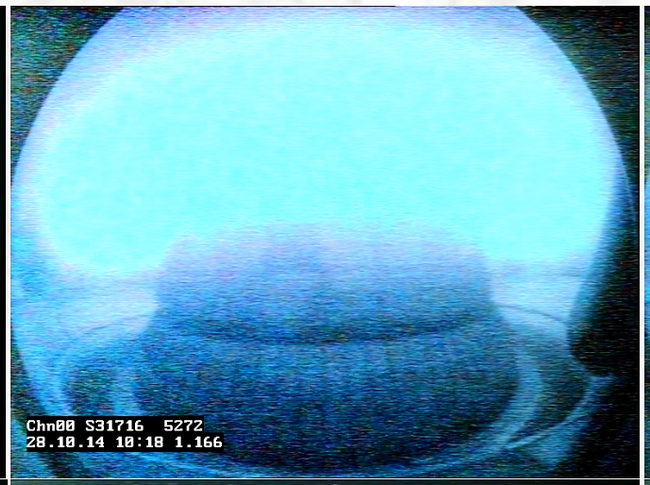
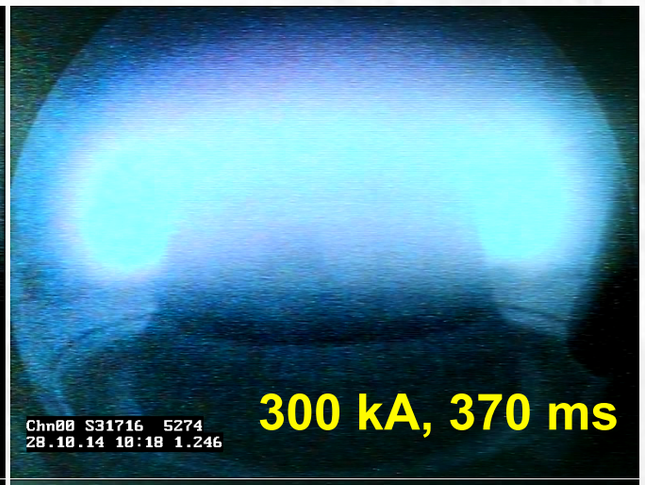
AUG runaways - camera images

Progress with REs

G. Pautasso, G. Papp, {many others} and AUG Team





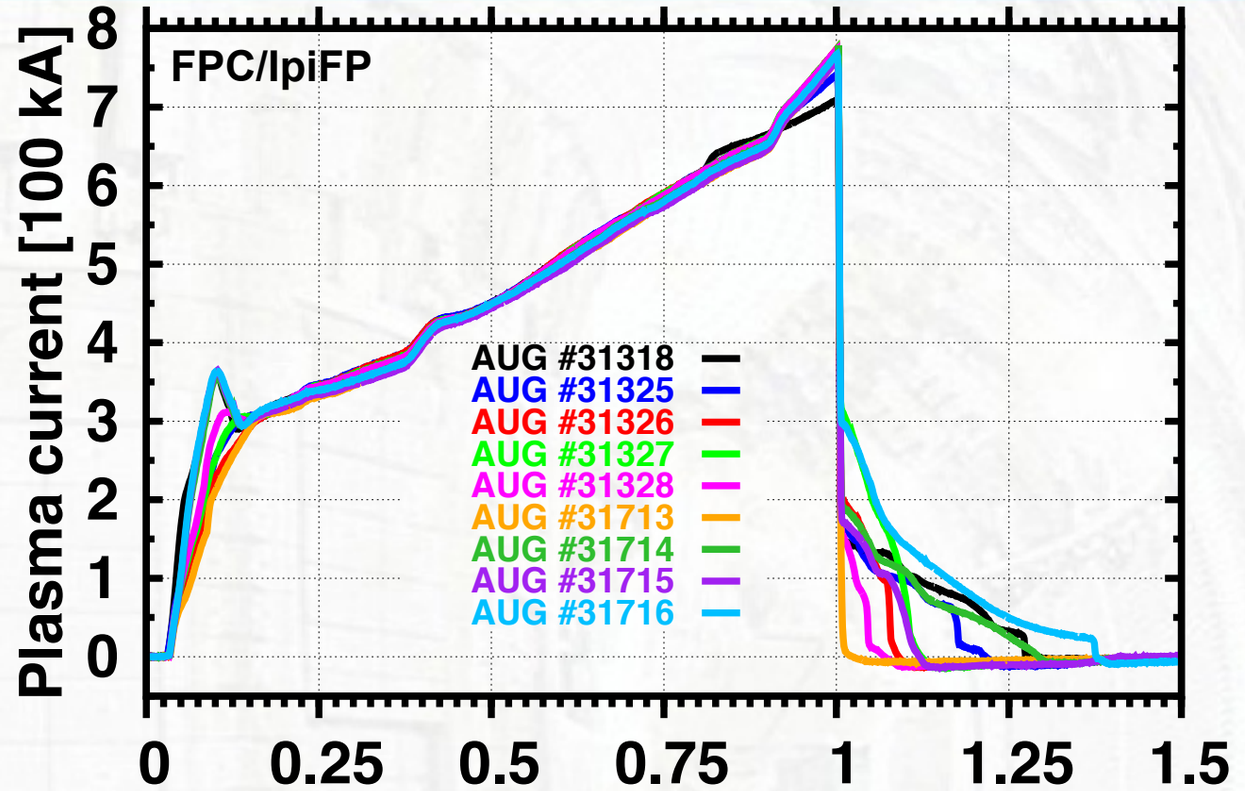
Runaways on AUG

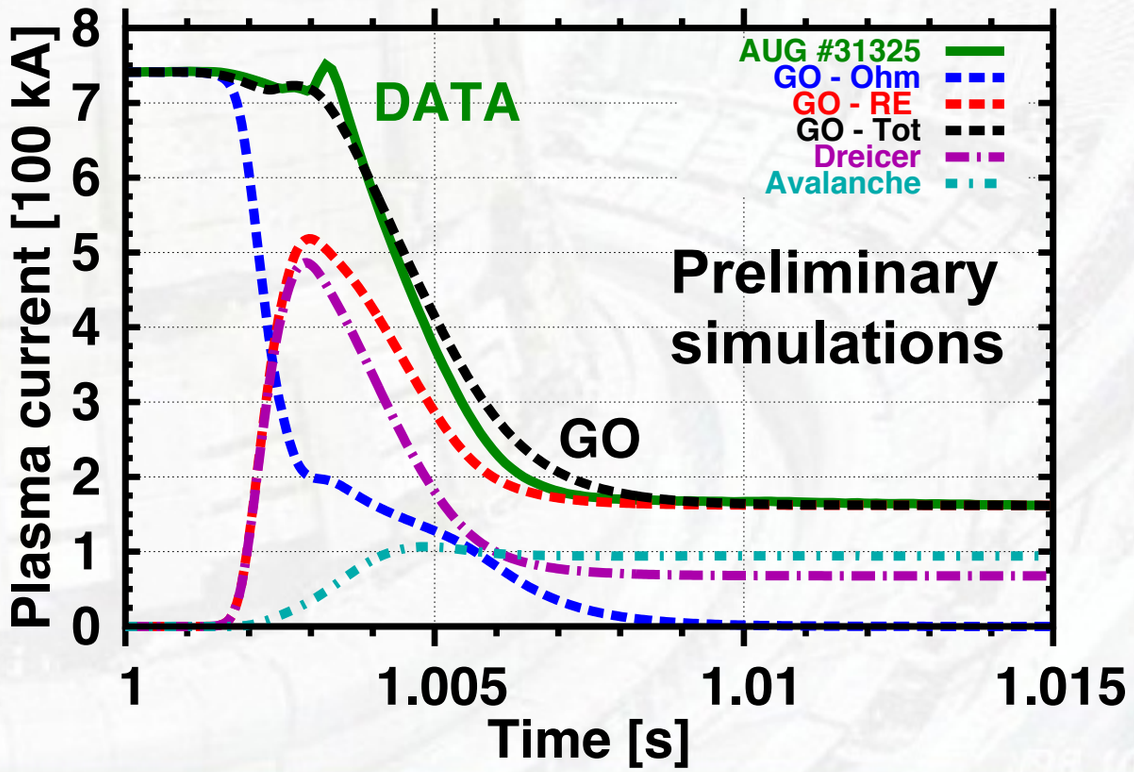
- Low density (2.5×10^{19} m^{-3}), 2.5 T, 0.8 MA circular plasmas ~2 MW ECRH at 0.9-1.0s, 1st Ar inj. @1s, 2nd @1.07
- Good beam control in general, **machine is safe**
- ***O*(30) shots planned for 2015 (MST)**

shot	REs	1st Ar [bar]	2nd Ar [bar]	Ip 1.01	t [ms] (<20kA)	Paux [MW]	plasma
31310	x	0.6	0	0	~	0	D
31311	x	0.8	0	0	10.9	0	D
31318	✓	**0.9**	**0**	**148.8**	**272.4**	**2.5**	**D**
31325	✓	**1.16**	**0**	**167.0**	**176.9**	**2.5**	**D**
31326	✓	**1.11**	**6.9**	**197.4**	**79.5**	**2.5**	**D**
31327	✓	**1.03**	**1.7**	**310.2**	**110.5**	**2**	**D**
31328	✓	**2**	**0**	**153.1**	**46.8**	**2**	**D**
31713	x	0.93	0	0	10.4	2.2	H
31714	✓	**0.93**	**0**	**190.4**	**259.9**	**2.0**	**H**
31715	✓	**0.93**	**3.17**	**171.5**	**108.3**	**2.4**	**H**
31716	✓	**0.71**	**0**	**297.0**	**373.1**	**2.5**	**H**

Summer

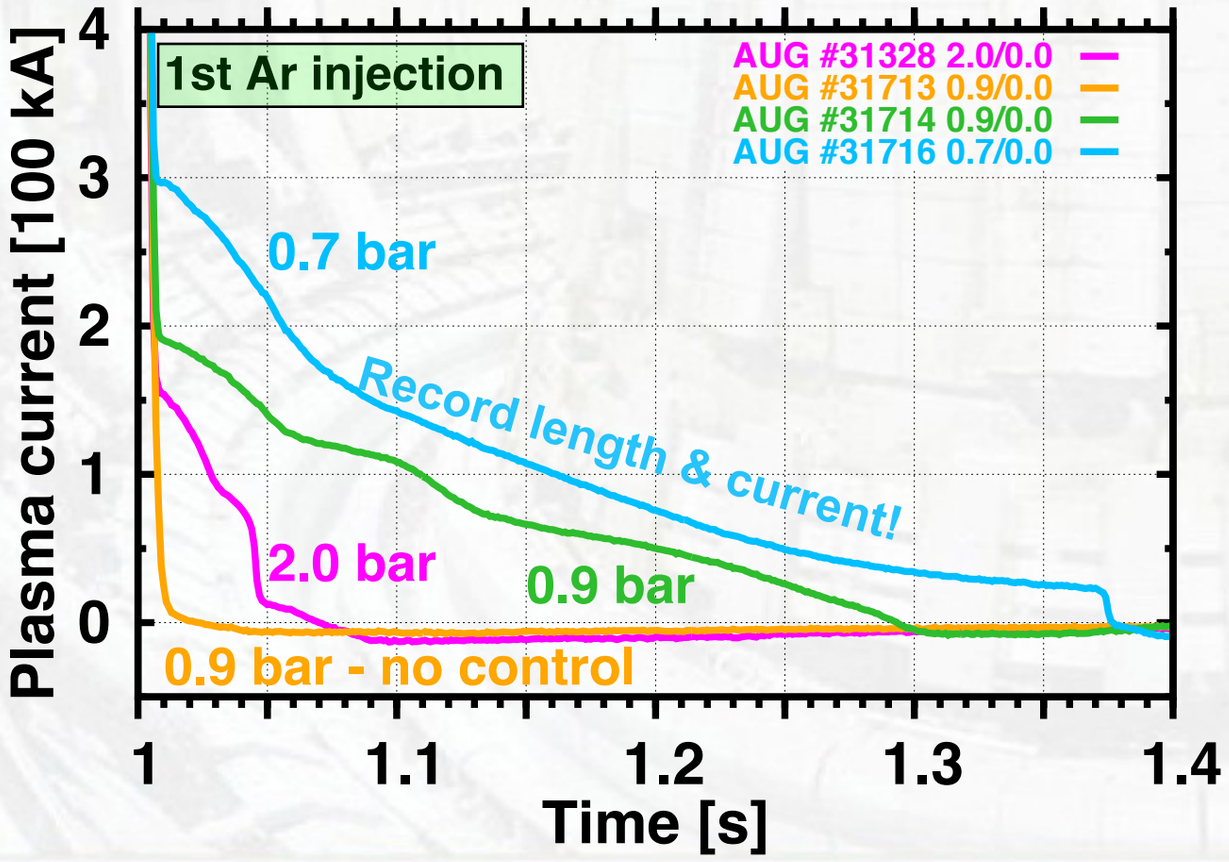
Autumn

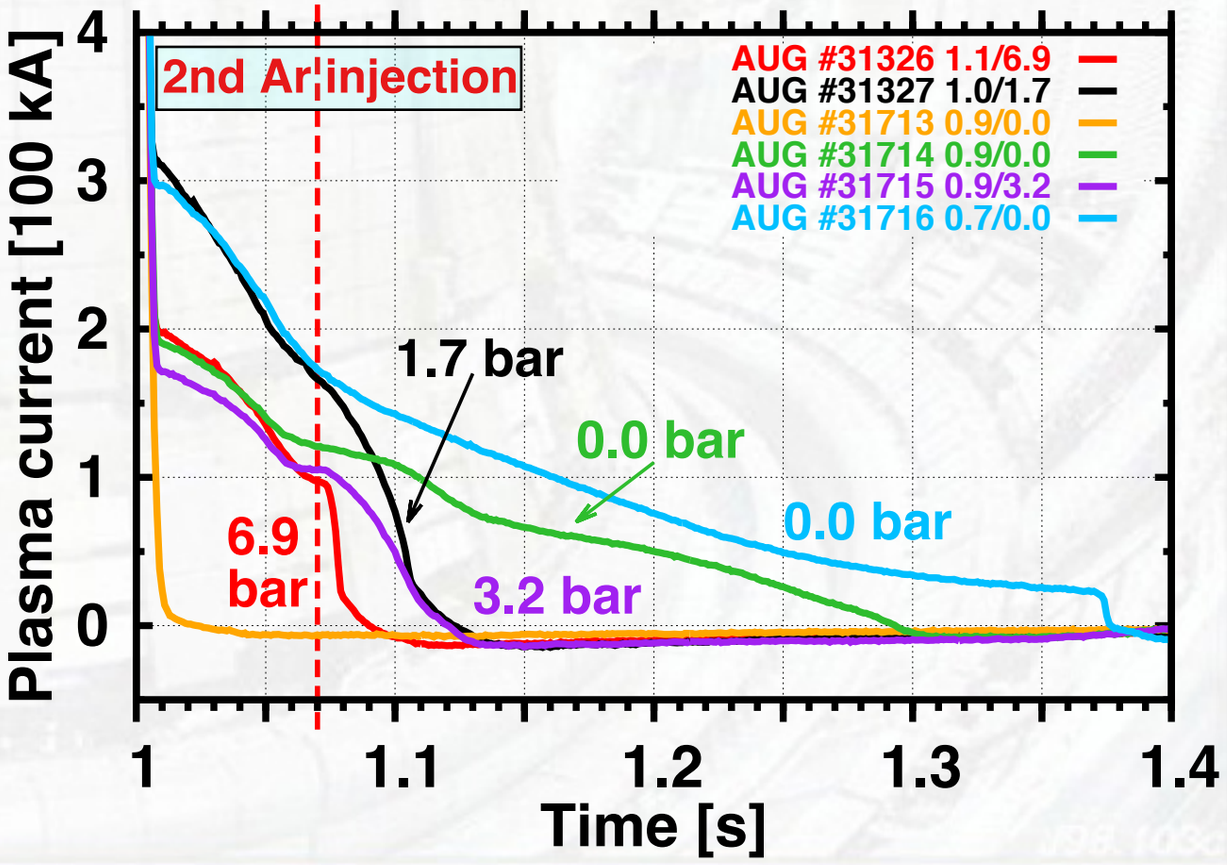




Motivation

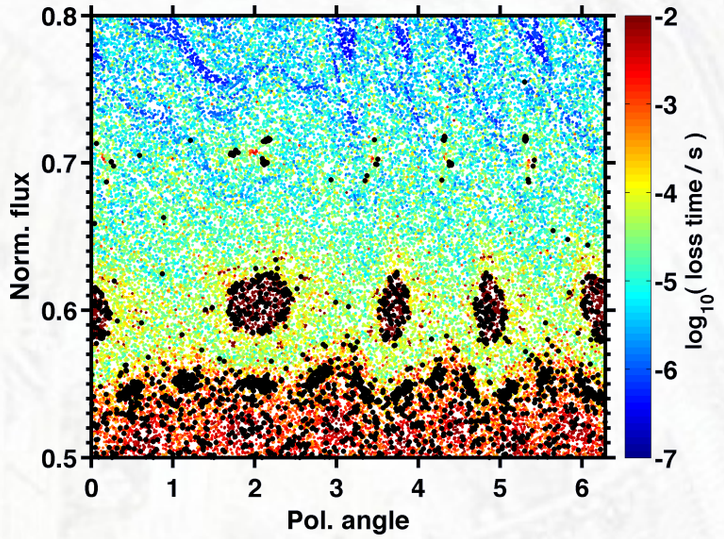
- **Understand RE dynamics with impurity injection**
  1. Effect of disruption mitigation gases on RE dynamics
  2. Influence of second injection on existing RE beams
- **One of the feasible RE mitigation strategies for ITER?**
- Also need to account for loss effects and other possible mitigation strategies

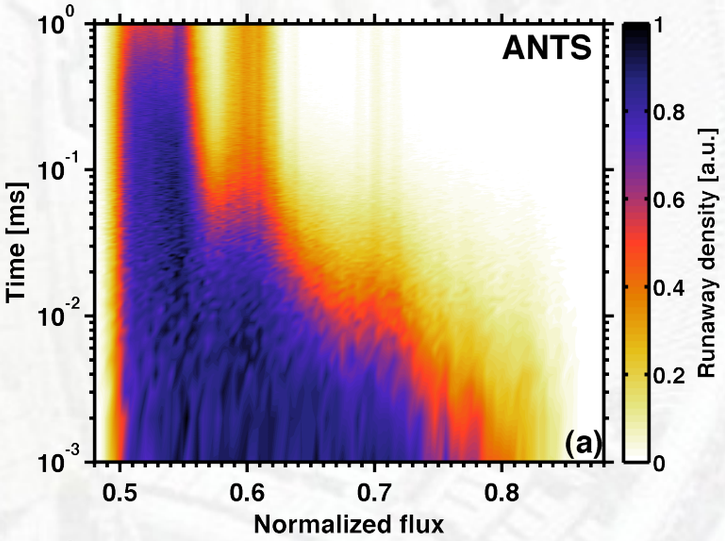


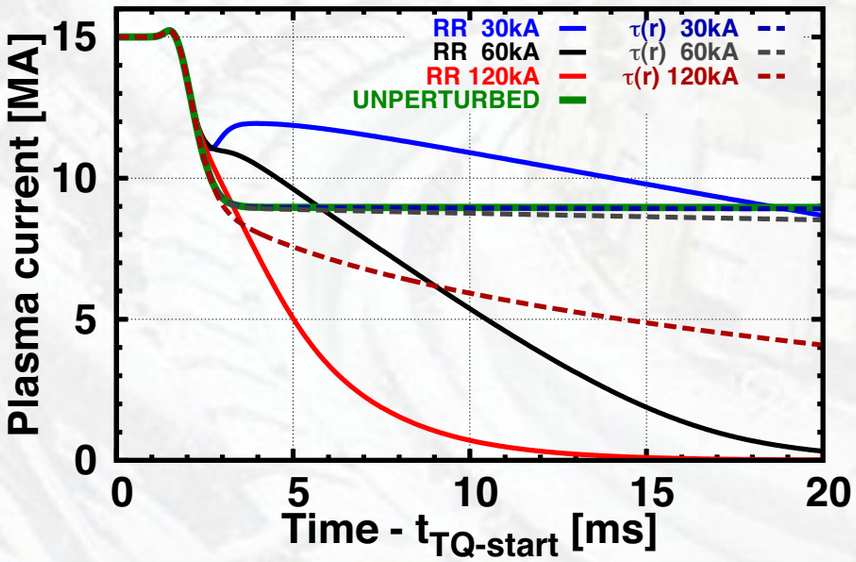


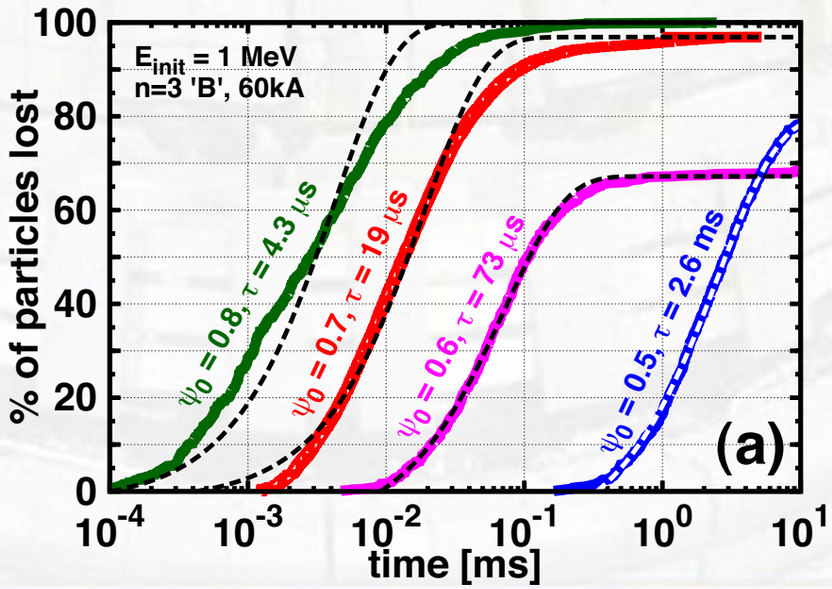
RMPs in GO

- ANTS ➡ 3D relativistic test particle simulations for the ITER RMP system
- Individual particle orbits are chaotic ***BUT* ensemble behavior is smooth**
- Fit exponential losses
  $N(\psi,t)=N_0(1-\exp\{-t / \tau(\psi,\delta B)\})$
  ➡ Forced boundary condition into GO
- Self-consistent calculation: ITER RMP for RE suppression **is not sufficient**

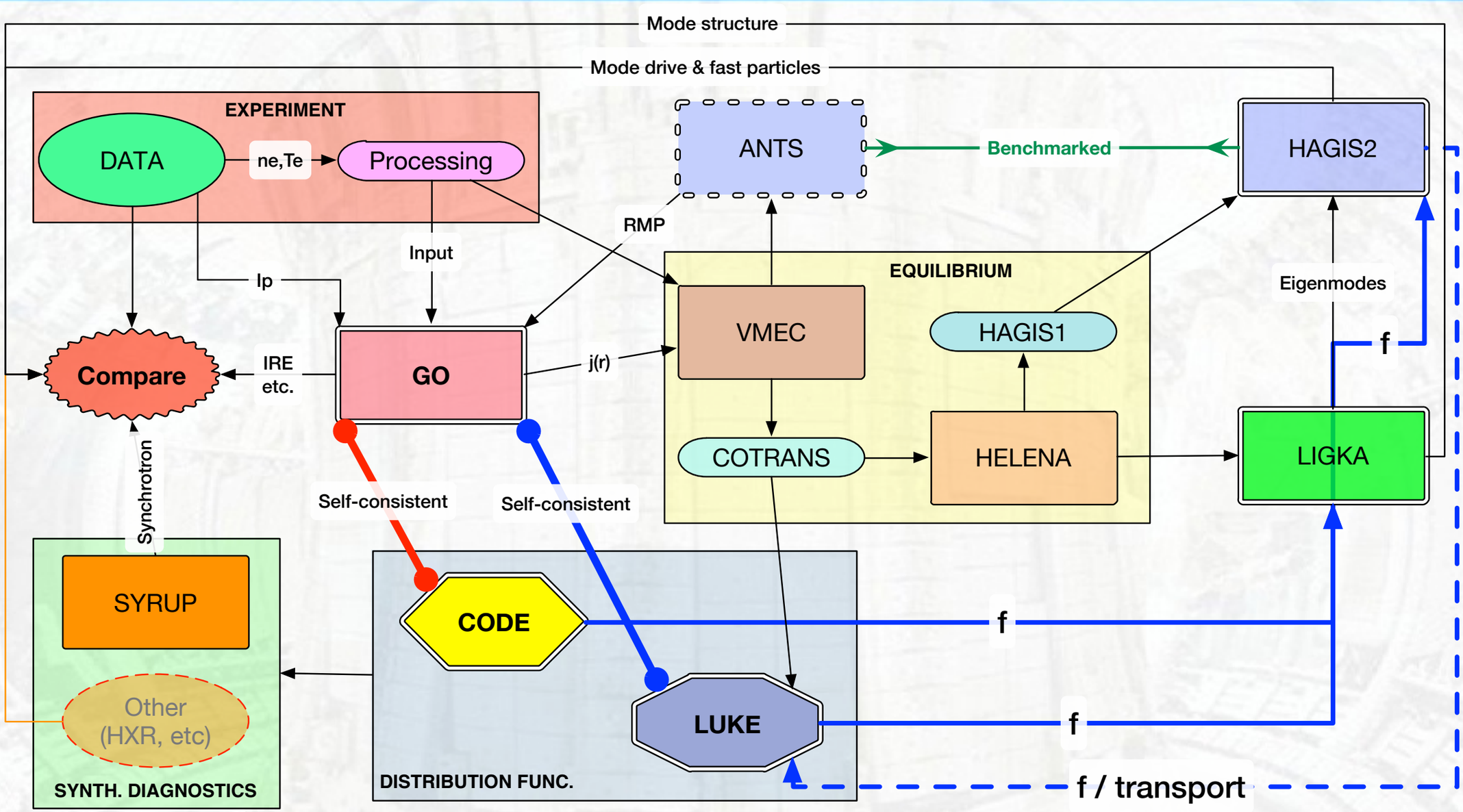








Planned numerical toolset



- CODE: 0D+2V Fokker-Planck solver [Landreman CPC 2014]
- LUKE: 1D+2V Fokker-Planck solver [Decker PSFC/RR-05-3 2005]
  - ➡ **Self-consistent coupling to GO, quasilinear to HAGIS**
- Continuous comparison with experimental data