

# KIC 004048488

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004048488-01 | OBS      | No   | 184.917132    | 197.518875   | 528.9       | 2.160            | 14.4 | 9.7 | 1.33                        | 6137            | 3.27                   | 5.38                   |
| 004048488-02 | OBS      | No   | 698.219542    | 152.916747   | 558.9       | 15.865           | 10.8 | 4.3 | 1.33                        | 6137            | 3.32                   | 0.92                   |
| 004048488-03 | OBS      | No   | 206.772297    | 179.032648   | 185.9       | 4.991            | 7.4  | 8.1 | 1.33                        | 6137            | 2.11                   | 4.64                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004048488-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 004048488-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_ZUMA—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS                  |
| 004048488-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—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.

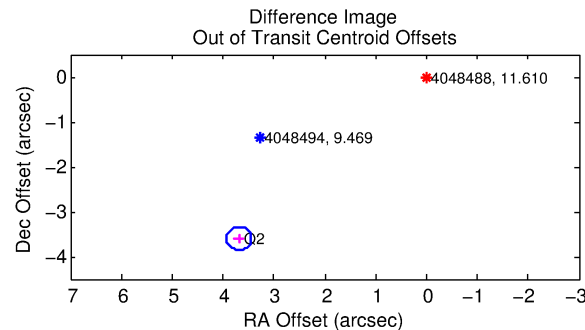
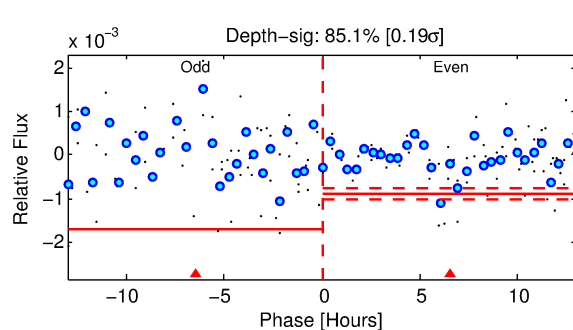
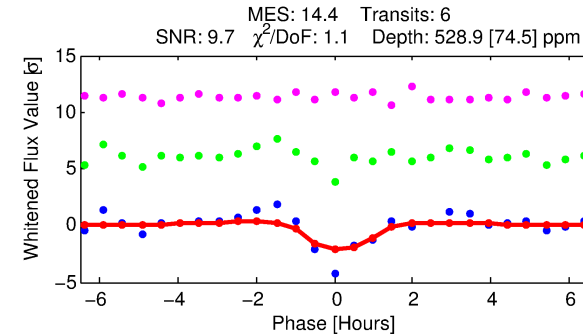
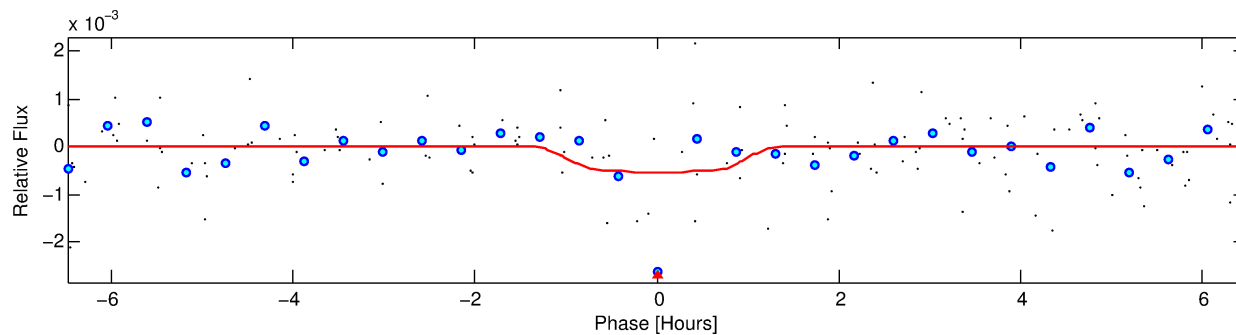
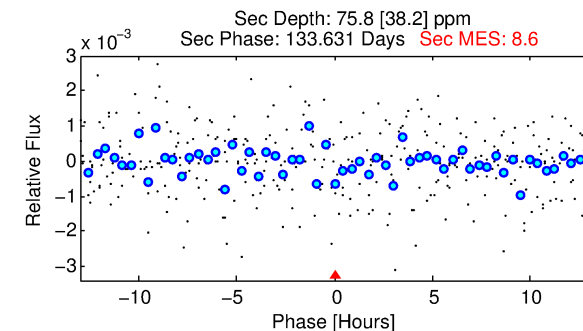
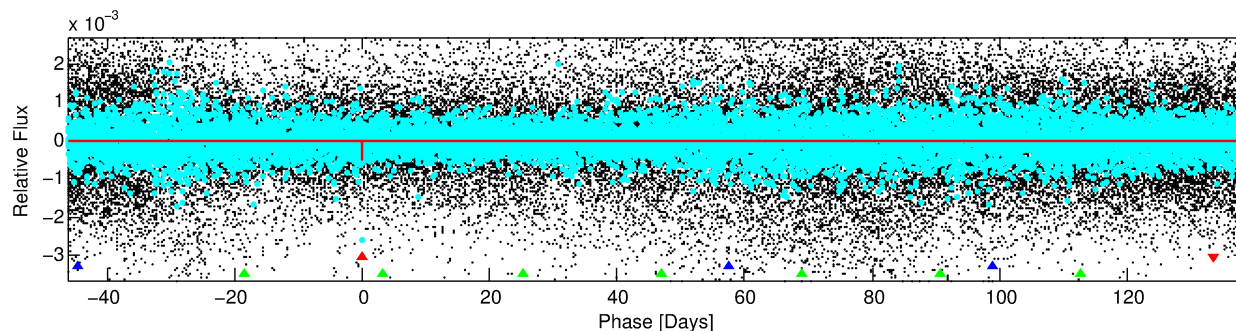
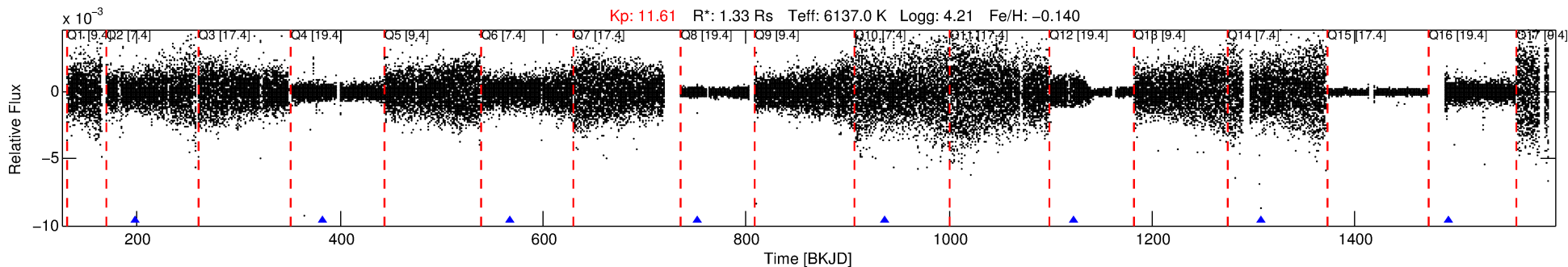
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004048488-01

No Significant Match Found

# DV One-Page Summary

KIC: 4048488 Candidate: 1 of 3 Period: 184.917 d



## DV Fit Results:

Period = 184.91713 [0.00297] d  
Epoch = 197.5189 [0.0104] BKJD  
Rp/R\* = 0.0225 [0.0634]  
a/R\* = 498.11 [7028.28]  
b = 0.68 [11.25]  
Seff = 5.38 [3.16]  
Teq = 388 [57] K  
Rp = 3.27 [9.28] Re  
a = 0.6472 [0.1898] AU  
Ag = 1636.72 [9303.76] [0.18σ]  
Teff = 3820 [5424] K [0.63σ]

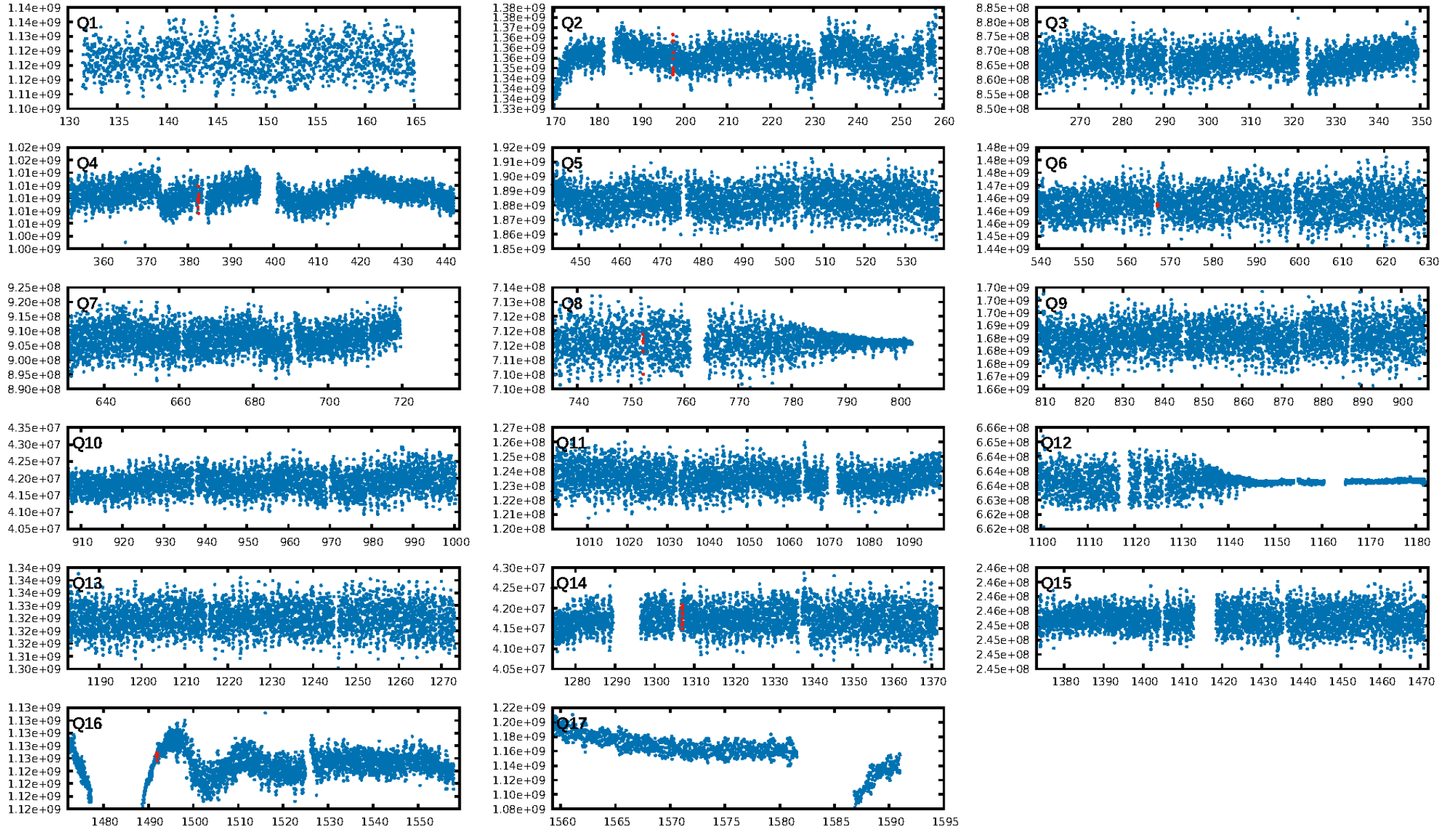
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [96.44σ]  
ModelChiSquare2-sig: 1.7%  
ModelChiSquareGof-sig: 96.7%  
Bootstrap-pfa: 7.67e-17  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 2.924  
Centroid-sig: 31.5%  
Centroid-so: 0.728 arcsec [0.32σ]  
OotOffset-rm: 5.154 arcsec [60.53σ]  
KicOffset-rm: 9.827 arcsec [113.40σ]  
OotOffset-st: 1/0/0/0 [1]  
KicOffset-st: 1/0/0/0 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 1.00 [4/4]

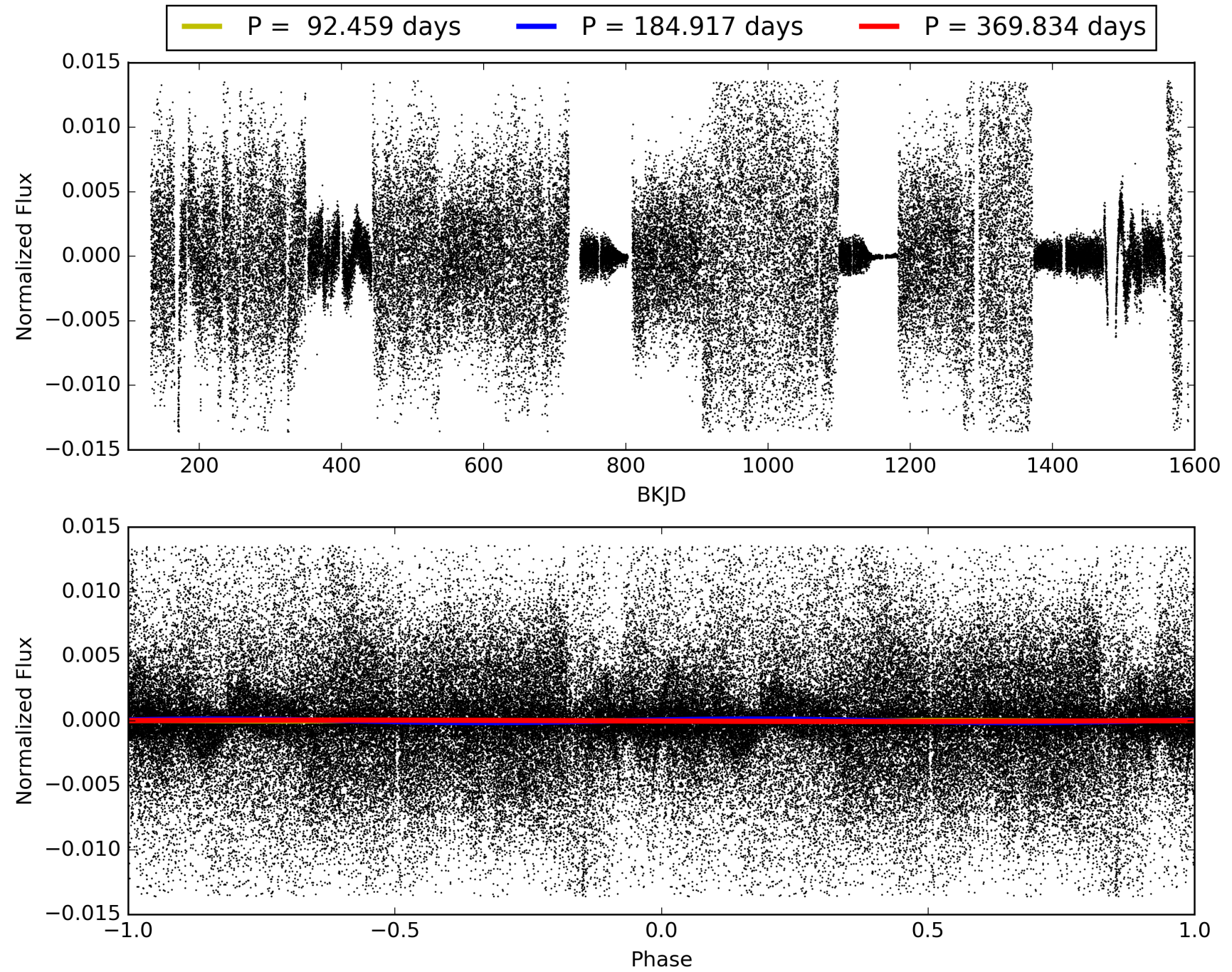
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 02:45:42 Z

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

# TCE 004048488-01, PDC Light Curves



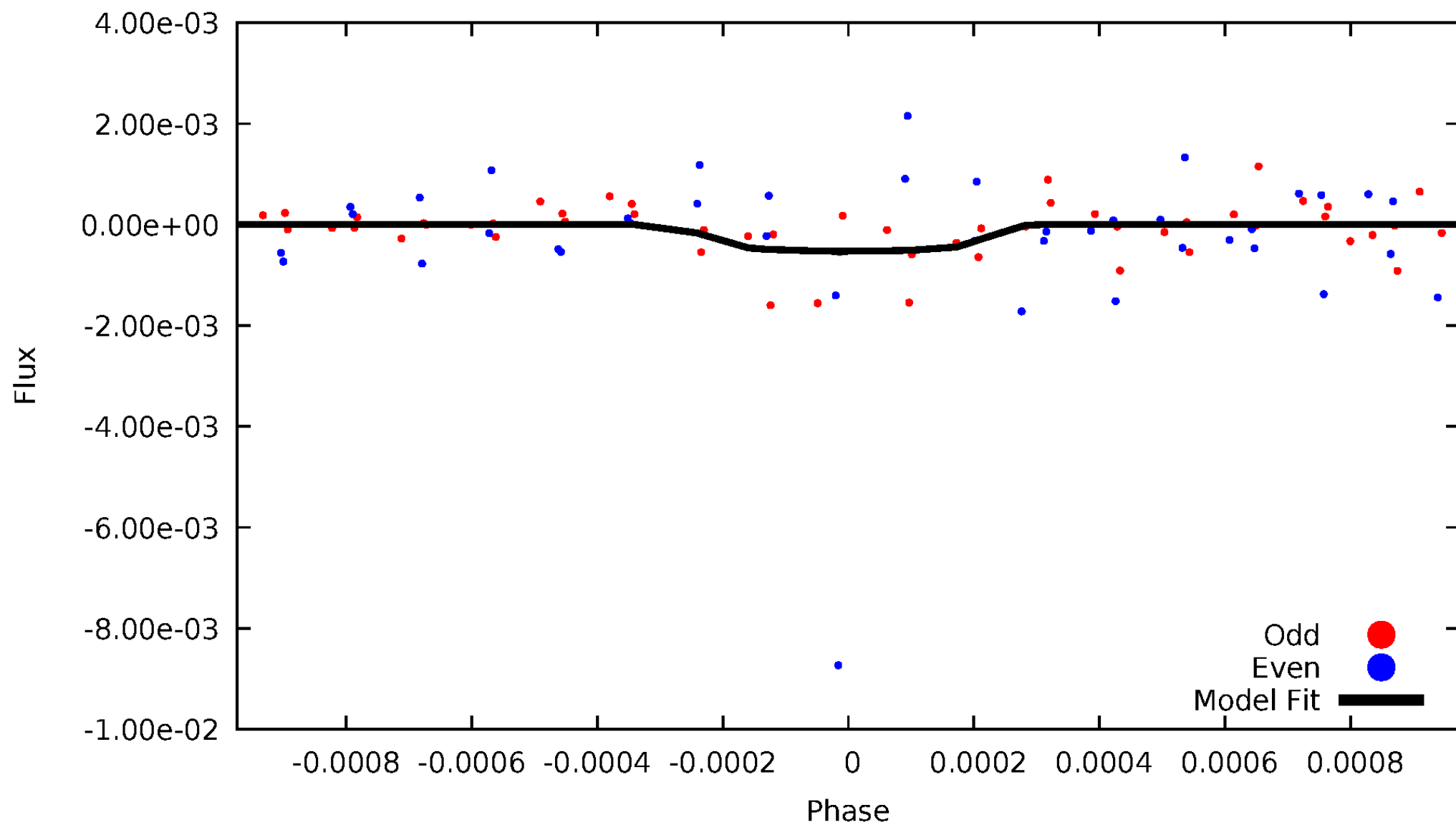
# TCE 004048488-01





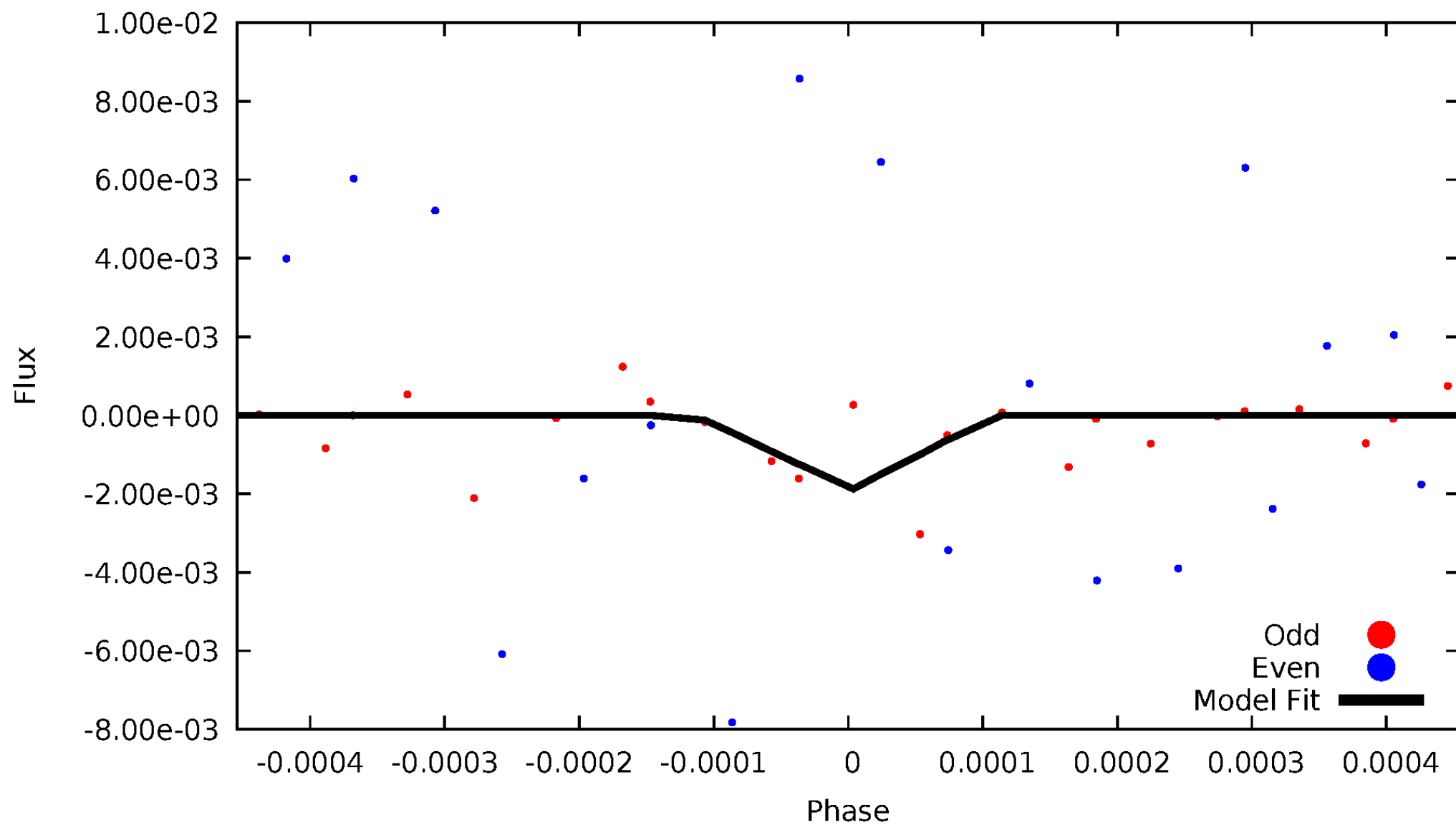
# DV Odd/Even

TCE 004048488-01

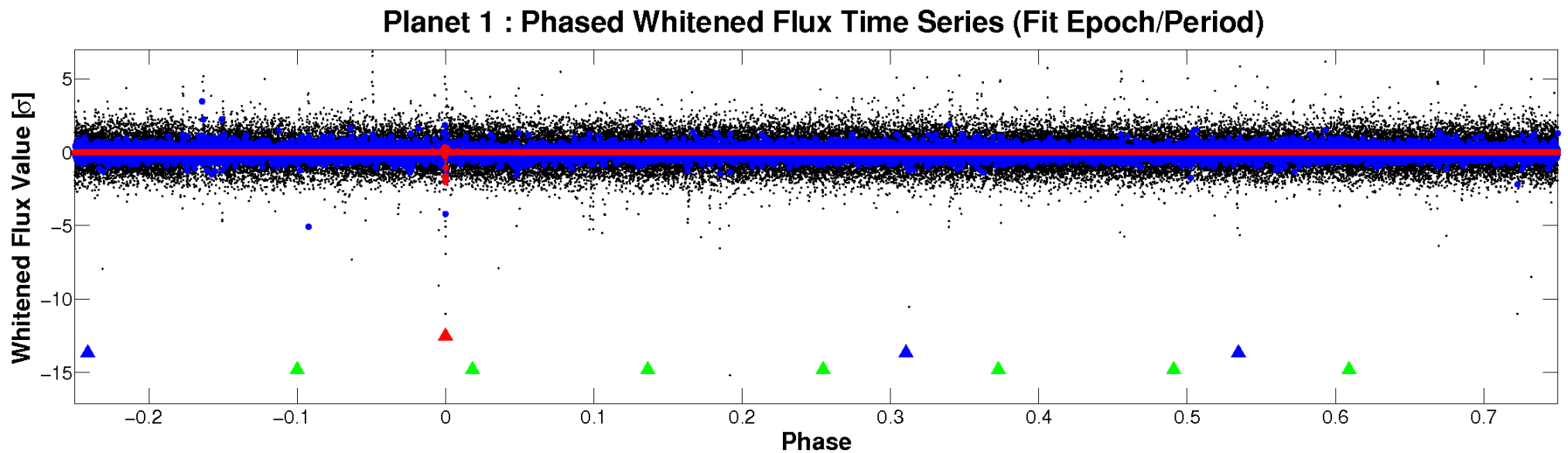
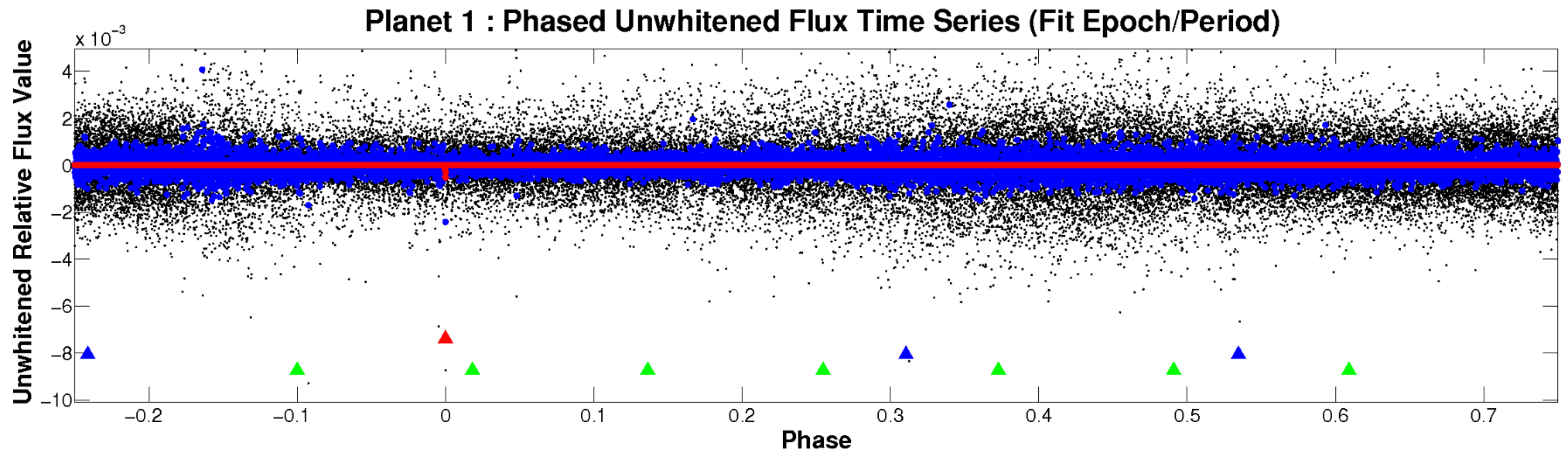


# ALT Odd/Even

TCE 004048488-01

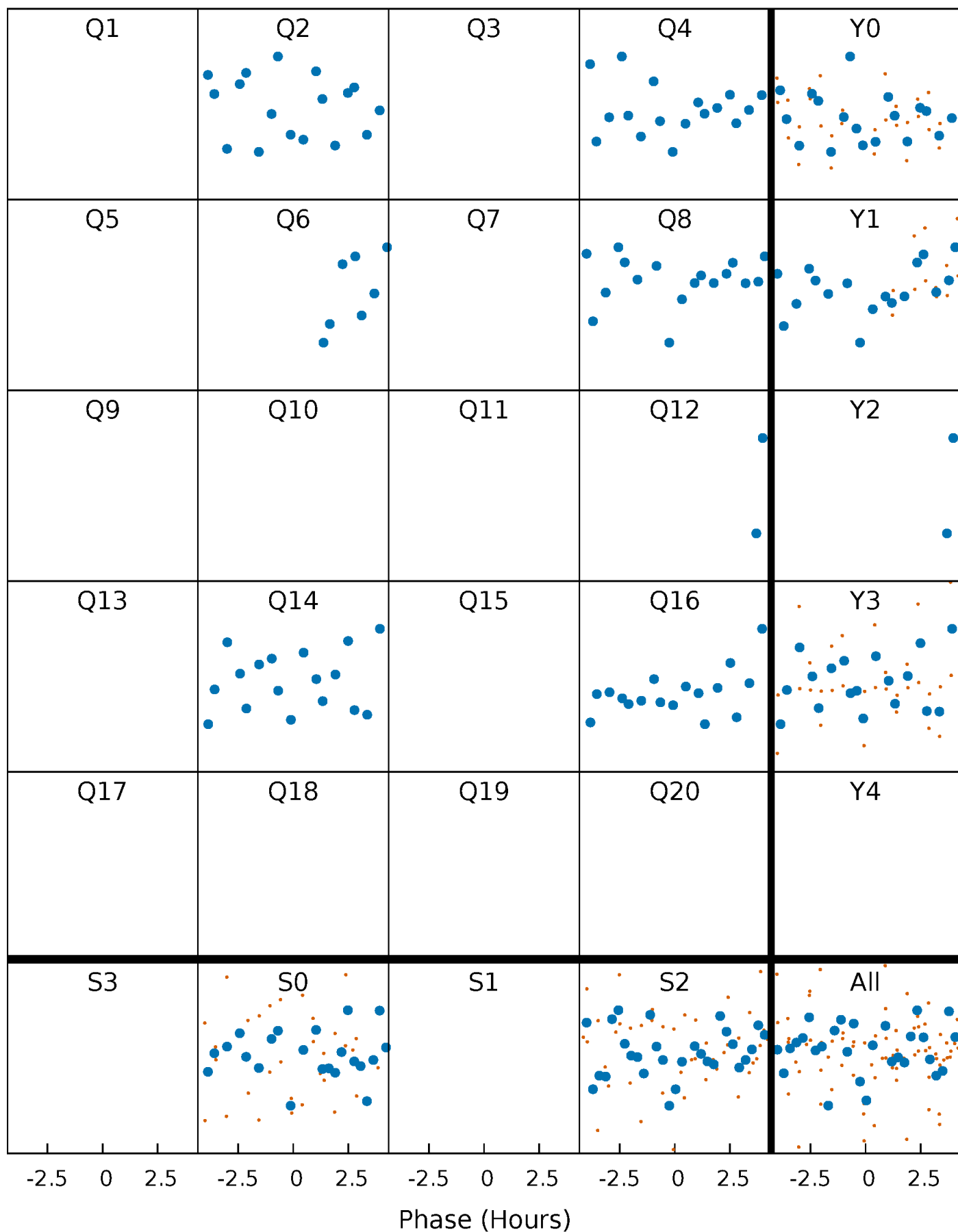


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

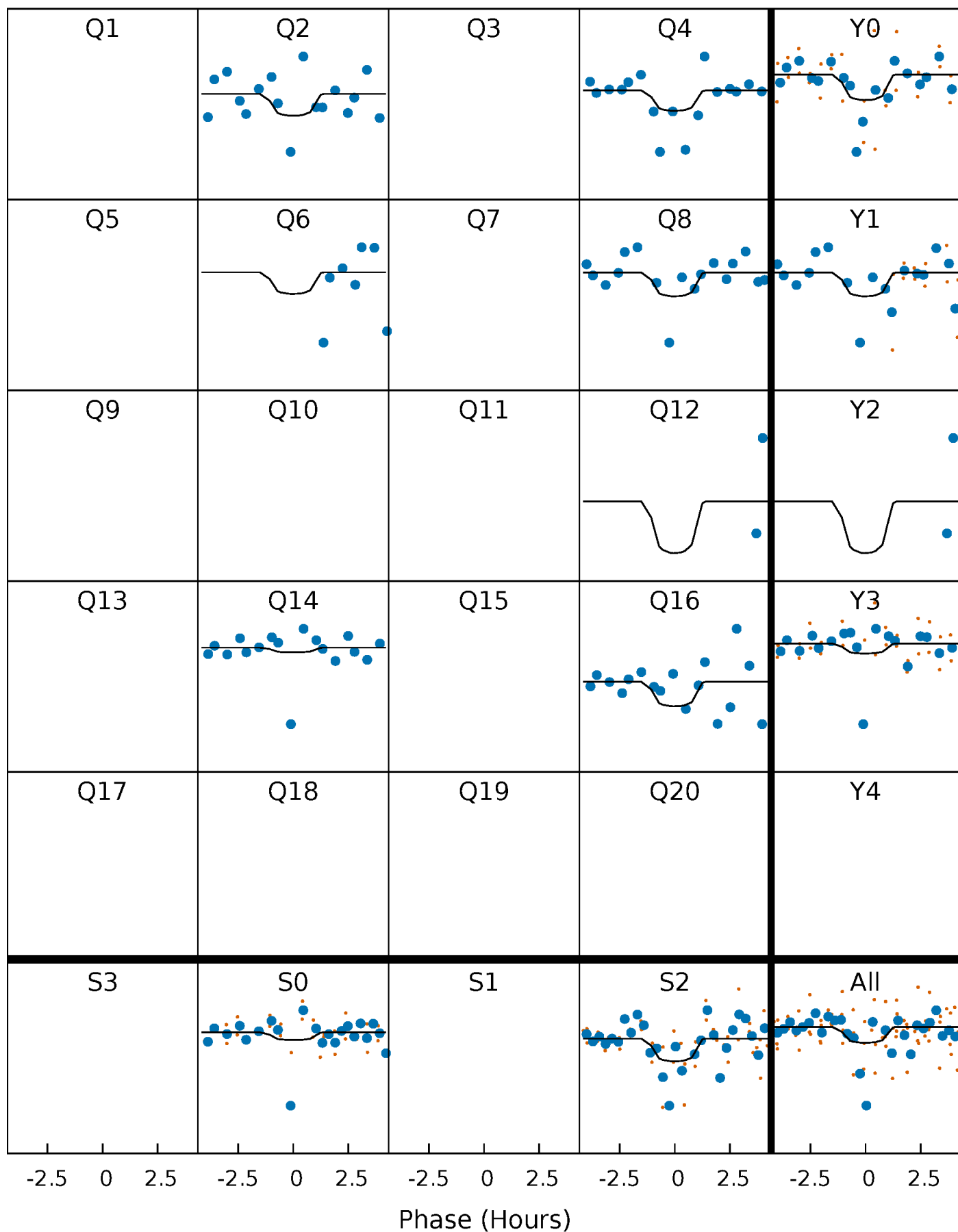
TCE 004048488-01 P=184.917132 Days  $T_0=197.518875$  (BKJD)





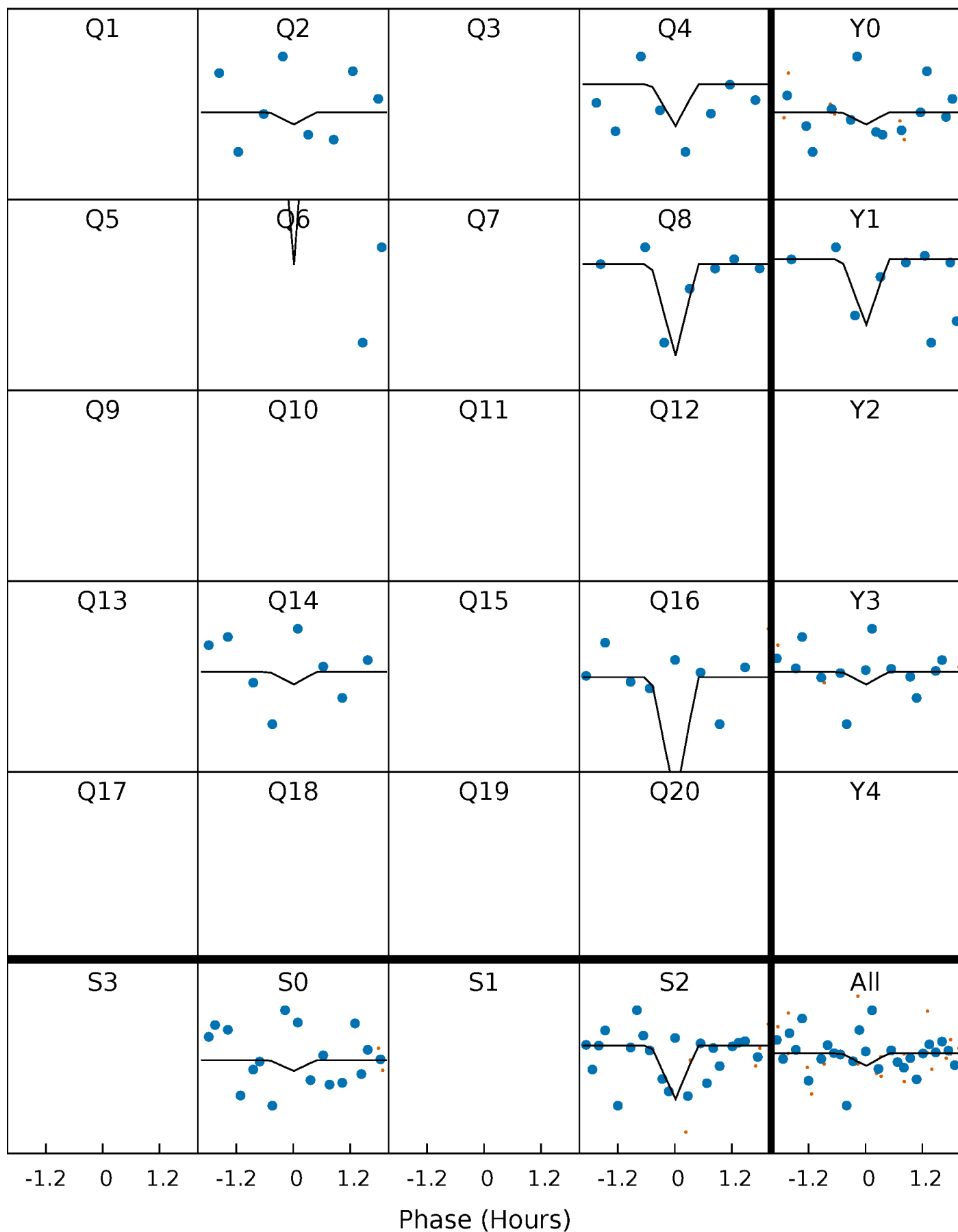
# DV Quarter-Phased Transit Curves

TCE 004048488-01 P=184.917132 Days  $T_0=197.518875$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

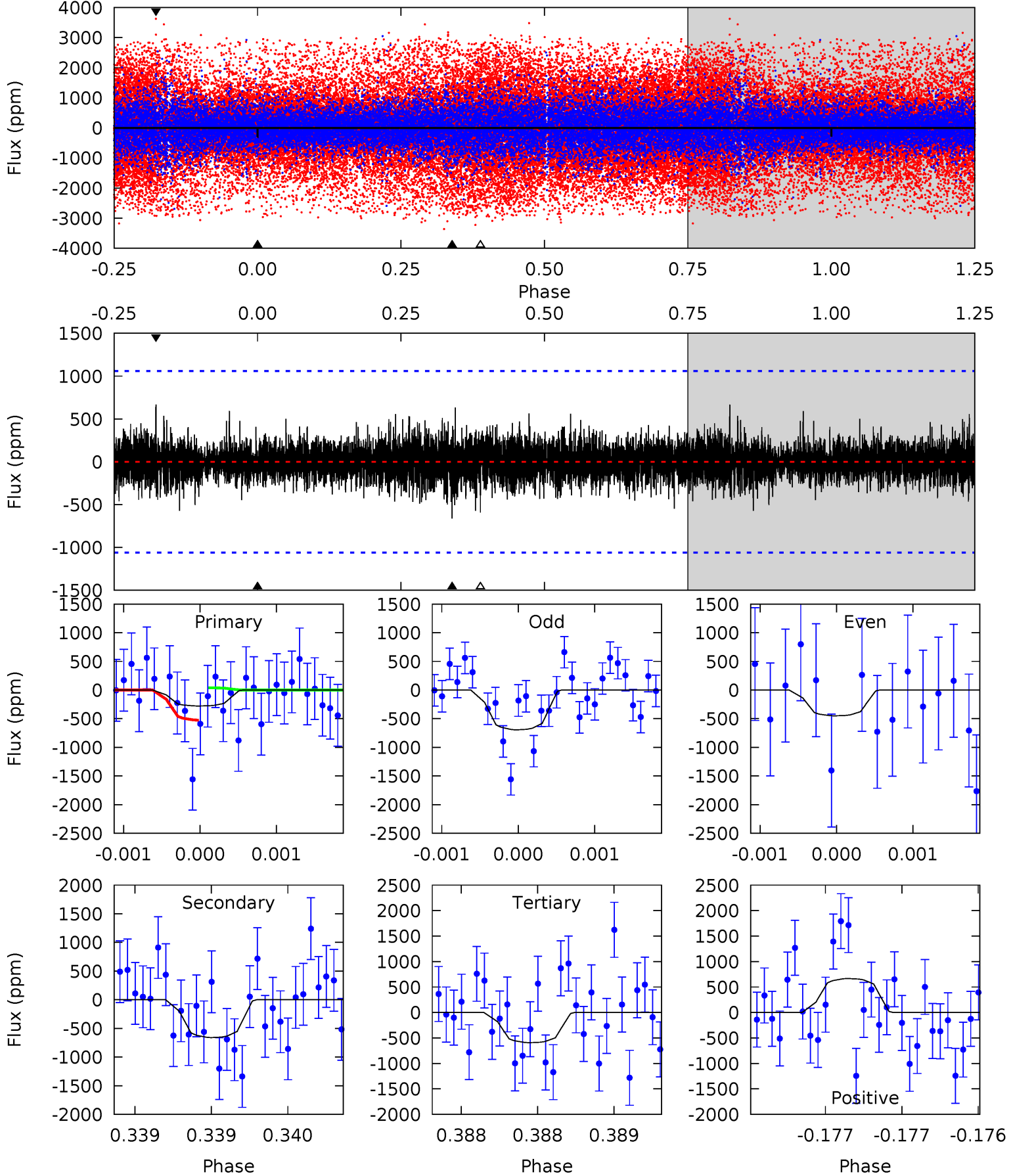
TCE 004048488-01 P=184.922196 Days  $T_0=197.501456$  (BKJD)



# DV Model-Shift Uniqueness Test

004048488-01, P = 184.917132 Days, E = 12.601743 Days

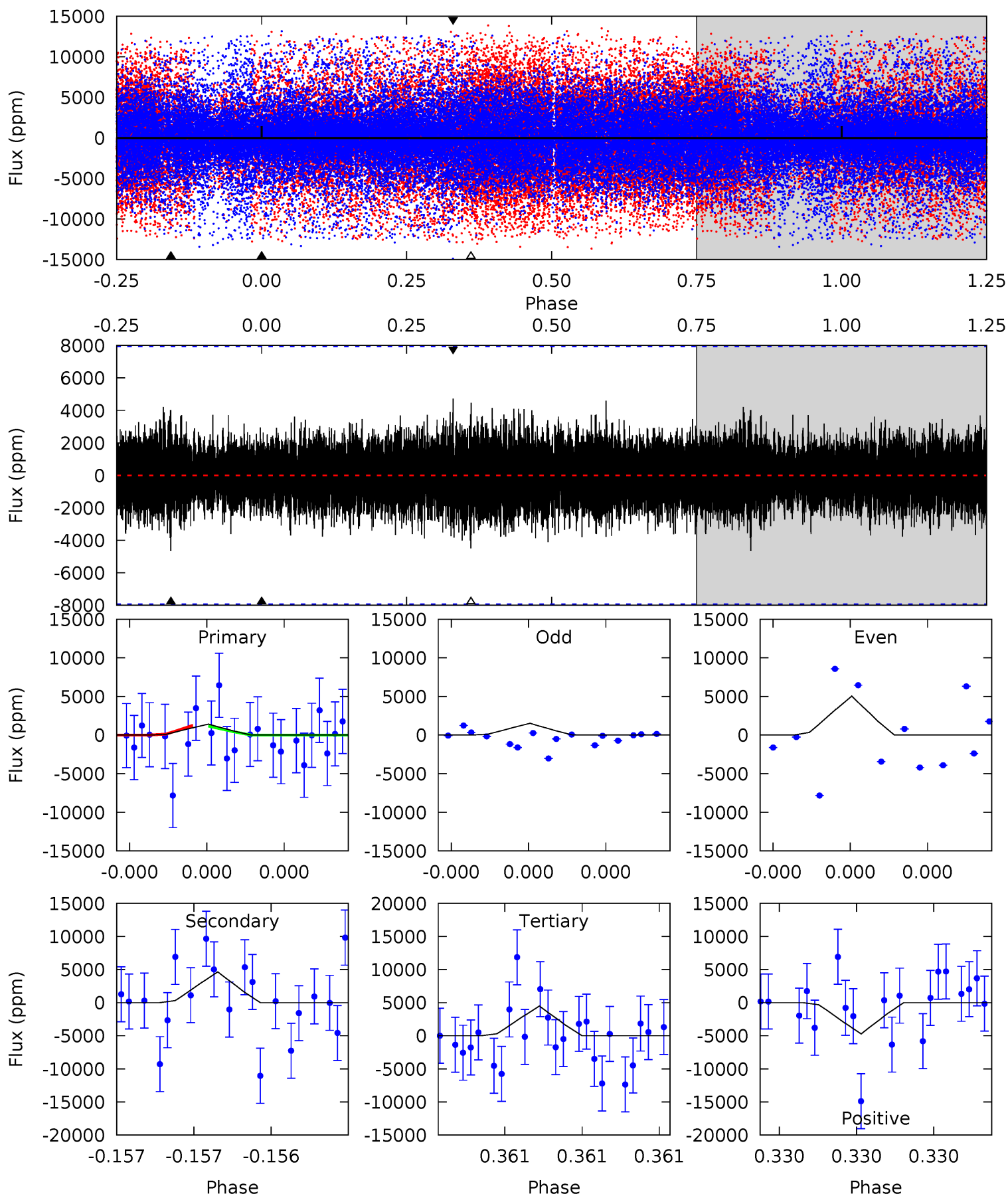
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.46 | 3.46 | 3.11 | 3.50 | 5.56            | 3.46            | 0.75             | -1.64   | -2.03   | 0.35    | -0.04   | 0.61    | 1.25 | 0.50  | 1.30 |



# Alt Model-Shift Uniqueness Test

004048488-01, P = 184.922196 Days, E = 12.579260 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.02 | 3.35 | 3.24 | 3.41 | 5.73            | 3.72            | 0.82             | -2.22   | -2.39   | 0.11    | -0.06   | 1.14    | 5.43 | 0.50  | 0.03 |



### Stellar Parameters For KIC 004048488

|        | $T_{\text{eff}} (K)$ | $\log(g)$                 | $[\text{Fe}/\text{H}]$     | $R (R_{\odot})$           | $M (M_{\odot})$           | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6137^{+389}_{-584}$ | $4.213^{+0.253}_{-0.184}$ | $-0.140^{+0.300}_{-0.300}$ | $1.332^{+0.439}_{-0.439}$ | $1.057^{+0.214}_{-0.214}$ | $0.630^{+1.164}_{-0.319}$                 |
|        | +6%/-10%             | +6%/-4%                   | +214%/-214%                | +33%/-33%                 | +20%/-20%                 | +185%/-51%                                |
| 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 004048488-01 / KOI

| Detrend | Depth (ppm)      | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$   | $A_{\text{obs}}$         |
|---------|------------------|------------------------|----------------------|------------------------|--------------------------|
| DV      | $-660 \pm 191$   | $7.00^{+7.44}_{-4.78}$ | $538^{+58}_{-65}$    | $4550^{+3370}_{-1096}$ | $2965^{+27162}_{-2252}$  |
| Alt.    | $-4648 \pm 1387$ | $9.26^{+8.63}_{-6.11}$ | $537^{+60}_{-68}$    | $6277^{+5861}_{-1683}$ | $12657^{+92769}_{-9525}$ |

$T_{\text{max}}$  = 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

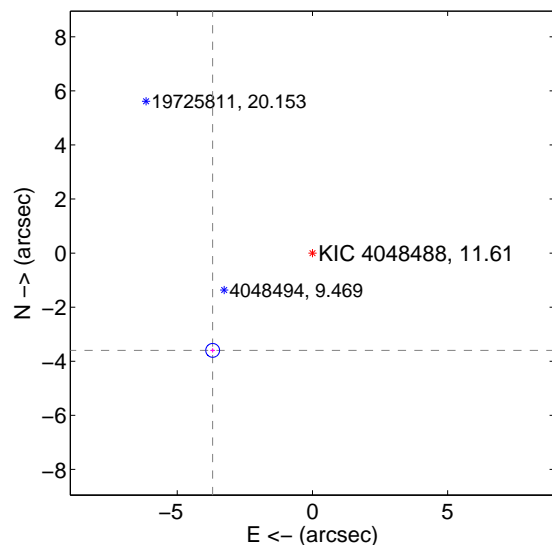
Supplemental centroid analysis for 004048488-01. **Kepler magnitude: 11.61.** Transit SNR 9.67

There are 0 quarters with good PRF difference image offsets

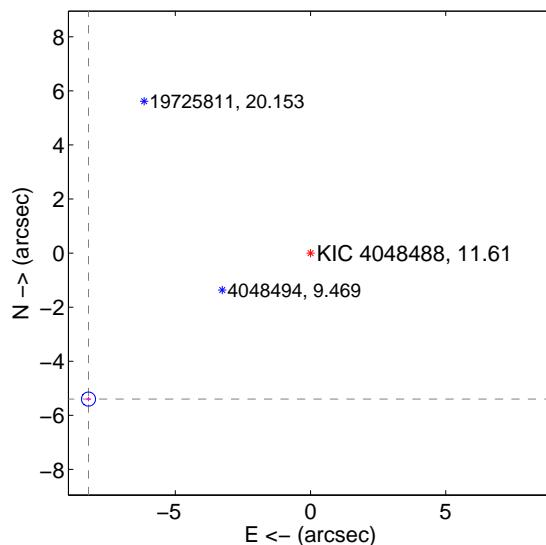
The OOT PRF centroid is offset from the target star catalog position by about 4.87 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec                  | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|-------------------------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | <b>5.154 <math>\pm</math> 0.085</b> | <b>60.53</b>        | 3.690 $\pm$ 0.089 | -3.598 $\pm$ 0.081 |
| PRF-fit source offset from KIC position | <b>9.827 <math>\pm</math> 0.087</b> | <b>113.40</b>       | 8.211 $\pm$ 0.089 | -5.399 $\pm$ 0.081 |
| photometric centroid source offset      | 0.73 $\pm$ 2.24                     | 0.32                | -0.06 $\pm$ 1.29  | 0.73 $\pm$ 2.25    |

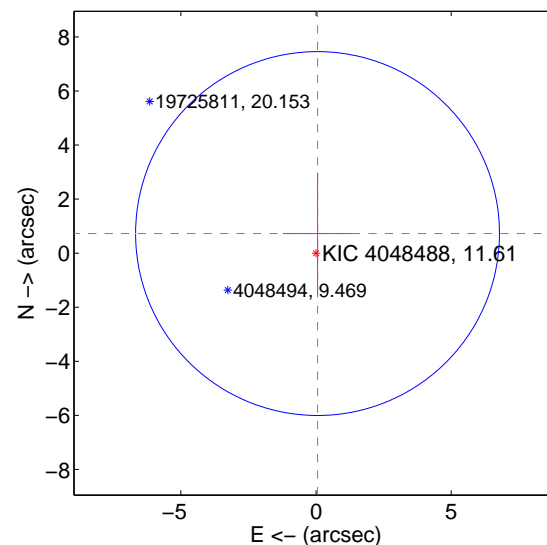
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



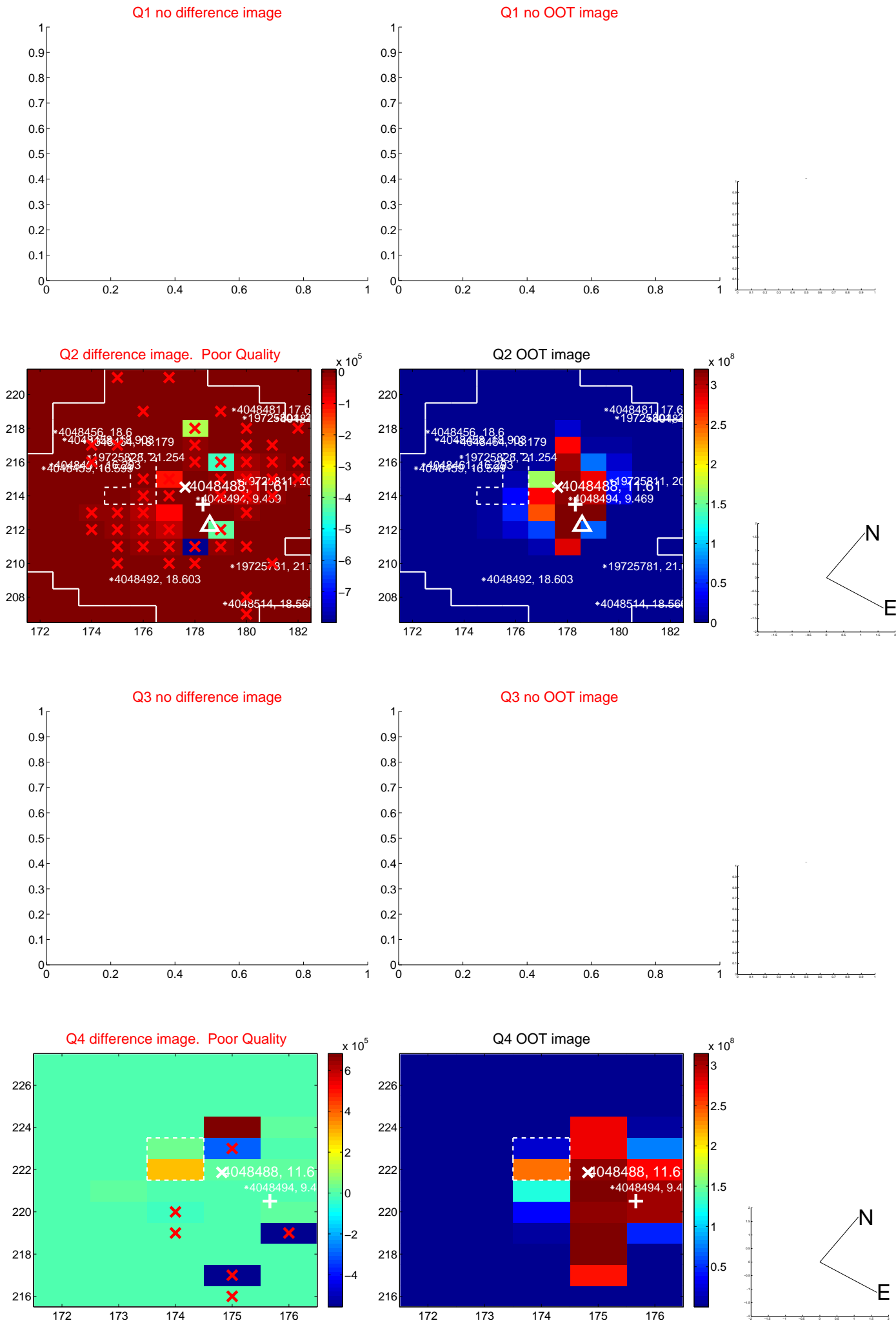
offset from photometric centroids



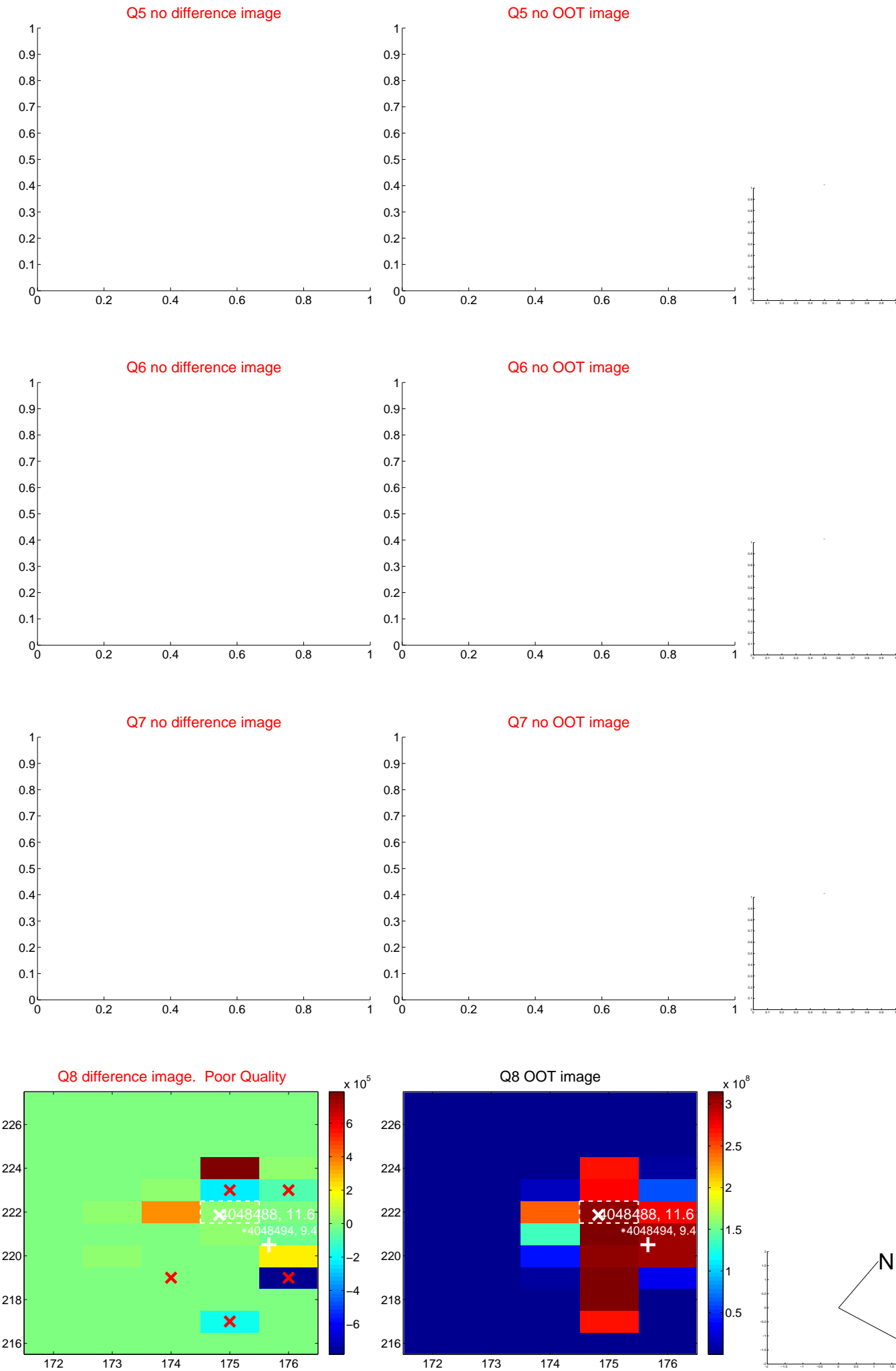
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



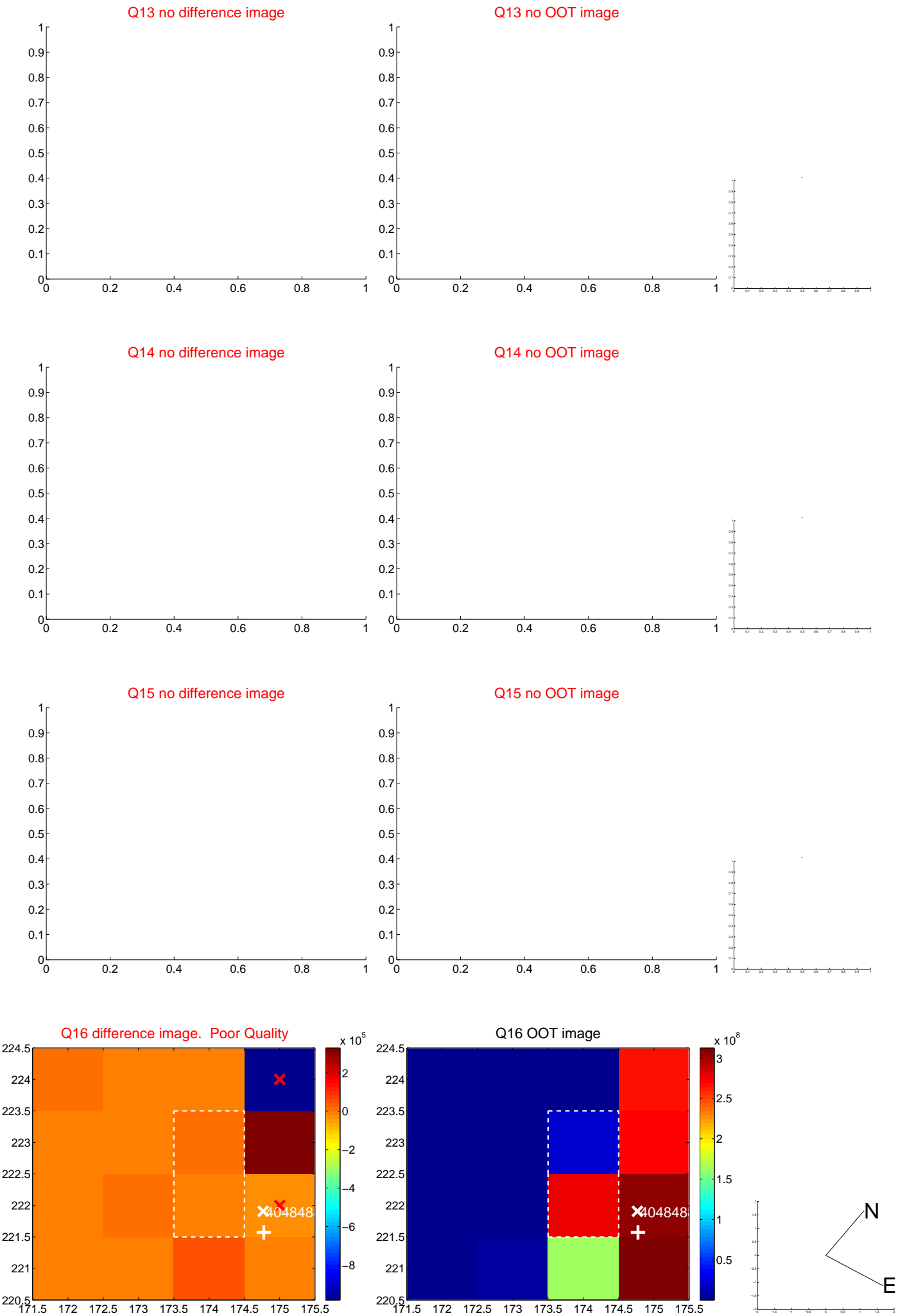
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



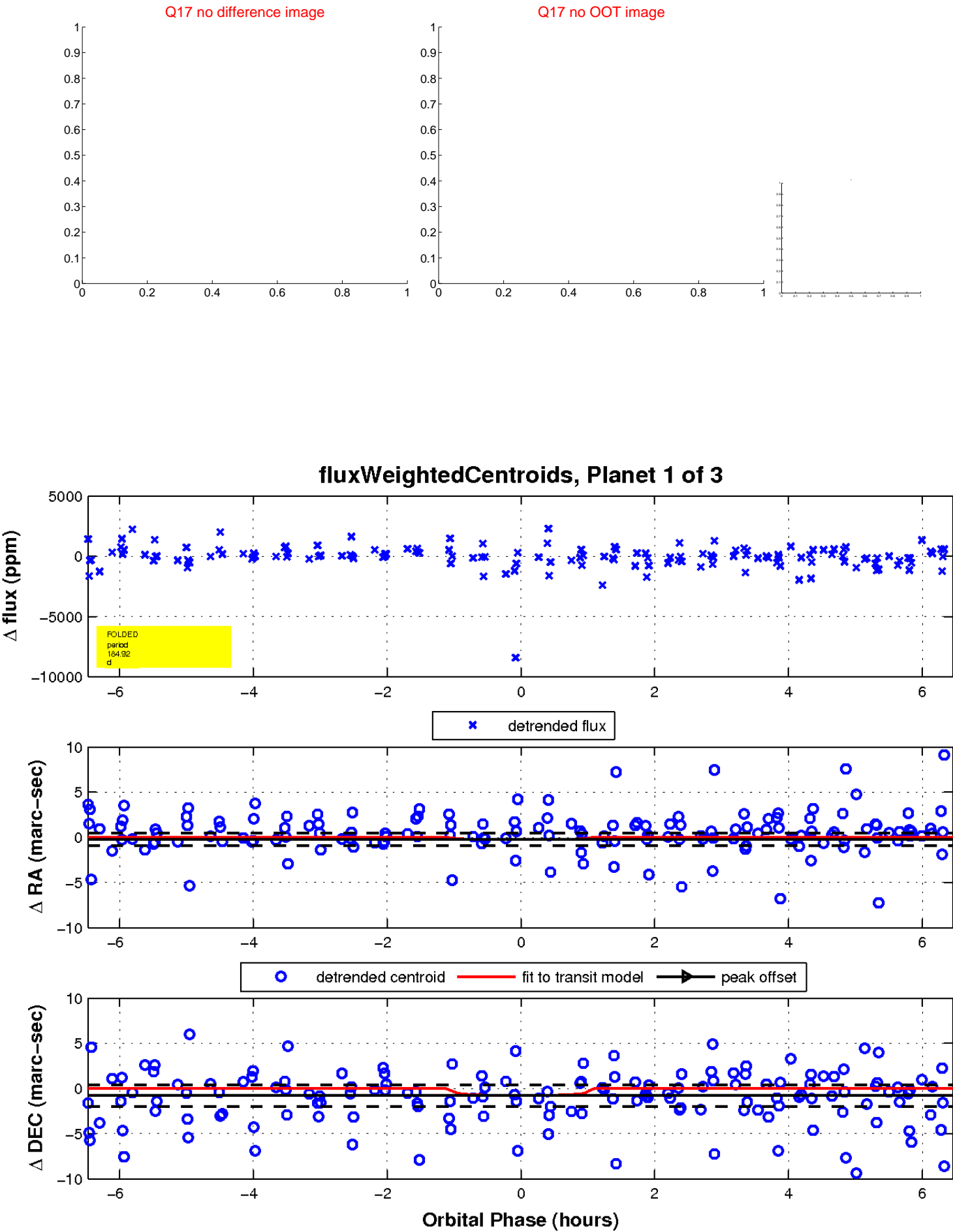
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



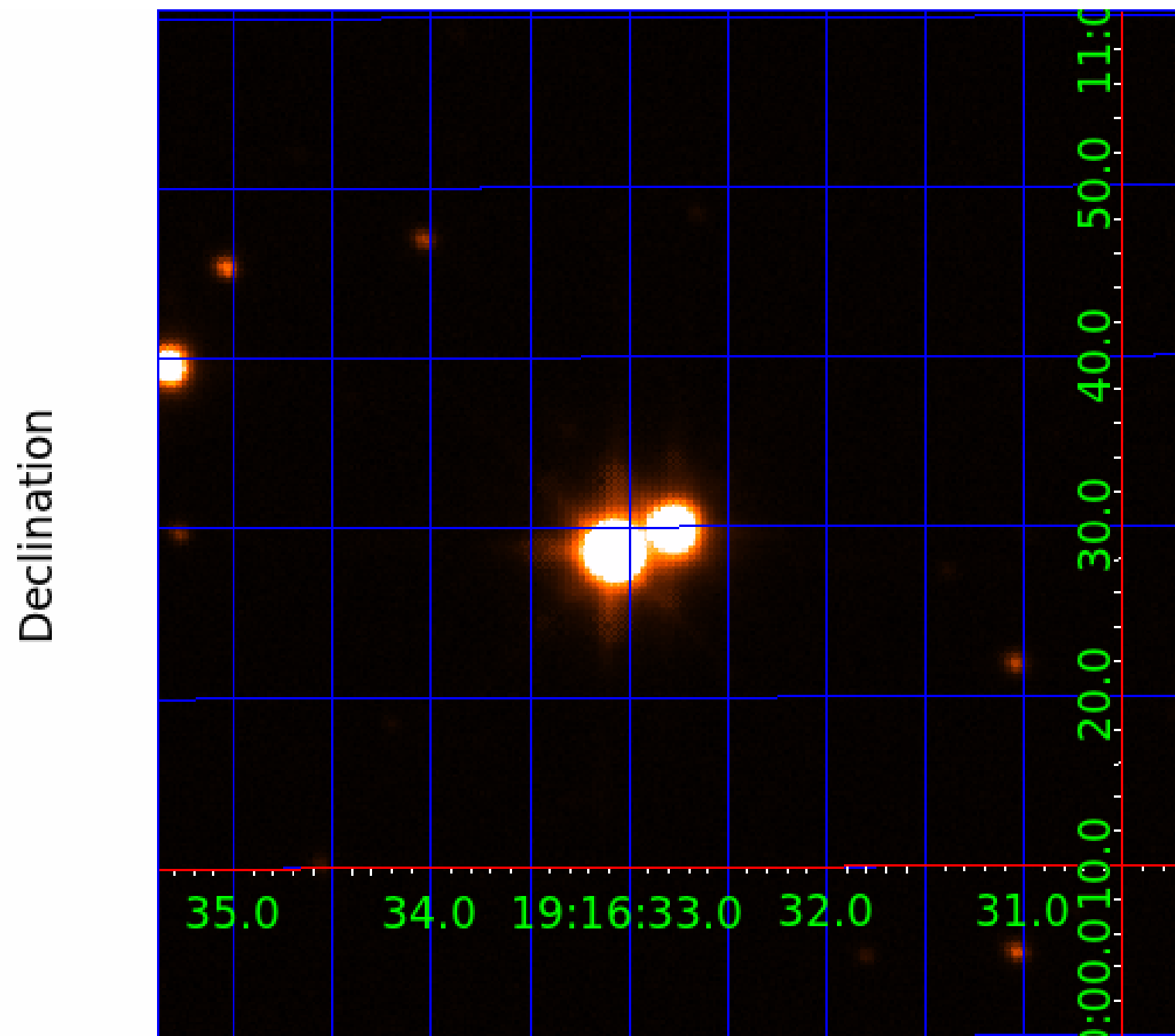
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 004048488

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004048488-01 | OBS      | No   | 184.917132    | 197.518875   | 528.9       | 2.160            | 14.4 | 9.7 | 1.33                        | 6137            | 3.27                   | 5.38                   |
| 004048488-02 | OBS      | No   | 698.219542    | 152.916747   | 558.9       | 15.865           | 10.8 | 4.3 | 1.33                        | 6137            | 3.32                   | 0.92                   |
| 004048488-03 | OBS      | No   | 206.772297    | 179.032648   | 185.9       | 4.991            | 7.4  | 8.1 | 1.33                        | 6137            | 2.11                   | 4.64                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004048488-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 004048488-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_ZUMA—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS                  |
| 004048488-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—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.

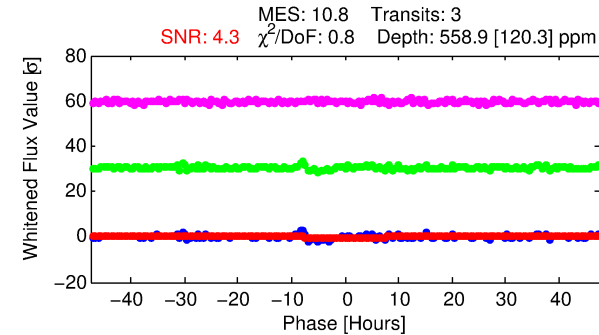
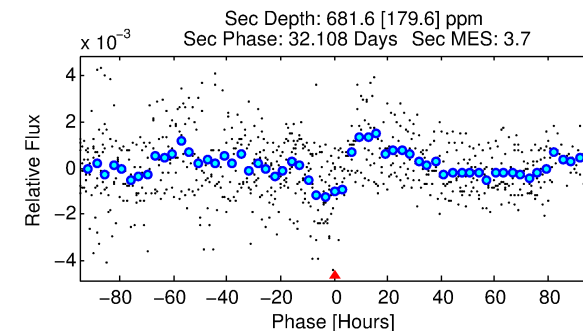
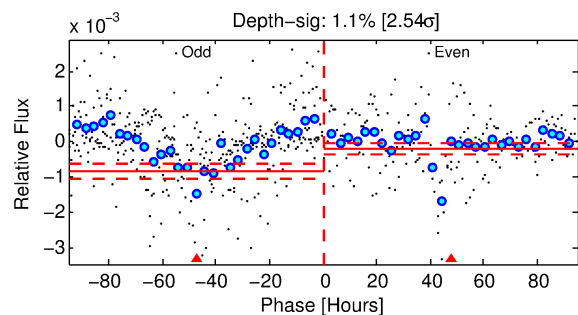
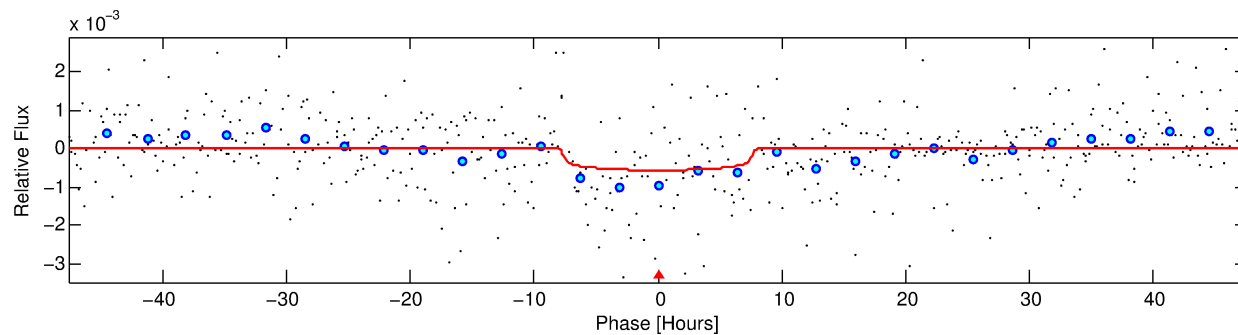
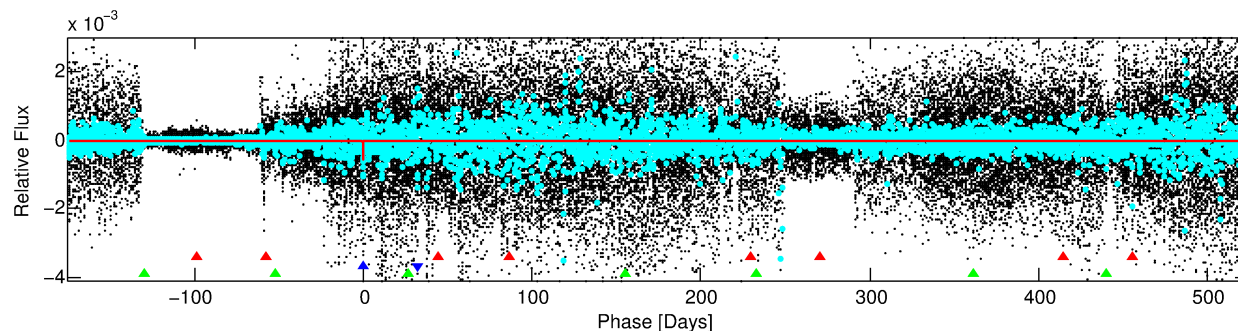
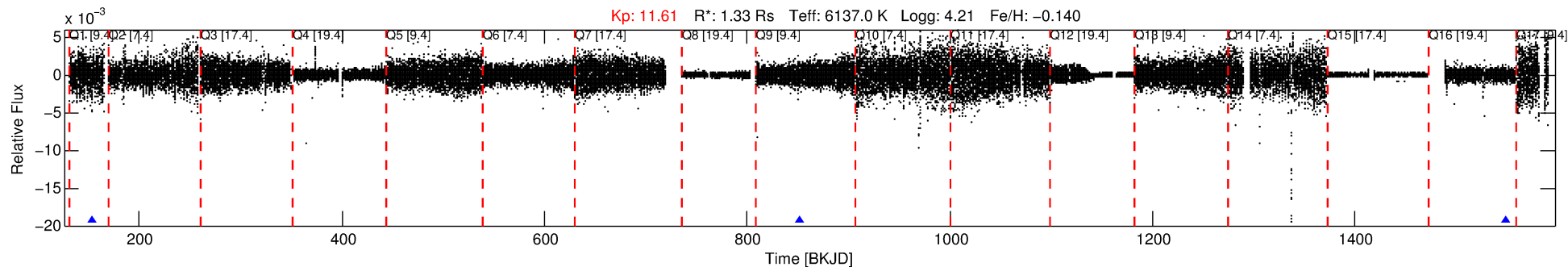
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004048488-02

No Significant Match Found

# DV One-Page Summary

KIC: 4048488 Candidate: 2 of 3 Period: 698.220 d



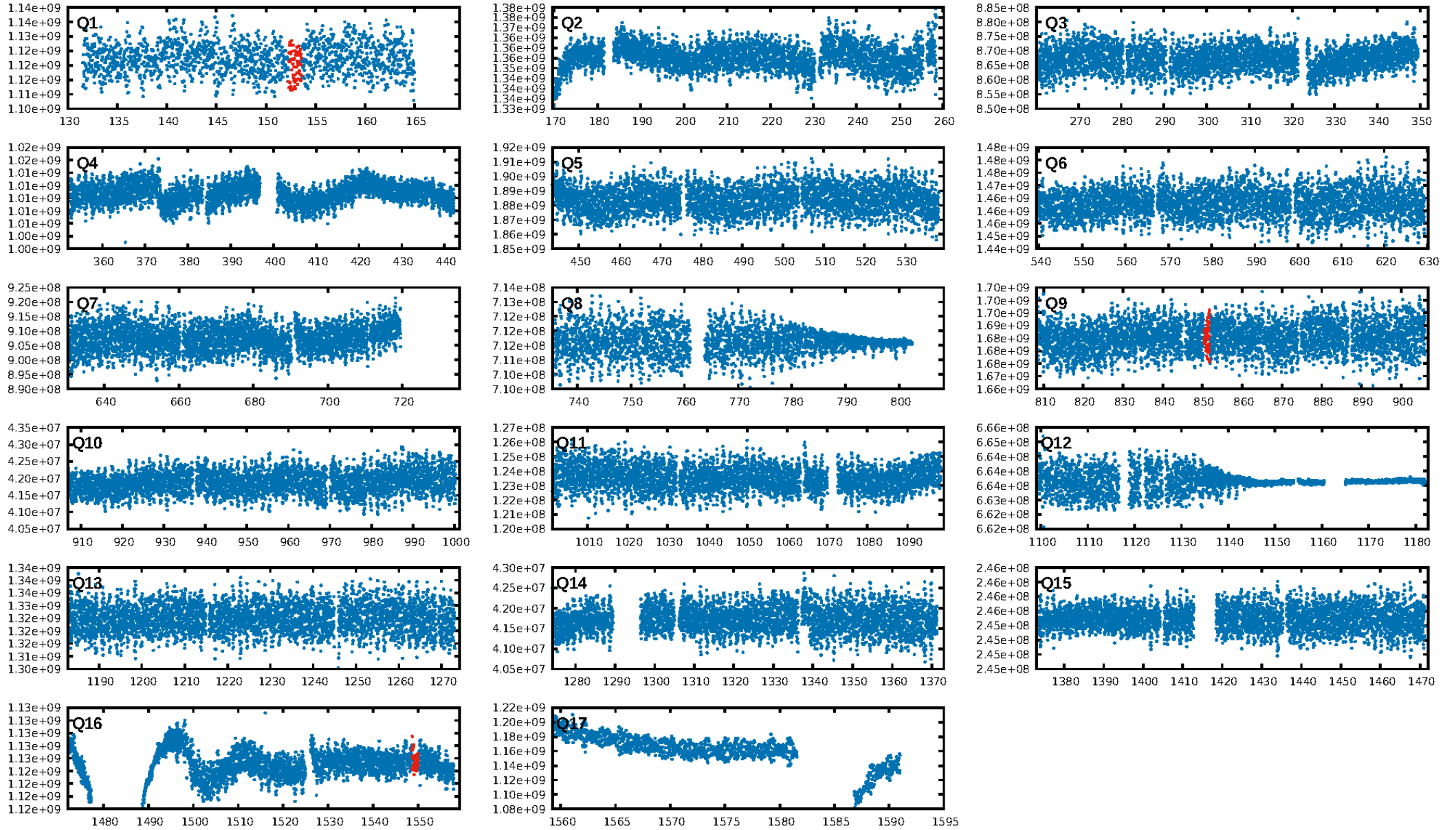
## DV Fit Results:

Period = 698.21954 [0.02477] d  
Epoch = 152.9167 [0.0395] BKJD  
 $R_p/R^* = 0.0229$  [0.0083]  
 $a/R^* = 266.59$  [447.48]  
 $b = 0.65$  [1.52]  
 $\text{Seff} = 0.92$  [0.54]  
 $T_{\text{eq}} = 249$  [37] K  
 $R_p = 3.32$  [1.63]  $R_e$   
 $a = 1.5693$  [0.4602] AU  
 $A_g = 83691.06$  [74687.59] [1.12 $\sigma$ ]  
 $T_{\text{eff}} = 6559$  [1413] K [4.46 $\sigma$ ]

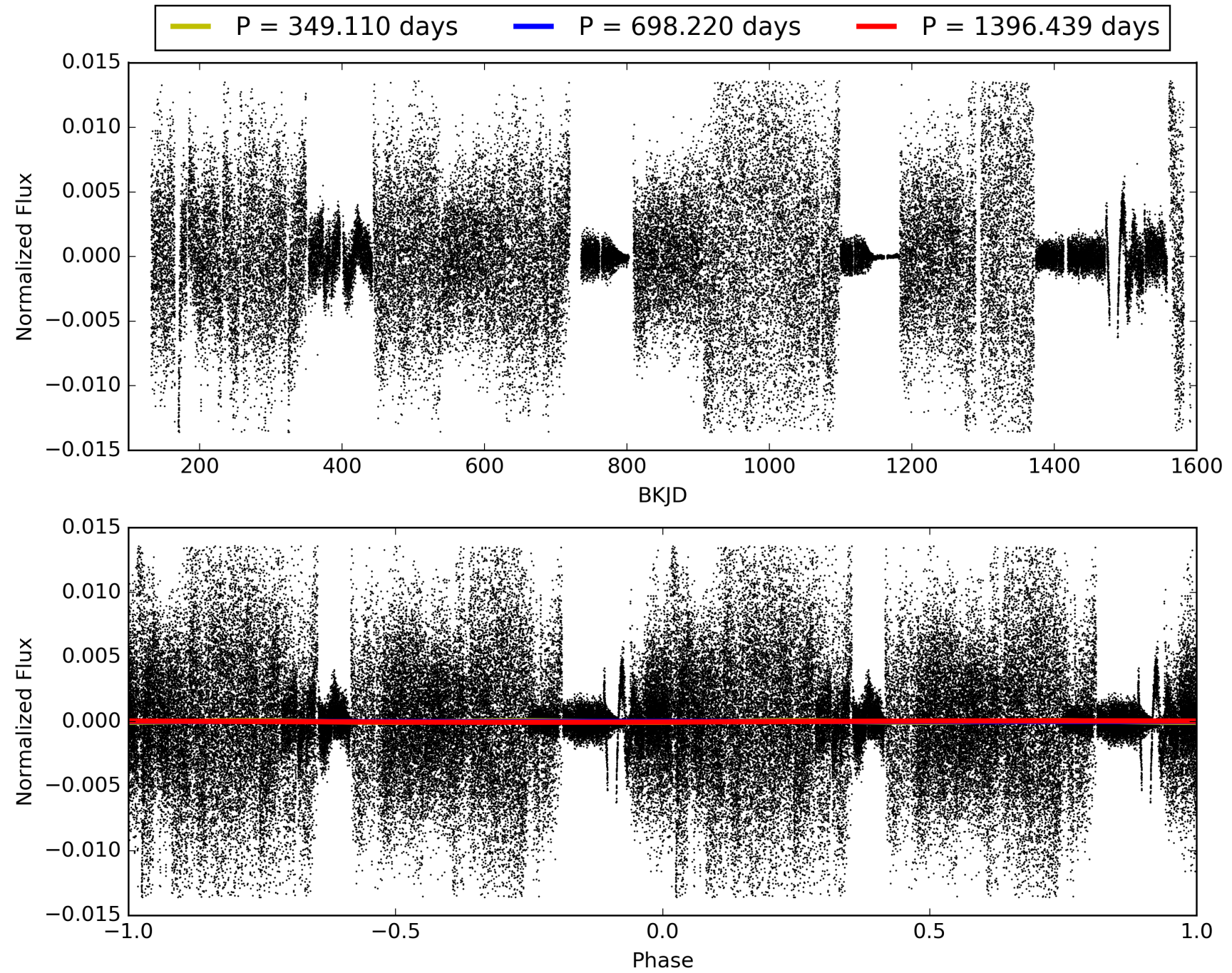
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [709.17 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 13.2%  
ModelChiSquareGof-sig: 99.3%  
Bootstrap-pfa: 1.37e-11  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: -0.4313  
Centroid-sig: 5.9%  
Centroid-so: 2.141 arcsec [1.49 $\sigma$ ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0 [0]  
KicOffset-st: 0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 1.00 [2/2]

# TCE 004048488-02, PDC Light Curves

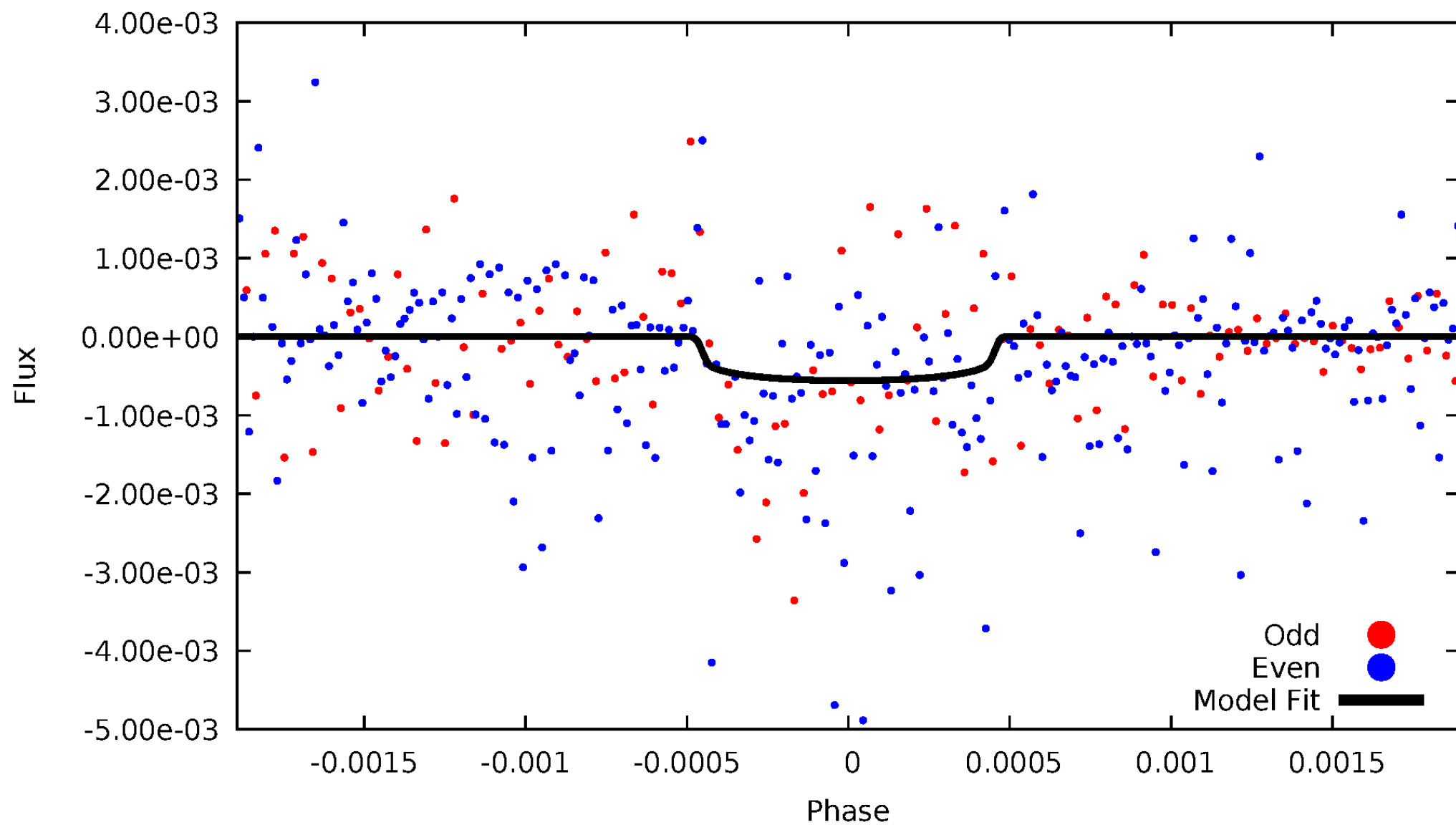


TCE 004048488-02



# DV Odd/Even

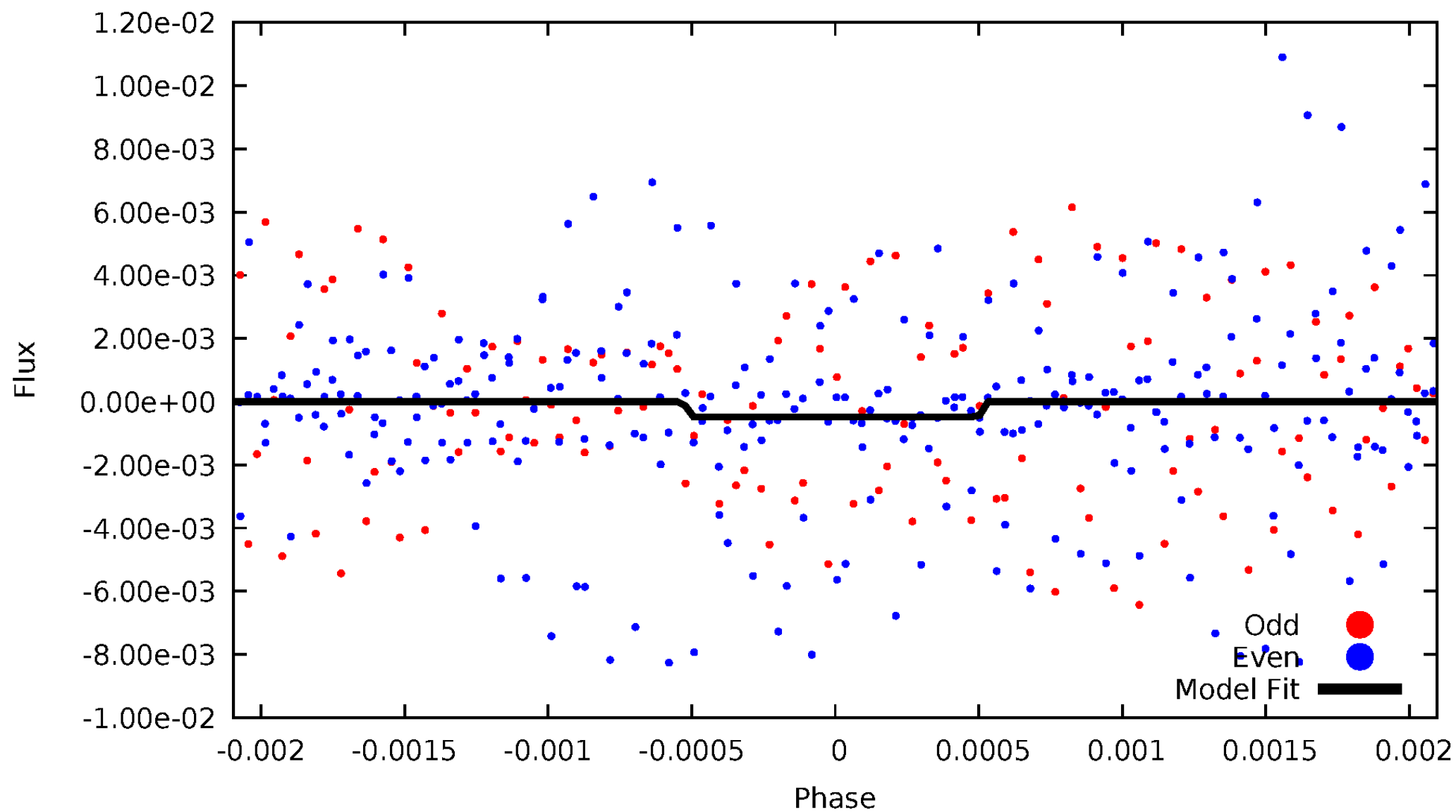
TCE 004048488-02





# ALT Odd/Even

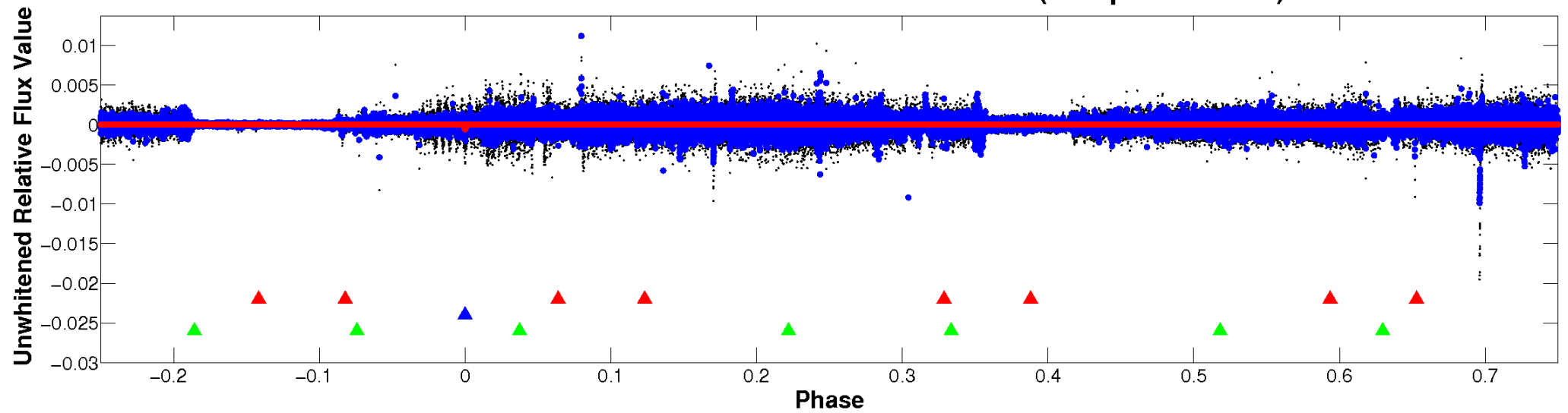
TCE 004048488-02



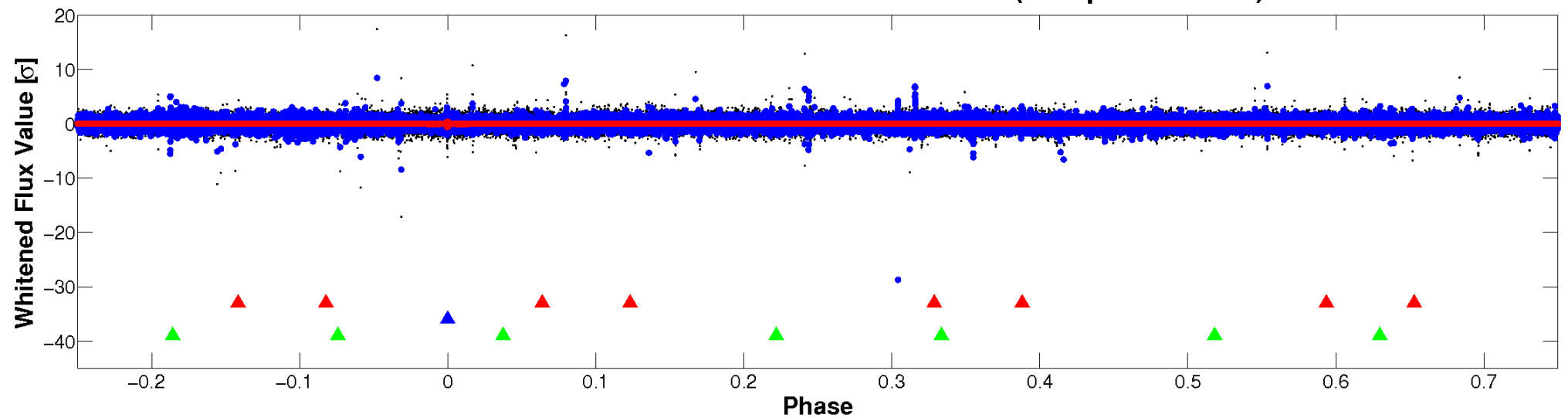


# Non-Whitened Vs. Whitened Light Curve

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

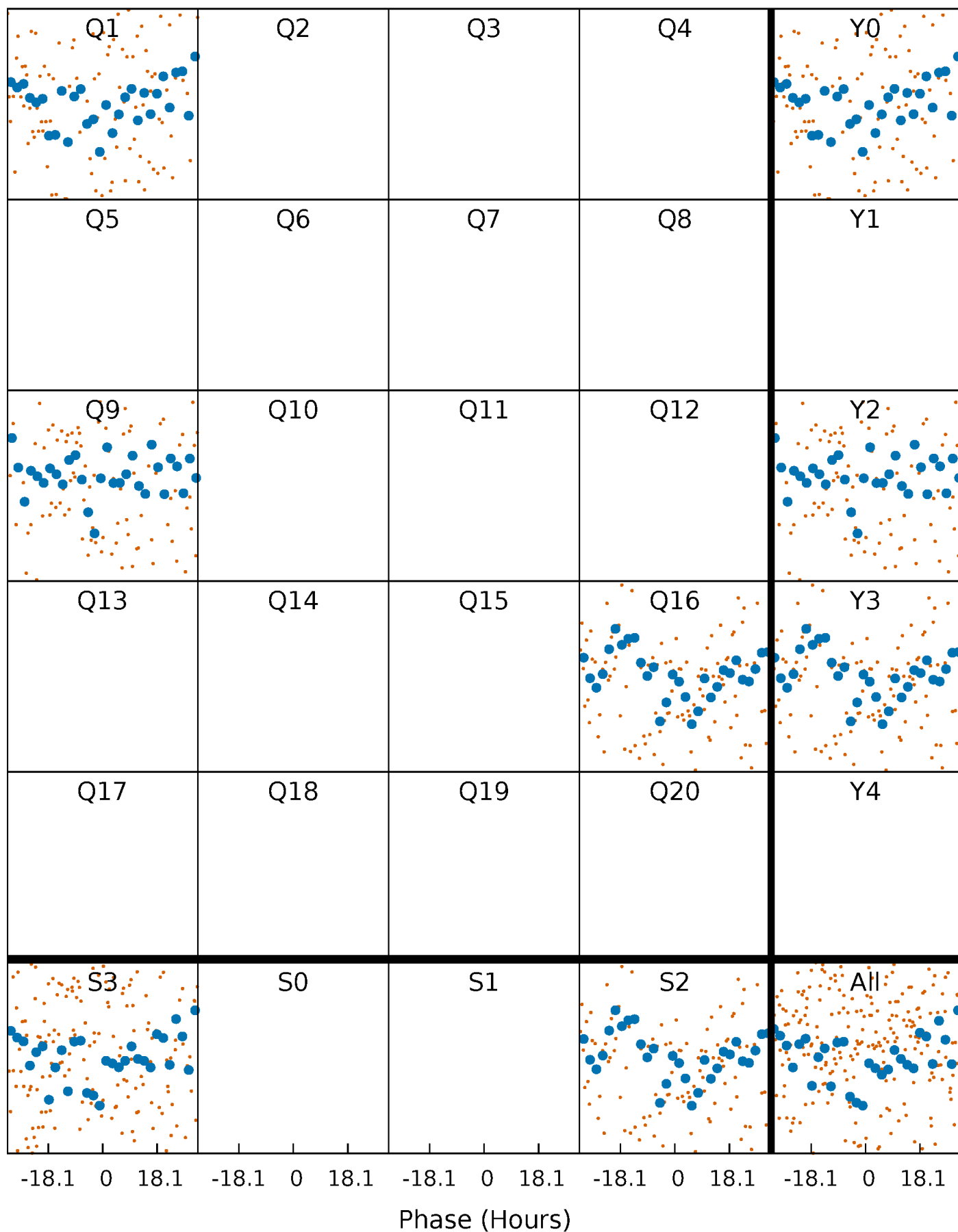


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



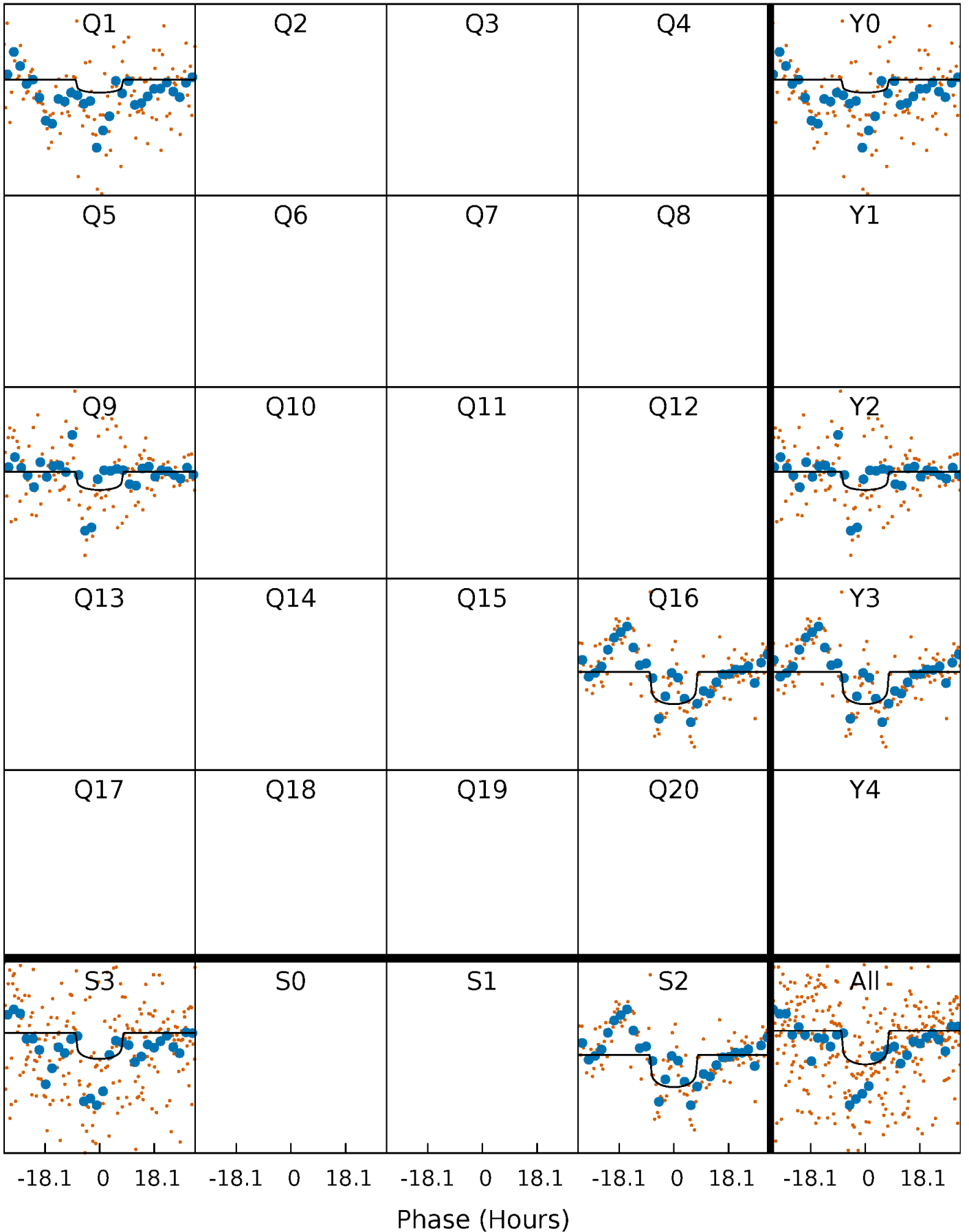
# PDC Quarter-Phased Transit Curves

TCE 004048488-02 P=698.219542 Days  $T_0=152.916747$  (BKJD)



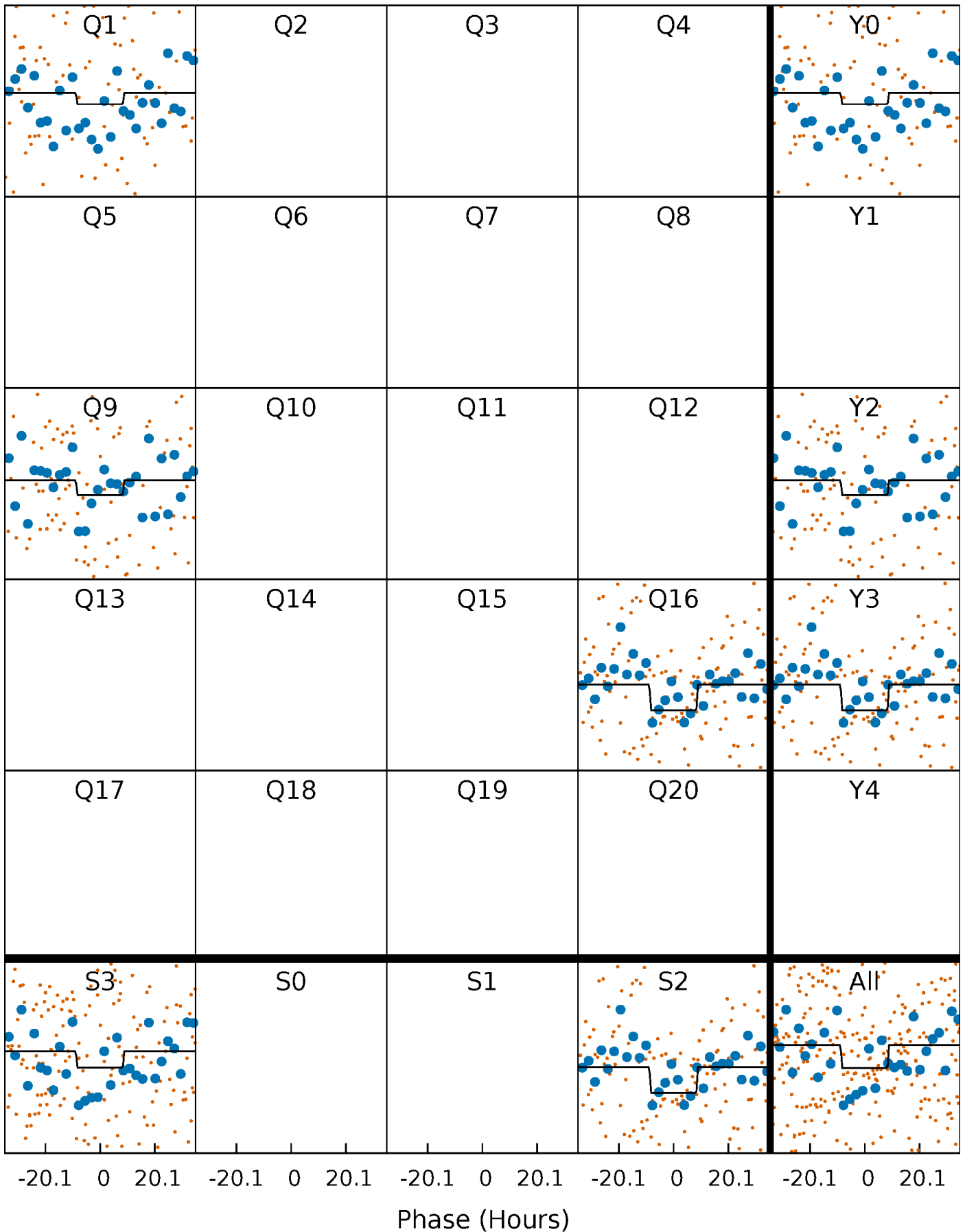
# DV Quarter-Phased Transit Curves

TCE 004048488-02     $P=698.219542$  Days     $T_0=152.916747$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

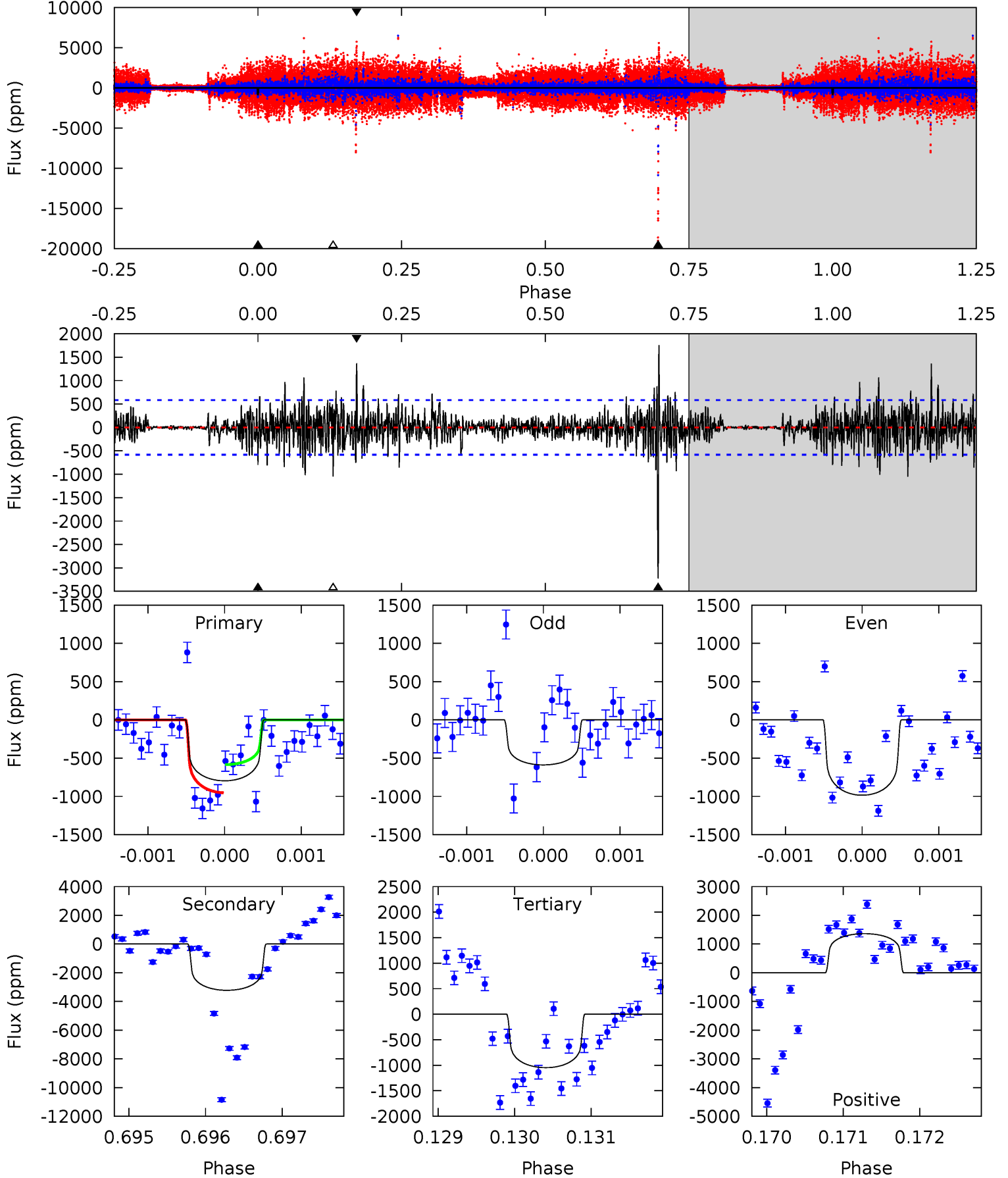
TCE 004048488-02 P=698.194312 Days  $T_0=153.025639$  (BKJD)



# DV Model-Shift Uniqueness Test

004048488-02, P = 698.219542 Days, E = 152.916747 Days

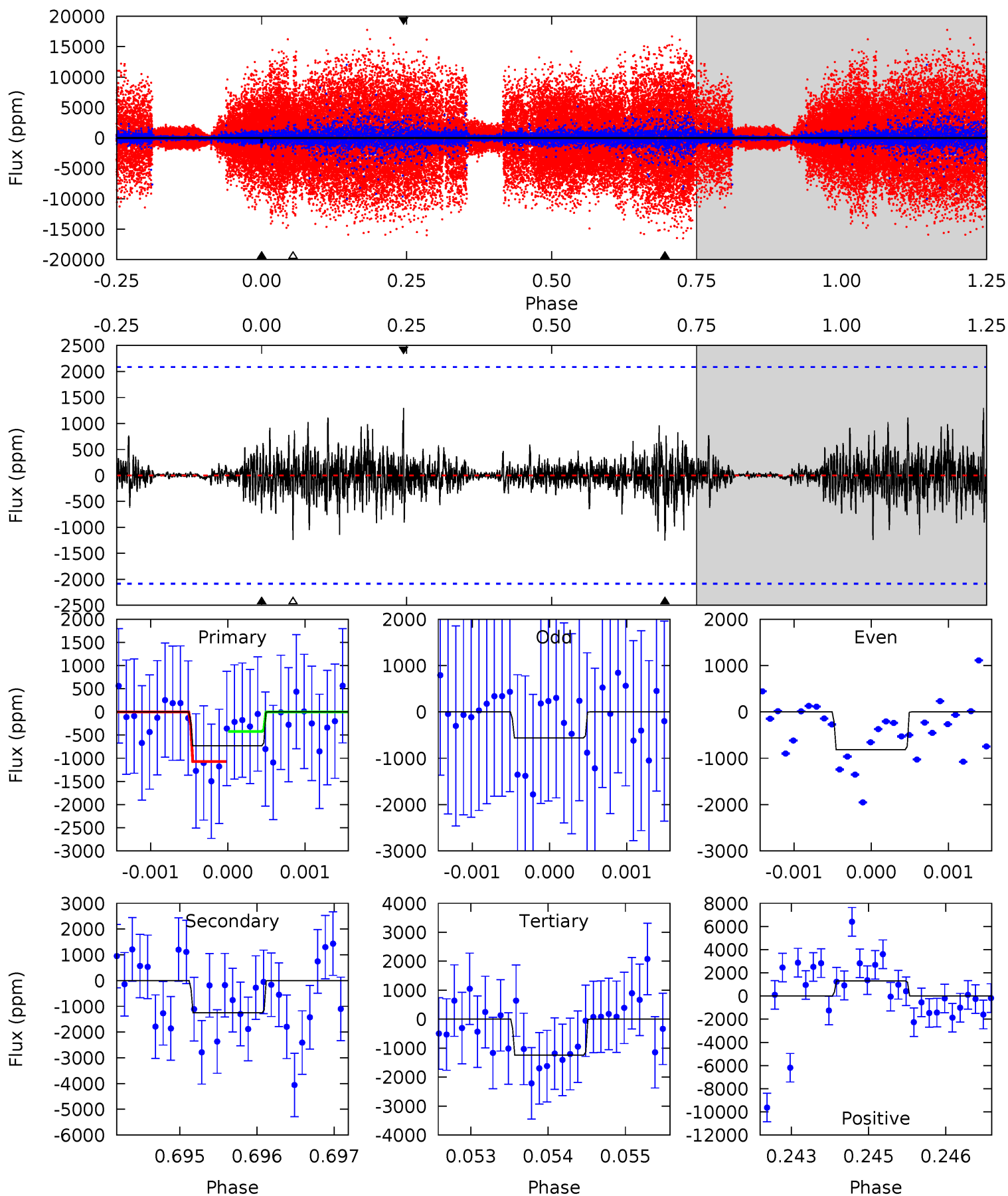
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.44 | 30.1 | 9.78 | 12.7 | 5.46            | 3.30            | 2.21             | -2.35   | -5.28   | 20.3    | 17.4    | 1.77    | 1.59 | 0.35  | 1.74 |



# Alt Model-Shift Uniqueness Test

004048488-02, P = 698.194312 Days, E = 153.025639 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.91 | 3.27 | 3.24 | 3.38 | 5.44            | 3.27            | 0.59             | -1.33   | -1.47   | 0.03    | -0.12   | 0.30    | 1.30 | 0.51  | 0.86 |



### Stellar Parameters For KIC 004048488

|        | $T_{\text{eff}} (K)$ | $\log(g)$                 | $[\text{Fe}/\text{H}]$     | $R (R_{\odot})$           | $M (M_{\odot})$           | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6137^{+389}_{-584}$ | $4.213^{+0.253}_{-0.184}$ | $-0.140^{+0.300}_{-0.300}$ | $1.332^{+0.439}_{-0.439}$ | $1.057^{+0.214}_{-0.214}$ | $0.630^{+1.164}_{-0.319}$                 |
|        | +6%/-10%             | +6%/-4%                   | +214%/-214%                | +33%/-33%                 | +20%/-20%                 | +185%/-51%                                |
| 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 004048488-02 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$    | $A_{\text{obs}}$             |
|---------|-----------------|------------------------|----------------------|-------------------------|------------------------------|
| DV      | $-3223 \pm 107$ | $3.29^{+1.32}_{-1.18}$ | $342^{+38}_{-39}$    | $10481^{+4766}_{-2242}$ | $415018^{+570838}_{-207413}$ |
| Alt.    | $-1253 \pm 383$ | $3.12^{+1.51}_{-1.31}$ | $344^{+39}_{-42}$    | $7859^{+3408}_{-1685}$  | $168899^{+341514}_{-95638}$  |

$T_{\text{max}}$  = 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

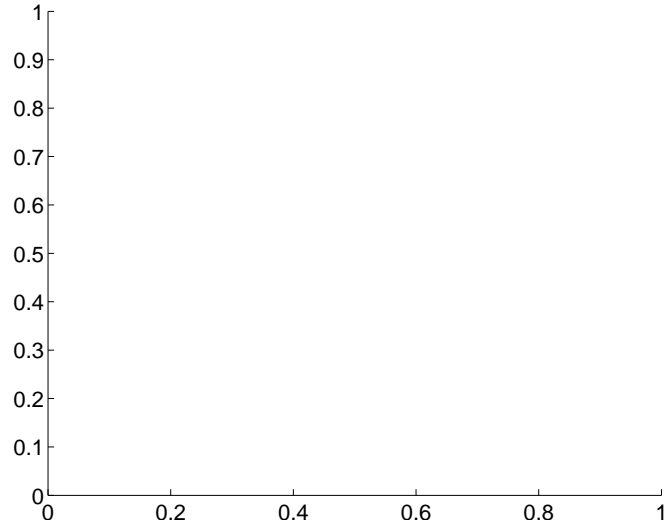
Supplemental centroid analysis for 004048488-02. **Kepler magnitude: 11.61.** Transit SNR 4.28

**There are 0 quarters with good PRF difference image offsets**

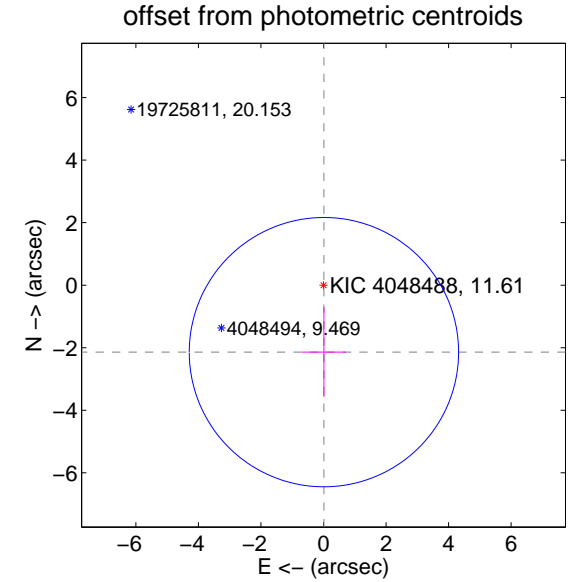
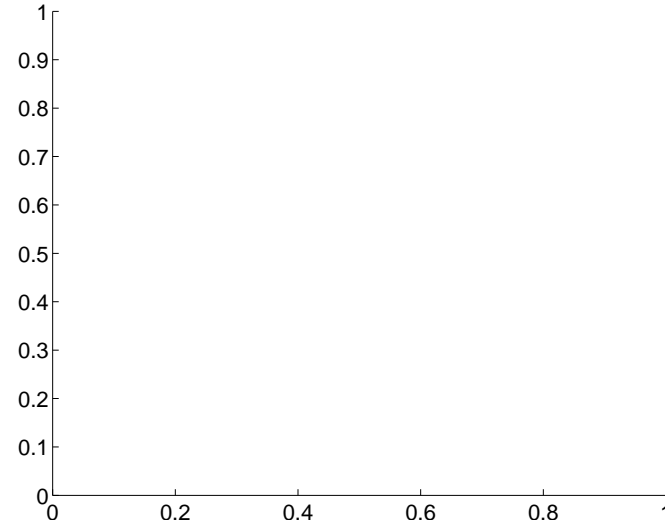
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA      | $\Delta$ Dec     |
|---|--------------------|---------------------|------------------|------------------|
| PRF-fit source offset from OOT          | —                  | —                   | —                | —                |
| PRF-fit source offset from KIC position | —                  | —                   | —                | —                |
| photometric centroid source offset      | $2.14 \pm 1.44$    | 1.49                | $-0.01 \pm 0.70$ | $-2.14 \pm 1.44$ |

There is no PRF-fit offset from OOT-fit



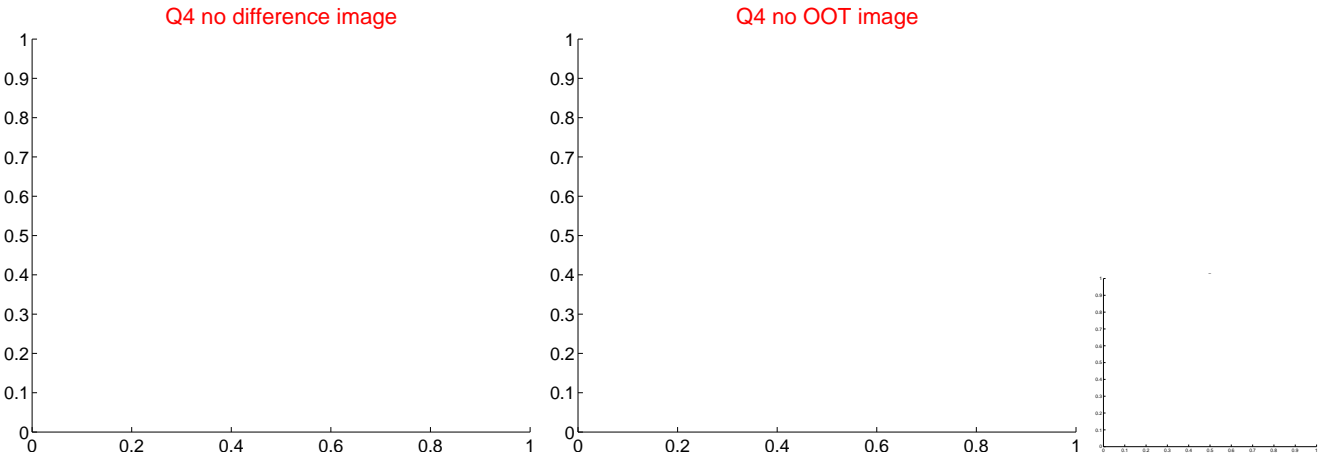
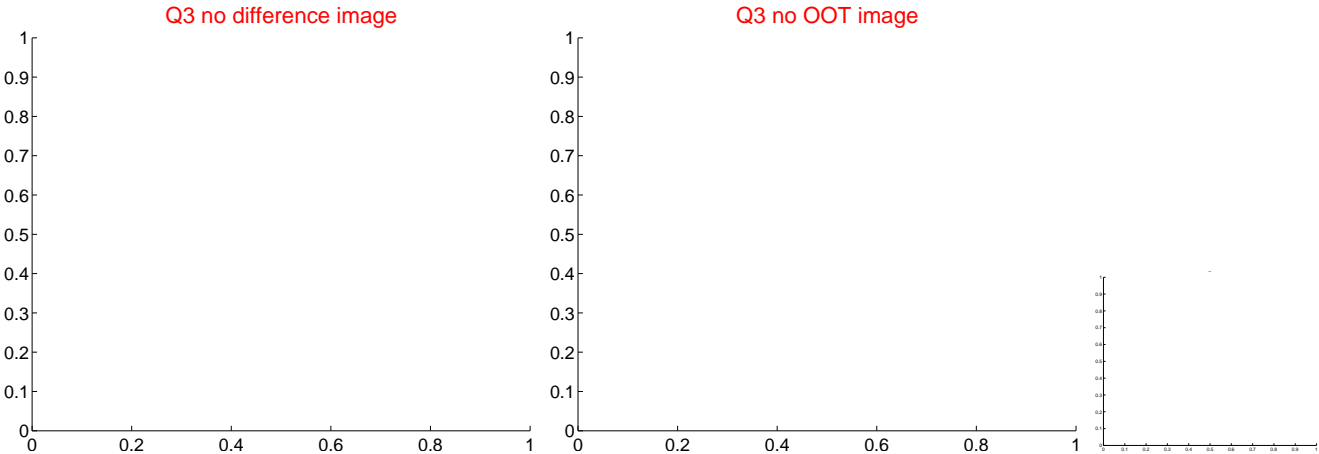
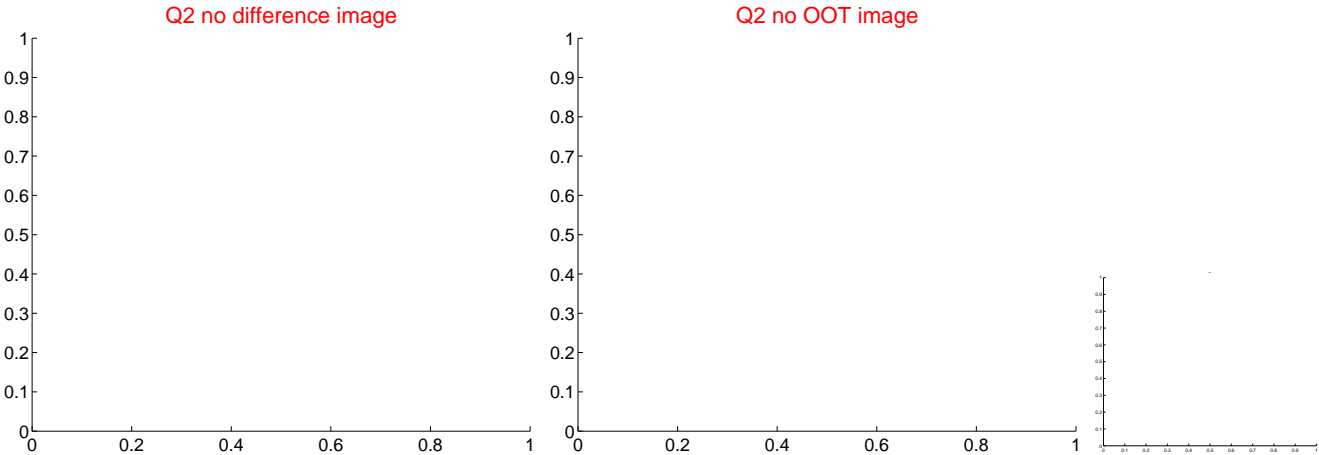
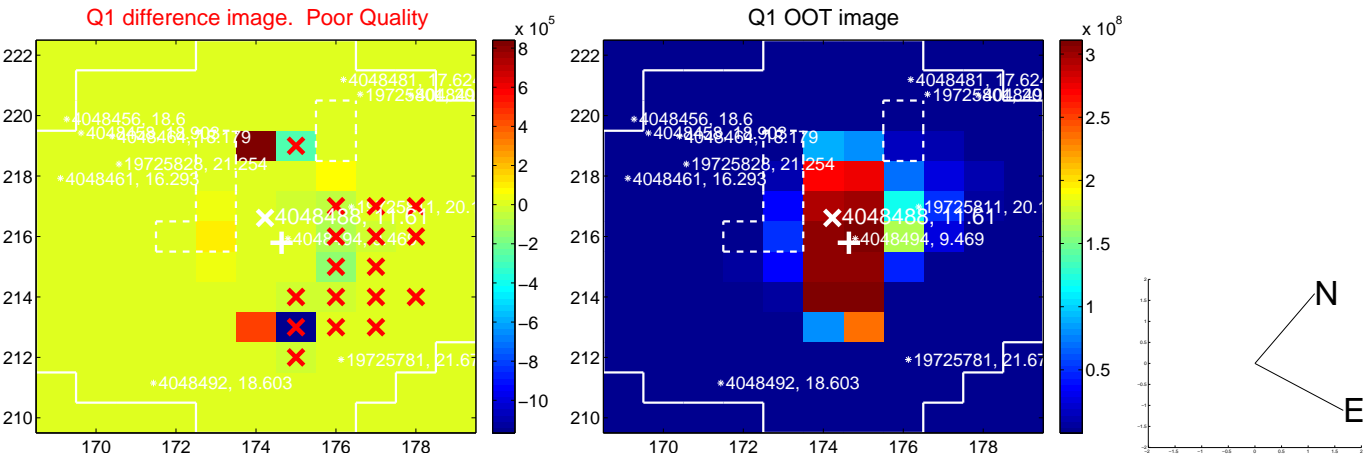
There is no PRF-fit offset from KIC



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



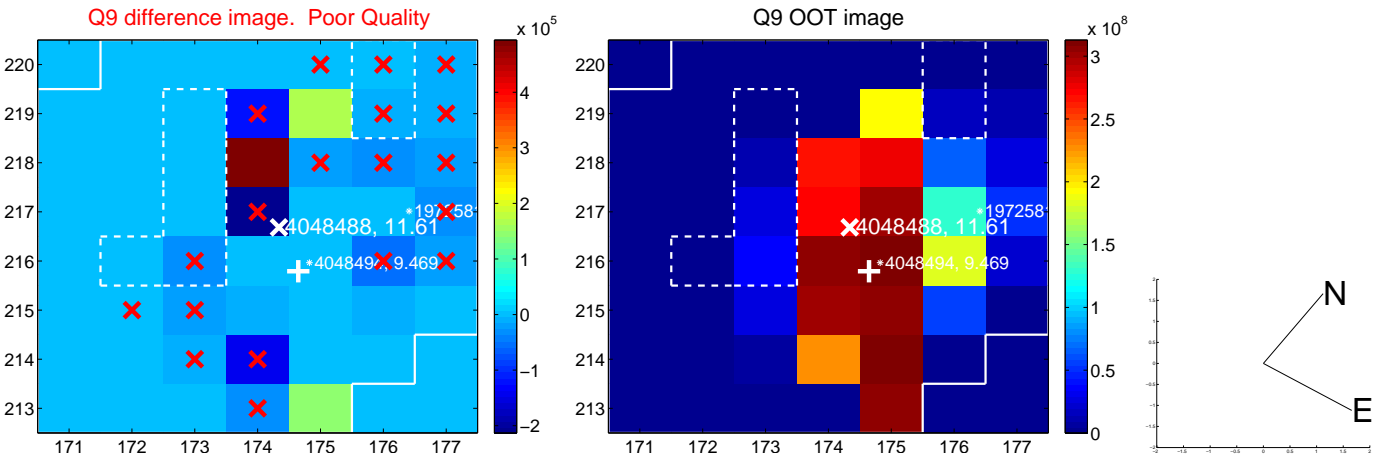
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



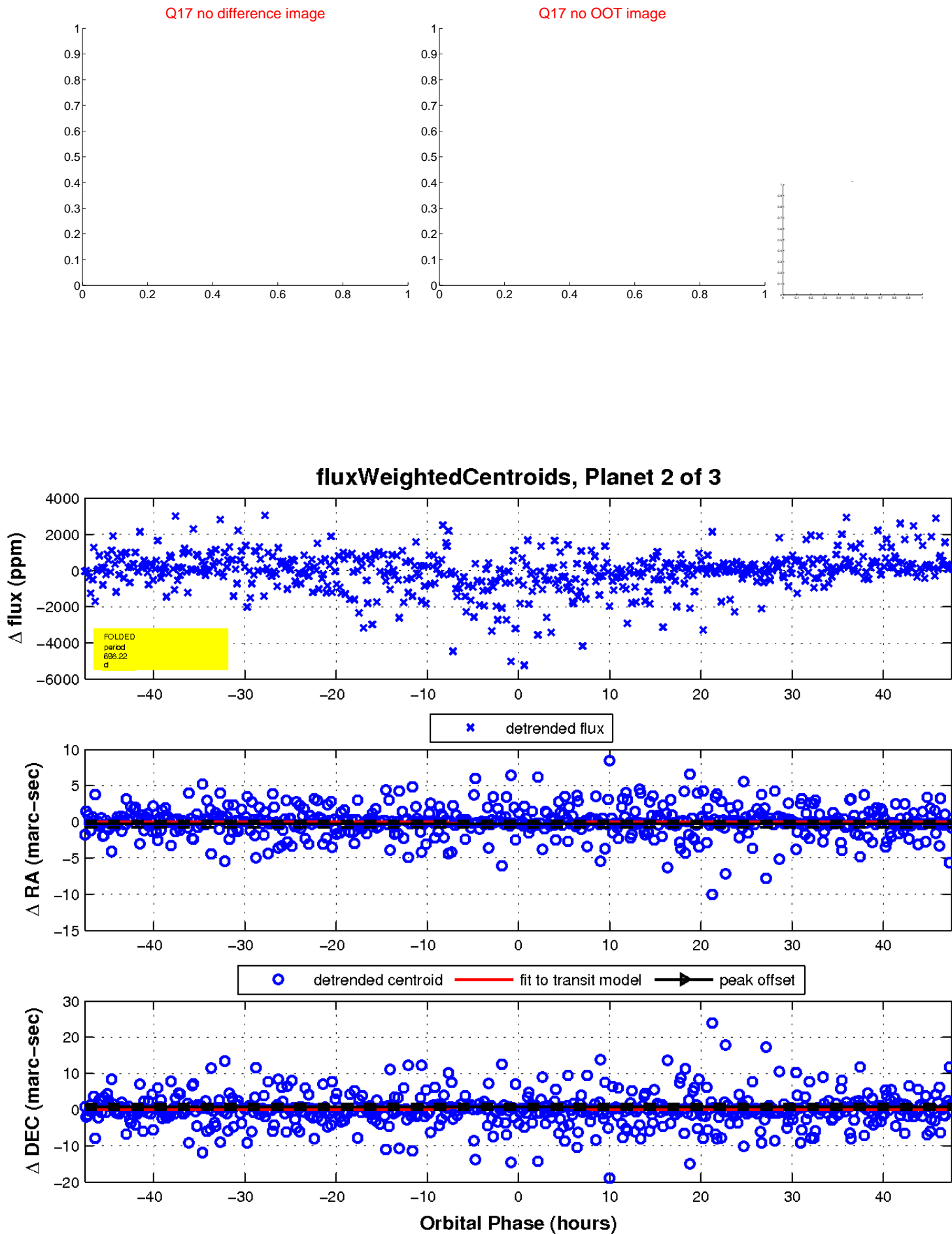
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



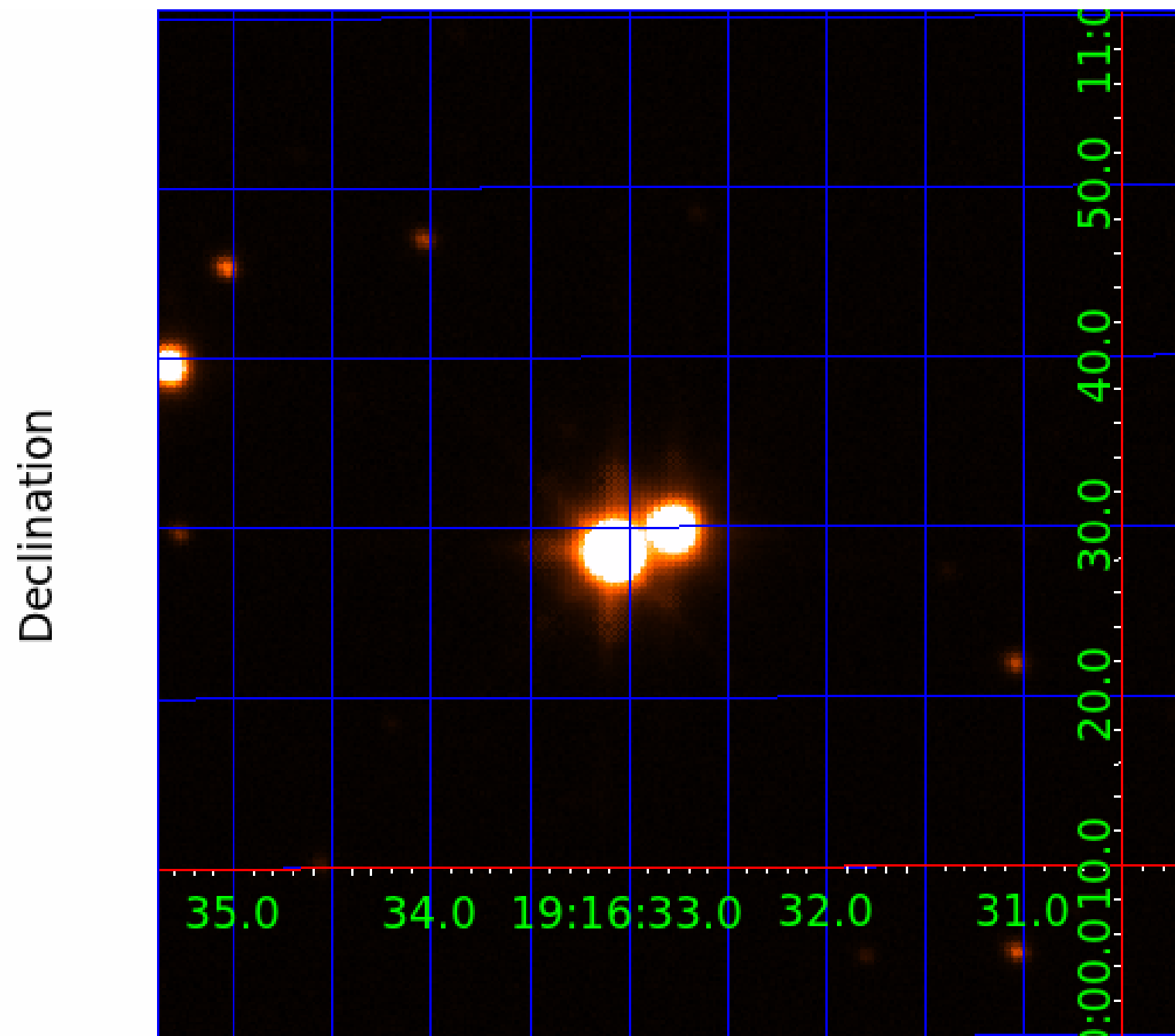
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 004048488

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004048488-01 | OBS      | No   | 184.917132    | 197.518875   | 528.9       | 2.160            | 14.4 | 9.7 | 1.33                        | 6137            | 3.27                   | 5.38                   |
| 004048488-02 | OBS      | No   | 698.219542    | 152.916747   | 558.9       | 15.865           | 10.8 | 4.3 | 1.33                        | 6137            | 3.32                   | 0.92                   |
| 004048488-03 | OBS      | No   | 206.772297    | 179.032648   | 185.9       | 4.991            | 7.4  | 8.1 | 1.33                        | 6137            | 2.11                   | 4.64                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004048488-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 004048488-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_ZUMA—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS                  |
| 004048488-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—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.

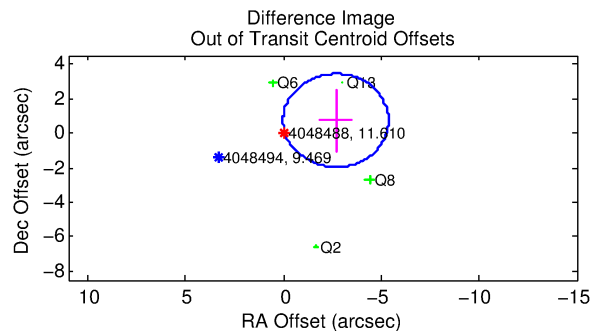
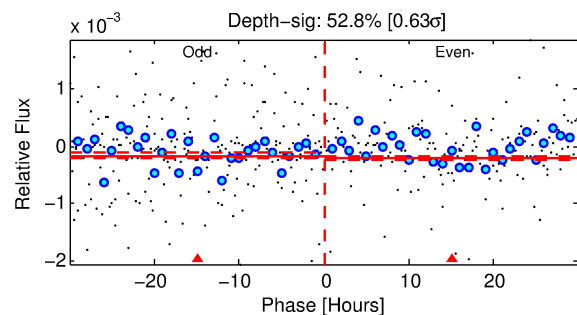
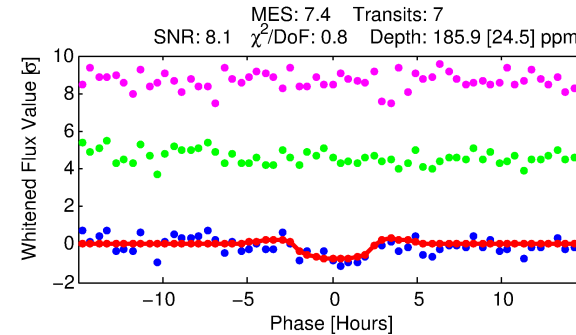
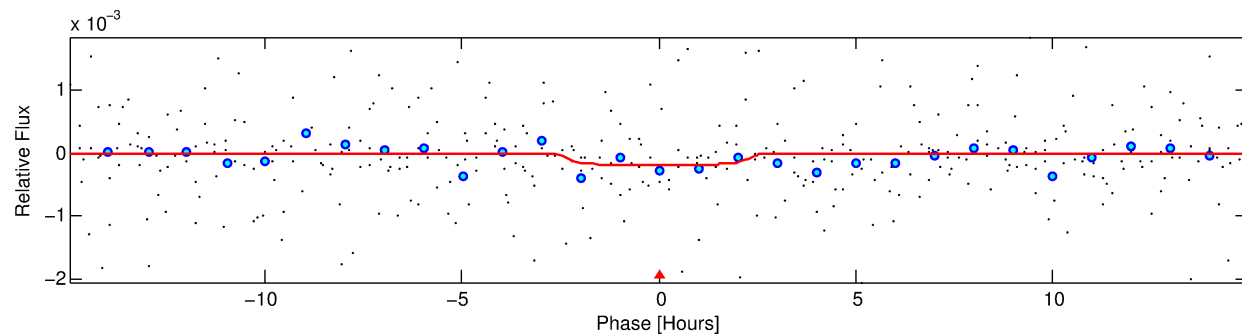
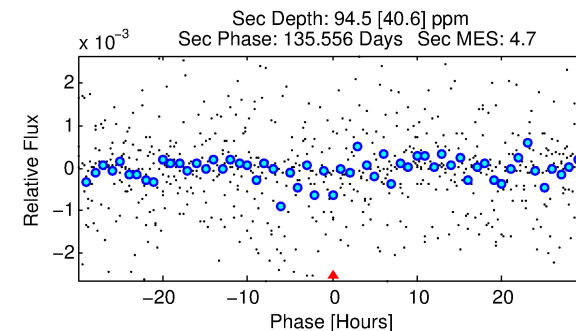
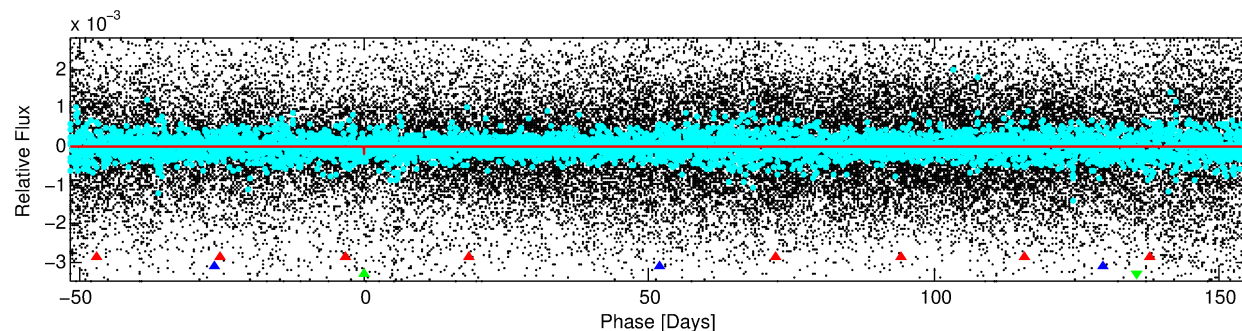
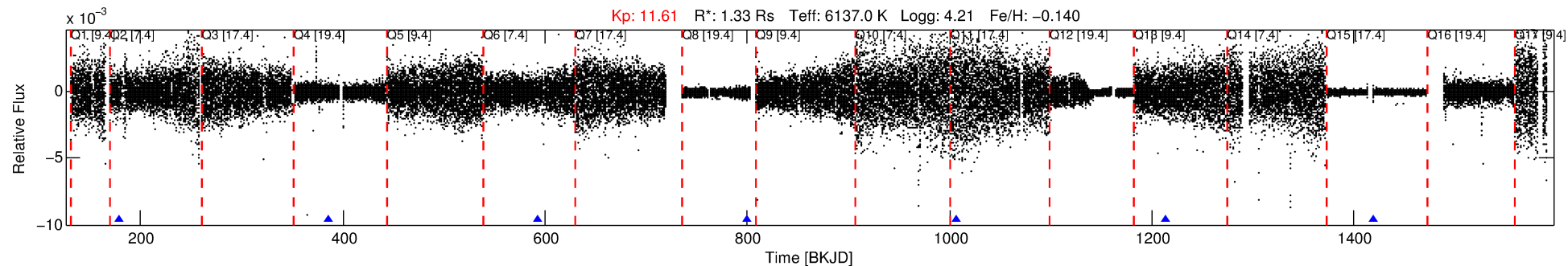
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004048488-03

No Significant Match Found

# DV One-Page Summary

KIC: 4048488 Candidate: 3 of 3 Period: 206.772 d



## DV Fit Results:

Period = 206.77230 [0.00371] d  
Epoch = 179.0326 [0.0152] BKJD  
Rp/R\* = 0.0145 [0.0134]  
a/R\* = 155.98 [747.94]  
b = 0.89 [1.18]  
Seff = 4.64 [2.72]  
Teq = 374 [55] K  
Rp = 2.11 [2.06] Re  
a = 0.6972 [0.2044] AU  
Ag = 5668.00 [10999.28] [0.52σ]  
Teffp = 5020 [2418] K [1.92σ]

## DV Diagnostic Results:

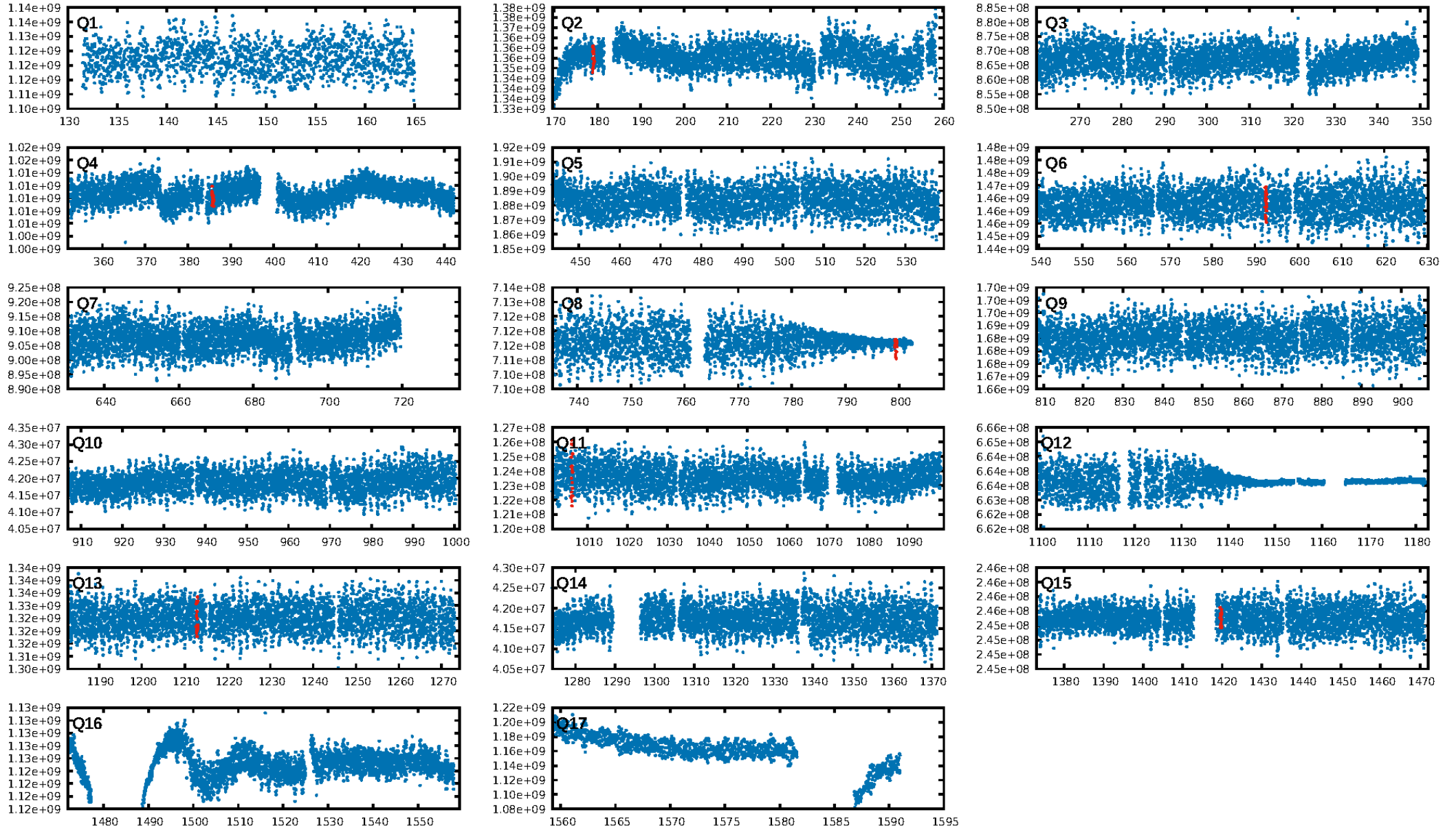
ShortPeriod-sig: 100.0% [96.44σ]  
LongPeriod-sig: 100.0% [709.17σ]  
ModelChiSquare2-sig: 96.6%  
ModelChiSquareGof-sig: 99.9%  
**Bootstrap-pfa: 4.19e-08**  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -1.872  
**Centroid-sig: 0.0%**  
Centroid-so: 9.113 arcsec [2.48σ]  
**OotOffset-rm: 2.773 arcsec [3.09σ]**  
OotOffset-st: 2/0/1/1 [4]  
KicOffset-rm: 2.019 arcsec [0.86σ]  
KicOffset-st: 2/0/1/1 [4]  
DiffImageQuality-fgm: 0.00 [0/4]  
DiffImageOverlap-fno: 1.00 [6/6]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 02:46:02 Z

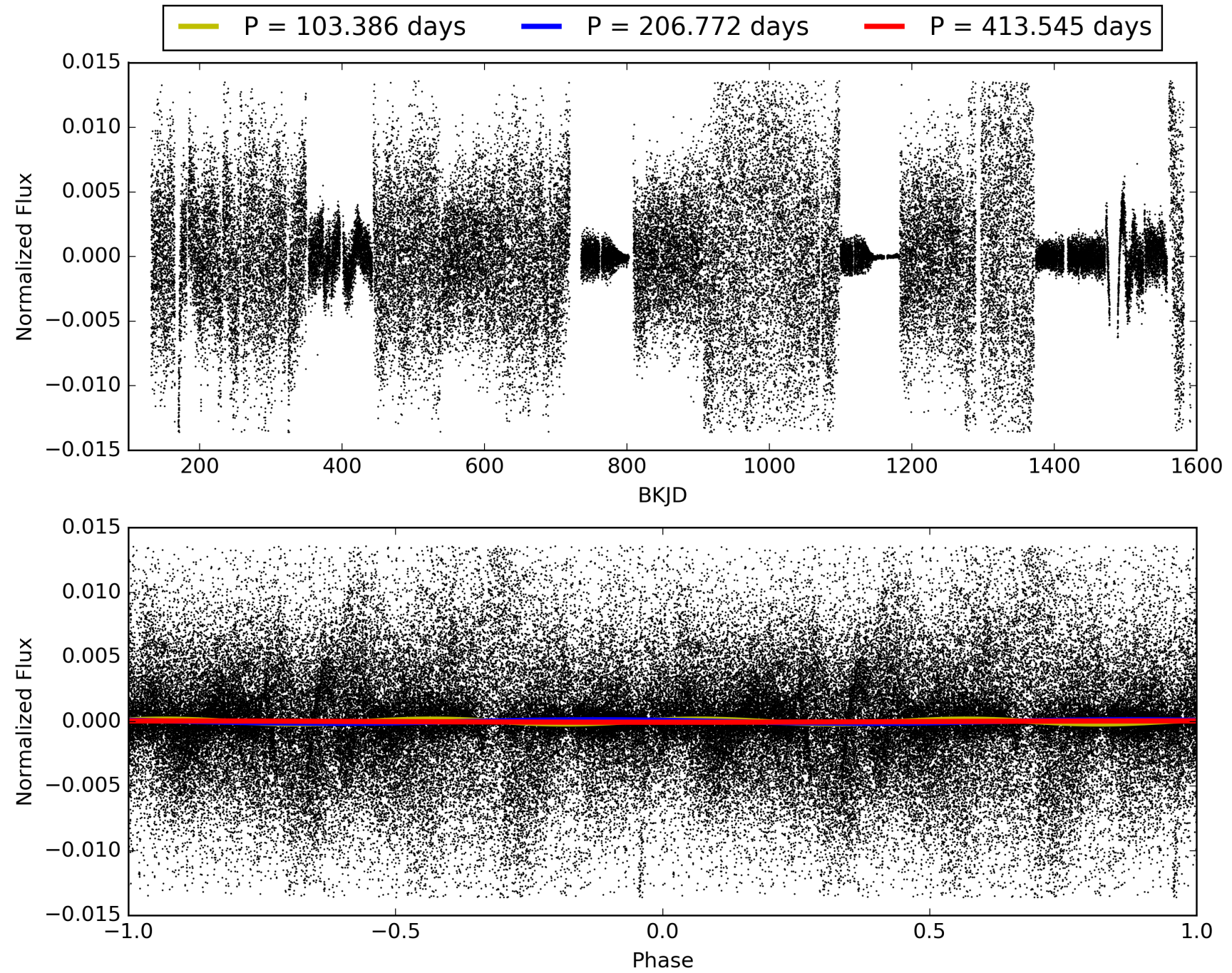
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 004048488-03, PDC Light Curves

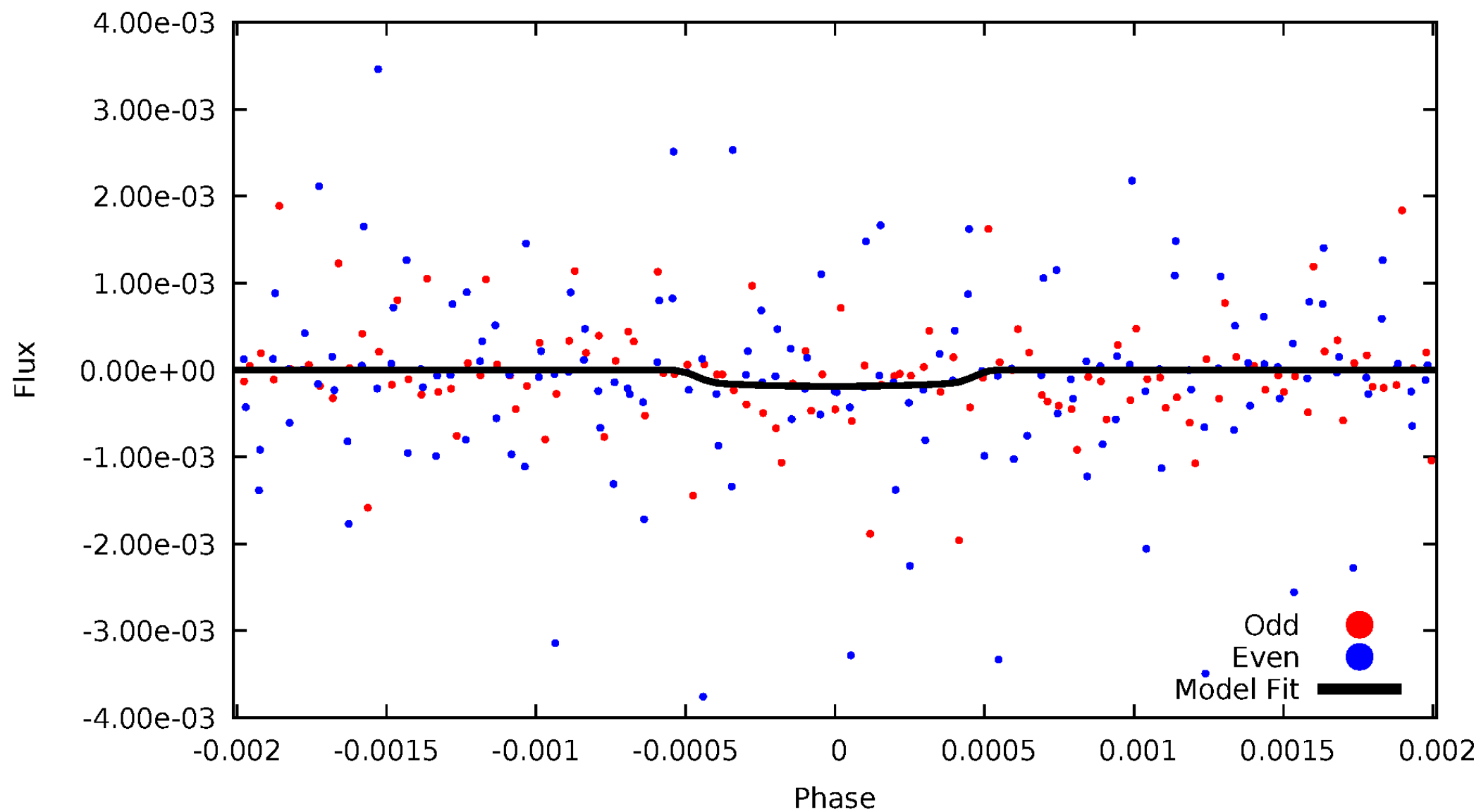


TCE 004048488-03



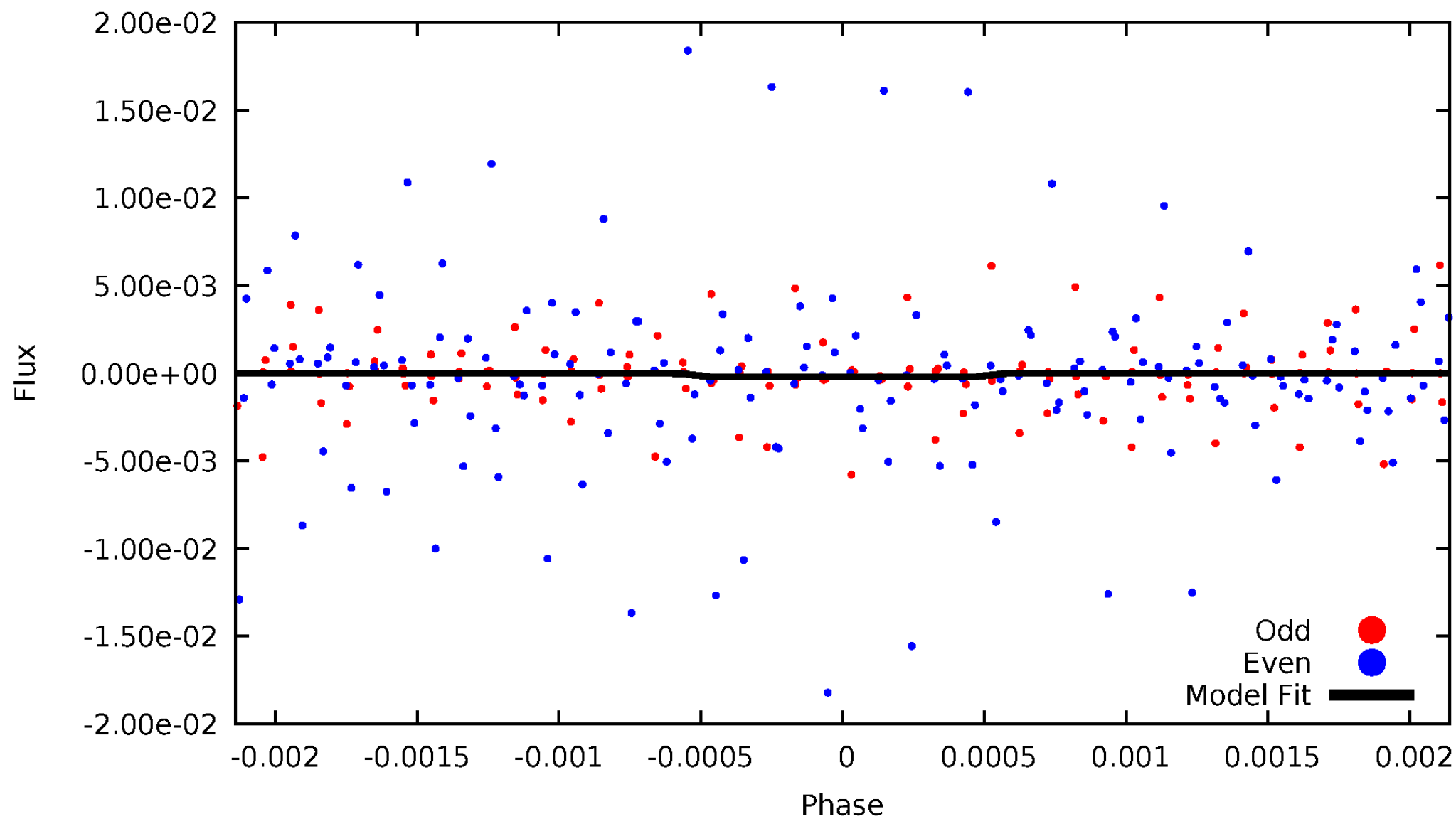
# DV Odd/Even

TCE 004048488-03



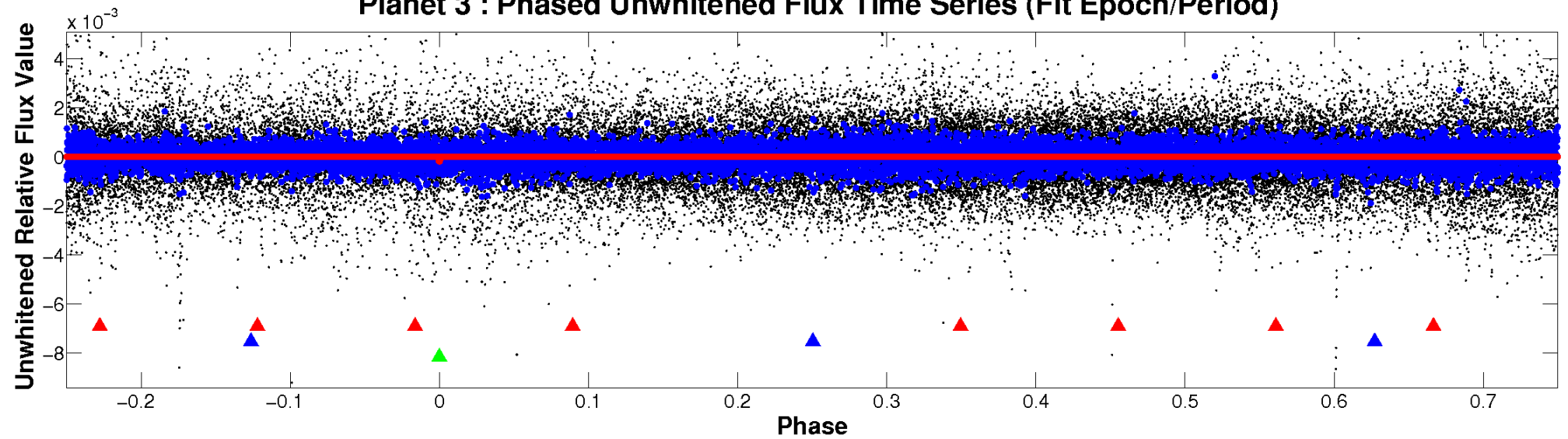
# ALT Odd/Even

TCE 004048488-03

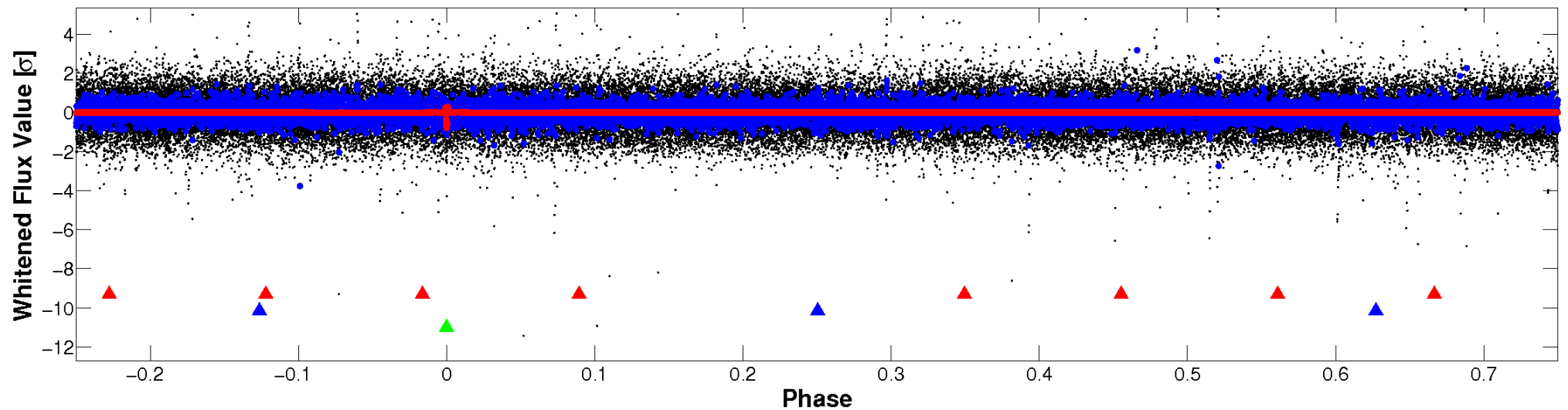


# Non-Whitened Vs. Whitened Light Curve

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

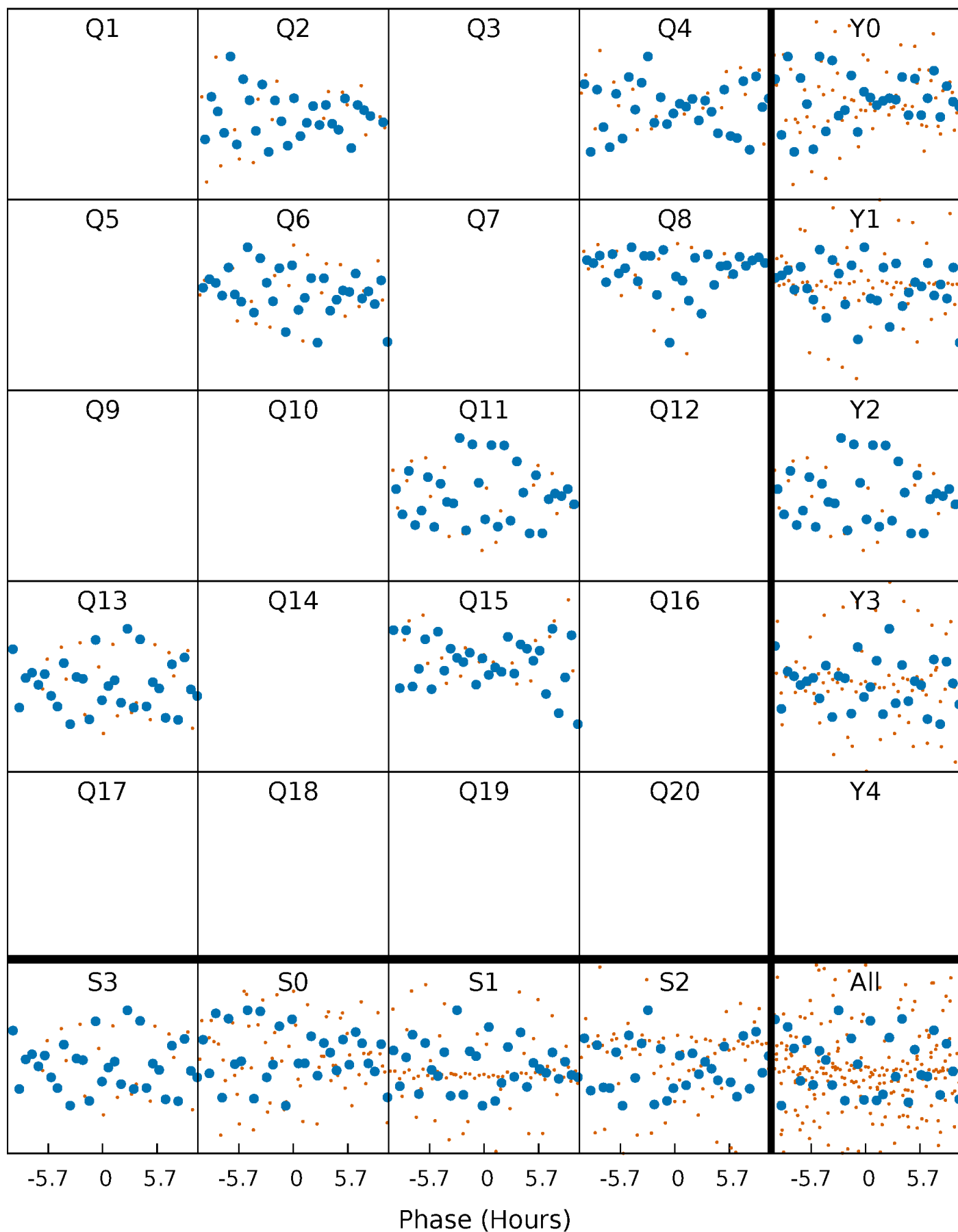


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

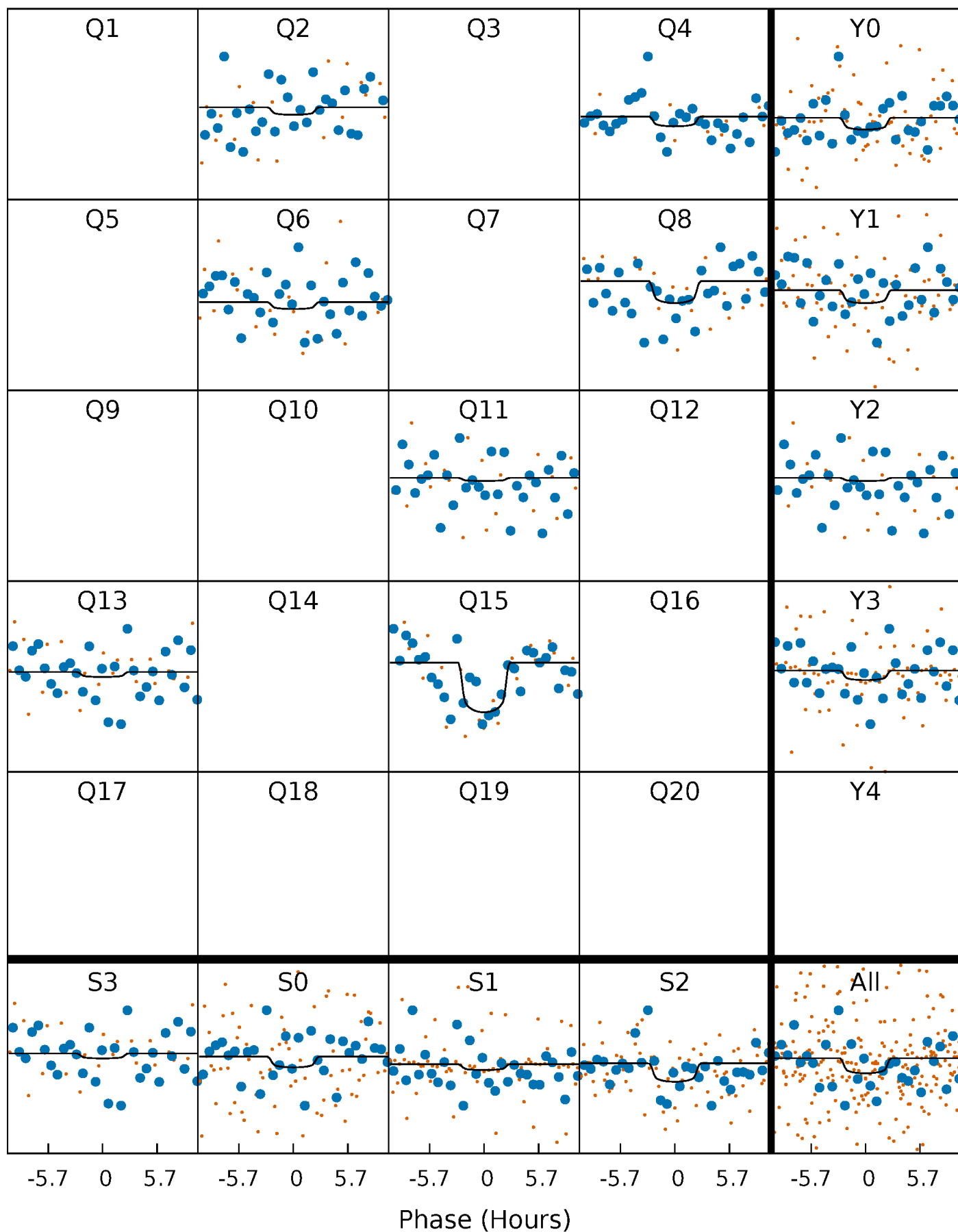
TCE 004048488-03 P=206.772297 Days  $T_0=179.032648$  (BKJD)





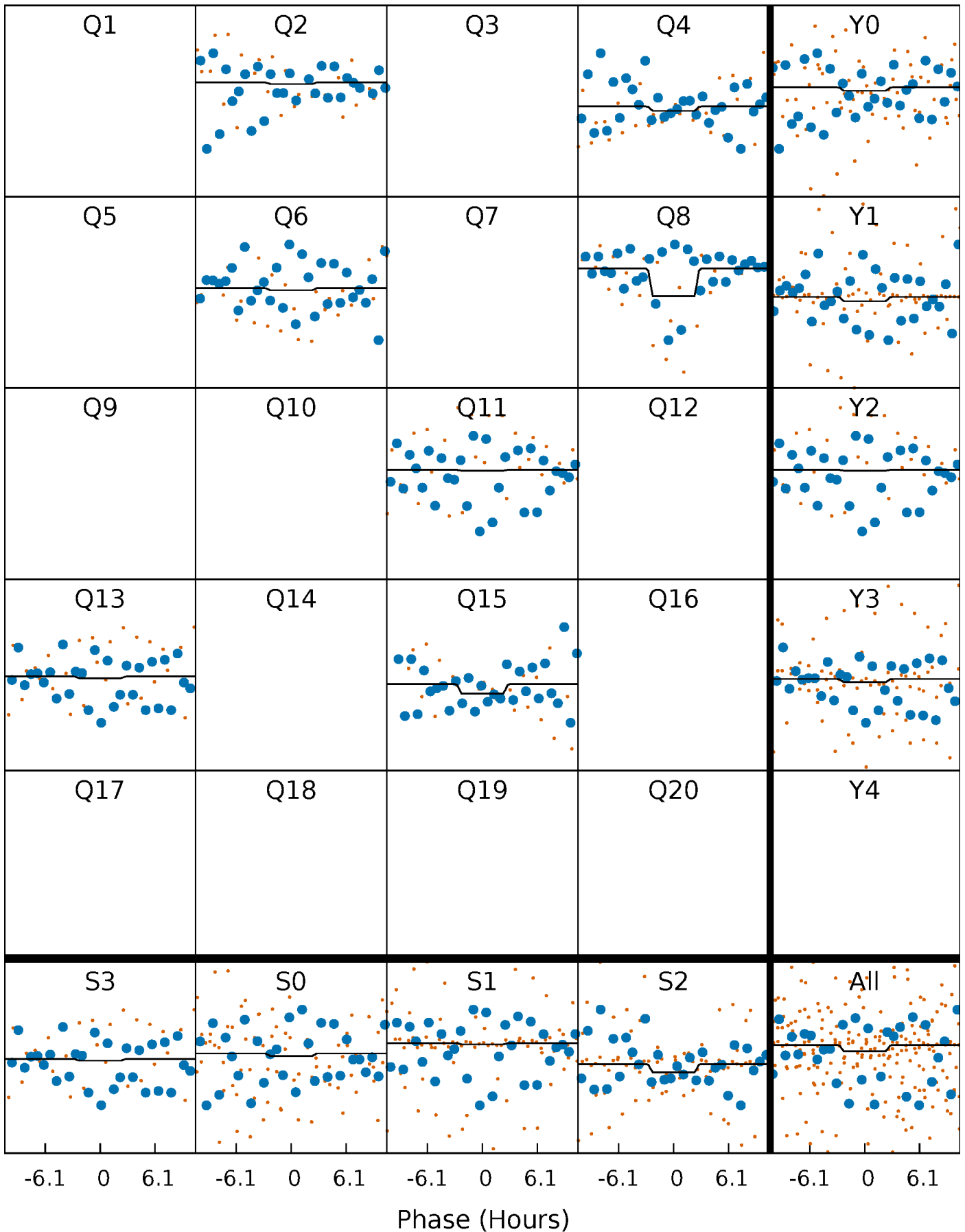
# DV Quarter-Phased Transit Curves

TCE 004048488-03     $P=206.772297$  Days     $T_0=179.032648$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004048488-03     $P=206.768624$  Days     $T_0=179.048614$  (BKJD)

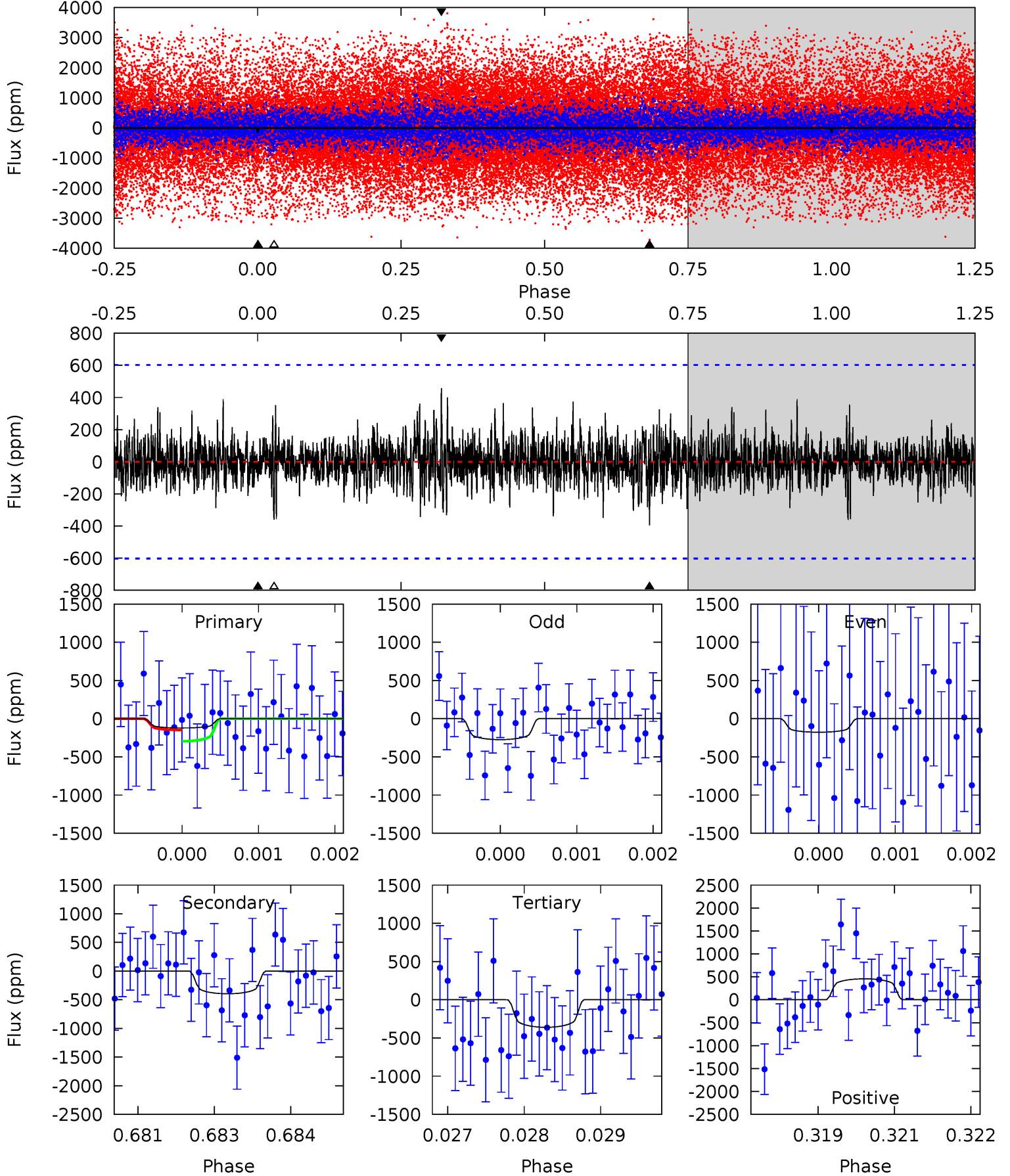




# DV Model-Shift Uniqueness Test

004048488-03, P = 206.772297 Days, E = 179.032648 Days

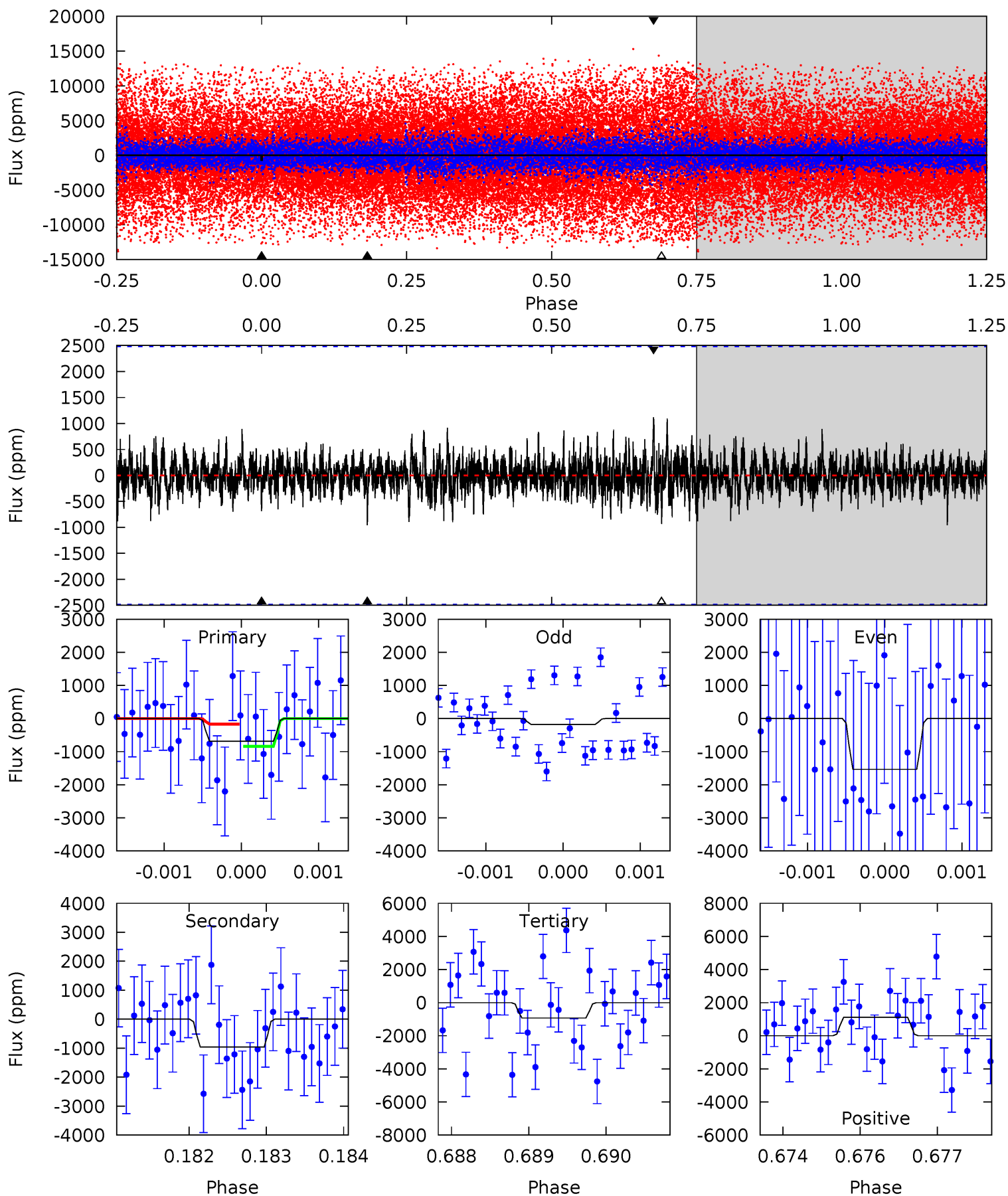
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.09 | 3.57 | 3.25 | 4.12 | 5.44            | 3.27            | 0.90             | -2.16   | -3.03   | 0.32    | -0.55   | 0.46    | 1.19 | 0.54  | 0.68 |



# Alt Model-Shift Uniqueness Test

004048488-03, P = 206.768624 Days, E = 179.048614 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.50 | 2.09 | 2.03 | 2.44 | 5.43            | 3.26            | 0.53             | -0.53   | -0.93   | 0.06    | -0.35   | 1.52    | 1.70 | 0.54  | 0.75 |



### Stellar Parameters For KIC 004048488

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6137^{+389}_{-584}$ | $4.213^{+0.253}_{-0.184}$ | $-0.140^{+0.300}_{-0.300}$ | $1.332^{+0.439}_{-0.439}$ | $1.057^{+0.214}_{-0.214}$ | $0.630^{+1.164}_{-0.319}$                     |
|        | +6%/-10%             | +6%/-4%                   | +214%/-214%                | +33%/-33%                 | +20%/-20%                 | +185%/-51%                                    |
| 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 004048488-03 / KOI

| Detrend | Depth (ppm)    | $R_p$ ( $R_{\oplus}$ ) | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)    | $A_{\text{obs}}$           |
|---------|----------------|------------------------|----------------------|-------------------------|----------------------------|
| DV      | $-395 \pm 111$ | $2.40^{+1.81}_{-1.54}$ | $515^{+56}_{-61}$    | $6562^{+6820}_{-1616}$  | $17489^{+116329}_{-11720}$ |
| Alt.    | $-958 \pm 458$ | $2.32^{+1.79}_{-1.43}$ | $520^{+56}_{-64}$    | $8405^{+11473}_{-2541}$ | $41381^{+283830}_{-29085}$ |

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

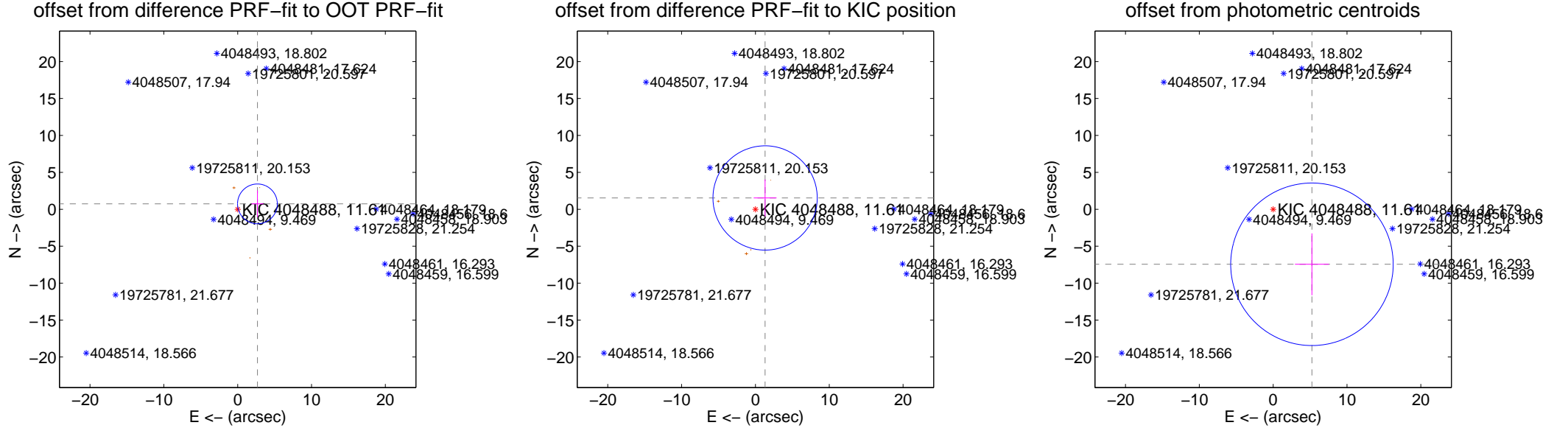
## DV Centroid Data

Supplemental centroid analysis for 004048488-03. **Kepler magnitude: 11.61.** Transit SNR 8.06

**There are 0 quarters with good PRF difference image offsets**

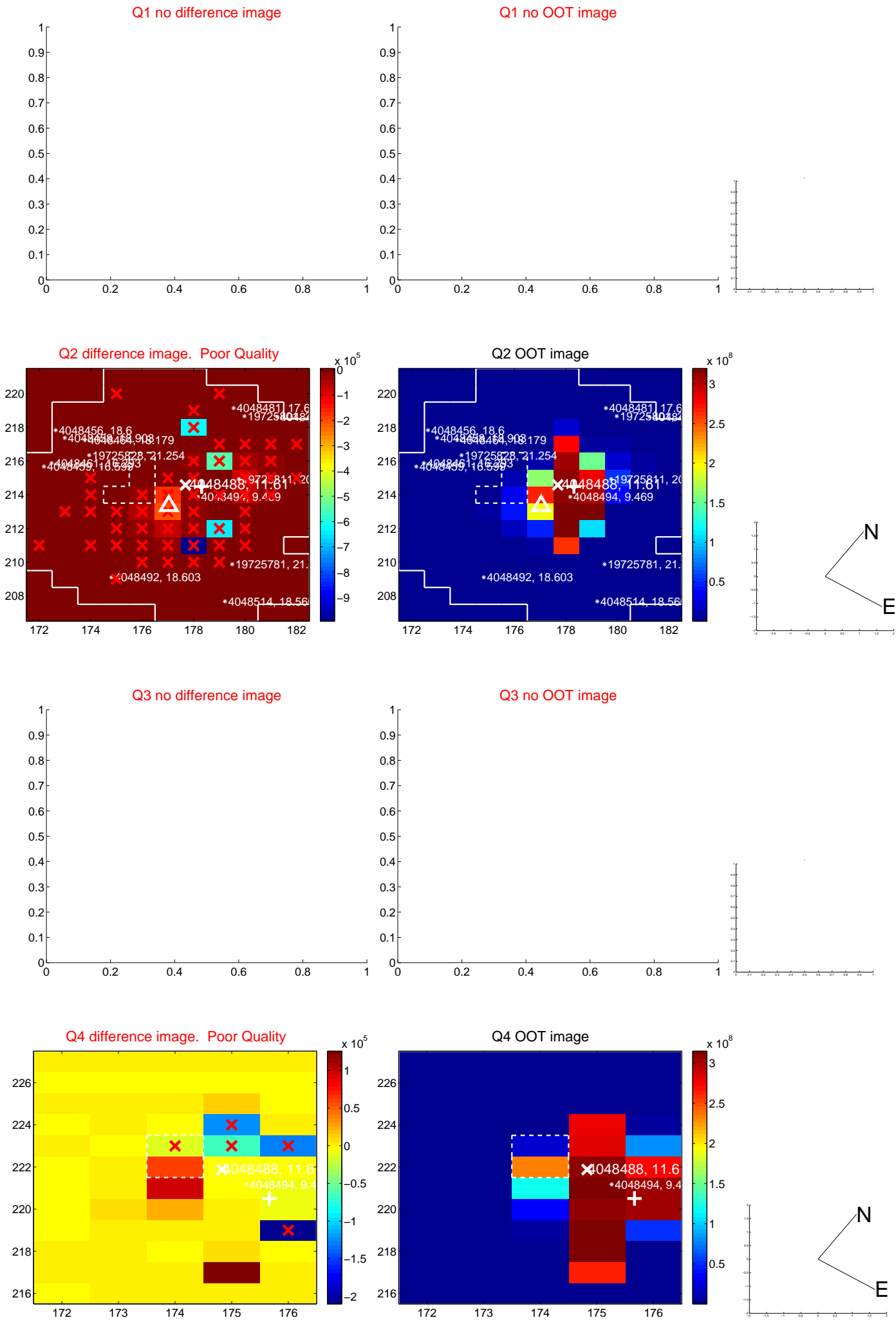
The direct PRF centroid is offset from the target star catalog position by about 1.38 arcsec

|   | Distance in arcsec                  | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec      |
|---|-------------------------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT          | <b>2.773 <math>\pm</math> 0.898</b> | <b>3.09</b>         | -2.674 $\pm$ 0.812 | 0.732 $\pm$ 1.809 |
| PRF-fit source offset from KIC position | 2.019 $\pm$ 2.354                   | 0.86                | -1.312 $\pm$ 1.549 | 1.535 $\pm$ 2.504 |
| photometric centroid source offset      | 9.11 $\pm$ 3.67                     | 2.48                | -5.25 $\pm$ 2.30   | -7.45 $\pm$ 4.18  |

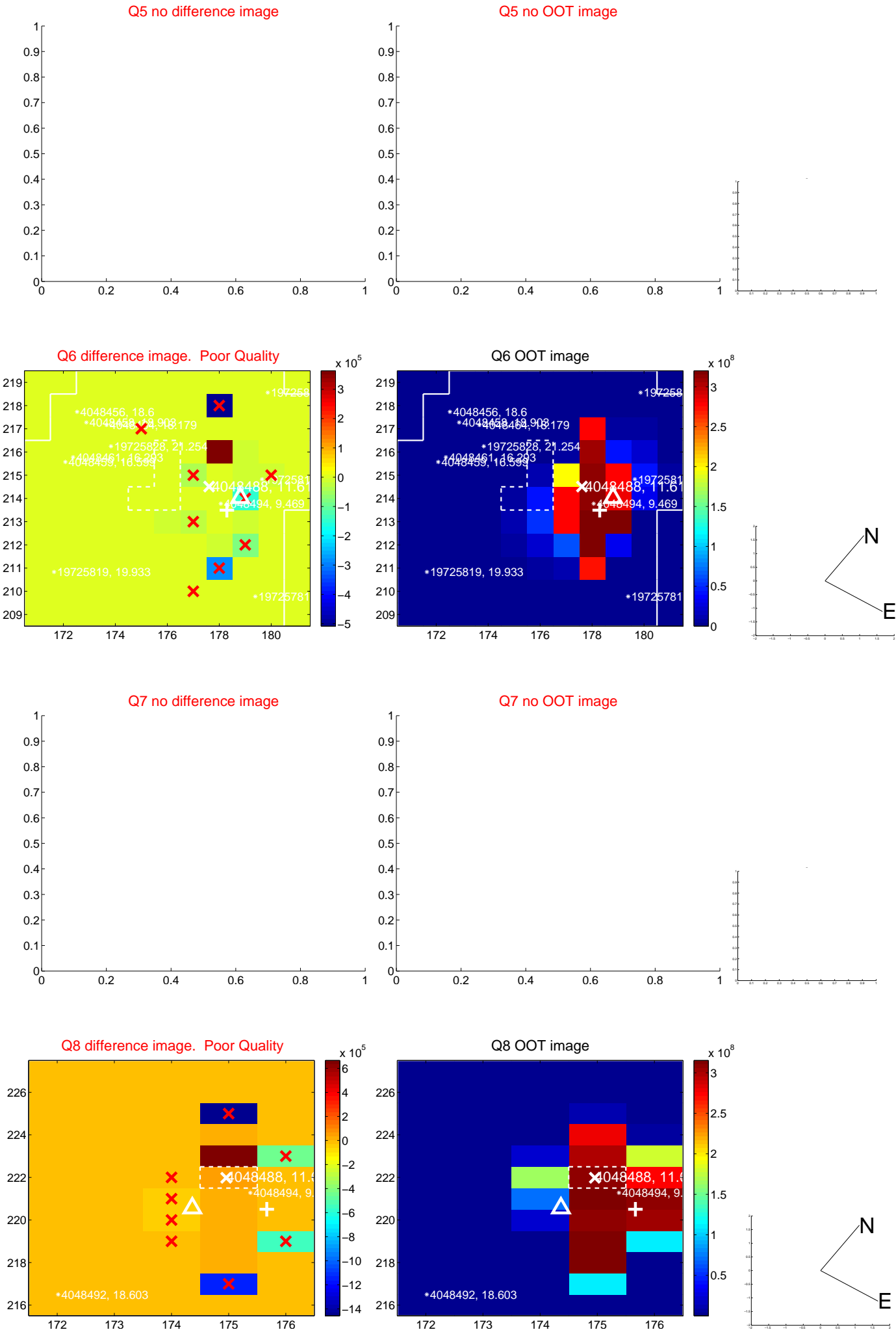


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

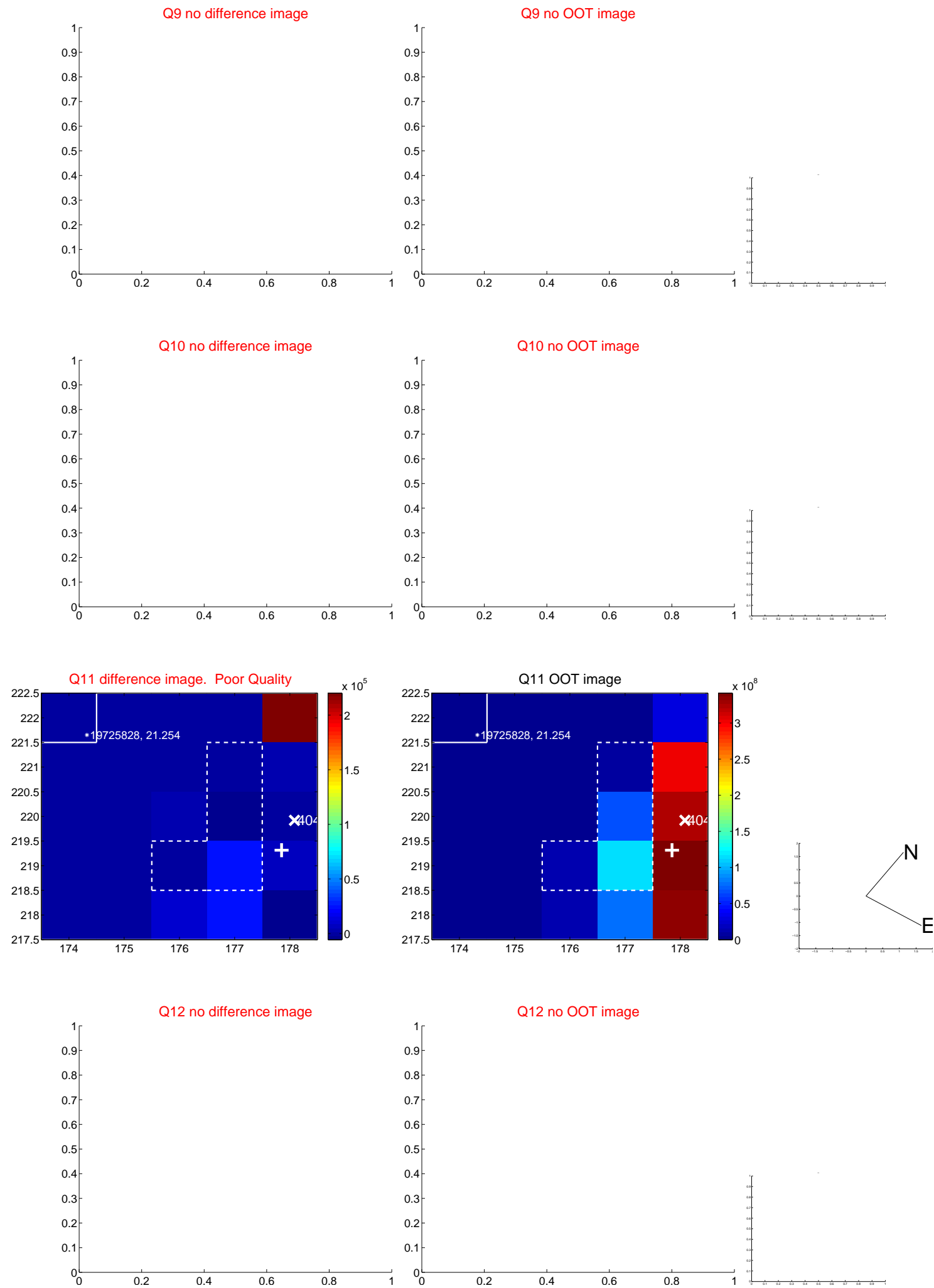
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



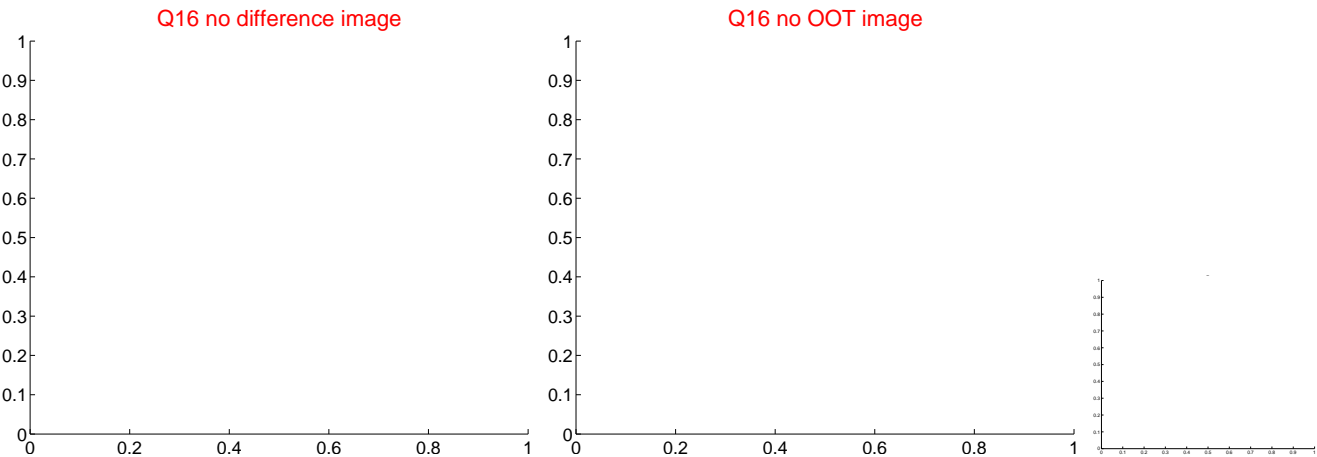
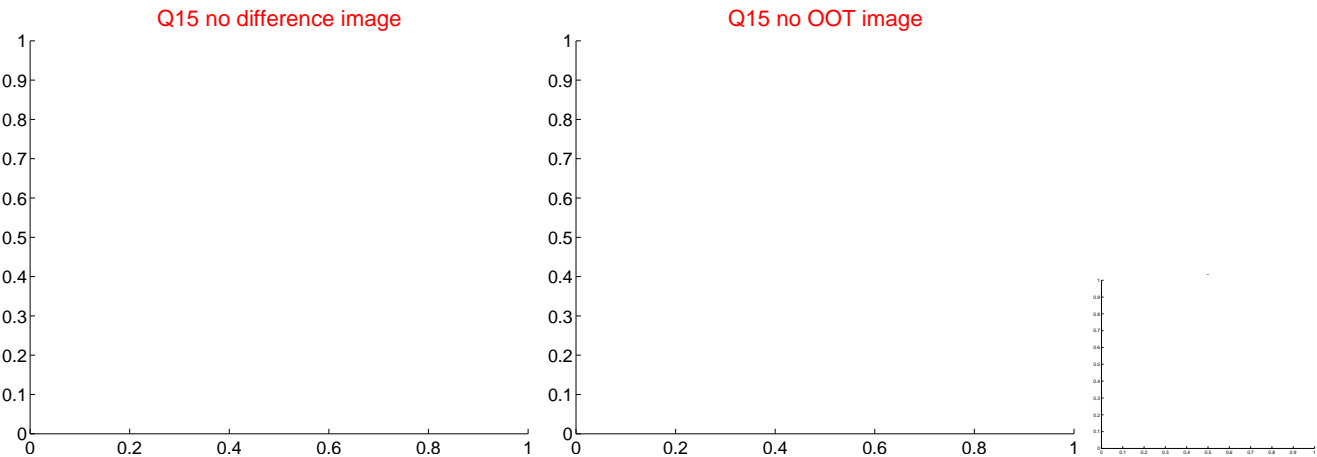
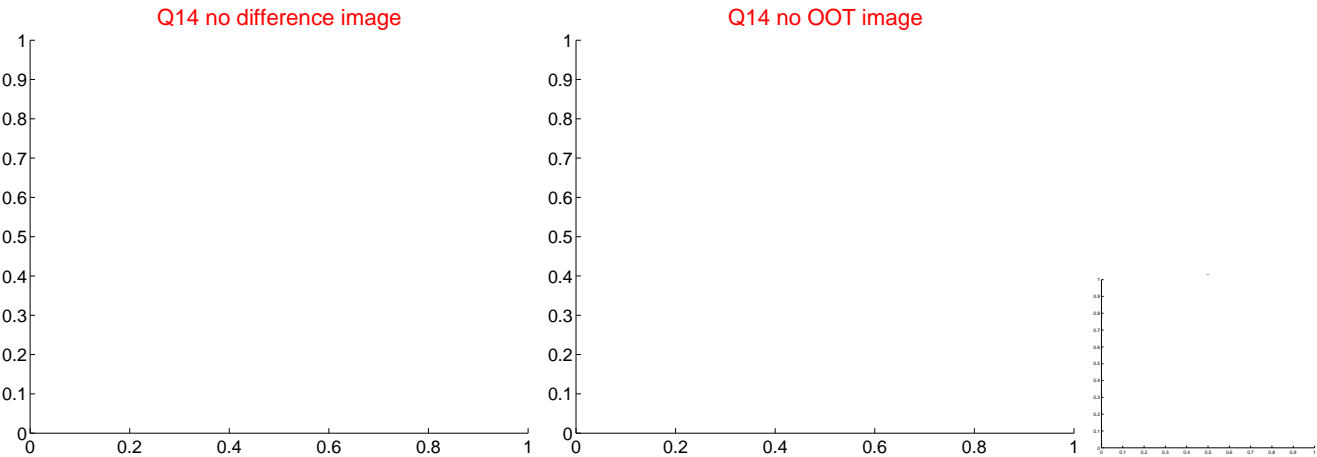
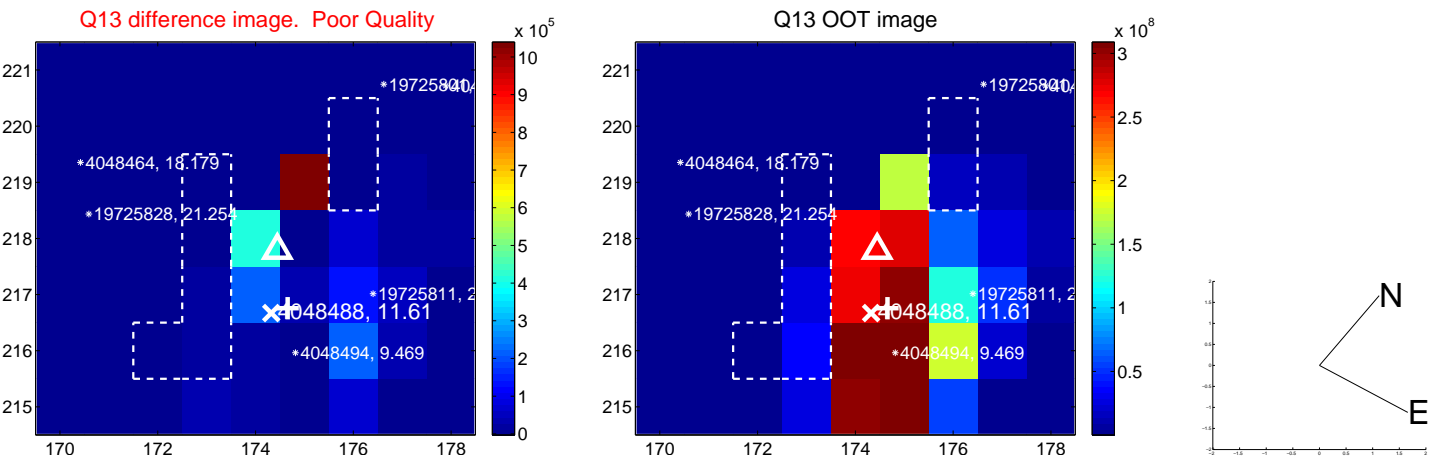
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

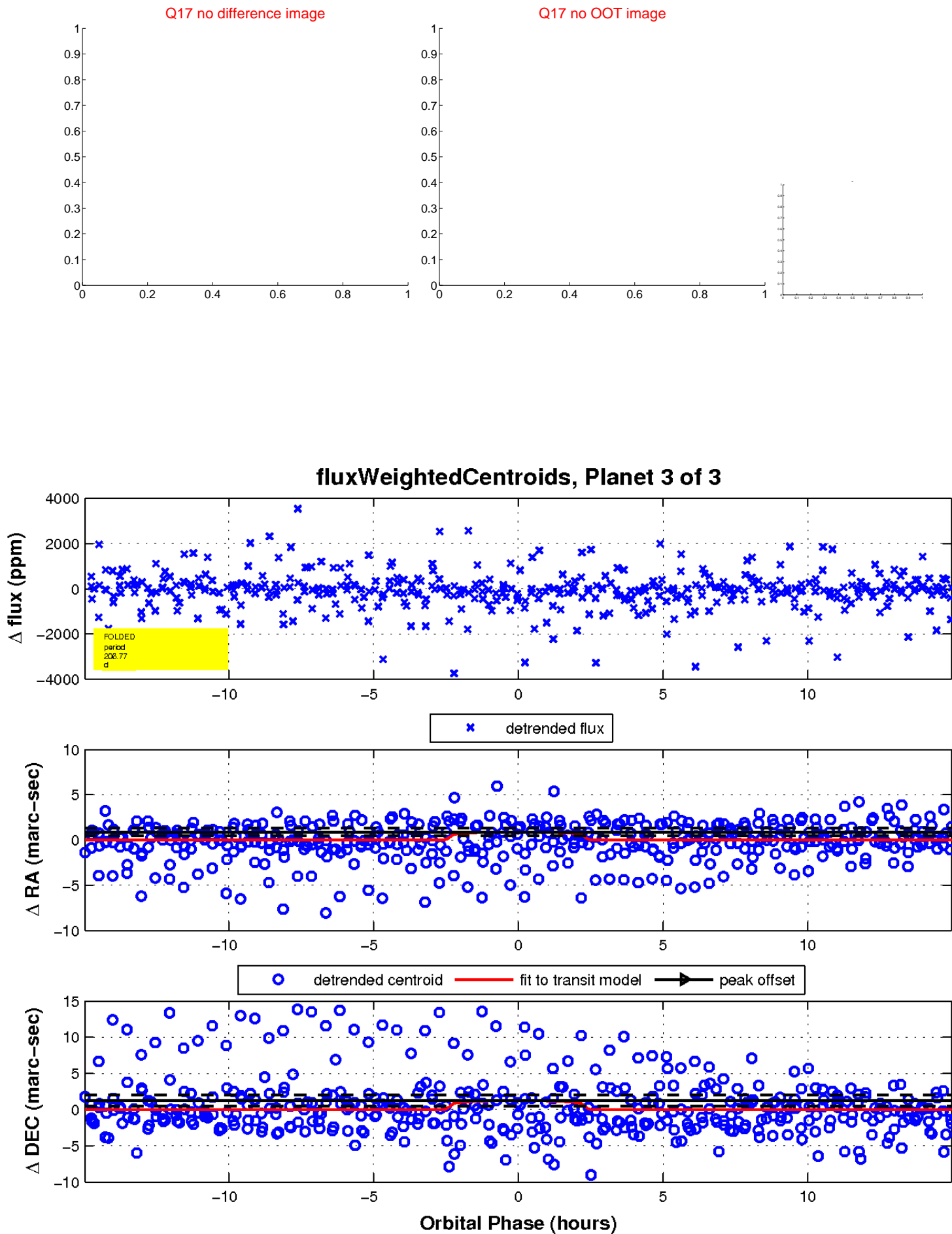


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

