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Spectroscopy of Rydberg atoms in a high-magnetic-field atom trap[1] ERIC PARADIS, STEFAN ZIGO, GEORG RAITHEL, University of Michigan — We study cold Rydberg atoms and their interactions in a high-magnetic-field atom trap with a central magnetic field of 2.6 Tesla. The presence of the large magnetic field creates a wide spectrum of non-degenerate Rydberg states that can be tailored towards Rydberg-atom interaction experiments by fine-tuning the magnetic field and adding a longitudinal electric field. To enable these experiments, we have calculated the spectra of high-lying Rydberg states of Rubidium 85 in parallel magnetic and electric fields, taking all known quantum defects and fine-structure effects into account. We identify near-degenerate pairs of states with equal magnetic quantum number and opposite z-parity (for electric field zero). These states couple strongly when a parallel electric field is applied, resulting in large, tunable permanent electric dipole moments that should enhance Rydberg-Rydberg interactions. Field tuning can also be used to induce energy exchange resonances (Förster resonances). In this presentation, we will discuss the calculated spectra and spectroscopic measurements on Rydberg atoms in the magnetic atom trap. Progress towards superimposing a far-off-resonant optical trap onto the high-magnetic-field trap is also reported.

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