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Effects of spin-exchange collisions on atomic radio-frequency spectroscopy CHUANPENG HAO, YUAN ZHU, ZHERU QIU, QI SUN, DONG SHENG, University of Science and Technology of China — A far-off-resonance radio-frequency (rf) field, oscillating in the direction perpendicular to the bias magnetic field, could modify the atomic gyromagnetic ratio. In cases of negligible atomic collisions, it has been well established that the modified gyromagnetic ratio is a zero-order Bessel function of the rf field parameters. In this talk, we show our efforts to study this spectroscopy in presence of strong spin-exchange collisions. We focus on the spin-exchange-relaxation-free (SERF) regime where spin-exchange collisions are much faster than the spin precession. In this regime, the modified atomic gyromagnetic ratio shows different relations with the rf field parameters, depending on the spin-exchange collision rate, bias magnetic field amplitude, and nuclear spin number. A surprising turning point appears when the spin-exchange collision rate is comparable with the rf field detuning.

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