Treatment of Drift eq. “Full”

$$\Delta t^{n+1} = \Delta t^n + T_0^{n+1}\left(\frac{1}{1-\eta(\delta^{n+1})\delta^{n+1}} - 1\right)$$

- Using the “full” drift equation, linear α_0 present in non-linear η_1, η_2

- By default, η_1, η_2 are ignored if only α_0 is declared, which is an approx. Forces the user to explicitly set $\alpha_1, \alpha_2 = 0$

- Possible re-expression to avoid truncation due to η

$$\eta_0 = \alpha_0 - \frac{1}{\gamma_s^2}$$

$$\eta_1 = \frac{3\beta_s^2}{2\gamma_s^2} + \alpha_1 - \alpha_0\eta_0$$

$$\eta_2 = -\frac{\beta_s^2(5\beta_s^2-1)}{2\gamma_s^2} + \alpha_2 - 2\alpha_0\alpha_1 + \frac{\alpha_1}{\gamma_s^2} + \alpha_0^2\eta_0 - \frac{3\beta_s^2\alpha_0}{2\gamma_s^2},$$

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const double coeff = 1./(beta*beta*energy);
const double eta0 = eta_zero*coeff;
const double eta1 = eta_one*coeff*coeff;
const double eta2 = eta_two*coeff*coeff*coeff;

if ( alpha_order == 1 )
for ( i = 0; i < n_macroparticles; i++ )
        beam_dt[i] += T*(1./(1. - eta0*beam_dE[i]) - 1.);
else if (alpha_order == 2)
for ( i = 0; i < n_macroparticles; i++ )
        beam_dt[i] += T*(1./(1. - eta0*beam_dE[i]
                - eta1*beam_dE[i]*beam_dE[i]) - 1.);
else
for ( i = 0; i < n_macroparticles; i++ )
        beam_dt[i] += T*(1./(1. - eta0*beam_dE[i]
                - eta1*beam_dE[i]*beam_dE[i]
                - eta2*beam_dE[i]*beam_dE[i]*beam_dE[i]) - 1.);
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$$\Longrightarrow \frac{\Delta T_{\mathrm{rev}}}{T_{\mathrm{rev},0}} = \left[1 + \sum_{i=0}^{\infty}\alpha_i\left(\frac{\Delta p}{p_0}\right)^{i+1}\right]\frac{1+(\Delta E/E_0)}{1+(\Delta p/p_0)} - 1$$