

# KIC 009166826

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009166826-01 | OBS      | No   | 1.105096      | 132.364571   | 32.2        | 3.666            | 10.2 | 8.4  | 1.57                        | 7261            | 0.98                   | 10334.27               |
| 009166826-02 | OBS      | No   | 1.105092      | 131.627107   | 24.5        | 4.563            | 10.6 | 6.9  | 1.57                        | 7261            | 0.83                   | 10334.32               |
| 009166826-03 | OBS      | No   | 18.475152     | 139.191330   | 54.8        | 1.368            | 8.4  | 1.4  | 1.57                        | 7261            | 1.33                   | 241.75                 |
| 009166826-04 | OBS      | No   | 18.475735     | 139.518855   | 71.3        | 2.308            | 8.5  | 2.3  | 1.57                        | 7261            | 1.53                   | 241.74                 |
| 009166826-05 | OBS      | No   | 44.304722     | 146.120989   | 282.3       | 4.500            | 8.0  | -1.0 | 1.57                        | 7261            | 2.67                   | 75.31                  |
| 009166826-06 | OBS      | No   | 47.695013     | 172.383956   | 274.8       | 4.358            | 7.3  | 6.5  | 1.57                        | 7261            | 2.83                   | 68.26                  |
| 009166826-07 | OBS      | No   | 74.722951     | 142.333969   | 266.5       | 4.500            | 7.5  | -1.0 | 1.57                        | 7261            | 2.60                   | 37.52                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 009166826-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009166826-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—SAME_NTL_PERIOD  |
| 009166826-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT      |
| 009166826-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD |
| 009166826-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS  |
| 009166826-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT   |
| 009166826-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS   |

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

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

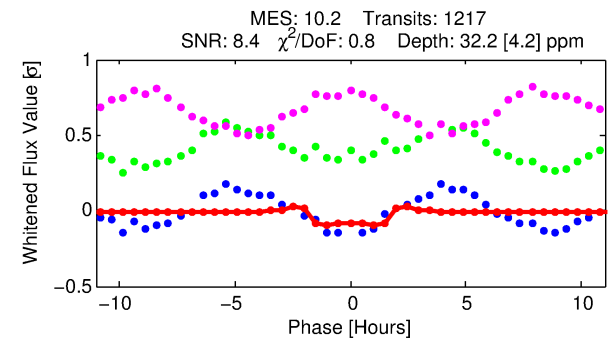
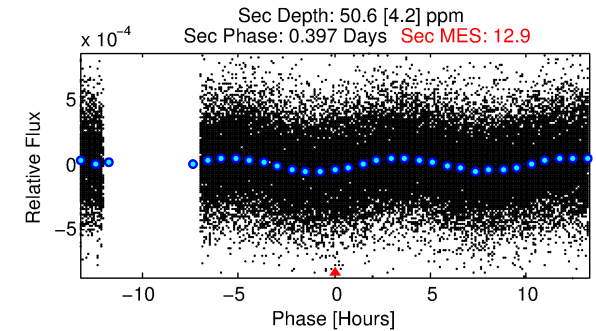
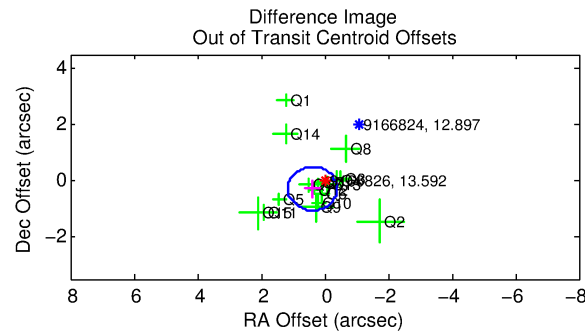
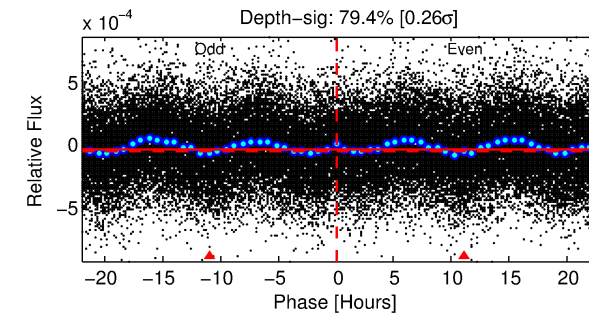
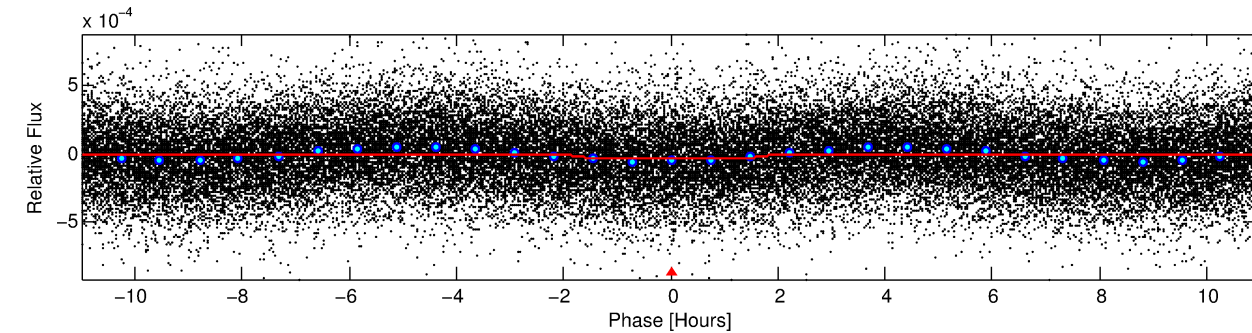
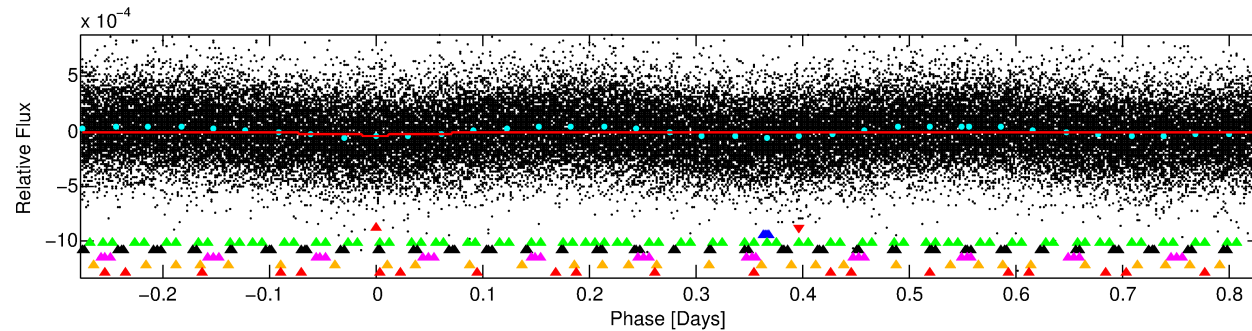
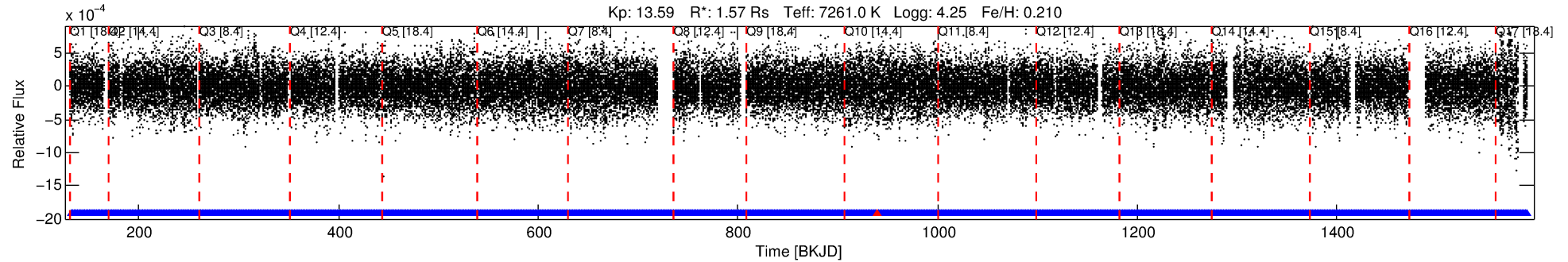
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009166826-01

No Significant Match Found

# DV One-Page Summary

KIC: 9166826 Candidate: 1 of 7 Period: 1.105 d



## DV Fit Results:

Period = 1.10510 [0.00001] d  
Epoch = 132.3646 [0.0032] BKJD  
Rp/R\* = 0.0057 [0.0017]  
a/R\* = 1.68 [1.89]  
b = 0.79 [0.83]  
Seff = 10334.28 [4799.07]  
Teq = 2571 [298] K  
Rp = 0.98 [0.46] Re  
a = 0.0244 [0.0073] AU  
Ag = 17.25 [12.45] [1.31 $\sigma$ ]  
Teffp = 8101 [1243] K [4.33 $\sigma$ ]

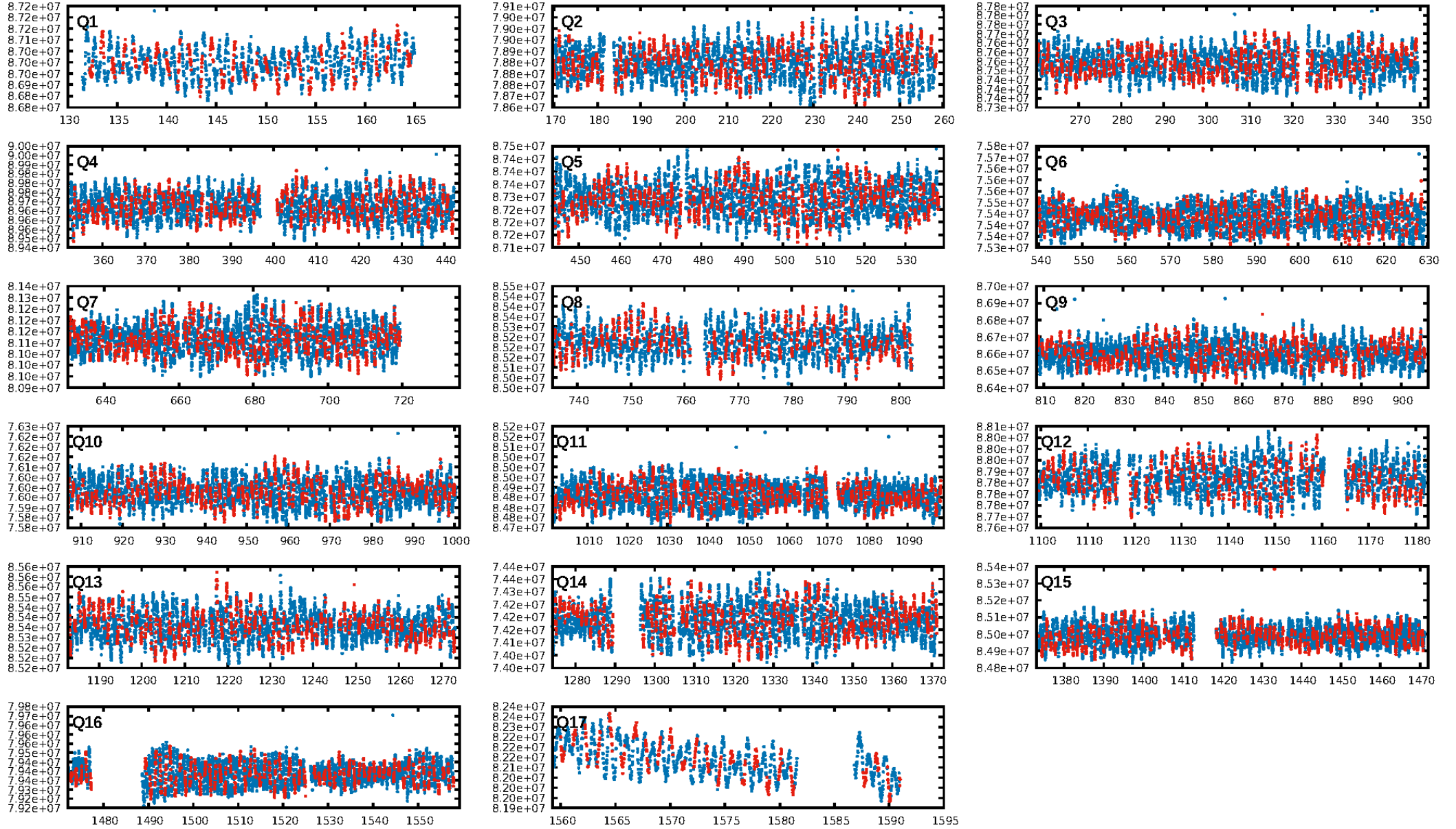
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: 100.0% [106.55 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1163/1164]  
GhostDiagnostic-chr: 20.54  
Centroid-sig: 0.1%  
Centroid-so: 1.340 arcsec [1.65 $\sigma$ ]  
OotOffset-rm: 0.483 arcsec [1.87 $\sigma$ ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-rm: 0.329 arcsec [1.30 $\sigma$ ]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.94 [15/16]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:03:32 Z

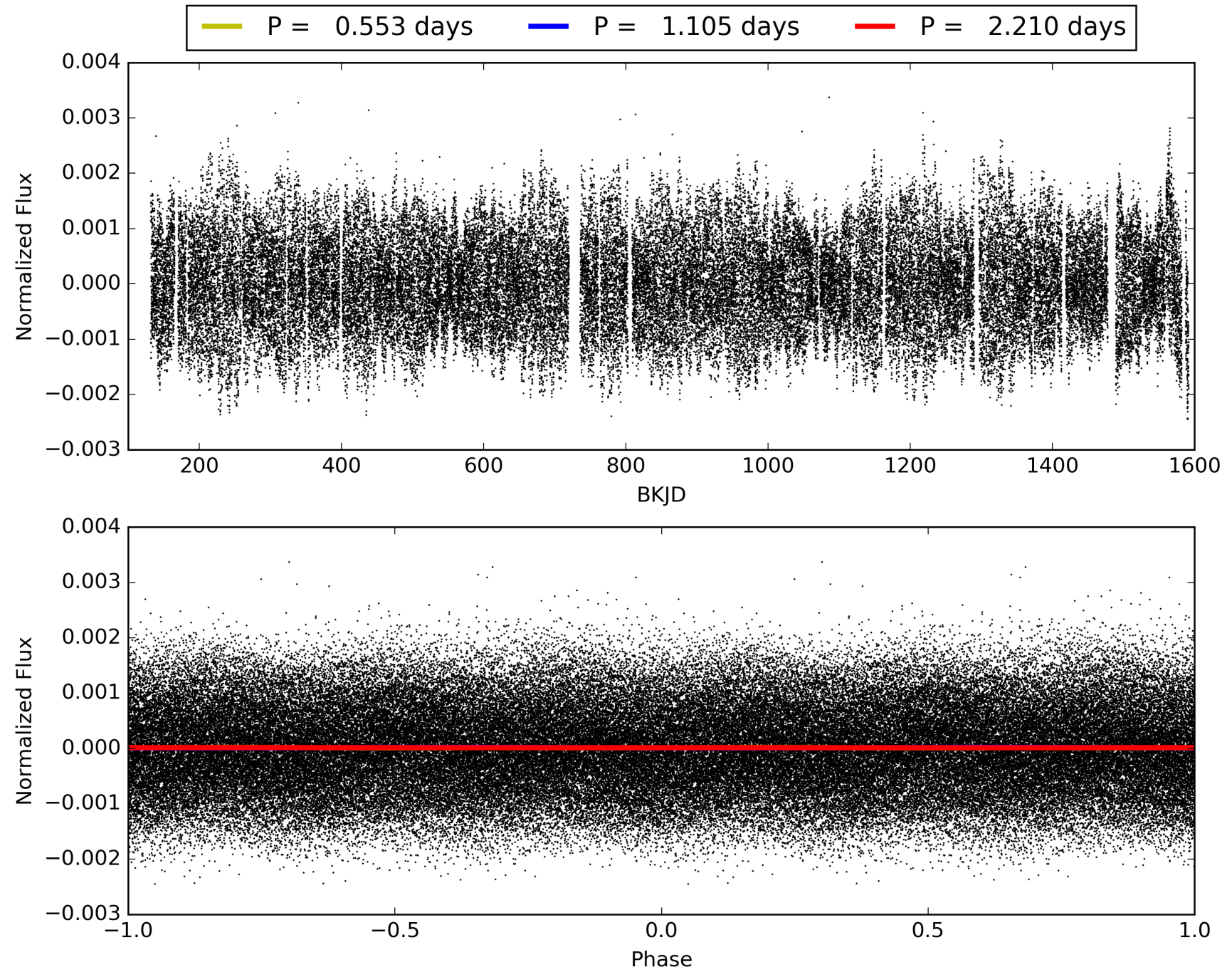
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009166826-01, PDC Light Curves





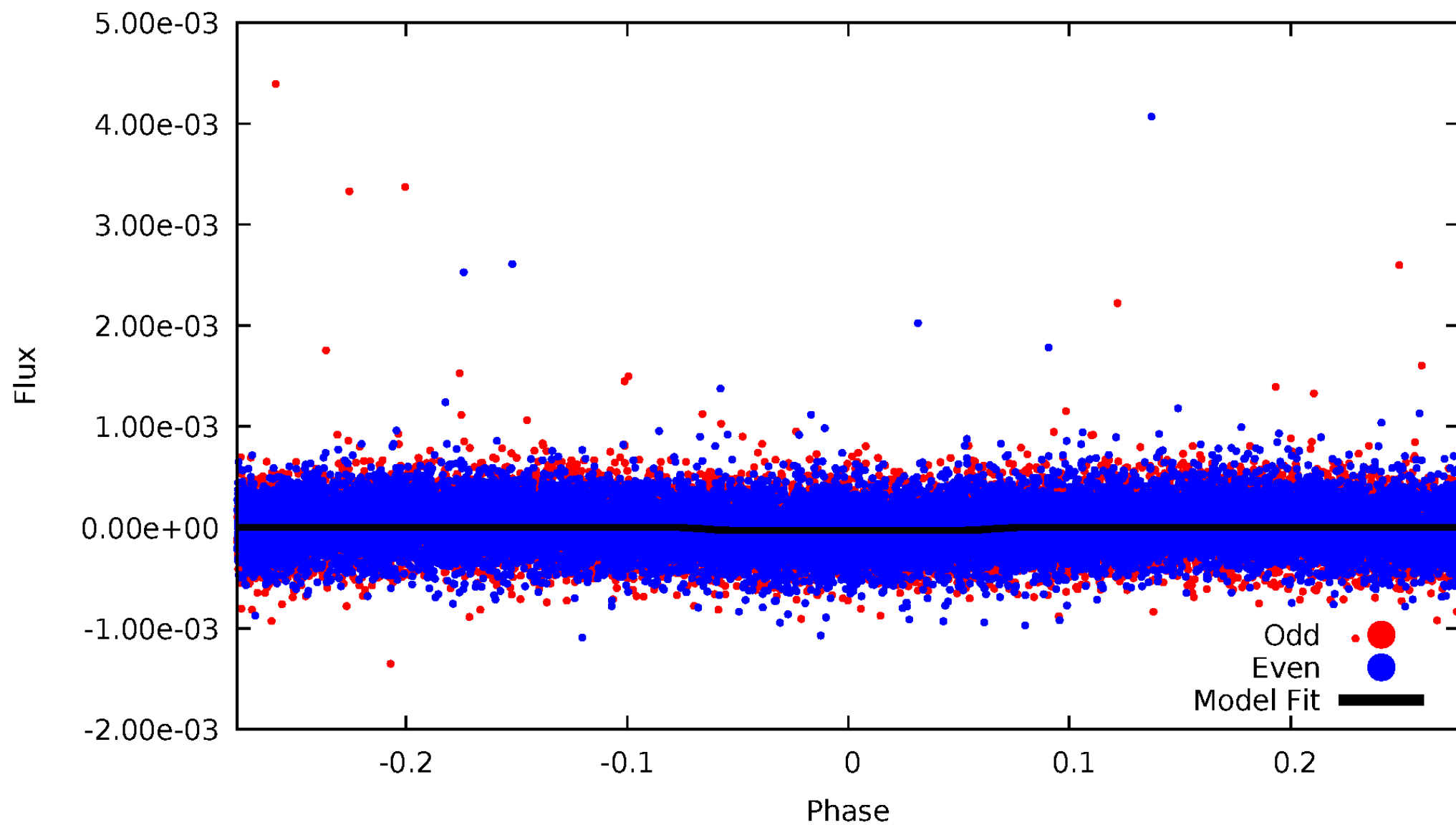
# TCE 009166826-01





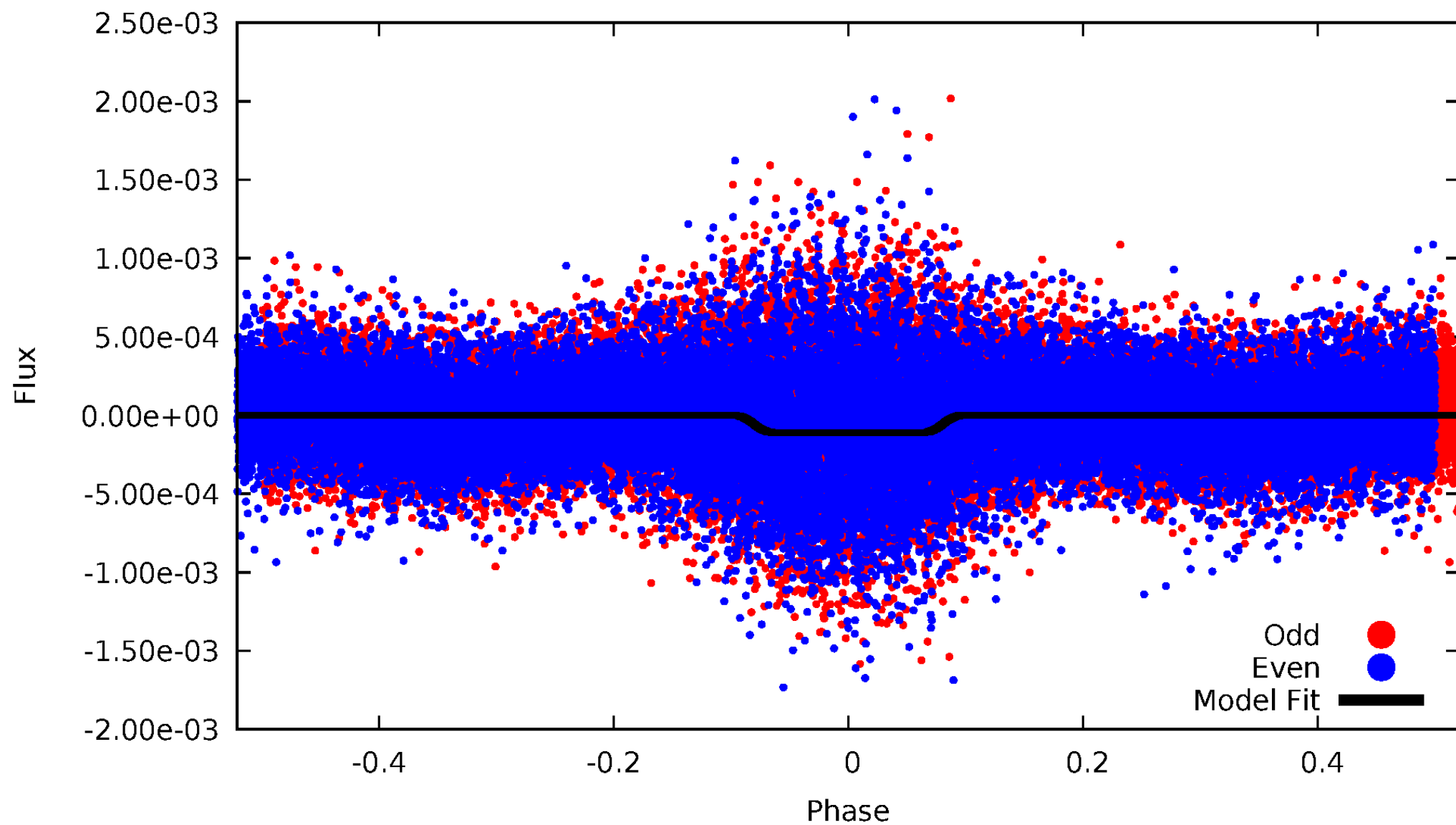
# DV Odd/Even

TCE 009166826-01



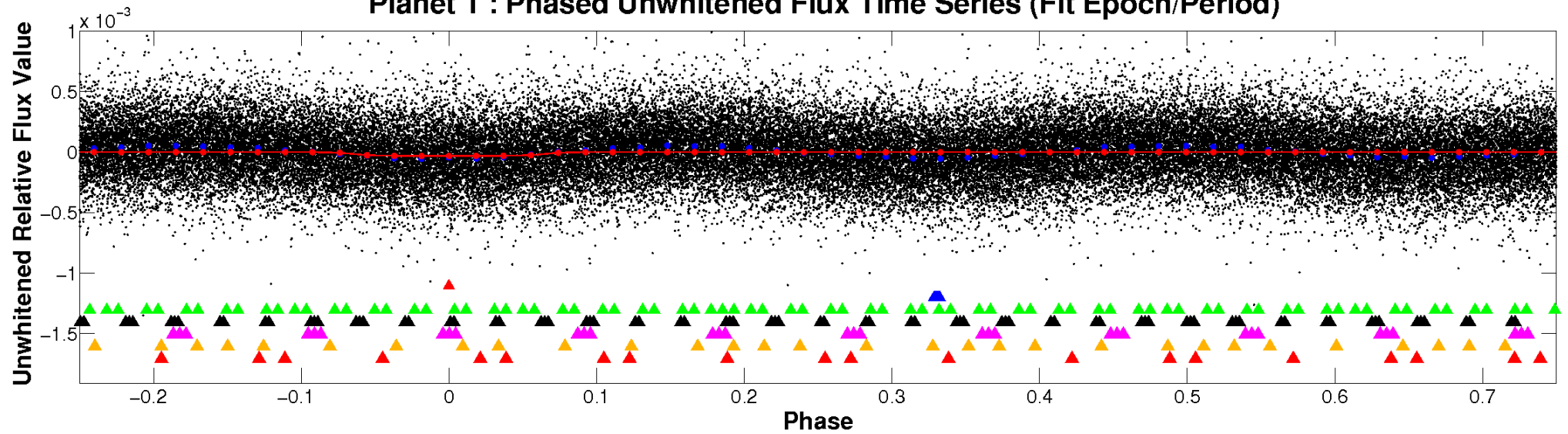
# ALT Odd/Even

TCE 009166826-01

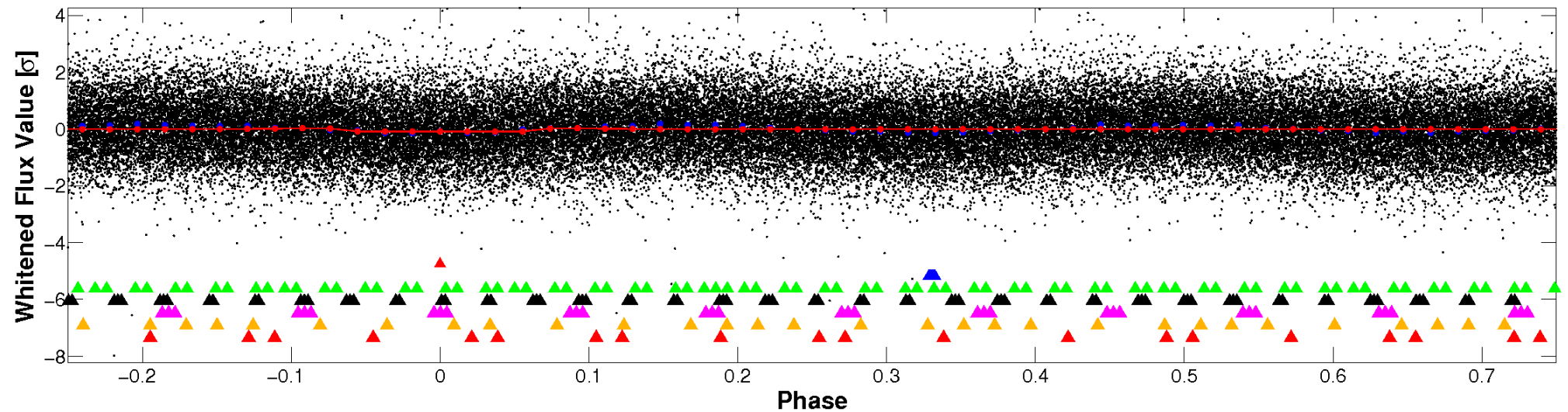


# Non-Whitened Vs. Whitened Light Curve

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



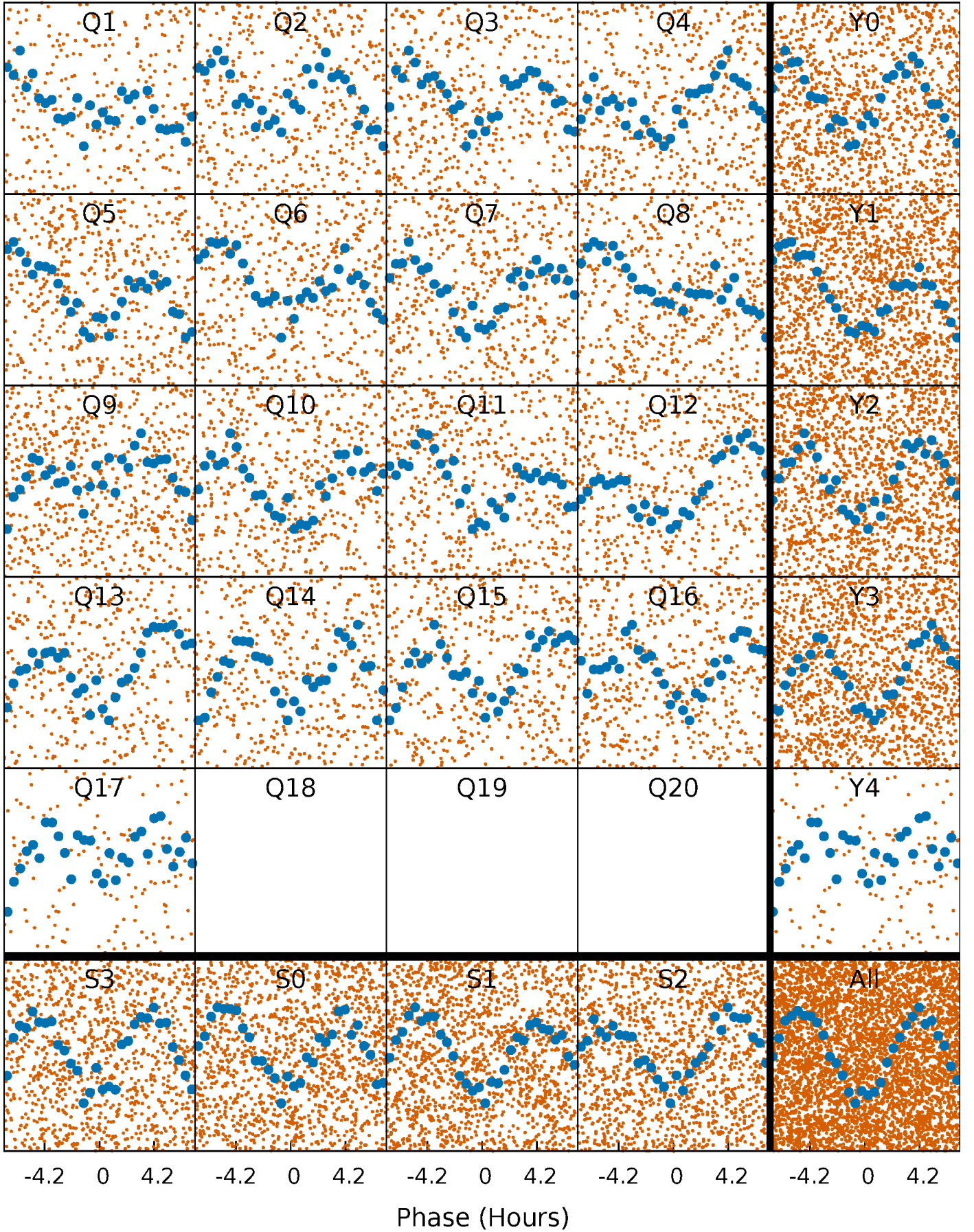
Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





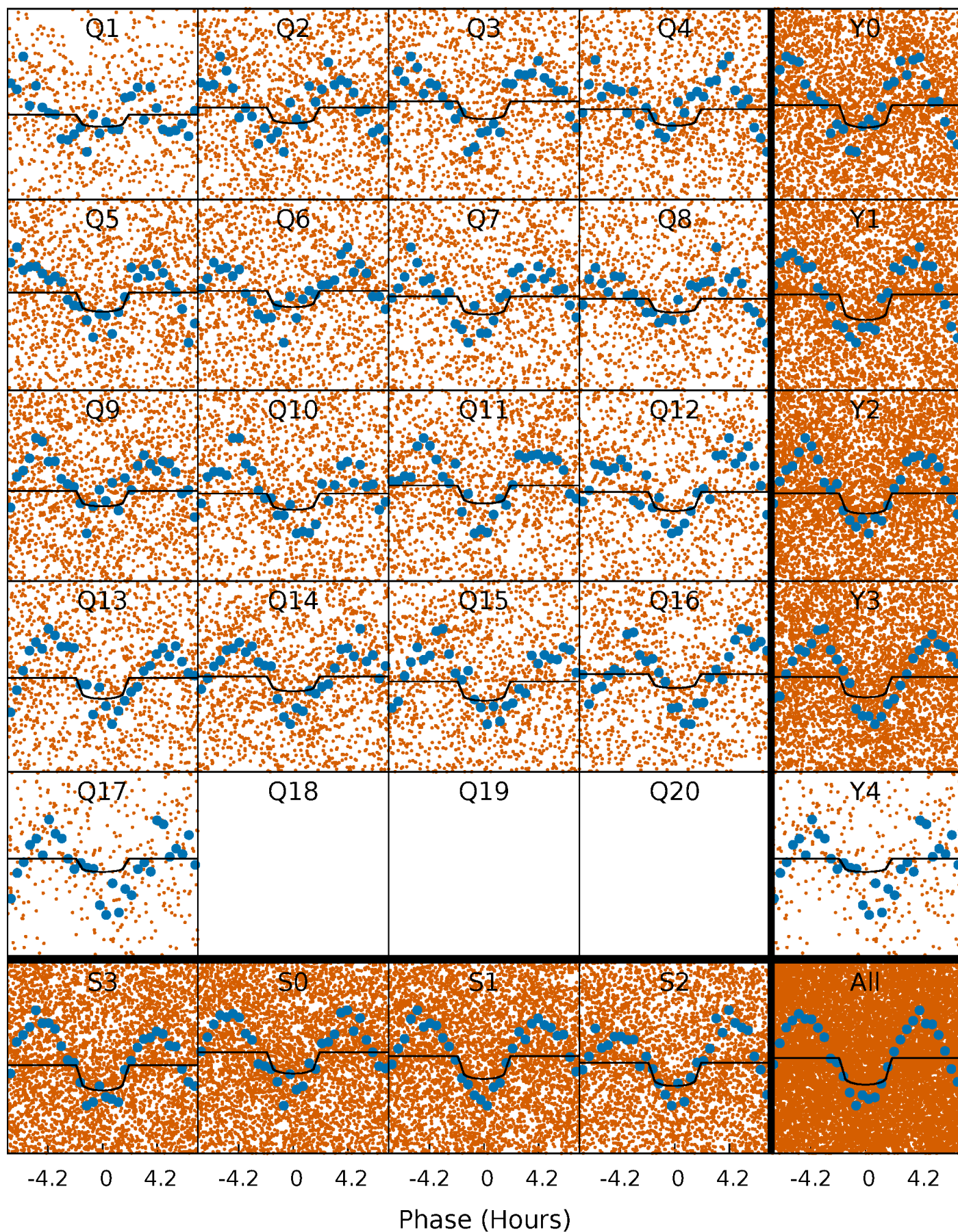
# PDC Quarter-Phased Transit Curves

TCE 009166826-01 P= 1.105096 Days  $T_0=132.364571$  (BKJD)



# DV Quarter-Phased Transit Curves

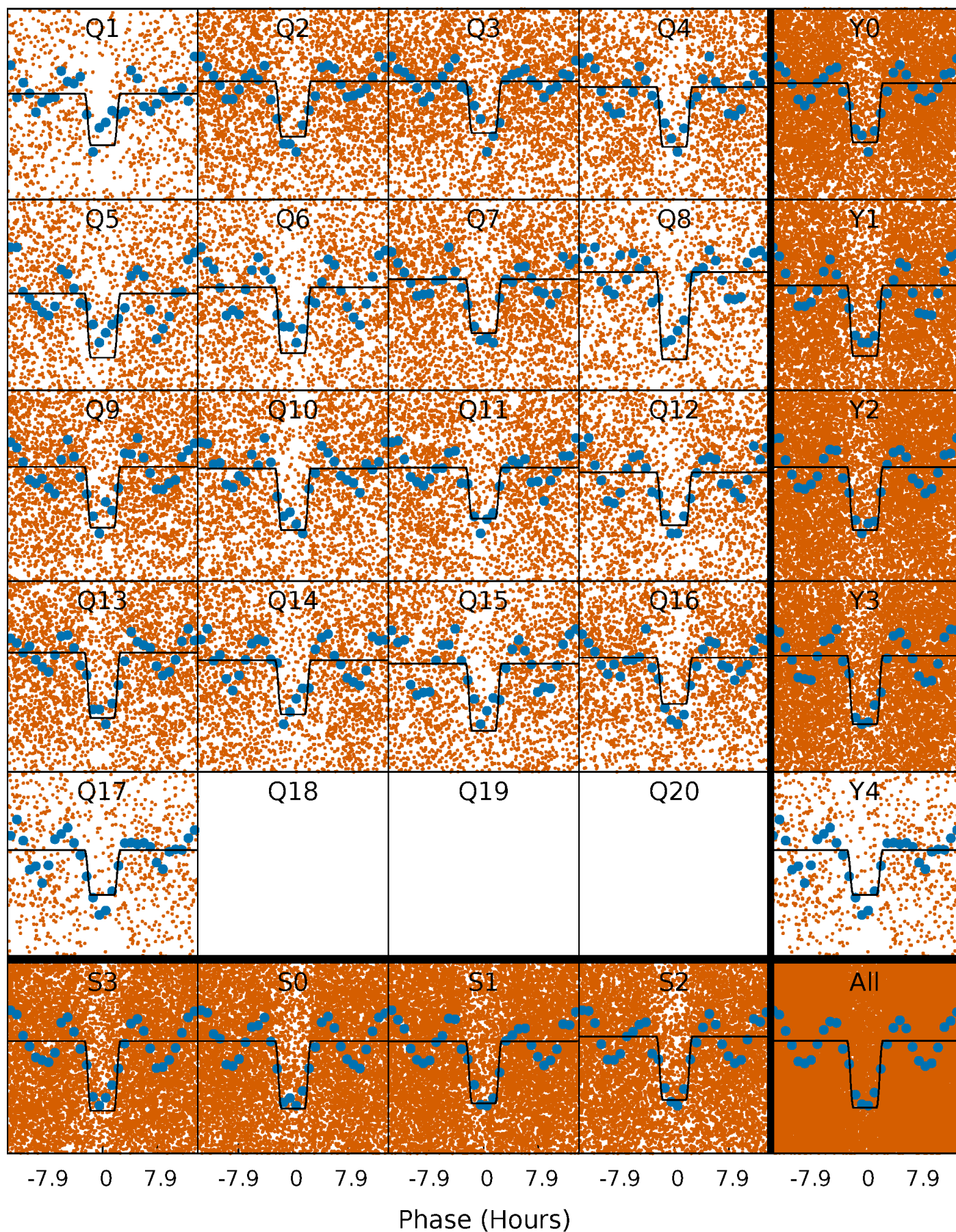
TCE 009166826-01 P= 1.105096 Days  $T_0=132.364571$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 009166826-01 P= 1.105179 Days  $T_0=132.297736$  (BKJD)

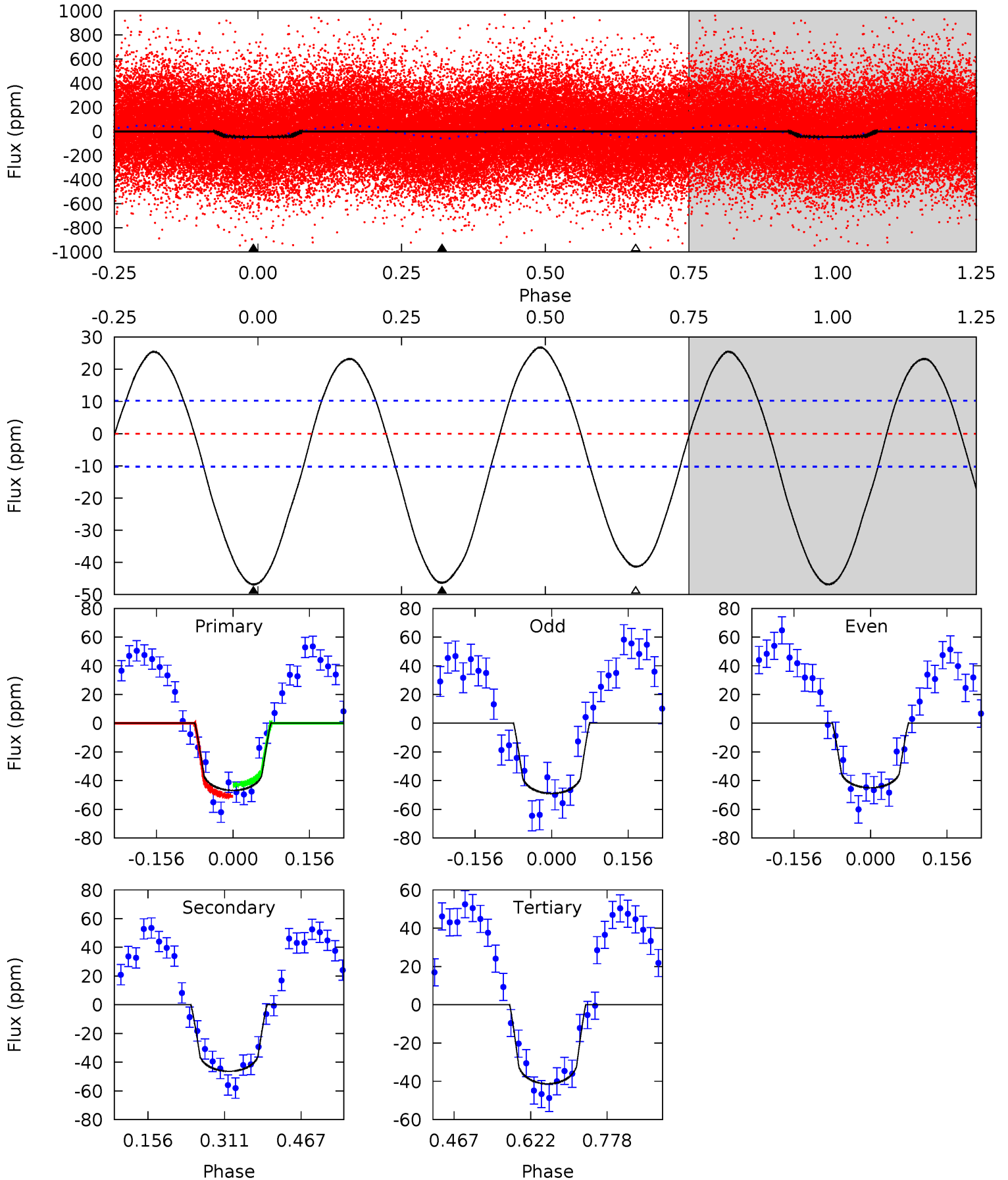




# DV Model-Shift Uniqueness Test

009166826-01, P = 1.105096 Days, E = 131.259475 Days

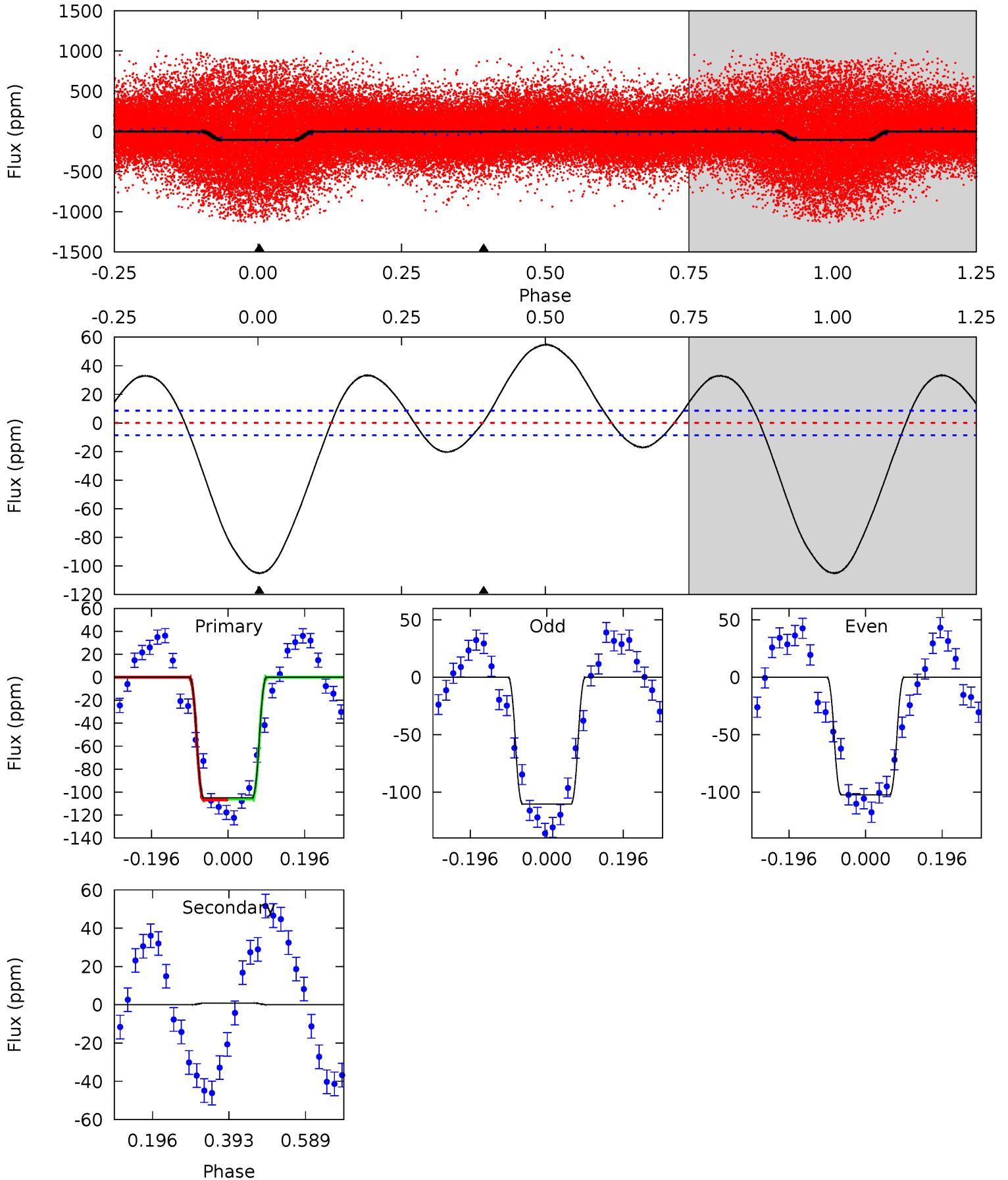
| Pri  | Sec  | Ter  | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 20.5 | 20.2 | 18.0 | 0   | 4.47            | 1.42            | 10.7             | 2.42    | 20.5    | 2.20    | 20.2    | 0.87    | 0.89 | 0.36  | 1.71 |



# Alt Model-Shift Uniqueness Test

009166826-01, P = 1.105179 Days, E = 131.192557 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 |
|------|-------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 54.2 | -0.44 | 0   | 0   | 4.42            | 1.29            | 8.53             | 54.2    | 54.2    | -0.44   | -0.44   | 2.08    | 0.85 | 0.34  | 0   |



### Stellar Parameters For KIC 009166826

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M$ ( $M_{\odot}$ )       | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $7261^{+228}_{-343}$ | $4.245^{+0.060}_{-0.225}$ | $0.210^{+0.150}_{-0.400}$ | $1.570^{+0.580}_{-0.193}$ | $1.591^{+0.211}_{-0.211}$ | $0.579^{+0.184}_{-0.323}$                     |
|        | +3%/-5%              | +1%/-5%                   | +71%/-190%                | +37%/-12%                 | +13%/-13%                 | +32%/-56%                                     |
| 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 009166826-01 / KOI

| Detrend | Depth (ppm) | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)        | $T_{obs}$ (K)          | $A_{obs}$                  |
|---------|-------------|------------------------|----------------------|------------------------|----------------------------|
| DV      | $-46 \pm 2$ | $1.04^{+0.34}_{-0.31}$ | $3656^{+311}_{-216}$ | $7907^{+2140}_{-1082}$ | $14^{+13}_{-6}$            |
| Alt.    | $1 \pm 2$   | $1.90^{+0.42}_{-0.37}$ | $3676^{+305}_{-235}$ | $-3619^{+370}_{-302}$  | $-0.069^{+0.168}_{-0.209}$ |

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



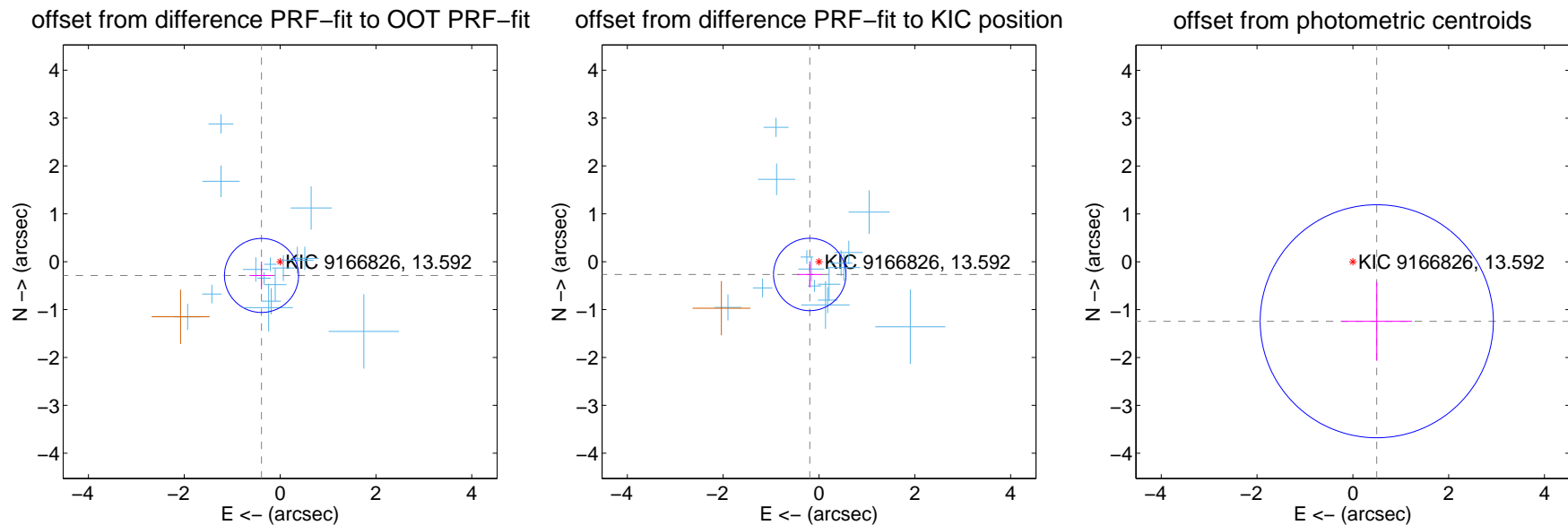
## DV Centroid Data

Supplemental centroid analysis for 009166826-01. Kepler magnitude: 13.59. Transit SNR 8.38

There are 15 quarters with good PRF difference image offsets

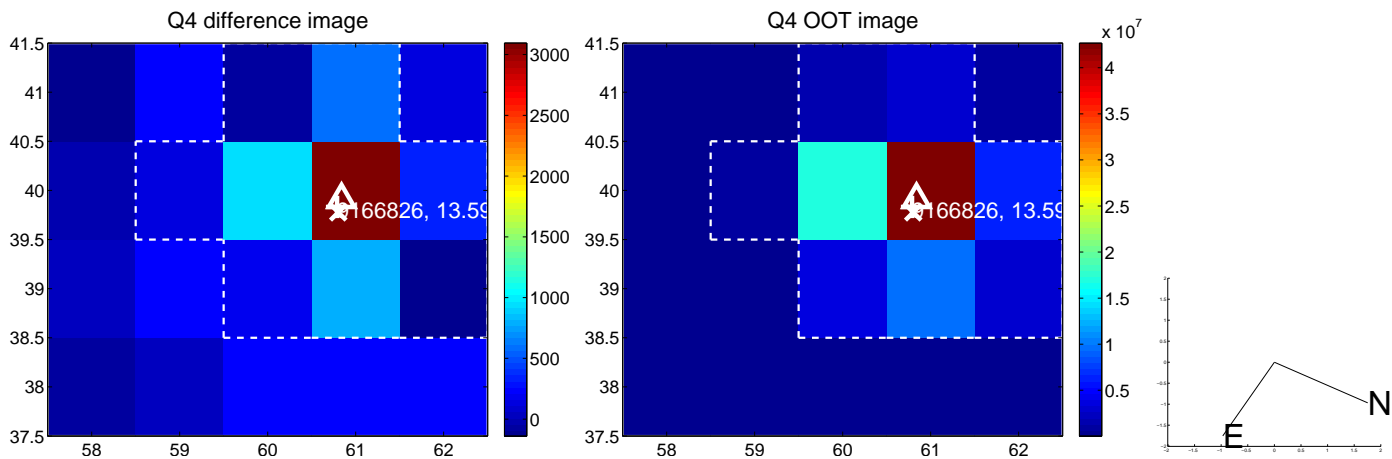
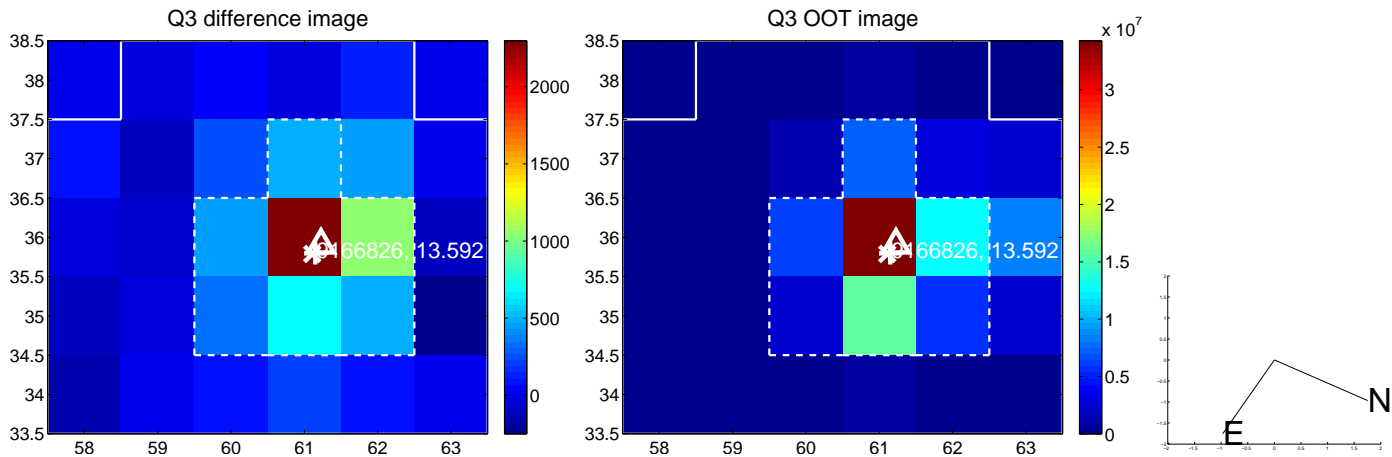
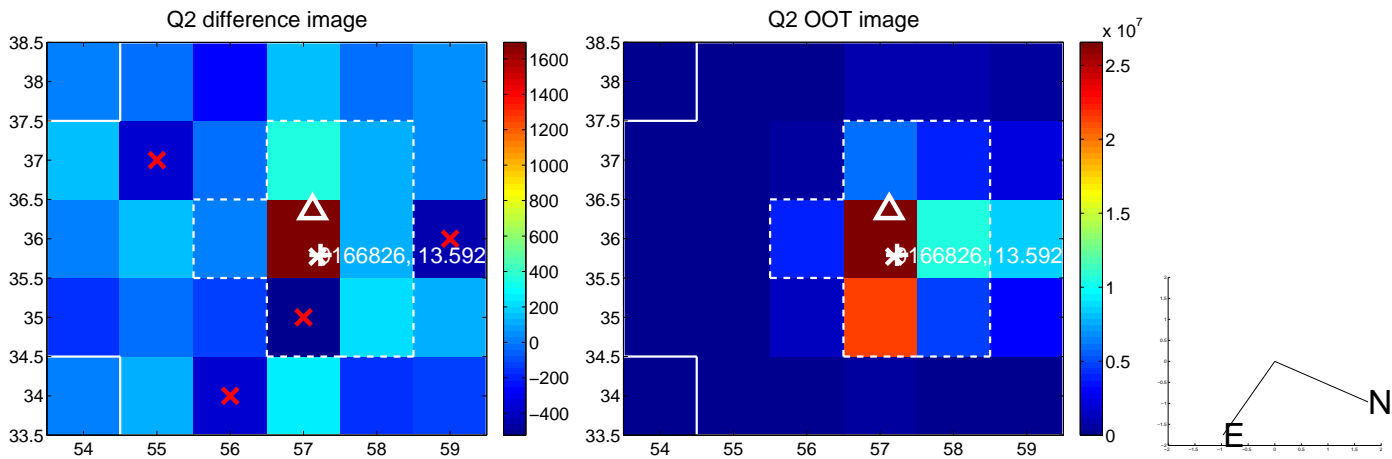
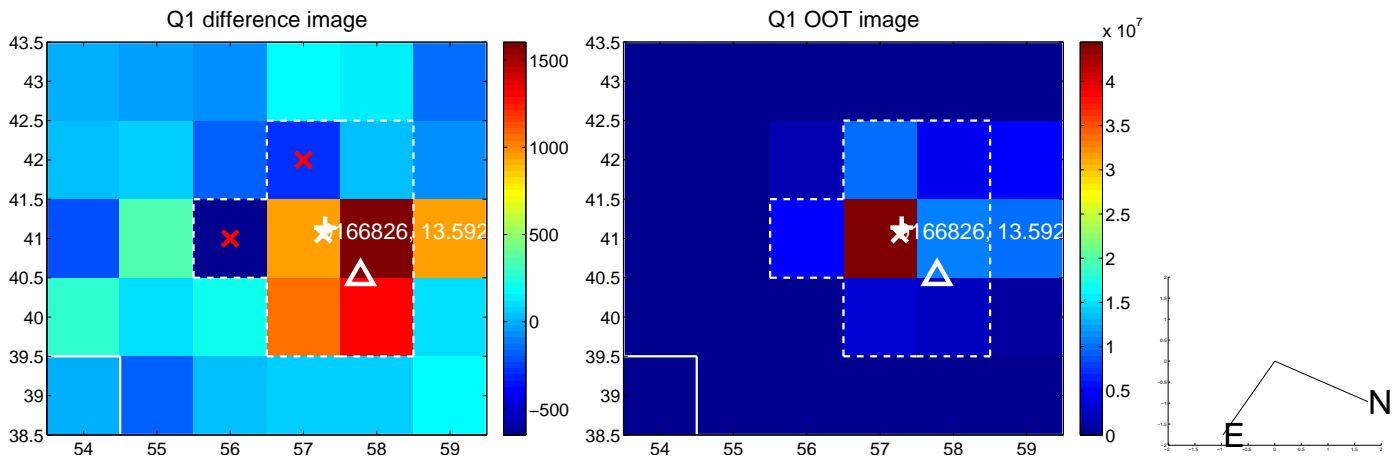
The direct PRF centroid is offset from the target star catalog position by about 0.35 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.483 \pm 0.258$  | 1.87                | $0.388 \pm 0.251$ | $-0.287 \pm 0.290$ |
| PRF-fit source offset from KIC position | $0.329 \pm 0.252$  | 1.30                | $0.193 \pm 0.258$ | $-0.266 \pm 0.272$ |
| photometric centroid source offset      | $1.34 \pm 0.81$    | 1.65                | $-0.50 \pm 0.74$  | $-1.24 \pm 0.82$   |

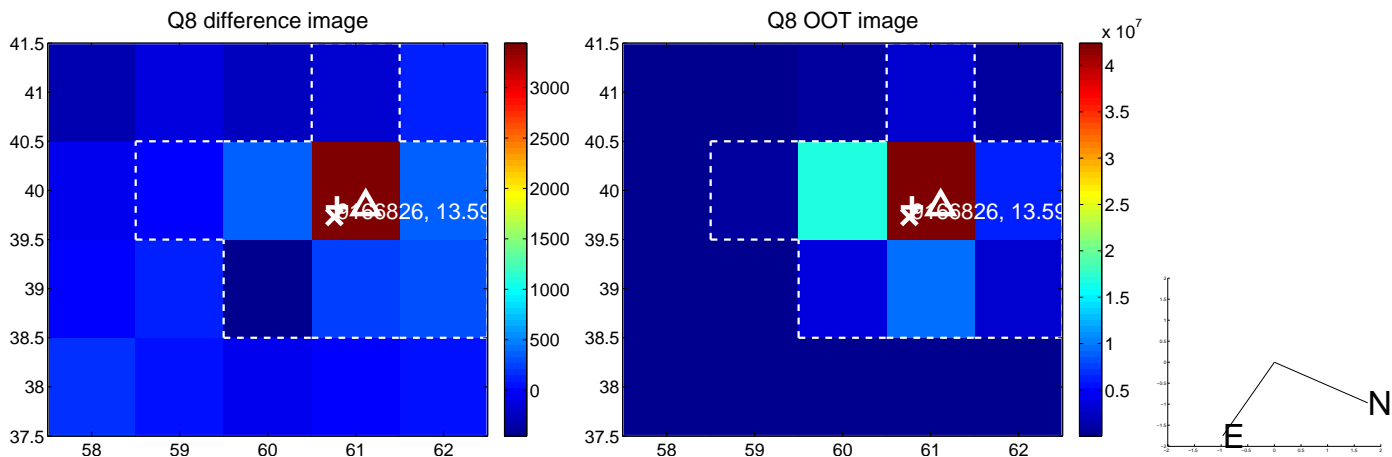
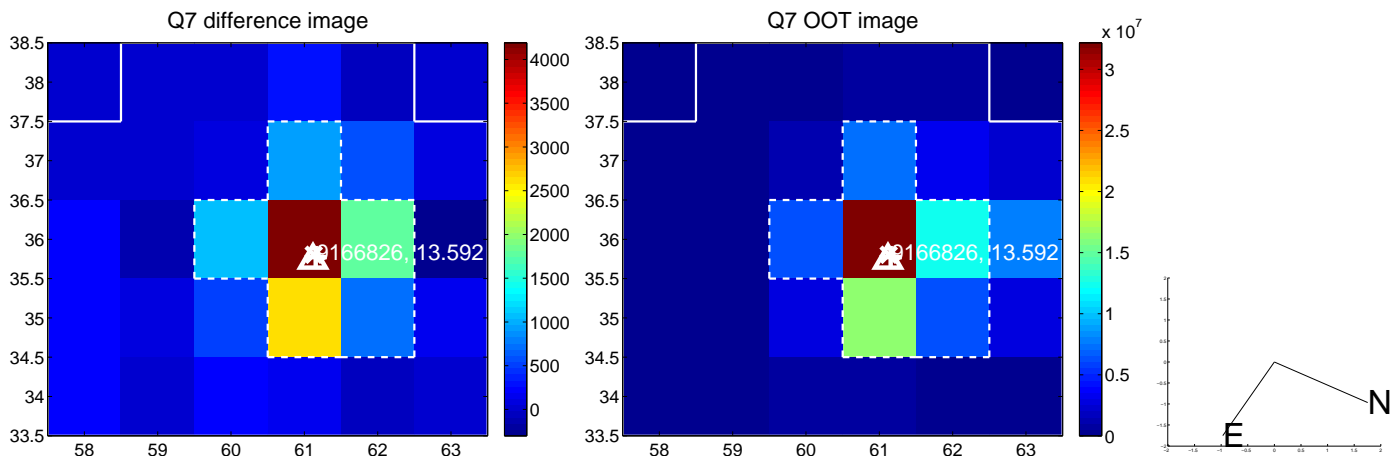
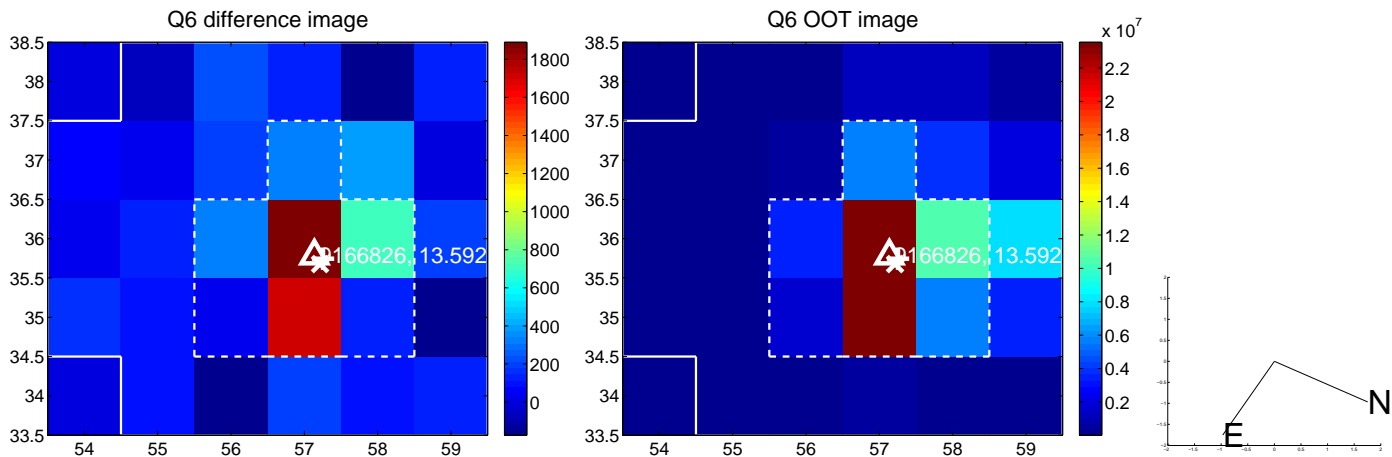
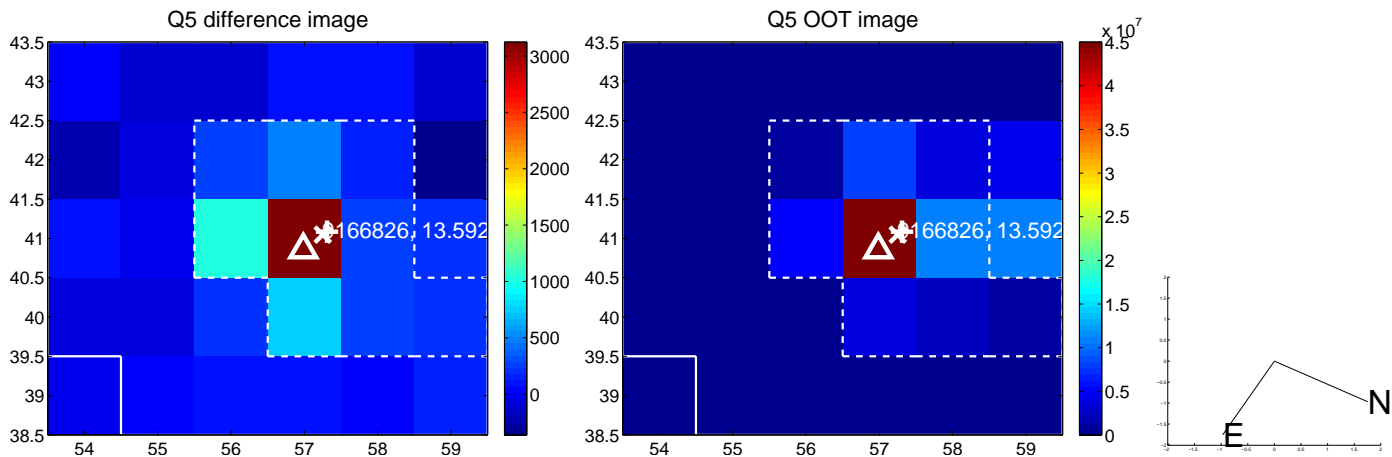


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

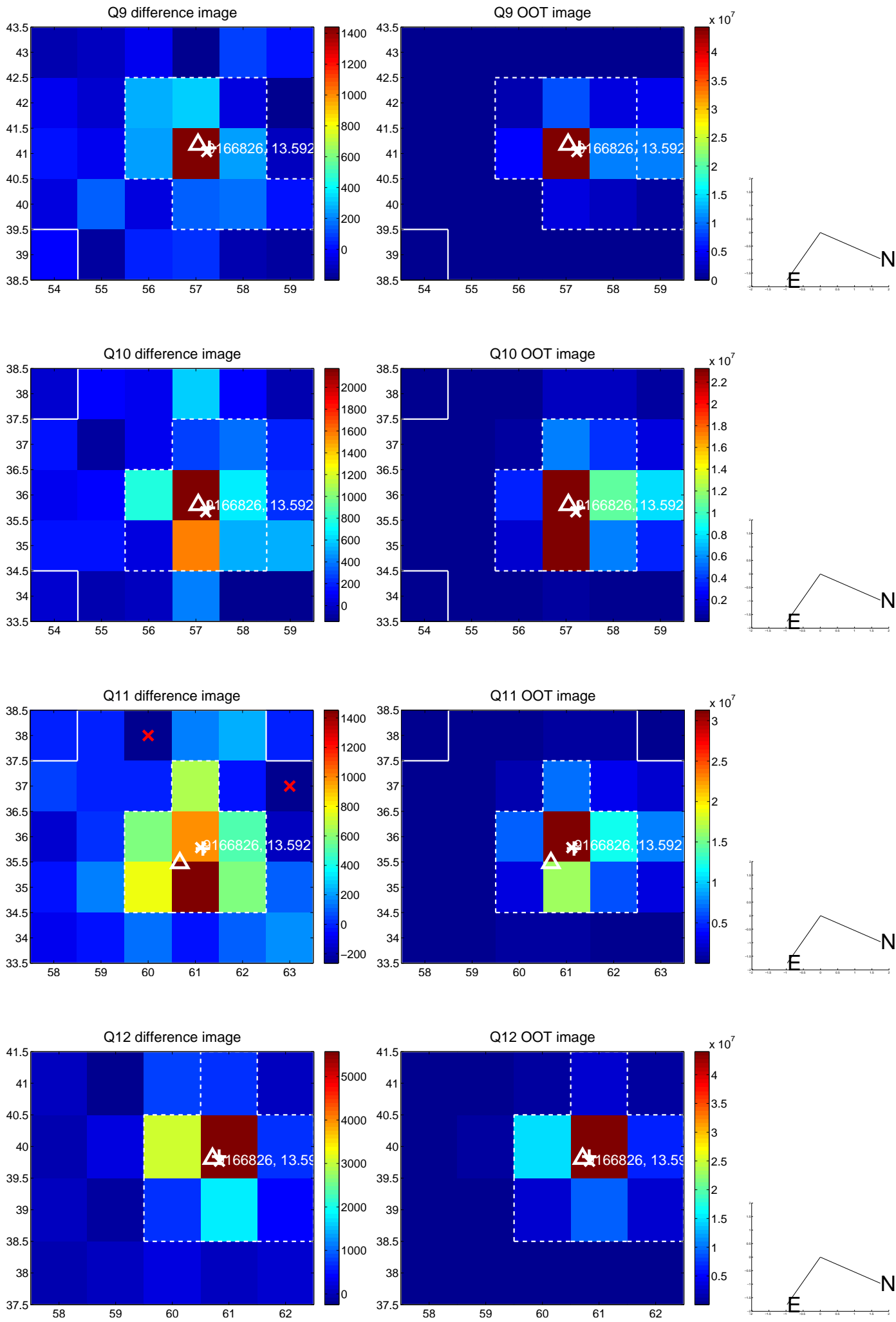


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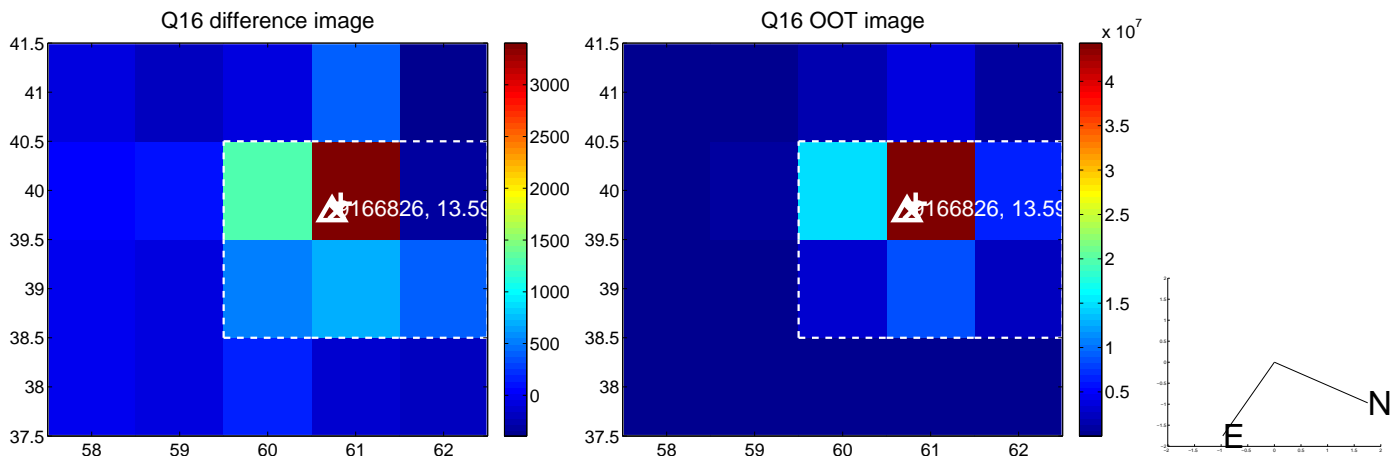
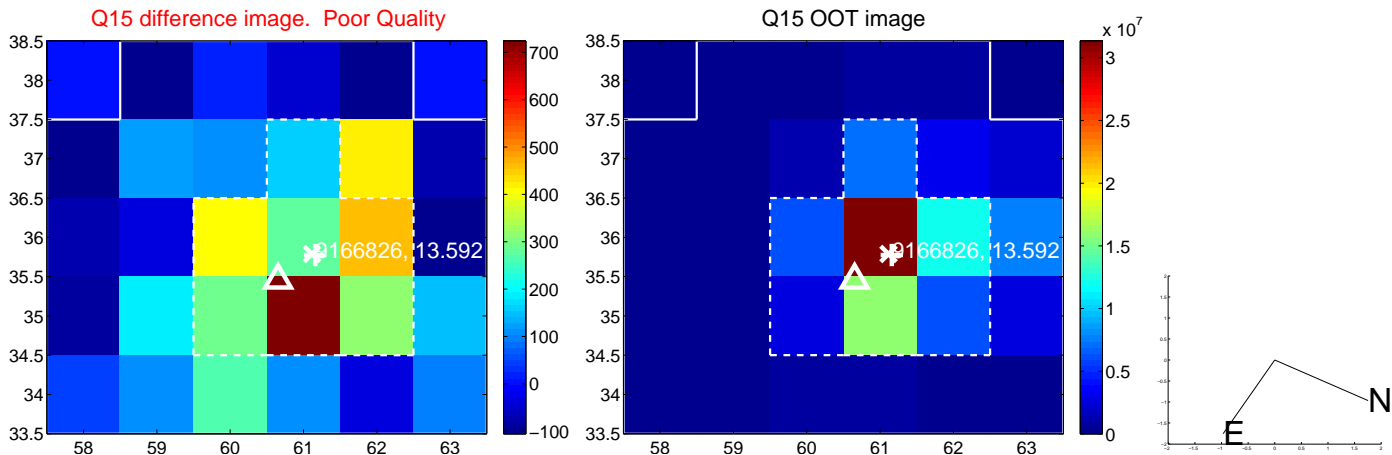
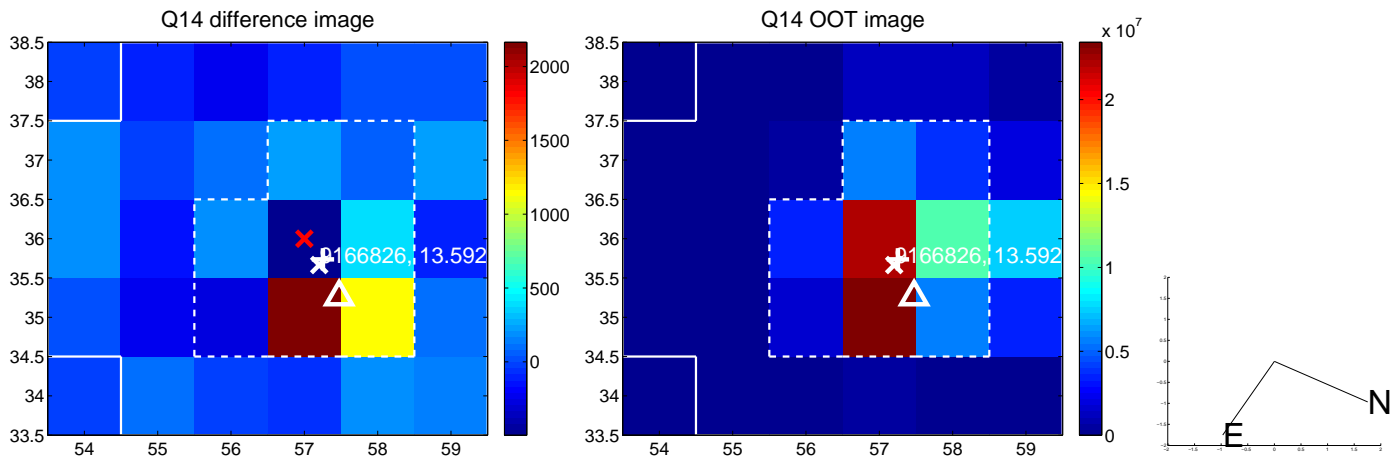
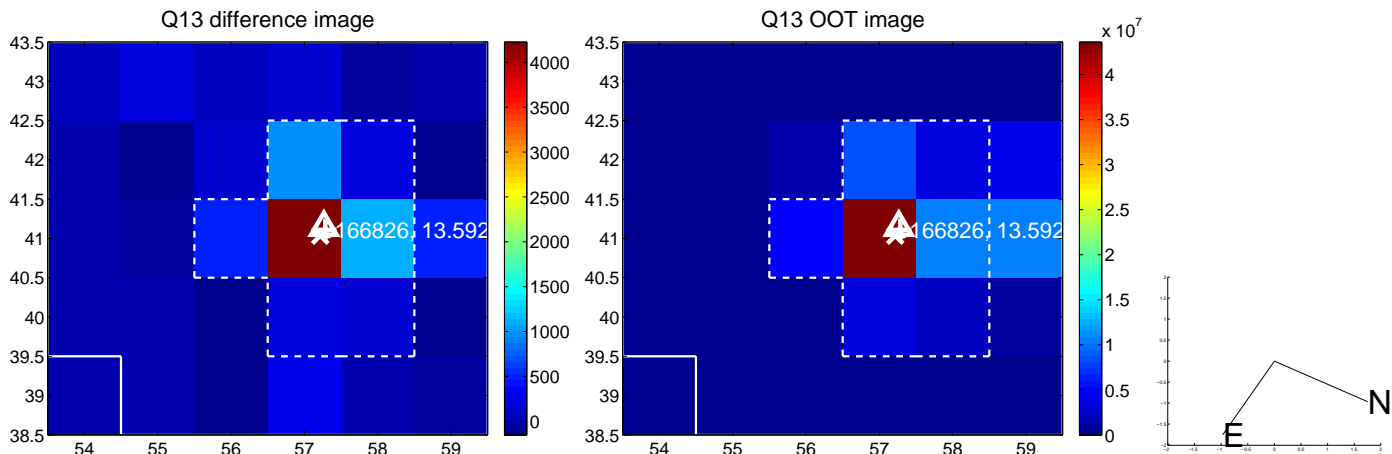




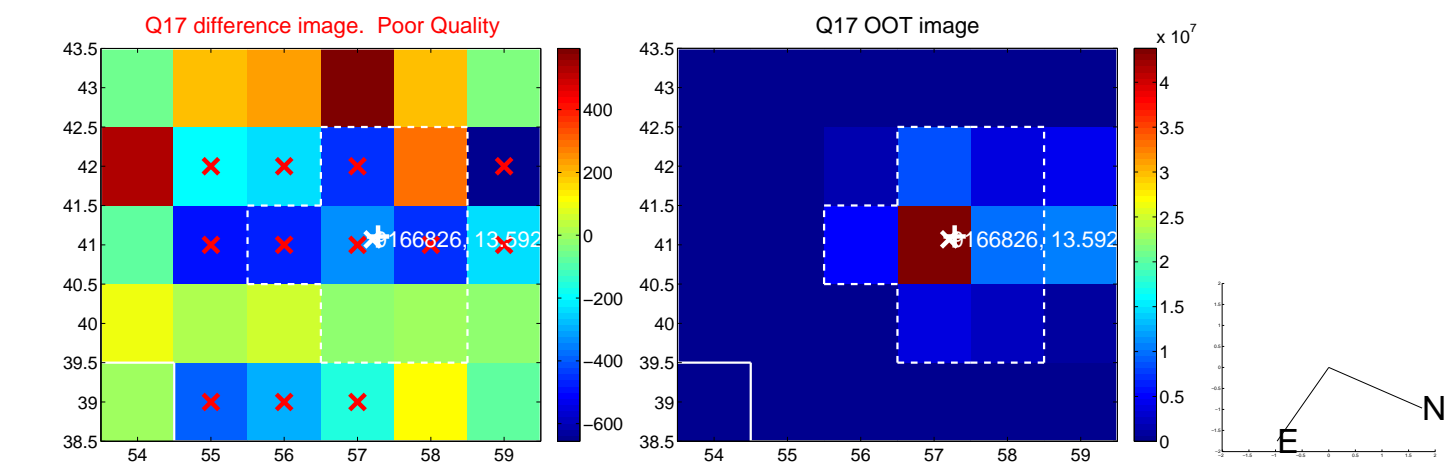
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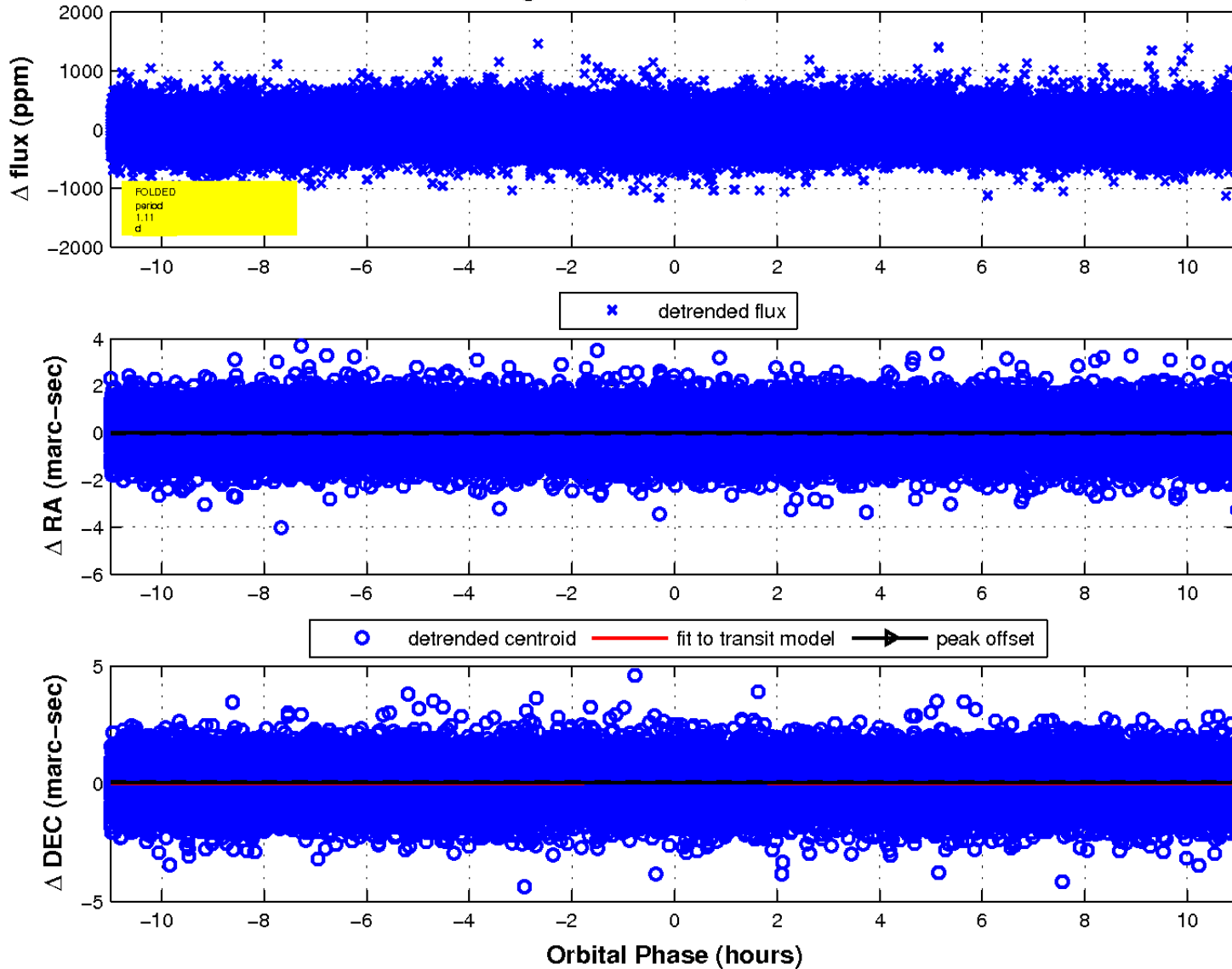
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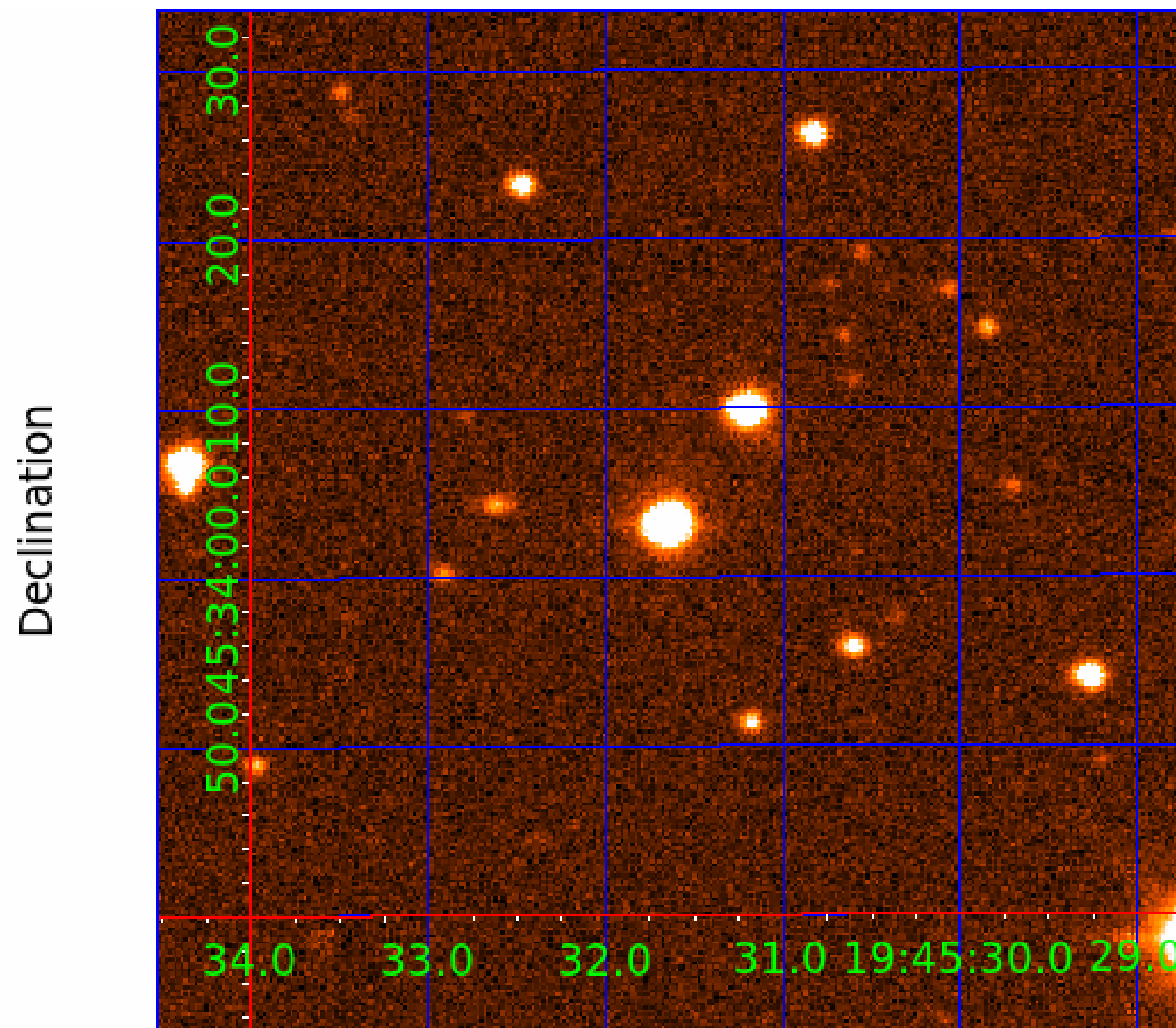
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fluxWeightedCentroids, Planet 1 of 7



UKIRT Image



# KIC 009166826

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
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## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 009166826-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009166826-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—SAME_NTL_PERIOD  |
| 009166826-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT      |
| 009166826-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD |
| 009166826-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS  |
| 009166826-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT   |
| 009166826-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS   |

**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.

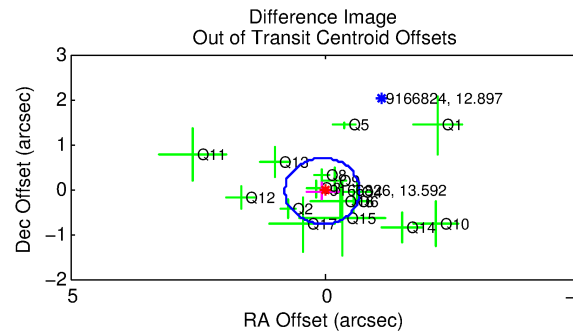
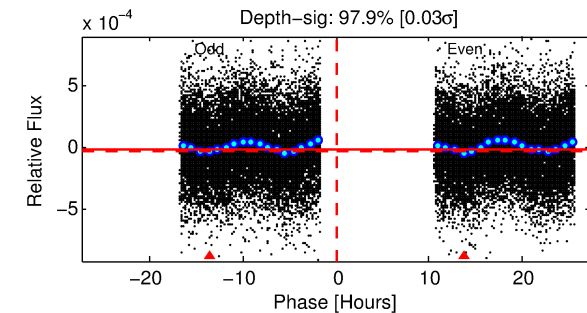
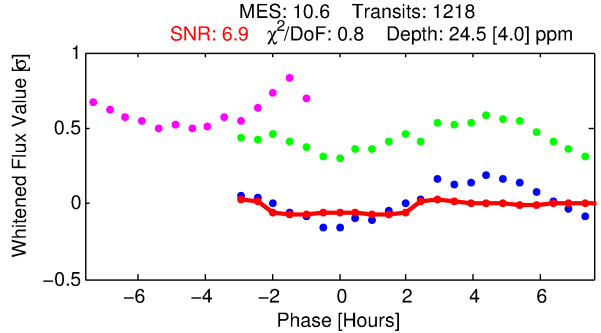
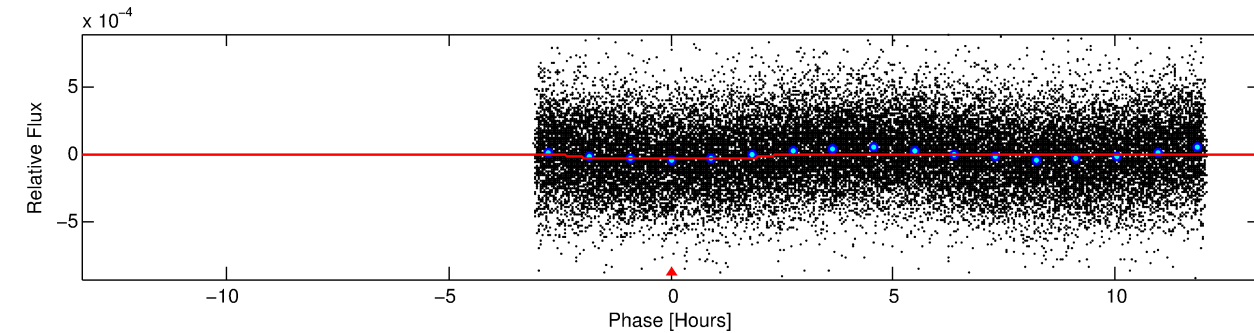
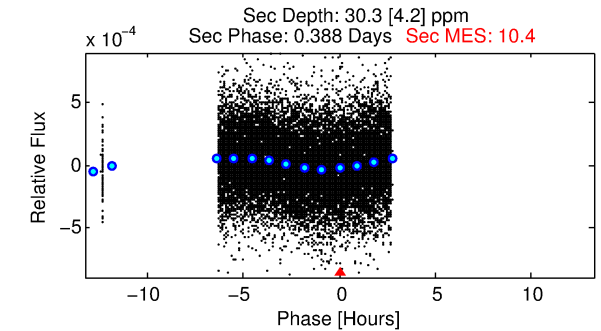
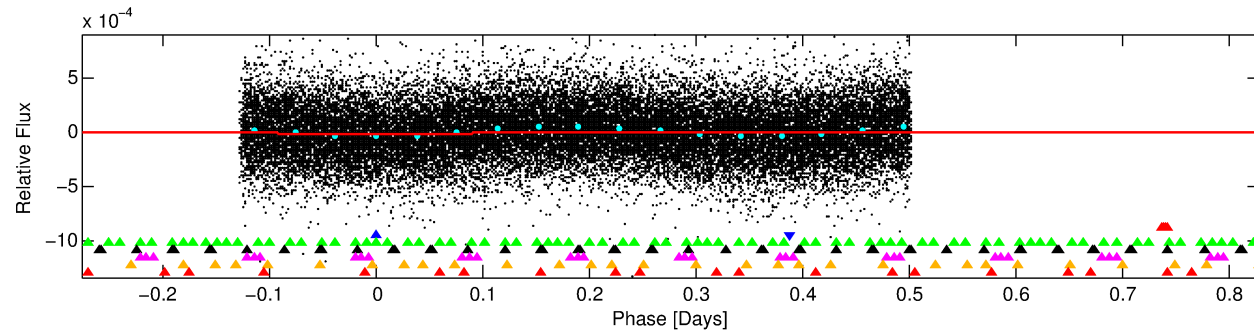
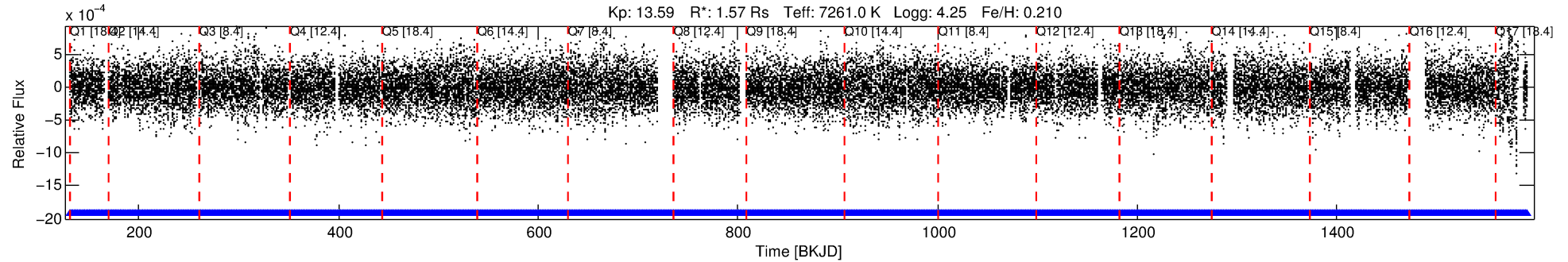
Ephemeris Match Information For 009166826-02

No Significant Match Found



# DV One-Page Summary

KIC: 9166826 Candidate: 2 of 7 Period: 1.105 d



## DV Fit Results:

Period = 1.10509 [0.00002] d  
Epoch = 131.6271 [0.0045] BKJD  
Rp/R\* = 0.0048 [0.0014]  
a/R\* = 1.59 [1.59]  
b = 0.68 [1.31]  
Seff = 10334.32 [4799.09]  
Teq = 2571 [298] K  
Rp = 0.83 [0.39] Re  
a = 0.0244 [0.0073] AU  
Ag = 14.40 [10.39] [1.29σ]  
**Teffp = 7743 [1188] K [4.22σ]**

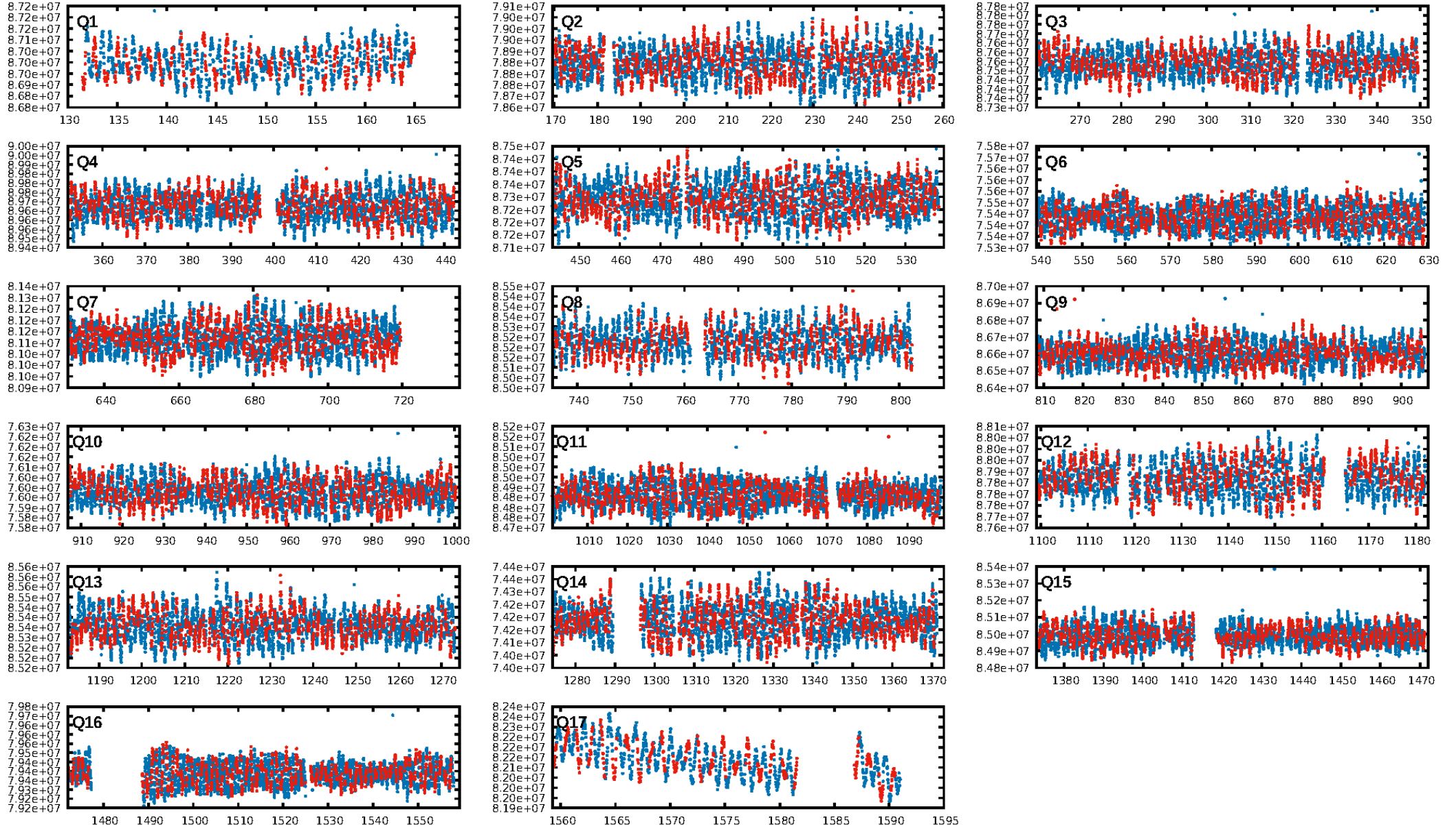
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
**LongPeriod-sig: 0.0% [0.00σ]**  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1162/1162]  
GhostDiagnostic-chr: 3.557  
**Centroid-sig: 0.1%**  
Centroid-so: 1.482 arcsec [1.50σ]  
OotOffset-rm: 0.064 arcsec [0.26σ]  
OotOffset-st: 4/3/4/5 [16]  
KicOffset-rm: 0.238 arcsec [0.82σ]  
KicOffset-st: 4/3/4/5 [16]  
DiffImageQuality-fgm: 0.81 [13/16]  
DiffImageOverlap-fno: 0.00 [0/17]

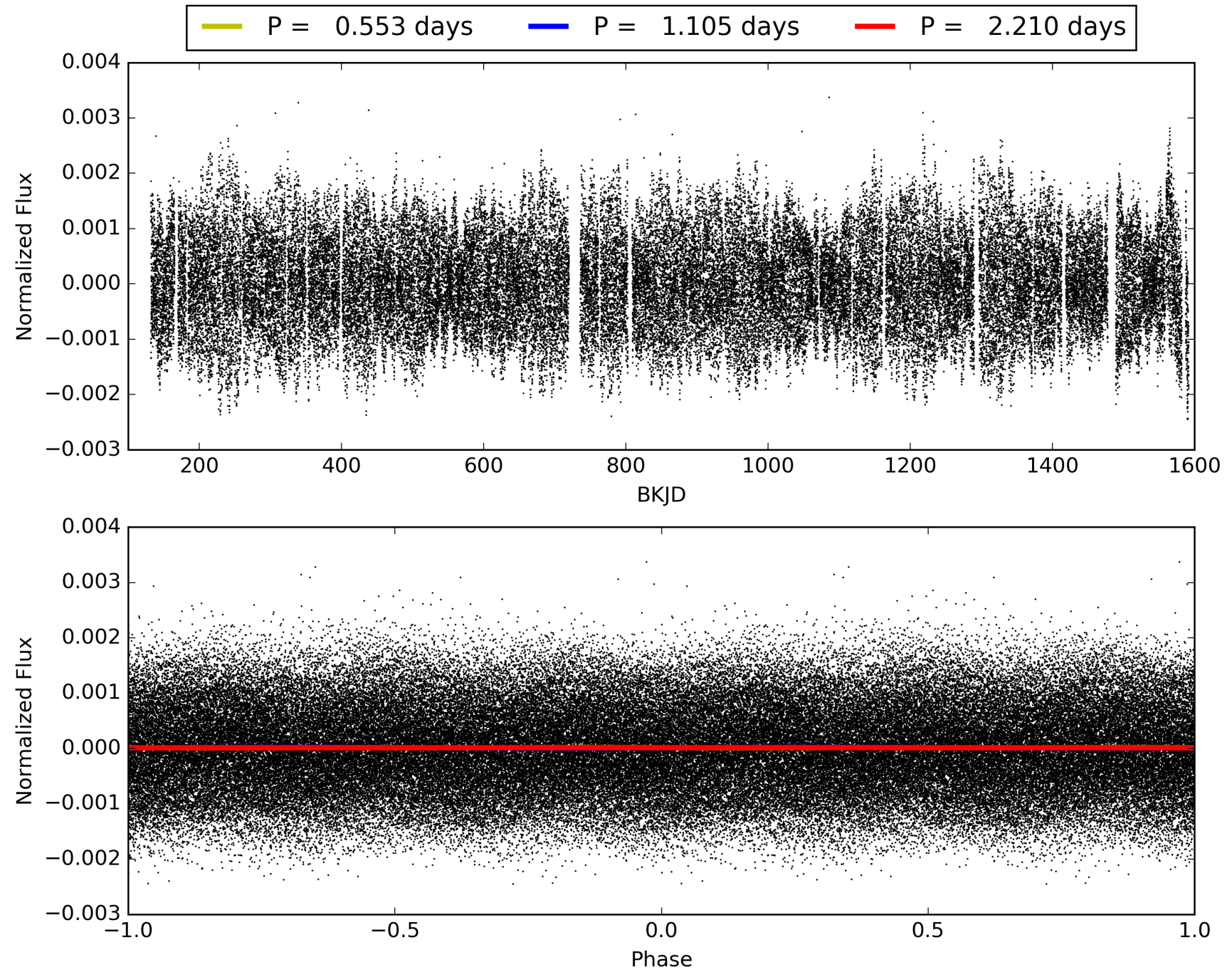
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:03:45 Z

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

# TCE 009166826-02, PDC Light Curves

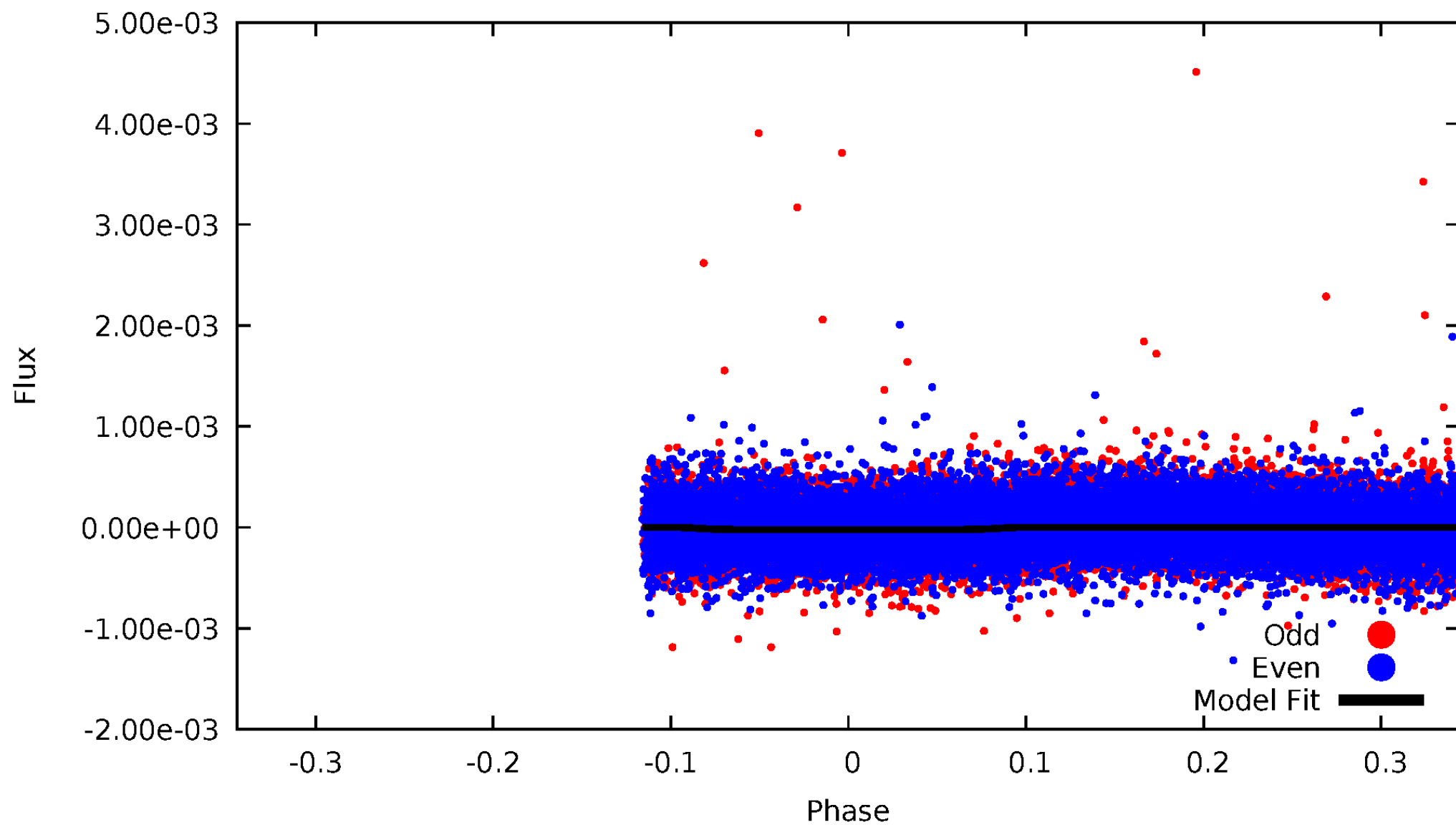


# TCE 009166826-02



# DV Odd/Even

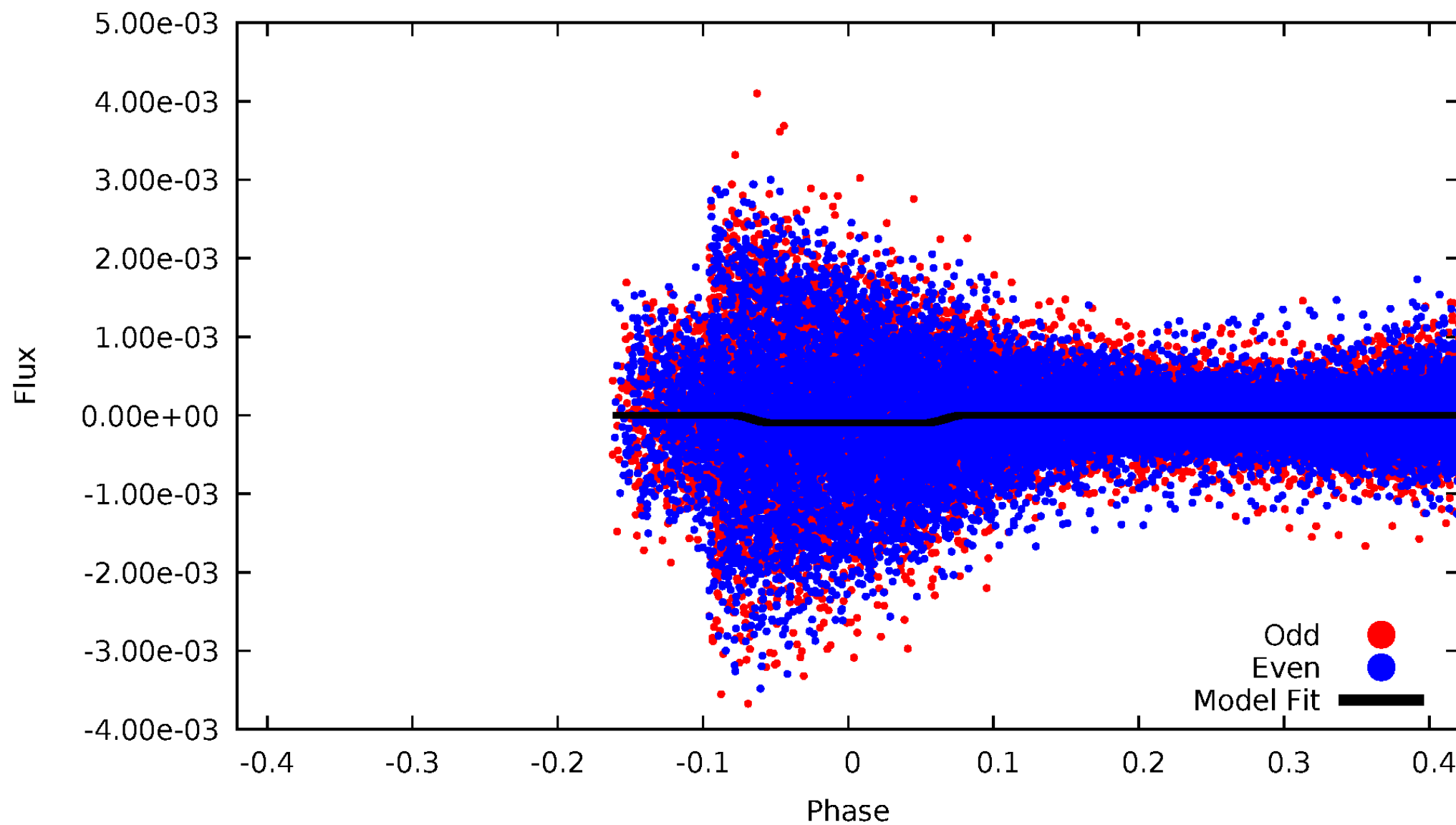
TCE 009166826-02





# ALT Odd/Even

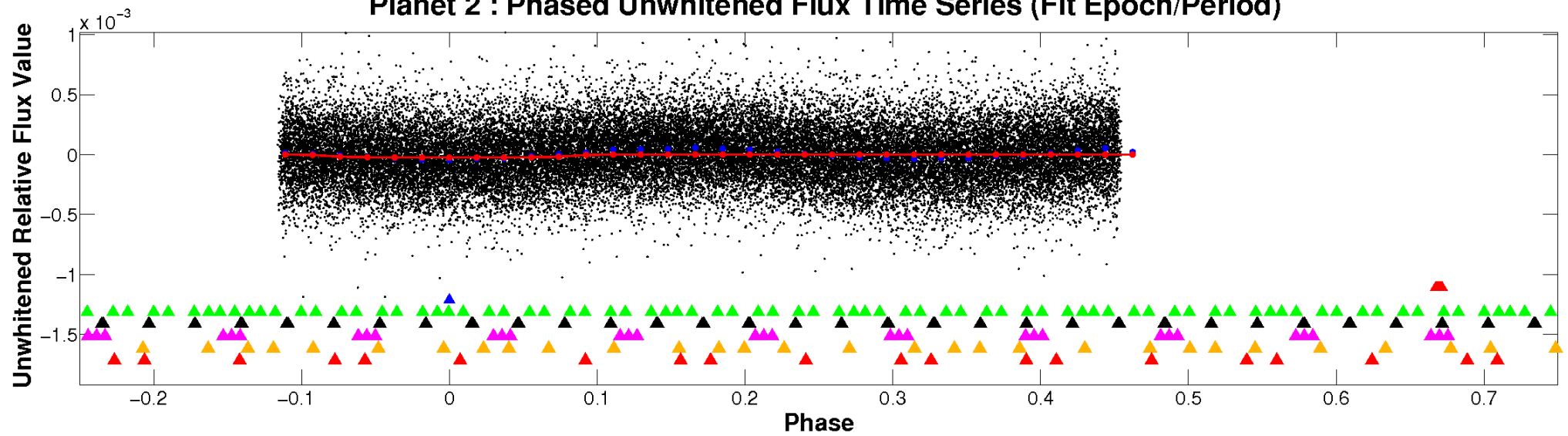
TCE 009166826-02



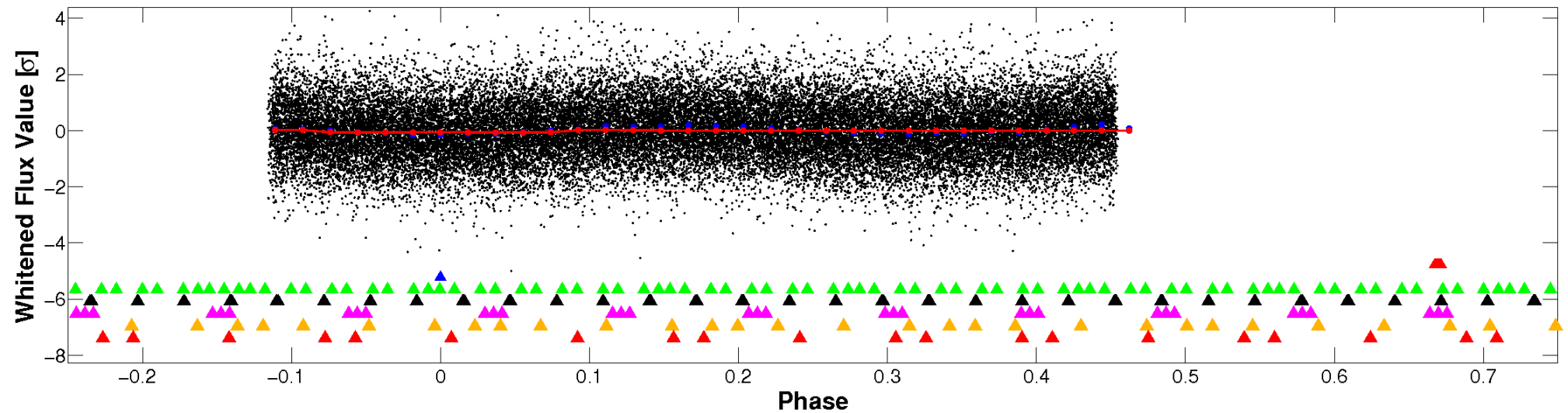


# Non-Whitened Vs. Whitened Light Curve

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

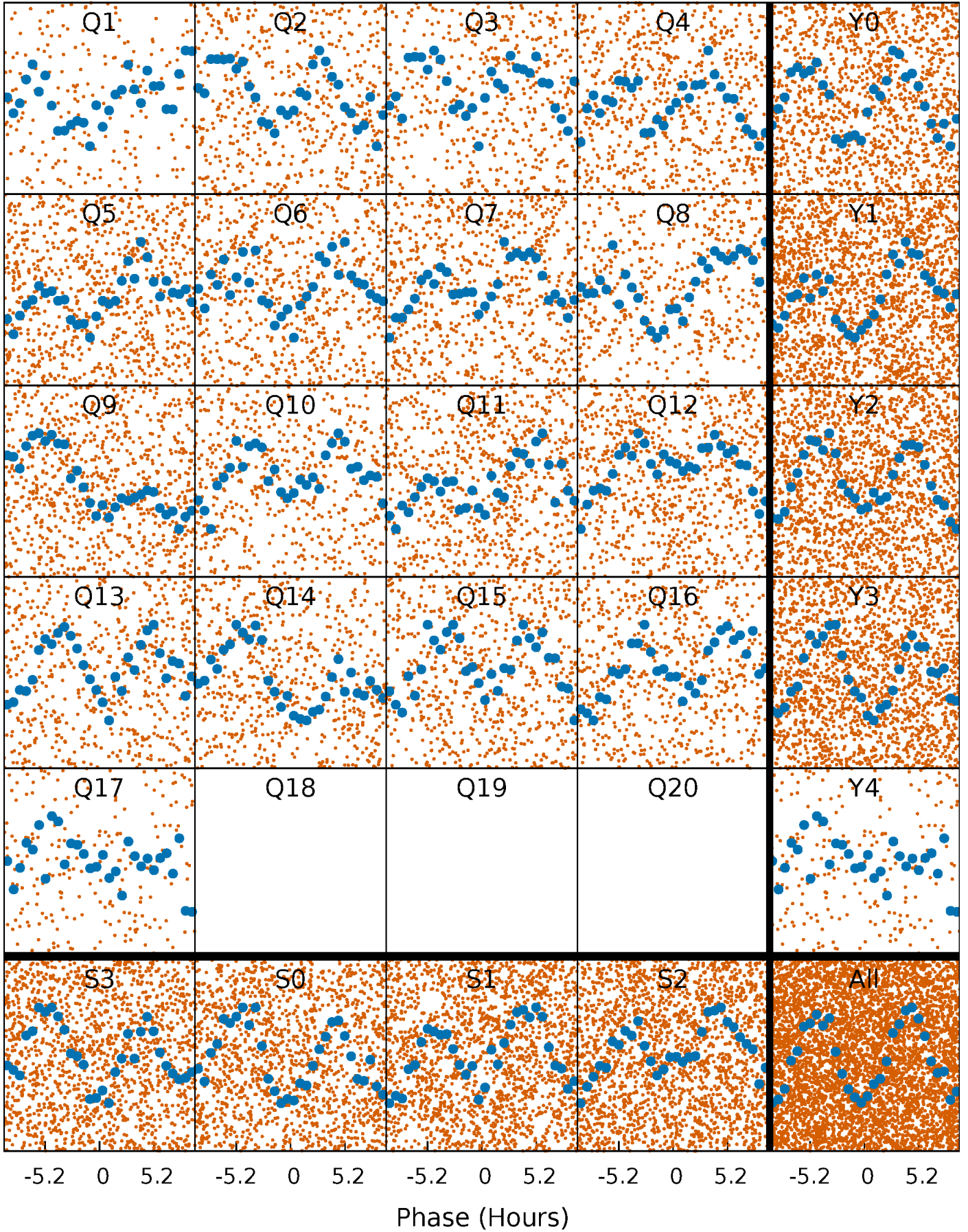


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



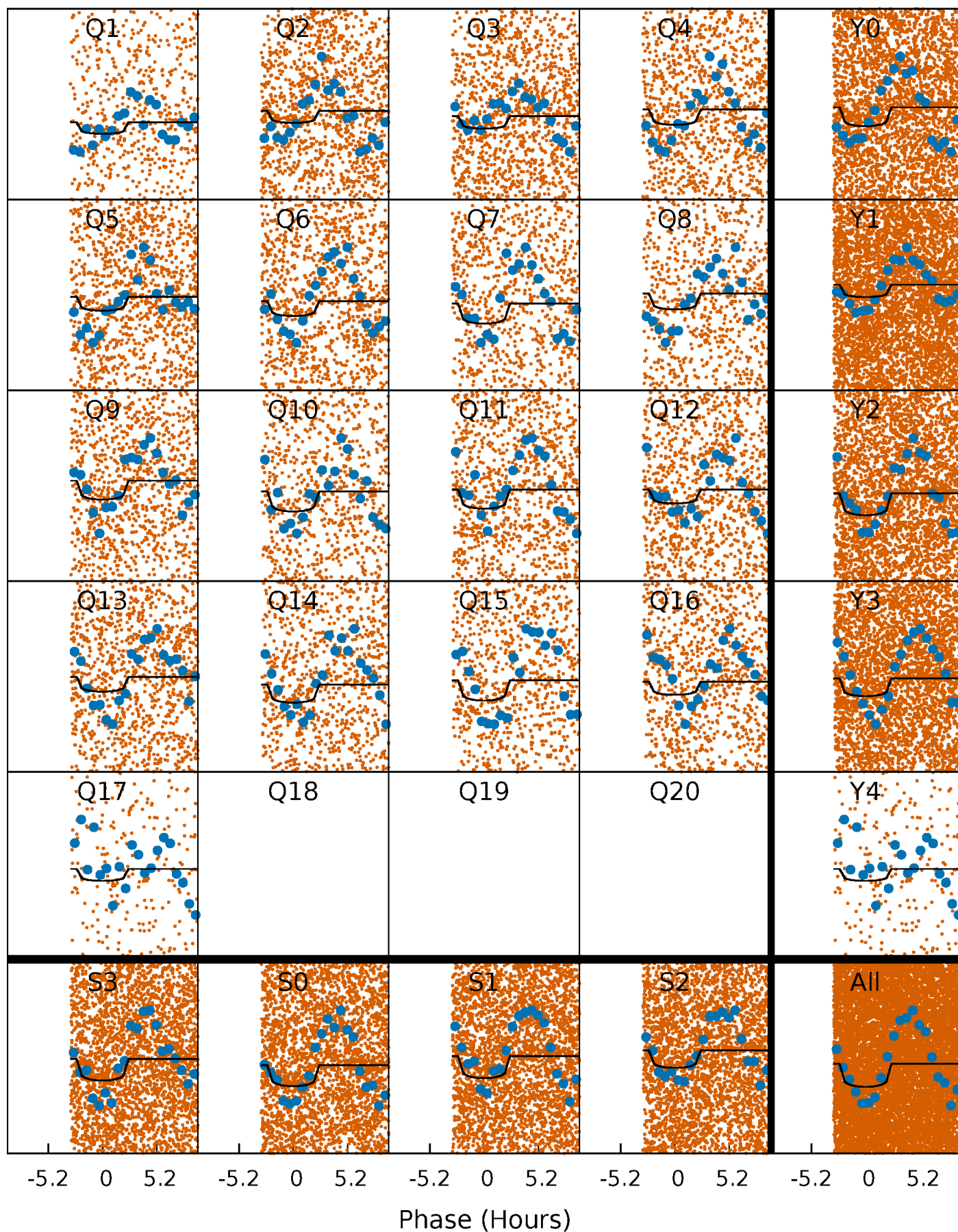
# PDC Quarter-Phased Transit Curves

TCE 009166826-02 P= 1.105092 Days  $T_0=131.627107$  (BKJD)



# DV Quarter-Phased Transit Curves

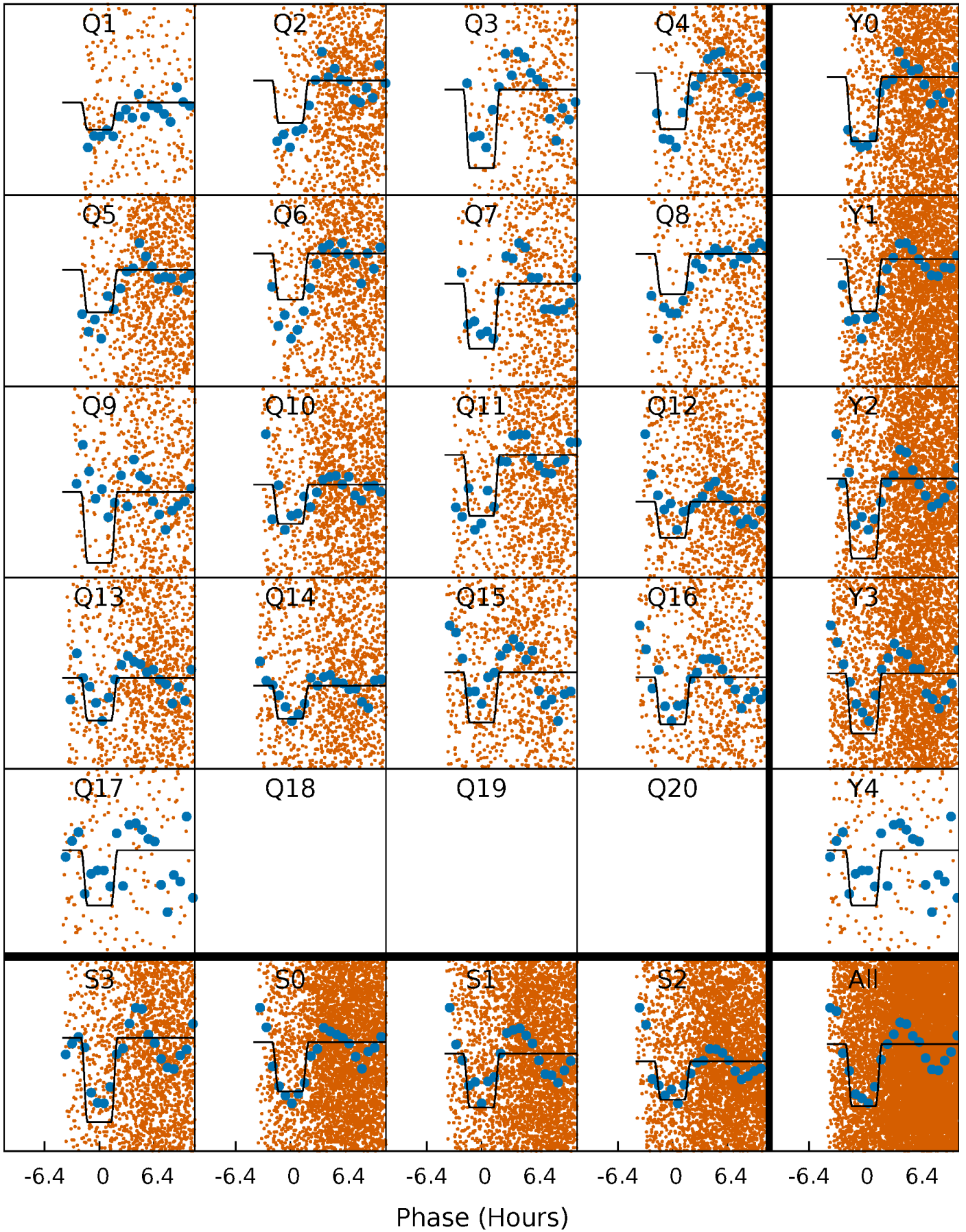
TCE 009166826-02   P= 1.105092 Days    $T_0=131.627107$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

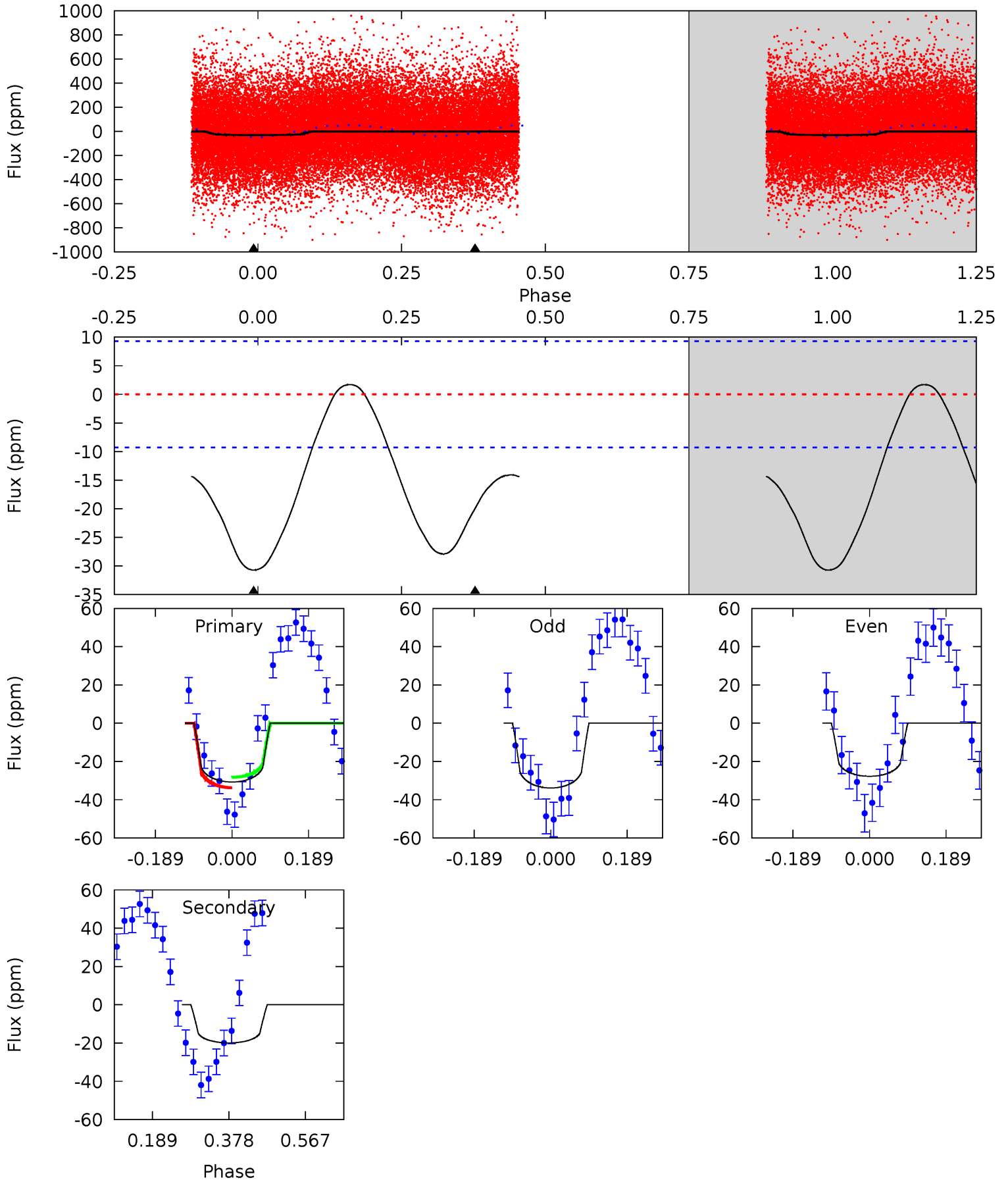
TCE 009166826-02 P= 1.105179 Days  $T_0=131.569639$  (BKJD)



# DV Model-Shift Uniqueness Test

009166826-02, P = 1.105092 Days, E = 130.522015 Days

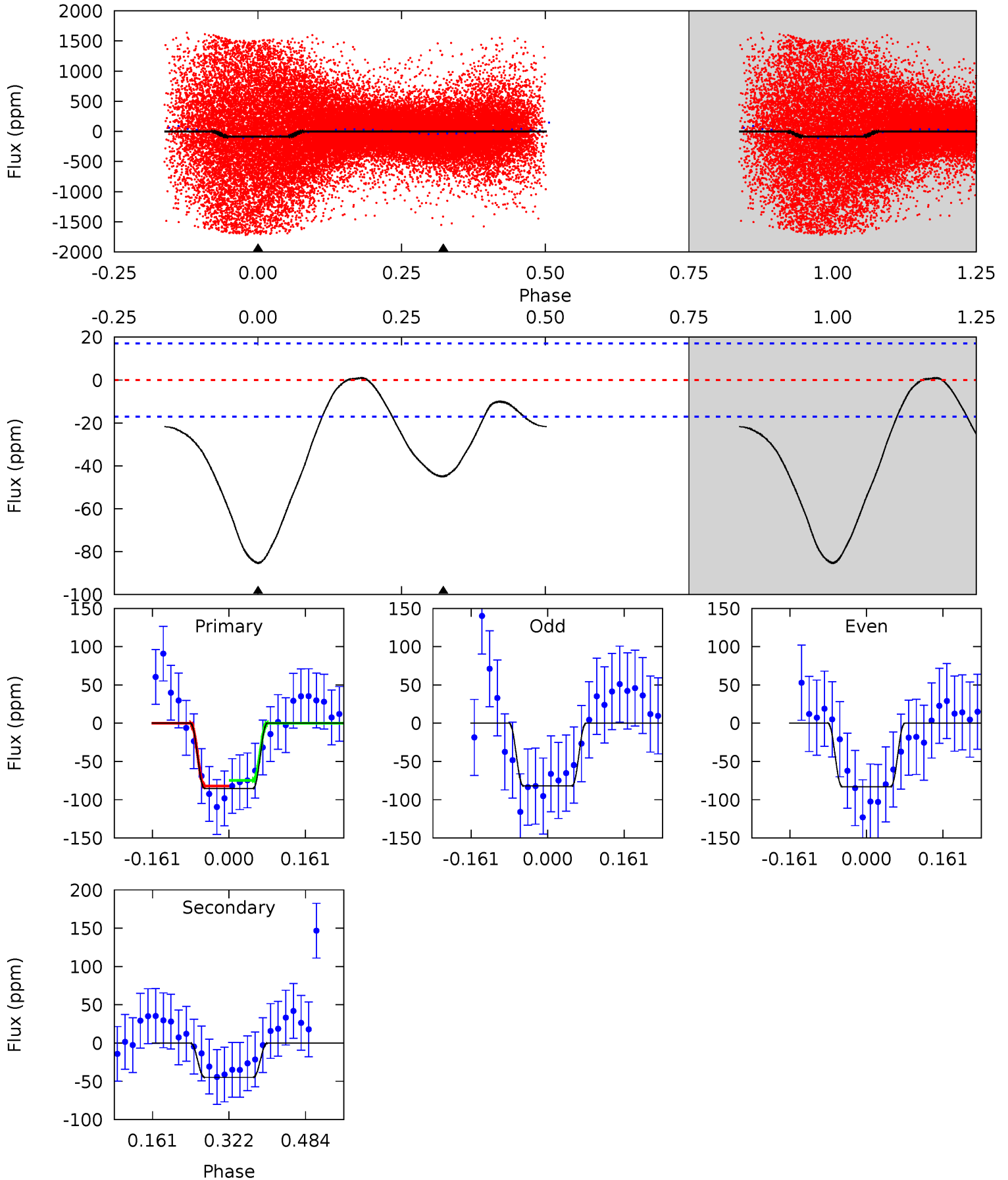
| Pri  | Sec  | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 14.7 | 9.51 | 0   | 0   | 4.43            | 1.31            | 1.12             | 14.7    | 14.7    | 9.51    | 9.51    | 1.45    | 0.77 | 0.05  | 1.34 |



# Alt Model-Shift Uniqueness Test

009166826-02, P = 1.105179 Days, E = 130.464460 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  |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 22.3 | 11.7 | 0   | 0   | 4.46            | 1.40            | 2.08             | 22.3    | 22.3    | 11.7    | 11.7    | 0.12    | 0.97 | 0.01  | 0.75 |





### Stellar Parameters For KIC 009166826

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $7261^{+228}_{-343}$ | $4.245^{+0.060}_{-0.225}$ | $0.210^{+0.150}_{-0.400}$ | $1.570^{+0.580}_{-0.193}$ | $1.591^{+0.211}_{-0.211}$ | $0.579^{+0.184}_{-0.323}$                 |
|        | +3%/-5%              | +1%/-5%                   | +71%/-190%                | +37%/-12%                 | +13%/-13%                 | +32%/-56%                                 |
| 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 009166826-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{max} (K)$        | $T_{obs} (K)$         | $A_{obs}$                 |
|---------|-------------|------------------------|----------------------|-----------------------|---------------------------|
| DV      | $-20 \pm 2$ | $0.88^{+0.28}_{-0.27}$ | $3668^{+287}_{-214}$ | $6768^{+1714}_{-836}$ | $8.212^{+9.525}_{-3.362}$ |
| Alt.    | $-45 \pm 4$ | $1.82^{+0.40}_{-0.30}$ | $3694^{+304}_{-229}$ | $5739^{+525}_{-414}$  | $4.339^{+1.852}_{-1.323}$ |

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

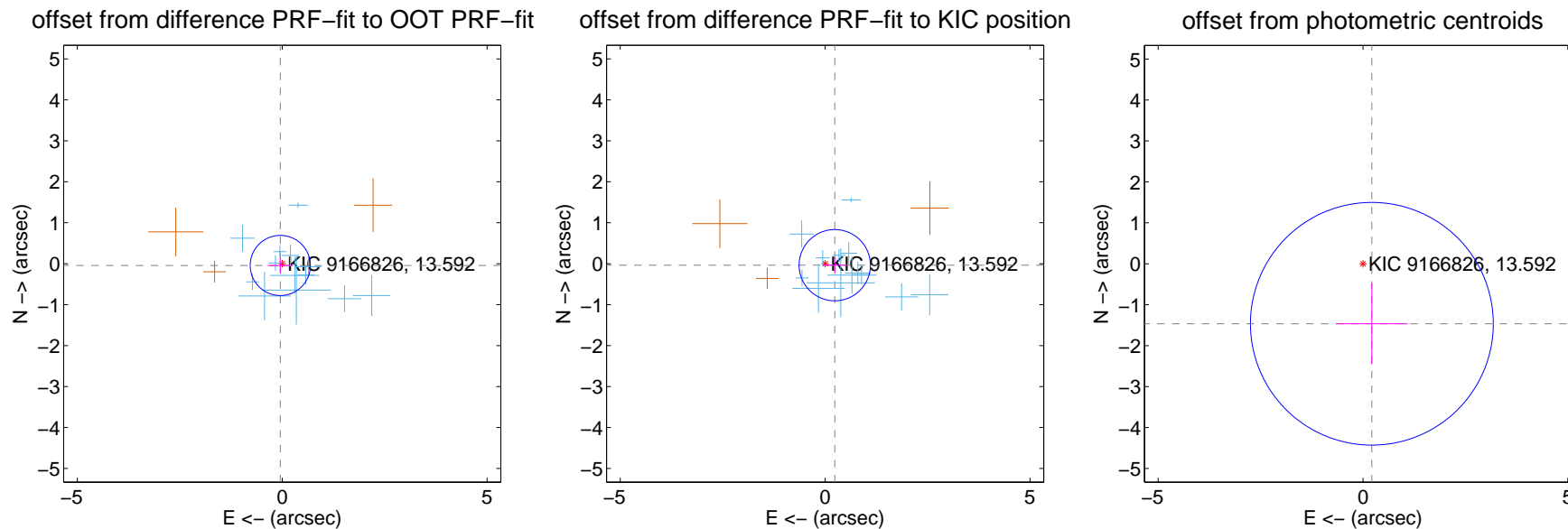
## DV Centroid Data

Supplemental centroid analysis for 009166826-02. Kepler magnitude: 13.59. Transit SNR 6.92

There are 13 quarters with good PRF difference image offsets

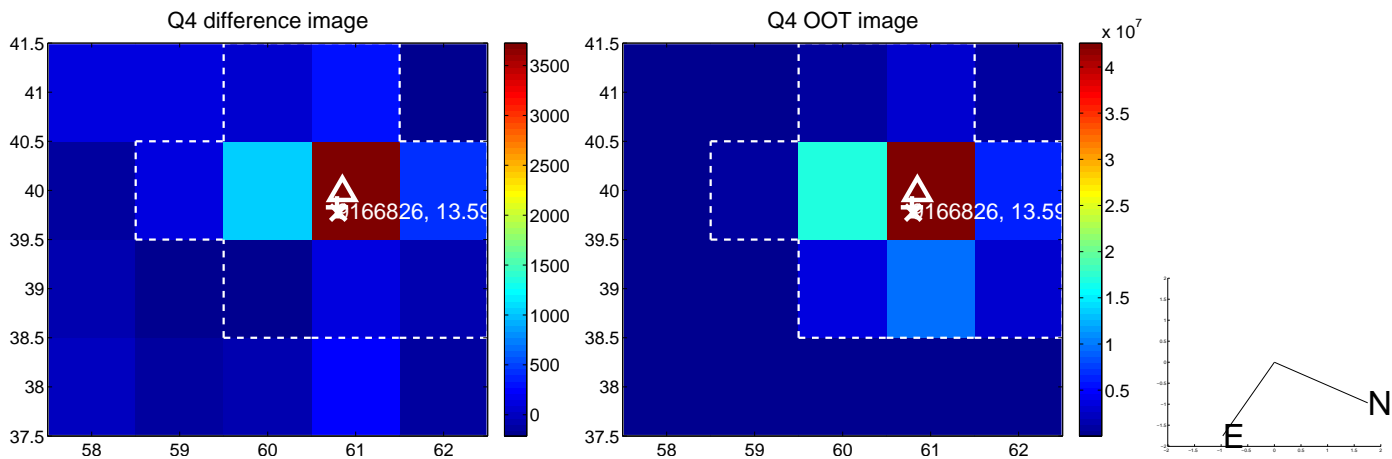
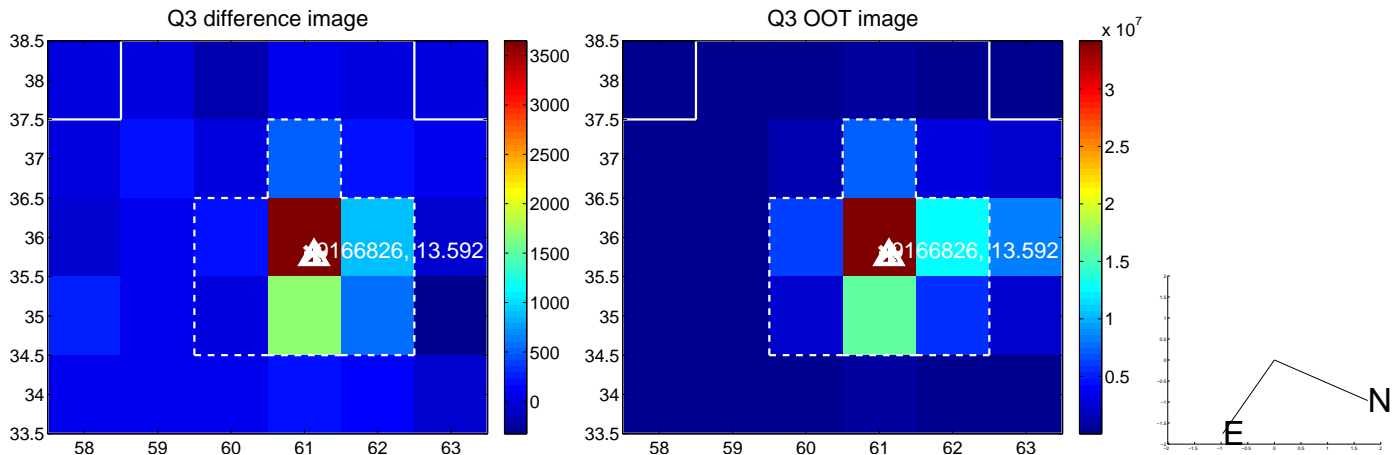
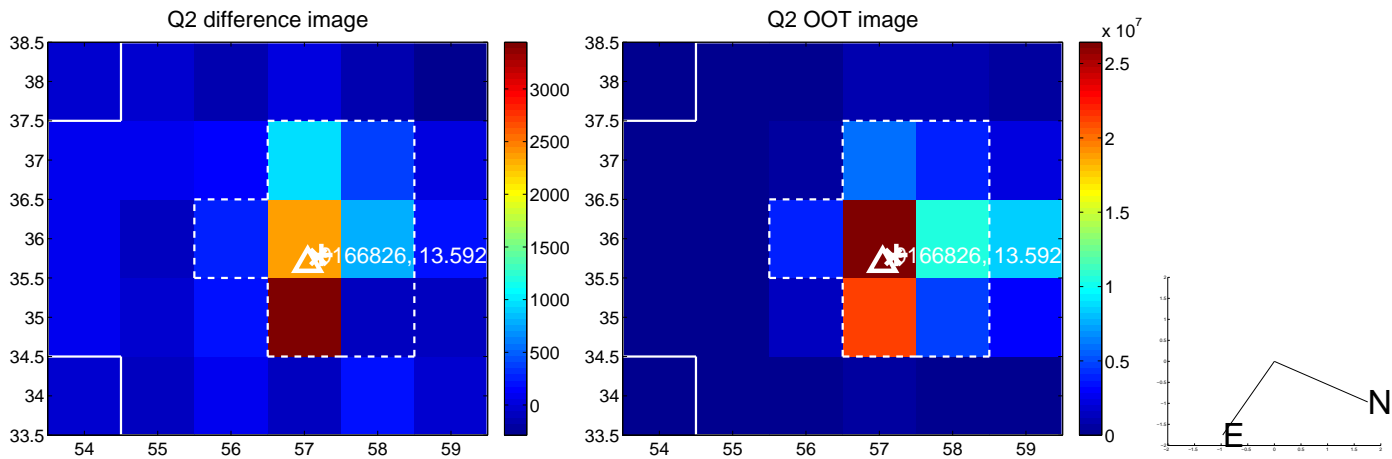
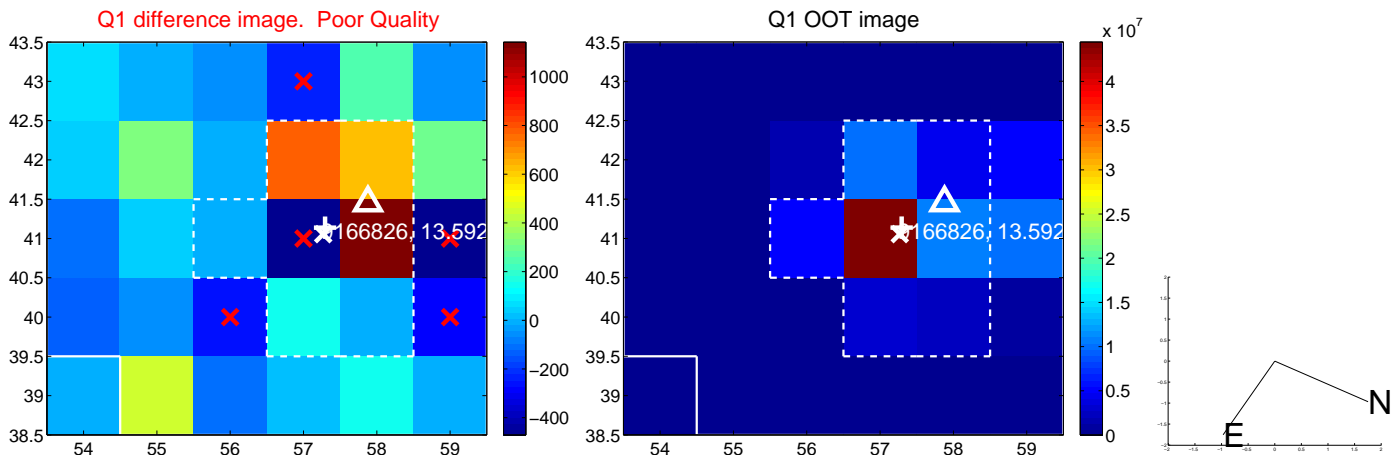
The direct PRF centroid is offset from the target star catalog position by about 0.33 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.064 \pm 0.245$  | 0.26                | $0.047 \pm 0.309$  | $-0.044 \pm 0.180$ |
| PRF-fit source offset from KIC position | $0.238 \pm 0.290$  | 0.82                | $-0.235 \pm 0.290$ | $-0.036 \pm 0.190$ |
| photometric centroid source offset      | $1.48 \pm 0.99$    | 1.50                | $-0.22 \pm 0.88$   | $-1.47 \pm 0.99$   |

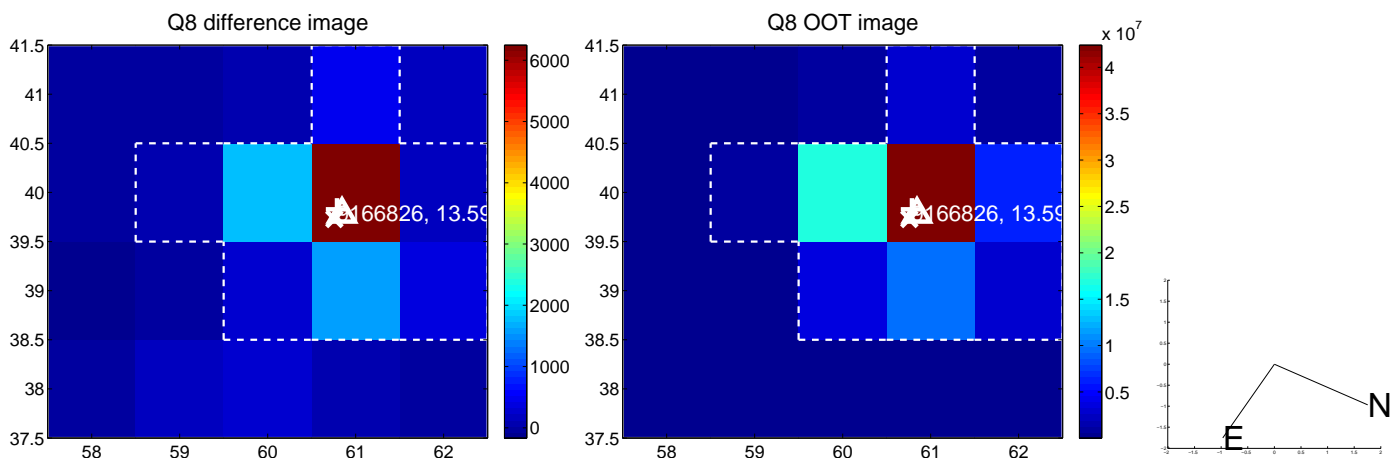
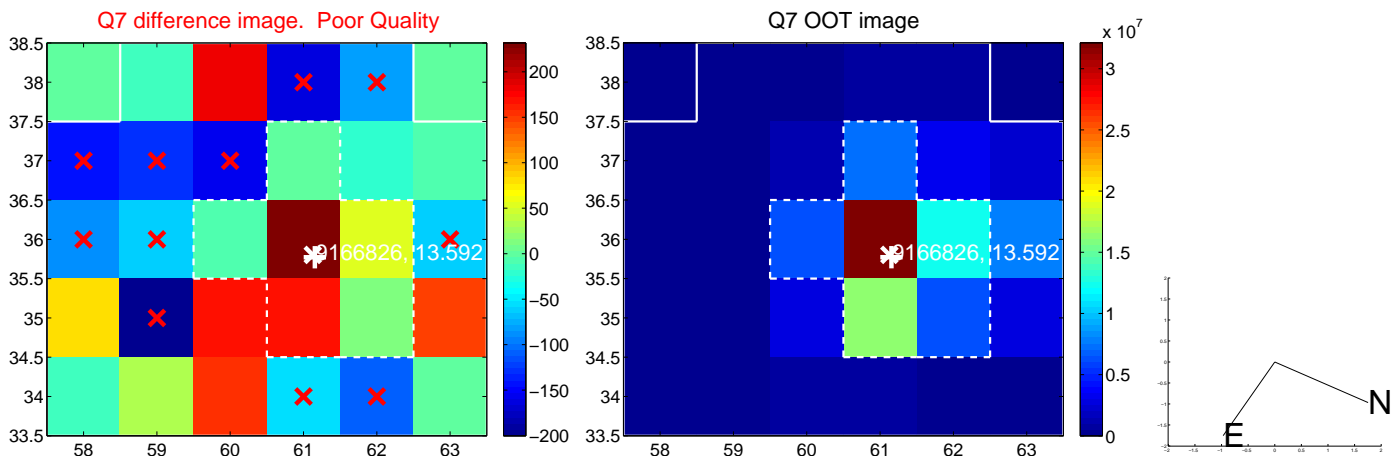
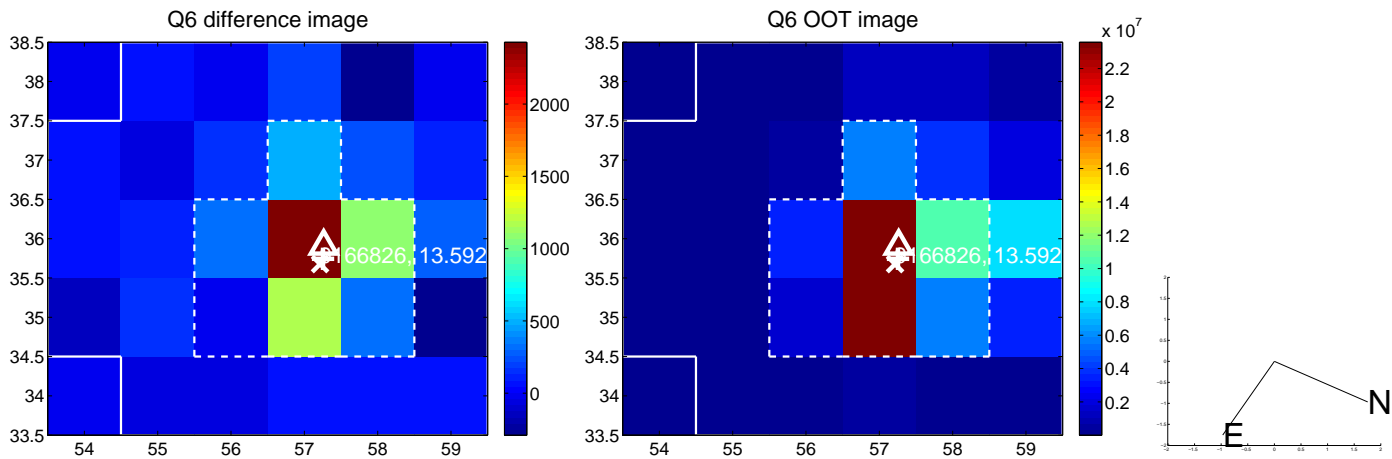
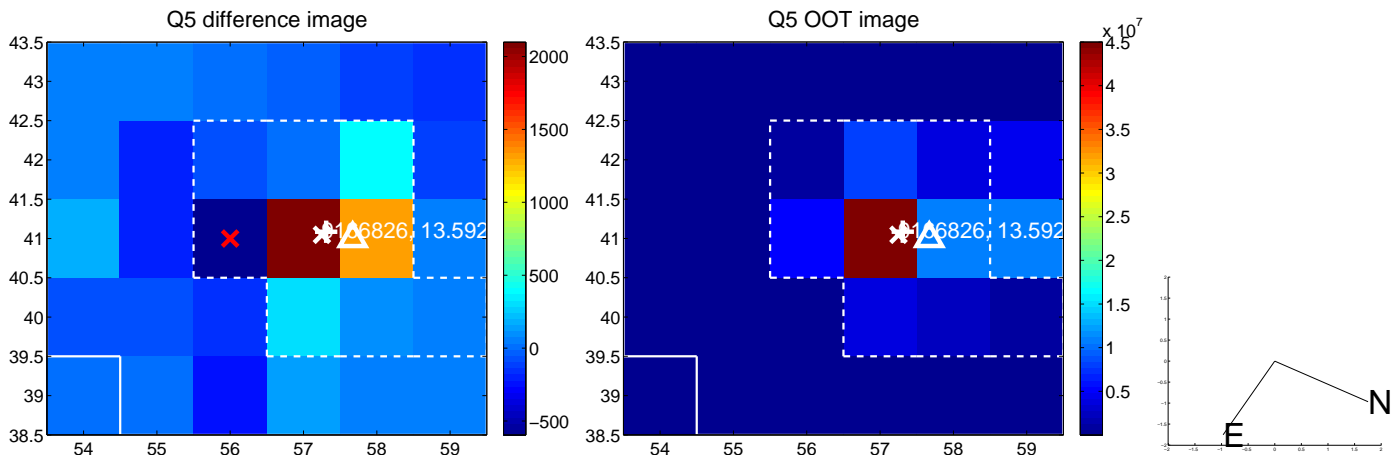


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

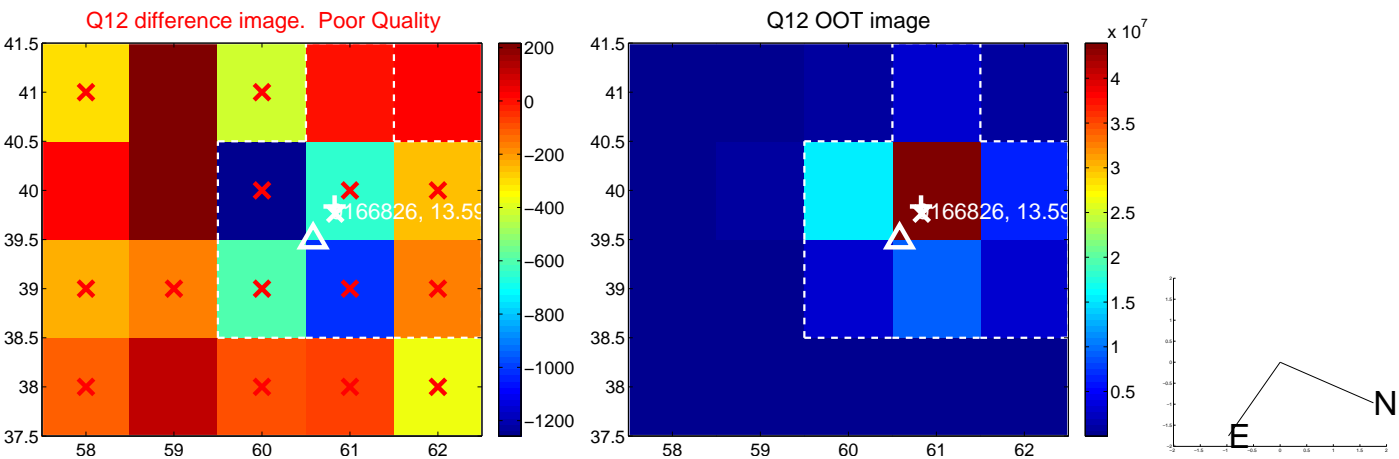
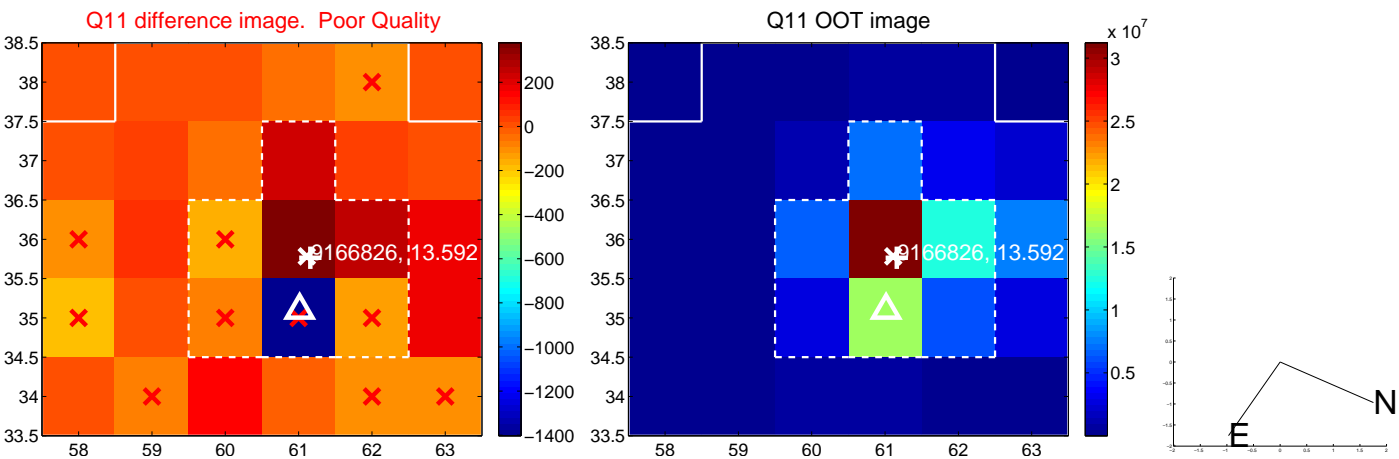
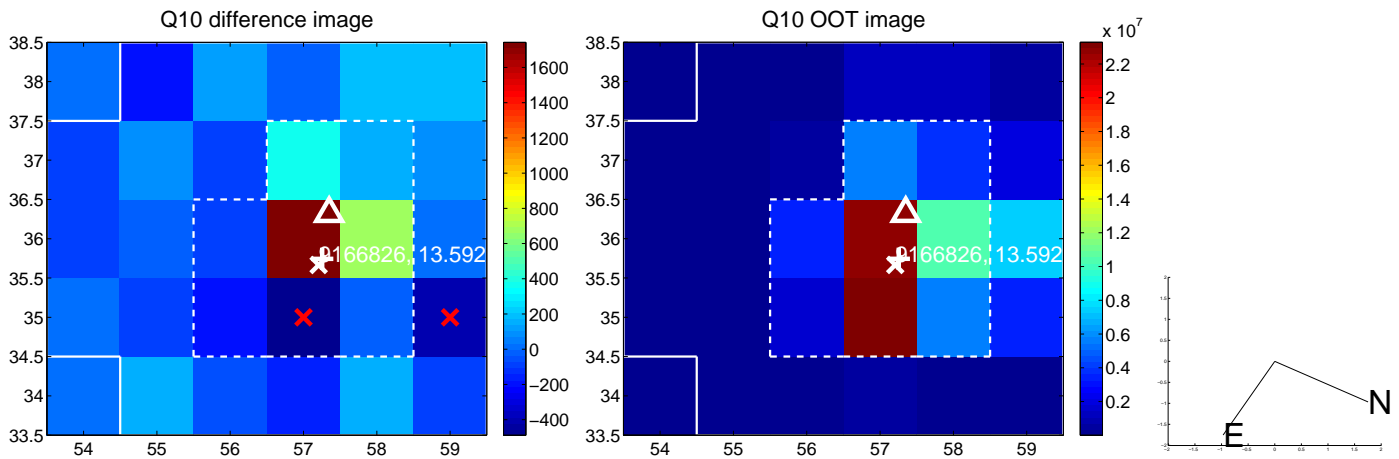
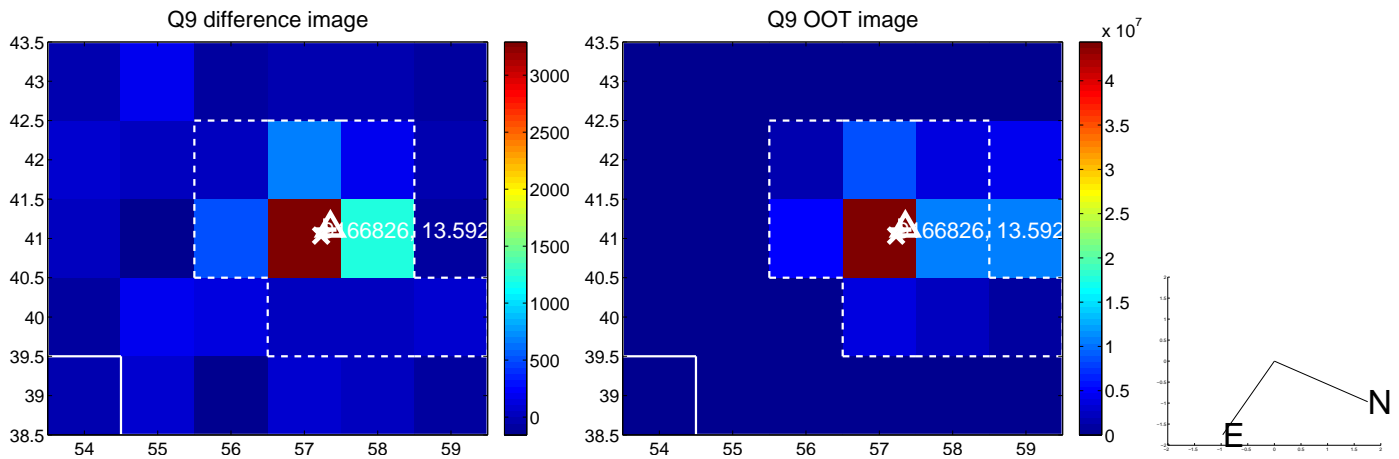


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

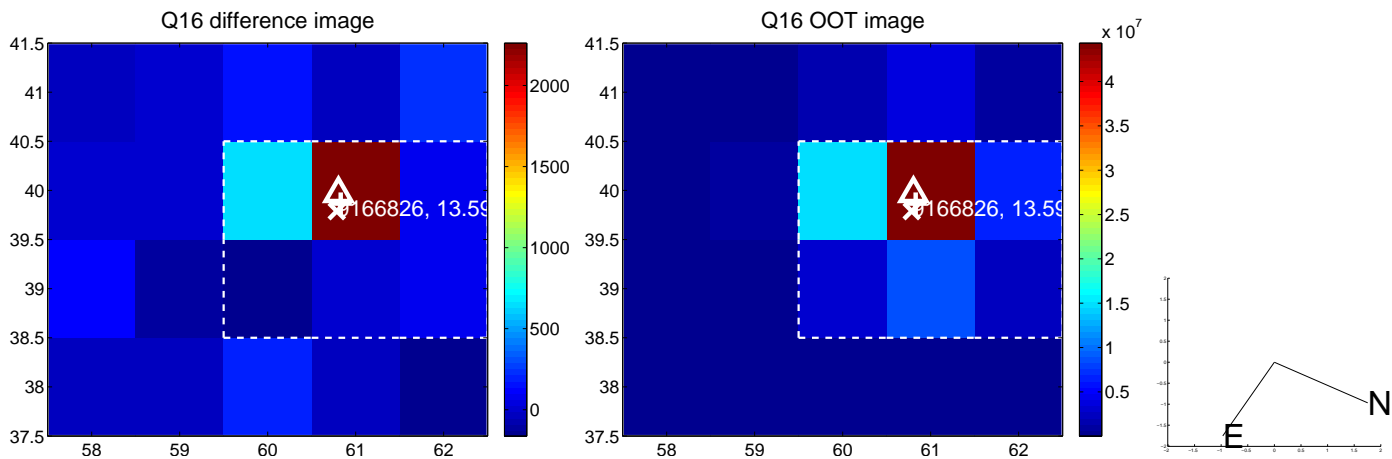
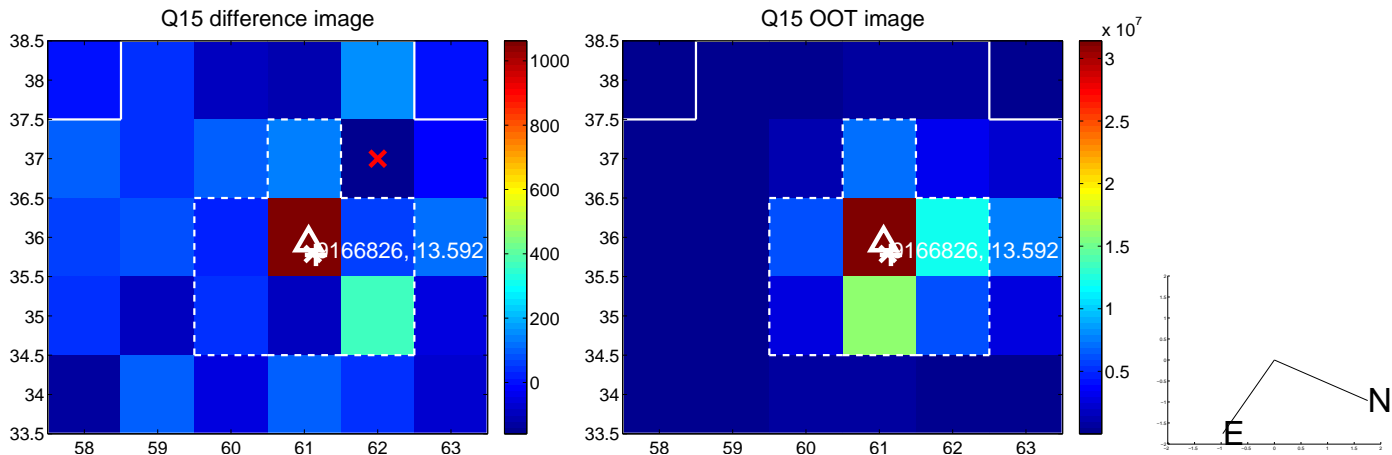
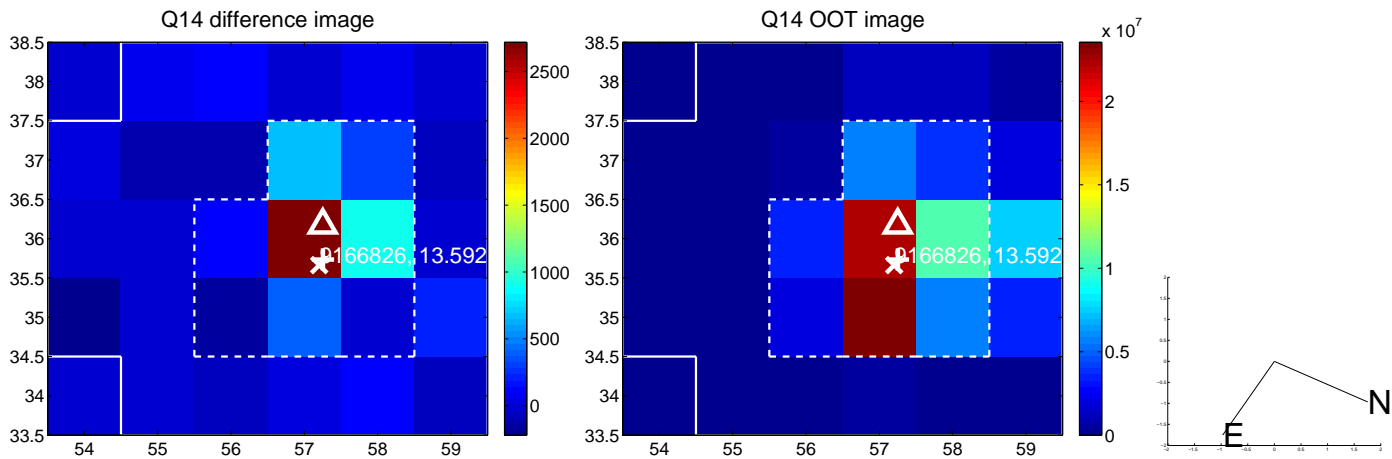
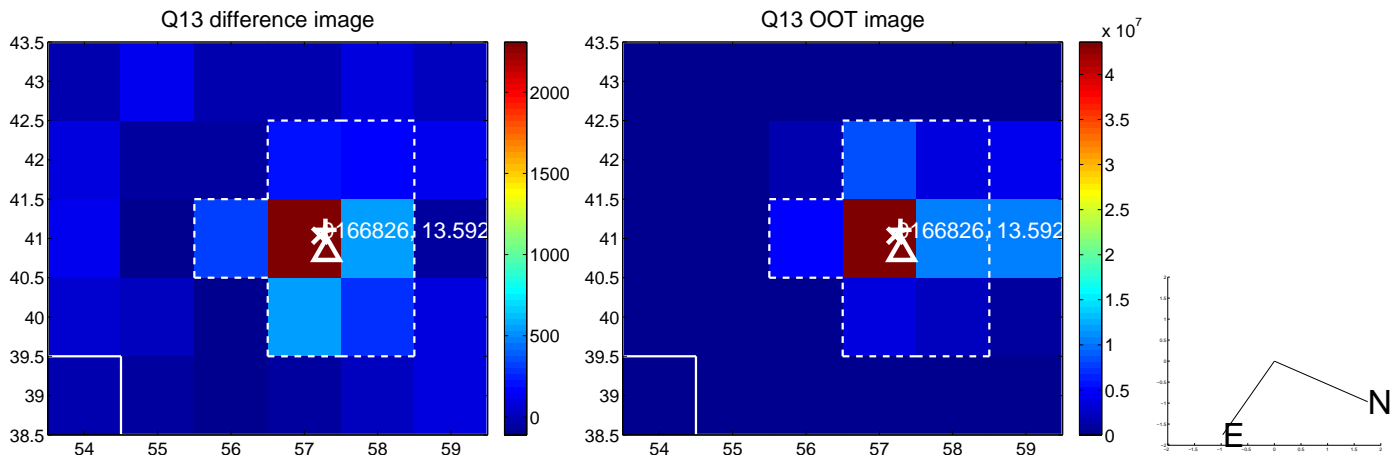




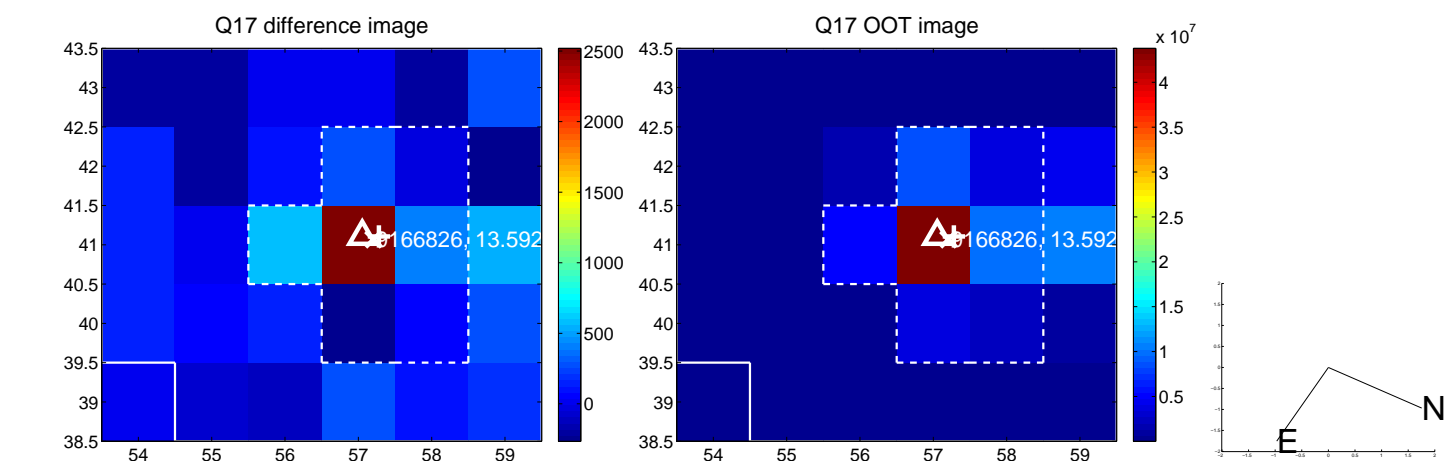
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



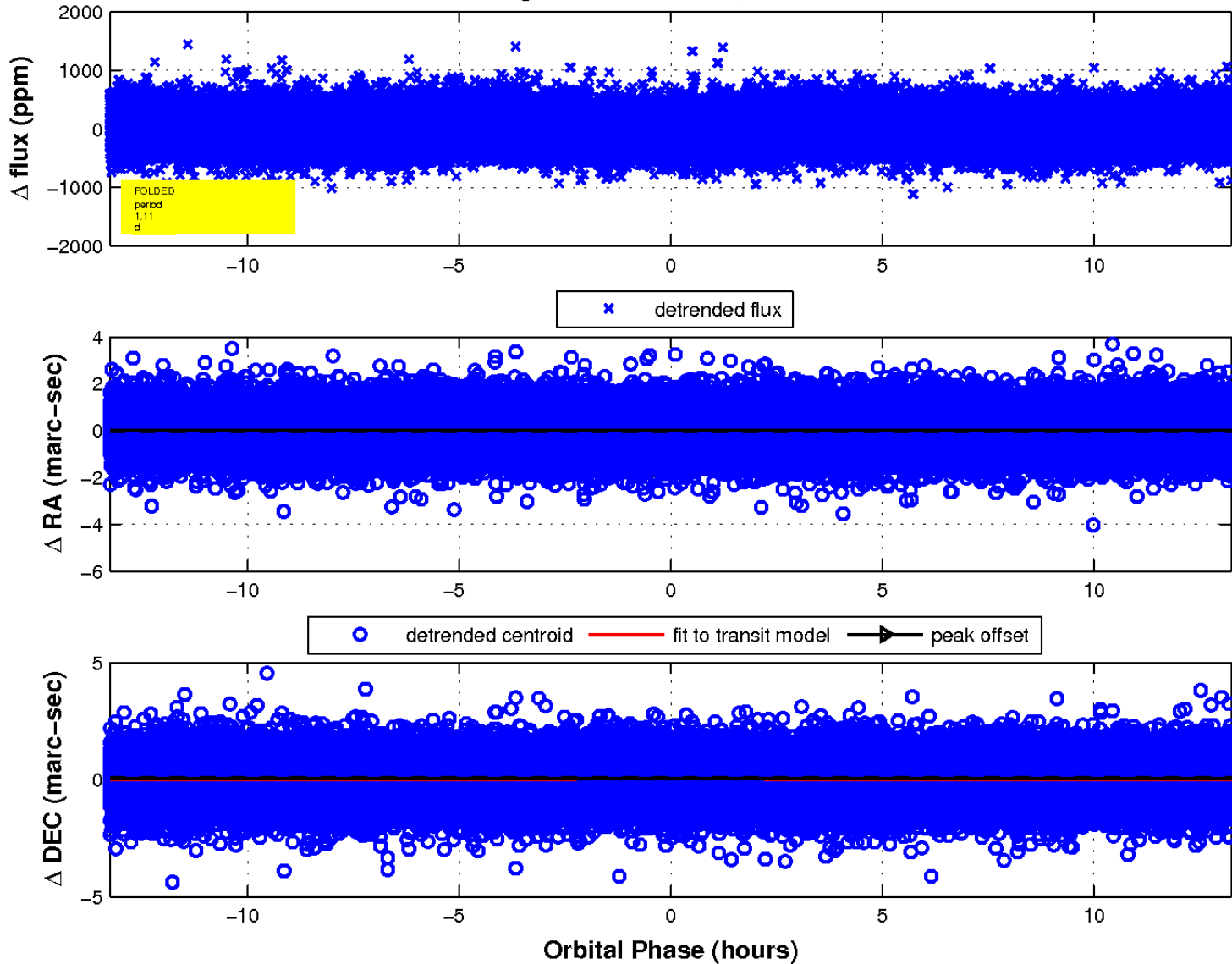
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

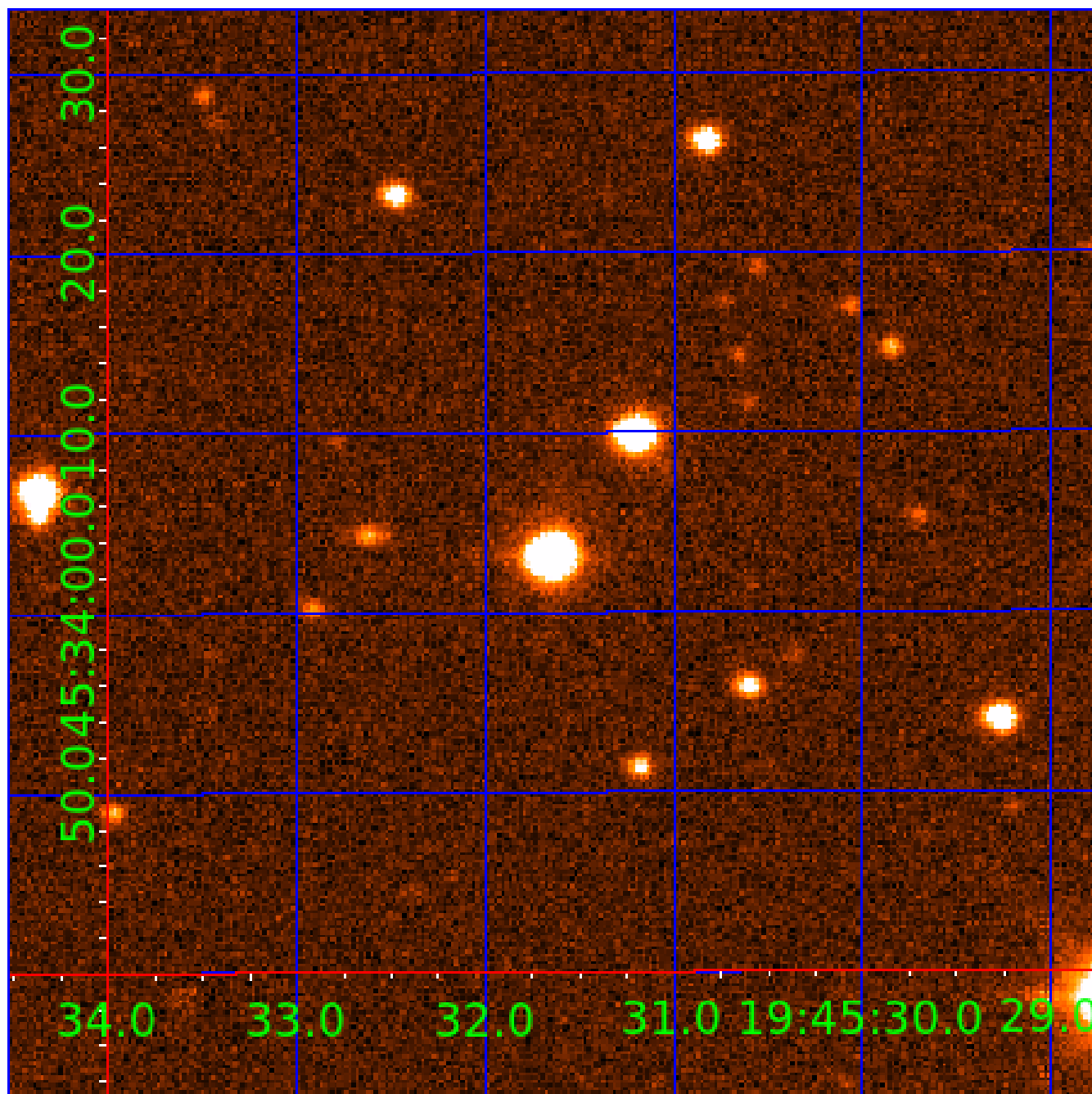


fluxWeightedCentroids, Planet 2 of 7



UKIRT Image

Declination



# KIC 009166826

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009166826-01 | OBS      | No   | 1.105096      | 132.364571   | 32.2        | 3.666            | 10.2 | 8.4  | 1.57                        | 7261            | 0.98                   | 10334.27               |
| 009166826-02 | OBS      | No   | 1.105092      | 131.627107   | 24.5        | 4.563            | 10.6 | 6.9  | 1.57                        | 7261            | 0.83                   | 10334.32               |
| 009166826-03 | OBS      | No   | 18.475152     | 139.191330   | 54.8        | 1.368            | 8.4  | 1.4  | 1.57                        | 7261            | 1.33                   | 241.75                 |
| 009166826-04 | OBS      | No   | 18.475735     | 139.518855   | 71.3        | 2.308            | 8.5  | 2.3  | 1.57                        | 7261            | 1.53                   | 241.74                 |
| 009166826-05 | OBS      | No   | 44.304722     | 146.120989   | 282.3       | 4.500            | 8.0  | -1.0 | 1.57                        | 7261            | 2.67                   | 75.31                  |
| 009166826-06 | OBS      | No   | 47.695013     | 172.383956   | 274.8       | 4.358            | 7.3  | 6.5  | 1.57                        | 7261            | 2.83                   | 68.26                  |
| 009166826-07 | OBS      | No   | 74.722951     | 142.333969   | 266.5       | 4.500            | 7.5  | -1.0 | 1.57                        | 7261            | 2.60                   | 37.52                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 009166826-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009166826-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—SAME_NTL_PERIOD  |
| 009166826-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT      |
| 009166826-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD |
| 009166826-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS  |
| 009166826-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT   |
| 009166826-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS   |

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

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

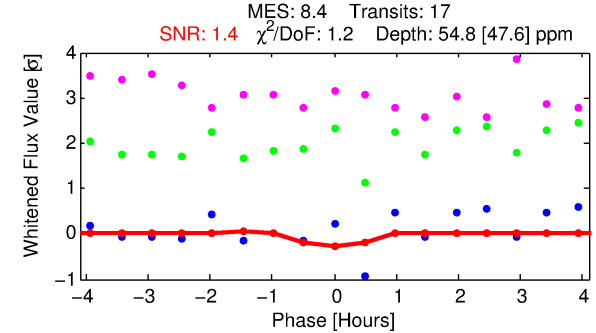
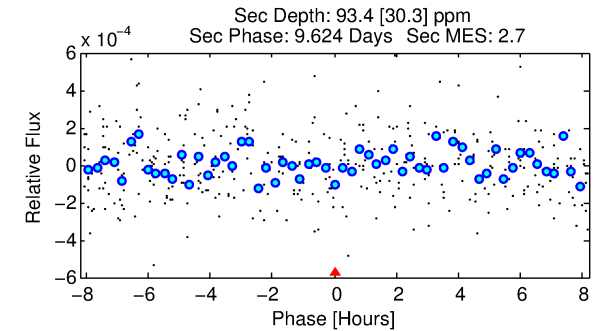
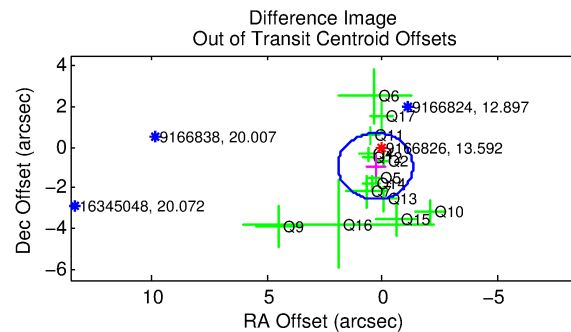
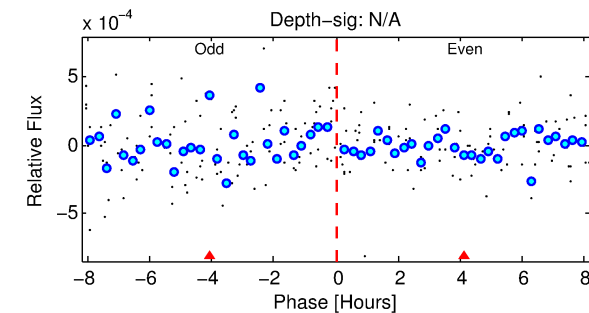
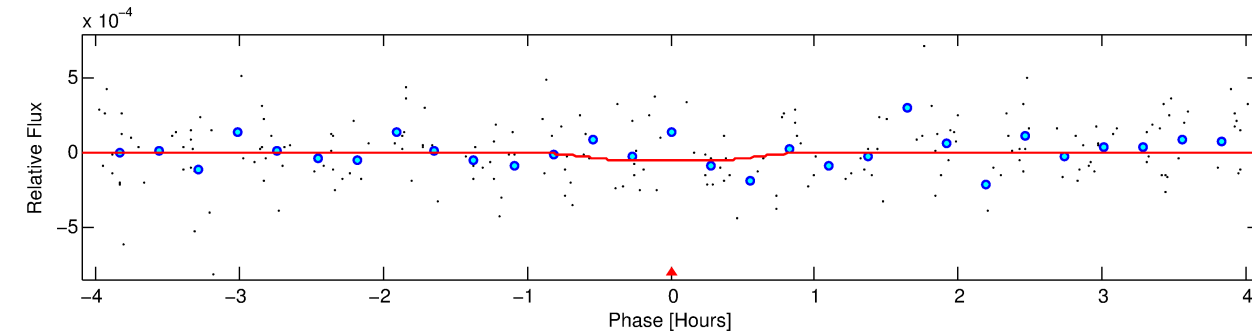
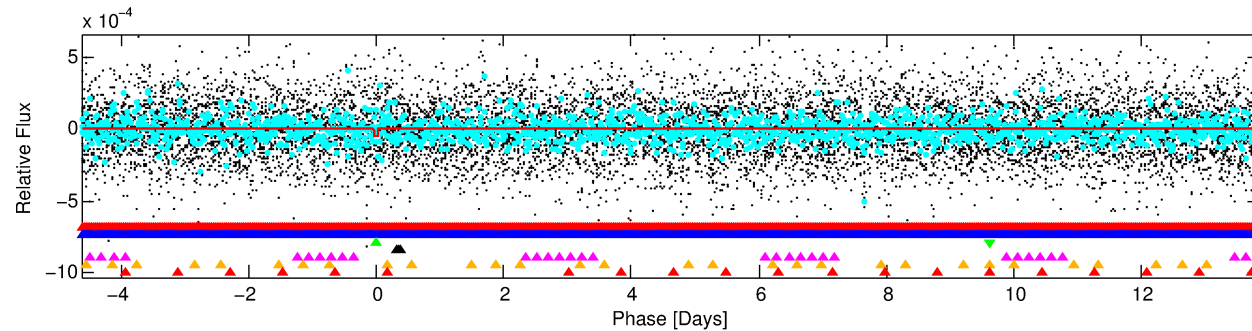
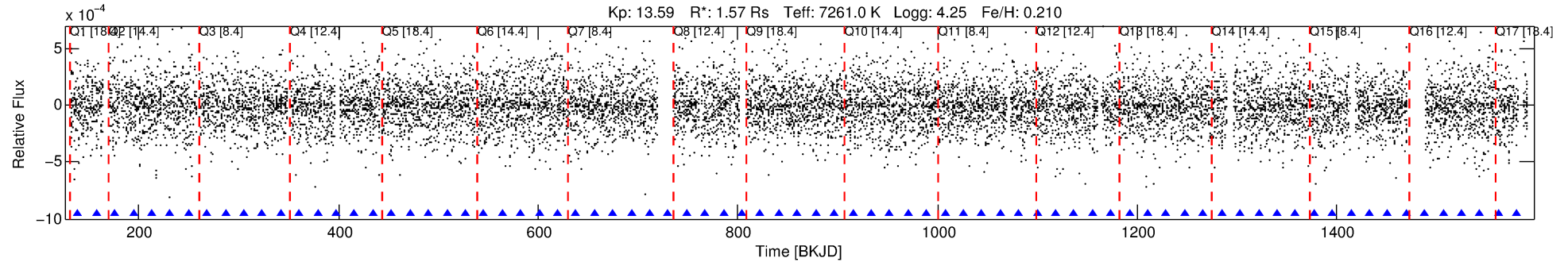
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009166826-03

No Significant Match Found

# DV One-Page Summary

KIC: 9166826 Candidate: 3 of 7 Period: 18.475 d



## DV Fit Results:

Period = 18.47515 [0.00082] d  
Epoch = 139.1913 [0.0338] BKJD  
Rp/R\* = 0.0078 [0.0147]  
a/R\* = 50.70 [611.65]  
b = 0.88 [3.05]  
Seff = 241.75 [112.26]  
Teq = 1005 [117] K  
Rp = 1.33 [2.57] Re  
a = 0.1594 [0.0479] AU  
Ag = 733.18 [2805.64] [0.26σ]  
Teffp = 8089 [7701] K [0.92σ]

## DV Diagnostic Results:

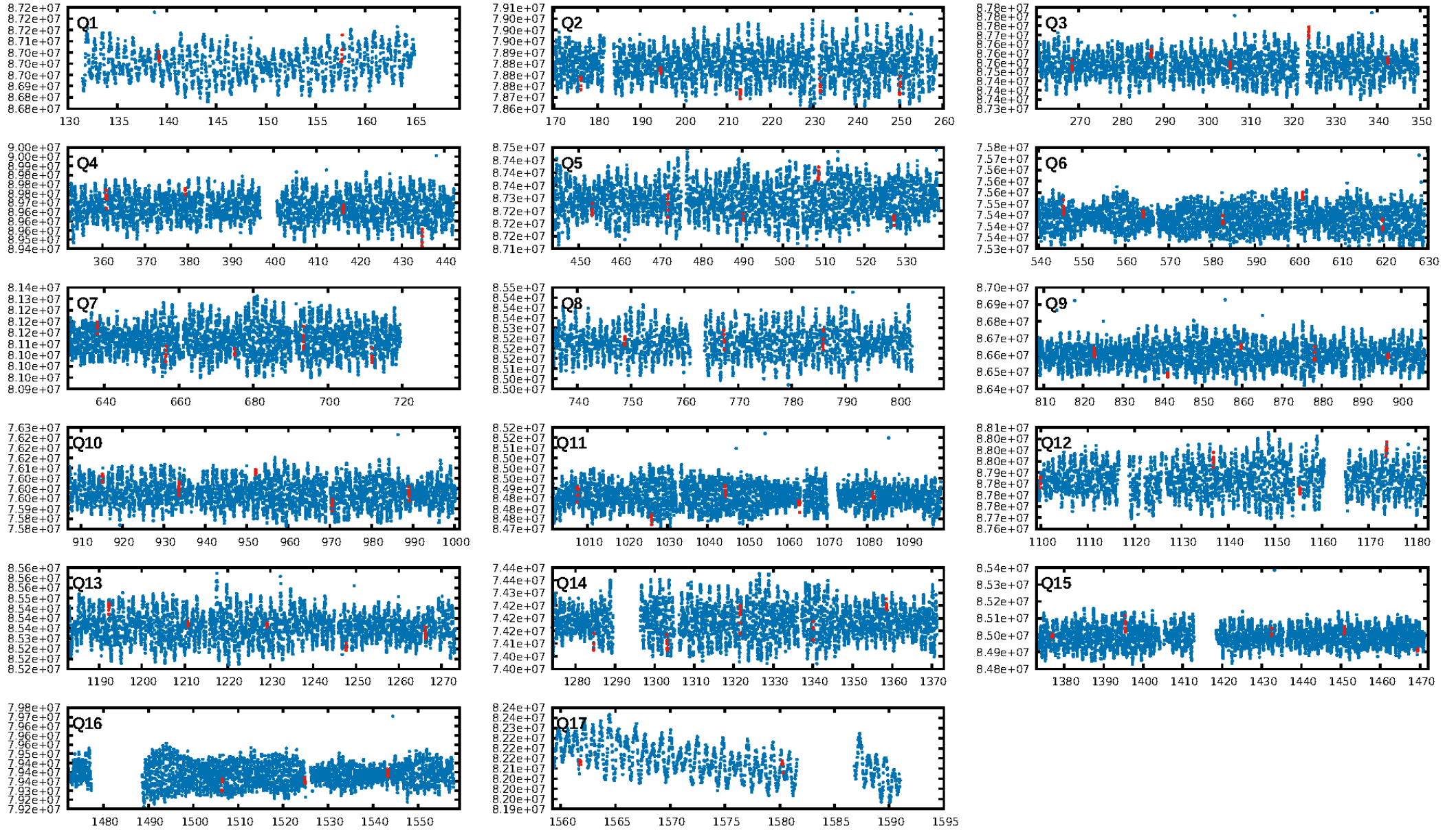
ShortPeriod-sig: 100.0% [106.55σ]  
LongPeriod-sig: 0.4% [0.01σ]  
ModelChiSquare2-sig: 47.0%  
ModelChiSquareGof-sig: 89.4%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [17/17]  
GhostDiagnostic-chr: 1.503  
Centroid-sig: 2.8%  
Centroid-so: 3.863 arcsec [1.25σ]  
OotOffset-rm: 0.977 arcsec [1.81σ]  
KicOffset-rm: 0.934 arcsec [1.89σ]  
OotOffset-st: 4/3/3/4 [14]  
KicOffset-st: 4/3/3/4 [14]  
DiffImageQuality-fgm: 0.50 [7/14]  
DiffImageOverlap-fno: 0.41 [7/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:03:52 Z

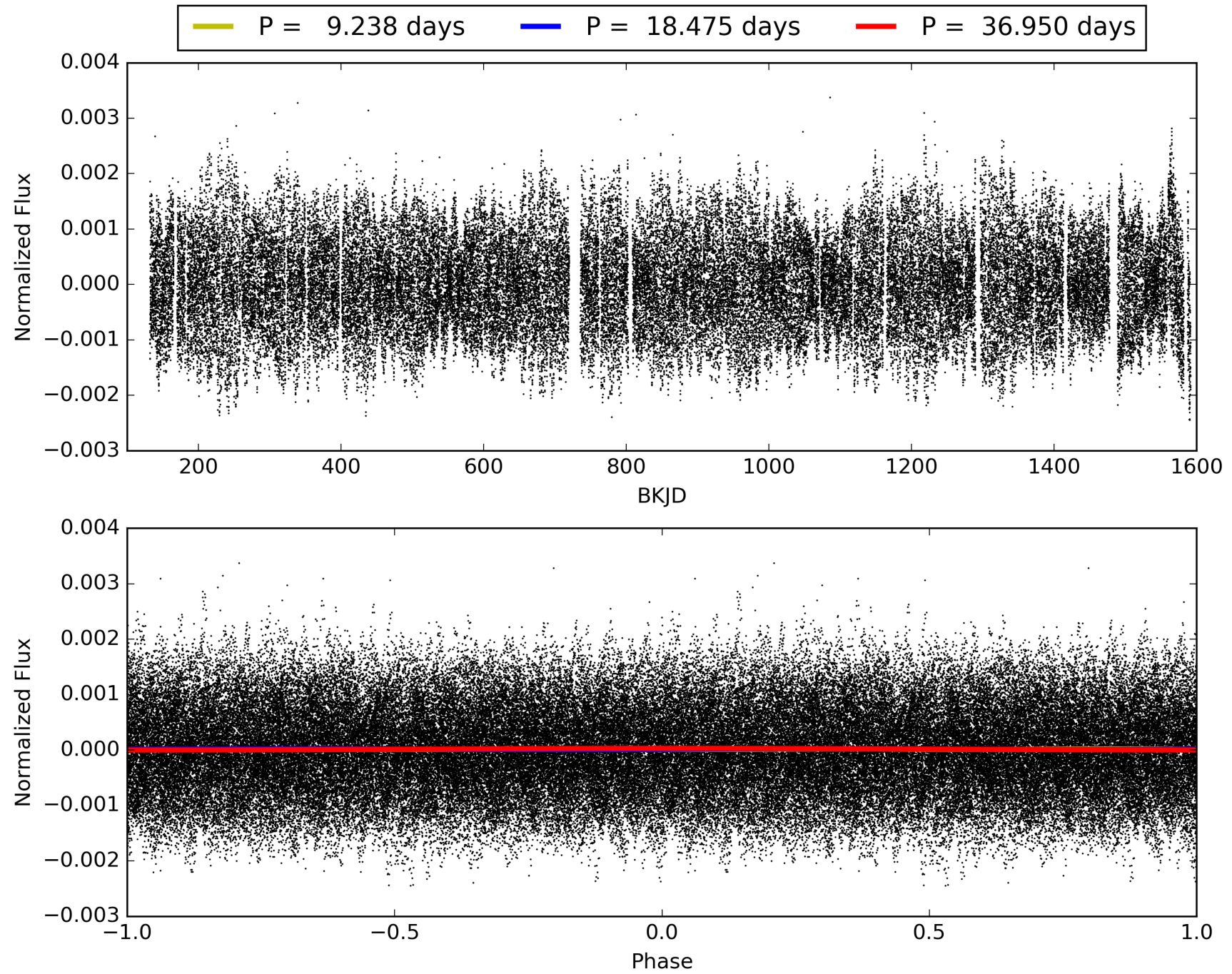
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 009166826-03, PDC Light Curves

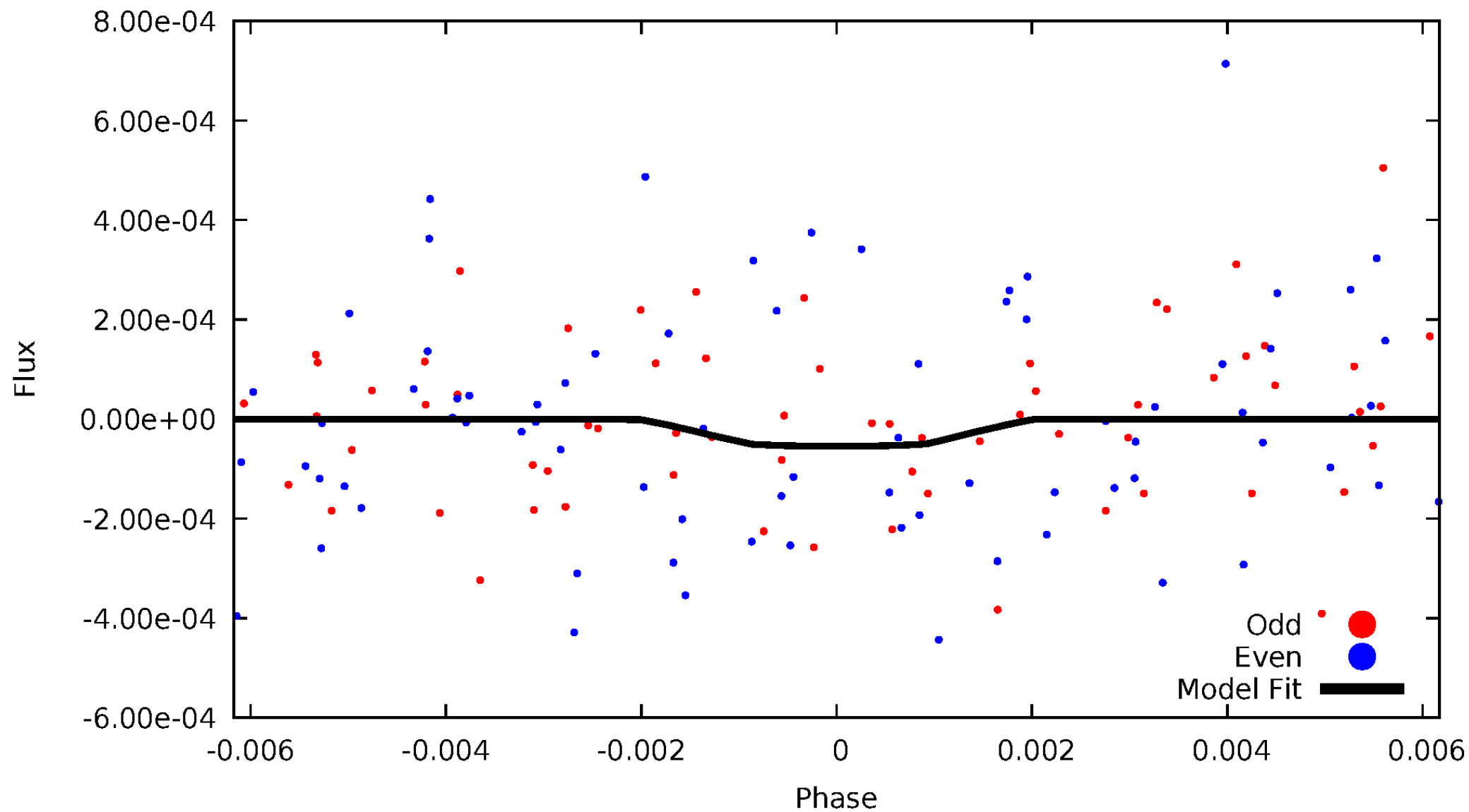


TCE 009166826-03



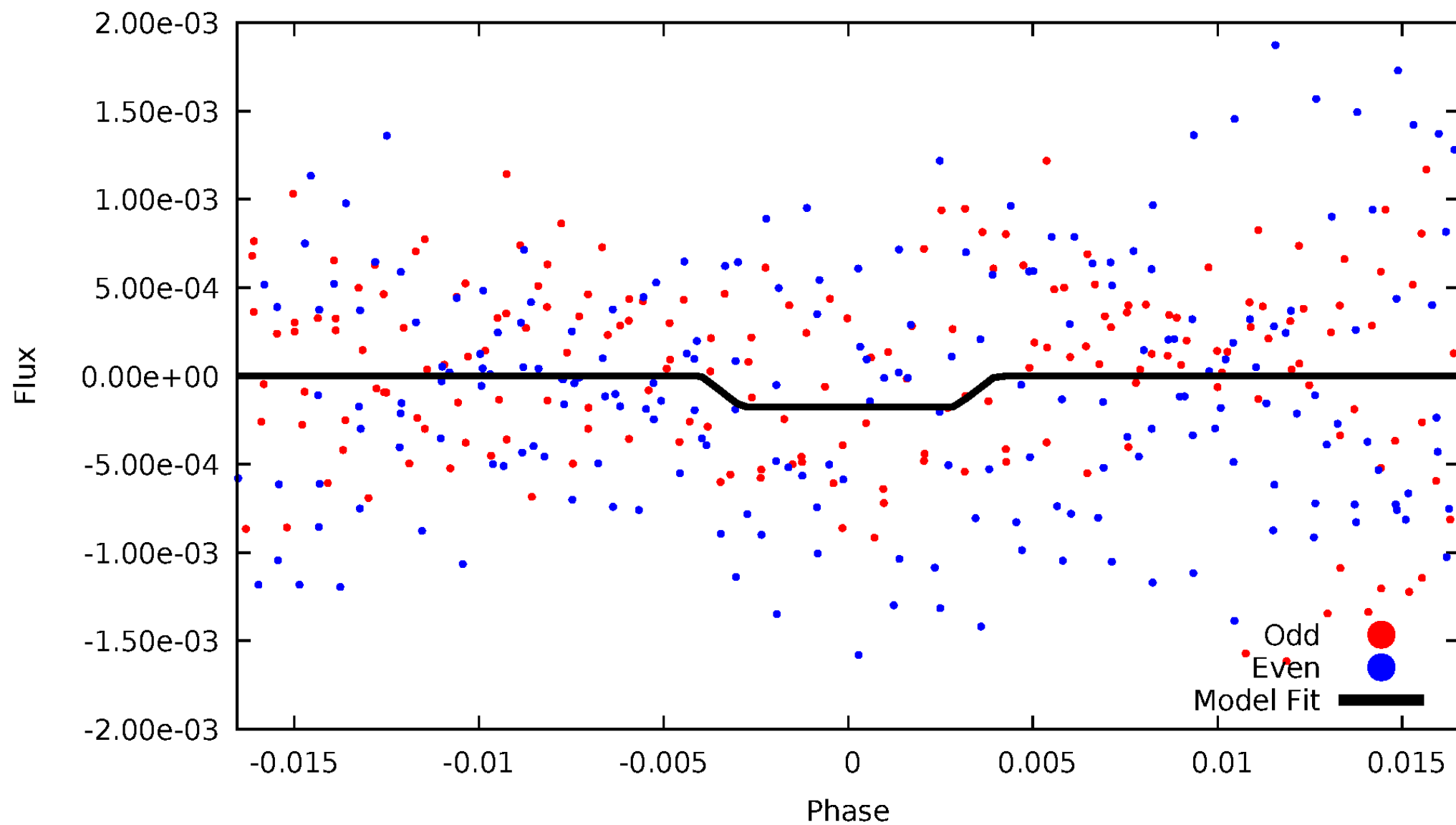
# DV Odd/Even

TCE 009166826-03



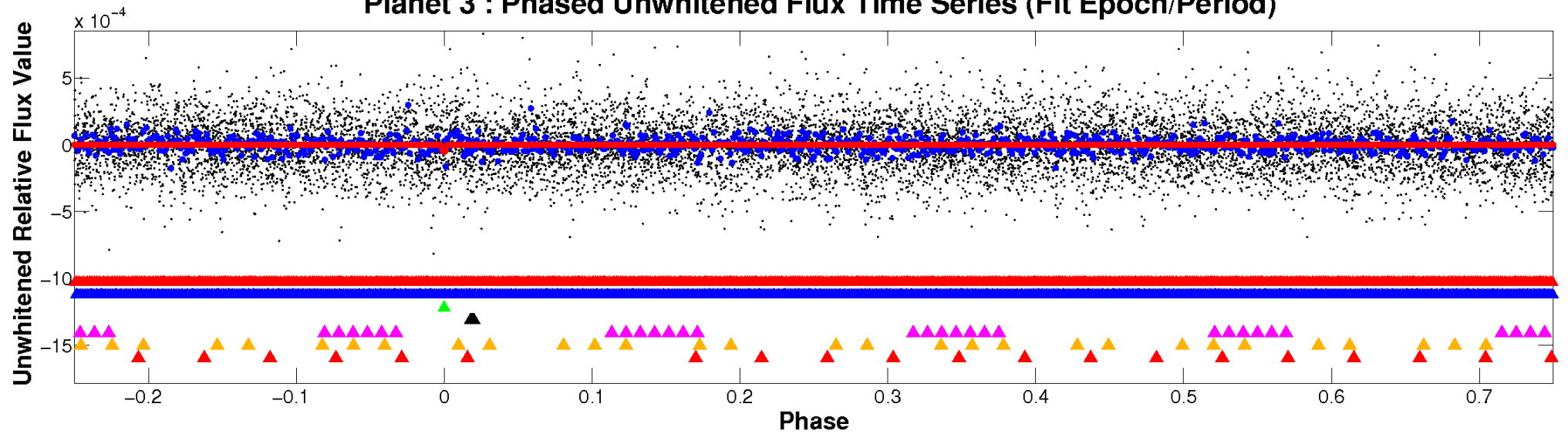
# ALT Odd/Even

TCE 009166826-03

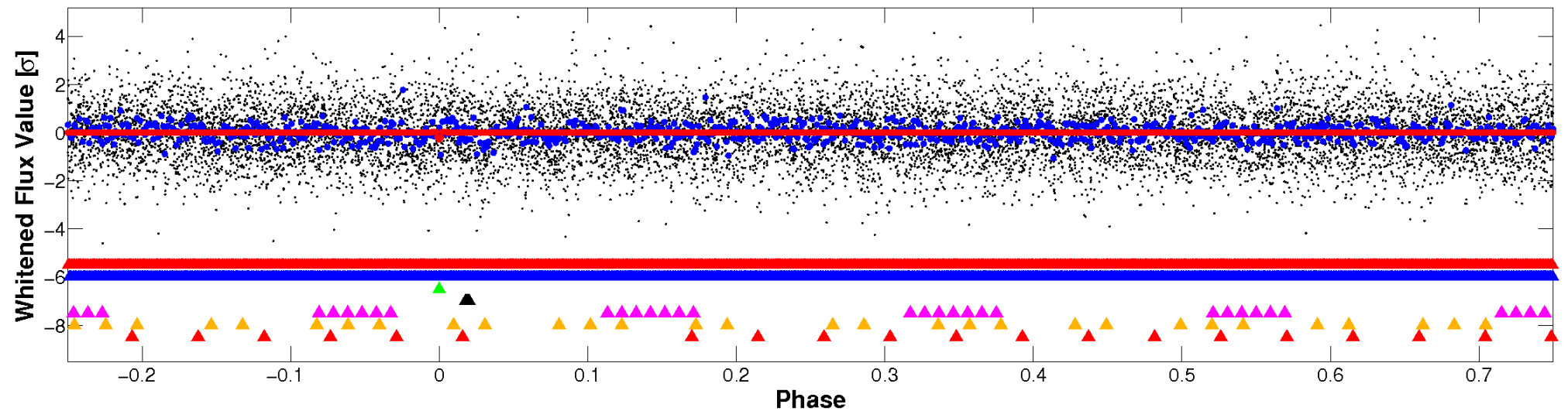


# Non-Whitened Vs. Whitened Light Curve

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



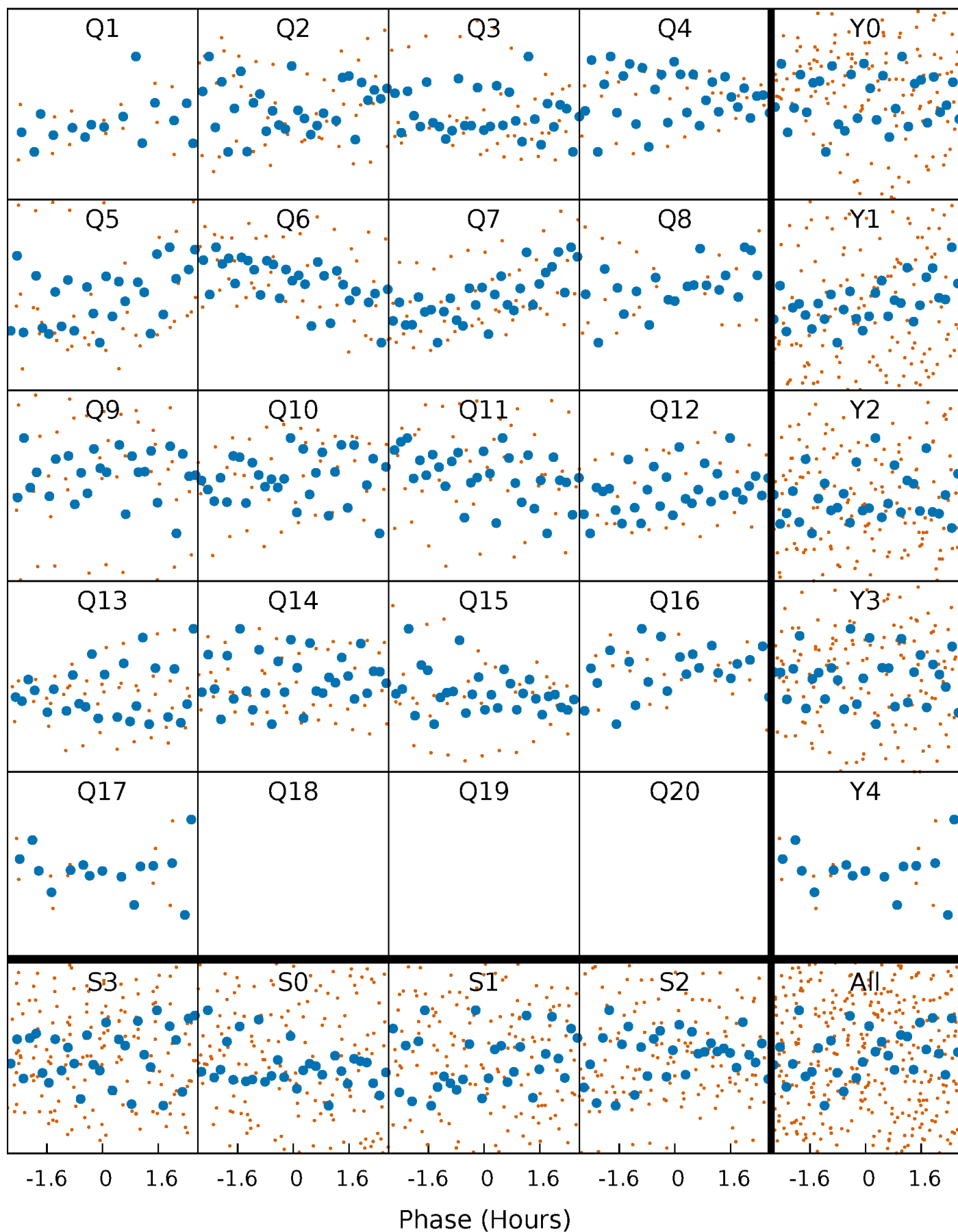
## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)





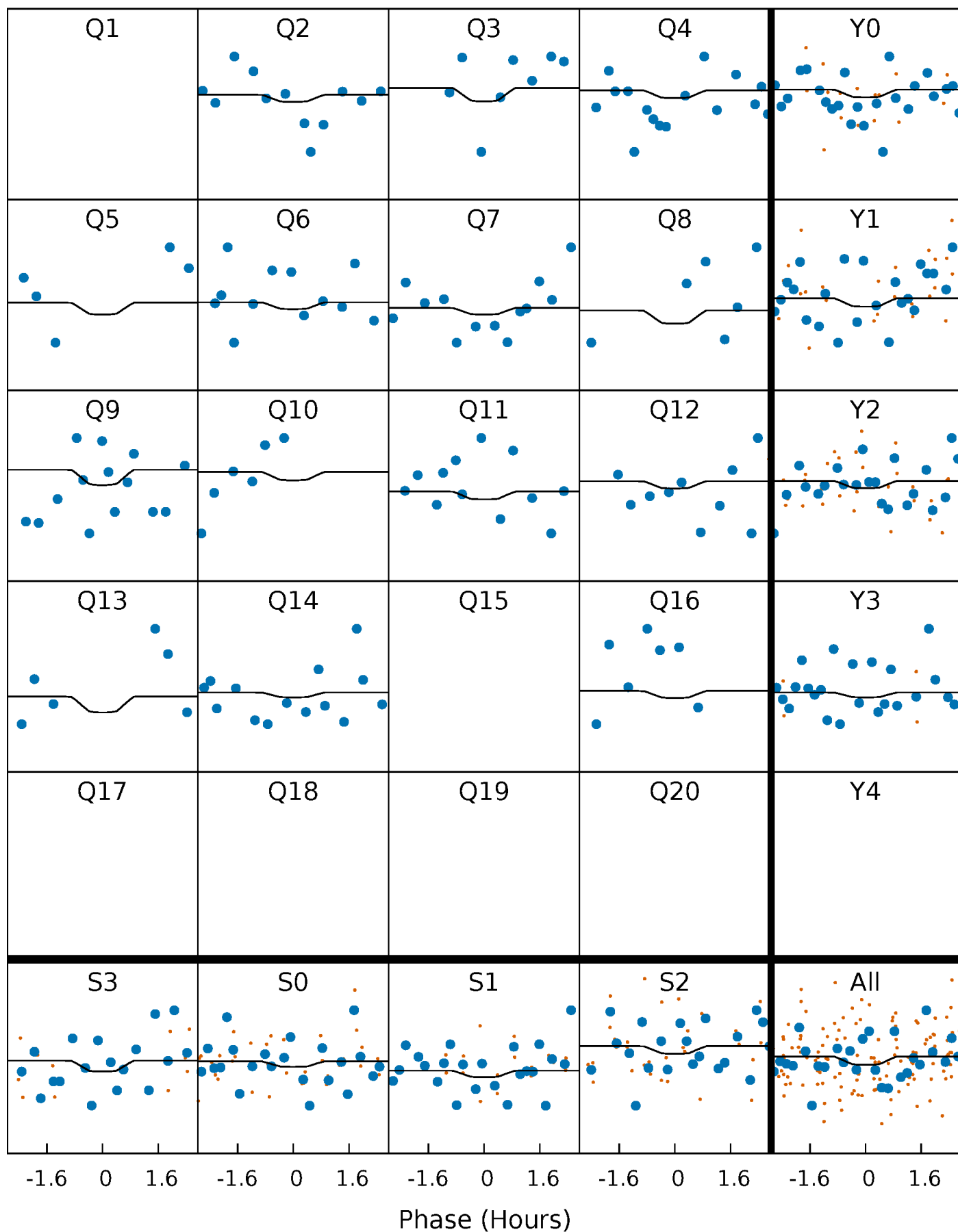
# PDC Quarter-Phased Transit Curves

TCE 009166826-03   P= 18.475152 Days    $T_0=139.191330$  (BKJD)



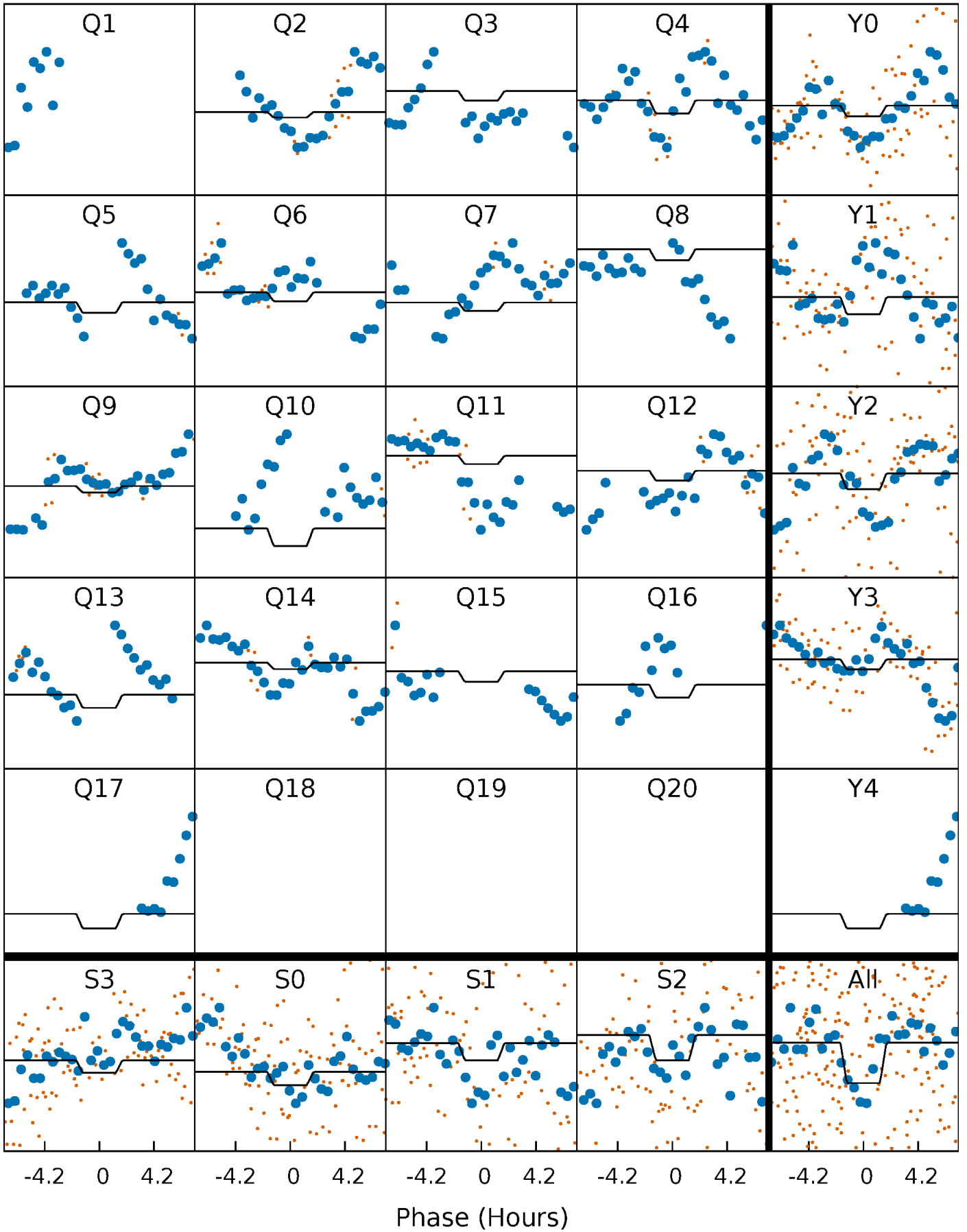
# DV Quarter-Phased Transit Curves

TCE 009166826-03 P= 18.475152 Days  $T_0=139.191330$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

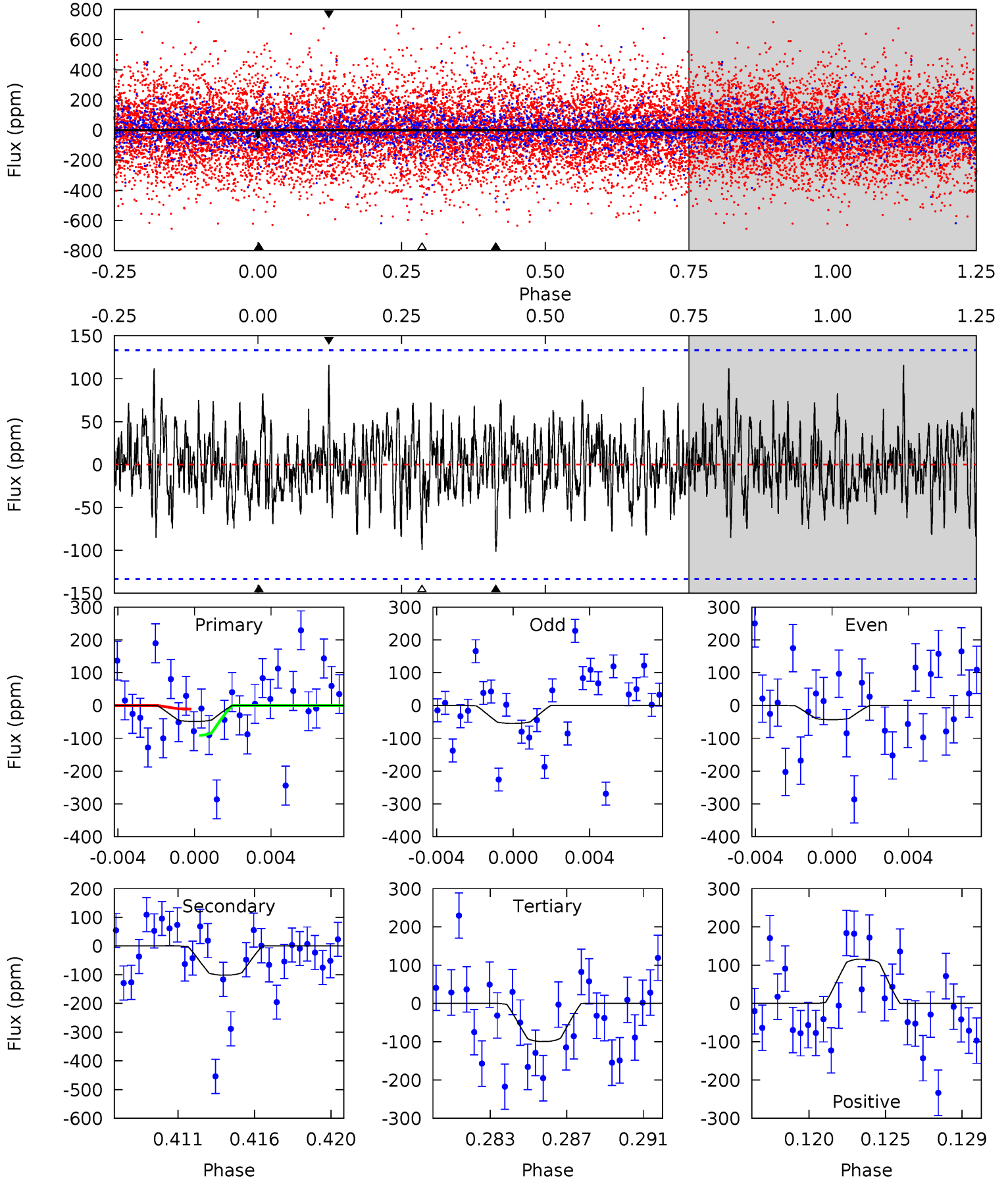
TCE 009166826-03 P= 18.475457 Days  $T_0=139.187300$  (BKJD)



# DV Model-Shift Uniqueness Test

009166826-03,  $P = 18.475152$  Days,  $E = 120.716178$  Days

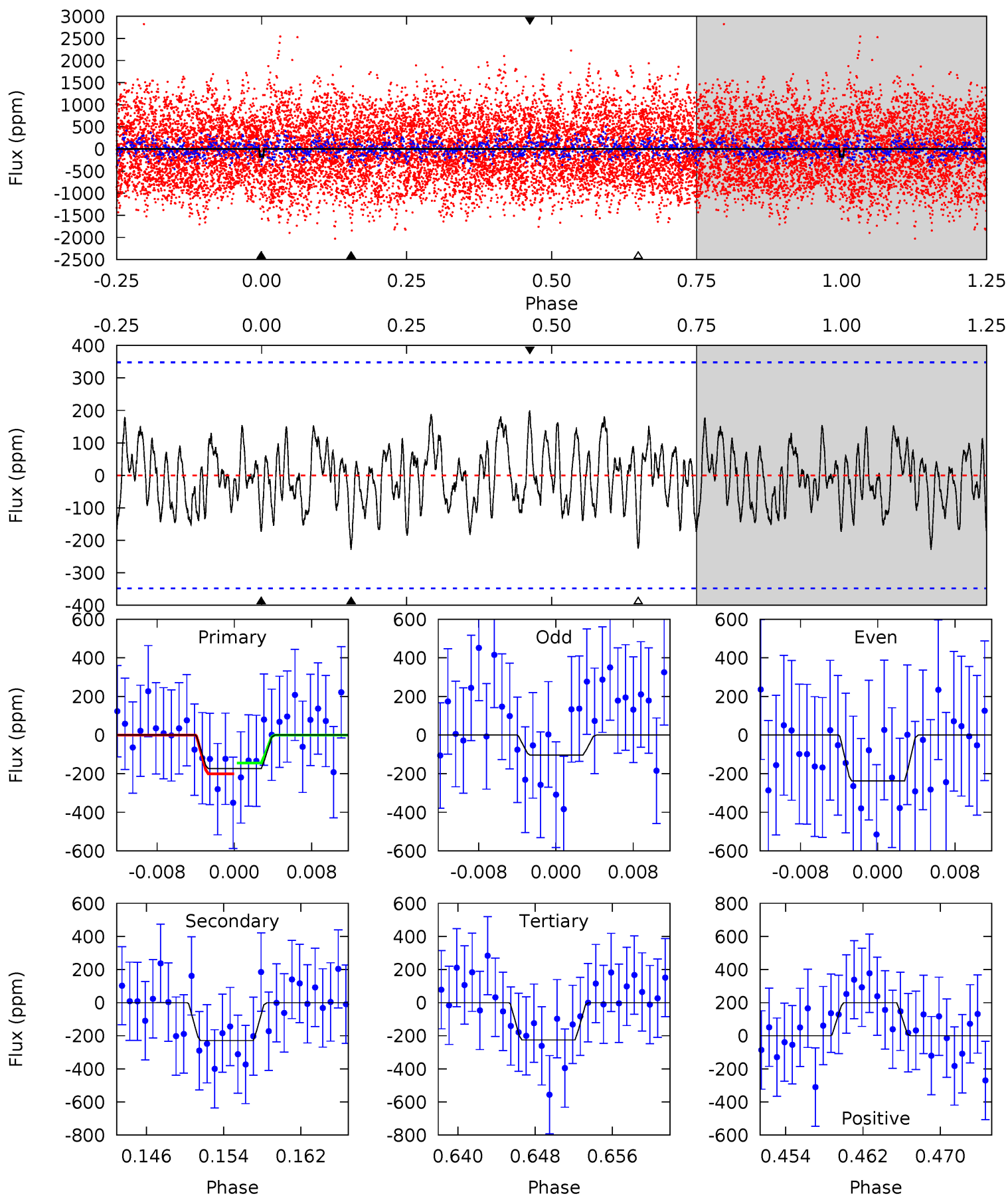
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.90 | 3.96 | 3.88 | 4.51 | 5.19            | 2.87            | 1.21             | -1.98   | -2.62   | 0.08    | -0.56   | 0.22    | 0.28 | 0.53  | 1.58 |



# Alt Model-Shift Uniqueness Test

009166826-03, P = 18.475457 Days, E = 120.711843 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 2.53 | 3.34 | 3.28 | 2.91 | 5.07            | 2.65            | 1.19             | -0.75   | -0.37   | 0.05    | 0.43    | 0.97    | 0.34 | 0.47  | 0.41 |





### Stellar Parameters For KIC 009166826

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $7261^{+228}_{-343}$ | $4.245^{+0.060}_{-0.225}$ | $0.210^{+0.150}_{-0.400}$ | $1.570^{+0.580}_{-0.193}$ | $1.591^{+0.211}_{-0.211}$ | $0.579^{+0.184}_{-0.323}$                 |
|        | +3%/-5%              | +1%/-5%                   | +71%/-190%                | +37%/-12%                 | +13%/-13%                 | +32%/-56%                                 |
| 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 009166826-03 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$       | $T_{obs} (K)$          | $A_{obs}$            |
|---------|---------------|------------------------|---------------------|------------------------|----------------------|
| DV      | $-102 \pm 26$ | $2.52^{+2.42}_{-1.76}$ | $1433^{+114}_{-87}$ | $6081^{+7026}_{-1589}$ | $224^{+2022}_{-169}$ |
| Alt.    | $-229 \pm 69$ | $3.20^{+2.39}_{-2.16}$ | $1427^{+116}_{-81}$ | $6610^{+7499}_{-1659}$ | $304^{+2333}_{-213}$ |

$T_{max}$  = 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

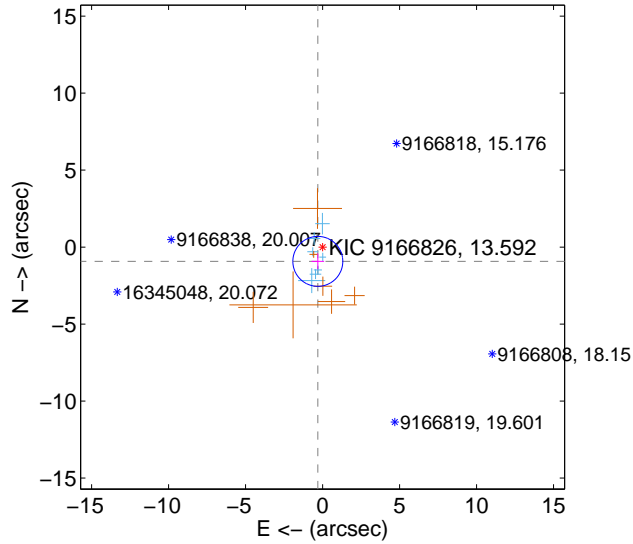
Supplemental centroid analysis for 009166826-03. Kepler magnitude: 13.59. Transit SNR 1.41

There are 7 quarters with good PRF difference image offsets

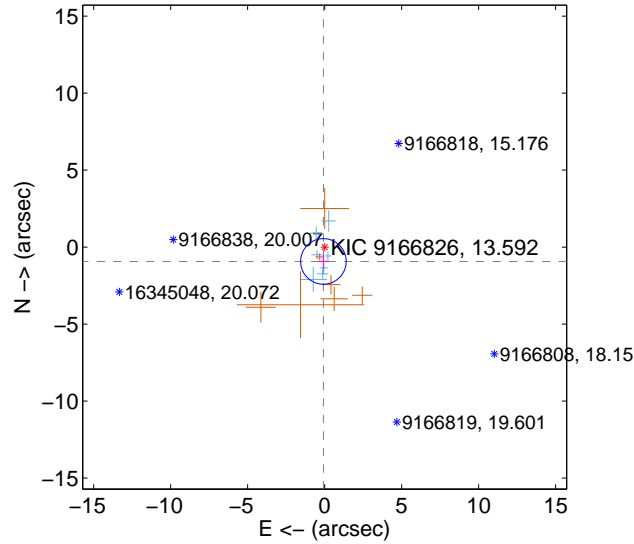
The direct PRF centroid is offset from the target star catalog position by about 0.32 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.977 \pm 0.541$  | 1.81                | $0.309 \pm 0.409$ | $-0.927 \pm 0.513$ |
| PRF-fit source offset from KIC position | $0.934 \pm 0.493$  | 1.89                | $0.081 \pm 0.379$ | $-0.930 \pm 0.490$ |
| photometric centroid source offset      | $3.86 \pm 3.08$    | 1.25                | $0.64 \pm 2.83$   | $-3.81 \pm 3.09$   |

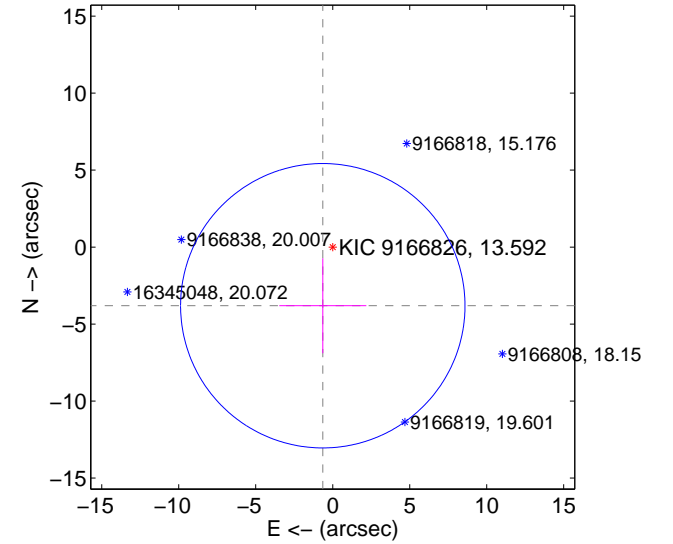
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

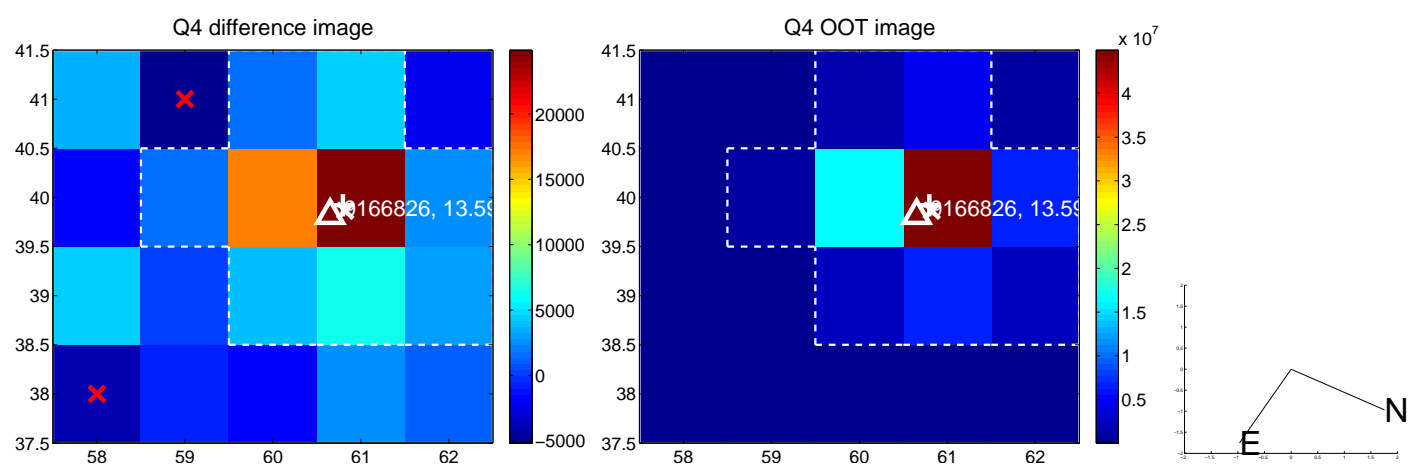
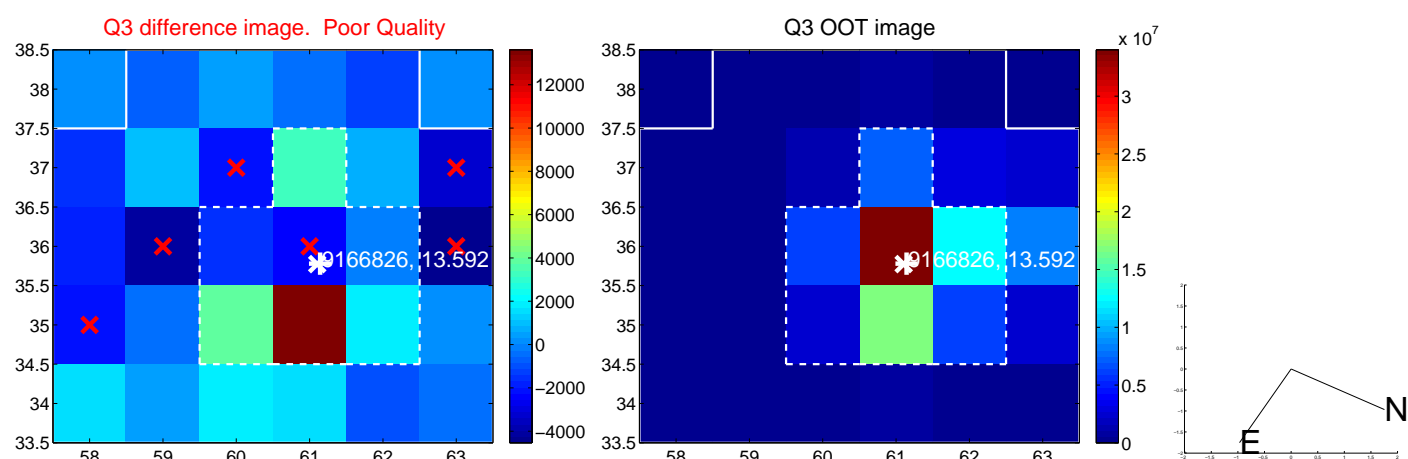
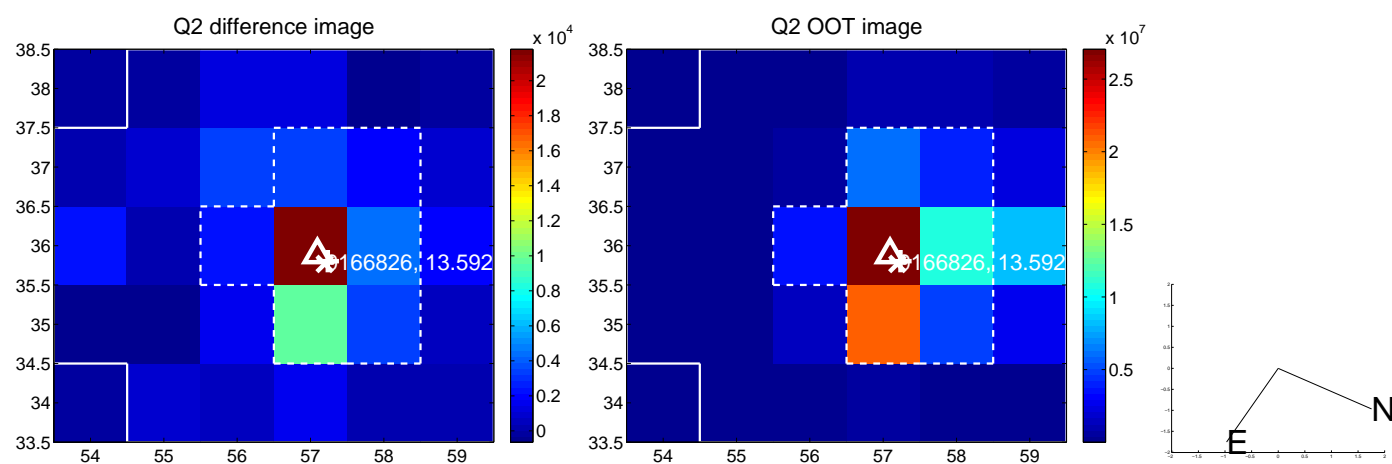
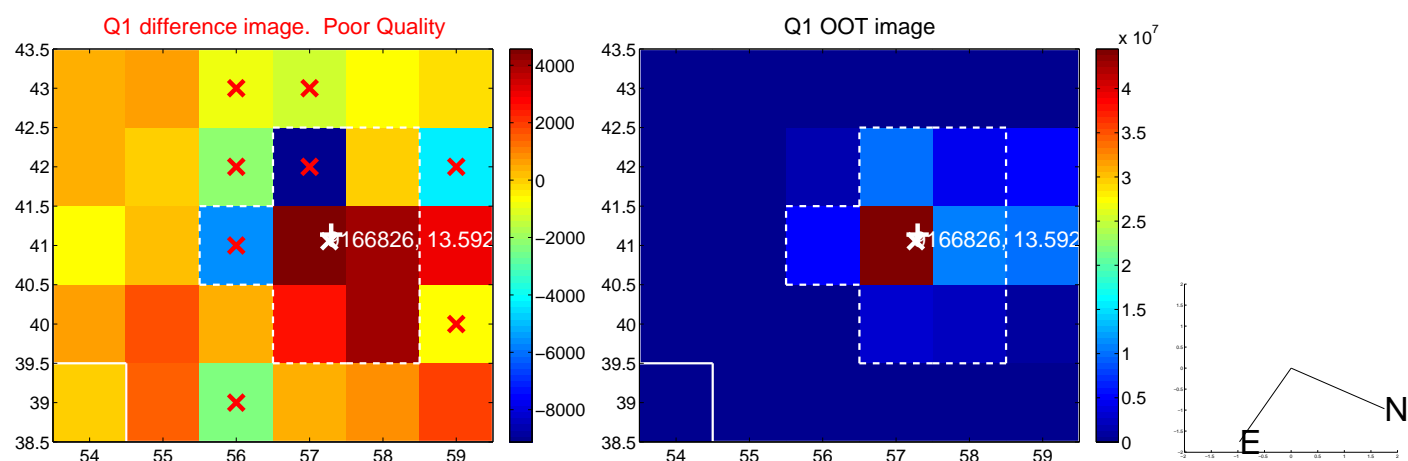


offset from photometric centroids

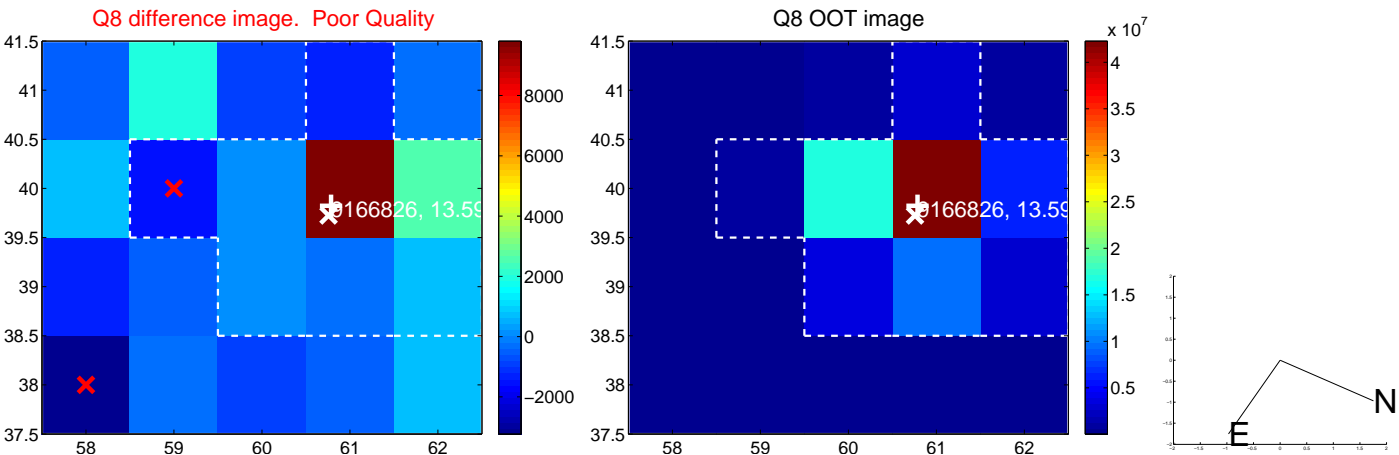
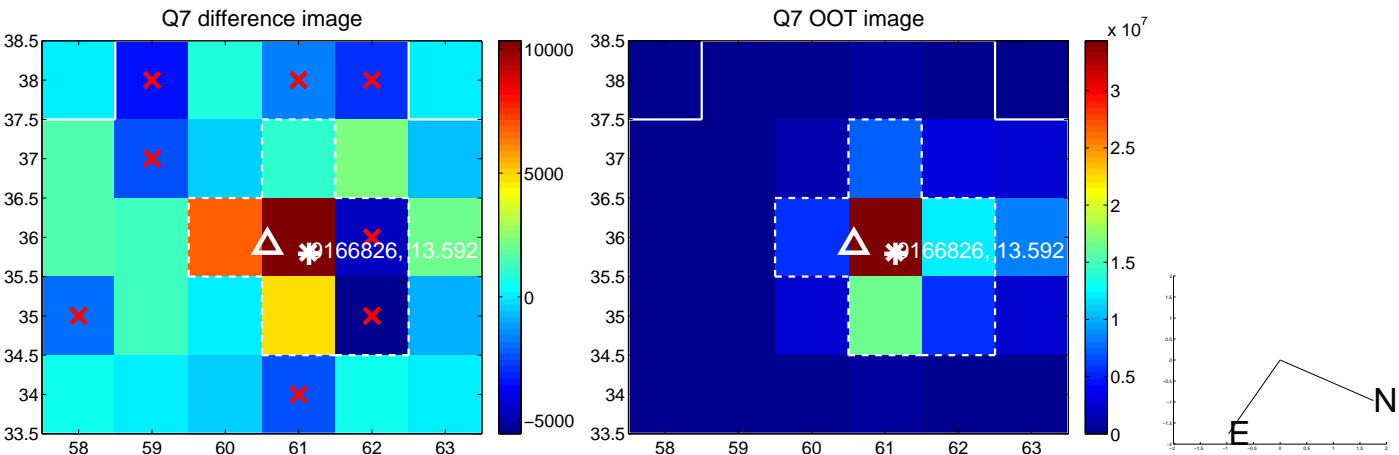
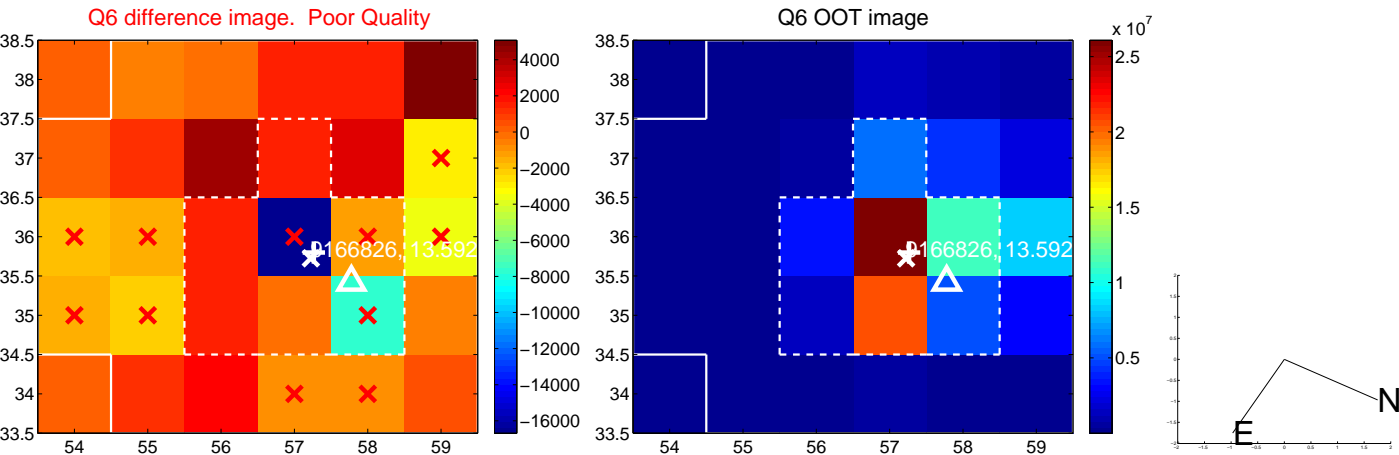
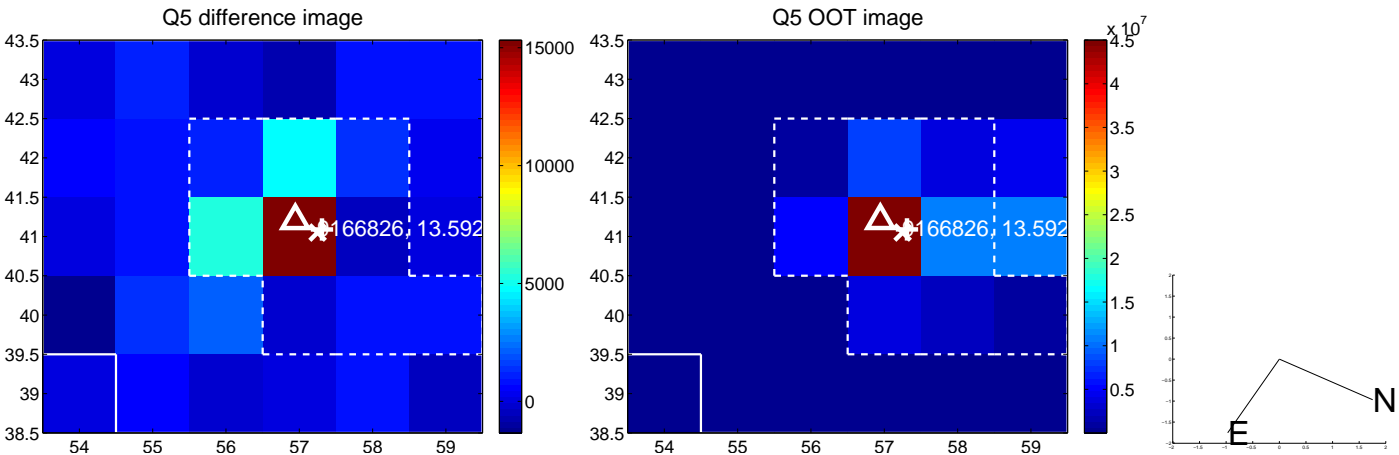


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

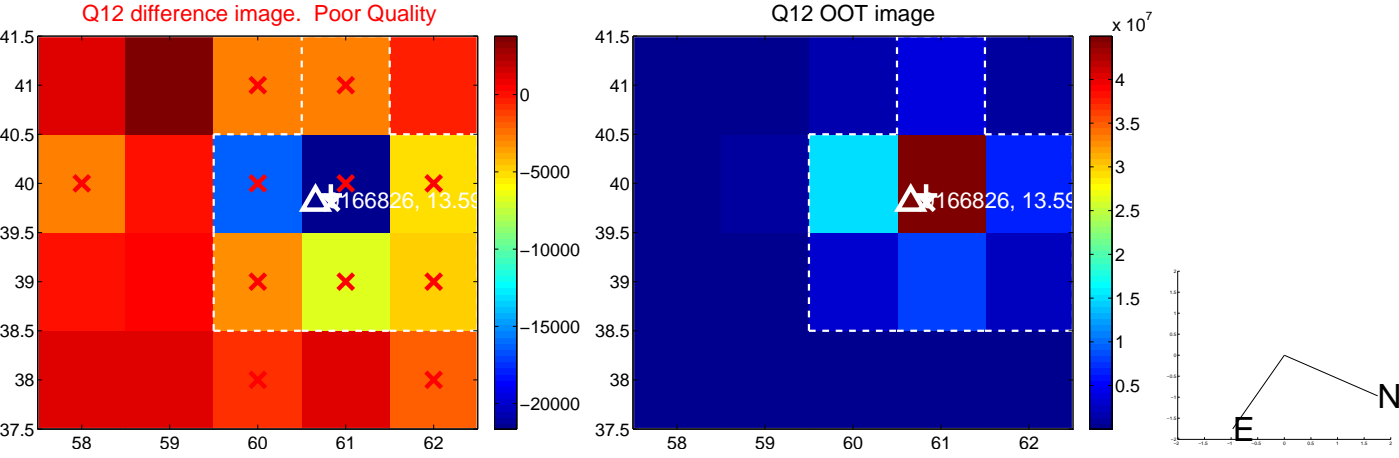
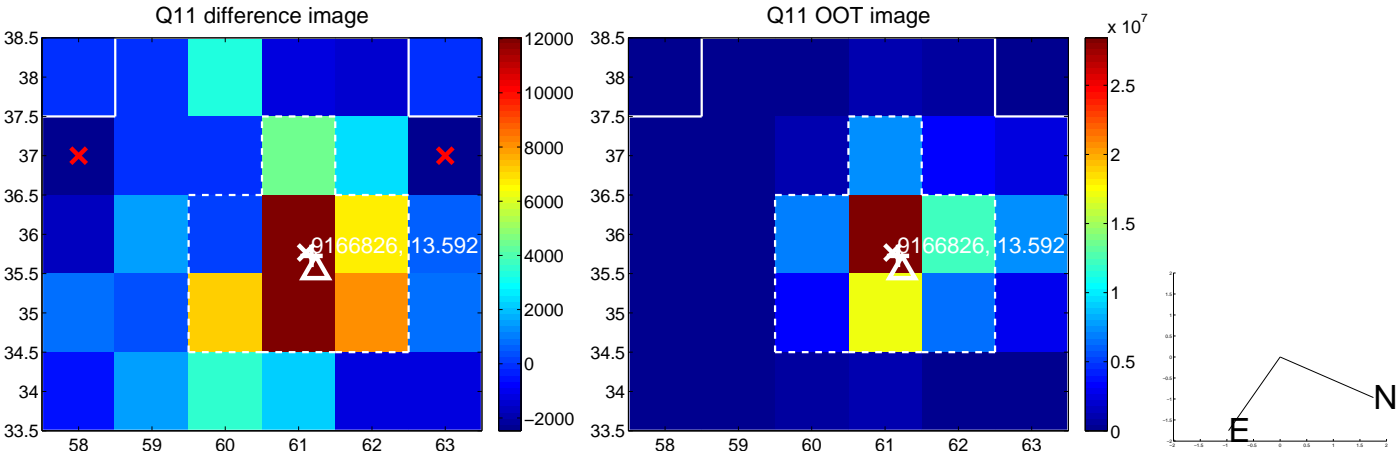
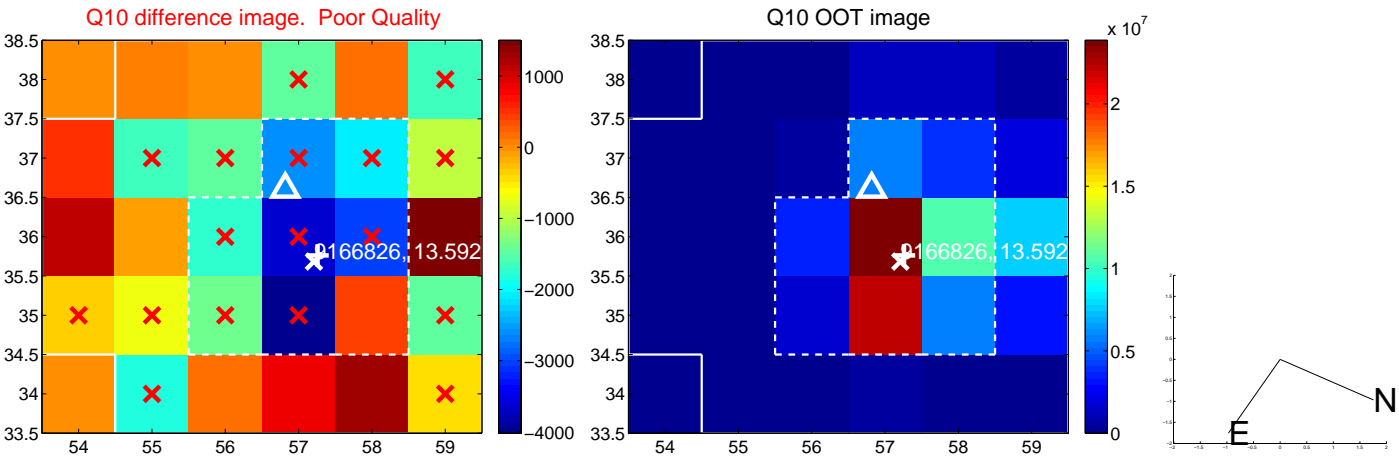
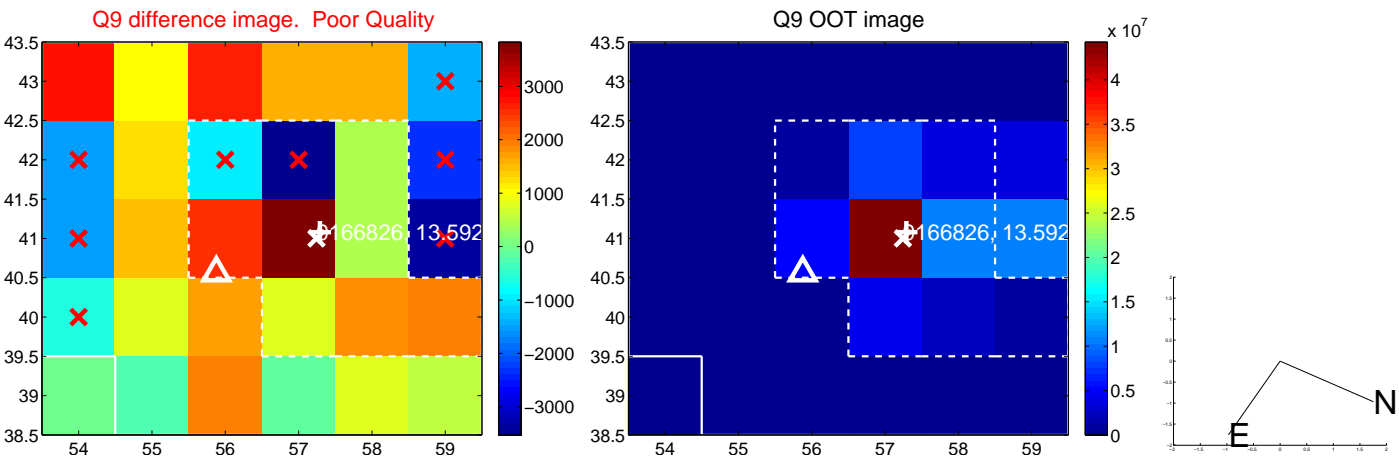
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

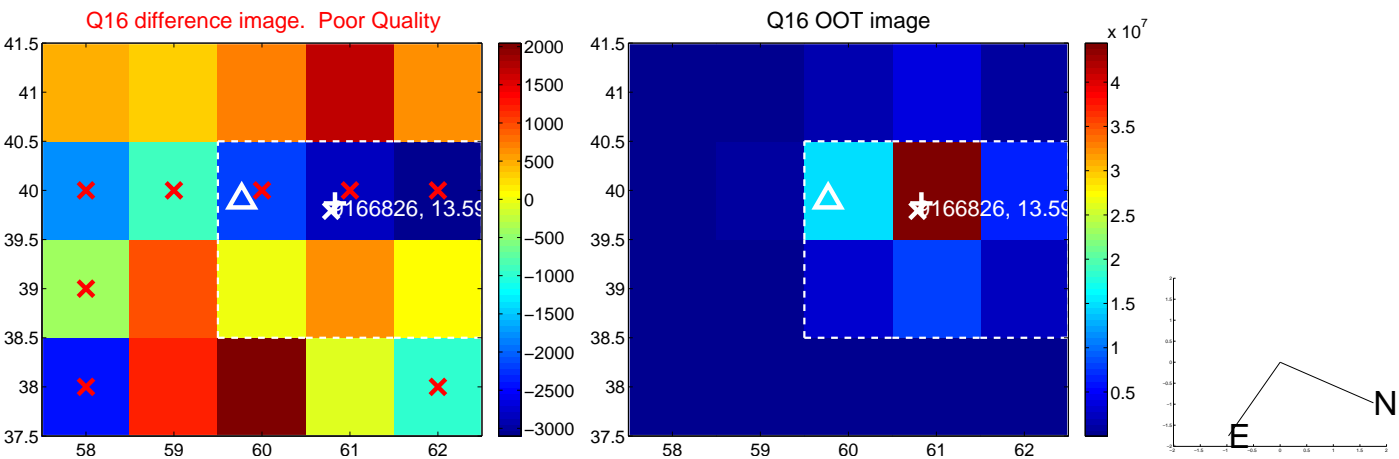
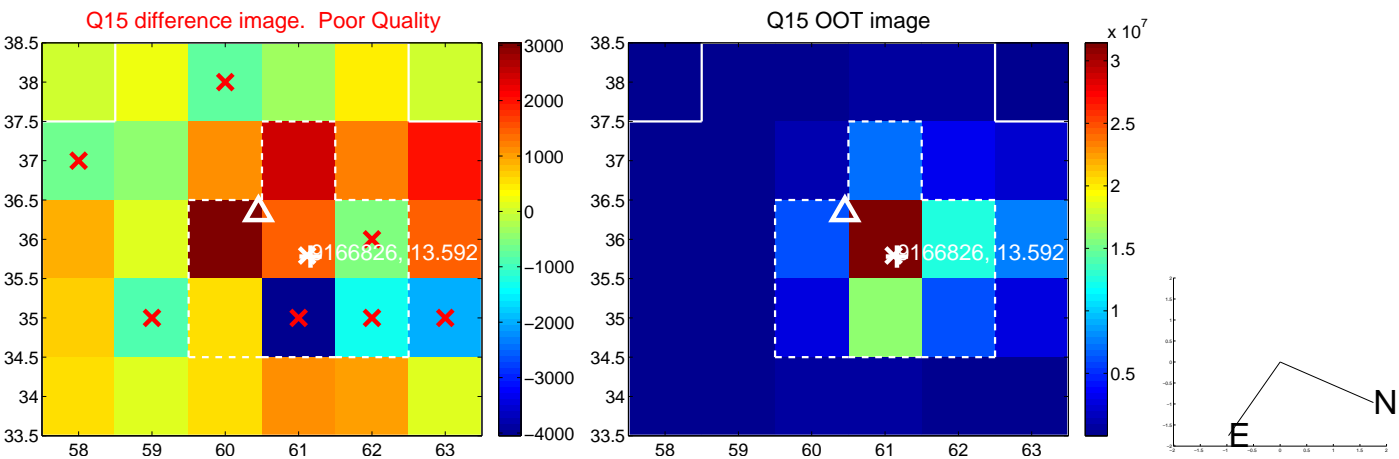
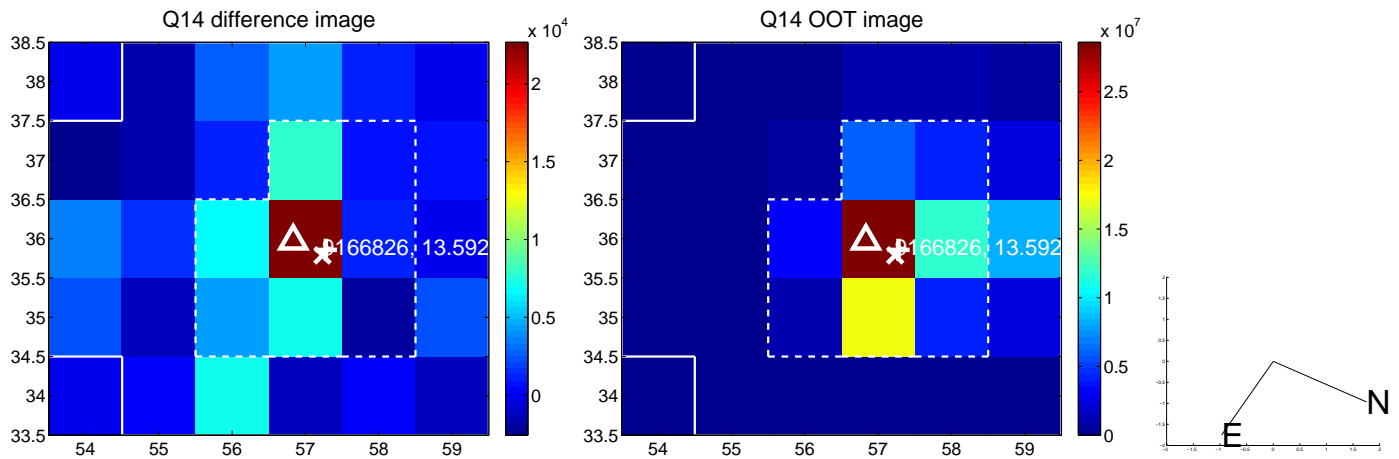
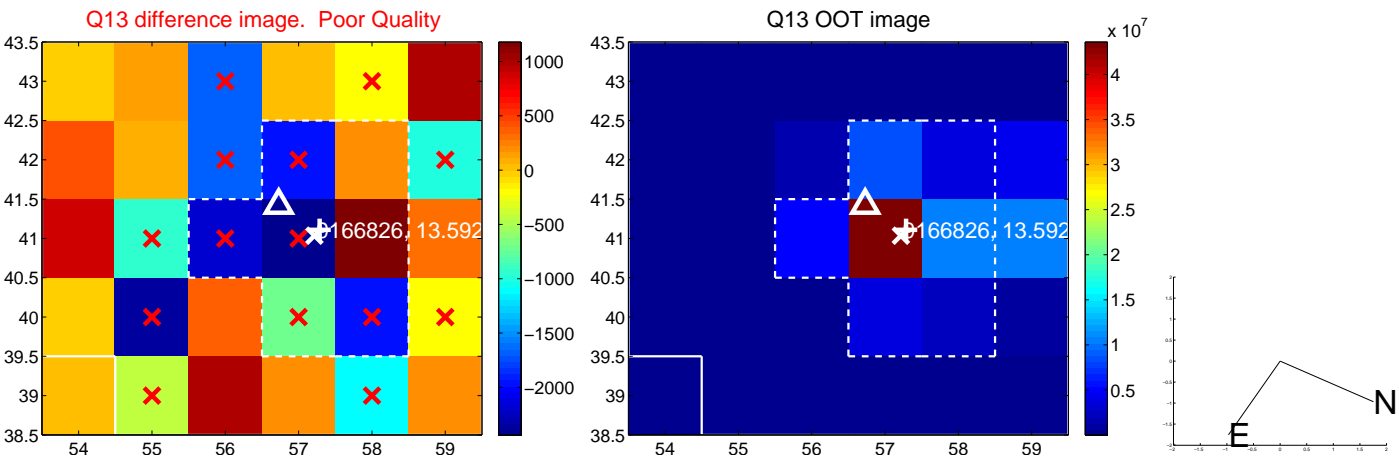


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

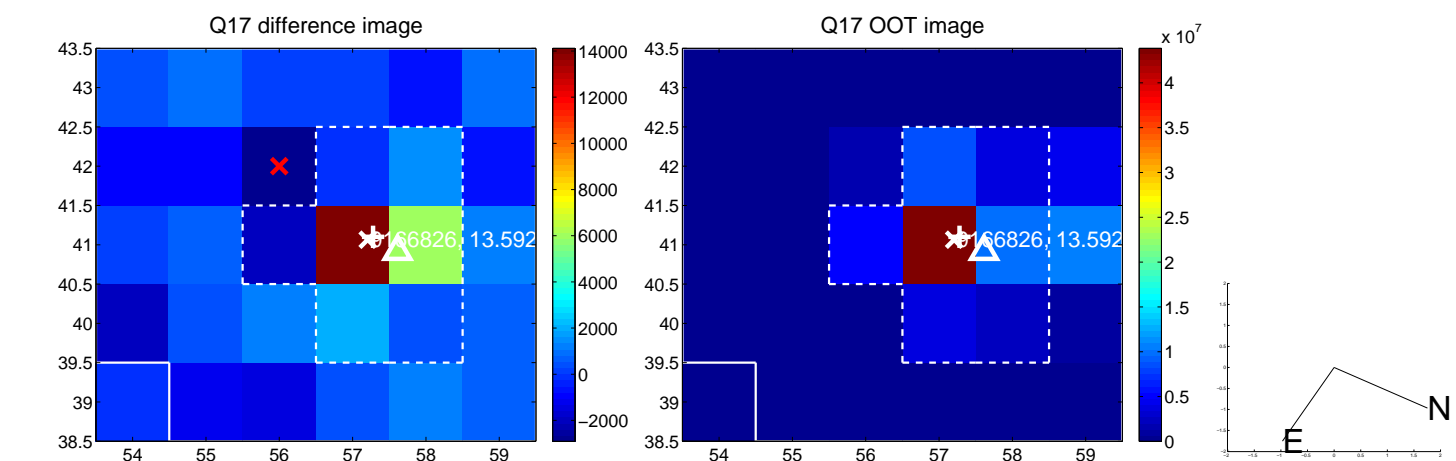




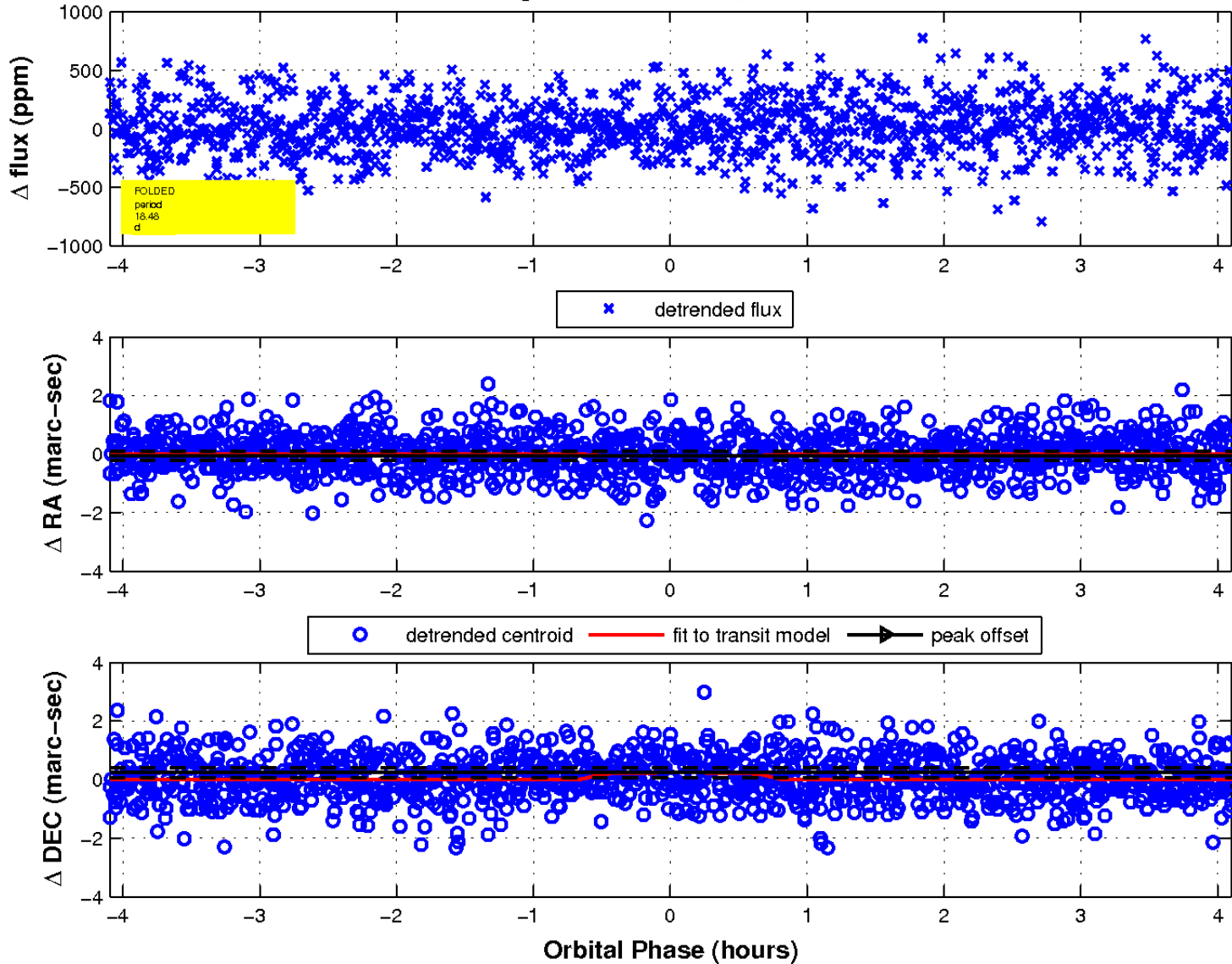
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



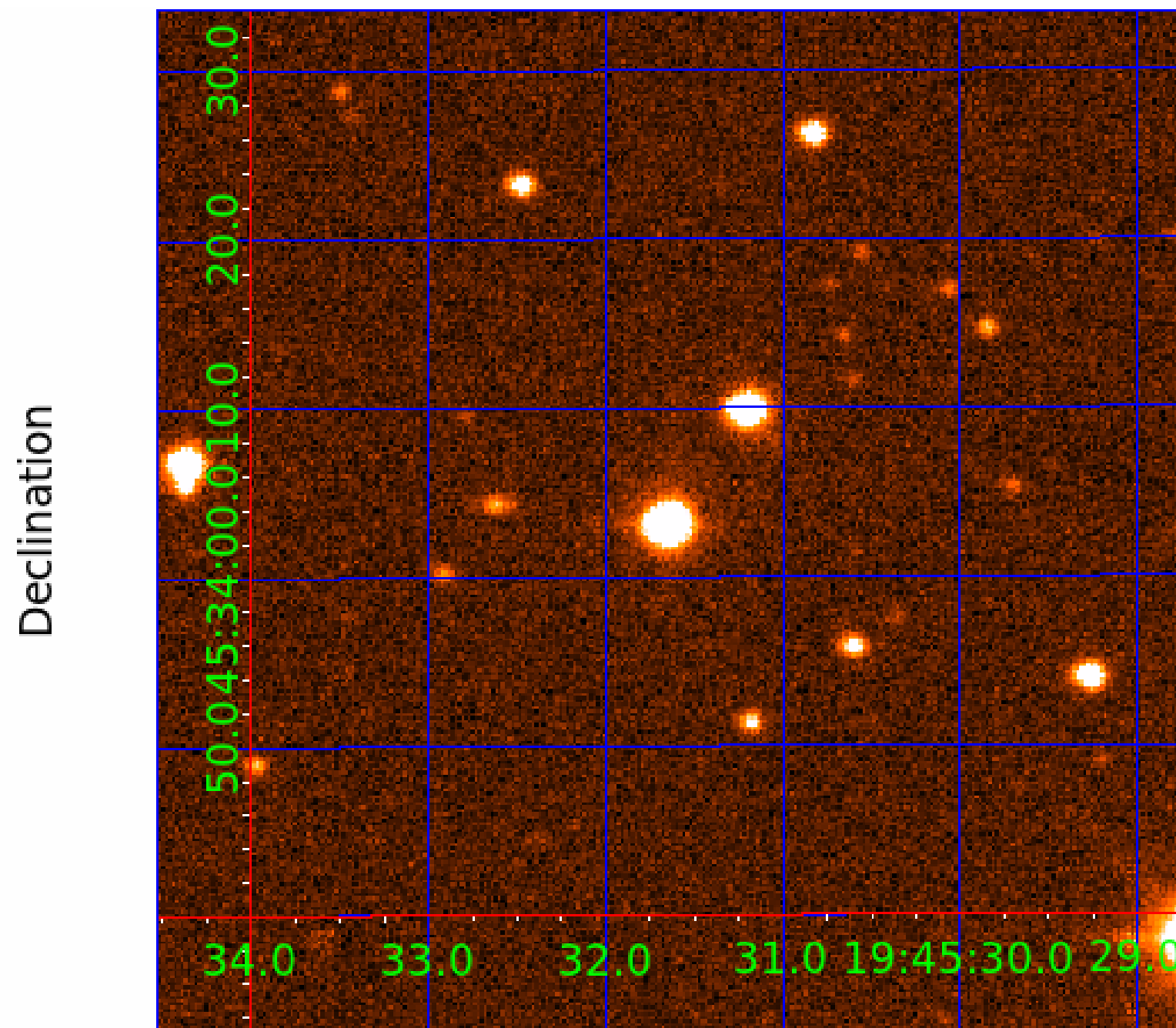
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 3 of 7



UKIRT Image



# KIC 009166826

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009166826-01 | OBS      | No   | 1.105096      | 132.364571   | 32.2        | 3.666            | 10.2 | 8.4  | 1.57                        | 7261            | 0.98                   | 10334.27               |
| 009166826-02 | OBS      | No   | 1.105092      | 131.627107   | 24.5        | 4.563            | 10.6 | 6.9  | 1.57                        | 7261            | 0.83                   | 10334.32               |
| 009166826-03 | OBS      | No   | 18.475152     | 139.191330   | 54.8        | 1.368            | 8.4  | 1.4  | 1.57                        | 7261            | 1.33                   | 241.75                 |
| 009166826-04 | OBS      | No   | 18.475735     | 139.518855   | 71.3        | 2.308            | 8.5  | 2.3  | 1.57                        | 7261            | 1.53                   | 241.74                 |
| 009166826-05 | OBS      | No   | 44.304722     | 146.120989   | 282.3       | 4.500            | 8.0  | -1.0 | 1.57                        | 7261            | 2.67                   | 75.31                  |
| 009166826-06 | OBS      | No   | 47.695013     | 172.383956   | 274.8       | 4.358            | 7.3  | 6.5  | 1.57                        | 7261            | 2.83                   | 68.26                  |
| 009166826-07 | OBS      | No   | 74.722951     | 142.333969   | 266.5       | 4.500            | 7.5  | -1.0 | 1.57                        | 7261            | 2.60                   | 37.52                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 009166826-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009166826-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—SAME_NTL_PERIOD  |
| 009166826-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT      |
| 009166826-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD |
| 009166826-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS  |
| 009166826-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT   |
| 009166826-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS   |

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

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

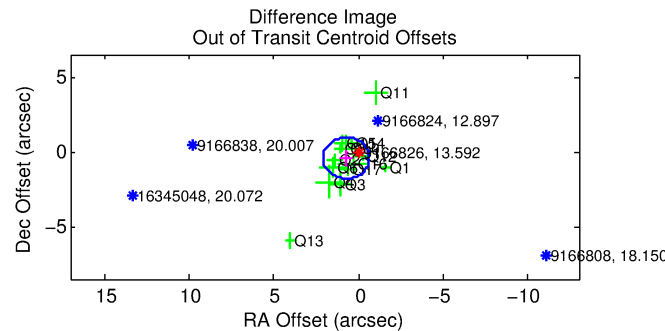
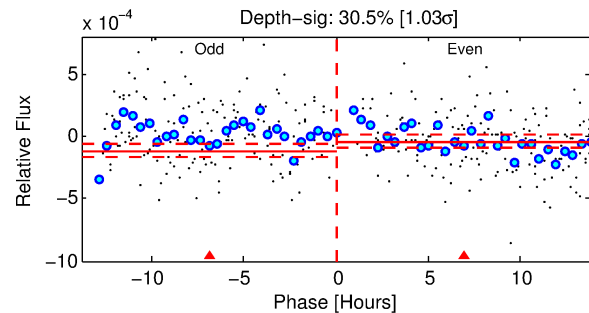
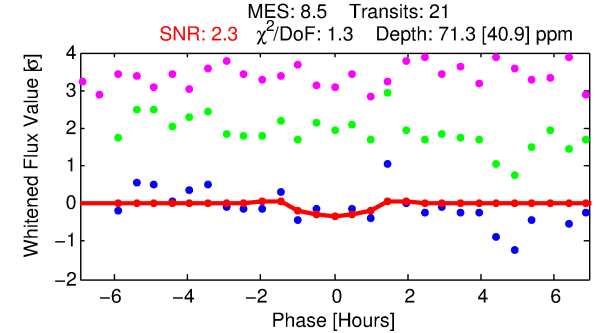
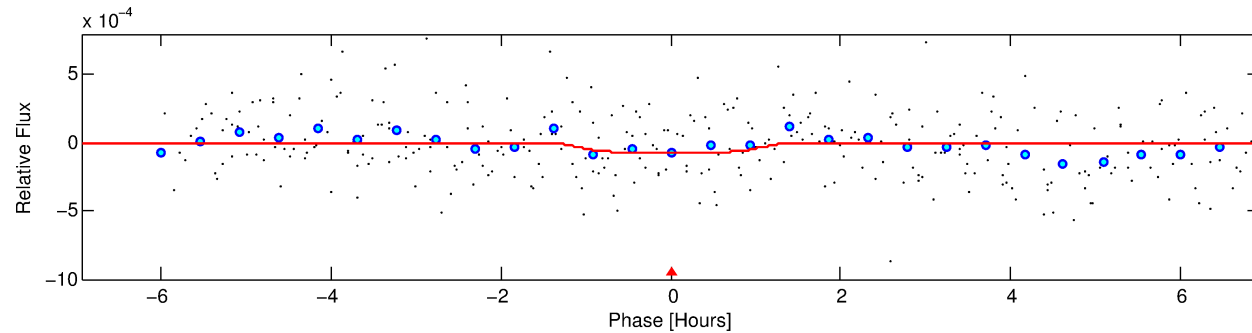
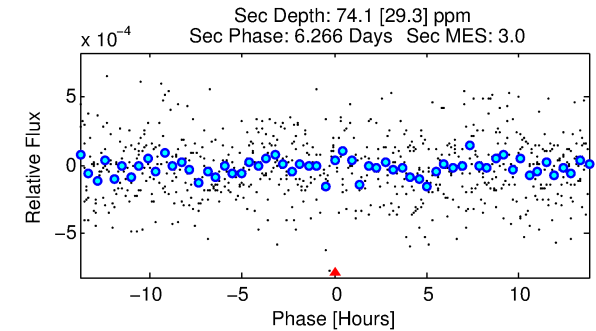
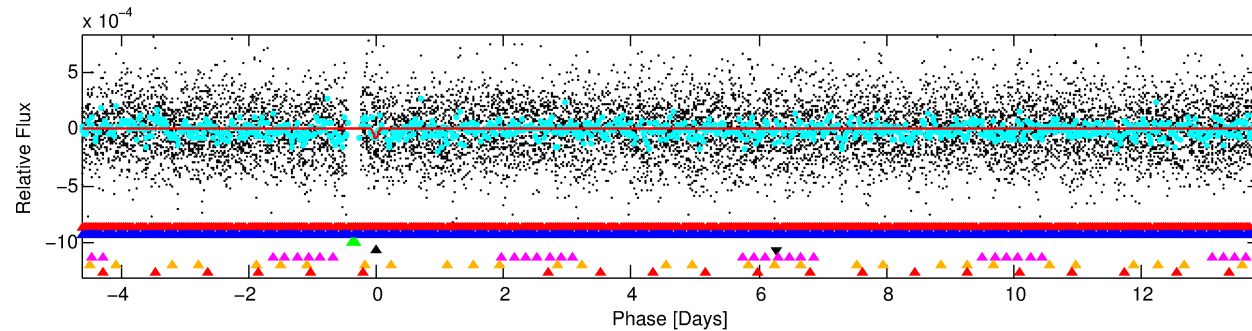
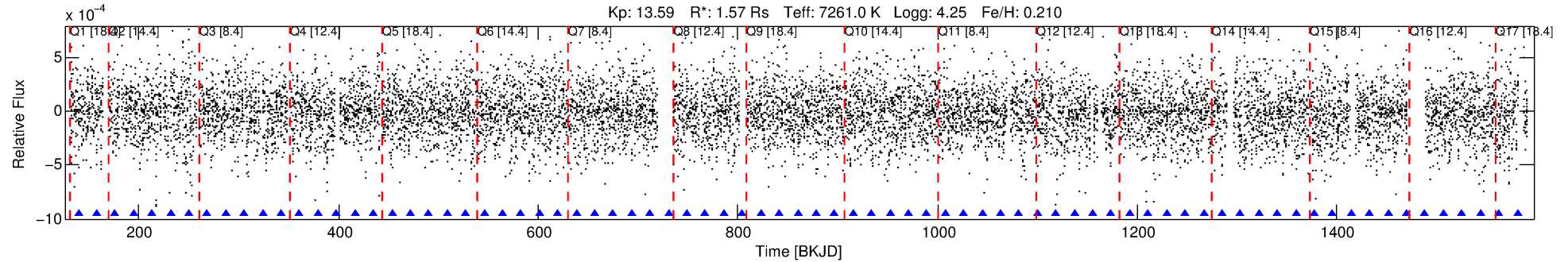
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009166826-04

No Significant Match Found

# DV One-Page Summary

KIC: 9166826 Candidate: 4 of 7 Period: 18.476 d



## DV Fit Results:

Period = 18.47573 [0.00060] d  
Epoch = 139.5189 [0.0271] BKJD  
Rp/R\* = 0.0089 [0.0190]  
a/R\* = 28.56 [375.31]  
b = 0.89 [2.98]  
Seff = 241.74 [112.26]  
Teq = 1005 [117] K  
Rp = 1.53 [3.31] Re  
a = 0.1594 [0.0479] AU  
Ag = 440.99 [1894.34] [0.23σ]  
Teffp = 7124 [7620] K [0.80σ]

## DV Diagnostic Results:

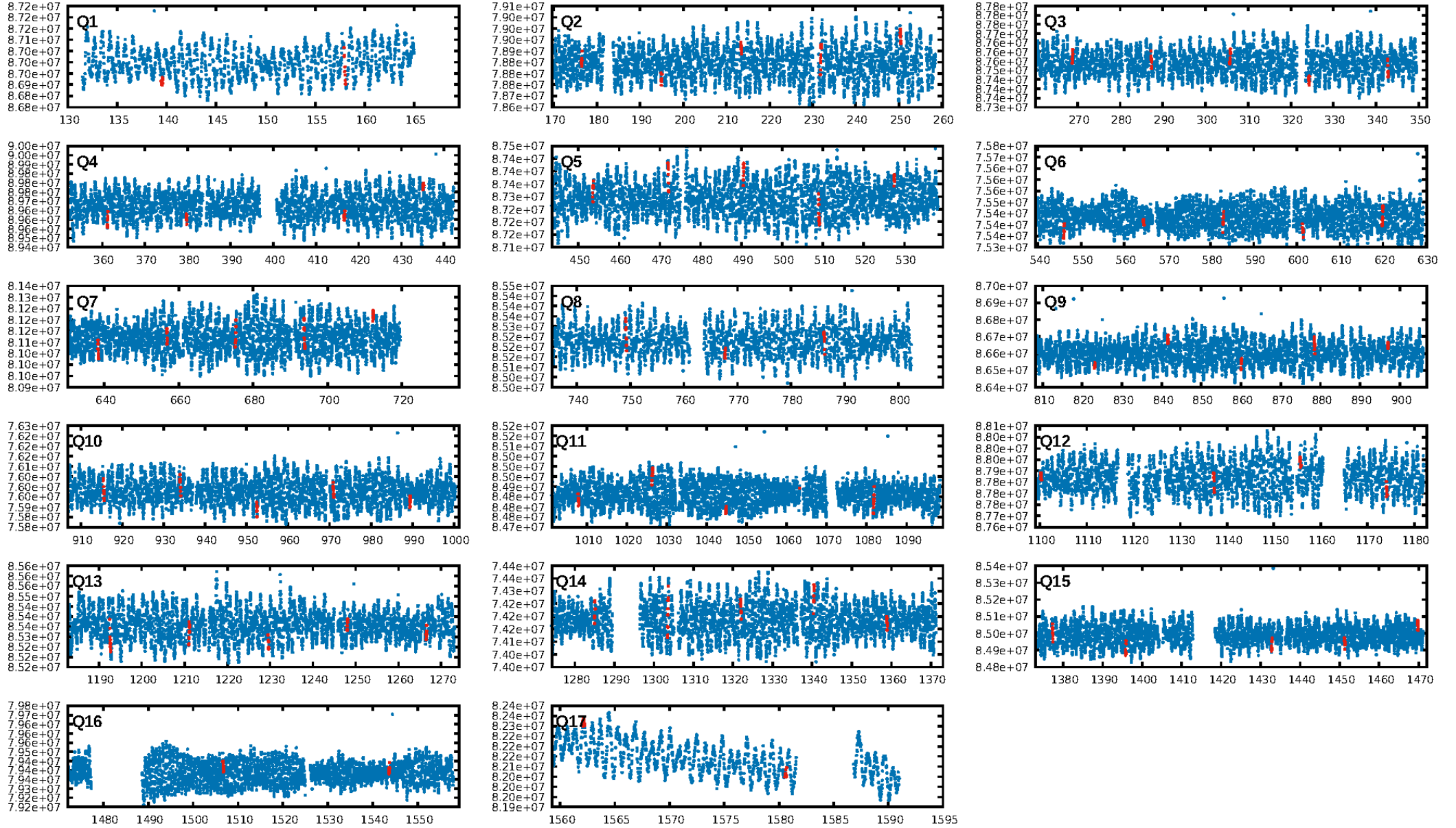
ShortPeriod-sig: 0.4% [0.01σ]  
LongPeriod-sig: 100.0% [122.57σ]  
ModelChiSquare2-sig: 1.0%  
ModelChiSquareGof-sig: 99.9%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [20/20]  
GhostDiagnostic-chr: 0.6684  
Centroid-sig: 0.0%  
Centroid-so: 4.836 arcsec [2.53σ]  
OotOffset-rm: 0.851 arcsec [1.86σ]  
KicOffset-rm: 0.639 arcsec [1.13σ]  
OotOffset-st: 4/3/3/4 [14]  
KicOffset-st: 4/3/3/4 [14]  
DiffImageQuality-fgm: 0.36 [5/14]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:03:56 Z

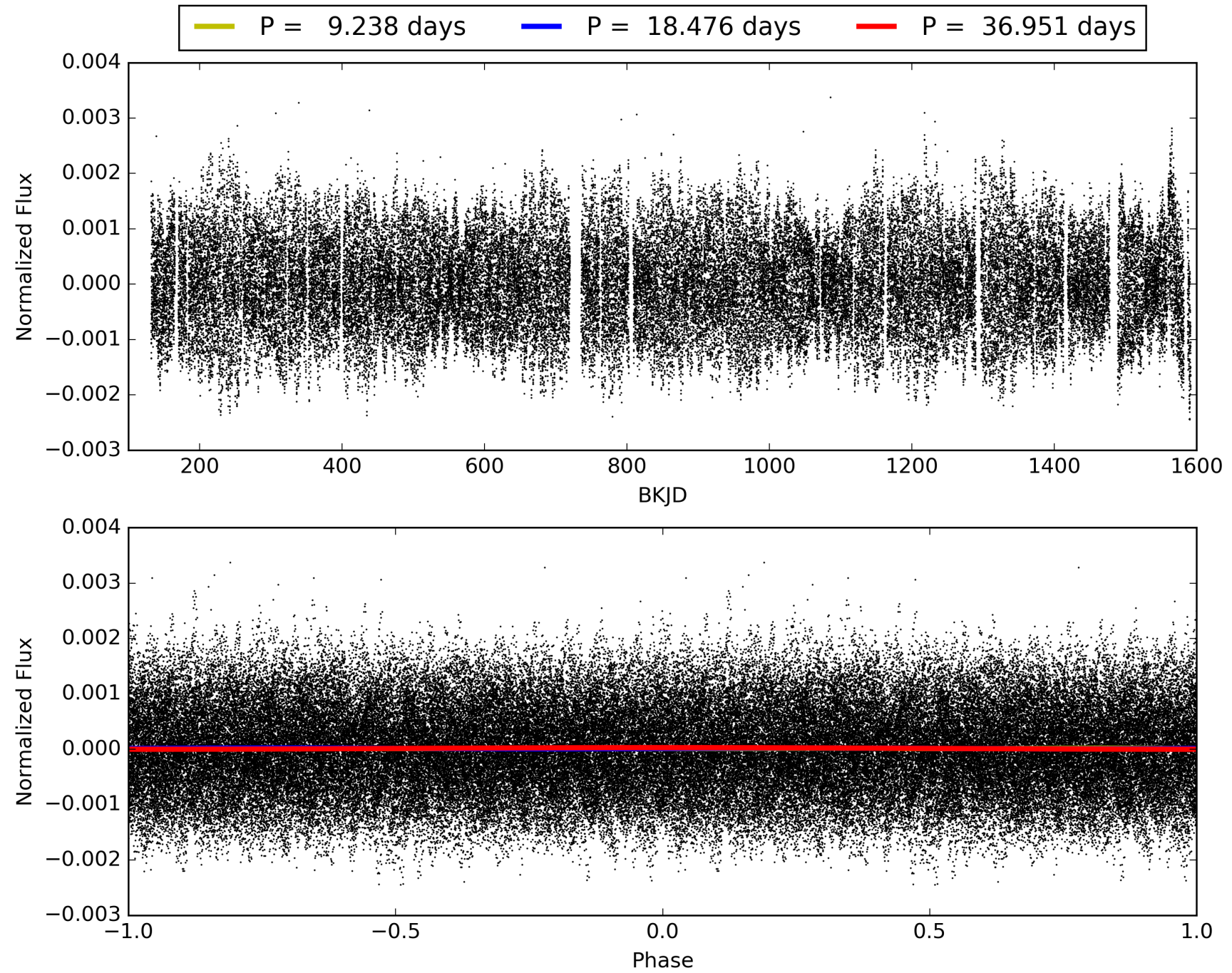
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 009166826-04, PDC Light Curves

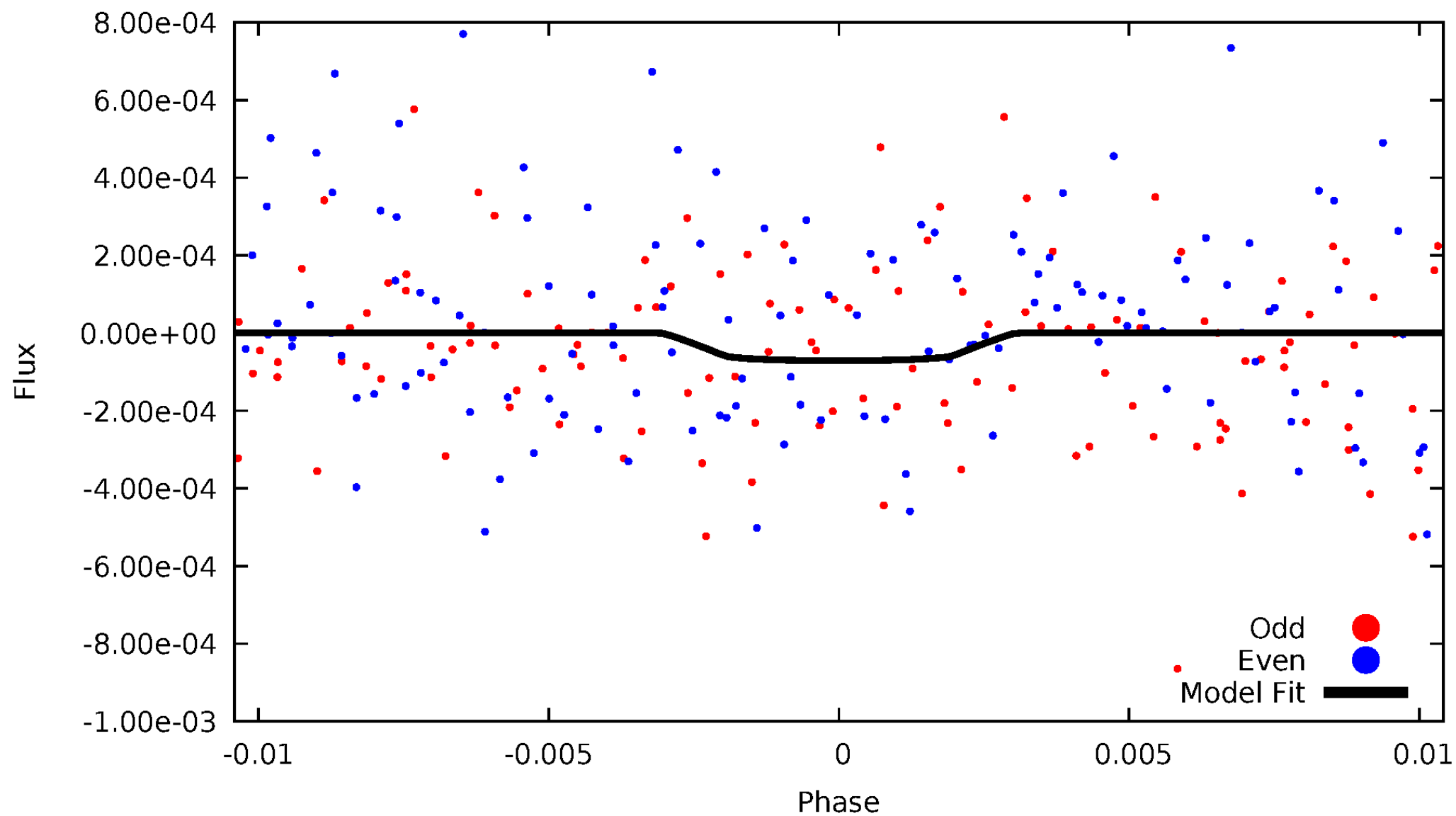


TCE 009166826-04



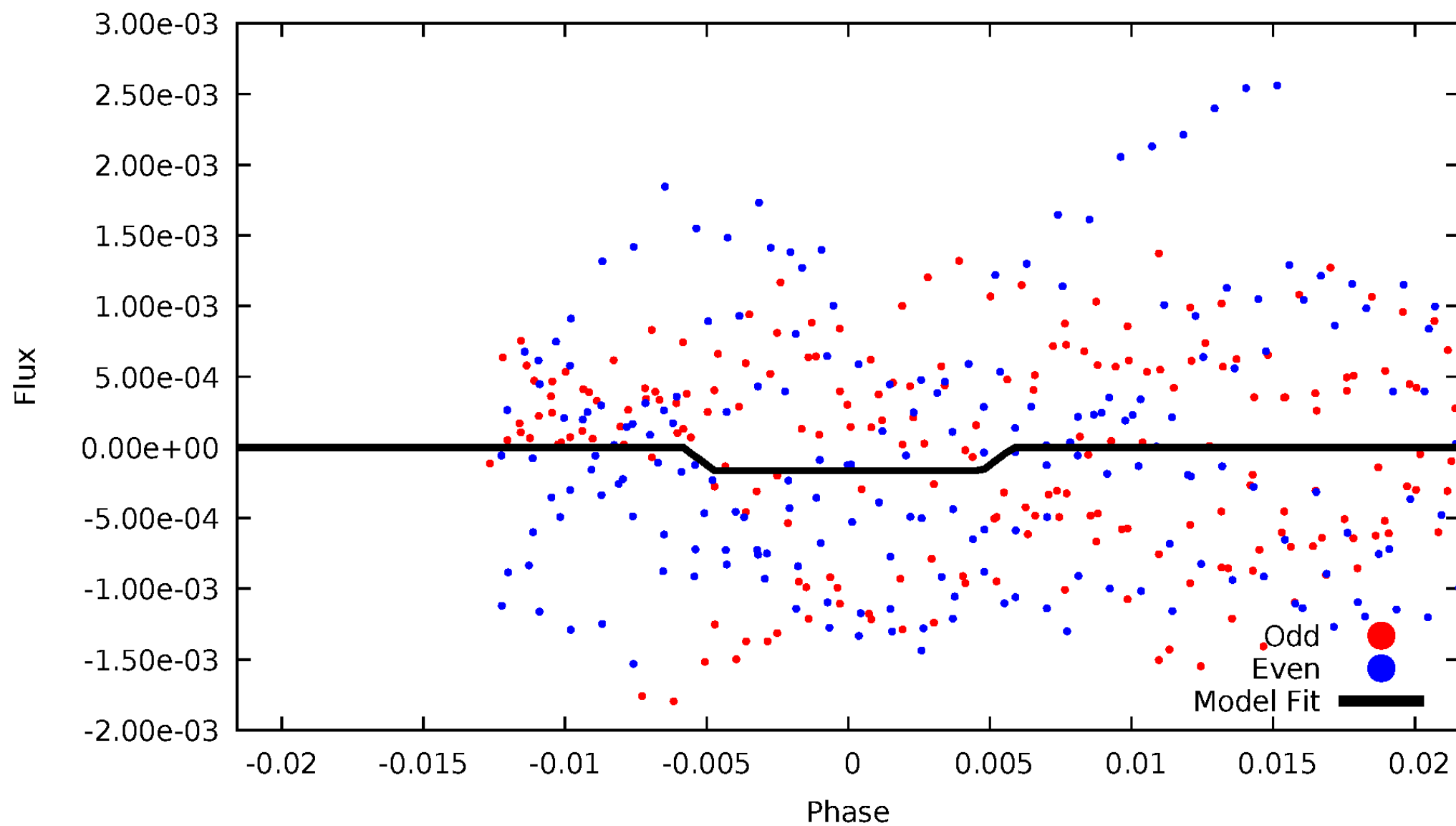
# DV Odd/Even

TCE 009166826-04



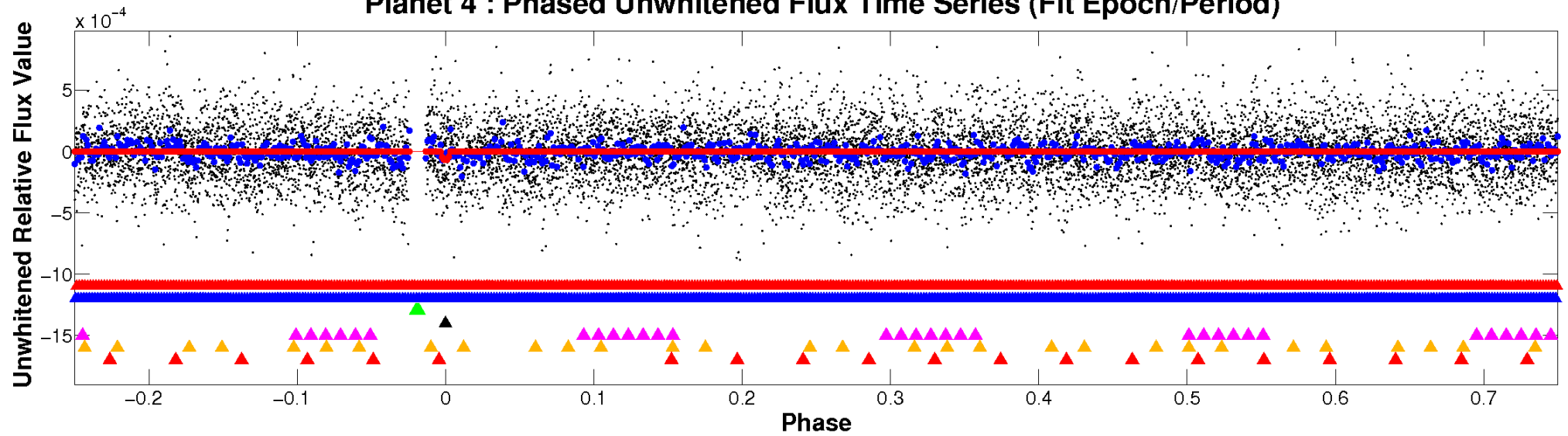
# ALT Odd/Even

TCE 009166826-04

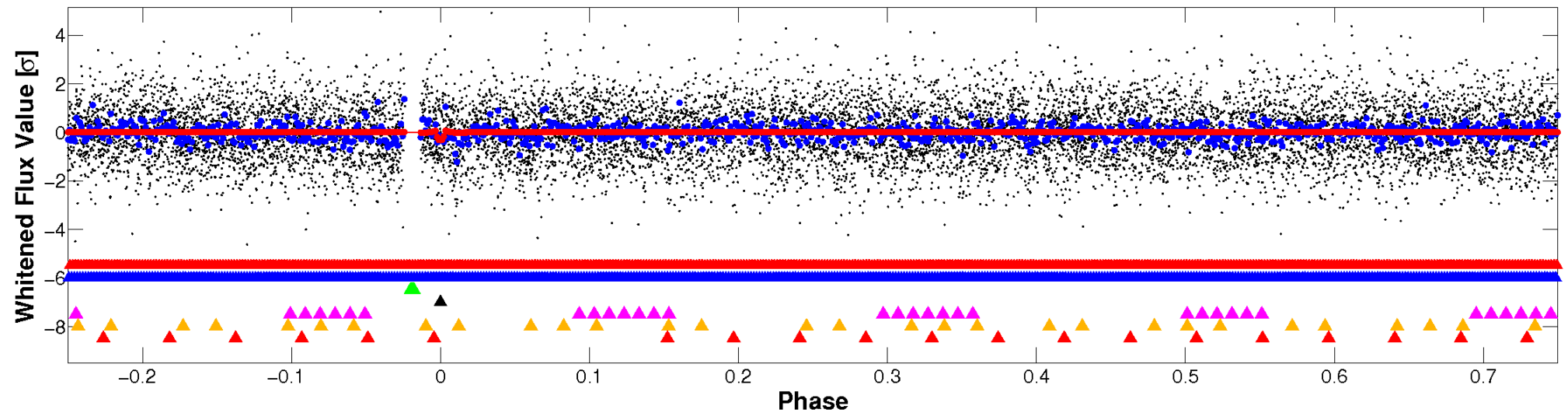


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



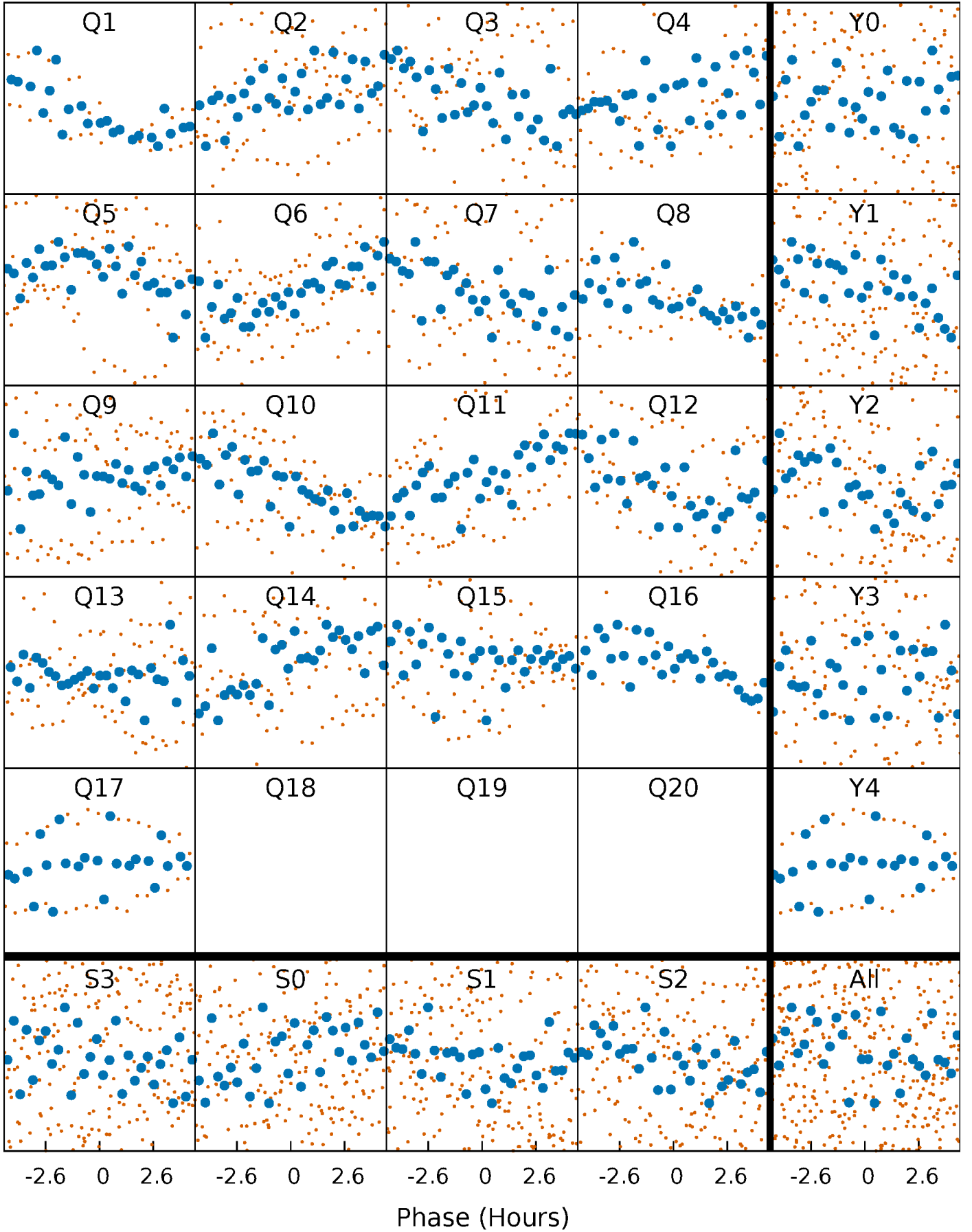
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

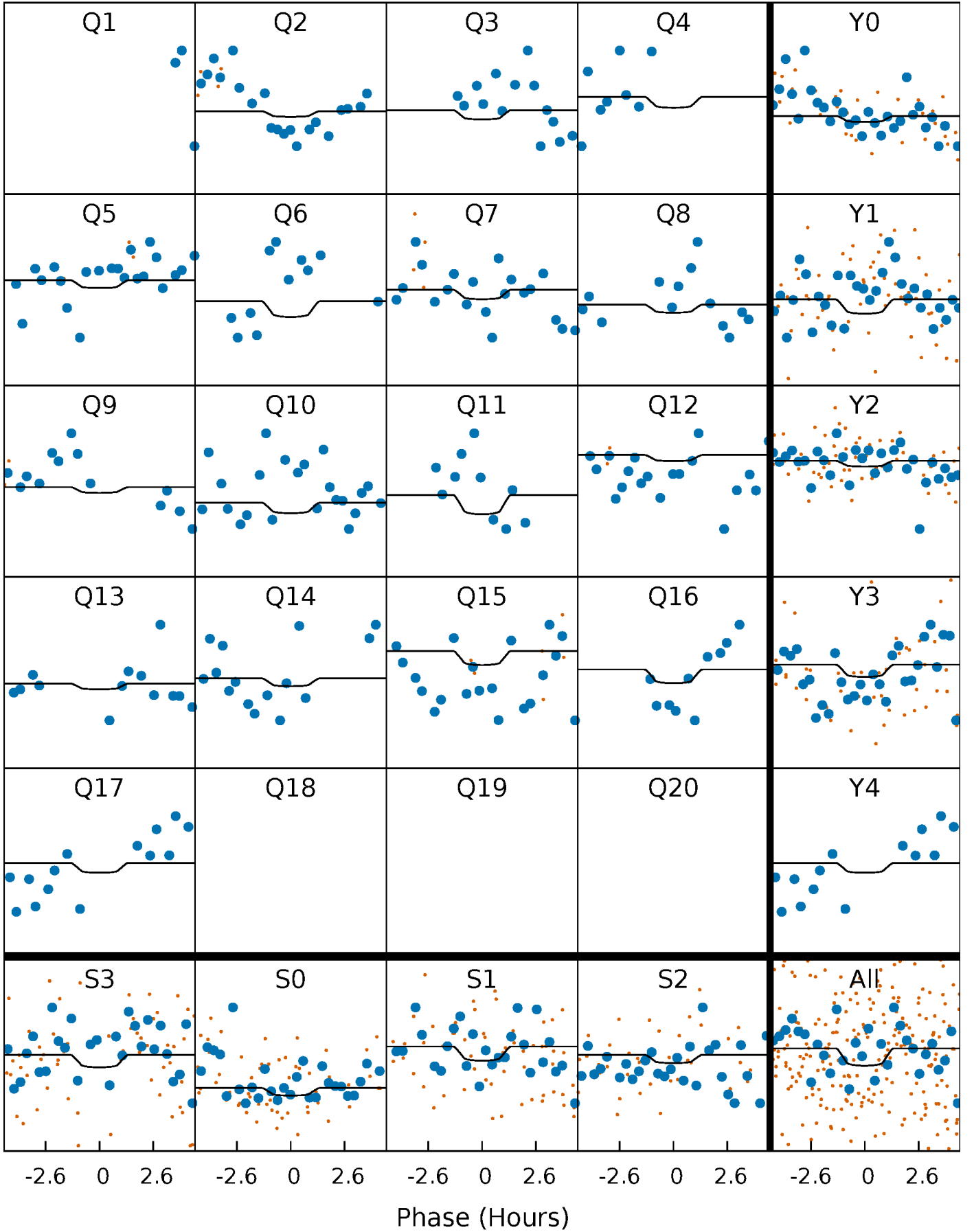
TCE 009166826-04   P= 18.475735 Days    $T_0=139.518855$  (BKJD)





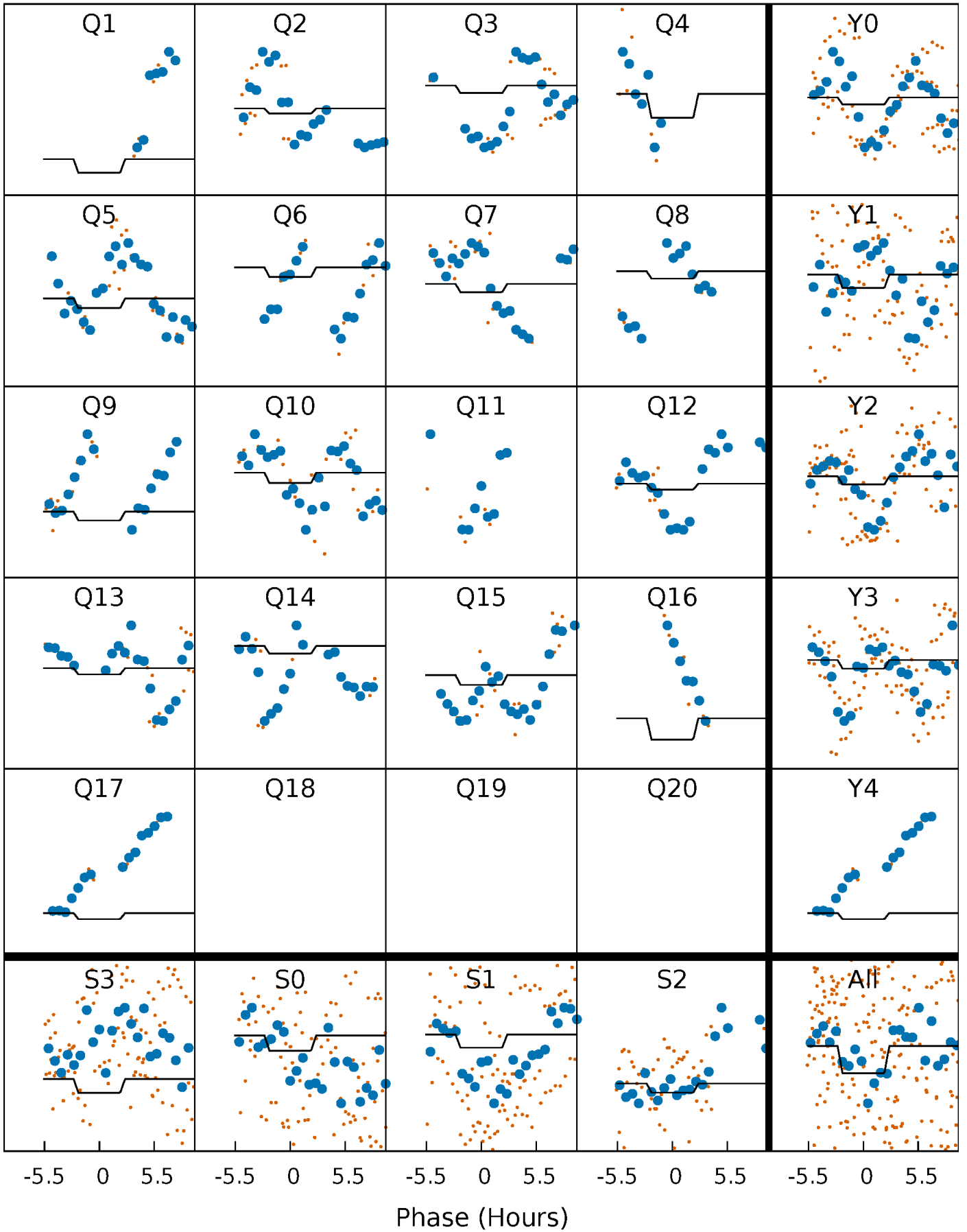
# DV Quarter-Phased Transit Curves

TCE 009166826-04   P= 18.475735 Days    $T_0=139.518855$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

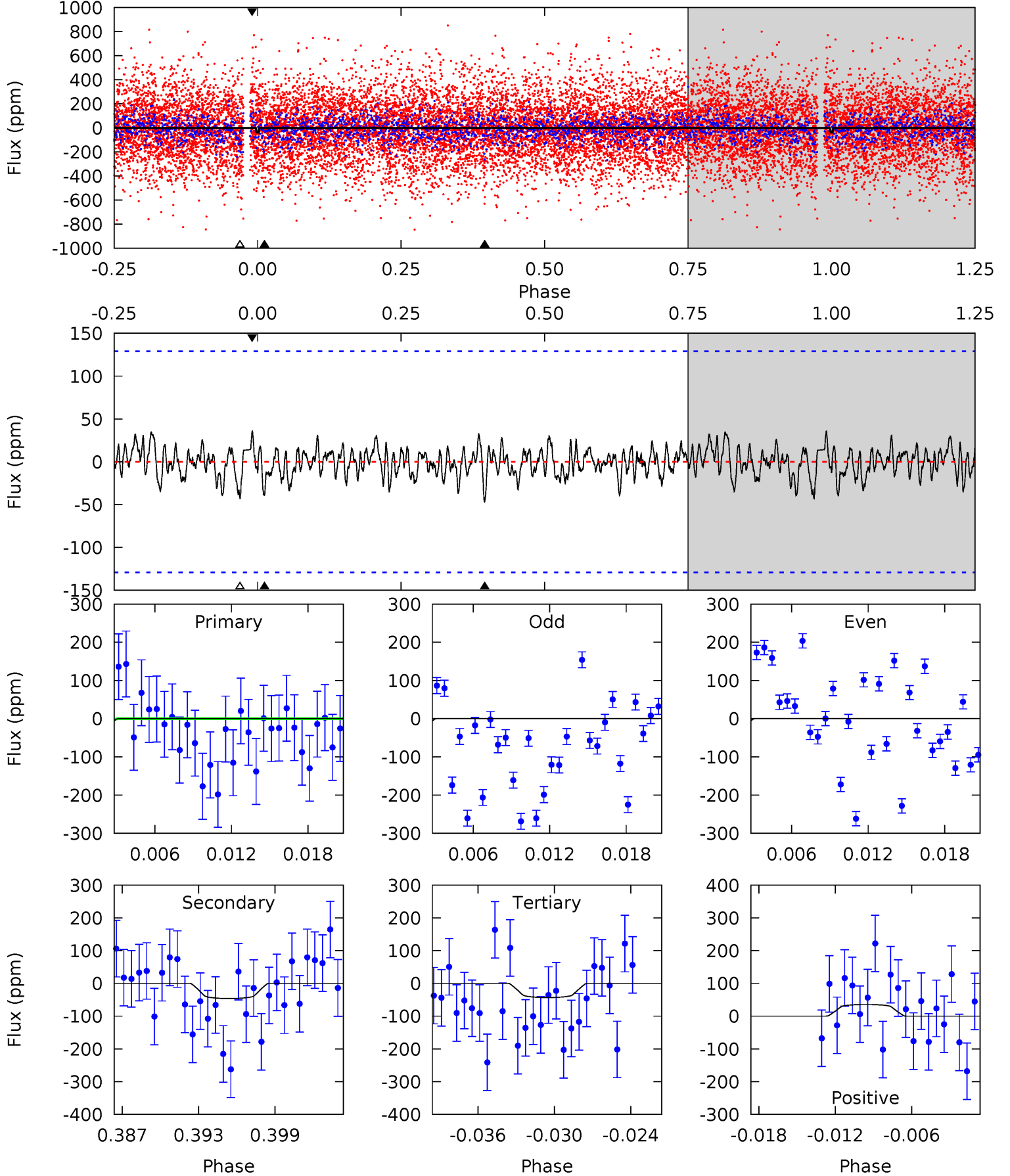
TCE 009166826-04   P= 18.475457 Days    $T_0=139.520558$  (BKJD)



# DV Model-Shift Uniqueness Test

009166826-04, P = 18.475735 Days, E = 121.043120 Days

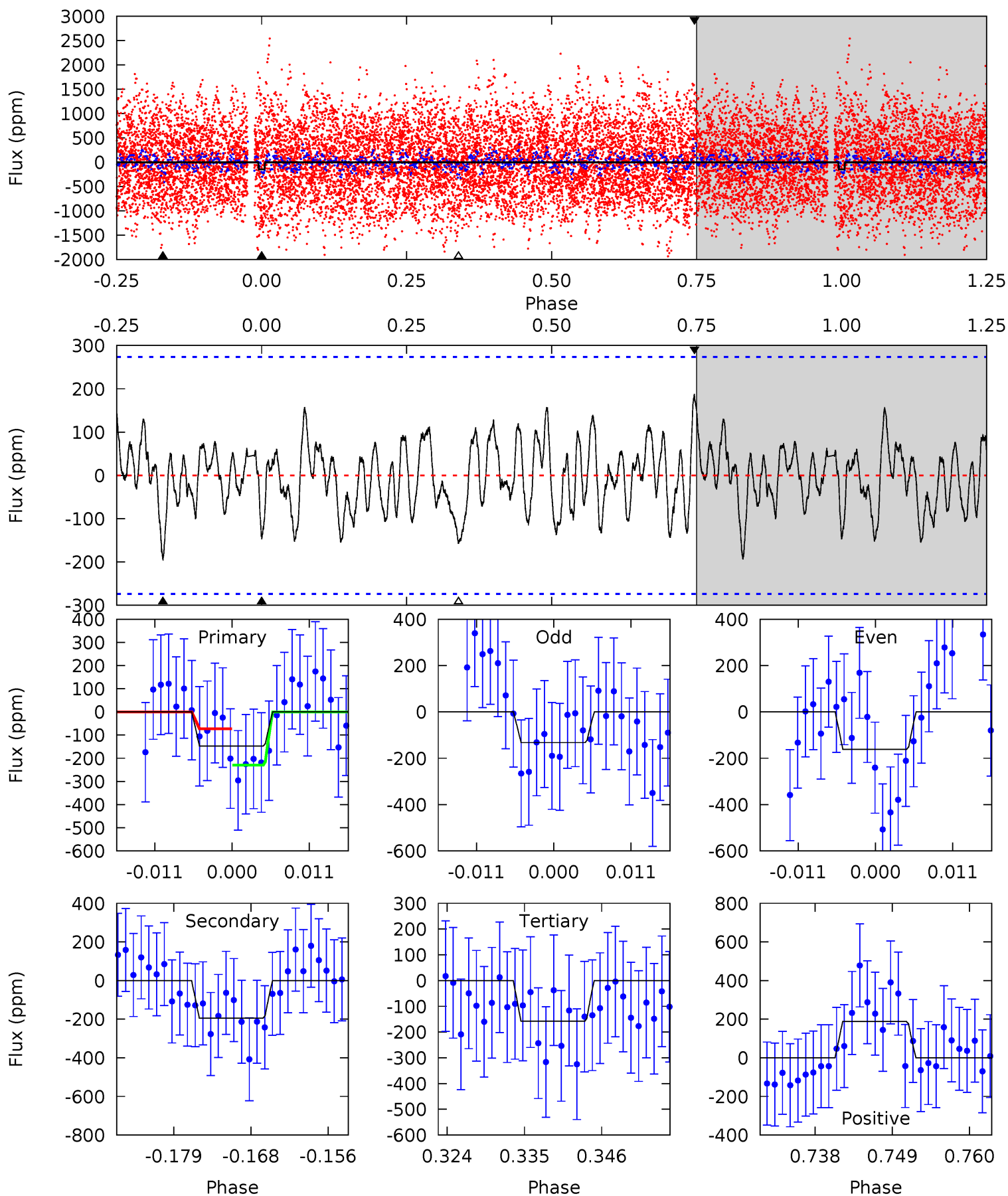
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.56 | 1.84 | 1.72 | 1.41 | 5.12            | 2.75            | 0.56             | -0.16   | 0.15    | 0.12    | 0.43    | 0.03    | 1.80 | 0.43  | 0.71 |



# Alt Model-Shift Uniqueness Test

009166826-04, P = 18.475457 Days, E = 121.045101 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|------|
| 2.69 | 3.55 | 2.89 | 3.44 | 5.00            | 2.54            | 1.26             | -0.20   | -0.74   | 0.66    | 0.12    | 0.27    | -1.04 | 0.49  | 1.44 |



### Stellar Parameters For KIC 009166826

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $7261^{+228}_{-343}$ | $4.245^{+0.060}_{-0.225}$ | $0.210^{+0.150}_{-0.400}$ | $1.570^{+0.580}_{-0.193}$ | $1.591^{+0.211}_{-0.211}$ | $0.579^{+0.184}_{-0.323}$                 |
|        | +3%/-5%              | +1%/-5%                   | +71%/-190%                | +37%/-12%                 | +13%/-13%                 | +32%/-56%                                 |
| 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 009166826-04 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$       | $T_{obs} (K)$          | $A_{obs}$            |
|---------|---------------|------------------------|---------------------|------------------------|----------------------|
| DV      | $-46 \pm 25$  | $2.84^{+3.15}_{-1.92}$ | $1433^{+118}_{-79}$ | $4712^{+3934}_{-1208}$ | $70^{+650}_{-57}$    |
| Alt.    | $-194 \pm 55$ | $3.27^{+3.29}_{-2.14}$ | $1439^{+124}_{-83}$ | $6189^{+6591}_{-1553}$ | $237^{+1821}_{-177}$ |

$T_{max}$  = 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

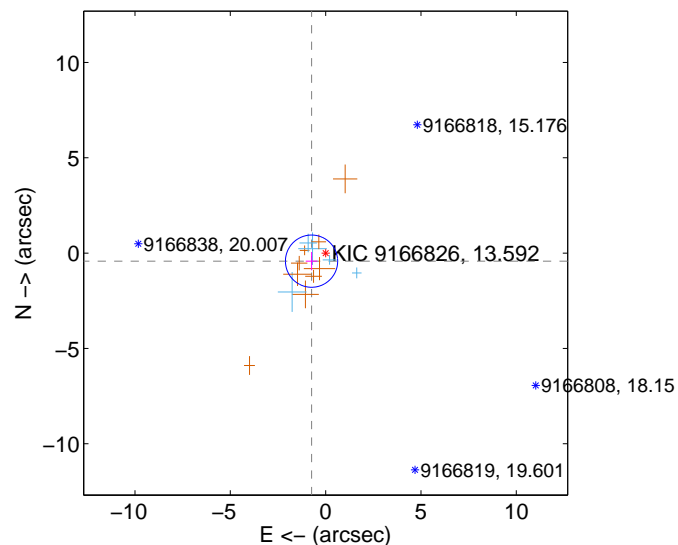
Supplemental centroid analysis for 009166826-04. Kepler magnitude: 13.59. Transit SNR 2.25

There are 5 quarters with good PRF difference image offsets

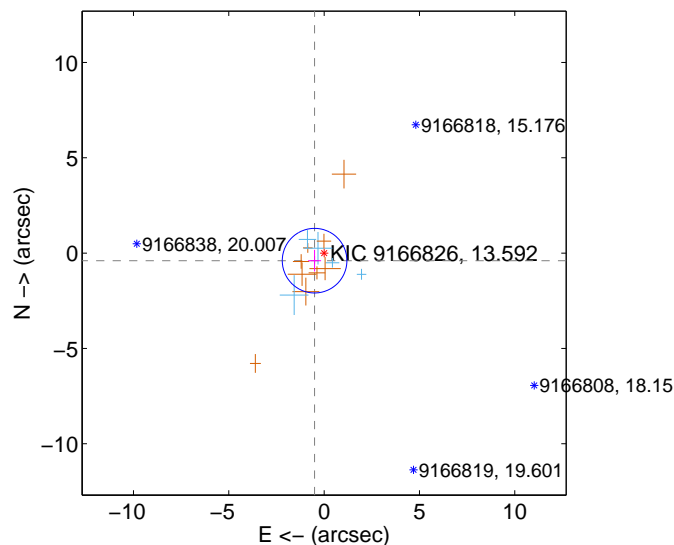
The direct PRF centroid is offset from the target star catalog position by about 0.32 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.851 \pm 0.457$  | 1.86                | $0.739 \pm 0.305$ | $-0.423 \pm 0.482$ |
| PRF-fit source offset from KIC position | $0.639 \pm 0.565$  | 1.13                | $0.500 \pm 0.339$ | $-0.397 \pm 0.566$ |
| photometric centroid source offset      | $4.84 \pm 1.91$    | 2.53                | $-0.37 \pm 1.73$  | $-4.82 \pm 1.92$   |

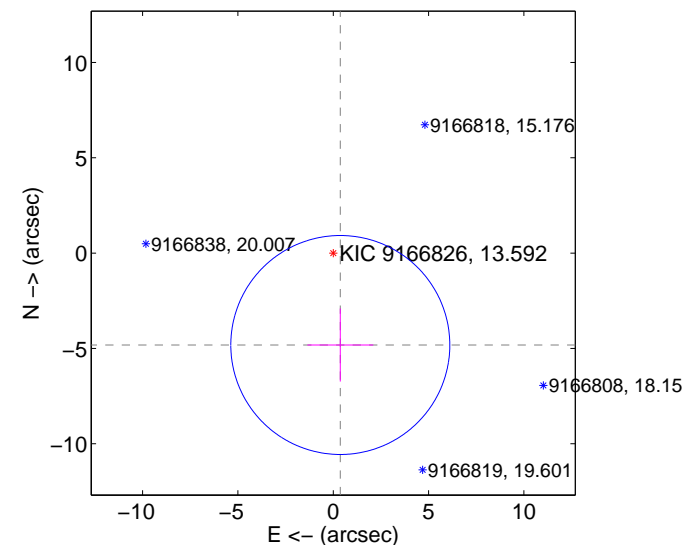
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



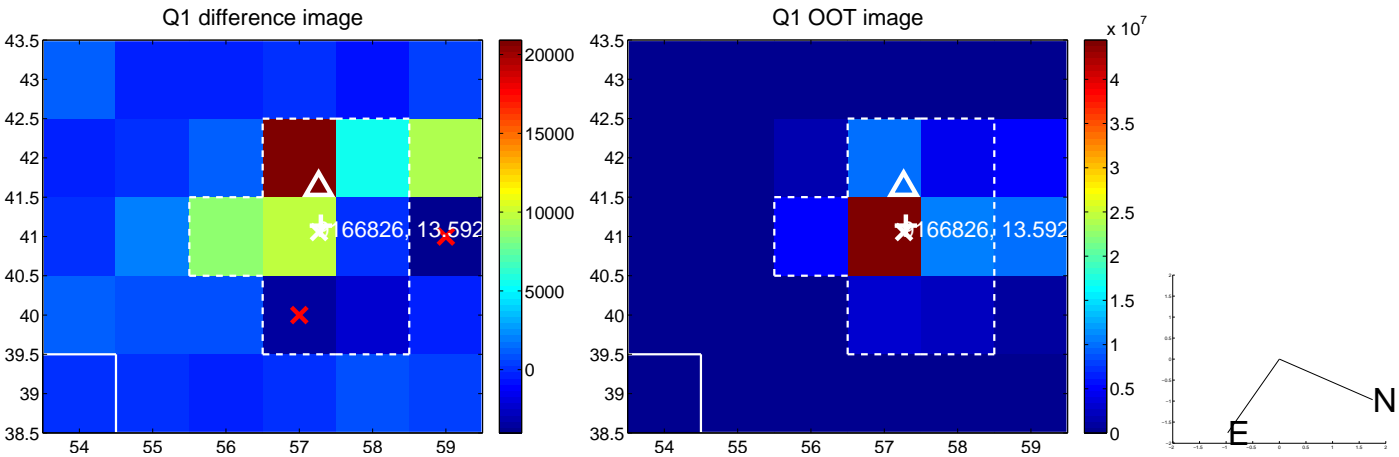
offset from photometric centroids



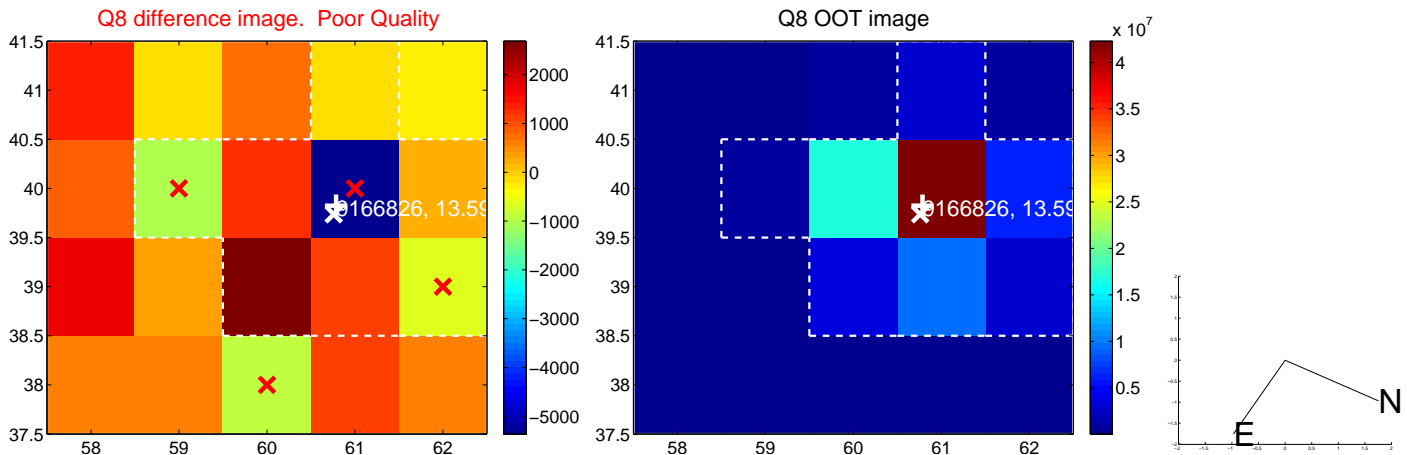
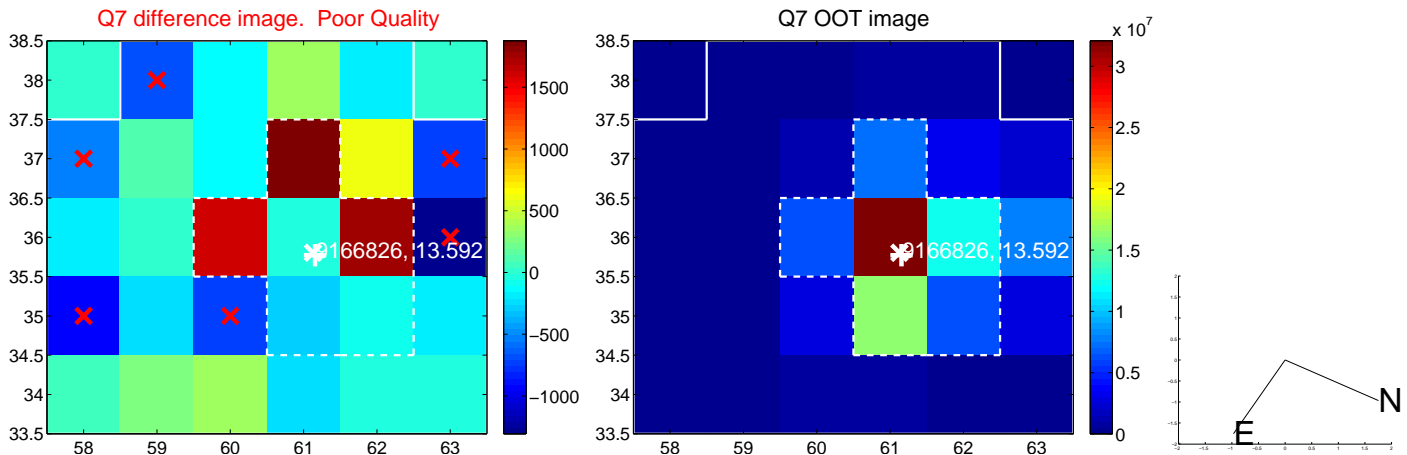
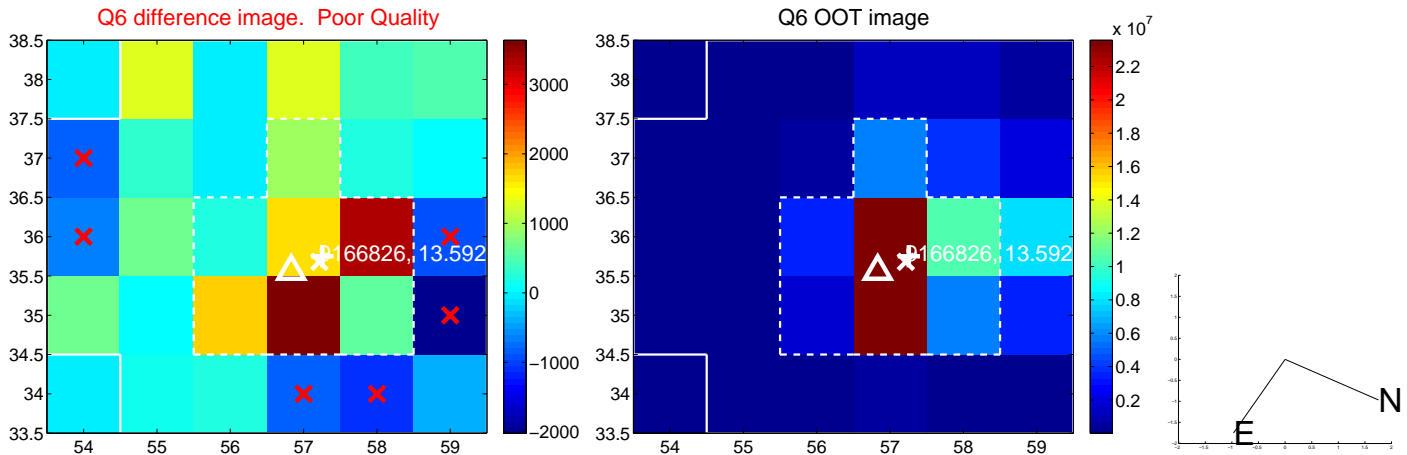
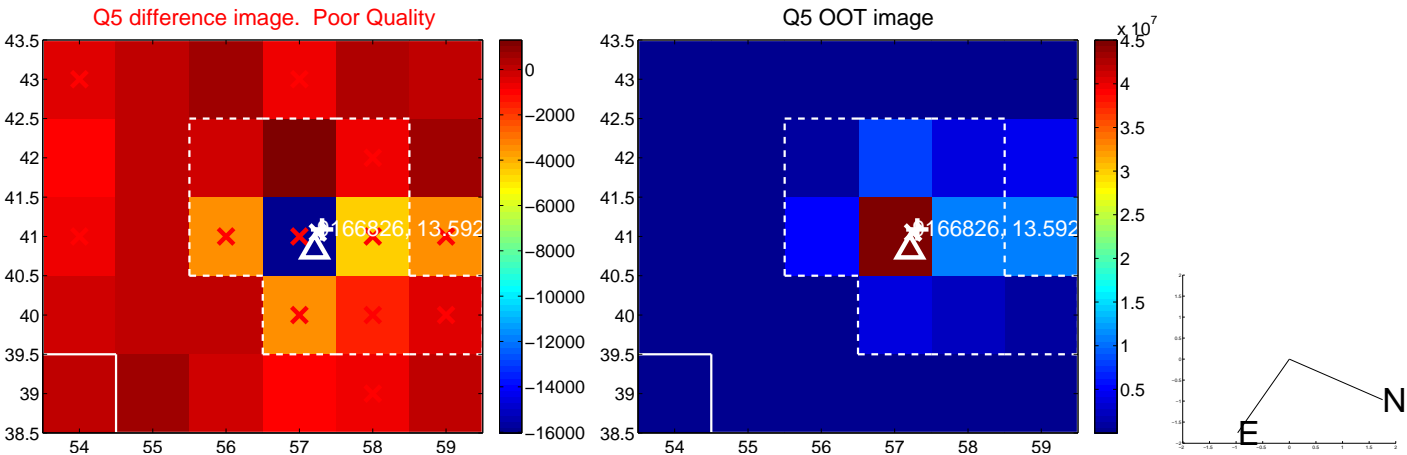
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



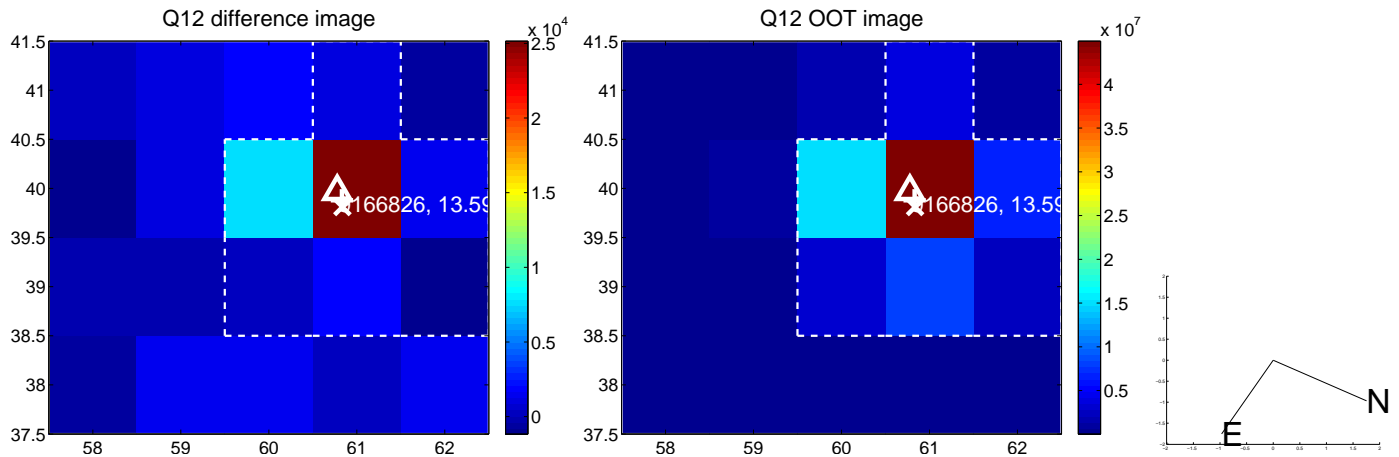
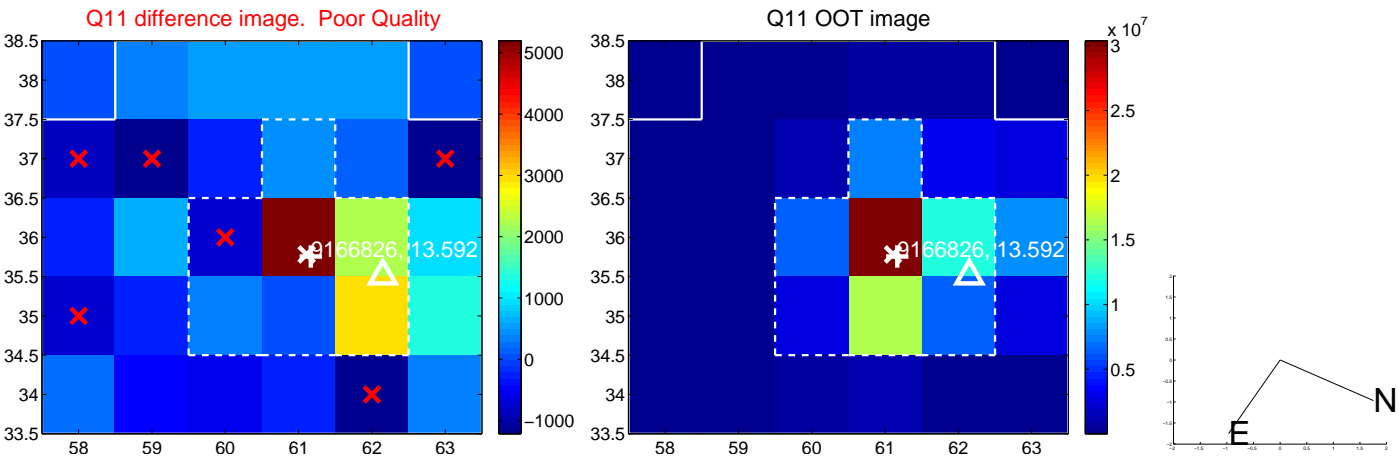
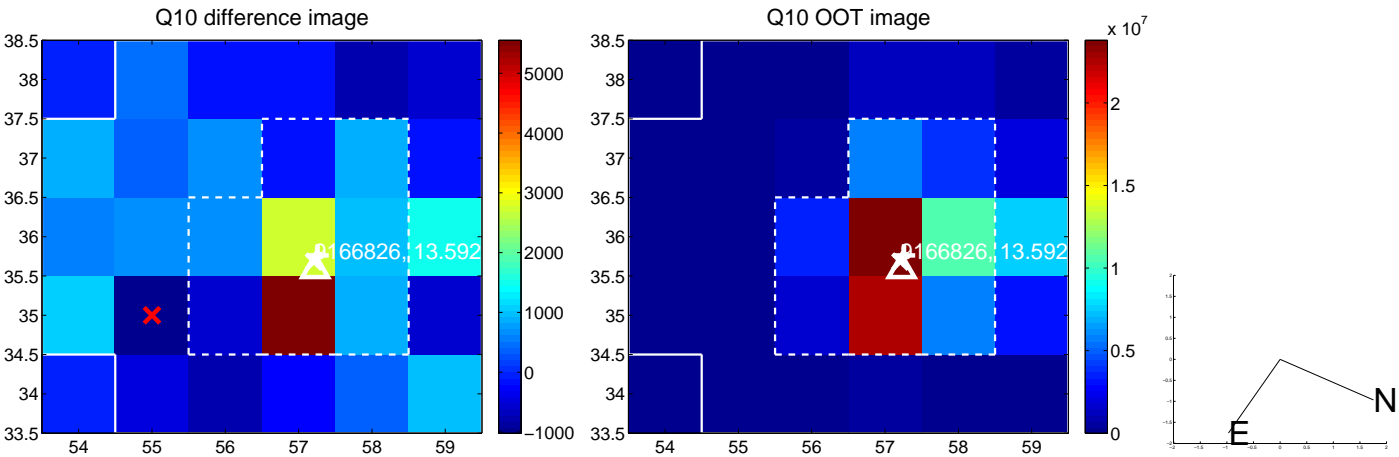
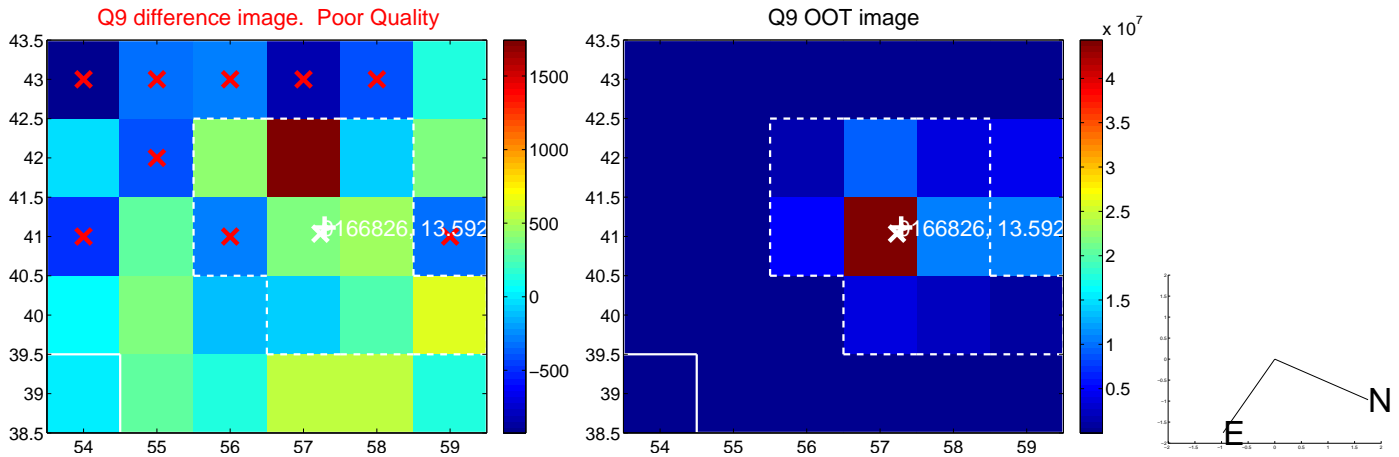
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



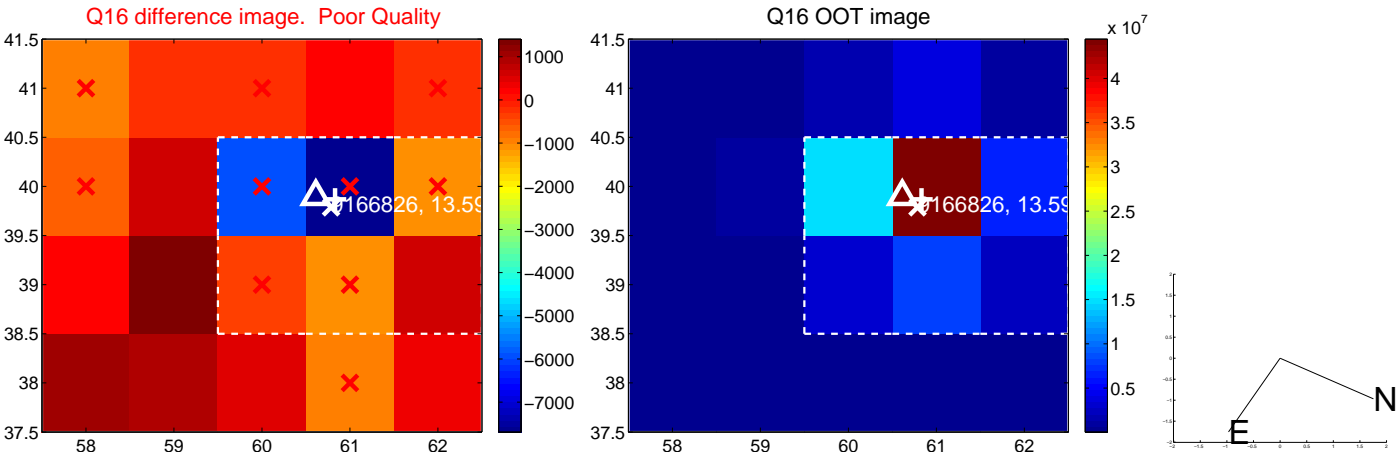
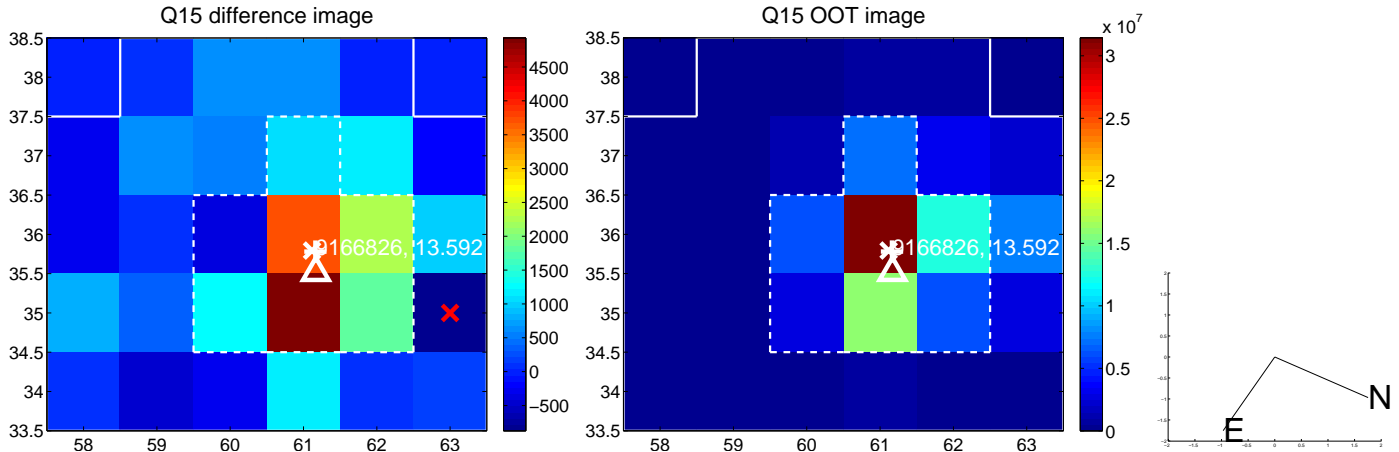
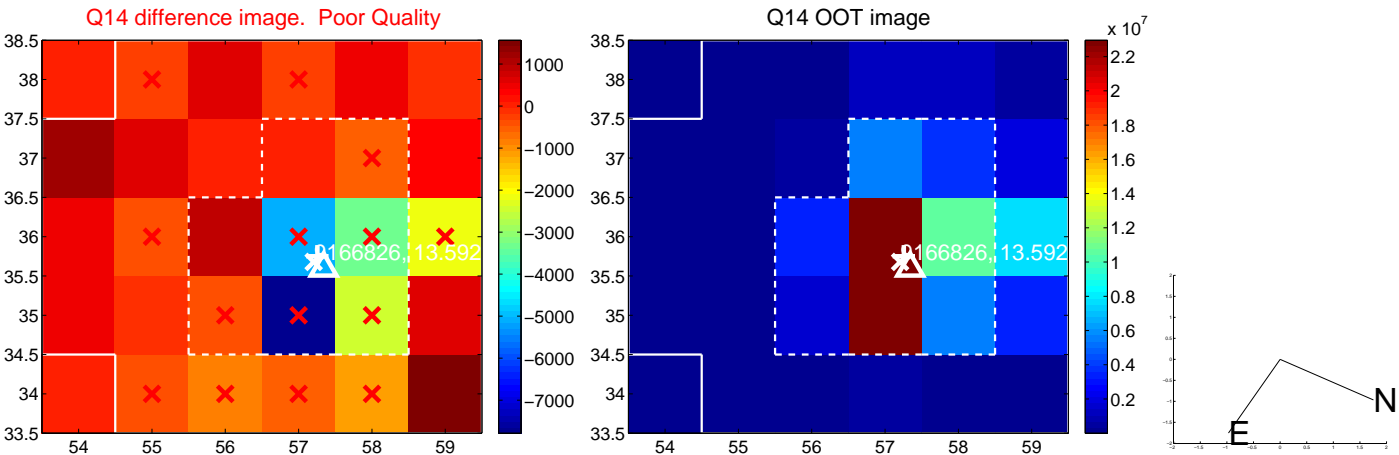
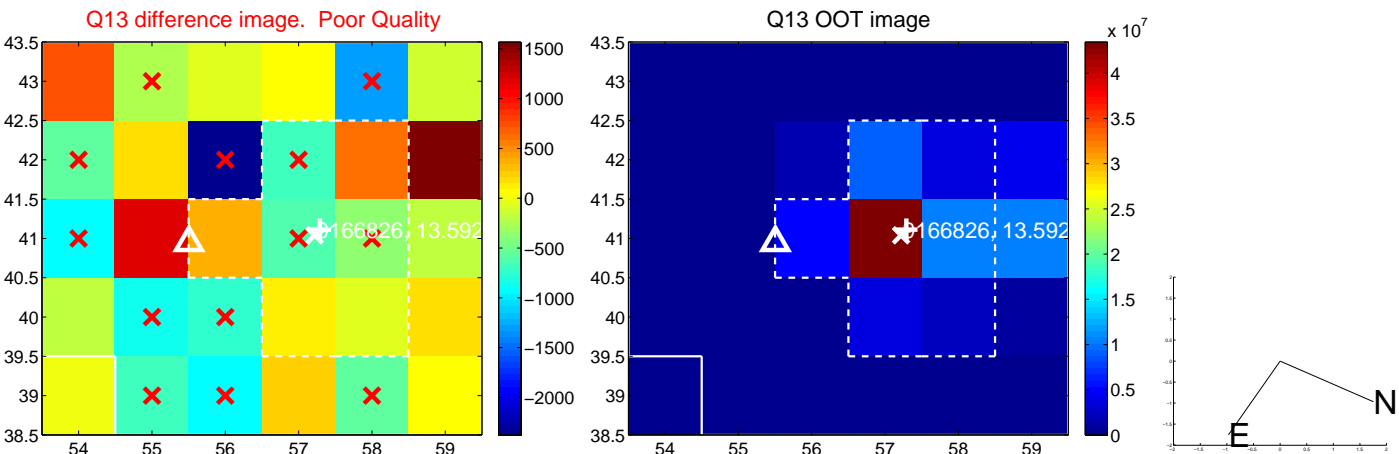
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



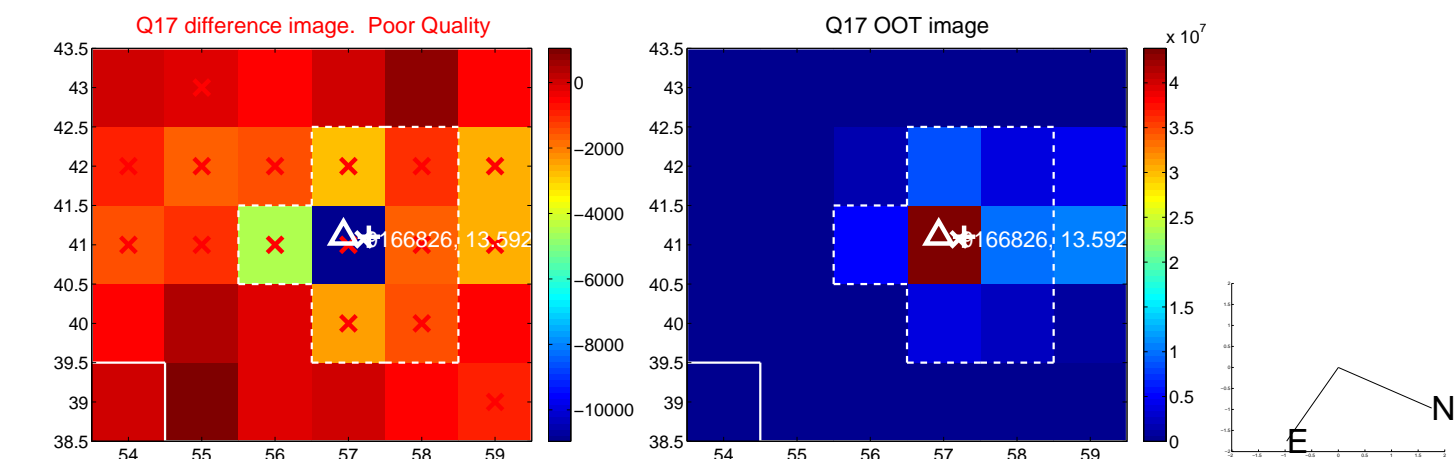
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



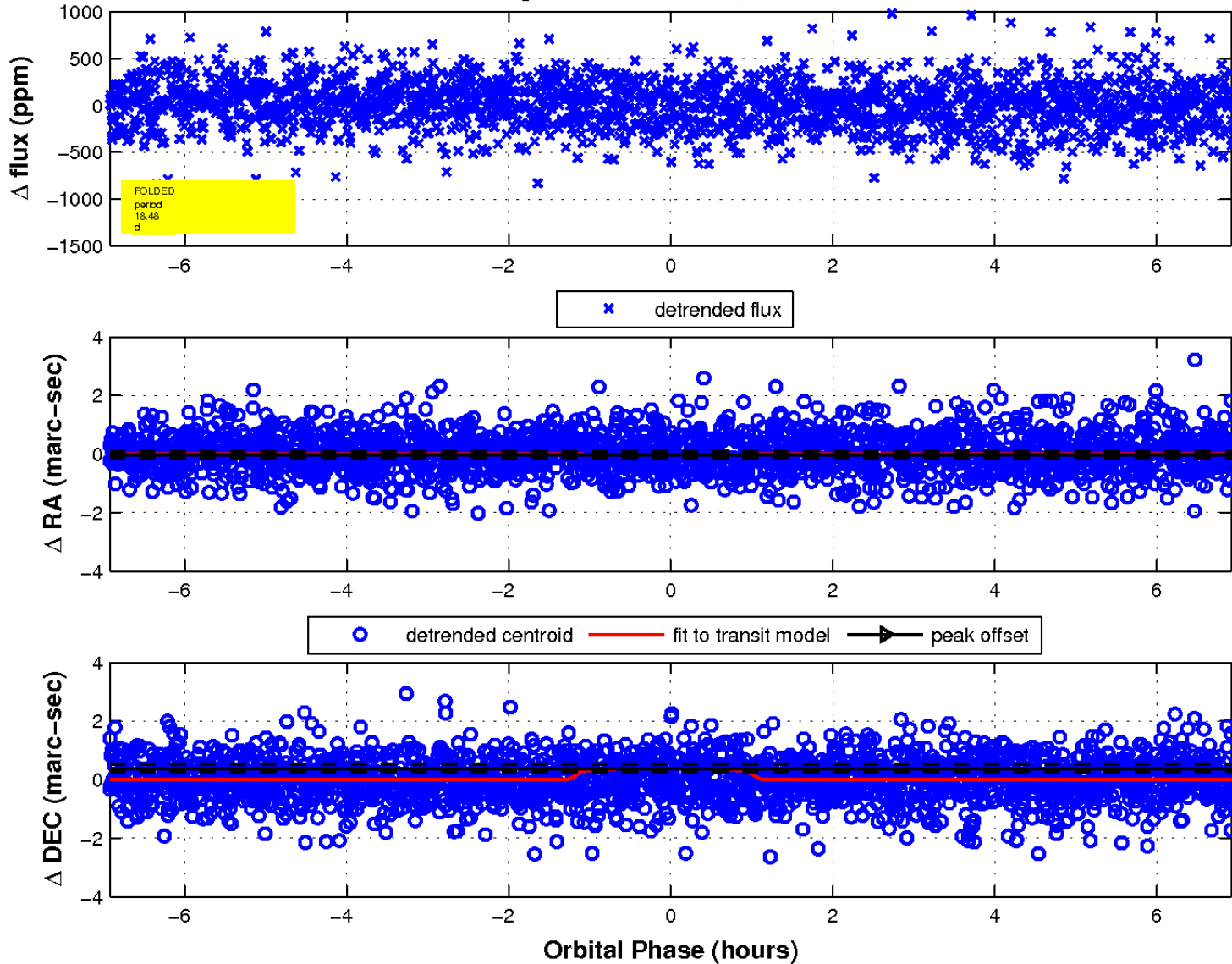
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

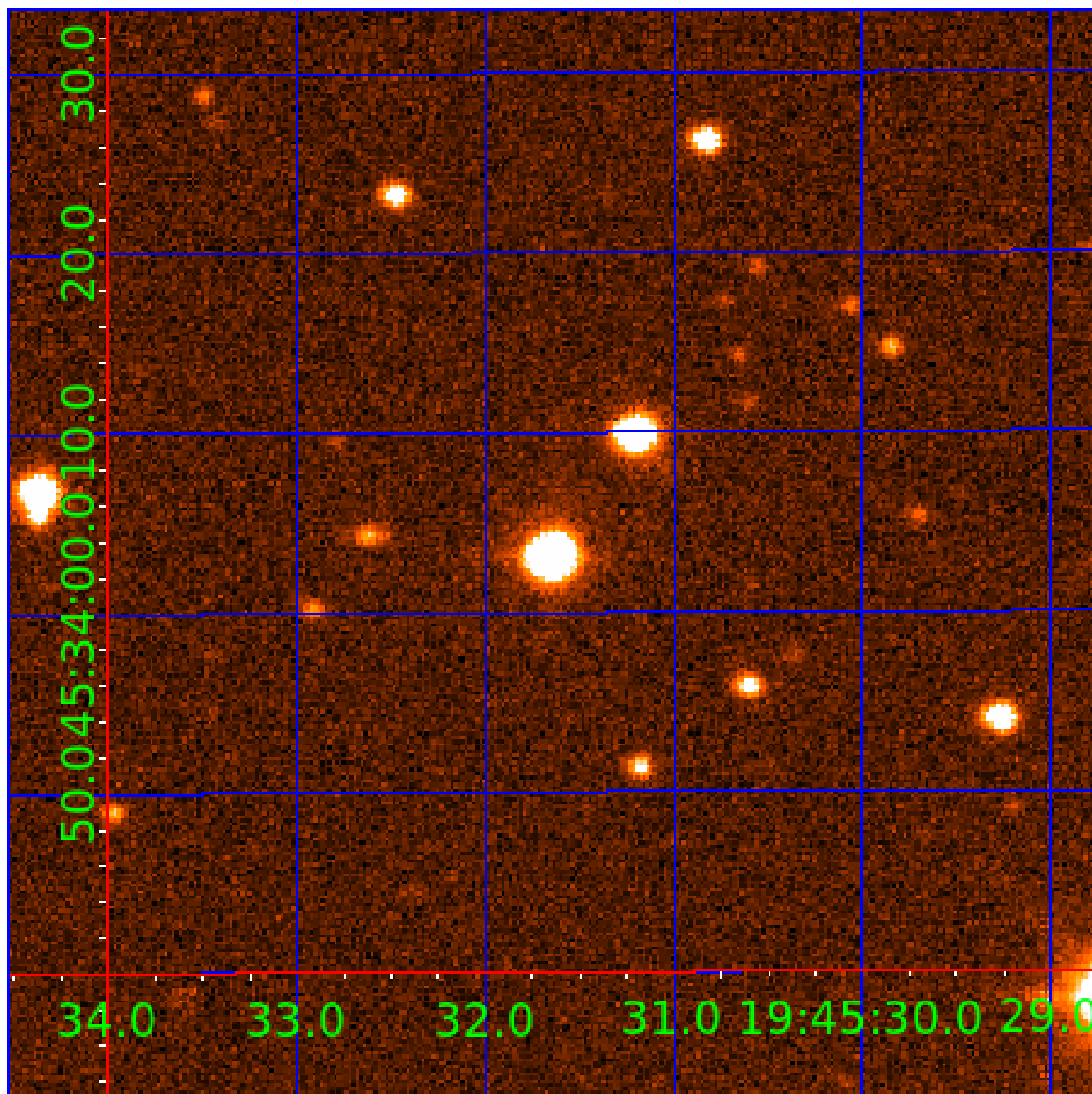


fluxWeightedCentroids, Planet 4 of 7



UKIRT Image

Declination





# KIC 009166826

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009166826-01 | OBS      | No   | 1.105096      | 132.364571   | 32.2        | 3.666            | 10.2 | 8.4  | 1.57                        | 7261            | 0.98                   | 10334.27               |
| 009166826-02 | OBS      | No   | 1.105092      | 131.627107   | 24.5        | 4.563            | 10.6 | 6.9  | 1.57                        | 7261            | 0.83                   | 10334.32               |
| 009166826-03 | OBS      | No   | 18.475152     | 139.191330   | 54.8        | 1.368            | 8.4  | 1.4  | 1.57                        | 7261            | 1.33                   | 241.75                 |
| 009166826-04 | OBS      | No   | 18.475735     | 139.518855   | 71.3        | 2.308            | 8.5  | 2.3  | 1.57                        | 7261            | 1.53                   | 241.74                 |
| 009166826-05 | OBS      | No   | 44.304722     | 146.120989   | 282.3       | 4.500            | 8.0  | -1.0 | 1.57                        | 7261            | 2.67                   | 75.31                  |
| 009166826-06 | OBS      | No   | 47.695013     | 172.383956   | 274.8       | 4.358            | 7.3  | 6.5  | 1.57                        | 7261            | 2.83                   | 68.26                  |
| 009166826-07 | OBS      | No   | 74.722951     | 142.333969   | 266.5       | 4.500            | 7.5  | -1.0 | 1.57                        | 7261            | 2.60                   | 37.52                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 009166826-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009166826-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—SAME_NTL_PERIOD  |
| 009166826-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT      |
| 009166826-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD |
| 009166826-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS  |
| 009166826-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT   |
| 009166826-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS   |

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

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

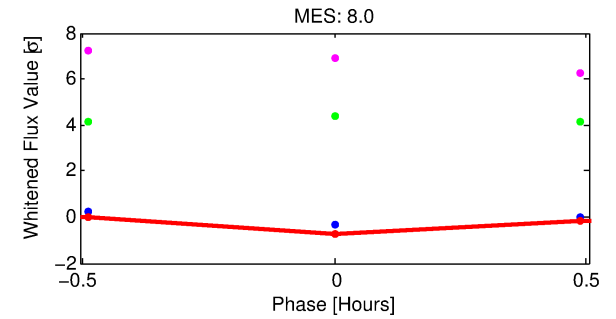
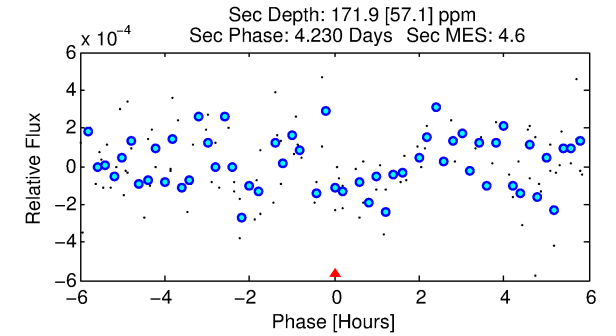
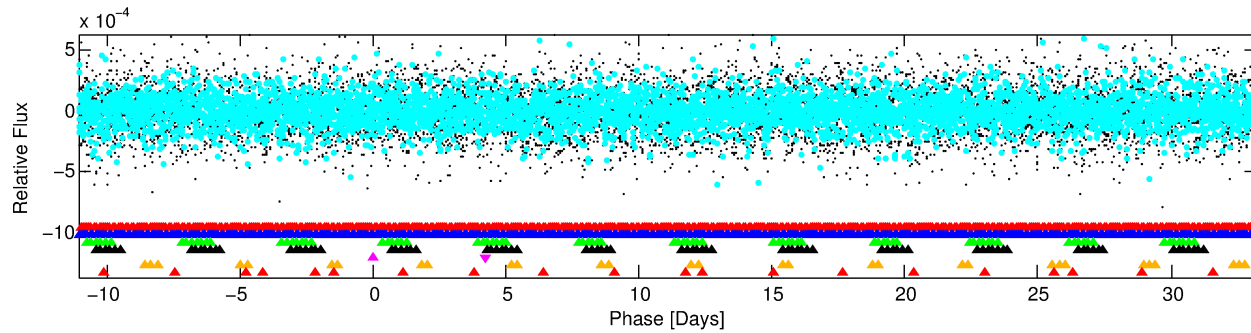
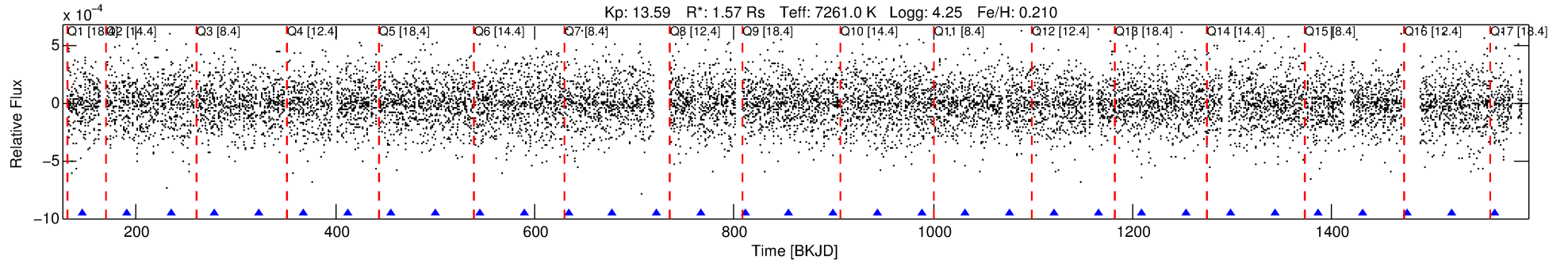
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009166826-05

No Significant Match Found

# DV One-Page Summary

KIC: 9166826 Candidate: 5 of 7 Period: 44.305 d



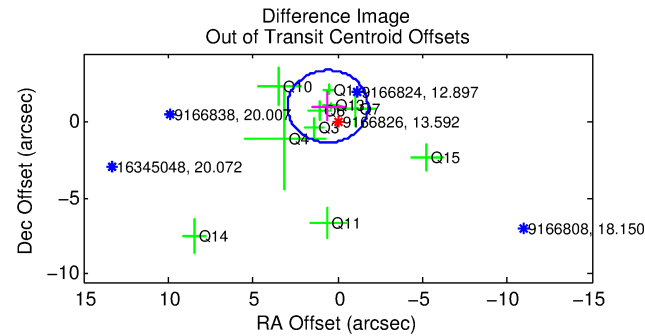
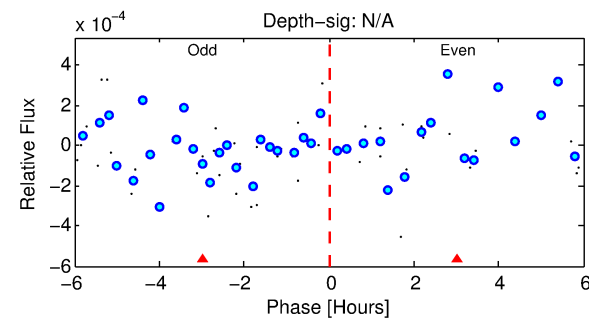
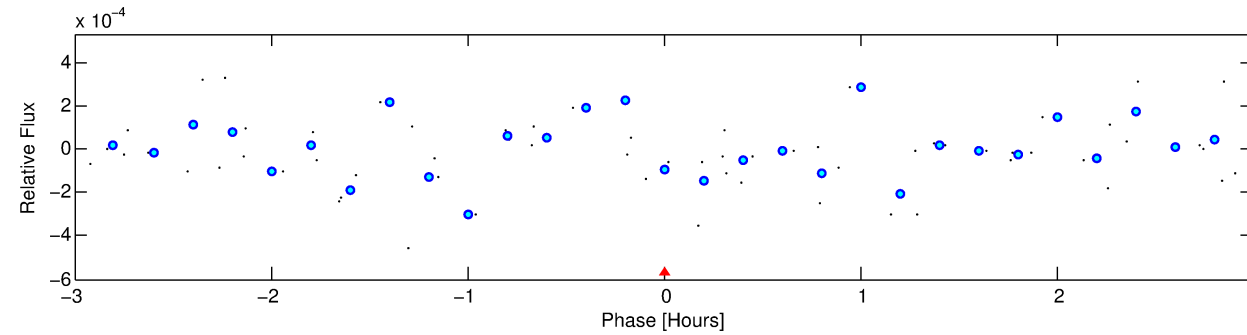
## TPS TCE Results:

Period = 44.30472 d  
Epoch = 146.1210 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

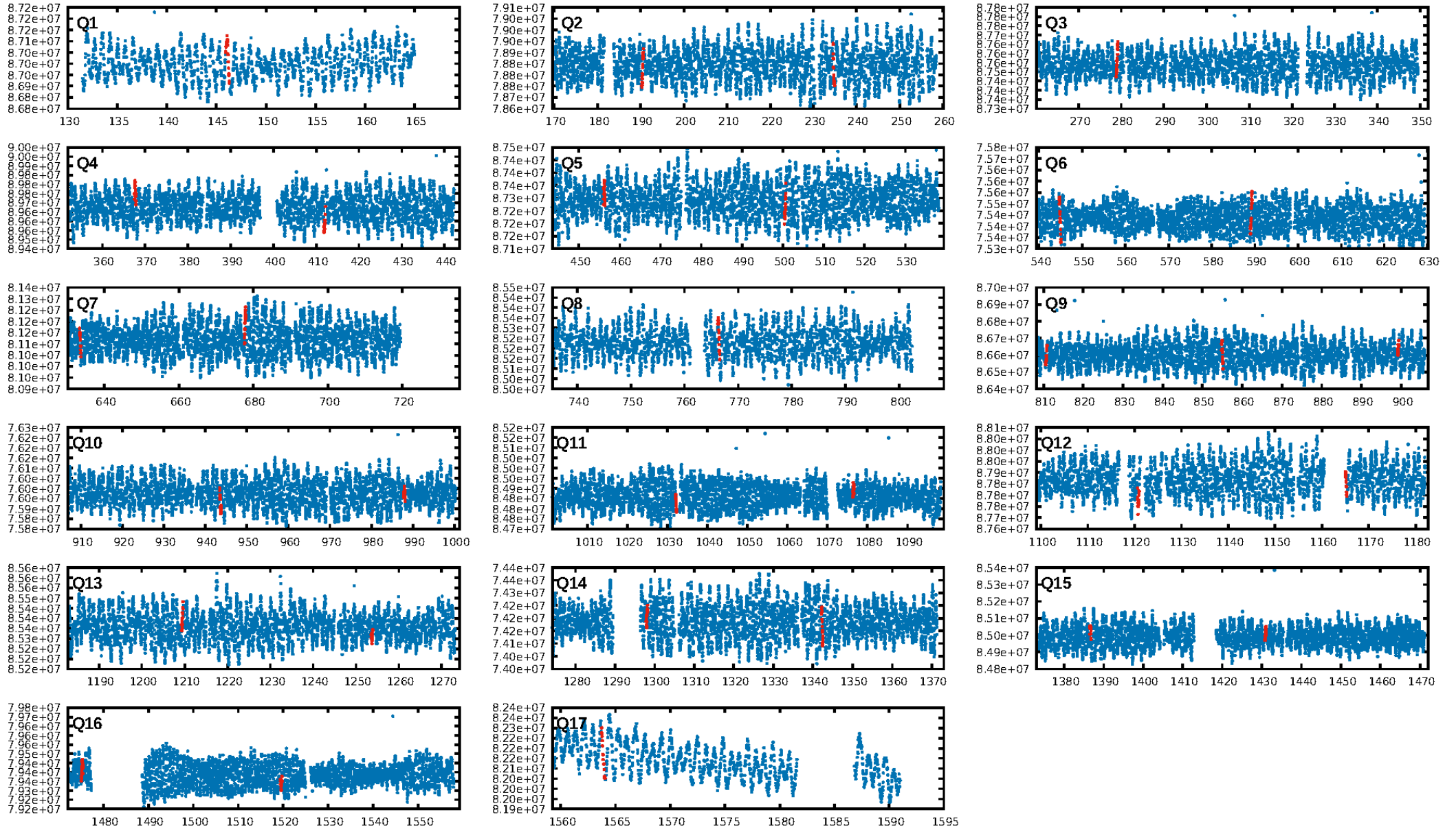
ShortPeriod-sig: 100.0% [122.57 $\sigma$ ]  
LongPeriod-sig: 100.0% [12.99 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: 1.984  
Centroid-sig: 33.0%  
Centroid-so: 0.786 arcsec [1.32 $\sigma$ ]  
OotOffset-rm: 1.191 arcsec [1.50 $\sigma$ ]  
KicOffset-rm: 1.182 arcsec [1.21 $\sigma$ ]  
OotOffset-st: 3/4/1/2 [10]  
KicOffset-st: 3/4/1/2 [10]  
DiffImageQuality-fgm: 0.20 [2/10]  
DiffImageOverlap-fno: 0.08 [1/12]



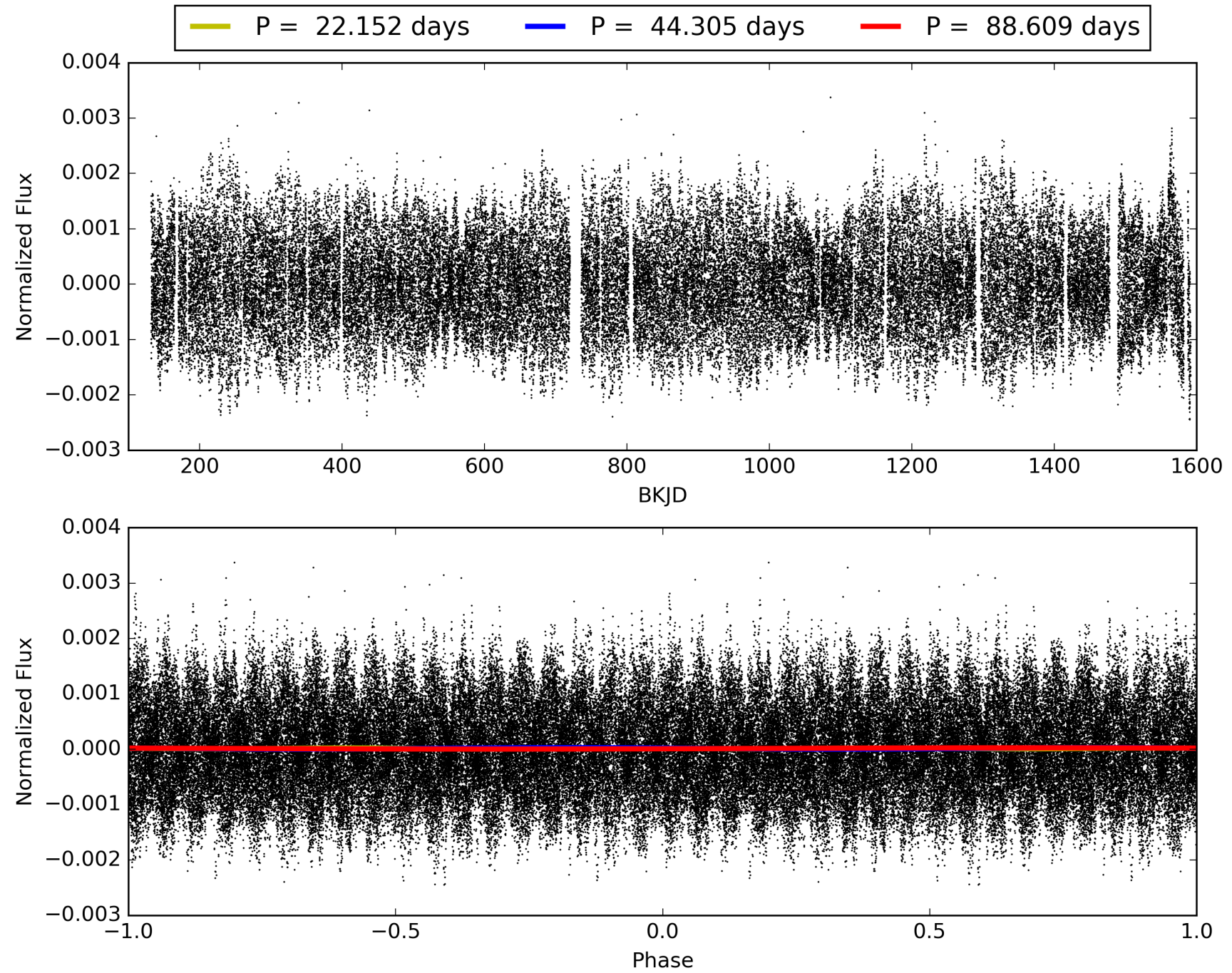
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:04:00 Z

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

# TCE 009166826-05, PDC Light Curves

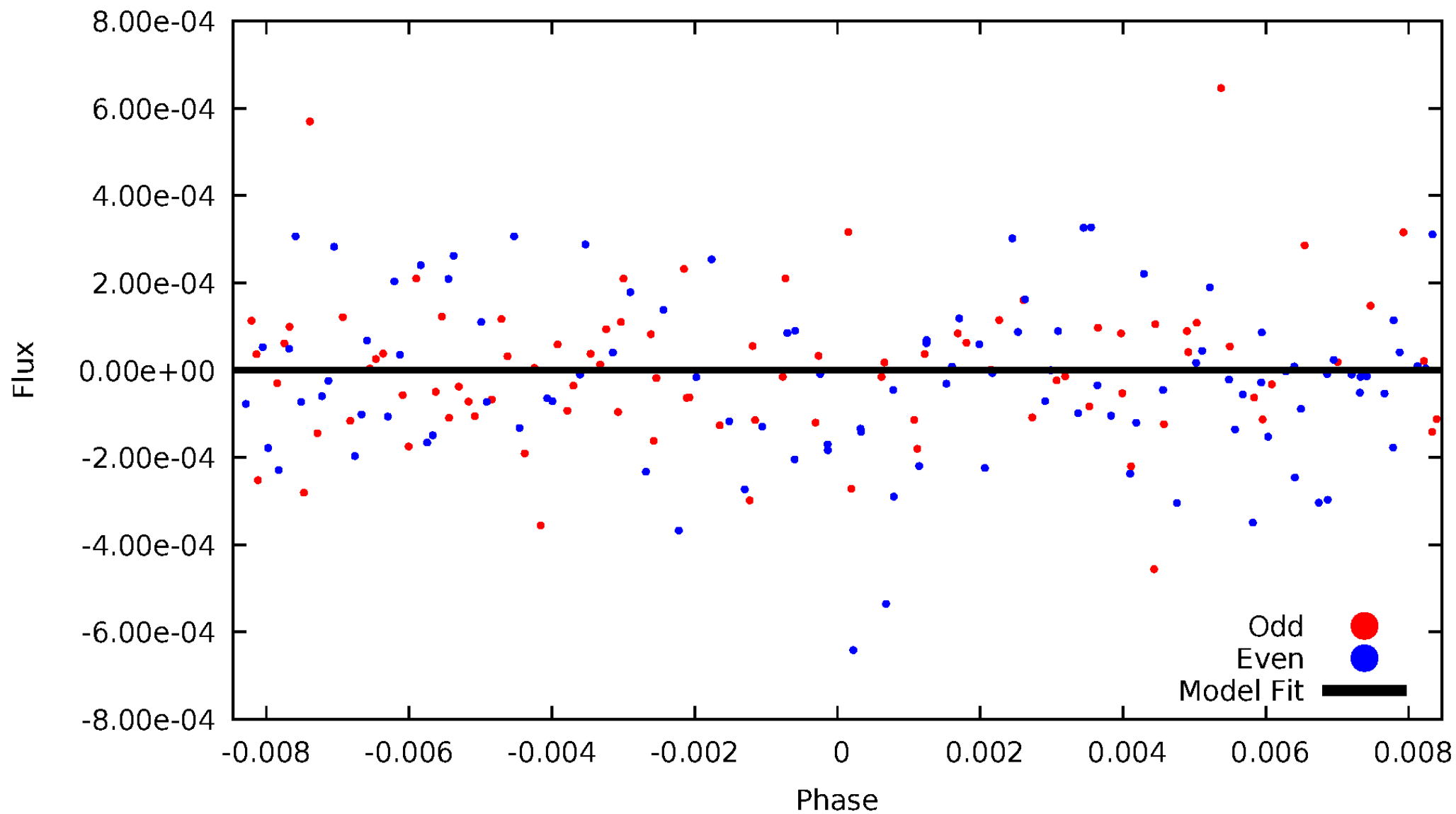


TCE 009166826-05



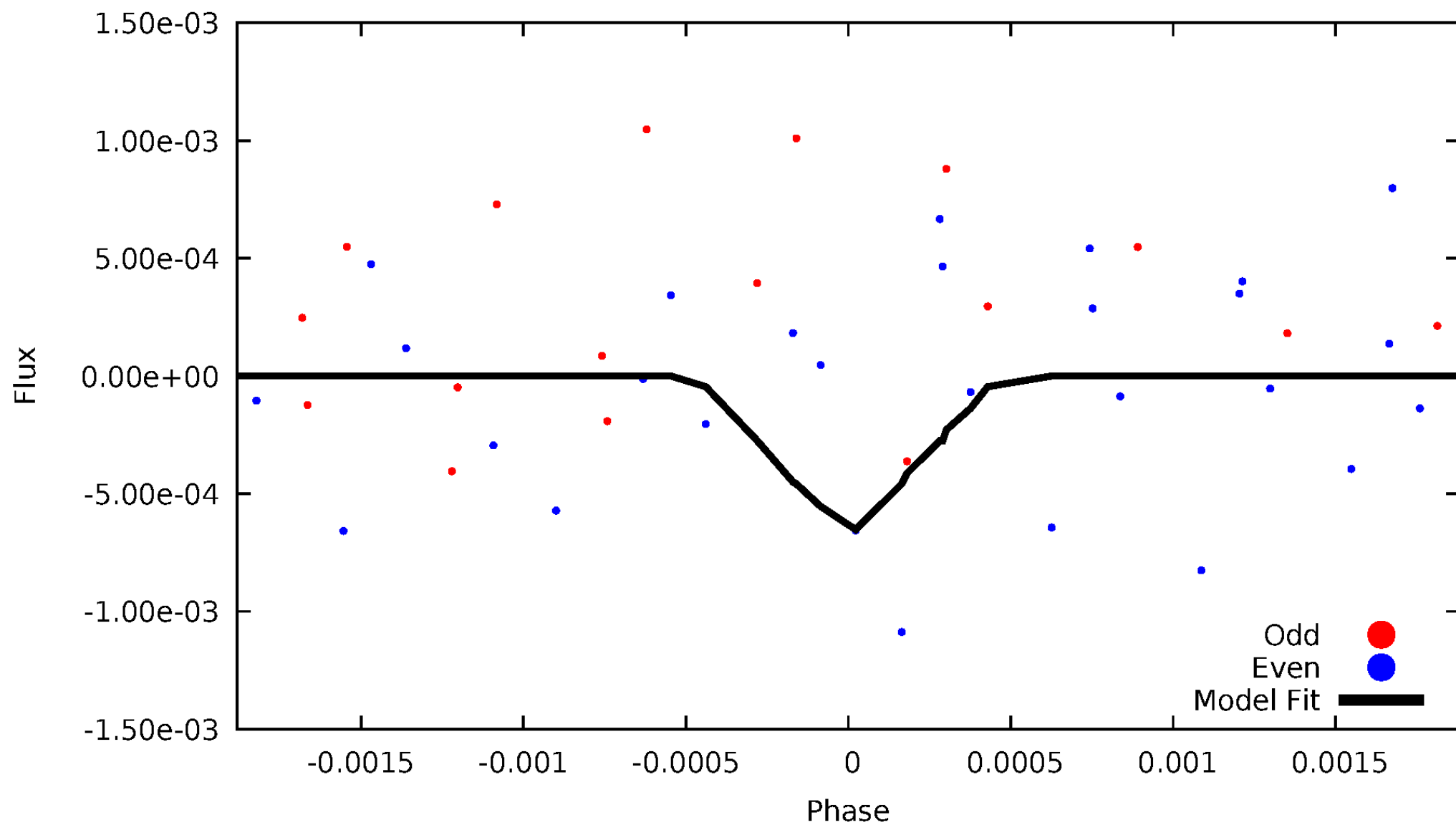
# DV Odd/Even

TCE 009166826-05



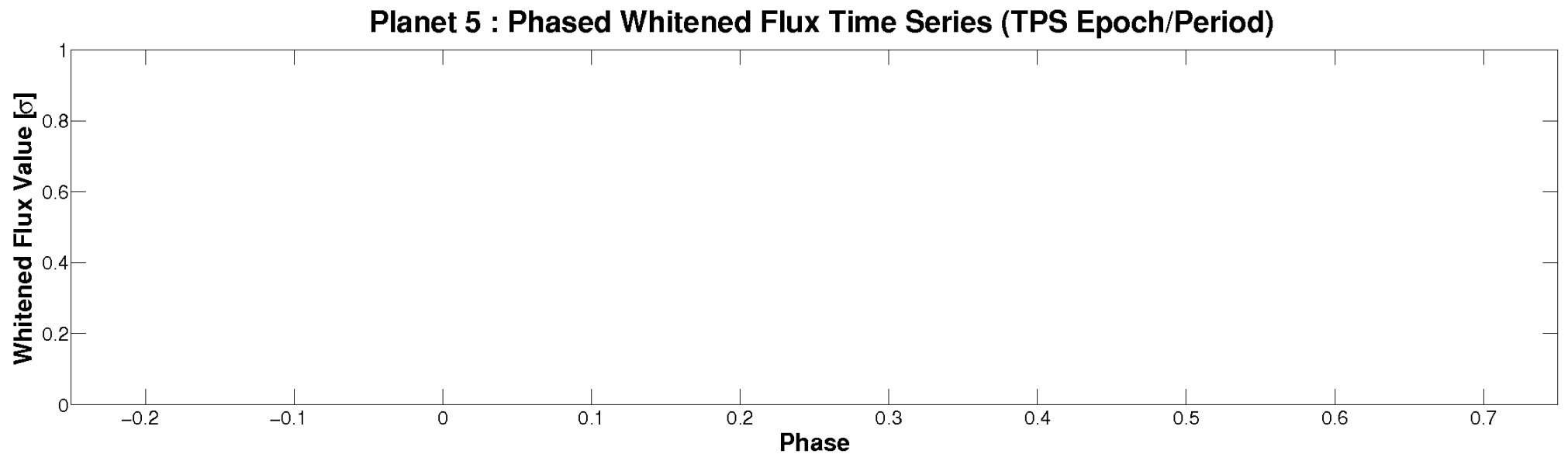
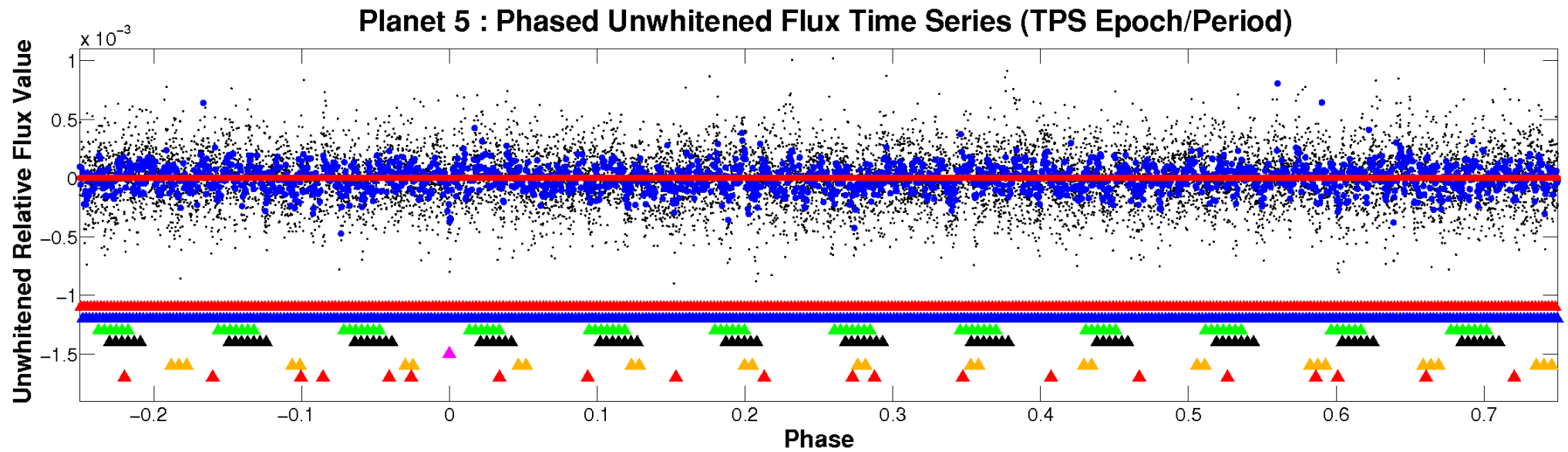
# ALT Odd/Even

TCE 009166826-05



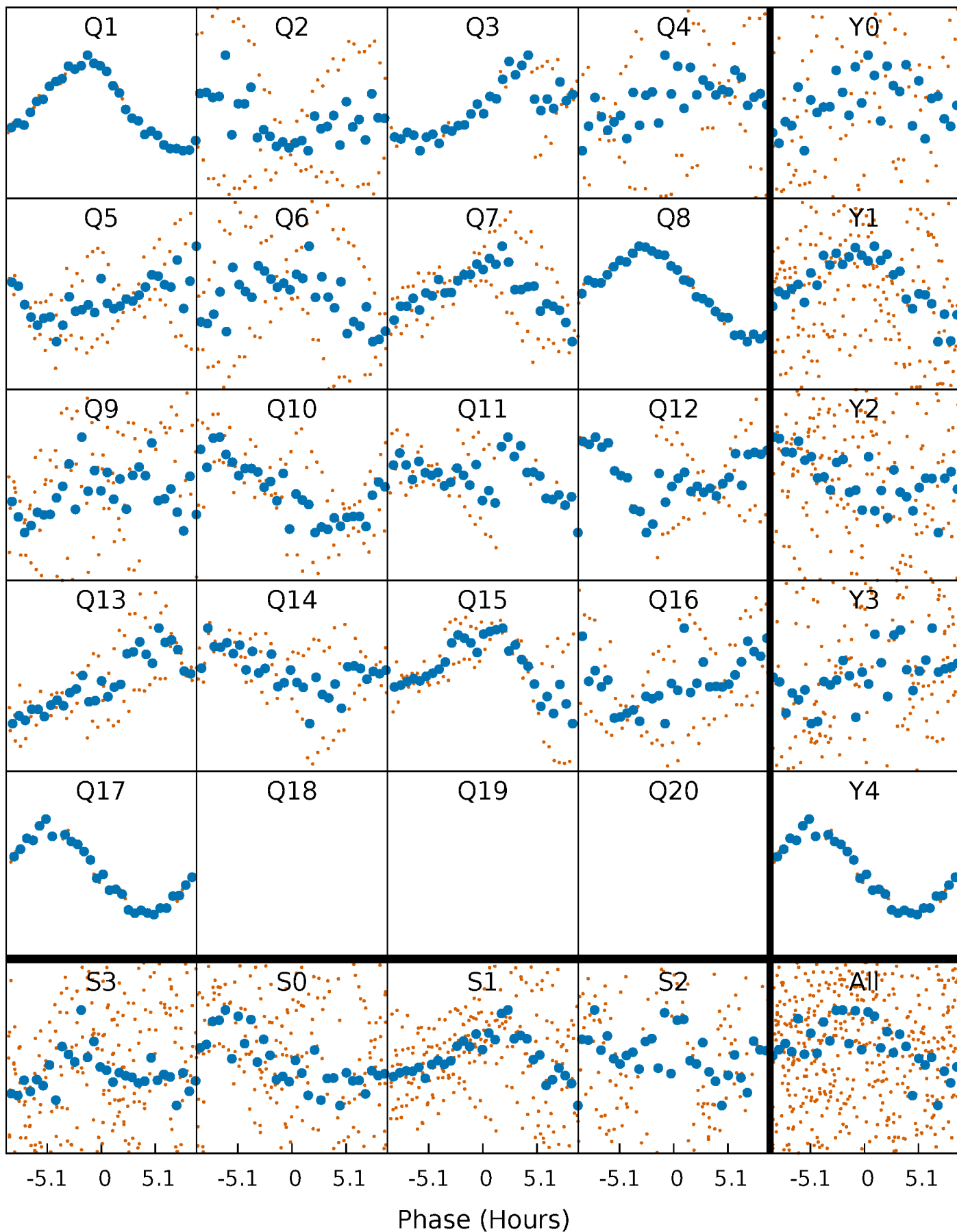


# Non-Whitened Vs. Whitened Light Curve



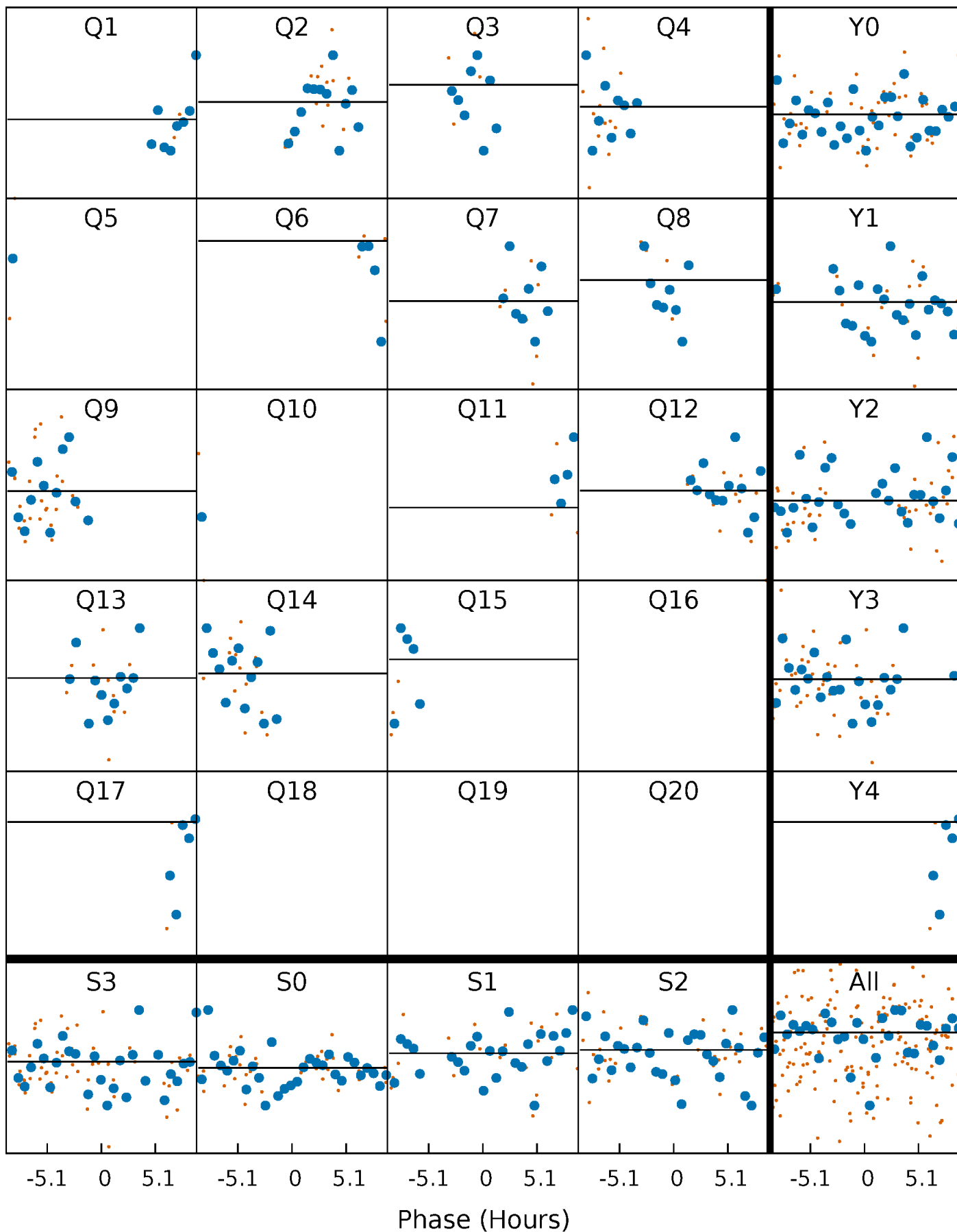
# PDC Quarter-Phased Transit Curves

TCE 009166826-05     $P = 44.304722$  Days     $T_0 = 146.120989$  (BKJD)



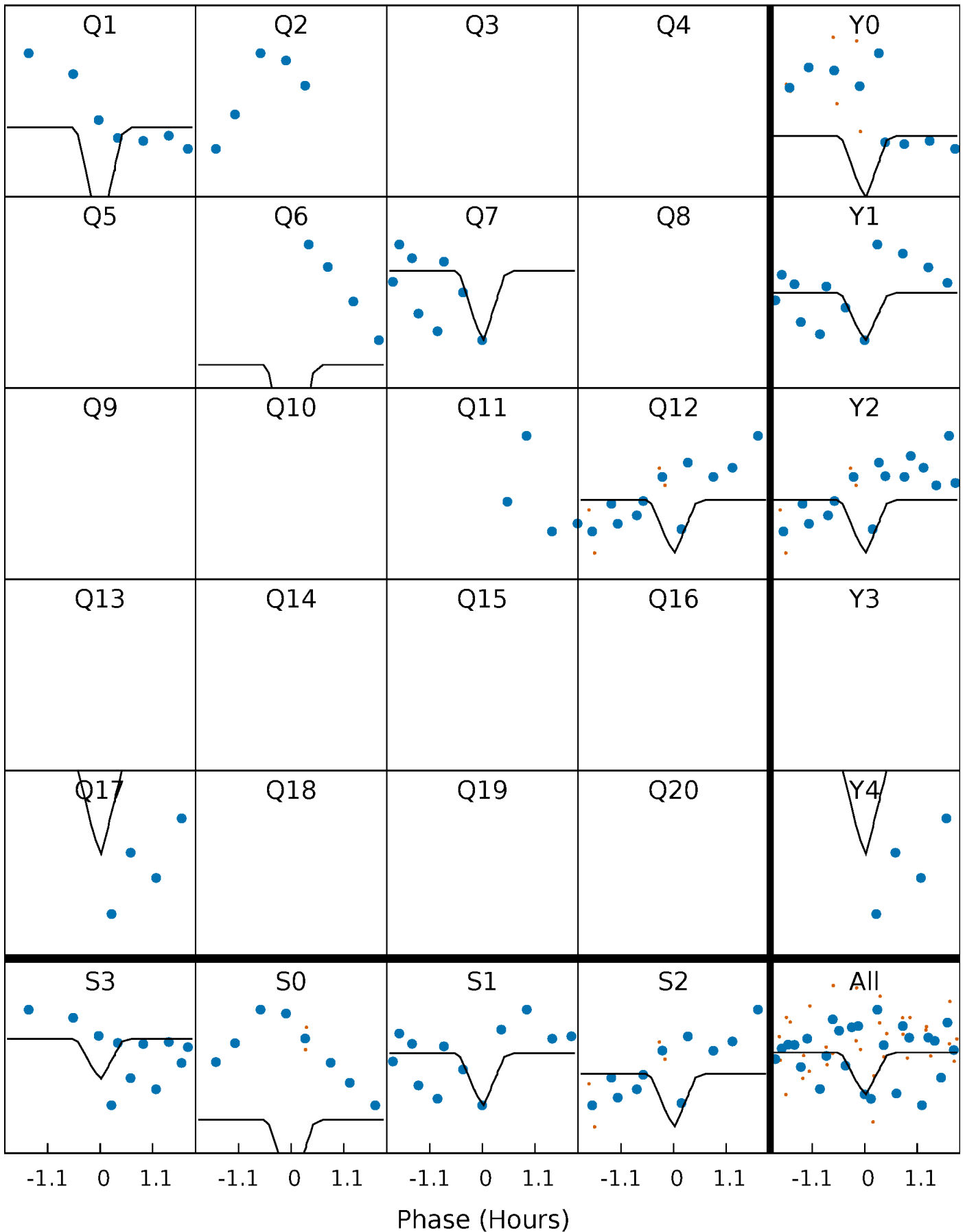
# DV Quarter-Phased Transit Curves

TCE 009166826-05     $P = 44.304722$  Days     $T_0 = 146.120989$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

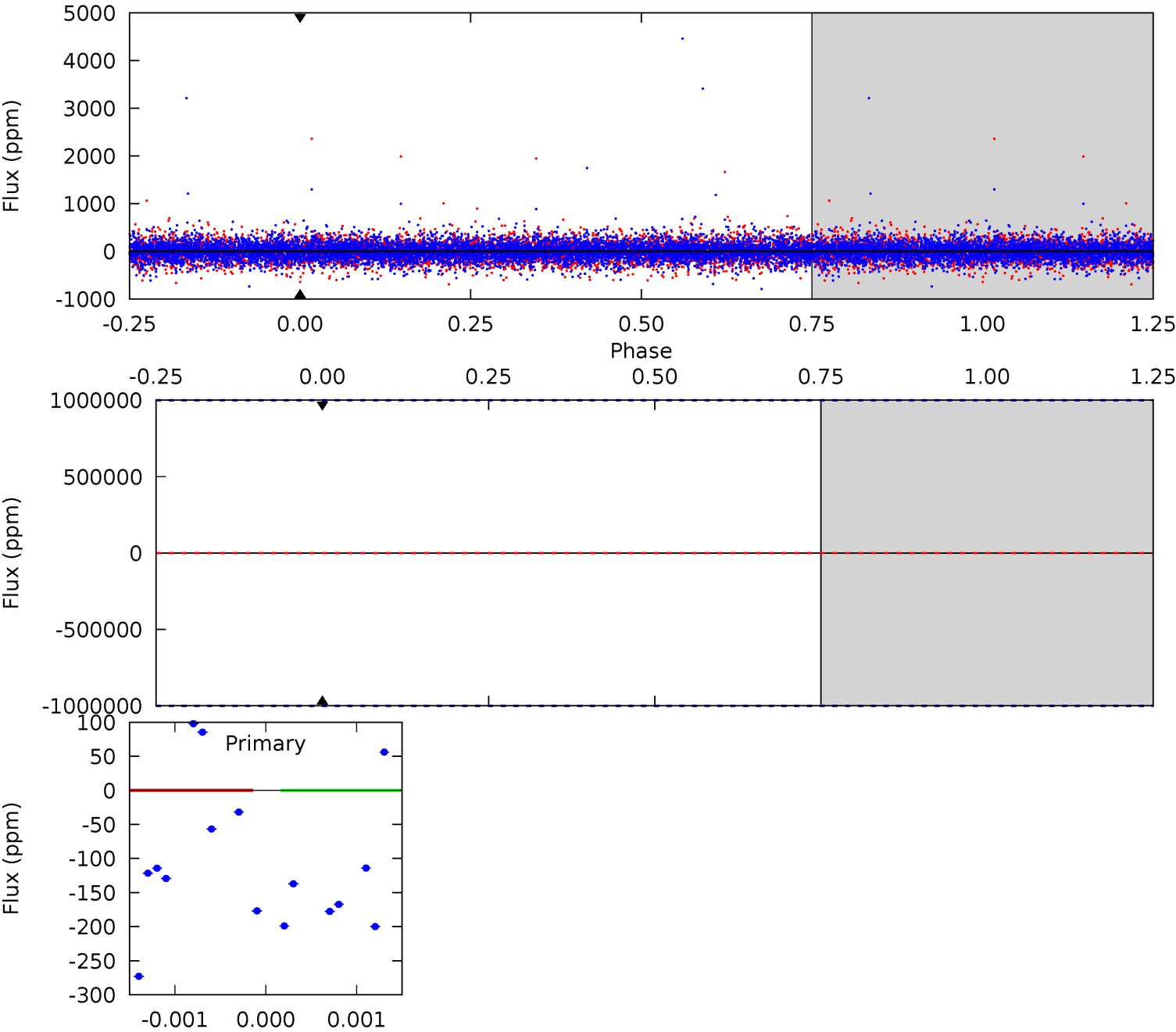
TCE 009166826-05     $P = 44.304722$  Days     $T_0 = 146.371537$  (BKJD)



# DV Model-Shift Uniqueness Test

009166826-05, P = 44.304722 Days, E = 101.816267 Days

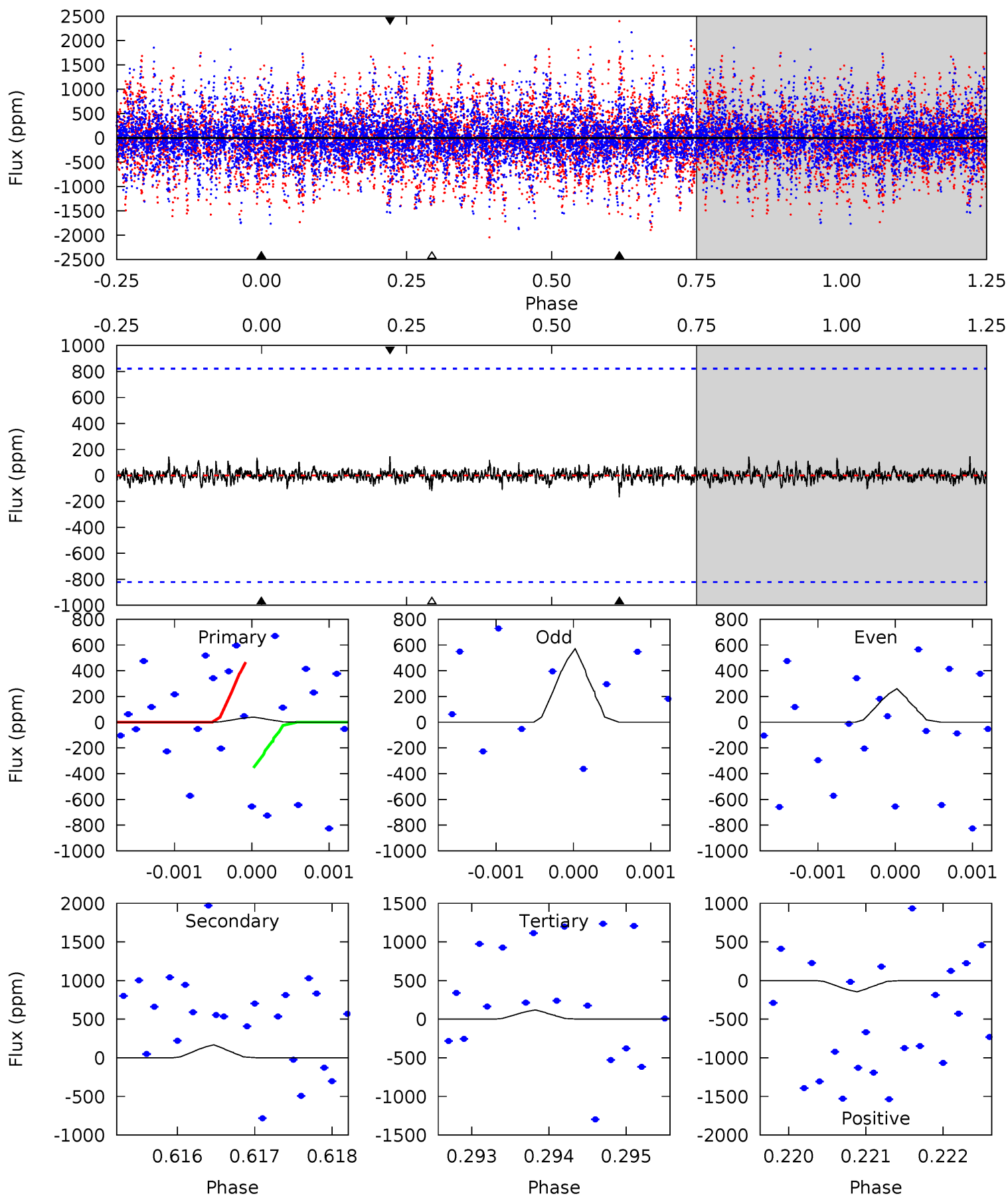
| Pri | Sec | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-----|-----|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|
| 0   | 0   | 0   | 0   | 1.00            | 1.00            | 1.00             | 0       | 0       | 0       | 0       | 0       | 0   | 0     | 0   |



# Alt Model-Shift Uniqueness Test

009166826-05, P = 44.304722 Days, E = 102.066815 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 0.26 | 1.11 | 0.79 | 0.97 | 5.44            | 3.27            | 0.21             | -0.53   | -0.71   | 0.32    | 0.15    | 1.06    | 8.42 | 0.47  | 0.35 |





### Stellar Parameters For KIC 009166826

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M$ ( $M_{\odot}$ )       | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $7261^{+228}_{-343}$ | $4.245^{+0.060}_{-0.225}$ | $0.210^{+0.150}_{-0.400}$ | $1.570^{+0.580}_{-0.193}$ | $1.591^{+0.211}_{-0.211}$ | $0.579^{+0.184}_{-0.323}$                     |
|        | +3%/-5%              | +1%/-5%                   | +71%/-190%                | +37%/-12%                 | +13%/-13%                 | +32%/-56%                                     |
| 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 009166826-05 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ )   | $T_{max}$ (K)      | $T_{obs}$ (K)            | $A_{obs}$               |
|---------|-----------------|--------------------------|--------------------|--------------------------|-------------------------|
| DV      | $0 \pm 1000000$ | $13.01^{+15.88}_{-8.68}$ | $1076^{+77}_{-63}$ | $5372^{+35063}_{-40602}$ | $408^{+49128}_{-39973}$ |
| Alt.    | $-168 \pm 151$  | $14.10^{+13.94}_{-9.87}$ | $1062^{+80}_{-62}$ | $3315^{+1746}_{-949}$    | $30^{+294}_{-27}$       |

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

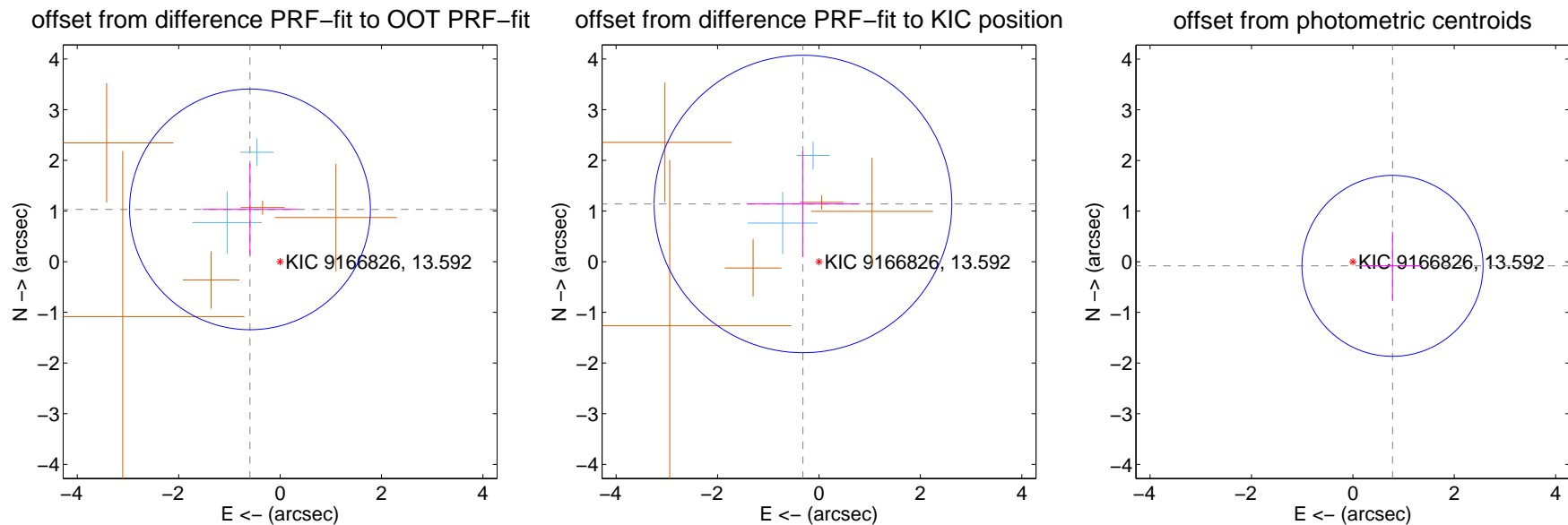
## DV Centroid Data

Supplemental centroid analysis for 009166826-05. Kepler magnitude: 13.59. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

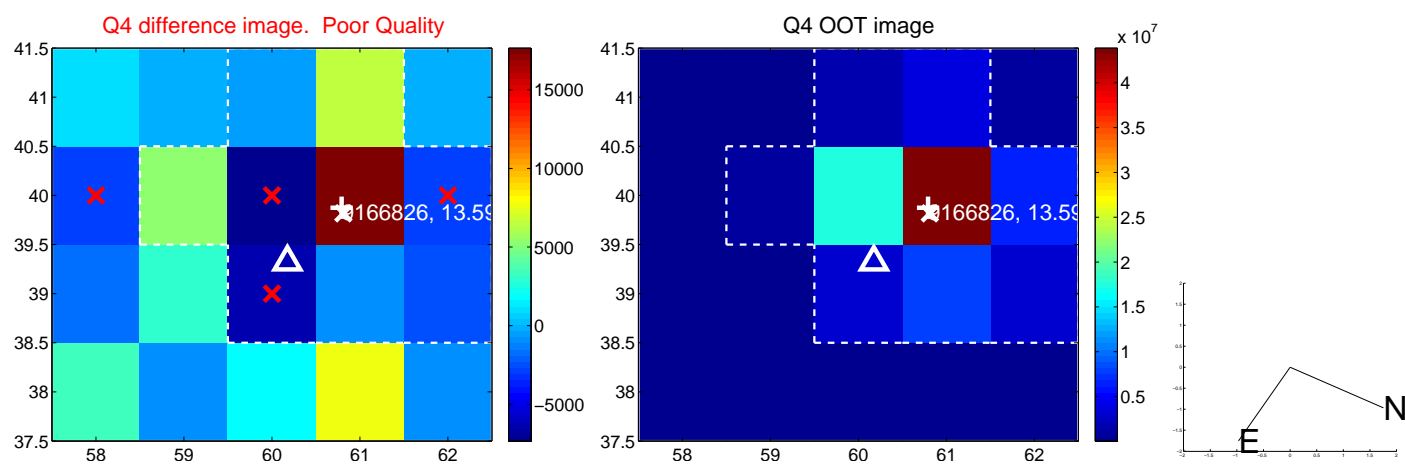
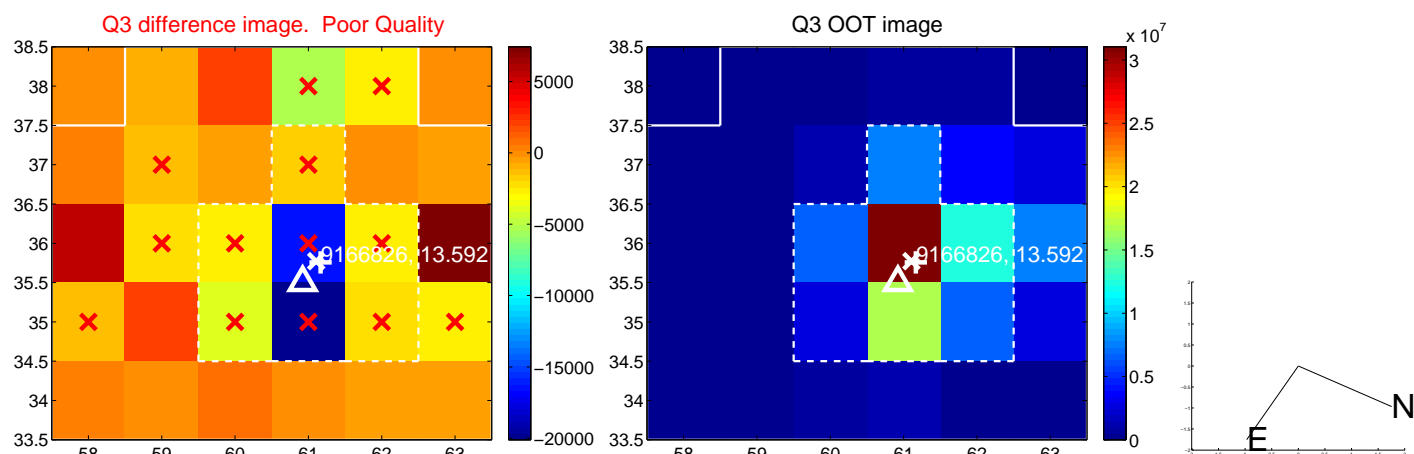
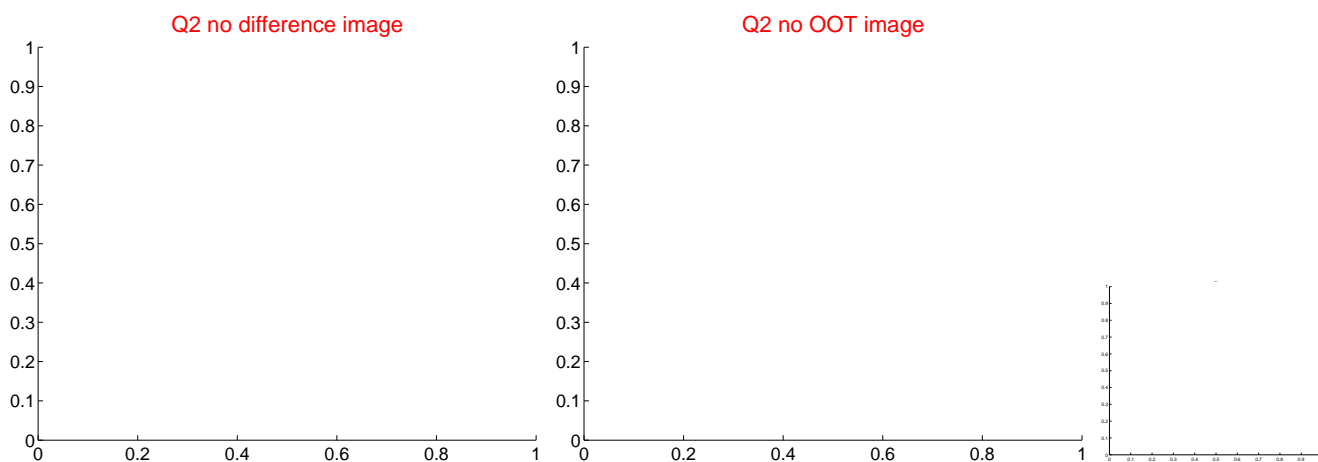
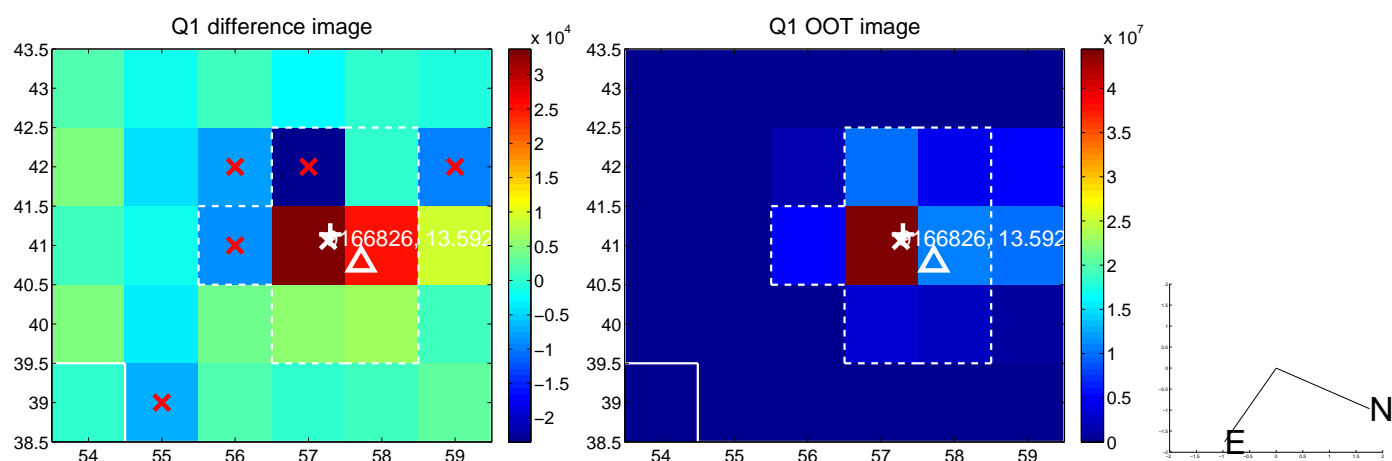
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $1.191 \pm 0.791$  | 1.50                | $0.594 \pm 0.936$ | $1.032 \pm 0.902$ |
| PRF-fit source offset from KIC position | $1.182 \pm 0.978$  | 1.21                | $0.316 \pm 1.110$ | $1.139 \pm 1.043$ |
| photometric centroid source offset      | $0.79 \pm 0.60$    | 1.32                | $-0.78 \pm 0.59$  | $-0.08 \pm 0.67$  |

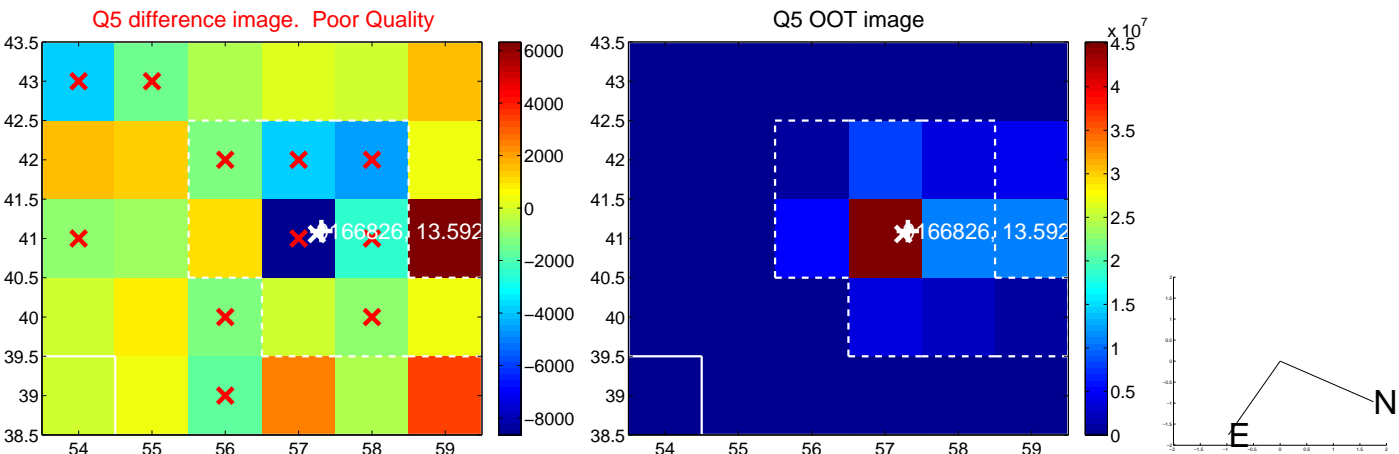


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

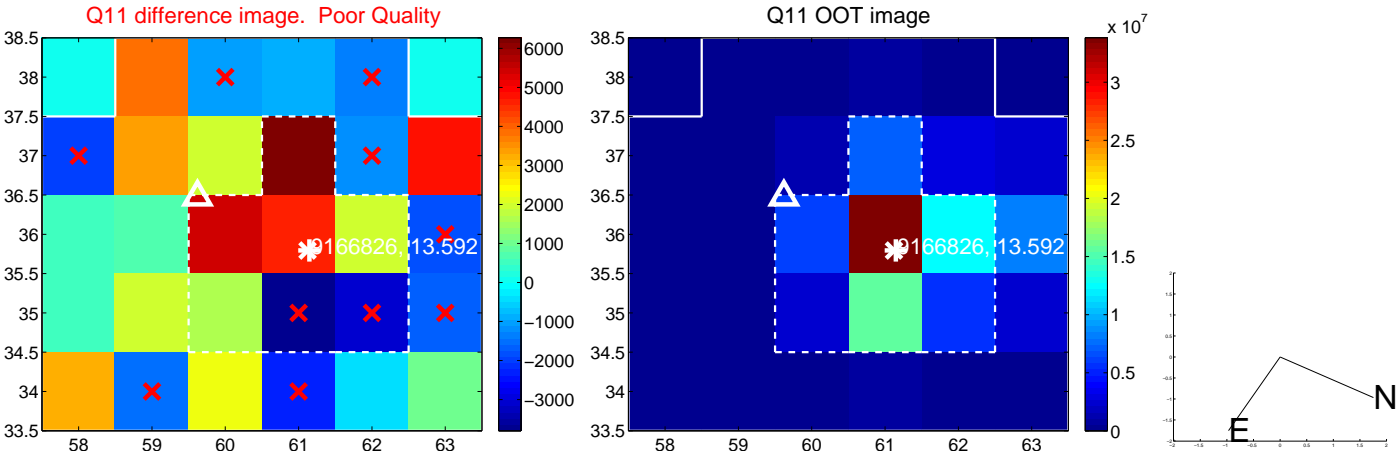
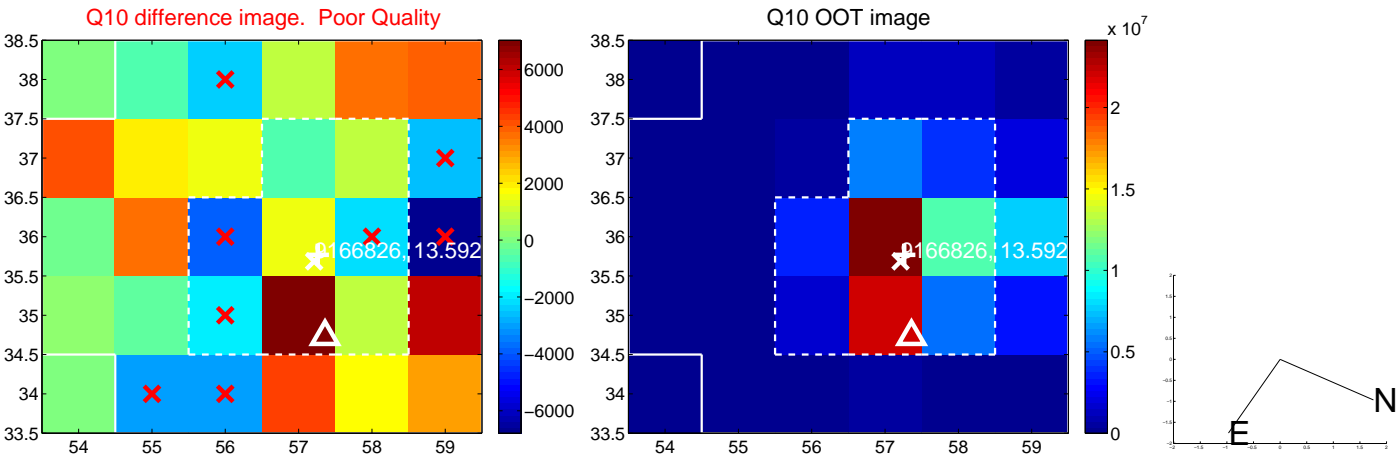
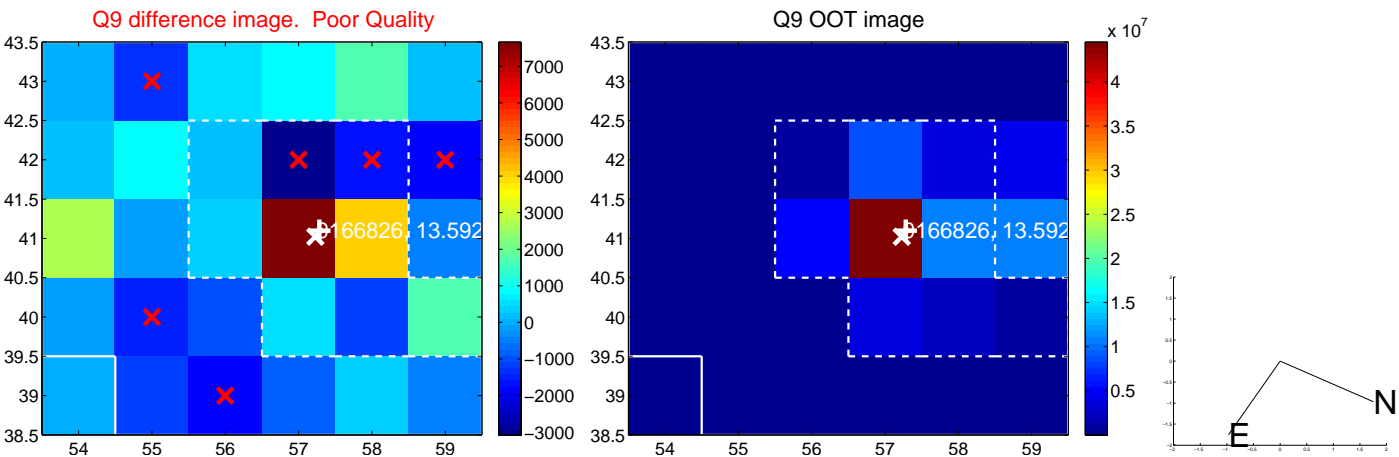
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



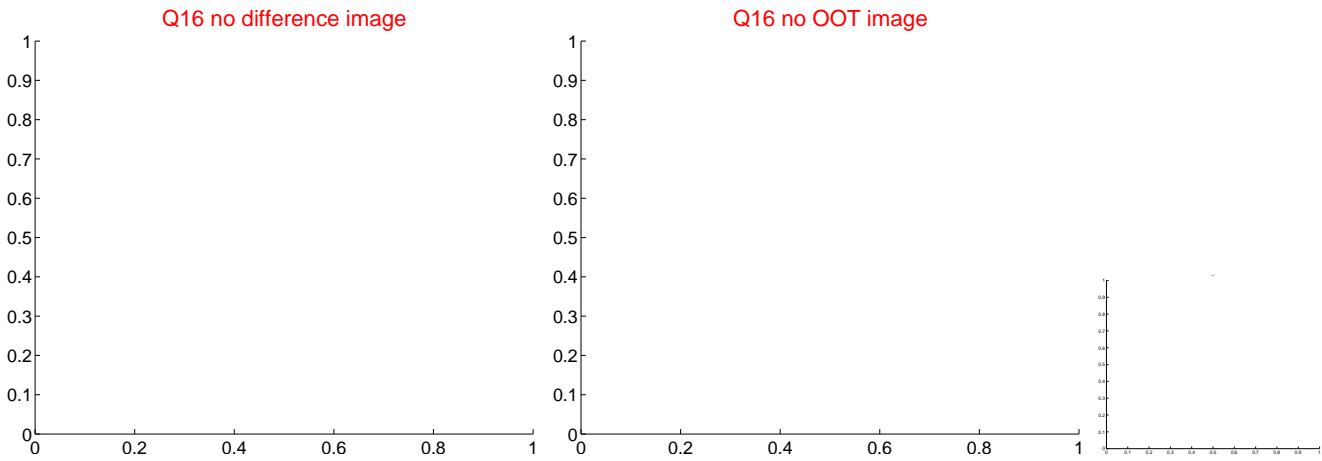
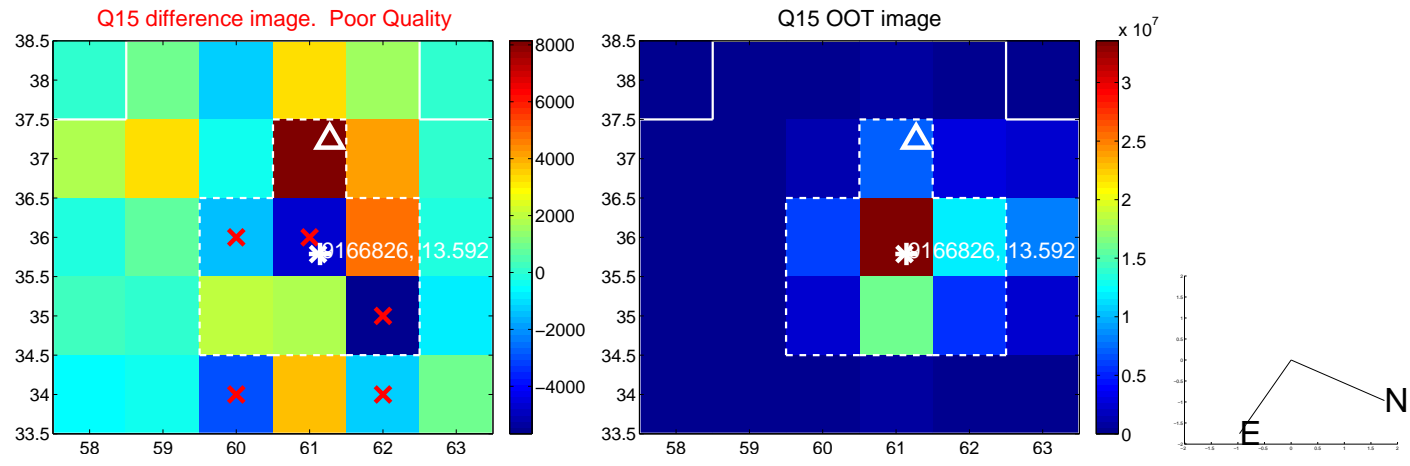
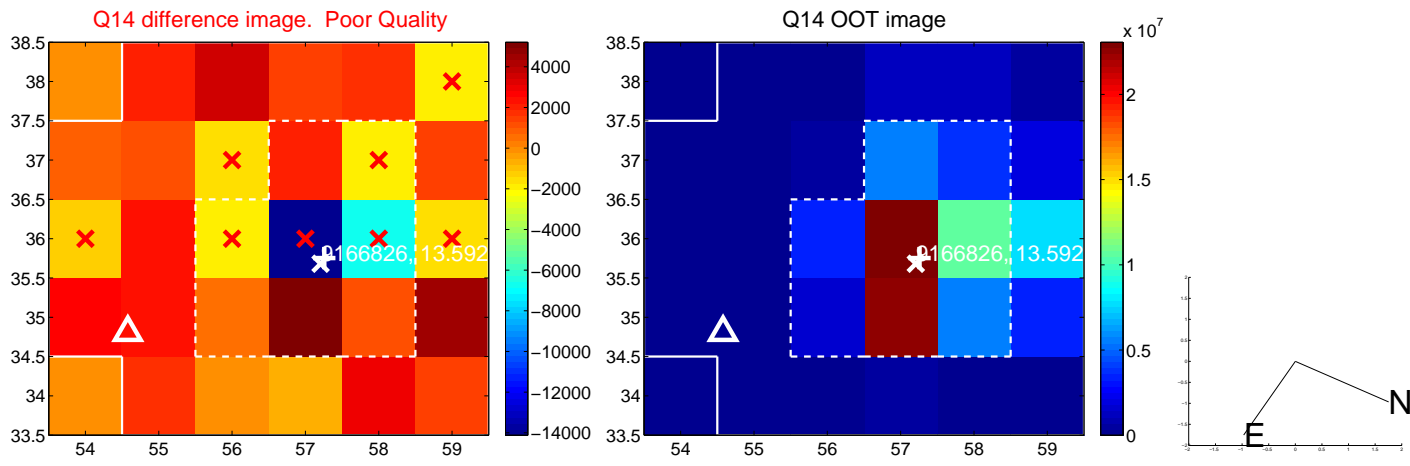
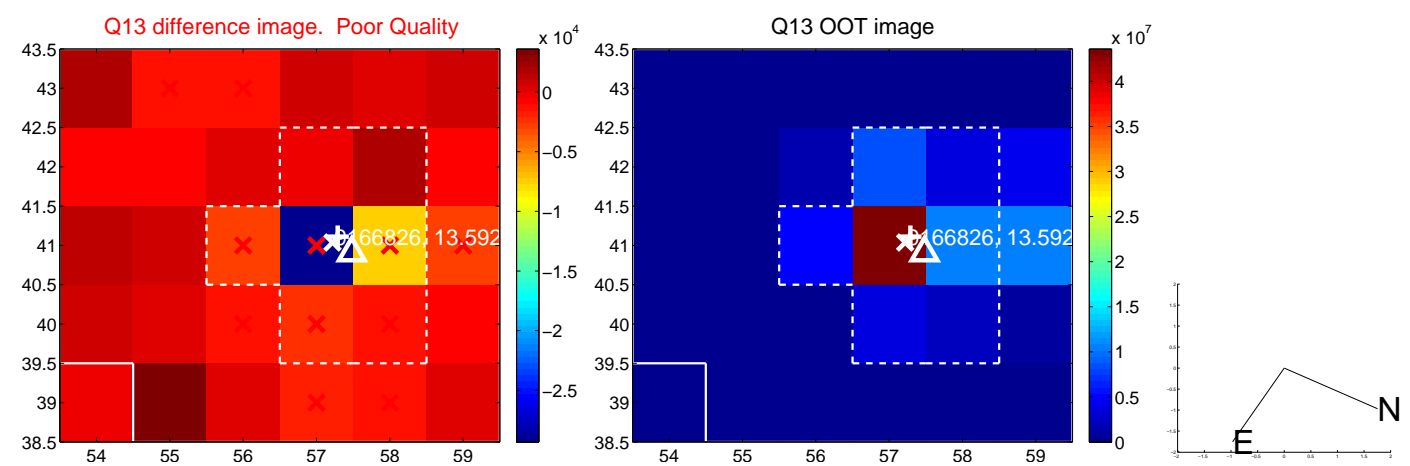
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

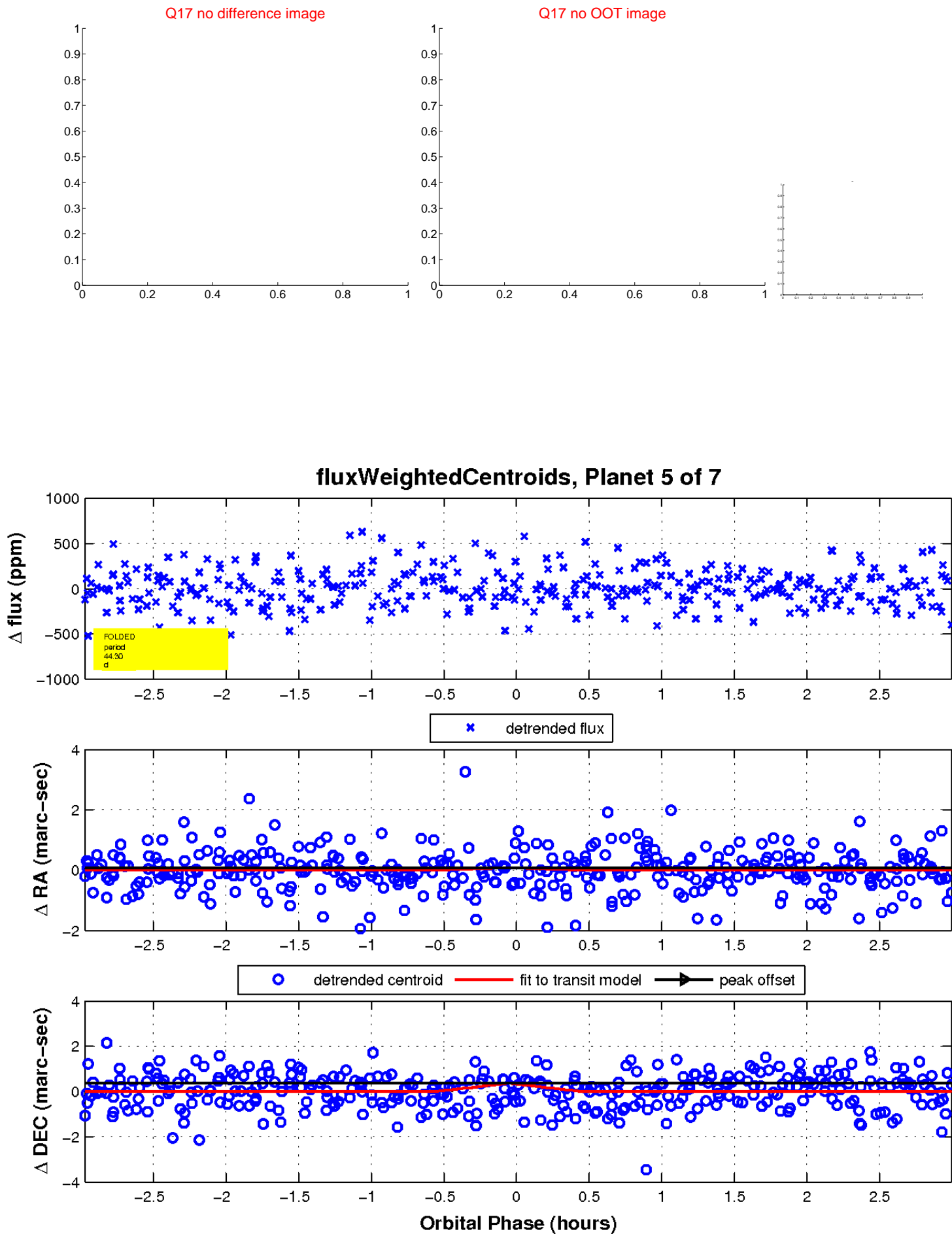


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

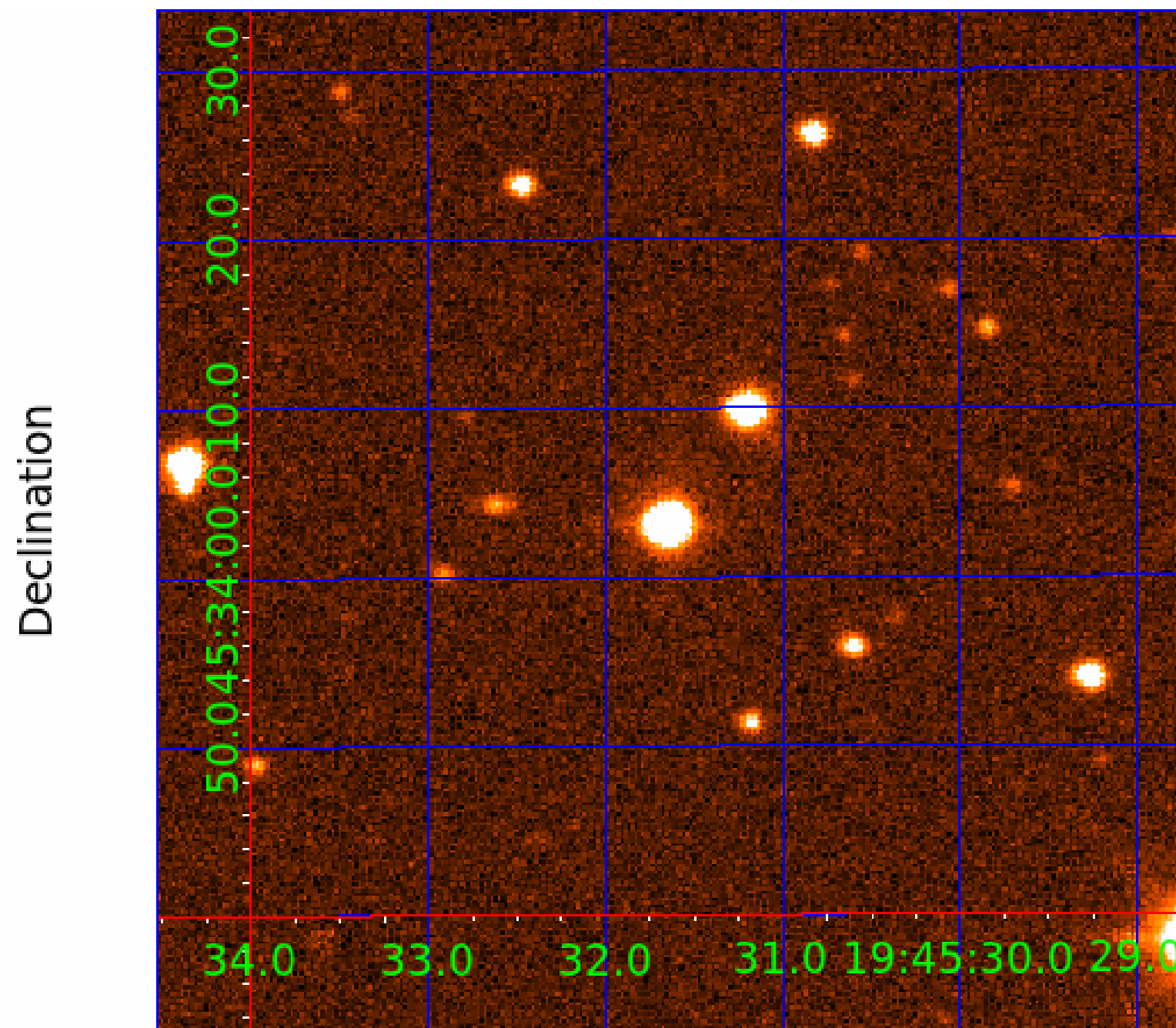




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image



# KIC 009166826

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009166826-01 | OBS      | No   | 1.105096      | 132.364571   | 32.2        | 3.666            | 10.2 | 8.4  | 1.57                        | 7261            | 0.98                   | 10334.27               |
| 009166826-02 | OBS      | No   | 1.105092      | 131.627107   | 24.5        | 4.563            | 10.6 | 6.9  | 1.57                        | 7261            | 0.83                   | 10334.32               |
| 009166826-03 | OBS      | No   | 18.475152     | 139.191330   | 54.8        | 1.368            | 8.4  | 1.4  | 1.57                        | 7261            | 1.33                   | 241.75                 |
| 009166826-04 | OBS      | No   | 18.475735     | 139.518855   | 71.3        | 2.308            | 8.5  | 2.3  | 1.57                        | 7261            | 1.53                   | 241.74                 |
| 009166826-05 | OBS      | No   | 44.304722     | 146.120989   | 282.3       | 4.500            | 8.0  | -1.0 | 1.57                        | 7261            | 2.67                   | 75.31                  |
| 009166826-06 | OBS      | No   | 47.695013     | 172.383956   | 274.8       | 4.358            | 7.3  | 6.5  | 1.57                        | 7261            | 2.83                   | 68.26                  |
| 009166826-07 | OBS      | No   | 74.722951     | 142.333969   | 266.5       | 4.500            | 7.5  | -1.0 | 1.57                        | 7261            | 2.60                   | 37.52                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 009166826-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009166826-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—SAME_NTL_PERIOD  |
| 009166826-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT      |
| 009166826-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD |
| 009166826-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS  |
| 009166826-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT   |
| 009166826-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS   |

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

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

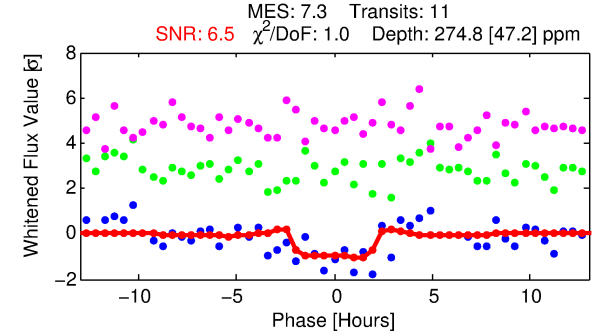
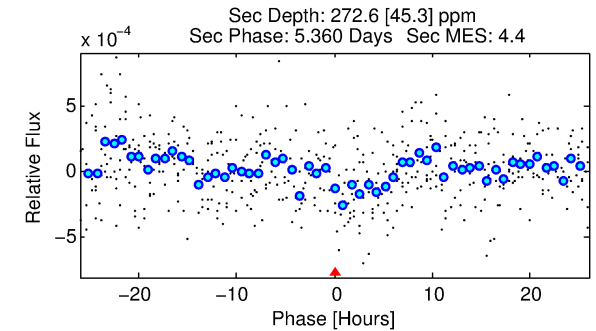
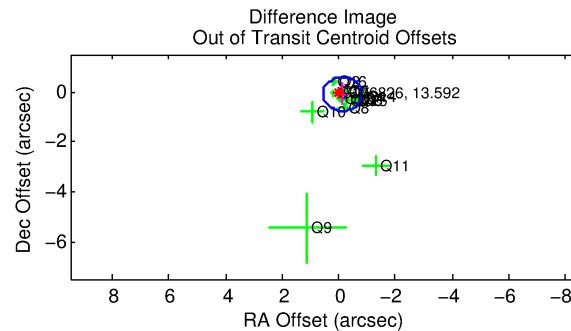
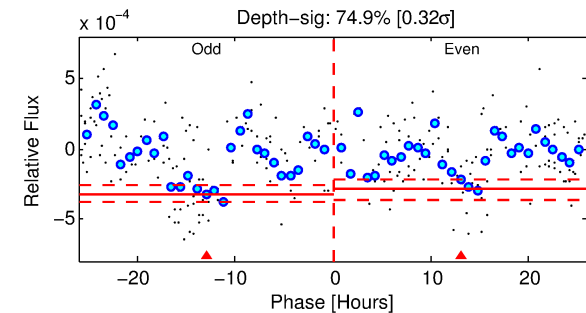
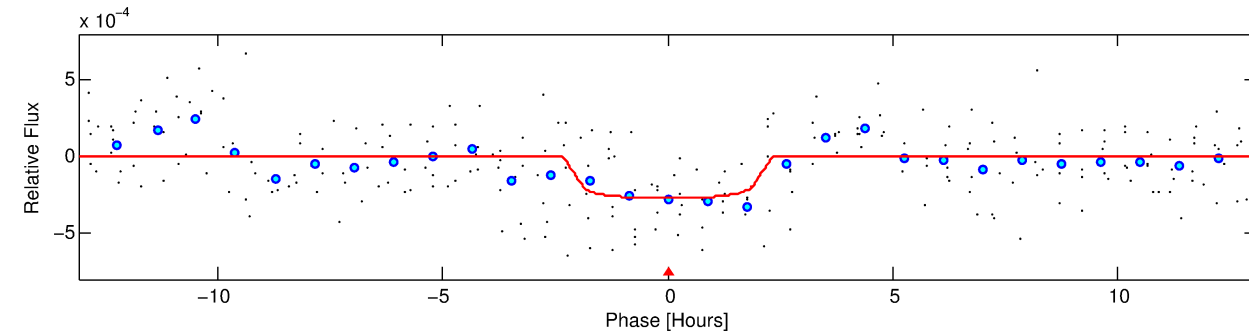
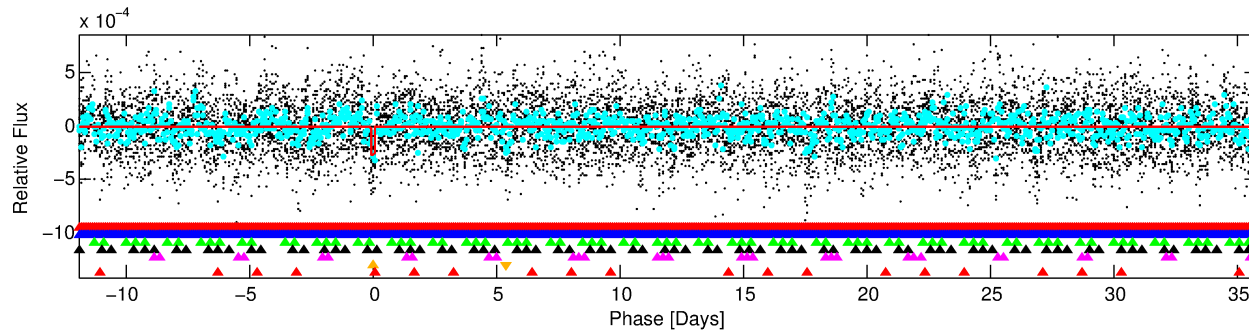
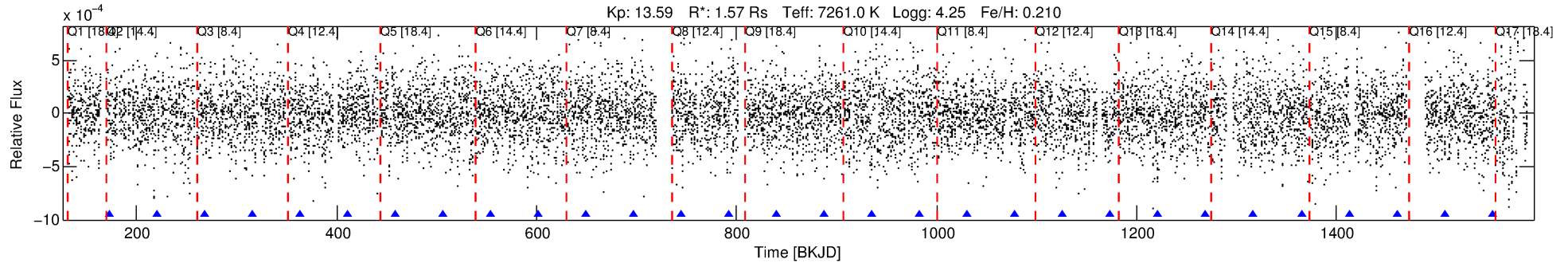
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009166826-06

No Significant Match Found

# DV One-Page Summary

KIC: 9166826 Candidate: 6 of 7 Period: 47.695 d



## DV Fit Results:

Period = 47.69501 [0.00066] d  
Epoch = 172.3840 [0.0108] BKJD  
Rp/R\* = 0.0165 [0.0152]  
a/R\* = 56.22 [314.63]  
b = 0.76 [3.10]  
Seff = 68.26 [31.70]  
Teff = 733 [85] K  
Rp = 2.83 [2.80] Re  
a = 0.2999 [0.0902] AU  
Ag = 1679.42 [3177.12] [0.53 $\sigma$ ]  
Teffp = 7254 [3361] K [1.94 $\sigma$ ]

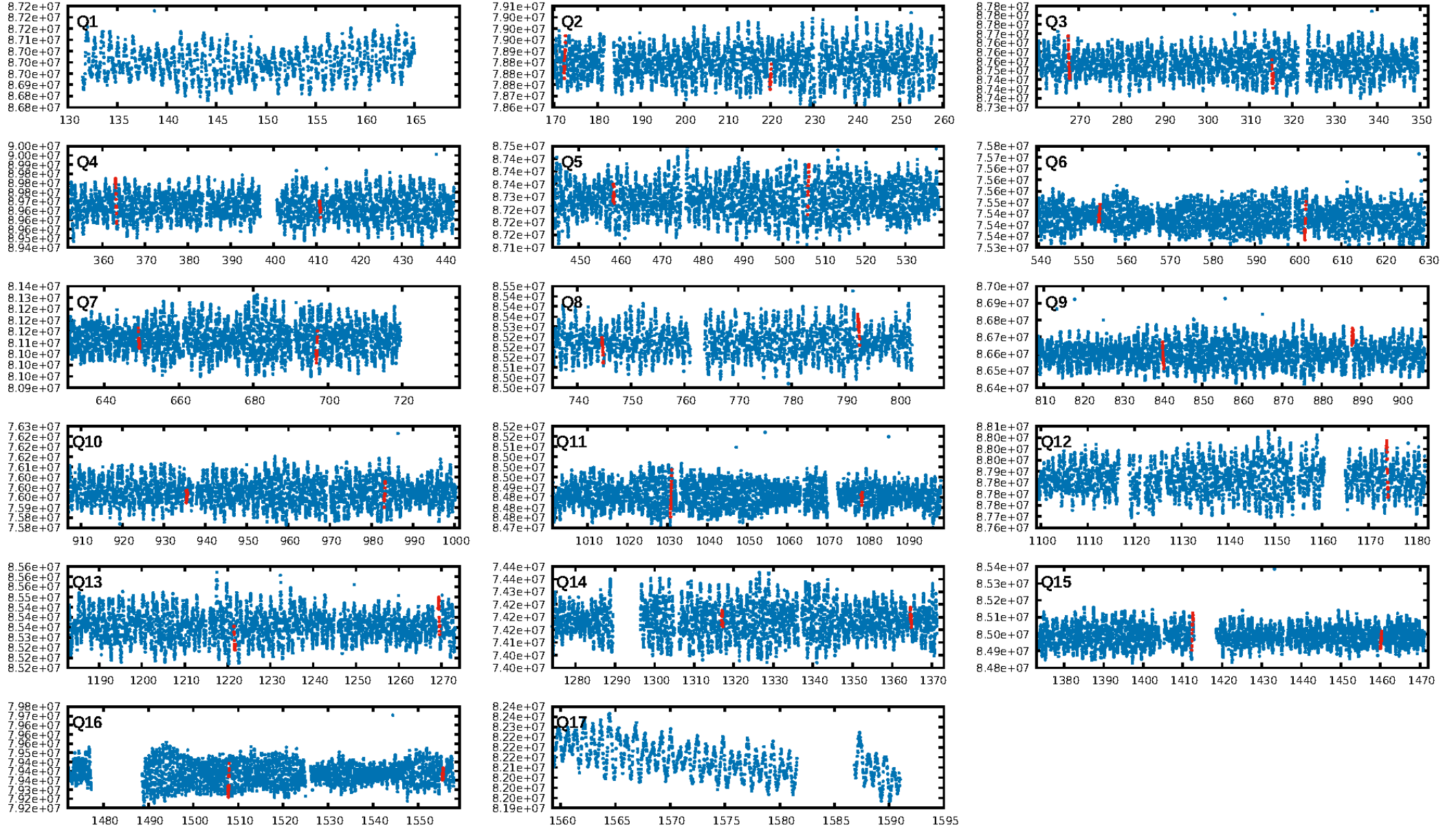
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [12.99 $\sigma$ ]  
LongPeriod-sig: 100.0% [103.55 $\sigma$ ]  
ModelChiSquare2-sig: 52.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [11/11]  
GhostDiagnostic-chr: 0.6875  
Centroid-sig: 0.9%  
Centroid-so: 1.734 arcsec [3.03 $\sigma$ ]  
OotOffset-rm: 0.155 arcsec [0.68 $\sigma$ ]  
KicOffset-rm: 0.337 arcsec [2.42 $\sigma$ ]  
OotOffset-st: 4/4/4/3 [15]  
KicOffset-st: 4/4/4/3 [15]  
DiffImageQuality-fgm: 0.53 [8/15]  
DiffImageOverlap-fno: 0.00 [0/15]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:04:04 Z

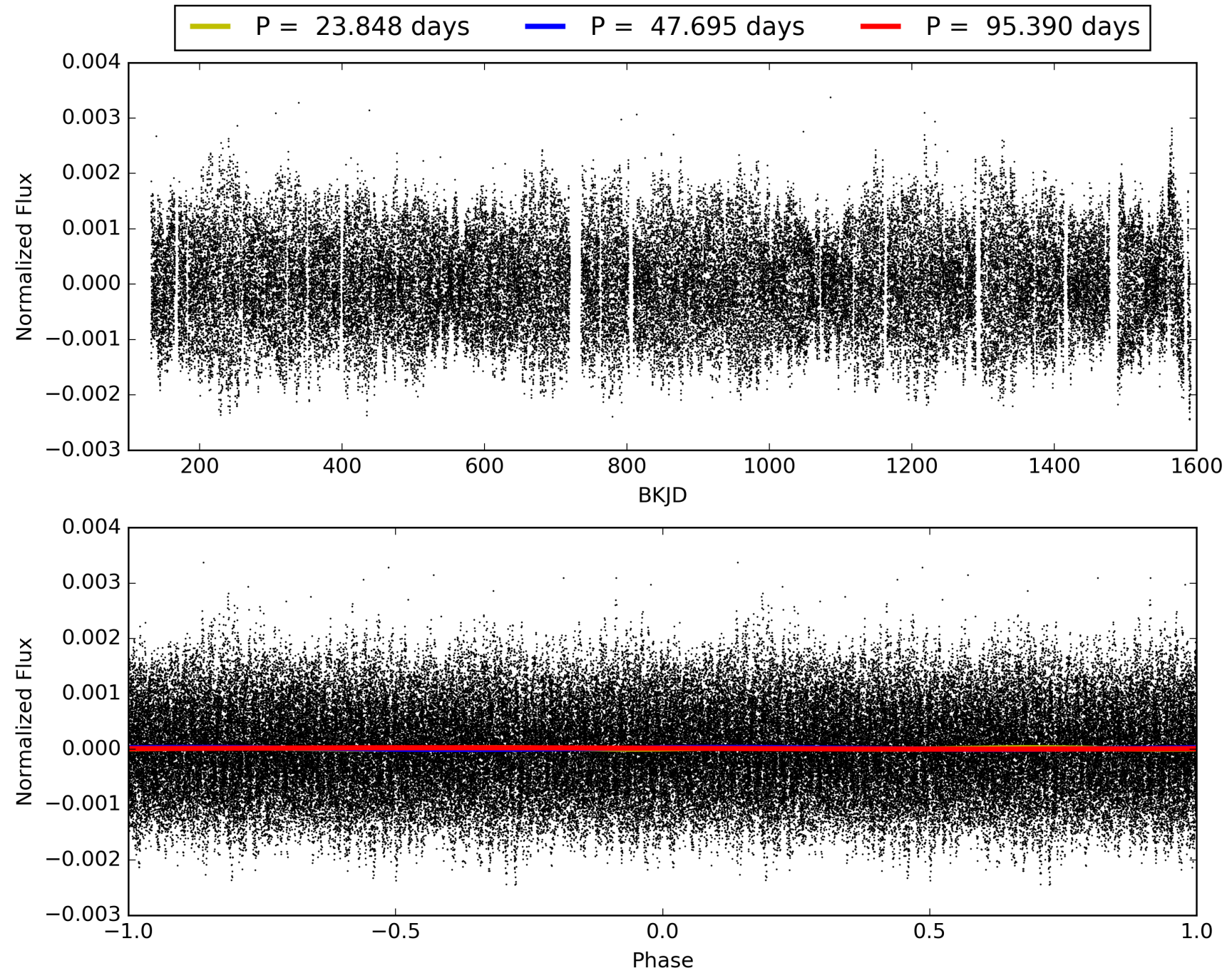
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009166826-06, PDC Light Curves





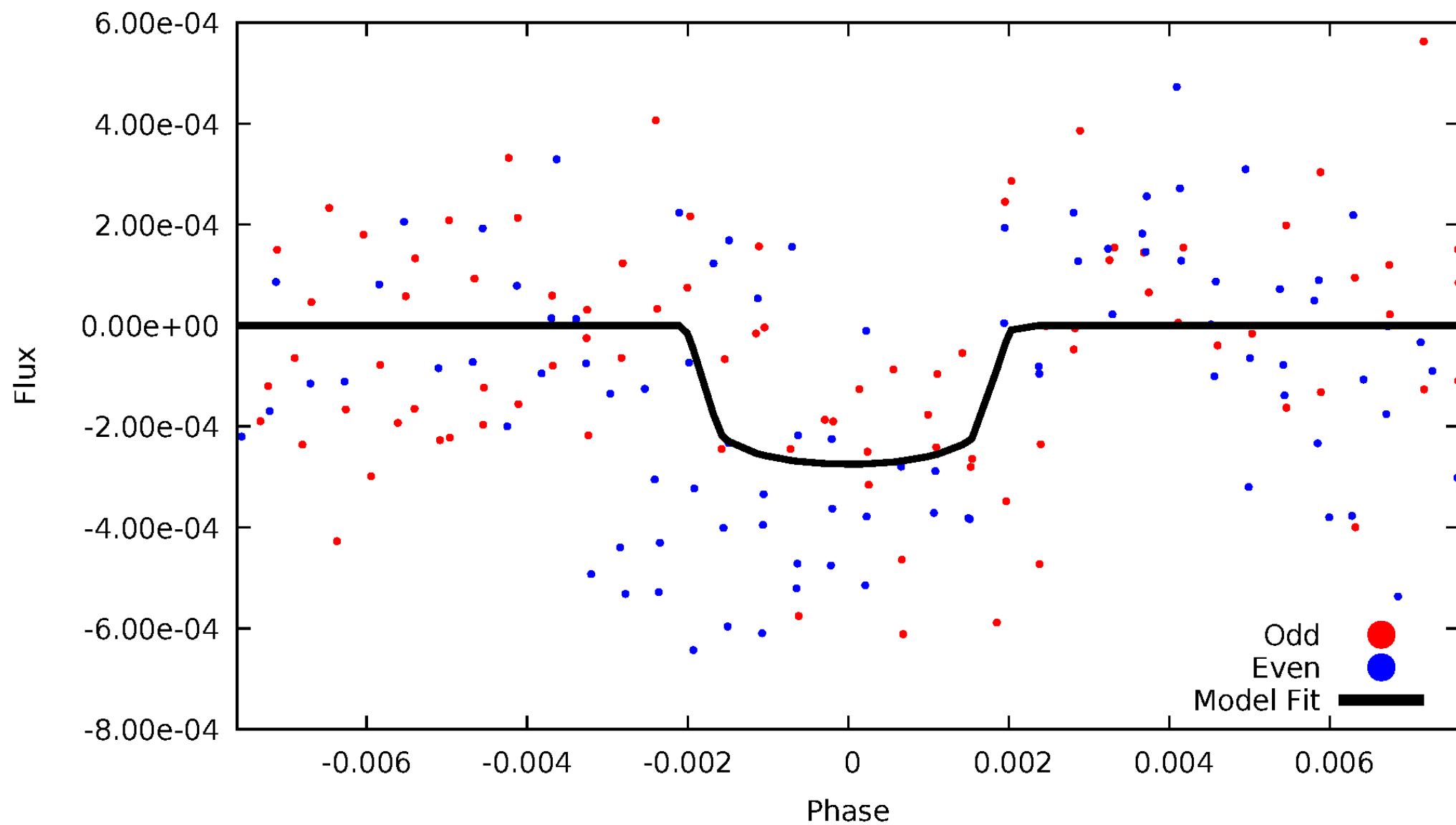
TCE 009166826-06





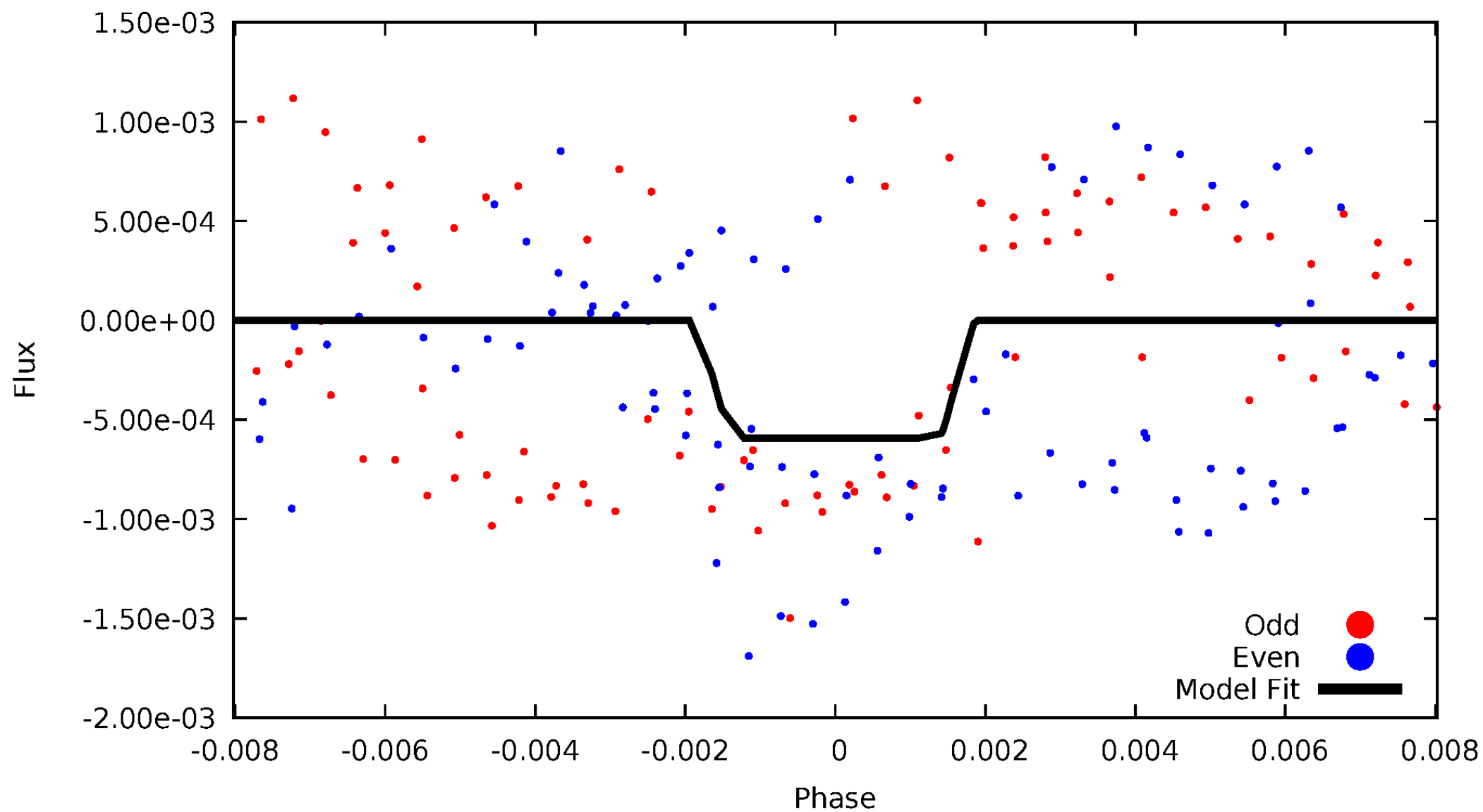
# DV Odd/Even

TCE 009166826-06



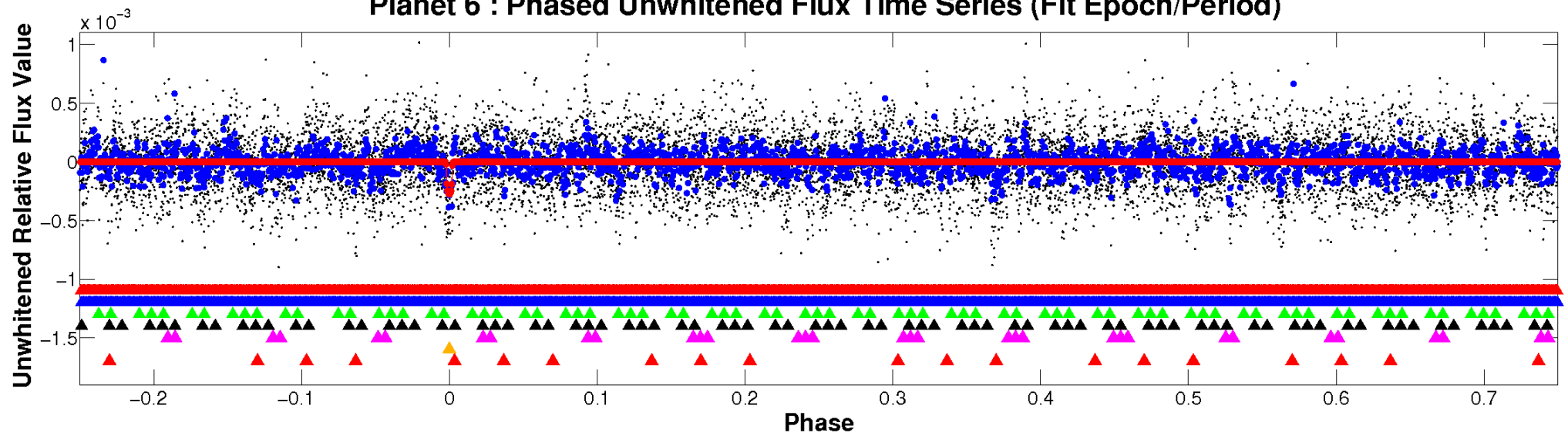
# ALT Odd/Even

TCE 009166826-06

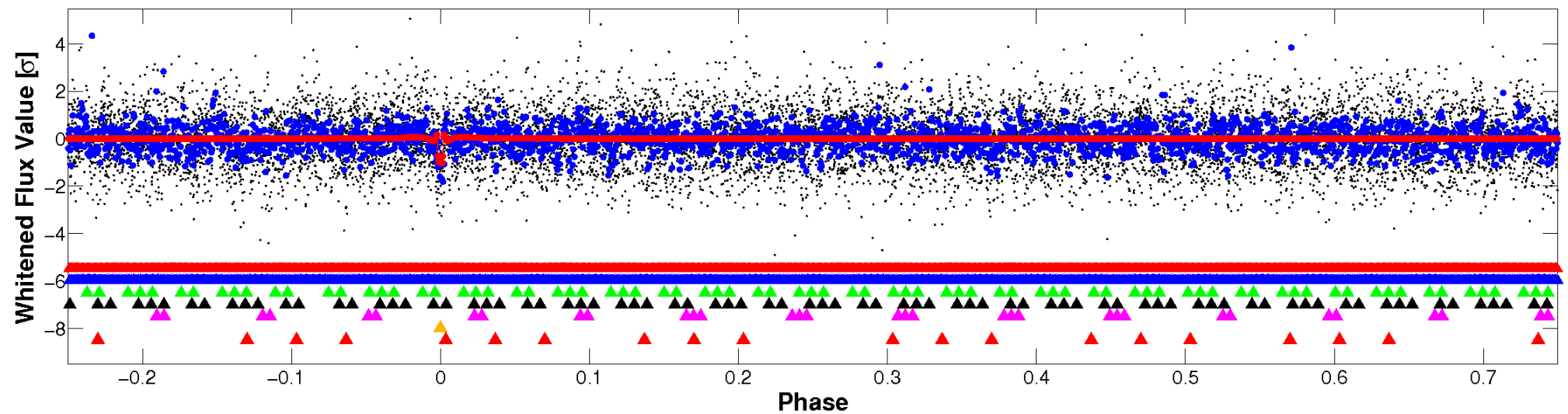


# Non-Whitened Vs. Whitened Light Curve

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

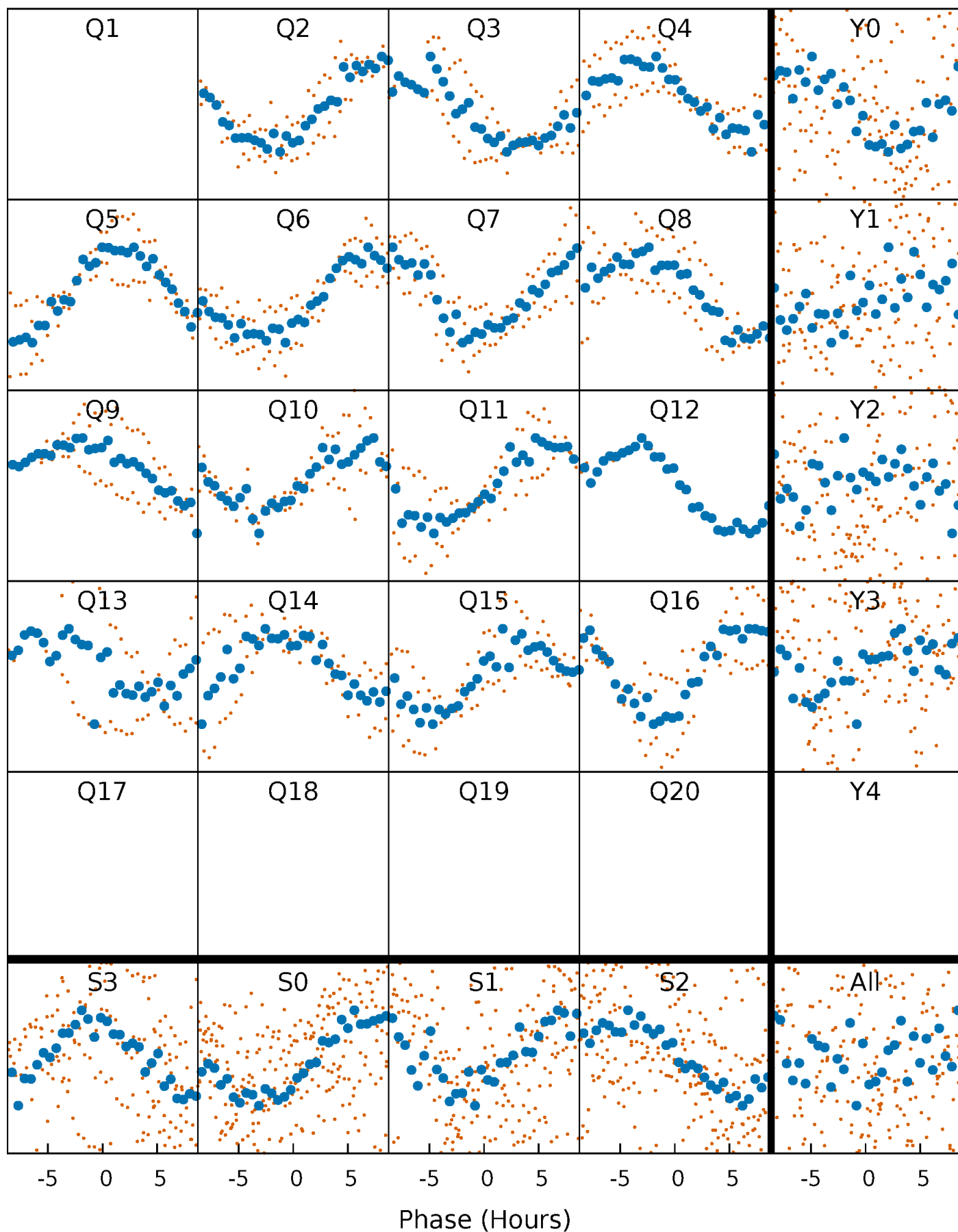


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



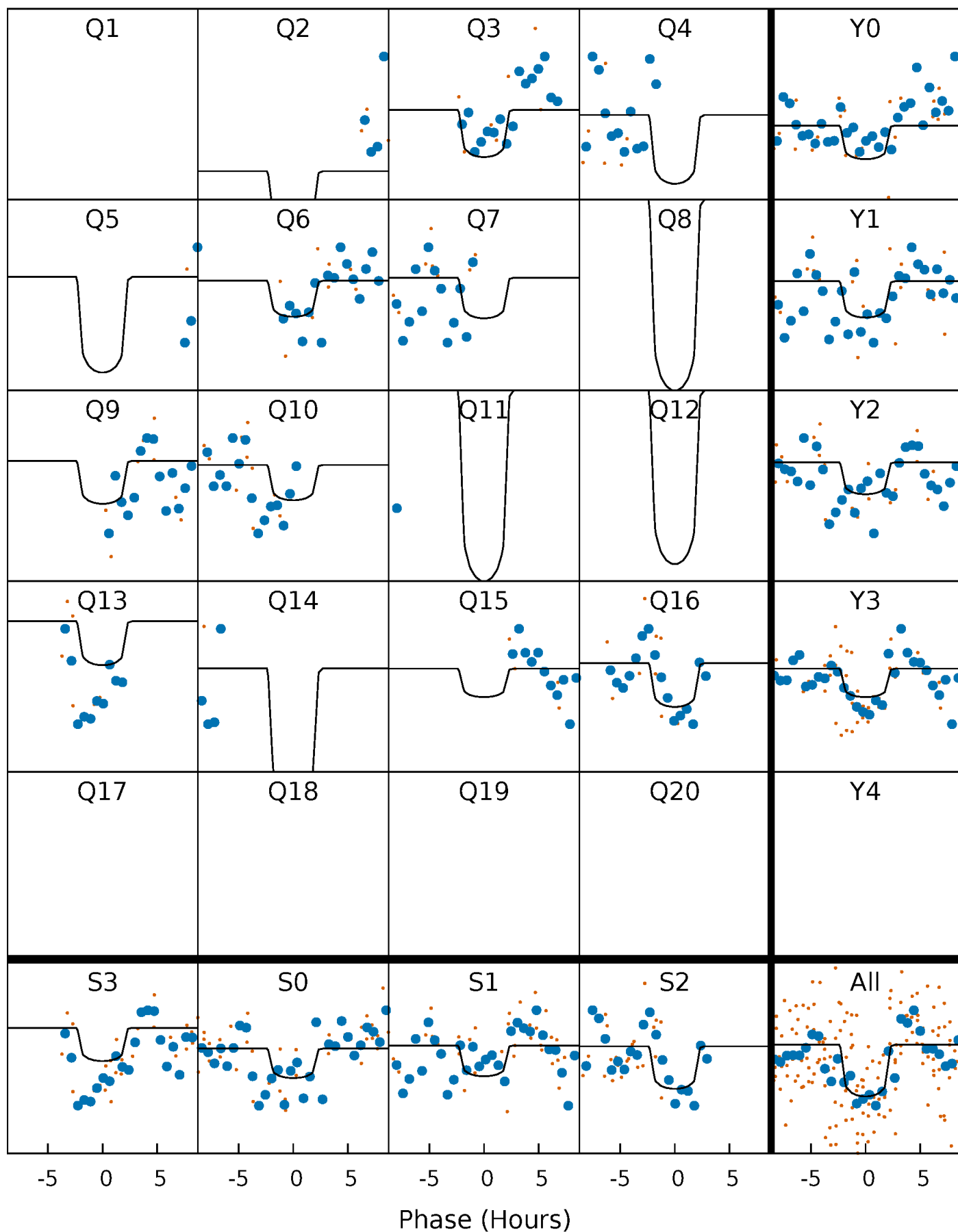
# PDC Quarter-Phased Transit Curves

TCE 009166826-06 P= 47.695013 Days  $T_0=172.383956$  (BKJD)



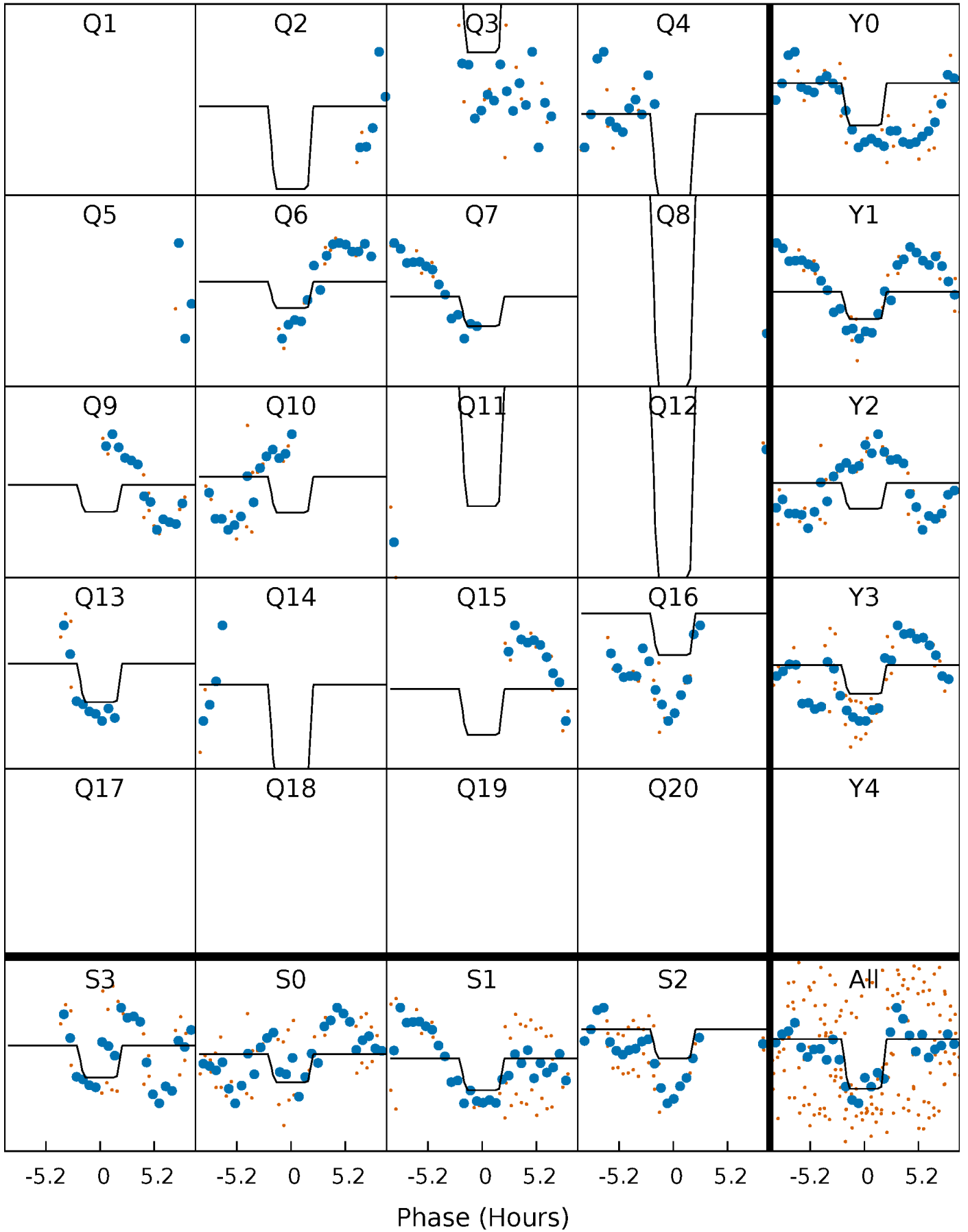
# DV Quarter-Phased Transit Curves

TCE 009166826-06 P= 47.695013 Days  $T_0=172.383956$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

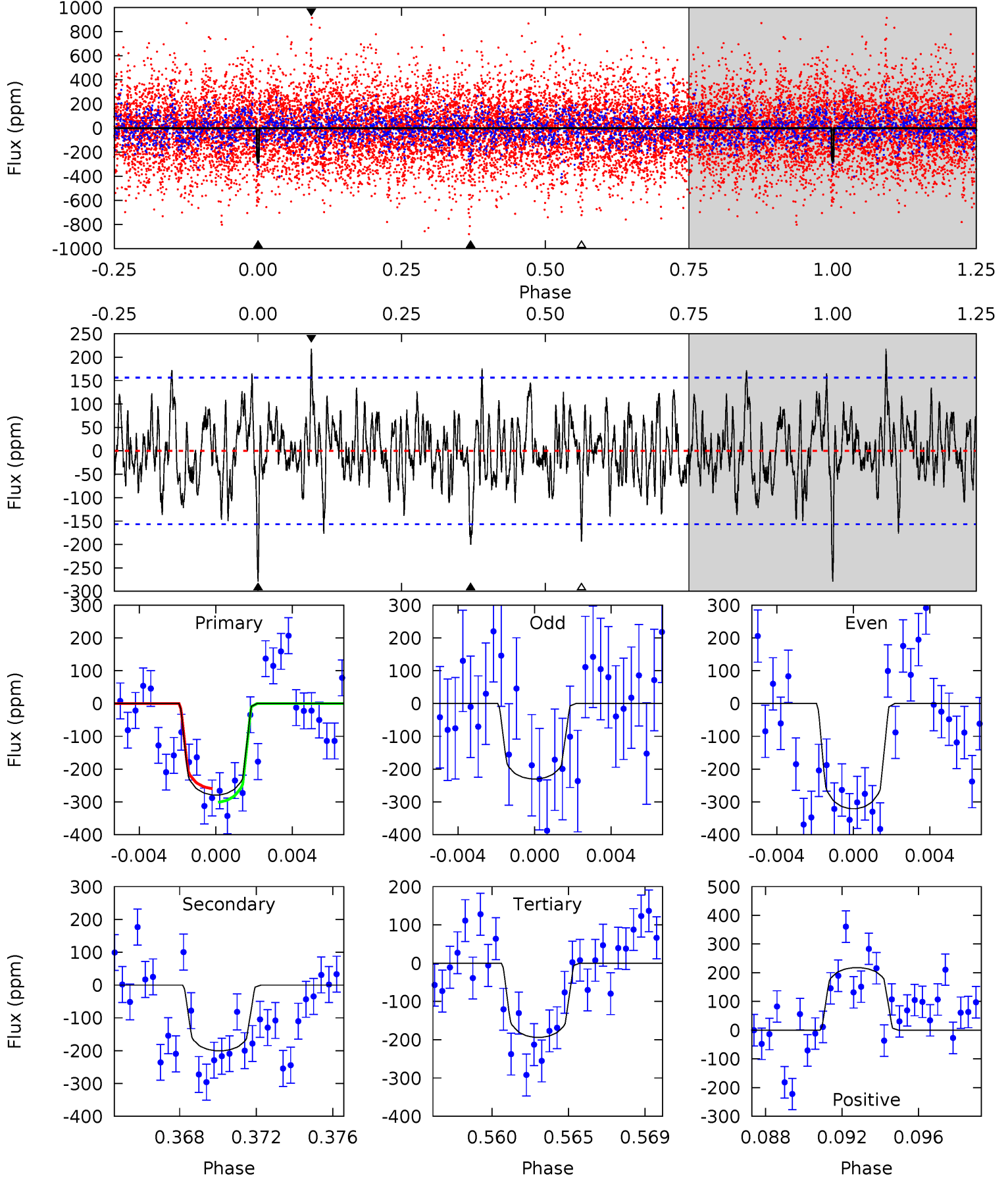
TCE 009166826-06 P= 47.695300 Days  $T_0=172.380605$  (BKJD)



# DV Model-Shift Uniqueness Test

009166826-06, P = 47.695013 Days, E = 124.688943 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.24 | 6.63 | 6.42 | 7.21 | 5.18            | 2.85            | 1.92             | 2.82    | 2.03    | 0.22    | -0.58   | 1.50    | 0.83 | 0.44  | 0.68 |

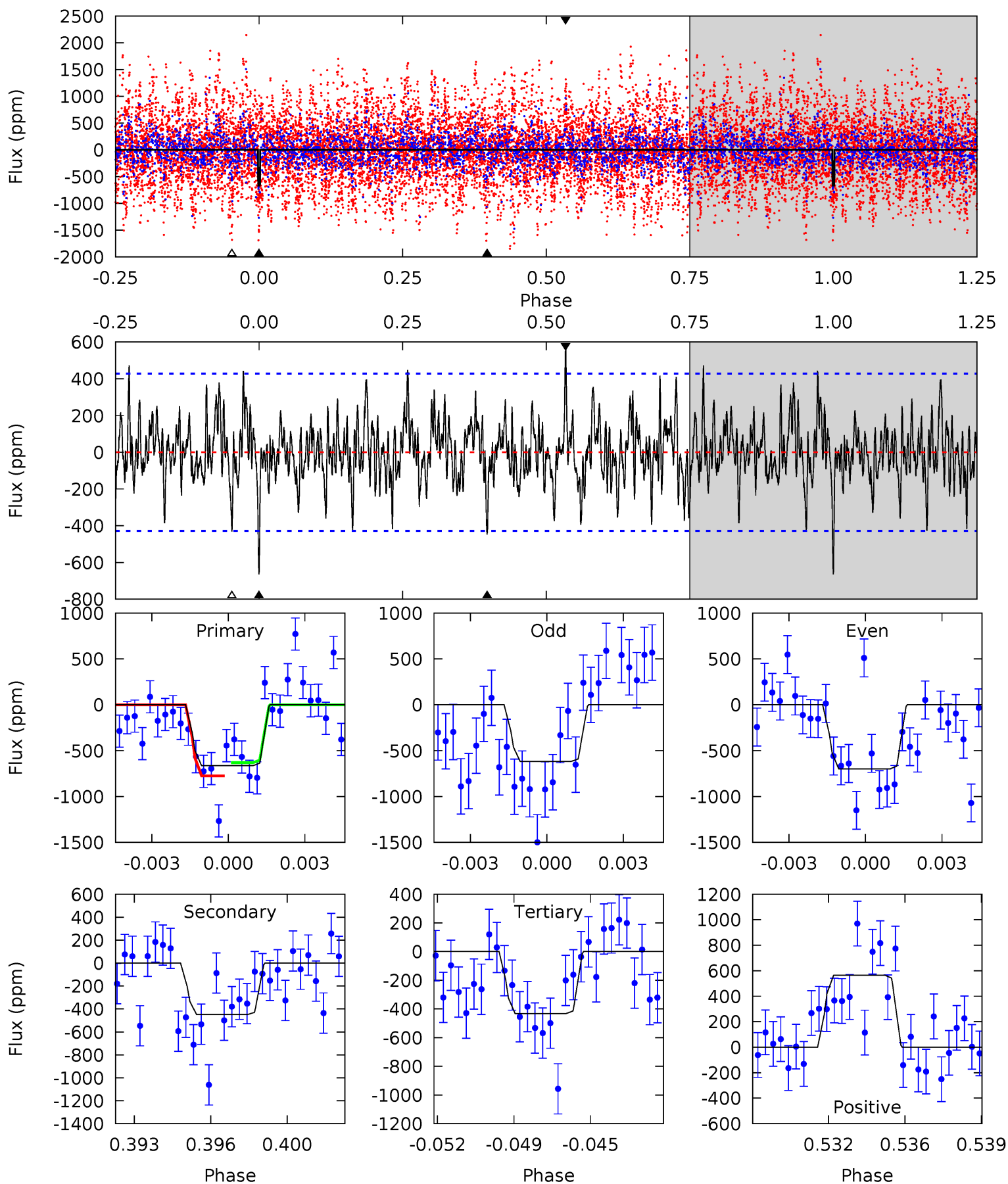




# Alt Model-Shift Uniqueness Test

009166826-06, P = 47.695300 Days, E = 124.685305 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.12 | 5.47 | 5.27 | 6.89 | 5.23            | 2.92            | 1.77             | 2.84    | 1.22    | 0.20    | -1.43   | 0.50    | 0.63 | 0.46  | 0.86 |



### Stellar Parameters For KIC 009166826

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R$ ( $R_{\odot}$ )       | $M$ ( $M_{\odot}$ )       | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $7261^{+228}_{-343}$ | $4.245^{+0.060}_{-0.225}$ | $0.210^{+0.150}_{-0.400}$ | $1.570^{+0.580}_{-0.193}$ | $1.591^{+0.211}_{-0.211}$ | $0.579^{+0.184}_{-0.323}$                     |
|        | +3%/-5%              | +1%/-5%                   | +71%/-190%                | +37%/-12%                 | +13%/-13%                 | +32%/-56%                                     |
| 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 009166826-06 / KOI

| Detrend | Depth (ppm)   | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)      | $T_{obs}$ (K)          | $A_{obs}$             |
|---------|---------------|------------------------|--------------------|------------------------|-----------------------|
| DV      | $-200 \pm 30$ | $3.58^{+2.64}_{-2.28}$ | $1043^{+84}_{-63}$ | $6073^{+5255}_{-1351}$ | $755^{+4810}_{-513}$  |
| Alt.    | $-448 \pm 82$ | $4.39^{+2.95}_{-2.31}$ | $1046^{+86}_{-60}$ | $6658^{+4132}_{-1460}$ | $1119^{+4074}_{-751}$ |

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

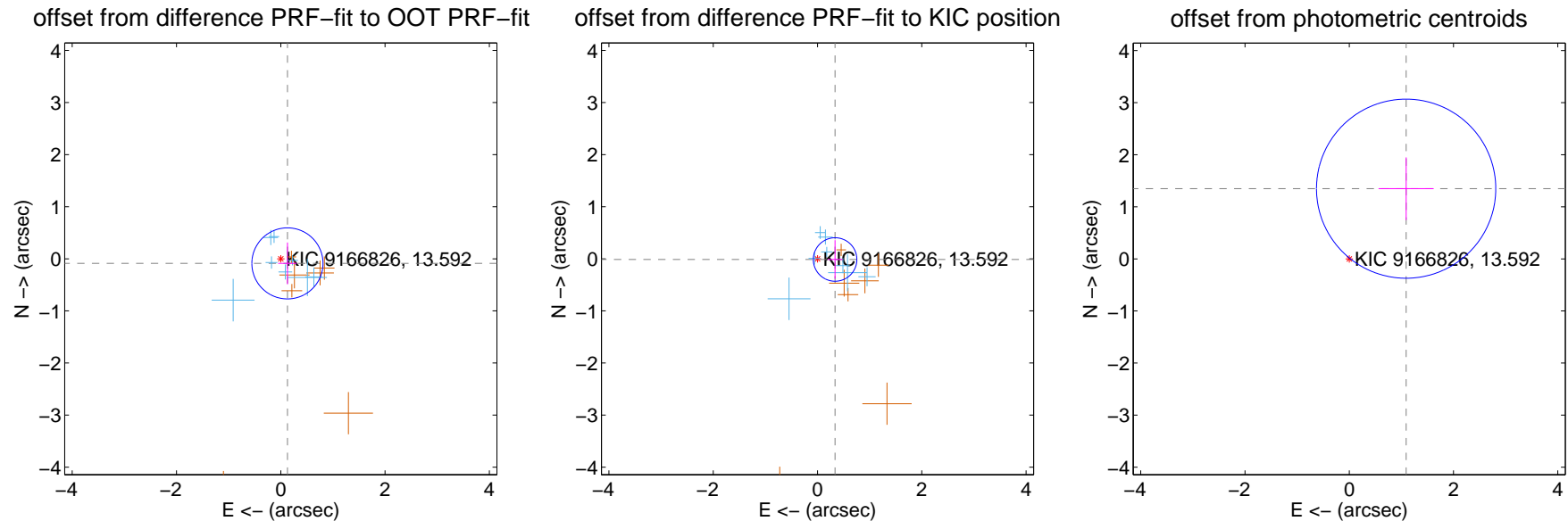
## DV Centroid Data

Supplemental centroid analysis for 009166826-06. Kepler magnitude: 13.59. Transit SNR 6.53

There are 8 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

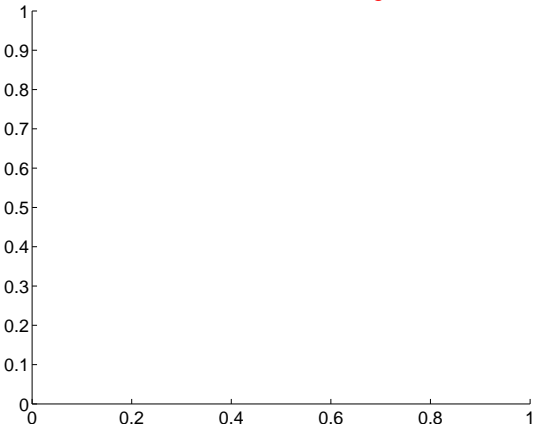
|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.155 \pm 0.227$  | 0.68                | $-0.128 \pm 0.177$ | $-0.088 \pm 0.402$ |
| PRF-fit source offset from KIC position | $0.337 \pm 0.139$  | 2.42                | $-0.337 \pm 0.143$ | $-0.013 \pm 0.370$ |
| photometric centroid source offset      | $1.73 \pm 0.57$    | 3.03                | $-1.09 \pm 0.53$   | $1.35 \pm 0.60$    |



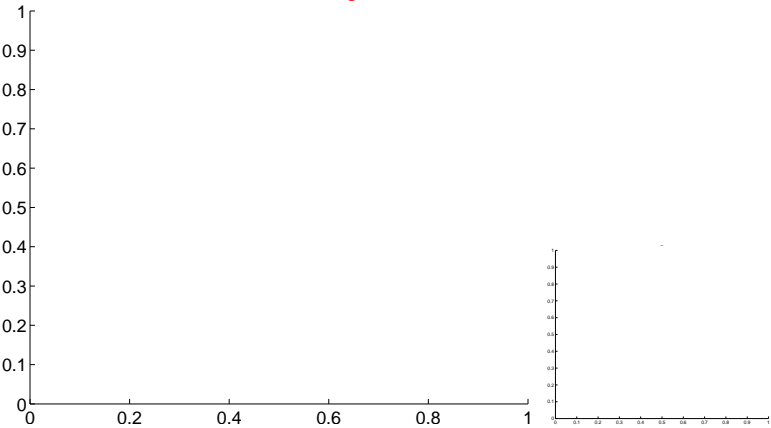
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

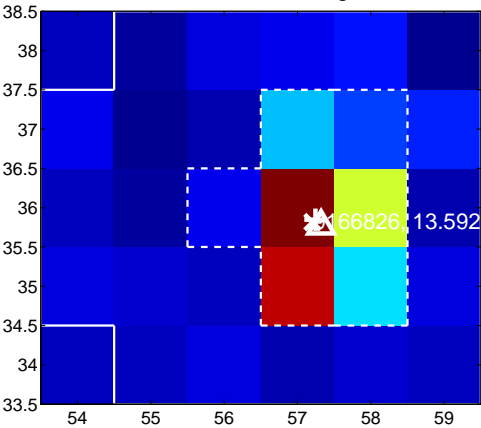
Q1 no difference image



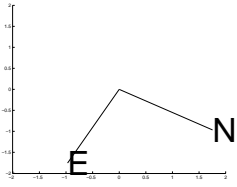
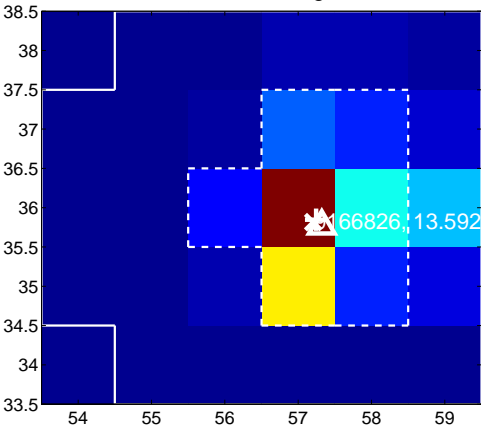
Q1 no OOT image



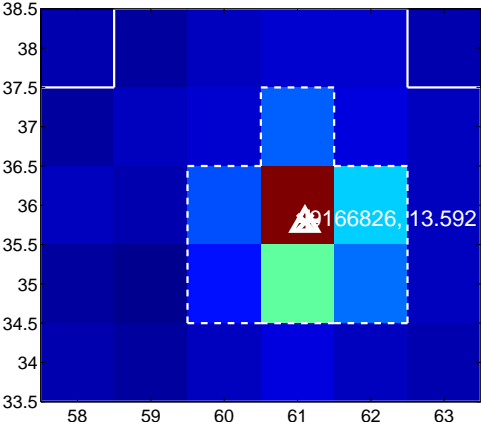
Q2 difference image



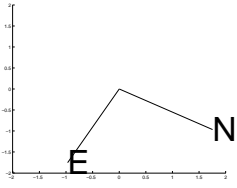
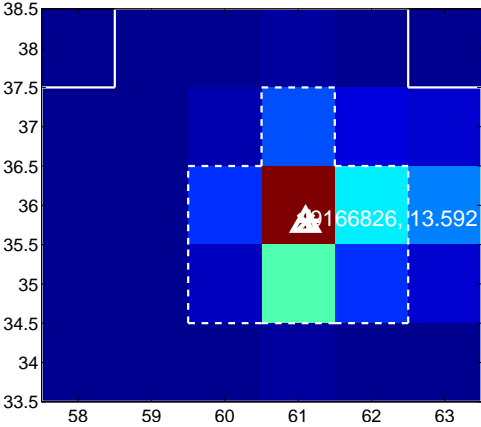
Q2 OOT image



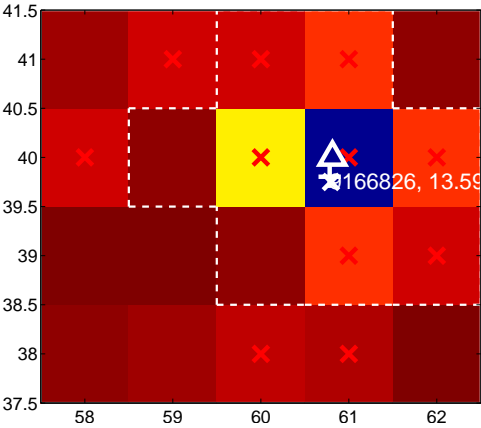
Q3 difference image



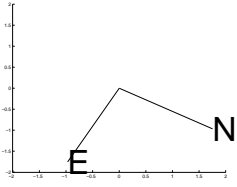
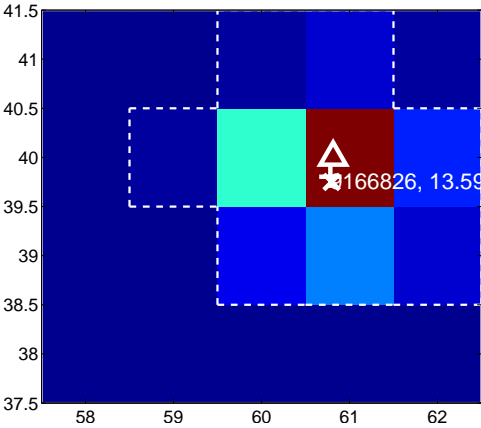
Q3 OOT image



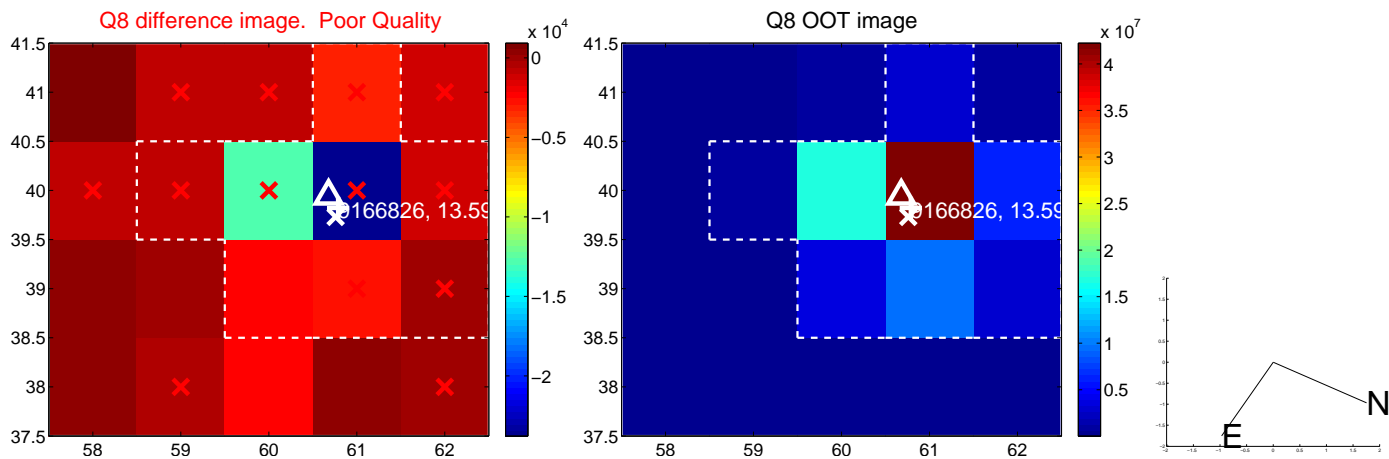
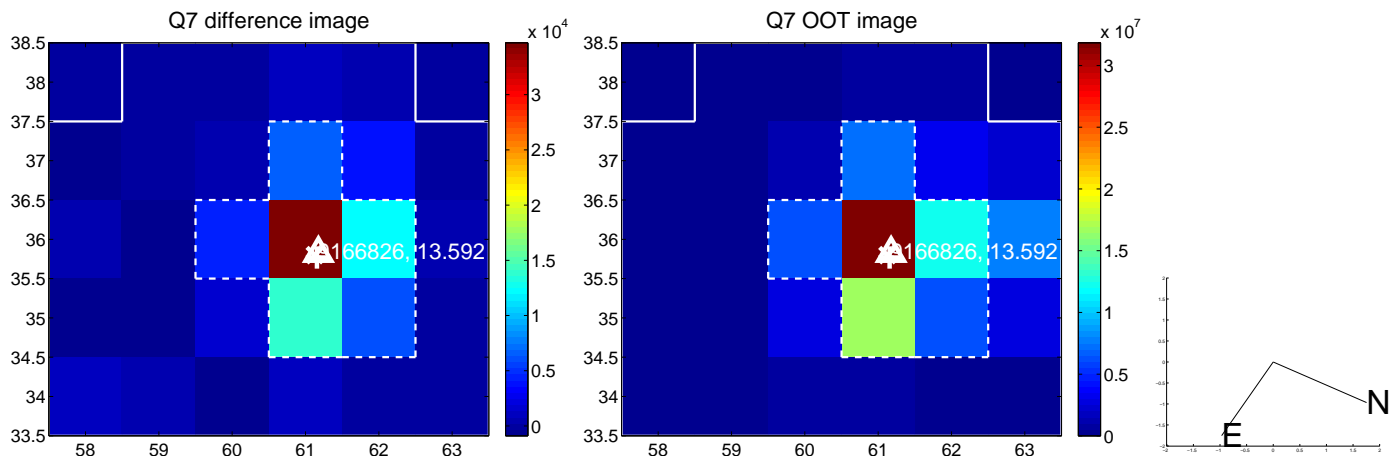
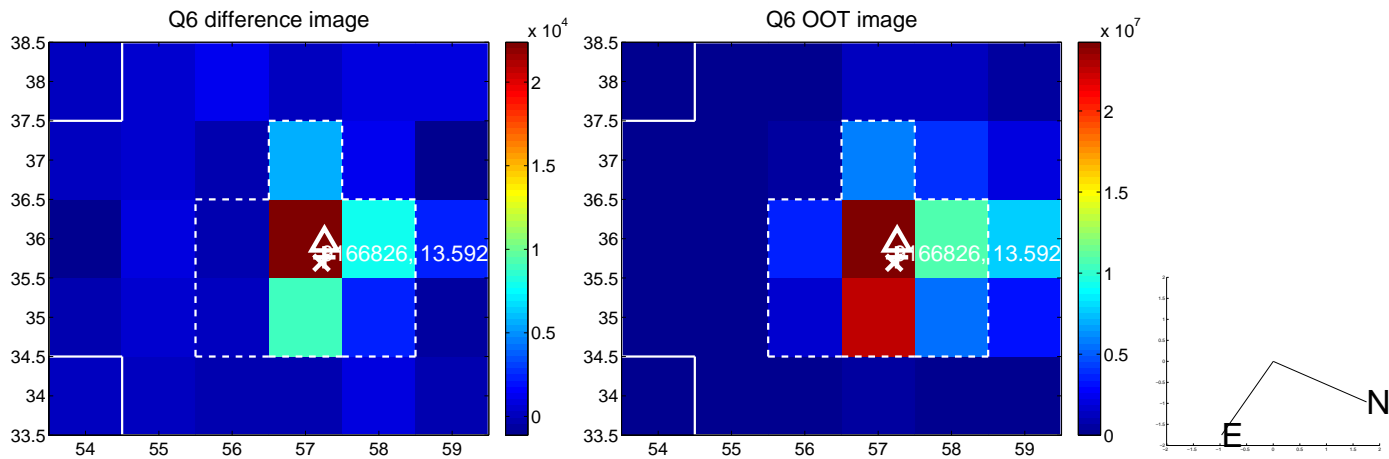
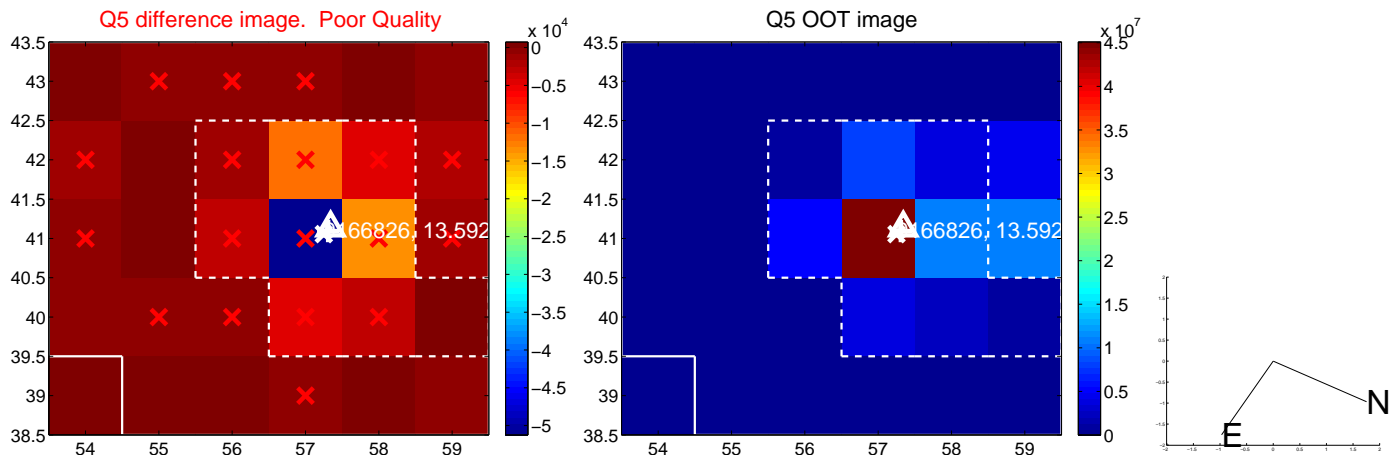
Q4 difference image. Poor Quality



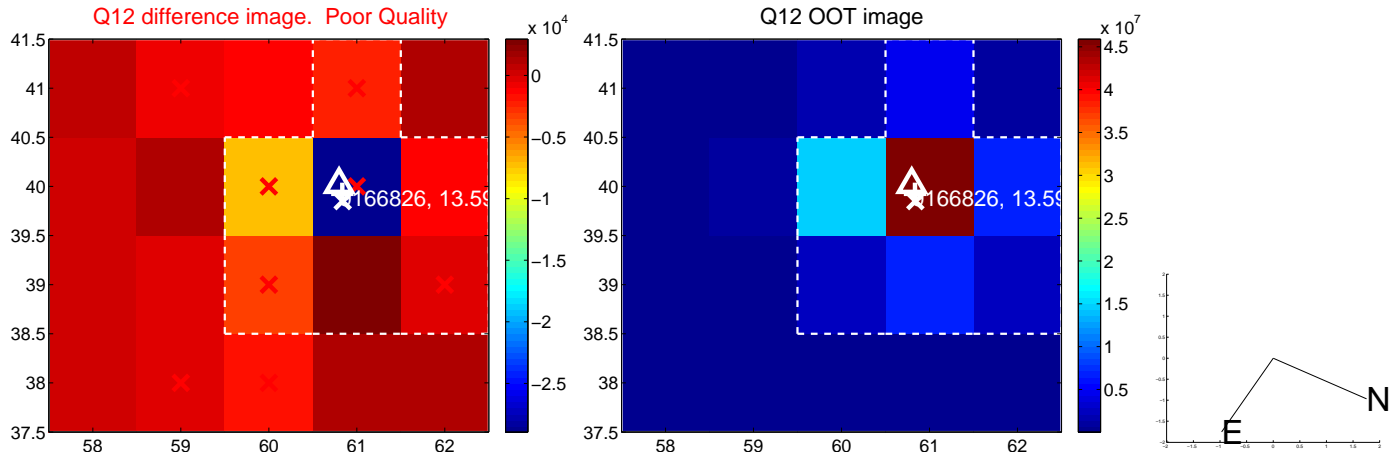
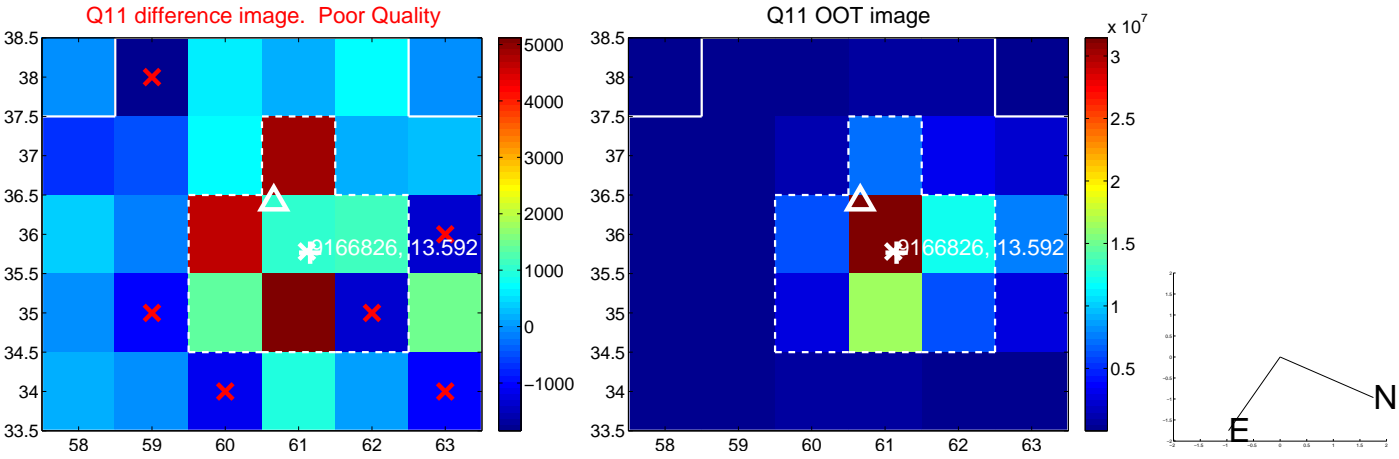
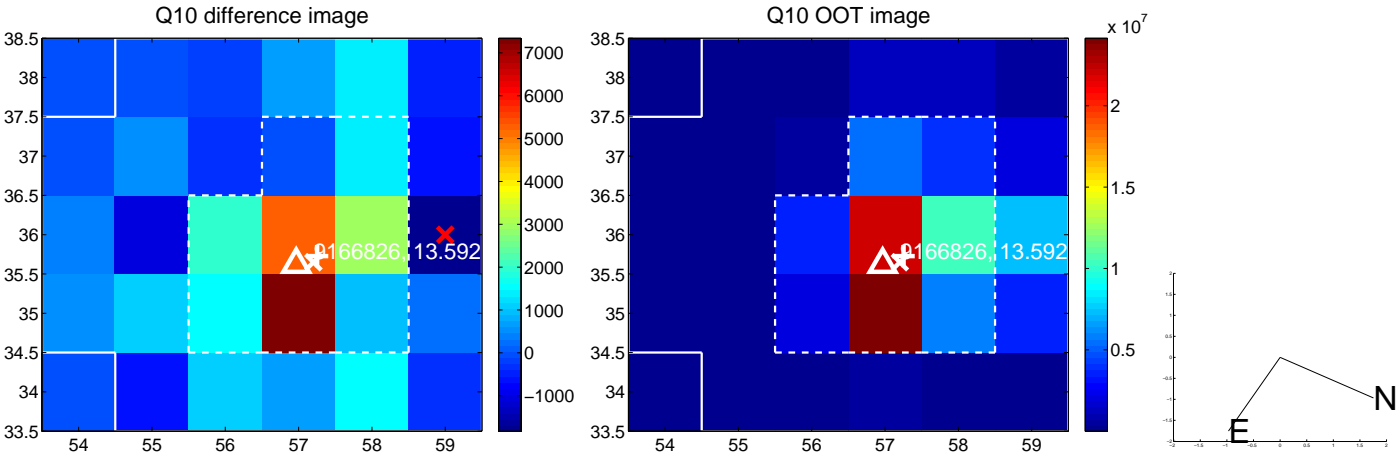
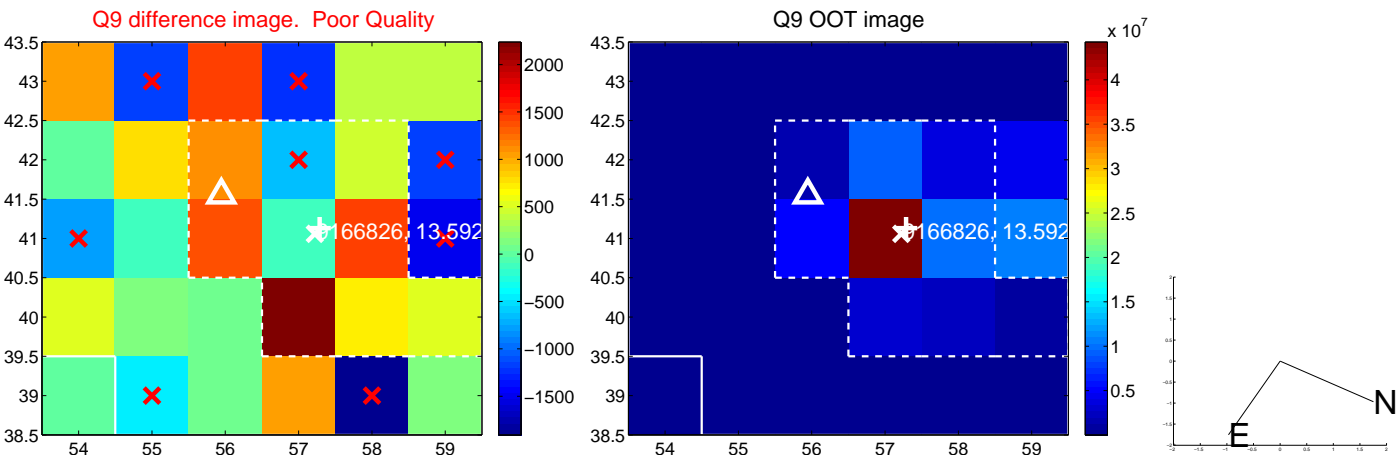
Q4 OOT image



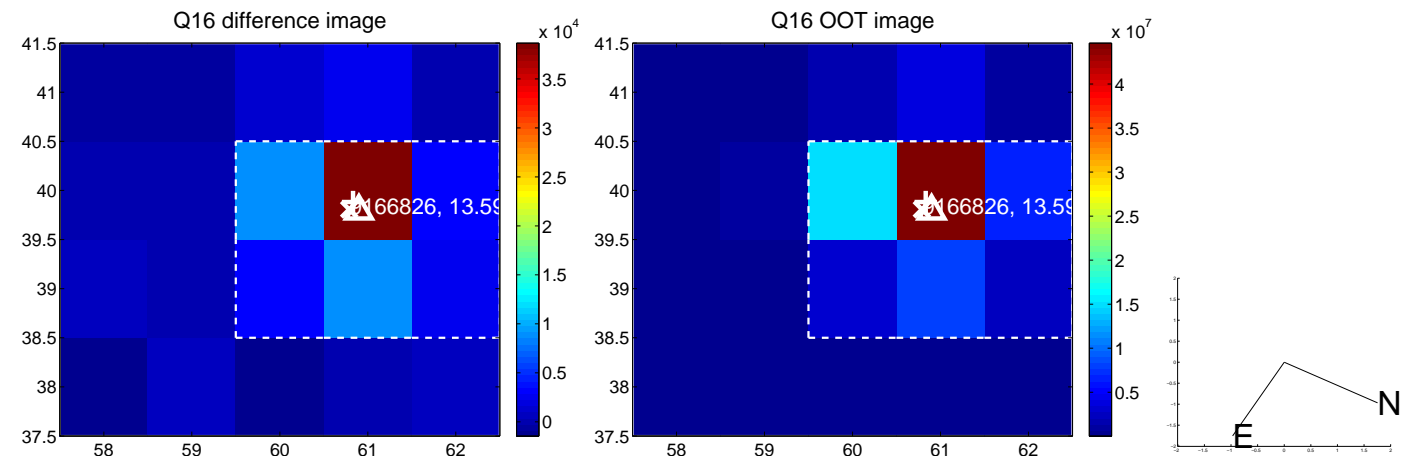
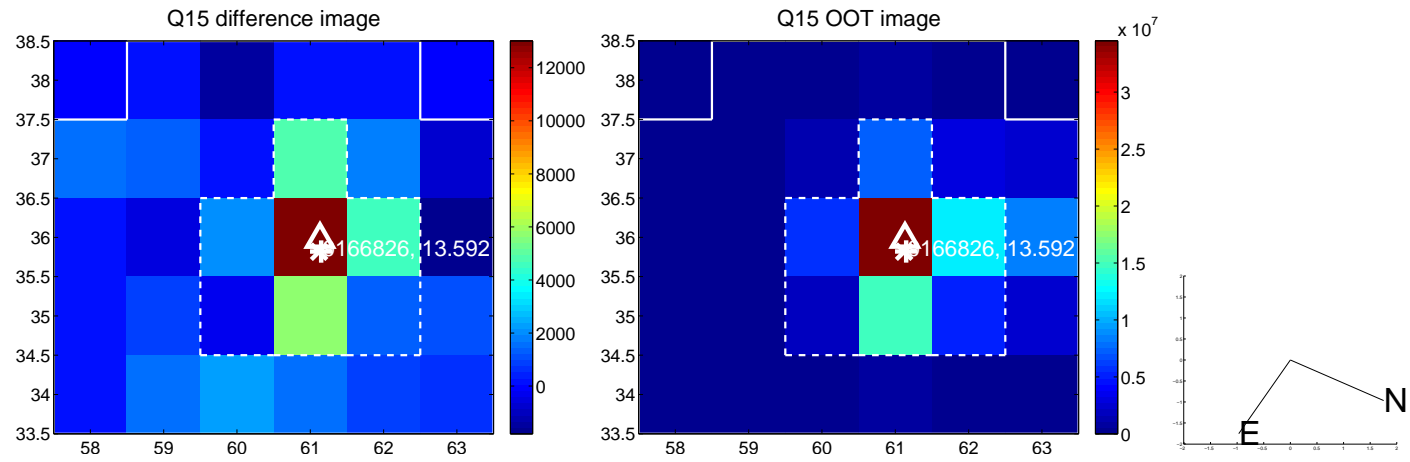
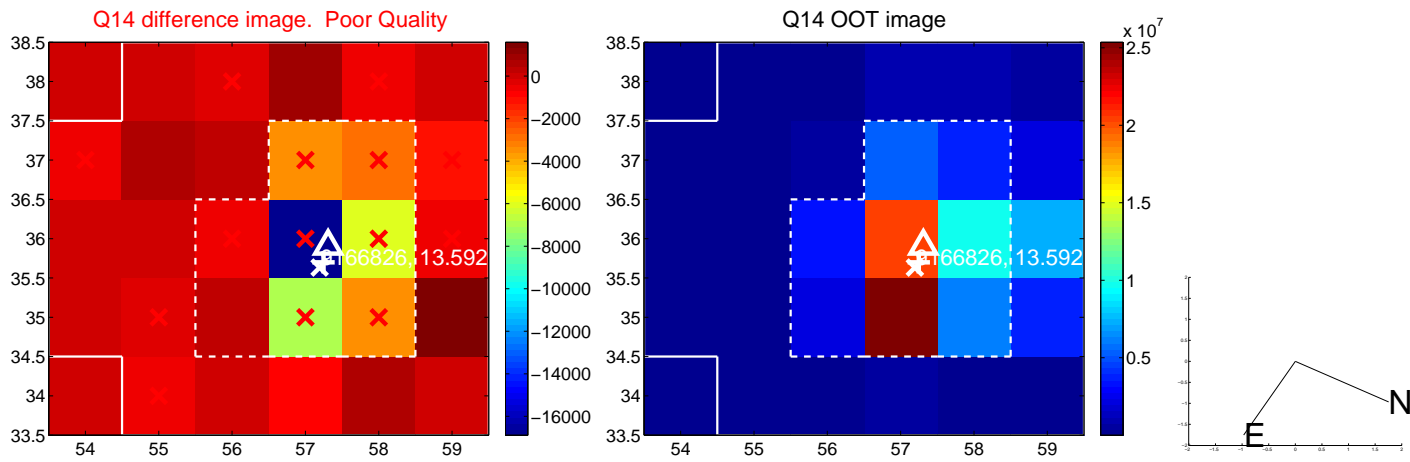
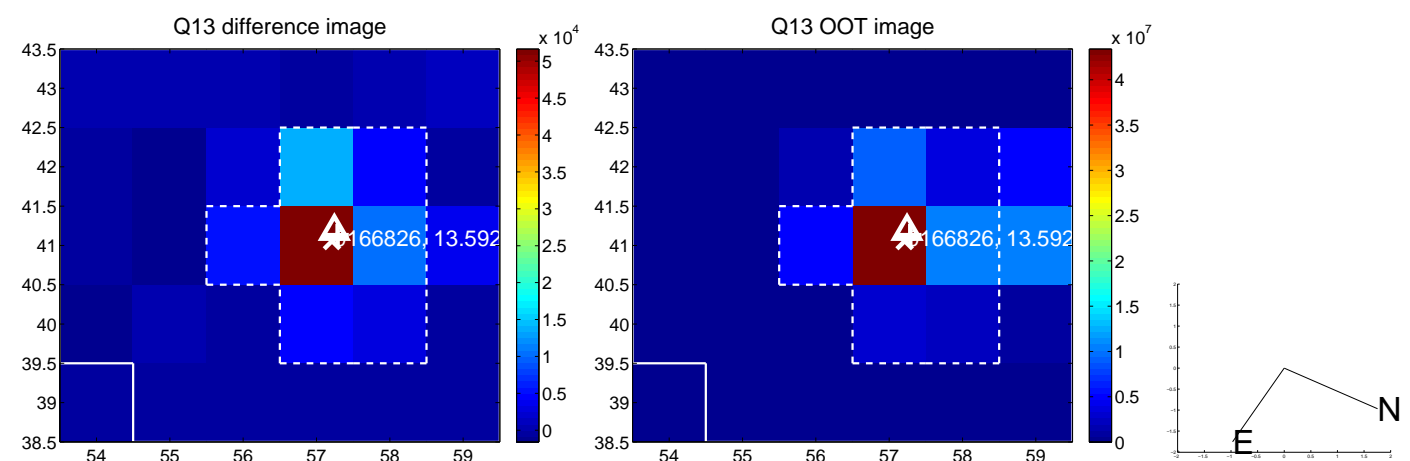
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

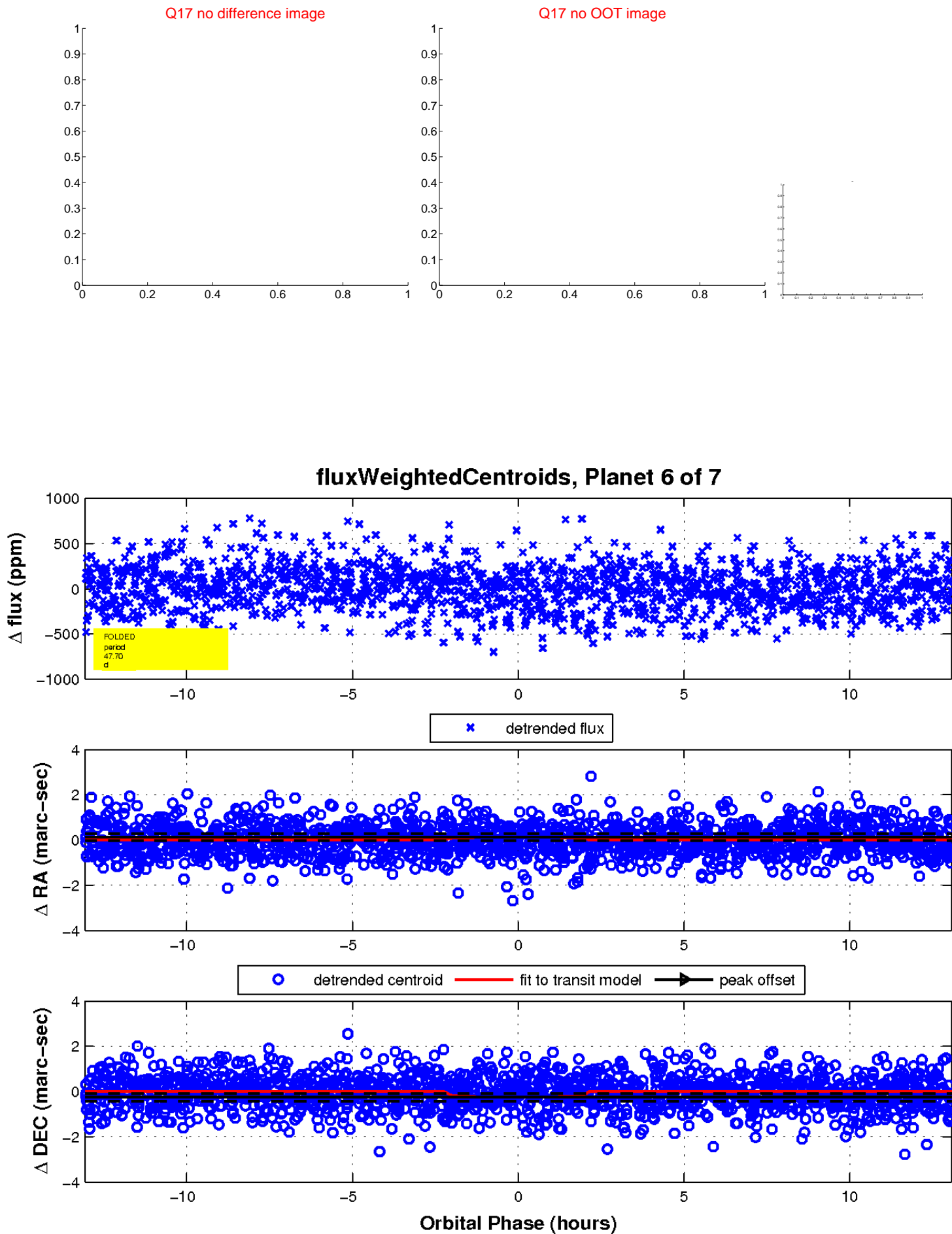


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



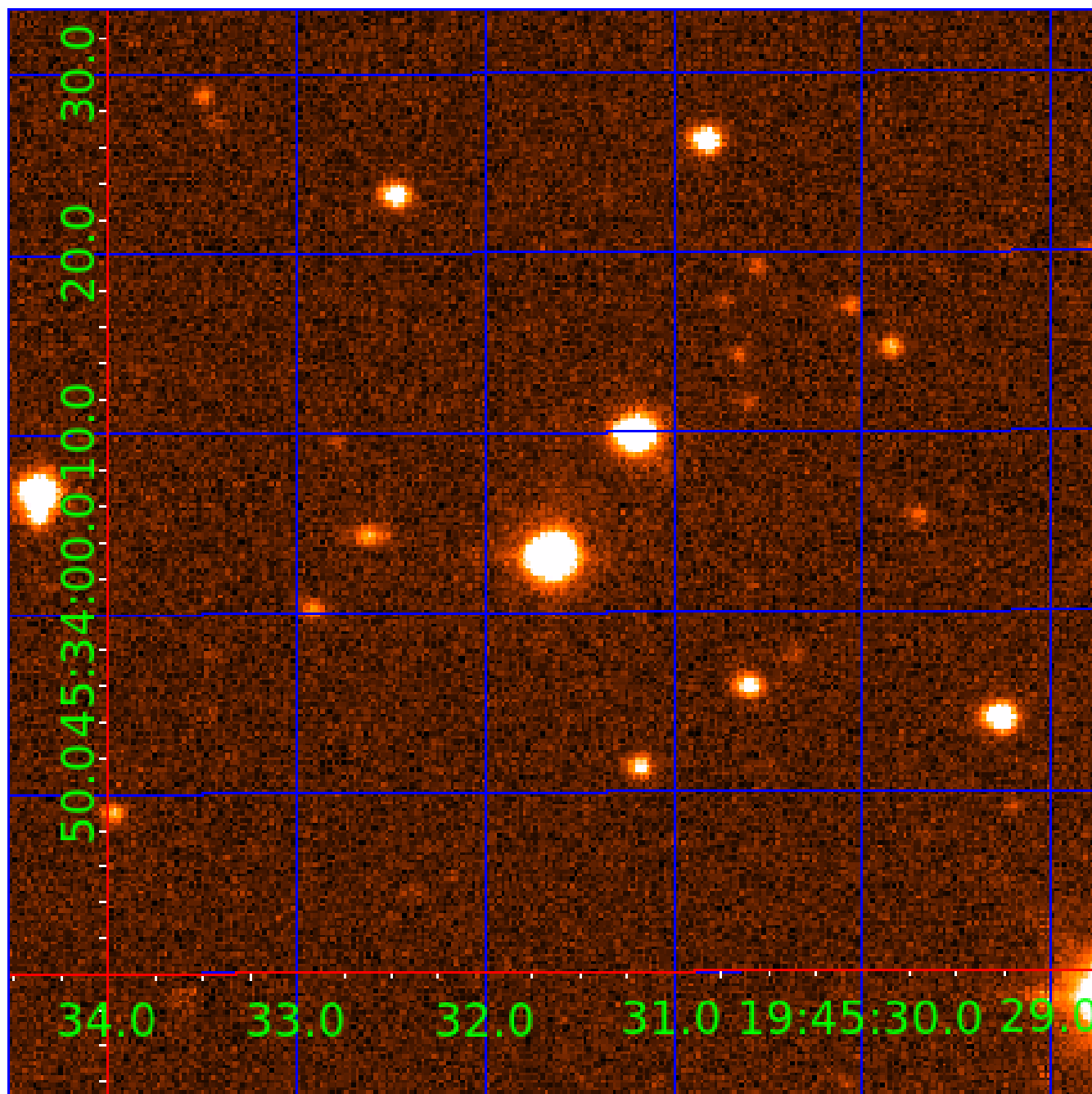


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009166826

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009166826-01 | OBS      | No   | 1.105096      | 132.364571   | 32.2        | 3.666            | 10.2 | 8.4  | 1.57                        | 7261            | 0.98                   | 10334.27               |
| 009166826-02 | OBS      | No   | 1.105092      | 131.627107   | 24.5        | 4.563            | 10.6 | 6.9  | 1.57                        | 7261            | 0.83                   | 10334.32               |
| 009166826-03 | OBS      | No   | 18.475152     | 139.191330   | 54.8        | 1.368            | 8.4  | 1.4  | 1.57                        | 7261            | 1.33                   | 241.75                 |
| 009166826-04 | OBS      | No   | 18.475735     | 139.518855   | 71.3        | 2.308            | 8.5  | 2.3  | 1.57                        | 7261            | 1.53                   | 241.74                 |
| 009166826-05 | OBS      | No   | 44.304722     | 146.120989   | 282.3       | 4.500            | 8.0  | -1.0 | 1.57                        | 7261            | 2.67                   | 75.31                  |
| 009166826-06 | OBS      | No   | 47.695013     | 172.383956   | 274.8       | 4.358            | 7.3  | 6.5  | 1.57                        | 7261            | 2.83                   | 68.26                  |
| 009166826-07 | OBS      | No   | 74.722951     | 142.333969   | 266.5       | 4.500            | 7.5  | -1.0 | 1.57                        | 7261            | 2.60                   | 37.52                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 009166826-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009166826-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—SAME_NTL_PERIOD  |
| 009166826-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT      |
| 009166826-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD |
| 009166826-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS  |
| 009166826-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT   |
| 009166826-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_NOFITS   |

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

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

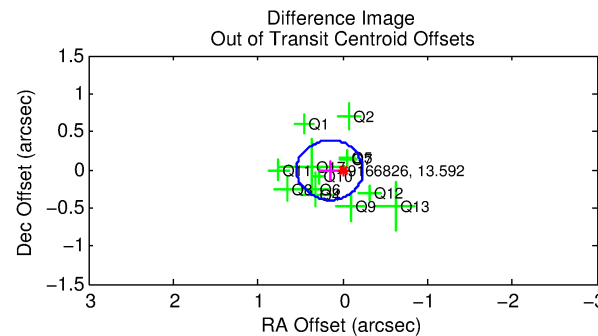
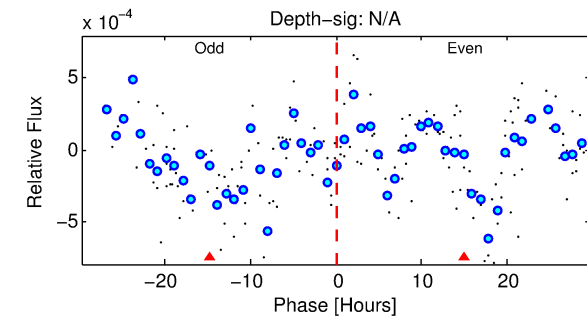
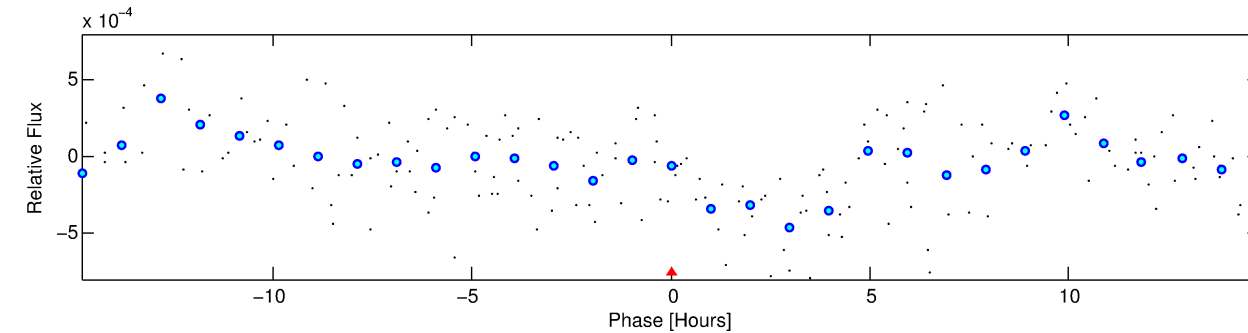
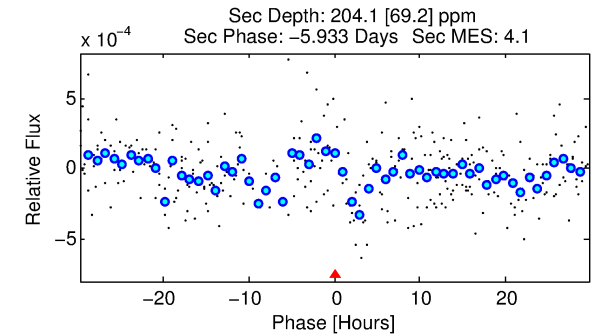
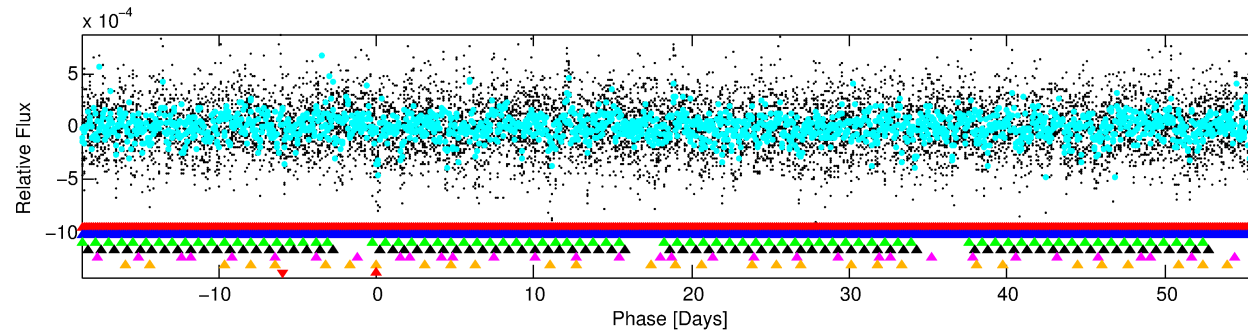
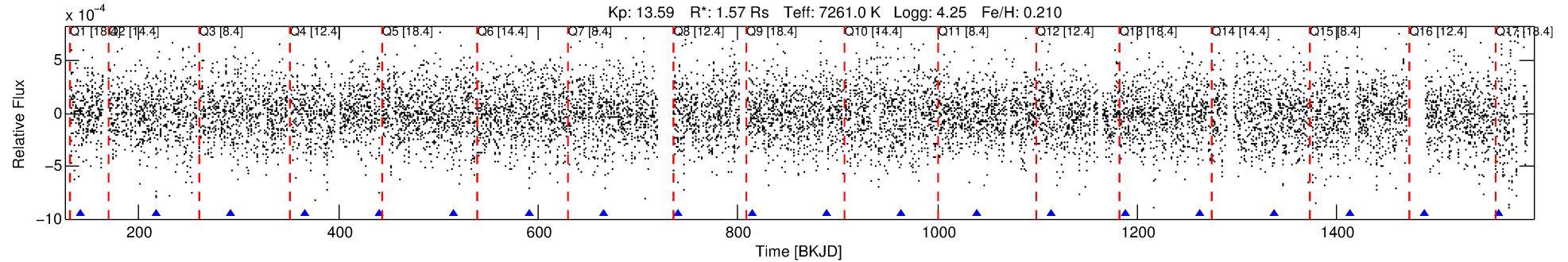
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009166826-07

No Significant Match Found

# DV One-Page Summary

KIC: 9166826 Candidate: 7 of 7 Period: 74.723 d



## TPS TCE Results:

Period = 74.72295 d  
Epoch = 142.3340 BKJD

DV fit results are unavailable

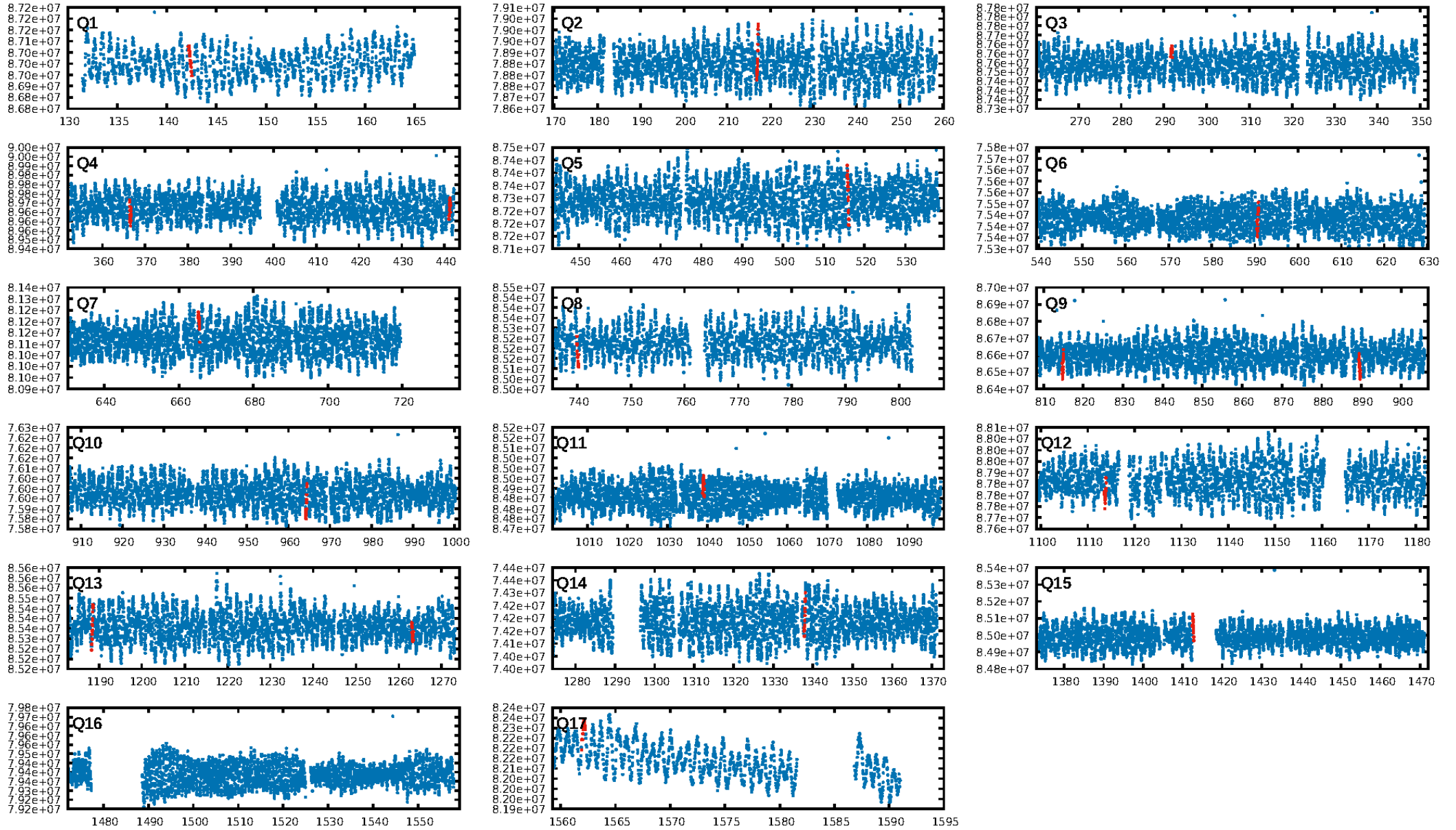
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [103.55σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -0.9505  
Centroid-sig: 82.2%  
Centroid-so: 0.989 arcsec [1.82σ]  
OotOffset-rm: 0.152 arcsec [1.17σ]  
KicOffset-rm: 0.110 arcsec [0.87σ]  
OotOffset-st: 3/2/3/5 [13]  
KicOffset-st: 3/2/3/5 [13]  
DiffImageQuality-fgm: 0.62 [8/13]  
DiffImageOverlap-fno: 0.00 [0/13]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:04:07 Z

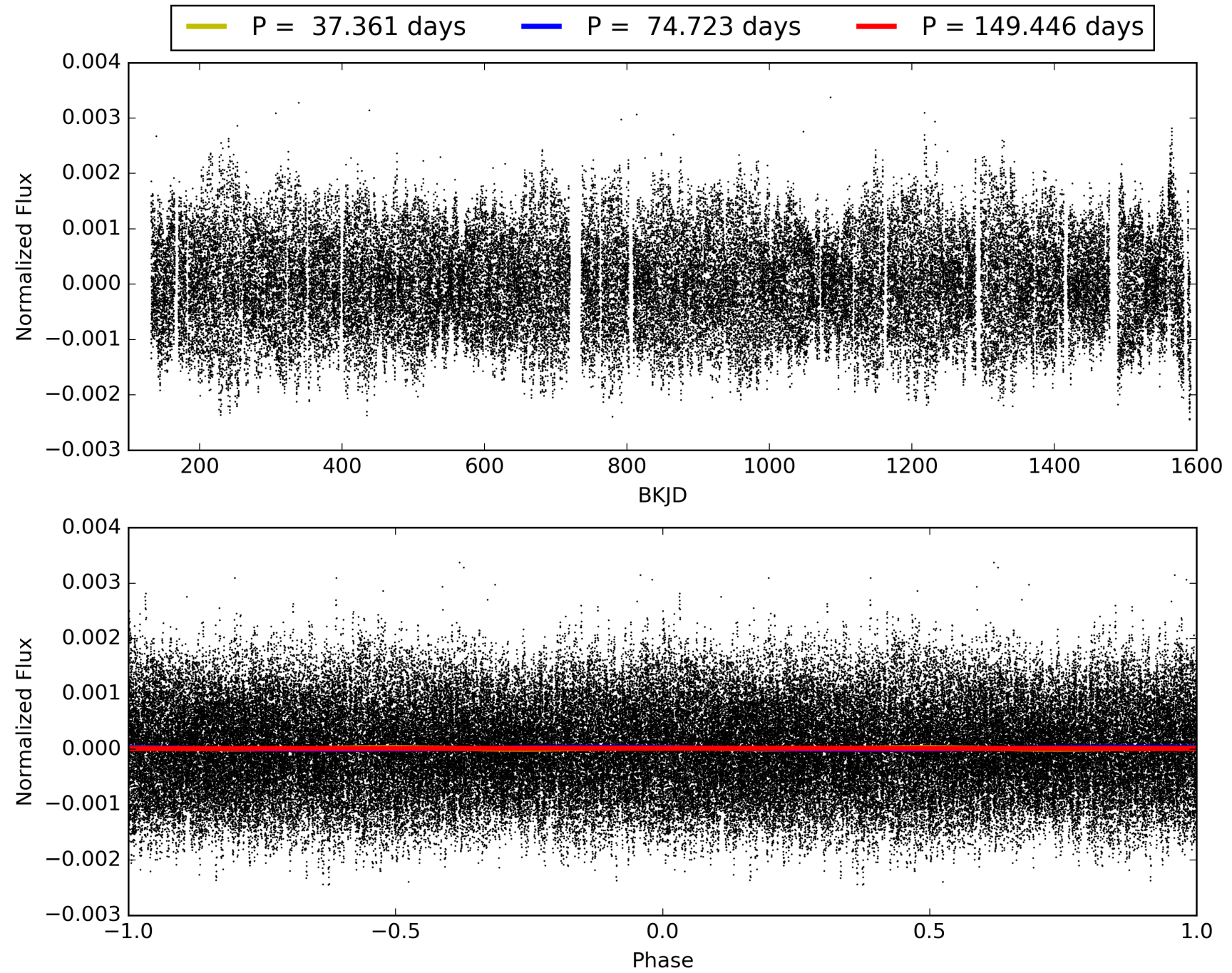
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009166826-07, PDC Light Curves



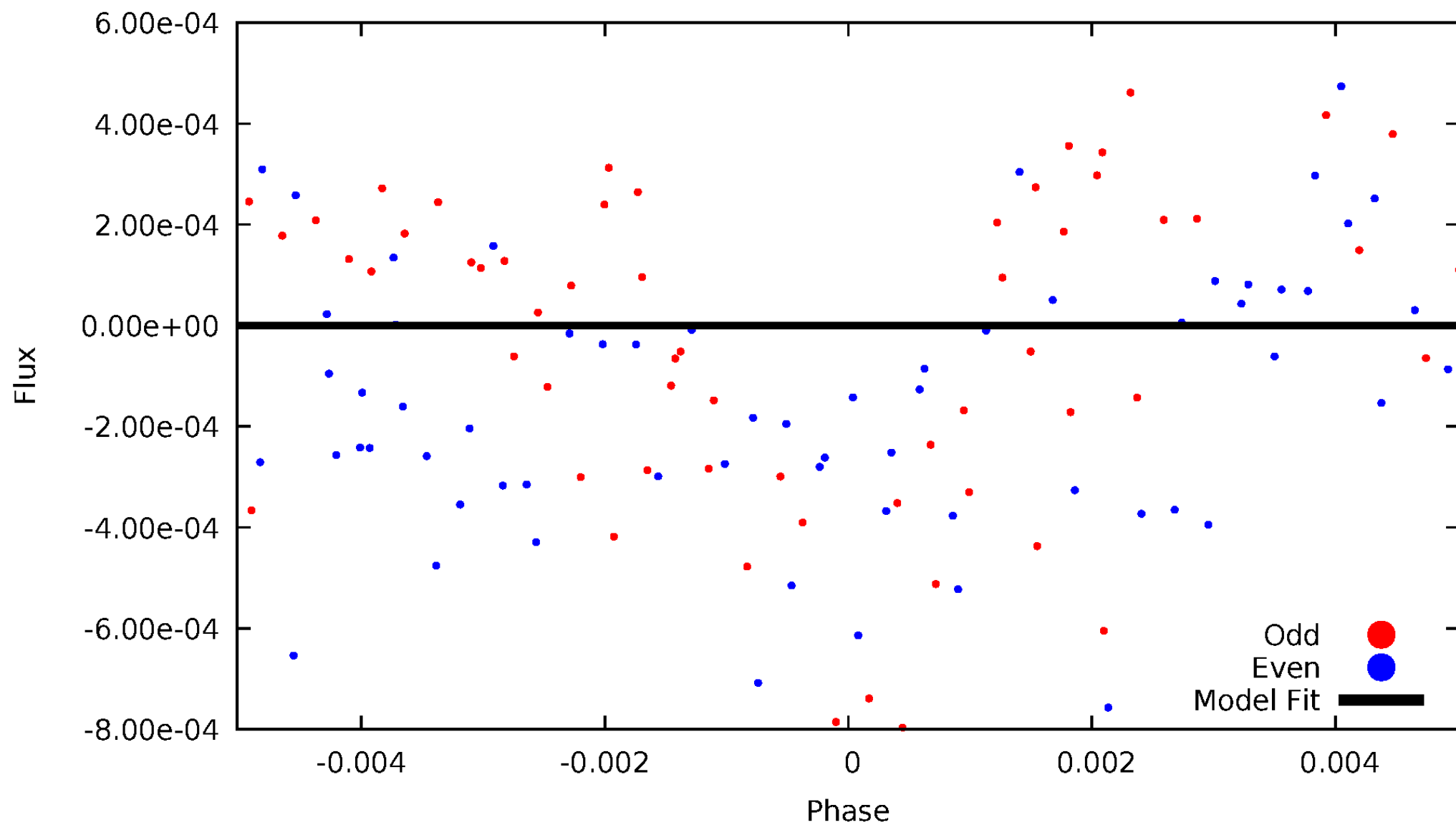


TCE 009166826-07



# DV Odd/Even

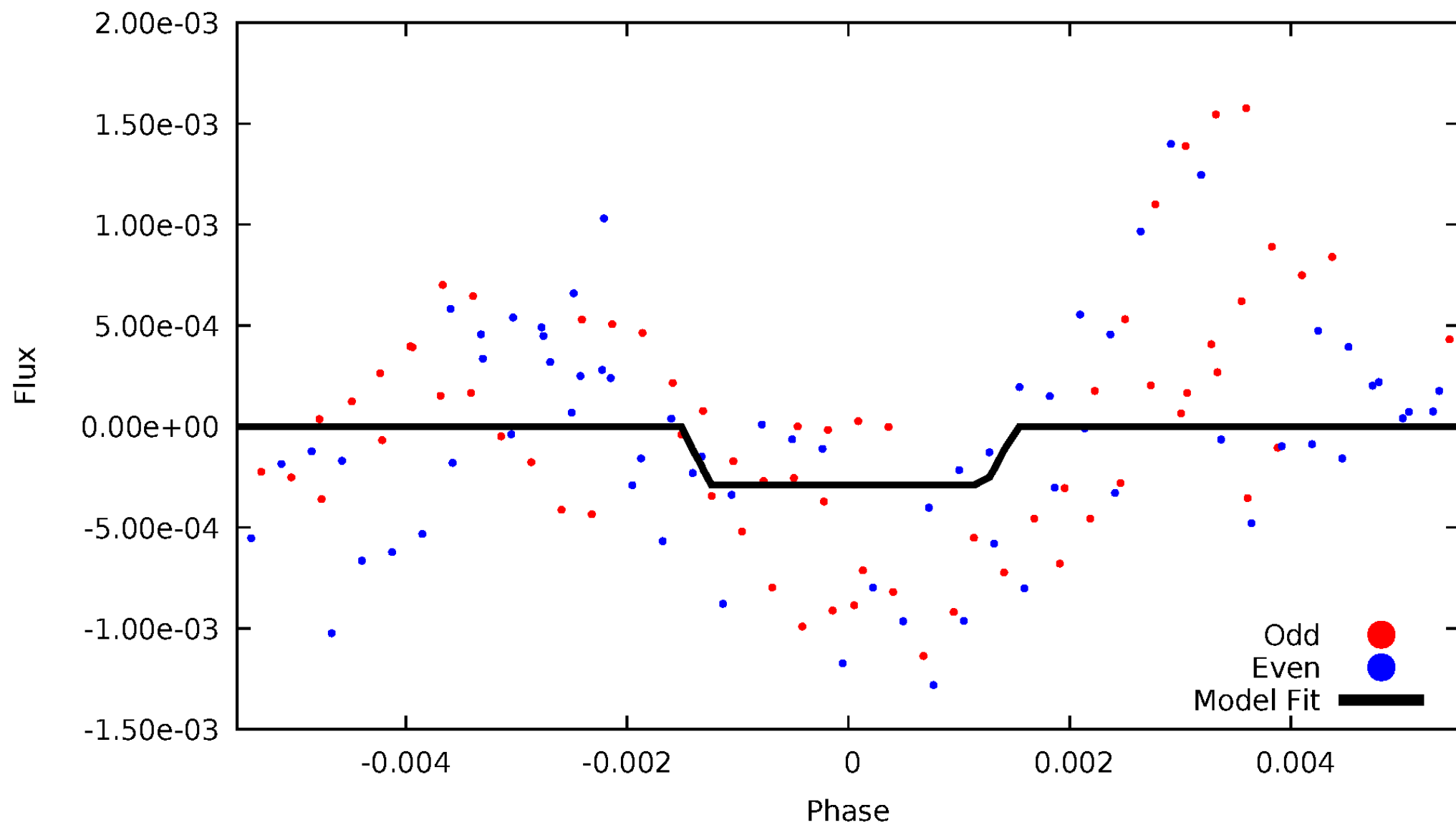
TCE 009166826-07



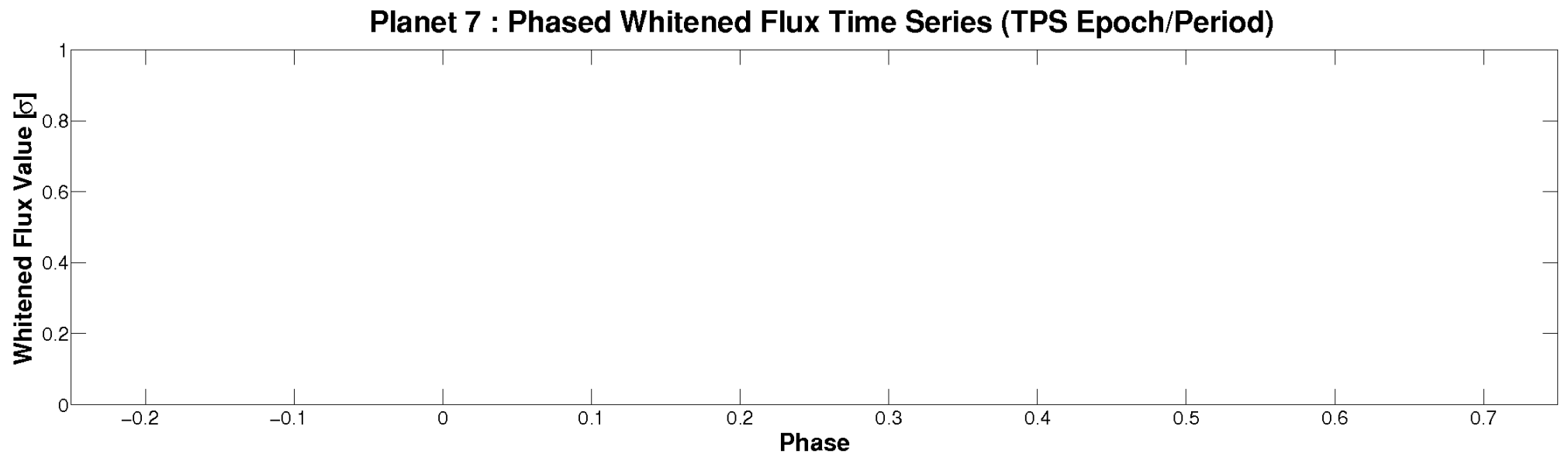
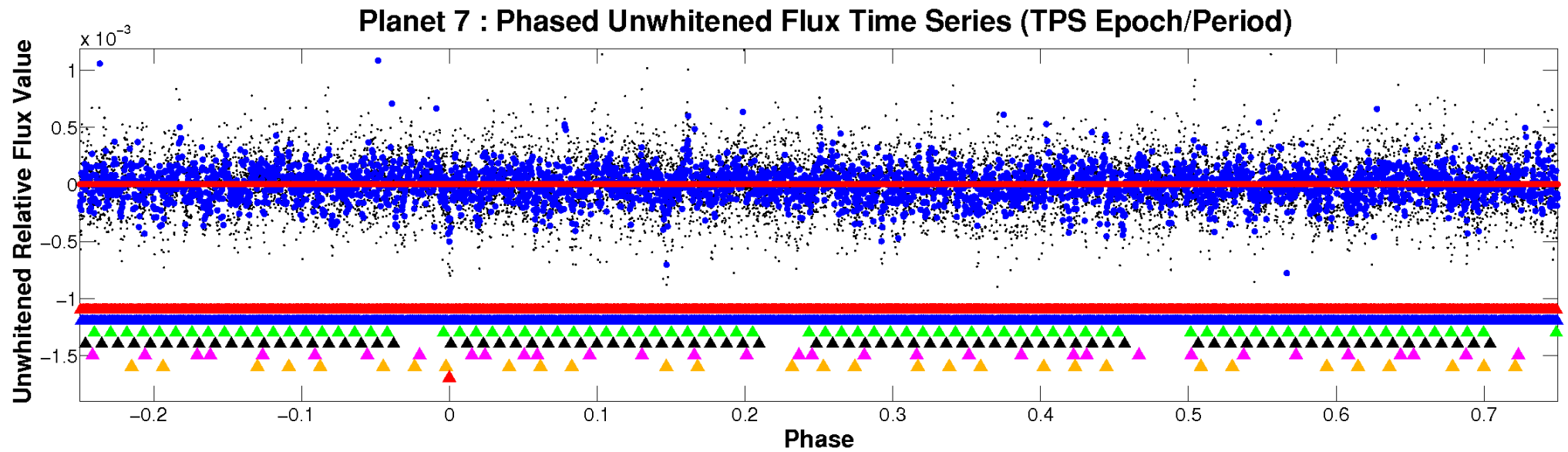


# ALT Odd/Even

TCE 009166826-07

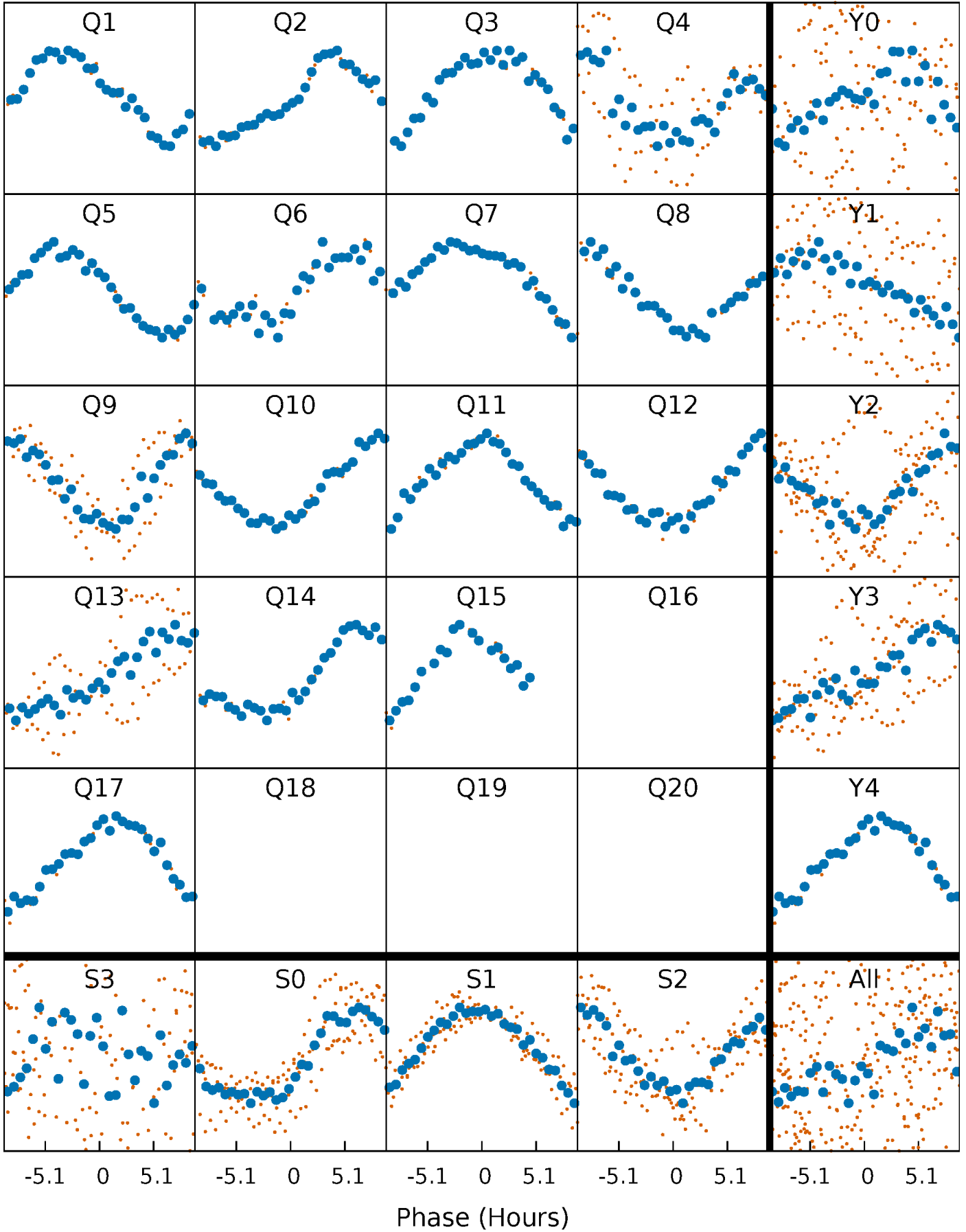


# Non-Whitened Vs. Whitened Light Curve



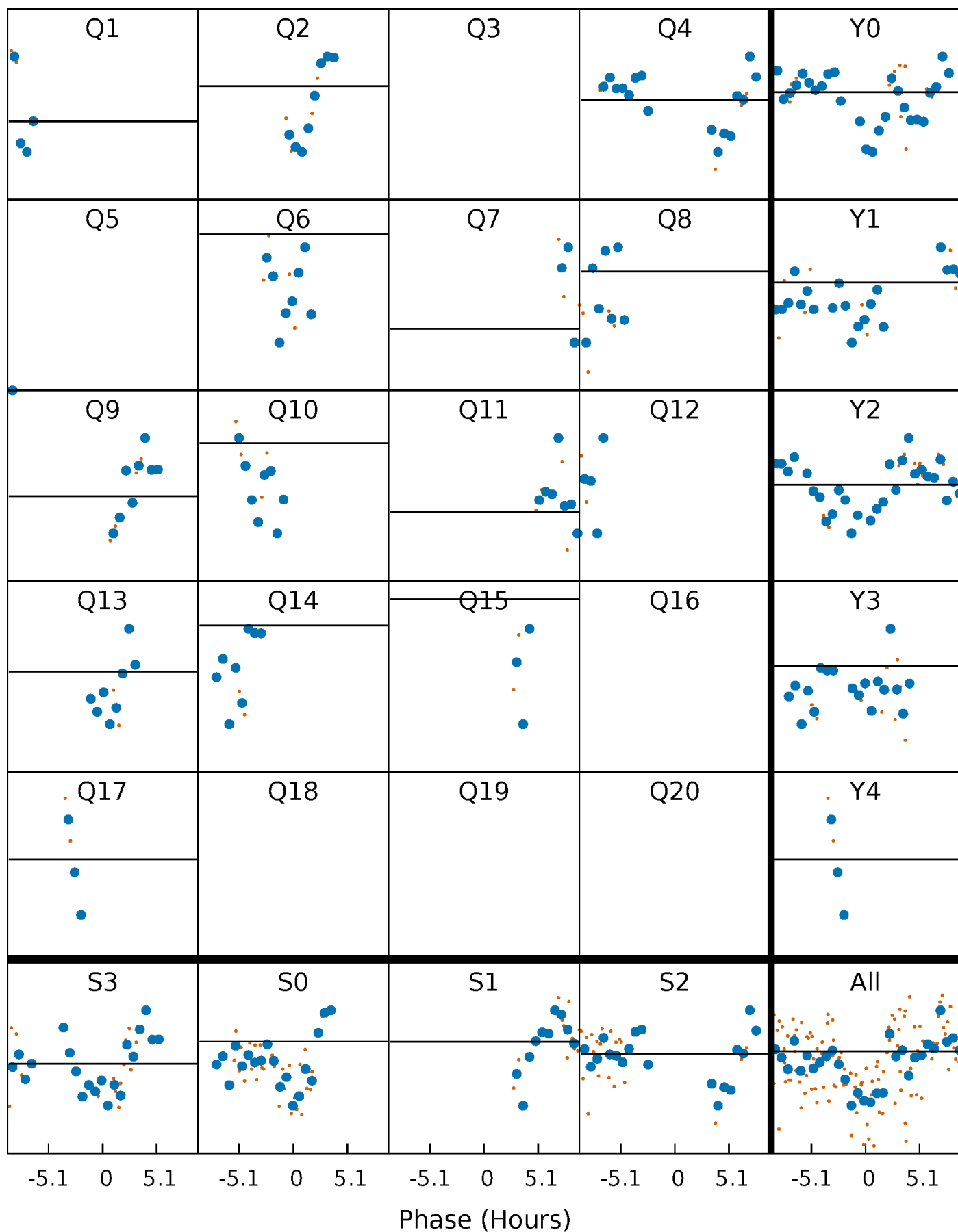
# PDC Quarter-Phased Transit Curves

TCE 009166826-07     $P = 74.722951$  Days     $T_0 = 142.333969$  (BKJD)



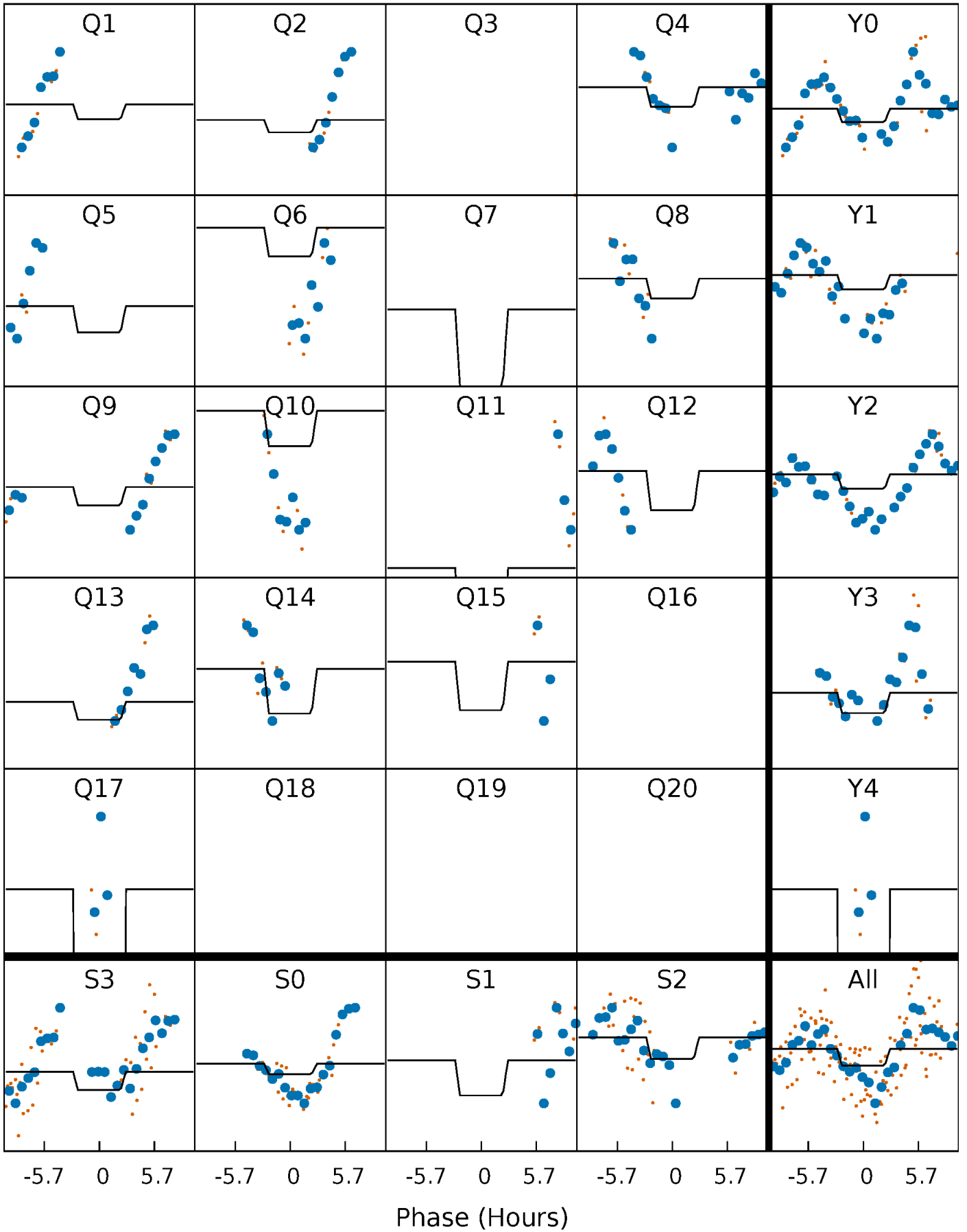
# DV Quarter-Phased Transit Curves

TCE 009166826-07   P= 74.722951 Days    $T_0=142.333969$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

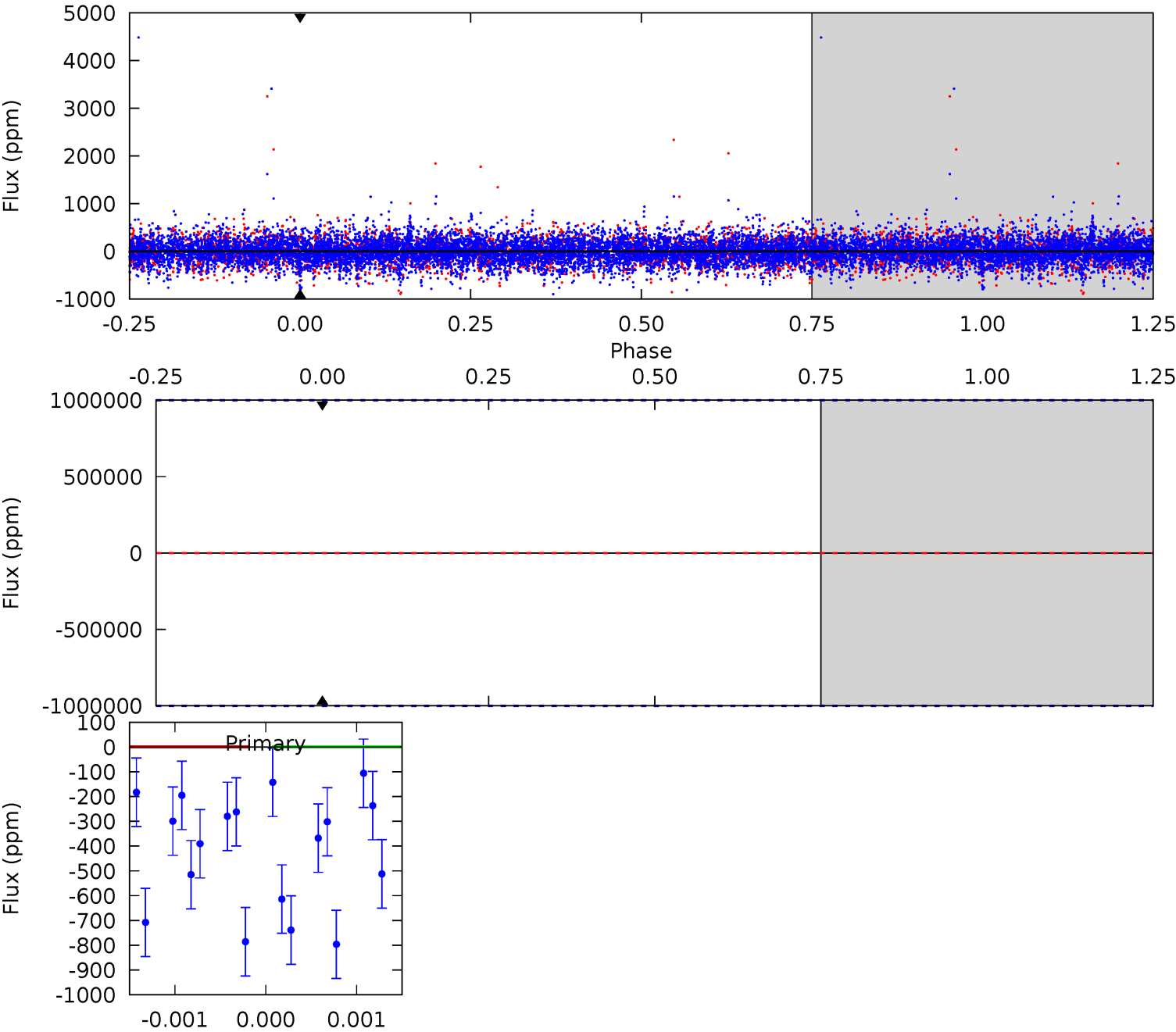
TCE 009166826-07   P= 74.722951 Days    $T_0=142.221155$  (BKJD)



# DV Model-Shift Uniqueness Test

009166826-07, P = 74.722951 Days, E = 67.611018 Days

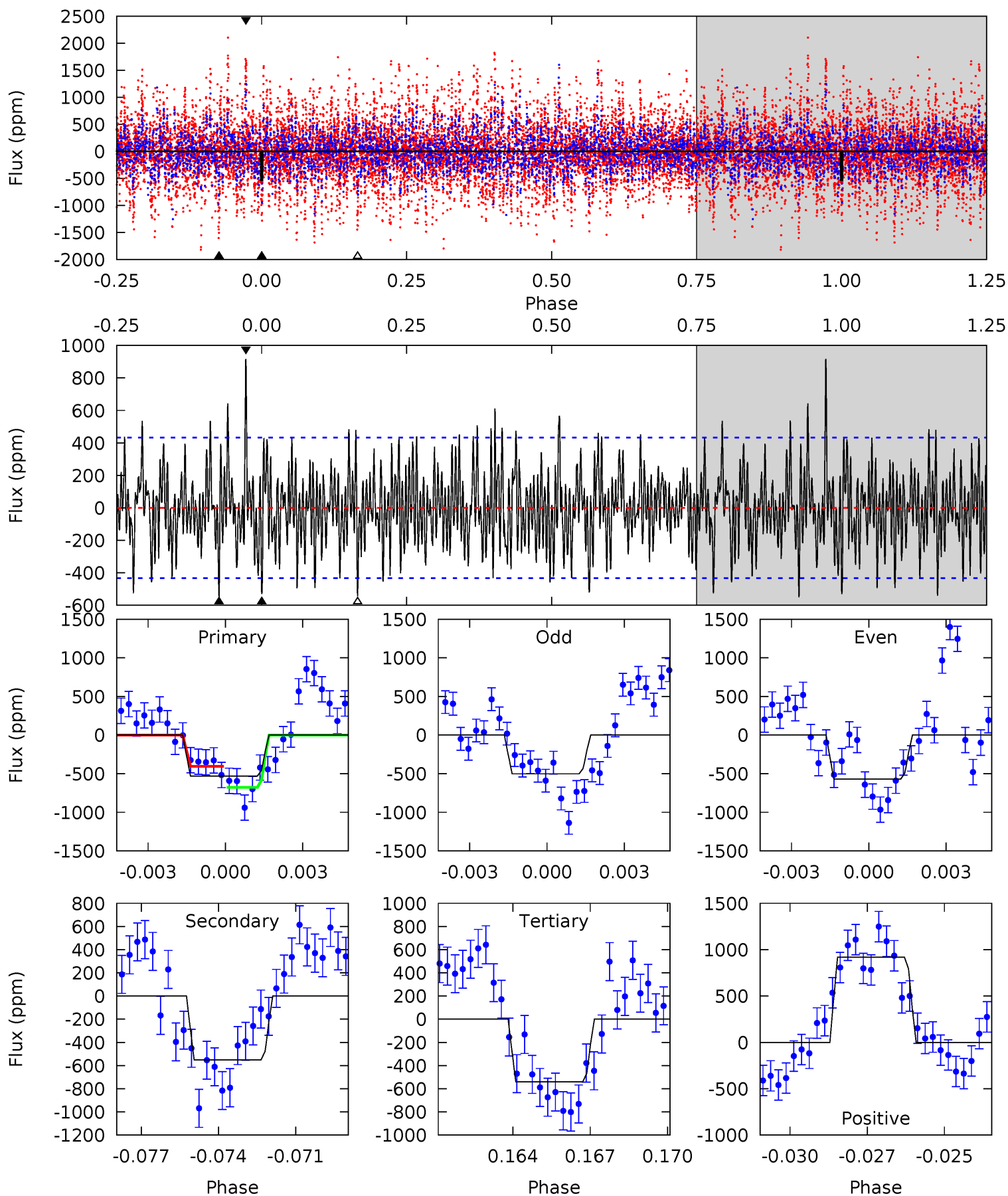
| Pri | Sec | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-----|-----|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|
| 0   | 0   | 0   | 0   | 1.00            | 1.00            | 1.00             | 0       | 0       | 0       | 0       | 0       | 0   | 0     | 0   |



# Alt Model-Shift Uniqueness Test

009166826-07, P = 74.722951 Days, E = 67.498204 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 6.45 | 6.70 | 6.57 | 11.2 | 5.27            | 3.00            | 2.44             | -0.12   | -4.72   | 0.13    | -4.47   | 0.40    | 0.96 | 0.63  | 1.65 |





### Stellar Parameters For KIC 009166826

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (g \cdot \text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------------------|
|        | $7261^{+228}_{-343}$ | $4.245^{+0.060}_{-0.225}$ | $0.210^{+0.150}_{-0.400}$ | $1.570^{+0.580}_{-0.193}$ | $1.591^{+0.211}_{-0.211}$ | $0.579^{+0.184}_{-0.323}$            |
|        | +3%/-5%              | +1%/-5%                   | +71%/-190%                | +37%/-12%                 | +13%/-13%                 | +32%/-56%                            |
| 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 009166826-07 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$       | $T_{max} (K)$     | $T_{obs} (K)$             | $A_{obs}$                              |
|---------|-----------------|--------------------------|-------------------|---------------------------|--|
| DV      | $0 \pm 1000000$ | $14.06^{+14.76}_{-9.46}$ | $901^{+69}_{-55}$ | $-6899^{+35564}_{-34263}$ | $-2394.388^{+65138.566}_{-103927.604}$ |
| Alt.    | $-550 \pm 82$   | $13.38^{+15.52}_{-9.20}$ | $900^{+65}_{-53}$ | $4280^{+3107}_{-984}$     | $286^{+2599}_{-229}$                   |

$T_{max}$  = 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

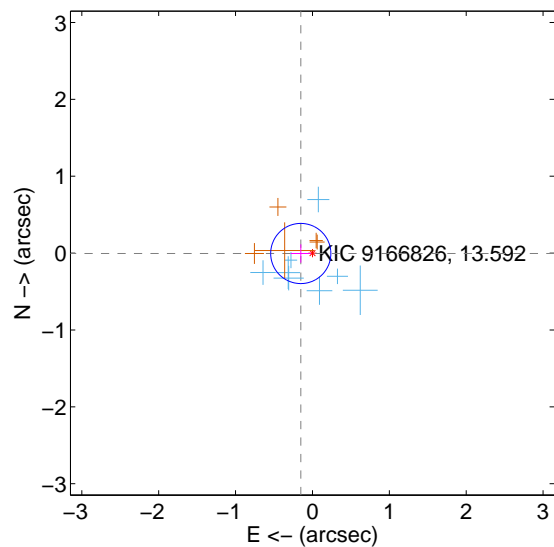
Supplemental centroid analysis for 009166826-07. Kepler magnitude: 13.59. Transit SNR -1.00

There are 8 quarters with good PRF difference image offsets

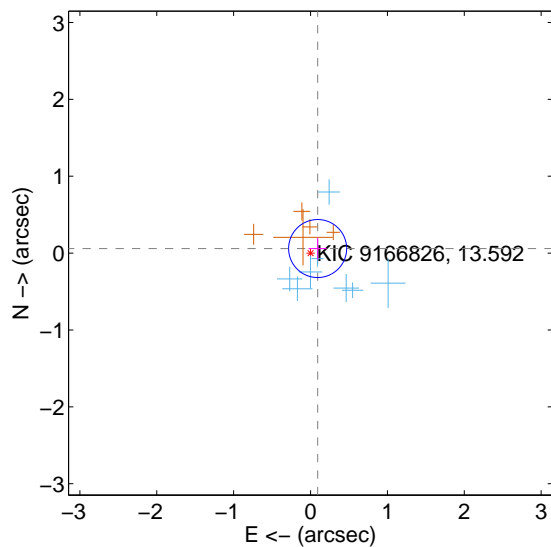
The direct PRF centroid is offset from the target star catalog position by about 0.31 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.152 \pm 0.130$  | 1.17                | $0.152 \pm 0.131$  | $-0.005 \pm 0.119$ |
| PRF-fit source offset from KIC position | $0.110 \pm 0.126$  | 0.87                | $-0.092 \pm 0.119$ | $0.059 \pm 0.141$  |
| photometric centroid source offset      | $0.99 \pm 0.54$    | 1.82                | $-0.91 \pm 0.53$   | $0.40 \pm 0.62$    |

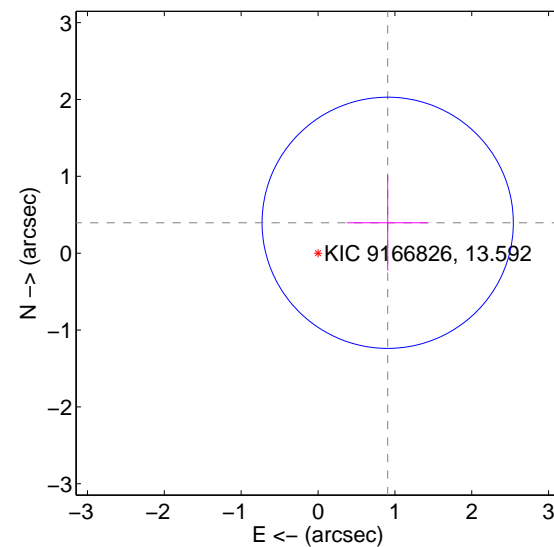
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

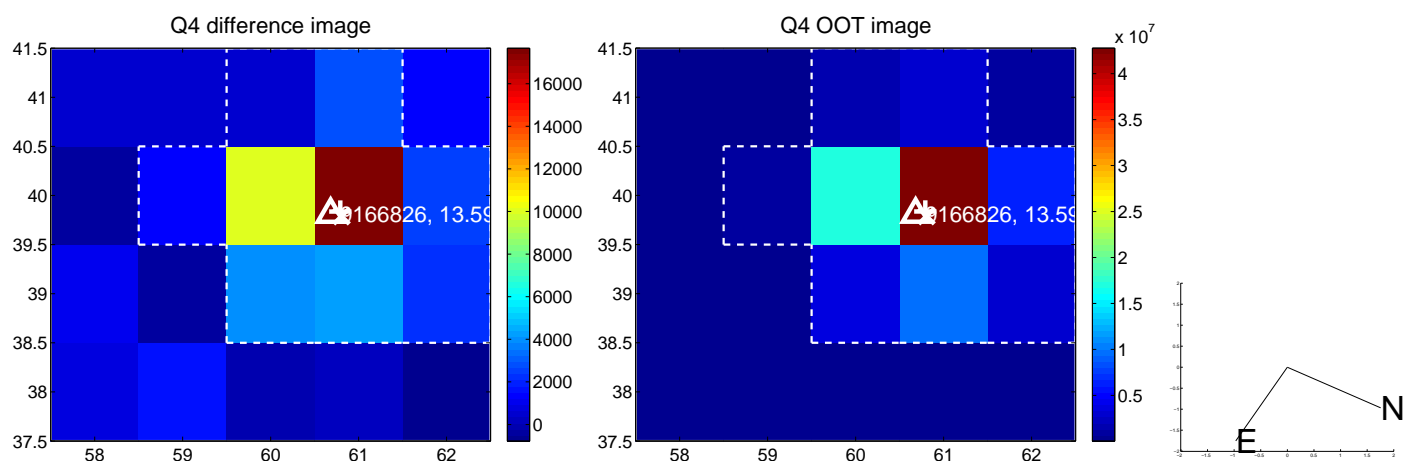
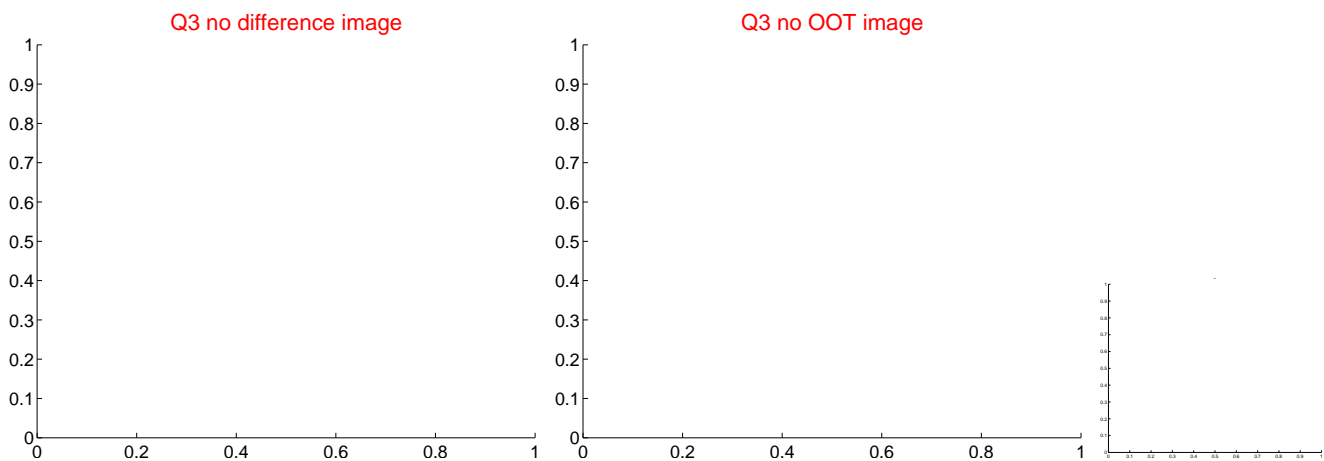
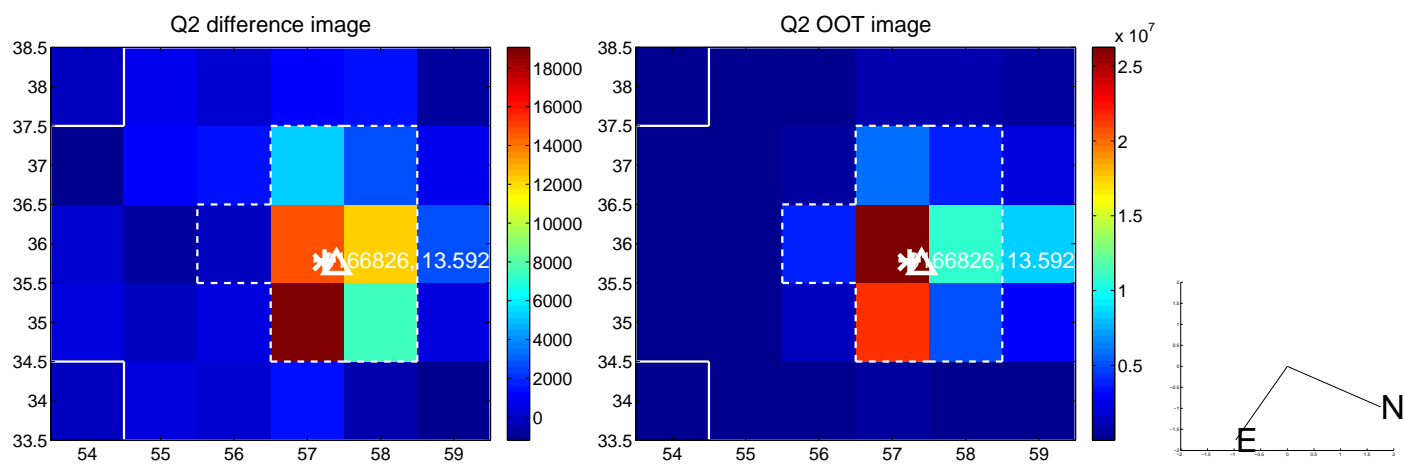
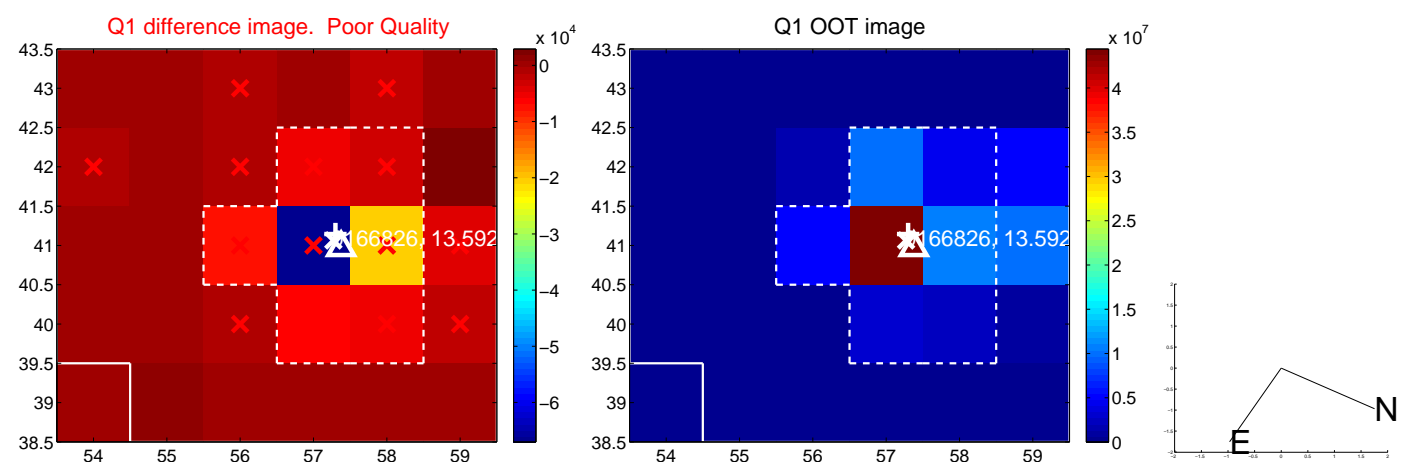


offset from photometric centroids

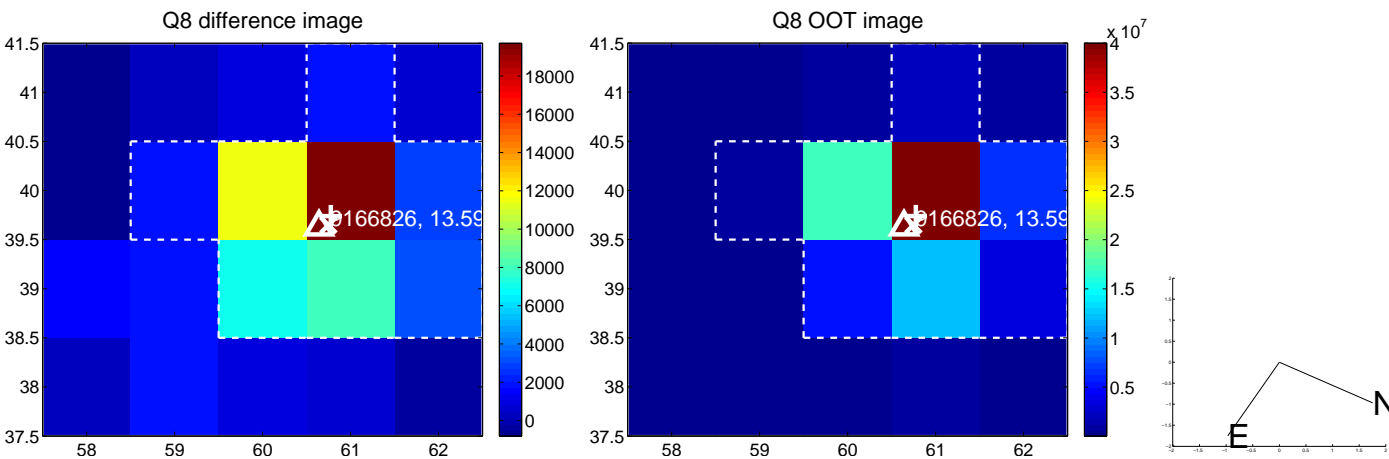
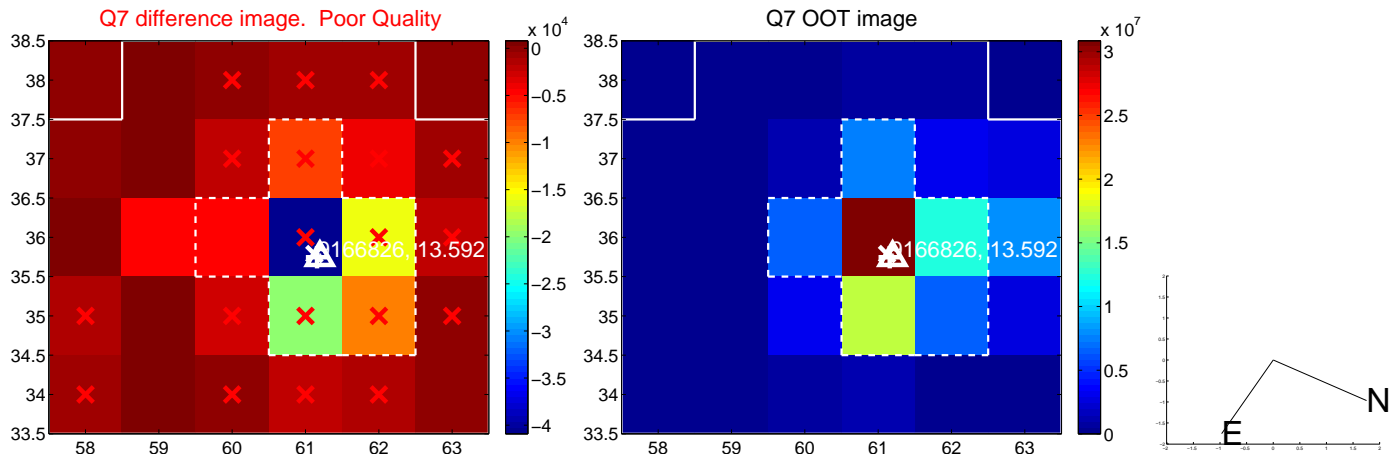
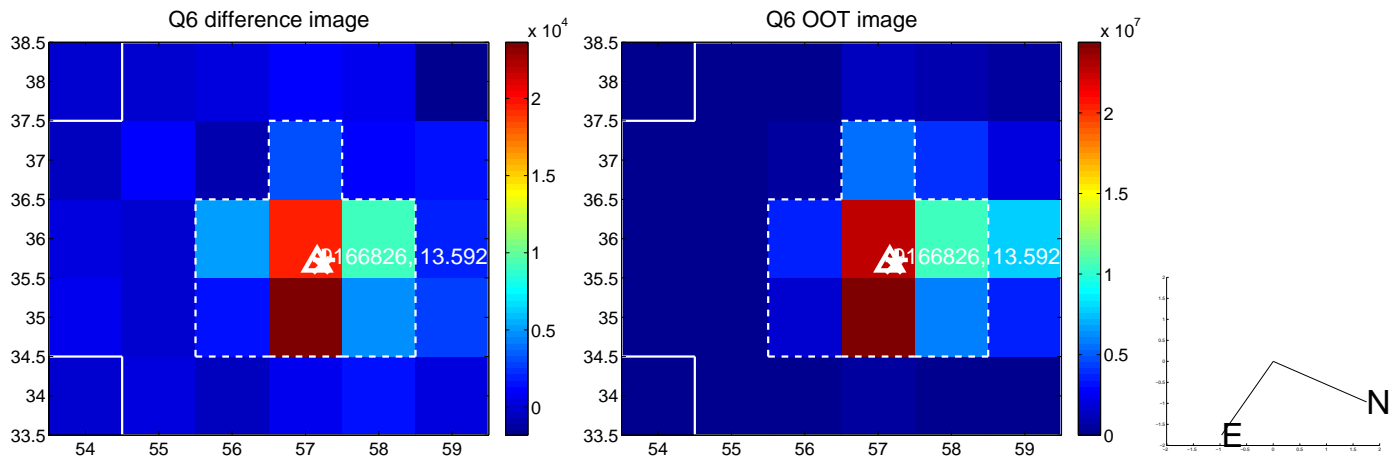
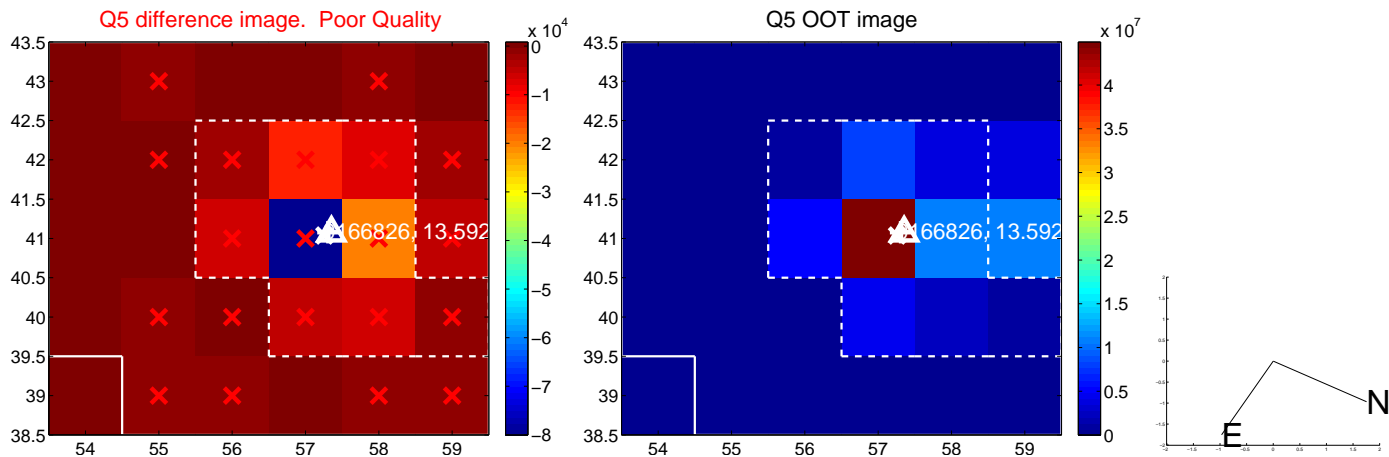


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

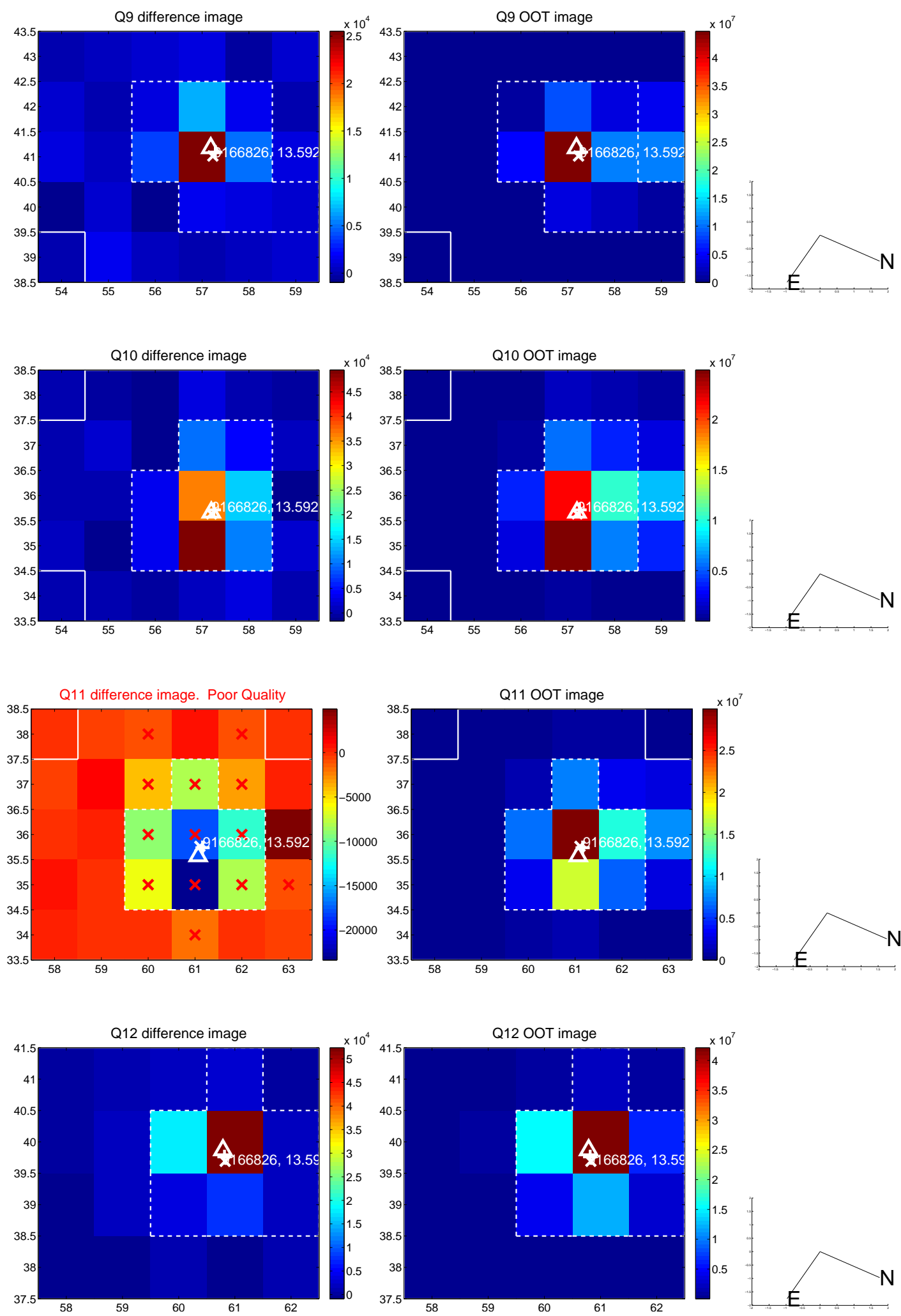
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



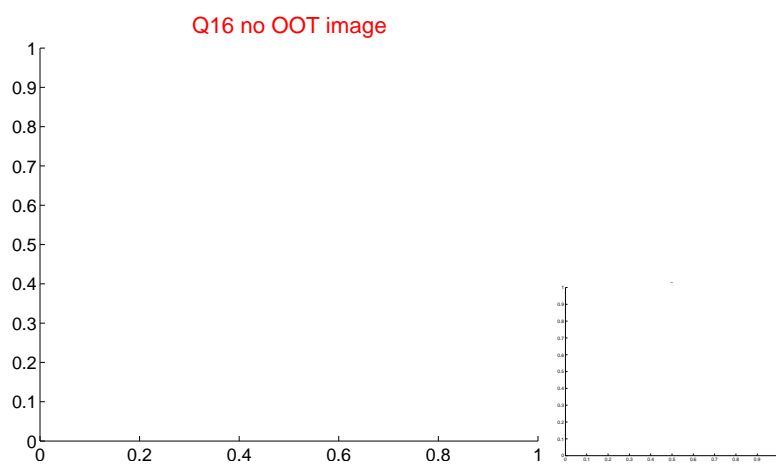
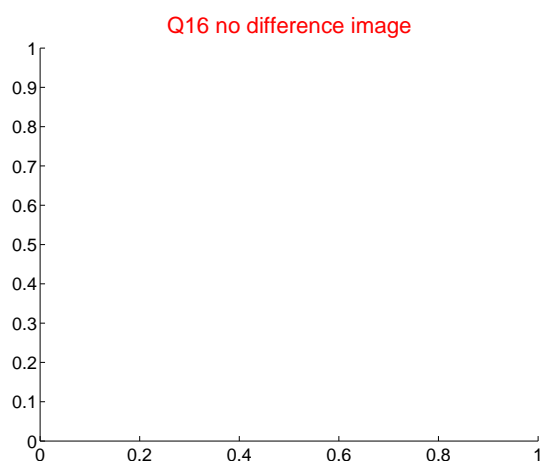
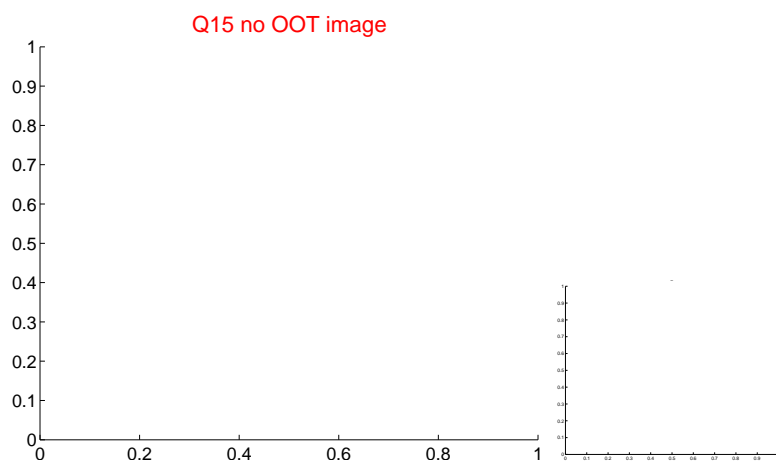
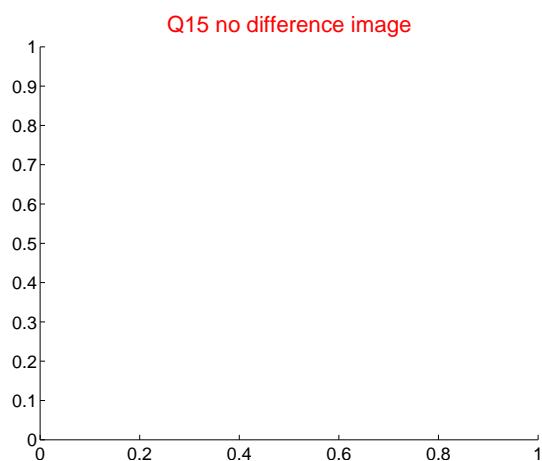
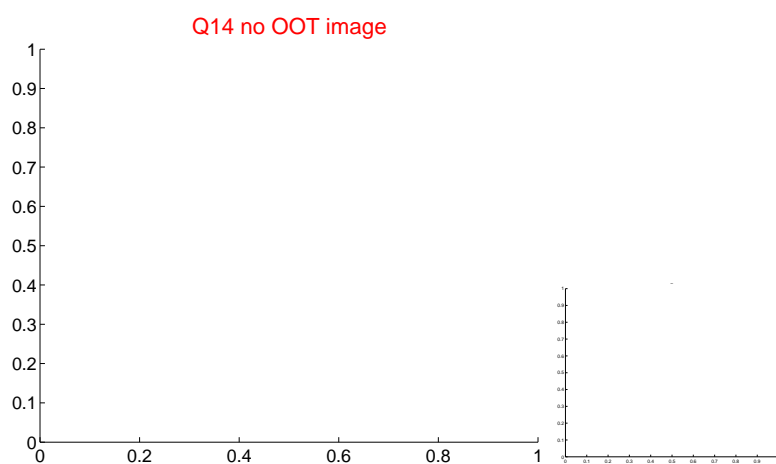
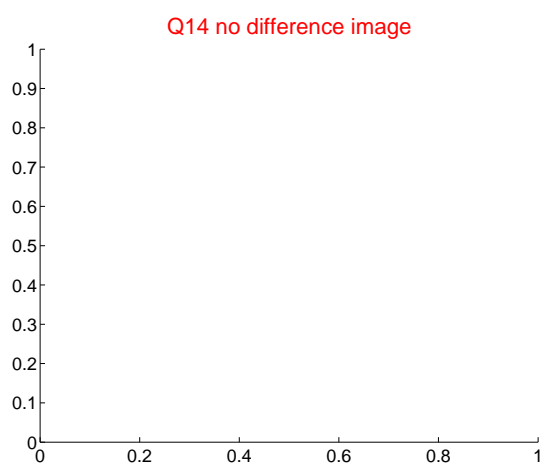
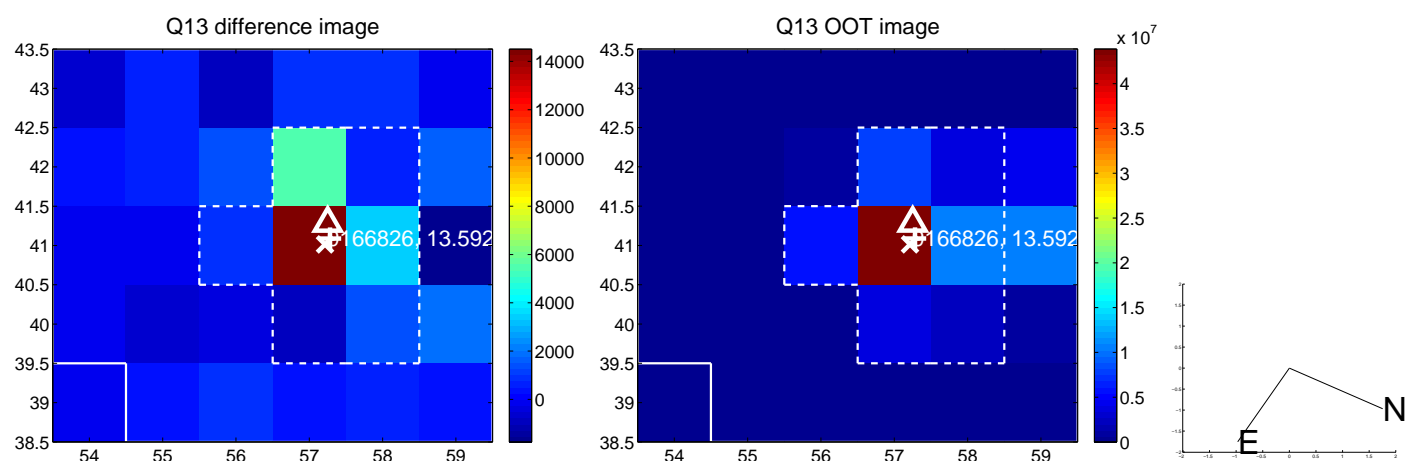
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



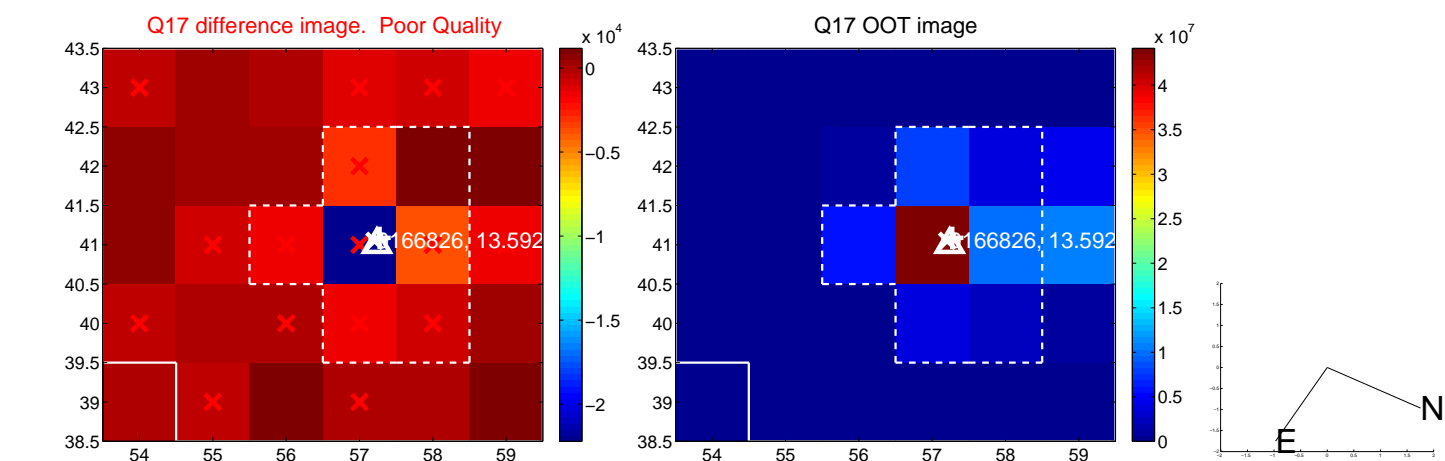
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



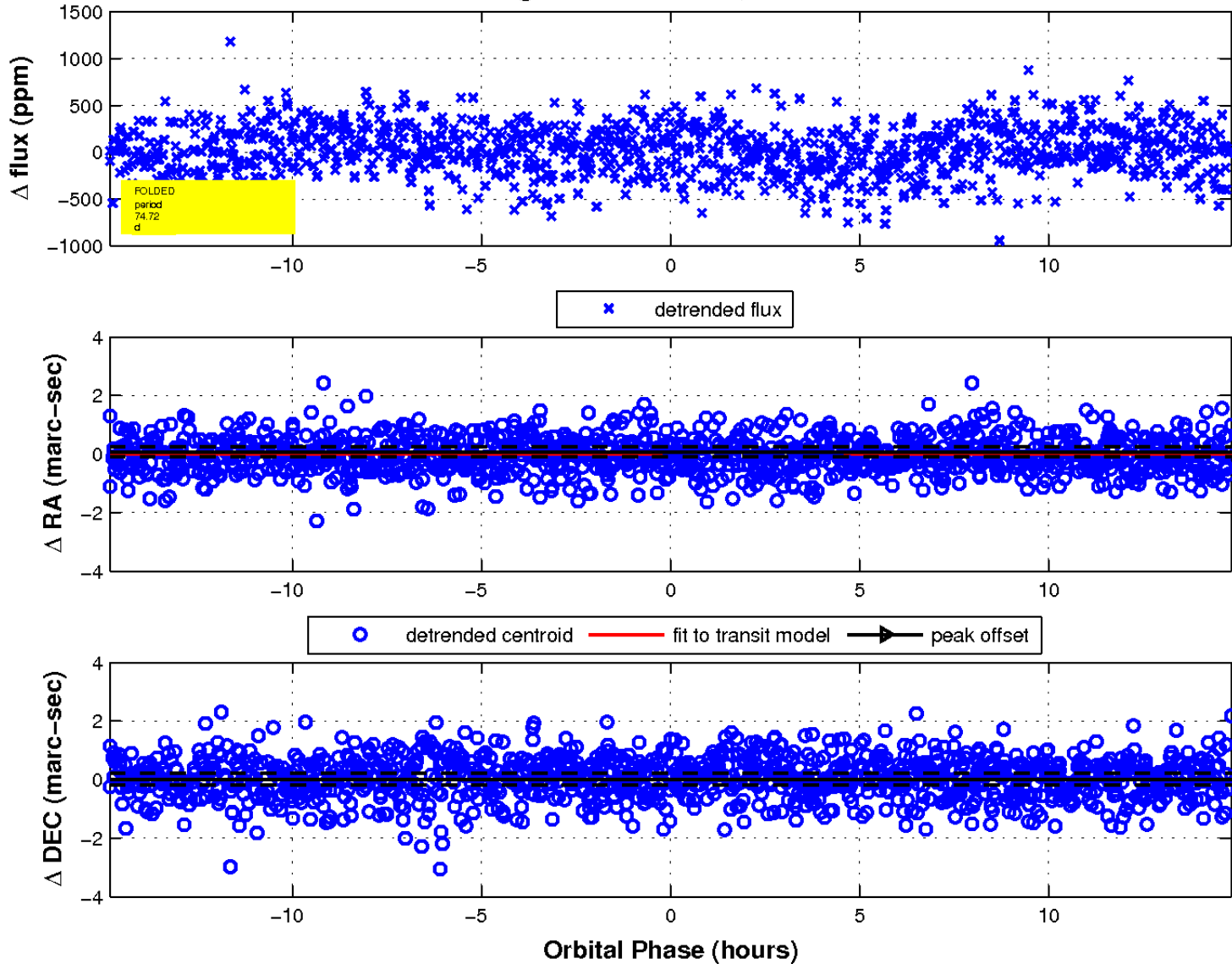
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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



fluxWeightedCentroids, Planet 7 of 7





UKIRT Image

