1,2

1

σ

t_{tel}

$$\sigma_{\mathrm{psw}}^{\mathrm{track}} = \frac{2\,T_{\mathrm{sys}}}{\eta_{\mathrm{spec}}\sqrt{d\nu\, n_{\mathrm{pol}}\,\eta_{\mathrm{tel}}\,t_{\mathrm{tel}}}}, \quad \text{and} \quad \sigma_{\mathrm{fsw}}^{\mathrm{track}} = \frac{\sqrt{2}\,T_{\mathrm{sys}}}{\eta_{\mathrm{spec}}\sqrt{d\nu\, n_{\mathrm{pol}}\,\eta_{\mathrm{tel}}\,t_{\mathrm{tel}}}}.$$

$$\sigma_{\mathrm{psw}}^{\mathrm{otf}} = \frac{\left(\sqrt{n_{\mathrm{beam}}} + \sqrt{n_{\mathrm{submap}}}\right)\ T_{\mathrm{sys}}}{\eta_{\mathrm{spec}}\ \sqrt{d\nu\, n_{\mathrm{pol}}\, \eta_{\mathrm{tel}}\, t_{\mathrm{tel}}}}, \quad \text{and} \quad \sigma_{\mathrm{fsw}}^{\mathrm{otf}} = \frac{\sqrt{2\, n_{\mathrm{beam}}}\, T_{\mathrm{sys}}}{\eta_{\mathrm{spec}} \sqrt{d\nu\, n_{\mathrm{pol}}\, \eta_{\mathrm{tel}}\, t_{\mathrm{tel}}}}.$$

η_{tel}

η_{spec}

$$d\nu$$

n_{pol}

T_{sys}

$T_{\mathrm{a}}^{\star}$

$$T_{\rm sys} = \frac{(1+G_{\rm im})\exp\{\tau_{\rm s}\,A\}}{F_{\rm eff}}\left[F_{\rm eff}\,T_{\rm atm}\;(1-\exp\{-\tau_{\rm s}\,A\}) + (1-F_{\rm eff})\,T_{\rm cab} + T_{\rm rec}\right],$$

G_{im}

$$F_{\mathrm{eff}}$$

$$A = 1/\sin(\text{elevation})$$

τ_{s}

T_{atm}

T_{cab}

T_{rec}

n_{beam}

$$n_{\mathrm{beam}} = \frac{A_{\mathrm{map}}}{A_{\mathrm{beam}}} \quad \text{with} \quad A_{\mathrm{beam}} = \frac{\eta_{\mathrm{grid}}\, \pi\, \theta^2}{4\, \ln(2)}.$$

A_{map}

A_{beam}

η_{grid}

θ

n_{submap}

$$n_{\mathrm{submap}} = \frac{A_{\mathrm{map}}}{A_{\mathrm{submap}}} \quad \text{with} \quad A_{\mathrm{submap}} = \frac{\theta}{2.5}\, v_{\mathrm{linear}}\, t_{\mathrm{stable}}$$

v_{linear}

t_{stable}

$$3 \times 3$$

$$\Delta = 24''$$

$$n_{\mathrm{pix}} = 9$$

$$\overline{T}_{\text{sys}}$$

deg

$$w = 1/\sigma^2$$

$$\frac{n_{\mathrm{pol}}\, n_{\mathrm{pix}}}{\overline{T}_{\mathrm{sys}}^{2}} = \sum_{i=1,n_{\mathrm{pol}},\, j=1,n_{\mathrm{pix}}} \frac{1}{T_{\mathrm{sys}_{ij}}^{2}}.$$

$$\sigma_{\mathrm{psw}}^{\mathrm{track}} = \frac{2\,\overline{T}_{\mathrm{sys}}}{\eta_{\mathrm{spec}}\sqrt{d\nu\, n_{\mathrm{pol}}\,\eta_{\mathrm{tel}}\,t_{\mathrm{tel}}}}, \quad \text{and} \quad \sigma_{\mathrm{fsw}}^{\mathrm{track}} = \frac{\sqrt{2}\,\overline{T}_{\mathrm{sys}}}{\eta_{\mathrm{spec}}\sqrt{d\nu\, n_{\mathrm{pol}}\,\eta_{\mathrm{tel}}\,t_{\mathrm{tel}}}}.$$

$$\Delta = \theta/2.5$$

$4''$

$$\Delta \simeq 2\theta$$

α

Δ

$$\sqrt{n_{\text{pix}}} \times \sqrt{n_{\text{pix}}}$$

$$\sqrt{n_{\mathrm{pix}}}$$

δ'

$$\delta = \Delta \sin\alpha \quad \text{and} \quad \delta' = \Delta \cos\alpha.$$

$$\delta' = n_{\mathrm{subscan}} \sqrt{n_{\mathrm{pix}}}\, \delta,$$

$$\tan\alpha = \frac{1}{n_{\mathrm{subscan}}\sqrt{n_{\mathrm{pix}}}}.$$

$$n_{\mathrm{subscan}} = 1$$

$$n_{\text{subscan}} = 2$$

$$\sqrt{n_{\text{pix}}} = 3$$

$$\sim 1$$

$$\alpha = 18.4^\circ$$

$$\Delta \sim 12''$$

$$\alpha = 9.5^\circ$$

$$\Delta \sim 24''$$

9.5°

$$3\delta = 12''$$

$$d_{\perp} = n_{\mathrm{subscan}} n_{\mathrm{pix}} \delta$$

$$d_{\parallel}$$

A_{target}

$n_{\perp}$

$$d_{\perp} \times d_{\parallel}$$

$$A_{\text{target}} = n_{\perp}\, d_{\perp}\, d_{\parallel}.$$

A_{edge}

$n_\perp \, d_\perp$

$$d_{\mathrm{edge}} = (\sqrt{n_{\mathrm{pix}}} - 1)\,\Delta\,(\cos\alpha + \sin\alpha)$$

$$d_{\mathrm{edge}} = (\sqrt{n_{\mathrm{pix}}} - 1)\,(1 + n_{\mathrm{subscan}}\,\sqrt{n_{\mathrm{pix}}})\delta$$

η_{edge}

$$\eta_{\mathrm{edge}} = \frac{A_{\mathrm{target}}}{A_{\mathrm{target}} + A_{\mathrm{edge}}}, \quad \text{with} \quad A_{\mathrm{edge}} = n_{\perp}\, d_{\perp}\, d_{\mathrm{edge}}.$$

$$\eta_{\mathrm{edge}} = \frac{1}{1 + \frac{d_{\mathrm{edge}}}{d_{\parallel}}} = \frac{1}{1 + \frac{d_{\mathrm{edge}}}{a\, n_{\perp}\, d_{\perp}}}.$$

$$a = \frac{d_{\parallel}}{n_{\perp}\, d_{\perp}} \quad \text{with} \quad a > 1 \quad \text{and} \quad n_{\perp} \text{ integer.}$$

$$A_{\text{chunk}}$$

t_{chunk}

$$n_\perp \, d_\perp \, (d_\parallel + d_{\mathrm{edge}}) = A_{\mathrm{chunk}} \quad \text{with} \quad A_{\mathrm{chunk}} = v_{\mathrm{linear}} \, d_\perp \, t_{\mathrm{chunk}}.$$

$$a\, n_\perp\, d_\perp$$

$$n_\perp^2 + n_\perp \frac{d_{\text{edge}}}{a\, d_\perp} - \frac{A_{\text{chunk}}}{a\, d_\perp^2} = 0.$$

$$n_\perp = \frac{1}{2}\,\frac{d_{\rm edge}}{a\,d_\perp}\,\left[\sqrt{1+\frac{4a\,A_{\rm chunk}}{d_{\rm edge}^2}}-1\right].$$

$$\eta_{\text{edge}} = \frac{1}{1 + \frac{2}{\sqrt{1+\frac{4a\ A_{\text{chunk}}}{d_{\text{edge}}^2}}-1}}$$

$$\text{with} \quad \frac{a\,A_{\text{chunk}}}{d_{\text{edge}}^2} = \frac{\theta}{4\delta}\,\frac{a\,f_{\text{dump}}t_{\text{chunk}}}{\left[\left(\sqrt{n_{\text{subscan}}\,n_{\text{pix}}} - \frac{1}{\sqrt{n_{\text{subscan}}\,n_{\text{pix}}}}\right) - \left(\sqrt{n_{\text{subscan}}} - \frac{1}{\sqrt{n_{\text{subscan}}}}\right)\right]^2}.$$

$$(a\, A_{\text{chunk}})/d_{\text{edge}}^2$$

f_{dump}

$$f_{\mathrm{dump}} = 2$$

a

$a > 1$

$$a = 1$$

$$n_\perp = \text{floor}(n_\perp),$$

$$a = \frac{A_{\text{chunk}}}{(n_\perp \, d_\perp)^2} - \frac{d_{\text{edge}}}{n_\perp \, d_\perp}.$$

$$d_{\perp} = n_{\text{subscan}}\, n_{\text{pix}}\, \delta,$$

$$d_{\mathrm{edge}} = (\sqrt{n_{\mathrm{pix}}} - 1)\,(1 + n_{\mathrm{subscan}}\,\sqrt{n_{\mathrm{pix}}})\delta,$$

$$t_{\text{chunk}}^{\text{psw}} = 2 \text{ minutes} \quad \text{and} \quad t_{\text{chunk}}^{\text{fsw}} = 10 \text{ minutes}.$$

$$A_{\text{chunk}} = \frac{\theta}{4} \, f_{\text{dump}} \, \frac{d_{\perp}}{n_{\text{subscan}}} \, t_{\text{chunk}}.$$

$$A_{\text{target}} < \eta_{\text{edge}}^{\min} A_{\text{chunk}}$$

$$\eta_{\text{edge}}^{\min} = 0.8$$

1.

$$n_\perp = \text{floor}\left[\frac{\sqrt{A_\text{target}}}{d_\perp}\right],$$

2.

if $n_\perp = 0$, then send an error message: "Area too small, use raster mapping.",

3.

$$a = \frac{A_{\text{target}}}{(n_\perp \, d_\perp)^2}.$$

$$A_{\text{target}} \geq \eta_{\text{edge}}^{\min} A_{\text{chunk}}$$

$$n_{\perp} = \text{floor}\left\{ \frac{1}{2}\,\frac{d_{\text{edge}}}{d_{\perp}}\;\left[\sqrt{1+\frac{4A_{\text{chunk}}}{d_{\text{edge}}^{2}}}-1\right]\right\},$$

$$a = \frac{A_{\text{chunk}}}{(n_\perp\, d_\perp)^2} - \frac{d_{\text{edge}}}{n_\perp\, d_\perp}.$$

$$\eta_{\mathrm{edge}} = \frac{1}{1 + \frac{d_{\mathrm{edge}}}{a\, n_{\perp}\, d_{\perp}}}.$$

$$A_{\text{target}} < \eta_{\text{edge}}^{\min} A_{\text{chunk}}$$

$$A_{\text{chunk}}^{\text{new}} = \frac{A_{\text{target}}}{\eta_{\text{edge}}},$$

$$t_{\text{chunk}}^{\text{new}} = t_{\text{chunk}} \frac{A_{\text{chunk}}^{\text{new}}}{A_{\text{chunk}}},$$

$$A_{\text{chunk}} = A_{\text{chunk}}^{\text{new}} \quad \text{and} \quad t_{\text{chunk}} = t_{\text{chunk}}^{\text{new}}.$$

$t_{\text{chunk}} < 1$

$$A_{\text{map}} + A_{\text{edge}}$$

$$\eta_{\mathrm{edge}}\left(A_{\mathrm{map}}+A_{\mathrm{edge}}\right)=A_{\mathrm{map}}.$$

$A_{\mathrm{map}}/\eta_{\mathrm{edge}}$

n_{pix}

$\eta_{\text{tel}}\, t_{\text{tel}}$

$$A_{\mathrm{map}}^{\mathrm{pix}} = \frac{A_{\mathrm{map}}/\eta_{\mathrm{edge}}}{n_{\mathrm{pix}}}.$$

$$\sigma_{\mathrm{psw}}^{\mathrm{otf}} = \frac{\left(\sqrt{n_{\mathrm{beam}}^{\mathrm{pix}}} + \sqrt{n_{\mathrm{submap}}^{\mathrm{pix}}}\right) \overline{T}_{\mathrm{sys}}}{\eta_{\mathrm{spec}} \sqrt{d\nu\, n_{\mathrm{pol}}\, \eta_{\mathrm{tel}}\, t_{\mathrm{tel}}}}, \quad \text{and} \quad \sigma_{\mathrm{fsw}}^{\mathrm{otf}} = \frac{\sqrt{2\, n_{\mathrm{beam}}^{\mathrm{pix}}}\, \overline{T}_{\mathrm{sys}}}{\eta_{\mathrm{spec}} \sqrt{d\nu\, n_{\mathrm{pol}}\, \eta_{\mathrm{tel}}\, t_{\mathrm{tel}}}},$$

$$n_{\mathrm{beam}}^{\mathrm{pix}}$$

$$n_{\text{submap}}^{\text{pix}}$$

$$n_{\mathrm{beam}}^{\mathrm{pix}} = \frac{A_{\mathrm{map}}}{\eta_{\mathrm{edge}}\, n_{\mathrm{pix}}\, A_{\mathrm{beam}}} \quad \text{and} \quad n_{\mathrm{submap}}^{\mathrm{pix}} = \frac{A_{\mathrm{map}}}{\eta_{\mathrm{edge}}\, n_{\mathrm{pix}}\, A_{\mathrm{submap}}^{\mathrm{pix}}}$$

$$\text{with} \quad A_{\text{submap}}^{\text{pix}} = v_{\text{area}}^{\text{pix}}\, t_{\text{stable}} \quad \text{and} \quad v_{\text{area}}^{\text{pix}} = \delta\, v_{\text{linear}}.$$

$$t^{\mathrm{pix}}_{\mathrm{onoff}} = \eta_{\mathrm{edge}}\,\eta_{\mathrm{tel}}\,t_{\mathrm{tel}} \quad \text{and} \quad t^{\mathrm{pix}}_{\mathrm{edge}} = (1 - \eta_{\mathrm{edge}})\,\eta_{\mathrm{tel}}\,t_{\mathrm{tel}}.$$

t_{onoff}

v_{area}

$t_{\mathrm{onoff}}^{\mathrm{pix}}$

$$v_{\text{area}}^{\text{pix}}$$