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Online Seminar

Swing-up of quantum emitter population using detuned pulses

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The controlled preparation of the excited state in a quantum emitter is a prerequisite for its usage as single-photon sources - a key building block for quantum technologies. Several different excitation schemes are already well-established to perform this control.

In this talk, we promote a radically different approach, making use of pulse modulation. Using our scheme, it is possible to excite a two-level emitter using two detuned laser pulses, where both lasers are tuned below the transition energy of the emitter.

In contrast to existing off-resonant schemes, our approach is coherent, and can not excite states of higher energy, if the laser energy is chosen accordingly.

In the next step, we analyze the applicability of the scheme on a semiconductor quantum dot. In this case, the excitation is several meV below the band gap, i.e., far away from the detection frequency, allowing for easy spectral filtering. But due to the universality of the scheme, it can be used on any two-level type emitter, including those present in modern 2D-materials. Thereby, we present a scheme with a broad range of possible applications, many of which have yet to be explored.

