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Physics beyond the Standard Model in the evolving computing architecture of the KISTI-5 supercomputer

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In November 2018, KISTI-5 supercomputer has launched. It is the heterogeneous machine of 25.3 PF Cray 3112-AA000T with Intel Xeon Phi KNL (Knight Landing) 7250 processor which has 68 cores per processor. The goal of this presentation is to discuss the application and usages of Intel KNL-based system of KISTI-5 supercomputer for physics beyond the Standard Model.

The world is made of dark energy, dark matter and the Standard Model particles. The Standard Model is the last frontier of universe. Evolving universe is towards a unified description of the nucleus. Let us show some of potential works –physics beyond the Standard Model, simulation, evolving universe and so on.

First, the Standard Model in particle physics is refined. However, new physics beyond the Standard Model, such as dark matter, requires thousand to million times of simulation events compared to those of the Standard Model. Thus, the development of software is required, especially for the development of simulation tool kits.

Second, computing is evolving to exascale, which requires the development of the simulation tool kit to accommodate the evolving computing architecture. Therefore, an efficient simulation tool kit is needed. A profiling system is also required to confirm it. In Geant4, a typical simulation tool kit, a profiling system in higher-energy physics areas such as the Large Hardon Collider (LHC) experiment is well developed, contributing to the development of the software. However, profiling systems in the low-energy physics domain are in the beginning stage. For this reason, we have developed and performed it. These profiling systems could be used to confirm the development of software for evolving computing architecture.

Third, the evolving universe requires thousand to million times of simulation. For this, KISTI-5 supercomputer is used in research for production of exotic nuclei and heavy elements, Abi initio nuclear structure and reactions, and lattice effective theory. Let us show the current status and future plan for these.

Consider for promotion

Yes

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