

# KIC 003241604

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003241604-01	OBS	No	330.573516	271.700399	3810.0	24.533	30.3	26.7	0.92	5881	7.71	1.02
003241604-02	OBS	2824.01	1.703336	132.469956	263.9	1.957	18.1	18.6	0.92	5881	1.76	1149.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003241604-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_ZUMA—LPP_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003241604-02	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH

**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.

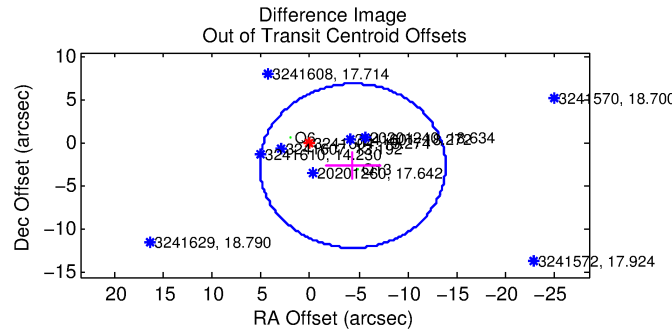
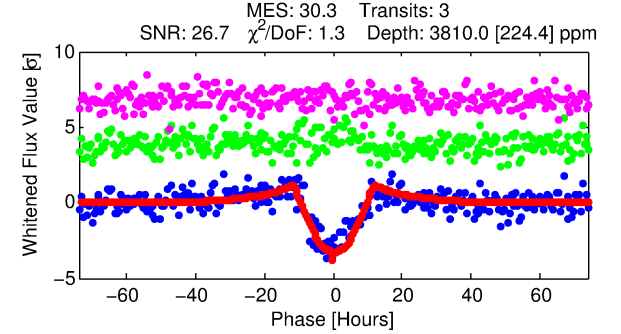
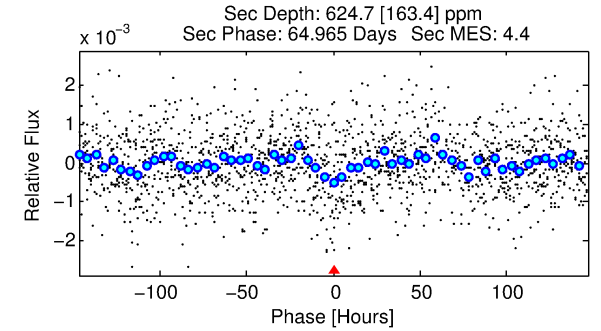
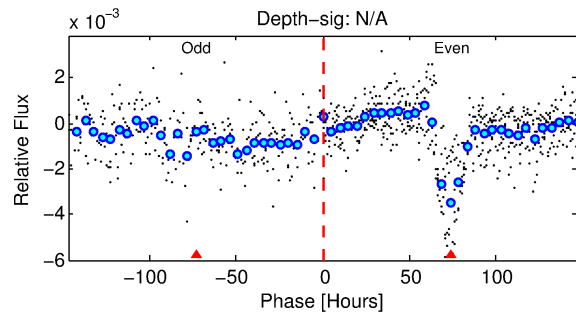
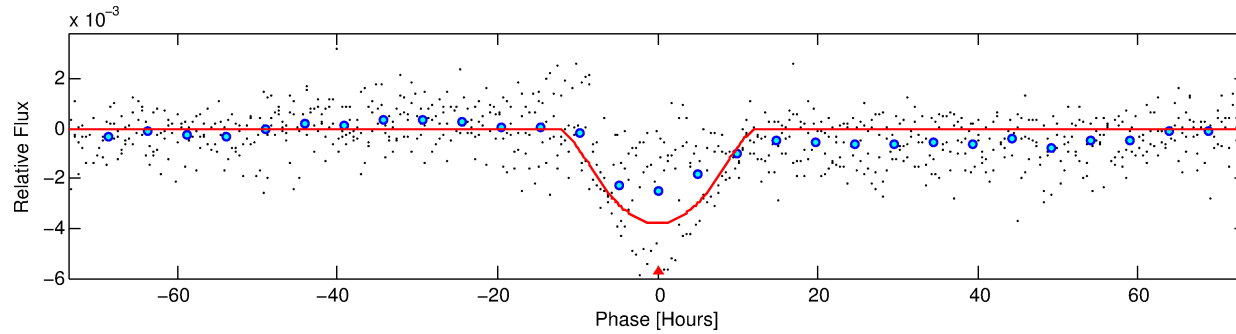
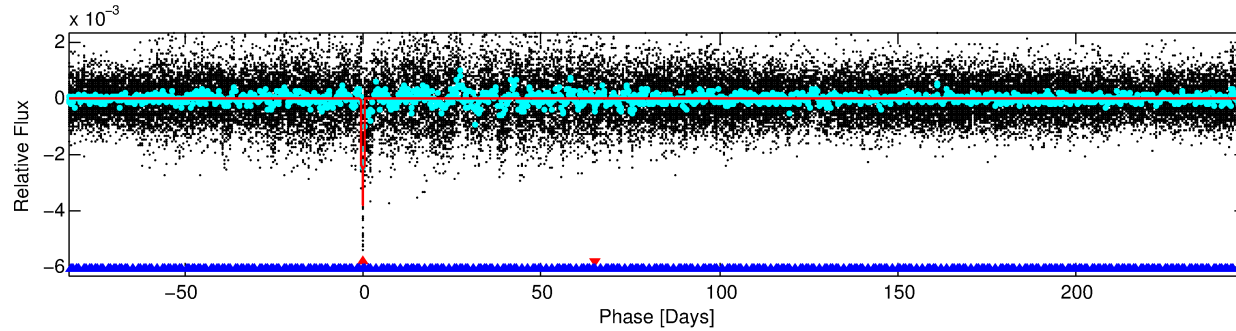
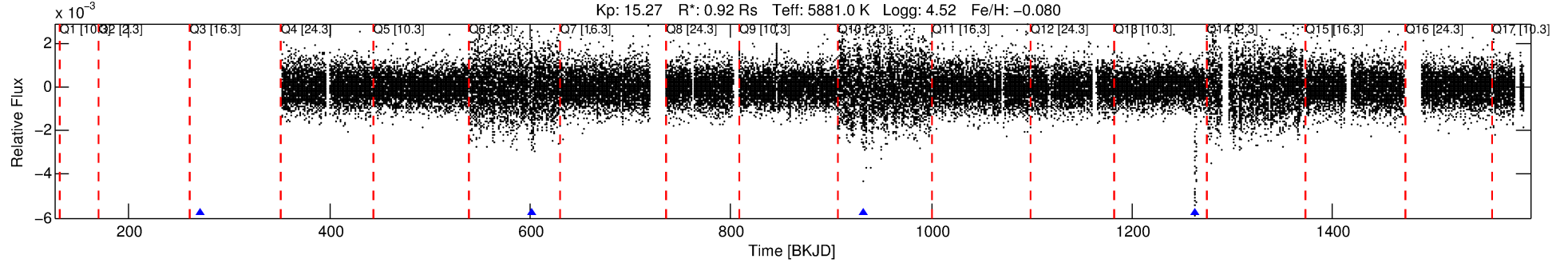
## Ephemeris Match Information For 003241604-01

No Significant Match Found

# DV One-Page Summary

KIC: 3241604 Candidate: 1 of 2 Period: 330.574 d  
KOI: K02824 Corr: No Ephemeris Match

Kp: 15.27 R\*: 0.92 Rs Teff: 5881.0 K Logg: 4.52 Fe/H: -0.080



## DV Fit Results:

Period = 330.57352 [0.01246] d  
Epoch = 271.7004 [0.0328] BKJD  
Rp/R\* = 0.0772 [0.0203]  
a/R\* = 51.80 [6.02]  
b = 0.95 [0.04]  
Seff = 1.02 [0.42]  
Teq = 256 [26] K  
Rp = 7.71 [3.17] Re  
a = 0.9365 [0.2475] AU  
Ag = 5066.83 [3552.18] [1.43σ]  
Teffp = 3345 [505] K [6.11σ]

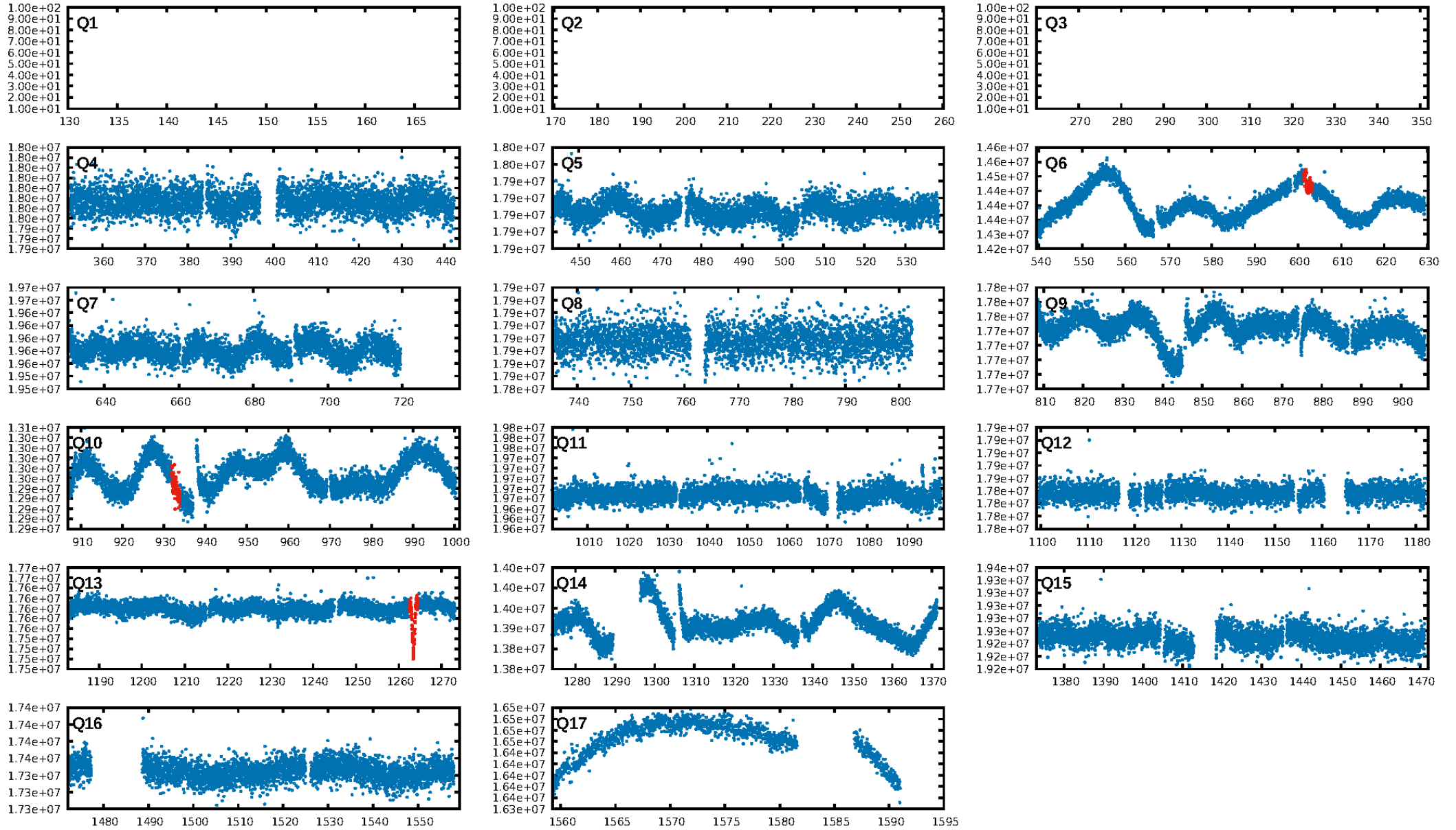
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [320.71σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 4.8%  
Bootstrap-pfa: 1.27e-162  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.4458  
Centroid-sig: 0.0%  
Centroid-so: 4.718 arcsec [36.71σ]  
OotOffset-rm: 5.080 arcsec [1.61σ]  
KicOffset-rm: 3.013 arcsec [2.62σ]  
OotOffset-st: 1/0/0/1 [2]  
KicOffset-st: 1/0/0/1 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 0.00 [0/3]

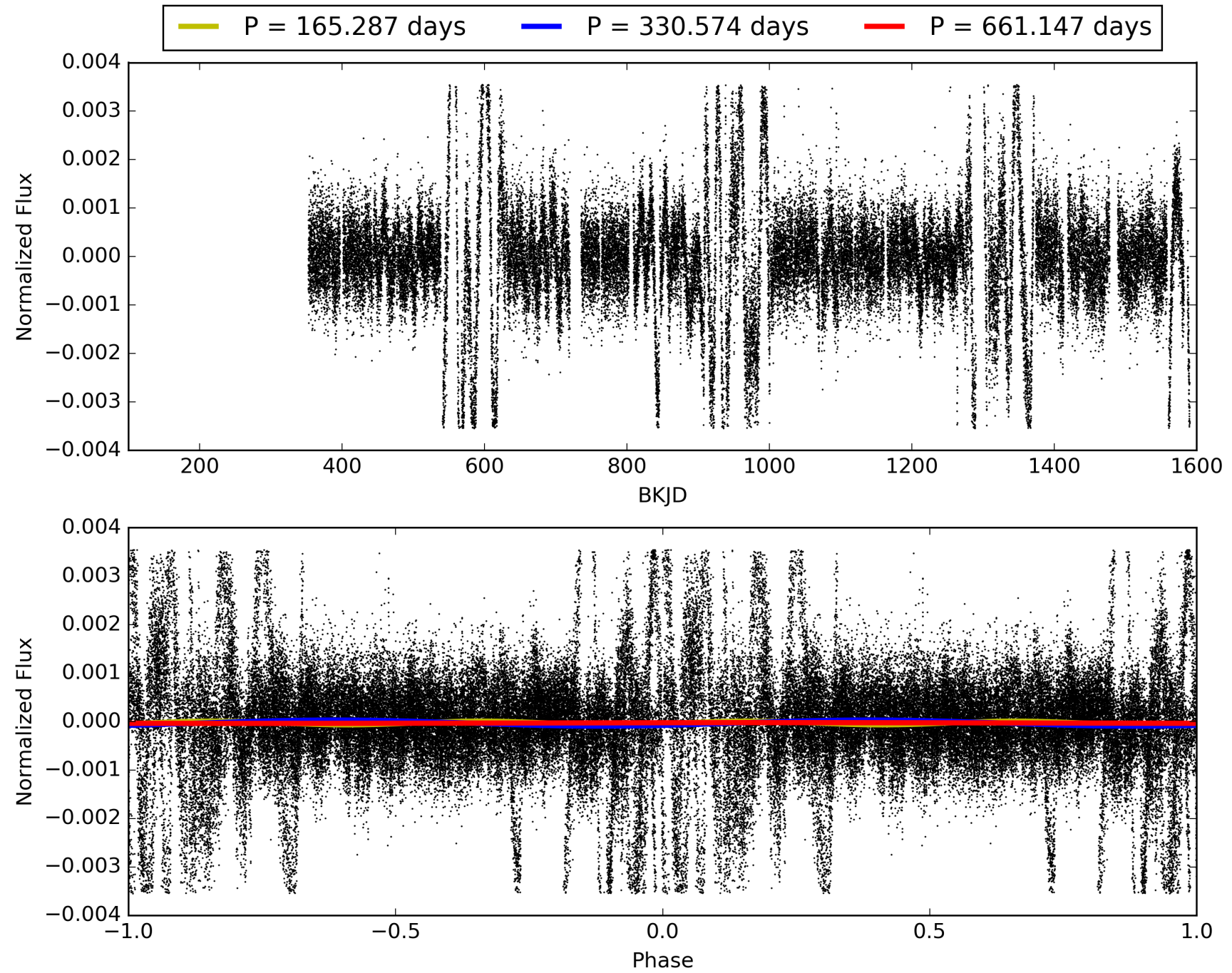
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 07:27:27 Z

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

# TCE 003241604-01, PDC Light Curves

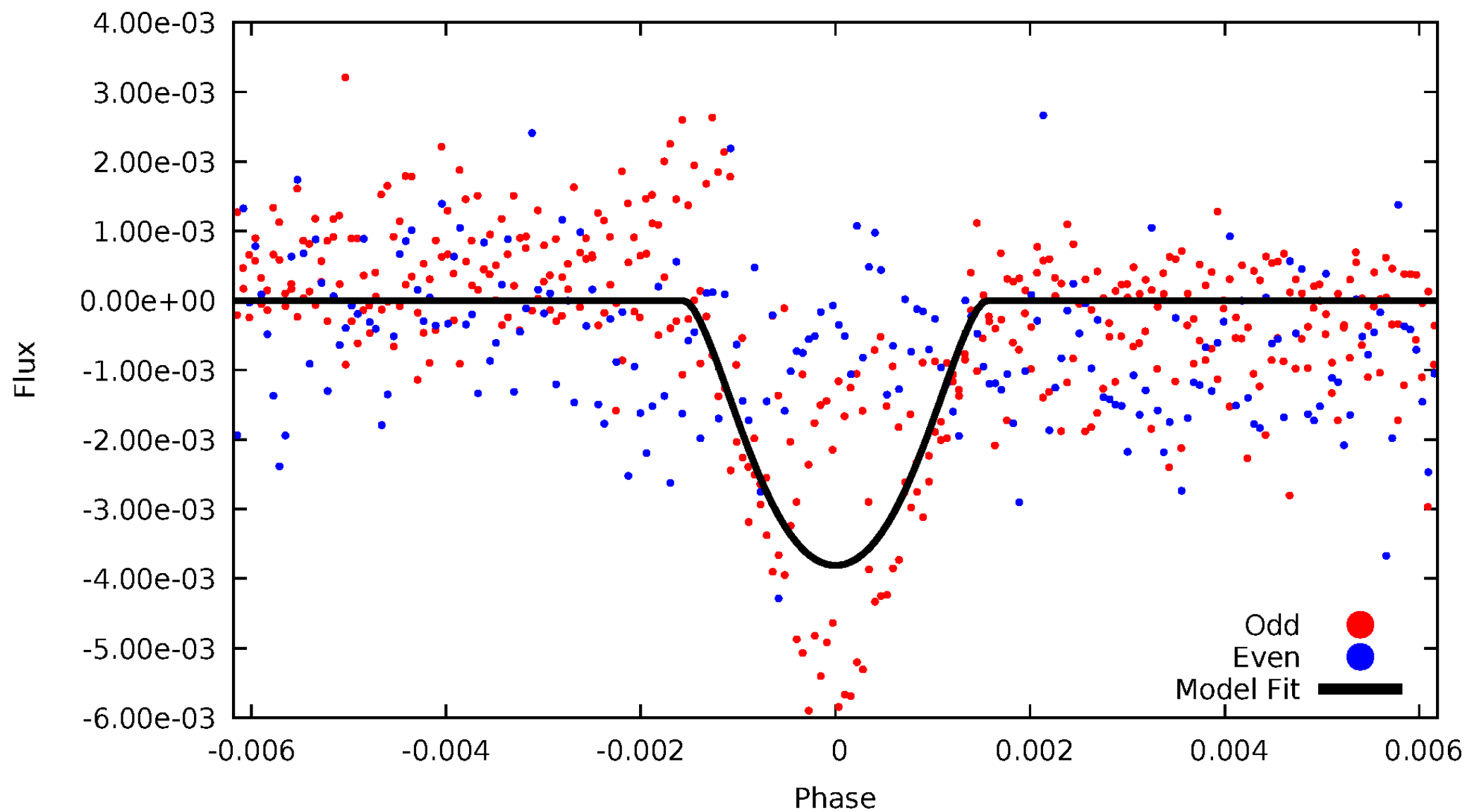


TCE 003241604-01



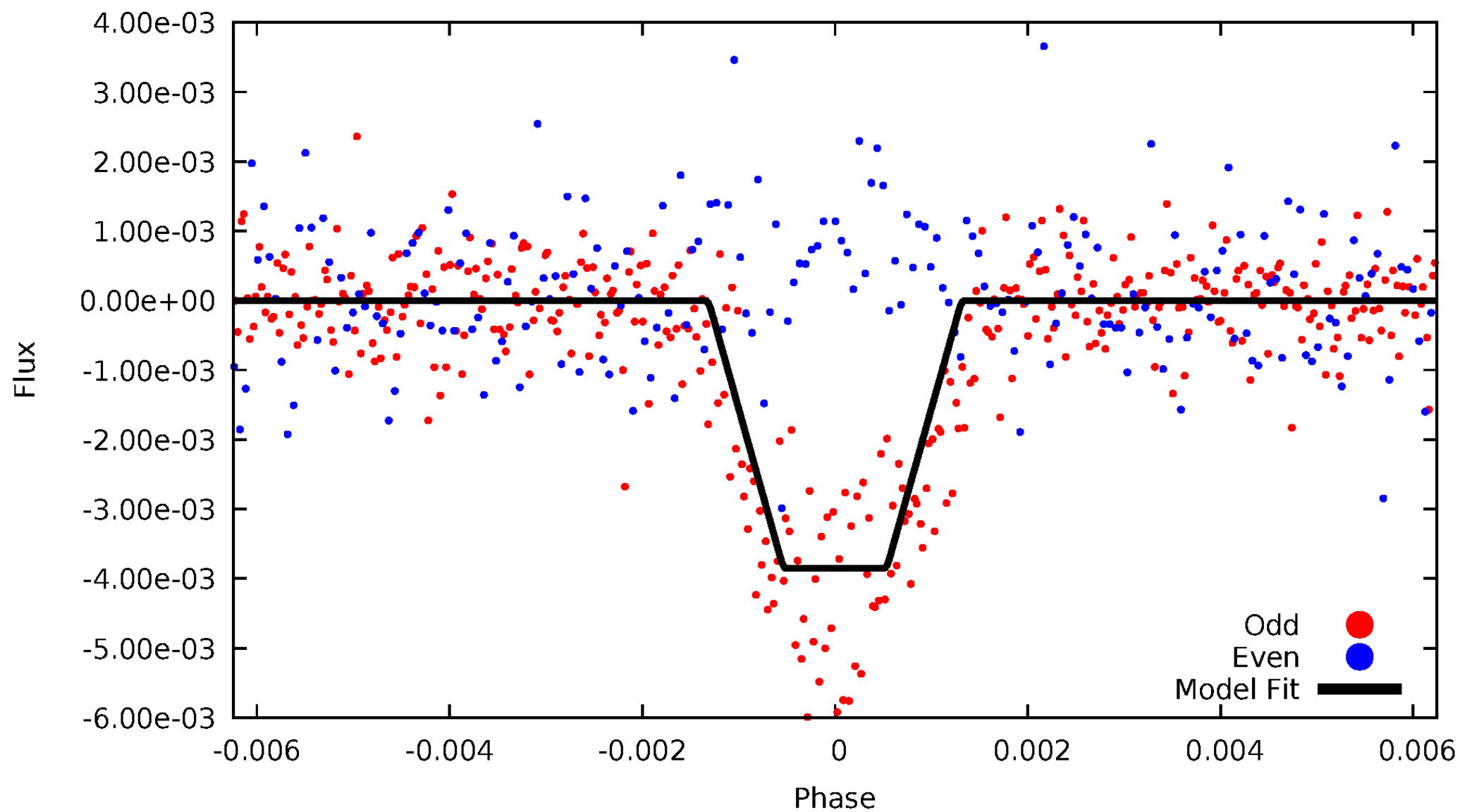
# DV Odd/Even

TCE 003241604-01



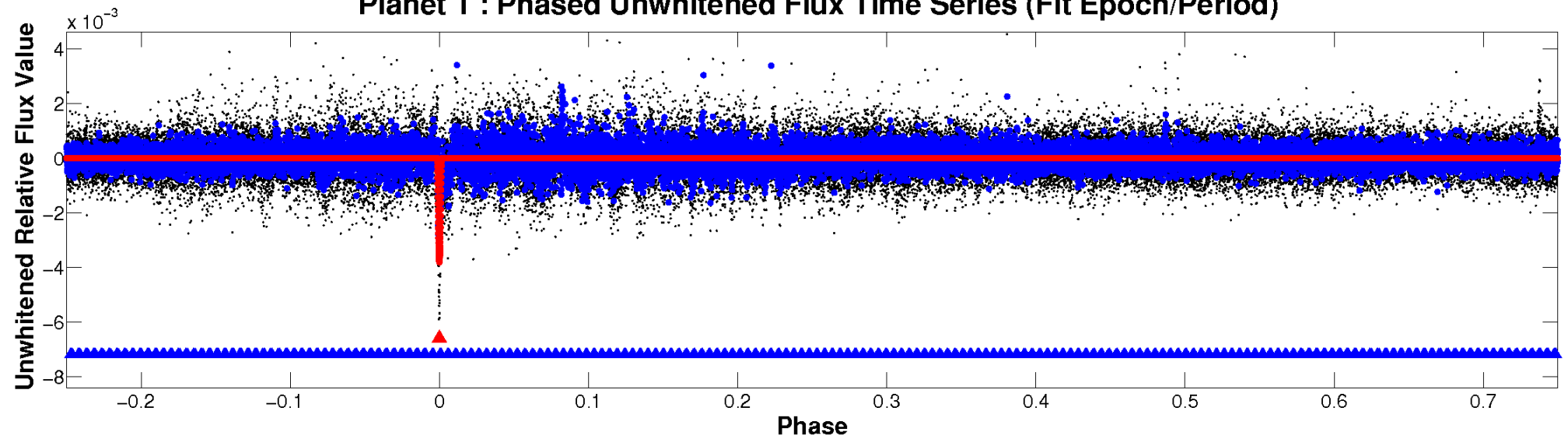
# ALT Odd/Even

TCE 003241604-01

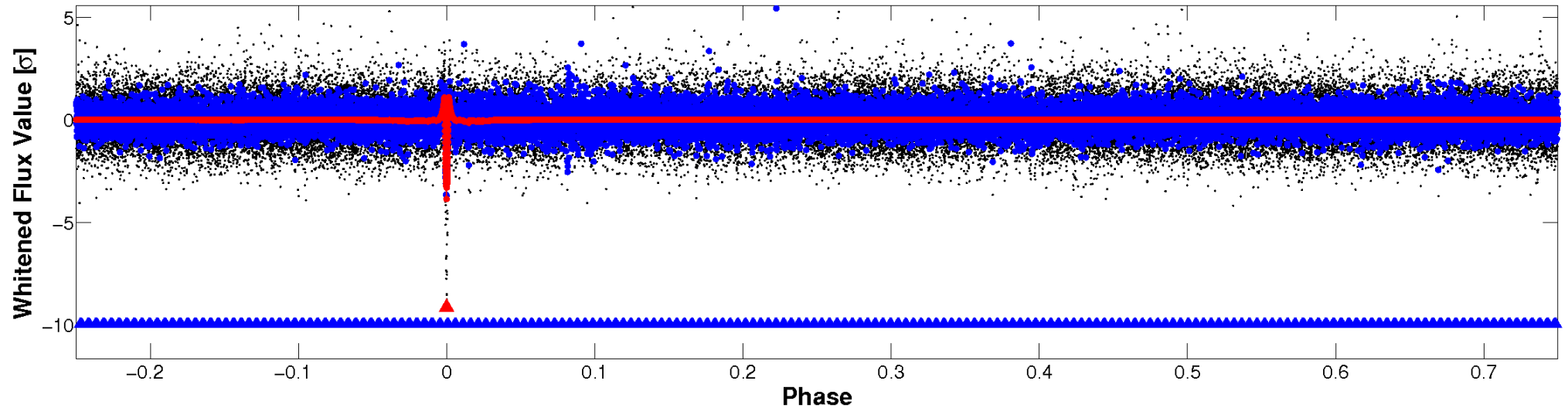


# Non-Whitened Vs. Whitened Light Curve

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



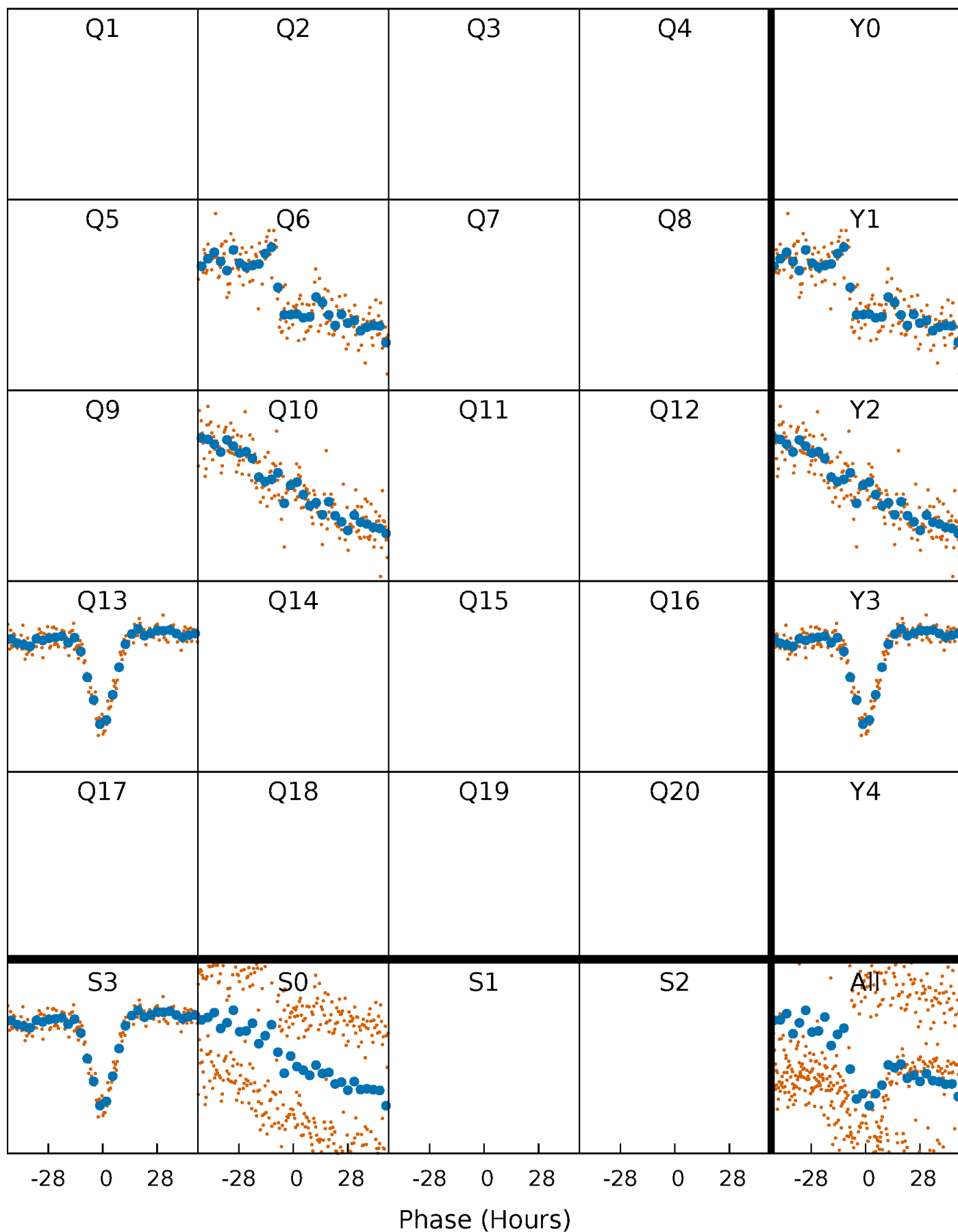
Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

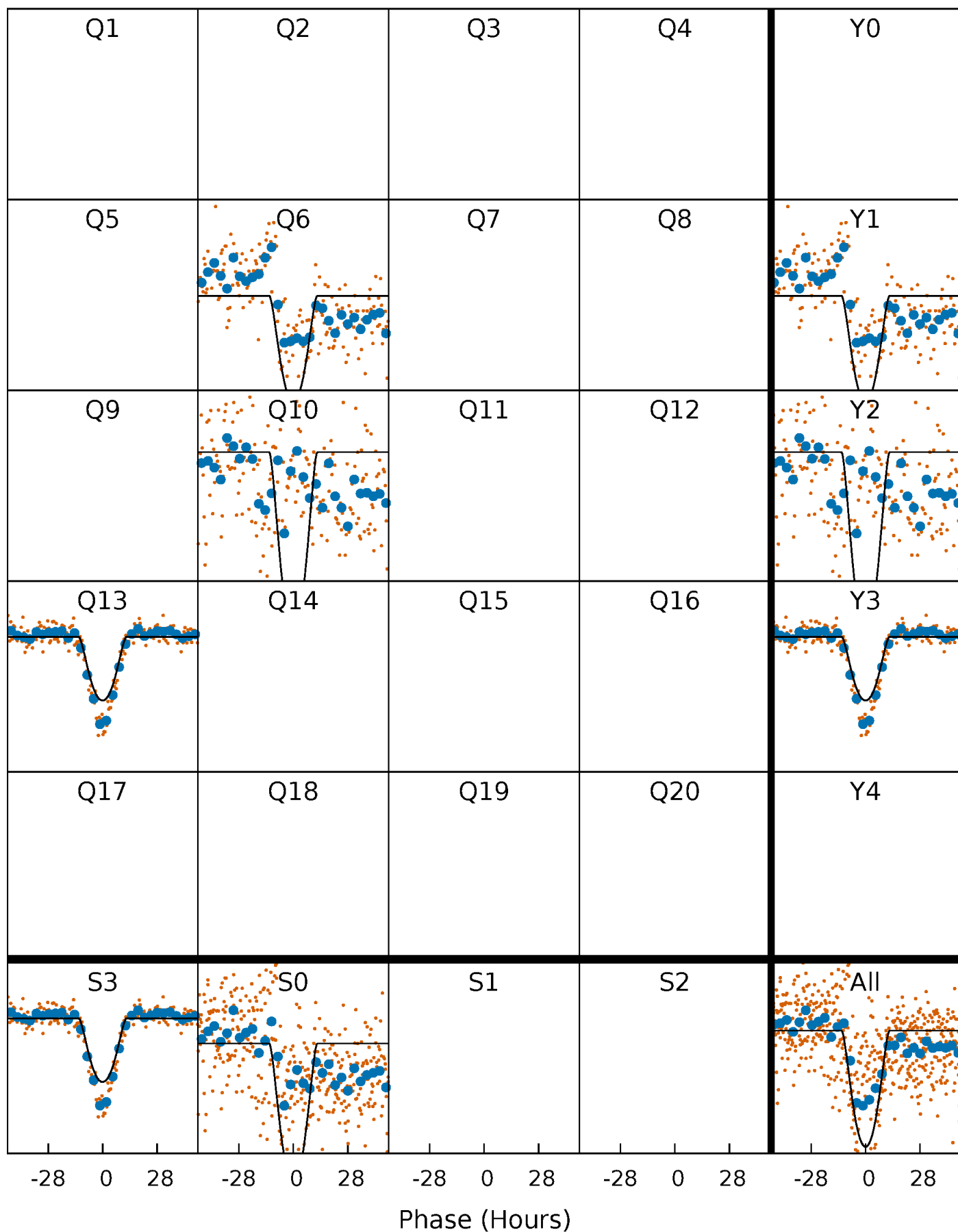
TCE 003241604-01 P=330.573516 Days  $T_0=271.700399$  (BKJD)





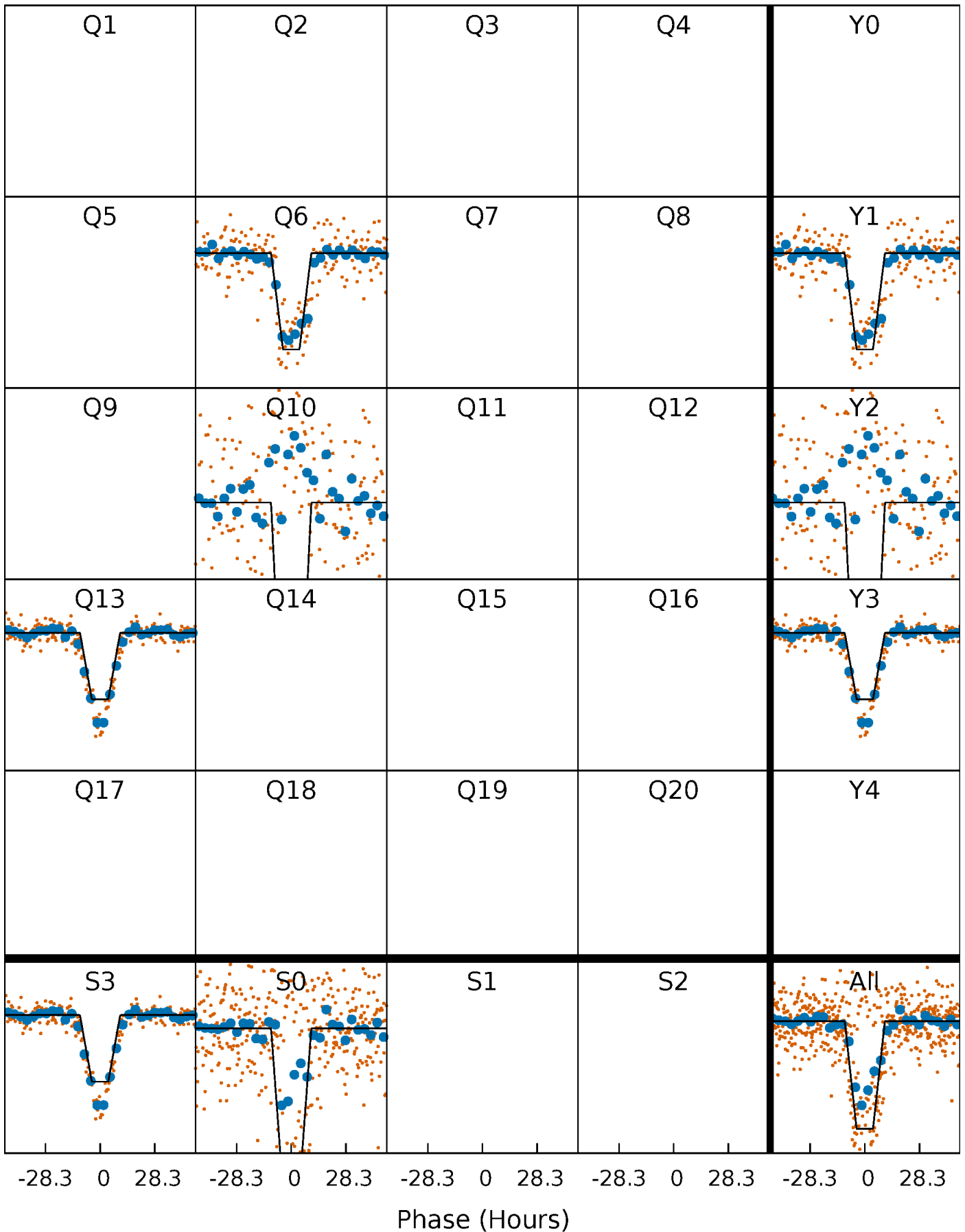
# DV Quarter-Phased Transit Curves

TCE 003241604-01 P=330.573516 Days  $T_0=271.700399$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

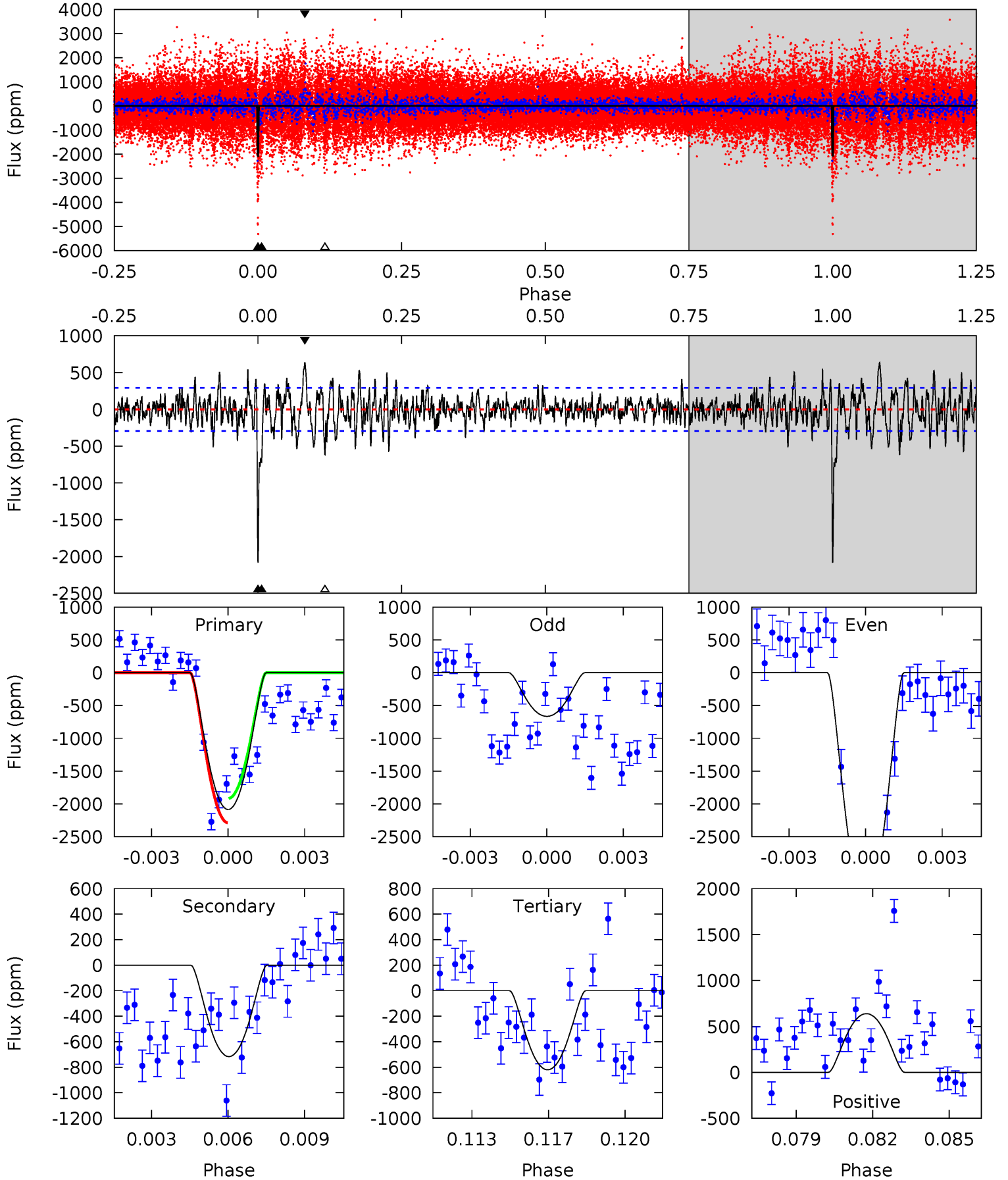
TCE 003241604-01 P=330.587756 Days  $T_0=271.661656$  (BKJD)



# DV Model-Shift Uniqueness Test

003241604-01, P = 330.573516 Days, E = 271.700399 Days

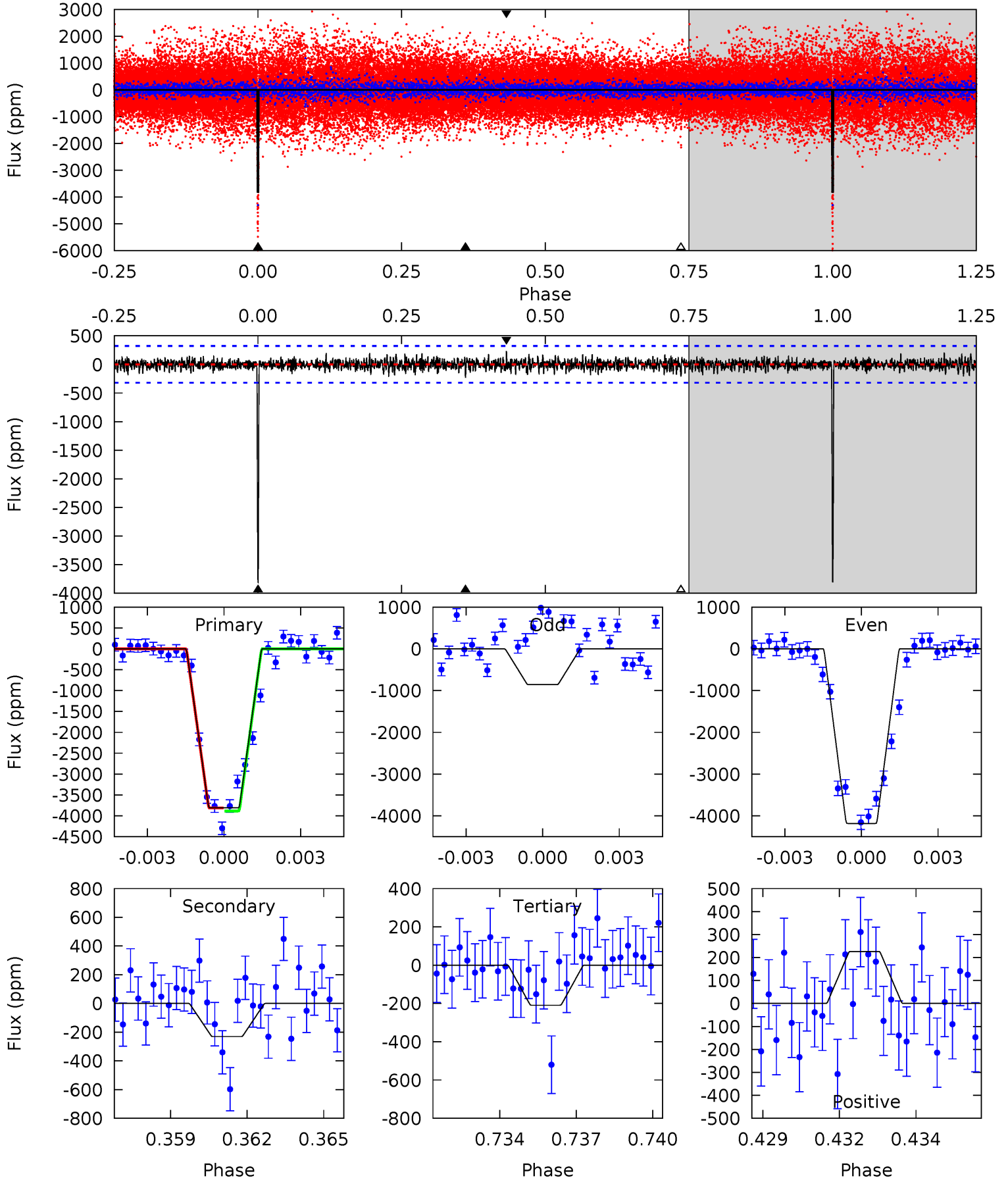
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
37.2	12.8	11.1	11.4	5.24	2.95	2.73	26.2	25.8	1.73	1.39	24.5	1.40	0.23	3.28



# Alt Model-Shift Uniqueness Test

003241604-01, P = 330.587756 Days, E = 271.661656 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
62.7	3.79	3.45	3.73	5.27	3.00	1.00	59.2	59.0	0.35	0.07	28.9	0.72	0.06	0.62



### Stellar Parameters For KIC 003241604

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5881^{+184}_{-204}$	$4.516^{+0.052}_{-0.208}$	$-0.080^{+0.250}_{-0.300}$	$0.915^{+0.289}_{-0.096}$	$1.002^{+0.126}_{-0.126}$	$1.840^{+0.481}_{-0.958}$
	+3%/-3%	+1%/-5%	+312%/-375%	+32%/-10%	+13%/-13%	+26%/-52%
Source	KIC0	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 003241604-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-716 \pm 56$	$8.11^{+2.32}_{-2.26}$	$367^{+26}_{-21}$	$3832^{+423}_{-288}$	$5103^{+4634}_{-1992}$
Alt.	$-230 \pm 61$	$6.39^{+2.42}_{-2.22}$	$366^{+25}_{-20}$	$3413^{+594}_{-312}$	$2607^{+4190}_{-1244}$

$T_{max}$  = 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

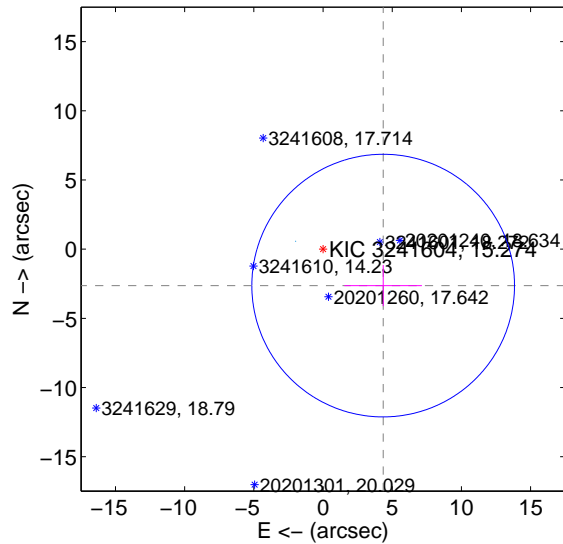
Supplemental centroid analysis for 003241604-01. Kepler magnitude: 15.27. Transit SNR 26.74

There are 2 quarters with good PRF difference image offsets

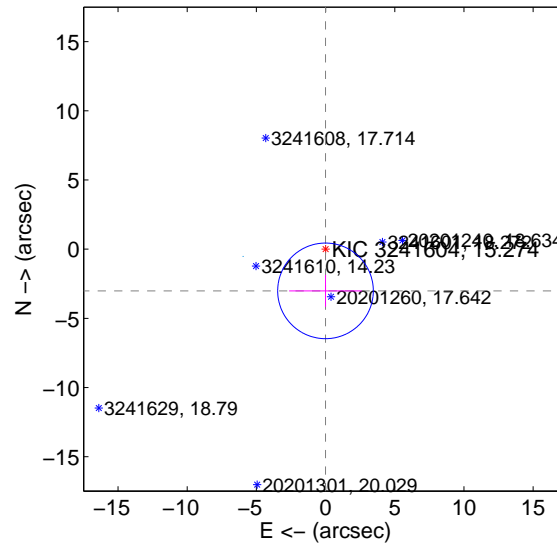
The OOT PRF centroid is offset from the target star catalog position by about 4.39 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.080 \pm 3.163$	1.61	$-4.345 \pm 2.799$	$-2.632 \pm 1.487$
PRF-fit source offset from KIC position	$3.013 \pm 1.152$	2.62	$0.006 \pm 2.631$	$-3.013 \pm 1.157$
photometric centroid source offset	$4.72 \pm 0.13$	36.71	$-0.24 \pm 0.20$	$-4.71 \pm 0.13$

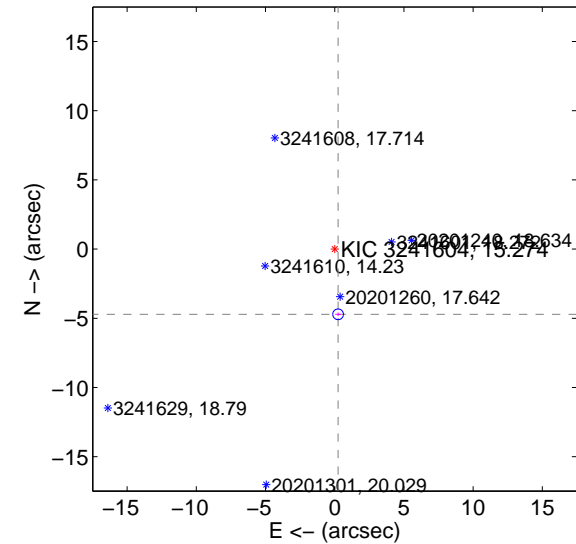
offset from difference PRF-fit to OOT PRF-fit



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.

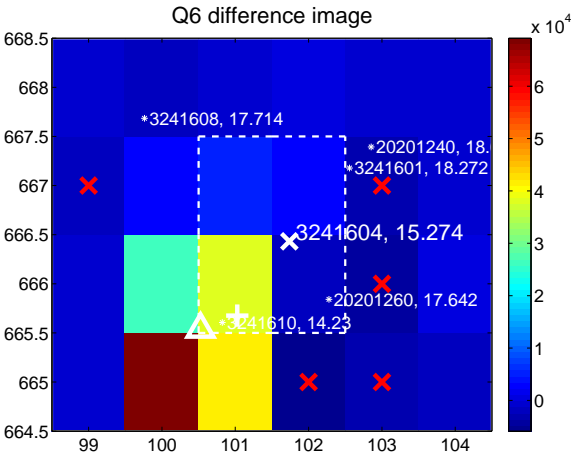
Q5 no difference image



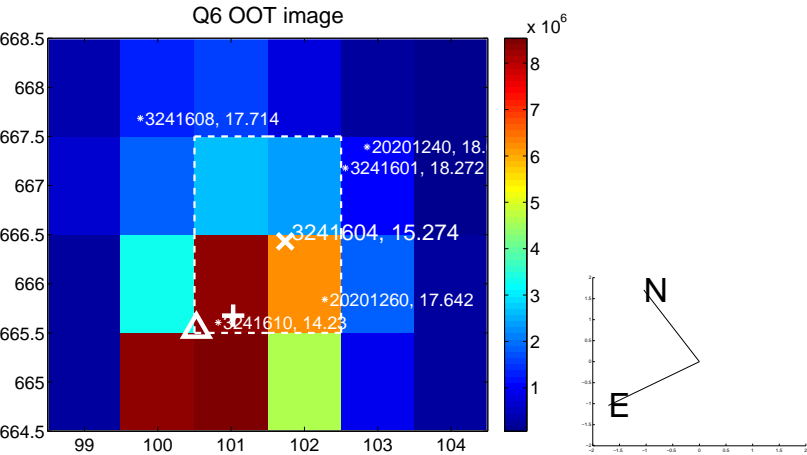
Q5 no OOT image



Q6 difference image



Q6 OOT image



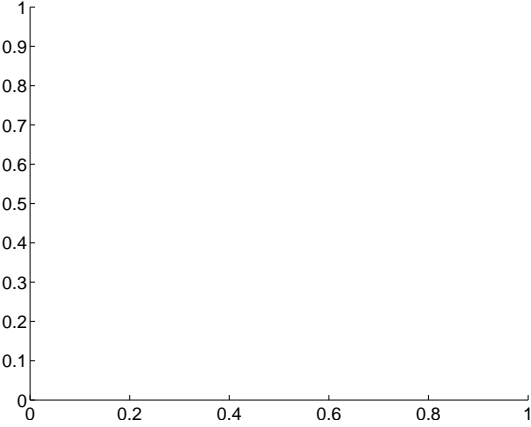
Q7 no difference image



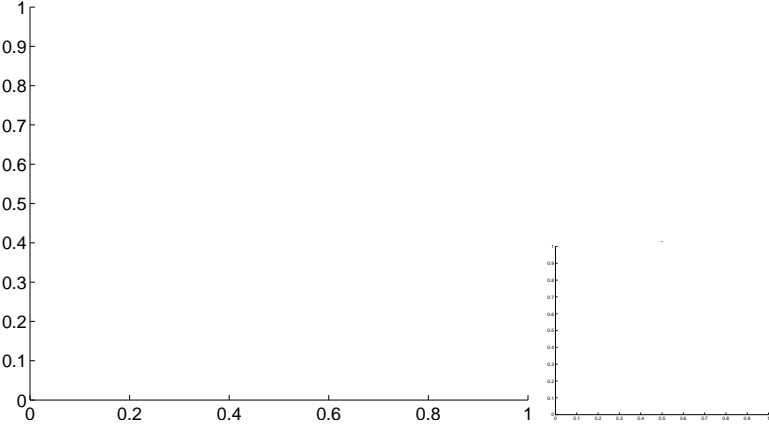
Q7 no OOT image



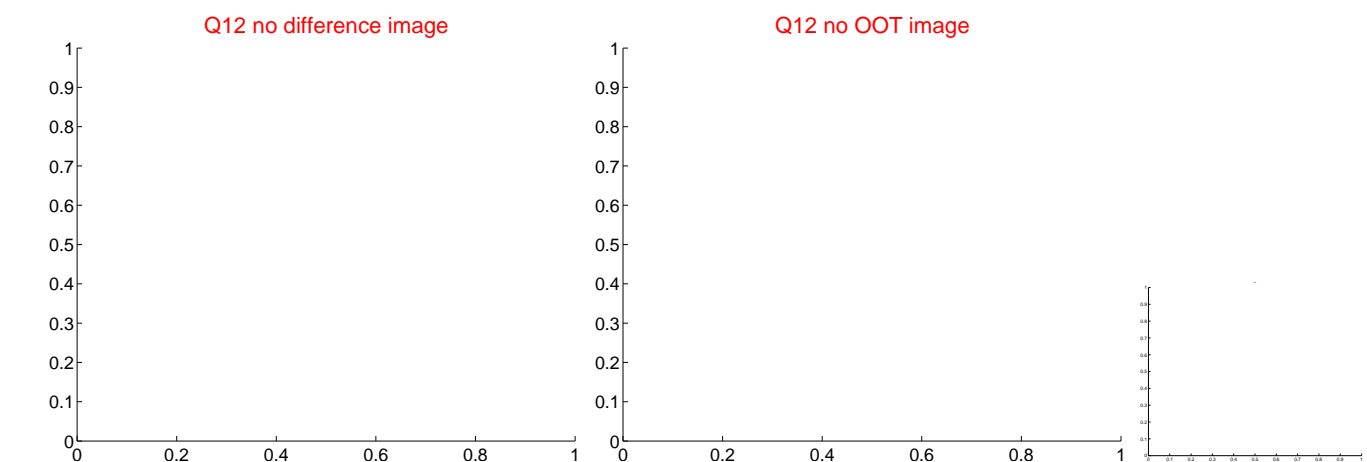
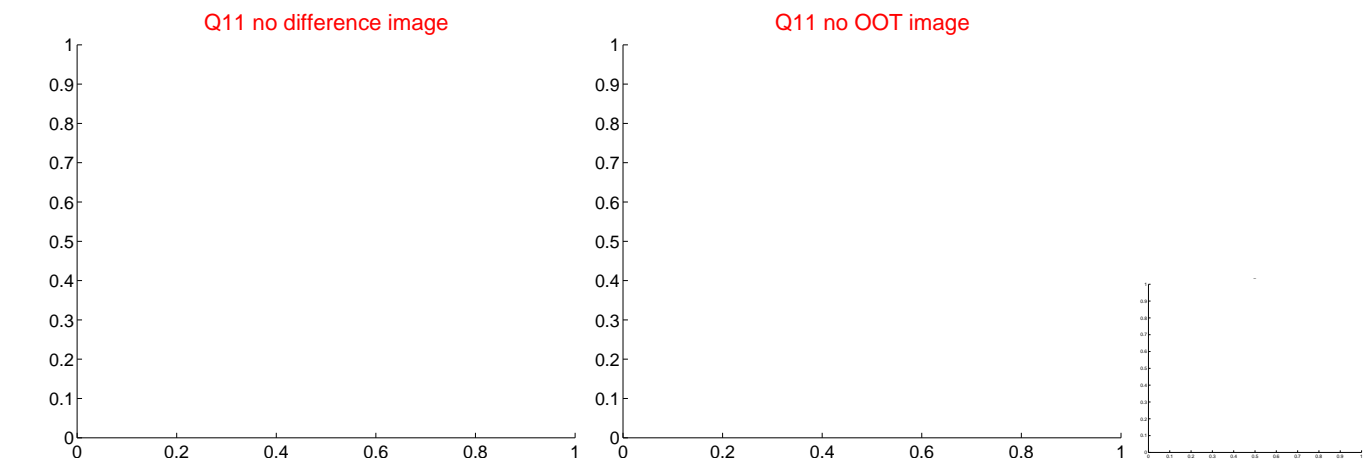
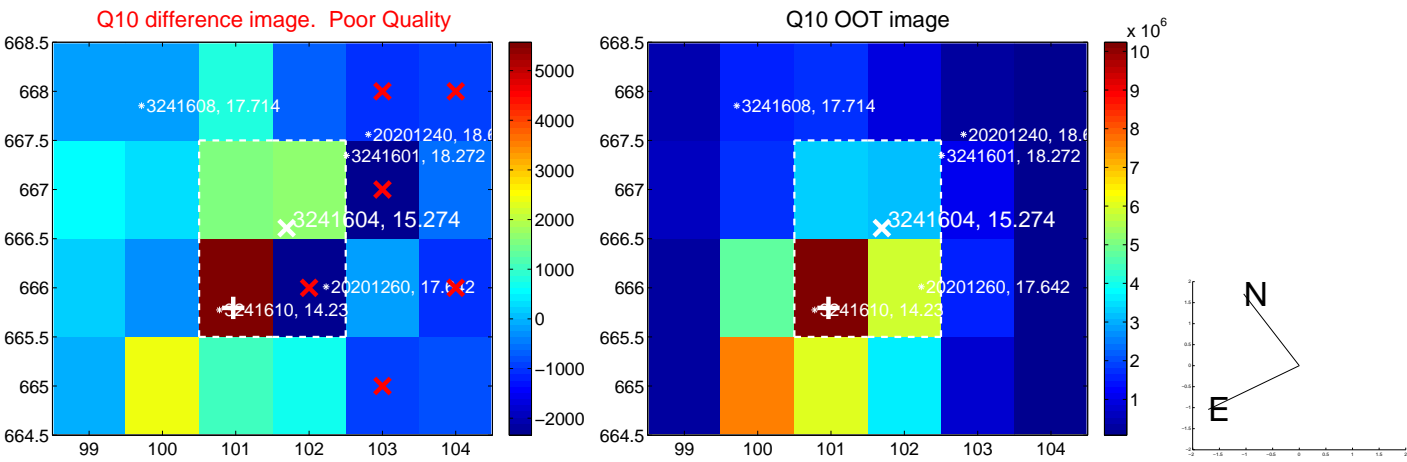
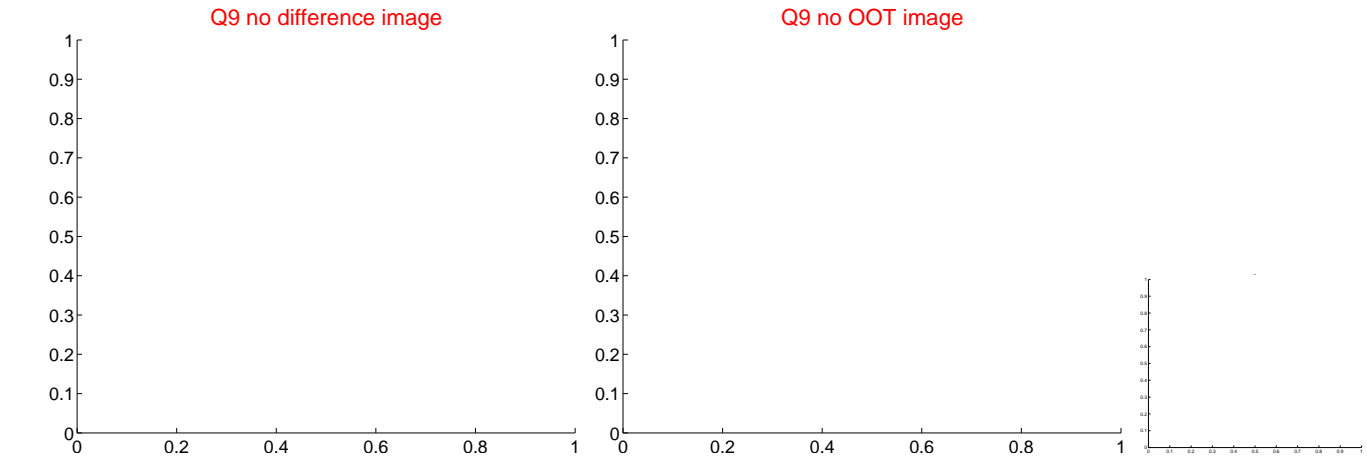
Q8 no difference image



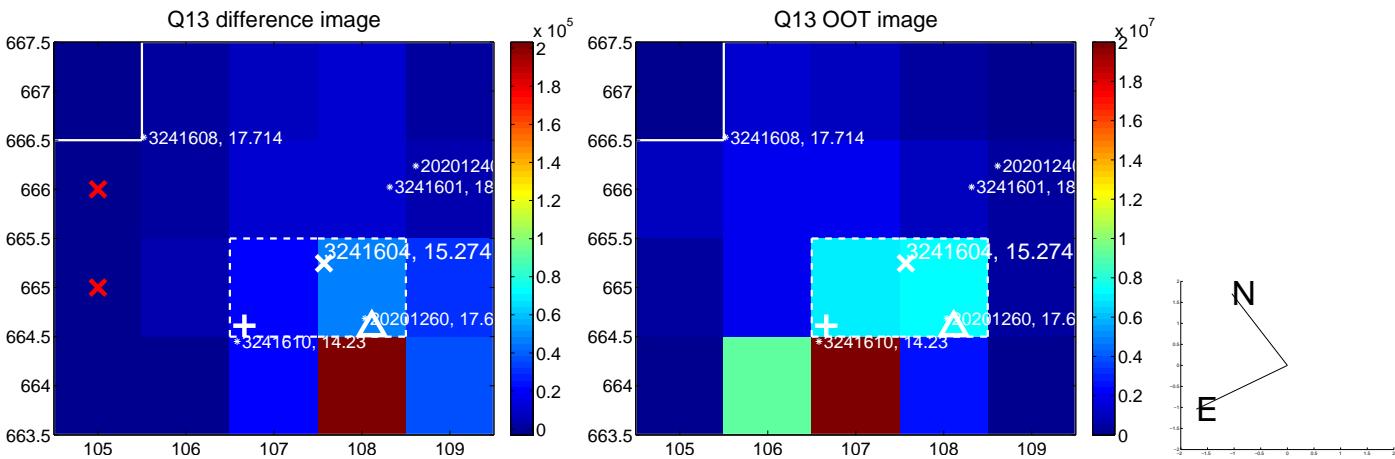
Q8 no OOT image



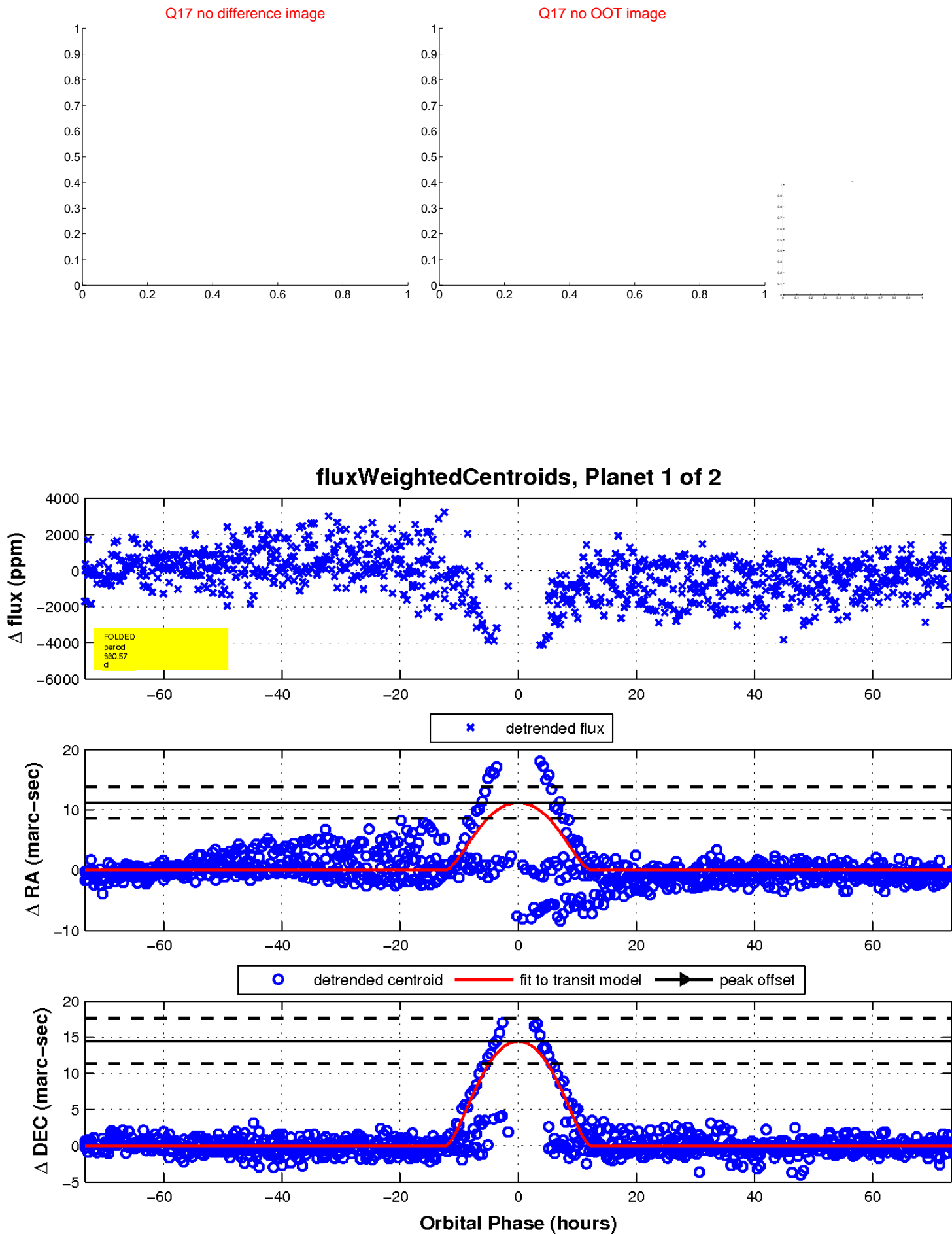
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

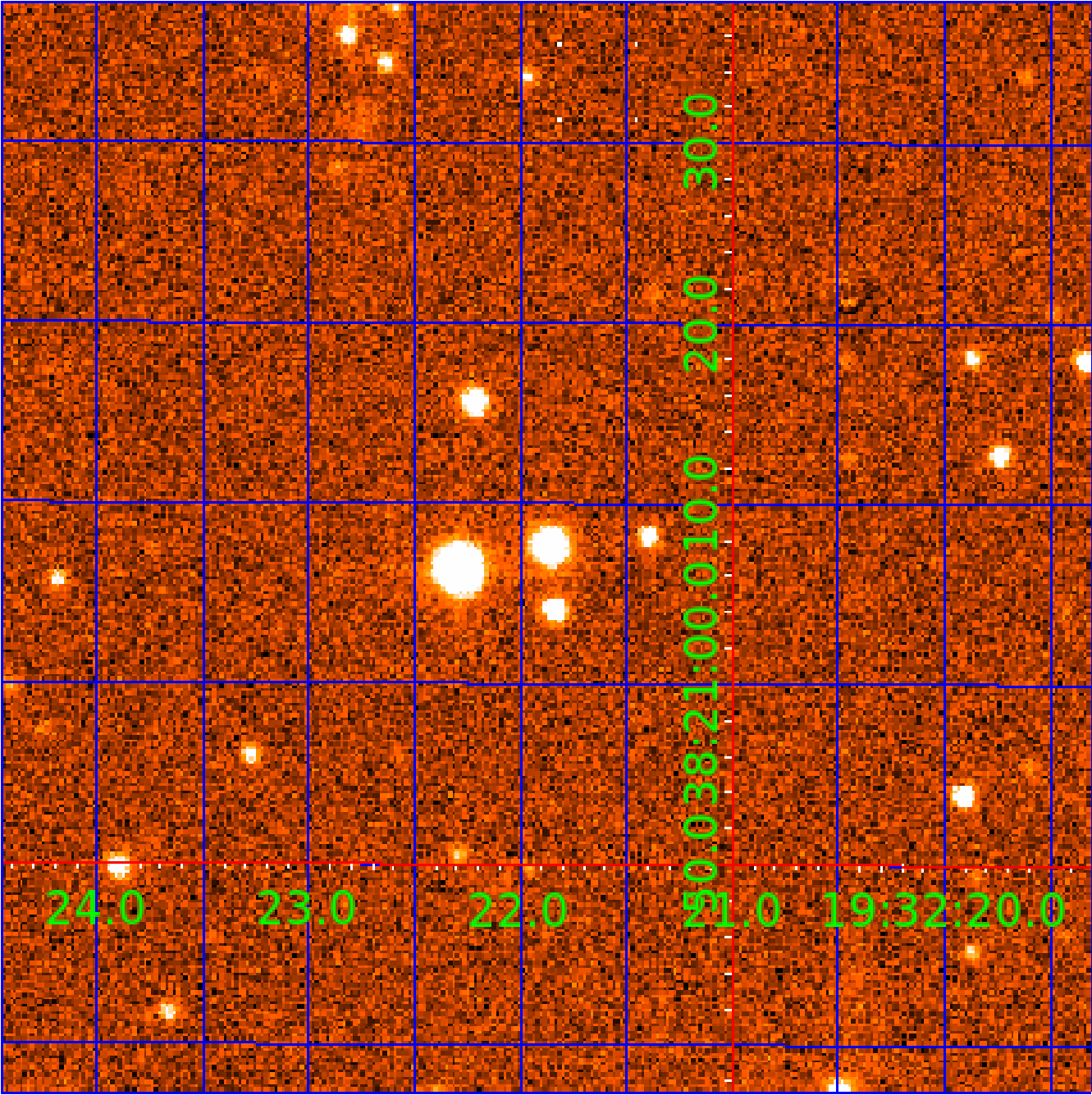


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003241604

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003241604-01	OBS	No	330.573516	271.700399	3810.0	24.533	30.3	26.7	0.92	5881	7.71	1.02
003241604-02	OBS	2824.01	1.703336	132.469956	263.9	1.957	18.1	18.6	0.92	5881	1.76	1149.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003241604-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_ZUMA—LPP_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
003241604-02	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH

**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.

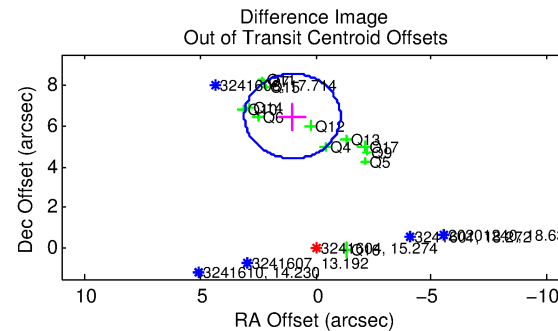
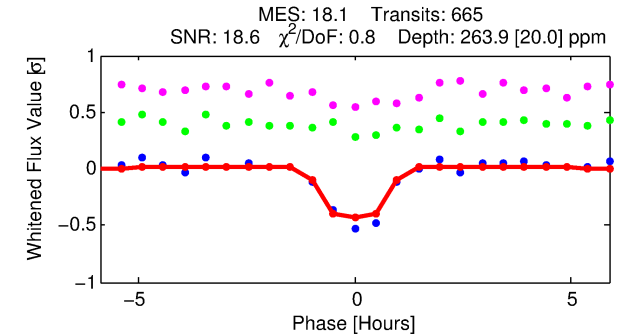
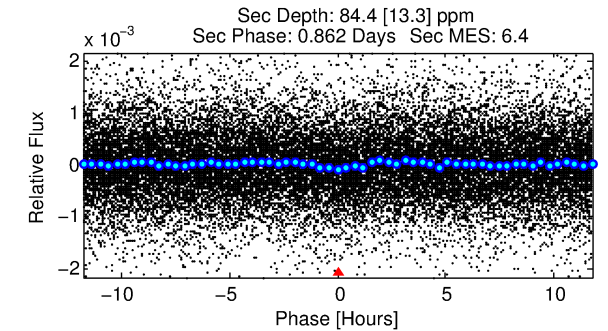
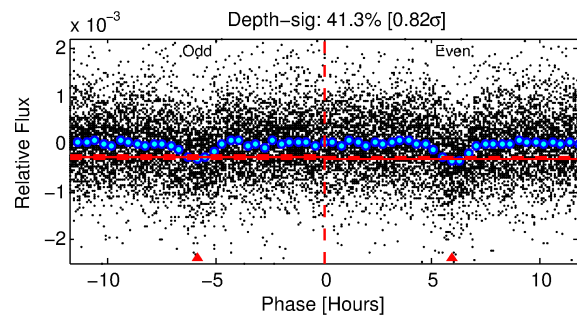
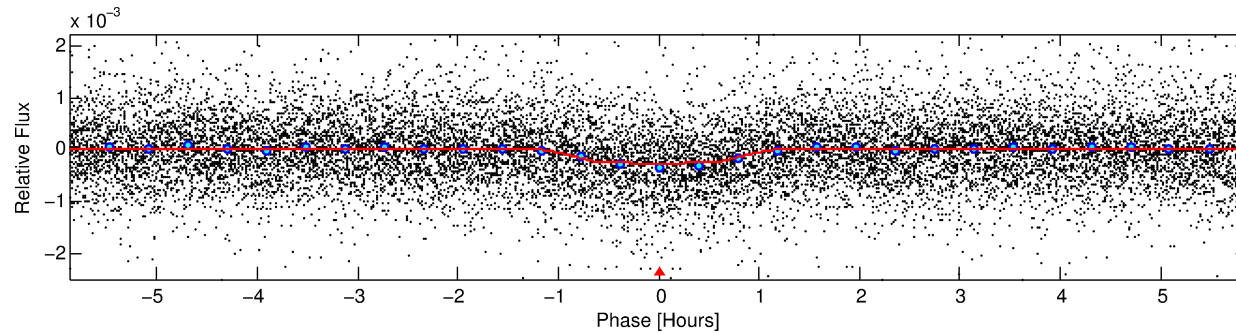
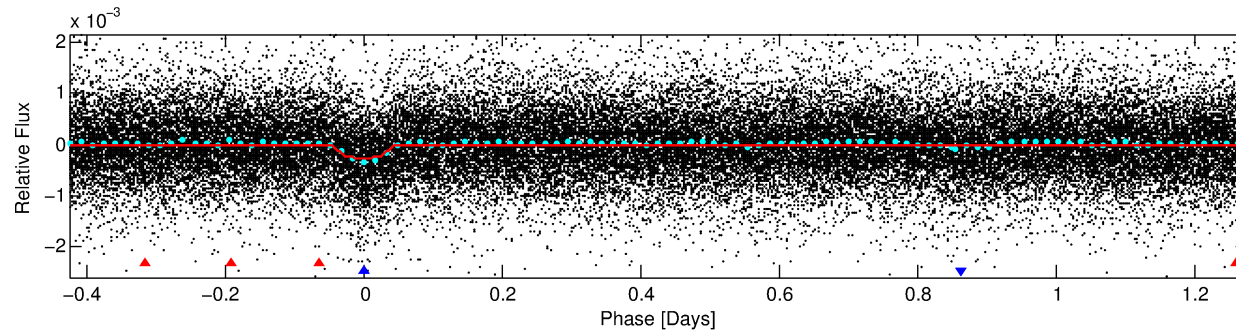
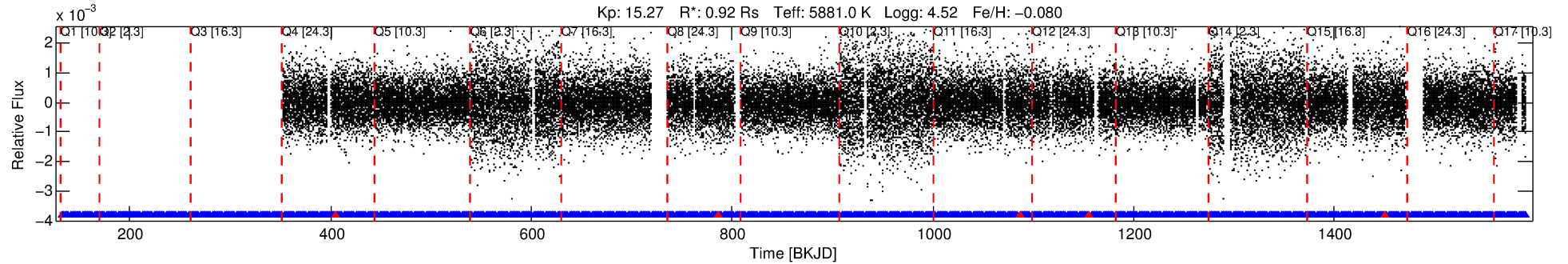
## Ephemeris Match Information For 003241604-02

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
003241604-02	3241604	6312.01	3241619	1:1	34.6	-5	7	12.52	15.27	1932.20	Direct-PRF	0	0.49	0.12

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 3241604 Candidate: 2 of 2 Period: 1.703 d  
KOI: K02824.01 Corr: 0.926



## DV Fit Results:

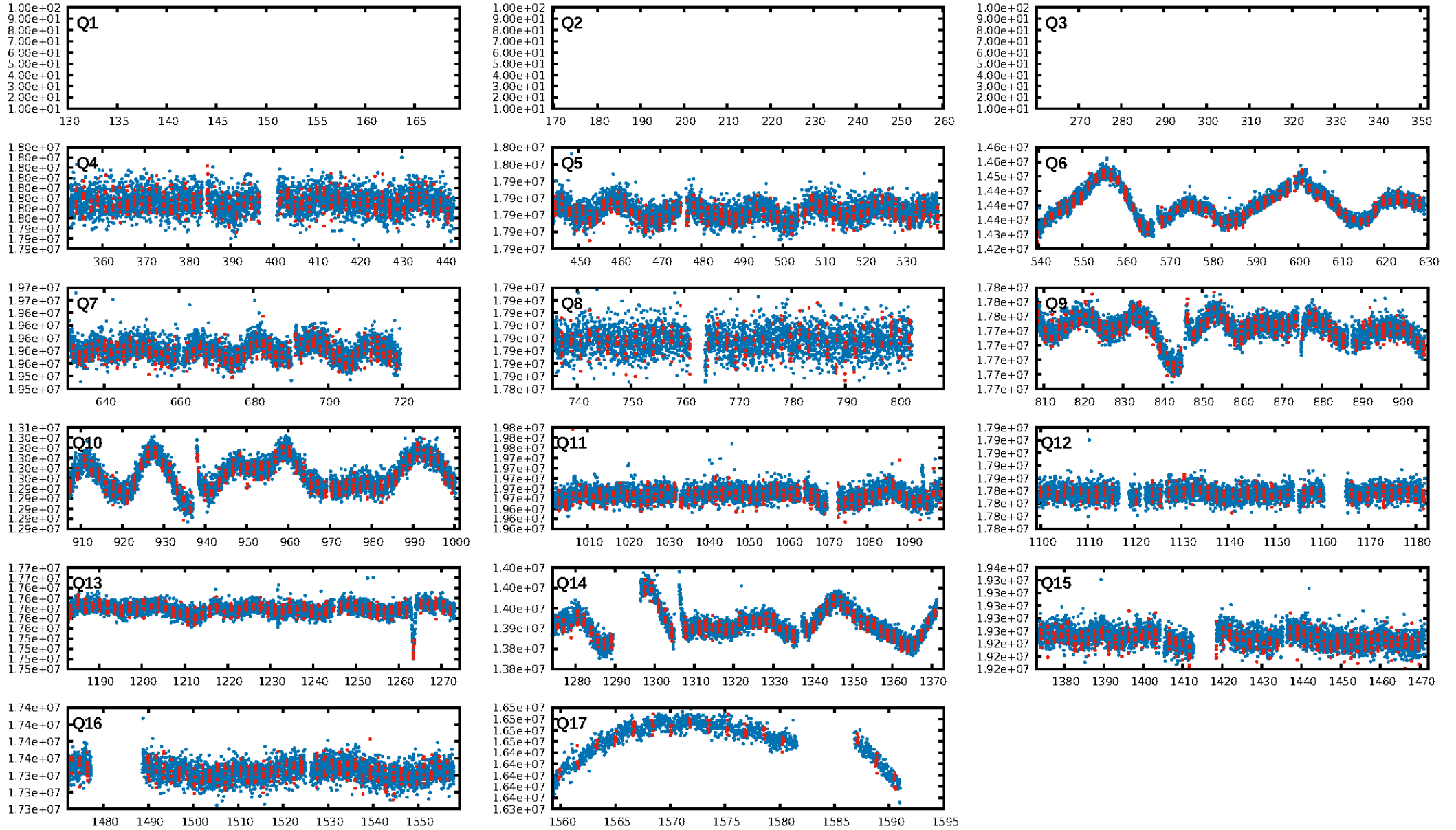
Period = 1.70334 [0.00001] d  
Epoch = 132.4700 [0.0016] BKJD  
Rp/R\* = 0.0177 [0.0061]  
a/R\* = 3.29 [5.01]  
b = 0.90 [0.36]  
Seff = 1149.69 [467.76]  
Teq = 1485 [151] K  
Rp = 1.77 [0.82] Re  
a = 0.0279 [0.0074] AU  
Ag = 11.63 [9.33] [1.14 $\sigma$ ]  
Teff = 4239 [761] K [3.55 $\sigma$ ]

## DV Diagnostic Results:

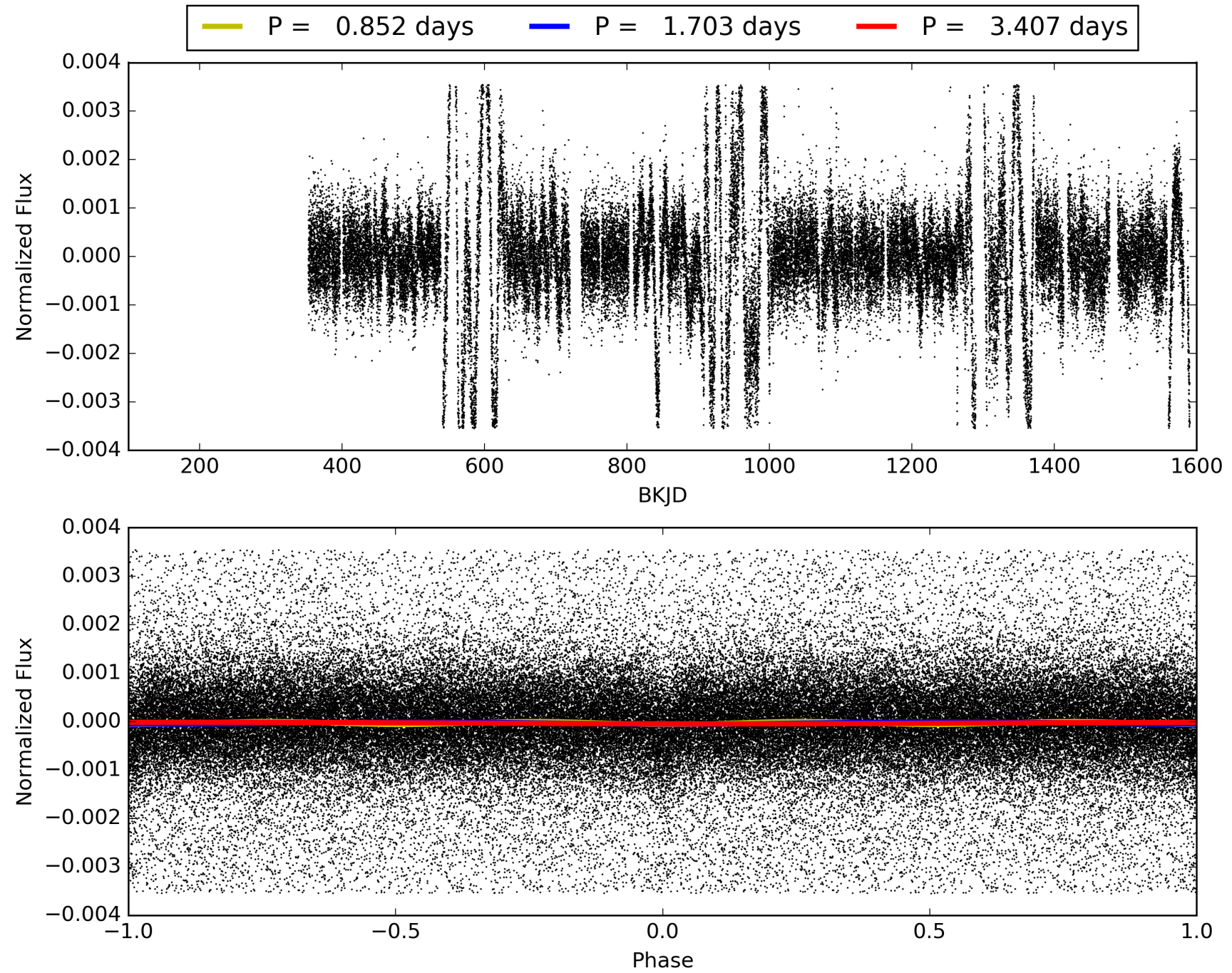
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [320.71 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.07e-69  
RollingBand-fgt: 0.99 [644/649]  
GhostDiagnostic-chr: 0.114  
Centroid-sig: 0.0%  
Centroid-so: 1.178 arcsec [4.31 $\sigma$ ]  
OotOffset-rm: 6.544 arcsec [9.47 $\sigma$ ]  
KicOffset-rm: 7.368 arcsec [11.31 $\sigma$ ]  
OotOffset-st: 3/3/3/4 [13]  
KicOffset-st: 3/3/3/4 [13]  
DiffImageQuality-fgm: 0.00 [0/13]  
DiffImageOverlap-fno: 1.00 [14/14]



# TCE 003241604-02, PDC Light Curves

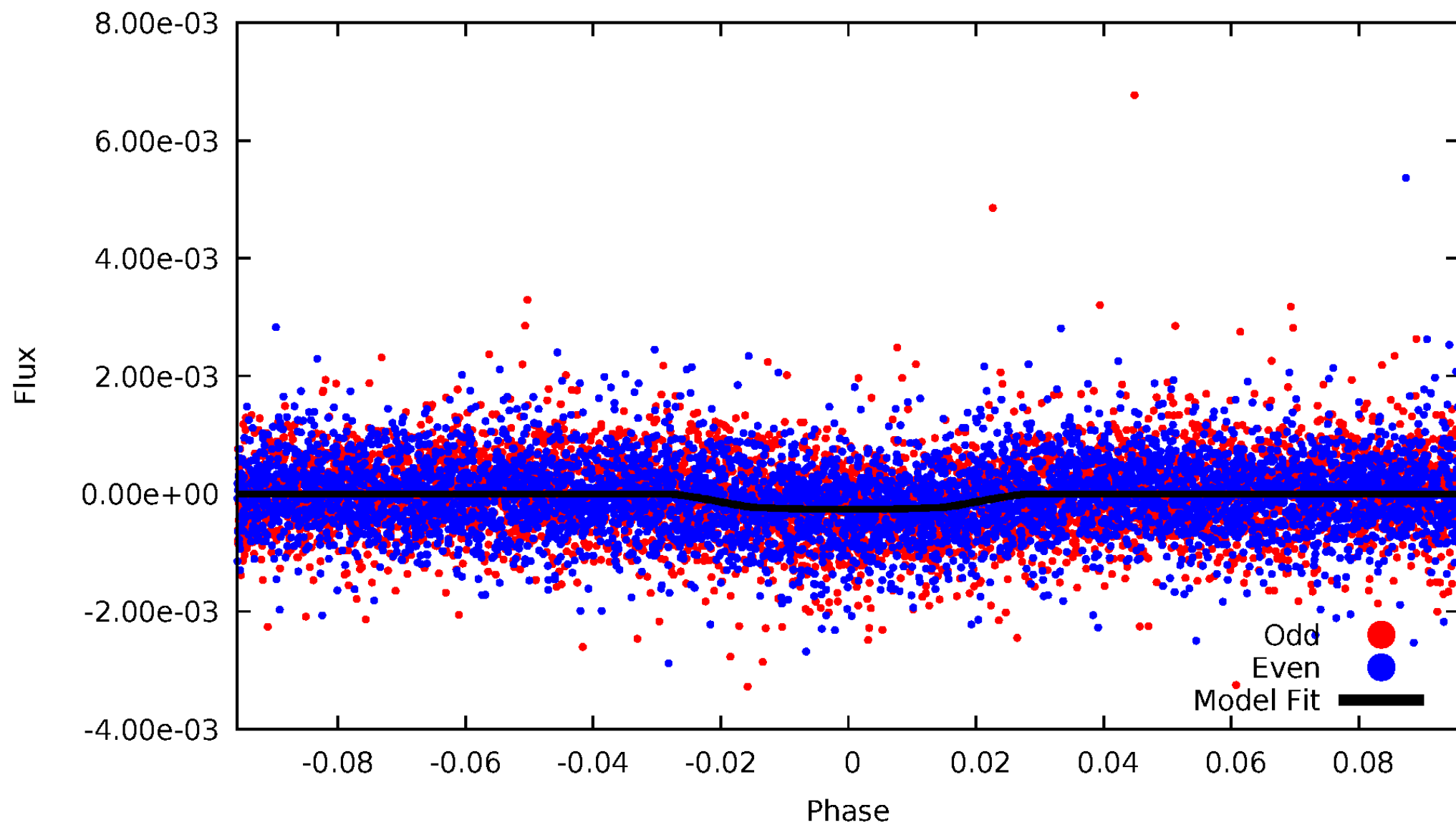


TCE 003241604-02



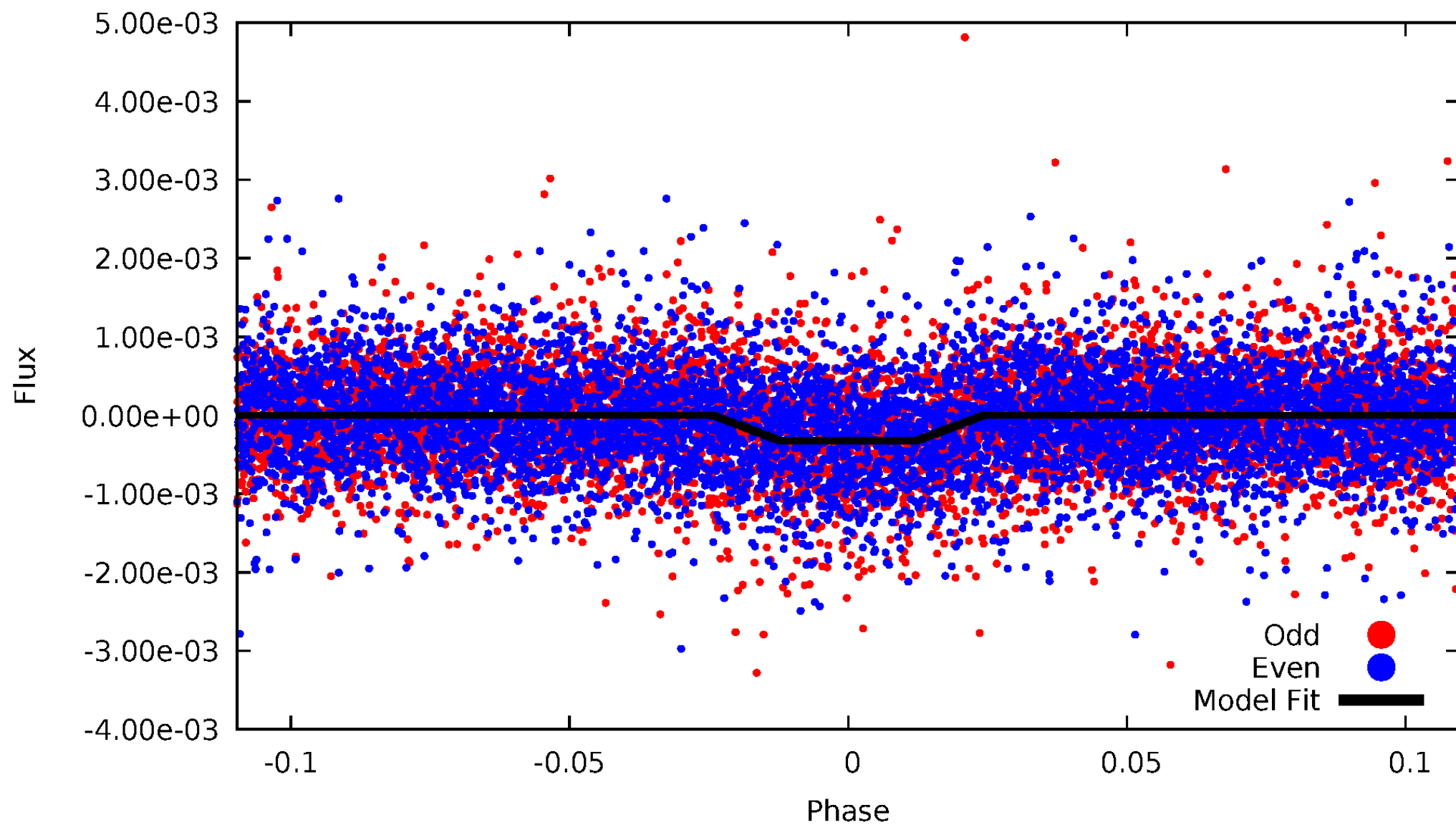
# DV Odd/Even

TCE 003241604-02



# ALT Odd/Even

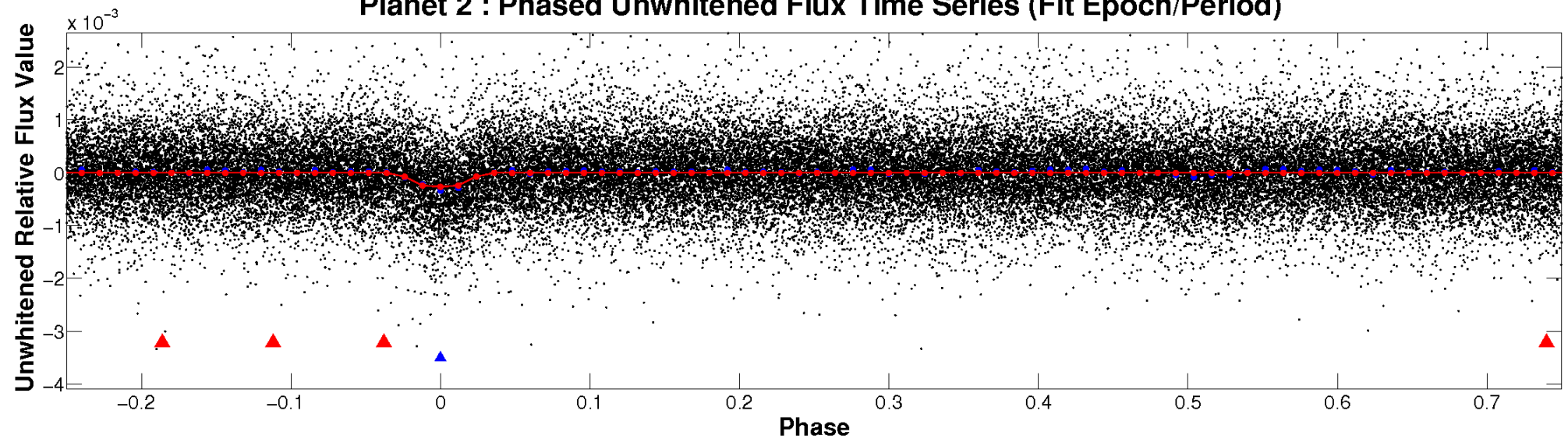
TCE 003241604-02



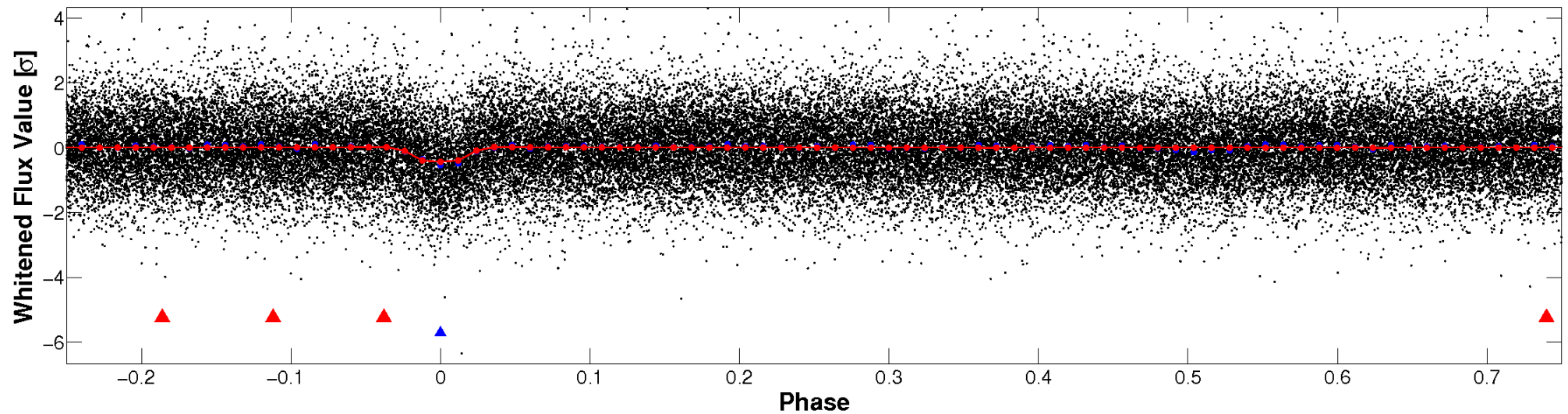


# Non-Whitened Vs. Whitened Light Curve

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

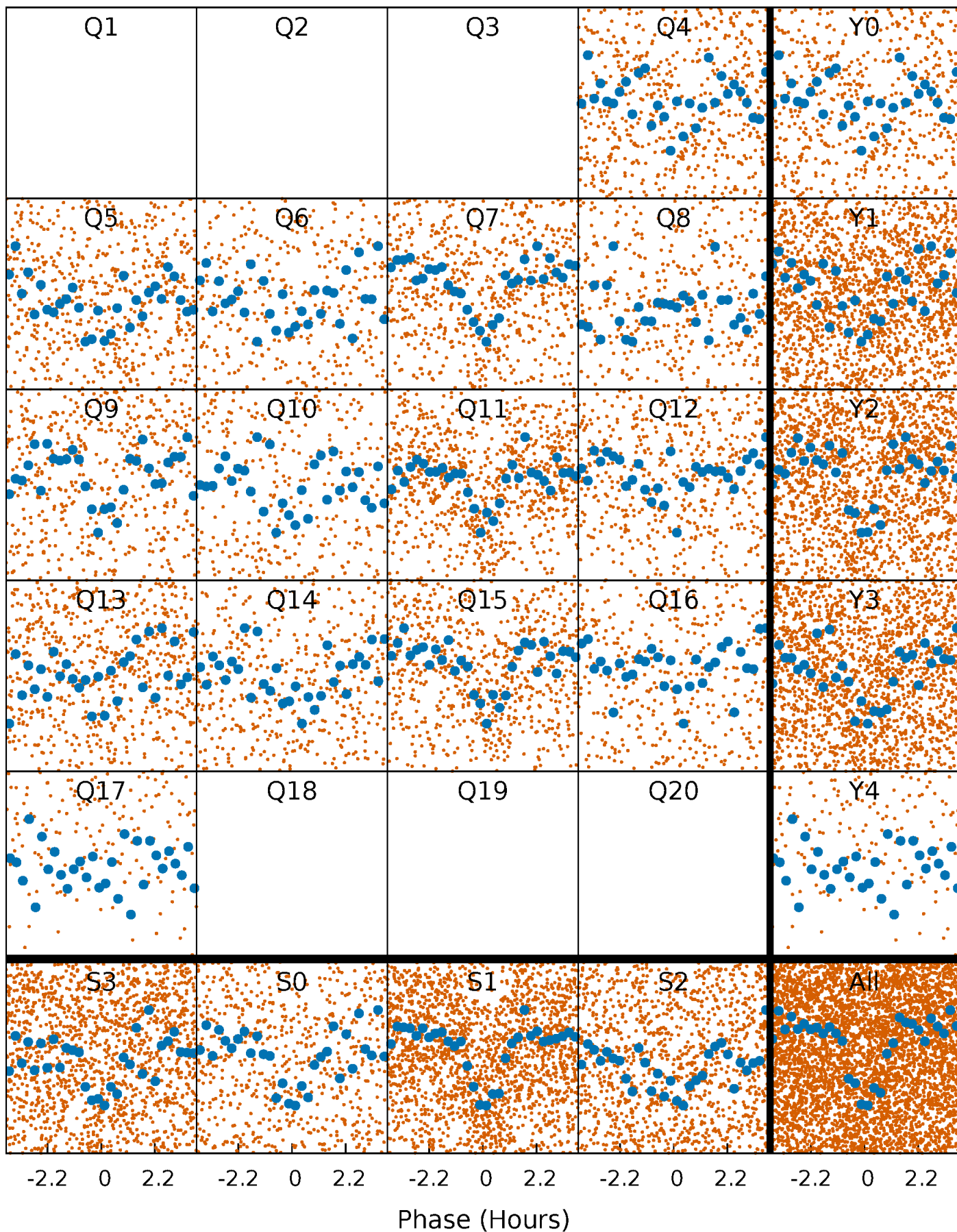


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



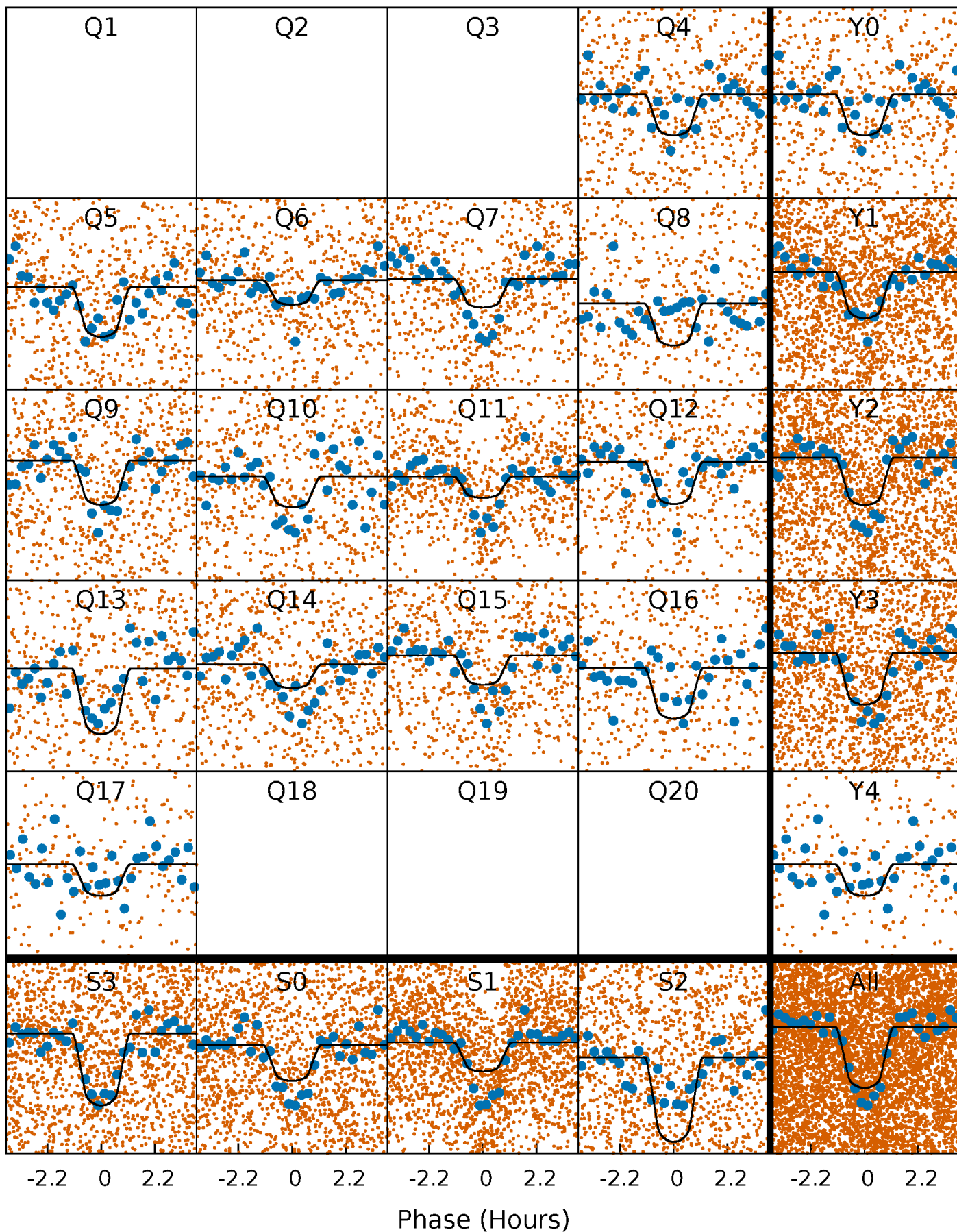
# PDC Quarter-Phased Transit Curves

TCE 003241604-02   P= 1.703336 Days    $T_0=132.469956$  (BKJD)



# DV Quarter-Phased Transit Curves

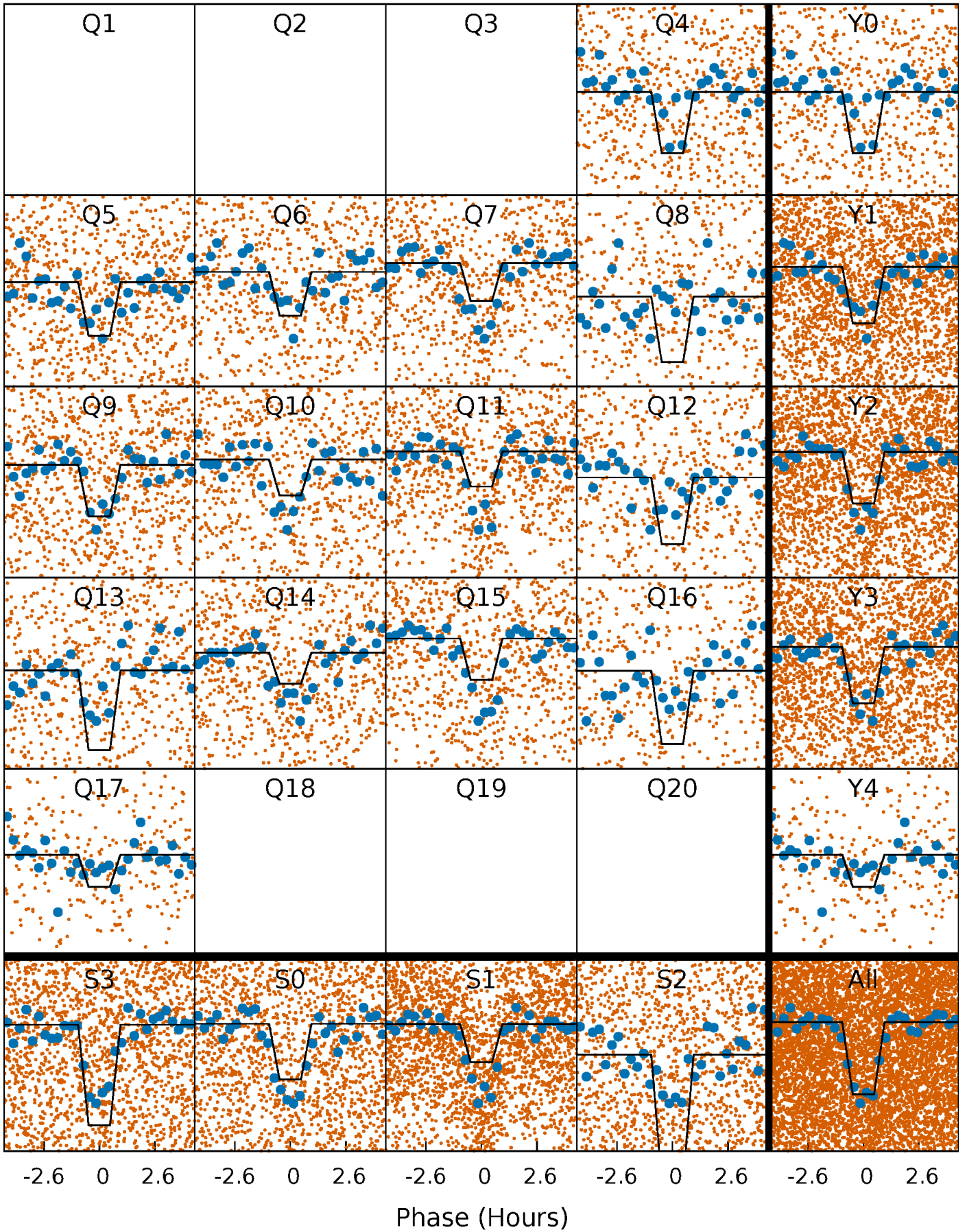
TCE 003241604-02 P= 1.703336 Days  $T_0=132.469956$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

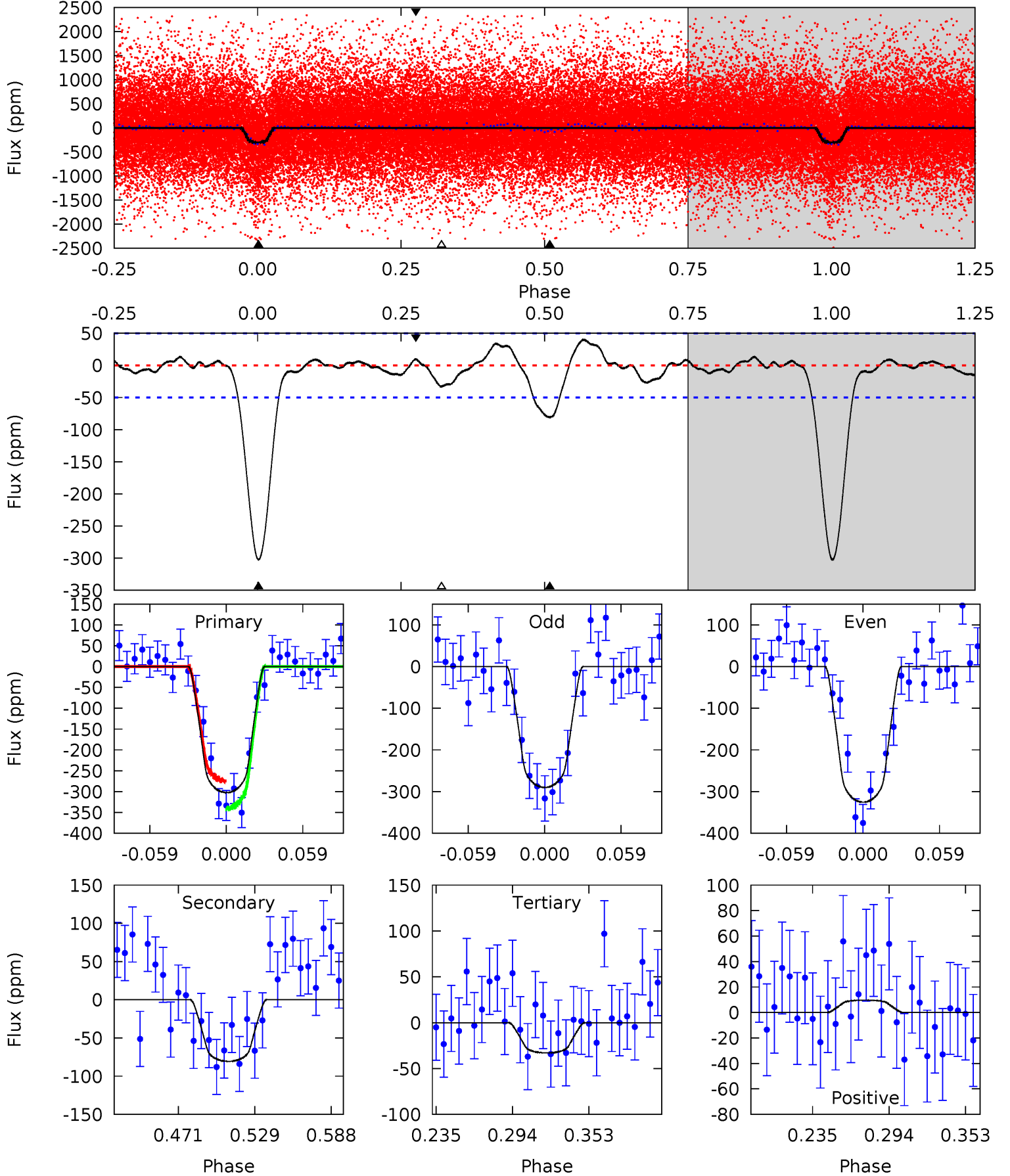
TCE 003241604-02 P= 1.703346 Days  $T_0=132.468709$  (BKJD)



# DV Model-Shift Uniqueness Test

003241604-02, P = 1.703336 Days, E = 132.469956 Days

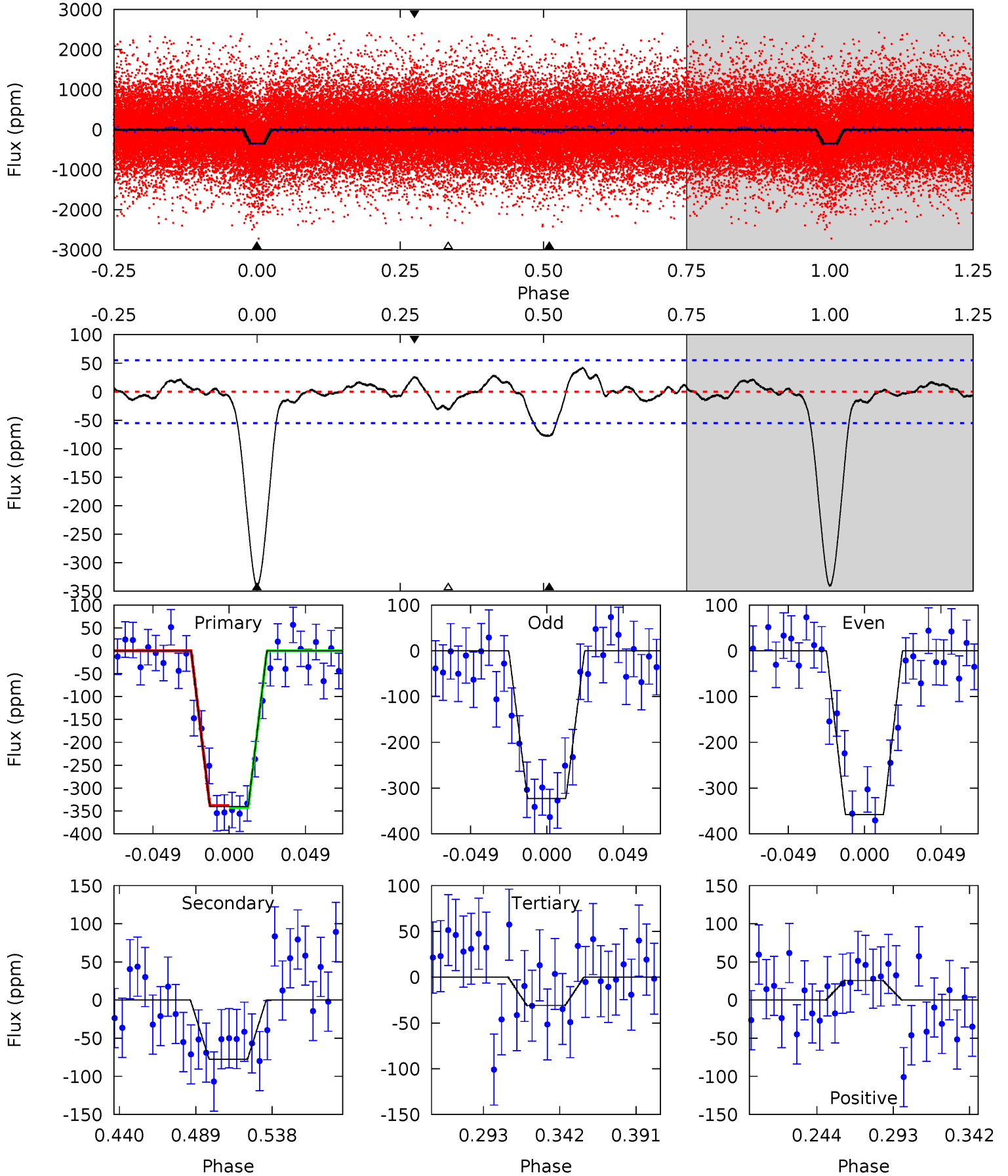
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
28.3	7.56	3.09	0.91	4.67	1.89	1.33	25.2	27.4	4.47	6.65	1.66	1.01	0.12	3.08



# Alt Model-Shift Uniqueness Test

003241604-02, P = 1.703346 Days, E = 132.468709 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	6.63	2.63	2.18	4.71	1.97	1.15	26.4	26.8	4.00	4.45	1.51	1.04	0.11	0.19



### Stellar Parameters For KIC 003241604

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5881^{+184}_{-204}$	$4.516^{+0.052}_{-0.208}$	$-0.080^{+0.250}_{-0.300}$	$0.915^{+0.289}_{-0.096}$	$1.002^{+0.126}_{-0.126}$	$1.840^{+0.481}_{-0.958}$
	+3%/-3%	+1%/-5%	+312%/-375%	+32%/-10%	+13%/-13%	+26%/-52%
Source	KIC0	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 003241604-02 / KOI 2824.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-81 \pm 11$	$1.83^{+0.73}_{-0.65}$	$2118^{+151}_{-96}$	$4388^{+870}_{-501}$	$10^{+14}_{-5}$
Alt.	$-78 \pm 12$	$1.88^{+0.74}_{-0.66}$	$2127^{+156}_{-113}$	$4323^{+907}_{-523}$	$9.361^{+13.176}_{-4.791}$

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

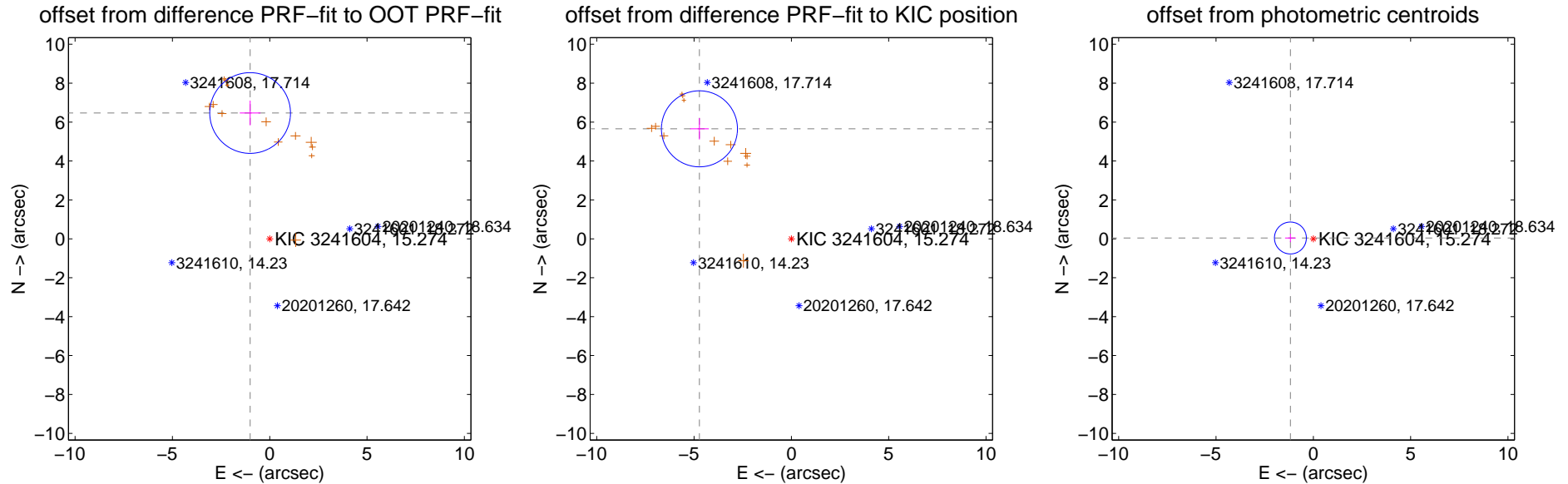
## DV Centroid Data

Supplemental centroid analysis for 003241604-02. Kepler magnitude: 15.27. Transit SNR 18.61

There are 0 quarters with good PRF difference image offsets

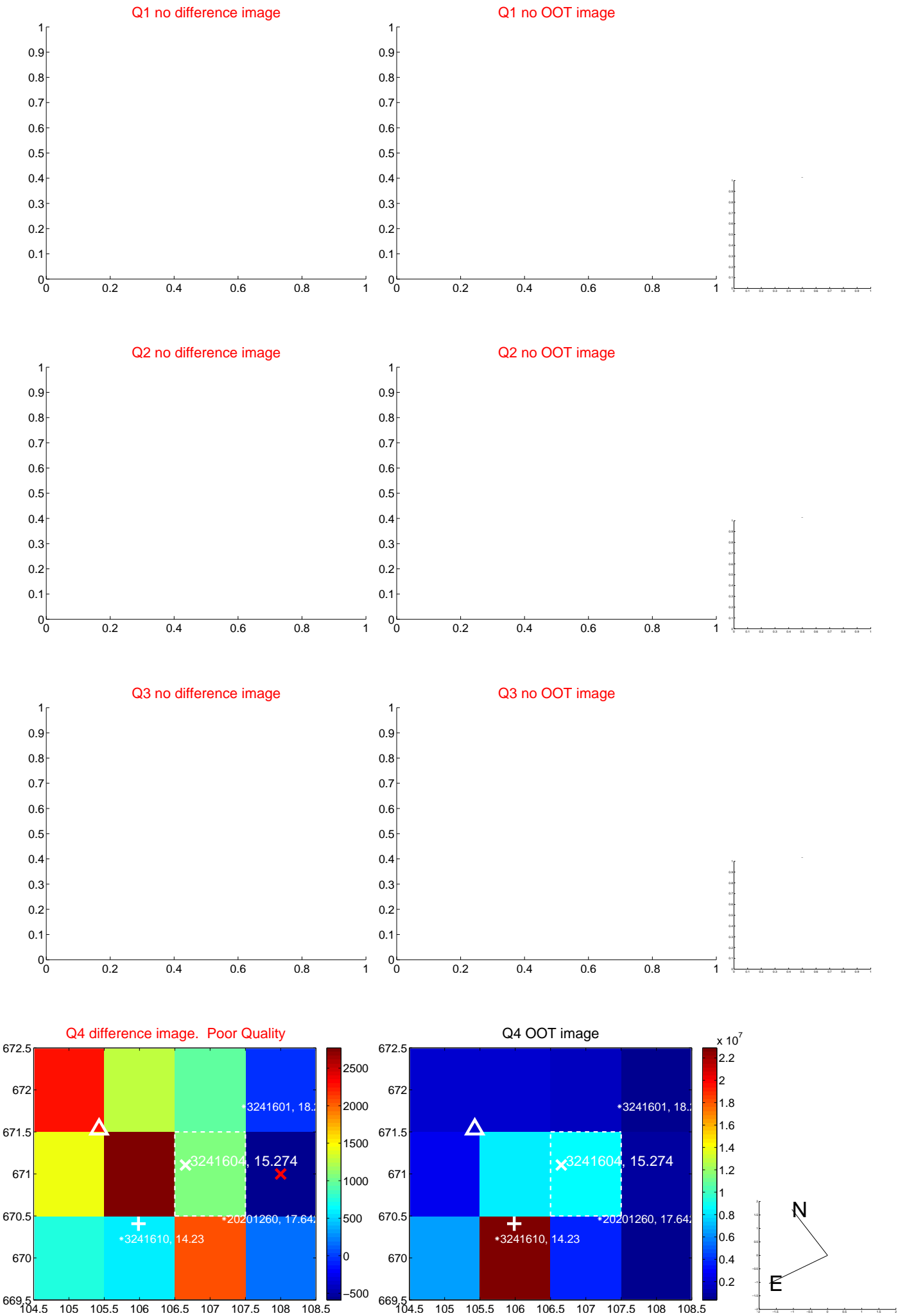
The OOT PRF centroid is offset from the target star catalog position by about 4.52 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$6.544 \pm 0.691$	9.47	$1.008 \pm 0.532$	$6.466 \pm 0.636$
PRF-fit source offset from KIC position	$7.368 \pm 0.651$	11.31	$4.724 \pm 0.477$	$5.654 \pm 0.547$
photometric centroid source offset	$1.18 \pm 0.27$	4.31	$1.18 \pm 0.27$	$0.04 \pm 0.21$

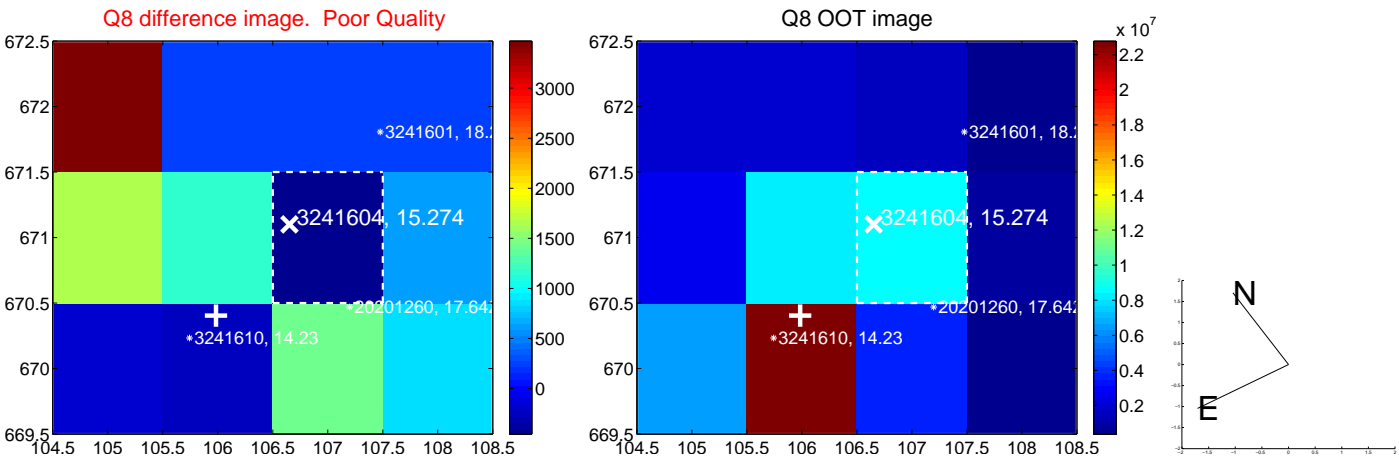
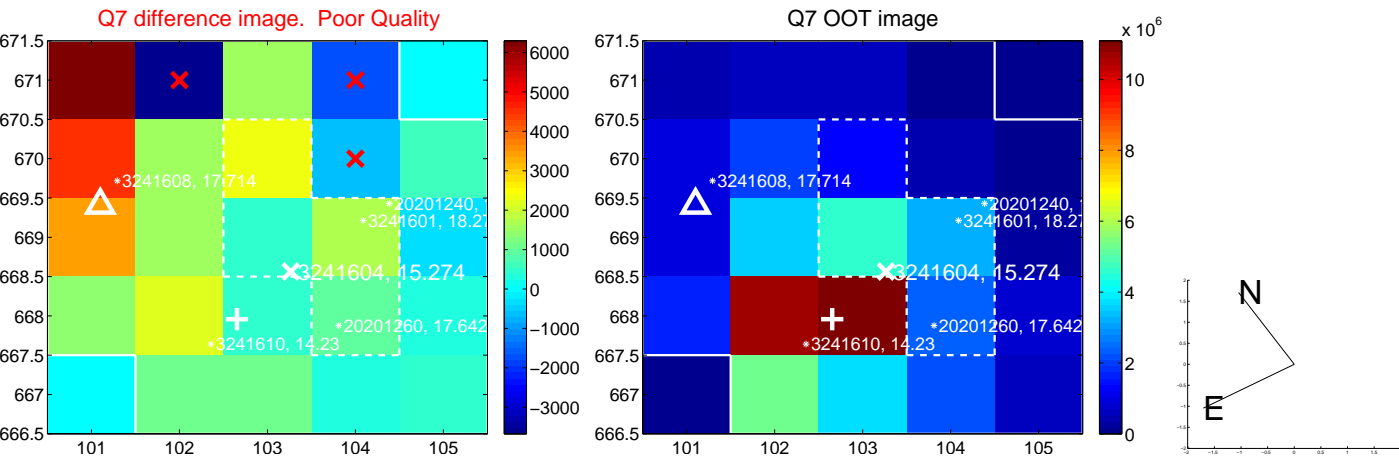
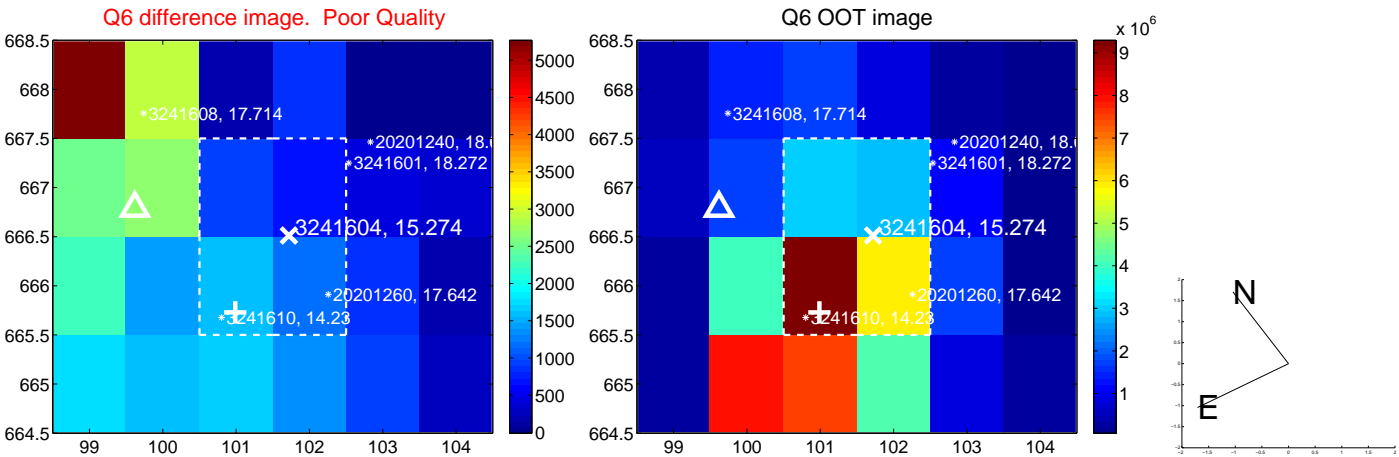
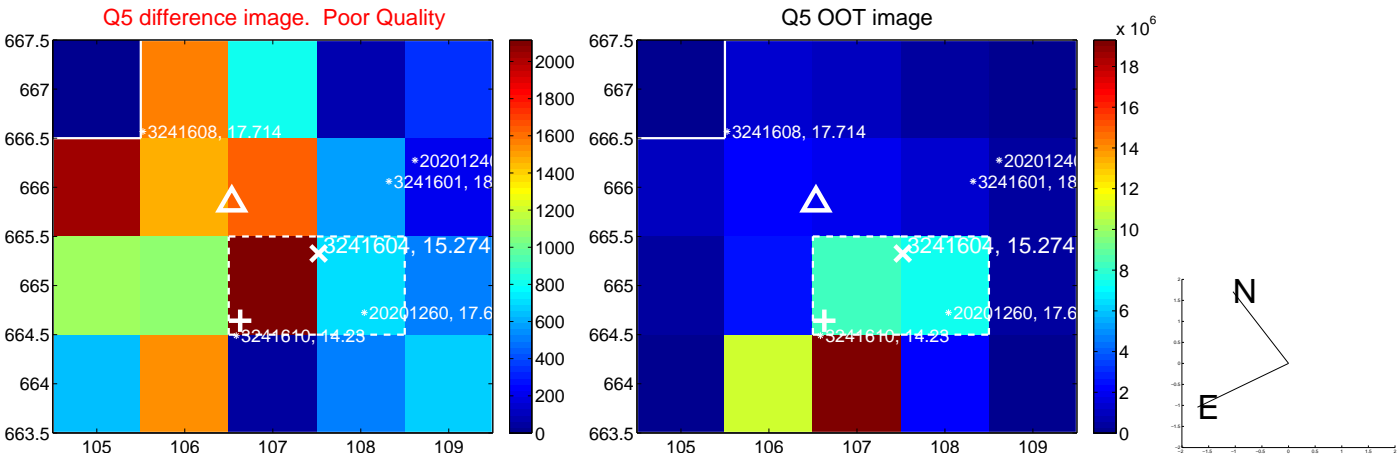


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

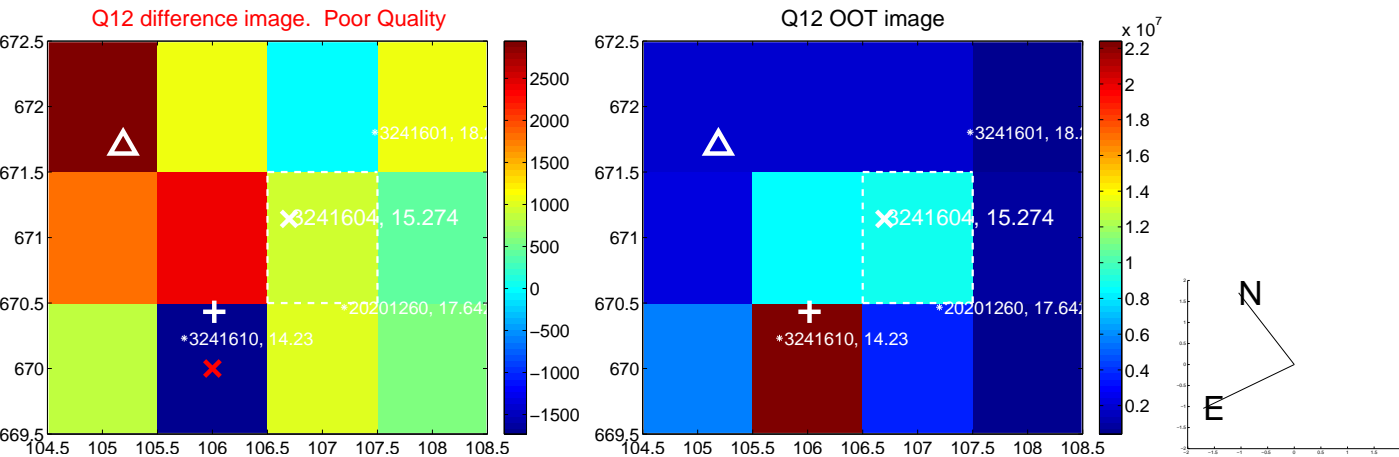
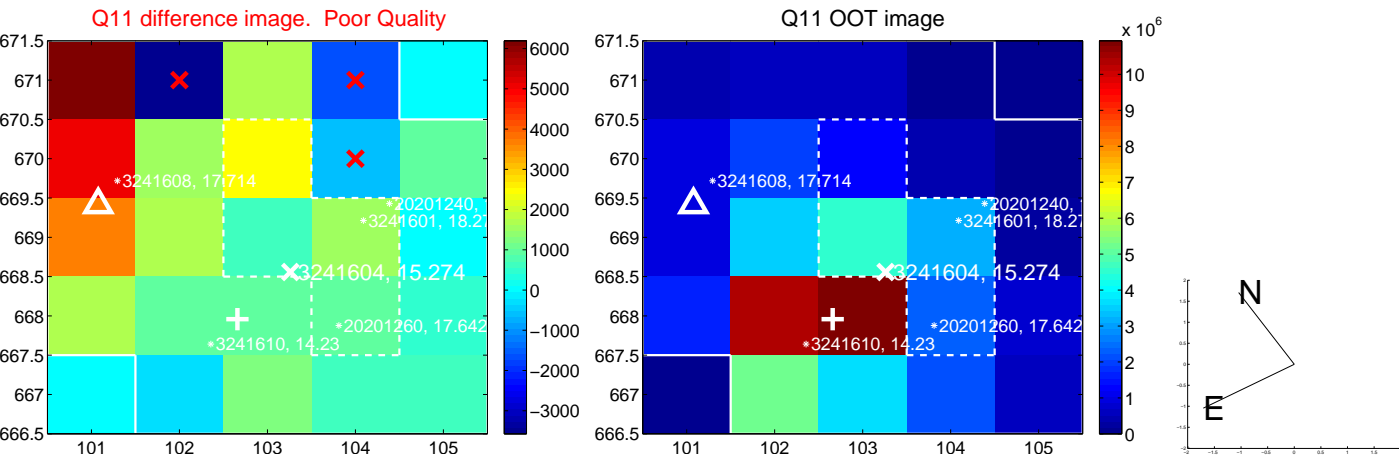
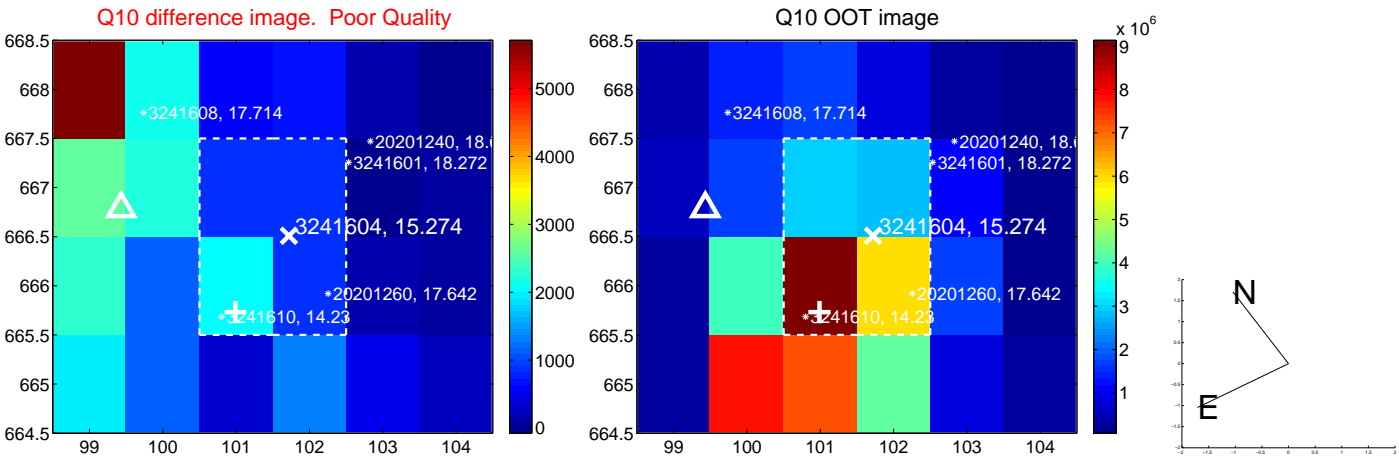
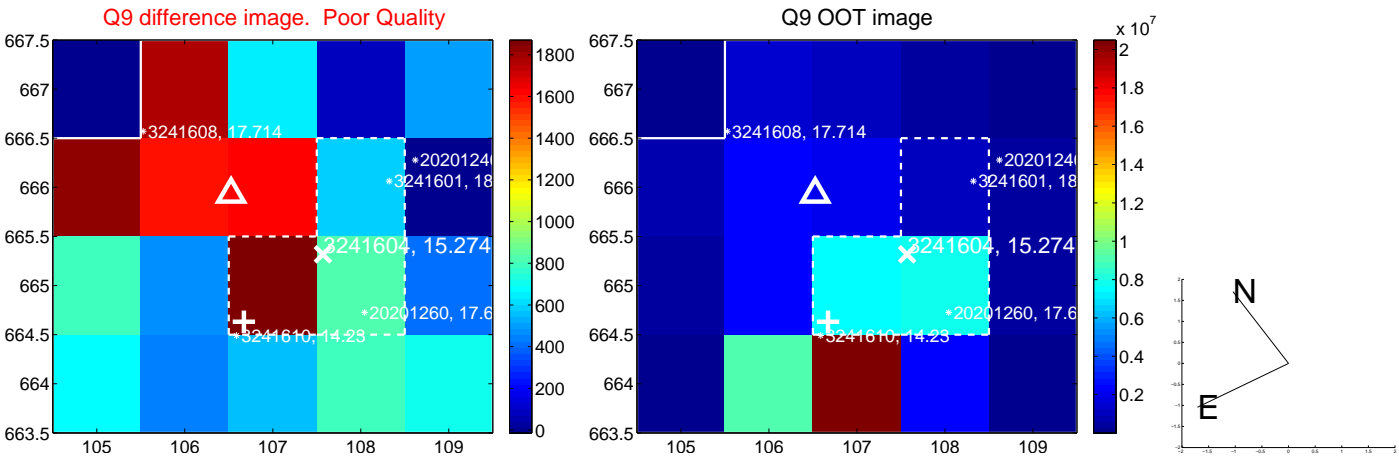


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

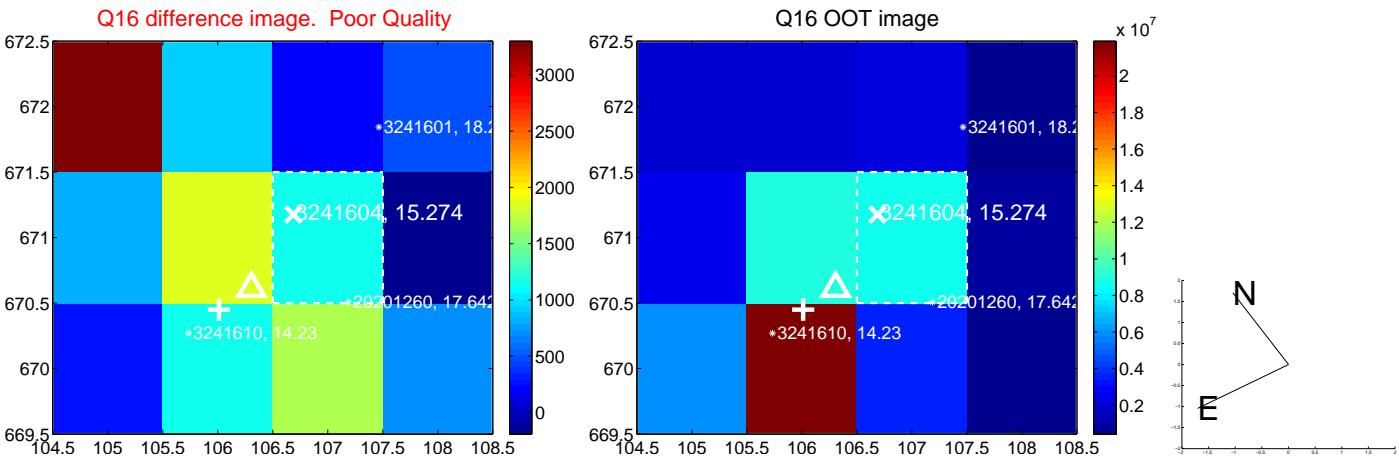
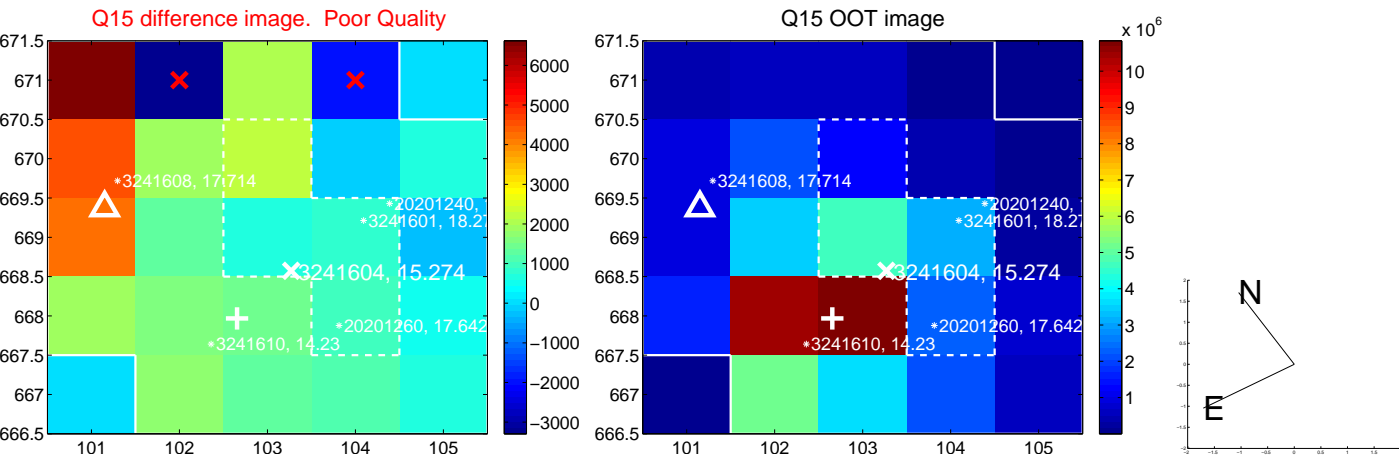
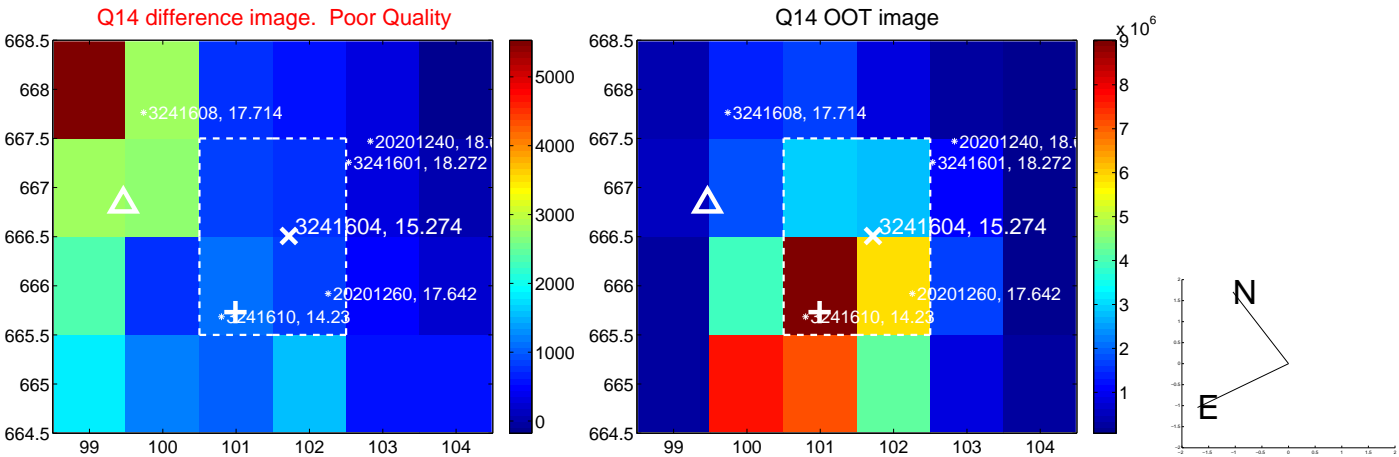
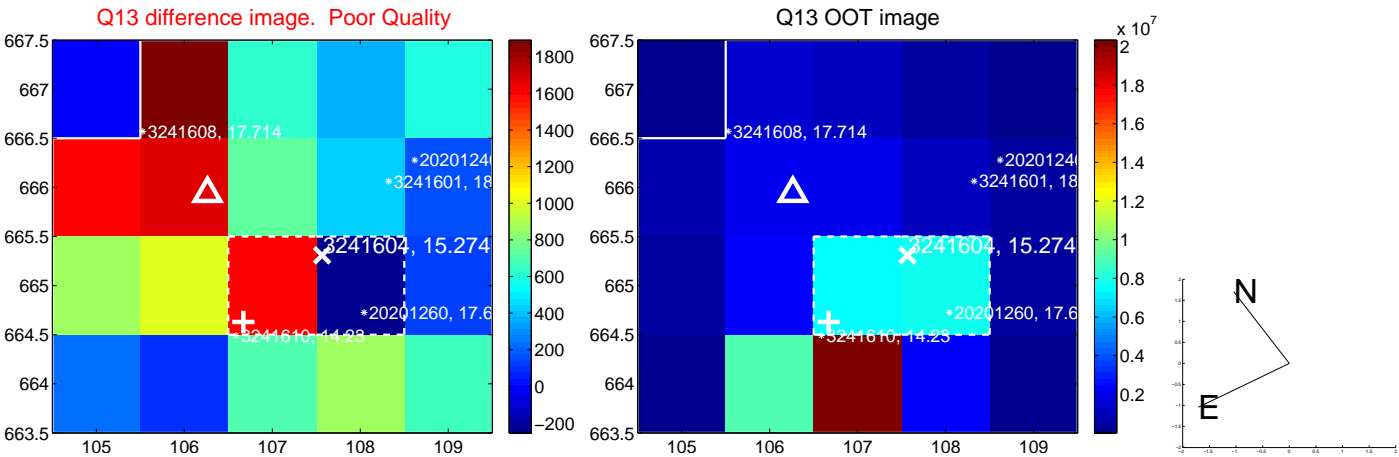




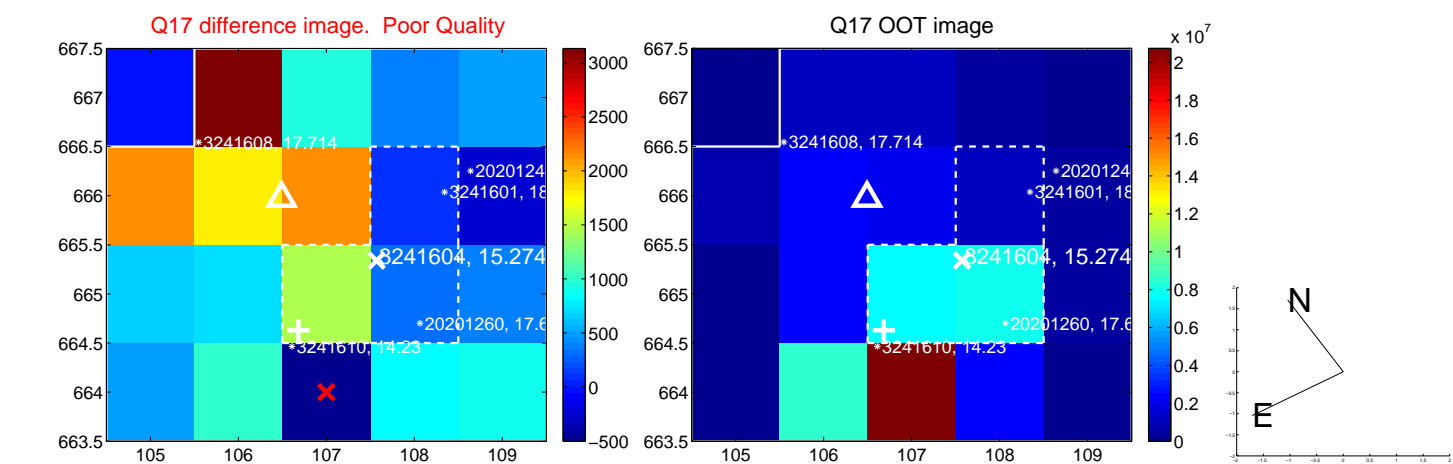
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



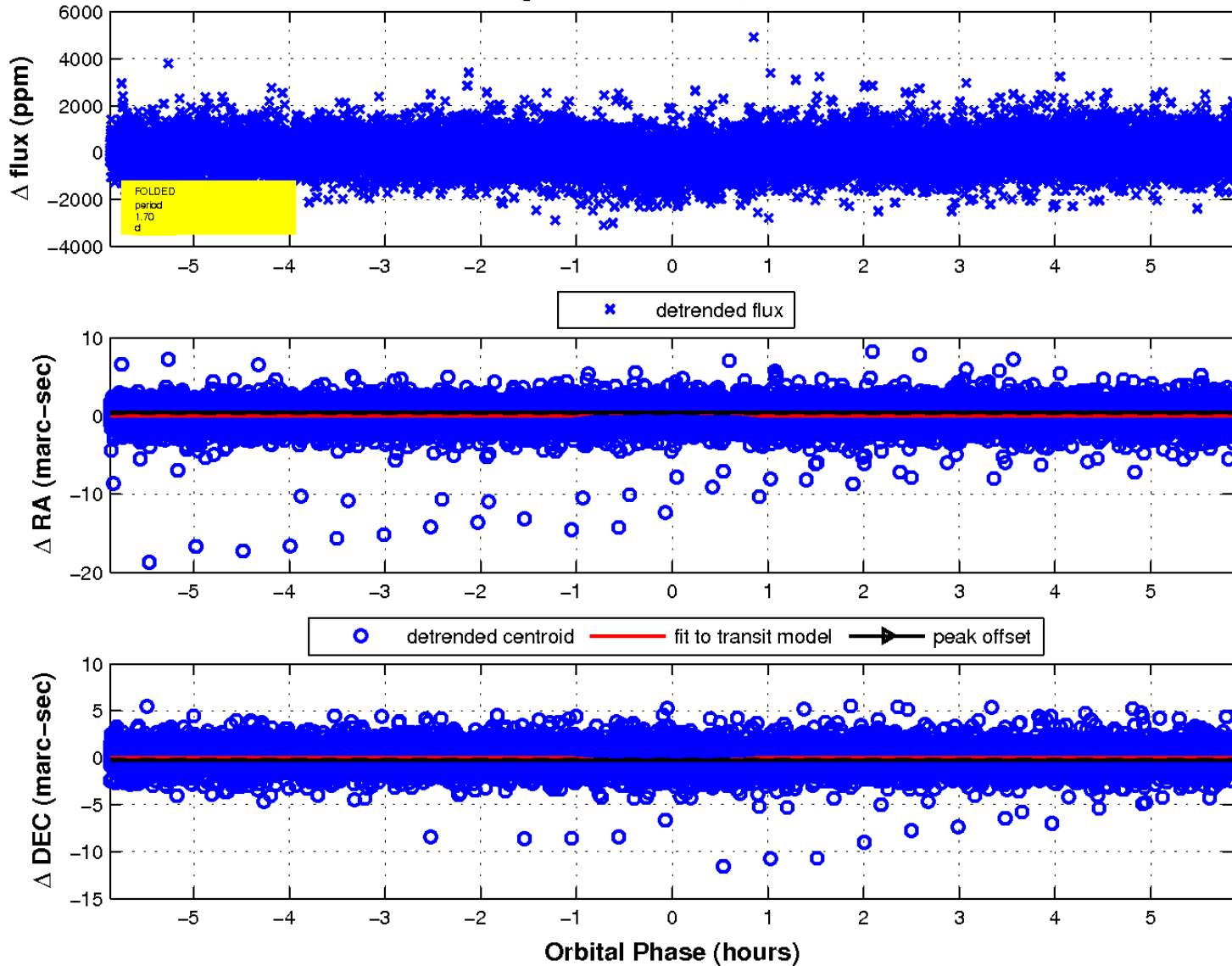
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



# UKIRT Image

Declination

