

## Optimum plasma states for next step tokamaks

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**Abstract.** The dependence of the ideal ballooning  $\beta$  limit on aspect ratio,  $A$ , and elongation  $\kappa$  is systematically explored for nearly 100% bootstrap current driven tokamak equilibria in a wide range of the shape parameters ( $A=1.2-7.0$ ,  $\kappa=1.5-6.0$  with triangularity  $\delta = 0.5$ ). The critical  $\beta_N$  is shown to be optimal at  $\kappa=3.0-4.0$  for all  $A$  studied and increases as  $A$  decreases with a dependence close to  $A^{-0.5}$ . The results obtained can be used as a theoretical basis for the choice of optimum aspect ratio and elongation of next step burning plasma tokamaks or tokamak reactors.

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