

# KIC 006721044

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 006721044-01 | OBS      | No   | 492.489985    | 391.994566   | 665.7       | 4.075            | 11.8 | 4.4 | 1.90                        | 5578            | 5.18                   | 1.97                   |
| 006721044-02 | OBS      | No   | 225.154094    | 355.172737   | 814.2       | 3.269            | 9.2  | 7.0 | 1.90                        | 5578            | 5.56                   | 5.59                   |
| 006721044-03 | OBS      | No   | 0.563501      | 131.874349   | 9.5         | 1.022            | 8.1  | 1.8 | 1.90                        | 5578            | 0.71                   | 16440.25               |
| 006721044-05 | OBS      | No   | 456.246278    | 186.971169   | 1082.2      | 3.570            | 10.5 | 5.5 | 1.90                        | 5578            | 6.95                   | 2.18                   |
| 006721044-06 | OBS      | No   | 389.569679    | 366.871550   | 122.7       | 4.179            | 10.4 | 0.5 | 1.90                        | 5578            | 2.54                   | 2.69                   |
| 006721044-07 | OBS      | No   | 223.351808    | 353.554215   | 278.6       | 3.849            | 8.6  | 1.7 | 1.90                        | 5578            | 3.16                   | 5.65                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 006721044-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS   |
| 006721044-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 006721044-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST  |
| 006721044-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—CENT_FEW_DIFFS   |
| 006721044-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                    |
| 006721044-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

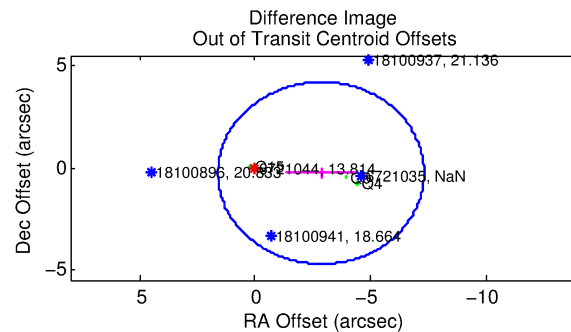
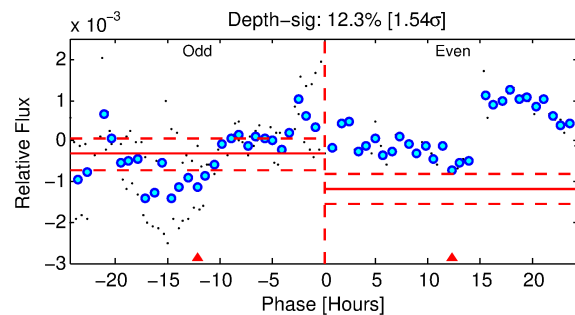
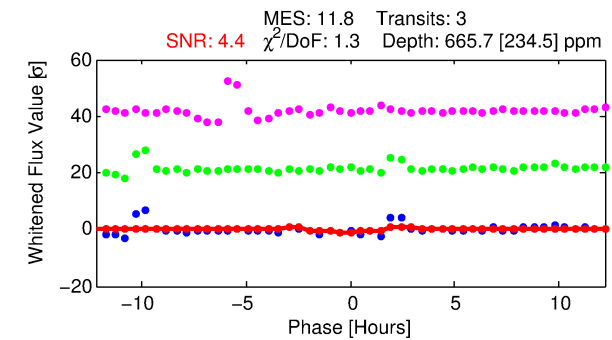
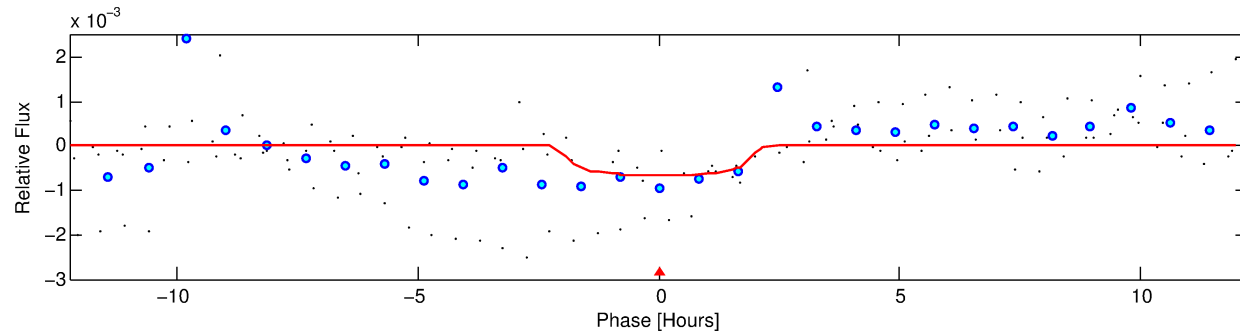
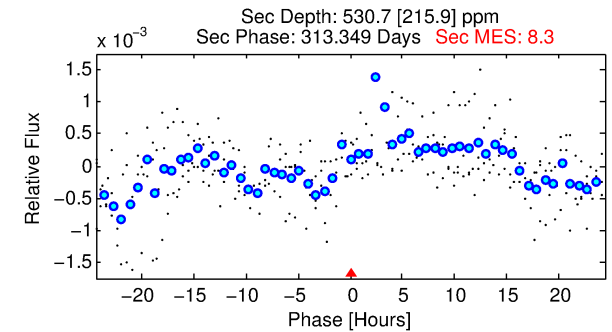
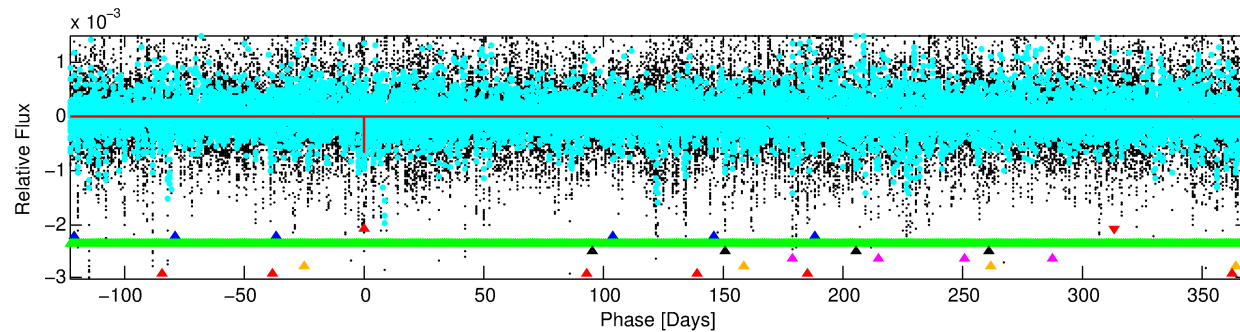
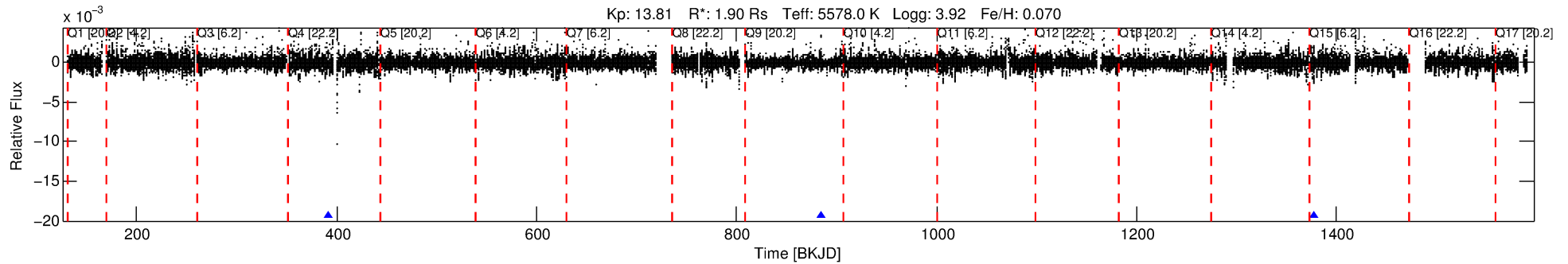
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 006721044-01

No Significant Match Found

# DV One-Page Summary

KIC: 6721044 Candidate: 1 of 7 Period: 492.490 d



## DV Fit Results:

Period = 492.48998 [0.01156] d  
Epoch = 391.9946 [0.0139] BKJD  
Rp/R\* = 0.0249 [0.0566]  
a/R\* = 722.97 [6711.82]  
b = 0.66 [8.01]  
Seff = 1.97 [1.72]  
Teq = 302 [66] K  
Rp = 5.18 [12.04] Re  
a = 1.2635 [0.6563] AU  
Ag = 17372.16 [80602.50] [0.22 $\sigma$ ]  
Teffp = 5361 [6112] K [0.83 $\sigma$ ]

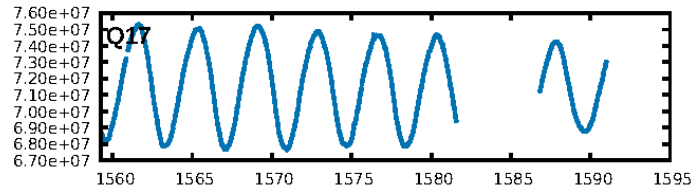
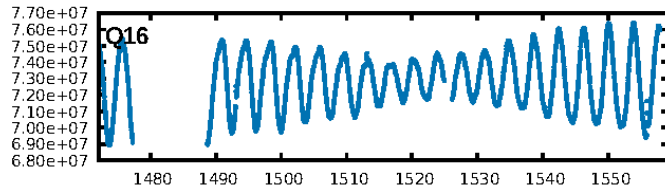
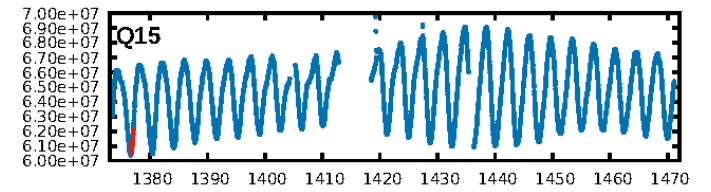
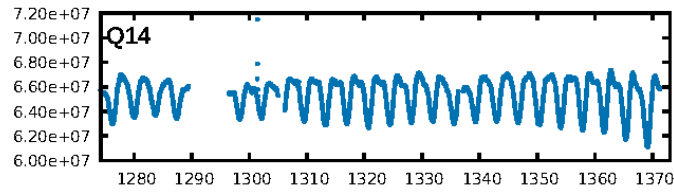
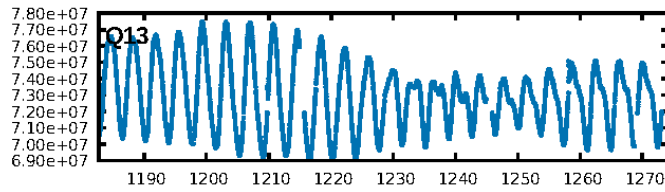
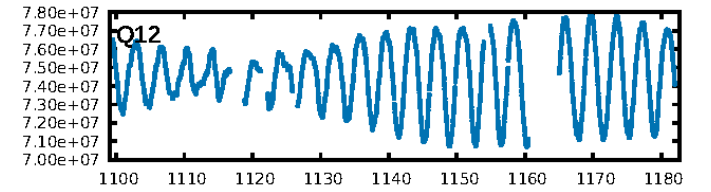
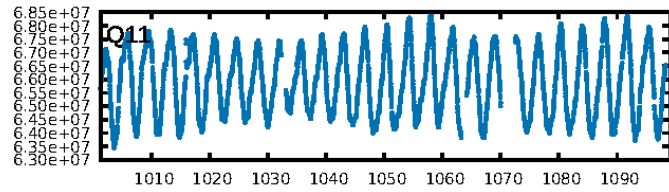
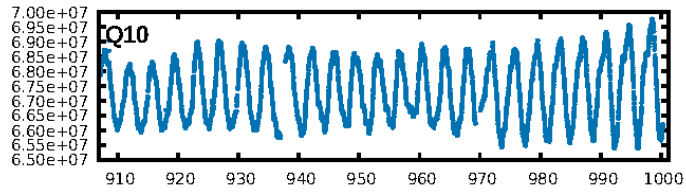
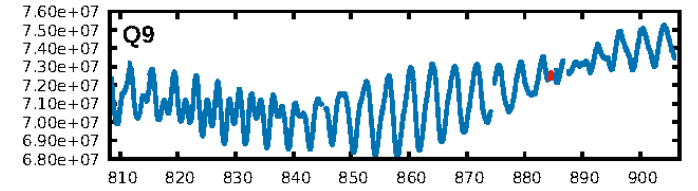
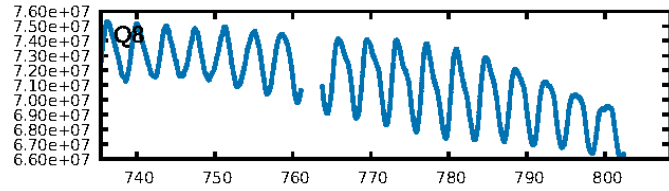
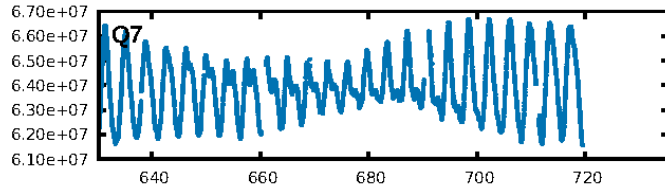
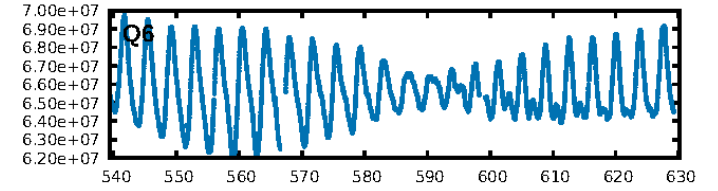
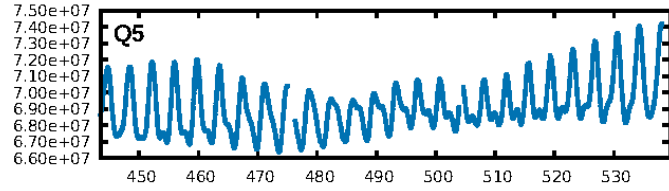
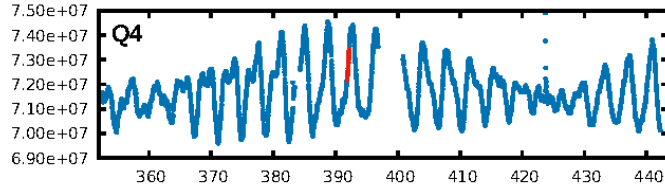
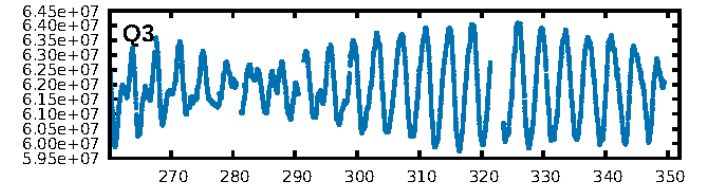
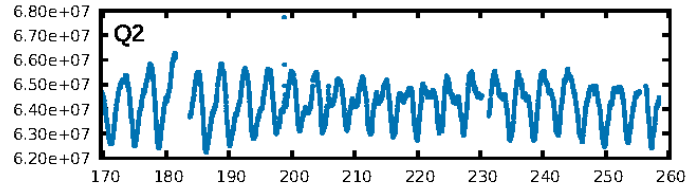
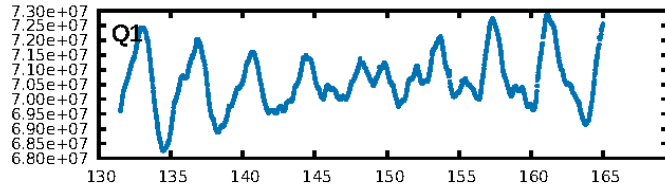
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [160.56 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 3.6%  
ModelChiSquareGof-sig: 81.6%  
**Bootstrap-pfa: 1.47e-11**  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: 0.3887**  
Centroid-sig: 57.3%  
Centroid-so: 0.878 arcsec [0.40 $\sigma$ ]  
OotOffset-rm: 2.857 arcsec [1.92 $\sigma$ ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-rm: 3.180 arcsec [2.11 $\sigma$ ]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 0.00 [0/3]

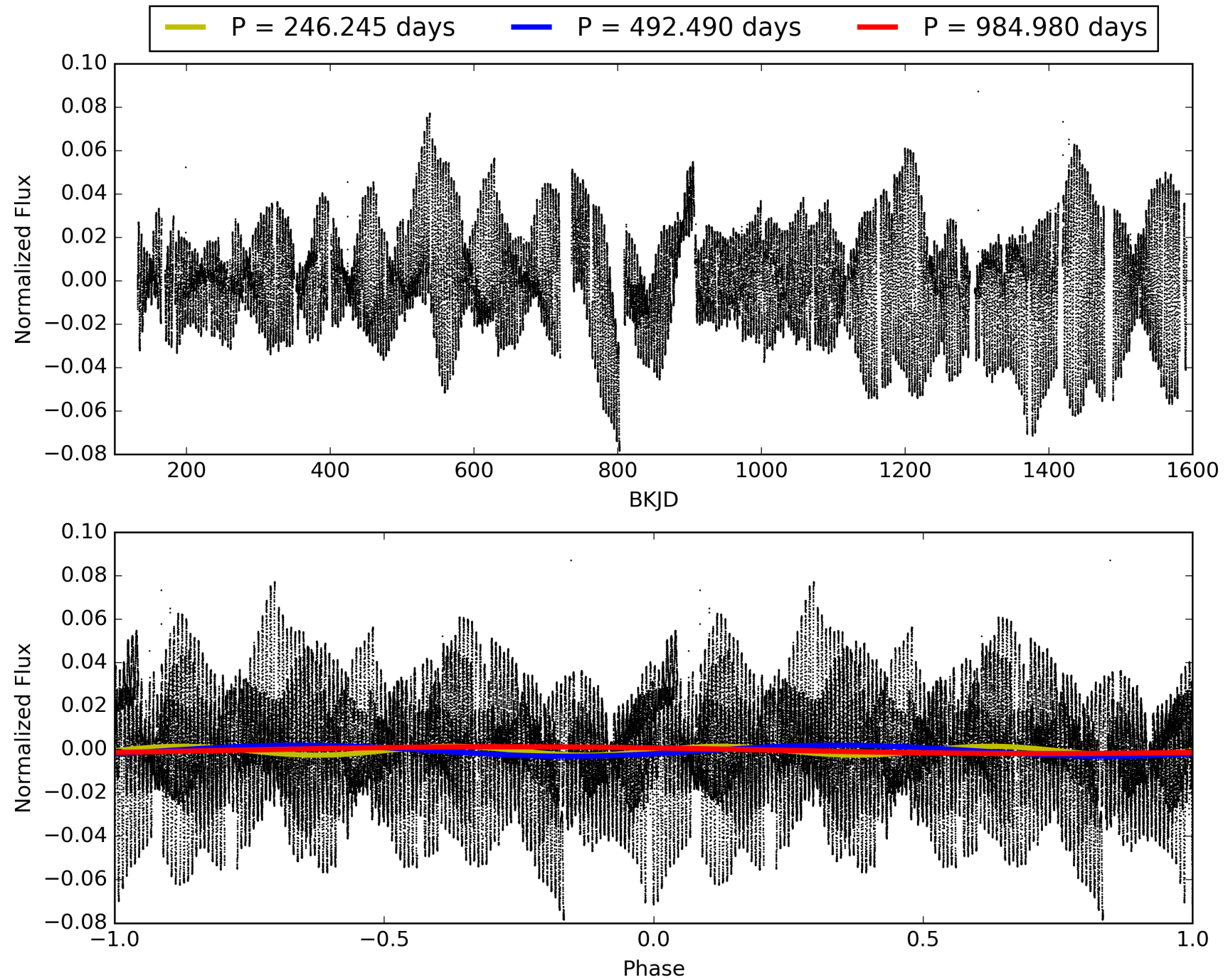
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 06:50:53 Z

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

# TCE 006721044-01, PDC Light Curves



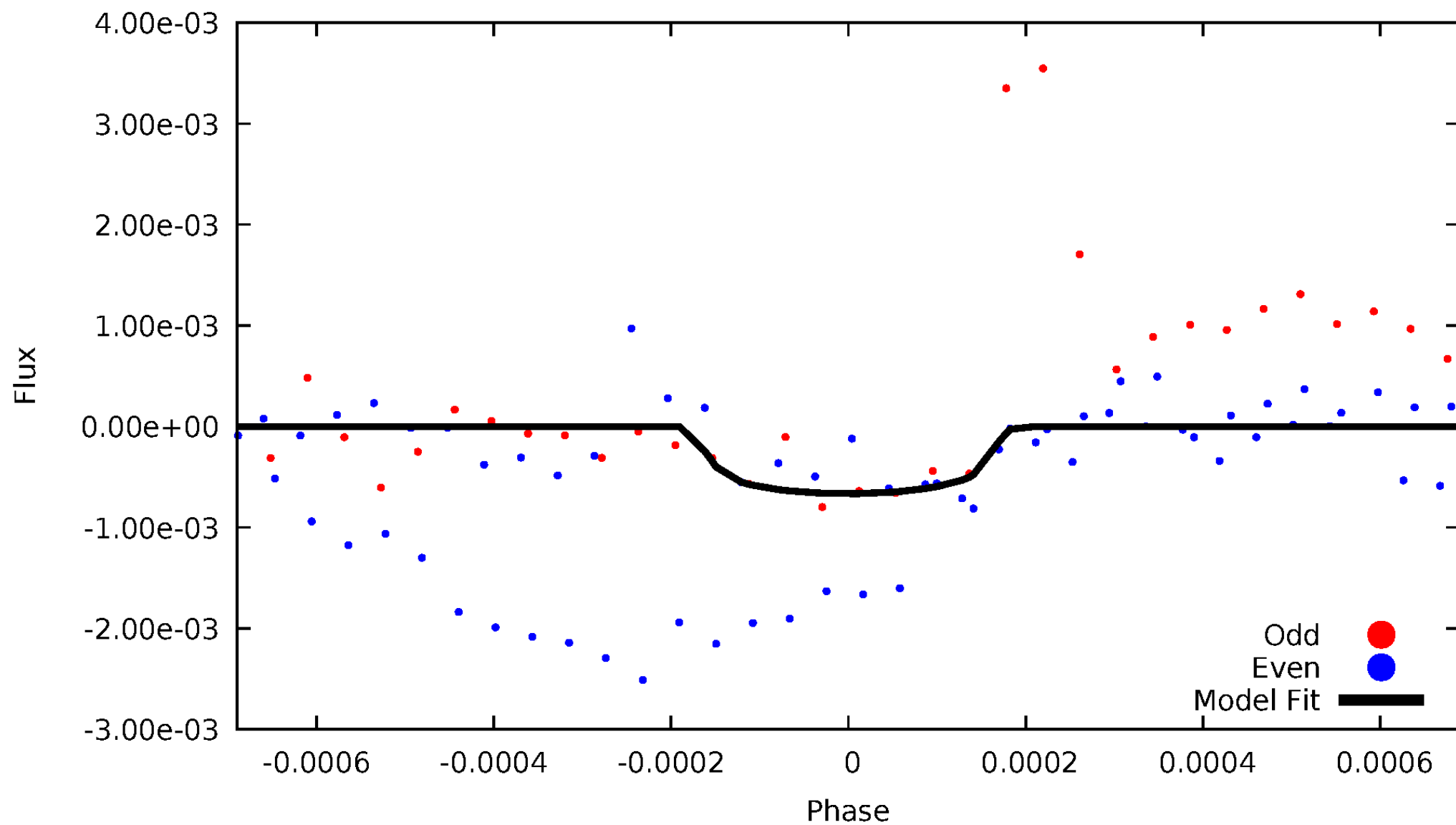
TCE 006721044-01





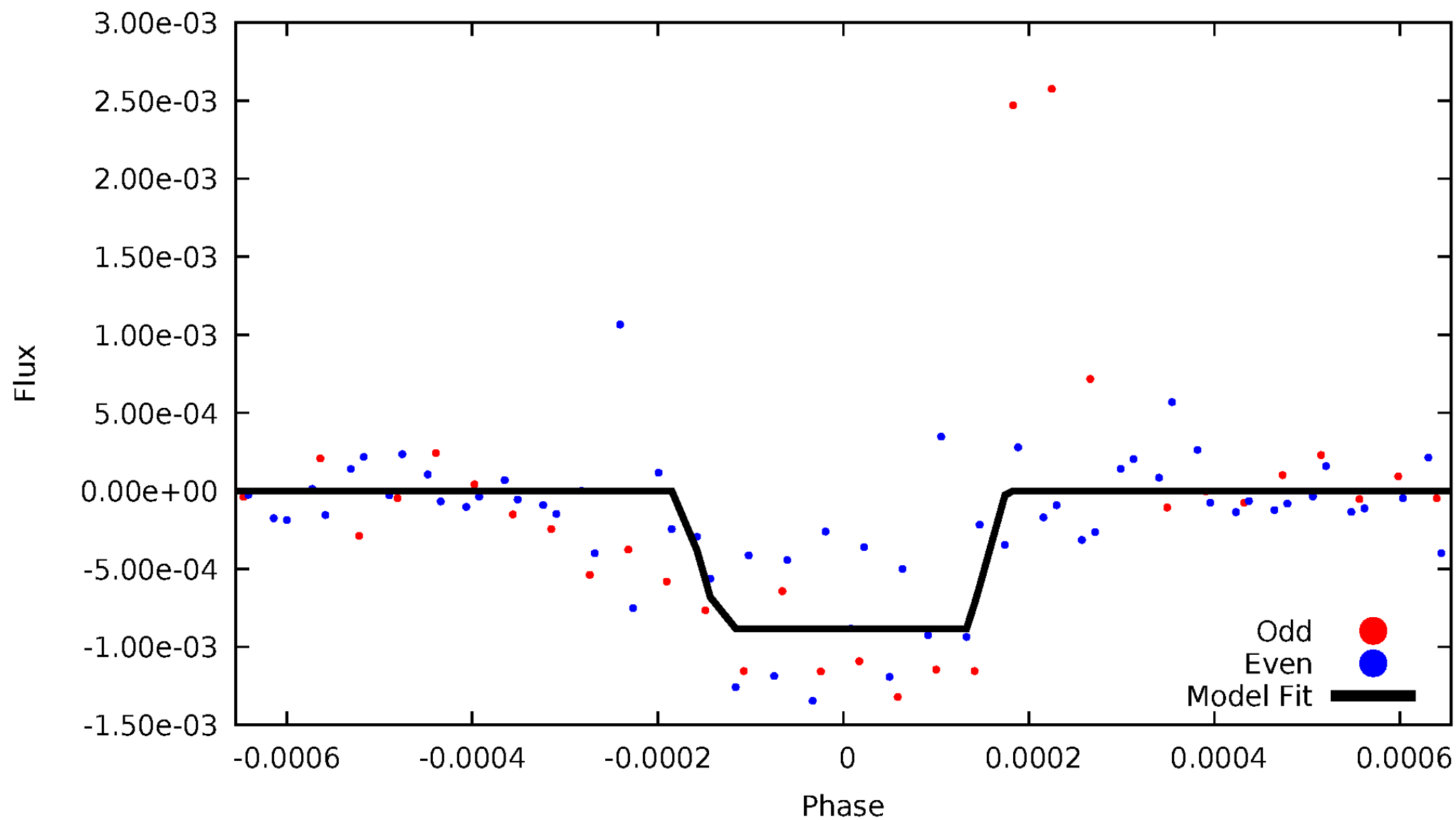
# DV Odd/Even

TCE 006721044-01



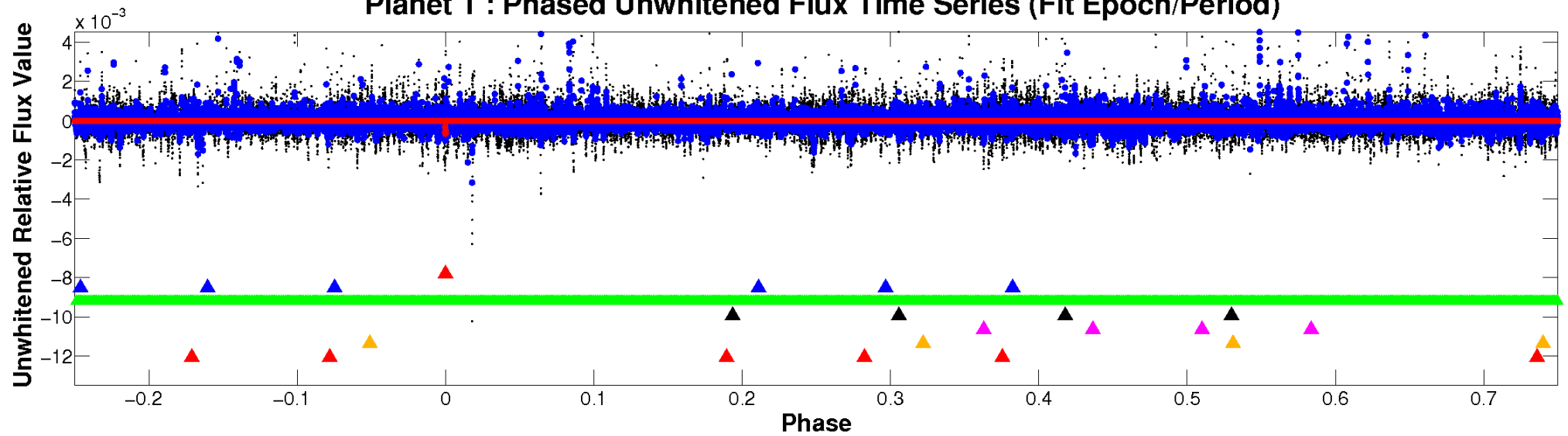
# ALT Odd/Even

TCE 006721044-01

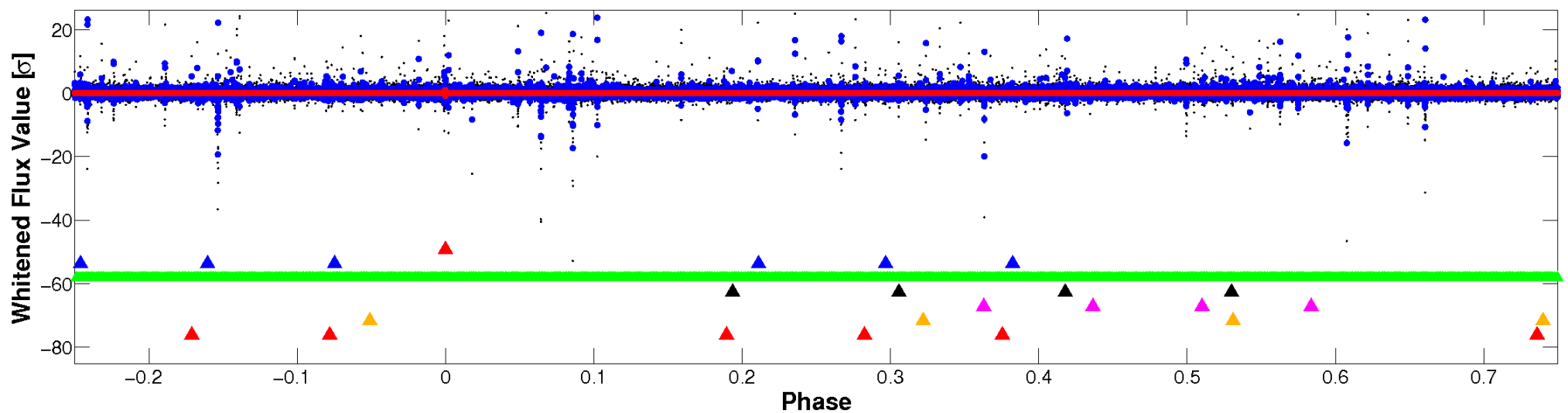


# Non-Whitened Vs. Whitened Light Curve

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

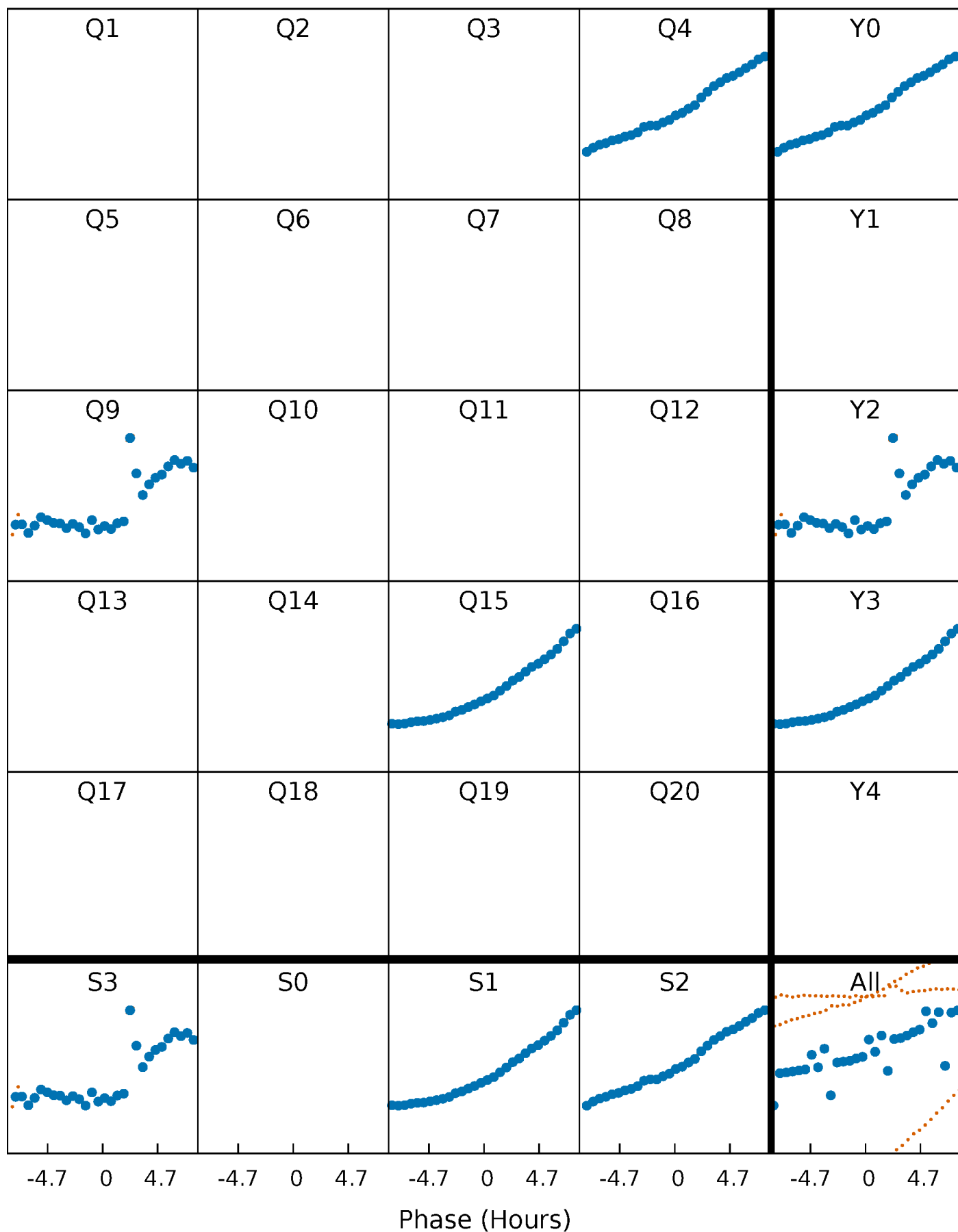


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

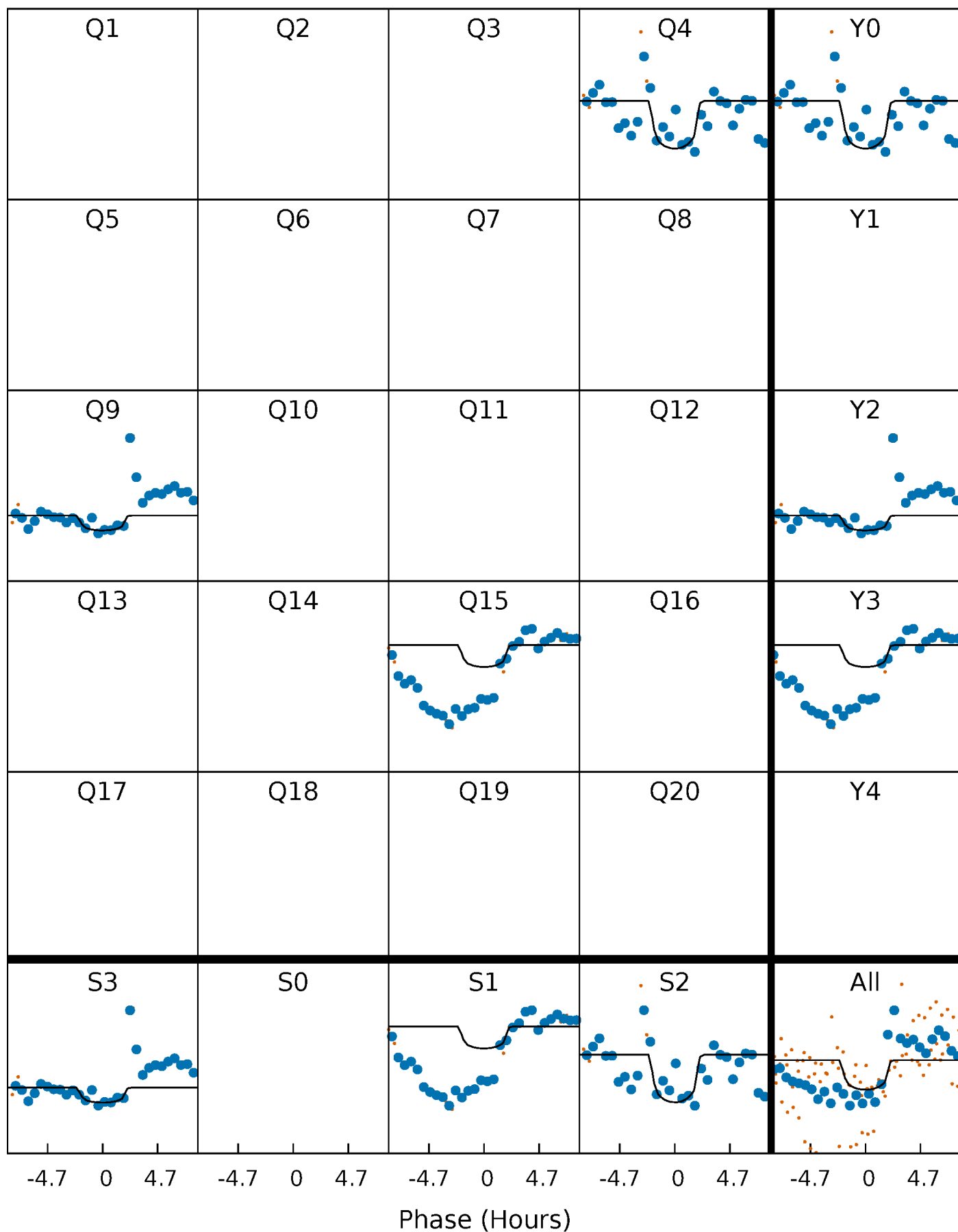
TCE 006721044-01 P=492.489985 Days  $T_0=391.994566$  (BKJD)





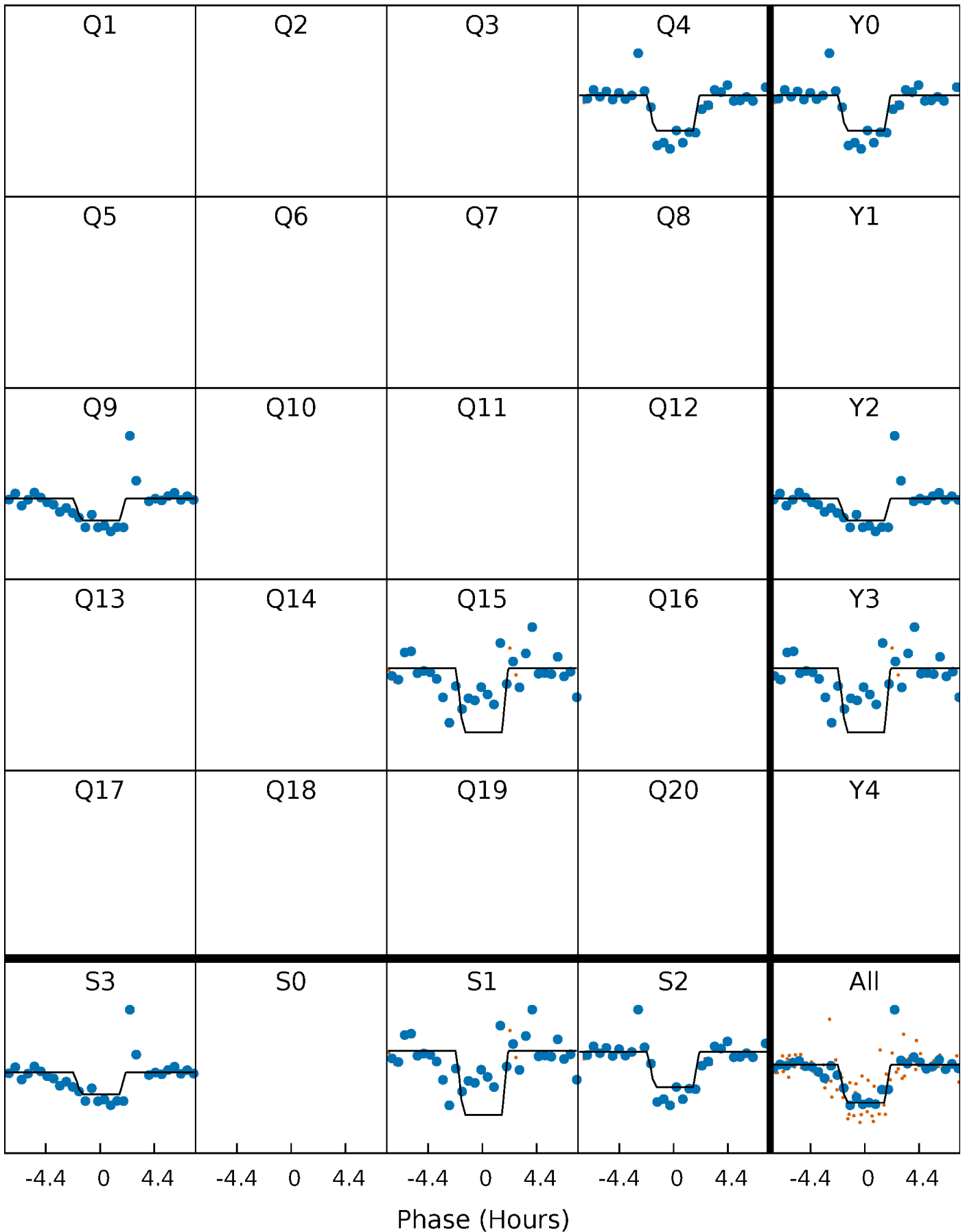
# DV Quarter-Phased Transit Curves

TCE 006721044-01 P=492.489985 Days  $T_0=391.994566$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

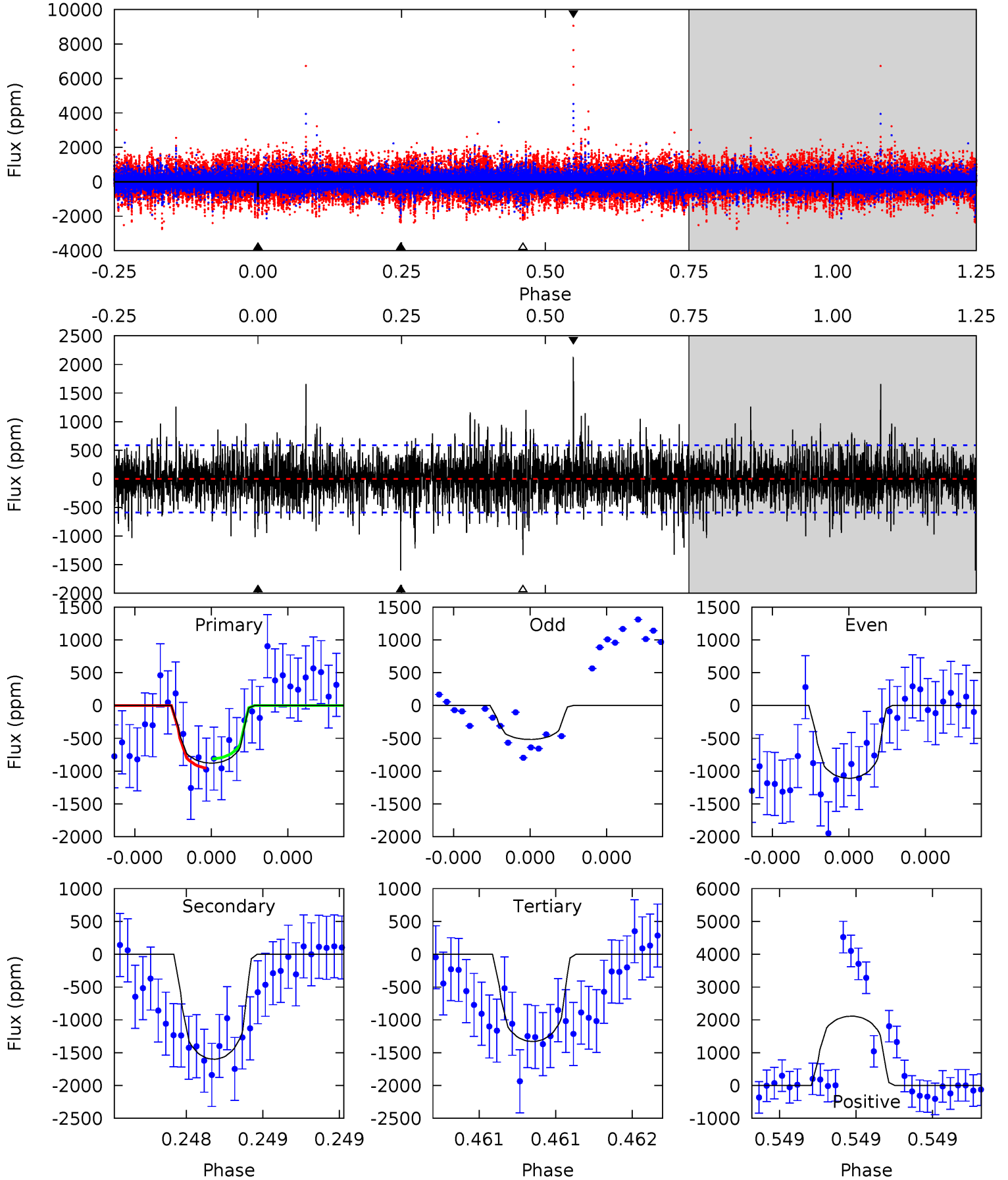
TCE 006721044-01 P=492.489663 Days  $T_0=391.992436$  (BKJD)



# DV Model-Shift Uniqueness Test

006721044-01, P = 492.489985 Days, E = 391.994566 Days

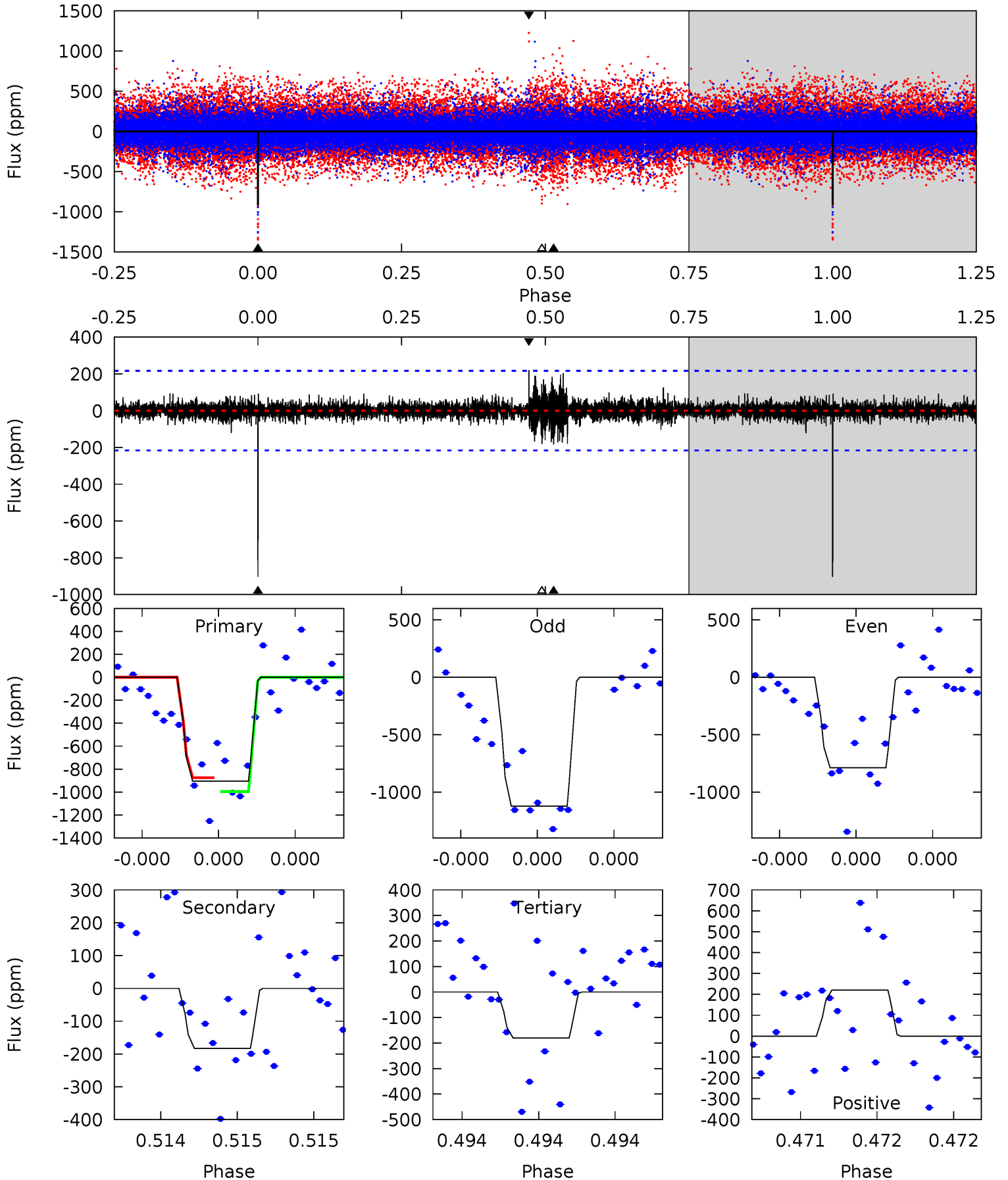
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.40 | 15.3 | 12.7 | 20.2 | 5.62            | 3.56            | 2.69             | -4.32   | -11.8   | 2.58    | -4.90   | 2.57    | 1.75 | 0.57  | 0.67 |



# Alt Model-Shift Uniqueness Test

006721044-01, P = 492.489663 Days, E = 391.992436 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 23.6 | 4.76 | 4.70 | 5.75 | 5.64            | 3.58            | 0.73             | 18.9    | 17.8    | 0.07    | -0.98   | 4.29    | 0.77 | 0.20  | 1.54 |





### Stellar Parameters For KIC 006721044

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $5578^{+186}_{-152}$ | $3.924^{+0.520}_{-0.130}$ | $0.070^{+0.250}_{-0.250}$ | $1.903^{+0.407}_{-0.949}$ | $1.109^{+0.128}_{-0.193}$ | $0.227^{+1.252}_{-0.099}$                     |
|        | +3%/-3%              | +13%/-3%                  | +357%/-357%               | +21%/-50%                 | +12%/-17%                 | +552%/-44%                                    |
| 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 006721044-01 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ )  | $T_{max}$ (K)     | $T_{obs}$ (K)          | $A_{obs}$                  |
|---------|-----------------|-------------------------|-------------------|------------------------|----------------------------|
| DV      | $-1600 \pm 105$ | $9.01^{+10.43}_{-6.00}$ | $411^{+34}_{-55}$ | $5085^{+3736}_{-1164}$ | $17343^{+142792}_{-13557}$ |
| Alt.    | $-183 \pm 38$   | $9.12^{+9.49}_{-6.22}$  | $413^{+34}_{-55}$ | $3424^{+1747}_{-609}$  | $1899^{+16466}_{-1447}$    |

$T_{max}$  = 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  $A_{obs} \gg 1.0$

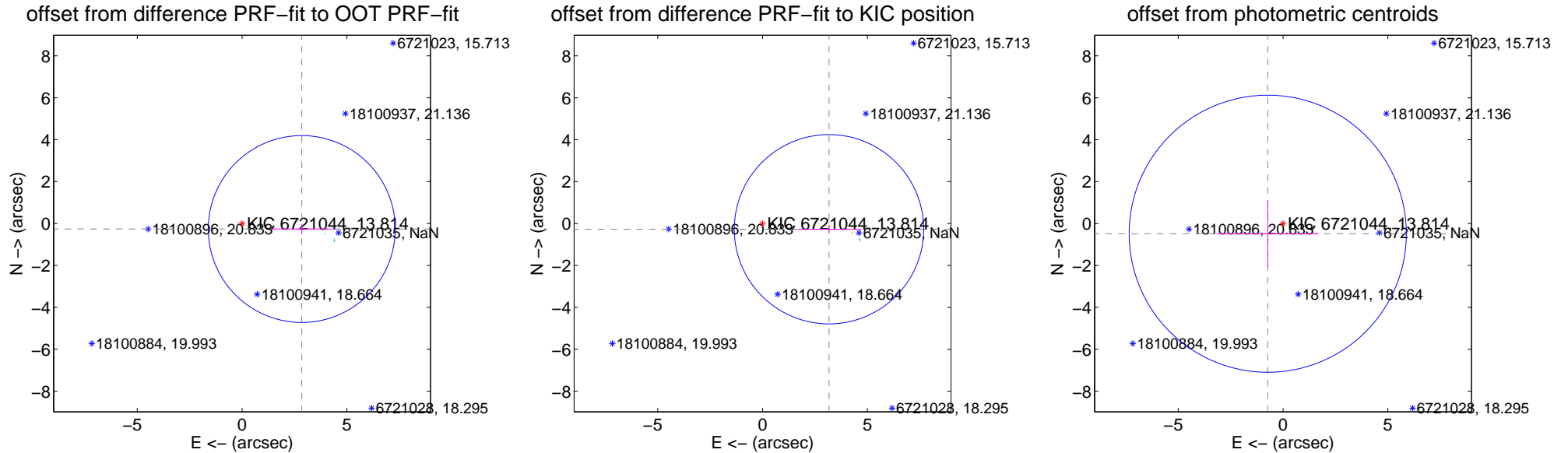
## DV Centroid Data

Supplemental centroid analysis for 006721044-01. Kepler magnitude: 13.81. Transit SNR 4.39

There are 3 quarters with good PRF difference image offsets

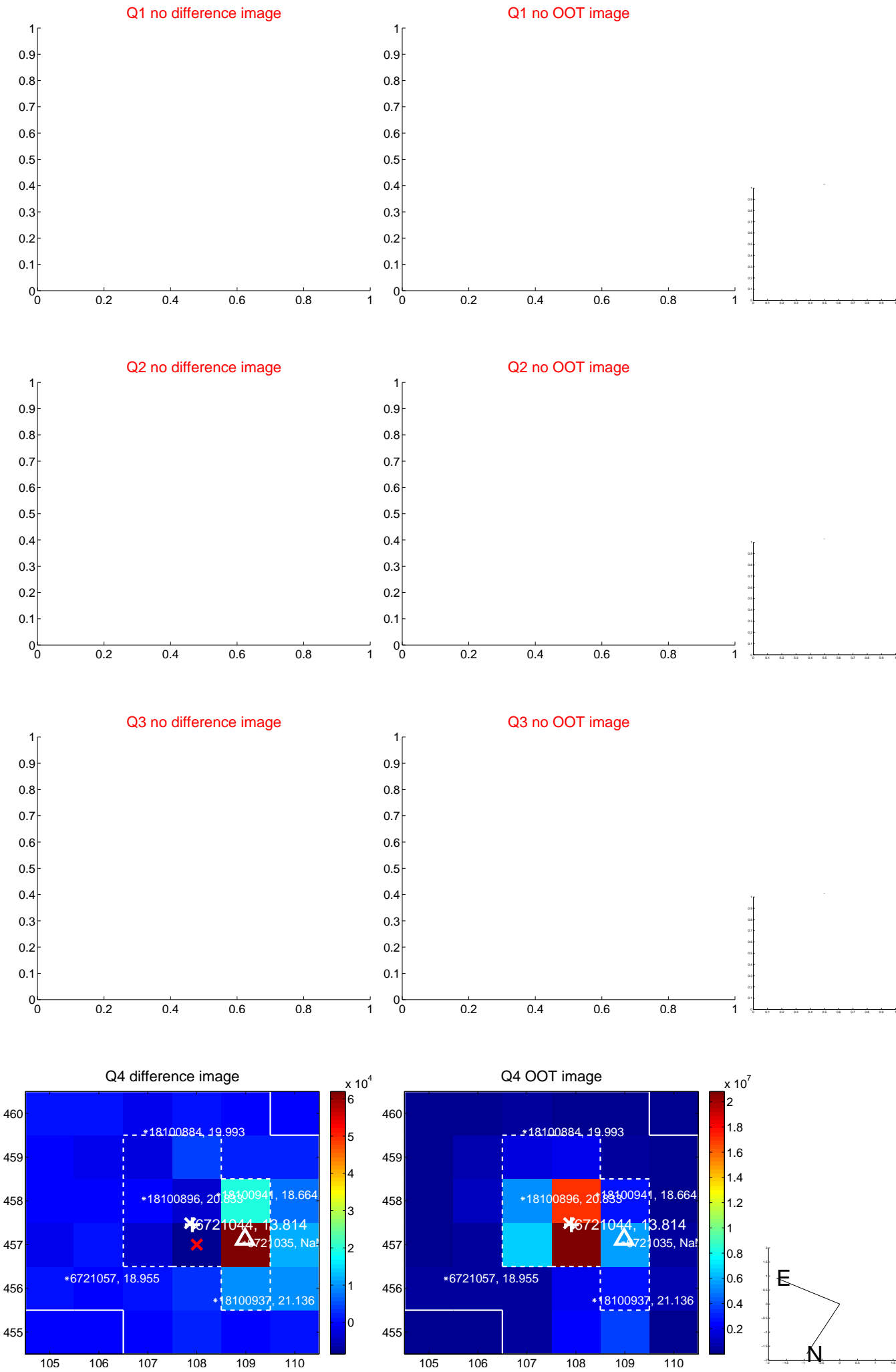
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $2.857 \pm 1.486$  | 1.92                | $-2.845 \pm 1.492$ | $-0.263 \pm 0.251$ |
| PRF-fit source offset from KIC position | $3.180 \pm 1.506$  | 2.11                | $-3.168 \pm 1.511$ | $-0.273 \pm 0.212$ |
| photometric centroid source offset      | $0.88 \pm 2.20$    | 0.40                | $0.73 \pm 2.43$    | $-0.49 \pm 1.59$   |



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.

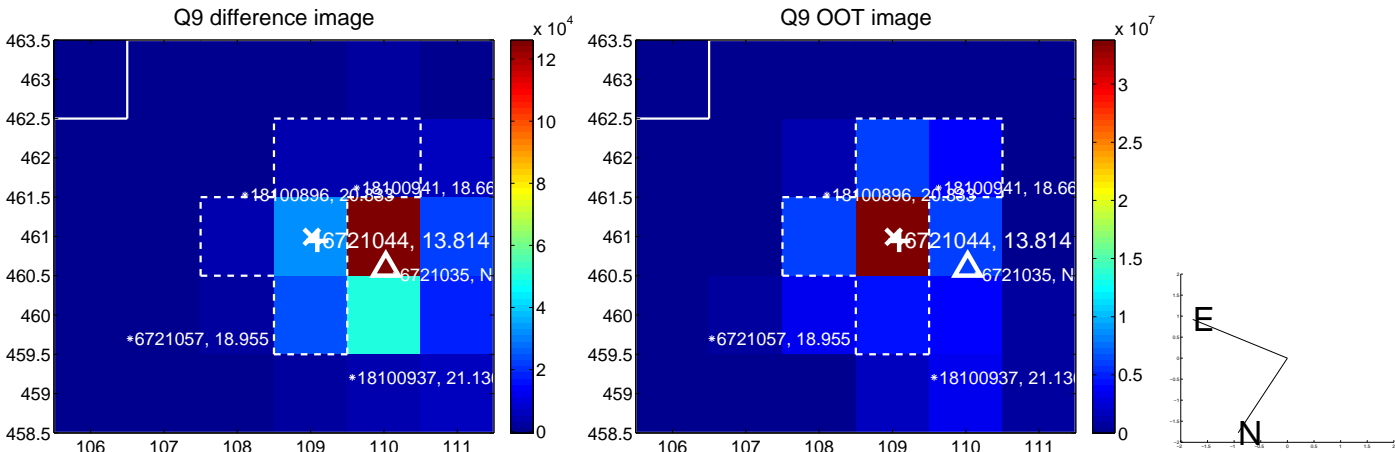


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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.

Q13 no difference image



Q13 no OOT image



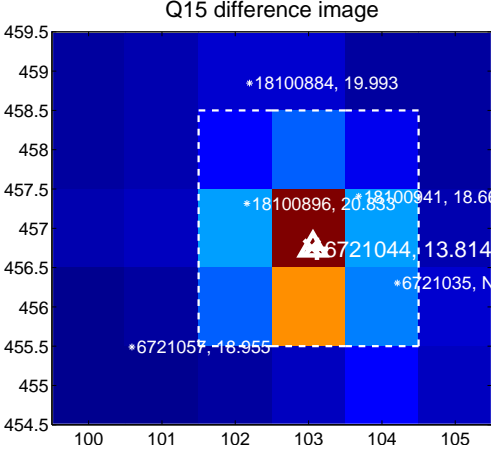
Q14 no difference image



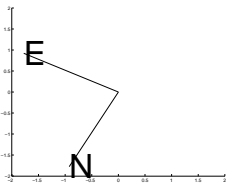
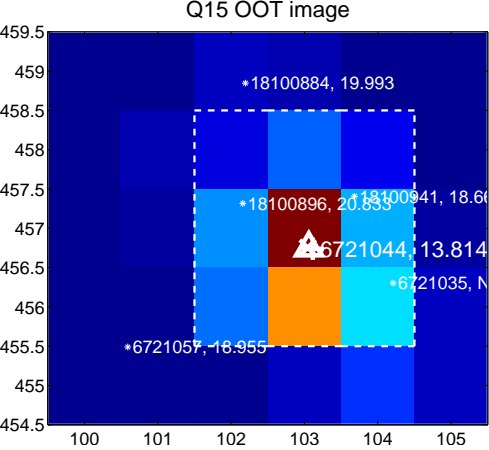
Q14 no OOT image



Q15 difference image



Q15 OOT image



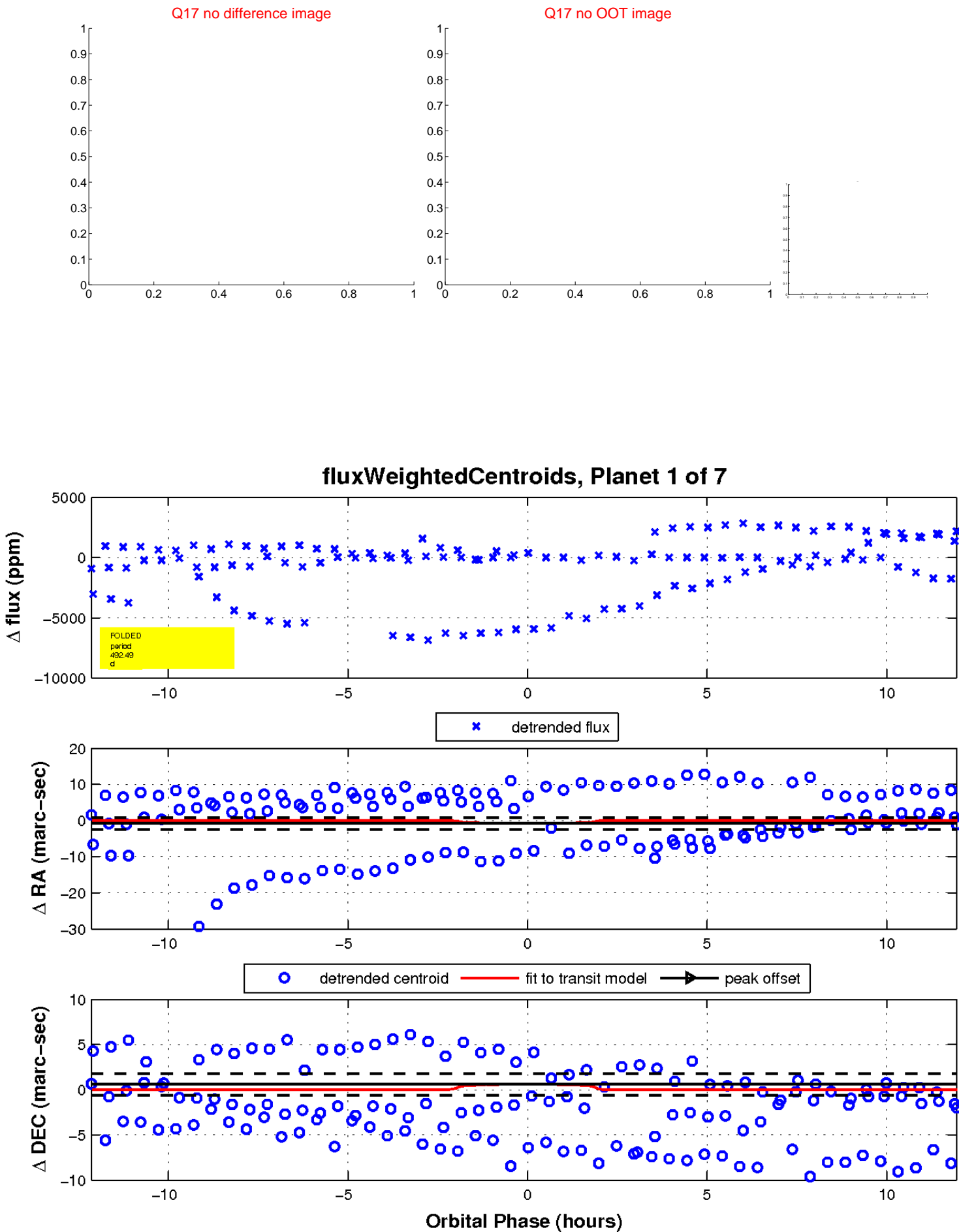
Q16 no difference image



Q16 no OOT image

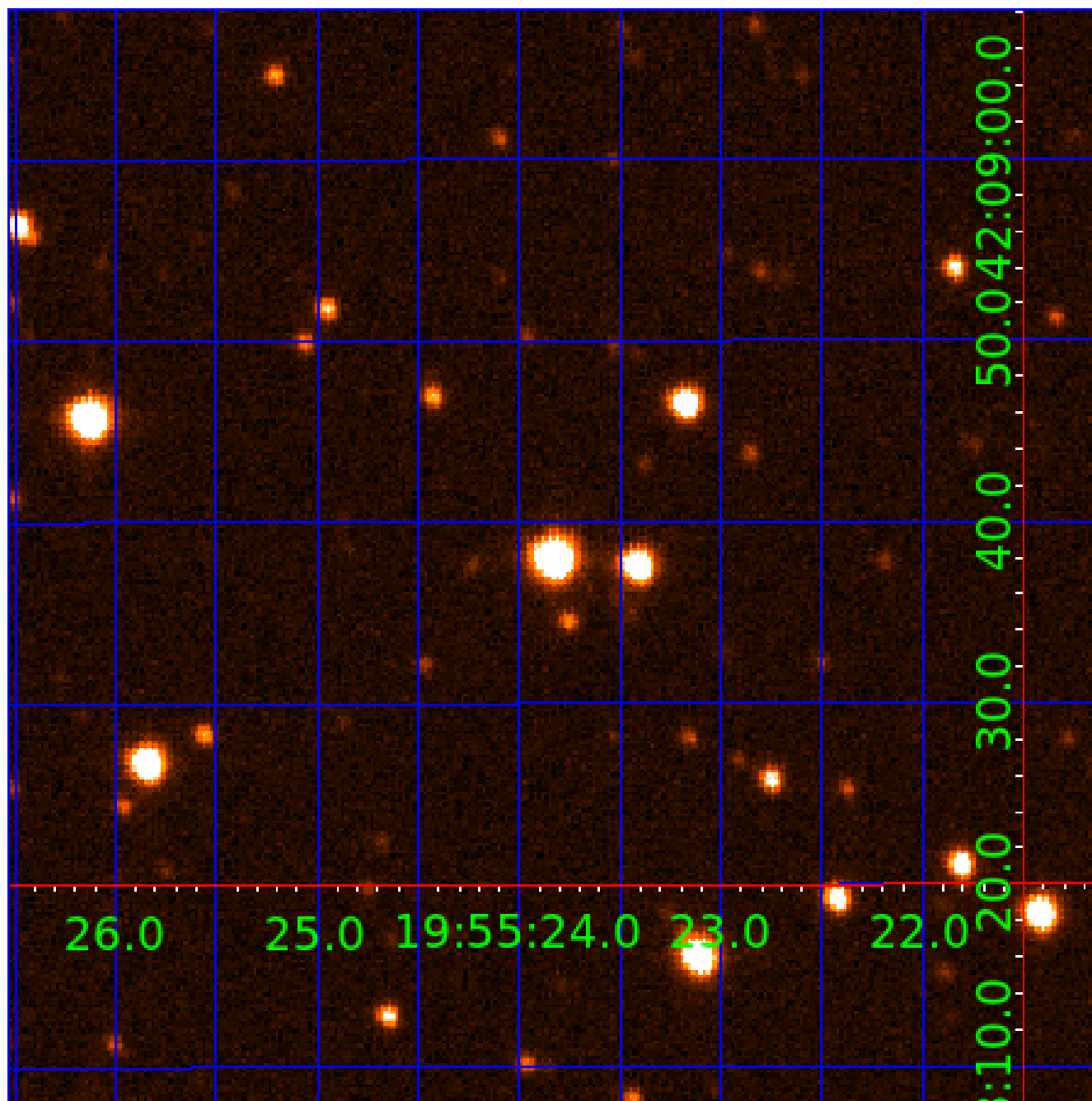


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 006721044

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 006721044-01 | OBS      | No   | 492.489985    | 391.994566   | 665.7       | 4.075            | 11.8 | 4.4 | 1.90                        | 5578            | 5.18                   | 1.97                   |
| 006721044-02 | OBS      | No   | 225.154094    | 355.172737   | 814.2       | 3.269            | 9.2  | 7.0 | 1.90                        | 5578            | 5.56                   | 5.59                   |
| 006721044-03 | OBS      | No   | 0.563501      | 131.874349   | 9.5         | 1.022            | 8.1  | 1.8 | 1.90                        | 5578            | 0.71                   | 16440.25               |
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| 006721044-07 | OBS      | No   | 223.351808    | 353.554215   | 278.6       | 3.849            | 8.6  | 1.7 | 1.90                        | 5578            | 3.16                   | 5.65                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 006721044-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS   |
| 006721044-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 006721044-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST  |
| 006721044-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—CENT_FEW_DIFFS   |
| 006721044-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                    |
| 006721044-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

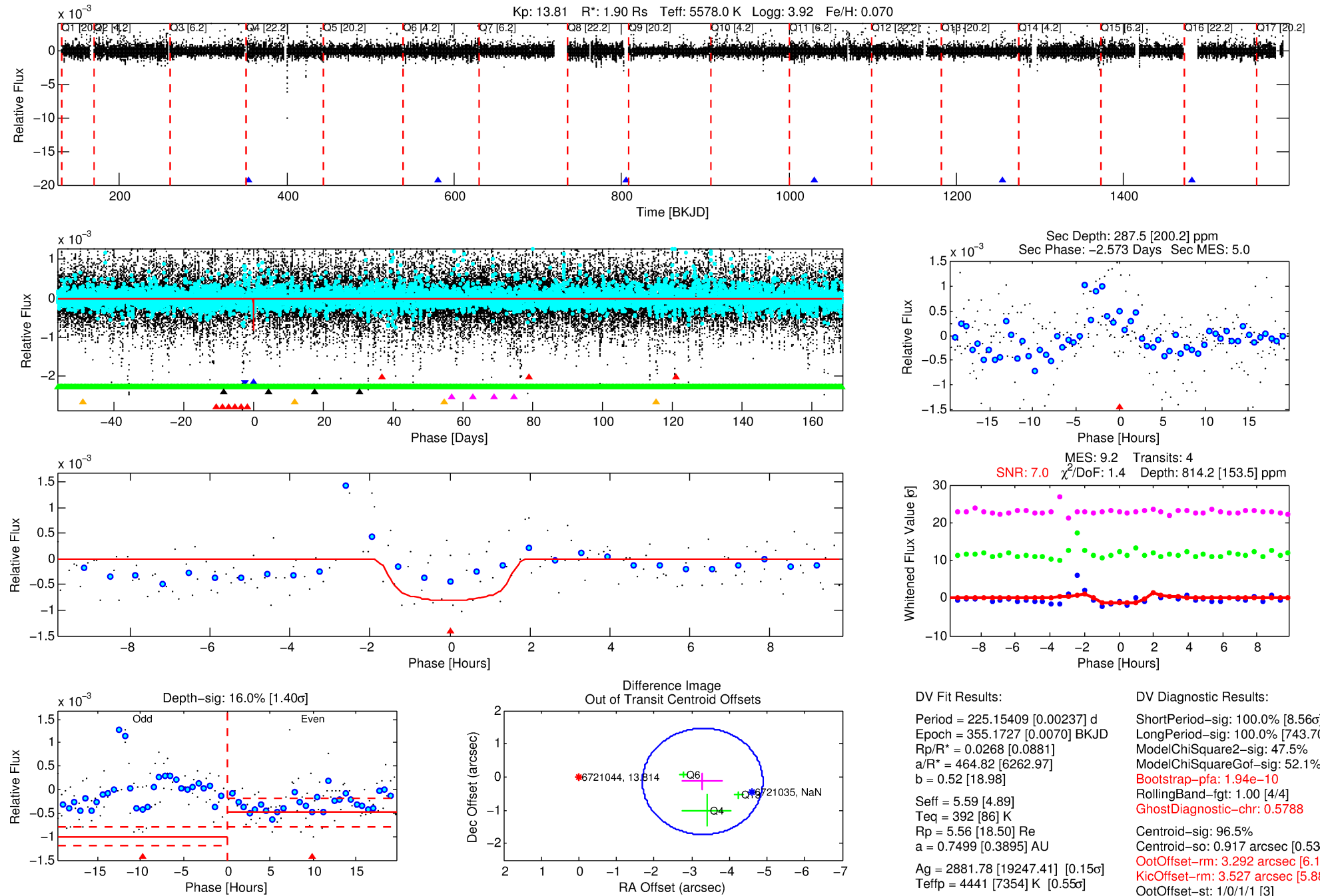
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 006721044-02

No Significant Match Found

# DV One-Page Summary

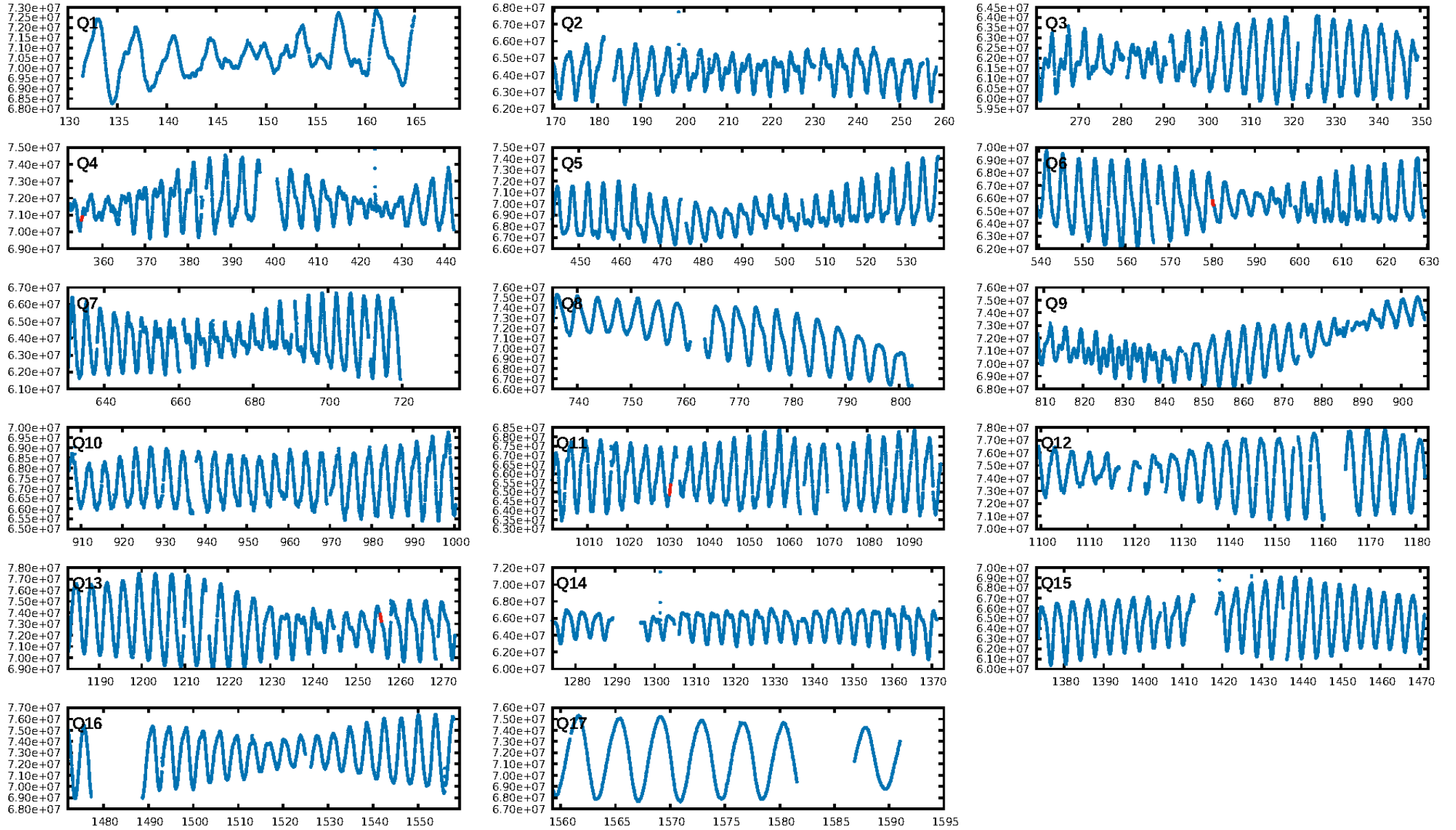
KIC: 6721044 Candidate: 2 of 7 Period: 225.154 d



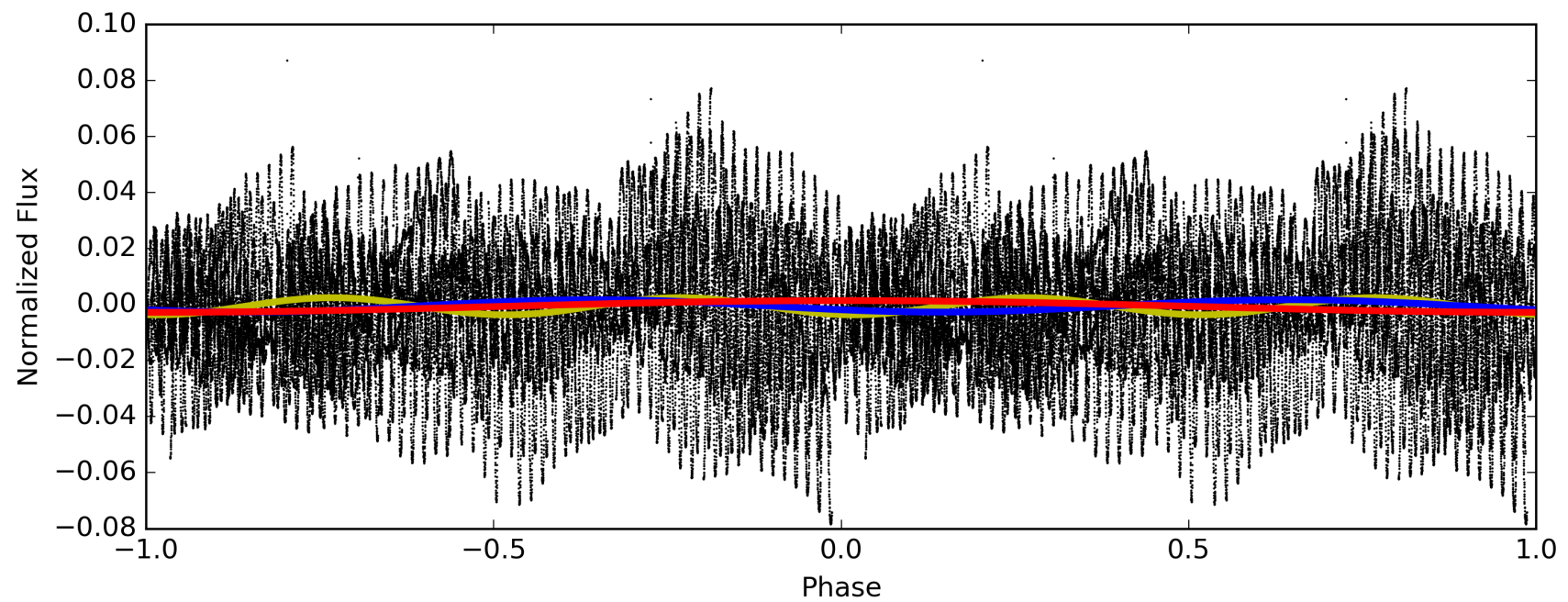
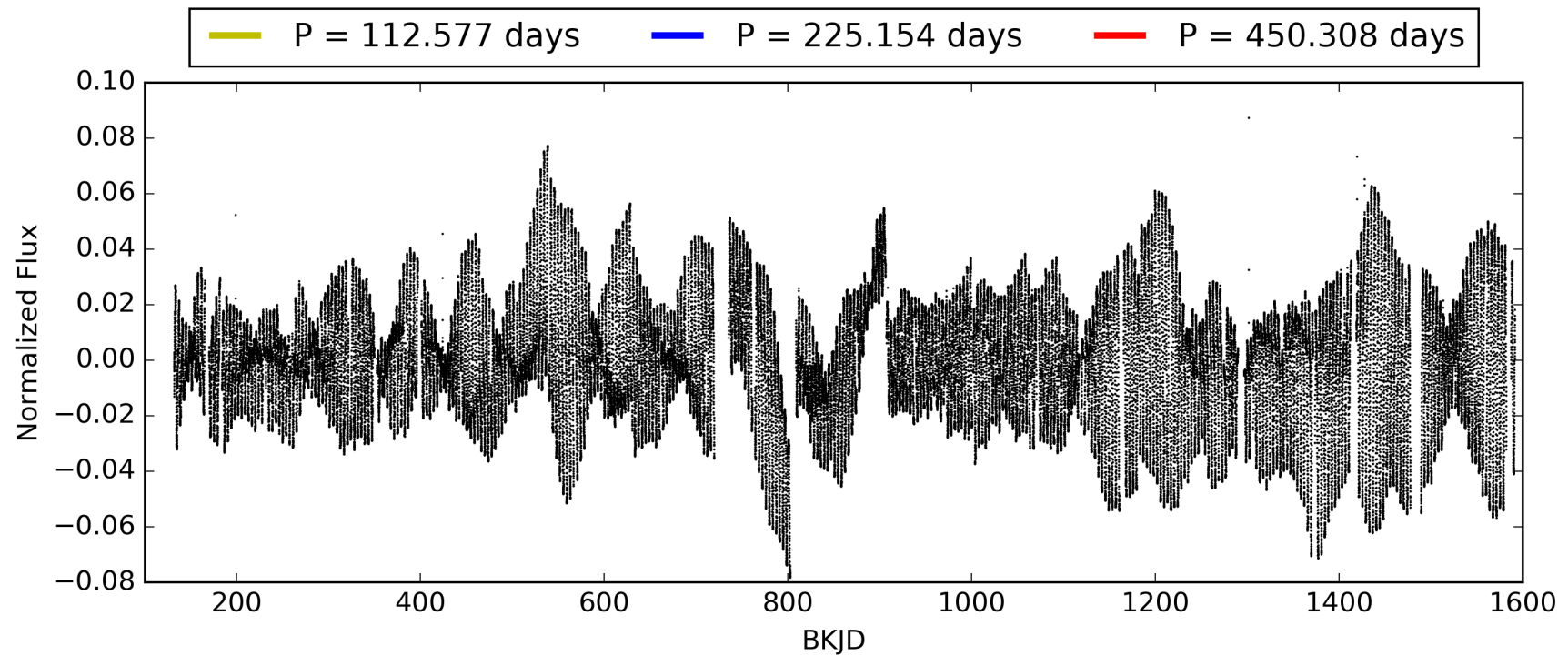
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 06:51:06 Z

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

# TCE 006721044-02, PDC Light Curves

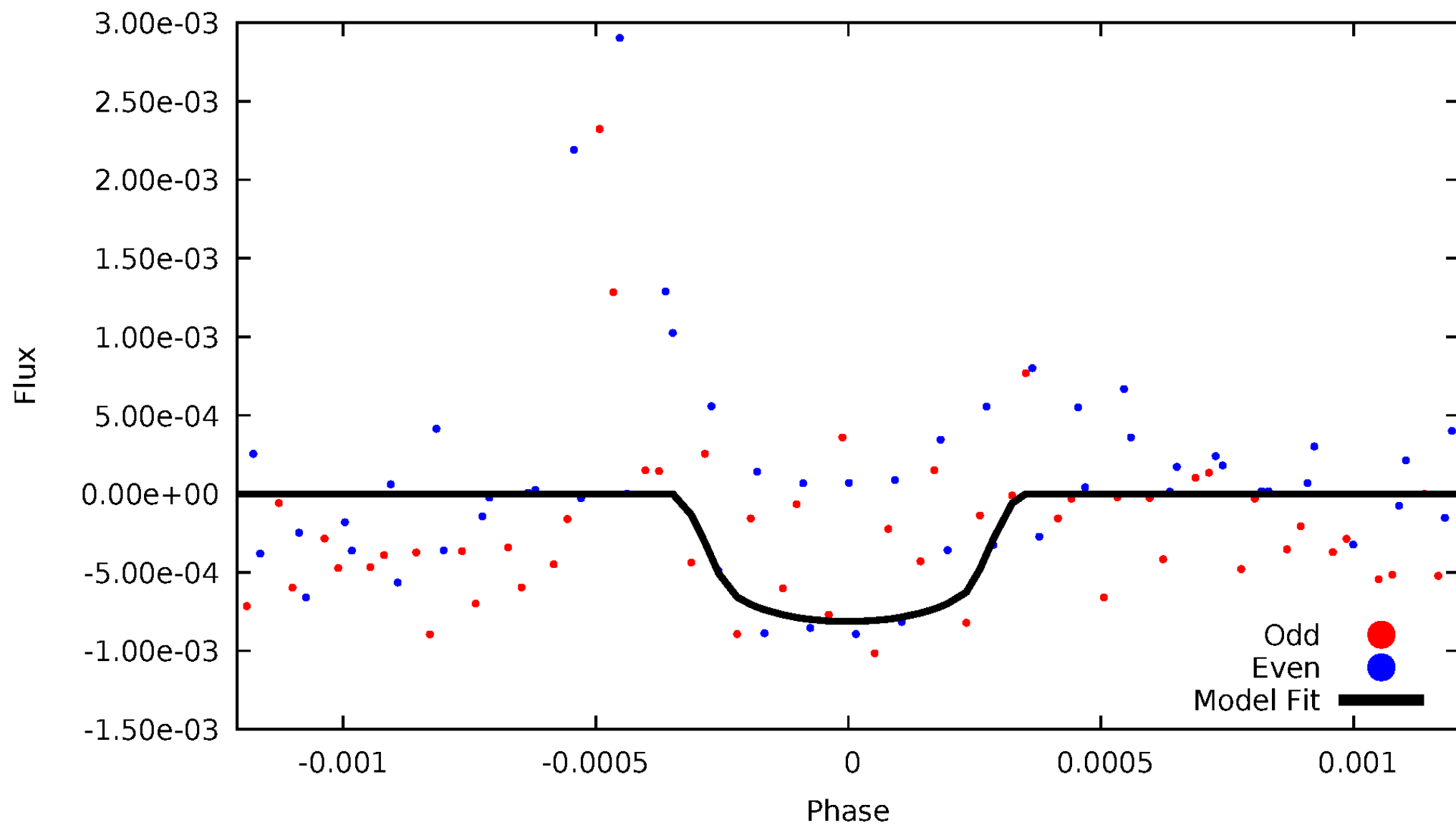


TCE 006721044-02



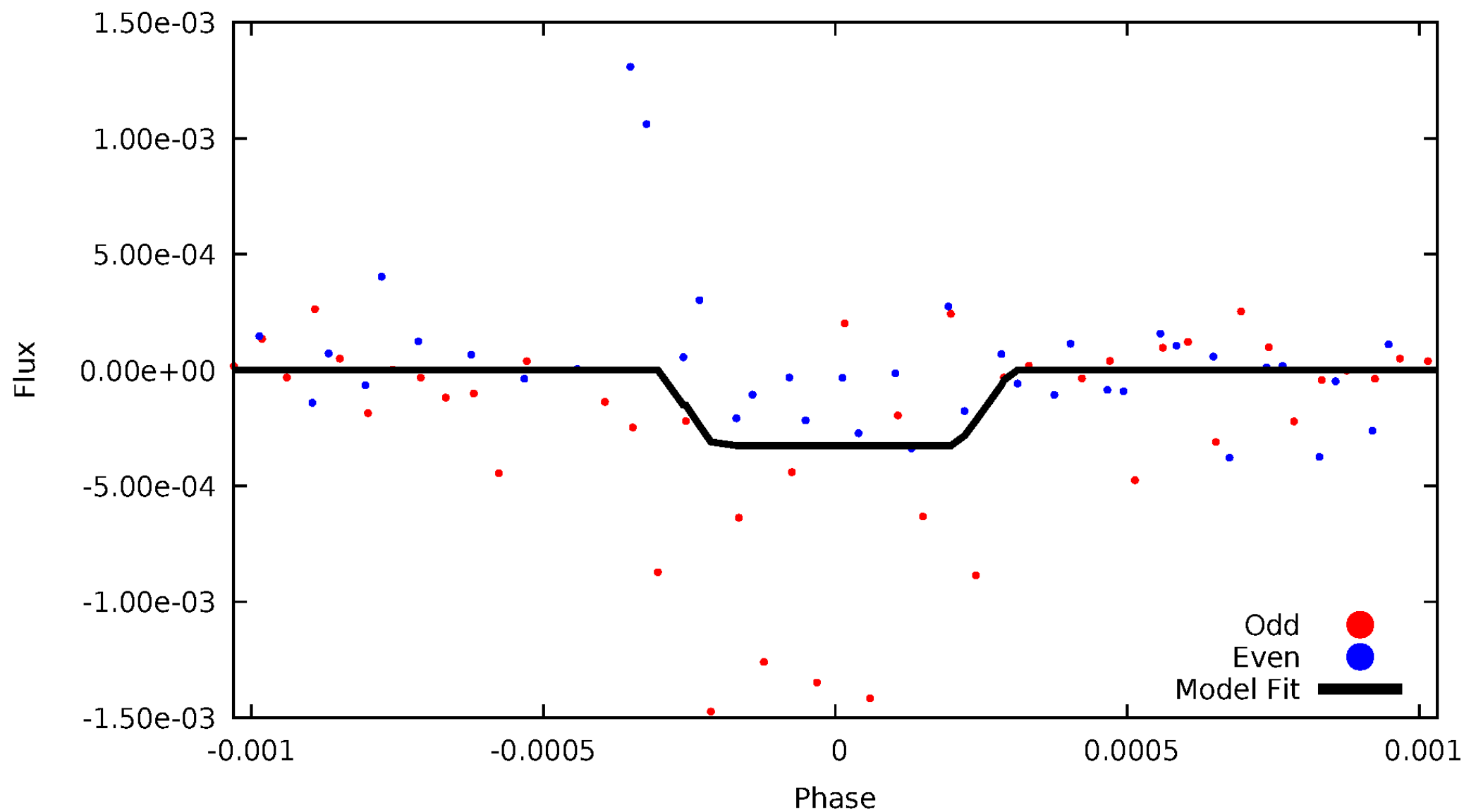
# DV Odd/Even

TCE 006721044-02



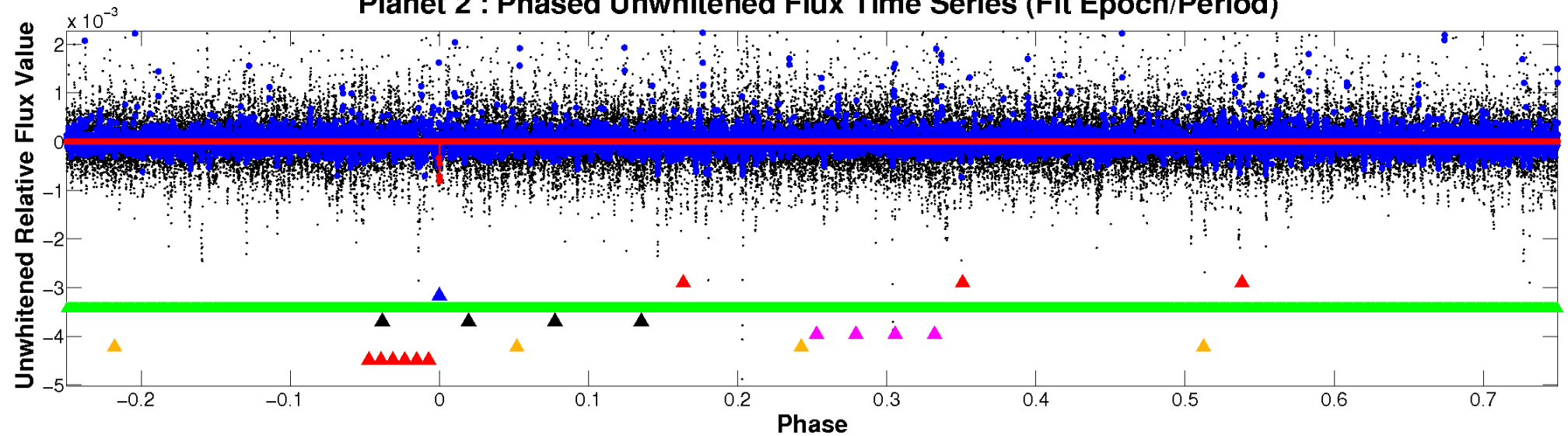
# ALT Odd/Even

TCE 006721044-02

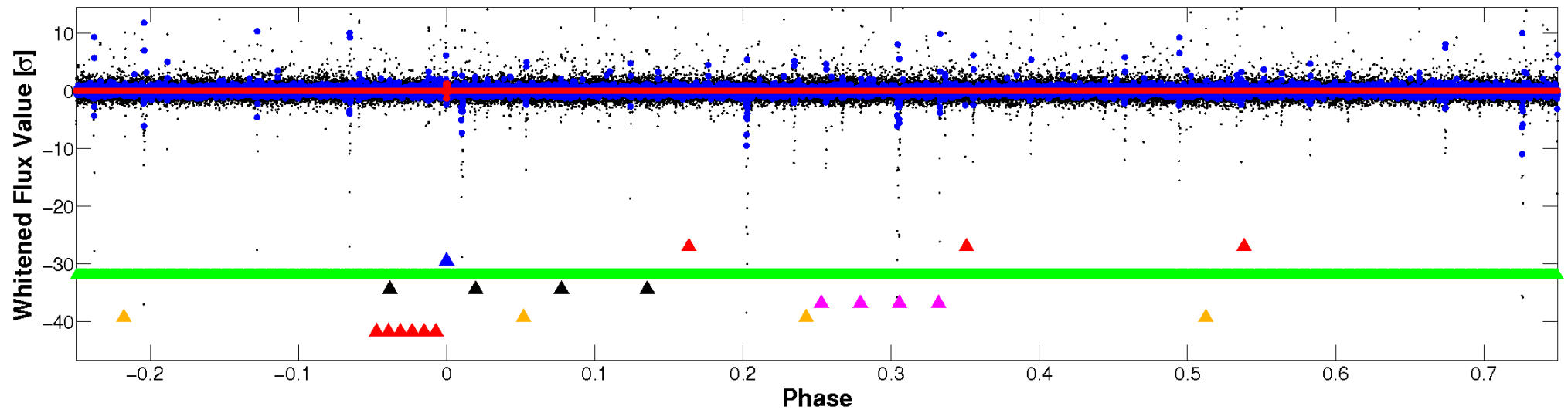


# Non-Whitened Vs. Whitened Light Curve

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



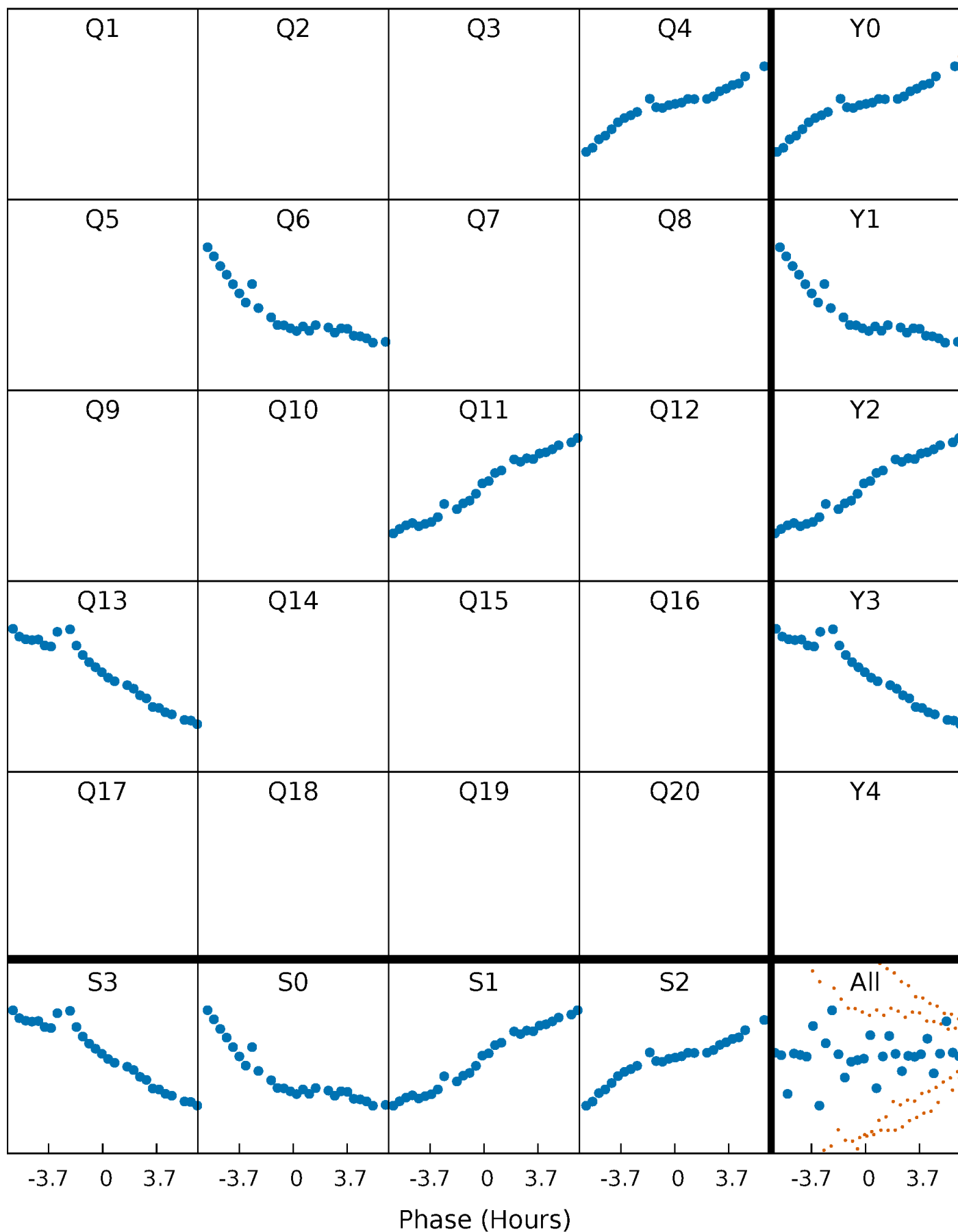
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

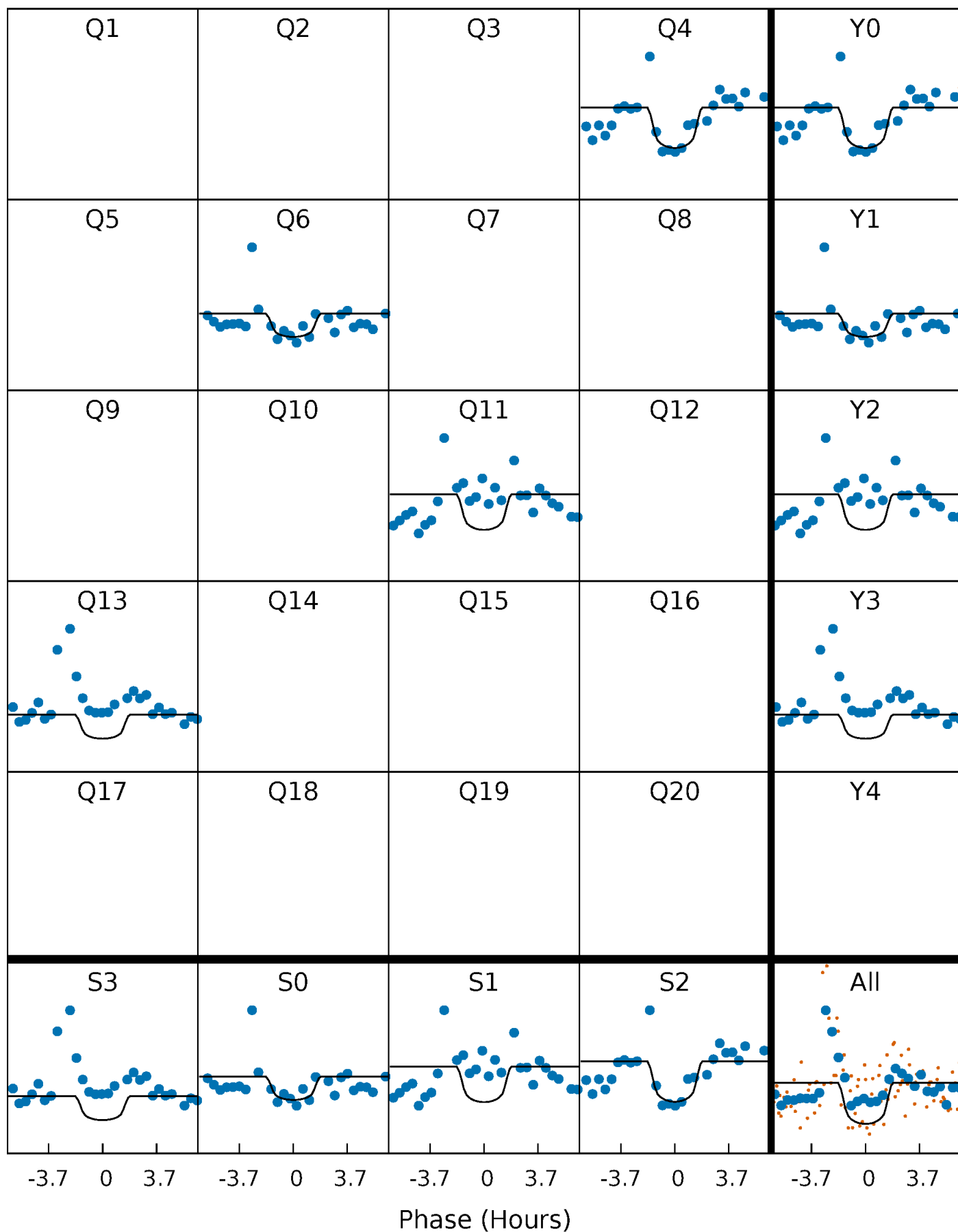
TCE 006721044-02 P=225.154094 Days  $T_0=355.172737$  (BKJD)





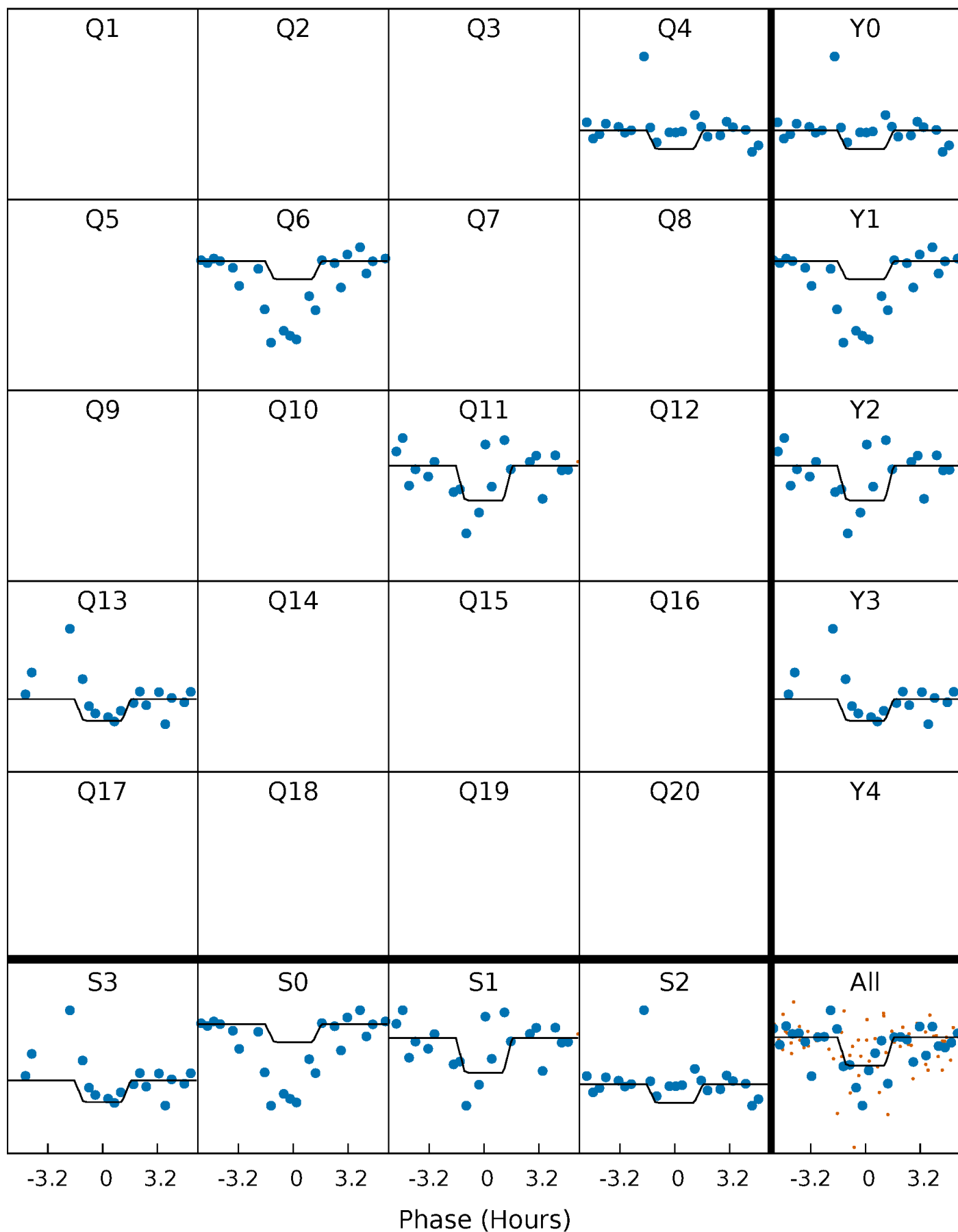
# DV Quarter-Phased Transit Curves

TCE 006721044-02 P=225.154094 Days  $T_0=355.172737$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

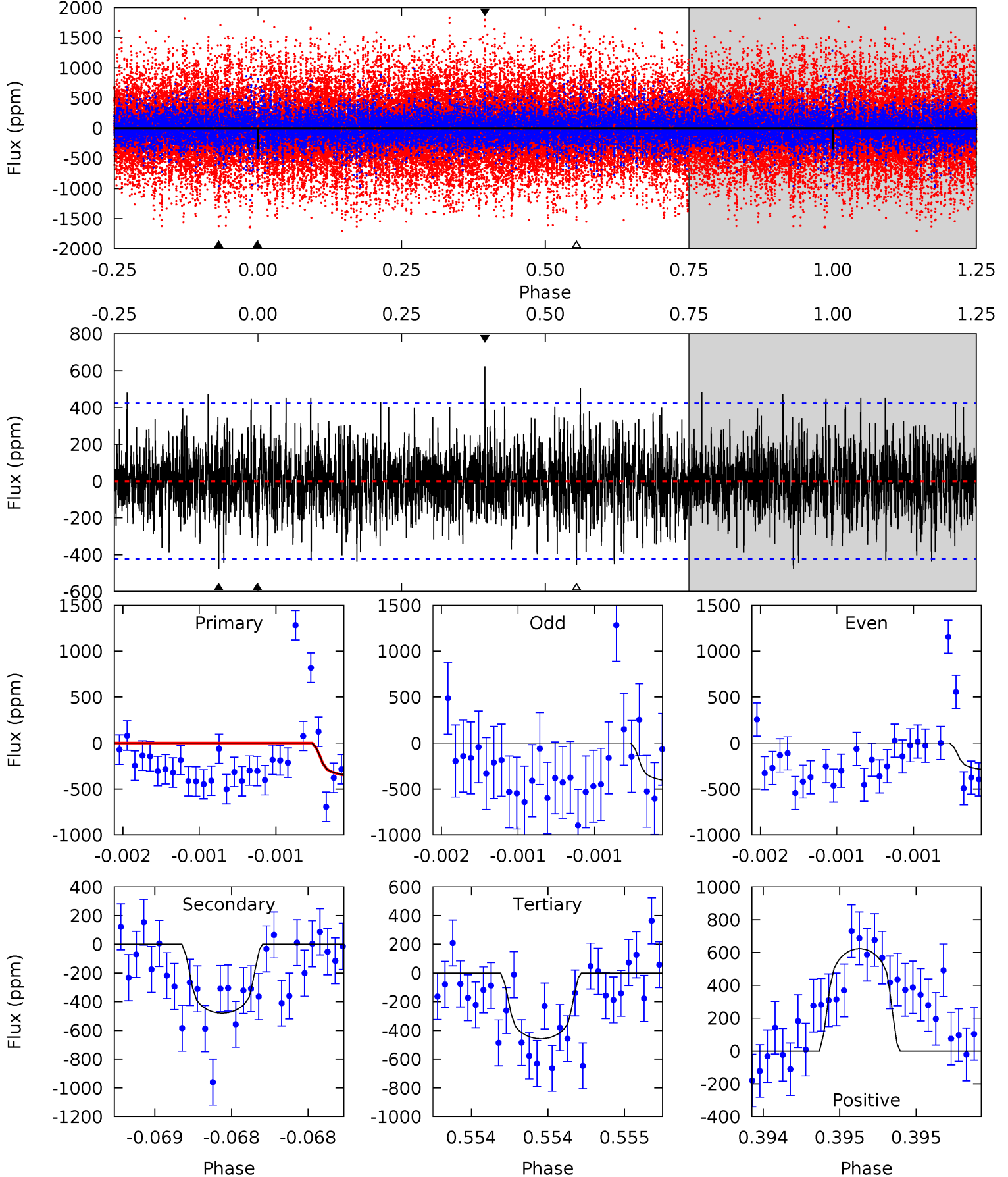
TCE 006721044-02 P=225.151745 Days  $T_0=355.173452$  (BKJD)



# DV Model-Shift Uniqueness Test

006721044-02, P = 225.154094 Days, E = 130.018643 Days

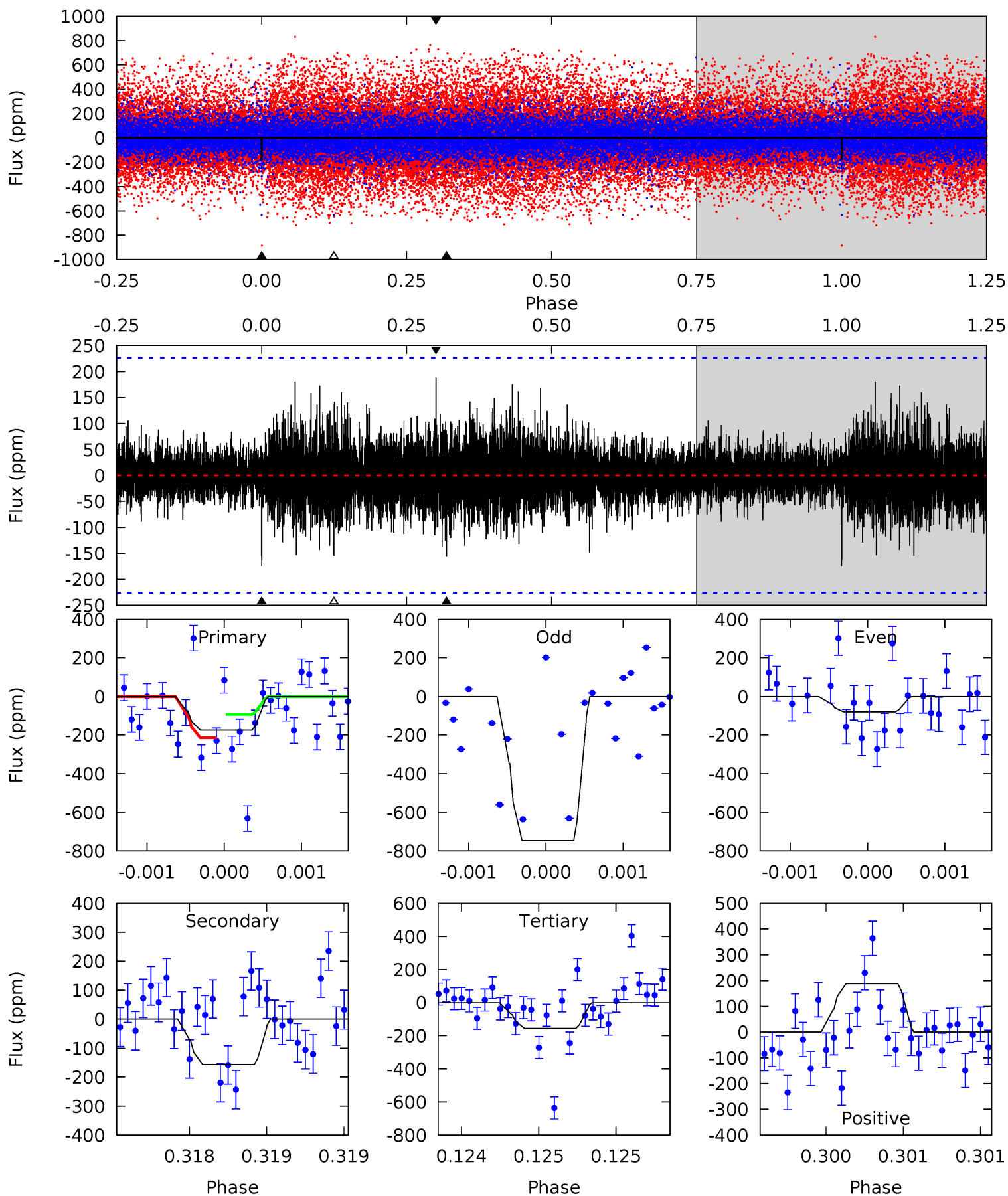
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4.57 | 6.26 | 5.98 | 8.13 | 5.52            | 3.40            | 1.71             | -1.40   | -3.56   | 0.29    | -1.87   | 0.76    | 0.87 | 0.57  | 0.03 |



# Alt Model-Shift Uniqueness Test

006721044-02, P = 225.151745 Days, E = 130.021707 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 |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 4.28 | 3.84 | 3.80 | 4.62 | 5.56            | 3.46            | 0.90             | 0.48    | -0.34   | 0.05    | -0.78   | 8.57    | 2.31 | 0.52  | 0   |



### Stellar Parameters For KIC 006721044

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $5578^{+186}_{-152}$ | $3.924^{+0.520}_{-0.130}$ | $0.070^{+0.250}_{-0.250}$ | $1.903^{+0.407}_{-0.949}$ | $1.109^{+0.128}_{-0.193}$ | $0.227^{+1.252}_{-0.099}$                     |
|        | +3%/-3%              | +13%/-3%                  | +357%/-357%               | +21%/-50%                 | +12%/-17%                 | +552%/-44%                                    |
| 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 006721044-02 / KOI

| Detrend | Depth (ppm)   | $R_p$ ( $R_{\oplus}$ )   | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)  | $A_{\text{obs}}$     |
|---------|---------------|--------------------------|----------------------|-----------------------|----------------------|
| DV      | $-480 \pm 77$ | $12.65^{+14.79}_{-8.94}$ | $535^{+46}_{-76}$    | $3588^{+2296}_{-683}$ | $910^{+9903}_{-725}$ |
| Alt.    | $-156 \pm 41$ | $11.99^{+15.25}_{-8.74}$ | $538^{+45}_{-76}$    | $3057^{+1597}_{-542}$ | $325^{+3420}_{-260}$ |

$T_{\text{max}}$  = 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

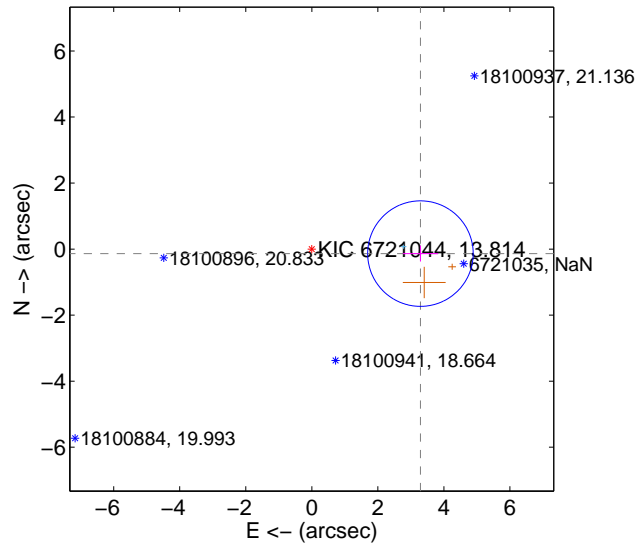
Supplemental centroid analysis for 006721044-02. Kepler magnitude: 13.81. Transit SNR 7.03

There are 1 quarters with good PRF difference image offsets

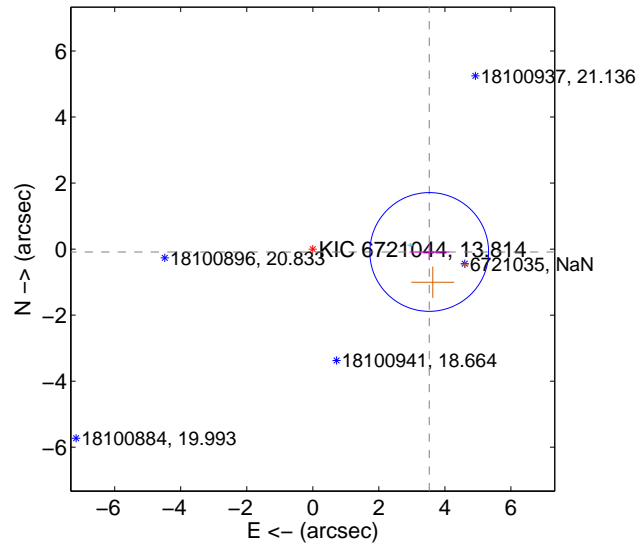
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $3.292 \pm 0.533$  | 6.18                | $-3.289 \pm 0.533$ | $-0.137 \pm 0.241$ |
| PRF-fit source offset from KIC position | $3.527 \pm 0.599$  | 5.88                | $-3.525 \pm 0.600$ | $-0.087 \pm 0.241$ |
| photometric centroid source offset      | $0.92 \pm 1.73$    | 0.53                | $-0.77 \pm 1.88$   | $0.49 \pm 1.28$    |

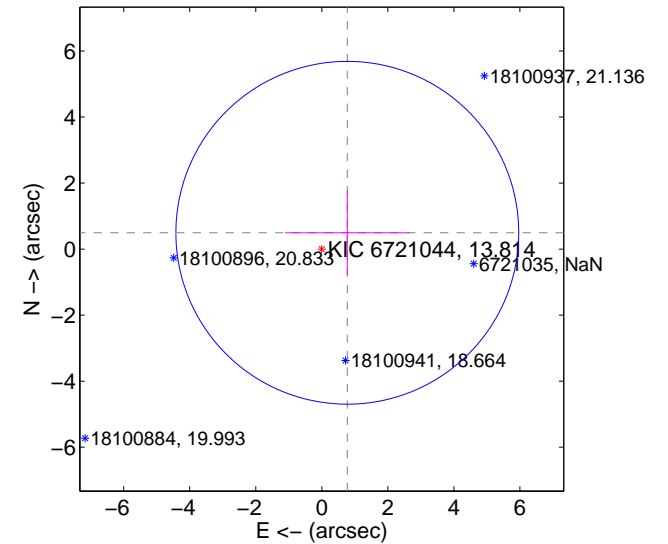
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

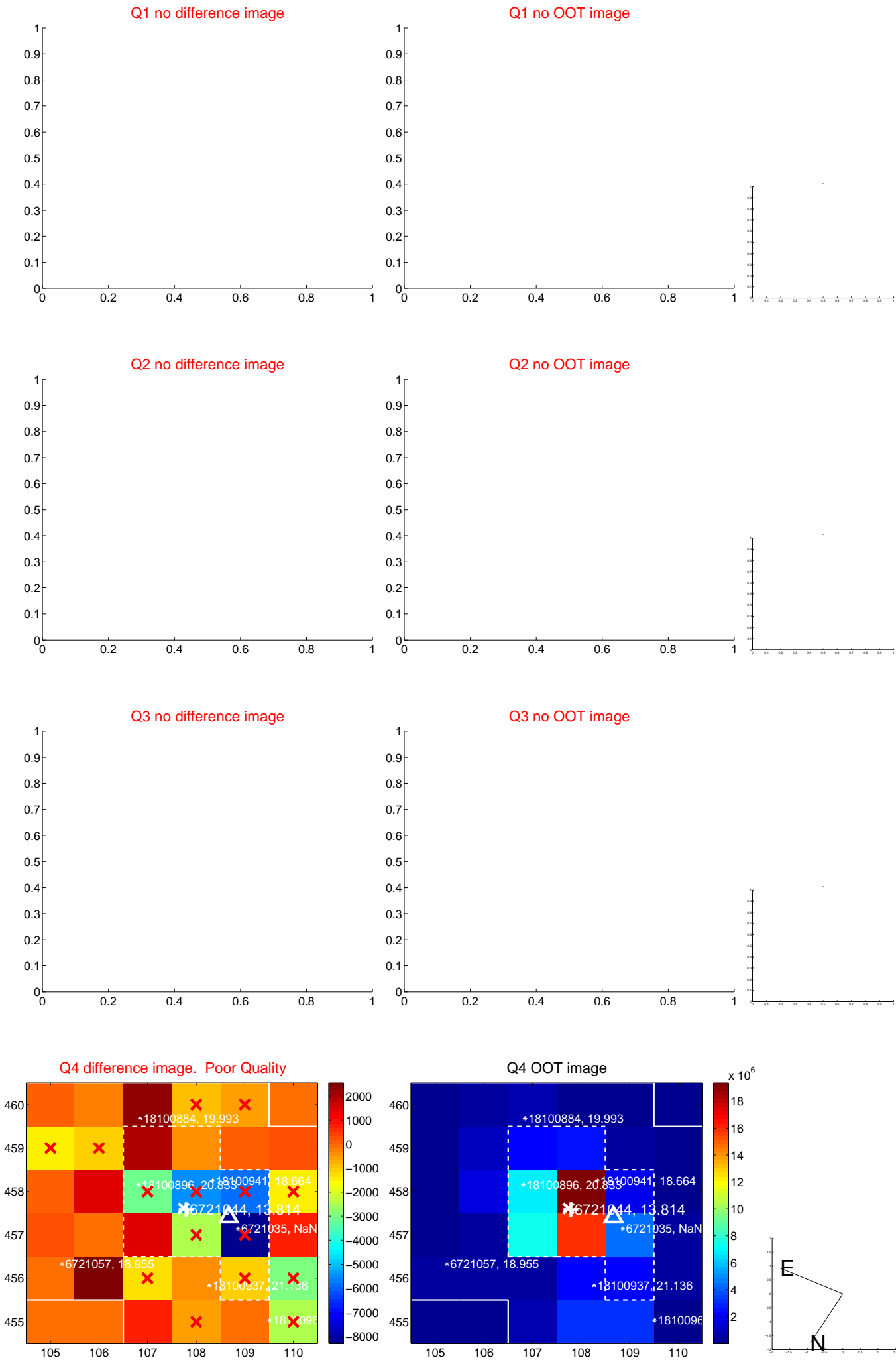


offset from photometric centroids

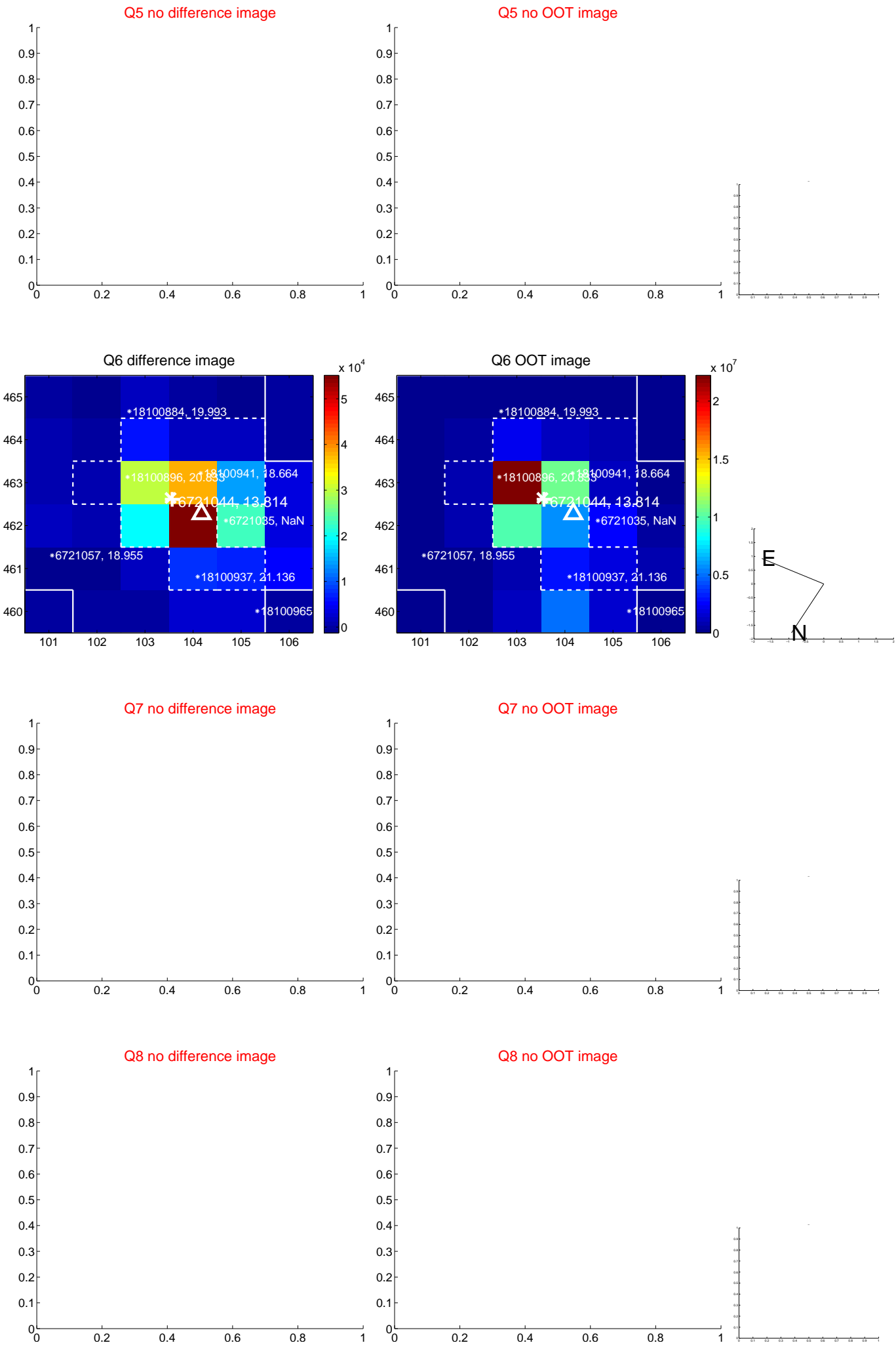


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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 ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

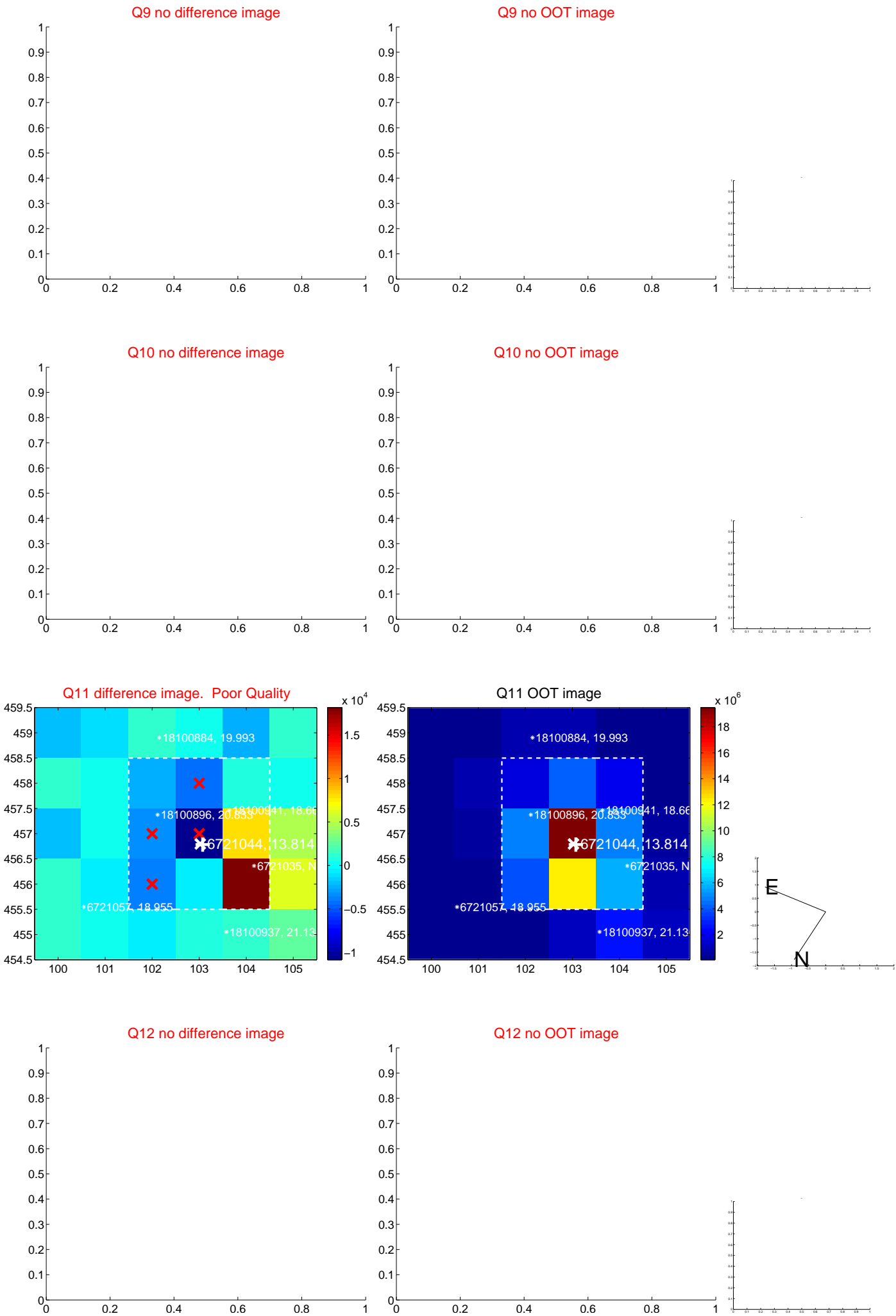


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

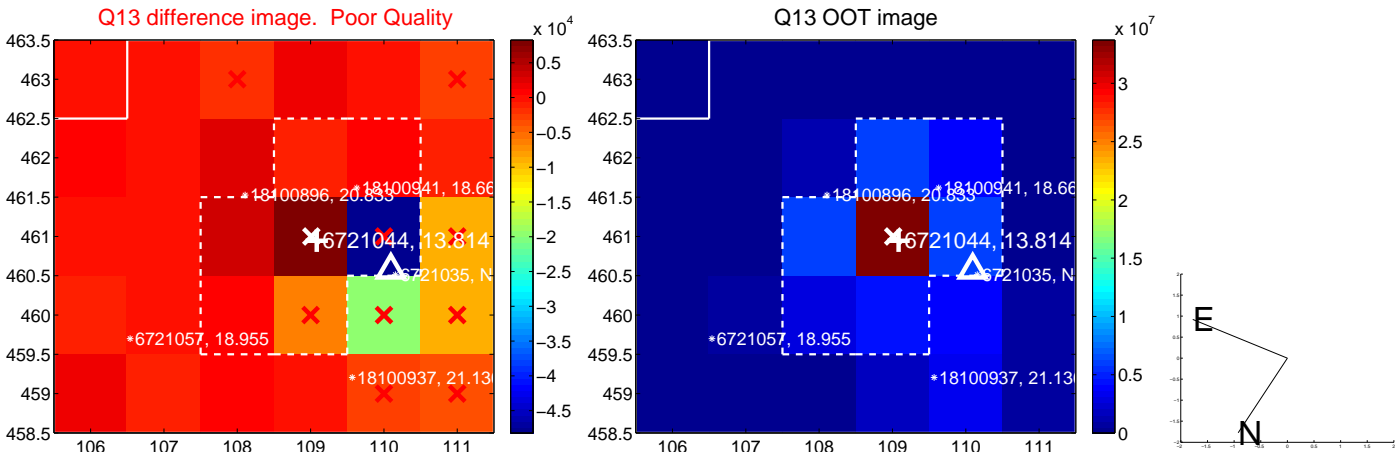




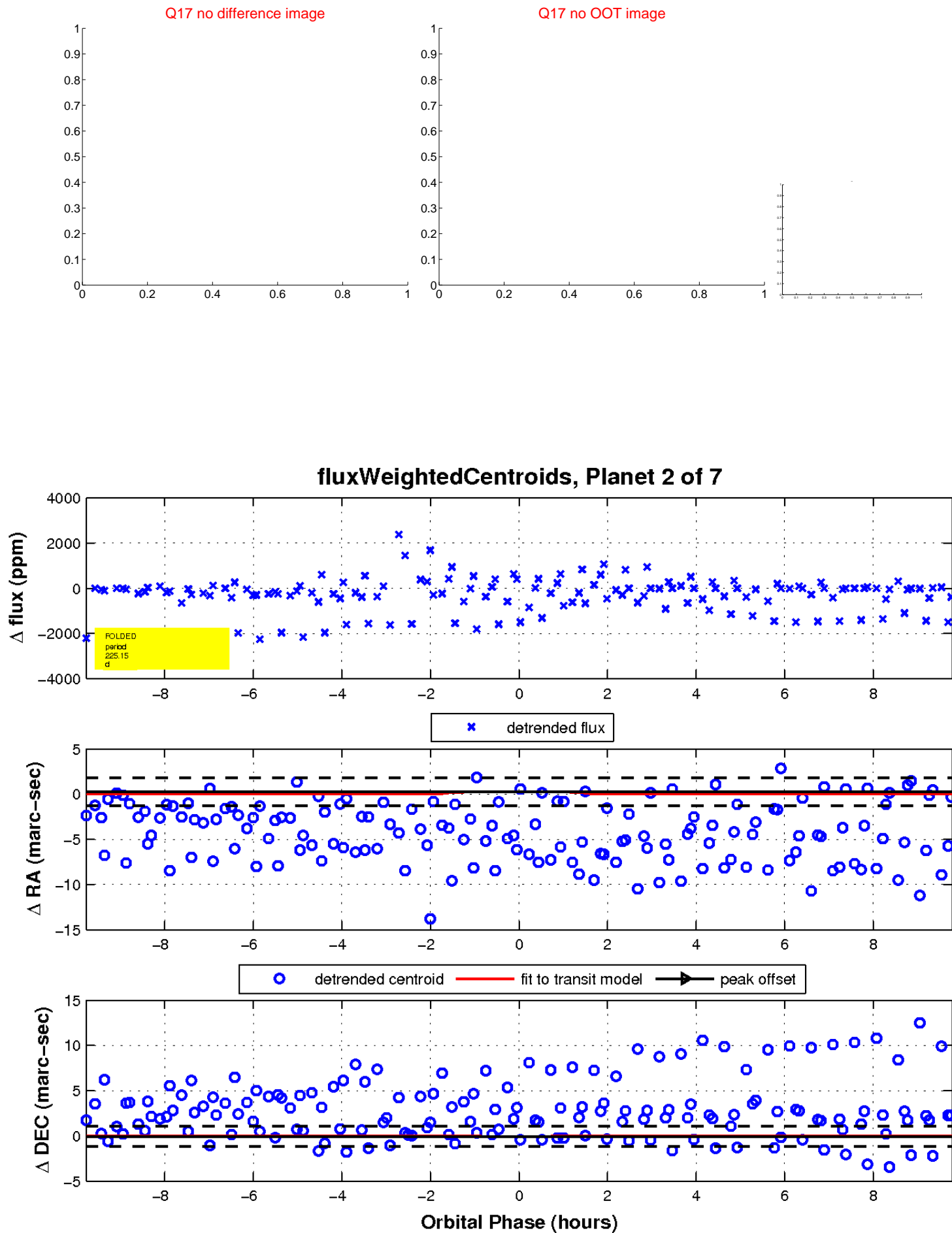
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

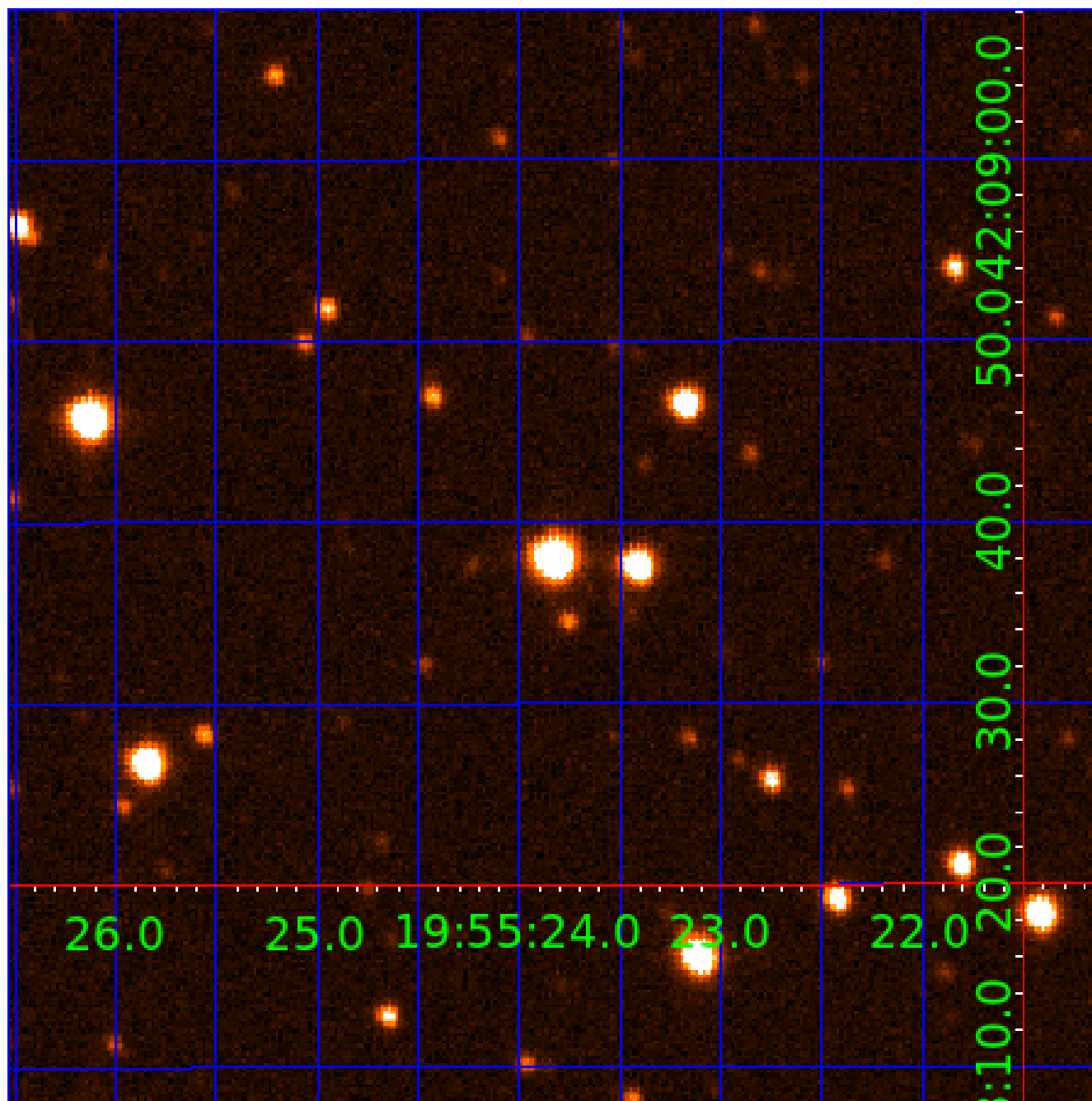


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 006721044

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 006721044-01 | OBS      | No   | 492.489985    | 391.994566   | 665.7       | 4.075            | 11.8 | 4.4 | 1.90                        | 5578            | 5.18                   | 1.97                   |
| 006721044-02 | OBS      | No   | 225.154094    | 355.172737   | 814.2       | 3.269            | 9.2  | 7.0 | 1.90                        | 5578            | 5.56                   | 5.59                   |
| 006721044-03 | OBS      | No   | 0.563501      | 131.874349   | 9.5         | 1.022            | 8.1  | 1.8 | 1.90                        | 5578            | 0.71                   | 16440.25               |
| 006721044-05 | OBS      | No   | 456.246278    | 186.971169   | 1082.2      | 3.570            | 10.5 | 5.5 | 1.90                        | 5578            | 6.95                   | 2.18                   |
| 006721044-06 | OBS      | No   | 389.569679    | 366.871550   | 122.7       | 4.179            | 10.4 | 0.5 | 1.90                        | 5578            | 2.54                   | 2.69                   |
| 006721044-07 | OBS      | No   | 223.351808    | 353.554215   | 278.6       | 3.849            | 8.6  | 1.7 | 1.90                        | 5578            | 3.16                   | 5.65                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 006721044-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS   |
| 006721044-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 006721044-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST  |
| 006721044-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—CENT_FEW_DIFFS   |
| 006721044-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                    |
| 006721044-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

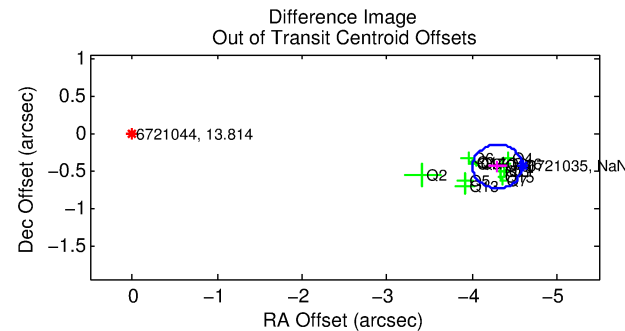
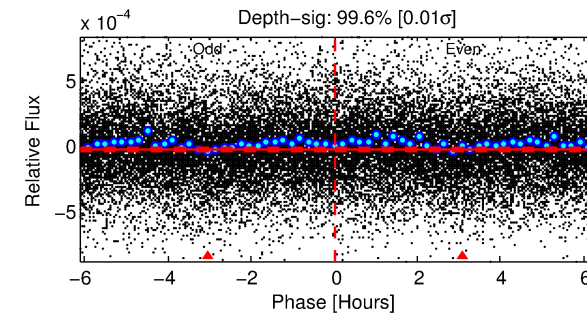
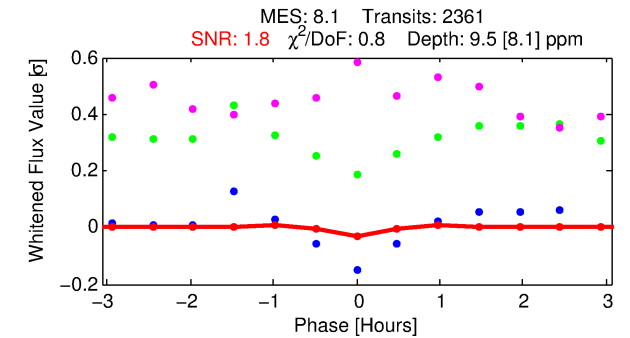
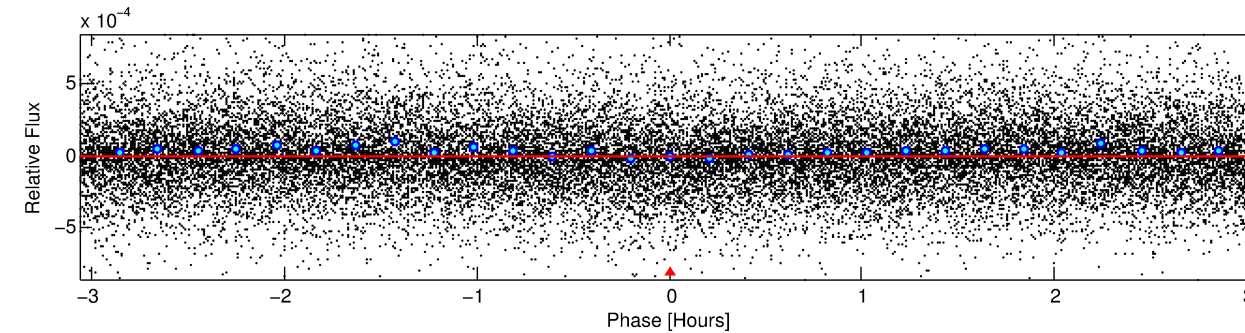
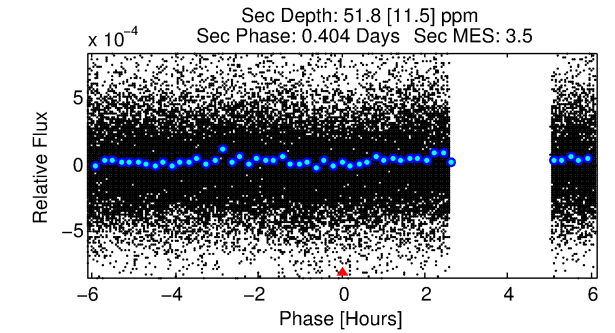
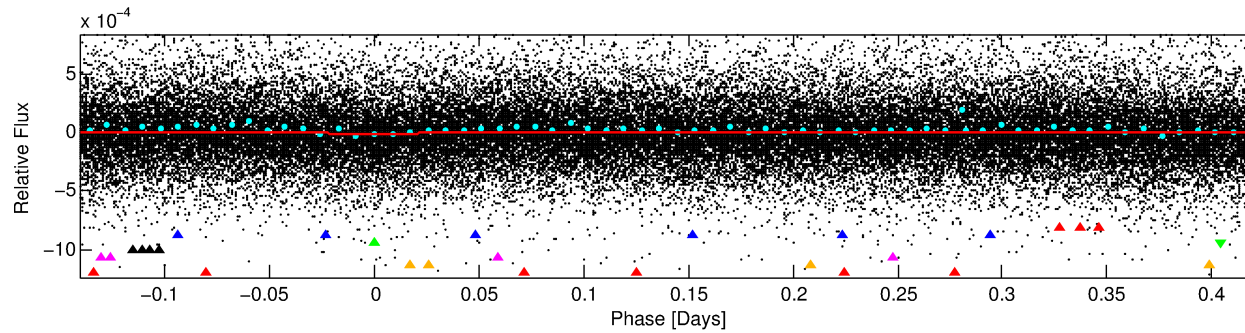
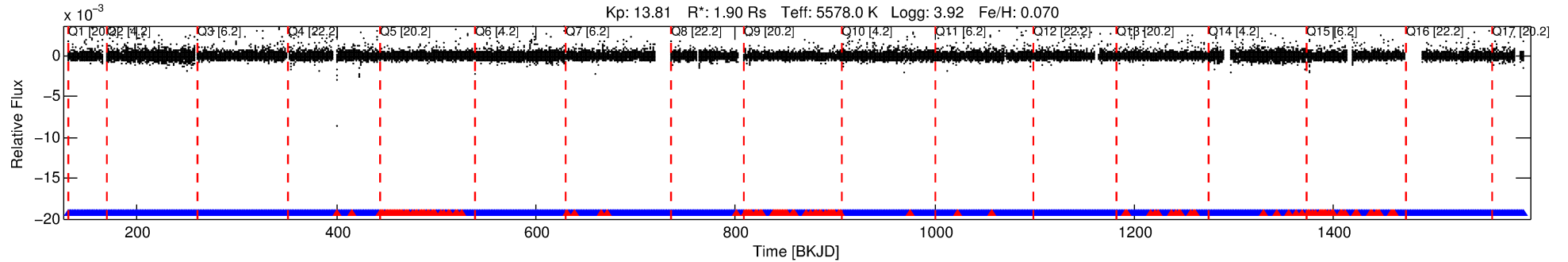
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 006721044-03

No Significant Match Found

# DV One-Page Summary

KIC: 6721044 Candidate: 3 of 7 Period: 0.564 d



## DV Fit Results:

Period = 0.56350 [0.00007] d  
Epoch = 131.8743 [0.0077] BKJD  
Rp/R\* = 0.0034 [0.0032]  
a/R\* = 2.11 [6.27]  
b = 0.90 [0.84]  
Seff = 16440.25 [14383.94]  
Teq = 2887 [632] K  
Rp = 0.71 [0.74] Re  
a = 0.0138 [0.0072] AU  
Ag = 10.91 [22.48] [0.44σ]  
Teffp = 8112 [3805] K [1.35σ]

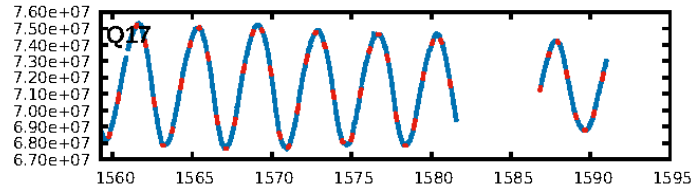
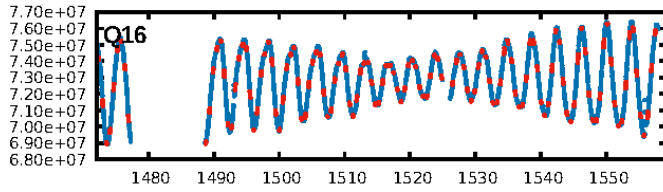
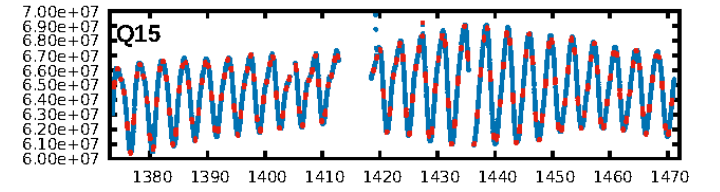
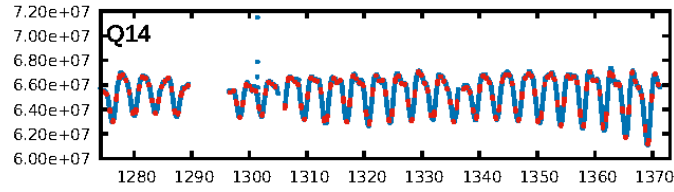
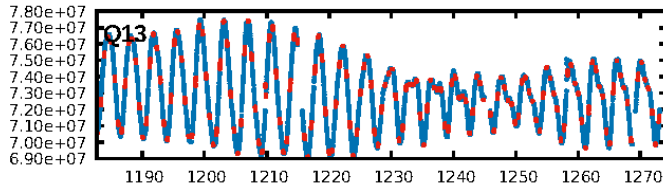
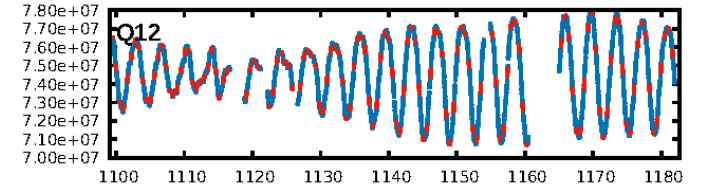
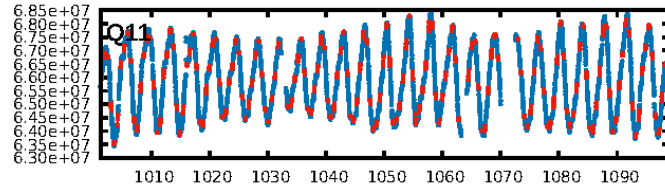
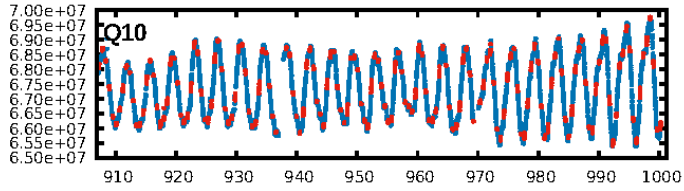
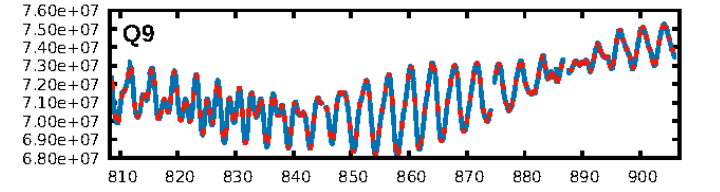
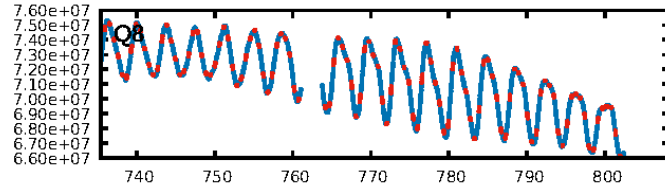
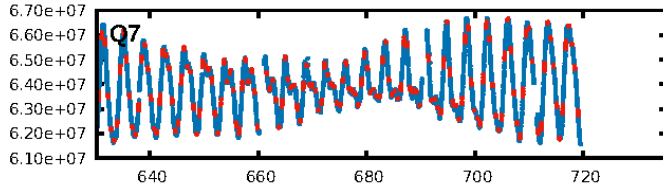
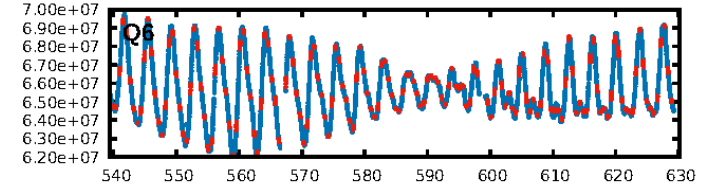
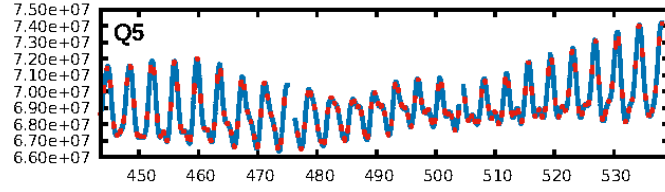
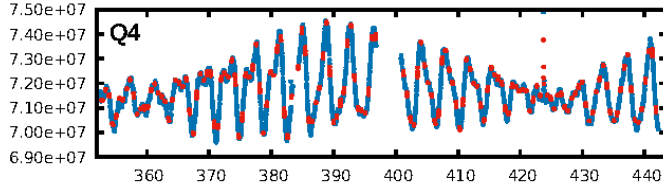
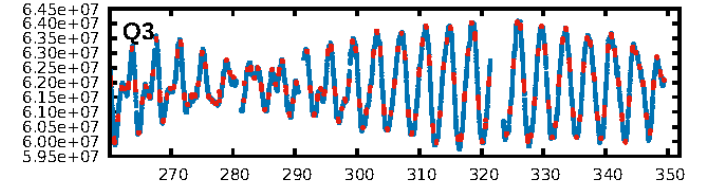
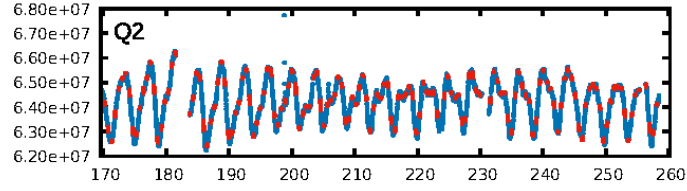
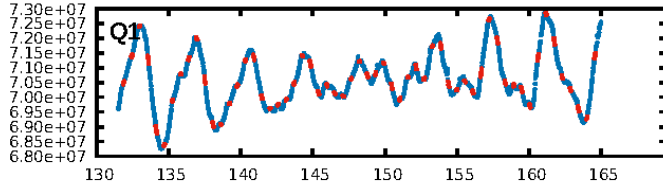
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [1342.50σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.52e-14  
RollingBand-fgt: 0.93 [2095/2255]  
GhostDiagnostic-chr: -0.06164  
Centroid-sig: 0.0%  
Centroid-so: 31.427 arcsec [4.08σ]  
OotOffset-rm: 4.323 arcsec [44.38σ]  
KicOffset-rm: 4.508 arcsec [48.75σ]  
OotOffset-st: 4/4/3/4 [15]  
KicOffset-st: 4/4/3/4 [15]  
DiffImageQuality-fgm: 0.33 [5/15]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 06:51:14 Z

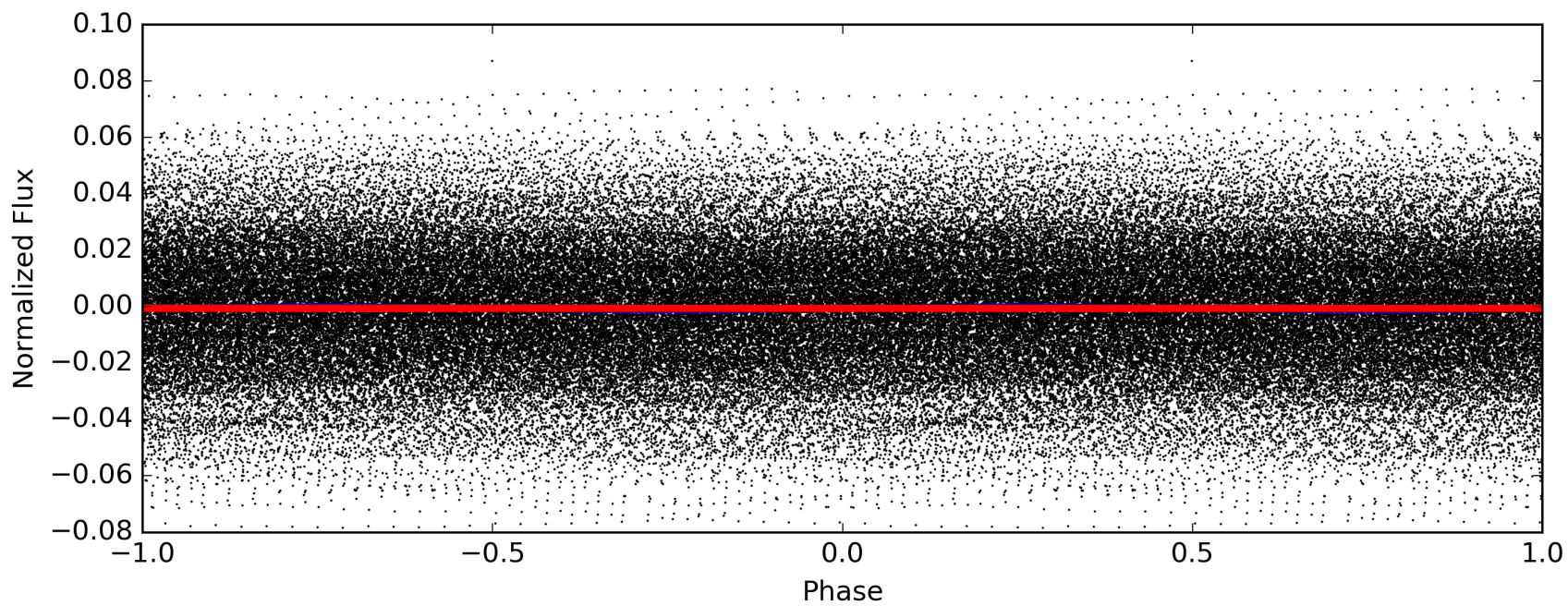
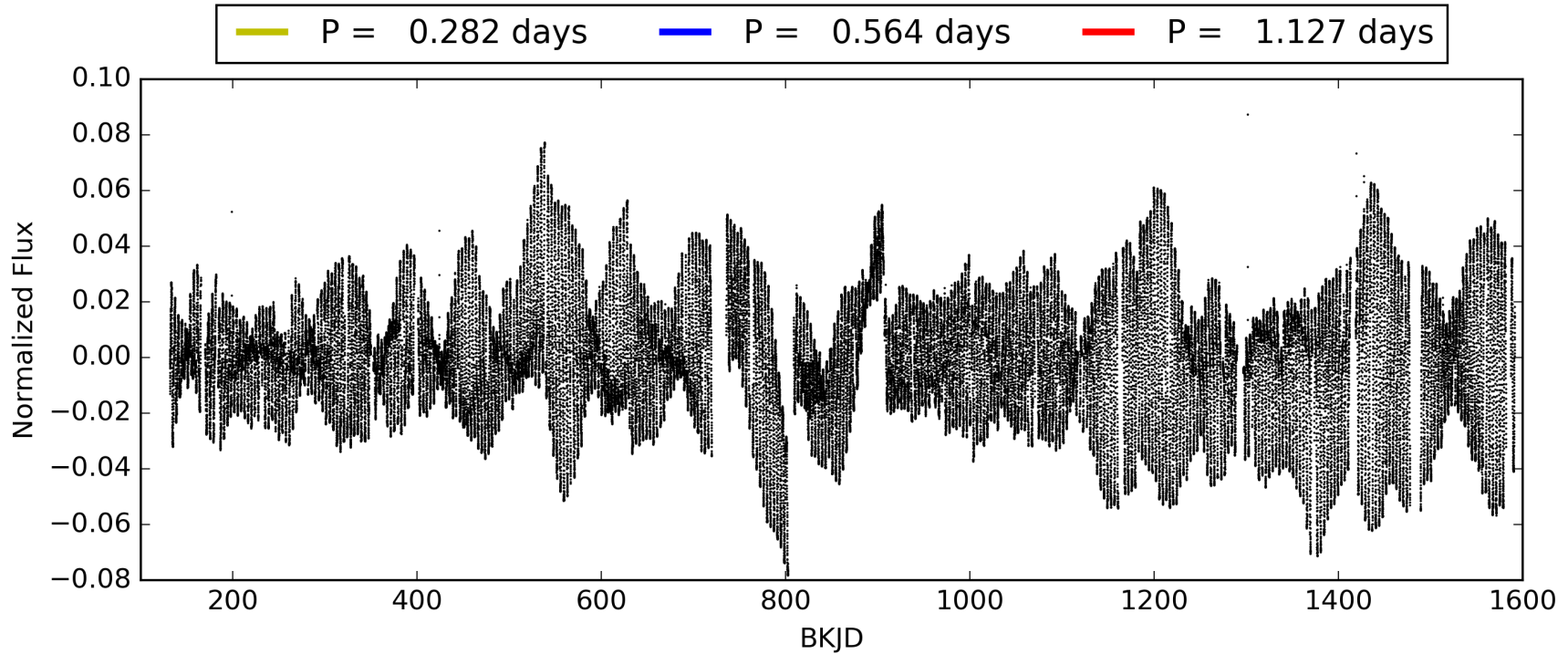
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006721044-03, PDC Light Curves





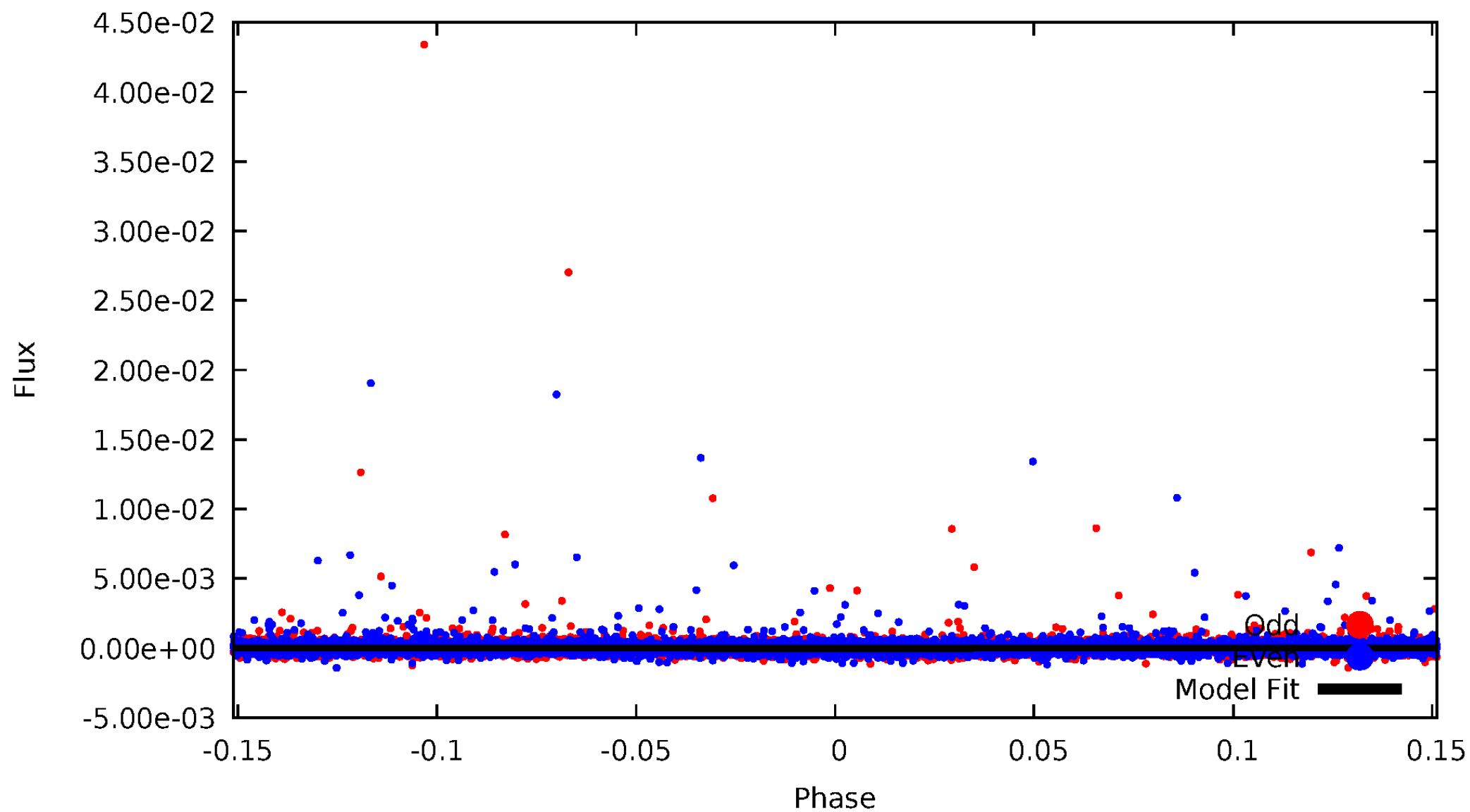
TCE 006721044-03





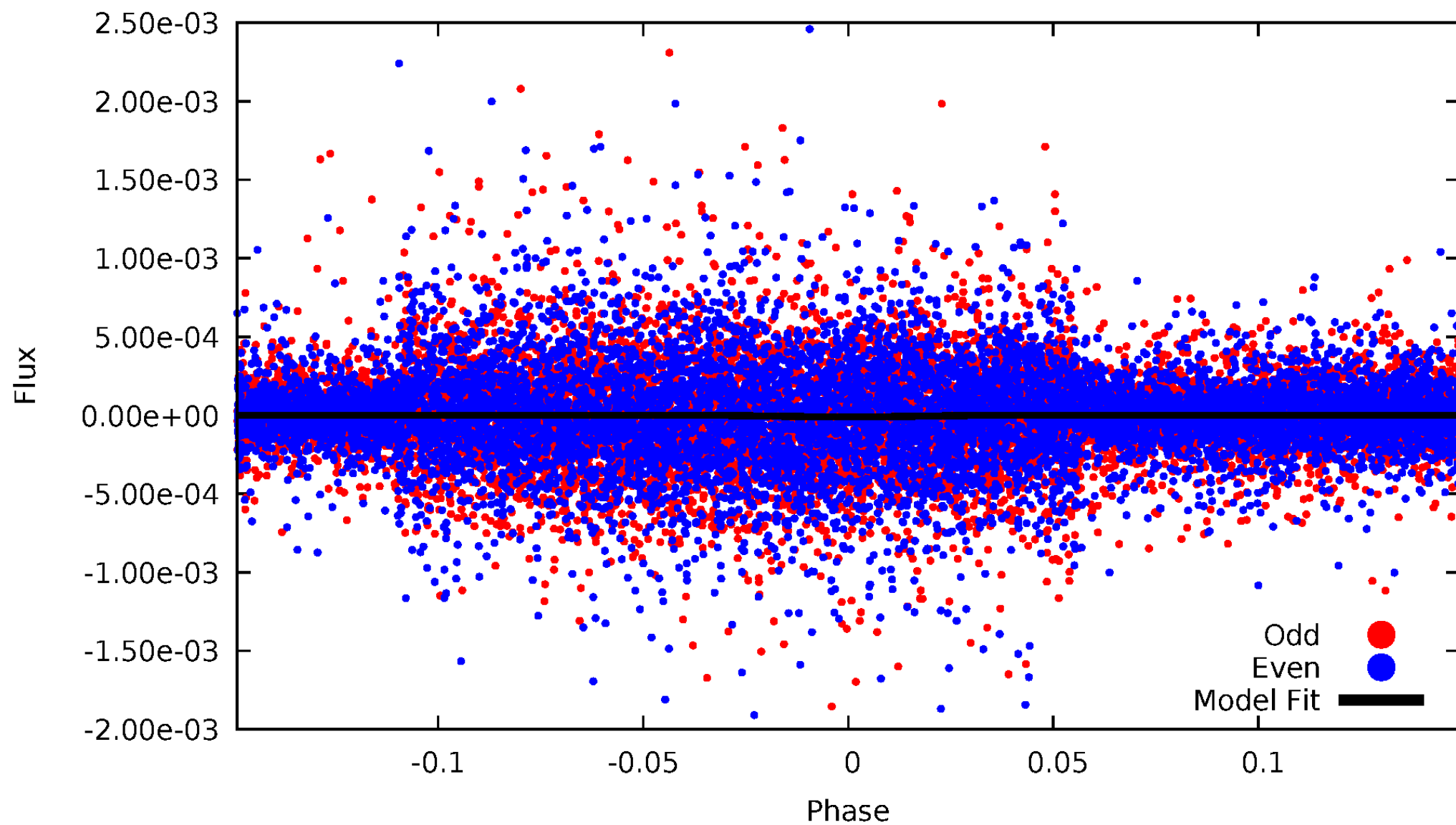
# DV Odd/Even

TCE 006721044-03



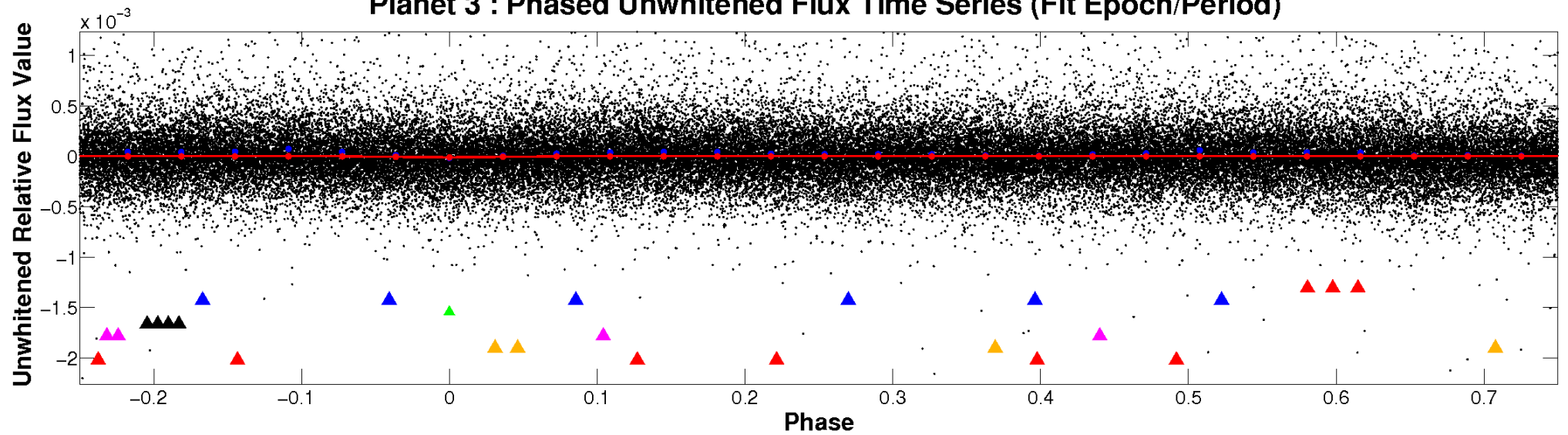
# ALT Odd/Even

TCE 006721044-03

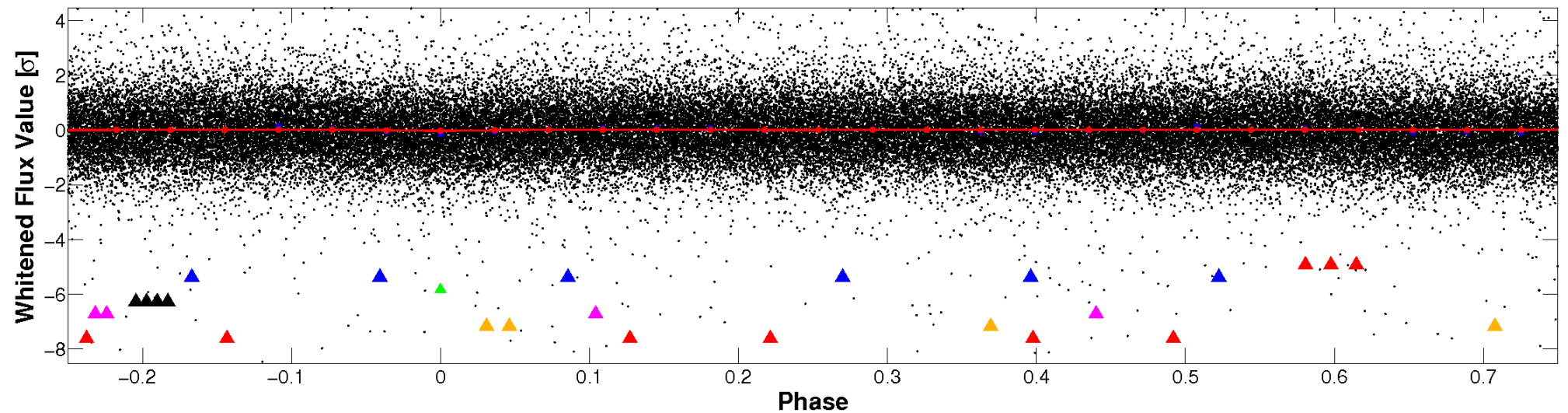


# Non-Whitened Vs. Whitened Light Curve

## Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

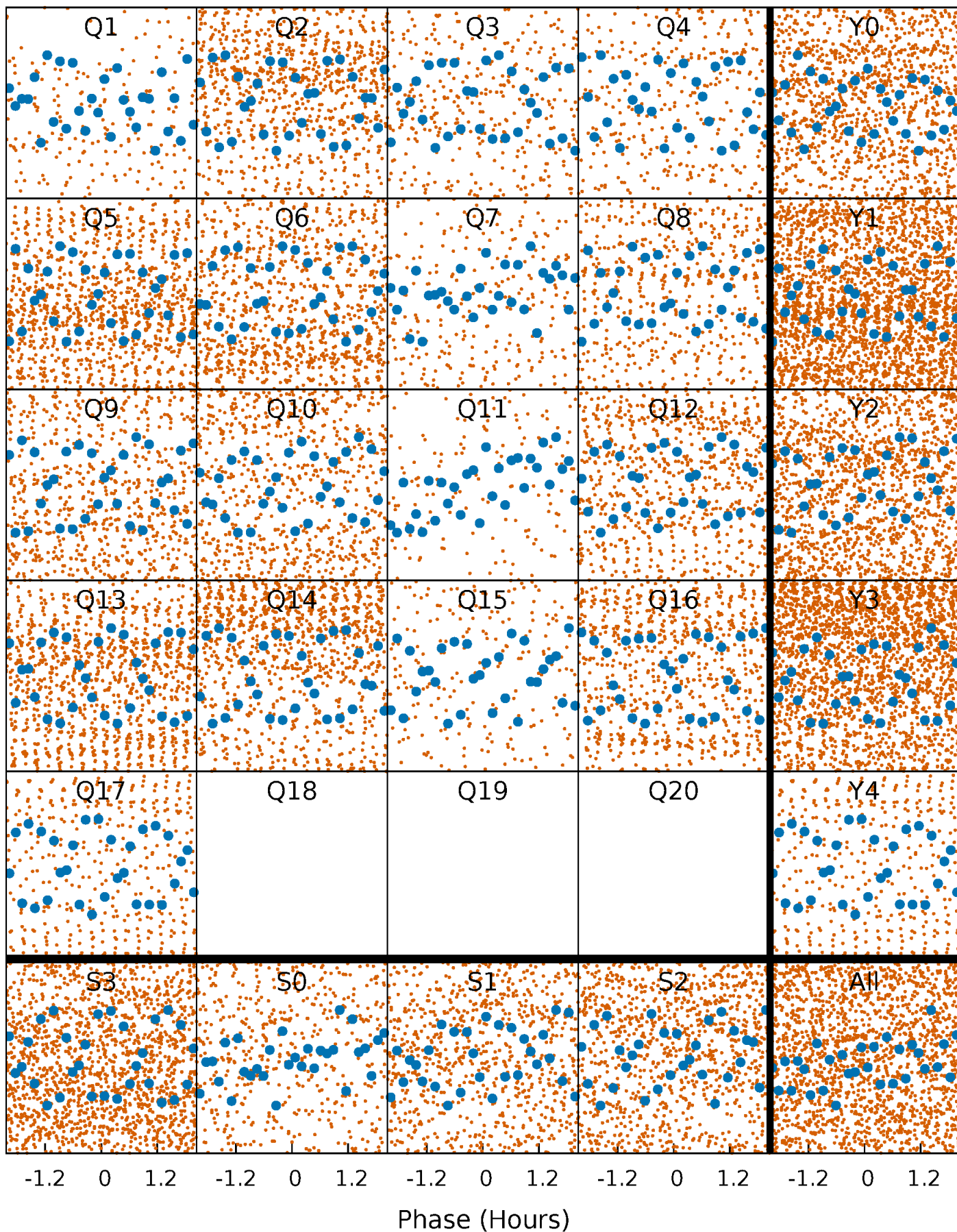


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

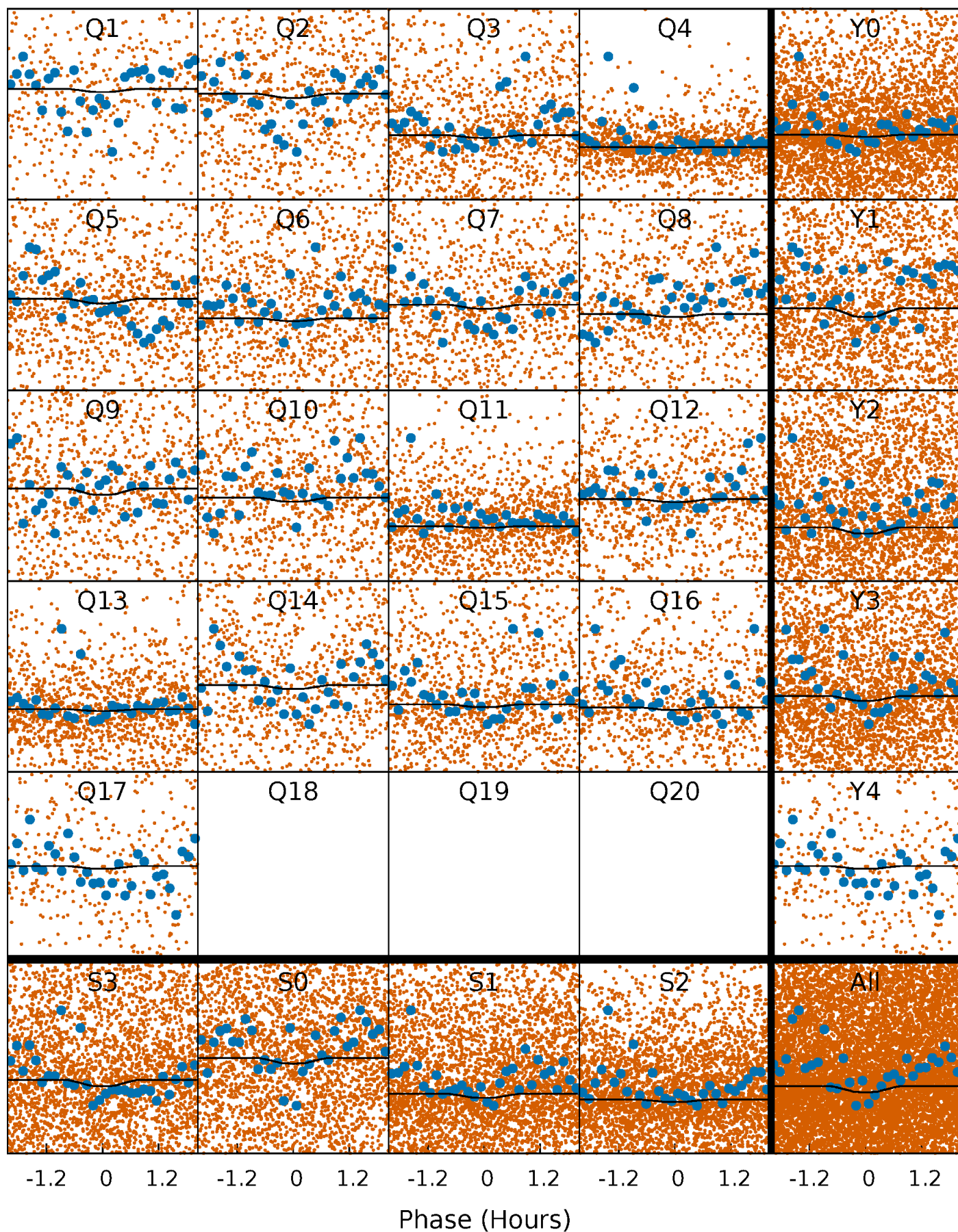
TCE 006721044-03 P= 0.563501 Days  $T_0=131.874349$  (BKJD)





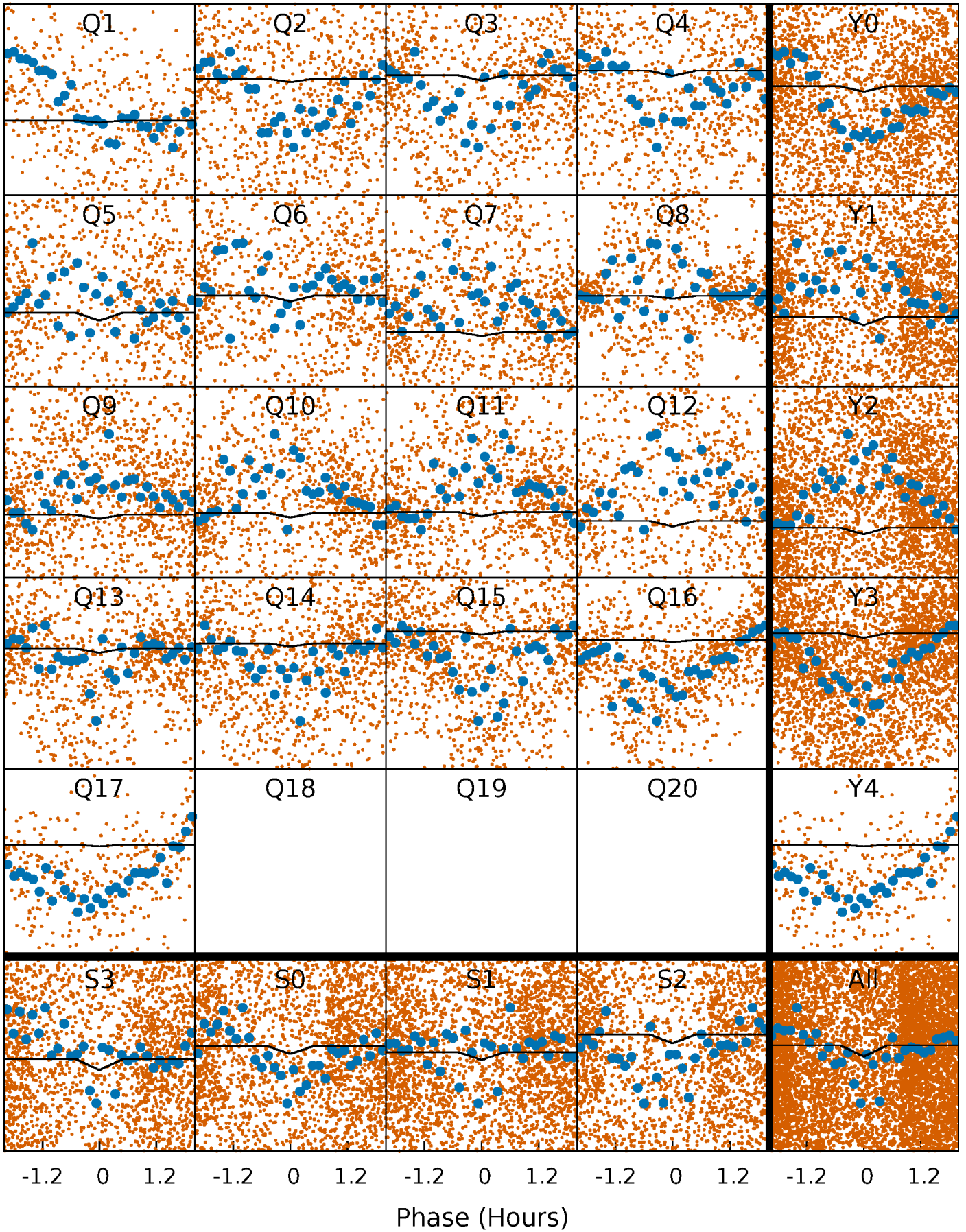
# DV Quarter-Phased Transit Curves

TCE 006721044-03 P= 0.563501 Days  $T_0=131.874349$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 006721044-03 P= 0.563503 Days  $T_0=131.874558$  (BKJD)

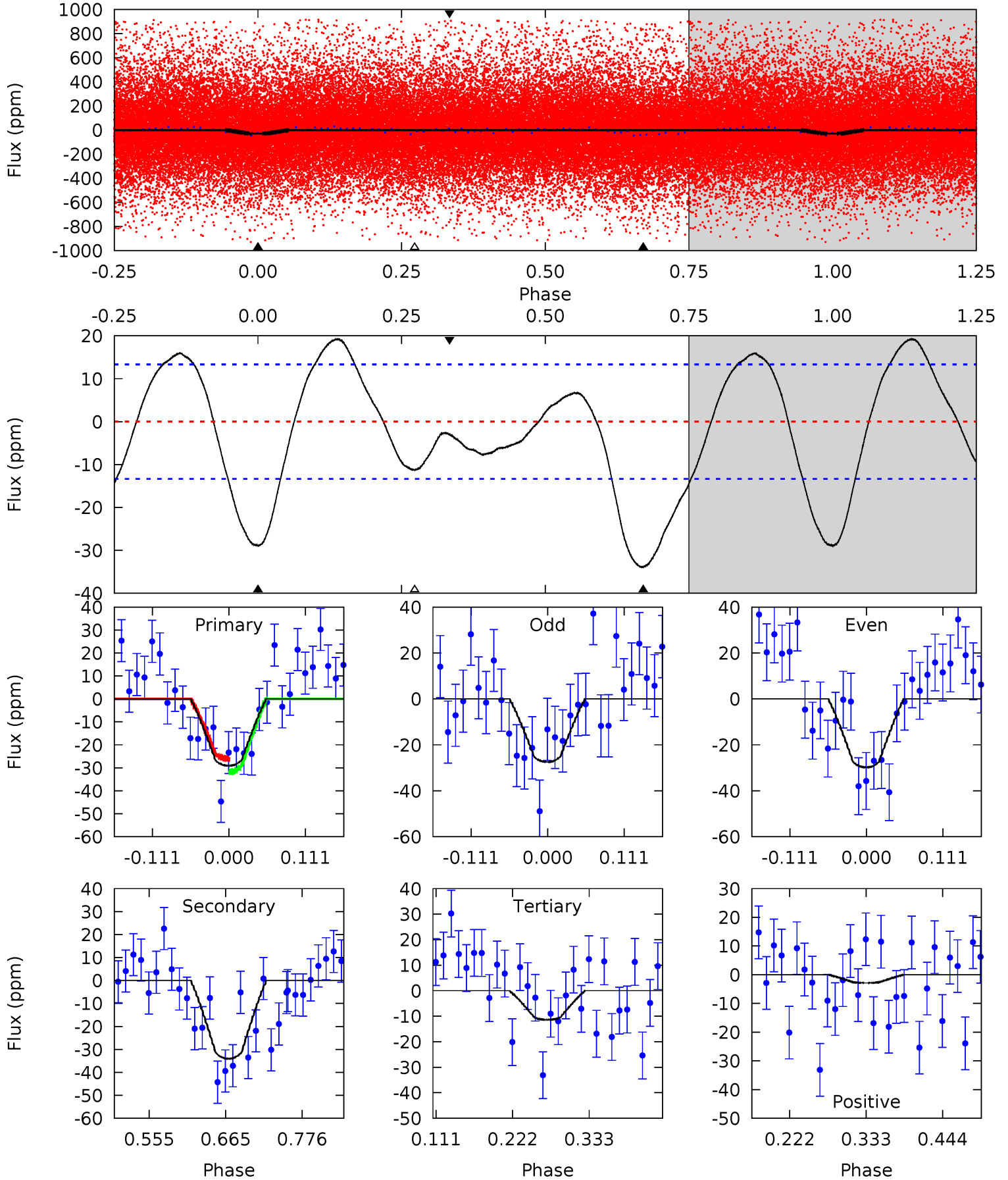




# DV Model-Shift Uniqueness Test

006721044-03, P = 0.563501 Days, E = 131.310848 Days

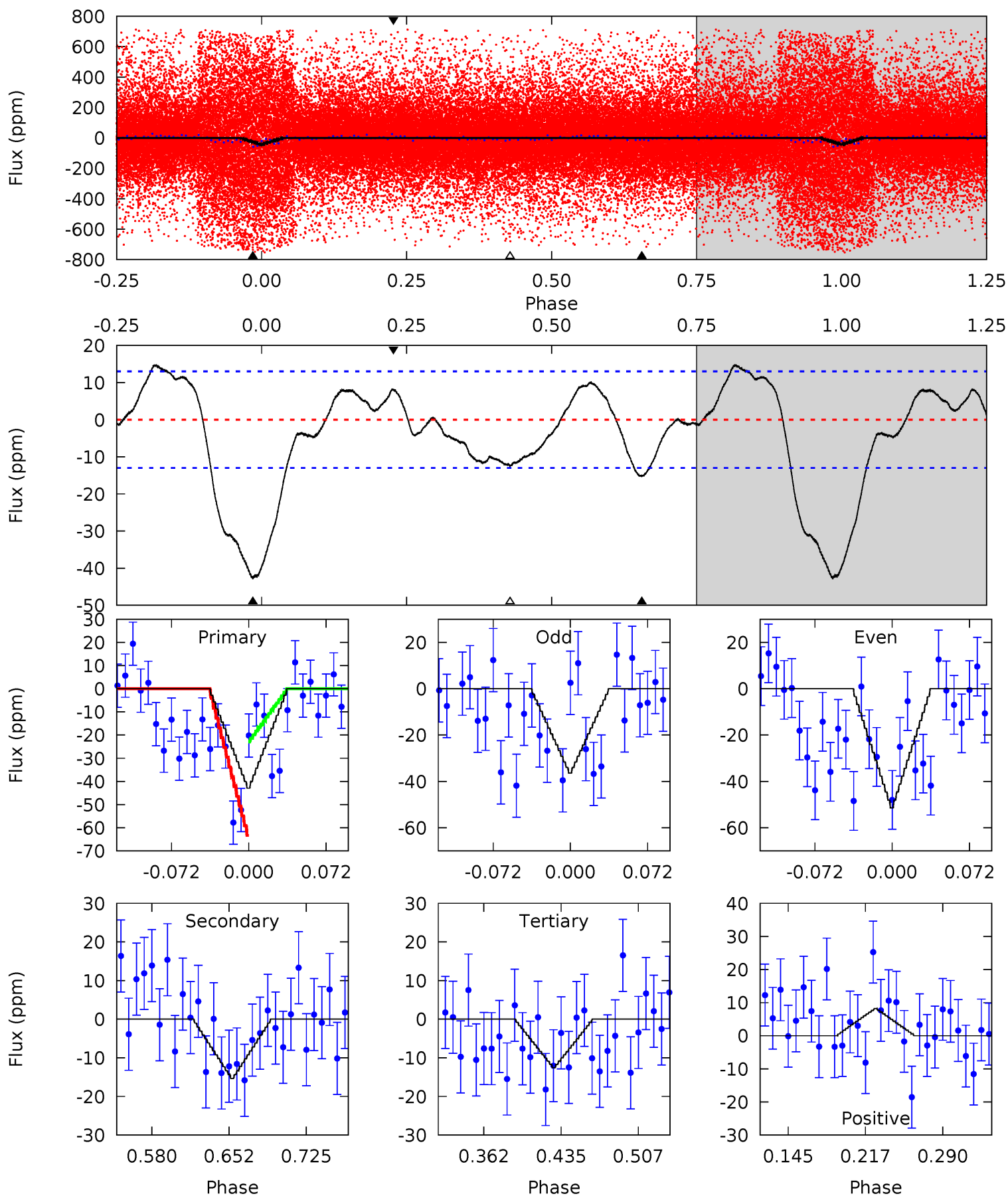
| Pri  | Sec  | Ter  | Pos   | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|-------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.91 | 11.6 | 3.89 | -0.97 | 4.54            | 1.59            | 3.13             | 6.03    | 10.9    | 7.72    | 12.6    | 0.40    | 0.20 | 0.36  | 1.00 |



# Alt Model-Shift Uniqueness Test

006721044-03, P = 0.563503 Days, E = 131.311055 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 15.3 | 5.47 | 4.47 | 2.93 | 4.63            | 1.80            | 2.68             | 10.8    | 12.4    | 1.00    | 2.54    | 2.67    | 1.12 | 0.26  | 7.12 |





### Stellar Parameters For KIC 006721044

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|--|
|        | $5578^{+186}_{-152}$ | $3.924^{+0.520}_{-0.130}$ | $0.070^{+0.250}_{-0.250}$ | $1.903^{+0.407}_{-0.949}$ | $1.109^{+0.128}_{-0.193}$ | $0.227^{+1.252}_{-0.099}$                        |
|        | +3%/-3%              | +13%/-3%                  | +357%/-357%               | +21%/-50%                 | +12%/-17%                 | +552%/-44%                                       |
| 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 006721044-03 / KOI

| Detrend | Depth (ppm) | $R_p$ ( $R_{\oplus}$ ) | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)   | $A_{\text{obs}}$           |
|---------|-------------|------------------------|----------------------|------------------------|----------------------------|
| DV      | $-34 \pm 3$ | $0.71^{+0.60}_{-0.42}$ | $3952^{+299}_{-533}$ | $6852^{+6507}_{-1769}$ | $7.040^{+36.989}_{-4.994}$ |
| Alt.    | $-15 \pm 3$ | $0.79^{+0.63}_{-0.45}$ | $3971^{+286}_{-513}$ | $5254^{+2859}_{-1258}$ | $2.596^{+11.934}_{-1.805}$ |

$T_{\text{max}}$  = 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  $A_{\text{obs}} \gg 1.0$

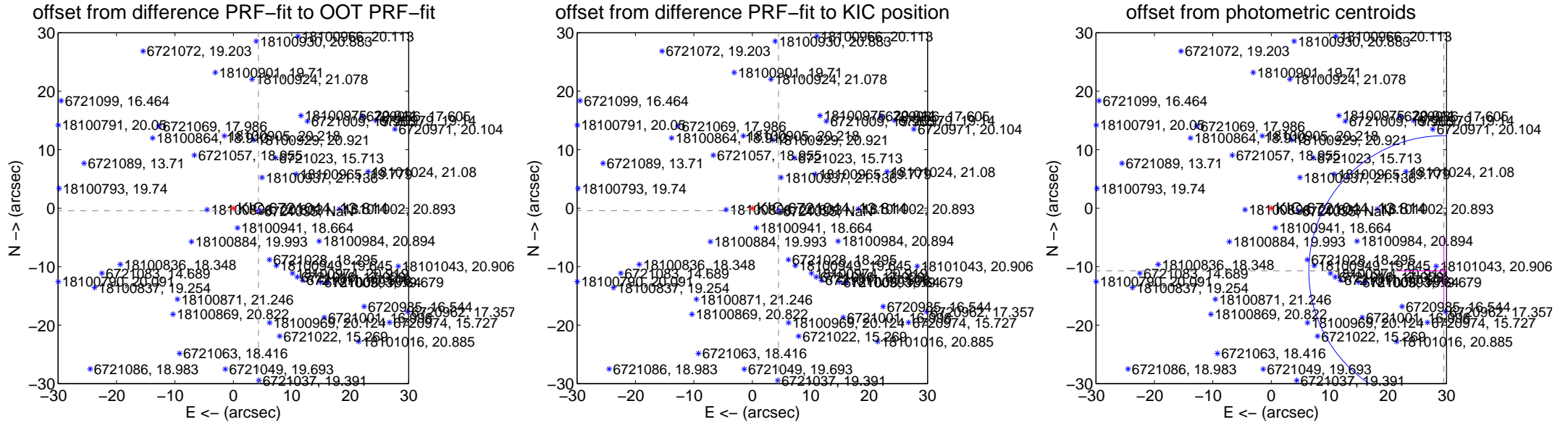
## DV Centroid Data

Supplemental centroid analysis for 006721044-03. Kepler magnitude: 13.81. Transit SNR 1.81

There are 5 quarters with good PRF difference image offsets

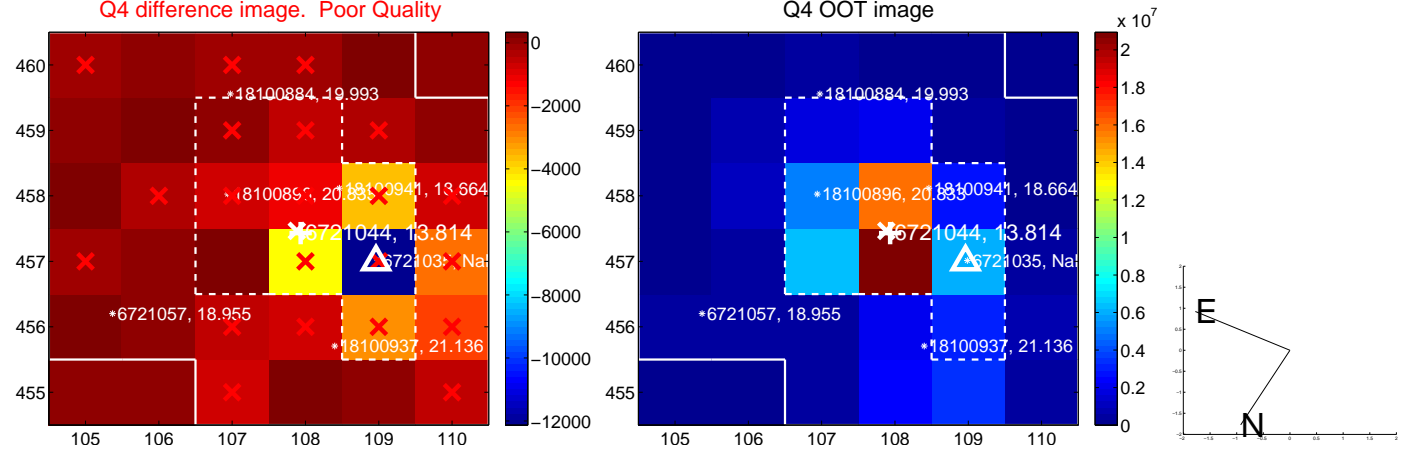
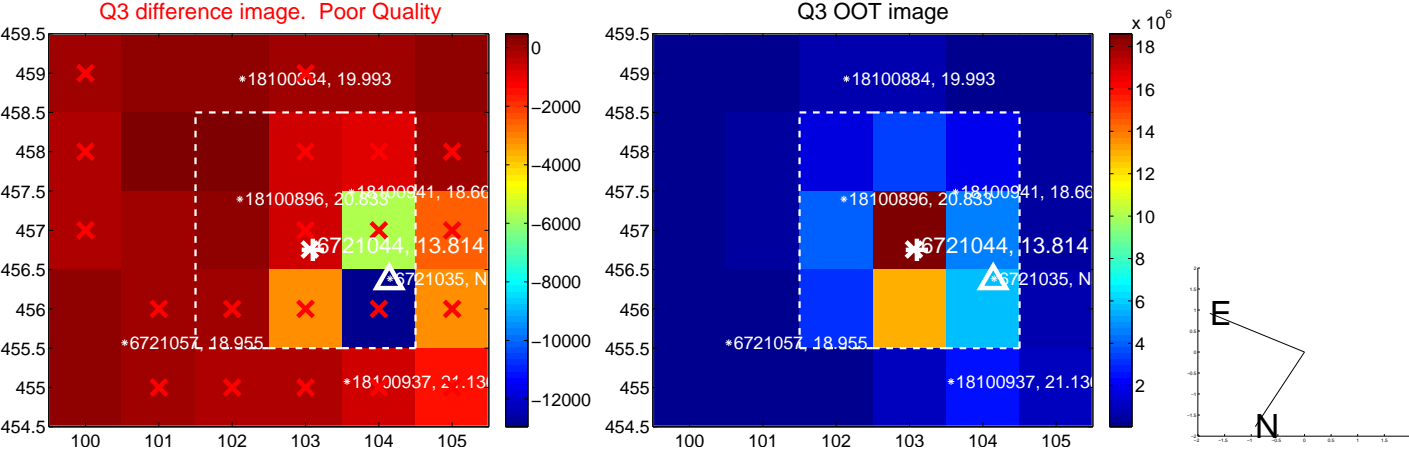
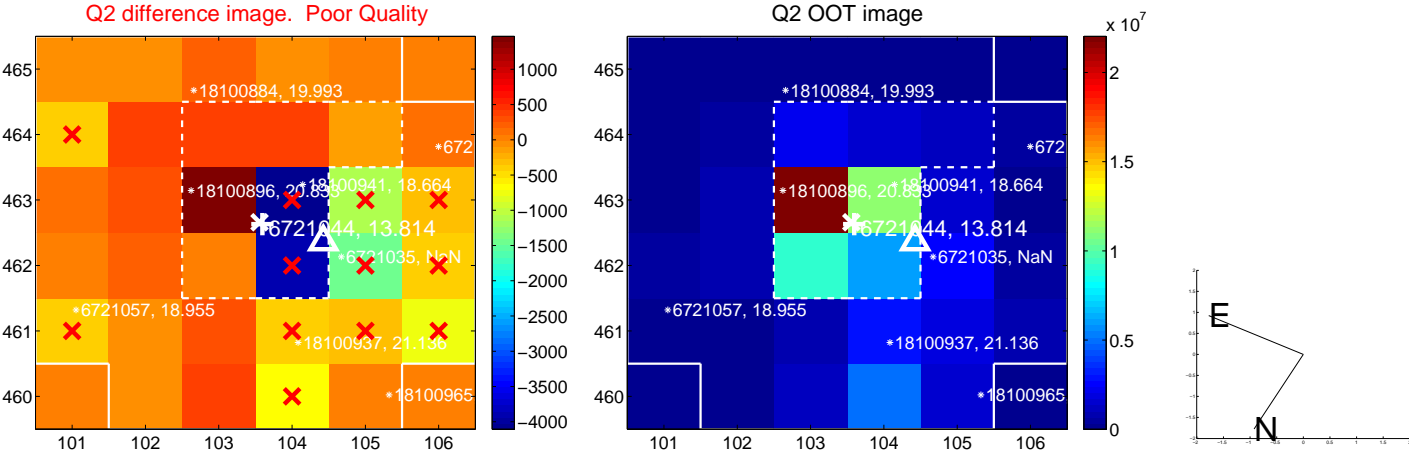
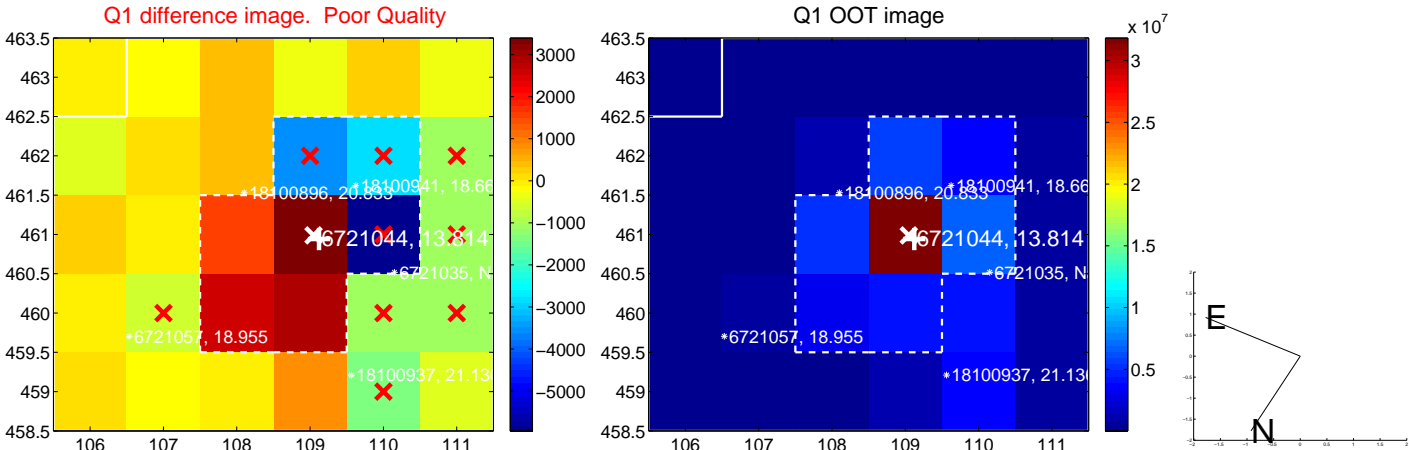
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

|   | Distance in arcsec                  | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|-------------------------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | <b>4.323 <math>\pm</math> 0.097</b> | <b>44.38</b>        | -4.299 $\pm$ 0.098 | -0.449 $\pm$ 0.073 |
| PRF-fit source offset from KIC position | <b>4.508 <math>\pm</math> 0.092</b> | <b>48.75</b>        | -4.487 $\pm$ 0.093 | -0.428 $\pm$ 0.075 |
| photometric centroid source offset      | <b>31.43 <math>\pm</math> 7.70</b>  | <b>4.08</b>         | -29.54 $\pm$ 7.90  | -10.72 $\pm$ 6.02  |

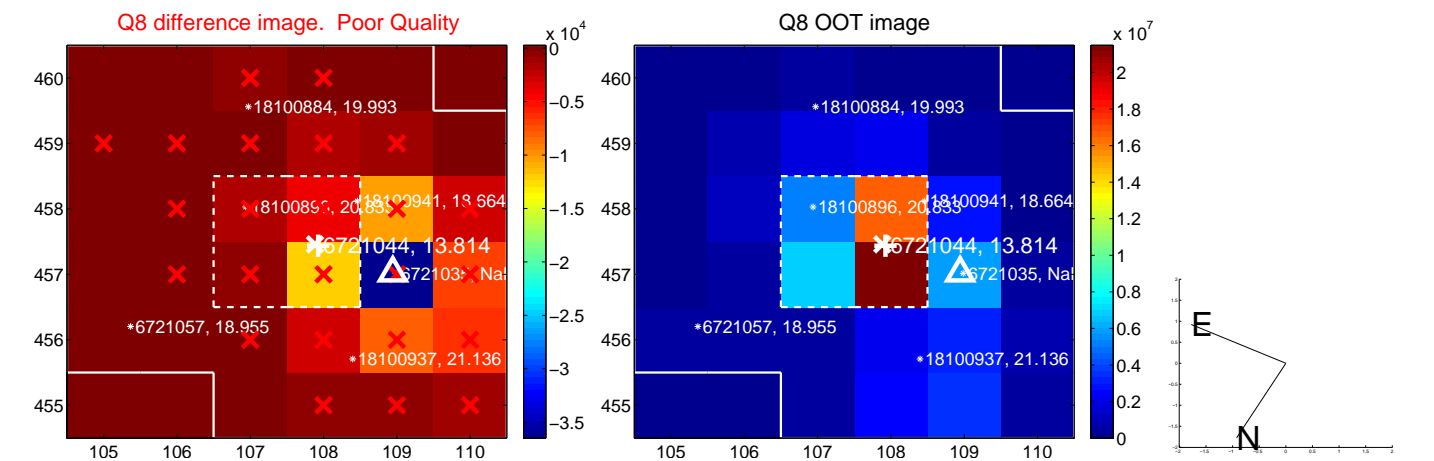
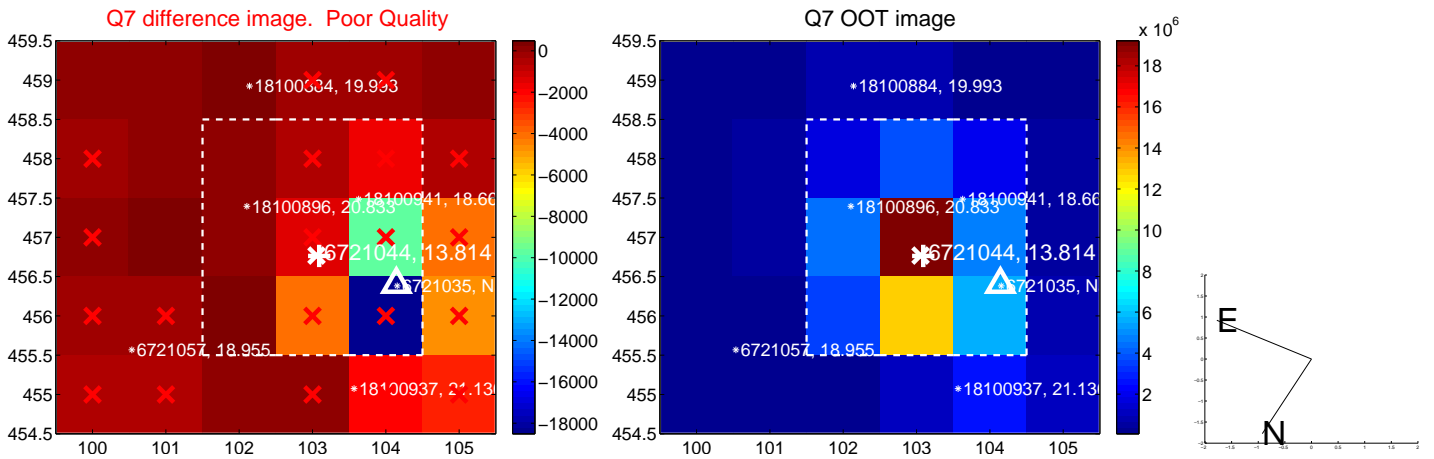
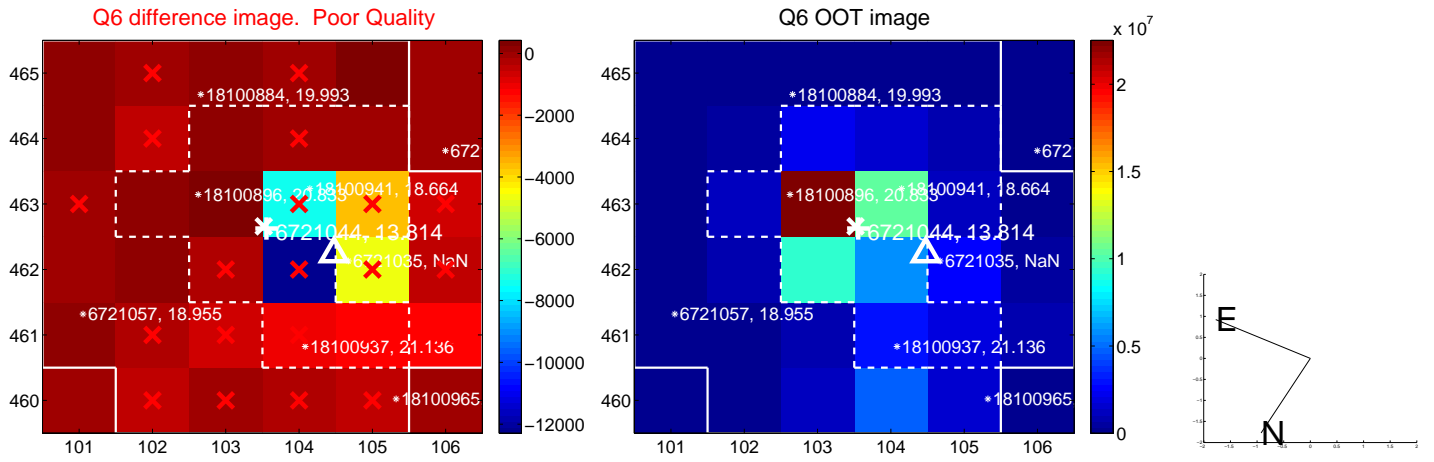
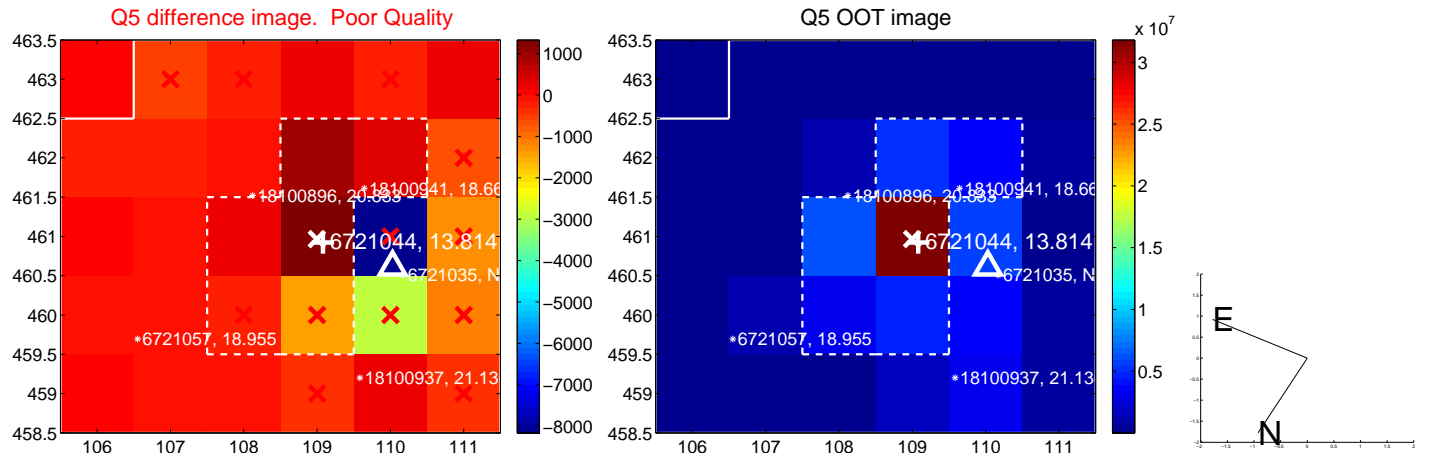


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: 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.

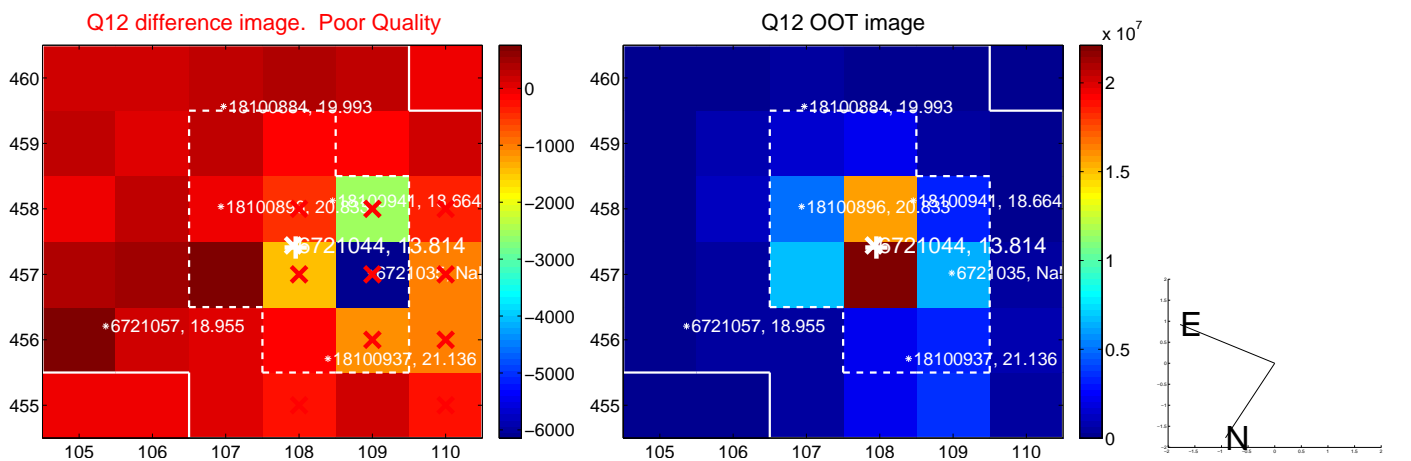
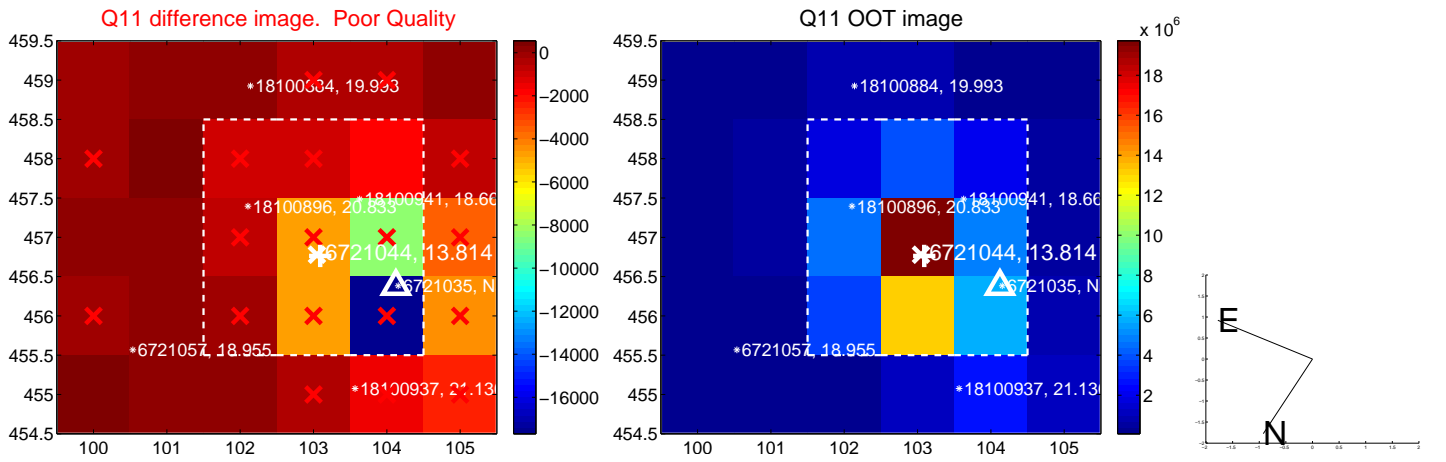
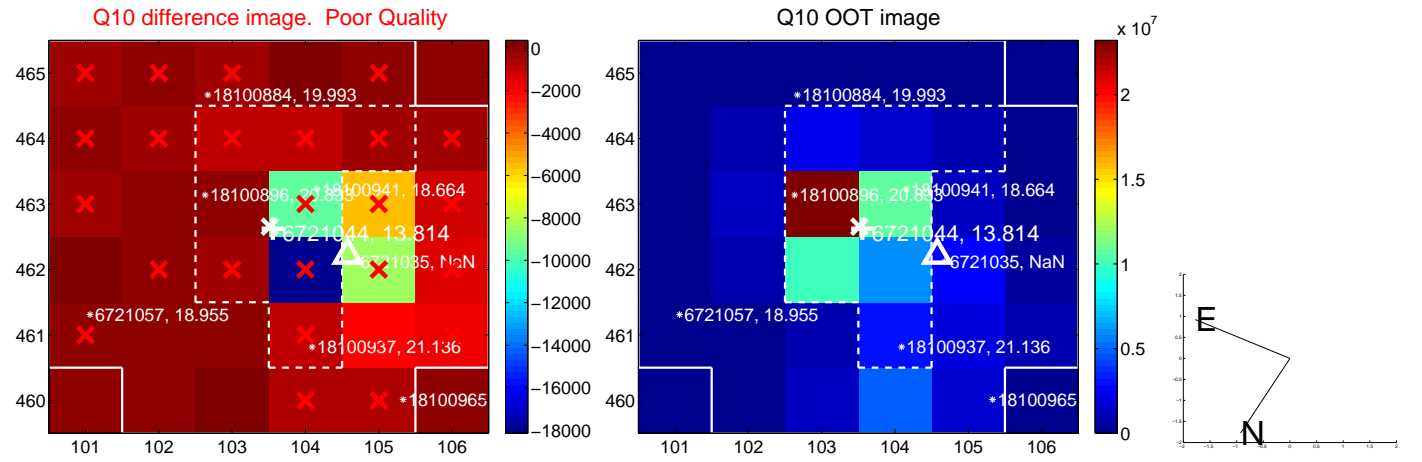
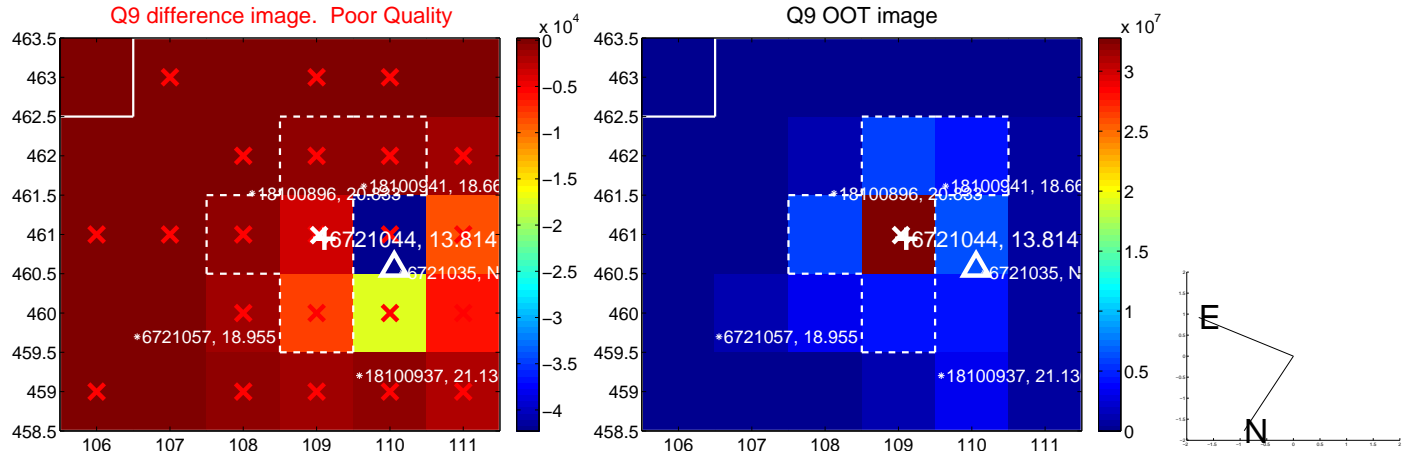
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



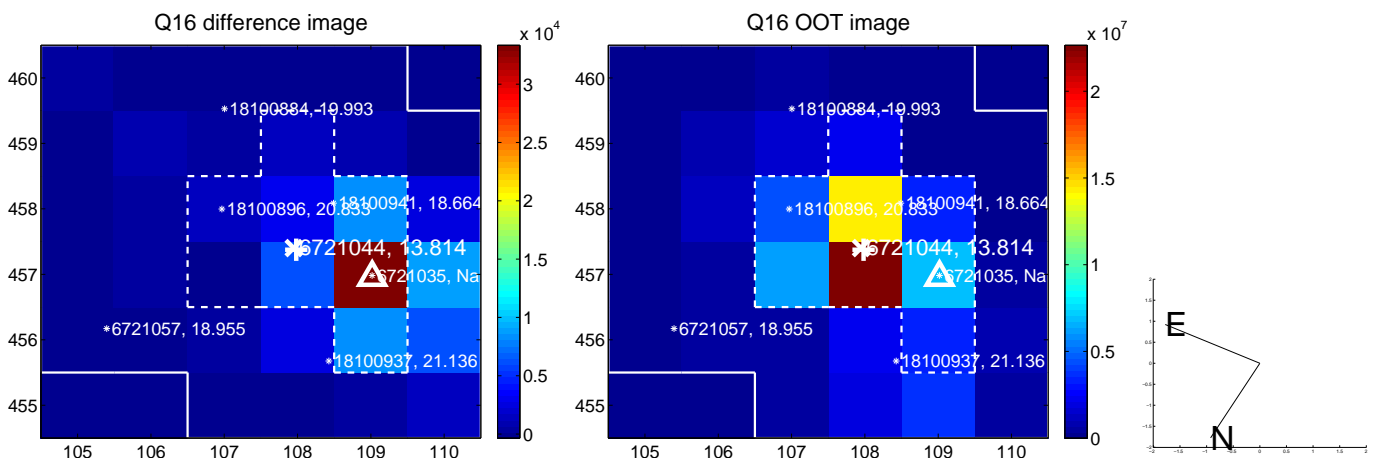
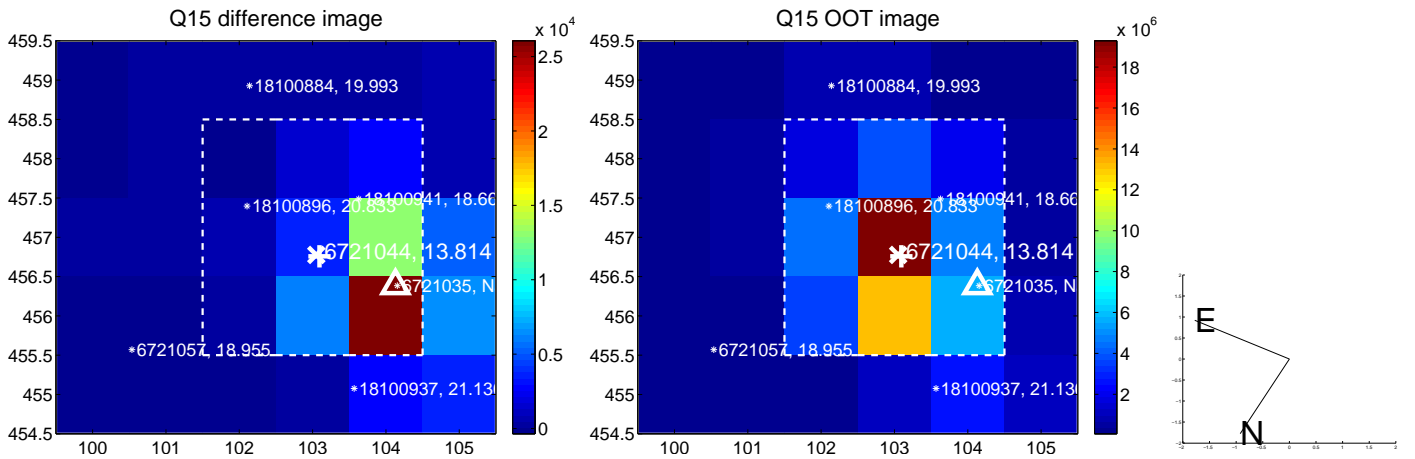
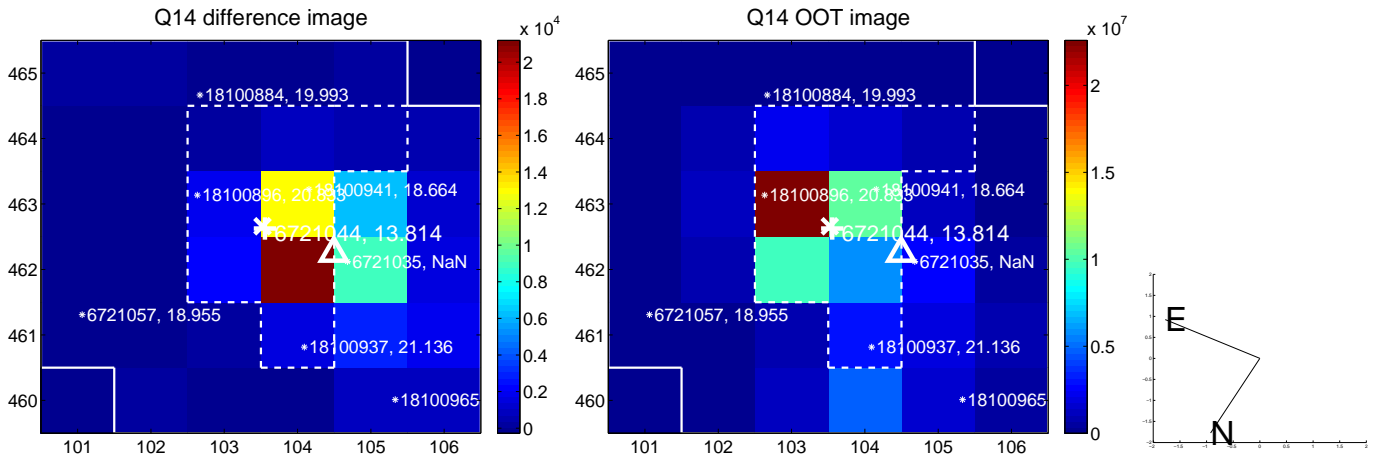
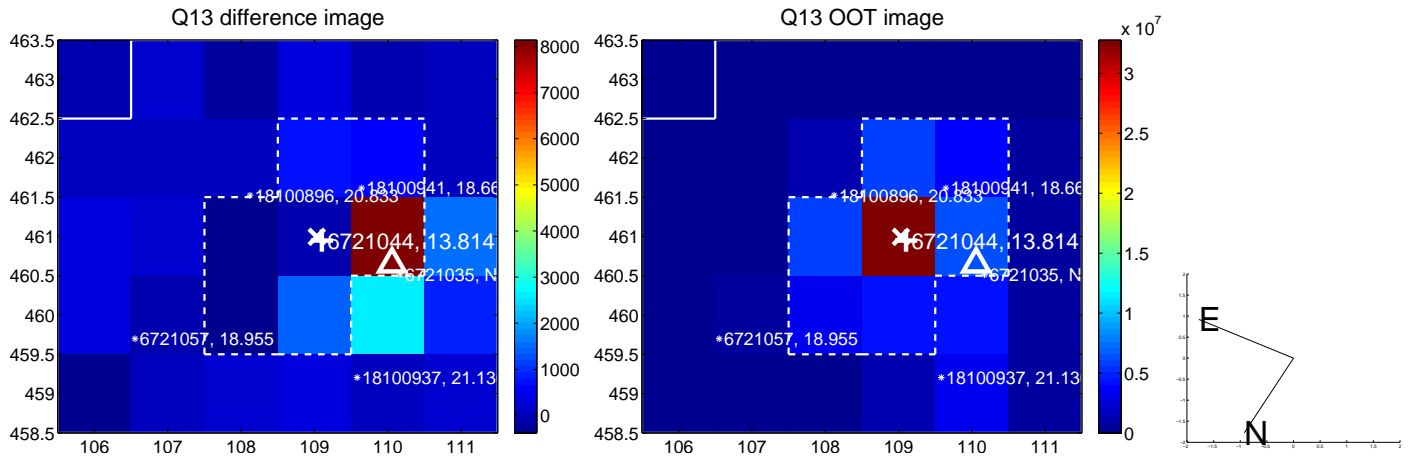
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



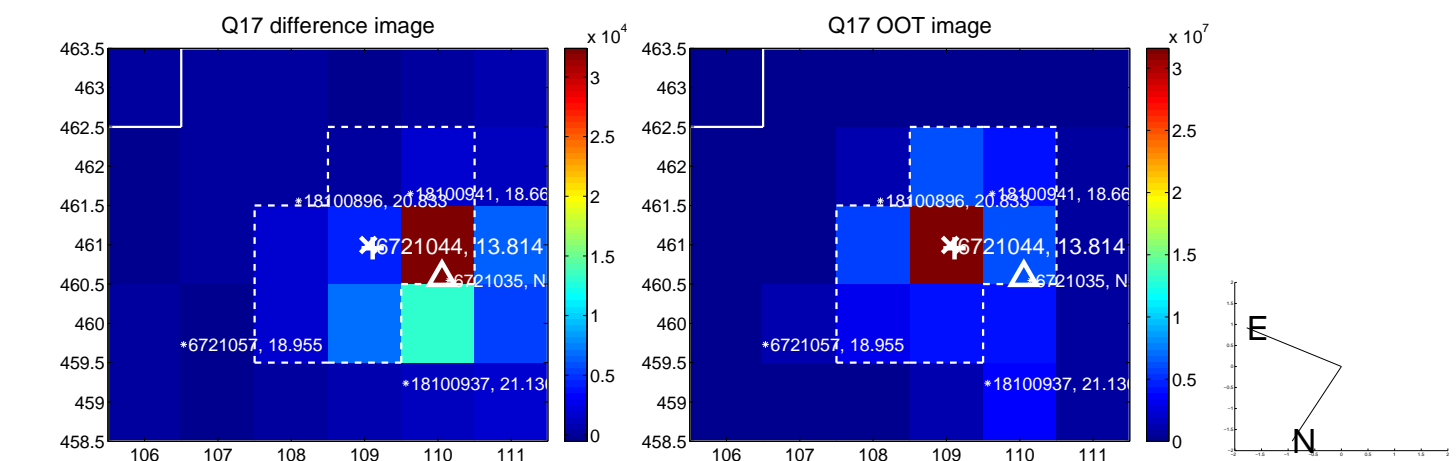
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



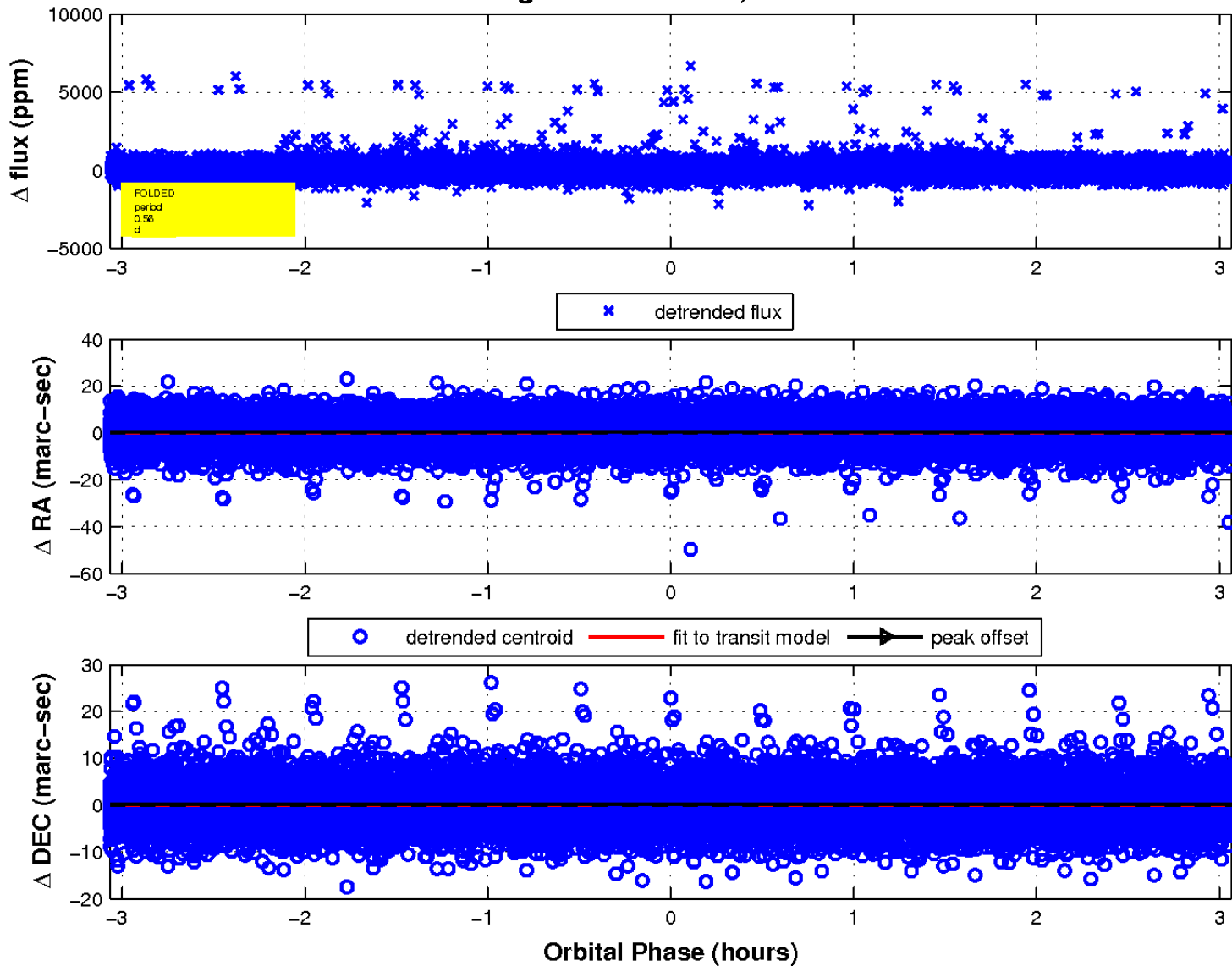
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

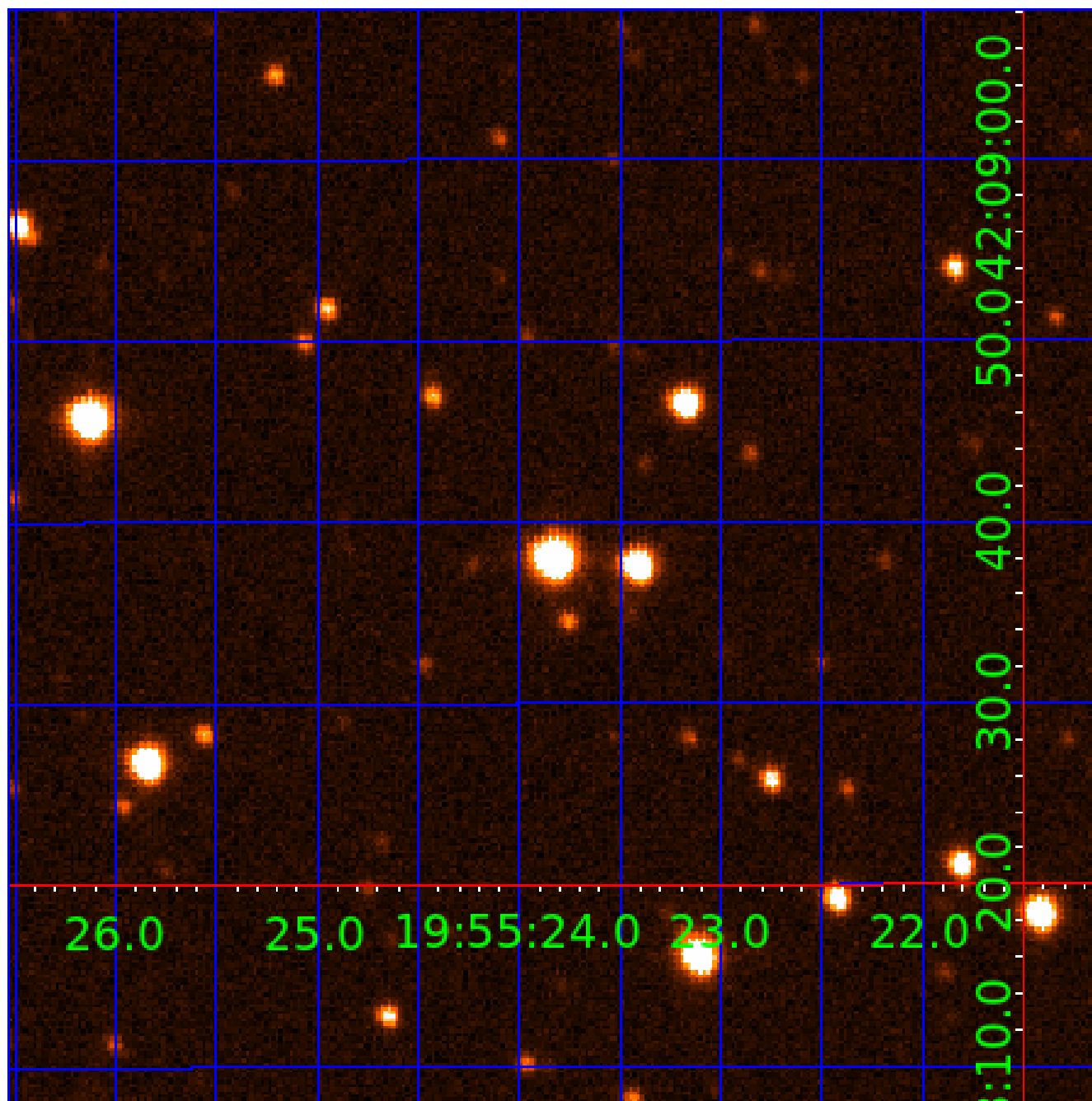


fluxWeightedCentroids, Planet 3 of 7



UKIRT Image

Declination





# KIC 006721044

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 006721044-01 | OBS      | No   | 492.489985    | 391.994566   | 665.7       | 4.075            | 11.8 | 4.4 | 1.90                        | 5578            | 5.18                   | 1.97                   |
| 006721044-02 | OBS      | No   | 225.154094    | 355.172737   | 814.2       | 3.269            | 9.2  | 7.0 | 1.90                        | 5578            | 5.56                   | 5.59                   |
| 006721044-03 | OBS      | No   | 0.563501      | 131.874349   | 9.5         | 1.022            | 8.1  | 1.8 | 1.90                        | 5578            | 0.71                   | 16440.25               |
| 006721044-05 | OBS      | No   | 456.246278    | 186.971169   | 1082.2      | 3.570            | 10.5 | 5.5 | 1.90                        | 5578            | 6.95                   | 2.18                   |
| 006721044-06 | OBS      | No   | 389.569679    | 366.871550   | 122.7       | 4.179            | 10.4 | 0.5 | 1.90                        | 5578            | 2.54                   | 2.69                   |
| 006721044-07 | OBS      | No   | 223.351808    | 353.554215   | 278.6       | 3.849            | 8.6  | 1.7 | 1.90                        | 5578            | 3.16                   | 5.65                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 006721044-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS   |
| 006721044-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 006721044-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST  |
| 006721044-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—CENT_FEW_DIFFS   |
| 006721044-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                    |
| 006721044-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

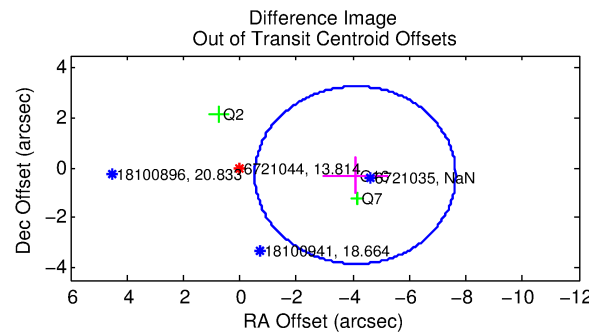
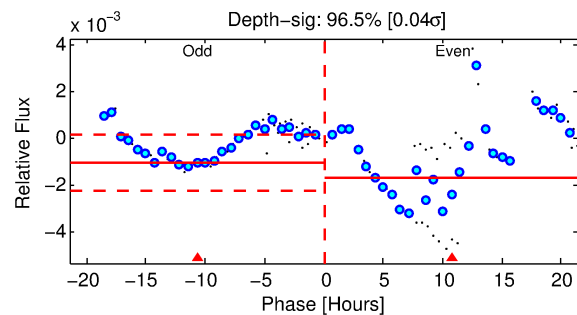
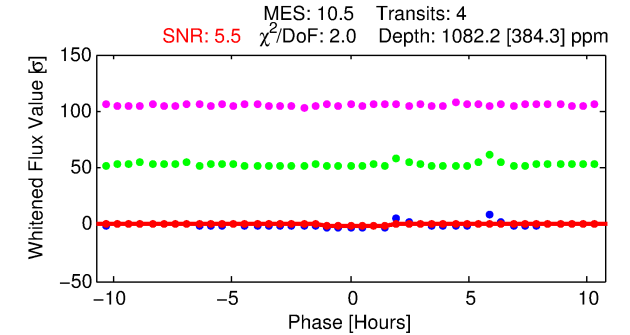
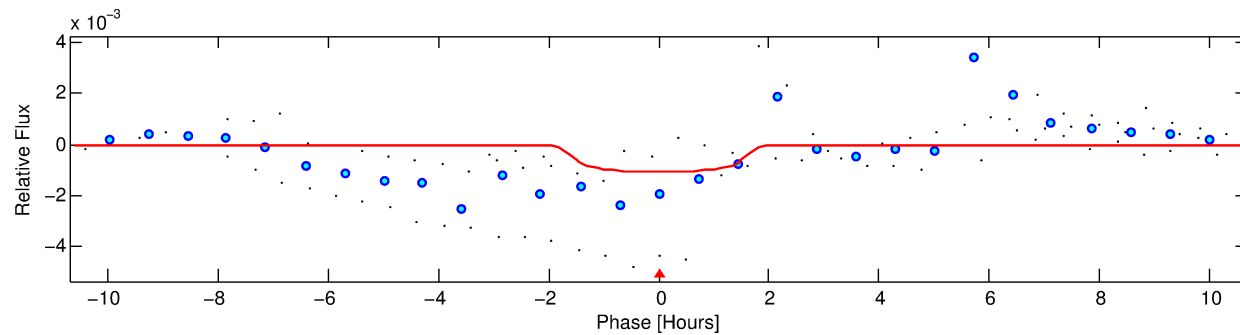
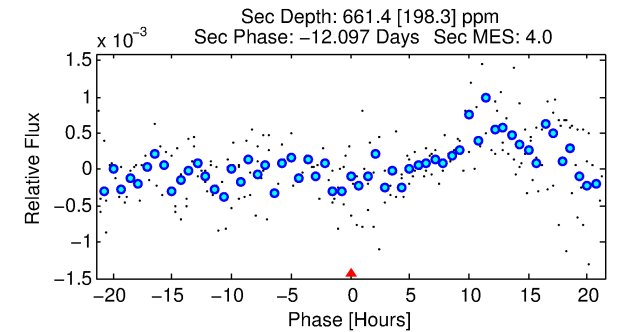
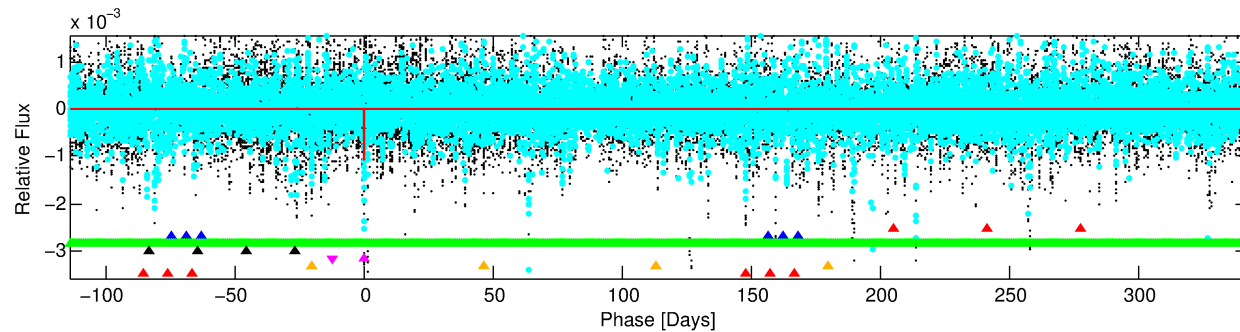
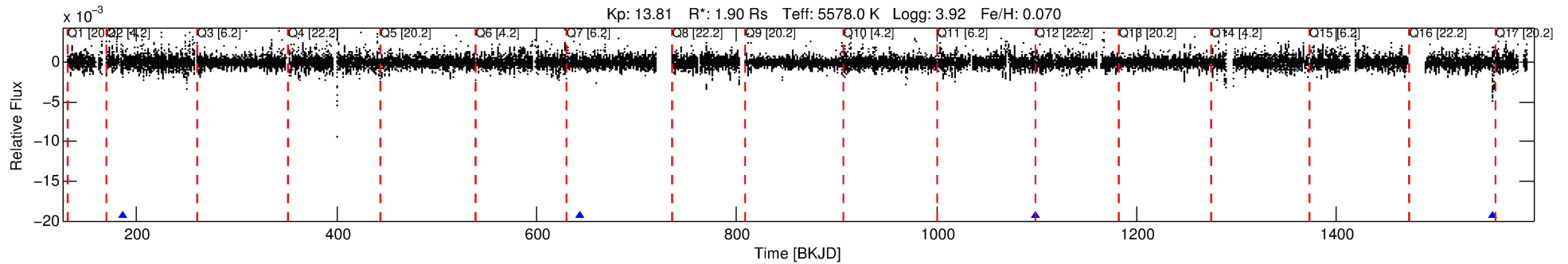
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 006721044-05

No Significant Match Found

# DV One-Page Summary

KIC: 6721044 Candidate: 5 of 7 Period: 456.246 d



## DV Fit Results:

Period = 456.24628 [0.00856] d  
Epoch = 186.9712 [0.0140] BKJD  
Rp/R\* = 0.0335 [0.0351]  
a/R\* = 645.86 [2704.82]  
b = 0.79 [1.98]  
Seff = 2.18 [1.91]  
Teq = 310 [68] K  
Rp = 6.95 [8.08] Re  
a = 1.2008 [0.6237] AU  
Ag = 10871.75 [24912.72] [0.44 $\sigma$ ]  
Teffp = 4891 [2600] K [1.76 $\sigma$ ]

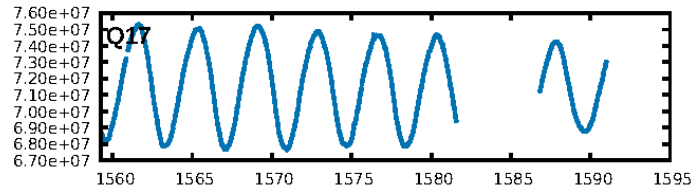
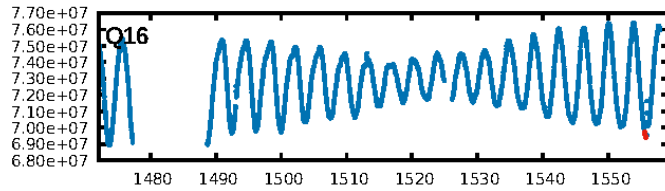
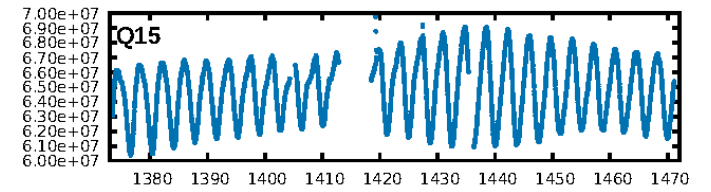
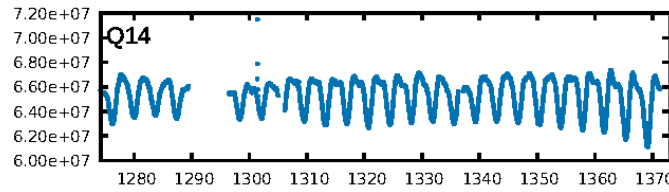
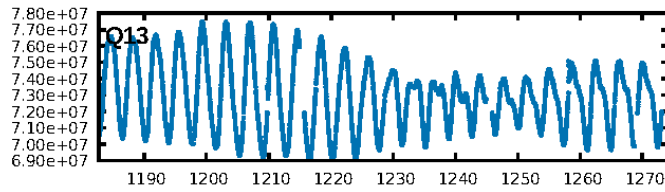
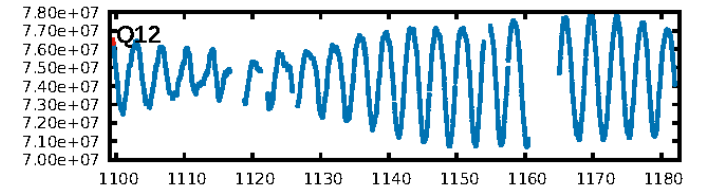
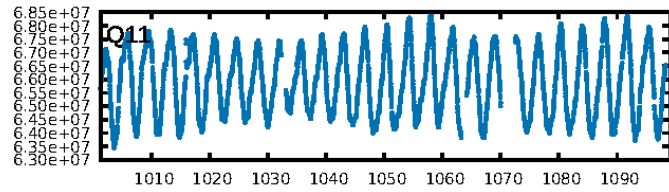
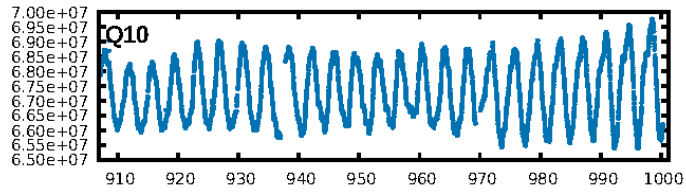
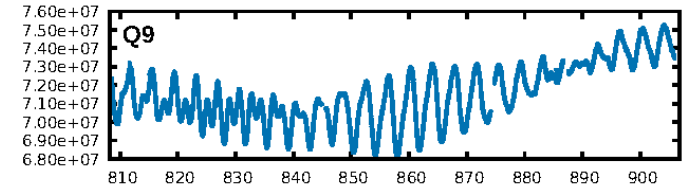
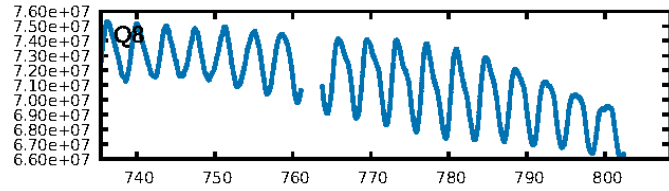
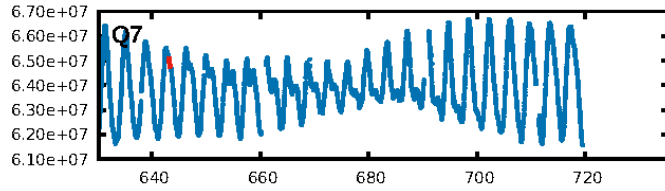
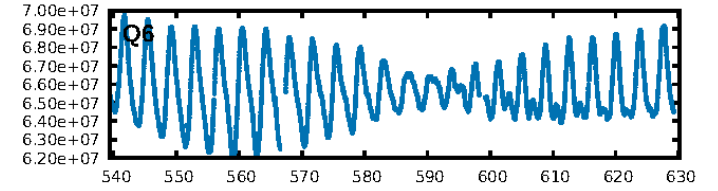
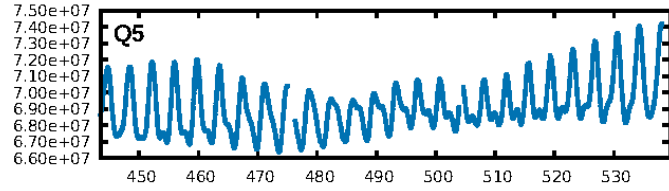
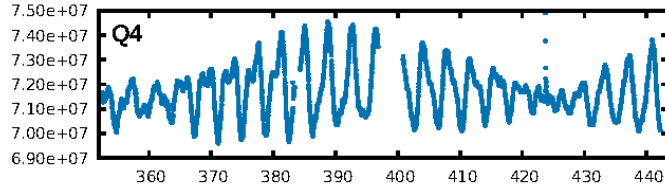
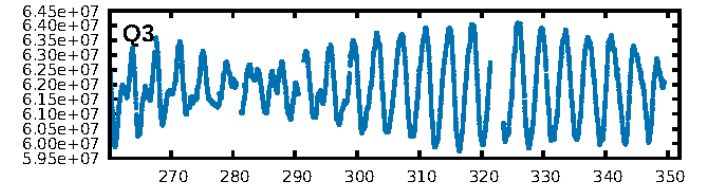
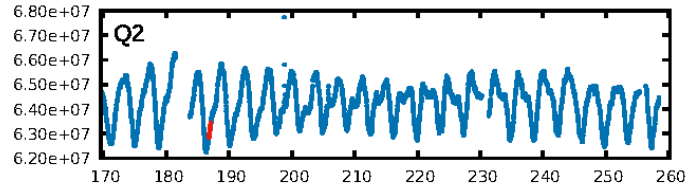
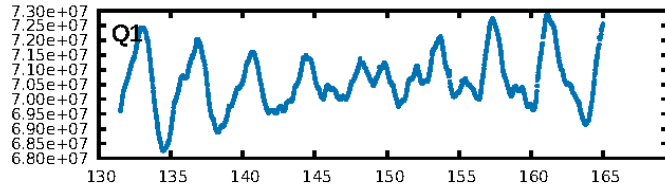
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [18.77 $\sigma$ ]  
LongPeriod-sig: 100.0% [160.56 $\sigma$ ]  
ModelChiSquare2-sig: 22.5%  
ModelChiSquareGof-sig: 79.9%  
**Bootstrap-pfa: 7.43e-11**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 2.111  
Centroid-sig: 76.2%  
Centroid-so: 0.876 arcsec [0.61 $\sigma$ ]  
**OotOffset-rm: 4.095 arcsec [3.46 $\sigma$ ]**  
**KicOffset-rm: 4.255 arcsec [3.30 $\sigma$ ]**  
OotOffset-st: 1/1/1/0 [3]  
KicOffset-st: 1/1/1/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 0.00 [0/3]

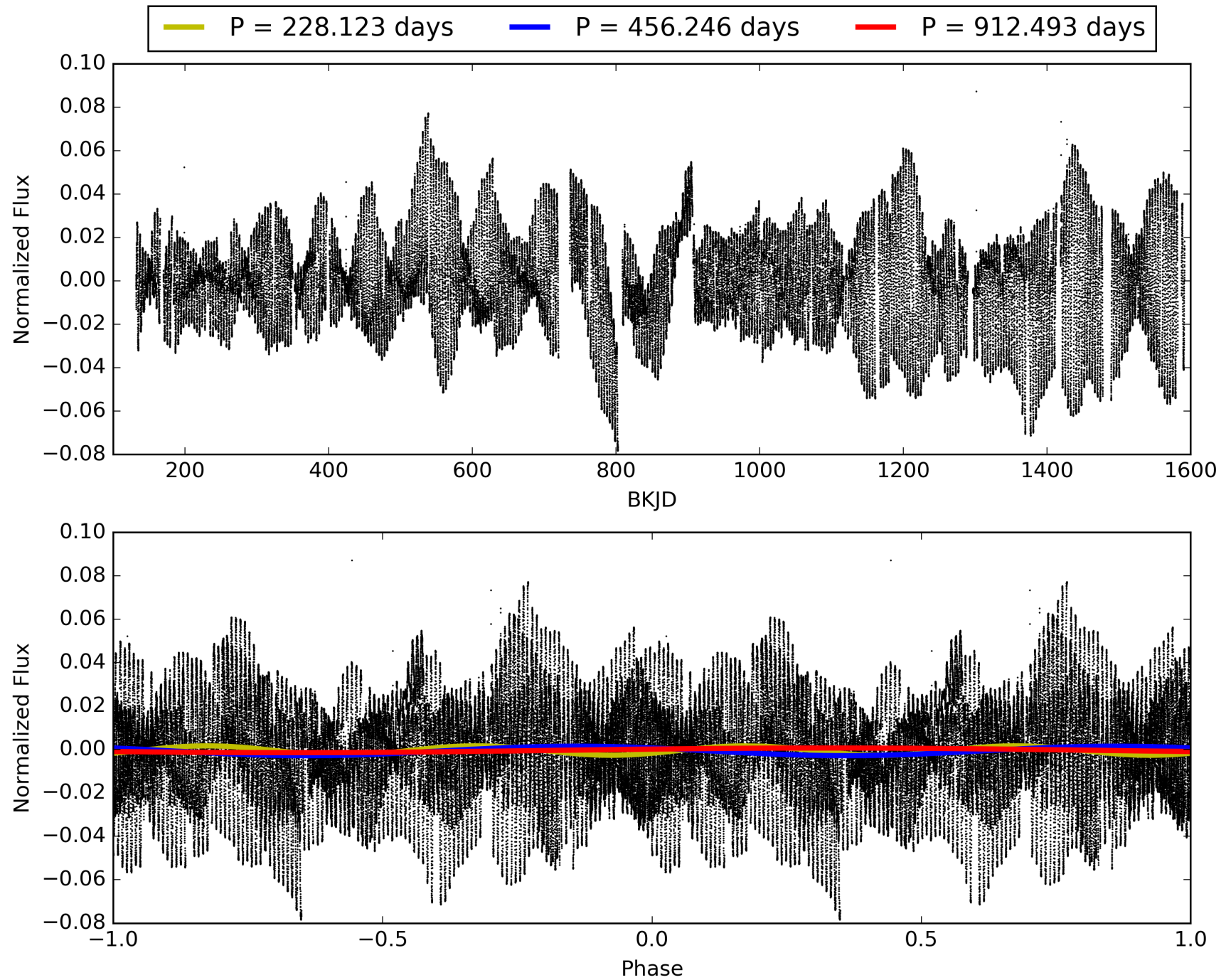
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 06:51:36 Z

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

# TCE 006721044-05, PDC Light Curves

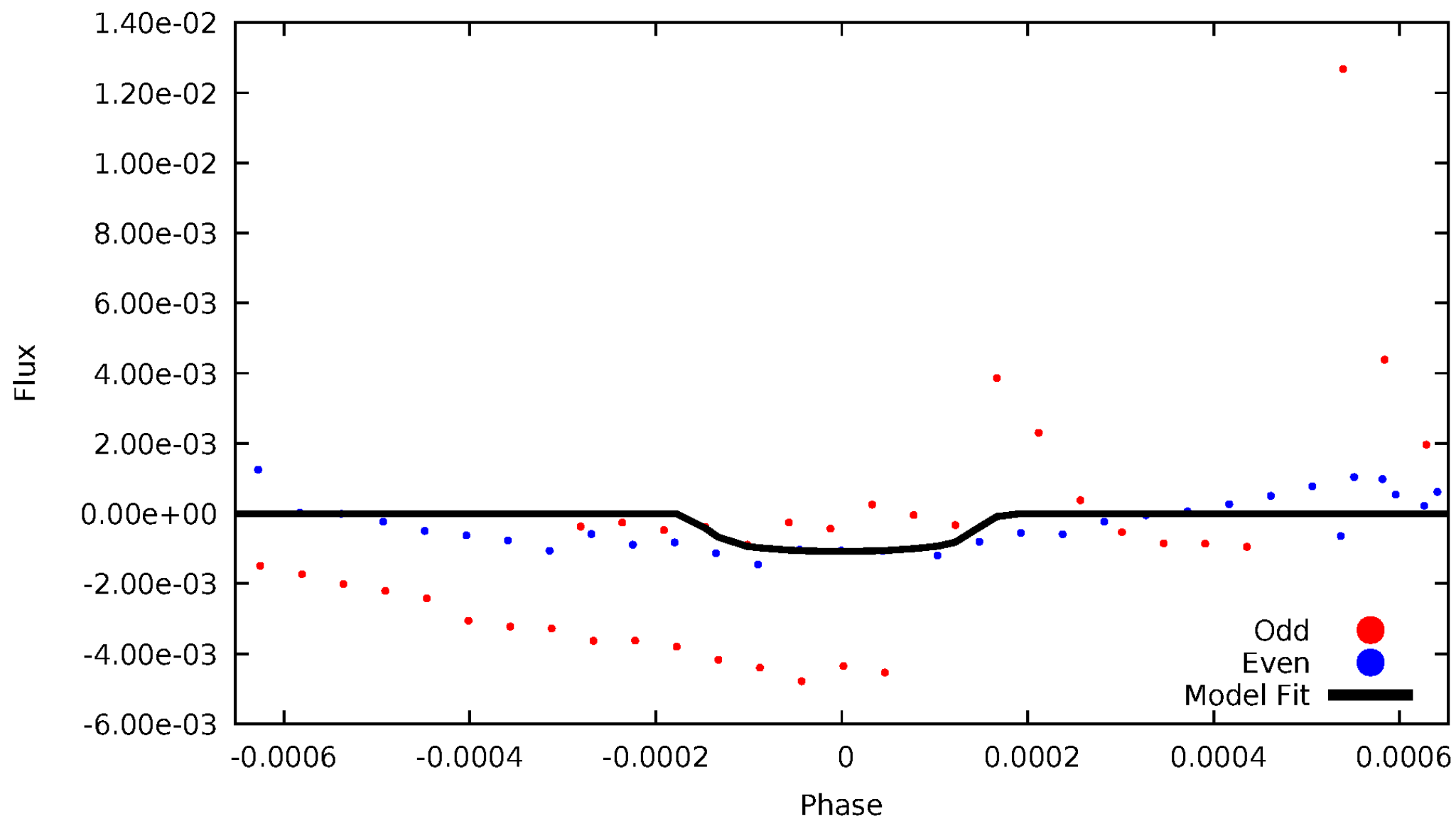


TCE 006721044-05



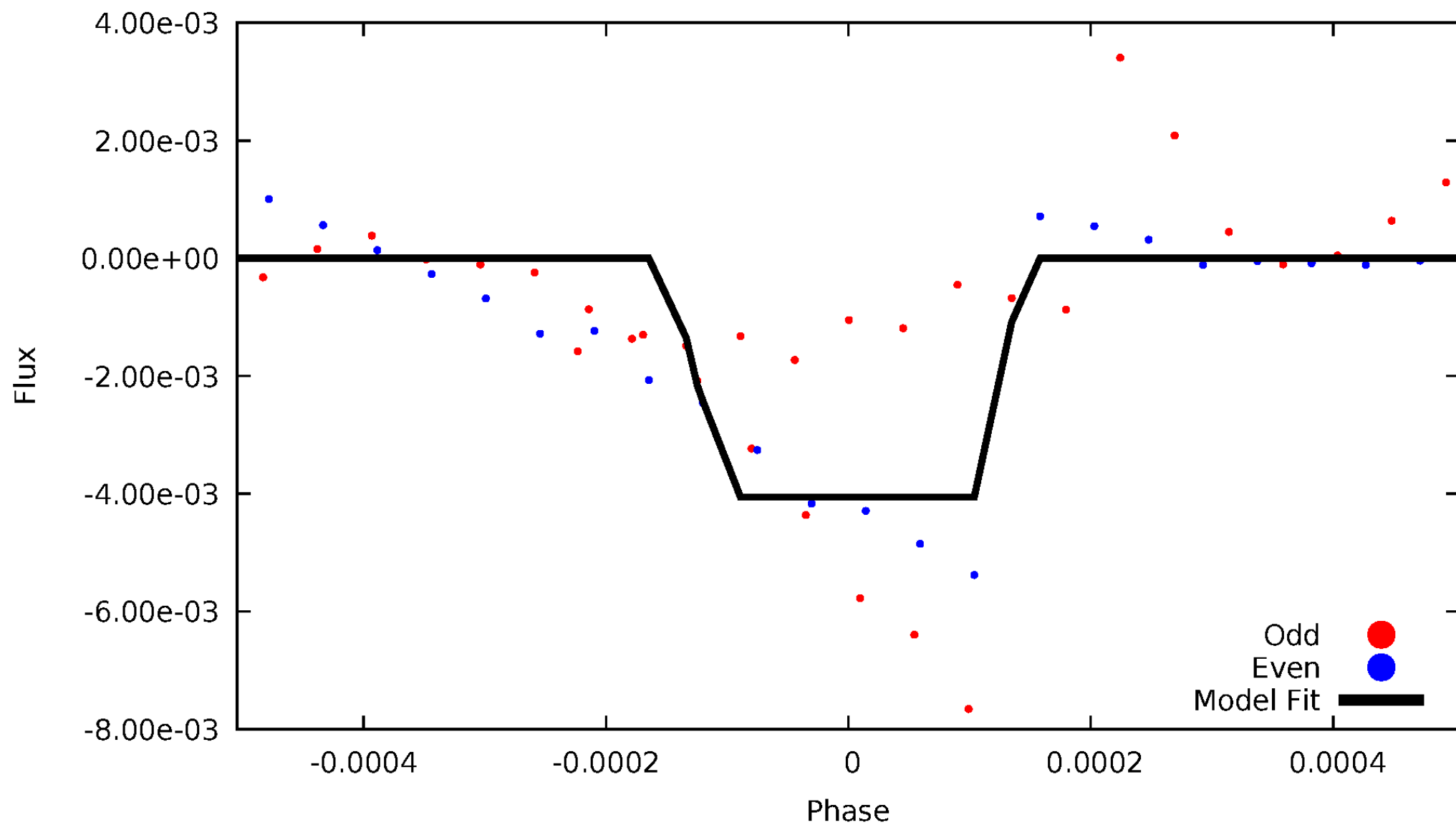
# DV Odd/Even

TCE 006721044-05



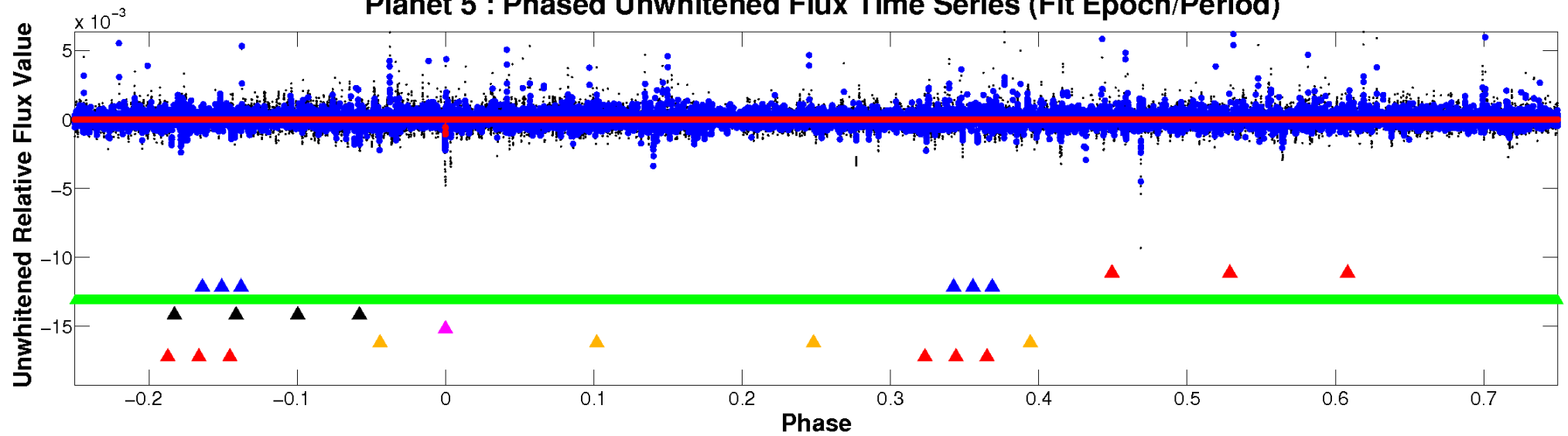
# ALT Odd/Even

TCE 006721044-05

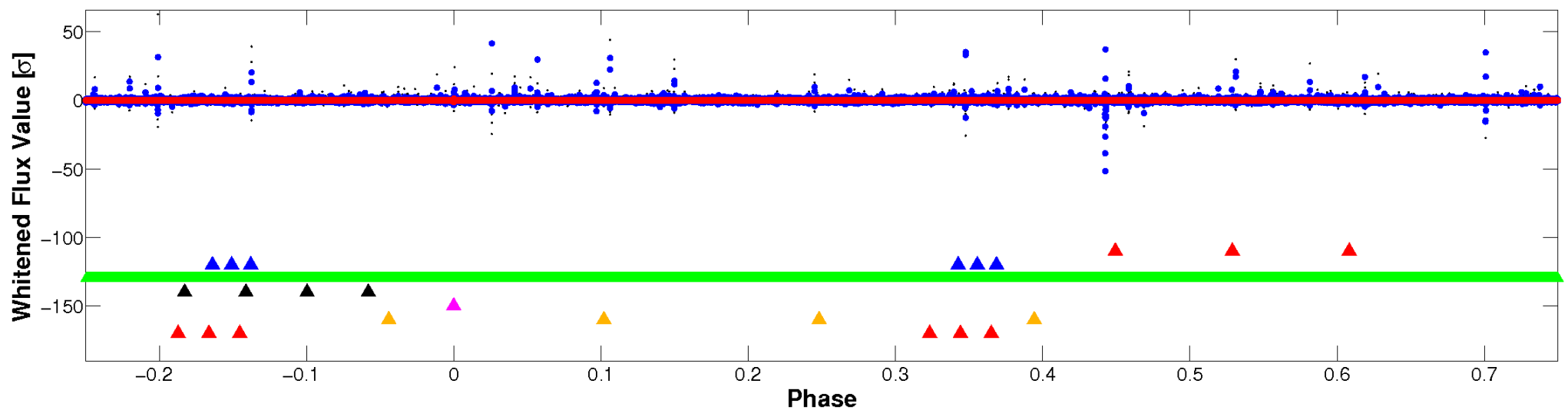


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

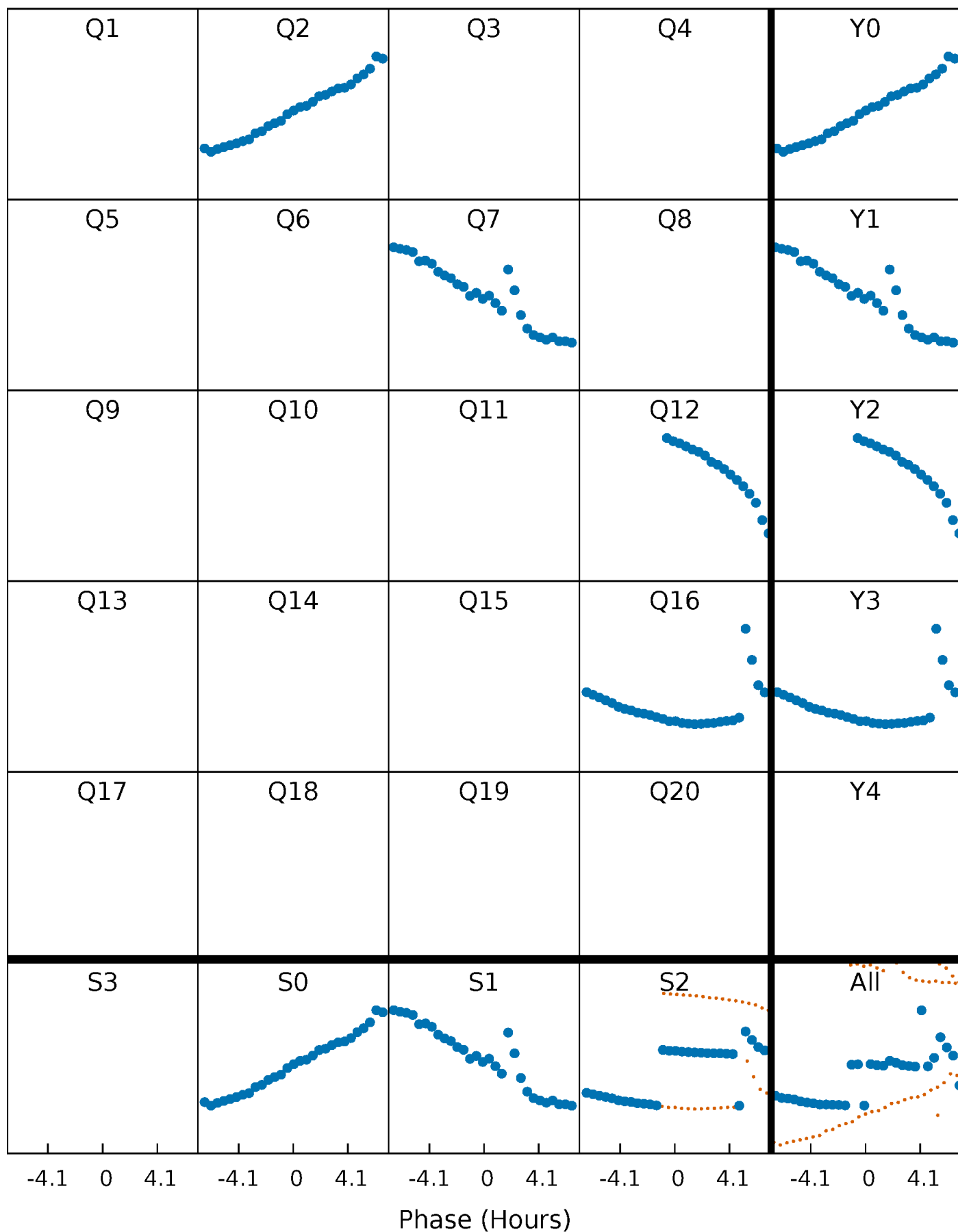


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

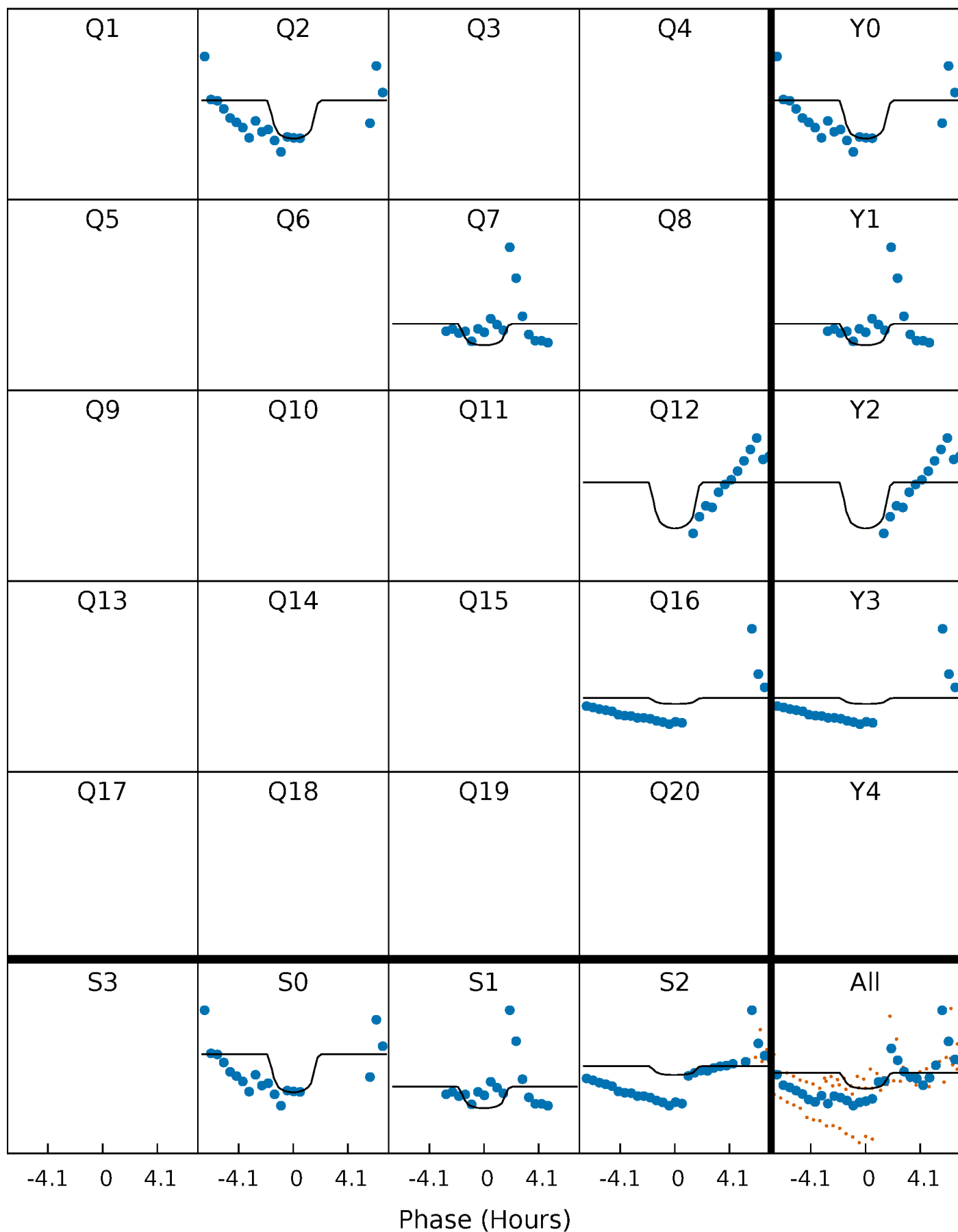
TCE 006721044-05     $P=456.246278$  Days     $T_0=186.971169$  (BKJD)





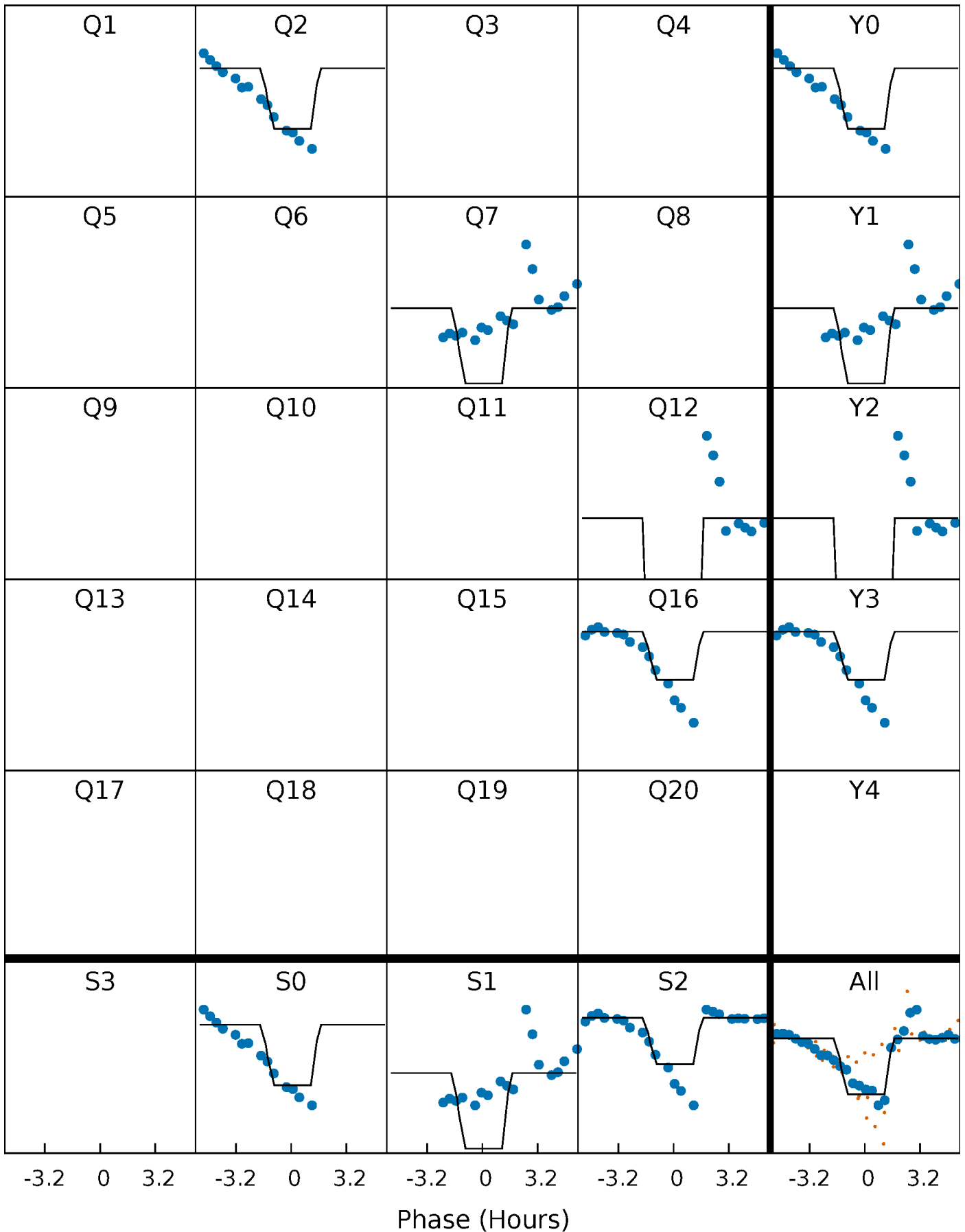
# DV Quarter-Phased Transit Curves

TCE 006721044-05     $P=456.246278$  Days     $T_0=186.971169$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

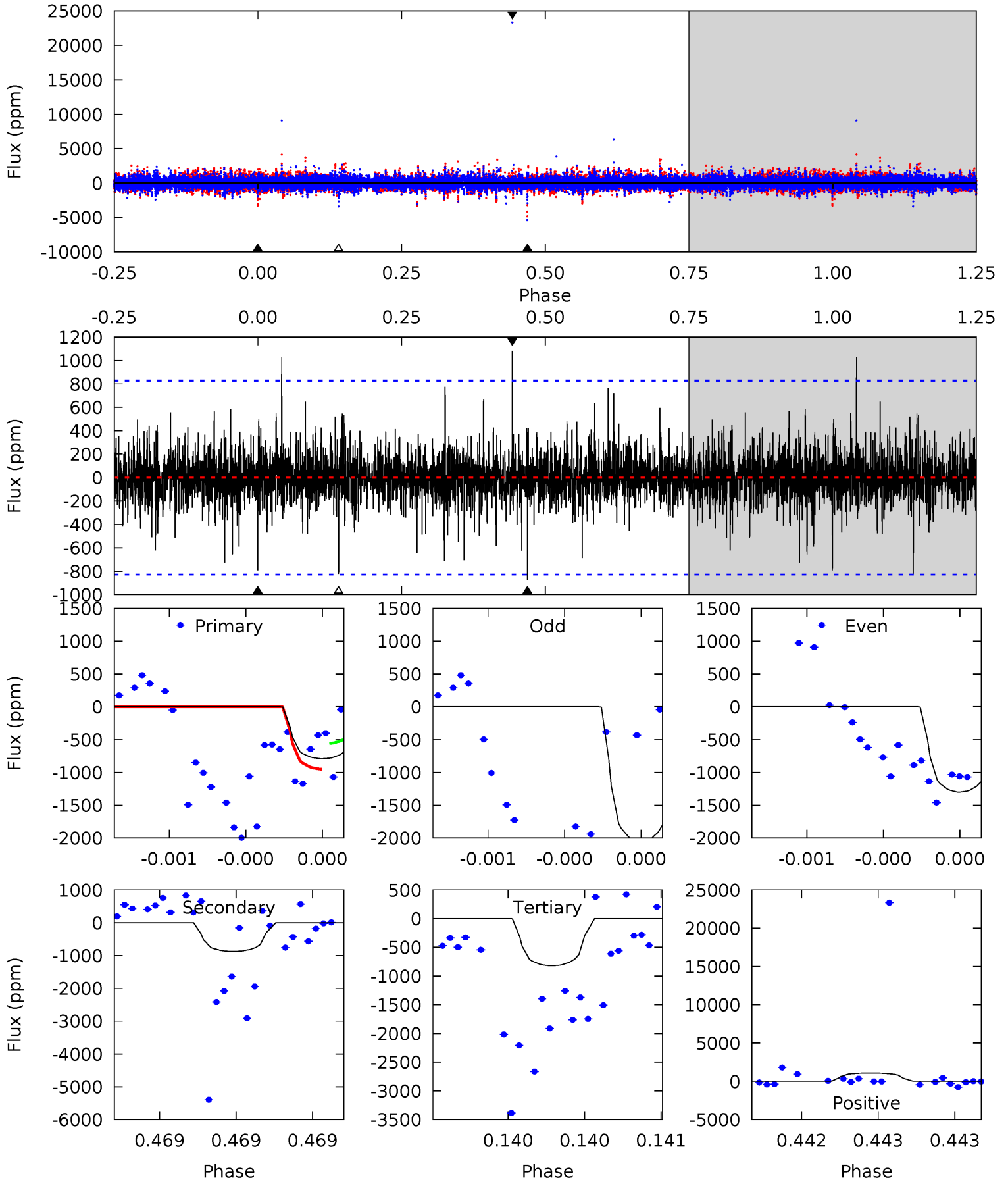
TCE 006721044-05 P=456.247339 Days  $T_0=186.943897$  (BKJD)



# DV Model-Shift Uniqueness Test

006721044-05, P = 456.246278 Days, E = 186.971169 Days

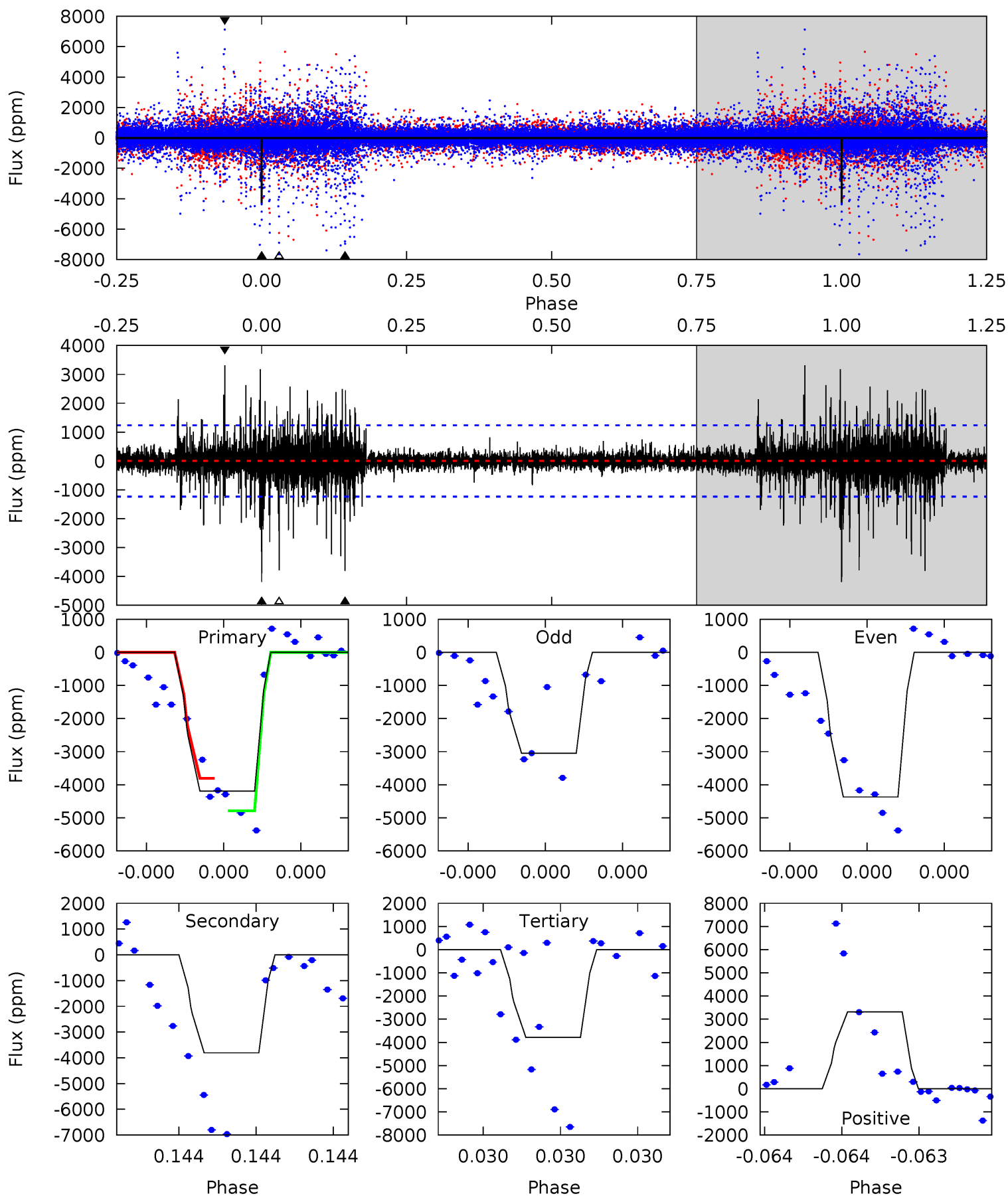
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 5.39 | 5.96 | 5.60 | 7.37 | 5.64            | 3.58            | 1.02             | -0.20   | -1.98   | 0.37    | -1.41   | 2.70    | 1.42 | 0.55  | 1.32 |



# Alt Model-Shift Uniqueness Test

006721044-05, P = 456.247339 Days, E = 186.943897 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 19.3 | 17.5 | 17.4 | 15.3 | 5.69            | 3.65            | 1.60             | 1.90    | 4.04    | 0.13    | 2.27    | 2.83    | 0.84 | 0.44  | 2.15 |



### Stellar Parameters For KIC 006721044

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $5578^{+186}_{-152}$ | $3.924^{+0.520}_{-0.130}$ | $0.070^{+0.250}_{-0.250}$ | $1.903^{+0.407}_{-0.949}$ | $1.109^{+0.128}_{-0.193}$ | $0.227^{+1.252}_{-0.099}$                     |
|        | +3%/-3%              | +13%/-3%                  | +357%/-357%               | +21%/-50%                 | +12%/-17%                 | +552%/-44%                                    |
| 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 006721044-05 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ )  | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)   | $A_{\text{obs}}$          |
|---------|-----------------|-------------------------|----------------------|------------------------|---------------------------|
| DV      | $-876 \pm 147$  | $7.45^{+7.21}_{-4.98}$  | $424^{+33}_{-56}$    | $4917^{+3312}_{-1045}$ | $12389^{+105648}_{-9271}$ |
| Alt.    | $-3808 \pm 217$ | $12.09^{+7.31}_{-6.45}$ | $423^{+37}_{-56}$    | $5485^{+2238}_{-925}$  | $20460^{+70326}_{-12446}$ |

$T_{\text{max}}$  = 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  $A_{\text{obs}} \gg 1.0$

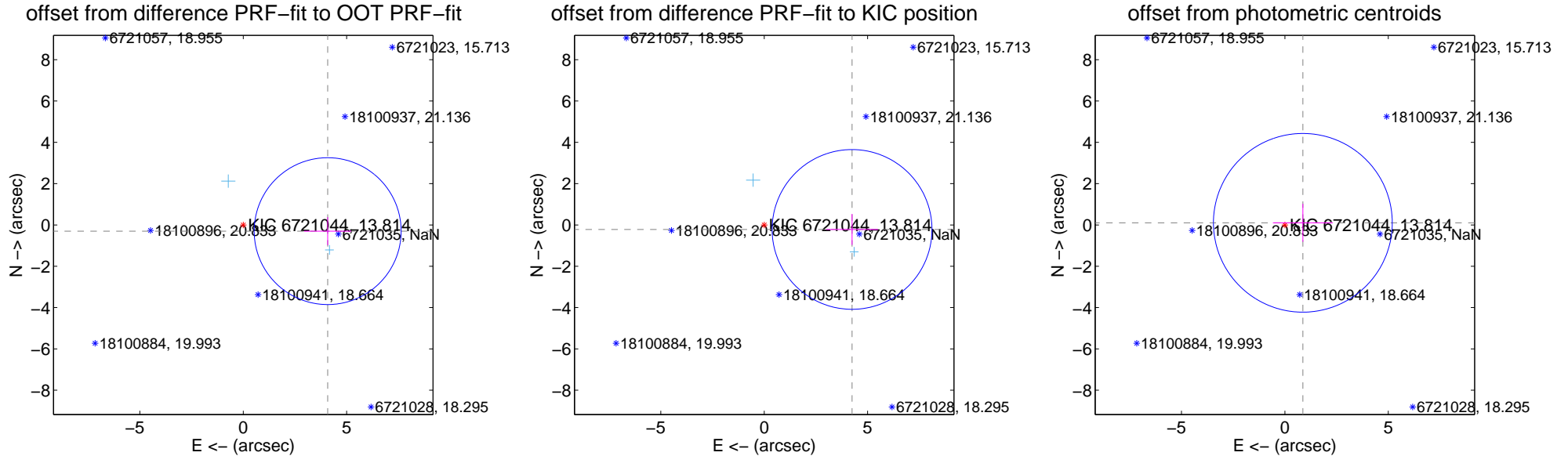
## DV Centroid Data

Supplemental centroid analysis for 006721044-05. Kepler magnitude: 13.81. Transit SNR 5.53

There are 3 quarters with good PRF difference image offsets

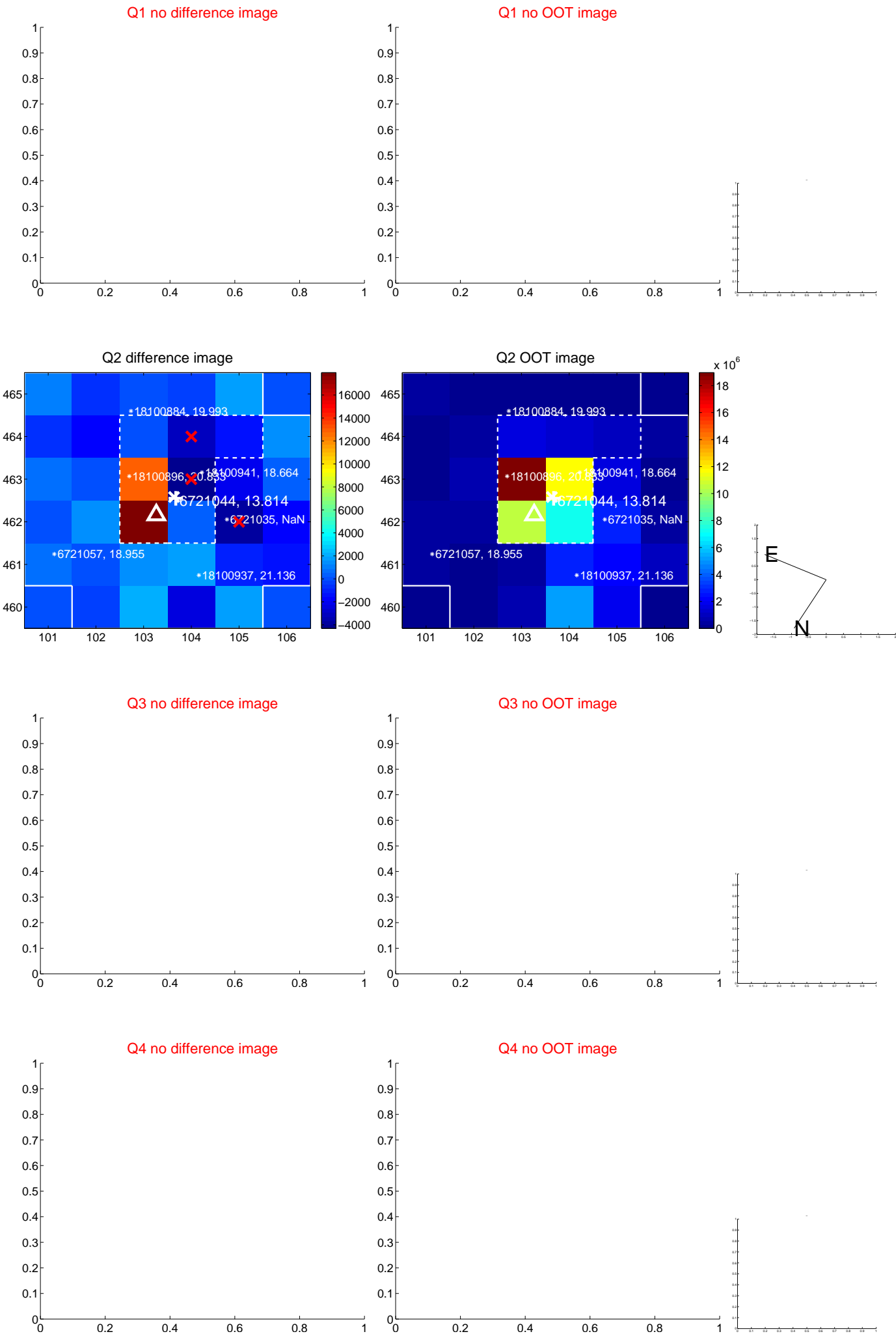
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $4.095 \pm 1.185$  | 3.46                | $-4.084 \pm 1.142$ | $-0.300 \pm 0.679$ |
| PRF-fit source offset from KIC position | $4.255 \pm 1.289$  | 3.30                | $-4.249 \pm 1.255$ | $-0.218 \pm 0.749$ |
| photometric centroid source offset      | $0.88 \pm 1.44$    | 0.61                | $-0.87 \pm 1.45$   | $0.10 \pm 0.92$    |



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.

Q5 no difference image



Q5 no OOT image



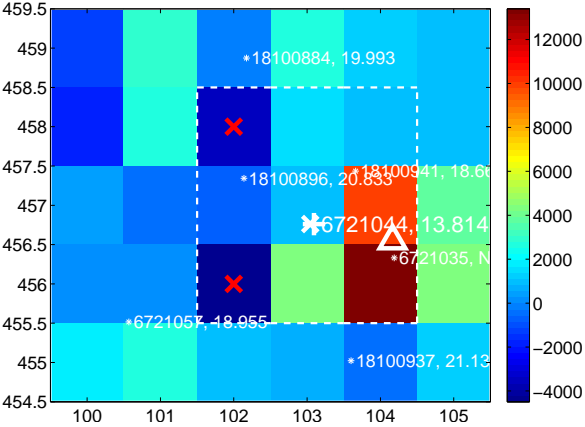
Q6 no difference image



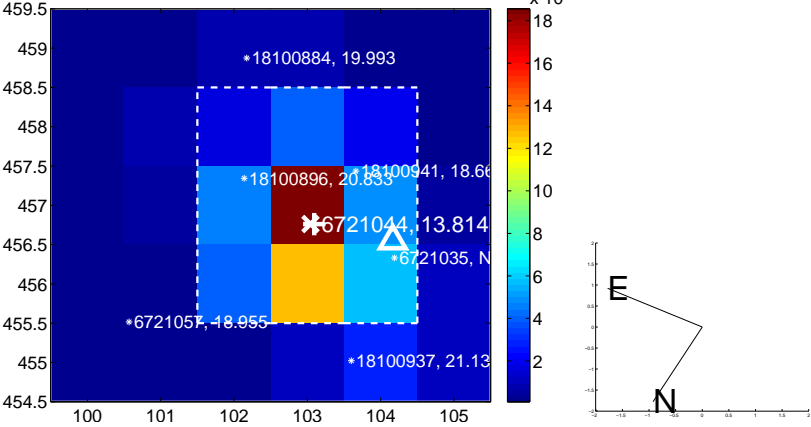
Q6 no OOT image



Q7 difference image



Q7 OOT image



Q8 no difference image



Q8 no OOT image

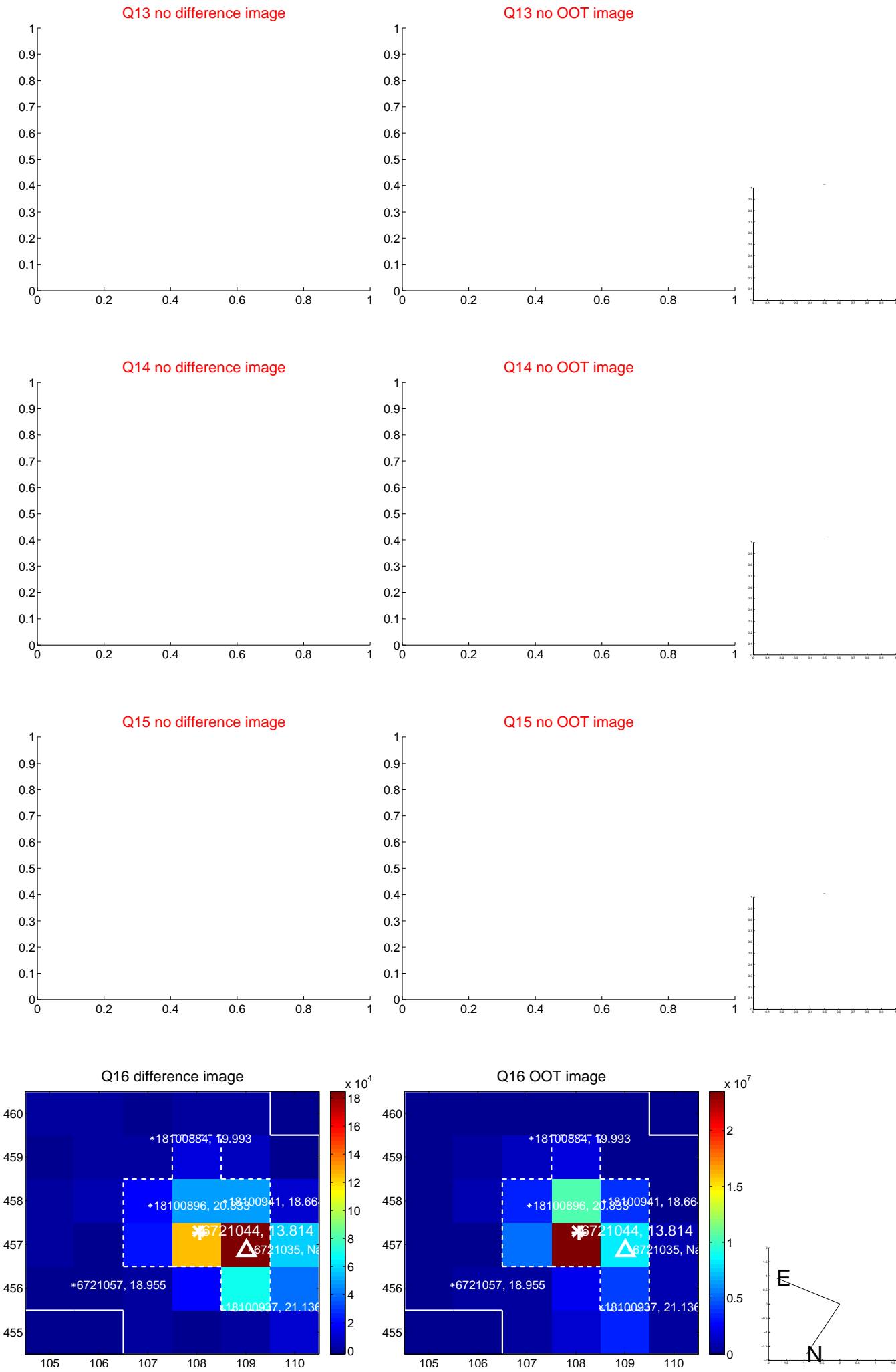




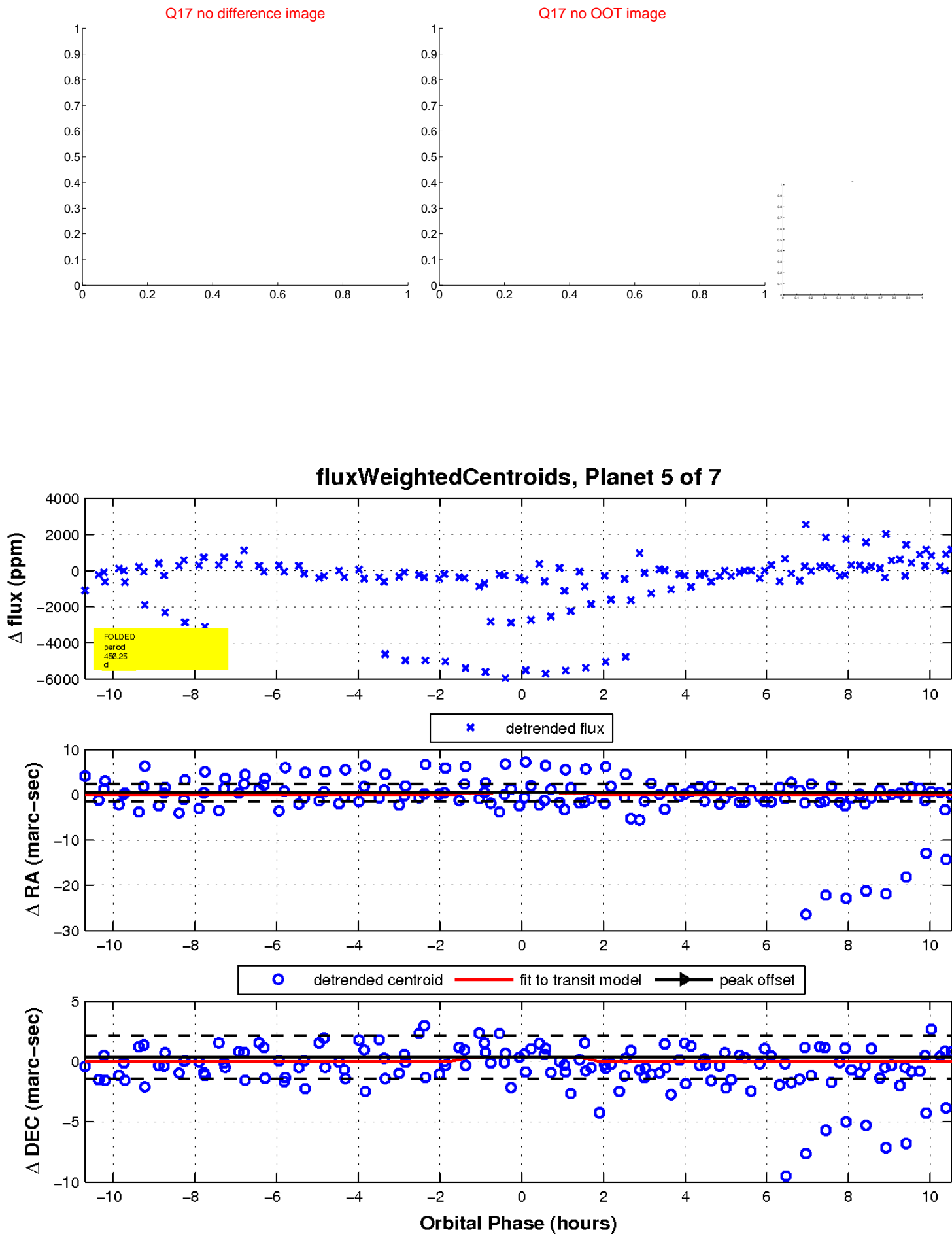
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

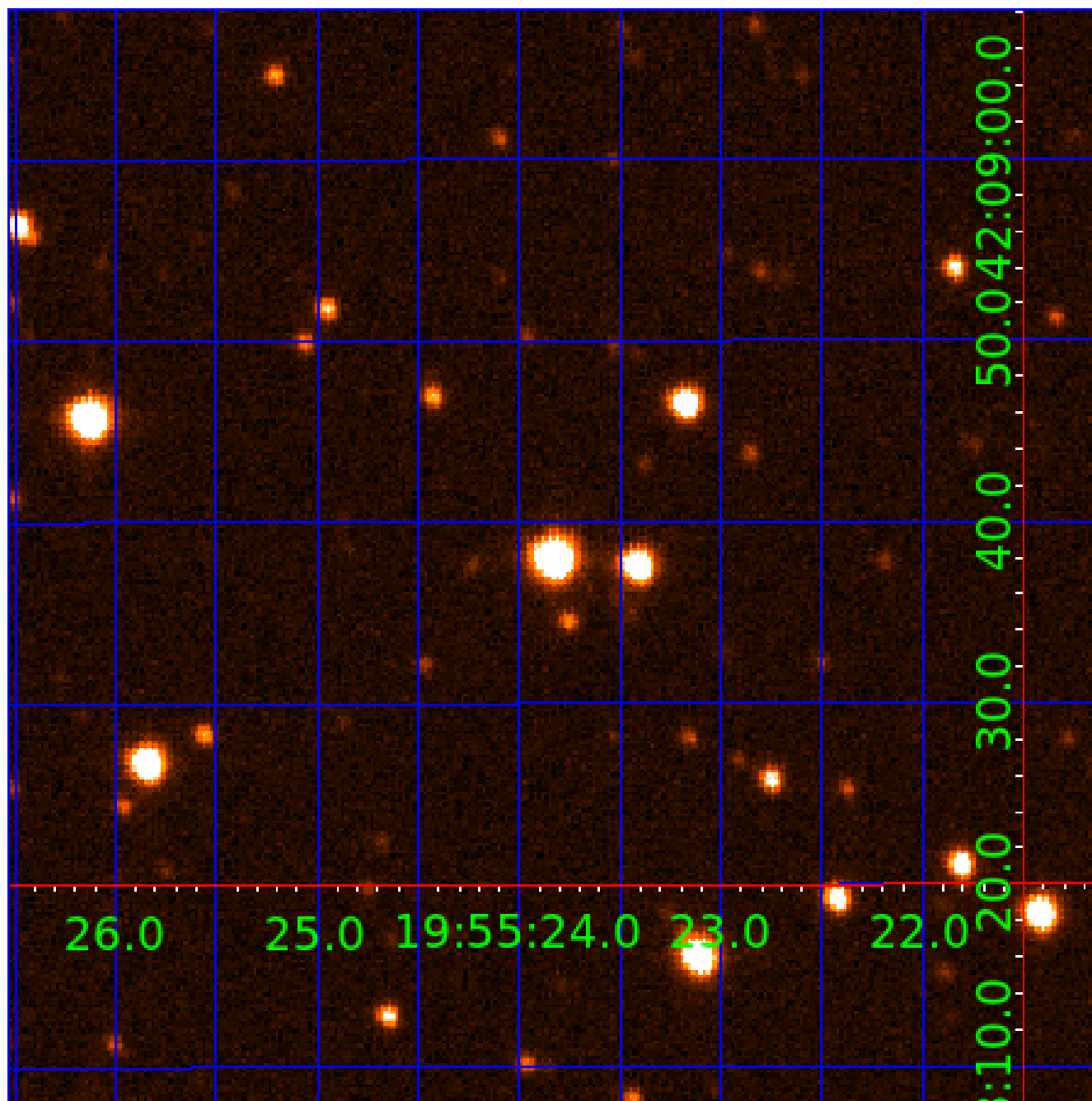


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 006721044

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 006721044-01 | OBS      | No   | 492.489985    | 391.994566   | 665.7       | 4.075            | 11.8 | 4.4 | 1.90                        | 5578            | 5.18                   | 1.97                   |
| 006721044-02 | OBS      | No   | 225.154094    | 355.172737   | 814.2       | 3.269            | 9.2  | 7.0 | 1.90                        | 5578            | 5.56                   | 5.59                   |
| 006721044-03 | OBS      | No   | 0.563501      | 131.874349   | 9.5         | 1.022            | 8.1  | 1.8 | 1.90                        | 5578            | 0.71                   | 16440.25               |
| 006721044-05 | OBS      | No   | 456.246278    | 186.971169   | 1082.2      | 3.570            | 10.5 | 5.5 | 1.90                        | 5578            | 6.95                   | 2.18                   |
| 006721044-06 | OBS      | No   | 389.569679    | 366.871550   | 122.7       | 4.179            | 10.4 | 0.5 | 1.90                        | 5578            | 2.54                   | 2.69                   |
| 006721044-07 | OBS      | No   | 223.351808    | 353.554215   | 278.6       | 3.849            | 8.6  | 1.7 | 1.90                        | 5578            | 3.16                   | 5.65                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 006721044-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS   |
| 006721044-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 006721044-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST  |
| 006721044-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—CENT_FEW_DIFFS   |
| 006721044-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                    |
| 006721044-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

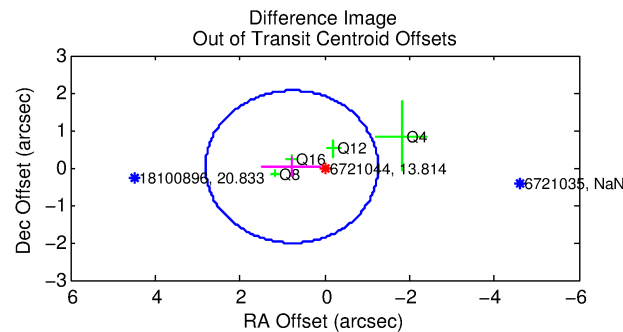
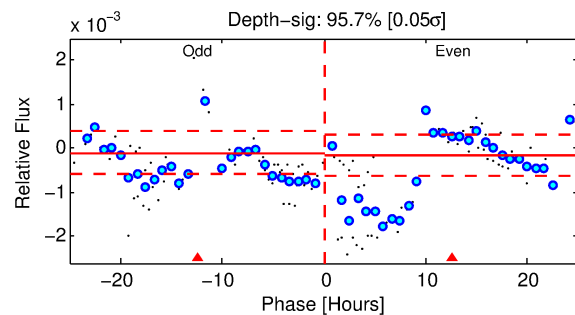
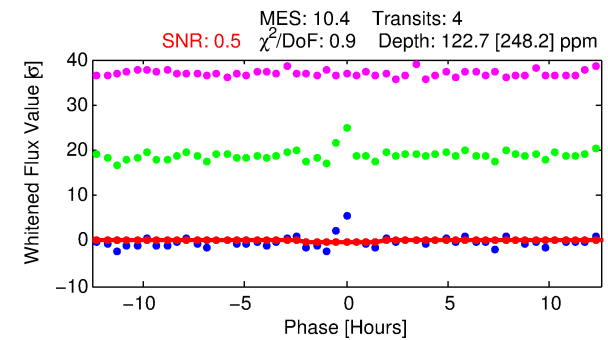
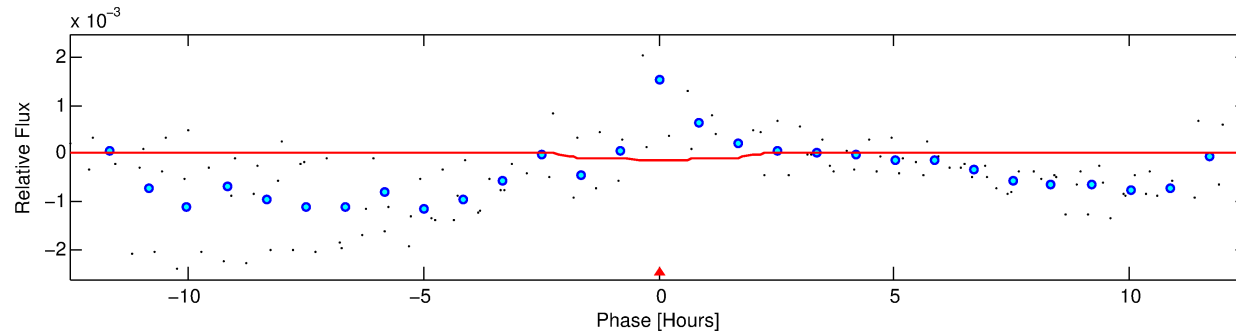
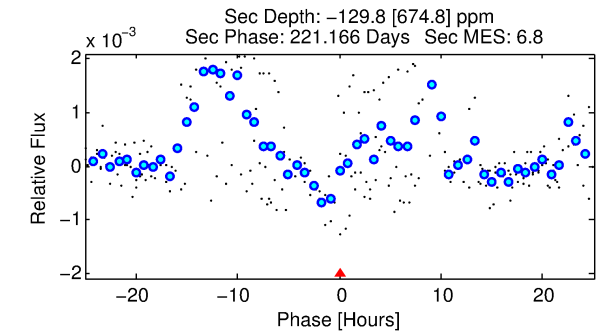
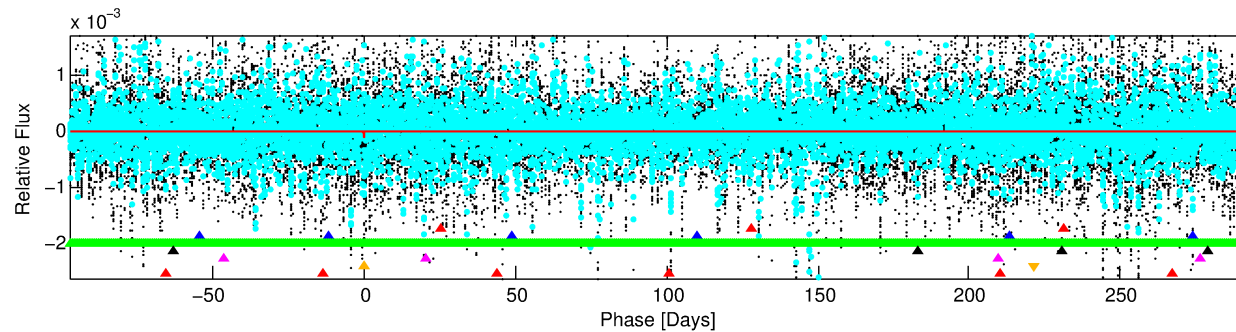
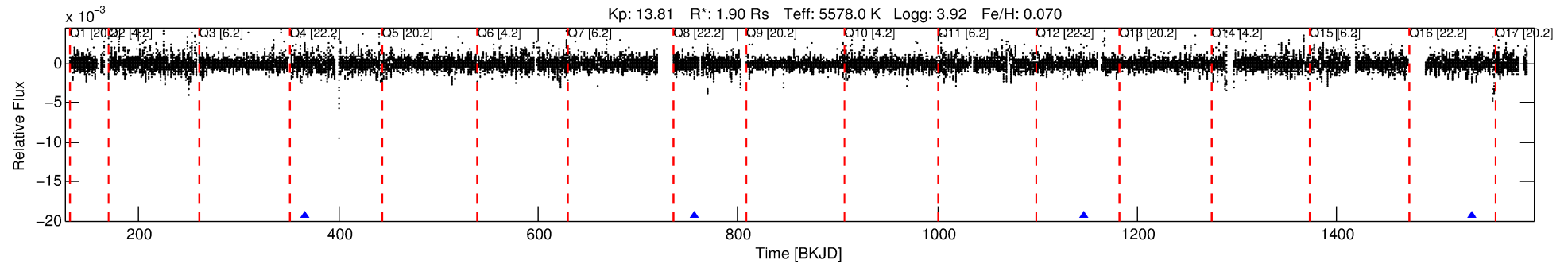
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 006721044-06

No Significant Match Found

# DV One-Page Summary

KIC: 6721044 Candidate: 6 of 7 Period: 389.570 d



## DV Fit Results:

Period = 389.56968 [0.05073] d  
Epoch = 366.8715 [0.1115] BKJD  
Rp/R\* = 0.0122 [0.0459]  
a/R\* = 319.54 [5057.58]  
b = 0.91 [3.13]  
Seff = 2.69 [2.35]  
Teq = 327 [71] K  
Rp = 2.54 [9.61] Re  
a = 1.0807 [0.5614] AU  
Ag = N/A  
Teffp = N/A

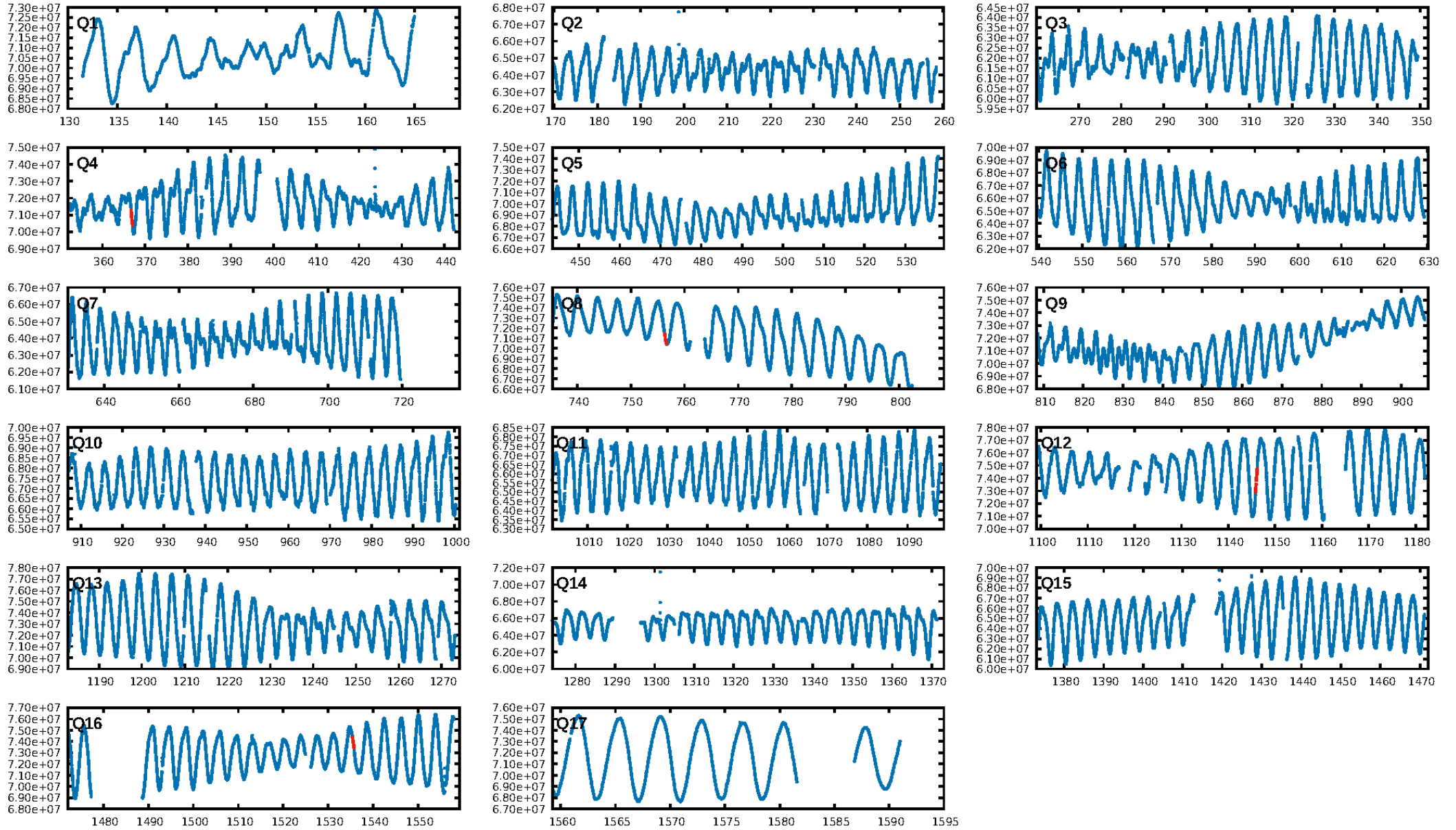
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [743.70 $\sigma$ ]  
LongPeriod-sig: 100.0% [47.00 $\sigma$ ]  
ModelChiSquare2-sig: 19.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.84e-09**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: -0.5223**  
Centroid-sig: 9.2%  
Centroid-so: 8.049 arcsec [0.95 $\sigma$ ]  
OotOffset-rm: 0.774 arcsec [1.14 $\sigma$ ]  
OotOffset-st: 0/0/4/0 [4]  
KicOffset-rm: 0.605 arcsec [1.22 $\sigma$ ]  
KicOffset-st: 0/0/4/0 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 0.00 [0/4]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 06:51:47 Z

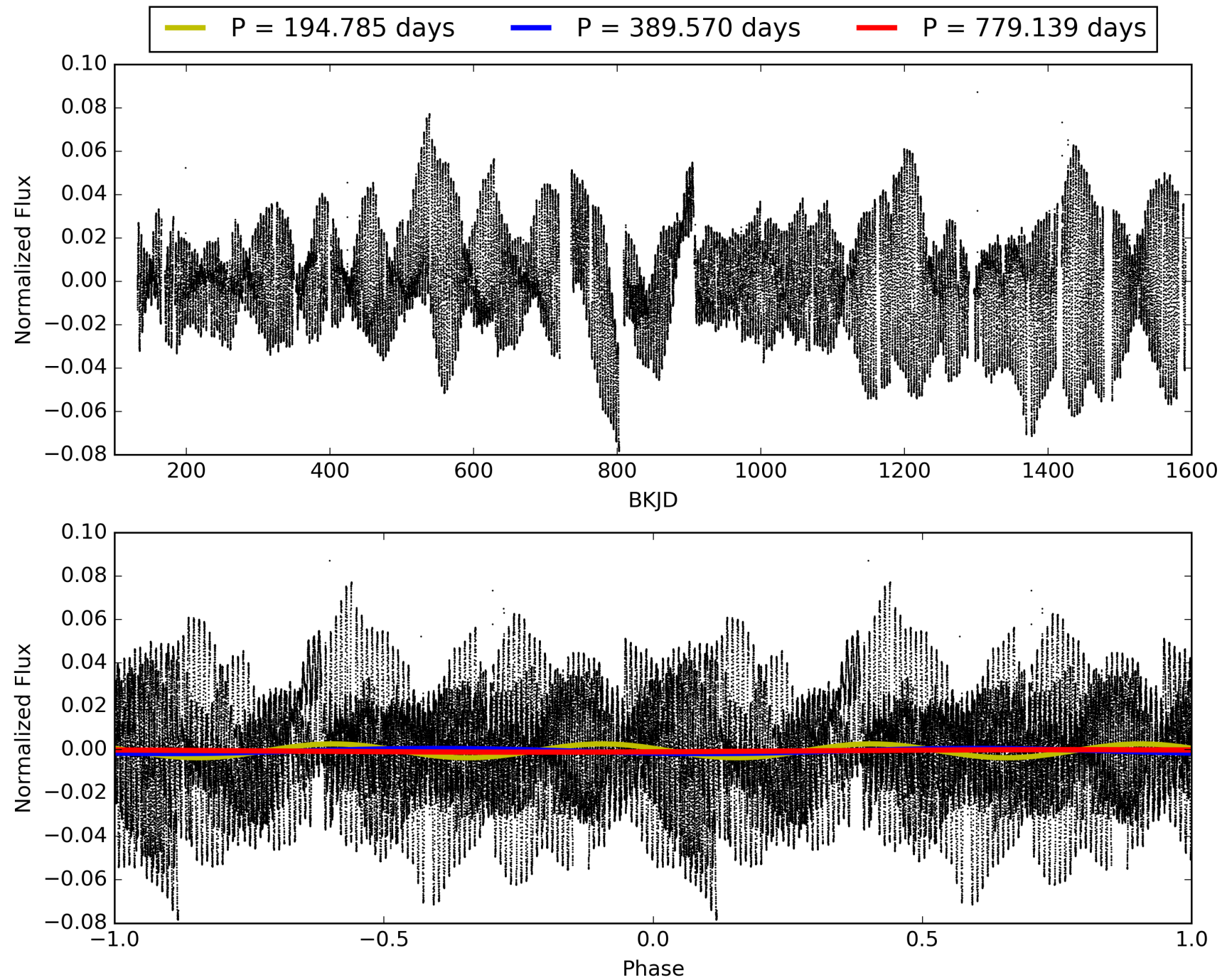
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006721044-06, PDC Light Curves



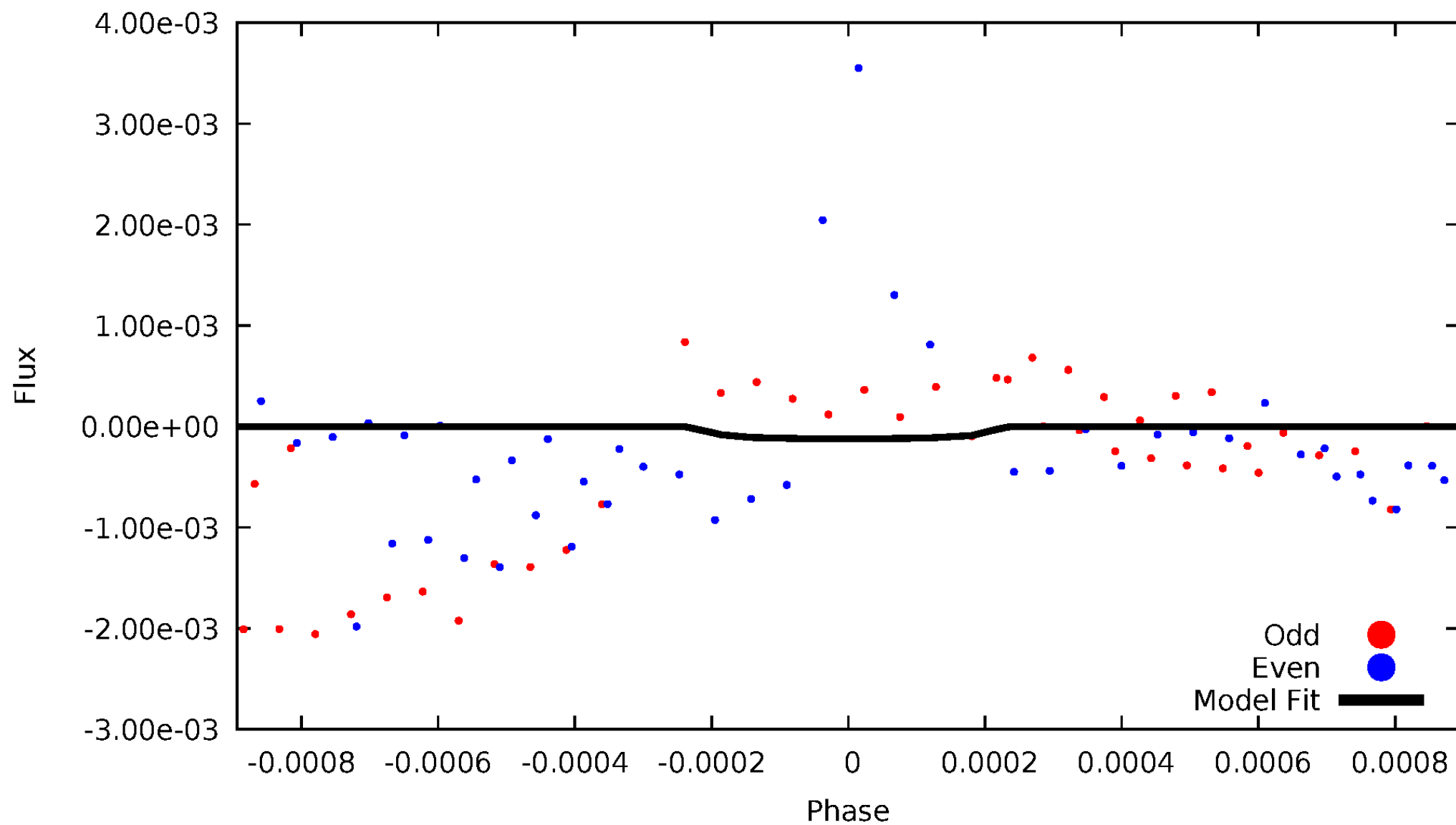


TCE 006721044-06



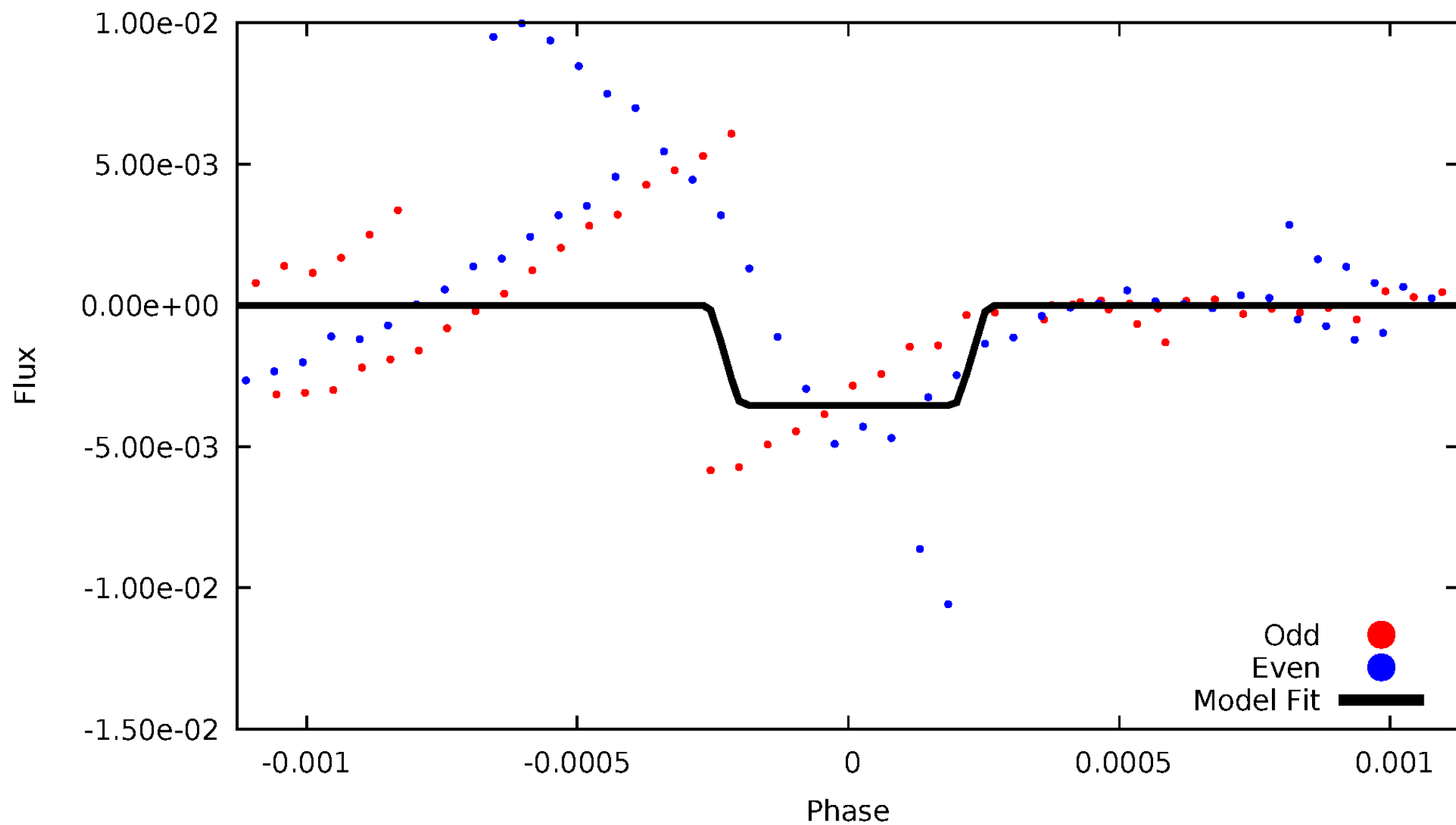
# DV Odd/Even

TCE 006721044-06



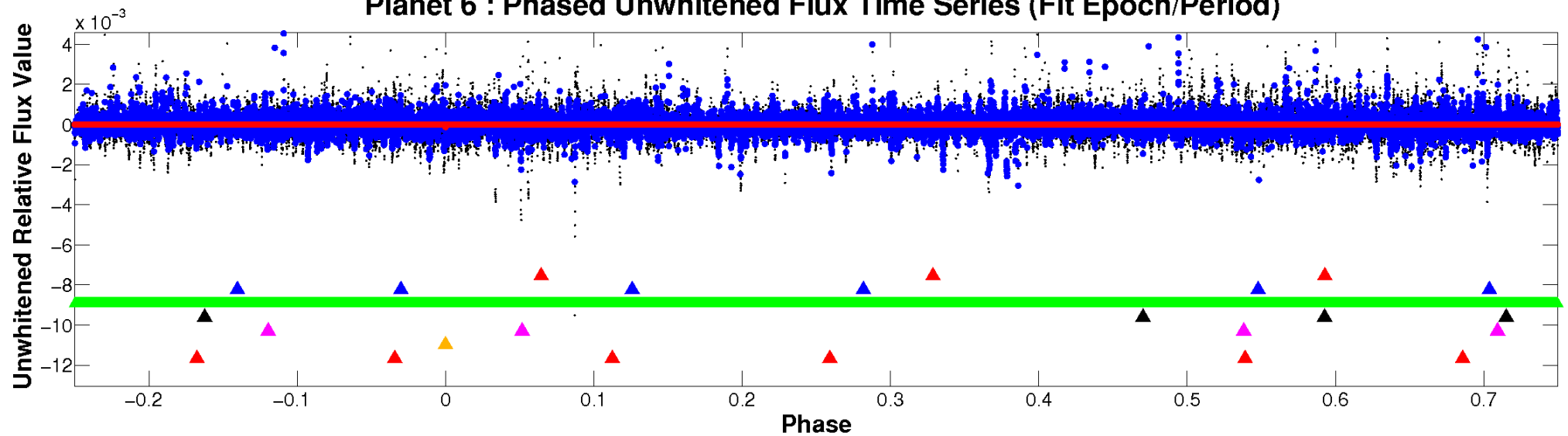
# ALT Odd/Even

TCE 006721044-06

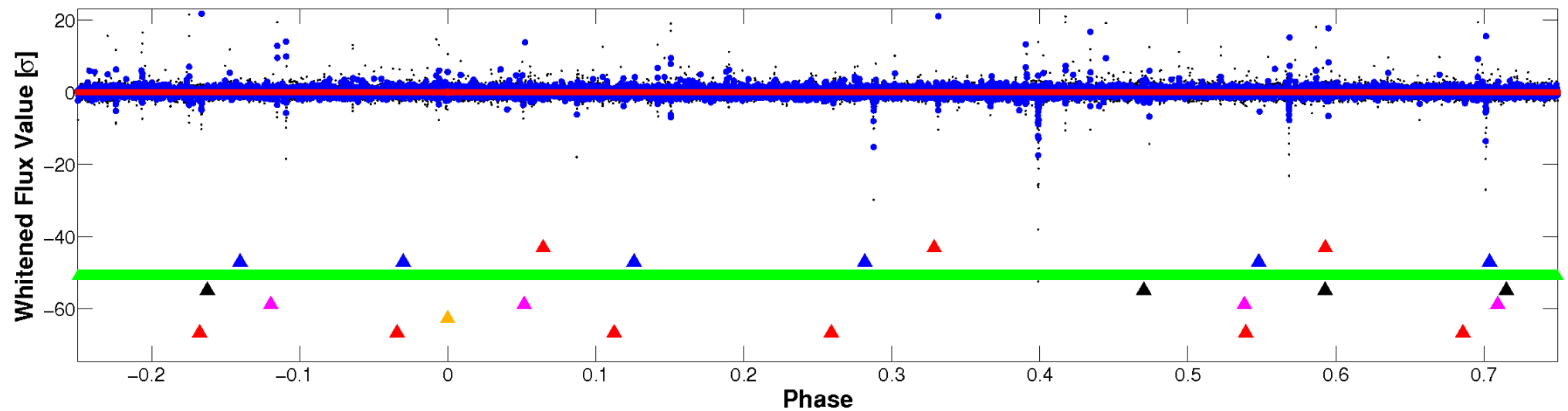


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

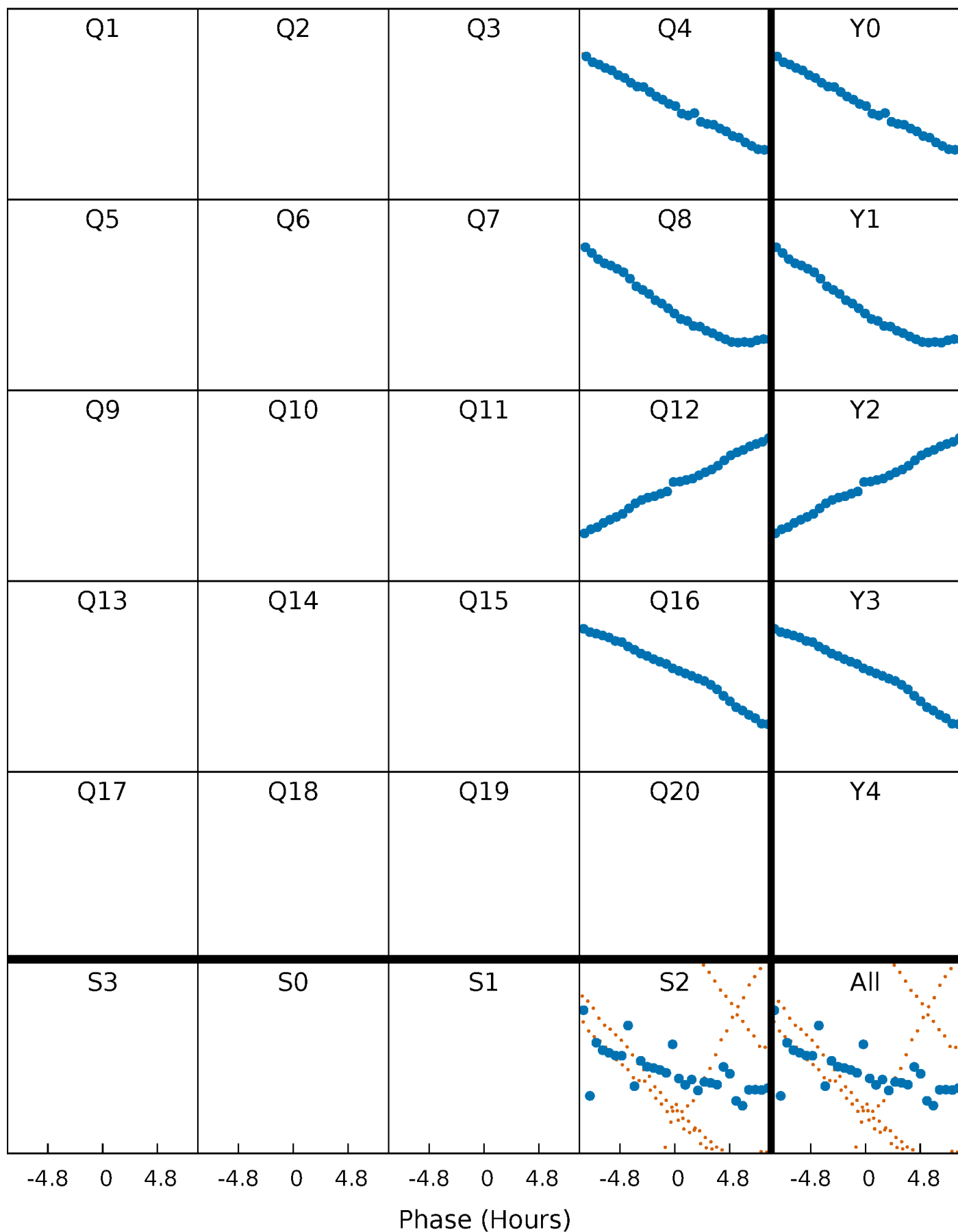


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



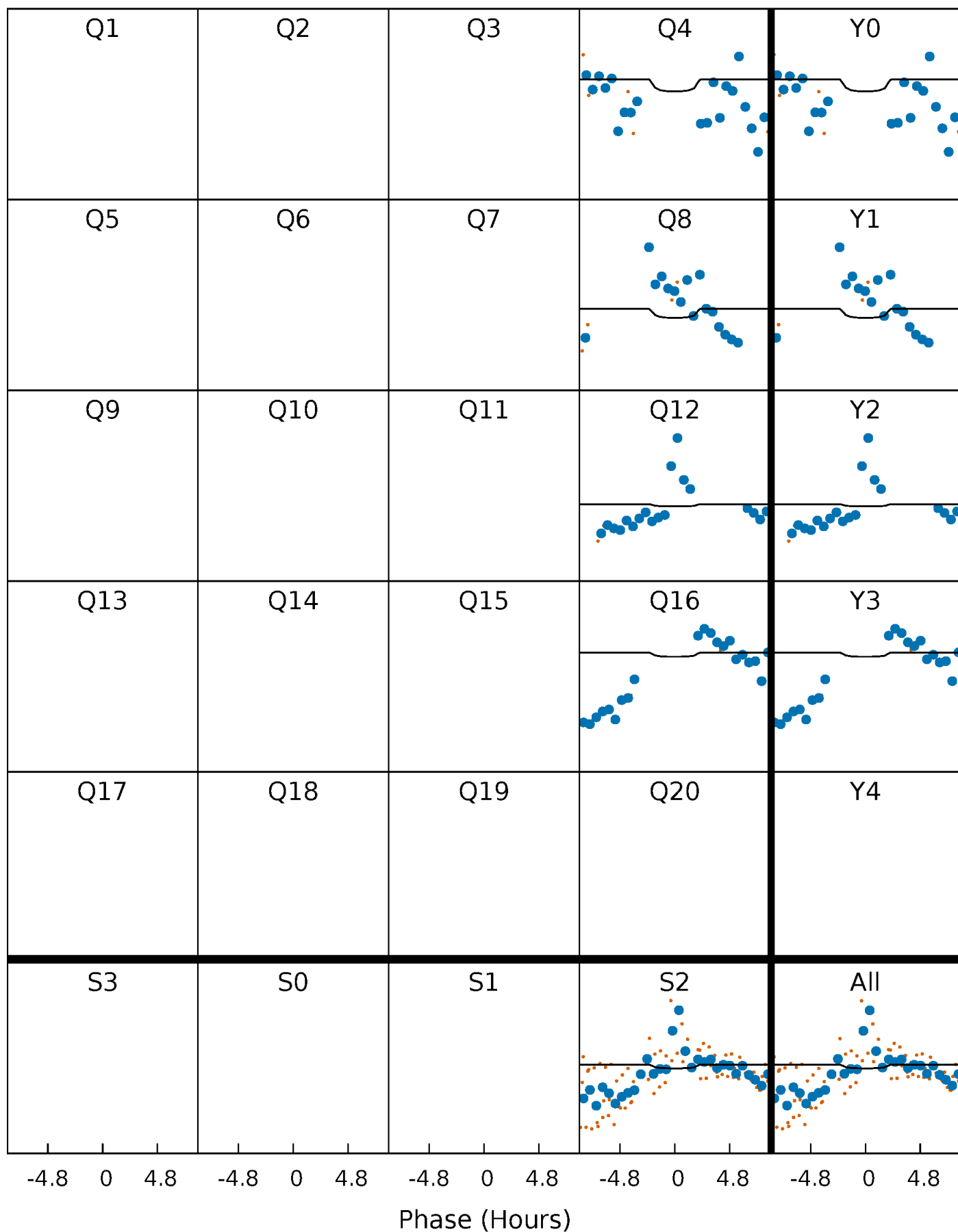
# PDC Quarter-Phased Transit Curves

TCE 006721044-06 P=389.569679 Days  $T_0=366.871550$  (BKJD)



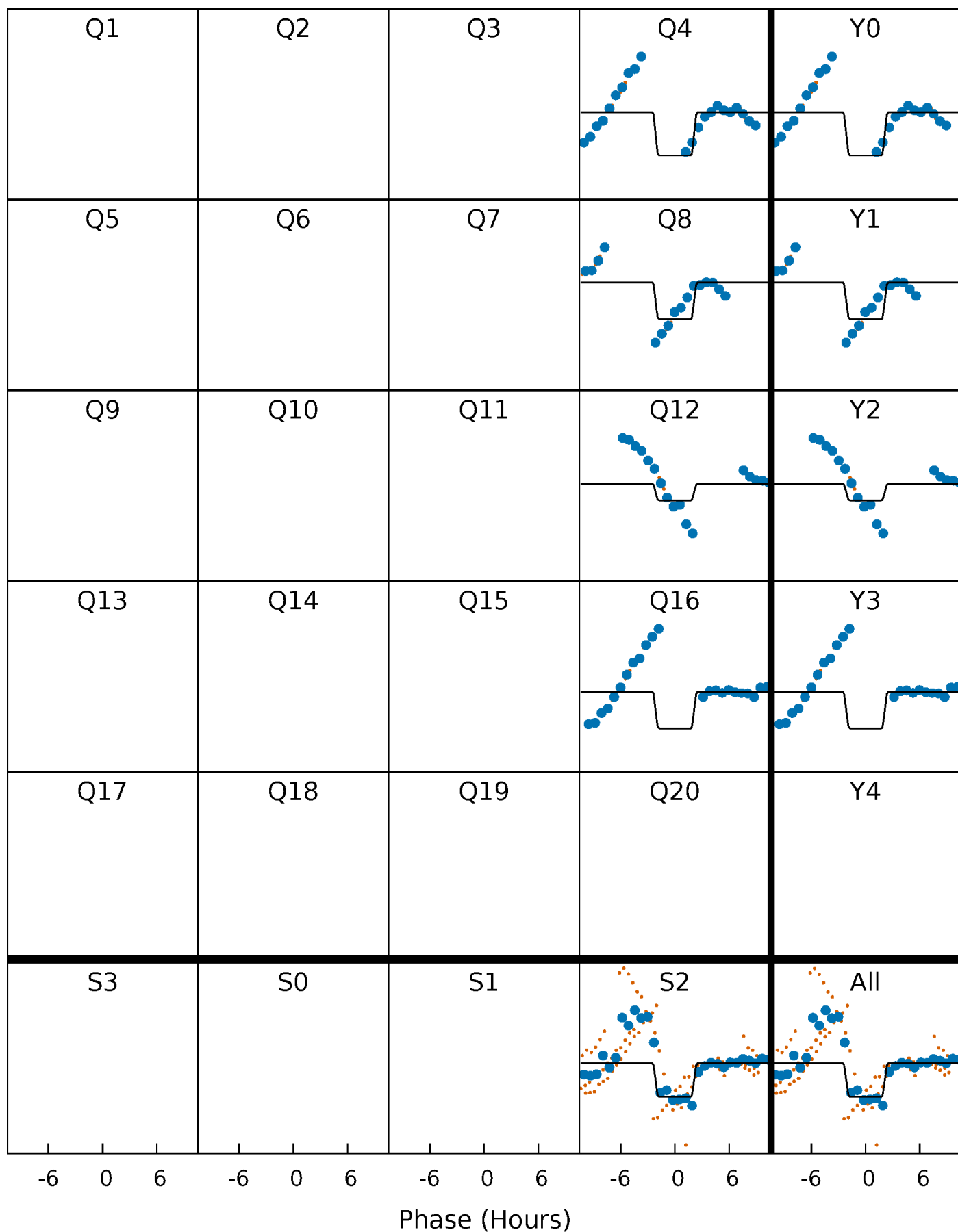
# DV Quarter-Phased Transit Curves

TCE 006721044-06     $P=389.569679$  Days     $T_0=366.871550$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

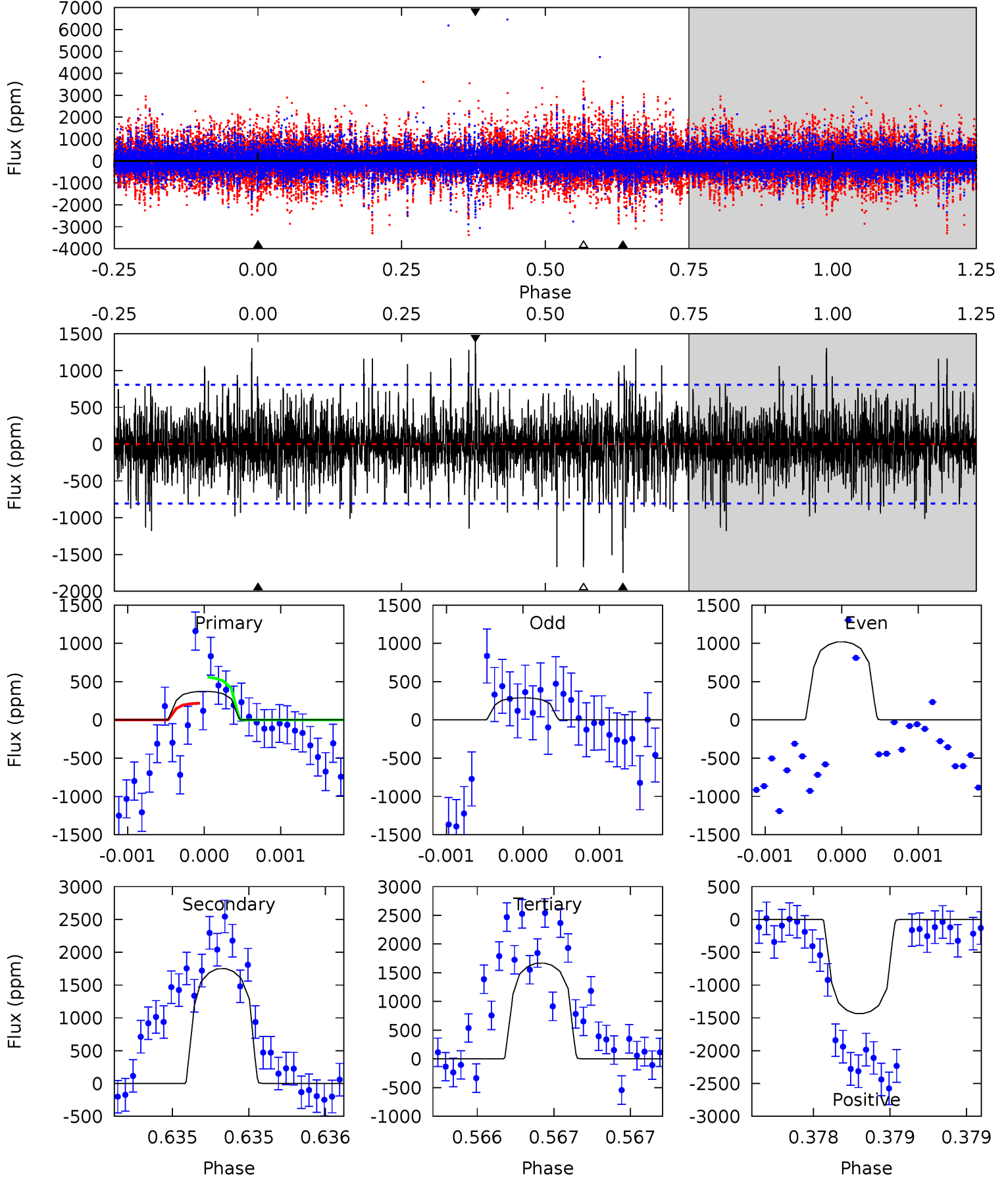
TCE 006721044-06 P=389.538577 Days  $T_0=366.908538$  (BKJD)



# DV Model-Shift Uniqueness Test

006721044-06, P = 389.569679 Days, E = 366.871550 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 2.58 | 12.1 | 11.5 | 9.89 | 5.57            | 3.48            | 1.97             | -8.93   | -7.31   | 0.56    | 2.18    | 2.24    | 1.00 | 0.45  | 1.18 |

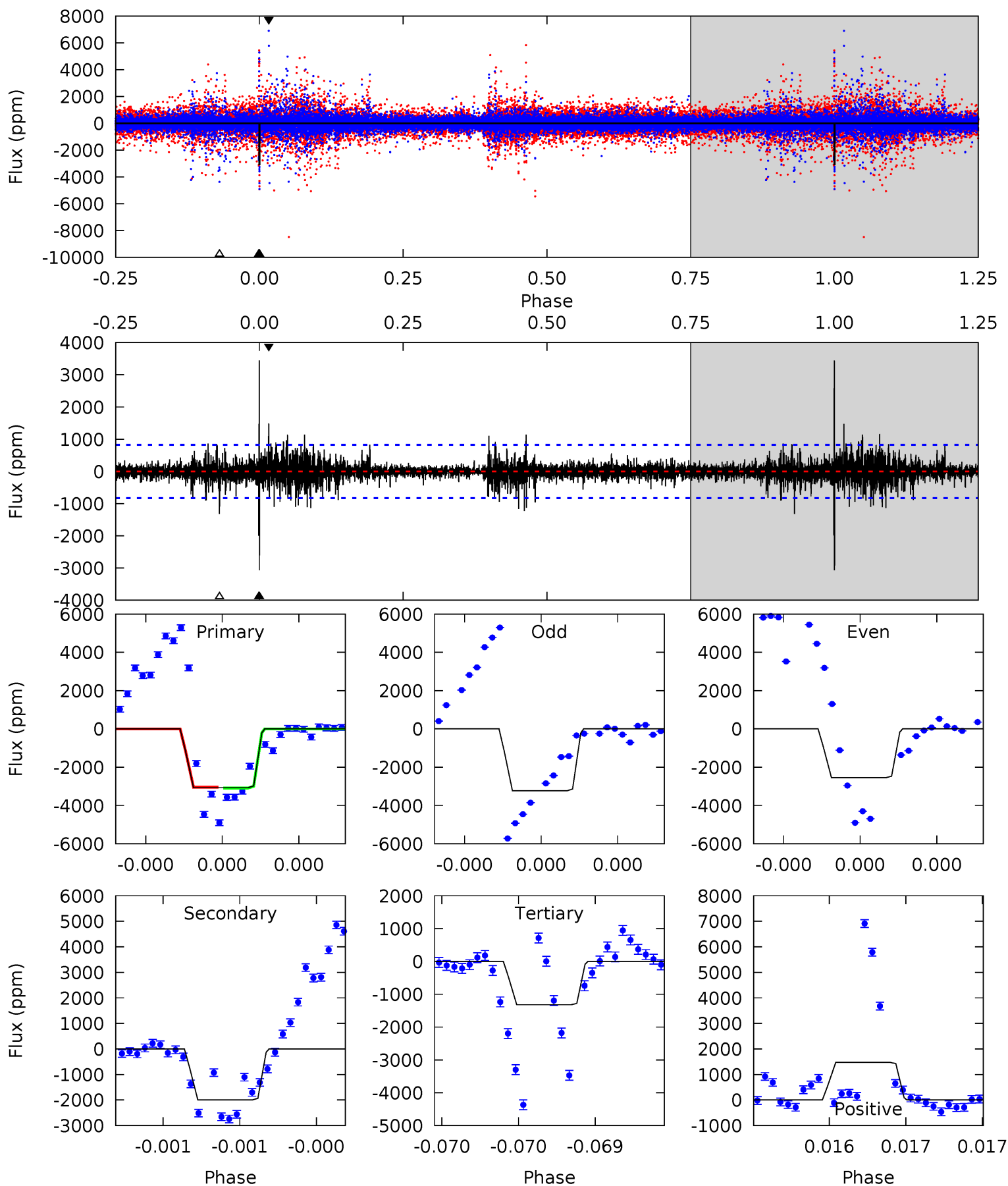




# Alt Model-Shift Uniqueness Test

006721044-06, P = 389.538577 Days, E = 366.908538 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 20.7 | 13.4 | 8.89 | 9.94 | 5.58            | 3.49            | 1.32             | 11.8    | 10.7    | 4.55    | 3.50    | 2.02    | 1.07 | 0.53  | 0.15 |



### Stellar Parameters For KIC 006721044

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|--|
|        | $5578^{+186}_{-152}$ | $3.924^{+0.520}_{-0.130}$ | $0.070^{+0.250}_{-0.250}$ | $1.903^{+0.407}_{-0.949}$ | $1.109^{+0.128}_{-0.193}$ | $0.227^{+1.252}_{-0.099}$                        |
|        | +3%/-3%              | +13%/-3%                  | +357%/-357%               | +21%/-50%                 | +12%/-17%                 | +552%/-44%                                       |
| 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 006721044-06 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ )  | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)   | $A_{\text{obs}}$           |
|---------|-----------------|-------------------------|----------------------|------------------------|----------------------------|
| DV      | $-1750 \pm 145$ | $7.01^{+7.91}_{-4.55}$  | $447^{+35}_{-56}$    | $5804^{+5088}_{-1438}$ | $22214^{+153493}_{-17221}$ |
| Alt.    | $-1992 \pm 148$ | $12.08^{+9.62}_{-7.36}$ | $448^{+34}_{-56}$    | $4763^{+2610}_{-873}$  | $8537^{+48767}_{-5757}$    |

$T_{\text{max}}$  = 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  $A_{\text{obs}} \gg 1.0$

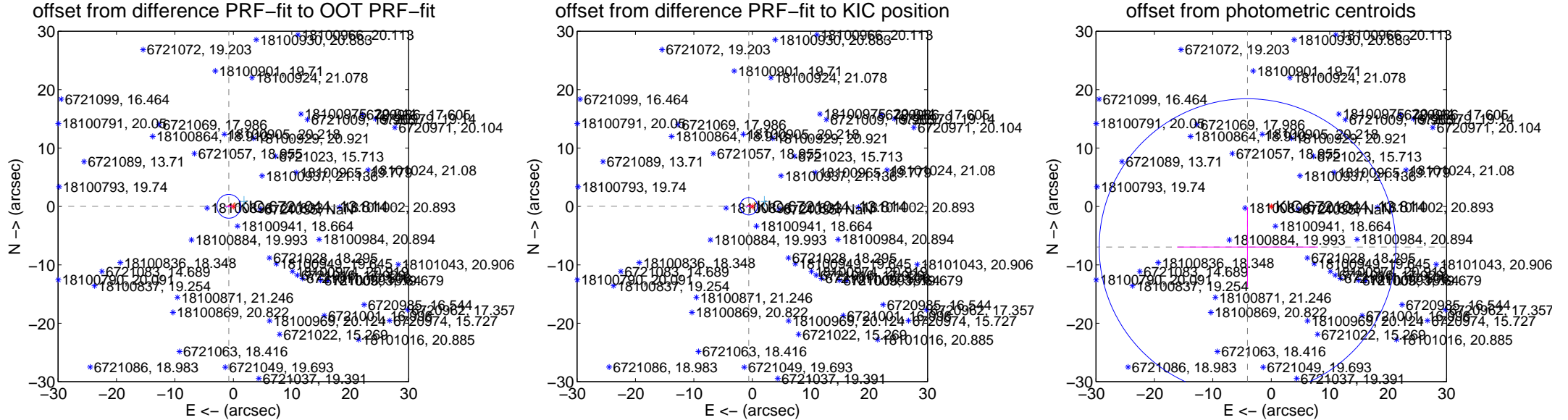
## DV Centroid Data

Supplemental centroid analysis for 006721044-06. Kepler magnitude: 13.81. Transit SNR 0.55

There are 2 quarters with good PRF difference image offsets

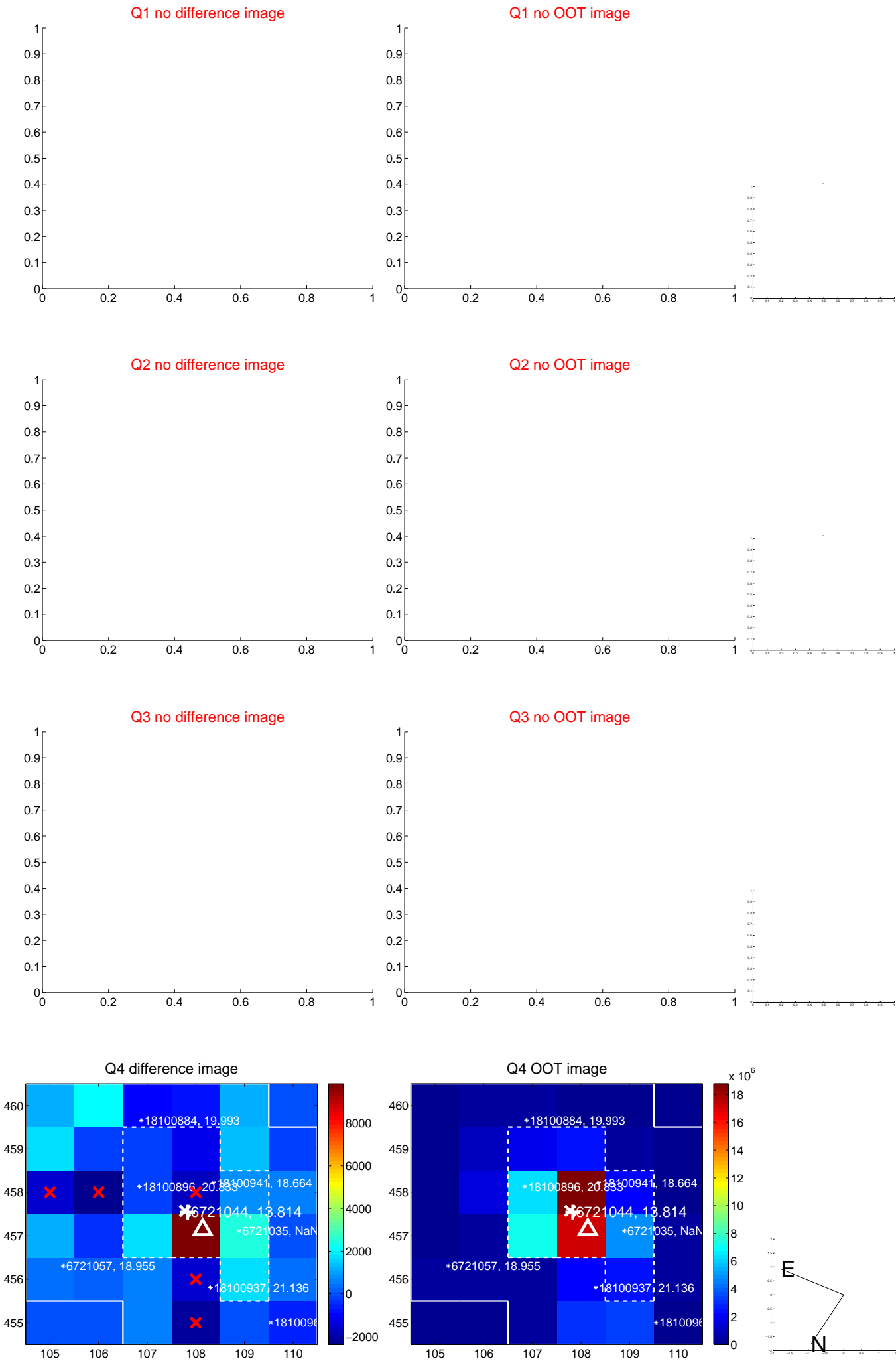
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $0.774 \pm 0.678$  | 1.14                | $0.774 \pm 0.685$ | $0.024 \pm 0.228$ |
| PRF-fit source offset from KIC position | $0.605 \pm 0.496$  | 1.22                | $0.604 \pm 0.506$ | $0.037 \pm 0.173$ |
| photometric centroid source offset      | $8.05 \pm 8.46$    | 0.95                | $4.06 \pm 12.05$  | $-6.95 \pm 6.81$  |

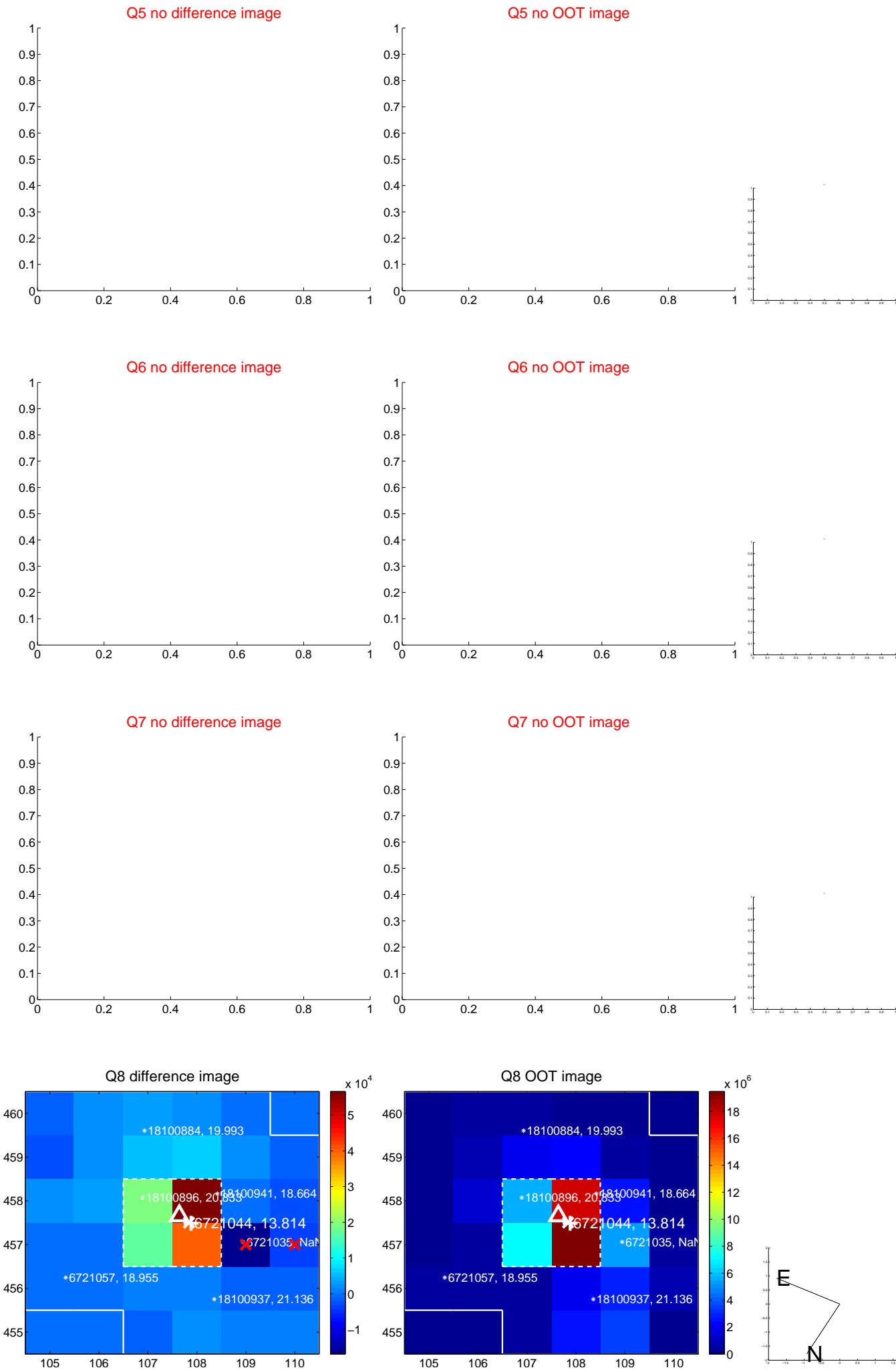


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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.

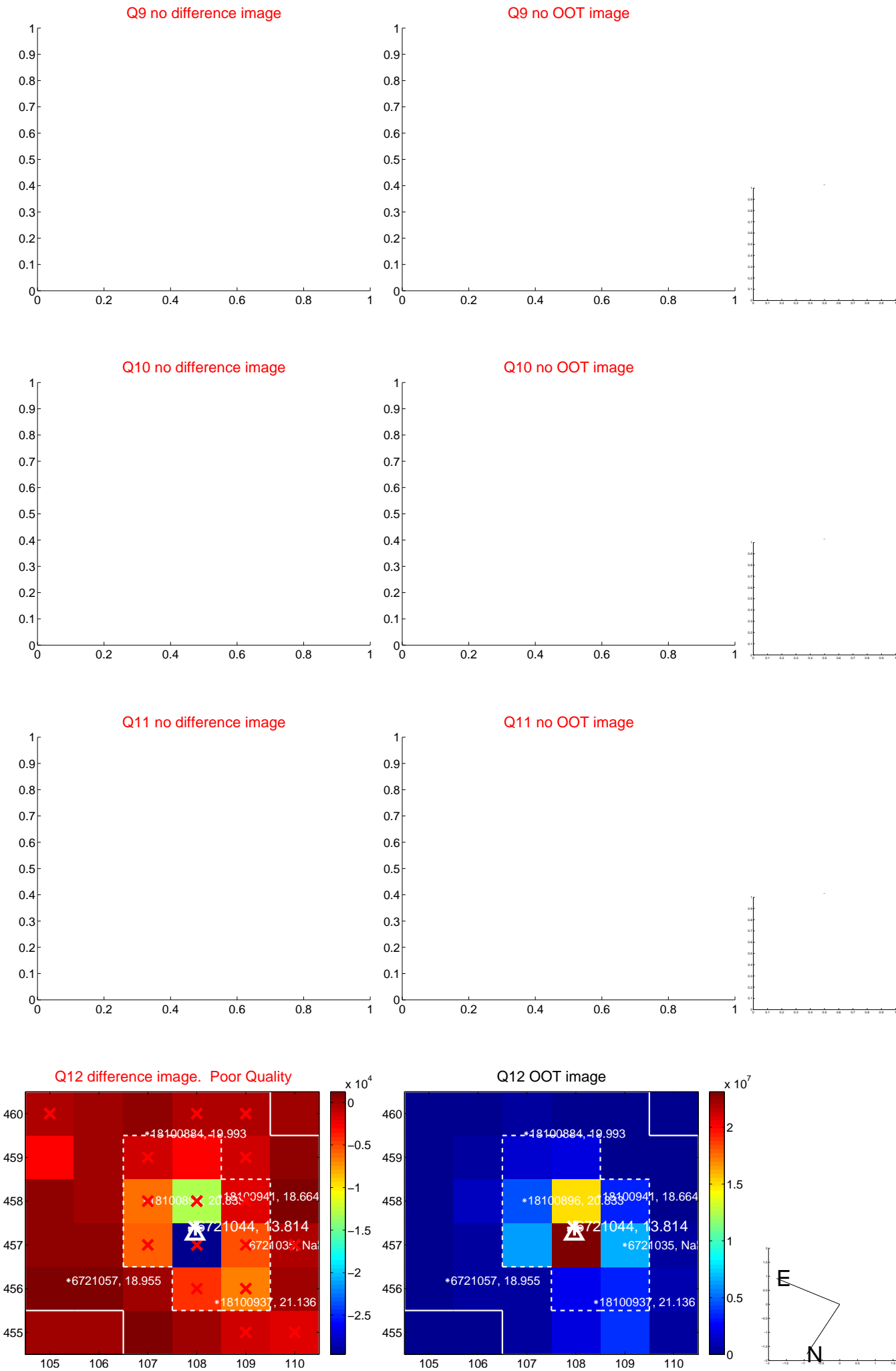
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



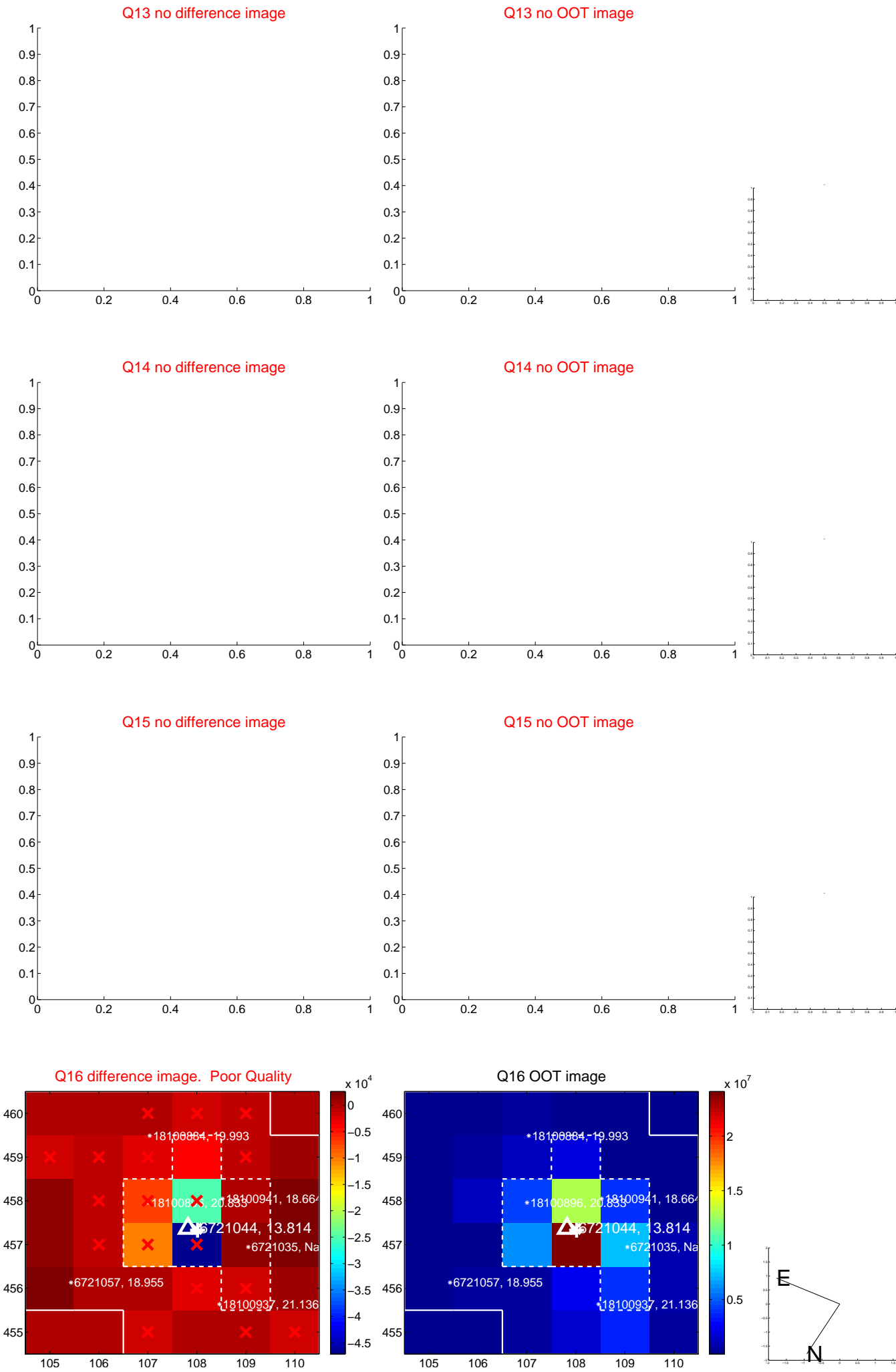
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



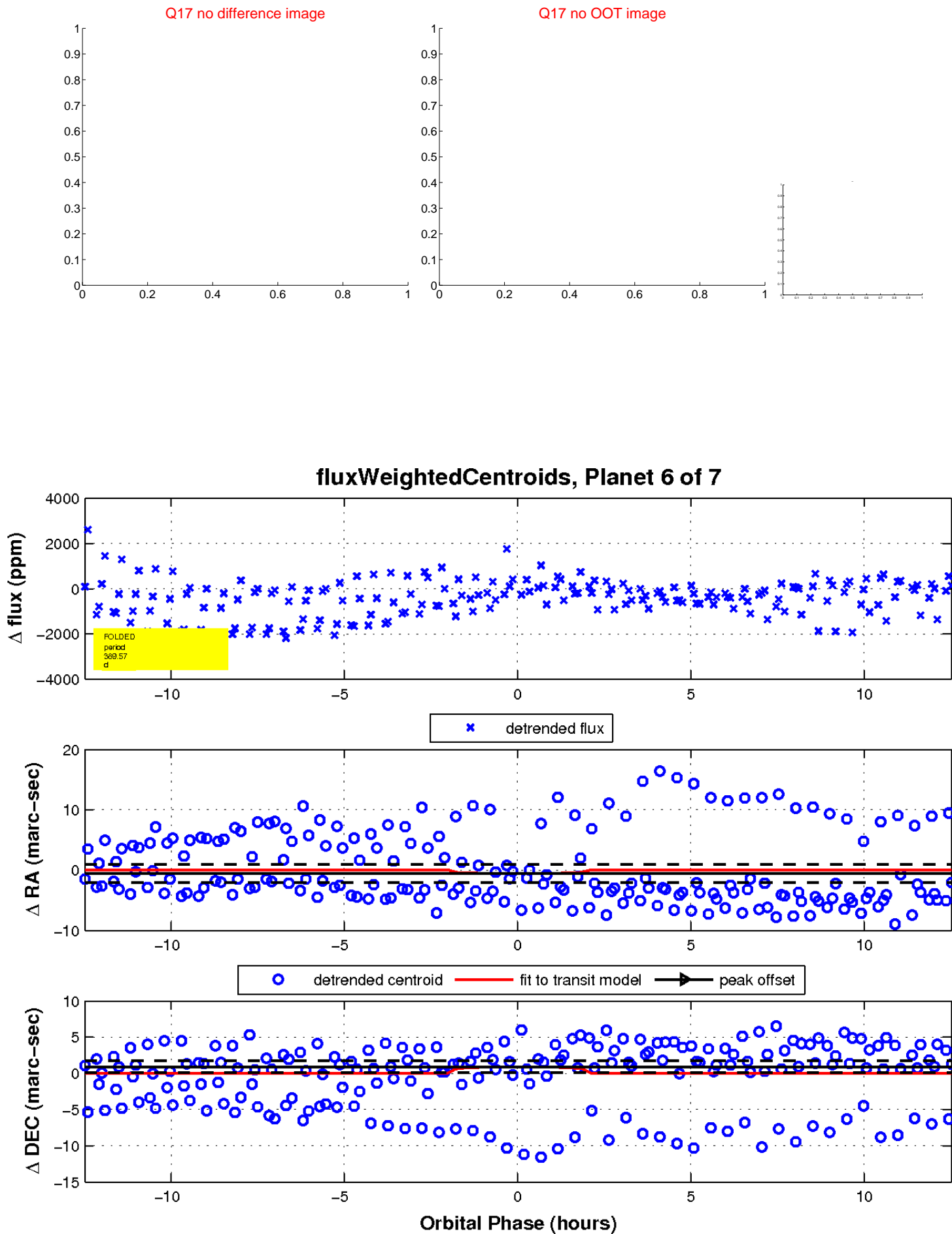
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



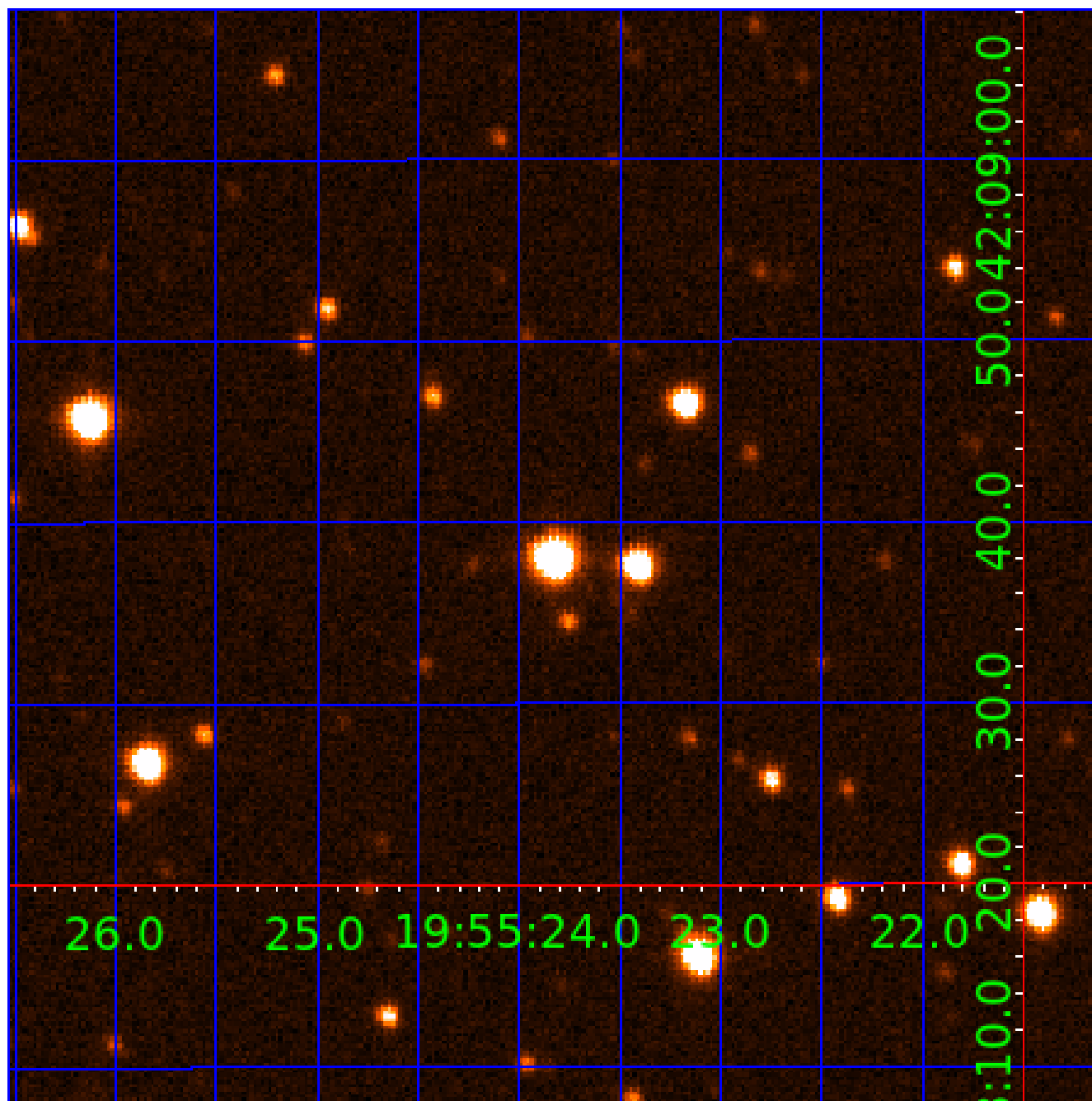
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 006721044

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 006721044-01 | OBS      | No   | 492.489985    | 391.994566   | 665.7       | 4.075            | 11.8 | 4.4 | 1.90                        | 5578            | 5.18                   | 1.97                   |
| 006721044-02 | OBS      | No   | 225.154094    | 355.172737   | 814.2       | 3.269            | 9.2  | 7.0 | 1.90                        | 5578            | 5.56                   | 5.59                   |
| 006721044-03 | OBS      | No   | 0.563501      | 131.874349   | 9.5         | 1.022            | 8.1  | 1.8 | 1.90                        | 5578            | 0.71                   | 16440.25               |
| 006721044-05 | OBS      | No   | 456.246278    | 186.971169   | 1082.2      | 3.570            | 10.5 | 5.5 | 1.90                        | 5578            | 6.95                   | 2.18                   |
| 006721044-06 | OBS      | No   | 389.569679    | 366.871550   | 122.7       | 4.179            | 10.4 | 0.5 | 1.90                        | 5578            | 2.54                   | 2.69                   |
| 006721044-07 | OBS      | No   | 223.351808    | 353.554215   | 278.6       | 3.849            | 8.6  | 1.7 | 1.90                        | 5578            | 3.16                   | 5.65                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 006721044-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS   |
| 006721044-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 006721044-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_UNRESOLVED_OFFSET—HALO_GHOST  |
| 006721044-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—CENT_FEW_DIFFS   |
| 006721044-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                    |
| 006721044-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

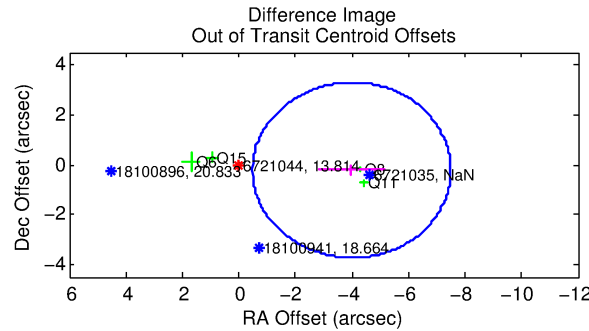
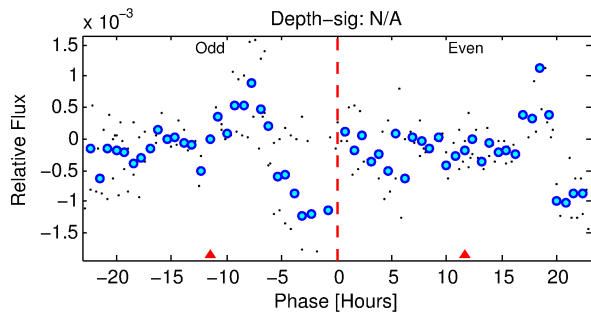
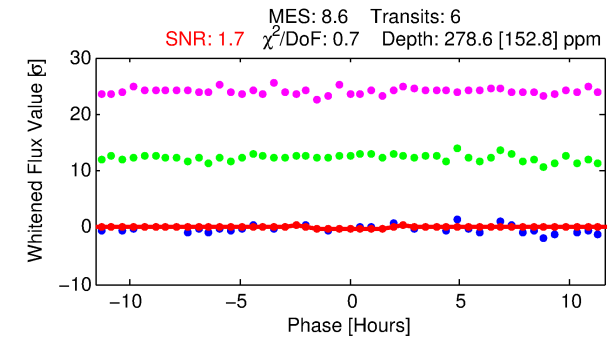
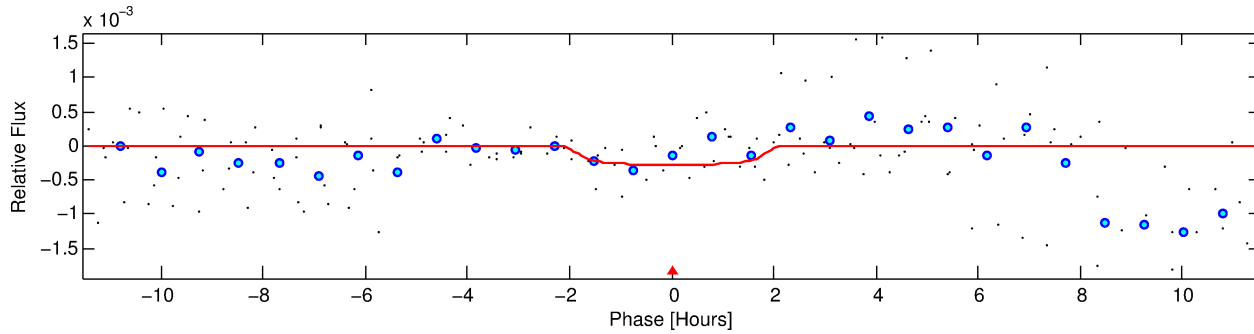
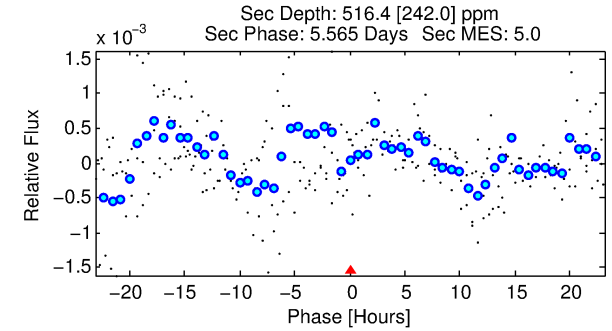
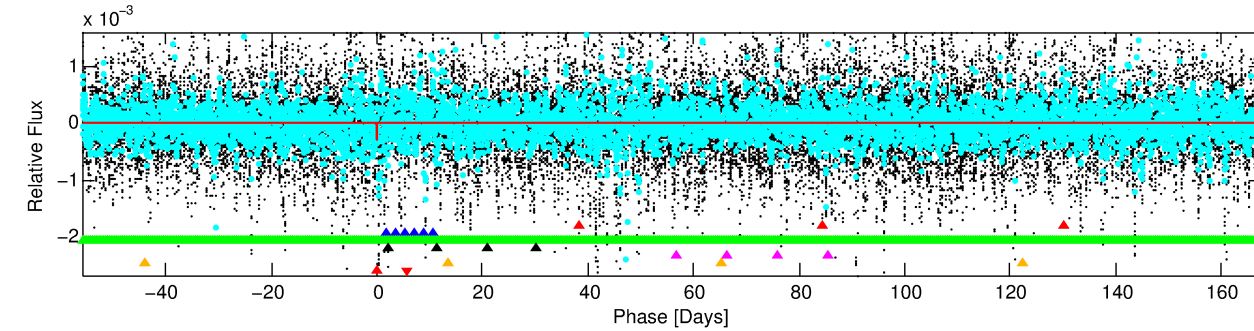
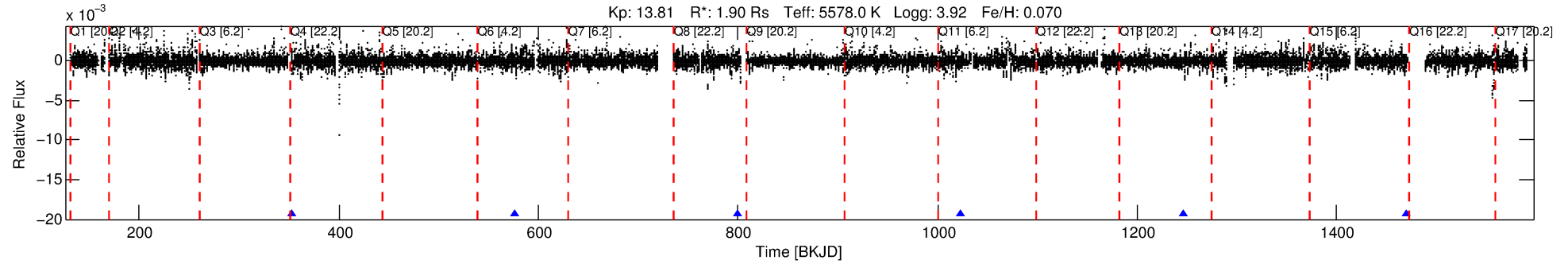
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 006721044-07

No Significant Match Found

# DV One-Page Summary

KIC: 6721044 Candidate: 7 of 7 Period: 223.352 d



## DV Fit Results:

Period = 223.35181 [0.00716] d  
Epoch = 353.5542 [0.0199] BKJD  
Rp/R\* = 0.0152 [0.0600]  
a/R\* = 428.66 [6981.38]  
b = 0.31 [48.10]  
Seff = 5.65 [4.94]  
Teq = 393 [86] K  
Rp = 3.16 [12.57] Re  
a = 0.7458 [0.3874] AU  
Ag = 15793.26 [125438.14] [0.13] $\sigma$   
Teffp = 6813 [13449] K [0.48] $\sigma$

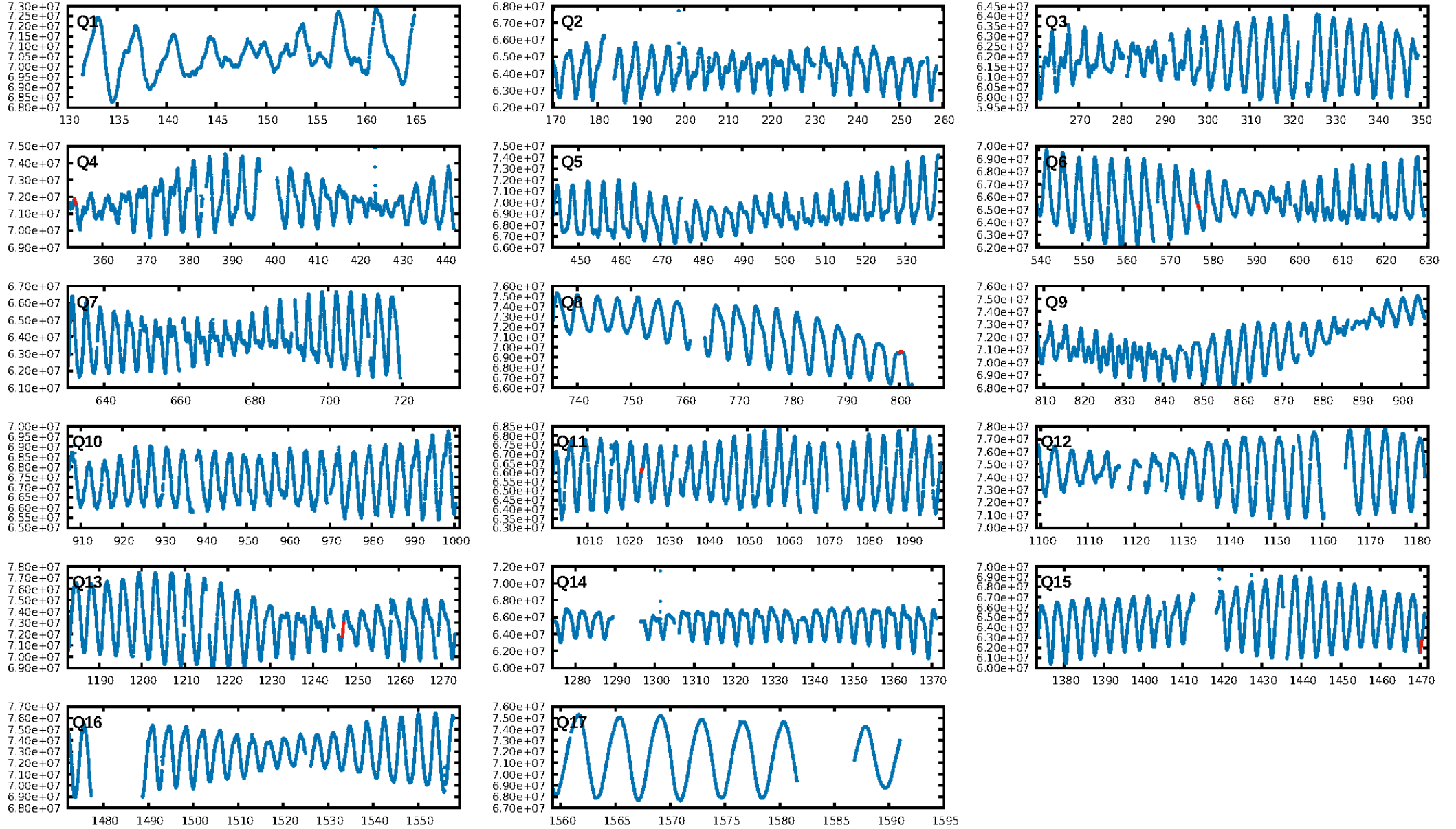
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1342.50] $\sigma$   
LongPeriod-sig: 100.0% [8.56] $\sigma$   
ModelChiSquare2-sig: 95.2%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.06e-09**  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 1.334  
Centroid-sig: 8.2%  
Centroid-so: 5.558 arcsec [1.39] $\sigma$   
**OotOffset-rm: 3.995 arcsec [3.41] $\sigma$**   
**KicOffset-rm: 4.154 arcsec [3.09] $\sigma$**   
OotOffset-st: 1/2/1/0 [4]  
KicOffset-st: 1/2/1/0 [4]  
DiffImageQuality-fgm: 0.25 [1/4]  
DiffImageOverlap-fno: 0.00 [0/4]

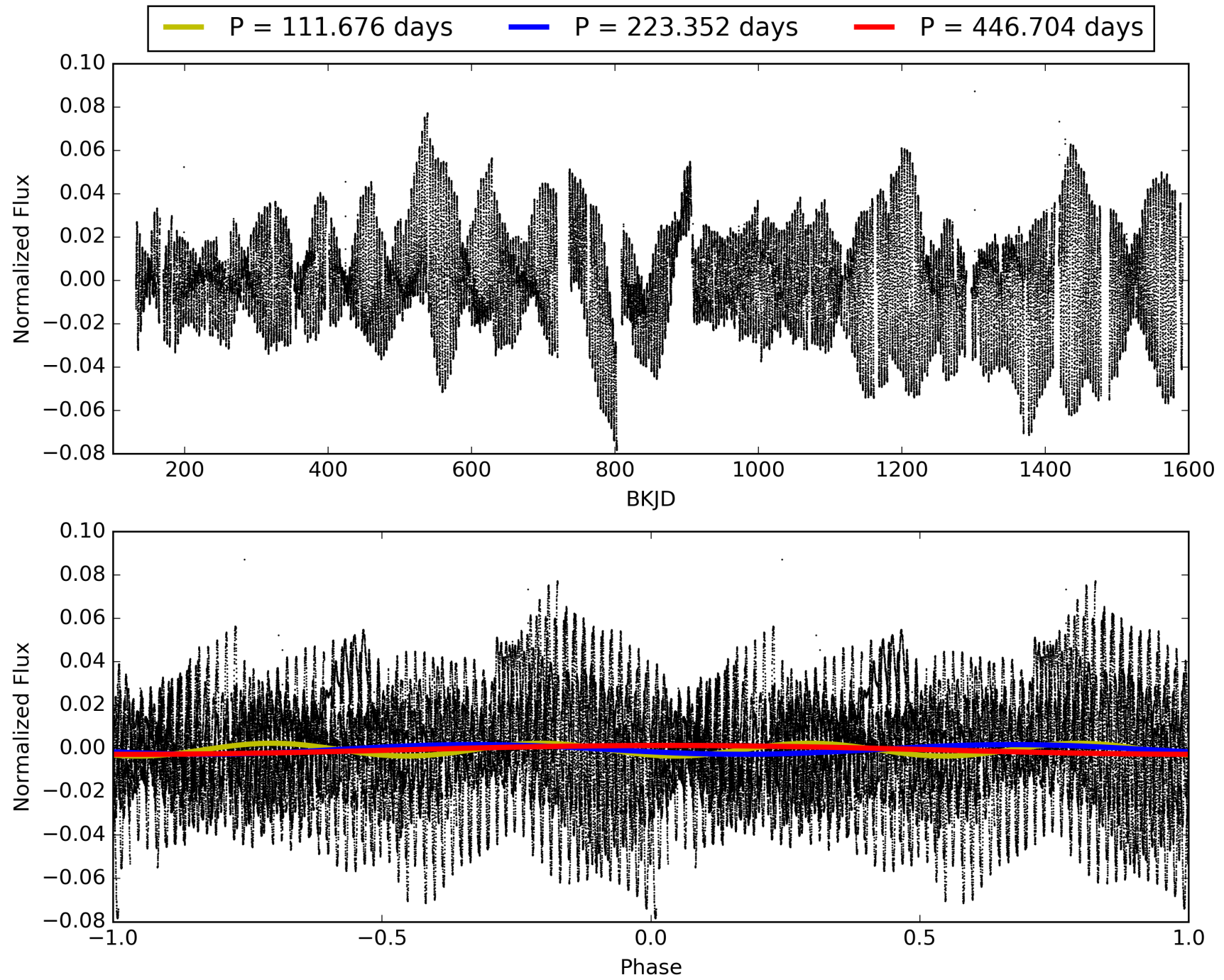
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 06:51:56 Z

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

# TCE 006721044-07, PDC Light Curves

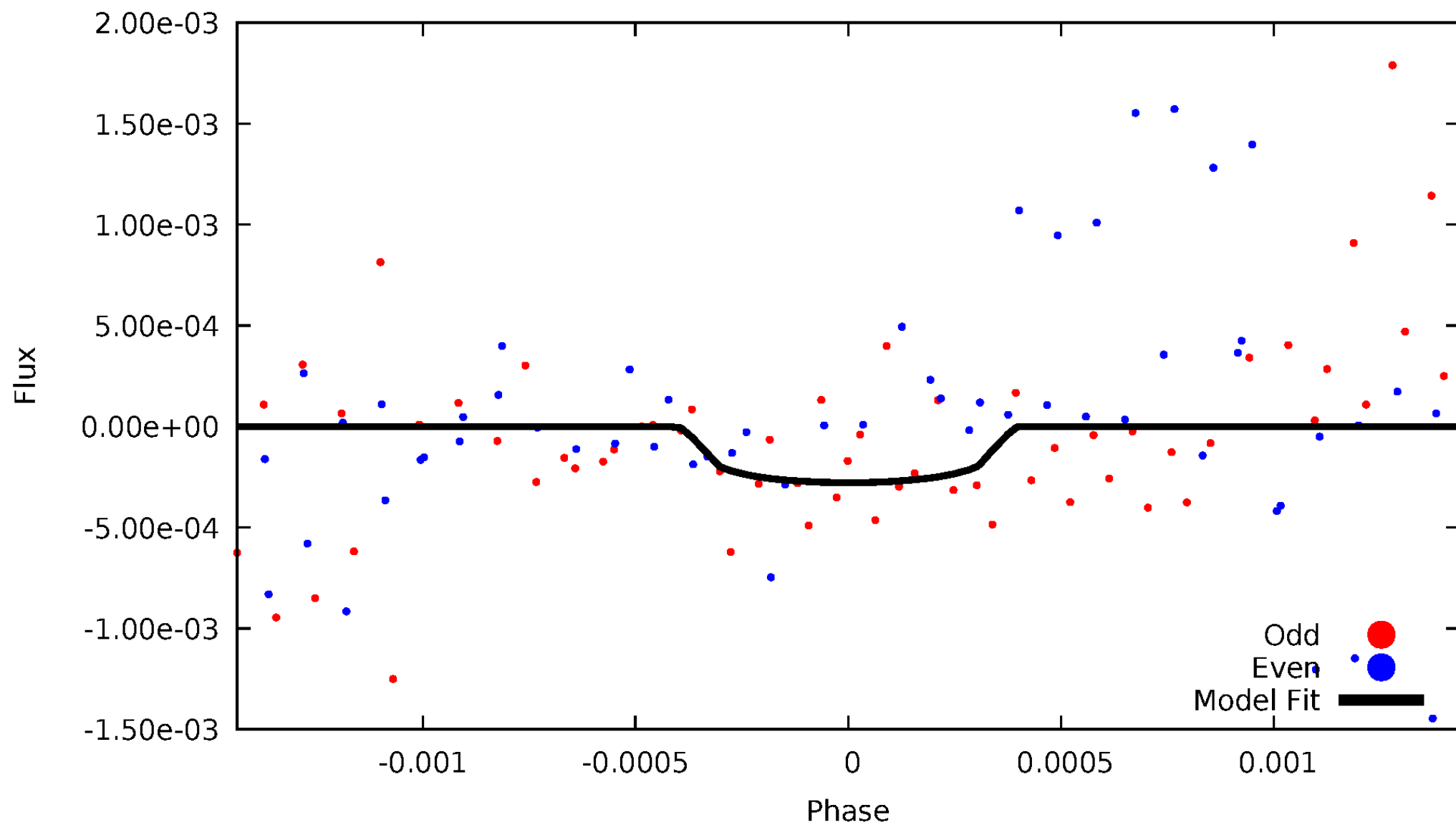


TCE 006721044-07



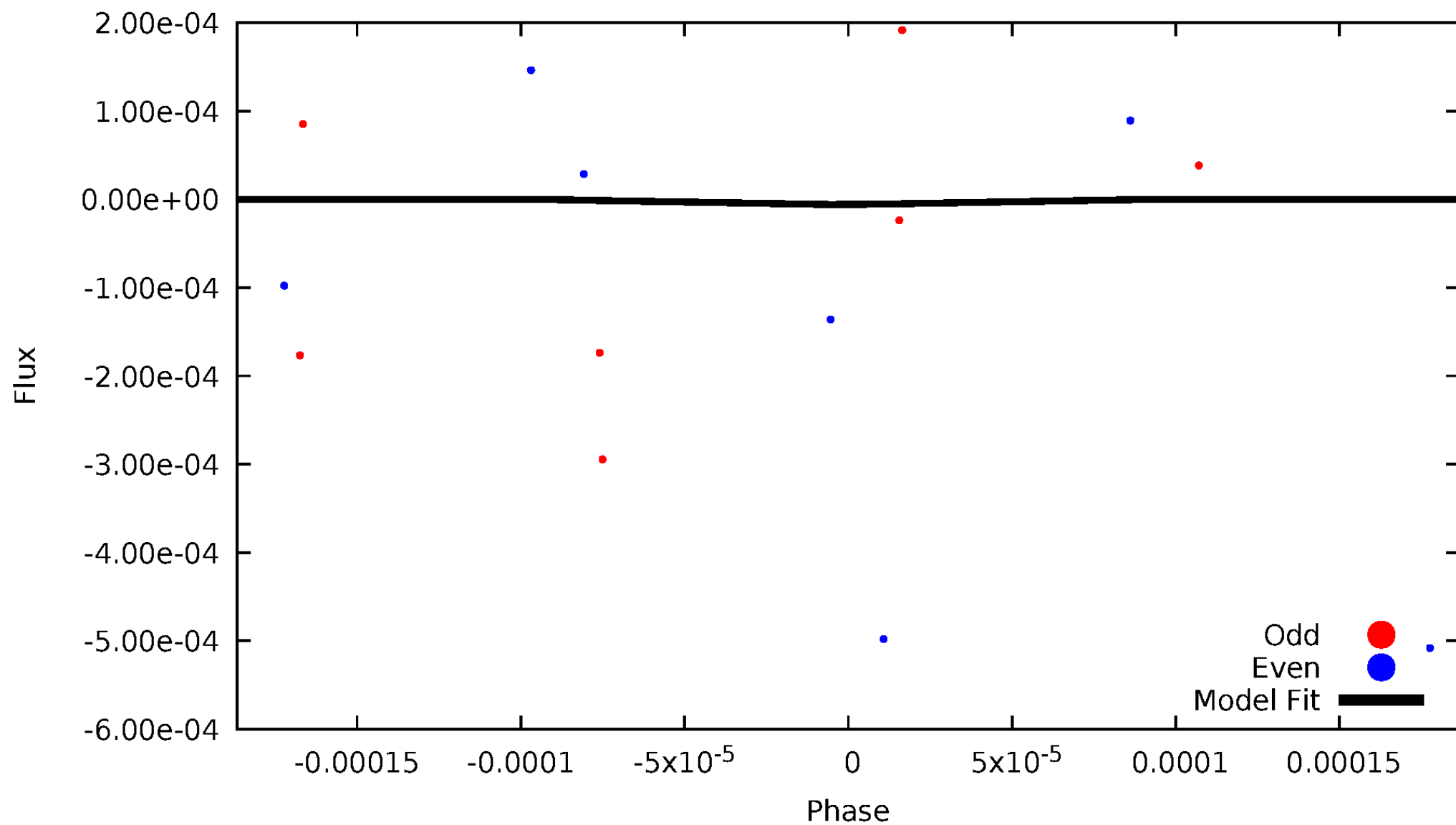
# DV Odd/Even

TCE 006721044-07



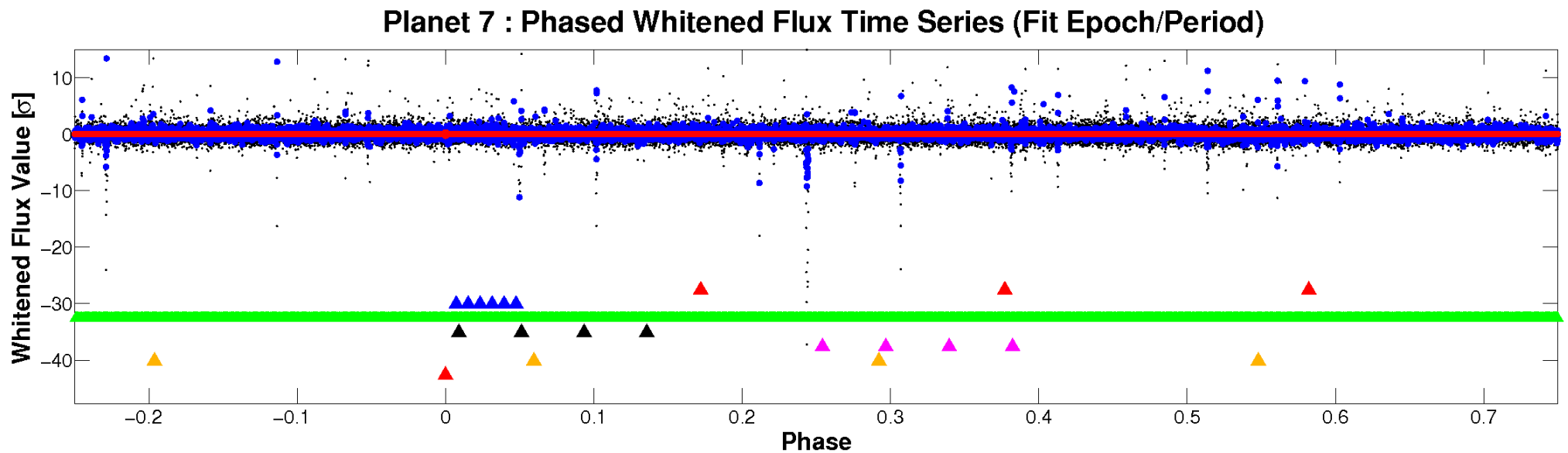
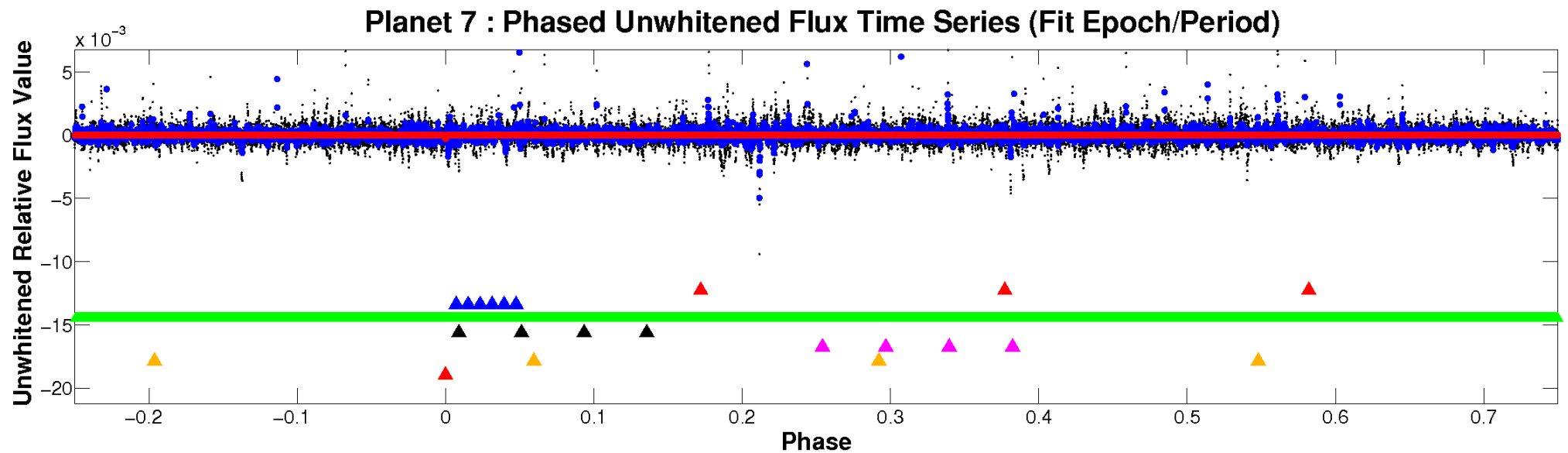
# ALT Odd/Even

TCE 006721044-07





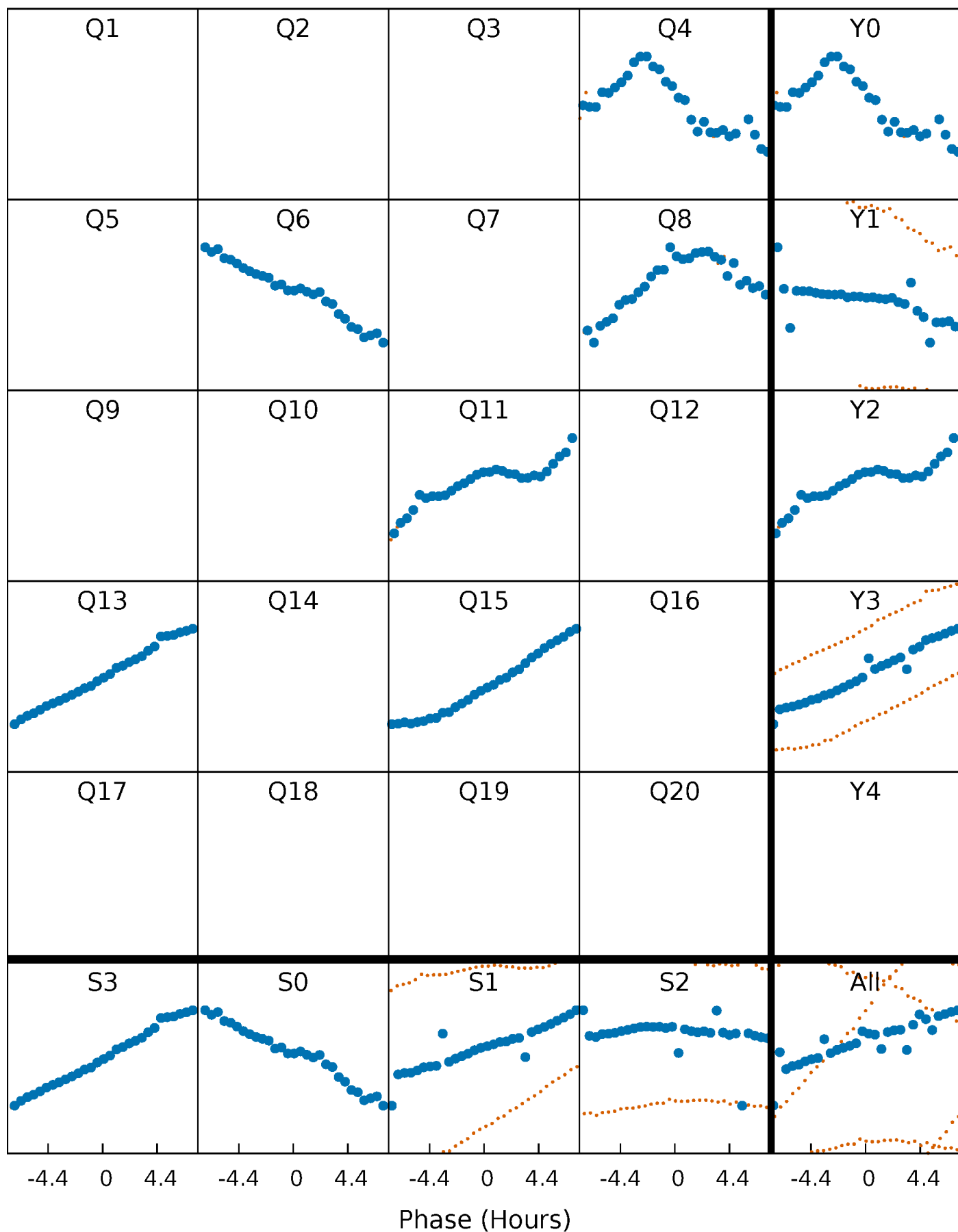
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

TCE 006721044-07 P=223.351808 Days  $T_0=353.554215$  (BKJD)



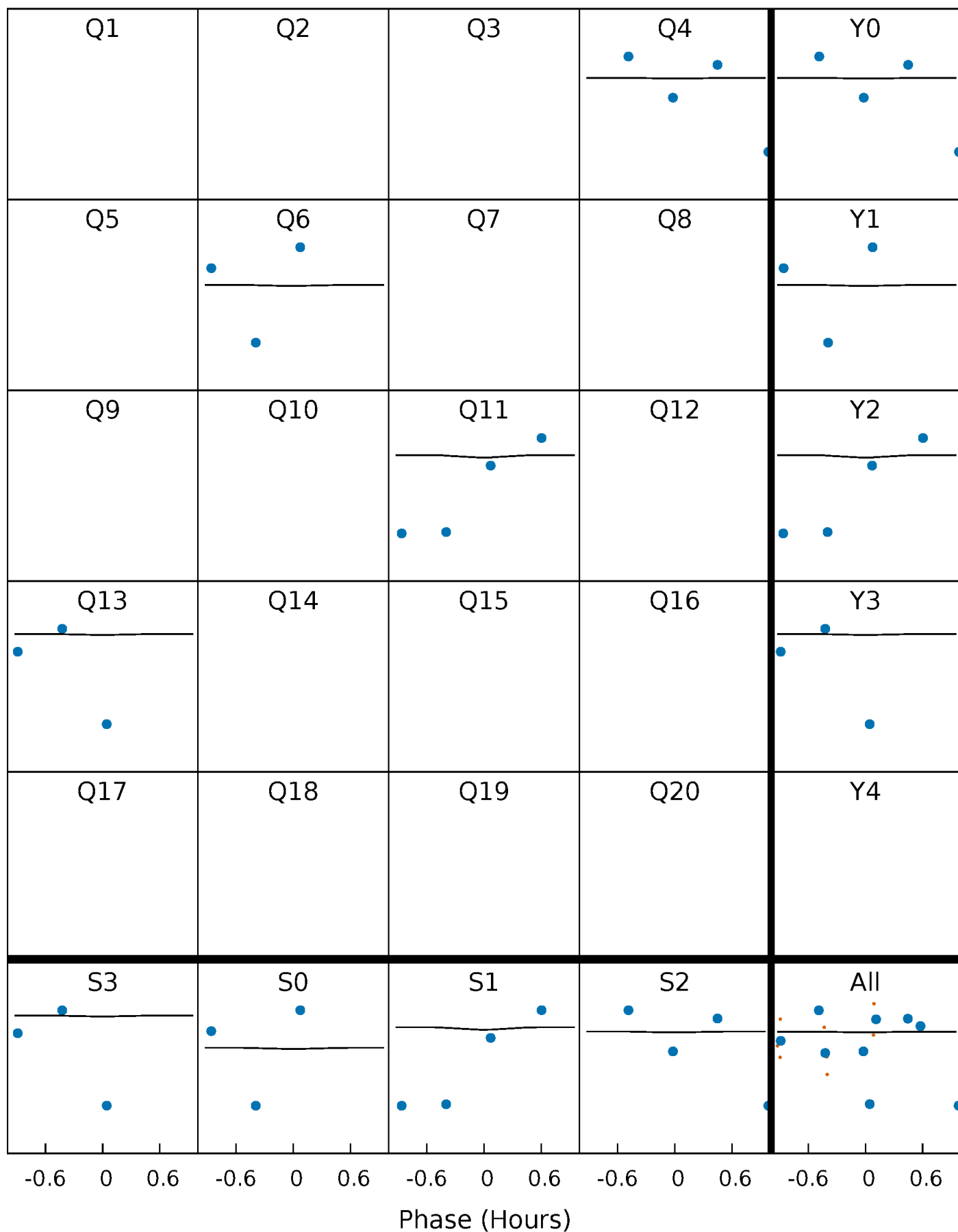
# DV Quarter-Phased Transit Curves

TCE 006721044-07     $P=223.351808$  Days     $T_0=353.554215$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

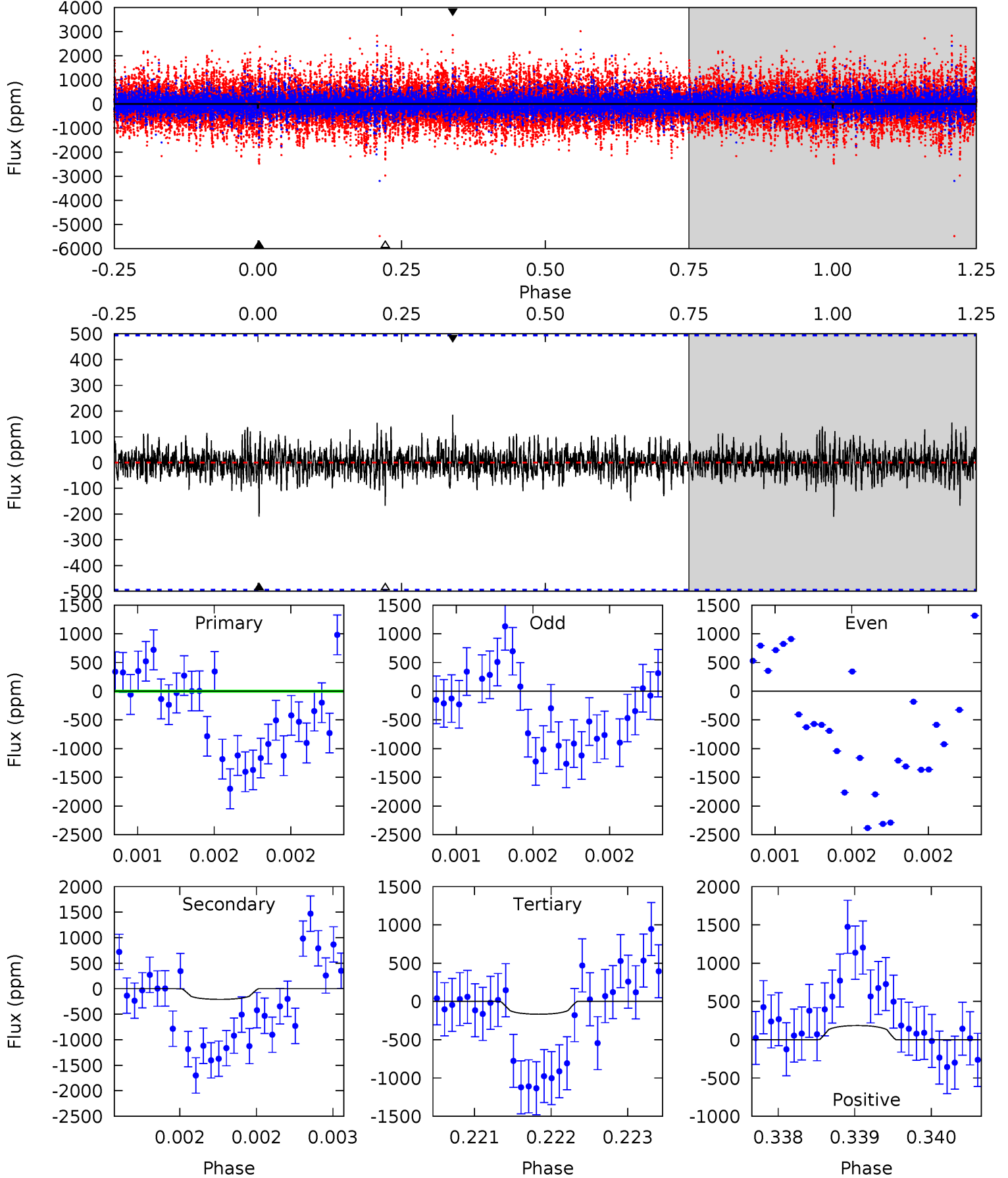
TCE 006721044-07 P=223.338811 Days  $T_0=353.563170$  (BKJD)



# DV Model-Shift Uniqueness Test

006721044-07, P = 223.351808 Days, E = 130.202407 Days

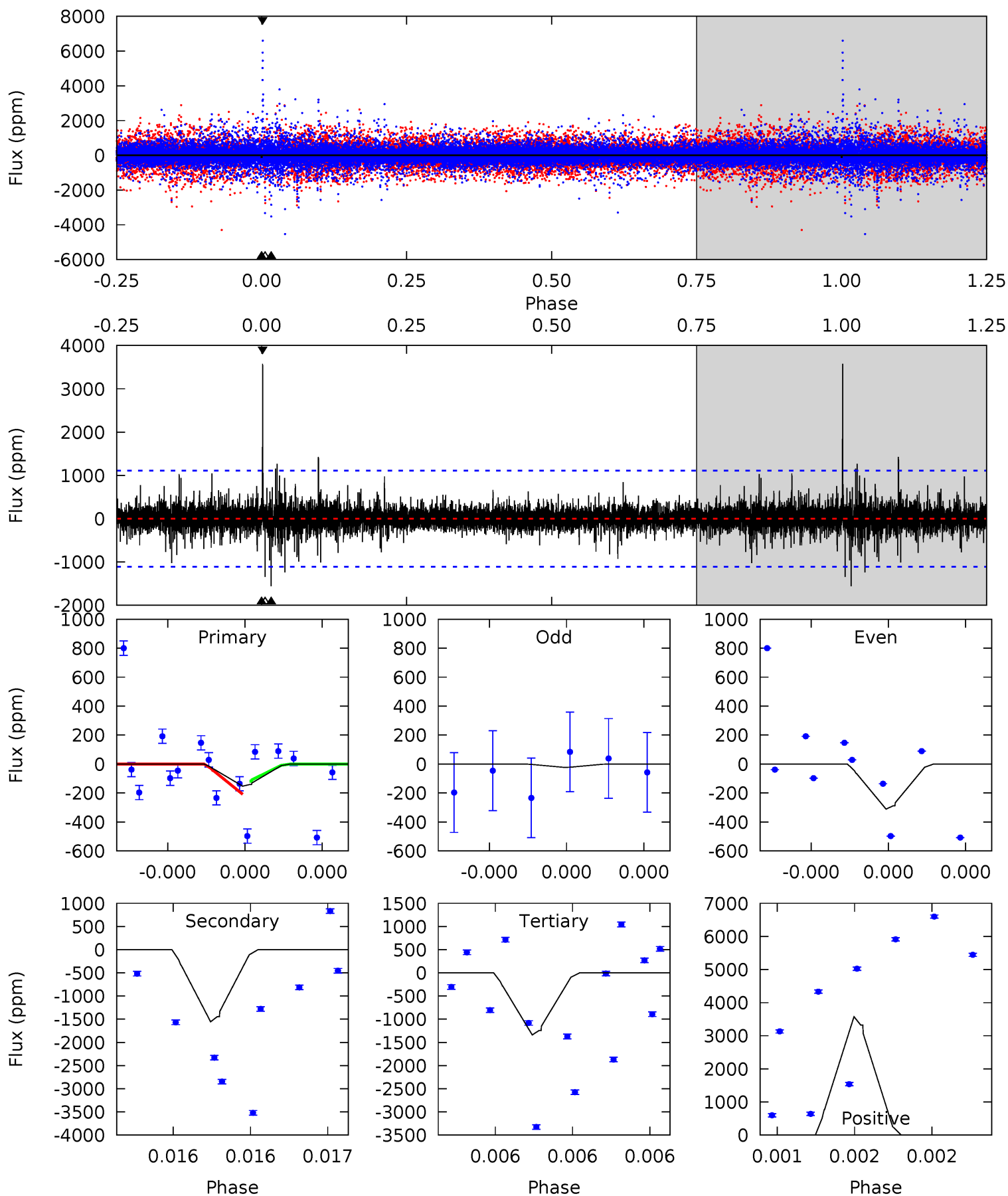
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.68 | 2.33 | 1.86 | 2.06 | 5.49            | 3.35            | 0.43             | -0.18   | -0.38   | 0.47    | 0.27    | 0.98    | 1.30 | 0.47  | 1.39 |



# Alt Model-Shift Uniqueness Test

006721044-07, P = 223.338811 Days, E = 130.224359 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 0.79 | 8.05 | 6.93 | 18.5 | 5.75            | 3.74            | 0.87             | -6.14   | -17.7   | 1.11    | -10.5   | 0.52    | 1.50 | 0.70  | 0.23 |



### Stellar Parameters For KIC 006721044

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $5578^{+186}_{-152}$ | $3.924^{+0.520}_{-0.130}$ | $0.070^{+0.250}_{-0.250}$ | $1.903^{+0.407}_{-0.949}$ | $1.109^{+0.128}_{-0.193}$ | $0.227^{+1.252}_{-0.099}$                     |
|        | +3%/-3%              | +13%/-3%                  | +357%/-357%               | +21%/-50%                 | +12%/-17%                 | +552%/-44%                                    |
| 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 006721044-07 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)     | $T_{obs}$ (K)          | $A_{obs}$               |
|---------|-----------------|------------------------|-------------------|------------------------|-------------------------|
| DV      | $-210 \pm 90$   | $8.92^{+9.77}_{-6.57}$ | $537^{+44}_{-68}$ | $3477^{+2178}_{-695}$  | $708^{+8860}_{-563}$    |
| Alt.    | $-1555 \pm 193$ | $7.45^{+8.32}_{-5.31}$ | $541^{+41}_{-74}$ | $5555^{+6381}_{-1426}$ | $8424^{+91742}_{-6499}$ |

$T_{max}$  = 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  $A_{obs} \gg 1.0$

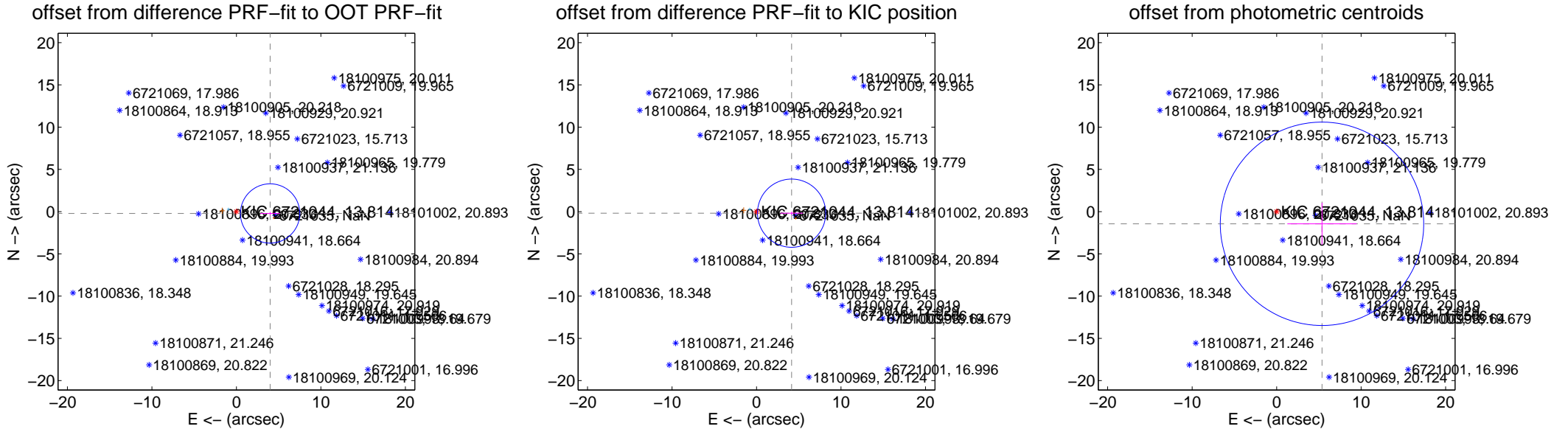
## DV Centroid Data

Supplemental centroid analysis for 006721044-07. Kepler magnitude: 13.81. Transit SNR 1.74

There are 1 quarters with good PRF difference image offsets

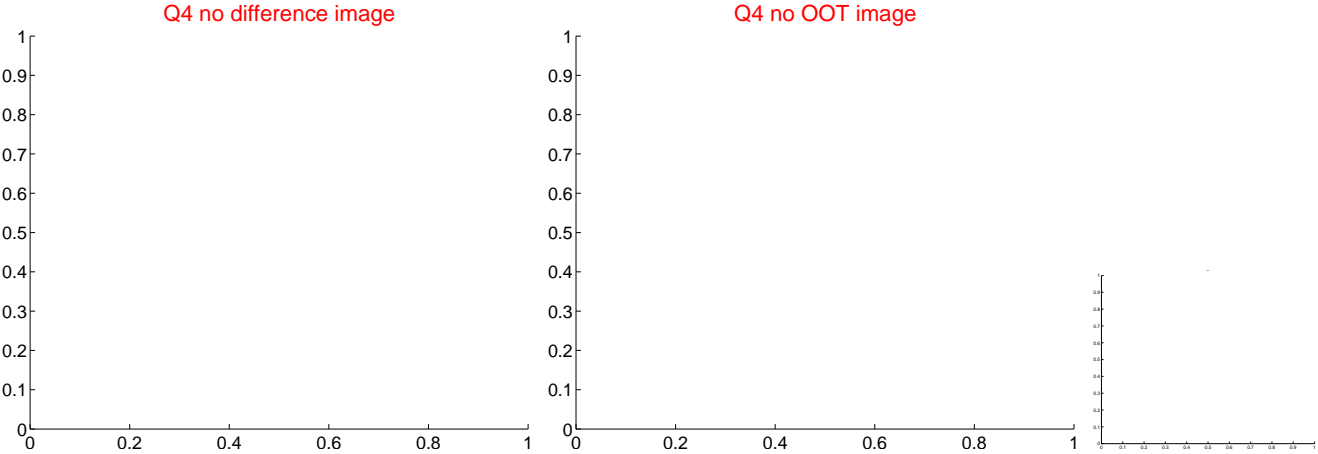
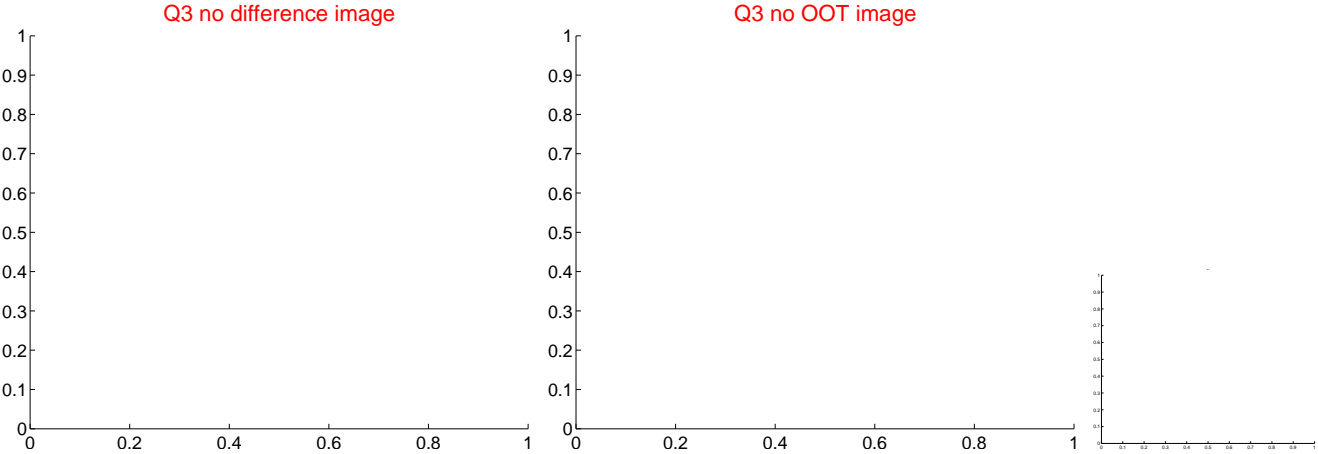
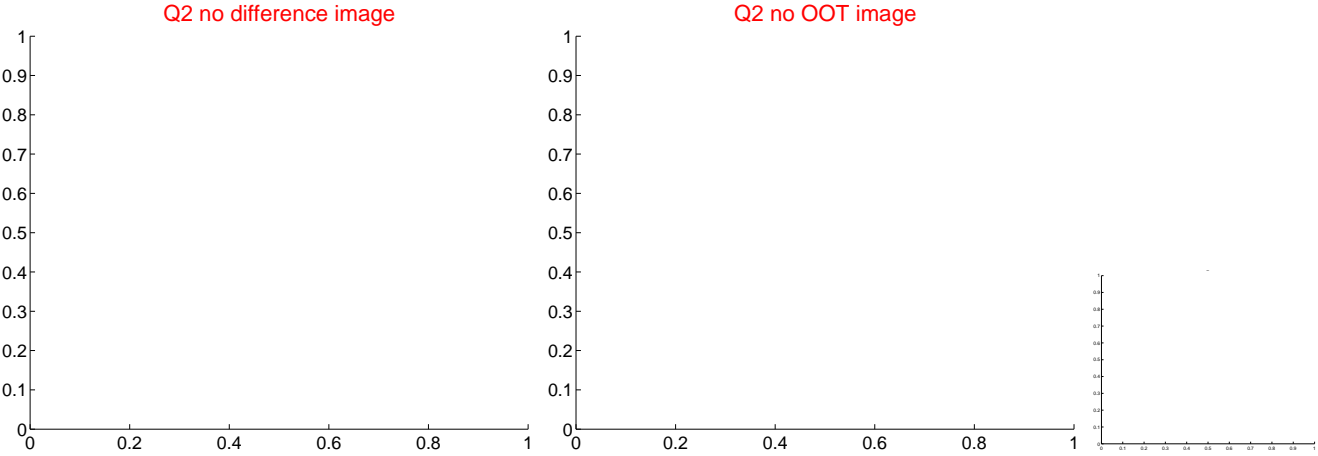
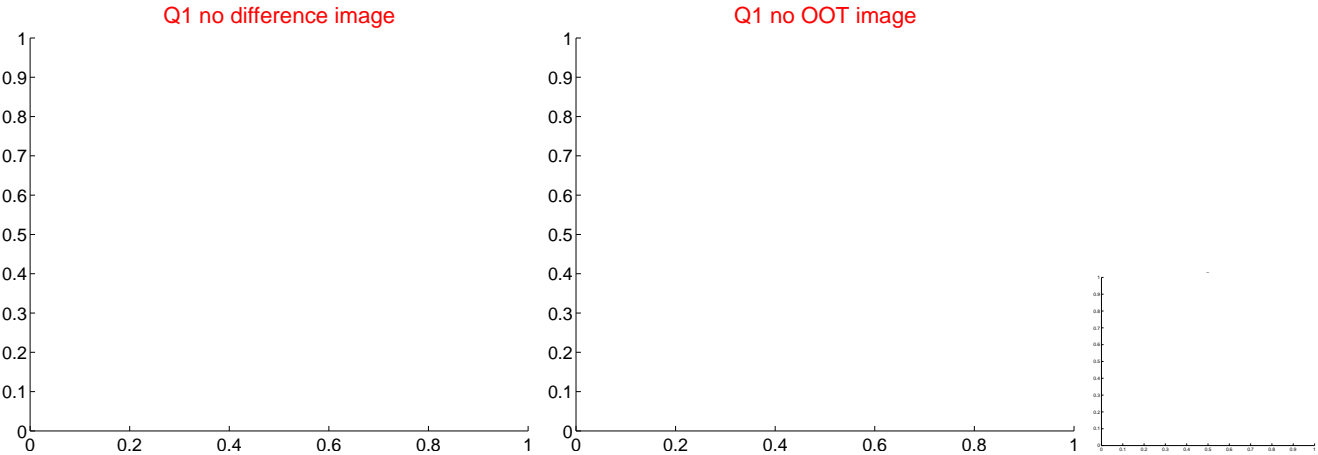
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $3.995 \pm 1.170$  | 3.41                | $-3.989 \pm 1.163$ | $-0.218 \pm 0.186$ |
| PRF-fit source offset from KIC position | $4.154 \pm 1.345$  | 3.09                | $-4.150 \pm 1.341$ | $-0.183 \pm 0.190$ |
| photometric centroid source offset      | $5.56 \pm 4.01$    | 1.39                | $-5.37 \pm 4.10$   | $-1.44 \pm 2.48$   |



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.

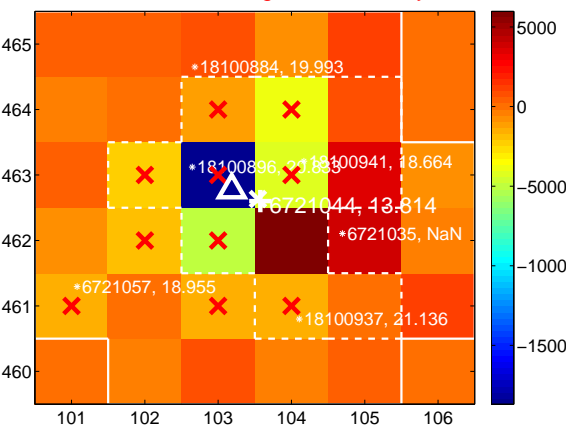
Q5 no difference image



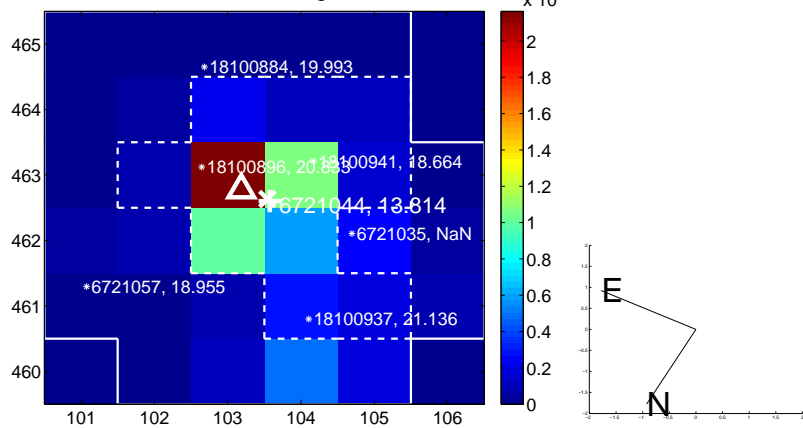
Q5 no OOT image



Q6 difference image. Poor Quality



Q6 OOT image



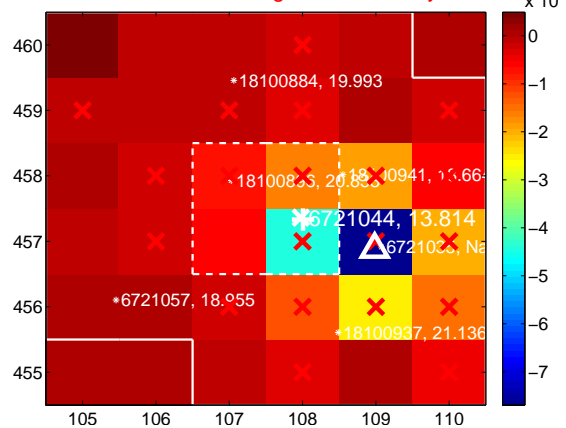
Q7 no difference image



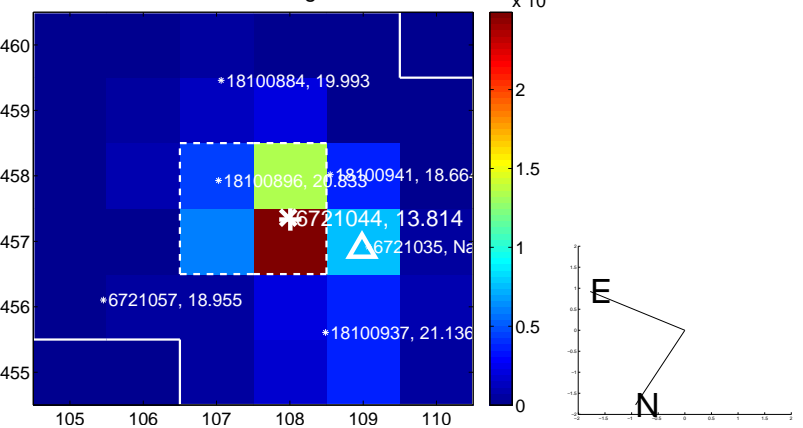
Q7 no OOT image



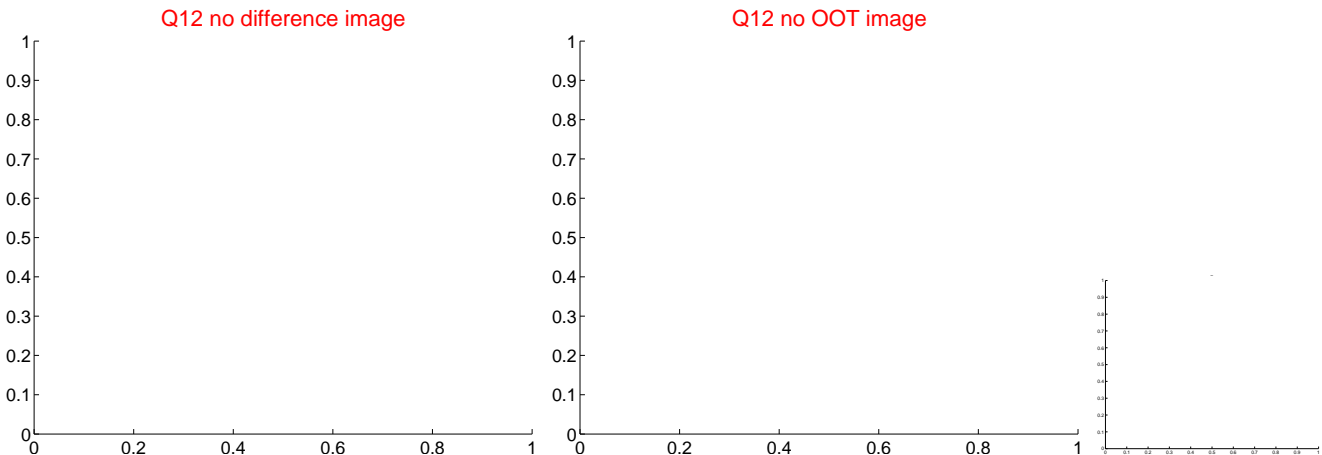
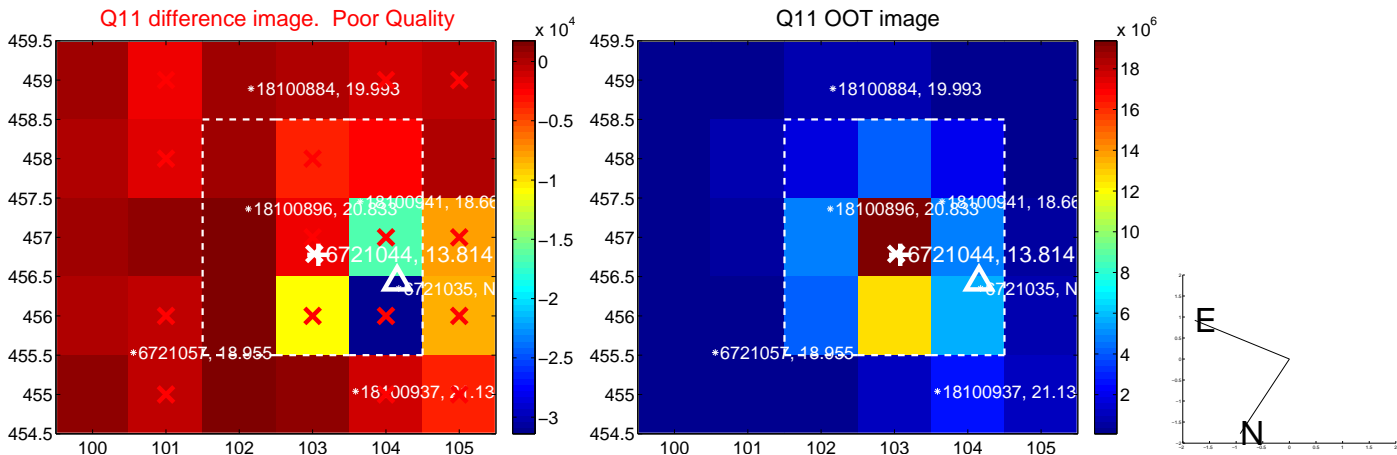
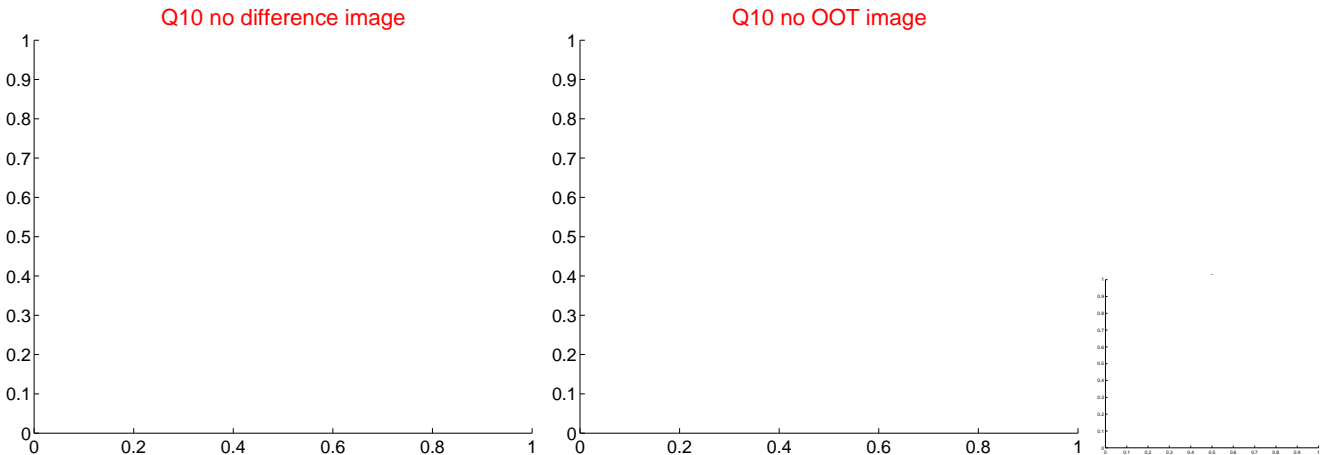
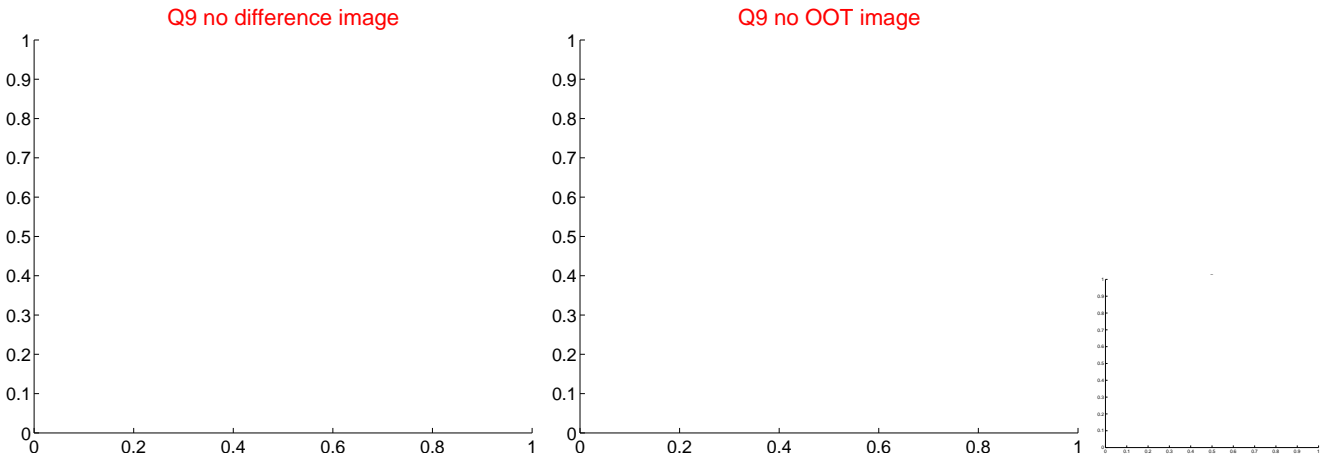
Q8 difference image. Poor Quality



Q8 OOT image



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.

Q13 no difference image



Q13 no OOT image



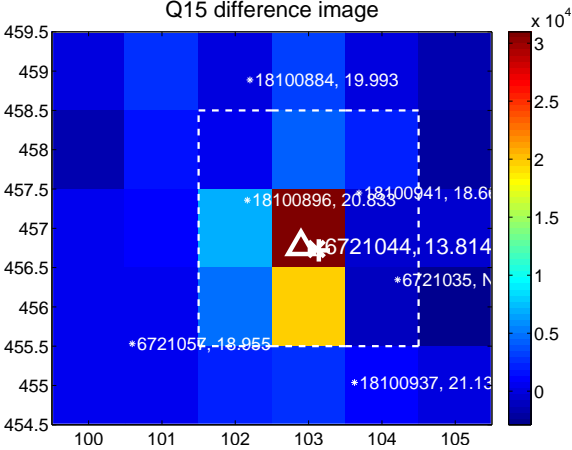
Q14 no difference image



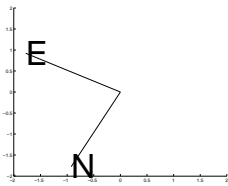
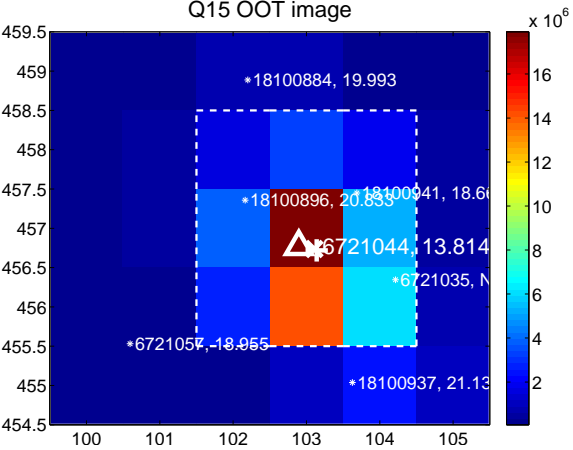
Q14 no OOT image



Q15 difference image



Q15 OOT image



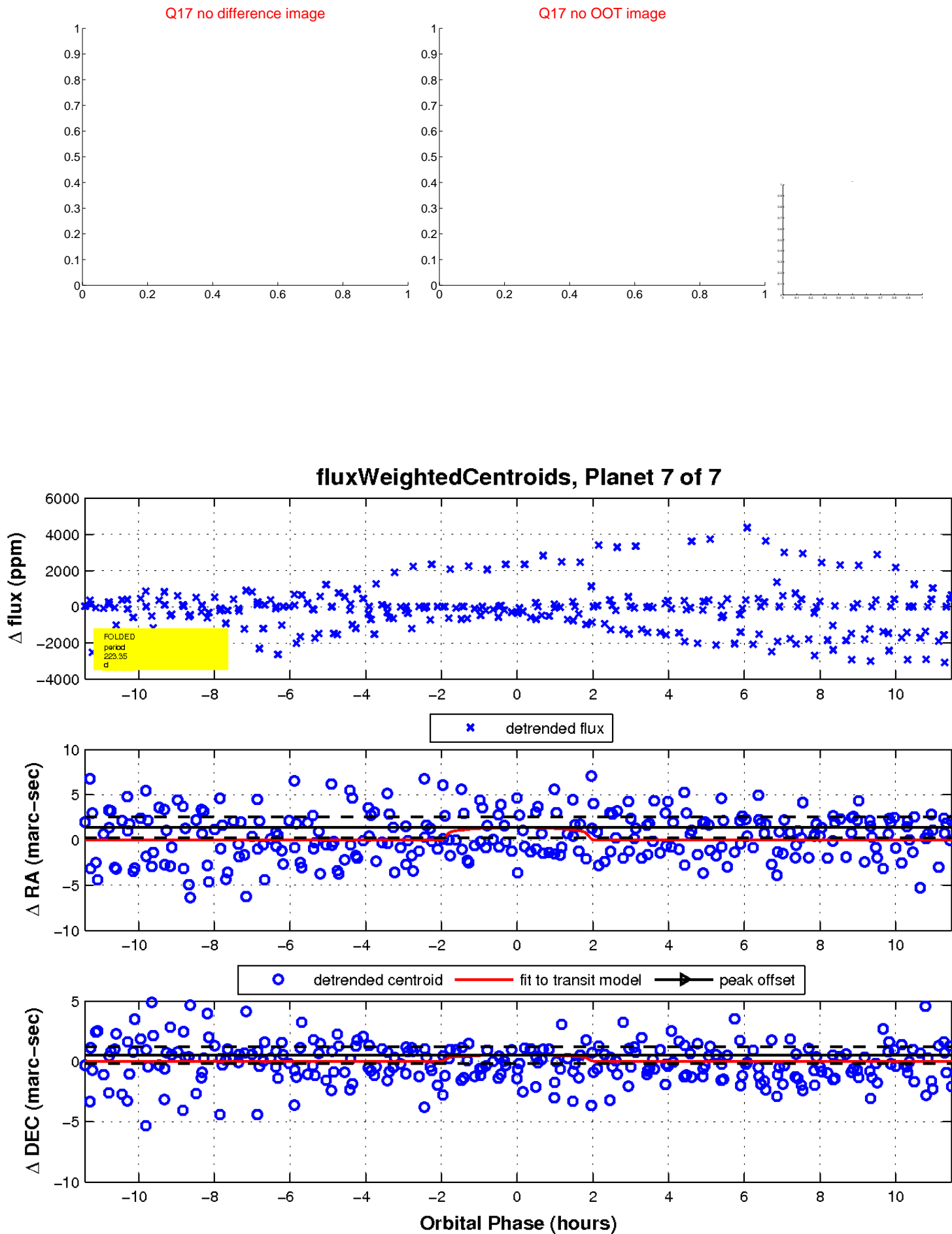
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

