

## Microscopic control of Si 29 nuclear spins near phosphorus donors in silicon

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### Abstract

© 2015 American Physical Society. We demonstrate an efficient control of Si29 nuclear spins for specific lattice sites near P31 donors in silicon at temperatures below 1 K and in a high magnetic field of 4.6 T. Excitation of the forbidden electron-nuclear transitions leads to a pattern of well-resolved holes and peaks in the electron spin resonance (ESR) lines of P31. The pattern originates from dynamic polarization (DNP) of the Si29 nuclear spins near the donors via the solid effect. DNP of Si29 is demonstrated also with the Overhauser effect where the allowed ESR transitions are excited. In this case mostly the remote Si29 nuclei having weak interaction with the donors are polarized, which results in a single hole and a sharp peak pair in the ESR spectrum. Our work shows that the solid effect can be used for initialization of Si29 nuclear spin qubits near the donors.

<http://dx.doi.org/10.1103/PhysRevB.92.121202>

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