An overview of computational methods in nuclear physics modelling

David Sangcheol Lee(sclee0620@live.co.kr)
The Manufacturing Technology Centre

Abstract

In the aspect of research and development for nuclear physics, computational methods have proven to be a valuable tool in assessing physical phenomena involved in nuclear reactors. Hence, utilising the computational methods can be beneficial in the various areas of the nuclear reactor such as the examination of safety features in the reactor, radiation protection for hazard environment, analysis of nuclear reactions rate etc.

With regards to assessing the nuclear process involved in a reactor, two computational methods have appeared widely in use; Monte-Carlo transport code (e.g FLUKA[1], GEANT4[2] and MCNPX[3]) and Finite Element Analysis (e.g ABAQUS [4], ANSYS [5] and ANSYS [6])

Even though each method can cover wide ranges of functionalities for nuclear physics research, each software has distinct features that are useful in the specific area fitted by each process.

This presentation introduces processes involved in each computation method used in nuclear engineering which then follows by the known programs for each technique. The presentation is then comparing the functionalities in each method related to specific areas in nuclear research.

The presentation concludes with ideas of possible techniques for combining each method to improve the reliability of computation methods describing nuclear physics process.

References

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Biography

David Sangcheol Lee is an applied physicist specialising in physics simulation. He completed his PhD subjected to the accelerator applications for energy production at International Institute for Accelerator Application, the UK in 2017. After his PhD degree, he worked at CERN as a senior research fellow scientist for the radiation protection and Accelerator Driven System project. Recently, he joined the manufacturing technology centre UK as an advanced researcher for physics modelling