MoEDAL NTD Group Status Report (INFN, Bologna, 20 Dec 2019)

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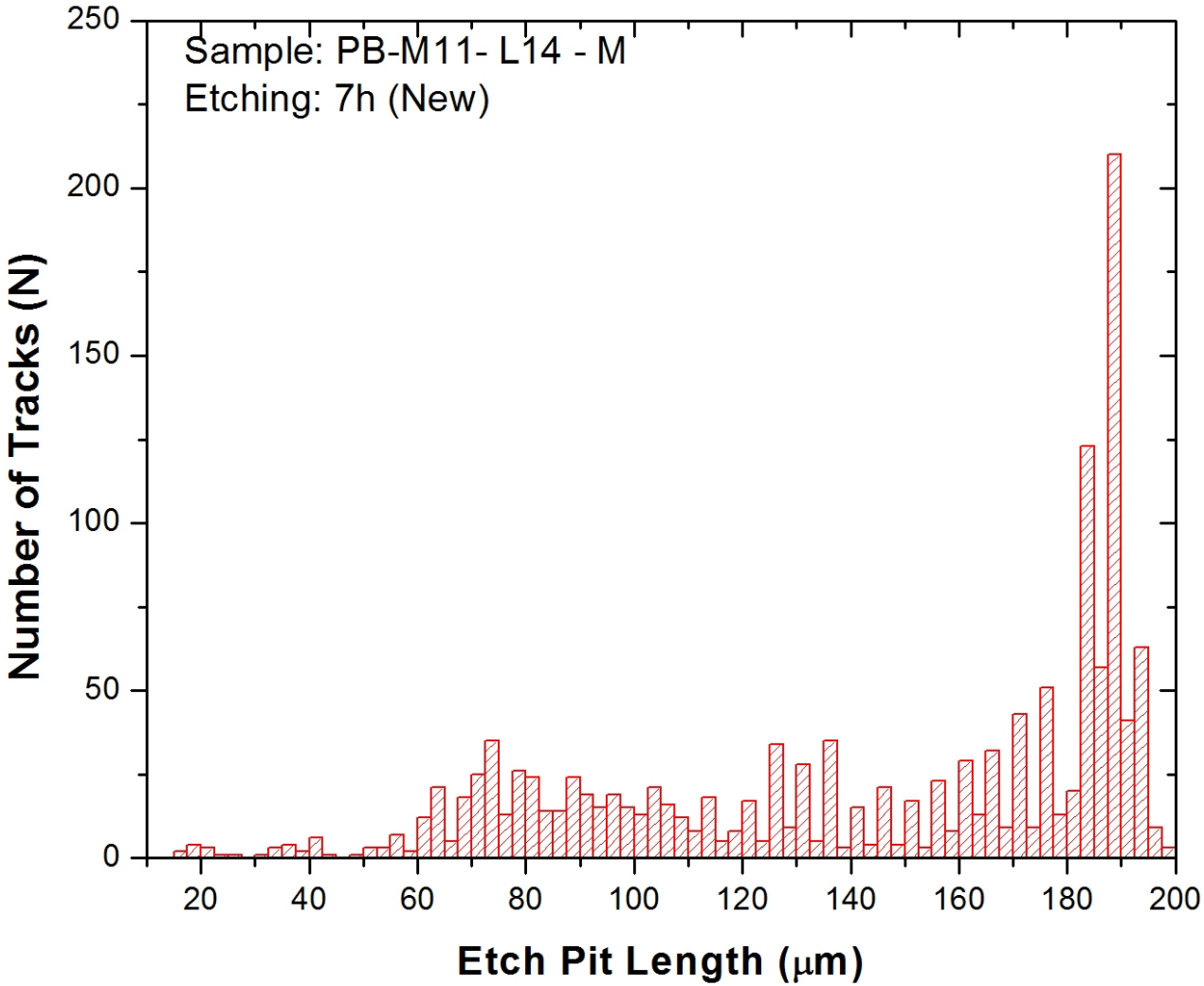
Makrofol Calibration
Etch-pit length distribution



Convolution based hybrid image processing techniqe

- Ref: Radiation Measurements 130 (2020) 106219 https://doi.org/10.1016/j.radmeas.2019.106219
- Copyrighted software developed by Dr. Kanik Palodhi and his student Joydeep Chatterjee of University of Calcutta, Kolkata, India

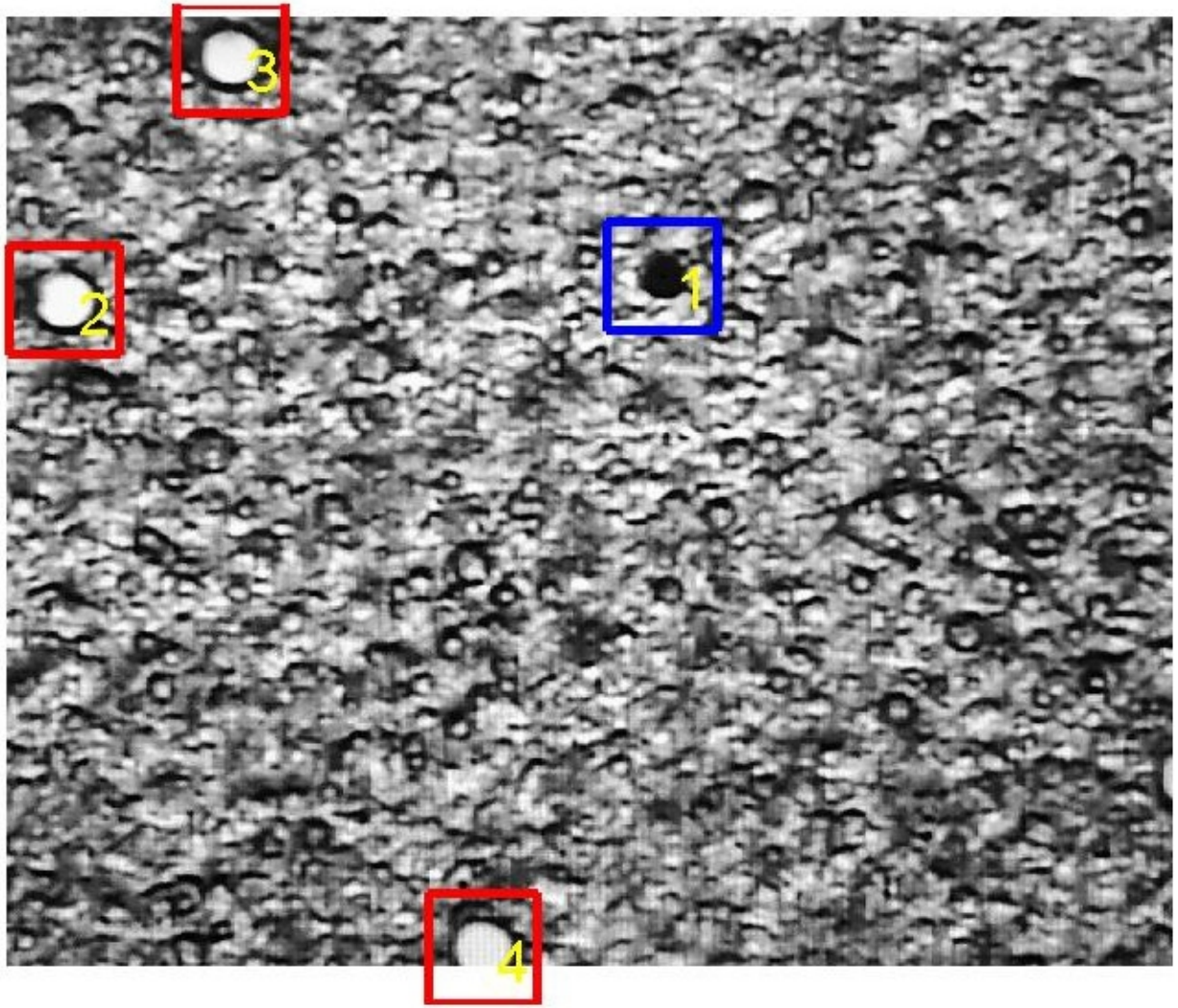
Main principles of the technique

- Sequential application of convolution and de-convolution
- Convolution with a circular mask of size ~ largest etch-pit opening
- Produces peaks at the location of the tracks, but defects of similar size also produce peaks
- To enhance the peaks due to actual etch-pits, a de-convolution with a Gaussian mask is applied followed by inverse Fourier transform
- This is followed by another convolution operation with the circular mask used previously
- Producing much better results compared to many other techniques (Hugh Transform, shape fitting etc.) especially for overlapping tracks and tracks near the edges of the image frame

Technique applied to MoEDAL and Pb exposed Makrofol

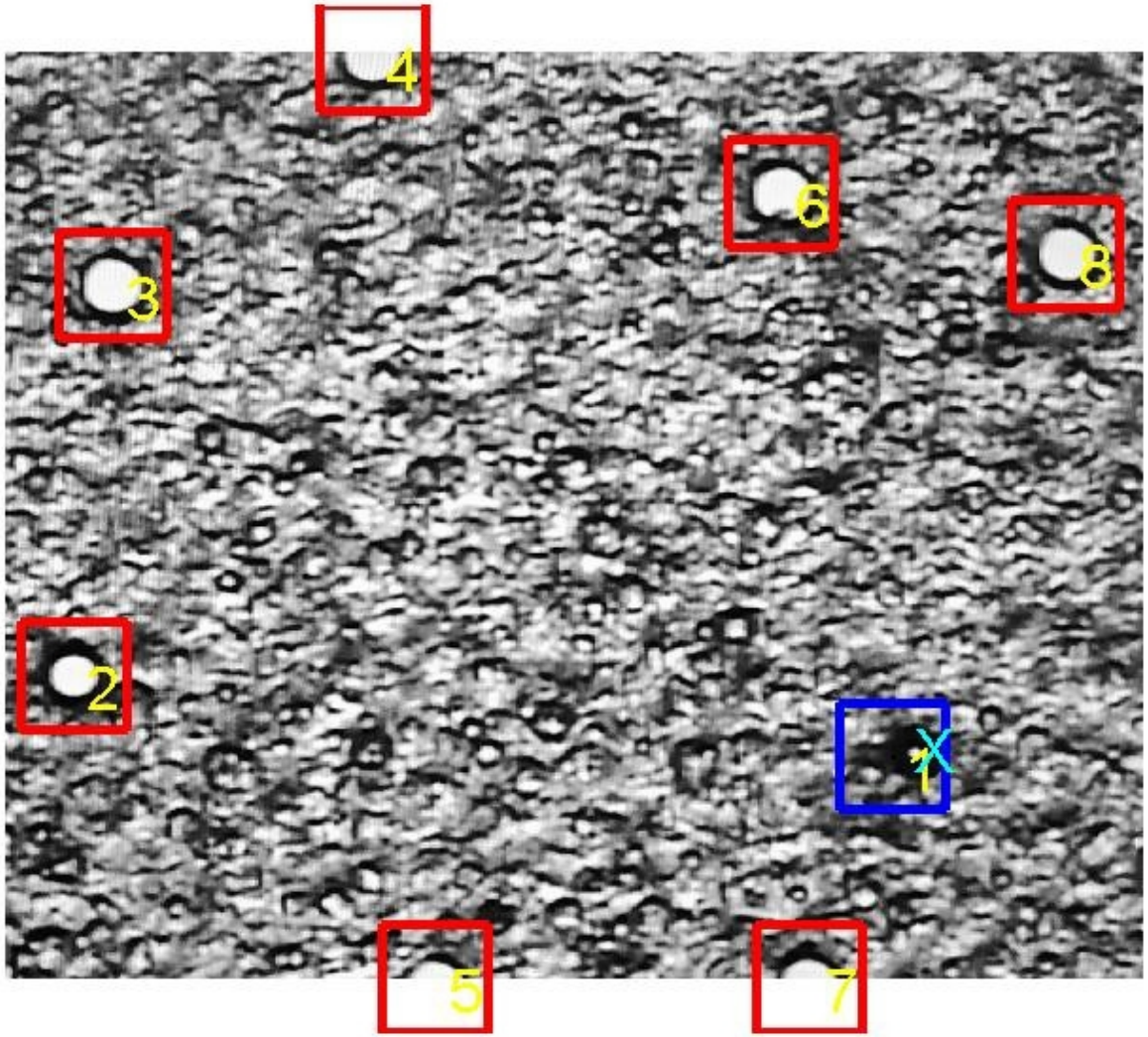
Sample :PB_E11_L21_ME Etching: 15 h (New)

TOTAL ETCH-PIT COUNT= 4 (PITS WITHOUT HOLES IN BLUE BOXES WITHOUT X = 1, HOLES IN RED BOXES AND BLUE BOXES WITH X = 3)



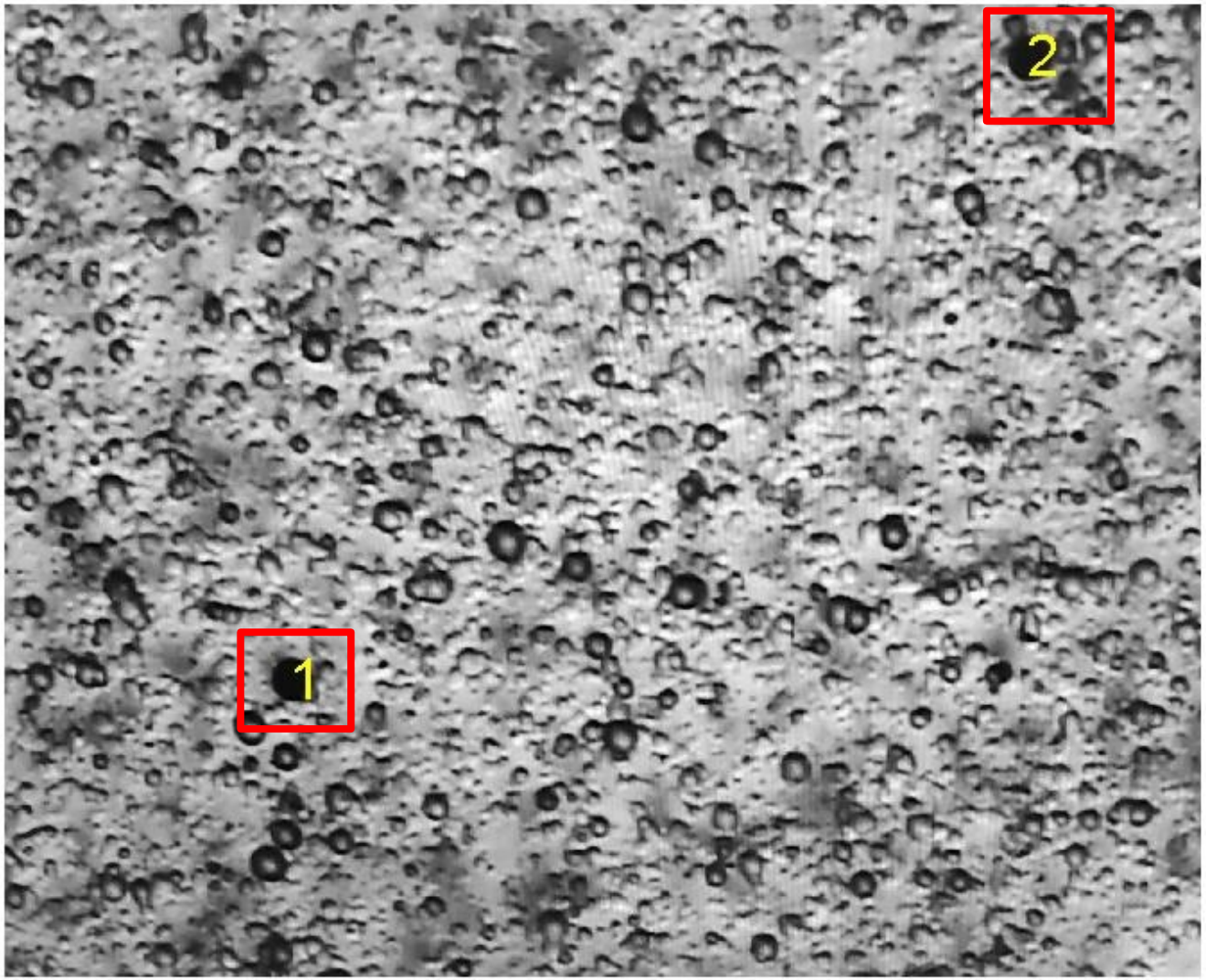
Sample :PB_E11_L21_ME [Etching: 15 h (New)]

TOTAL ETCH-PIT COUNT= 8 (PITS WITHOUT HOLES IN BLUE BOXES WITHOUT X = 0, HOLES IN RED BOXES AND BLUE BOXES WITH X = 8)



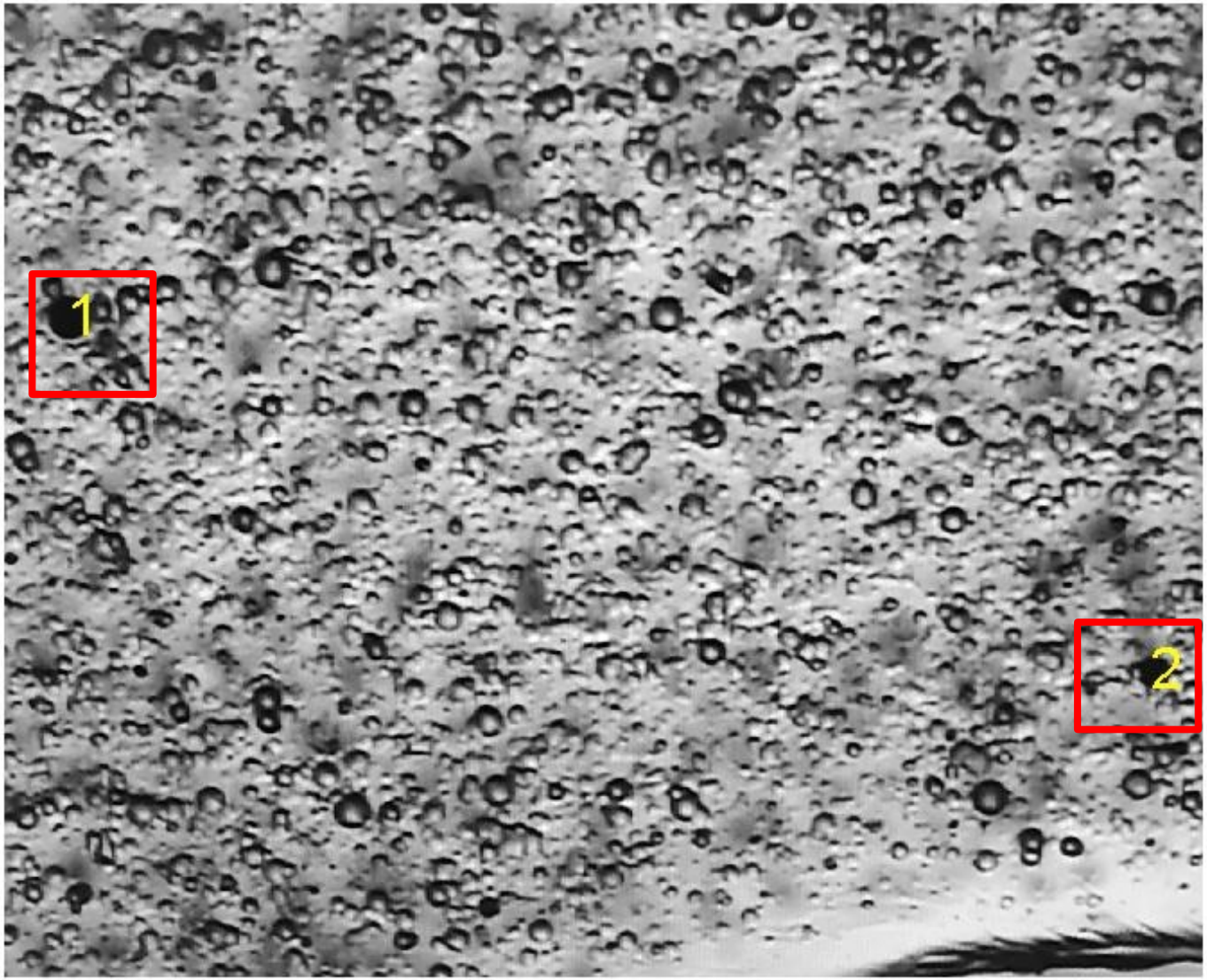
Sample: PB-M14 – L11 – M [Etching: 7h (New)]

NTD COUNT = 2



Sample: PB-M14 – L11 – M [Etching: 7h (New)]

NTD COUNT = 2



Thoughts on further development....

- Use of Machine learning algorithms.
- Development of Scanning systems.
- New Illumination techniques for better discrimination of tracks.