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Quantum spinor gases of dipolar fermions.[1] LAURIANE CHOMAZ, SIMON BAIER, DANIEL PETTER, ALEXANDER PATSCHEIDER, JAN HENDRICK BECHER, GABRIELE NATALE, Universitt Innsbruck, MANFRED MARK, FRANCESCA FERLAINO, Universitt Innsbruck, IQOQI — Ultracold gases of highly magnetic atoms such as erbium offer an ideal platform for investigating novel aspects of many-body quantum phenomena in the presence of dipole-dipole interactions. We have realized and studied tunable spin mixtures of fermionic erbium 167. Our achievements rely on a lattice protection technics. In a first set of experiments, we explore the scattering properties of the two lowest spin states. We perform high resolution Feshbach spectroscopy and identify a comparatively broad interspin resonance in the vicinity of which, we precisely map the interspin scattering length as a function of the magnetic field via lattice modulation spectroscopy. This system paves the way for studying a broad range of physical phenomena from BEC-BCS crossover physics to lattice spin physics. In a second set of experiments, we prepare high-filling and pure samples of high spin states in a deep lattice and study the spin dynamics driven by off-site spin-changing dipolar interactions. A magnetization-conserving flip-flop dynamics shows a resonant behavior with the relative detuning of the neighboring spin states. We investigate the characteristic dependences of the dynamics on resonance, in particular with the spin state quantum number and with the quantization axis.

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