

# KIC 010724621

## Q1-17 DR25 TCE Parameters

| TCE          | Run Type | KOI? | Period (Days) | Epoch (BKJD) | Depth (ppm) | Duration (Hours) | MES | SNR | $R_{\star}$ ( $R_{\odot}$ ) | $T_{\star}$ (K) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 010724621-01 | OBS      | No   | 0.745043      | 131.848548   | 16.9        | 4.690            | 9.3 | 6.5 | 1.00                        | 6201            | 0.44                   | 5093.17                |
| 010724621-02 | OBS      | No   | 40.751114     | 162.178433   | 563.1       | 1.192            | 8.5 | 9.9 | 1.00                        | 6201            | 2.40                   | 24.53                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 010724621-01 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 1 | LPP_DV—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH      |
| 010724621-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—CENT_FEW_DIFFS |

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

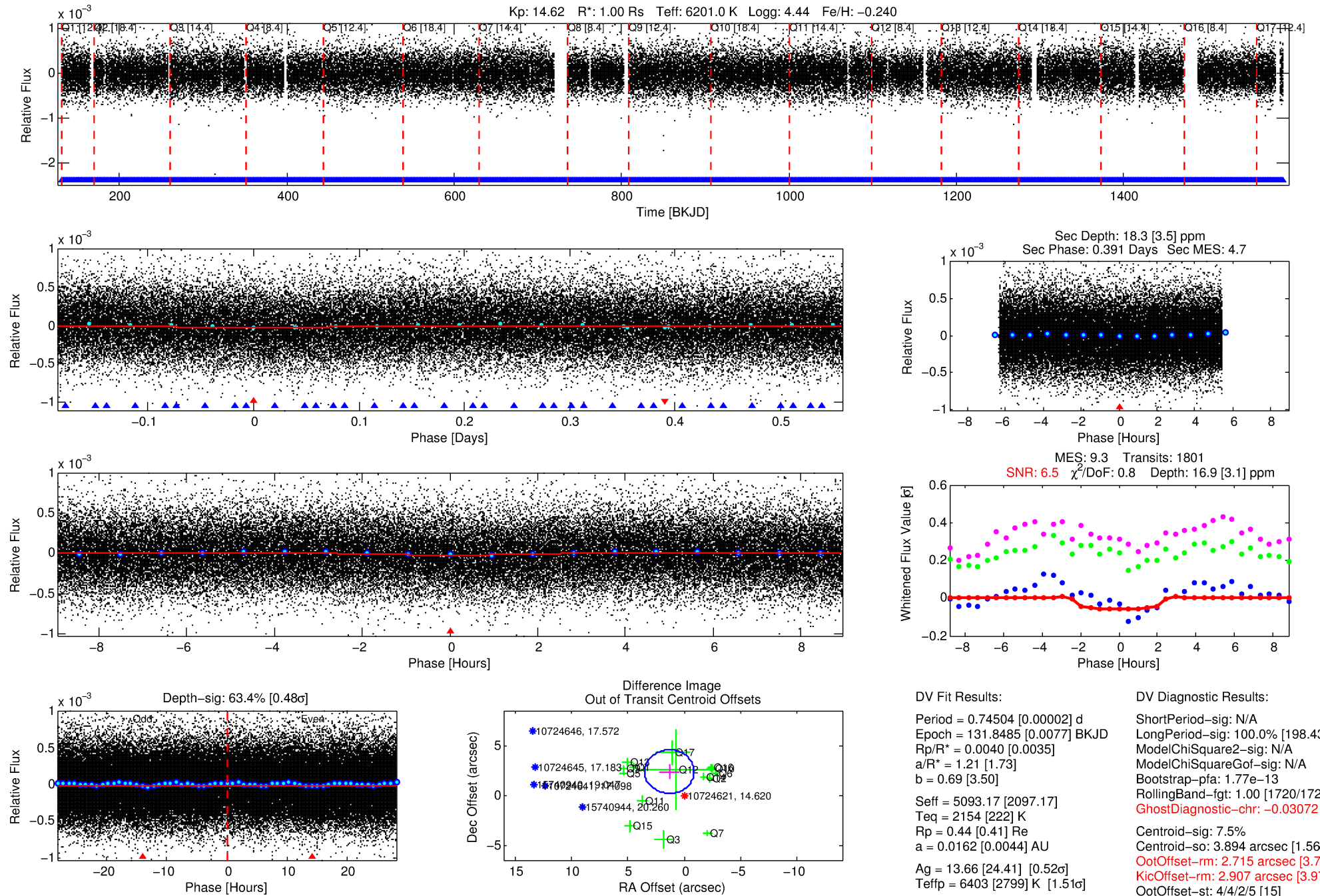
## Ephemeris Match Information For 010724621-01

| TCE (1)      | KIC      | Parent (2)   | Parent KIC | $P_1:P_2$ | Dist ( $\mu$ ) | $\Delta$ Row | $\Delta$ Col | $m_2$ | $m_1$ | $D_2/D_1$ | Mechanism  | Flag | $\sigma_P$ | $\sigma_T$ |
|--------------|----------|--------------|------------|-----------|----------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 010724621-01 | 10724621 | 010724569-01 | 10724569   | 1:1       | 52.7           | 12           | -7           | 15.49 | 14.62 | 3.71      | Direct-PRF | 1    | 2.80       | 0.79       |

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

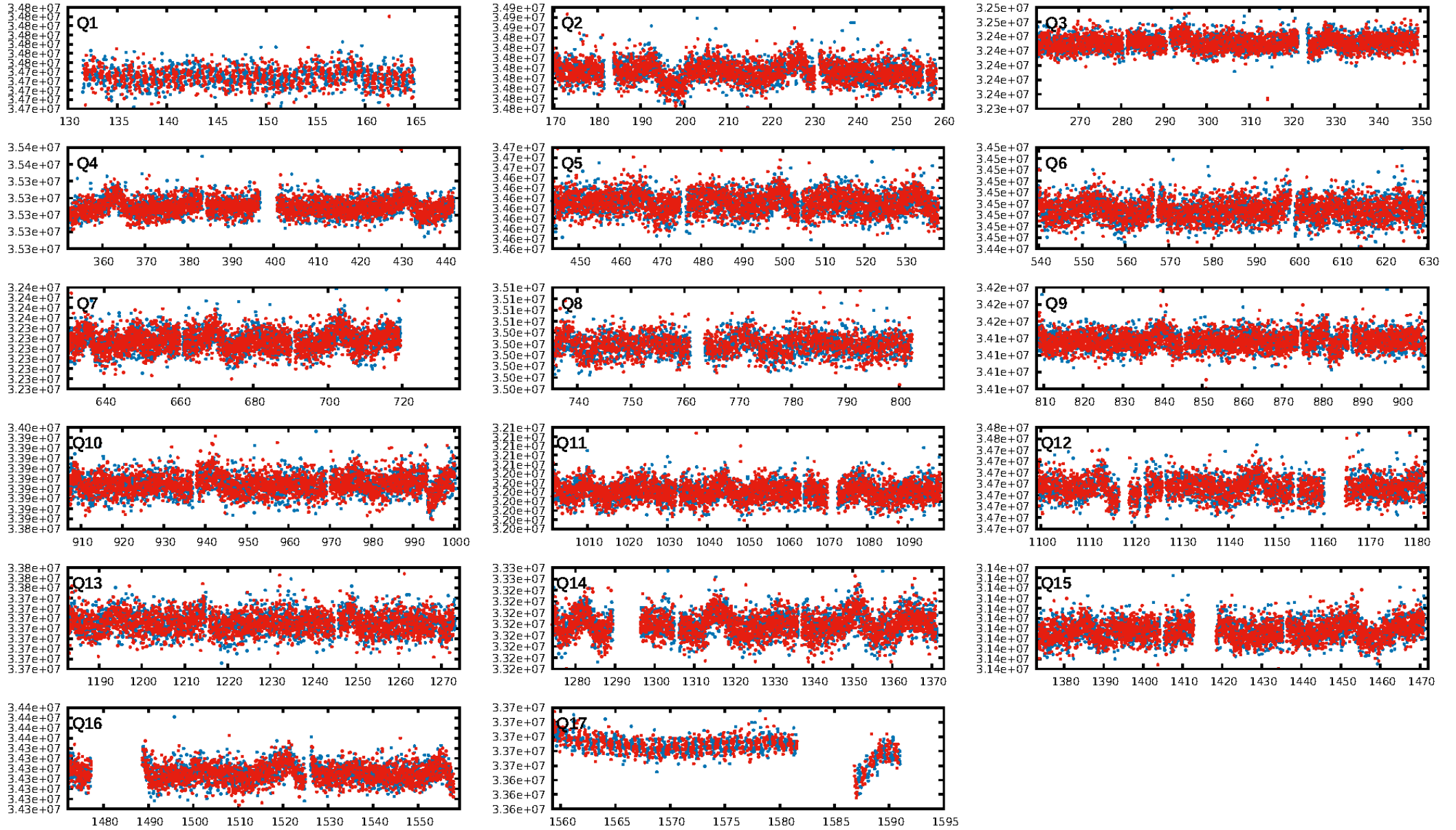
KIC: 10724621 Candidate: 1 of 2 Period: 0.745 d



Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 04:11:06 Z

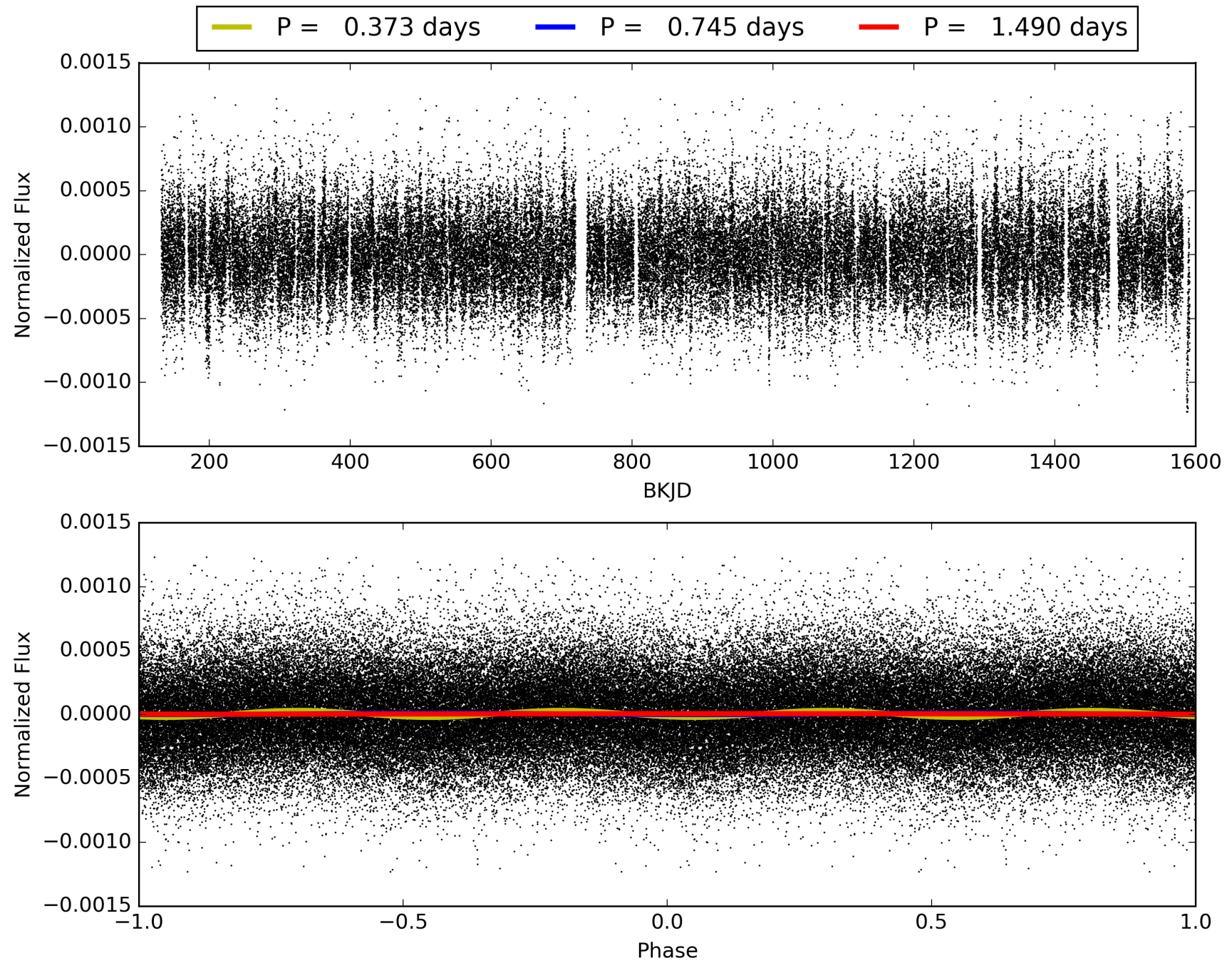
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010724621-01, PDC Light Curves



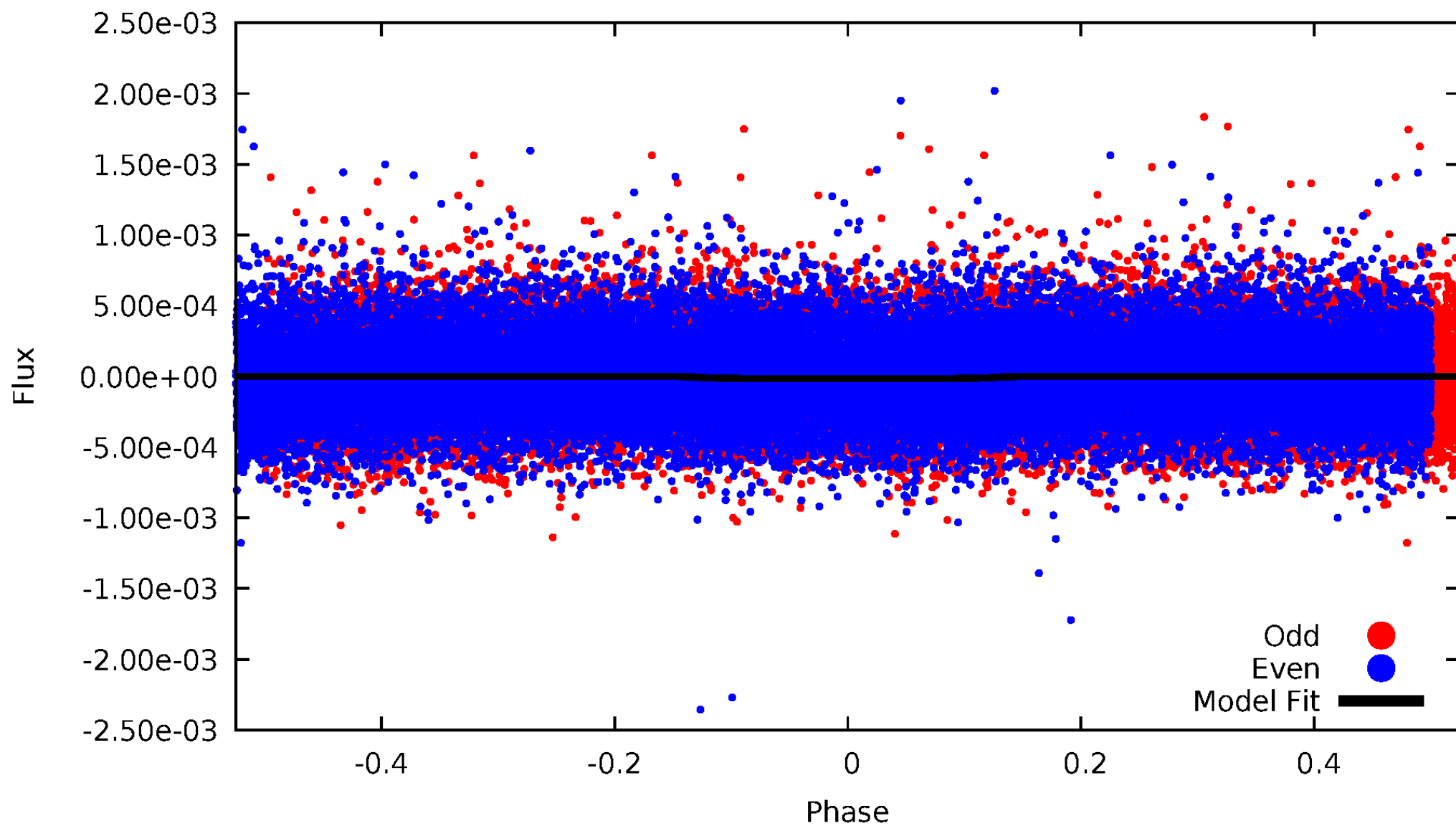


TCE 010724621-01



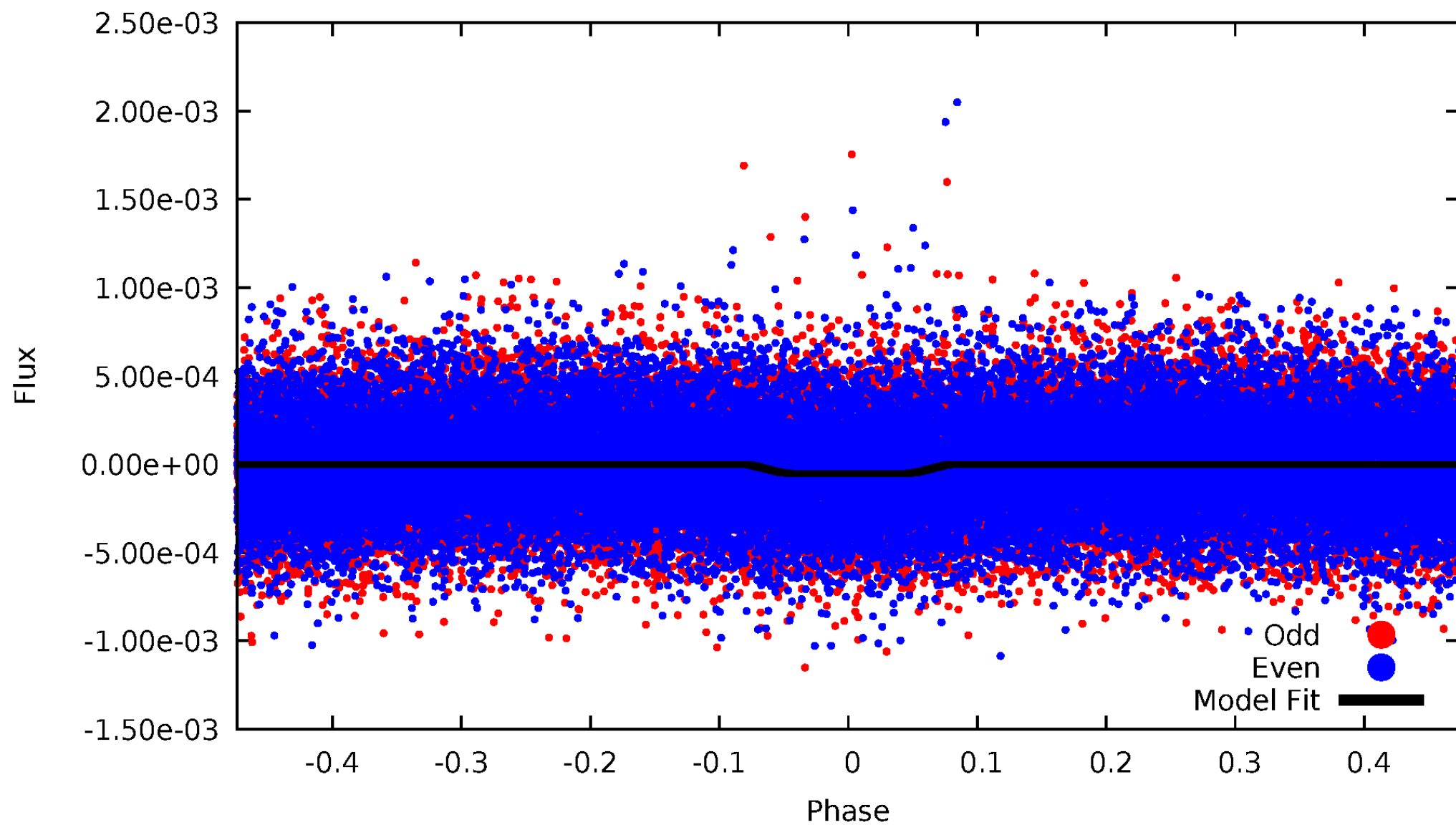
# DV Odd/Even

TCE 010724621-01



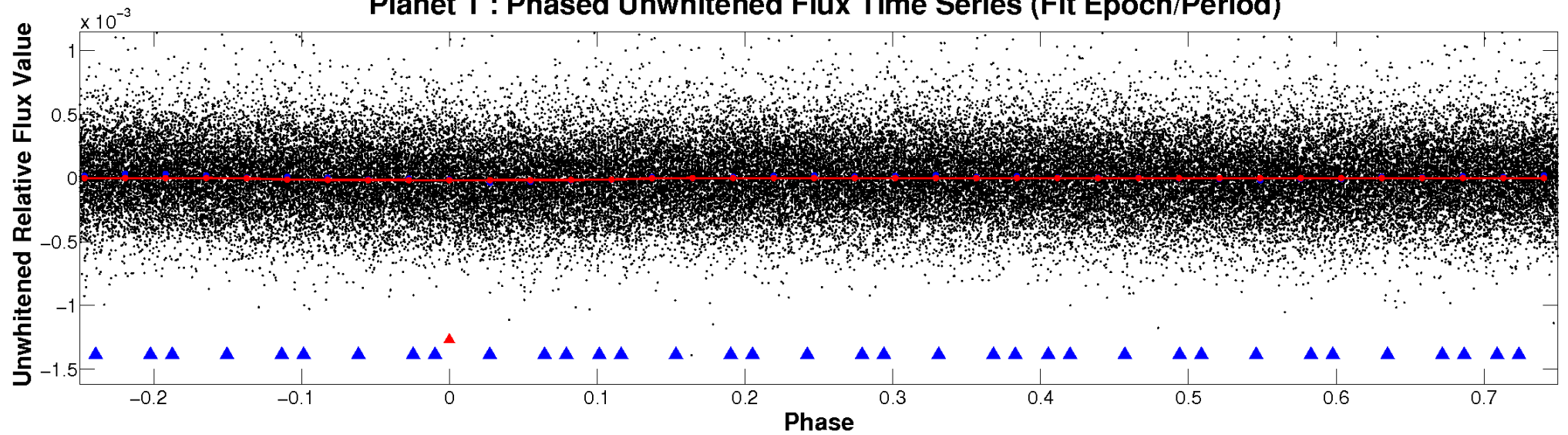
# ALT Odd/Even

TCE 010724621-01

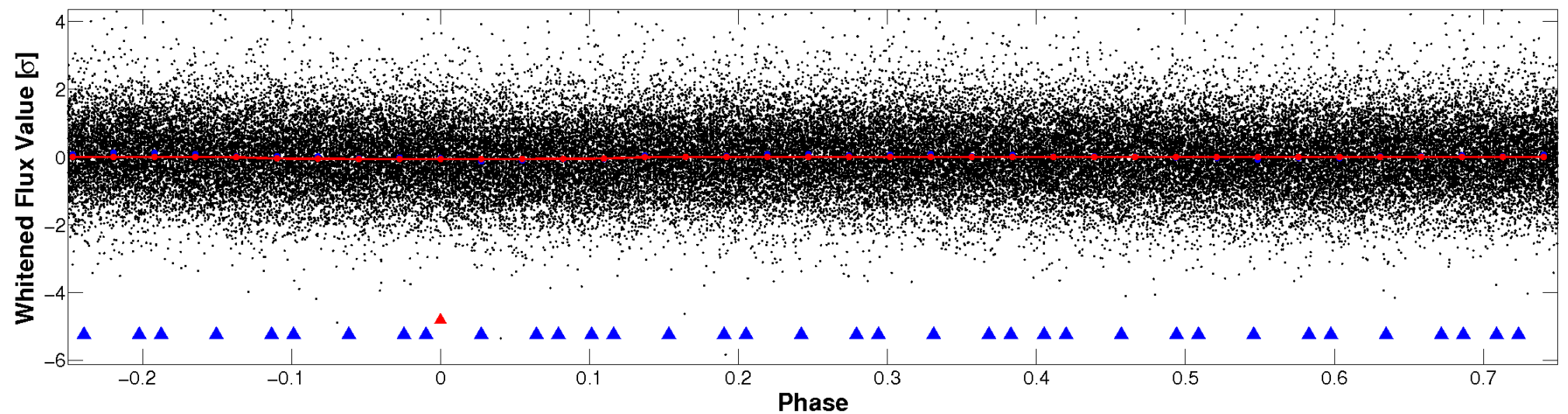


# Non-Whitened Vs. Whitened Light Curve

**Planet 1 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)**



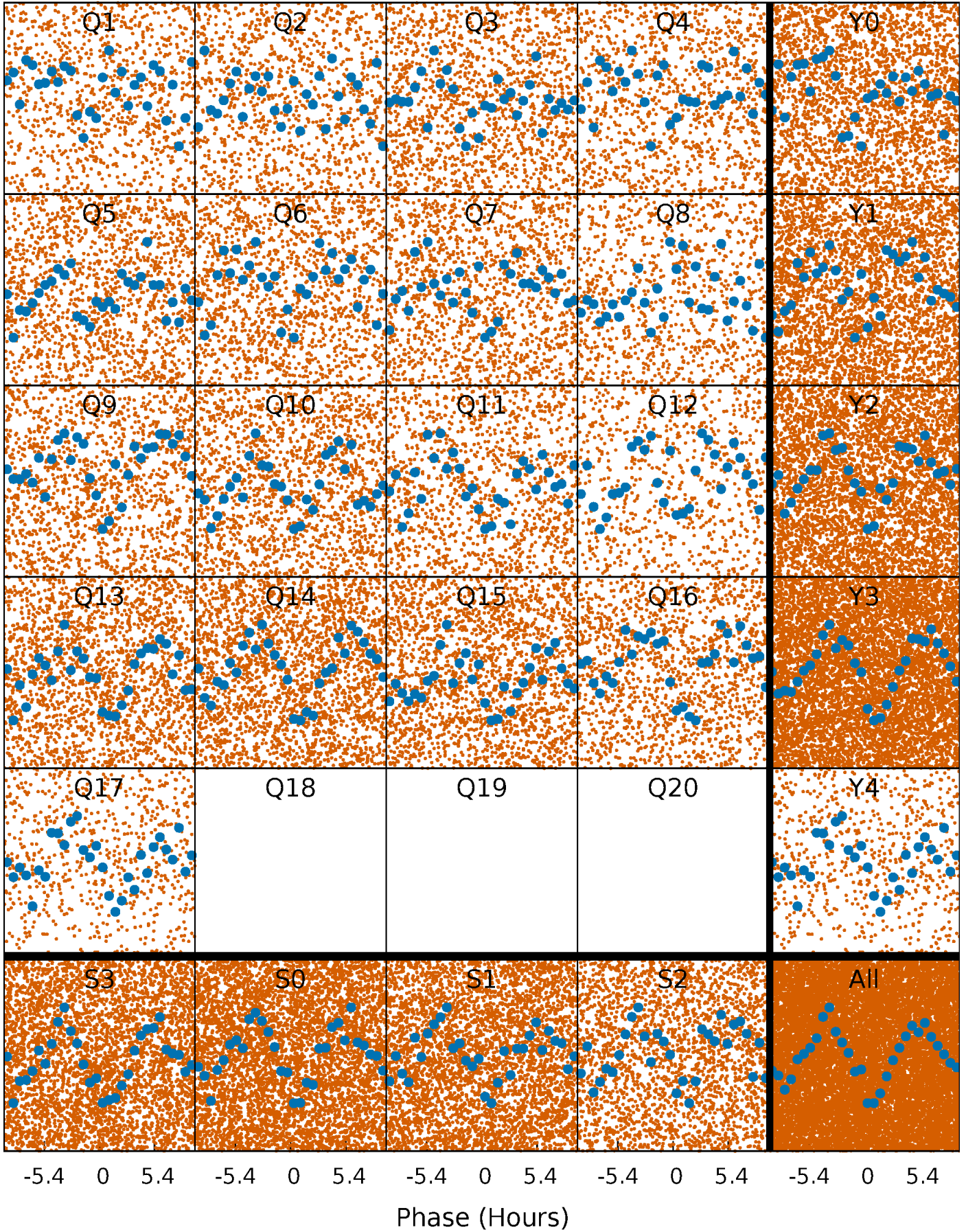
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

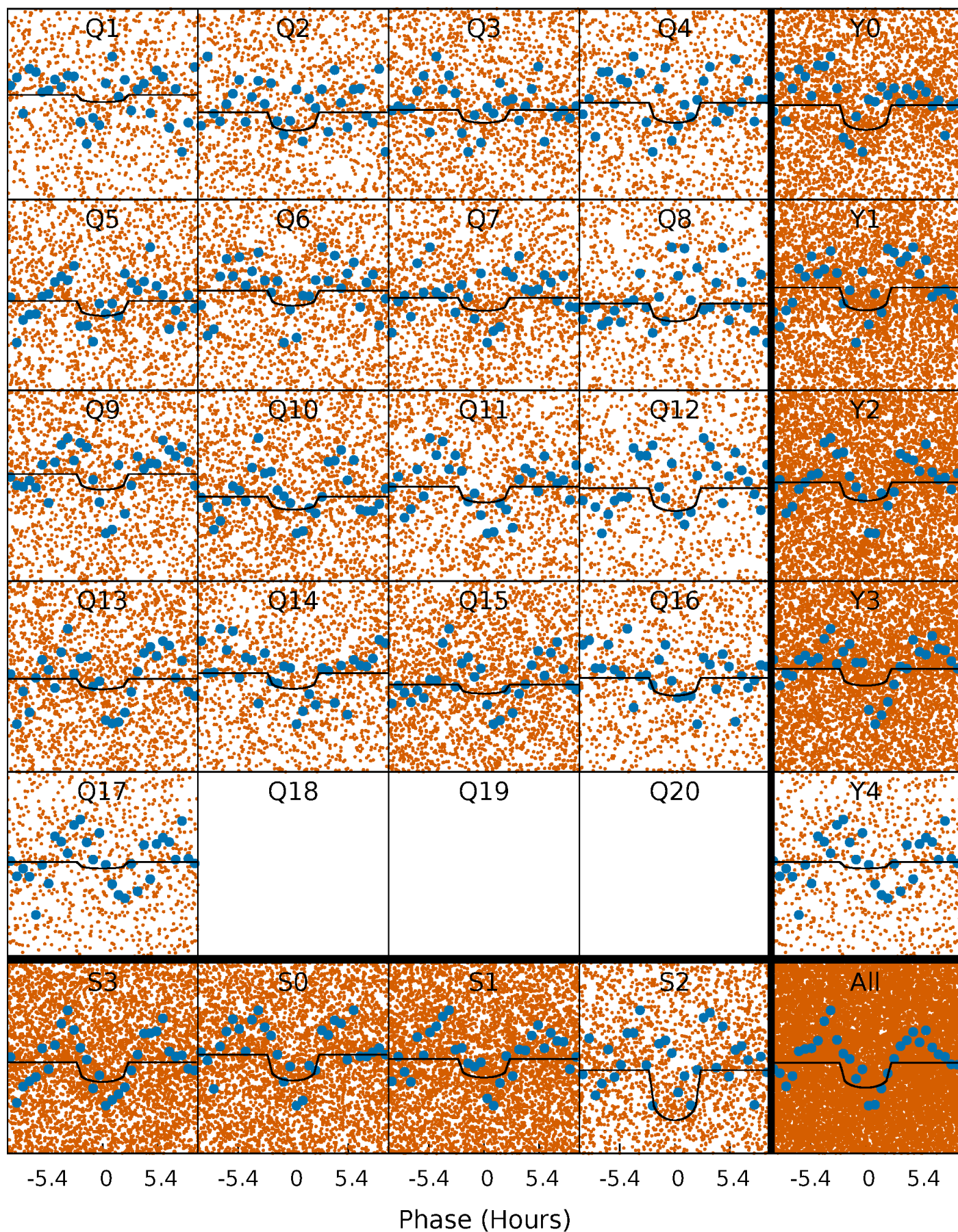
TCE 010724621-01 P= 0.745043 Days  $T_0=131.848548$  (BKJD)





# DV Quarter-Phased Transit Curves

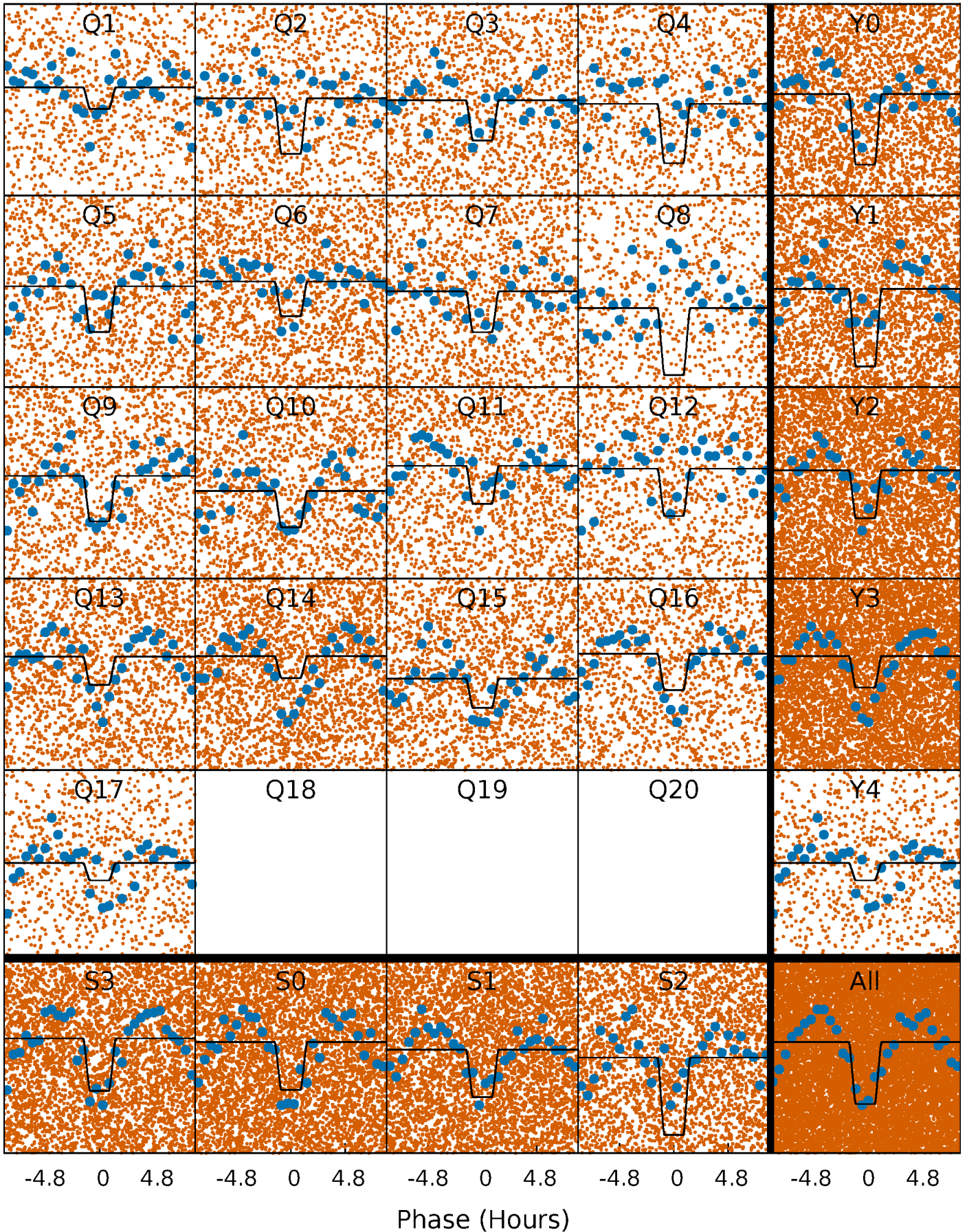
TCE 010724621-01 P= 0.745043 Days  $T_0=131.848548$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

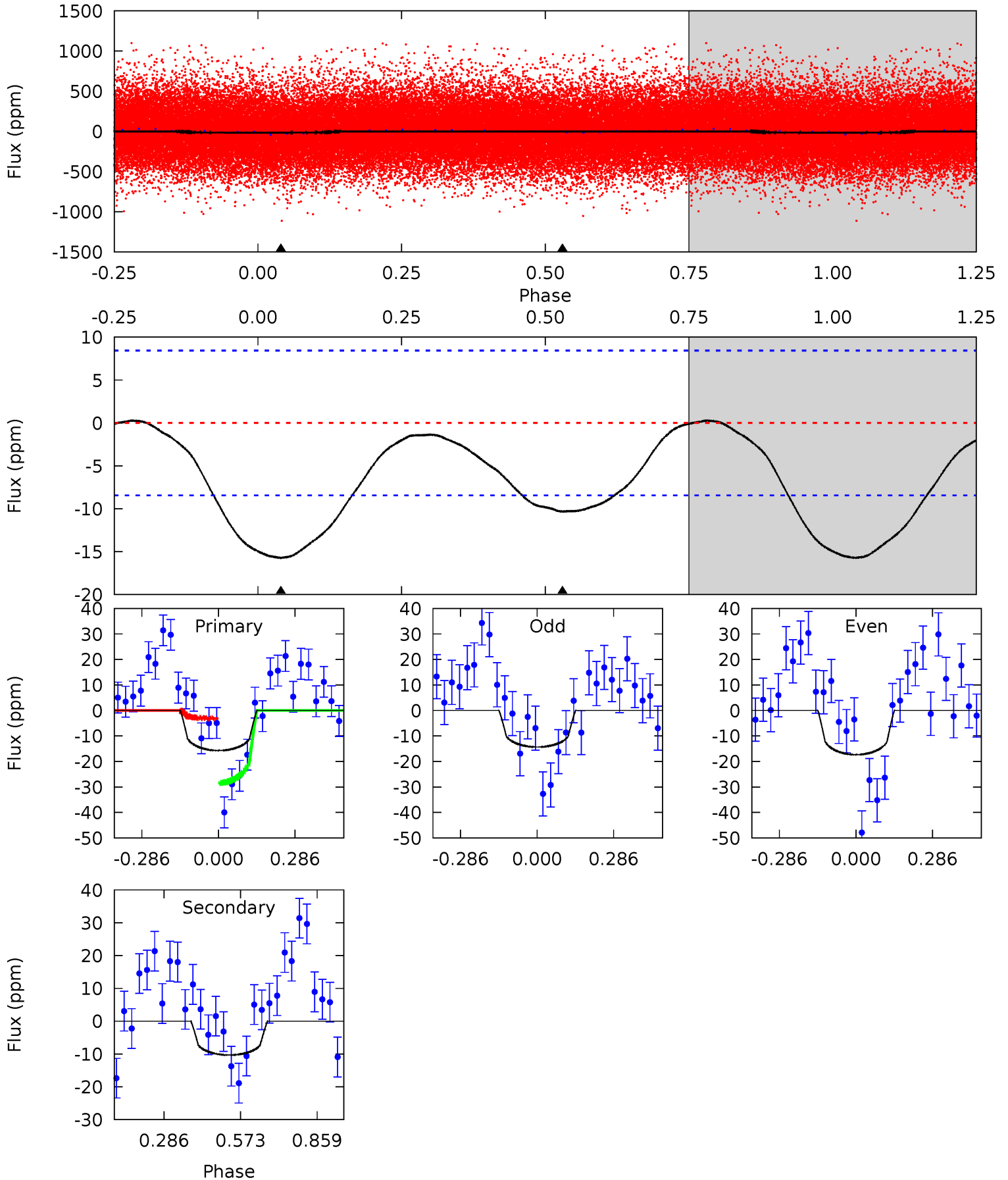
TCE 010724621-01 P= 0.745089 Days  $T_0=131.824494$  (BKJD)



# DV Model-Shift Uniqueness Test

010724621-01, P = 0.745043 Days, E = 131.103505 Days

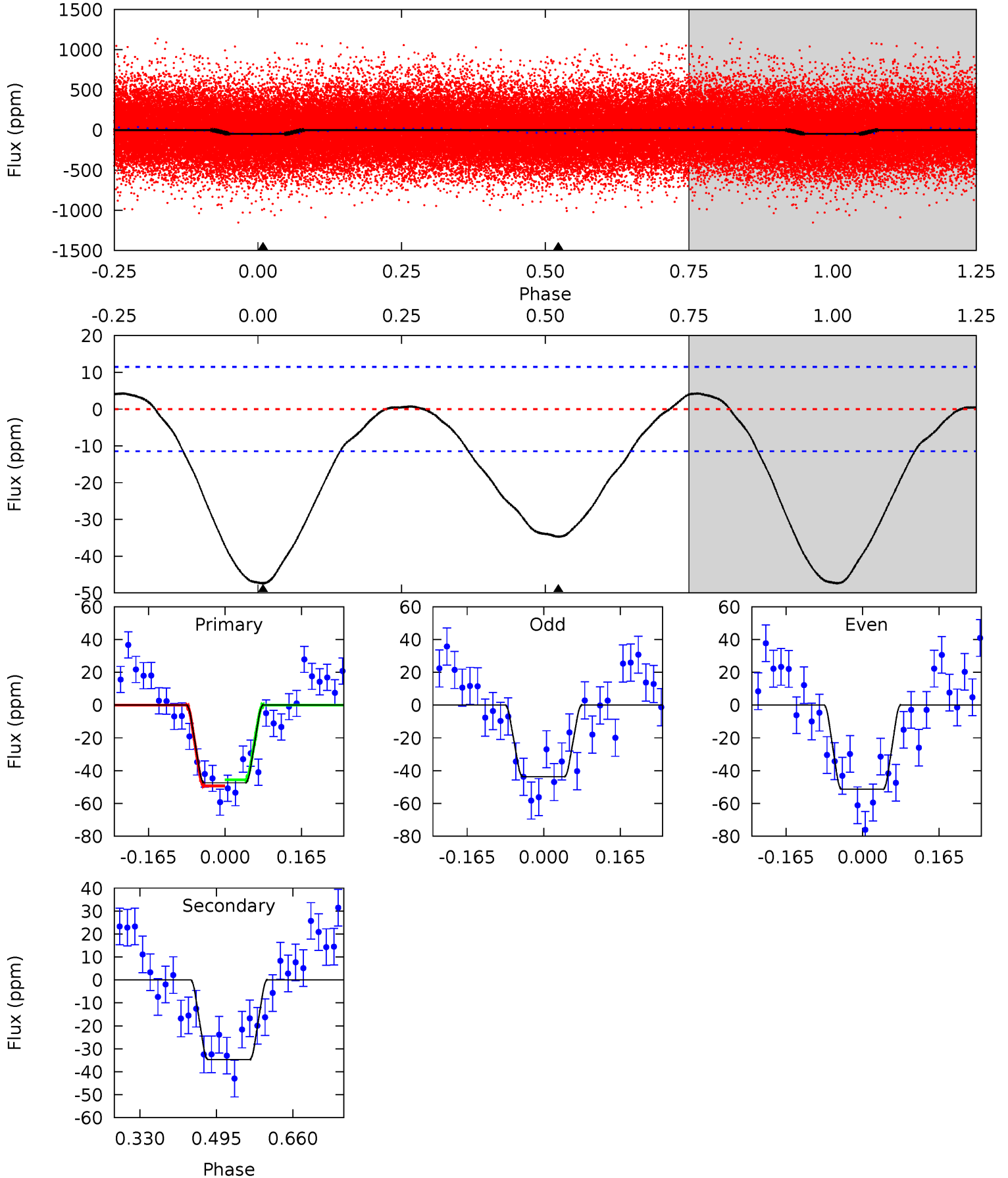
| Pri  | Sec  | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.08 | 5.30 | 0   | 0   | 4.34            | 1.07            | 0.39             | 8.08    | 8.08    | 5.30    | 5.30    | 0.77    | 0.85 | 0.02  | 6.46 |



# Alt Model-Shift Uniqueness Test

010724621-01, P = 0.745089 Days, E = 131.079405 Days

| Pri  | Sec  | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 18.4 | 13.5 | 0   | 0   | 4.46            | 1.39            | 1.22             | 18.4    | 18.4    | 13.5    | 13.5    | 1.48    | 0.93 | 0.08  | 0.72 |





### Stellar Parameters For KIC 010724621

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|--|
|        | $6201^{+175}_{-197}$ | $4.443^{+0.070}_{-0.210}$ | $-0.240^{+0.250}_{-0.300}$ | $1.004^{+0.335}_{-0.112}$ | $1.014^{+0.147}_{-0.120}$ | $1.412^{+0.418}_{-0.764}$                    |
|        | +3%/-3%              | +2%/-5%                   | +104%/-125%                | +33%/-11%                 | +14%/-12%                 | +30%/-54%                                    |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |  |

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010724621-01 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$   | $A_{\text{obs}}$           |
|---------|-------------|------------------------|----------------------|------------------------|----------------------------|
| DV      | $-10 \pm 2$ | $0.53^{+0.39}_{-0.31}$ | $3058^{+230}_{-149}$ | $5063^{+3132}_{-1052}$ | $4.980^{+23.682}_{-3.308}$ |
| Alt.    | $-35 \pm 3$ | $0.85^{+0.35}_{-0.42}$ | $3075^{+221}_{-166}$ | $5534^{+2405}_{-846}$  | $7.066^{+19.668}_{-3.645}$ |

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming A=0.3)

$A_{\text{obs}}$  = Observed Albedo (Assuming T=0)

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

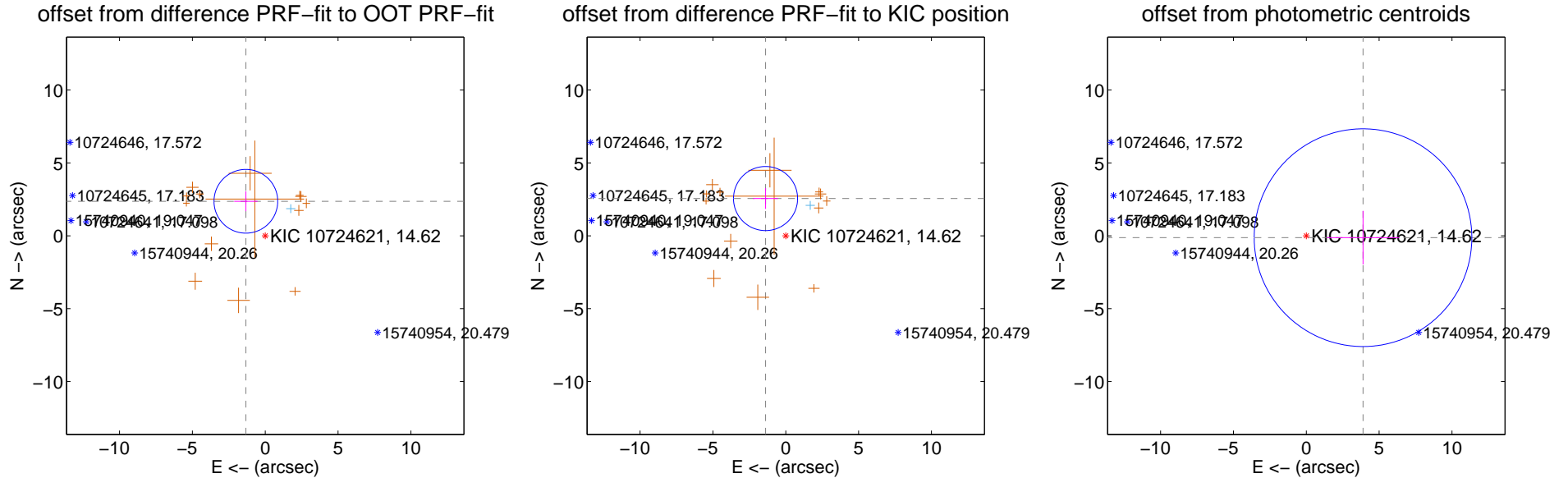
## DV Centroid Data

Supplemental centroid analysis for 010724621-01. Kepler magnitude: 14.62. Transit SNR 6.49

There are 1 quarters with good PRF difference image offsets

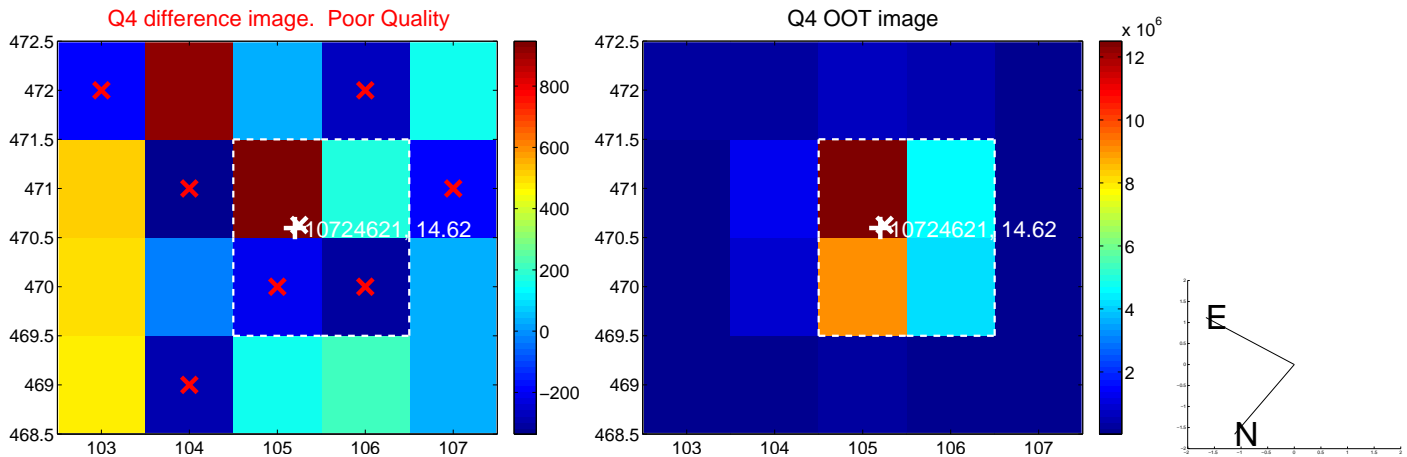
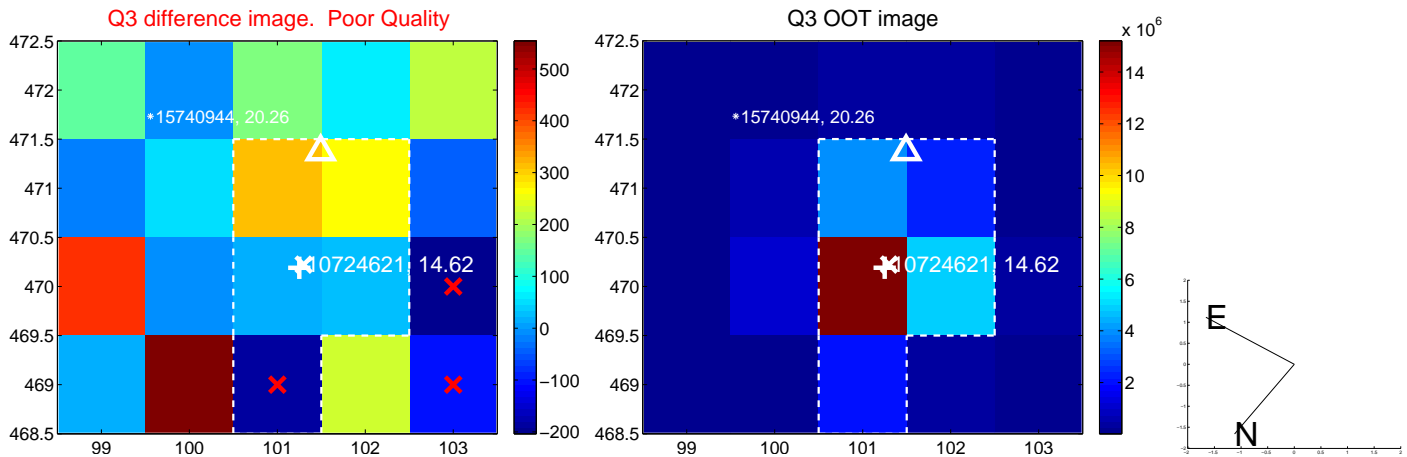
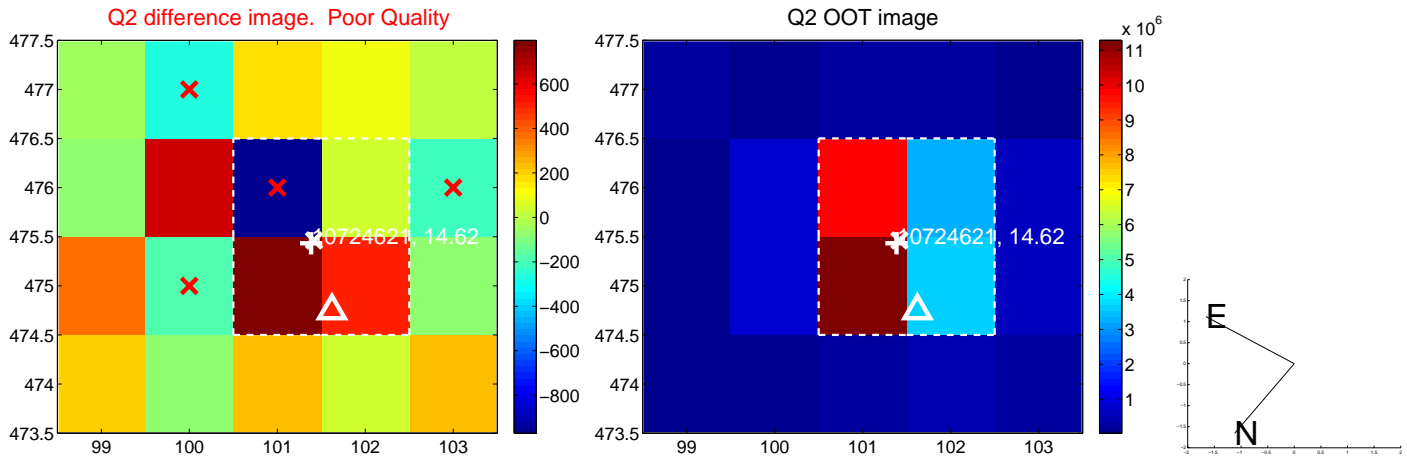
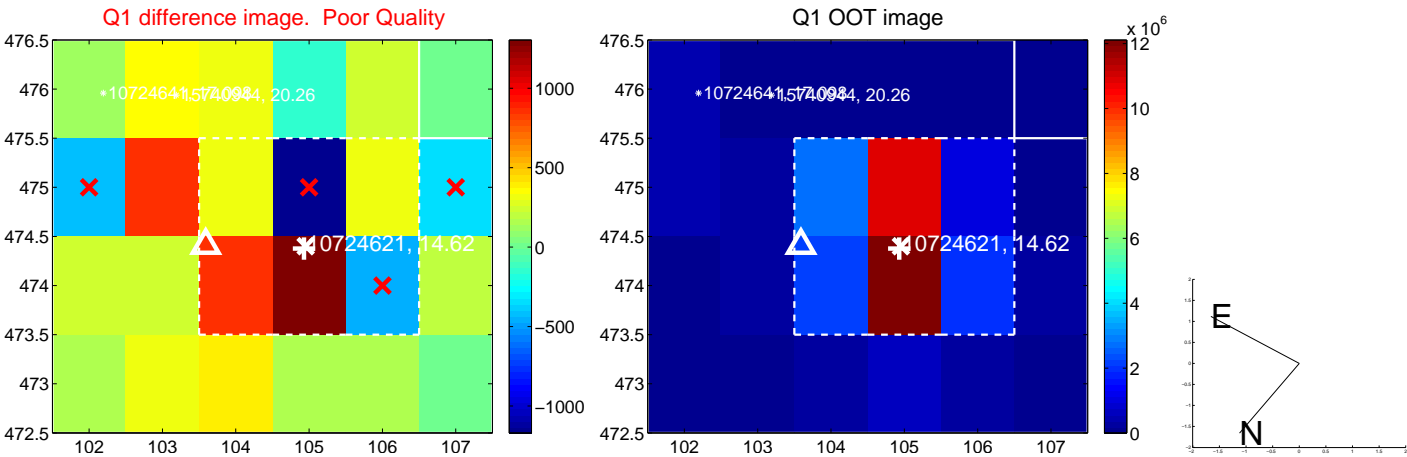
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $2.715 \pm 0.729$  | 3.72                | $1.329 \pm 0.805$ | $2.368 \pm 0.682$ |
| PRF-fit source offset from KIC position | $2.907 \pm 0.733$  | 3.97                | $1.387 \pm 0.856$ | $2.555 \pm 0.710$ |
| photometric centroid source offset      | $3.89 \pm 2.49$    | 1.56                | $-3.89 \pm 2.49$  | $-0.13 \pm 1.84$  |

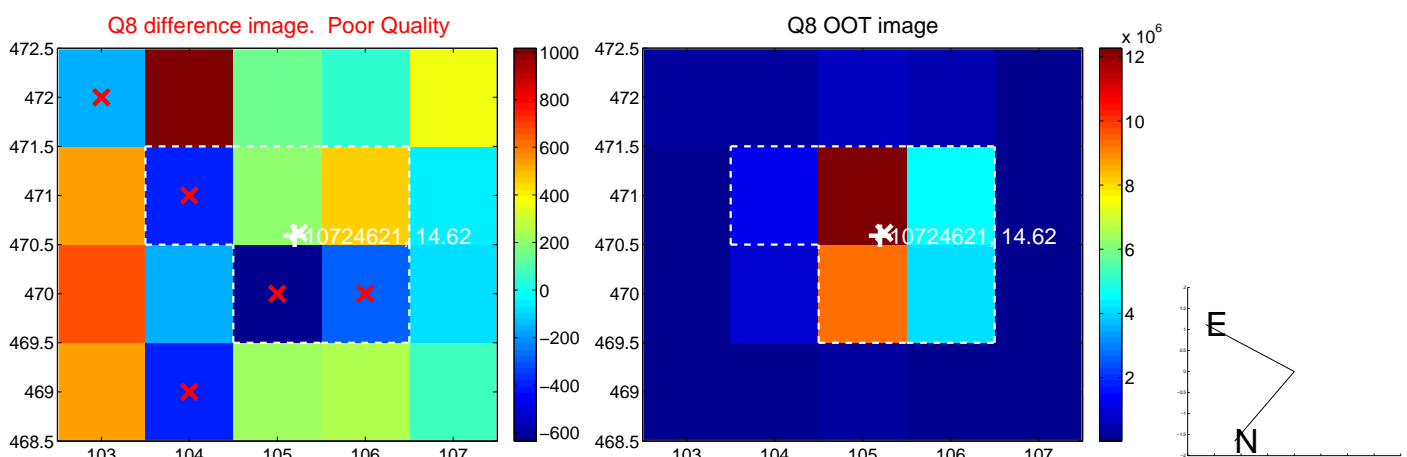
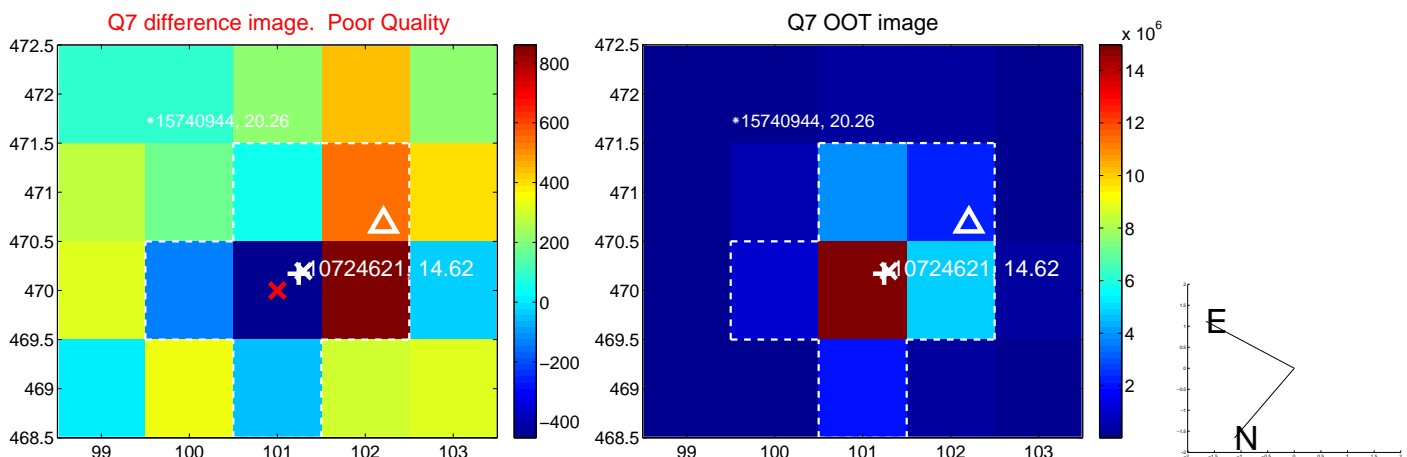
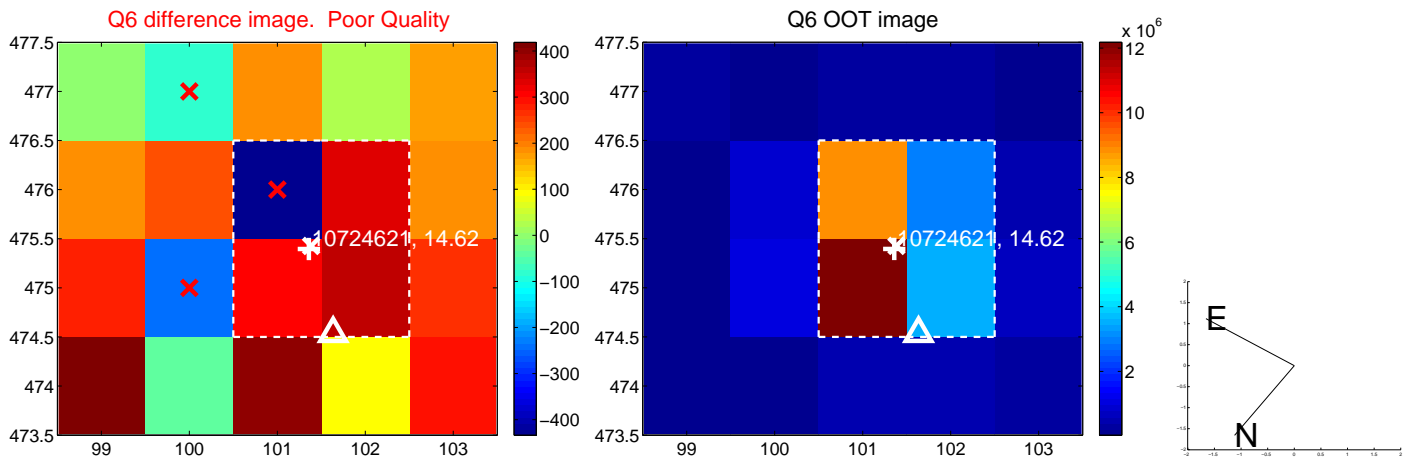
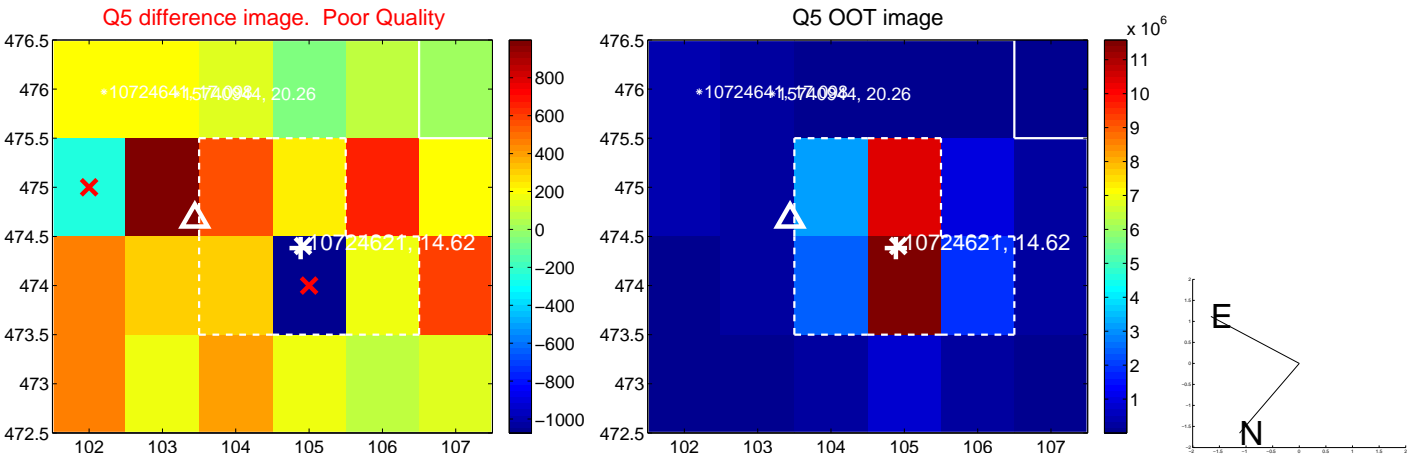


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

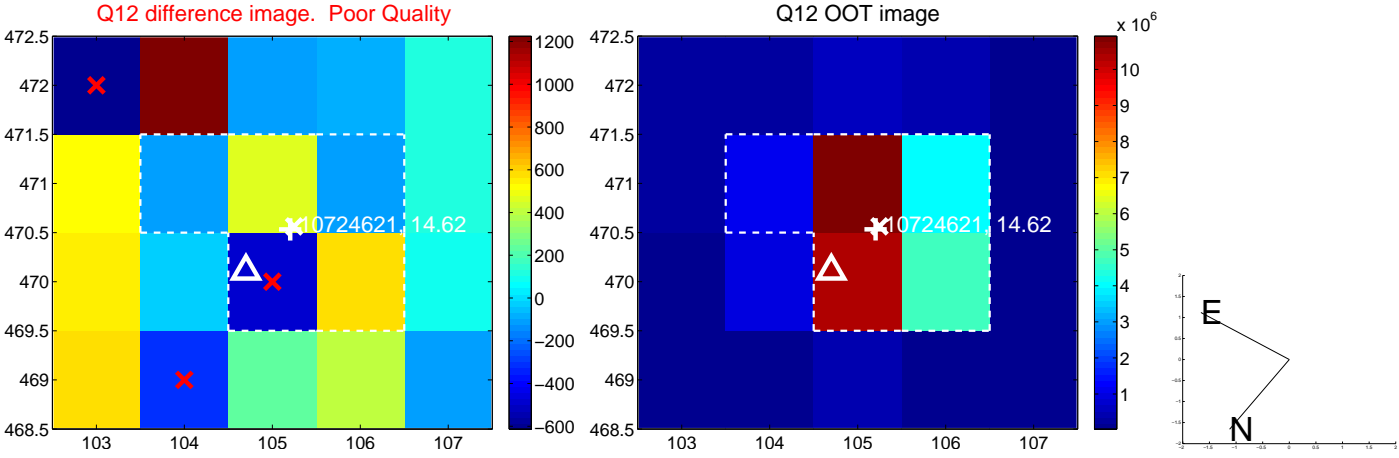
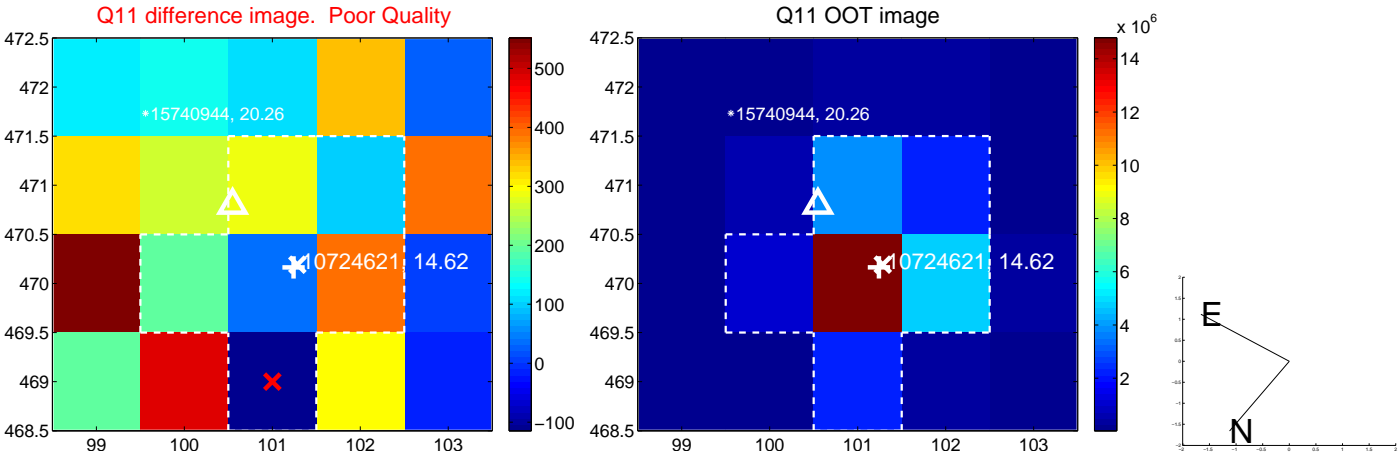
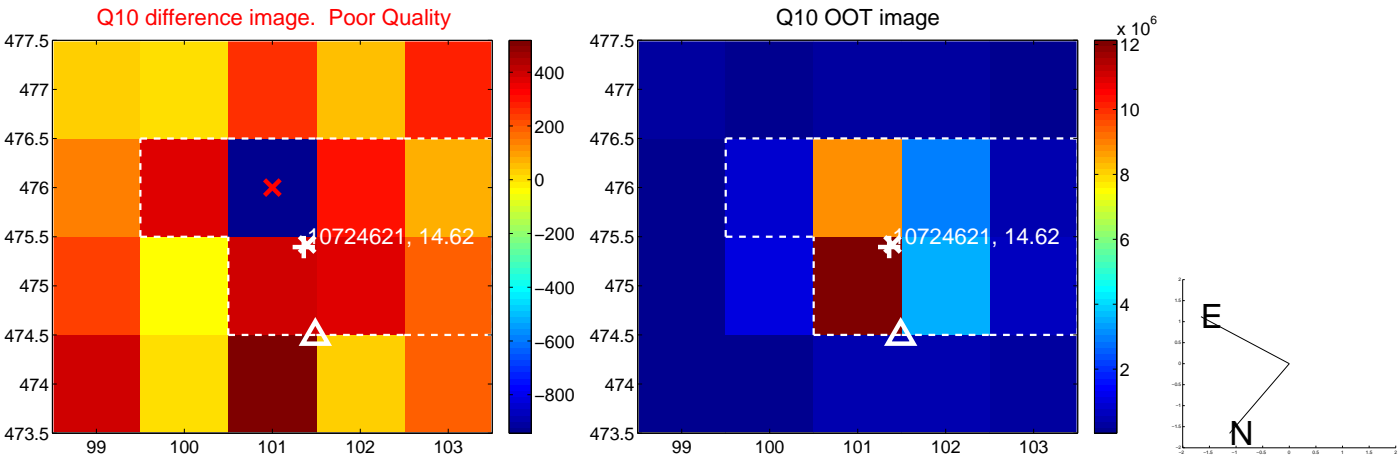
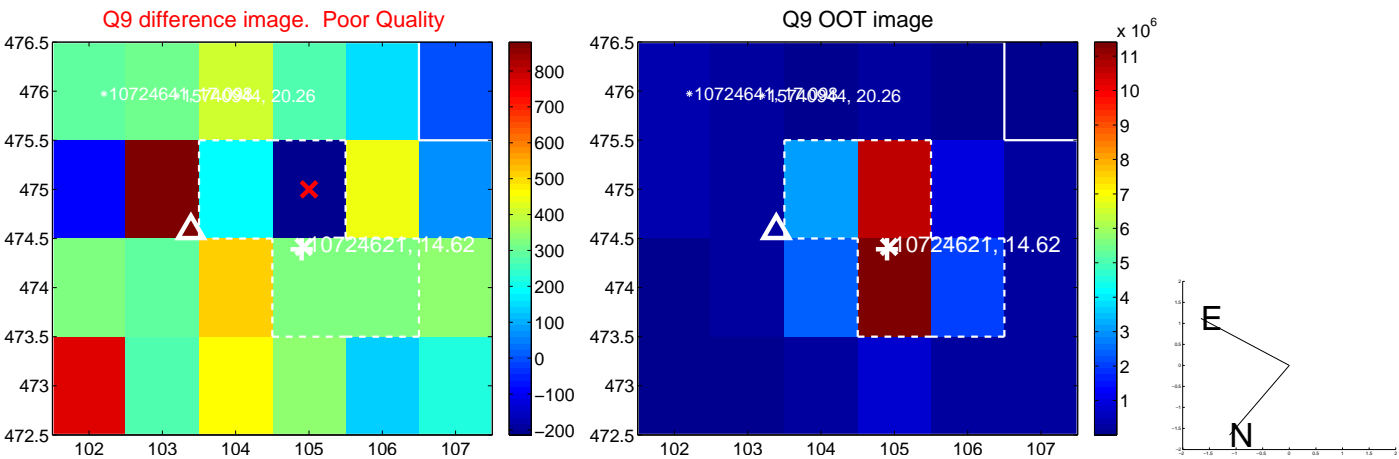


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

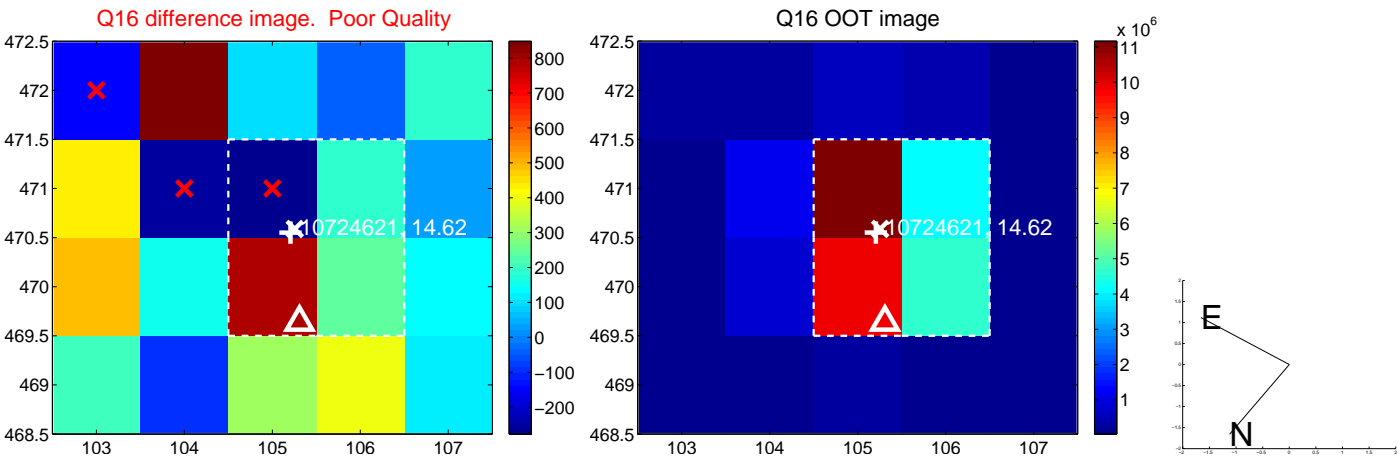
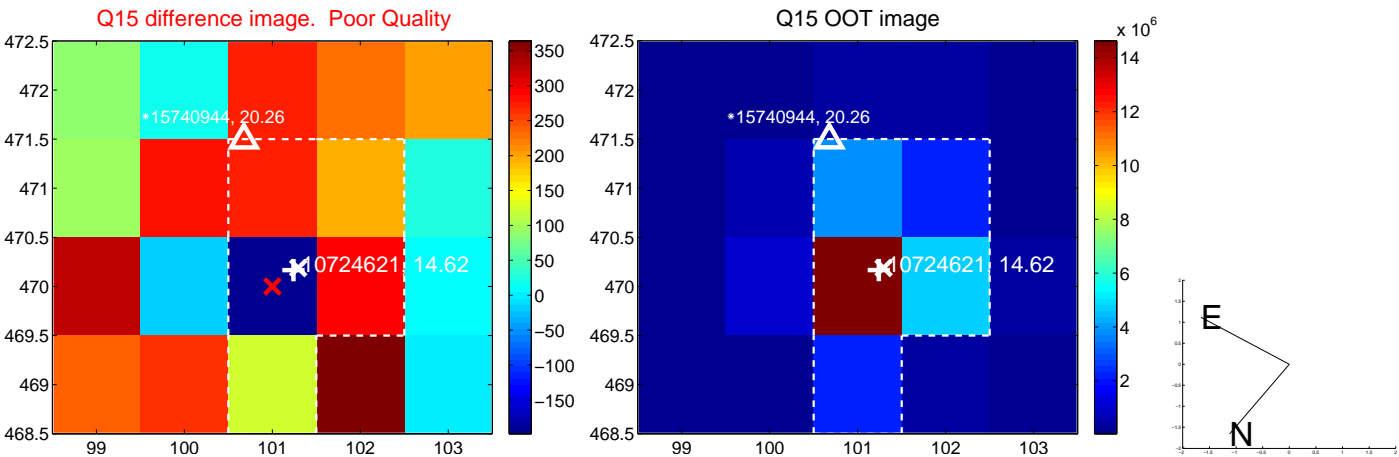
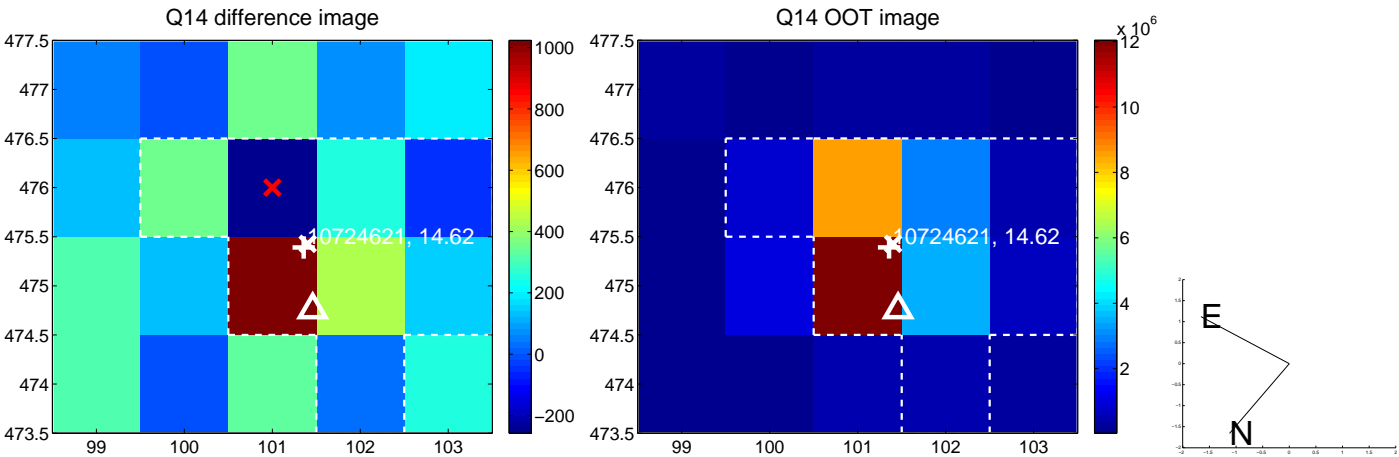
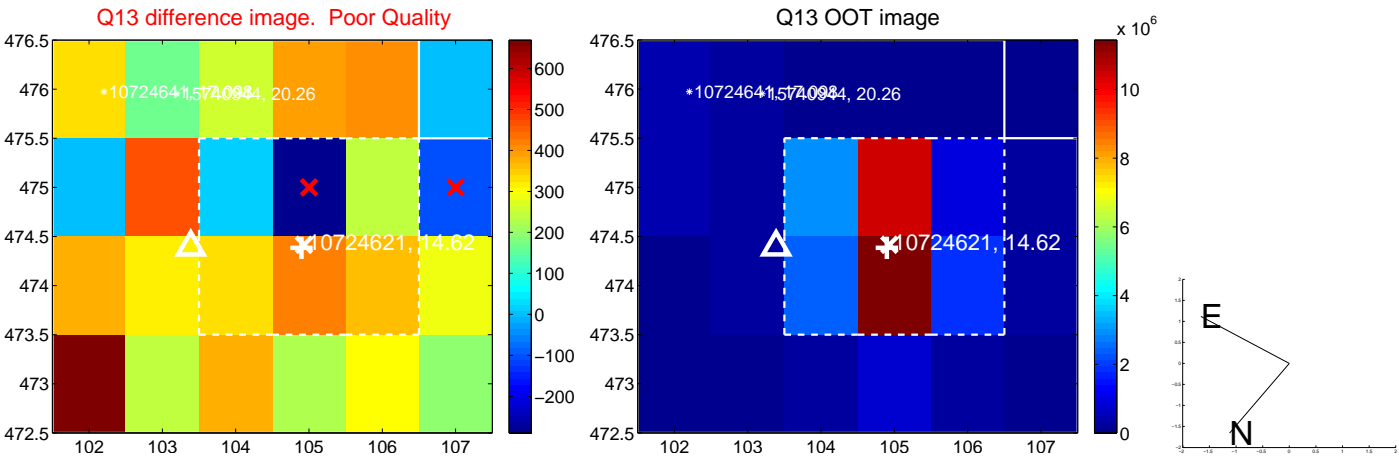




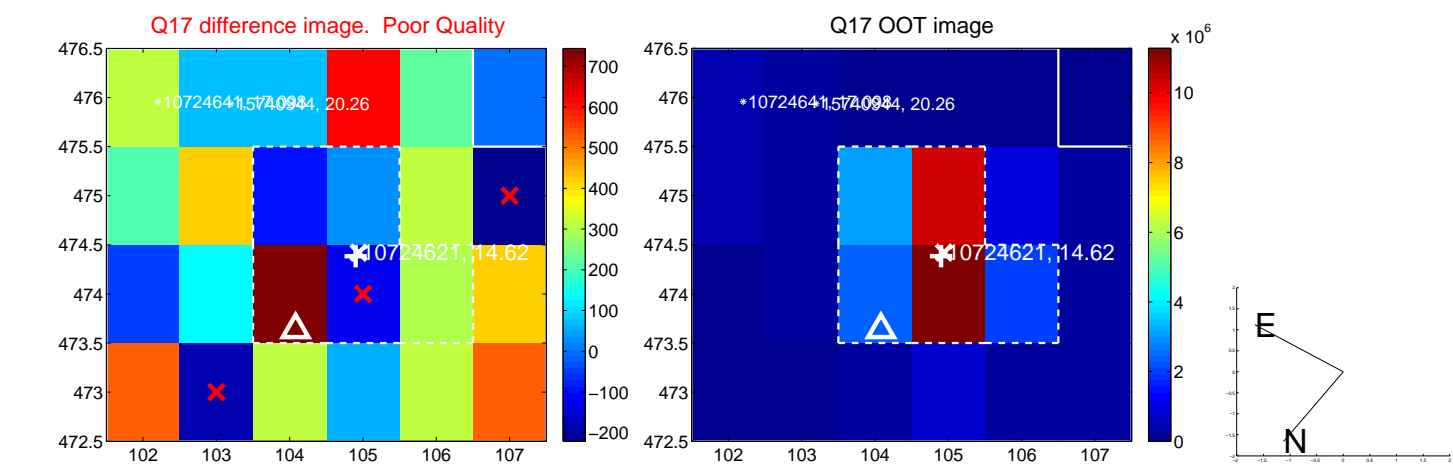
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



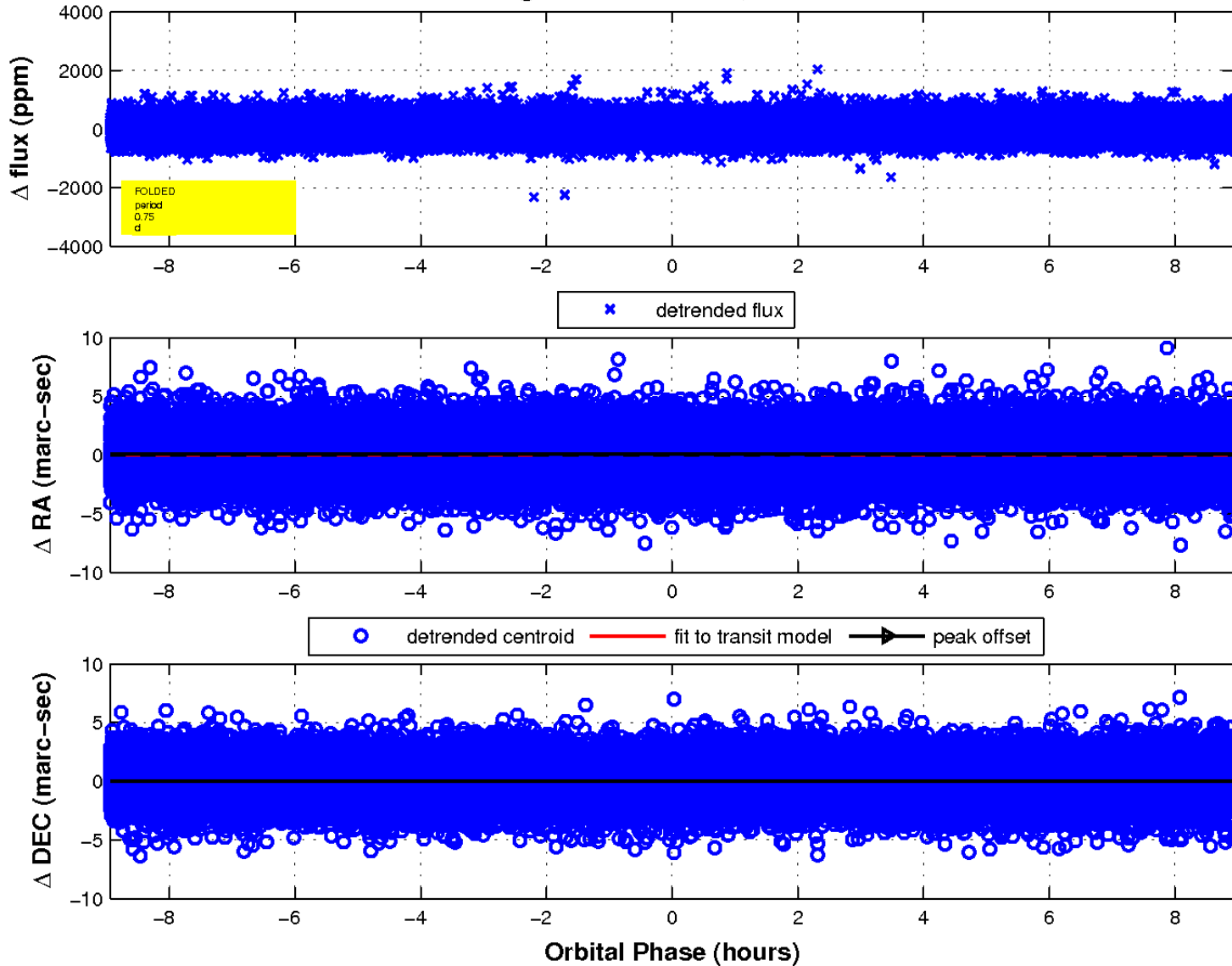
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

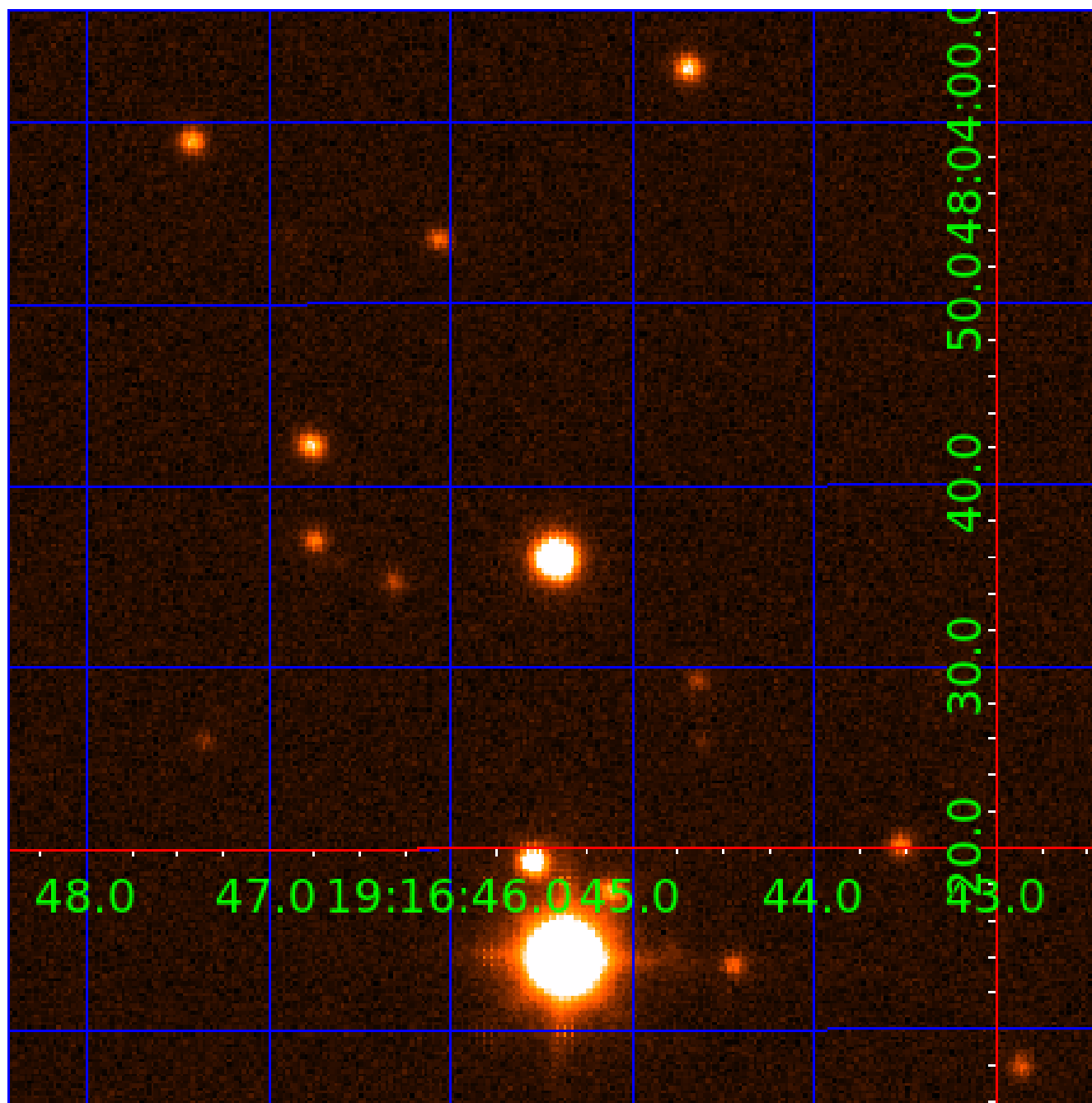


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 010724621

## Q1-17 DR25 TCE Parameters

| TCE          | Run Type | KOI? | Period (Days) | Epoch (BKJD) | Depth (ppm) | Duration (Hours) | MES | SNR | $R_{\star}$ ( $R_{\odot}$ ) | $T_{\star}$ (K) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 010724621-01 | OBS      | No   | 0.745043      | 131.848548   | 16.9        | 4.690            | 9.3 | 6.5 | 1.00                        | 6201            | 0.44                   | 5093.17                |
| 010724621-02 | OBS      | No   | 40.751114     | 162.178433   | 563.1       | 1.192            | 8.5 | 9.9 | 1.00                        | 6201            | 2.40                   | 24.53                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 010724621-01 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 1 | LPP_DV—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH      |
| 010724621-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—CENT_FEW_DIFFS |

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

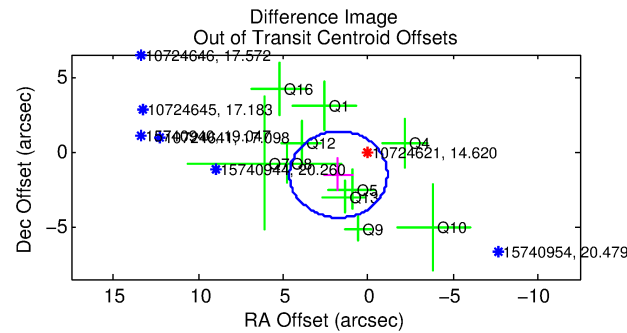
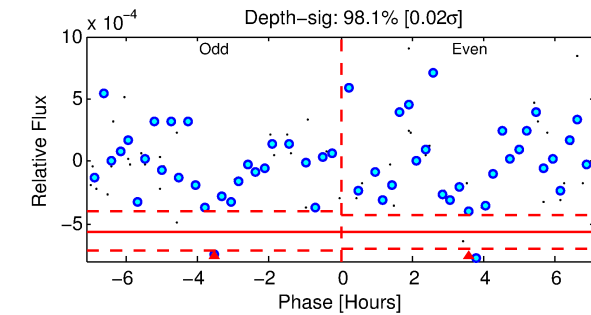
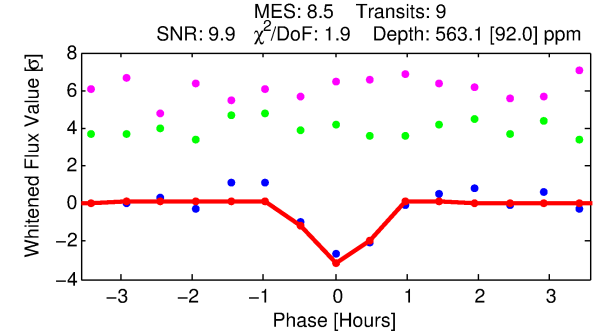
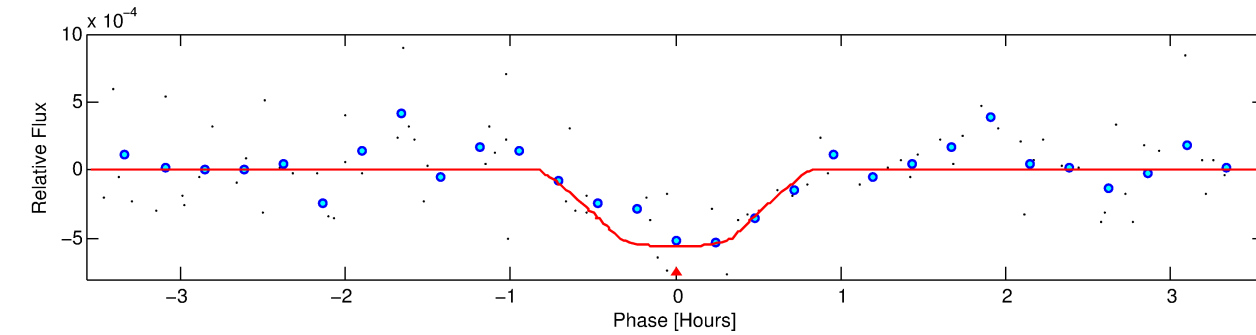
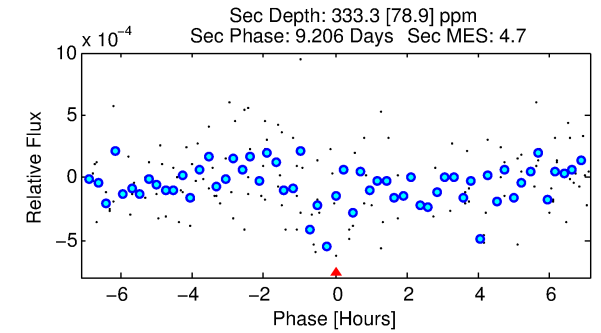
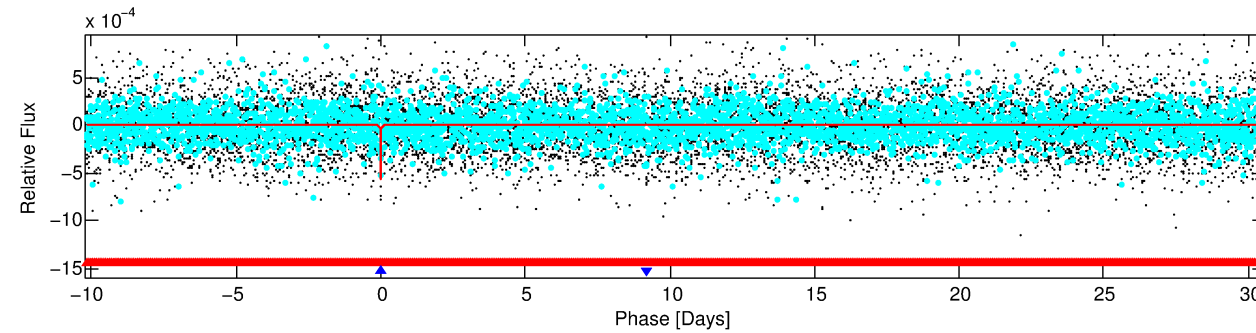
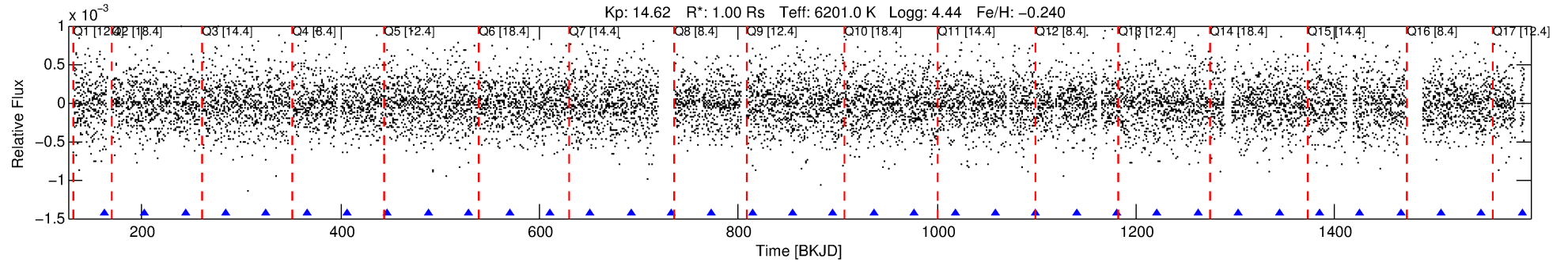
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010724621-02

No Significant Match Found

# DV One-Page Summary

KIC: 10724621 Candidate: 2 of 2 Period: 40.751 d



## DV Fit Results:

Period = 40.75111 [0.00035] d  
Epoch = 162.1784 [0.0085] BKJD  
Rp/R\* = 0.0219 [0.0593]  
a/R\* = 264.83 [3630.72]  
b = 0.13 [107.82]  
Seff = 24.53 [10.10]  
Teff = 567 [58] K  
Rp = 2.40 [6.54] Re  
a = 0.2333 [0.0641] AU  
Ag = 1729.48 [9385.23] [0.18 $\sigma$ ]  
Teffp = 5658 [7658] K [0.66 $\sigma$ ]

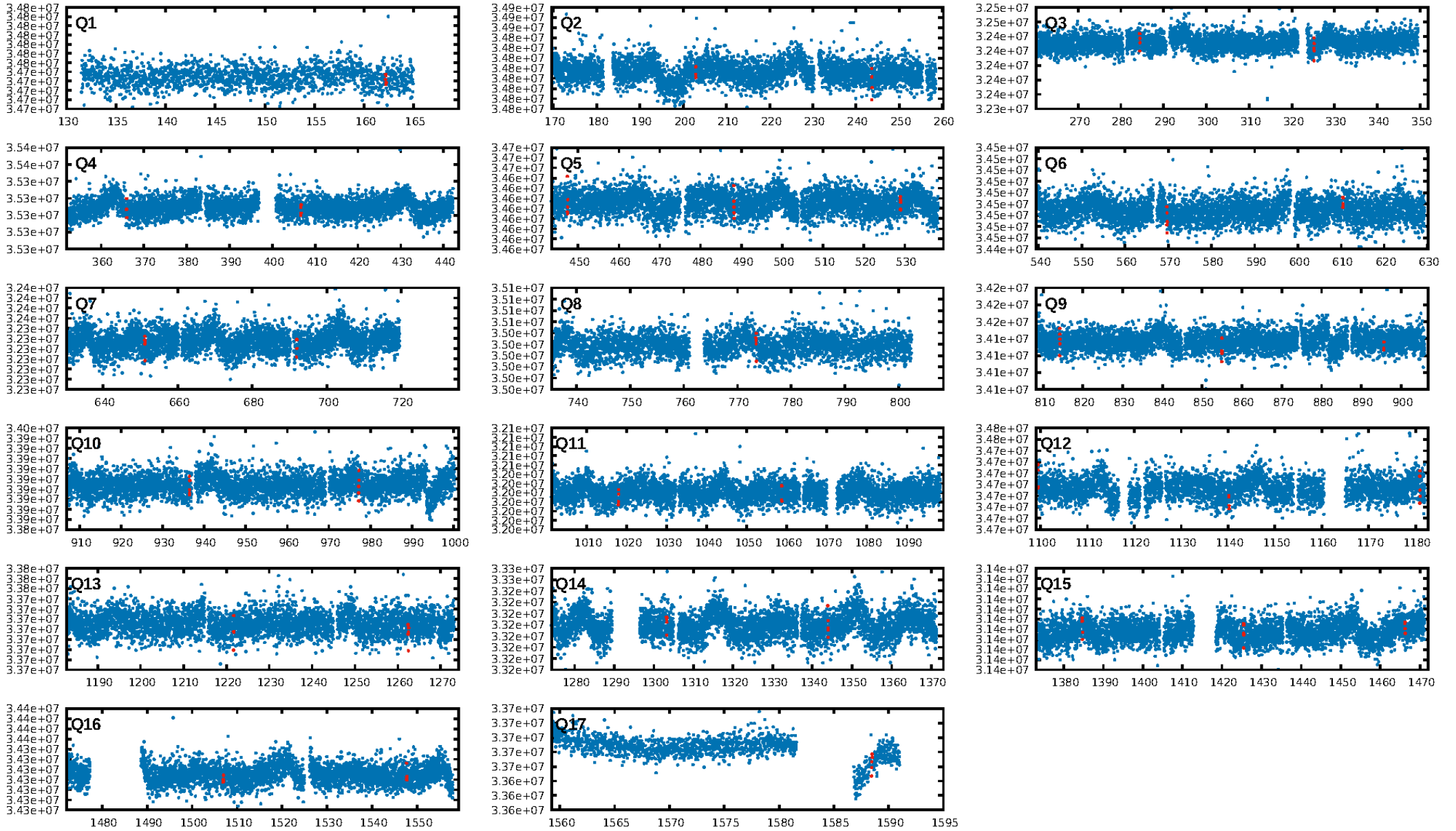
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [198.43 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 50.4%  
ModelChiSquareGof-sig: 88.3%  
**Bootstrap-pfa: 1.26e-09**  
**RollingBand-fgt: 1.00 [9/9]**  
**GhostDiagnostic-chr: 2.344**  
Centroid-sig: 5.9%  
Centroid-so: 1.032 arcsec [1.18 $\sigma$ ]  
OotOffset-rm: 2.309 arcsec [2.40 $\sigma$ ]  
KicOffset-rm: 2.250 arcsec [2.37 $\sigma$ ]  
OotOffset-st: 1/1/4/4 [10]  
KicOffset-st: 1/1/4/4 [10]  
DiffImageQuality-fgm: 0.00 [0/10]  
DiffImageOverlap-fno: 0.18 [3/17]

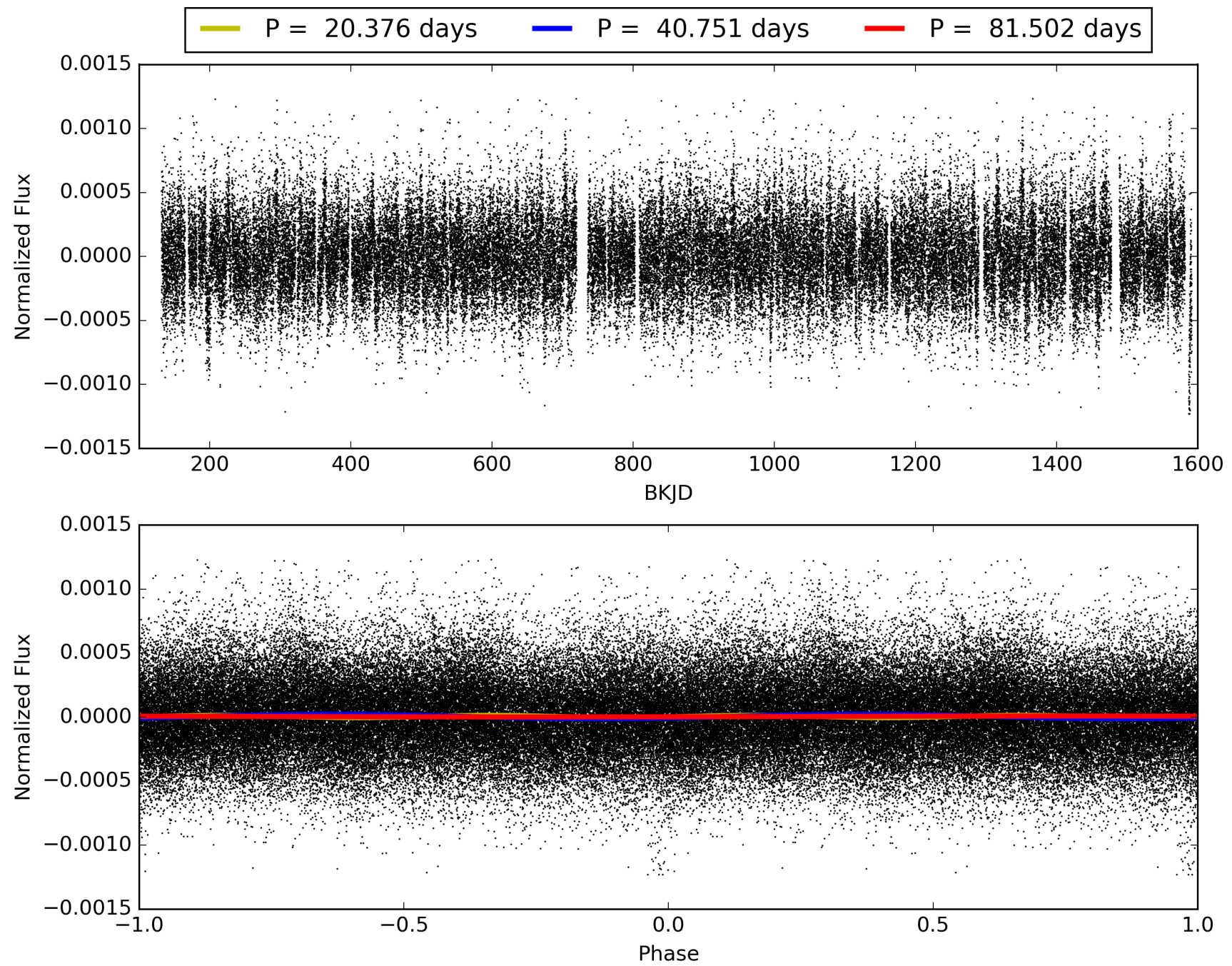
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 04:11:17 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010724621-02, PDC Light Curves



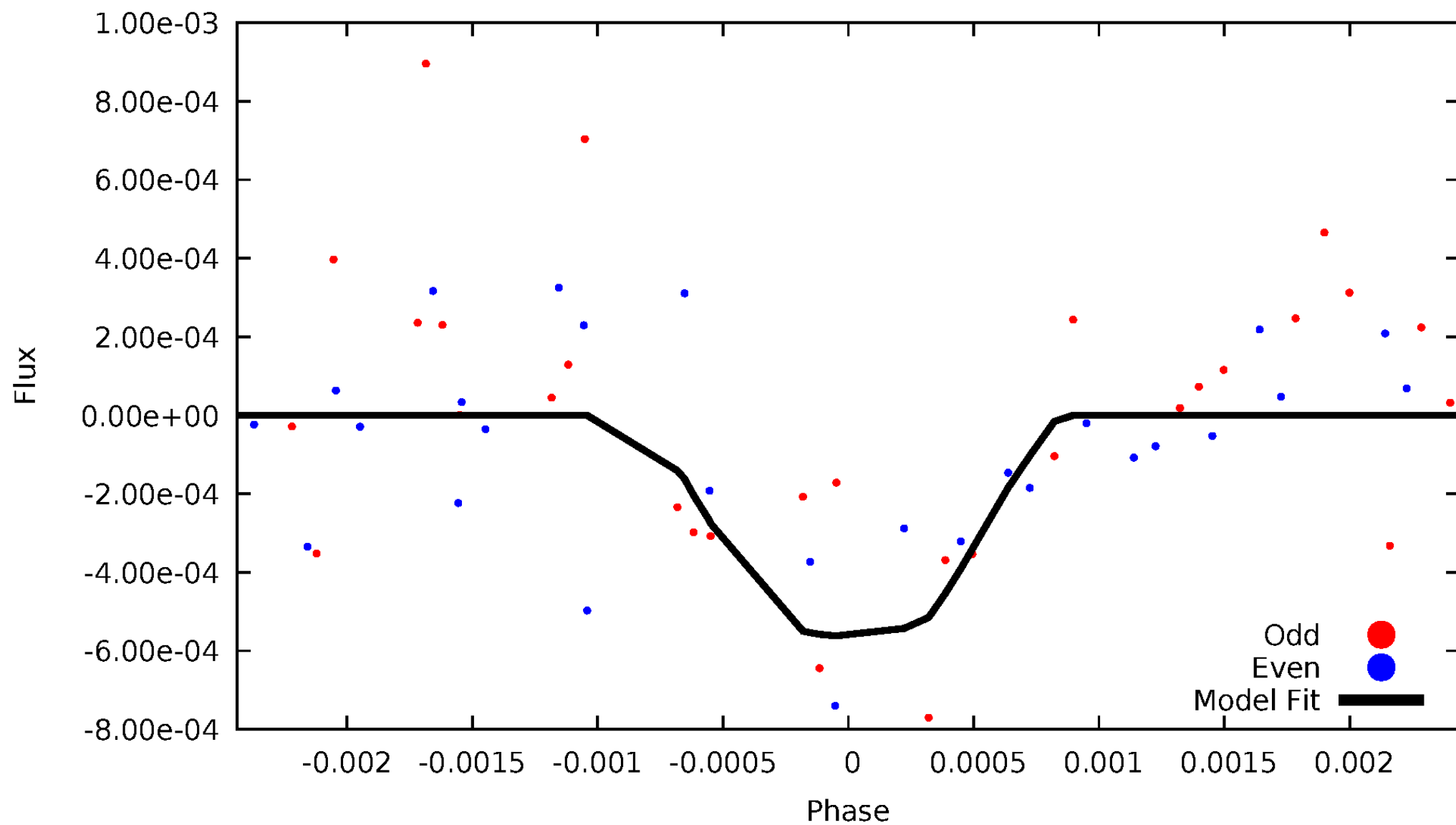
# TCE 010724621-02





# DV Odd/Even

TCE 010724621-02



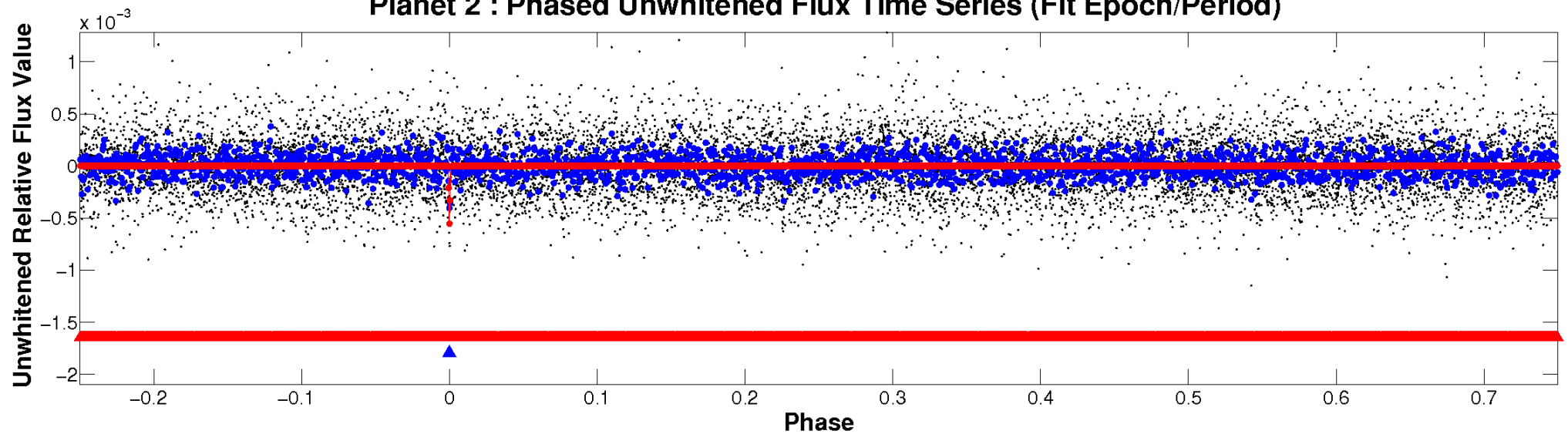


ALT Odd/Even

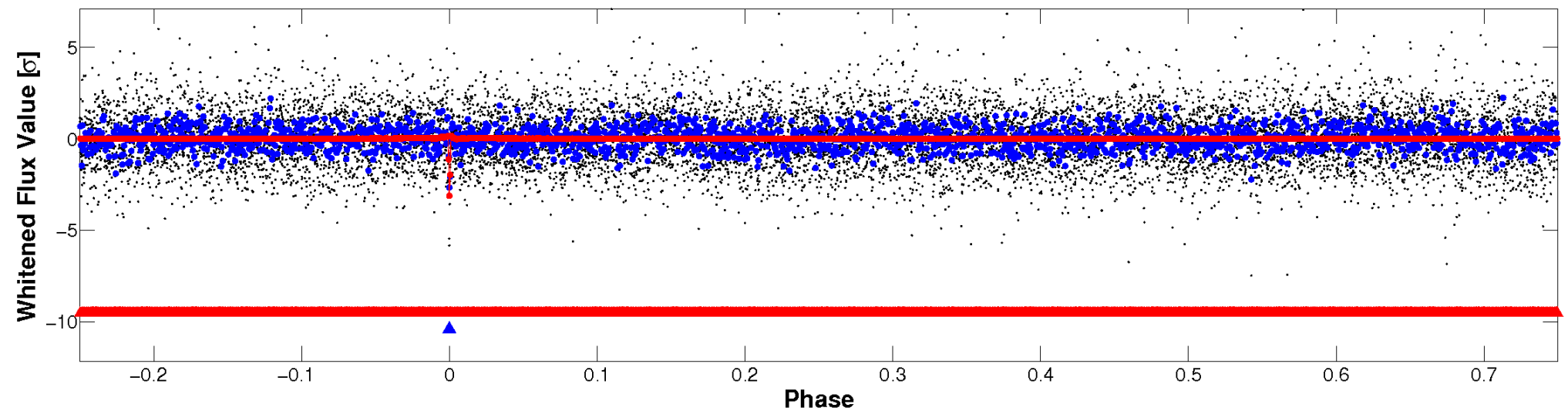
This plot does not exist for this TCE.

# Non-Whitened Vs. Whitened Light Curve

## Planet 2 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

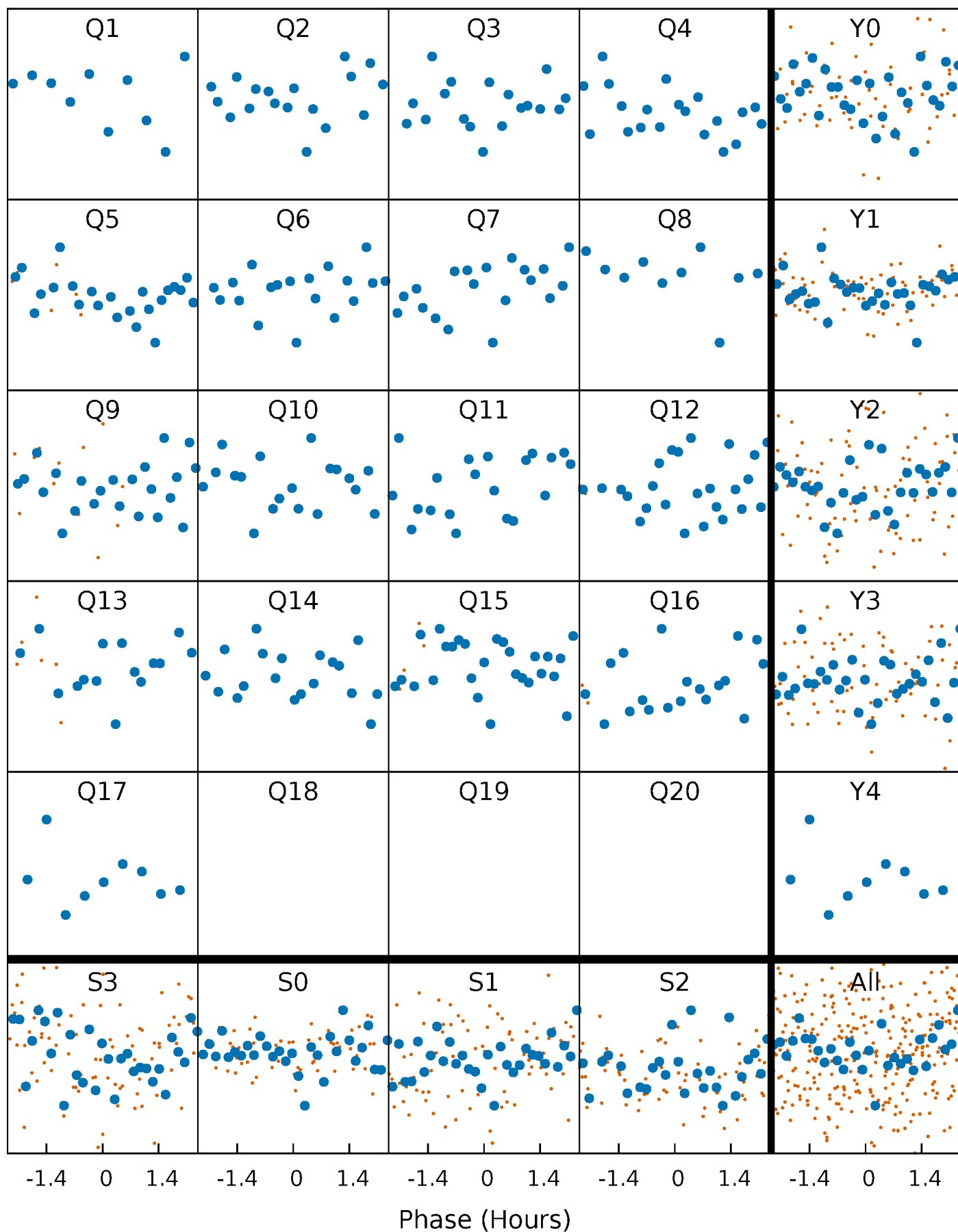


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



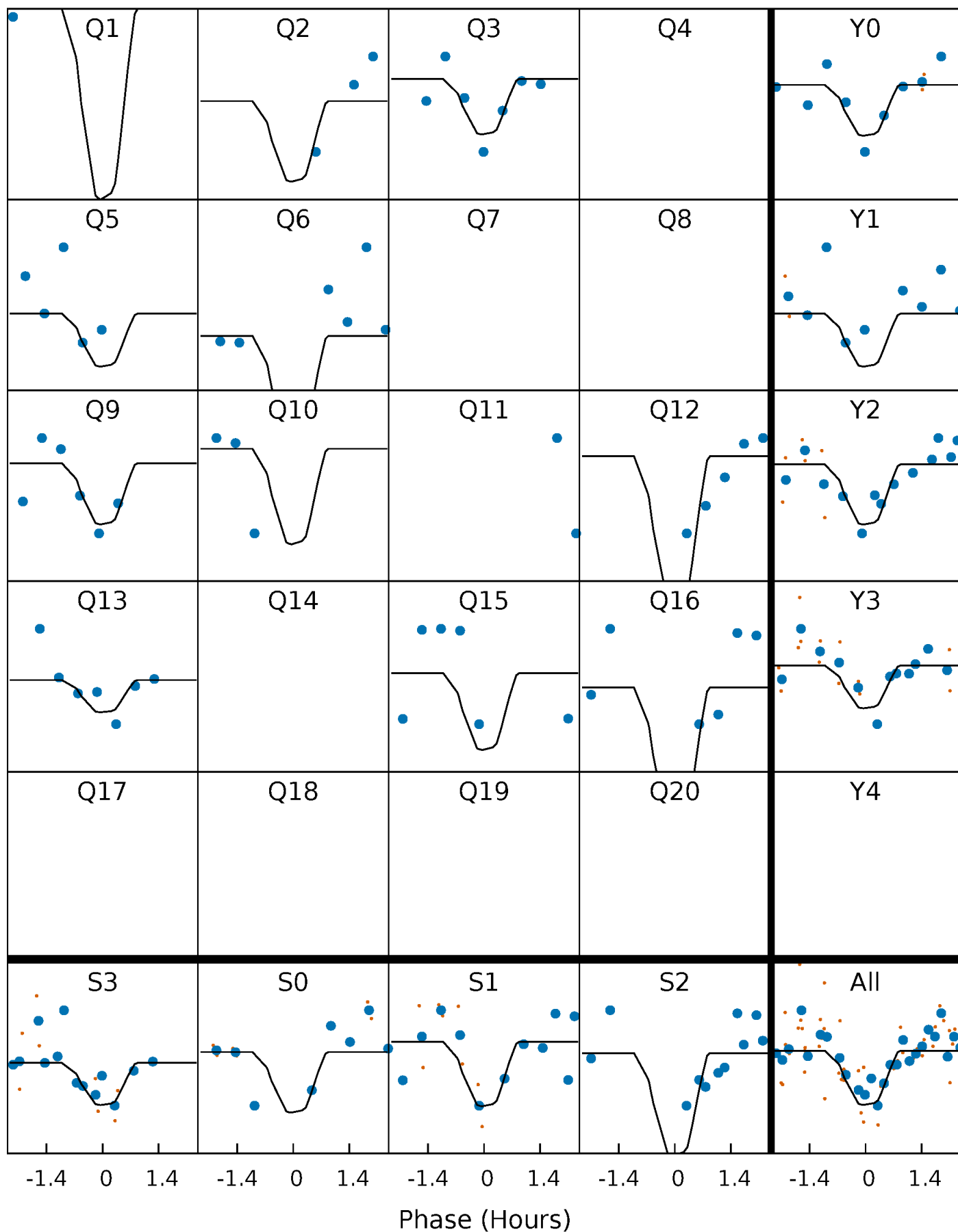
# PDC Quarter-Phased Transit Curves

TCE 010724621-02 P= 40.751114 Days  $T_0=162.178433$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 010724621-02 P= 40.751114 Days  $T_0=162.178433$  (BKJD)



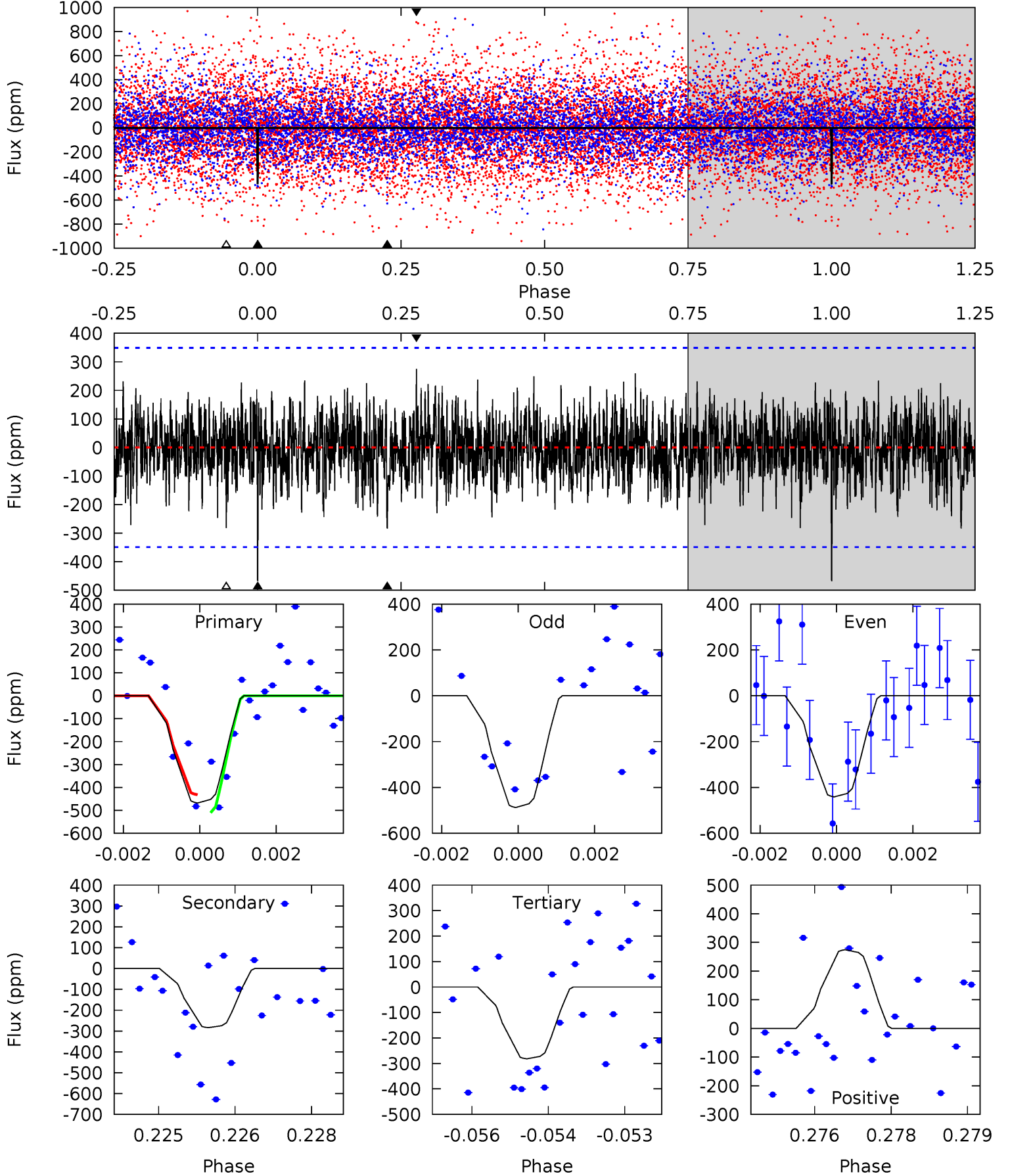


This plot does not exist for this TCE.

# DV Model-Shift Uniqueness Test

010724621-02, P = 40.751114 Days, E = 121.427319 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.21 | 4.37 | 4.34 | 4.23 | 5.37            | 3.17            | 1.28             | 2.87    | 2.98    | 0.03    | 0.14    | 0.36    | 1.02 | 0.37  | 0.61 |



## Alt Model-Shift Uniqueness Test

This plot does not exist for this TCE.

### Stellar Parameters For KIC 010724621

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6201^{+175}_{-197}$ | $4.443^{+0.070}_{-0.210}$ | $-0.240^{+0.250}_{-0.300}$ | $1.004^{+0.335}_{-0.112}$ | $1.014^{+0.147}_{-0.120}$ | $1.412^{+0.418}_{-0.764}$                 |
|        | +3%/-3%              | +2%/-5%                   | +104%/-125%                | +33%/-11%                 | +14%/-12%                 | +30%/-54%                                 |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010724621-02 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$     | $T_{obs} (K)$         | $A_{obs}$            |
|---------|---------------|------------------------|-------------------|-----------------------|----------------------|
| DV      | $-284 \pm 65$ | $5.48^{+6.07}_{-3.73}$ | $806^{+59}_{-40}$ | $3972^{+2532}_{-813}$ | $272^{+2454}_{-212}$ |
| Alt.    | N/A           | N/A                    | N/A               | N/A                   | N/A                  |

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming A=0.3)

$A_{obs}$  = Observed Albedo (Assuming T=0)

If a secondary eclipse is present, the system is likely an EB if  $T_{obs} \gg T_{max}$  AND  $A_{obs} \gg 1.0$

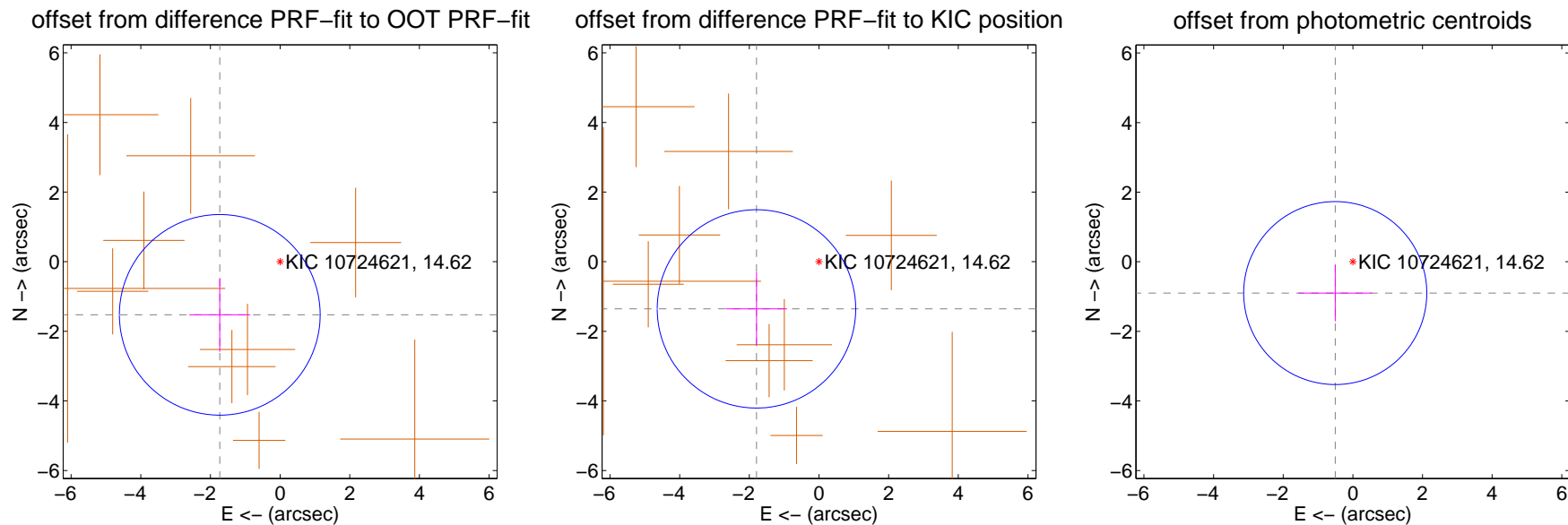
## DV Centroid Data

Supplemental centroid analysis for 010724621-02. Kepler magnitude: 14.62. Transit SNR 9.89

There are 0 quarters with good PRF difference image offsets

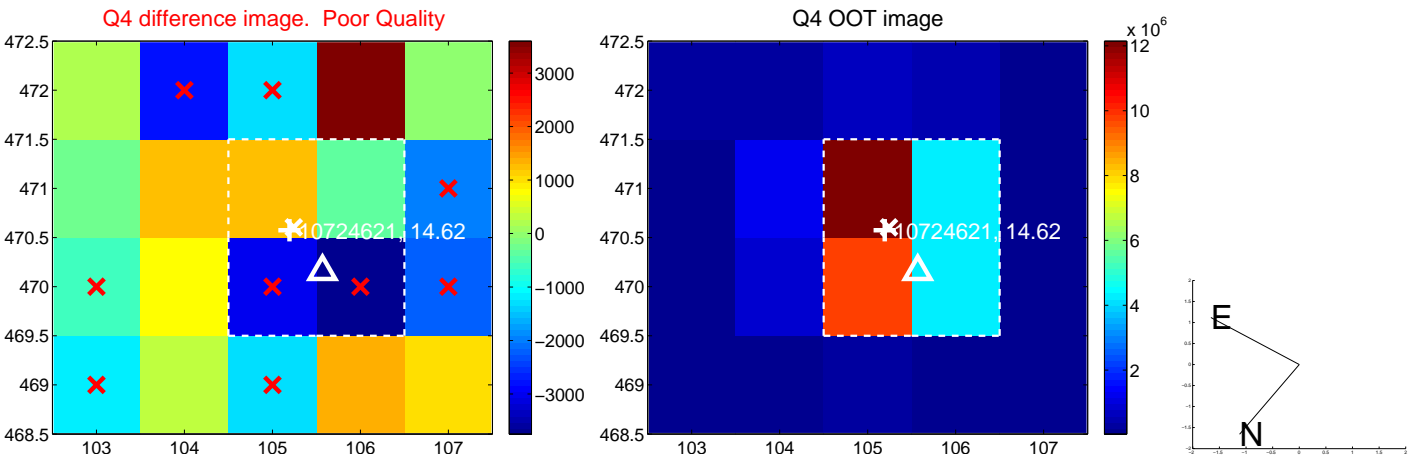
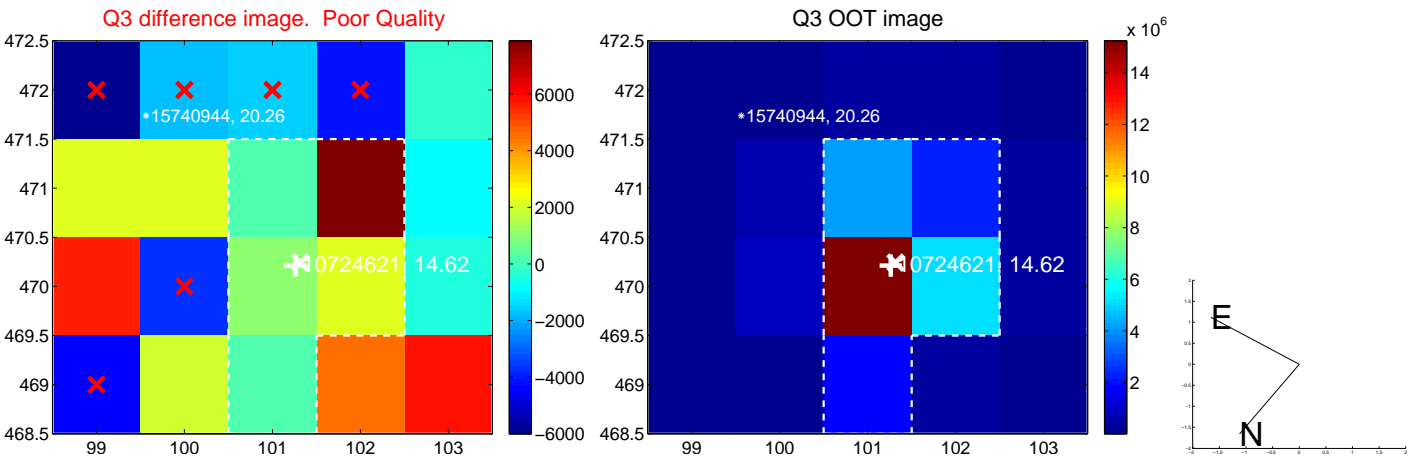
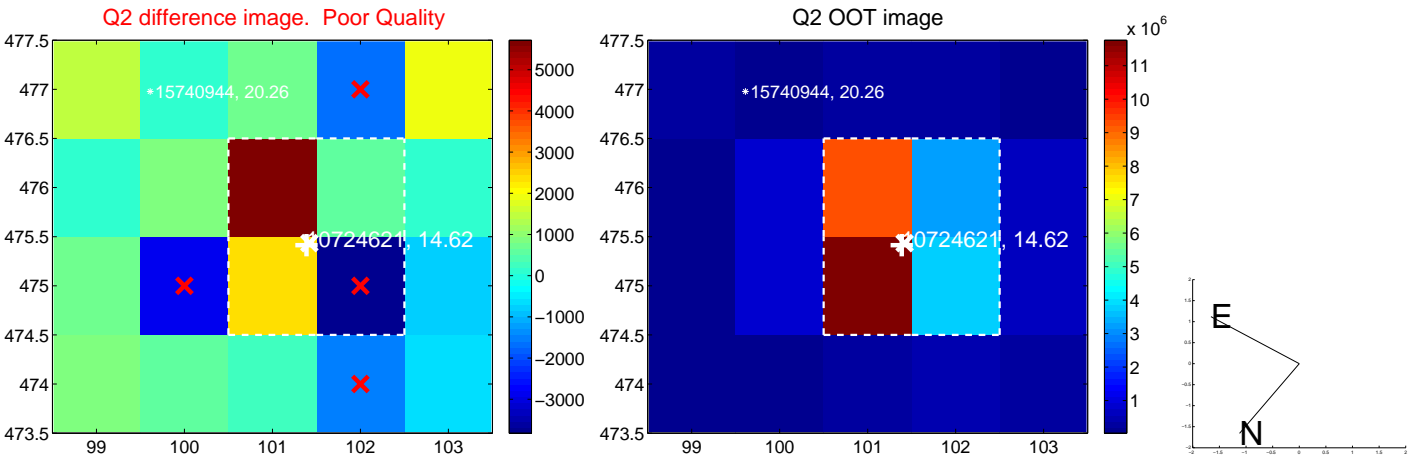
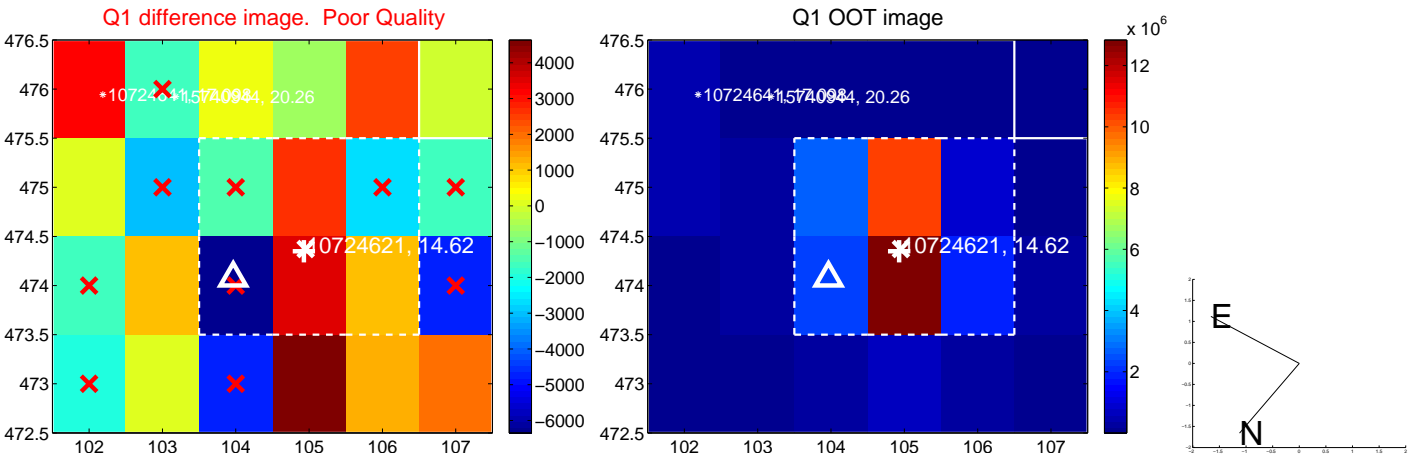
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $2.309 \pm 0.961$  | 2.40                | $1.732 \pm 0.877$ | $-1.527 \pm 1.059$ |
| PRF-fit source offset from KIC position | $2.250 \pm 0.950$  | 2.37                | $1.795 \pm 0.879$ | $-1.356 \pm 1.061$ |
| photometric centroid source offset      | $1.03 \pm 0.88$    | 1.18                | $0.51 \pm 1.06$   | $-0.90 \pm 0.81$   |



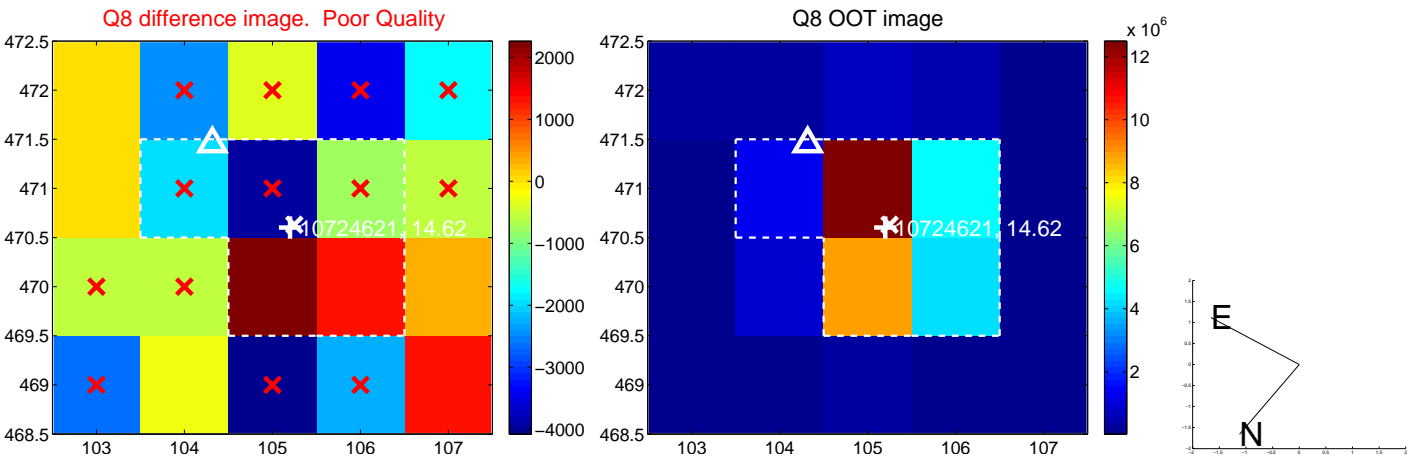
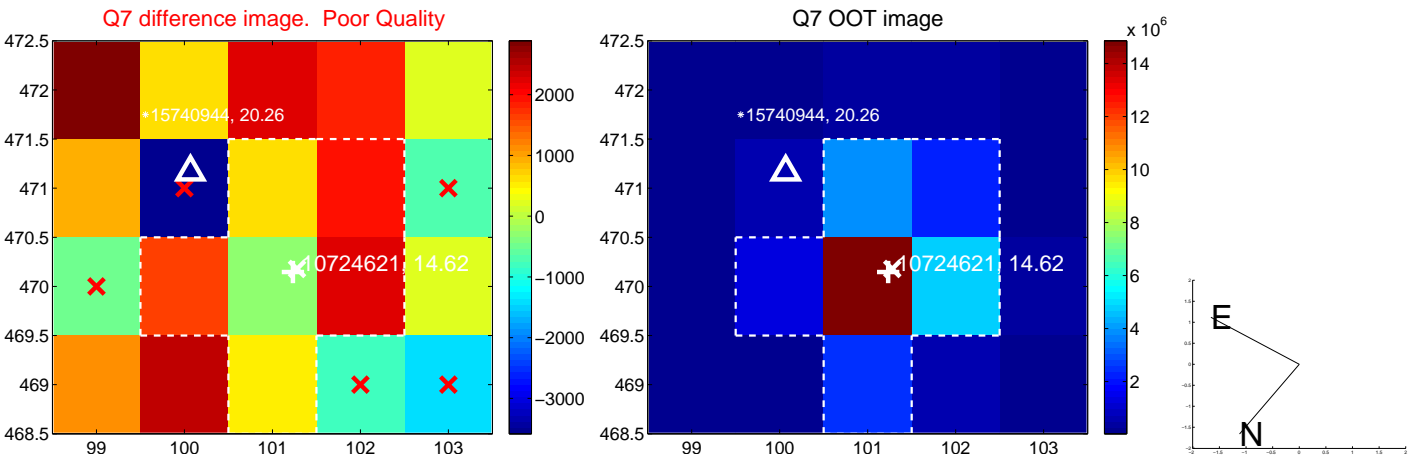
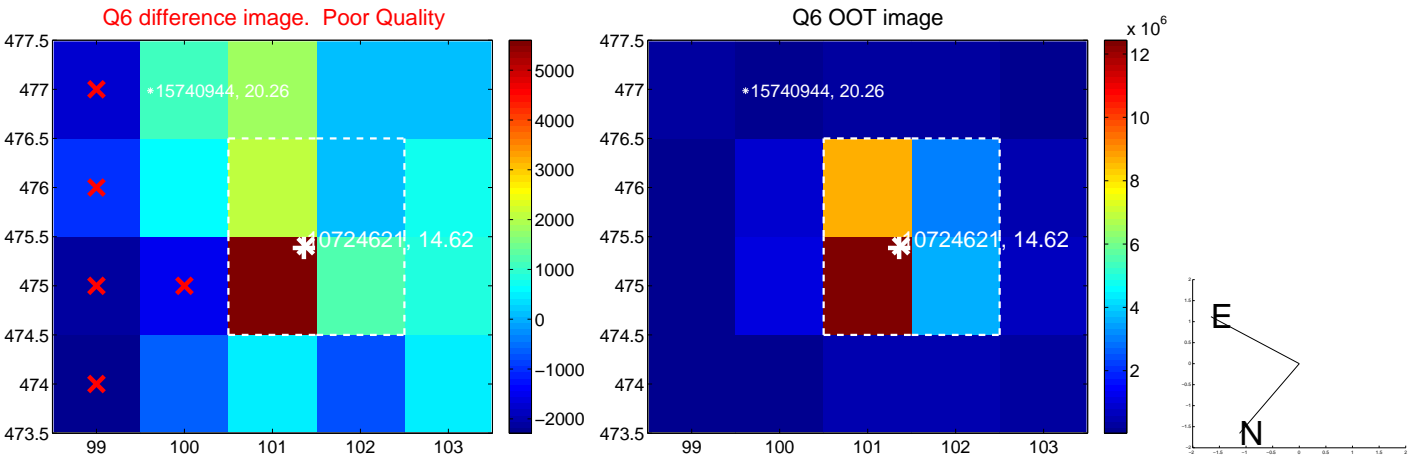
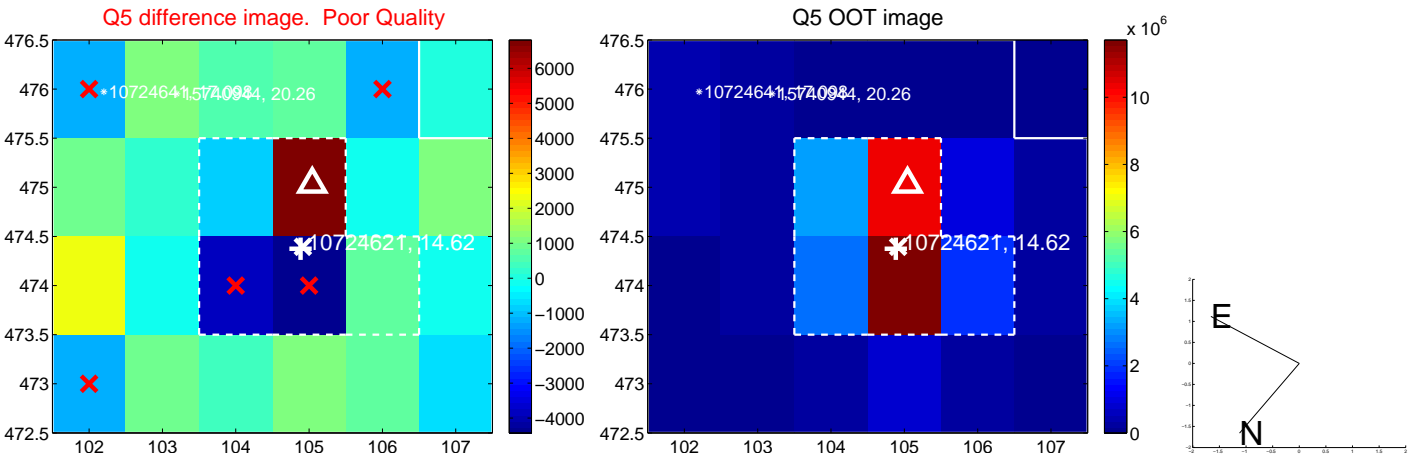
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

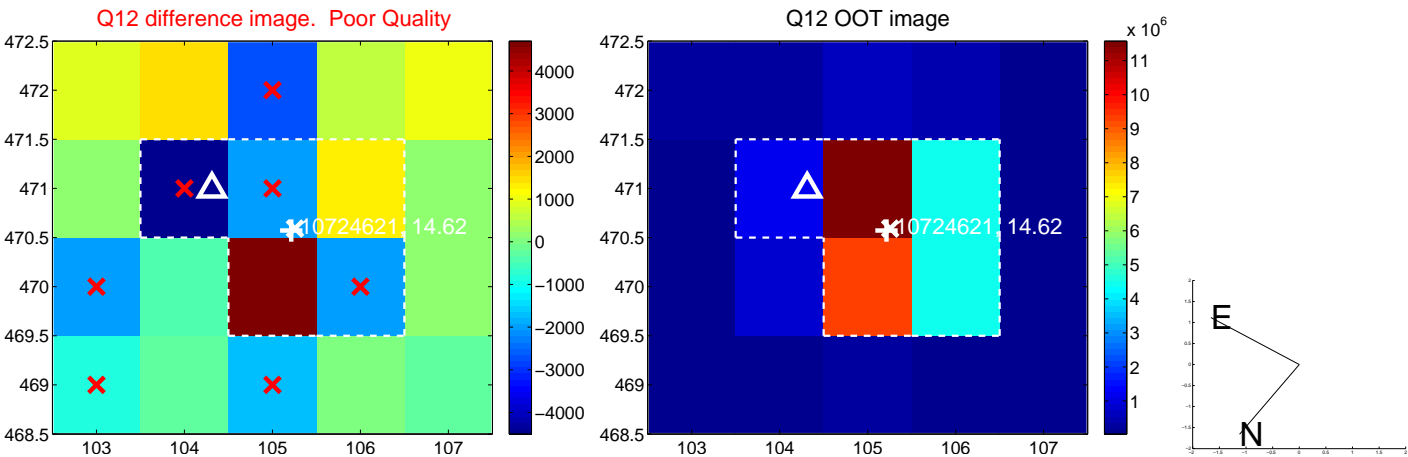
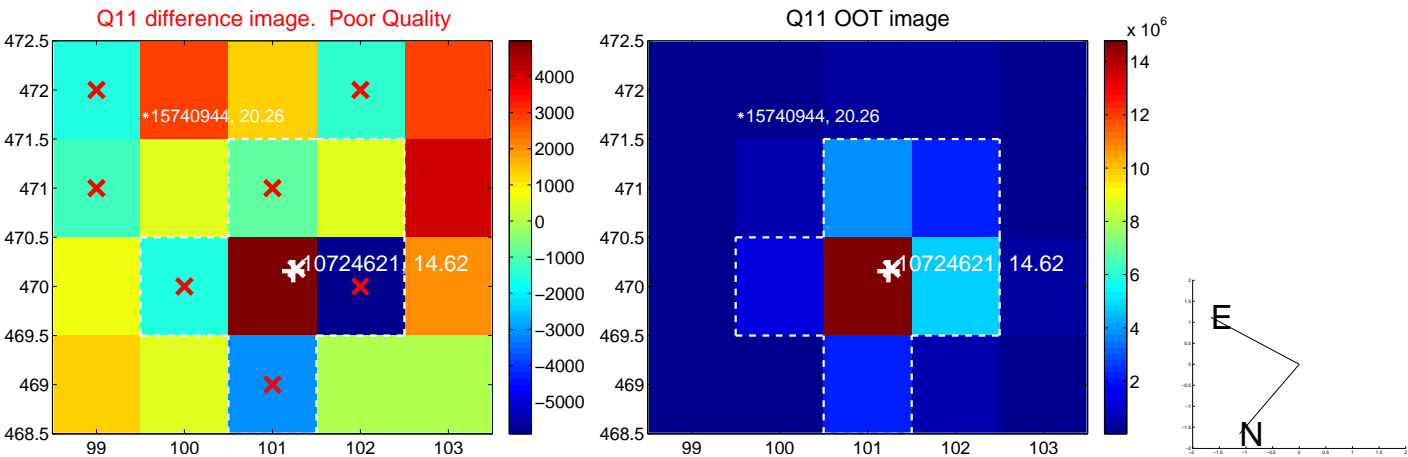
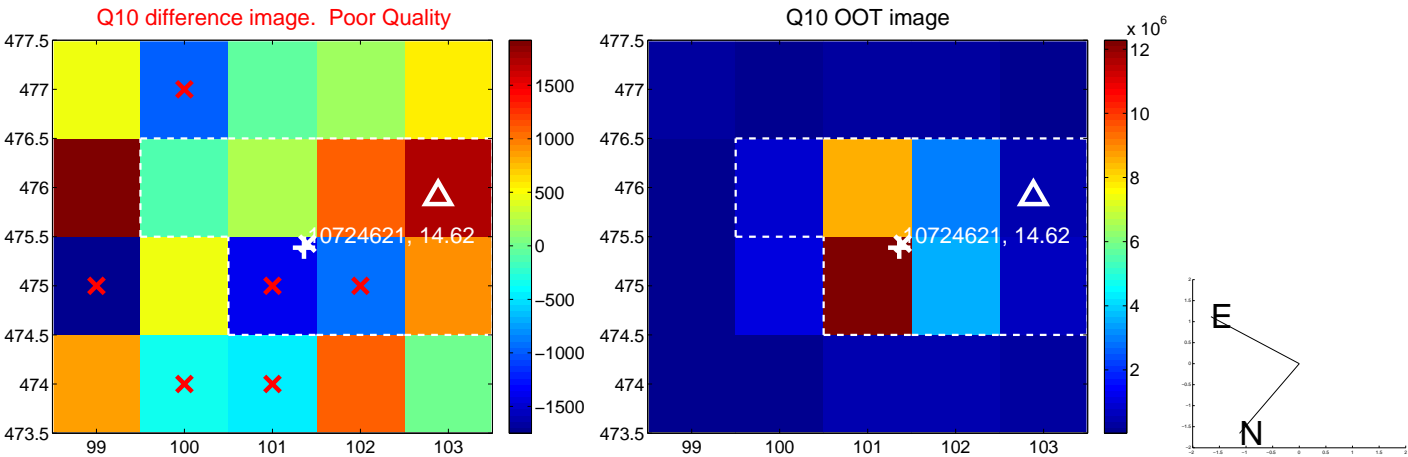
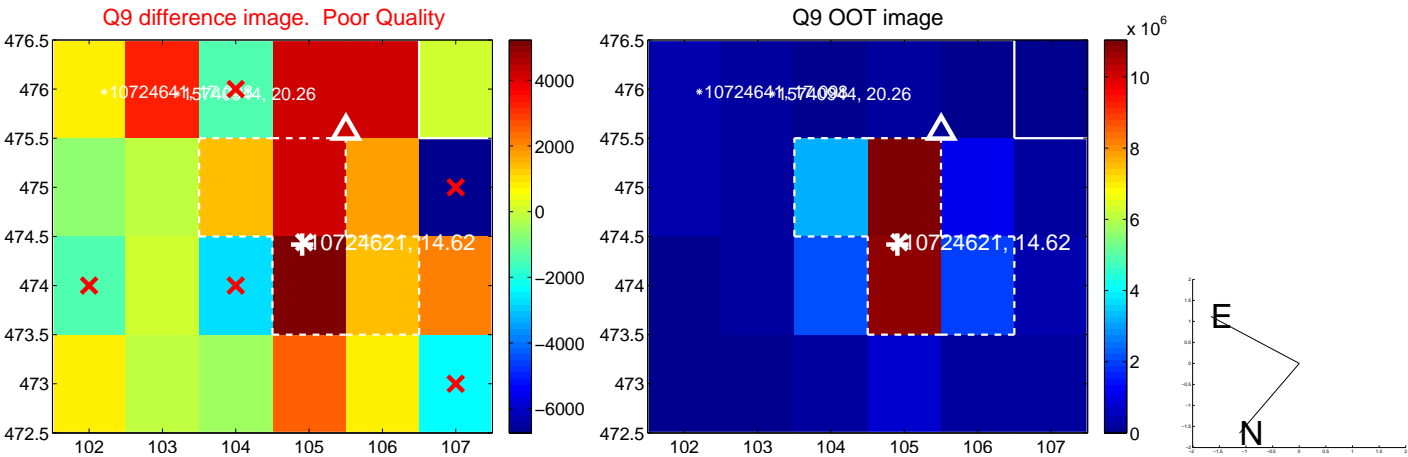




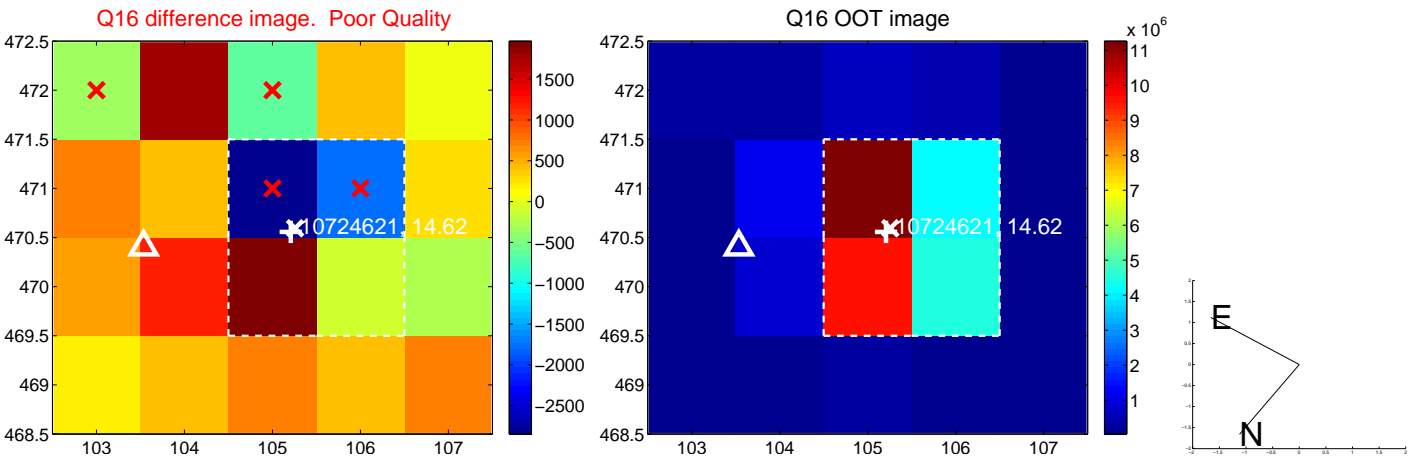
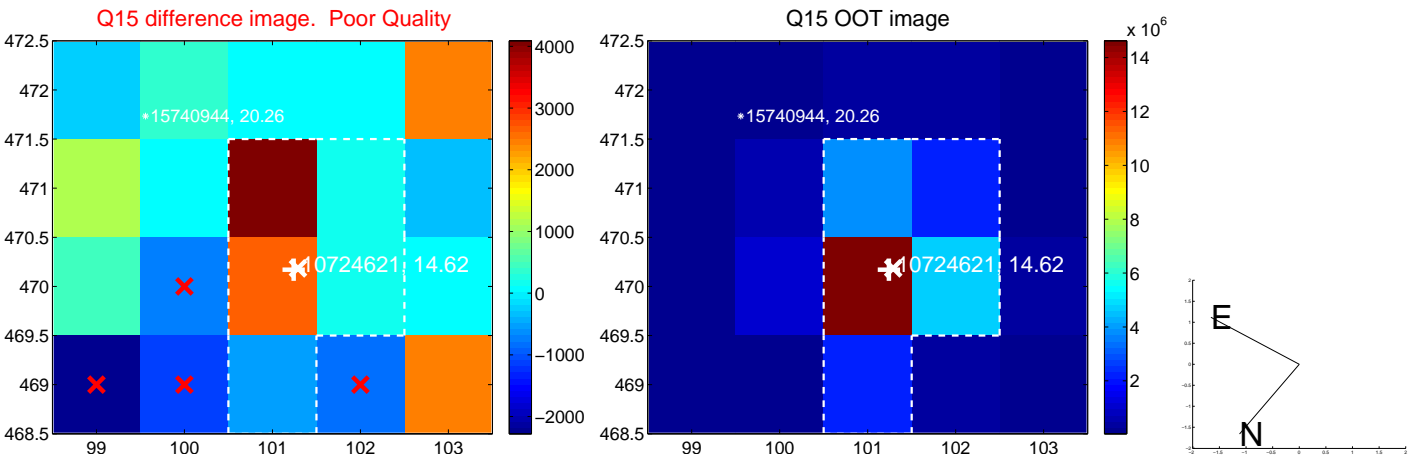
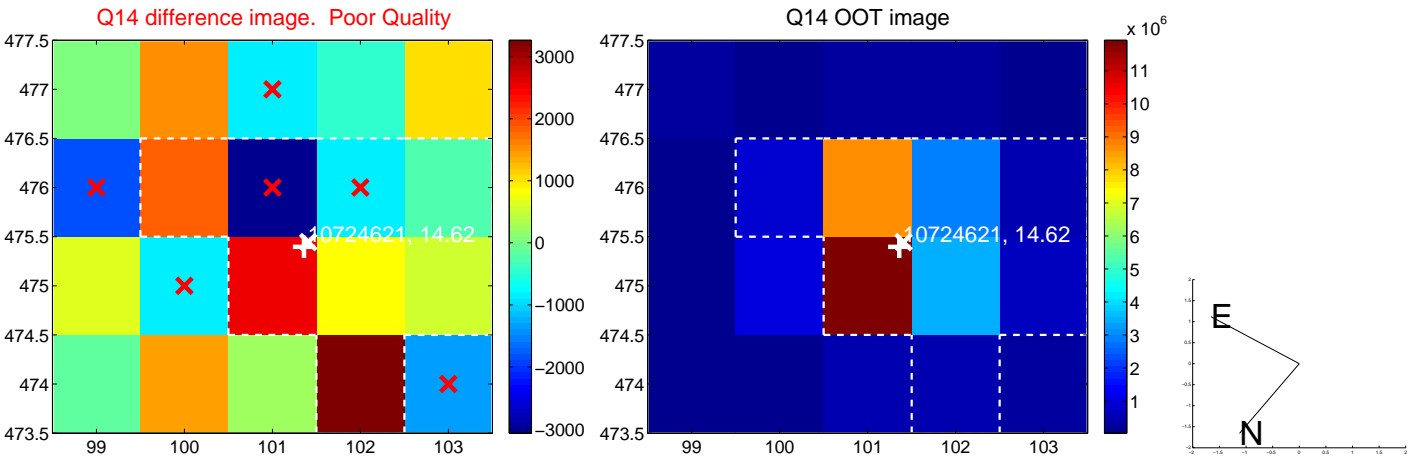
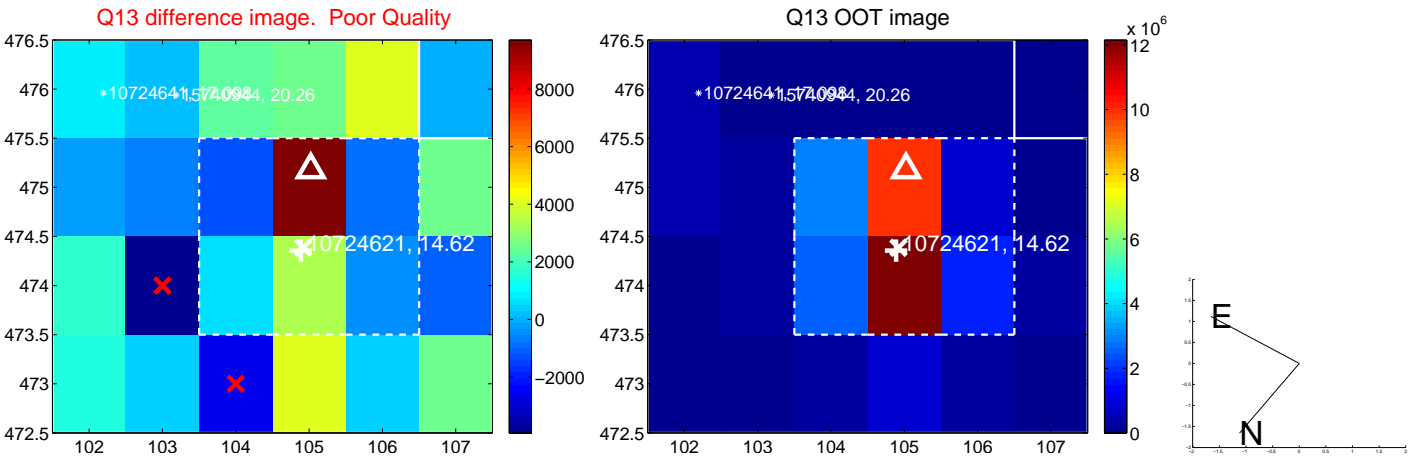
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



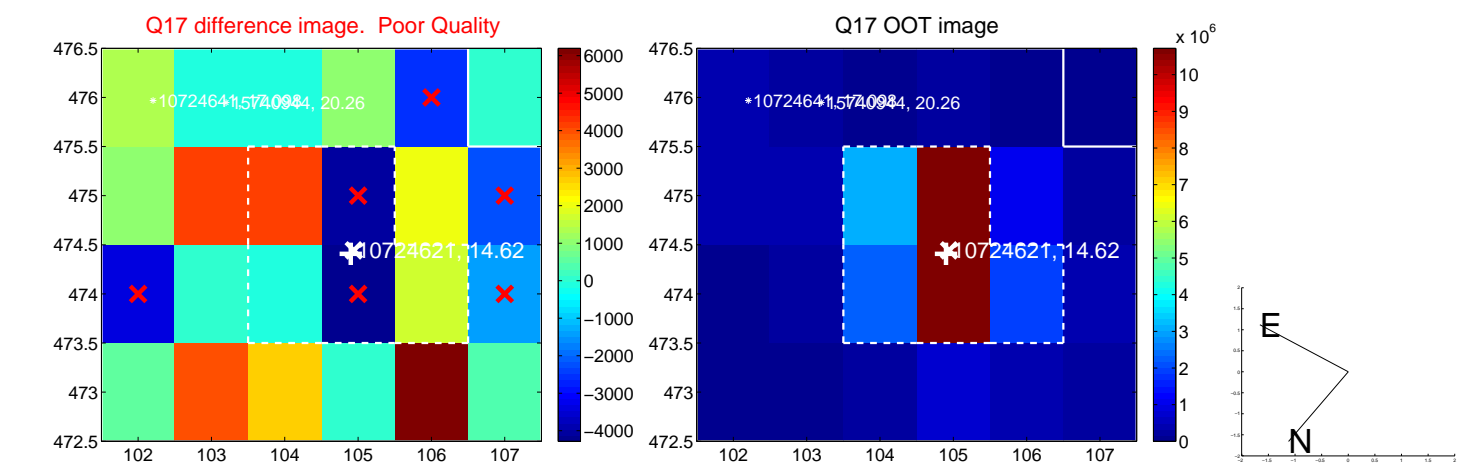
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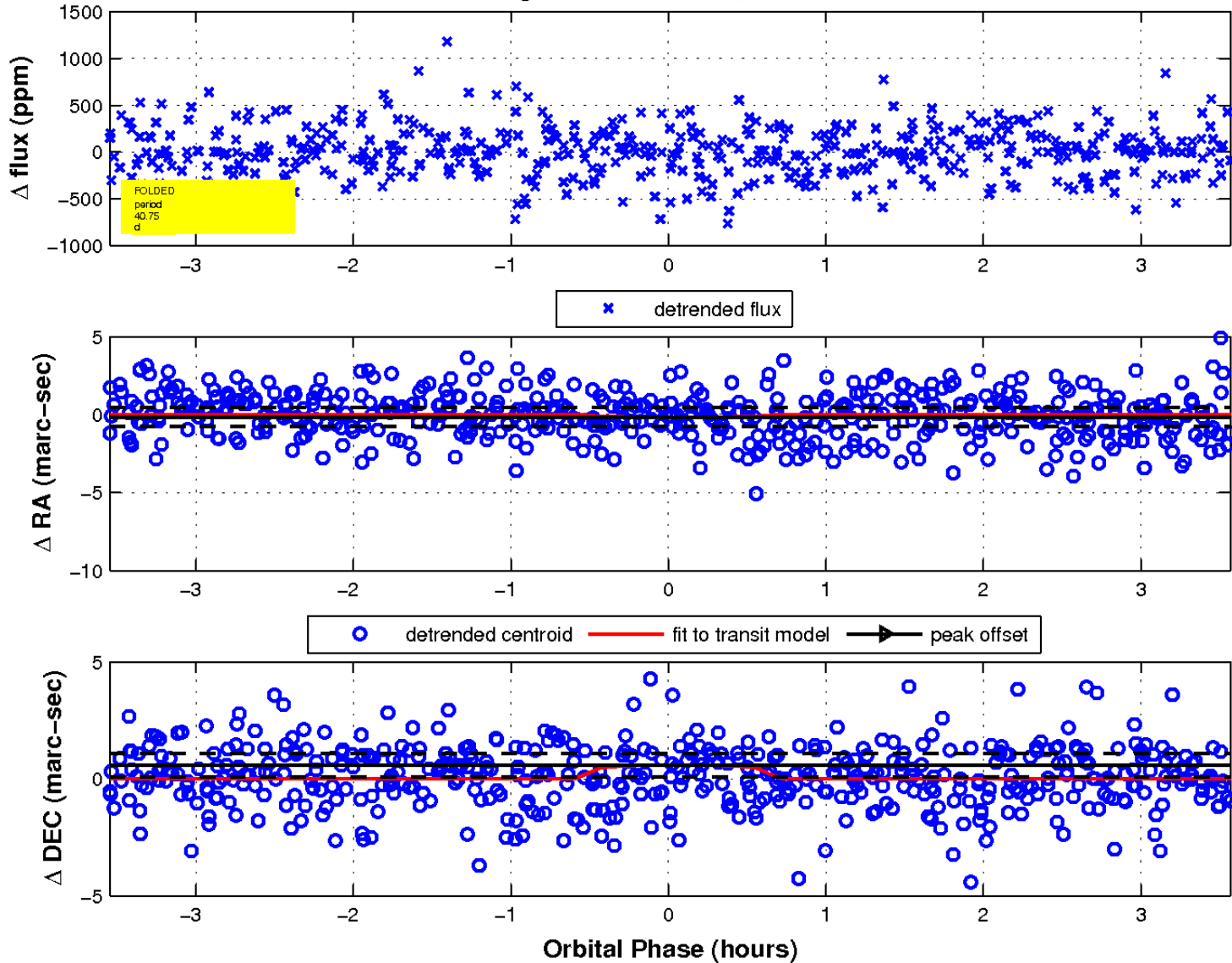
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fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

