

Snapshot story of EBSN2021

- Few zoom moments picked up randomly...

Nahid Talebi's introduction

Electron Beam Spectroscopy for Nano-Optics · 14th - 15th June, 2024



Mathieu Kociak
CNRS, FR



Nahid Talebi
Kiel University, DE





LIVE sur Personnaliser le service de rediffusion en direct

Wash My PC... Afficher l'affichage


Physics Institute in Kiel University

C | A | U Christian-Albrechts-Universität zu Kiel Mathematisch-Naturwissenschaftliche Fakultät

Ulrich Hohenester

9 Faculties
2 Clusters of Excellence
25277 Students
12 Nobel prize winners



https://www.physik.uni-kiel.de/de/institute/ieap/ag_talebi

Active Observer video Participants Comments Portuguese Videos Embedded Level to make Quitter

In real life, it should have been in Kiel... too bad!



Our Booming Field!

Enjoy the Conference!

La parole est à : **Narid Talebi**

EELS

CL

PINEM

Several EU programs
eBEAM, ONEM,
SMART-electron,
QSORT

Quantum technology

Atomic-scale spectroscopy

Electron-beam shaping

Ultrafast dynamics

Mon Jun 14 2021		
12:00 - 12:10		Introduction
Session 1A - Swift electron-light interactions		
Chair: Albert Polman		
13:10 - 13:35 Interactions-I1	Hornmuthoff, Peter -	Electron phase space control on a nanophotonic chip -
13:35 - 13:40		Discussion
13:40 - 14:05 Interactions-I2	Kováčik, Andrea - ICFO-Institute of Photonics and Barcelona Institute of Science and Technology	Electron beam aberration correction and shaping using optical fields -
14:05 - 14:10		Discussion
14:10 - 14:20 Interactions-O1	Feist, Armin - University of Göttingen	Continuous-Wave Optical Phase Modulation of Electron Beams Using Chip-based High-Q Microresonators -
	 Feist, Armin University of Göttingen, DE	
14:20 - 14:25		Discussion
14:25 - 14:35 Interactions-O2	Dorian, Raphael -	Improving the quantum statistics of photons in free electrons -
14:35 - 14:40		Discussion
14:40 - 15:00		Break
15:00 - 15:20		ePoster Session



Peter Hommeloff

- (Albert Polman chairing the first session)

Peter 's microscope: maybe too big for our labs? ;)

Particle accelerators for science

La parole est à : Peter Hommelhoff



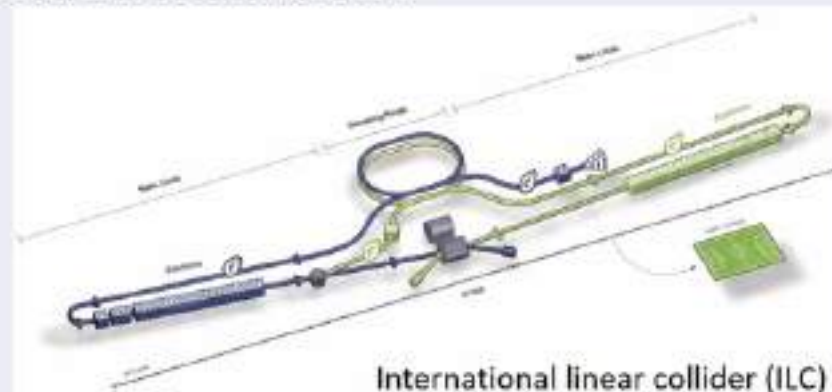
SLAC, Menlo Park, CA



European XFEL, Hamburg

Size given by final energy & acceleration gradient

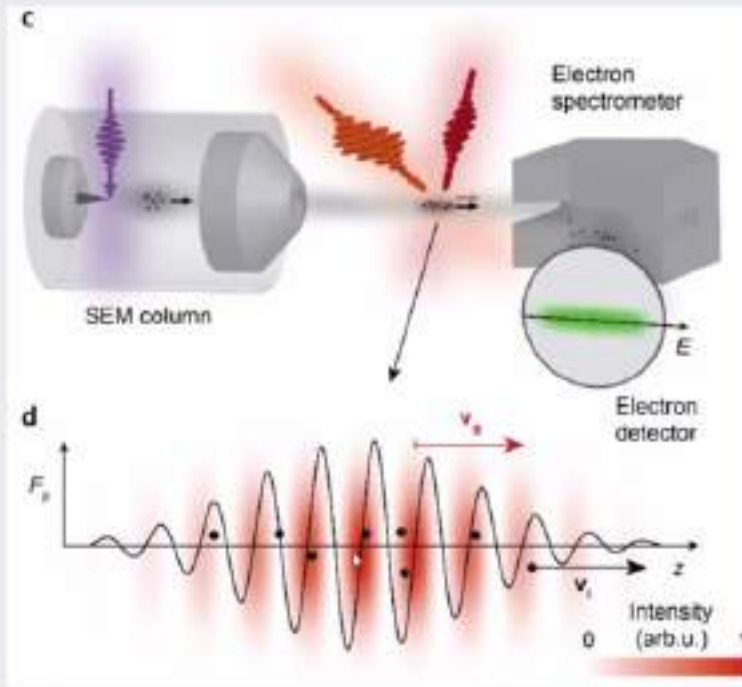
ILC design gradient:
31.5 MeV/m
➡ 1 TeV energies
require 30 km



International linear collider (ILC)

Inelastic ponderomotive electron scattering

La parole est à : Peter Hommelhoff



$\lambda_1 = 1356 \text{ nm}$ (0.91 eV)
 $\lambda_2 = 1958 \text{ nm}$ (0.63 eV)
 $\alpha = 41^\circ$
 $\beta = 107^\circ$

- Forward (longitudinal) momentum change only
- Gradient up to 2.2 GeV/m
- Strong energy modulation imprinted

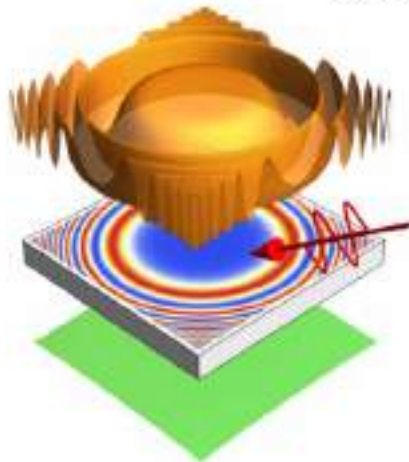
$$\lambda_g = 2\pi c / (\omega_1 \cos \alpha - \omega_2 \cos \beta) = 1.41 \mu\text{m}$$

Femtosecond SEM: M. Kozák et al., J. Appl. Phys. 124, 023104 (2018)

Andrea Konecna



Electron Beam Aberration Correction and Shaping Using Optical Fields



Andrea Konečná & F. Javier García de Abajo

EBSN virtual conference

14 June 2021

Interaction of fast electrons and light



$$\psi(\mathbf{r}, t) = \psi_i(\mathbf{r}, t) \exp\left[\frac{-i}{\hbar} \int_{-\infty}^t dt' \hat{\mathcal{H}}_1(\mathbf{r} - \mathbf{v}t + \mathbf{v}t', t')\right]$$

Final electron
wavefunction
Initial electron
wavefunction
Light-electron interaction
Hamiltonian

1. With a scatterer

$$\hat{\mathcal{H}}_1 = \frac{eV}{c} A_z + \frac{e^2}{2m_e c^2 \gamma} \left(A_x^2 + A_y^2 + \frac{1}{\gamma^2} A_z^2 \right)$$

2. Without a scatterer
(light in free space)

$$\hat{\mathcal{H}}_1 = \cancel{\frac{eV}{c} A_z} + \frac{e^2}{2m_e c^2 \gamma} \left(A_x^2 + A_y^2 + \frac{1}{\gamma^2} A_z^2 \right)$$

For details, see:
 Garcia de Abajo & Konečná, PRL 126 (2021)
 Garcia de Abajo & Di Giulio, ACS Photonics 8 (2021)

Apparently, Andrea wants to make things more complicated ;)

Armin Feist

Armin should teach us how to get embedded ...

LIVE sur Personnaliser le service de rediffusion en direct

Efficient electron-light coupling

IV. Physical Institute
Solids and Nanostructures



[quasi-]phase-matching at

fiber-coupled high-Q microresonator

- Integrated photonics for light delivery
- single-mode excitation and phase matching
- $Q > 10^5$, strong optical field enhancement

Microsphere

cavity enhancement

K. Wang et al., *Nature* 582, 50-54 (2020)
Q. Yi et al., *Nature* 582, 46-49 (2020).

ultramicroscope 203, 44-53 (2019).
CS Photonics 6, 2499-2508 (2019).
Sci. Adv. 6, eabb1393 (2020).

phase-matching
evanescent light
M. Kozak et al., *Optica*
R. Dahan et al., *Rep. Prog. Phys.* 84, 044601 (2021)

ISSN 2021, 14.06.2021 Armin Feist, University & MPI for Photonics Göttingen armin.feist@uni-goettingen.de 5

Raphael Dahan

Philipp Haslinger

Raphael Dahan

LIVE sur Personnaliser le service de rediffusion en direct

AdQuanta

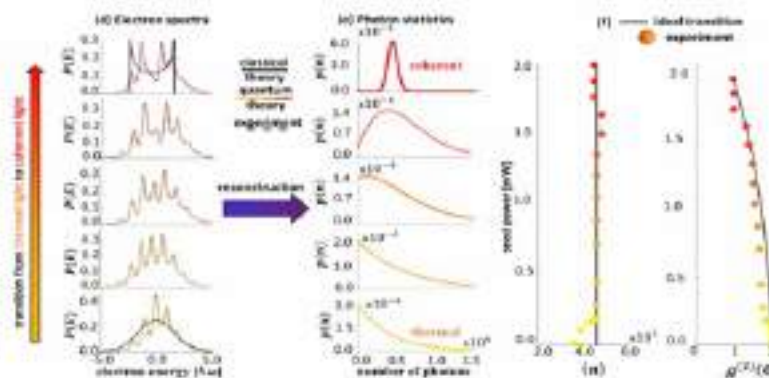
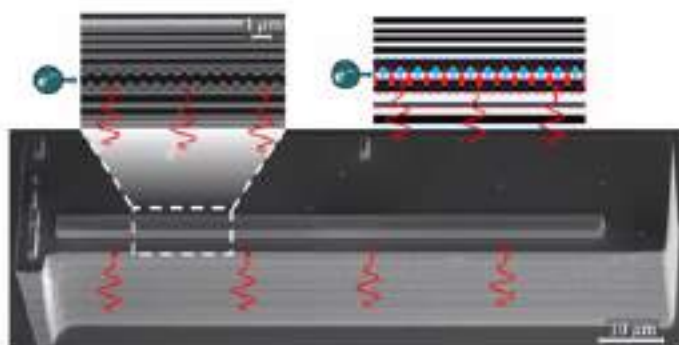


Imprinting the quantum statistics of photons on free electrons

EBSN 2021



Raphael Dahan^{*}, Alexey Gorlach^{*}, Urs Haeusler^{*}, Aviv Karnieli^{*}, Ori Eyal, Peyman Yousefi, Mordechai Segev, Ady Arie, Gadi Eisenstein, Peter Hommelhoff, and Ido Kaminer^{*}



[arXiv:2105.03105](https://arxiv.org/abs/2105.03105)



Mathieu Kociak



Neus Pons_Fundaci...



Raphael Dahan


A story of PINEM and EEGS ...

zoom.us Réunion Voir Modifier Favoris Aide

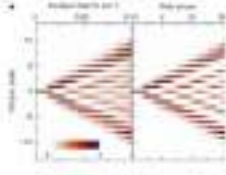
Webinaire Zoom

LIVE sur Personnaliser le service de rediffusion en direct

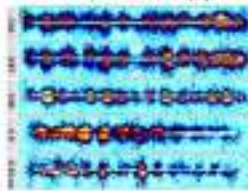
PINEM- the electron is treated quantum mechanically



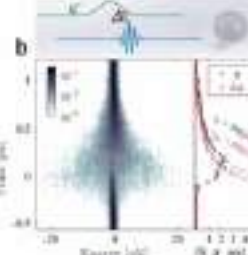
First PINEM
Zewail, *Nature* 462, 902 (2009)



Observation of quantum walk
Ropers, *Nature* 521, 200 (2015)



meV spectroscopy
Carbone, *ACS Phot.* 5, 759 (2018)



b
Kfir, *Nature* 582, 46 (2020)

2009 2010 2015 2018 2019

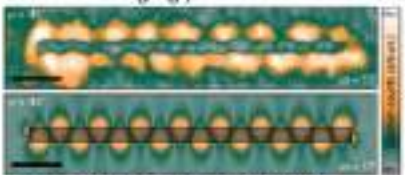
→ contributions by other groups (Kociak, Flannigan-Baum, Banhart, Weissenreider,...)
→ theory by Gover, Pan, Talebi, ...

back-to-back in *Nature*: our group & Ropers

our group, *Nature* 582, 50 (2020)

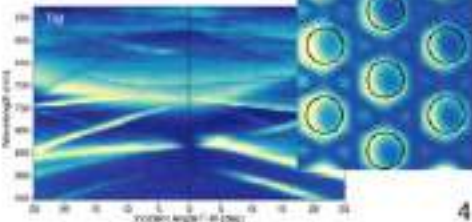
PINEM theory:
García de Abajo, Aserjo-García, and Kociak, *Nano Letters* 10, 1859 (2010)
Park, Lin, and Zewail, *New Journal of Physics* 12, 123028 (2010)

Imaging plasmons




Carbone, *Nat. Comm.* 6, 6407 (2015)


Coherent electrons in photonic cavities




4



Mathieu Kociak



Neus Pons_Fundaci...



Poster session

Firefox Fichier Edition Affichage Historique Marque-pages Outils Fenêtre Aide

Memoire nanoGe - EBSN2021 - VIRTUA EBSN2021 - Poster session | Go EBSN2021_Poster_Liebtrau.png |

https://gather.town/app/8lp29RBCMfipQLas/EBSN2021 - Poster session parquerolles cnrs

atxavelUPSUD MM 2021 Chapter 1 - Cetic Developer Install... Evaluations KOCIAK Mathieu http://kural.hores... Vente en gros Auth... bigKNOB - a curio... Autres marque-pages

EBSN2021 - Poster session

Search

- mathieu kociak
- Marla_nanoGe
- Vlastimil Krápek
- du ran
- Simon
- Roy
- Albert Polman
- Fatemeh chahshouri
- Giorgio Divitini
- Michal Horak
- Anders Gustafsson
- Yuval Adiv

50 Invite

041 Fatemeh davoodi

042 Paul Bittorf

043 Ton va

046 Luiz Tizei

049 Matthias Liebtrau

mathieu kociak Online

Wolfgang Schleich

- (Nahid Talebi chairing)

Pure quantum optics ahead – electrons guys need to learn ...

Quantum carpets: a tool to observe decoherence

W.P. Schleich



Mathieu Kociak



Corinne & Faudie

Amparo_nanoGe

Jelena Vuckovic

Another frightening electron microscope?

The image is a screenshot of a Zoom meeting interface. At the top, the Zoom menu bar is visible with options like 'Réunion', 'Voir', 'Modifier', 'Fenêtre', and 'Aide'. The browser address bar shows the Zoom URL and the name of the host, Jelena Vuckovic. The main content area displays a presentation slide titled 'Particle accelerators' with a blue and red underline. Below the title are two images: an aerial view of the SLAC National Accelerator Laboratory and an interior view of a particle accelerator tunnel. The names 'SLAC National Accelerator Laboratory' and 'Maximilien Brice/CERN' are placed below their respective images. On the right side, a vertical list of participants is shown, including Wolfgang Schleich, Mathieu Kociak, Naveed Talebi, Magdalena Solà-Ga..., and Jelena Vuckovic (who is highlighted with a yellow border). At the bottom, the Zoom control bar includes icons for 'Activer', 'Démarrer audio', 'Participants', 'Coversonne', 'Partager l'écran', 'Envoyer', and 'Lever la main', along with a red 'Quitter' button.


zoom.us Réunion Voir Modifier Fenêtre Aide

Vous n'avez actuellement aucun de Jelena Vuckovic Options d'affichage


LIVE sur Personnaliser le service de rediffusion en direct

Affichage

Particle accelerators



SLAC National Accelerator Laboratory



Maximilien Brice/CERN

Wolfgang Schleich

Mathieu Kociak

Naveed Talebi

Magdalena Solà-Ga...

Jelena Vuckovic

Jelena Vuckovic, Stanford

Activer Démarrer audio Participants Coversonne Partager l'écran Envoyer Lever la main Quitter

Sean Collins

Sean Collins switches to radically different topics: first material talk!

The screenshot shows a Zoom webinar interface. The main content area displays a presentation slide titled "Structural order: Key role in organic optoelectronics". The slide content includes:

- P3HT: Poly(3-hexylthiophene)**
- Nanofibers (Prepared via CVD)**: A diagram showing parallel nanofibers with the label "Highly crystalline".
- Spincoated n-P3HT (Traditional processing method)**: A diagram showing a disordered network of nanofibers with the label "Highly disordered mix of amorphous and crystalline regions".
- Simulation**: A graph showing "MSD (nm²)" vs "Time (ps)". The legend indicates:
 - Without D hoppings: $D = 0.000$ nm²/ps (red line)
 - With D hoppings: $D = 0.3$ nm²/ps (blue line)The blue line shows a linear increase in MSD over time, while the red line is flat at zero.
- References**: Three histograms showing charge carrier distributions for different conditions: "n-P3HT at 0.1 eV/eV", "n-P3HT at 0.1 eV/eV, D=0.3 nm²/ps", and "n-P3HT at 0.1 eV/eV, D=0.3 nm²/ps, T=300K".
- Citation**: A. Sneyd et al. *ACS* 2009, 06, 989

The right side of the interface shows a chat window with the following messages:

- Unfortunatly there's no way from here to see all the attendees as they're watching us from vimeo which is a different platform
- Moi à Nahid Talebi (message direct) 6:10 PM: Question: why is the energy peak broadening? is it intrinsic to the process or an experimental issue?
- Maria_nanoGe & moi (message direct) 6:10 PM: What we can do is giving the participants an invitation and ask them to join at the end of today for a quick group picture
- Moi à Jelena Vackovic (message direct) 6:14 PM: OK, thanks for the answer! Great talk, thanks
- Moi à Maria_nanoGe (message direct) 6:22 PM: That would be great!
- Jelena Vackovic à moi (message direct) 6:22 PM: Thank you very much Mathieu!
- Moi à Maria_nanoGe (message direct) 6:22 PM: But personally I can't SEE more than 12 people... I am sure there are more!
- So is there a way to get the picture of all?

At the bottom of the chat, there is a "Message (Direct)" button and a "Save to message list..." option.

Magdalena Solà-Garci

Complexity made simple ...

Description of $g^{(2)}(\tau)$ in CL

S. Mouri et al. PRL 934 (2005)

N_{counting} : correlations between photons generated by the same electron $\rightarrow n_{\text{el}} b(b+1)m^2q^2$

N_{counting} : correlations between photons generated from different electrons $\rightarrow n_{\text{el}}(n_{\text{el}}-1)b^2m^2q^2$

Excitation of semiconductor/wide-band gap material with electrons

- ① Generation of b bulk plasmons ($\sim 10-30$ eV) \rightarrow Poisson distribution with mean b
- ② Plasmon decay into $2n_i$ e-/hole pairs (\sim eV) \rightarrow Poisson distribution with mean n
- ③ Emission of photons with efficiency q through:
 - a) Radiative recombination of e/h pairs
 - b) Excitation and subsequent decay of emitter

Color center Quantum well

n_{el} : number of electrons

I : electron current (in n_{el})
 b : mean number of interacting bulk plasmons
 q : electron charge
 τ_{emitter} : related to emitter lifetime

$$g_{\text{count}}^{(2)}(0) - 1 \propto \frac{N_{\text{counting}}}{N_{\text{counting}}}$$

$$g_{\text{count}}^{(2)}(0) = 1 + \frac{q}{I\alpha_{\text{emitter}}} \frac{b+1}{b}$$

Excitation efficiency: Probability that 1 electron creates an interaction with emitter ($\gamma = 1 - \text{Poisson}(0; b) = 1 - e^{-b}$)

See full derivation of model: M. Sels (doctoral, ACS Photonics 8 9 881-873 (2013))

Webinaire Zoom

LIVE

sur Personnaliser le service de rediffusion en direct

Mathieu Kociak

Sean Collins

Converser

Moi à Nahid Talebi (message direct) 5:32 PM

Did Sean see the defect itself? From imaging or diffraction?

Moi à Sean Collins (message direct) 5:35 PM

Thanks for the great talk Sean!

Moi à Maria_nanoGe (message direct) 5:35 PM

Ok, I'm forwarding to Nahid for the announcement?

Maria_nanoGe à moi (message direct) 5:36 PM

Ok, perfect :) When we start the last discussion I'll prepare a message in the chat with the link so when Nahid says it I can just press send

Moi à Nahid Talebi (message direct) 5:37 PM

Hi Nahid. Would be good to have a picture of everyone. But we are in two different rooms in fact. NanoGe will send a link to our room to log on the right one, but you should make the announcement that we need everyone to stay in the other room... thanks

Sean Collins à moi (message direct) 5:37 PM

Thanks! I think I may have rushed a bit as I thought I was going over time.

Nahid Talebi à moi (message direct) 5:38 PM

Hi Mathieu, excellent, I will do the announcement.

A : Na... (Message direct)

Moi à message id...

Ulrich Hohenester

Typical Austrian recipe: first, get quality ingredients, then, mix them in a simple and straightforward way to get the best flavors ...

The image shows a Zoom webinar interface. The main content is a slide titled "Recipe for tomography of surface phonon polaritons". The slide is divided into two sections: "Ingredients" and "Important considerations".

Ingredients

1. Nion microscope, use only best quality
2. Normal computer for tomography

Important considerations

1. NMF plays a central role in the data acquisition, however, its performance should be understood as a deconvolution procedure rather than a decomposition into eigenmodes.
2. The reprojected EELS maps are dominated by the long-range field components, the photonic LDOS by the short-range field components.
3. Plasmon and phonon field tomography are robust procedures, however, a limited number of eigenmodes or a bias for a few numbers thereof is needed to obtain meaningful results.

On the right side of the Zoom window, there is a vertical list of participants:

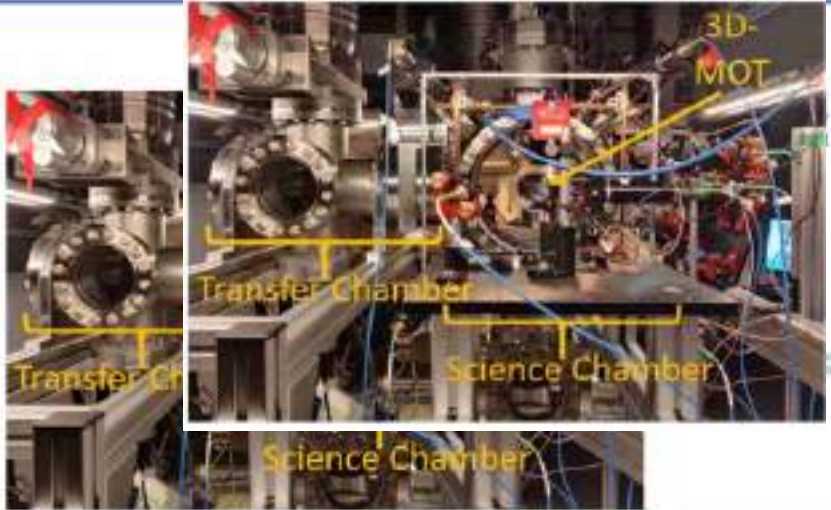
- Magdalena Solà-Ga...
- Mathieu Kociak
- Sean Collins

The Zoom window title bar shows "Webinaire Zoom" and the system tray indicates the date and time: "Lun 14 Jun à 18:01".

Philipp Haslinger

Atomic physics meets EBSN...

A Quantum Klystron - Controlling Quantum Systems with Modulated Electron Beams



TU WIEN TECHNISCHE UNIVERSITÄT WIEN

ESQ
Discovery

FWF Der Wissenschaftsfonds.

Philipp Haslinger
Technische Universität Wien

ÖAW ÖSTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN

- Magdalena Solà-Ga...
- Mathieu Kociak
-  Nahid Talebi
-  Philipp Haslinger
- Ulrich Hohenester

Steffi Woo

First band structure of the conference!

van der Waals Materials: Transition Metal Dichalcogenides

Thickness-Dependent Electronic Properties

MX_2 : M = Mo, W
X = S, Se, Te, ...

(a) Band structure of WSe_2 showing Energy (eV) vs. momentum along the $M-K-M$ path. The bands are labeled E, C, A, D, and B. The legend indicates Single Layer (red), Bilayer (blue), and Bulk (black).

(b) Absorption coefficient ($\times 10^4 \text{ cm}^{-1}$) vs. Energy (eV) for WSe_2 at $T = 5K$. The plot shows absorption peaks for 1ML, 2ML, 3ML, 4ML, and 10ML. The peaks are labeled T, A, A*, B, B*, and C.

Zoom Meeting Controls: Activer, Désactiver vidéo, Participants, Converser, Partager l'écran, Enregistrer, Lancer la main, Quitter

Participants: Mathieu Kociak, Mahid Talebi, Philipp Haslinger, Ulrich Hohenester

Ofer Kfir/ Valerio di Guilio

Coherence is back, and will last until tomorrow...

The image is a screenshot of a Zoom meeting interface. The main content is a presentation slide with a teal background and white text. The slide title is "Optical coherence transfer by free electrons and its effects on CL emission (part I)" by Ofer Kfir, an Electrical Engineering professor at Tel-Aviv University, Israel. The slide also lists two publications: "Science Advances 7, eabf6380 (2021)" and "ACS Nano 15, 7290–7304 (2021)". Logos for Tel Aviv University, GA, and Marie Curie are visible. The Zoom interface includes a top menu bar with "Réunion", "Voir", "Modifier", "Fenêtre", and "Aide". A status bar at the bottom shows "Ofer Kfir, Tel-Aviv", "KielOnline", "EBSN 2021", and "March 14, 2020". On the right, a vertical list of participants includes Steffi Y. Woo, Mathieu Kociak, Nahid Talebi (with a video thumbnail), and Philipp Haslinger. A "Ofer Kfir" video thumbnail is also visible at the bottom of the participant list. A red "Quitter" button is at the bottom right.

Optical coherence transfer
by free electrons
and its effects on CL emission
(part I)
Ofer Kfir
Electrical Engineering, Tel-Aviv University, Israel.

With Valerio Javier and Claus
Science Advances 7, eabf6380 (2021).
ACS Nano 15, 7290–7304 (2021).

TEL AVIV UNIVERSITY תל אביב
GA
MARIE CURIE
EBSN 2021

Ofer Kfir, Tel-Aviv KielOnline EBSN 2021 March 14, 2020 1

Steffi Y. Woo
Mathieu Kociak
Nahid Talebi
Philipp Haslinger
Ofer Kfir

Quitter

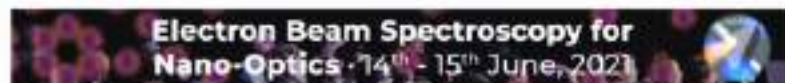
A twin presentation

LIVE sur Personnaliser le service de rediffusion en direct

Optical coherence transfer by free electrons and its effects on CL emission (part II)

Valerio Di Giulio¹, Ofer Kfir^{2,3}, Claus Ropers^{3,4} and F. Javier García de Abajo^{1,5}

- 1 – ICFO - The Institute of Photonic Sciences, (Spain)
- 2 – Tel Aviv University, School of Electrical engineering, Tel Aviv 69978, (Israel)
- 3 – MPIBPC - Max Planck Institute for Biophysical Chemistry (Germany)
- 4 – University of Göttingen, IV. Physical Institute (Germany)
- 5 – ICREA - Institució Catalana de Recerca i Estudis Avançats. (Spain)



Science Advances 7, 18, eabf6380, (2021)
ACS Nano 2021, 15, 4, (2021)



Email: valerio.digiulio@icfo.eu

Steffi Y. Woo

Mathieu Kociak



Cheers!

- Unfortunately, not everyone could connect...



LIVE sur Personnaliser le service de rediffusion en direct

Affichage

Maria_nanoGe	Armin Feist	Ofer Kfir	Ben Hourshini	Anders Gustafsson
Fatemeh Davoodi	Andrea Konežná	Hugo Lourenco Martins	Maximilian Black	Liluz Tizel
Juan-Carlos Idrobo	Jonas Lähnemann	Sean Collins	Michal Horák	Paul Bittorf
S Vadivel	Magdalena Solís-García	Matthias Liebräu	Vincenzo Cirillo	Masoud Taleb
Zackaria	Daphne Dekker	Malo Bézard	fatemeh.chahshouri	Dolev Reitman

2/2

2/2

Rachel Oliver

- (Javier Garcia de Abajo Chairing)

III-N physics at its best!

The image shows a Zoom meeting interface. The main content is a presentation slide from the University of Cambridge, Cambridge Centre for Gallium Nitride. The slide title is "Cathodoluminescence of InGaN Nano-objects Employing Spatial, Spectral and Temporal Resolution". The presenter is Rachel Oliver. The slide lists several authors and their affiliations: B. Kusch¹, F.C.P. Massabuau^{1,2}, K. Loutfi¹, S.M. Fardoughi¹, E.J. Corish^{1,3}, S. Hammersley¹, P.M. Coulon¹, E. La Boubarf¹, I. Gilgal¹, P.A. Shields¹, M.J. Kappers¹, P. Dawson¹, R.A. Oliver¹. The affiliations are: ¹ Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS; ² Department of Physics, SUPA, University of Strathclyde, Glasgow G4 0NG; ³ Photon Science Institute, Department of Electrical and Electronic Engineering, School of Engineering, The University of Manchester, Manchester, M13 9PL; ⁴ Department of Electronic and Electrical Engineering, University of Bath, BA2 7AY Bath. The slide also includes a Twitter handle @ProfRachelGaN. The Zoom interface shows a list of participants on the right: Amparo Taroncher_n..., Nahid Talebi, Javier Garcia, Rachel Oliver, and Maria_nanoGe. The bottom of the screen shows Zoom controls: Activer, Démarrer vidéo, Participants, Converser, Partager l'écran, Enregistrer, Lever la main, and Quitter.

UNIVERSITY OF CAMBRIDGE

CAMBRIDGE CENTRE FOR GALLIUM NITRIDE

Cathodoluminescence of InGaN Nano-objects Employing Spatial, Spectral and Temporal Resolution

Appuyer sur ESC ou double-cliquer pour quitter le mode plein écran

B. Kusch¹, F.C.P. Massabuau^{1,2}, K. Loutfi¹, S.M. Fardoughi¹, E.J. Corish^{1,3}, S. Hammersley¹, P.M. Coulon¹, E. La Boubarf¹, I. Gilgal¹, P.A. Shields¹, M.J. Kappers¹, P. Dawson¹, R.A. Oliver¹

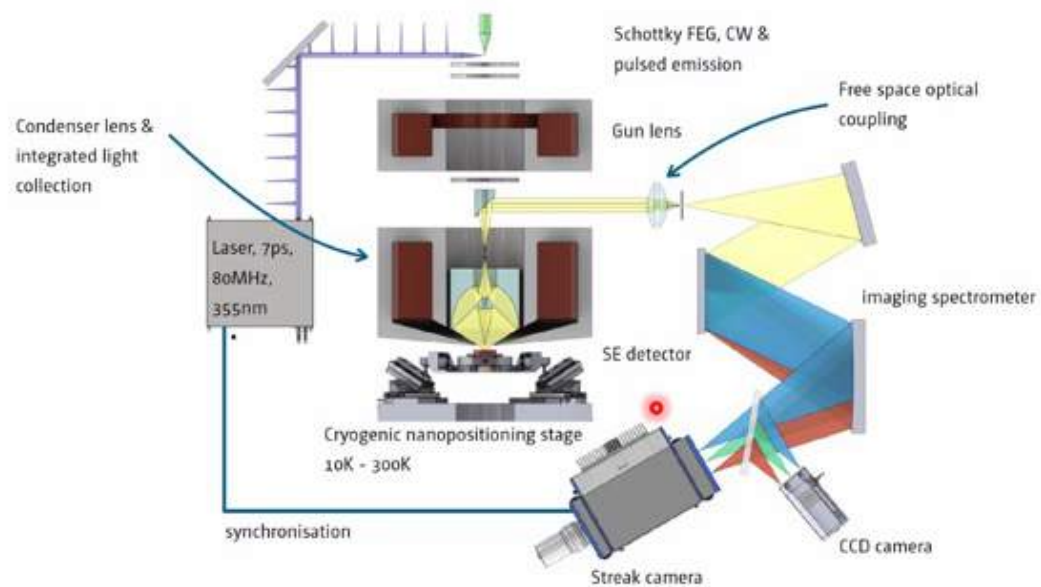
¹ Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS
² Department of Physics, SUPA, University of Strathclyde, Glasgow G4 0NG
³ Photon Science Institute, Department of Electrical and Electronic Engineering, School of Engineering, The University of Manchester, Manchester, M13 9PL
⁴ Department of Electronic and Electrical Engineering, University of Bath, BA2 7AY Bath

Rachel Oliver (she/her) @ProfRachelGaN

Participants: Amparo Taroncher_n..., Nahid Talebi, Javier Garcia, Rachel Oliver, Maria_nanoGe

Zoom Controls: Activer, Démarrer vidéo, Participants, Converser, Partager l'écran, Enregistrer, Lever la main, Quitter

Time-resolved cathodoluminescence system



Amparo Taroncher_n...

Nahid Talebi



Fabrizio Carbone

Takumi Sannomyia

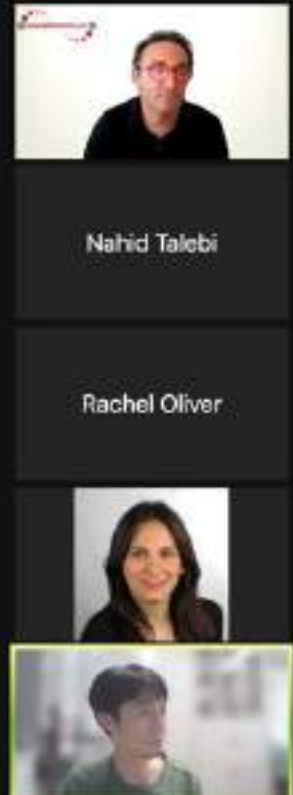
Coherence is back (now classical) ...

LIVE sur Personnaliser le service de rediffusion en direct ▾

Contents

- STEM-CL (3D → 4D)
- Surface Plasmons of Particles
- Circularly Polarized Light Generation from Sphere (4D)
- Interference with Transition Radiation
- Linac – TEM (RF acceleration)

2

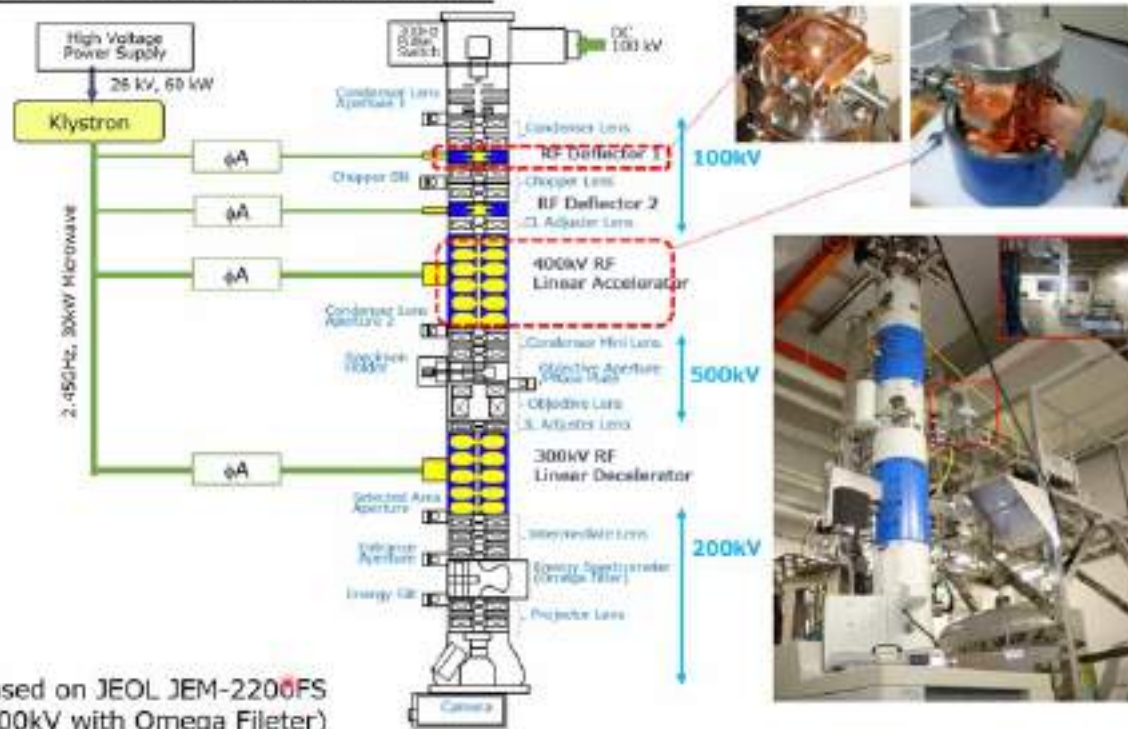


The image shows a video call interface with a list of participants on the right side. The participants are: Nahid Talebi, Rachel Oliver, and a man in a green shirt. The interface also includes a 'LIVE' indicator and a dropdown menu for personalizing the live streaming service.

... and Klystron, too!

LIVE sur Personnaliser le service de rediffusion en direct

Linac - TEM Instrumentation



Based on JEOL JEM-2200FS (200kV with Omega Filter)



Nahid Talebi



Rachel Oliver



Sophie Meuret

Time (resolved) to make cathodoluminescence in a TEM!

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Time-resolved CL in a TEM

Cold-FEG Time-resolved TEM

Arnaud Arbouet

Florent Houdellier

Nahid Talebi

Takumi Sannomiya

CEMES

Houdellier et al, Ultramicroscopy (2018)

Masoud Taleb

Coherence... again!

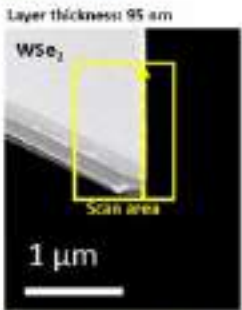
zoom.us Réunion Voir Modifier Fenêtre Aide

Webinaire Zoom

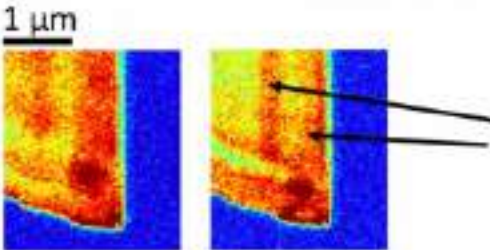
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C | A | U Christian-Albrecht-Universität zu Kiel

Spontaneous coherence of interference fringes

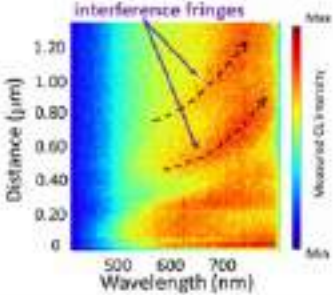


Layer thickness: 95 nm
WSe₂
Scan area
1 μm

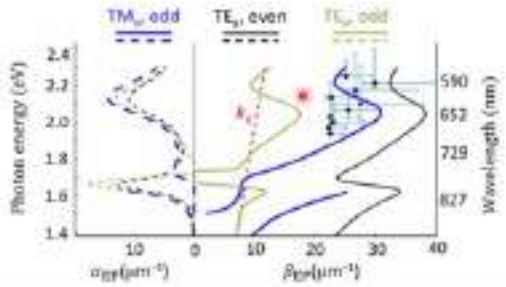


1 μm
 $\lambda = 700 \text{ nm}$ $\lambda = 600 \text{ nm}$

spatially resolved standing wave patterns, parallel to the edges are noticeable




Interference fringes
Distance (μm)
Wavelength (nm)
Measured CL intensity



TM_n, odd TE_n, even TE_n, odd
Photon energy (eV)
Wave-length (nm)
 $\alpha_{TE}(\mu\text{m}^{-1})$ $\beta_{TE}(\mu\text{m}^{-1})$

Simulations show various modes and specifically excitation of TE_n modes



Nahid Talebi
Sophie Meuret

Fabrizio Carbone


- (Jo Verbeeck chairing)

Next step: a gamma ray laser!

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Laboratory for Ultrafast Microscopy and Electron Scattering (LUMES)

Coherent control of matter down to the nuclei





Fabrizio Carbone

EPFL LUMES Funding sources erc FNSNF Google

Amparo Taroncher_n...

Mathieu Kociak



Jo Verbeeck

Vincenzo Grillo

Sorting vortices becomes a reality!

The image shows a Zoom meeting interface. The main content is a presentation slide with the following text:

ELECTRON SPECTROSCOPY WITH AN ORBITAL ANGULAR MOMENTUM SORTER: RESULTS AND CHALLENGES

Vincenzo Grillo
CNR –NANO Modena Italy

Thank for Invitation !!!!!!!

The slide also features a 3D visualization of a blue helical structure, likely representing the orbital angular momentum sorter. At the bottom of the slide, there are logos for the European Union, the French Republic, and a project logo for "Electron Beam Spectroscopy for Nano-objects, 19/01/2019-2023".

On the right side of the Zoom window, there is a vertical list of participants:

- Vincenzo Grillo (active video)
- Mathieu Kociak
- Fabrizio Carbone
- Javier Garcia (active video)
- Jo Verbeeck

The Zoom control bar at the bottom includes icons for "Activer", "Démarrer vidéo", "Participants" (10), "Converser", "Partager l'écran", "Désactiver", "Lever la main", and a red "Quitter" button.

Jo Verbeeck

Jo made a great job in auto-chairing himself ;)

And brought to us amazing high pixel density programmable phase plates!

The image is a screenshot of a Zoom meeting interface. The main window displays a presentation slide with the following text:

Demonstration of a 48 pixel programmable phase plate for adaptive electron optics

Jo Verbeeck, Francisco Vega, Armand Béché
EMAT, University of Antwerp, Belgium

At the bottom of the slide, there are logos for Intel, the University of Antwerp, and AdaptEM, along with the text "Electron Microscopy for Materials Science University of Antwerp".

On the right side of the Zoom window, there is a vertical list of participants:

- Vicenzo Grillo
- Mathieu Kociak
- Fabrizio Carbone
- Javier Garcia (with a small video thumbnail)
- Jo Verbeeck (with a larger video thumbnail)

The Zoom interface includes a top navigation bar with options like "Reunion", "Voir", "Modifier", "Fenêtre", and "Aide". A status bar at the bottom shows "Active", "Participants", "Conversation", "Partager l'écran", "Enregistrer", and "Lancer le chat". A "Gitter" logo is visible in the bottom right corner.

Stefan Kempers

Light meets electron ... and phase plates!

The screenshot shows a Zoom meeting interface. The main content is a presentation slide with a night-time aerial view of a university campus. The slide title is "Development of a Pulsed Laser Phase Plate inside a Cavity-Based Transmission Electron Microscope". The presenter is identified as Stefan Kempers, PhD, with the date 15 - 06 - 2021. The slide footer includes "Coherence and Quantum Technology, Department of Applied Physics", "ThermoFisher TII/e", and "Eindhoven University of Technology".

On the right side of the Zoom window, there is a vertical list of participants: Vincenzo Grillo, Mathieu Kociak, Fabrizio Carbone, Stefan Kempers (who is currently speaking, indicated by a small video icon), and Jo Verbeeck.

The Zoom control bar at the bottom includes icons for "Activer", "Démarrer vidéo", "Participer", "Commenter", "Partager l'écran", "Enregistrer", "Lever la main", and a "Quitter" button.


Yaniv Kurman

Seeing phononic light in action!


zoom.us Réunion Voir Modifier Fenêtre Aide

Webinaire Zoom

LIVE sur Personnaliser le service de rediffusion en direct



Technion
Israel Institute of Technology




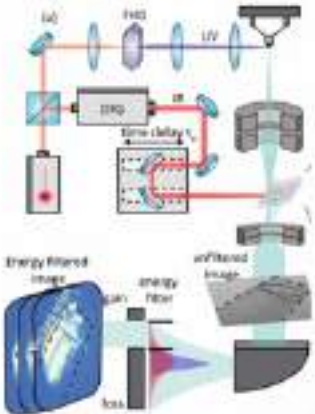
AdQuanta Group

Imaging the dynamics of 2D polariton wavepackets

Yaniv Kurman^{1,3}, Raphael Dahan^{1,4}, Hanan Herzig Shenfux², Kangpeng Wang¹, Michael Yannai¹, Yuval Adiv¹, Ori Reinhardt¹, Luiz H. G. Tizei⁵, Steffi Y. Woo⁵, Jiahua Li⁴, James H. Edgar⁴, Mathieu Kociak³, Frank H. L. Koppens^{2,5*}, and Ido Kaminer^{1*}

Just published in Science last Friday

¹Technion
²ICFO, Barcelona, Spain
³CNRS, Orsay, France
⁴Kansas State University, USA
⁵ICREA, Barcelona, Spain



electron probe

propagating polariton wavepacket

Energy filtered image

energy filter

unfiltered image

count [a.u.]

distance from excited edge [μm]

t_e=0

t_e=0.1 ps

t_e=0.2 ps

t_e=0.3 ps

t_e=0.4 ps

t_e=0.5 ps


t_e=0.6 ps

t_e=0.7 ps

exciton along excited edge

Vicenzo Grillo

Mathieu Kociak



Yaniv Kurman

Stefan Kempers

Jo Verbeeck

Thanks everyone, and see you soon in real life!