

# KIC 009243421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009243421-01 | OBS      | No   | 1.198209      | 132.236181   | 31.8        | 3.815            | 10.9 | 11.7 | 4.59                        | 6331            | 3.01                   | 41542.18               |
| 009243421-02 | OBS      | No   | 2.571808      | 132.660977   | 39.4        | 6.612            | 8.5  | 9.5  | 4.59                        | 6331            | 3.32                   | 15004.26               |
| 009243421-03 | OBS      | No   | 154.192245    | 235.238303   | 126.2       | 9.905            | 11.7 | 4.7  | 4.59                        | 6331            | 5.54                   | 63.94                  |
| 009243421-04 | OBS      | No   | 2.569394      | 133.568846   | 52.7        | 9.075            | 7.9  | 10.1 | 4.59                        | 6331            | 3.88                   | 15023.05               |
| 009243421-05 | OBS      | No   | 18.484254     | 145.906309   | 78.3        | 7.890            | 7.6  | 6.1  | 4.59                        | 6331            | 4.48                   | 1081.76                |
| 009243421-06 | OBS      | No   | 42.090762     | 137.660605   | 169.3       | 6.557            | 7.9  | 8.4  | 4.59                        | 6331            | 6.55                   | 361.09                 |
| 009243421-07 | OBS      | No   | 152.795479    | 152.270891   | 252.5       | 3.580            | 7.5  | 7.7  | 4.59                        | 6331            | 8.17                   | 64.72                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 009243421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT   |
| 009243421-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—<br>MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—HALO_GHOST |
| 009243421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009243421-06 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—HALO_GHOST   |
| 009243421-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>CENT_FEW_DIFFS                    |

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

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

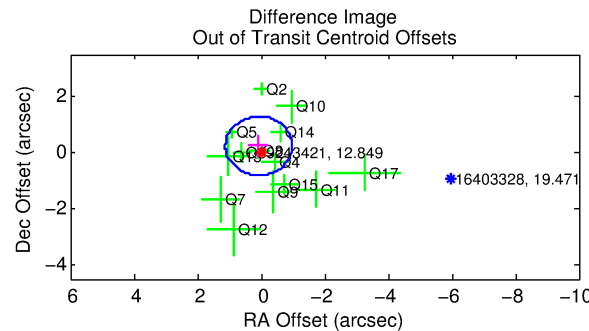
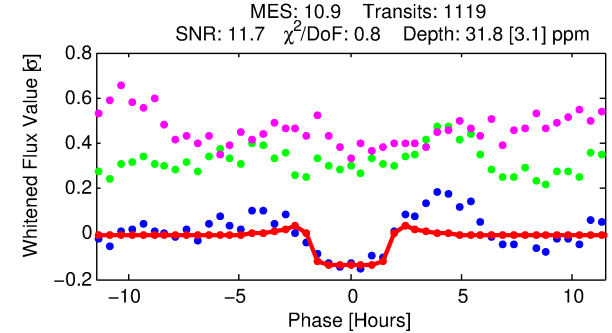
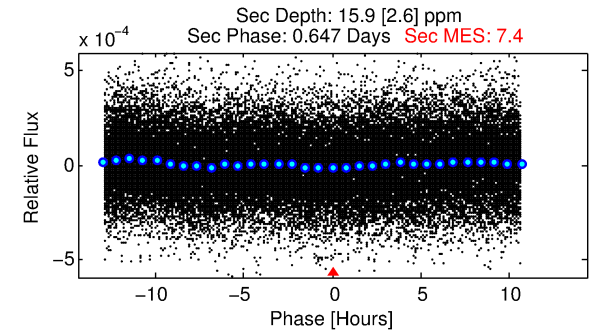
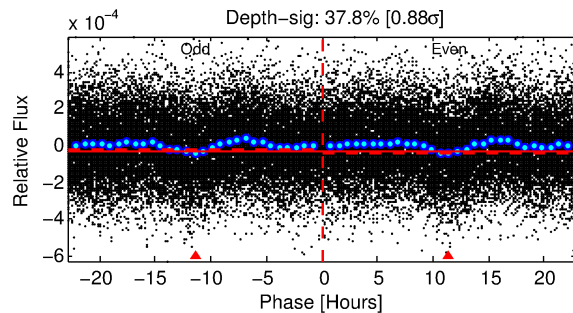
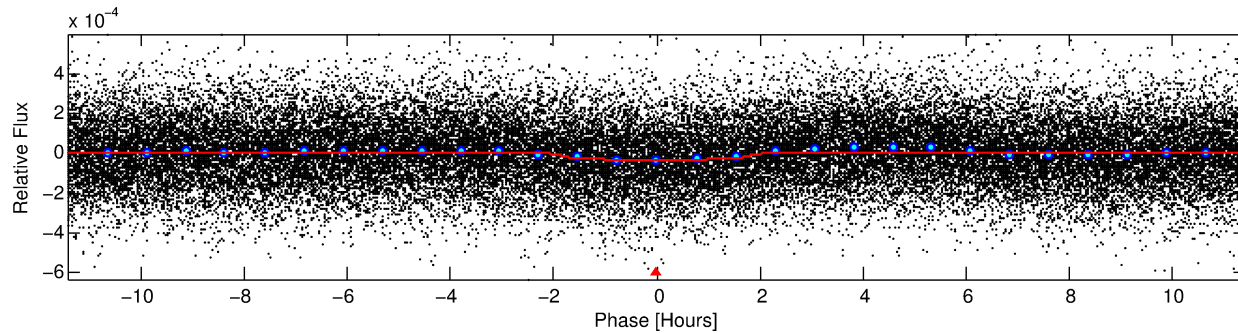
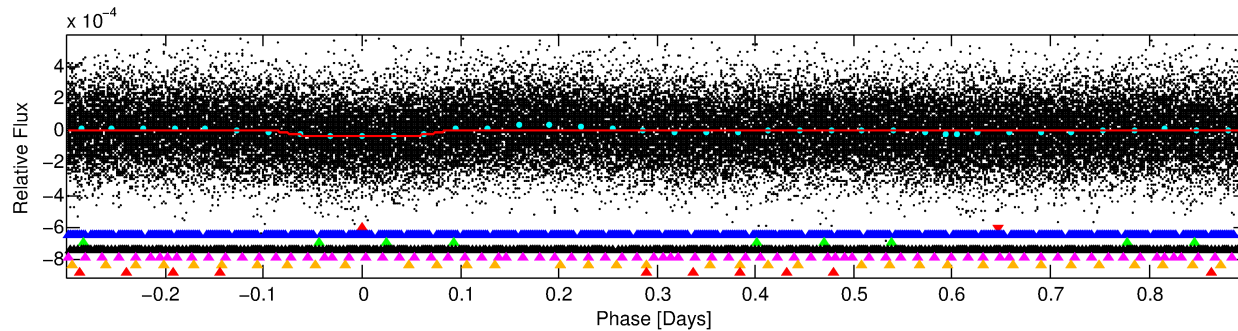
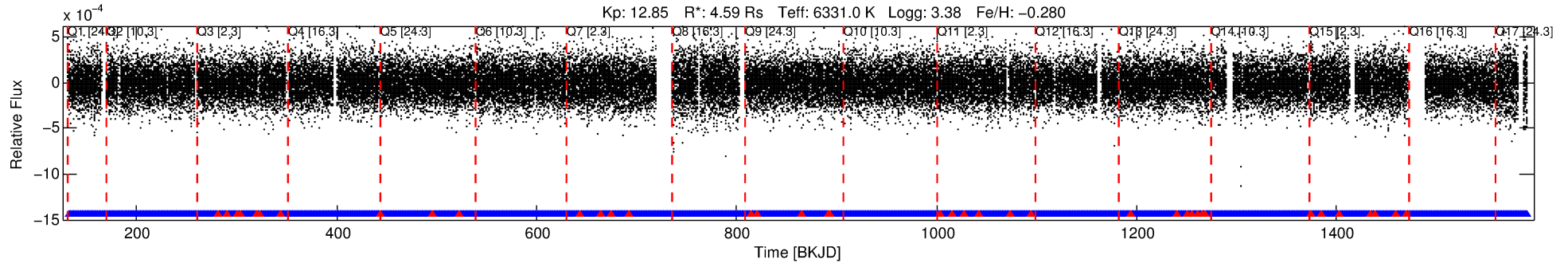
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009243421-01

No Significant Match Found

# DV One-Page Summary

KIC: 9243421 Candidate: 1 of 7 Period: 1.198 d



## DV Fit Results:

Period = 1.19821 [0.00001] d  
Epoch = 132.2362 [0.0028] BKJD  
Rp/R\* = 0.0060 [0.0017]  
a/R\* = 1.45 [1.24]  
b = 0.89 [0.37]  
Seff = 41542.18 [29133.07]  
Teff = 3640 [638] K  
Rp = 3.01 [1.57] Re  
a = 0.0270 [0.0115] AU  
Ag = 0.71 [0.64] [-0.46 $\sigma$ ]  
Teffp = 5159 [787] K [1.50 $\sigma$ ]

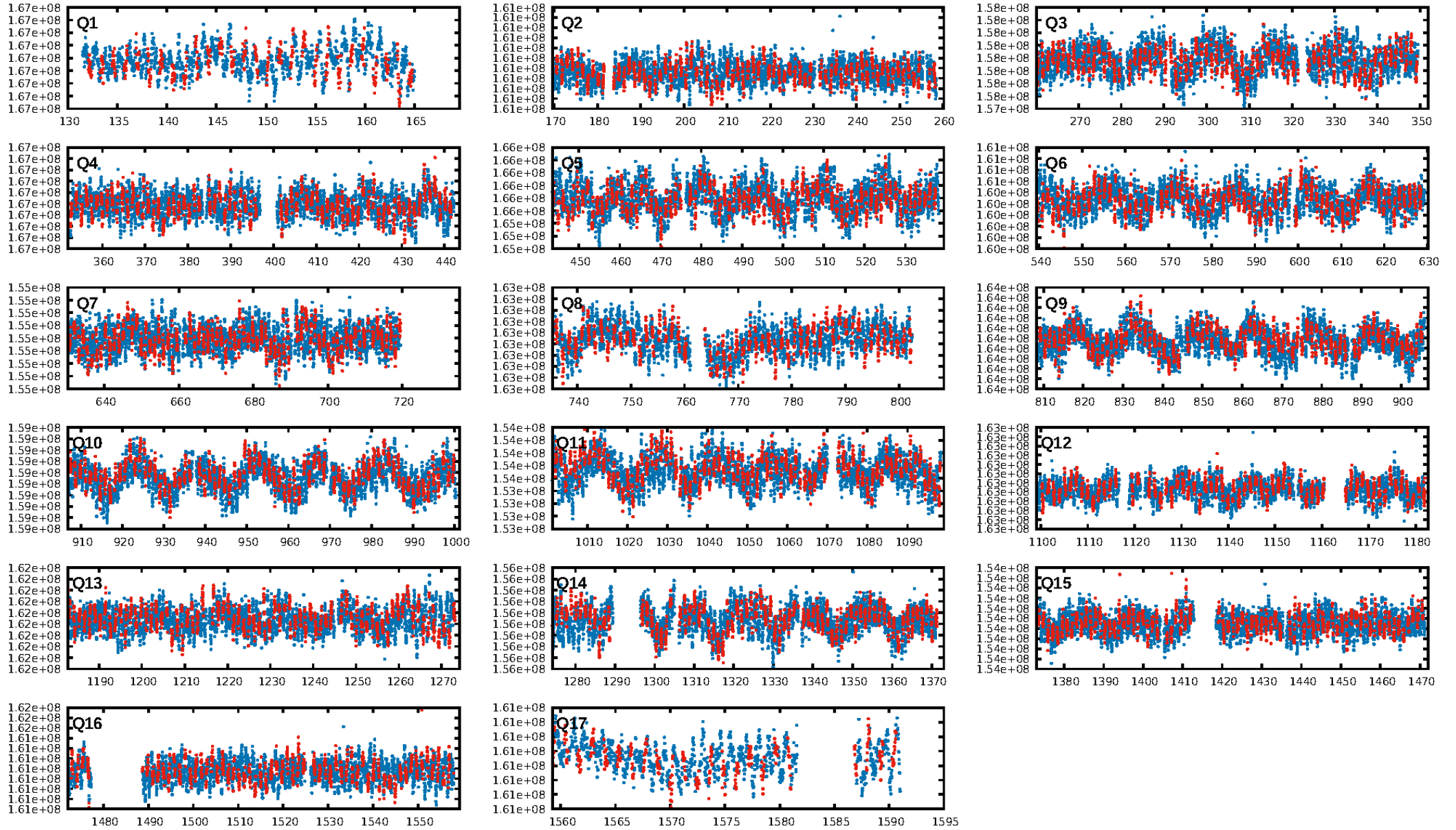
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 99.9% [3.34 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.08e-23  
RollingBand-fgt: 0.96 [1028/1068]  
GhostDiagnostic-chr: -13.93  
Centroid-sig: 2.2%  
Centroid-so: 1.471 arcsec [1.87 $\sigma$ ]  
OotOffset-rm: 0.249 arcsec [0.71 $\sigma$ ]  
KicOffset-rm: 0.152 arcsec [0.47 $\sigma$ ]  
OotOffset-st: 3/4/3/4 [14]  
KicOffset-st: 3/4/3/4 [14]  
DiffImageQuality-fgm: 0.79 [11/14]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 07:14:09 Z

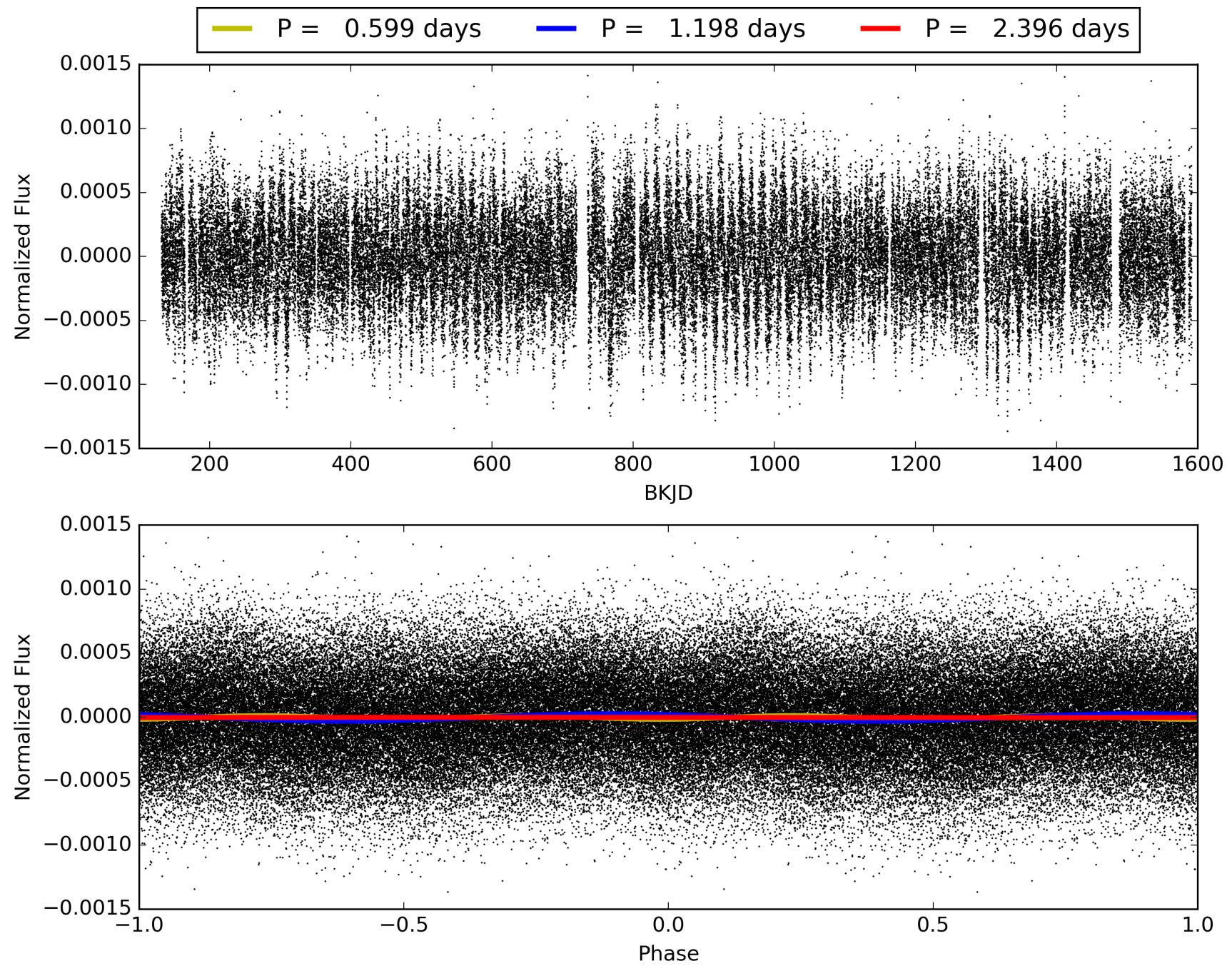
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009243421-01, PDC Light Curves





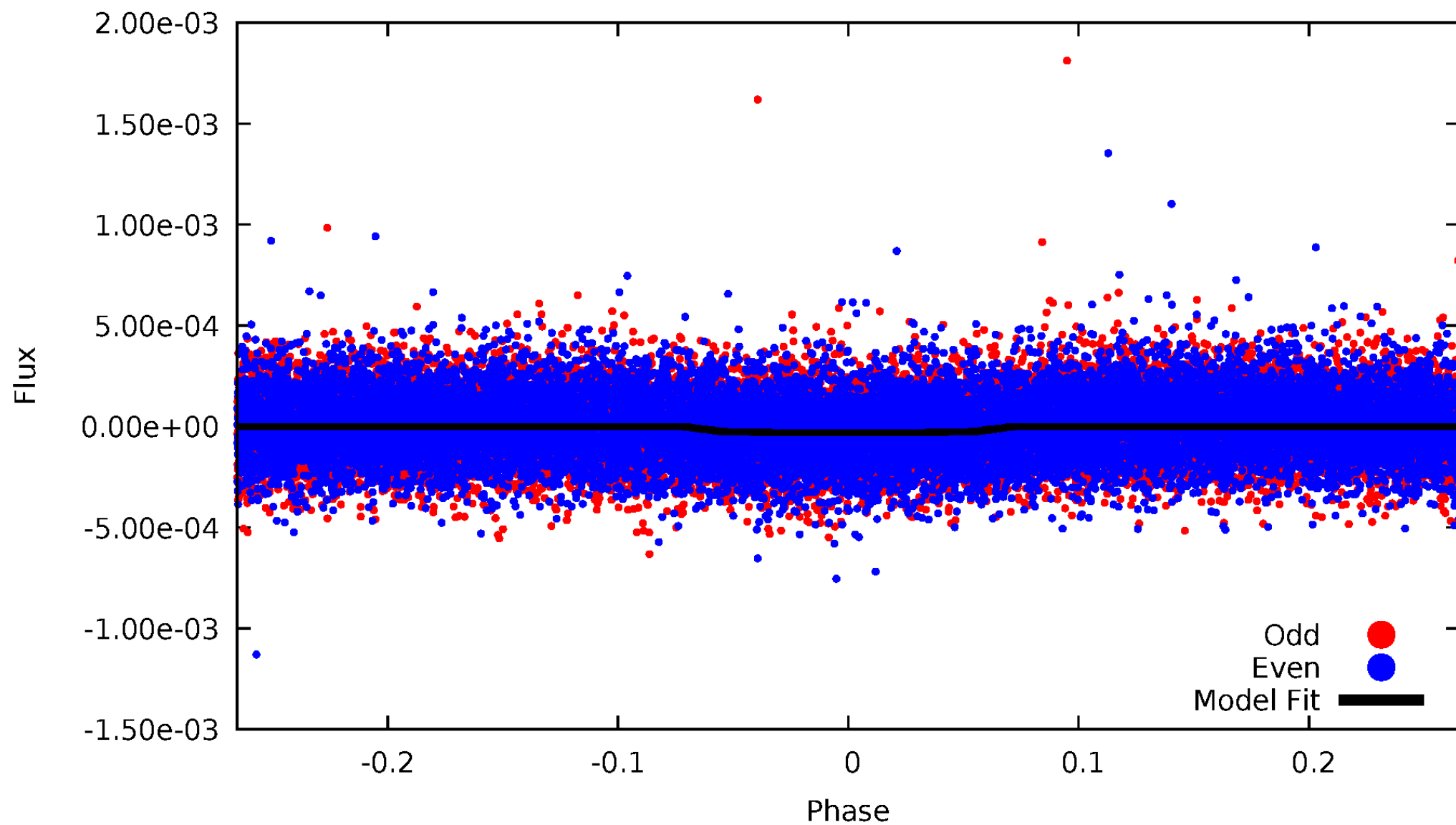
TCE 009243421-01





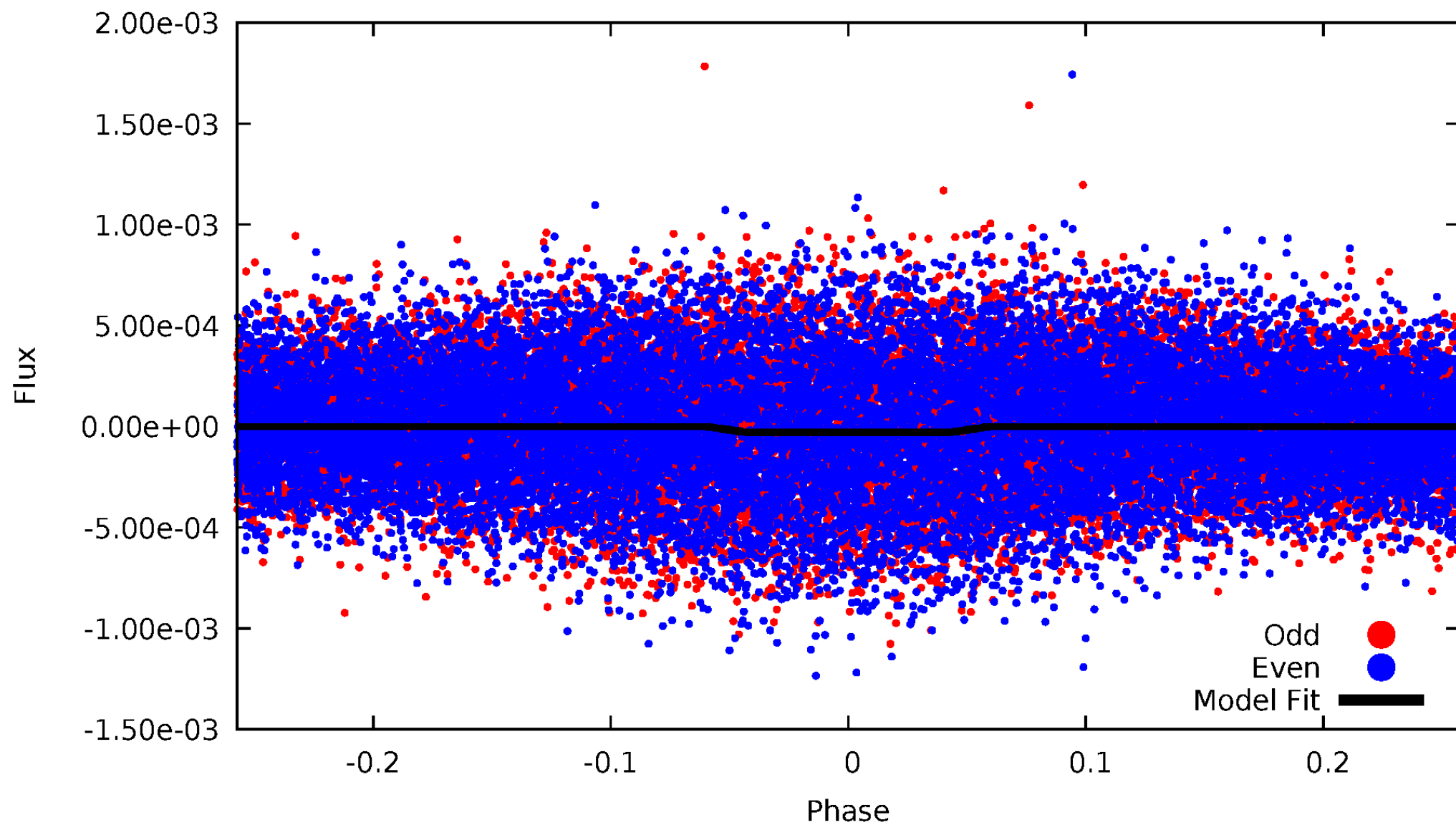
# DV Odd/Even

TCE 009243421-01

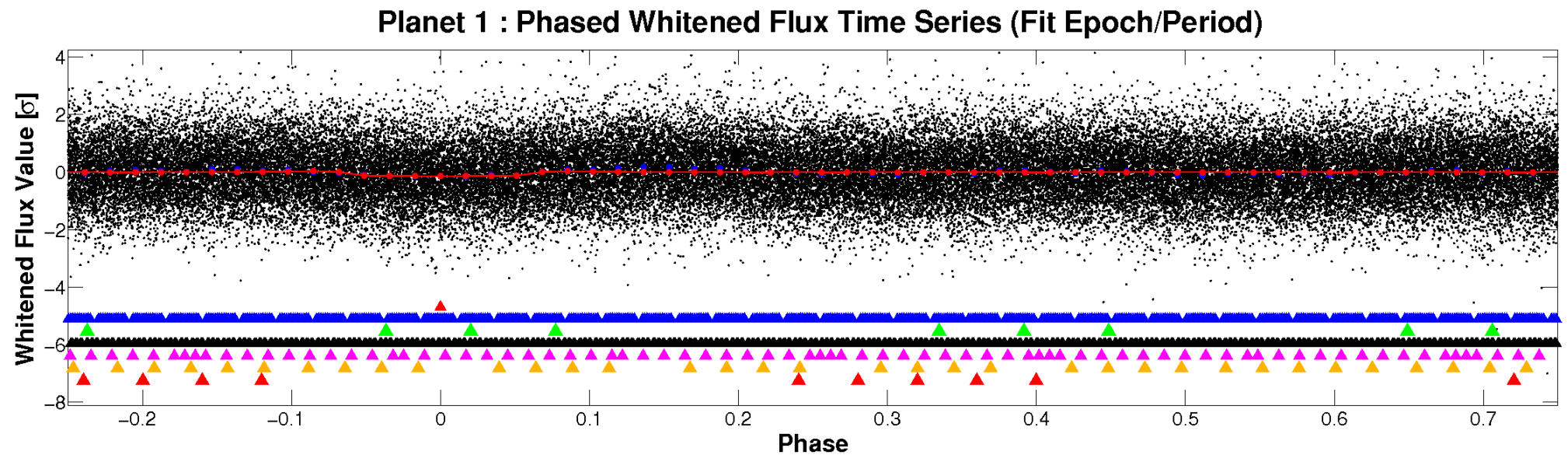
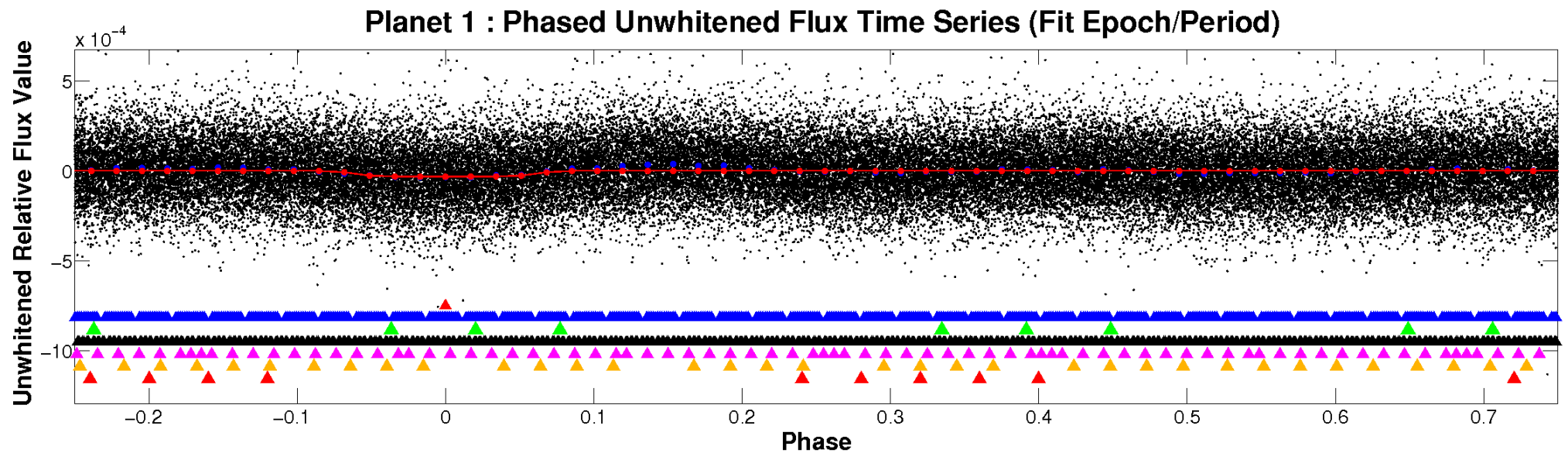


# ALT Odd/Even

TCE 009243421-01



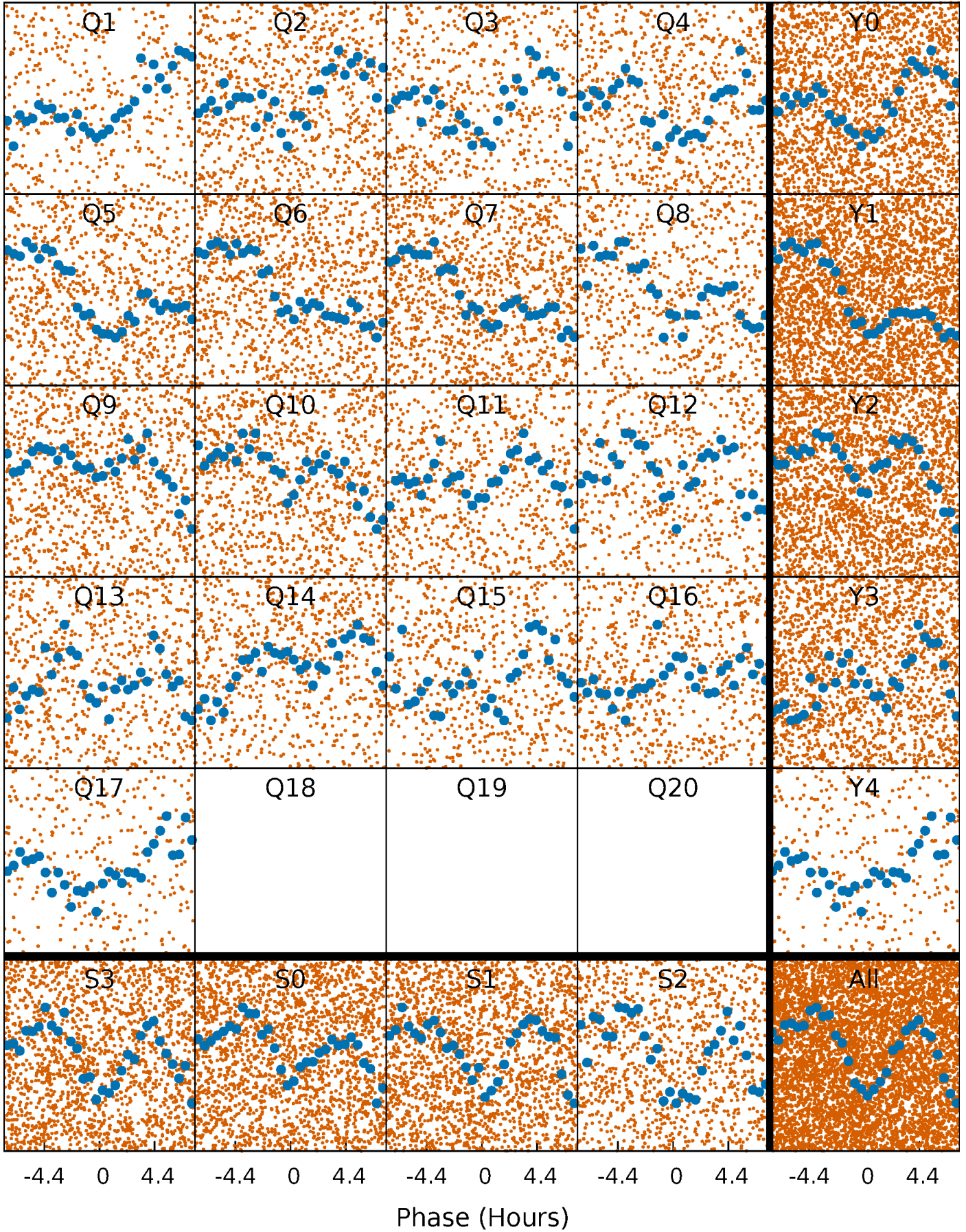
# Non-Whitened Vs. Whitened Light Curve





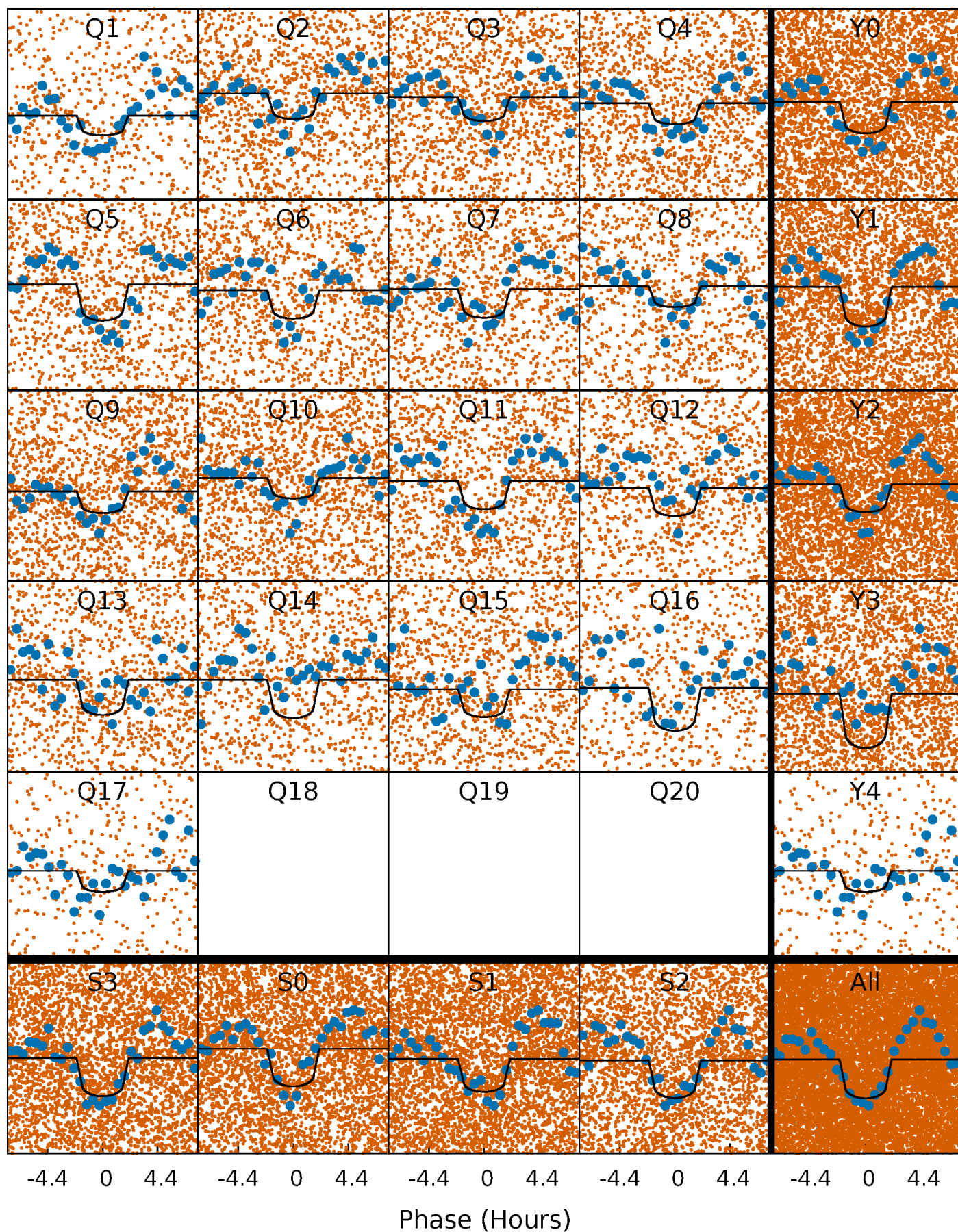
# PDC Quarter-Phased Transit Curves

TCE 009243421-01 P= 1.198209 Days  $T_0=132.236181$  (BKJD)



# DV Quarter-Phased Transit Curves

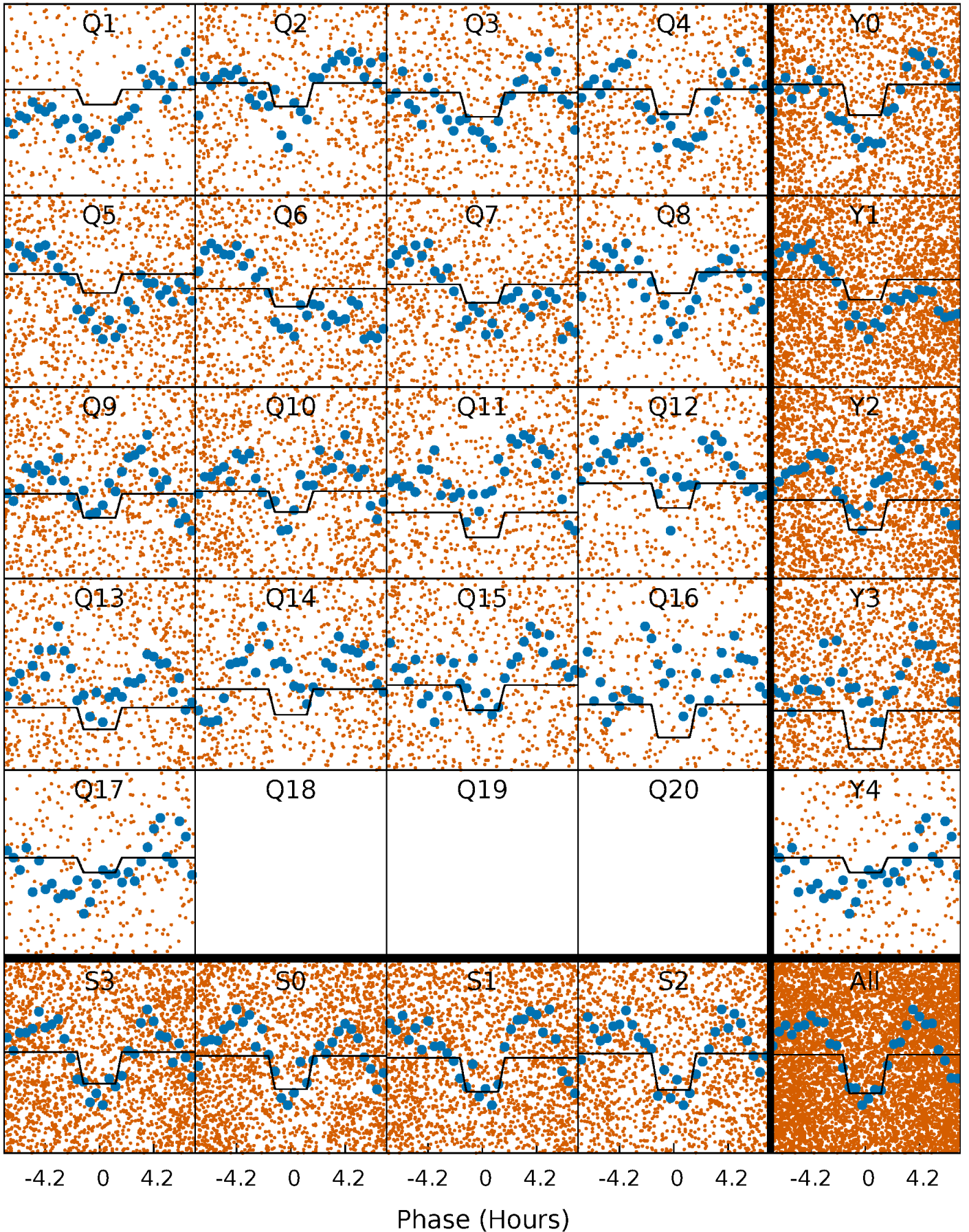
TCE 009243421-01 P= 1.198209 Days  $T_0=132.236181$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 009243421-01 P= 1.198231 Days  $T_0=132.234910$  (BKJD)

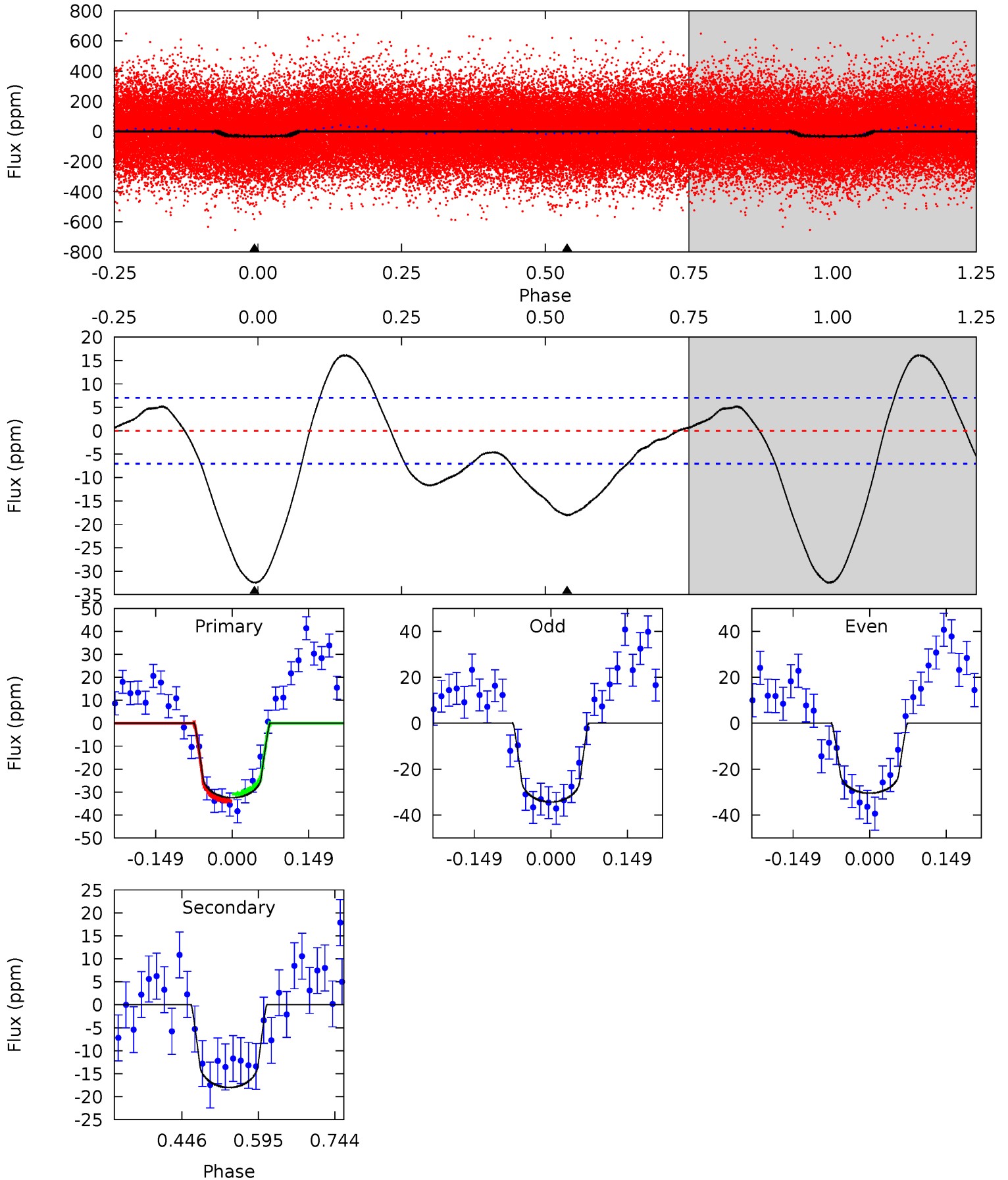




# DV Model-Shift Uniqueness Test

009243421-01, P = 1.198209 Days, E = 131.037972 Days

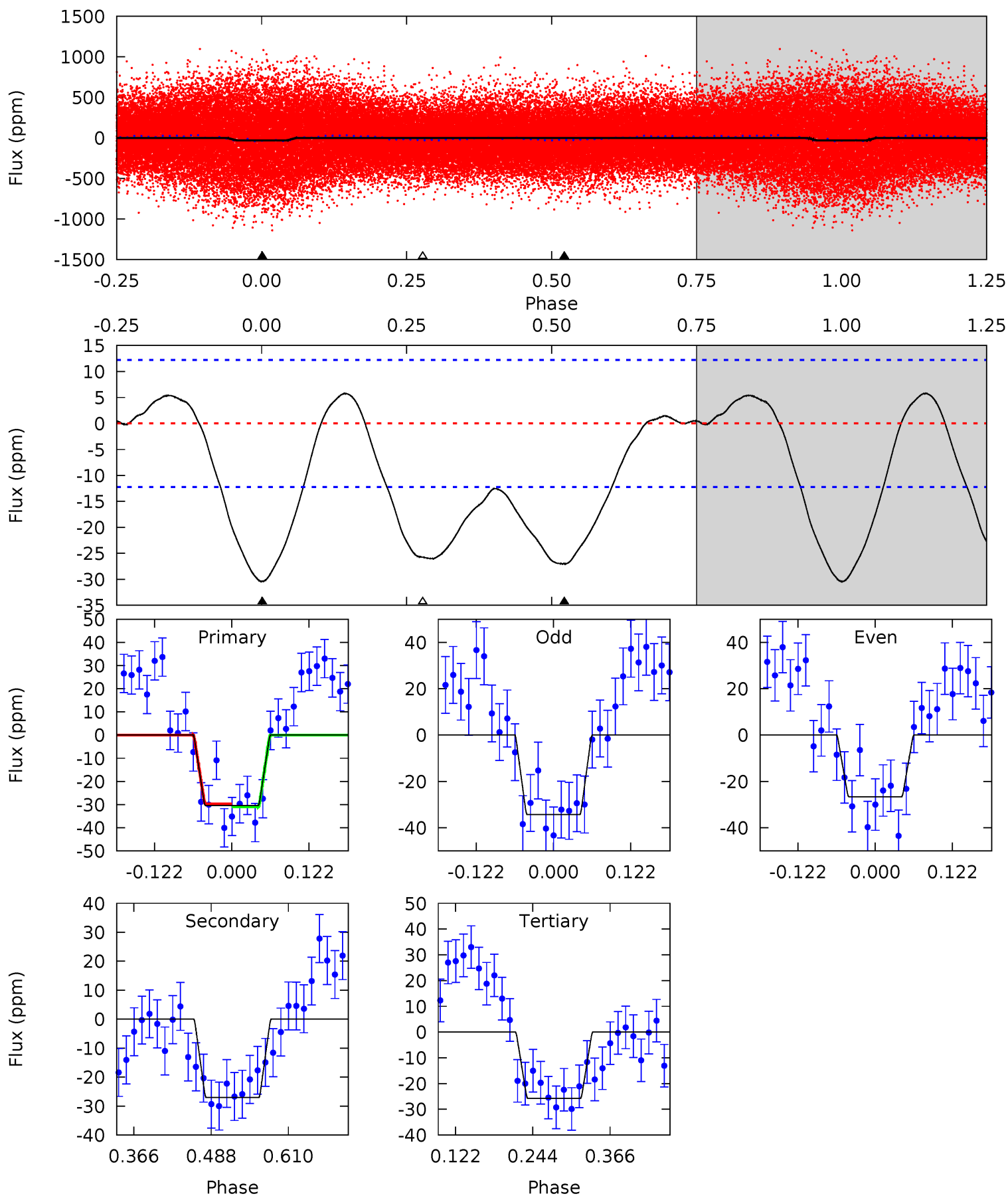
| Pri  | Sec  | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 20.6 | 11.4 | 0   | 0   | 4.48            | 1.44            | 5.11             | 20.6    | 20.6    | 11.4    | 11.4    | 1.22    | 1.10 | 0.33  | 0.93 |



# Alt Model-Shift Uniqueness Test

009243421-01, P = 1.198231 Days, E = 131.036679 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  |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 11.3 | 10.0 | 9.53 | 0   | 4.52            | 1.55            | 4.15             | 1.73    | 11.3    | 0.48    | 10.0    | 1.42    | 1.62 | 0.16  | 0.24 |



### Stellar Parameters For KIC 009243421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6331^{+195}_{-176}$ | $3.377^{+0.408}_{-0.072}$ | $-0.280^{+0.400}_{-0.300}$ | $4.588^{+0.666}_{-1.999}$ | $1.832^{+0.125}_{-0.468}$ | $0.027^{+0.099}_{-0.006}$                     |
|        | +3%/-3%              | +12%/-2%                  | +143%/-107%                | +15%/-44%                 | +7%/-26%                  | +370%/-24%                                    |
| Source | PHO1                 | FLK73                     | 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 009243421-01 / KOI

| Detrend | Depth (ppm) | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)        | $T_{obs}$ (K)         | $A_{obs}$                 |
|---------|-------------|------------------------|----------------------|-----------------------|---------------------------|
| DV      | $-18 \pm 2$ | $2.70^{+0.96}_{-0.97}$ | $4941^{+315}_{-566}$ | $4952^{+1143}_{-857}$ | $0.996^{+1.240}_{-0.469}$ |
| Alt.    | $-27 \pm 3$ | $2.37^{+1.01}_{-0.88}$ | $4928^{+325}_{-572}$ | $5977^{+1523}_{-992}$ | $1.855^{+2.705}_{-0.899}$ |

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



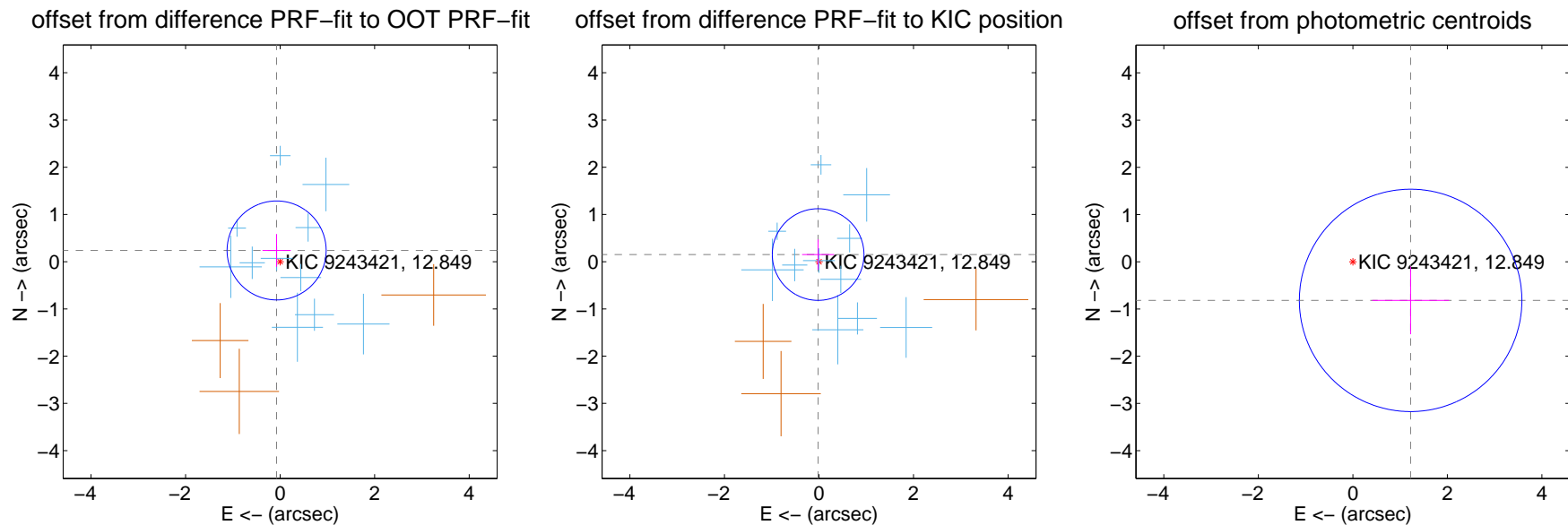
## DV Centroid Data

Supplemental centroid analysis for 009243421-01. Kepler magnitude: 12.85. Transit SNR 11.70

There are 11 quarters with good PRF difference image offsets

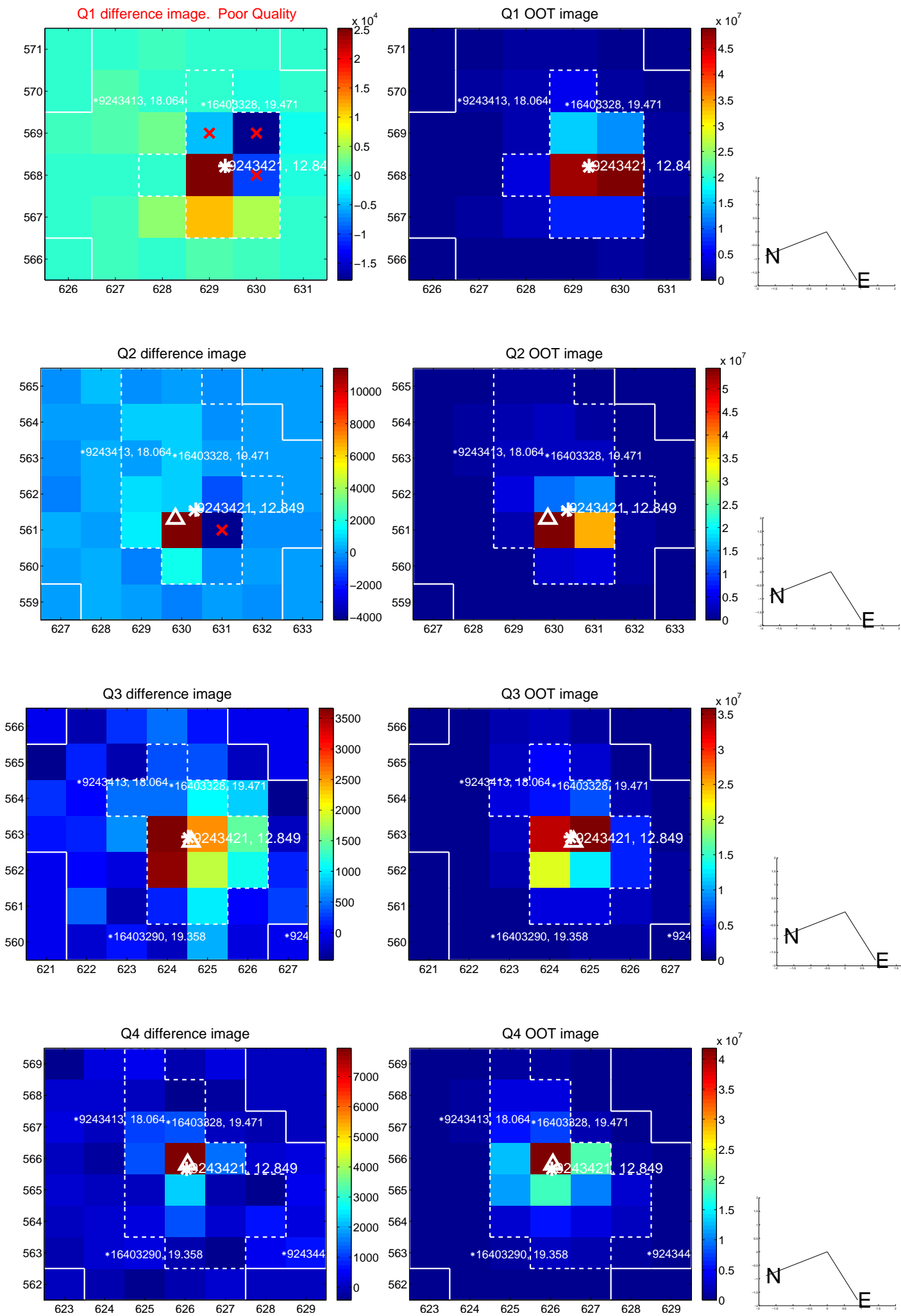
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $0.249 \pm 0.349$  | 0.71                | $0.074 \pm 0.299$ | $0.238 \pm 0.348$ |
| PRF-fit source offset from KIC position | $0.152 \pm 0.323$  | 0.47                | $0.018 \pm 0.340$ | $0.151 \pm 0.321$ |
| photometric centroid source offset      | $1.47 \pm 0.78$    | 1.87                | $-1.22 \pm 0.81$  | $-0.82 \pm 0.72$  |

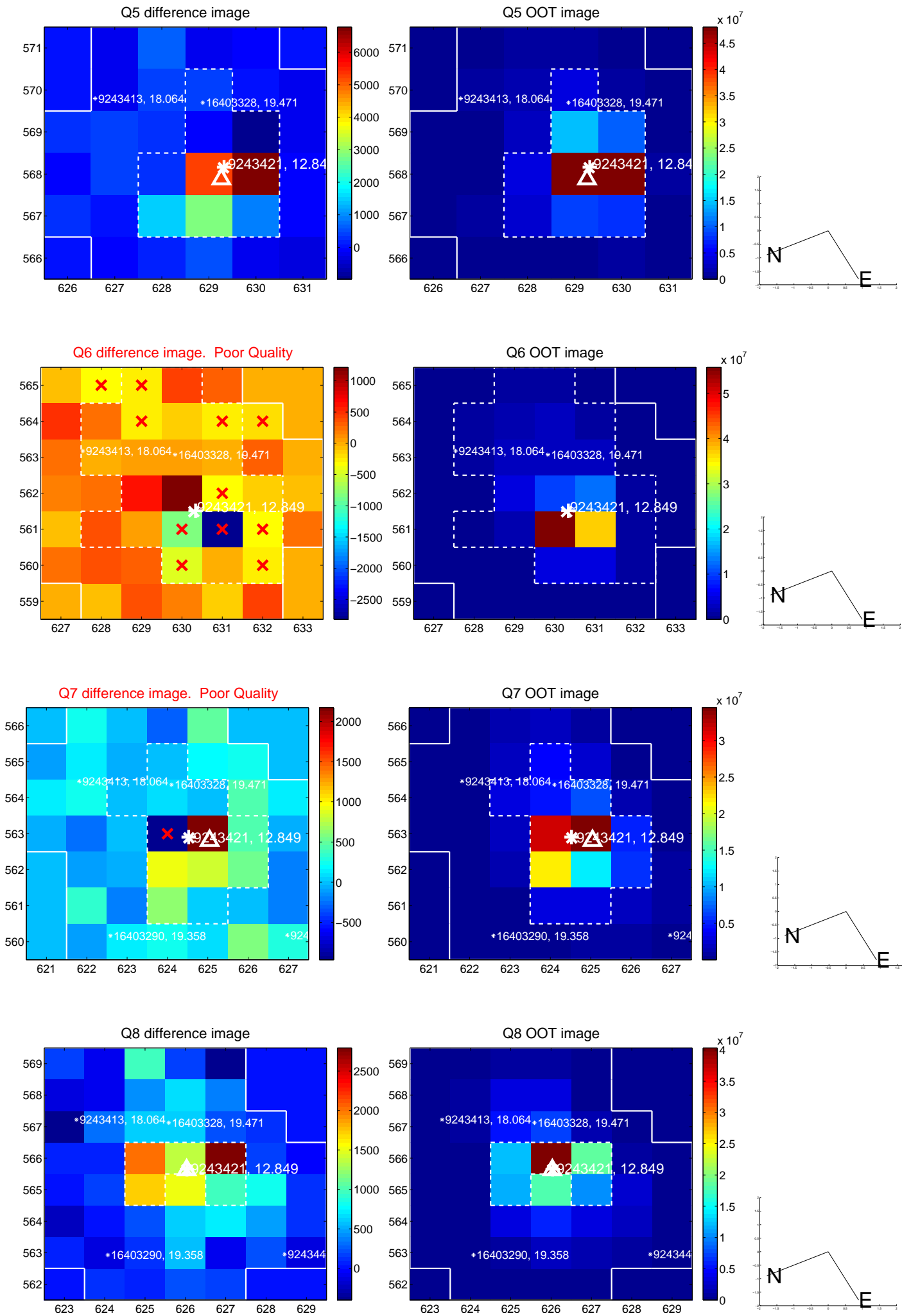


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

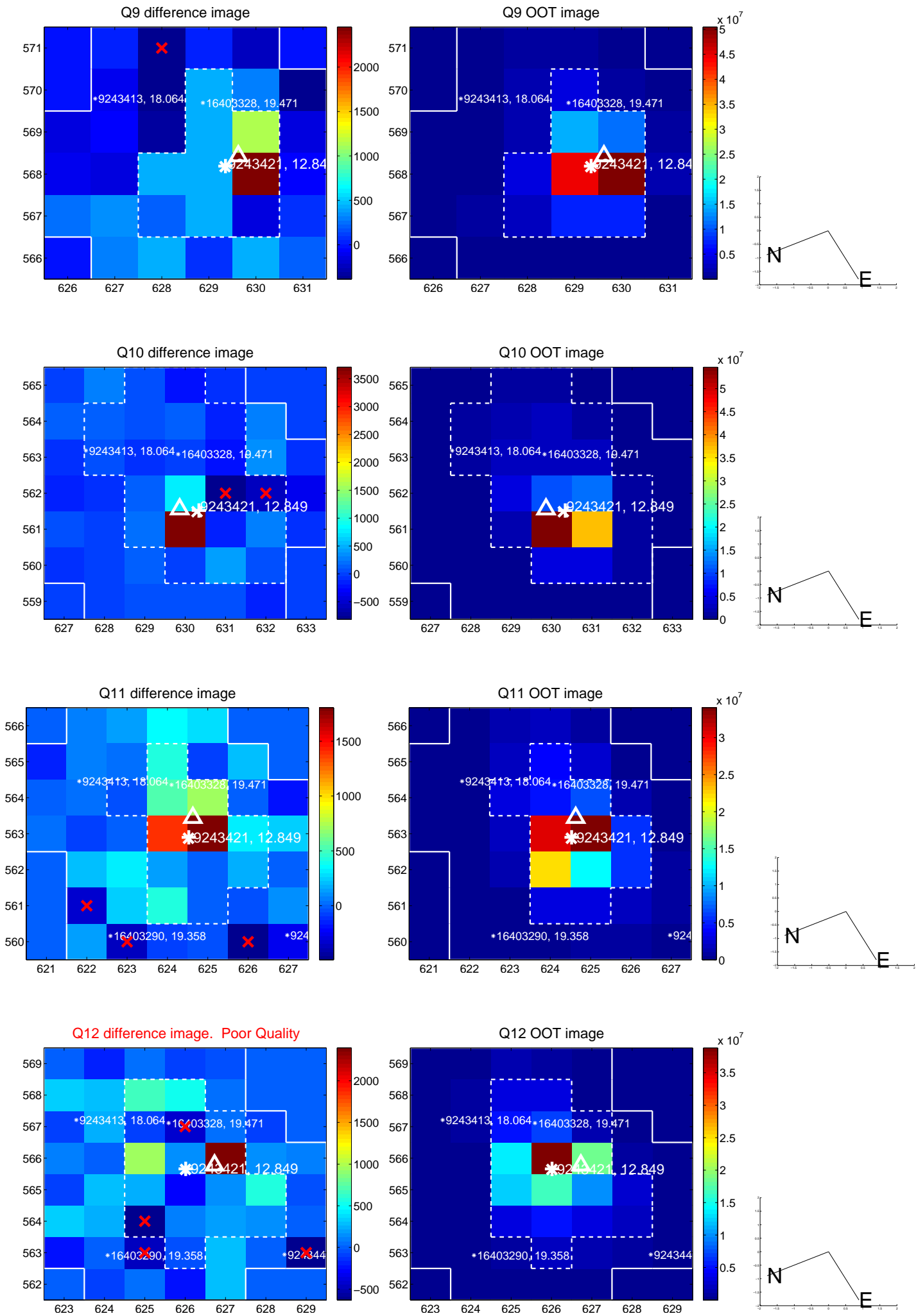


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

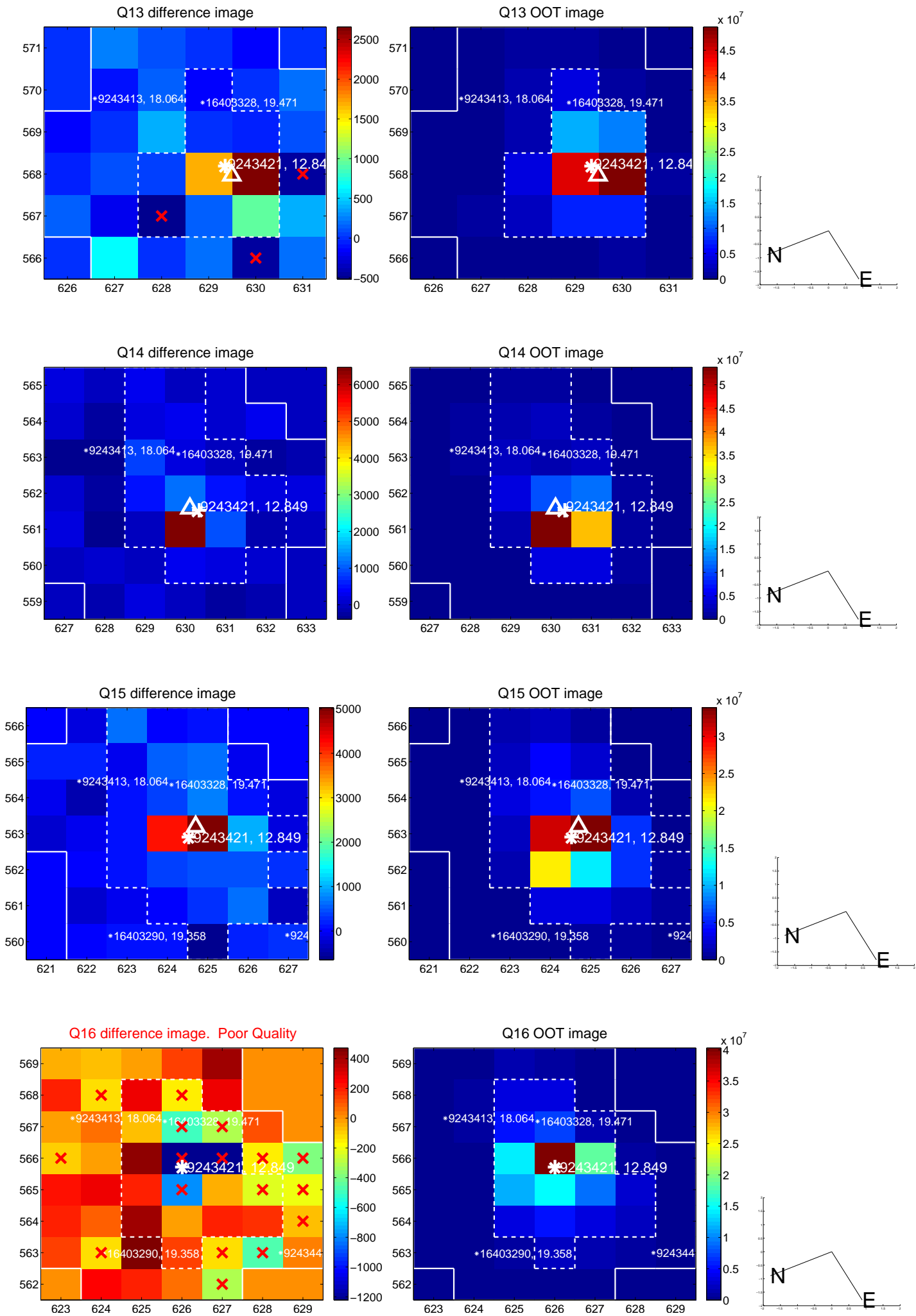




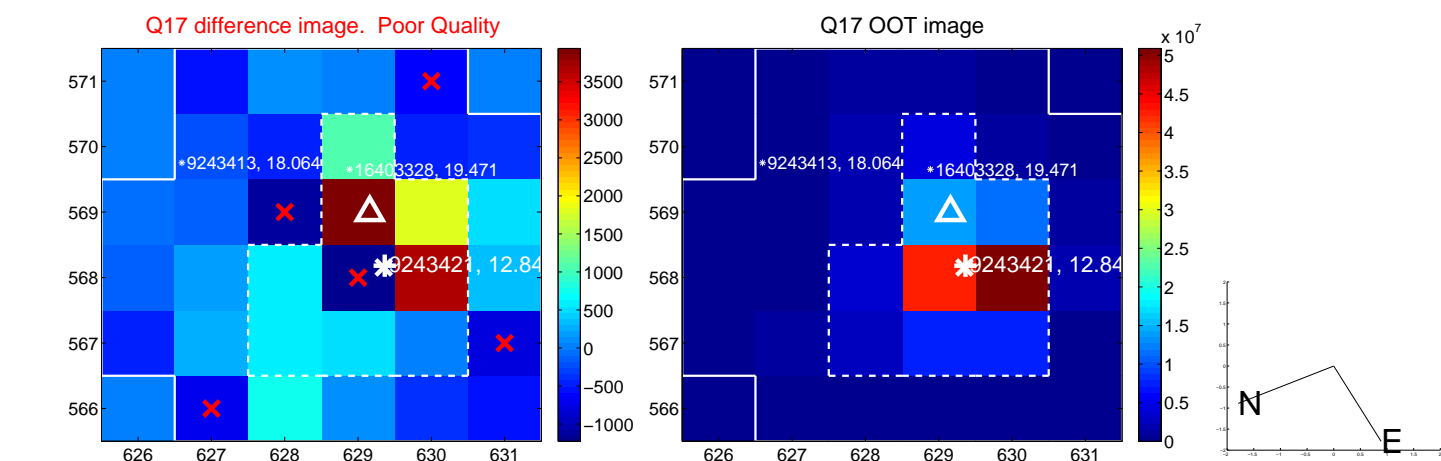
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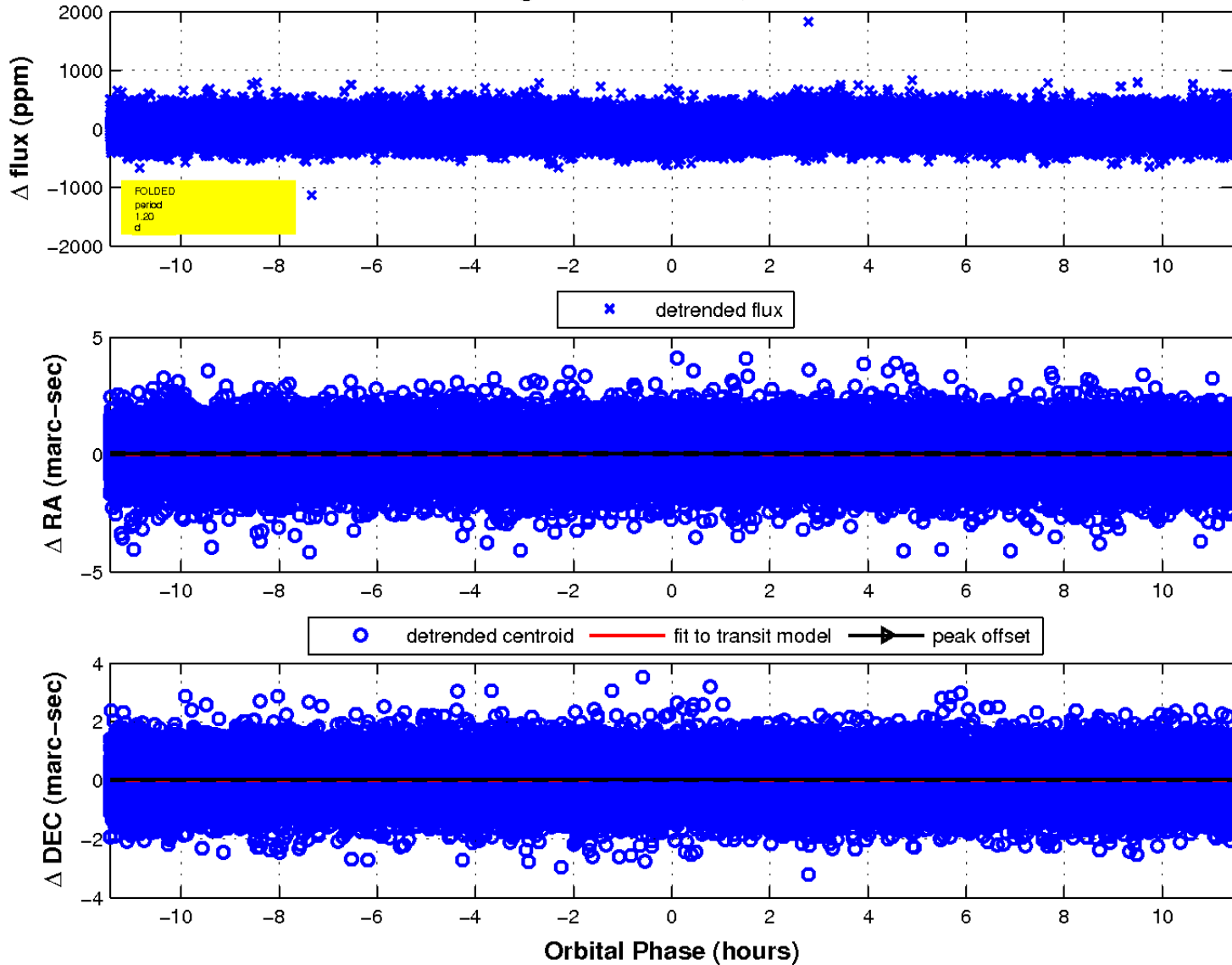
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

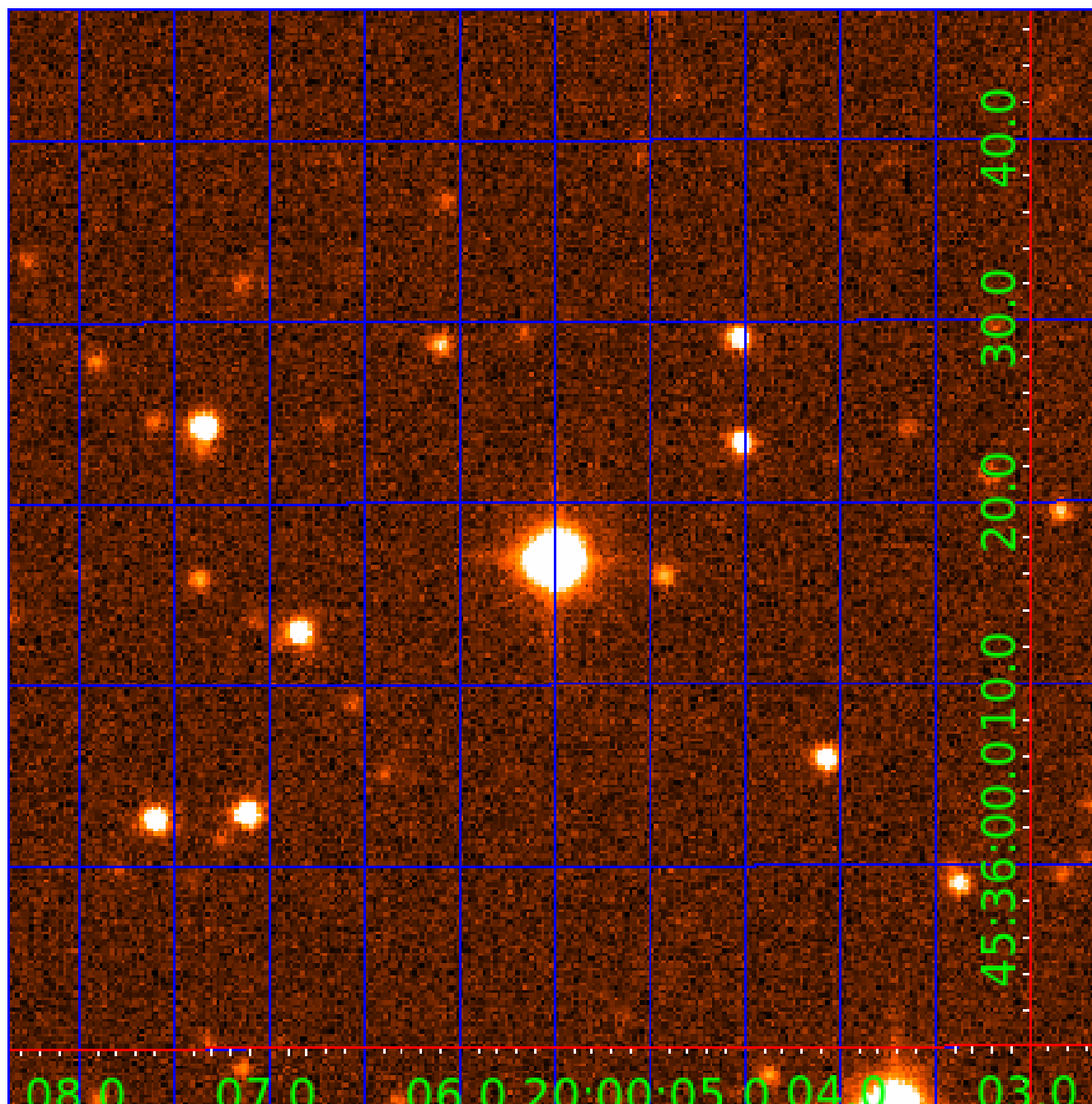


fluxWeightedCentroids, Planet 1 of 7



UKIRT Image

Declination



# KIC 009243421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009243421-01 | OBS      | No   | 1.198209      | 132.236181   | 31.8        | 3.815            | 10.9 | 11.7 | 4.59                        | 6331            | 3.01                   | 41542.18               |
| 009243421-02 | OBS      | No   | 2.571808      | 132.660977   | 39.4        | 6.612            | 8.5  | 9.5  | 4.59                        | 6331            | 3.32                   | 15004.26               |
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| 009243421-07 | OBS      | No   | 152.795479    | 152.270891   | 252.5       | 3.580            | 7.5  | 7.7  | 4.59                        | 6331            | 8.17                   | 64.72                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 009243421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT   |
| 009243421-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—<br>MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—HALO_GHOST |
| 009243421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009243421-06 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—HALO_GHOST   |
| 009243421-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>CENT_FEW_DIFFS                    |

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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.

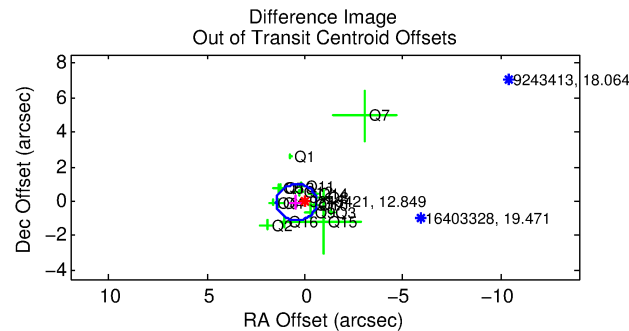
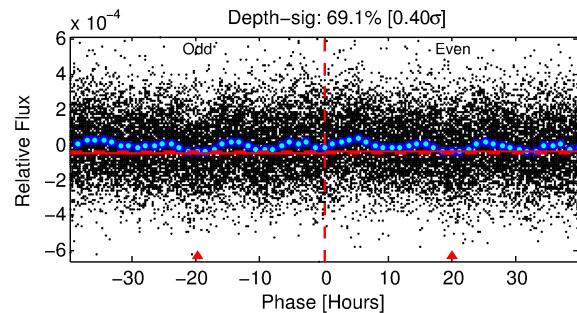
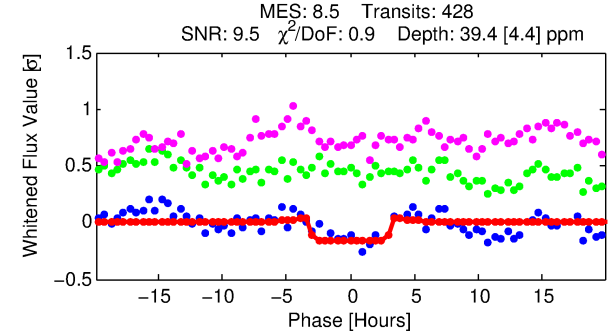
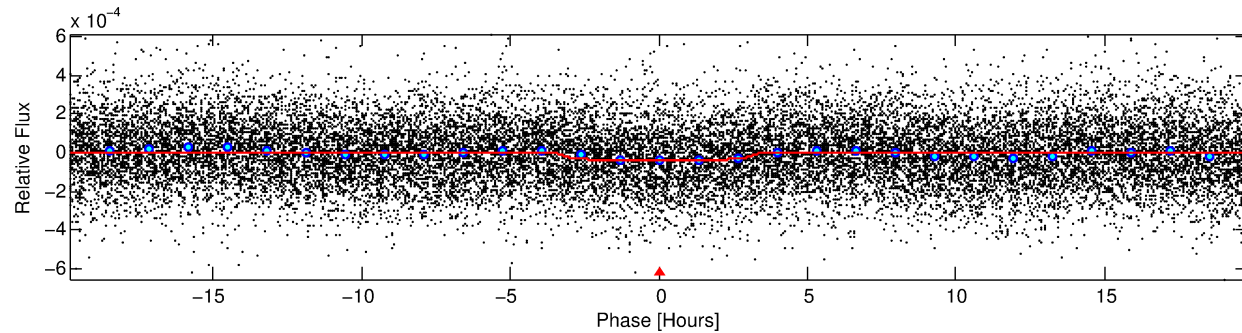
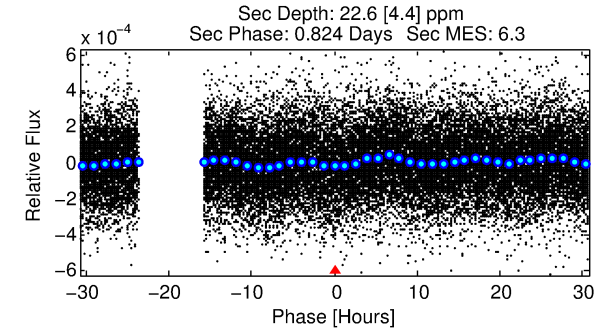
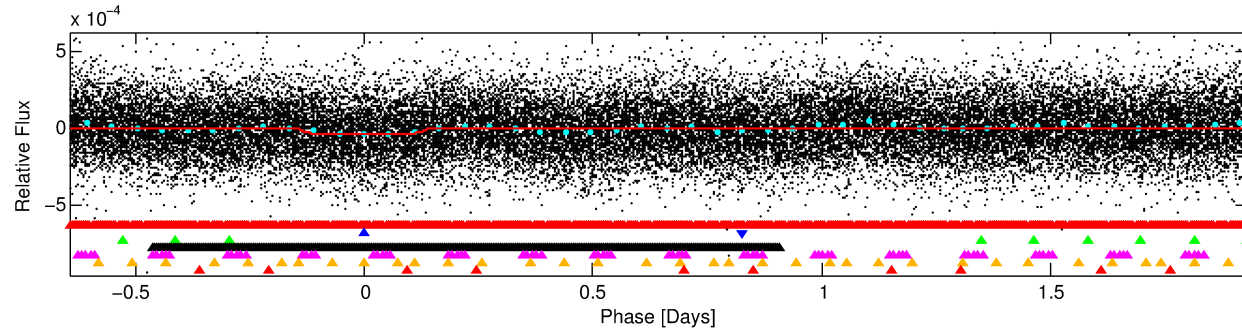
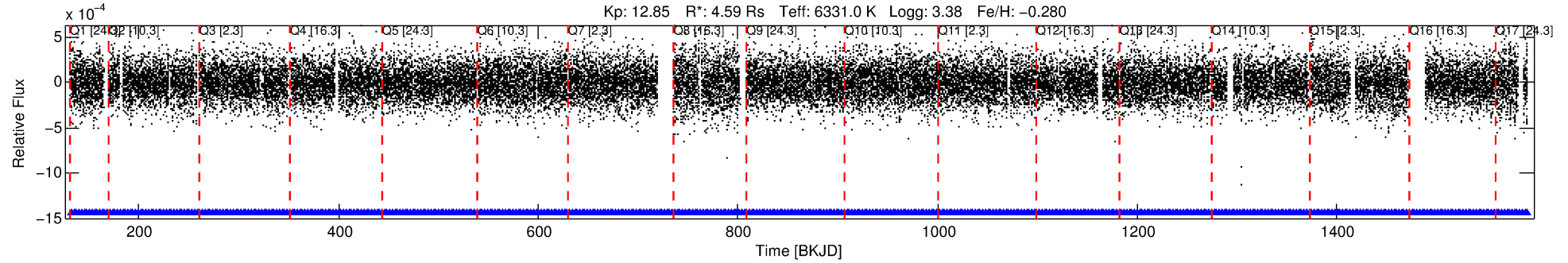
Ephemeris Match Information For 009243421-02

No Significant Match Found



# DV One-Page Summary

KIC: 9243421 Candidate: 2 of 7 Period: 2.572 d



## DV Fit Results:

Period = 2.57181 [0.00002] d  
Epoch = 132.6610 [0.0052] BKJD  
Rp/R\* = 0.0066 [0.0019]  
a/R\* = 1.71 [1.83]  
b = 0.88 [0.41]  
Seff = 15004.26 [10522.32]  
Teq = 2822 [495] K  
Rp = 3.32 [1.74] Re  
a = 0.0449 [0.0192] AU  
Ag = 2.27 [2.10] [0.61σ]  
Teffp = 5358 [837] K [2.61σ]

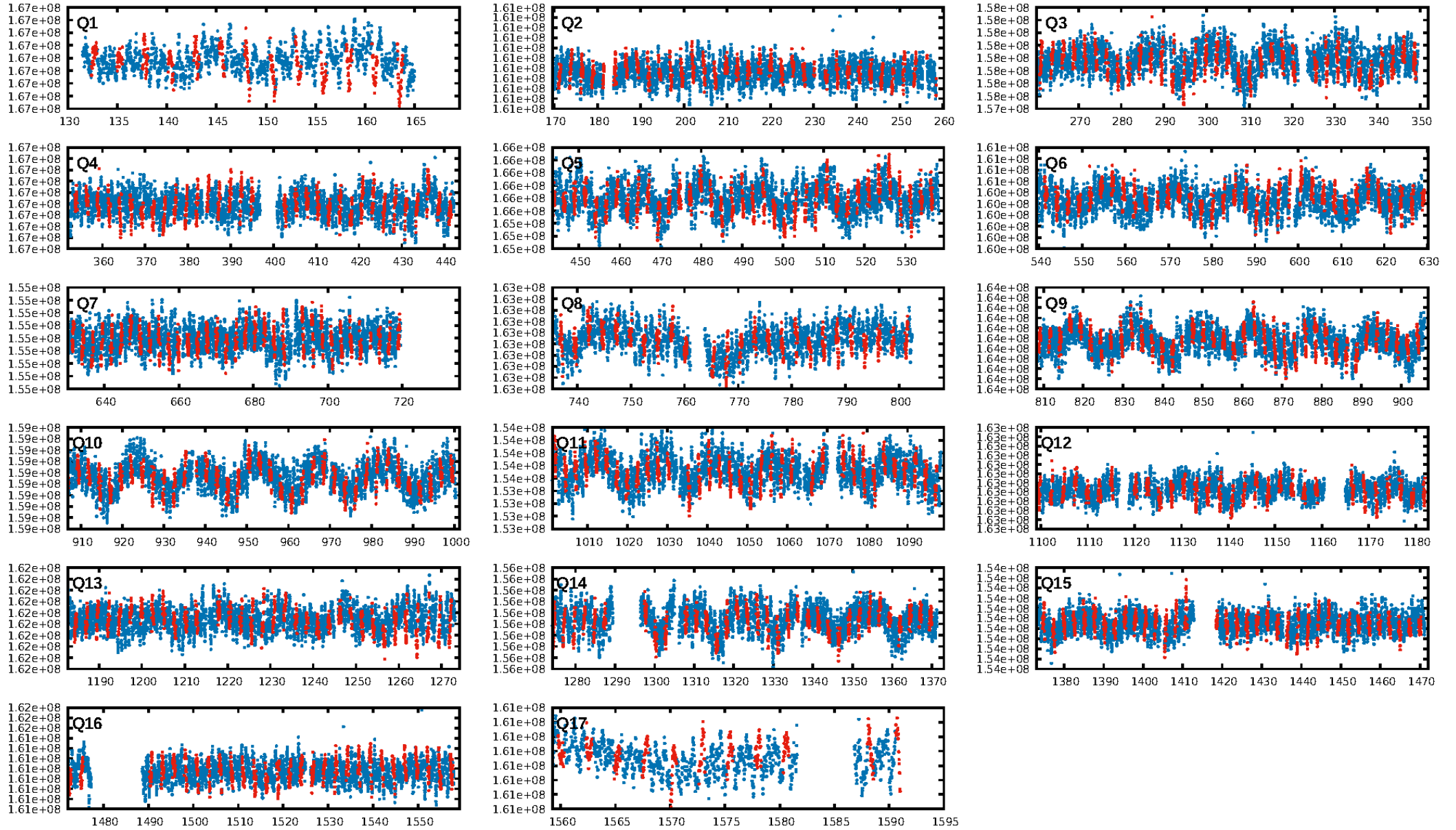
## DV Diagnostic Results:

ShortPeriod-sig: 0.4% [0.01σ]  
LongPeriod-sig: 100.0% [37.1σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.94e-13  
RollingBand-fgt: 1.00 [408/408]  
**GhostDiagnostic-chr: 0.5157**  
Centroid-sig: 45.0%  
Centroid-so: 0.812 arcsec [1.05σ]  
OotOffset-rm: 0.455 arcsec [1.32σ]  
KicOffset-rm: 0.418 arcsec [1.09σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.59 [10/17]  
DiffImageOverlap-fno: 0.00 [0/17]

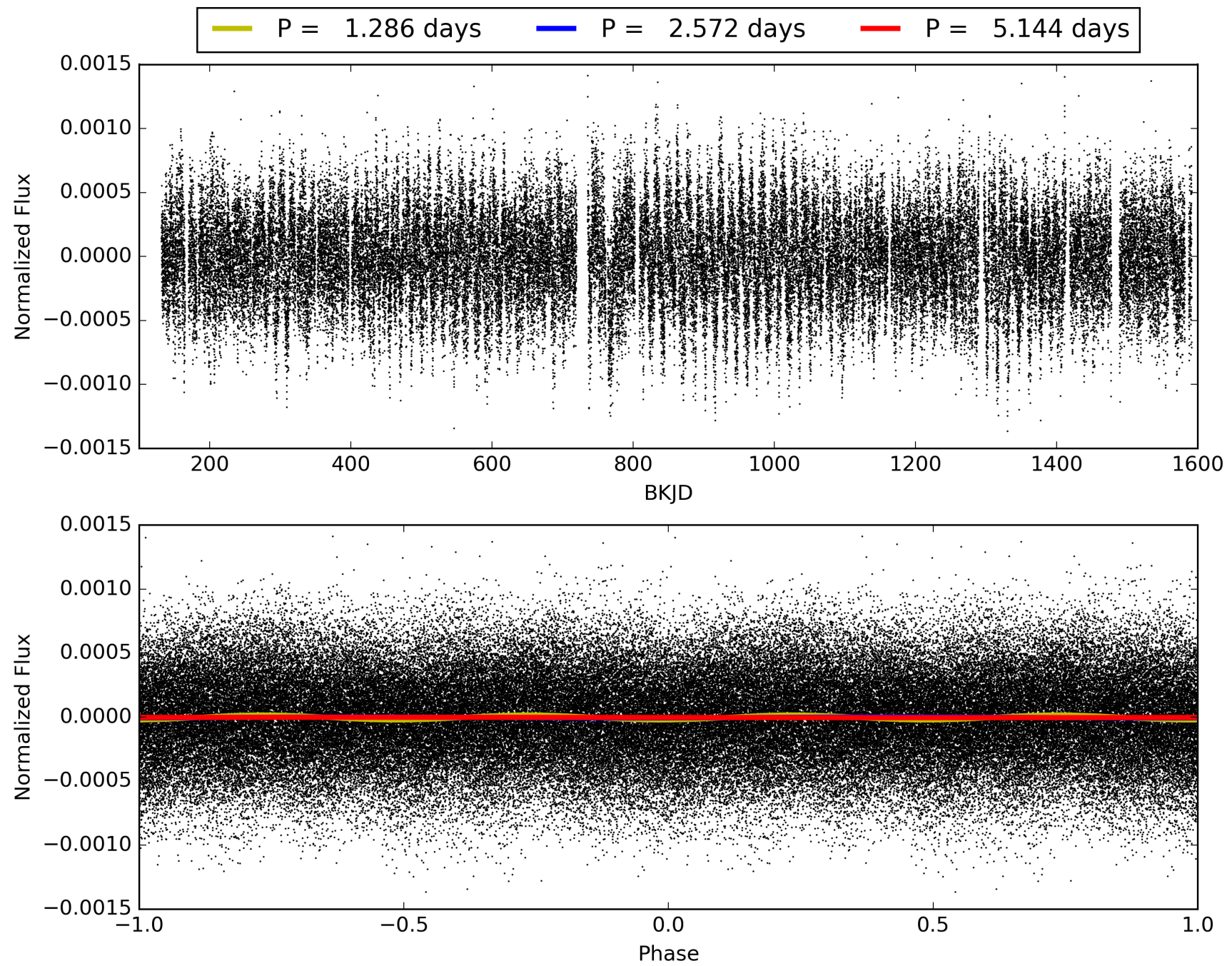
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 07:14:21 Z

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

# TCE 009243421-02, PDC Light Curves



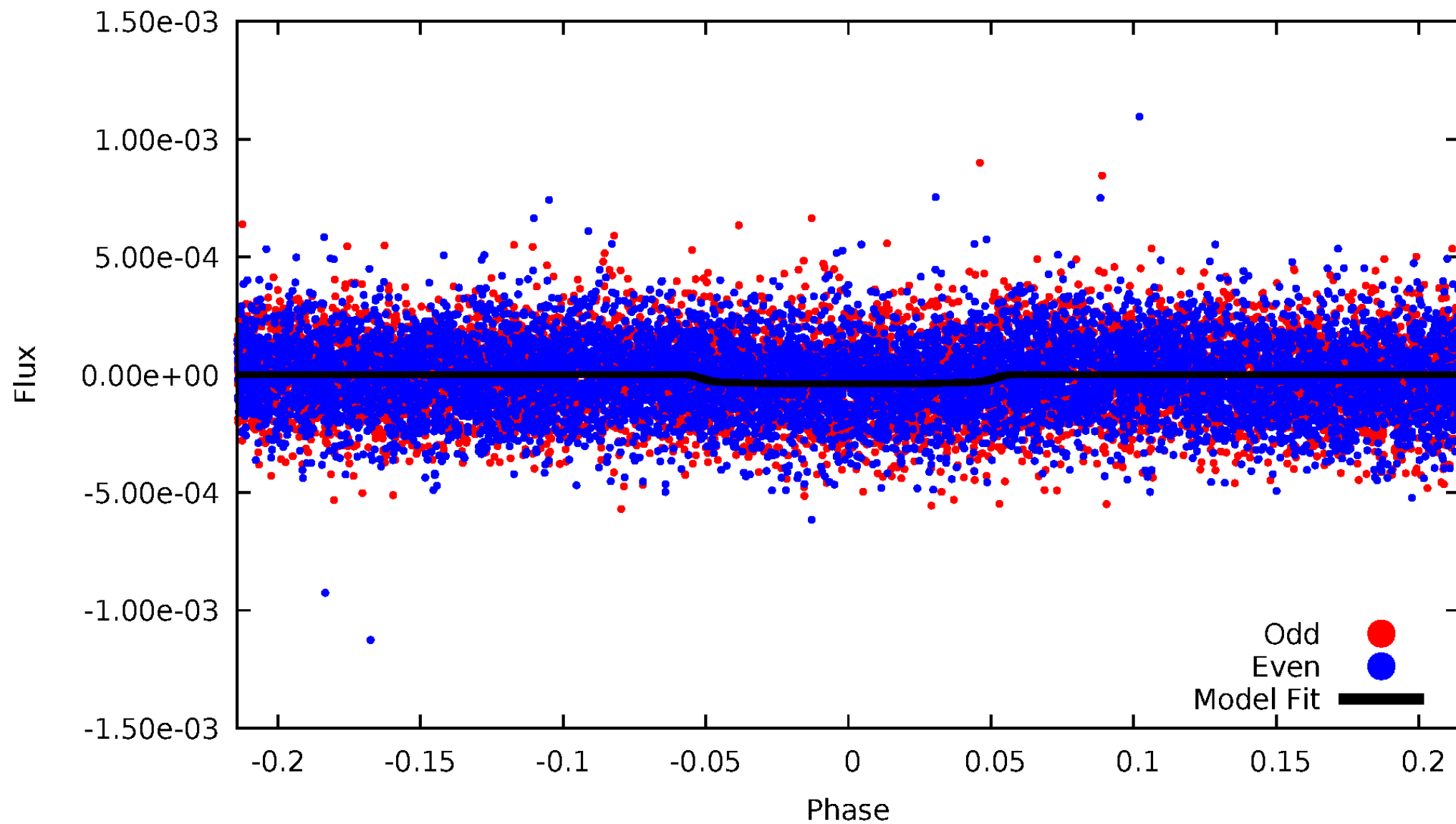
TCE 009243421-02





# DV Odd/Even

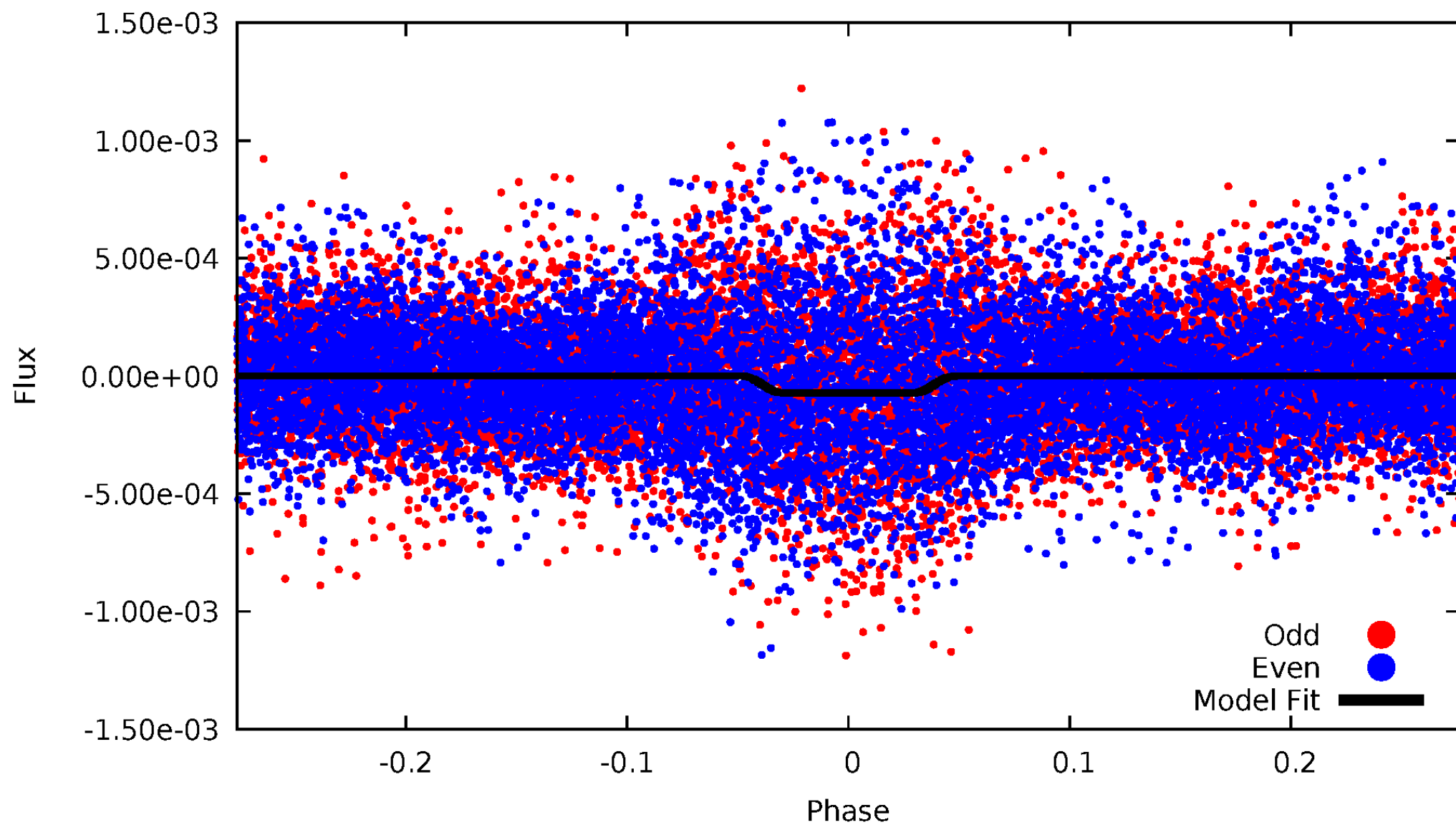
TCE 009243421-02





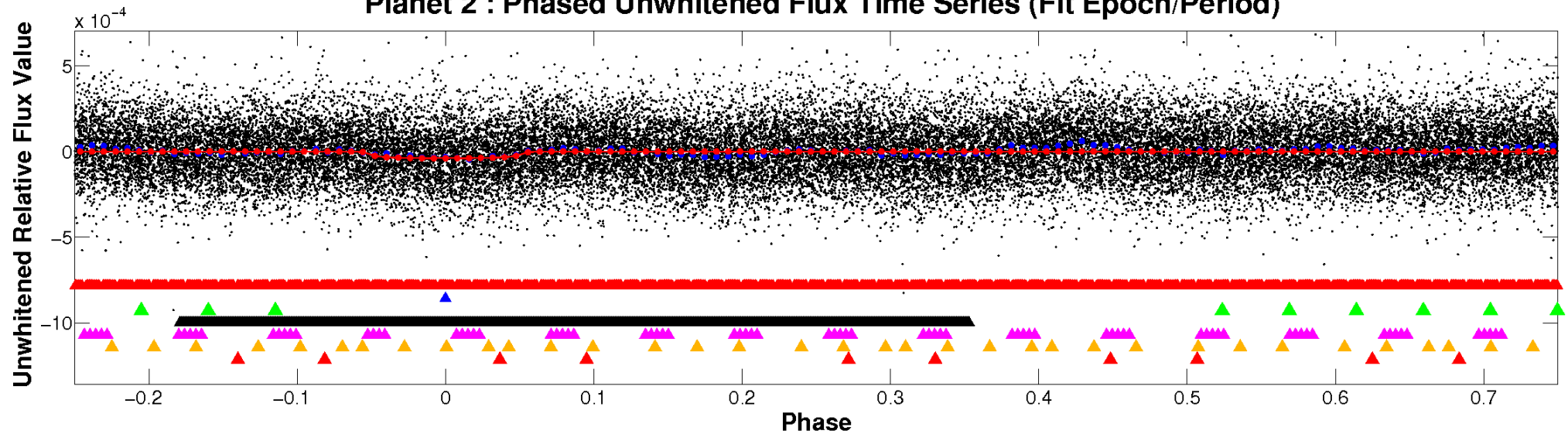
# ALT Odd/Even

TCE 009243421-02

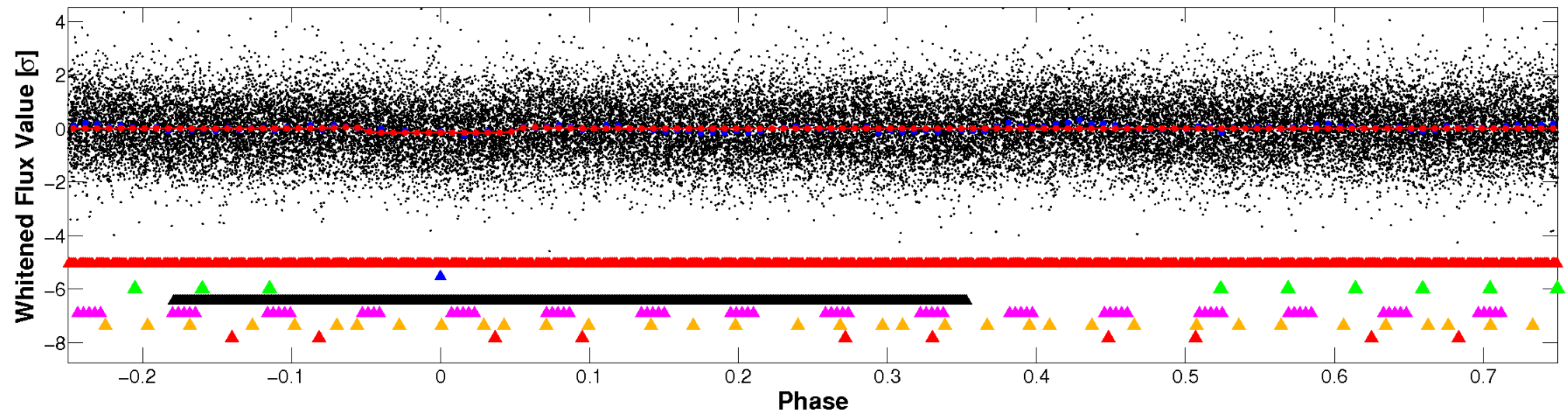


# Non-Whitened Vs. Whitened Light Curve

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

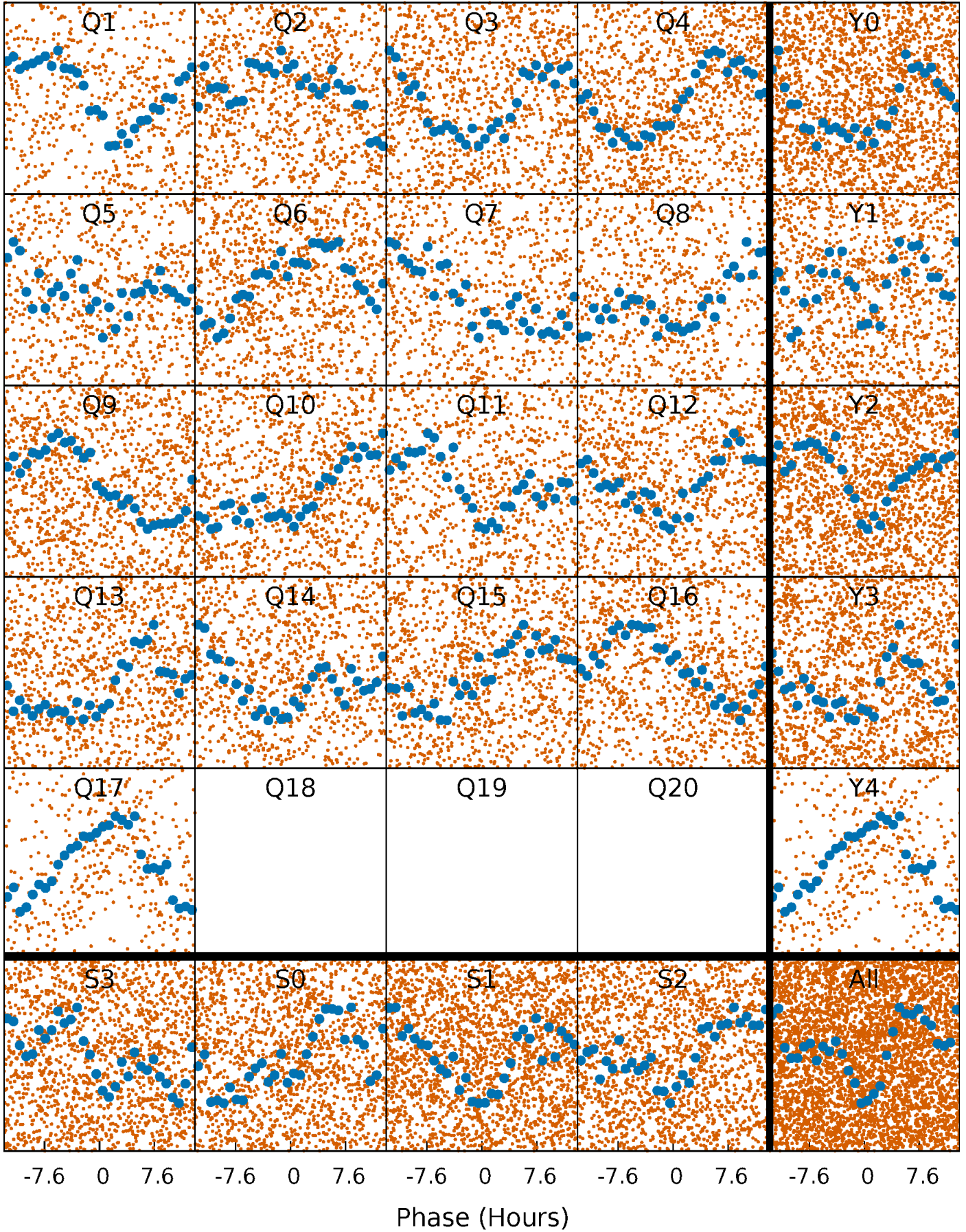


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

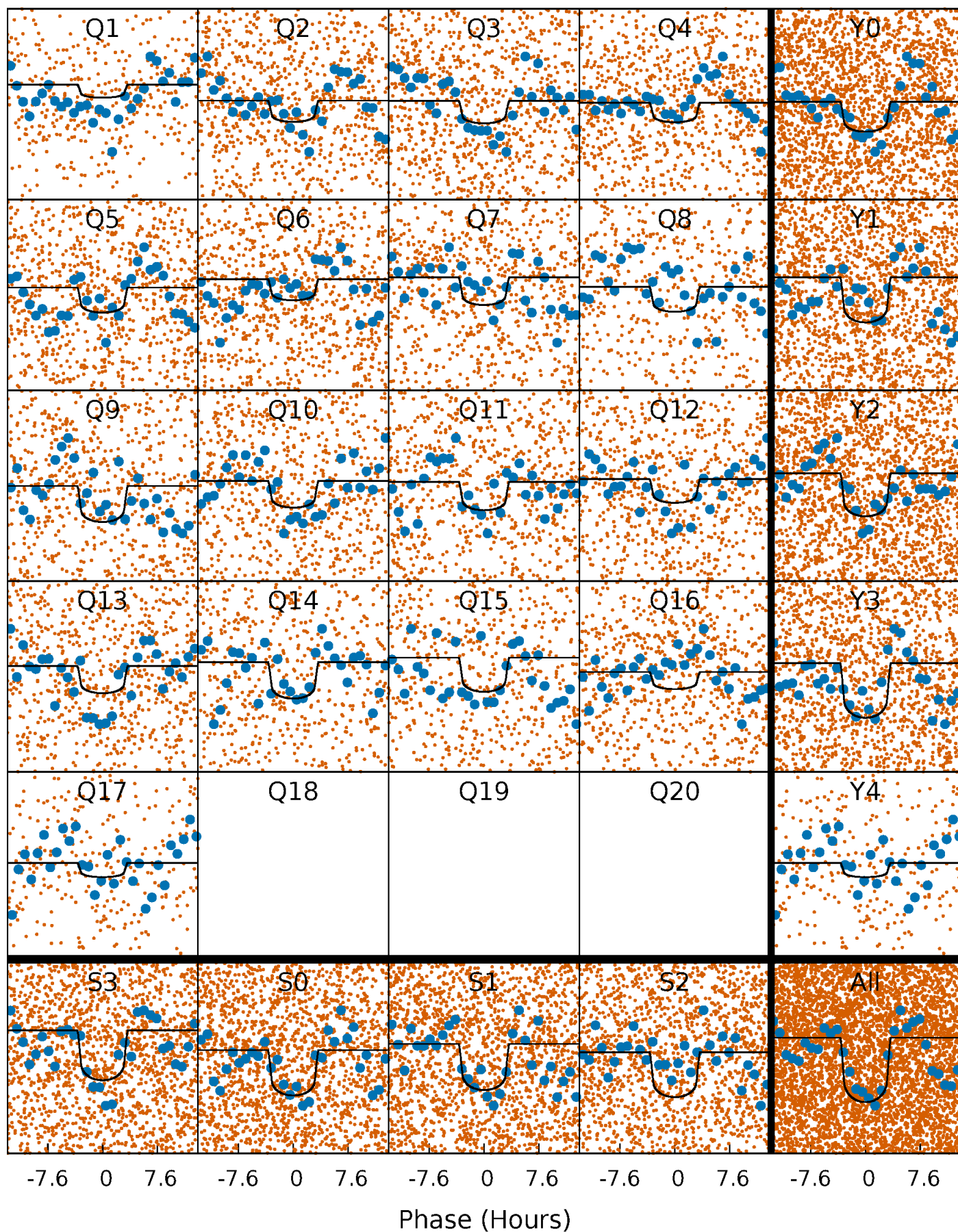
TCE 009243421-02   P= 2.571808 Days    $T_0=132.660977$  (BKJD)





# DV Quarter-Phased Transit Curves

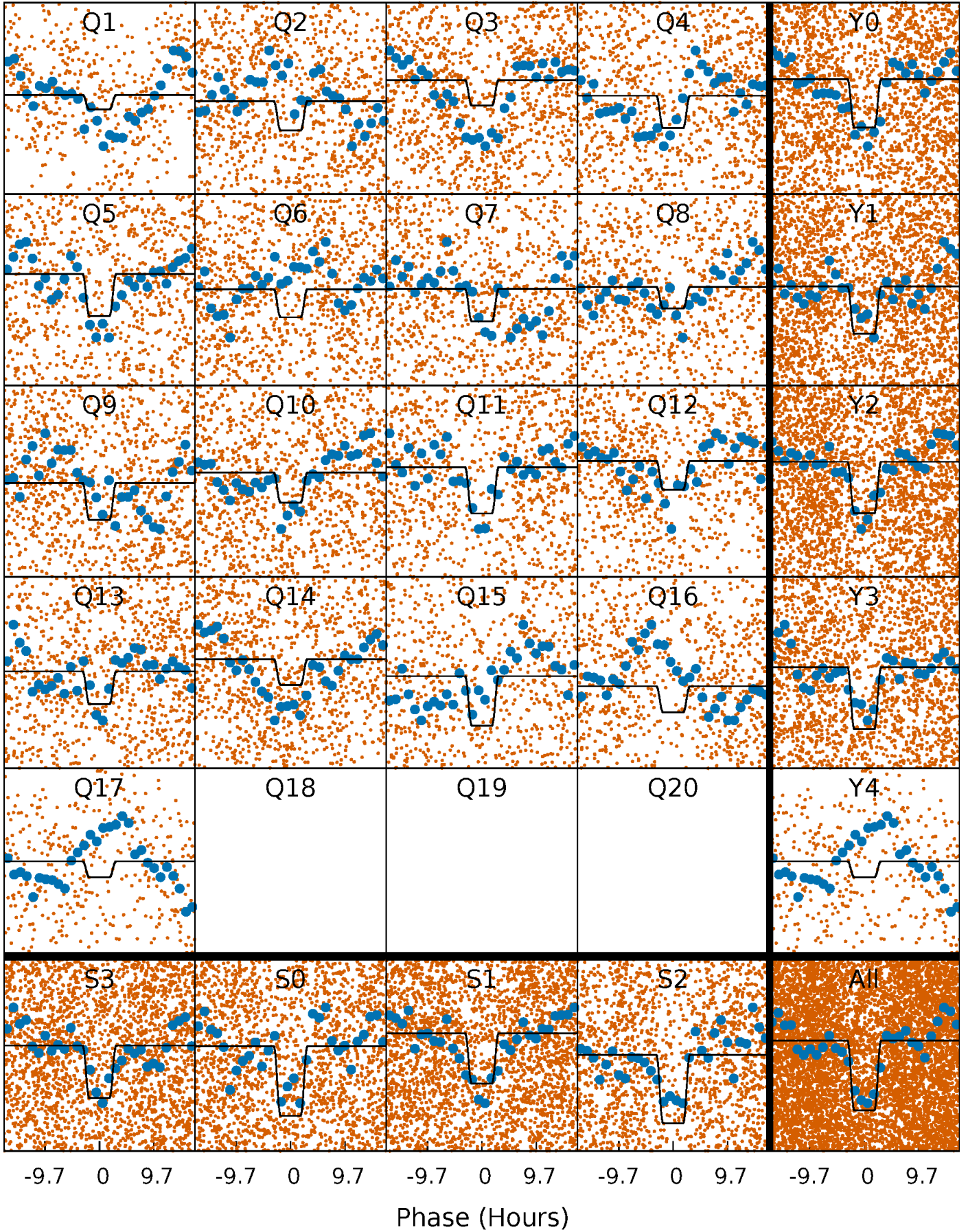
TCE 009243421-02 P= 2.571808 Days  $T_0=132.660977$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

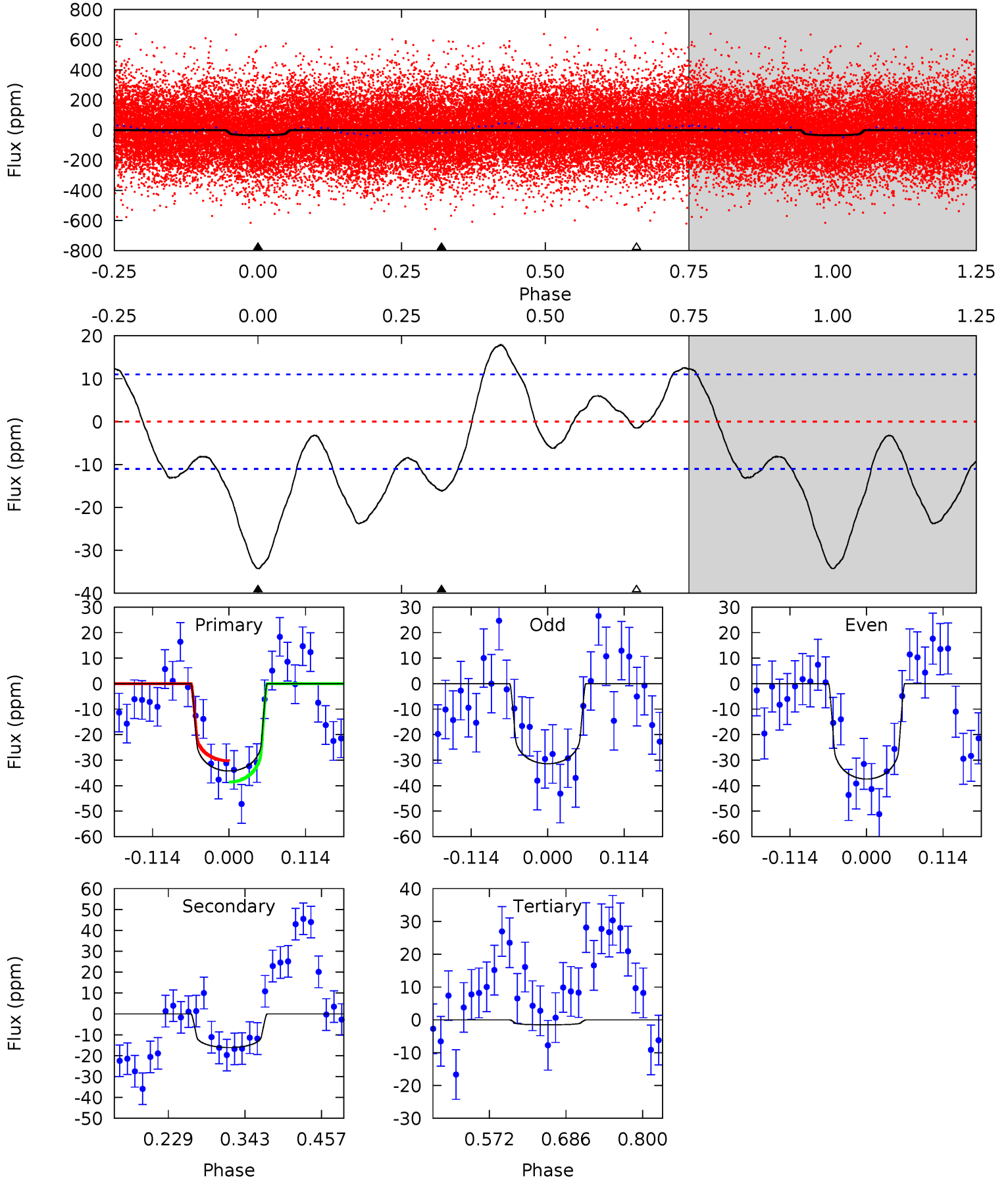
TCE 009243421-02   P= 2.571682 Days    $T_0=132.715261$  (BKJD)



# DV Model-Shift Uniqueness Test

009243421-02, P = 2.571808 Days, E = 130.089169 Days

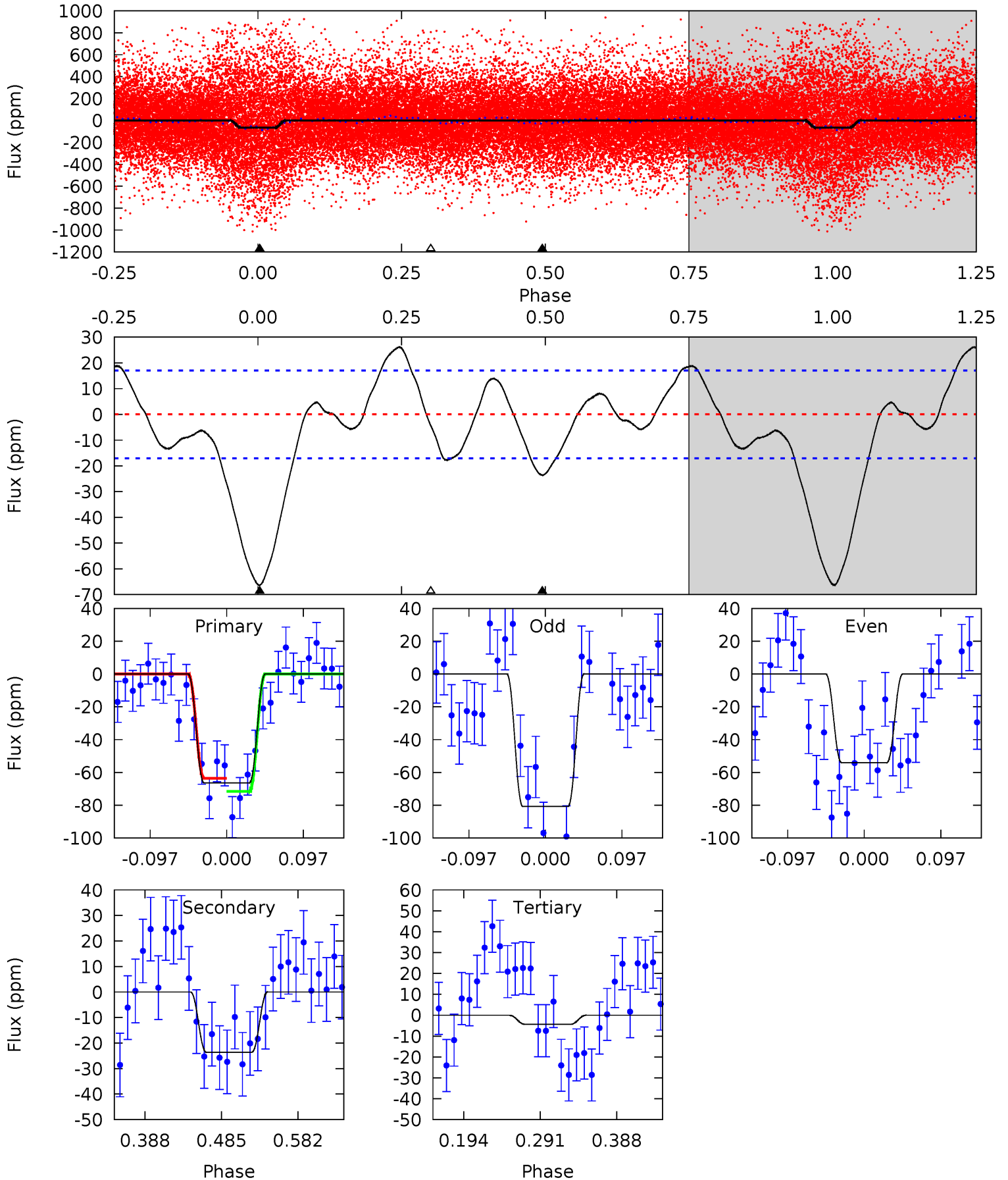
| Pri  | Sec  | Ter  | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 14.1 | 6.64 | 0.62 | 0   | 4.54            | 1.58            | 4.16             | 13.5    | 14.1    | 6.02    | 6.64    | 1.24    | 0.82 | 0.34  | 1.72 |



# Alt Model-Shift Uniqueness Test

009243421-02, P = 2.571682 Days, E = 130.143579 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  |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.8 | 6.34 | 1.16 | 0   | 4.57            | 1.66            | 3.00             | 16.6    | 17.8    | 5.17    | 6.34    | 3.59    | 0.71 | 0.28  | 1.06 |



### Stellar Parameters For KIC 009243421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6331^{+195}_{-176}$ | $3.377^{+0.408}_{-0.072}$ | $-0.280^{+0.400}_{-0.300}$ | $4.588^{+0.666}_{-1.999}$ | $1.832^{+0.125}_{-0.468}$ | $0.027^{+0.099}_{-0.006}$                     |
|        | +3%/-3%              | +12%/-2%                  | +143%/-107%                | +15%/-44%                 | +7%/-26%                  | +370%/-24%                                    |
| Source | PHO1                 | FLK73                     | 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 009243421-02 / KOI

| Detrend | Depth (ppm) | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)        | $T_{obs}$ (K)         | $A_{obs}$                 |
|---------|-------------|------------------------|----------------------|-----------------------|---------------------------|
| DV      | $-16 \pm 2$ | $3.01^{+1.03}_{-1.11}$ | $3817^{+242}_{-414}$ | $4764^{+1070}_{-524}$ | $1.926^{+2.851}_{-0.880}$ |
| Alt.    | $-24 \pm 4$ | $3.78^{+1.18}_{-1.14}$ | $3820^{+252}_{-453}$ | $4704^{+678}_{-508}$  | $1.740^{+1.847}_{-0.717}$ |

$T_{max}$  = 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

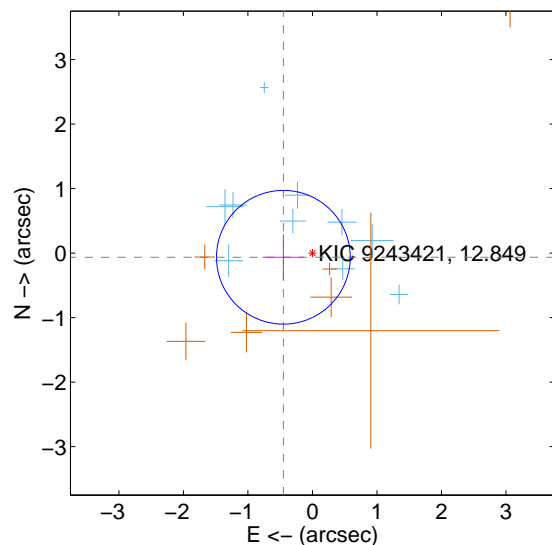
Supplemental centroid analysis for 009243421-02. Kepler magnitude: 12.85. Transit SNR 9.46

There are 10 quarters with good PRF difference image offsets

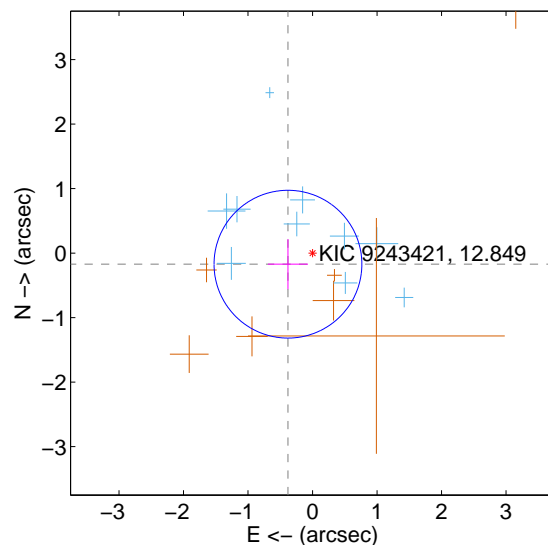
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.455 \pm 0.345$  | 1.32                | $0.451 \pm 0.322$ | $-0.065 \pm 0.359$ |
| PRF-fit source offset from KIC position | $0.418 \pm 0.382$  | 1.09                | $0.381 \pm 0.310$ | $-0.172 \pm 0.388$ |
| photometric centroid source offset      | $0.81 \pm 0.77$    | 1.05                | $0.81 \pm 0.77$   | $-0.01 \pm 0.68$   |

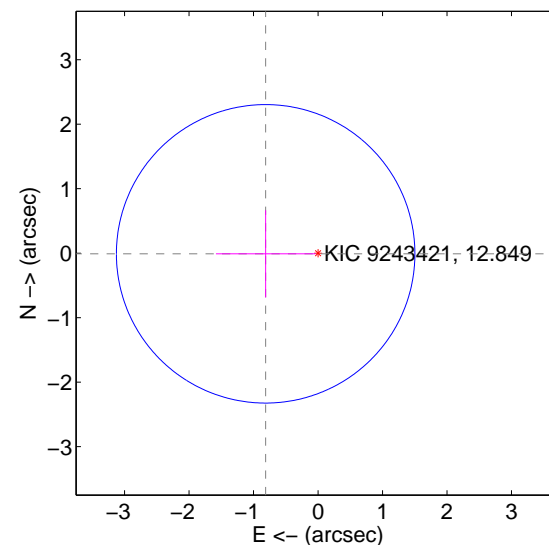
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

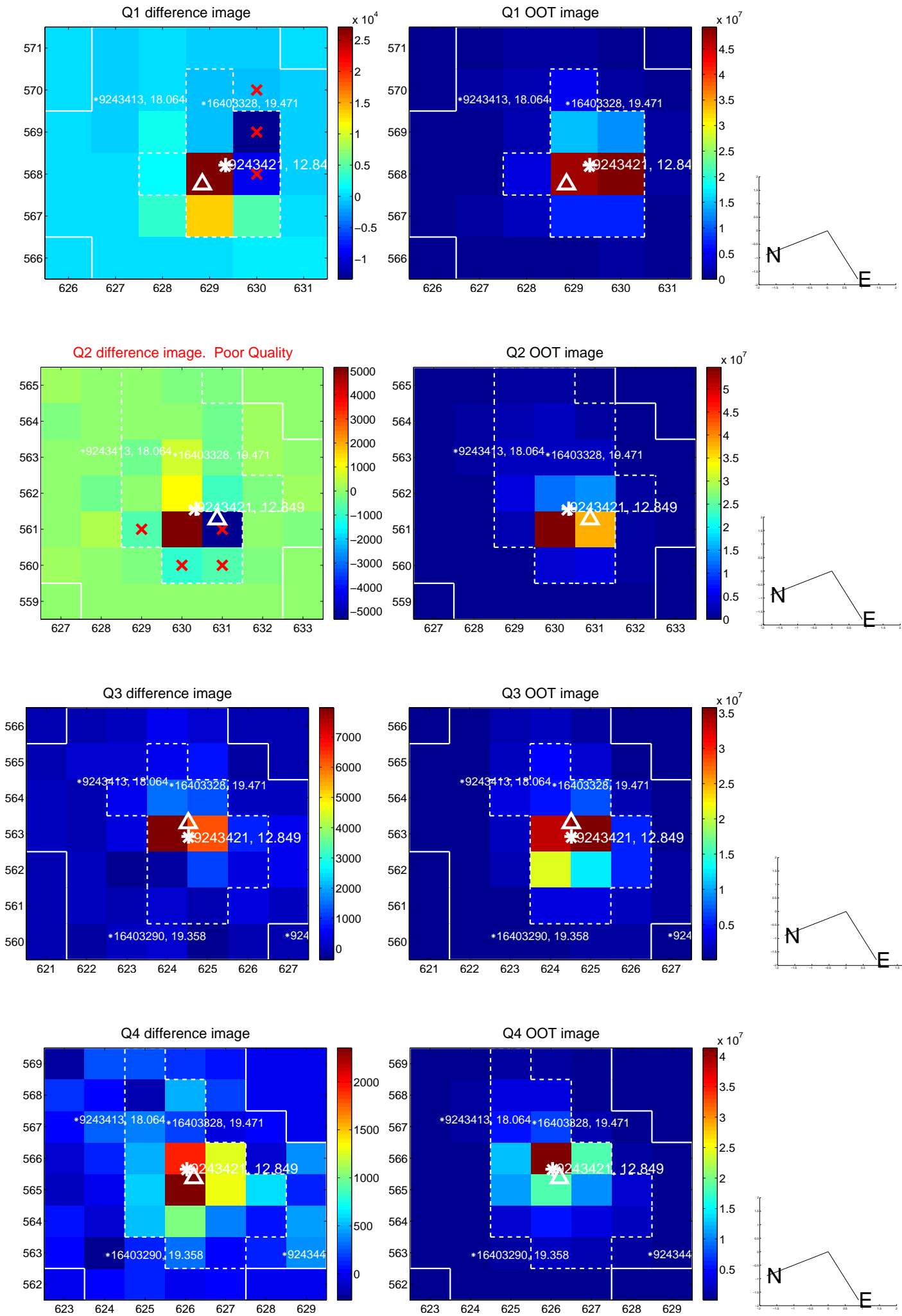


offset from photometric centroids

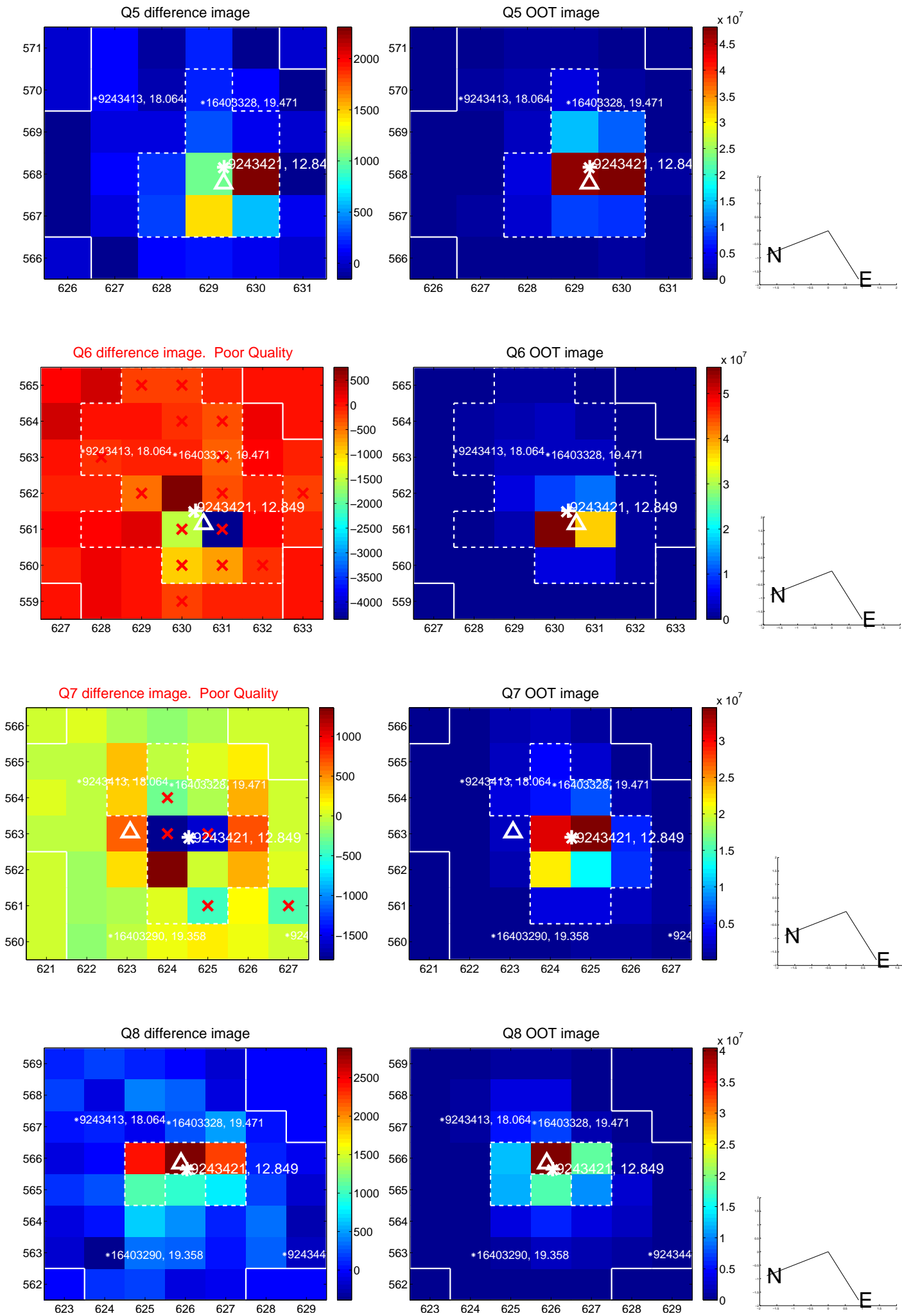


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

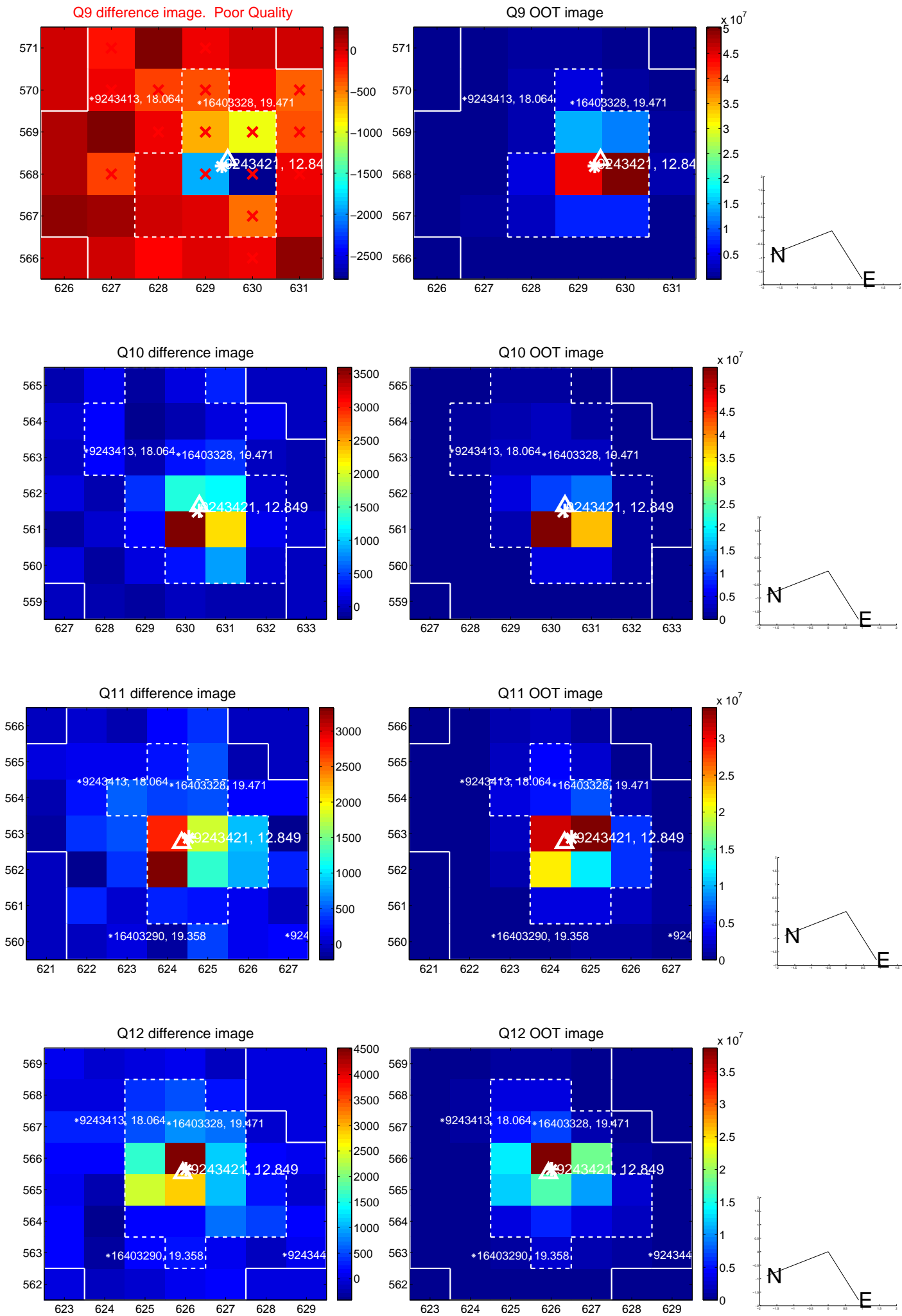
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



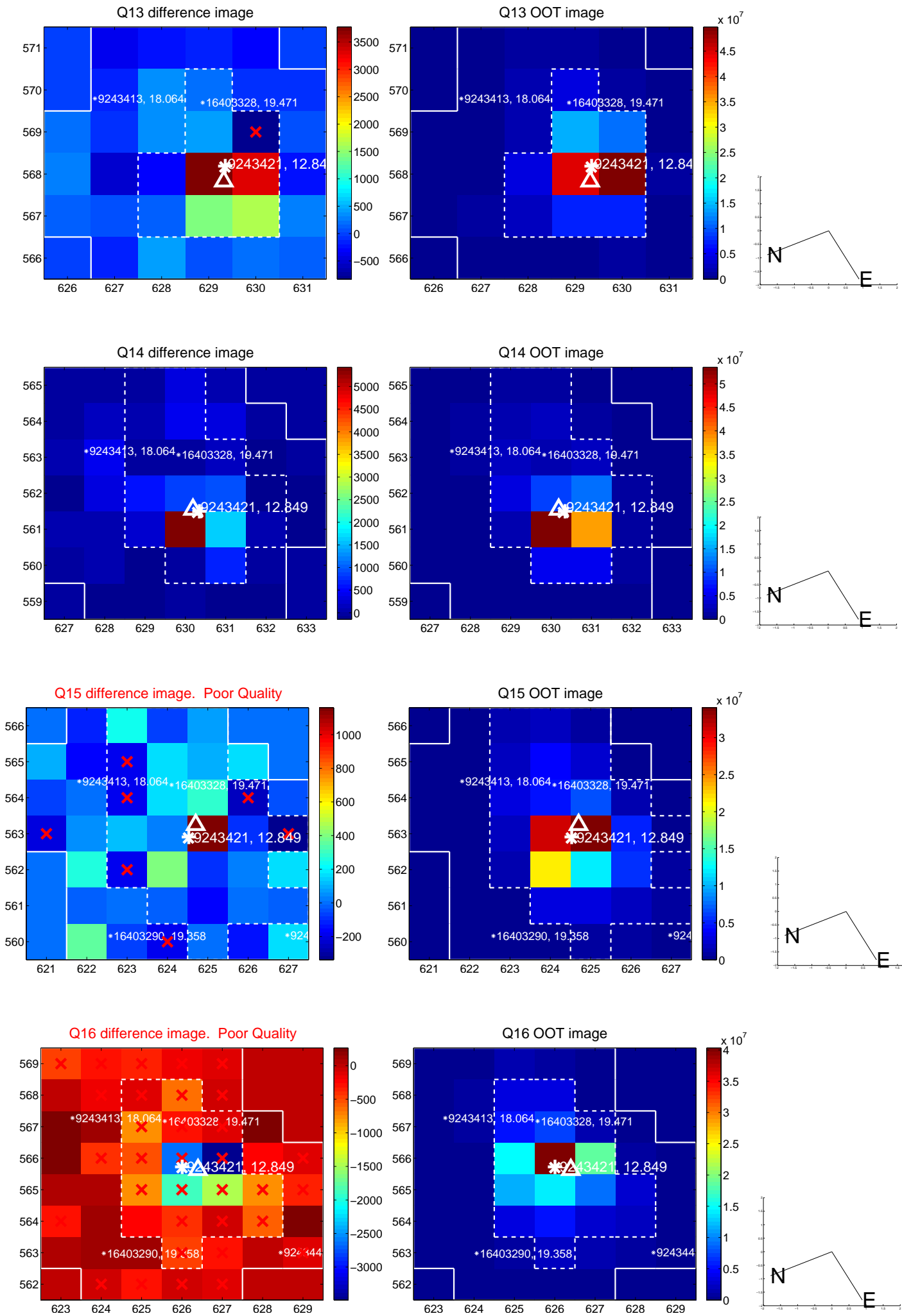
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

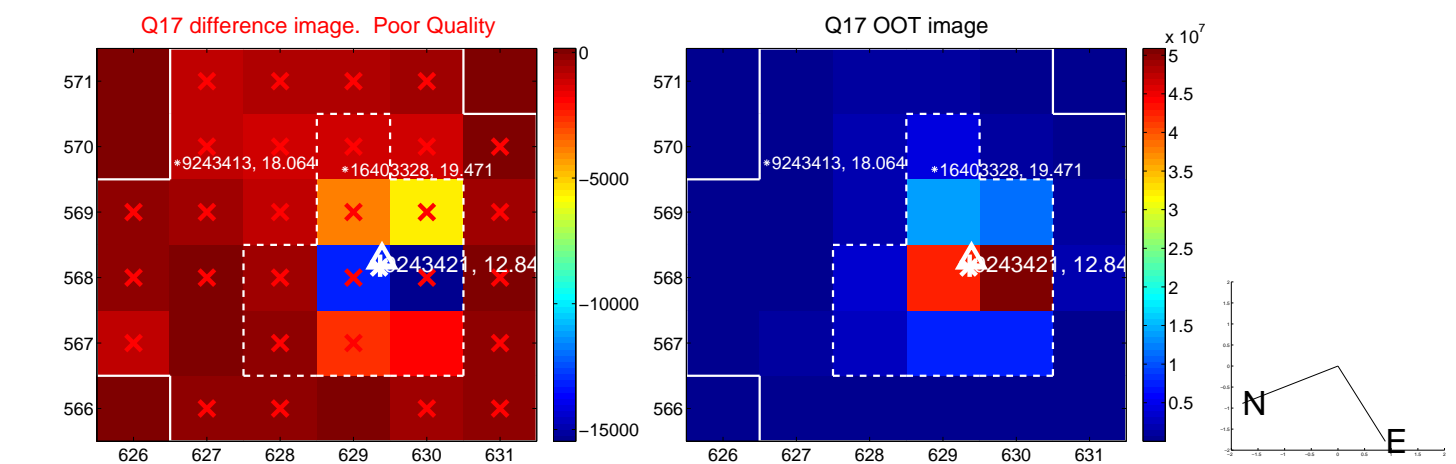


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

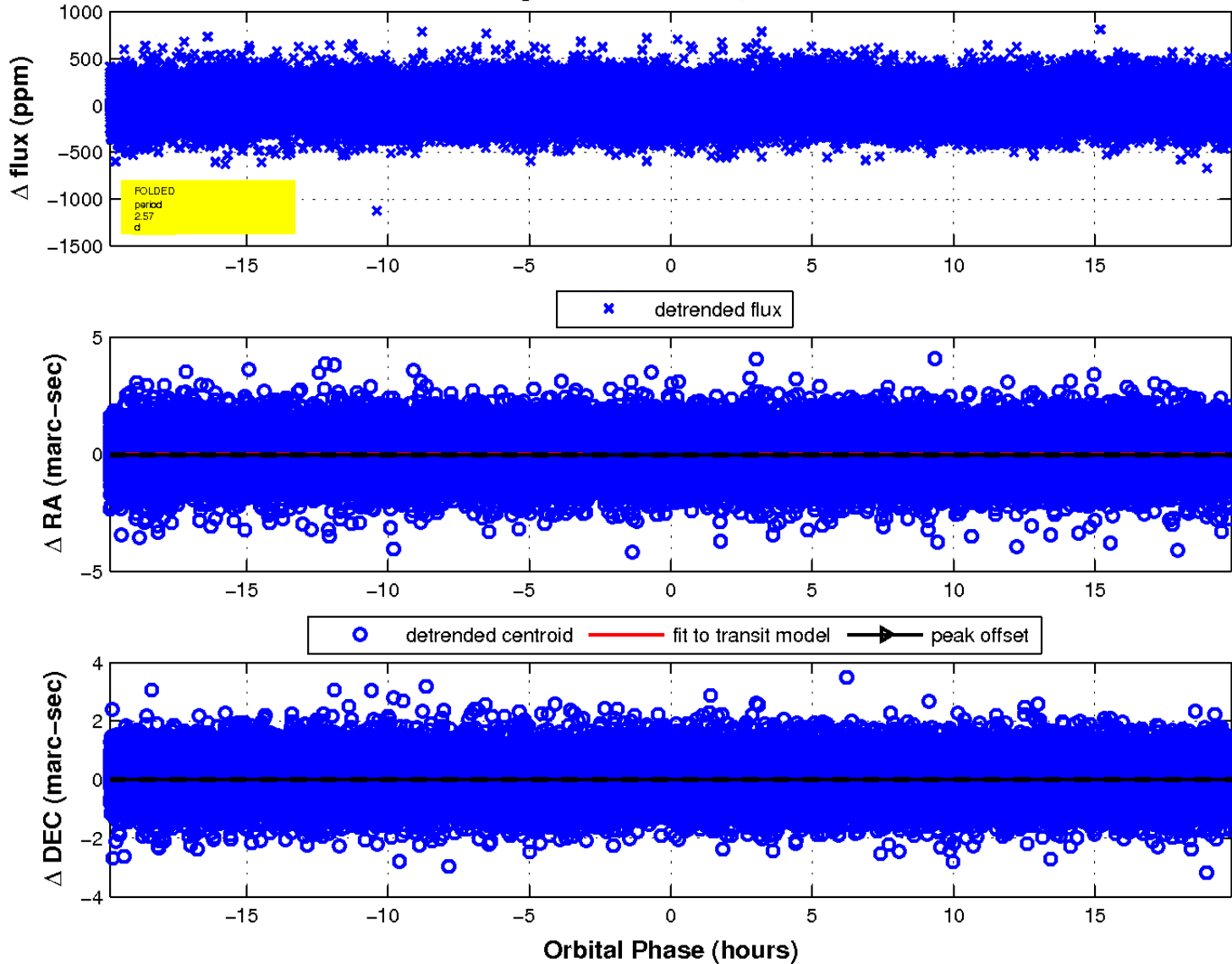




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

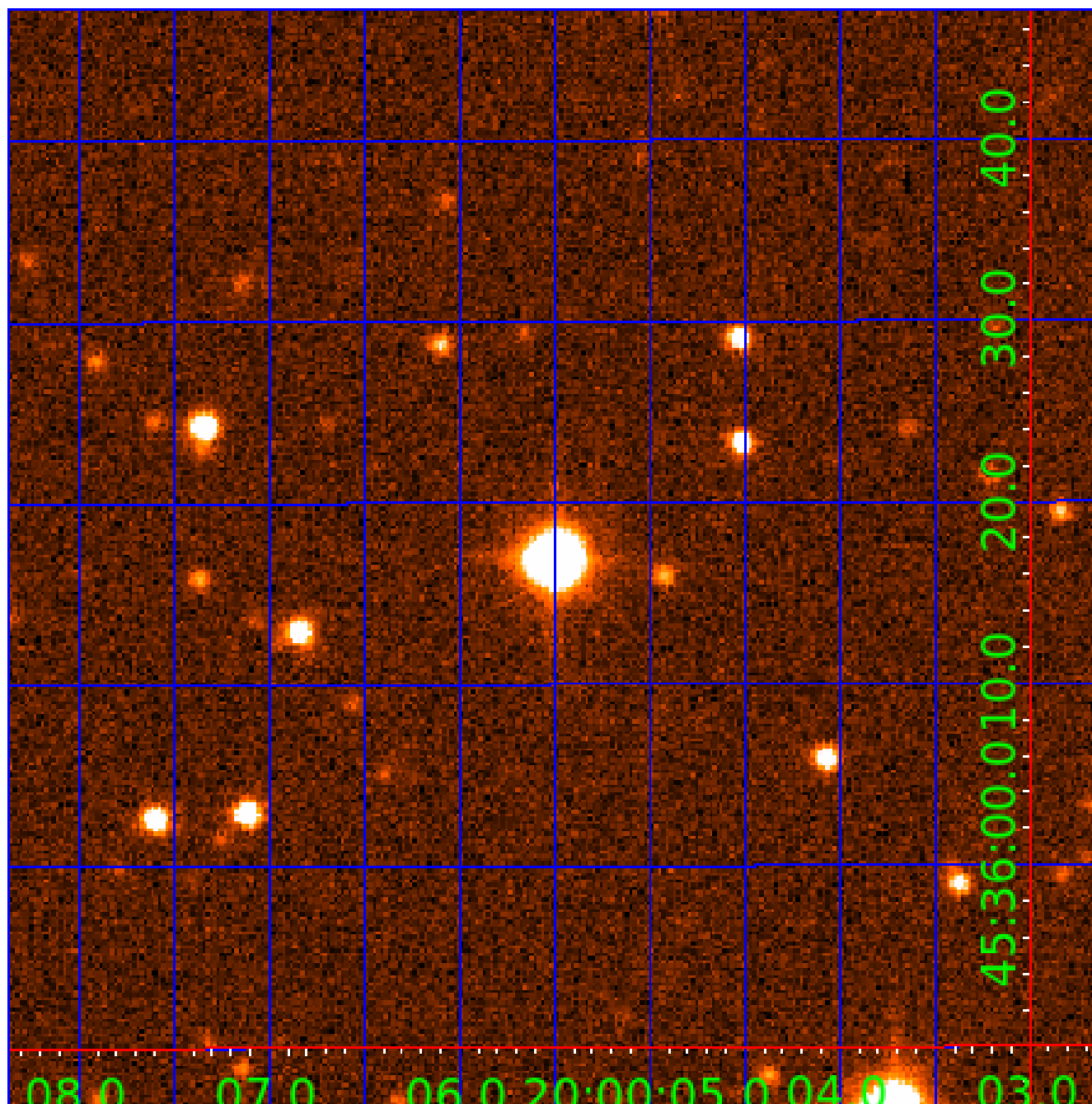


fluxWeightedCentroids, Planet 2 of 7



UKIRT Image

Declination



# KIC 009243421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009243421-01 | OBS      | No   | 1.198209      | 132.236181   | 31.8        | 3.815            | 10.9 | 11.7 | 4.59                        | 6331            | 3.01                   | 41542.18               |
| 009243421-02 | OBS      | No   | 2.571808      | 132.660977   | 39.4        | 6.612            | 8.5  | 9.5  | 4.59                        | 6331            | 3.32                   | 15004.26               |
| 009243421-03 | OBS      | No   | 154.192245    | 235.238303   | 126.2       | 9.905            | 11.7 | 4.7  | 4.59                        | 6331            | 5.54                   | 63.94                  |
| 009243421-04 | OBS      | No   | 2.569394      | 133.568846   | 52.7        | 9.075            | 7.9  | 10.1 | 4.59                        | 6331            | 3.88                   | 15023.05               |
| 009243421-05 | OBS      | No   | 18.484254     | 145.906309   | 78.3        | 7.890            | 7.6  | 6.1  | 4.59                        | 6331            | 4.48                   | 1081.76                |
| 009243421-06 | OBS      | No   | 42.090762     | 137.660605   | 169.3       | 6.557            | 7.9  | 8.4  | 4.59                        | 6331            | 6.55                   | 361.09                 |
| 009243421-07 | OBS      | No   | 152.795479    | 152.270891   | 252.5       | 3.580            | 7.5  | 7.7  | 4.59                        | 6331            | 8.17                   | 64.72                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 009243421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT   |
| 009243421-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—<br>MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—HALO_GHOST |
| 009243421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009243421-06 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—HALO_GHOST   |
| 009243421-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>CENT_FEW_DIFFS                    |

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

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

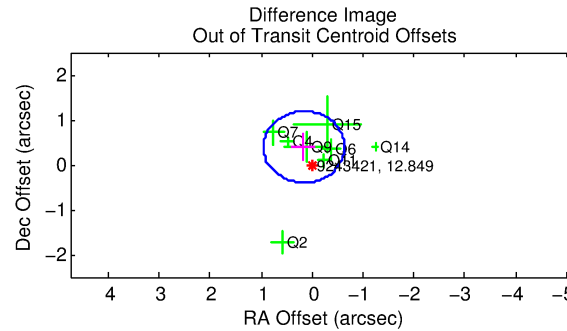
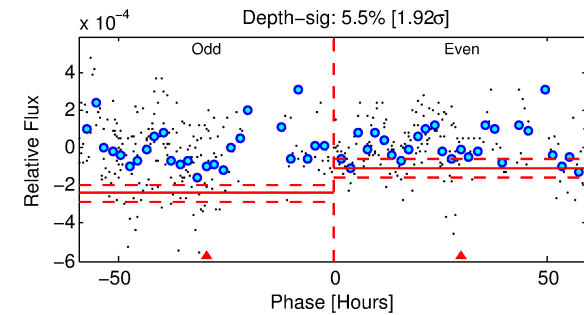
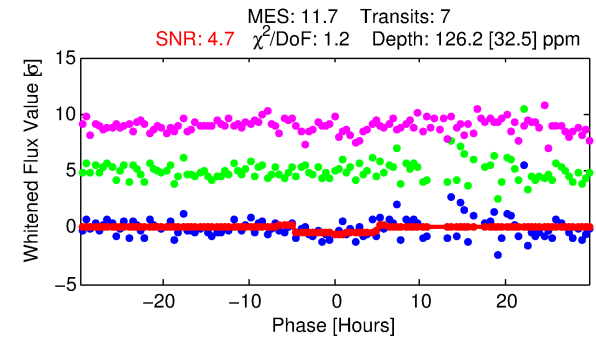
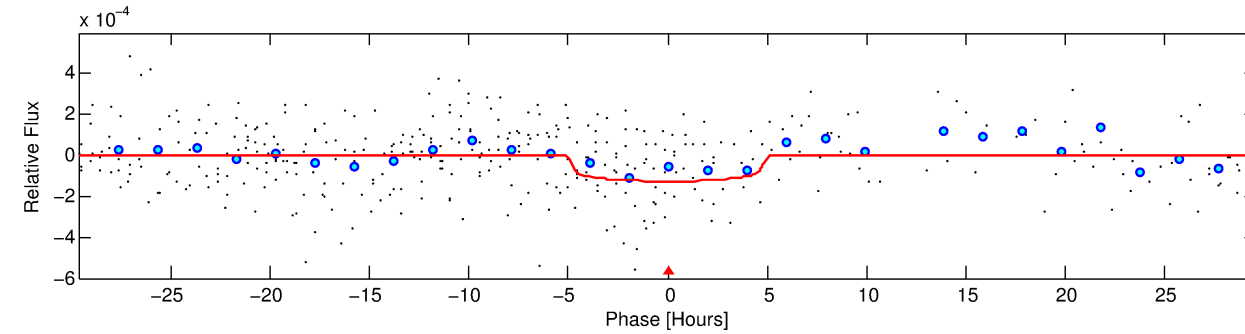
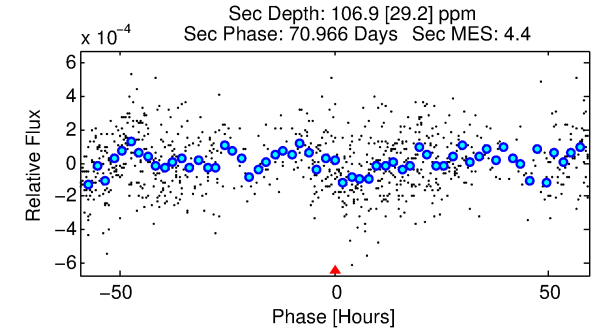
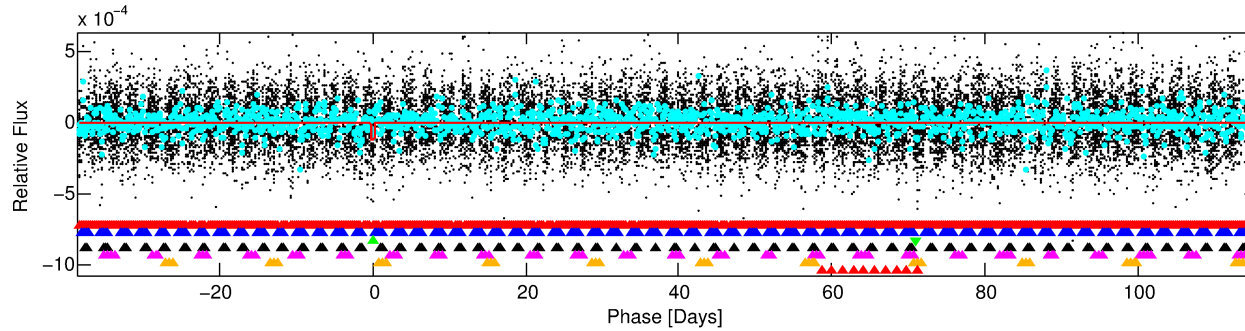
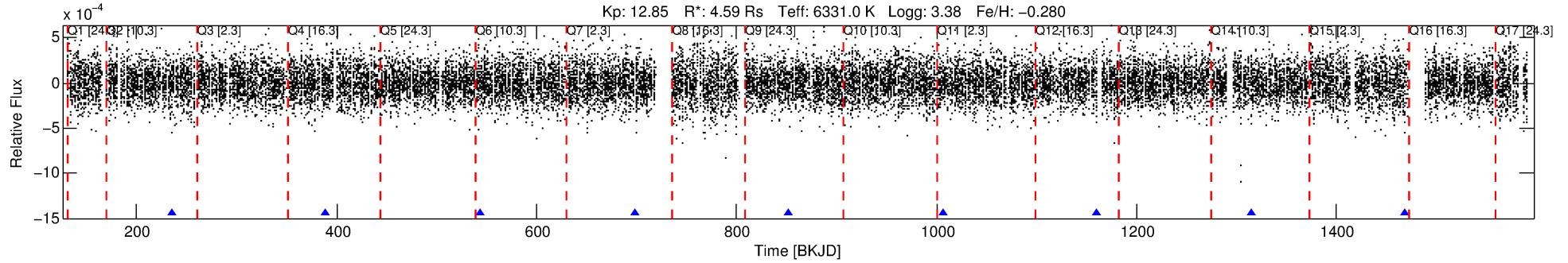
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009243421-03

No Significant Match Found

# DV One-Page Summary

KIC: 9243421 Candidate: 3 of 7 Period: 154.192 d



## DV Fit Results:

Period = 154.19224 [0.00584] d  
Epoch = 235.2383 [0.0350] BKJD  
Rp/R\* = 0.0111 [0.0084]  
a/R\* = 84.77 [339.12]  
b = 0.72 [2.73]  
Seff = 63.94 [44.84]  
Teq = 721 [126] K  
Rp = 5.54 [4.86] Re  
a = 0.6884 [0.2940] AU  
Ag = 907.29 [1537.53] [0.59σ]  
Teffp = 6119 [2375] K [2.27σ]

## DV Diagnostic Results:

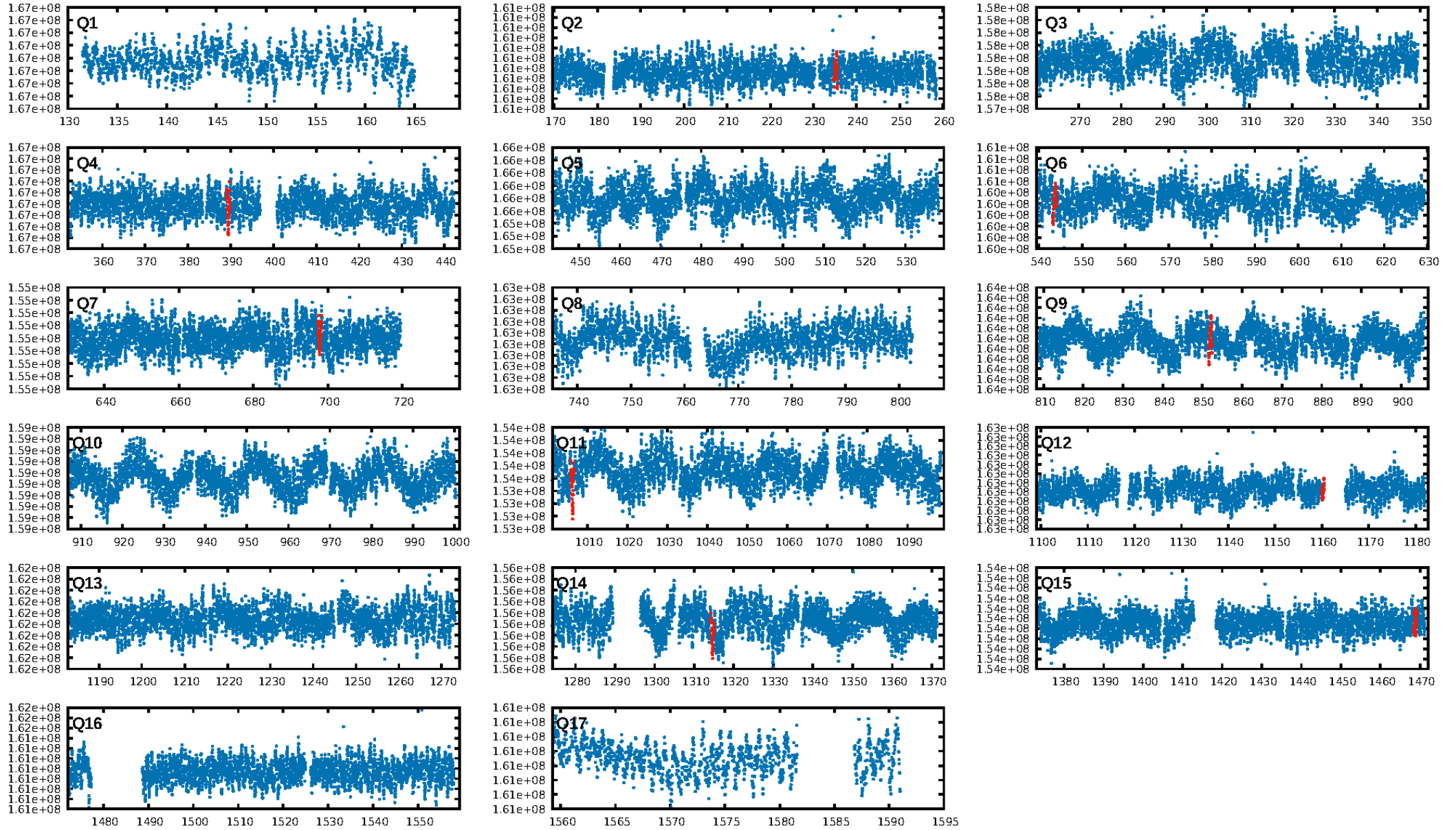
ShortPeriod-sig: 99.9% [3.18σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 99.6%  
Bootstrap-pfa: 3.57e-17  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: 0.07644  
Centroid-sig: 0.1%  
Centroid-so: 5.722 arcsec [3.08σ]  
OotOffset-rm: 0.424 arcsec [1.60σ]  
OotOffset-st: 3/3/1/1 [8]  
KicOffset-rm: 0.260 arcsec [1.09σ]  
KicOffset-st: 3/3/1/1 [8]  
DiffImageQuality-fgm: 0.62 [5/8]  
DiffImageOverlap-fno: 0.00 [0/8]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 07:14:28 Z

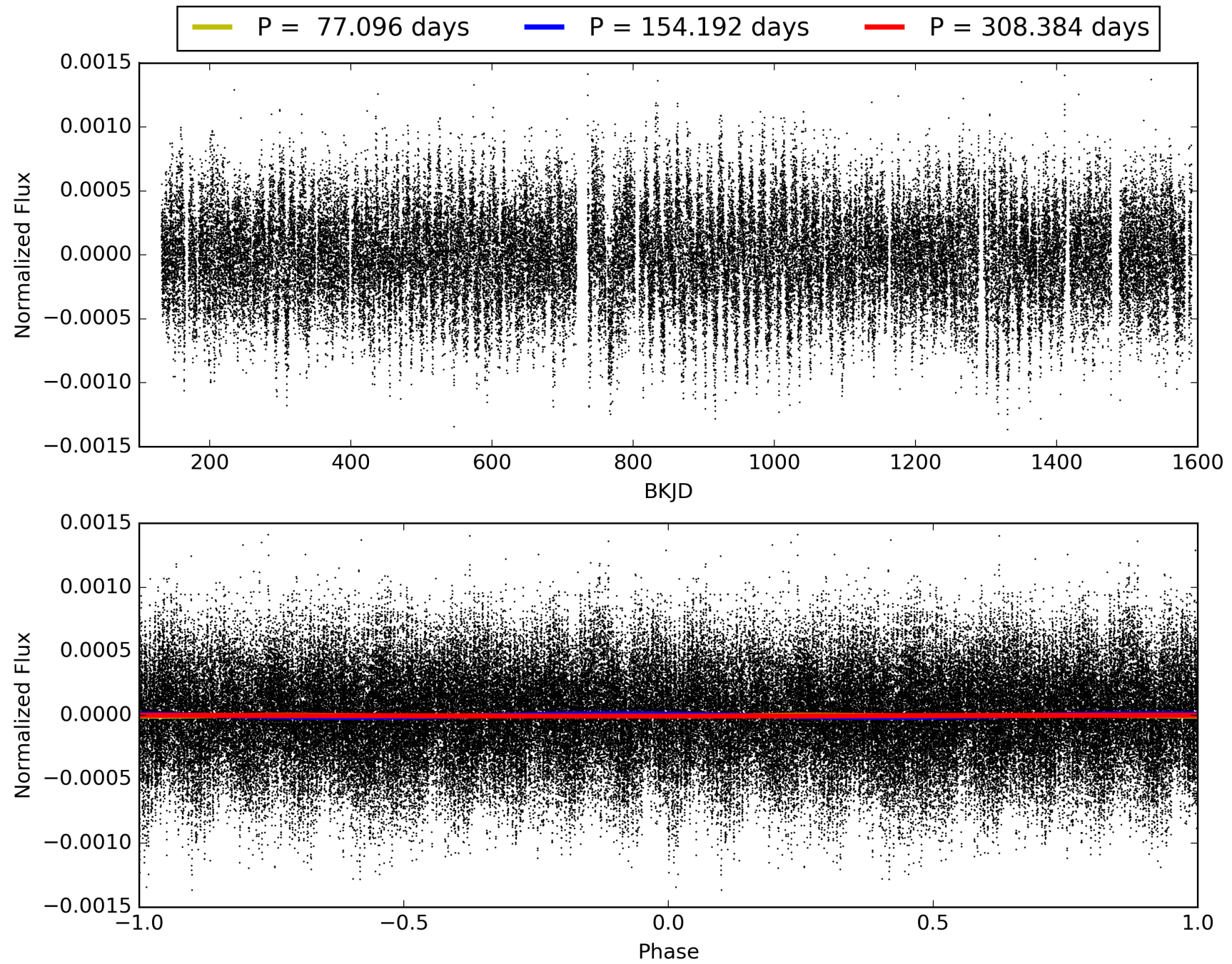
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 009243421-03, PDC Light Curves

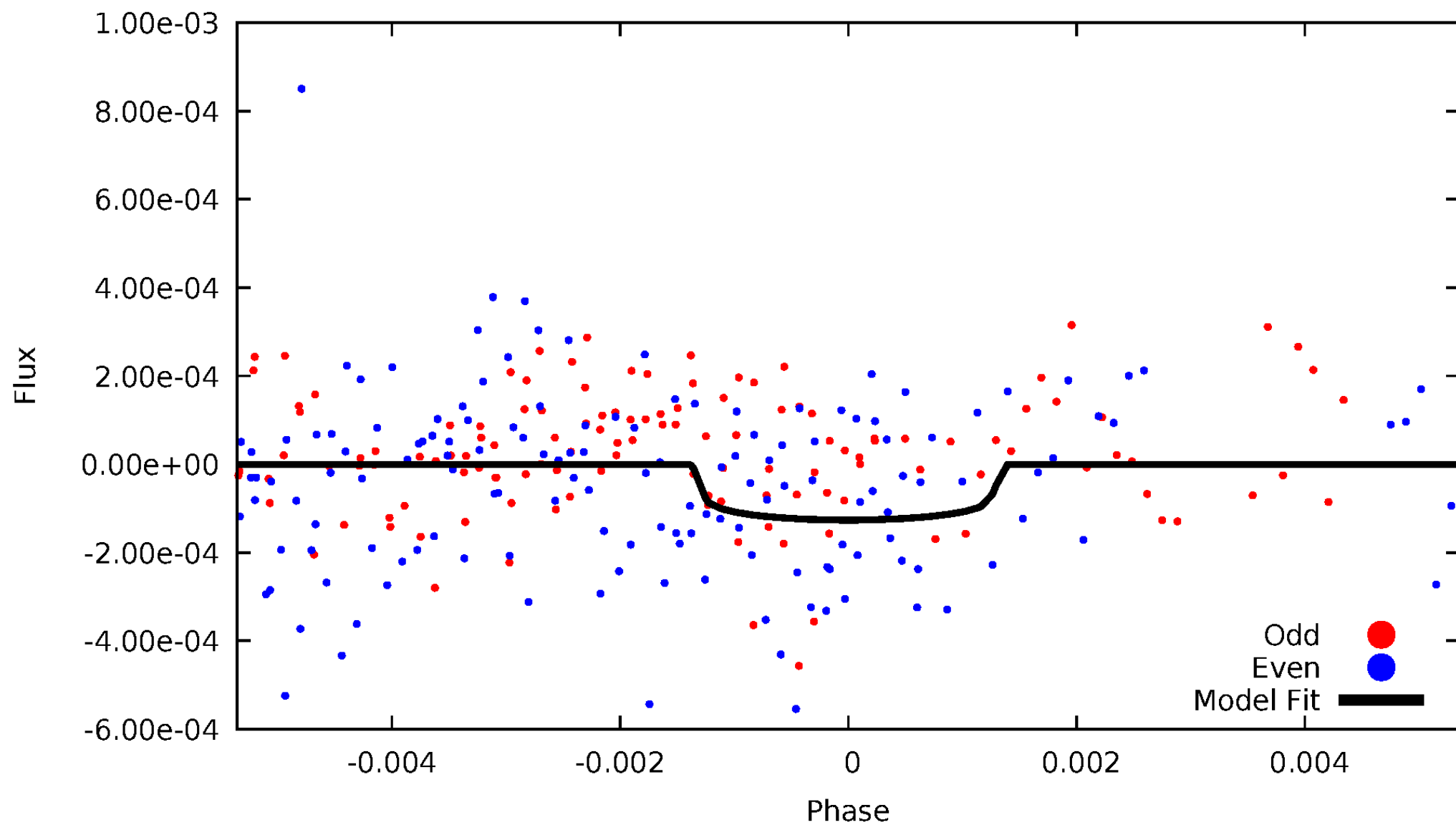


TCE 009243421-03



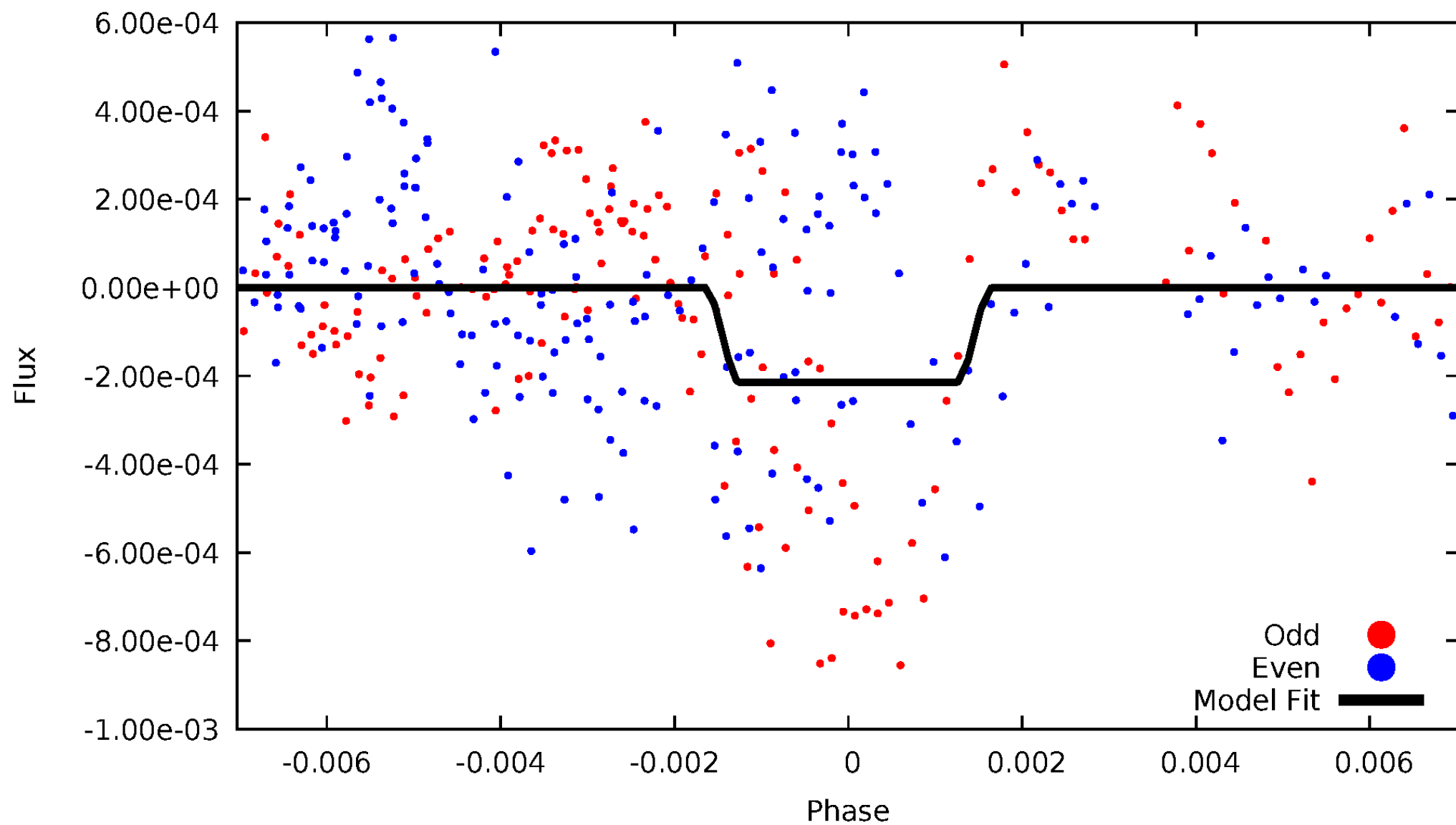
# DV Odd/Even

TCE 009243421-03



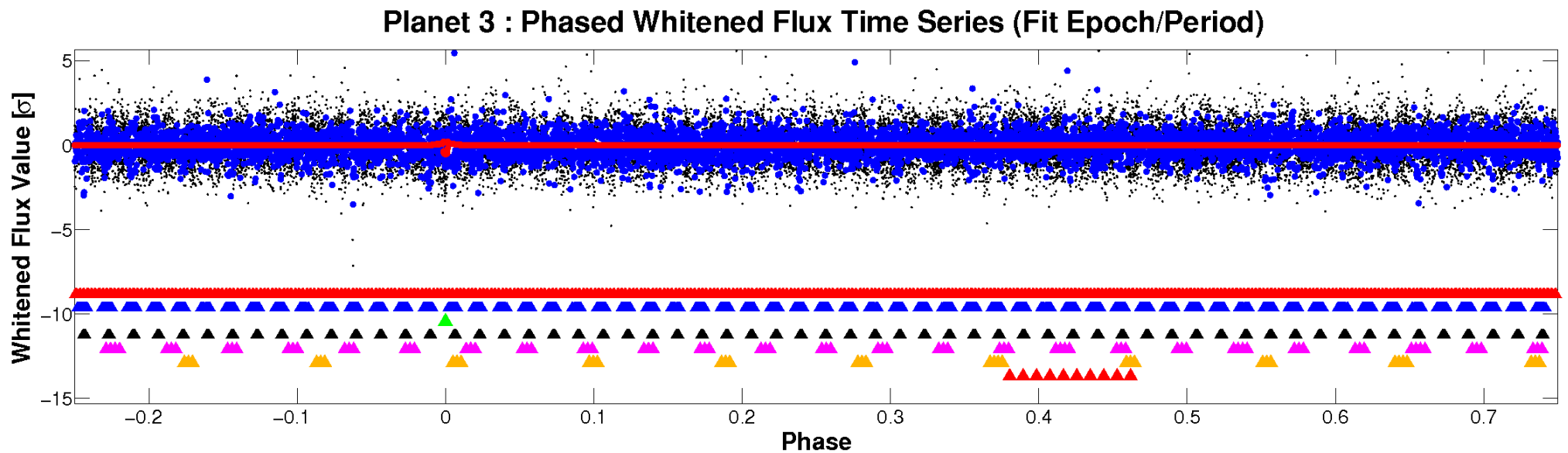
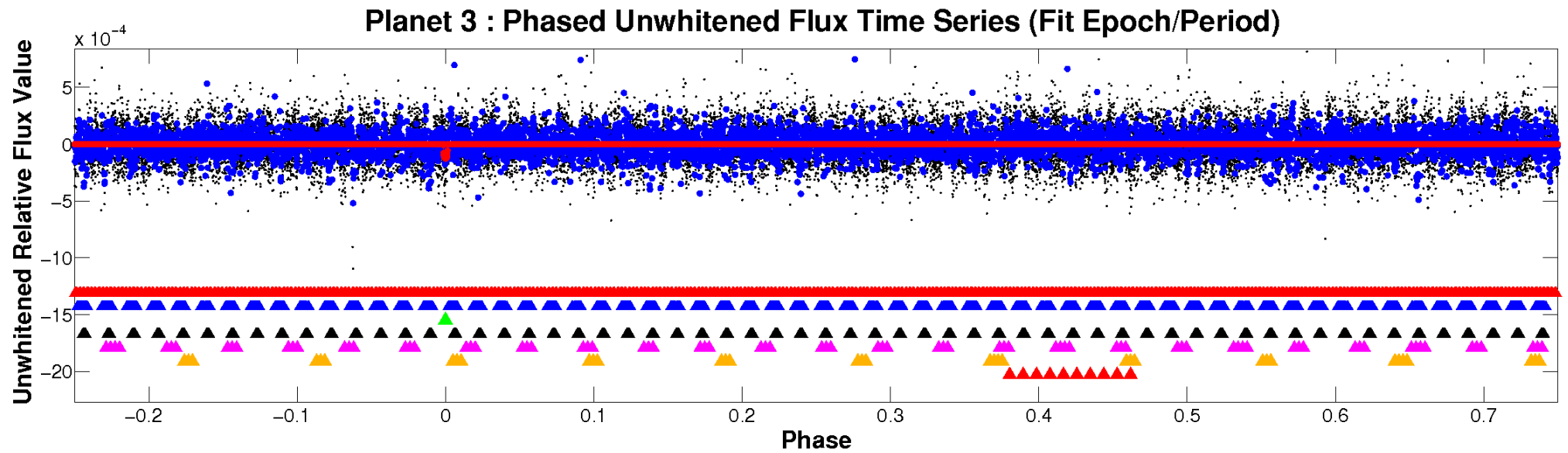
# ALT Odd/Even

TCE 009243421-03



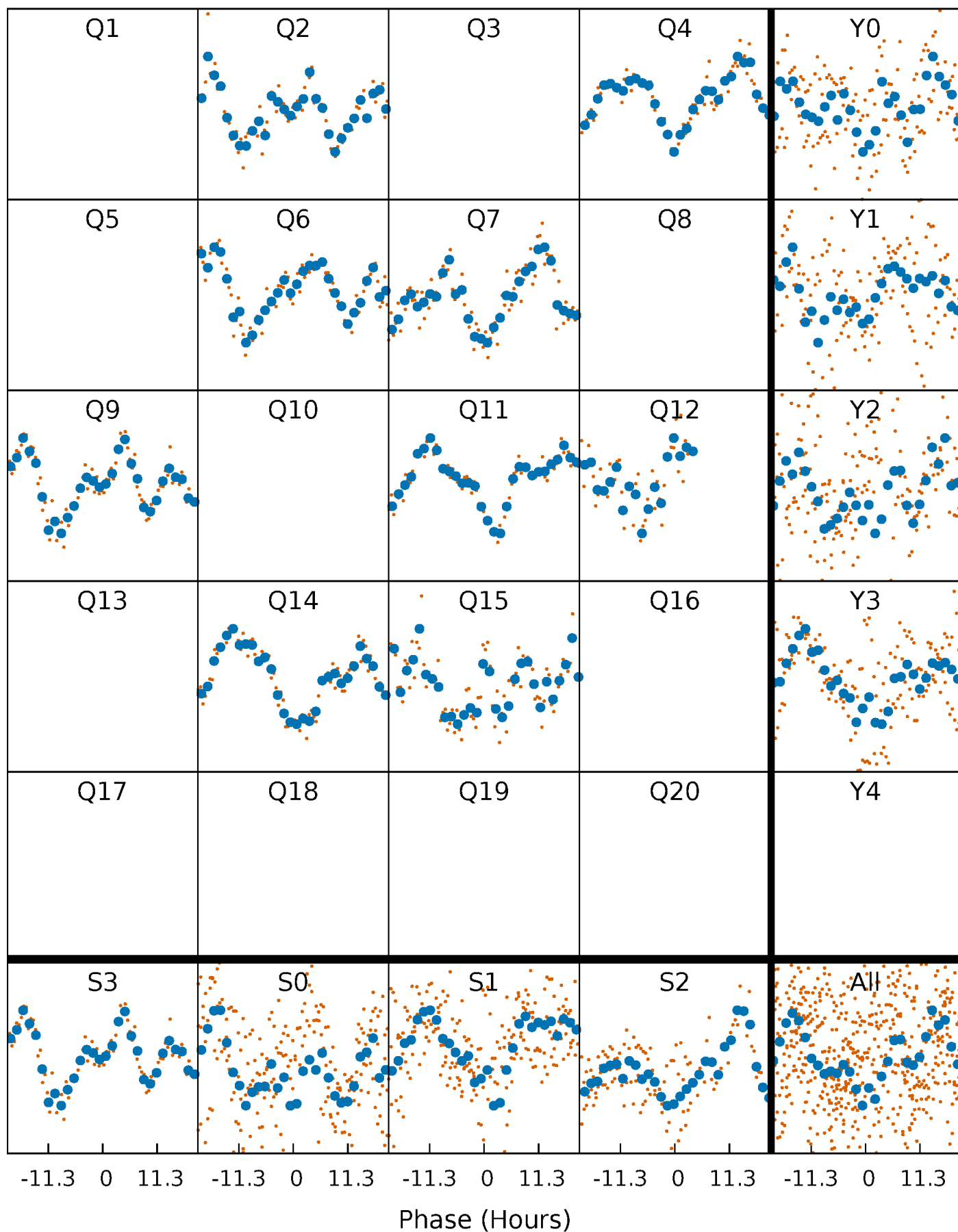


# Non-Whitened Vs. Whitened Light Curve



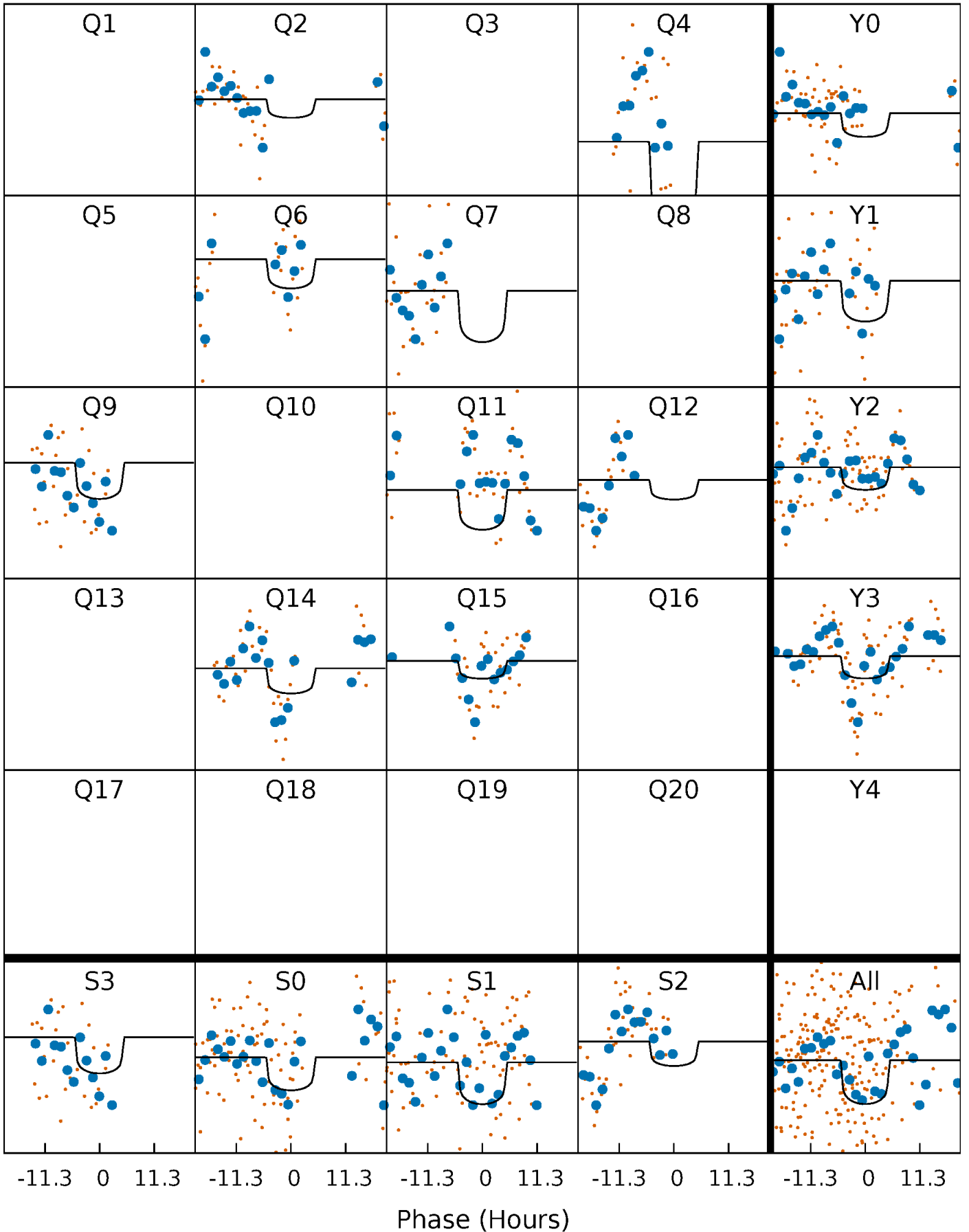
# PDC Quarter-Phased Transit Curves

TCE 009243421-03 P=154.192245 Days  $T_0=235.238303$  (BKJD)



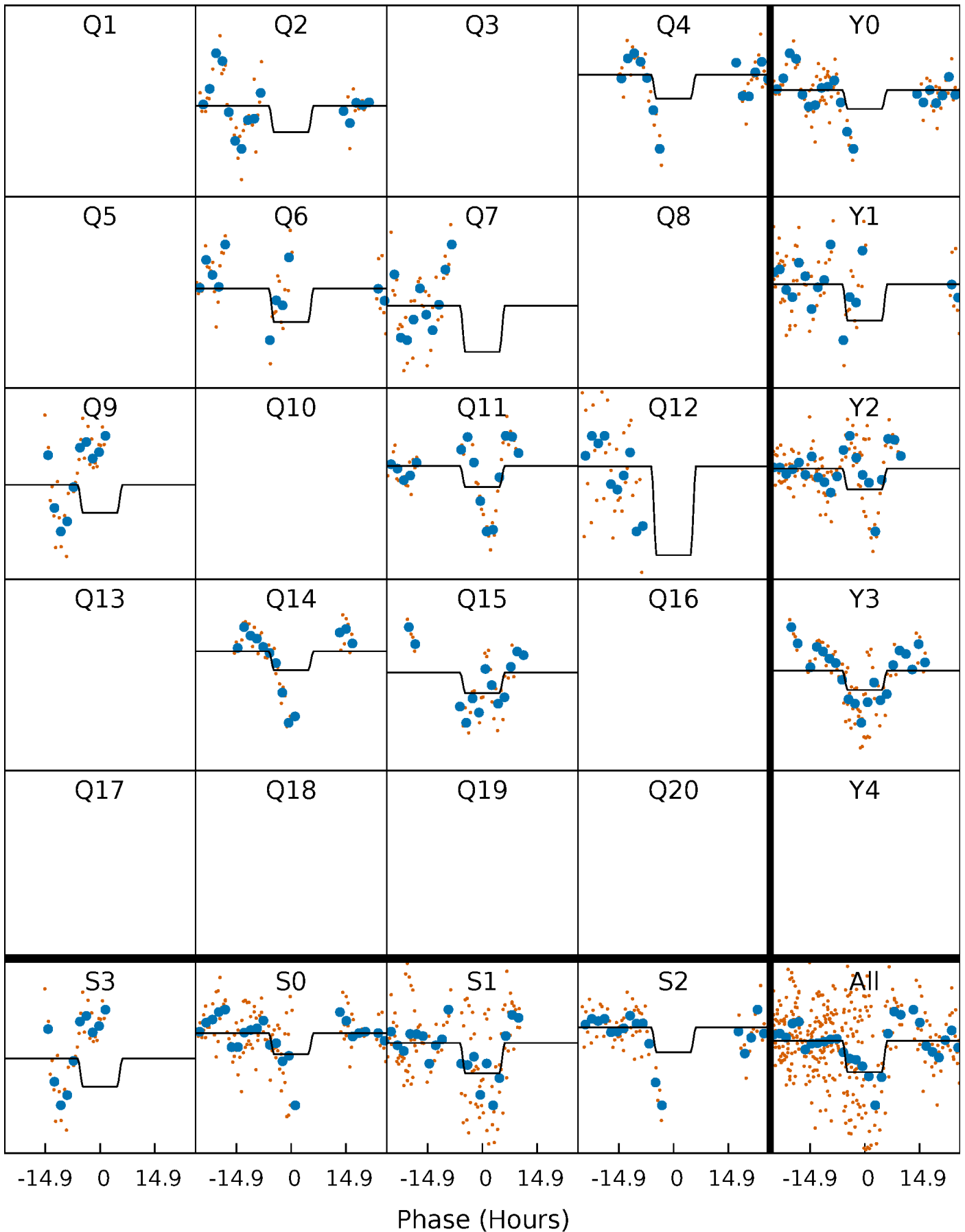
# DV Quarter-Phased Transit Curves

TCE 009243421-03 P=154.192245 Days  $T_0=235.238303$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009243421-03 P=154.171210 Days  $T_0=235.368586$  (BKJD)

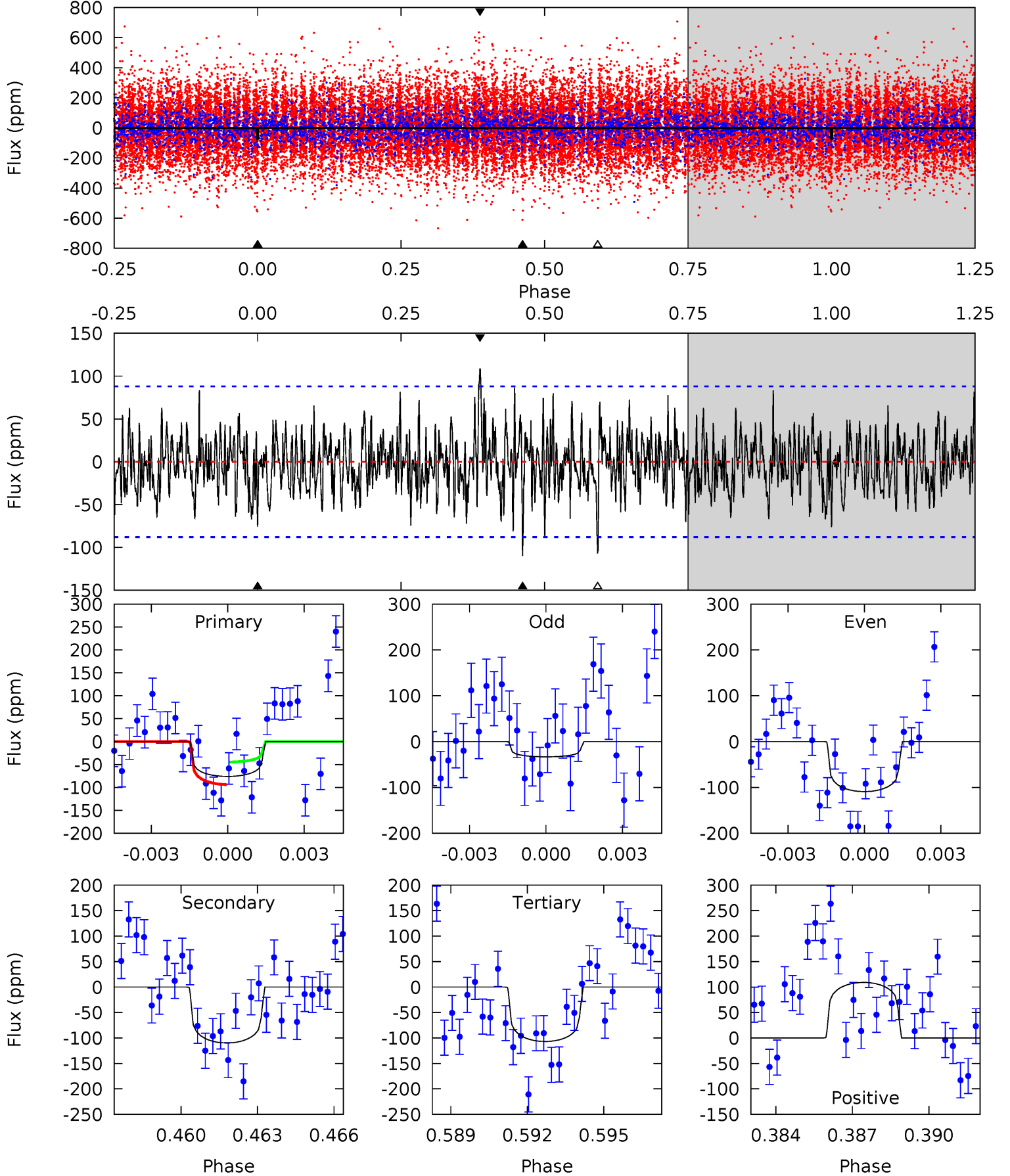




# DV Model-Shift Uniqueness Test

009243421-03, P = 154.192245 Days, E = 81.046058 Days

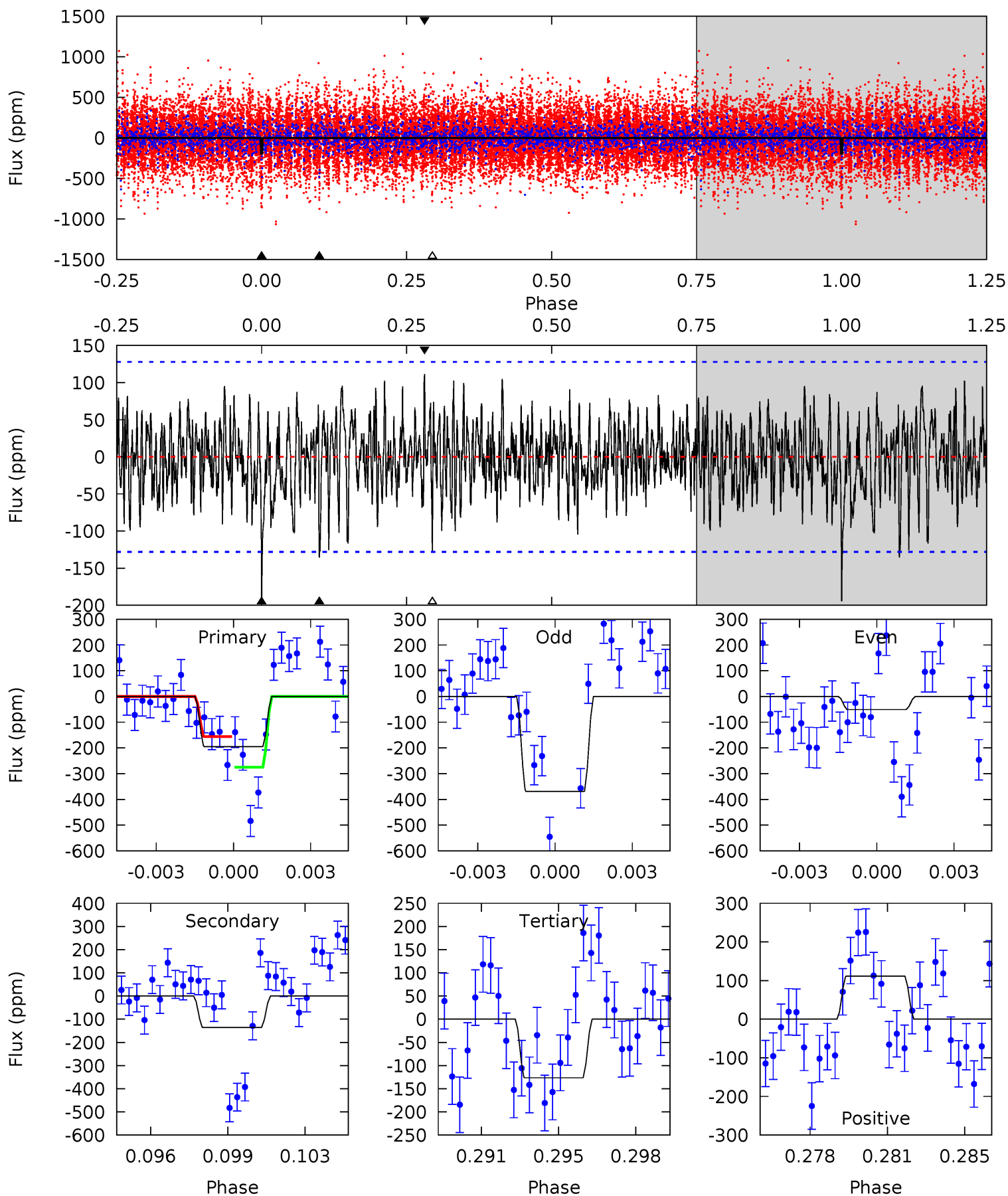
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4.54 | 6.56 | 6.39 | 6.51 | 5.26            | 2.99            | 1.76             | -1.84   | -1.97   | 0.18    | 0.05    | 2.24    | 0.92 | 0.50  | 1.40 |



# Alt Model-Shift Uniqueness Test

009243421-03, P = 154.171210 Days, E = 81.197376 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.96 | 5.56 | 5.17 | 4.57 | 5.23            | 2.94            | 1.58             | 2.79    | 3.40    | 0.39    | 0.99    | 6.45    | 0.85 | 0.36  | 2.28 |



### Stellar Parameters For KIC 009243421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6331^{+195}_{-176}$ | $3.377^{+0.408}_{-0.072}$ | $-0.280^{+0.400}_{-0.300}$ | $4.588^{+0.666}_{-1.999}$ | $1.832^{+0.125}_{-0.468}$ | $0.027^{+0.099}_{-0.006}$                     |
|        | +3%/-3%              | +12%/-2%                  | +143%/-107%                | +15%/-44%                 | +7%/-26%                  | +370%/-24%                                    |
| Source | PHO1                 | FLK73                     | 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 009243421-03 / KOI

| Detrend | Depth (ppm)   | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)      | $T_{obs}$ (K)          | $A_{obs}$            |
|---------|---------------|------------------------|--------------------|------------------------|----------------------|
| DV      | $-110 \pm 17$ | $5.26^{+3.81}_{-3.04}$ | $977^{+61}_{-105}$ | $5897^{+3509}_{-1182}$ | $975^{+4320}_{-630}$ |
| Alt.    | $-136 \pm 24$ | $6.84^{+4.23}_{-3.64}$ | $980^{+58}_{-97}$  | $5520^{+2550}_{-986}$  | $727^{+2532}_{-443}$ |

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

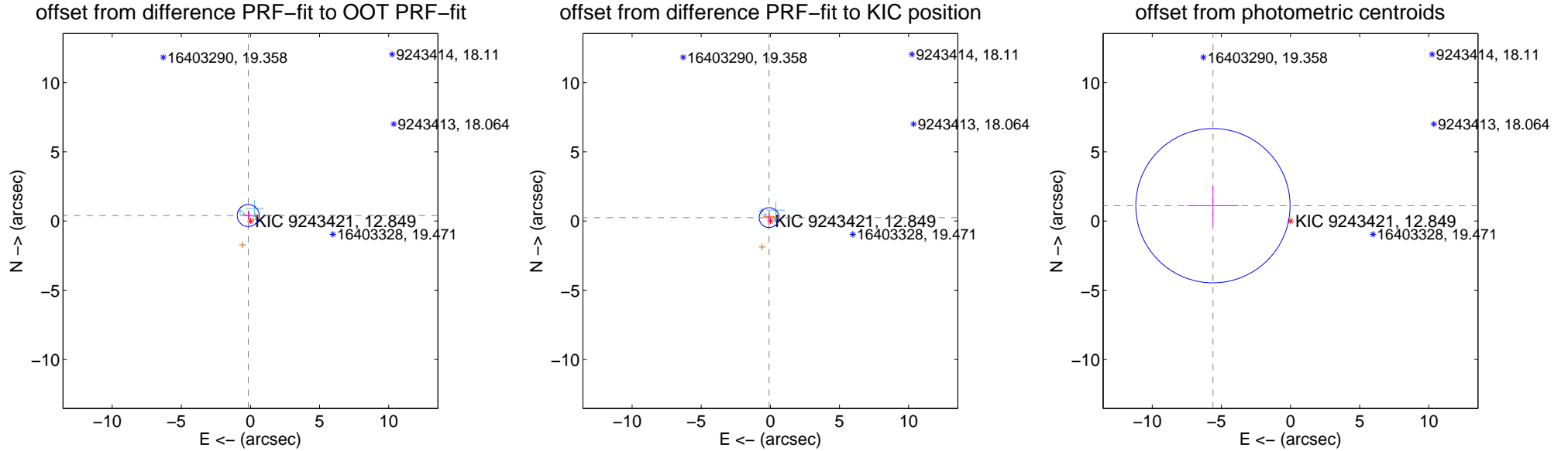
## DV Centroid Data

Supplemental centroid analysis for 009243421-03. Kepler magnitude: 12.85. Transit SNR 4.66

There are 5 quarters with good PRF difference image offsets

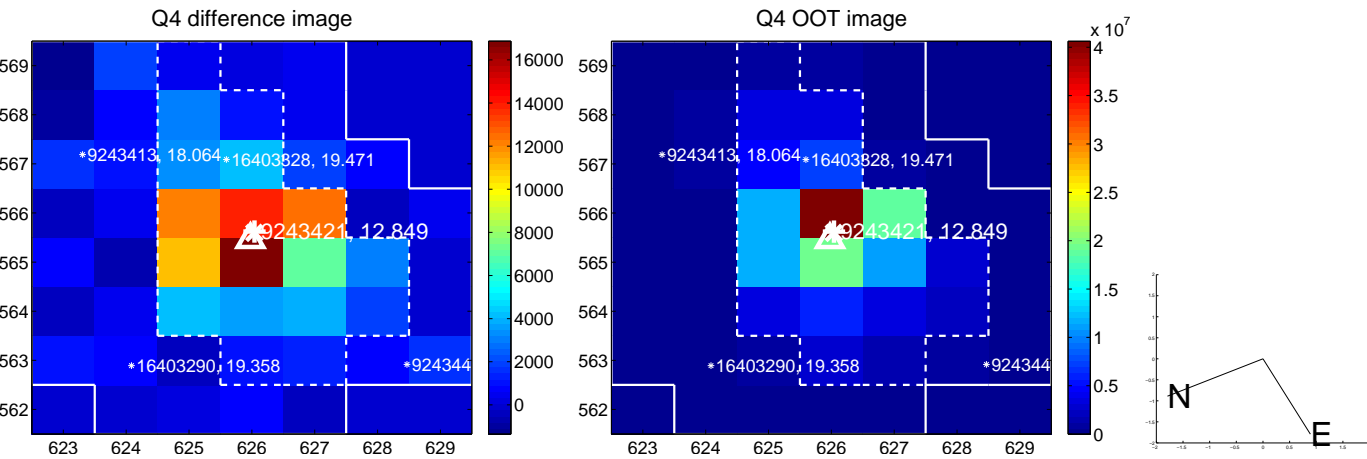
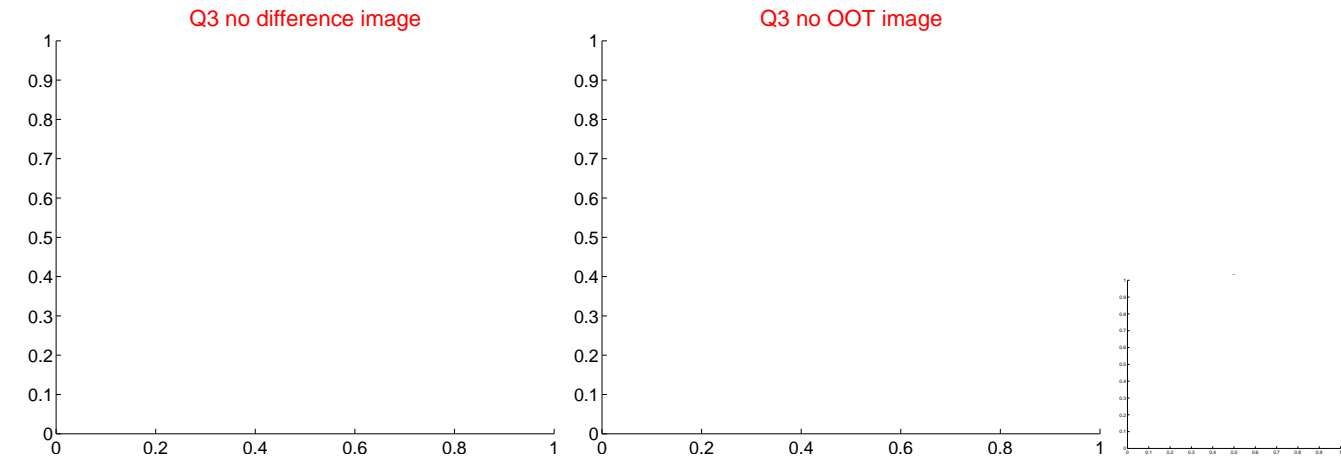
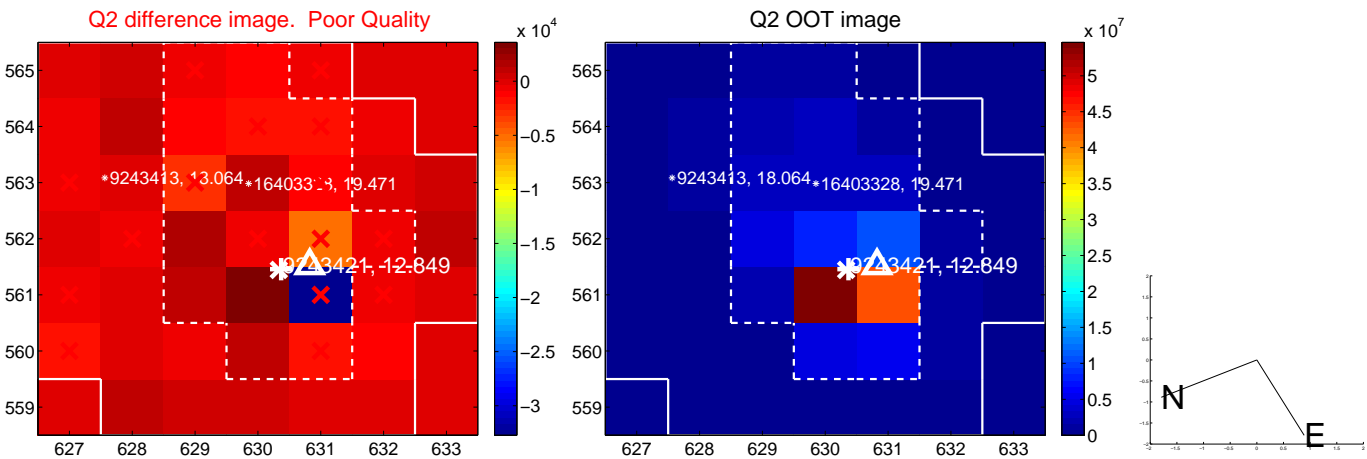
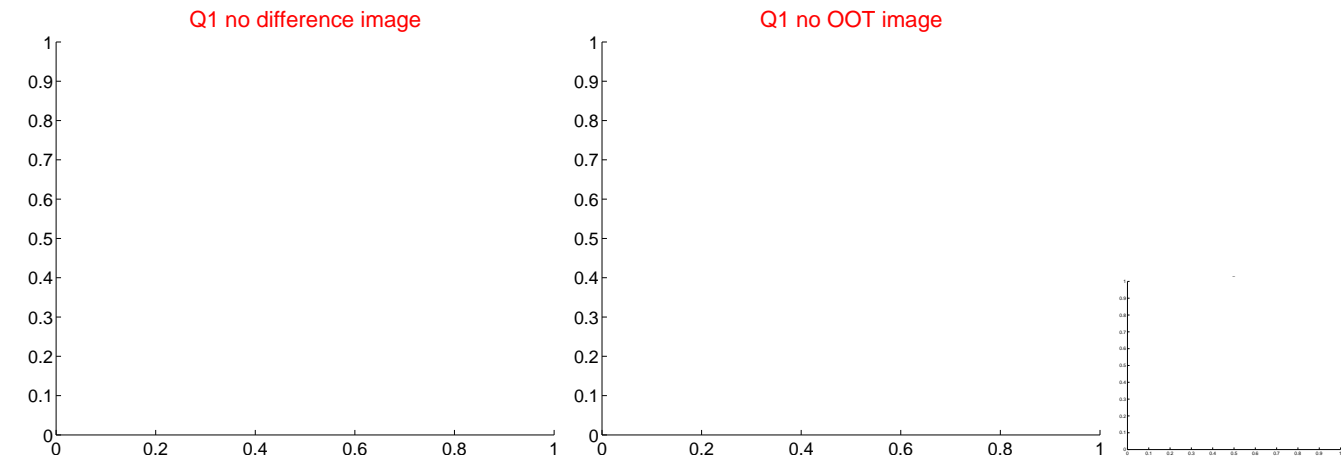
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $0.424 \pm 0.266$  | 1.60                | $0.160 \pm 0.217$ | $0.393 \pm 0.296$ |
| PRF-fit source offset from KIC position | $0.260 \pm 0.239$  | 1.09                | $0.090 \pm 0.210$ | $0.244 \pm 0.243$ |
| photometric centroid source offset      | $5.72 \pm 1.86$    | 3.08                | $5.61 \pm 1.87$   | $1.11 \pm 1.42$   |



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

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





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

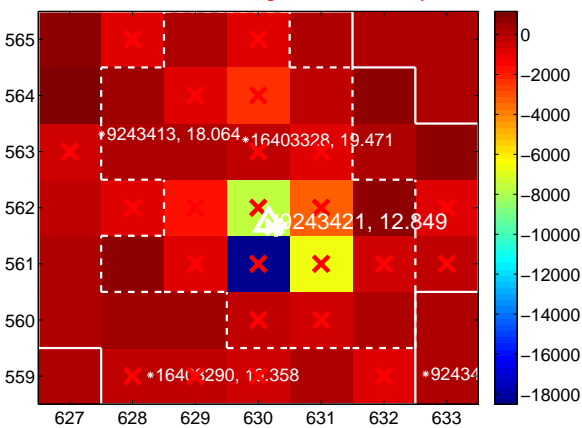
Q5 no difference image



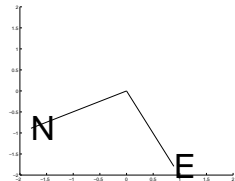
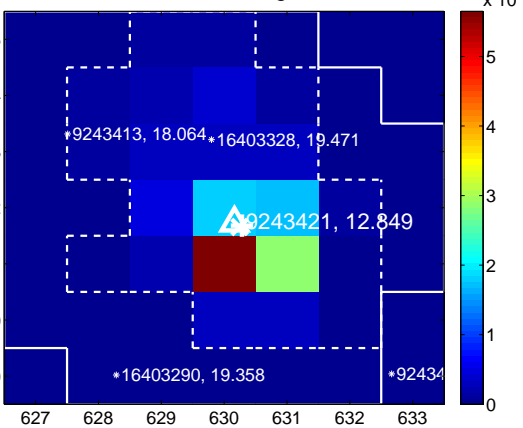
Q5 no OOT image



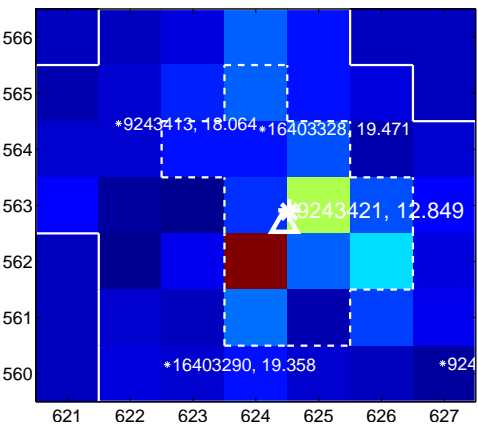
Q6 difference image. Poor Quality



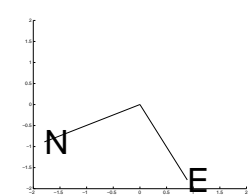
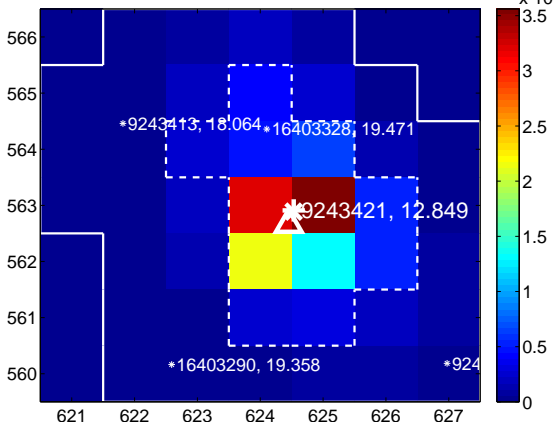
Q6 OOT image



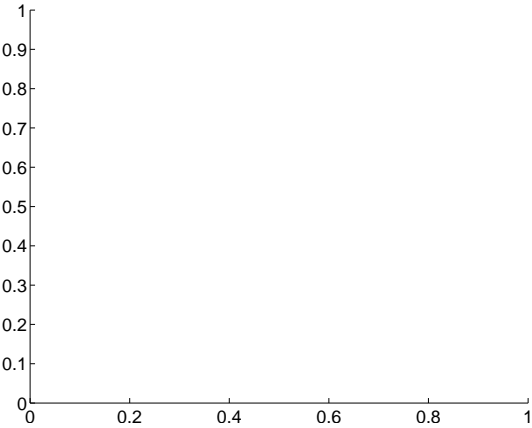
Q7 difference image



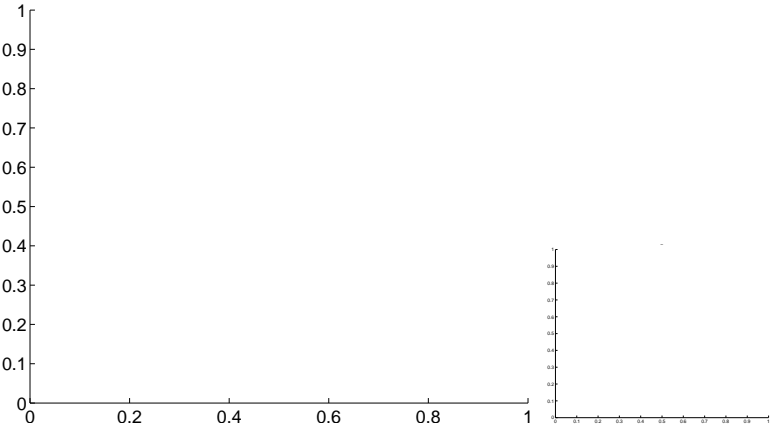
Q7 OOT image



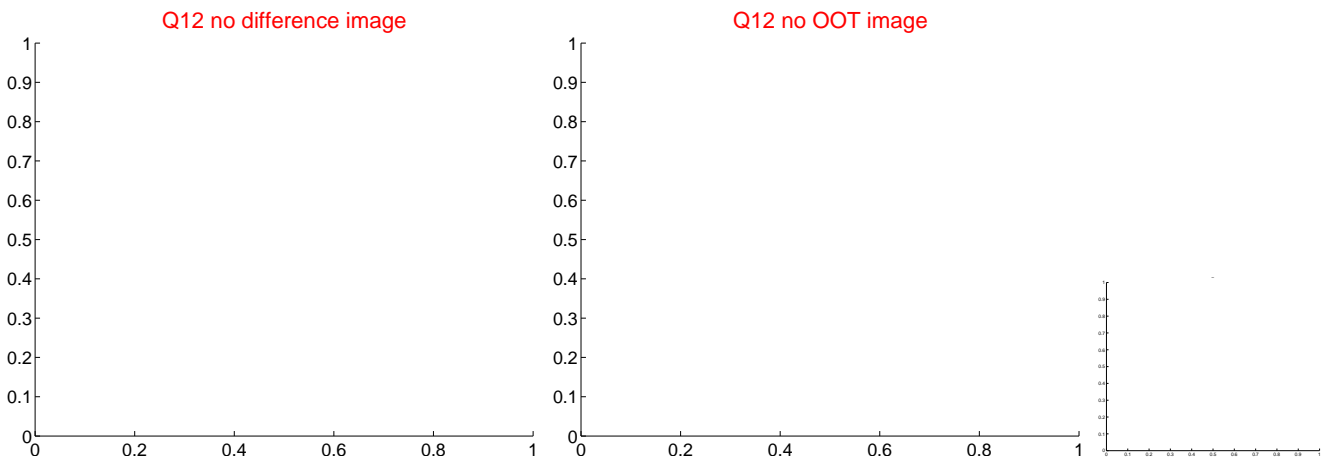
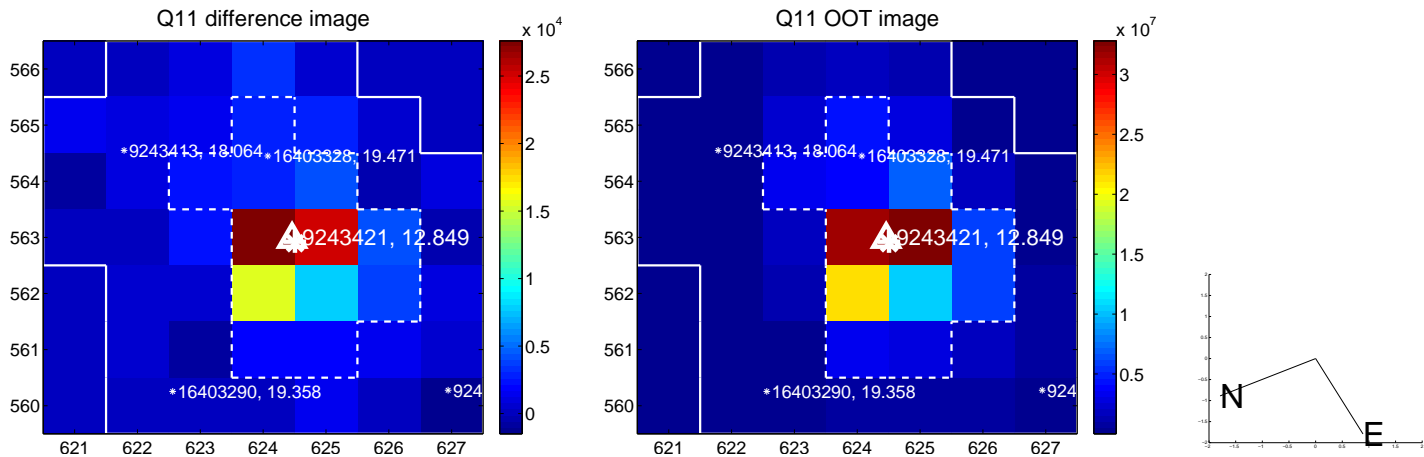
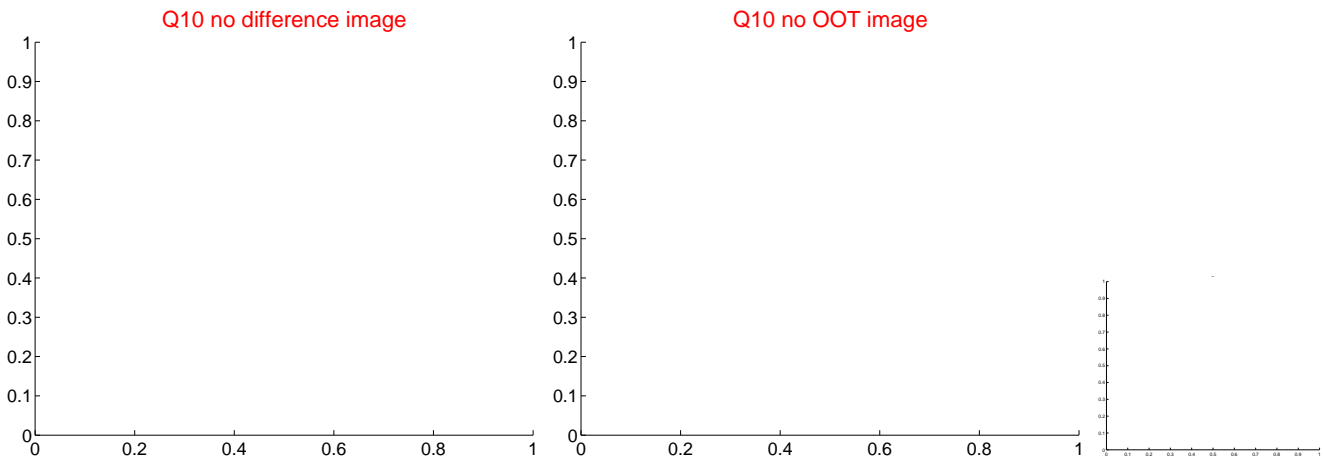
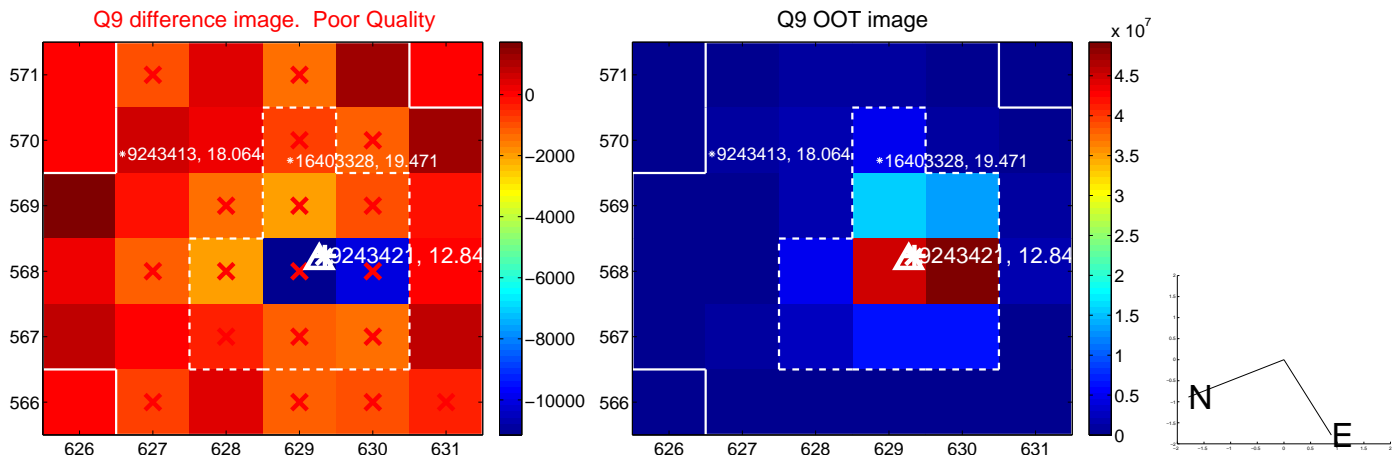
Q8 no difference image



Q8 no OOT image

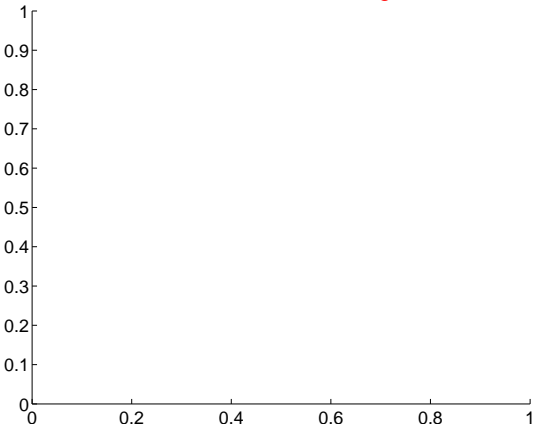


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

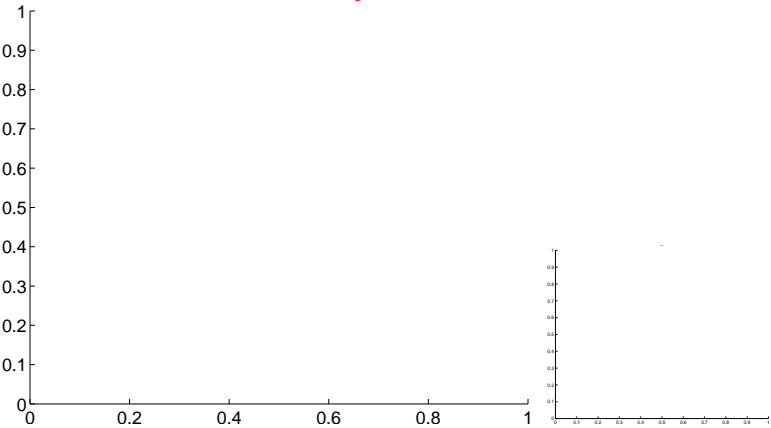


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

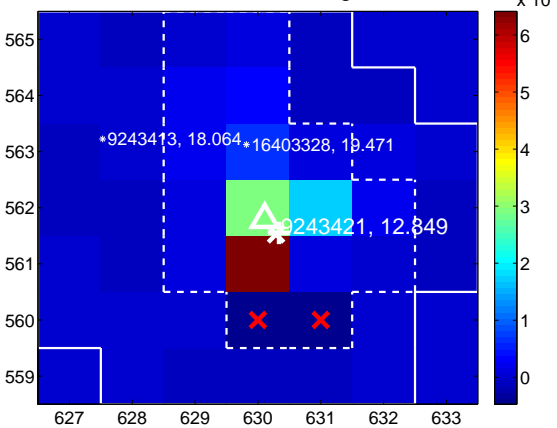
Q13 no difference image



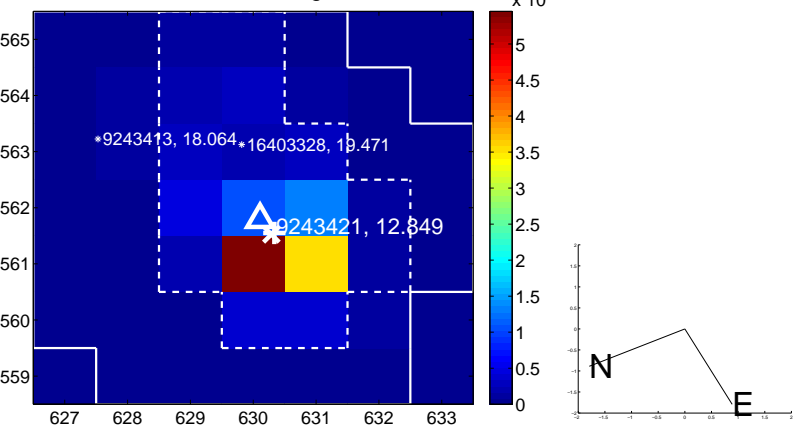
Q13 no OOT image



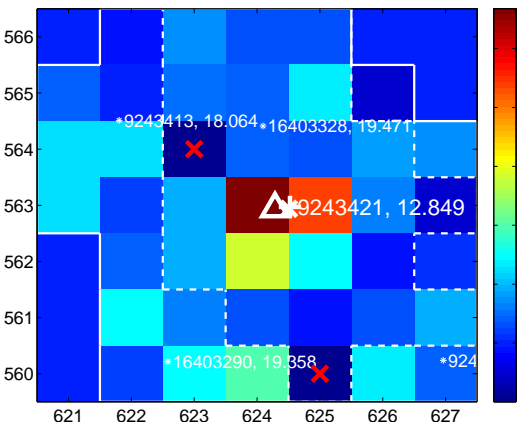
Q14 difference image



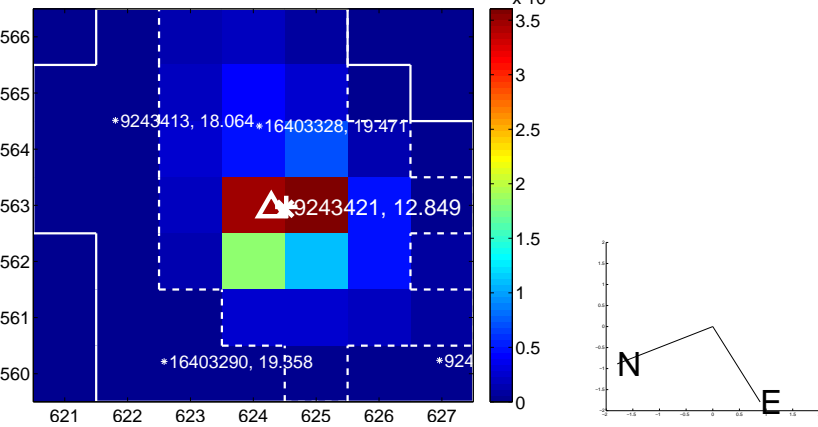
Q14 OOT image



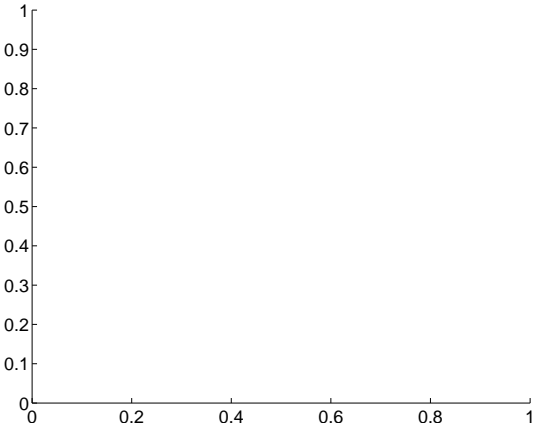
Q15 difference image



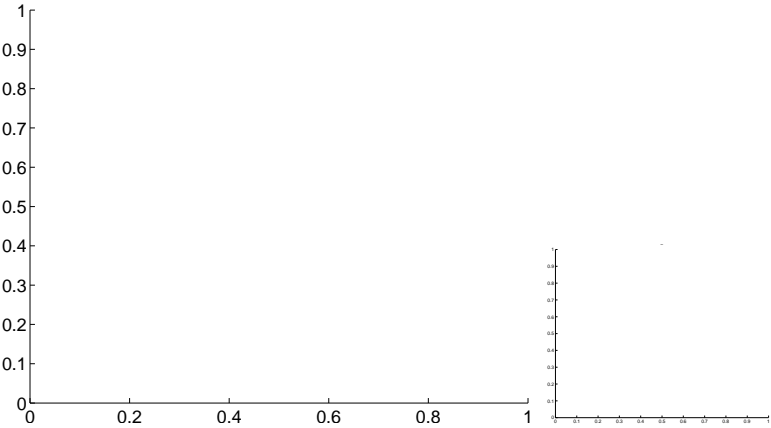
Q15 OOT image



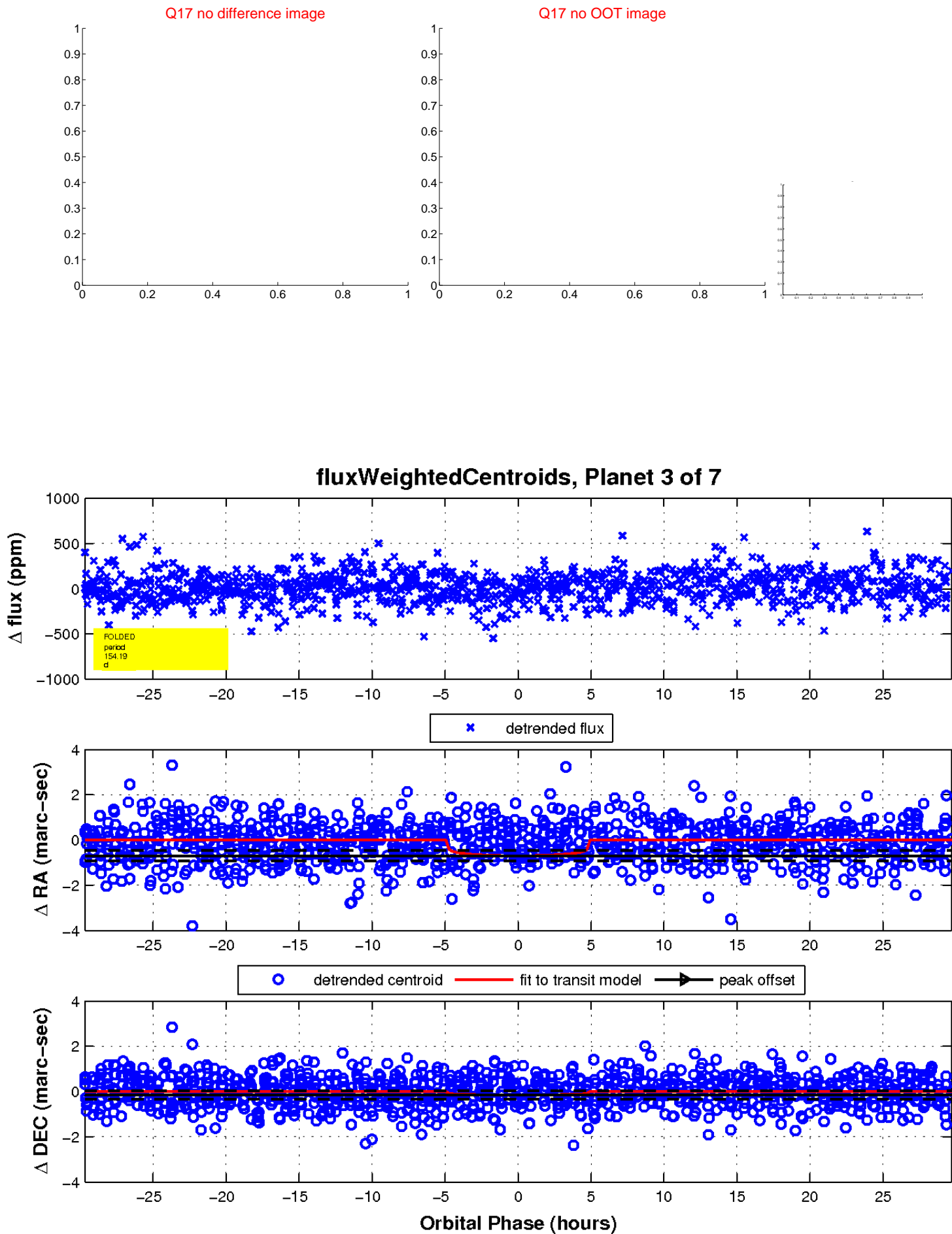
Q16 no difference image



Q16 no OOT image

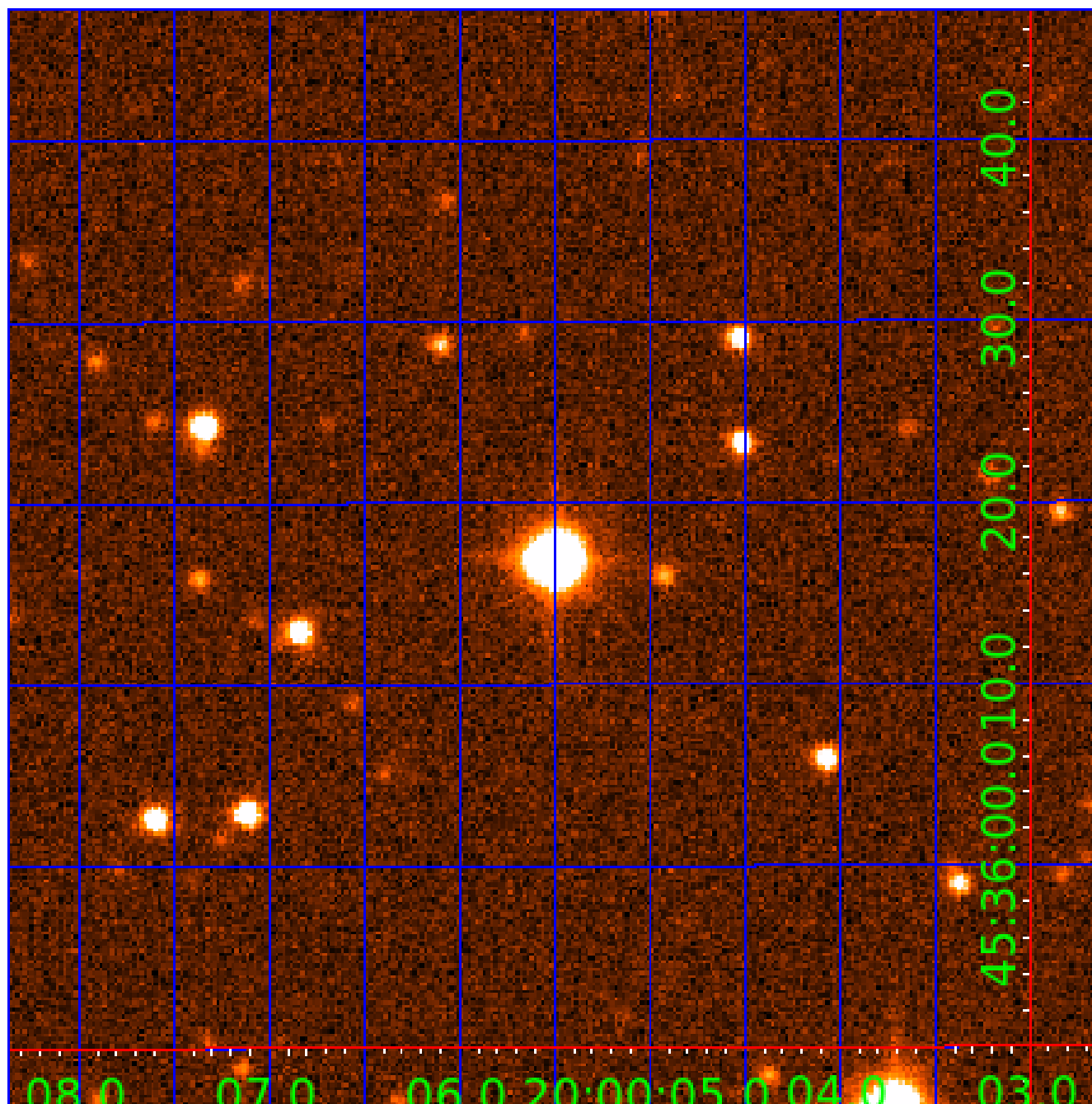


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009243421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009243421-01 | OBS      | No   | 1.198209      | 132.236181   | 31.8        | 3.815            | 10.9 | 11.7 | 4.59                        | 6331            | 3.01                   | 41542.18               |
| 009243421-02 | OBS      | No   | 2.571808      | 132.660977   | 39.4        | 6.612            | 8.5  | 9.5  | 4.59                        | 6331            | 3.32                   | 15004.26               |
| 009243421-03 | OBS      | No   | 154.192245    | 235.238303   | 126.2       | 9.905            | 11.7 | 4.7  | 4.59                        | 6331            | 5.54                   | 63.94                  |
| 009243421-04 | OBS      | No   | 2.569394      | 133.568846   | 52.7        | 9.075            | 7.9  | 10.1 | 4.59                        | 6331            | 3.88                   | 15023.05               |
| 009243421-05 | OBS      | No   | 18.484254     | 145.906309   | 78.3        | 7.890            | 7.6  | 6.1  | 4.59                        | 6331            | 4.48                   | 1081.76                |
| 009243421-06 | OBS      | No   | 42.090762     | 137.660605   | 169.3       | 6.557            | 7.9  | 8.4  | 4.59                        | 6331            | 6.55                   | 361.09                 |
| 009243421-07 | OBS      | No   | 152.795479    | 152.270891   | 252.5       | 3.580            | 7.5  | 7.7  | 4.59                        | 6331            | 8.17                   | 64.72                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 009243421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT   |
| 009243421-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—<br>MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—HALO_GHOST |
| 009243421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009243421-06 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—HALO_GHOST   |
| 009243421-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>CENT_FEW_DIFFS                    |

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

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

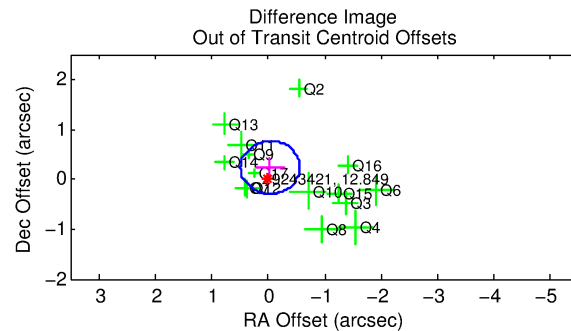
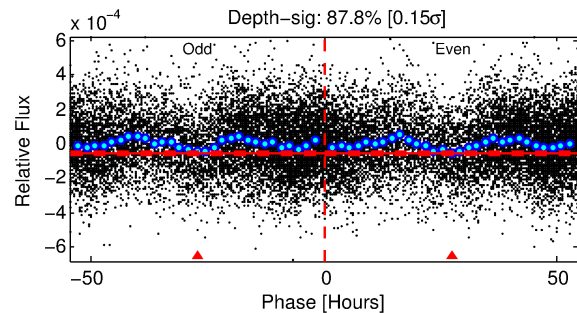
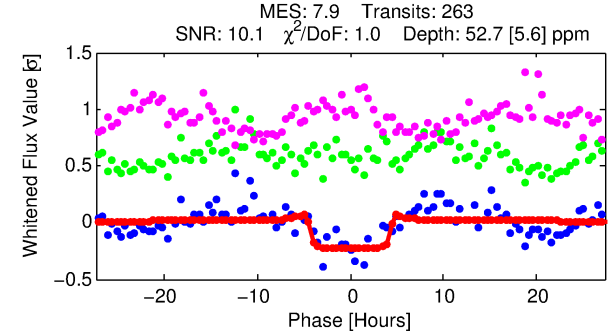
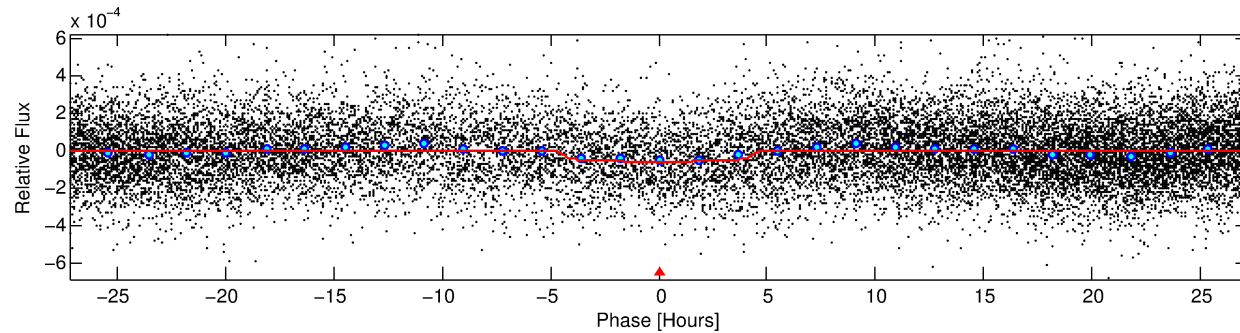
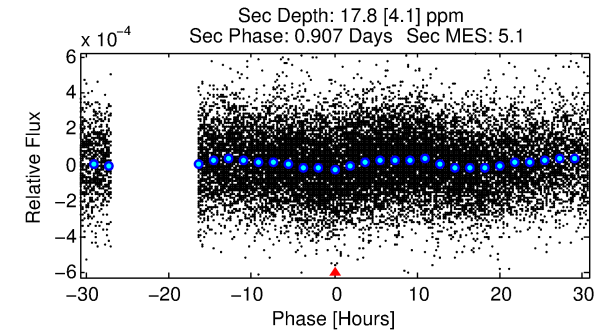
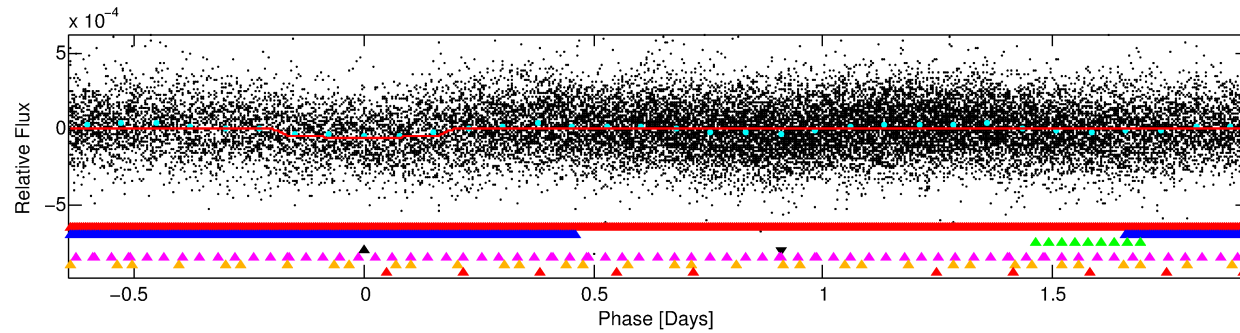
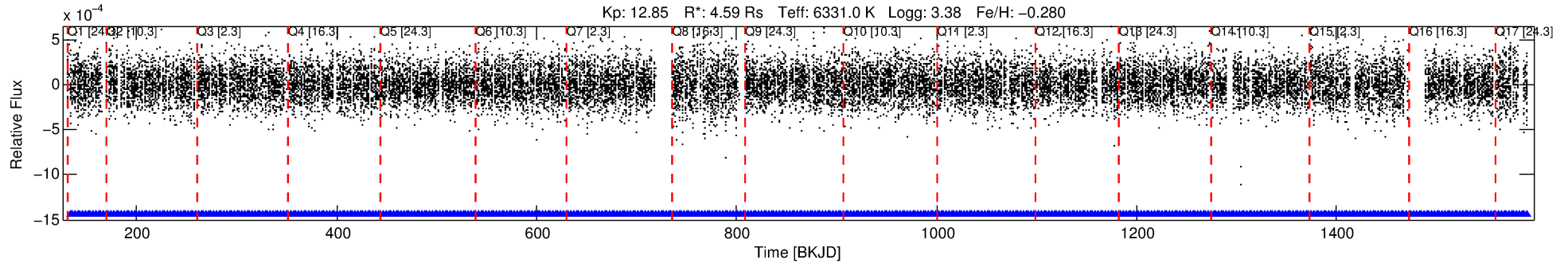
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009243421-04

No Significant Match Found

# DV One-Page Summary

KIC: 9243421 Candidate: 4 of 7 Period: 2.569 d



## DV Fit Results:

Period = 2.56939 [0.00004] d  
Epoch = 133.5688 [0.0072] BKJD  
Rp/R\* = 0.0078 [0.0016]  
a/R\* = 1.37 [0.74]  
b = 0.90 [0.26]  
Seff = 15023.05 [10535.50]  
Teq = 2823 [495] K  
Rp = 3.88 [1.88] Re  
a = 0.0449 [0.0192] AU  
Ag = 1.31 [1.10] [0.28σ]  
Teffp = 4667 [578] K [2.42σ]

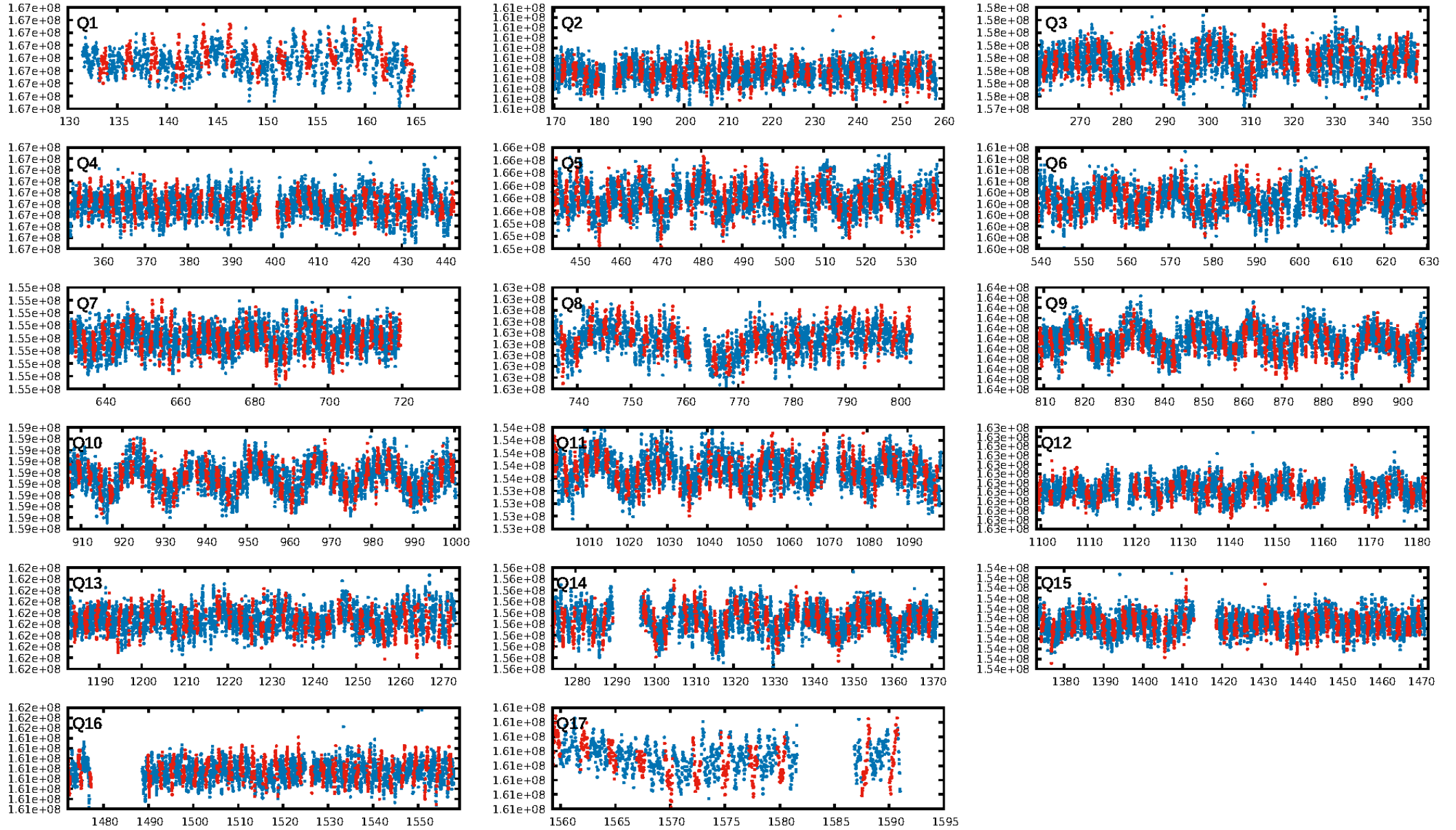
## DV Diagnostic Results:

ShortPeriod-sig: 99.9% [3.34σ]  
LongPeriod-sig: 0.4% [0.01σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 2.85e-12**  
RollingBand-fgt: 1.00 [243/243]  
GhostDiagnostic-chr: 2.251  
Centroid-sig: 47.6%  
Centroid-so: 0.544 arcsec [1.09σ]  
OotOffset-rm: 0.237 arcsec [1.35σ]  
KicOffset-rm: 0.162 arcsec [0.86σ]  
OotOffset-st: 4/4/4/3 [15]  
KicOffset-st: 4/4/4/3 [15]  
DiffImageQuality-fgm: 0.80 [12/15]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 07:14:35 Z

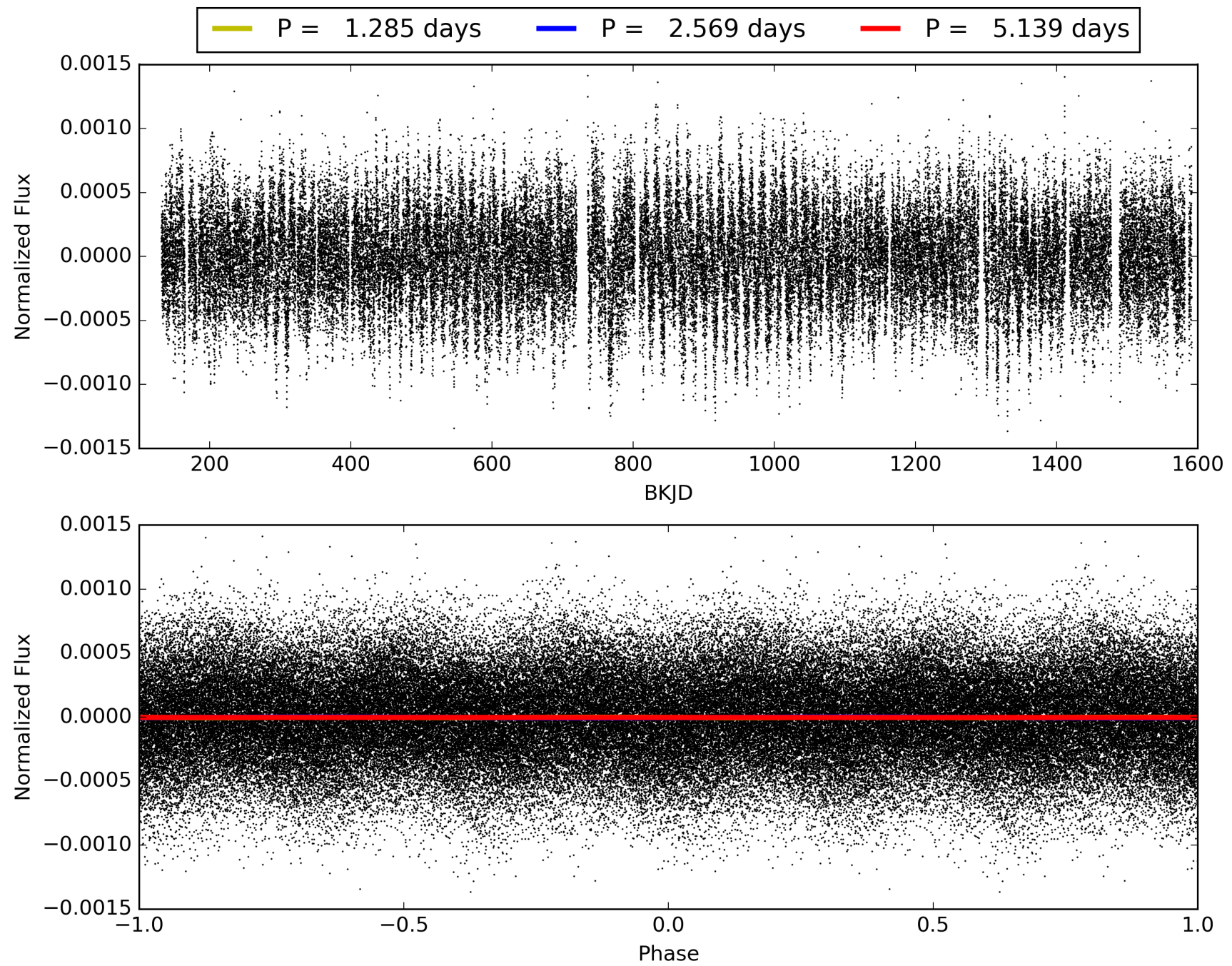
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009243421-04, PDC Light Curves



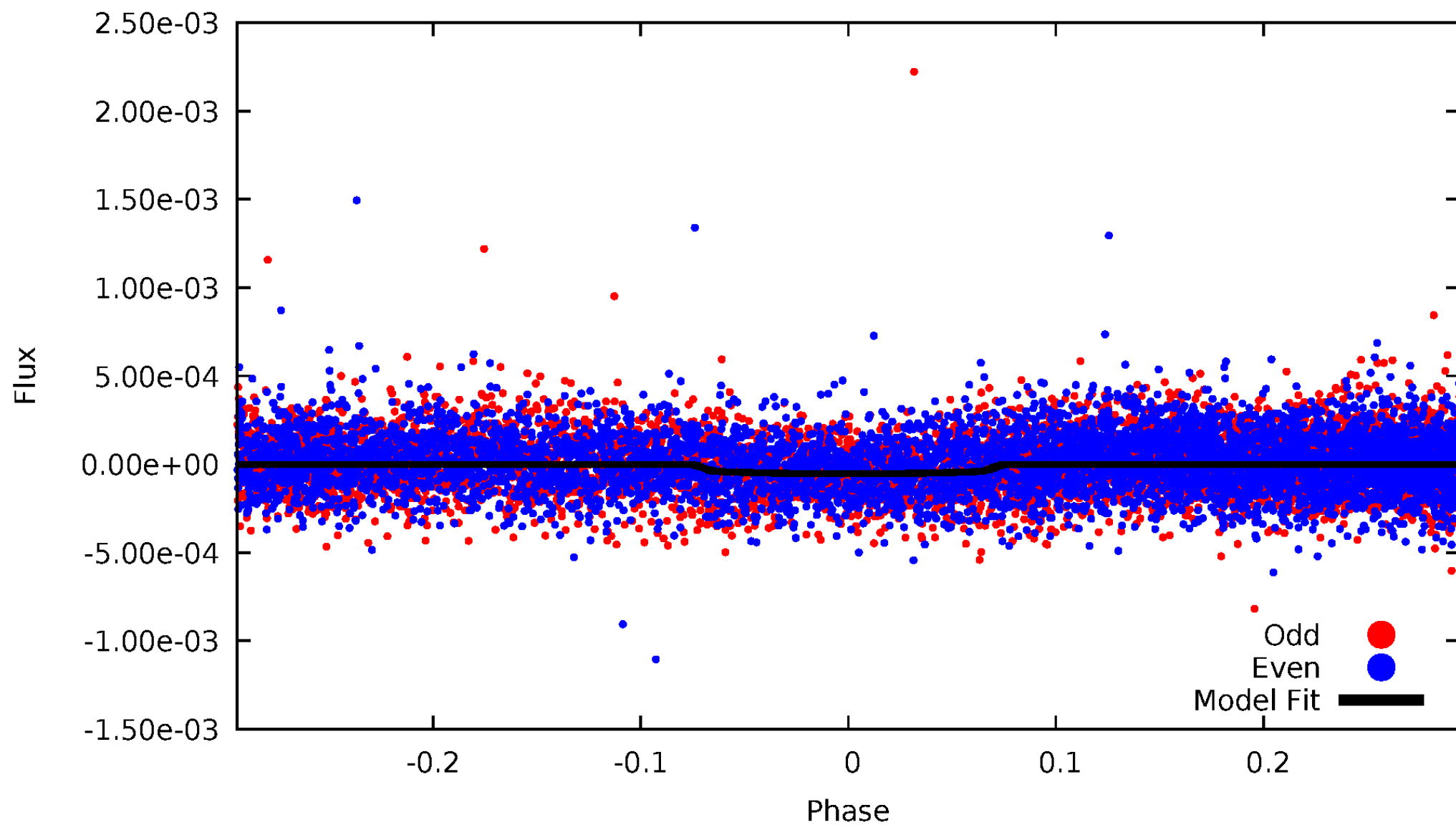


TCE 009243421-04



# DV Odd/Even

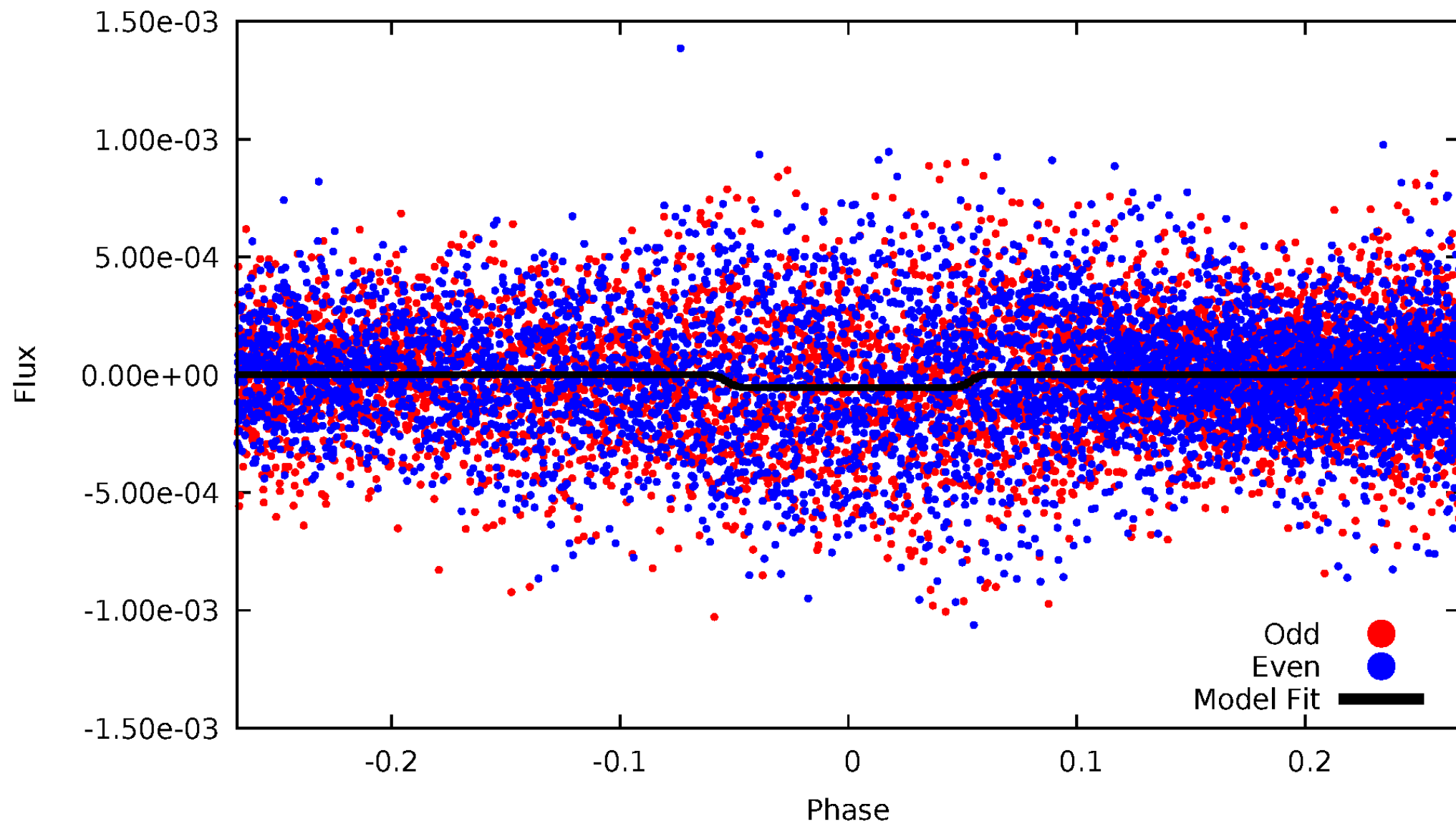
TCE 009243421-04





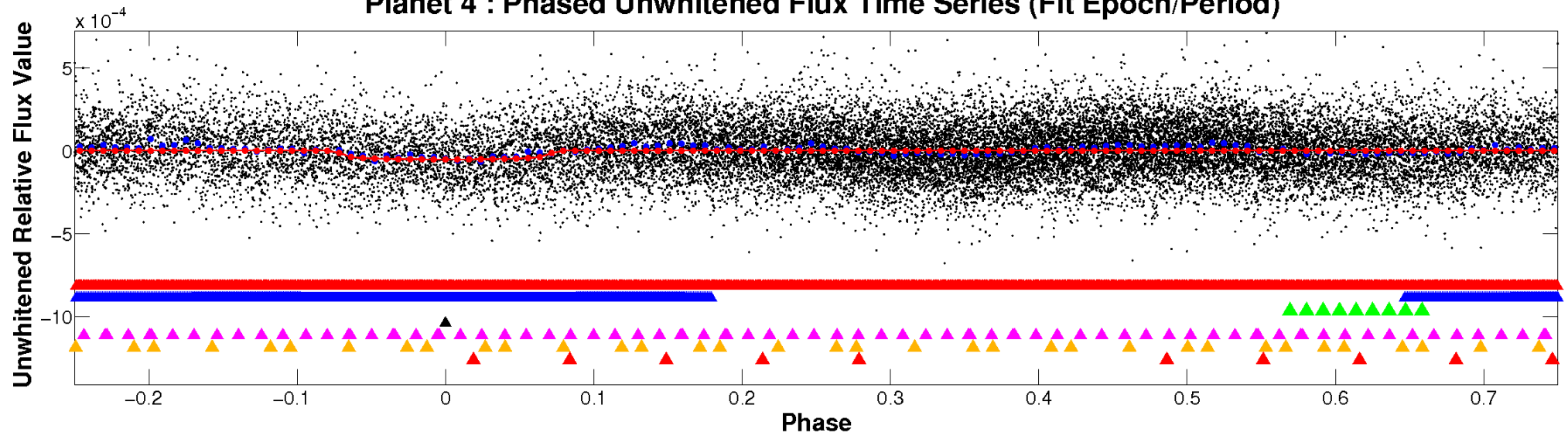
# ALT Odd/Even

TCE 009243421-04

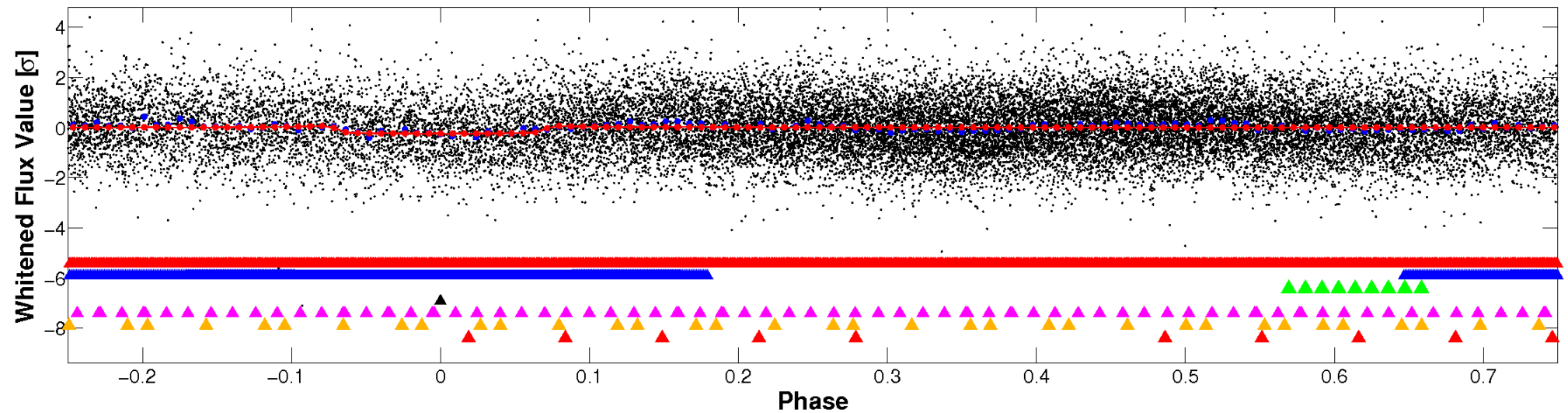


# Non-Whitened Vs. Whitened Light Curve

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

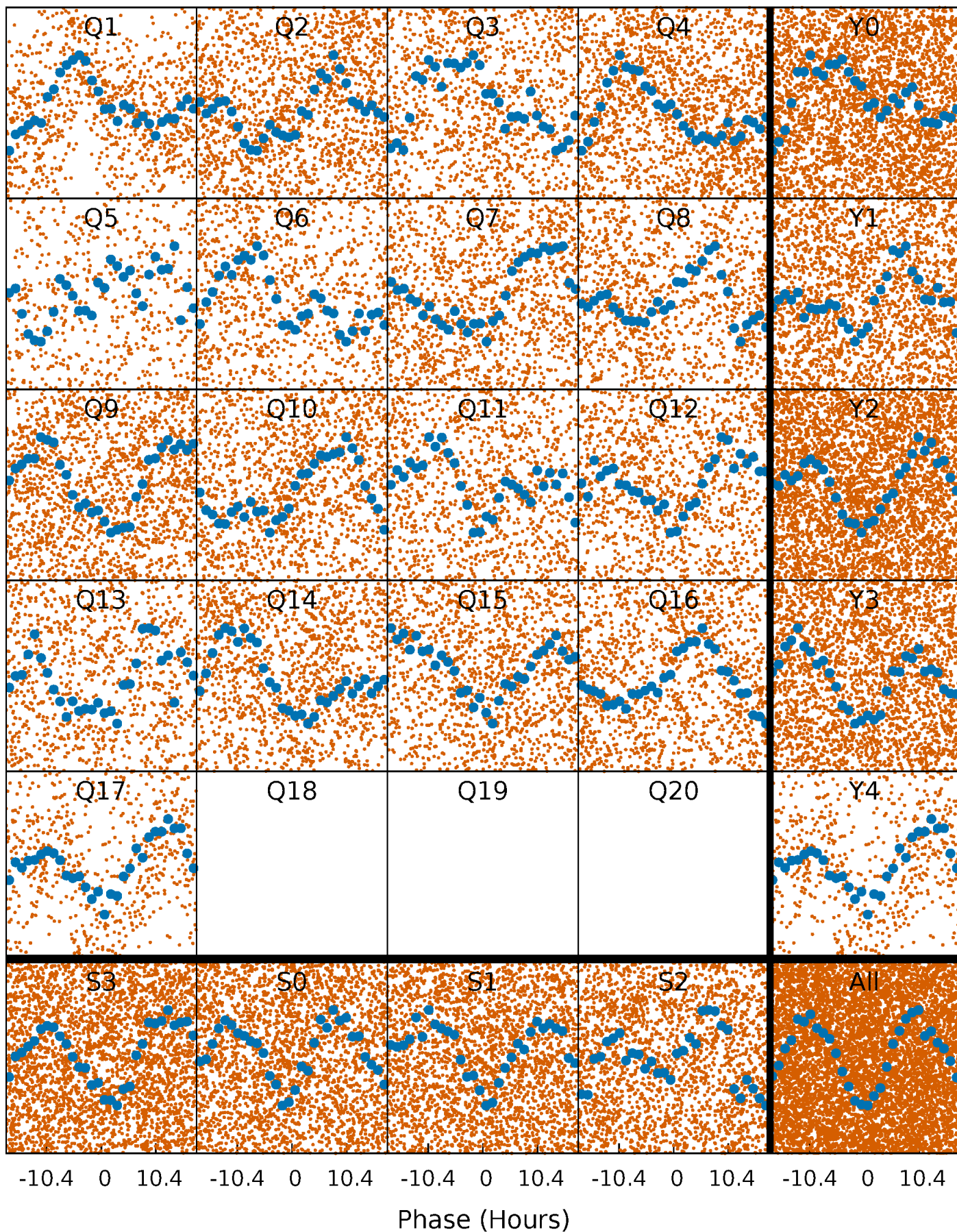


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

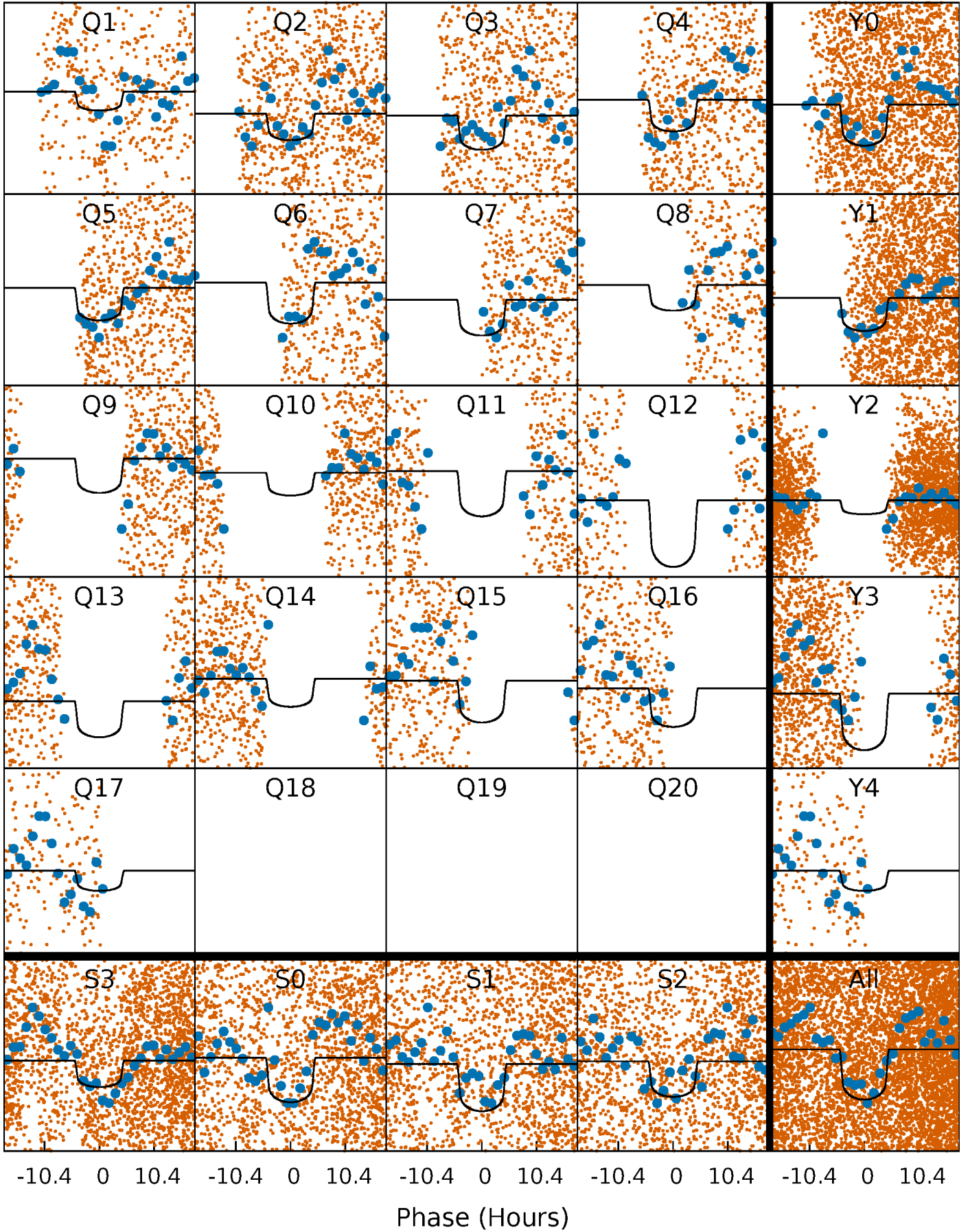
TCE 009243421-04 P= 2.569394 Days  $T_0=133.568846$  (BKJD)





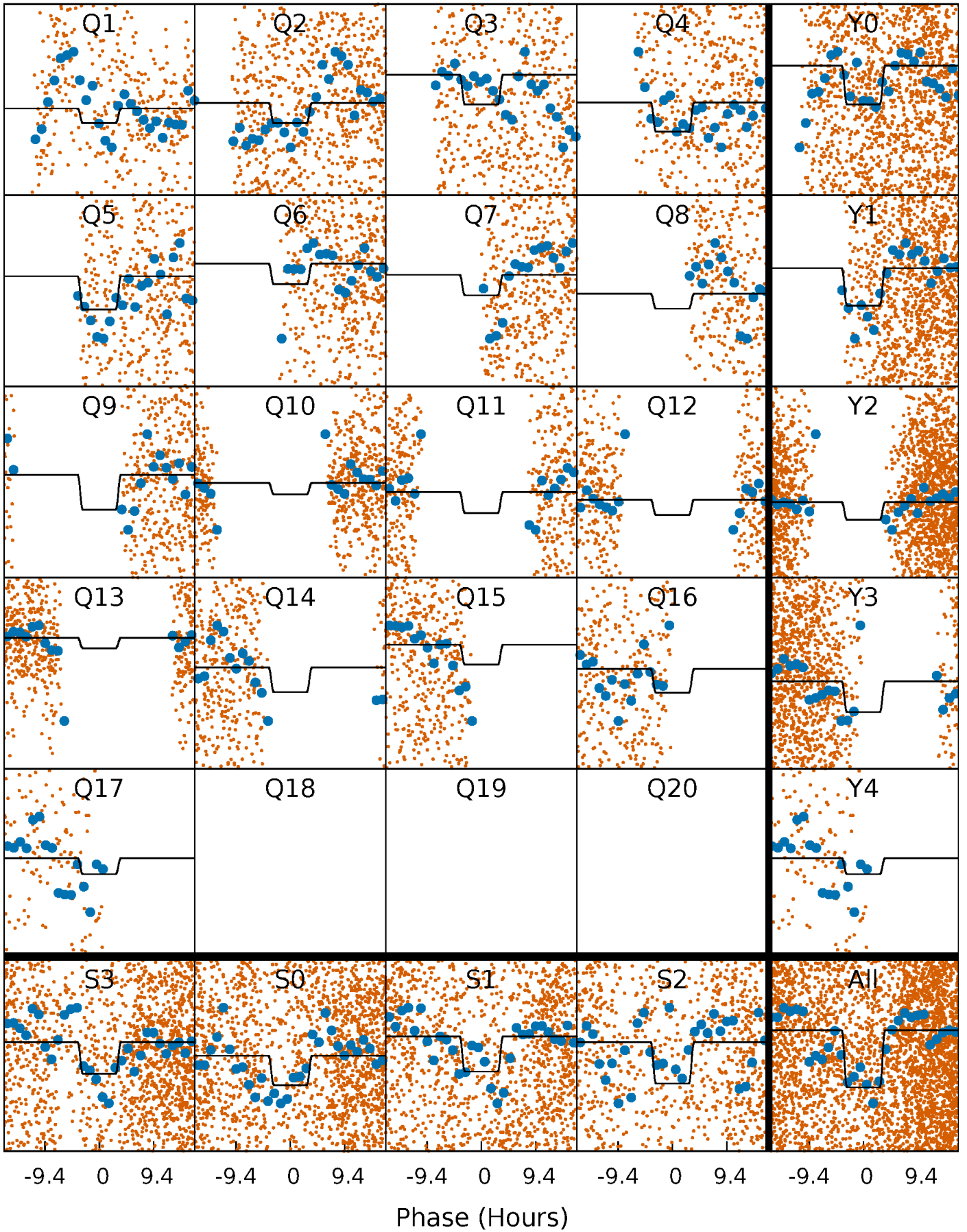
# DV Quarter-Phased Transit Curves

TCE 009243421-04   P= 2.569394 Days    $T_0=133.568846$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009243421-04   P= 2.569378 Days    $T_0=133.568477$  (BKJD)

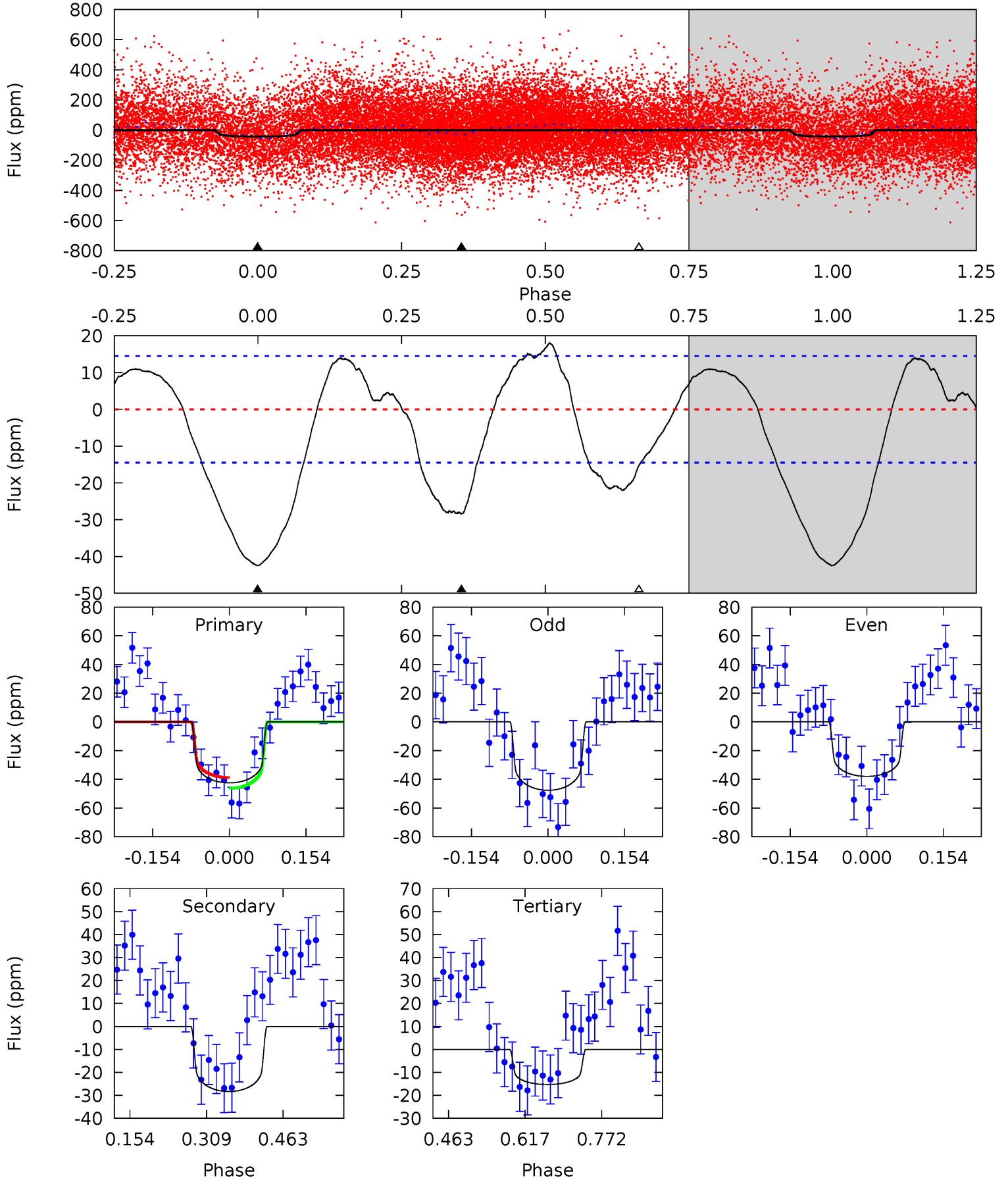




# DV Model-Shift Uniqueness Test

009243421-04, P = 2.569394 Days, E = 130.999452 Days

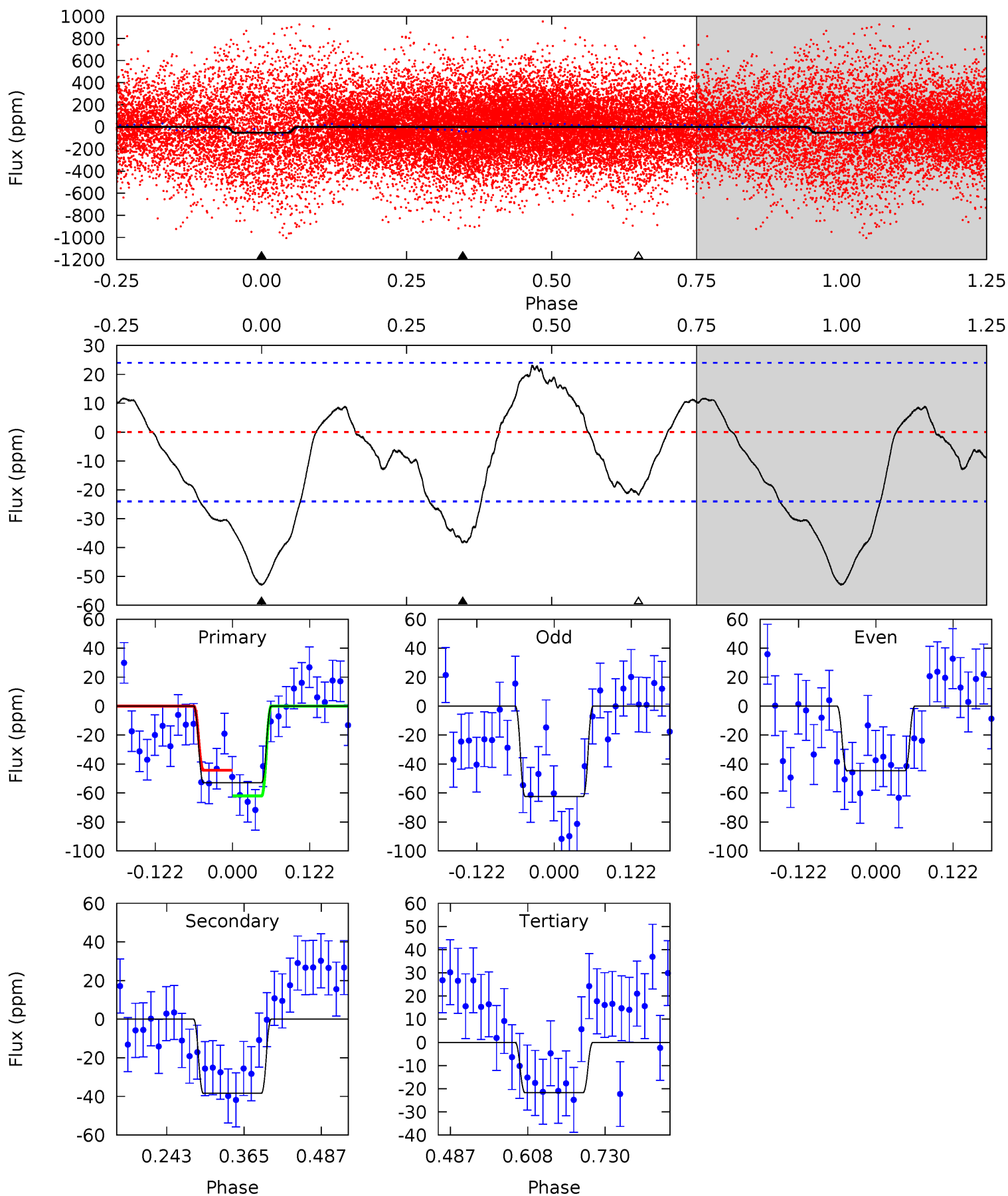
| Pri  | Sec  | Ter  | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 13.1 | 8.74 | 4.71 | 0   | 4.47            | 1.42            | 3.96             | 8.38    | 13.1    | 4.02    | 8.74    | 1.49    | 0.98 | 0.30  | 1.15 |



# Alt Model-Shift Uniqueness Test

009243421-04, P = 2.569378 Days, E = 130.999099 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  |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.97 | 7.24 | 4.09 | 0   | 4.52            | 1.55            | 2.41             | 5.88    | 9.97    | 3.15    | 7.24    | 1.67    | 1.08 | 0.30  | 1.62 |



### Stellar Parameters For KIC 009243421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6331^{+195}_{-176}$ | $3.377^{+0.408}_{-0.072}$ | $-0.280^{+0.400}_{-0.300}$ | $4.588^{+0.666}_{-1.999}$ | $1.832^{+0.125}_{-0.468}$ | $0.027^{+0.099}_{-0.006}$                     |
|        | +3%/-3%              | +12%/-2%                  | +143%/-107%                | +15%/-44%                 | +7%/-26%                  | +370%/-24%                                    |
| Source | PHO1                 | FLK73                     | 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 009243421-04 / KOI

| Detrend | Depth (ppm) | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)        | $T_{obs}$ (K)        | $A_{obs}$                 |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV      | $-28 \pm 3$ | $3.42^{+1.06}_{-0.96}$ | $3813^{+263}_{-424}$ | $5160^{+672}_{-507}$ | $2.579^{+2.315}_{-1.038}$ |
| Alt.    | $-38 \pm 5$ | $3.28^{+0.96}_{-0.92}$ | $3824^{+252}_{-432}$ | $5696^{+830}_{-564}$ | $3.858^{+3.302}_{-1.586}$ |

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

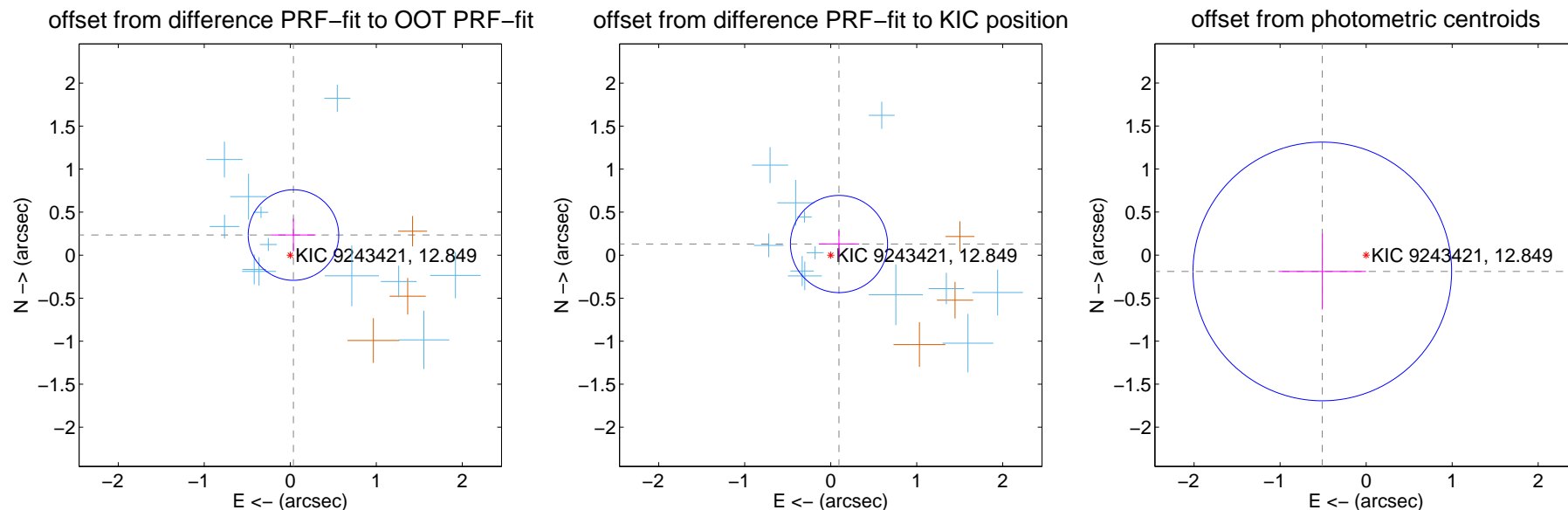
## DV Centroid Data

Supplemental centroid analysis for 009243421-04. Kepler magnitude: 12.85. Transit SNR 10.13

There are 12 quarters with good PRF difference image offsets

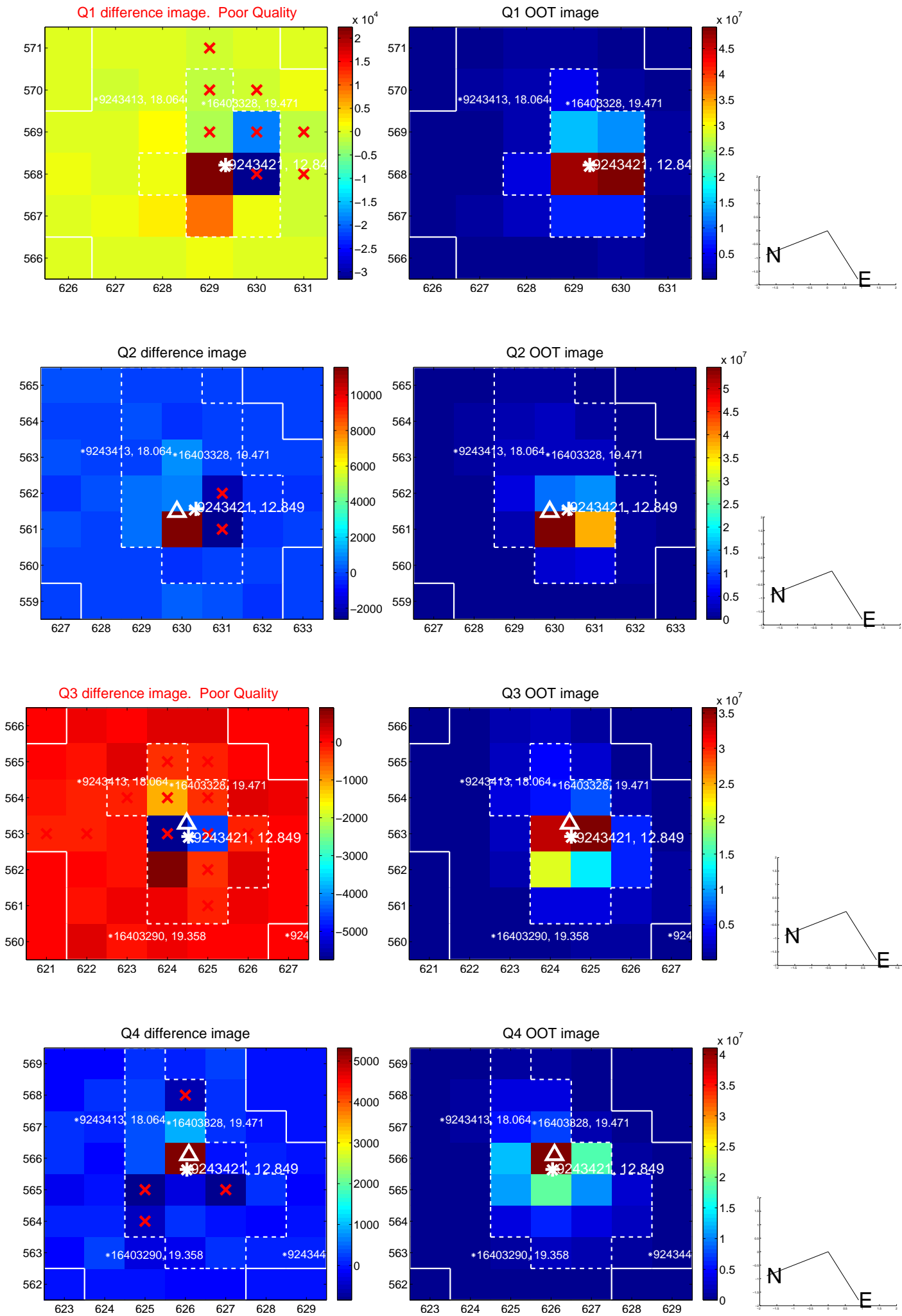
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec      |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT          | $0.237 \pm 0.175$  | 1.35                | $-0.037 \pm 0.258$ | $0.234 \pm 0.192$ |
| PRF-fit source offset from KIC position | $0.162 \pm 0.188$  | 0.86                | $-0.096 \pm 0.235$ | $0.130 \pm 0.157$ |
| photometric centroid source offset      | $0.54 \pm 0.50$    | 1.09                | $0.51 \pm 0.51$    | $-0.19 \pm 0.44$  |



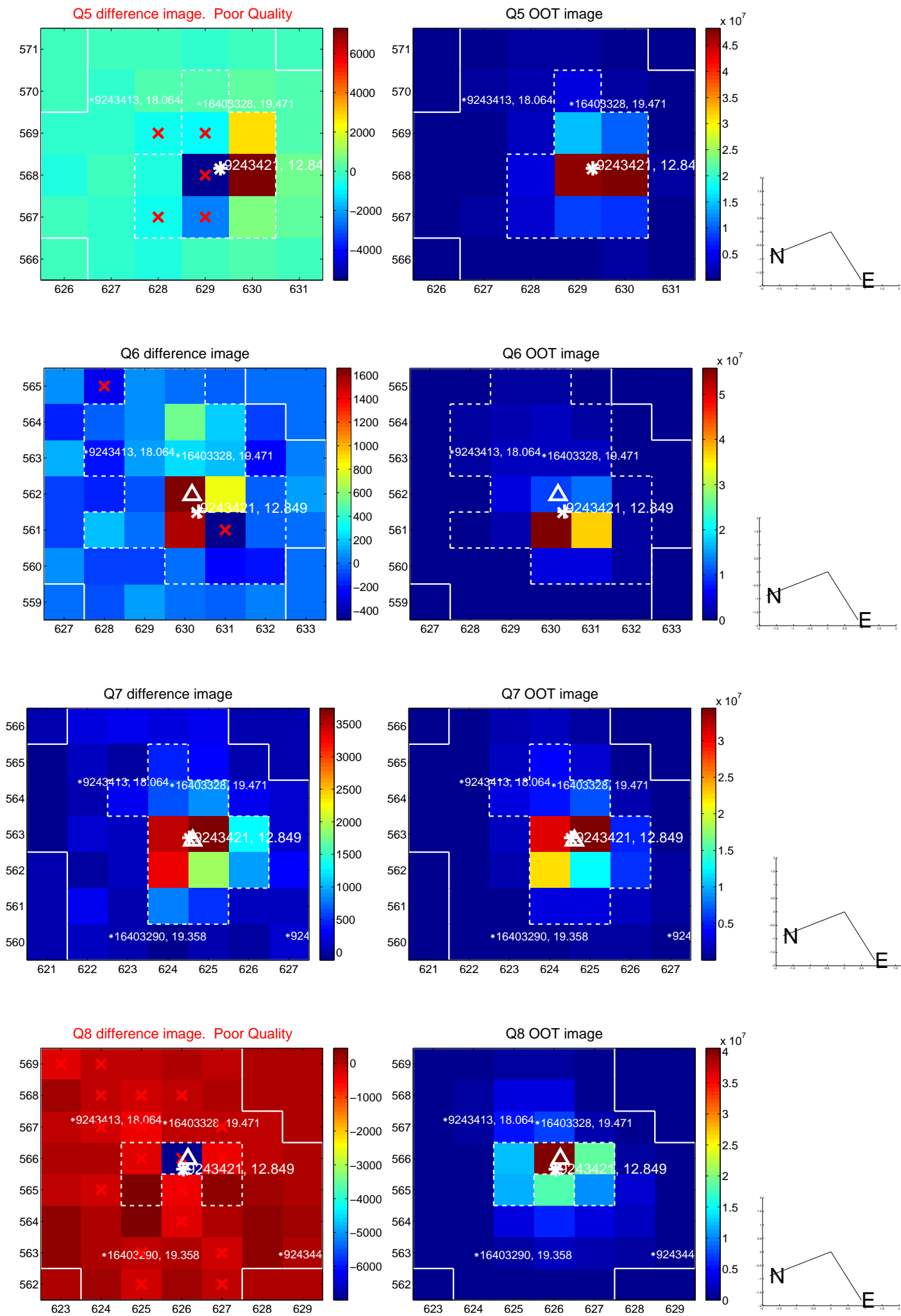
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

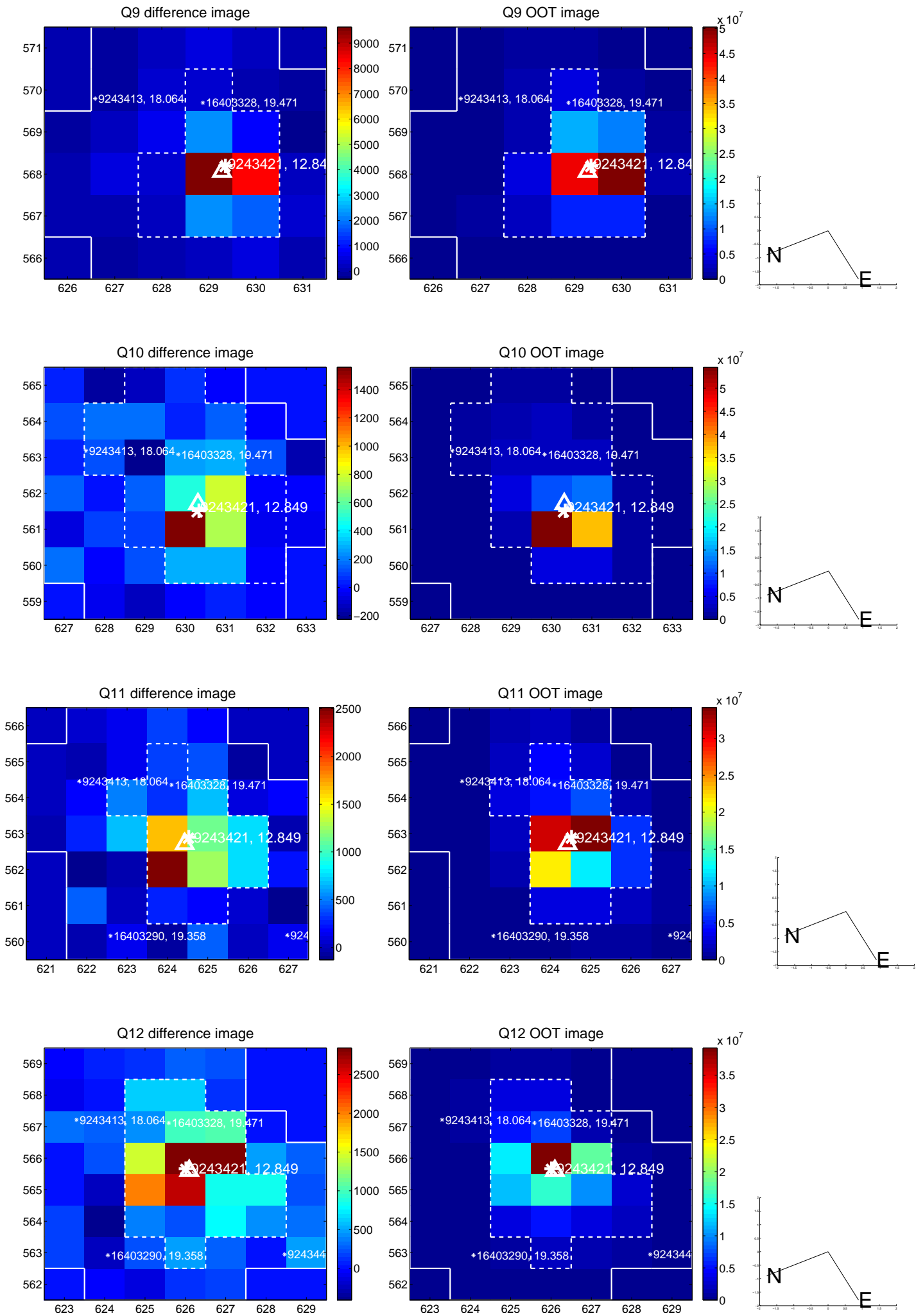




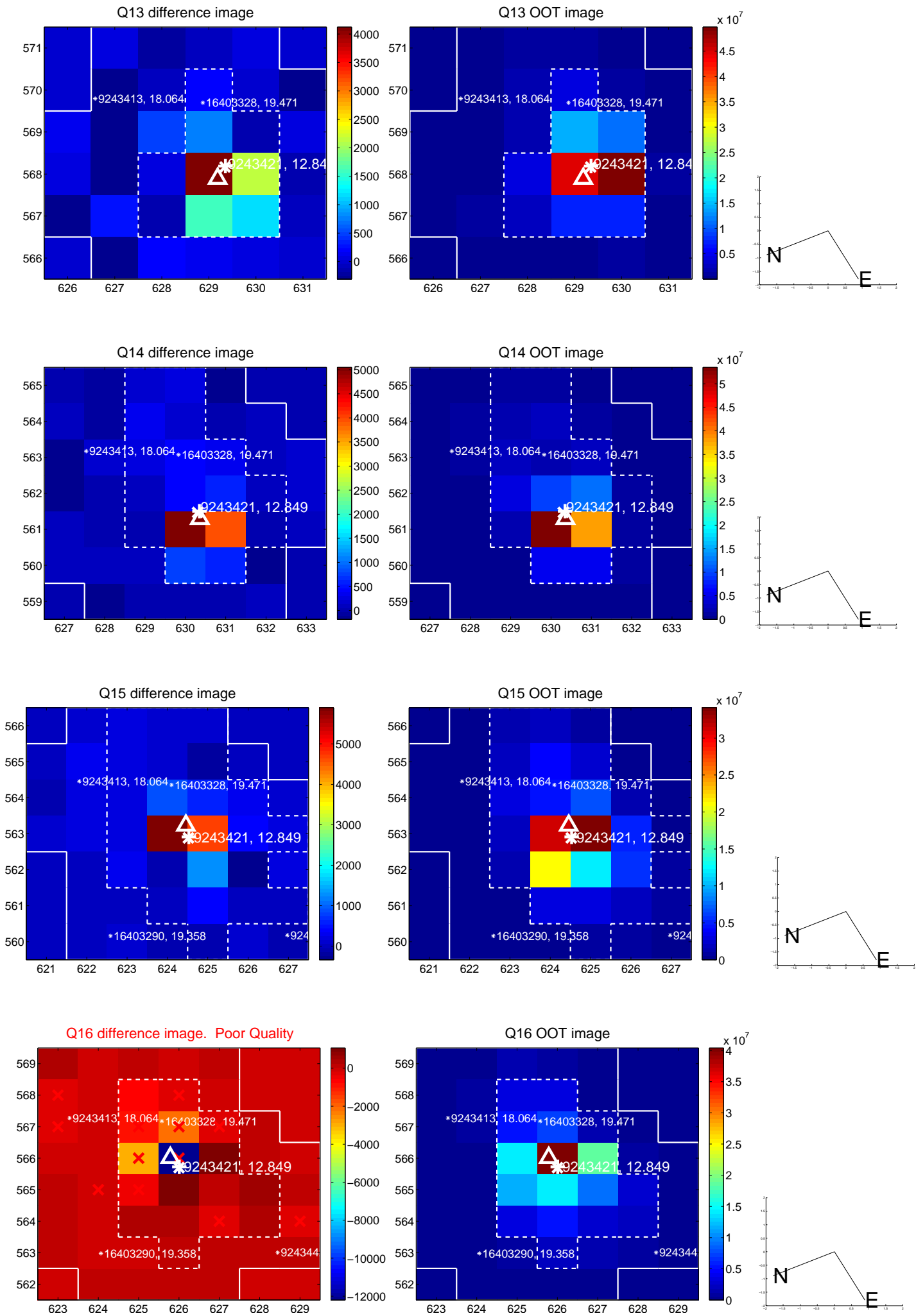
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



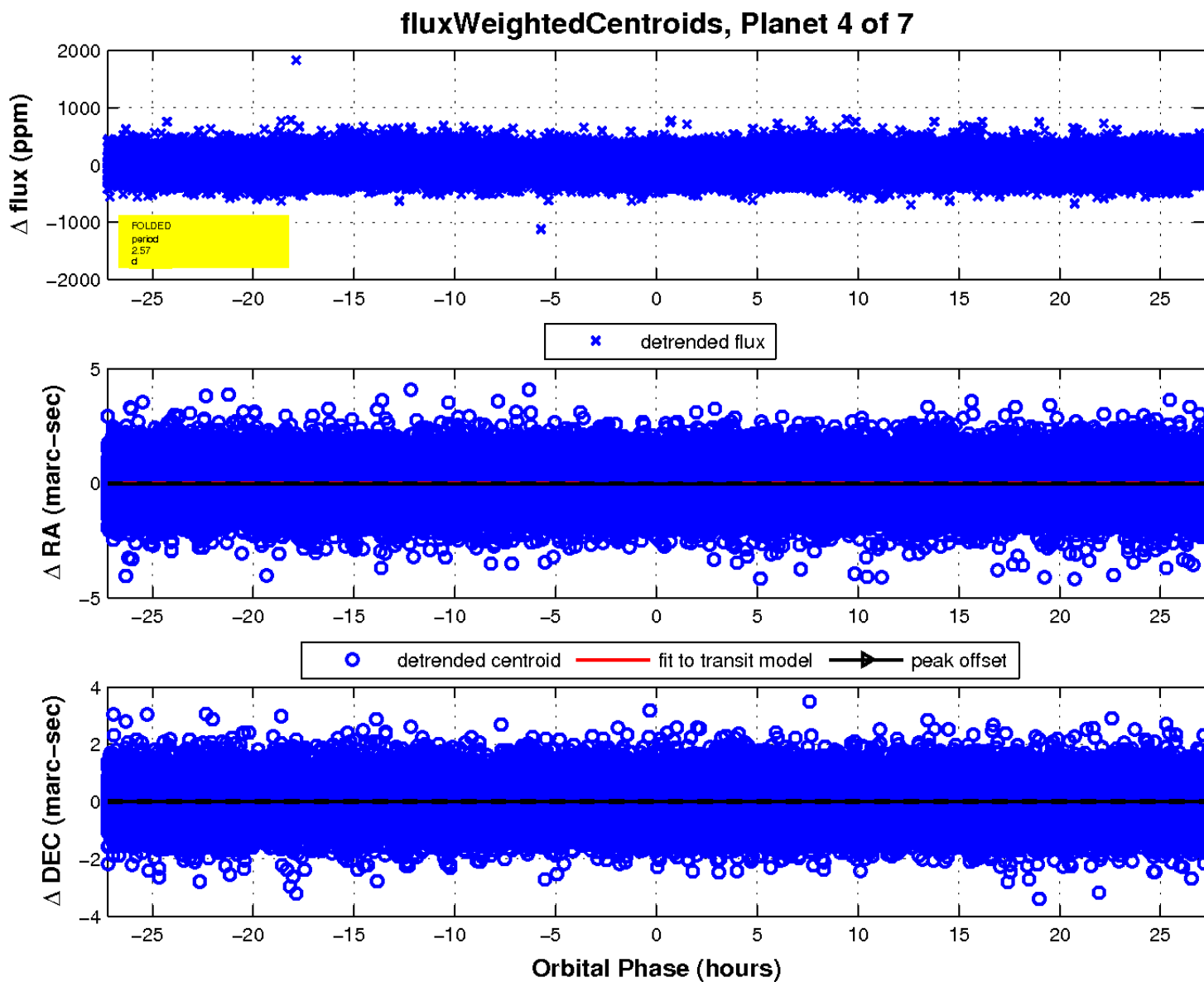
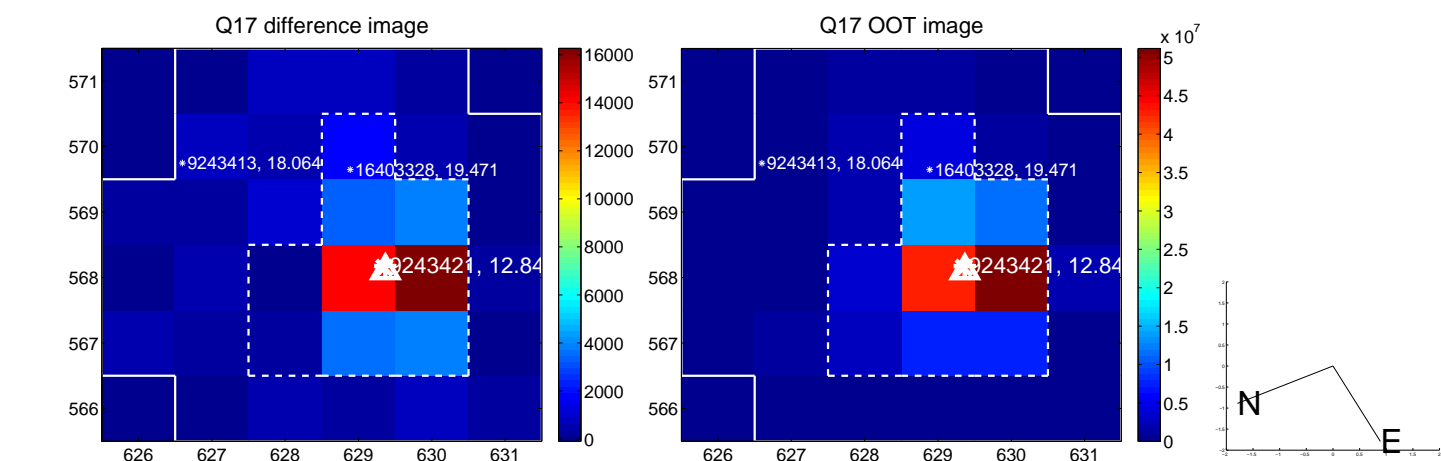
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

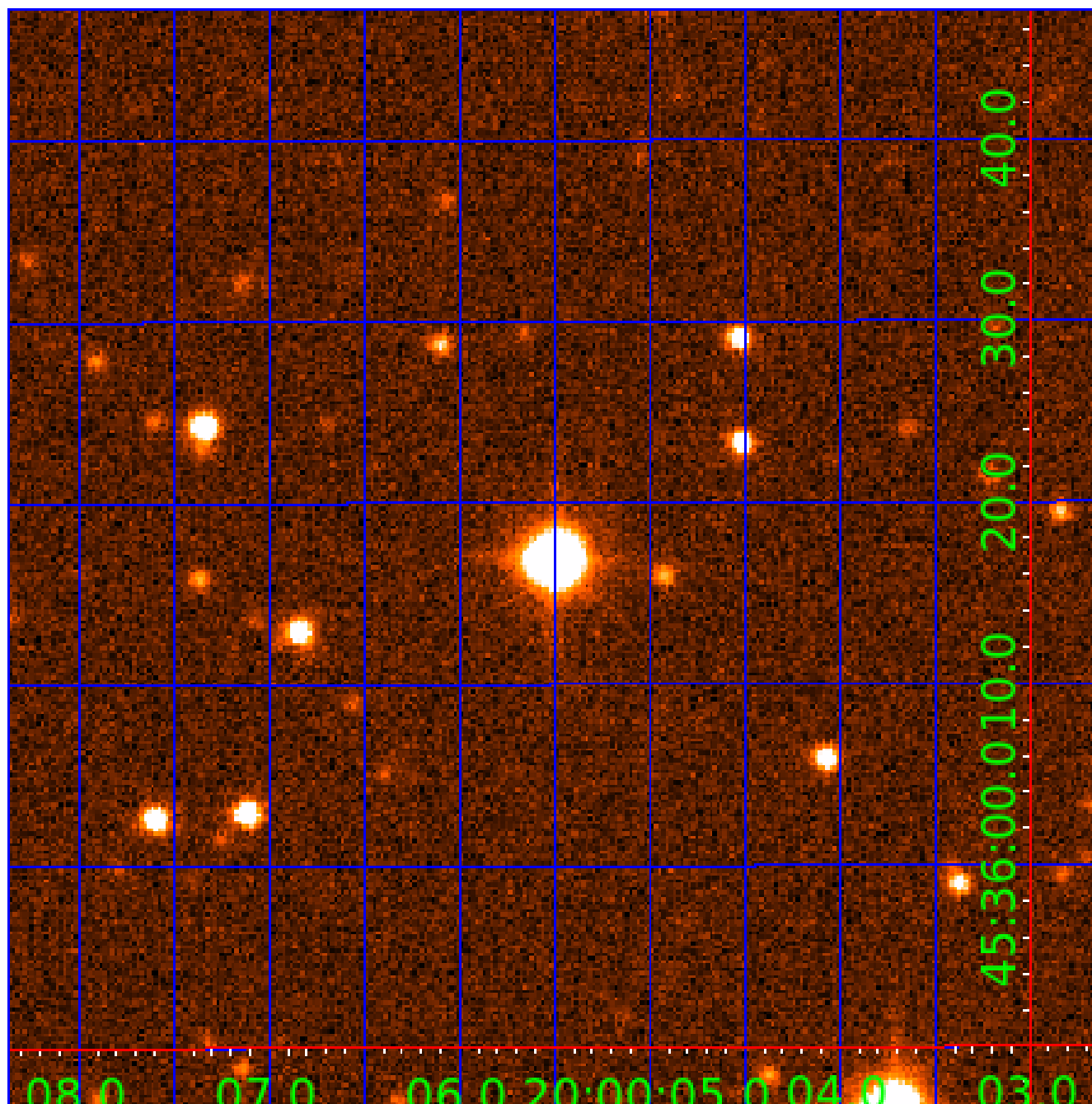


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009243421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009243421-01 | OBS      | No   | 1.198209      | 132.236181   | 31.8        | 3.815            | 10.9 | 11.7 | 4.59                        | 6331            | 3.01                   | 41542.18               |
| 009243421-02 | OBS      | No   | 2.571808      | 132.660977   | 39.4        | 6.612            | 8.5  | 9.5  | 4.59                        | 6331            | 3.32                   | 15004.26               |
| 009243421-03 | OBS      | No   | 154.192245    | 235.238303   | 126.2       | 9.905            | 11.7 | 4.7  | 4.59                        | 6331            | 5.54                   | 63.94                  |
| 009243421-04 | OBS      | No   | 2.569394      | 133.568846   | 52.7        | 9.075            | 7.9  | 10.1 | 4.59                        | 6331            | 3.88                   | 15023.05               |
| 009243421-05 | OBS      | No   | 18.484254     | 145.906309   | 78.3        | 7.890            | 7.6  | 6.1  | 4.59                        | 6331            | 4.48                   | 1081.76                |
| 009243421-06 | OBS      | No   | 42.090762     | 137.660605   | 169.3       | 6.557            | 7.9  | 8.4  | 4.59                        | 6331            | 6.55                   | 361.09                 |
| 009243421-07 | OBS      | No   | 152.795479    | 152.270891   | 252.5       | 3.580            | 7.5  | 7.7  | 4.59                        | 6331            | 8.17                   | 64.72                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 009243421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT   |
| 009243421-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—<br>MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—HALO_GHOST |
| 009243421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009243421-06 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—HALO_GHOST   |
| 009243421-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>CENT_FEW_DIFFS                    |

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

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

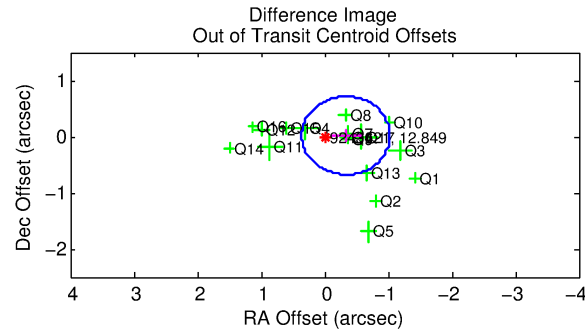
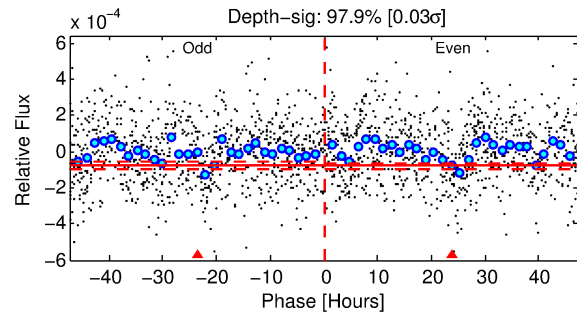
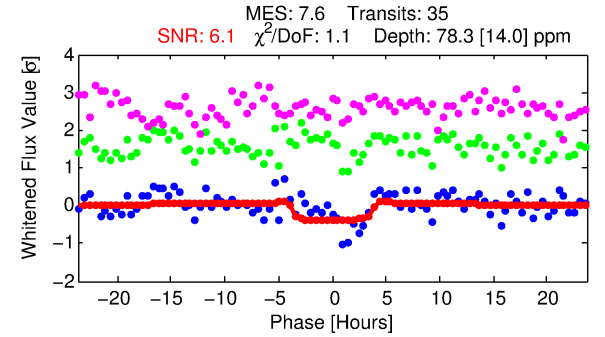
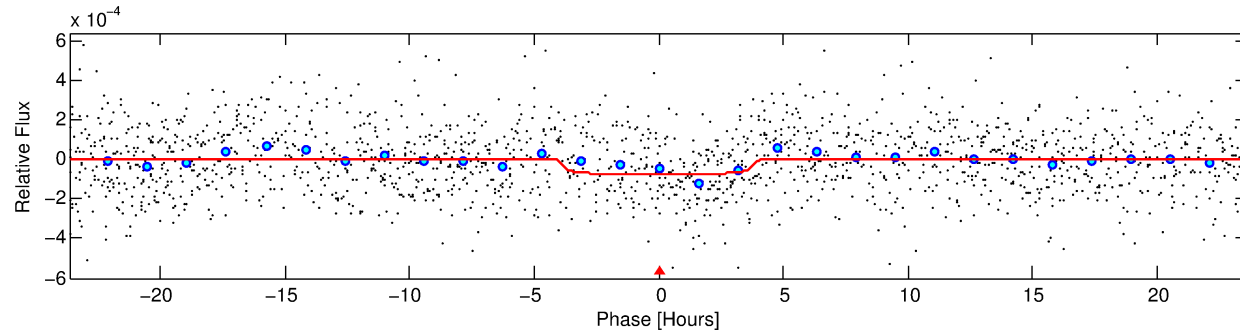
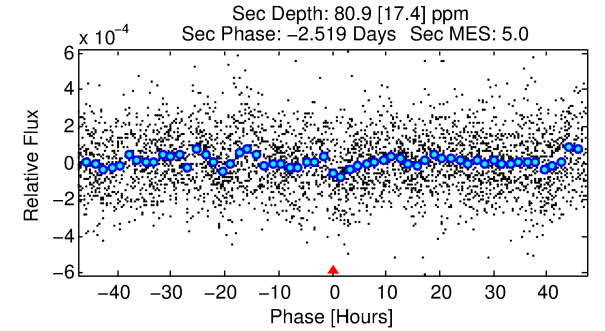
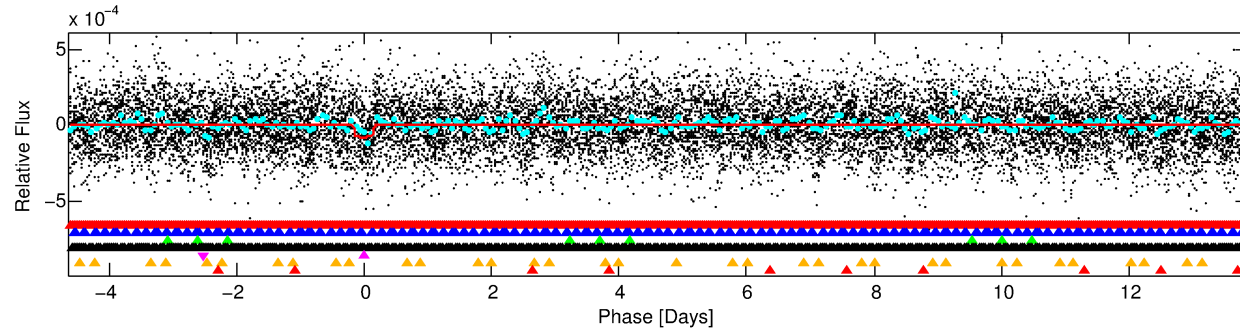
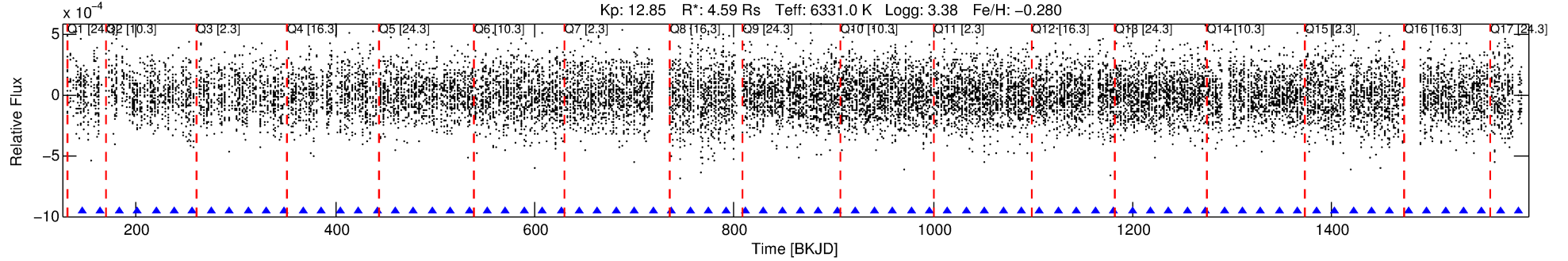
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009243421-05

No Significant Match Found

# DV One-Page Summary

KIC: 9243421 Candidate: 5 of 7 Period: 18.484 d



## DV Fit Results:

Period = 18.48425 [0.00051] d  
Epoch = 145.9063 [0.0216] BKJD  
Rp/R\* = 0.0089 [0.0057]  
a/R\* = 11.11 [38.26]  
b = 0.80 [1.60]  
Seff = 1081.76 [758.62]  
Teq = 1462 [256] K  
Rp = 4.48 [3.45] Re  
a = 0.1674 [0.0715] AU  
Ag = 62.14 [90.81] [0.67σ]  
Teffp = 6348 [2054] K [2.36σ]

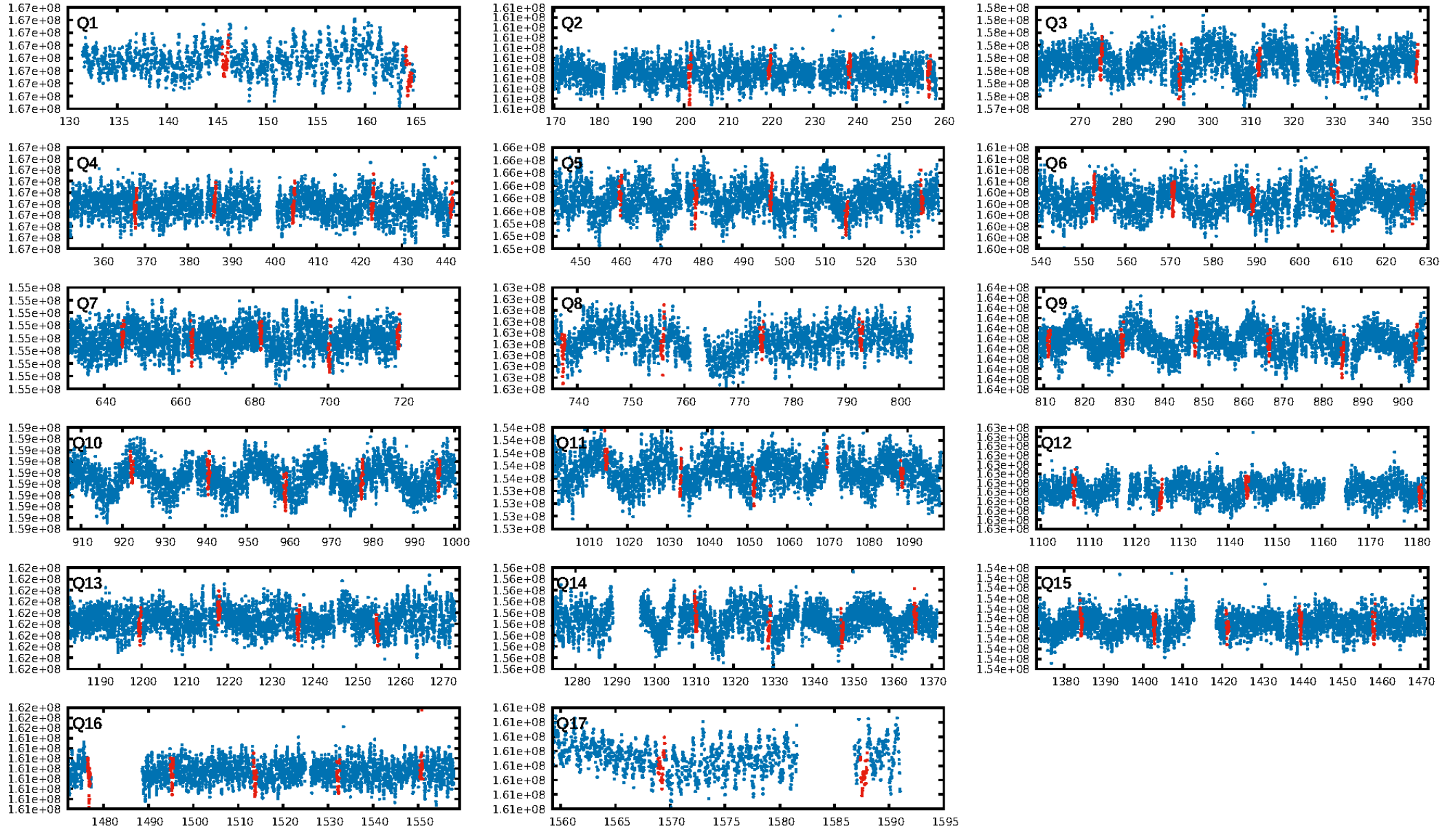
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [37.10σ]  
LongPeriod-sig: 100.0% [55.23σ]  
ModelChiSquare2-sig: 0.5%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.35e-09**  
RollingBand-fgt: 1.00 [34/34]  
GhostDiagnostic-chr: 1.029  
Centroid-sig: 30.0%  
Centroid-so: 0.779 arcsec [0.93σ]  
OotOffset-rm: 0.333 arcsec [1.44σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-rm: 0.454 arcsec [2.06σ]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

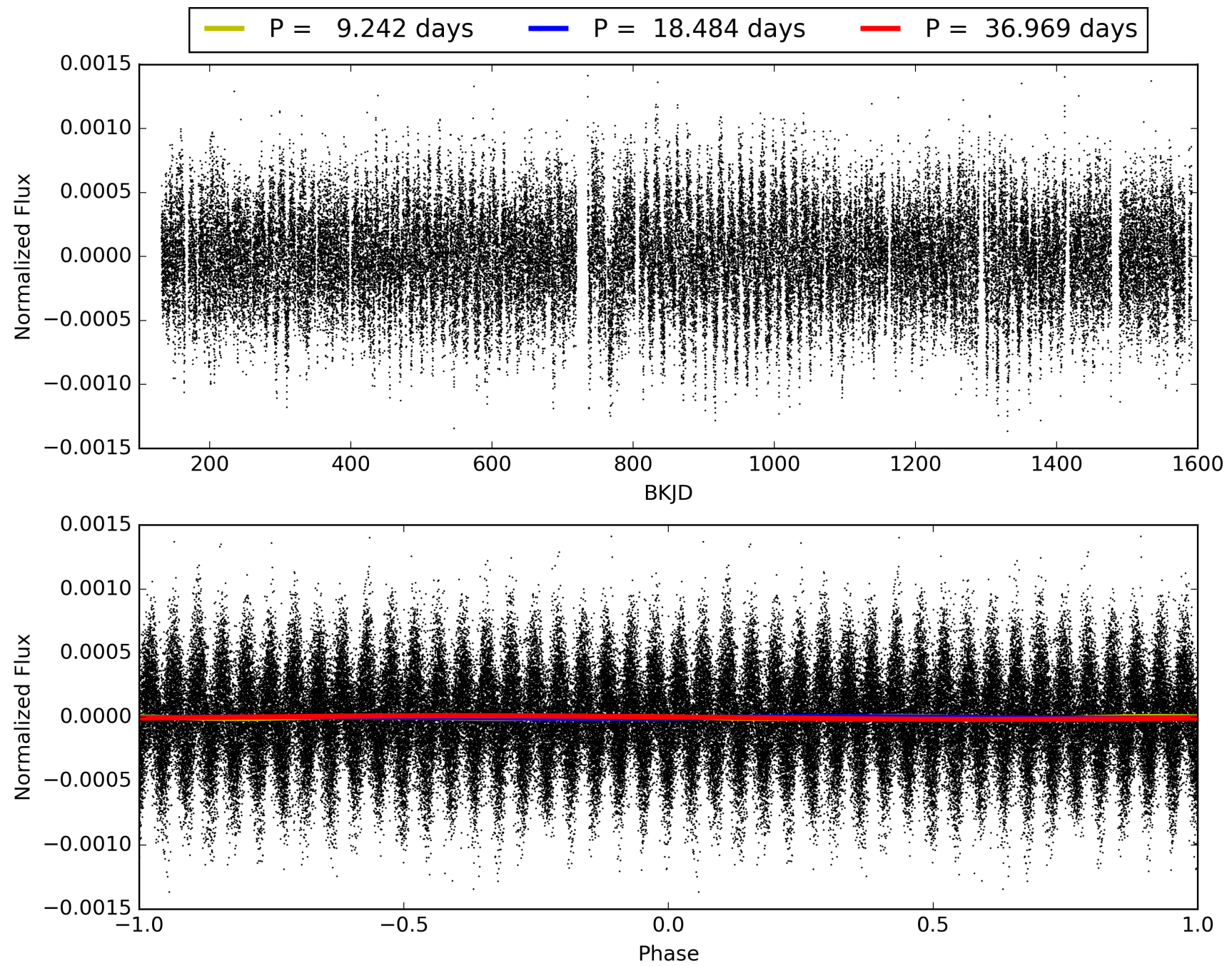
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 07:14:42 Z

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

# TCE 009243421-05, PDC Light Curves



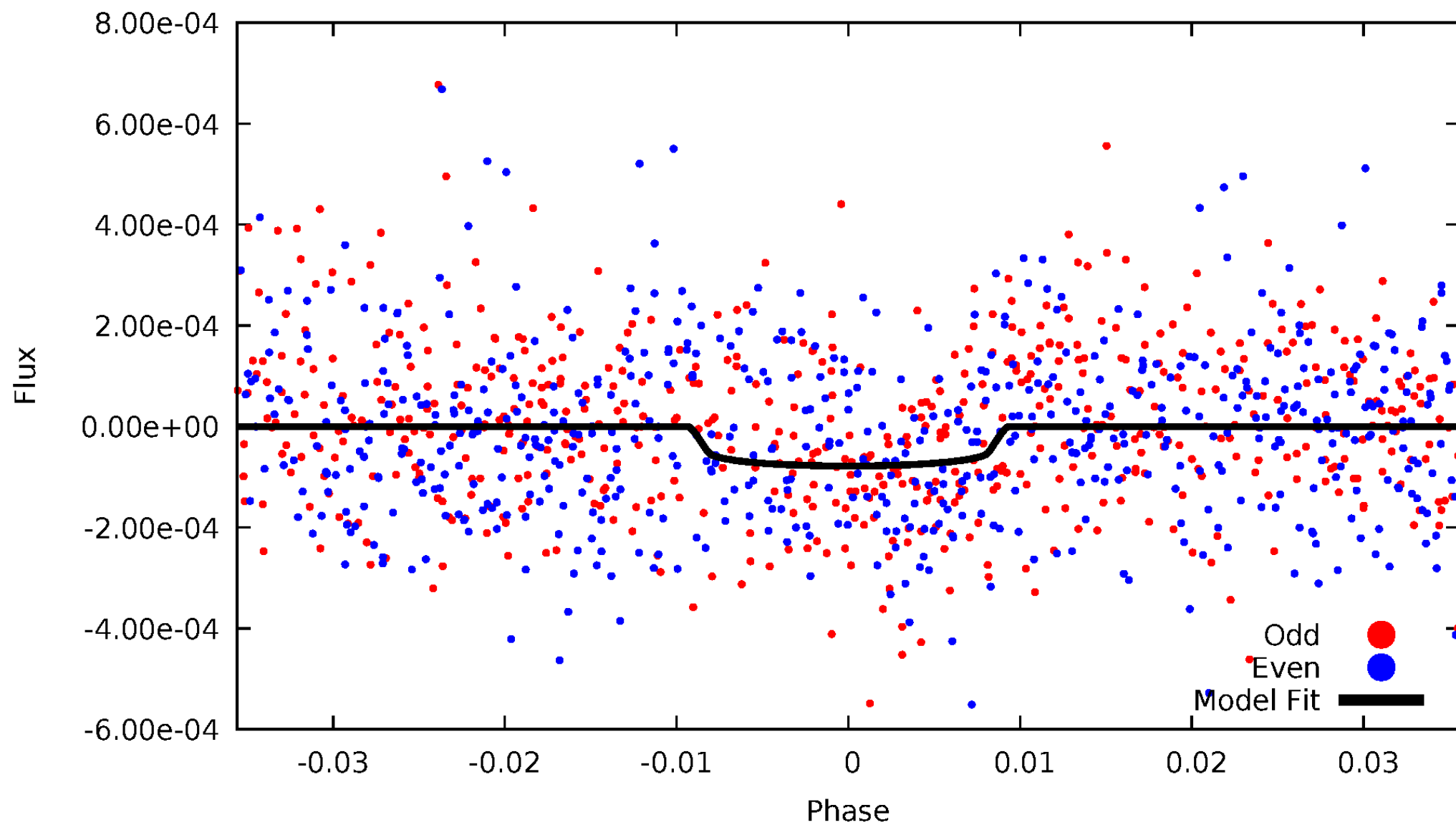
TCE 009243421-05





# DV Odd/Even

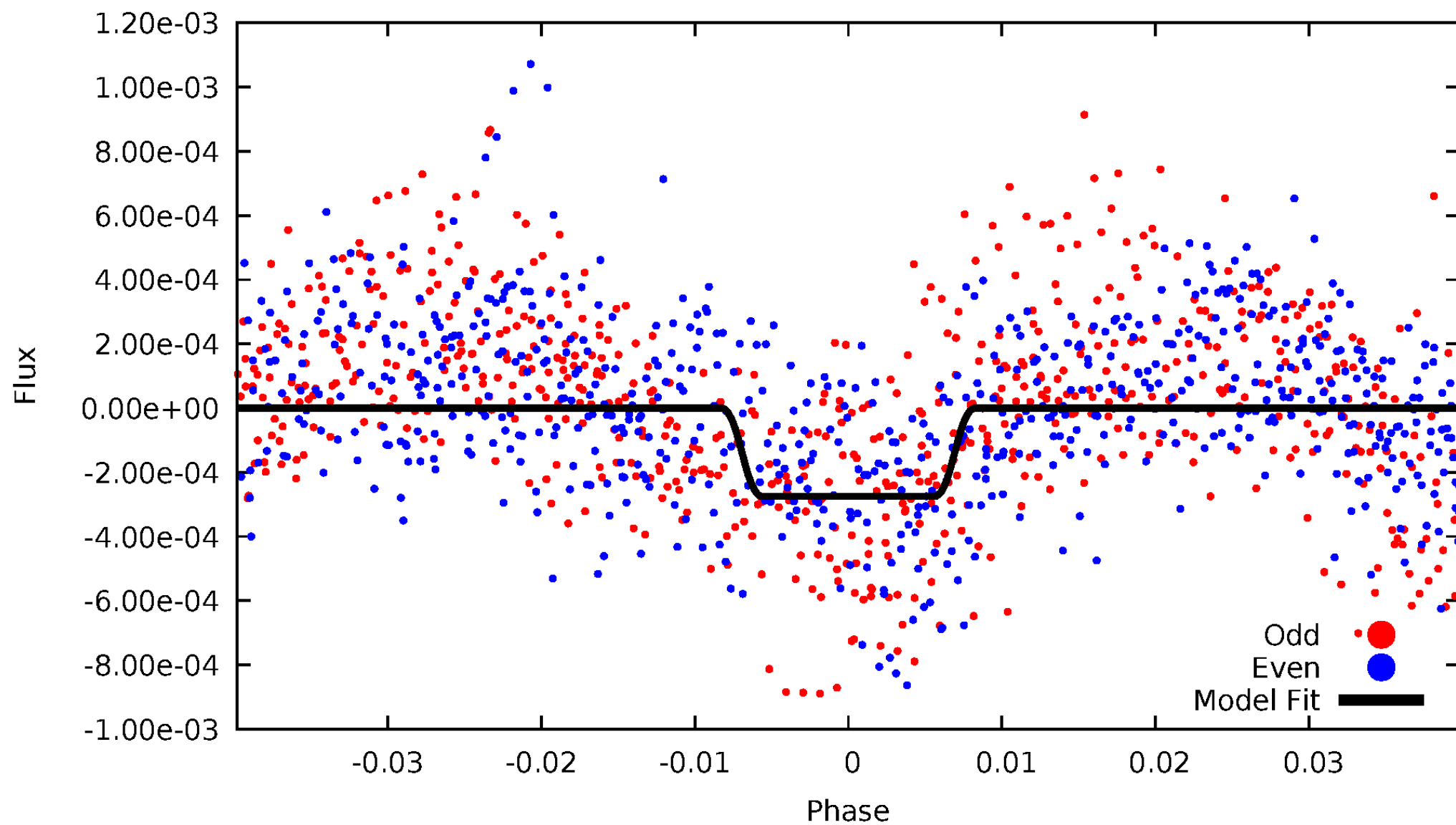
TCE 009243421-05





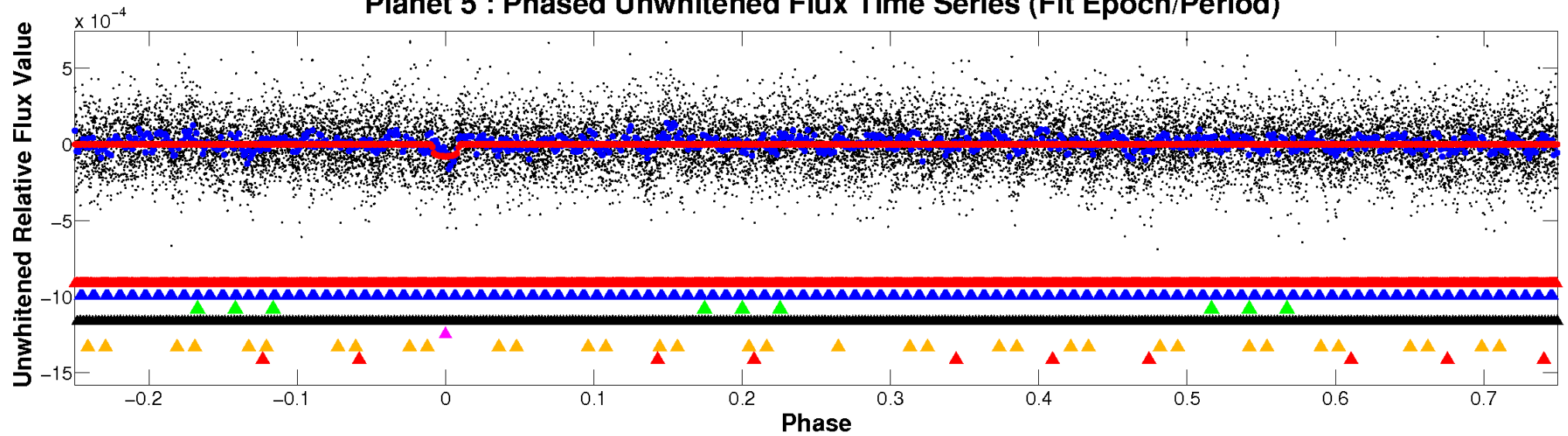
# ALT Odd/Even

TCE 009243421-05

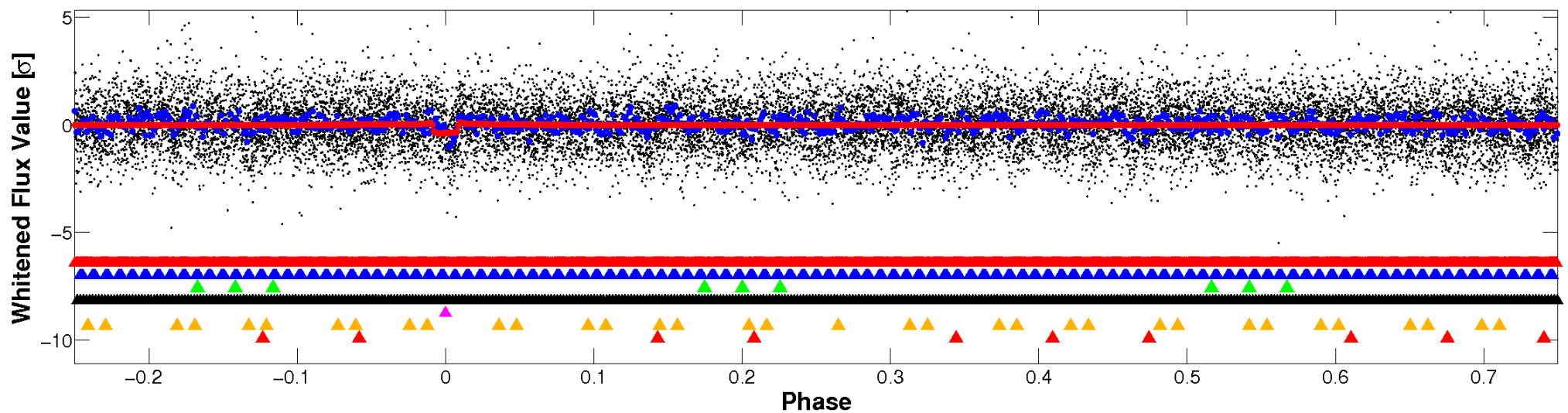


# Non-Whitened Vs. Whitened Light Curve

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

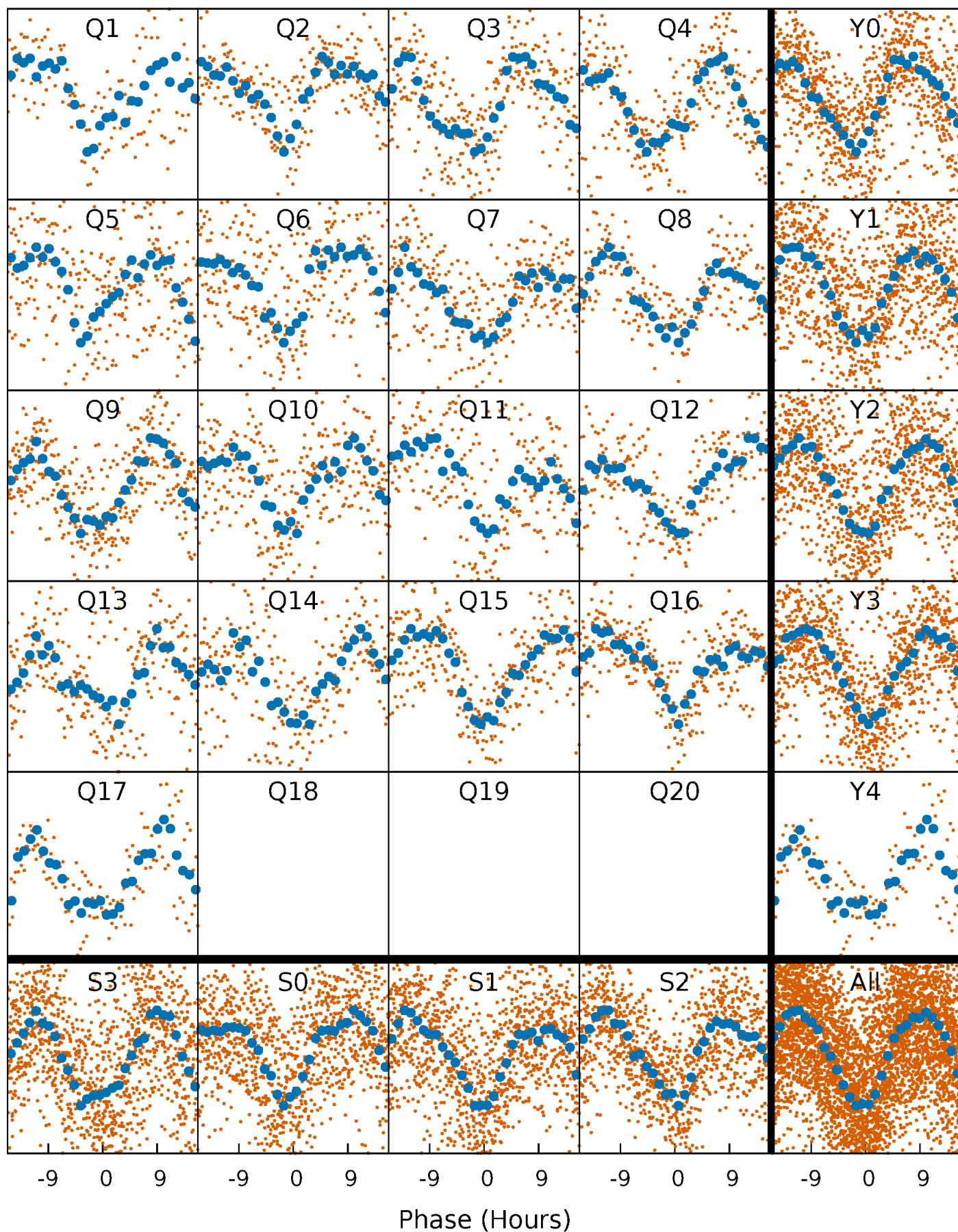


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



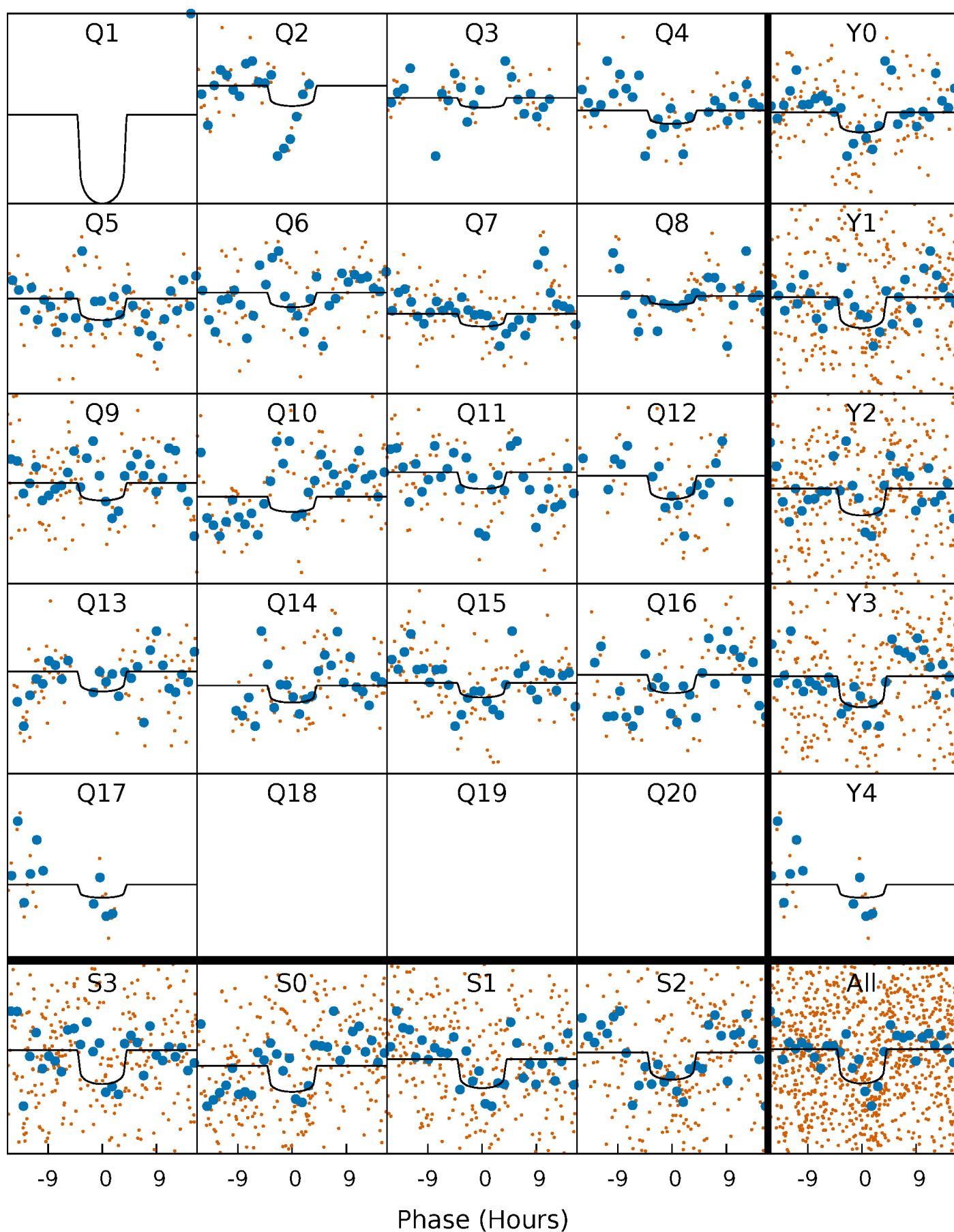
# PDC Quarter-Phased Transit Curves

TCE 009243421-05   P= 18.484254 Days    $T_0=145.906309$  (BKJD)



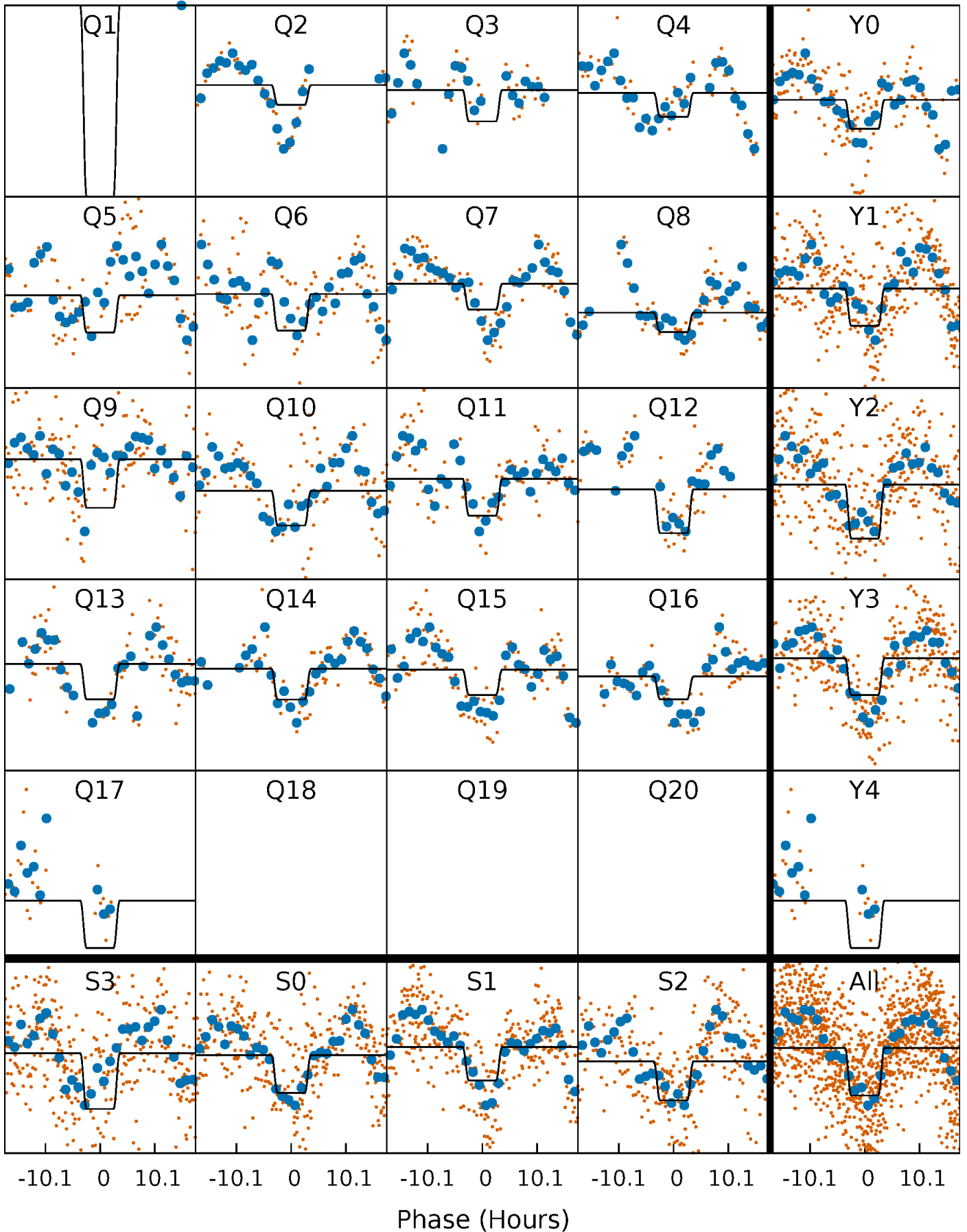
# DV Quarter-Phased Transit Curves

TCE 009243421-05   P= 18.484254 Days    $T_0=145.906309$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009243421-05   P= 18.484378 Days    $T_0=145.896091$  (BKJD)

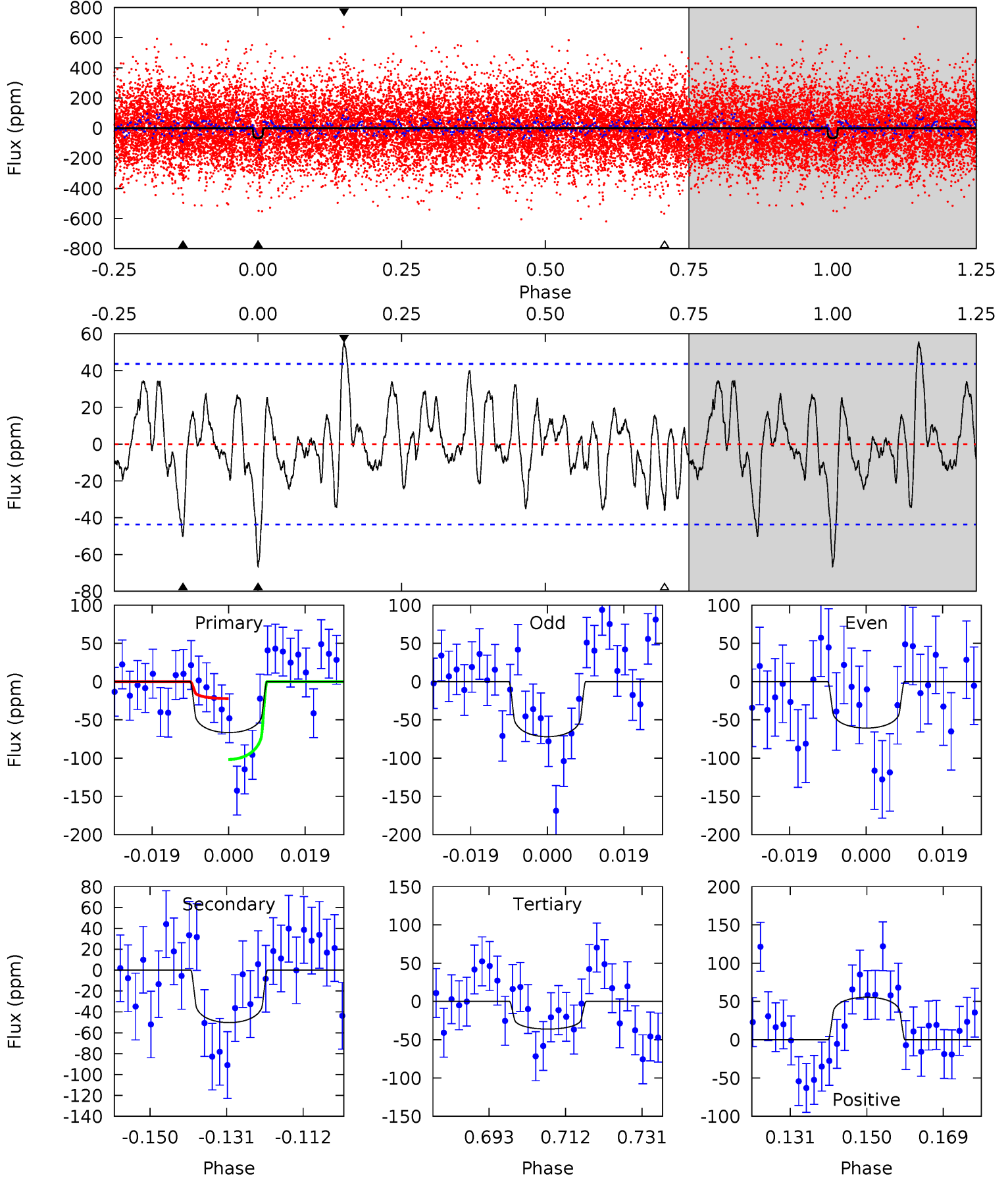




# DV Model-Shift Uniqueness Test

009243421-05, P = 18.484254 Days, E = 127.422055 Days

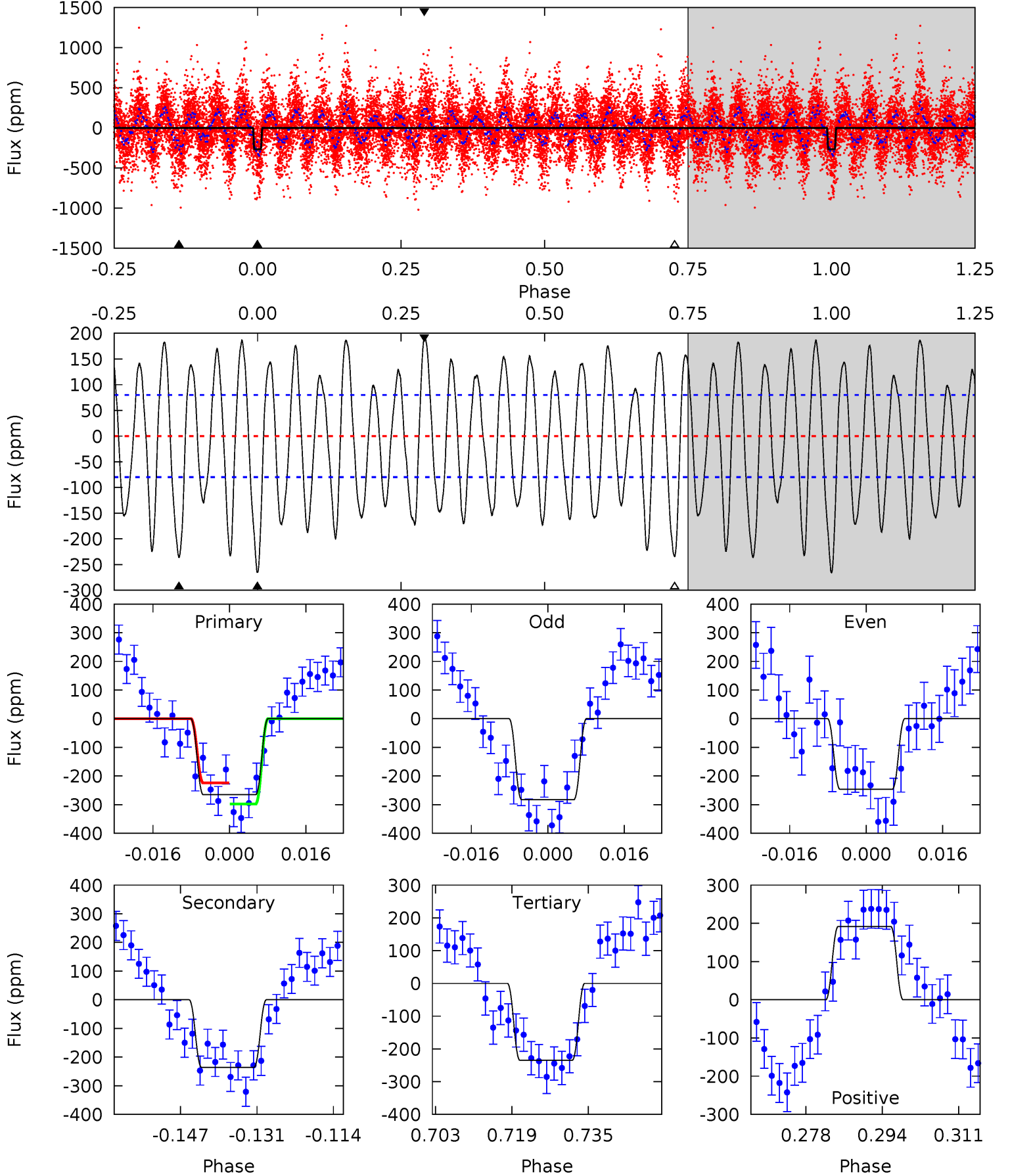
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.48 | 5.64 | 4.05 | 6.24 | 4.90            | 2.35            | 1.82             | 3.43    | 1.24    | 1.59    | -0.60   | 0.63    | 0.82 | 0.45  | 4.44 |



# Alt Model-Shift Uniqueness Test

009243421-05, P = 18.484378 Days, E = 127.411713 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 16.4 | 14.6 | 14.5 | 11.8 | 4.93            | 2.40            | 7.13             | 1.89    | 4.53    | 0.07    | 2.72    | 1.12    | 1.25 | 0.42  | 2.23 |



### Stellar Parameters For KIC 009243421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6331^{+195}_{-176}$ | $3.377^{+0.408}_{-0.072}$ | $-0.280^{+0.400}_{-0.300}$ | $4.588^{+0.666}_{-1.999}$ | $1.832^{+0.125}_{-0.468}$ | $0.027^{+0.099}_{-0.006}$                     |
|        | +3%/-3%              | +12%/-2%                  | +143%/-107%                | +15%/-44%                 | +7%/-26%                  | +370%/-24%                                    |
| Source | PHO1                 | FLK73                     | 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 009243421-05 / KOI

| Detrend | Depth (ppm)   | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)        | $T_{obs}$ (K)         | $A_{obs}$         |
|---------|---------------|------------------------|----------------------|-----------------------|-------------------|
| DV      | $-50 \pm 9$   | $4.13^{+2.62}_{-2.39}$ | $1975^{+129}_{-195}$ | $5525^{+3255}_{-981}$ | $44^{+215}_{-28}$ |
| Alt.    | $-236 \pm 16$ | $7.22^{+3.20}_{-2.54}$ | $1972^{+134}_{-217}$ | $6123^{+1481}_{-883}$ | $66^{+98}_{-33}$  |

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

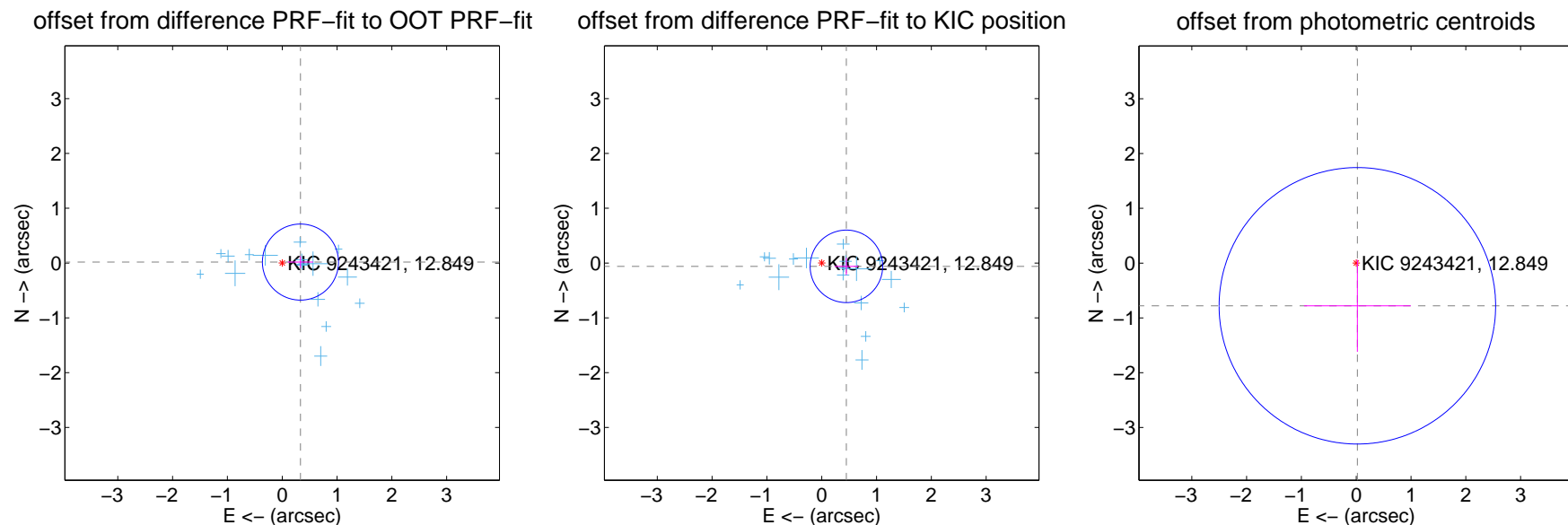
## DV Centroid Data

Supplemental centroid analysis for 009243421-05. Kepler magnitude: 12.85. Transit SNR 6.14

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

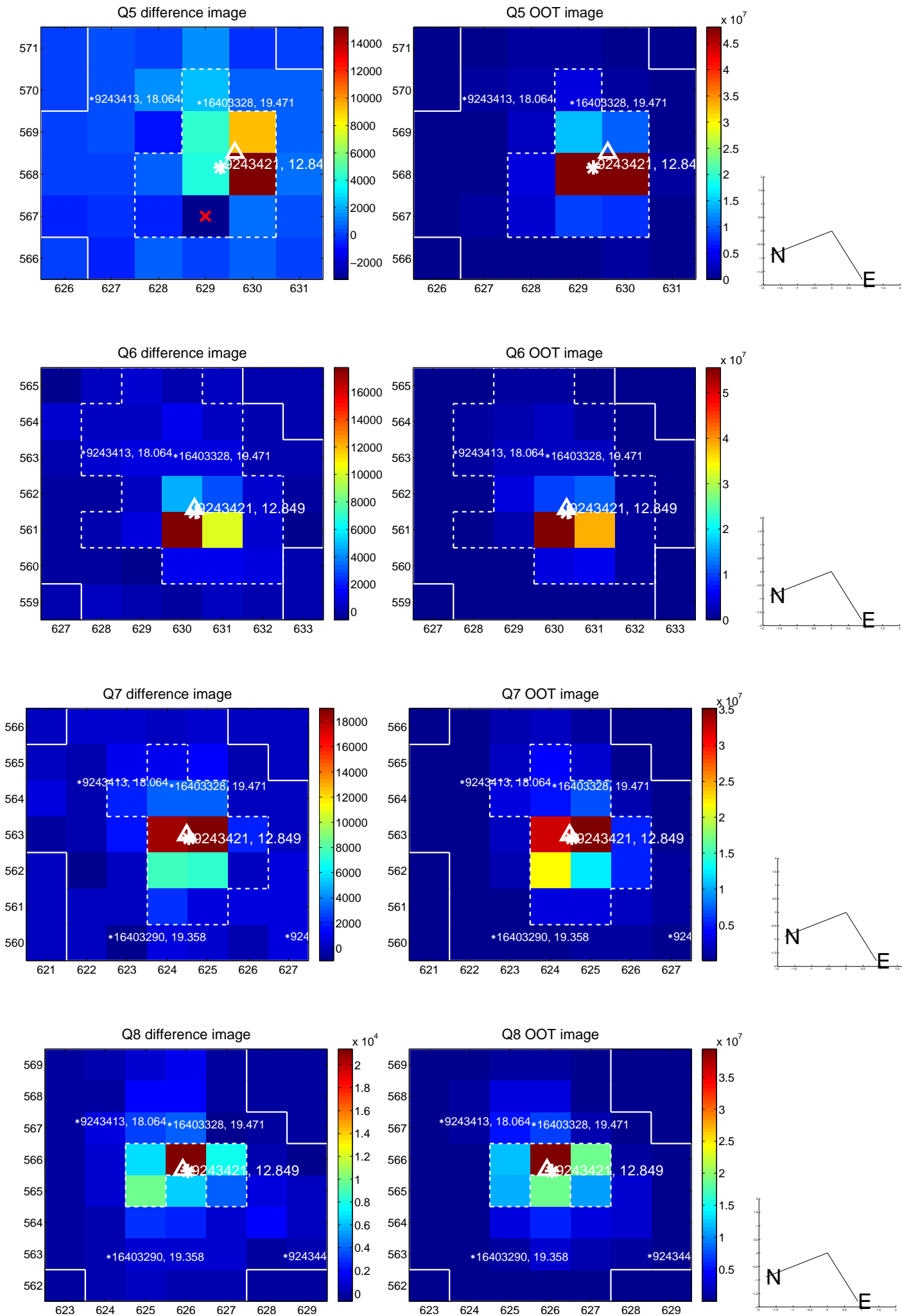
|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.333 \pm 0.231$  | 1.44                | $-0.333 \pm 0.232$ | $0.017 \pm 0.108$  |
| PRF-fit source offset from KIC position | $0.454 \pm 0.220$  | 2.06                | $-0.450 \pm 0.215$ | $-0.060 \pm 0.157$ |
| photometric centroid source offset      | $0.78 \pm 0.84$    | 0.93                | $-0.02 \pm 0.97$   | $-0.78 \pm 0.84$   |



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

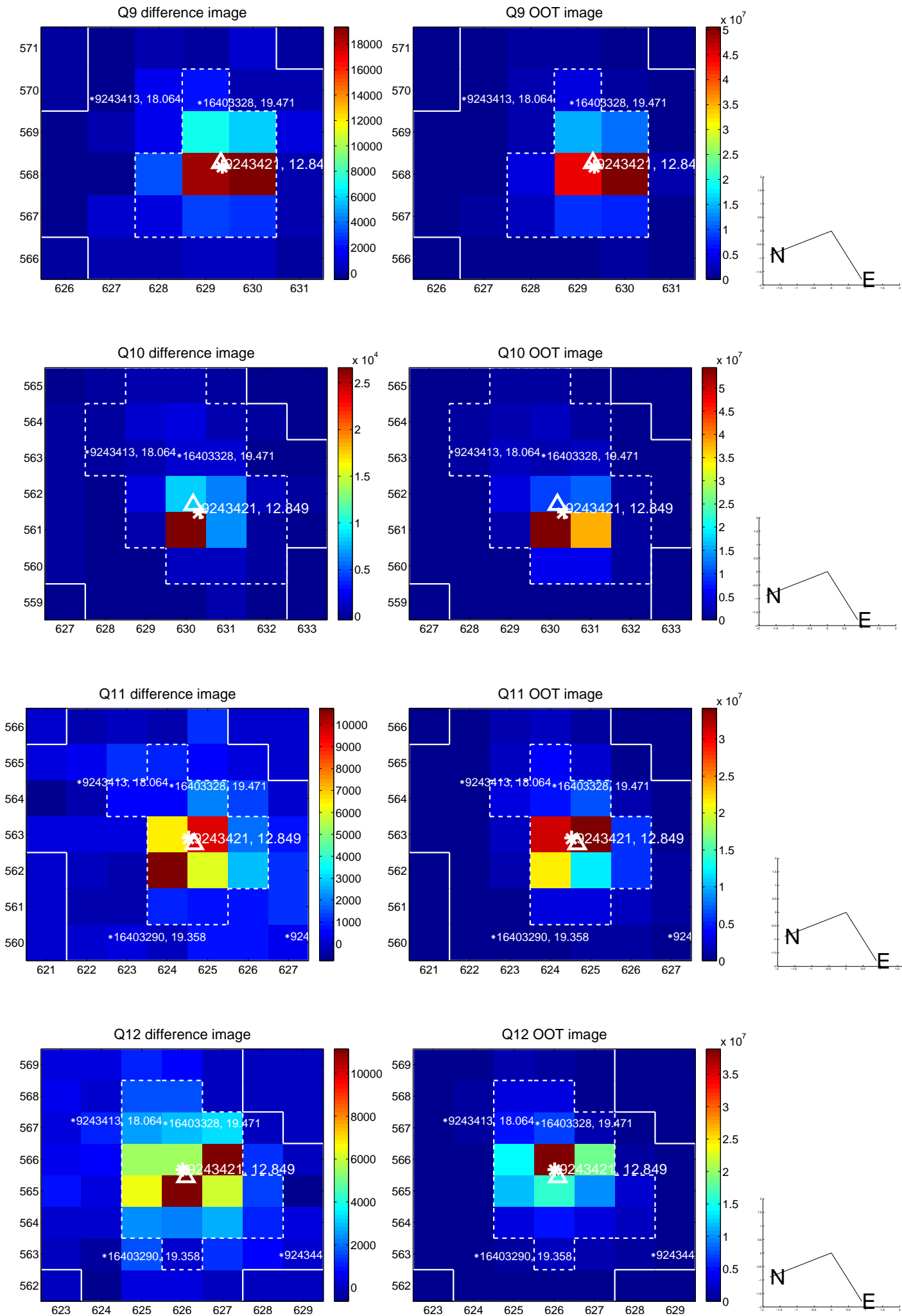


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

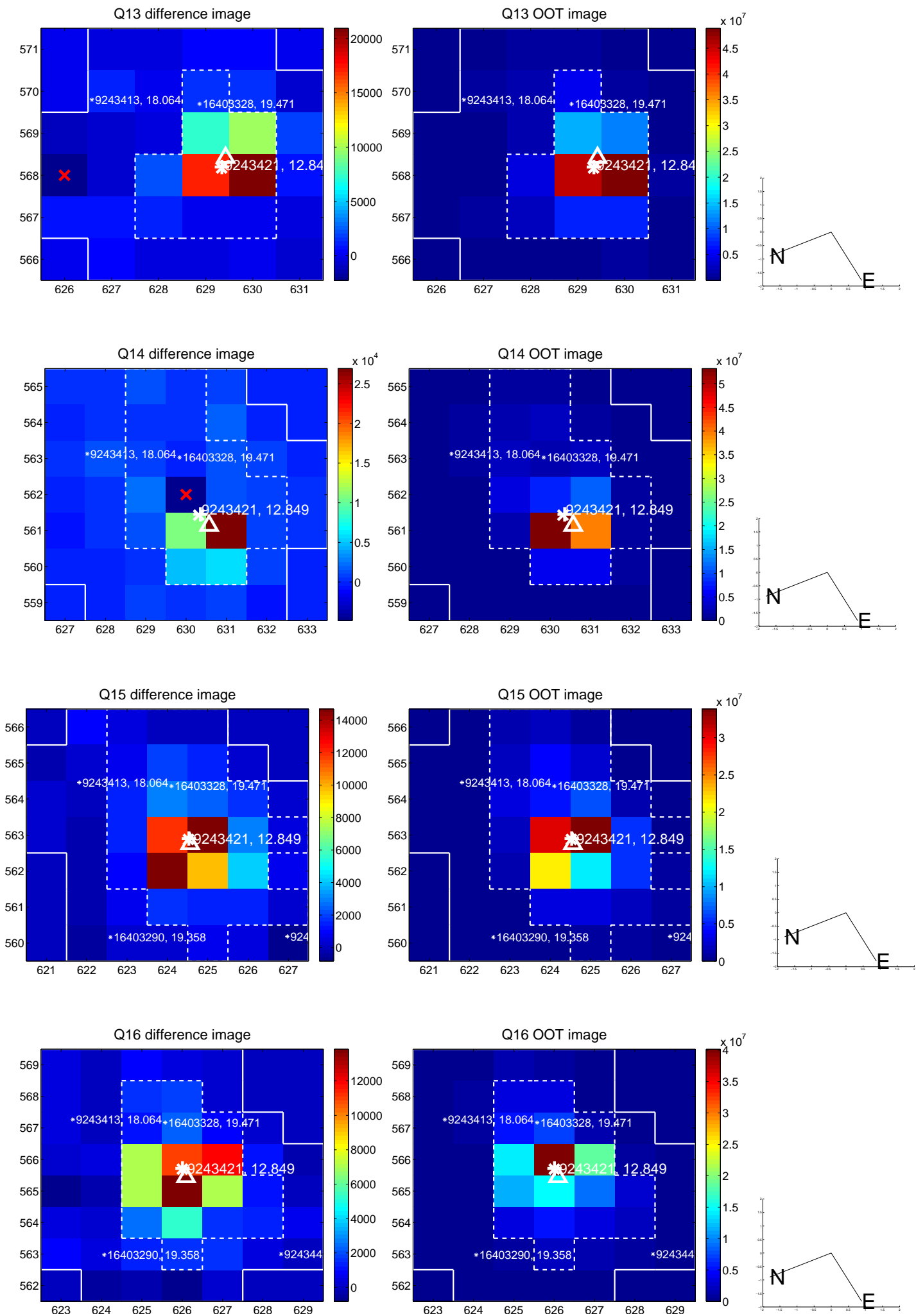




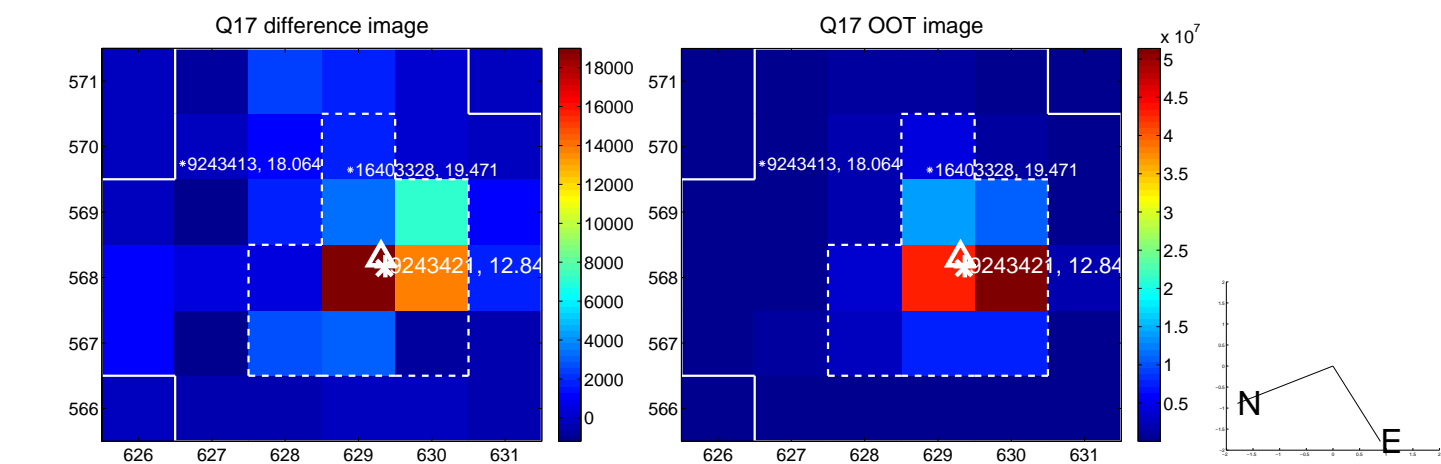
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



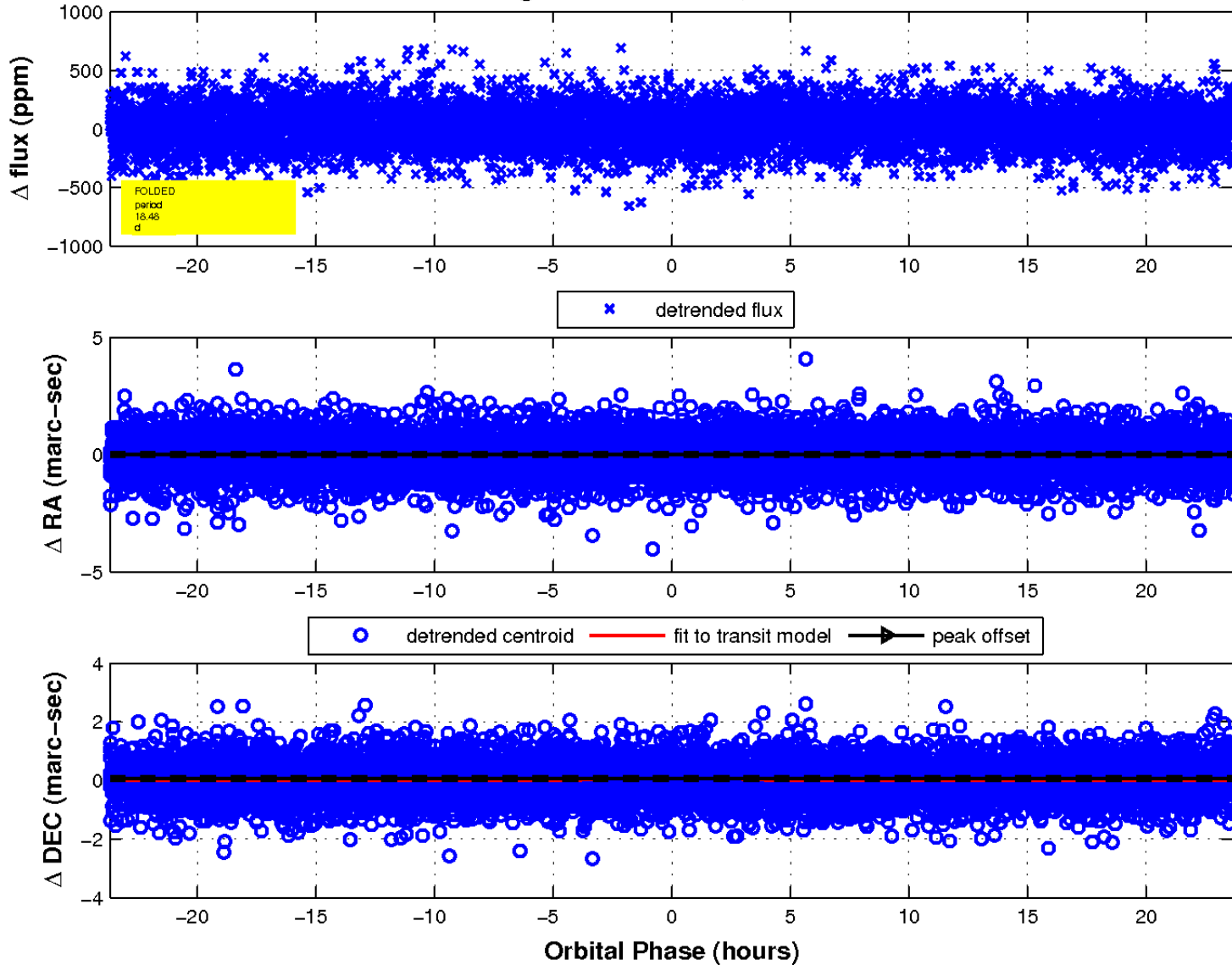
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

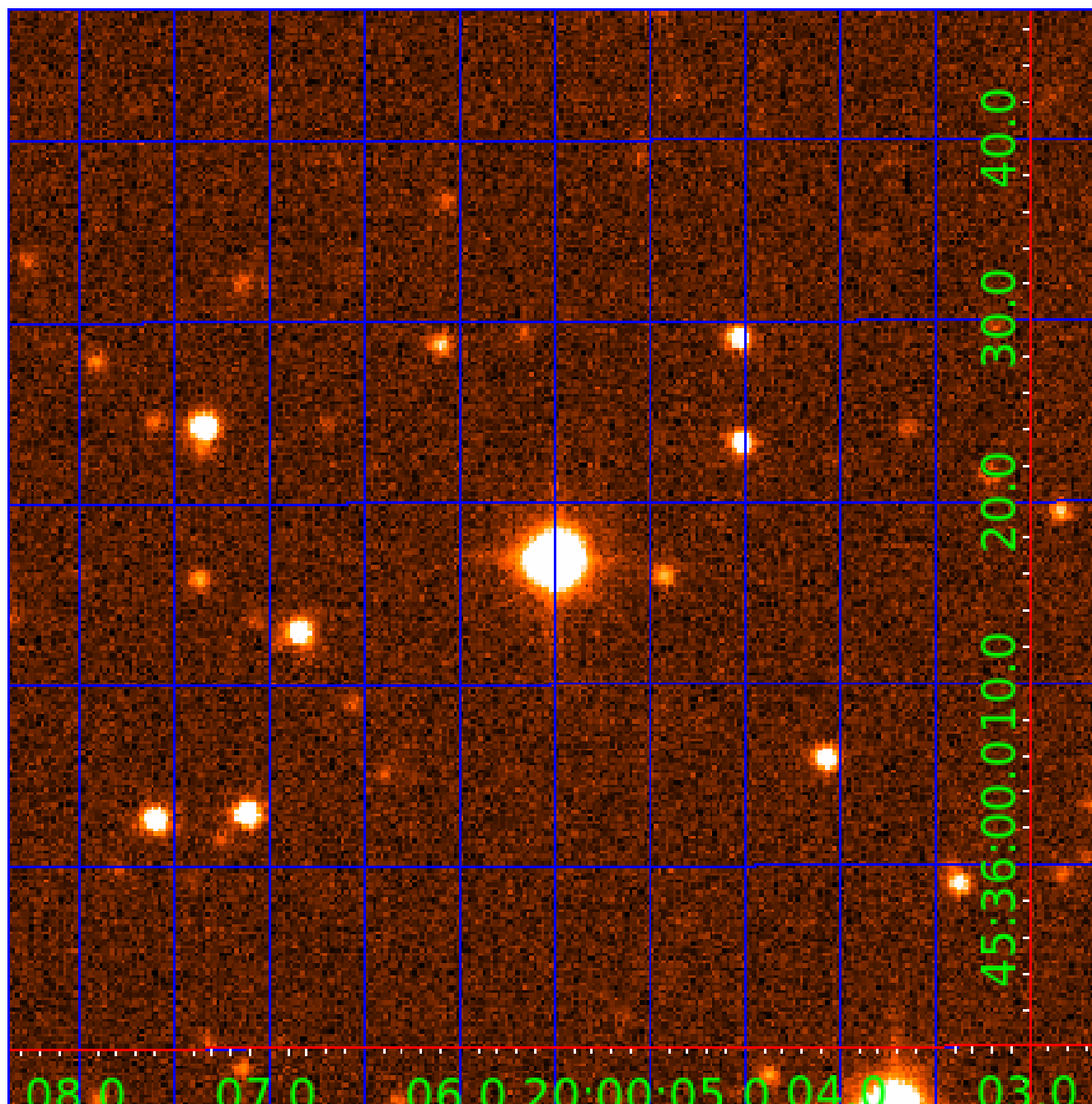


fluxWeightedCentroids, Planet 5 of 7



UKIRT Image

Declination



# KIC 009243421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009243421-01 | OBS      | No   | 1.198209      | 132.236181   | 31.8        | 3.815            | 10.9 | 11.7 | 4.59                        | 6331            | 3.01                   | 41542.18               |
| 009243421-02 | OBS      | No   | 2.571808      | 132.660977   | 39.4        | 6.612            | 8.5  | 9.5  | 4.59                        | 6331            | 3.32                   | 15004.26               |
| 009243421-03 | OBS      | No   | 154.192245    | 235.238303   | 126.2       | 9.905            | 11.7 | 4.7  | 4.59                        | 6331            | 5.54                   | 63.94                  |
| 009243421-04 | OBS      | No   | 2.569394      | 133.568846   | 52.7        | 9.075            | 7.9  | 10.1 | 4.59                        | 6331            | 3.88                   | 15023.05               |
| 009243421-05 | OBS      | No   | 18.484254     | 145.906309   | 78.3        | 7.890            | 7.6  | 6.1  | 4.59                        | 6331            | 4.48                   | 1081.76                |
| 009243421-06 | OBS      | No   | 42.090762     | 137.660605   | 169.3       | 6.557            | 7.9  | 8.4  | 4.59                        | 6331            | 6.55                   | 361.09                 |
| 009243421-07 | OBS      | No   | 152.795479    | 152.270891   | 252.5       | 3.580            | 7.5  | 7.7  | 4.59                        | 6331            | 8.17                   | 64.72                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 009243421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT   |
| 009243421-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—<br>MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—HALO_GHOST |
| 009243421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009243421-06 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—HALO_GHOST   |
| 009243421-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>CENT_FEW_DIFFS                    |

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

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

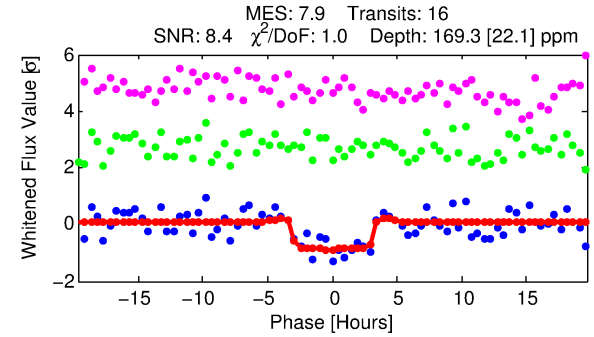
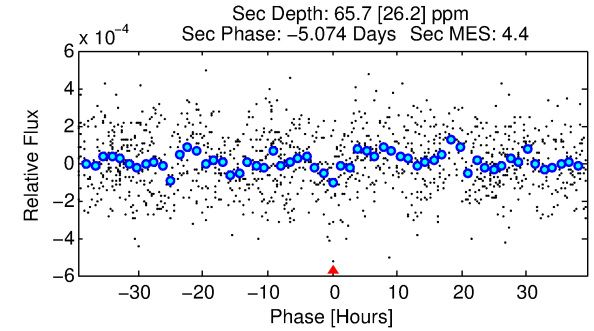
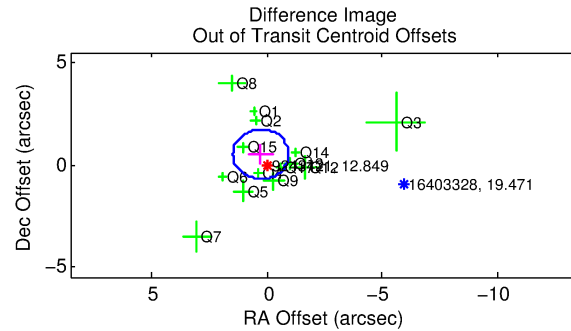
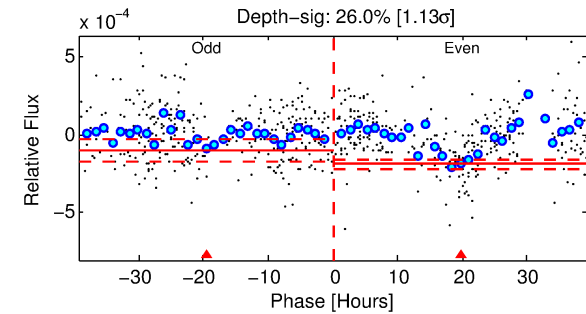
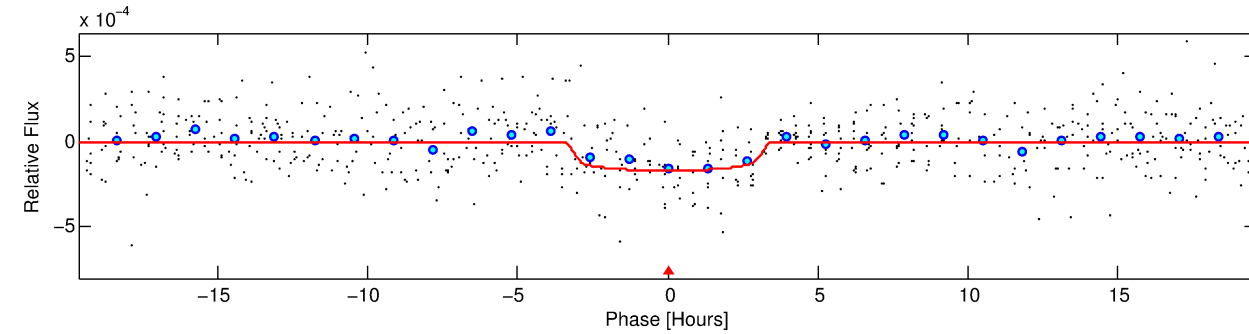
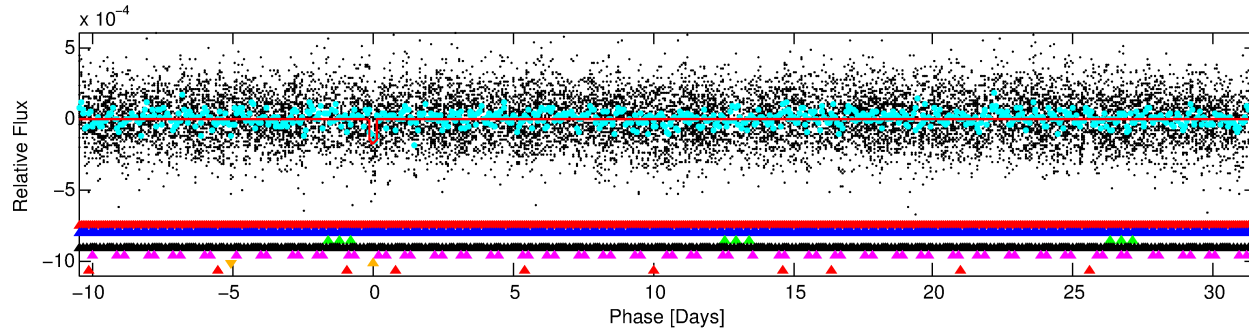
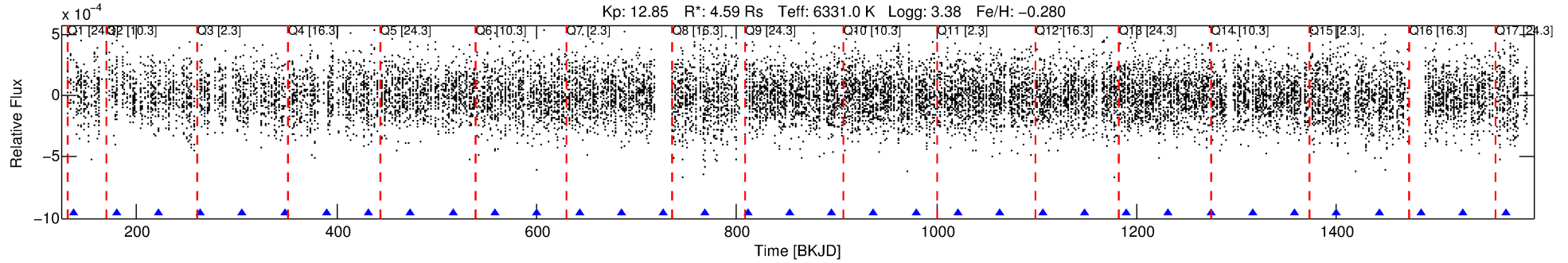
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009243421-06

No Significant Match Found

# DV One-Page Summary

KIC: 9243421 Candidate: 6 of 7 Period: 42.091 d



## DV Fit Results:

Period = 42.09076 [0.00060] d  
Epoch = 137.6606 [0.0129] BKJD  
Rp/R\* = 0.0131 [0.0092]  
a/R\* = 31.53 [121.64]  
b = 0.78 [1.92]  
Seff = 361.09 [253.23]  
Teq = 1112 [195] K  
Rp = 6.55 [5.43] Re  
a = 0.2897 [0.1237] AU  
Ag = 70.67 [114.52] [0.61σ]  
Teffp = 4983 [1833] K [2.10σ]

## DV Diagnostic Results:

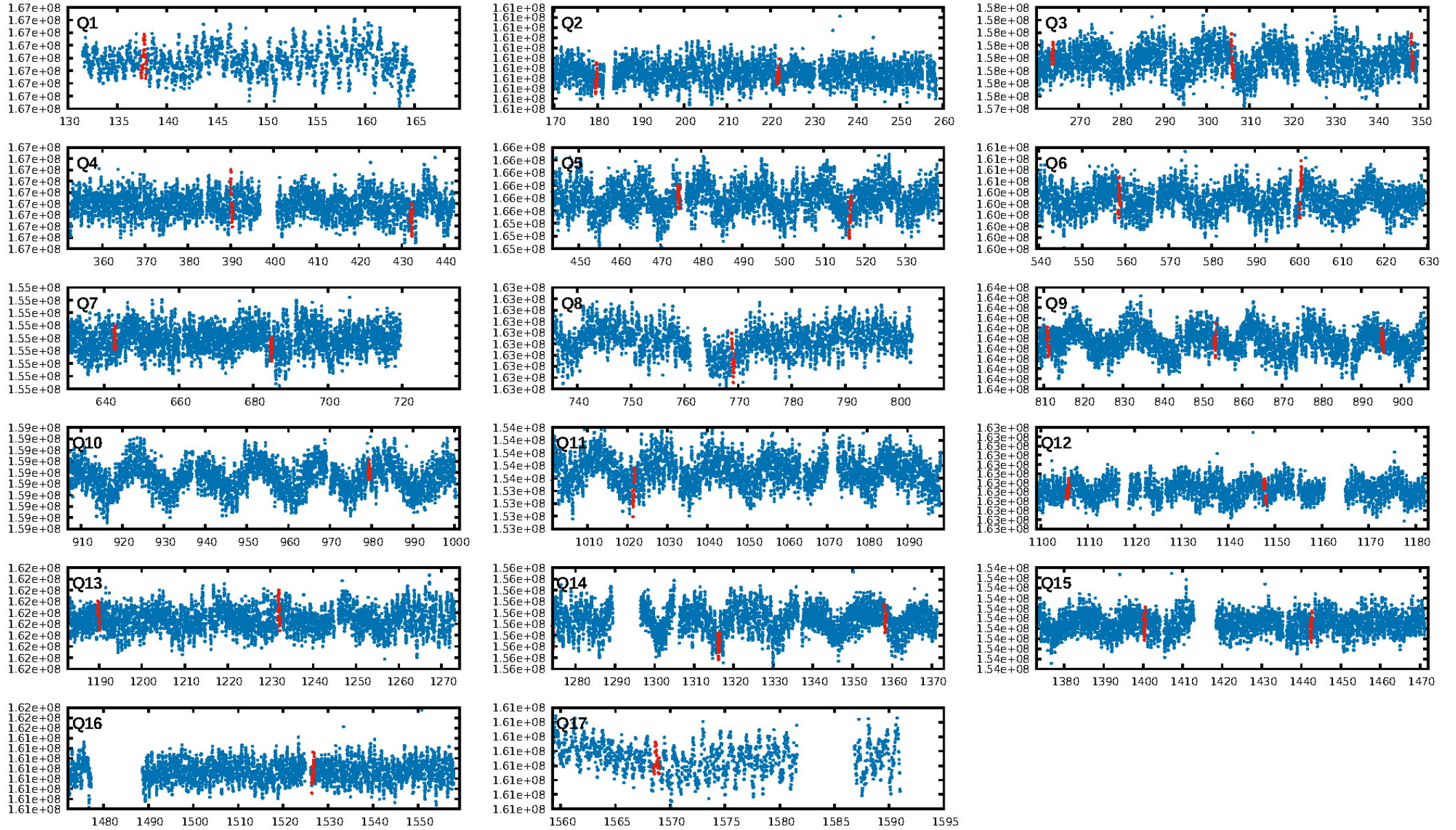
ShortPeriod-sig: 100.0% [55.23σ]  
LongPeriod-sig: 100.0% [355.66σ]  
ModelChiSquare2-sig: 41.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 4.19e-09**  
RollingBand-fgt: 1.00 [15/15]  
**GhostDiagnostic-chr: -0.05078**  
**Centroid-sig: 0.2%**  
Centroid-so: 1.194 arcsec [1.77σ]  
OotOffset-rm: 0.572 arcsec [1.42σ]  
KicOffset-rm: 0.401 arcsec [0.87σ]  
OotOffset-st: 3/3/3/5 [14]  
KicOffset-st: 3/3/3/5 [14]  
DiffImageQuality-fgm: 0.36 [5/14]  
DiffImageOverlap-fno: 0.00 [0/15]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 07:14:46 Z

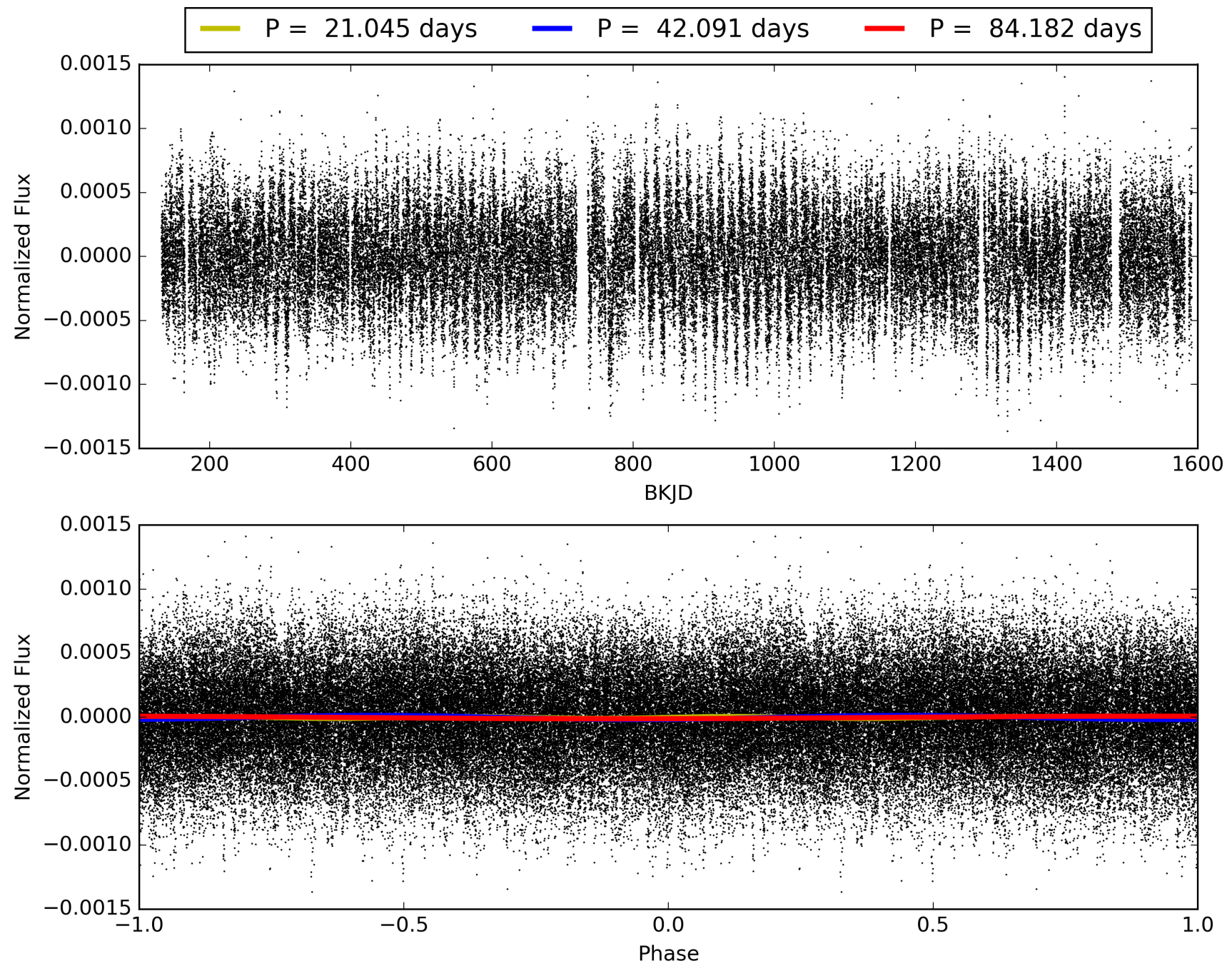
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 009243421-06, PDC Light Curves

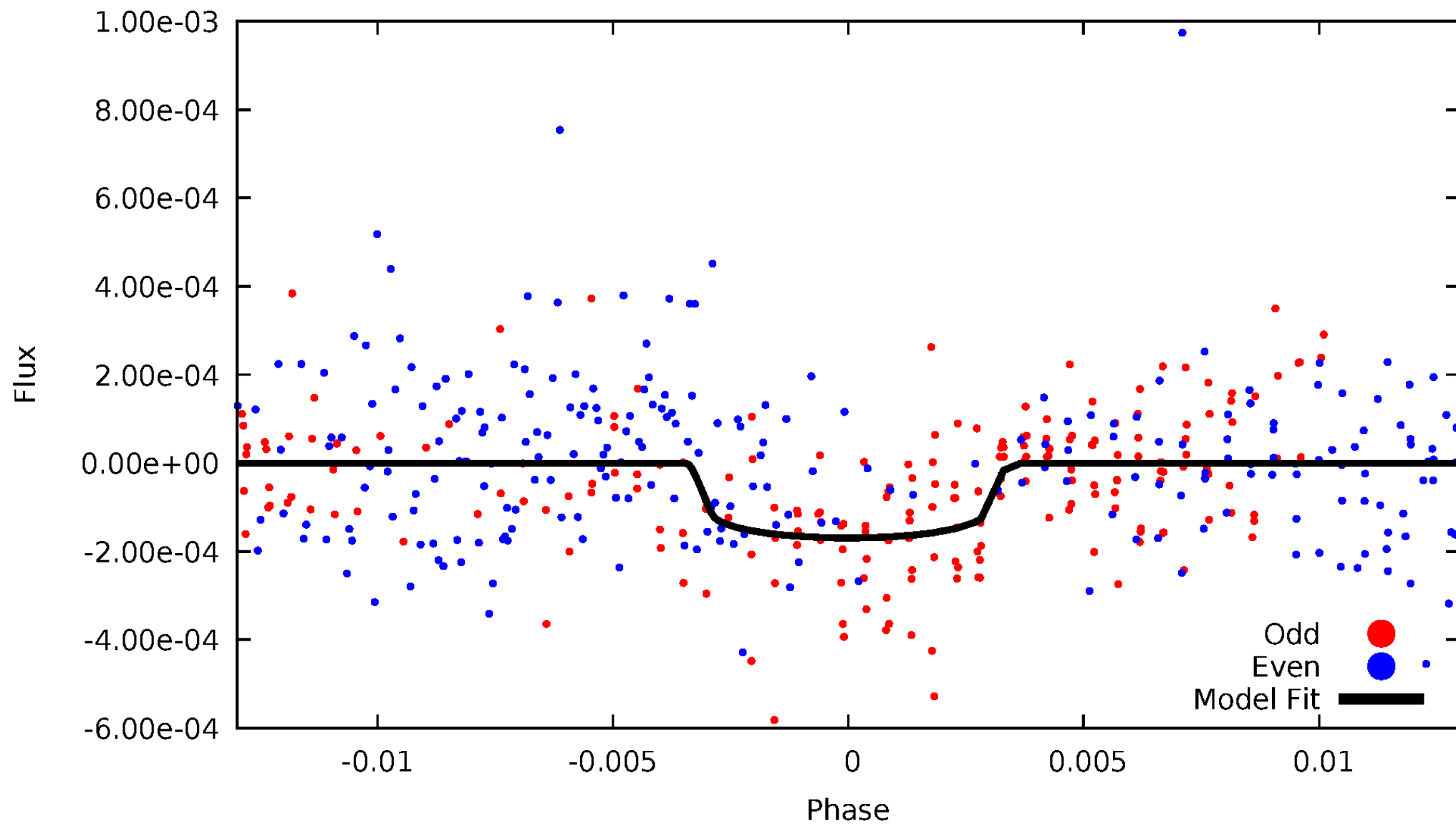


TCE 009243421-06



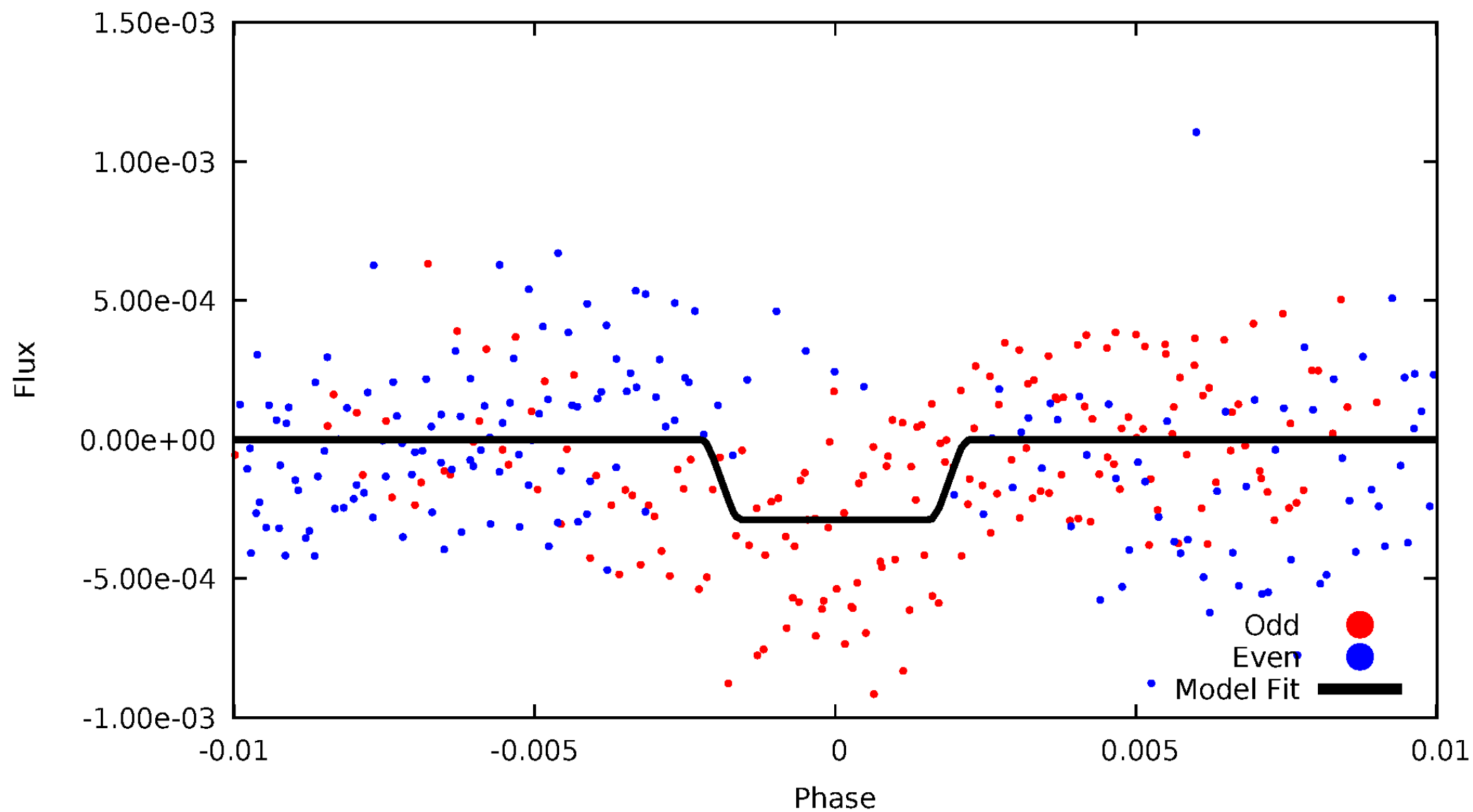
# DV Odd/Even

TCE 009243421-06



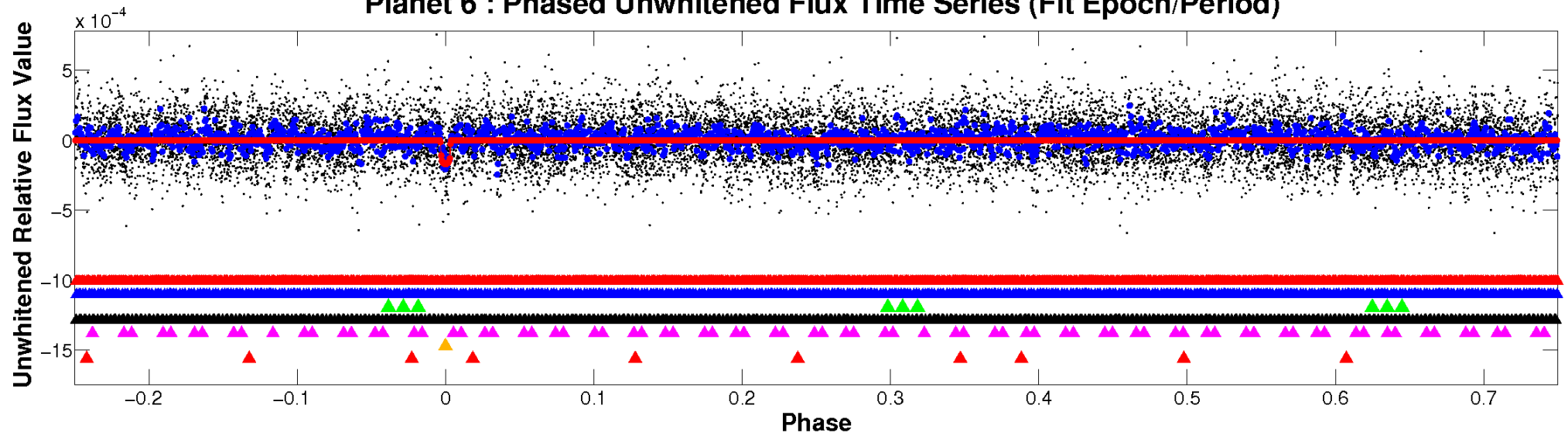
# ALT Odd/Even

TCE 009243421-06

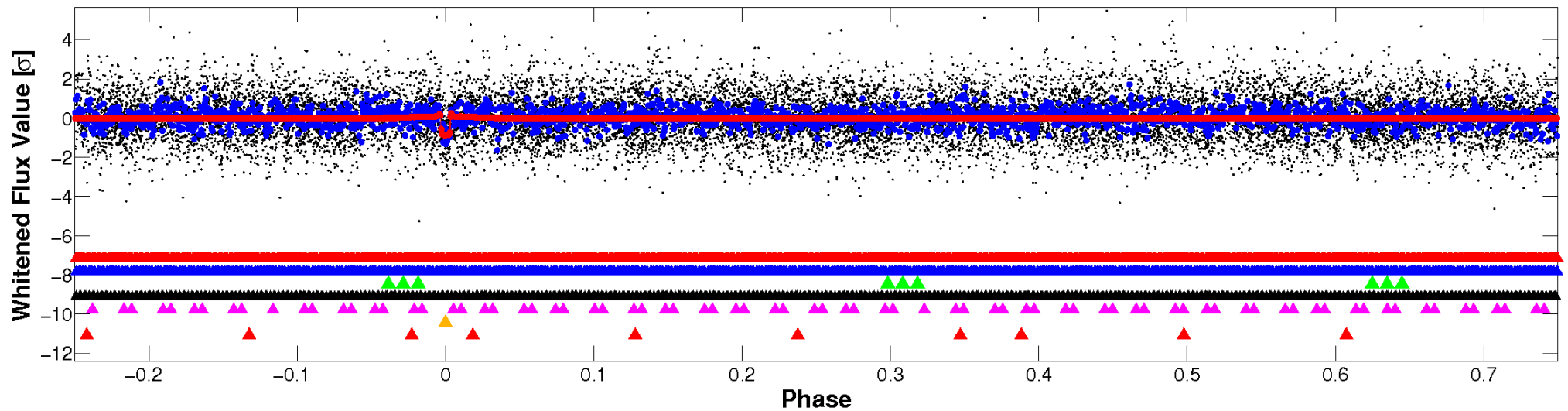


# Non-Whitened Vs. Whitened Light Curve

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



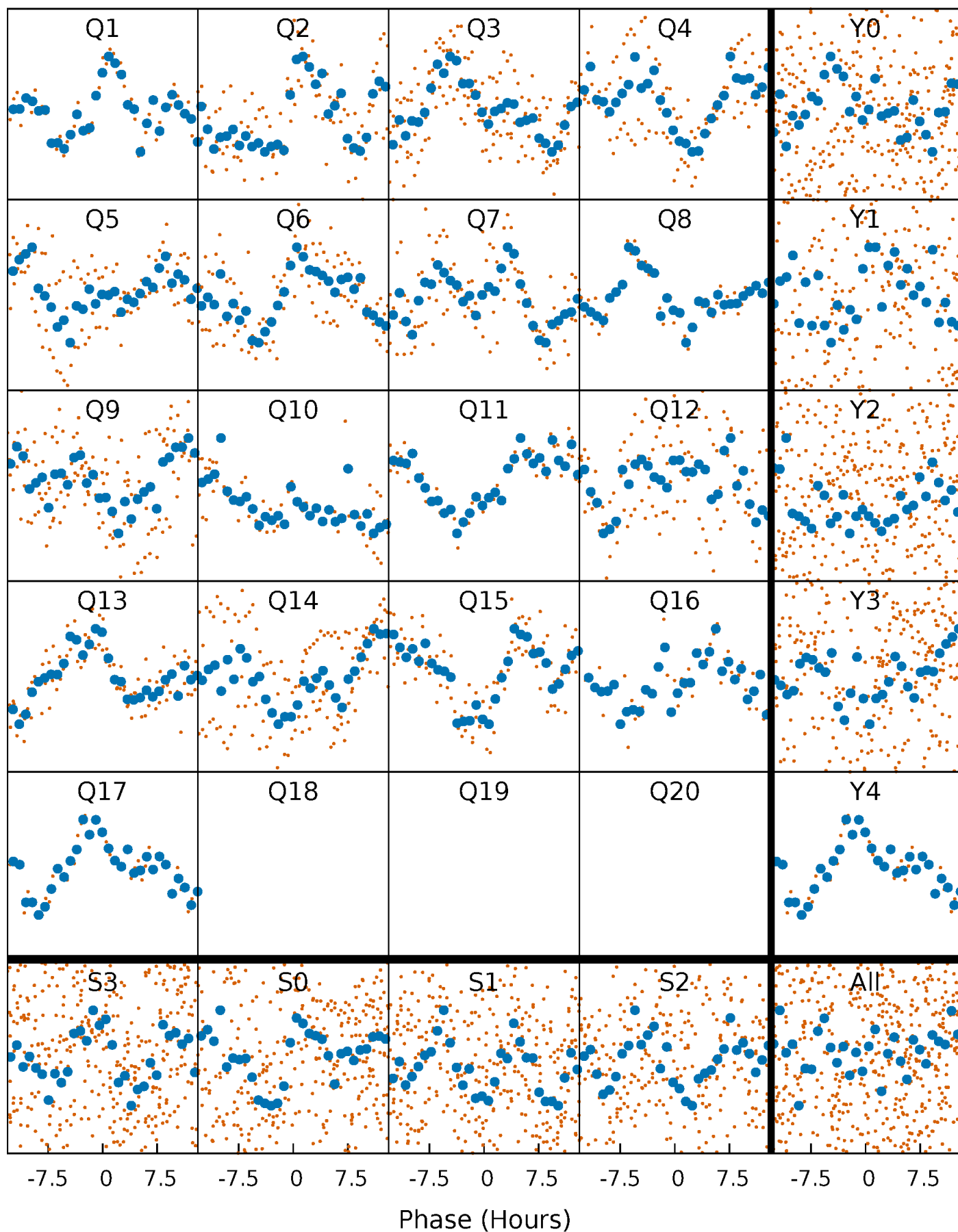
## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

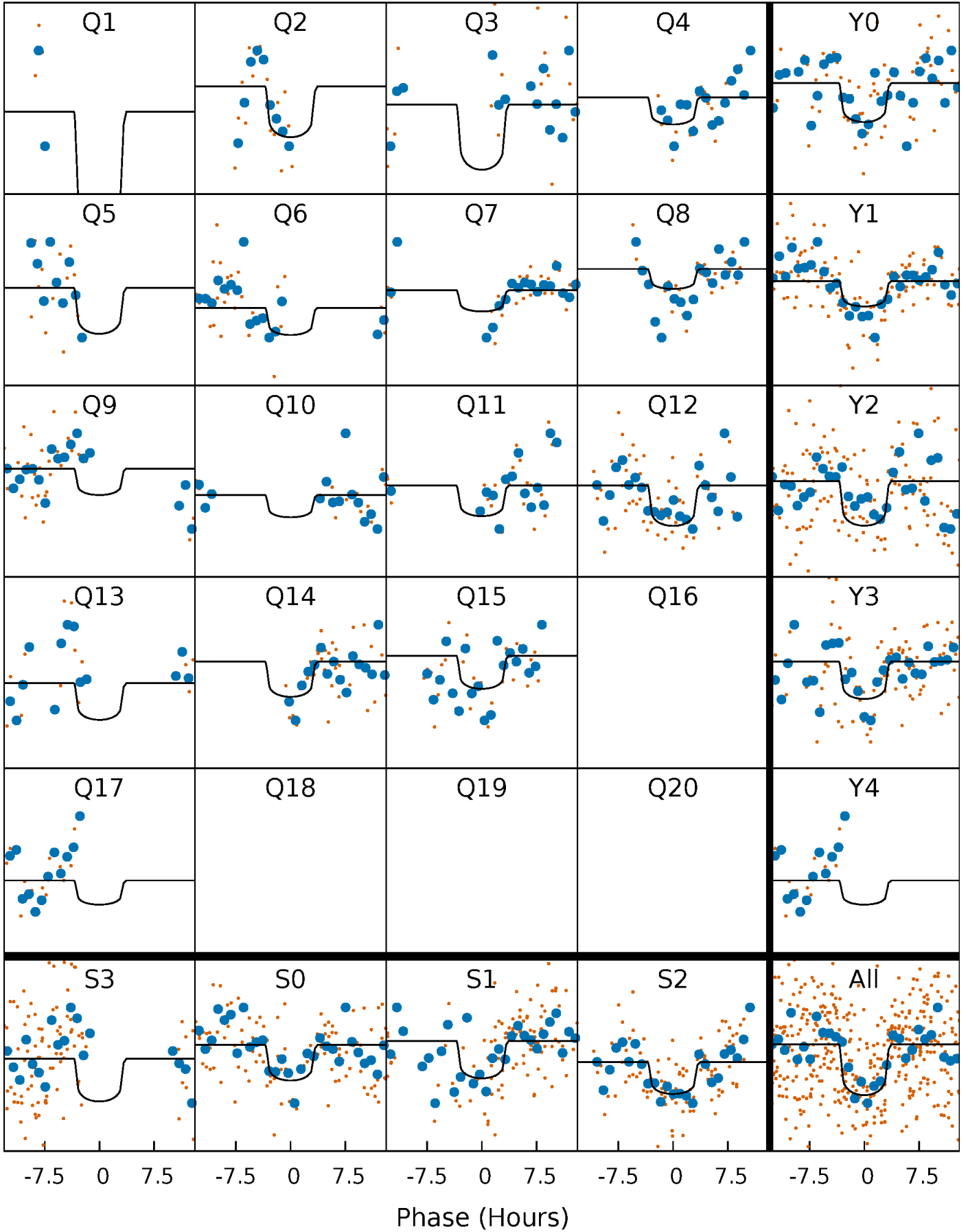
TCE 009243421-06     $P = 42.090762$  Days     $T_0 = 137.660605$  (BKJD)





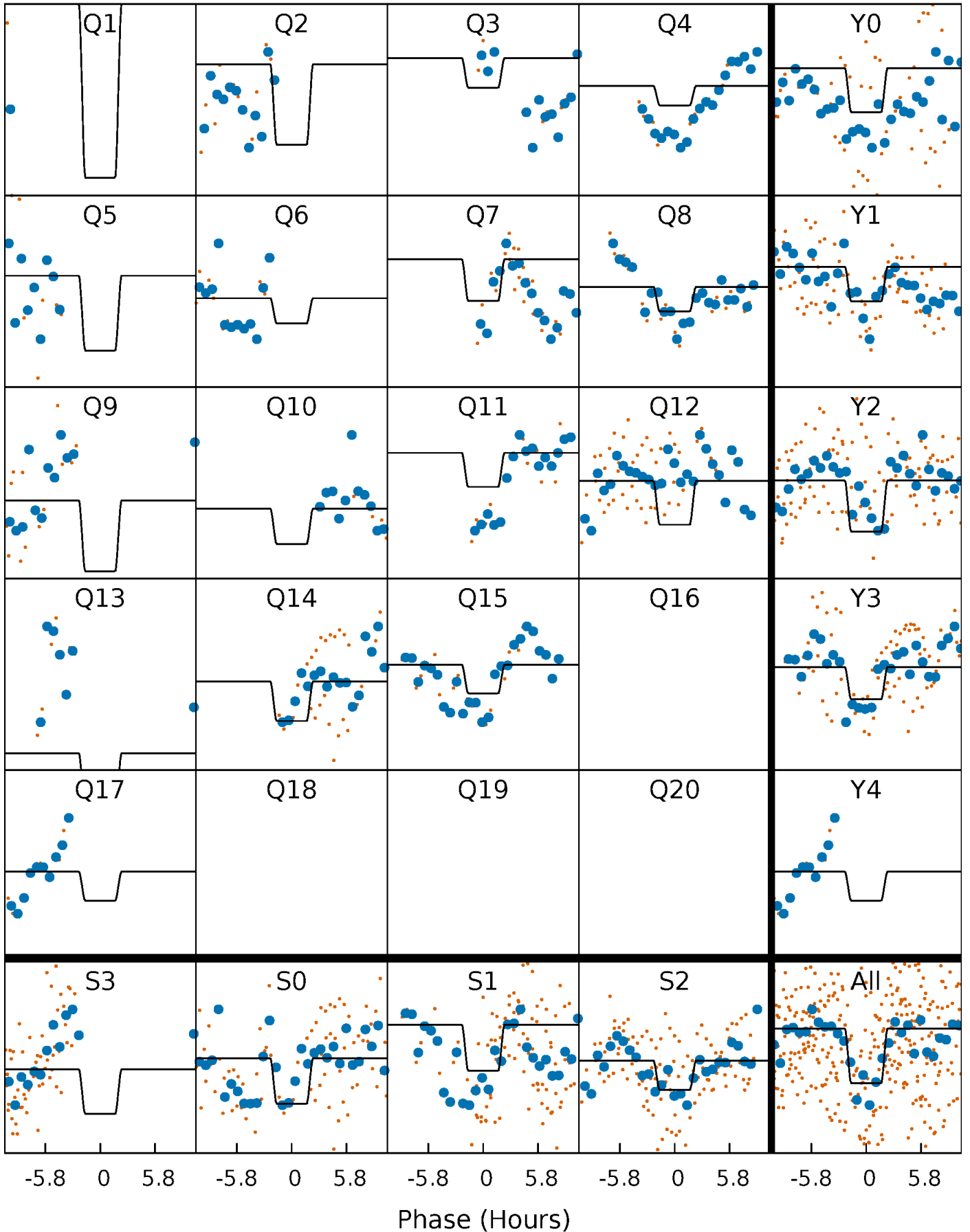
# DV Quarter-Phased Transit Curves

TCE 009243421-06 P= 42.090762 Days  $T_0=137.660605$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

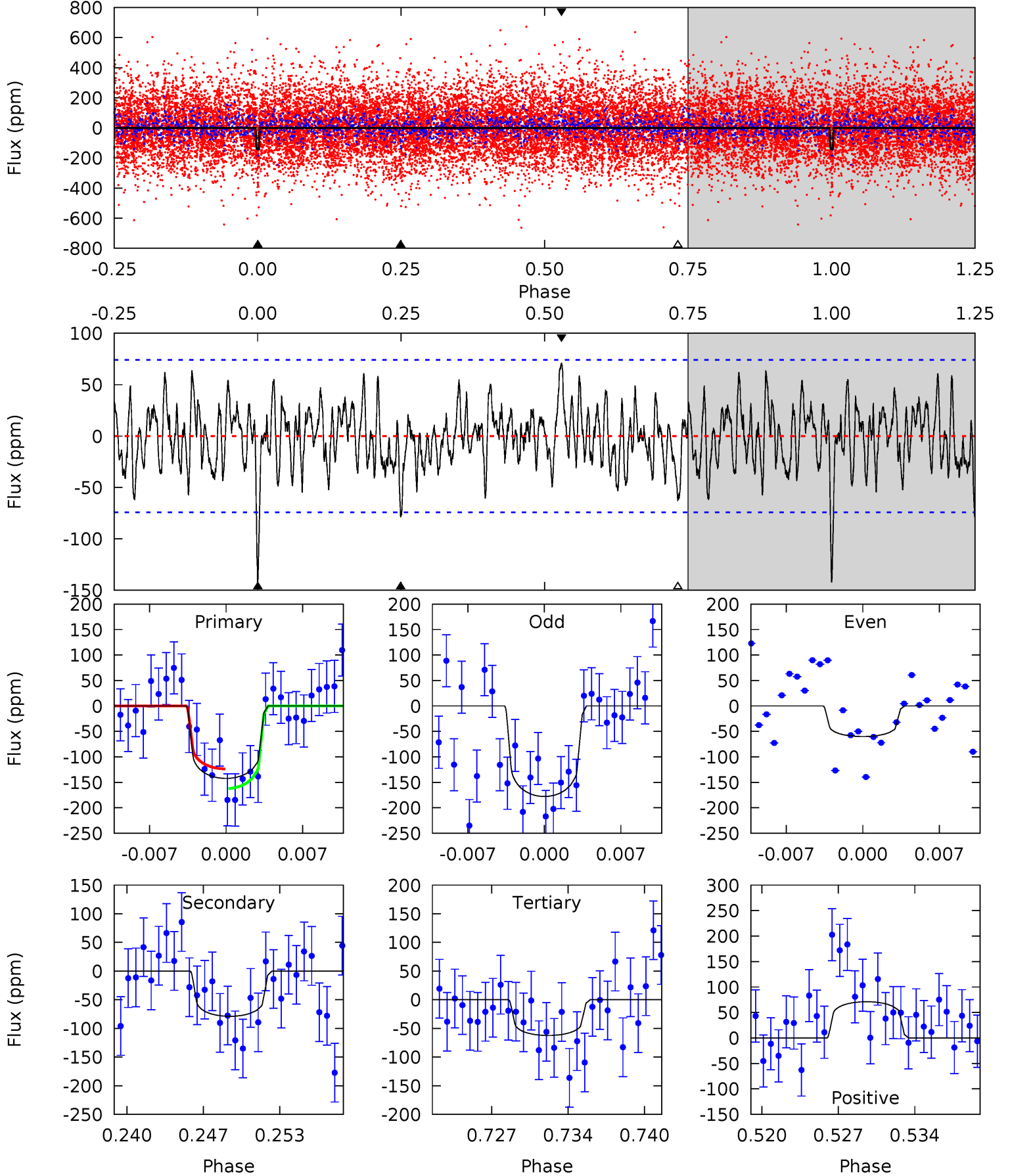
TCE 009243421-06   P= 42.088815 Days    $T_0=137.745220$  (BKJD)



# DV Model-Shift Uniqueness Test

009243421-06, P = 42.090762 Days, E = 95.569843 Days

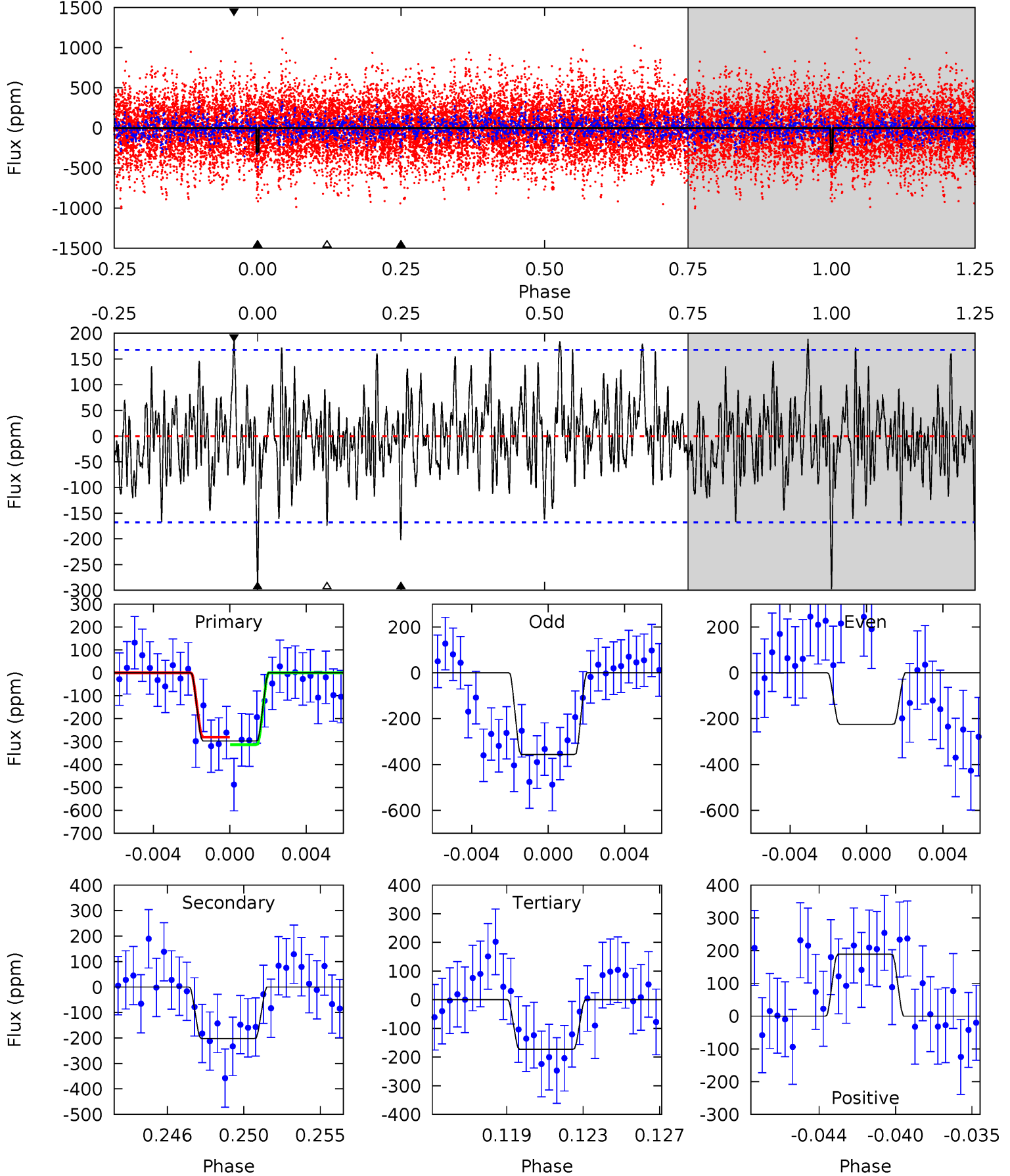
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.80 | 5.43 | 4.29 | 4.90 | 5.10            | 2.71            | 1.68             | 5.51    | 4.90    | 1.14    | 0.54    | 3.78    | 0.48 | 0.33  | 1.33 |



# Alt Model-Shift Uniqueness Test

009243421-06, P = 42.088815 Days, E = 95.656405 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.18 | 6.25 | 5.34 | 5.83 | 5.18            | 2.85            | 1.84             | 3.85    | 3.35    | 0.91    | 0.42    | 1.29    | 1.08 | 0.39  | 0.51 |



### Stellar Parameters For KIC 009243421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6331^{+195}_{-176}$ | $3.377^{+0.408}_{-0.072}$ | $-0.280^{+0.400}_{-0.300}$ | $4.588^{+0.666}_{-1.999}$ | $1.832^{+0.125}_{-0.468}$ | $0.027^{+0.099}_{-0.006}$                     |
|        | +3%/-3%              | +12%/-2%                  | +143%/-107%                | +15%/-44%                 | +7%/-26%                  | +370%/-24%                                    |
| Source | PHO1                 | FLK73                     | 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 009243421-06 / KOI

| Detrend | Depth (ppm)   | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)        | $T_{obs}$ (K)         | $A_{obs}$          |
|---------|---------------|------------------------|----------------------|-----------------------|--------------------|
| DV      | $-79 \pm 15$  | $6.24^{+4.34}_{-3.56}$ | $1515^{+89}_{-155}$  | $5137^{+2589}_{-958}$ | $92^{+386}_{-60}$  |
| Alt.    | $-202 \pm 32$ | $7.56^{+4.82}_{-3.96}$ | $1505^{+101}_{-157}$ | $5736^{+2814}_{-962}$ | $155^{+555}_{-94}$ |

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

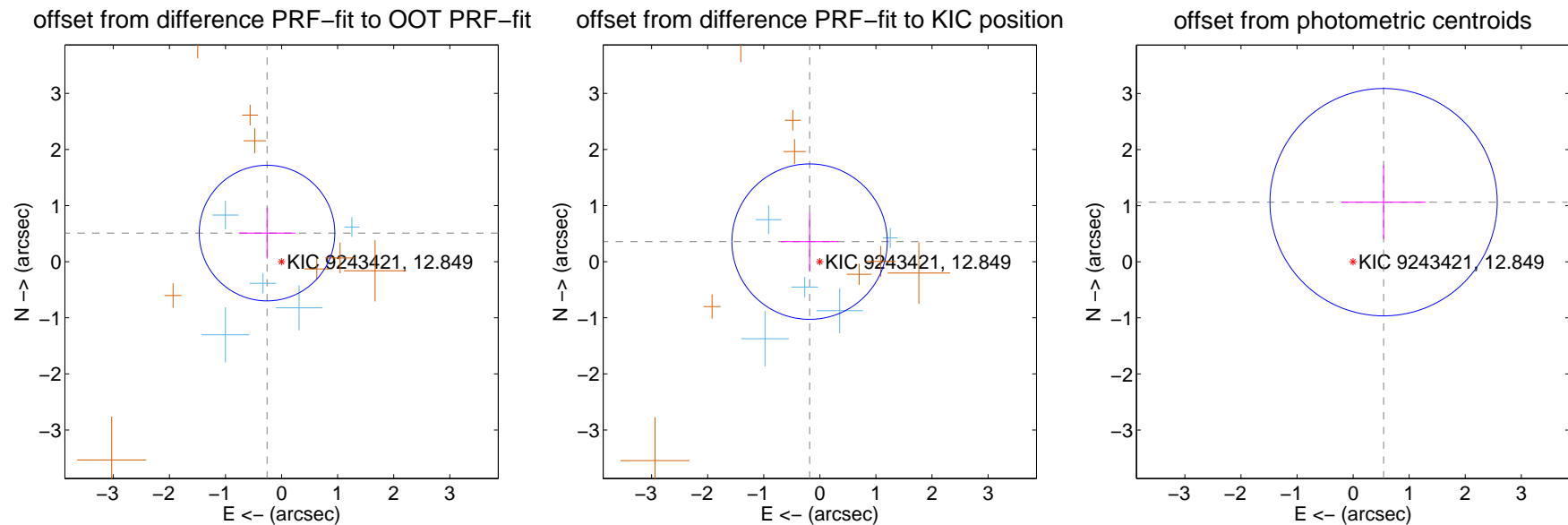
## DV Centroid Data

Supplemental centroid analysis for 009243421-06. Kepler magnitude: 12.85. Transit SNR 8.38

There are 5 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

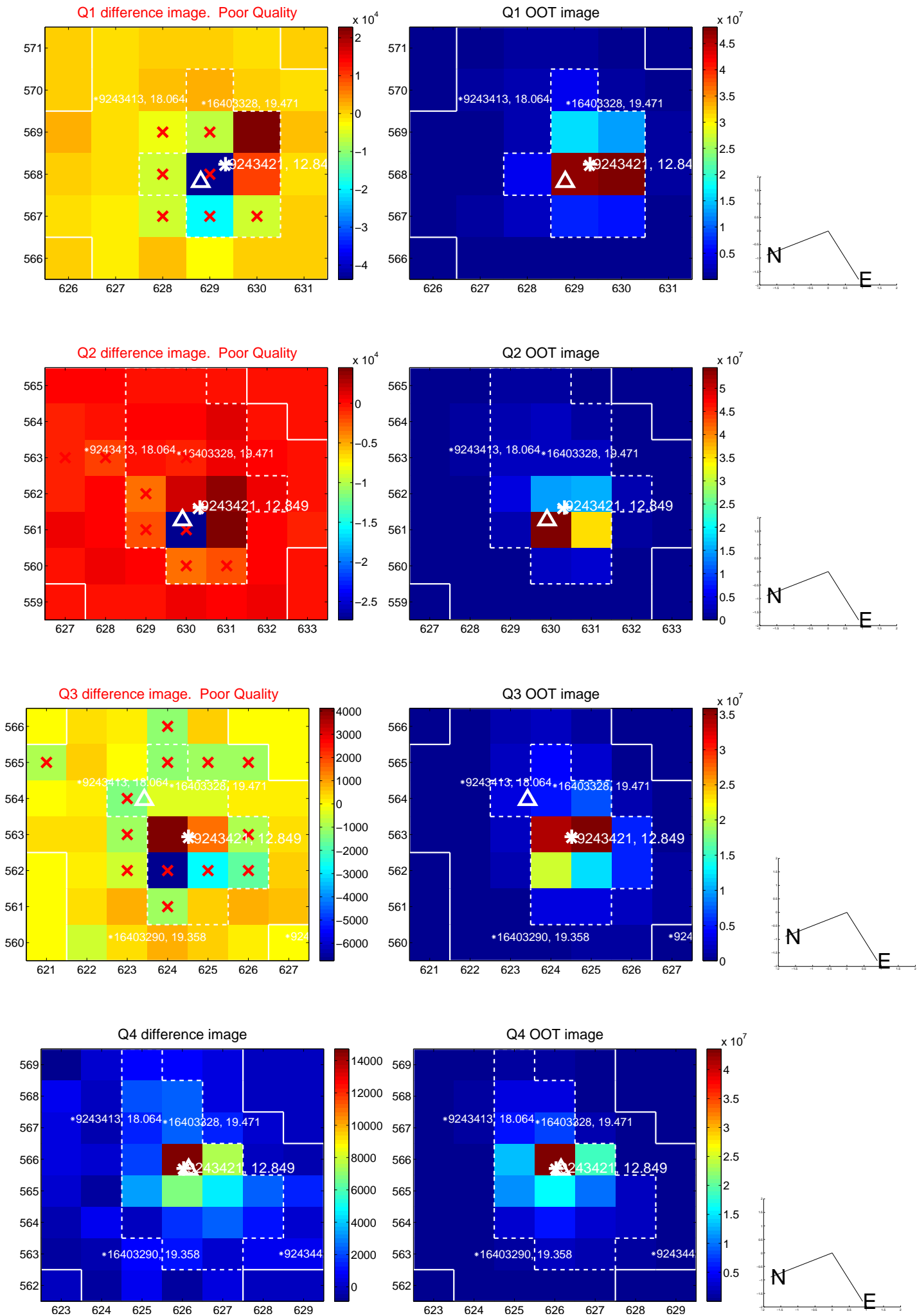
|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $0.572 \pm 0.403$  | 1.42                | $0.260 \pm 0.504$ | $0.510 \pm 0.455$ |
| PRF-fit source offset from KIC position | $0.401 \pm 0.462$  | 0.87                | $0.183 \pm 0.515$ | $0.357 \pm 0.521$ |
| photometric centroid source offset      | $1.19 \pm 0.68$    | 1.77                | $-0.54 \pm 0.75$  | $1.06 \pm 0.66$   |



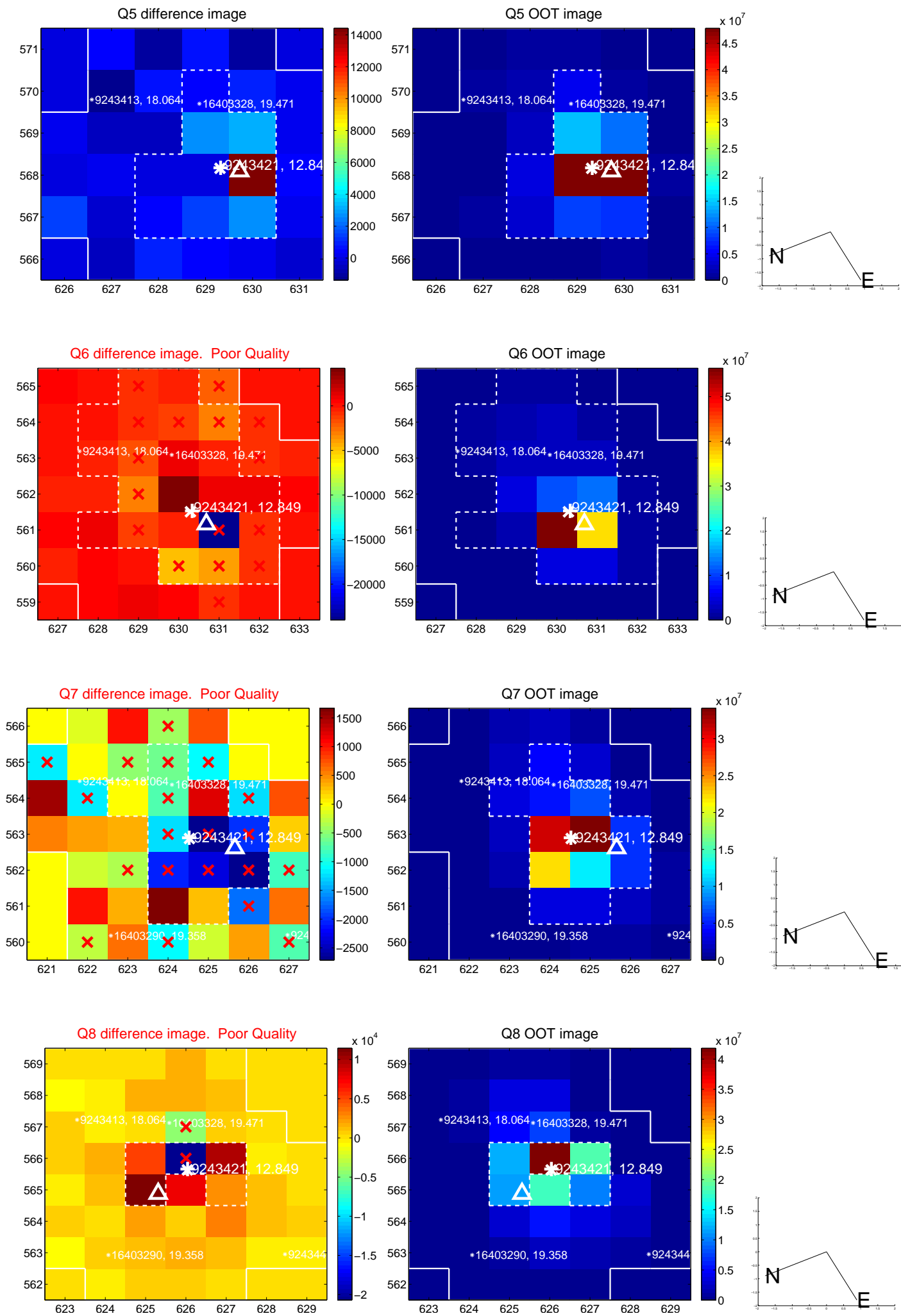
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



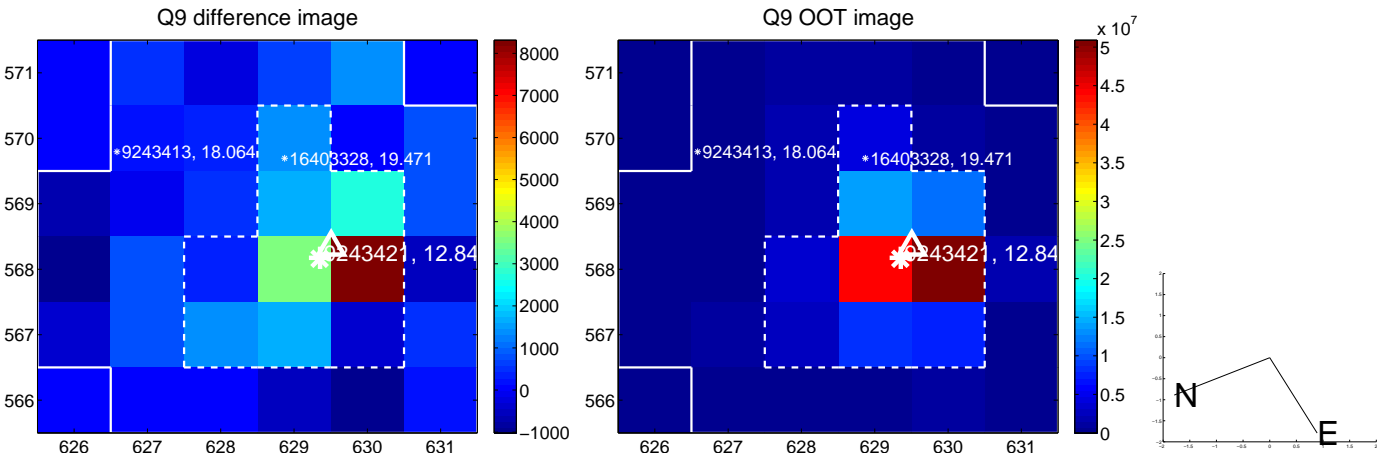
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



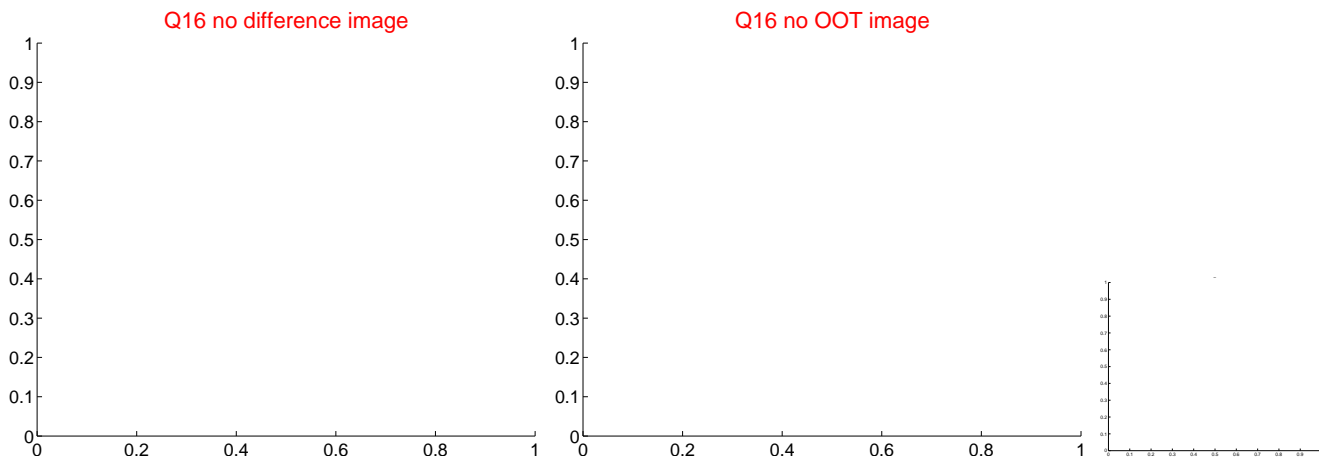
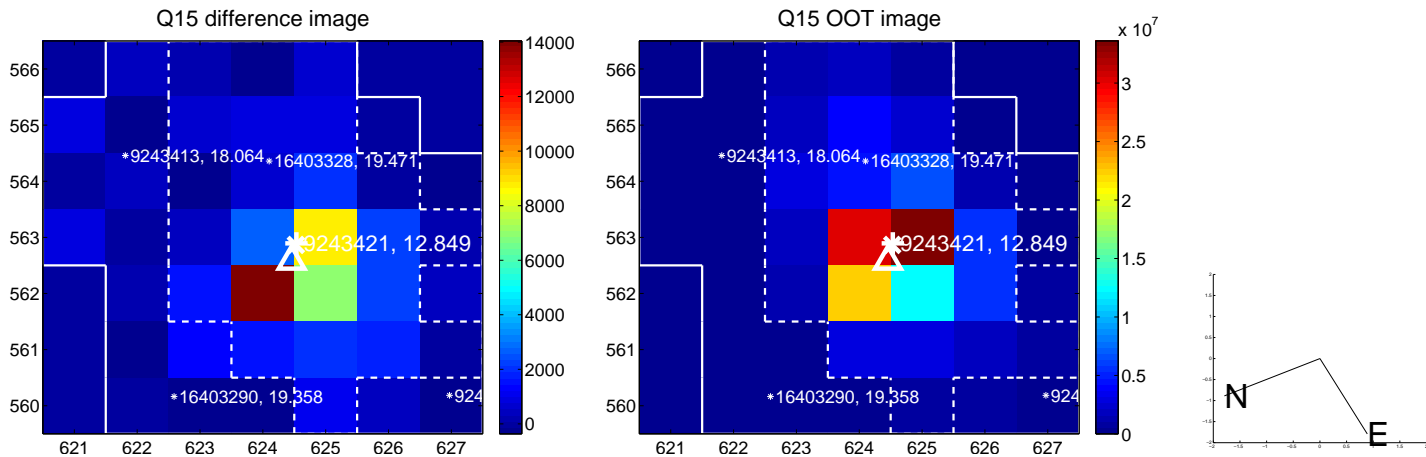
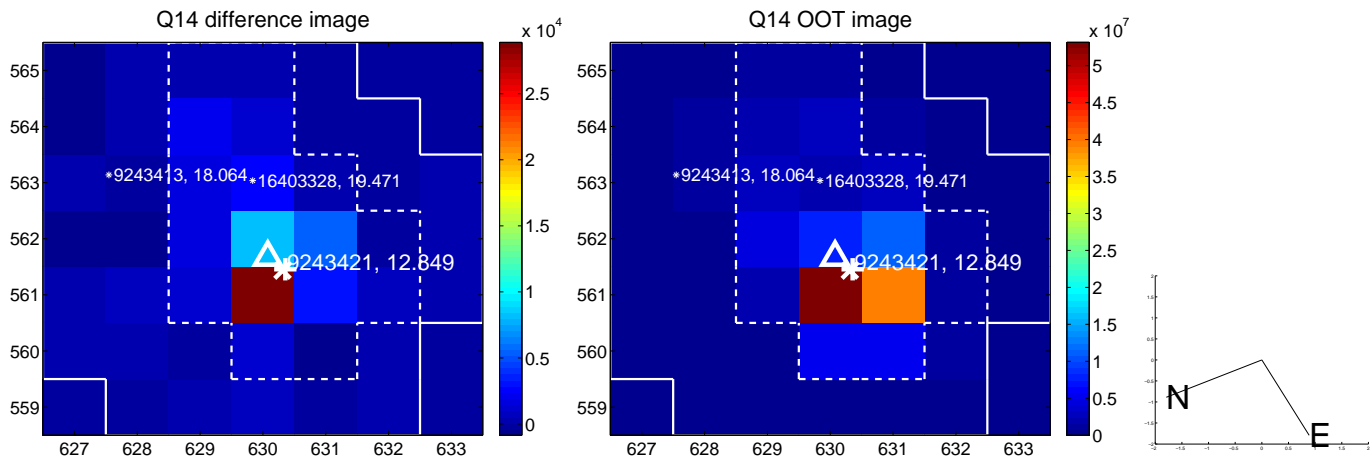
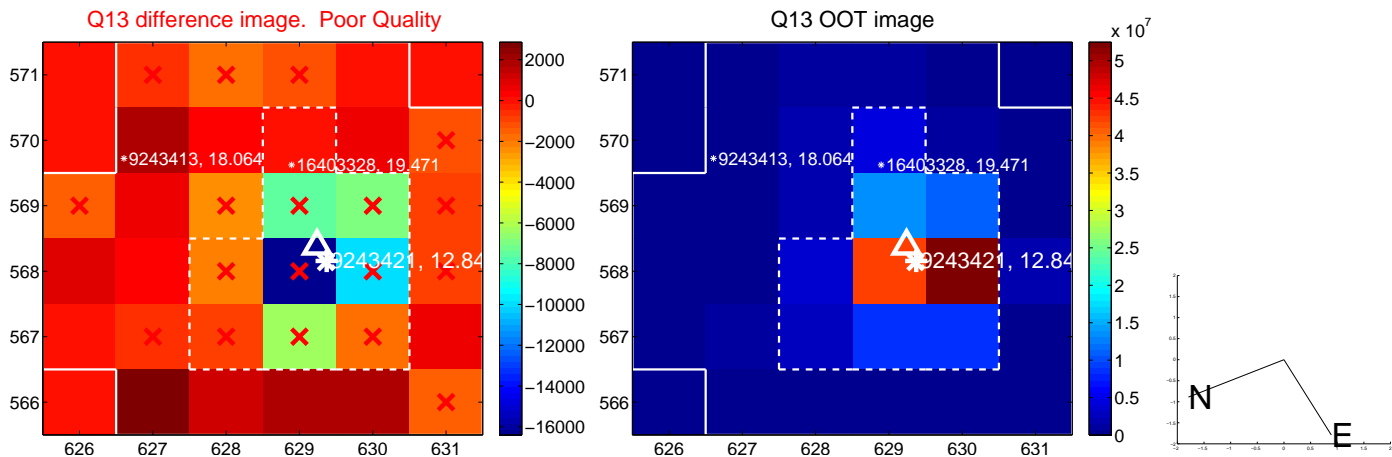
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



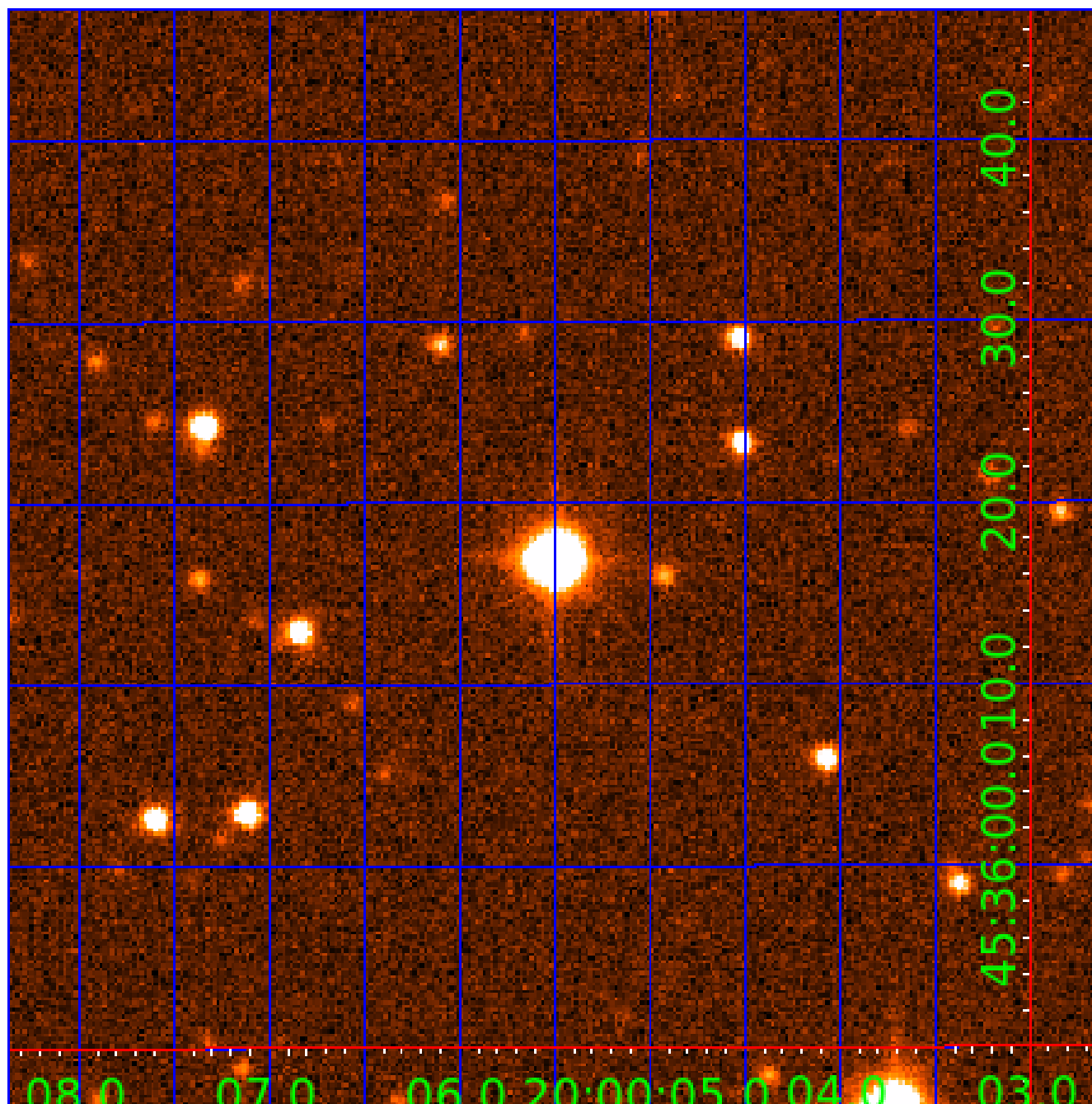
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination





# KIC 009243421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009243421-01 | OBS      | No   | 1.198209      | 132.236181   | 31.8        | 3.815            | 10.9 | 11.7 | 4.59                        | 6331            | 3.01                   | 41542.18               |
| 009243421-02 | OBS      | No   | 2.571808      | 132.660977   | 39.4        | 6.612            | 8.5  | 9.5  | 4.59                        | 6331            | 3.32                   | 15004.26               |
| 009243421-03 | OBS      | No   | 154.192245    | 235.238303   | 126.2       | 9.905            | 11.7 | 4.7  | 4.59                        | 6331            | 5.54                   | 63.94                  |
| 009243421-04 | OBS      | No   | 2.569394      | 133.568846   | 52.7        | 9.075            | 7.9  | 10.1 | 4.59                        | 6331            | 3.88                   | 15023.05               |
| 009243421-05 | OBS      | No   | 18.484254     | 145.906309   | 78.3        | 7.890            | 7.6  | 6.1  | 4.59                        | 6331            | 4.48                   | 1081.76                |
| 009243421-06 | OBS      | No   | 42.090762     | 137.660605   | 169.3       | 6.557            | 7.9  | 8.4  | 4.59                        | 6331            | 6.55                   | 361.09                 |
| 009243421-07 | OBS      | No   | 152.795479    | 152.270891   | 252.5       | 3.580            | 7.5  | 7.7  | 4.59                        | 6331            | 8.17                   | 64.72                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 009243421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT   |
| 009243421-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-03 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—<br>MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—HALO_GHOST |
| 009243421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 009243421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 009243421-06 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—HALO_GHOST   |
| 009243421-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>CENT_FEW_DIFFS                    |

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

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

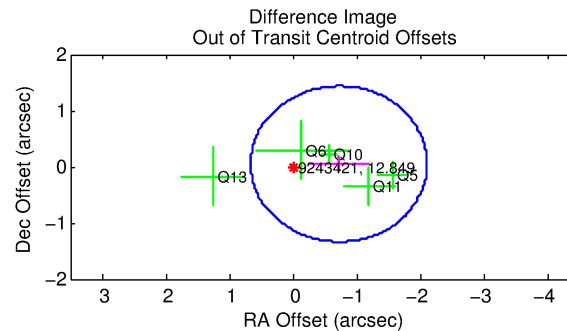
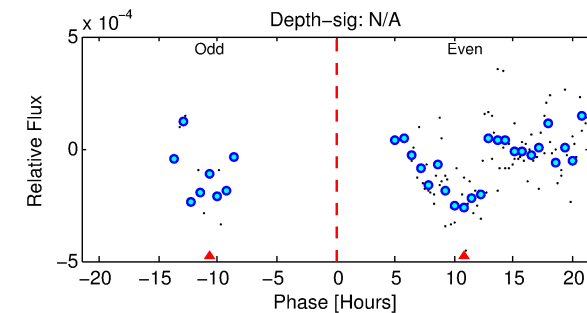
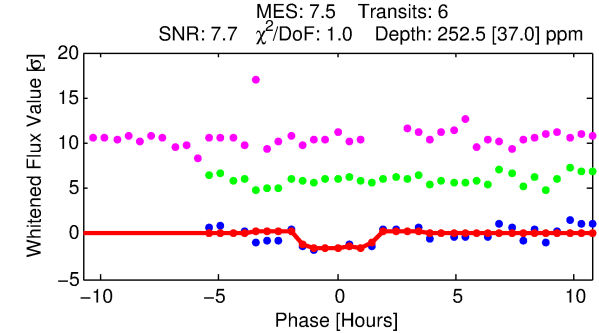
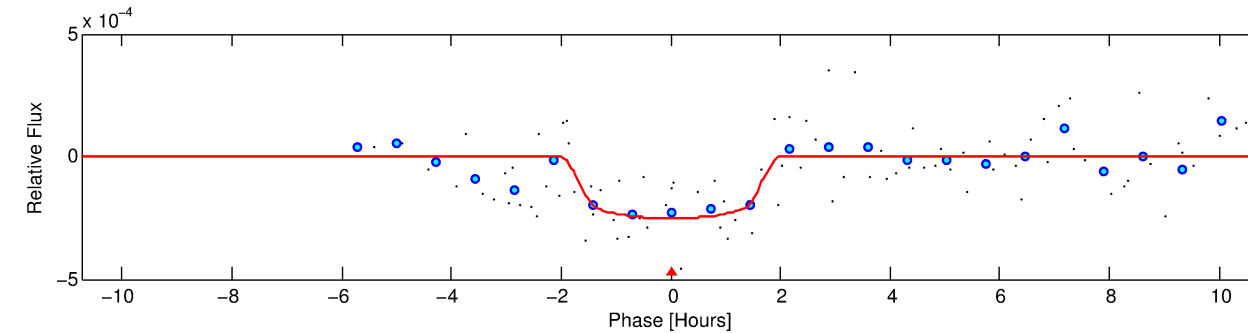
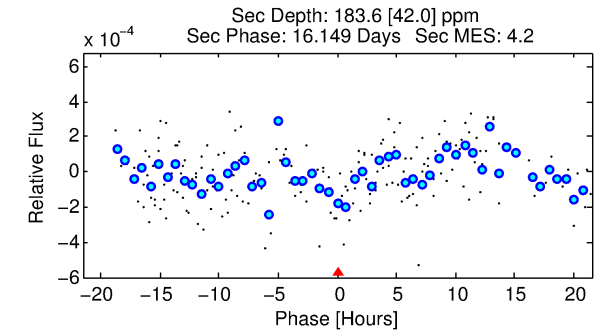
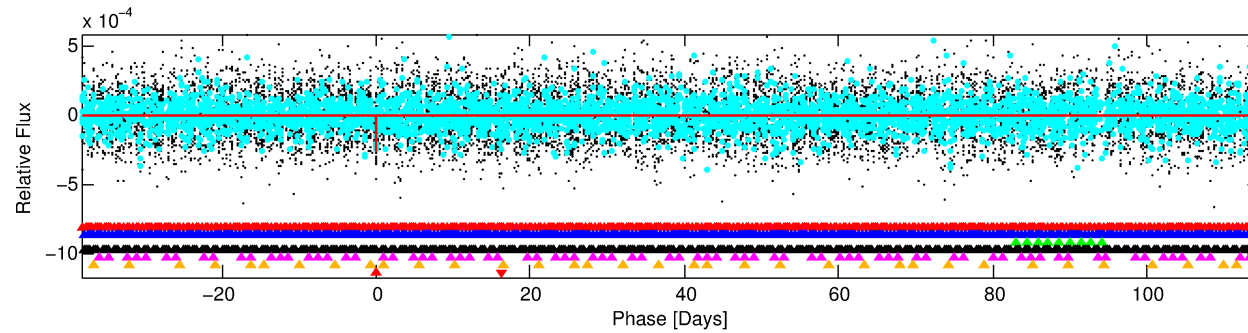
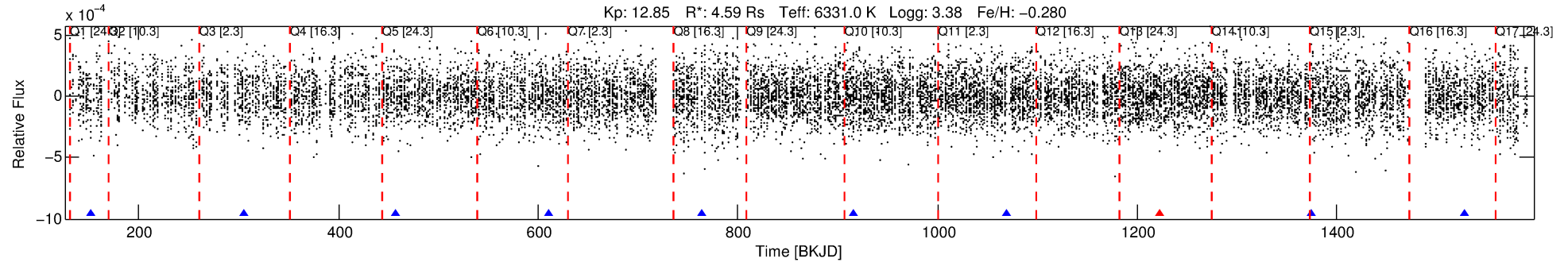
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009243421-07

No Significant Match Found

# DV One-Page Summary

KIC: 9243421 Candidate: 7 of 7 Period: 152.795 d



## DV Fit Results:

Period = 152.79548 [0.00158] d  
Epoch = 152.2709 [0.0092] BKJD  
Rp/R\* = 0.0163 [0.0094]  
a/R\* = 190.59 [595.61]  
b = 0.83 [1.17]  
Seff = 64.72 [45.39]  
Teq = 723 [127] K  
Rp = 8.17 [5.91] Re  
a = 0.6842 [0.2922] AU  
Ag = 708.28 [966.67] [0.73σ]  
Teffp = 5769 [1707] K [2.95σ]

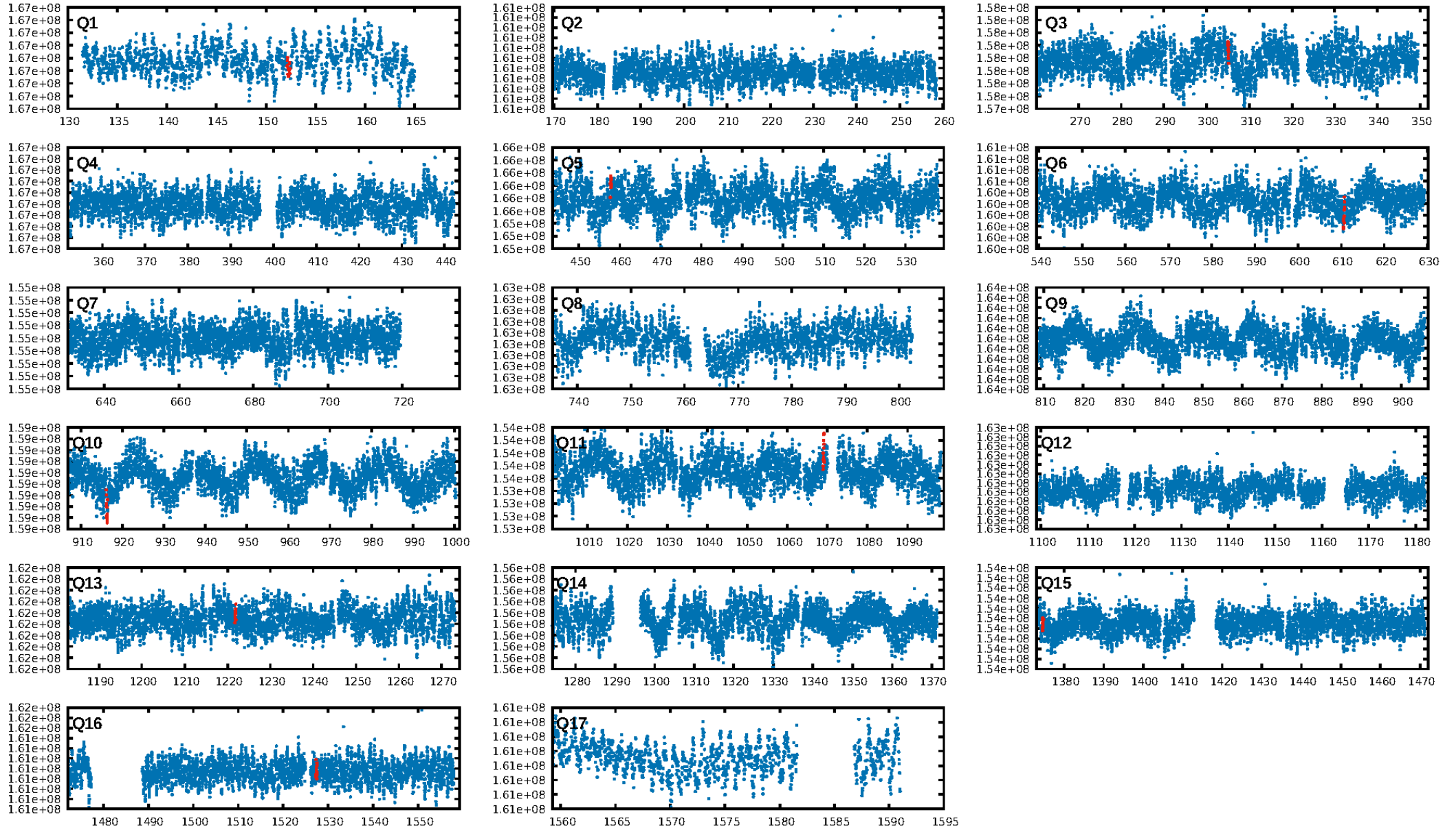
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [355.66σ]  
LongPeriod-sig: 99.9% [3.18σ]  
ModelChiSquare2-sig: 45.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.34e-08**  
RollingBand-fgt: 0.80 [4/5]  
GhostDiagnostic-chr: 2.871  
Centroid-sig: 87.5%  
Centroid-so: 0.596 arcsec [0.47σ]  
OotOffset-rm: 0.726 arcsec [1.57σ]  
KicOffset-rm: 0.755 arcsec [1.96σ]  
OotOffset-st: 2/1/0/2 [5]  
KicOffset-st: 2/1/0/2 [5]  
DiffImageQuality-fgm: 0.40 [2/5]  
DiffImageOverlap-fno: 0.25 [2/8]

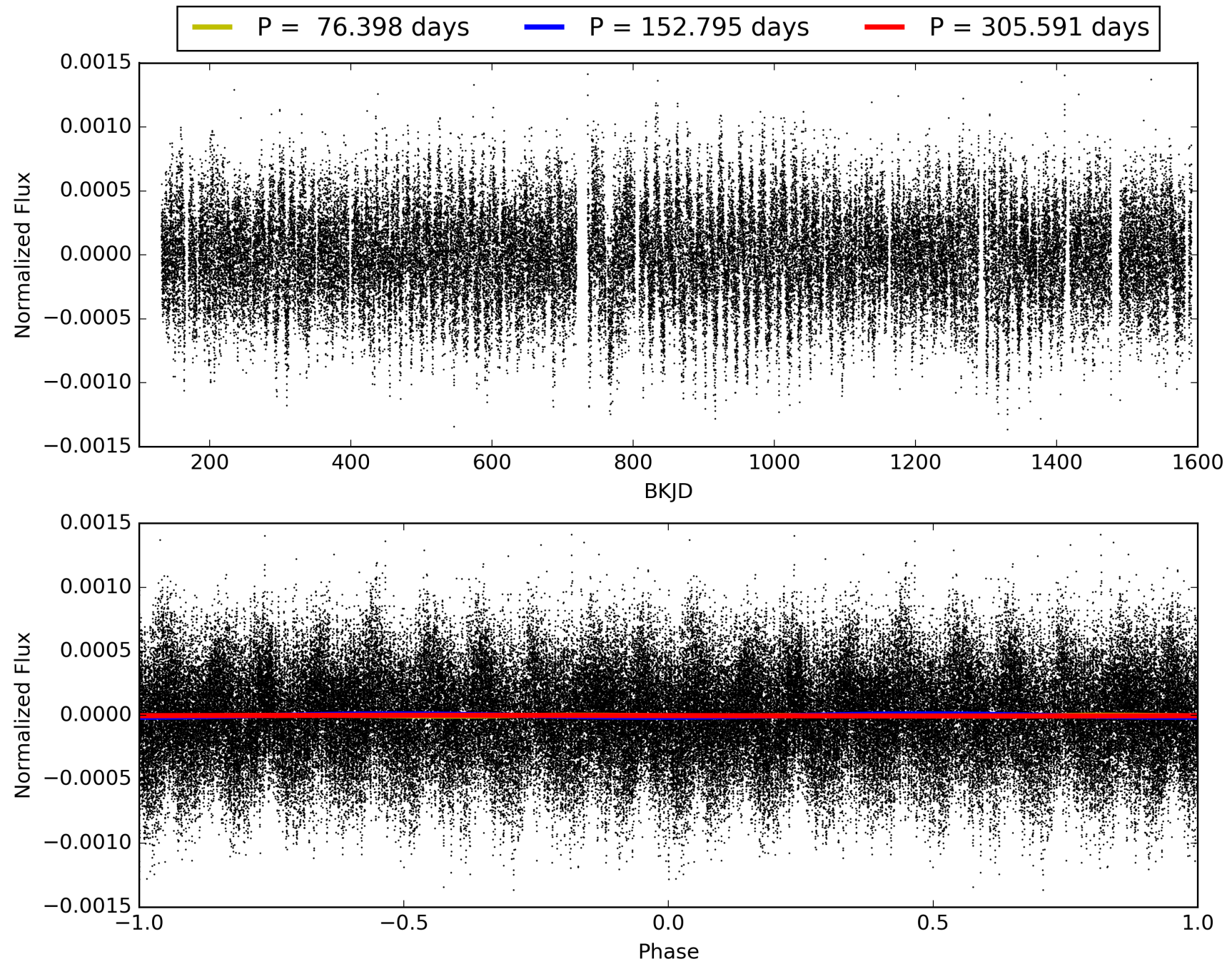
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 07:14:51 Z

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

# TCE 009243421-07, PDC Light Curves

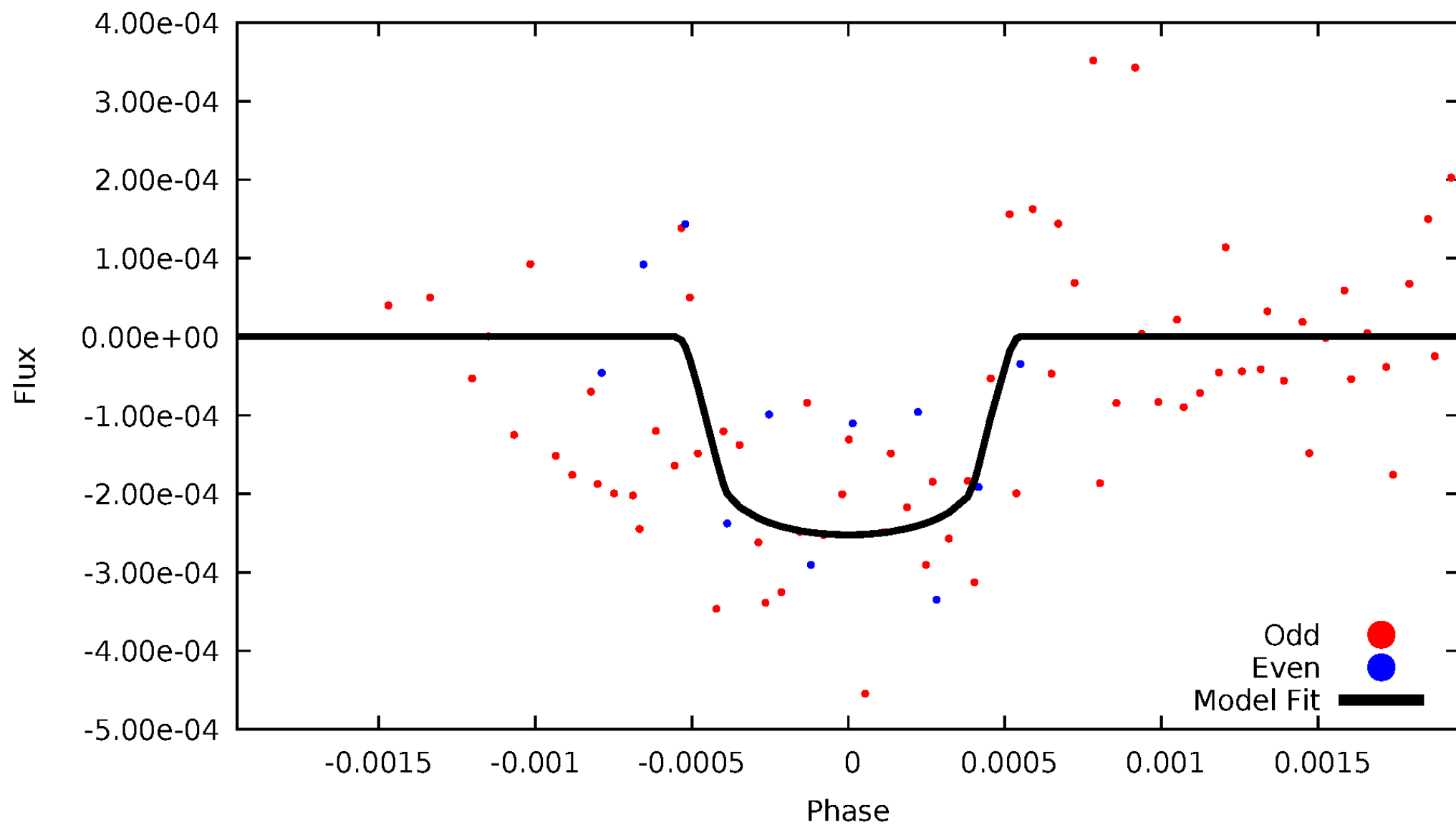


TCE 009243421-07



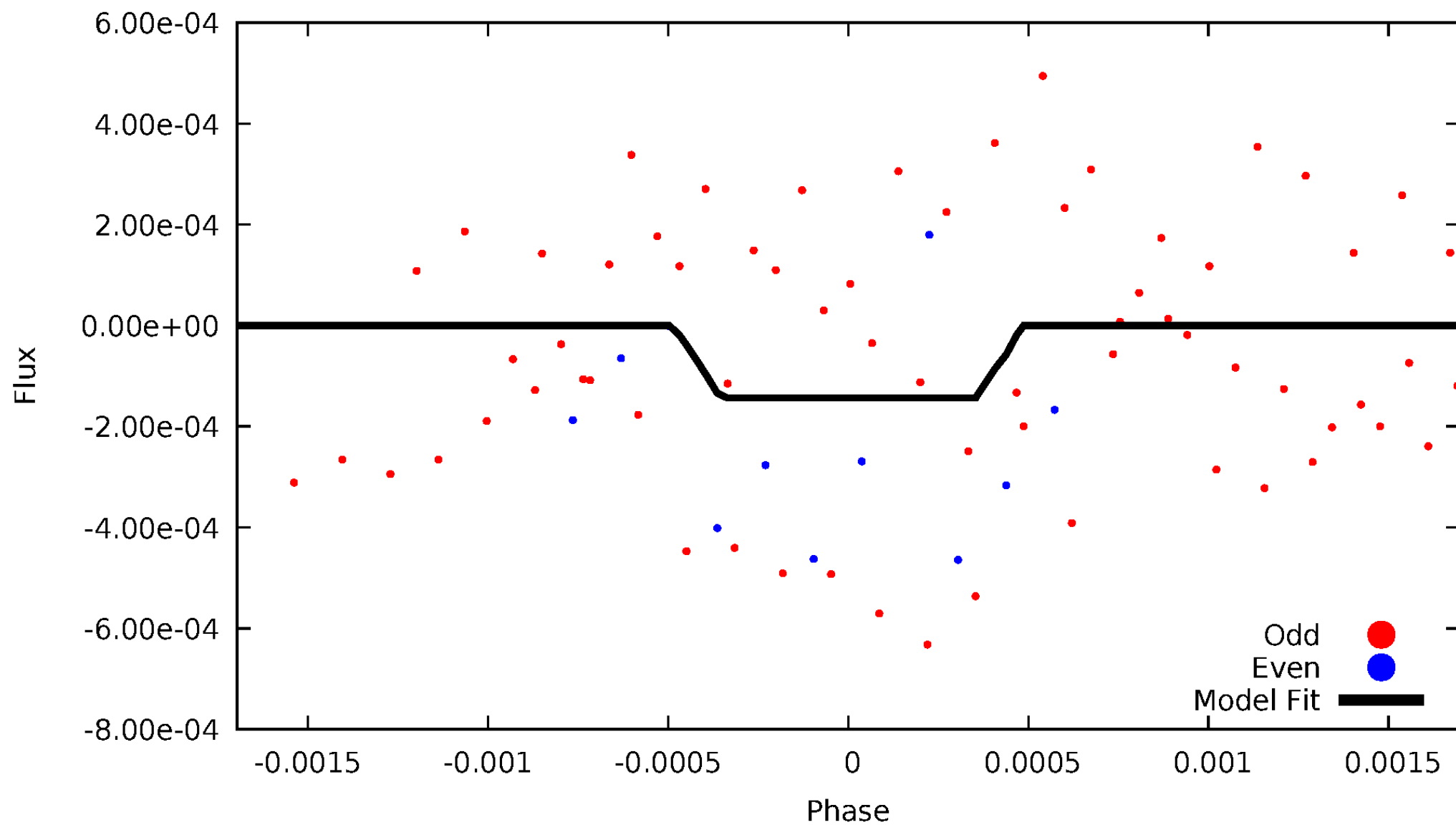
# DV Odd/Even

TCE 009243421-07



# ALT Odd/Even

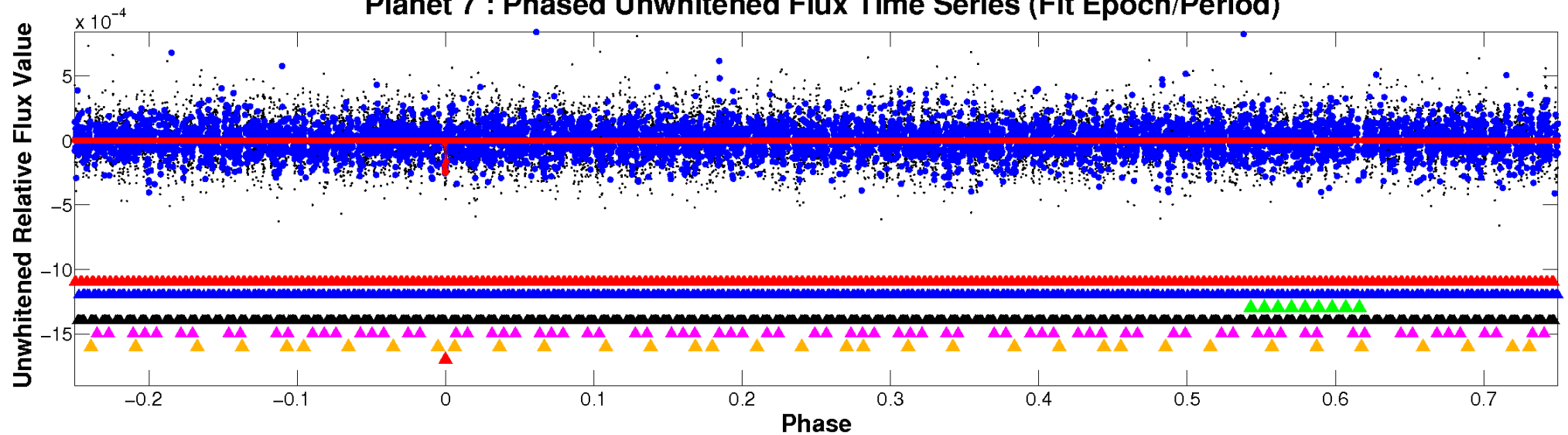
TCE 009243421-07



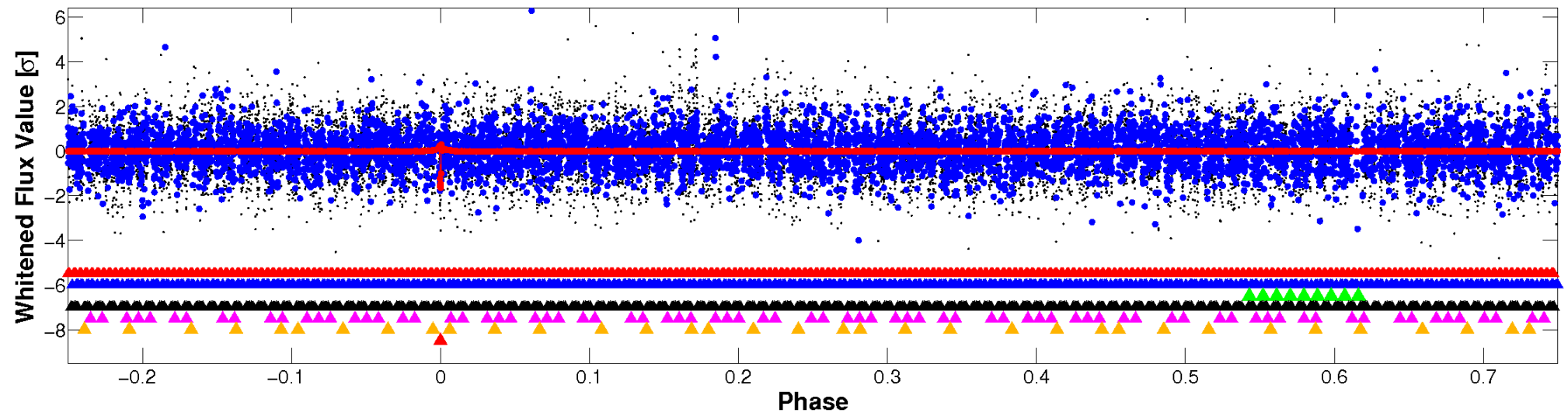


# Non-Whitened Vs. Whitened Light Curve

## Planet 7 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

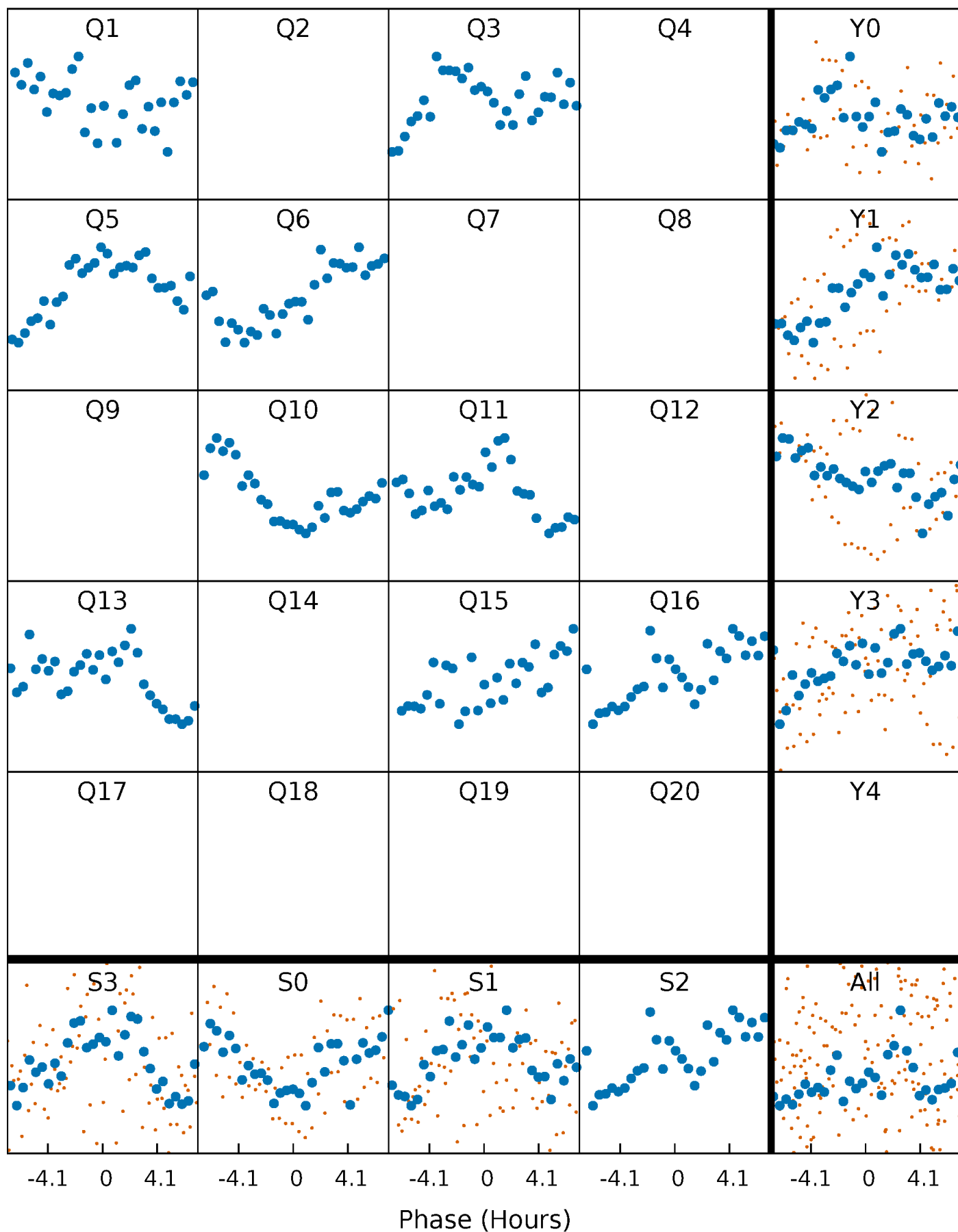


## Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



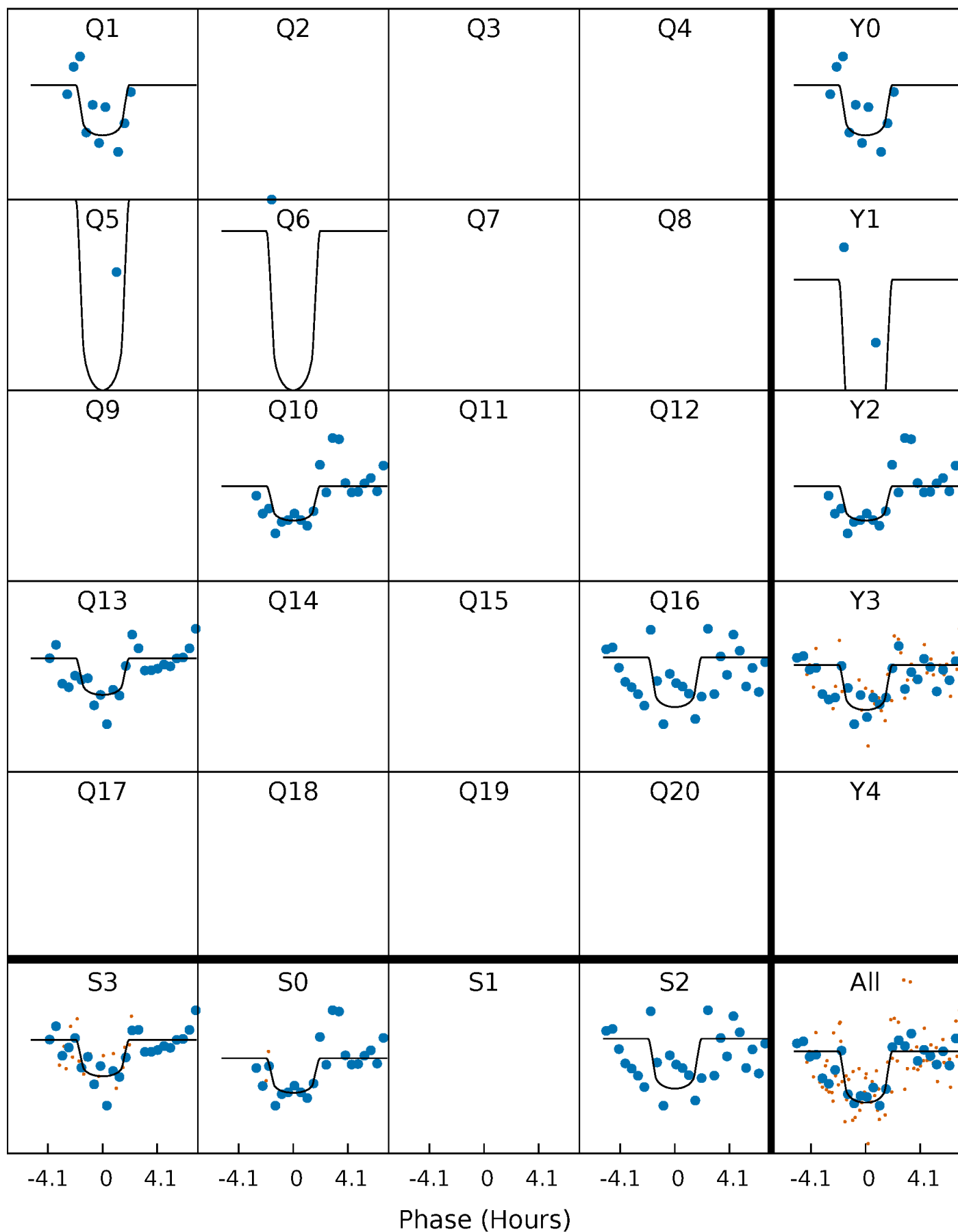
# PDC Quarter-Phased Transit Curves

TCE 009243421-07 P=152.795479 Days  $T_0=152.270891$  (BKJD)



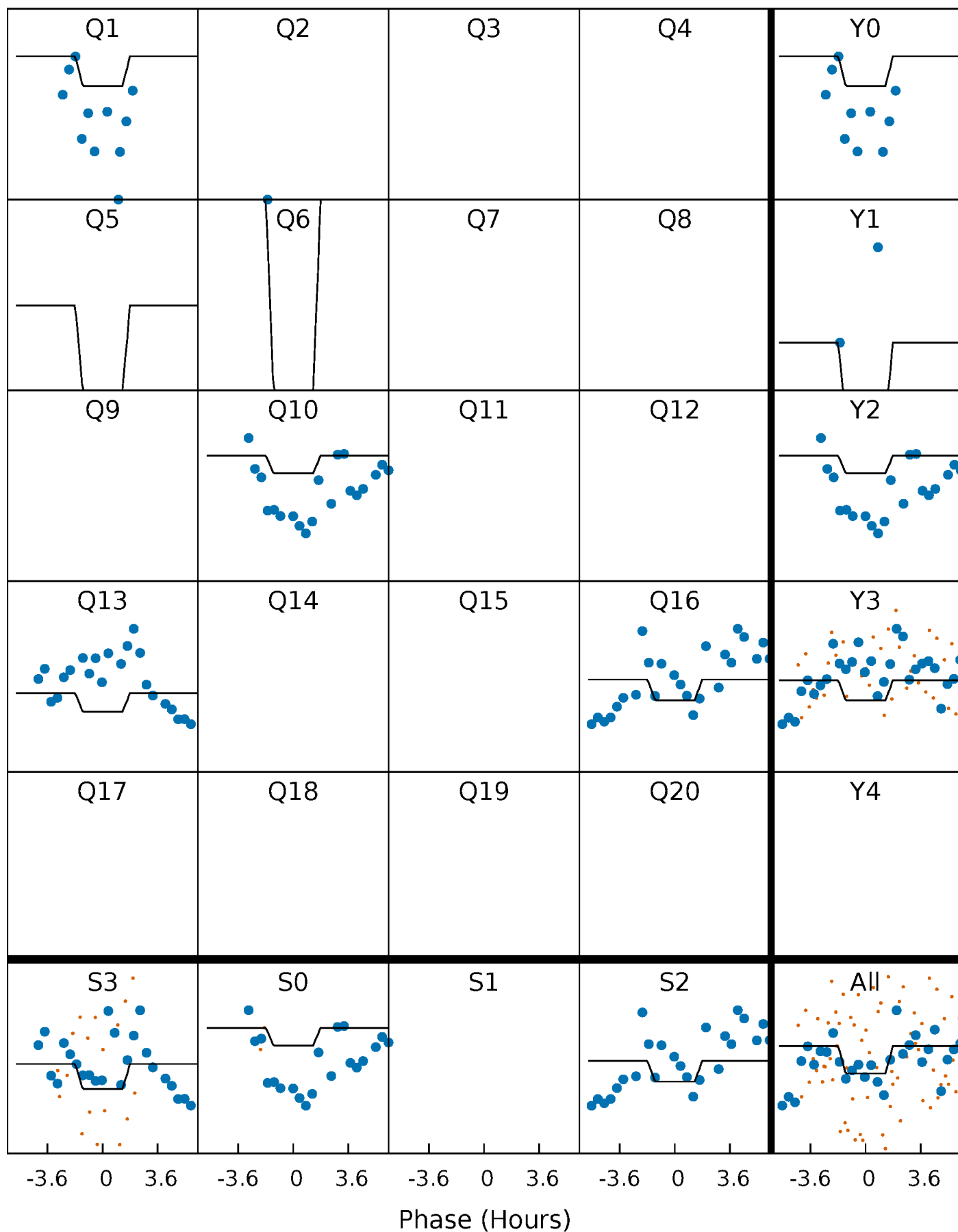
# DV Quarter-Phased Transit Curves

TCE 009243421-07 P=152.795479 Days  $T_0=152.270891$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

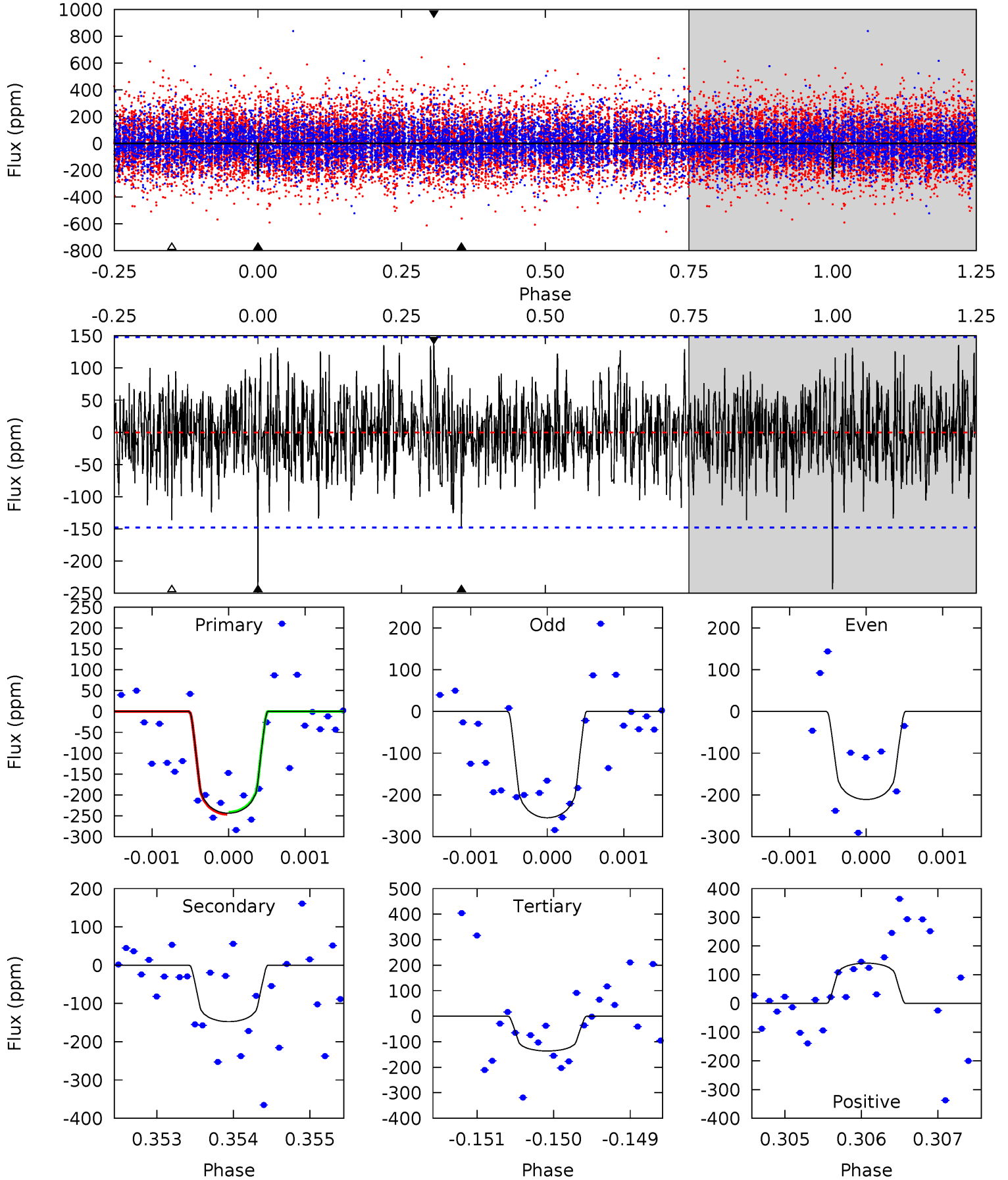
TCE 009243421-07 P=152.797050 Days  $T_0=152.267362$  (BKJD)



# DV Model-Shift Uniqueness Test

009243421-07, P = 152.795479 Days, E = 152.270891 Days

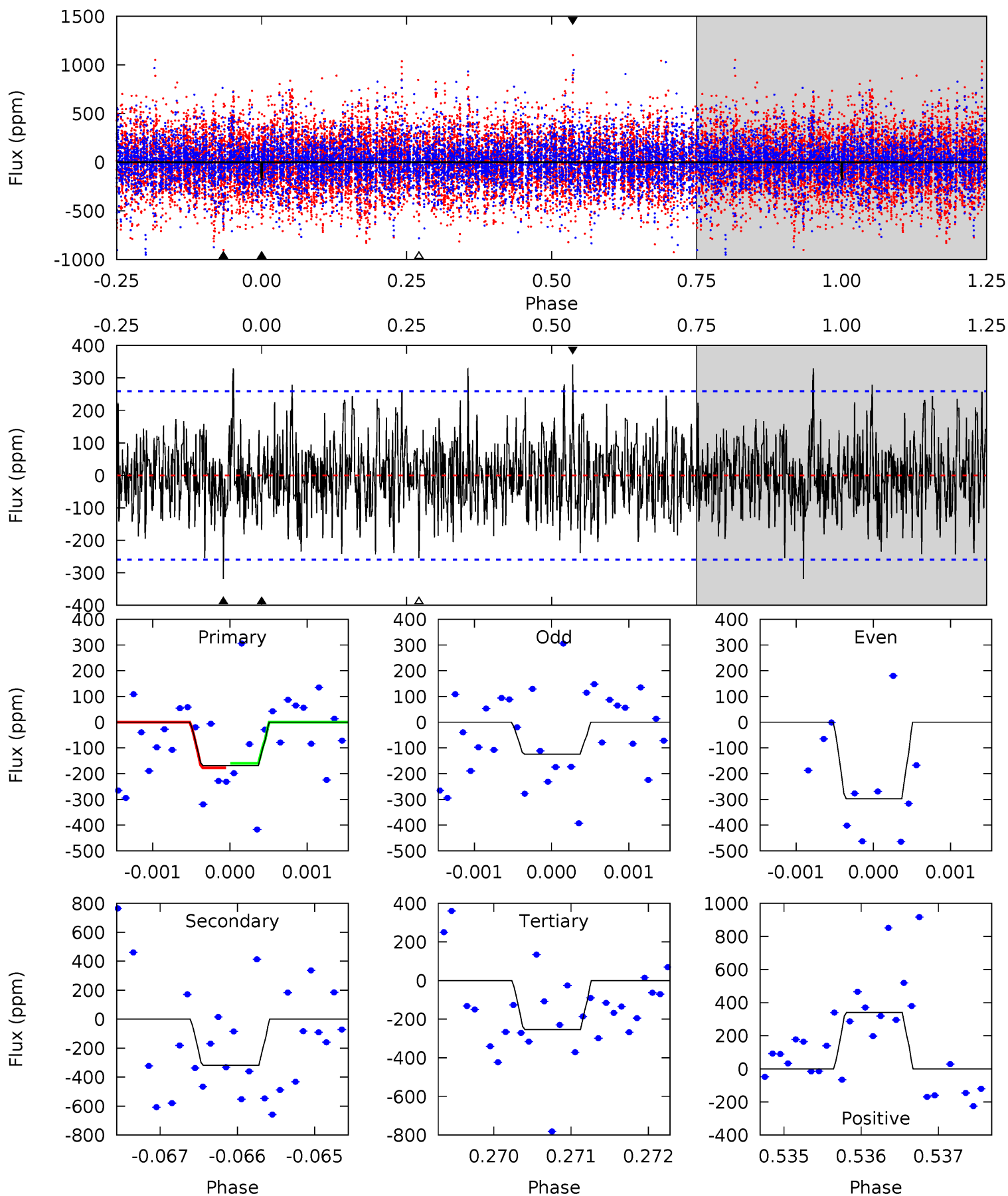
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.97 | 5.43 | 5.02 | 5.17 | 5.44            | 3.27            | 1.57             | 3.96    | 3.80    | 0.41    | 0.26    | 0.69    | 0.99 | 0.37  | 0.10 |



# Alt Model-Shift Uniqueness Test

009243421-07, P = 152.797050 Days, E = 152.267362 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 3.53 | 6.71 | 5.34 | 7.18 | 5.46            | 3.30            | 1.76             | -1.80   | -3.64   | 1.37    | -0.47   | 1.57    | 0.82 | 0.52  | 0.18 |





### Stellar Parameters For KIC 009243421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6331^{+195}_{-176}$ | $3.377^{+0.408}_{-0.072}$ | $-0.280^{+0.400}_{-0.300}$ | $4.588^{+0.666}_{-1.999}$ | $1.832^{+0.125}_{-0.468}$ | $0.027^{+0.099}_{-0.006}$                     |
|        | +3%/-3%              | +12%/-2%                  | +143%/-107%                | +15%/-44%                 | +7%/-26%                  | +370%/-24%                                    |
| Source | PHO1                 | FLK73                     | 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 009243421-07 / KOI

| Detrend | Depth (ppm)   | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)      | $T_{obs}$ (K)          | $A_{obs}$               |
|---------|---------------|------------------------|--------------------|------------------------|-------------------------|
| DV      | $-148 \pm 27$ | $7.49^{+4.84}_{-4.14}$ | $986^{+62}_{-113}$ | $5365^{+2714}_{-960}$  | $675^{+2662}_{-440}$    |
| Alt.    | $-319 \pm 48$ | $5.67^{+4.48}_{-3.30}$ | $981^{+65}_{-113}$ | $7433^{+6959}_{-1775}$ | $2390^{+11682}_{-1627}$ |

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

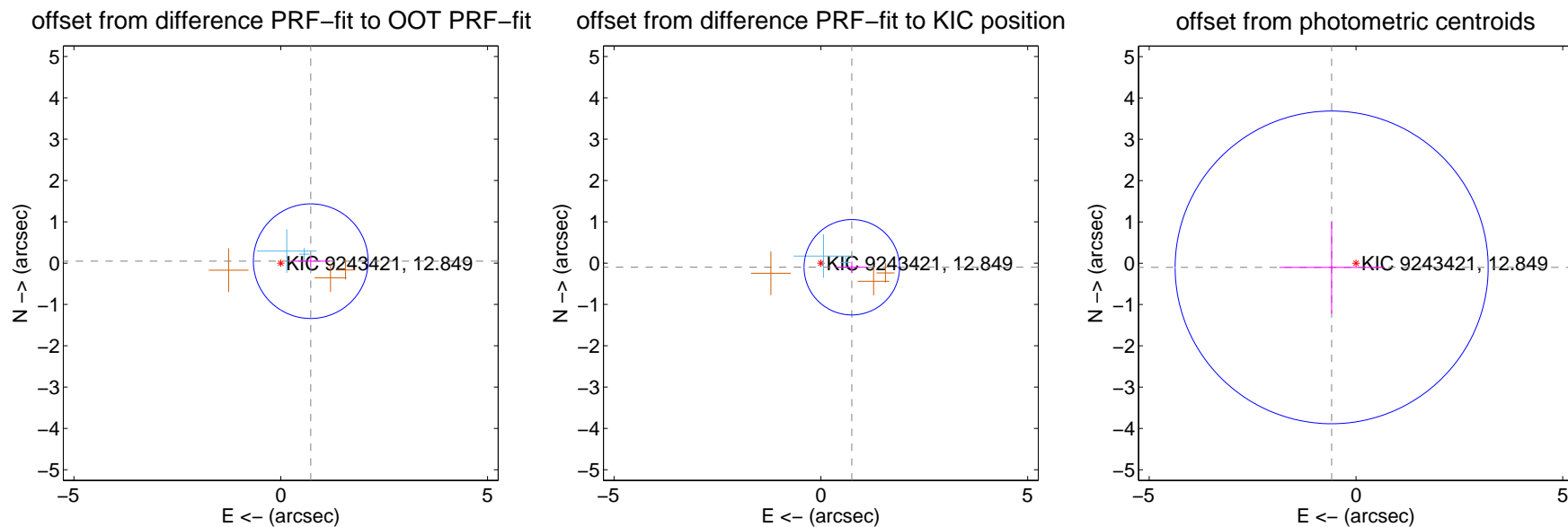
## DV Centroid Data

Supplemental centroid analysis for 009243421-07. Kepler magnitude: 12.85. Transit SNR 7.66

There are 2 quarters with good PRF difference image offsets

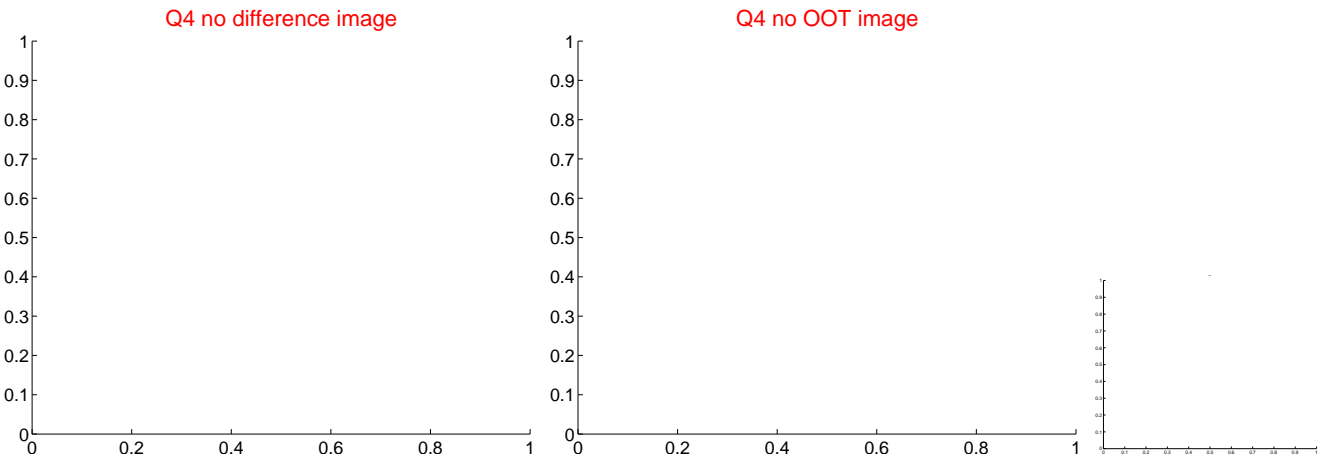
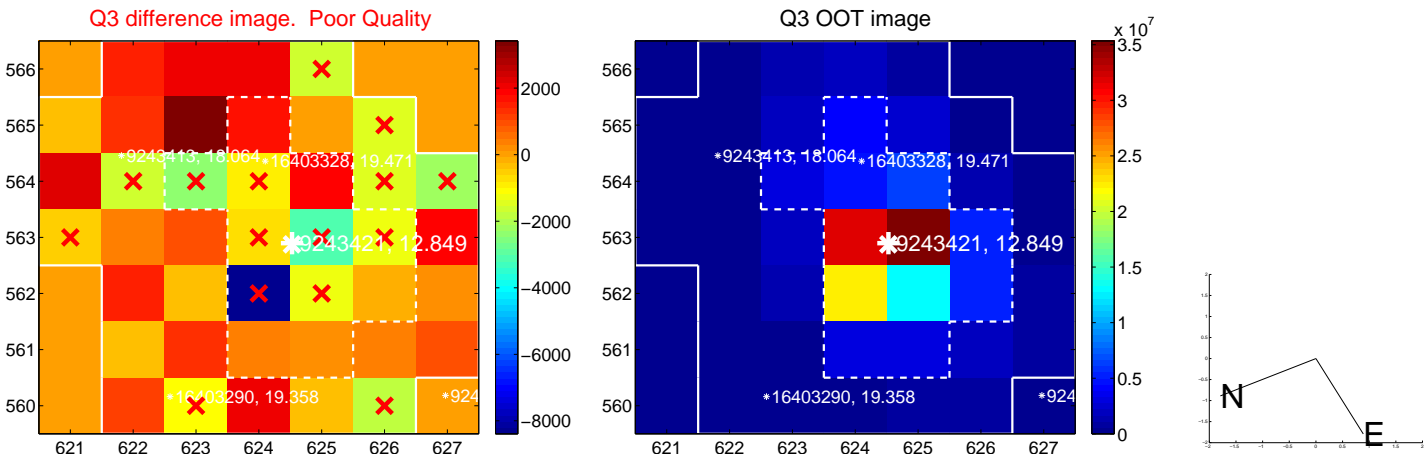
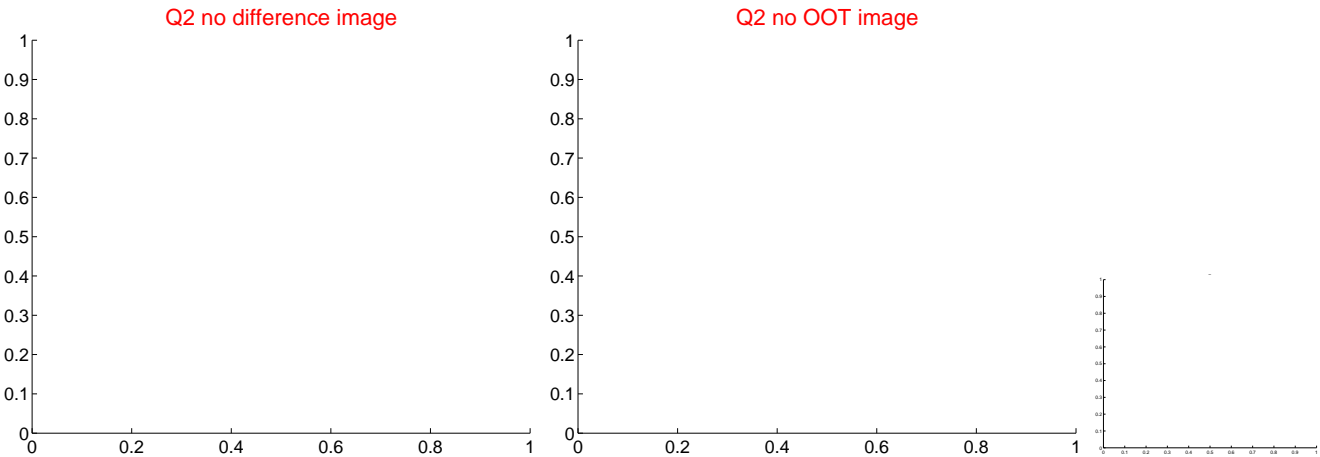
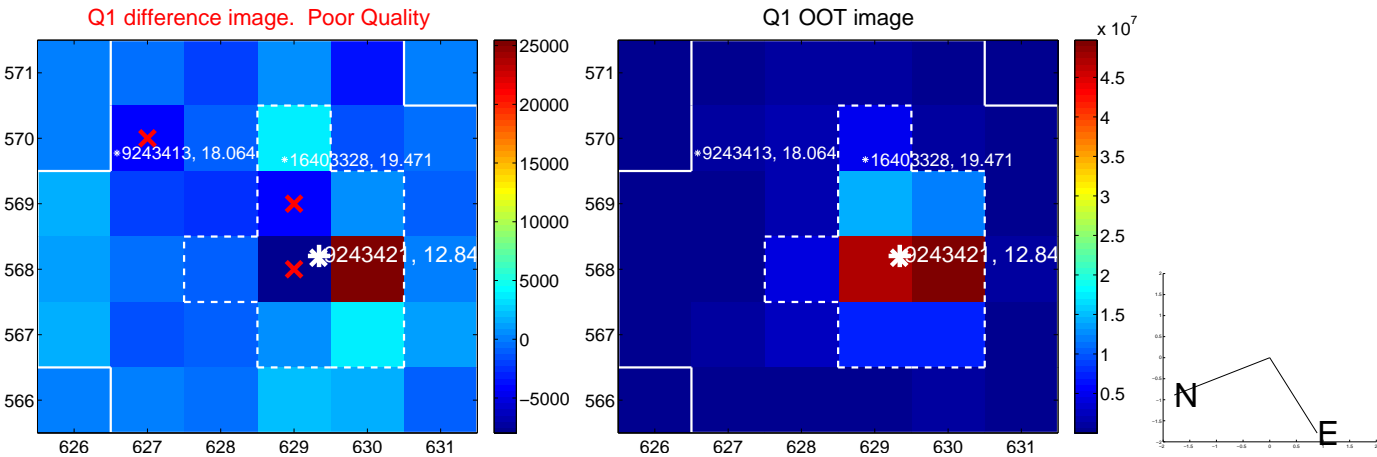
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.726 \pm 0.462$  | 1.57                | $-0.725 \pm 0.465$ | $0.048 \pm 0.124$  |
| PRF-fit source offset from KIC position | $0.755 \pm 0.385$  | 1.96                | $-0.748 \pm 0.383$ | $-0.099 \pm 0.136$ |
| photometric centroid source offset      | $0.60 \pm 1.26$    | 0.47                | $0.59 \pm 1.27$    | $-0.10 \pm 1.12$   |

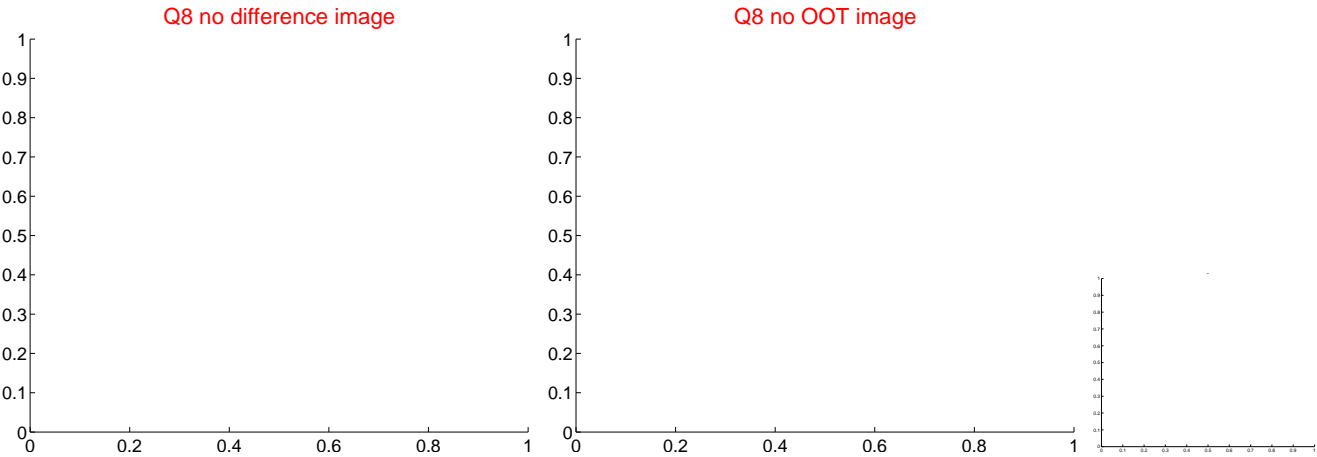
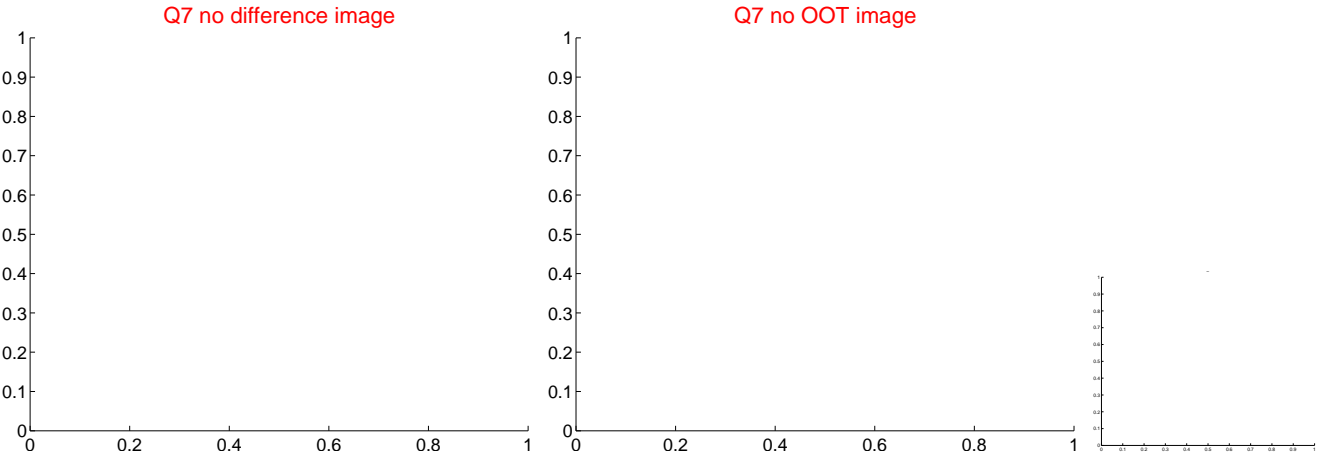
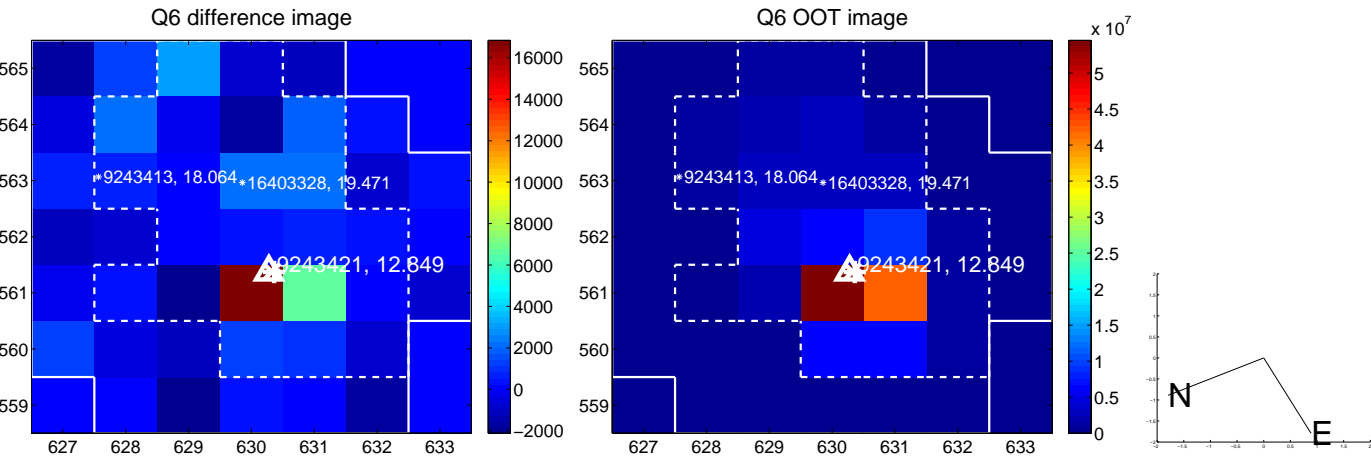
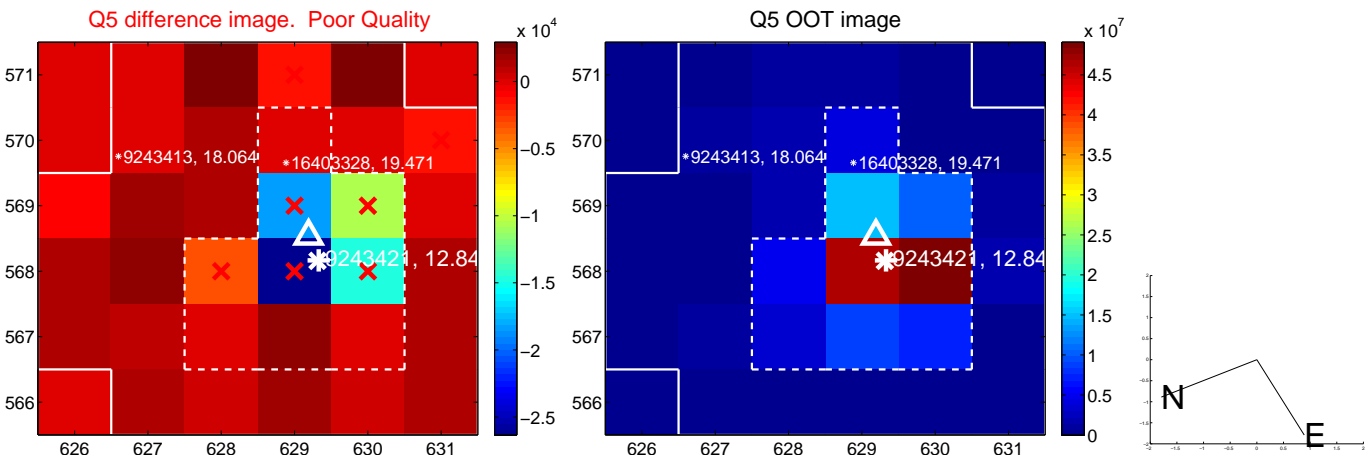


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

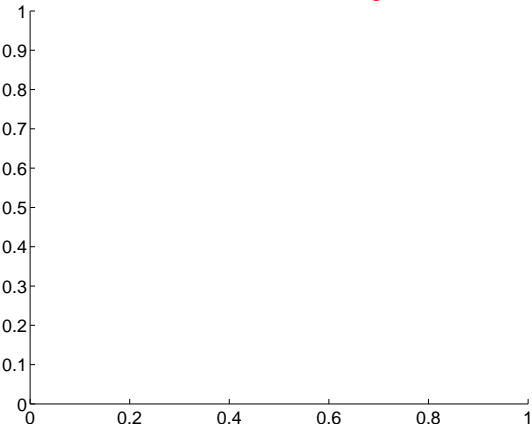


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

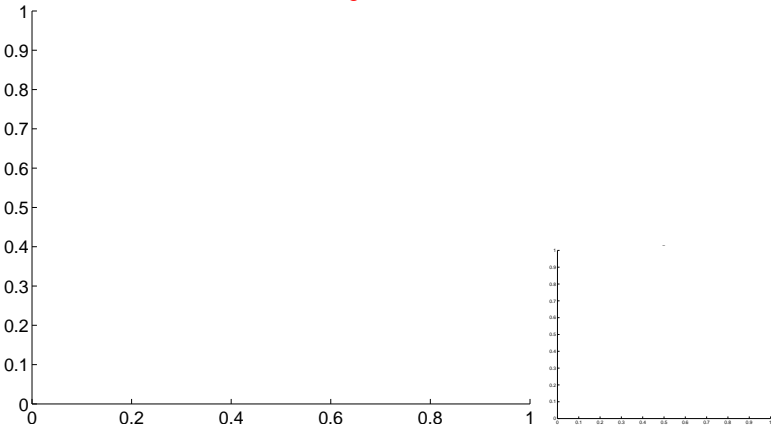


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

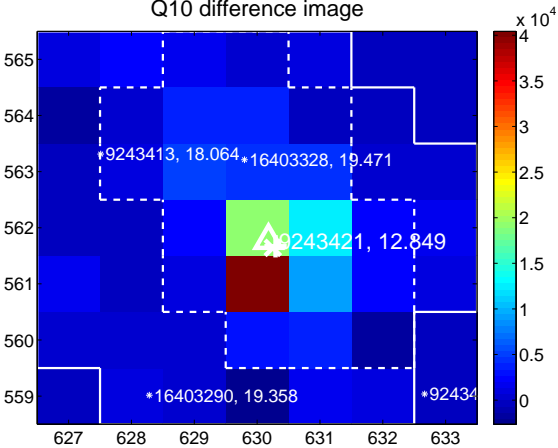
Q9 no difference image



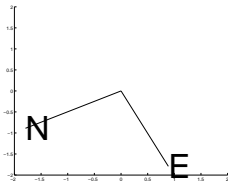
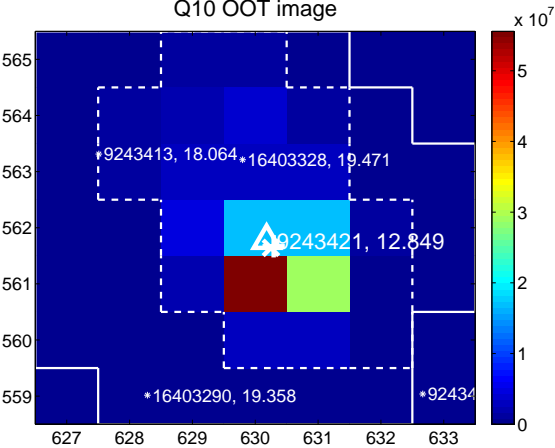
Q9 no OOT image



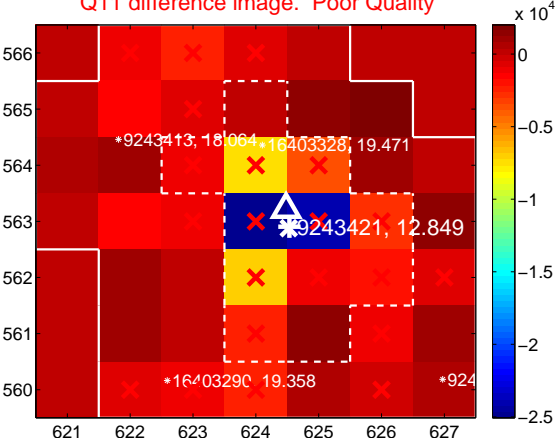
Q10 difference image



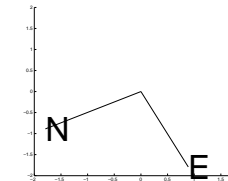
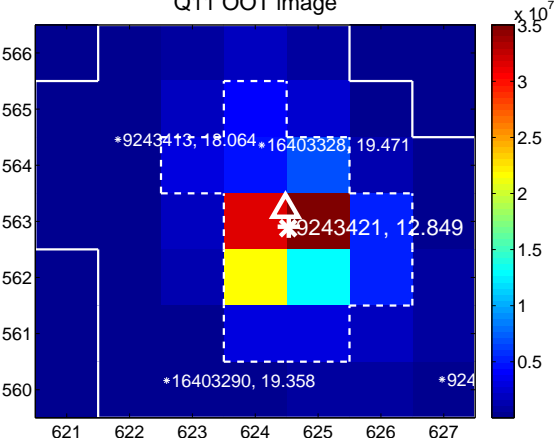
Q10 OOT image



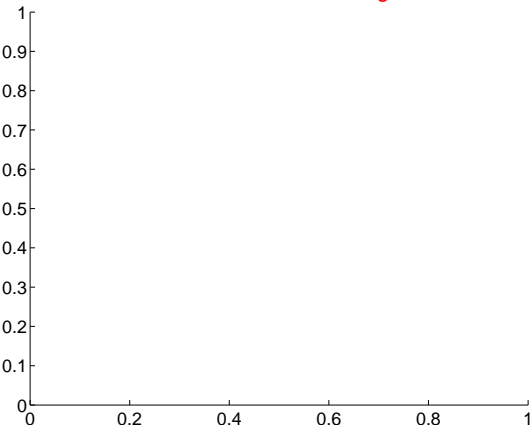
Q11 difference image. Poor Quality



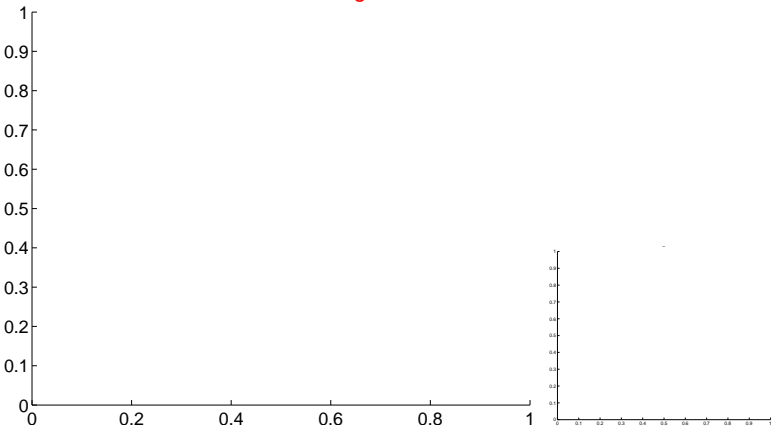
Q11 OOT image



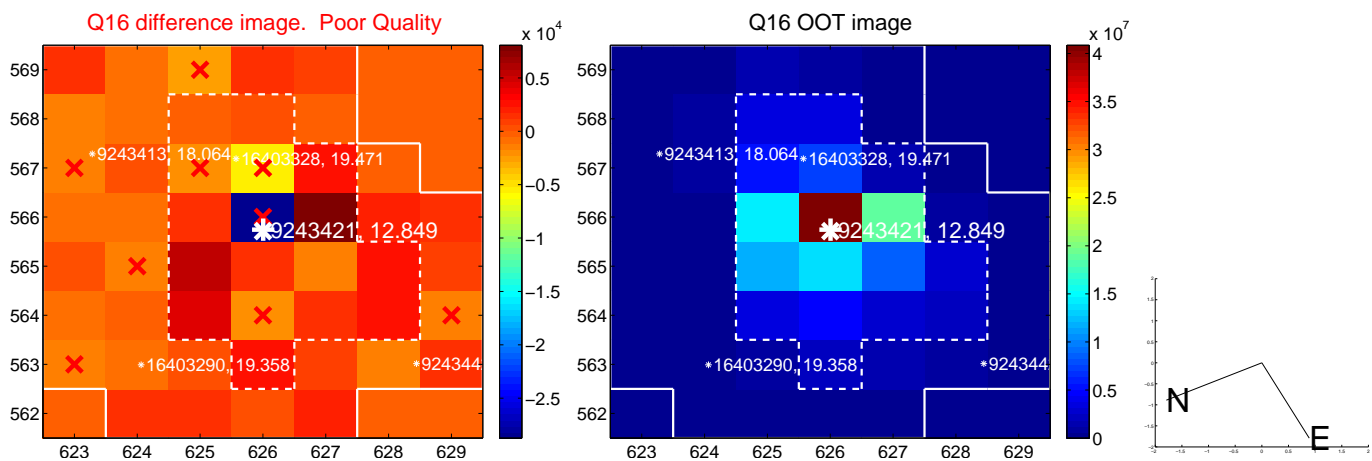
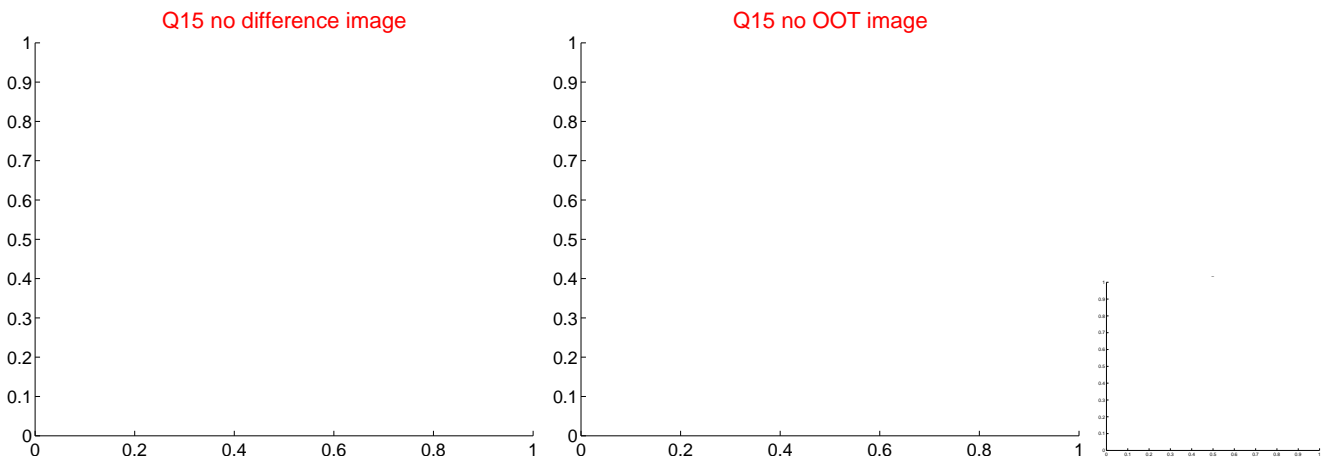
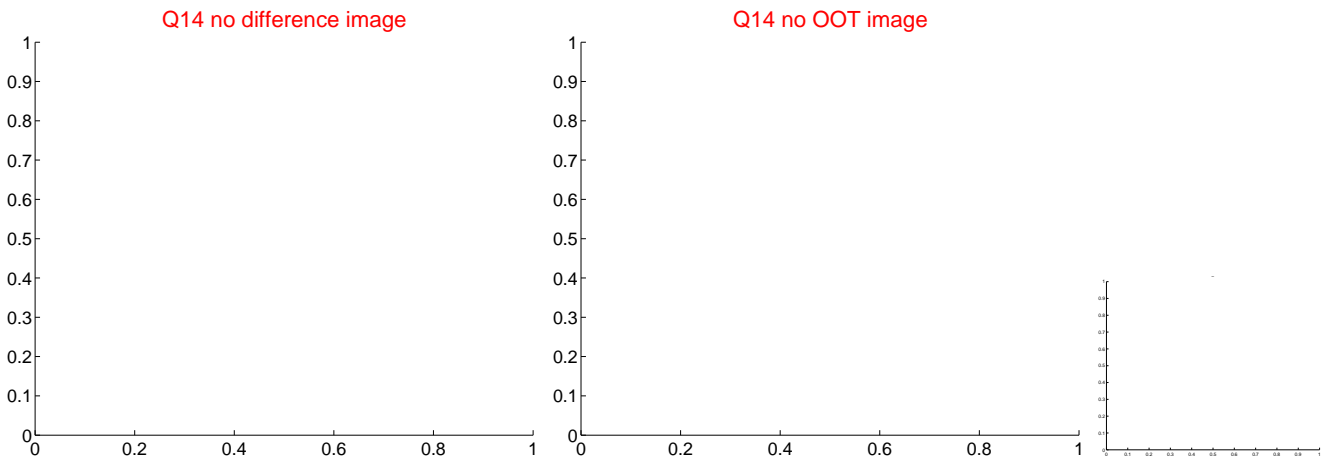
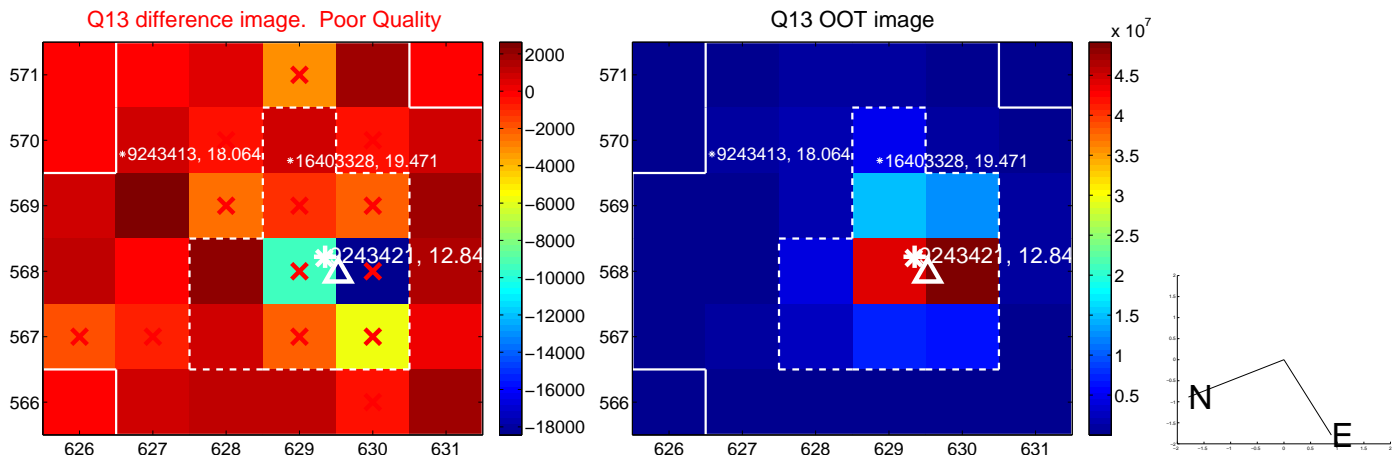
Q12 no difference image



Q12 no OOT image

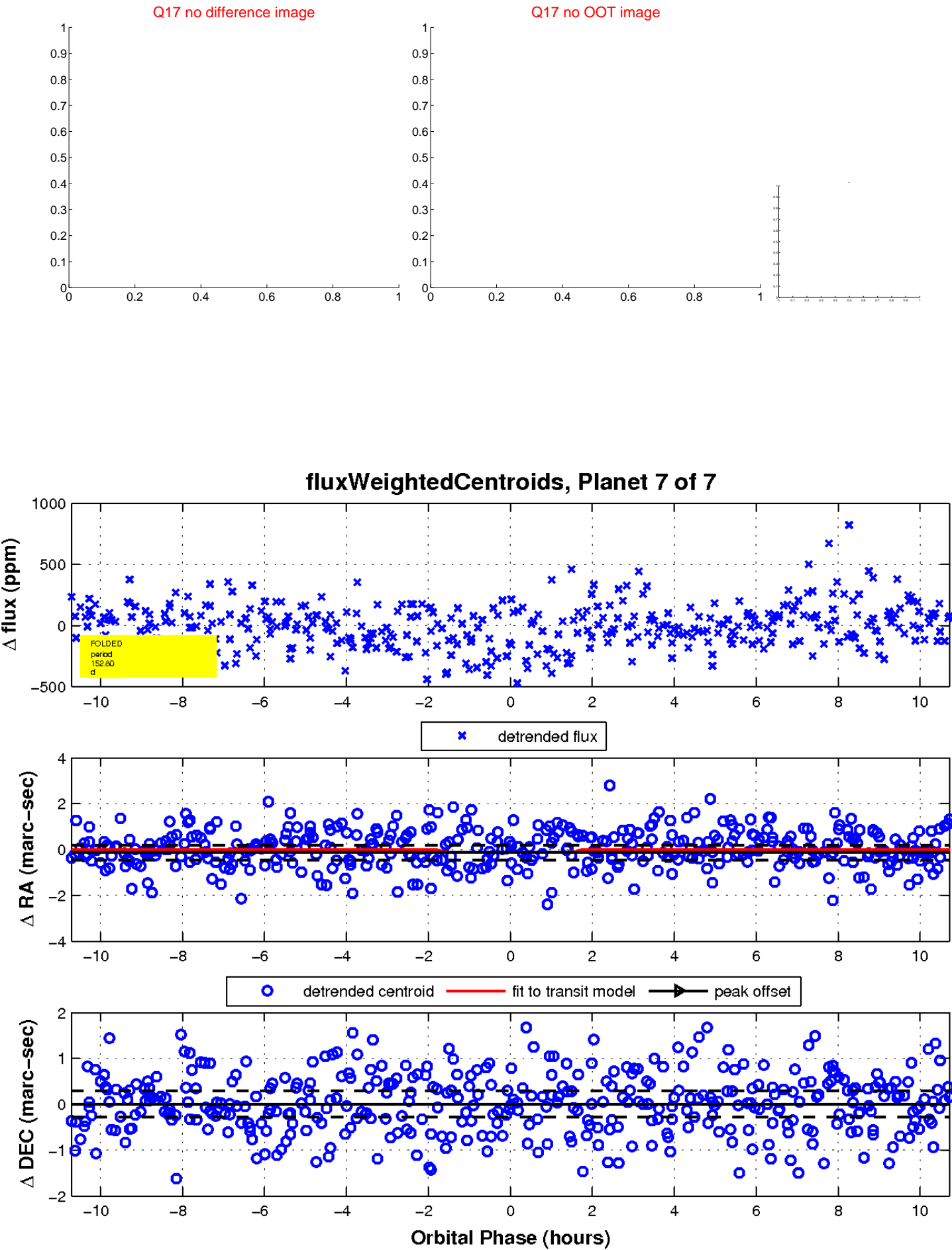


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

