
Retirement

Professor SAKABE, Shuji

Advanced Research Center for Beam Science

– Laser Matter Interaction Science –



On 31 March 2020, Dr. SAKABE, Shuji retired from Institute for Chemical Research (ICR), Kyoto University after about 17 years of service and was honored with the title of Professor Emeritus of Kyoto University.

Dr. Sakabe was born in Hyogo Prefecture in September 1954. He graduated from Faculty of Engineering, Osaka University in 1978, and went on the graduate school at Osaka University to study the sciences of laser plasma and laser nuclear fusion under the supervision of the late Professor Chiyo Yamanaka at Institute of Laser Engineering (ILE). He was employed as Assistant Professor at ILE, Osaka University in 1982, and was awarded the degree of Doctor of Engineering for the thesis titled “Research on energy absorption and implosion uniformity for laser nuclear fusion” in 1985. In 1983–1985, he served as a group leader to lead the project for the construct of the world’s largest output-power laser facility “GekkoXII” at the time. In 1985 he was employed as researcher at Max-Planck Institute for Quantum Optics, Federal Republic of Germany (West Germany), the division of laser plasma physics directed by Drs. Sibert Witkowski and Richard Sigel. He was re-employed as assistant professor at ILE, in 1986, moved to Graduate School of Engineering, Osaka University in 1989, and was promoted to Associate Professor in 1996. He was appointed as Visiting Associate Professor at National Institute for Fusion Science of MEXT in 1997–2002. He spent months in 2002 as Visiting Professor at Technical University of Vienna. In 2003, he was employed as full-professor at ICR. Since the reorganization of ICR in 2002 he has held the chair of the Laboratory for Laser Matter Interaction Science in Advanced Research Center for Beam Science. He served as the director of Advanced Research Center for Beam Science in 2009–2011 and 2017–2019.

Throughout his academic career, Dr. Sakabe has been engaged in the fundamental research on the physics of high-intensity laser interaction with matter (plasmas), and its applications such as quantum beam generation and laser processing, and has achieved significant results. In particular, during the inception of laser fusion science research in Japan, he made pioneering contributions in the field of high-intensity laser science, such as physical elucidation of laser plasma absorption and fast ion generation, demonstration of indirect laser implosion, construction of the world’s largest output-power laser facility, and the database construction of atom-ion collision cross section for laser isotope separation.

It should be noted that he constructed ultra-intense short-pulse laser system by the wisdom that he has cultivated so far, opened the research facility for the physics of the interaction between high-intensity lasers and materials and its application in the Advanced Beam Nanoscience Center, ICR, and established a base for high-intensity laser science infrastructure. From this facility, he achieved many remarkable results, including:

- Demonstration of laser proton acceleration

- Demonstration of laser-induced cluster coulomb explosion
- Exploring the possibility of applying explosive accelerated ions to compact neutron sources
- Physics of interaction between high-intensity short-pulse laser and large molecules
- Demonstration of terahertz wave generation from clusters induced by laser
- Development of laser accelerated electron source and its application
- Demonstration of compression method of laser accelerated electron pulse
- Development of ultrafast electron diffraction/deflection method using laser accelerated electron pulses
- Discovery of electron generation and induction by laser
- Generation of high-intensity surface electromagnetic waves by laser
- Observation of ultra-high-speed phenomena by deflection method using laser-accelerated electron pulses
- Investigation of the physics of nano-ablation with femtosecond laser
- Investigation of the physics of self-organization of nano periodical structure on matter surface with femtosecond laser
- Applications of femtosecond laser to laser matter processing

In addition, he made the high-performance laser with high availability and high quality, and provided the facility use as a joint use / research center, and conducted many joint researches.

As described above, he made extensive contributions to the foundation of high-intensity laser science by conducting extensive research on high-intensity laser material interactions and their applications. His achievements were highly regarded internationally and he gave invited talks at many international conferences. These achievements have been published as 126 original papers and 15 reviews papers in academic journals, 6 books (edited and co-authored), 183 international conference lectures, and 432 domestic conference lectures. He is also active in international activities such as the chair of the organizing committee of OPIC (Optics and Photonics International Congress). He also holds important positions at academic societies in Japan, such as the Vice President of the Laser Society of Japan.

His educational contribution to Kyoto University is also noteworthy. He has guided 34 graduate students and sent many valuable human resources to universities and academia society.

For his achievements, he was awarded from the Laser Society of Japan, Achievement Award for Excellent Paper in 1989, 2016 and 2017, Achievement Award for Excellent Progress in 2007, Fellow in 2015 and The Laser Society Achievement Award in 2018.

Dr. Sakabe’s contribution to Kyoto University and ICR and academic societies through his scientific, educational and administrative activities is hereby gratefully acknowledged.