

Phonon-induced spin-spin interactions in diamond nanostructures: application to spin squeezing

Fri, 2013-05-10 14:06 - [Mattia Giardini](#) [1] **Date:** 2013-04-09

Author(s):

S. Bennett, N. Y. Yao, J. Otterbach, P. Zoller, P. Rabl, M. Lukin

Reference:

URL: <http://link.aps.org/doi/10.1103/PhysRevLett.110.156402> [2]

DOI: 10.1103/PhysRevLett.110.156402

PACS: 71.55.-i, 07.10.Cm, 42.50.Dv

We propose and analyze a novel mechanism for long-range spin-spin interactions in diamond nanostructures. The interactions between electronic spins, associated with nitrogen-vacancy centers in diamond, are mediated by their coupling via strain to the vibrational mode of a diamond mechanical nanoresonator. This coupling results in phonon-mediated effective spin-spin interactions that can be used to generate squeezed states of a spin ensemble. We show that spin dephasing and relaxation can be largely suppressed, allowing for substantial spin squeezing under realistic experimental conditions. Our approach has implications for spin-ensemble magnetometry, as well as phonon-mediated quantum information processing with spin qubits.

- [AQUTE](#) [3]
- [Result](#) [4]
- [04.60.+s Entanglement in mesoscopic/macroscopic systems](#) [5]
- [16.20.Dc Defect centers in diamonds](#) [6]

Source URL:

<http://qurope.eu/db/publications/phonon-induced-spin-spin-interactions-diamond-nanostructures-application-spin-squeez>

Links:

[1] <http://qurope.eu/users/giardini>

[2] <http://link.aps.org/doi/10.1103/PhysRevLett.110.156402>

[3] <http://qurope.eu/category/projects/ips/aqute>

[4] <http://qurope.eu/category/attribute/result>

[5] <http://qurope.eu/category/qics/00-quantum-information-science/04-entanglement-many-body-systems/0460s-entanglement-me>

[6] <http://qurope.eu/category/qics/10-quantum-computation/16-implementations-condensed-matter/1620dc-defect-centers-diamo>