

# KIC 006203421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 006203421-01 | OBS      | No   | 555.754648    | 238.117755   | 722.0       | 7.685            | 16.8 | 2.3  | 0.70                        | 5377            | 1.99                   | 0.28                   |
| 006203421-02 | OBS      | No   | 575.380113    | 355.145876   | 2632.3      | 4.095            | 18.8 | 8.1  | 0.70                        | 5377            | 3.59                   | 0.26                   |
| 006203421-03 | OBS      | No   | 380.496036    | 150.922745   | 2120.0      | 5.296            | 20.5 | 6.4  | 0.70                        | 5377            | 3.32                   | 0.46                   |
| 006203421-04 | OBS      | No   | 624.043177    | 328.809753   | 2182.8      | 4.127            | 17.6 | 7.5  | 0.70                        | 5377            | 3.35                   | 0.24                   |
| 006203421-05 | OBS      | No   | 356.184196    | 265.970630   | 635.9       | 4.500            | 15.7 | -1.0 | 0.70                        | 5377            | 1.76                   | 0.50                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 006203421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS     |
| 006203421-02 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_CHASES_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS—CENT_UNCERTAIN—HALO_GHOST |
| 006203421-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 006203421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS                       |
| 006203421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS  |

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

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

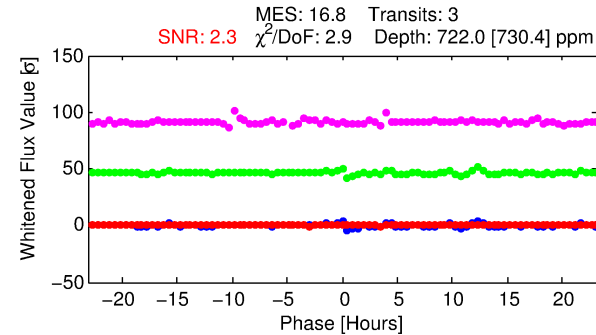
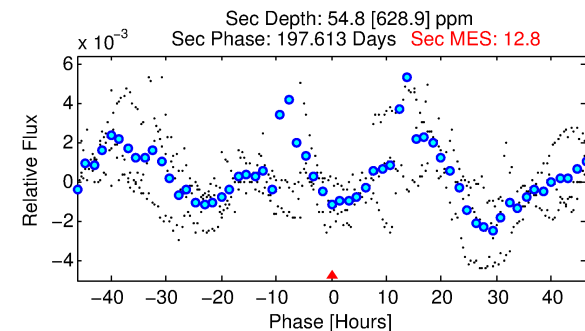
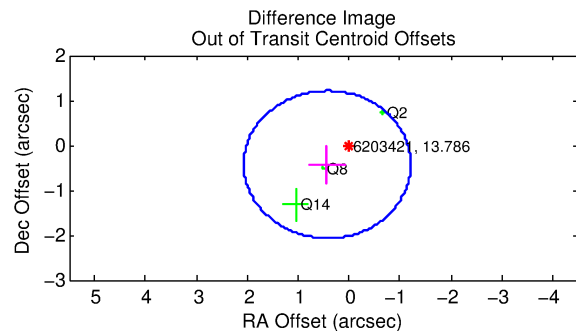
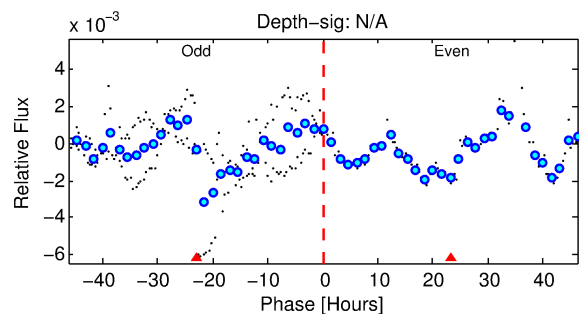
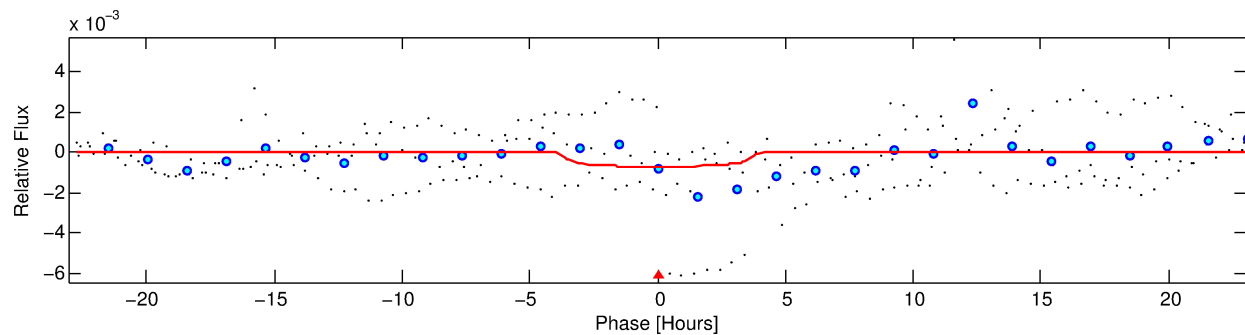
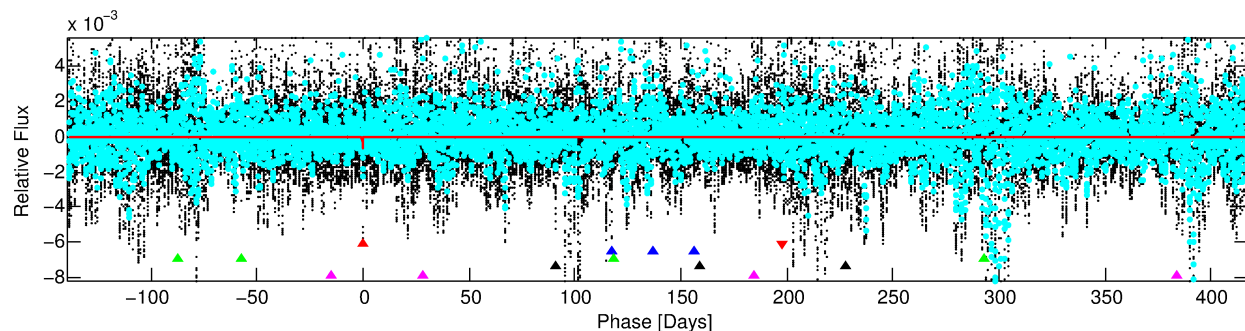
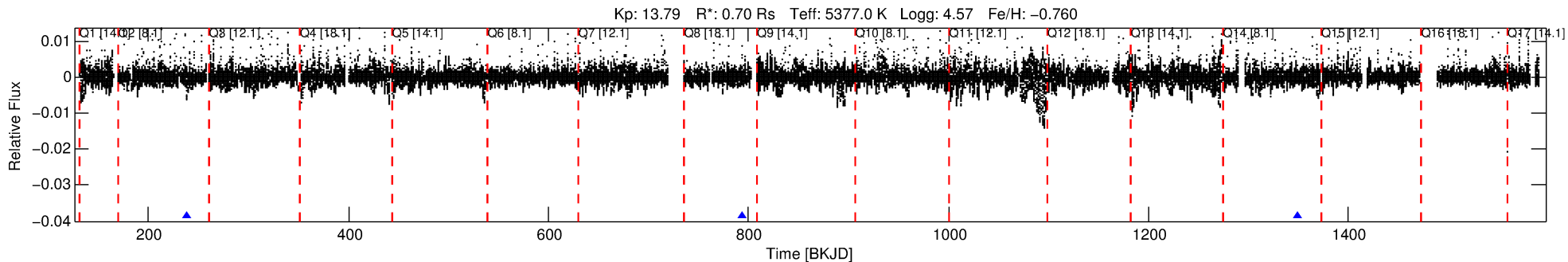
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006203421-01

No Significant Match Found

# DV One-Page Summary

KIC: 6203421 Candidate: 1 of 5 Period: 555.755 d



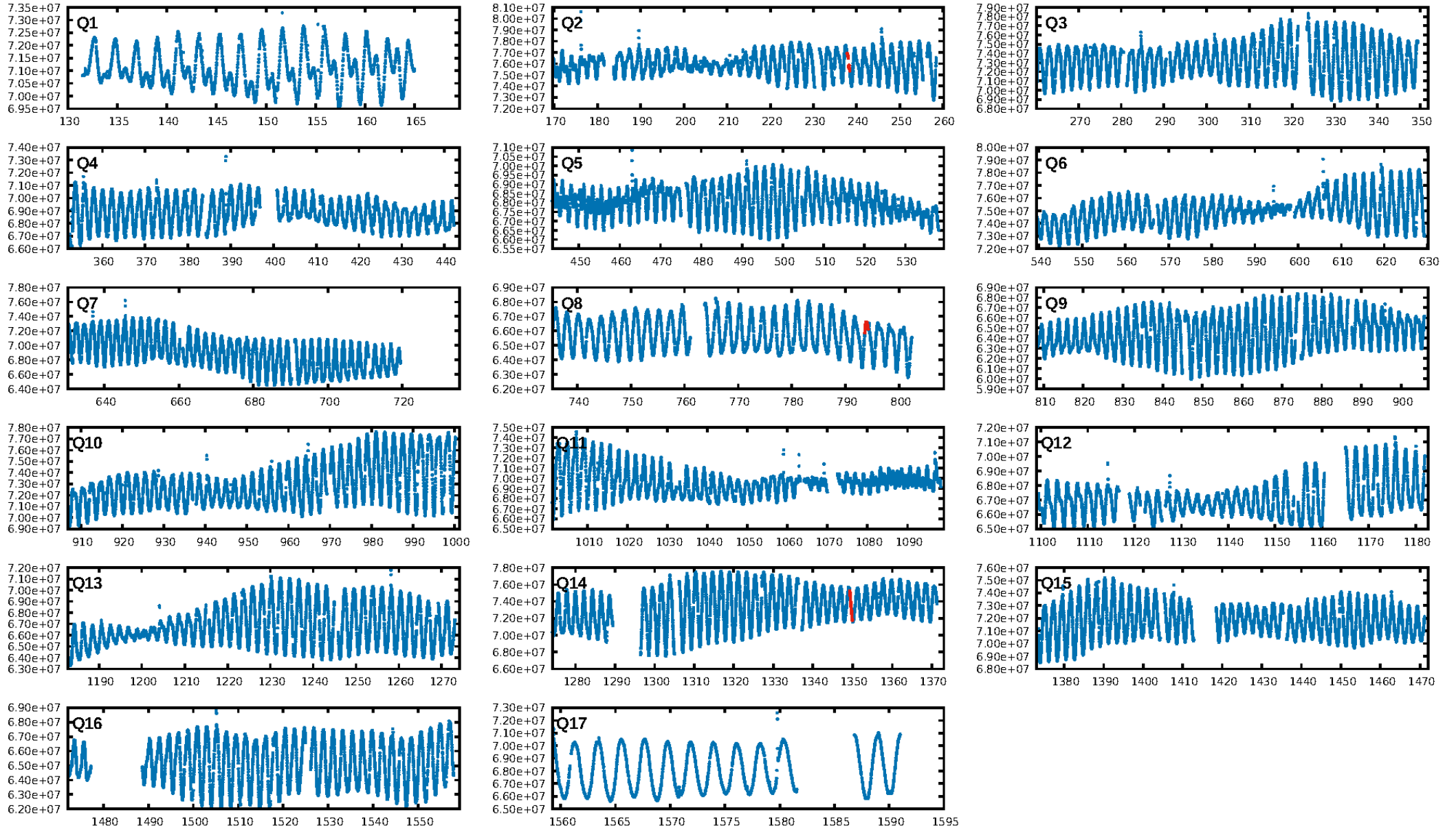
## DV Fit Results:

Period = 555.75465 [0.02383] d  
Epoch = 238.1178 [0.0320] BKJD  
Rp/R\* = 0.0260 [0.0394]  
a/R\* = 434.54 [2476.98]  
b = 0.66 [4.93]  
Seff = 0.28 [0.05]  
Teq = 185 [9] K  
Rp = 1.99 [3.03] Re  
a = 1.1568 [0.1217] AU  
Ag = 10171.36 [120674.26] [0.08σ]  
Teffp = 2871 [8516] K [0.32σ]

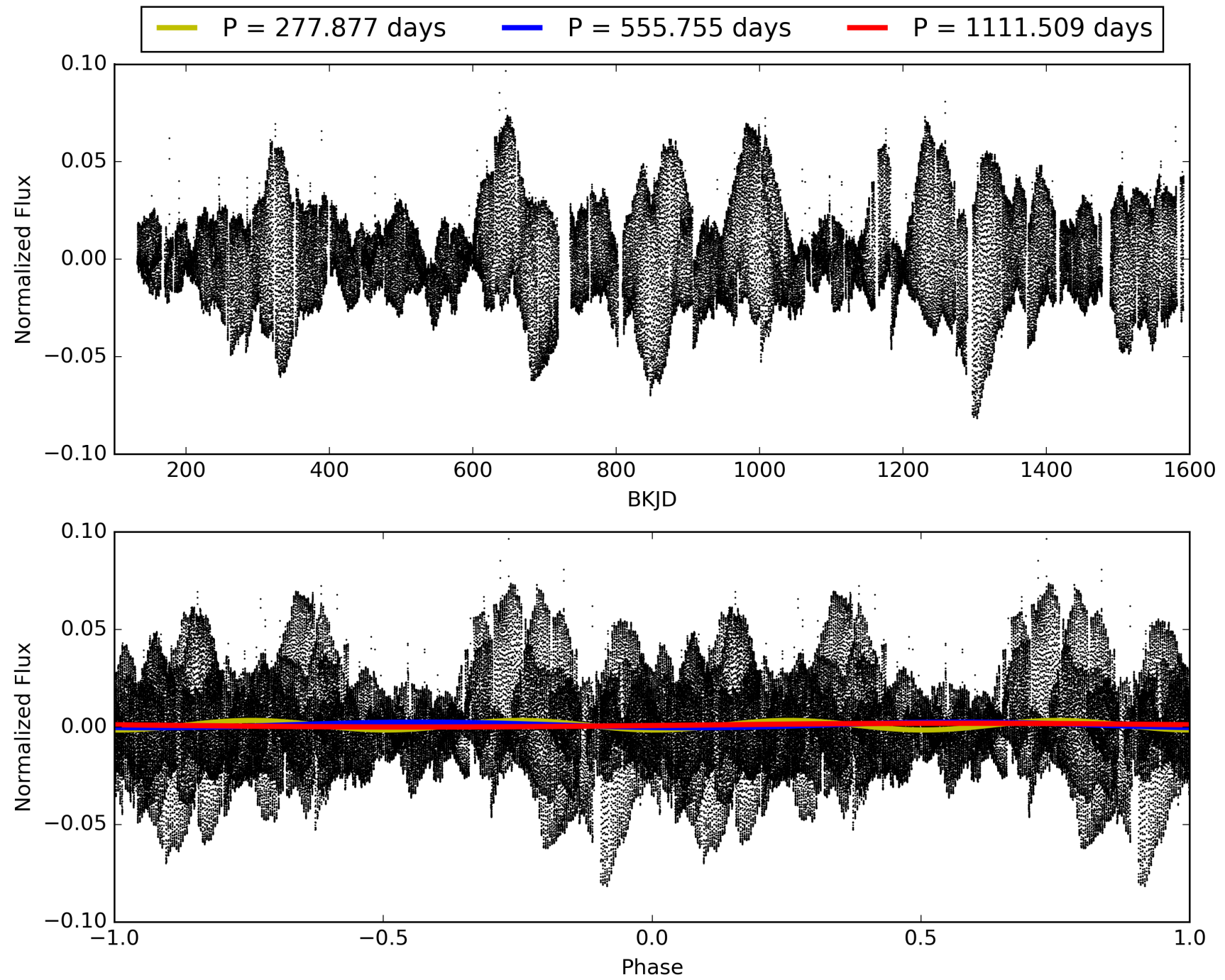
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [450.69σ]  
LongPeriod-sig: 100.0% [54.09σ]  
ModelChiSquare2-sig: 17.4%  
ModelChiSquareGof-sig: 11.5%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.6188  
Centroid-sig: 6.0%  
Centroid-so: 4.306 arcsec [2.33σ]  
OotOffset-rm: 0.608 arcsec [1.11σ]  
OotOffset-st: 2/0/1/0 [3]  
KicOffset-rm: 0.557 arcsec [3.73σ]  
KicOffset-st: 2/0/1/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 006203421-01, PDC Light Curves



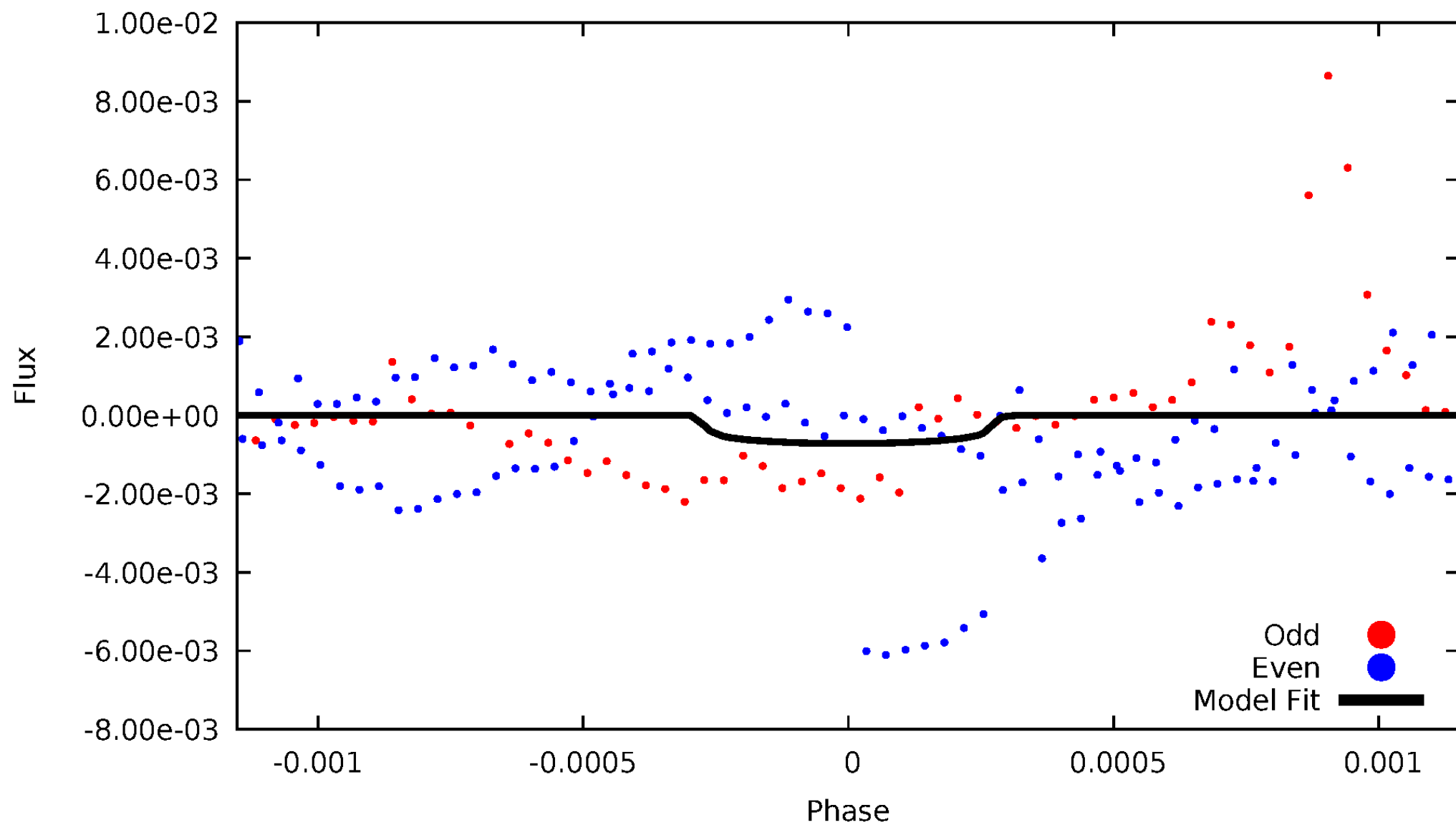
TCE 006203421-01





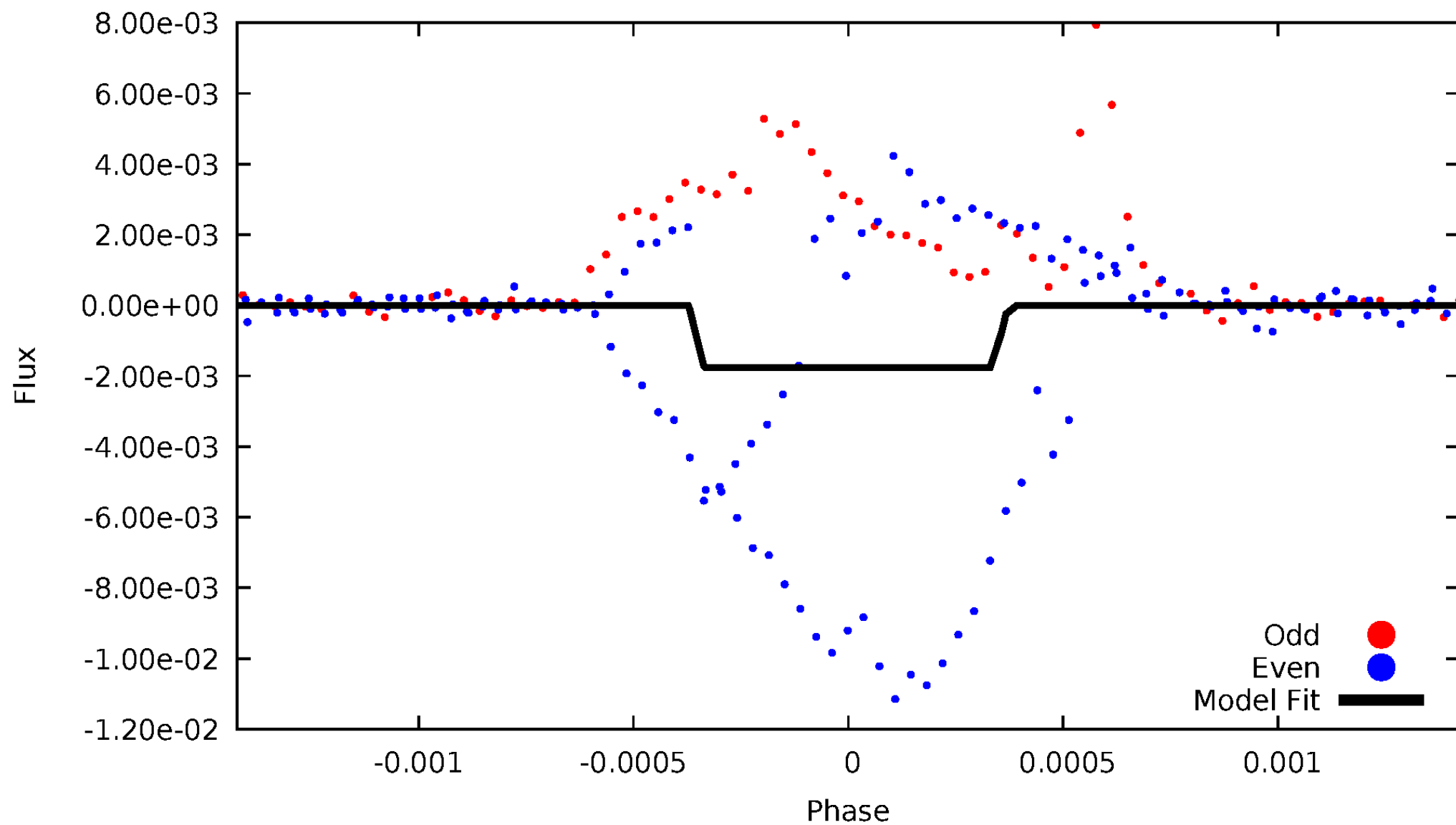
# DV Odd/Even

TCE 006203421-01



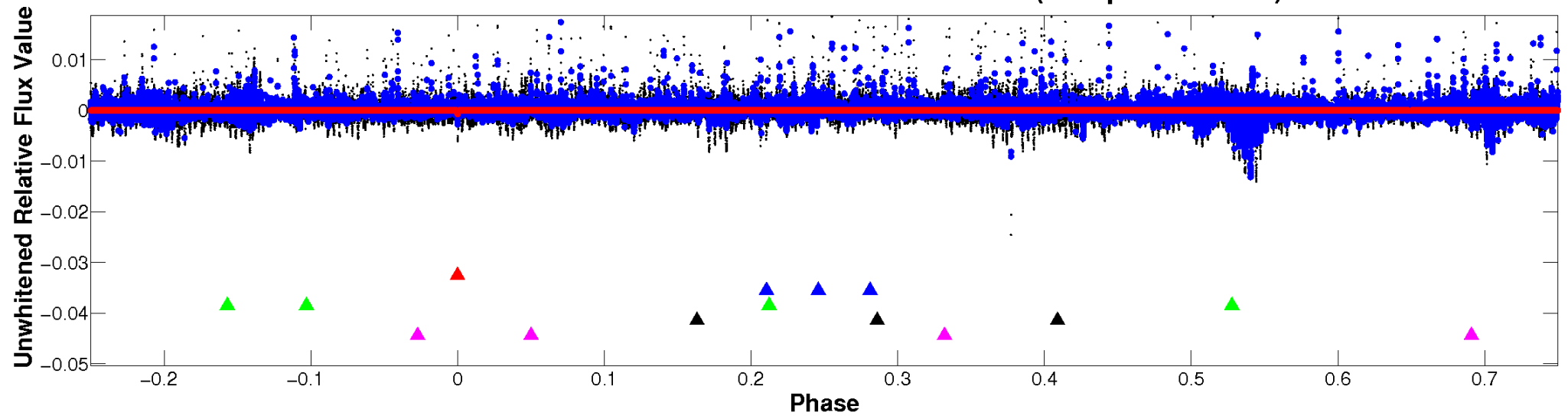
# ALT Odd/Even

TCE 006203421-01

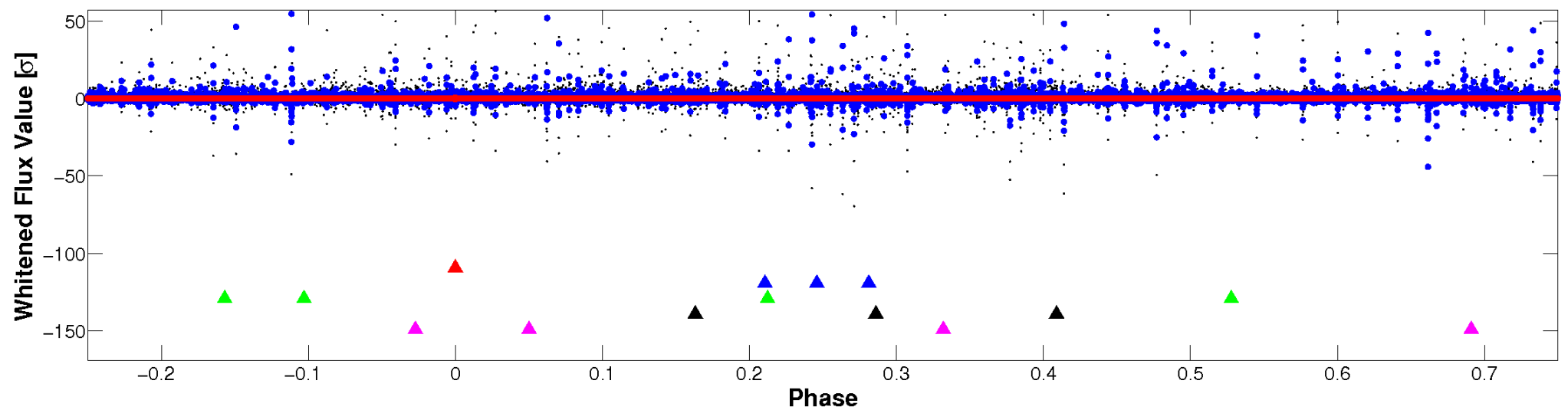


# Non-Whitened Vs. Whitened Light Curve

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

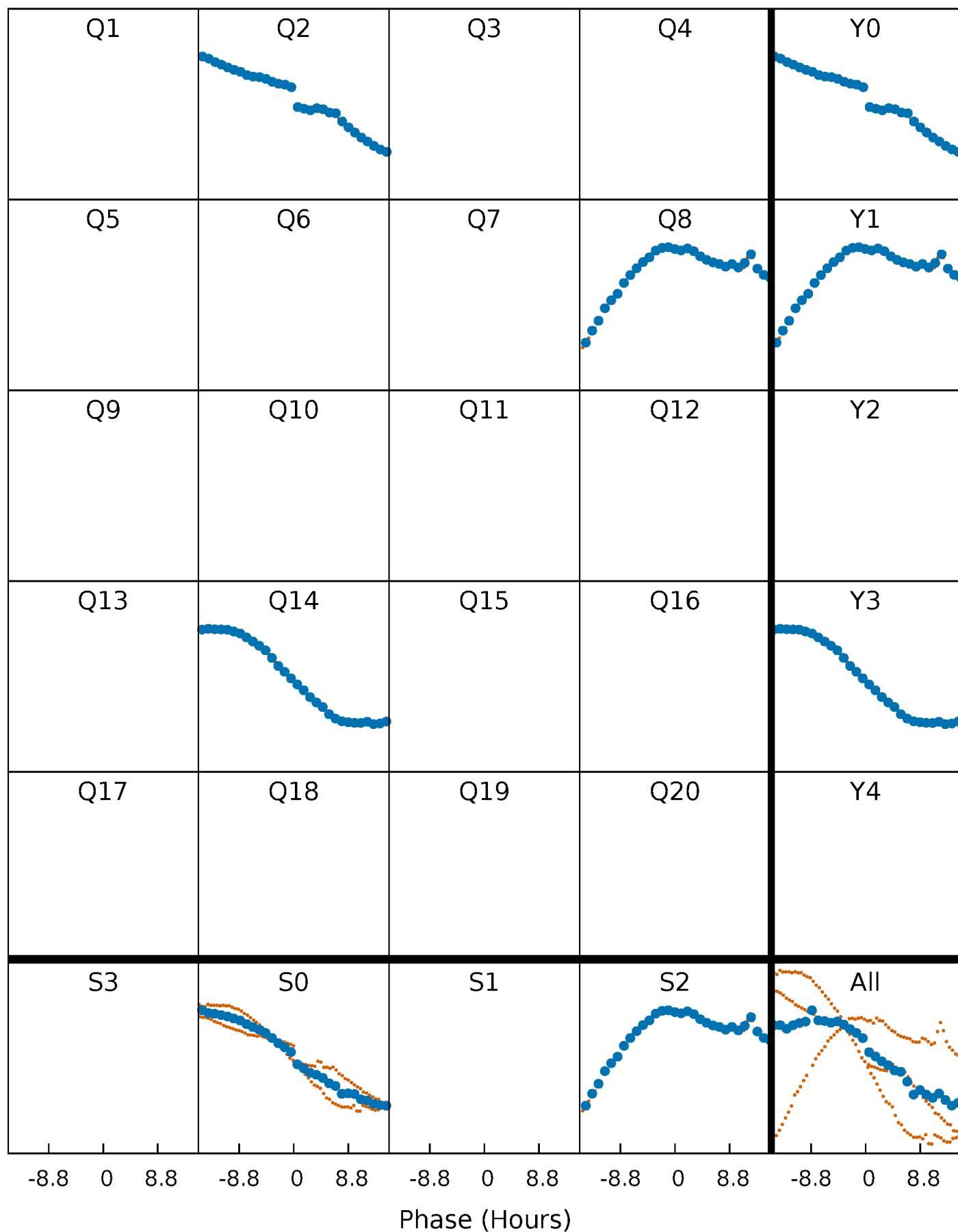


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



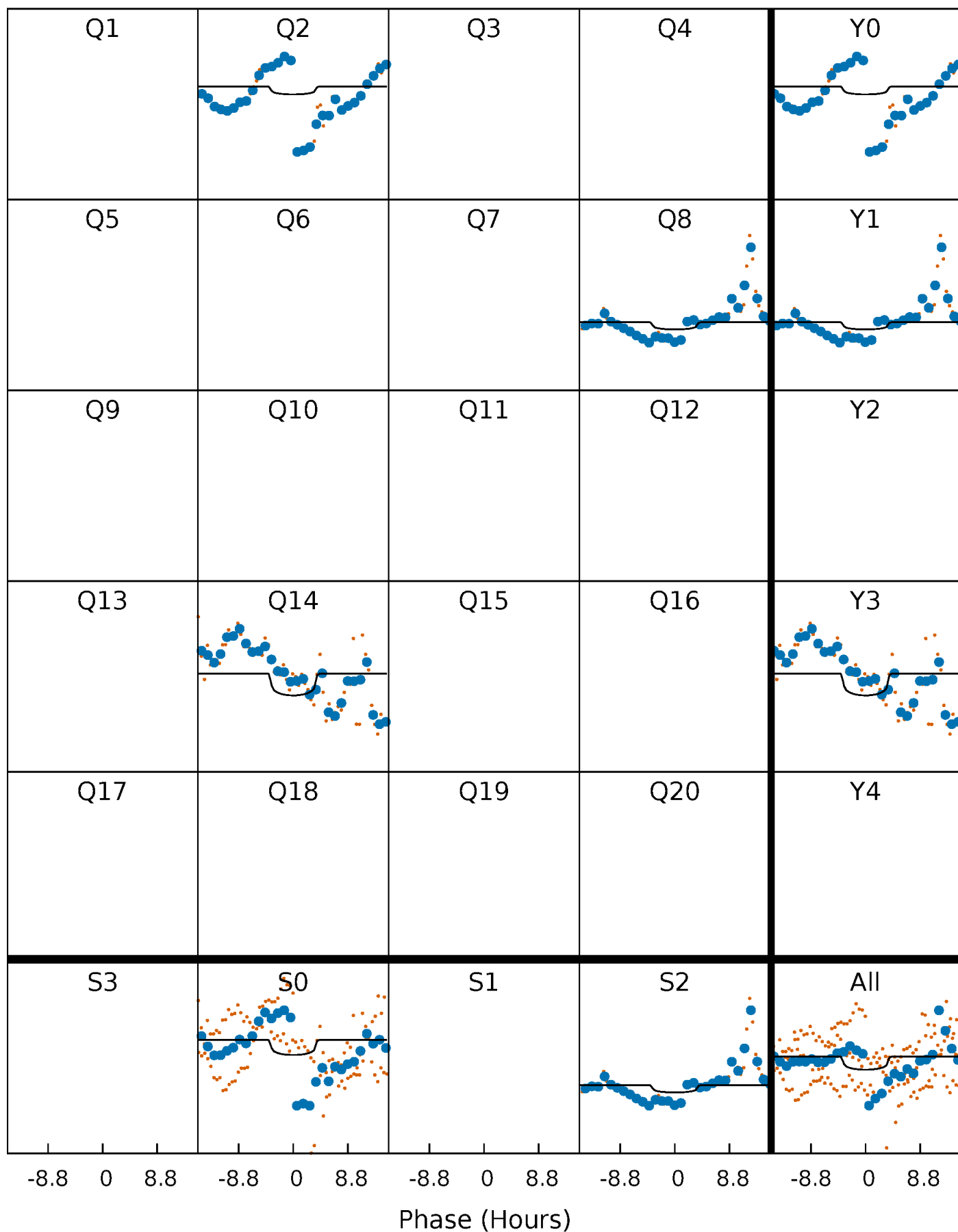
# PDC Quarter-Phased Transit Curves

TCE 006203421-01 P=555.754648 Days  $T_0=238.117755$  (BKJD)



# DV Quarter-Phased Transit Curves

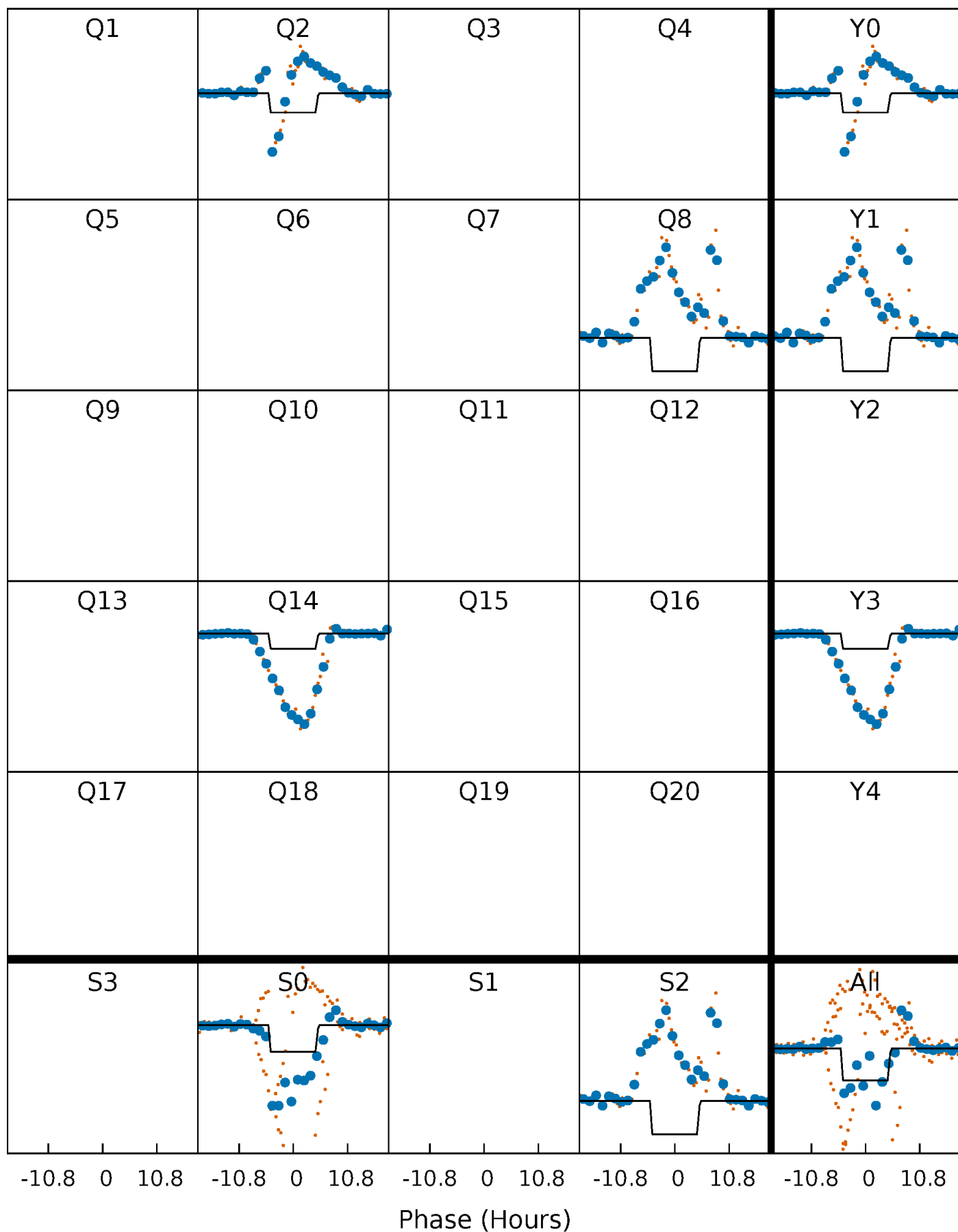
TCE 006203421-01 P=555.754648 Days  $T_0=238.117755$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

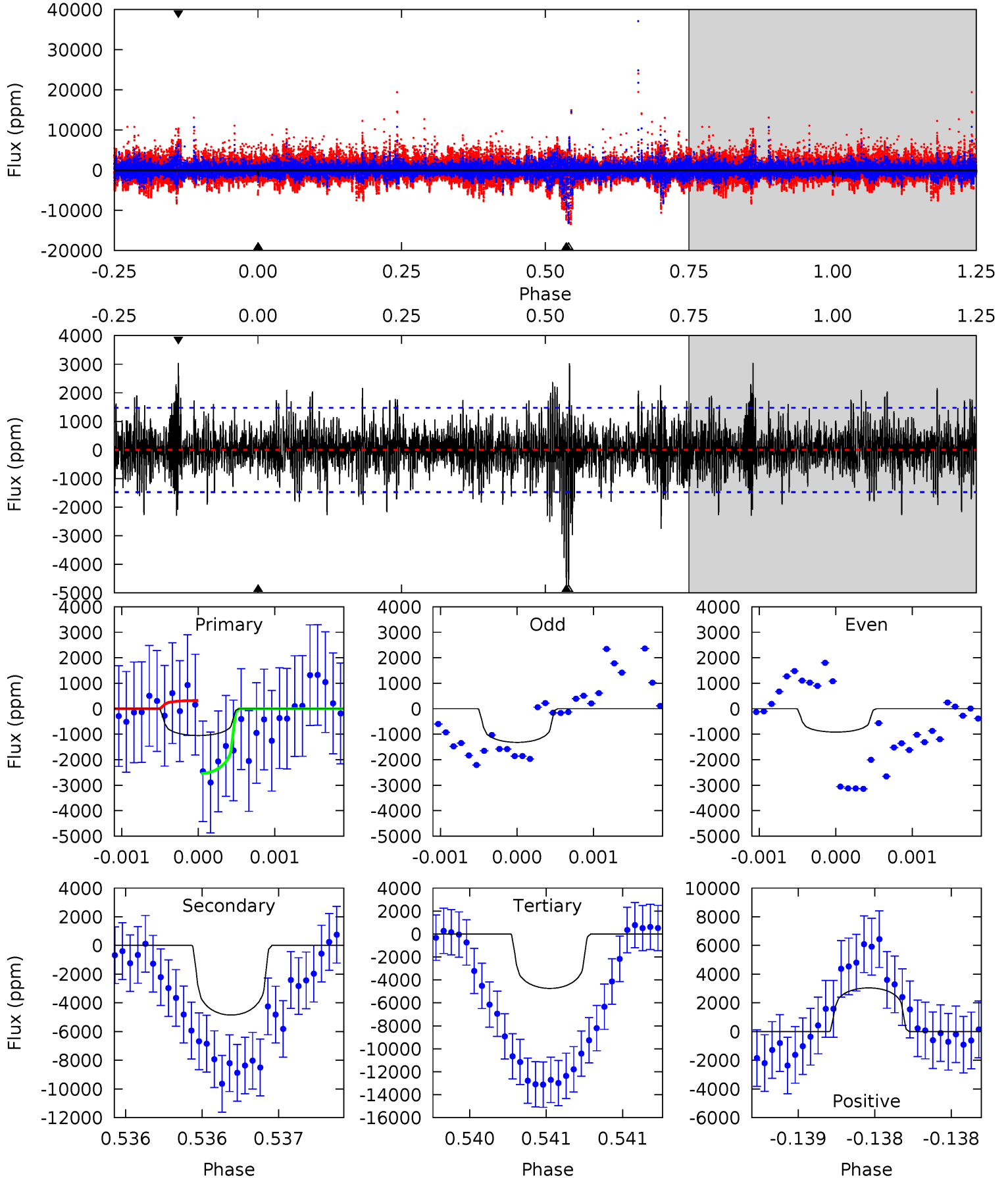
TCE 006203421-01 P=555.731531 Days  $T_0=238.323600$  (BKJD)



# DV Model-Shift Uniqueness Test

006203421-01, P = 555.754648 Days, E = 238.117755 Days

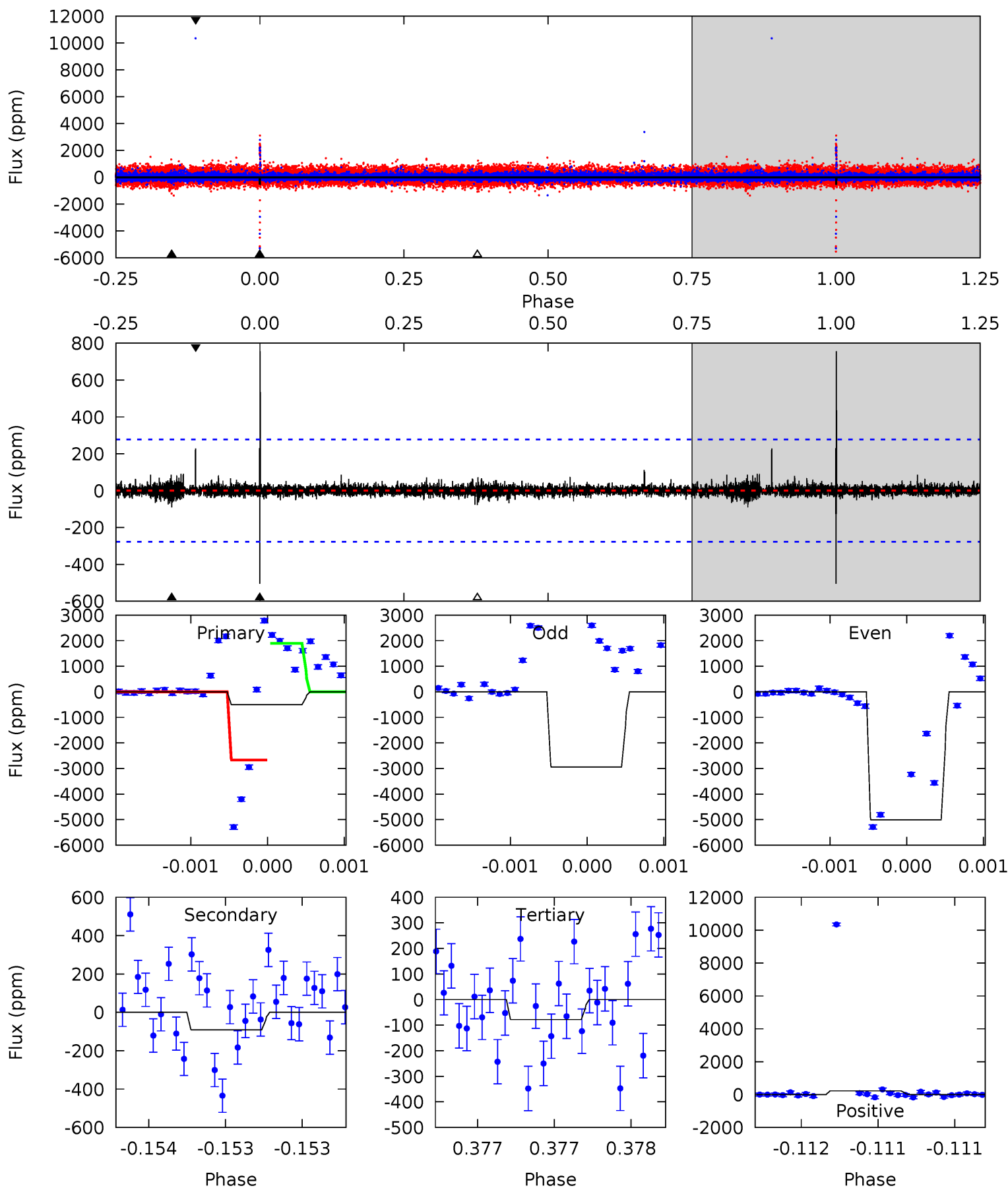
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 3.95 | 18.2 | 17.8 | 11.4 | 5.54            | 3.43            | 2.46             | -13.8   | -7.48   | 0.41    | 6.78    | 0.65    | 0.80 | 0.39  | 4.17 |



# Alt Model-Shift Uniqueness Test

006203421-01, P = 555.731531 Days, E = 238.323600 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 |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|-----|
| 10.0 | 1.80 | 1.55 | 4.54 | 5.51            | 3.39            | 0.36             | 8.45    | 5.46    | 0.25    | -2.74   | 24.1    | -6.41 | 0.60  | 0   |



### Stellar Parameters For KIC 006203421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5377^{+160}_{-160}$ | $4.569^{+0.088}_{-0.072}$ | $-0.760^{+0.350}_{-0.300}$ | $0.703^{+0.085}_{-0.077}$ | $0.669^{+0.076}_{-0.033}$ | $2.709^{+0.958}_{-0.648}$                     |
|        | +3%/-3%              | +2%/-2%                   | +46%/-39%                  | +12%/-11%                 | +11%/-5%                  | +35%/-24%                                     |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 006203421-01 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)     | $T_{obs}$ (K)           | $A_{obs}$                     |
|---------|-----------------|------------------------|-------------------|-------------------------|-------------------------------|
| DV      | $-4849 \pm 266$ | $2.97^{+2.78}_{-2.01}$ | $259^{+10}_{-11}$ | $7313^{+10680}_{-2072}$ | $416443^{+3611600}_{-306086}$ |
| Alt.    | $-91 \pm 50$    | $3.87^{+2.70}_{-2.47}$ | $257^{+11}_{-11}$ | $2971^{+1047}_{-498}$   | $4327^{+25965}_{-3294}$       |

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

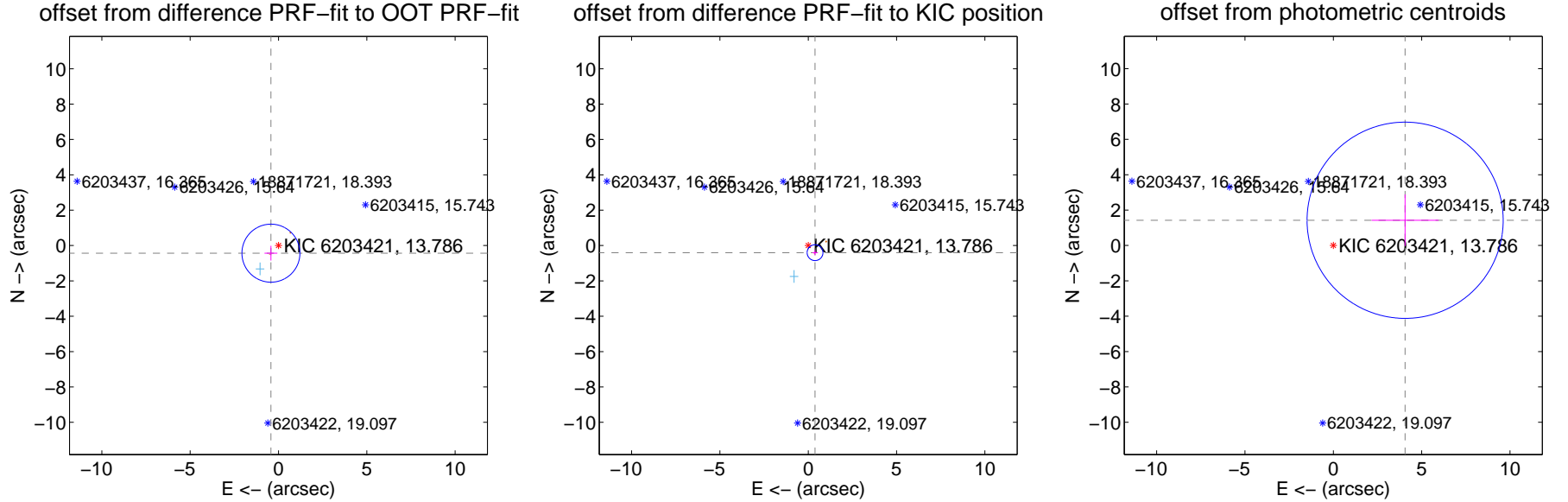
## DV Centroid Data

Supplemental centroid analysis for 006203421-01. Kepler magnitude: 13.79. Transit SNR 2.26

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.49 arcsec

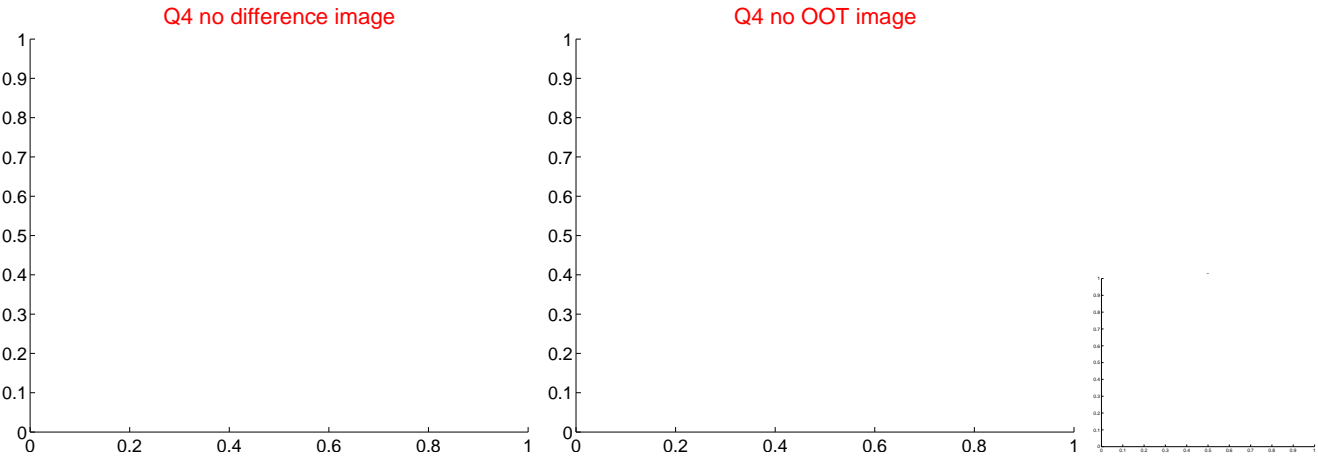
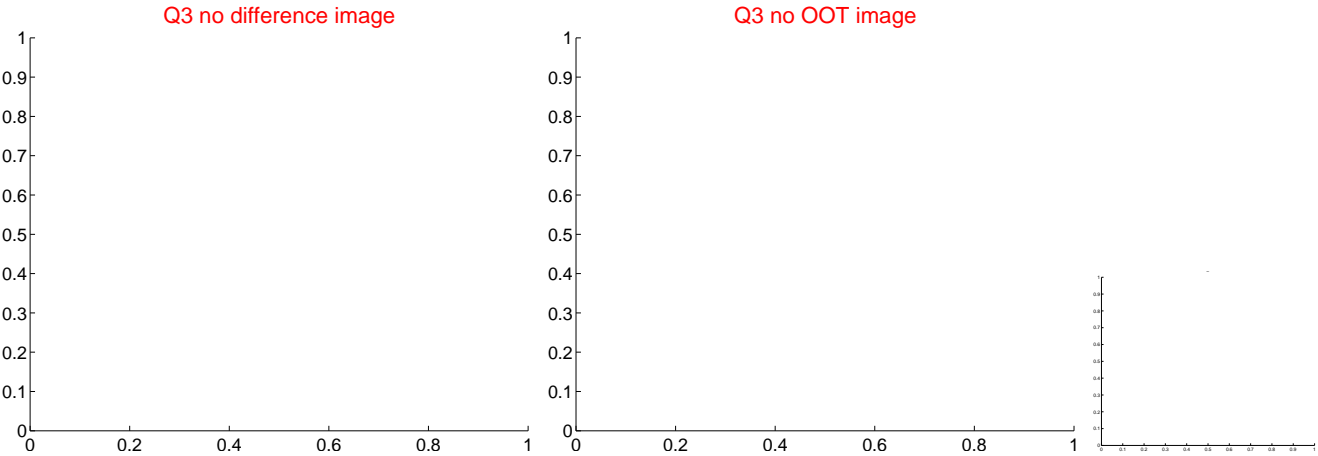
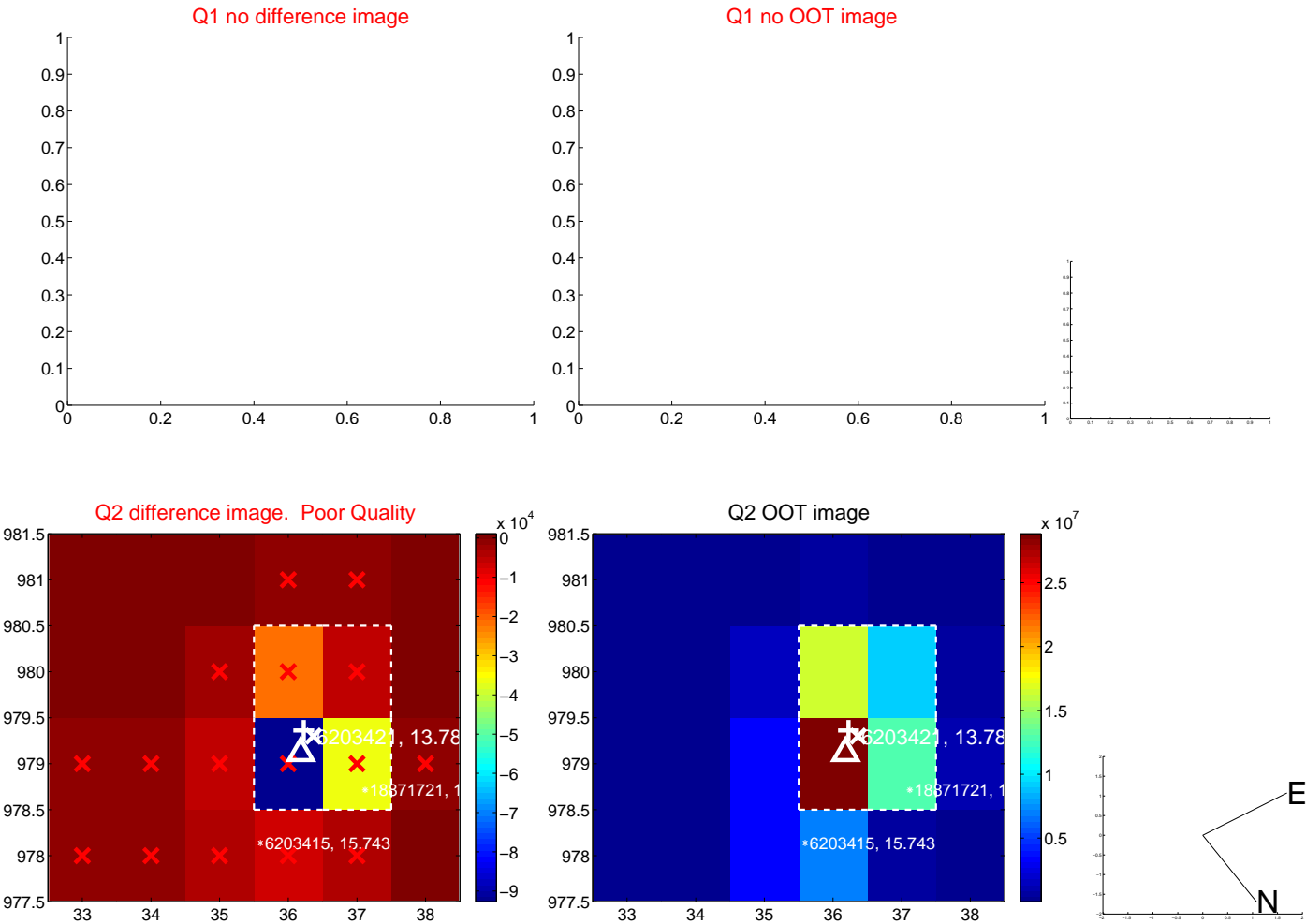
|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.608 \pm 0.547$  | 1.11                | $0.428 \pm 0.364$  | $-0.432 \pm 0.417$ |
| PRF-fit source offset from KIC position | $0.557 \pm 0.149$  | 3.73                | $-0.385 \pm 0.152$ | $-0.403 \pm 0.147$ |
| photometric centroid source offset      | $4.31 \pm 1.85$    | 2.33                | $-4.06 \pm 1.89$   | $1.43 \pm 1.46$    |



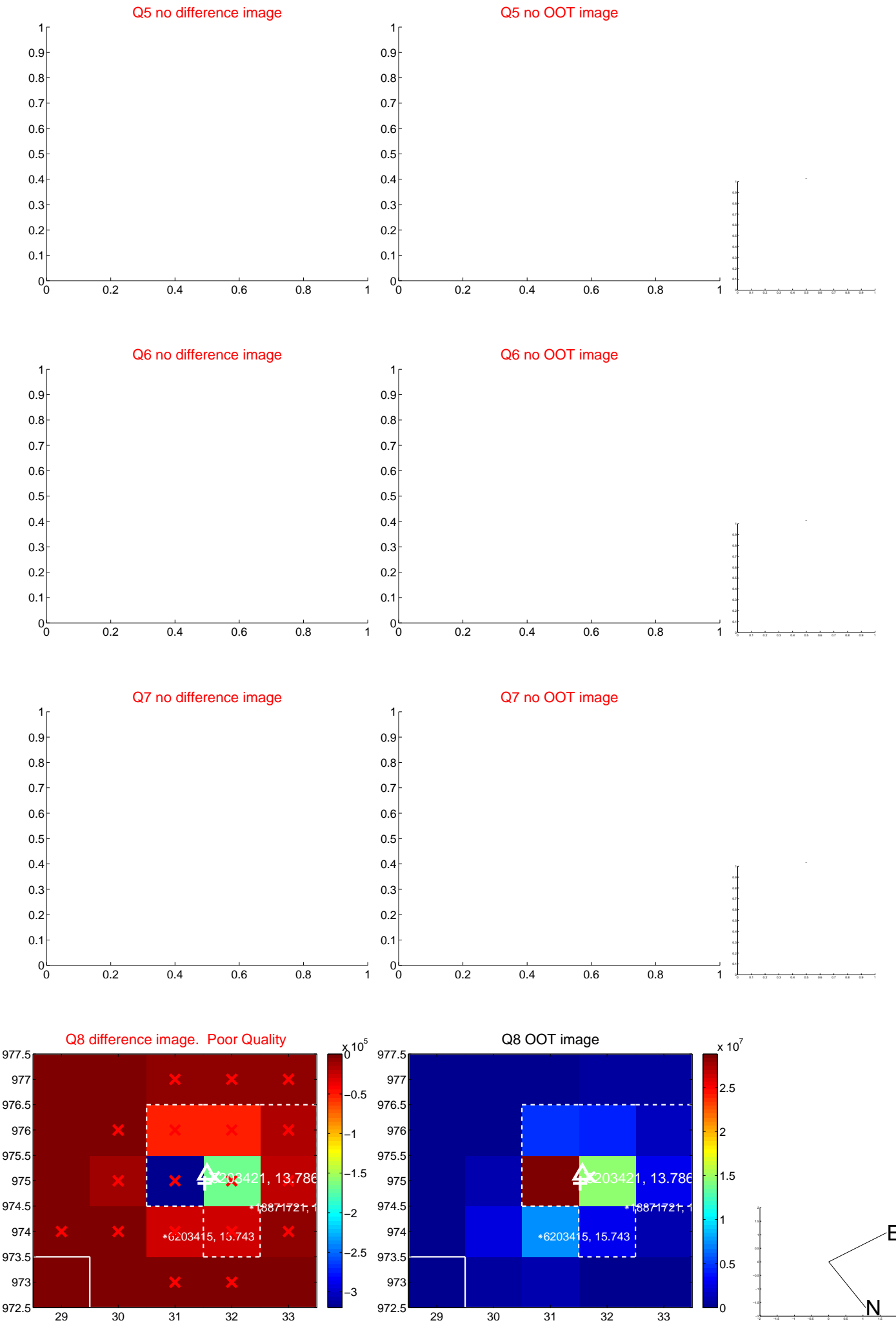
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



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



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

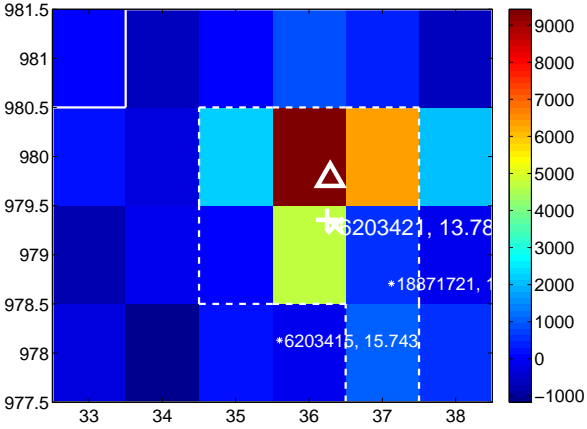
Q13 no difference image



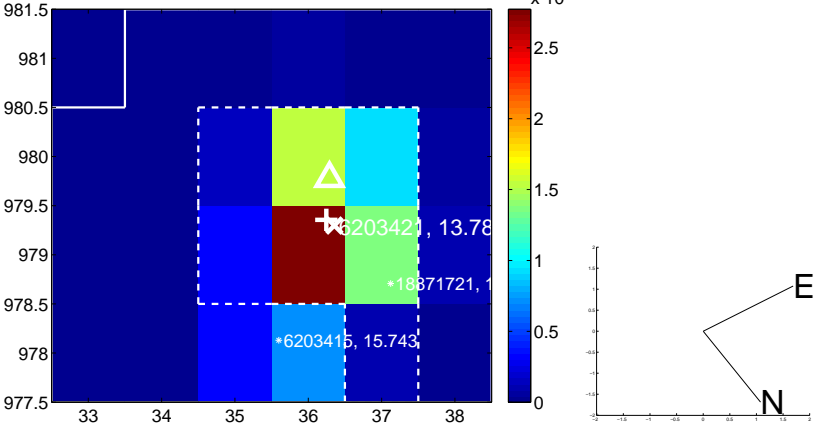
Q13 no OOT image



Q14 difference image



Q14 OOT image



Q15 no difference image



Q15 no OOT image



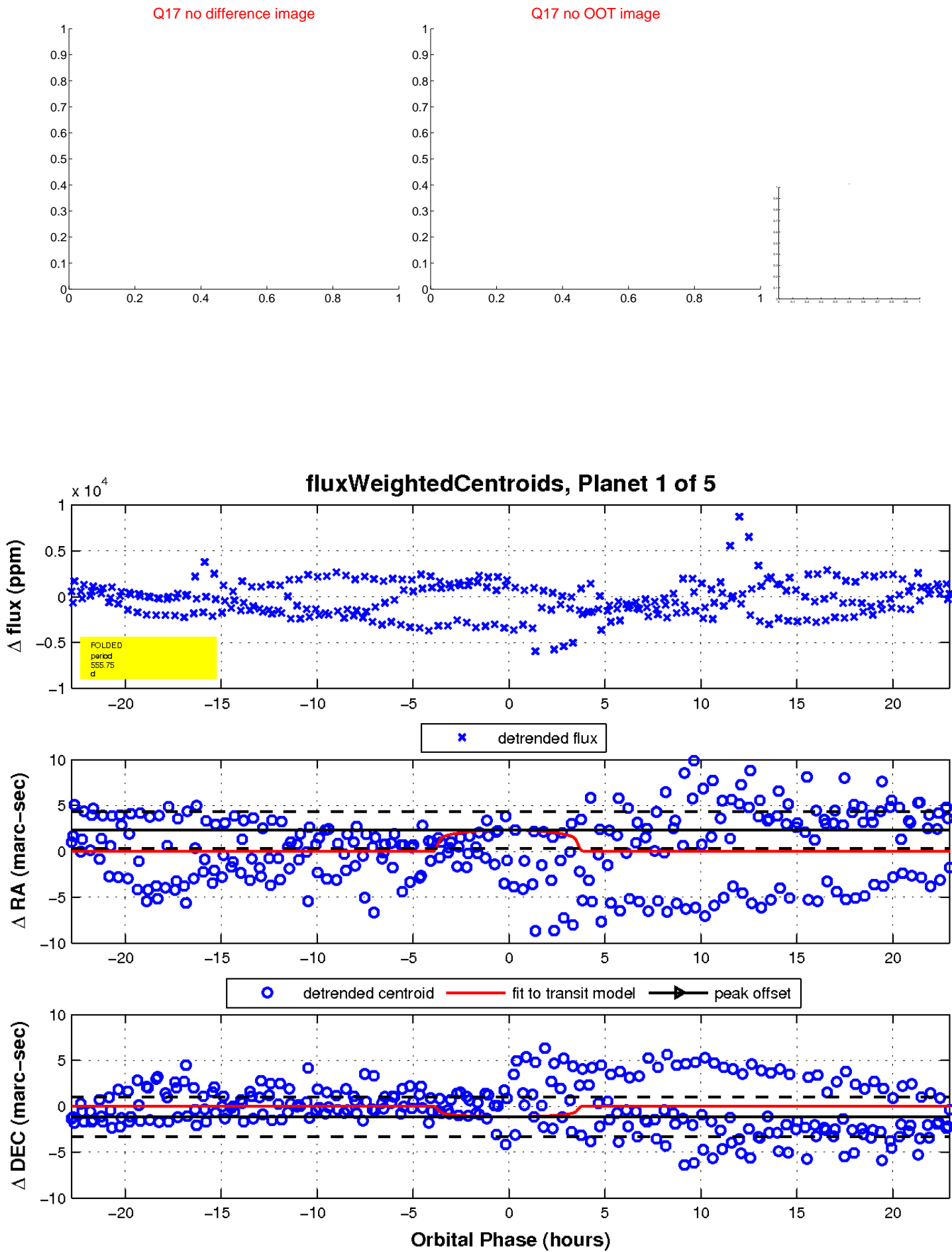
Q16 no difference image



Q16 no OOT image



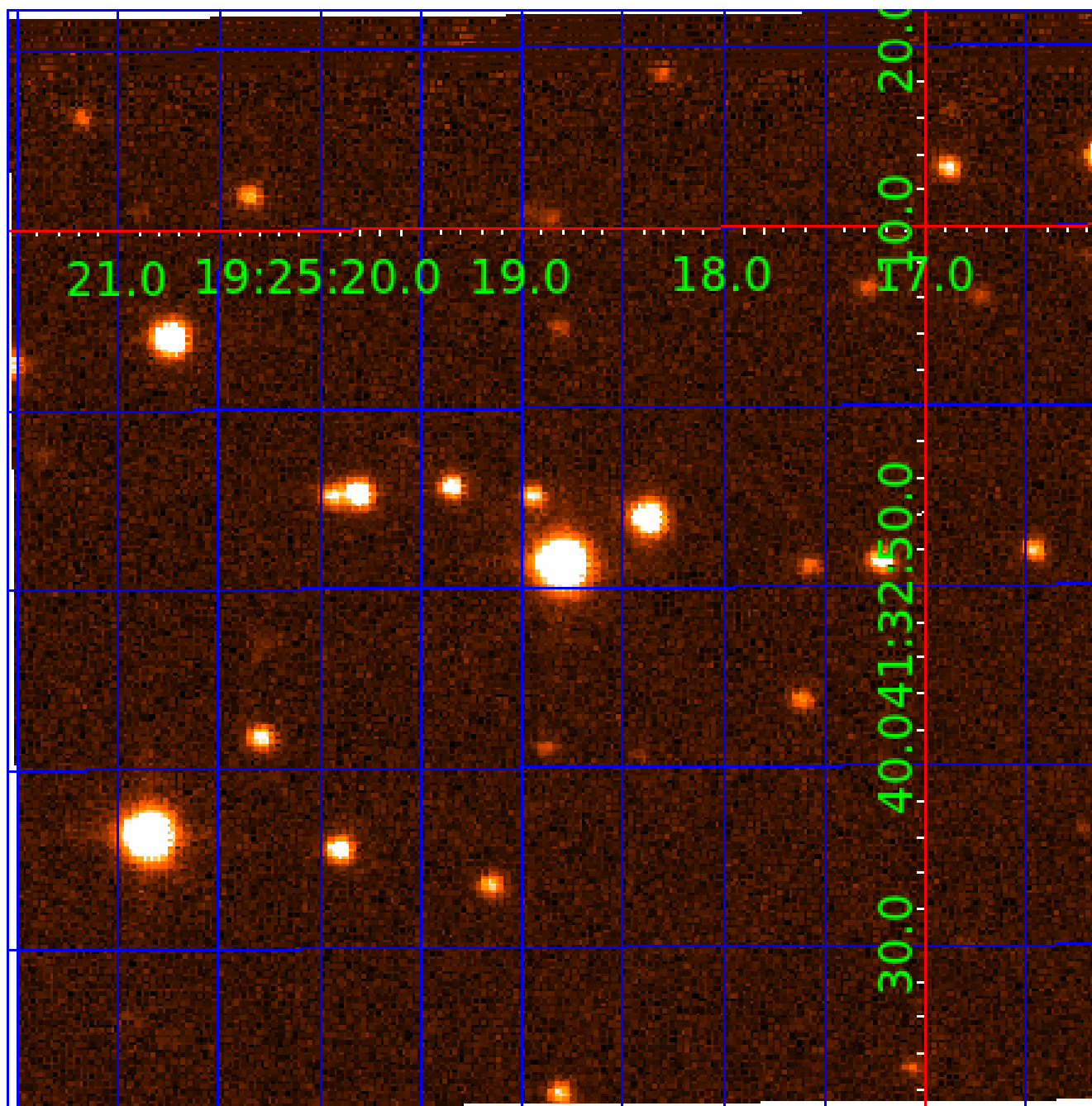
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 006203421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 006203421-01 | OBS      | No   | 555.754648    | 238.117755   | 722.0       | 7.685            | 16.8 | 2.3  | 0.70                        | 5377            | 1.99                   | 0.28                   |
| 006203421-02 | OBS      | No   | 575.380113    | 355.145876   | 2632.3      | 4.095            | 18.8 | 8.1  | 0.70                        | 5377            | 3.59                   | 0.26                   |
| 006203421-03 | OBS      | No   | 380.496036    | 150.922745   | 2120.0      | 5.296            | 20.5 | 6.4  | 0.70                        | 5377            | 3.32                   | 0.46                   |
| 006203421-04 | OBS      | No   | 624.043177    | 328.809753   | 2182.8      | 4.127            | 17.6 | 7.5  | 0.70                        | 5377            | 3.35                   | 0.24                   |
| 006203421-05 | OBS      | No   | 356.184196    | 265.970630   | 635.9       | 4.500            | 15.7 | -1.0 | 0.70                        | 5377            | 1.76                   | 0.50                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 006203421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS     |
| 006203421-02 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_CHASES_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS—CENT_UNCERTAIN—HALO_GHOST |
| 006203421-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 006203421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS                       |
| 006203421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS  |

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

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

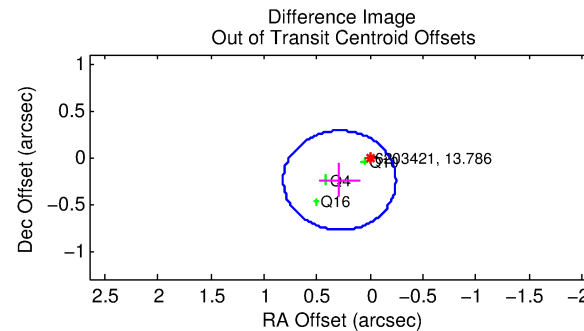
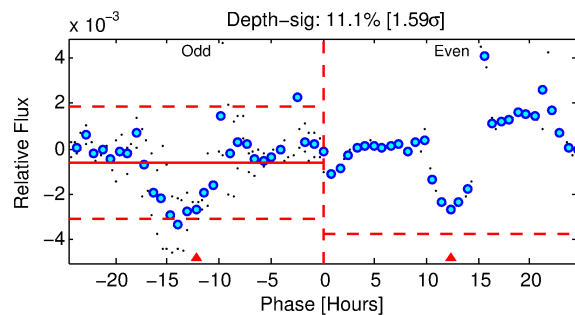
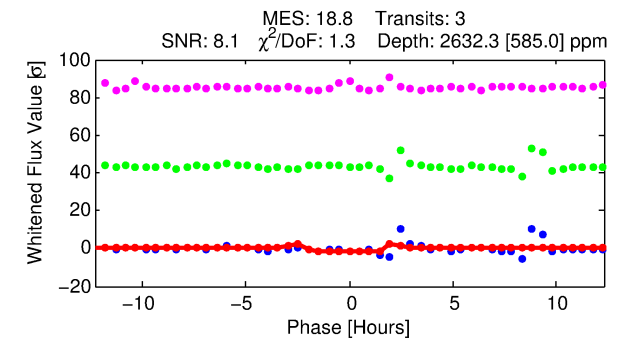
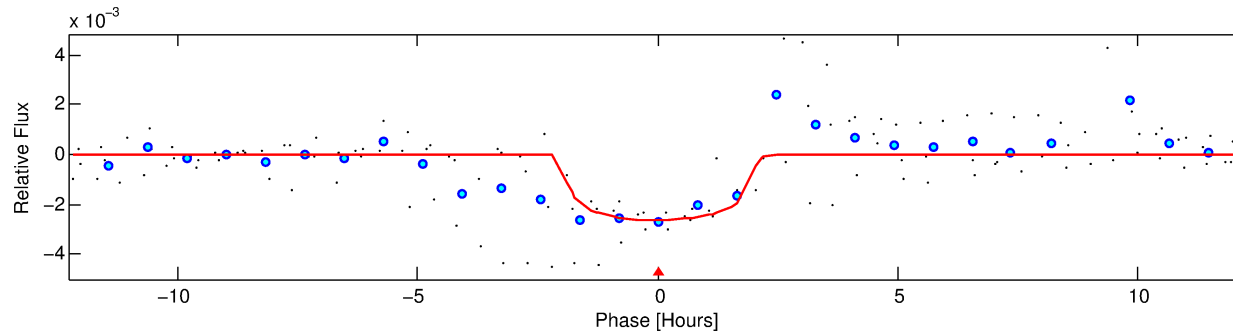
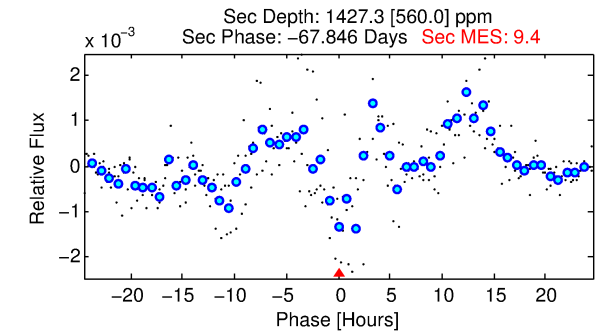
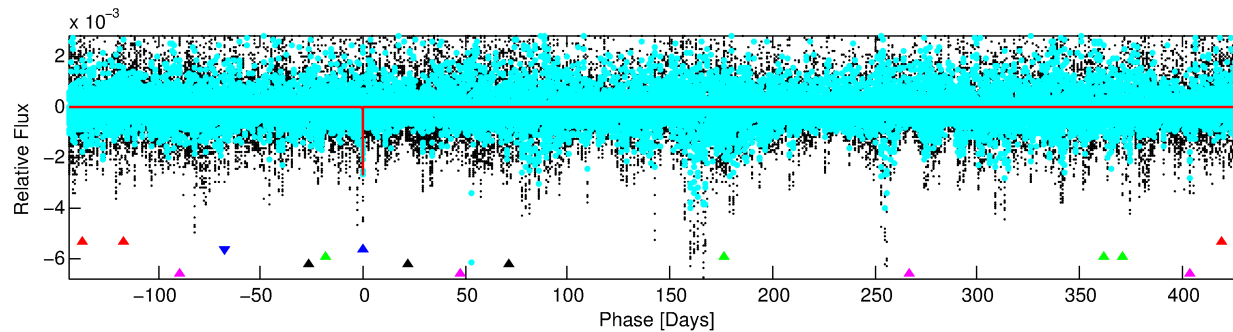
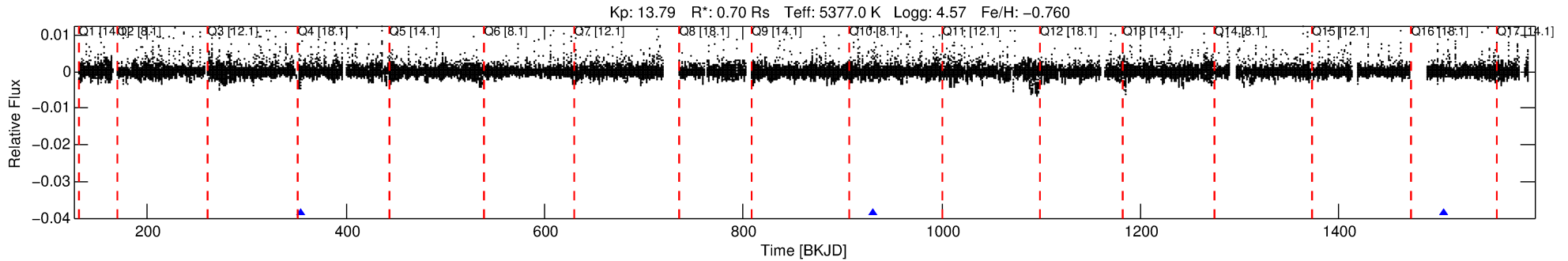
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006203421-02

No Significant Match Found

# DV One-Page Summary

KIC: 6203421 Candidate: 2 of 5 Period: 575.380 d



## DV Fit Results:

Period = 575.38011 [0.00577] d  
Epoch = 355.1459 [0.0074] BKJD  
Rp/R\* = 0.0468 [0.0440]  
a/R\* = 1100.21 [4373.59]  
b = 0.21 [17.90]  
Seff = 0.26 [0.05]  
Teq = 183 [9] K  
Rp = 3.59 [3.40] Re  
a = 1.1839 [0.1245] AU  
Ag = 85407.16 [164604.74] [0.52σ]  
Teffp = 4831 [2325] K [2.00σ]

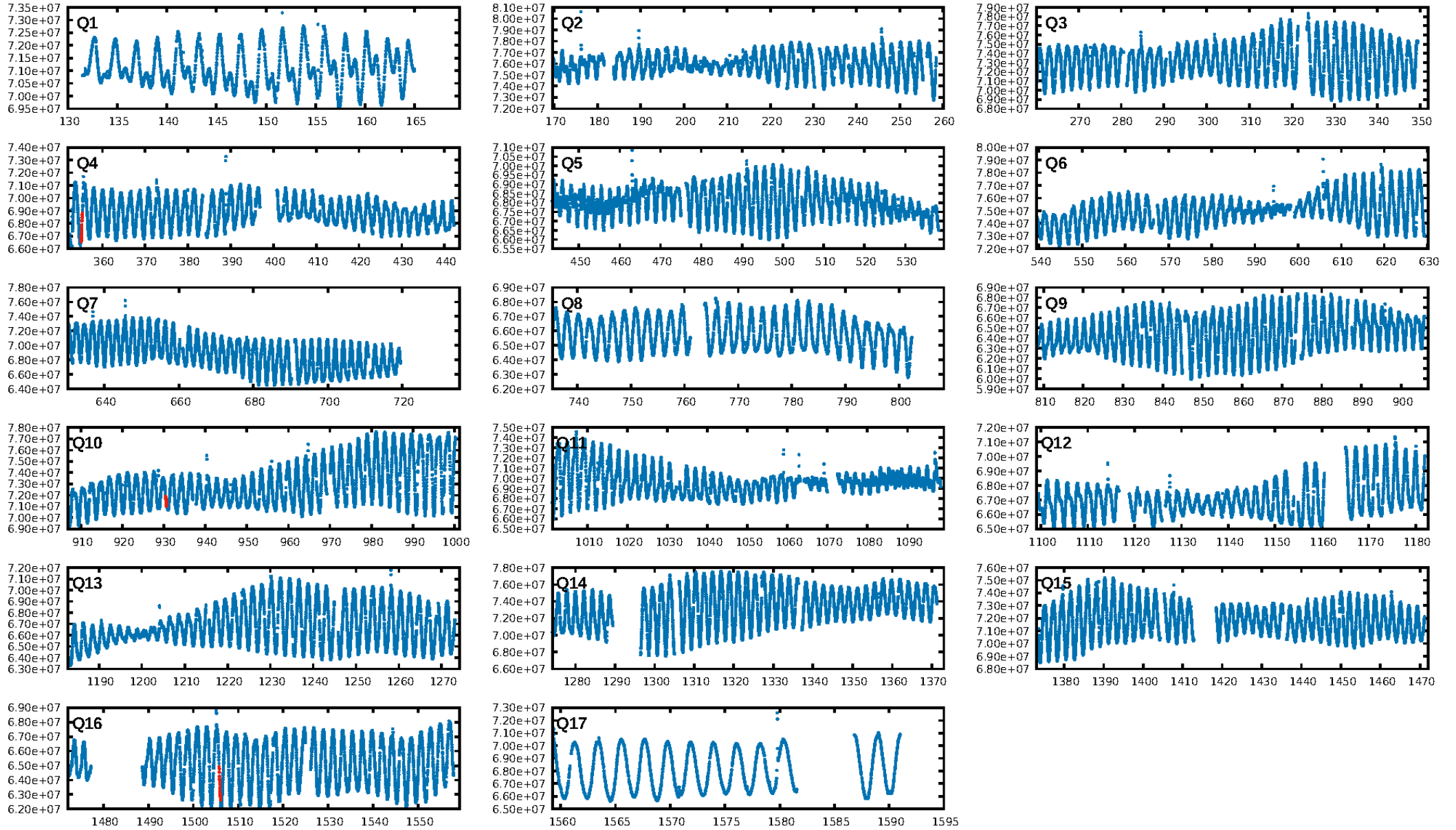
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [54.09σ]  
LongPeriod-sig: 100.0% [200.88σ]  
ModelChiSquare2-sig: 61.7%  
ModelChiSquareGof-sig: 98.5%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.03267  
Centroid-sig: 0.9%  
Centroid-so: 1.356 arcsec [2.48σ]  
OotOffset-rm: 0.378 arcsec [2.13σ]  
KicOffset-rm: 0.635 arcsec [4.41σ]  
OotOffset-st: 1/0/2/0 [3]  
KicOffset-st: 1/0/2/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

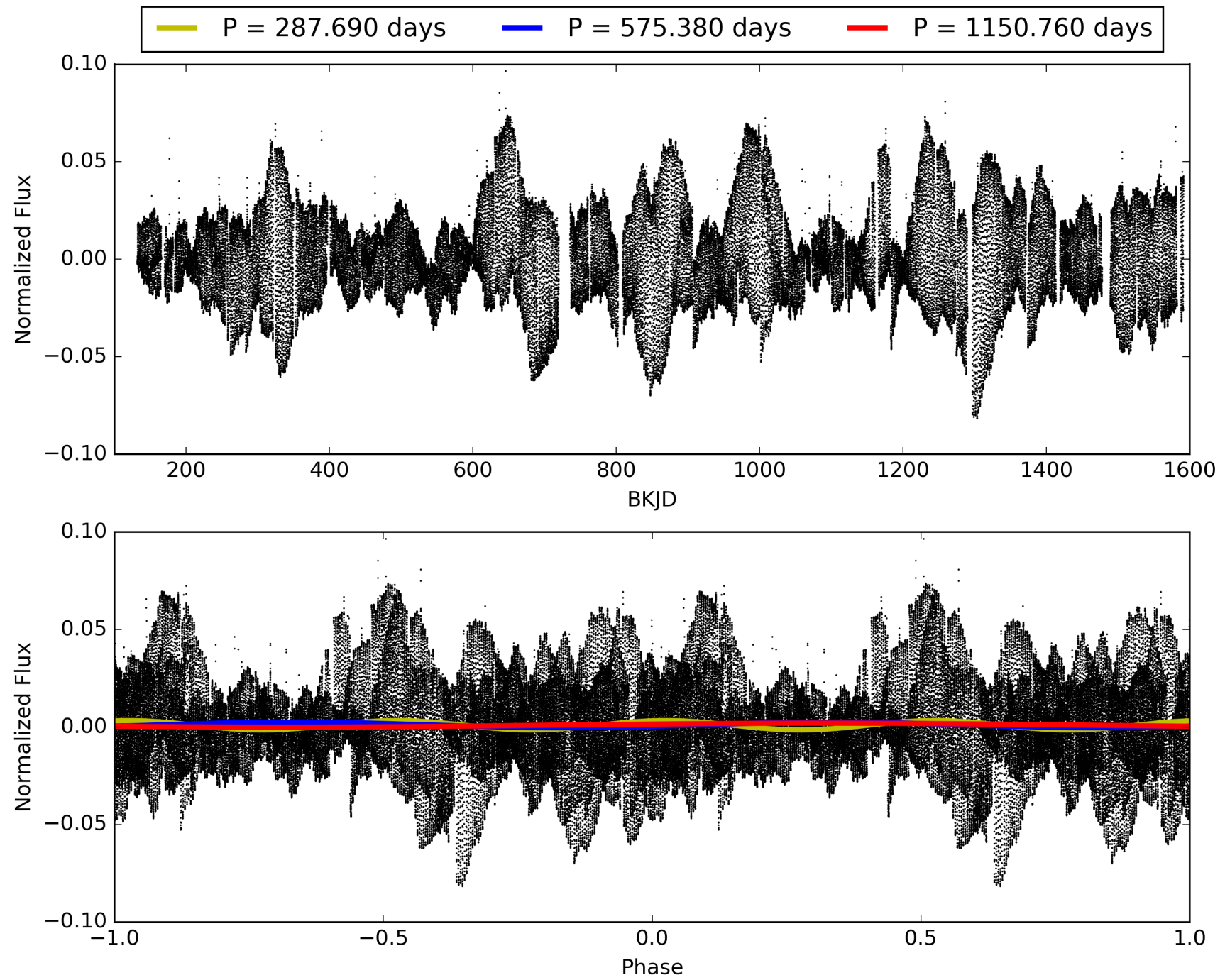
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 14:05:13 Z

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

# TCE 006203421-02, PDC Light Curves



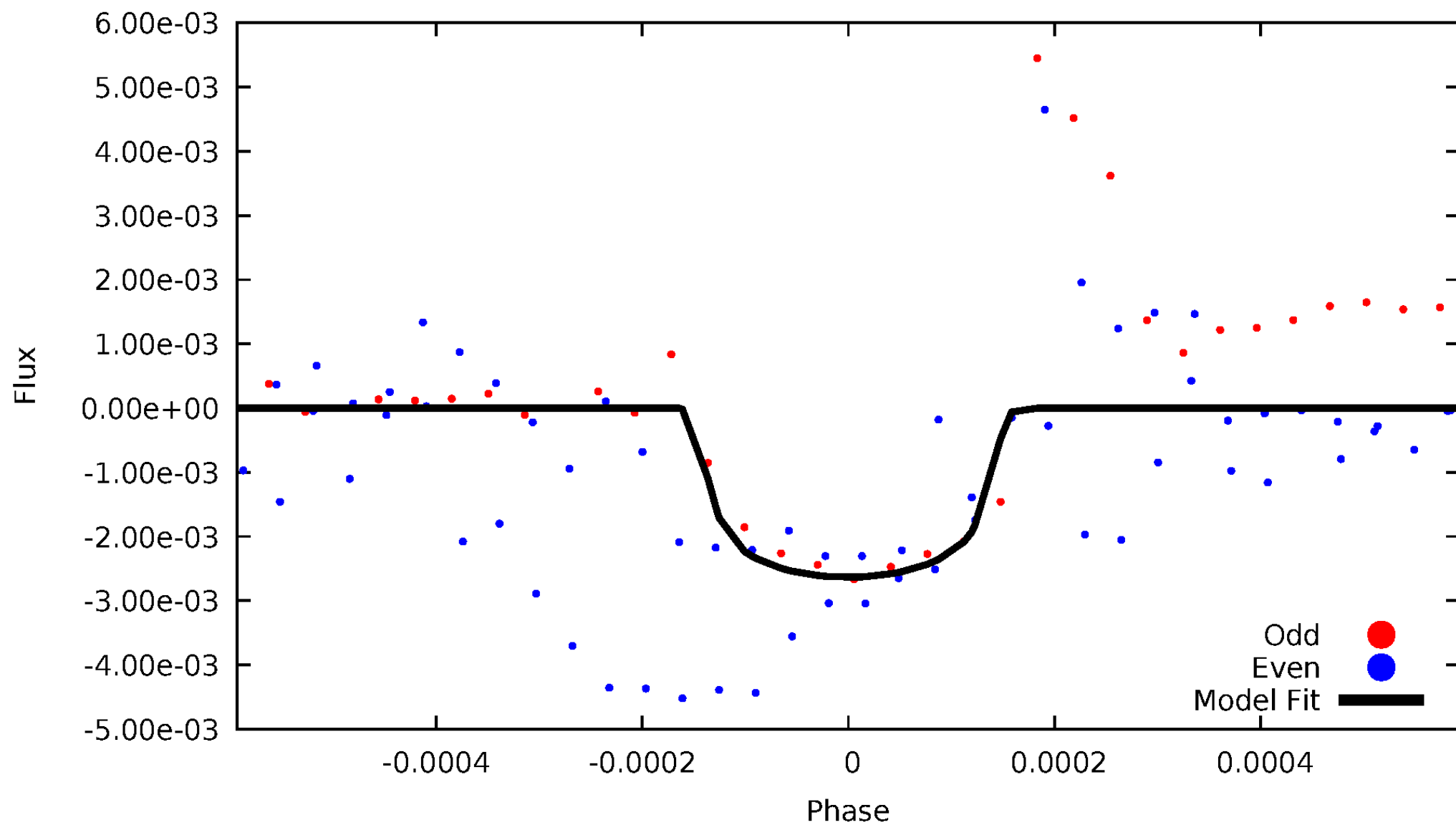
TCE 006203421-02





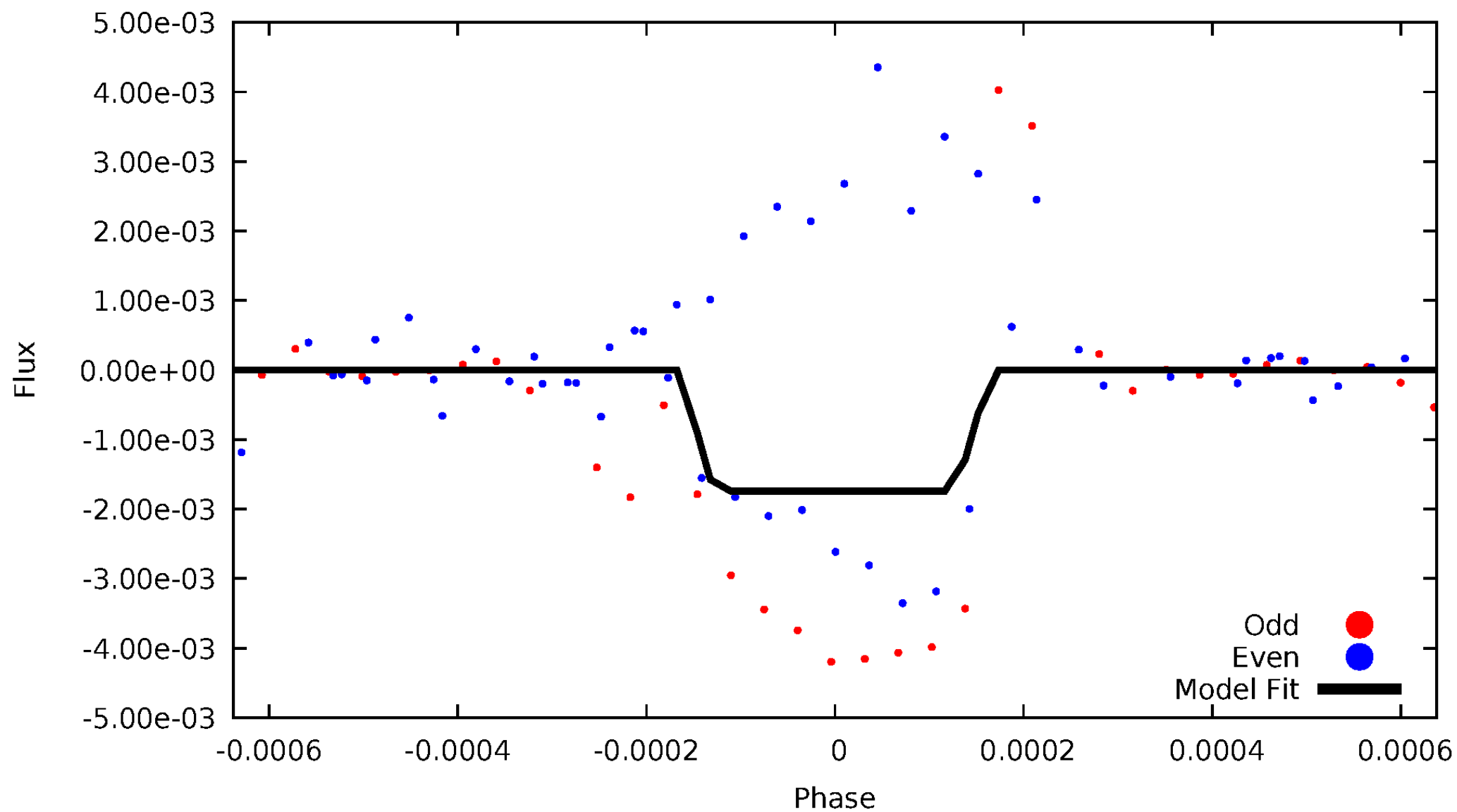
# DV Odd/Even

TCE 006203421-02



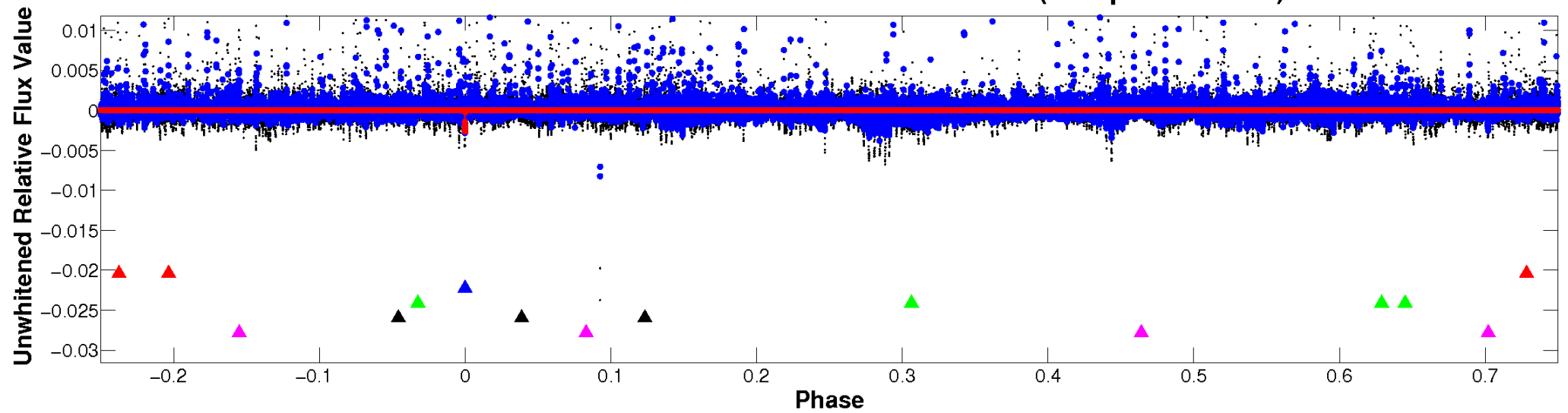
# ALT Odd/Even

TCE 006203421-02

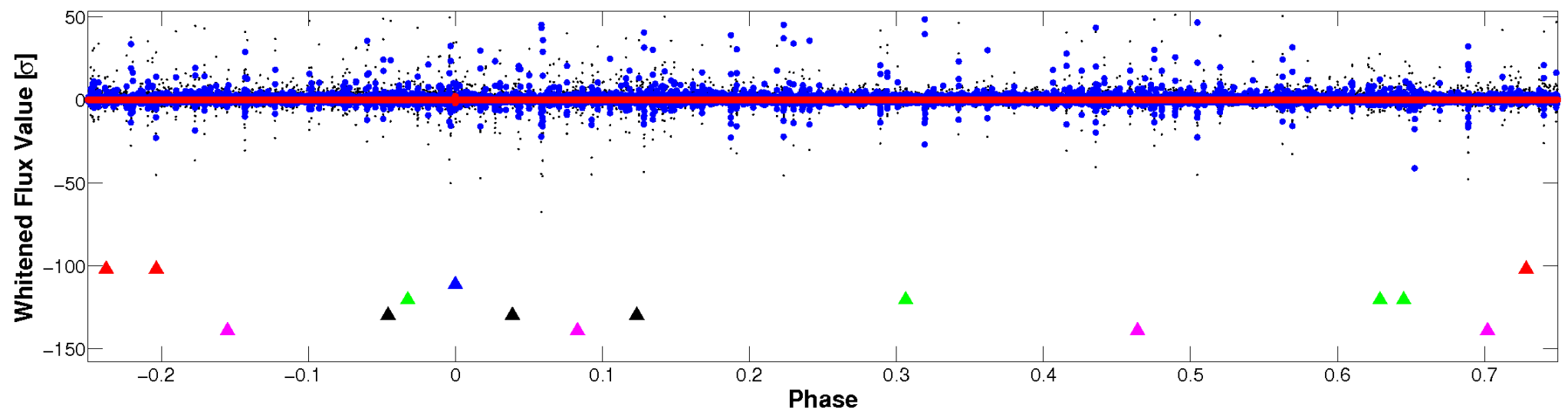


# Non-Whitened Vs. Whitened Light Curve

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

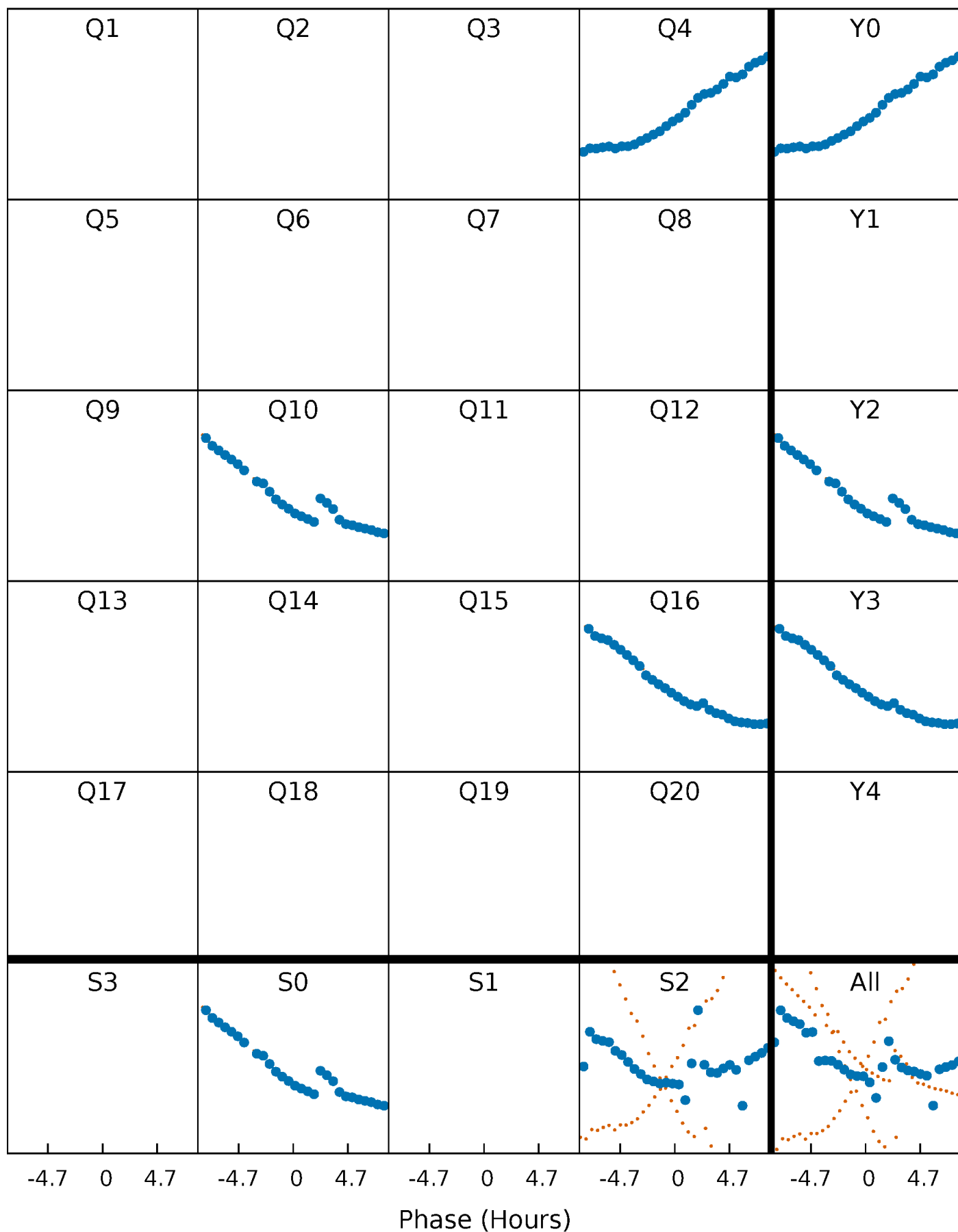


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



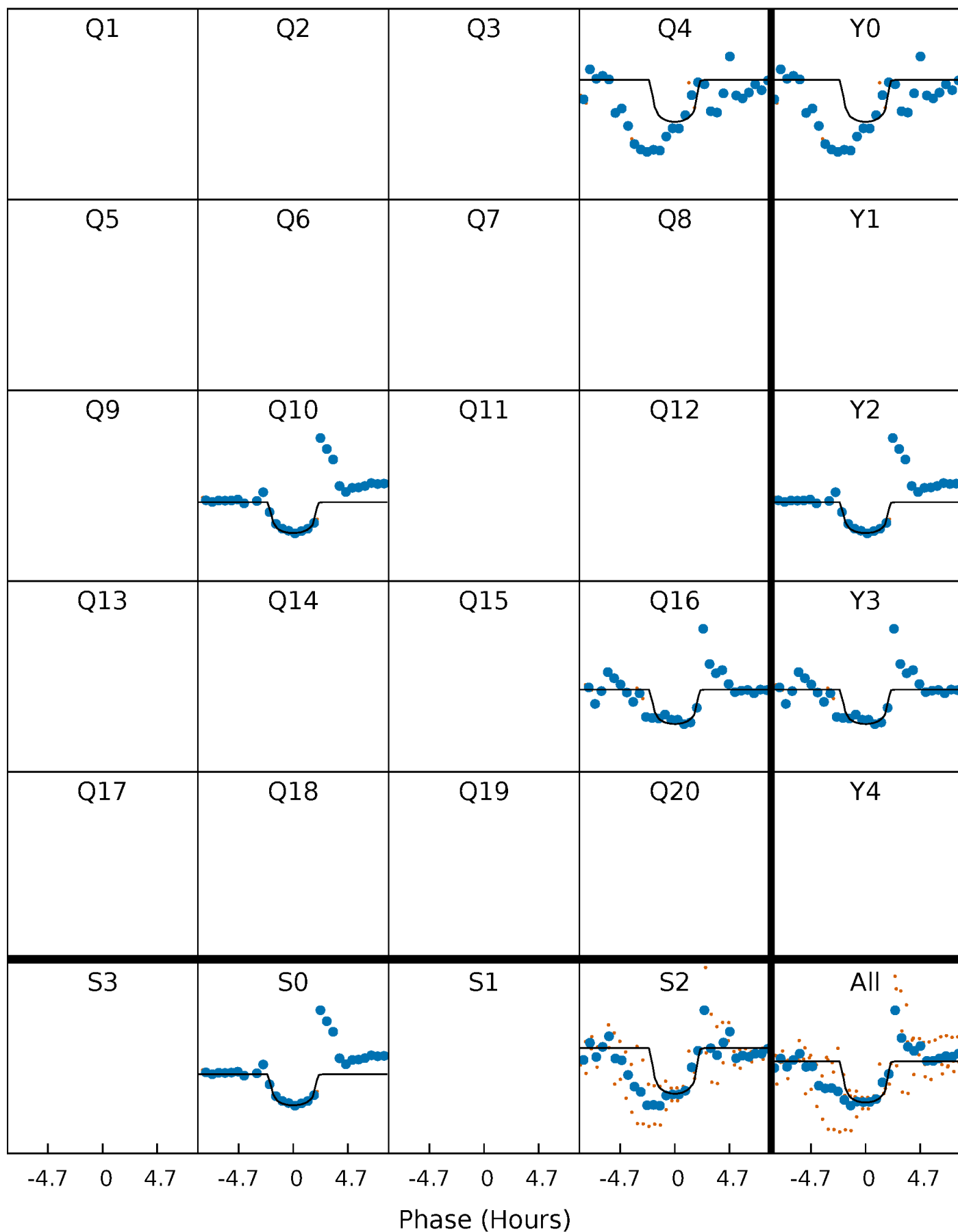
# PDC Quarter-Phased Transit Curves

TCE 006203421-02 P=575.380113 Days  $T_0=355.145876$  (BKJD)



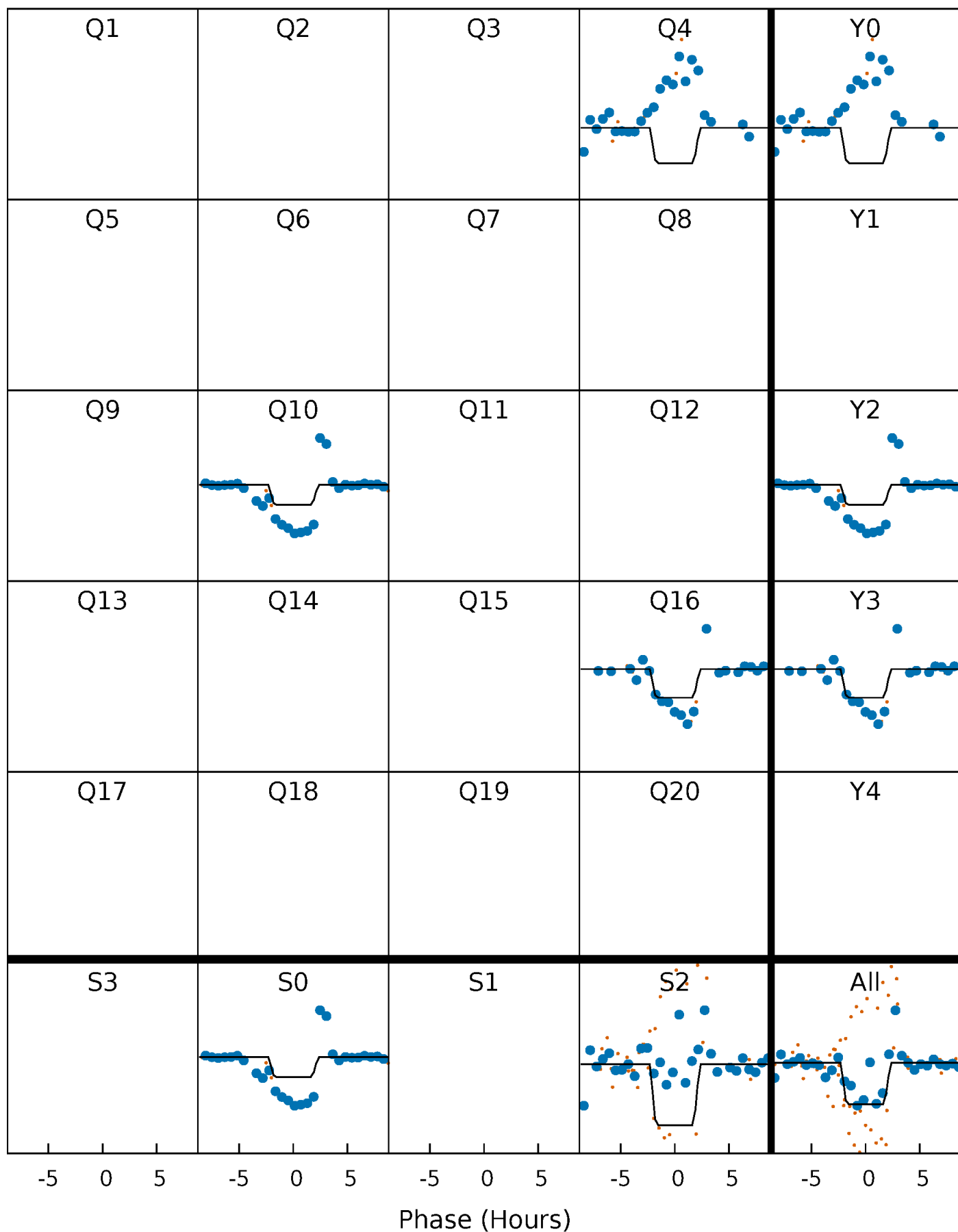
# DV Quarter-Phased Transit Curves

TCE 006203421-02 P=575.380113 Days  $T_0=355.145876$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

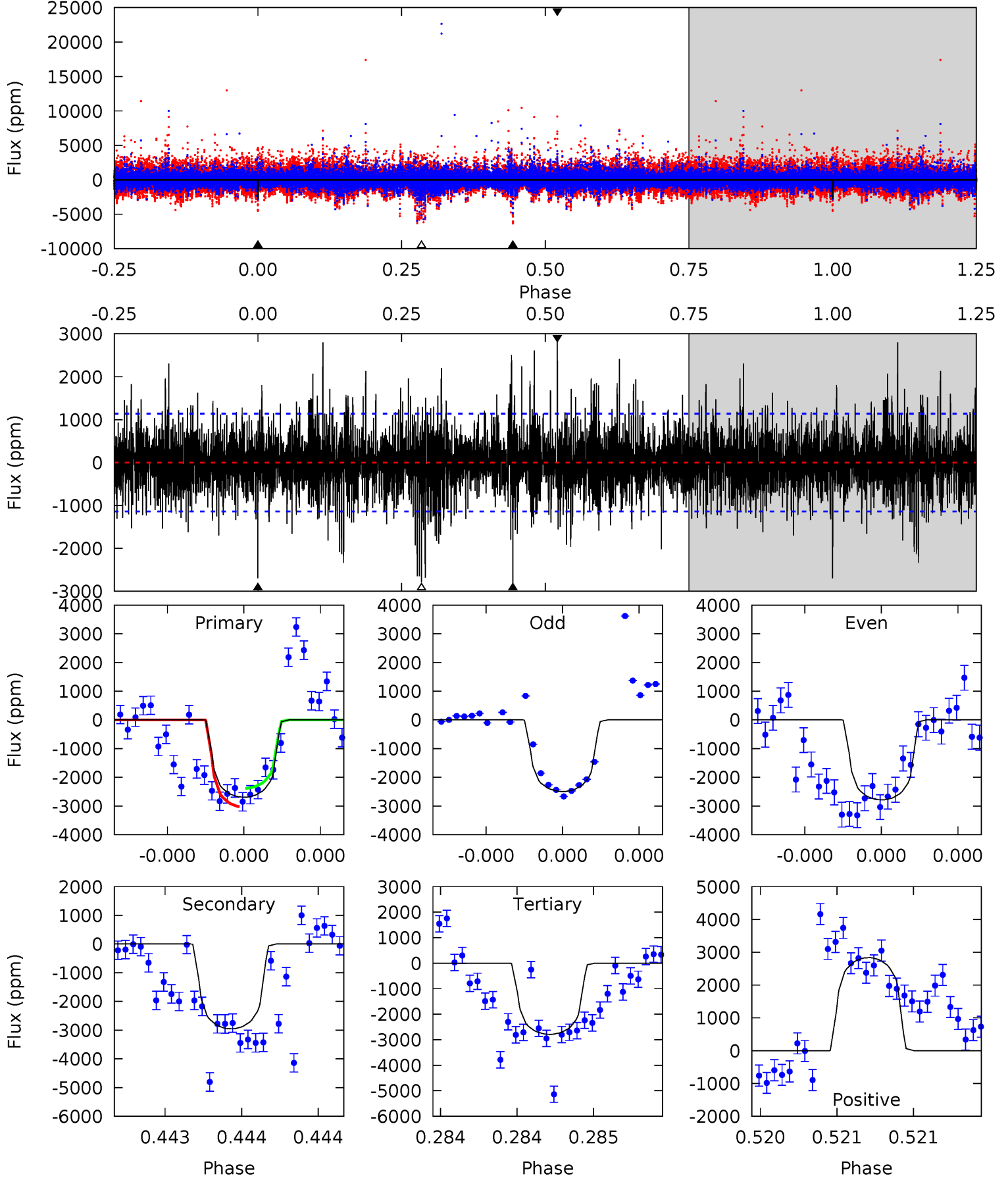
TCE 006203421-02 P=575.361371 Days  $T_0=355.170205$  (BKJD)



# DV Model-Shift Uniqueness Test

006203421-02, P = 575.380113 Days, E = 355.145876 Days

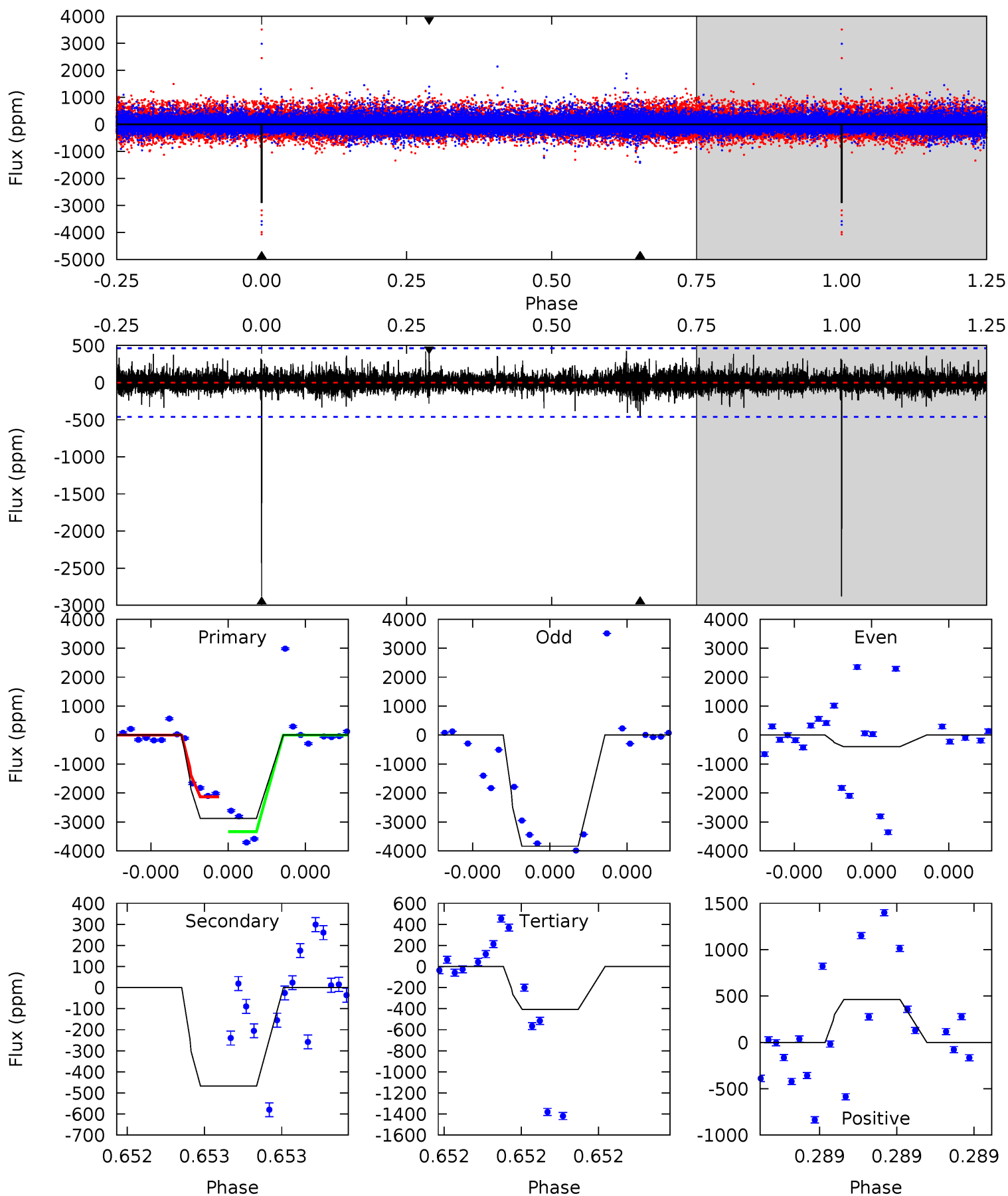
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 13.4 | 14.7 | 13.8 | 14.1 | 5.65            | 3.60            | 2.71             | -0.47   | -0.70   | 0.82    | 0.59    | 0.51    | 1.08 | 0.49  | 1.59 |



# Alt Model-Shift Uniqueness Test

006203421-02, P = 575.361371 Days, E = 355.170205 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 |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 35.3 | 5.72 | 4.98 | 5.67 | 5.67            | 3.62            | 0.81             | 30.3    | 29.6    | 0.74    | 0.06    | 26.0    | 0.49 | 0.14  | 0   |





### Stellar Parameters For KIC 006203421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5377^{+160}_{-160}$ | $4.569^{+0.088}_{-0.072}$ | $-0.760^{+0.350}_{-0.300}$ | $0.703^{+0.085}_{-0.077}$ | $0.669^{+0.076}_{-0.033}$ | $2.709^{+0.958}_{-0.648}$                 |
|        | +3%/-3%              | +2%/-2%                   | +46%/-39%                  | +12%/-11%                 | +11%/-5%                  | +35%/-24%                                 |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 006203421-02 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$   | $A_{\text{obs}}$            |
|---------|-----------------|------------------------|----------------------|------------------------|-----------------------------|
| DV      | $-2955 \pm 202$ | $4.36^{+2.77}_{-2.85}$ | $255^{+10}_{-10}$    | $5338^{+4357}_{-1045}$ | $123346^{+909711}_{-78399}$ |
| Alt.    | $-467 \pm 82$   | $3.88^{+3.19}_{-2.46}$ | $255^{+11}_{-11}$    | $3840^{+1842}_{-672}$  | $24830^{+149816}_{-17951}$  |

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

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

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

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

## DV Centroid Data

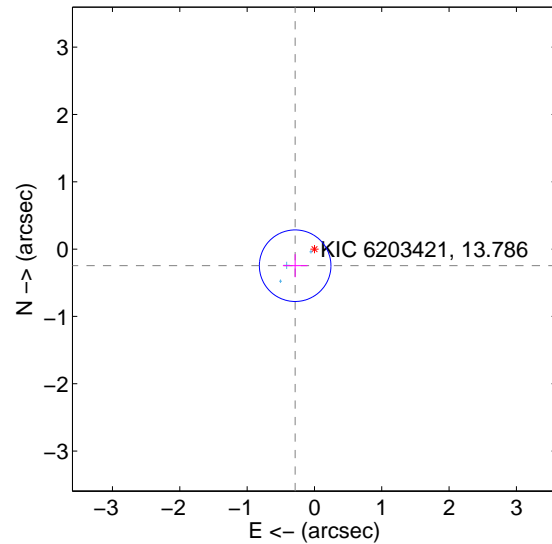
Supplemental centroid analysis for 006203421-02. Kepler magnitude: 13.79. Transit SNR 8.11

There are 3 quarters with good PRF difference image offsets

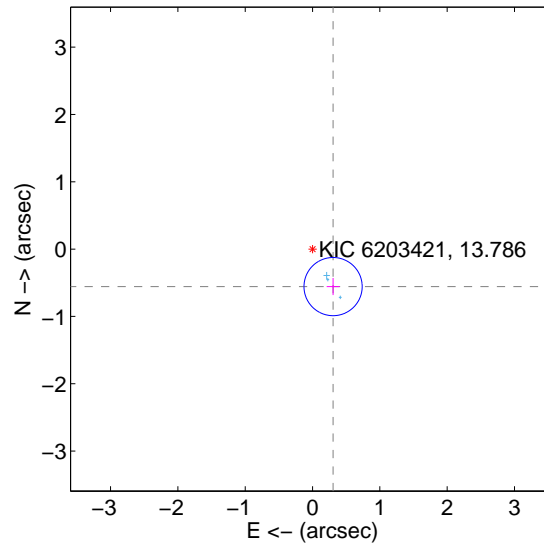
The direct PRF centroid is offset from the target star catalog position by about 0.95 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.378 \pm 0.177$  | 2.13                | $0.286 \pm 0.181$  | $-0.247 \pm 0.171$ |
| PRF-fit source offset from KIC position | $0.635 \pm 0.144$  | 4.41                | $-0.305 \pm 0.096$ | $-0.557 \pm 0.127$ |
| photometric centroid source offset      | $1.36 \pm 0.55$    | 2.48                | $-0.92 \pm 0.63$   | $-0.99 \pm 0.46$   |

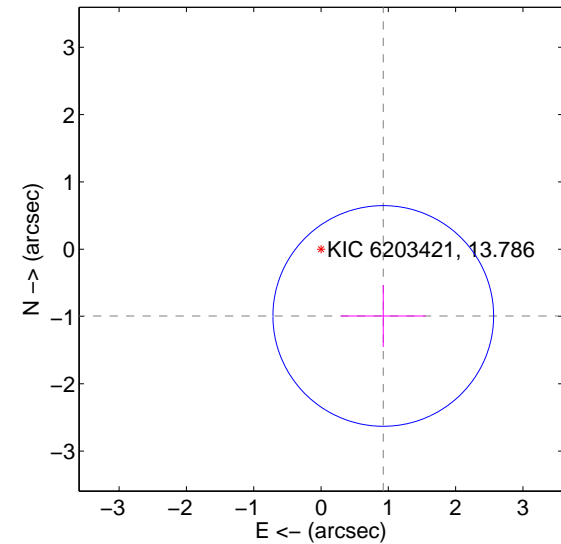
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

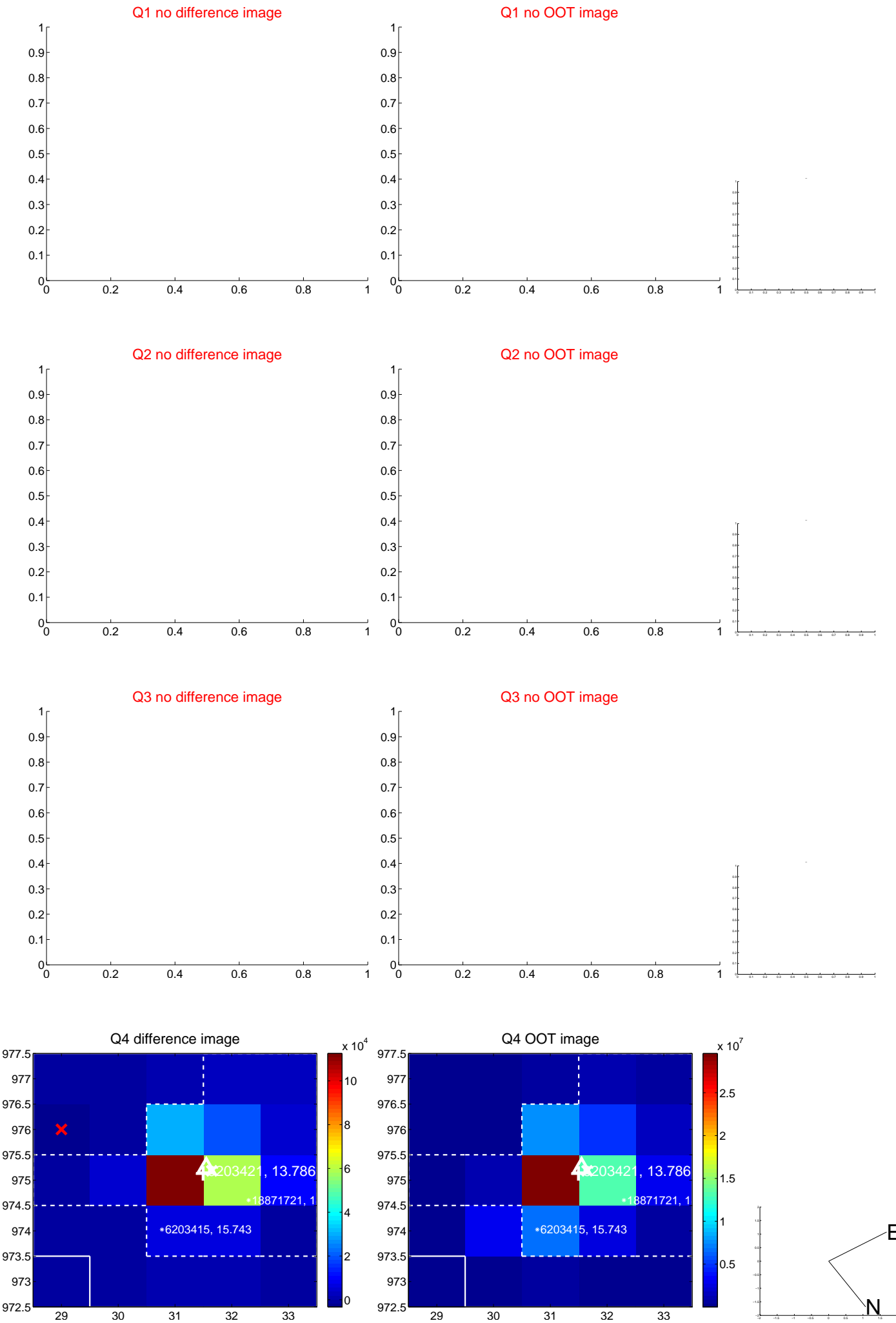


offset from photometric centroids



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.

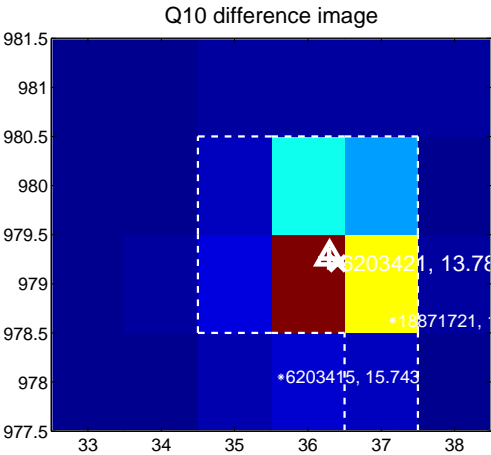
Q9 no difference image



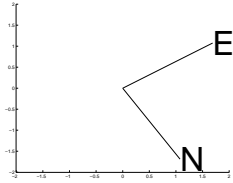
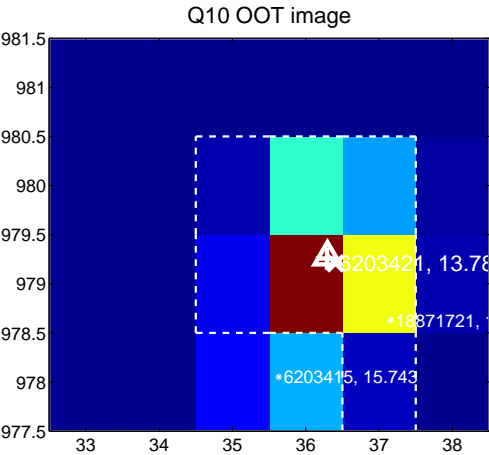
Q9 no OOT image



Q10 difference image



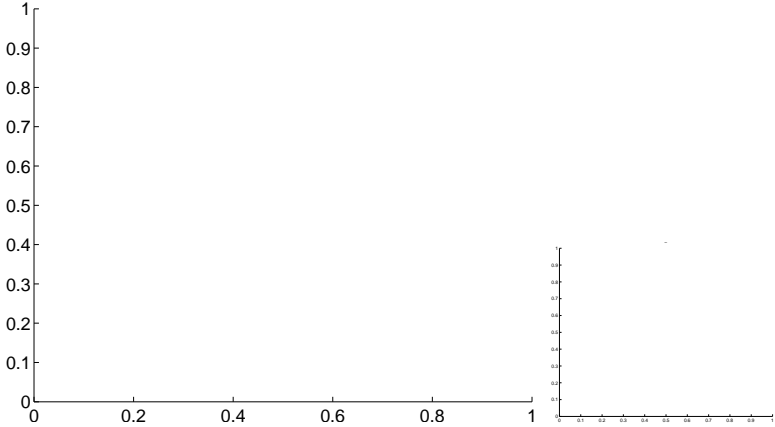
Q10 OOT image



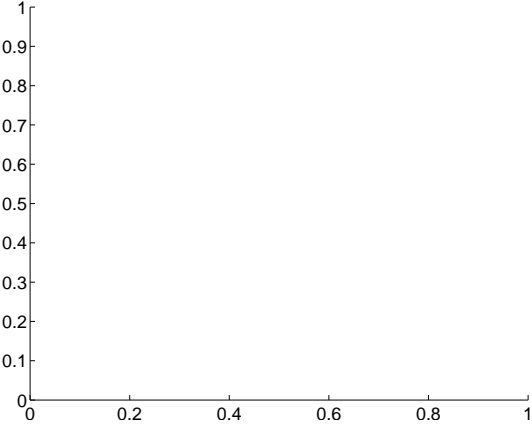
Q11 no difference image



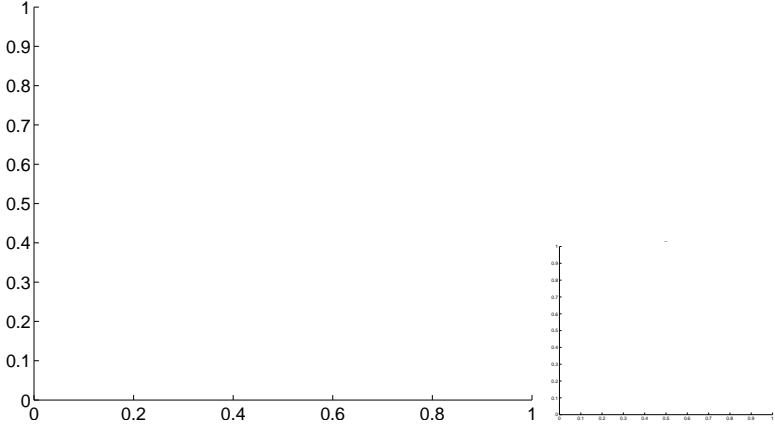
Q11 no OOT image



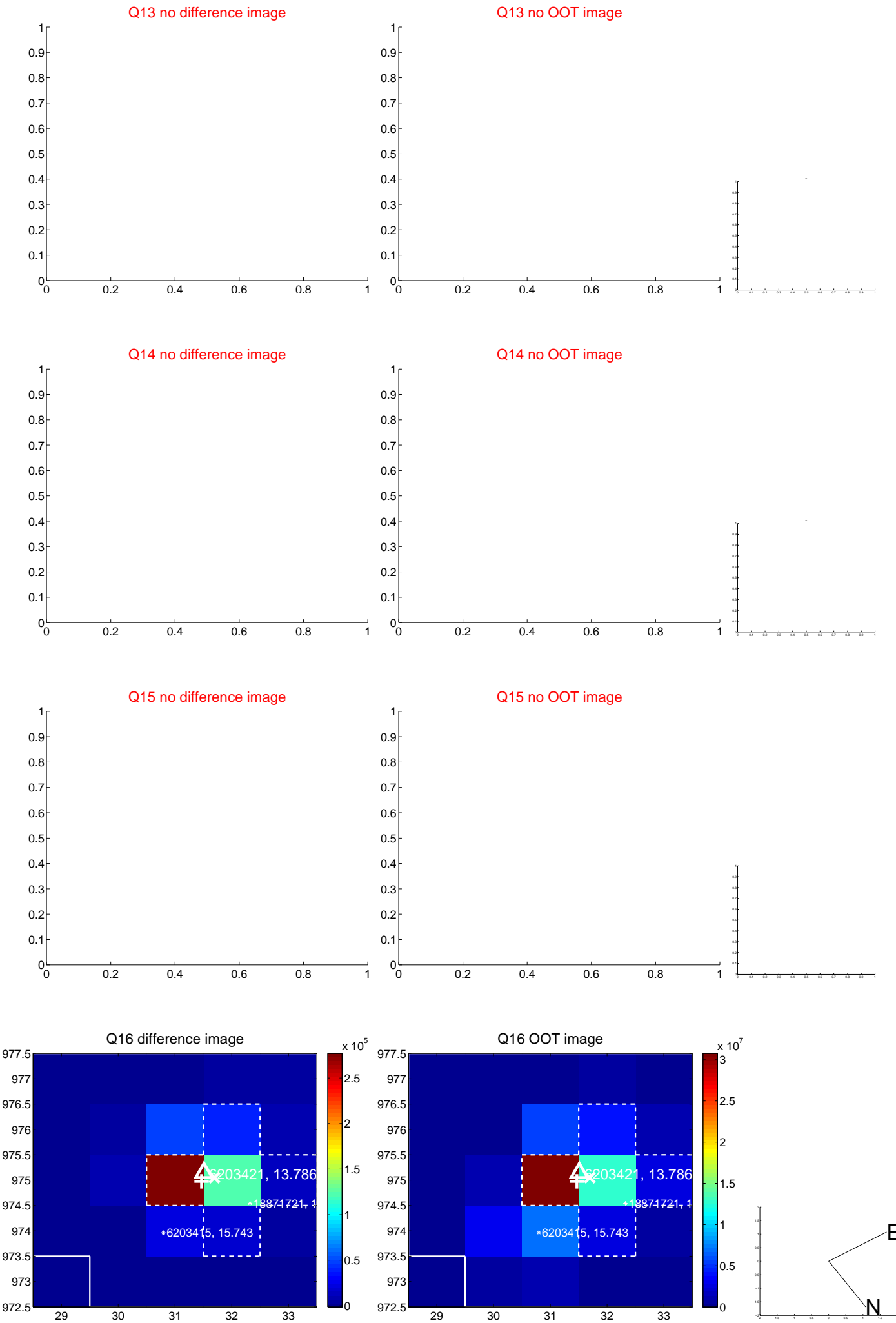
Q12 no difference image



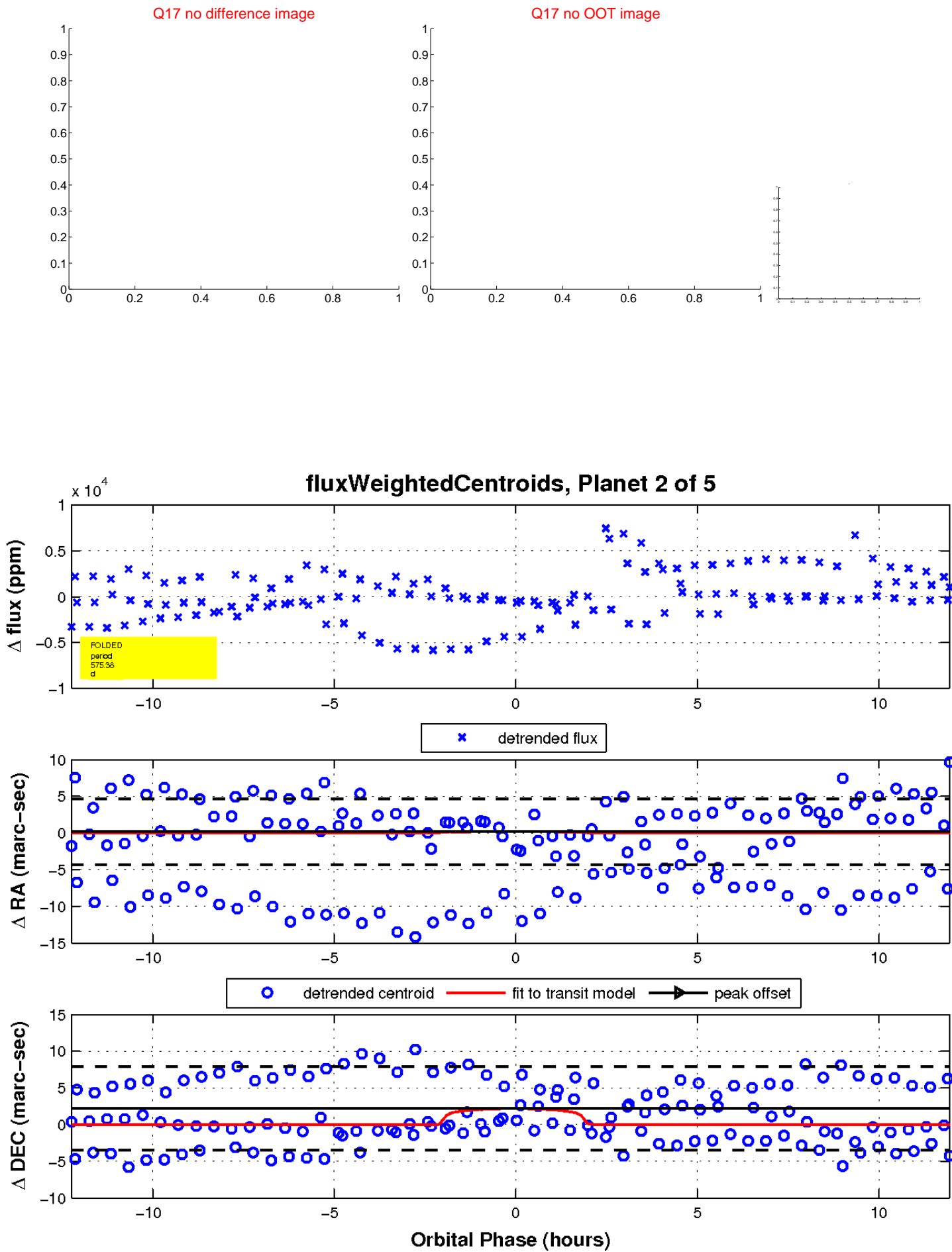
Q12 no OOT image



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

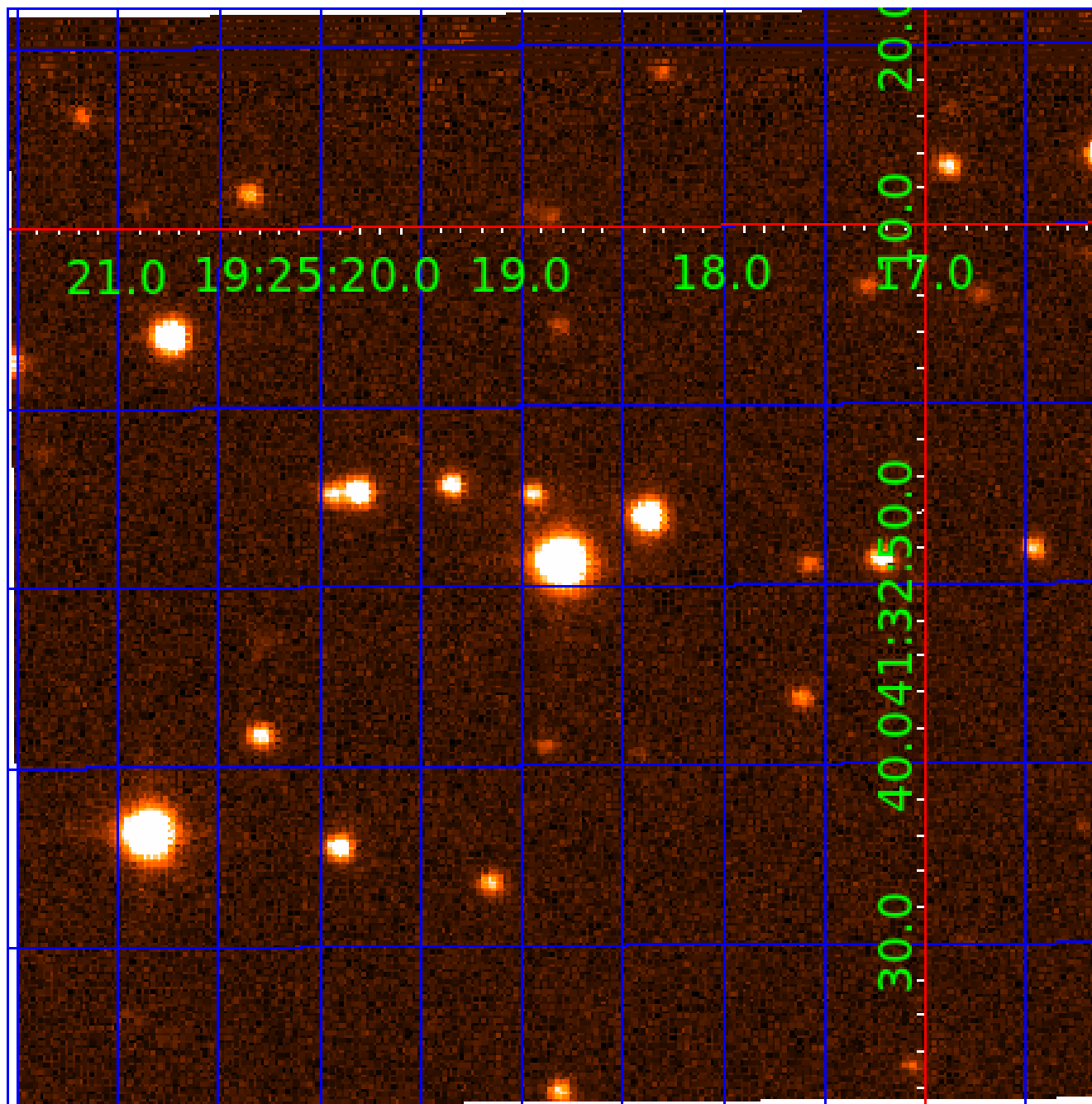


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 006203421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 006203421-01 | OBS      | No   | 555.754648    | 238.117755   | 722.0       | 7.685            | 16.8 | 2.3  | 0.70                        | 5377            | 1.99                   | 0.28                   |
| 006203421-02 | OBS      | No   | 575.380113    | 355.145876   | 2632.3      | 4.095            | 18.8 | 8.1  | 0.70                        | 5377            | 3.59                   | 0.26                   |
| 006203421-03 | OBS      | No   | 380.496036    | 150.922745   | 2120.0      | 5.296            | 20.5 | 6.4  | 0.70                        | 5377            | 3.32                   | 0.46                   |
| 006203421-04 | OBS      | No   | 624.043177    | 328.809753   | 2182.8      | 4.127            | 17.6 | 7.5  | 0.70                        | 5377            | 3.35                   | 0.24                   |
| 006203421-05 | OBS      | No   | 356.184196    | 265.970630   | 635.9       | 4.500            | 15.7 | -1.0 | 0.70                        | 5377            | 1.76                   | 0.50                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 006203421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS     |
| 006203421-02 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_CHASES_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS—CENT_UNCERTAIN—HALO_GHOST |
| 006203421-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 006203421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS                       |
| 006203421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS  |

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

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

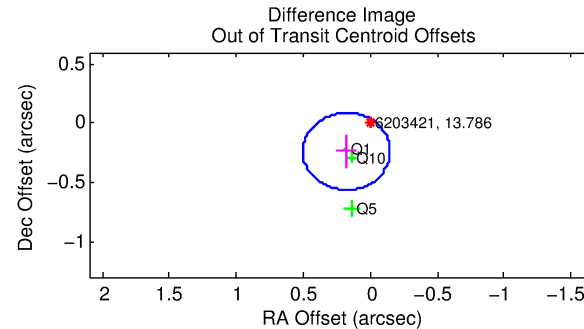
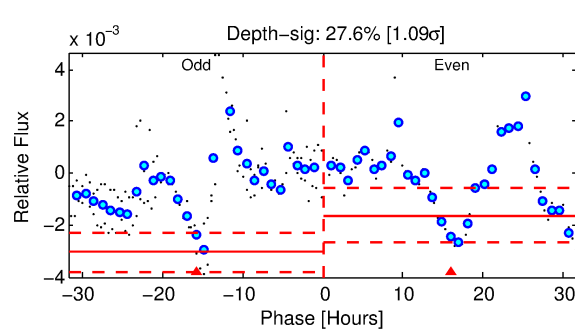
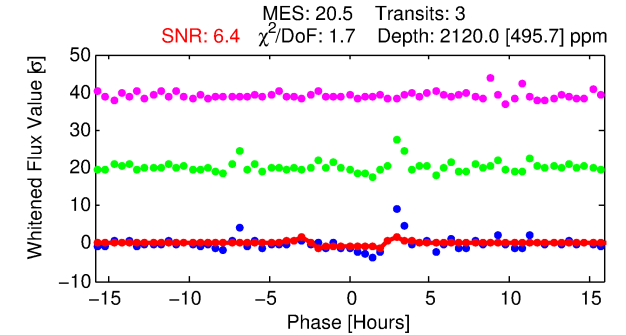
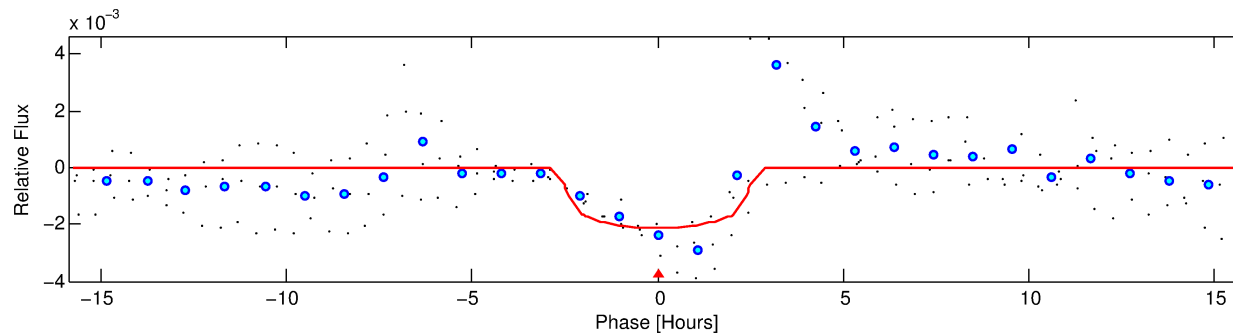
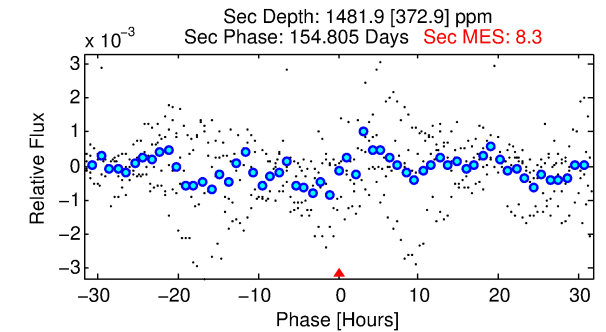
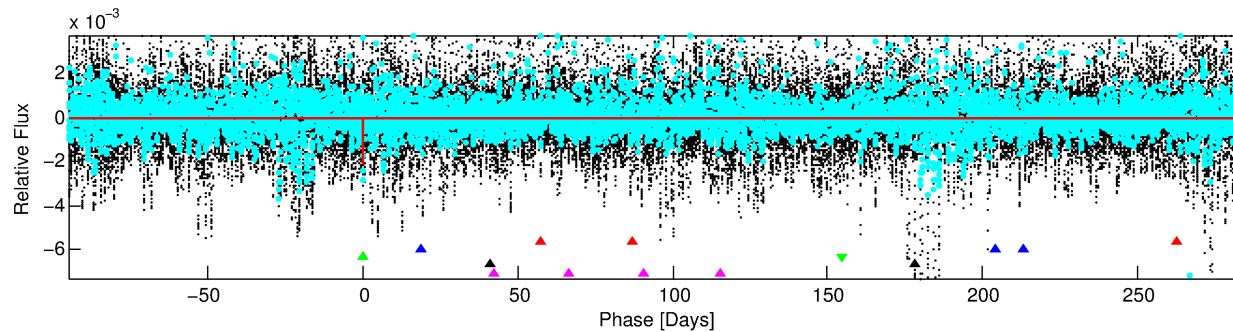
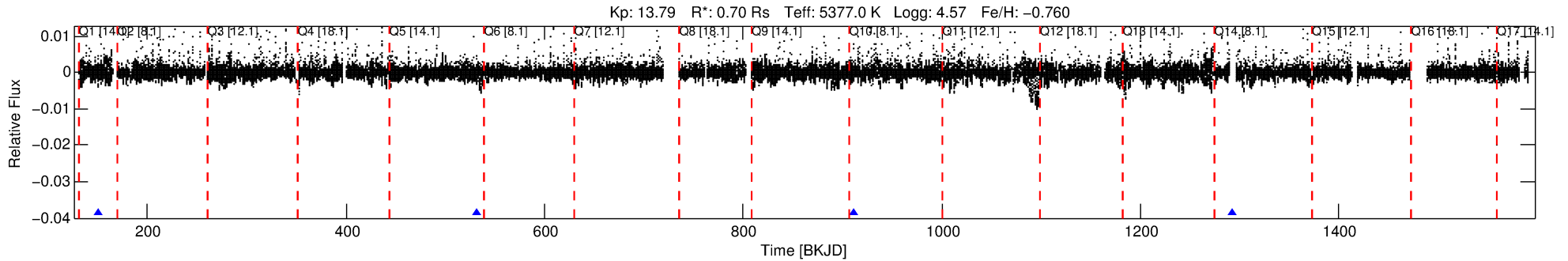
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006203421-03

No Significant Match Found

# DV One-Page Summary

KIC: 6203421 Candidate: 3 of 5 Period: 380.496 d



## DV Fit Results:

Period = 380.49604 [0.00493] d  
Epoch = 150.9227 [0.0069] BKJD  
Rp/R\* = 0.0433 [0.2384]  
a/R\* = 494.86 [11979.43]  
b = 0.52 [33.76]  
Seff = 0.46 [0.09]  
Teq = 210 [10] K  
Rp = 3.32 [18.30] Re  
a = 0.8986 [0.0945] AU  
Ag = 59677.44 [657559.44] [0.09σ]  
Teffp = 5070 [13966] K [0.35σ]

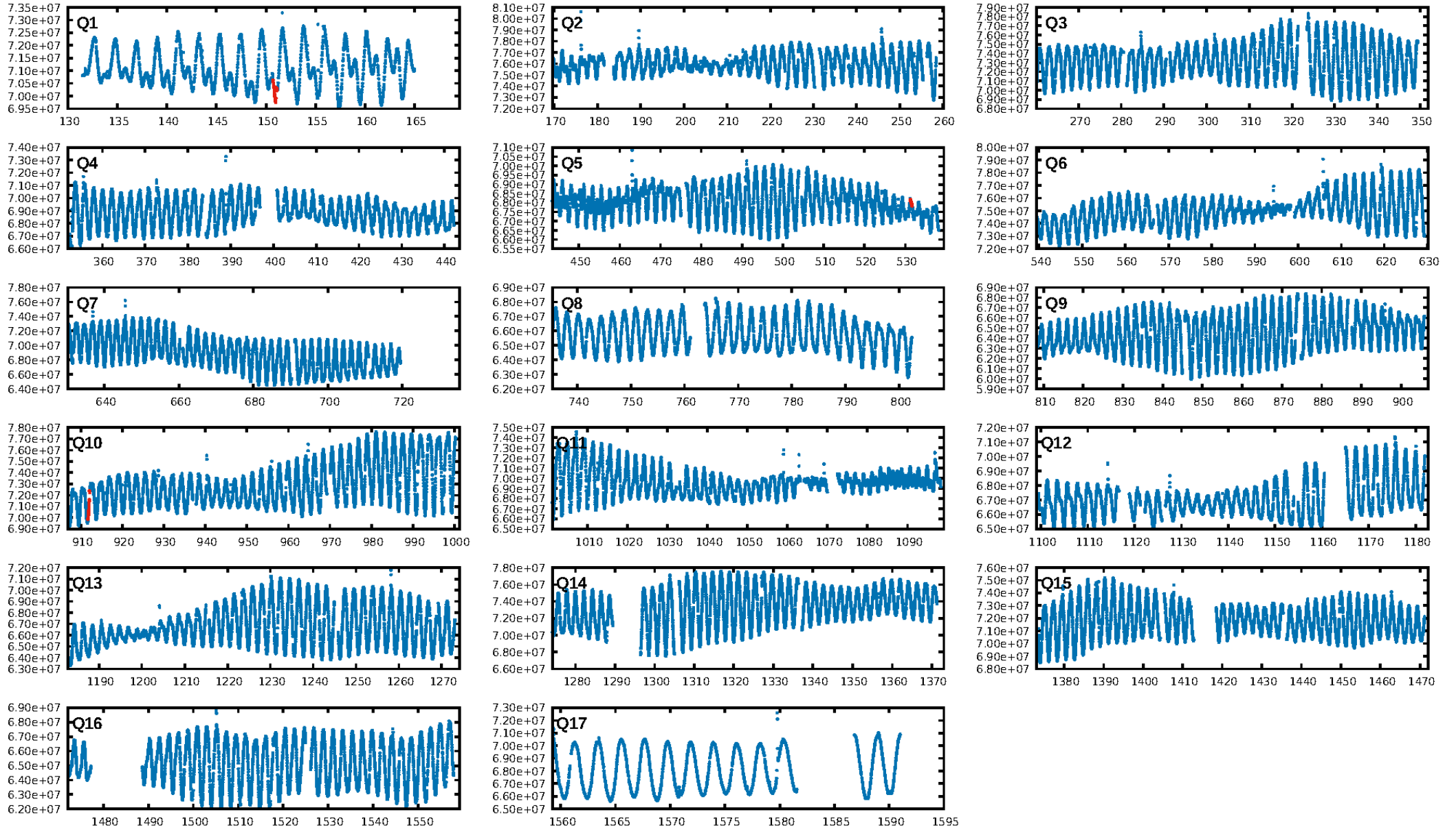
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [83.96σ]  
LongPeriod-sig: 100.0% [450.69σ]  
ModelChiSquare2-sig: 17.8%  
ModelChiSquareGof-sig: 48.2%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2/2]  
**GhostDiagnostic-chr: 0.8256**  
Centroid-sig: 0.6%  
Centroid-so: 0.757 arcsec [1.57σ]  
OotOffset-rm: 0.297 arcsec [2.73σ]  
OotOffset-st: 1/0/0/2 [3]  
KicOffset-rm: **0.724 arcsec [7.11σ]**  
KicOffset-st: 1/0/0/2 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

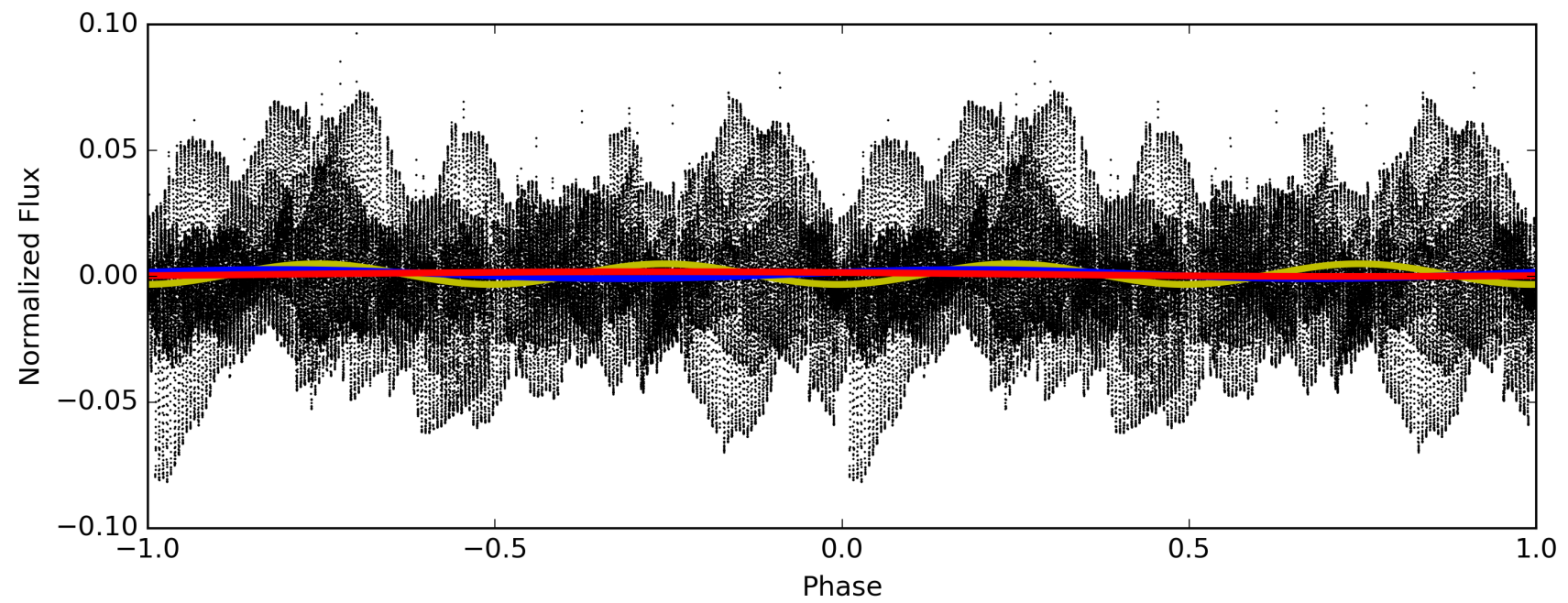
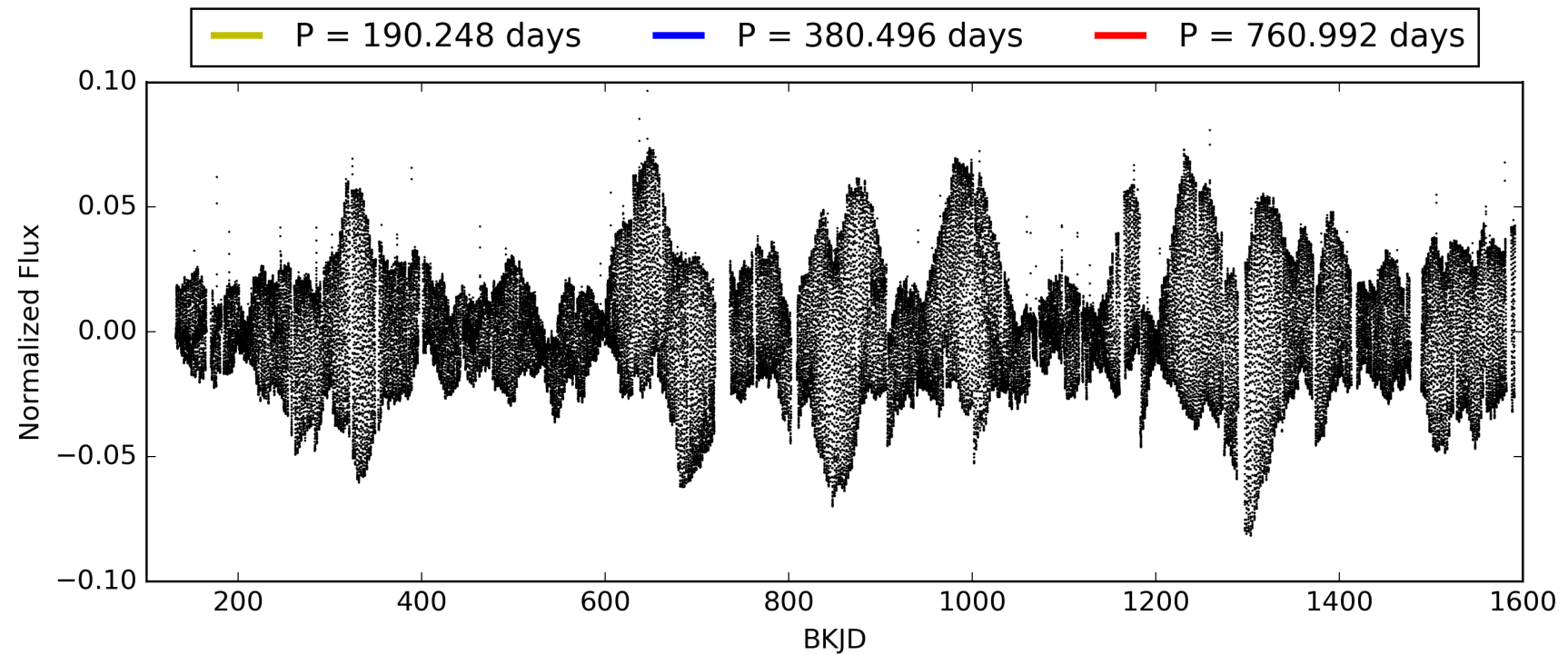
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 14:05:26 Z

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

# TCE 006203421-03, PDC Light Curves

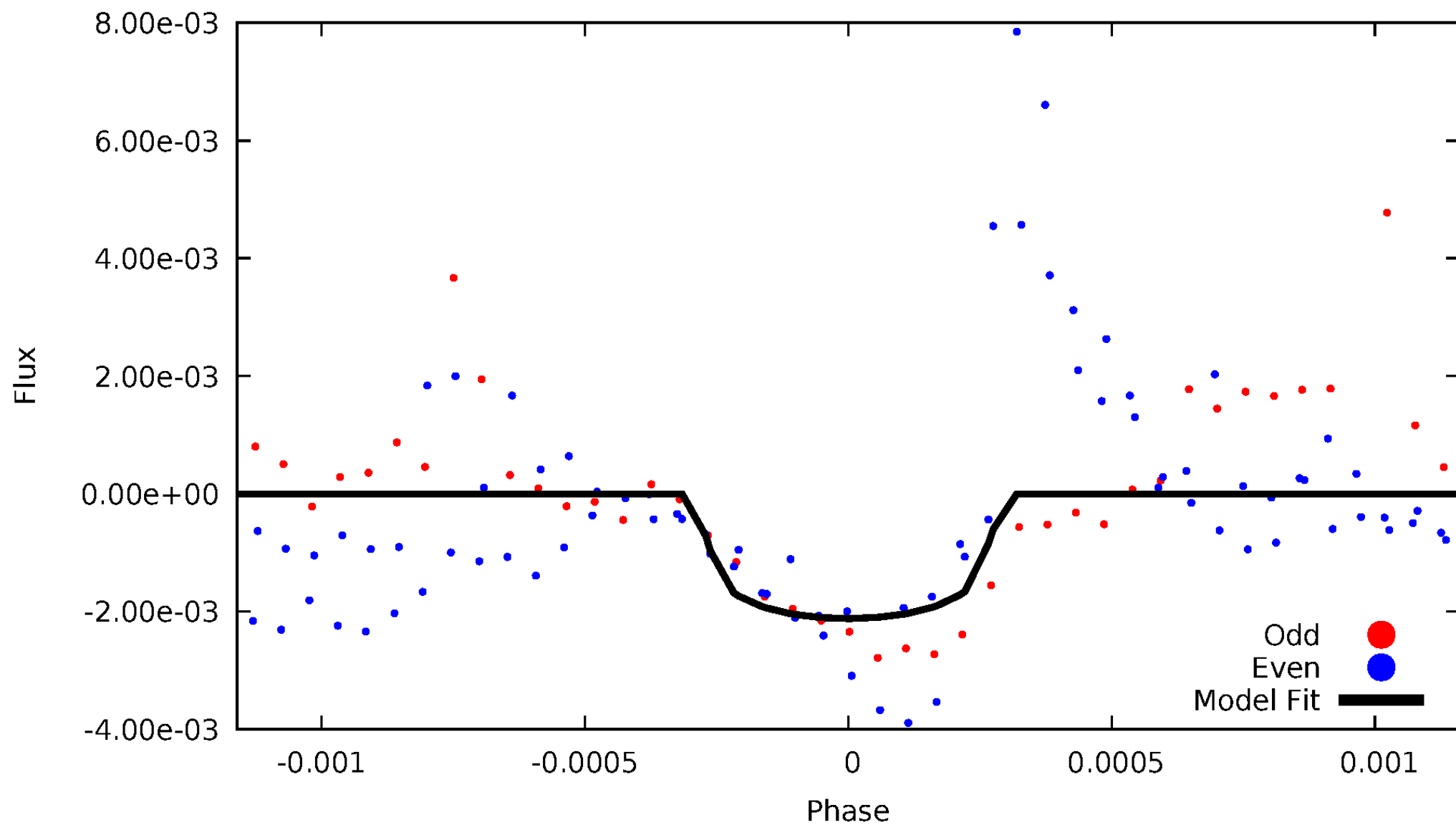


TCE 006203421-03



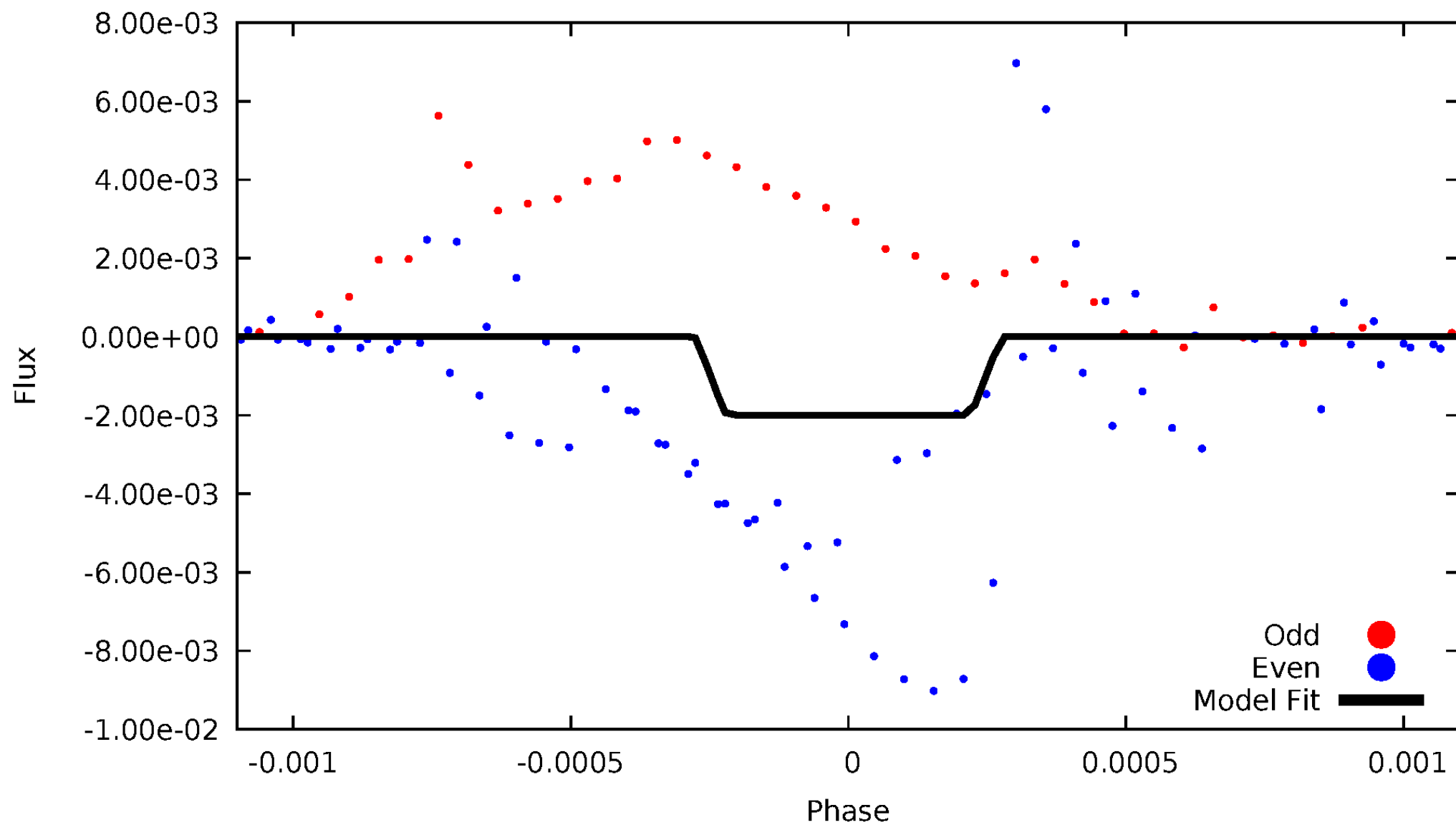
# DV Odd/Even

TCE 006203421-03



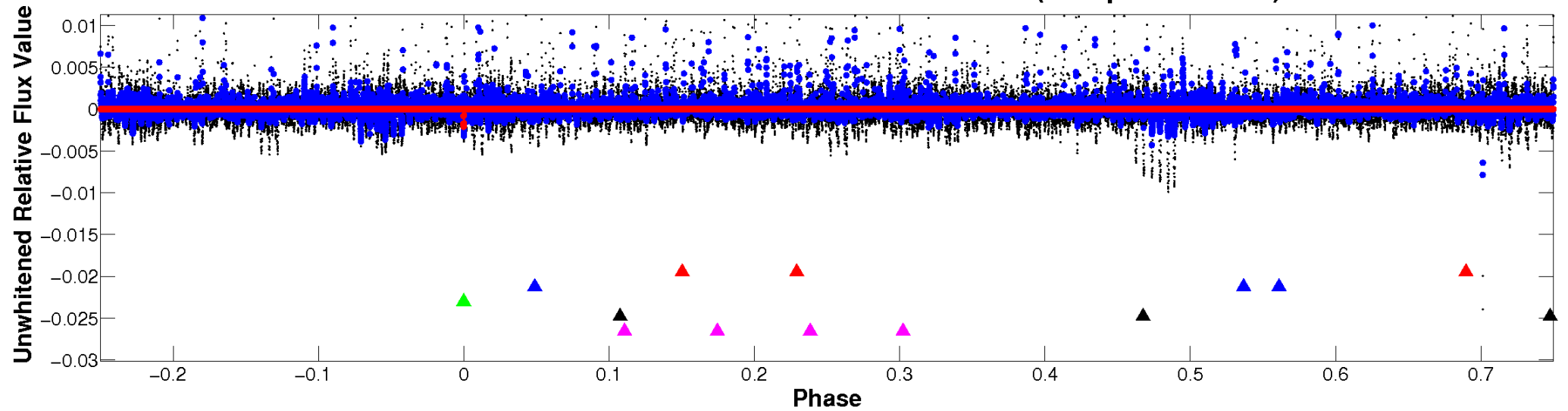
# ALT Odd/Even

TCE 006203421-03

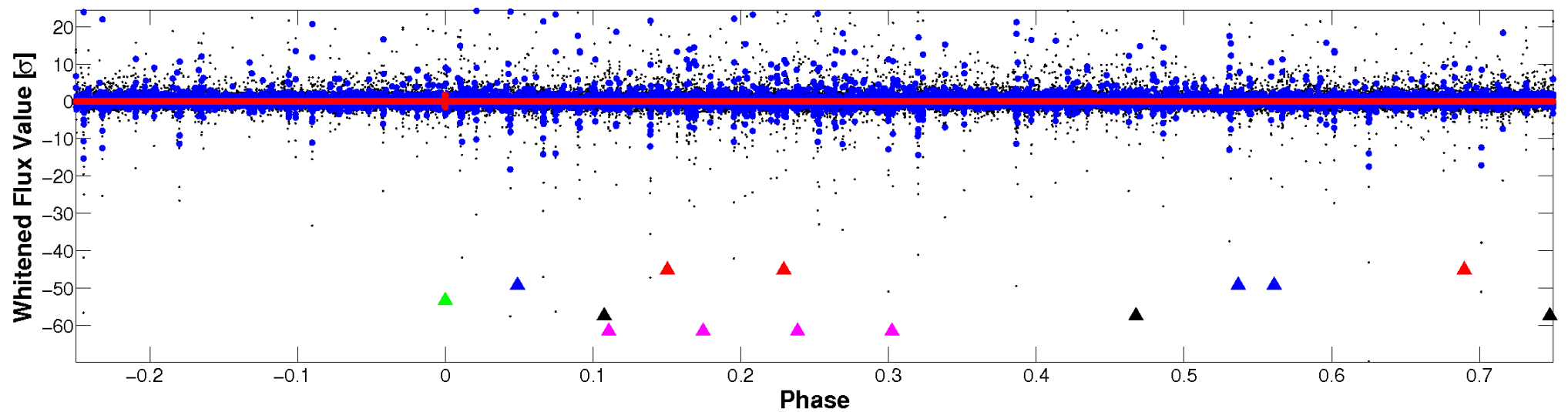


# Non-Whitened Vs. Whitened Light Curve

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

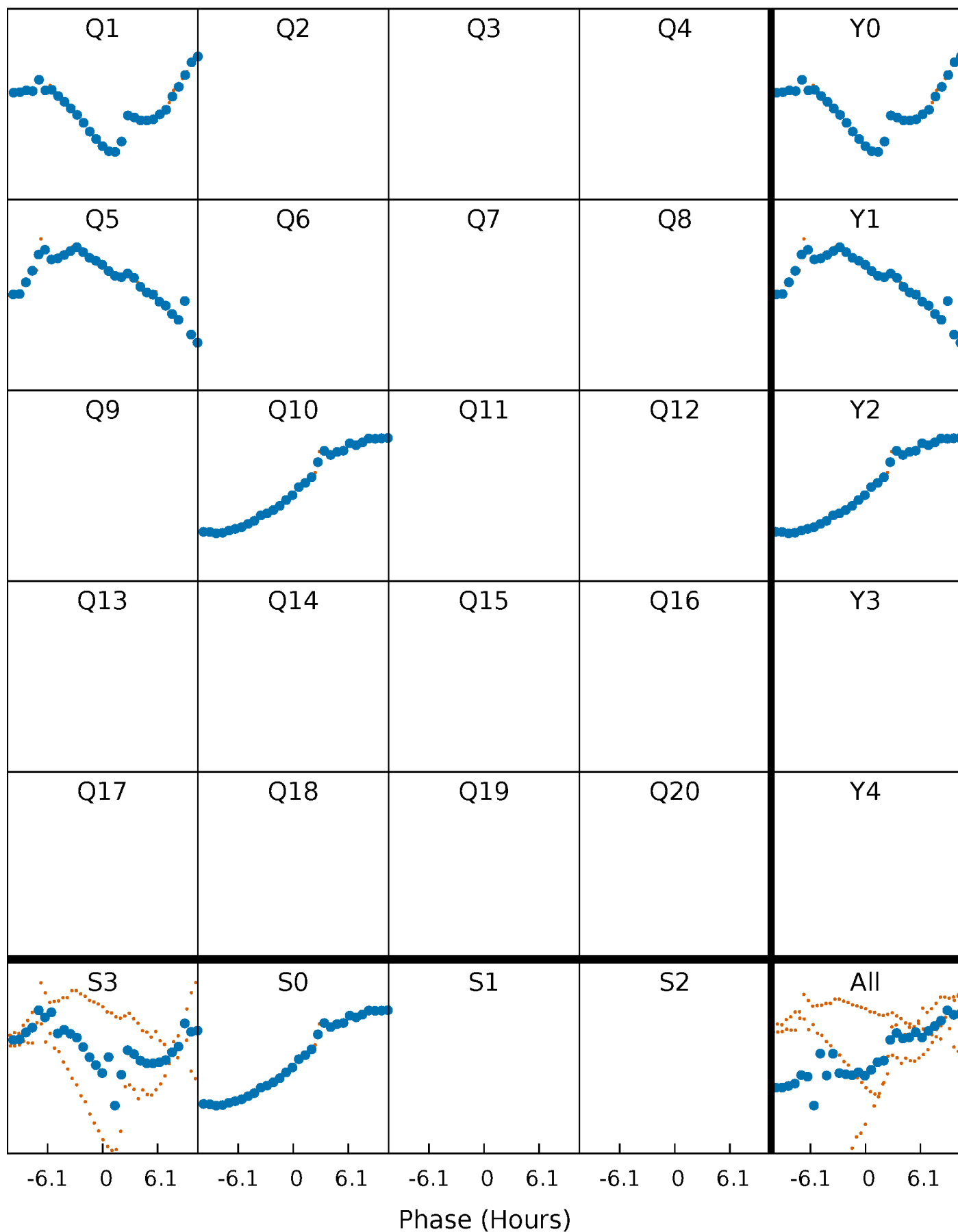


**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

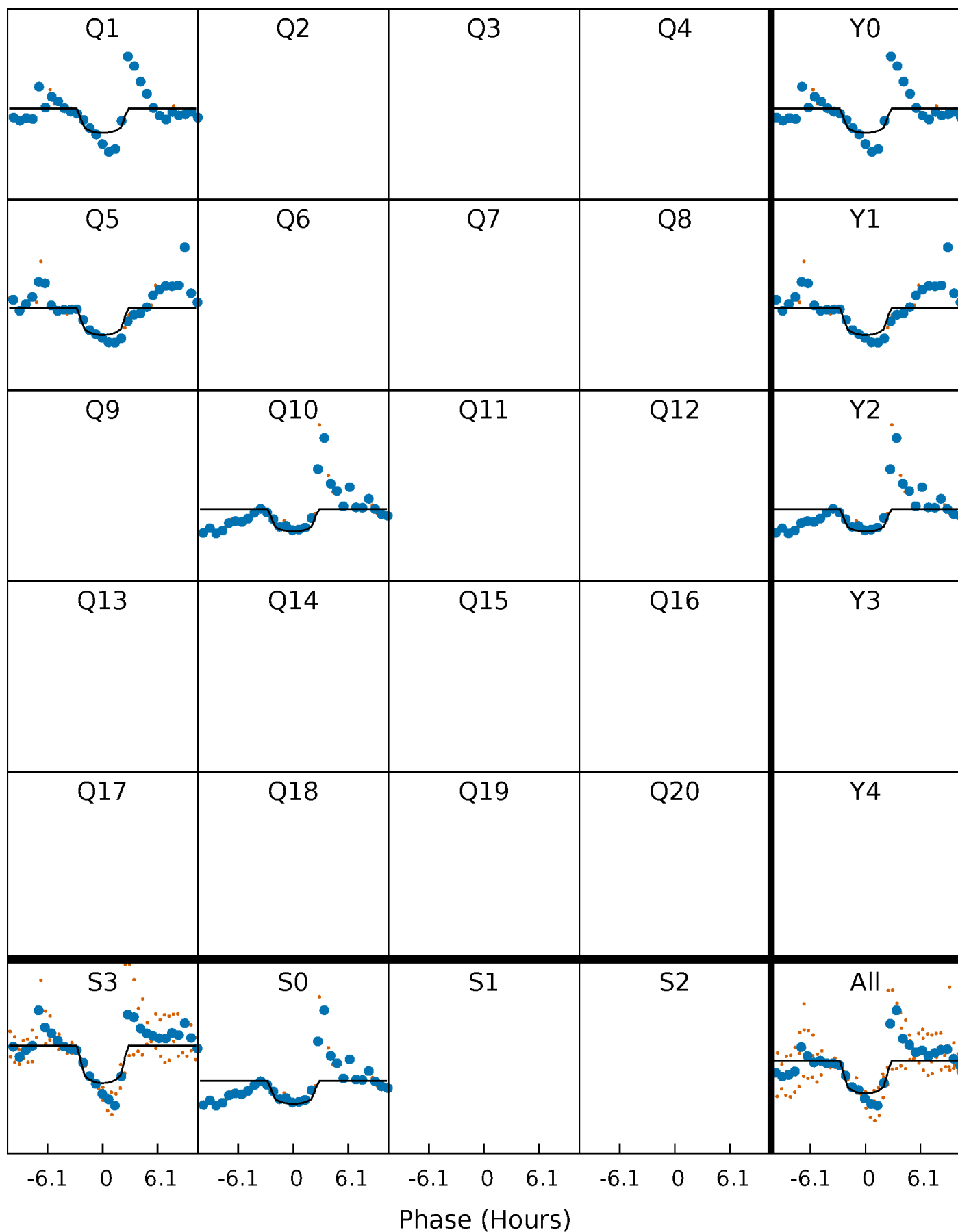
TCE 006203421-03     $P=380.496036$  Days     $T_0=150.922745$  (BKJD)





# DV Quarter-Phased Transit Curves

TCE 006203421-03     $P=380.496036$  Days     $T_0=150.922745$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

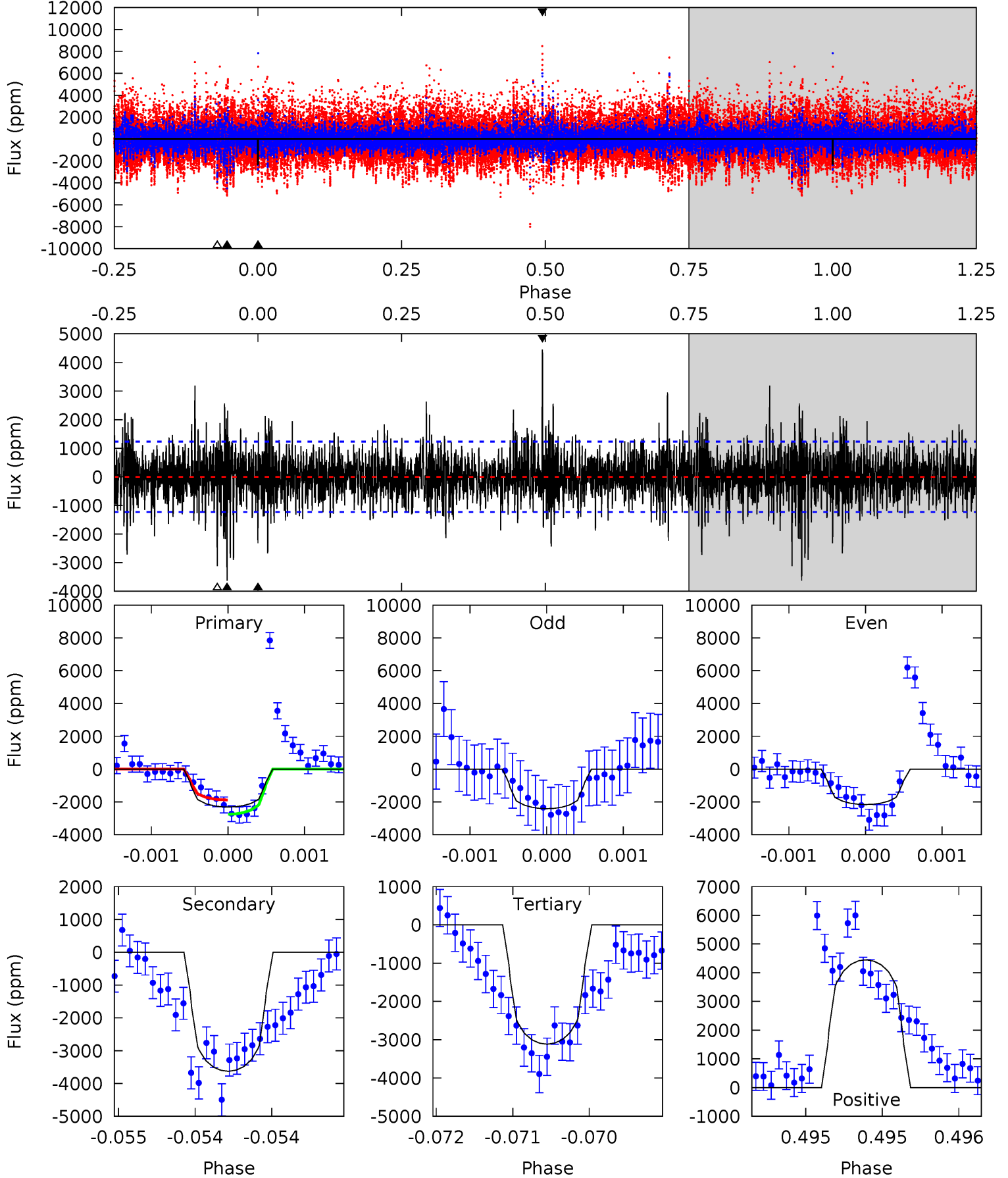
TCE 006203421-03 P=380.506943 Days  $T_0=150.907546$  (BKJD)



# DV Model-Shift Uniqueness Test

006203421-03, P = 380.496036 Days, E = 150.922745 Days

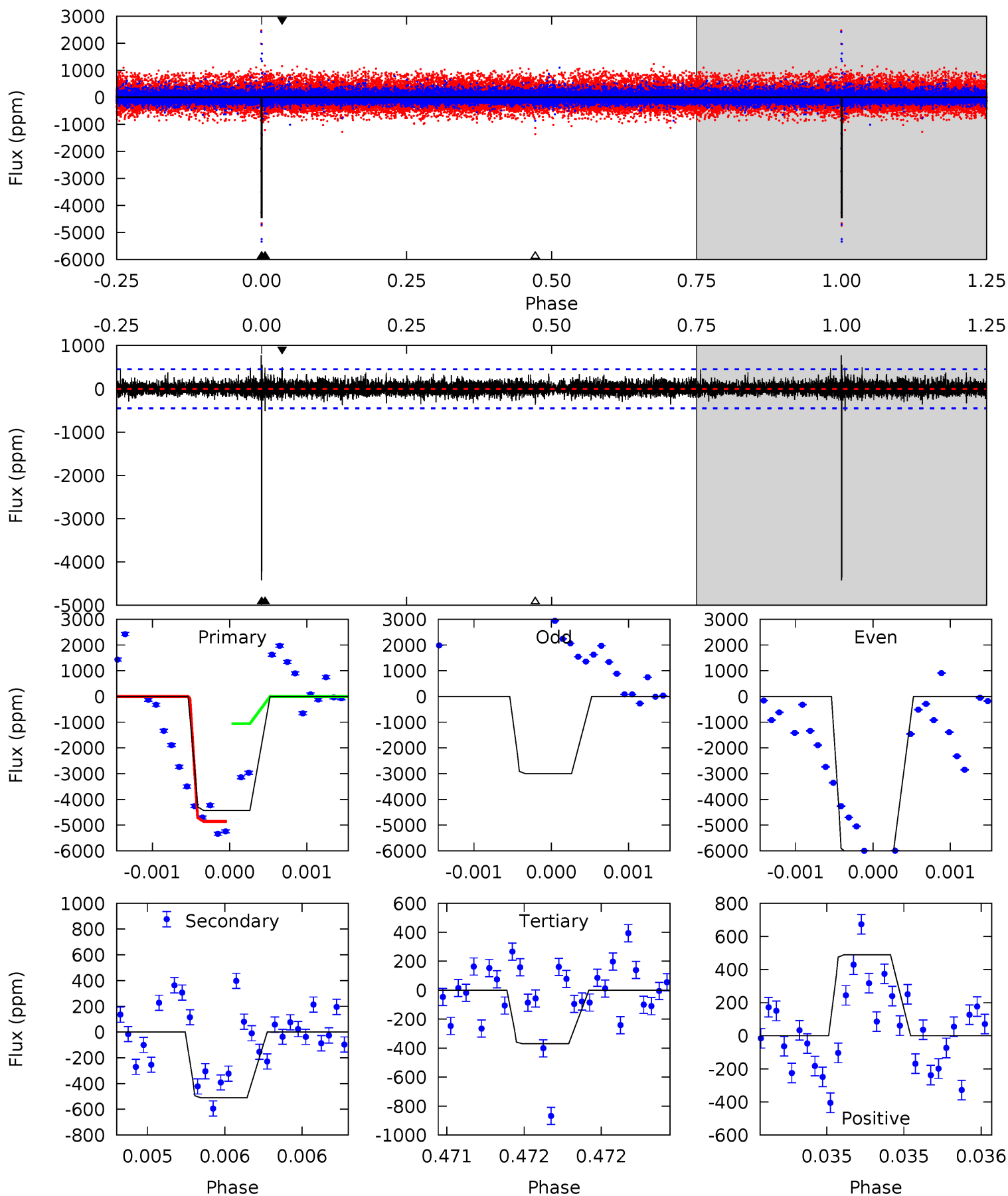
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.4 | 16.4 | 14.0 | 20.1 | 5.56            | 3.46            | 2.94             | -3.61   | -9.64   | 2.31    | -3.71   | 0.48    | 0.92 | 0.55  | 1.99 |



# Alt Model-Shift Uniqueness Test

006203421-03, P = 380.506943 Days, E = 150.907546 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 54.3 | 6.26 | 4.54 | 6.01 | 5.56            | 3.46            | 0.98             | 49.8    | 48.3    | 1.72    | 0.25    | 29.2    | 0.68 | 0.15  | 0   |



### Stellar Parameters For KIC 006203421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5377^{+160}_{-160}$ | $4.569^{+0.088}_{-0.072}$ | $-0.760^{+0.350}_{-0.300}$ | $0.703^{+0.085}_{-0.077}$ | $0.669^{+0.076}_{-0.033}$ | $2.709^{+0.958}_{-0.648}$                     |
|        | +3%/-3%              | +2%/-2%                   | +46%/-39%                  | +12%/-11%                 | +11%/-5%                  | +35%/-24%                                     |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 006203421-03 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ )    | $T_{max}$ (K)     | $T_{obs}$ (K)         | $A_{obs}$               |
|---------|-----------------|---------------------------|-------------------|-----------------------|-------------------------|
| DV      | $-3626 \pm 222$ | $13.98^{+14.38}_{-9.40}$  | $293^{+12}_{-12}$ | $3535^{+1941}_{-644}$ | $8393^{+69895}_{-6304}$ |
| Alt.    | $-510 \pm 81$   | $14.01^{+13.40}_{-10.14}$ | $293^{+12}_{-12}$ | $2663^{+1208}_{-392}$ | $1161^{+15100}_{-855}$  |

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

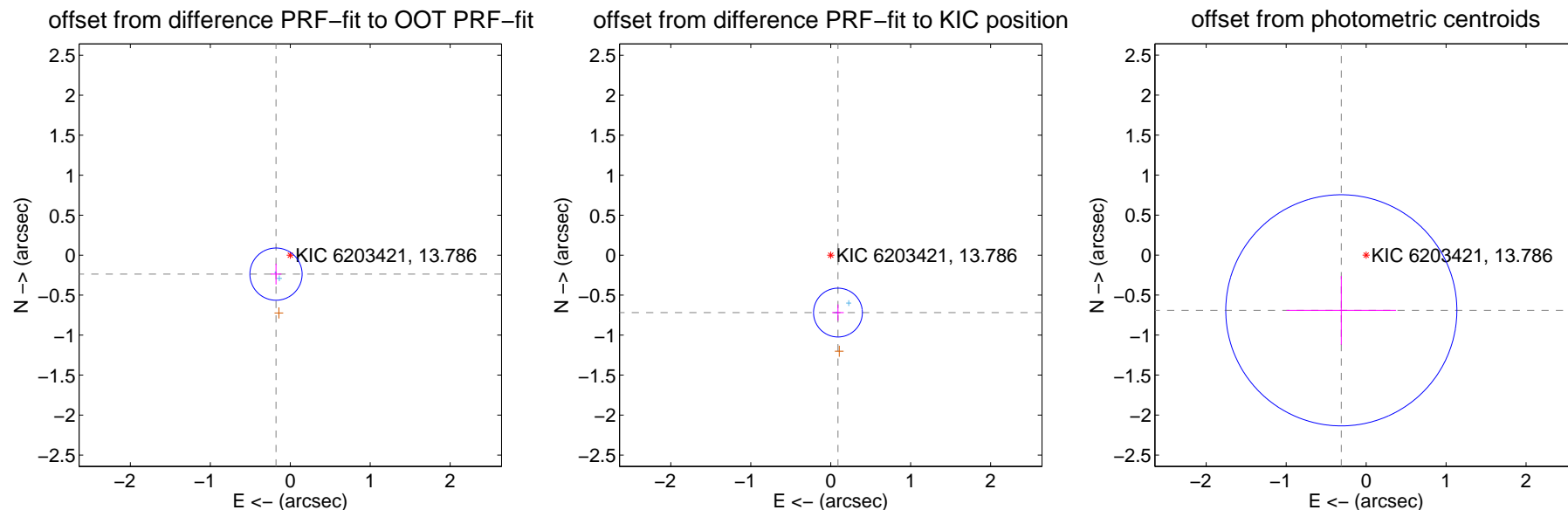
## DV Centroid Data

Supplemental centroid analysis for 006203421-03. Kepler magnitude: 13.79. Transit SNR 6.36

There are 2 quarters with good PRF difference image offsets

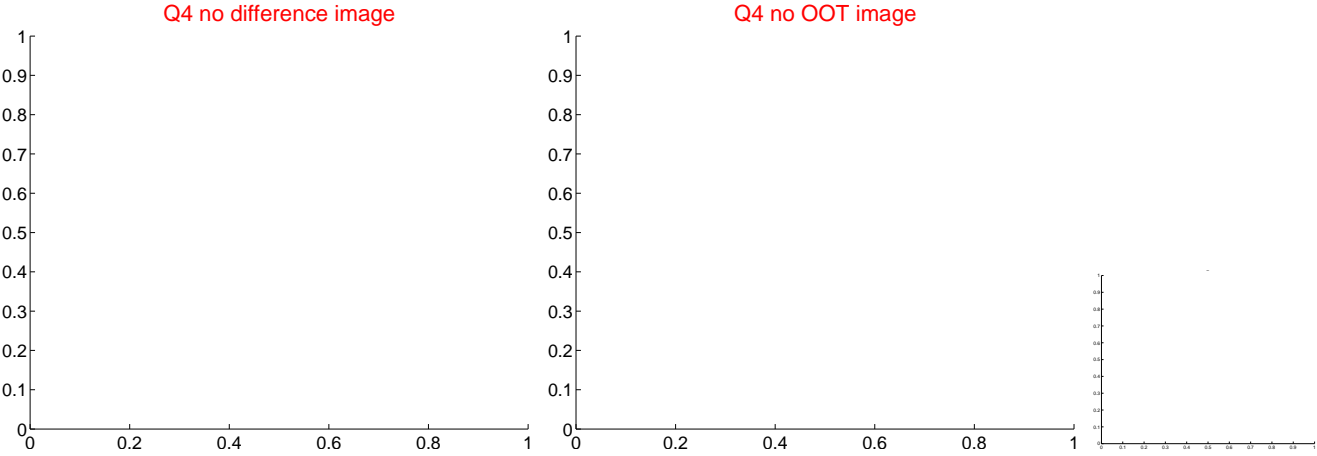
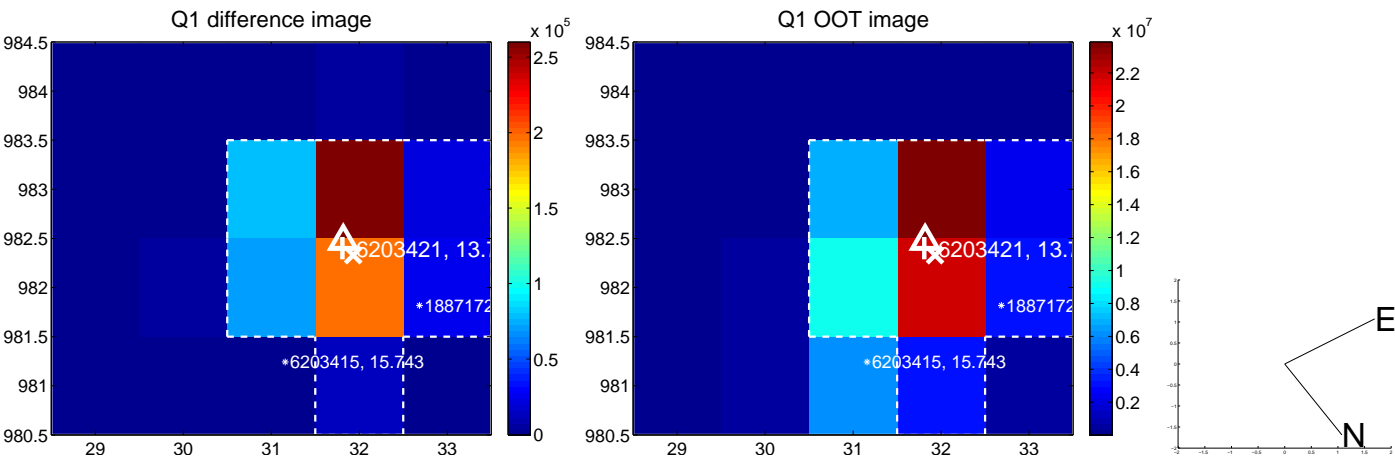
The direct PRF centroid is offset from the target star catalog position by about 0.48 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.297 \pm 0.109$  | 2.73                | $0.178 \pm 0.068$  | $-0.237 \pm 0.130$ |
| PRF-fit source offset from KIC position | $0.724 \pm 0.102$  | 7.11                | $-0.091 \pm 0.073$ | $-0.718 \pm 0.101$ |
| photometric centroid source offset      | $0.76 \pm 0.48$    | 1.57                | $0.31 \pm 0.69$    | $-0.69 \pm 0.43$   |

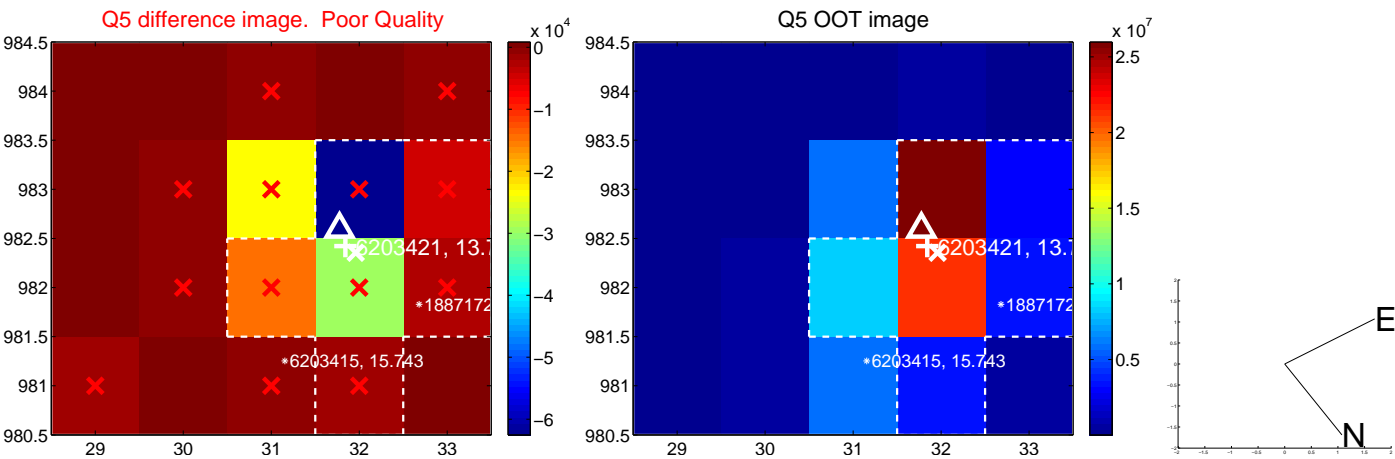


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



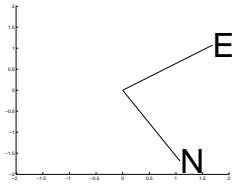
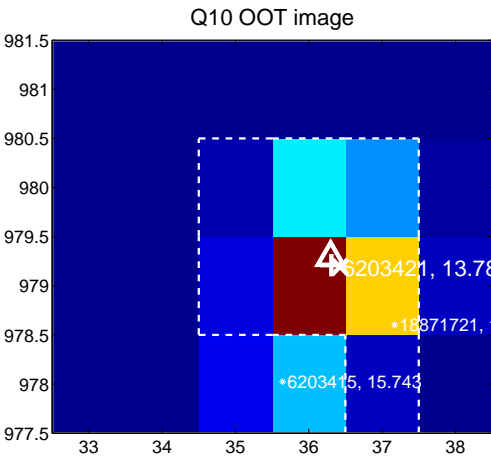
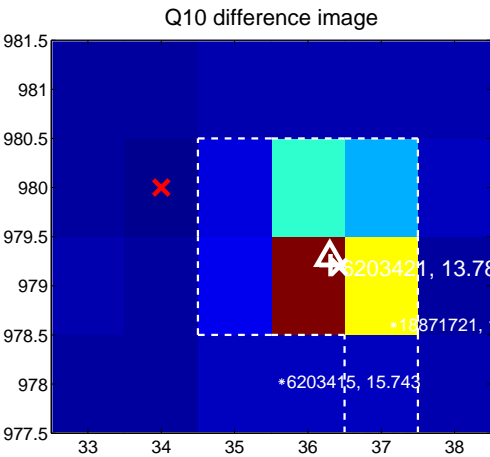


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

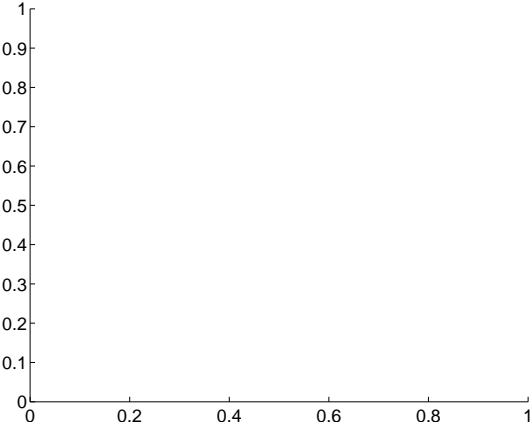
Q9 no difference image



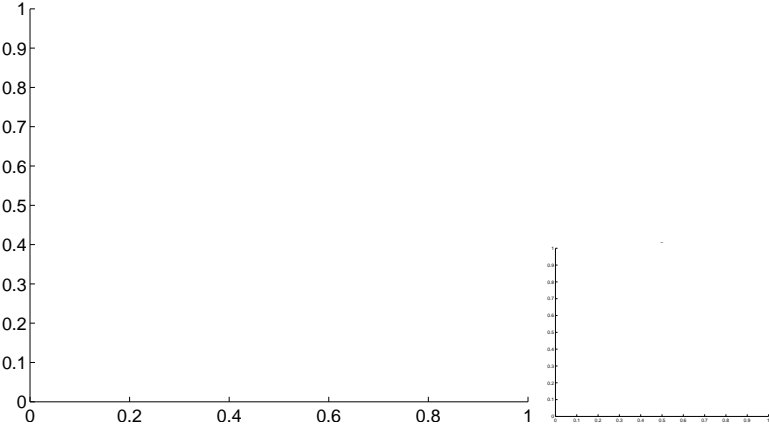
Q9 no OOT image



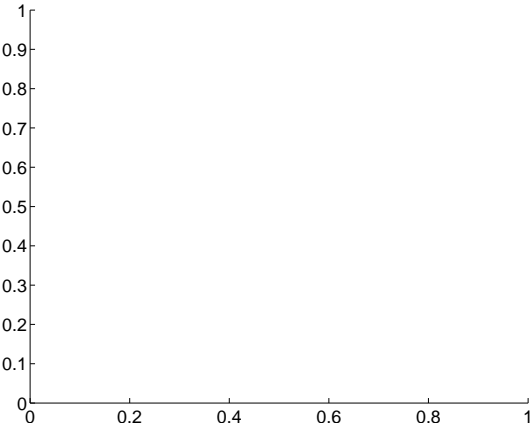
Q11 no difference image



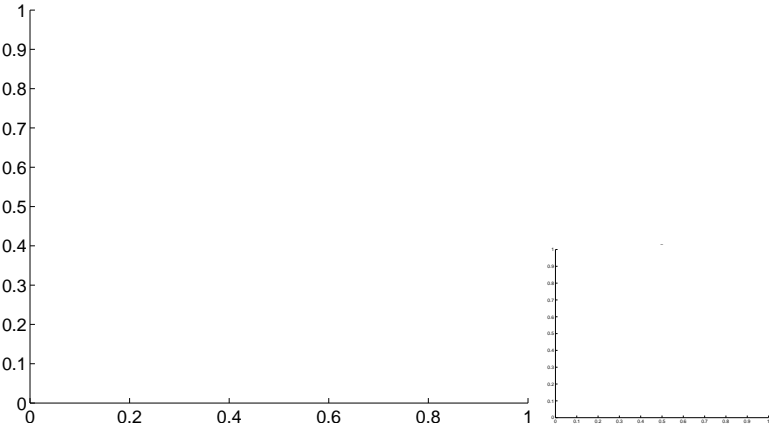
Q11 no OOT image



Q12 no difference image



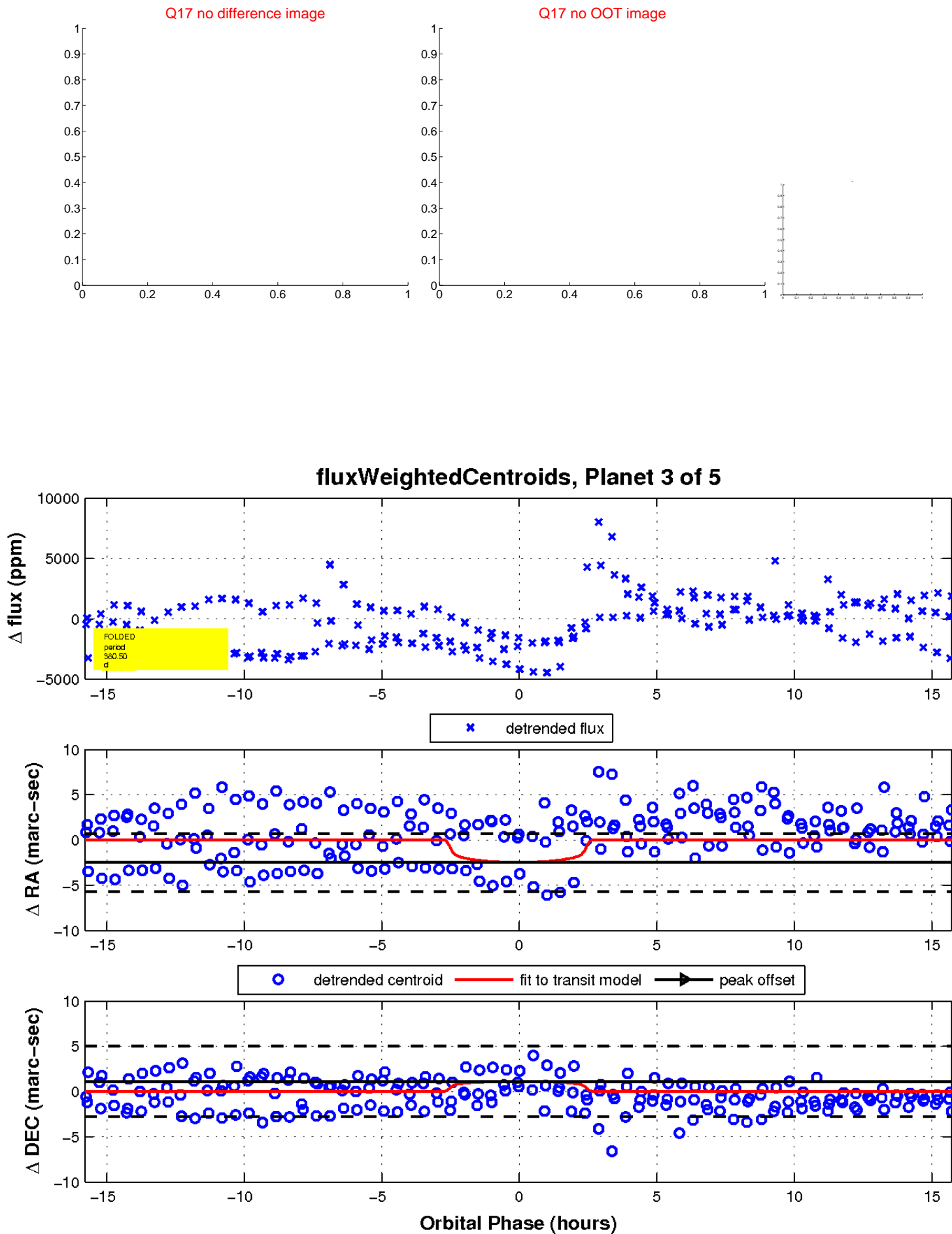
Q12 no OOT image



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

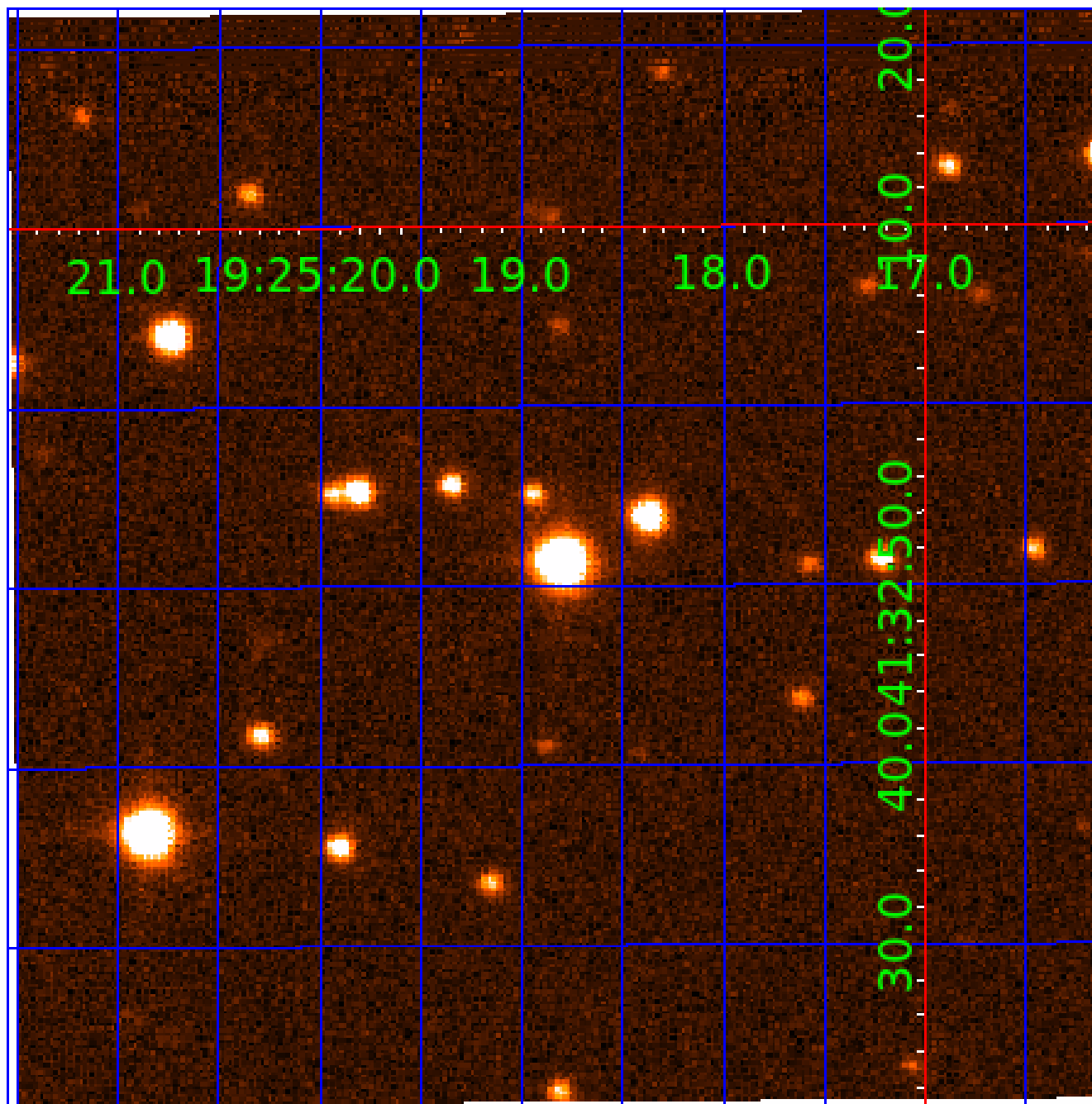


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 006203421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 006203421-01 | OBS      | No   | 555.754648    | 238.117755   | 722.0       | 7.685            | 16.8 | 2.3  | 0.70                        | 5377            | 1.99                   | 0.28                   |
| 006203421-02 | OBS      | No   | 575.380113    | 355.145876   | 2632.3      | 4.095            | 18.8 | 8.1  | 0.70                        | 5377            | 3.59                   | 0.26                   |
| 006203421-03 | OBS      | No   | 380.496036    | 150.922745   | 2120.0      | 5.296            | 20.5 | 6.4  | 0.70                        | 5377            | 3.32                   | 0.46                   |
| 006203421-04 | OBS      | No   | 624.043177    | 328.809753   | 2182.8      | 4.127            | 17.6 | 7.5  | 0.70                        | 5377            | 3.35                   | 0.24                   |
| 006203421-05 | OBS      | No   | 356.184196    | 265.970630   | 635.9       | 4.500            | 15.7 | -1.0 | 0.70                        | 5377            | 1.76                   | 0.50                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 006203421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS     |
| 006203421-02 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_CHASES_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS—CENT_UNCERTAIN—HALO_GHOST |
| 006203421-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 006203421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS                       |
| 006203421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS  |

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

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

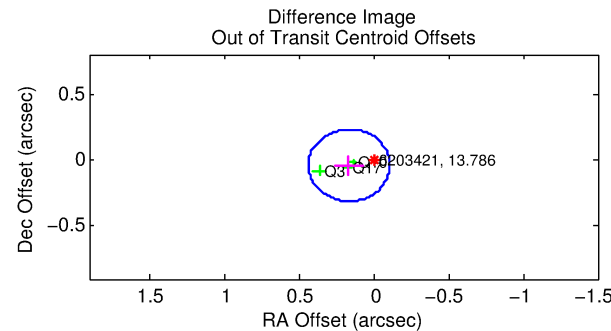
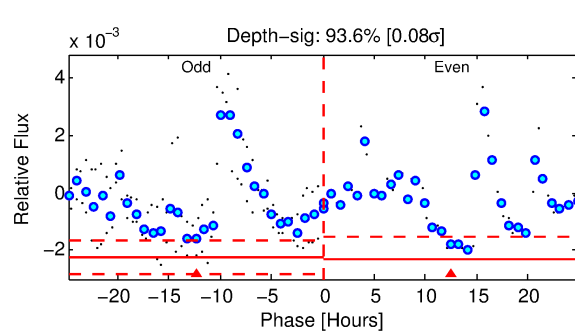
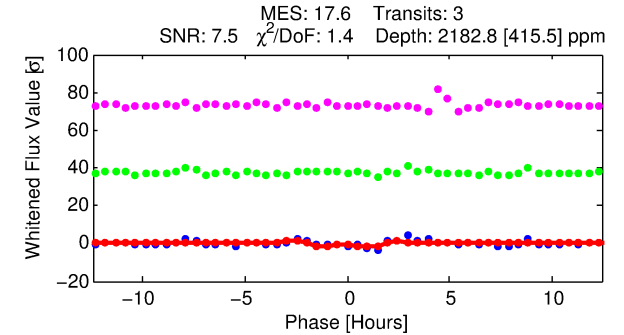
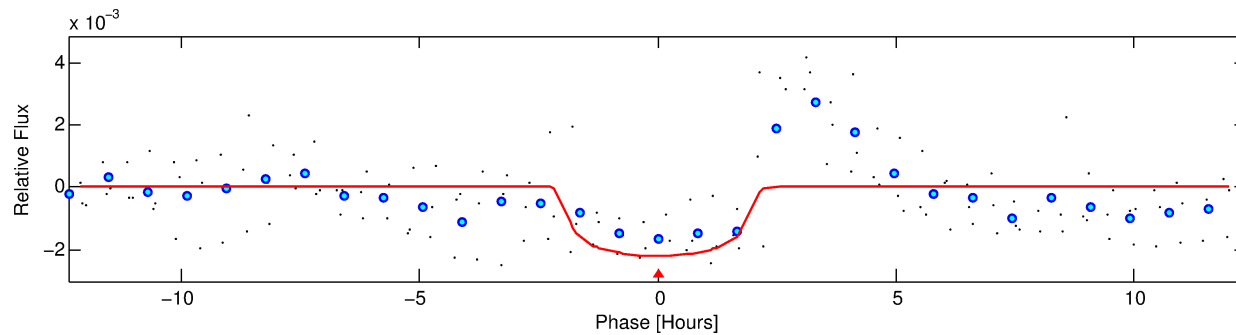
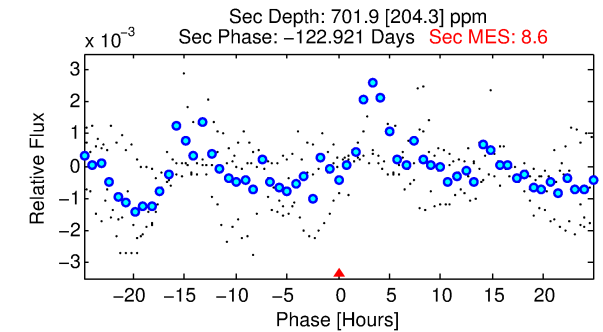
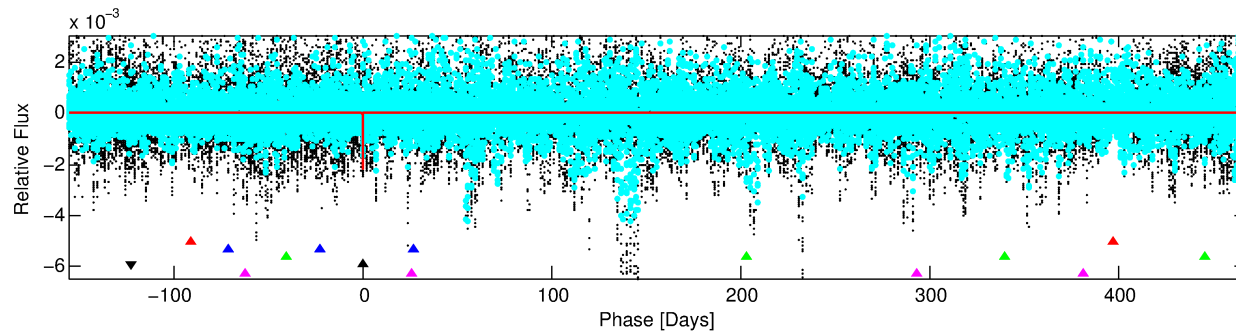
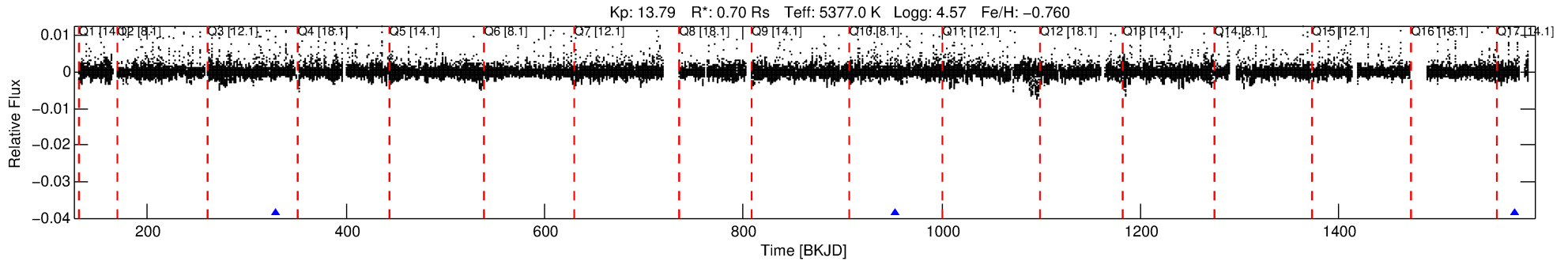
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006203421-04

No Significant Match Found

# DV One-Page Summary

KIC: 6203421 Candidate: 4 of 5 Period: 624.043 d



## DV Fit Results:

Period = 624.04318 [0.00405] d  
Epoch = 328.8098 [0.0063] BKJD  
Rp/R\* = 0.0436 [0.0249]  
a/R\* = 1074.80 [2503.28]  
b = 0.47 [3.86]  
Seff = 0.24 [0.05]  
Teq = 178 [9] K  
Rp = 3.35 [1.95] Re  
a = 1.2497 [0.1314] AU  
Ag = 53856.79 [64015.97] [0.84σ]  
**Teffp = 4190 [1241] K [3.23σ]**

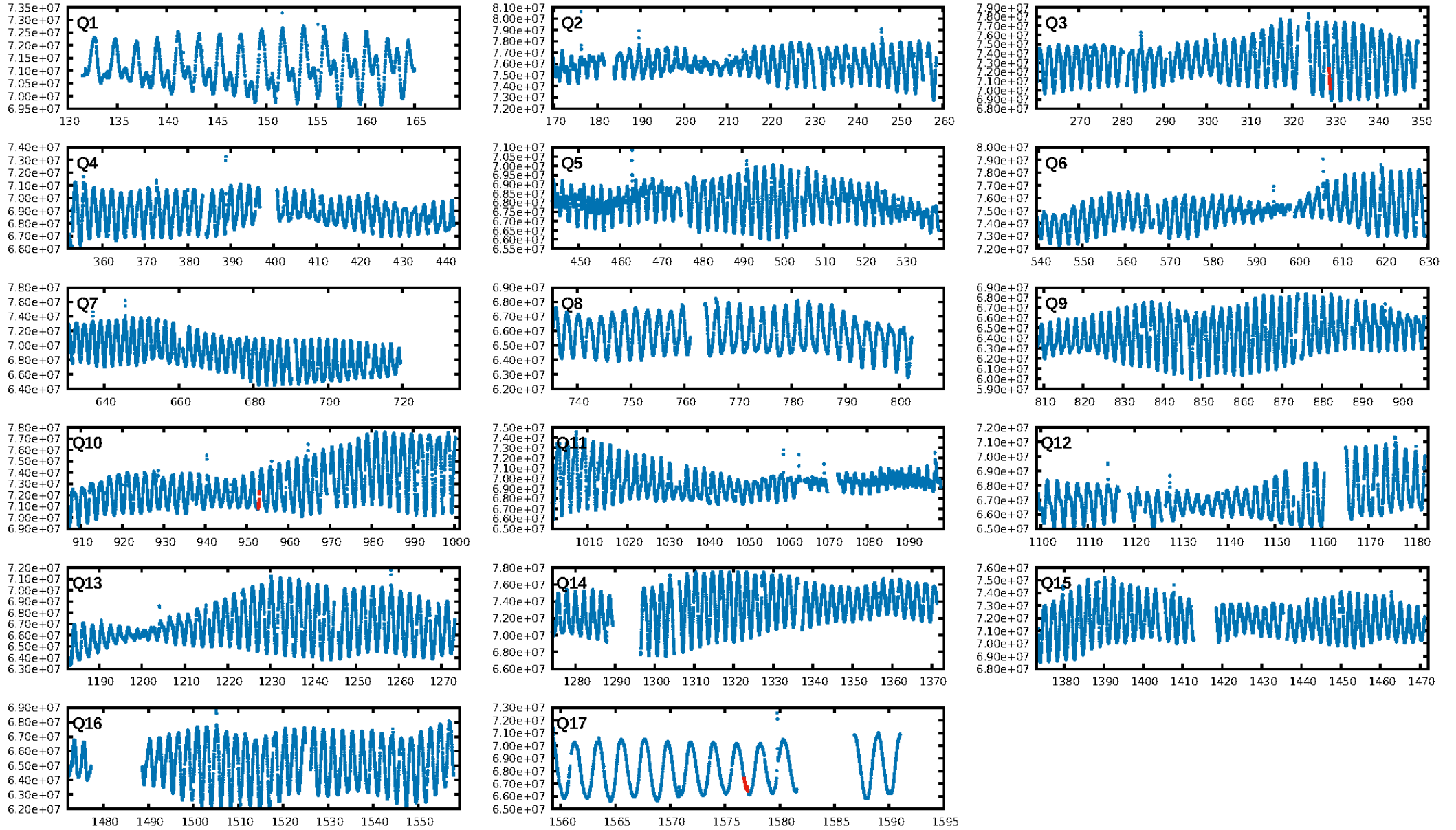
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [200.88σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 5.5%  
ModelChiSquareGof-sig: 77.2%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: 2.902  
Centroid-sig: 65.8%  
Centroid-so: 0.323 arcsec [0.42σ]  
OotOffset-rm: 0.168 arcsec [1.86σ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-rm: **0.601 arcsec [5.77σ]**  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

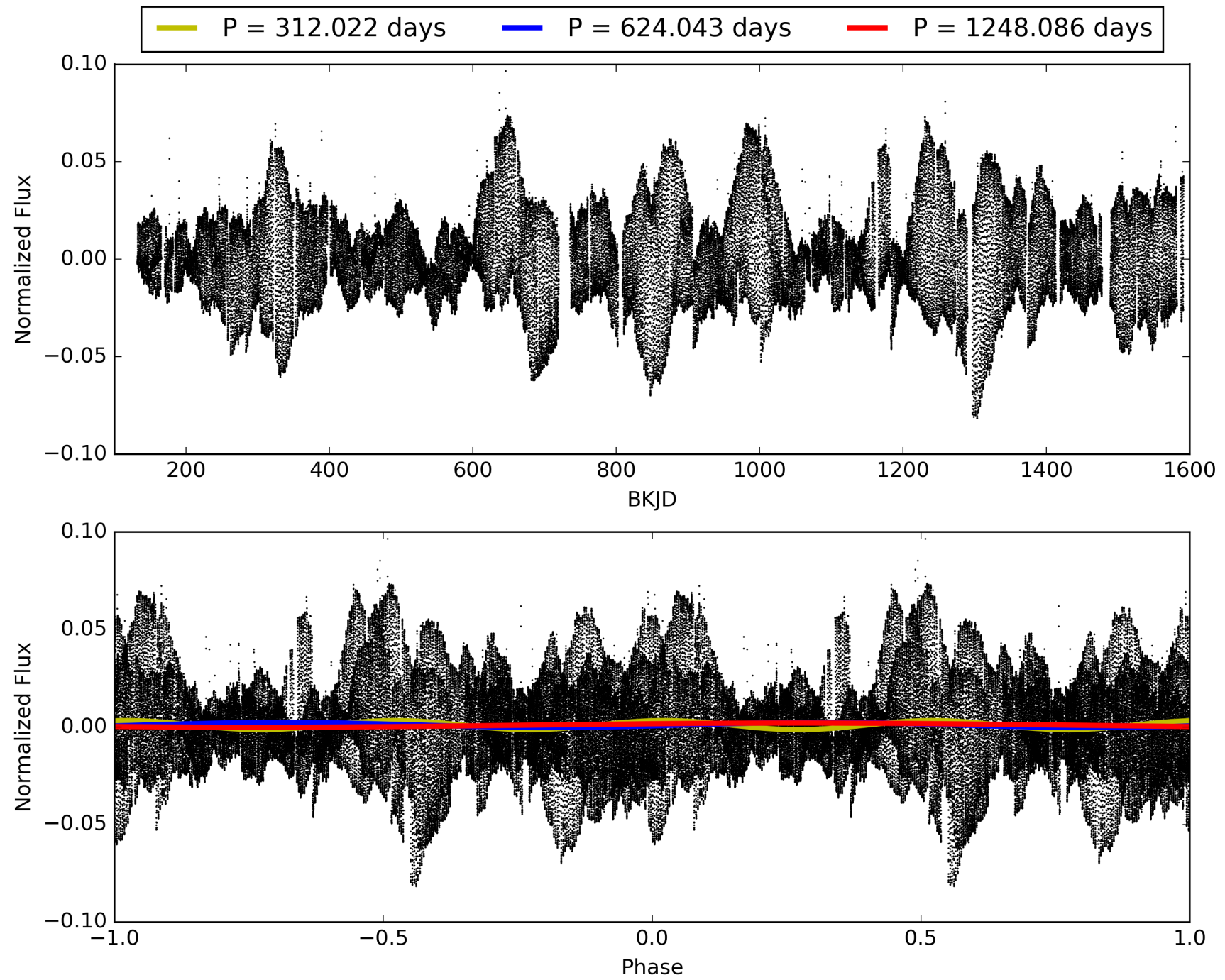
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 14:05:46 Z

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

# TCE 006203421-04, PDC Light Curves



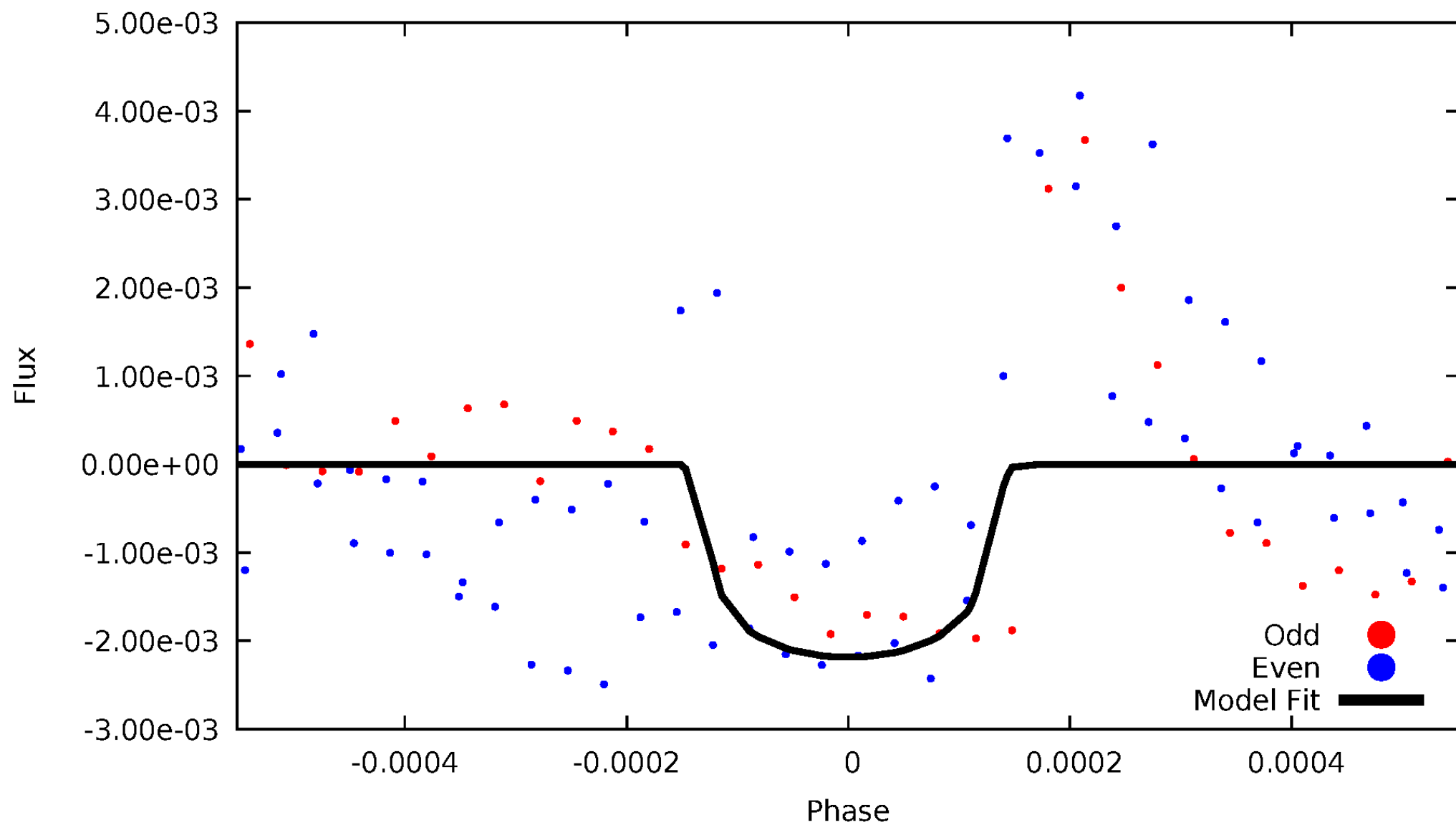
TCE 006203421-04





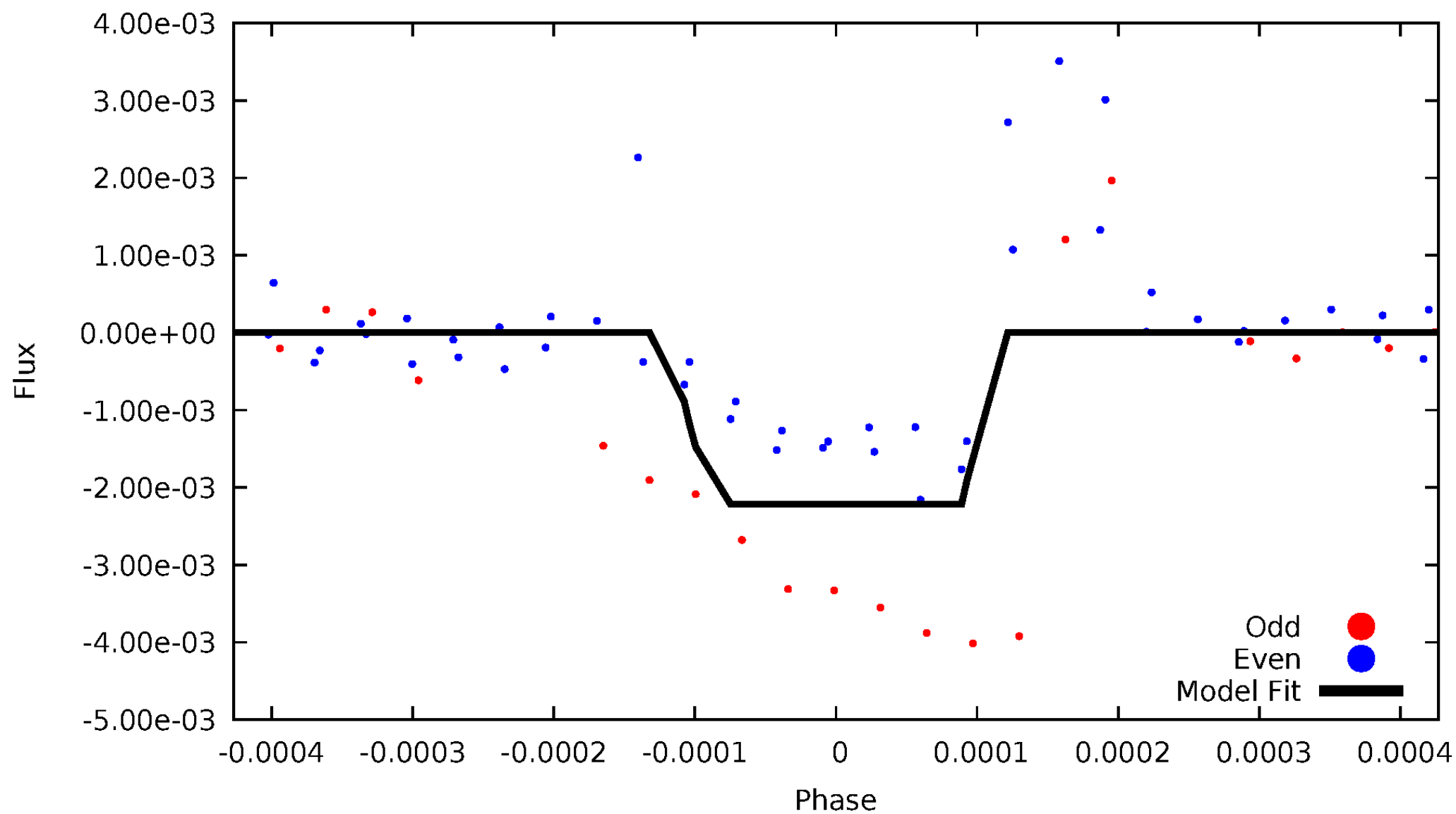
# DV Odd/Even

TCE 006203421-04



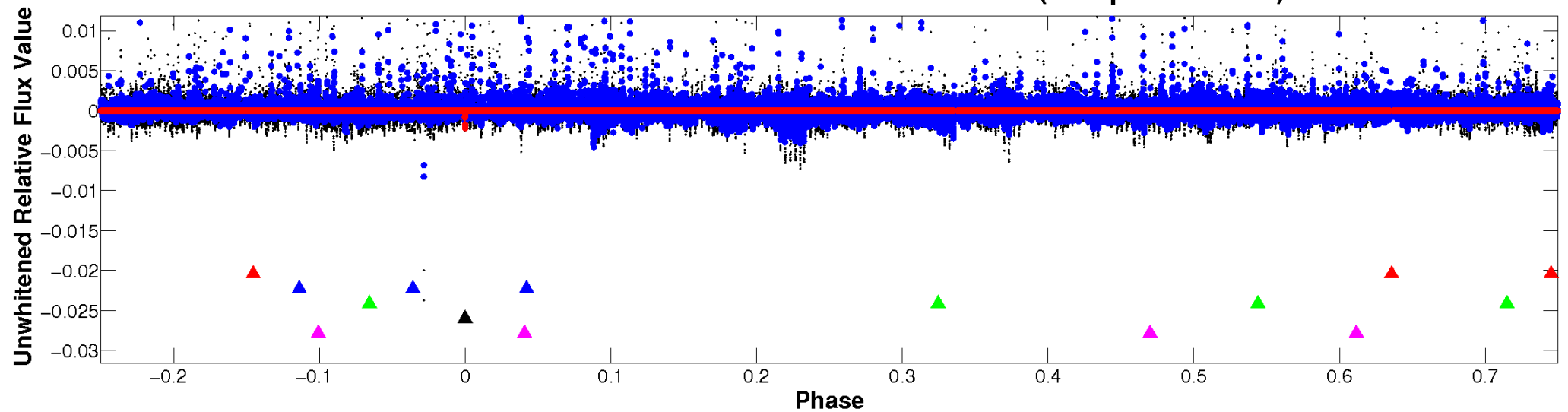
# ALT Odd/Even

TCE 006203421-04

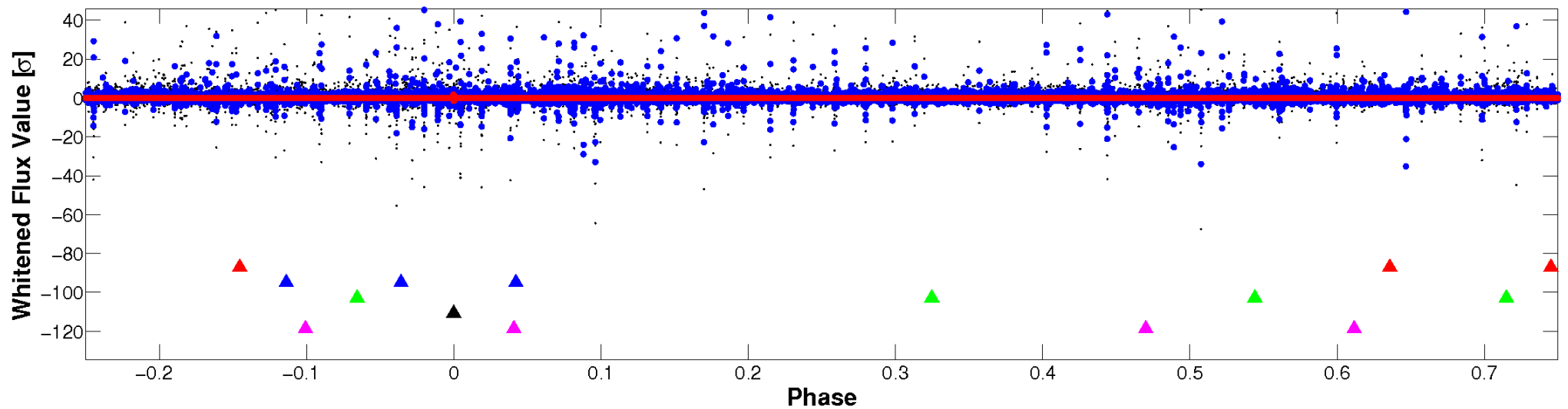


# Non-Whitened Vs. Whitened Light Curve

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

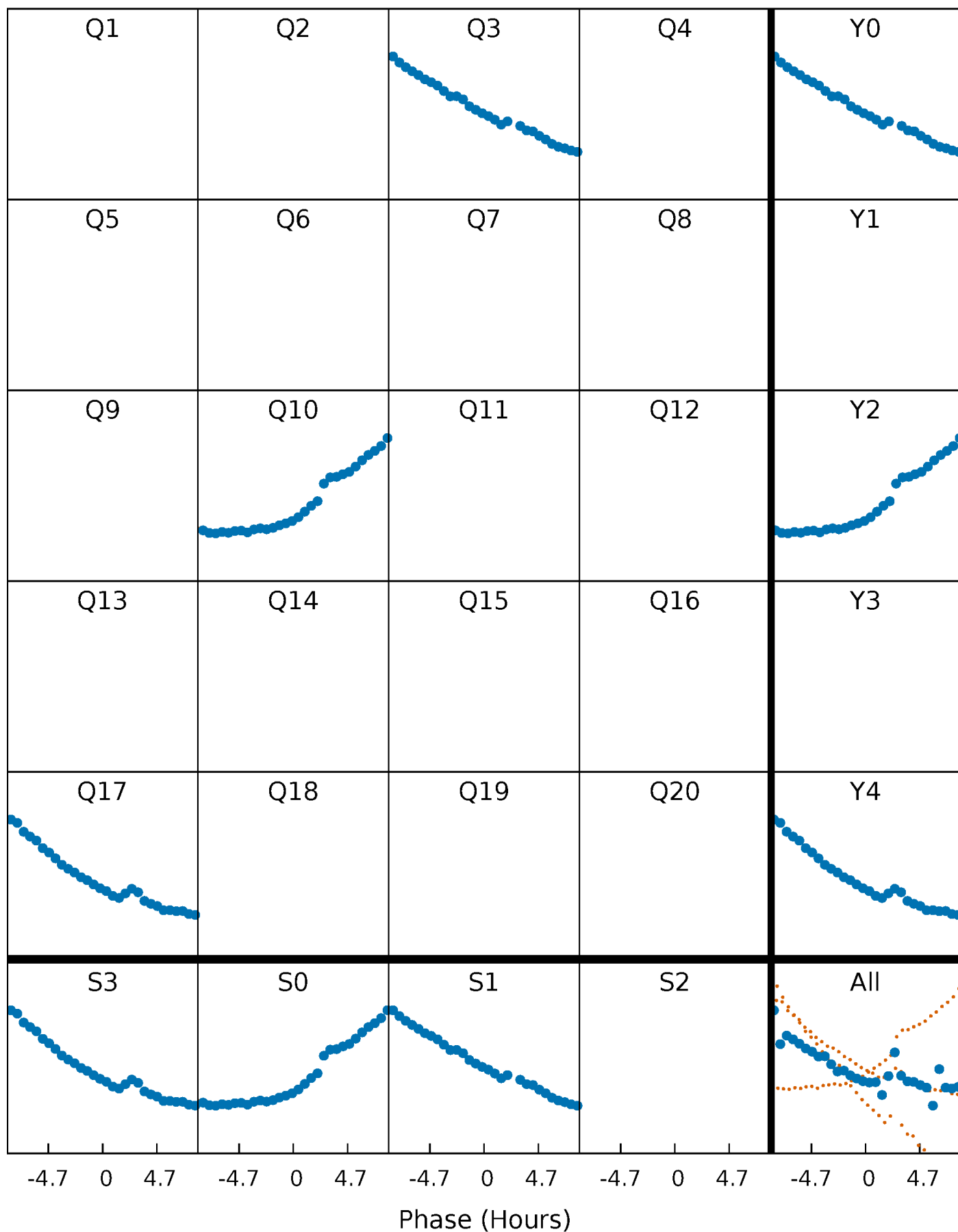


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



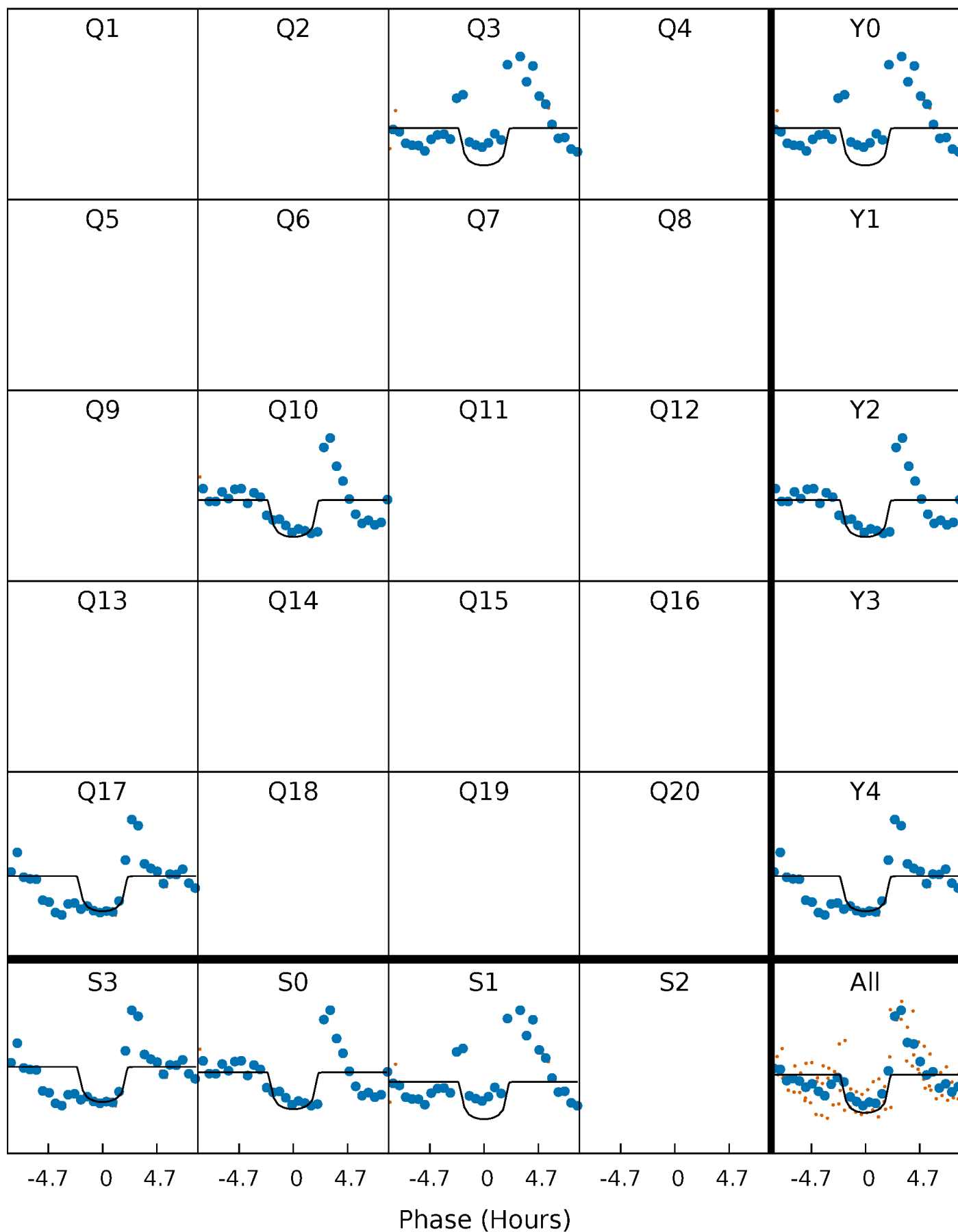
# PDC Quarter-Phased Transit Curves

TCE 006203421-04     $P=624.043177$  Days     $T_0=328.809753$  (BKJD)



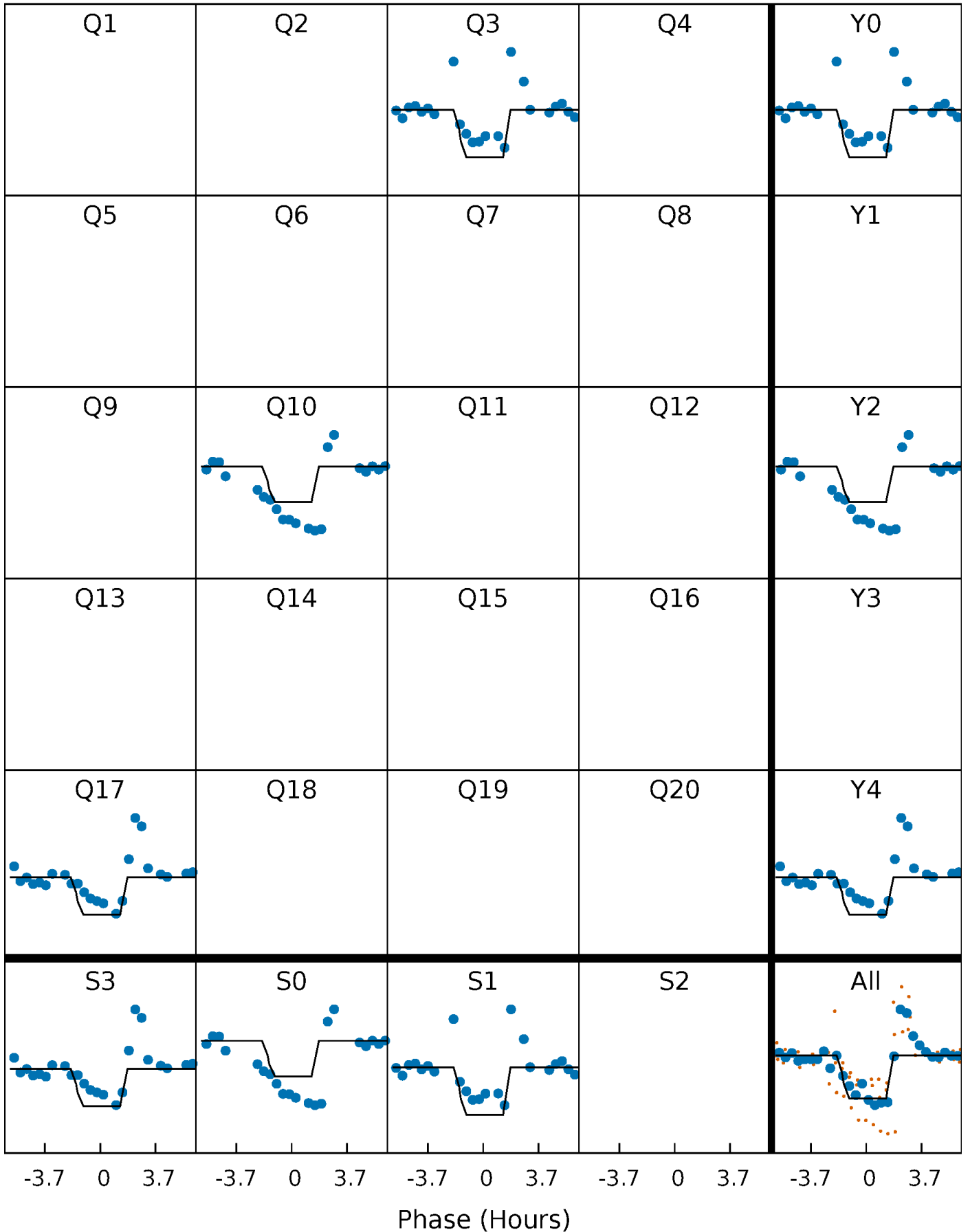
# DV Quarter-Phased Transit Curves

TCE 006203421-04     $P=624.043177$  Days     $T_0=328.809753$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

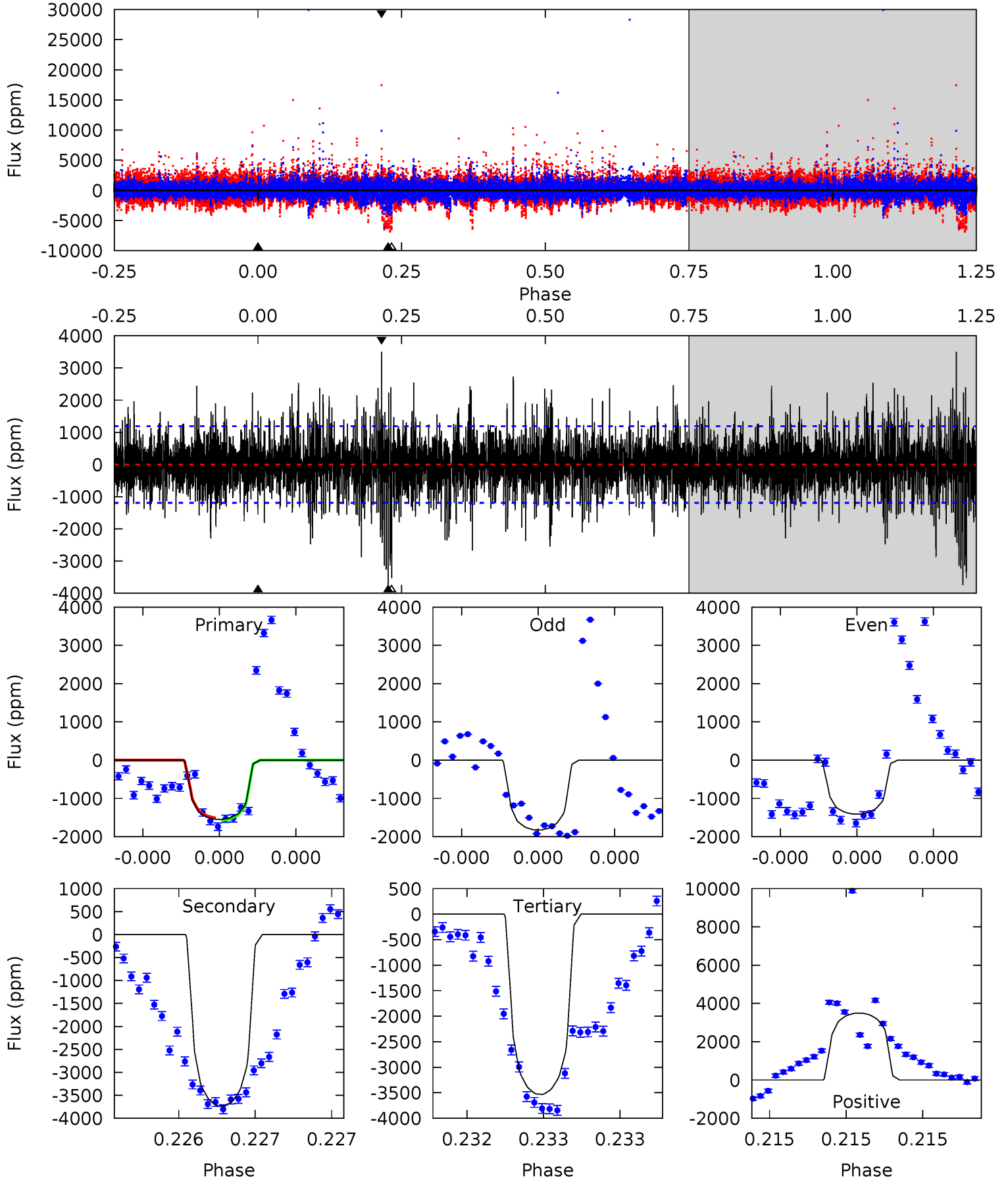
TCE 006203421-04 P=624.040922 Days  $T_0=328.823280$  (BKJD)



# DV Model-Shift Uniqueness Test

006203421-04, P = 624.043177 Days, E = 328.809753 Days

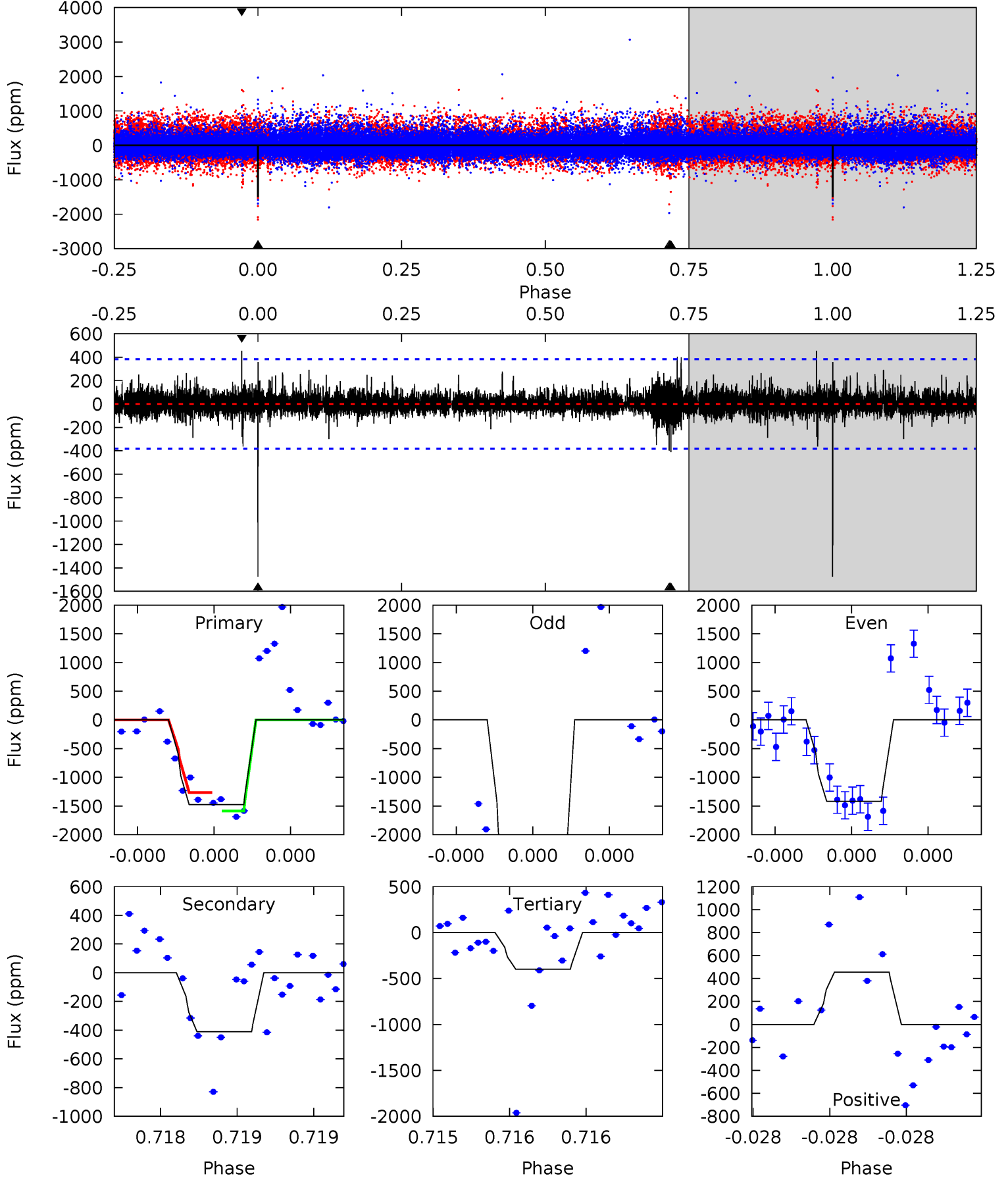
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.36 | 17.8 | 16.8 | 16.6 | 5.65            | 3.60            | 3.05             | -9.42   | -9.26   | 0.98    | 1.14    | 0.72    | 0.85 | 0.48  | 0.17 |



# Alt Model-Shift Uniqueness Test

006203421-04, P = 624.040922 Days, E = 328.823280 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 22.0 | 6.12 | 5.94 | 6.78 | 5.71            | 3.68            | 0.80             | 16.1    | 15.2    | 0.18    | -0.66   | 14.7    | 1.47 | 0.24  | 0   |





### Stellar Parameters For KIC 006203421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M$ ( $M_{\odot}$ )       | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5377^{+160}_{-160}$ | $4.569^{+0.088}_{-0.072}$ | $-0.760^{+0.350}_{-0.300}$ | $0.703^{+0.085}_{-0.077}$ | $0.669^{+0.076}_{-0.033}$ | $2.709^{+0.958}_{-0.648}$                     |
|        | +3%/-3%              | +2%/-2%                   | +46%/-39%                  | +12%/-11%                 | +11%/-5%                  | +35%/-24%                                     |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 006203421-04 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ ) | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)   | $A_{\text{obs}}$             |
|---------|-----------------|------------------------|----------------------|------------------------|------------------------------|
| DV      | $-3738 \pm 211$ | $3.34^{+2.04}_{-1.59}$ | $248^{+11}_{-11}$    | $6332^{+3006}_{-1278}$ | $284511^{+796382}_{-171299}$ |
| Alt.    | $-410 \pm 67$   | $3.70^{+1.90}_{-1.80}$ | $248^{+10}_{-10}$    | $3841^{+1087}_{-483}$  | $25783^{+71455}_{-14598}$    |

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

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

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

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

## DV Centroid Data

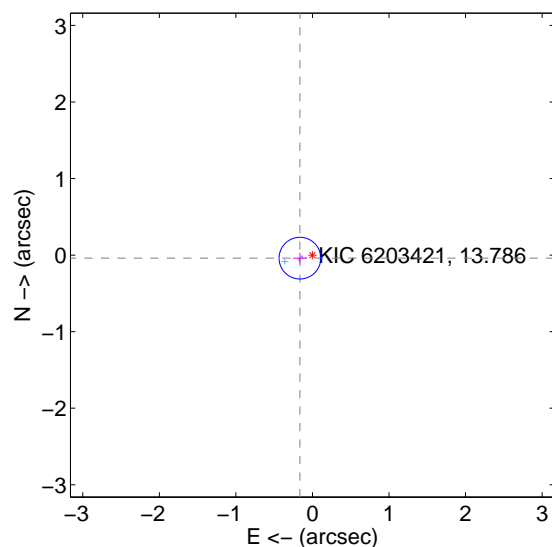
Supplemental centroid analysis for 006203421-04. Kepler magnitude: 13.79. Transit SNR 7.45

There are 3 quarters with good PRF difference image offsets

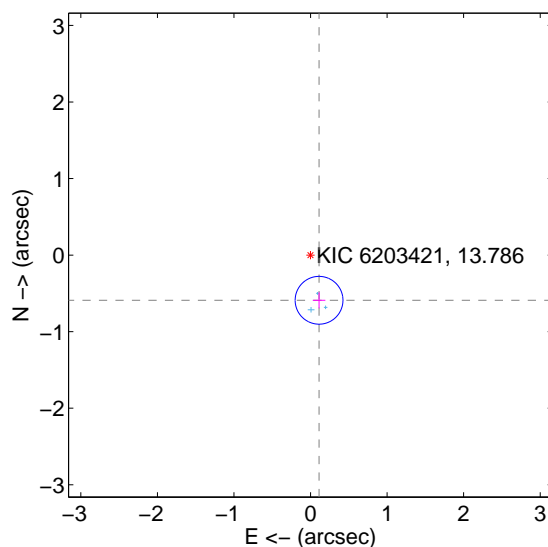
The direct PRF centroid is offset from the target star catalog position by about 0.73 arcsec

|   | Distance in arcsec                  | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|-------------------------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.168 \pm 0.091$                   | 1.86                | $0.164 \pm 0.090$  | $-0.040 \pm 0.068$ |
| PRF-fit source offset from KIC position | <b><math>0.601 \pm 0.104</math></b> | <b>5.77</b>         | $-0.111 \pm 0.083$ | $-0.590 \pm 0.105$ |
| photometric centroid source offset      | $0.32 \pm 0.77$                     | 0.42                | $-0.31 \pm 0.79$   | $-0.10 \pm 0.59$   |

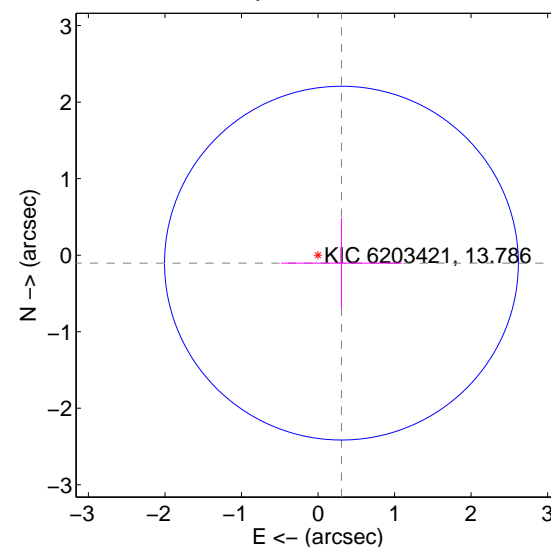
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

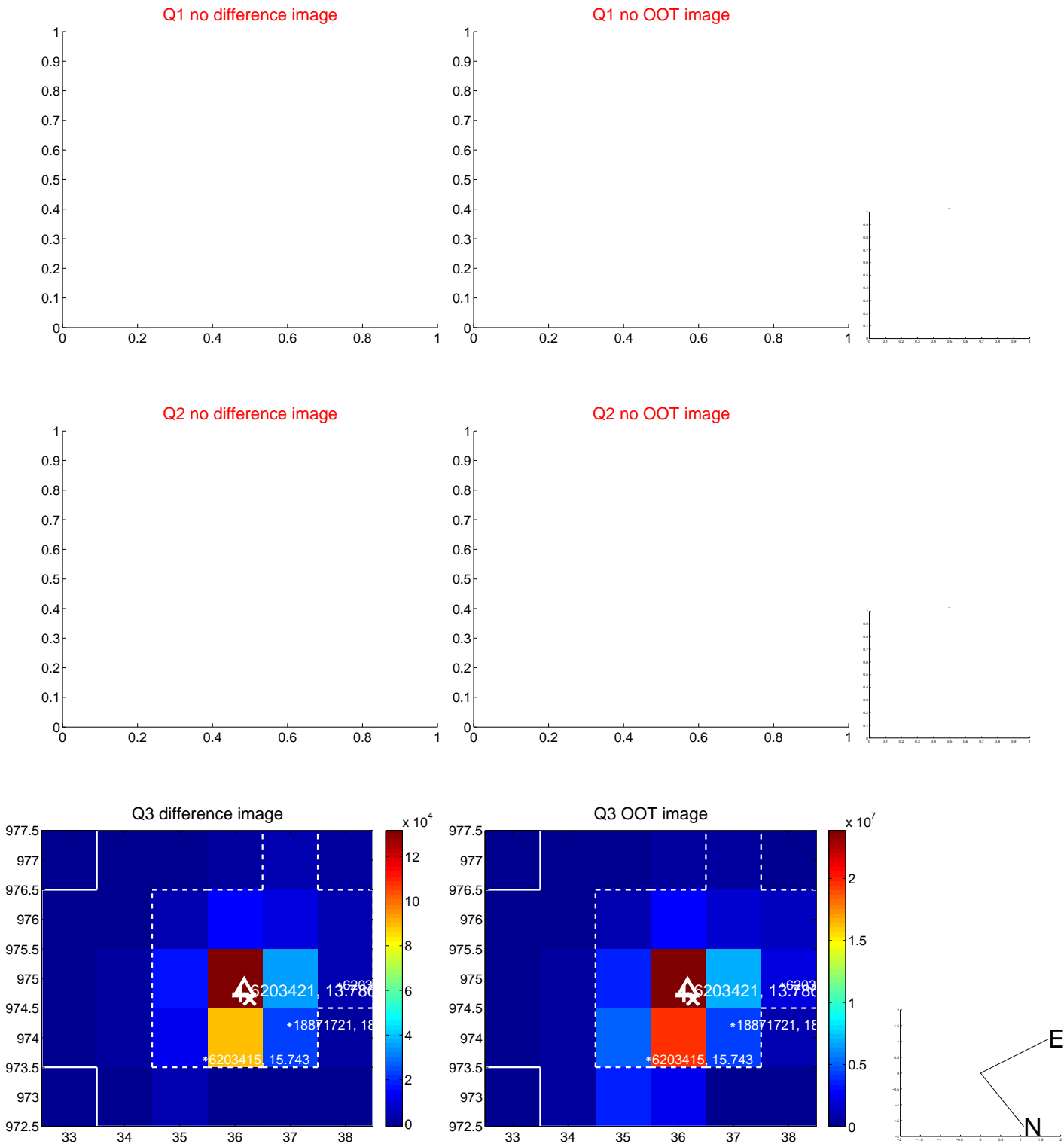


offset from photometric centroids



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

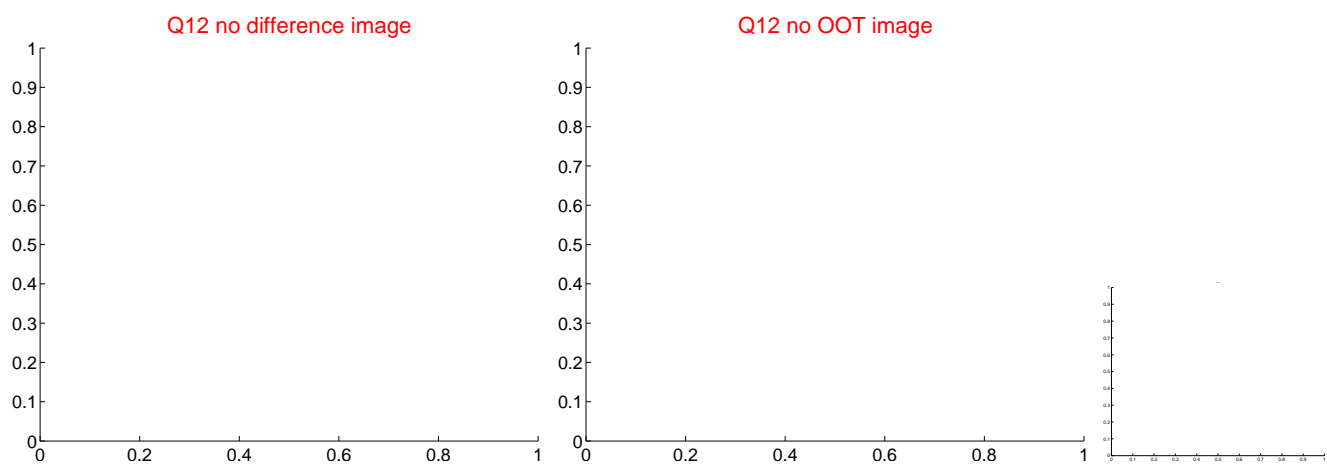
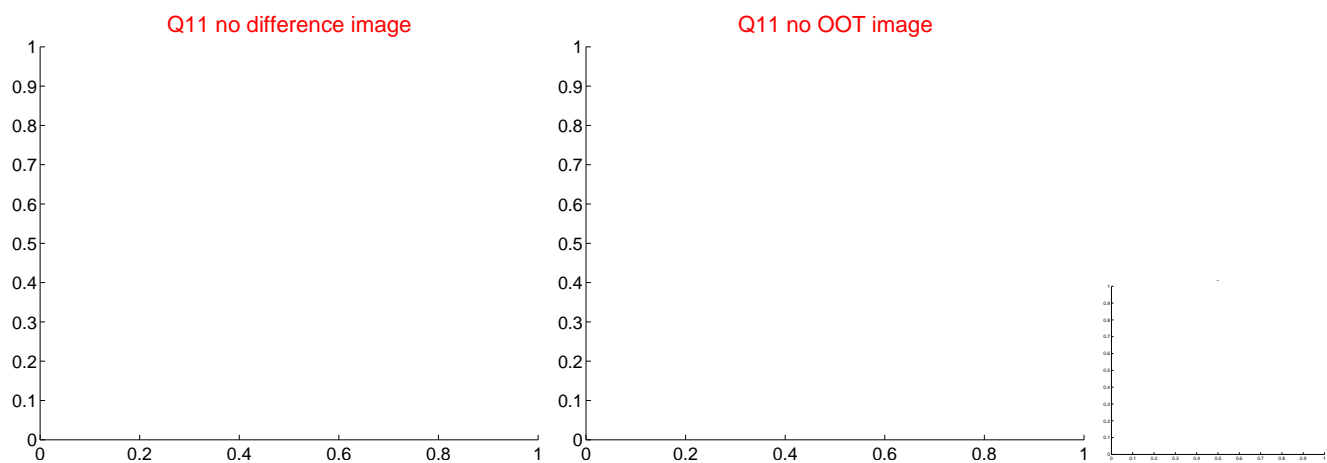
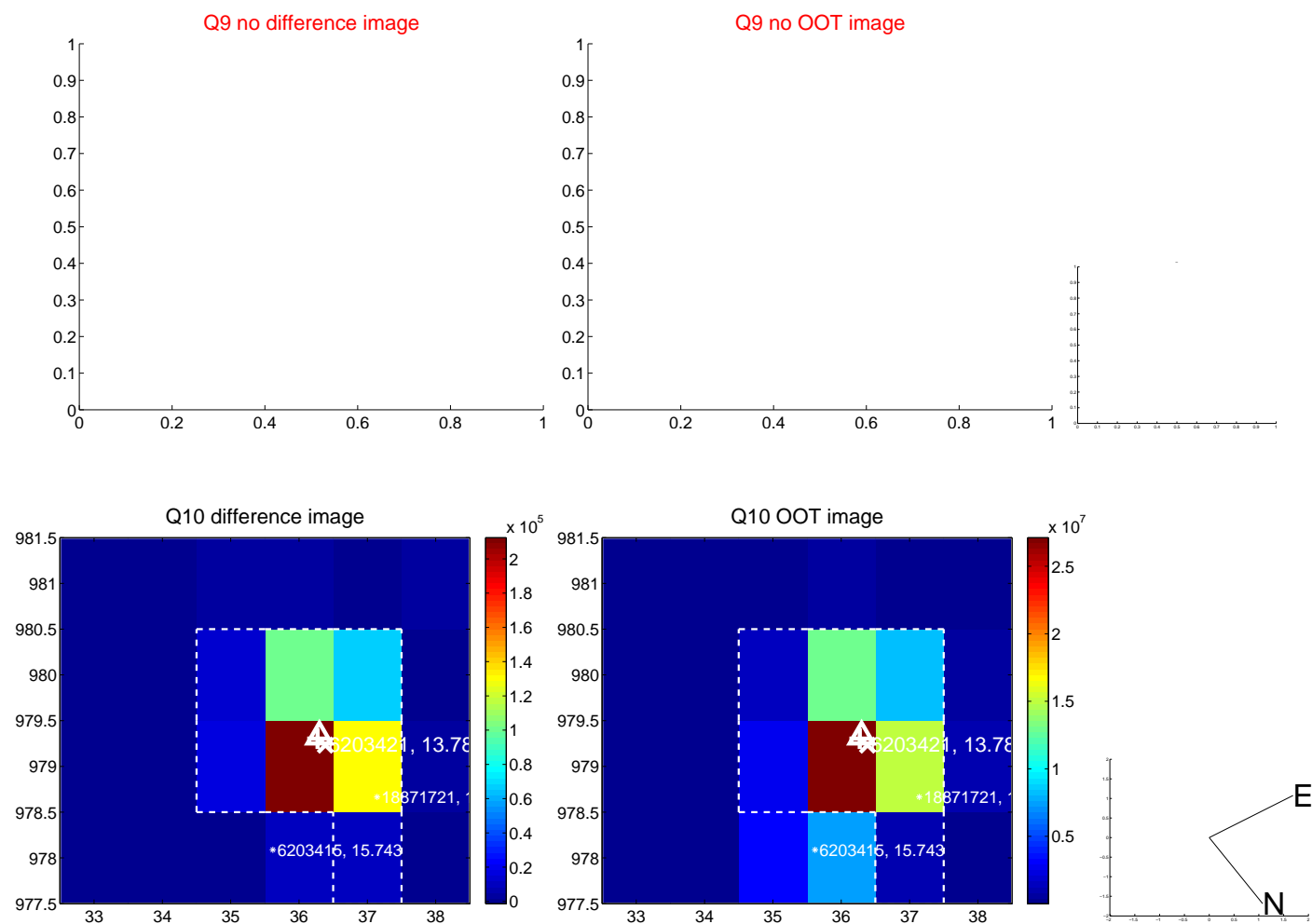
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



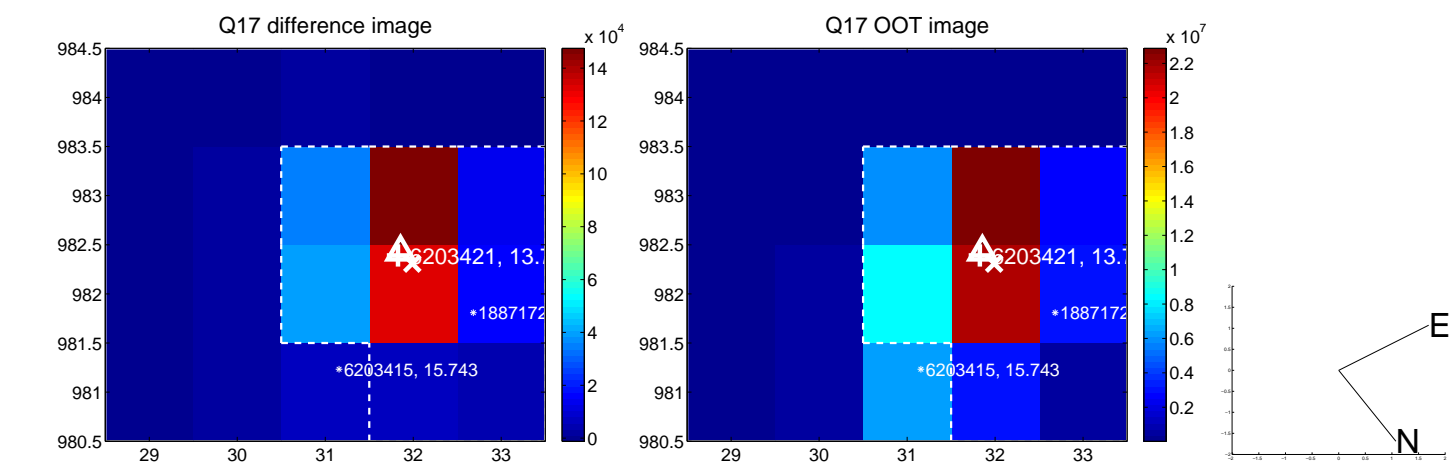
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



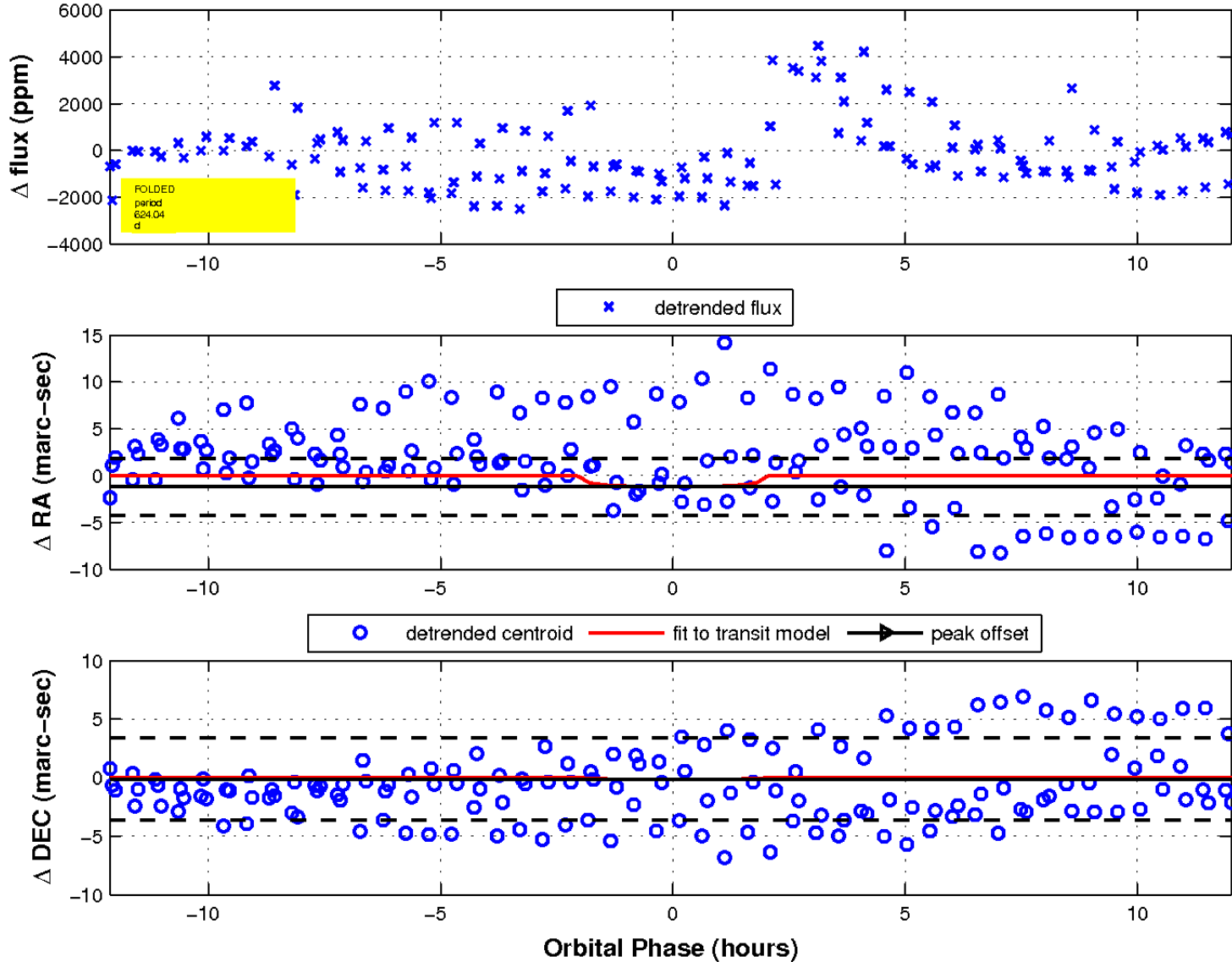
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

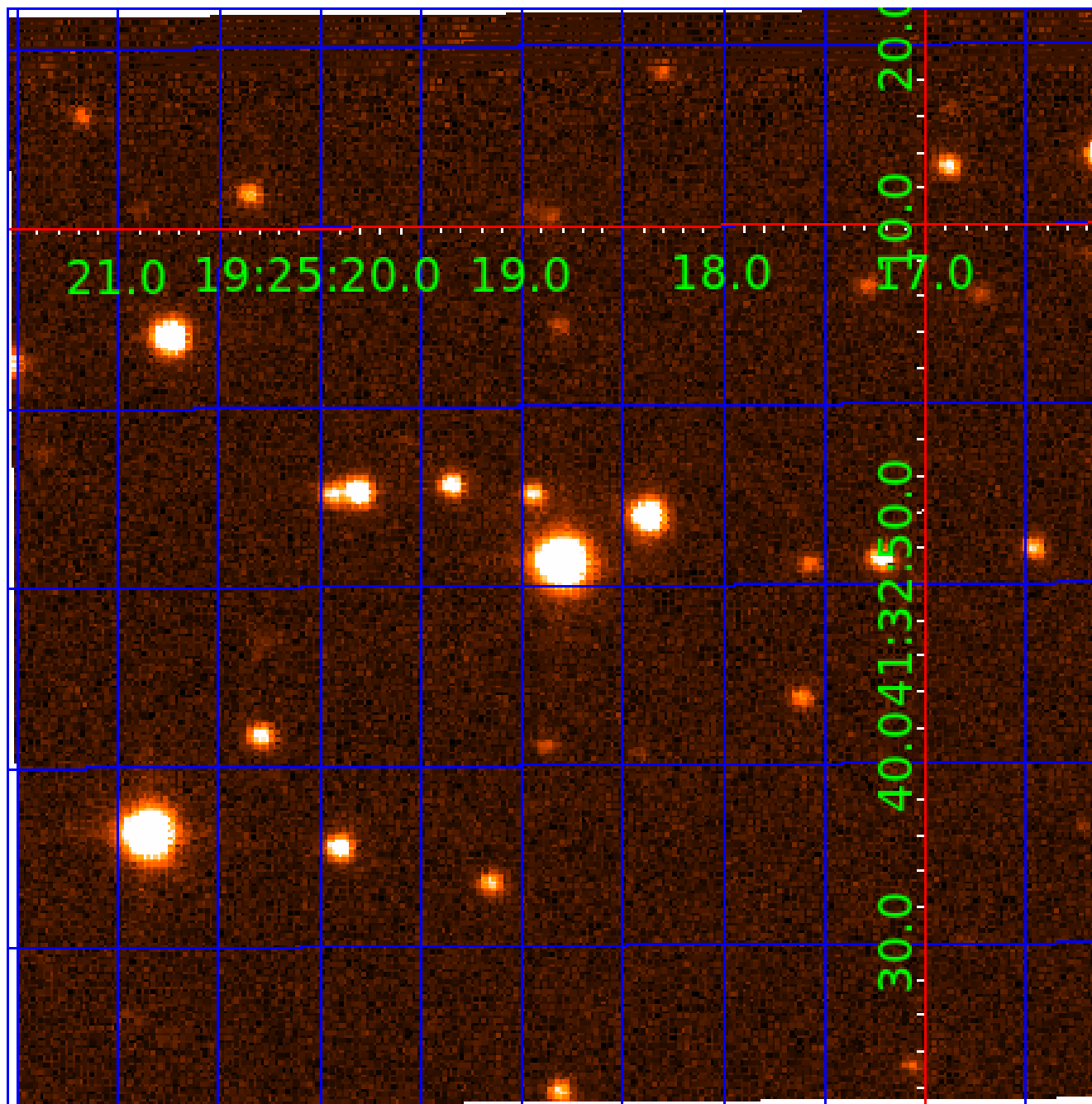


fluxWeightedCentroids, Planet 4 of 5



UKIRT Image

Declination





# KIC 006203421

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 006203421-01 | OBS      | No   | 555.754648    | 238.117755   | 722.0       | 7.685            | 16.8 | 2.3  | 0.70                        | 5377            | 1.99                   | 0.28                   |
| 006203421-02 | OBS      | No   | 575.380113    | 355.145876   | 2632.3      | 4.095            | 18.8 | 8.1  | 0.70                        | 5377            | 3.59                   | 0.26                   |
| 006203421-03 | OBS      | No   | 380.496036    | 150.922745   | 2120.0      | 5.296            | 20.5 | 6.4  | 0.70                        | 5377            | 3.32                   | 0.46                   |
| 006203421-04 | OBS      | No   | 624.043177    | 328.809753   | 2182.8      | 4.127            | 17.6 | 7.5  | 0.70                        | 5377            | 3.35                   | 0.24                   |
| 006203421-05 | OBS      | No   | 356.184196    | 265.970630   | 635.9       | 4.500            | 15.7 | -1.0 | 0.70                        | 5377            | 1.76                   | 0.50                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 006203421-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS     |
| 006203421-02 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 0 | INDIV_TRANS_CHASES_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS—CENT_UNCERTAIN—HALO_GHOST |
| 006203421-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 006203421-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_KIC_POS                       |
| 006203421-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—CENT_NOFITS  |

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

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

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

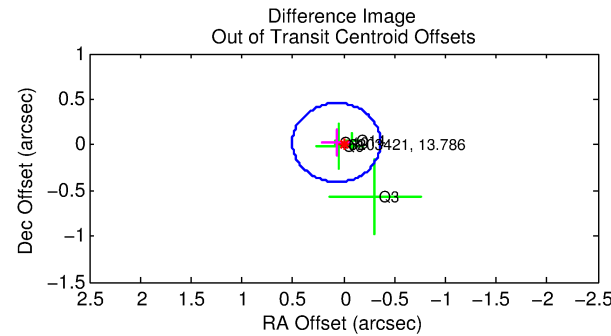
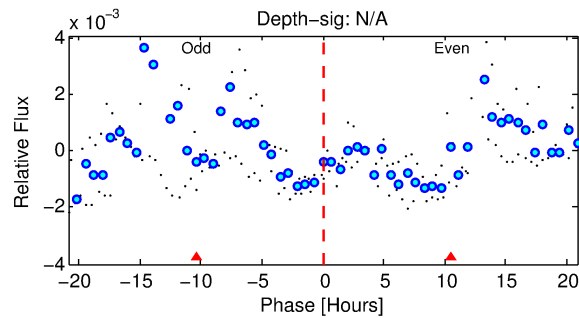
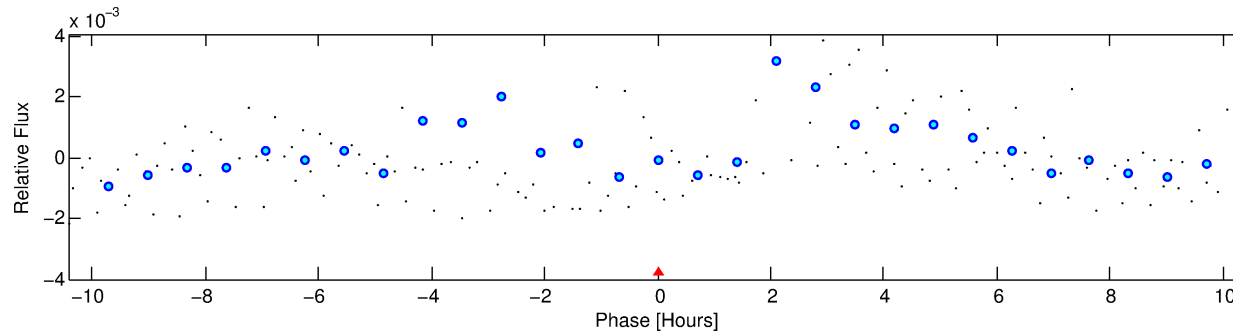
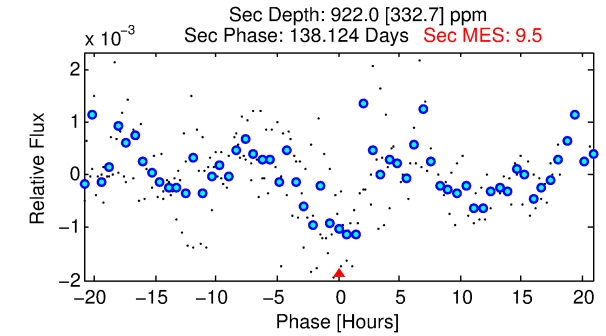
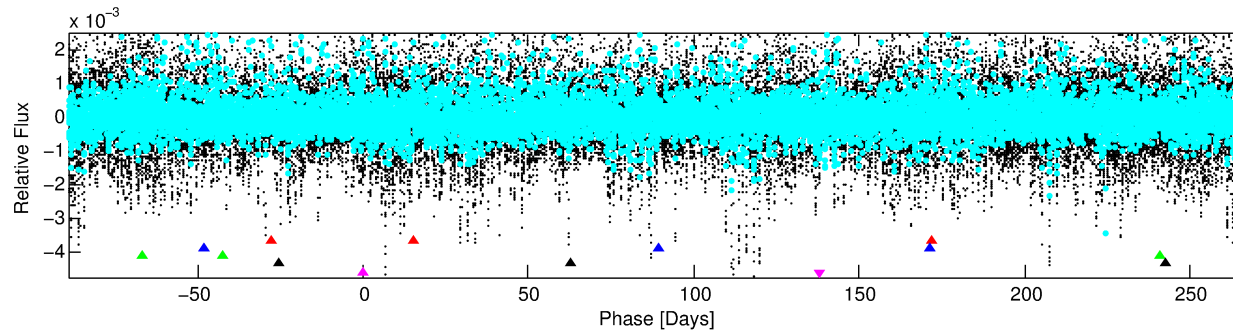
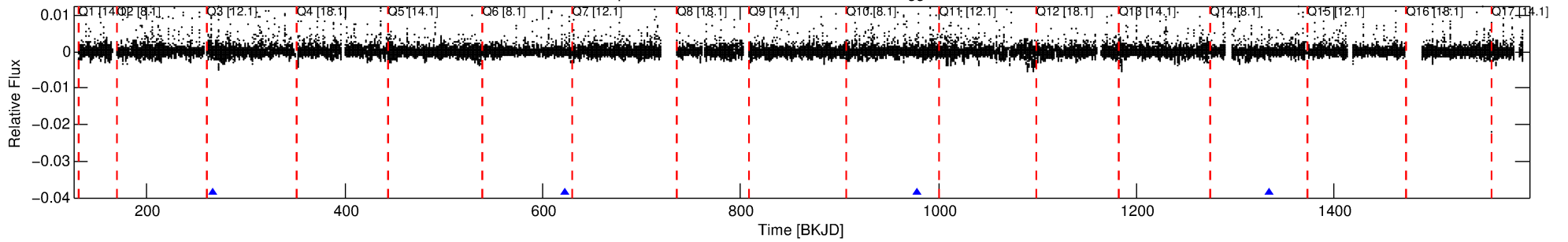
## Ephemeris Match Information For 006203421-05

No Significant Match Found

# DV One-Page Summary

KIC: 6203421 Candidate: 5 of 5 Period: 356.184 d

Kp: 13.79 R\*: 0.70 Rs Teff: 5377.0 K Logg: 4.57 Fe/H: -0.760



## TPS TCE Results:

Period = 356.18420 d  
Epoch = 265.9706 BKJD

DV fit results are unavailable

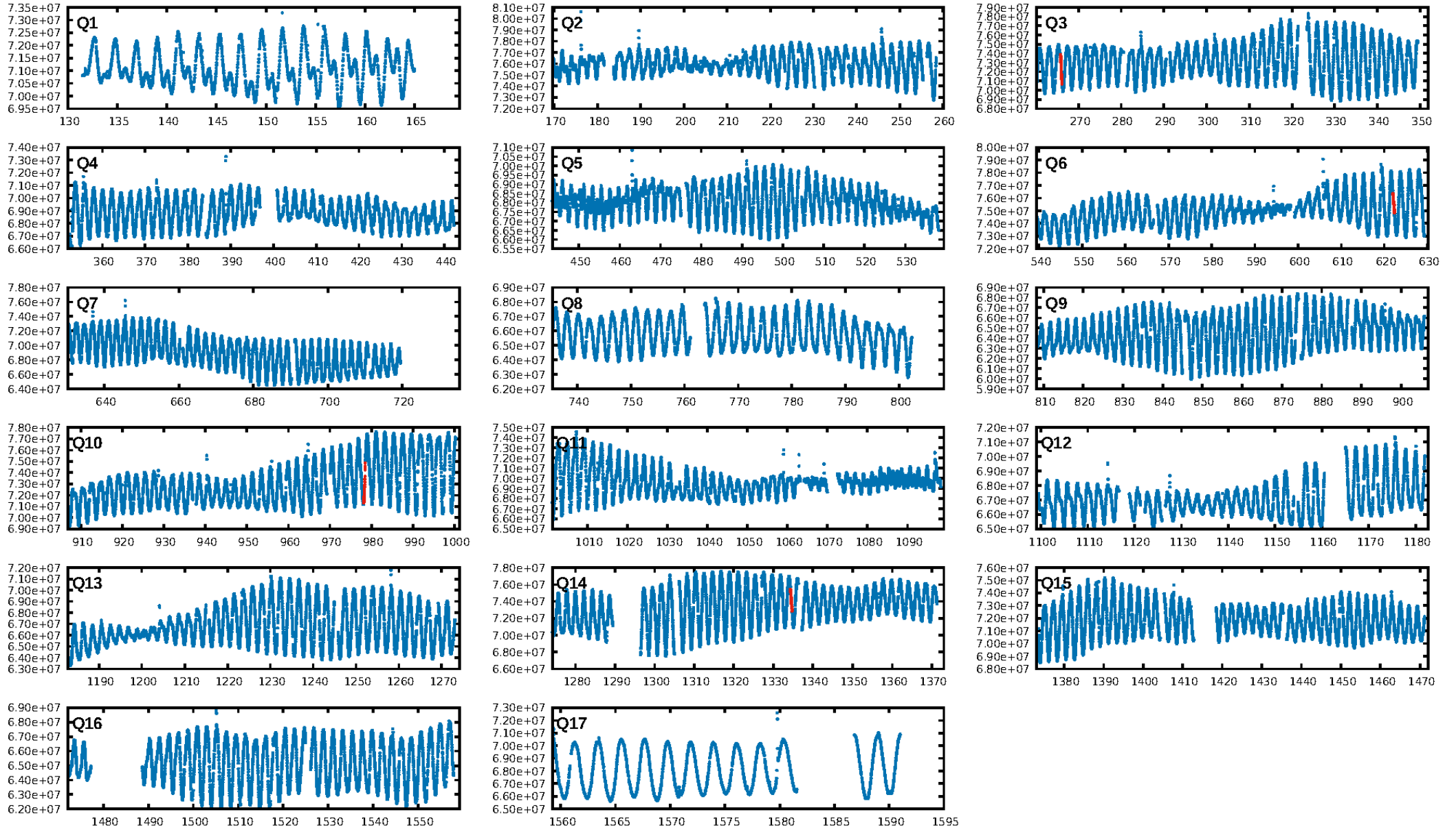
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [83.96σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -38.7  
Centroid-sig: 71.0%  
Centroid-so: 1.373 arcsec [1.62σ]  
OotOffset-rm: 0.076 arcsec [0.53σ]  
KicOffset-rm: 0.487 arcsec [3.50σ]  
OotOffset-st: 3/1/0/0 [4]  
KicOffset-st: 3/1/0/0 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 1.00 [4/4]

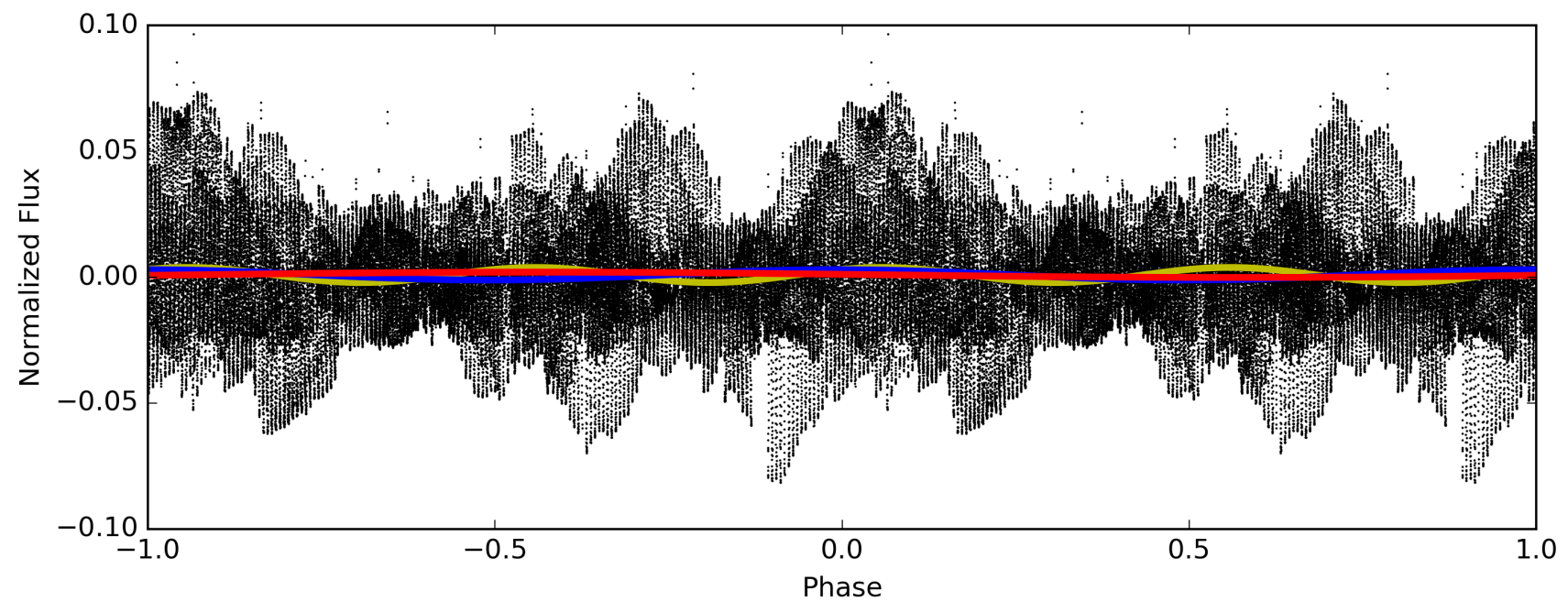
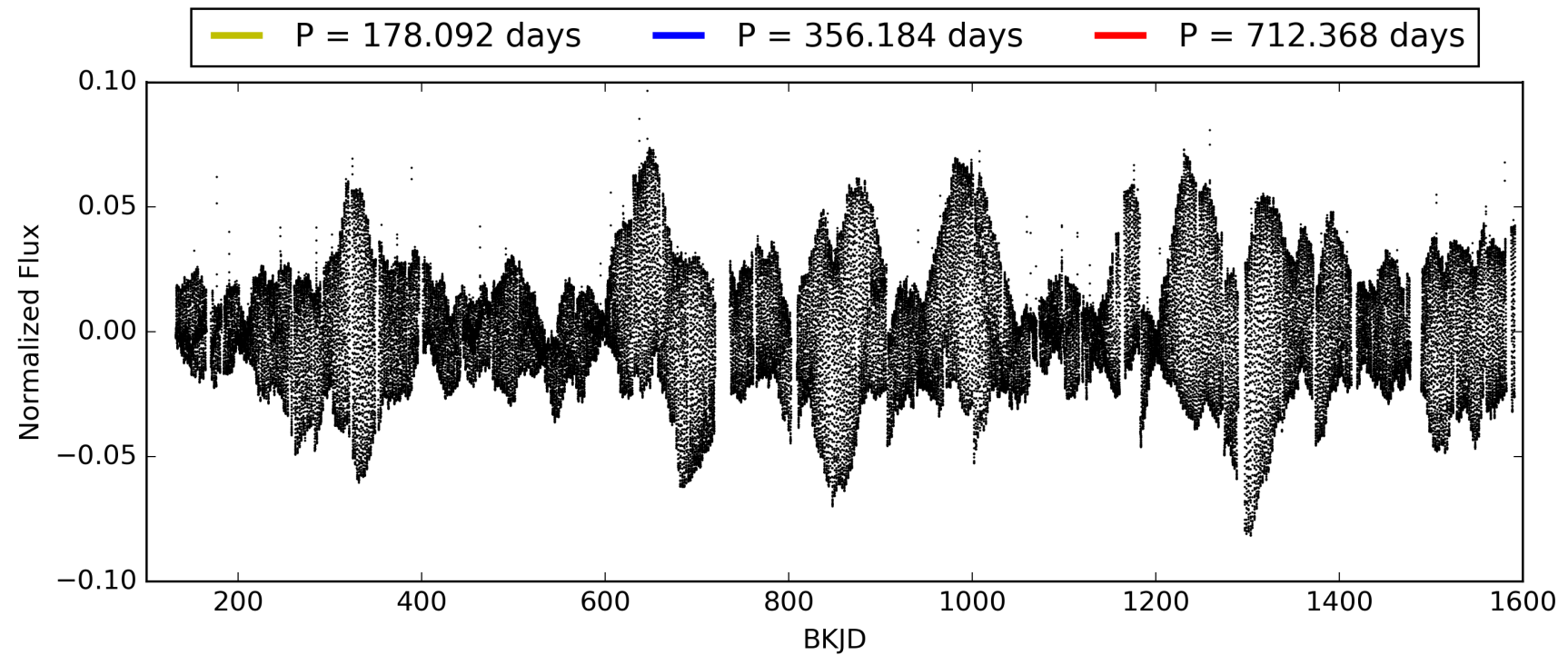
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 14:06:02 Z

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

# TCE 006203421-05, PDC Light Curves

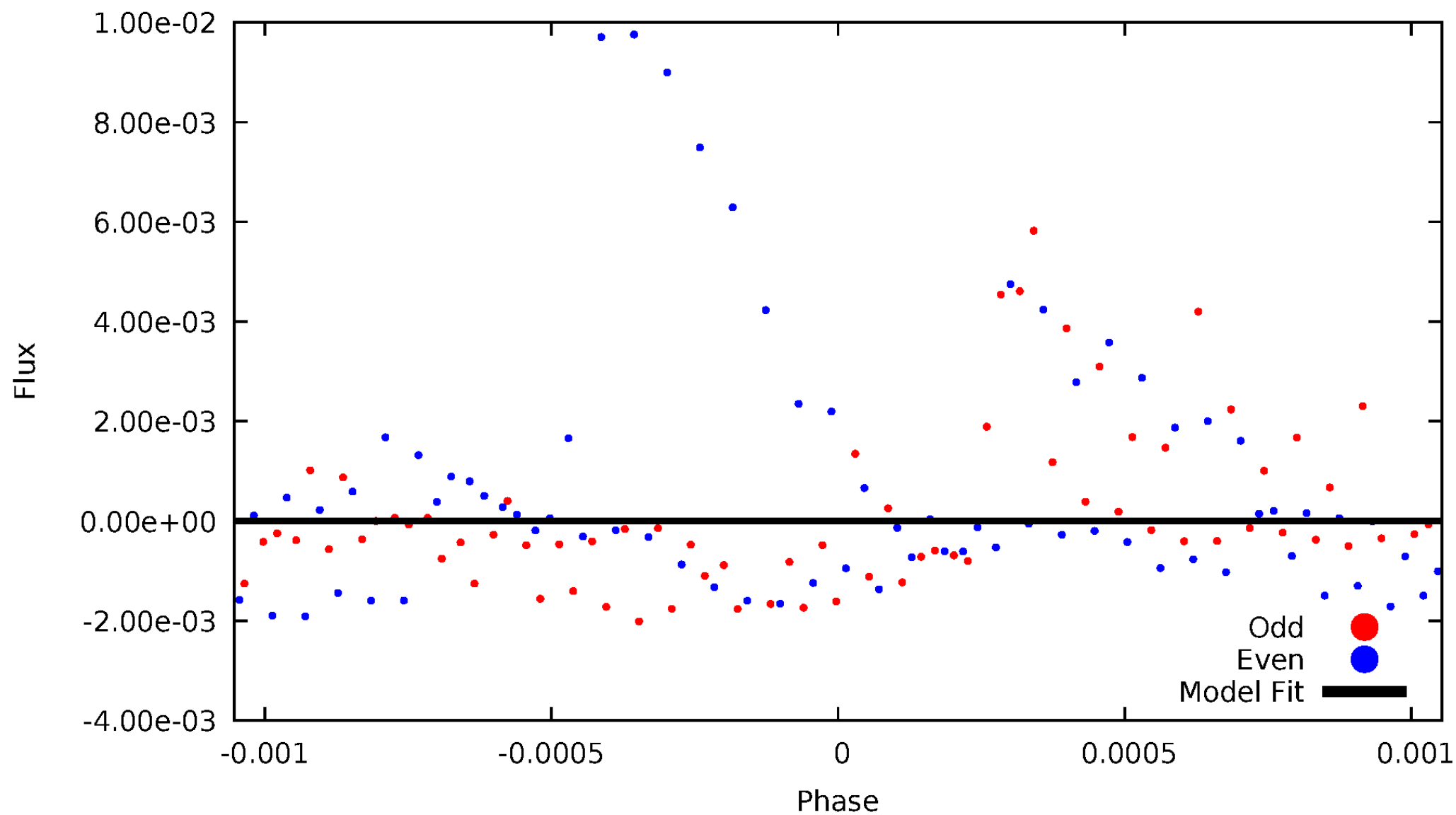


TCE 006203421-05



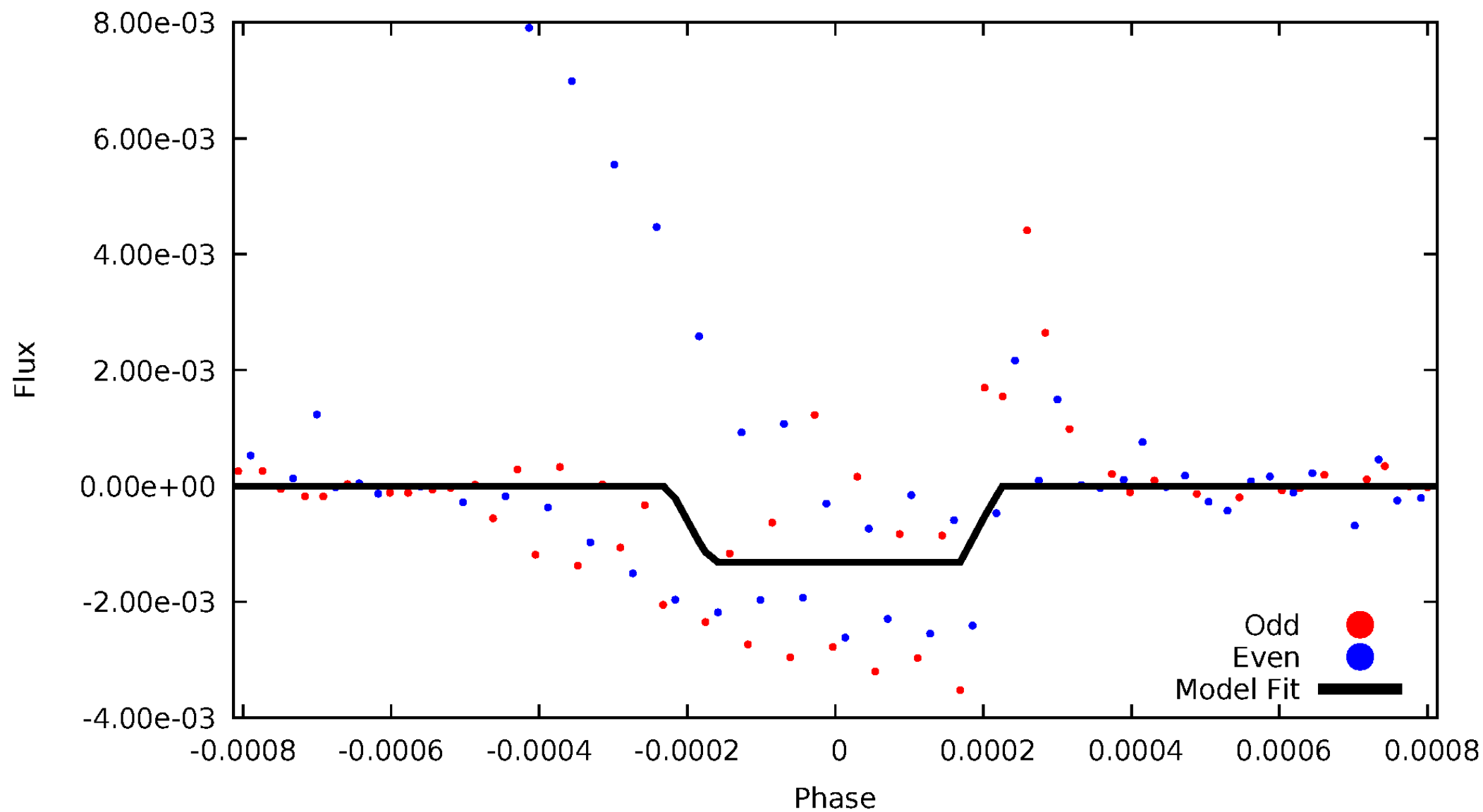
# DV Odd/Even

TCE 006203421-05

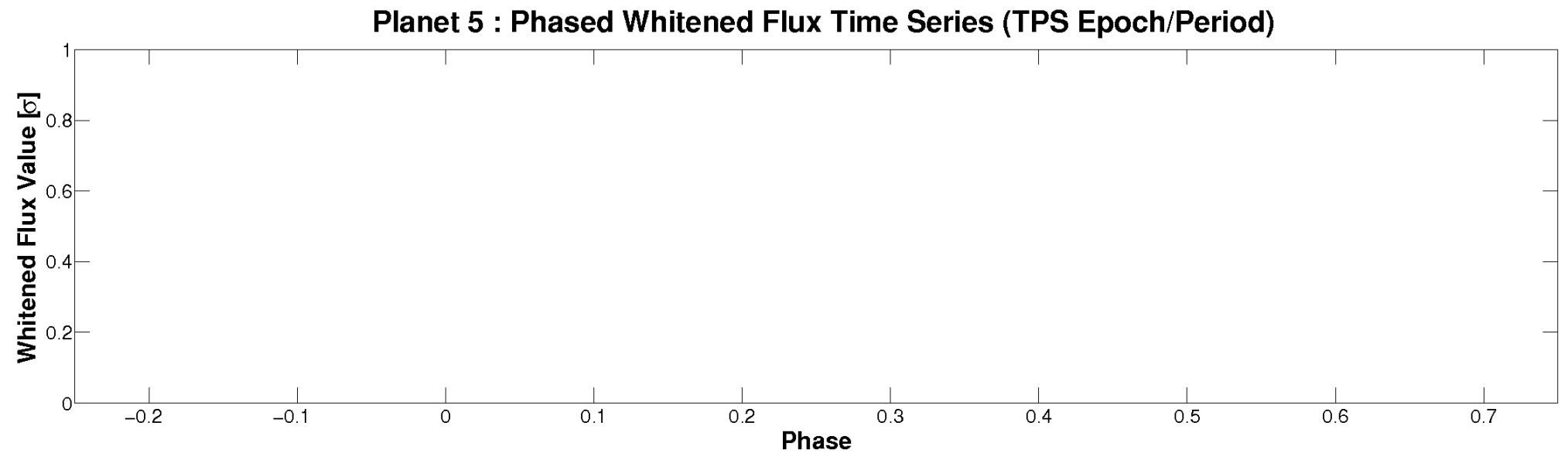
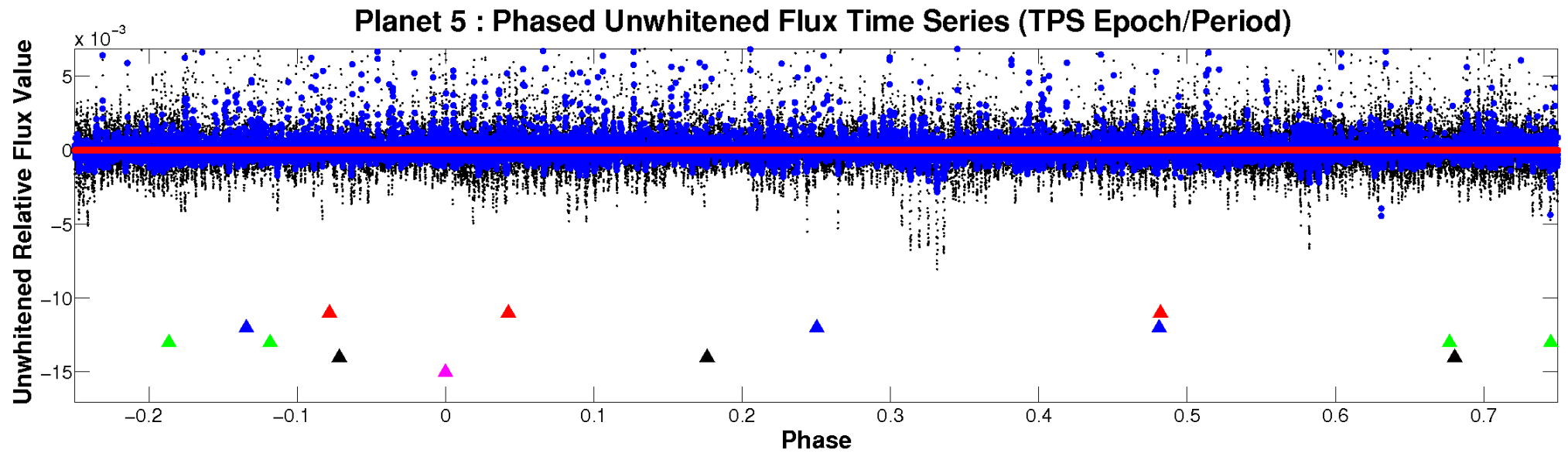


# ALT Odd/Even

TCE 006203421-05

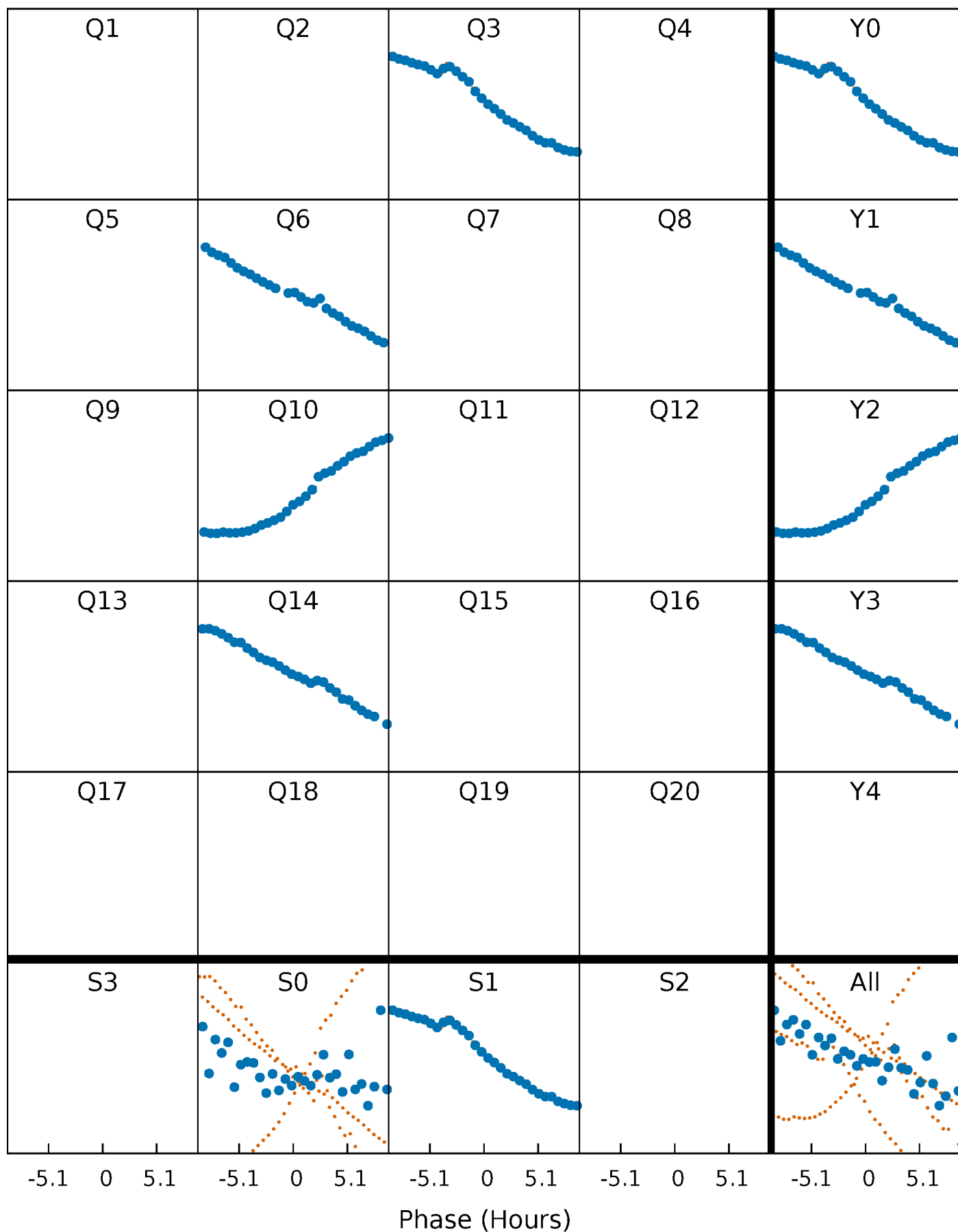


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

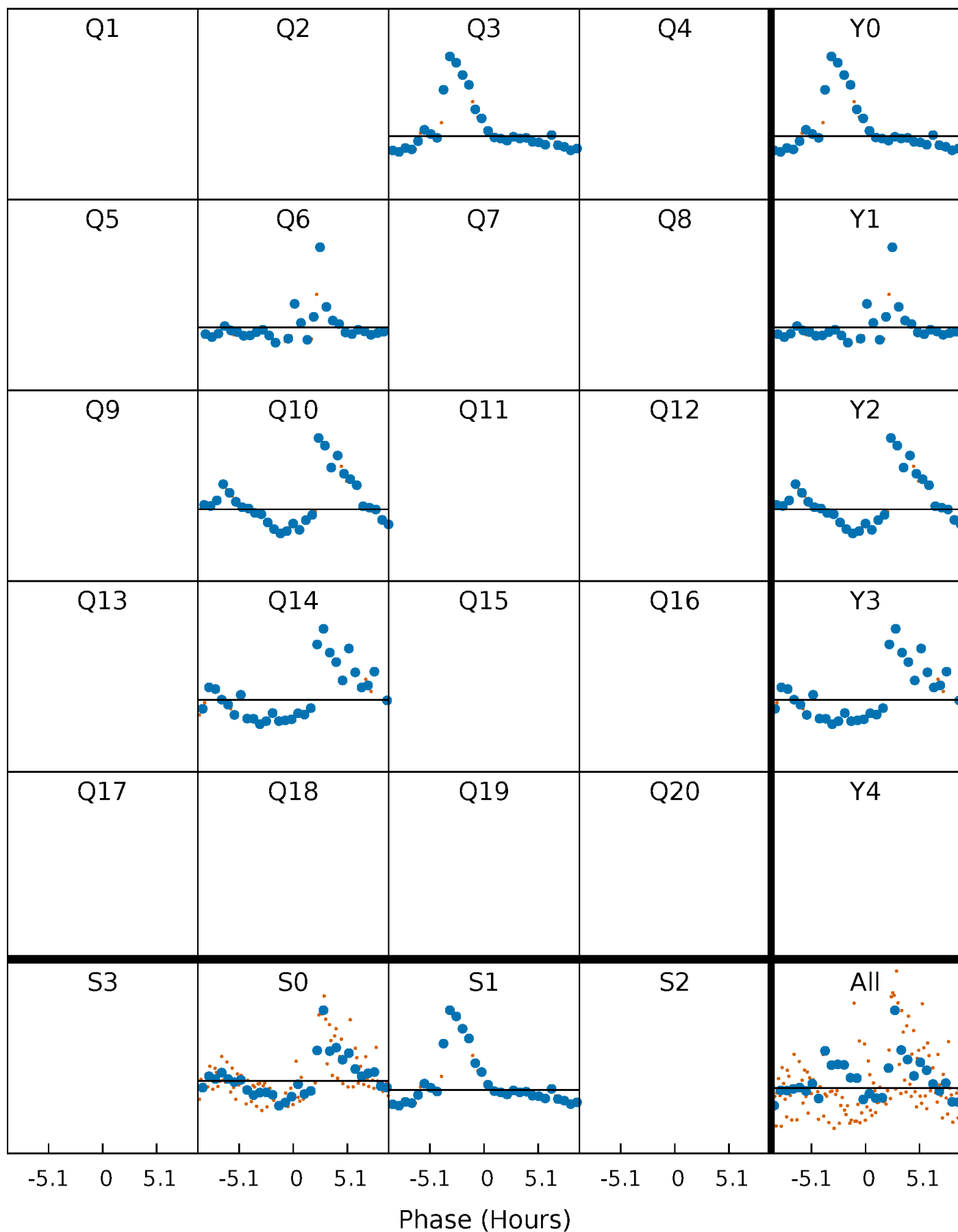
TCE 006203421-05     $P=356.184195$  Days     $T_0=265.970630$  (BKJD)





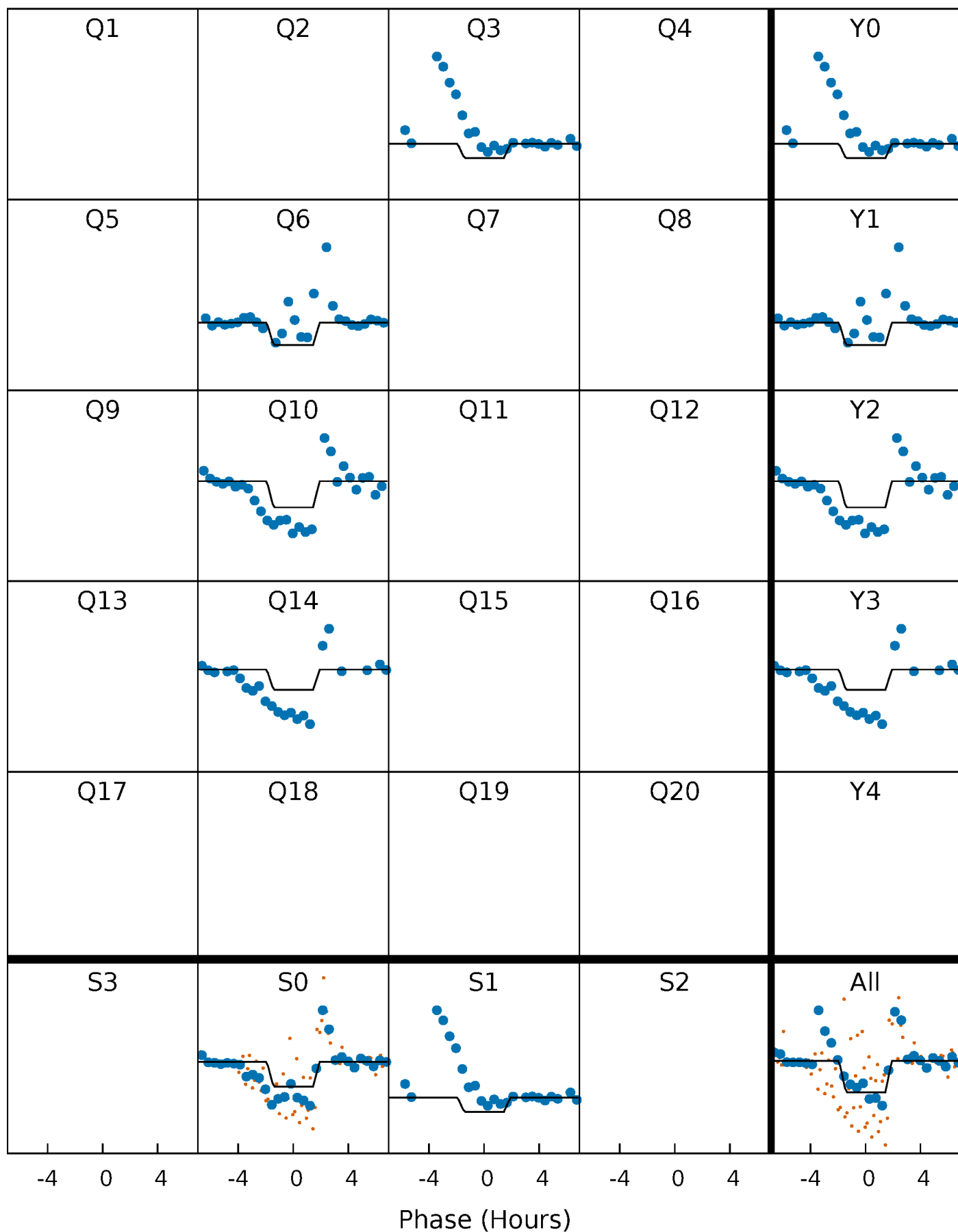
# DV Quarter-Phased Transit Curves

TCE 006203421-05     $P=356.184195$  Days     $T_0=265.970630$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

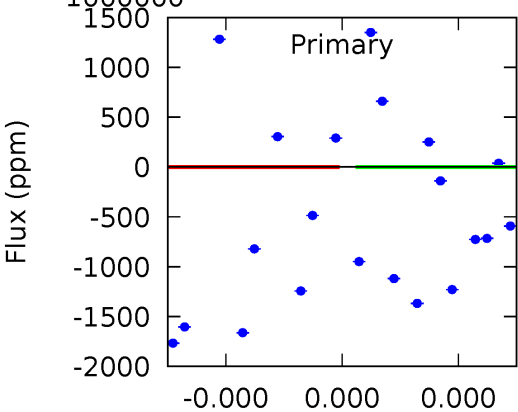
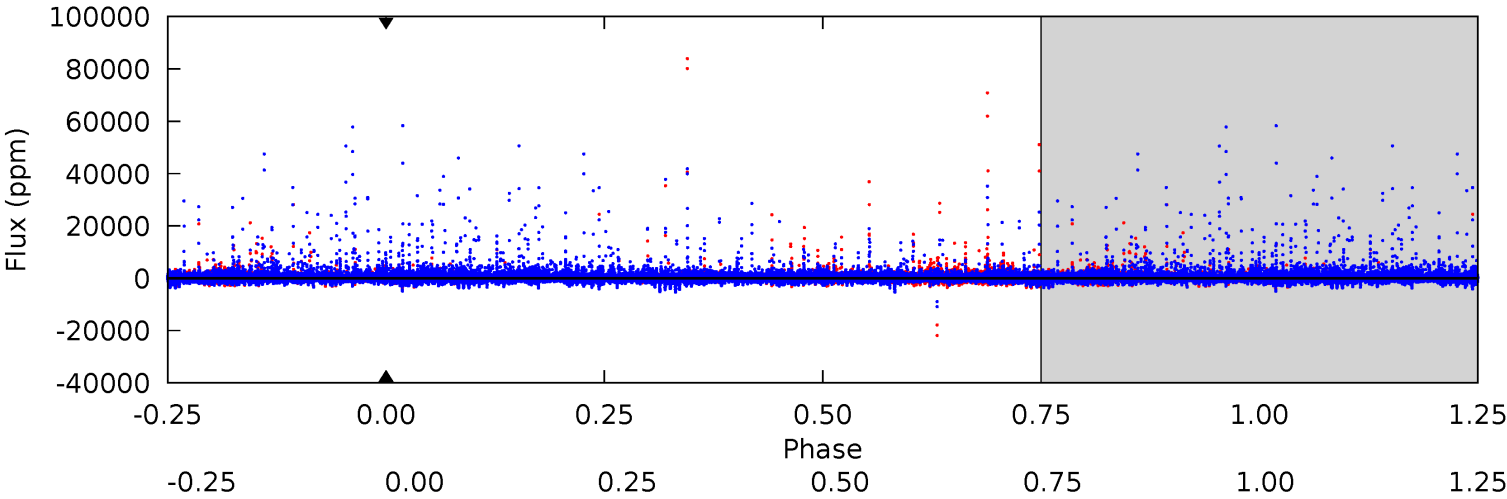
TCE 006203421-05 P=356.184195 Days  $T_0=265.991238$  (BKJD)



# DV Model-Shift Uniqueness Test

006203421-05, P = 356.184195 Days, E = 265.970630 Days

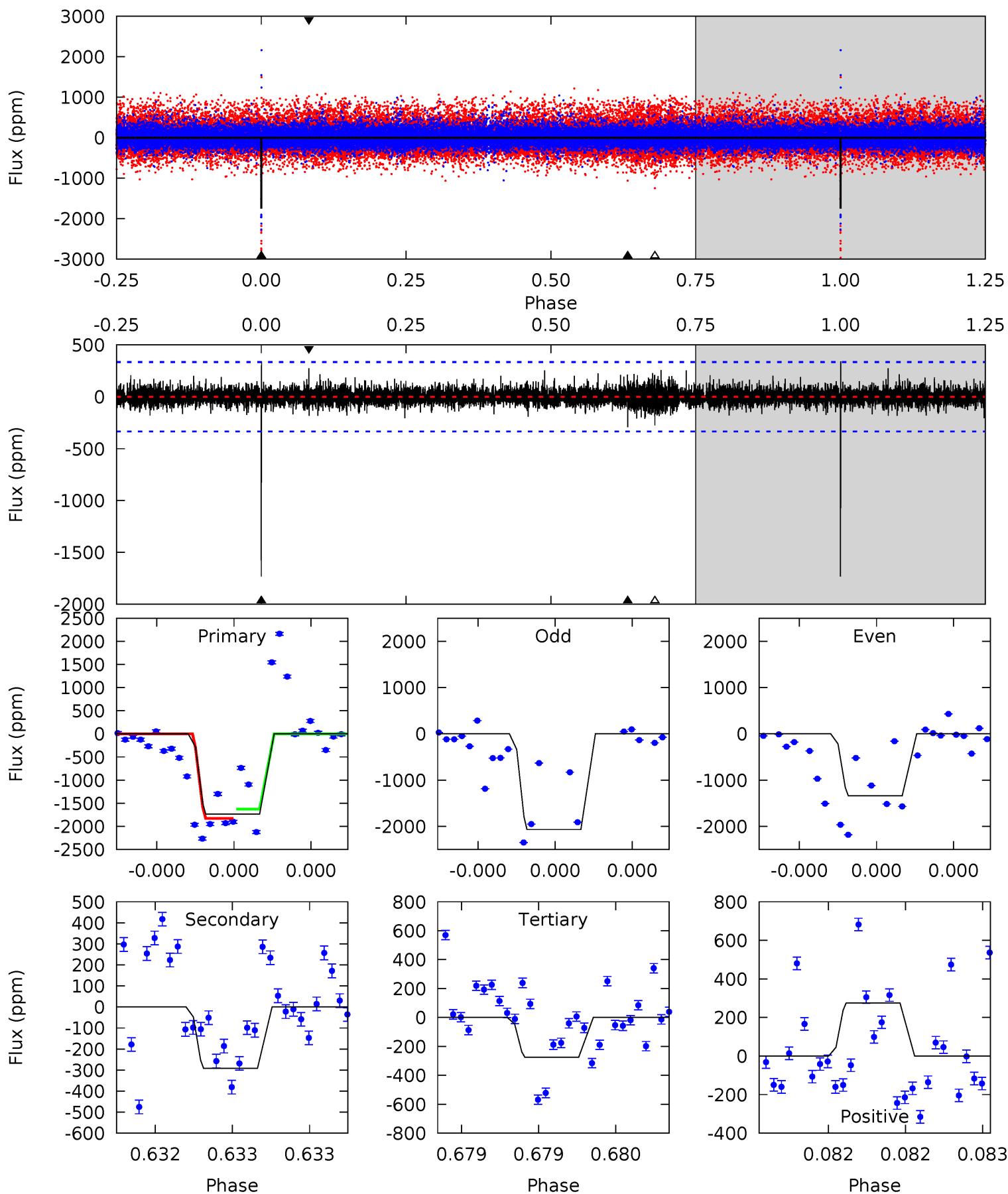
| Pri | Sec | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-----|-----|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|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



# Alt Model-Shift Uniqueness Test

006203421-05, P = 356.184195 Days, E = 265.991238 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 29.0 | 4.88 | 4.60 | 4.60 | 5.60            | 3.52            | 0.83             | 24.4    | 24.4    | 0.28    | 0.28    | 6.78    | 1.01 | 0.16  | 1.71 |



### Stellar Parameters For KIC 006203421

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5377^{+160}_{-160}$ | $4.569^{+0.088}_{-0.072}$ | $-0.760^{+0.350}_{-0.300}$ | $0.703^{+0.085}_{-0.077}$ | $0.669^{+0.076}_{-0.033}$ | $2.709^{+0.958}_{-0.648}$                 |
|        | +3%/-3%              | +2%/-2%                   | +46%/-39%                  | +12%/-11%                 | +11%/-5%                  | +35%/-24%                                 |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 006203421-05 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$     | $T_{max} (K)$     | $T_{obs} (K)$             | $A_{obs}$                                  |
|---------|-----------------|------------------------|-------------------|---------------------------|--|
| DV      | $0 \pm 1000000$ | $5.87^{+5.54}_{-4.27}$ | $299^{+12}_{-12}$ | $-3744^{+23877}_{-13401}$ | $-11589.255^{+2876197.722}_{-2019726.348}$ |
| Alt.    | $-291 \pm 60$   | $6.29^{+6.31}_{-4.29}$ | $299^{+12}_{-12}$ | $3066^{+1459}_{-506}$     | $2906^{+26220}_{-2180}$                    |

$T_{max}$  = 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

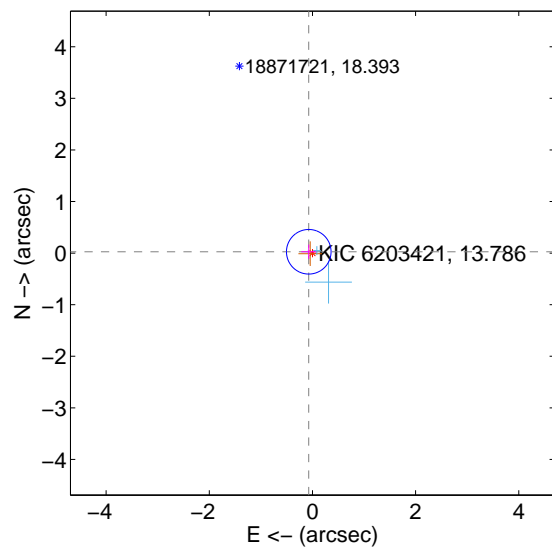
Supplemental centroid analysis for 006203421-05. Kepler magnitude: 13.79. Transit SNR -1.00

There are 3 quarters with good PRF difference image offsets

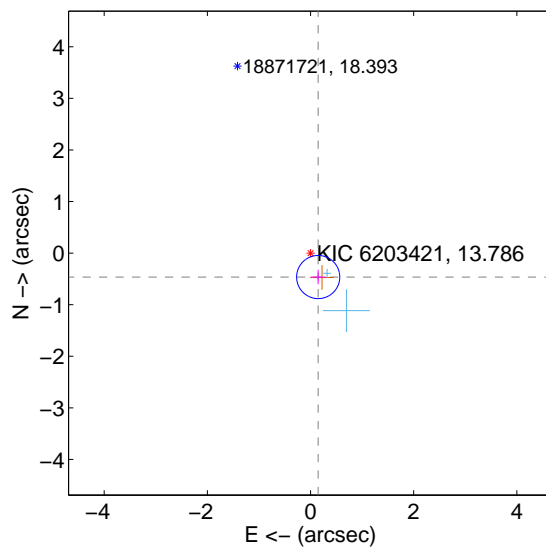
The direct PRF centroid is offset from the target star catalog position by about 0.50 arcsec

|   | Distance in arcsec                  | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|-------------------------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.076 \pm 0.144$                   | 0.53                | $0.071 \pm 0.145$  | $0.026 \pm 0.139$  |
| PRF-fit source offset from KIC position | <b><math>0.487 \pm 0.139</math></b> | <b>3.50</b>         | $-0.149 \pm 0.145$ | $-0.464 \pm 0.139$ |
| photometric centroid source offset      | $1.37 \pm 0.85$                     | 1.62                | $-1.32 \pm 0.86$   | $-0.38 \pm 0.63$   |

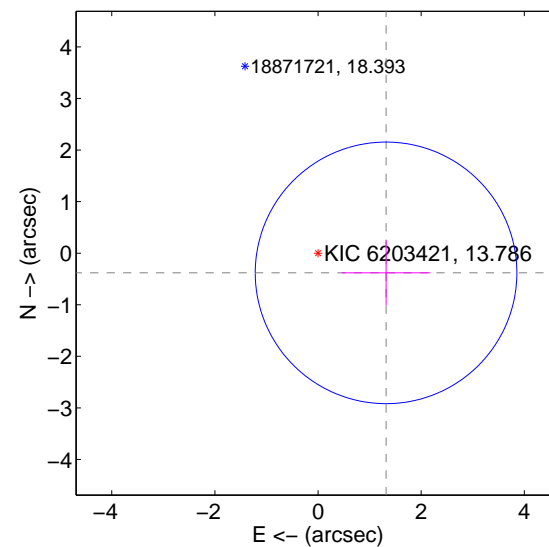
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

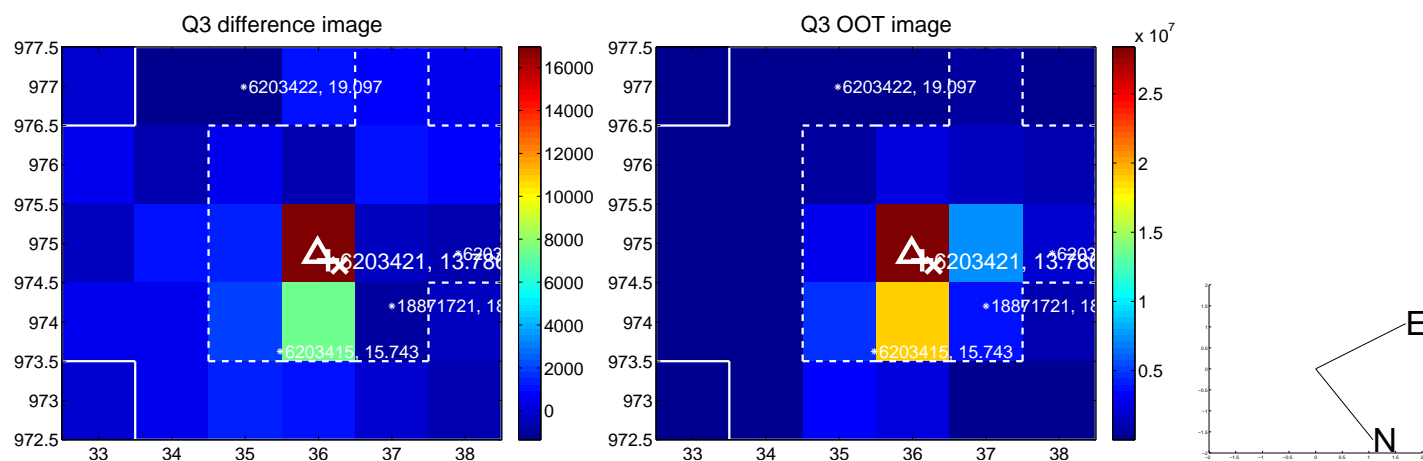


offset from photometric centroids



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.

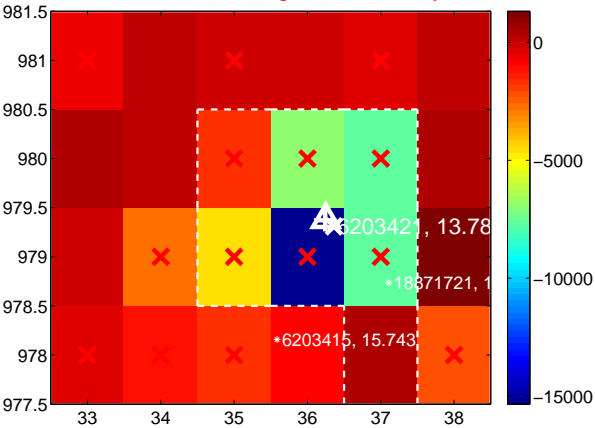
Q5 no difference image



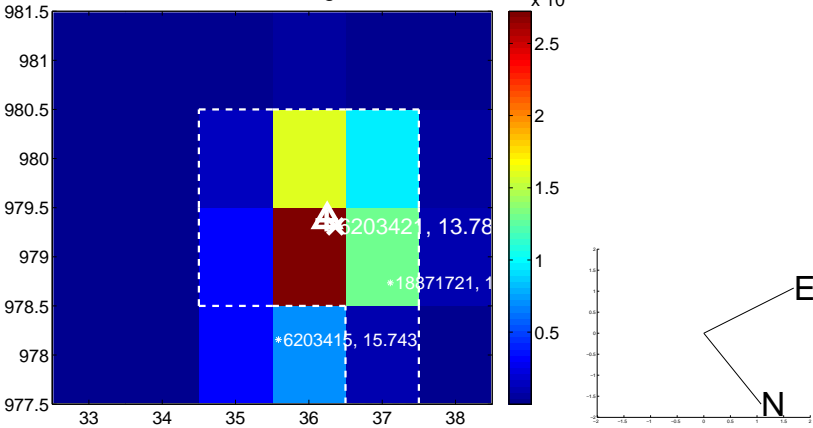
Q5 no OOT image



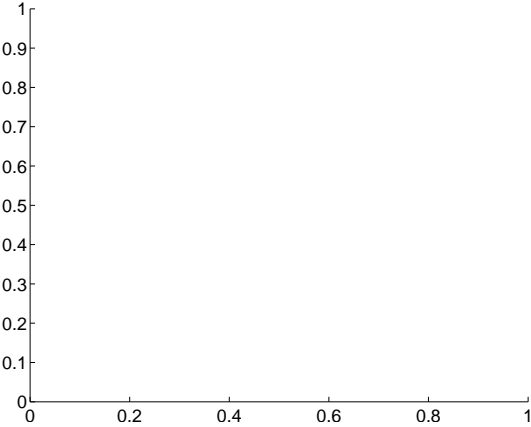
Q6 difference image. Poor Quality



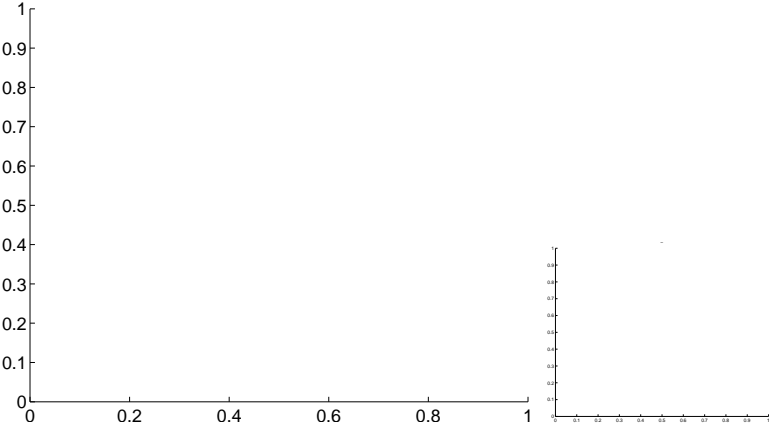
Q6 OOT image



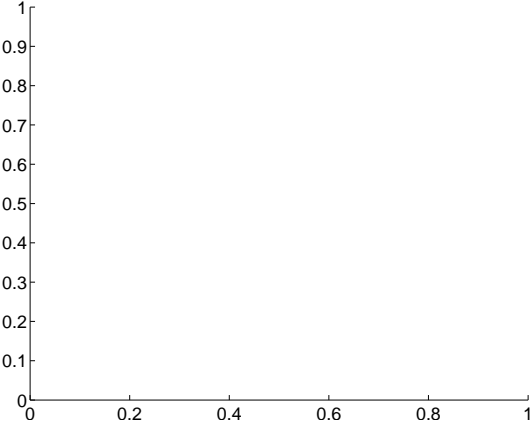
Q7 no difference image



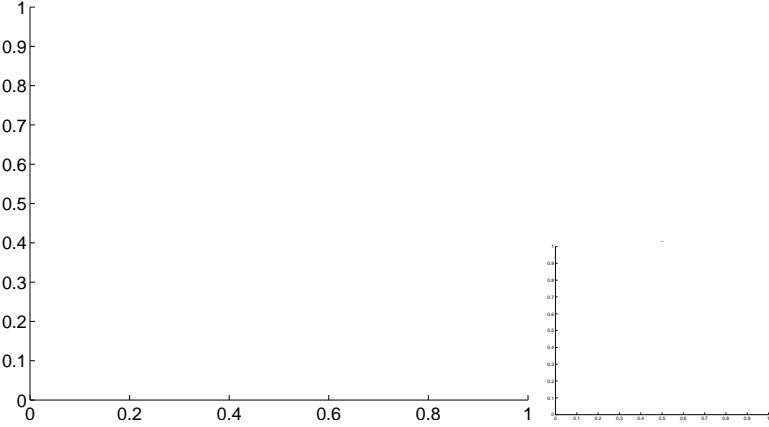
Q7 no OOT image



Q8 no difference image

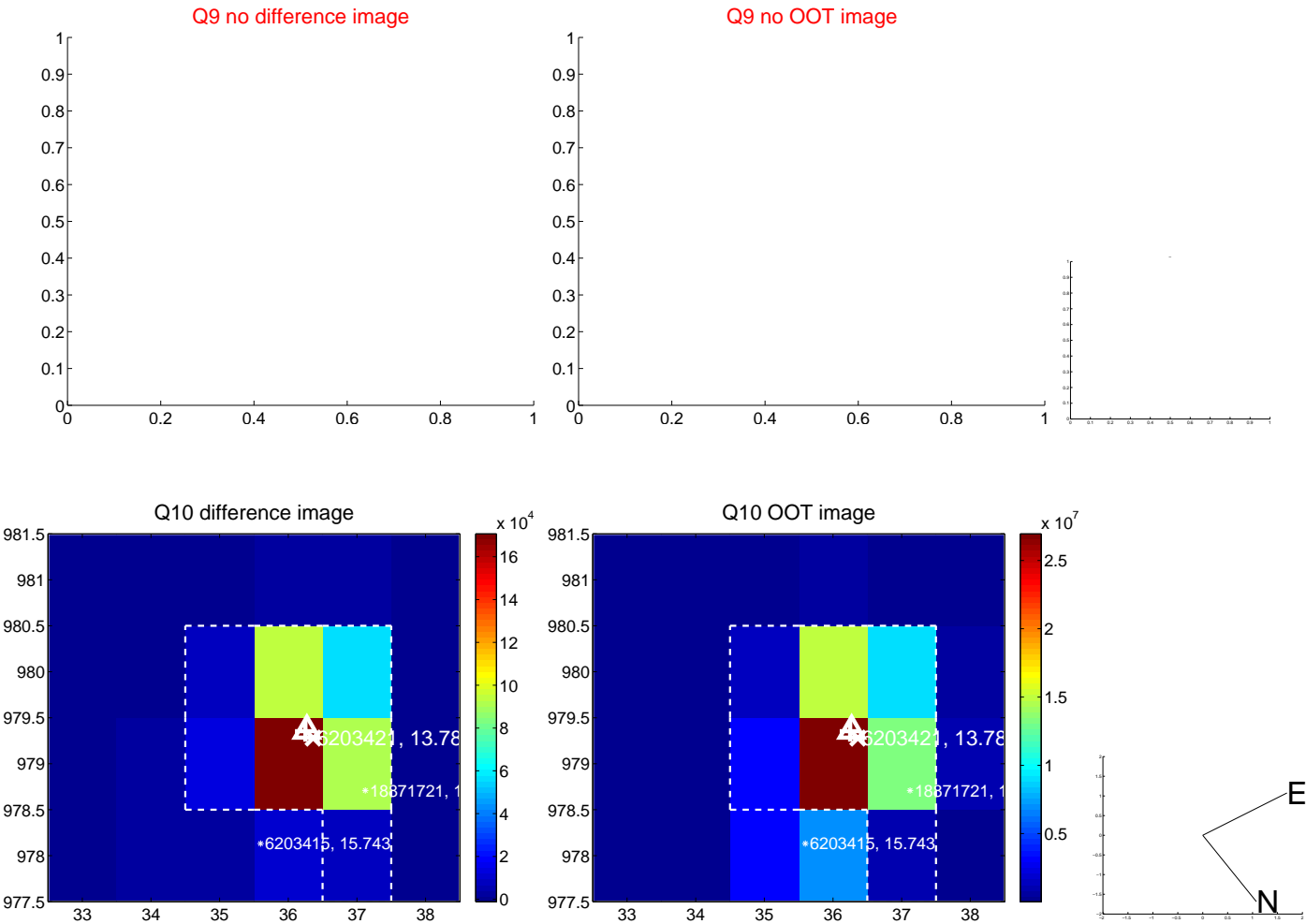


Q8 no OOT image





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

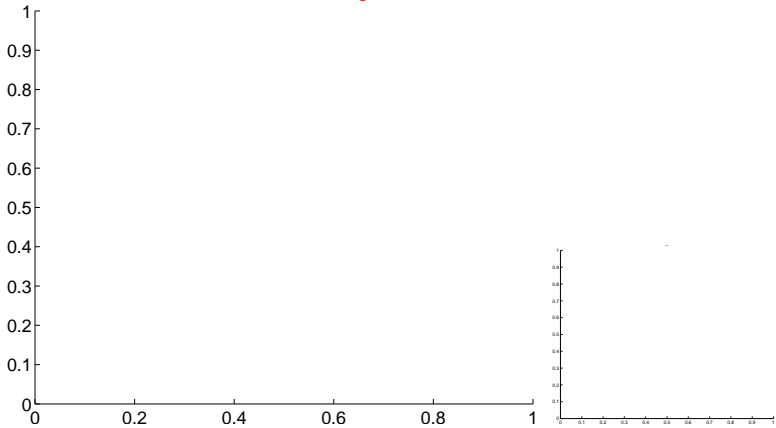


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

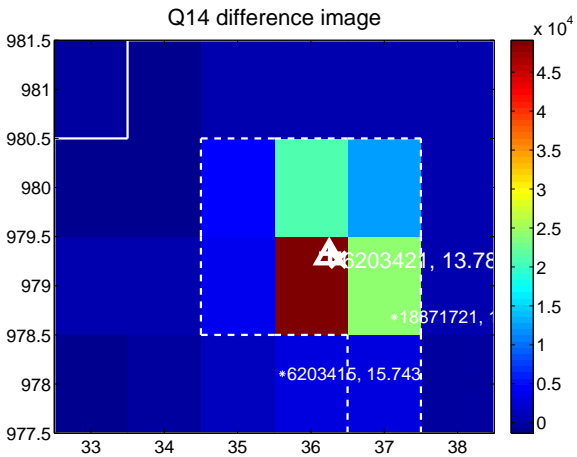
Q13 no difference image



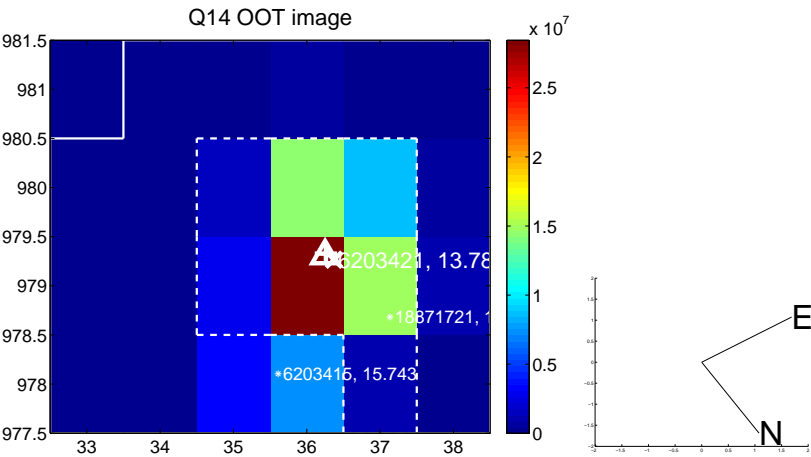
Q13 no OOT image



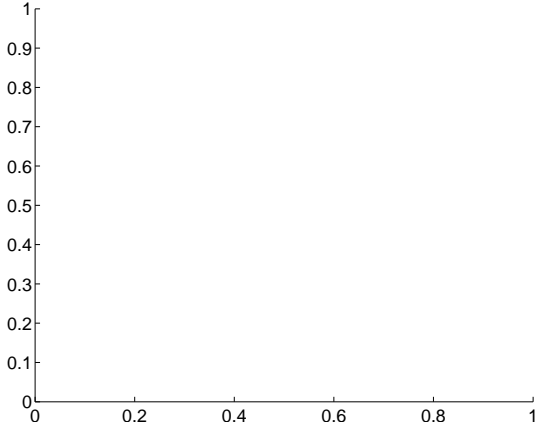
Q14 difference image



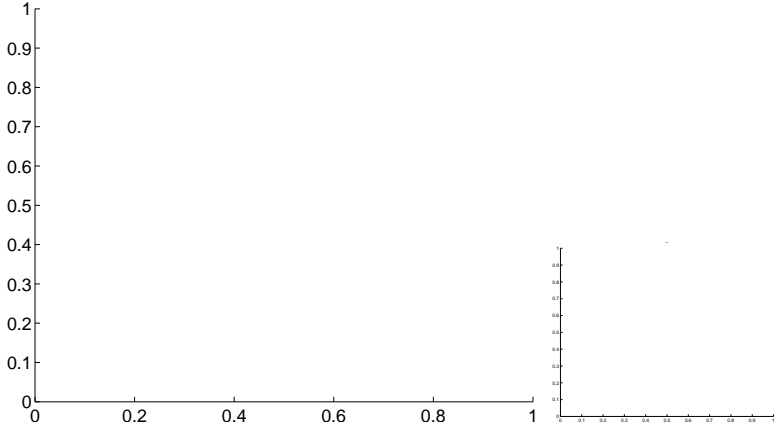
Q14 OOT image



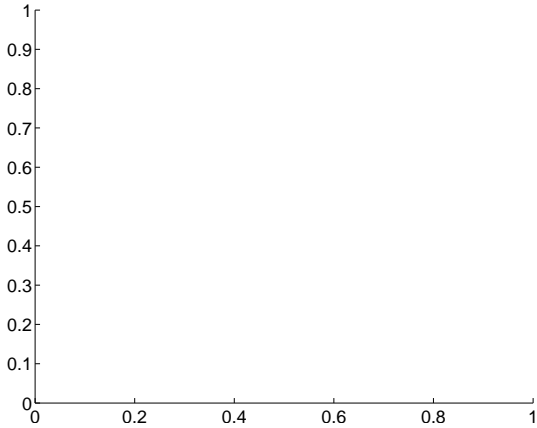
Q15 no difference image



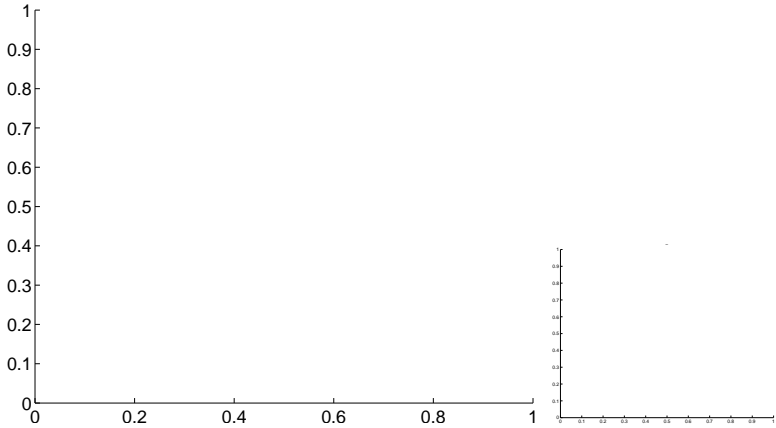
Q15 no OOT image



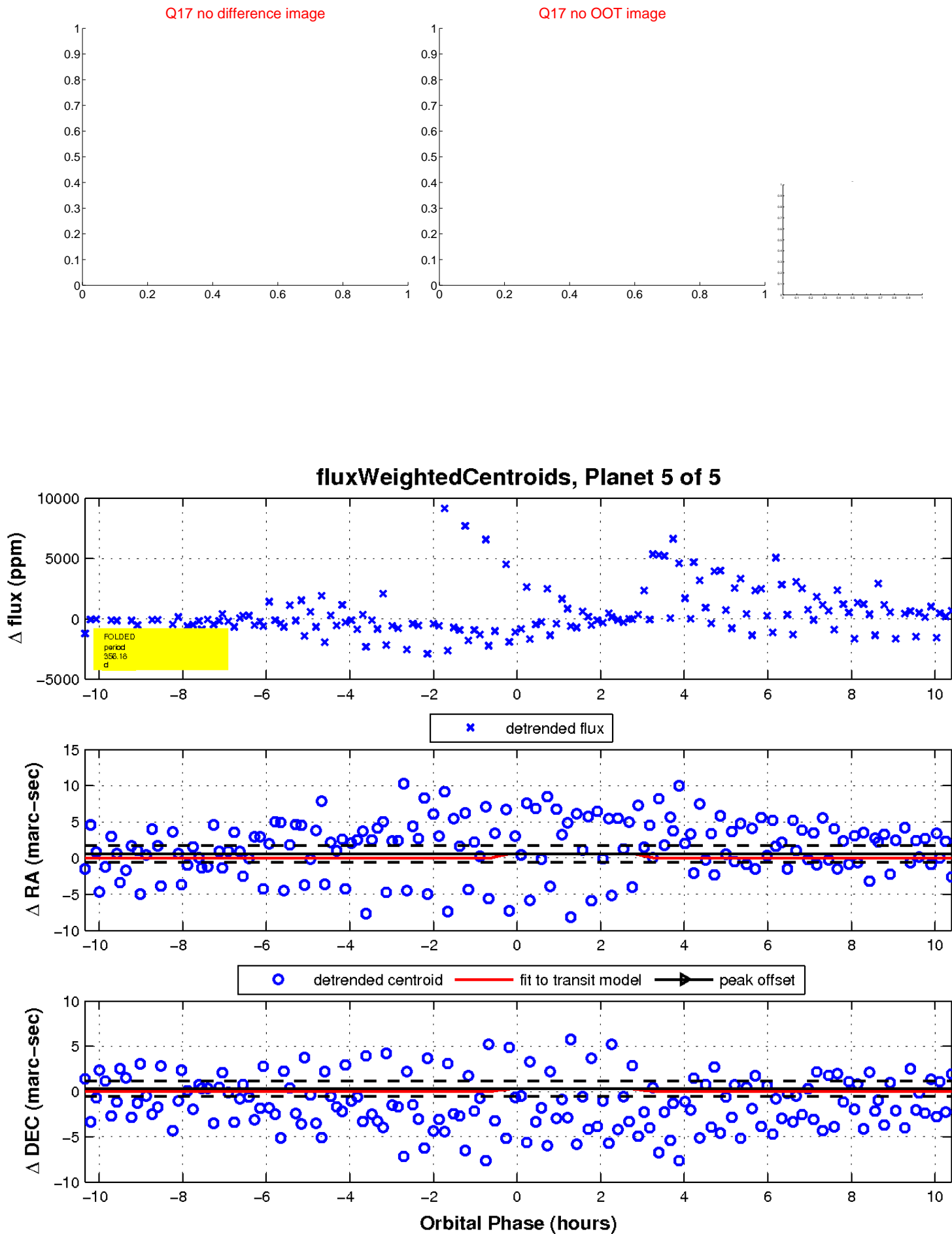
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

