# Conference Program

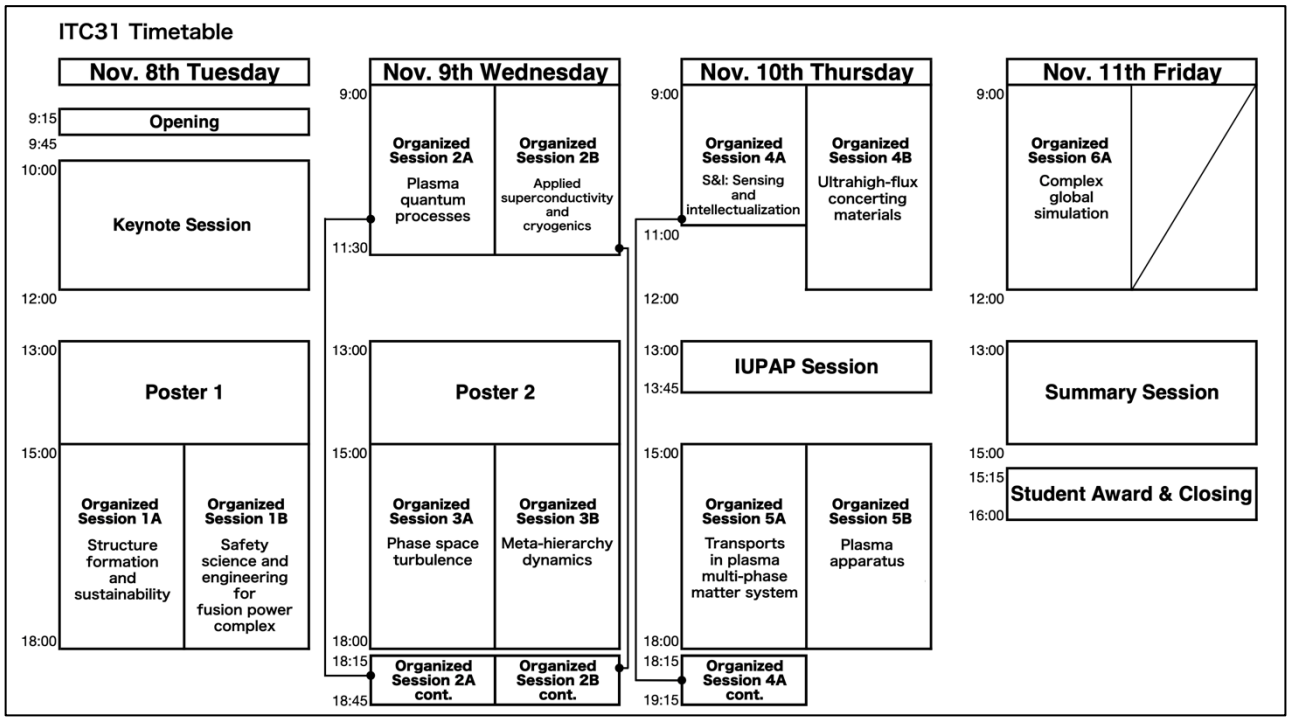
Online Conference

# ITC31

## The 31st International Toki Conference on Plasma and Fusion Research

Expanding academic world emerging from fusion science

November 8-11, 2022



# 1st day – November 8th, 9:15 – 18:00(JST)

## Opening Session (9:15 – 9:45)

Chair: Yasushi Todo (National Institute for Fusion Science)

## Keynote Session (10:00 – 12:00)

Chair: Ryuichi Sakamoto (National Institute for Fusion Science)

10:00 – 11:00 PL1: Zensho Yoshida (National Institute for Fusion Science)
*Future of fusion science -- perspective of general physics*

11:00 – 12:00 PL2: Amitava Bhattacharjee (Princeton Plasma Physics Laboratory, Princeton University)
*Current sheets and the plasmoid instability: mediators of fast magnetic reconnection and turbulence*

## Poster Session 1 (13:00 – 15:00)

*cf. "Poster List" in ITC31 web*

## Organized Session 1A "Structure formation and sustainability" (15:00 – 18:00)

Chair: Masaki Osakabe (National Institute for Fusion Science)

15:00 – 15:25 1A-1: Hiroyuki Yamaguchi (National Institute for Fusion Science)
*Direction and perspectives of "Structure formation and sustainability" unit*

15:25 – 15:50 1A-2: Hiromi Takahashi (National Institute for Fusion Science)
*Research plan in the "Structure Formation and Sustainability" unit*

15:50 – 16:00 Break

16:00 – 17:00 1A-3: Per Helander (Max-Planck Institute for Plasma Physics)
*Stellarators optimisation: a brief review*

17:00 – 17:30 1A-4: Takuma Sugi (Hiroshima University)
*Active matter physics and high-speed single-shot 4D imaging*

17:30 – 18:00 1A-5: Takahiko Ban (Osaka University)
*Maximum Entropy Production Principle in Spontaneous Structure*

## Organized Session 1B “Safety science and engineering for fusion power complex” (15:00 – 18:00)

Chair: Yoshitaka Mori (The Graduate School for the Creation of New Photonics Industries)

15:00 – 15:45 1B-1: Naoko Ashikawa (National Institute for Fusion Science)

*Safety Science and Engineering for Fusion Power Complex*

15:45 – 16:40 1B-2: Ian Chapman (UKAEA, Culham Science Centre)

*An overview of the UK fusion programme*

16:40 – 16:50 Break

16:50 – 17:10 1B-3: Jumpei Baba (The University of Tokyo)

*Current state of electric power systems in Japan and expectations for fusion energies*

17:10 – 17:30 1B-4: Hiroko Shoji (Chuo University)

*Modeling a sense of security, “Anshin-kan”*

17:30 – 18:00 Discussion

# 2nd day – November 9th, 9:00 – 18:45(JST)

## Organized Session 2A "Plasma quantum processes" (9:00 – 11:30 & 18:15 - 18:45)

Chair: Daiji Kato (National Institute for Fusion Science)

9:00 – 9:25 2A-1: Izumi Murakami (National Institute for Fusion Science)
*Research on Plasma Quantum Processes in Various Plasmas*

9:25 – 10:20 2A-2: Yuri Ralchenko (National Institute of Standards and Technology)
*Quantum processes in collisional-radiative modeling of plasmas*

10:20 – 10:30 Break

10:30 – 11:00 2A-3: Nobuyuki Nakamura (The University of Electro-Communications)
*Plasma atomic processes studied with two complementary electron beam ion traps in Tokyo*

11:00 – 11:30 2A-4: Yasuhiro Kuramitsu (Osaka University)
*Relativistic ion acceleration by irradiating large area suspended graphene with an ultra-intense laser*

18:15 – 18:45 2A-5: Yasushi Kino (Tohoku University)
*New kinetics model of muon catalyzed fusion*

## Organized Session 2B "Applied superconductivity and cryogenics" (9:00 – 11:30 & 18:15 - 18:45)

Chair: Nagato Yanagi (National Institute for Fusion Science)

9:00 – 9:25 2B-1: Naoki Hirano (National Institute for Fusion Science)
*Overview of the Applied Superconductivity and Cryogenics Unit*

9:25 – 9:35 2B-2: Shinji Hamaguchi (National Institute for Fusion Science)
*Academic Plan on Cryogenic Engineering (Applied Superconductivity and Cryogenics Unit)*

9:35 – 9:45 2B-3: Yuta Onodera (National Institute for Fusion Science)
*Research and development of high-temperature superconducting large-current conductors in NIFS*

9:45 – 9:50 Break

9:50 – 10:20 2B-4: Wolfgang Stautner (GE Research)
*Recent Advances in Cryogenics*

10:20 – 10:25 Break

10:25 – 10:55 2B-5: Naoyuki Amemiya (Kyoto University)
*High-current assembled conductor technology as a key for innovative applications of high $T_c$ superconductors*

10:55 – 11:00 Break

11:00 – 11:30 2B-6: Shirabe Akita (Central Research Institute of Electric Power Industry)
*Power Industry in Japan and Expectations for Superconducting Application*

18:15 – 18:45 2B-7: Bernhard Holzapfel (Karlsruhe Institute of Technology)
*HTSC Coated Conductors for Power and Magnet applications*

## Poster Session 2 (13:00 – 15:00)

*cf. "Poster List" in ITC31 web*

## Organized Session 3A "Phase space turbulence" (15:00 – 18:00)

Chair: Yusuke Kosuga (Kyushu University)

15:00 – 15:30 3A-1: Tatsuya Kobayashi (National Institute for Fusion Science)
*Research plan of phase-space turbulence unit*

15:30 – 16:00 3A-2: Tokihiko Tokuzawa (National Institute for Fusion Science)
*Development plan and status of phase-space diagnostics in high temperature plasma*

16:00 – 16:20 Break

16:20 – 17:10 3A-3: Maxime Lesur (Université de Lorraine)
*Nonlinear kinetics: from isolated hole-clump pairs to phase-space turbulence*

17:10 – 18:00 3A-4: Masaki Kando (National Institutes for Quantum Science and Technology, Kansai Photon Science Institute)
*Strong plasma wave excitation by an intense, short laser pulse and challenge to high-energy and high-brightness electron beams*

## Organized Session 3B “Meta-hierarchy dynamics” (15:00 – 18:00)

Chair: Motoki Nakata, Atsushi M. Ito (National Institute for Fusion Science)

15:00 – 15:25 3B-1: Masanori Nunami (National Institute for Fusion Science)
*Prospects of Meta-Hierarchy Dynamics*

15:25 – 15:50 3B-2: Atsushi M. Ito (National Institute for Fusion Science)
*Directions of Meta-Hierarchy Dynamics Unit*

15:50 – 16:30 3B-3: Yasuaki Kishimoto (Kyoto University)
*Dynamics and structure of plasma due to multi-scale interactions in a global open system*

16:30 – 16:40 Break

16:40 – 17:20 3B-4: Yuto Katoh (Tohoku University)
*Nonlinear wave-particle interactions in the Earth’s inner magnetosphere: Cross-energy and cross-scale couplings*

17:20 – 18:00 3B-5: Ryoichi Yamamoto (Kyoto University)
*Direct numerical simulations of active particles with fully resolved hydrodynamics*

# 3rd day – November 10th, 9:00 – 19:15(JST)

## Organized Session 4A "S&I: Sensing and intellectualization" (9:00 – 11:00 & 18:15 - 19:15)

Chair: Satoru Sakakibara (National Institute for Fusion Science)

9:00 – 9:30 4A-1: Ryo Yasuhara (National Institute for Fusion Science)
*Introduction of S&I: Sensing and Intellectualizing Technology Unit*

9:30 – 10:00 4A-2: Satoshi Ohdachi (National Institute for Fusion Science)
*S&I: Sensing and Intellectualizing Technology Unit, Research Plan*

10:00 – 11:00 4A-3: Kwan-Liu Ma (University of California at Davis)
*Trends and Challenges of Scientific Visualization*

18:15 – 19:15 4A-4: Pär Strand (Chalmers University of Technology)
*FAIR and open data exchange for the fusion community*

## Organized Session 4B "Ultrahigh-flux concerting materials" (9:00 – 12:00)

Chair: Teruya Tanaka, Sadatsugu Takayama (National Institute for Fusion Science)

9:00 – 9:30 4B-1: Takuya Nagasaka (National Institute for Fusion Science)
*Ultrahigh-flux concerting materials*

9:30 – 10:00 4B-2: Makoto I. Kobayashi (National Institute for Fusion Science)
*Control and application of ultrahigh flux hydrogen in materials*

10:00 – 10:10 Break

10:10 – 11:05 4B-3: Lance L. Snead (Stony Brook University)
*Development of Irradiation Tolerant Materials*

11:05 – 12:00 4B-4: Katsuhisa Tanaka (Kyoto University)
*Metastable oxides with magnetic functionalities*

## IUPAP Session (13:00 – 13:45)

Chair: Hideo Sugama (National Institute for Fusion Science)

13:00 – 13:25　Akihide Fujisawa (Kyusyu University)

*Introduction of IUPAP and its Centenary*

13:25 – 13:45　Yuko Okamoto (Nagoya University)

*IUPAP C20 Commission (Computational Physics) and Conference on Computational Physics 2023 (CCP2023)*

## Organized Session 5A "Transports in plasma multi-phase matter system" (15:00 – 18:00)

Chair: Masahiro Kobayashi, Hiroaki Nakamura (National Institute for Fusion Science)

15:00 – 15:30 5A-1: Suguru Masuzaki (National Institute for Fusion Science)

*Introduction of the Transports in Plasma Multi-Phase Matter System Unit*

15:30 – 16:20 5A-2: Sebastijan Brezinsek (Forschungszentrum Jülich)

*Plasma-surface interaction in magnetically-confined plasmas: from graphite-based materials to metallic first walls*

16:20 – 17:10 5A-3: Masahiro Katoh (Hiroshima University)

*Physics and applications of electromagnetic radiation from relativistic electrons*

17:10 – 18:00 5A-4: Kensei Kobayashi (Yokohama National University)

*Prebiotic Formation of Amino Acids and Their Homochirality: With a Focus on the Roles of Cosmic Rays*

## Organized Session 5B "Plasma apparatus" (15:00 – 18:00)

Chair: Haruhisa Nakano (National Institute for Fusion Science)

15:00 – 15:20 5B-1: Haruhisa Nakano (National Institute for Fusion Science)

*Introduction of "Plasma Apparatus" unit*

15:20 – 15:45 5B-2: Katsuyoshi Tsumori (National Institute for Fusion Science)

*Physics and Engineering Research of n-NBI at NIFS*

15:45 – 16:10 5B-3: Haruhiko Saitoh (The University of Tokyo)

*Creation and investigation of antimatter plasmas*

16:10 – 16:35 5B-4: Shinji Okada (Chubu University)
*Muon and fusion science collaboration*

16:35 – 16:40 Break

16:40 – 17:20 5B-5: Magdaleno R. Vasquez Jr. (University of the Philippines Diliman)
*Development of Plasma Sources for Surface Modification*

17:20 – 18:00 5B-6: Kazunori Takahashi (Tohoku University)
*Magnetic nozzle radiofrequency plasma systems for space and industry*

# 4th day – November 11th, 9:00 – 16:00(JST)

## Organized Session 6A "Complex global simulation" (9:00 – 12:00)

Chair: Hideaki Miura, Mieko Toida (National Institute for Fusion Science)

9:00 – 9:30 6A-1: Yasushi Todo (National Institute for Fusion Science)
*Complex Global Simulation Unit*

9:30 – 10:00 6A-2: Susumu Goto (Osaka University)
*Data-driven turbulence modeling*

10:00 – 11:00 6A-3: Anatoly Spitkovsky (Princeton University)
*Simulations of multiscale plasmas in high-energy astrophysics*

11:00 – 12:00 6A-4: Kengo Nakajima (The University of Tokyo)
*h3-Open-BDEC: Innovative Software Infrastructure for Scientific Computing in the Exascale Era by Integrations of (Simulation + Data + Learning)*

## Summary Session (13:00 – 15:00)

Chair: Tomohiro Morisaki (National Institute for Fusion Science)

13:00 – 14:00 S1: Hiroshi Yamada (The University of Tokyo)
*Some remarks on what is demanded and appearing in "Expanding academic world emerging from fusion science"*

14:00 – 15:00 S2: Kanya Kusano (Institute for Space-Earth Environmental Research)
*A few topics of plasma physics in solar physics: Eruption, Reconnection, and Dynamo*

## Student Award & Closing Session (15:15 – 16:00)

Chair: Yasushi Todo (National Institute for Fusion Science)