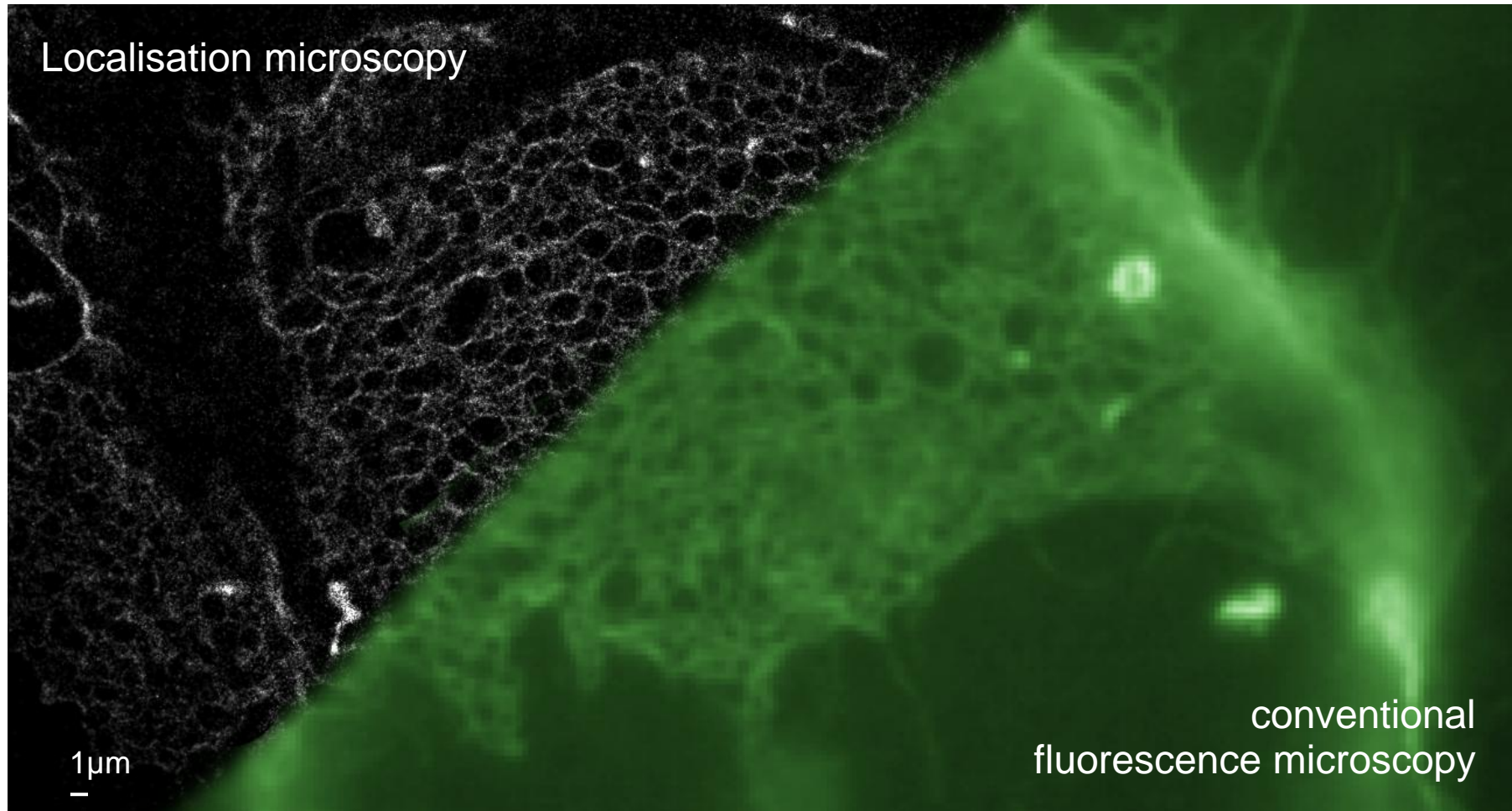


Stochastic Localization Microscopy (STORM)

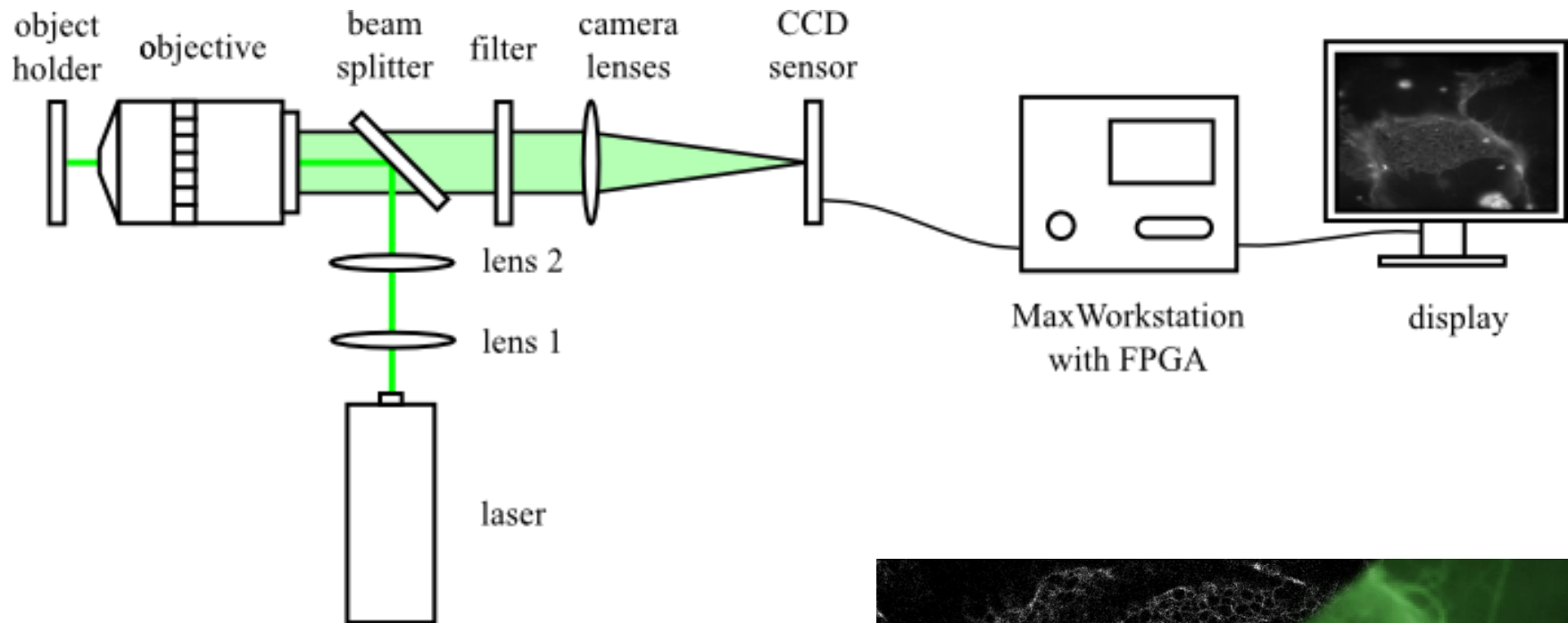
Frederik Gröll
IRI, Goethe University Frankfurt

Motivation

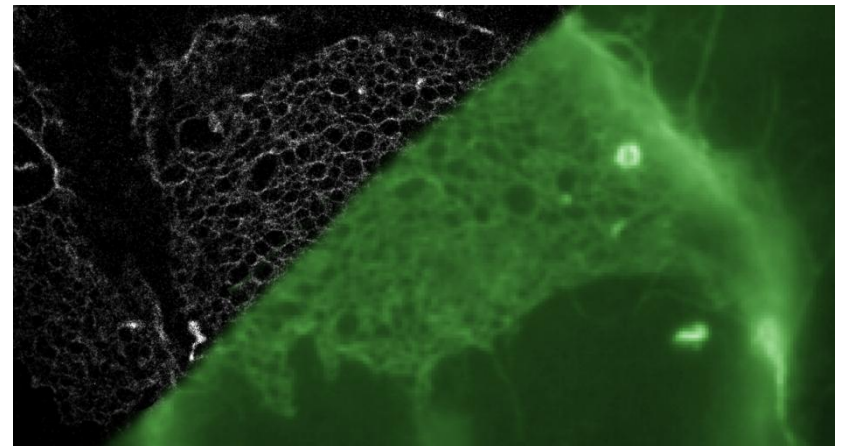


Increases the resolution of visible light microscopy by about a factor of 10.

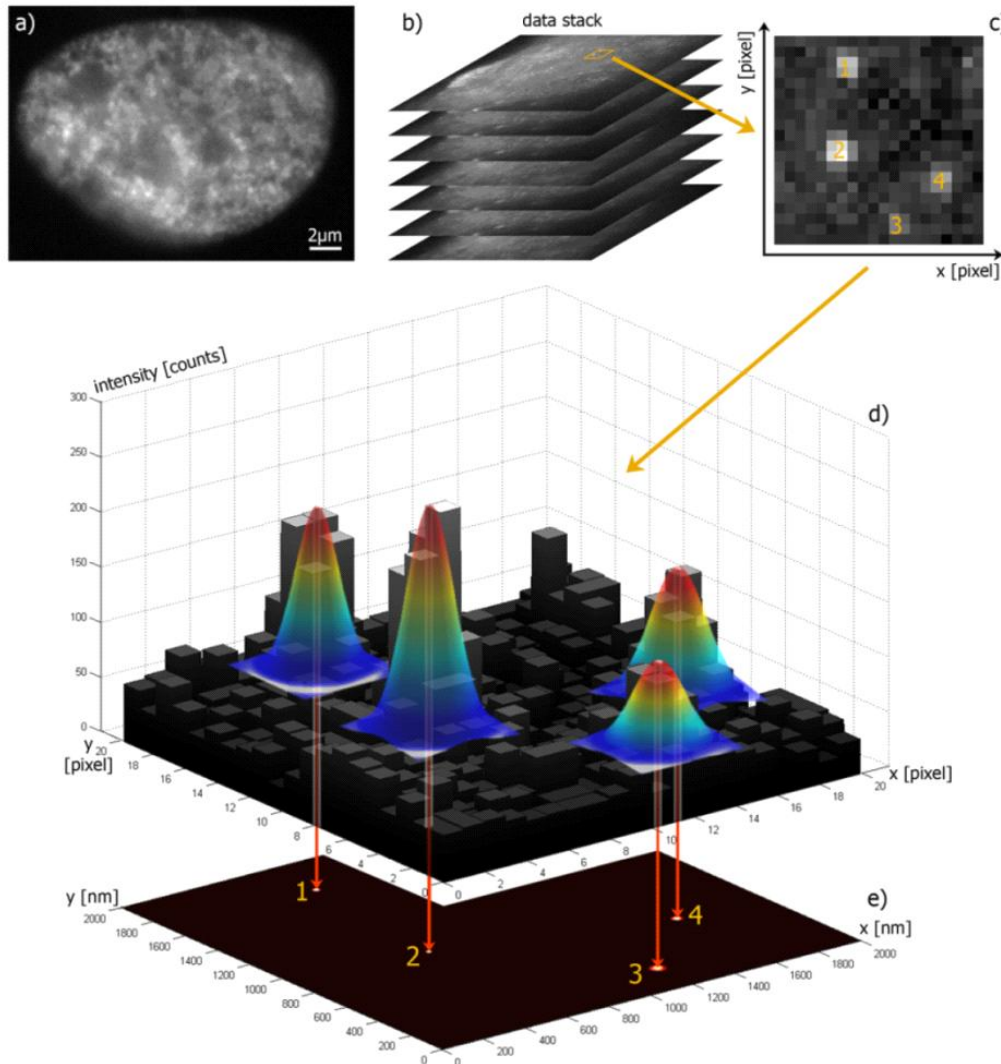
Localisation microscopy



Fluorophores blink and
can be optically separated



The algorithm

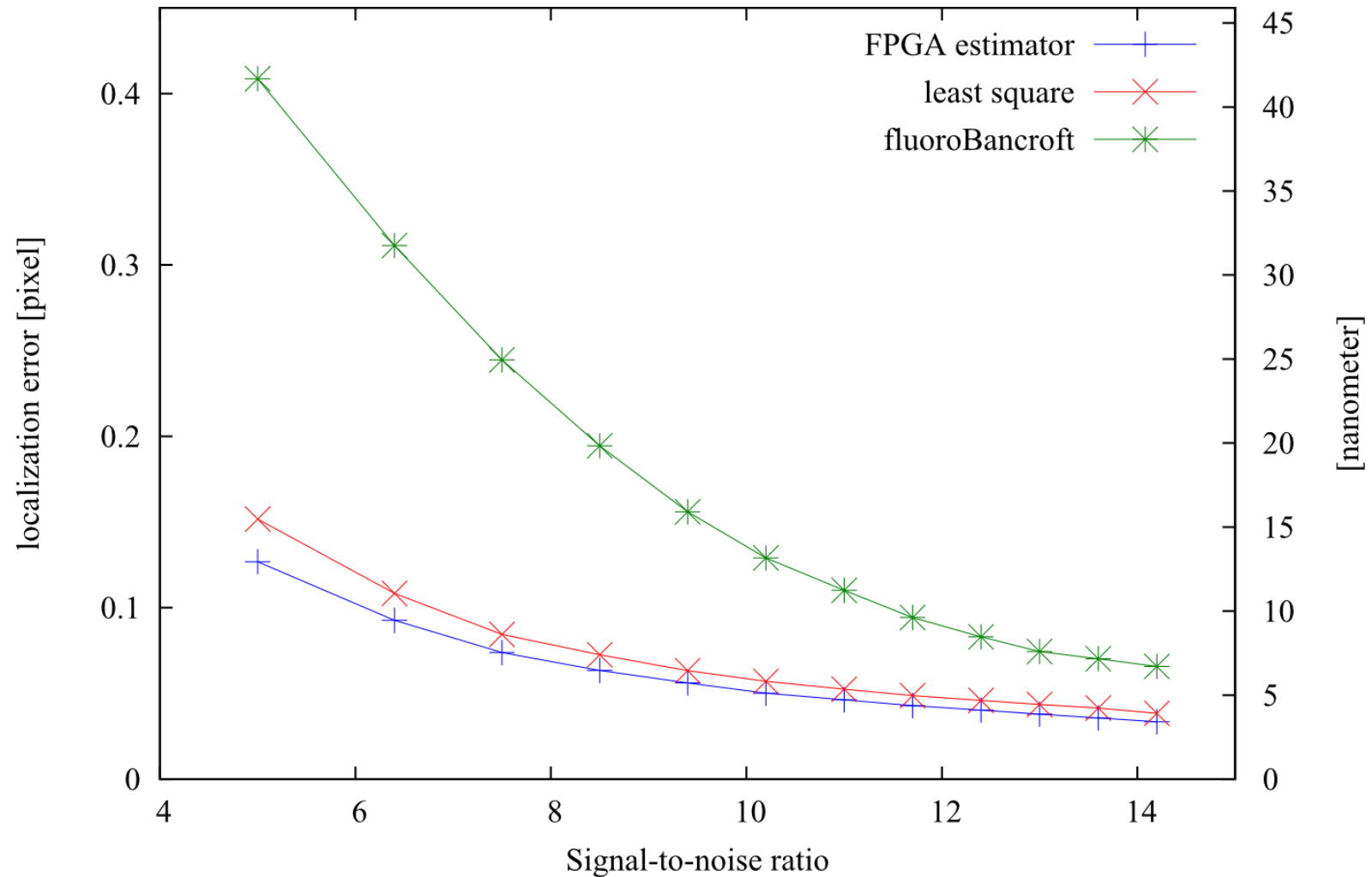


- a) Record movie
- b) Remove background
- c) Find signals of blinking fluorophores
- d) Locate
- e) Plot positions

Steps b) to d) were implemented on the DFE.

Localization accuracy, low background

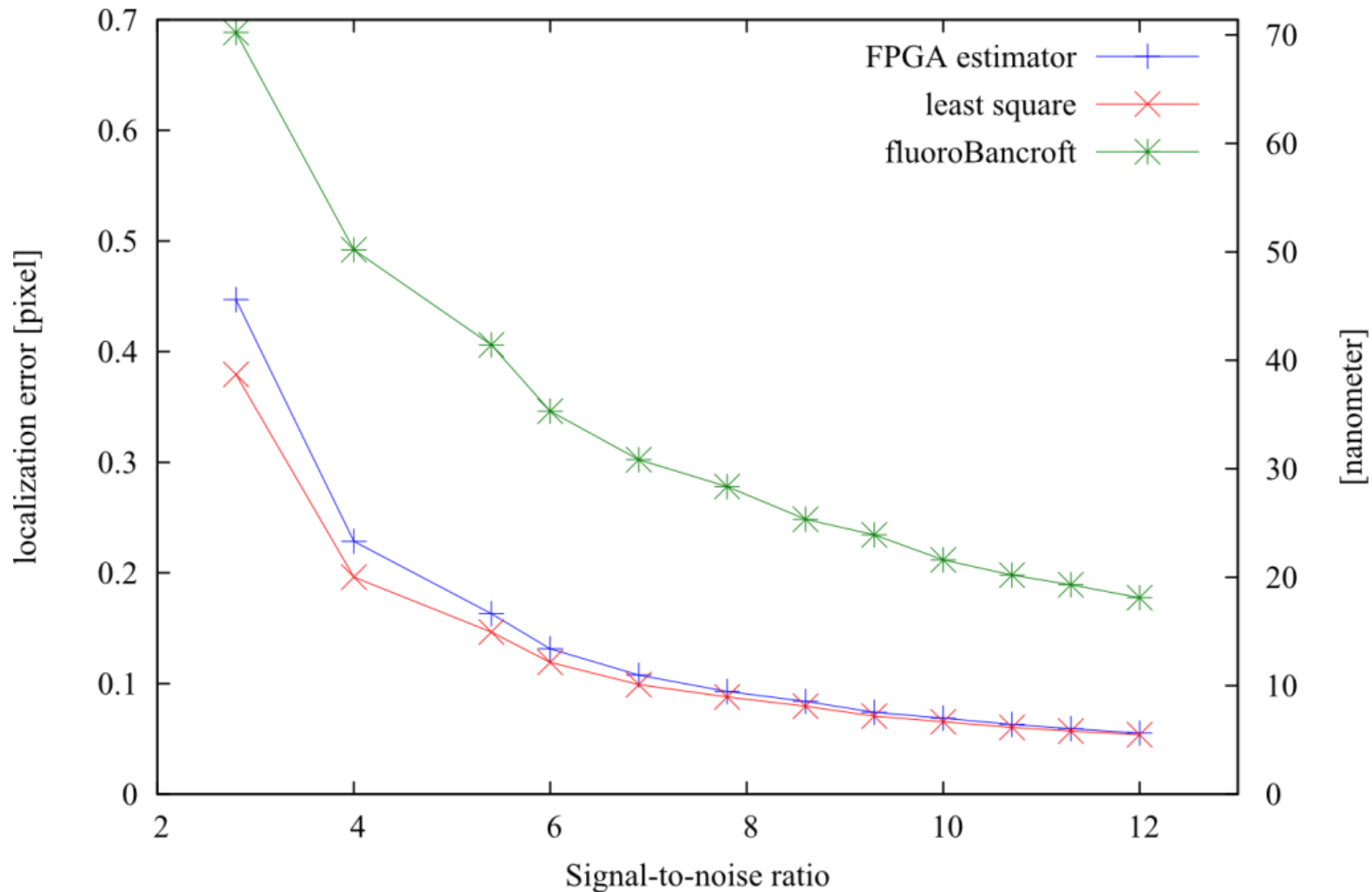
B=10



Better accuracy than least-square fit for low backgrounds

Localization accuracy, high background

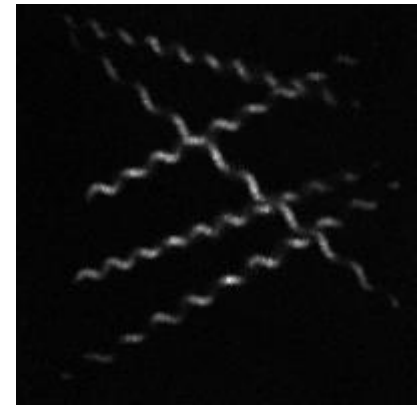
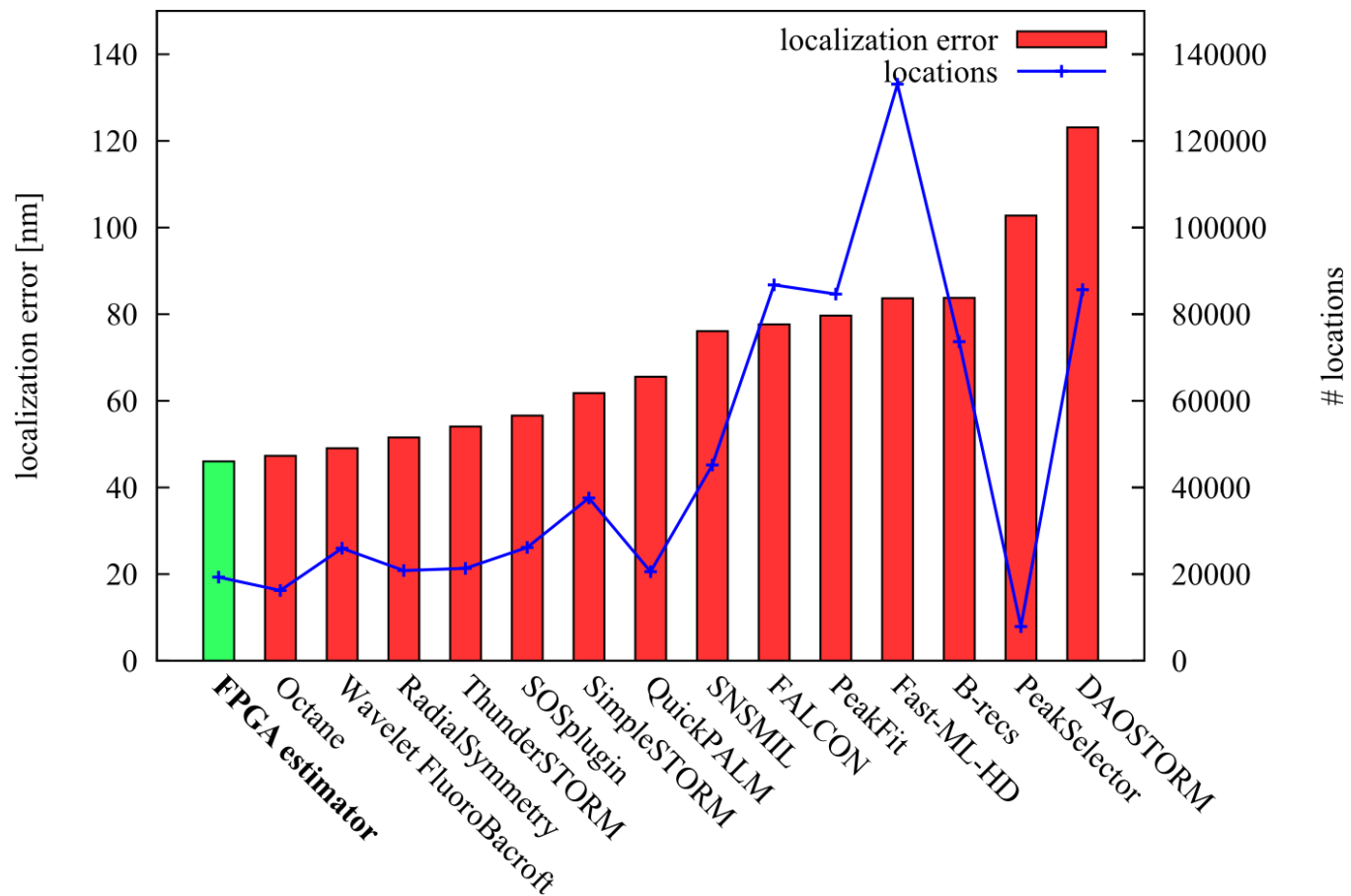
B=100



Accuracy within 5% for high backgrounds

Accuracy

ISBI Localization Microscopy Challenge 2013, sample HD3



Acceleration

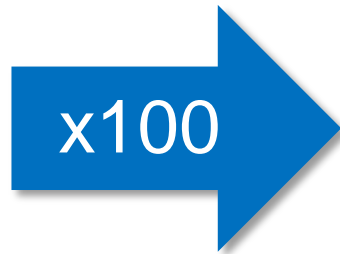
Typical image with 329,444 signals

Intel i5 450:
Iterative signal fitting



[Intel]

4h

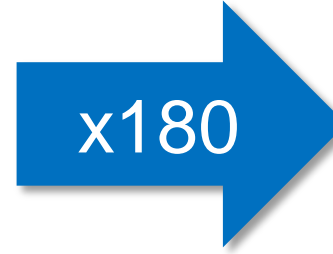


Intel i5: New algorithm with
center-of-mass calculation



[Intel]

1min 20s



Max3
Dataflow design



0.8s

See also:

Gruell, Kirchgessner, Kaufmann, Hausmann, Kebschull:
Accelerating Image Analysis For Localization Microscopy With FPGAs, FPL 2011;

Kaufmann, Piontek, Grüll, Kirchgessner, Rossa, Wolburg, Blasig, Cremer:
Visualization and Quantitative Analysis of Reconstituted Tight Junctions Using Localization Microscopy,
PLoS ONE, vol. 7, Public Library of Science, 2012