

## Publications – Institute for Quantum Optics

- (1) Joas T, Schmitt S, Santagati R, Gentile A A, Bonato C, Laing A, McGuinness L P & Jelezko F **(2021)**: Online adaptive quantum characterization of a nuclear spin. *npj Quantum Information* (2021)7:56
- (2) Findler C, Lang J, Osterkamp C, Nesladek M & Jelezko F **(2020)**: Indirect overgrowth as a synthesis route for superior diamond nano sensors. *Scientific Reports* volume 10, Article number: 22404
- (3) Osterkamp C, Balasubramanian P, Wolff G, Teraji T, Nesladek M & Jelezko F **(2020)**: Benchmark for Synthesized Diamond Sensors Based on Isotopically Engineered Nitrogen-Vacancy Spin Ensembles for Magnetometry Applications. *Advanced Quantum Technologies* 2000074
- (4) Mindarava Y, Blinder R, Laube C, Knolle W, Abel B, Jentgens C, Isoay J, Scheuer J, Lang J, Schwartz I, Naydenov B & Jelezko F **(2020)**: Efficient conversion of nitrogen to nitrogen-vacancy centers in diamond particles with high-temperature electron irradiation. *Carbon*, Volume 170, 182-190
- (5) Genov G T, Ben-Shalom Y, Jelezko F, Retzker A & Bar-Gill N **(2020)**: Efficient and robust signal sensing by sequences of adiabatic chirped pulses. *PhysRevResearch* 2, 033216
- (6) Mindarava Y, Blinder R, Liu Y, Scheuer J, Lang J, Agafonov V, Davydov V A, Laube C, Knolle W, Abel B, Naydenov B & Jelezko F **(2020)**: Synthesis and coherent properties of  $^{13}\text{C}$ -enriched sub-micron diamond particles with nitrogen vacancy color centers. *Carbon*, Volume 65, 395-403
- (7) Lang J, Häußler S, Fuhrmann J, Waltrich R, Laddha S, Scharpf J, Kubanek A, Naydenov B & Jelezko F **(2020)**: Long optical coherence times of shallow-implanted, negatively charged silicon vacancy centers in diamond. *Applied Physics Letters* 116, 064001
- (8) Häußler S, Hartung L, Fehler K G, Antoniuk L, Kulikova L F, Davydov V A, Agafonov V N, Jelezko F & Kubanek A **(2019)**: Preparing single  $\text{SiV}^-$  center in nanodiamonds for external, optical coupling with access to all degrees of freedom. *New Journal of Physics* 21, 103047
- (9) Genov G T, Aharon N, Jelezko F & Retzker A **(2019)** Mixed dynamical decoupling. *Quantum Science and Technology*, Volume 4, Number 3
- (10) Fehler K G, Ovvyan A P, Gruhler N, Pernice W H P & Kubanek A **(2019)** Efficient Coupling of an Ensemble of Nitrogen Vacancy (NV-) to the Mode of a High-Q,  $\text{Si}_3\text{N}_4$  Photonic Crystal Cavity. *ACS Nano* 13, 6, 6891-6898
- (11) Metsch M H, Senkalla K, Tratzmiller B, Scheuer J, Kern M, Achard J, Tallaire A, Plenio M B, Siyushev P & Jelezko **(2019)** Initialization and Readout of Nuclear Spins via a Negatively Charged Silicon-Vacancy Center in Diamond. *Phys. Rev. Lett.* **122**, 190503
- (12) Häußler S, Benedikter J, Bray K, Regan B, Dietrich A, Twamley J, Aharonovich I, Hunger D & Kubanek A **(2019)** Diamond-Photonics Platform Based on Silicon-Vacancy Centers in a Single Crystal Diamond Membrane and a Fiber Cavity. *Phys. Rev. B* 99, 165310
- (13) Osterkamp C, Mangold M, Lang J, Balasubramanian P, Teraji T, Naydenov B & Jelezko F **(2019)** Engineering preferentially-aligned nitrogen-vacancy centre ensembles in CVD grown diamond. *Scientific Reports*, 9:5786
- (14) Siyushev P, Nesladek M, Bourgeois E, Gulka M, Hruby J, Yamamoto T, Trupke M, Teraji T, Isoya J & Jelezko F **(2019)** Photoelectrical imaging and

- coherent spin-state readout of single nitrogen-vacancy centers in diamond. *Science* Vol. 363, Issue 6428, pp. 728-731
- (15) Rogers L J, Wang O, Liu Y, Antoniuk L, Osterkamp C, Davydov V A, Agafonov V N, Filipovski A B, Jelezko F & Kubanek A **(2019)** Single SiV<sup>-</sup> centers in low-strain nanodiamonds with bulk-like spectral properties and nano-manipulation capabilities. *Phys. Rev. Applied* 11, 024073
  - (16) Dietrich A., Bürk M., Steiger E. S., Antoniuk L., Tran T. T., Nguyen M., Aharonovich I., Jelezko F. & Kubanek A. **(2018)** Observation of Fourier transform limited lines in hexagonal boron nitride. *Phys. Rev. B* 98, 081414(R)
  - (17) Unden T., Tomek N., Weggler T., Frank F., London P., Zopes J., Degen C., Raatz N., Meijer J., Watanabe H., Itoh K. M., Plenio M. B., Naydenov B. & Jelezko F. **(2018)** Coherent control of solid state nuclear spin nano-ensemble. *npj Quantum Information* 4, Article number: 39
  - (18) Nizovtsev A. P., Kilin S. Ya, Pushkarchuk A. L., Pushkarchuk V. A., Kuten S. A., Zhikol O. A., Schmitt S., Unden T. & Jelezko F. **(2018)** Non-flipping <sup>13</sup>C spins near an NV center in diamond: hyperfine and spatial characteristics by density functional theory simulation of the C<sub>510</sub>[NV]H<sub>252</sub> cluster. *New Journal of Physics* 20, 023022
  - (19) Frank F., Unden T., Zoller J., Said R. S., Calarco T., Montangero S., Naydenov B. & Jelezko F. **(2017)** Autonomous calibration of single spin qubit operations. *npj Quantum Information* 3, Article number: 48
  - (20) Scheuer J., Schwartz I., Müller S., Chen Q., Dhang I., Plenio M. B., Naydenov B. & Jelezko F. **(2017)** Robust techniques for polarization and detection of nuclear spin ensembles. *Phys. Rev. B* 96, 174436
  - (21) Stark A., Aharon N., Unden T., Louzon D., Huck A., Retzker A., Andersen U. L. & Jelezko F. **(2017)** Narrow-bandwidth sensing of high-frequency fields with continuous dynamical decoupling. *Nature Communications*, DOI: 10.1038/s41467-017-01159-2
  - (22) Siyushev P., Metsch M. H., Ijaz A., Binder J. M., Bhaskar M. K., Sukachev D. D., Sipahigil A., Evans R. E., Nguyen C. T., Lukin M. D., Hemmer P. R., Palyanov Y. N., Kupriyanov I. N., Borzdov Y. M., Rogers L. J., & Jelezko F. **(2017)** Optical and microwave control of germanium-vacancy center spins in diamond. *Phys. Rev. B* 96, 081201(R)
  - (23) Häußler S., Thiering G., Dietrich A., Waasem N., Teraji T., Isoya J., Iwasaki T., Hatano M., Jelezko F., Gali A. & Kubanek A. **(2017)** Photoluminescence excitation spectroscopy of SiV<sup>-</sup> and GeV<sup>-</sup> color center in diamond. *New Journal of Physics*, Volume 19
  - (24) Bhaskar M. K., Sukachev D. D., Sipahigil A., Evans R. E., Burek M. J., Nguyen C. T., Rogers L. J., Siyushev P., Metsch M. H., Park H., Jelezko F., Loncar M. & Lukin M. D. **(2017)** Quantum Nonlinear Optics with a Germanium-Vacancy Color Center in a Nanoscale Diamond Waveguide. *Phys. Rev. Lett.* 118, 223603
  - (25) Schmitt S., Gefen T., Stürner F.M., Unden T., Wolff G., Müller C., Scheuer J., Naydenov B., Markham M., Pezzagna S., Meijer J., Schwarz I., Plenio M., Retzker A., McGuinness L.P., Jelezko F. **(2017)** Submillihertz magnetic spectroscopy performed with a nanoscale. *Science*, Vol 356, Issue 6340, pages 832-837
  - (26) Binder J. M., Stark A., Tomek N., Scheuer J., Frank F., Jahnke K. D., Müller C., Schmitt S., Metsch M. H., Unden T., Gehring T., Huck A., Andersen U. L., Rogers L. J. & Jelezko F. **(2017)** Qudi: a modular python suite for experiment control and data processing. *SoftwareX*, Volume 6, 2017, Pages 85–90

- (27) Barson M. S. J., Peddibhotla P., Ovarthaiyapong P., Ganesan K., Taylor R. L., Gebert M., Mielens Z., Koslowski B., Simpson D. A., McGuinness L. P., McCallum J., Praver S., Onoda S., Ohshima T., Bleszynski Jayich A. C., Jelezko F., Manson N. B. & Doherty M. W. **(2017)** Nanomechanical Sensing Using Spins in Diamond. *Nano Lett.* DOI: 10.1021/acs.nanolett.6b04544
- (28) Jantzen U., Kurz A. B., Rudnicki D. S., Schäfermeier C., Jahnke K. D., Andersen U. L., Davydov V. A., Agafonov V. N., Kubanek A., Rogers L. J. & Jelezko F. **(2016)** Nanodiamonds carrying silicon-vacancy quantum emitters with almost lifetime-limited linewidths. *New J. Phys.* 18 073036
- (29) Uden T., Balasubramanian P., Louzon D., Vinkler Y., Plenio M. B., Markham M., Twitchen D., Stacey A., Lovchinsky I., Sushkov A. O., Lukin M. D., Retzker A., Naydenov B., McGuinness L. P., & Jelezko F. **(2016)** Quantum Metrology Enhanced by Repetitive Quantum Error Correction. *Phys. Rev. Lett.* 116, 230502
- (30) Wu Y., Jelezko F., Plenio M. B. & Weil T. **(2016)** Diamond Quantum Devices in Biology. *Angewandte Chemie-International Edition* 55, 6586-6598
- (31) Felgen N., Naydenov B., Turner S., Jelezko F., Reithmaier J. P., Popov C. **(2016)** Incorporation and study of SiV centers in diamond nanopillars. *Diamond and Related Materials* 64, 64–69
- (32) de Oliveira F. F., Ali Momenzadeh S., Antonov D., Scharpf J., Osterkamp C., Naydenov B., Jelezko F., Denisenko A. & Wrachtrup J. **(2016)** Toward Optimized Surface  $\delta$ -Profiles of Nitrogen-Vacancy Centers Activated by Helium Irradiation in Diamond. *Nano Letters*, 2016, 16 (4), pp 2228–2233
- (33) Rogers L. & Jelezko F. **(2016)** QUANTUM OPTICS Robust light-controlled qubits. *Nature Photonics* 10, 147–148
- (34) Chen Q., Schwarz I., Jelezko F., Retzker A. & Plenio M. B. **(2016)** Resonance-inclined optical nuclear spin polarization of liquids in diamond structures. *Phys. Rev. B* 93, 060408
- (35) Lovchinsky I., Sushkov A. O., Urbach E., de Leon N. P., Choi S., De Greve K., Evans R., Gertner R., Bersin E., Müller C., McGuinness L. P., Jelezko F., Walsworth R. L., Park H. & Lukin M. D. **(2016)** Nuclear magnetic resonance detection and spectroscopy of single proteins using quantum logic. *Science*. DOI: 10.1126/science.aad8022
- (36) Scheuer J., Schwartz I., Chen Q., Schulze-Sünninghausen D., Carl P., Höfer P., Retzker A., Sumiya H., Isoya J., Luy B., Plenio M. B., Naydenov B. & Jelezko F. **(2016)** Optically induced dynamic nuclear spin polarisation in diamond. *New J. Phys.* 18 013040
- (37) Lehtinen O., Naydenov B., Börner P., Melentjevic K., Müller C., McGuinness L. P., Pezzagna S., Meijer J., Kaiser U. & Jelezko F. **(2016)** Molecular dynamics simulations of shallow nitrogen and silicon implantation into diamond. *Phys. Rev. B* 93, 035202. DOI:<http://dx.doi.org/10.1103/PhysRevB.93.035202>
- (38) Scheuer J., Stark A., Kost M., Plenio M. B., Naydenov B. & Jelezko F. **(2015)** Accelerated 2D magnetic resonance spectroscopy of single spins using matrix completion. *Scientific reports* 5: 17728, DOI:10.1038/srep17728
- (39) Nagumo R., Brandenburg F., Ermakova A., Jelezko F. & Yatsui T. **(2015)** Spectral control of nanodiamond using dressed photon–phonon etching. *Applied Physics A*, 121:1335–1339, DOI 10.1007/s00339-015-9400-0
- (40) Mkhitarian V. V., Jelezko F. & Dobrovitski V. V. **(2015)** Highly selective detection of individual nuclear spins with rotary echo on an electron spin probe. *Scientific reports*. 5:15402, DOI:10.1038/srep15402

- (41) Zhang T., Neumann A., Lindlau J., Wu Y., Pramanik G., Naydenov B., Jelezko F., Schüder F., Huber S., Huber M., Stehr F., Högele A., Weil T. & Liedl T. **(2015)** DNA-Based Self-Assembly of Fluorescent Nanodiamonds. *J. Am. Chem. Soc.* 137, DOI: 10.1021/jacs.5b04857
- (42) Iwasaki T., Ishibashi F., Miyamoto Y., Doi Y., Kobayashi S., Miyazaki T., Tahara K., Jahnke K. D., Rogers L. J., Naydenov B., Jelezko F., Yamasaki S., Nagamachi S., Inubushi T., Mizuochi N. & Hatano M. **(2015)** Germanium-Vacancy Single Color Centers in Diamond. *Scientific reports.* 5:12882, DOI:10.1038/srep12882
- (43) Kong X., Stark A., Du J., McGuinness L. P. & Jelezko F. **(2015)** Towards Chemical Structure Resolution with Nanoscale Nuclear Magnetic Resonance Spectroscopy. *Phys. Rev. Applied.* 4:024004, DOI:http://dx.doi.org/10.1103/PhysRevApplied.4.024004
- (44) Liu Y., Chen G., Rong Y., McGuinness L. P., Jelezko F., Tamura S., Tanii T., Teraji T., Onoda S., Ohshima T., Isoya J., Shinada T., Wu E. & Zeng H. **(2015)** Fluorescence Polarization Switching from a Single Silicon Vacancy Colour Centre in Diamond. *Scientific reports.* 5:12244, DOI:10.1038/srep12244
- (45) Shimo-Oka T., Kato H., Yamasaki S., Jelezko F., Miwa S., Suzuki Y. & Mizuochi N. **(2015)** Control of coherence among the spins of a single electron and the three nearest neighbor  $^{13}\text{C}$  nuclei of a nitrogen-vacancy center in diamond. *Appl. Phys. Lett.* 106, 153103, DOI:10.1063/1.4917539
- (46) Jahnke K. D., Sipahigil A., Binder J. M., Doherty M. W., Metsch M., Rogers L. J., Manson N. B., Lukin M. D. & Jelezko F. **(2015)** Electron-phonon processes of the silicon-vacancy centre in diamond. *New J. Phys.* 17 043011: DOI:10.1088/1367-2630/17/4/043011
- (47) McGuinness L. P. & Jelezko F. **(2015)** Look but don't touch the metals. *Science* 347 6226, DOI: 10.1126/science.aaa6908
- (48) Osterkamp C., Lang J., Scharpf J., Müller C., McGuinness L. P., Diemant T., Behm R. J., Naydenov B. & Jelezko F. **(2015)** Stabilizing shallow color centers in diamond created by nitrogen delta-doping using SF<sub>6</sub> plasma treatment. *Appl. Phys. Lett.* 106 113109: DOI: 10.1063/1.4915305
- (49) Stangenberg R., Wu Y., Hedrich J., Kurzbach D., Wehner D., Weidinger G., Kuan S. L., Jansen M. I., Jelezko F., Luhmann H. J., Hinderberger D., Weil T. & Müllen K. **(2015)** A Polyphenylene Dendrimer Drug Transporter with Precisely Positioned Amphiphilic Surface Patches. *Advanced Healthcare Materials*, 4, DOI: 10.1002/adhm.201400291
- (50) Romach Y., Müller C., Unden T., Rogers L. J., Isoda T., Ioh K. M., Markham M., Stacey A., Meijer J., Pezzagna S., Naydenov B., McGuinness L. P., Bar-Gill N. & Jelezko F. **(2015)** Spectroscopy of Surface-Induced Noise Using Shallow Spins in Diamond. *Phys. Rev. Lett.* 114 017601: DOI: http://dx.doi.org/10.1103/PhysRevLett.114.017601
- (51) Rogers L. J., Jahnke K.D., Metsch M. H., Sipahigil A., Binder J. M., Teraji T., Sumiya H., Isoya J., Lukin M. D., Hemmer P. & Jelezko F. **(2014)** All-Optical Initialization, Readout, and Coherent Preparation of Single Silicon-Vacancy Spins in Diamond. *Phys. Rev. Lett.* 113, 263602
- (52) Häußler A., Heller P., McGuinness L. P., Naydenov B. & Jelezko F. **(2014)** Optical depth localization of nitrogen-vacancy centers in diamond with nanometer accuracy. *Optics Express*, Vol. 22, Issue 24, pp. 29986-29995: DOI: 10.1364/OE.22.029986

- (53) Dietrich A., Jahnke K. D., Binder J. M., Teraji T., Isoya J., Rogers L. J. & Jelezko F. **(2014)** Isotopically varying spectral features of silicon-vacancy in diamond. *New J. Phys.* **16** 113019: DOI:10.1088/1367-2630/16/11/113019
- (54) Scheuer J., Kong X., Said R. S., Chen J., Kurz A., Marseglia L., Du J., Hemmer P. R., Montangero S., Calarco T., Naydenov B. & Jelezko F. **(2014)** Precise qubit control beyond the rotating wave approximation. *New J. Phys.* **16** 093022: DOI:10.1088/1367-2630/16/9/093022
- (55) Sipahigil A., Jahnke K. D., Rogers L. J., Teraji T., Isoya J., Zibrov A. S., Jelezko F. & Lukin M. D. **(2014)** Indistinguishable Photons from Separated Silicon-Vacancy Centers in Diamond. *Phys. Rev. Lett.* **113**, 113602
- (56) Yamamoto, T., Onoda, S., Ohshima, T., Teraji, T., Watanabe, K., Umeda, T., McGuinness, L. P., Müller, C., Naydenov, B., Dolde, F., Fedder, H., Honert, J., Markham, M. L., Twitchen, D., Wrachtrup, J., Jelezko, F. & Isoya, J. **(2014)** Isotopic identification of engineered nitrogen-vacancy spin qubits in ultrapure diamond. *Phys. Rev. B* **90**, 081117
- (57) Rogers, L. J., Jahnke, K. D., Teraji, T., Marseglia, L., Müller, C., Naydenov, B., Schaufert, H., Kranz, C., Isoya, J., McGuinness, L. P. & Jelezko, F. **(2014)** Multiple intrinsically identical single photon emitters in the solid-state. *Nature Communications*: DOI: 10.1038/ncomms5739
- (58) Müller, C., Kong, X., Cai, J.-M., Melentijević, K., Stacey, A., Markham, M., Twitchen, D., Isoya, J., Pezzagna, S., Meijer, J., Du, J. F., Plenio, M. B., Naydenov, B., McGuinness, L. P. & Jelezko, F. **(2014)** Nuclear magnetic resonance spectroscopy with single spin sensitivity. *Nature communications* 5, Article number 4703: DOI:10.1038/ncomms5703
- (59) Rogers, L. J., Jahnke, K. D., Doherty, M. W., Dietrich, A., McGuinness, L. P., Müller, C., Teraji, T., Sumiya, H., Isoya, J., Manson, N. B. & Jelezko, F. **(2014)** Electronic structure of the negatively charged silicon-vacancy center in diamond. *Phys. Rev. B* 89, 235101: DOI: 10.1103/PhysRevB.89.235101
- (60) Dolde, F., Bergholm, V., Wang, Y., Jakobi, I., Naydenov, B., Pezzagna, S., Meijer, J., Jelezko, F., Neumann, P., Schulte-Herbrüggen, T., Biamonte, J. & Wrachtrup, J. **(2014)** High-fidelity spin entanglement using optimal control. *Nature Communications* 5: DOI: 10.1038/ncomms4371
- (61) Dolde, F., Doherty, M. W., Michl, J., Jakobi, I., Naydenov, B., Pezzagna, S., Meijer, J., Neumann, P., Jelezko, F., Manson, N. B. & Wrachtrup, J. **(2014)** Nanoscale Detection of a Single Fundamental Charge in Ambient Conditions Using the NV<sup>-</sup> Center in Diamond. *Phys. Rev. Lett.* 112
- (62) Antonov, D., Häußermann, T., Aird, A., Roth, J., Trebin, H.-R., Müller, C., McGuinness, L., Jelezko, F., Yamamoto, T., Isoya, J., Pezzagna, S., Meijer, J. & Wrachtrup, J. **(2014)** Statistical investigations on nitrogen-vacancy center creation. *Appl. Phys. Lett.* 104, 012105: dx.doi.org/10.1063/1.4860997
- (63) Dolde, F., Jakobi, I., Naydenov, B., Zhao, N., Pezzagna, S., Trautmann, C., Meijer, J., Neumann, P., Jelezko, F. & Wrachtrup, J. **(2013)** Room-temperature entanglement between single defect spins in diamond. *Nature Physics* 9: 139–143. DOI: 10.1038/nphys2545
- (64) Ermakova, A., Pramanik, G., Cai, J.-M., Algara-Siller, G., Kaiser, U., Weil, T., Tzeng, Y.-K., Chang, H.C., McGuinness, L.P., Plenio, M.B., Naydenov, B. & Jelezko, F. **(2013)** Detection of a Few Metallo-Protein Molecules Using Color Centers in Nanodiamonds. *Nano Letters* 13: 3305–3309. DOI: 10.1021/nl4015233
- (65) London, P., Scheuer, J., Cai, J.-M., Schwarz, I., Retzker, A., Plenio, M.B., Katagiri, M., Teraji, T., Koizumi, S., Isoya, J., Fischer, R., McGuinness, L.P.,

- Naydenov, B. & Jelezko, F. **(2013)** Detecting and Polarizing Nuclear Spins with Double Resonance on a Single Electron Spin. *Physical Review Letters* 111: 067601. DOI: 10.1103/PhysRevLett.111.067601
- (66) Osterkamp, C., Scharpf, J., Pezzagna, S., Meijer, J., Diemant, T., Behm, R.J., Naydenov, B. & Jelezko, F. **(2013)** Increasing the creation yield of shallow single defects in diamond by surface plasma treatment. *Applied Physics Letters* 103: 193118. DOI: 10.1063/1.4829875
- (67) Yamamoto, T., Umeda, T., Watanabe, K., Onoda, S., Markham, M.L., Twitchen, D.J., Naydenov, B., McGuinness, L.P., Teraji, T., Koizumi, S., Dolde, F., Fedder, H., Honert, J., Wrachtrup, J., Ohshima, T., Jelezko, F. & Isoya, J. **(2013)** Extending spin coherence times of diamond qubits by high-temperature annealing. *Physical Review B* 88 : DOI: 10.1103/PhysRevB.88.075206
- (68) Yamamoto, T., Muller, C., McGuinness, L.P., Teraji, T., Naydenov, B., Onoda, S., Ohshima, T., Wrachtrup, J., Jelezko, F. & Isoya, J. **(2013)** Strongly coupled diamond spin qubits by molecular nitrogen implantation. *Physical Review B* 88 : DOI: 10.1103/PhysRevB.88.201201
- (69) Jahnke, K.D., Naydenov, B., Teraji, T., Koizumi, S., Umeda, T., Isoya, J. & Jelezko, F. **(2012)** Long coherence time of spin qubits in C-12 enriched polycrystalline chemical vapor deposition diamond. *Applied Physics Letters* 101: 012405. DOI: 10.1063/1.4731778
- (70) Cai, J.-M., Naydenov, B., Pfeiffer, R., McGuinness, L.P., Jahnke, K.D., Jelezko, F., Plenio, M.B. & Retzker, A. **(2012)** Robust dynamical decoupling with concatenated continuous driving. *New Journal of Physics* 14: 113023. DOI: 10.1088/1367-2630/14/11/113023