

Q-SORT

Q-SORT 2017 - Modena, Italy - Outreach Toolkit

Please feel free to use the following sample press release, social media updates, emails, hashtags, and/or blog posts as they are, or alter them accordingly.

Press Release:

Q-SORT

A New Era in Electron Microscopy

Kick-off Meeting

Dates: 02-03 October 2017

Venue: Palazzo dei Musei

Viale Vittorio Veneto 5

41121 Modena, Italy

Web: <http://www.nano.cnr.it/index.php?mod=men&id=292>

Title: Q-SORT project to hold its Kick-off Meeting in Modena.

On **2 October 2017** the **CNR-NANO** institute in Modena will host the **Q-SORT Kick-off Meeting** for the official launch and first-ever public presentation of the Q-SORT Project. Funded by the European Commission under its highly competitive **Future and Emerging Technologies** Programme (FET), the project will run for 42 months starting on 1 October 2017.

The Kick-off event - which is organised by Q-SORT and supported by CNR-NANO- will bring together leading institutions in the field of electron microscopy and quantum light optics, i.e. CNR-NANO (Project scientific coordinator), the Forschungszentrum Jülich, Thermo Fisher Scientific, The Max Planck Institute for the Science of Light, University of Glasgow, University of Modena and Reggio Emilia, Maastricht University, University of Ottawa.

Representatives from the European Commission, Wikimedia, and the creative industries will also be in attendance.

Q-SORT introduces a revolutionary concept whereby the transmission electron microscope (TEM) is employed as a so-called **Quantum Sorter**, i.e. a device that is able to pick out and display detailed information about electron quantum states. This in turn provides researchers with precious new information about the sample being examined.

The project -which includes applications in physics, biology, and biochemistry- is expected to have a wide-ranging impact due to the ubiquitous adoption of TEM and STEM across many disciplines. Indeed, strong interdisciplinarity, featuring a multi-year collaboration between physicists and biologists, is one of Q-SORT's defining traits. The project features a strong international consortium with potential industrial applications.

Q-SORT also has foundational value in physics as it fosters its own kind of sparse-sensing approach to TEM, advancing the field in the direction of quantum measurement. Intuitively, sparse sensing is analogous to how we recognise familiar people from just a few small details: it means that only a few measurements are taken compared to traditional approaches, yet these are still sufficient to extract all the relevant information. A similar thing happens when we recognise relatives just from their silhouette or profile or any other small detail - we don't need to see their full face to identify them.

The scientific coordinator and principal investigator of Q-SORT is Vincenzo Grillo, a senior research fellow at CNR - the Italian National Research Council and recipient of the prestigious Humboldt Foundation's Bessel Research Award for his work on beam shaping.

The project also features an international advisory board led by Ebrahim Karimi (University of Ottawa), who has a long-standing collaboration with the principal investigator, Vincenzo Grillo.

The Q-SORT consortium comprises the following European institutions:

CNR-NANO (Project scientific coordinator) - IT
Forschungszentrum Jülich, Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons - DE
Thermo Fisher Scientific - NL
The Max Planck Institute for the Science of Light - DE
University of Glasgow, Department of Physics and Astronomy - UK
QED Film & Stage Productions Ltd. - UK
University of Modena and Reggio Emilia, Department of Physics, Informatics, and Mathematics - IT
Maastricht University, Maastricht MultiModal Molecular Imaging Institute - NL

A policy based on equal opportunities and gender balance informs the entire project.

Q-SORT at a Glance

Title: Q-SORT. The Quantum Sorter: A New Measurement Paradigm in Electron Microscopy

Acronym: Q-SORT

Principal Investigator: Vincenzo Grillo

Tagline: Q-SORT. A New Era in Electron Microscopy

Start Date: 1 October 2017

End Date: 31 March 2021

Funding Body: European Commission
Research Executive Agency
Unit A5 - Fostering Novel Ideas: [FET-Open](#)

Project Partners:

CNR-NANO (Project scientific coordinator) - IT
The Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons - Forschungszentrum Jülich - DE
Maastricht University - NL
Thermo Fisher Scientific - NL
University of Glasgow - UK
The Max Planck Institute for the Science of Light - DE
QED Film & Stage Productions Ltd. - UK
University of Modena and Reggio Emilia - IT

A bit more about the science behind Q-SORT

Q-SORT introduces a revolutionary concept whereby the TEM is employed as a Quantum Sorter. All TEM techniques are in fact limited to the imaging and energy spectroscopy of the electron wavefunction. Moreover, when a single sample property is sought, most of the image information is useless, a waste that cannot be afforded in dose-sensitive materials.

The Quantum Sorter leverages the recently-acquired capacity to structure electron beams. This implies that if, in a quantum experiment (=tunable state preparation, interaction, analysis), the analysis is performed over the

'optimal' basis of quantum states, very few electrons are necessary for the full characterisation of a sought property. In other words, the TEM can be tuned to answer only a single question, but with maximum efficiency.

To this end, Q-SORT introduces a new parallel analysis strategy, based on a suitable conformal mapping of the wavefunction: the starting point is the analysis of orbital angular momentum (OAM), but building a more general recipe for diagonalising a wider range of observables is one of the anticipated breakthroughs of Q-SORT. This will in turn allow Q-SORT to achieve three other high-risk breakthroughs of vast applicability: assessing the OAM of plasmonic resonances in select nanoparticles, achieving atomic-resolution magnetic dichroism measurement, identifying different proteins based on selected properties.

The Quantum Sorter will become so important that it will eventually be part of every state-of-the-art TEM, since the new technology is easy to integrate with energy-loss spectrometry.

The project consortium includes world leaders in optical and electronic vortex beams, as well as in protein cryoTEM. A major industrial partner in TEM is included -i.e. FEI now part of Thermo Fisher Scientific -, to secure market penetration of technological outcomes. The Q-SORT Consortium comprises some of the top players in the world of OAM, quantum optics, TEM including cryoTEM.

About Vincenzo Grillo

Vincenzo Grillo is senior research fellow at CNR - National Research Council (Italy). He graduated in Physics from the University of Genova in 1997 (110/110 cum laude). He received his PhD in Physics with a thesis on electron microscopy at the University of Parma, while performing collaborative work with Erlangen University (Germany). In 2001, he was a visiting scientist at the Tokyo Institute of Technology working on cathodoluminescence in TEM. Since 2003 he has been working at INFM, the Italian Institute for the Physics of Matter (now part of CNR) as a Senior Fellow researcher in electron microscopy. He has developed an innovative TEM-STEM methodology and published the first quantitative use of STEM with HAADF detector for chemical analyses.

He is now working on Vortex beams and holographic beam generation. He and his group are now among the world's leading groups in this sector for their work on phase holograms, large vortex beams, and the theory of spin-orbit coupling with a vortex. In 2015, he was a visiting researcher at the University of Oregon.

He received the Humboldt Foundation's Bessel research award for his work on beam shaping. Dr. Grillo is co-author of at least 100 articles and 5 book chapters. The H-factor of his publications is 29.

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Sample email announcement:

SUBJECT:

Q-SORT to hold its kick-off meeting in Modena.

****Apologies for cross-posting. Please forward to interested parties.****

Dear Colleagues,

We warmly invite you to the **QSORT Kick-off Meeting** for the official launch and first-ever public presentation of the QSORT Project. The event will take place **October 2-3 2017**, in Modena and it will bring together leading institutions in the field of electron microscopy and quantum light optics, namely CNR-NANO (Project scientific coordinator), the Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons Forschungszentrum Jülich, Thermo Fisher Scientific, The

Max Planck Institute for the Science of Light, University of Glasgow, University of Modena and Reggio Emilia, Maastricht University.

Universities, research centres and innovative SMEs from all over Europe, as well as representatives from the European Commission and Wikimedia will be in attendance.

We invite all QSORT network members to attend this event in order to discuss issues and raise questions about the project.

Information about the event is available on the CNR NANO website [here](#)..

Please circulate this information within your network.

Thank you and best wishes!

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Event WebPage

Please ask for any information to:

● Luisa Neri, luisa.neri@nano.cnr.it

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Q-SORT introduces a revolutionary concept whereby the TEM is employed as a Quantum Sorter.
Q-SORT is funded under the highly competitive OPEN-FET Programme of the European Commission.

Hashtag

#QSORT2017

Sample tweets/Facebook Update

#QSORT2017: A new Era in Electron Microscopy <https://tinyurl.com/ydettl8t>

#QSORT2017. Find out what's happening at the cutting edge of electron orbital angular momentum analysis!
<http://tinyurl.com/o8dqxn>

#QSORT2017 is launching the single biggest project in quantum free electron optics in history. Don't miss it!
<https://tinyurl.com/ydettl8t>

#QSORT2017. Interested in quantum physics and electron microscopy? Join us at our event
<https://tinyurl.com/ydettl8t>

#QSORT2017. Meet us in Modena! Q-SORT Kick-off Meeting: <https://tinyurl.com/ydettl8t>

#QSORT2017 Don't miss out! Kick-off Meeting in Modena <https://tinyurl.com/ydettl8t>

#QSORT2017 Join us in Modena for the Q-SORT Kick-off Meeting <https://tinyurl.com/ydettl8t>

#QSORT2017 Interested in? This event is not to be missed! <https://tinyurl.com/ydettl8t>

Sample Blog Post

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The event will bring together leading institutions in the field of electron microscopy and quantum light optics, namely CNR-NANO, Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons Forschungszentrum Jülich, Thermo Fisher Scientific, The Max Planck Institute for the Science of Light, University of Glasgow, University of Modena and Reggio Emilia, Maastricht University.

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The scientific coordinator and principal investigator of QSORT is Vincenzo Grillo, an Italian research fellow at CNR and recipient of the prestigious Humboldt Foundation's Bessel Research Award for his work on beam shaping.

The project features an international advisory board lead by prof. Ebrahim Karimi, a longstanding collaborator of the PI.

Funded by the European Commission under its highly competitive FET OPEN Programme, the project will run for 42 months starting from October 1, 2017.

REGISTER HERE

Registration is free and open through September 21, 2015

FURTHER INFORMATION

The event will be held in English.

If you have any questions or need additional information, please contact:

● Luisa Neri, luisa.neri@nano.cnr.it

Date & Venue

Q-SORT

THE QUANTUM SORTER: A NEW ERA IN Electron Microscopy

Kickoff Meeting

Dates: 02-03 October 2017

Venue: Palazzo dei Musei

Viale Vittorio Veneto 5

41121 Modena, Italy

Program Committee Chairs

- Vincenzo Grillo, National Research Council, Italy
- Stefano Frabboni, University of Modena and Reggio Emilia, Italy

Contact Information

For information on this workshop please contact:

- Luisa Neri, luisa.neri@nano.cnr.it
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