

Large Scale Computing Meeting
Higher-Order 3D Electromagnetic Code Development
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(Excerpted from monthly AP group activity reports.)

August

- (LDRD) Y.-C. Chae worked on Higher-Order 3D Electromagnetic Code Development LDRD. **He received CAD file of TESLA 9-cell cavity with couplers for wake potential computation from E. Gjonaj from Darmstadt, Germany. He tried to convert the CAD file into input for GdfidL and HOMER-T3**, but failed due to the corrupted file; it took two weeks to figure this out with help from G. Waldschmidt, P. Choi, M. Givens. After that he received the new CAD file and is testing it now. He **made an ascii file of 9-cell cavity without coupler** which is suitable for GdfidL and ABCI input. Y.-C. Chae also **supervised Dr. Min (MCS) in order to implement 3D Napoly integral method in HOMER-T3**.

September

- Y.-C. Chae **coordinated a collaboration meeting with TechX on developing high-order code by using WENO method**. Three presentations by ANL scientists and one presentation by TechX scientist were followed by technical discussion. **V. Sajaev, Y.-e Sun (both ASD) and M. Min (MCS) gave presentation on ERL overview, injector modeling, high-order code development, respectively**. Participants from **TechX were John Cary, Peter Stoltz and Amar Hakim**. They also discussed the scope of SBIR's Phase-I including the specific goal and date of accomplishment by February, 2008.
- (LDRD) Y.-C. Chae continued leading the **international collaboration on high order wake field code that include APS/ANL, MCS/ANL, Brown University, DESY, Tech. University Darmstadt (TUD), TechX, WB Field Computation, and KEK**. He received **results from E. Gjonaj** (TU of Darmstadt, Germany) for wake potential of **1-ps bunched beam** passing through Fermilab's 9-cell ILC cavity computed by **PBCI**. This will be compared to other results. Also, Y.-C. Chae supervised Dr. Min (MCS/ANL) **developing high order HOMER-T3 code**; they found a bug in integration routine which resulted in the poor agreement when compared with GdfidL result. He collaborated with Dr. Min on a paper and poster, which will be **presented at** the upcoming **international workshop on superconducting rf, SRF07**, in Beijing, China. Y.-C. Chae coordinated the **high-order PIC code development subcontracting Brown University with KV beam**, whose result has a good agreement with theory in cylindrical tube.
- Y.-C. Chae together with Dr. W. Bruns **tested GdfidL's window wake computation for large scale computing; several problems** associated with memory allocation and de-allocation, Napoly integral hang-up, Strang Splitting operator hang-up were

discovered and fixed. This is an **on-going process, because the APS is the first user** to run such a state-of-art computation.

- Y.-C. Chae continued working on **short bunch wake potential computation for ERL** application. He computed **wake potentials of 9-cell tesla cavity** for **5-mm, 1-mm, 0.333-mm** by ABCI, GdfidL (50% completion). He also computed wake potential of 9-cell tesla cavity **with end-tube equipped with HOM damper and input coupler** for 5-mm, 1-mm, 0.333-mm by GdfidL (50% completion). Also, he computed **wake potential of HOM coupler** of 9-cell tesla cavity for 5-mm, 1-mm, 0.333-mm by GdfidL (10% completion) and **tested mesh convergence of moving window** for 1-mm and 1-ps bunched beam of 9-cell tesla cavity. He found that, **even with moving window which simulates only fraction of total 1.3 m long cavity, 1-ps bunched beam required more than a whole APEX cluster.**