Homework Problems 4

1. Suppose for a moment that one could create a distribution with no intrinsic spread but which had a parabolic distortion in the phase space. Compute the longitudinal emittance as a function of the parabolic distortion. Does your result approach the proper limit as $\Delta z_{\text{min}}$ goes to zero?

\[
f(z, \Delta E) = A \delta(z + \Delta z_{\text{min}} (\Delta E / \Delta E_{\text{max}})^2) \left[ \Theta(\Delta E + \Delta E_{\text{max}}) - \Theta(\Delta E - \Delta E_{\text{max}}) \right]
\]

2. Assuming no microphonics, plot $\beta_{\text{opt}}$ and $P_{\text{opt}}^g$ as function of $b$ (beam loading), $b = -5$ to 5, and explain the results.

How do the results change if microphonics is present?