

Bicycle helmet for epileptics: winning team from the University of Freiburg triumphs at COSIMA 2025

A smart bicycle helmet that detects epileptic seizures took first place in this year's COSIMA competition. With their development, the students at the University of Freiburg want to give those affected a piece of freedom and security back in their everyday lives. COSIMA – "Competition of Students in Microsystems Applications" – is organized by the Association for Electrical, Electronic & Information Technologies (VDE) as a project sponsored by the Federal Ministry of Education and Research (BMBF).

(Frankfurt am Main, November 6, 2025) Microsystems can be used to achieve amazing things. This is demonstrated every year by the participants in the VDE's COSIMA student competition. The final took place from October 27 to 29 as part of the MicroSystemTechnology Congress in Duisburg. Eight teams competed against each other. Thematic guidelines? None. What counts is the combination of technology and practicality. "The prototype must work and make microsystem technology usable in everyday life," explains Dr. Ronald Schnabel, Managing Director of the VDE/VDI Society for Microelectronics, Microsystems and Precision Engineering (VDE VDI GMM). "In addition, it is the students' task to develop a marketing concept and find supporters to finance the project." The sponsors of the competition include Bosch, Infineon, and Faulhaber.

For an independent life

First place went to the team from the University of Freiburg. "With the EPIONE project, we have developed an intelligent bicycle helmet. An integrated system warns the rider of epileptic seizures," explains team member Levi Kloos. "We want to help those affected to be safer on the road again and thus live a self-determined life." The built-in dry EEG system is comfortable and stable to wear. The electronics for data transmission are installed at the back of the head and consist of a microprocessor, Bluetooth module, and battery. The outer shell protects against

falls and conceals the technology. Via a Bluetooth connection, a smartphone app analyzes the EEG data using machine learning. This allows epileptic seizures to be detected at an early stage, and users are warned via LEDs and a loudspeaker. "We are still in our master's program, but we want to develop the project to market maturity," promises Levi Kloos. His team received prize money of €2,000 for first place.

Fighting headaches

Second place went to the team from the University of Hamburg with their project ChillPod: Coolness for Headaches. "Our portable, rechargeable cooling device provides targeted relief for headaches and migraines," explains team spokesperson Zuhra Sadriddin. The system uses compact thermoelectric Peltier modules with integrated sensors that continuously monitor and regulate the temperature. Two connected cooling pads are placed on the head or neck, while the temperature and treatment duration can be conveniently adjusted individually via a Bluetooth app. Thanks to passive cooling technologies with optimized heat pads and graphite layers, ChillPod works quietly and comfortably – without any annoying fans. The idea came from one of the students with a background in pharmaceuticals; the team plans to develop a miniaturized version in the future. The group received prize money of €1,500 for this innovative project.

Microsystem technology in the pasture

"While hiking in the Alps, we were surprised at how loud and large some cowbells are," says team spokesperson Fabian Galka from the Baden-Württemberg Cooperative State University (DHBW) in Stuttgart. They also weigh a lot, which the animals have to carry around with them. So how can farmers monitor their herds in a cost-effective and uncomplicated way – even in remote locations with no or poor mobile phone coverage? This is how the FarmLink project came about. "This is made possible by a robust LoRa mesh network that transmits data over long distances without mobile communications or expensive infrastructure," explains Fabian Galka. To do this, farmers equip each animal with its own tracker. This allows them to locate their livestock in real time, evaluate grazing patterns, and receive early warnings of stress, disease, or even theft. The team took third place for this smart solution and was delighted to receive €1,000 in funding. "Now we want to find farmers who will use our technology. This will allow us to put our project through realistic tests," says the team spokesperson. "We also want to apply for a start-up grant, with the possibility of further funding."

About the VDE/VDI-Society Microelectronics, Microsystems and Precision Engineering (VDE VDI GMM):

The VDE/VDI Society Microelectronics, Microsystems and Precision Engineering (VDE VDI GMM) is the comprehensive platform in microelectronic application areas. It is jointly supported by the VDE and VDI, and promotes the valuable transfer of interdisciplinary knowledge. Its spectrum ranges from basic technologies in the production of microelectronics and microsystem technology right through to mechatronics and fields of electromagnetic compatibility. The GMM stands for cooperation and international networking to foster innovation. It works with interdisciplinary research institutes, companies and universities at every stage, from basic research to applications, and offers its members all the advantages of being part of a progressive expert community. Thanks to its expertise, the GMM has an influence on technical standards and is involved in national and European research programs. Other important goals for the GMM include promoting young scientists as well as training and further education. The COSIMA competition (Competition of Students in Microsystems Applications), which is funded by the Federal Ministry of Education and Research, is essential in achieving this.

For more information, visit www.vde.com/gmm

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The VDE (VDE Association for Electrical, Electronic & Information Technologies) is headquartered in Frankfurt am Main. For more information, visit www.vde.com

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