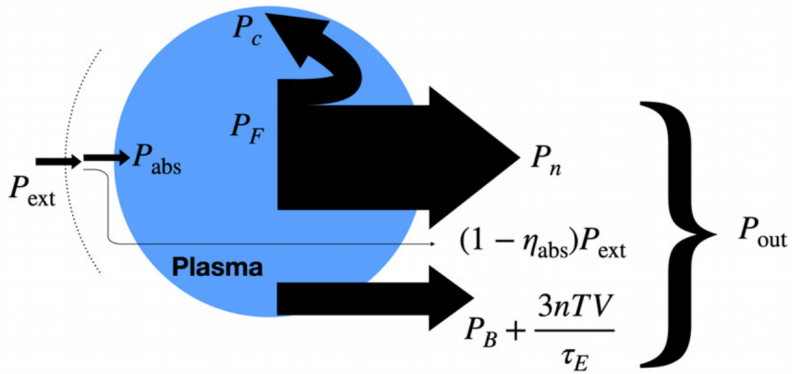
Two key fusion technology parameters you can touch experimentally

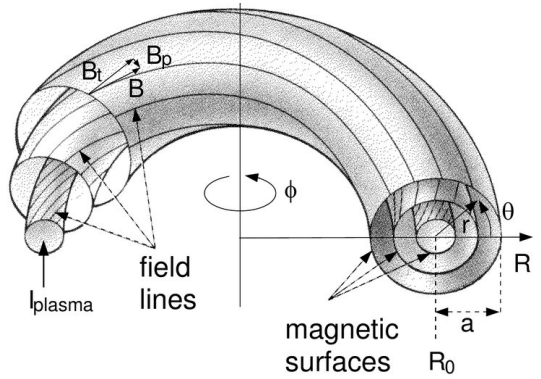
Energy Confinement Time τ_E



credit:[Wurzel and Hsu, 2022]

- Indicates how long the plasma keeps its energy — a key fusion metric.
- $$\tau_E = \frac{W_{\text{plasma}}}{P_{\text{loss}}}$$
- On tG, from energy balance, we estimate the electron component $\tau_{E,e}$ (we can measure only n_e and T_e).

Safety Factor q



credit:[Wesson, 2004]

- Describes how magnetic field lines wind around the torus. Key stability parameter (MHD behaviour).
- $$q(a) = \frac{2\pi a^2 B_t}{\mu_0 R I_p}$$
- On tG, derived from B_t and plasma current I_p.


Wesson, J. (Third Edition, 2004). *Tokamaks*, volume 118 of *International Series of Monographs on Physics*. Oxford University Press Inc., New York.


Wurzel, S. E. and Hsu, S. C. (2022). Progress toward fusion energy breakeven and gain as measured against the lawson criterion. *Physics of Plasmas*, 29(6):062103.