Reformulation of Harmonic Number Jump

- Step in energy is $\Delta E = -E_0\beta^2\gamma^3\Delta h/h$
- E_0 is the rest energy of the particle
- Variation of path length with $\delta p/p$ is neglected
- Formula uses derivatives and is not suitable for turn by turn simulation
- More suitable approach starts from the definition of the harmonic number h

$$h = C/\lambda_{\mathrm{RF}}\beta$$

  with circumference C, free-space RF wavelength λ_{RF} and particle speed $c\beta$
- Rearrange and find that $h\beta = C/\lambda_{\mathrm{RF}}$ is an invariant
- Find $\beta_{n+1} = \beta_n h_n/(h_n - \Delta h)$
- Get all particle properties, energy gain, etc. from β_{n+1}