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Spin-NANO Partners	
USFD	THE UNIVERSITY OF SHEFFIELD
UCAM	THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE
HPL	HELIA PHOTONICS LTD
TUM	TECHNISCHE UNIVERSITAET MUENCHEN
UKON	UNIVERSITAT KONSTANZ
ATTOCUBE	ATTOCUBE SYSTEMS AG
CNRS	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE
TU Delft	TECHNISCHE UNIVERSITEIT DELFT
ETH Zürich	EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH
UNIBAS	UNIVERSITAT BASEL
UCPH	KOBENHAVNS UNIVERSITET

Spin-NANO website

- The Spin-NANO website is managed by Sally Greenhough (Spin-NANO Network Administrator).
- The website includes an Outreach, Publications and Open Access page.

Spin-NANO social media & project specific material

- Spin-NANO Facebook page, Twitter and LinkedIn accounts have been created with the aim of sharing the work done by the network with a broader audience. ESR 2 – Luca Sortino & ESR3 – Alejandro Rodriquez lead on social media.
- A Spin-NANO Blog was launched by the ESRs in September 2017 (led by ESR6 – Matt Brooks) to maintain connection of the network in between workshops and share knowledge across and beyond the network. The target is for a minimum of 2 posts per month and there have been 8 posts so far.
- Spin-NANO Youtube channel - launched December 2017. At the Think Ahead Workshop 1 (June 2017 in Delft), ESRs were tasked with developing a video narrative of their research for a non-specialist audience. The videos were uploaded to the Spin-NANO YouTube Channel in December 2017 and are currently being promoted on Spin-NANO social media. ESRs have been encouraged to enter their videos into the European Commission initiative - Showcase your project!
- Spin-NANO newsletter.

Publication in high impact journals

In the first 24 months of the network, 13 papers co-authored by ESRs have been published in high impact journals see Publications

- 2D Materials (1)
- Advanced Materials (1)
- Nature Communications (2)
- Nature (1)
- Nano Letters (2)
- Physical Review X (1)
- Physical Review B (4)
- Physical Review Letters (1)

Communication and public engagement strategy of the project

ESRs are expected to be actively engaged in several annual local outreach activities with a target of 3 events per year – see European Commission Guidelines.

In order to achieve the best possible engagement with the general public, ESRs received specific training for outreach at the Think Ahead Workshop 1 - "Becoming excellent and impactful communicators" - (20-22 June 2017 in Delft) - which included the following topics.

- Communicating your research to peers - Presentation Skills Masterclass
- Developing a video narrative of your research for non-specialist audience – (uploaded in December 2017 on Spin-NANO YouTube Channel)
- Communication for effective networking
- Refining the quality of your writing
- Strategies for effective writing habits

- Communicating to access research funding
- Communicating in the digital age

Think Ahead Workshop 2 "Collaborations across borders" which will take place in Sheffield 24-25 January 2018 will focus on **collaboration, outreach and public engagement**. This will involve the ESRs collaborating as an ITN PhD cohort to deliver an **interactive outreach activity** to an invited group of 6th form pupils (16-17 years old).

This workshop will:

- Consider effective collaboration approaches within and across disciplines
- Introduce key concepts of dialogue and engagement in science communication, as well as responsible research and Innovation
- Explore range of approaches and opportunities for outreach and public engagement
- Consider approaches to engaging young people in science
- Understanding of widening participation issues
- Provide opportunity to practice an outreach activity and receive feedback from pupils and teachers
- Review and feedback on the 3 min video

One to one support by the Researcher Development/Training Manager with public engagement activities is also available to all ESRs.

In May 2018 (following on from the workshop), the Researcher Development/Training Manager contacted all ESRS regarding delivering the outreach commitments for **Period 2** and asking ESRs -

1. to reflect on what took place during the January 2018 workshop by filling in an evaluation form, and
2. to set in motion a plan of action for:
   · outreach goals and commitments

· some cohort shared outreach projects

In addition, the Researcher Development Training Manager has proposed the following projects and asked for ESRs to volunteer as team leaders –

1. Develop a small booklet that captures the outreach activity that was delivered in Sheffield.
2. Develop a DEMOC discussion game about quantum technology
3. Develop an adaptation to the Postnote Policy briefing.

The Researcher Development/Training Manager will contact all ESRs in early June 2018 to set up a 1:1 discussion regarding developing and delivering their outreach activities.

Dissemination/Outreach activities by ESRs in period 1

A log of specific outreach and dissemination activities carried out by Spin-NANO ESRs for Period 1 can be viewed on the website and is listed below –

ESR 1 - Alessandro Catanzaro

- *Imaging of Interlayer Coupling in van der Waals Heterostructures Using a Bright-Field Optical Microscope* - DOI: 10.1021/acs.nanolett.7b01763
- Created short video on research
  - https://www.youtube.com/watch?v=JJ3WKMHWjcI
- Contribution to Spin-NANO Newsletter Spring 2017 - 'Optical properties of van der Waals heterostructures'.
- Poster - TMD-UK 17 conference (Sheffield, UK, 13 July 2017) – 'Fabrication strategies for van der Waals heterostructures.'

ESR 2 - Luca Sortino

- Oral presentation at TMD-UK in Bath (September 2016) – 'Electrically pumped quantum emitters in van der Waals heterostructures'.
- Oral presentation at NOEKS 13 in Dortmund (October 2016).
- Contribution to Spin-NANO Blog – 'Single photon sources'
- Public talk for the PubhD Sheffield series of events in December 2017, a format that gives researchers 10 minutes to explain his/her research and 20 minutes of friendly Q&A from the public - https://twitter.com/i/moments/938873564614275073
- Production of an outreach video with a local film maker on the setup a new optical spectroscopy lab https://youtu.be/pjEJeay0LRc
- Italian subtitles translation for outreach video on 2D materials - https://youtu.be/jkAXhJWixJ8
- Currently learning software for 3D animation for future outreach videos and images for publications
- Poster presentation at TMD-UK 17 conference (Sheffield, UK, 13 July 2017) - "Optical stability of colour centres in hexagonal boron nitride under red excitation"

ESR 3 - Alejandro Rodriguez

- *Large-scale quantum-emitter arrays in atomically thin semiconductors* - DOI: 10.1038/ncomms15093
- Short video on research - https://www.youtube.com/watch?v=38f9XSoeDqI

- Contribution to Spin-NANO Blog – '2D Heterostructures'
- Participation in Physics at Work 2017 - a three-day event hosted at Cavendish Laboratory, Cambridge, that aims to stimulate interest and encourage wider participation in physics amongst 14- to 16-year-olds by showcasing the many and varied ways in which physics is used in the wider world.
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ESR 4 - Najwa Sidqi

- Talk entitled " Efficient single photon emitters for quantum communication systems" at the SU2P symposium held in April 2017 at Heriot-Watt university.
- Contribution to Spin-NANO blog – "Optical innovations: high reflectance mirrors for the James Webb space telescope - about high reflectance mirrors used in the next generation James Webb telescope currently developed in NASA.
- Spin-NANO newsletter article on the industrial applications of high reflectance mirrors.
- Produced a short outreach video summarising research work - https://www.youtube.com/watch?v= O4ufCg144M&t=10s)
- In June 2017, I participated in the Photonex roadshow - an annual event bringing together the UK's top photonics technology supplier companies. Invited by Simon Andrews, the executive director of Fraunhofer UK. The talk was an introduction to the Spin-NANO network and the contribution of Helia Photonics in developing Future's communication systems
  - https://www.photonex.org/scotland/17/fraunhofer-special-session.php
- Future outreach ideas - participate in outreach activities for school pupils and in public talks in radio or on TV.

ESR 5 - Andrii Volkovskyi

- Attending 20th International Winter school on New Developments in Solid State Physics, 25 Feb - 02 Mar 2018, Mauterndorf, Austria.
- To contribute to Spin-NANO Blog (16 April 2018).
- Participation in weekly open meetings (open to all students) where each PhD candidate has to present his most recent results and also present some article connected to nano photonics.
- Took part in TUM Open Door's Day (21 October 2017) - a comprehensive program of experiments, tours, presentations and lectures, providing fascinating insights into the world of science.

ESR 6 - Matt Brooks

- *Spin-degenerate regimes for single quantum dots in transition metal dichalcogenide monolayers* - Phys. Rev. B 95, 245411 – Published 12 June 2017
- Short video on research - https://www.youtube.com/watch?v=BpgRfB5R030
- Lead for Spin-NANO Blog.
- Contribution to Spin-NANO Blog – 'Strained TMD Monolayers: Next Generation Circuitry'
- Attended and presented a poster at NanoQI Summer School, San Sebastian, Spain in July 2017- 'Spin Degenerate Regimes for Single Two-Dimensional Quantum Dots on Transition Metal Dichalcogenide Monolayers'.
- Attended and presented a poster at Trends in Nanoscience 2017, Kloster Irsee, Germany in March 2017.
- Oral presentation at DPG'17, Dresden, Germany in March 2017.
- 'About Me' post on Spin-NANO facebook.

ESR 7 - Samarth Vadia

- Contribution to Spin-NANO Newsletter Spring 2017 – 'Solid-state based quantum emitters for their application in quantum information technologies'
- Contribution to Spin-NANO Blog – 'Life of a PhD Student: Conferences'

ESR 8 - Marco Manca

- 'About Me' post on Spin-NANO facebook.
- Oral presentation @ PLMCN18 – Würzburg – 'Enabling valley selective exciton scattering in monolayer WSe2 through upconversion'
- *Ultra-low power threshold for laser induced changes in optical properties of 2D molybdenum dichalcogenides* - 2D Mater. 2016;3(4):045008
- *Synthesis of Highly Anisotropic Semiconducting GaTe Nanomaterials and Emerging Properties Enabled by Epitaxy* - Adv Mater [Internet]. 2016;1605551
- *Enabling valley selective exciton scattering in monolayer WSe$_2$ through upconversion* - Nat Commun. 2017;8(1) 1–7
- *Excitonic Linewidth Approaching the Homogeneous Limit in MoS$_2$-Based van der Waals Heterostructures* - Phys Rev X. 2017;7(2):021026
- *Charged excitons in monolayer WSe$_2$: experiment and theory* - PRB. 2017;085302:1–12
- *Fine structure and lifetime of dark excitons in transition metal dichalcogenide monolayers* - Phys. Rev. B 96, 155423
- Contribution to Spin-NANO Blog – 'From the lab into a computer'
- Contribution to Spin-NANO Spring 2017 newsletter – 'Optoelectronics and Valleytronics with atomically thin 2D Materials'

ESR 9 - Riccardo Pisoni

- *Gate-Defined One-Dimensional Channel and Broken Symmetry States in MoS2 van der Waals Heterostructures* - Nano Lett., 2017, 17 (8), pp 5008–5011 - DOI: 10.1021/acs.nanolett.7b02186
- Contribution to Spin-NANO Blog - "Valleytronics in a nutshell"
- Produced a video promoting my research activity - https://www.youtube.com/watch?v=Sf6tndAfQPo
- Contribution to Spin-NANO Spring 2017 newsletter – 'Quantum transport in nanostructures based on semiconducting van der Waals heterostructures'
- 'About Me' post on Spin-NANO facebook.
- Talk given at a conference - Graphene flagship meeting - Quantum devices in 2D materials - 13/01/2017
- Talk given at a conference - Graphene week - Gate-defined nanostructures in MoS2 van der Waals heterostructures - 28/09/2017
- Poster - Graphene flagship meeting - Quantum phenomena in a trilayer MoS2 van der Waals heterostructure - 13/01/2017
- Poster - QSIT Arosa 2017 - Electron transport in van der Waals heterostructure - 30/01/2017
- Poster - EP2DS - Gate-defined nanostructures in MoS2 van der Waals heterostructures - 31/07/2017

ESR 10 - Aroosa Ijaz

- Contribution to Spin-NANO Spring 2017 newsletter – 'Atomically thin perfect mirrors'.

- Talk entitled "Realization of an atomically thin mirror using monolayer MoSe2" at QSIT junior meeting, 12-14 June 2017 - Passug, Switzerland

ESR 11 - Sigurd Flagan

- Oral Presentation at QSIT Junior meeting in Passugg June 2017 – 'Cavity Quantum Electrodynamics with Diamond - Coupling of single photon emitters to a tuneable microcavity'
- Poster presentation at Frontiers of Nanophotonics in Ascona August 2017 – 'Cavity Enhanced Raman Scattering'
- Poster presentation at QSIT 7th site visit in Zurich November 2017 – 'Quantum Photonics with Solid-State Materials'
- Contribution to Spin-NANO Spring 2017 newsletter – 'The Nitrogen-Vacancy centre in diamond'
- Short video on research - https://www.youtube.com/watch?v=xeovlntM66U&t=91s
- To contribute of to Spin-NANO Blog in 2018.
- 30 minute presentation of research to a group of Norwegian school children (17-19 years) at CERN, Genève, entitled "A spin-photon interface using solid-state spins and an optical cavity".
- 'About Me' post on Spin-NANO Facebook.

ESR 12 - Yanick Volpez

- *Three-dimensional fractional topological insulators in coupled Rashba layers* - Phys. Rev. B 96, 085422 – Published 15 August 2017
- Short video on research - https://www.youtube.com/watch?v=b7qtkg_GaXI
- Contribution to Spin-NANO Blog - 'Quantum Computation and Simulation: A Beginners Guide'

ESR 13 - Matteo Pompili

Matteo only recently joined the network on 20 Nov 2017.

ESR 14 - Stephan Philips

- Oral presentation at QTC2017 - 'A Programmable Two-Qubit Quantum Processor In Silicon'
- 'A programmable two-qubit quantum processor in silicon' – to be published (prob January), Nature, (preprint at https://arxiv.org/abs/1708.04214) - will notify when published.
- Regularly lead visitors around in the lab (including students, teachers, companies).
- Given talks to bachelor students and high school student about spin qubits at host institution.
- NEMO Science Museum - answering scientific questions from young children.
- Created a short video about research - 'Color Centers in a Tunable Cavity'.
- Contribution to Spin-NANO Spring 2017 newsletter – 'Quantum computation in Silicon spin qubits'
- To contribute to the Spin-NANO blog for the first time in 2018.

ESR 15 - Fabio Ansaloni

- Planning to attend international conferences in 2018.
- To contribute to the Spin-NANO blog for the first time - March 2018.

- Article for Spin-NANO newsletter, where I gave a general description about the project I am currently working on - Spring 2017 newsletter – 'Spin qubits with all-electrical control in Ge-Si quantum dots'
- Created a three-minute video where I try to explain the basics of my research - https://www.youtube.com/watch?v=U3ELtXnHEhw

This shows that ESRs have -

- created their own network-specific outreach material - Spin-NANO blog, short videos on their research (uploaded to Spin-NANO YouTube channel) & newsletter
- participated in significant international conferences
- presented informal talks to non-specialist audience
- engaged with school children and general public
- participated in local outreach events/science exhibitions

Conferences (outside the consortium) attended by ESRs in period 1

ESR 1 - Alessandro Catanzaro

- Poster - TMD-UK 17 conference (Sheffield, UK, 13 July 2017) – 'Fabrication strategies for van der Waals heterostructures'.

ESR 2 - Luca Sortino

- Oral presentation at TMD-UK in Bath (September 2016) – 'Electrically pumped quantum emitters in van der Waals heterostructures'.
- Oral presentation at NOEKS 13 in Dortmund (October 2016).
- Poster presentation at TMD-UK 17 conference (Sheffield, UK, 13 July 2017) - "Optical stability of colour centres in hexagonal boron nitride under red excitation"

ESR 3 - Alejandro Rodriguez

- MRS Conference in Boston (Nov 2017)
- Graphene Conference in Barcelona (March 2017)
- Quantum Dot Day in Edinburgh (Jan 2017)
- Summer School - "Quantum thermodynamics and non-equilibrium light/matter interfaces" – Cambridge, September 2016

ESR 4 - Najwa Sidqi

- Talk entitled " Efficient single photon emitters for quantum communication systems" at the SU2P symposium held in April 2017 at Heriot-Watt university.

ESR 5 - Andrii Volkovskyi

- Attended 20th International Winter school on New Developments in Solid State Physics, 25 Feb - 02 Mar 2018, Mauterndorf, Austria

ESR 6 - Matt Brooks

- Oral presentation at Capri Spring School April 2018, Capri, Italy
- Oral presentation at DPG'18, Berlin, Germany in March 2017
- Oral Presentation APS March Meeting, March 2018, Los Angeles
- Attended and presented a poster at NanoQI Summer School, San Sebastian, Spain in July 2017- 'Spin Degenerate Regimes for Single Two-Dimensional Quantum Dots on Transition Metal Dichalcogenide Monolayers'
- Attended and presented a poster at Trends in Nanoscience 2017, Kloster Irsee, Germany in March 2017.

- Oral presentation at DPG'17, Dresden, Germany in March 2017

ESR 7 - Samarth Vadia
- Attended Resonator QED 2017 organized by NIM, Munich in August 2017

ESR 8 - Marco Manca
- Oral presentation @ PLMCN18 – Würzburg – 'Enabling valley selective exciton scattering in monolayer WSe2 through upconversion'
- Poster presentation at International Thematic school Excitonics for Photonic applications, 16-27 /04/2018, Les Houches
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ESR 9 - Riccardo Pisoni
- Talk given at a conference - Graphene flagship meeting - Quantum devices in 2D materials - 13/01/2017
- Talk given at a conference - Graphene week - Gate-defined nanostructures in MoS2 van der Waals heterostructures - 28/09/2017
- Poster - Graphene flagship meeting - Quantum phenomena in a trilayer MoS2 van der Waals heterostructure - 13/01/2017
- Poster - QSIT Arosa 2017 - Electron transport in van der Waals heterostructure - 30/01/2017
- Poster - EP2DS - Gate-defined nanostructures in MoS2 van der Waals heterostructures - 31/07/2017

ESR 10 - Aroosa Ijaz
- QSIT Winter school in Arosa, Switzerland – 30 January – 3 February 2017
- Attended and gave a talk entitled "Realization of an atomically thin mirror using monolayer MoSe2" at QSIT junior meeting, 12-14 June 2017 - Passug, Switzerland
- 20th International Winter school on New Developments in Solid State Physics, 25 Feb - 02 Mar 2018, Mauterndorf, Austria

ESR 11 - Sigurd Flagan
- Oral Presentation at QSIT Junior meeting in Passugg June 2017 – 'Cavity Quantum Electrodynamics with Diamond - Coupling of single photon emitters to a tuneable microcavity'
- Poster presentation at Frontiers of Nanophotonics in Ascona August 2017 – 'Cavity Enhanced Raman Scattering'
- Poster presentation at QSIT 7th site visit in Zurich November 2017 – 'Quantum Photonics with Solid-State Materials'
- Poster presentation at QSIT General meeting 2018 in Arosa 2018 – 'NV Centres in a Tunable Microcavity'

ESR 12 - Yanick Volpez
APS March Meeting 2018, Los Angeles, California - March 5-9, 2018

ESR 13 - Matteo Pompili
Matteo only recently joined the network on 20 Nov 2017.

ESR 14 - Stephan Philips
- Oral presentation at QTC2017 - 'A Programmable Two-Qubit Quantum Processor In Silicon'

ESR 15 - Fabio Ansaloni

Fabio joined the network quite late (November 2016) and has not attended any conferences outside the network in Period 1. Fabio plans to attend the School and Conference "Spin Qubit 4" in Konstanz 10-14 Sep 2018. Although this is one of the network events, this is also the most important conference in the spin qubit community.