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Microwave De-excitation schemes for Rydberg Hydrogen Atoms
LUCA PEROTTI, DANIEL VRINCEANU, Texas Southern University — Control of Rydberg atom wavefunctions has evolved from static or periodic protocols to transport ones, exploiting either modulation or chirping of the controlling periodic field. Applications vary from quantum computing schemes using excitation blockades to the production of anti-hydrogen atoms in Penning traps. Theoretical studies have essentially been limited to 1-D models. Applications such as the production of anti-hydrogen atoms mentioned above, instead require the study of some 3D statistical ensemble of orbits. Our preliminary numerical 3D studies show that chirping of the microwave field is most effective in de-exciting atoms that are almost one dimensional, as transport terminates when the two parabolic quantum numbers are equal, thus seriously limiting its efficiency for initial states which are not almost 1D. Alternative approaches are suggested.

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