, Functional Electrical Stimulator (FES), Nerve and/or muscular stimulation etc...
Picture	
Brief description	Prismatic small Li ion battery, using Li-Ni_x Co_y Al_z O2 /LiC_6 electrochemistry
Key features	High energy density, Long track record on cycle life and calendar life, State of charge indication. Requires protection against overcharge.
Main characteristics	Operating temperature 37°C Dimensions <5 x 10 x 22 mm Weight 2.45 g Capacity 50 mAh Autonomy 16 – 20 hours Max cont. discharge current 10 mA Max pulse (1000 µs) current 50 mA Lifetime at 37°C >10 years Nbr. of charges/discharges* >4000 *(*100% DoD, with more than 50% o initial capacity remaining*) Min charge time 2 hours Voltage window 3.0 – 4.0 V 
Contact	**Saft - Specialty Battery Group** 12, rue Sadi Carnot 93170 Bagnolet – France **Name:** Michel Broussely **Office:** +33 1 49 93 19 18 **Fax:** +33 1 49 93 19 69 **Web:** http://www.saftbatteries.com/	**CEA/LITEN** 17, rue des Martyrs 38054 Grenoble cedex 9 – France Sébastien Martinet / Séverine Jouanneau +33 6 80 51 69 62 / +33 4 38 78 40 34 www.cea.fr

Solution	Single-Chip, multi-axis inertial measurement unit
Markets	Healthcare, Consumer, Communication, Automation, Logistics, Robotic, Automotive
Picture	 ***Microscopy view of the HSG-IMIT MEMS 3-axis gyroscope (sensor chip)***
Brief description	Based on MEMS technologies this single-chip 3-axis-gyroscope is very small and light weight. The application area focuses on the acquisition, analysis and control of complex motion processes. It can also be used for supporting navigation and tracking procedure. Examples -medical: Detection of human posture and motion for gait analysis, sensor for FES-application, fall detection; Automation and Robotics: driverless transport systems, robot motion control; Consumer: camera stabilization; …
Key features	• Small Size (sensor chip: 7.5mm x 7.5mm), Light weight • All measurement axis realized in one plane on same Si-substrate • Standard Silicon-On-Insulator (SOI) –Technology
Main characteristics	(Preliminary)

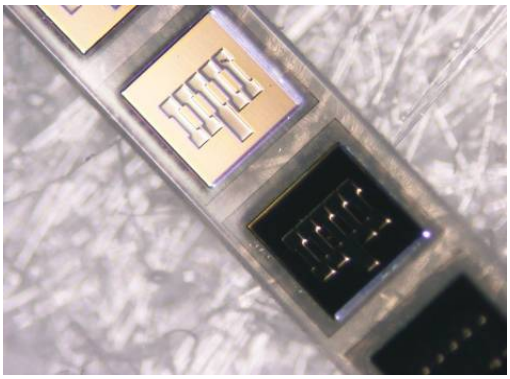
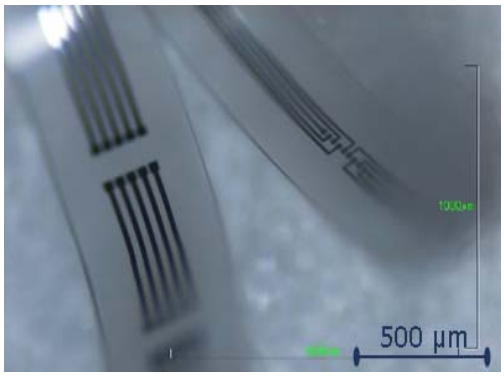
Parameters	X-Gyro	Y-Gyro	Z-Gyro
Range [°/s]	± 400	± 400	± 400
Bandwidth [Hz]	50	50	50
Nonlinearity [%]	≤ 0.2	≤ 0.2	< 0.1
Noise [°/s] @ Bandwidth	< 0.45	< 0.45	< 0.2

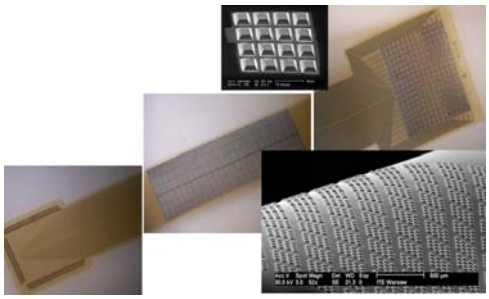
Contact

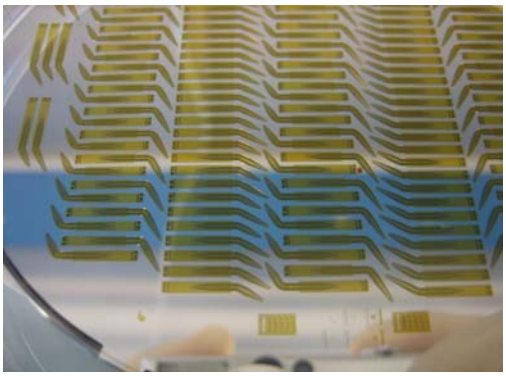
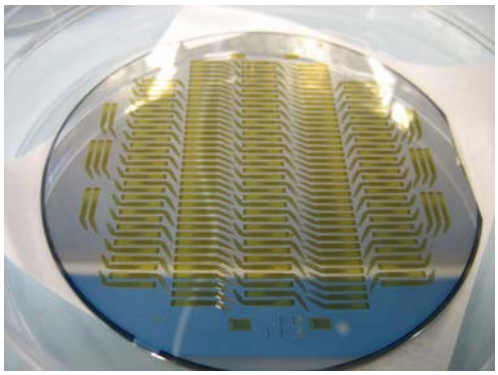
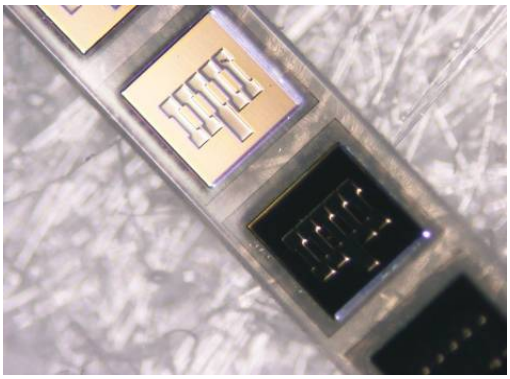
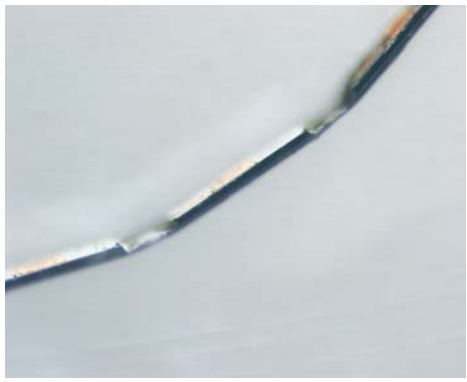
HSG-IMIT - Institute of Micromachining and Information Technology
Wilhelm-Schickard-Str. 10,
78052 Villingen-Schwenningen, Germany

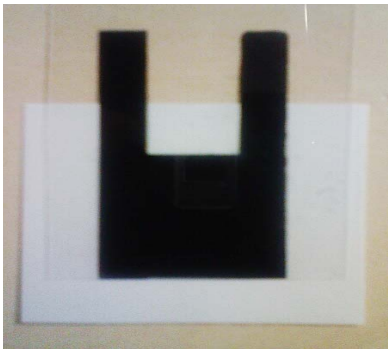
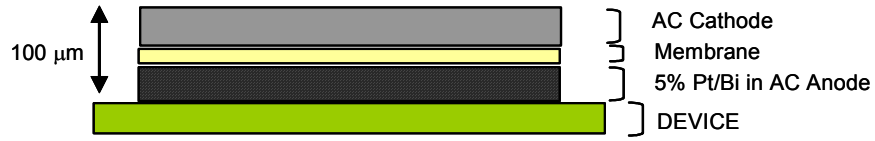
Name: Martin Trächtler
Office: +49 7721 943-226
Fax: +49 7721 943-210
e-mail: martin.traechtler@hsg-imit.de
Web: www.hsg-imit.de

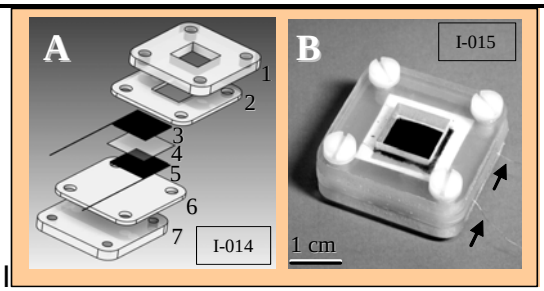
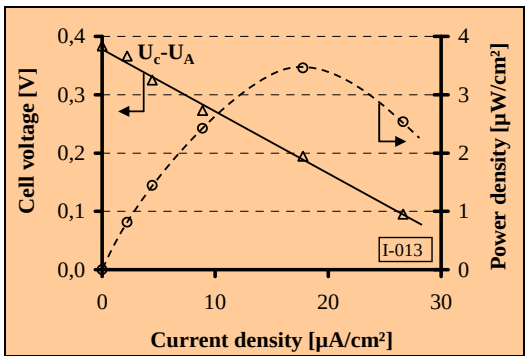
HSG IMIT

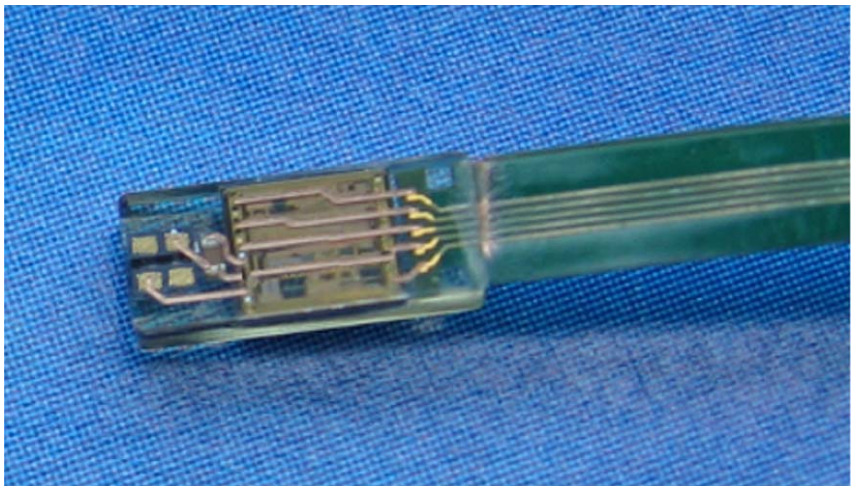
Solution	Transferable technologies linked to the development of electrodes and sensors for medical implants
Markets	Biomedical systems houses
Picture	 ***Thin Si dies embedded in silicone (top view)***  ***Pt interconnects,embedded in silicone***
Brief description	In the Healthy Aims project IMEC is involved in the development of active micro-electrodes arrays to be used in cochlear implants.
Key features	The product developed is based on IMEC's Chip-in-Wire concept, where active dies are encapsulated, interconnected and embedded, in order to form an active micro-electrode array. Key features are : • Active die embedding / encapsulation • Multiple barrier coating (silicone, parylene, Platinum,…) • Die/Wafer thinning • Wafer to Wafer or Die to Wafer process • Wafer Level Packaging
Main characteristics	Dimensions • 300 – 1000 µm long electrodes • 100 – 500 µm wide electrode • 80-100 µm gap between adjacent electrodes • 1 µm thick Pt interconnects • ~20 µm thin active dies • ~50 µm total thickness
Contact	IMEC vzw Kapeldreef 75 B-3001 Leuven, Belgium **Name:** Chris Van Hoof **Office:** +32 16 281 815 **Fax:** +32 16 288 500 **e-mail:** Chris.VanHoof@imec.be **Web:** www.imec.be

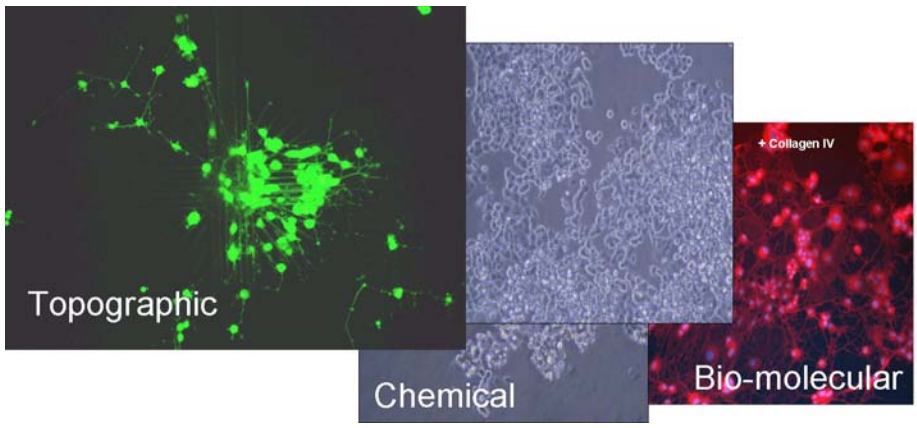
Solution	Development of microelectrodes and sensors for medical implants
Markets	Healthcare
Picture	  ***Electrode for retina implant*** ***Modiolus electrode***
Brief description	ITE provides technology and experience in the development and fabrication of different type of flexible 3-D shaped microelectrodes and sensors. Microsystem technologies enables to fabricate dense arrays of electrodes which can be used as components of medical implants for electrical stimulation of nerves or recording of neural signals.
Key features	The microelectrodes developed for human implants consist of biocompatible polymers (silicone, parylene, polyimide) and metals (Pt, Ti, Au). The microelectrodes could be integrated with silicon structures containing ICs and sensors.
Main characteristics	Dimensions of stimulation electrodes: • width 5-1000µm, • height < 50 µm Typical thickness of layers in the device: • parylene 1-10 µm, • polyimide 3-30µm, • silicone 20-200µm, • Pt 0,1 - 5 µm, • Au 0,1 - 30 µm Size and density of electrode matrix: up to of 4000 separate stimulation sites (arranged in 250 electrodes) per 25 mm^2
Contact	Instytut Technologii Elektronowej Al. Lotnikow 32/46, 02-668 Warszawa, Poland **Name:** Dr. Piotr Grabiec: Dr. Krzysztof Domanski: **Office:** +48 22 716-59-90 +48 22 716-59-92 **e-mail:** grabiec@ite.waw.pl kdoman@ite.waw.pl **Web:** www.ite.waw.pl

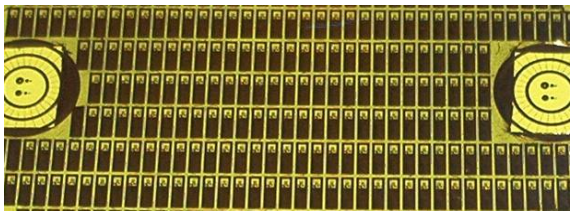
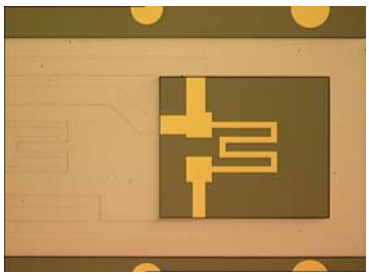
Solution	Novel intra-cochlear and modiolus electrode arrays
Markets	Severely to profoundly hearing impaired people
Picture	  ***A wafer of Platinum-polyimide intra-modiolus electrodes prior to release produced by the Institute of Microelectronics and Microsystems, EPFL in Switzerland.***   ***Flat silicone-coated electrode arrays integrating thin Si dies (left: top view right: side view). The electrodes are produced by IMEC, Belgium.***
Brief description	In the Healthy Aims project CTC is involved in design and evaluation of new types of electrode arrays for use in next generation of Cochlear Implants. Modiolus electrodes will not be implanted in the cochlea as is common in cochlear implantation today, but directly into the nerve bundle located in the centre of the cochlea. A second electrode type developed in Healthy Aims is the active or smart electrode where the Pt stimulation sites are combined with silicon chips featuring active circuitry.
Key features	The expected advantages of modiolus electrodes are that there is less risk of damage to the cochlea and that less electrical power will be consumed during neural stimulation. Smart or active electrodes are capable of improving speech and music perception by significantly increasing the number of stimulation sites.
Contact	Cochlear Technology Centre Europe Schaliënhoevedreef 20,I 2800 Mechelen, Belgium **Name:** Bart Volckaerts **Office:** +32 153 62 838 **Fax:** +32 153 62 800 **e-mail:** bvolckaerts@cochlear.be **Web:** www.cochlear.com

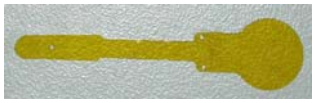
Solution	Low cost technique to manufacture glucose fuel cells as coatings for low power medical devices
Markets	Healthcare and sensor industry
Picture	 ***Front view of a glucose fuel cell prototype***  ***Cross-section of a glucose fuel cell prototype with components and dimensions***
Brief description	DINAMIC provides technology and experience in the manufacturing of electrochemically active coatings, mainly glucose fuel cells, for integration with implantable devices to harvest electrical energy from the surrounding body fluids.
Key features	• Low cost, adaptable and versatile manufacturing technique • Electrochemically active. Low power production capabilities • Biocompatible
Main characteristics	Power output: Stable in the range of units of μW cm^{-2} Coating: approximately 100 μm thick Assembly: pseudo mass production Production costs: ~ 35 € / unit
Contact	DINAMIC Biotechnology Innovation Center Building CTTi. Universitat Rovira i Virgili Avda. Paisos Catalans, 18. 43007 TARRAGONA. SPAIN **Name:** Dr. Ioanis Katakis — Dr. Pablo Lozano Sanchez **Office:** +34 977559655 — +34 977558601 **e-mail:** ioanis.katakis@urv.cat — pablo.lozano@fundacio.urv.cat **Web:** www.etseq.urv.es/dinamic

Solution	Development of implantable glucose fuel cells for low power medical implants and sensors
Markets	Healthcare
Picture	 ***Device for the rapid assembly of various biofuel cell designs A: Components. B: Assembled biofuel cell.***  ***Current density – potential and power density plots of the assembled biofuel cell.***
Brief description	IMTEK provides technology and experience in the development and characterization of implantable glucose fuel cells that harvest electrical energy from glucose and oxygen available in body fluids. The intended applications of these devices are autonomous power supply systems for low power medical implants and sensors.
Key features	• Battery independent, autonomous power supply system • Continuous power output • Biocompatible & long-term stable abiotic catalysts • Amenable to heat sterilization
Main characteristics	Operation conditions: PBS containing 0.1 % Glucose, 37 °C Maximum power output: 3.5 µW cm^{-2} at a cell voltage of 200 mV Long-term performance: > 1.5 µW cm^{-2} after > 200 days
Contact	Laboratory for MEMS Applications, Department of Microsystems Engineering (IMTEK), University of Freiburg, Georges-Koehler-Allee 106, 79110 Freiburg, Germany **Name:** Dr. Felix von Stetten; Sven Kerzenmacher: **Office:** +49-(0)761-203-7393; +49-(0)761-203-7328 **e-mail:** vstetten@imtek.de; kerzenma@imtek.de **Web:** www.imtek.de/anwendungen

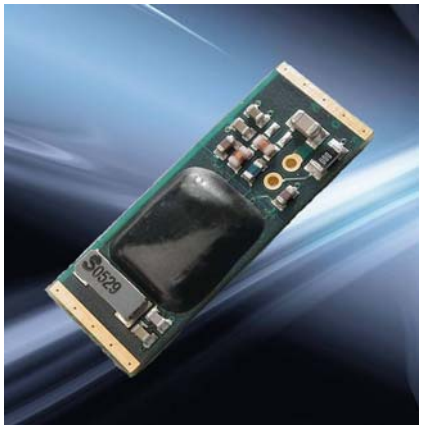
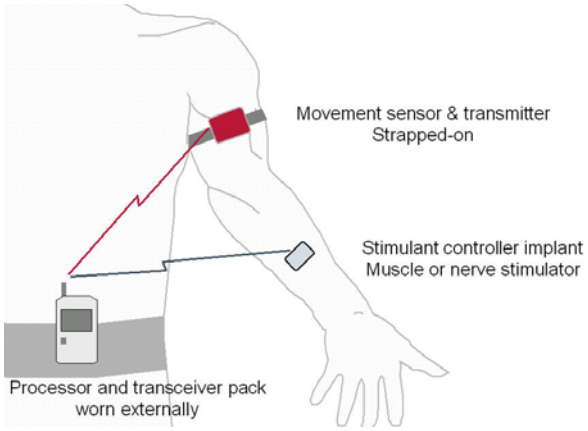
Solution	Sensor Packaging and Assembly solutions for medical products
Markets	Urology, Dialysis, Ophthalmology, Neurology, and many others
	
Brief description	Sensor packaging and interconnection solution for various applications are available. Packaging is done using 3D-CSP technology, where different components can be integrated in smallest space to result in a “System-in-a-Package”. Examples for integration are microchips with digital or analogue functions or different manufacturing technologies, RF-components, different substrate materials, SMT-components, micro-lenses, micro-sensors, micro-optics, micro-mechanics etc.
Key features	The picture above shows an example, where the sensor package has been interfaced to a flexible, polyimide based cable. The width of the package is almost the same as the interface chip, almost a real chip size package.
Main characteristics	• Sensor with 24 bit Capacitance to Digital Converter • On Chip temperature sensor • resolution 0.1°C • Two wire serial interface I^2C bus compatible
Contact	microTEC Gesellschaft für Mikrotechnologie mbH Bismarckstr. 142 b, 47057 Duisburg
Office: **Fax:** **e-mail:** **Web:**	+49 203 306 2050 +49 203 306 2069 info@microtec-d.com www.microtec-d.com

Solution	Prevention or control of cell growths on micro-electrodes
Markets	Medical devices, sensors
Picture	
Brief description	Within Healthy Aims INEX has led an activity to investigate surface modification by addition of textures (topographic features) and/or by chemical and bio-molecular functionalisation. Topographic structures can be applied to direct the growth of neurites in preferred paths, such as toward a stimulation or recording electrode. Other textures can deter infiltration of glial cells, with current activity looking to combine both texture types.
Key Features	Reduction or control of cell growth
Main characteristics	Infiltration of electrode surfaces by cells and cellular processes as well as the proliferation of cells is controlled or avoided by the modification of the surface properties of the structures using • topographic • chemical or • bio-molecular methods. They reduce and stabilize the electrical interface between electrode and tissue. Structures are investigated using advanced fluorescence imaging and electrophysiological techniques within the INEX biology and cell culture facility.
Contact	INEX - Innovation in Nanotechnology Exploitation Herschel Annex Newcastle Upon Tyne NE1 7RU, UK **Name:** Dr. Angela Silmon **Office:** +44 (0)191 222 3500 **e-mail:** enquiries@inex.org.uk / a.m.silmon@inex.org.uk **Web:** www.inex.org.uk

Solution	Microstructures and interconnect on flexible substrates
Markets	Medical devices, Microwave antennas, High density interconnect patches
Picture	 ***An array of gauges on a film***  ***A gauge on a wafer***
Brief description	INEX has a developed capability to form structures on flexible polymers, such as Kapton film. This was originally developed to form very fine pitch flexible circuits. The images are part of an array of a strain gauge structures formed in a variation of the process used in the Healthy Aims programme.
Key features	• Processing of microstructures on readily available polymer film (Kapton HN). • Sputter deposition of thin films of various metals including: titanium, nichrome, copper, gold and nickel. • Electroforming of relatively thick, fine structures in copper, nickel or gold.
Main characteristics	• Thin film and/or electroformed structures on plastic film • Structures from ~100nm thick to 25µm thick • film from 8µm thickness upwards.
Contact	INEX - Innovation in Nanotechnology Exploitation Herschel Annex Newcastle Upon Tyne NE1 7RU, UK **Name:** Tony Corless **Office:** +44 (0)191 222 3500 **e-mail:** enquiries@inex.org.uk / tony.corless@inex.org.uk **Web:** www.inex.org.uk

Solution	Biocompatible coatings for microelectronic devices
Markets	Medical diagnostic, Biosensors, Biomaterials
Picture	***Partner products coated with modified silicones***  ***Before coating***  ***Coated with modified silicone***  ***Before coating***  ***Coated with modified silicone***
Brief description	Three new different biocompatible coatings for microelectronic implantable devices were developed and optimised within Healthy Aims project. Modified materials included: • silicone rubber • polyurethane • diamond like carbon (DLC)
Key features	• New silicone composite material • Polyurethane with various modifiers • DLC/silicone laminate design for encapsulation of microelectronic devices
Main characteristics	These coatings proved to be • flexible • able to conform to the surface of irregularly shaped devices • improved impermeability to avoid ingress of biological fluids to the device • biocompatible to avoid unfavourable reactions with the body • showing good adhesion to the underlying device
Contact	IRC in Biomedical Materials, Queen Mary University of London, Mile End Road, London, E1 4NS, UK **Name:** Prof. Pankaj Vadgama **Office:** +44 207 882 5151 **e-mail:** p.vadgama@qmul.ac.uk, **Web:** www.materials.qmul.ac.uk/irc

Queen Mary University of London

Solution	Remote patient monitoring solutions
Markets	Medical: Active Implant Devices, Wearable Monitors, Diagnostics, Drug Delivery
Picture	  ***MICS Module*** ***FES Application***
Brief description	Custom designed system in a package (SIP), incorporating Zarlink's ZL70101 MICS RF transceiver chip and antenna matching circuit in a fully tested device suitable for integration in implanted medical devices and base stations.
Key features	• Meets MICS Band (Medical Implant Communications Service), FCC, ETSI and IEC requirements • Operates in the 402-405 MHz (10 MICS channels) and 433- 434 MHz (2 ISM channels) frequency bands • High data rates (800/400/200 kbps) allow for short duty cycle, • Power efficient bi-directional transmission of patient and device date • Ultra low-power consumption of less than 5 mA Tx/Rx extends implanted device battery operating life • Low-current RF wake-up receiver averages 250 nA in "sleep" mode
Applications	• Implantable medical devices, including pacemakers, ICDs (implantable cardioverter defibrillators), neurostimulators, • Implantable insulin pumps, bladder control devices, • Implantable physiological monitors • Static and wearable base stations for remote monitoring • Short-range Body Area Network applications using the 433 MHz band
Contact	General information: **martin.mchugh@zarlink.com** Advanced packaging: **http://micro.zarlink.com** MICS technology: **http://ulp.zarlink.com** ZARLINK SEMICONDUCTOR

Solution	Exploitation/Dissemination Management and Coaching
Markets	Funded R&D projects (European, national and regional)
Picture	
Brief description	All knowledge generated within a project must being managed. Actual and future growth of business must be considered. Task is to secure excellence of research with the benefit to European community, especially integrating the new countries in Europe. Dissemination and exploitation activities, IPR agreements, training are covered.
Key features	• Development of exploitation plans • Business plan approach • Accurate market estimations • Improved access to the market • Coaching
Main characteristics	• Fast transfer of R&D results into new business • Encourage entrepreneuers (particular spin offs) • Focusses on needs driven R&D
Contact	microTEC Gesellschaft für Mikrotechnologie mbH Bismarckstr. 142 b, 47057 Duisburg **Office:** +49 203 306 2050 **Fax:** +49 203 306 2069 **e-mail:** info@microtec-d.com **Web:** www.microtec-d.com

Solution	Quality Management
Markets	Funded R&D projects (European, national and regional)
Picture	
Brief description	A management system for a project must be fit-for-purpose. This involves defining the processes, procedures and templates to allow the members to work efficiently and effectively within the EC guidelines.
Key features	• Define information flow, responsibilities and communication channels • Identify data requirements for all parties • Compilation of procedures and templates ensuring standardisation across all partners • Training
Main characteristics	• Bespoke on-line information control system, tailored to individual projects • Controlled documentation in hierarchical structure • Standardisation of reporting
Contact	**www.healthyaims.org** ZARLINK SEMICONDUCTOR

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SIXTH FRAMEWORK PROGRAMME

Information Society Technologies