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Efficient charged particle transport software

In astrophysics, the search for sources of the highest-energy cosmic rays continues. For further progress, not only ever better observatories but also ever more realistic numerical simulations are needed. We present here a novel approach to charged particle propagation that finds its application in Simulations of particle propagation in jets of active galactic nuclei, possible sources of ultra-high-energy cosmic rays.

Our code is based on a correlated random walk and is thus significantly faster than algorithms that solve the equation of motion in each step. Compared to diffusive propagation codes, our method has the significant advantage of matching relevant statistical properties such as the running diffusion coefficient of simulated particles based on solving the equation of motion also for the important initial propagation phase, whereas diffusive approaches by definition fail in doing so.

Significance

The novel plasma physics algorithms presented here find great benefit by significantly speeding up or improving accuracy in simulations of some of the most extreme particle accelerators in space: active galactic nuclei.

References

Speaker time zone

Compatible with Europe

Primary author: REICHHERZER, Patrick (Ruhr-University Bochum)

Presenter: REICHHERZER, Patrick (Ruhr-University Bochum)

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