Press Release

Sept. 10 2020

Association of Asia-Pacific Physical Societies (AAPPS)

Division of Plasma Physics (AAPPS-DPP)

Subramanyan Chandrasekhar Prize of Plasma Physics

– Professor Hyeon Park is selected as 7th (2020) Laureate –

The Division of Plasma Physics (Chair: Mitsuru Kikuchi) under the Association of Asia Pacific Physical Societies (President: Jun'ichi Yokoyama) has selected Professor Hyeon Park of the UNIST (Ulsan National Institute of Science and Technology) as the 7th (2020) Laureate of S. Chandrasekhar Prize of Plasma Physics, which is awarded to scientist who have made seminal / pioneering contributions in the field of plasma physics. He is the first Korean Laureate of this prize.

Citations

Hyeon Park : *Through his original and pioneering works in fusion plasma diagnostics, the electron cyclotron emission imaging (ECEI) and microwave imaging reflectometry enabled to visualize magnetohydrodynamic instabilities and turbulent fluctuations with unprecedented high-resolution, leading to rich discoveries of novel plasma physics phenomena, for example, in the sawtooth crash process and the edge localized mode events. The plasma physics research assisted by the advanced imaging diagnostics enhanced the synergies with numerical modeling and theories, and elevated fusion plasma research program in Korea. Nowadays the ECEI system is a standard research tool in majority of toroidal devices.*

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Press Release

On the achievements of Professor Hyeon Park

Prof. Hyeon K. Park

Hyeon K. Park received B.S. degree in physics, USC (1978) and Ph.D. degrees in electrical engineering, UCLA (1984). He pioneered THz collective scattering system for study of waves in the plasmas: Ion acoustic wave and Ion Bernstein wave measurement). His professional career started at Princeton Plasma Physics Laboratory (PPPL), Princeton University, where he worked until late 2007; his last rank was Principal Research Physicist. While he was working on multi-channel interferometer system on TFTR tokamak, he invented a versatile new inversion algorithm for interferometry measurement. Using the density profile information, he established that the stored energy/neutron yield of the discharges of the "supershot" regime has a strong correlation with the density profile shape in TFTR. After decommissioning of the TFTR, he developed high speed/high resolution 2-D microwave camera [electron cyclotron imaging (ECEI) for electron temperature and microwave imaging reflectometry (MIR) for electron density] to elevate understanding of the physics of MHD instabilities and turbulence through international collaboration. The successful test of the ECEI/MIR system was performed on TEXTOR device, Germany. The result was highlighted in the back to back PRL papers (2006) on the physics of sawtooth instability as the first author. In late 2007, he returned to Korea as a professor of physics, Pohang University of Science and Technology (POSTECH), Pohang and established one of the fusion plasma research centers in Korea. There, he developed the most sophisticated 2D/3D ECEI and MIR systems at the time on KSTAR as shown in Fig.1 with sample 2-D images. The ECEI system successfully visualized time evolution of the edge localized mode (ELM) from growth to burst for the first time and the observed ELM structure was validated with the MHD code. Since then the ECEI system has been instrumental for the KSTAR physics research. In 2013, he moved to the physics department at Ulsan National Institute of Science and Technology (UNIST), Ulsan, where he established a new fusion research center. He has continued validation work on major MHD instabilities with worldwide theory groups (Commissariat à l'énergie atomique et aux (CEA), National Fusion Research Institute (NFRI), and PPPL). Highlight was a clear clarification of the physics models developed for the sawtooth instability for more than four decades through intricate validation experiments on KSTAR. Recently, his research has been on energy exchange problem through interaction between the simultaneously measured micro-turbulence and mesoscale fluctuation (neoclassical tearing mode and ELMs) in 2-D. This unique and powerful visualization diagnostic tool become a standard in majority of tokamak devices throughout the world. Since 2015, he has simultaneously served the KSTAR research center as a director and senior adviser. He has published more than 300 SCI papers, including 36 PRLs. The recent review paper in Advances in Physics-X, 2019, summarized his work on new physics uncovered by the ECEI system up to now. He has delivered numerous plenary and invited talks at major international conferences, including IAEA-FEC, AAPPS-DPP, EPS-DPP, and APS-DPP. He

has served on many international committees, including the International Fusion Research Council and the ITER Science and Technology Advisory committee, and was a Chair of the ITPA Diagnostic Division. He also served Plasma Physics and Controlled Fusion as an editorial board member, and he is a Fellow of American Physical Society.

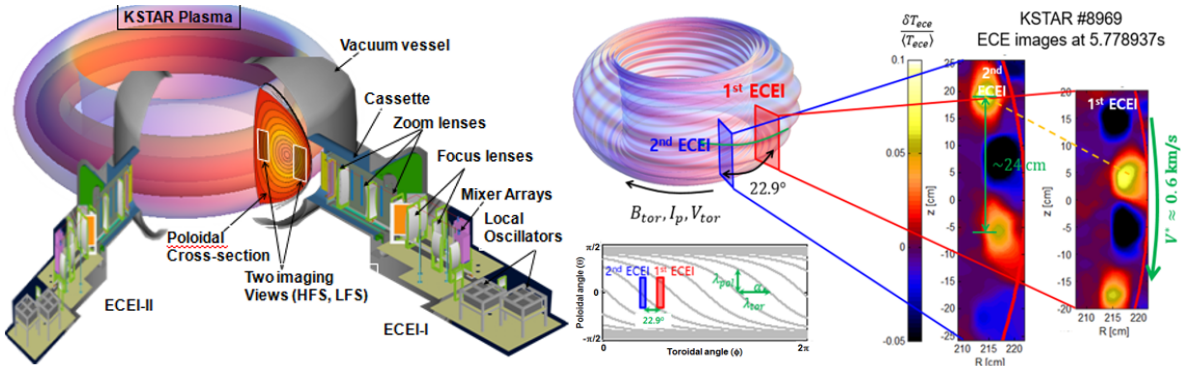
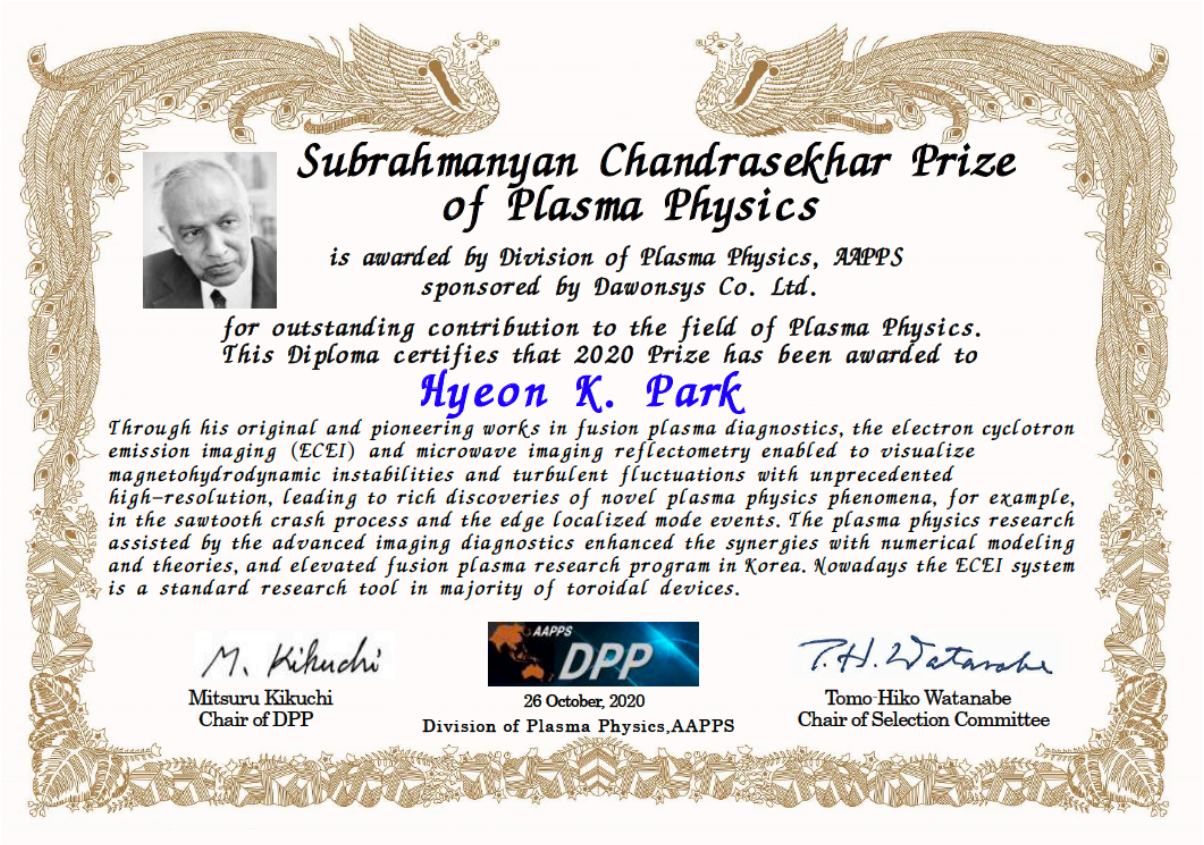


Fig.1 (left) Two toroidally separated (~23 degree) ECEI systems combined with MIR system on KSTAR. ECEI-I has two views on poloidal plane and ECEI-II has a single view. (right) Two sample images of the same ELM structure with different zoom factor at two toroidal location are shown: field line pitch, rotation speed and mode number and mode dynamics are comprehensively measured simultaneously.

Appendix-1: Certificates of 2020 S. Chandrasekhar Prize of Plasma Physics

Certificate and medal will be virtually given at the 4th Asia-Pacific Conference on Plasma Physics (AAPPS-DPP2020 online e-conference) Oct, 26-31, 2020.



Subrahmanyan Chandrasekhar Prize of Plasma Physics

is awarded by Division of Plasma Physics, AAPPS
sponsored by Dawonsys Co. Ltd.

for outstanding contribution to the field of Plasma Physics.
This Diploma certifies that 2020 Prize has been awarded to

Hyeon K. Park

Through his original and pioneering works in fusion plasma diagnostics, the electron cyclotron emission imaging (ECEI) and microwave imaging reflectometry enabled to visualize magnetohydrodynamic instabilities and turbulent fluctuations with unprecedented high-resolution, leading to rich discoveries of novel plasma physics phenomena, for example, in the sawtooth crash process and the edge localized mode events. The plasma physics research assisted by the advanced imaging diagnostics enhanced the synergies with numerical modeling and theories, and elevated fusion plasma research program in Korea. Nowadays the ECEI system is a standard research tool in majority of toroidal devices.

M. Kikuchi
Mitsuru Kikuchi
Chair of DPP

AAPPS DPP
26 October, 2020
Division of Plasma Physics,AAPPS

T.H. Watanabe
Tomo-Hiko Watanabe
Chair of Selection Committee

Press Release

Appendix-2: Glossary

1. Subrahmanyan Chandrasekhar

Astrophysicist born in India. He received the Nobel Prize in Physics in 1983 *for his theoretical studies of the physical processes of importance to the structure and evolution of stars,* including the Chandrasekhar limit on the mass of white dwarf stars. His research covered several broad areas, as seen from his texts, which included *Principles of Stellar Dynamics* (1942), *Hydrodynamics and Hydromagnetic Stability* (1981), and an influential book based on his lecture notes in *Plasma Physics* (1960).

2. AAPPS: Association of Asia-Pacific Physical Societies

(HP: http://www.aapps.org/main/index.php)

The Association of physical societies in the Asia Pacific region founded by the Nobel Laureate in Physics C.N. Yang, and Professor Akito Arima in 1983. The AAPPS held the 12th Asia Pacific Physics Conference under the president (at that time) Shoji Nagamiya in Makuhari, Japan. The current president is Professor Jun'ichi Yokoyama, the University of Tokyo, Japan.

3. AAPPS-DPP: Division of Plasma Physics, AAPPS

(HP : http://aappsdpp.org/AAPPSDPPF/index.html)

The first division under the AAPPS based on the success of the plasma physics program in the APPC-12. This division was formed in January 2014 based on the recommendation of Professor Nagamiya at the AAPPS council. From Nov 28, 2018, AAPPS-DPP becomes legal entity.

4. Subrahmanyan Chandrasekhar Prize of Plasma Physics

Subrahmanyan Chandrasekhar Prize of Plasma Physics is a top plasma physics prize founded by the AAPPS-DPP in July 2014 and is endorsed by AAPPS. This prize is given to a plasma physicist annually for pioneering and/or seminal contribution to plasma physics. The prize recipients were Professor S. Ichimaru (2014), Professor P. Kaw (2015), Professor D. Melrose (2016), Professors C.Z. Cheng and Lou C. Lee (2017), Professor Toshiki Tajima (2018), Professor Liu Chen and Kazunari Shibata (2019) (http://aappsdpp.org/AAPPSDPPF/prizetable.html). The 2020 prize is sponsored by Dawonsys Co. Ltd., Korea (CEO SunSoon Park).

The 2020 Selection Committee composed of leading plasma physicists in Asia-Pacific region.
Chairman : Professor Tomo-Hiko Watanabe (Nagoya University)
Members : Professor Akihide Fujisawa (Kyushu University),
Professor Liu Chen (Zhejiang University),
Professor Siming Liu (Purple Mountain Observatory),
Professor Robert Dewar (Australian National University),
Professor Donald B. Melrose (University of Sydney),
Professor Amita Das (Indian Institute of Technology Delhi),
Professor G.C. Anupama (Indian Institute of Astrophysics),
Professor Kwo Ray Chu (National Taiwan University),
Professor Kerchung Shaing (National Cheng Kung University)
Professor Chang-Hee Nam (Gwangju Institute of Science and Technology),
Professor Dong-Hun Lee (Kyung Hee University),