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Sommario/riassunto	Hybrid quantum circuits interfacing rare earth spin ensembles with microwave resonators are a promising approach for application as coherent quantum memory and frequency converter. In this thesis, hybrid circuits based on Er and Nd ions doped into Y ₂ SiO ₅ and YAlO ₃ crystals are investigated by optical and on-chip microwave spectroscopy. Coherent strong coupling between the microwave resonator and spin ensemble as well as a multimode memory for weak coherent microwave pulses are demonstrated.