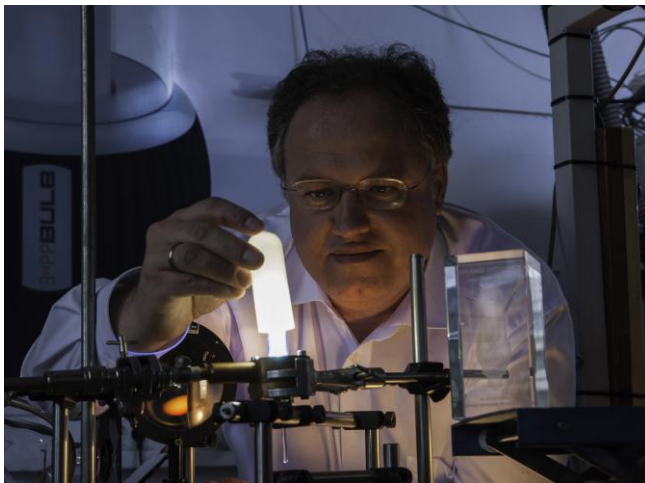


KIT at the 2013 Hannover Trade Fair

Mercury-free Energy-saving Lamp – Storage System for Power from Regenerative Sources – Superconductors in Energy Technology – Protection of Reinforced Concrete Constructions – Pocket Radar



The energy-saving lamp made by KIT, here with its inventor, Dr. Rainer Kling, is free of mercury. (Photo: Martin Lober, KIT)

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Innovations for the future energy system, for sustainable construction, and for coping with other future challenges will be presented by Karlsruhe Institute of Technology (KIT) at the Hannover Messe from April 8 to 12, 2013. At its main stand, KIT will present an energy-saving lamp without any mercury as well as a system that stores and distributes electricity from renewable sources, while power variations are balanced. In addition, material innovations and protection concepts to extend the service life of constructions and a highly integrated radar with all high-frequency components being accommodated in one housing will be exhibited. KIT will also be involved in other stands and exhibitions, such as “SuperConductingCity”.

**KIT Main Stand, Hall 2, Stand C18 –
Leading Trade Fair “Research & Technology“**

Mercury-free energy-saving lamp. The “3rdPPBulb“ is a novel energy-saving lamp developed by researchers of KIT and Aachen University of Applied Sciences. The bulb works completely without

the highly toxic heavy metal mercury. The electrode-free lamp reaches a high efficiency and favorable CO₂ balance. It can be produced at low cost and offers many advantages for the user, such as a high luminous density, agreeable luminous color, dimmability, shorter start-up phase, and extremely long service life. The novel energy-saving lamp is not larger than a classical bulb and can be used for many purposes. Presently, the “3rdPPBulb” produces a light flux of about 85 lumen at a power consumption of 17 watts. This corresponds to an effective light yield of about 50 lumen/watt and, hence, to the performance of a conventional 75-watt bulb. While KIT researchers have developed the mercury-free filling, luminescent coating, internal coating, and the geometry of the “3rdPPBulb”, researchers from Aachen designed the ballast. The plasma bulbs are operated physically via an ISM (industrial, scientific, and medical) band voltage transformer.

The video on the “mercury-free energy-saving lamp” can be found on the KIT Youtube channel at <http://www.youtube.com/watch?v=BqRFh2sw9AA&feature=youtu.be>

Storage system for power from regenerative sources. Transformation of the energy system focuses on an enhanced use of renewable energy sources. However, power generation by wind generators and photovoltaics systems varies as a function of time and weather, as does consumption. By means of energy storage systems, generation and consumption of power can be synchronized. For this purpose, advanced storage technologies based on lithium-ion batteries and smart energy flow management solutions are required. Researchers of KIT and the Siemens Industry Sector have developed an energy storage system that stores and distributes power from renewable sources, thus balancing variations of power supply. The individual components, such as batteries and power generation units, are connected by an indirect direct current (DC) converter. While the energy management system with lithium-ion batteries was developed by the **Competence E** project of KIT, the DC/DC converters and the real-time-capable “local grid controller” (LGC) for safety-relevant control functions in the system were made by Siemens Industry.

Protection of Reinforced Concrete Constructions. Sustainable construction means permanent and stable construction. In line with this principle, **IONYS AG**, a spinoff of KIT, is now commercializing fundamental research findings obtained by KIT in cooperation with Karlsruhe University of Applied Sciences. IONYS AG develops inno-

vative materials as well as prevention concepts to considerably extend the service life of technical constructions and, thus, to significantly reduce the lifecycle costs. Among these constructions are classical transport routes as well as water supply and wastewater disposal facilities. An example of the innovative products of IONYS AG is a gel to hydrophobize surfaces of mineral materials, e.g. reinforced concrete, for protection purposes. IONYS AG has already been granted several prizes, among others, the bwcon CyberOne Hightech Award, a prize by the Deutsche Börse AG, the Baden-Württemberg State Award for Young Enterprises, and the STEP Award of the F.A.Z. Institute.

Pocket Radar. The EU-funded project **SUCCESS** (Silicon-based Ultra Compact Cost-efficient System Design for mmWave Sensors) yielded a highly integrated radar frontend, with all high-frequency components being accommodated in a single housing. Users can solder the chip onto their standard circuit board. Complex connection technology for high-frequency signals is no longer required. The sensor transmits and receives electromagnetic waves of 122 GHz in frequency. From the runtime of the waves, the distance to an object is calculated with an accuracy of up to less than 1 mm. In addition, the velocity of the respective object can be measured via the Doppler effect. The sensor measures only 8 x 8 mm², but contains all high-frequency components necessary, inclusive of antennas. Compact technology allows for low-cost manufacture and a number of new applications. Besides vehicle environment detection and control of industrial robots, extremely flat motion sensors that can be hidden behind the wallpaper or drilling machines switching off automatically once the desired drilling depth is reached are feasible. The chip was developed by KIT in cooperation with the IHP Leibniz Innovations for High Performance Microelectronics, STMicroelectronics, Silicon Radar GmbH, the University of Toronto, Evatronix, Hightec MC AG, SELMIC, and Robert Bosch GmbH.

Other contributions of KIT to the 2013 Hannover Trade Fair

SuperConductingCity (hall 13, stand C39). The joint SuperConductingCity stand has turned into the most important presentation stand of the superconductor sector worldwide. Here, KIT, together with its partners RWE and Nexans, will present the AmpaCity project for installation of the longest superconducting cable worldwide in the ground below the city center of Essen. This project is an example of innovative developments and applications of high-temperature superconductors in energy technology made by KIT. High-temperature

superconductivity ensures energy transmission with hardly any losses, increases energy efficiency, facilitates grid structures, and allows for the integration of decentralized and regenerative energy sources in the grid. High-temperature superconductors can be used for economically efficient and environmentally compatible new applications in the energy sector. In cooperation with industry partners, KIT scientists develop superconducting cables, current limiters, and transformers.

Energy Solution Center (hall 25, stand H12). At the stand of the state of Baden-Württemberg, the Energy Solution Center (EnSoC) will present itself. Operated by KIT and other industry partners, EnSoC pools the competences of science and industry. It works on enhancing the use of high-performance computers in application-oriented energy research and in the energy sector. EnSoC pursues projects in the fields of energy management and energy technology, such as electric mobility.

iZeus (hall 25, stand H13). At the OGEMA stand of the Federal Government, KIT will present its joint project “iZEUS - intelligent Zero Emission Urban System“. Partners from research and industry are cooperating under iZEUS to enhance electric mobility with the help of latest innovation technologies. For this purpose, KIT’s “Energy Smart Home Lab” is further developed, a smart household, in which an electric vehicle is integrated as a mobile power storage system. Moreover, KIT researchers develop an integrated platform for electric mobility services, such as energy-efficient navigation or planning of multi-modal routes.

Bionics – Solutions Based on Nature as a Model (hall 2, stand D12). The BIONICS platform of KIT will present innovative nature-derived methods for the development and improvement of materials and components. To improve technical constructions, scientists study the design of biological structures and transfer it to engineering. With the help of computer programs based on biological growth principles and simple graphical methods, the weight of technical components can be reduced and their service life can be increased.

Karlsruhe Institute of Technology (KIT) is a public corporation according to the legislation of the state of Baden-Württemberg. It fulfills the mission of a university and the mission of a national research center of the Helmholtz Association. KIT focus-

es on a knowledge triangle that links the tasks of research, teaching, and innovation.

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