Title:	Experiments on sub-tomographic imaging of a transparent birefringent phase pattern localized in a phase space.
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Abstract:	In conventional imaging experiments, optically responsive objects localized in position space are imaged using a lens and hence viewed by the human eye. Recently, a counter intuitive concept and experiment on a three-dimensional tomographic imaging of a pat- tern localized in a phase space of atoms has been introduced in a paper entitled "Three- dimensional classical imaging of a pattern localized in a phase space, Phys. Rev. A 98, 053828". In the mentioned experiment, objects imaged were three 2D transparent masks. The experiment was based on the concept of velocity-selective hole-burning in the Doppler broadened absorption profile of an atomic gaseous medium. The object laser beam interacted with the objects and imprinted their tomographic images onto the phase space of an atomic medium. These patterns in phase space were localized in unique 3D subspace of 6D phase space spanned by x̂, ŷ and p ˆ z coordinates. These tomographic images in phase space were then captured by image laser beam. By varying the frequency of image laser beam, tomographic images at different locations on momentum axis were captured. However, method employed in this experiment can imprint and image only light absorbing objects. The work in this thesis presents an experiments to imprint a transparent birefringent phase pattern onto a phase space of an atomic gaseous medium. A position space localized 2D transparent birefringent phase pattern is produced with a spatial light modulator (SLM). This position space localized pattern is imprinted onto the phase space of rubidium atoms at room temperature by using atomic state depen- dent velocity selective hole burning. The phase space localized transparent pattern is imaged by measuring the atomic state population difference induced phase shift at differ- ent detunings. Sub-tomographic images of the transparent phase space localized pattern obtained in this experiment are inverted with respect to each other. This transparent birefringent phase pattern donot absorb light but exhibit polarization dependent phase shift of the transmitted light. Therefore, these alphabets can modify the polarization of the transmitted light without absorption. The idea and technique reported in this thesis are inspired by the imprinting and tomographic imaging of such tranparent birefringent phase pattern.
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