pmh_2016_1013

Detector::do_Ray

Element of solid angle from pmh_2015_0210, page 1.

$$\Delta\Omega = \int_{\text{wedge}} d\Omega = \int_{\varphi_{min}}^{\varphi_{max}} d\varphi \int_{\vartheta_{min}}^{\vartheta_{max}} \sin\vartheta \, d\vartheta = \Delta\varphi \left(\cos\vartheta_{min} - \cos\vartheta_{max}\right)$$

$$= 2\,\Delta\varphi \sin\frac{\vartheta_{max} + \vartheta_{min}}{2} \sin\frac{\vartheta_{max} - \vartheta_{min}}{2}$$

Central Ray: $\vartheta = 0$, $\vartheta_{min} = 0$, $\vartheta_{max} = \frac{\Delta\vartheta}{2}$

$\varphi_{min} = 0$, $\varphi_{max} = 2\pi$

$$\Delta\Omega = 2 \times 2\pi \times \sin\frac{\frac{\Delta\vartheta}{2}}{2} \times \sin\frac{\frac{\Delta\vartheta}{2}}{2} = \underline{\underline{4\pi \sin^2\frac{\Delta\vartheta}{4}}}$$

if $\Delta\vartheta \to 0$, then $\Delta\Omega \approx 4\pi\left(\frac{\Delta\vartheta}{4}\right)^2 = \pi\left(\frac{\Delta\vartheta}{2}\right)^2$ ✓

All other Rays: $\vartheta \neq 0$, $\vartheta_{min} = \vartheta - \frac{\Delta\vartheta}{2}$, $\vartheta_{max} = \vartheta + \frac{\Delta\vartheta}{2}$

$$\underline{\underline{\Delta\Omega = 2\,\Delta\varphi \sin\vartheta \sin\frac{\Delta\vartheta}{2}}}$$