























$$\sigma_K = \frac{T_{\text{sys}}}{\sqrt{2} dv \Delta t}.$$







π_j
sys

=

$\sqrt{\pi_j \text{sys}}$

π_j
sys,





1992

2

100

$$\sigma_K = \frac{T_{\rm sys}}{\eta_{\rm spec} \sqrt{2} dv \Delta t}.$$





$$j_{\text{ant}}^{\text{sd}} = \frac{2k F_{\text{eff}}}{A_{\text{eff}}},$$







$$\sigma_{Jy} = \frac{J_{\text{ant}}^{\text{sd}} T_{\text{sys}}}{\eta_{\text{spec}} \sqrt{2} dv \Delta t}.$$



$$\sqrt[n]{a_{ij}} = \sqrt[n]{a_{ij}^i a_{ij}^j}$$

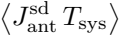


and
all

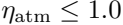
A pixelated, black and white representation of the mathematical expression $\exp(-1) \cdot \exp(2)$. The characters are rendered in a low-resolution, dithered font style.



$$\sigma_{\mathrm{Jy}} = \frac{\left(J_{\mathrm{ant}}^{\mathrm{sd}} T_{\mathrm{sys}} \right)}{\eta_{\mathrm{spec}} \sqrt{n_{\mathrm{ant}} \left(n_{\mathrm{ant}} - 1 \right)} dv \Delta t},$$









$$j_{\text{ant}}^{\text{int}} = \frac{j_{\text{ant}}^{\text{sd}}}{\eta_{\text{atm}}}$$

WILLIAM

1871

1871

Q. 100

$$\text{rotation} = e^{-\frac{\phi^2}{2}} e^{\frac{1}{2} \ln 10}$$

$$\sigma_{Jy} = \frac{\langle J_{\rm ant}^{\rm int} T_{\rm sys} \rangle}{\eta_{\rm spec} \sqrt{n_{\rm ant} (n_{\rm ant} - 1)} dv \Delta t}.$$

$$\sigma_{Jy} = \frac{\langle J_{\text{ant}}^{\text{int}} T_{\text{sys}} \rangle}{\eta_{\text{spec}} \sqrt{n_{\text{ant}} (n_{\text{ant}} - 1)} d\nu \Delta t}, \quad \text{with} \quad J_{\text{ant}}^{\text{int}} = \frac{J_{\text{ant}}^{\text{sd}}}{\eta_{\text{atm}}} \quad \text{and} \quad \eta_{\text{atm}} = e^{-\frac{\phi_{\text{rms}}^2}{2}} \leq 1.0,$$



1000

1

1000

NEWBORN





Q

W

W

W

W



$$j_{\text{ant}} = \frac{2k \Omega_{\text{ant}} F_{\text{eff}}}{\lambda^2} \cdot$$

QPR100

$$j_{\text{ant}}^{\text{int}} = \frac{j_{\text{ant}}^{\text{sd}}}{\eta_{\text{atm}}} = \frac{1}{\eta_{\text{atm}}} \frac{F_{\text{eff}}}{B_{\text{eff}}} \frac{2k\Omega_{\text{prim}}}{\lambda^2}.$$

QWERTY



2014

—

1

1000

1000

1000

$$\sqrt{\frac{\rho_{\text{syn}}}{\rho_{\text{ant}}}} = \frac{2k\Omega_{\text{syn}}}{\lambda^2} \cdot$$

$$\sigma_K = \frac{\sigma_{Jy}}{J_{\text{ant}}^{\text{syn}}} \quad \text{with} \quad J_{\text{ant}}^{\text{syn}} = \frac{2\pi k \theta_{\text{maj}} \theta_{\text{min}}}{4 \ln 2 \lambda^2},$$

$$\sigma_K = \frac{\Omega_{\text{prim}}}{\Omega_{\text{syn}}} \left\langle \frac{F_{\text{eff}} T_{\text{sys}}}{B_{\text{eff}} \eta_{\text{atm}}} \right\rangle \frac{1}{\eta_{\text{spec}} \sqrt{n_{\text{ant}} (n_{\text{ant}} - 1)} d\nu \Delta t} = \frac{\theta_{\text{prim}}^2}{\theta_{\text{maj}} \theta_{\text{min}}} \left\langle \frac{F_{\text{eff}} T_{\text{sys}}}{B_{\text{eff}} \eta_{\text{atm}}} \right\rangle \frac{1}{\eta_{\text{spec}} \sqrt{n_{\text{ant}} (n_{\text{ant}} - 1)} d\nu \Delta t},$$

Q. 100

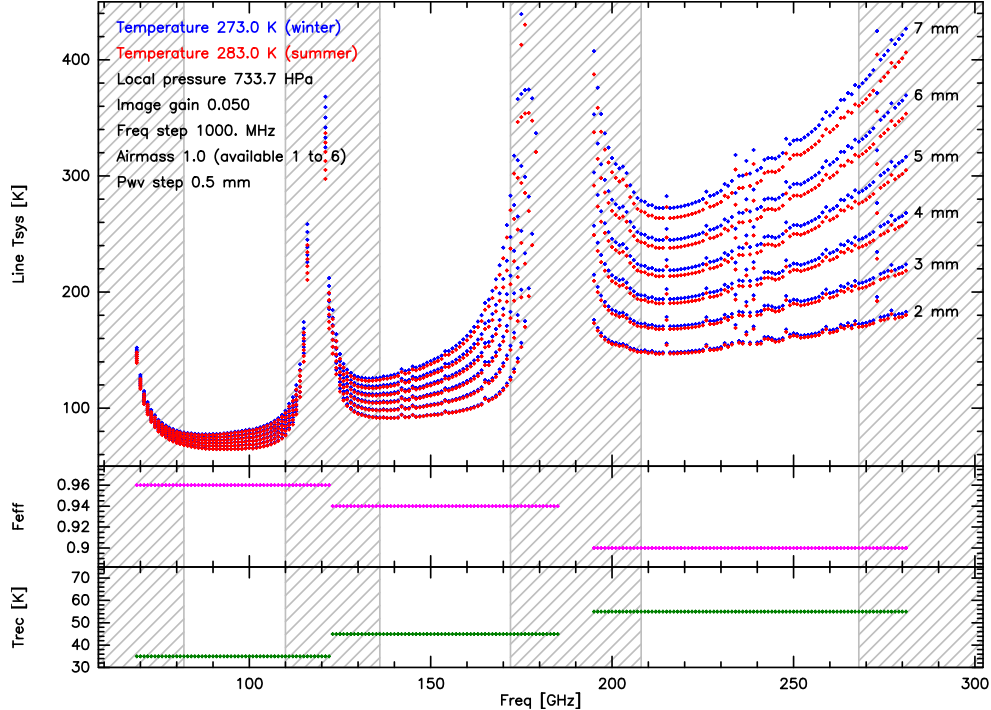
A pixelated, grayscale version of the number 9. The image is composed of a grid of squares in various shades of gray, from black to white, arranged to form the shape of the digit 9. The style is reminiscent of early digital art or a low-resolution scan of a printed number.

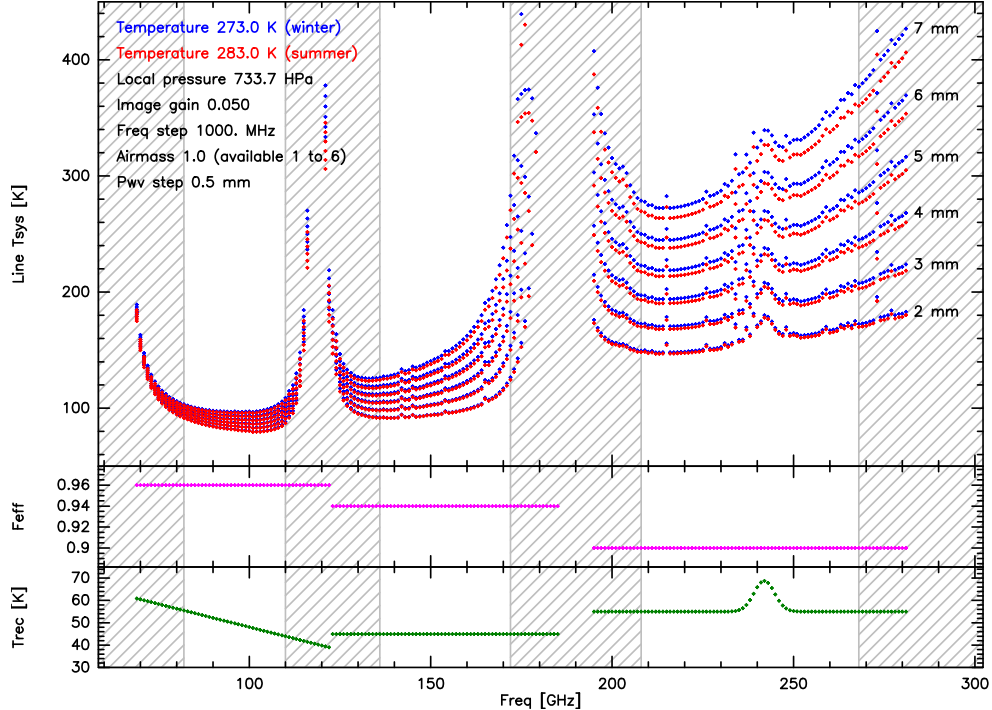


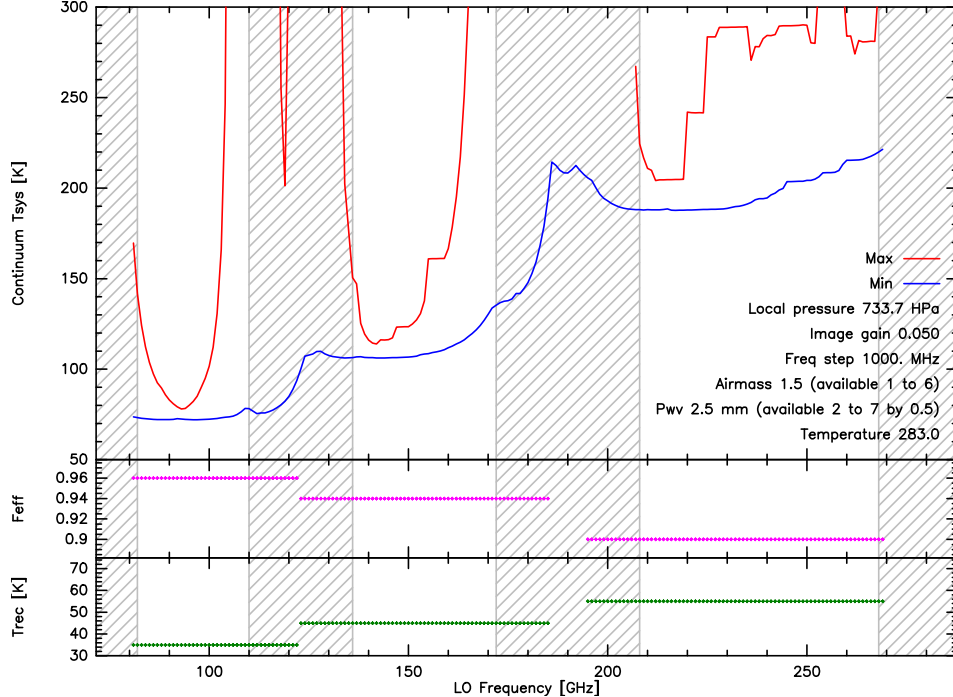


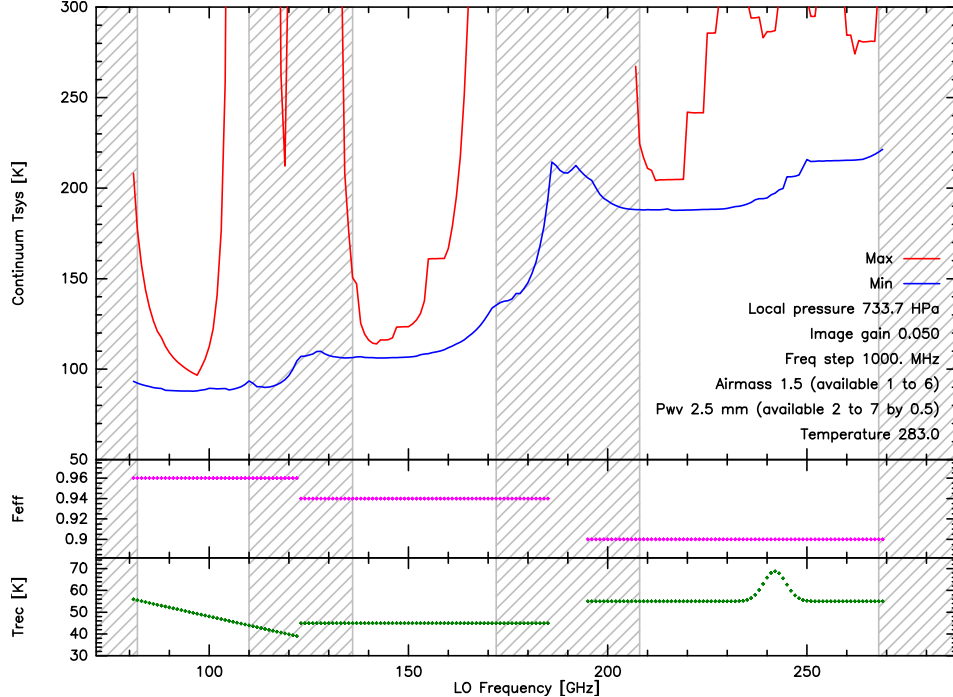
100% 24

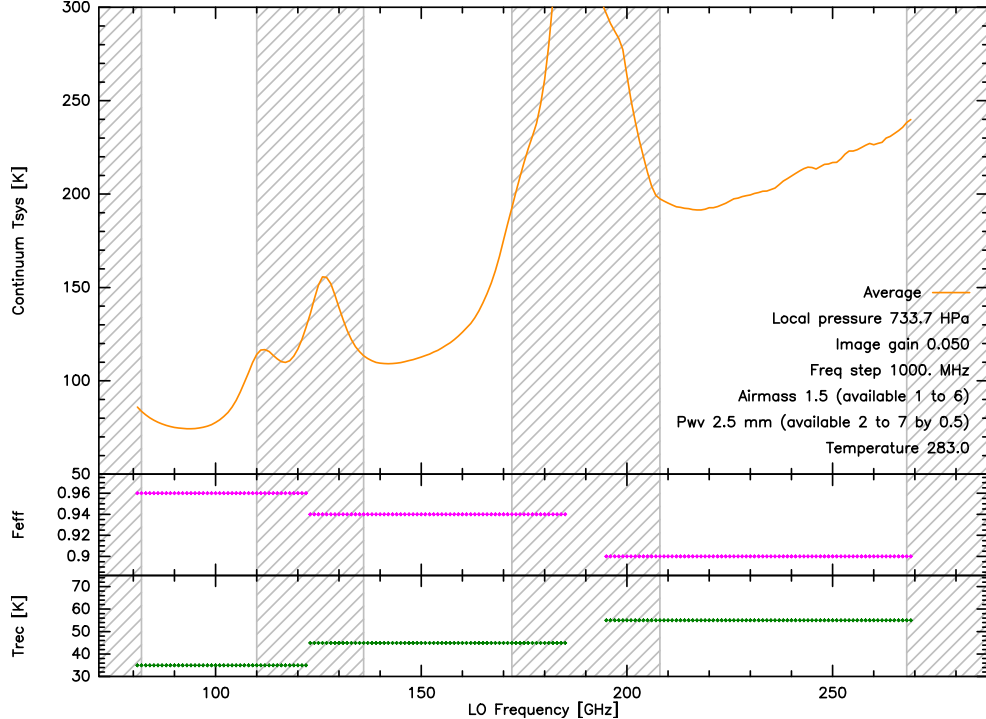


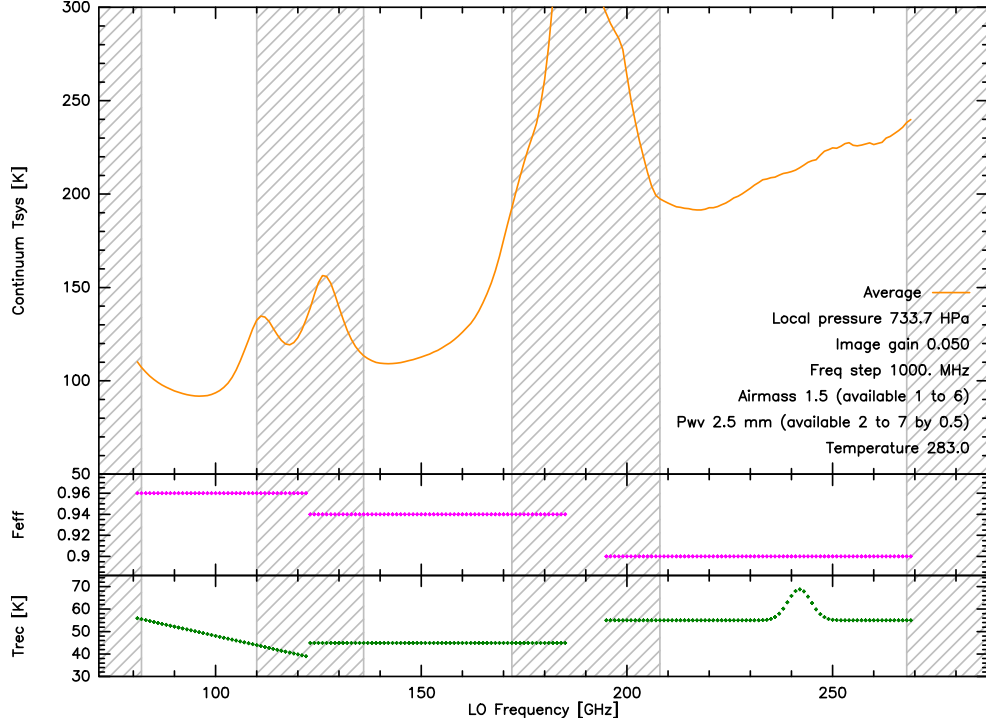












$$T_{sys} = \frac{(1 + G_{im}) \exp \{ \tau_s A \}}{F_{eff}} [F_{eff} T_{atm} (1 - \exp \{ -\tau_s A \}) + (1 - F_{eff}) T_{cab} + T_{rec}] ,$$





Adrianus





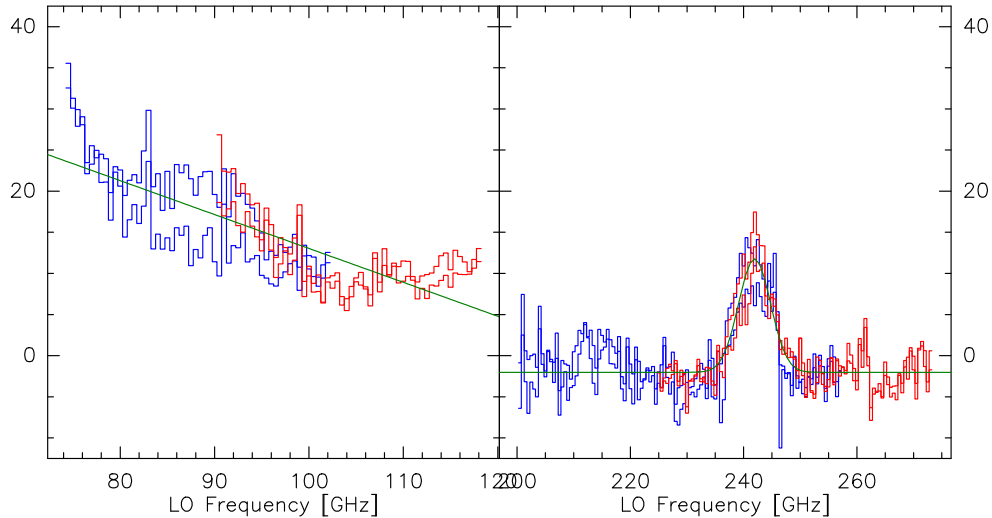




$$\frac{1}{\langle T_{\text{sys}} \rangle^2} = \frac{1}{N} \sum \frac{1}{T_{\text{sys}}^2} \cdot$$

Band 1

Band 3









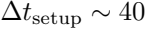
$$\sigma_{Jy} = \frac{j_{\text{ant}}^{\text{int}} T_{\text{sys}}}{\eta_{\text{spec}} \sqrt{n_{\text{ant}} (n_{\text{ant}} - 1)} dv n_{\text{pol}} \Delta t_{\text{on}}} .$$

$$\sigma_{Jy} = \frac{j_{\rm ant}^{\rm int} T_{\rm sys}}{\eta_{\rm spec} \sqrt{n_{\rm ant} (n_{\rm ant} - 1)} d\nu n_{\rm pol} \Delta t_{\rm on}} \quad \text{with} \quad j_{\rm ant}^{\rm int} = \frac{j_{\rm ant}^{\rm sd}}{\eta_{\rm atm}} \quad \text{and} \quad \eta_{\rm atm} = e^{-\frac{\phi_{\rm rms}^2}{2}} \leq 1.0,$$

$$\sigma_K = \frac{\sigma_{Jy}}{J_{\text{ant}}^{\text{syn}}} \quad \text{with} \quad J_{\text{ant}}^{\text{syn}} = \frac{2\pi k \theta_{\text{maj}} \theta_{\text{min}}}{4 \ln 2 \lambda^2}.$$







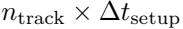


$$\Delta t_{\text{setup}} = \Delta t_{\text{setupmin}} + (n_{\text{freq}} - 1) \Delta t_{\text{setup}} / \text{freq};$$

Upland

△✱
estp
isq





100%

$$\Delta t_{obs} = \Delta t_{tel} - n_{track} \times \Delta t_{setup}.$$

$$n_{\text{track}} = \frac{\Delta t_{\text{tel}}}{\Delta t_{\text{visible}} + \Delta t_{\text{setup}}},$$

Welding

0.95

[illegible]

2019

10000000

△ + △ = △

Δt_{on}

$=$

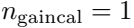
Δt_{obs}

\times

η_{obs}

A pixelated, grayscale image of the text "100%". The first "100%" is small and positioned on the left. To its right is a large, stylized "100%" that dominates the right half of the image. The characters are composed of various shades of gray and black pixels, giving it a retro, low-resolution appearance. The background is white.





$$\eta_{\text{obs}} = \frac{1}{\Omega_{\text{obs}}} \quad \text{with} \quad \Omega_{\text{obs}} = \Omega_{\text{min}} + n_{\text{gaincal}} n_{\text{freq}} \Omega_{\text{/freq/gaincal}}, \quad \Omega_{\text{min}} = 1.3, \quad \text{and} \quad \Omega_{\text{/freq/gaincal}} = 0.3.$$



Uplinked

100%

100%

100%

A horizontal sequence of six grayscale images showing the progression of a handwritten digit '1'. The images are arranged from left to right, showing a transformation from a noisy, pixelated state to a clean, sharp state. The first image on the left is highly noisy and pixelated. The second image shows a more defined shape. The third image is a clean, sharp '1'. The fourth image is a clean, sharp '1'. The fifth image is a clean, sharp '1'. The sixth image on the right is a clean, sharp '1' with a small, dark, pixelated artifact at the bottom right.

2020-2021

opinion



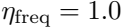
$$\eta_{\text{tot}} = \frac{\Sigma \Delta t_{\text{on}}}{\Delta t_{\text{tel}}}$$

WORLD OF

$$\sigma_{Jy} = \frac{j_{\rm ant}^{\rm int} T_{\rm sys}}{\eta_{\rm spec} \sqrt{n_{\rm ant} (n_{\rm ant} - 1)} dv n_{\rm pol} \Delta t_{\rm on}},$$

$$\Delta t_{on} = n_{obs} \eta_{freq} (\Delta t_{tel} - n_{track} \times \Delta t_{setup}) ,$$





A pixelated, grayscale image of the text "Wag the Dog" in a stylized, blocky font. The letters are composed of various shades of gray, giving it a retro, digital appearance. The text is arranged in a single line, with "Wag" on the left, "the" in the middle, and "Dog" on the right. The overall style is reminiscent of early computer graphics or video game text.





$$\sigma_{Jy} = \frac{j_{\text{ant}}^{\text{int}} T_{\text{sys}}}{\eta_{\text{spec}} \sqrt{n_{\text{ant}} (n_{\text{ant}} - 1)} dv n_{\text{pol}} \Delta t_{\text{on}}}$$

$$\Delta t_{\text{on}} = \eta_{\text{obs}} \eta_{\text{freq}} \left(\frac{\Delta t_{\text{tel}} - n_{\text{track}} \times \Delta t_{\text{setup}}}{n_{\text{sou}}} \right) .$$

The image displays the word "Amp" in a highly pixelated, grayscale font. The letters are composed of various shades of gray, creating a blocky, digital appearance. The 'A' is on the left, followed by 'm', 'p', and 'p'. The overall style is reminiscent of early computer graphics or low-resolution digital art.



$$n_{\text{beam}} = \frac{A_{\text{map}}}{A_{\text{beam}}}$$

1990



$$A_{\text{beam}} = \frac{0.8 \pi \theta_{\text{prim}}^2}{4 \ln(2)} ;$$

$$\sigma_{Jy} = \frac{j_{\text{ant}}^{\text{int}} T_{\text{sys}}}{\eta_{\text{spec}} \sqrt{n_{\text{ant}} (n_{\text{ant}} - 1)} dv n_{\text{pol}} \Delta t_{\text{on}}}$$

$$\Delta t_{\text{on}} = \eta_{\text{obs}} \eta_{\text{mos}} \left(\frac{\Delta t_{\text{tel}} - n_{\text{track}} \times \Delta t_{\text{setup}}}{n_{\text{beam}}} \right), \quad \text{and} \quad \eta_{\text{mos}} = \frac{\Delta t_{\text{point/cycle}}}{\Delta t_{\text{point/cycle}} + \Delta t_{\text{slew}}},$$

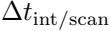
penitence

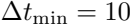
A pixelated, grayscale illustration of the word "EUREKA" in a stylized, blocky font. The letters are composed of various shades of gray and black pixels, giving it a digital or retro aesthetic. The background is white.

WORLDWIDE

$$n_{\text{point}} = n_{\text{beam}} \left(\frac{7}{4} \right)^2,$$









$$\frac{\Delta t_{\text{int}}/\text{scan}}{1\text{s}} < < \frac{6900}{\theta_{\text{alias}}/\theta_{\text{syn}}},$$

Q112

QWID

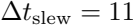
$$\Delta t_{\text{int}/\text{scan}} \leq \eta \frac{6900}{1\text{sec}} \sqrt{\frac{\theta_{\text{maj}}\theta_{\text{min}}}{A_{\text{map}}}},$$



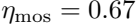




$$\leq \Delta t_{\text{int}/\text{scan}} = \min \left(45 \text{ sec}, \eta \frac{6\,900}{1 \text{ sec}} \sqrt{\frac{\theta_{\text{maj}} \theta_{\text{min}}}{A_{\text{map}}}} \right) \quad \text{with} \quad \eta = 0.5.$$



The image is a pixelated, black and white graphic of the text "The End of the World". The text is rendered in a highly stylized, jagged, and irregular font that resembles a low-resolution digital or hand-drawn aesthetic. The letters are composed of various shades of gray and black pixels, giving it a textured, almost mosaic-like appearance. The words are arranged in a single line, with "The" and "of" being smaller and positioned between the larger words "End" and "World". The overall effect is one of digital decay or a corrupted digital message.



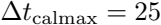


1990-1991

$$\eta_{\text{mos}} = \frac{\Delta t_{\text{point/cycle}}}{\Delta t_{\text{point/cycle}} + \Delta t_{\text{slew}}}$$

$$\Delta t_{\text{cycle}} = \Delta t_{\text{point/track}} (\Delta t_{\text{point/cycle}} + \Delta t_{\text{slw}}),$$

$\Delta t_{\text{point/cycle}} = \sqrt{\text{repeat}} \cdot t_{\text{point/cycle}} \cdot \Delta t_{\text{acc}}$



$$n_{\text{repeat/point/cycle}}^{\text{max}} = \frac{\Delta t_{\text{calmax}}/n_{\text{point/track}} - \Delta t_{\text{slew}}}{\Delta t_{\text{int/scan}}},$$

$$\eta_{\text{mos}} = 1 - \frac{n_{\text{point}} / \text{track} \Delta t_{\text{slew}}}{\Delta t_{\text{calmax}}}.$$

$$n_{\text{point/track}}^{\text{large}} = \text{floor} \left(\frac{\Delta t_{\text{calmax}}}{\Delta t_{\text{int/scan}} + \Delta t_{\text{slew}}} \right).$$

1991-2000

$$n_{\text{point}/\text{track}}^{\text{max}} = \frac{\Delta t_{\text{cyclenmax}}}{\Delta t_{\text{min}} + \Delta t_{\text{slew}}} \sim 150.$$

$$\Delta t_{\text{int/scan}} = \min \left\{ \Delta t_{\text{int/scan}}, \left(\frac{\Delta t_{\text{cyclmax}}}{n_{\text{point/track}}} - \Delta t_{\text{slew}} \right) \right\}.$$

$$\eta_{\min} = \frac{\Delta t_{\min}}{\Delta t_{\min} + \Delta t_{\text{slew}}} = 0.47.$$

$$n_{\text{beam}} = \frac{A_{\text{map}}}{A_{\text{beam}}}, \quad \text{where} \quad A_{\text{beam}} = \frac{0.8 \pi \theta_{\text{prim}}^2}{4 \ln(2)}.$$

$$n_{\text{point}} = n_{\text{beam}} \left(\frac{7}{4}\right)^2, \quad \text{and} \quad n_{\text{point}/\text{track}} = \min\left(n_{\text{point}}, \frac{n_{\text{point}}}{n_{\text{track}}}\right).$$

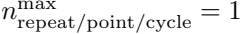
$$10 \text{ sec} \leq \Delta t_{\text{int/scan}} = \min \left(45 \text{ sec}, \eta \frac{6900}{1 \text{ sec}} \sqrt{\frac{\theta_{\text{maj}} \theta_{\text{min}}}{A_{\text{map}}}} \right) \quad \text{with} \quad \eta = 0.5.$$

$$n_{\text{point/track}}^{\text{large}} = \text{floor} \left(\frac{\Delta t_{\text{calmax}}}{\Delta t_{\text{int/scan}} + \Delta t_{\text{slew}}} \right), \quad \text{where} \quad \Delta t_{\text{slew}} = 11 \text{ sec}, \quad \text{and} \quad \Delta t_{\text{calmax}} = 25 \text{ min}.$$

$\left(\text{point/track} \right) \leq \left(\text{large point/track} \right)$

$$n_{\text{repeat/point/cycle}}^{\text{max}} = \frac{\frac{\Delta t_{\text{calmax}}}{n_{\text{point/track}}} - \Delta t_{\text{slew}}}{\Delta t_{\text{int/scan}}}.$$

$\left(\text{point/track} \right) \rightarrow \left(\text{large} \right. \\ \left. \text{point/track} \right)$



$$n_{\text{point/track}} \leq n_{\text{point/track}}^{\text{max}}, \quad \text{where} \quad n_{\text{point/track}}^{\text{max}} = \frac{\Delta t_{\text{cyclemax}}}{\Delta t_{\text{min}} + \Delta t_{\text{slew}}} \sim 150, \quad \text{and} \quad \Delta t_{\text{cyclemax}} = 60 \text{ min.}$$

$$\text{if } n_{\text{point/track}} > n_{\text{point/track}}^{\text{large}}, \quad \text{then } \Delta t_{\text{int/scan}} = \min \left\{ \Delta t_{\text{int/scan}}, \left(\frac{\Delta t_{\text{cyclemax}}}{n_{\text{point/track}}} - \Delta t_{\text{slew}} \right) \right\}.$$

$$\eta_{\text{mos}} = \frac{\Delta t_{\text{point/cycle}}}{\Delta t_{\text{point/cycle}} + \Delta t_{\text{slew}}}, \quad \text{and} \quad \Delta t_{\text{point/cycle}} = n_{\text{repeat/point/cycle}}^{\text{max}} \Delta t_{\text{int/scan}},$$

$$\Delta t_{\text{cycle}} = n_{\text{point/track}} (\Delta t_{\text{point/cycle}} + \Delta t_{\text{slew}}).$$

$$\sigma_{\text{Jy}} = \frac{J_{\text{ant}}^{\text{int}} T_{\text{sys}}}{\eta_{\text{spec}} \sqrt{n_{\text{ant}} (n_{\text{ant}} - 1)} d\nu n_{\text{pol}} \Delta t_{\text{on}}}, \quad \text{and} \quad \Delta t_{\text{on}} = \eta_{\text{obs}} \eta_{\text{mos}} \left(\frac{\Delta t_{\text{tel}} - n_{\text{track}} \times \Delta t_{\text{setup}}}{n_{\text{beam}}} \right).$$











$$\Omega_{\text{ant}}(\nu) = \int_{4\pi} P_{\text{ant}}(\theta, \phi, \nu) d\Omega,$$







airbnb

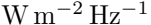


$$\Omega_{\text{fb}}(\nu) = \int_{2\pi} P_{\text{ant}}(\theta, \phi, \nu) d\Omega, \quad \text{and} \quad \Omega_{\text{mb}}(\nu) = \int_{\text{main lobe}} P_{\text{ant}}(\theta, \phi, \nu) d\Omega.$$

$$F_{\text{eff}} = \frac{\Omega_{\text{fb}}}{\Omega_{\text{ant}}}, \quad \text{and} \quad B_{\text{eff}} = \frac{\Omega_{\text{mb}}}{\Omega_{\text{ant}}}.$$

$$F_{\text{sou}}(\nu) = \int_{\text{source}} B(\theta, \phi, \nu) d\Omega,$$

2011







90 100

$$F_{\text{obs}}(\theta_0, \phi_0, \nu) = \int_{\text{source}} B(\theta, \phi, \nu) P_{\text{ant}}(\theta - \theta_0, \phi - \phi_0, \nu) d\Omega,$$



$$F_{\text{obs}}(\theta_0, \phi_0, \nu) = \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega,$$

$$P_{\text{int}}(\theta_0 - \theta, \phi_0 - \phi, v) = P_{\text{int}}(\theta - \theta_0, \phi - \phi_0, v).$$

$$B_{\text{obs}}(\theta_0, \phi_0, \nu) = \frac{1}{\Omega} \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega,$$









1990-1991

$$= \frac{1}{\Omega_{\text{ant}}} \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega,$$

[illegible]

$$= \frac{1}{\Omega_{\text{fb}}} \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega,$$

Beethoven's Op. 10, No. 1

$$= \frac{1}{\Omega_{\text{mb}}} \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega.$$

$$B_{fb} = \frac{1}{F_{eff}} B_{ant} \quad \text{and} \quad B_{mb} = \frac{F_{eff}}{B_{eff}} B_{fb}.$$

overlapping
= overlapping



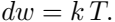












$$T_{\text{mb}}(\theta_0, \phi_0, \nu) = \frac{1}{\Omega_{\text{mb}}} \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega.$$





139059x1021

$$d\nu(\theta_0, \phi_0, \nu) = \frac{1}{2} A_{\text{eff}} \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega.$$





$$\eta_{\text{ant}} = \frac{A_{\text{eff}}}{A_{\text{geo}}} < 1;$$

$$A_{geo} = \pi \left(\frac{D_{ant}}{2} \right)^2 \cdot$$

$$\text{Aeff}(v) \text{ quant}(v) = \lambda^2,$$

$$B(\theta, \phi, \nu) = \frac{2kT}{\lambda^2},$$

$$d\nu(\theta_0, \phi_0, \nu) = \frac{1}{2} A_{\text{eff}} \int_{\text{source}} B(\theta, \phi, \nu) \tilde{P}_{\text{ant}}(\theta_0 - \theta, \phi_0 - \phi, \nu) d\Omega = \frac{1}{2} A_{\text{eff}} \Omega_{\text{ant}}(\nu) \frac{2kT}{\lambda^2}.$$

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$$A_{\text{eff}}(\nu)\Omega_{\text{fb}}(\nu)=\lambda^2 F_{\text{eff}}(\nu) \text{ and } A_{\text{eff}}(\nu)\Omega_{\text{mb}}(\nu)=\lambda^2 B_{\text{eff}}(\nu).$$

$$B_{\text{eff}}(v) = \eta_{\text{ant}} A_{\text{geo}} \frac{\Omega_{\text{mb}}(v)}{\lambda^2}.$$

$$A_{\mathrm{geo}} = \frac{\pi}{4} D^2, \quad \frac{\Omega_{\mathrm{mb}}(\nu)}{\lambda^2} = \frac{\pi}{4 \ln 2} \left(\frac{\theta_{\mathrm{mb}}}{\lambda} \right)^2,$$

$$\theta_{mb} = \alpha \frac{\lambda}{D},$$

$$B_{\text{eff}}(\nu) = \frac{\pi^2}{16 \ln 2} a^2 \eta_{\text{ant}}(\nu) \simeq 0.88899 a^2 \eta_{\text{ant}}(\nu).$$







$$\eta_{\text{ant}}(\nu) = \eta_{\text{ant}}^0 \exp \left\{ - \left(\frac{4\pi\sigma}{\lambda} \right)^2 \right\}.$$