



KARP

Korean Association for Radiation Protection

Application for the Executive Council of IRPA

March 8th, 2024

1. Name of the Association Society making this proposal:

Korean Association for Radiation Protection (KARP)

2. Name of the candidate:

Hee-Seock Lee, Ph.D.

Pohang Accelerator Laboratory (PAL),

Pohang University of Science and Technology (POSTECH),

South Korea

3. Name of the Associate Society to which the candidate belongs:

Korean Association for Radiation Protection (KARP)

4. Regional affiliation of the candidate:

ASIA

* Attachments: CV, the statement of motivation & willingness

이희석

Hee-Seock Lee, Ph.D

President of Korean Association for Radiation Protection (KARP)



Curriculum Vitae

Name: Hee-Seock Lee
Date of Birth: 1965. 02.22. (Male)
Title: Ph.D, Chief Scientist,
Deputy Director General, PAL
Head of 4GSR Radiation Shielding Analysis Team
Affiliate Professor of DANE of POSTECH
(Division of Advanced Nuclear Engineering)
Affiliation: Pohang Accelerator Laboratory (PAL),
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(POSTECH)
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Academic Career

BS(1984 - 1988) Dept. of Nuclear Engineering, Seoul National University, Korea
MS(1988 - 1990) Dept. of Nuclear Engineering, Seoul National University, Korea
Ph.D(1990 - 2000) Dept. of Nuclear Engineering, Seoul National University, Korea

Professional Positions

2023.9 - Present Deputy Director General, PAL/POSTECH
1991 - Present Researcher (1991) ► Chief Scientist (2020)
Radiation Protection Department, PAL/POSTECH
2000 - 2023 Head of Radiation Protection Department, PAL/POSTECH
1993 - 2022 Radiation Safety Supervisor of PAL & POSTECH
**2012.9 - Present Affiliate Professor, Division of Advanced Nuclear Engineering
(DANE), POSTECH**
(Accelerator Radiation Engineering Laboratory, ARELab)
2008.9 - 2010.8 Visiting Scientist / Department Associate of Radiation Protection
Department, SLAC National Accelerator Laboratory
2024 - 2025 President of Korean Association for Radiation Protection (KARP)
2014 - 2023 Auditor, International Affair Secretary, Vice President, President-elect of
Korean Association for Radiation Protection (KARP)
2020.9 - 2022.8 Chair, Division of Radiation Protection, Korean Nuclear Society
2010 - Present OECD/NEA Databank Liaison Officer

Professional and Academic Activities

2006 - Present Science Committee Member of SATIF & Chair of SATIF-8 & 14
“International Workshop on Shielding Aspects of Accelerators, Targets, and

	Irradiation Facilities”
2015 - Present	Steering Committee Member of ARIA “International Workshop on Accelerator Radiation Induced Activation”
2020.4 - 2021	Secretary General of International Congress Organizing Committee for IRPA15
2016 - 2020.3	Deputy General Secretary of International Congress Organizing Committee for IRPA15
2013 - 2015.10	Deputy Secretary-general of Korea Organization Committee for ICRP2015
	“3rd International Symposium on the System of Radiological Protection
2015 & 2023	Vice Chairman of ISORD-8 & -11 “International Symposium On Radiation Safety and Detection Technology”
2004 - 2009	Foreign Expert Reviewer of ANSI N43.1 Writing Committee (Radiation Safety for the Design and Operation of Particle Accelerator)
2020 - 2022	Course Director of 12 th Course of the International School of Radiation Damage and Protection, Erice

Prizes

2022	Prime Minister’s Citation (Nuclear Safety)
2016	Commendation of Minister of Future, Planning, and Science (Project)
1995	Commendation of Minister of Science and Technology (Project)

Selected Research Fields

- High Energy Neutron Production and Measurements from High Energy Accelerator
- **Radiation Shielding of High Energy Electron, Proton, and Heavy Ion Accelerator**
- **Safety System Design of High Energy Accelerator**
- Nuclear Data Production of High Energy Particle induced Reactions
- **Decommissioning of Particle Accelerators including Medical Cyclotron**
- **Radiation Safety Regulation**
- Radiation Damage of Accelerator Components and Fusion Device Material
- **Risk Analysis and Safety Estimation of Radioactive Isotopes and Radiation Generators**
- Radiation Shielding Analysis and Safety System Design of Fusion Device

Selected List of Funded Projects (as Project Instructor)

- 1. Development of safety verification system considering all phases of the life cycle of large accelerator facilities (2022.04-2025.12)**
2. Development of machine learning-based analysis technology of 3D radioactivity distribution in large-scale radioactive (2021.5-2022.12)
- 3. Development of the regulatory requirements for the safety of large accelerator facilities (2019.01-06)**
- 4. Development of Decommissioning Procedures of Domestic Cyclotron based on Safety Assessment (2016.3-2018.12)**
- 5. Development of Core Safety Technology for Large Accelerator Facility (2013.11-**

2016.08)

6. Radiation Safety Analysis of Rare Isotope Accelerator of RISP (as section instructor, 2013.12-2018.11)
7. Analysis of Safety Design of High-Power Proton Accelerator, and Development of Shielding Estimation, and Activity Analysis Method (2007-2011)
- 8. Development of Incident Database System (2005~2006)**
- 9. Risk Analysis of Radioisotopes and Radiation Generating Devices (2002-2004)**
10. Radiation Safety Analysis of KSTAR and Design of Safety System (2002-2004)
- 11. Developments of Radiation Safety Requirements for the Managements of Radiation Devices (2001.4-2002.3)**
- 12. Safety Guidance and Inspection Program for Particle Accelerator (2000.4-2001.3)**

Selected Recent Publication (SCI & SCIE Journal)

1. M. Bakhtiari, H.S. Lee*, et al., "Microstructure and texture analysis of 304 austenitic stainless-steel using Bragg edge transmission imaging", *J.App. Crystal.* Vol.56, (2023) pp1403-1415.
2. M. Bakhtiari, H.S. Lee*, et al., "Monte Carlo study of an electron-based neutron source for Bragg edge imaging", *Nucl. Sci. and Eng.*, (online 2023), Vol.198, No. 2, (2024) pp461-475. <https://www.tandfonline.com/doi/full/10.1080/00295639.2022.21627911>
3. M. Bakhtiari, NS Jung, H.S. Lee*, "Contribution of compound, preequilibrium and direct reactions to photoneutron emission spectrum from various targets induced by 16.6-MeV monoenergetic photons", *NIMB521*, (2022) pp38-46.
4. C.M. Lee, H.S. Lee*, "Development of a dose estimation code for BNCT with GPU accelerated Monte Carlo and collapsed cone Convolution method", *Nucl. Eng. Tech.* Vol.54, (2022) pp1769-1780.
5. C.H. Lee*, H.S. Lee, et al., "Status of development and planning activities on CANS in Korea", *J. Neutron Research*, Vol.23, (2021) pp127-141.
6. N.S Jung*, H.S. Lee, et al., "Development and operation of fiber-based radiation protection beam-loss monitor for PAL-XFEL", *J. Radioanal. Nucl. Chem.* Vol.330, (2021) pp521-528.
7. M. Bakhtiari, H.S. Lee*, et al., "Production cross section measurements of proton-induced reactions on Nb at energies of 58 to 100 MeV", *Phys. Rev. C*103 (2021) 064617.
8. N.S, Jung, H.S. Lee*, et al, "An Alternative Proposal for the Regulatory Framework of the Large Accelerator Facilities in Korean Nuclear Safety Act", *J. Radio. Prot.* 41, (2021) S150-S159.
9. M. Bakhtiari, H.S. Lee*, et al., "Estimation of neutron production yields from H₂¹⁸O as the ¹⁸F-production target bombarded by 18-MeV protons", *Rad. Phys. Chem.* 177, (2020) 109120.
10. L. Mokhtari Oranj, H.S. Lee*, et al., "Extension of excitation functions of proton-induced reactions on bismuth", *Phys. Rev. C*101, (2020) 014602.
11. L. Mokhtari Oranj, H.S. Lee*, et al., "Benchmarking FLUKA, PHITS, MCNPX, and MARS15 codes with product yields of 209Bi(p, x) reactions", *NIMB462*, (2020) pp154-162.
12. N.S. Jung, H.S. Lee*, et al, "Assessment of the Radiation Dose Level of the PAL-XFEL Hard X-ray Beamlines under Accident Conditions", *JKPS* Vol.73, No. 8, (2018) pp 1061-1067.
13. A. Lee, H.S. Lee*, et al., "Leakage of radioactive materials from particle accelerator facilities by non-radiation disasters like fire and flooding and its environmental impacts", *Journal of Physics: Conference Series* 1046, (2018) 012019.
14. H.S. Kang, H.S. Lee, et al, "Hard X-ray free-electron laser with femtosecond scale timing jitter", *Nature Photonics*, Vol. 11, (2017) pp708-713.
15. L. Mokhtari Oranj, H.S. Lee*, M. Santana Leitner, "Estimation of Dose Delivered to Accelerator Devices from Stripping of 18.5 MeV/n ²³⁸U Ions Using the FLUKA Code", *JKPS* Vol.71, No.11, (2017), pp764-768.
16. I.S. Ko, H.S. Lee, et al., "Construction and Commissioning of PAL-XFEL Facility", *Applied Science*, Vol.7, (2017) 479.
17. H.S. Lee*, et al., "Neutron Productions from thin Be target irradiated by 50 MeV/u ²³⁸U beam", *EPJ Web of Conferences* 153, 01020 (2017).
18. L. Mokhtari Oranj, H.S. Lee*, et al., "Cross sections of proton-induced nuclear reactions on

- bismuth and lead up to 100 MeV”, *Phys. Rev. C* 95, (2017) p044609.
19. L. Mokhtari Oranj, H.S. Lee*, et al., “Depth profile of production yields of $^{nat}\text{Pb}(p, xn)$ $^{206,205,204,203,202,201}\text{Bi}$ nuclear reactions”, *NIMB* 386, (2016) pp54-60.
 20. J.H. Oh, H.S. Lee*, et al. “New Estimation Method of Neutron Skyshine for a High-Energy Particle Accelerator”, *JKPS* Vol.69, No.6, (2016) pp1057-1064.
 21. L. Mokhtari Oranj, H.S. Lee*, et al., “100-MeV proton beam intensity measurement by Au activation analysis using $^{197}\text{Au}(p,pn)^{196}\text{Au}$ and $^{197}\text{Au}(p,p3n)^{194}\text{Au}$ reactions”, *NIMB* 375, (2016) pp26-31.
 22. N.S. Jung, H.S. Lee*, et al., “Radiation Shielding Design of the PAL-XFEL”, *JKPS* Vol.66, No.3, (2015) pp425-431.
 23. J.H. Oh, H.S. Lee*, et al., “Study on Radiation Production in the Charge Stripping Section of the RISP Linear Accelerator”, *JKPS* Vol.66, No.3, (2015) pp432-438.
 24. T. Kajimoto, H.S. Lee, et al., “Measurements and parameterization of neutron energy spectra from targets bombarded with 120 GeV protons”, *NIMB* 337, (2014) 68-77.
 25. I. Hwang, H.S. Lee, et al., “Top-up operation at Pohang Light Source-II”, *Rev. Sci. Instr.* 85, (2014) 055113-1 ~ -9
 26. H.S. Lee*, W.K. Cho, J.H. Oh, S.K. Ko, “Activation characteristics due to beam loss and energy dependency of its criteria for 100 MeV proton linac”, *Progress Nucl. Sci. Tech.* Vol.4, (2014) 268-271.
 27. M. Brugger, H.S. Lee, et al., “Activation benchmark study at a 2.5 GeV electron accelerator”, *Progress in Nucl. Sci & Tech.* Vol.4, (2014) 363-366.
 28. S. Shin, H.S. Lee, et al., “Commissioning of the PLS-II”. *Jinst* Vol.8, Jan (2013) P01019.
 29. T.Y. Lee, H.S. Lee, “Analysis of the X-ray free-electron laser parameter and determination of the optimal electron energy and undulator”, *JKPS* Vol.63, (2013) 1728-1730.
 30. B.Y. Lee, H.S. Lee, et al., “Calculation of the damage and the H and He productions for 14.1-MeV neutrons”, *JPKS* Vol.63, (2013)
 31. T.Y. Lee, H.S. Suh, H.S. Lee, “Particle orbit in a radial-sector scaling FFAG”, *NIMA* 707, (2013) pp54-57.
 32. Y. Iwamoto, H.S. Lee, et al., “Measurement of Thick Target Neutron Energy Spectra at 15 degrees and 90 degrees Bombarded with 120-GeV Protons”, *Prog. Nucl. Sci. Tech.* Vol.3, (2012) pp65-68.
 33. T. Sanami, H.S. Lee, et al., “Methodology for the Neutron Time of Flight Measurement of 120-GeV Proton-induced Reactions on a Thick Copper Target”, *NIMA* 274, (2012) pp26-35
 34. B.Y. Lee, H.S. Lee, et al., “DPA Calculation for the D-D Nuclear Fusion Reaction in the KSTAR PFC”, *JKPS* Vol.60, (2012) pp773-776.
 35. Van Do Nguyen, H.S. Lee, et al., “Measurement of isomeric yield ratios for the $^{44m,g}\text{Sc}$ isomeric pairs produced from ^{45}Sc and ^{nat}Ti targets at 50-, 60-, and 70-MeV bremsstrahlung”, *J. Radioanal. Nucl. Chem.* 287, (2011) pp813-820.
 36. N. Nakao, H.S. Lee, et al., “Estimation of Shielding Parameters for the Heavy Ion Accelerator Facility Using a Monte Carlo Simulation”, *JKPS* Vol.59, (2011) pp546-552.
 37. J.H. Oh, H.S. Lee*, et al., “Comparison of the FLUKA, MCNPX, and PHITS Codes in Yield Calculation of Secondary Particles Produced by Intermediate Energy Proton Beam”, *Prog. Nucl.Sci.&Tech.* Vol.1, (2011) pp85-88.
 38. Van Do Nguyen, H.S. Lee, et al., “Isomeric yield ratios in the photoproduction of $^{52m,g}\text{Mn}$ from natural iron using 50-, 60-, 70-MeV, and 2.5-GeV bremsstrahlung”, *J. Radioanal. Nucl. Chem.* 283, (2010) pp683-690.
 39. Md. Shakilur Rahman, H.S. Lee, et al., “Measurement of isomeric yield ratios in ^{nat}In and ^{nat}Sn with 50-, 60-, and 70-MeV bremsstrahlung”, *NIMB* 268, (2010) pp13-19.
 40. Md. Shakilur Rahman, H.S. Lee, et al., “Measurement of isomeric yield ratios for $^{197}\text{Au}(c,n)^{196m,g}\text{Au}$ reactions induced by bremsstrahlung”, *J. Radioanal. Nucl. Chem.* 283, (2010) pp519-525.
 41. Van Do Nguyen, H.S. Lee, et al., “Thermal neutron cross-section and resonance integral of the $^{98}\text{Mo}(n,c)^{99}\text{Mo}$ reaction”, *NIMB* 267, (2009) pp462-468.
 42. H. Naik, H.S. Lee, et al., “Product yields for the photo-fission of ^{209}Bi with 2.5 GeV bremsstrahlung”, *NIMB* 267, (2009) pp1891-1898.
 43. Md. Shakilur Rahman, H.S. Lee, et al., “Measurement of isomeric yield ratios for $^{90}\text{Zr}(\gamma, n)^{89m,g}\text{Zr}$, $^{nat}\text{Zr}(\gamma, xn)^{86m,g}\text{Y}$, and $^{89}\text{Y}(\gamma, xn)^{87m,g,86m,g}\text{Y}$ reactions with 50-, 60-, and 70-

- MeV bremsstrahlung”, NIMB267, (2009) pp3511-3518.
44. Van Do Nguyen, H.S. Lee, et al., “Thermal neutron cross-section and resonance integral of the $^{98}\text{Mo}(n,c)^{99}\text{Mo}$ reaction”, NIMB267, (2009) pp462-468.
 45. Van Do Nguyen, H.S. Lee, et al., “Thermal neutron cross-section and resonance integral of the $^{186}\text{W}(n,\gamma)^{187}\text{W}$ reaction”, NIMB266, (2008) pp863-871.
 46. R. Qiu, H.S. Lee, et al., “Radiation Damage of Nd₂Fe₁₄B Permanent Magnets at 2.5 GeV Electron Accelerator” NIMA594, (2008) pp111-118.
 47. R. Qiu, H.S. Lee*, et al., “Demagnetization of Nd-Fe-B Permanent Magnet at 2.5 GeV Electron Accelerator”, Journal of Nuclear Science and Technology, 45, Sup5 (2008) pp46-49.
 48. H.S. Lee*, et al., “High Level Dosimetry at the Demagnetization Experiments of Permanent Magnets”, Rad.Prod.Dosim.Vol.126, (2007) pp283-286.
 49. R. Qiu, H.S. Lee*, et al., “Induced Radioactivity in Rare-earth Permanent Magnets at 2.5 GeV Electron Accelerator”, NIMA575, (2007) pp305-314.
 50. S.Y. Park, H.S. Lee, et al., “Atomic Ratio Determination by Attenuation of White Pulsed Fast Neutrons”, JKPS Vol.49, (2006) pp82-88.
 51. H.S. Lee*, et al., “Study on Detection Technique of Illicit Materials using Pulsed Fast White Neutron Analysis, NIMA562, (2006) pp1076-1080.
 52. H.S. Lee*, et al., “Angular Distribution Measurements of Photo-neutron Yields Produced by 2.0 GeV Electrons Incident on Thick Targets”, Rad. Prot. Dosim. Vol.116, (2005) pp653-657.
 53. H. Kim, H.S. Lee*, et al., “Radioactivity Evaluation for the KSTAR Tokamak”, Rad. Prot. Dosim. Vol.116, (2005) pp24-27.
 54. H.S. Lee*, S. Ban, T. Sanami, K. Takahashi, T. Sato, K. Shin, C.W. Chung "Status of Angular Distribution Measurements of Photo-Neutron Yields from Cu, Sn, and Pb Targets Irradiated by 2 GeV Electrons", Journal of Nucl Sci. Tech. 41, Sup3, (2004) pp65-68.
 55. B.H. Kim, S.Y. Chang, J.S. Kim, H.S. Lee, W. Kwack, G. Cho "Measurement of Neutron Spectra at the Inside and Outside of the Target Room of 65 MeV Electron Linac using an Extended Bonner Sphere", Journal of Nucl Sci. Tech. 41, Sup3, (2004)
 56. T. Bizen, T. Asano, T. Hara, X. Marechal, T. Seike, T. Tanaka, H.S. Lee, D.E.Kim, C.W. Chung, H. Kitamura, "Baking Effect for NdFeB magnets against demagnetization induced by high-energy electrons", Nucl. Instr. & Meth. A515, (2003) 850-852.
 57. H.S. Lee*, S. Ban, K. Shin, T. Sato, S. Maetaki, C.W. Chung, H.D. Choi, "Systematics of Differential Photoneutron Yields Produced from Al, Ti, Cu, Sn, W, and Pb Targets by Irradiation of 2.04 GeV Electrons", Journal of Nuclear Science and Technology 39, Sup2, (2002) pp1228-1231. (KEK Preprint 2001-120)
 58. S. Ban, Y. Oki, T. Sato, K. Tanaka, K. Shin, H.S. Lee, J.S. Bak, “Radioactivity in Aluminium, Water and Carbon Beam Dumps by 2 - 2.5 GeV Electrons”, Journal of Nuclear Science and Technology 39, Sup2, (2002) pp1191-1193.
 59. H.S. Lee*, S. Ban, T. Sato, K. Shin, J.S. Bak, C.W. Chung, H.D. Choi, "Photoneutron Spectra from Thin Targets Bombarded with 2.0 GeV Electrons," Journal of Nuclear Science and Technology, 37, Sup1, (2000) pp207-211.
 60. T. Sato, K. Shin, R. Yuasa, S. Ban, H.S. Lee, "Measurement of the Neutron Spectrum by the Irradiation of a 2.04 GeV Electron Beam into Thick Targets" Nucl. Instr. and Meth. A463, (2001) pp299-308
 61. T. Sato, K. Shin, R. Yuasa, S. Ban, H.S. Lee, G.N. Kim, "Experimental Setup for Measurements of High Energy Photo-neutron Spectra from Thick Targets" Journal of Nuclear Science and Technology, 37, Sup1, (2000) pp202-206
 62. T. Bizen, T. Tanaka, Y. Asano, D.E. Kim, J.S. Bak, H.S. Lee, H.Kitamura, “Demagnetization of undulator magnets irradiated high energy electrons”, Nucl. Instr. and Meth. A467, (2001) pp185-189

A Statement of Motivation of the Candidate & A Statement of Willingness

The safe utilization of radiation has been an important value which I have learned from my university. The first job in 1991, and my work at the Pohang Accelerator Laboratory, POSTECH, which I have been working at until now, was radiation shielding analysis of large-scale particle accelerator and designing its radiation safety system. To this day, I have conducted research on radiation protection of particle accelerators and worked as a radiation safety supervisor of the laboratory and the university. Based on that, I have accumulated the knowledge and experience on radiation protection continuously.

Research to secure the safety of RI use and radiation generators including various particle accelerators rather than nuclear power plant, was the subject of my major interest, and recently also participated in the revision of the National Law (Radiation Protection Section of Nuclear Safety Act). As a senior member and current president of KARP (Korean Association for Radiation Protection), I firmly believe that the communication with the public on the radiation risk is very important and I have contributed to set up the right thing for radiation protection issues in Korea.

While interacting domestically and internationally in the field of radiation protection, for more than 33 years of professional career in the area of major large-scale facilities such as synchrotron radiation accelerators, proton accelerators, heavy ion accelerators, and nuclear fusion devices, I have understood the role of international organizations such as IRPA and ICRP and used those data and philosophy in the education of graduate students and radiation workers in POSTECH.

It has become increasingly recognized that radiation is being used more deeply and widely in human life, and that the related science, technology and regulations to ensure safety are also important. While ICRP and others gather basic scientific evidence for radiation protection, and provide radiation protection principles and recommendations, I think that the IRPA, the association of radiation protection societies around the world, should play an important role in developing practical idea and preparing international standards for realistic application of these recommendations.

In particular, there is a need for an expert group to review the social impact of ICRP data and recommendations in terms of radiation safety regulations, and the IRPA should collect opinions from each member country (AS) and present reasonable judgments.

ASIA is a region that accounts for 60% of the world's population and the number of radiation and nuclear facilities including nuclear power plants in the region is continuously increasing. Therefore, I would like to play a role as a collector of opinions from ASIA and present guidelines for international standards. In addition, as an IRPA EC member, I will support and cooperate with academic societies around the world, and help to establish the strong academic societies by supporting the radiation protection communities in developing countries, including Asian countries, where the associate society is still not clearly established. To this end, as the current president of the Korean Association for Radiation Protection, I will try to induce and

strengthen the support of the Korean government and other radiation protection related organizations in Korea as well as in Asian region for the activity.

If elected as an EC member, I will do my role faithfully to the values and objectives of the IRPA during my term, including attendance at every EC meeting.

이희석

Hee-Seock Lee, Ph.D

President of Korean Association for Radiation Protection (KARP)

Deputy Director General of Pohang Accelerator Laboratory, POSTECH