**Nuclear Fusion: “Limitless” Energy Source?**

- Power of sun and stars \( \rightarrow \) releases much more energy than a fission reaction
- Virtually limitless fuel supply, but extremely high temperatures and pressures are required to overcome electromagnetic force; possible on sun due to gravity, but we must be more creative on earth
- Leading candidate: magnetic confinement fusion with deuterium-tritium reactions
- Poloidal (toroidal) coil current causes toroidal (poloidal) magnetic field \( \rightarrow \) leads to high confinement in a helical path

**Langmuir Probes Characterize ELM Response**

- 20 pyrolytic graphite probes, capable of handling higher heat fluxes
- Installed in 2005 near the strike point where ELMs occur
- Densely packed tips for higher spatial resolution
- Apply an AC voltage and measure current \( \rightarrow \) Able to determine particle flux, temperature, density, floating potential
- Majority of plasma power is dumped to the divertor through the strike points \( \rightarrow \) area of interest
- I-coil response is characterized by particle flux profiles derived from measurements near the strike point

- In order to have accurate particle flux calculations, the surface area of each probe as “seen” by the field vector must be known
- Particle flux profile code was modified to incorporate a time-dependent surface area calculation (old code used a constant area)
- Validates particle flux data \( \rightarrow \) up to a 50% difference in some cases

**Experiments Help Understanding of Physics**

- Density, power, strike point sweep approximately the same
- Similar multi-peaked structures, but varying peak amplitudes within \( q_{95} \) resonance window
- Multiple peaks demonstrate strike point splitting

- Higher flux at higher density, as expected
- Same multi-peaked structure at higher density
- Structure more clearly defined near peak \( q_{95} \)

**Theoretical modeling predicts multi-peaked structures along target plate**

- Reasonable agreement between theory and experiment, but differences in location and spread of peaks exist