

# KIC 002856209

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 002856209-01 | OBS      | No   | 446.988884    | 263.324588   | 1348.0      | 5.630            | 7.8 | 8.4 | 1.00                        | 6072            | 4.59                   | 0.91                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 002856209-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_MARSHALL—MOD_POS_DV—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.

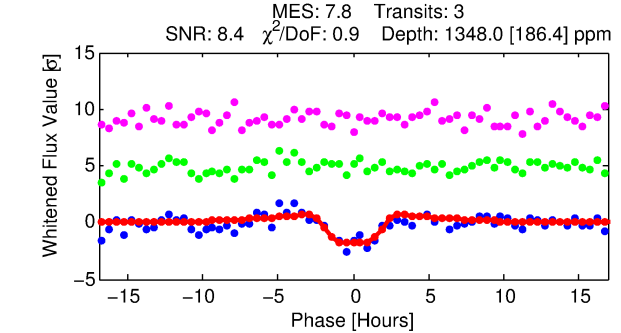
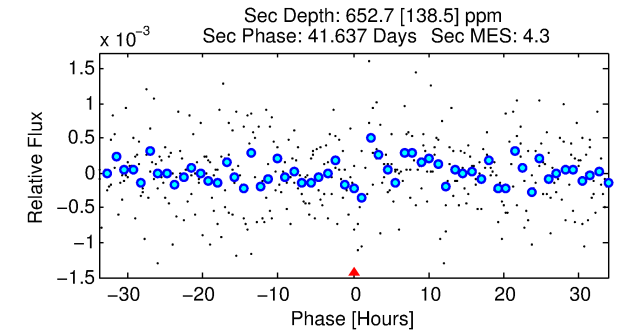
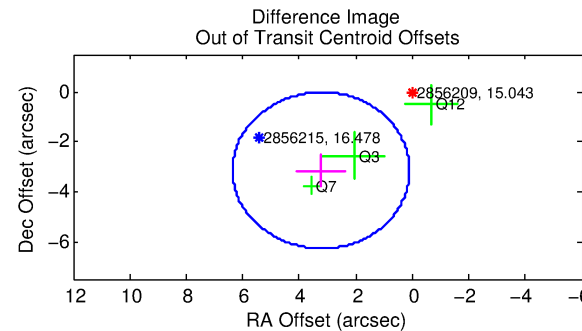
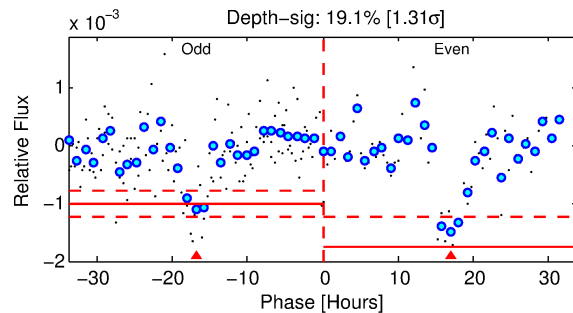
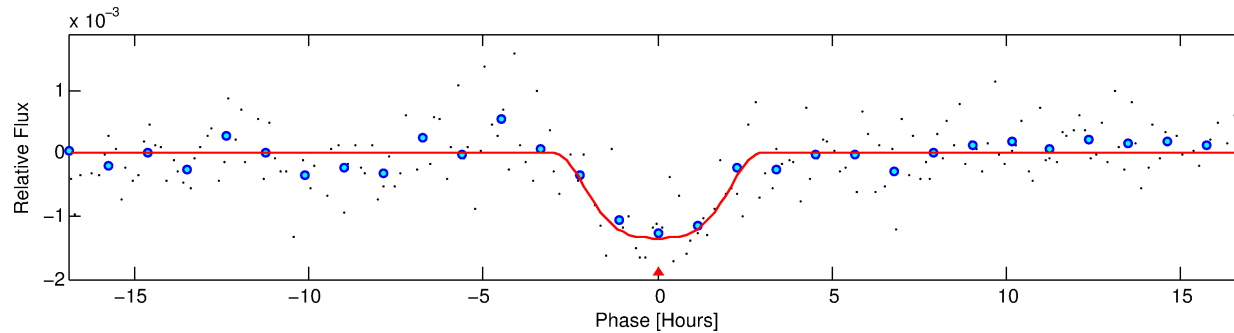
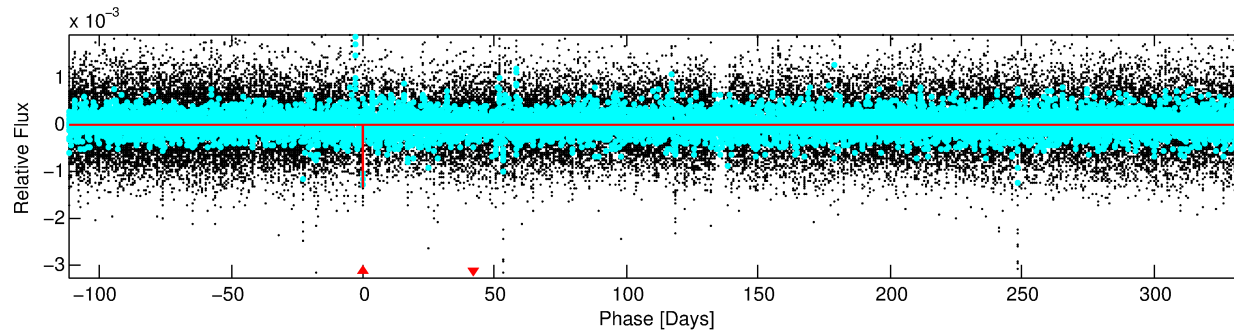
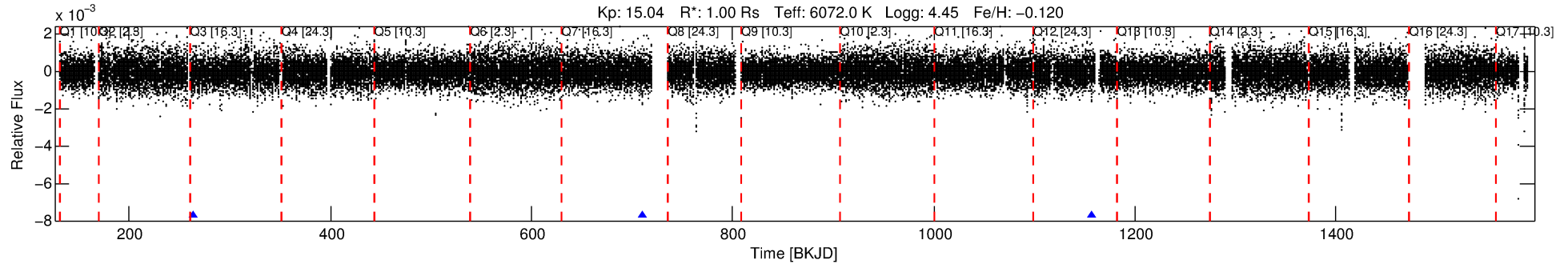
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002856209-01

No Significant Match Found

# DV One-Page Summary

KIC: 2856209 Candidate: 1 of 1 Period: 446.989 d



## DV Fit Results:

Period = 446.98888 [0.00814] d  
Epoch = 263.3246 [0.0109] BKJD  
Rp/R\* = 0.0422 [0.0042]  
a/R\* = 263.30 [54.81]  
b = 0.95 [0.03]  
Seff = 0.91 [0.39]  
Teq = 249 [27] K  
Rp = 4.59 [1.58] Re  
a = 1.1543 [0.3227] AU  
Ag = 22690.16 [11358.96] [2.00 $\sigma$ ]  
Teff = 4726 [379] K [11.78 $\sigma$ ]

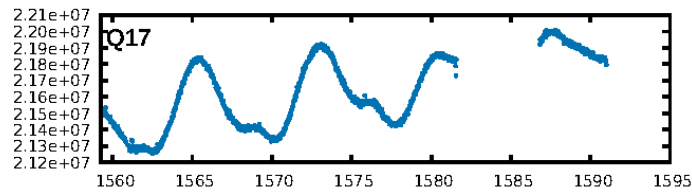
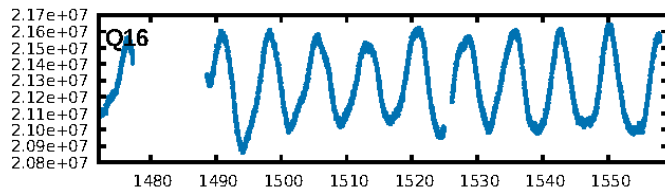
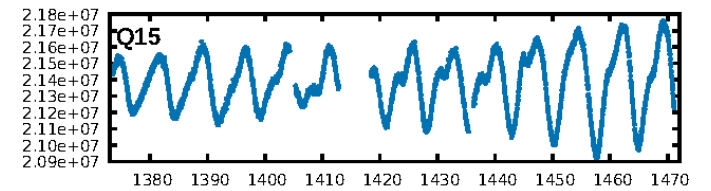
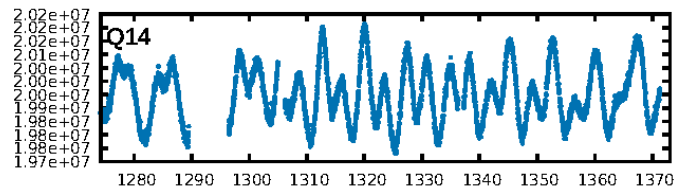
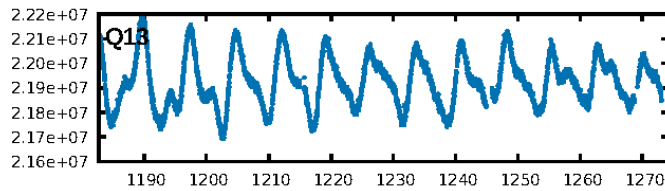
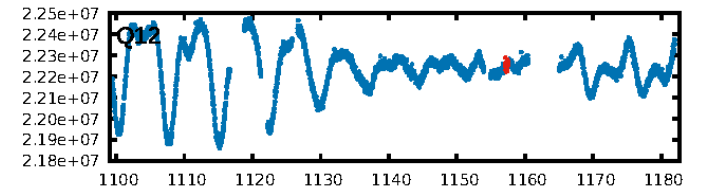
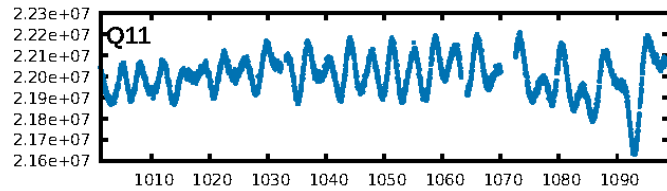
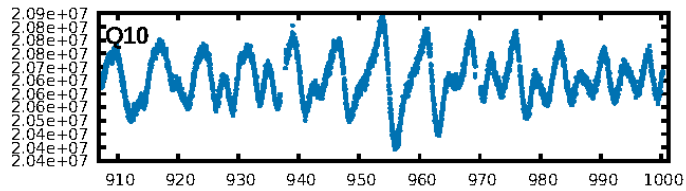
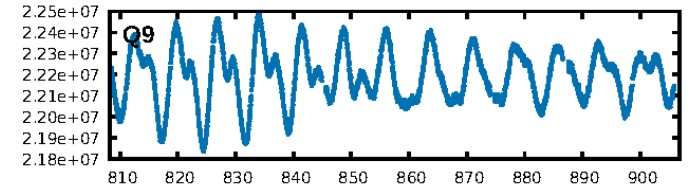
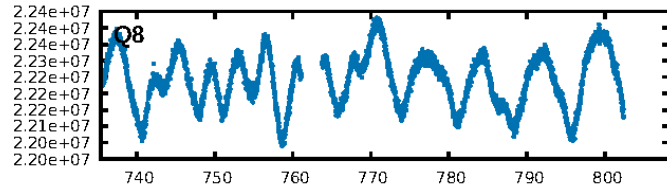
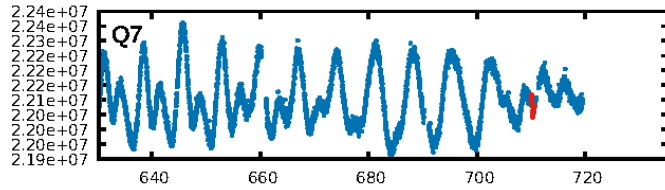
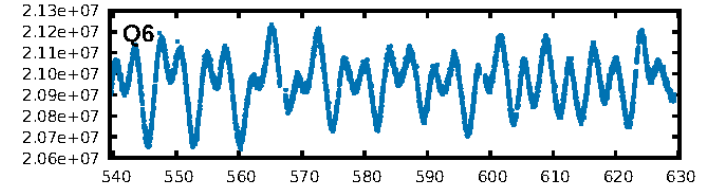
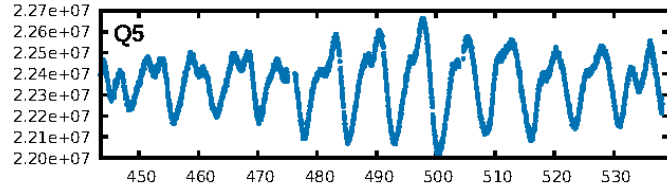
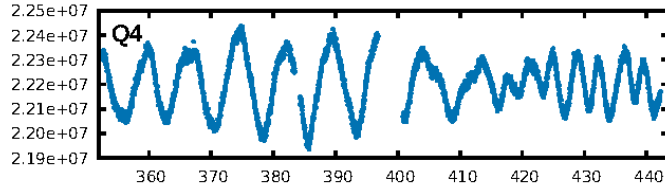
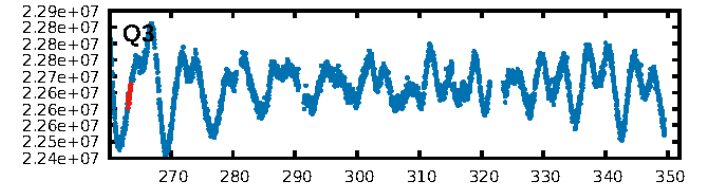
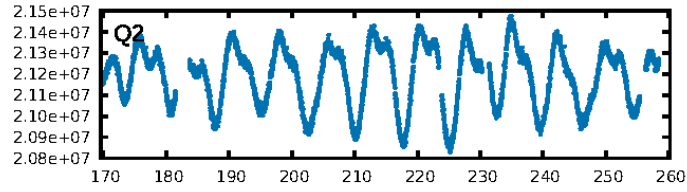
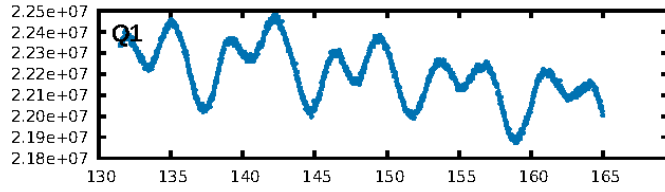
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 23.3%  
ModelChiSquareGof-sig: 96.4%  
Bootstrap-pfa: 1.28e-09  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.831  
Centroid-sig: 6.7%  
Centroid-so: 2.982 arcsec [2.06 $\sigma$ ]  
OotOffset-rm: 4.508 arcsec [4.32 $\sigma$ ]  
KicOffset-rm: 4.847 arcsec [3.75 $\sigma$ ]  
OotOffset-st: 0/2/1/0 [3]  
KicOffset-st: 0/2/1/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

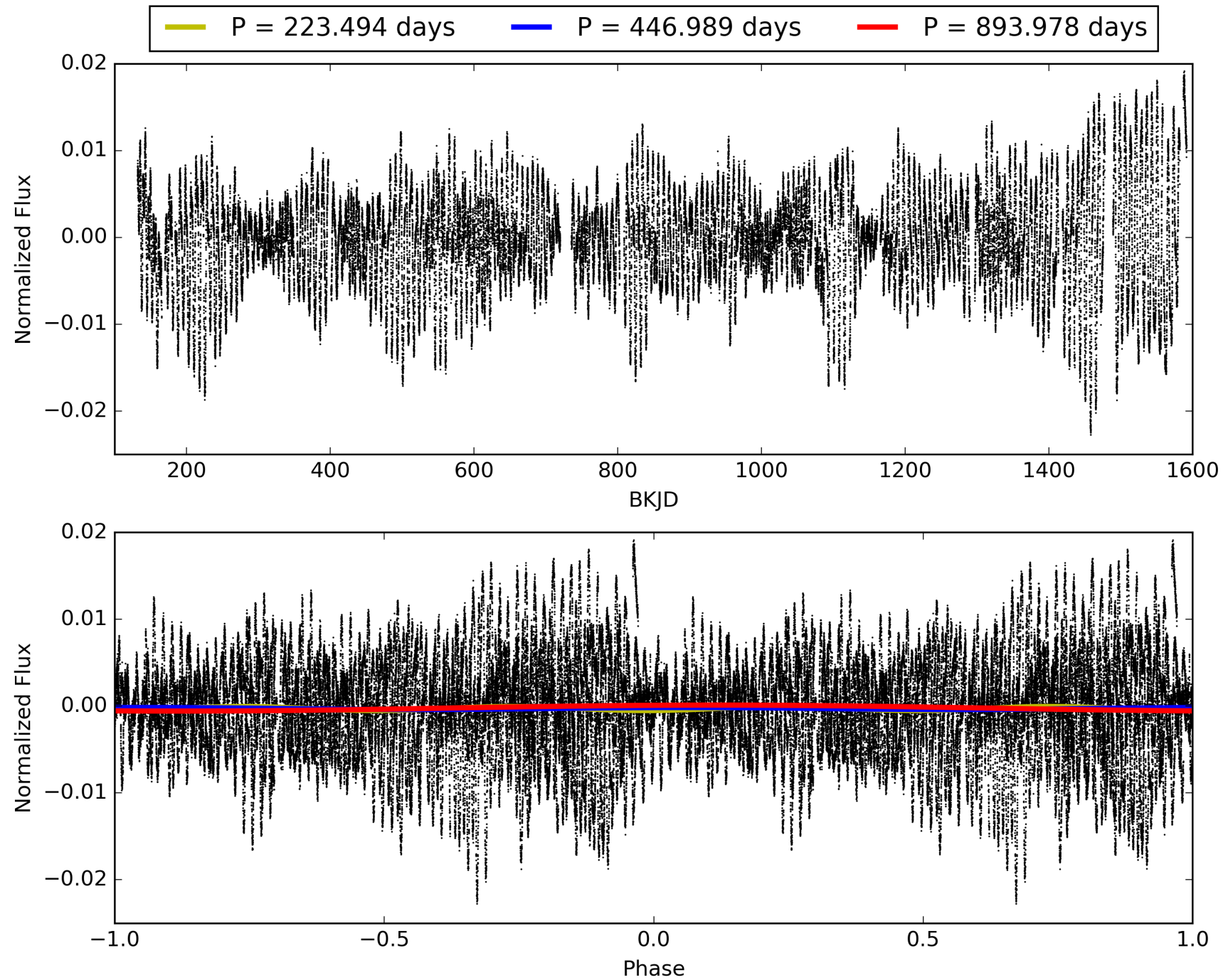
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 19:38:57 Z

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

# TCE 002856209-01, PDC Light Curves

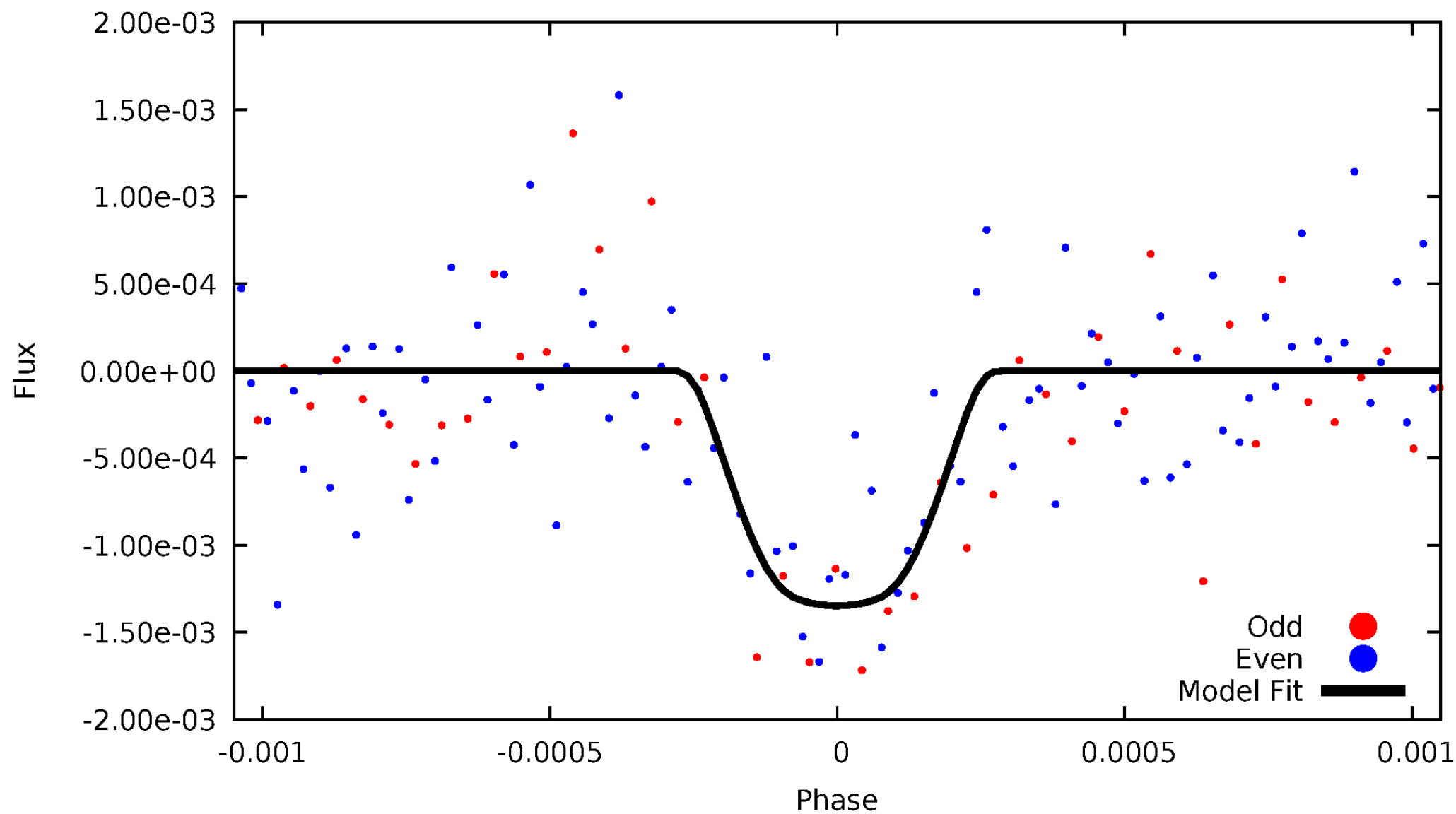


TCE 002856209-01



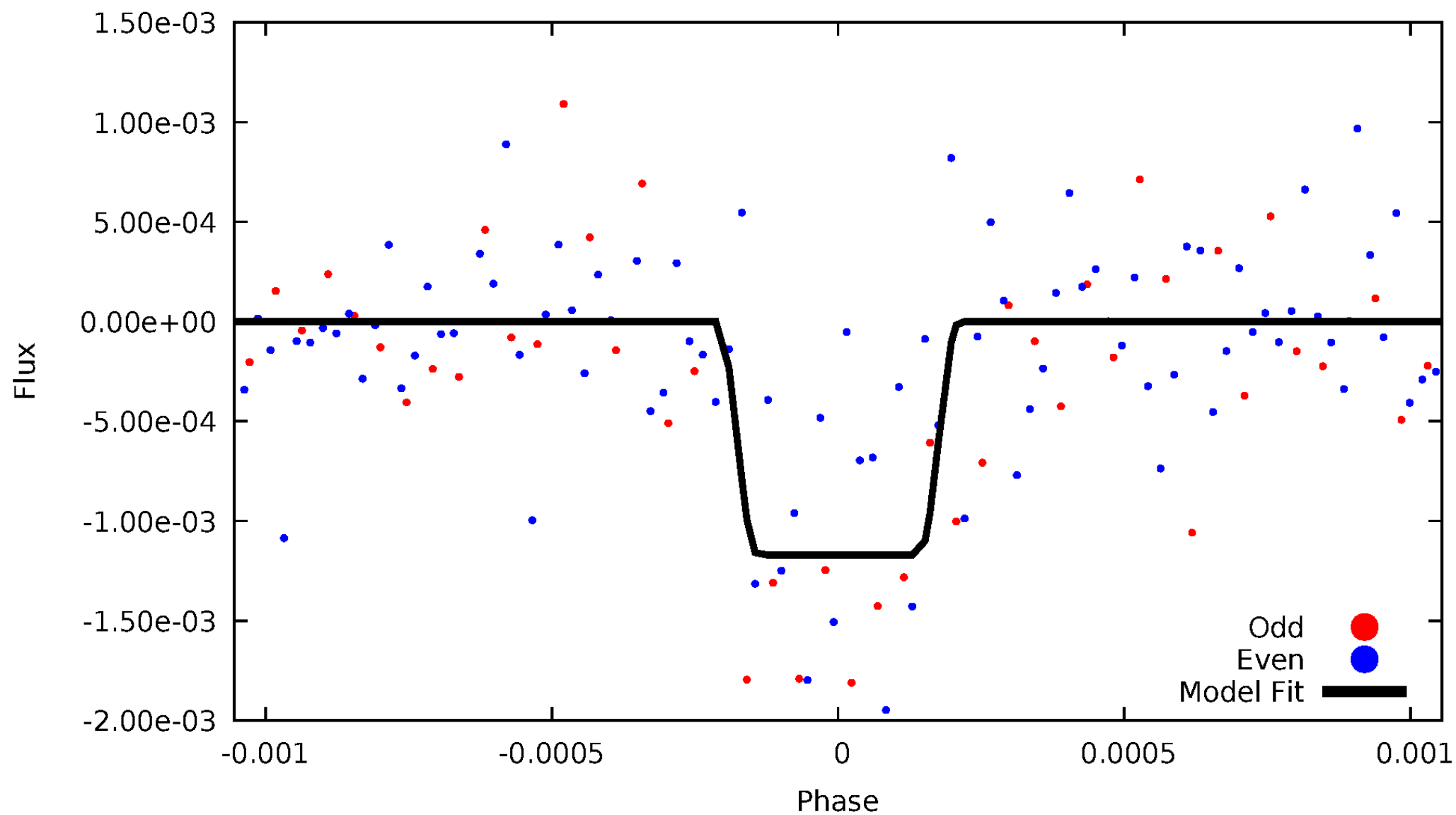
# DV Odd/Even

TCE 002856209-01



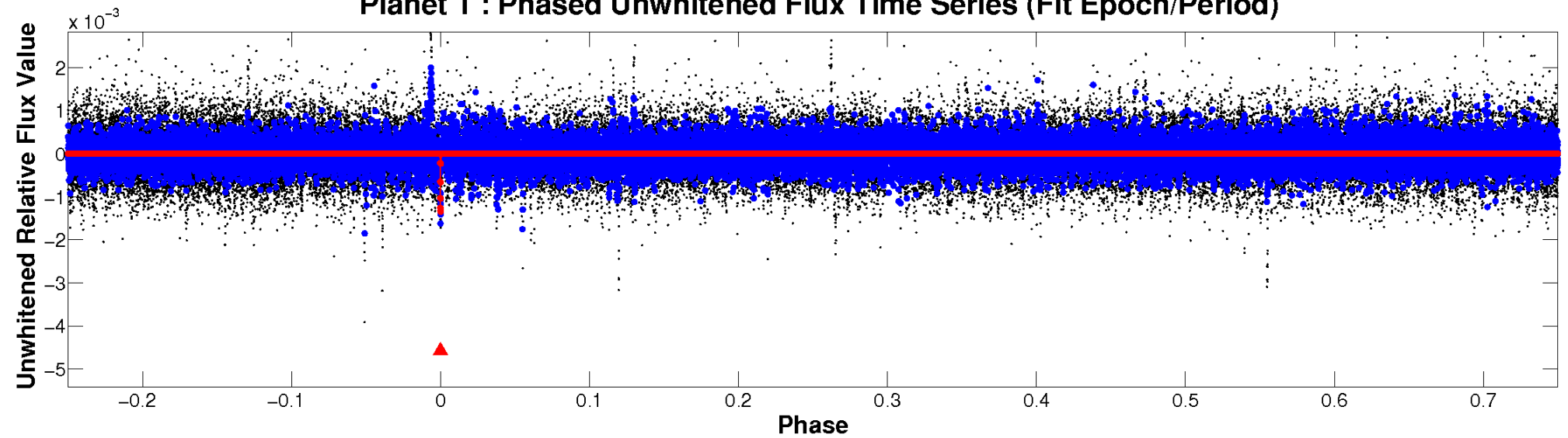
# ALT Odd/Even

TCE 002856209-01

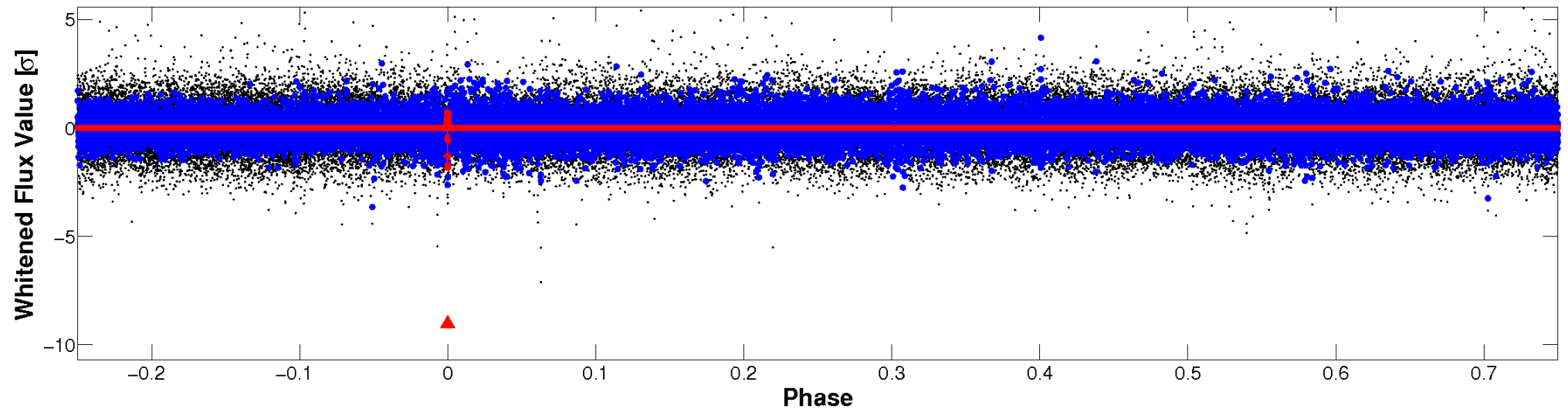


# Non-Whitened Vs. Whitened Light Curve

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

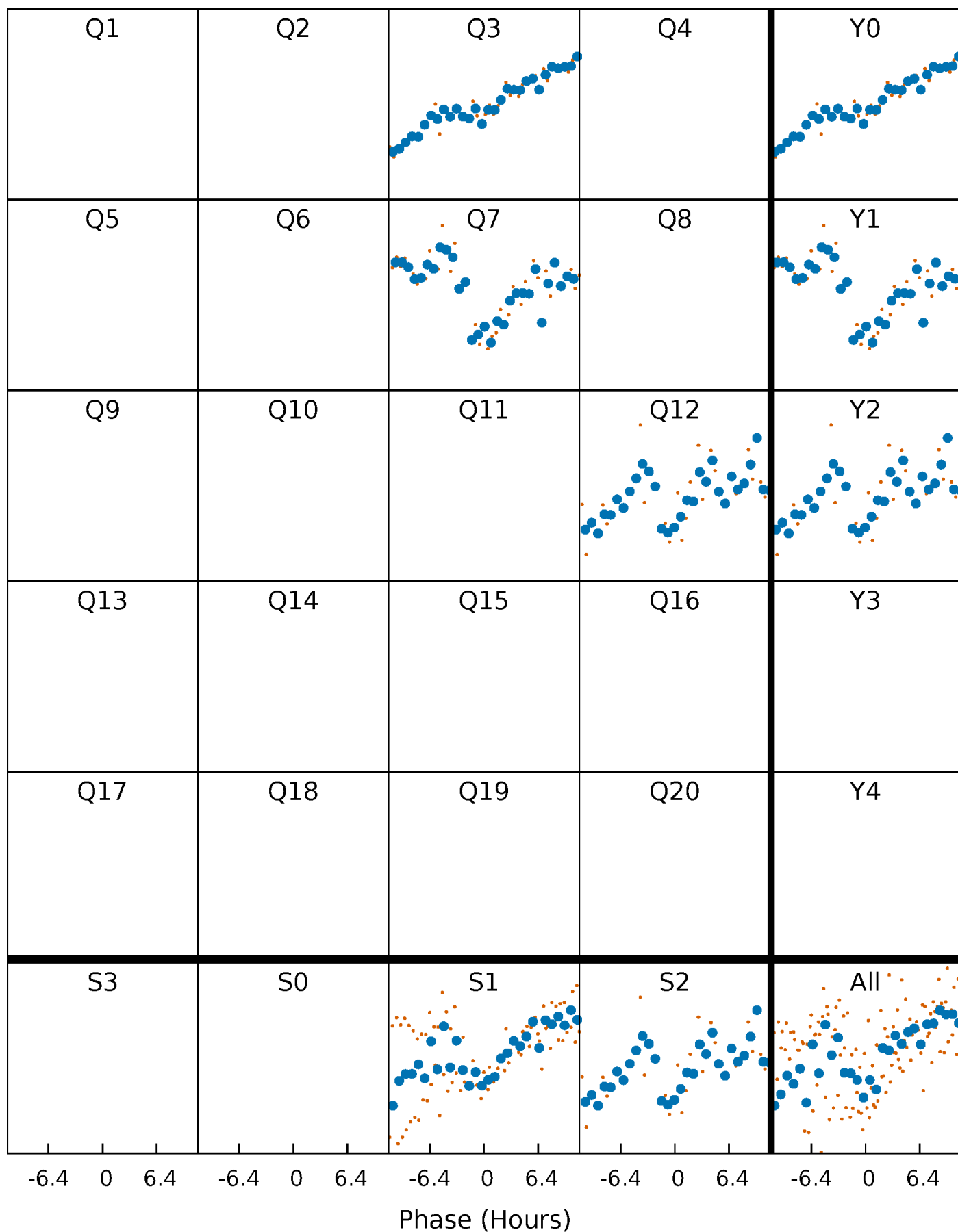


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



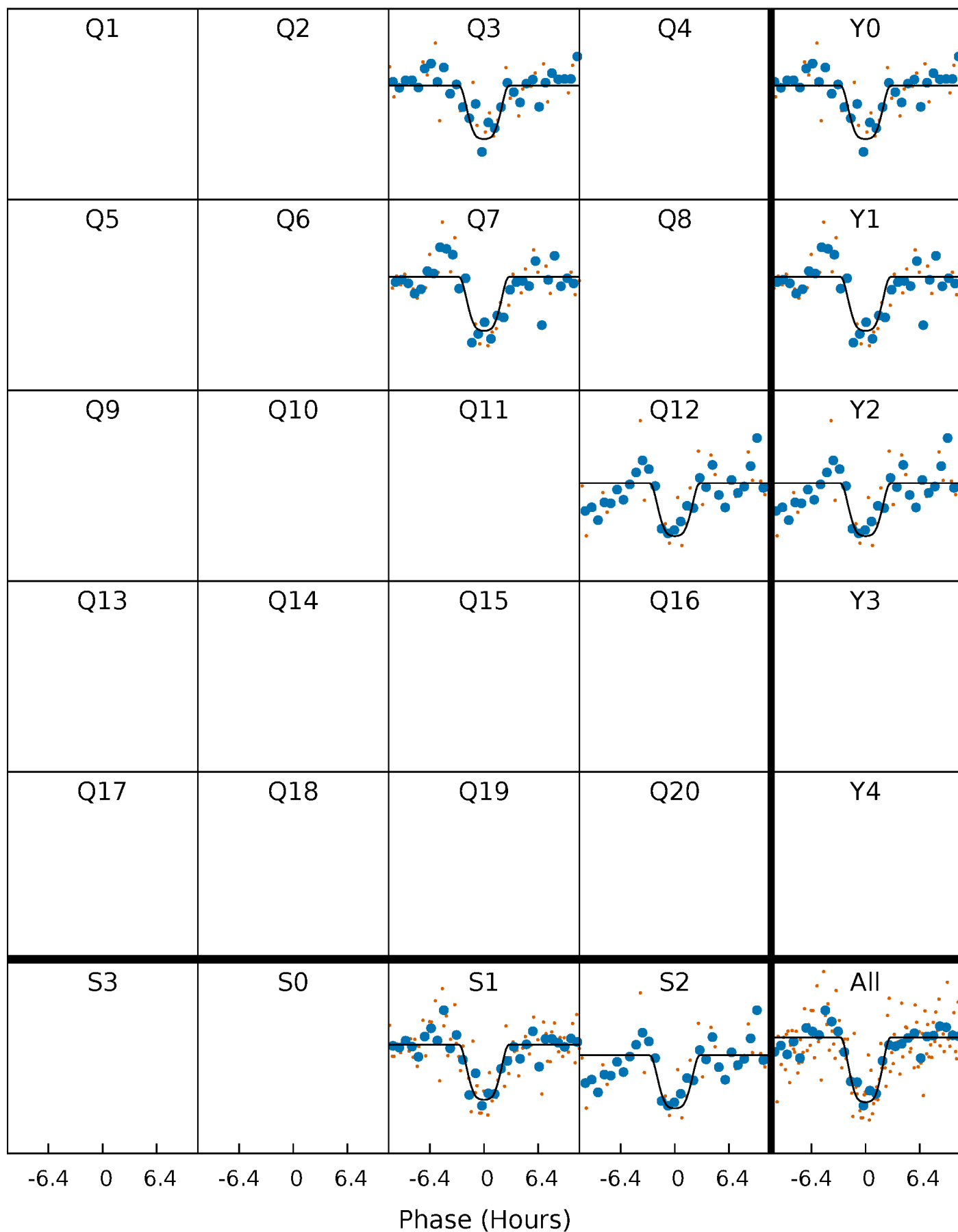
# PDC Quarter-Phased Transit Curves

TCE 002856209-01 P=446.988884 Days  $T_0=263.324588$  (BKJD)



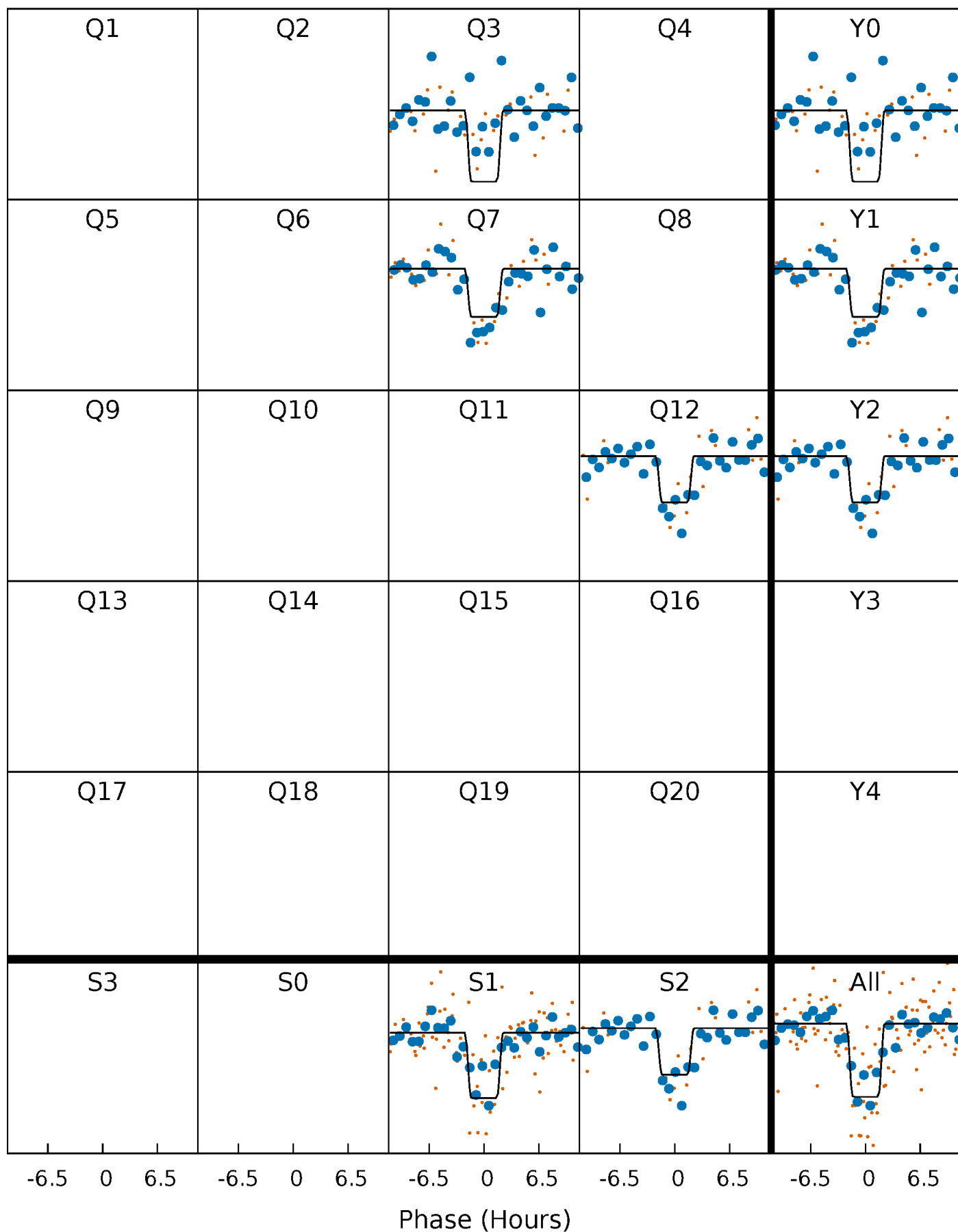
# DV Quarter-Phased Transit Curves

TCE 002856209-01   P=446.988884 Days    $T_0=263.324588$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

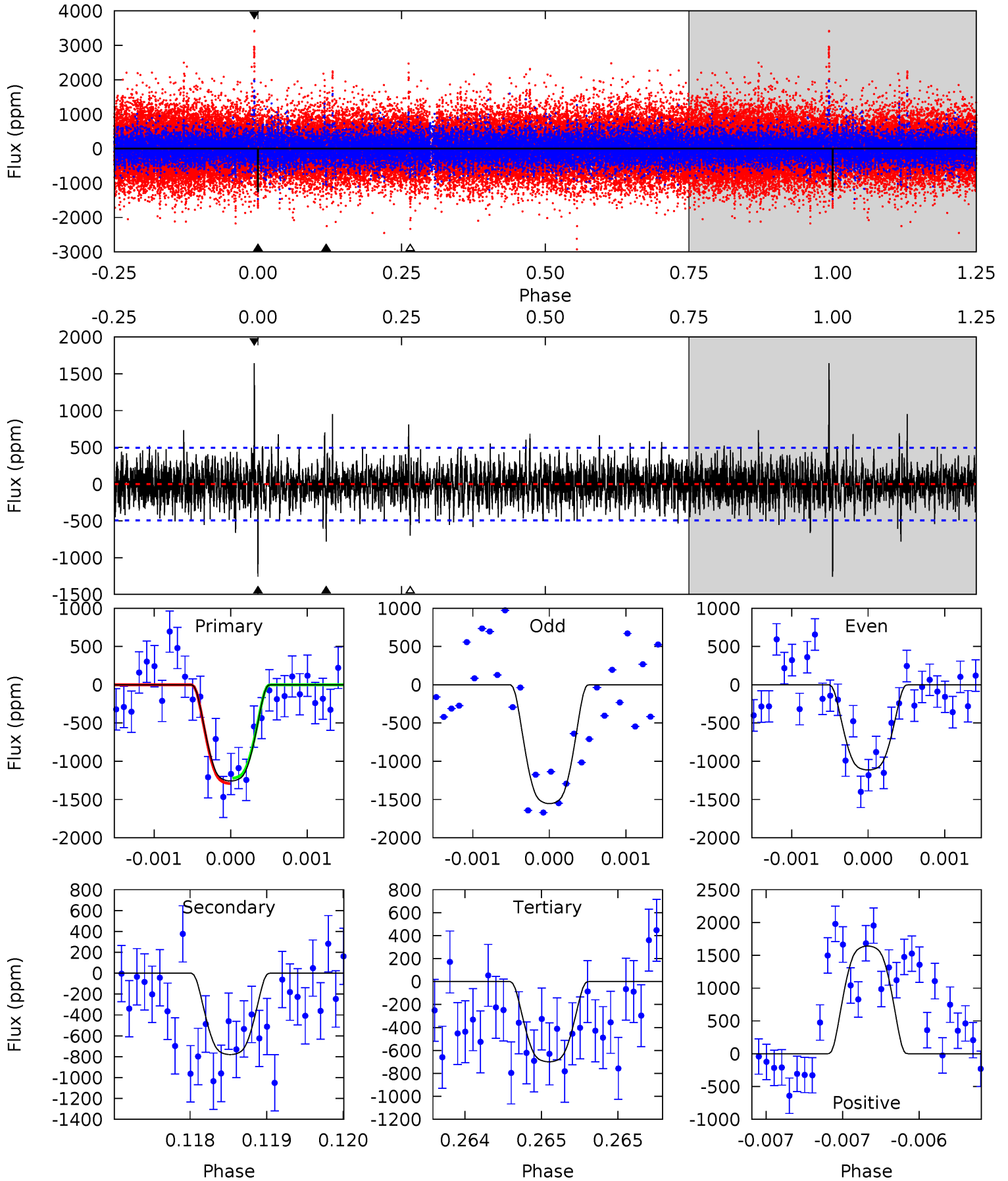
TCE 002856209-01 P=446.977314 Days  $T_0=263.344754$  (BKJD)



# DV Model-Shift Uniqueness Test

002856209-01, P = 446.988884 Days, E = 263.324588 Days

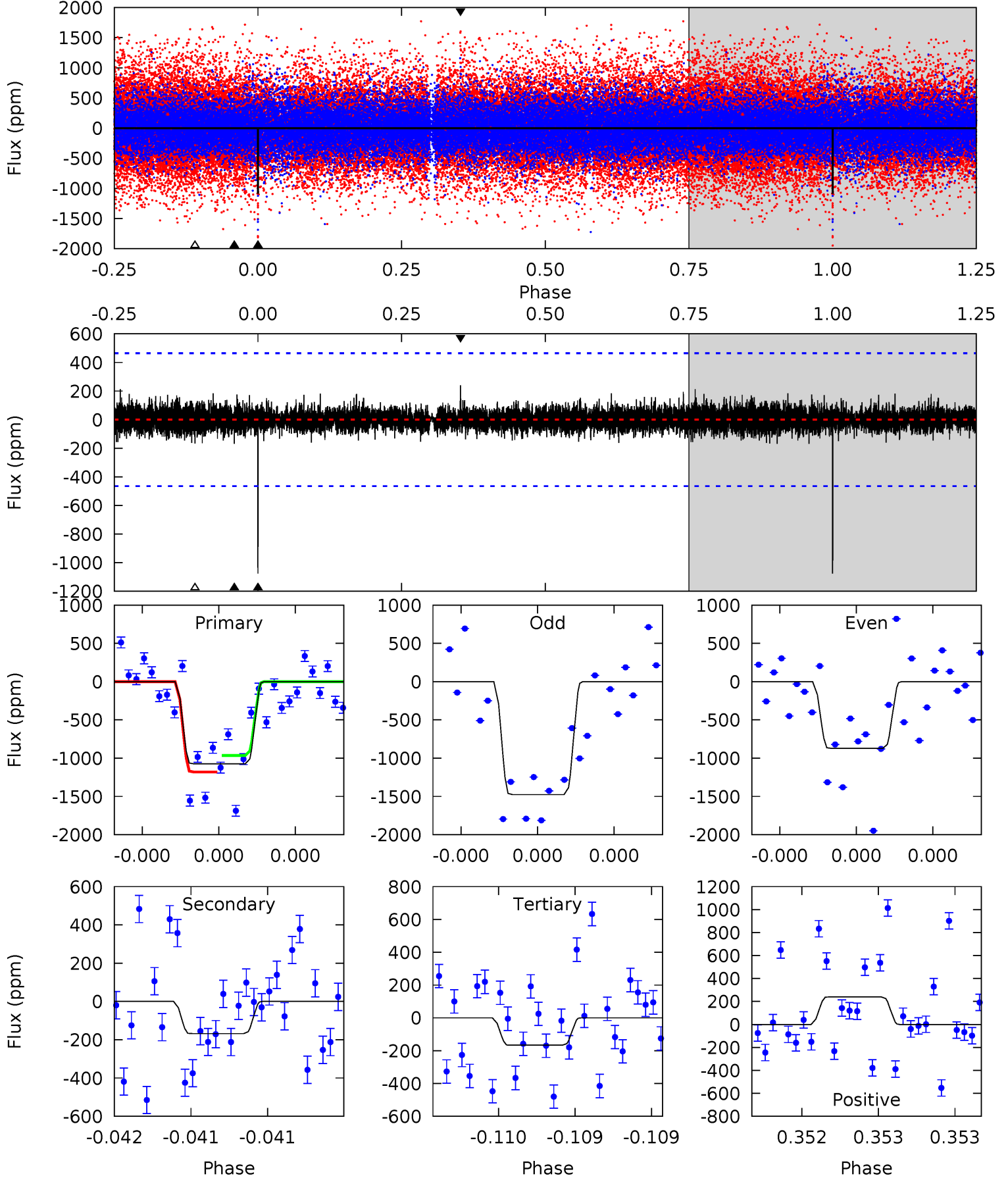
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 14.1 | 8.77 | 7.86 | 18.5 | 5.56            | 3.46            | 2.04             | 6.28    | -4.30   | 0.91    | -9.68   | 2.26    | 1.09 | 0.57  | 0.39 |



# Alt Model-Shift Uniqueness Test

002856209-01, P = 446.977314 Days, E = 263.344754 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 13.0 | 2.03 | 2.02 | 2.90 | 5.62            | 3.56            | 0.53             | 11.0    | 10.1    | 0.01    | -0.87   | 3.50    | 0.77 | 0.18  | 1.31 |



### Stellar Parameters For KIC 002856209

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6072^{+189}_{-210}$ | $4.451^{+0.070}_{-0.224}$ | $-0.120^{+0.300}_{-0.300}$ | $0.998^{+0.330}_{-0.110}$ | $1.021^{+0.153}_{-0.126}$ | $1.448^{+0.426}_{-0.778}$                 |
|        | +3%/-3%              | +2%/-5%                   | +250%/-250%                | +33%/-11%                 | +15%/-12%                 | +29%/-54%                                 |
| 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 002856209-01 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | $A_{\text{obs}}$        |
|---------|---------------|------------------------|----------------------|----------------------|-------------------------|
| DV      | $-780 \pm 89$ | $4.78^{+0.88}_{-0.61}$ | $356^{+26}_{-20}$    | $5013^{+297}_{-271}$ | $24322^{+8563}_{-6795}$ |
| Alt.    | $-168 \pm 83$ | $3.90^{+0.78}_{-0.62}$ | $354^{+29}_{-19}$    | $4037^{+393}_{-480}$ | $7819^{+5640}_{-4252}$  |

$T_{\text{max}}$  = 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

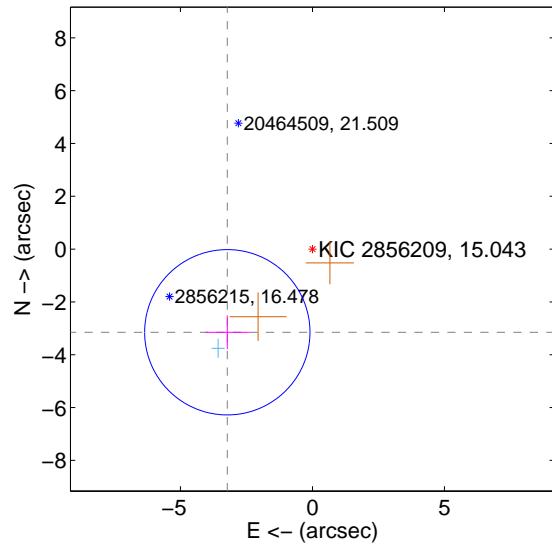
Supplemental centroid analysis for 002856209-01. Kepler magnitude: 15.04. Transit SNR 8.43

There are 1 quarters with good PRF difference image offsets

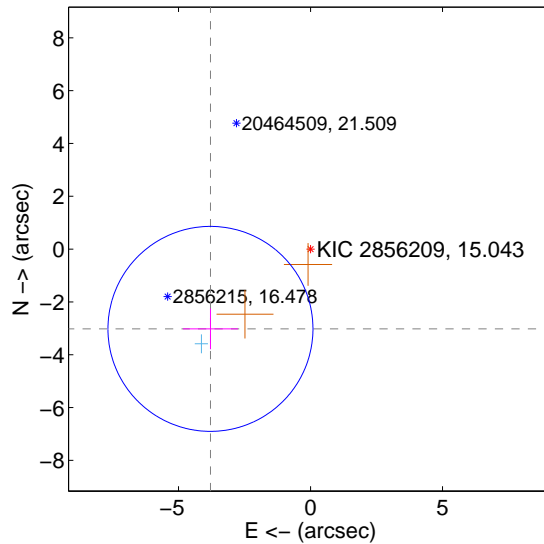
The direct PRF centroid is offset from the target star catalog position by about 0.76 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | 4.508 $\pm$ 1.044  | 4.32                | 3.224 $\pm$ 0.836 | -3.150 $\pm$ 0.641 |
| PRF-fit source offset from KIC position | 4.847 $\pm$ 1.294  | 3.75                | 3.790 $\pm$ 1.042 | -3.022 $\pm$ 0.772 |
| photometric centroid source offset      | 2.98 $\pm$ 1.45    | 2.06                | 2.00 $\pm$ 1.35   | -2.21 $\pm$ 1.53   |

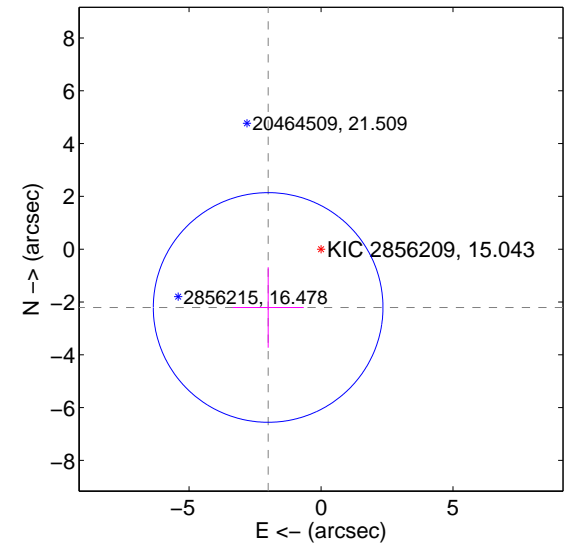
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



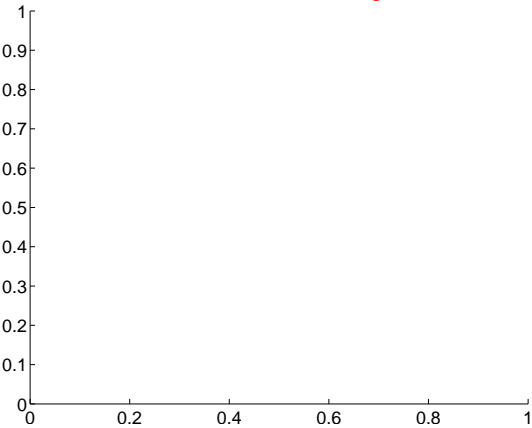
offset from photometric centroids



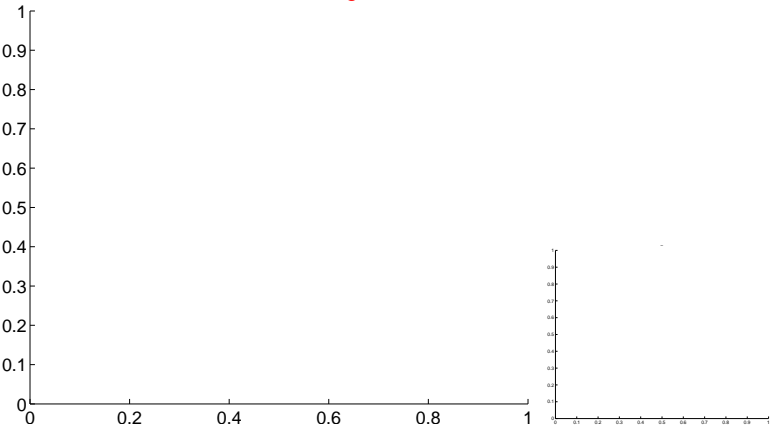
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

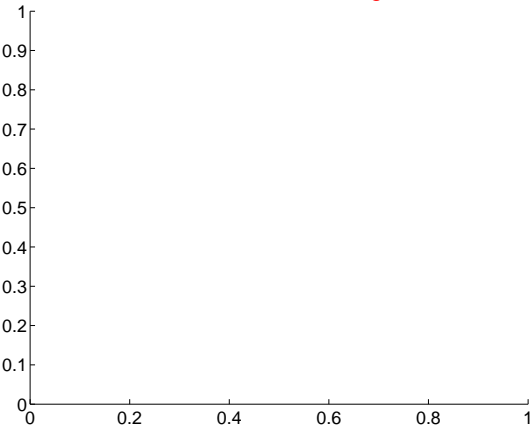
Q1 no difference image



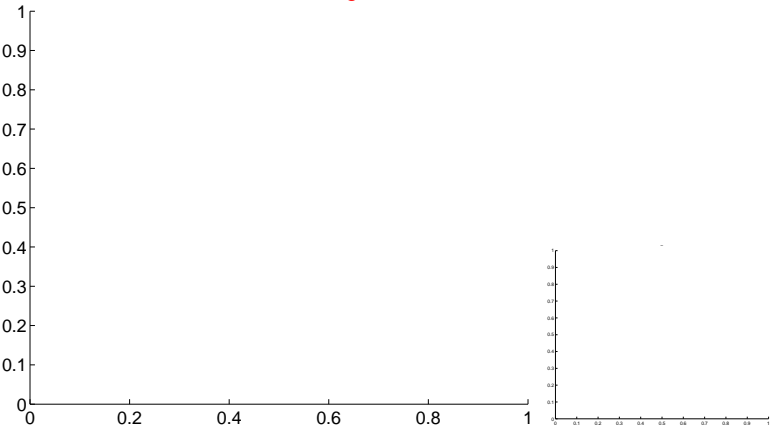
Q1 no OOT image



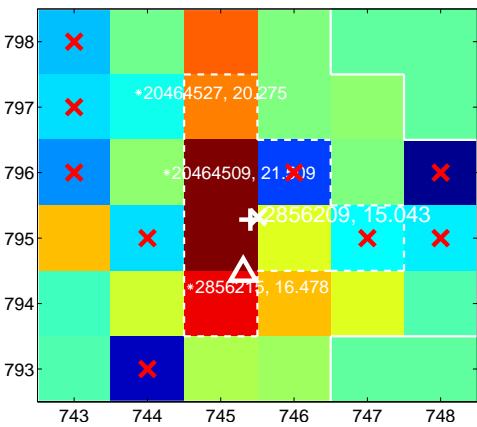
Q2 no difference image



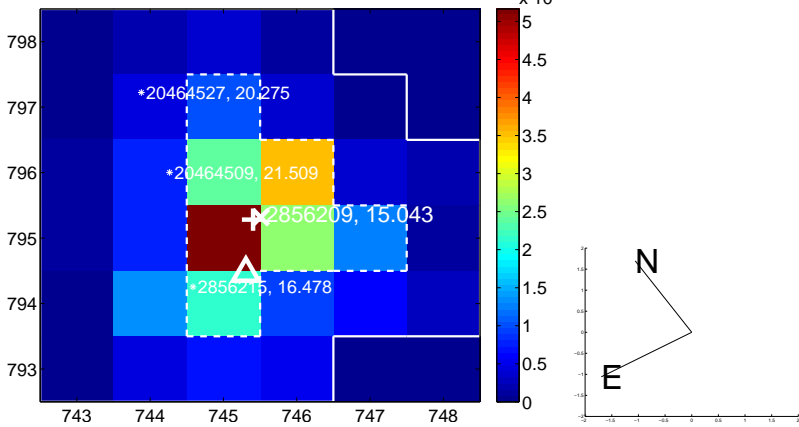
Q2 no OOT image



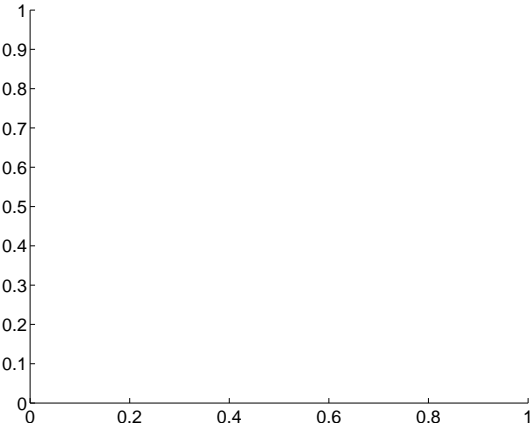
Q3 difference image. Poor Quality



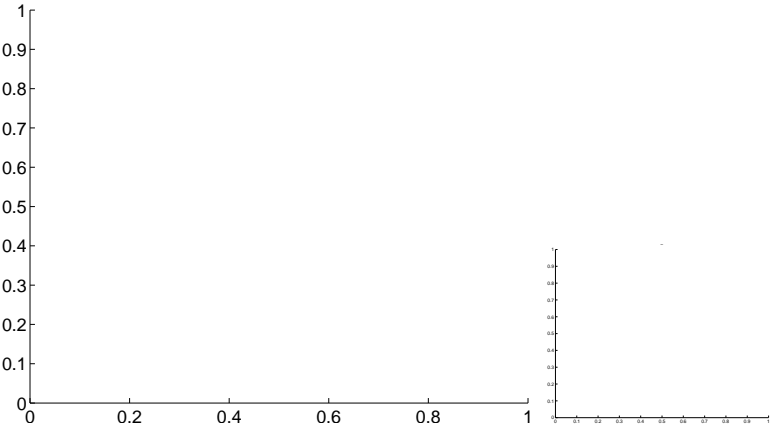
Q3 OOT image



Q4 no difference image

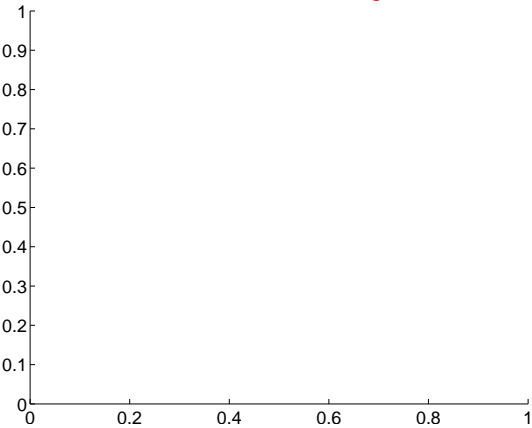


Q4 no OOT image

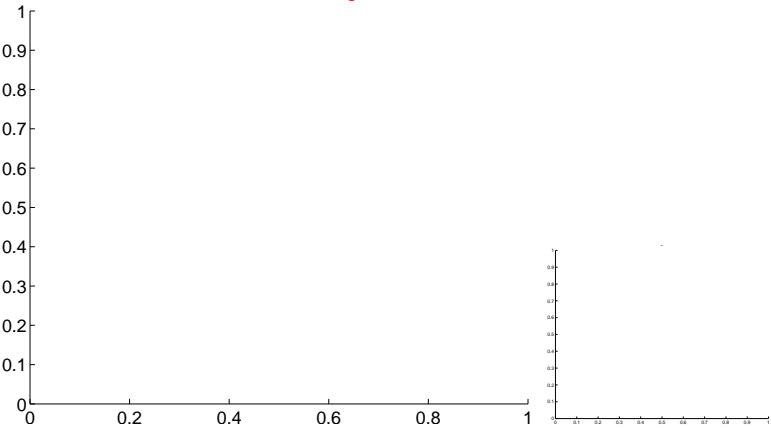


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

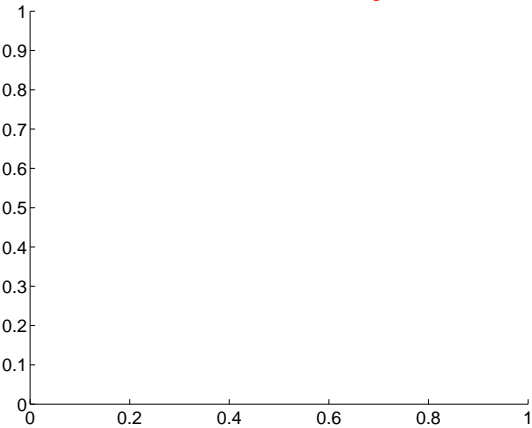
Q5 no difference image



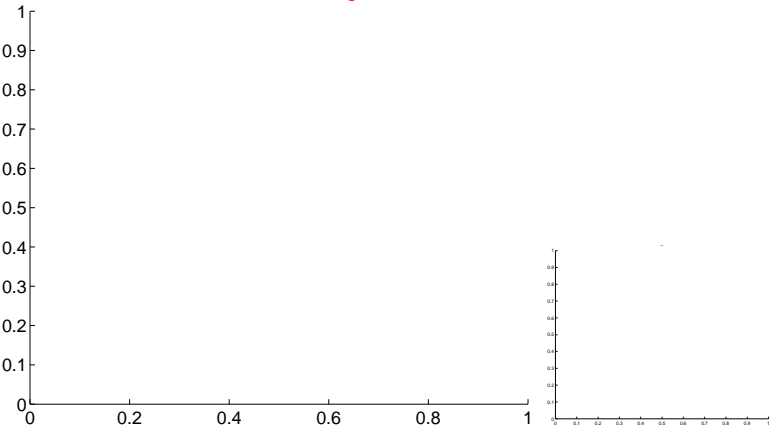
Q5 no OOT image



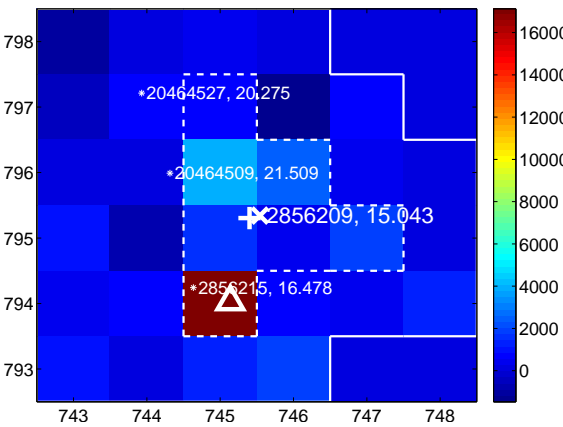
Q6 no difference image



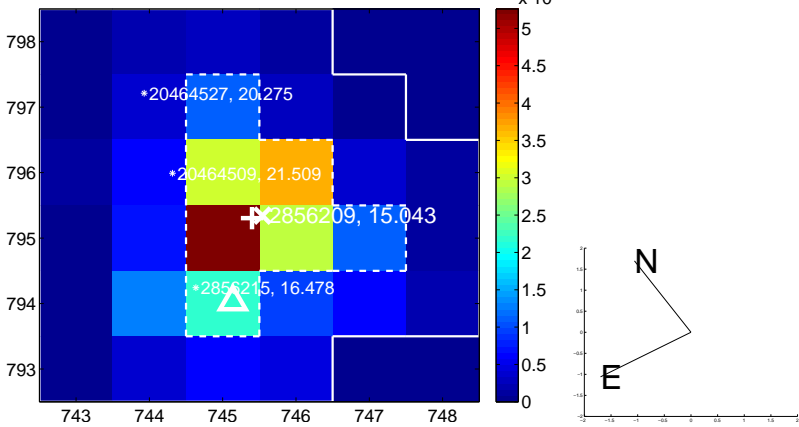
Q6 no OOT image



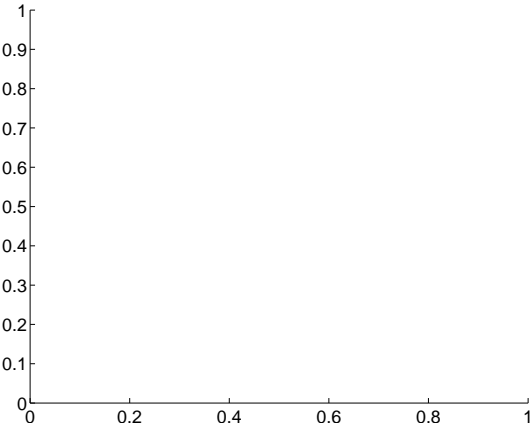
Q7 difference image



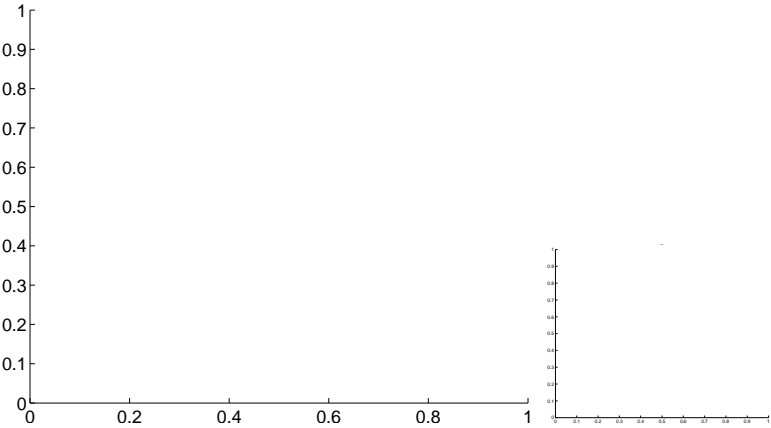
Q7 OOT image



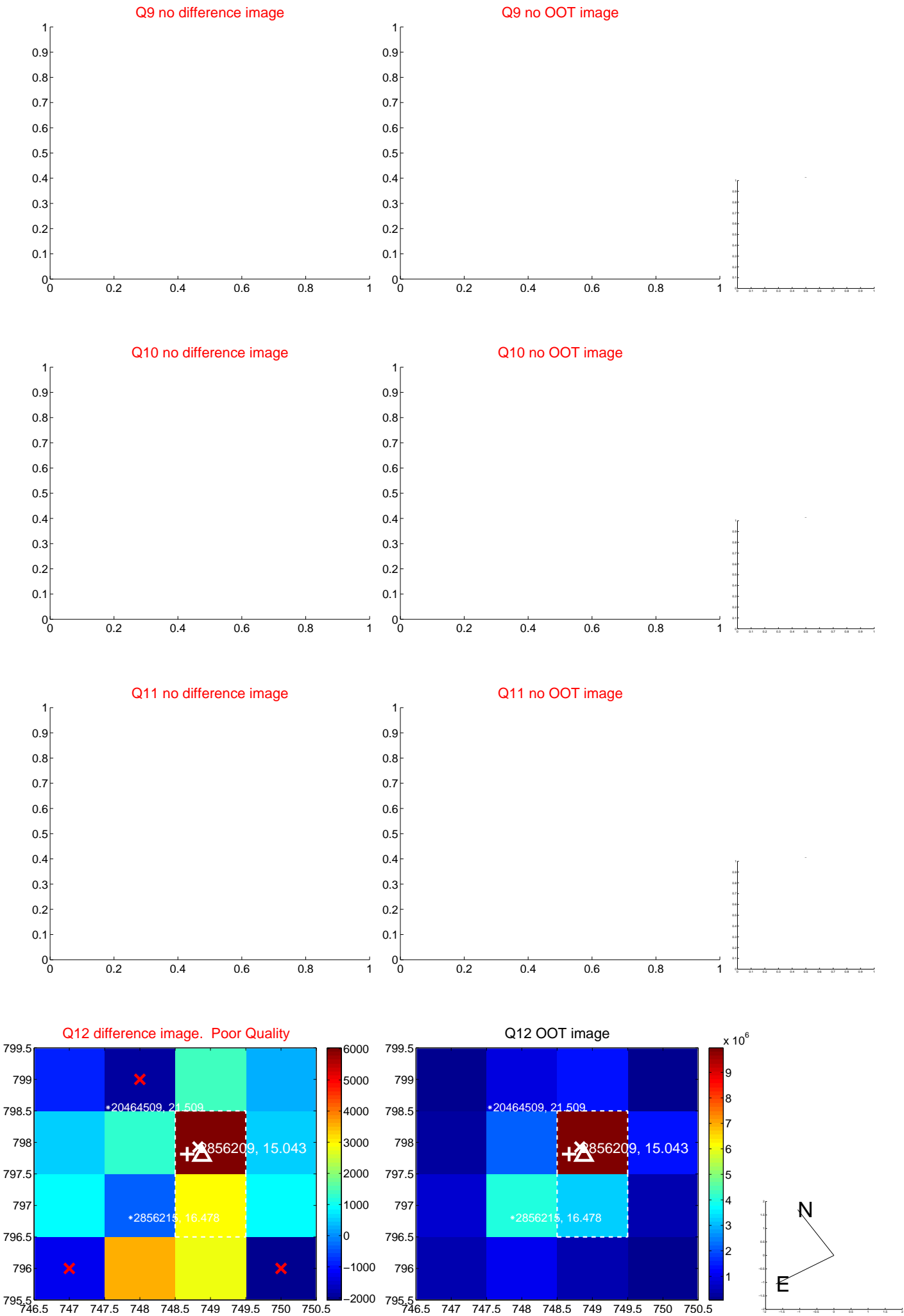
Q8 no difference image



Q8 no OOT image



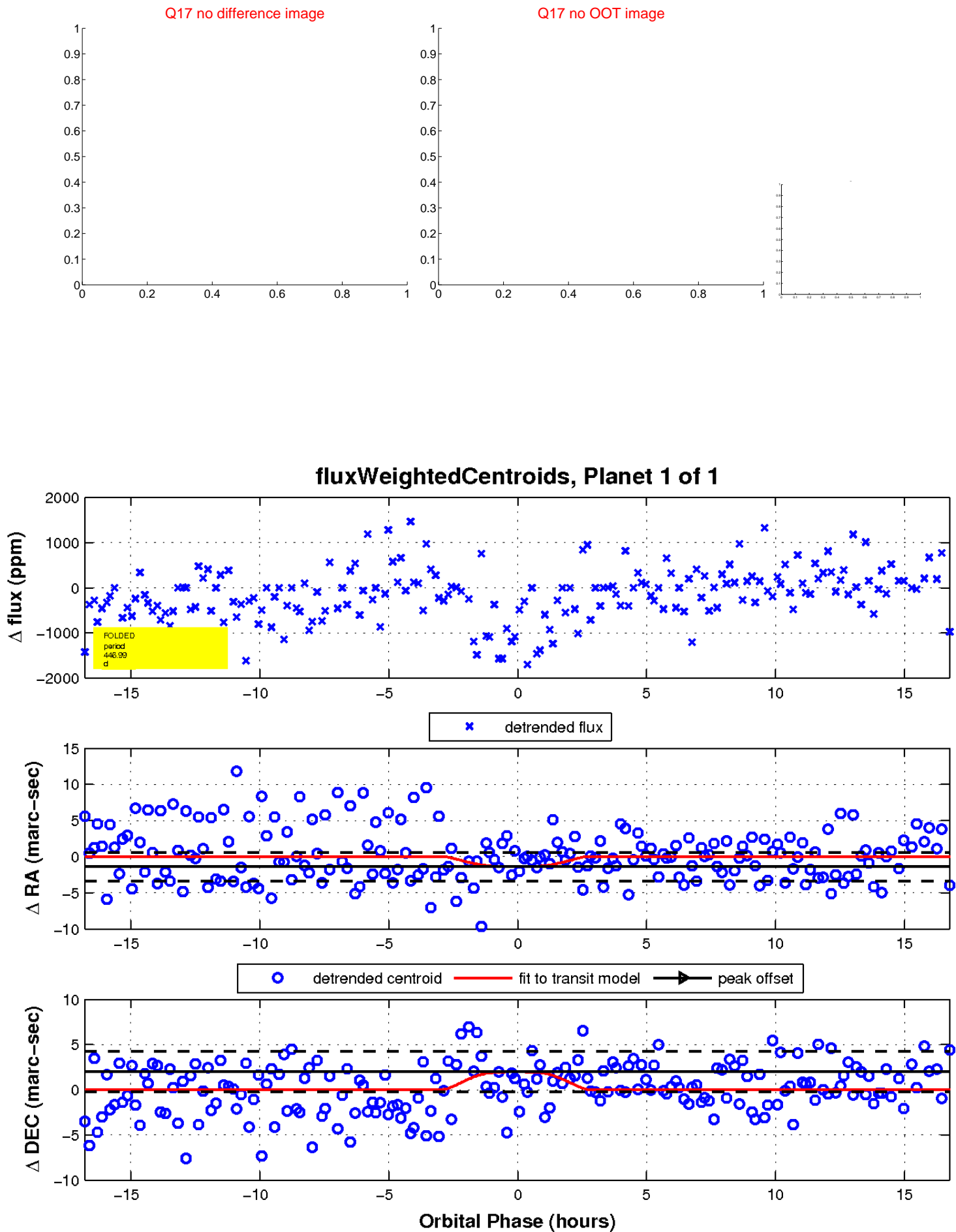
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

