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Sub-nanoscale Resolution for Microscopy via Coherent Population Oscillations KISHOR KAPALE, Western Illinois University, Macomb, IL 61455, GIRISH AGARWAL, Oklahoma State University, Stillwater, OK 74078 — We present microscopy schemes to attain sub-nanoscale resolution based on two phenomena—coherent population trapping (CPT) and coherent population oscillation (CPO). The CPT based method uses three-level atoms coupled to amplitude modulated probe field and a spatially dependent drive field. Whereas, the CPO based schemes involve two-level atoms coupled to two optical fields slightly different in frequency. The modulation of the probe field (in CPT-based scheme) allows us to tap into the steep dispersion normally associated with electromagnetically induced transparency and offers an avenue to attain sub-nanometer resolution using just the optical fields. CPO-based schemes offer similar resolution as the CPT-based schemes but they are attainable in a larger class of materials. It is known that group velocity manipulations with the CPO effect have been observed in room temperature solids and biological samples as opposed to in atomic vapors and cold atomic gases in the case of CPT. This parallel allows us to extend our CPT-based work to CPO-based microscopy schemes and makes them attainable in much larger class of materials including solids and biological samples.

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