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**Complete ultrafast optical coherent control and spin echo of single InAs quantum dot spins** KRISTIAAN DE GREVE, PETER MCMAHON, DAVID PRESS, Ginzton Labs, Stanford University, THADDEUS LADD<sup>1</sup>, Ginzton Labs, Stanford University and National Institute of Informatics (NII), Tokyo, CHRISTIAN SCHNEIDER, DIRK BISPING, MARTIN KAMP, LUKAS WORSCHKECH, SVEN HOEFLING, ALFRED FORCHEL, Technische Physik, Physikalisches Institut, Wilhelm Conrad Röntgen Research Center for Complex Material Systems, Universität Würzburg, YOSHIHISA YAMAMOTO, Ginzton labs, Stanford University and National Institute of Informatics (NII), Tokyo — We report on recent progress on the complete ultrafast optical coherent control of individual InAs quantum dot spin qubits. We demonstrate Rabi-oscillations and Ramsey-fringes, and implement a spin echo to overcome time-averaged dephasing.<sup>2</sup> We probe the hyperfine interaction of a single spin using optical pulse control. Interesting non-Markovian dynamics could be observed in the single electron spin free-induction decay, resulting from feedback between the strong electron spin Overhauser shift and spin dependent nuclear relaxation.<sup>3</sup>

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<sup>2</sup>D. Press, K. De Greve, P. McMahon *et al.*, Nat. Phot. **4**, 367 (2010)

<sup>3</sup>T. D. Ladd, D. Press, K. De Greve *et al.*, Phys. Rev. Lett. 105, 107401 (2010)

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