Fusion for ENERGY is difficult:

For economic energy, we need: tritium, large size to obtain hot fusing plasma; high fields and large currents

→ high running costs, large stored energy (beware disruptions, ELMs)

Fusion for NEUTRONS (F4N) is easier and can be useful much sooner!

MANY APPLICATIONS: materials research; isotope production; processing fuel for (and waste from) fission plants; hybrids – and Component Test Facilities to aid the Fusion programme

SMALL SCALE is possible, using beam - plasma fusion. Jassby (1975!) showed that injection of high energy neutral beams into 'warm' plasmas provides a very effective neutron source

F4N works already – the MAST Spherical Tokamak at Culham can produce ~ 10^{14} neutrons / pulse (in D-D, and not optimised for neutron production)

Advantages of F4N research

The smaller scale (and possible near-term commercial applications) of F4N can attract private investment

F4N studies assist Fusion programme – e.g. via Component Test Facility; by training new fusion scientists

- Aiding the ultimate goal of Fusion for Energy

Example: a Component Test Facility is much needed; ST appears simplest and most economic in tritium: BUT the high cost (> $1B) and uncertainties in materials, start-up etc are delaying construction of a CTF ….

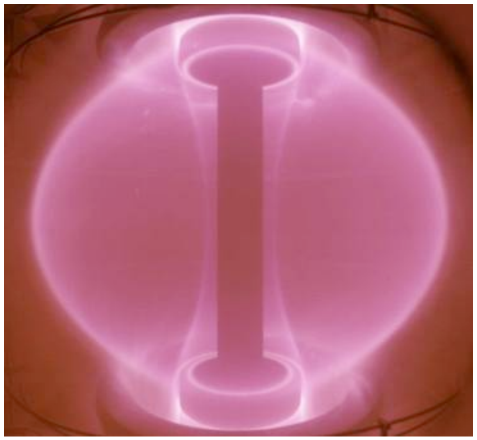
- These uncertainties can be resolved by a small device producing 1-2MW neutrons, costing < $0.2B…. or by a smaller D-D device costing << $0.1B: see:

SOFE Invited Paper: “F4N: a realisable neutron source” Alan Sykes Tues 15.30pm

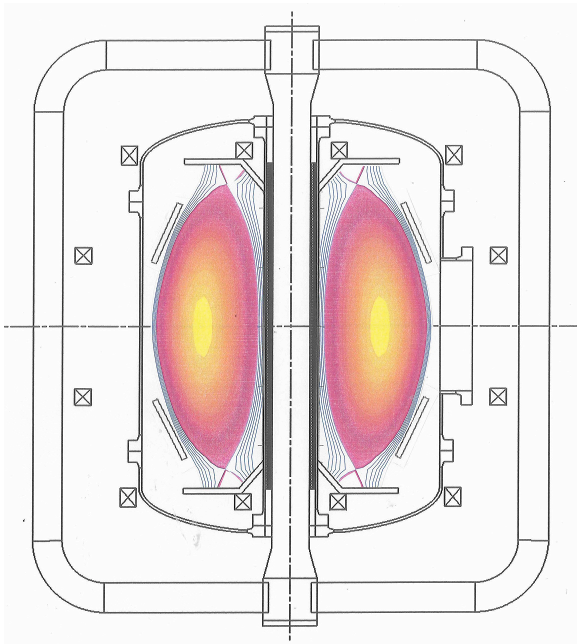
Summary

"Fusion for Neutrons" (F4N) is bringing new impetus to Fusion Research

- Including new interest in small STs both for basic research – and into new studies of beam-plasma fusion



Plasma in START



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