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Structured Rydberg Excitations

Rydberg atoms are highly excited atoms with strong and highly tunable interactions, which makes them into great building blocks for quantum simulation and computation. For these applications, we typically require the Rydberg excitations to reside on regularly spaced locations. However, this situation is not easy to realise in the laboratory, due to various complicating factors. Merely switching on an excitation laser will typically not do the trick. In this talk I will discuss two distinct ways to create structured Rydberg excitations in an atomic gas. In the first half, I will discuss temporal shaping of an laser excitation pulse to create 'Rydberg crystals', a technique which has recently been demonstrated experimentally. In the second half of the talk, I will discuss recent experiments where the excitation laser is shaped spatially. Although the second method sounds conceptually very simple, there is some exciting new technology behind it in the form of a so-called Spatial Light Modulator.



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