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SURVEY

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# Photometric calibrations from SV Nights 1 and 2

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# Background

1. Used NCSA First Cut Pipeline results for nights of Nov 1 & 2 (MJD 56233 and 56234).
  - No illumination correction applied; mag\_aper\_8 is used.
2. Standard stars: older version of Marriner Stripe 82 standards catalog that has been used for the NCSA Data Challenges
  - New catalog, based on John's newer catalog and supplemented with nearly full Y-band data coverage from UKIDSS DR8, will be delivered to NCSA later today.
3. Results can also be viewed on the Standard Star Photometry section of the SV Commissioning Tests wiki here:

[https://cdcv.s.fnal.gov/redmine/projects/des-sci-verification/wiki/Standard\\_Star\\_Photometry](https://cdcv.s.fnal.gov/redmine/projects/des-sci-verification/wiki/Standard_Star_Photometry)



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# Basic Form of Photometric Equation (using g-band as an example)

$$g\_std = -2.5 \log_{10}(\text{counts[ADU]}/\text{sec}) - a\_g - k\_g * X - b\_g * ( (g-r)\_std - 0.53 )$$

where:

`g_std` is the standard, or calibrated, magnitude of the star  
`(g-r)_std` is the standard, or calibrated, g-r color of the star  
`a_g` is the photometric zeropoint in g  
`k_g` is the first-order extinction in g  
`b_g` is the instrumental color term coefficient in g  
`X` is the airmass  
0.53 is a "fiducial" reference color for stars in g-r (based on SDSS experience)

Note that there is a separate photometric zeropoint (`a_g`) and instrumental color term coefficient (`b_g`) for each CCD.

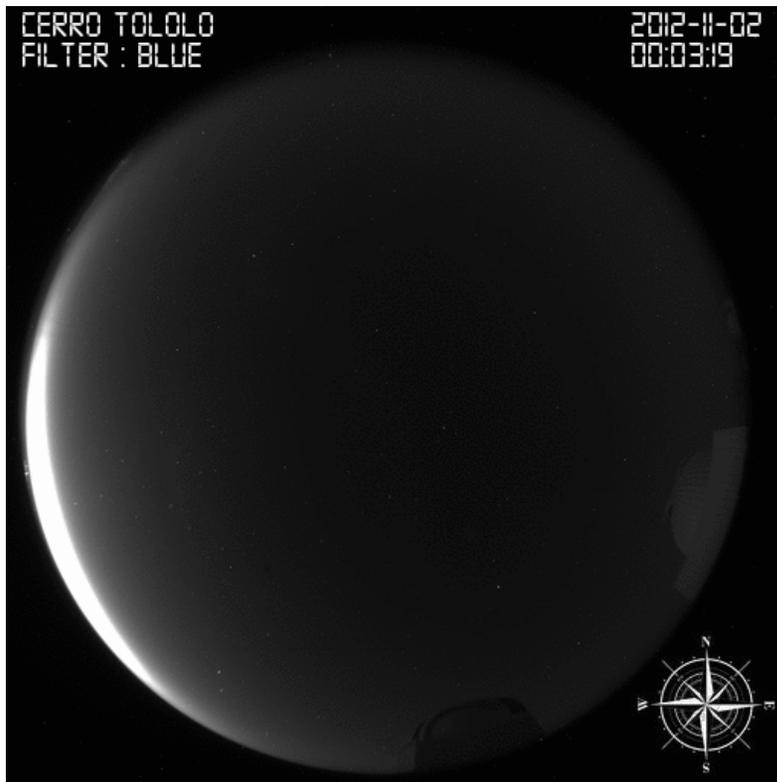
- 125 parameters in full solution
  - 62 photometric zeropoints (`a_g`'s)
  - 62 instrumental color term coefficients (`b_g`'s)
  - 1 first-order extinction (`k_g`)



# Night 1 Overview (Nov 1, MJD56233)

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TASCA blue-band animated GIF  
for the night



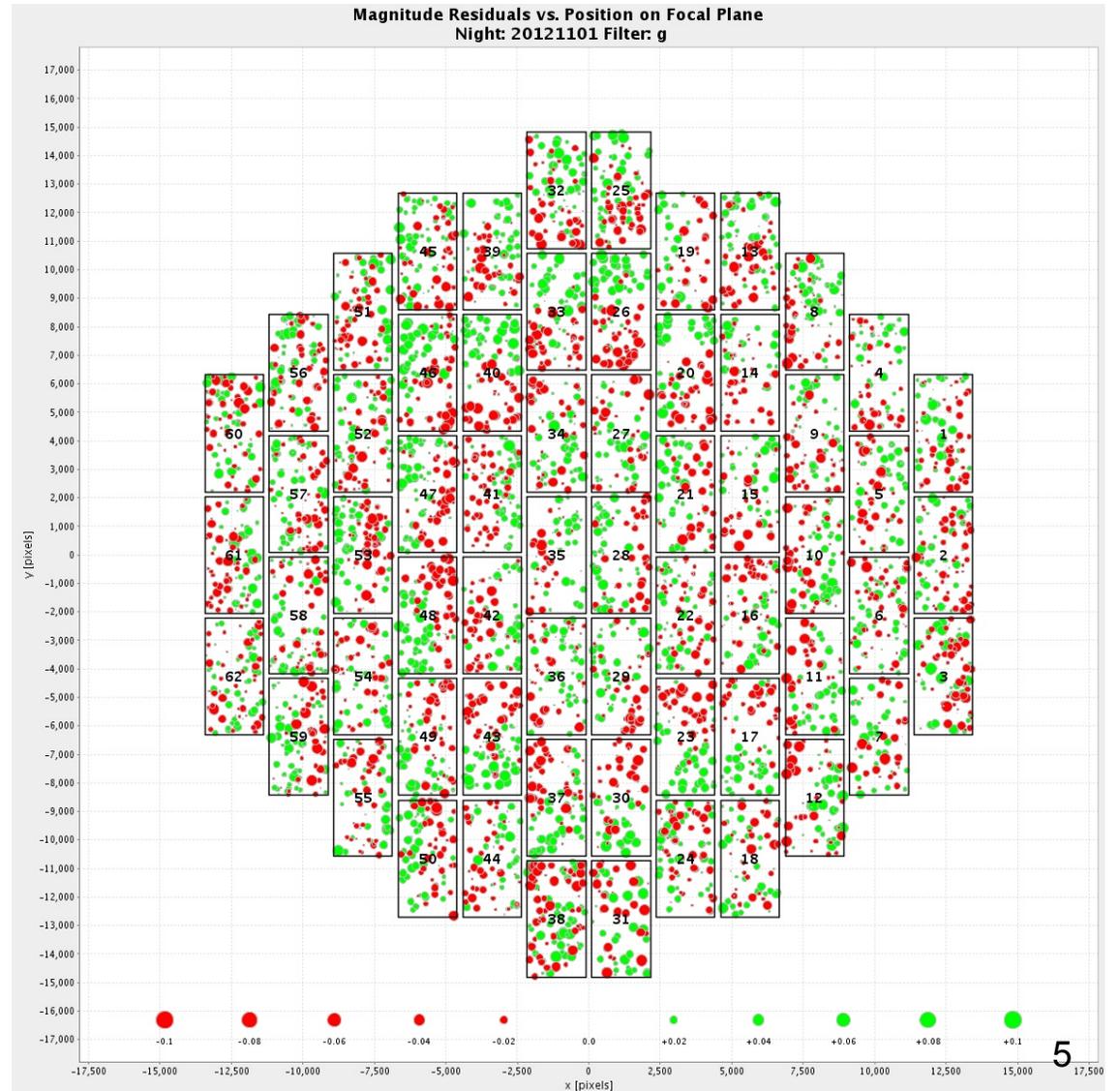
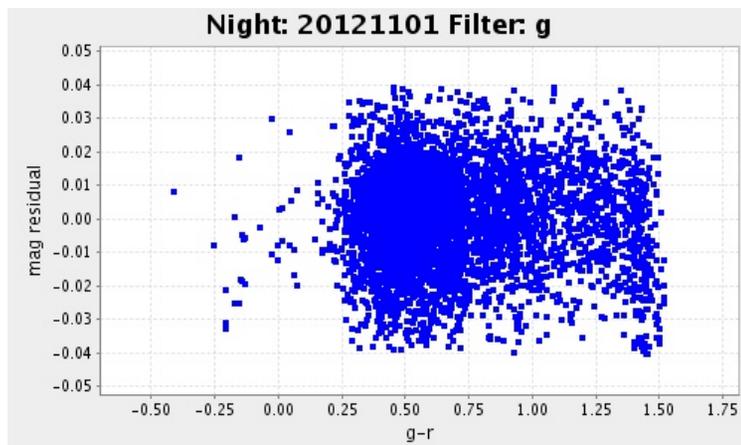
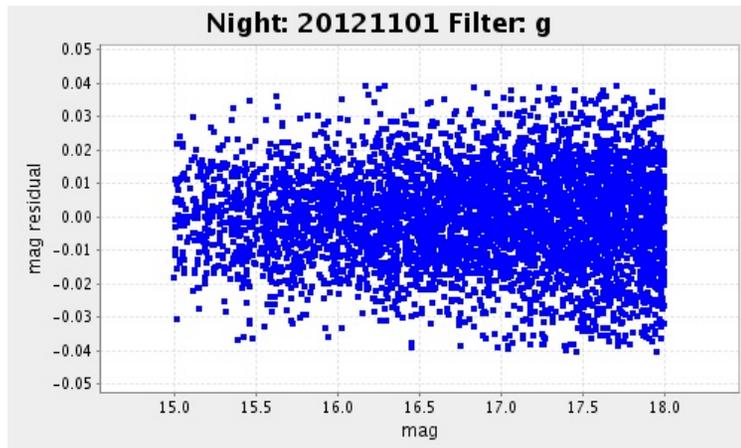
RMS of Residuals of the  
Standard Star Solution

Filter	RMS (mag)
u	TBD
g	0.014
r	0.018
i	0.013
z	0.017
Y	TBD



# g-band residuals

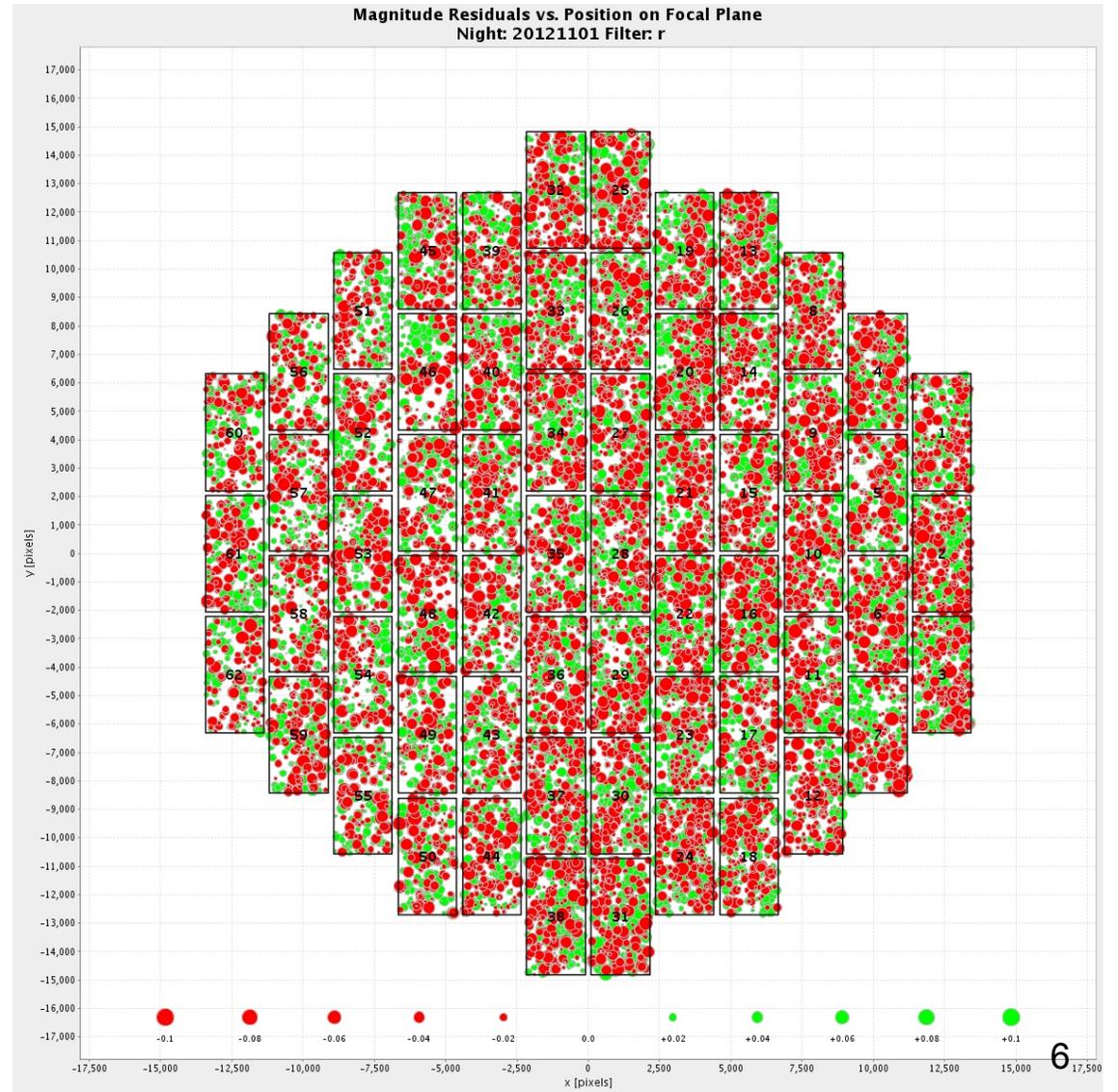
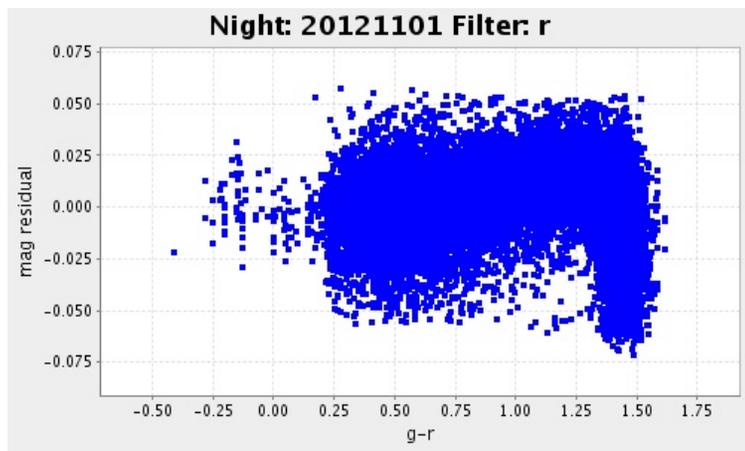
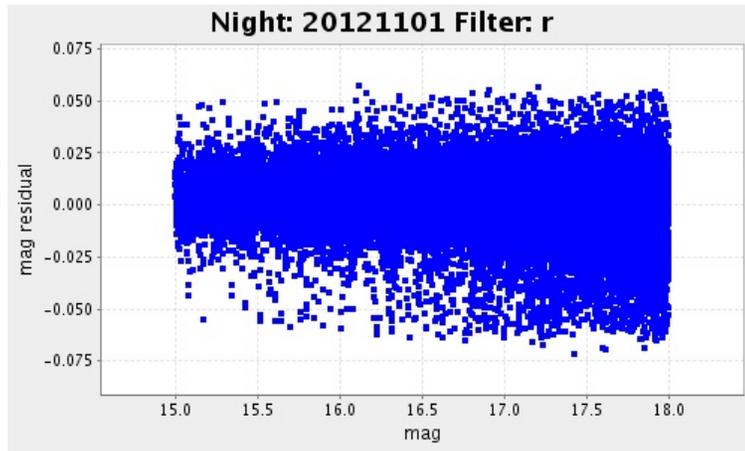
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# r-band residuals

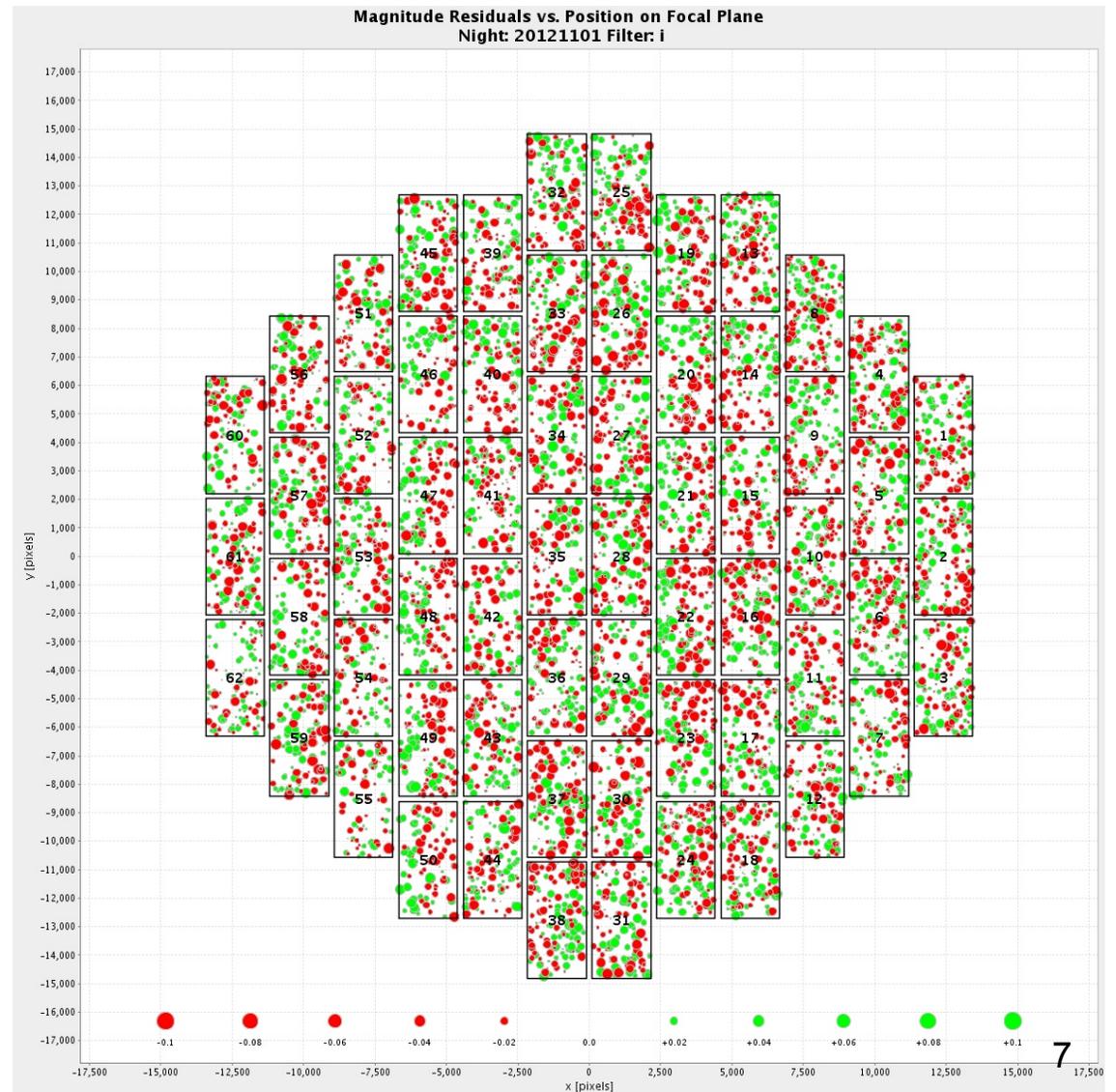
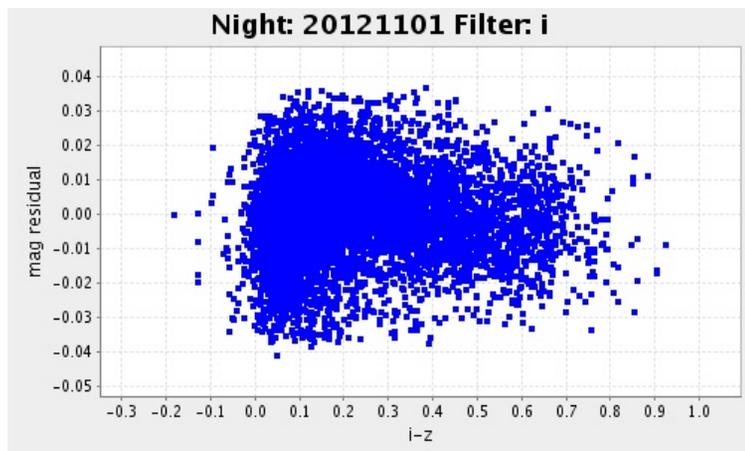
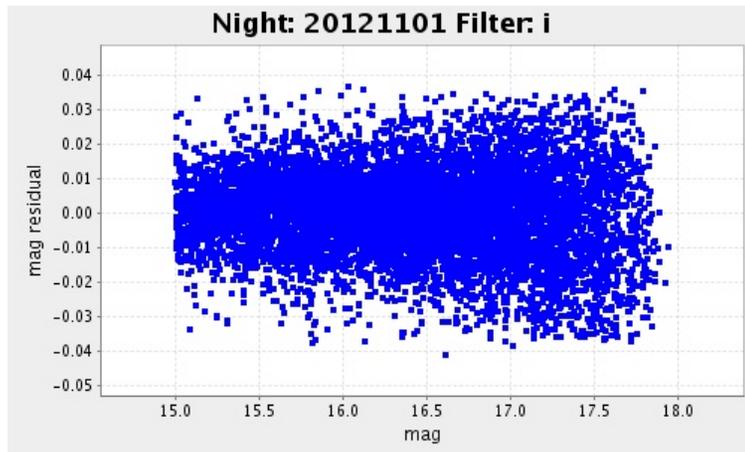
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# i-band residuals

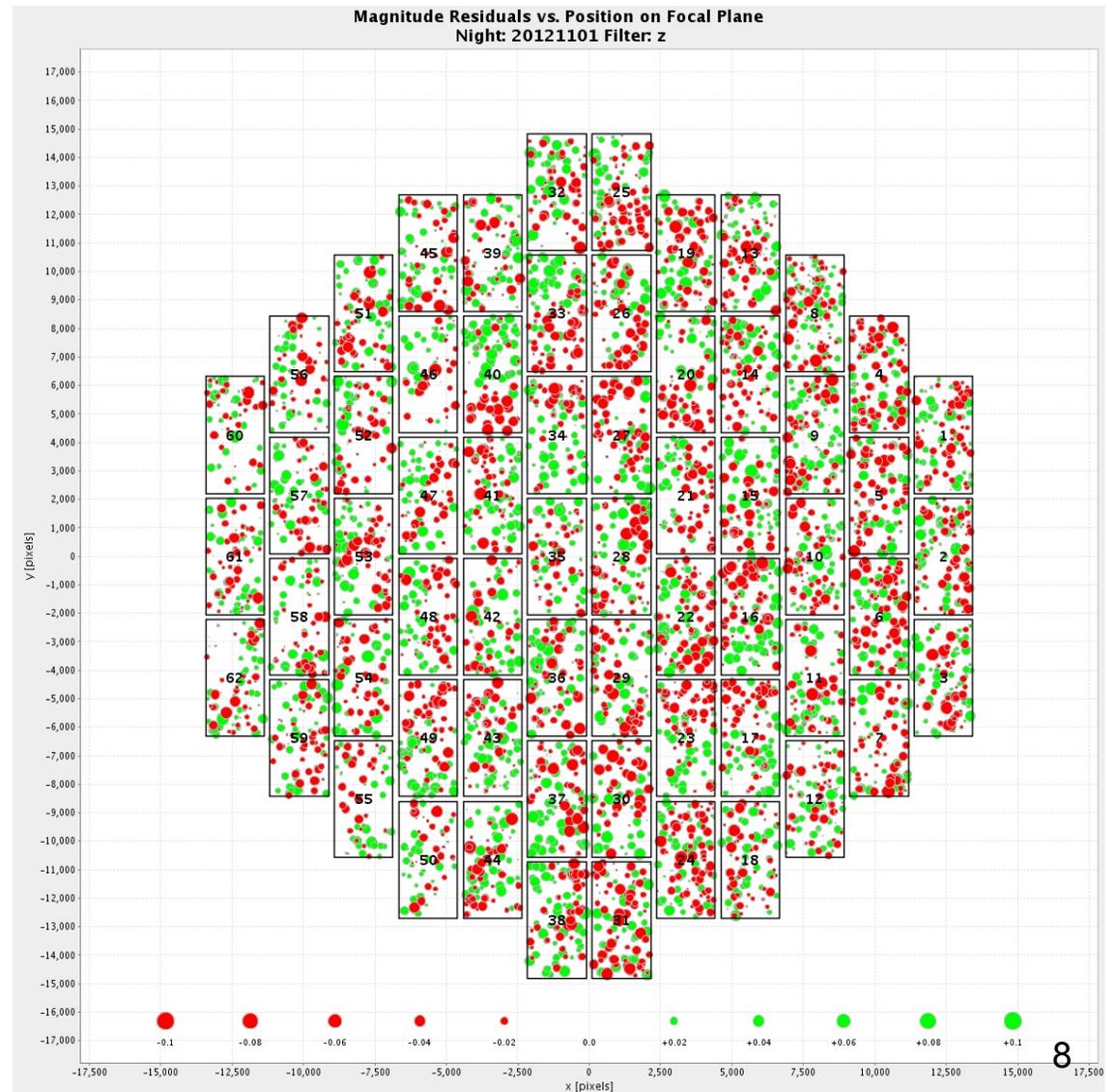
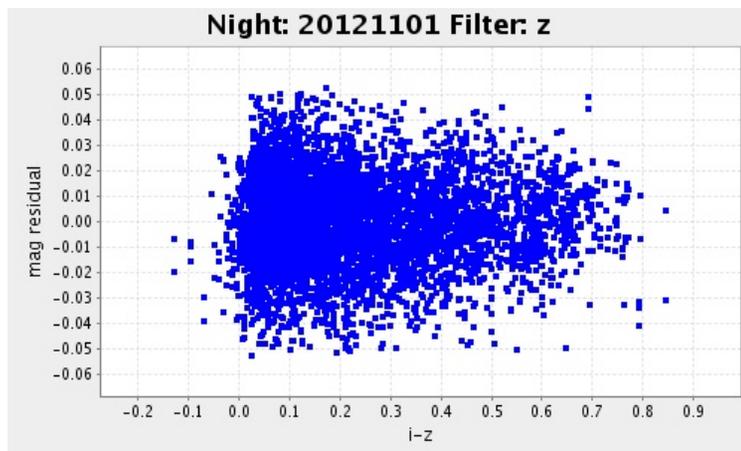
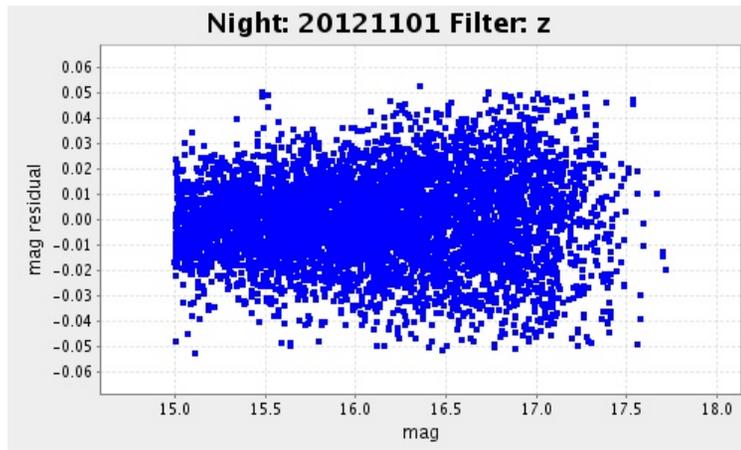
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# z-band residuals

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# Night 1 Overview (Nov 2, MJD56234)

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TASCA blue-band animated GIF  
for the night

Oops – I did not copy it over in time.  
Log indicates photometric conditions,  
however

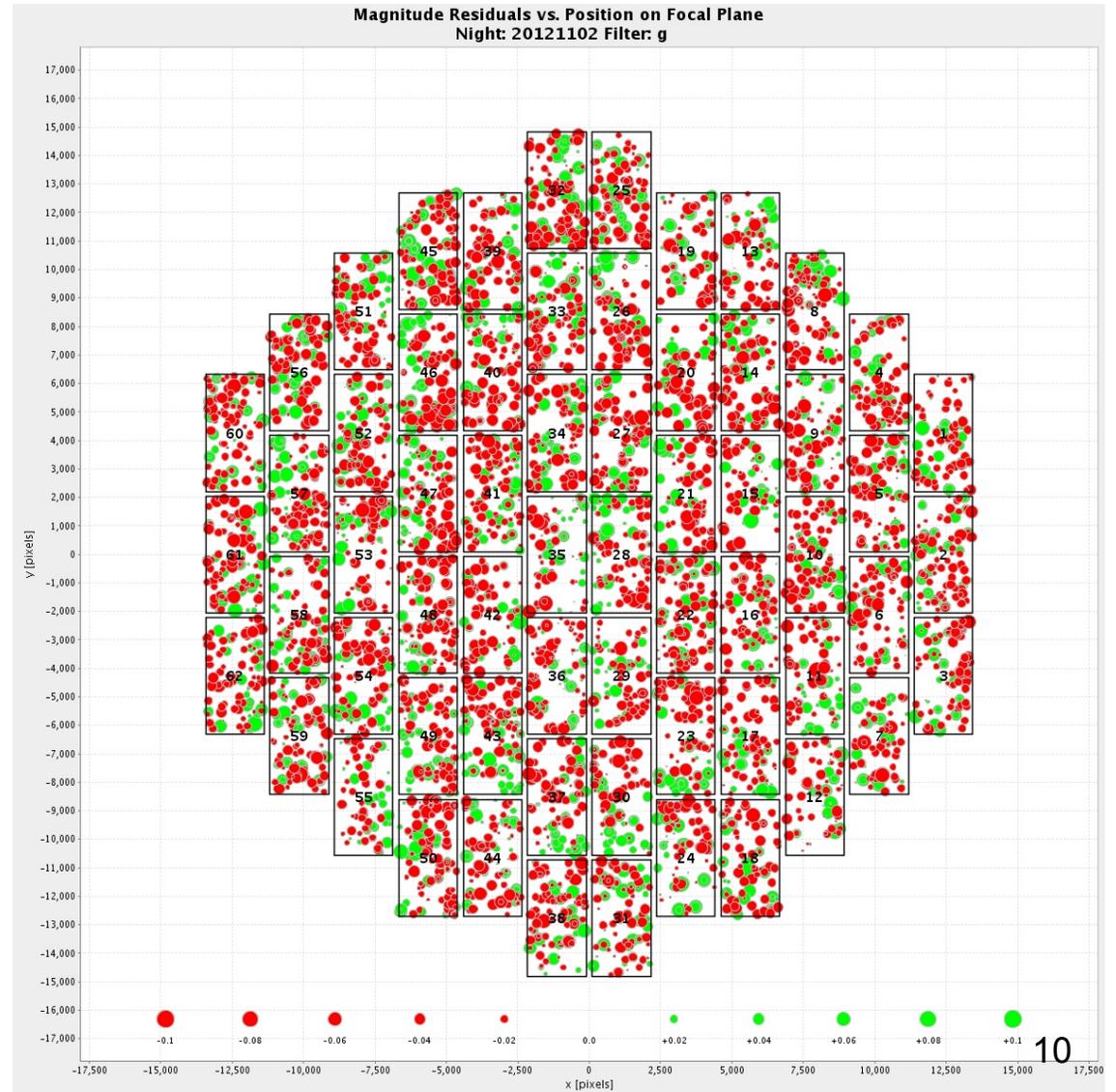
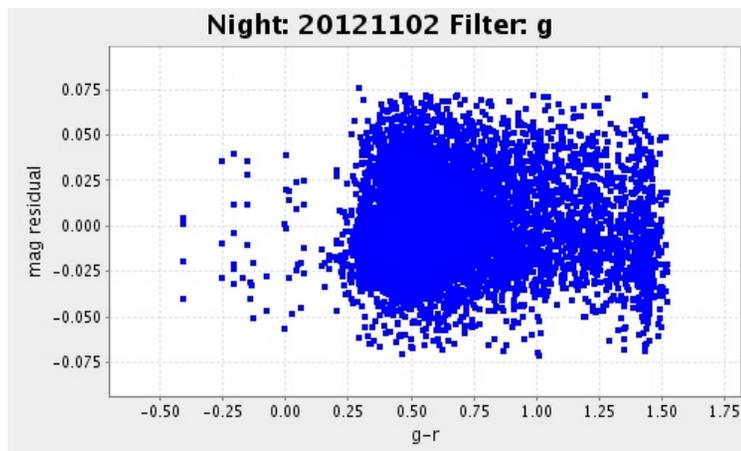
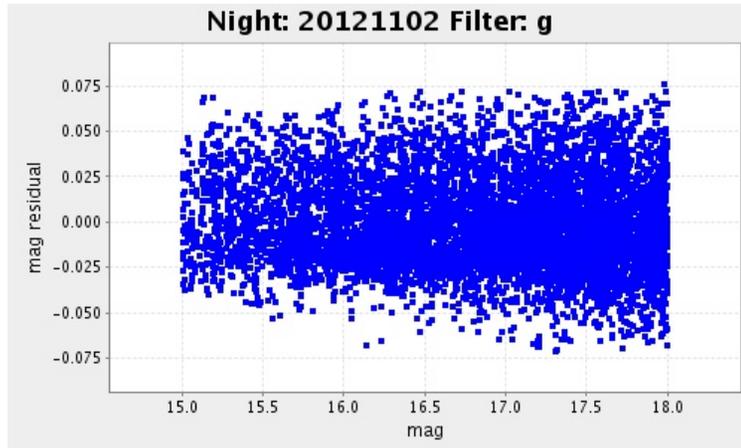
RMS of Residuals of the  
Standard Star Solution

Filter	RMS (mag)
u	TBD
g	0.026
r	0.015
i	0.014
z	0.021
Y	TBD



# g-band residuals

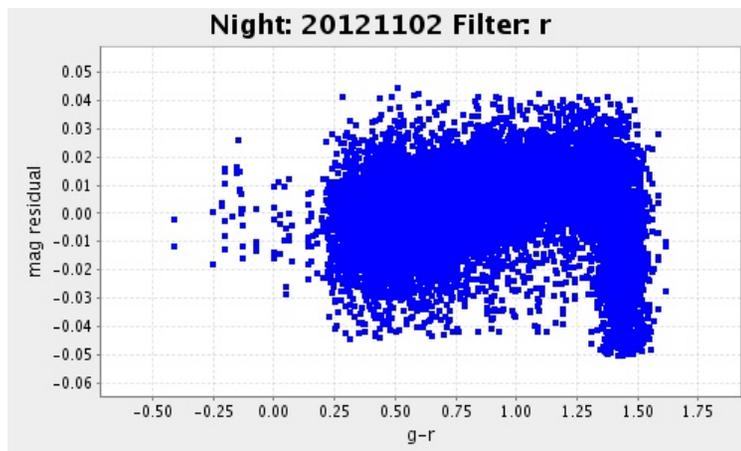
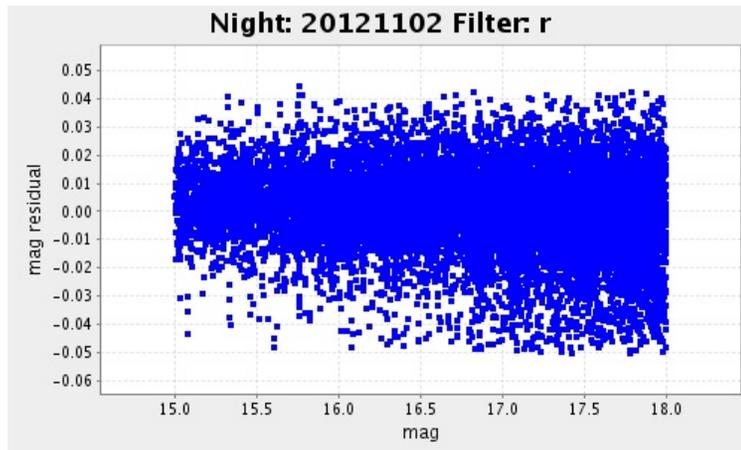
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# r-band residuals

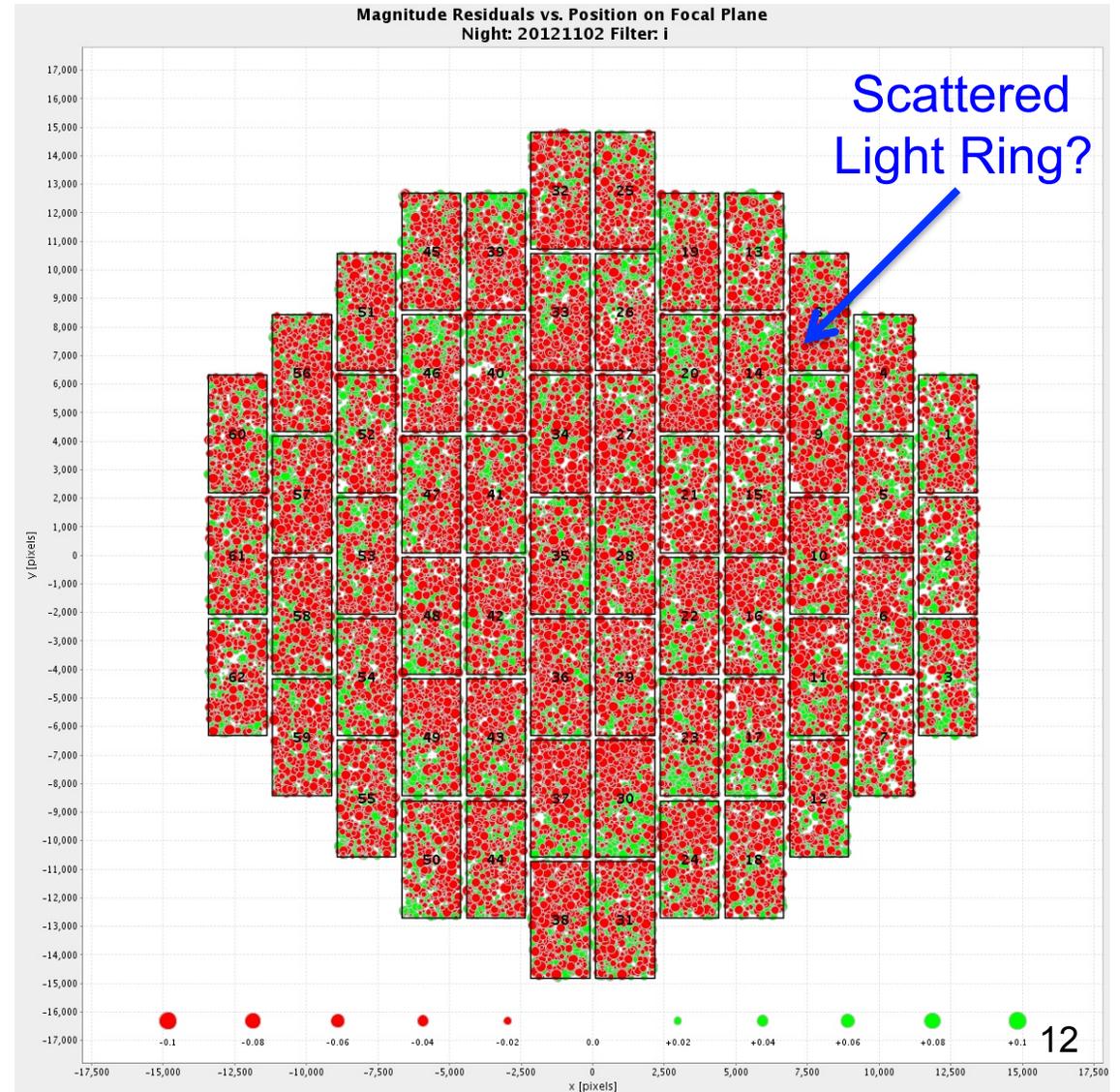
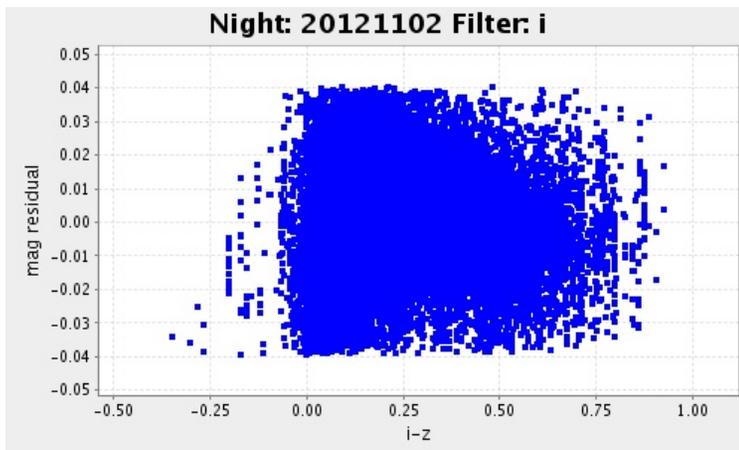
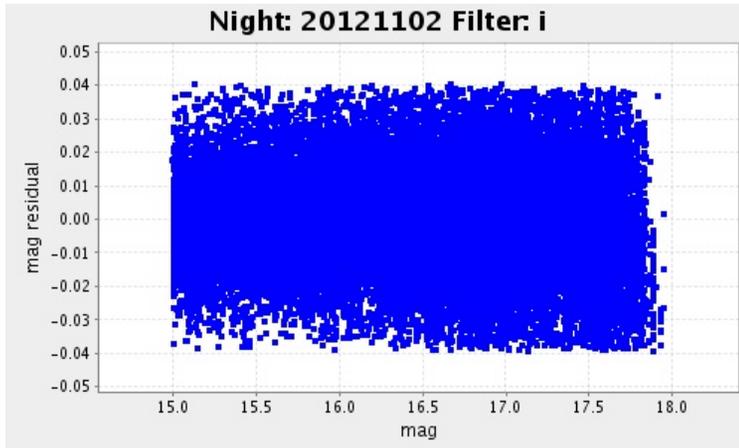
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# i-band residuals

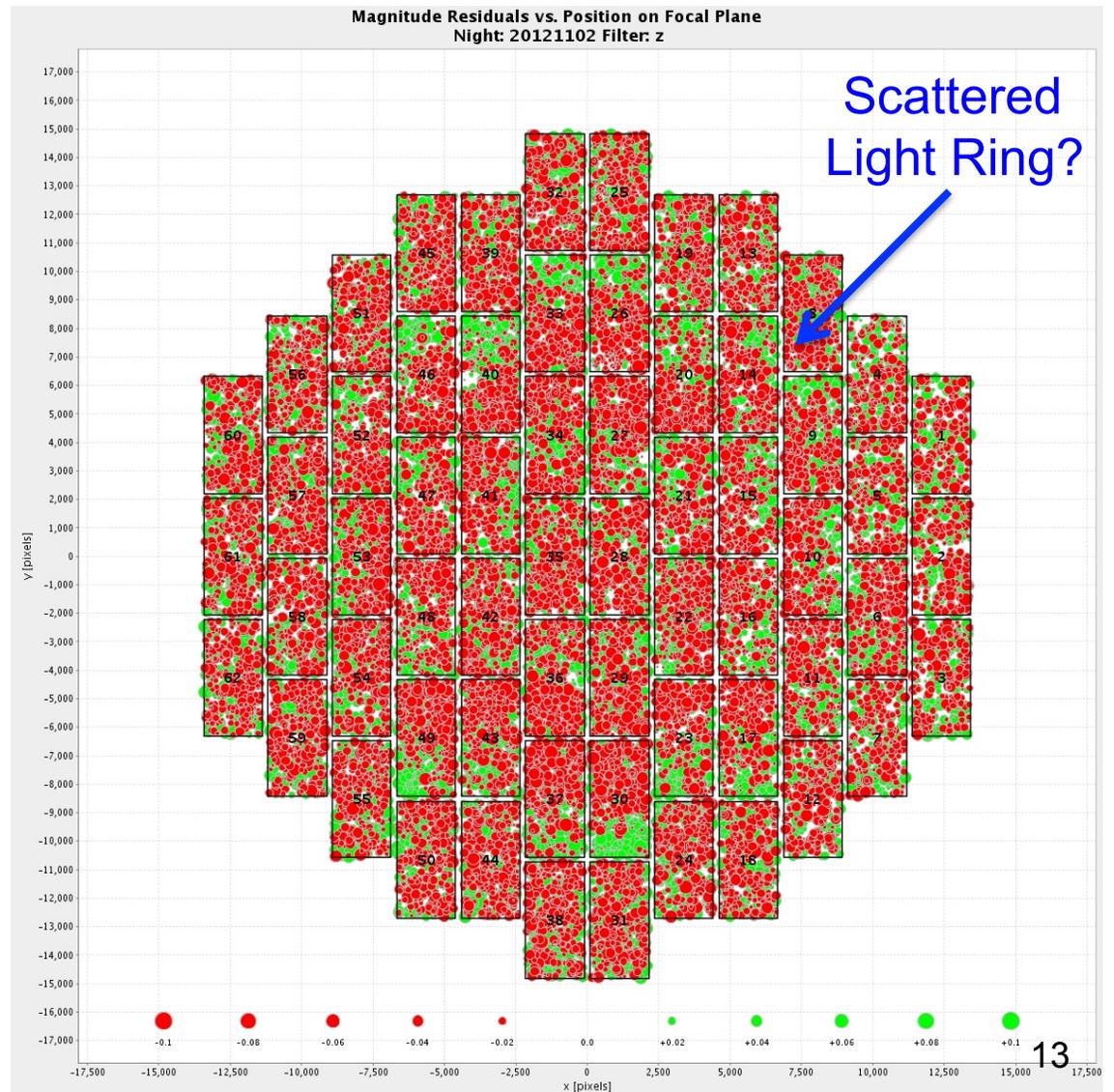
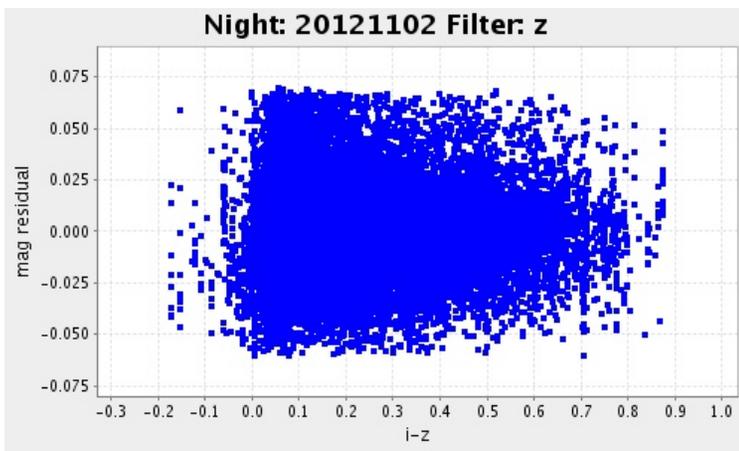
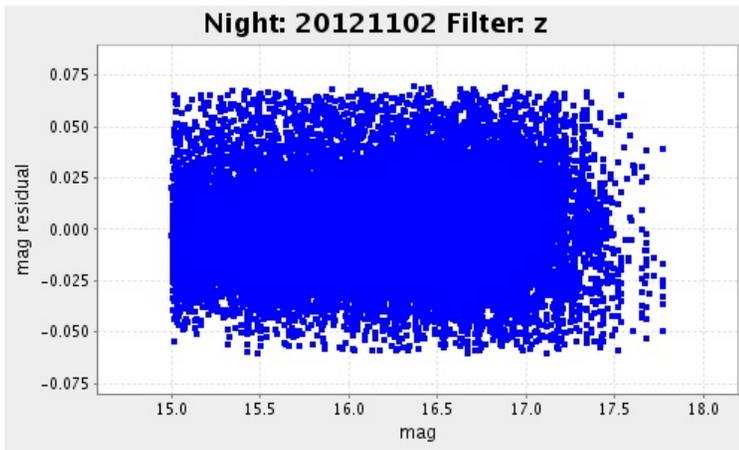
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# z-band residuals

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# Extra Slides



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# Photometric Equation: g-band

$$g\_std = -2.5 \log_{10}(\text{counts}[\text{ADU}]/\text{sec}) - a\_g - k\_g * X - b\_g * ( (g-r)\_std - 0.53 )$$

where:

`g_std` is the standard, or calibrated, magnitude of the star

`(g-r)_std` is the standard, or calibrated, g-r color of the star

`a_g` is the photometric zeropoint in g

`k_g` is the first-order extinction in g

`b_g` is the instrumental color term coefficient in g

`X` is the airmass

0.53 is a "fiducial" reference color for stars in g-r (based on SDSS experience)

Note that there is a separate photometric zeropoint (`a_g`) and instrumental color term coefficient (`b_g`) for each CCD.



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# Photometric Equation: r-band

$$r\_std = -2.5\log_{10}(\text{counts}[\text{ADU}]/\text{sec}) - a\_r - k\_r * X - b\_r * ( (g-r)\_std - 0.53 )$$

where:

$r\_std$  is the standard, or calibrated, magnitude of the star

$(g-r)\_std$  is the standard, or calibrated, g-r color of the star

$a\_r$  is the photometric zeropoint in r

$k\_r$  is the first-order extinction in r

$b\_r$  is the instrumental color term coefficient in r

X is the airmass

0.53 is a "fiducial" reference color for stars in g-r (based on SDSS experience)

Note that there is a separate photometric zeropoint ( $a\_r$ ) and instrumental color term coefficient ( $b\_r$ ) for each CCD.



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# Photometric Equation: i-band

$$i\_std = -2.5\log_{10}(\text{counts}[\text{ADU}]/\text{sec}) - a\_i - k\_i * X - b\_i * ( (i-z)\_std - 0.09 )$$

where:

$i\_std$  is the standard, or calibrated, magnitude of the star

$(i-z)\_std$  is the standard, or calibrated,  $i-z$  color of the star

$a\_i$  is the photometric zeropoint in  $i$

$k\_i$  is the first-order extinction in  $i$

$b\_i$  is the instrumental color term coefficient in  $i$

$X$  is the airmass

0.09 is a "fiducial" reference color for stars in  $i-z$  (based on SDSS experience)

Note that there is a separate photometric zeropoint ( $a\_i$ ) and instrumental color term coefficient ( $b\_i$ ) for each CCD.



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# Photometric Equation: z-band

$$z\_std = -2.5\log_{10}(\text{counts}[\text{ADU}]/\text{sec}) - a\_z - k\_z * X - b\_z * ( (i-z)\_std - 0.09 )$$

where:

`z_std` is the standard, or calibrated, magnitude of the star

`(i-z)_std` is the standard, or calibrated, i-z color of the star

`a_z` is the photometric zeropoint in z

`k_z` is the first-order extinction in z

`b_z` is the instrumental color term coefficient in z

`X` is the airmass

0.09 is a "fiducial" reference color for stars in i-z (based on SDSS experience)

Note that there is a separate photometric zeropoint (`a_z`) and instrumental color term coefficient (`b_z`) for each CCD.