

Console

Enter the number of sequential elements(lenses) 8

Enter the focal lengths of sequential elements in order

--> 2

--> -9

--> 3

--> 8

--> -12

--> 14

--> 22

--> -24

Enter the input angle(in radian)0.1

Enter the input height0.4

Enter the object distance12

Enter the distance between lenses in order

--> 2

--> 8

--> 5

--> 21

--> 4

--> 6

--> 12

The lens matrices are

1. -0.5
0. 1.

1. 0.1111111
0. 1.

1. -0.3333333
0. 1.

1. -0.125
0. 1.

1. 0.0833333
0. 1.

1. -0.0714286
0. 1.

1. -0.0454545
0. 1.

1. 0.0416667
0. 1.

The image distance from the last lens of cascade is

93.955437

The image matrices are

1. 0.
2.4 1.

1. 0.
0.4186047 1.

1. 0.
4.964467 1.

1. 0.
-0.0356915 1.

1. 0.
-7.6410781 1.

$$\begin{pmatrix} 1. & 0. \\ -69.088803 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ 31.1168 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ 93.955437 & 1. \end{pmatrix}$$

The object distance matrices are

$$\begin{pmatrix} 1. & 0. \\ 12. & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ -0.4 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ 7.5813953 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ 0.035533 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ 21.035692 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ 11.641078 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ 75.088803 & 1. \end{pmatrix}$$

$$\begin{pmatrix} 1. & 0. \\ -19.1168 & 1. \end{pmatrix}$$

The composite matrix for whole cascade of lenses

$$\begin{pmatrix} -1.6543615 & -0.1921127 \\ -3.585D-14 & -0.6044628 \end{pmatrix}$$

Angular Magnification by cascade of lenses is

$$-1.6543615$$

Spatial Magnification by cascade of lenses is

-0.6044628

alpha_out is

-0.2422812

x_out is

-0.2417851