

Defense Announcement

Multi-Spectral Laser Scanning Confocal Microscopy with Structured Illumination

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There is a need for high-resolution laser imaging system for health/life science and industrial applications, especially for microelectronics wafer inspection with increasingly shrinking feature size and nano materials characterization. A variety of super resolution methods have been invented in the last two decades to overcome the light diffraction limit barrier (so called Abbe's theory), such as structured illumination microscopy (SIM) and related techniques. This dissertation introduces a novel method of combining SIM and laser scanning confocal microscopy, which is widely used in industrial metrology inspection and health/life science. This technique is multi-spectral-scalable, and provides a dye-free solution to bypass Abbe's resolution barrier and can be easily implemented in most of the existing confocal microscopes. The theoretical concept, numerical simulations, structured illumination imaging results, and multi-spectral imaging results are presented in this dissertation.