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Design of Scattering Scanning Near-field Optical Microscope
DUSTIN SCHRECONGOST, West Virginia University — The objective of this work is to construct a functional scattering type Scanning Near-Field Optical Microscope (s-SNOM), and to understand the working mechanisms. An s-SNOM is an instrument made of two separate instruments working in unison. One instrument is a scanning optical microscope focusing light onto a raster scanning sample surface. The second is an Atomic Force Microscope (AFM) operating in noncontact mode. The AFM uses a small probe that interacts with the sample surface to map out the topography of the surface. An s-SNOM uses both instruments simultaneously by focusing the light onto the probe of the AFM. This probe acts as a nano-antenna and confines the light allowing for light-matter interaction to be inferred below the resolution of the diffraction limit of light. This s-SNOM system is ultra-high vacuum compatible and variable temperature. It is efficient at collecting scattered light due to the focusing objective being an elliptical mirror which collects 360^{o} of light around the major axis. This s-SNOM system will be used for direct imaging of surface plasmons. Intended works are inducing surface plasmons on graphene and InSe thin films. Also dielectric properties of materials will be interpreted such as metal-insulator phase transitions in NbO_2 and VO_2.

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