

SYMPOSIUM ED12

Quantum Sensing, Metrology and Devices
April 18 - April 21, 2017

Symposium Organizers

David Awschalom, University of Chicago
Fedor Jelezko, University Ulm
Milos Nesladek, IMEC vzw.
Dmitry Budlker, Johannes Gutenberg University

Proceedings Statement

All authors are invited to submit articles based on their 2017 MRS Spring Meeting presentations to the journals in the MRS portfolio (www.mrs.org/publications-news). Papers submitted and accepted for publication in MRS Advances (www.mrs.org/mrs-advances) will be available as symposium collections. Visit the MRS/Cambridge University Press Publications Booth #100 in the Exhibit Hall to learn more, including MRS Advances print options available at special rates during the meeting week only.

* Invited Paper

SESSION ED12.1/ED1.1: Joint Session I: Solid-State Quantum Matter I
Session Chair: Joerg Wrachtrup
Tuesday Morning, April 18, 2017
PCC North, 100 Level, Room 132 A

10:30 AM *ED12.1.01/ED1.1.01
Creating Quantum Technologies with Spins in Semiconductors [David Awschalom](#); University of Chicago, United States.

11:00 AM *ED12.1.02/ED1.1.02
Single Photon Emitters—Diamond and Beyond [Igor Aharonovich](#); University of Technology Sydney, Australia.

11:30 AM *ED12.1.03/ED1.1.03
Single Photon Sources in Silicon Carbide [Brett Johnson](#); University of Melbourne, Australia.

SESSION ED12.2/ED1.2: Joint Session II: Advanced Spin Control for Quantum Technology
Session Chair: Vladimir Dyakonov
Tuesday Afternoon, April 18, 2017
PCC North, 100 Level, Room 132 A

1:30 PM *ED12.2.01/ED1.2.01
Color Centers Coupled to Nanobeam Cavities in 4H Silicon Carbide—Beyond “Simple” Resonant Enhancement [Evelyn L. Hu](#); Harvard University, United States.

2:00 PM *ED12.2.02/ED1.2.02
Theory of Dynamic Nuclear Polarization through Hybrid Registers in Diamond and SiC [Viktor Ivady](#)^{1,2}; ¹Linköping University, Sweden; ²Wigner Research Centre for Physics, Hungary.

2:30 PM *ED12.2.03/ED1.2.03
Silicon Vacancies in Silicon Carbide as a Novel Quantum System [Sang-Yun Lee](#)^{1,2}; ¹University of Stuttgart and Stuttgart Research Center of Photonic Engineering (SCoPE) and IQST, Germany; ²Korea Institute of Science and Technology, Korea (the Republic of).

3:00 PM BREAK

SESSION ED12.3/ED1.3: Joint Session III: Spintronics and Optomechanics
Session Chairs: Brett Johnson and Ren-Bao Liu
Tuesday Afternoon, April 18, 2017
PCC North, 100 Level, Room 132 A

3:30 PM *ED12.3.01/ED1.3.01
Nanomechanical Sensing Using Spins in Diamond [Marcus W. Doherty](#); Australian National University, Australia.

4:00 PM *ED12.3.02/ED1.3.02
Nuclear Spintronics in Silicon Carbide [Abram Falk](#)^{1,2}; ¹IBM T.J. Watson Research Center, United States; ²University of Chicago, United States.

4:30 PM *ED12.3.03/ED1.3.03
Tunneling-Mediated Charge Transfer between Nitrogen-Vacancy Centers and Nitrogen Impurities in Type-1b Diamond [Carlos A. Meriles](#); City College of New York, United States.

SESSION ED12.4/ED1.4: Joint Session IV: Solid-State Quantum Matter II
Session Chair: Evelyn Hu
Wednesday Morning, April 19, 2017
PCC North, 100 Level, Room 132 A

8:00 AM *ED12.4.01/ED1.4.01
Engineering Single-Photon Sources in Hexagonal Boron Nitride [Lee Bassett](#); University of Pennsylvania, United States.

8:30 AM *ED12.4.02/ED1.4.02
Engineering of Highly Coherent Spin Defects in Silicon Carbide [Vladimir Dyakonov](#); University of Wuerzburg, Germany.

9:00 AM *ED12.4.03/ED1.4.03
Spins in Silicon Carbide for Quantum Technologies [Paul V. Klimov](#); University of Chicago, United States.

9:30 AM *ED12.4.04/ED1.4.04
Towards Coherent Manipulation of Single NV Spins Using Hybrid Photoelectric MR Detection [Milos Nesladek](#); imec Leuven & Hasselt University, Belgium.

10:00 AM BREAK

SESSION ED12.5/ED1.5: Joint Session V: Advanced Spin Control for Sensing
Session Chair: Martin Plenio
Wednesday Morning, April 19, 2017
PCC North, 100 Level, Room 132 A

10:30 AM *ED12.5.01/ED1.5.01
Advanced Spin Control for Enhanced Sensing Using NV Centers in Diamond [Nir Bar-Gill](#); Hebrew University, Israel.

11:00 AM *ED12.5.02/ED1.5.02
Novel Sensing Schemes for Frequency Tracking and Resolution [Alex Retzker](#); Racah Institute of Physics, Israel.

11:30 AM *ED12.5.03/ED1.5.03
Nitrogen-Vacancy Diamond Sensor—Novel Diamond Surfaces and Interaction with Spins [Adam Gali](#)^{1,2}; ¹Hungarian Academy of Sciences, Hungary; ²Budapest University of Technology and Economics, Hungary.

SESSION ED12.6/ED1.6: Joint Session VI: Sensing of Single Spins
Session Chairs: Patrick Maletinsky and Jean-Francois Roch
Wednesday Afternoon, April 19, 2017
PCC North, 100 Level, Room 132 A

1:30 PM *ED12.6.01/ED1.6.01
Sensing Single Molecular Spins [Joerg Wrachtrup](#)^{1,2}; ¹University of Stuttgart, Germany; ²Institute for Quantum Science and Technology, IQST, Germany.

2:00 PM *ED12.6.02/ED1.6.02

Single-Molecule Electron Spin Resonance Spectroscopy by Diamond
Sensor [Fazhan Shi](#); University of Science and Technology of China, China.

2:30 PM BREAK

3:30 PM *ED12.6.03/ED1.6.03

Quantum Sensing and Imaging with Diamond Color Centers [Fedor Jelezko](#);
University Ulm, Germany.

4:00 PM *ED12.6.04/ED1.6.04

Coherent Few-Spin Systems in Diamond Nanocrystals for Quantum Sensing [Helena S. Knowles](#); University of Cambridge, United Kingdom.

4:30 PM *ED12.6.05/ED1.6.05

Nanoscale Nuclear Magnetic Resonance and Scanning Magnetometry with Single NV Centers in Diamond [Christian Degen](#); ETH Zurich, Switzerland.

SESSION ED12.7: Poster Session
Session Chair: Thierry Debuisschert
Wednesday Afternoon, April 19, 2017
8:00 PM - 10:00 PM
Sheraton, Third Level, Phoenix Ballroom

ED12.7.01

A Silicon Carbide Based Quantum Vector Magnetometer [Matthias Niethammer](#); University of Stuttgart, Germany.

ED12.7.02

Comparisons and Common Ground in Flying Qubits [Kan Xie](#); Michigan State University, United States.

ED12.7.03

Photoelectric Nitrogen-Vacancy Electron Spin Magnetometry [Michal Gulka](#)^{1,2,3}; ¹Czech Technical University in Prague, Czech Republic; ²Czech Academy of Sciences, Czech Republic; ³Hasselt University, Belgium.

ED12.7.04

Ultra-Sensitive Probing of the Local Electronic Structure Based on State-of-the-Art Transition-Edge Sensor (TES) Technology and Soft X-Ray Spectroscopy [Sang Jun Lee](#)^{1,2}; ¹SLAC, United States; ²Stanford University, United States.

SESSION ED12.8/ED1.8: Joint Session VII: Qubit Arrays and Spin Device Principles
Session Chairs: Fedor Jelezko and Milos Nesladek
Thursday Morning, April 20, 2017
PCC North, 100 Level, Room 132 A

8:00 AM *ED12.8.01/ED1.8.01

Scaled Control of Solid-State Qubit Arrays [Michael Trupke](#); University of Vienna, Austria.

8:30 AM *ED12.8.02/ED1.8.02

Quantum Sensing and Imaging using Color Centers in Diamond and Extensions to Quantum Networks [Dirk R. Englund](#); Massachusetts Institute of Technology, United States.

9:00 AM *ED12.8.03/ED1.8.03

Silicon Carbide—Material Growth and Defect Engineering for Spintronics [Nguyen T. Son](#); Linköping University, Sweden.

9:30 AM ED12.8.04/ED1.8.04

Defects and Decoherence at Diamond Surfaces [Alastair Stacey](#)^{1,2}; ¹University of Melbourne, Australia; ²Melbourne Centre for Nanofabrication, Australia.

9:45 AM ED12.8.05/ED1.8.05

High Purity and High Quality Homoepitaxial Diamond Growth for Quantum Information and Quantum Sensing Device Applications [Tokuyuki Teraji](#); National Institute for Materials Science, Japan.

10:00 AM BREAK

SESSION ED12.9: Technology and Techniques for Sensing and Imaging

Session Chair: Victor Acosta
Thursday Morning, April 20, 2017
PCC North, 100 Level, Room 132 A

10:30 AM *ED12.9.01

NV Ensemble Diamond Device Technologies for Quantum Sensing Applications [Mutsuko Hatano](#)^{1,2}; ¹Tokyo Institute of Technology, Japan; ²JST CREST, Japan.

11:00 AM ED12.9.02

Downscaling of Photoelectric Detection of NV Centres Magnetic Resonances to Small NV Ensembles [Emilie Bourgeois](#)^{2,1}; ¹Hasselt University, Belgium; ²imec, Belgium.

11:15 AM ED12.9.03

Imaging the Current Flow in Graphene with a Diamond Sensing Platform [Jean-Philippe Tetienne](#); University of Melbourne, Australia.

11:30 AM *ED12.9.04

Magnetic Imaging with an Ensemble of NV Centers [Thierry Debuisschert](#); Thales Research & Technology, France.

SESSION ED12.10: Nanoscale NMR Imaging

Session Chair: Christian Degen
Thursday Afternoon, April 20, 2017
PCC North, 100 Level, Room 132 A

1:30 PM *ED12.10.01

Nitrogen-Vacancy Spin Sensors for Nanoscale Nuclear Magnetic Resonance [John Mamin](#); IBM Research Division, United States.

2:00 PM *ED12.10.02

Magnetic Resonance Spectroscopy on a Diamond Chip [Victor Acosta](#); University of New Mexico, United States.

2:30 PM *ED12.10.03

Improving the Precision of Quantum Metrology for Nanoscale NMR [Liam McGuinness](#); Institute for Quantum Optics, University Ulm, Germany.

3:00 PM BREAK

SESSION ED12.11: Spin Magnetometry Imaging and Spectroscopy I

Session Chair: Dmitry Budker
Thursday Afternoon, April 20, 2017
PCC North, 100 Level, Room 132 A

3:30 PM *ED12.11.01

Quantum Sensing with Ensembles of Nitrogen Vacancies in Diamond [Danielle A. Braje](#); MIT-LL, United States.

4:00 PM *ED12.11.02

Engineered NV Centers in a Diamond Anvil for Magnetic Imaging of Materials under Extreme Conditions [Margarita Lesik](#); Université Paris Saclay, France.

4:30 PM *ED12.11.03

Single Spin Magnetometry of Antiferromagnets and Superconductors [Patrick Maletinsky](#); University of Basel, Switzerland.

SESSION ED12.12: Nanodiamonds for Quantum Technology and Sensing
Session Chair: Liam McGuinness
Friday Morning, April 21, 2017
PCC North, 100 Level, Room 132 A

8:00 AM *ED12.12.01

Imaging Magnetism at the Nanoscale with a Single Spin

Microscope [Waseem Akhtar](#); Université de Montpellier and CNRS, France.

8:30 AM *ED12.12.02

On Approaches to Mass Production of Nanodiamonds with Nitrogen-Vacancy Color Centers

[Petr Cigler](#); IOCB AS CR VVI, Czech Republic.

9:00 AM *ED12.12.03

Intraneuronal Transport Abnormalities Revealed by Fluorescent

Nanodiamonds Tracking [Francois Treussart](#)^{2,3,1}; ¹Ecole Normale Supérieure Paris-Saclay, France; ²CNRS, France; ³Université Paris Sud, France.

9:30 AM ED12.12.04

Nanodiamond-Hydrogel-Magnetic Nanoparticle Sensors [Ting Zhang](#); The Chinese University of Hong Kong, Hong Kong.

9:45 AM ED12.12.05

Developments in Nanodiamond Particle Functionalization for Enabling Advancements in Conjugation to Surfaces and Sensing [Zachary Kennedy](#); Pacific Northwest National Lab, United States.

10:00 AM BREAK

10:30 AM *ED12.12.06

Hybrid Nano-Sensors Composed of a Nanodiamond and a Magnetic

Nanoparticle [Ren-Bao Liu](#)^{1,2,3}; ¹The Chinese University of Hong Kong, China; ²The Chinese University of Hong Kong, China; ³The Chinese University of Hong Kong Shenzhen Research Institute, China.

11:00 AM *ED12.12.07

Hyperpolarised MR Imaging via Diamond Technologies [Martin B. Plenio](#); Ulm University, Germany.

11:30 AM ED12.12.08

Criticality-Enhanced Hybrid Nanodiamond-Thermometer [Ning Wang](#); The Chinese University of Hong Kong, China.

11:45 AM ED12.12.09

Correlating Transmission Electron Microscopy and Nanomagnetometry [Xi Feng](#); The Chinese University of Hong Kong, Hong Kong.

SESSION ED12.13: Spin Magnetometry Imaging and Spectroscopy II
Session Chair: Jean-Philippe Tetienne
Friday Afternoon, April 21, 2017
PCC North, 100 Level, Room 132 A

1:30 PM ED12.13.01

Microwave-Free Nanoscale Magnetic Resonance Spectroscopy with the

NV Center [James Wood](#)^{1,2}; ¹Universität Basel, Switzerland; ²University of Melbourne, Australia.

1:45 PM ED12.13.02

Direct Measurement of Topological Numbers with Spins in Diamond

[Fei Kong](#)^{1,2}; ¹University of Science and Technology of China, China; ²University of Science and Technology of China, China.

2:00 PM ED12.13.03

Electron Spin Resonance Imaging with Nitrogen Vacancy Centres

in Diamond [David A. Simpson](#)^{1,2}; ¹University of Melbourne, Australia; ²University of Melbourne, Australia.

2:15 PM ED12.13.04

High Spatial Resolution Optical Far-Field Microscopy for Local Field

Sensing with Nitrogen Vacancy Center [Fang-Wen Sun](#); University of Science and Technology of China, China.

2:30 PM ED12.13.05

Optically Narrowing of Nitrogen-Vacancy Center Spin Ensembles in

Nanodiamonds [Gang-Qin Liu](#); Department of Physics, The Chinese University of Hong Kong, China.