

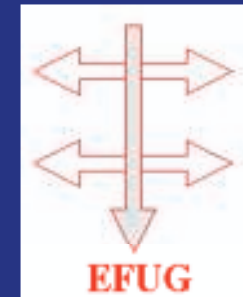
Lithography and deposition with a sub-nanometer focused helium beam (part II)

Paul Alkemade

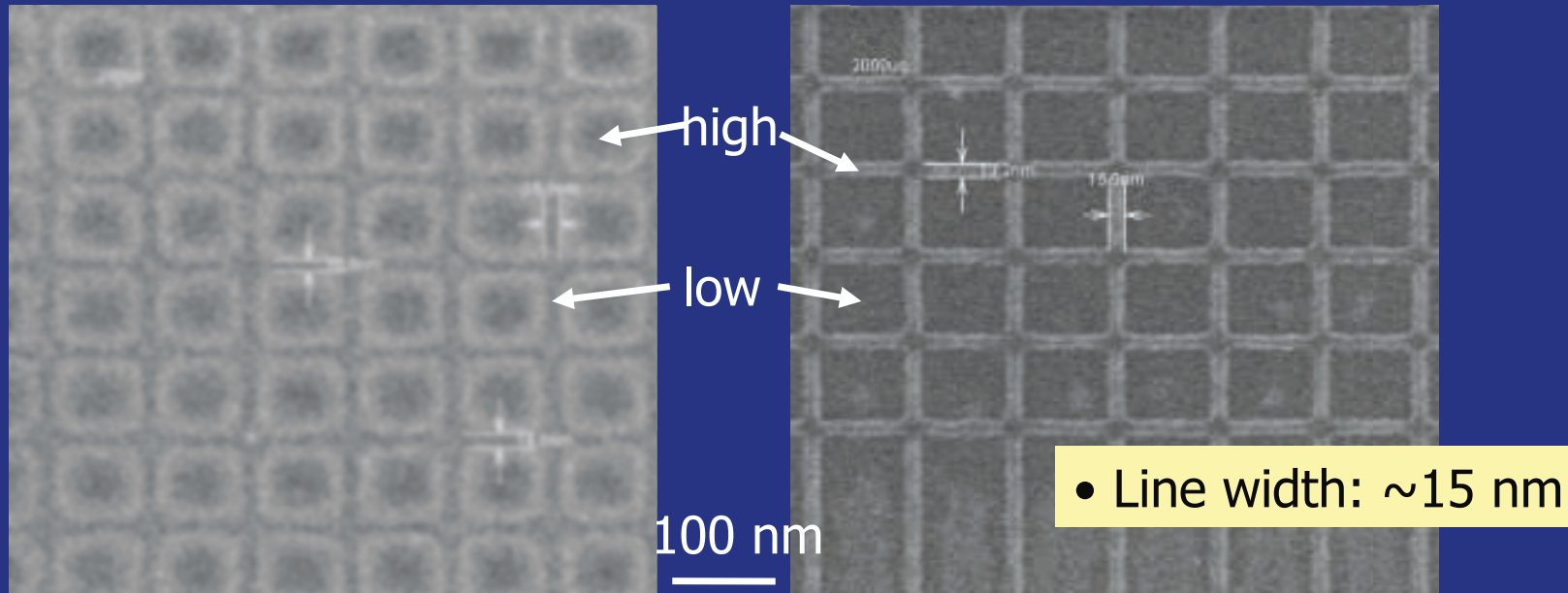
Kavli Institute of Nanoscience

Delft University of Technology

EFUG2009 : Monday 5 October 2009
Arcachon, France



PMMA exposure of a grid



positive tone
(250 $\mu\text{C}/\text{cm}^2$)

negative tone
(2500 $\mu\text{C}/\text{cm}^2$)

1c. Proximity and beam-shape effects

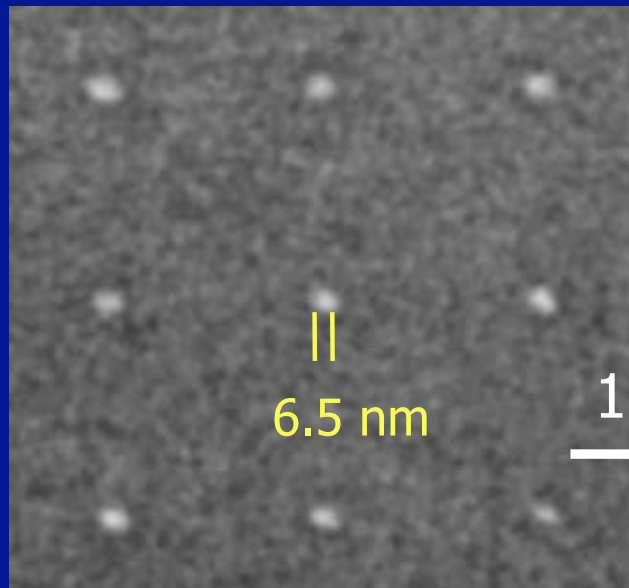
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2. He-ion beam induced deposition

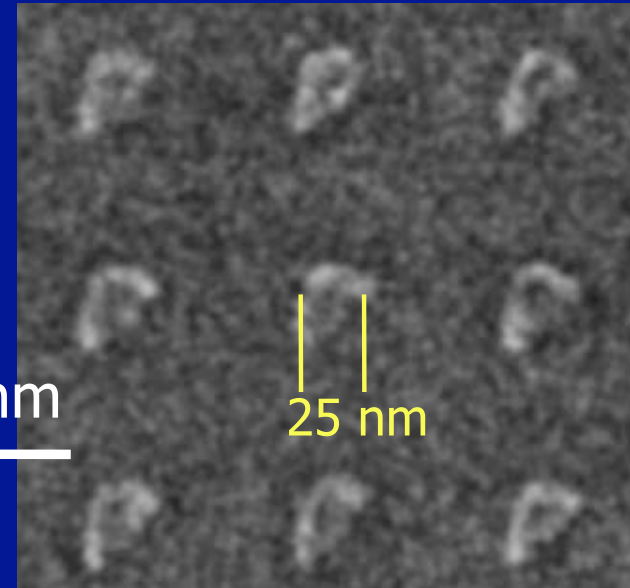
Direct nanofabrication technique:
deposition via decomposition of adsorbed molecules

Dot size (HSQ) vs. dwell time per spot

In 5 nm HSQ

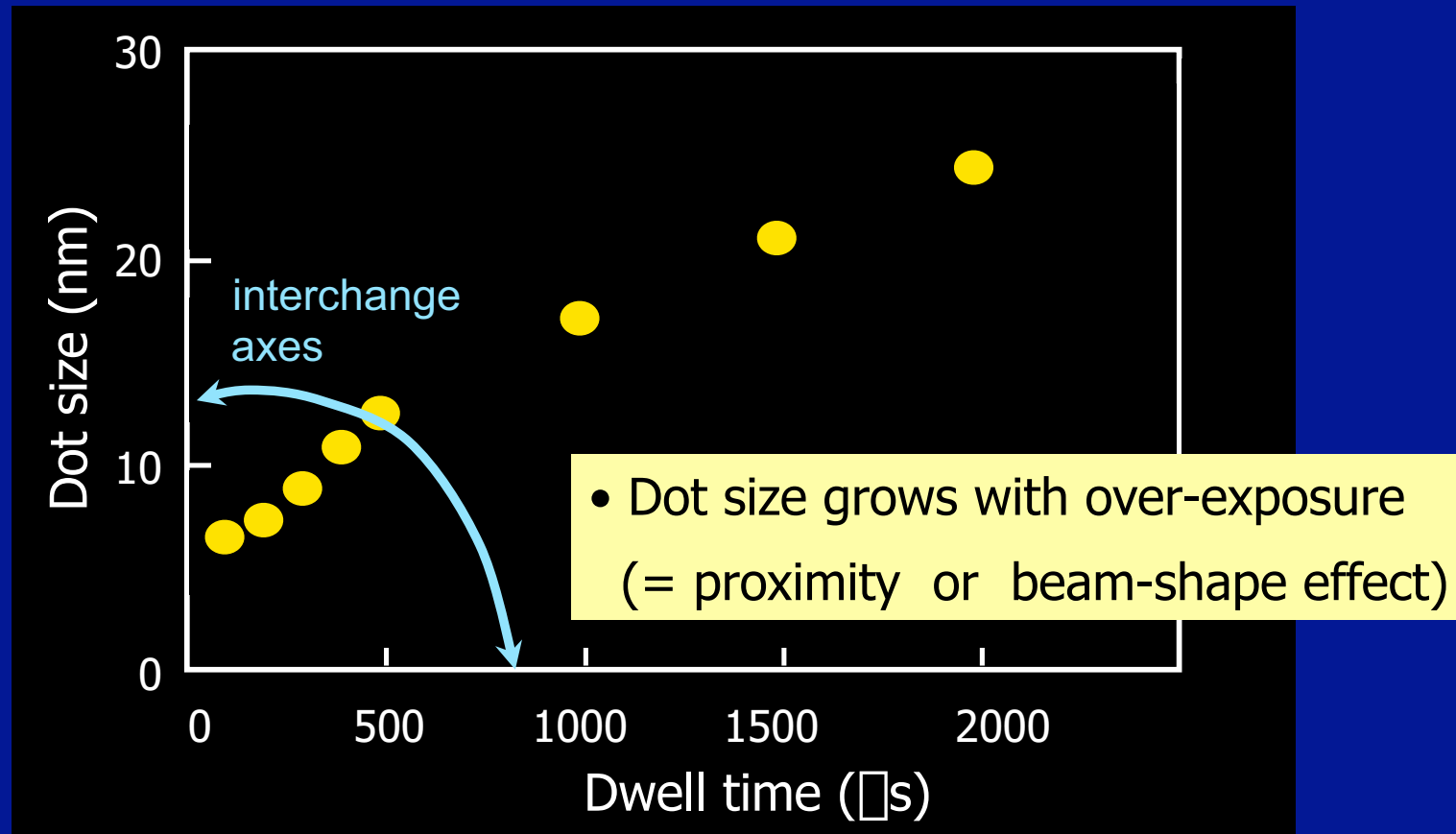


100 ns per spot

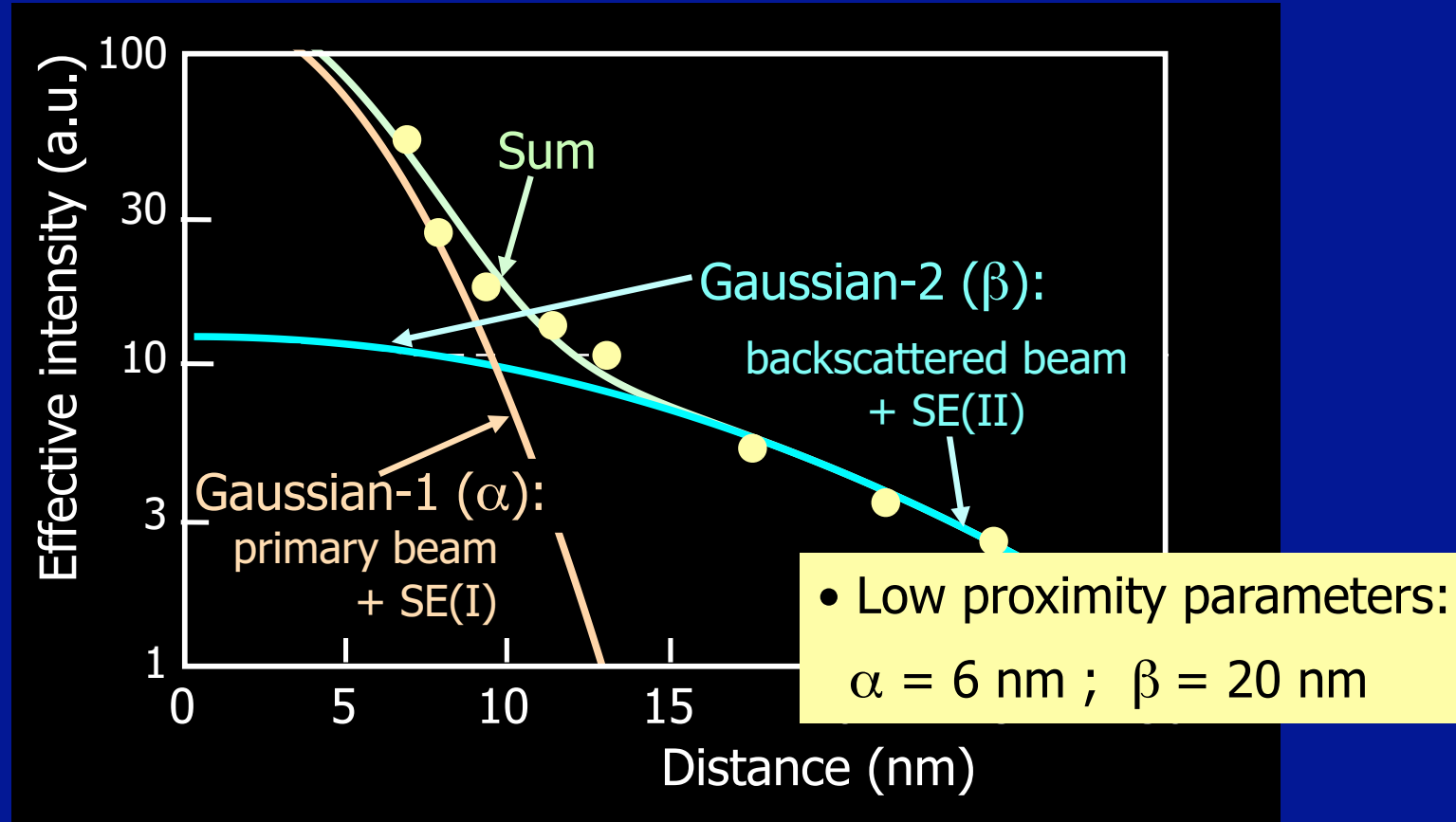


2000 ns per spot

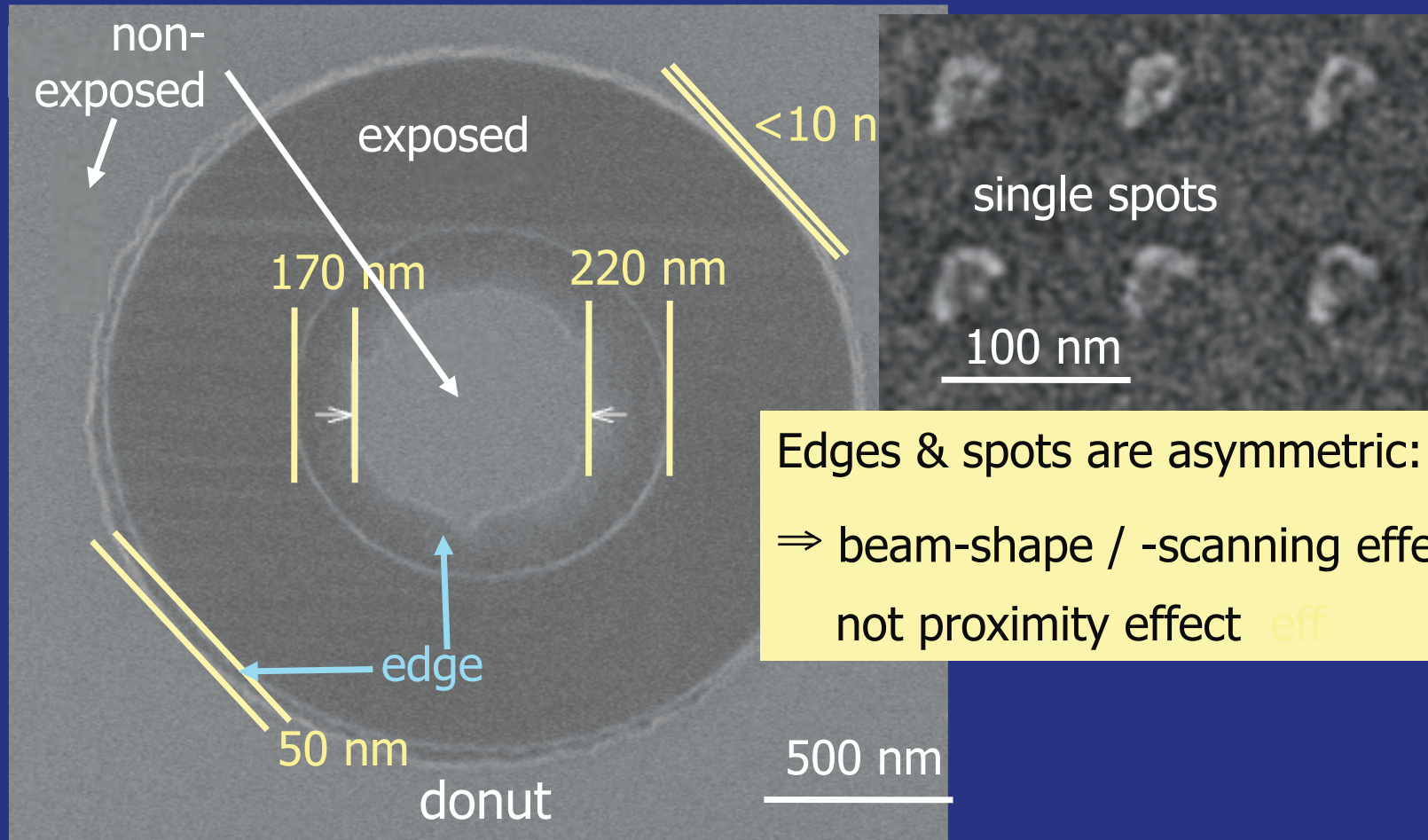
Dot size (HSQ) vs. dwell time per spot



Lithographic point-spread-function



Promixity / beam-shape effect (in HSQ)



Edges & spots are asymmetric:
⇒ beam-shape / -scanning effect
not proximity effect

New add-on on Orion Helium Microscope



OmniGIS system from Omiprobe
(3 gas containers + flushing gas)

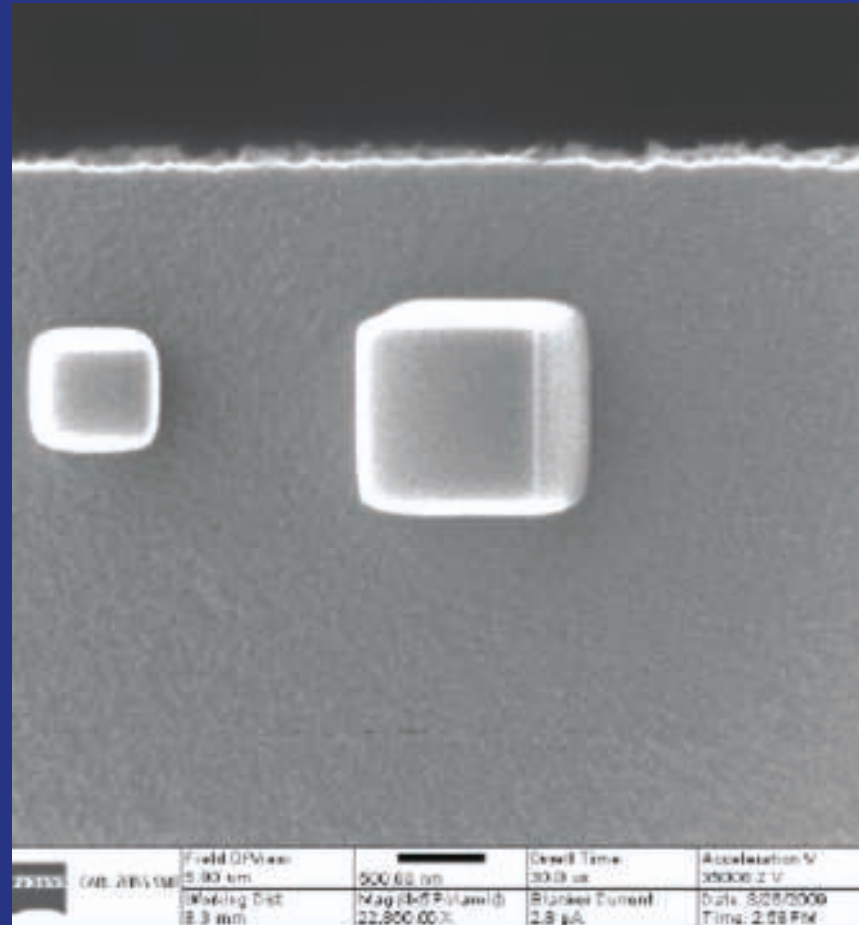
&



Orion Plus from Zeiss

Pt growth via He-ion beam induced deposition

First trial:
Sanford et al.
Zeiss,
(EIPBN 2009)

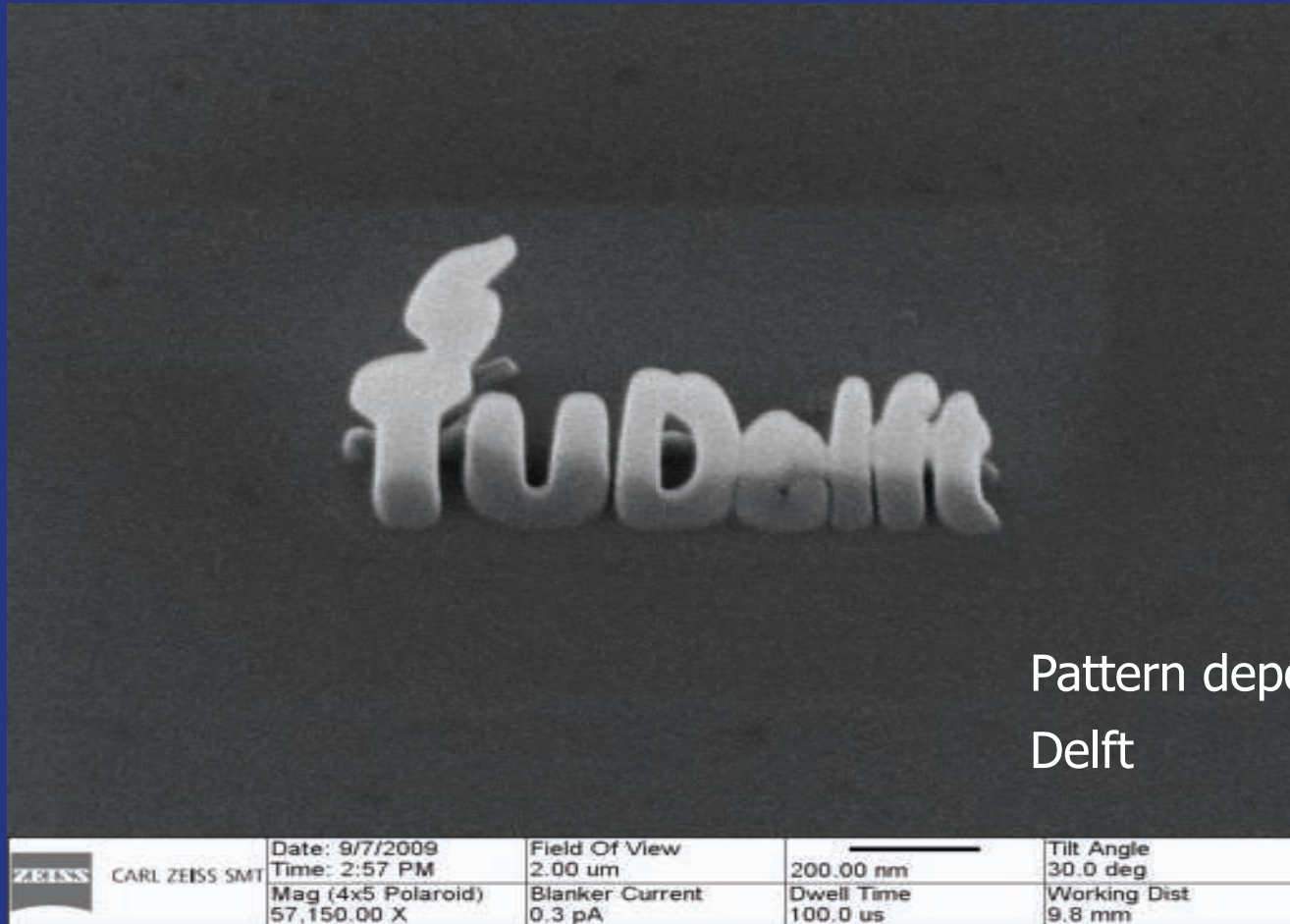


Precursor gas:
 $(\text{CH}_3)_3\text{Pt}(\text{C}_6\text{H}_5)_3$

0.2 pA 30 keV He

Box deposition
(by beam scanning)

Pt growth via He-ion beam induced deposition



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