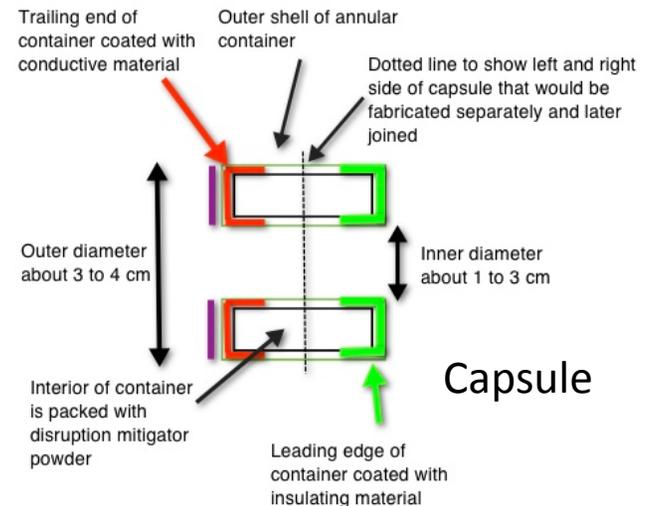
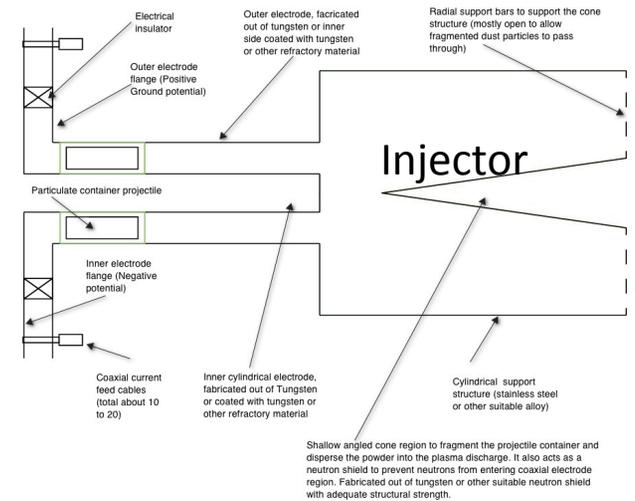


Disruption Mitigation Tools for NSTX-U Plans for MGI, EPI & CT systems on NSTX-U

- 2012
 - Design Electromagnetic particle (EPI) injection system
 - Design MGI system and identify components (3 injection locations: PFR, outer mid-plane, above outer mid-plane) – new electromagnetic valve?
- 2013
 - Conduct 3D simulations for runaway current suppression by plasmoid injection
 - Conduct DEGAS-2 simulations and use analytic models to design MGI plenum size and impurity fractions
 - Possible fabrication of a proto-type EM particle injection system & installation consideration for NSTX-U (or on another tokamak?)
 - Possible fabrication of a new Electromagnetic valve for MGI
 - Dependent on MGI system design and peer reviews (early 2013)
- 2014: [\[Thrust-1: EPI Feasibility Test – if installed on NSTX\]](#)
 - Possible commissioning of CT injector (based on 3D results)
 - Install MGI (PFR, Mid-plane, above midplane) & conduct initial tests
 - Possible installation of an EPD system
- 2015: [\[Thrust-1 part B: Test poloidal variation of MGI\]](#)
 - Conduct more detailed MGI tests (higher Z isotopes)
 - Test EPI system (if installed)
- 2016-17:
 - Couple MGI to Locked Mode sensor for automatic triggering
 - Possible Test of runaway electron suppression using CT injection

An Electromagnetic Massive Particle (EPI) Injection System has Several Advantages over Conventional Methods for Disruption Mitigation in ITER

- **Well suited for long stand-by mode operation**
 - Large particle inventory
 - All particles delivered at nearly the same time
 - Particles tailored to contain multiple elements in different fractions and sizes
 - Tailored particles fully ionized only in higher current discharges (to control current quench rates)
- **Toroidal nature and conical disperser ensures that,**
 - The capsule does not enter the tokamak intact
 - The capsule will fragment symmetrically and deliver a uniform distribution of particles (or via tapered final section)
 - Particle penetration not impeded by B-fields
- **Coaxial Rail Gun is a fully electromagnetic system with no moving parts, so should have high reliability from long stand-by mode to operate on demand**
 - Conventional gas guns will inject gas before capsule and trigger pre-mature thermal quench



Detailed design of a proto-type system now underway