$1,2$

3

1

σ



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

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





$d\nu$







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

F_{eff}

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

τ_{S}

T_{atm}

T_{cab}

T_{rec}



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




A_{beam}

η_{grid}

θ

n_{submap}

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




t_{stable}

3×3

$\Delta = 24''$

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



deg

$w = 1/\sigma^2$

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

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

$$\Delta = \theta/2.5$$

$\Delta \simeq 2\theta$

α

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

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

δ'

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

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

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

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

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

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

~ 1

$\alpha = 18.4^\circ$

$\Delta \sim 12''$

$\alpha = 9.5^\circ$

$\Delta \sim 24''$

9.5°

$3\delta = 12''$

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


A_{target}

$n_\perp$

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

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

A_{edge}

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

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



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

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

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





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

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

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

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

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

$(a\,A_{\mathrm{chunk}})/d^2_{\mathrm{edge}}$



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

a

$a > 1$

$a = 1$

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

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

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

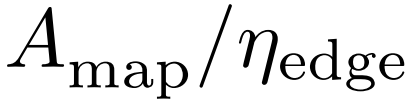
$$t_{\text{chunk}}^{\text{new}} = t_{\text{chunk}} \, \frac{A_{\text{chunk}}^{\text{new}}}{A_{\text{chunk}}},$$

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

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

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

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



n_{pix}

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

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

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

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



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

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

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





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

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