

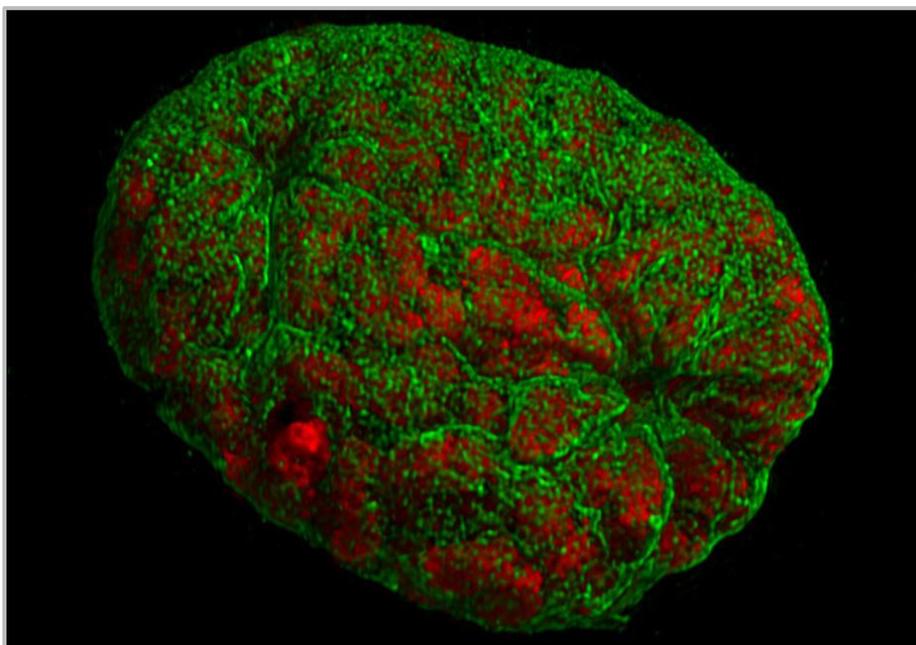
## TECHNOLOGY OFFERS

# Localization of Light Emitting Molecules of Unknown Orientation (P-899)

*A method for calculating exact spatial position and orientation of a light emitting particle in a sample*

### EXECUTIVE SUMMARY

Many light emitting entities routinely used, in cell biological settings show a dipole orientation. If the exact z position of the light emitting entity is unknown, using simple two-dimensional Gaussian fit algorithms to the light intensity distribution of a range of emitted light, may lead to calculation errors of the x- and y-position of several 10 nm. The invention discloses a method for calculation of the exact spatial position and orientation of a light emitting particle in a sample.



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[https://commons.wikimedia.org/wiki/File:3D-SIM-2\\_Nucleus\\_prophase\\_3d\\_rotated.jpg](https://commons.wikimedia.org/wiki/File:3D-SIM-2_Nucleus_prophase_3d_rotated.jpg)

#### Category

Devices

#### Indication

High Resolution  
Microscopes

#### Development stage

Prototype

#### Seeking

Licensing, Development &  
Commercial Partner

### BENEFITS

- Method of three-dimensional localization of light emitting marker entities of unknown orientation in a sample
- Fluorescence super-resolution
- Single molecule localization accuracy

## TECHNOLOGY BACKGROUND

First the virtual x- and y-positions of a light emitting entity are determined for several planes parallel to the focus plane. Thereafter, the absolute and/or relative total or peak emitted light intensities in the images of the marker entity are accounted for in determining the z-position and spatial orientation of the marker (Figure 1).

## DEVELOPMENT STAGE

The method has been verified experimentally as well as theoretically (see reference below).

## APPLICATIONS

DKFZ is looking for a licensee for further development and commercialization this technology for samples in high resolution microscopes particularly FPALM, PALM, STORM and PALMIRA.

## INTELLECTUAL PROPERTY

Patent application submitted. Patented.

- Priority filing was October 9, 2009 as EP09172670.3
- An international PCT was published as WO2011042493A1 .
- The US patent US8559021B2 and the European patent equivalent EP2486438B1 have been granted.

## PUBLICATIONS & REFERENCES

- "Molecular orientation affects localization accuracy in super-resolution far-field fluorescence microscopy." by Johann Engelhardt et al.in Nano Lett. 2011 Jan 12;11(1):209-13

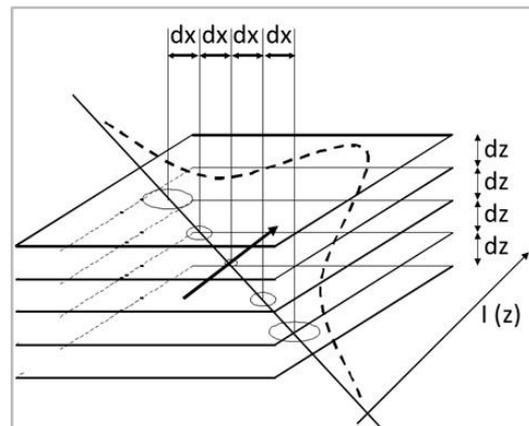
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## ABOUT THE DKFZ INNOVATION MANAGEMENT

Working at the interface of research and industry, the Innovation Management of the German Cancer Research Center (DKFZ) helps to get new cancer medications, diagnostic tests, and research instruments onto the market as quickly as possible.

The DKFZ with its more than 3,000 employees is the largest biomedical research institution in Germany. At the Center more than 1,300 scientists investigate how cancer develops, identify cancer risk factors and endeavor to find new strategies to prevent people from getting cancer. They develop novel approaches to make tumor diagnosis more precise and treatment of cancer patients more successful. DKFZ is a member of the Helmholtz Association of National Research Centers, with ninety percent of its funding coming from the German Federal Ministry of Education and Research and the remaining ten percent from the State of Baden-Württemberg.



**Figure 1:** The figure shows the peak emitted light intensity  $I(z)$  and the relative x- and y-position of a dipole in images depending on the z-position of the focal plane. The exact spatial orientation of the light emitting entity can be calculated using all these information.