Contribution ID: **3330** Type: **not specified**

# P2.2018 RaDiO-Radiation Diagnostic for Osiris: an efficient radiation processing tool for particle-in-cell simulations

*Tuesday, 9 July 2019 14:00 (2 hours)*

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P2.2018.pdf

Radiation processes in plasmas are extremely relevant for a number of fields, ranging from astrophysics [1] to small scale microscopy [2]. These processes are usually associated with the motion of a large number of electrons, under the action of intense electric and magnetic self-consistent fields and require numerical descriptions in order to be explored. Particle-In-Cell (PIC) codes like OSIRIS [3] are able to accurately describe the motion of the individual particles but they cannot be employed to capture radiation emission at wavelengths much smaller than the grid size because of the large computational requirements. To circumvent this issue, here, we present RaDiO [4], which is fully integrated into Osiris and is capable of capturing the spatiotemporal properties of the radiation emitted by tens of millions of charged particles. RaDiO has built-in spatial and temporal coherence and uses a sophisticated radiation deposition algorithm that allows for radiation to be deposited in a grid with much higher resolution than the PIC simulation grid. This tool recovers the theoretical spectra for well-known scenarios of radiation emission, and has been thoroughly tested and benchmarked for typical trajectories associated with undulator radiation in the undulator and wiggler regimes, as shown in Figure 1. In this work, we use RaDiO to explore the properties of radiation emission in unexplored scenarios such as new regimes of High Harmonic Generation (HHG). We show that our algorithm strongly reduces the computational requirements associated with HHG simulations in three-dimensions, allowing to describe HHG to very high harmonic orders in 3D.

References

[1] F. Tamburini, et al., Nature Physics 7, 195-197 (2011)
[2] S. Hell et al., Optics Letters 11, 780-782, (1994)
[3] R. Fonseca et al., LNCS 2331, (2002)
[4] M. Pardal et al., to be submitted (2019)

**Presenter:** PARDAL, M. (EPS 2019)

**Session Classification:** Poster P2

**Track Classification:** BPIF