Recent activities of RPD of AESJ

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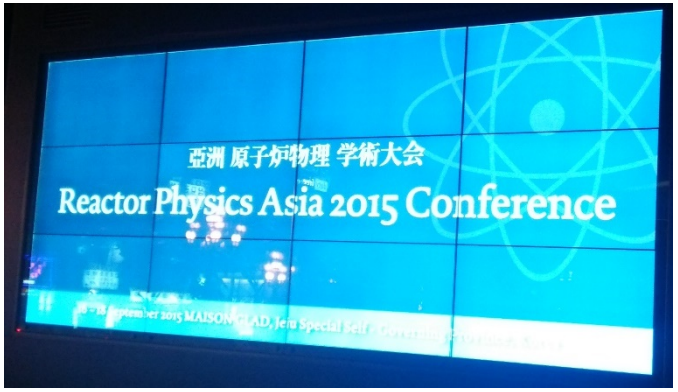
Welcome to RPHA2019

- Reactor Physics Asia (RPHA) was launched in 2015 Jeju, Korea
- RPHA2017, Chengdu, China
- RPHA2019, Osaka, Japan
- Excellent information exchange meetings on reactor physics
- Enjoy reactor physics as well as cool & deep culture of Osaka!



https://www.travel.co.jp/guide/matome/90/

Recent status of Nuclear Power in Japan

Recent status of Nuclear Power in Japan

- Power plants
  - Nine PWRs have been restarted
  - Four BWRs (Kashiazaki-Kariwa, Unit 6&7, ABWR, Tokai-Daini, BWR5, Onagawa, BWR5) received approval from NRA
  - ~20 PWRs/BWRs are going to decommission
- Rokkasho fuel reprocessing plant is under final phase of approval from NRA
- Fukushima Daiichi ... decommissioning
  - Removal of spent fuel from SFP – currently unit 3
  - Fuel debris removal – will start 2021
- METI launched NEXIP program in 2019
  - Looking for “innovation” for nuclear power, focusing on new reactor designs

Inside Fukushima Daiichi

Recent activities of RPD/AESJ

Recent activities of RPD/AESJ

- Update of the R&D roadmap in reactor physics field (2017)
- Reactor physics textbook for novices
  - ~400 pages (in Japanese ...)
  - No mathematical formulation – Yes!
  - Physics oriented description : includes thermal hydraulics, fuel mechanical behavior, plant safety
- Portal web page on reactor physics researches/information for beginners
- Discussion on future of research reactors

RPD R&D roadmap 2017

- Vision of reactor physics
  - Reactor physics contributes to sound and sustainable developments of human society through a deep understanding of physics and their safe control of nuclear systems in the academic field mainly focusing on interactions of neutrons and nucleus including nuclear fission
- Missions of reactor physics
  - Propose best nuclear utilization for human society through maximization of resource value of nuclear materials
  - Pursuit energy security, environmental affinity, and economics throughout the whole life-cycle of nuclear utilization while putting the first priority to safety
  - Improve our understanding of physics appeared in nuclear systems from microscopic to macroscopic scales
  - Inherit reactor physics and hand over the improved one while considering that it is the sole academic area answering the question “why it is a nuclear reactor?”
  - Pursuit useful ways to use nuclear reactions for human society

RPD R&D roadmap 2017

- Regulatory and standard infrastructures
  - 7 plans
  - E.g., develop a standard for critical control during fuel debris removal
- Human resources infrastructures
  - 17 plans
  - E.g., develop a reactor physics textbook for novices
- Experimental infrastructures
  - 6 plans
  - E.g., maintain, improve, and/or replace research reactors
- Technology infrastructures
  - 25 plans
  - E.g., Multi-physics analysis for nuclear safety

New textbook on “physics of reactors”

1. Physics of reactors
2. Development history of nuclear power
3. Basics of nuclear physics
4. Interaction of neutron and nucleus
5. Fission and chain reactions
6. Multiplication of neutrons and criticality
7. Whole life of neutrons
8. Burnup
8. Kinetics
9. Power reactors
10. Heat generation and heat transfer
11. Interaction among multi-physics
12. Critical assemblies
13. Research reactors
14. Safety evaluation of nuclear power plants
15. Criticality safety

Recent topics in reactor physics research in Japan

Major research topics

- Uncertainty quantification/data assimilation
- Reduced order model
- High fidelity simulation methods
- Experiment analysis, V&V
- Criticality safety for fuel debris
- Cross section processing
- ADS experiments/design
- Innovative reactor design, ATF
- 50 presentations / AESJ meeting (twice a year)

Summary

Future of reactor physics

- Reactor physics is the heat of nuclear engineering
  - Can answer “why it is a nuclear reactor?”
  - Can provides most important safety principles of nuclear power
- From “reactor physics” to “physics of reactors”

Thank you and enjoy the meeting!