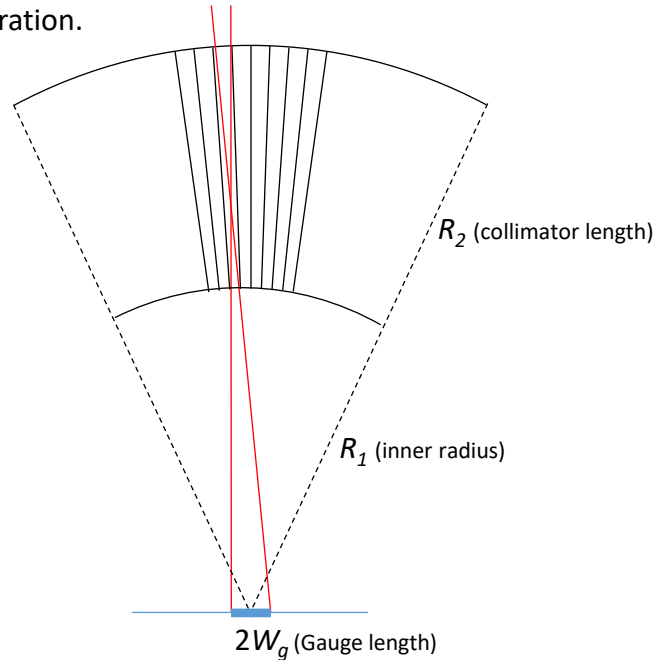


Definition and Calculation of Gauge Length

Two important design parameters for both radial and double converging collimators are the Gauge length and the angular foil separation.



The angular foil separation, α can be calculated as:

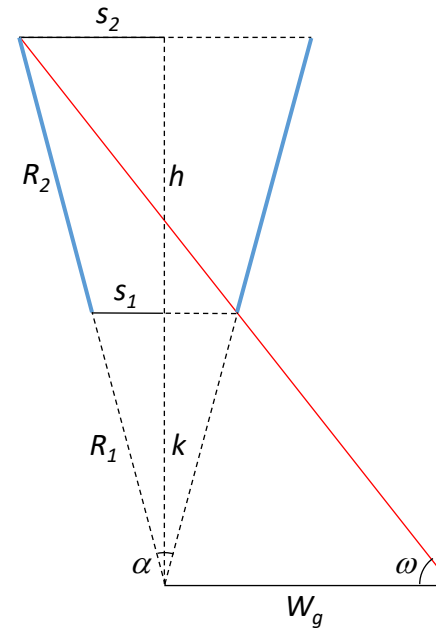
$$\alpha = 2 \sin^{-1} \left(\frac{W_g}{2} \cdot \frac{R_2}{R_1 R_2 + R_1^2} \right) \quad (1)$$

where W_g is the gauge length, R_1 is the inner radius of the foils and R_2 is the length of the foils.

The gauge volume is then given by:

$$W_g = 2 \sin \left(\frac{\alpha}{2} \right) \left(\frac{R_1^2}{R_2} + R_1 \right) \quad (2)$$

The calculations of α and W_g is illustrated in the following figure with two succeeding foils.



$$h = R_2 \cos \frac{\alpha}{2}$$

$$k = R_1 \cos \frac{\alpha}{2}$$

$$s_1 = R_1 \sin \frac{\alpha}{2}$$

$$s_2 = (R_1 + R_2) \sin \frac{\alpha}{2}$$

$$\frac{S_2 + w_g}{h + k} = \frac{S_1 + S_2}{h} \Rightarrow w_g = S_1 + \frac{k}{h} (S_1 + S_2) \Rightarrow$$

$$w_g = R_1 \sin \frac{\alpha}{2} + \frac{R_1 \cos \frac{\alpha}{2}}{R_2 \cos \frac{\alpha}{2}} \left(R_1 \sin \frac{\alpha}{2} + (R_1 + R_2) \sin \frac{\alpha}{2} \right) =$$

$$2 \sin \frac{\alpha}{2} \left(R_1 + \frac{R_1^2}{R_2} \right)$$