ARIES Town Meeting On Physics of Compact Stellarators as Power Plants

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Princeton Plasma Physics Laboratory

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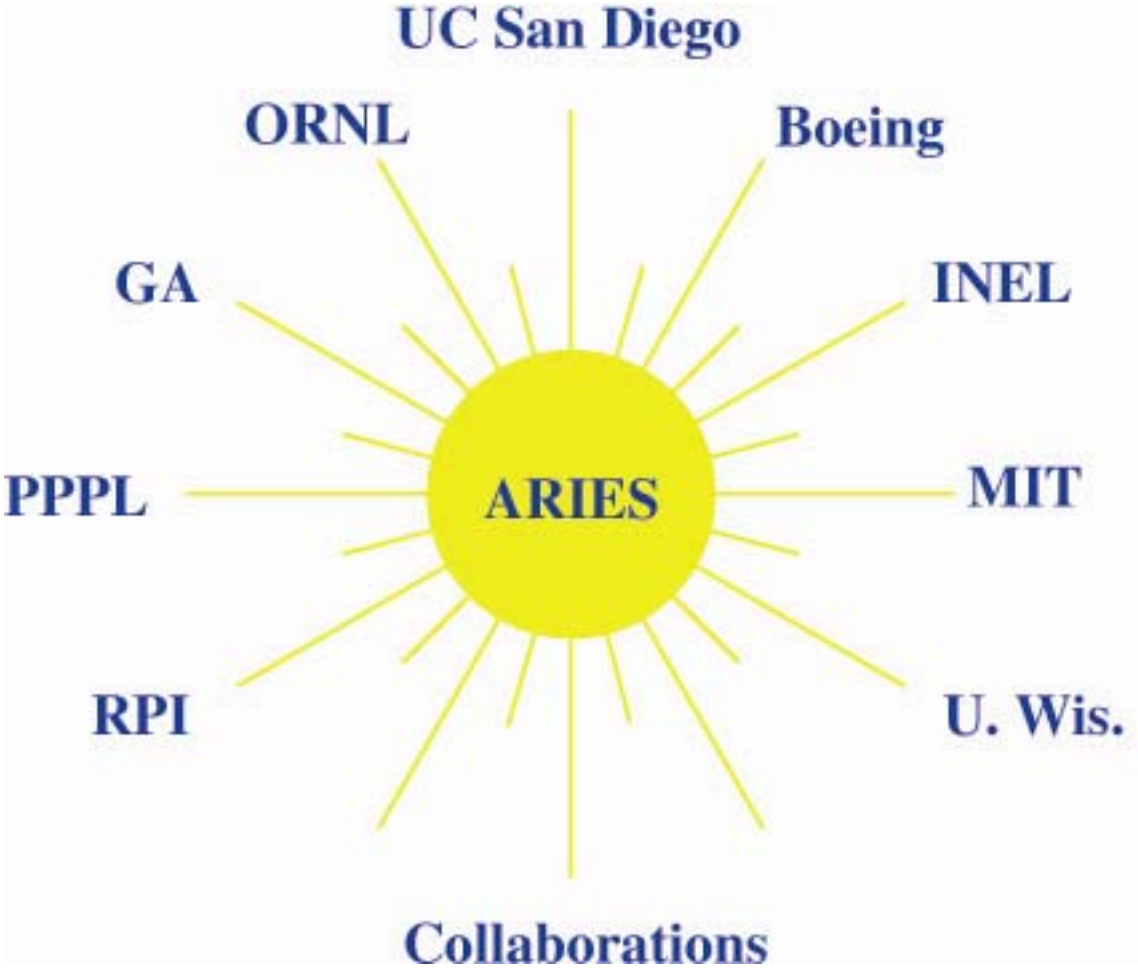

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Advanced Design Program Has Been Investigating the Compact Stellarator Concept

ARIES Compact Stellarator Program has three phases:

I. Exploration of plasma/coil configuration and engineering options (FY03/FY04).

II. Exploration of configuration design space (FY04/FY05). ⇐

III. Detailed system design and optimization (FY06).

Purpose of this meeting

I. Progress to date

II. Science/technology areas which has a high leverage on optimization/attractiveness of stellarators.

III. Areas that we need input from Physics Community (e.g., β limit) ⇐

Focus Areas

- The physics basis of QA as candidate of compact stellarator reactors has been assessed. New configurations have been developed, others refined and improved, all aimed at low plasma aspect ratios ($A \leq 6$), hence compact size. Quasi-helical configurations are under study.
- Modular coils are designed to examine the geometric complexity and the constraints of the maximum allowable field, desirable coil-plasma spacing, etc.
- Assembly and maintenance is a key issue in configuration optimization:
  - ✓ Field-period assembly and maintenance.
  - ✓ Modular assembly and maintenance through ports.
- Five different blanket concept were evaluated:
  - ✓ Nuclear performance
  - ✓ Affinity with assembly/maintenance scheme
  - ✓ Minimum coil-plasma separation.
- Divertor and First wall Engineering.
- Systems level assessment of these options.

We need feedback from Stellarator Physics Community

- We would like your advice on the assumptions, the approach, and the choices we have made with respect to the proposed plasma and coil configurations, applicability of beta limits, systems code assumptions, power core and maintenance, and the overall approach.