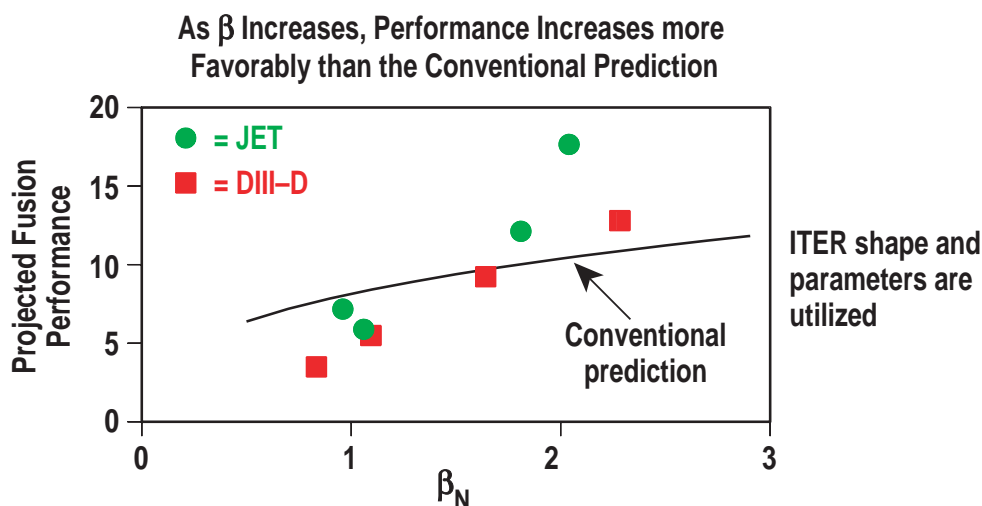


## An International Collaboration in Fusion Research Obtained Results that are Favorable for ITER Performance

*Joint experiments on the DIII-D (in San Diego, California) and JET (in Culham, United Kingdom, operated under the European Fusion Development Agreement) tokamaks have obtained a result that indicates that ITER might perform better than the baseline design assumption.*

Joint experiments on the DIII-D (in San Diego, California) and JET (in Culham, United Kingdom) tokamaks have measured the dependence of energy confinement on beta, the ratio of the plasma's kinetic and magnetic pressures (C.C. Petty, "Beta Scaling of Transport on the DIII-D Tokamak: Is Transport Electrostatic or Electromagnetic?" to be published in Bull. Am. Phys. Soc., 2003). These experiments were done in similar "ITER relevant" discharges. The beta dependence helps to distinguish whether turbulent transport is primarily electrostatic (no beta dependence) or electromagnetic (unfavorable beta dependence), and strongly affects the optimization of fusion in a burning plasma. These joint experiments varied beta by a factor-of-3 while holding the other dimensionless parameters constant. DIII-D utilized the JET plasma geometry to strengthen the inter-machine comparison and because it matched the expected plasma shape for ITER. The beta values of both the edge and core regions were scanned in concert by varying the neutral beam heating power.

Both DIII-D and JET found the beta dependence of confinement to be weak, possibly nonexistent, which favors electrostatic theories of turbulent transport. As a consequence, the fusion performance (proportional to the product of beta and confinement time and the square of the magnetic field, and normalized to factor out JET's large size) increased with increasing beta on both DIII-D and JET, as seen in the figure below. Since one of the more commonly used predictions for fusion plasmas contains a strong, unfavorable beta dependence, this new result indicates that ITER could perform better than the baseline design assumption if operation at a normalized beta above the nominal value of 1.8 can be achieved. Future experiments should build upon these results and provide an improved predictive capability for ITER performance over a wider range of operational parameters.



*Fusion performance, proportional to fusion gain (in arbitrary units), increases with plasma pressure.*

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