



Curriculum Vitae

Hyunsuk Lee

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AFFILIATION

Combined Master's and Ph.D Program (2013.03 ~ present)

Ulsan National Institute of Science & Technology (UNIST)
44919, UNIST-gil 50, Ulsan Metropolitan City, Republic of Korea

EDUCATION

Bachelor of Engineering

- Major: Nuclear Science & Engineering
Thermo- Fluid & Power Engineering
- UNIST, Ulsan, Korea, 2009.03 - 2013.02

RESEARCH EXPERIENCE

• Monte Carlo Neutron & Photon Transport Code Development

- Develop the code from the scratch as a main developer
- Perform the benchmark calculation for verification and validation: BEAVRS, VERA, MHTGR-350, VENUS-2, C5G7, Hoogenboom-Martin, etc.

• Inter-cycle Correlation in Monte Carlo Simulation

- Real variance estimation
- Inter-cycle correlation reduction technique

• Acceleration Technique of Monte Carlo

- MOC-MC hybrid method
- Modified Power Method (MPM)
- Coarse Mesh Finite Difference (CMFD) method

• Self-Powered Neutron Detector (SPND)

- Development calculation procedure with MCNP6 and BETA-S

• Boron Meter

- Development calculation procedure with MCNP6

RESEARCH INTERESTS

• Monte Carlo Method

- Validation & verification
- Acceleration technique
- Inter-cycle correlation
- Sensitivity and uncertainty quantification
- Decomposition algorithm

• Monte Carlo Simulation

- Reactor design

- Self-Powered Neutron Detector (SPND)
- Boron meter
- **Reactor Analysis**
- PWR, Gen-IV reactor

SKILLS

- **Nuclear-physics Code**
- MCNP, Serpent, McCARD, NJOY
- **Programming Language**
- Fortran, Python, C/C++, Matlab, Shell, Awk, Sed
- **OS/Tools**
- Linux, Windows, MS office, git

CERTIFICATES

- **Awards & Scholarship**
- RPHA 17 best student papers Award: Performance Evaluation of CMFD on Inter-Cycle Correlation of Monte Carlo Simulation (August, 2017)
- KNS best paper prize: Preliminary Solution of BEAVRS Hot Full Power at BOC by Monte Carlo Code (May, 2017)
- National natural sciences and engineering scholarship, Korean Student Aid Foundation (March, 2009 - February, 2013)
- **Training (International)**
- MCNP VISED training (Las Vegas, Feb, 2015)
- Research reactor Kyoto University Critical Assembly (KUCA) Experiment, Kyoto University (Osaka, July, 2013)
- MCNP5 training (Paris, March, 2013)
- **Training (Domestic)**
- VISUAL MCNP training (Daejeon, 2015)
- LWR refueling core design training, KHNP CRI (HYU, July, 2014)
- Basic theory and programming practice of nuclear reactor design and analysis with Monte Carlo method (INTEC, January, 2014)
- McCARD user training course, Seoul National University (SNU, August, 2013)
- Whole core transport analysis seminar, KAERI (Muju, March, 2013)
- **Membership**
- Korean Nuclear Society Student Member (March, 2013)

PUBLICATIONS SCI(E) JOURNAL

1. **Hyunsuk Lee**, Sooyoung Choi, and Deokjung Lee*, "A Hybrid Monte Carlo/Method-of-Characteristics Method for Efficient Neutron Transport Analysis," Nucl. Sci. Eng., 180 (1) pp.69-85, <http://dx.doi.org/10.13182/NSE13-102> (2015)
2. **Hyunsuk Lee**, Sooyoung Choi, Kyoon-Ho Cha, Kwangho Lee, and Deokjung Lee*, "New Computational Model for Self-Powered Neutron Detector Based on Monte Carlo Simulation," J. Nucl. Sci. Tech., <http://dx.doi.org/10.1080/00223131.2014.975766> (2015)
3. Matthieu Lemaire, **Hyunsuk Lee**, Bamidele Ebiwonjumi, Chidong Kong, Wonkyeong Kim, Yunki Jo, Jinsu Park, Deokjung Lee*, "Verification of Photon Transport Capability of UNIST Monte Carlo Code MCS", Comput. Phys. Commun., Accepted for Publication (2018)

4. Jiankai Yu, **Hyunsuk Lee**, Hanjoo Kim, Peng Zhang, Deokjung Lee*, "Preliminary Coupling of the Thermal/Hydraulic Solvers in the Monte Carlo Code MCS for Practical LWR Analysis", *Annals of Nuclear Energy*, Accepted for Publication (2018)
5. Jaerim Jang, Wonkyeong Kim, Sanggeol Jeong, Eun Jeong, Jinsu Park, Matthieu Lemaire, **Hyunsuk Lee**, Yongmin Jo, Peng Zhang, Deokjung Lee*, "Validation of UNIST Monte Carlo Code MCS for Criticality Safety Analysis of PWR Spent Fuel Pool and Storage Cask," *Annals of Nuclear Energy*, 114: 495-509. <https://doi.org/10.1016/j.anucene.2017.12.054> (2018)
6. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee*, "On the Transfer Matrix of the Modified Power Method," *Comput. Phys. Commun.*, 222: 102-112. <https://doi.org/10.1016/j.cpc.2017.09.022> (2018)
7. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee*, "Extension of the Noise Propagation Matrix Method for Higher Mode Solutions," *J. Comput. Phys.*, Published Online. <http://dx.doi.org/10.1016/j.jcp.2017.05.007> (2017)
8. Matthieu Lemaire, **Hyunsuk Lee**, Nam-il Tak, Hyun Chul Lee, Deokjung Lee*, "Multi-physics steady state analysis of OECD/NEA Modular High Temperature Gas-cooled Reactor MHTGR-350," *J. Nucl. Sci. Technol.*, Published Online. <http://dx.doi.org/10.1080/00223131.2017.1299649> (2017)
9. Jinsu Park, **Hyunsuk Lee**, Taewoo Tak, Ho Cheol Shin, Deokjung Lee*, "Physics Study of Canada Deuterium Uranium Lattice with Coolant Void Reactivity Analysis," *Nucl. Eng. Tech.*, 49 (1): 6-16. <http://dx.doi.org/10.1016/j.net.2016.07.003> (2017)
10. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee*, "Calculation of Degenerated Eigenmodes with Modified Power Method," *Nucl. Eng. Tech.*, 49 (1): 17-28. <http://dx.doi.org/10.1016/j.net.2016.08.009> (2017)
11. Chidong Kong, **Hyunsuk Lee**, Taewoo Tak, Deokjung Lee*, Si Hwan Kim, Seokjean Lyou, "Accuracy Improvement of Boron Meter Adopting New Fitting Function and Multi-detector", *Nucl. Eng. Tech.*, Published Online. <http://dx.doi.org/10.1016/j.net.2016.06.012> (2016)
12. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee*, "Extension of Modified Power Method to Two-Dimensional Problems," *J. Comput. Phys.*, <http://dx.doi.org/doi/10.1016/j.jcp.2016.05.024> (2016)
13. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee* "A General Solution Strategy of Modified Power Method for Higher Mode Solutions," *J. Comput. Phys.*, 305:387-402 <http://dx.doi.org/doi:10.1016/j.jcp.2015.10.042> (2016)
14. Sooyoung Choi, **Hyunsuk Lee**, Ser Gi Hong, and Deokjung Lee*, "Resonance Self-Shielding Methodology of New Neutron Transport Code STREAM," *J. Nucl. Sci. Technol.*, 52(9):1133-1150, <http://dx.doi.org/10.1080/00223131.2014.993738>, (2015)

PROCEEDING CONFERENCES

1. **Hyunsuk Lee**, Wonkyeong Kim, Peng Zhang, Azamat Khassenov, Jinsu Park, Jiankai Yu, Sooyoung Choi, Hwan Soo Lee and Deokjung Lee*, "Preliminary Simulation Results of BEAVRS Three-dimensional Cycle 1 Wholecore Depletion by UNIST Monte Carlo Code MCS," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
2. **Hyunsuk Lee**, and Deokjung Lee*, "Application of CMFD with Wielandt Method on Continuous Energy Monte Carlo Simulation for Eigenvalue Problems," ANS MC2015, Nashville, TN, USA, April 19-23 (2015)
3. **Hyunsuk Lee**, Chidong Kong, and Deokjung Lee*, "Status of Monte Carlo Code Development at UNIST," PHYSOR2014, Kyoto, Japan, September 28 October 3 (2014) [Oral Presentation]
4. **LEE Hyunsuk**, CHOI Sooyoung, KIM Si Hwan, LYOU Seokjean, and LEE Deokjung *, "Development of MCNPX Model for Boronmeter," International Symposium on Symbiotic Nuclear Power Systems for the 21st Century (ISSNP2013), November 22-24, Beijing, China (2013) [Oral Presentation]
5. **Hyunsuk Lee** and Deokjung Lee *, "Hybrid Method of Deterministic and Probabilistic Approaches for Continuous Energy Neutron Transport Problem," M&C2013, Sun

Valley, USA, May (2013) [Oral Presentation]

6. Vutheam Dos, **Hyunsuk Lee**, Yunki Jo, Matthieu Lemaire, Chang Je Park, Deokjung Lee*, "Verification of MCS Monte Carlo Code for the JRTR Research Reactor," PHYSOR2018, Cancun, Mexico, April 22-26 (2018) [Oral Presentation]
7. Peng Zhang, **Hyunsuk Lee**, Yunki Jo, Deokjung Lee*, "Monte Carlo Adjoint Eigenmode Calculation with the Application of Modified Power Method," PHYSOR2018, Cancun, Mexico, April 22-26 (2018) [Oral Presentation]
8. Jiankai Yu, Hanjoo Kim, **Hyunsuk Lee**, Matthieu Lemaire, Peng Zhang, Deokjung Lee*, "Verification of Monte Carlo code MCS Coupled with CTF and FRAPCON", PHYSOR2018, Cancun, Mexico, April 22-26 (2018) [Oral Presentation]
9. Tran Quoc Tuan, Sanggeol Jeong, Nguyen Hoang Nhat Khang, **Hyunsuk Lee**, Sooyoung Choi, Peng Zhang, Min Jae Lee, Jae-Yong Lim and Deokjung Lee*, "Evaluation of the MCNP6 code for SFR shielding analysis", PHYSOR2018, Cancun, Mexico, April 22-26 (2018) [Oral Presentation]
10. Matthieu Lemaire, **Hyunsuk Lee**, Bamidele Ebiwonjumi, Chidong Kong, Wonkyeong Kim, Yunki Jo, Jinsu Park, Deokjung Lee*, "Development of photon-transport capability in UNIST Monte Carlo code MCS", PHYSOR2018, Cancun, Mexico, April 22-26 (2018) [Oral Presentation]
11. Jiankai Yu, **Hyunsuk Lee**, Khassenov Azamat, Kan Wang and Deokjung Lee, "PERFORMANCE OF ON-THE-FLY CROSS SECTIONS PROCESSING IN MONTE CARLO SIMULATION CODE," 37th Annual Conference of the Canadian Nuclear Society, Niagara Falls, ON, Canada, Jun 4-7 (2017)
12. Matthieu Lemaire, **Hyunsuk Lee**, Nam-il Tak, Hyun-Chul Lee, Deokjung Lee*, "Monte Carlo Thermal-Fluids Coupled Calculations for MHTGR-350MW Benchmark," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
13. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee, "A New Accumulation Scheme for the Monte Carlo Implementation of the Modified Power Method," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
14. Wonkyeong Kim, **Hyunsuk Lee**, Sooyoung Choi, Ji-Eun Jung and Deokjung Lee*, "Hybrid Depletion Method for the Light Water Reactor analysis," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
15. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee, "Monte Carlo Higher Modes Calculation based on the Extension of the Noise Propagation Matrix," M&C, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
16. Jinsu Park, **Hyunsuk Lee**, Deokjung Lee*, "Optimization of CANDU Lattice Design for Negative Coolant Void Reactivity," PBNC 2016, Beijing, China, April 5-9 (2016)
17. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee*, "Extension of Modified Power Method to Multi-Dimensional Monte Carlo Simulations," PHYSOR2016, Sun Valley, ID, USA, May 1-5 (2016)
18. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee*, "On the Characteristics of Transfer Matrix of Generalized Modified Power Method," PHYSOR2016, Sun Valley, ID, USA, May 1-5 (2016)
19. Hanjoo Kim, Kiho Kim, Sooyoung Choi, **Hyunsuk Lee**, and Deokjung Lee, "Analysis of NCA Tungsten Critical Experiment by New Monte Carlo Code," PHYSOR2016, Sun Valley, ID, USA, May 1-5 (2016)
20. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seakjean Lyou, and Deokjung Lee*, "Optimization of Boron Meter Model" ICAPP2016, San Francisco, CA, USA, April

17-20 (2016)

21. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee*, "A Monte Carlo Convergence Acceleration Technique based on the Modified Power Method," SMMS2015, Chiang Mai, Thailand, November 22-23 (2015)
22. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee*, "A Monte Carlo Convergence Acceleration Technique Based on the Modified Power Iteration Method," Modelling and Simulation: Techniques and Applications 2015, Bangkok, Thailand, June 28-29 (2015)
23. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee*, "Stabilization Technique of Modified Power Iteration for Monte Carlo Simulation of Neutron Transport Eigenvalue Problem," ANS MC2015, Nashville, TN, USA, April 19-23 (2015)

CONFERENCE

1. **Hyunsuk Lee** and Deokjung Lee*, "On-The-Fly Interpolation for Thermal Scattering in MCS," Transactions of the KNS Spring Meeting, Jeju, Korea, May 16-18 (2018) [Oral presentation] Download Paper Download Presentation
2. **Hyunsuk Lee**, Eun Jeong, Hocheol Lee, Hyun Chul Lee, Deokjung Lee*, "Verification of MCS VHTR Modeling Capability," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
3. **Hyunsuk Lee**, Deokjung Lee, Peng Zhang, and Azamat Khassenov, "Preliminary Solution of BEAVRS Hot Full Power at BOC by Monte Carlo Code" KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
4. **Hyunsuk Lee**, Wonkyeong Kim, Peng Zhang, Azamat Khassenov, Yunki Jo, and Deokjung Lee, "Development Status of Monte Carlo Code at UNIST", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)
5. **Hyunsuk Lee**, Azamat Khassenov, Peng Zhang, and Deokjung Lee*, "Computational Approaches to Large-scale/complex Nuclear Reactor Analysis," CPMMS2016, Bangkok, Thailand, January 24-26 (2016)
6. **Hyunsuk Lee** and Deokjung Lee, Performance Evaluation of CMFD with Superhistory Method on Continuous Energy Monte Carlo Eigenvalue Simulation, KNS Spring Meeting, Jeju, Korea, May 6-8 (2015)
7. **Hyunsuk Lee** and Deokjung Lee*, "Application of CMFD on Continuous Energy Monte Carlo Simulation for Eigenvalue Problems," KNS Fall Meeting, Pyeongchang, Korea, October 30-31 (2014) [Oral Presentation]
8. **Hyunsuk Lee**, Chidong Kong, and Deokjung Lee*, "A New Monte Carlo Neutron Transport Code at UNIST," KNS Spring Meeting, Jeju Convention Center, May 28-30 (2014) [Oral Presentation]
9. **Hyunsuk Lee**, Sooyoung Choi, and Deokjung Lee*, "Development of Boron Meter Model with MCNPX," KNS Fall Meeting, Kyeongju, October (2013) [Oral Presentation]
10. **Hyunsuk Lee** and Deokjung Lee*, "Application of Analytic Slowingdown Kernel for MOC-MC Hybrid Method," ANS Winter Meeting, Washington D.C., November (2013) [Oral Presentation]
11. **Hyunsuk Lee**, Si Hwan Kim, Seokjean Lyou, and Deokjung Lee *, "Performance Evaluation of Boronmeter based on MCNPX Model," ANS Winter Meeting, Washington D.C., November (2013) [Oral Presentation]
12. **Hyunsuk Lee**, Chidong Kong, Sooyoung Choi, and Deokjung Lee *, "Hybrid Method of MOC and MC for Efficient Continuous Energy Neutron Transport Analysis," ANS Annual Meeting, Atlanta, GA, June (2013) [Oral Presentation]

13. Jinsu Park, Peng Zhang, **Hyunsuk Lee**, Deokjung Lee*, "Performance Evaluation of CMFD on Inter-Cycle Correlation of Monte Carlo Simulation," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
14. Khang Nguyen, JiwonChoe, Sooyoung Choi, **Hyunsuk Lee**, Wonkyeong Kim, Deokjung Lee*, Matthieu Lemaire, "Verification of STREAM and MCS against OPR FA depletion calculation," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
15. Matthieu Lemaire, **Hyunsuk Lee**, Bamidele Ebiwonjummi, ChidongKong, Wonkyeong Kim, Yunki Jo, Jinsu Park, Deokjung Lee*, "Recent Work on Photon Transport with UNIST Monte Carlo Code MCS," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
16. Chidong Kong, **Hyunsuk Lee**, Matthieu Lemaire, Wonkyeong Kim, Yunki Jo, Jinsu Park, JiwonChoe, Bamidele Ebiwonjumi, Deokjung Lee*, "Introduction to UNIST Spent Nuclear Fuel Transportation Package Analysis Code System," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
17. Vutheam Dos, **Hyunsuk Lee**, Yunki Jo, Deokjung Lee*, Change Je Park, "Verification of MCS Model of the Jordan Research and Training Reactor for Neutronic Calculations," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
18. Tung Dong Cao Nguyen, **Hyunsuk Lee**, Jiwon Choe, Ho Choel Shin, Hwan Soo Lee, Deokjung Lee*, "LPPT Analysis of APR1400 Reactor Core by UNIST Monte Carlo Code MCS," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
19. Azamat Khassenov, Jiankai Yu, **Hyunsuk Lee**, Peng Zhang, Deokjung Lee*, "On the Window Multi-pole Library Generation," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
20. Jiankai YU, **Hyunsuk Lee**, Hanjoo Kim, Peng Zhang, Deokjung Lee*, "Preliminary Validation of MCS Multi-Physics Coupling Capability with CTF," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
21. Jaerim Jang, Jiwon Choe, Sooyoung Choi, **Hyunsuk Lee**, Bamidele Ebiwonjumi, Ho Cheol Shin, Deokjung Lee*, "Boron-free SMPWR Analysis with MCS and STREAM codes," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
22. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee*, "Prediction on Underestimation of Statistical Uncertainty for Fission Source Tally in Monte Carlo Simulation Based on the Modified Power Method," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
23. Jinsu Park, Wonkyeong Kim, Sooyoung Choi, **Hyunsuk Lee**, and Deokjung Lee, "Comparative Analysis of VERA Depletion Problems," KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
24. Matthieu Lemaire, **Hyunsuk Lee**, and Deokjung Lee, Nam-il Tak, Hyun Chul Lee, "MHTGR-350 Coupled Steady-State Results Using MCS and GAMMA+," KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
25. Peng ZHANG, **Hyunsuk LEE**, and Deokjung LEE, "Extension of NPMM for Higher Mode Solutions," KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
26. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seokjean Lyou, Deokjung Lee*, "Development of High Accuracy Boron Meter," International Conference on Advanced Technology Innovation 2016(ICATI 2016), Bali, Indonesia, June 30-July 3 (2016)
27. Jinsu Park, **Hyunsuk Lee**, Taewoo Tak, and Deokjung Lee, "Coolant Void Reactivity Analysis of CANDU Lattice", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)

28. Chidong Kong, **Hyunsuk Lee**, and Deokjung Lee, Ho Cheol Shin and Kyoong-Ho Cha, "Feasibility Study of Silver as Emitter of In-core Neutron Detector", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)
29. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee, "Application of the Modified Power Method to 2D Core Simulation", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)
30. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seakjean Lyou, and Deokjung Lee*, "Sensitivity Evaluation of Boron Meter Model," KNS Fall Meeting, Gyeongju, Korea, October 29-30 (2015), submitted
31. Peng Zhang, **Hyunsuk Lee**, Kyoong-Ho Cha, Sun-Kwan Hong, and Deokjung Lee*, "Application of Modified Power Method to 2D Problems," RPHA15, Jeju, Korea, September 16-18 (2015)
32. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seokjean Lyou, and Deokjung Lee*, "Application of Rational Function for Accuracy Improvement of Boron Meter Model," RPHA15, Jeju, Korea, September 16-18 (2015)
33. Yongjin Jeong, Sooyoung Choi, **Hyunsuk Lee**, Kyoong-Ho Cha, Sun-Kwan Hong, and Deokjung Lee*, "Hybrid Depletion Method for Monte Carlo Analysis of PWRs," RPHA15, Jeju, Korea, September 16-18 (2015)
34. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee*, "The Implementation of Modified Power Iteration Method in Monte Carlo," 2015 ANS Annual Meeting, San Antonio, TX, June 7-11 (2015)
35. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee, Extension of Tom Booth's Modified Power Method for Higher Eigen Modes, KNS Spring Meeting, Jeju, Korea, May 6-8 (2015)
36. Hyeon-Jun Jeong, **Hyunsuk Lee**, Deokjung Lee and Hyun Chul Lee, MHTGR-350MW Benchmark Analysis by MCS Code, KNS Spring Meeting, Jeju, Korea, May 6-8 (2015)
37. Taewoo Tak, Jiwon Choe, **Hyunsuk Lee** and Deokjung Lee*, "Verification of UCFR-100 Depletion Calculation with Deterministic Method by Comparing with Probabilistic Method," ANS Winter Meeting, Washington D.C., November (2013) [Oral Presentation]

PATENT

1. Deokjung Lee, Wonkyeong Kim, Sooyoung Choi, **Hyunsuk Lee**, "Hybrid Depletion Method for Light Water Reactor Analysis," KOR patent: 10-2017-0059904 (2017)
2. Deokjung Lee et al., "보론미터(Boron Meter)," KOR patent: 1014625040000, NOV., 11 (2014)