1.0 Introduction [sj]

1.1 physics goals,
- more aggressive and more complete than ARIES-RS
- aggressive: better optimization of plasma shape, profiles, edge density, and current drive systems
- complete: includes transport analysis, RWM, NTM, edge physics

1.2 relation to ARIES-RS,
- $\beta$ 5.0 $\rightarrow$ 9.2,
- $(\kappa, \delta)$: $(1.9, .76) \rightarrow (2.2, .86)$
- etc

1.3 overview

2.0 MHD Stability and Self-Generated Currents [ck]

2.1 Plasma equilibrium shapes, profiles [ck]
2.2 Bootstrap model [ck]
2.3 Stability to Ballooning Modes (including shape dependence) [ck]
2.4 Stability to Kink Modes (including wall distance) [ck]
2.5 Stability/Current-drive tradeoff [ck]
2.6 Effects of H-mode like pressure and current profiles [ga]
- Small modification to pressure profiles makes them more H-mode like improves ballooning stability
- Finite edge pressure gradient and current of 20% to 30% of central values

2.7 Resistive Wall Mode Stabilization [ga]
- Separate calculations for rotation and for active stabilization.
- Rotation by itself requires 0.1 $V_A$ (from MARS analysis)
- It is thought that an improved feedback coil design can get rid of rotation requirement entirely
- Feedback coils outside the blanket but inside the vacuum vessel
- 16 coils
- stabilization shell same separation as vertical stabilizing shell with 1 cm tungsten
2.8 Neoclassical Tearing Mode Stabilization [ga]
- 5/2 mode is unstable
- replacing missing bootstrap current with local current drive not very effective
- Need to change current profile to make $\Delta'$ more negative
- Refer to Lower Hybrid and ECCD stabilization experiments.

2.9 Edge stability/ELMs [ga]
- Intermediate-n of 15 or higher with oscillatory behavior causing ELM
- Relation of edge pedestal size and grassy ELMs

3.0 Plasma Equilibrium and Control [ck]
3.1 Free-boundary equilibrium and PF coil solutions [ck]
3.2 Vertical Stability and Control [ck]

4.0 Current Drive [tkm]
4.1 System overview [tkm]
4.2 ICRF/FW system for on-axis CD [tkm]
- Justify why FW is used and give results
4.3 LHW system for off axis [tkm]
- Justify why LH is used.
- Mention NTM stabilization and quote experimental results from COMPASS
4.4 HHFW, NBI, ECCD backup systems [tkm]
- NBI primarily for rotation, ECCD for NTM stabilization, and HHFW (needs development) is used for current profile control.
4.5 Overall efficiencies and scaling [tkm]
- Efficiency as function of temperature.

5.0 Transport Analysis and Energy Confinement [ga]
5.1 GLF23 transport analysis (including radial electric field) [ga]
- Density profile input to calculation.
- Temperature profile comes from GLF23 calculation (typically agrees to about 20% with experimental data)
- Pressure (ie, $n\times T$) in reasonable agreement with those assumed from stability.
- H89p = 2.1 (above neoclassical minimum)
- Strict requirement on density profile for optimized solution. Must be peaked. Only depends weakly on rotation profile.
• Bootstrap alignment is not as good for peaked density.

5.2 Rotational drive [ga]
• Baseline does not require rotation. However, rotation does provide some flexibility.
• NBI and RF rotation being quantified.
• Perkins analysis gives 50-100 MW of ICH power for rotational drive.
• NBI power needed to produce rotational power required for RWM stabilization is also quite high.

5.3 Particle fueling (including density limit, and fueling) [sj]
• Demonstrate that a reasonable pellet fueling story exists using a combination of high speed and inside or vertical launch.
• Refer to Osborn paper and Schmidt/Jardin for this.
• Needs more experimental study.

6.0 Power and Particle Exhaust [ga]
6.1 General considerations
• Neon, Argon and/or Krypton radiating just inside the last closed flux surface.
• About half the power is radiated inside the last closed flux surface.

6.2 Divertor heat load
• Petrie working on a radiative divertor scheme to reduce both the peak and the average heat flux.
• Interacting with Najmabadi.

6.3 MIST impurity modeling
• GA calculating Zeff as function of radius.
• Will give this to T.K. for analysis of effect on CD.
• Should take into account H-mode edge.

7.0 Plasma Operating Regime and Startup [rm]
7.1 POPCON analysis [rm]
• Ron miller will generate.

7.2 Plasma startup (including H-mode threshold and heating requirements) [ga&tkm]
• 0D analysis of non-inductive startup being performed similar to what was done for ARIES-ST.

8.0 Summary [sj]