

# Press Release

June 2012

The Fraunhofer Institute for Photonic Microsystems IPMS and its 200 employees turn over an annual research volume of 20 million euros. Fraunhofer IPMS generates more than two thirds of this production capacity out of commissions from industry and publicly financed projects in applied research. The focus of our development and production services lies in the practical industrial application of unique technological know-how in the fields of (optical) micro-electromechanical systems [MEMS, MOEMS]. Fraunhofer IPMS uses scientific know-how, application experience and customer contacts as well as modern equipment and clean room infrastructure. Fraunhofer IPMS covers a broad spectrum of industrial applications. Our services range from initial conception to product development, right down to serial pilot production – from a single component to a complete system solution.

## New MEMS mirror makes linear scanning possible

Fraunhofer IPMS is providing MEMS scanning mirrors that can deflect light in one and two dimensions to its customers for years already. So far, devices that oscillate continuously at a fixed frequency have been available. A new concept for a quasi-static mirror – “LinScan” – now allows the motion pattern to be adapted variably.

They are the ultimate feature for the cell phones of the future: small projectors that can be integrated into the mobile end device – they are known as pico-projectors. A projection the size of a television screen from a short distance and in high definition (HD) now seems to be technically possible.

The Fraunhofer Institute for Photonic Microsystems IPMS has been doing research into pico-projector solutions for quite some time. The institute uses the principle of laser beam steering for image generation. Somewhat similar to an old CRT television, a laser beam whose brightness can be controlled (or, rather, three laser beams – one each in red, green, and blue for full color) is moved quickly across the projection surface using a single miniaturized scanner mirror. To the human eye, what then appears is a single cohesive image. The scanner mirrors have a typical diameter of approx. 1 mm and are manufactured in large batches cost-effectively from silicon wafers.

Fraunhofer IPMS uses an electrostatic actuator to move the scanner mirrors. Previously, only scanners with a planar structure were available; in this case, the mirror oscillates sinusoidally at a fixed frequency. Using these scanners, Fraunhofer IPMS has been able to build extremely compact projectors: They are so small that they fit into current smartphones.

### LinScan: linear scanning made easy

Scientists at Fraunhofer IPMS have now used the quasi-static scanner concept “LinScan” to develop a new device that allows the mirror to be redirected selectively. Previous disadvantages of resonant scanners, such as the fixed vibration frequency or the comparatively high scan frequencies that resulted from the mapping principle and made HD more difficult, have been overcome with LinScan. The basic technology has not been changed, but it has been sufficient to make a small modification to the mechanical design: in a later micro assembly step, the actuator combs are tilted towards one another permanently.

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**Caption:**

Pico projectors based on Fraunhofer IPMS LinScan MEMS scanner technology may become the ultimate feature for cell phones of the future.

Photo: Fraunhofer IPMS



This makes it possible to use a combination of resonant drive in the fast horizontal axis and LinScan in the slow vertical axis in a two-dimensional scanner – the core of pico-projectors. The laser beam can be directed to jump from row to row at a frequency that can be adjusted from outside. Pico-projectors with resolutions of SVGA (800 x 600) and above will be simple to put into practice. LinScan is also suitable for all other applications where static positioning of a laser beam or scanning at variable frequency is required. This is ideal for making "LinScan" the pocket presentation tool of the future for meetings, at school, for e-learning sessions, and for entertainment.

Both MEMS scanner types plus achievements at Fraunhofer IPMS concerning MEMS micro mirror arrays (i.e. Spatial Light Modulators) will be shown at MEMS/Micromachine exhibition (booth D20) at Tokyo Big Sight Exhibition Center from July 11 to July 13.

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