Contribution ID: **51** Contribution code: **WEP067** Type: **Poster Presentation**

Study of Uncorrelated Resonance Crossing in a Controlled Environment

Wednesday 13 August 2025 16:00 (2 hours)

With the current designs of spin-polarized particle accelerators such as the Future Circular Collider (FCC) at CERN and the Electron-Ion Collider at BNL well-underway, there is presently a strong need for an efficient and modern spin tracking code. The multi-scale nature of spin-orbit dynamics dictates the use of high order algorithms and sympathetic integration, while the overall complexity necessitates the efficient use of computing resources - modern supercomputers with CPUs, GPUs, or built with new shared memory architectures. This work peruses two distinct goals: (1) to develop a simple but descriptive theoretical model to study uncorrelated resonance crossing,
(2) develop a profiling framework for code development that validates, benchmarks, and optimizes emerging spin-orbit tracking algorithms, for example a portable SciBmad tool-set.
Uncorrelated resonance crossing may affect polarization at the very high energies of accelerators like the aforementioned FCC, and can be described by energy (and spin precession frequency) oscillations uncorrelated with orbital synchrotron radiation effects. We would like to study this effect in a controllable environment by modifying a single resonance model with added radiation.
This model, solved by Monte-Carlo tracking on a GPU, will also serve as a first test to verify our profiling framework. In this way, emerging state of the art GPU capable spin-tracking codes can be seamlessly validated and tested on new architectures.
Here we present the spin-tune (energy) scans in our single resonance model with radiation in the presence of uncorrelated resonance crossing. The GPU performance profiling results will be displayed as well.

Please consider my poster for contributed oral presentation

No

Would you like to submit this poster in student poster session on Sunday (August 10th)

Yes

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

Authors: KELLEY, Jack (Virginia Tech; Los Alamos National Laboratory); Dr BEZNOSOV, Oleksii (Los Alamos National Laboratory)

Presenter: KELLEY, Jack (Virginia Tech; Los Alamos National Laboratory)

Session Classification: WEP: Wednesday Poster Session

Track Classification: MC7 –Accelerator Technology and Sustainability