Abstract

Microscopy based on photonic chips giving ultra-wide field of view in super resolution and diffraction limited mode.

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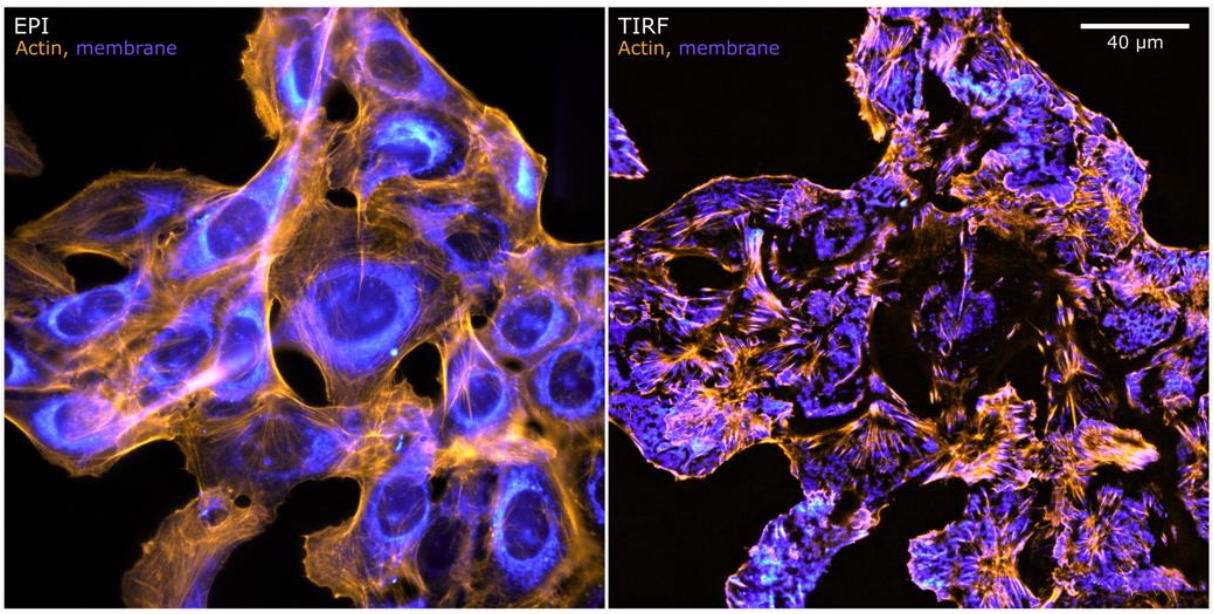
Chip NanoImaging AS (chipnano) is a spin-off company from UiT the Arctic University of Norway commercializing chipbased microscopy giving ultra large field of view both in super resolution and in diffraction limited mode. The technology is based on replacing the traditional glass slide with a photonic chip comprising many waveguides in parallel on top of the chip. The sample is put on top of the waveguides on top of the chip. Preparation techniques are like what is being used on a standard glass slide or cover glass. Standard labelling techniques with standard fluorophores can be used.

The new contribution is that the illumination is brought to the sample via the waveguide thus separating the illumination path from the imaging path. This has the effect combined with features of our technology, that a larger area can be illuminated with evenly distributed light intensity. This makes it possible to achieve super resolution single molecule localization microscopy over ultra large areas compared to traditional technologies, up to two orders of magnitude larger.

This is a TIRF (Total Internal Reflection Fluorescence) method where the optical sectioning Is even better defined and with a stronger evanescent field. This gives lower contribution from fluorophores out of focus and an improved signal to noise ratio respectively.

However, the chip-based microscope technology is not limited to TIRF imaging, but can utilize other imaging modalities as well, EPI and white light with illumination through the objective lens with the sample on the chip. Different modalities can be used almost simultaneously. Today up to 4 different wavelengths are supported and the combination of chipbased TIRF and standard EPI with the same sample and same sample preparation makes it possible to combine TIRF imaging of the cell membrane with other features inside the cell using EPI.

We believe this novel chip-based microscope technology can contribute to new achievements within multiple disciplines of the life sciences.



References
Chip-based wide field-of-view nanoscopy, Robin Diekmann, Øystein I. Helle, et al. Nature Photonics volume 11, pages 322–328 (2017).