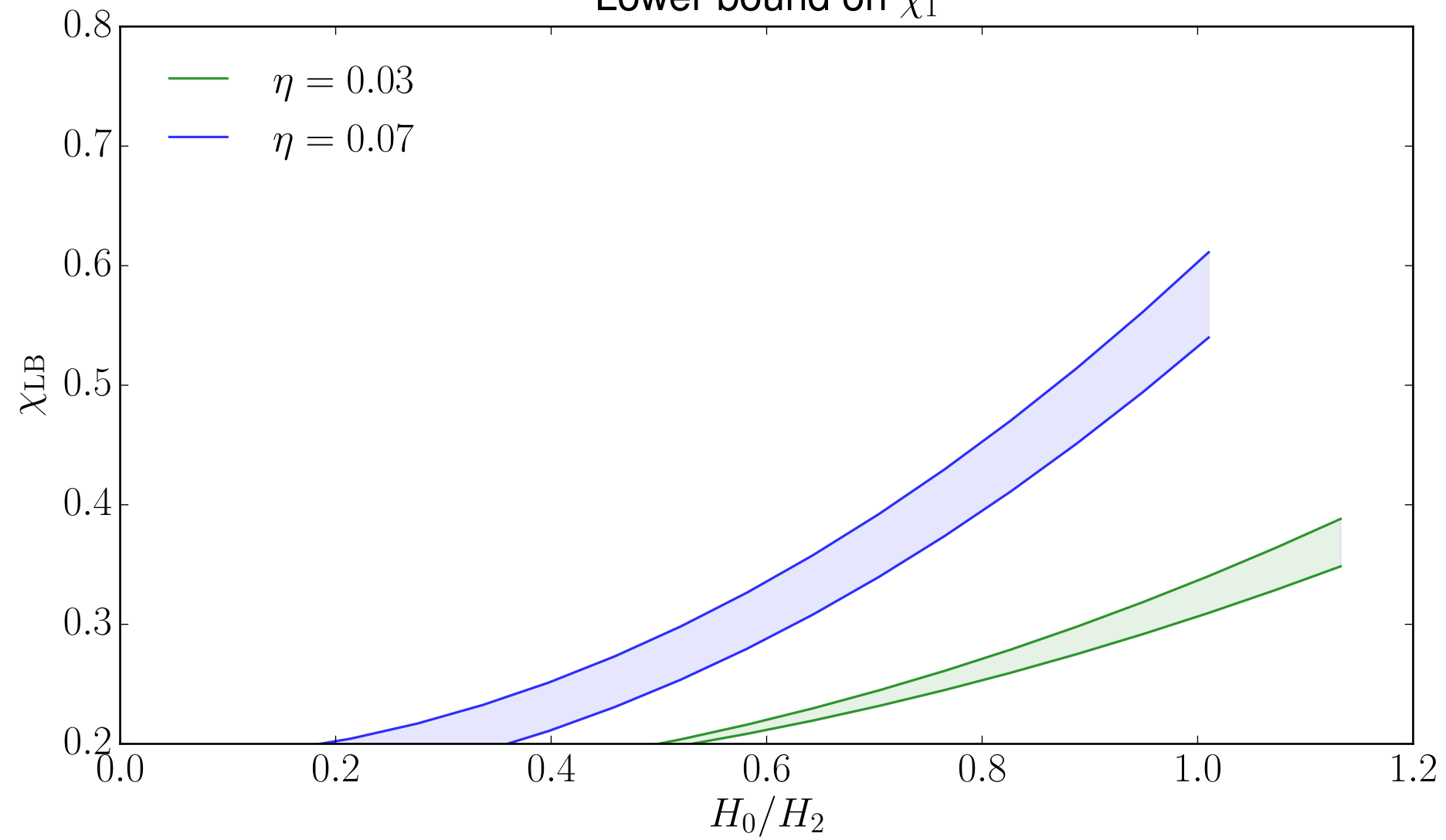


Lower bound on  $\chi_1$ Upper bound on  $\kappa$ 