

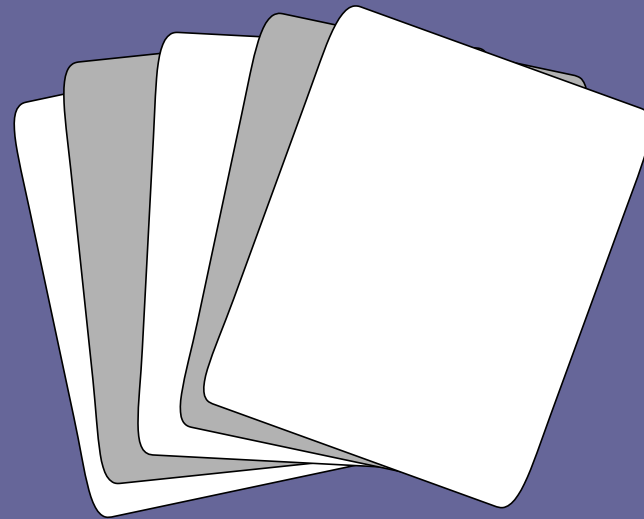
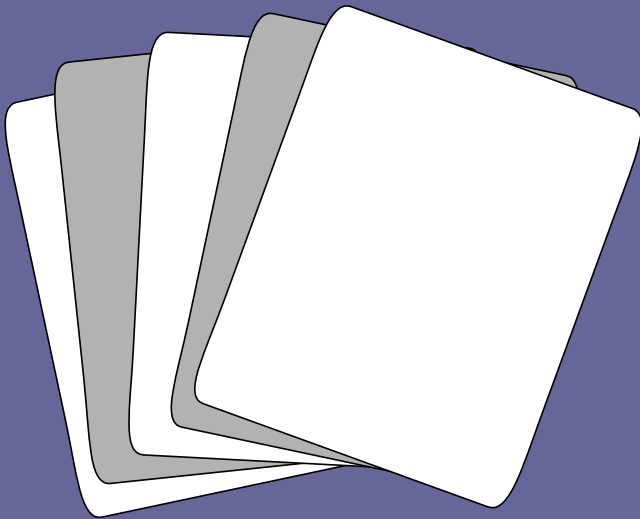
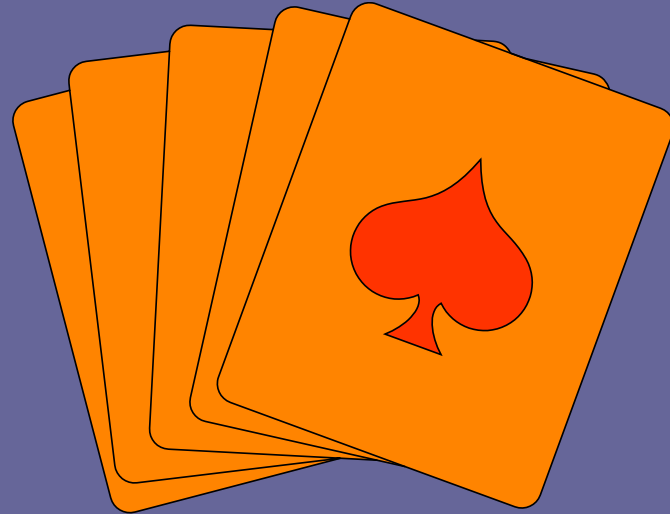
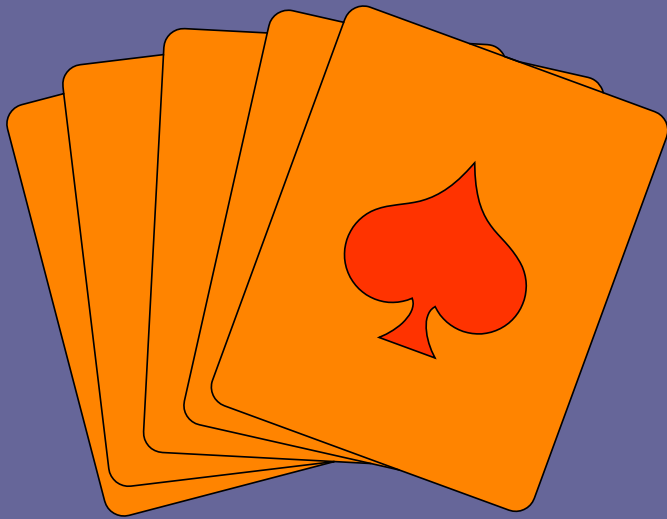


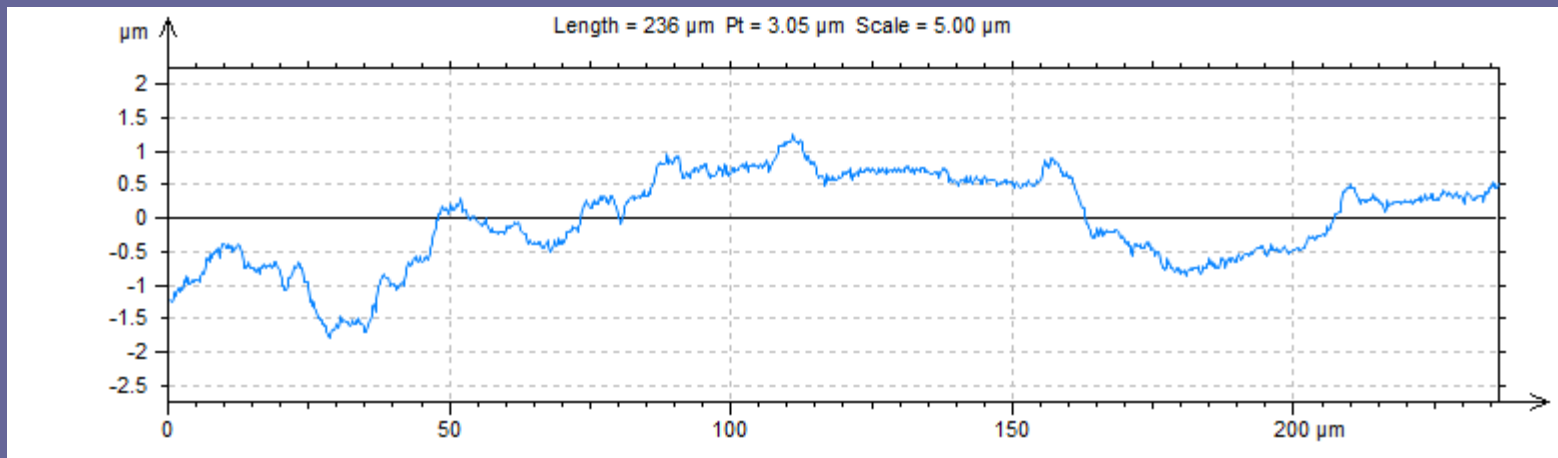
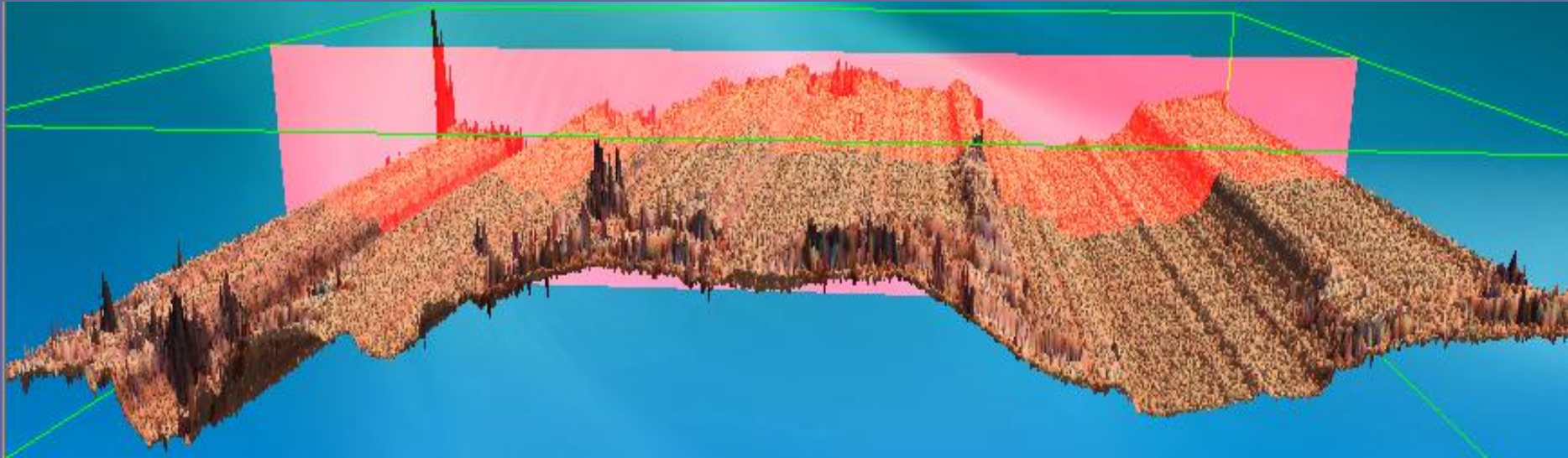
Bullet comparisons using confocal microscopy

Ashley Chu, David G. Howitt, Stephen A.
Shaffer and Frederic Tulleners.
University of California, Davis
Forensic Science Graduate Program
Surface Topography Research Group

UC DAVIS
UNIVERSITY OF CALIFORNIA









100 microns



Confocal Microscopy

Advantages

3D representation and so theoretically invariant to specimen placement.

Disadvantages

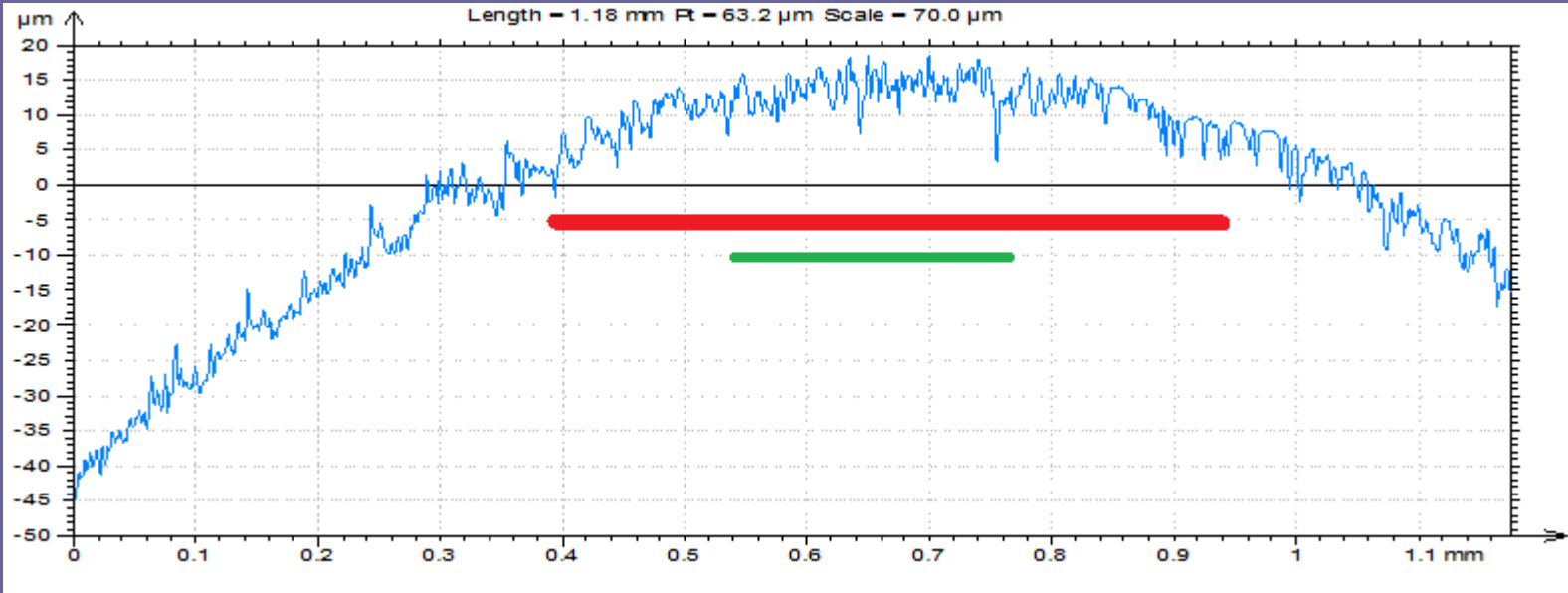
Not really invariant for bullets because of the curved surface

Low signal to noise

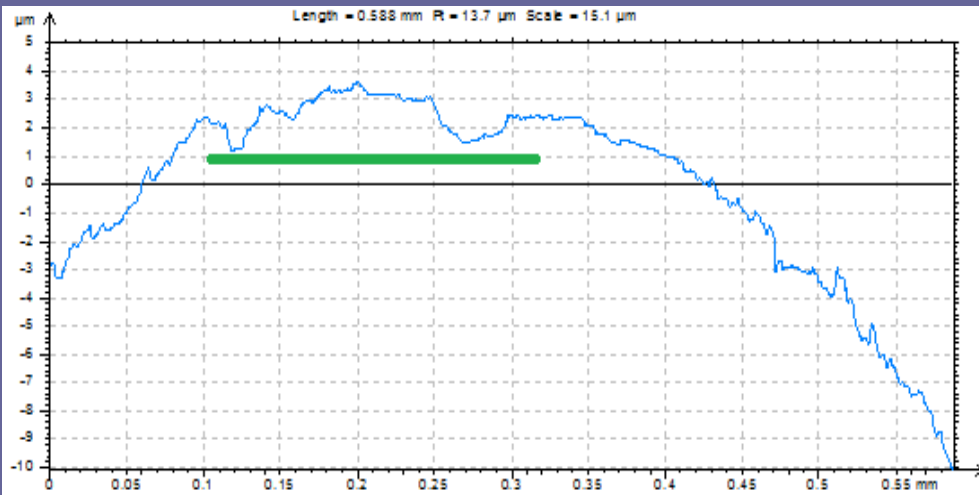
High resolution instrument, the examiner uses 4X to 6X objective we have to use a 20X to 50X objective to get the same level of detail, because of the shallow depth of the striae.



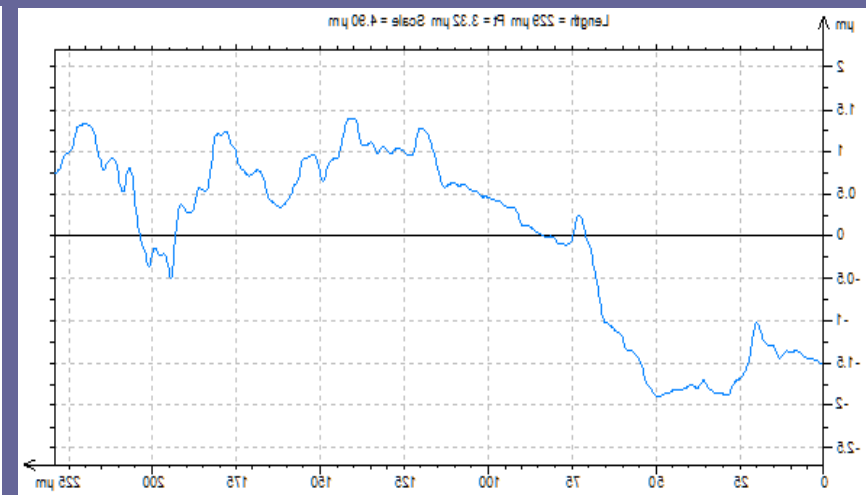
Image comparison of 10 x 20x and 50x



10x



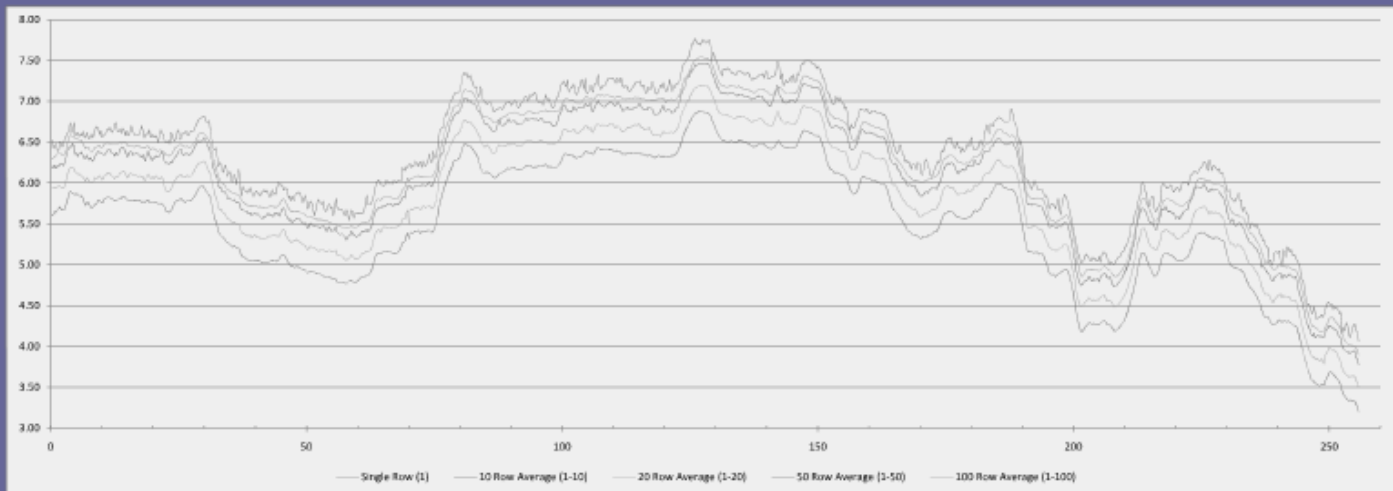
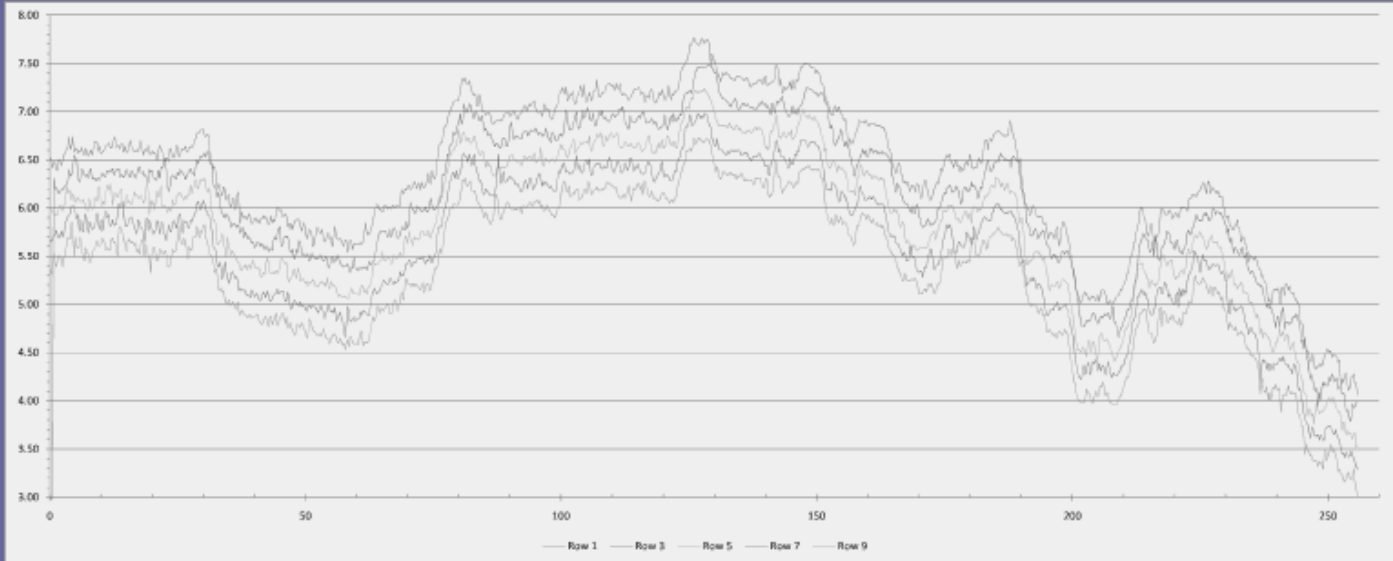
20x

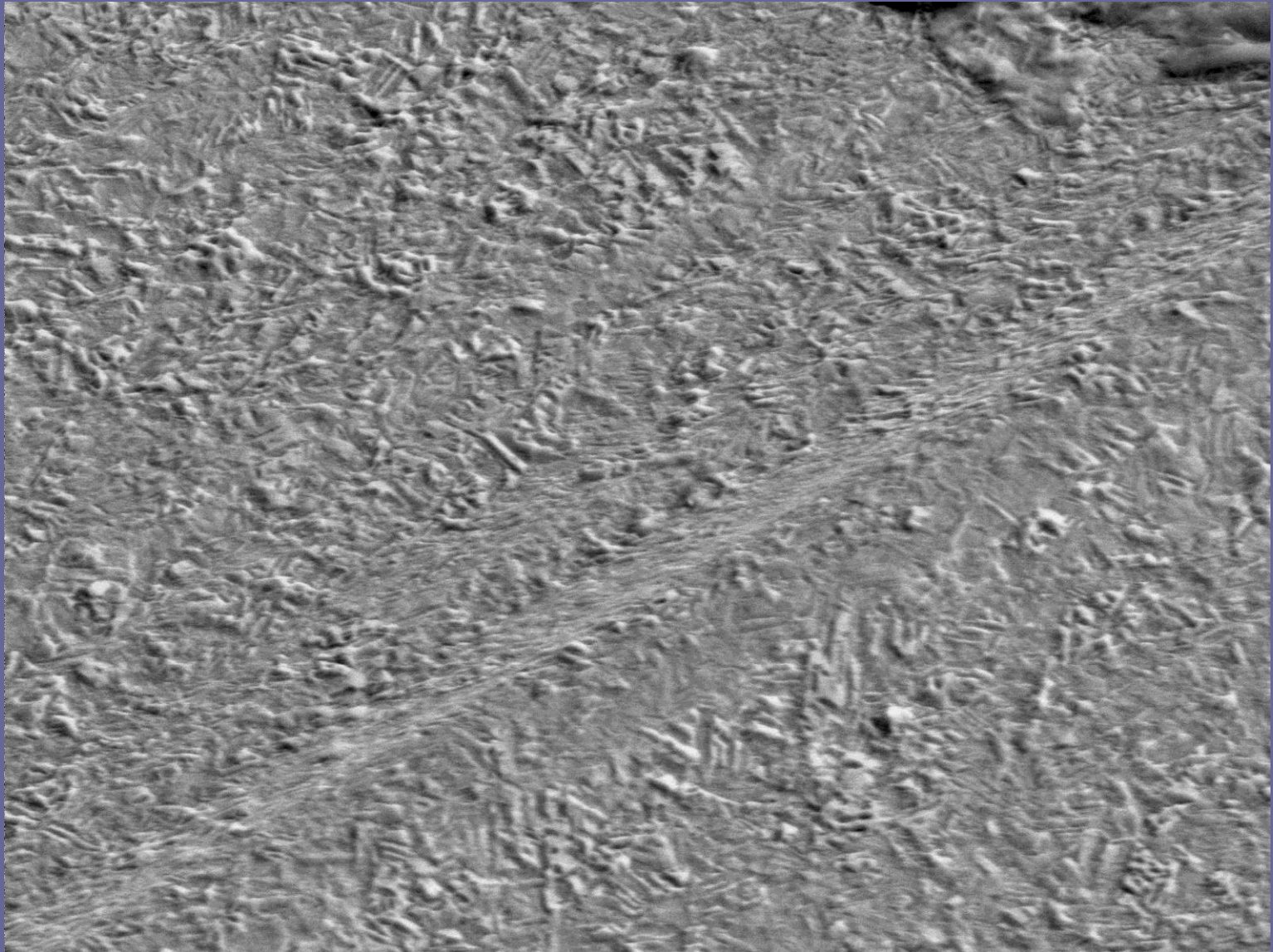


50x

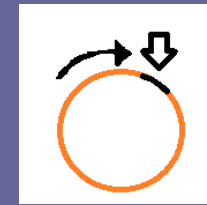
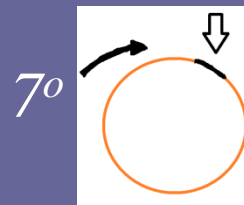
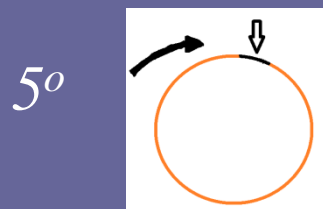
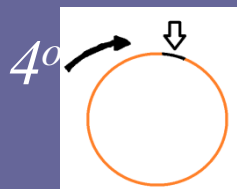
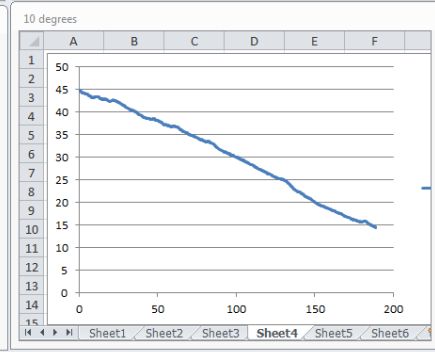
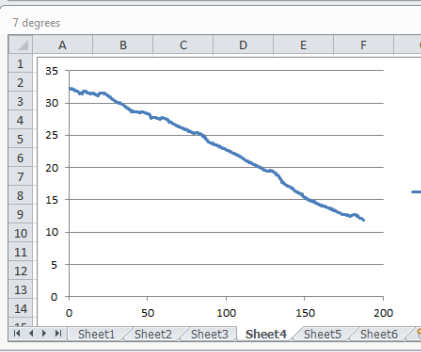
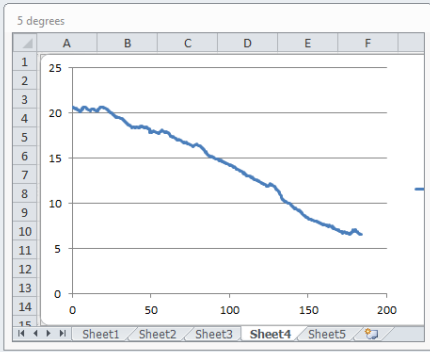
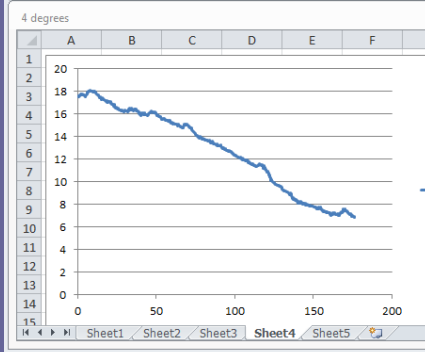
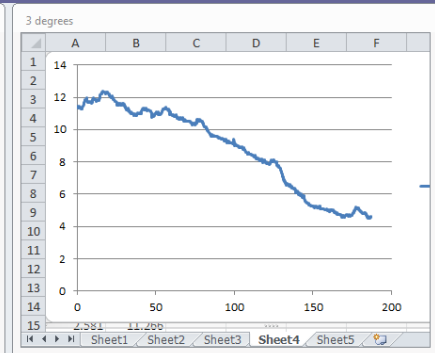
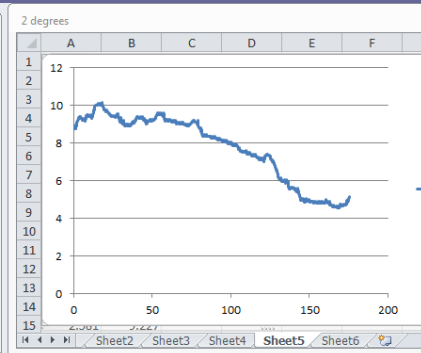
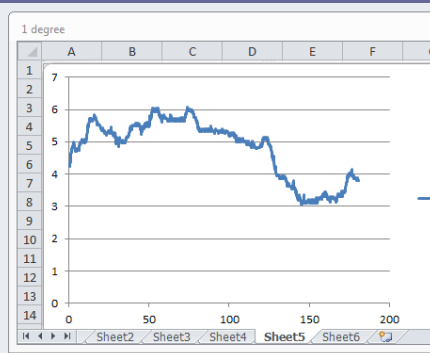
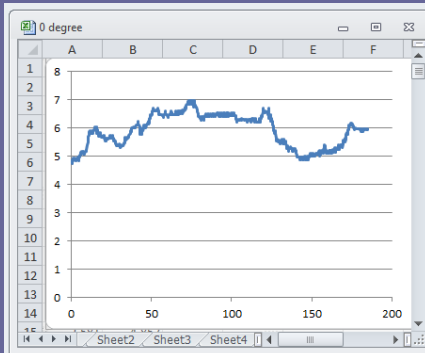
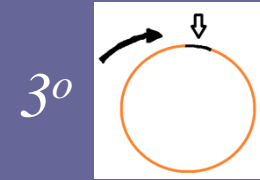
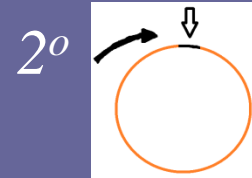
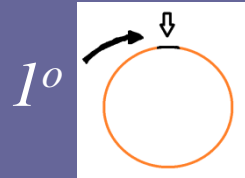
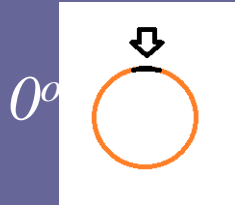


Land1_100X_01
Selected Data Plots
Data by Karen Coburn, 04/03/2010
Data analysis and plotting by Stephen Shaffer, 05/12/2010





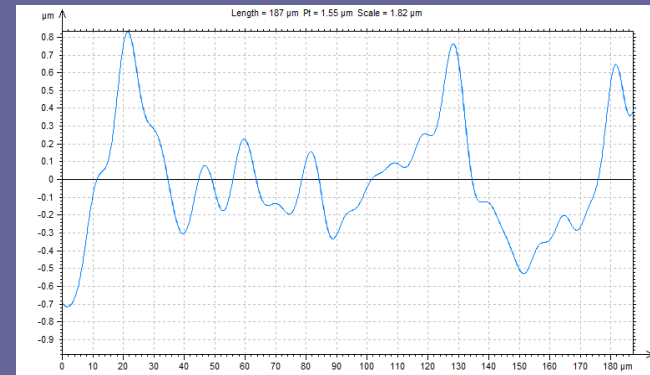
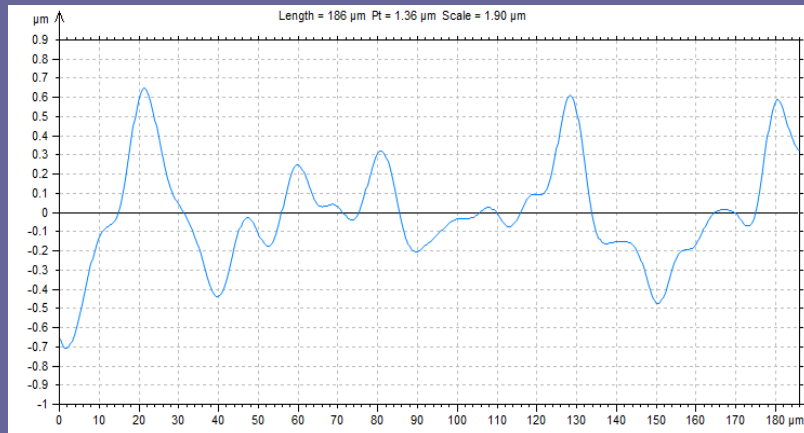
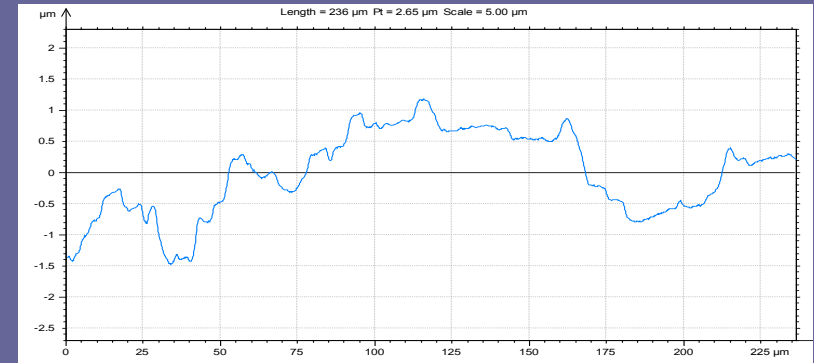
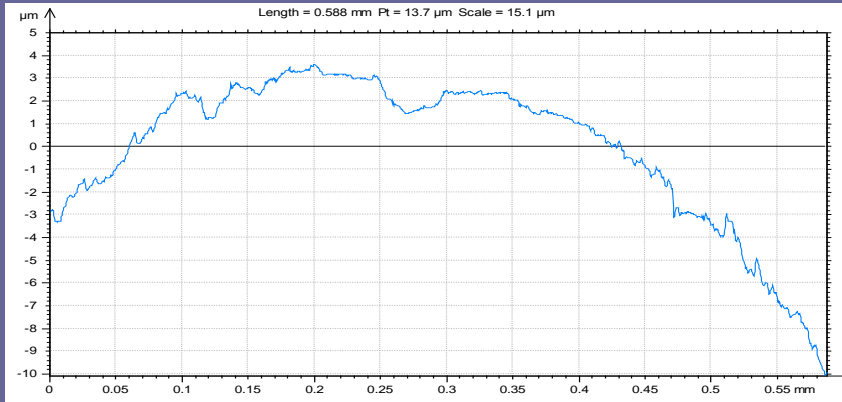
Rotational shifts and the decrease in signal to noise



10°



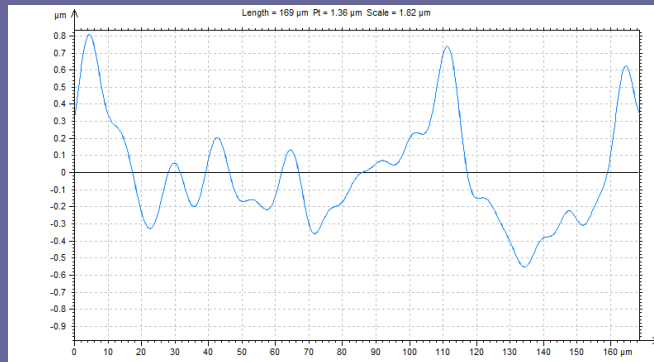
Results of the FFT filter using Mountains Map at 50x and 20x



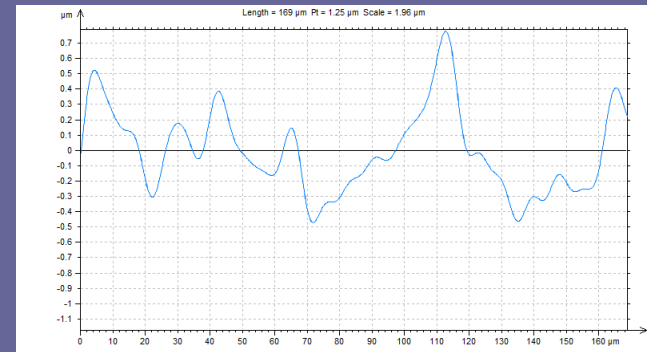


FFT on rotational images

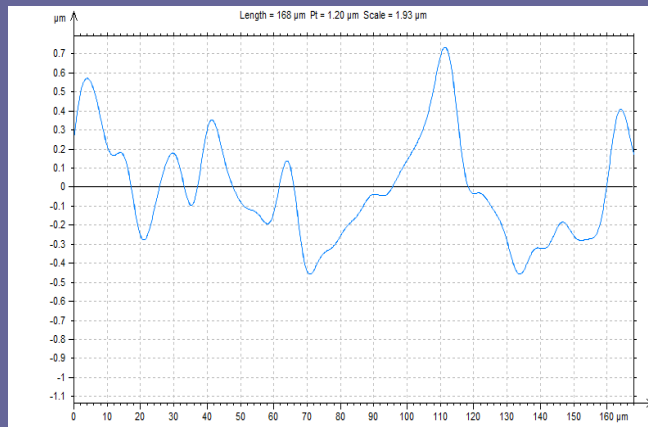
0°



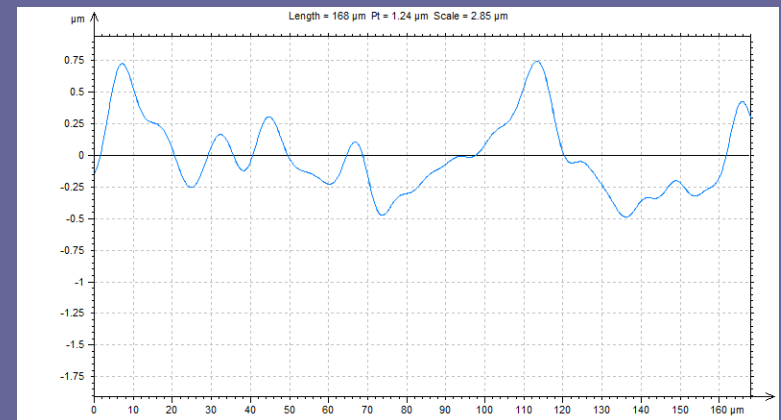
3°

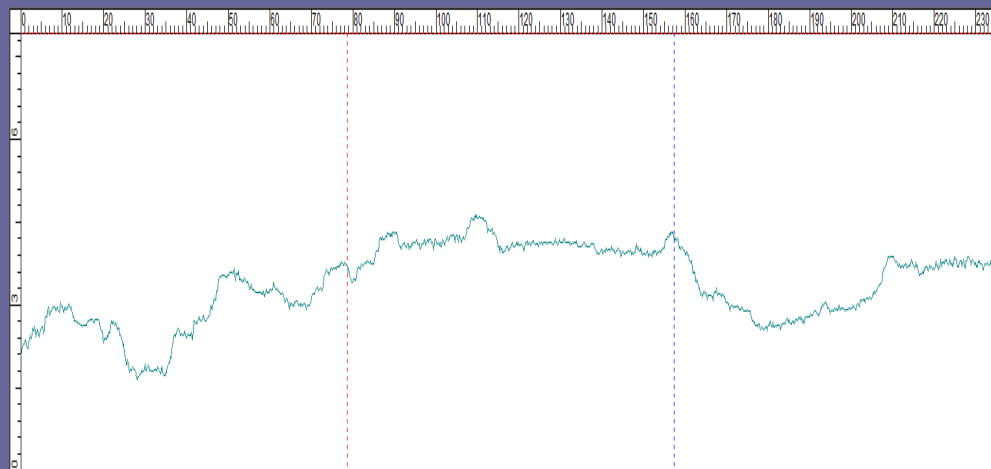
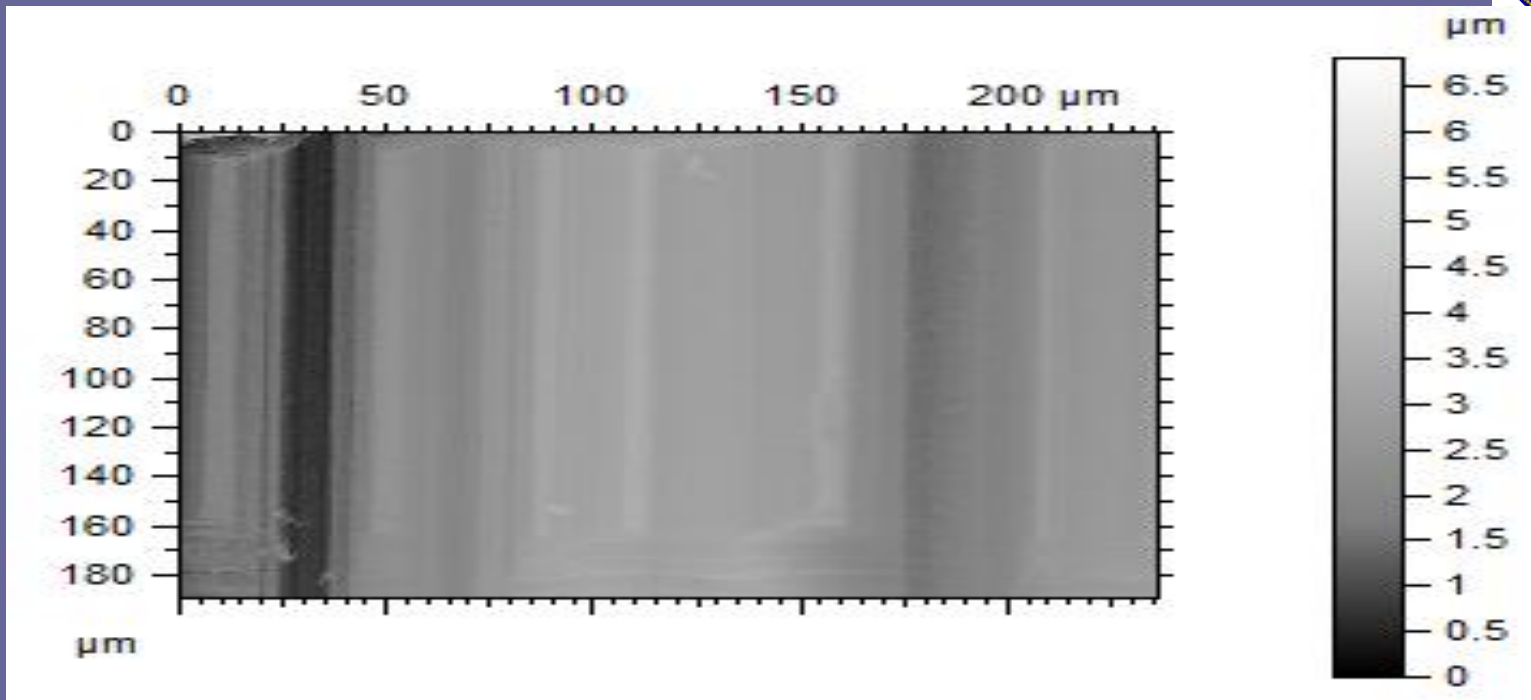


5°

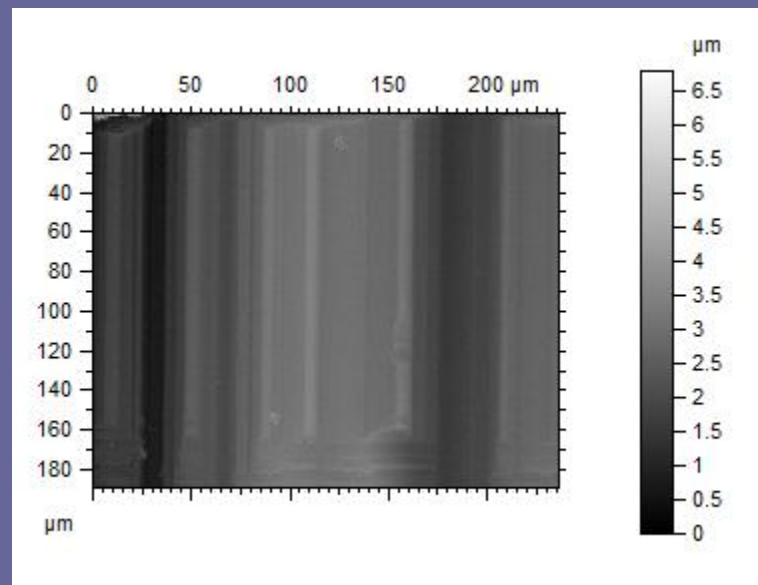
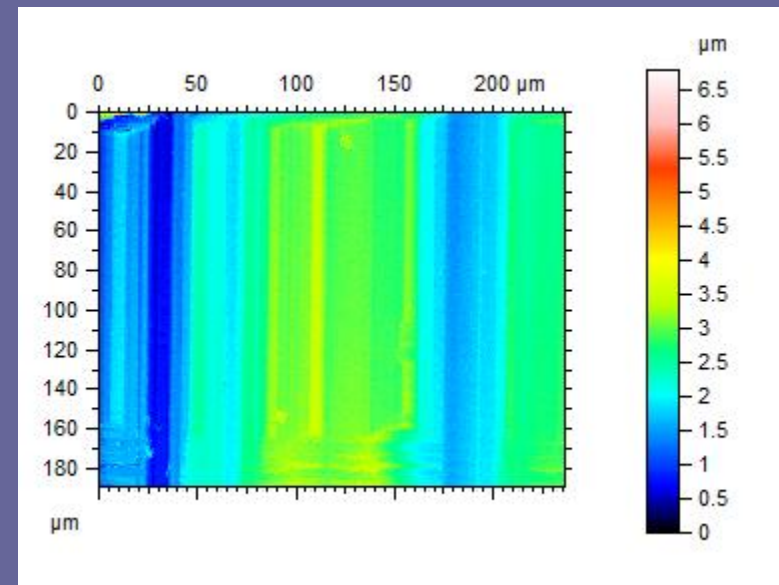
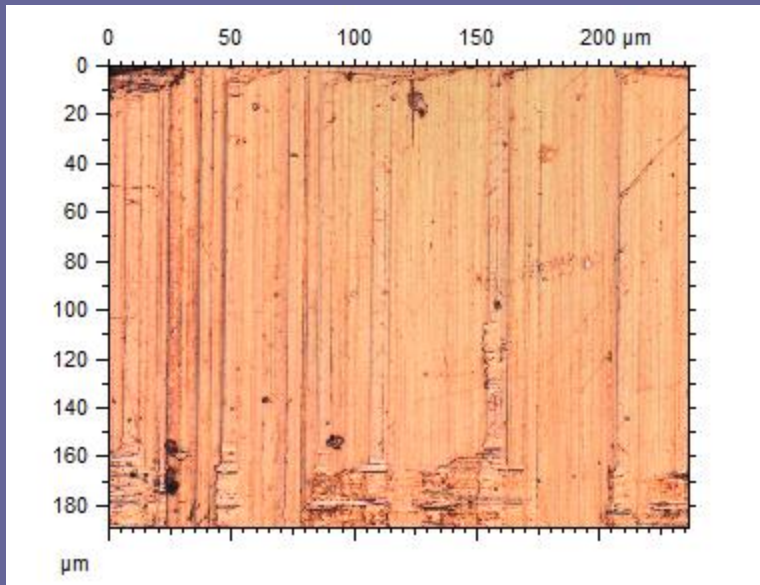


10°



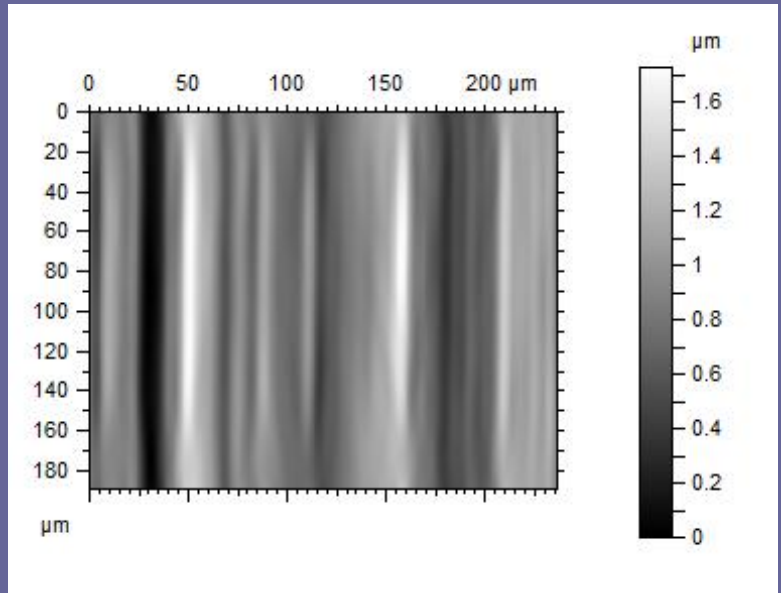
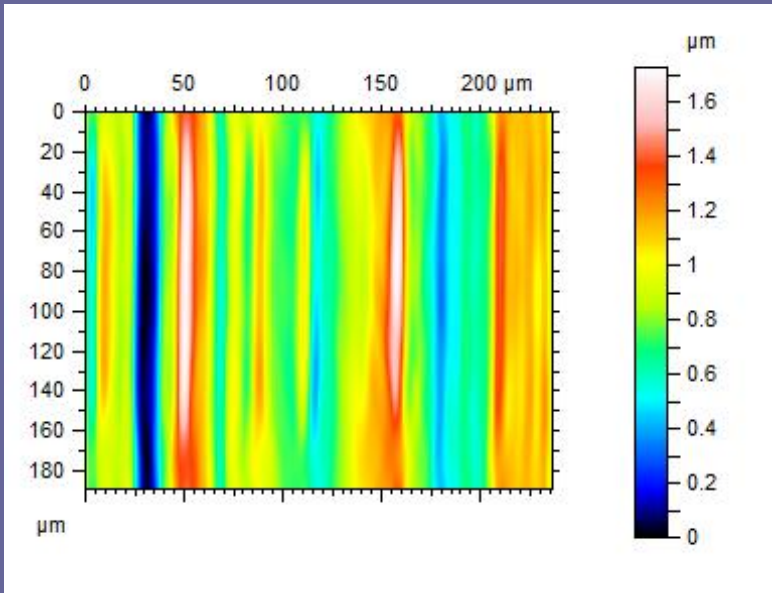
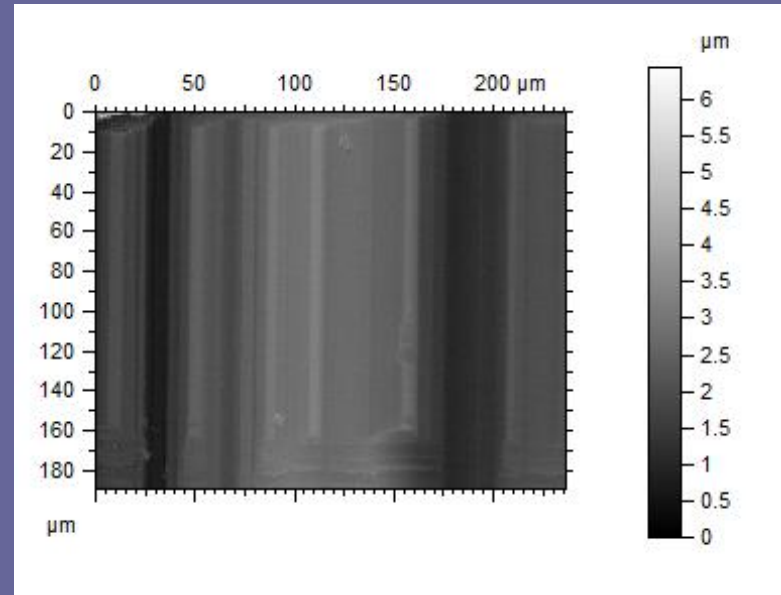
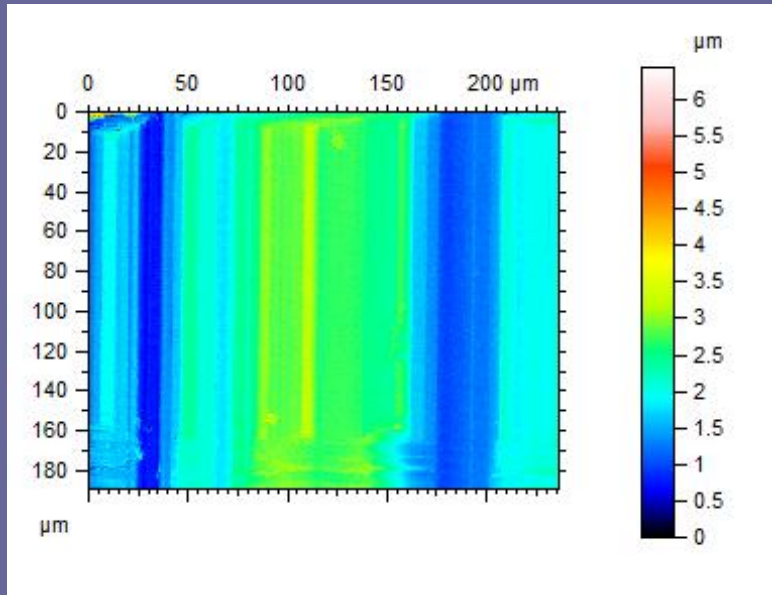


Raw data from the NIST un-etched standard bullet TDC



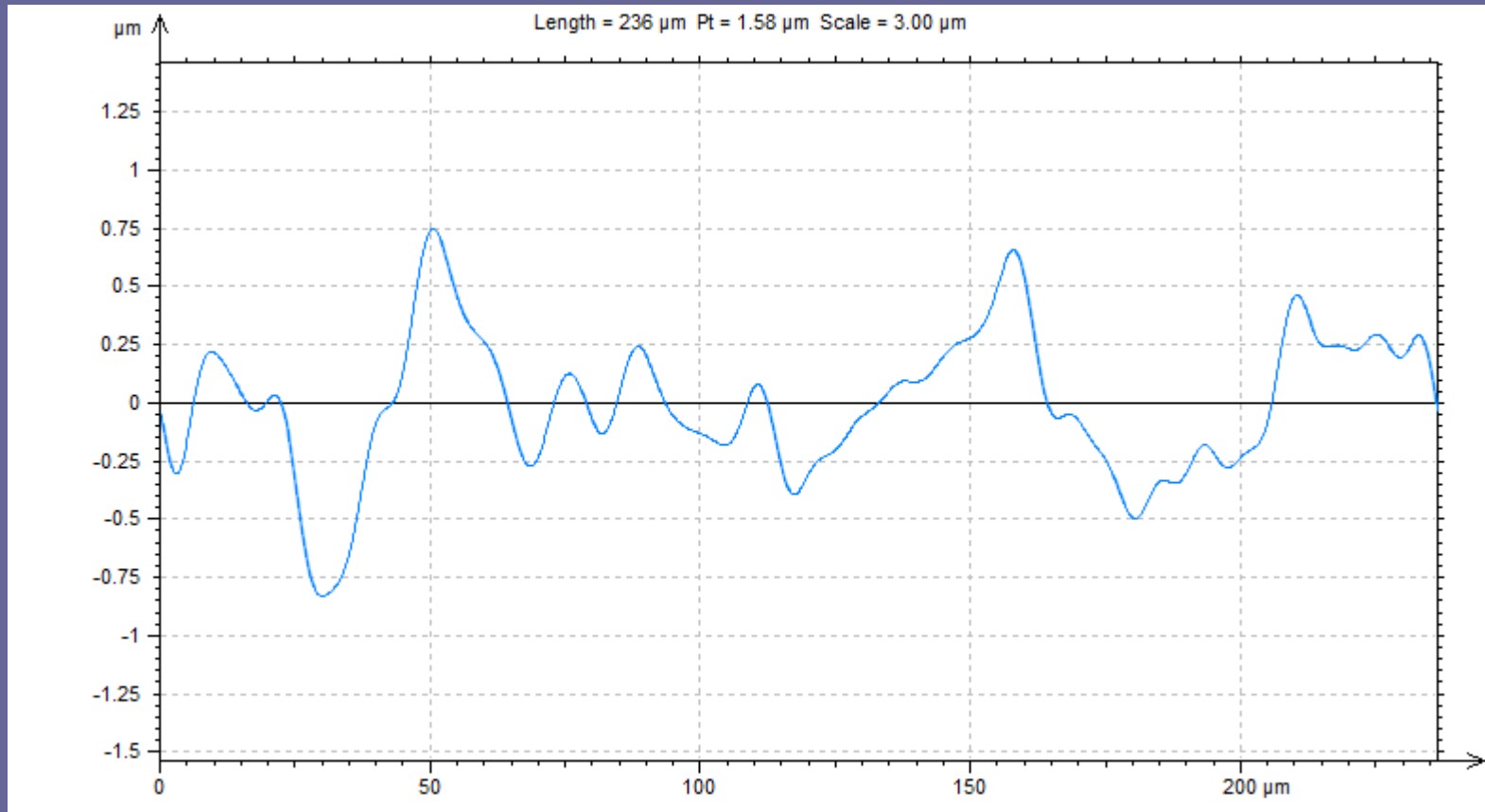


The un-etched data after leveling and FFT filtering

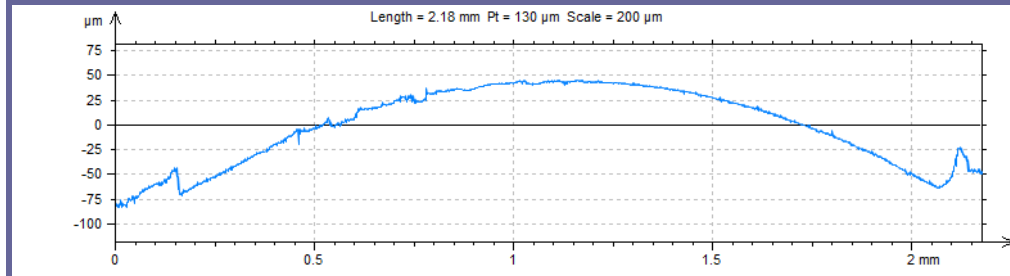
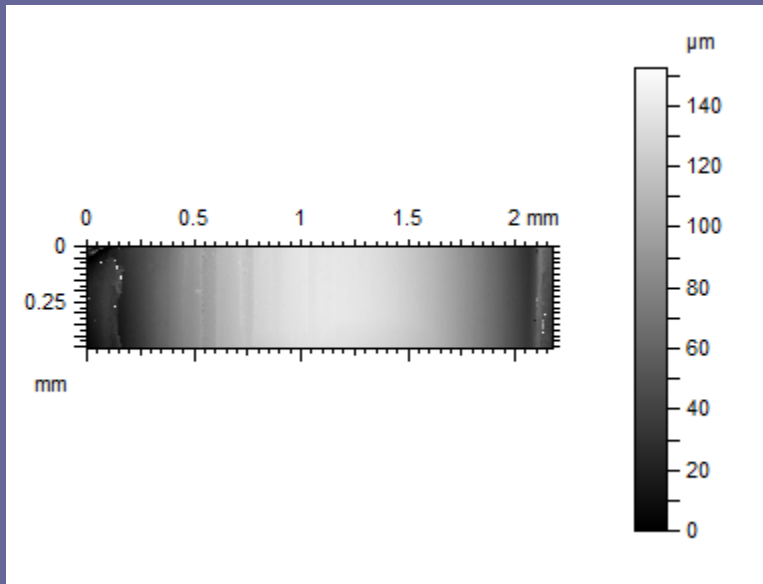
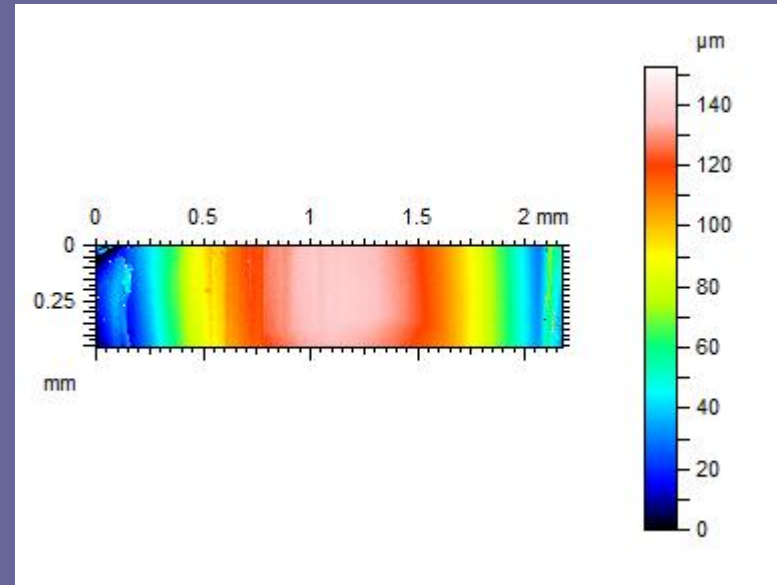
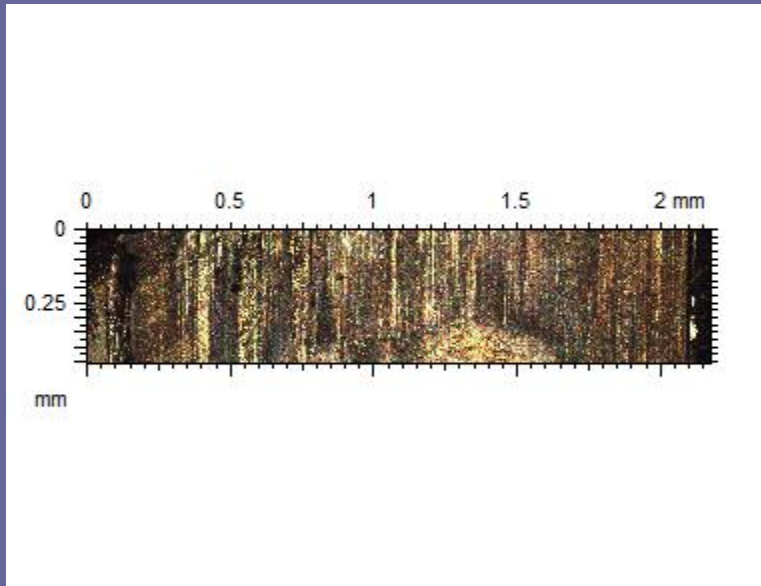




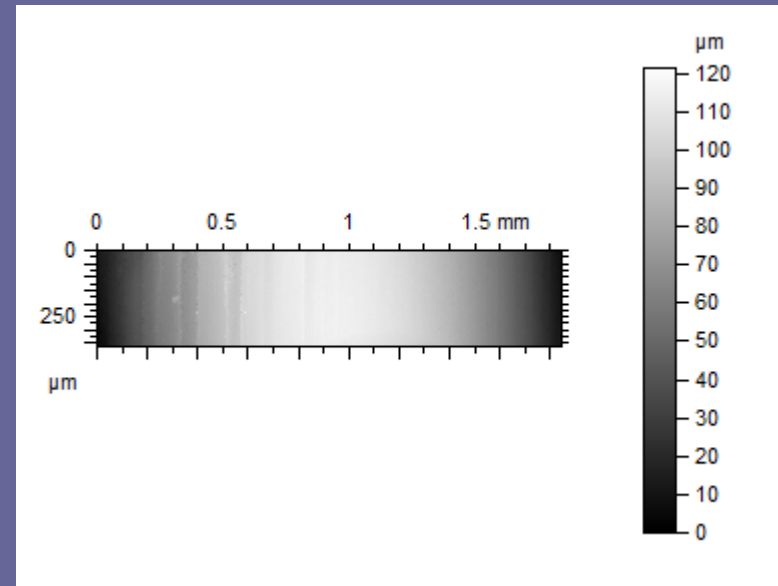
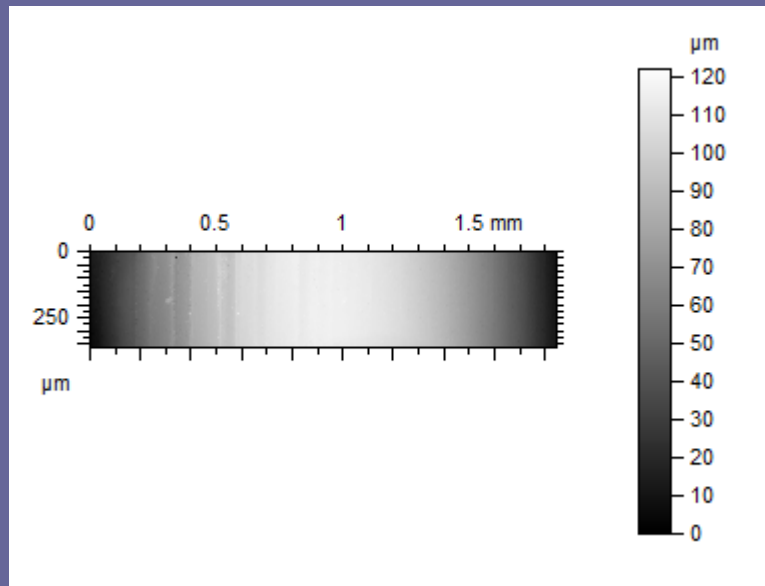
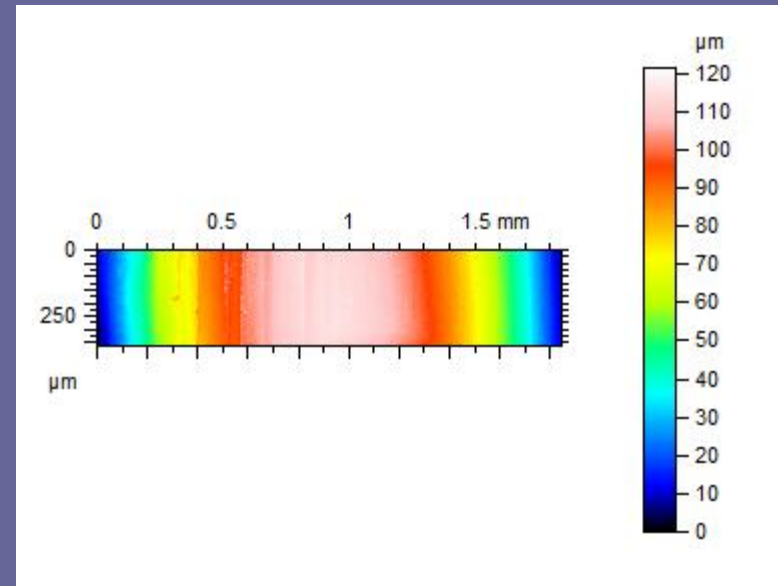
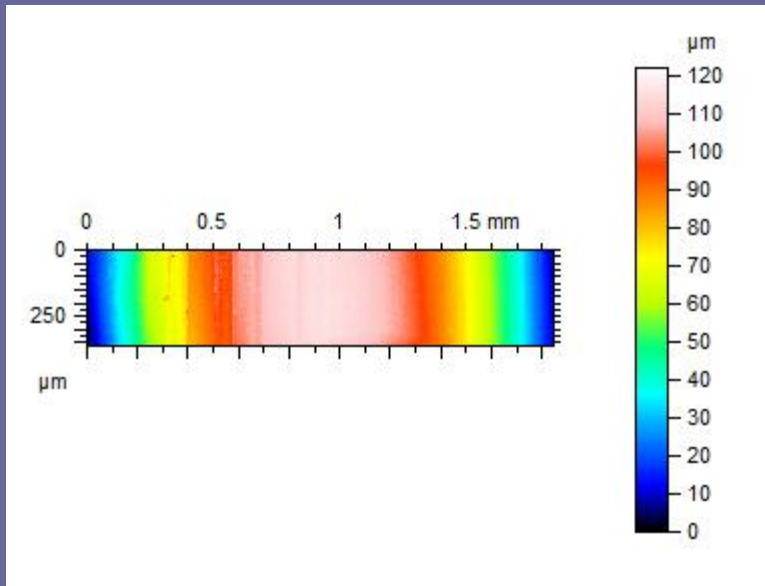
Final filtered profile



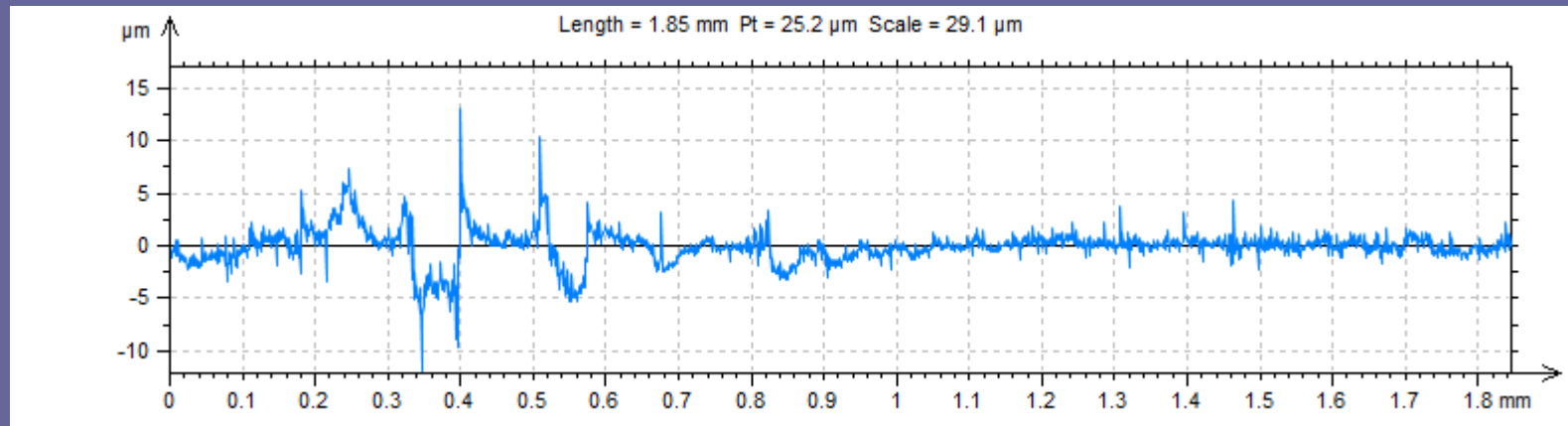
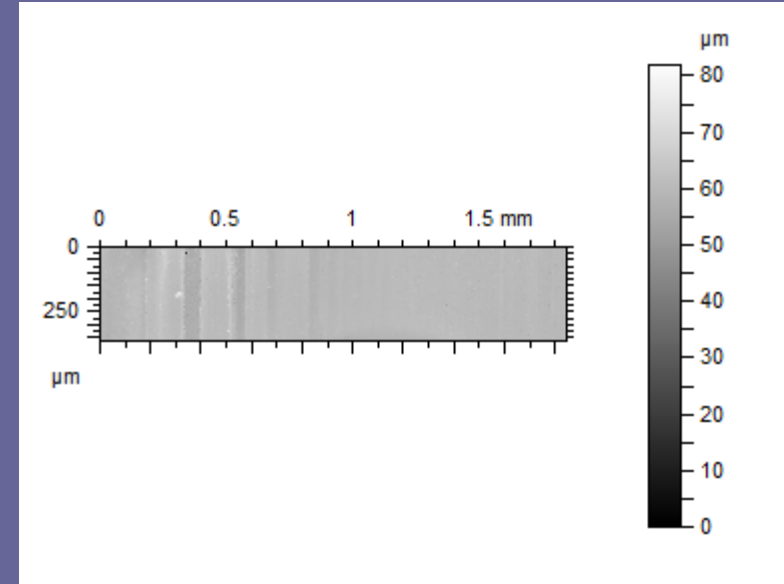
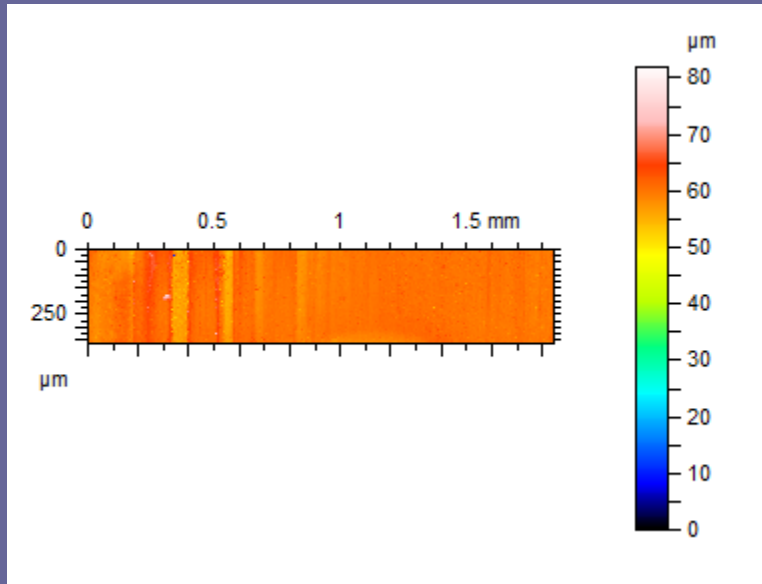
Raw data from the land impression of a fired bullet



Processed data from the land impression of a fired bullet

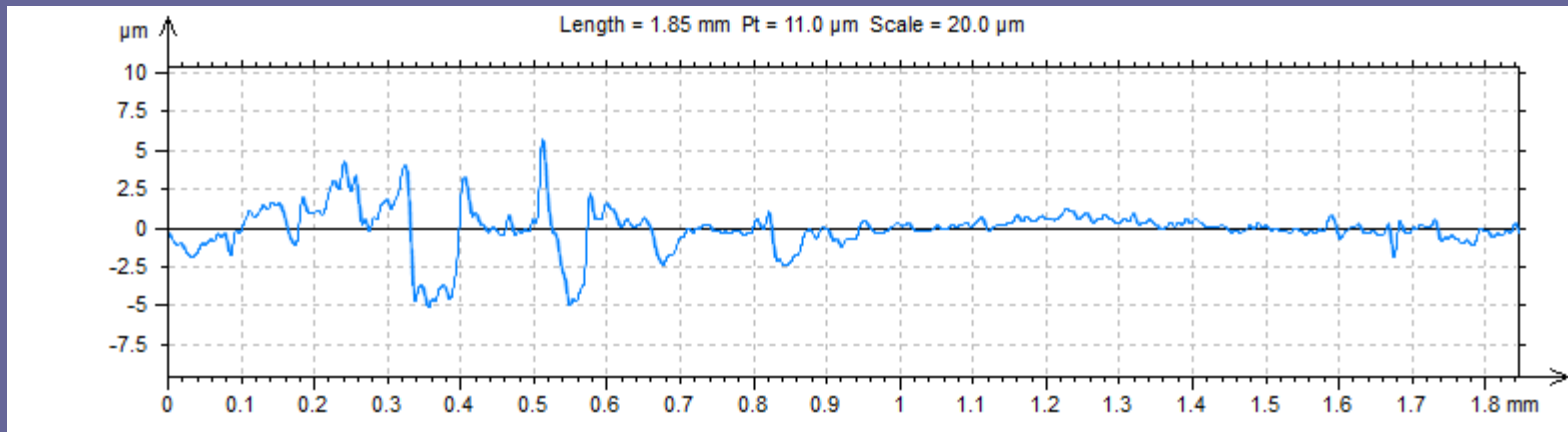
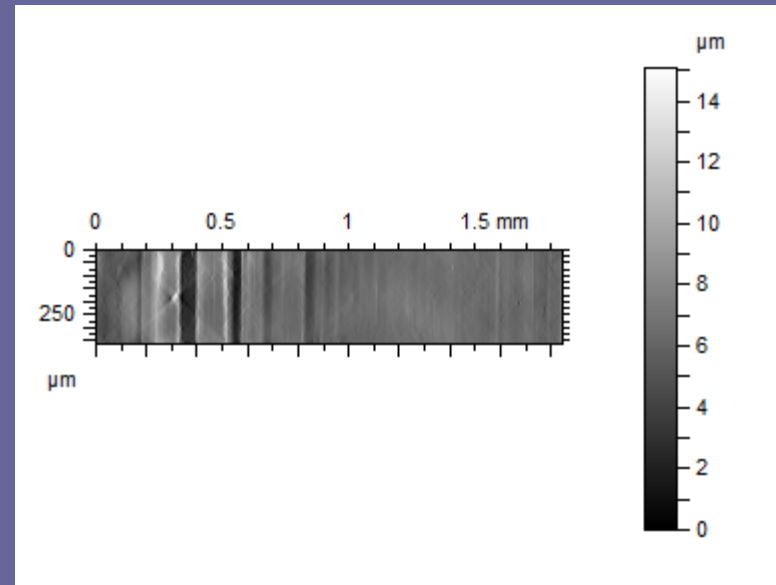
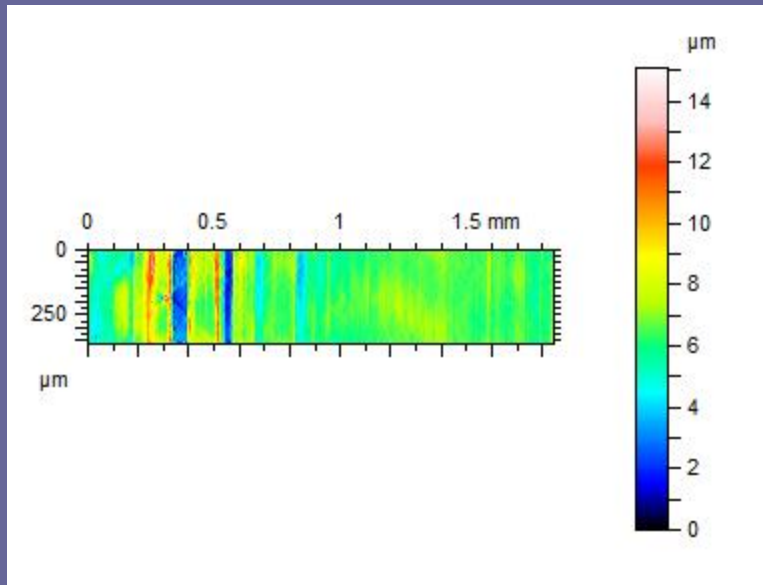


After form removal





After FFT filtering





Three land impressions from successive firings

