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Q-SORT
International
Conference
on Quantum Imaging
and Electron Beam
Shaping

Tuesday 2 — Friday 5
July 2019

Max Planck Institute
for the Science of Light

Staudtstraße 2
91058 Erlangen
Germany



This project has received funding from the European
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Programme

Tuesday 2 July

Leuchs-Russell Auditorium

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — Germany

14:00 — 14:30 • Registration

14:30 — 15:00 • Welcome and Institutional Delegates

Keynote Speech: 1st Q-SORT Webinar

Chair: Gerd Leuchs
Max Planck Institute for the Science of Light (Germany)

15:00 — 16:00 Design and potential applications of patterned electron mirrors

Pieter Kruit
Delft University of Technology (The Netherlands)

16:00 — 16:30 ● Coffe Break

Special Seminar

Chair: Rafal Dunin-Borkowski
Forschungszentrum Jülich GmbH (Germany)

16:30 — 17:15 Making open science work for you

Najla Rettberg
University of Gottingen (Germany) /
Tim Smith
CERN (Switzerland)

Session A: Phase effects in inelastic scattering (Plasmons)

Chair: Gerd Leuchs
Max Planck Institute for the Science of Light (Germany)

17:15 — 17:35 A1 — Innovative 4D STEM approaches towards mapping transient electrical fields and strain at the nanoscale

Giulio Guzzinati
University of Antwerp (Belgium)

17:35 — 18:00 A2 — Orbital angular momentum and energy loss characterization of plasmonic excitations in metallic nanostructures in TEM

Matteo Zanfrognini
University of Modena and Reggio Emilia (Italy)

18:00 — 18:25 A3 — Dihedral plasmonics: from optical skyrmions to novel spin-orbit interaction of light

Shai Tsesses
Technion, Israel Institute of Technology (Israel)

Wednesday 3 July

Leuchs-Russell Auditorium

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — Germany

8:30 — 9:00 • Registration

Session B: Quantum Imaging

Chair: Pieter Kruit
Delft University of Technology (The Netherlands)

- 9:00 — 9:15 B1 — Quantum correlations in electron microscopy
Chen Mechel
Technion, Israel Institute of Technology (Israel)
- 9:15 — 9:30 B2 — Implementing Conditional Re-illumination
for Low-Damage Electron Microscopy
Akshay Agarwal
Massachusetts Institute of Technology (USA)
- 9:30 — 9:45 B3 — Improving Image Contrast with 2-Pass
Electron Microscopy
Navid Abedzadeh
Massachusetts Institute of Technology (USA)
- 9:45 — 10:00 B4 — Spiral Phase Contrast Imaging
in Cryo-Electron Microscopy
Yue Zhang
Maastricht University (The Netherlands)
- 10:00 — 10:15 B5 — A proposal for a basis change paradigm
to optimally look at proteins
Vincenzo Grillo
National Research Council (Italy)
- 10:15 — 10:30 B6 — Structured detection and structured illumination
in constant-dose particle counting experiments
Wouter Van den Broek
Humboldt University of Berlin (Germany)
- 10:30 — 10:45 B7 — Atomic Resolution Dynamics for Soft-Materials: from
Low Dose to Interaction-Free “Electron Microscopy”?
Fu-Rong Chen
National Tsing Hua University (Taiwan)

10:45 — 11:15 ● Coffe Break

Keynote Speech: 2nd Q-SORT Webinar

Chair: Vincenzo Grillo
National Research Council (Italy)

- 11:15 — 12:15 Quantum aspects of the interaction between
beam electrons and optical near fields
Javier García de Abajo
ICFO, The Institute of Photonic Sciences (Spain)

12:15 — 13:15 ● Lunch

Session C: Time-resolved and near-field excitation

Chair: Avraham Gover
Tel Aviv University (Israel)

- 13:15 — 13:40 C1 YR — Quantum coherent optical transverse and
longitudinal shaping of free electron beams
Armin Feist
University of Göttingen (Germany)
- 13:40 — 14:05 C2 YR — Polarization-controlled photon-induced
near-field electron microscopy
Tyler Harvey
University of Göttingen (Germany)

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Max Planck Institute for the Science of Light
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| 14:05 — 14:30 | C3 YR — Sub-cycle electron pulse shaping with terahertz control fields | <i>Dominik Ehberger</i>
<i>Ludwig Maximilian University of Munich (Germany)</i> |
| 14:30 — 14:55 | C4 YR — Ultrafast coherent manipulation of a free-electron wave function by electron-light quantum interaction | <i>Giovanni Maria Vanacore</i>
<i>Swiss Federal Institute of Technology in Lausanne (Switzerland)</i> |
| | Keynote Speech:
3rd Q-SORT Webinar
1st Q-SORT Women in Science Lecture Series | Chair: <i>Vincenzo Grillo</i>
<i>National Research Council (Italy)</i> |
| 15:00 — 16:00 | Coherent control of single electron wave packets with light and nanostructures | <i>Nahid Talebi</i>
<i>Max Planck Institute Solid State Research (Germany)</i> |
| 16:00 — 16:30 | ☉ Coffe Break | |
| | Session D:
Beam Shaping | Chair: <i>Ebrahim Karimi</i>
<i>University of Ottawa (Canada)</i> |
| 16:30 — 16:55 | D1 YR — Optimizing blazed efficiency of electron diffractive optics with ion beam gas-assisted etching for structured electron spectroscopy | <i>Cameron Johnson</i>
<i>University of Oregon (USA)</i> |
| 16:55 — 17:10 | D2 YR — Tuning of off-axis vortex beam using Pancharatnam-Berry phase | <i>Philip Jacob</i>
<i>Indian Institute of Technology Kharagpur (India)</i> |
| 17:10 — 17:25 | D3 YR — Realization of a holographic fan-out e-beam OAM sorter | <i>Paolo Rosi</i>
<i>University of Modena and reggio Emilia (Italy)</i> |
| 17:25 — 17:40 | D5 YR — The role of spatial coherence for the creation of and imaging with atom size electron vortex beams | <i>Darius Pohl</i>
<i>Dresden University of Technology (Germany)</i> |
| 17:40 — 17:55 | D6 YR — Wavefront modulation by inverted Gabor holography | <i>Tatiana Latychevskaia</i>
<i>University of Zurich (Switzerland)</i> |
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Round Table | Chair: <i>Vincenzo Grillo</i>
<i>National Research Council (Italy)</i> |
| 17:55 — 18:55 | How much information can a quantum system carry? | <i>Ebrahim Karimi</i>
<i>University of Ottawa (Canada)</i> |
| 19:00 | ☉ Social Dinner: Kitzmann Bräuschänke | Südliche Stadtmauerstraße 25, 91054 Erlangen |

Thursday 4 July

Leuchs-Russell Auditorium

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — German

8:30 — 9:00 • Registration

Session E: Phase Plates

Chair: Pieter Kruit
Delft University of Technology (The Netherlands)

9:00 — 9:25	E1 YR — A programmable phase patterning device for electron beams	Stewart Koppell Stanford University (USA)
9:25 — 9:50	E2 YR — Design and implementation of a tunable phase plate for electron microscopy based on Ampere's law	Peng-Han Lu Forschungszentrum Jülich GmbH (Germany)
9:50 — 10:05	E3 — Towards an electrostatic OAM sorter	Amir Tavabi Forschungszentrum Jülich GmbH (Germany)
10:05 — 10:20	E4 — Progress on the realization of a pixelated programmable phase plate for electrons	Armand Béché University of Antwerp (Belgium)
10:20 — 10:35	E5 — Nanofabrication of spiral phase plate for electron microscopy	Stefano Frabboni University of Modena and Reggio Emilia (Italy)
10:35 — 10:50	E6 — Optimal electrode design for programmable phase plates for use in electron microscopes	Helmut Soltner Forschungszentrum Jülich GmbH (Germany)
10:50 — 11:30	● Coffe Break	

Heinrich-Schliemann Gymnasium

Königstraße 105 — 90762 Fürth — Germany

Q-SORT Science Bash (Outreach event for schools)

11:20 — 12:30	Does God Play Dice?	Miles Padgett Glasgow University (United Kingdom)
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Leuchs-Russell Auditorium

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Session F:

Cathodoluminescence

Chair: Vincenzo Grillo

National Research Council (Italy)

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| 11:30 — 11:45 | F1 — High spectral resolution EELS and CL to probe optical properties at the nanometer scale | Luiz Tizei
French National Center for Scientific Research (France) |
| 11:45 — 12:00 | F2 — Time-, and phase-resolved cathodoluminescence spectroscopy | Albert Polman
AMOLF (The Netherlands) |
| 12:00 — 12:15 | F3 — FEL: quantum effects in phase space | Moritz Carmesin
University of Ulm (Germany) |

Session G:

Electron-Light Interaction

Chair: Peter Hommelhoff

University of Erlangen-Nuremberg (Germany)

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| 12:15 — 12:40 | G1 — Spontaneous radiation from a wide quantum electron beam | Aviv Karnieli
Tel Aviv University (Israel) |
| 12:40 — 12:55 | G2 — Towards a quantum electron microscope: microwave based interferometer and resonator for electrons | Robert Zimmermann
University of Erlangen-Nürnberg (Germany) |

13:00 — 14:00 ● Lunch

Session G:

Electron-Light Interaction (Continued)

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| 14:00 — 14:25 | G3 — Sub-relativistic electrons in dielectric acceleration and ultrafast interactions | Roy Shiloh
University of Erlangen-Nürnberg (Germany) |
| 14:25 — 14:40 | G4 — Towards direct imaging of GHz magnetic dynamics with sub-100-nm resolution in a transmission electron microscope | Yoshie Murooka
Forschungszentrum Jülich GmbH (Germany) |
| 14:40 — 14:45 | G5 — Controlled generation of higher order vortex arrays using a Microlens Array | B.S. Harshith
Indian Institute of Science Education Research
Pune (India) |

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Roundtable

Chair: Gerd Leuchs

Max Planck Institute for the Science of Light (Germany)

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| 14:45 — 15:45 | When only one pixel is more | Miles Padgett
Glasgow University (United Kingdom) |
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15:45 — 16:15 ● Coffee Break

Thursday 4 July (Continued)

Foyer on 1st floor

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — Germany

16:15 — 18:30

Poster Exhibition

P1 — Control of free electrons in the vicinity
of dielectric nanostructures

Chair: Enzo Rotunno
National Research Council (Italy)

Norbert Schönenberger
University of Erlangen–Nürnberg (Germany)

P2 — Structured detection and structured
illumination in constant-dose particle
counting experiments

Wouter Van den Broek
Humboldt University of Berlin (Germany)

P3 — Tuning of Off-axis Vortex Beam using
Pancharatnam-Berry Phase

Philip Jacob
Indian Institute of Technology Kharagpur (India)

P4 — High spectral resolution EELS and CL
to probe optical properties
at the nanometer scale

Luiz Tizei
French National Center for Scientific Research (France)

P5 — Controlled generation of higher order vortex
arrays using a Microlens Array

B.S. Harshith
*Indian Institute of Science Education Research,
Pune (India)*

P6 — A proposal for a basis change paradigm
to optimally look at proteins

Vincenzo Grillo
National Research Council (Italy)

P7 — Orbital angular momentum and energy loss
characterization of plasmonic excitations
in metallic nanostructures in TEM

Matteo Zanfrognini
University of Modena and Reggio Emilia (Italy)

P8 — Nanofabrication of spiral phase plate
for electron microscopy

Stefano Frabboni
University of Modena and Reggio Emilia (Italy)

P9 — Electron magnetic chiral dichroism using
the orbital angular momentum sorter

Enzo Rotunno
National Research Council (Italy)

P10 — Design and implementation of a tunable
phase plate for electron microscopy based
on Ampere's law

Peng-Han Lu
Forschungszentrum Jülich GmbH (Germany)

Bibliothek Room

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — Germany

16:15 — 18:30

Wikipedia Edit-a-thon



Chair: *Alessandro Marchetti*

Expert Wikimedia User and Researcher (Italy)

Friday 5 July

Leuchs-Russell Auditorium

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — Germany

8:30 — 9:00 • Registration

Keynote Speech: 4th Q-SORT Webinar

Chair: Peter Hommelhoff
University of Erlangen - Nuremberg (Germany)

9:00 — 10:00 The reality of the quantum electron wavefunction
in interactions with light and matter

Avraham Gover
Tel Aviv University (Israel)

10:00 — 10:30 ● Coffee Break

Session H: Phase effects in inelastic scattering EMCD

Chair: Pieter Kruit
Delft University of Technology (Germany)

10:30 — 10:55 H1 YR — Vortex filter EMCD: experimental evidence
and for sub nanometre resolution

Thomas Schachinger
Vienna University of Technology (Austria)

10:55 — 11:10 H3 — Electron magnetic chiral dichroism
using the orbital angular momentum sort

Enzo Rotunno
National Research Council (Italy)

11:10 — 11:25 H4 — Atomic-plane-resolved electron magnetic chiral
dichroism using a defocused electron beam

Dongsheng Song
Forschungszentrum Jülich (Germany)

11:25 — 11:40 H5 — A simple procedure for the optimization
of classical electron magnetic circular
dichroism measurements

Sebastian Schneider
Leibniz Institute for Solid State and Materials
Research in Dresden (Germany)

Session I: Electron-Light Interaction

Chair: Nahid Talebi
Max Planck Institute Solid State Research (Germany)

11:40 — 11:55 I1 — Attosecond electron bunch creation in optical
traveling waves via ponderomotive scattering

Norbert Schönenberger
Friedrich–Alexander University Erlangen–Nürnberg
(Germany)

11:55 — 12:10 I2 — Quantized interaction of free electrons with
cavity photons stimulated by pJ laser pulses

Kangpeng Wang
Technion-Israel Institute of Technology (Israel)

12:10 — 12:25 I3 — The classical-to-quantum transition of
measurements from linear particle accelerators
to photon-induced near-field electron microscopy

Yiming Pan
Weizmann Institute of Science (Israel)

Leuchs-Russell Auditorium

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — Germany

12:25 — 12:40

ThermoFisher Best Poster Award

- Concluding Remarks

12:45 — 13:45 ● Lunch

Chair: *Peter Tiemeijer*

ThermoFisher (The Netherlands)

Gerd Leuchs, Max Planck Institute (Germany)

Vincenzo Grillo, National Research Council (Italy)

Bibliothek Room

Max Planck Institute for the Science of Light
Staudtstraße 2 — 91058 Erlangen — Germany

13:40 — 18:30

Wikipedia Edit-a-thon



Chair: *Alessandro Marchetti*

Expert Wikimedia User and Researcher (Italy)

