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Quantum Logic Enabled Test of Discrete Symmetries TIMKO DUBIELZIG, MALTE NIEMANN, ANNA-GRETA PASCHKE, IQO and QUEST, Leibniz University Hannover, Germany, MARTINA CARSJENS, MATTHIAS KOHNEN, CHRISTIAN OSPELKAUS, IQO and QUEST, Leibniz University Hannover and PTB Branschweig, Germany — Much progress has been made recently towards a CPT test with baryons based on the (anti-)proton's magnetic moment [1, 2]. A big challenge in any such experiment is the spin state measurement for single (anti-)protons, which has not been realized yet at the single-shot level, as would be desirable for an accurate and competitive g-factor CPT test. We describe concepts and simulations for an experiment which will implement single-shot fast readout using quantum logic operations according to the proposal by Heinzen and Wineland [3]. We discuss trapping geometries, concepts for single (anti-)proton rf sideband control, and for ground state cooling of the atomic quantum logic ion at fields exceeding 1 Tesla in a miniaturized Penning trap.

[1] S.Ulmer et al., Phys. Rev. Let. 106, 253001 (2011)
[2] N. Guise et al., Phys. Rev. Let. 104, 143001 (2010)
[3] Heinzen and Wineland, PRA 42, 2977 (1990)

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