Usage Report for Fiscal Year 2016

Project Title:

High Intensity RFQ Development and Simulation

Name:
Xingguang Liu

Laboratory at RIKEN:
RIKEN Nishina Center for Accelerator-Based Science
High-Intensity Accelerator R&D Group
High-Gradient Cavity R&D Team

Description of the project

1. Background and purpose of the project, relationship of the project with other projects

   As part of the ImPACT [1] program: Reduction and Resource Recycling of High–level Radioactive Wastes through Nuclear Transmutation [2], high intensity deuteron (D+) linear accelerator is under investigation as a promising candidate. The RFQ is the frontend of such an accelerator. The design of such an RFQ requires multi-particle simulation which consumes computation time that depends on the simulated number of macro-particle. This kind of work requires supercomputer when this number goes large for precise calculation.

   We have the simulation code written in Fortran for our job. Most of the design work will done on desktop while the confirmation work should be done on the super computer. We will use only the CPU computing at this momentum and our code relies on Intel's Fortran Compiler for automatic parallel computation.

2. Specific usage status of the system and calculation method

   At this momentum, the usage status is listed in the following table.

Table 1: Ssage status

unit	Limit	Used	Used(%)
gwmpc	1,003,622.0	0.1	0.0%
gwacsg	20,908.8	-	-
gwacsl	3,484.8	3.4	0.1%

As we use CPU only and our code depends on Intel package, so we basically use "gwacsl" only. This is our first time time using the supercomputer and we are just beginning the design. So the CPU time listed in this table are mainly used for test purpose: whether our code can running on the supercomputer and what the performance looks like.

3. Result

   We have learned to how to compile code and upload and submit jobs to the supercomputer and get results from it. We confirmed that "gwacsl" unit can be used for our existing code, which is a good start point. However, with our limited use of the supercomputer, we find that our present code is not so efficient in parallel computation: we tried to assign different number of CPUs for computation but the total computing time did not change too much. It is quite difficult to rewrite such a large code for the parallel computation. So will will test more before we make the next decision.

4. Conclusion

Though we have a clear need for parallel computing provided by the supercomputer and learned how to use it, our problem now turns out to be that we are still not ready to take the full advantage out of it.

5. Schedule and prospect for the future

We will continue to test our design on the supercomputer with “gwascl” as our project goes on.

Reference:

[1] ImPACT, Impulsing Paradigm Change through Disruptive Technologies, http://www.jst.go.jp/impact

[2] http://www.jst.go.jp/impact/program/08.html