2nd In-class Exam, Apr. 13

Take home exam (final exam) Apr.27, due May 6.

Reading:

6.5 Global leakage

10.3 Toroidal particle trapping (Bananna orbits → neoclassical $D_\perp$ where $D_\perp \sim \frac{r_{banana}^2}{\tau_s}$ instead of classical $D_\perp \sim \frac{r_g^2}{\tau_s}$.)

P158 Safety factor q

4.5 ICF (Review)

9.3-9.5 Magnetic Mirror

] for subsequent comparison to Tokamaks

HOMEWORK 8

~~Homework = 30% of exam, turn in Apr. 13.~~ 50%

Note change 4/6/10

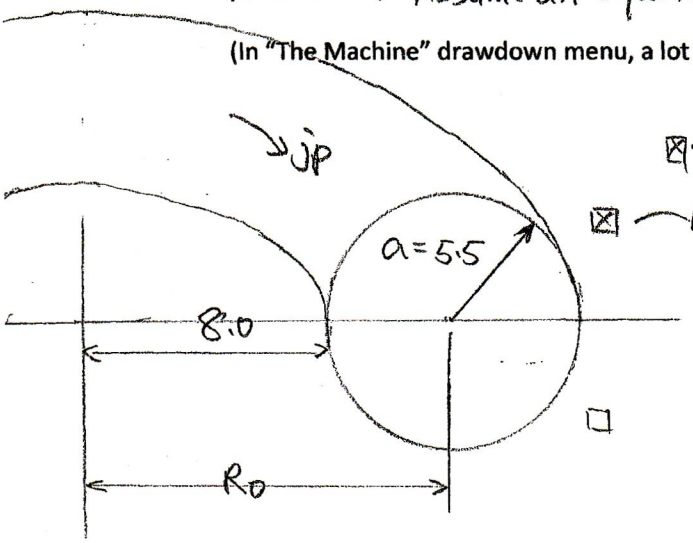
ITER (see ITER internal website) http://www.iter.org/default.aspx

1) What is the goal of ITER? (Hint: Engineering and Physics goal) What needs to be done then to make it a power plant?

(Physics: , such as the energy balance. Eng: Blanket, etc.)

2) Make a table of specs of ITER: R_0, a, B_T, $B_\theta(a)$, P_{in}(plasma & auxiliary), Fueling rate, Fusion power level P_f. Assume an equivalent circle cross section as shown below.

(In "The Machine" drawdown menu, a lot of info is provided.)



$B_T \sim \frac{1}{R}$, $a = 5.5\,m$

$R_0 = (8 + 5.5)\,m$

$A_s = \frac{R_0}{a} = \frac{8+5.5}{5.5}$

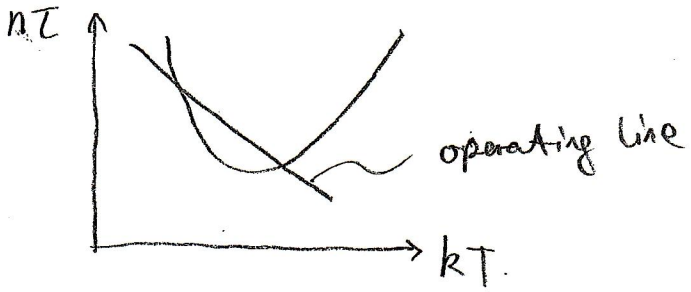
$B_T \sim \frac{1}{R} \sim \frac{1}{R_0 + r\cos\theta}$

$\theta = 0 \rightarrow \frac{1}{B_0 + a}$

$\theta = \pi \rightarrow \frac{1}{B_0 - a}$

$B_T = 13\,T$

3). Plot $n\tau_{ig}$ vs. kT for an ITER plasma.
(Hint: p132-133). To get rid of N, $N = \frac{\beta B_0^2}{4\mu kT}$
Assume $\beta = 5\%$ max, ...



4) Add ITER operating line to graph, i.e. $n\tau_{IER}$ vs. kT.

(classical $D_\perp \sim \frac{r_g^2}{\tau} \sim$ constant. $\frac{1}{B^2\sqrt{kT}}$)

$n\tau = K n_0 B_0^2 \sqrt{kT}$

5). Calculate confine time margin $\equiv \frac{\tau_{min}}{\tau_{intercept}}$ we calculate.