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Small but mighty! New ultra-low power microdisplays from Fraunhofer FEP wins Product of the Year 2023 award!

The electronics industry is one of the most innovative. That is why the readers of the journal *Elektronik* and the online platform *elektroniknet.de* had no less than 111 innovative products to choose from, from which they could select the finalists in ten categories as their favorites. The researchers at Fraunhofer FEP were pleased to be among the finalists. In the category "Optoelectronics and Displays", the new ultra-low power OLED microdisplay entered the race and won first place.

Developments in the field of OLED microdisplays are progressing rapidly.

Tiny display elements such as microdisplays are key components in wearables used as daily little assistants in leisure and sports, but also for professional environments. They can display vital data or navigation instructions to the user, or even show warnings in warehouse logistics, e.g. integrated in helmets. But also full-color displays with a diagonal of up to one inch and resolutions of extended full-HD for virtual reality applications have been realized.

Years ago, Fraunhofer FEP scientists realized that such integrated microdisplays are most useful when they consume extremely little power in the overall system to ensure the longest possible battery life for the entire device. This is how the first generations of ultra-low power microdisplays were developed, with a special backplane architecture that allowed the researchers to significantly minimize power consumption to just a few milliwatts.

The existing "ultra-low-power microdisplay platform" of Fraunhofer FEP only featured monochrome displays. This is sufficient for simple information displays in wearables or data glasses, however not for many other areas of application. Especially the distinguishability of the signal colors red and green is of particular importance here.

In order to make their use even more attractive, new variants have been developed. Among other things, bicolor or warm white versions and new brightness levels from 5,000 - 35,000 nits are now available in addition to a monochrome version. These OLED microdisplays can now display significantly brighter navigation instructions in



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systems such as helmets during firefighting missions and still manage without charging breaks. The multicolor version with two primary colors in QVGA resolution (320 × 240 pixels) can address applications well beyond mere displays.

Another 720p version of a full-color display, also designed to be very low-power consumption, is predestined for integration in augmented reality (AR) applications.

The readers of *Elektronik* and *elektroniknet.de* have now voted these new microdisplays, which are also available as evaluation kits, the winner in the category "Optoelectronics and Displays".

The new architecture of ultra-low power microdisplays opens up many new applications wherever simple, space-saving and ergonomic systems are required.

Stephan Brenner, IC designer at Fraunhofer FEP, explains: "In addition, we were able to design the color subpixels of the new displays to be only half the size of those of the monochrome version, while maintaining the same optical properties and higher circuit density, i. e. also higher data rates".

He received the award from *elektroniknet.de* and *ELEKTRONIK* on behalf of all IC designers, technologists and researchers in the field of microdisplays and sensors. "We are very happy about this award! It shows that our research, always close to the application for innovative products of tomorrow, is of great interest by the readers. It also motivates all our colleagues, who have been working on such projects with great enthusiasm for years, to develop new solutions together with even more imagination, patience and energy."

From the large number of new launches, the editors of *Elektronik* had made a pre-selection of already 111 innovative products. These were put to the vote in ten categories: automotive, electromechanics and passive components, embedded hardware, semiconductors and IP, industrial IoT, communication, medical electronics, optoelectronics and displays, power and software.

Fraunhofer FEP would like to thank the readers and the editors for nominating and voting for the winner. Fraunhofer FEP will continue to offer the research and development of microdisplays and the transfer to industry from a single source: starting with application-specific, highly integrated CMOS circuitry, through OLED integration to the package and system integration. If there is no suitable microdisplay in the portfolio for new applications or according to special requirements, the institute's researchers will be happy to continue to be available for customer- and project-specific developments in the future.

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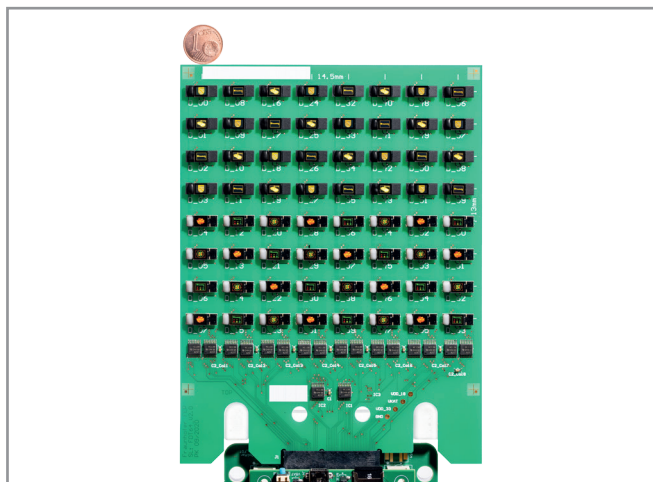
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Stephan Brenner from Fraunhofer FEP during the award ceremony for the “Product of the Year” in the category “Optoelectronics and Displays”

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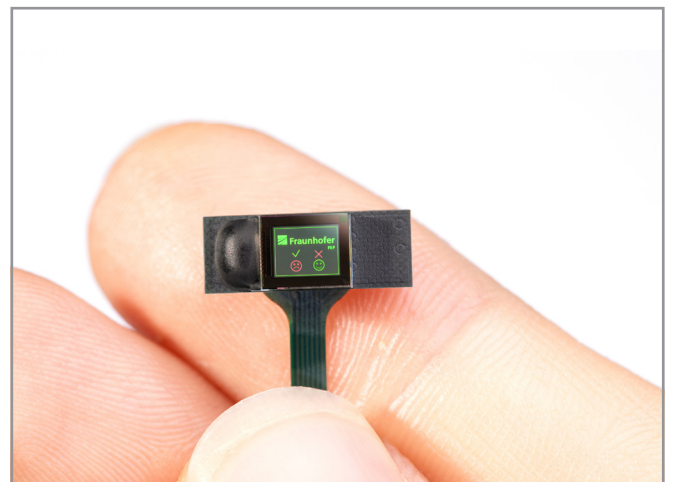
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Test board with monochrome and multicolor OLED microdisplays in low-power design

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New ultra-bright and ultra-low-power microdisplay

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The **Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP** works on innovative solutions in the fields of vacuum coating, surface treatment as well as organic semiconductors. The core competencies electron beam technologies, roll-to-roll technology, plasma-activated large-area and precision coating as well as technologies for organic electronics and IC design provide a basis for these activities. Thus, Fraunhofer FEP offers a wide range of possibilities for research, development and pilot production, especially for the processing, sterilization, structuring and refining of surfaces as well as OLED microdisplays, organic and inorganic sensors as well as optical filters. Our aim is to seize the innovation potential of the electron beam, plasma technology and organic electronics for new production processes and devices and to make it available for our customers.