

























$$\tilde{V}_{ijk} = g_i(t) g_j^*(t) b_{ijk}(t) V_{ij}(v_k(t), v_k(t)) + \text{noise term}$$





















10

11

12 13 14 15









$$T_a^* = \frac{(1 + g_{im})}{\eta_f} e^{\tau_{atm}} T_a$$









$$I_b = \frac{c^2}{2kT^2} I_\nu$$





$$T_a^* = \frac{\eta_0 A}{2k} S_v = \frac{1}{j} S_v$$

↓

—  
—

24  
—  
no A

*Indice + Indice + Indice + Indice*











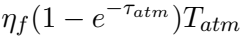














1-17-2020







$$T_{sys} = \frac{1 + g_{irm}}{\eta_f} e^{\tau_{atm}} T_{noise}$$















$$\sigma = \frac{1}{\eta_g \eta_p} \frac{\sqrt{2k}}{\eta_a A} \frac{T_{sys}}{\sqrt{\delta v \delta t}}$$

$$\sigma = \frac{1}{\eta_g \eta_p} \frac{2k}{\eta_a A} \frac{T_{sys}}{\sqrt{n(n-1)} \delta v \delta t}$$



100



1

0

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2

$$W_{ij} = \frac{1}{\sigma_{ij}^2}$$

*Vijaya = vijaya*







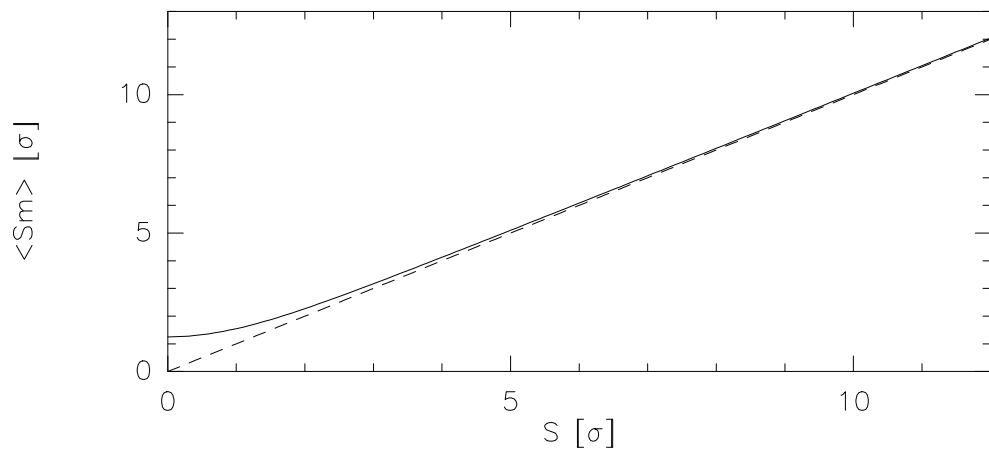
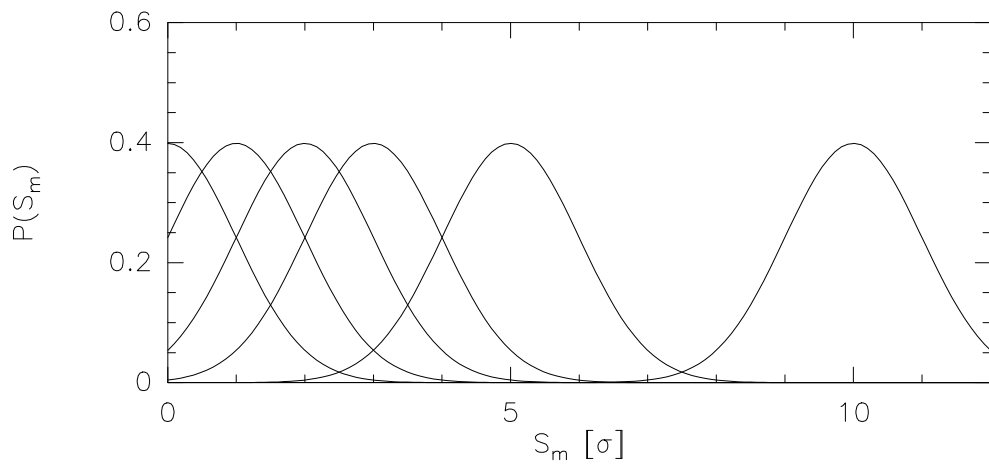
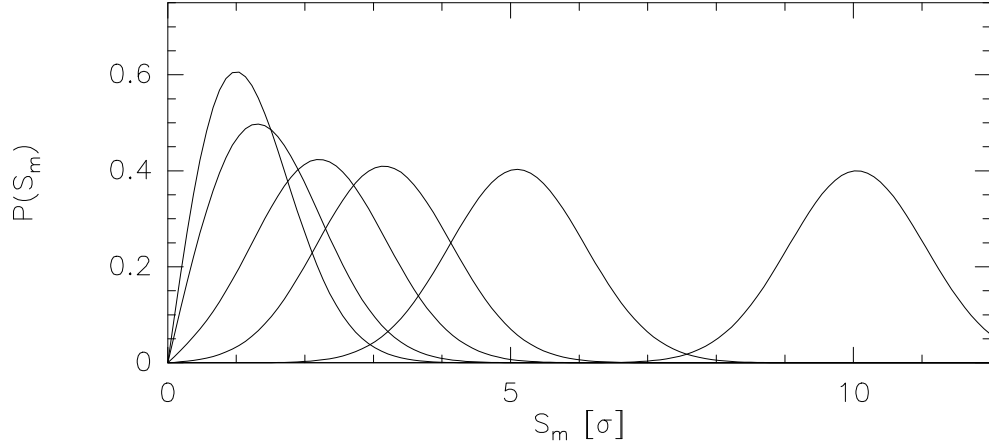
$$\begin{array}{r} \sim \qquad \qquad \sim \\ a_{ij} a_{kl} \\ \hline \end{array}$$

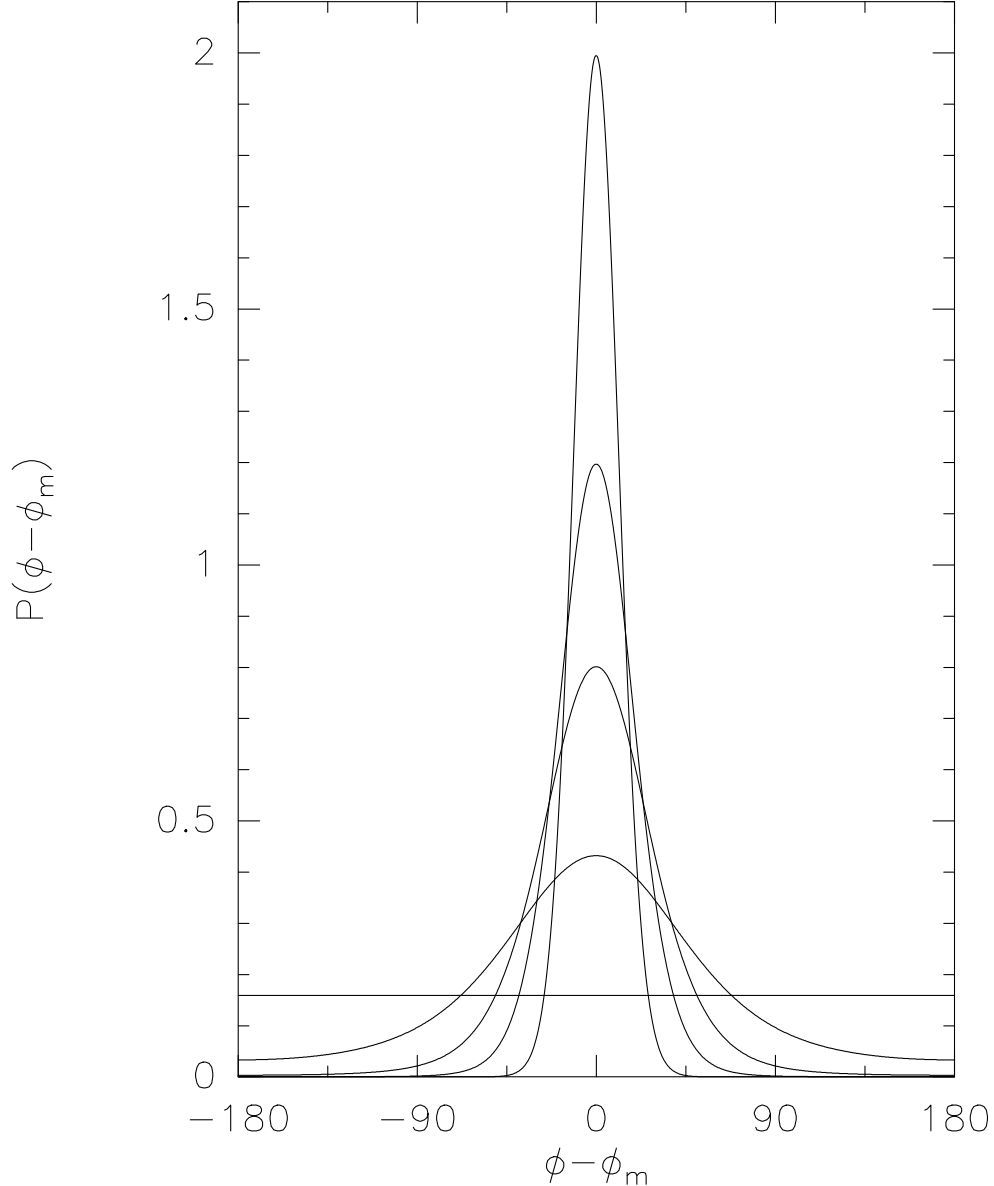
$$\begin{array}{r} \sim \qquad \qquad \sim \\ a_{ik} a_{jl} \end{array}$$

Qzj Qkl

---

Qzk Qji



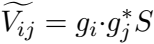


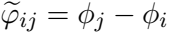


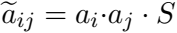
9020



Geometrische Optik



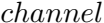






(spelled out, spelled in)

*(c) 1997, 2000, 2003, 2006, 2009, 2012, 2015, 2018, 2021, 2024*





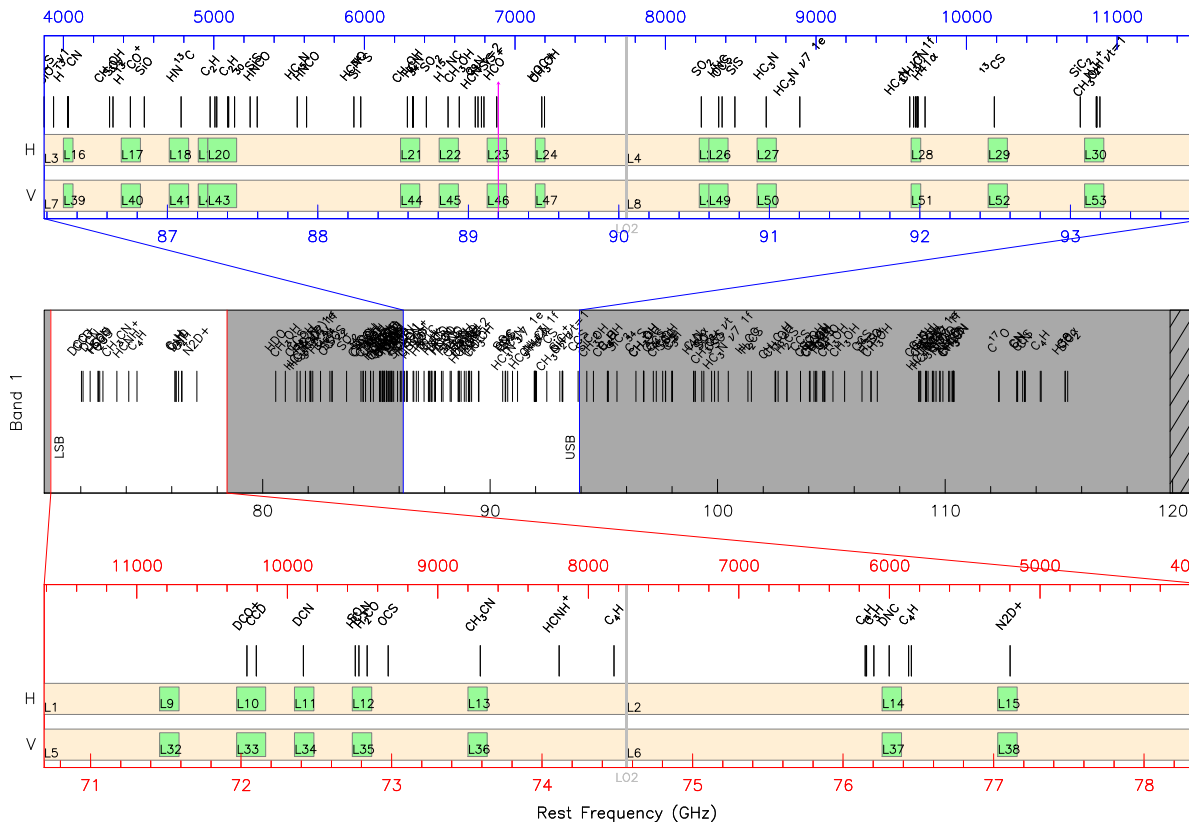


3C8

LO: 82.299 GHz

Intermediate Frequency IF1 (MHz)

3C8



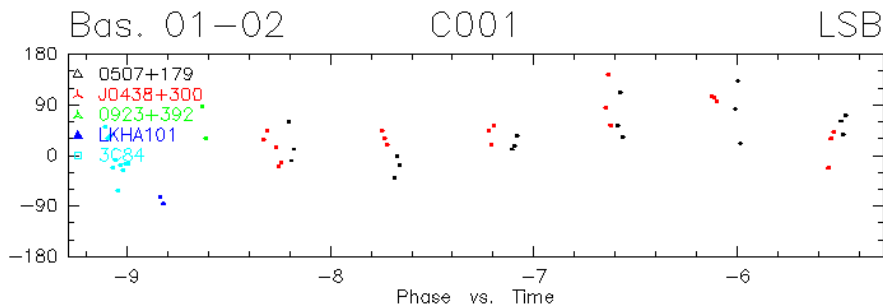
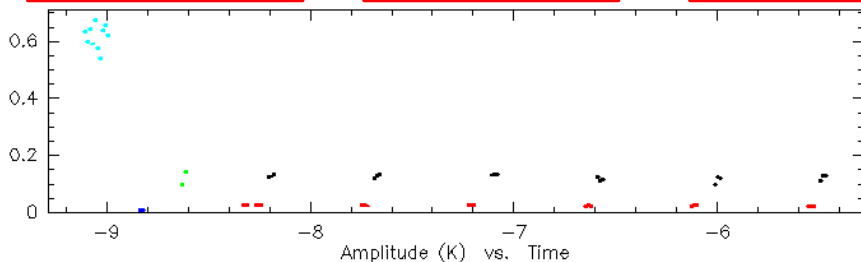
4

RF: Uncal.  
Am: Abs.  
Ph: Abs.

CLIC - 06-NOV-2019 13:30:29 - pietu@pietu.iram.fr ED3W12N11W20E16E68W09 7ant-Special  
017IC001 isotopologue 89.200GHz B1 Q0() Q0()  
( 17 6322 P CORR)-( 373 6602 P CORR) 19-APR-2018 14:53-18:31

Scan Avg.  
HORIZONTAL pol.

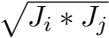
1 Bas. 01-02 2 C001 3 LSB





100%

15











Erw

—

Erw





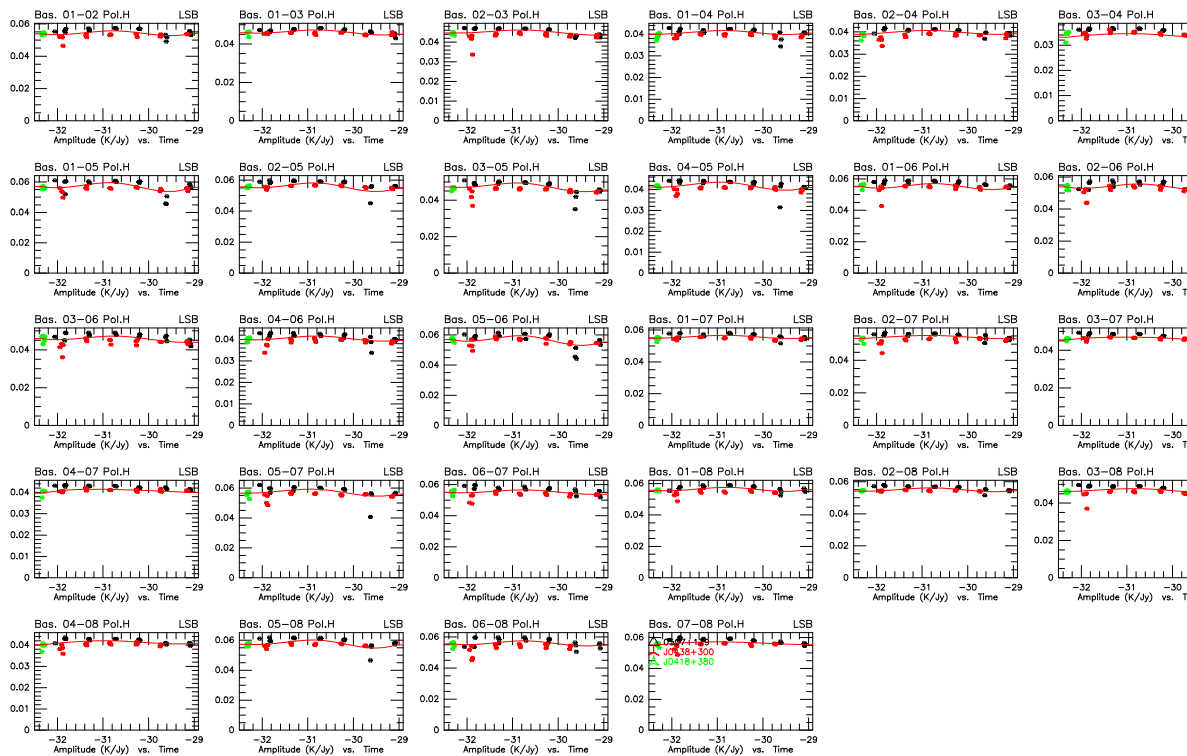


Q. 10.  $\frac{1}{x^2} = x^{-2}$

RF: Uncal.  
Am: Scaled  
Ph: Abs.

CLIC - 07-NOV-2017 14:06:59 - pietu@pietu.iram.fr  
D17IC001 isotopologue 89.200GHz B1 Q0() Q0()  
( 21 4716 P CORR)-( 352 4985 P CORR) 18-APR-2018 15:39-18:55

Scan  
HORIZONTAL





RF: Uncal.

CLIC - 07-NOV-2019 14:02:27 - pietu@pietu.iam.fr

E03W12N11N29W20E16N20W09 9C-E10

Scan

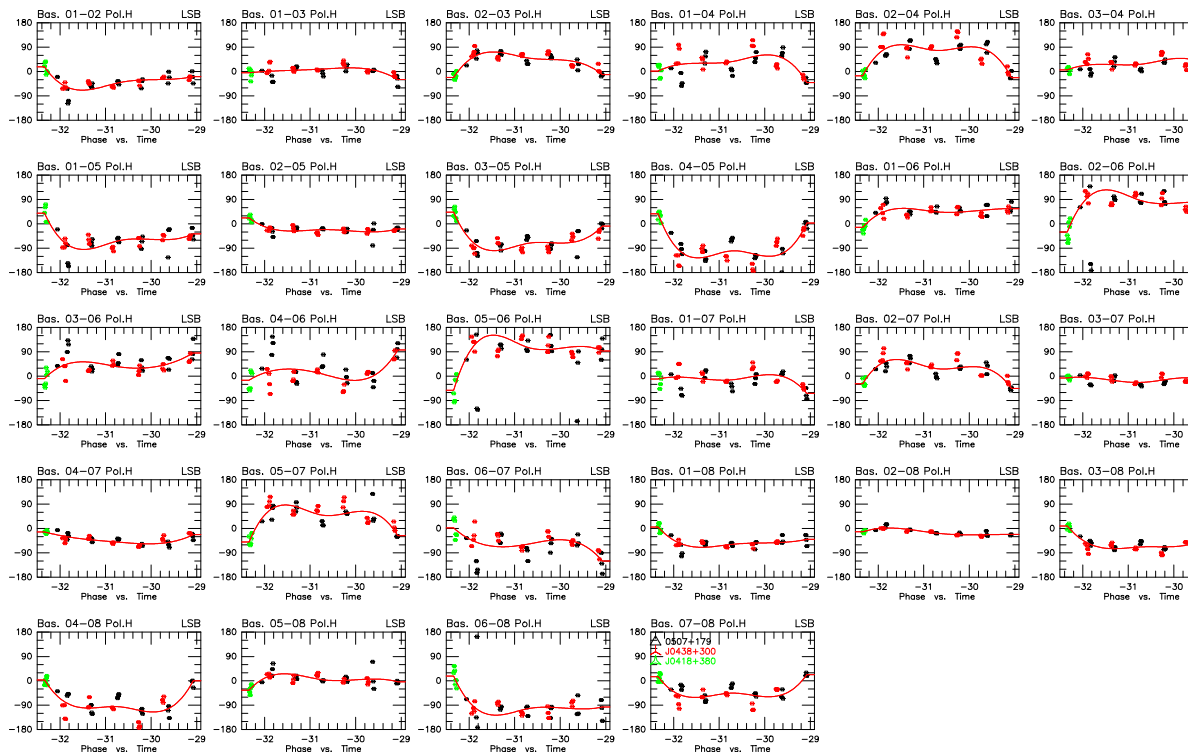
Am: Abs.

D17IC001 isotopologue 89.200GHz B1 Q0() Q0()

HORIZONTAL

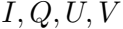
Ph: Abs.

( 21 4716 P CORR)-( 352 4985 P CORR) 18-APR-2018 15:39-18:55



$$A_j = a_j(1 + b \cos(2x) + c \sin(2x))$$





P

=

$$\frac{\sqrt{v_0^2 + v^2}}{I}$$



2020-2021











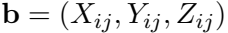


$$(T_{hot} + T_{rec}) \times \frac{P_{sky}}{P_{hot}} - T_{rec} = \eta_f \times Airmass \times T_{zenith} + (1 - \eta_f) \times T_{ground}$$

$\tau_g$

$=$

$\frac{b.s}{c}$



$B = (b_{ij})_{i,j=1}^n$





2020-2021

$2\pi$

---

$\lambda$

b.s

$$\frac{2\pi}{\lambda_k} (X_{ij} \cos h \cos \delta - Y_{ij} \sin h \cos \delta + Z_{ij} \sin \delta)$$

GOVERNMENT

2024



30-sep-2019-holo-r1

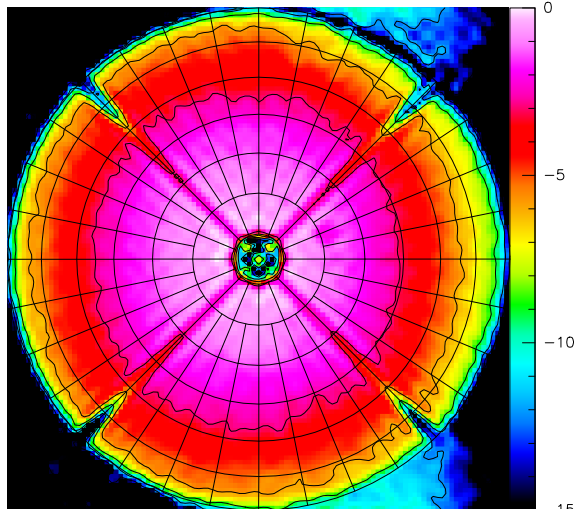
RF: Fr.(B) CLIC - 19-NOV-2019 10:01:36 - pietu@pietu.iram.fr - Ant 10 - N05N13W12W09E10E04W05N02N09  
 Am: Rel.(B) 3C454.3 9D scans 6011 to 6085 30-SEP-2019 23:23UT El: 56.00  
 Ph: Rel.(B)

rms Pha.

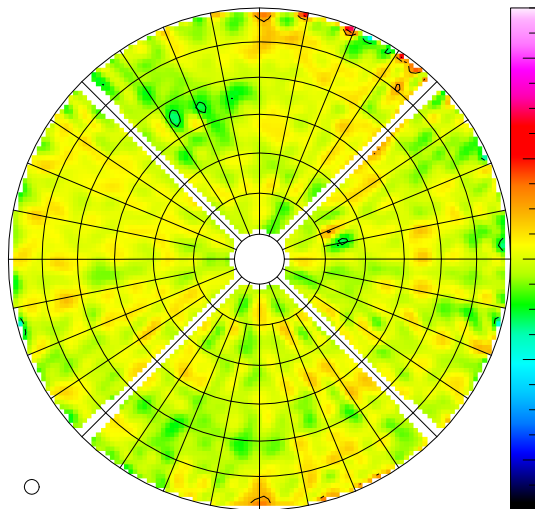
01-09 4.82  
 02-09 3.75  
 03-09 14.35  
 04-09 13.36  
 05-09 10.87  
 06-09 10.26  
 07-09 11.02  
 08-09 8.17

Edge taper = 19.05x 16.49 dB - offset X= -0.39 Y= -0.13 m  
 Focus offsets (X,Y,Z) = -0.71 -1.40 0.12 mm; Astigmatism = 20.4  $\mu\text{m}$  ( 52.0deg.)  
 Phase rms (unweighted)= 0.101 (weighted)= 0.097 radians  
 Surface rms (unweighted)= 33.63 - (weighted)= 31.09  $\mu\text{m}$   
 $\eta_A$ ( 82.000 GHz) = 0.737;  $\eta_A$ (230.0 GHz) = 0.692;  $\eta_A$ (345.0 GHz) = 0.632  
 S/T( 82.000 GHz)= 21.179 Jy/K; S/T(230GHz)= 22.573 Jy/K; S/T(345 GHz)= 24.720 Jy/K  
 $\eta_I=0.744$   $-\eta_S=0.862$   $-\eta_P$ ( 82.000 GHz)=0.991  $-\eta_P$ (230 GHz)=0.930  $-\eta_P$ (345 GHz)=0.849  
 Rms/ring: 27.6 29.3 26.5 33.4 31.0 37.8

Amplitude (back view)  
 -15.000 to 0.000 by 3.000

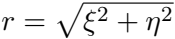


Normal errors (back view)  
 -500.000 to 500.000 by 100.000











01234567















$$\delta z \left( 1 - \frac{1 - \frac{r^2}{4f^2}}{\sqrt{\frac{r^2}{f^2} + \left(1 - \frac{r^2}{4f^2}\right)^2}} \right)$$

051917

$$\delta x \frac{\xi}{f} \left( 1 - \frac{1}{\sqrt{\frac{r^2}{f^2} + \left( 1 - \frac{r^2}{4f^2} \right)^2}} \right)$$



$$\delta y \frac{\eta}{f} \left( 1 - \frac{1}{\sqrt{\frac{r^2}{f^2} + \left( 1 - \frac{r^2}{4f^2} \right)^2}} \right)$$





$$a + \frac{\xi^2 - \eta^2}{2f^2}$$



$$a_x \frac{257}{2f^2}$$























$$\psi_a = \frac{\arctan(a_x, a_y)}{2}$$









$$|\int_A A(\xi, \eta) \exp(i\phi(\xi, \eta)) d\xi d\eta|^2$$


---

$$\pi r^2 \int_A A(\xi, \eta)^2 d\xi d\eta$$



$$|\int_A A(\xi, \eta) d\xi d\eta|^2$$


---

$$\pi r^2 \int_A A(\xi, \eta)^2 d\xi d\eta$$

$$J = \frac{2k}{\eta_A \pi r^2}$$

$$\delta p = \delta \phi \times \frac{\lambda}{4\pi} \times \sqrt{1 + \frac{r^2}{4f^2}}$$









bs



$$\frac{1}{c}(X_{ij}\cos h\cos\delta-Y_{ij}\sin h\cos\delta+Z_{ij}\sin\delta)$$

Free  
Free



Free  
AI







$$F_{topo} = F_{rest} \left( 1 + \delta - \varepsilon \right)$$





$$F_{IF} = \pm \left( F_{rest} \left( 1 + \delta - \frac{v}{c} \right) - F_{D1} \right)$$

$$F_{IO1} = F_{rest} \left( 1 + \delta - \frac{v}{c} \right) \mp F_{IF}^{rest}$$





$$iF(\partial) * \partial F_{\text{top}} + F(\partial)$$



THE UNIVERSITY OF CHICAGO

Wrestling \* Wrestling + Wrestling



$$dI_{pop} = dI_{rest} + d - c$$











FO

reel















Av



Kp Av



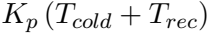






10

0010





$\ln \left( 1 + \frac{1}{n} \right) \approx \frac{1}{n}$





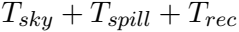
*Reciprocal*











$$T_{rec} = \frac{P_{cold} T_{hot} - P_{hot} T_{cold}}{P_{hot} - P_{cold}}$$

$$T_{sky} = (T_{hot} + T_{rec}) \frac{P_{sky}}{P_{hot}} - T_{rec} - T_{spill}$$





$$T_{\text{err}} = \frac{T_{\text{sky}}}{\eta_f}$$

Тотта

снэ, а







$$T_{emi} = \frac{T_{atm_{emi,s}} + g_{im} T_{atm_{emi,i}}}{1 + g_{im}}$$







$$T_{sys,s} = \frac{e^{\tau_s} (T_{hot} - T_{sky} - T_{spill}) (1 + G_{im})}{\eta_f} \frac{P_{sky}}{P_{hot} - P_{sky}}$$

$$T_{sys,i} = \frac{e^{\tau_i} (T_{hot} - T_{sky} - T_{spill}) \left(1 + \frac{1}{g_{im}}\right)}{\eta_f} \frac{P_{sky}}{P_{hot} - P_{sky}}$$

$$T_{sky} + T_{spill} = (1 - \eta_f) \left( \frac{T_{atm, s} + g_{im} T_{atm, i}}{1 + g_{im}} \right) + \eta_f T_{ground}$$





$$T_{ijk} = \frac{C_{ijk}}{\sqrt{C_{ik}C_{jk}}} \sqrt{T_{sys}(i)T_{sys}(j)}$$

















$$T_{triple} = \frac{1 - \left(\frac{\nu_1}{\nu_2}\right)^2}{1 - \left(\frac{\nu_2}{\nu_3}\right)^2} \left(T_2 - T_3 \left(\frac{\nu_2}{\nu_3}\right)^2\right) - \left(T_1 - T_2 \left(\frac{\nu_1}{\nu_2}\right)^2\right)$$

