

^{catalyst}
Update 07/27/2026
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- News
- G4beamline Setup and simulation
 - Clear some misunderstanding of beam simulation
- ↳ Beam coordinate, reference particles

Global coordinate

● particle

→

$\begin{pmatrix} x \\ p_x \end{pmatrix}$

Relative coordinate

● reference ● particle

→

$\begin{pmatrix} x \\ p_x \end{pmatrix} - \begin{pmatrix} x \\ p_x \end{pmatrix} = \begin{pmatrix} x \\ p_x \end{pmatrix}_{\text{relative}}$

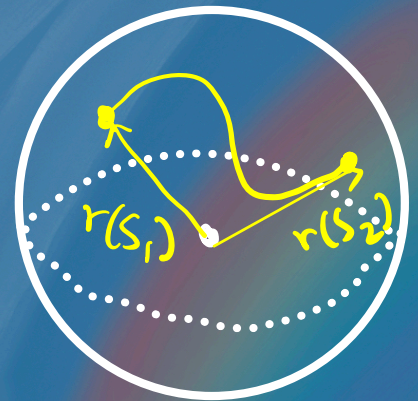
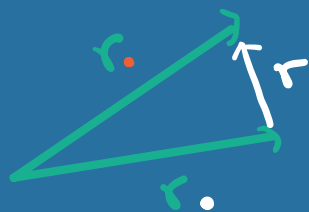
$\begin{pmatrix} x \\ p_x \\ y \\ p_y \\ z \\ p_z \end{pmatrix}$

$$\begin{pmatrix} x \\ y \\ z \\ p_x \\ p_y \\ p_z \end{pmatrix} = \begin{pmatrix} x \\ y \\ z \\ 0 \\ 0 \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \\ 0 \\ p_x \\ p_y \\ p_z \end{pmatrix} = r + p$$

$$\mathbf{r}_i = \begin{pmatrix} x_i \\ y_i \\ z_i \end{pmatrix}$$

$$r = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

$$r = r_{\bullet} - r_{\circ}$$

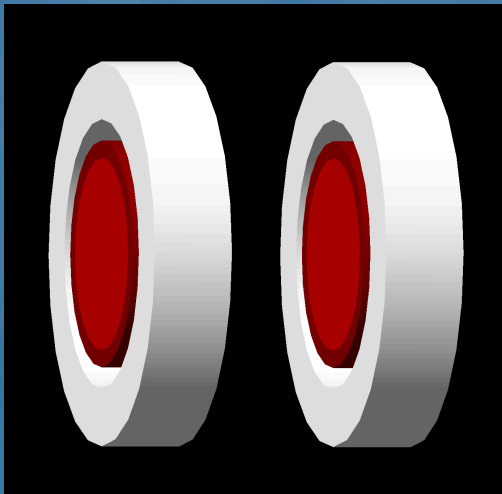


particle
Optical
Coordinate

=

$$\begin{pmatrix} x \\ P_x/P_0 \\ y \\ P_y/P_0 \\ x(t-t_0) \\ (K-K_0)/K_0 \end{pmatrix}$$

$$, K = -V_0 \frac{\gamma_0}{1+\gamma_0}$$



```
#BLTrackFile NTuple/Z2000
#x y z Px Py Pz t PDGid EventID TrackID ParentID Weight
#mm mm mm MeV/c MeV/c MeV/c ns - - - - -
0 0 0 19.9007 0 199.007 0 -13 1 1 0 1
0.99995 -0.00860502 10 19.8978 -0.344422 199.007 0.0379132 -13 1 1 0 1
1.99959 -0.0348951 20 19.8884 -0.704827 199.007 0.0758265 -13 1 1 0 1
2.99859 -0.0797125 30 19.8718 -1.08178 199.007 0.11374 -13 1 1 0 1
3.99655 -0.1439 40 19.8471 -1.47588 199.007 0.151653 -13 1 1 0 1
4.99304 -0.228332 50 19.8133 -1.88765 199.007 0.189566 -13 1 1 0 1
5.98759 -0.333911 60 19.7695 -2.31759 199.007 0.22748 -13 1 1 0 1
6.97967 -0.461562 70 19.7145 -2.76625 199.007 0.265393 -13 1 1 0 1
7.96868 -0.612238 80 19.6472 -3.23408 199.006 0.303306 -13 1 1 0 1
8.95397 -0.786912 90 19.5661 -3.72147 199.006 0.34122 -13 1 1 0 1
9.93482 -0.98658 100 19.47 -4.22886 199.005 0.379133 -13 1 1 0 1
10.9104 -1.21225 110 19.3573 -4.75651 199.004 0.417047 -13 1 1 0 1
11.8799 -1.46495 120 19.2264 -5.30465 199.003 0.454961 -13 1 1 0 1
12.8424 -1.74572 130 19.0755 -5.87346 199.002 0.492875 -13 1 1 0 1
13.7967 -2.05559 140 18.9029 -6.46297 199 0.53079 -13 1 1 0 1
```

- Next • Study phase space
- Understand transfer matrix and phase space of my simulation