From Syphers and Edwards, eq. 2.15, the contours of particle motion are given by

$$\Delta E^2 + \frac{2\beta^2 E_s eV}{\eta\omega_{RF}\tau}\left(\cos\phi + \phi\sin\phi_s\right) = \Delta E^2 + \frac{\beta^2 E_s eV}{\eta\pi h}\left(\cos\phi + \phi\sin\phi_s\right) = \text{ constant}$$

For coasting beam below transition, $\eta < 0$, $\phi_s = 0$, and the endpoints of stable motion are $\phi = \pm\pi/2$. To find the constant for the separatrix, we plug in $\phi = \pi/2, \Delta E = 0$ and get

$$\text{constant} = -\frac{\beta^2 E_s eV}{\eta\pi h}$$

We can then find the bucket height by pluggin in $\phi = 0$ to obtain

$$\left(\Delta E_b\right)^2 = -\frac{2\beta^2 E_s eV}{\eta\pi h}$$

$$\rightarrow V = \frac{1}{e}\frac{|\eta|\pi h\left(\Delta E_b\right)^2}{2E_s\beta^2}$$