

## Photonic Crystal Materials and Devices

Tuesday - Thursday 5 - 7 April 2016

### Conference Sessions At A Glance

[SHOW](#) | [HIDE](#)

- 1: Phonon-Photon Interaction: Optomechanics and SBS  
Poster Pops
- 2: Quantum Optics in PhC Structures and Light Emission Control
- 3: Photonic Crystal-based Devices and Photonic Integrated Circuits  
Poster Pops  
Hot Topics II  
Posters - Tuesday
- 4: Hybrid Photonic Crystal-based Devices
- 5: Nonlinear Optics and Lasers
- 6: Light Control and Confinement in PhC Structures and Cavities I
- 7: Light Control and Confinement in PhC Structures and Cavities II  
Hot Topics III
- 8: 3D Photonic Crystals and Colloidal Structures
- 9: Plasmonics and Biosensing
- 10: Disorder Effects in Photonic Structures

### Important Dates

[SHOW](#) | [HIDE](#)

- Abstract Due:**  
19 October 2015
- Author Notification:**  
15 January 2016
- Manuscript Due Date:**  
7 March 2016

### Conference Committee

[SHOW](#) | [HIDE](#)

#### Conference Chairs

- [Dario Gerace](#), Univ. degli Studi di Pavia (Italy)  
[Gabriel Lozano](#), Consejo Superior de Investigaciones Científicas (Spain)  
[Christelle Monat](#), Ecole Centrale de Lyon (France)  
[Sergei G. Romanov](#), Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany),  
 Ioffe Physical Technical Institute (Russian Federation)

#### Program Committee

- [Hernán Ruy Míguez](#), Consejo Superior de Investigaciones Científicas (Spain)  
[Lucio Claudio Andreani](#), Univ. degli Studi di Pavia (Italy)  
 Antonio Badolato, Univ. of Rochester (United States)  
[Kurt Busch](#), Humboldt-Univ. zu Berlin (Germany)  
[Eric Cassan](#), Institut d'Électronique Fondamentale (France)  
[Emmanuel Centeno](#), Univ. d'Auvergne Clermont-Ferrand I (France)  
[Richard M. De La Rue](#), Univ. of Malaya (Malaysia) and Univ. of Glasgow  
 (United Kingdom)  
[Massimo De Vittorio](#), Univ. del Salento (Italy)  
[Alejandro Giacomotti](#), Lab. de Photonique et de Nanostructures (France)  
[Romuald Houdré](#), Ecole Polytechnique Fédérale de Lausanne (Switzerland)  
[Sven Höfling](#), Julius-Maximilians-Univ. Würzburg (Germany)

#### Program Committee continued...

- [Thomas F. Krauss](#), Univ. of St. Andrews (United Kingdom)  
 Kobus Kuipers, FOM Institute for Atomic and Molecular Physics  
 (Netherlands)  
 Mikhail F. Limonov, Ioffe Physico-Technical Institute (Russian Federation)  
[Cefe López](#), Consejo Superior de Investigaciones Científicas (Spain)  
 Manuela Lunz, Philips Research (Netherlands)  
[Bary Luther-Davies](#), The Australian National Univ. (Australia)  
 Jordi Martorell, ICFO - Institut de Ciències Fotòniques (Spain)  
[Adriana Passaseo](#), Univ. del Salento (Italy)  
[Min Qiu](#), KTH Royal Institute of Technology (Sweden)  
[Vincenzo Savona](#), Ecole Polytechnique Fédérale de Lausanne (Switzerland)  
[Christian Seassal](#), Ecole Centrale de Lyon (France)  
[Anne Sentenac](#), Institut Fresnel Equipe SEMO (France)  
[Silvia Vignolini](#), Univ. of Cambridge (United Kingdom)  
[Diederik S. Wiersma](#), European Lab. for Non-linear Spectroscopy (Italy)

TUESDAY 5 APRIL

[Show All Abstracts](#)

### Opening Remarks

Tuesday 5 April 2016  
8:25 AM - 8:30 AM

### Session 1: Phonon-Photon Interaction: Optomechanics and SBS

Tuesday 5 April 2016  
8:30 AM - 10:00 AM

Session Chair: [Christelle Monat](#), Ecole Centrale de Lyon (France)

Proceedings Home Browse Proceedings > by Conference By Year by Volume No. by Volume Title

SPIE Proceedings | Volume 9885 | Light Control and Confinement in PhC Structures and Cavities I >

< Previous Article Next Article >

Proceedings Article

## In-situ measurement of bound states in the continuum in photonic crystal slabs (Conference Presentation)

*Stefan Kalchmair ; Roman Gansch ; Patrice Genevet ; Tobias Zederbauer ; Donald MacFarland ; Hermann Detz ; Aaron Maxwell Andrews ; Werner Schrenk ; Gottfried Strasser ; Federico Capasso ; Marko Loncar*

[+] Author Affiliations

Proc. SPIE 9885, Photonic Crystal Materials and Devices XII, 98850M (April 21, 2016); doi 10.1117/12.2227203

Text Size: A A A

From Conference Volume 9885

Photonic Crystal Materials and Devices XII  
Dario Gerace; Gabriel Lozano; Christelle Monat; Sergei G. Romanov  
Brussels, Belgium | April 03, 2016

### Abstract

#### abstract

Photonic crystal slabs have been subject to research for more than a decade, yet the existence of bound states in the radiation continuum (BICs) in photonic crystals has been reported only recently [1]. A BIC is formed when the radiation from all possible channels interferes destructively, causing the overall radiation to vanish. In photonic crystals, BICs are the result of accidental phase matching between incident, reflected and in-plane waves at seemingly random wave vectors [2]. While BICs in photonic crystals have been discussed previously using reflection measurements, we report for the first time in-situ measurements of the bound states in the continuum in photonic crystal slabs. By embedding a photodetector into a photonic crystal slab we were able to directly observe optical BICs. The photonic crystal slabs are processed from a GaAs/AlGaAs quantum wells heterostructure, providing intersubband absorption in the mid-infrared wavelength range. The generated photocurrent is collected via doped contact layers on top and bottom of the suspended photonic crystal slab. We were mapping out the photonic band structure by rotating the device and by acquiring photocurrent spectra every 5°. Our measured photonic bandstructure revealed several BICs, which was confirmed with a rigorously coupled-wave analysis simulation. Since coupling to external fields is suppressed, the photocurrent measured by the photodetector vanishes at the BIC wave vector. To confirm the relation between the measured photocurrent and the Q-factor we used temporal coupled mode theory, which yielded an inverse proportional relation between the photocurrent and the out-coupling loss from the photonic crystal. Implementing a plane wave expansion simulation allowed us to identify the corresponding photonic crystal modes. The ability to directly measure the field intensity inside the photonic crystal presents an important milestone towards integrated opto-electronic BIC devices. Potential applications range include nonlinear optics, nano-optics, sensing and optical computing. This research was supported by the Austrian Science Fund FWF (Grant No. F2503-N17), the PLATON project 35N, the "Gesellschaft für Mikro- und Nanoelektronik" GfME and the European Research Council (Grant no. 639109). [1] C.W. Hsu et al. "Observation of trapped light within the radiation continuum", Nature 499, 188 (2013) [2] Y. Yang Y et al., "Analytical Perspective for Bound States in the Continuum in Photonic Crystal Slabs", Phys Rev Lett

Some tools below are only available to our subscribers or users with an online account.

PDF Email  
Share Get Citation

Article Alerts

### Related Content

Customize your page view by dragging & repositioning the boxes below.

Related Proceedings Articles

Related Book Chapters

Topic Collections

Advertisement

SPIE.

STARTUP  
challenge

JENOPTIK  
FOUNDING  
PARTNER

WIN  
\$10,000 CASH  
FROM JENOPTIK

LEARN MORE

113, 037401 (2014) © (2016) COPYRIGHT Society of Photo-Optical Instrumentation Engineers (SPIE). Downloading of the abstract is permitted for personal use only.

## Topics

Photonic crystals ; Radiation ; Simulations ; Photodetectors ; Plane waves ; Phase matching ; Reflection ; Quantum wells ; Absorption ; Gallium arsenide

**Citation** Stefan Kalchmair ; Roman Gansch ; Patrice Genevet ; Tobias Zederbauer ; Donald MacFarland, et al.

" In-situ measurement of bound states in the continuum in photonic crystal slabs (Conference Presentation) ", *Proc. SPIE* 9885, Photonic Crystal Materials and Devices XII, 98850M (April 21, 2016); doi 10.1117/12.2227203; <http://dx.doi.org/10.1117/12.2227203>

### Piezo Stages

PRECISION | SPEED | STABILITY



**PI** [Learn more](#)

Access This Proceeding


#### Sign In

Username

Password

[Sign In](#)

Forgot your password?  
[click here to reset it on our main site, spie.org](#)

Sign in via [Shibboleth](#) 

You don't have access to view full content.

If you believe you should have access to this article through your institution, [click here to try again](#).

#### Site Map

[HOME](#)  
[PROCEEDINGS](#)  
[JOURNALS](#)  
[eBOOKS](#)  
[TOPIC COLLECTIONS](#)

#### Services

[Subscribe](#)  
[Alerts](#)  
[Information for Librarians](#)  
[Privacy Policy](#)  
[Terms Of Use](#)  
[Contact Us](#)  
[About the Digital Library](#)  
[Help](#)

#### Other Resources

[SPIE.org](#)  
[SPIE Membership](#)  
[SPIE Career Center](#)

#### Information for Authors

[Books](#)  
[Journals](#)  
[Proceedings](#)  
[Reprint Permissions](#)  
[About Open Access](#)

