

# PROCEEDINGS OF SPIE

*19th International Conference and School on  
Quantum Electronics*

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## ***Laser Physics and Applications***

**Tanja Dreischuh**  
**Sanka Gateva**  
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*Editors*

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## Introduction

The International School on Quantum Electronics "Laser Physics and Applications" is a traditional event, organized biennially by the Institute of Electronics, Bulgarian Academy of Sciences, since 1980 with the aim to act as a forum for interchange and dissemination of knowledge and ideas on the latest developments and results in the research areas of quantum electronics and optics, as well as the technological practical applications of new ideas, devices, instruments and laser systems. Leading scientists and companies are invited to deliver lectures and demonstration on the fundamentals of laser physics and applications of lasers as well as the newest results in these areas. The informal atmosphere stimulated further collaborations and joint works. The School Proceedings have been published since 1996 on the SPIE Digital Library. In 2016, the scientific program was such that this year's edition of the School somehow naturally grew to being also a Conference.

Thus, the 19th International Conference and School on Quantum Electronics (ICSQE2016) was held from 26 to 30 September 2016 in the Black Sea resort town of Sozopol, Bulgaria. It was sponsored by the Optical Society of America (OSA), SPIE, the European Physical Society and the Bulgarian National Scientific Fund, to whom the Organizing Committee expresses its deep gratitude. The leading companies such Coherent and Toptica Photonics presented their products through oral presentations and exhibitions.

For over 35 years, ICSQE has provided an excellent opportunity for young researchers to meet internationally renowned scientists to exchange ideas, review latest technologies and achievements, discuss the future directions, and initiate new collaborations and joint research projects. To recognize research excellence and scientific presentation abilities, SPIE, OSA and EPS sponsored the Best Student Paper Awards Competition.

More than 80 scientists from Armenia, Azerbaijan, Belarus, Canada, Germany, Greece, Italy, Latvia, Poland, Russia, Switzerland, Turkey, United Kingdom and Bulgaria participated in ICSQE2016 and presented around 100 contributions – invited lectures, oral and poster presentations. One of the highlights of the ICSQE2016 was related to the processes occurring in three-level systems - coherent population trapping, bright resonances, electromagnetic-induced transparency, marking the three anniversaries: 40 years since the first dark-state observation in Pisa, 20 years of its theoretical interpretation, and 25 years of the first experimental evidence of electromagnetically-induced transparency.

This Proceedings volume contains fifty-four invited and contributed papers covering the Conference topics of laser-matter interactions, laser spectroscopy and metrology, laser remote sensing and ecology, lasers in biology and medicine, and laser systems and nonlinear optics. All the submitted manuscripts were peer-

reviewed by experts in the respective fields using the SPIE review system.

ICSQE2016 owes its success to many people. The International Program Committee planned and organized the scientific program, ensuring high-quality plenary presentations. The Local Committee bore the brunt of the organization and ensured the smooth running of the conference. The choice of Sozopol, one of the oldest towns on the Bulgarian Black Sea coast, strongly enhanced the friendly and stimulating atmosphere of the Conference.

The Editors of the volume would like to thank all the invited speakers and participants for their contribution to these proceedings, the members of the International Advisory and Program Committees for their great support, as well as the reviewers for their time and effort evaluating the papers. Thanks also go to the SPIE staff for their invaluable assistance. We hope that the readers will find this collection of papers interesting and useful and we would like to invite them to take part in the next 20<sup>th</sup> ICSQE, which will be held in September 2018.

**Tanja Dreischuh**  
**Sanka Gateva**  
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