

Proceedings of the

**XVII INTERNATIONAL YOUNG SCIENTISTS'
CONFERENCE ON APPLIED PHYSICS**

May, 23-27, 2017, Kyiv, Ukraine

**Taras Shevchenko National University of Kyiv
Faculty of Radio Physics, Electronics and Computer Systems**

Збірник наукових праць

**СІМНАДЦЯТОЇ МІЖНАРОДНОЇ КОНФЕРЕНЦІЇ
МОЛОДИХ УЧЕНИХ З ПРИКЛАДНОЇ ФІЗИКИ**

23-27 травня 2017 року, Київ, Україна

**Київський національний університет імені Тараса Шевченка
Факультет радіофізики, електроніки та комп'ютерних систем**

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General information

Date	May, 23-27, 2017
Location	Taras Shevchenko National University of Kyiv, Faculty of Radio Physics, Electronics and Computer Systems, building No 4 g, Acad. Glushkov Avenue
Organizers	Taras Shevchenko National University of Kyiv, Faculty of Radio Physics, Electronics and Computer Systems, Young Scientists Council of Taras Shevchenko National University of Kyiv, Student Parliament of the Faculty of Radio Physics, Electronics and Computer Systems, Ukrainian Physical Society

Scope

The XVII International Young Scientists' Conference on Applied Physics is the annual meeting of students, postgraduate students, young scientists and researchers in field of applied physics (radio physics and electronics). The leading Ukrainian and foreign scientists will speak on the plenary meeting of the Conference. The reports of the participants will be given hearing during sections and published afterwards in the book of proceedings.

Scientific program

The Conference contributions are accepted from the following areas:

- Laser Physics and Optoelectronics
- Magnetism and Superconductivity
- Surface Physics and Nanoelectronics
- Physics of Semiconductors and Dielectrics, Semiconductor Devices
- Medical Physics
- Plasma Physics
- Computer Engineering
- Radio Engineering and Communications

Conference venue

All events associated with the XVII International Young Scientists' Conference on Applied Physics will take place in the lecture halls of Faculty of Radio Physics, Electronics and Computer Systems (building No 4 g, Acad. Glushkov Avenue)

Climate

The weather in Kyiv in May is usually warm and sunny. The average temperature in May is + 18°C. The climate in Ukraine is mild, moderate continental.

Time

Local time is one hour ahead of Middle European time.

Conference language

The language of the Conference Proceedings is English.

Meals

There are many snack bars, cafes and open-area cafes close the Conference Site (at the territory of Faculty of Radio Physics, Electronics and Computer Systems, in the University Campus and at the National Exhibition Center of Ukraine)

Presentation

The Conference program includes invited lectures and contributed paper. All reports will be lectured in oral presentation and poster session.

Invited talks: 60 minutes (including discussion)

Other talks: 20 minutes (including discussion)

Multimedia projectors are available.

Social program

General information

The main organizer of the Conference is the Faculty of Radio Physics, Electronics and Computer Systems of Taras Shevchenko National University of Kyiv. During over fifty years it is the prominent center of education and scientific research in fields of applied physics, radiophysics, electronics, computer engineering, radio engineering. Taras Shevchenko National University of Kyiv is founded in 1834. It possesses the unique position among the high schools of Ukraine, which is accepted by the special edicts of the President of Ukraine.

Kyiv

Kyiv is the capital of Ukraine, one of the most ancient cities in the world. It is known in history as the “Mother of Russian cities”, the capital of the first Eastern-Slavonic state, the Kyiv Russ. Kyiv plays an important role in the development of the world culture. It is founded in the VI century and from the Christianity, adopted by Prince Vladimir in 988, started spreading in Russ.

Kyiv is a major scientific center. It is the seat of numerous universities and institutions of higher education, research and design organizations.

Kyiv is one of largest cultural centers. There are many remarkable monuments of history, architecture and arts such as St. Sophia Cathedral (XI-XVIII centuries), The Golden Gates (XI-XX), the Kyiv-Pechery Lavra (XI-XX), St. Cyril Church (XII-XIX), St. Andrew Church (XVIII, architect B.Rastrelli), Marian Palace (XVIII, architect B.Rastrelli) etc.

Kyiv is known as city-park. Woods, gardens, parks and tree-lined boulevard take more than 2/3 of its area. Kyiv is situated on the banks of the Dnipro River, making it inimitable in its charm.

Walking-tour (excursion) in the center of Kyiv will take place at May 25, 2017 from 16:00 to 20:00.

Another Conference’s events will be announced at the Conference registration desk during the Conference.

**Edited by Dr. Olexiy Y. Nechyporuk,
Dr. Andriy V. Netroba,
Dr. Ivan S. Kolomiets, Dr. Oleksandr V. Pylypovskyi**

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THE INVESTIGATION OF TEMPORAL EVOLUTION OF ELECTRON CONCENTRATION IN ALUMINIUM PLASMA PLUME

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Emission spectroscopy of aluminum laser plume allowed to learn the dynamics of population of the excited states of atoms and plasma parameters. Understanding these processes and their spatial and temporal scales is very important to optimize the operation of radiation, atoms and ions sources based on laser plasma

The maximum of electron concentration is observed at time of $t \sim 25$ ns and consists of $3.4 \times 10^{17} \text{ cm}^{-3}$. During the followings 25 ns concentration of electrons fell to $2.8 \times 10^{16} \text{ cm}^{-3}$, and in the sentinel interval of (55-90) ns changed within the limits of $(2-2.8) \times 10^{16} \text{ cm}^{-3}$. Since 80 ns the expansion is more perceptible and will result in the diminishing of concentration of electrons almost into an order to a size of $4.7 \times 10^{15} \text{ cm}^{-3}$ at time of 160 ns.

Fig. 1 shows the electron concentration from 40 to 160 ns in laser plasma plume at a distance of 1 mm from the aluminum target.

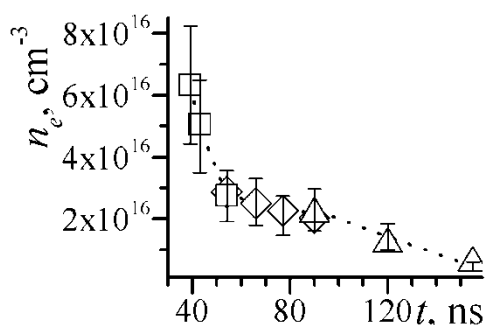


Fig. 1: Temporal evolution of electron concentration in plasma plume at a distance of 1 mm from the aluminum target: \circ – experimental obtained data; \square – doubly charged ions recombination; \diamond – one-dimensional expansion; \triangle – one-dimensional expansion + singly charged ions recombination.

The best description of the experimental data is obtained by the recombination of the doubly charged ions at the 40-55 ns time interval. After the time of 55 ns good agreements with the experiment have dependences for one-dimensional expansion. In the 40-150 ns time interval at a distance of 1 mm from target the temporal dynamics of the electron concentration determined by dominance of doubly charged ions recombination, one-dimensional expansion of plasma and singly charged ions recombination. The concentration of electrons varies from $3.4 \times 10^{17} \text{ cm}^{-3}$ to $4.7 \times 10^{15} \text{ cm}^{-3}$ to 160 ns in the distance of 1 mm from the target.

From the analysis of results [1-3] evidently, at the similar terms of experiment the increase of power results to the growth of values of temperature and concentration of electrons.

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