

2012 II: 1A Quicke

a.) $\tau_E = \frac{W}{P}$

↑ global energy confinement time

← plasma stored energy

← ohmic heating power

For an Ohmic tokamak at steady state, $P = I_\phi V_\phi$

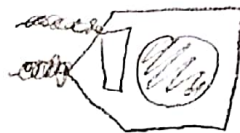
$I_\phi \rightsquigarrow$ measured with Rogowski coil

$V_\phi \rightsquigarrow$ measured with toroidal loop



$W \sim (\text{Vol}) \langle p \rangle \sim 2\pi R_0 \pi a^2 \langle p \rangle$

$\langle p \rangle \rightsquigarrow$ measured with diamagnetic loop and compensation coil



b.) Now introduce radial power injection $P_{\text{beam}} \gg P_{\text{ohmic}}$

Now $P = IV + P_{\text{aux}} \leftarrow \text{Need}$

Note that W also changes, so τ_E does not necessarily decrease.

Additionally, beam injection might produce anisotropy

$P_\perp \neq P_\parallel$, which could lead to errors.