

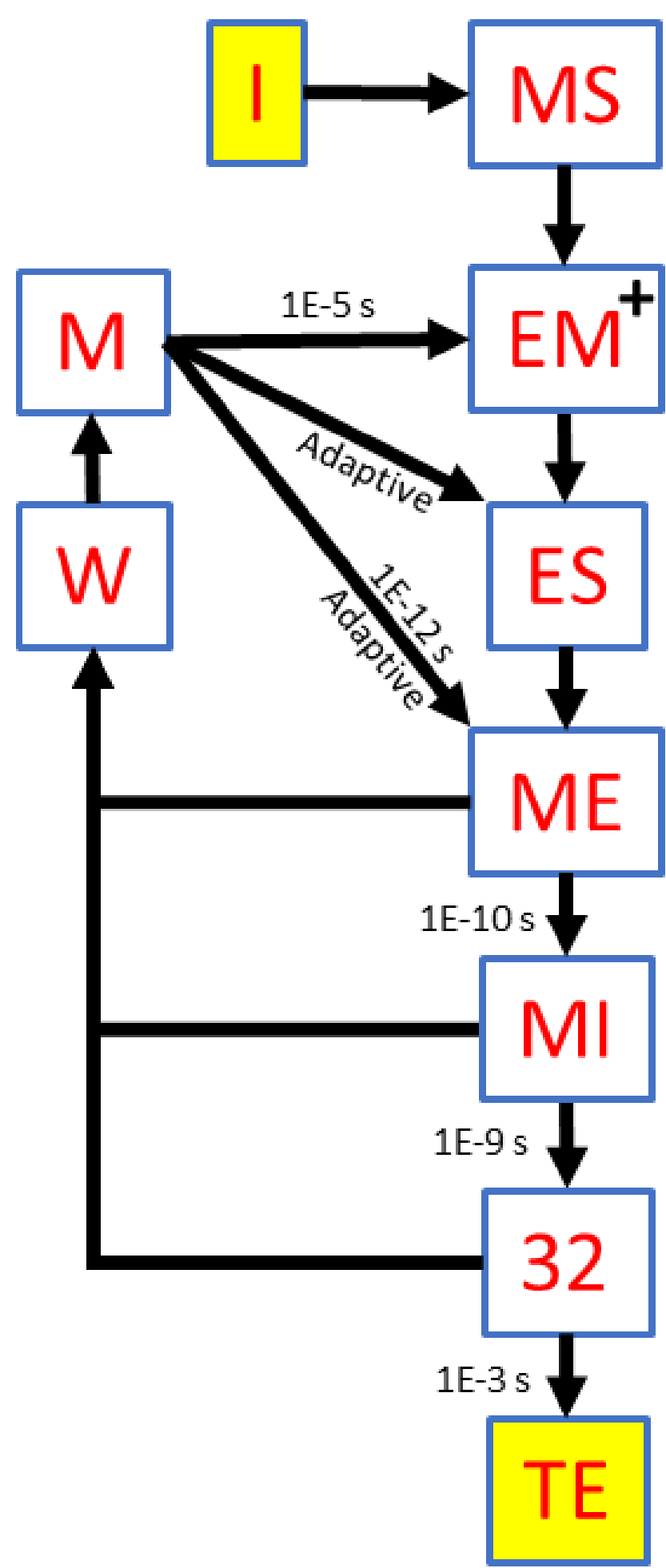
Virtual Versatile Ion Production

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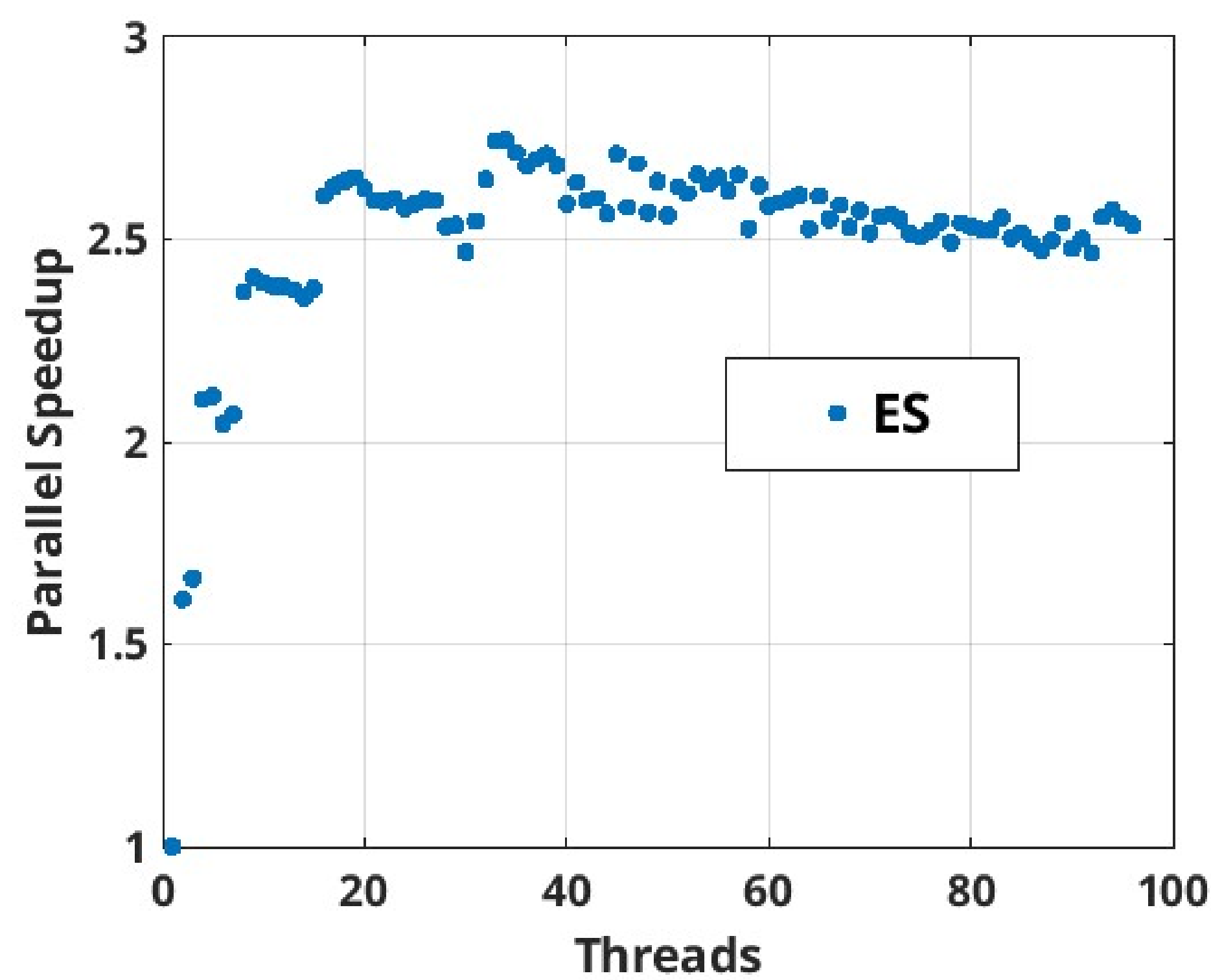
Objective: Development of a Particle In Cell code for the simulation of 2.45 GHz ECR ion sources

Applications:

- High current proton source
- High current low charge state high current ion sources
- Metallic single charged ion beam production
- H⁻ ion sources (prospects in mind)
- ECR multiple charge state ion sources (prospects in mind)

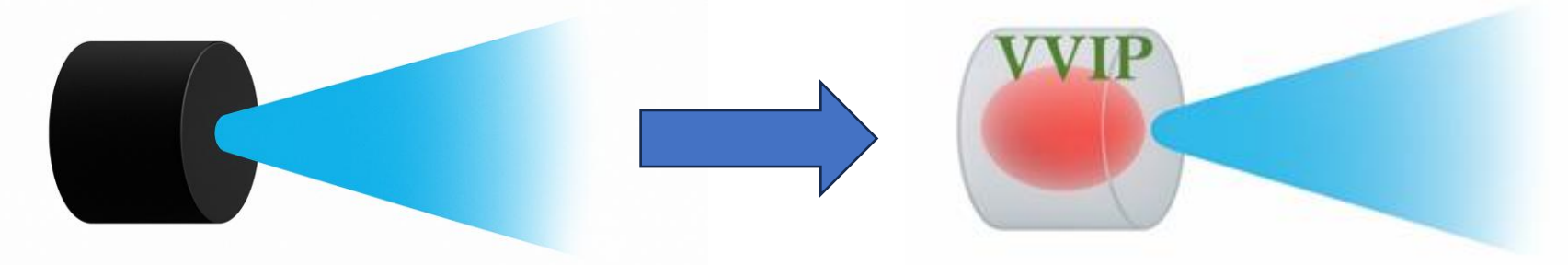


- 3D Initialization of 1E7 particles
- 3D MagnetoStatic simulation
- 3D (2.45GHz) ElectroMagnetic
- 2D Axial Symmetric ElectroStatic
- 3D Motion of Electrons (Boris mover)
- 3D Motion of Ions (Boris mover)
- Adaptive sequence
- 3D 32 Plasma reactions
- 3D Interaction with Walls
- Maps (e⁻, H⁺, H₂⁺, H₃⁺, H₂, H, H₂^v, Hⁿ, d)
- The End



Parallel code optimization?

- **MS:** 1 execution → not needed
- **EM:** (1 · 406 s = 0.8% total time) Comsol → can't be
- **ES:** (500000 · 69 ms = 70% total time) PARDISO → Unsatisfactory optimization
[TeRABIT for CPU optimization \(PARDISO or MUMPS\)](#)
[TeRABIT for GPU optimization \(NVIDIA cuDSS\)](#)
- **ME, 32, W:** (500000 · 20 ms = 20.8% total time) → Excellent optimization
- **MI, 32, W:** (5000 · 11 ms = 0.1% total time) → Excellent optimization
- **M:** (500000 · 7 ms = 7.5% total time) → Excellent optimization
- Remaining Matlab code: 0.8% total time → not needed



From a **black-box** that produce ion beam to A much clearer understanding and use of ECR plasma to produce ion beam

