

Nuclear Science and Engineering
Doctoral Qualifying Oral Exam.
Part 2 Question. Fusion and Plasma Physics
February 2015

Plasma current is important in tokamaks. As far as possible give quantitative answers to the questions below, for which you may use formulas for a tokamak of circular cross-section and conventional aspect ratio (moderately large ratio of major to minor radius R/a).

1. What phenomena determine the minimum and maximum permitted plasma current in a tokamak fusion reactor? Give estimates for the current minima and maxima, and explain the consequences of the associated phenomena and their relative importance.
2. What mechanisms can be used to drive the plasma current, and what are the important limitations or challenges for those current-drive mechanisms?