Toroidal Electromagnetic Particle-in-Cell Code with Gyro-kinetic Election and Fully-kinetic ion*

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- RF waves has multiple applications in fusion plasma. It's commonly used to drive current and auxiliary heating.
- Current simulation models include Ray-tracing, Full-wave method, which, though contains geometry effects, are essentially linear simulation.

- Current drive and auxiliary heating are confronted **with low efficiency at high density and H-mode regime**. The **nonlinear effect** along with wave propagation maybe responsible for this parasitic energy lost.
- A Electromagnetic Particle-in-Cell code is developed to simulate nonlinear physics of RF wave with geometry effect included. The code is thoroughly tested by part.

- Further benchmark with RF waves and linear mode conversions are planed. New field solver is needed for open field line regime.