

Hanle electromagnetically induced transparency and absorption resonances with a Laguerre Gaussian beam.

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We describe a computational and experimental study on Hanle electromagnetically induced transparency and absorption resonance line shapes with a Laguerre Gaussian (LG) beam, which has a spatially varying phase factor and mode amplitude. It is seen that the LG beam profile brings about a significant narrowing in the line shape of the Hanle resonance and ground-state Zeeman coherence in comparison to a Gaussian beam. It is shown by computation and experiment that this narrowing can be attributed to the azimuthal mode index of the LG field which induces long-lived Zeeman coherences.

LG field induced narrowing of EIT/EIA profiles may have several important applications such as atomic clocks, magnetometers, slow light etc. Further experiments on coherence induced phenomenon using spatially varying optical fields are in progress.