

BOUT:
**Boundary Turbulence Simulations
and Validations for NSTX**

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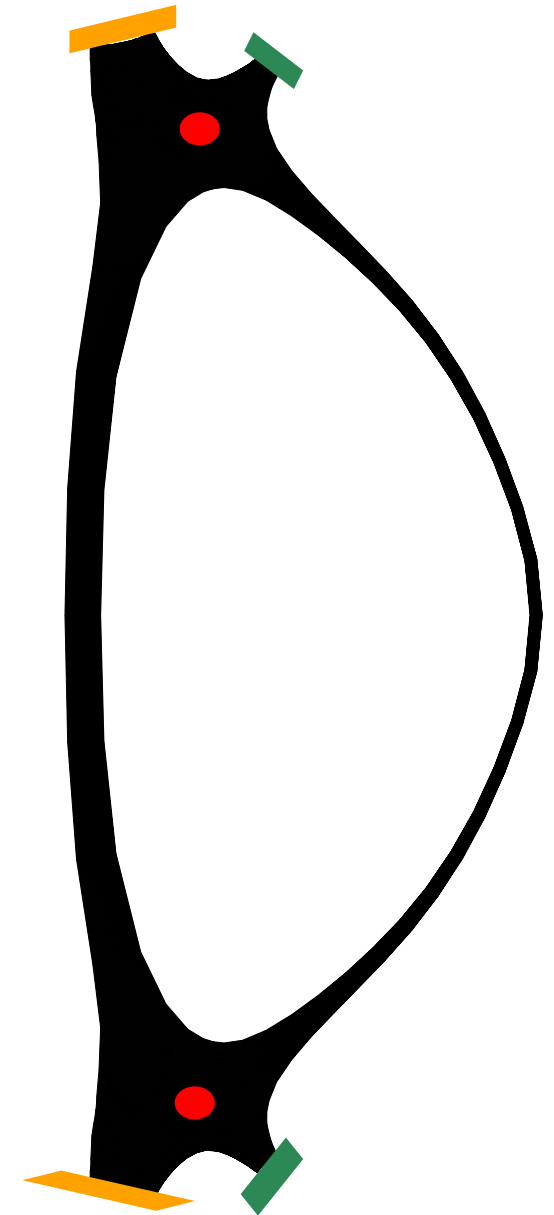


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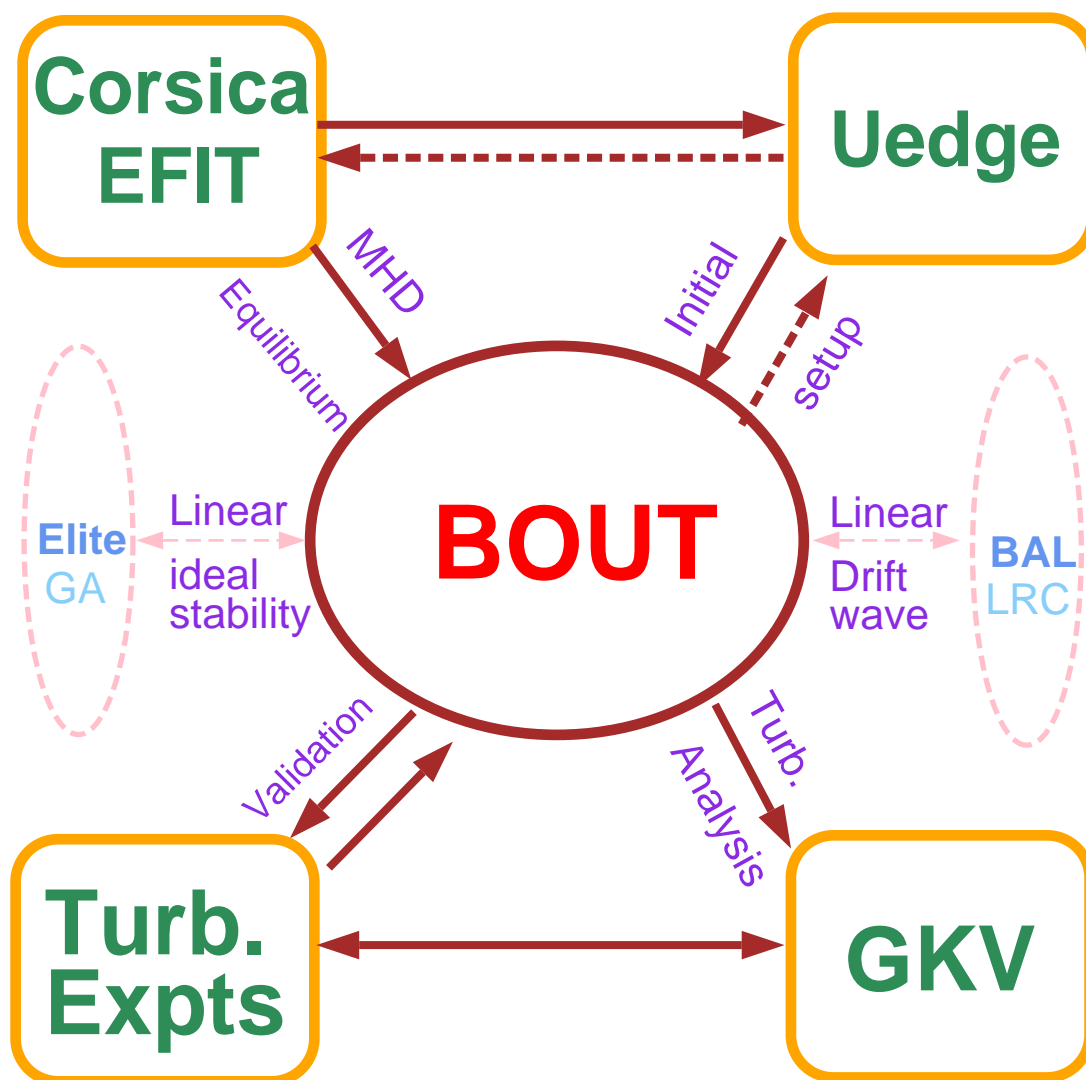
BOUT is 3D EM Boundary Plasma Turbulence Code



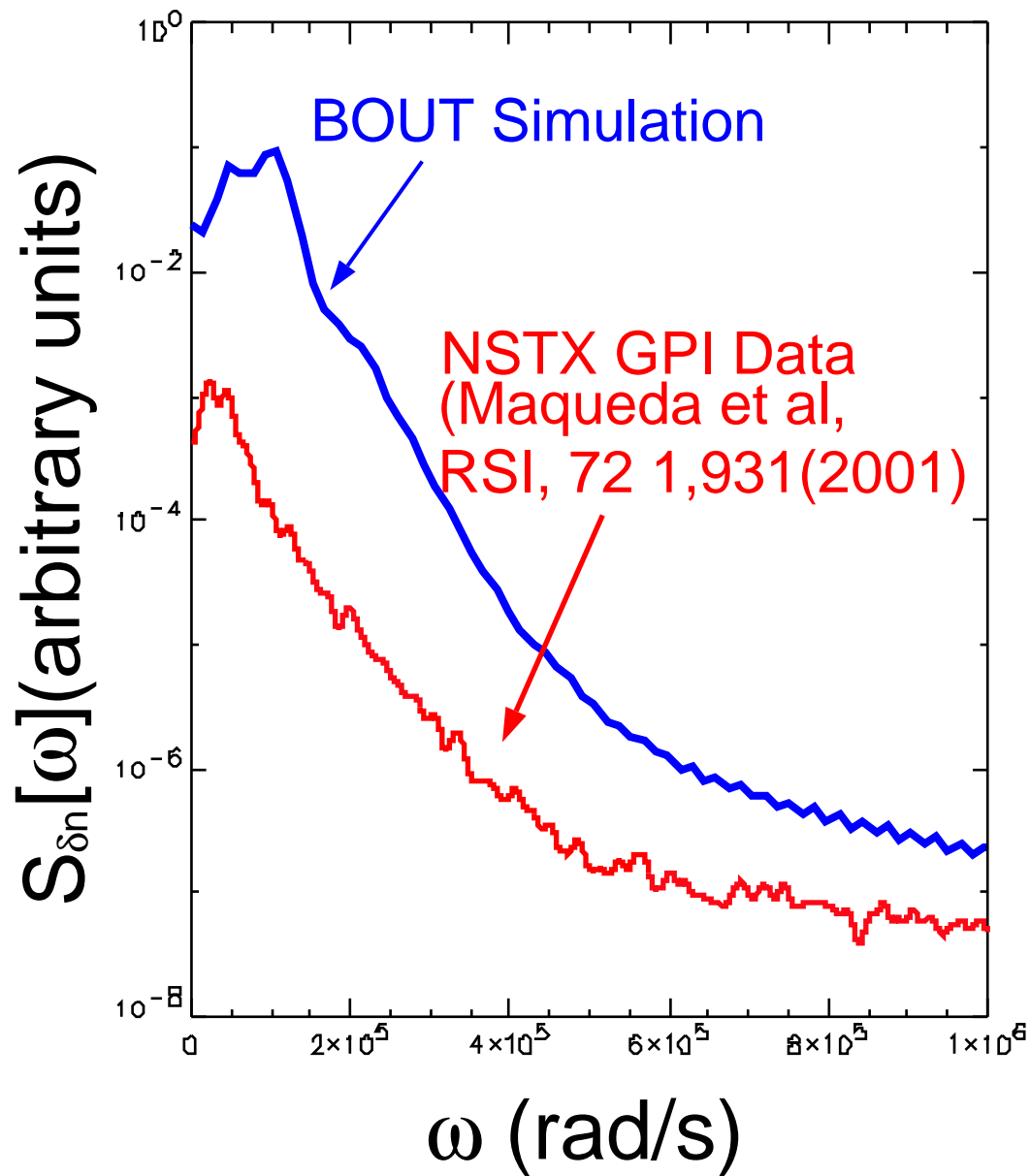
- Braginskii --- collisional, two-fluids electromagnetic equations
 - Realistic X-point geometry
 - open+closed flux surfaces
 - BOUT is being applied to DIII-D, C-mod, NSTX, ITER (for Snowmass), ...
 - There is LOTS of edge fluctuation data!
 - GPI offers the fastest and the highest resolution images of edge turbulence.
- ⇒ An excellent opportunity for validating BOUT against experiments.



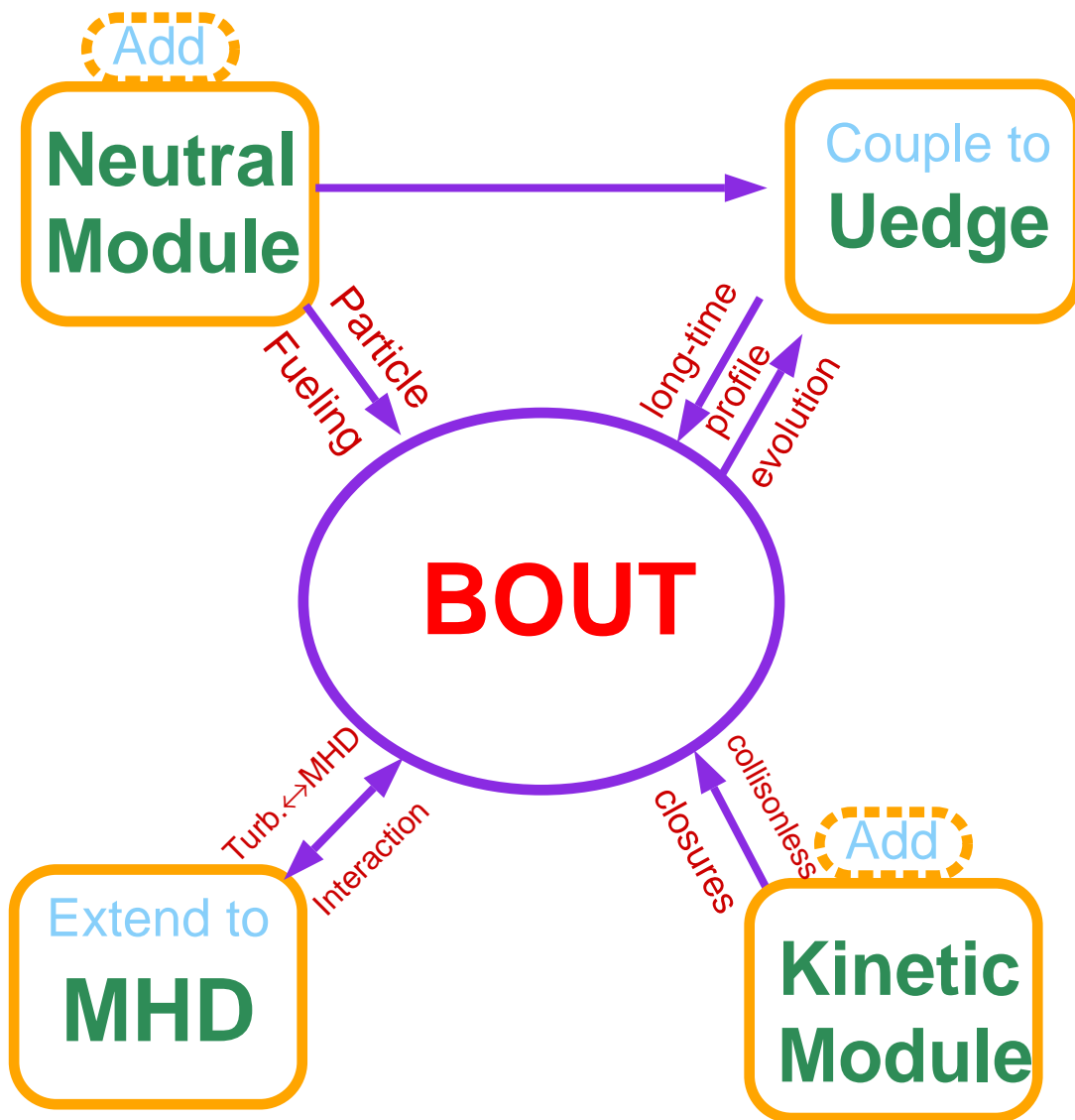
A suite of the codes work together to make BOUT simulation results similar to real experiments



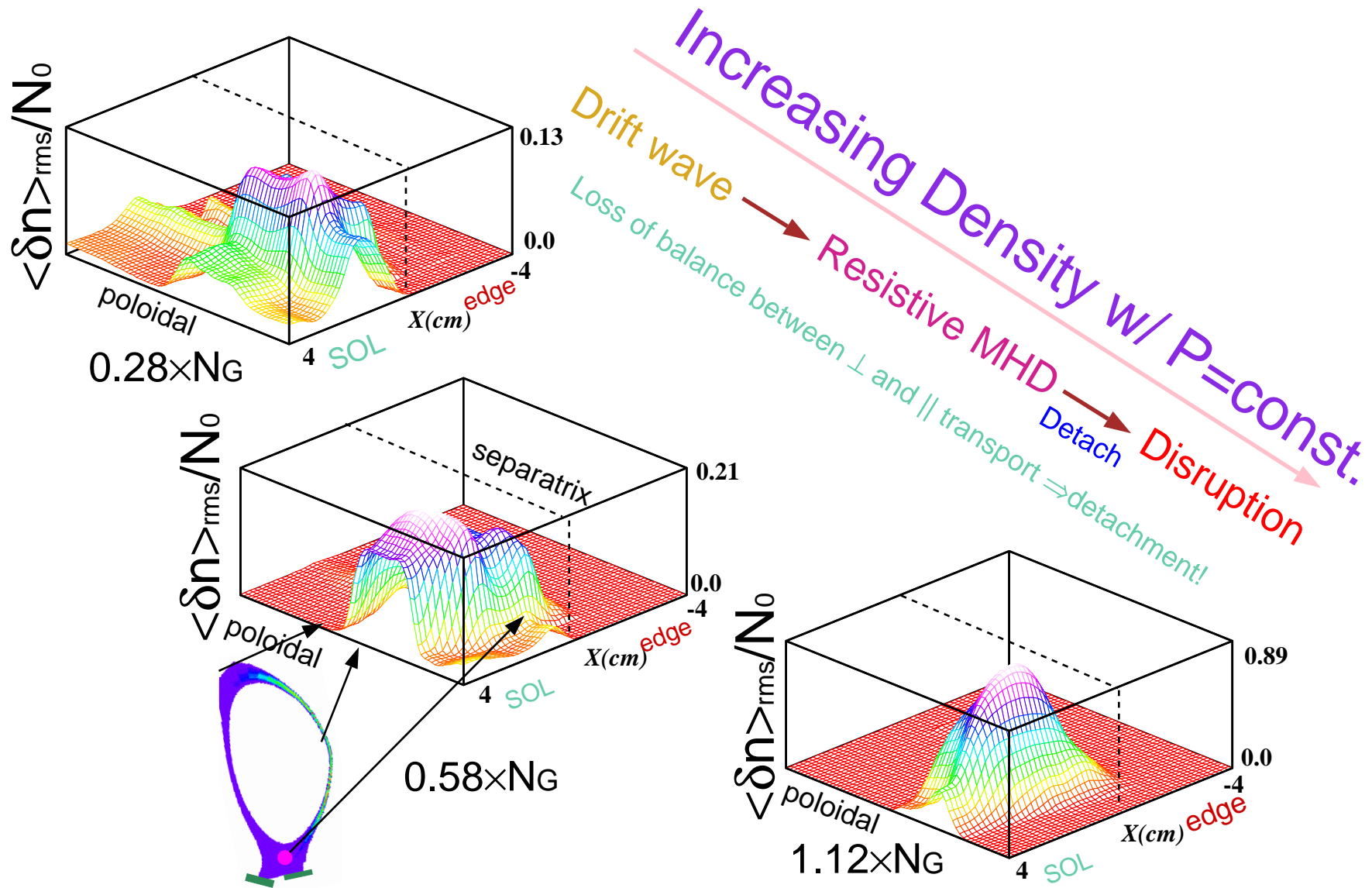
BOUT shows similar frequency spectrum as Gas Puff Image



Planned extensions of BOUT enhance its full capabilities toward simulating boundary physics on first principle



Density Limit: High collisionality affects fluctuation: level/transport \uparrow and parallel correlation length \downarrow



Planned Physics Studies



Use BOUT simulations to address critical issues in boundary plasma stabilities, turbulence and transport

- ➡ **Edge Pedestal: Formation, structure, stability**
- ➡ **Physics of ELMs in the presence of sheared flow, diamagnetic effects, and bootstrap current**
- ➡ **Physics of density limit: role of flows, burst transport, atomic and sheath physics**
- ➡ **Active controls of spreading heat flux on divertor floor by biasing**