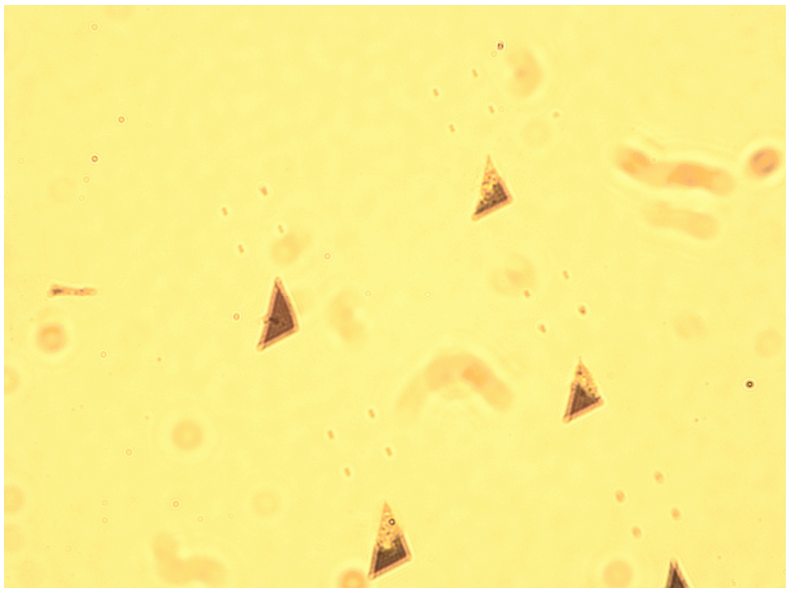
Plasmonics

We investigate the ability of small metallic particles to sustain coherent electron oscillation known as surface plasmon polariton leading to electromagnetic fields confined to the metallic surface. These coherent oscillations lead to strong enhanced fields at the surface of these metallic nanostructures, as well as in its immediate vicinity.
Our work focuses on the ability of these confined light fields to generate strong enhancement of Optical fields and nonlinear optical processes. We investigate the enhancement of third harmonic light produced at the interface of air and dielectric scanned across nanostructures due to ultrafast excitation, and the possibility of concentrating its energy in different parts of the system by means of coherent control. This technique is used to determine and characterize reduction of the threshold for plasma formation or permanent damage in a wide variety of self-organized nanostructures termed laser induced optical breakdown (LIOB).
We propose to study the modes structures around these noble metal nanostructures by means of electron energy loss spectroscopy (EELS). This work will have important practical significance to the understanding of the catalytic properties of metal particles and a great impact on nonlinear laser scanning microscopy of biological samples.



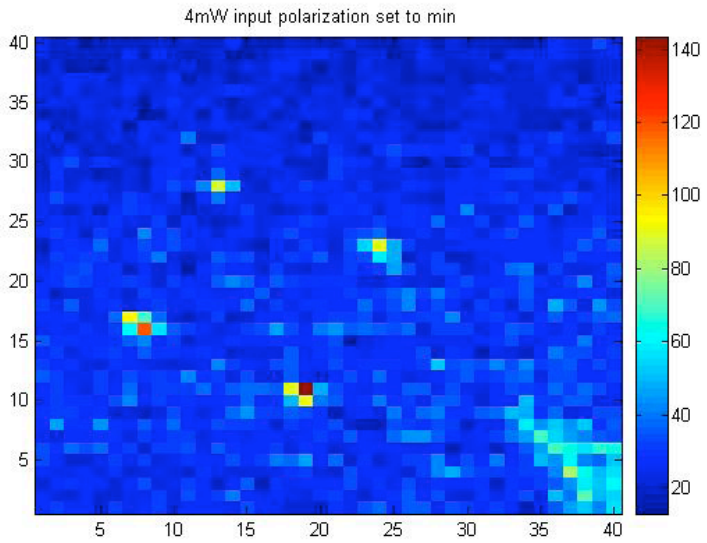


Figure 1: (a) 40X view e-beam sample: a set of four 10 nano-lines 50nm apart, 500nm long; the triangle faded tip point towards the set of 4 nano-lines. (b) Intensity graph of THG 2-D scan (50 X 50 μm) scan of nano-lines and the resulting THG enhanced signal