

# Quantum Memory for Hard X-Ray Photons

X ZHANG<sup>1</sup> AND O A KOCHAROVSKAYA<sup>1</sup>

<sup>1</sup>*Department of Physics and Astronomy, Texas A&M University, Mitchell Physics Building, 578 University Drive, College Station, TX, USA. Contact Phone: +1-979-324-4928  
Contact Email: kochar@physics.tamu.edu*

Hard X-ray – nuclear interfaces offer unique potential advantages over optical-atomic systems for room temperature, solid-state quantum information processing, including lower background noise, tighter photon focusing, larger bandwidth, larger emitters densities, and exceptionally high resonance qualities.

Quantum memories, enabling reliable storage and retrieval of quantum states of light in atomic medium are required for the long-distance quantum networks, synchronization of different processes in quantum computation and realization of on-demand single photon sources. While several memory protocols have been realized for optical photon qubits, the storage of hard X-ray photons has remained an outstanding challenge. Recently, nuclear quantum memory has been demonstrated for the first time in hard X-ray range in a set of synchronously moving nuclear absorbers [1]. However, on-demand retrievals of stored photons in such a setup have not been achieved. Two new protocols for realization of on-demand quantum memory in the stationary absorbers (which extend the optical gradient echo memory and atomic frequency comb techniques to the hard-X-ray range) have been proposed recently [2,3]. We will discuss these proposals and the feasibility of their experimental demonstration.

## References

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