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Atomic clock transitions in NV centers in diamond CECILE GREZES, YUIMARU KUBO, MICHAEL STERN, CEA-Saclay, IGNACIO ALVIZU, Pontificia Universidad Catolica, BRIAN JULSGAARD, Aarhus University, TAKASHI UMEDA, JUNICHI ISOYA, Tsukuba University, JERONIMO MAZE, Pontificia Universidad Catolica, VINCENT JACQUES, ENS de Cachan, KLAUS MOELMER, Aarhus University, DENIS VION, DANIEL ESTEVE, PATRICE BERTET, CEA-Saclay — Progress towards a spin-ensemble based quantum memory for superconducting qubits has been made over the past few years, involving reversible coherent storage and retrieval of a single microwave photon from a qubit into the spin ensemble [1]. In this experiment, the storage time is however limited to few 100ns by inhomogeneous broadening of the ensemble, and refocusing techniques like Hahn echo have to be applied to benefit from their long coherence times [2]. First experimental results with refocusing will be presented demonstrating the storage and retrieval of a few-photon field into an ensemble of electronic spins (NV centers in diamond) with storage time up to 40μs. Of particular importance in this adaptation of Hahn echo techniques for quantum memory are so-called 'clock transitions' where the spin frequency is insensitive to first order magnetic field fluctuations, leading to longer coherence times [3]. We study the spectrum and coherence time of an ensemble of ^{14}NV centers, and reveal the existence of three such clock transitions.

[1] Y. Kubo, PRL 107, 220501 (2011).
[2] B. Julsgaard, PRL 110, 250503 (2013).
[3] G. Wolfowicz, Nature Nano 8, 561-564 (2013).

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