

$$\rho_{\text{vector}} \approx \frac{H_I^4}{(2\pi)^2} \left(\frac{a_{\text{exit}}}{a_*} \right)^2 \left(\frac{a_*}{a} \right)^3 \approx \frac{H_I^2 H_{\text{m.r.e.}}^{\frac{3}{2}} m^{\frac{1}{2}}}{(2\pi)^2} \left(\frac{a_{\text{m.r.e.}}}{a} \right)^3,$$