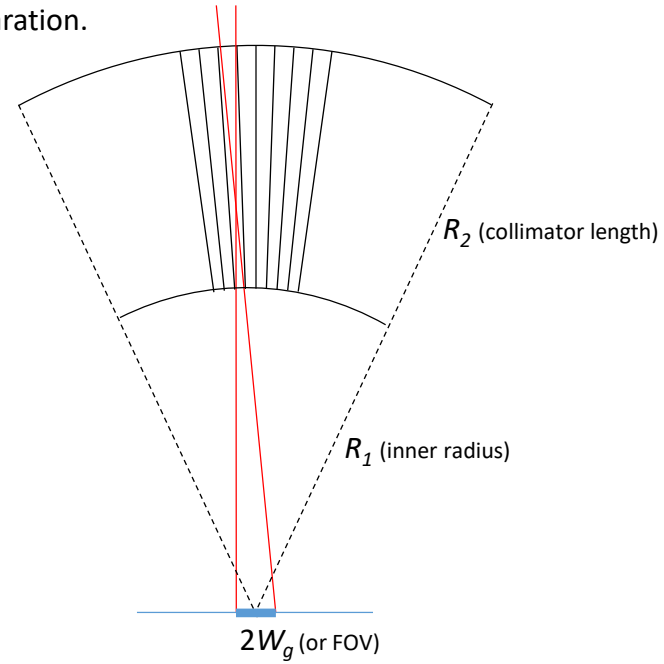
Definition and Calculation of Gauge Width

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



The angular foil separation, α can be calculated as:

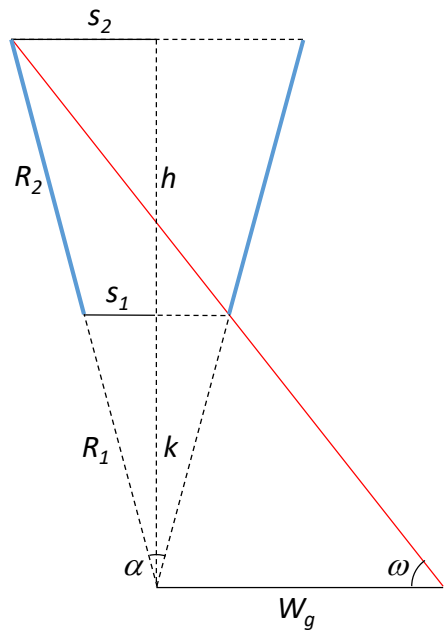
$$\alpha = 2\sin^{-1}\left(\frac{W_g}{2}\cdot\frac{R_2}{R_1R_2+R_1^2}\right) \quad (1)$$

where W_g is the gauge width, R_1 is the inner radius of the foils and R_2 is the length of the foils. The intensity distribution through one collimator channel is approximately triangular, and thus the W_g is approximately FWHM(FOV) ≅ FOV/2

The gauge width 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.



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

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

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

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

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

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

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