ETH zürich

# Support of (publicly funded) Research Projects with Industry at ETH Zurich

Dr. Stefan Lux · ETH transfer · Intellectual Property & Licenses

SWISS PHOTONICS

Workshop Public Funding Opportunities
04.12.2019 · Brugg-Windisch

# ETH Institutes and Professorships active in Photonics

## Prof. Dr. Lukas Novotny

**Adresse**
ETH Zürich

**Prof. Dr. Lukas Novotny**
Professur für Photonik
HPP → M 25.2 →
Hönggerbergring 64
8093 Zürich
Schweiz

## Esslinger, Tilman, Prof. Dr.

**Address**
ETH Zürich
Dep. of Physics →

**Prof. Dr. Tilman Esslinger**
Institut für Quantenelektronik →
HPF → D 4 →
Otto-Stern-Weg 1
8093 Zürich
Switzerland

## Wood, Vanessa, Prof. Dr.

**Address**
ETH Zürich
Dep. of Inform.Technol. Electrical Eng. →

**Prof. Dr. Vanessa Wood**
Institut für Elektronik →
RSA → G 388 →
Säumerstrasse 4
8803 Rüschlikon
Switzerland

## Keller, Ursula, Prof. Dr.

**Address**
ETH Zürich
Dep. of Physics →

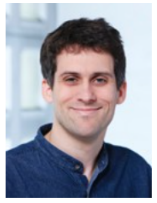
**Prof. Dr. Ursula Keller**
Institut für Quantenelektronik →
HPT → E 16.3 →
Auguste-Piccard-Hof 1
8093 Zürich
Switzerland

## Imamoglu, Atac, Prof. Dr.

**Address**
ETH Zürich
Dep. of Physics →

**Prof. Dr. Atac Imamoglu**
Institut für Quantenelektronik →
HPT → G 12 →
Auguste-Piccard-Hof 1
8093 Zürich
Switzerland

## Johnson, Steven, Prof. Dr.



**Address**
ETH Zürich
Dep. of Physics →

**Prof. Dr. Steven Johnson**
Institut für Quantenelektronik →
HPT → D 15 →
Auguste-Piccard-Hof 1
8093 Zürich
Switzerland

## Faist, Jérôme, Prof. Dr.

**Address**
ETH Zürich
Dep. of Physics →

**Prof. Dr. Jérôme Faist**
Institut für Quantenelektronik →
HPT → F 5 →
Auguste-Piccard-Hof 1
8093 Zürich
Switzerland

## Home, Jonathan, Prof. Dr.

**Address**
ETH Zürich
Dep. of Physics →

**Prof. Dr. Jonathan Home**
Institut für Quantenelektronik →
HPF → E 8 →
Otto-Stern-Weg 1
8093 Zürich
Switzerland

## Leuthold, Juerg, Prof. Dr.

**Address**
ETH Zurich
Professur Photonik u. Kommunikat.
Prof. Dr. Juerg Leuthold
Inst. of Electromagnetic Fields →
ETZ → K81 →
Gloriastrasse 35
8092 Zürich
Switzerland

## Grange, Rachel, Prof. Dr.

**Address**
ETH Zürich
Dep. of Physics →

**Prof. Dr. Rachel Grange**
Institut für Quantenelektronik
HPT → H 2 →
Auguste-Piccard-Hof 1
8093 Zürich
Switzerland

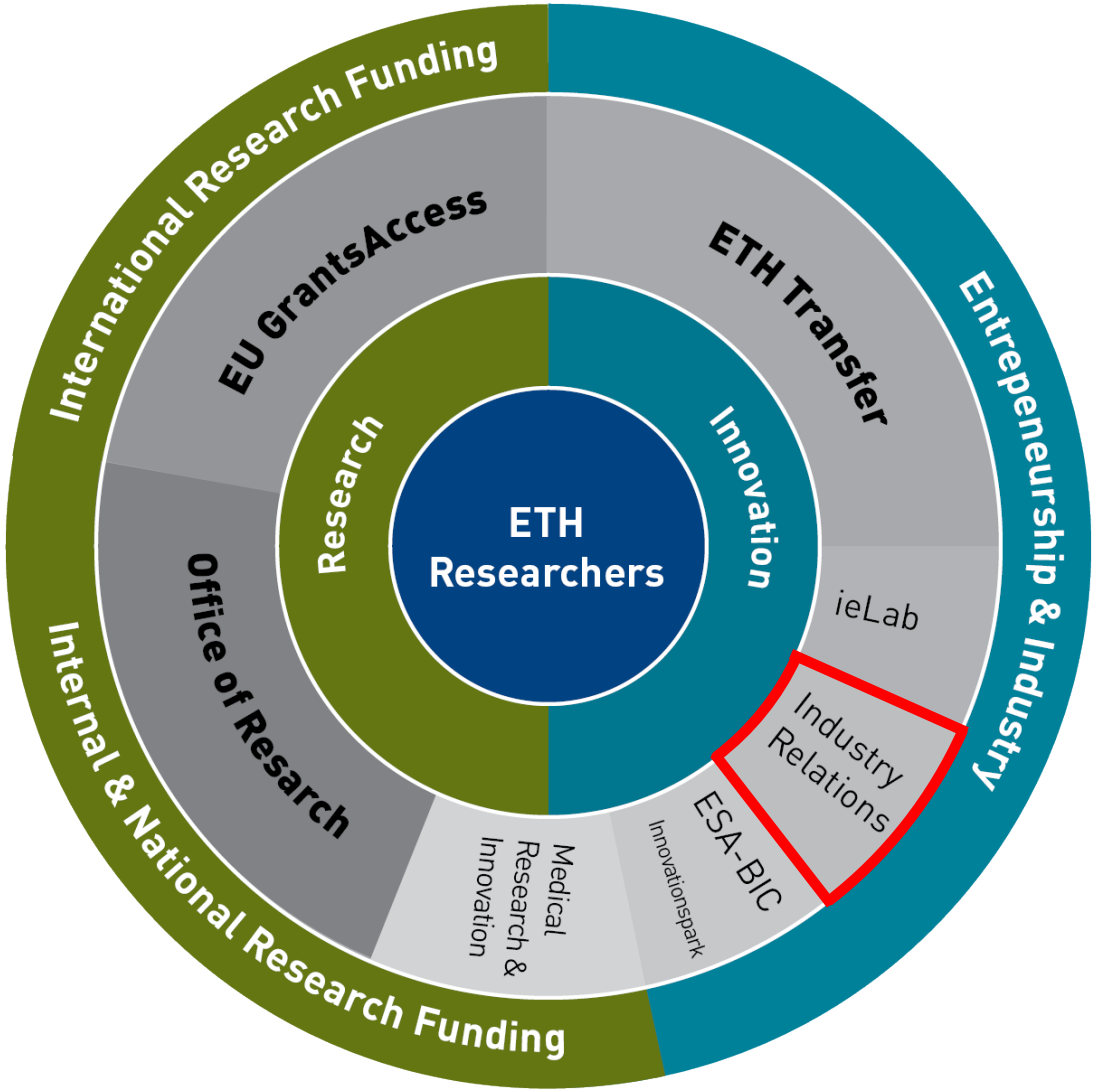
## Smajic, Jasmin, Dr.

**Address**
HSR - Hochschule Rapperswil

**Dr. Jasmin Smajic**
Institut für Energietechnik
Oberseestrasse 10
8640 Rapperswil SG
Switzerland

... and many more ...

# Staff units under the Vive President for Research and Corporate Relations



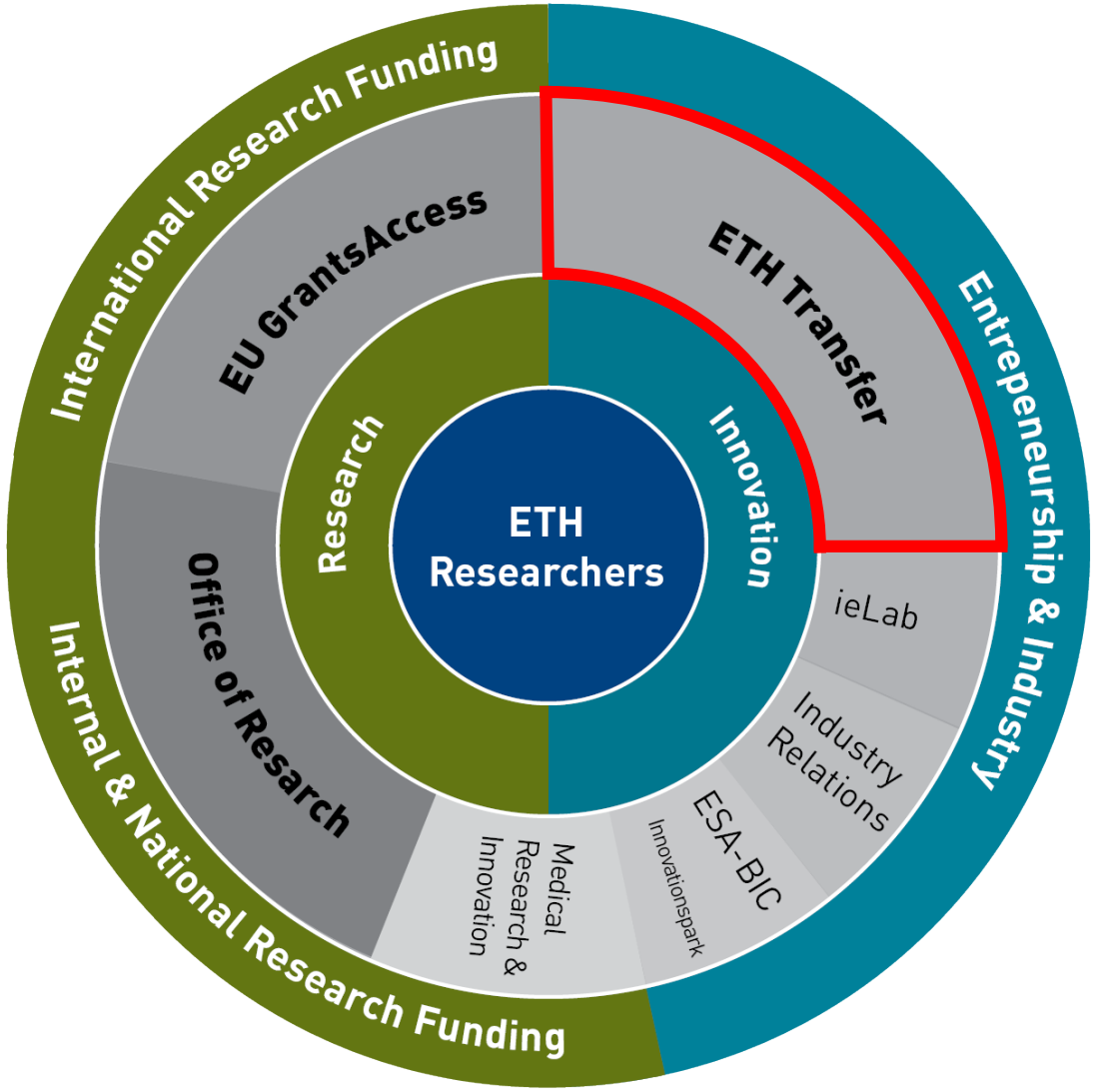
# ETH Industry Relations / ETH Industry Day

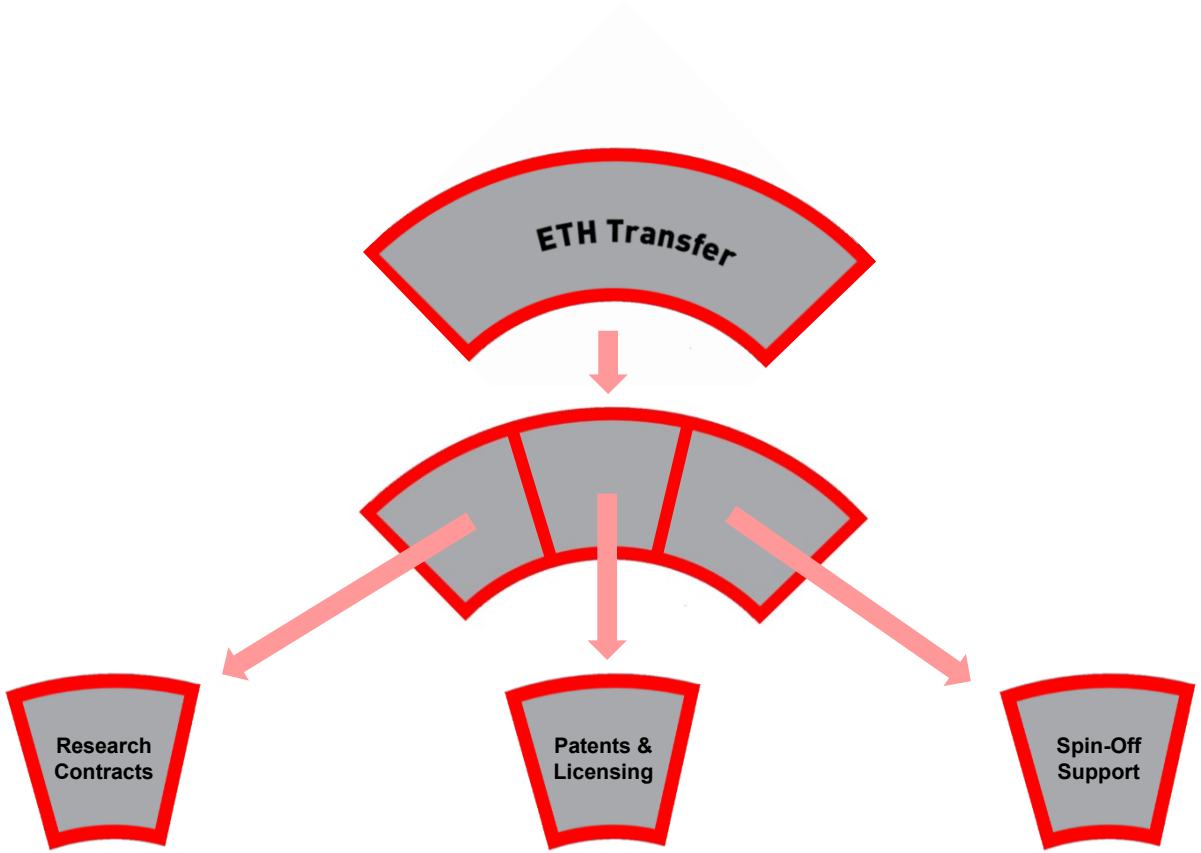
Services of ETH Industry Relations:

- Entry point for industry inquiries (more than 300 inquiries each year)
- Finding research partners, relationship building between industry and ETH
- Organization of company visits, lab tours and events

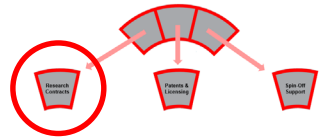

- More than 500 participants
- Thematic sessions, speed presentations from ETH professors and spin-offs
- Exhibition of research groups and spin-offs

# Staff units under the Vive President for Research and Corporate Relations



# Group for Research Collaboration – team and tasks



**Group for Research Collaboration**

**Dr. Andreas Klöti**
Head Research Agreements
MATL, CHAB

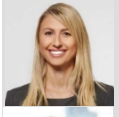
**Christoph Neubauer, RA**
Deputy Head Res. Agreements
Legal Counsel ETH transfer
GESS, ITET, MATH, MAVT, MTEC; CSCS

**Dr. Alexa Mundy**
BIOL, HEST

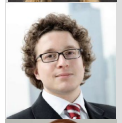
**Mira Krämer, RA**
Legal Counsel ETH transfer
BAUG, INFK, ITET, ScopeM

**Hannah Jacob, RA**
Legal Counsel ETH transfer
MAVT, PHYS, BSSE

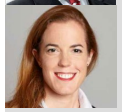
**Alexander Kummer, lic. iur.**
Legal Counsel ETH transfer
ARCH, CHAB, ITET, USYS



**Aleksandra Góes, lic. iur.**
Legal Counsel ETH transfer
BAUG, INFK, MAVT, ScopeM



**Maxim Eifinger, RA**
Legal Counsel ETH transfer



**Isabella Longoni, RA**
Legal Counsel ETH transfer

Support of ETH Researchers in doing research with third parties, by

Drafting, reviewing and negotiating

- Research Project Agreements
- Agreements for Scientific Services
- Agreements on Research Grants (excl. EU, US public, SNF)
- Framework Agreements
- NDAs, MTAs
- Agreements involving internal or external student projects
- Agreements involving guests at ETH Zurich

Advising ETH Researchers in all aspects of collaborating and interacting with third parties

**Regulated by:**

**Guidelines concerning Contracts in the Field of Research at ETH Zurich**

# IP Protection and Licensing Group – Team and Tasks

**IP & Licenses**

**Dr. Silke Meyns**
Head Patents & Licenses
D-CHAB (not pharma), D-ERDW, D-HEST (food sciences)

**Dr. Stefan Lux**
D-ARCH, D-BAUG, D-MAVT

**Emanuel Weber**
D-MATL, D-MTEC, D-PHYS, D-GESS, Software Licenses

**Dr. René Widmer**
D-INFK, D-ITET, D-MATH, D-HEST (no food sciences)

**Dr. Melanie Johnson**
Technology Marketing, Communication
Spark Award / Venture

**Dr. Christoph Fik**
D-CHAB (not pharma)

**Dr. Andrea Haag**
D-BIOL, D-BSSE, D-CHAB (only pharma), D-USYS, MTAs

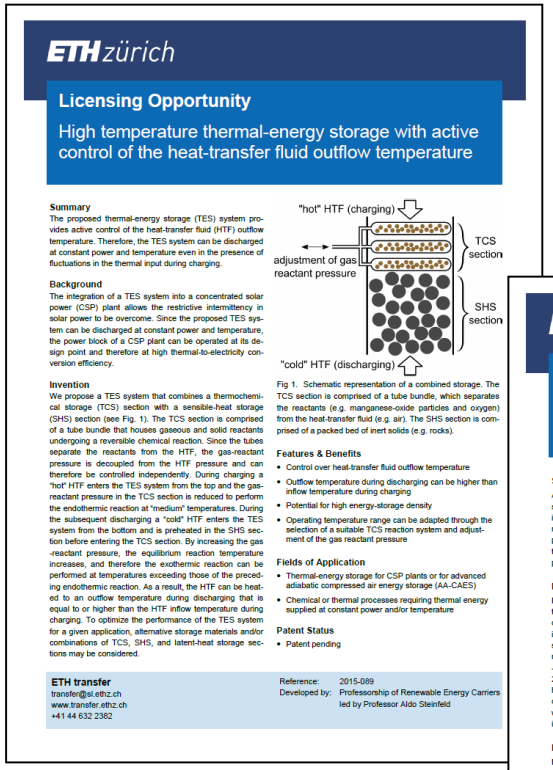
Support of ETH Researchers in protecting and valorizing IP:

- Evaluation of ETH inventions
- Counseling regarding patentability
- Support with application for protection of IP (incl. funding) and associated strategy
- Presentations and Fact Sheets
- Licensing Opportunities & Tech Alerts
- Identifying industry partners
- Licensing and sale OF ETH technologies / IP
- Controlling und distributing revenues

Regulated by:
Guidelines for the Financial Exploitation of Research Results at ETH Zurich

**SPARK – Award for the most promising Invention of the Year!**

# IP Protection and Licensing Group – Technology Information



ETH zürich

**Licensing Opportunity**

High temperature thermal-energy storage with active control of the heat-transfer fluid outflow temperature

**Summary**

The proposed thermal-energy storage (TES) system provides active control of the heat-transfer fluid (HTF) outflow temperature. Therefore, the TES system can be discharged at constant power and temperature even in the presence of fluctuations in the thermal input during charging.

**Background**

The integration of a TES system into a concentrated solar power (CSP) plant allows the restrictive intermittency in solar power to be overcome. Since the proposed TES system can be discharged at constant power and temperature, the power block of a CSP plant can be operated at its design point and therefore at high thermal-to-electricity conversion efficiency.

**Invention**

We propose a TES system that combines a thermochemical storage (TCS) section with a sensible-heat storage (SHS) section (see Fig. 1). The TCS section is comprised of a tube bundle that houses gaseous and solid reactants undergoing a reversible chemical reaction. Since the tubes separate the reactants from the HTF, the gas-reactant pressure is decoupled from the HTF pressure and can therefore be controlled independently. During charging a "hot" HTF enters the TES system from the top and the gas-reactant pressure in the TCS section is reduced to perform the endothermic reaction at "medium" temperatures. During the subsequent discharging a "cold" HTF enters the TES system from the bottom and is preheated in the SHS section before entering the TCS section. By increasing the gas-reactant pressure, the equilibrium reaction temperature increases, and therefore the exothermic reaction can be performed at temperatures exceeding those of the preceding endothermic reaction. As a result, the HTF can be heated to an outflow temperature during discharging that is equal to or higher than the HTF inflow temperature during charging. To optimize the performance of the TES system for a given application, alternative storage materials and/or combinations of TCS, SHS, and latent-heat storage sections may be considered.




Fig 1. Schematic representation of a combined storage. The TCS section is comprised of a tube bundle, which separates the reactants (e.g. manganese-oxide particles and oxygen) from the heat-transfer fluid (e.g. air). The SHS section is comprised of a packed bed of inert solids (e.g. rocks).

**Features & Benefits**

- Control over heat-transfer fluid outflow temperature
- Outflow temperature during discharging can be higher than inflow temperature during charging
- Potential for high energy-storage density
- Operating temperature range can be adapted through the selection of a suitable TCS reaction system and adjustment of the gas reactant pressure

**Fields of Application**

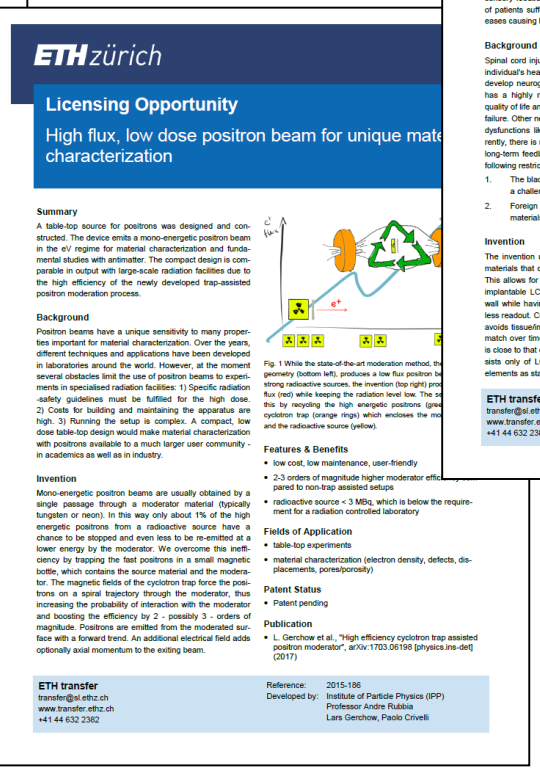
- Thermal-energy storage for CSP plants or for advanced adiabatic compressed air energy storage (AA-CAES)
- Chemical or thermal processes requiring thermal energy supplied at constant power and/or temperature

**Patent Status**

- Patent pending

**ETH transfer**
transfer@sl.ethz.ch
www.transfer.ethz.ch
+41 44 632 2382

Reference: 2015-089
Developed by: Professorship of Renewable Energy Carriers led by Professor Aldo Steinfeld



ETH zürich

**Licensing Opportunity**

High flux, low dose positron beam for unique mate characterization

**Summary**

A table-top source for positrons was designed and constructed. The device emits a mono-energetic positron beam in the eV regime for material characterization and fundamental studies with antimatter. The compact design is comparable in output with large-scale radiation facilities due to the high efficiency of the newly developed trap-assisted positron moderation process.

**Background**

Positron beams have a unique sensitivity to many properties important for material characterization. Over the years, different techniques and applications have been developed in laboratories around the world. However, at the moment several obstacles limit the use of positron beams to experiments in specialised radiation facilities: 1) Specific radiation -safety guidelines must be fulfilled for the high dose. 2) Costs for building and maintaining the apparatus are high. 3) Running the setup is complex. A compact, low dose table-top design would make material characterization with positrons available to a much larger user community - in academics as well as in industry.

**Invention**

Mono-energetic positron beams are usually obtained by a single passage through a moderator material (typically tungsten or neon). In this way only about 1% of the high energetic positrons from a radioactive source have a chance to be stopped and even less to be re-emitted at a lower energy by the moderator. We overcome this inefficiency by trapping the fast positrons in a small magnetic bottle, which contains the source material and the moderator. The magnetic fields of the cyclotron trap force the positrons on a spiral trajectory through the moderator, thus increasing the probability of interaction with the moderator and boosting the efficiency by 2 - possibly 3 - orders of magnitude. Positrons are emitted from the moderated surface with a forward trend. An additional electrical field adds optionally axial momentum to the exiting beam.




Fig. 1 While the state-of-the-art moderation method, the geometry (bottom left), produces a low flux positron be strong radioactive sources, the invention (top right) pro flux (red) while keeping the radiation level low. The se this by recycling the high energetic positrons (gree cyclotron trap (orange rings) which encloses the mo and the radioactive source (yellow).

**Features & Benefits**

- low cost, low maintenance, user-friendly
- 2-3 orders of magnitude higher moderator effic pared to non-trap assisted setups
- radioactive source < 3 MBq, which is below the requirement for a radiation controlled laboratory

**Fields of Application**

- table-top experiments
- material characterization (electron density, defects, displacements, pores/porosity)

**Patent Status**

- Patent pending

**Publication**

- L. Gerchow et al., "High efficiency cyclotron trap assisted positron moderator", arXiv:1703.06198 [physics.ins-det] (2017)

**ETH transfer**
transfer@sl.ethz.ch
www.transfer.ethz.ch
+41 44 632 2382

Reference: 2015-186
Developed by: Institute of Particle Physics (IPP)
Professor Andre Rubbia
Lars Gerchow, Paolo Crivelli

ETH zürich

**Licensing Opportunity**

Stretchable electronics based wireless and passive bladder sensor

**Summary**

The present invention involves implantable wireless sensors for measuring bladder extension/volume properties read out by an inductively coupled readout circuit placed outside the body. The invention demonstrates a minimal invasive approach for passive chronic implants providing sensory feedback with a direct impact on the quality of life of patients suffering from spinal cord injury and other diseases causing bladder dysfunction.

**Background**

Spinal cord injury have far-reaching consequences for the individual's health and social life. Most of these patients will develop neurogenic lower urinary tract dysfunction, which has a highly negative impact on patients' health-related quality of life and may progressively lead to end stage renal failure. Other neurological diseases can also cause bladder dysfunctions like incontinence and urinary retention. Currently, there is no existing solution for providing continuous long-term feedback of the bladder state mainly due to the following restrictions:

1. The bladder wall can stretch above 100%, making it a challenging environment for implants.
2. Foreign body reaction: most sensing principles and materials are not applicable for chronic use.

**Invention**

The invention uses recent advances in soft & stretchable materials that combine high stretchability and conductivity. This allows for designing sensors or sensor elements of a implantable LCR circuit that can stretch with the bladder wall while having a high quality factor necessary for wireless readout. Compared to other solutions, the soft material avoids tissue/implant damage induced by mechanical mismatch over time since the Young's modulus of the implant is close to that of the tissue. Most important, the circuit consists only of LCR elements without any additional circuit elements as standard RFID tags have.



Fig. 1: The sensor is implanted on the bladder and str along with the bladder surface. Stretching the sensor in a measurable change of its electrical properties.

**Features & Benefits**

- Implantable passive and wireless bladder sensor, ma Young's modulus of the implant and the bladder.
- Made out of materials fully embedded in medical gra silicone rubber for chronic use.
- Passive readout from outside of the body using an IS band excitation frequency, avoiding regulation issues
- Long-term and continuous bladder properties feedba

**Fields of Application**

- Monitoring of the bladder volume and extension prop of patients suffering from lower urinary tract dysfunct
- Monitoring of strains in various (biological) environme

**Patent Status**

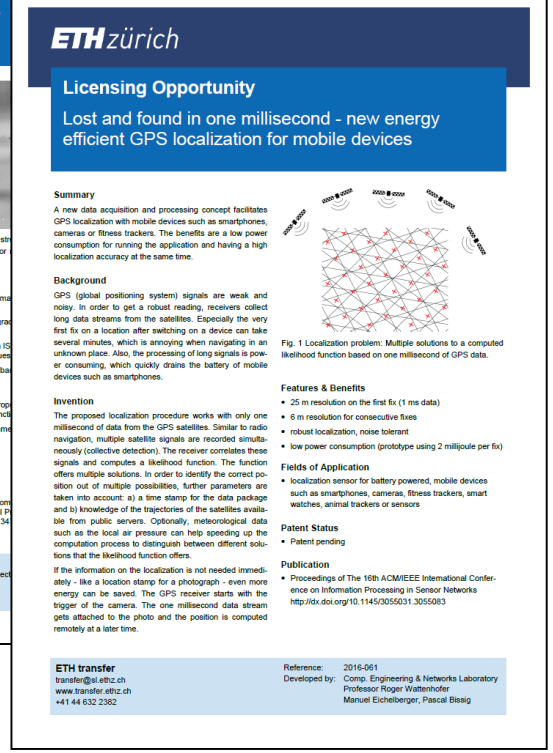
- Patent pending

**Publications**

- Martinez et al., "Stretchable Silver Nanowire-Elastom Composite Microelectrodes with Tailored Electrical P ties", *ACS Appl. Mater. Interfaces*, 7(24), 13467–134 2015

**ETH transfer**
transfer@sl.ethz.ch
www.transfer.ethz.ch
+41 44 632 2382

Reference: 2016-054
Developed by: Laboratory of Biosensors and Bioelect Professor Janos Vörös



ETH zürich

**Licensing Opportunity**

Lost and found in one millisecond - new energy efficient GPS localization for mobile devices

**Summary**

A new data acquisition and processing concept facilitates GPS localization with mobile devices such as smartphones, cameras or fitness trackers. The benefits are a low power consumption for running the application and having a high localization accuracy at the same time.

**Background**

GPS (global positioning system) signals are weak and noisy. In order to get a robust reading, receivers collect long data streams from the satellites. Especially the very first fix on a location after switching on a device can take several minutes, which is annoying when navigating in an unknown place. Also, the processing of long signals is power consuming, which quickly drains the battery of mobile devices such as smartphones.

**Invention**

The proposed localization procedure works with only one millisecond of data from the GPS satellites. Similar to radio navigation, multiple satellite signals are recorded simultaneously (collective detection). The receiver correlates these signals and computes a likelihood function. The function offers multiple solutions. In order to identify the correct position out of multiple possibilities, further parameters are taken into account: a) a time stamp for the data package and b) knowledge of the trajectories of the satellites available from public servers. Optionally, meteorological data such as the local air pressure can help speeding up the computation process to distinguish between different solutions that the likelihood function offers.

If the information on the localization is not needed immediately - like a location stamp for a photograph - even more energy can be saved. The GPS receiver starts with the trigger of the camera. The one millisecond data stream gets attached to the photo and the position is computed remotely at a later time.



Fig. 1 Localization problem: Multiple solutions to a computed likelihood function based on one millisecond of GPS data.

**Features & Benefits**

- 25 m resolution on the first fix (1 ms data)
- 6 m resolution for consecutive fixes
- robust localization, noise tolerant
- low power consumption (prototype using 2 millijoule per fix)

**Fields of Application**

- localization sensor for battery powered, mobile devices such as smartphones, cameras, fitness trackers, smart watches, animal trackers or sensors

**Patent Status**

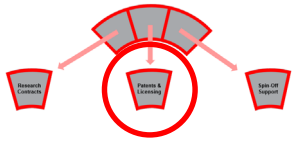
- Patent pending

**Publication**

- Proceedings of The 16th ACM/IEEE International Conference on Information Processing in Sensor Networks http://dx.doi.org/10.1145/3055031.3055083

**ETH transfer**
transfer@sl.ethz.ch
www.transfer.ethz.ch
+41 44 632 2382

Reference: 2016-061
Developed by: Comp. Engineering & Networks Laboratory
Professor Roger Wattenhofer
Manuel Eichelberger, Pascal Bissig




⇨ "Technology Alert"

# Thank you for your interest ! Questions?