

# KIC 009899414

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009899414-01	OBS	3955.01	1.332532	132.065081	190.4	2.895	24.8	25.2	0.97	6046	1.59	1942.26
009899414-02	OBS	No	232.165051	137.987958	770.8	2.767	14.8	5.7	0.97	6046	2.99	2.00

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009899414-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—EPHEM_MATCH
009899414-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—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 009899414-01

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	$\sigma_P$	$\sigma_T$
009899414-01	9899414	BR-Cyg-pri	9899416	1:1	43.4	6	9	10.03	14.92	3520.40	Direct-PRF	0	2.01	1.11

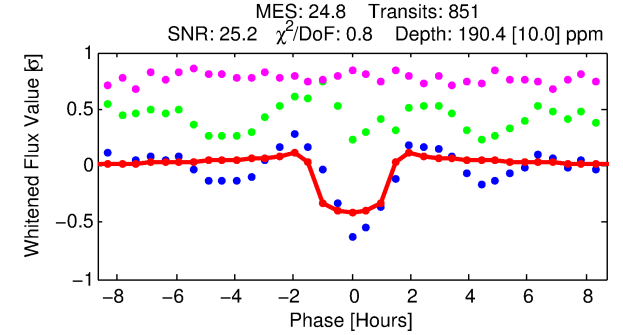
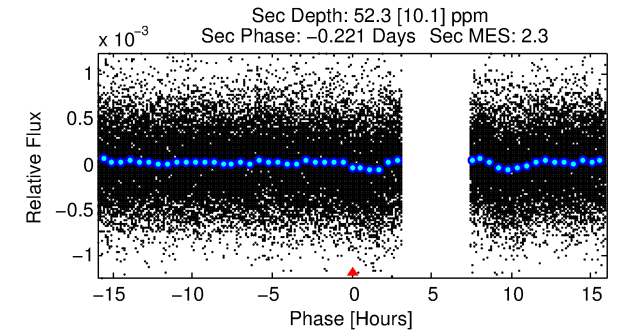
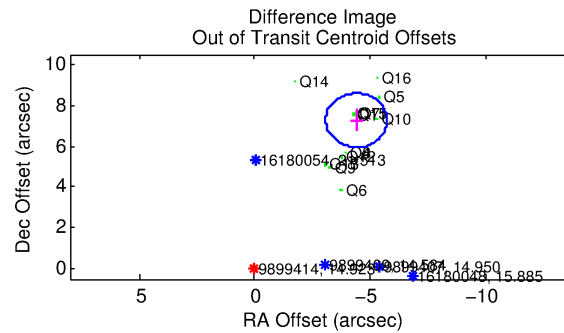
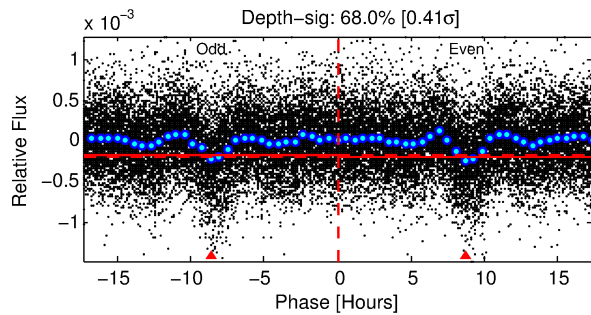
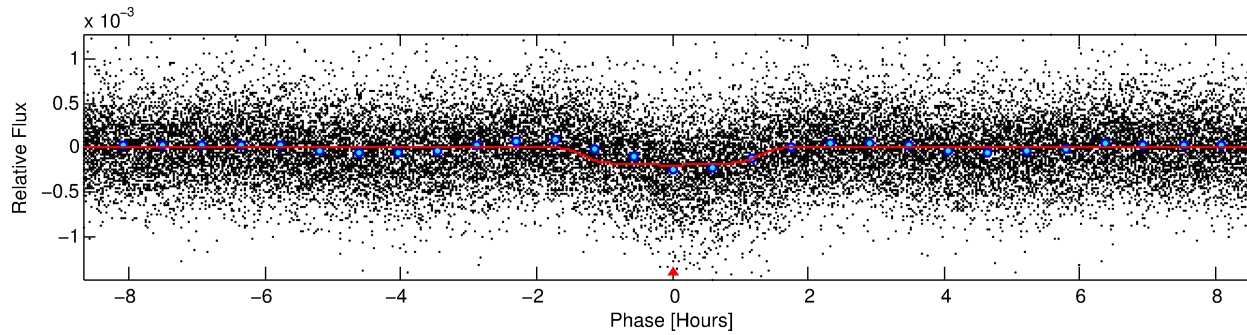
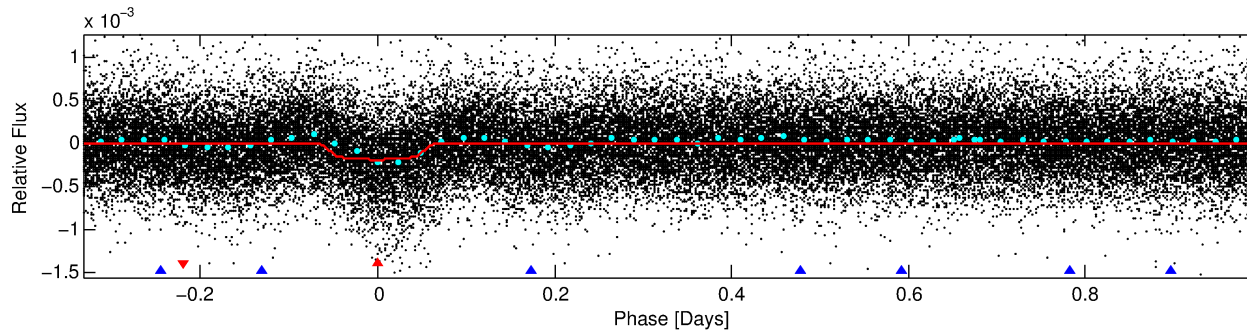
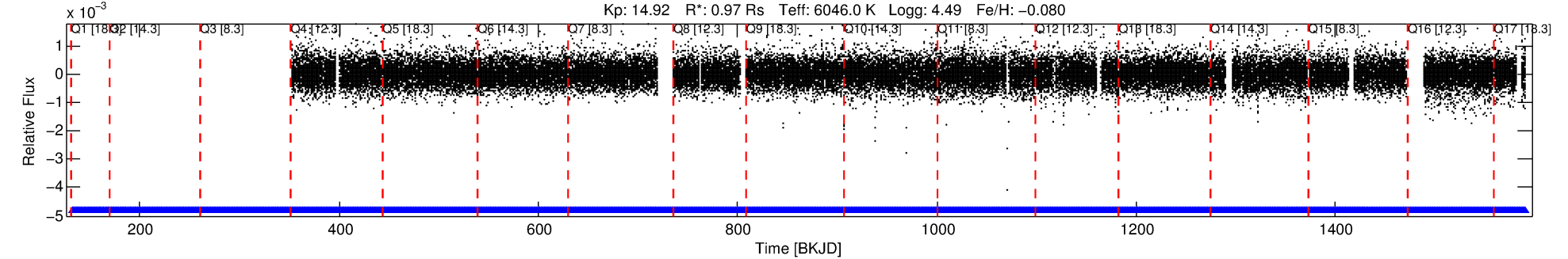
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  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: 9899414 Candidate: 1 of 2 Period: 1.333 d

KOI: K03955 Corr: No Ephemeris Match

Kp: 14.92 R\*: 0.97 Rs Teff: 6046.0 K Logg: 4.49 Fe/H: -0.080



## DV Fit Results:

Period = 1.33253 [0.00000] d  
Epoch = 132.0651 [0.0012] BKJD  
Rp/R\* = 0.0150 [0.0023]  
a/R\* = 1.88 [1.05]  
b = 0.90 [0.16]  
Seff = 1942.26 [855.06]  
Teq = 1693 [186] K  
Rp = 1.59 [0.57] Re  
a = 0.0241 [0.0067] AU  
Ag = 6.64 [3.65] [1.55σ]  
Teffp = 4201 [414] K [5.53σ]

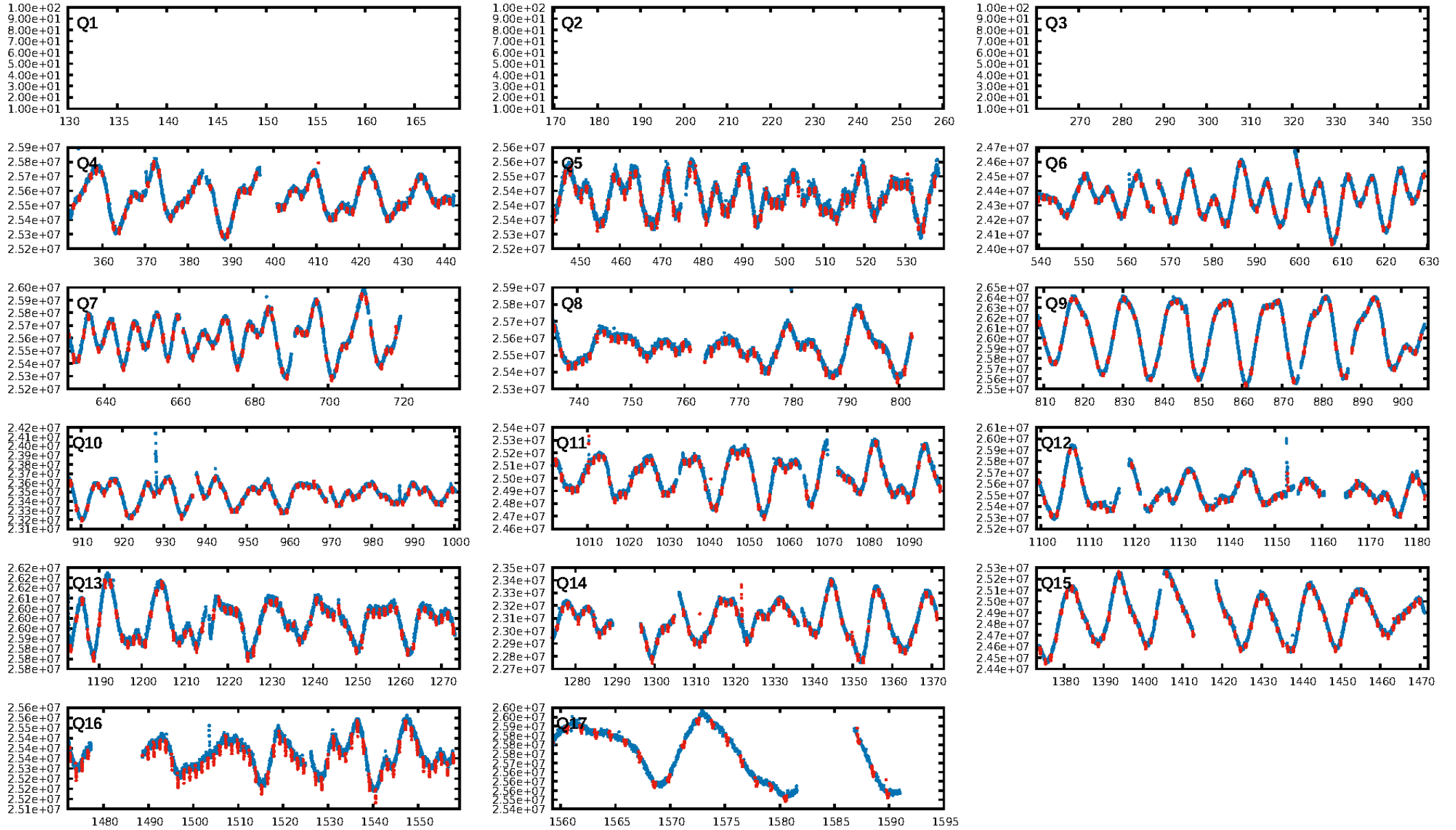
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [1383.47σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.45e-120  
RollingBand-fgt: 1.00 [831/831]  
GhostDiagnostic-chr: -0.5674  
Centroid-sig: 0.0%  
Centroid-so: 4.207 arcsec [8.27σ]  
OotOffset-rm: 8.489 arcsec [19.28σ]  
KicOffset-rm: 8.520 arcsec [18.94σ]  
OotOffset-st: 3/3/4/4 [14]  
KicOffset-st: 3/3/4/4 [14]  
DiffImageQuality-fgm: 0.43 [6/14]  
DiffImageOverlap-fno: 1.00 [14/14]

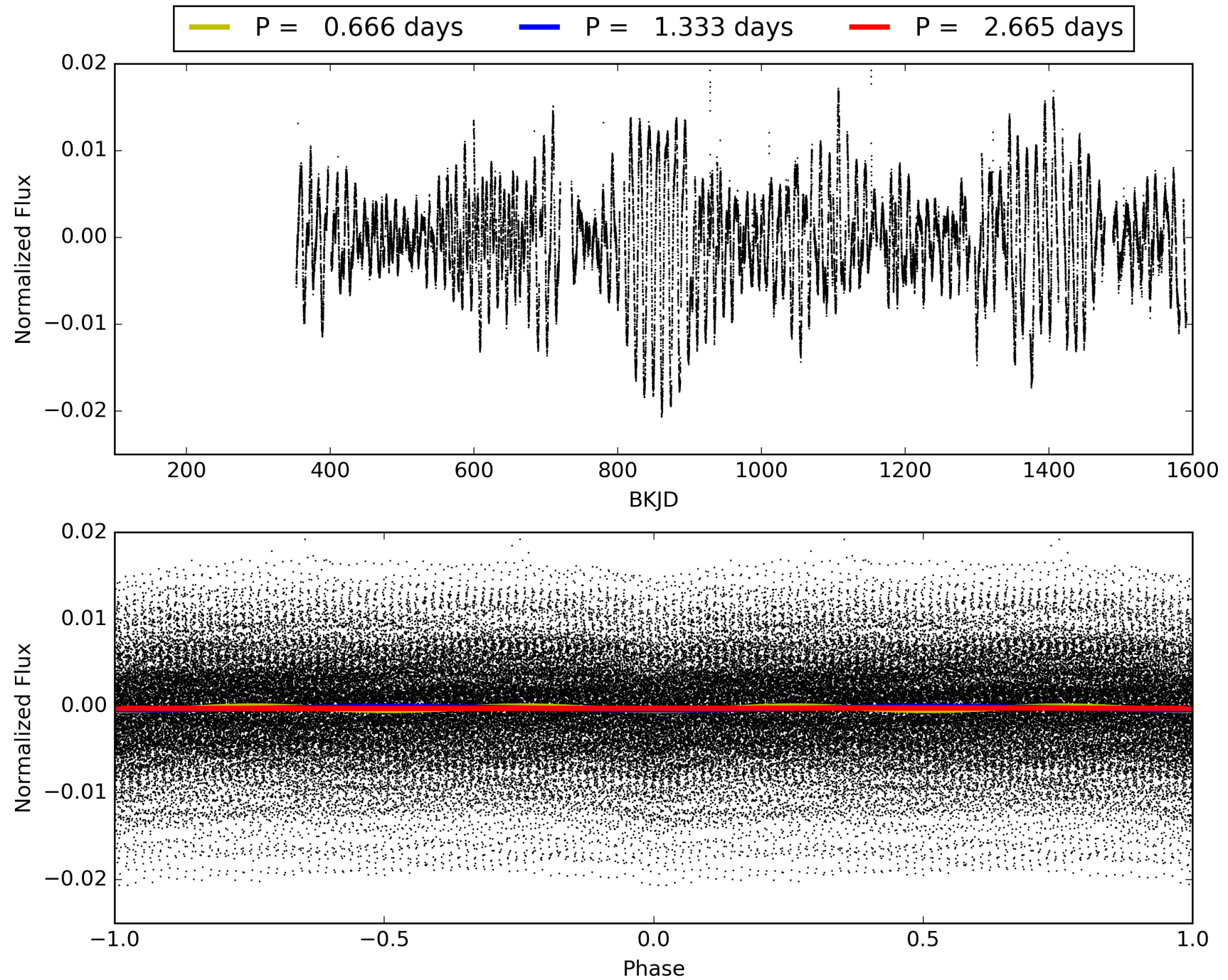
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 13:26:03 Z

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

# TCE 009899414-01, PDC Light Curves

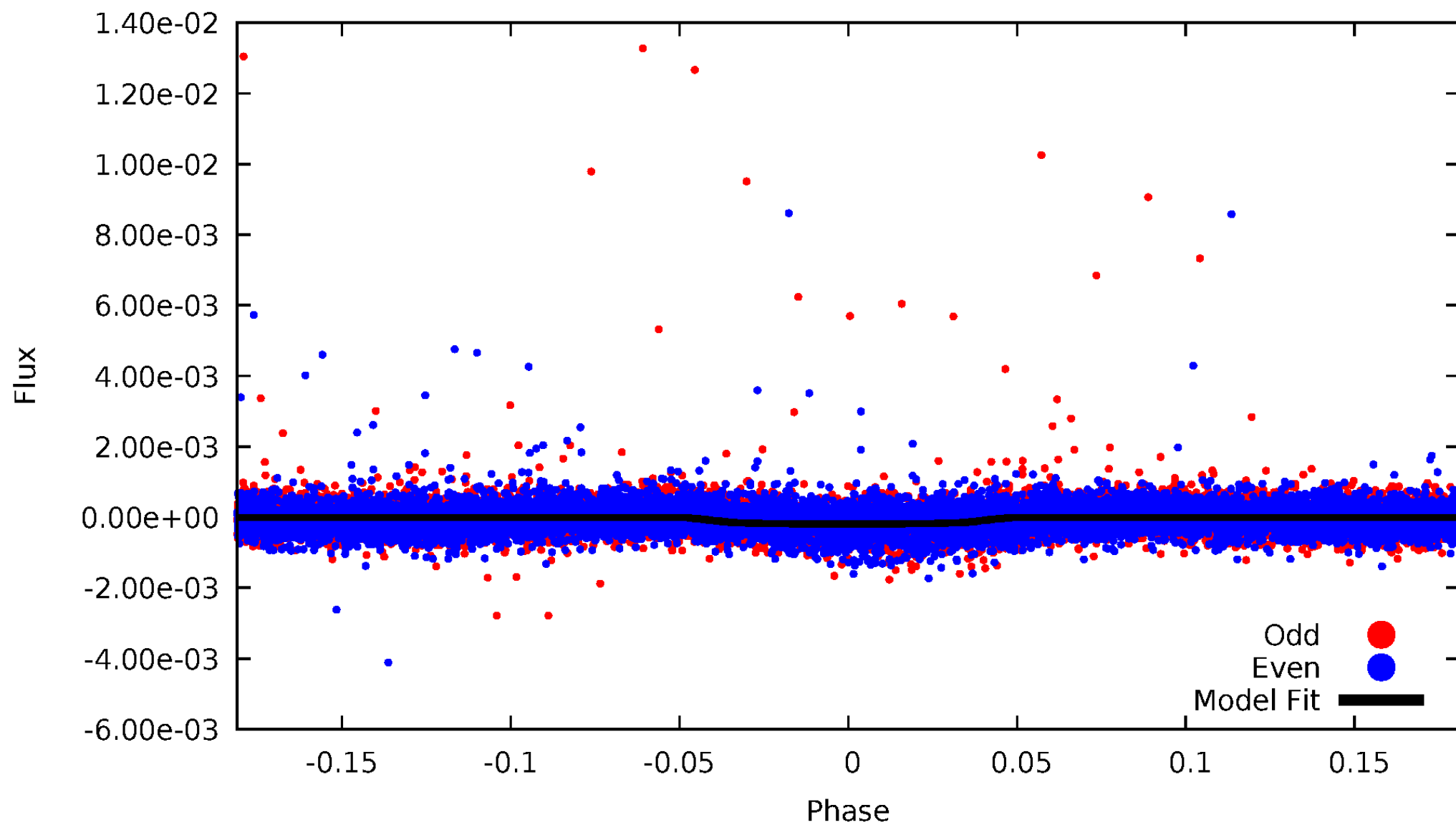


TCE 009899414-01



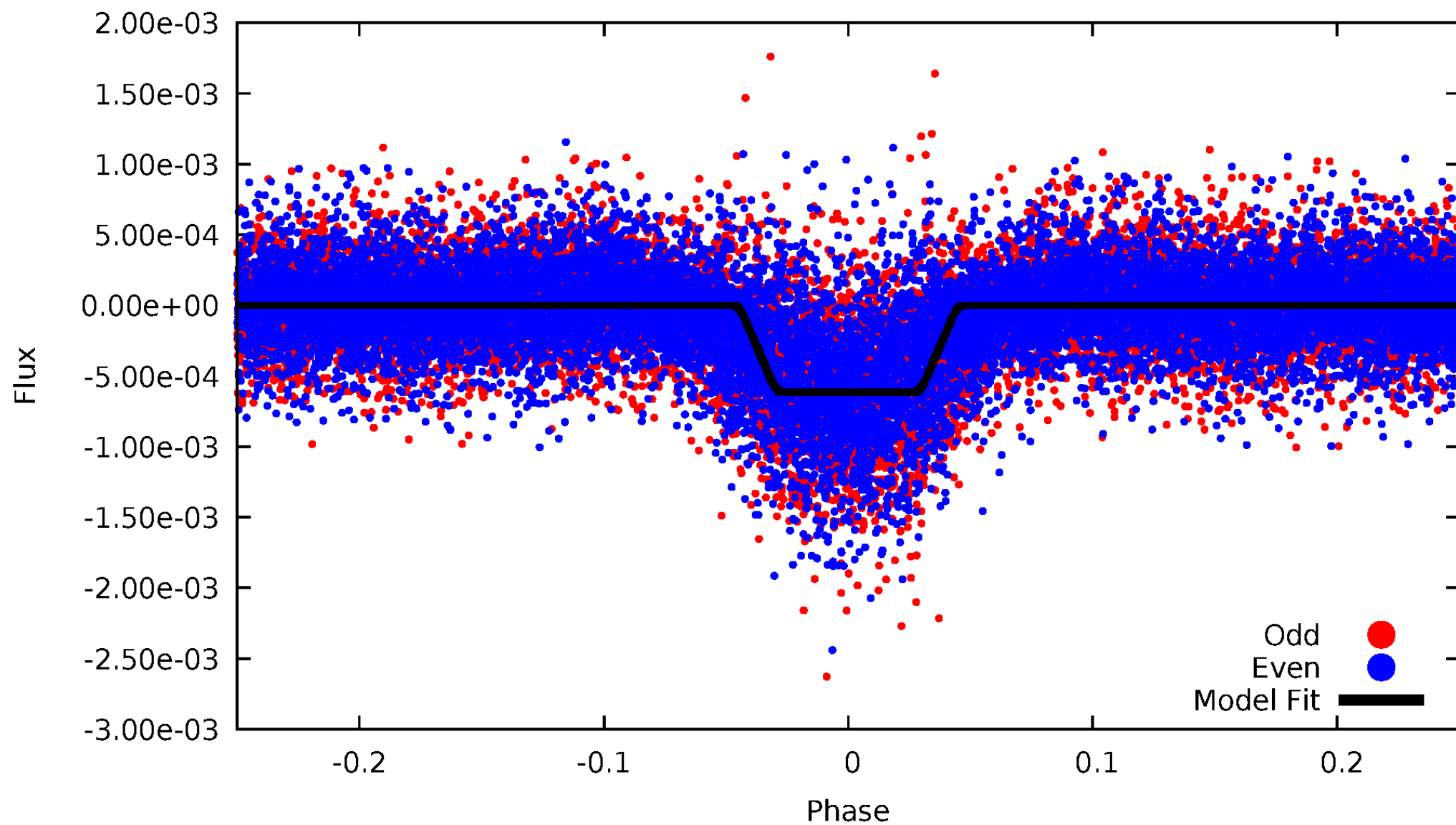
# DV Odd/Even

TCE 009899414-01



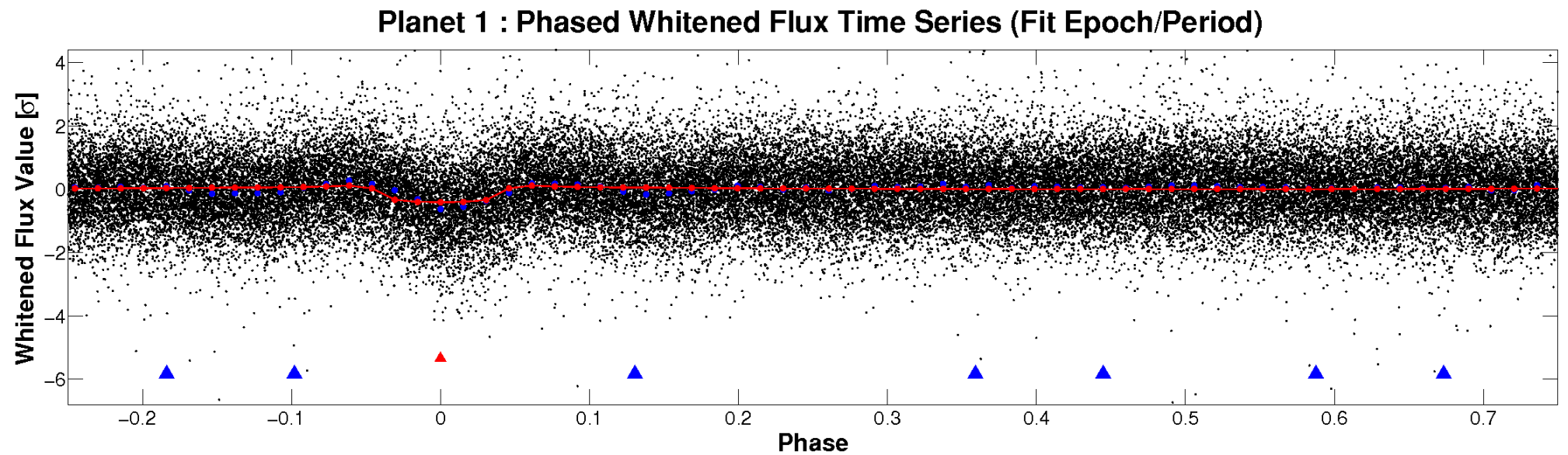
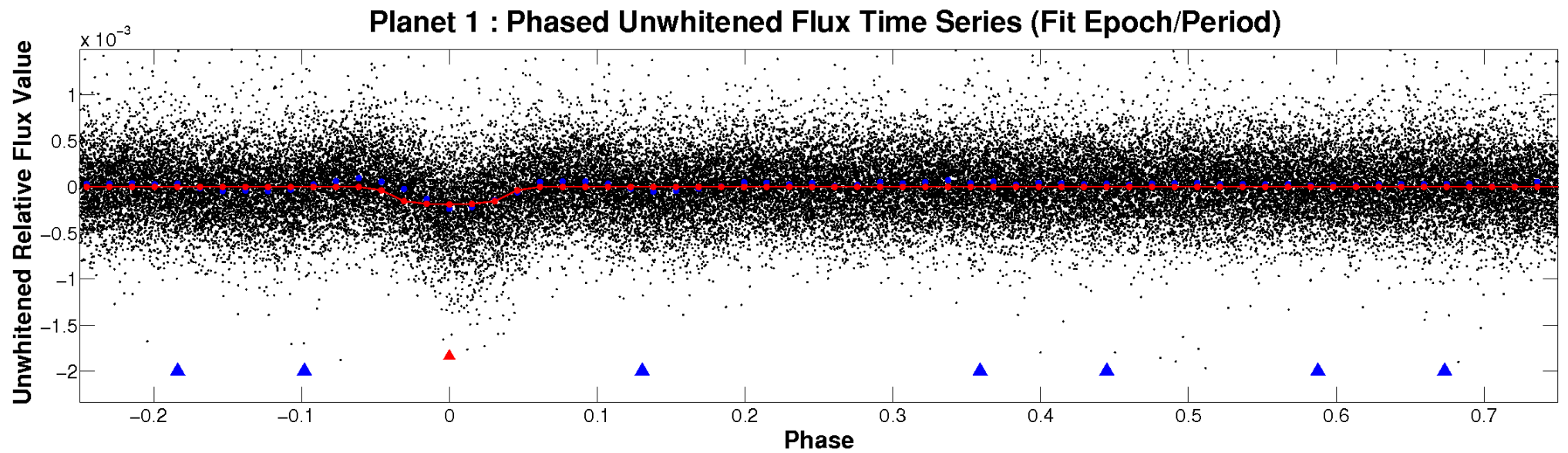
# ALT Odd/Even

TCE 009899414-01



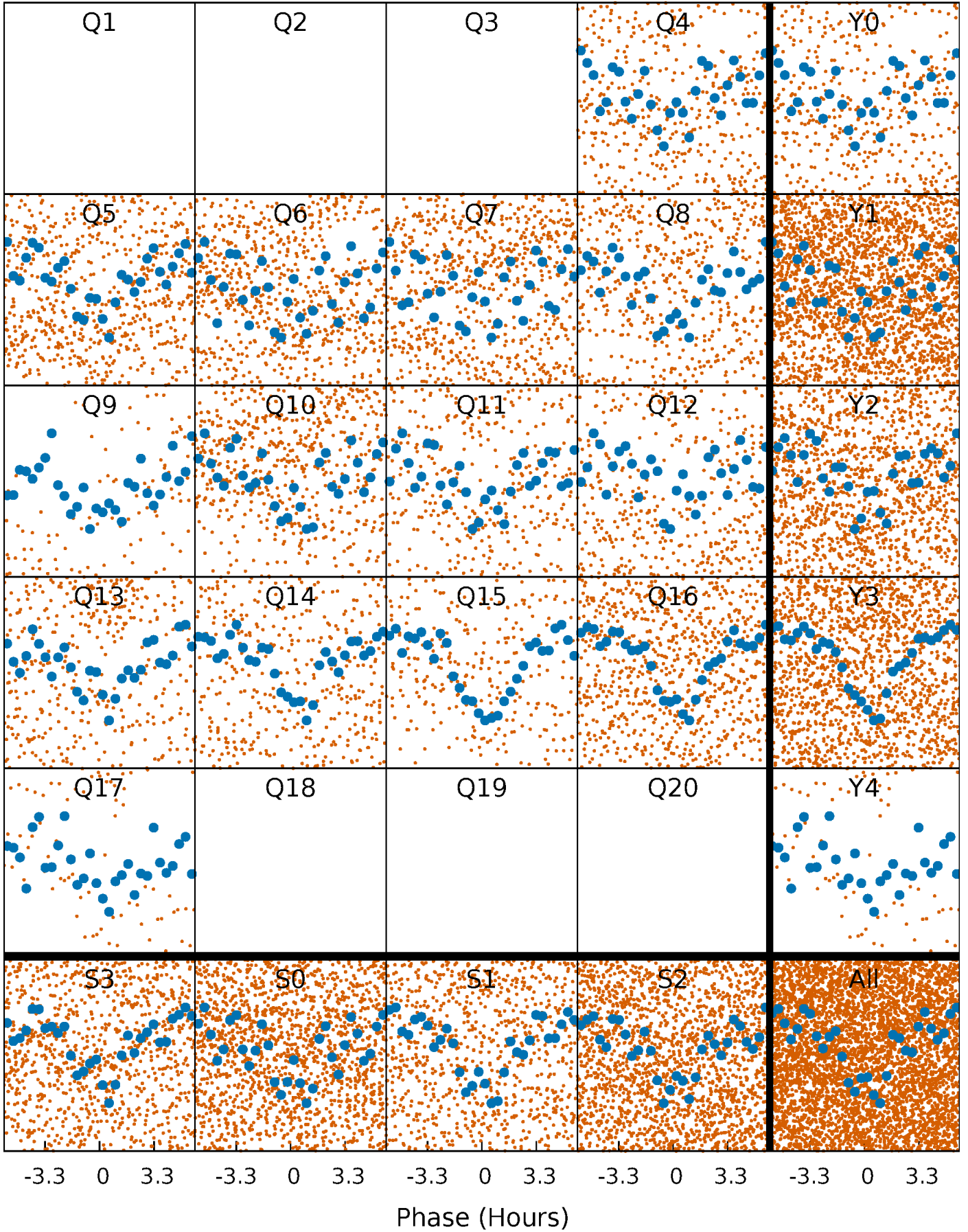


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

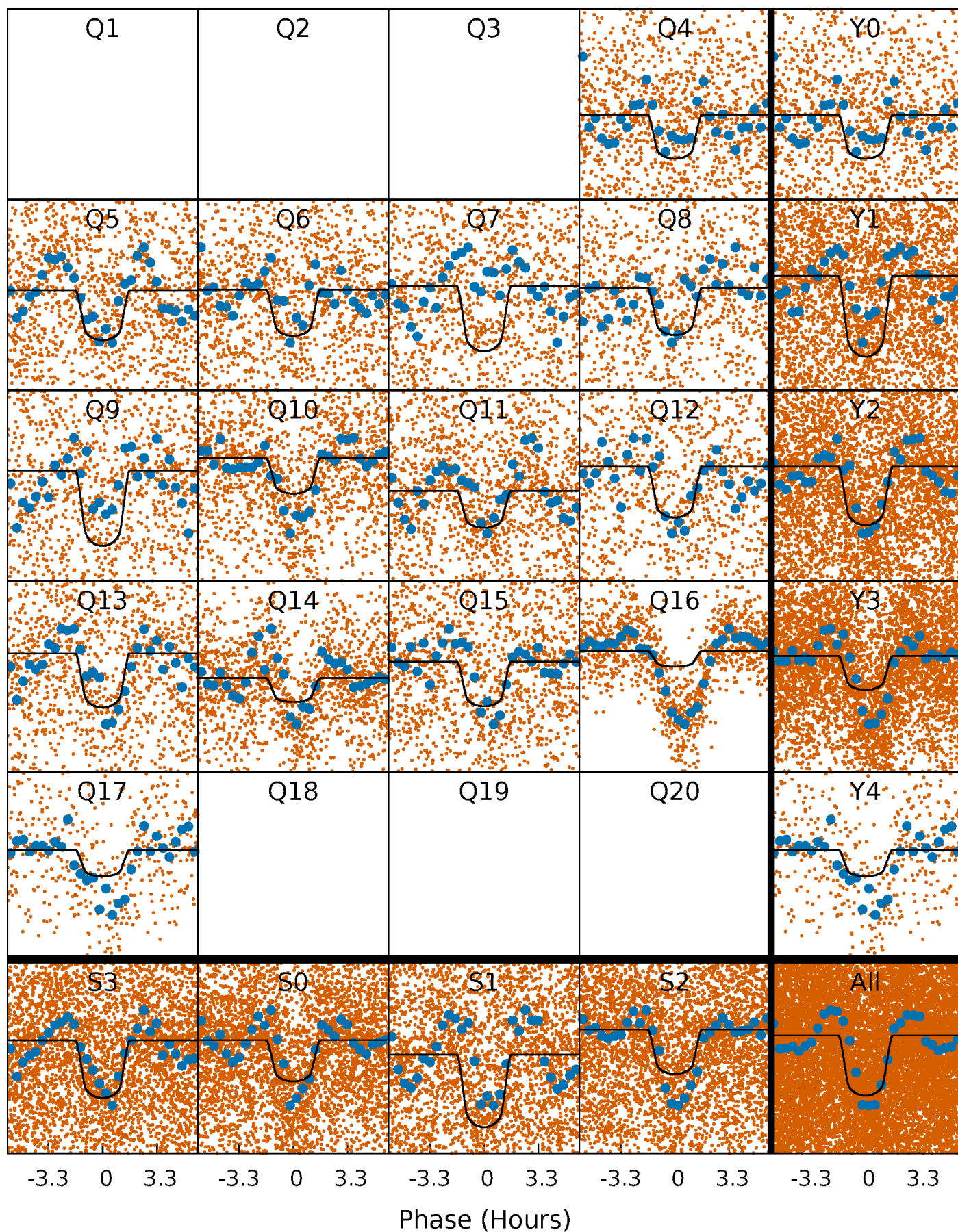
TCE 009899414-01   P= 1.332532 Days    $T_0=132.065081$  (BKJD)





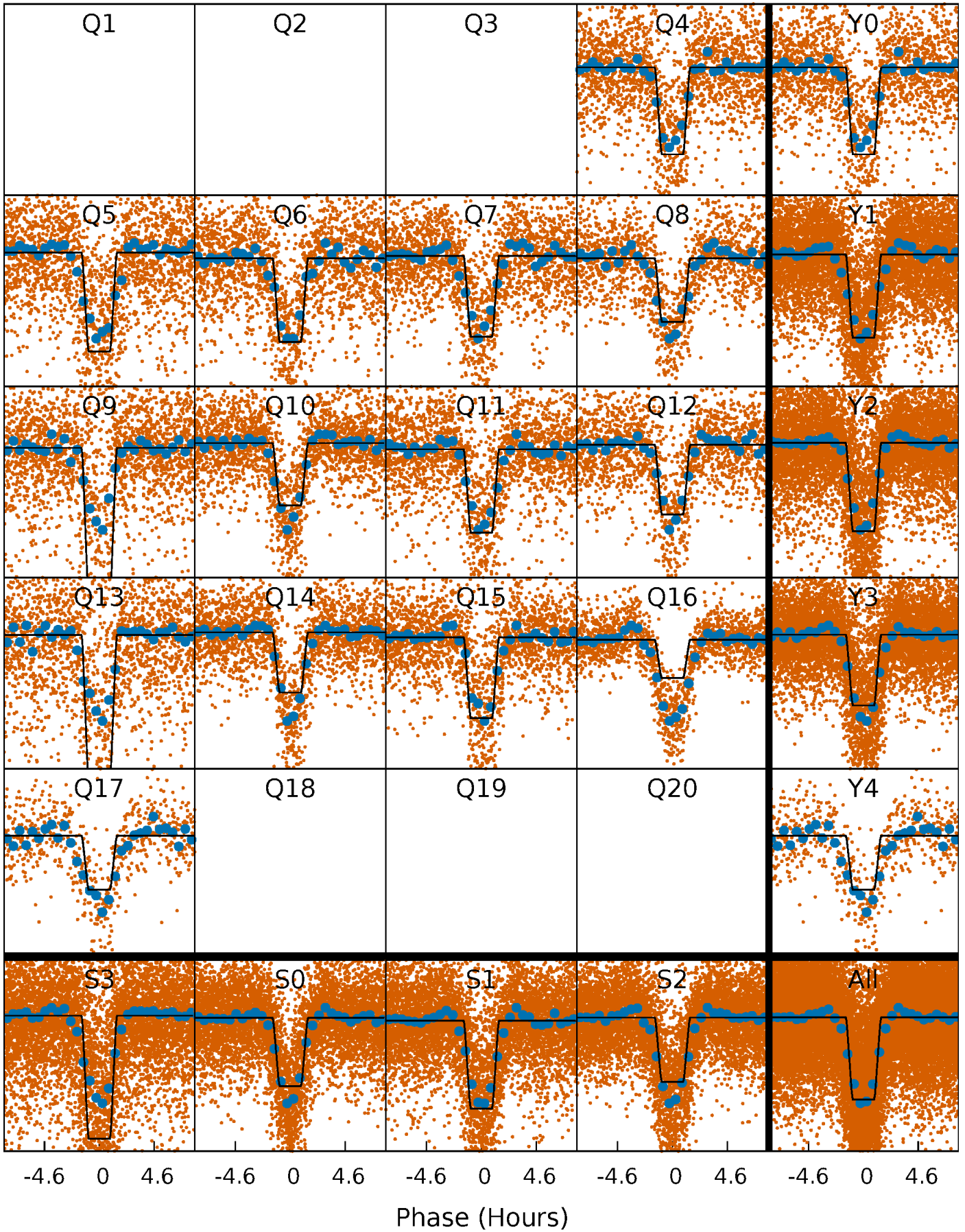
# DV Quarter-Phased Transit Curves

TCE 009899414-01 P= 1.332532 Days  $T_0=132.065081$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

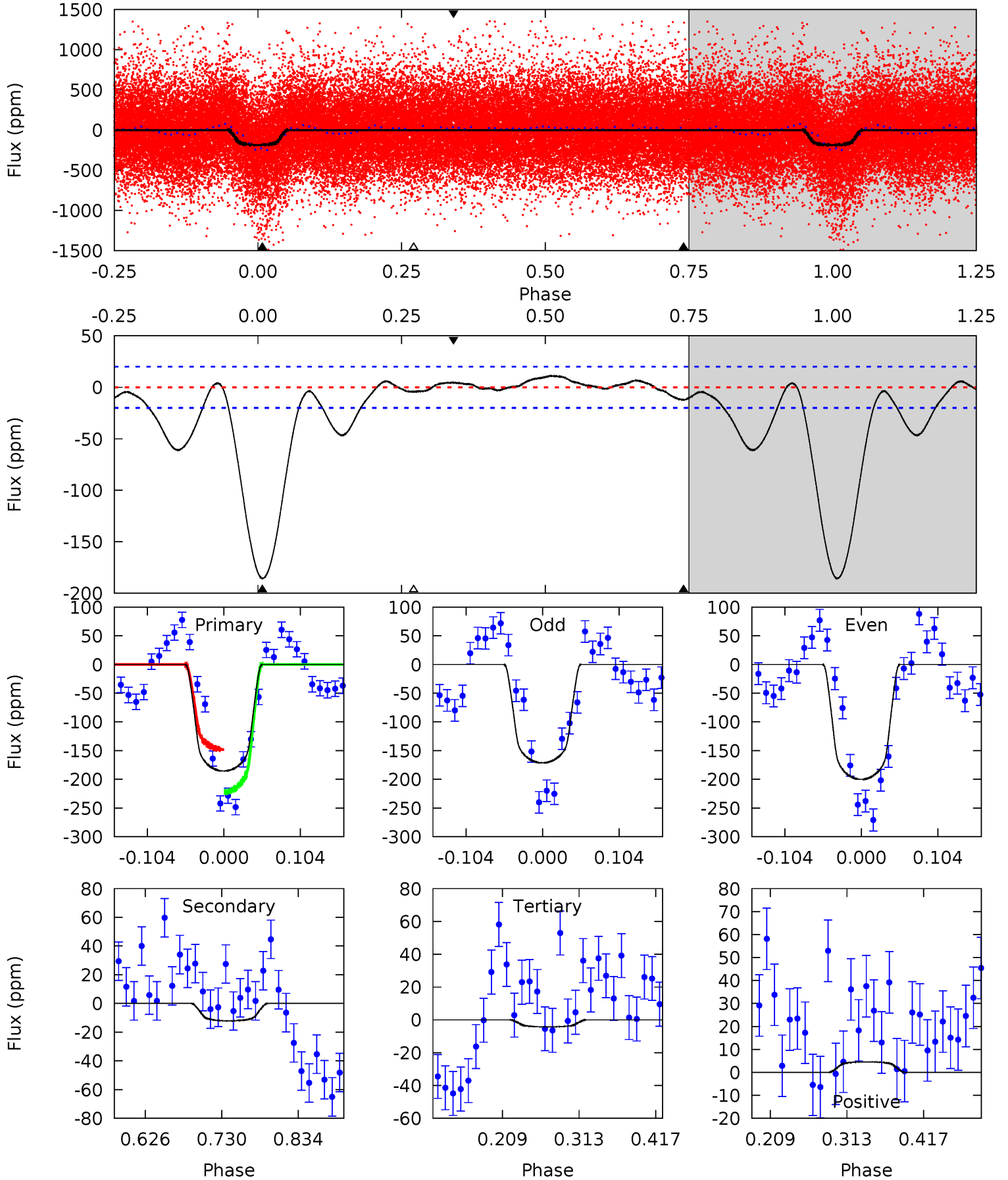
TCE 009899414-01 P= 1.332562 Days  $T_0=132.052705$  (BKJD)



# DV Model-Shift Uniqueness Test

009899414-01, P = 1.332532 Days, E = 132.065081 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
42.2	2.76	0.97	1.04	4.56	1.62	4.43	41.3	41.2	1.79	1.72	3.29	1.03	0.06	8.38

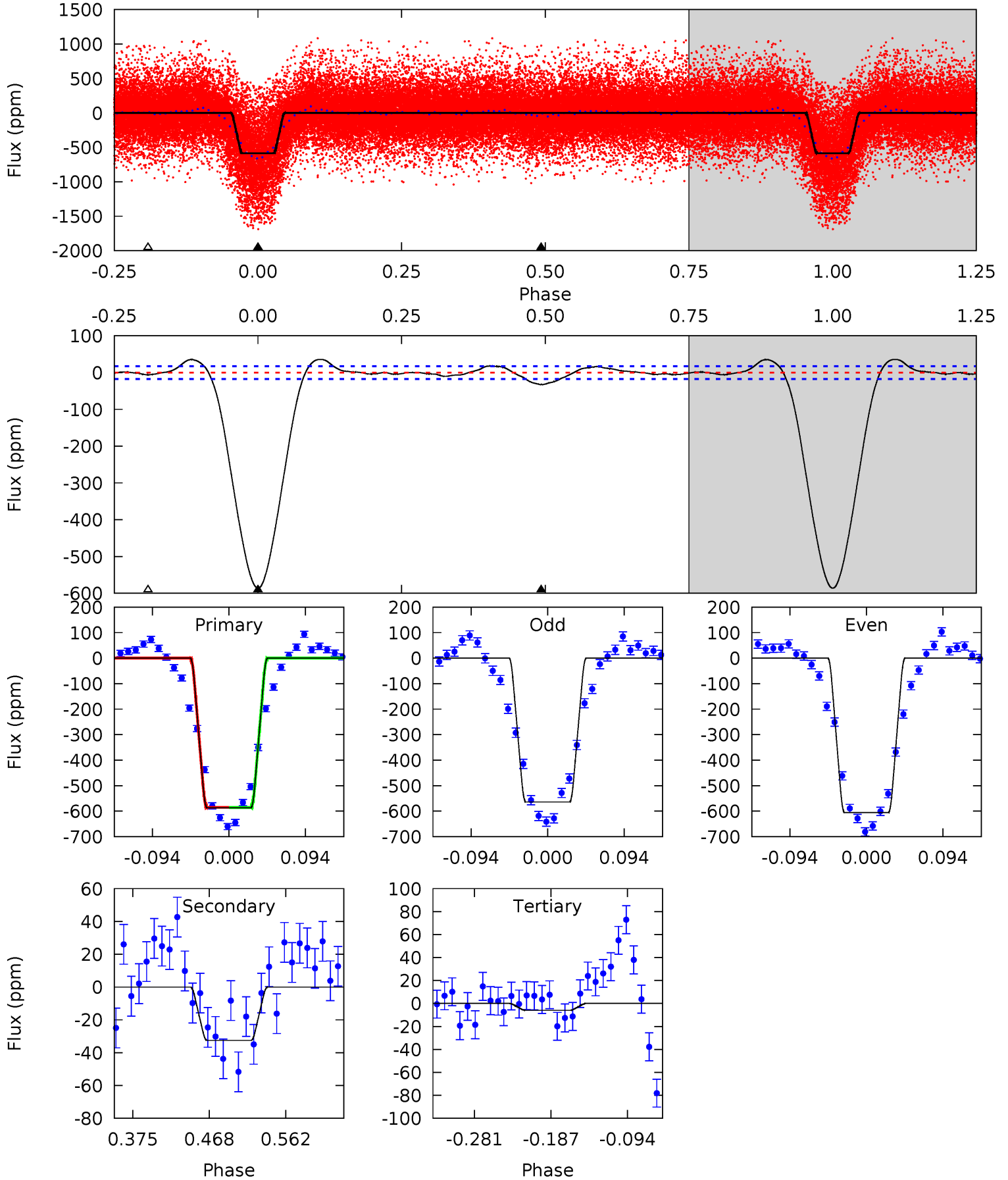




# Alt Model-Shift Uniqueness Test

009899414-01, P = 1.332562 Days, E = 132.052705 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
155.1	8.60	1.59	0	4.58	1.68	3.04	153.5	155.1	7.02	8.60	5.47	1.02	0.06	0.09



### Stellar Parameters For KIC 009899414

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6046^{+189}_{-232}$	$4.486^{+0.054}_{-0.229}$	$-0.080^{+0.250}_{-0.300}$	$0.972^{+0.315}_{-0.105}$	$1.053^{+0.135}_{-0.150}$	$1.615^{+0.461}_{-0.889}$
	+3%/-4%	+1%/-5%	+312%/-375%	+32%/-11%	+13%/-14%	+29%/-55%
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 009899414-01 / KOI 3955.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-12 \pm 4$	$1.67^{+0.33}_{-0.31}$	$2413^{+195}_{-131}$	$3284^{+320}_{-364}$	$1.335^{+0.891}_{-0.590}$
Alt.	$-33 \pm 4$	$2.75^{+0.53}_{-0.35}$	$2419^{+195}_{-139}$	$3267^{+163}_{-165}$	$1.340^{+0.422}_{-0.369}$

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



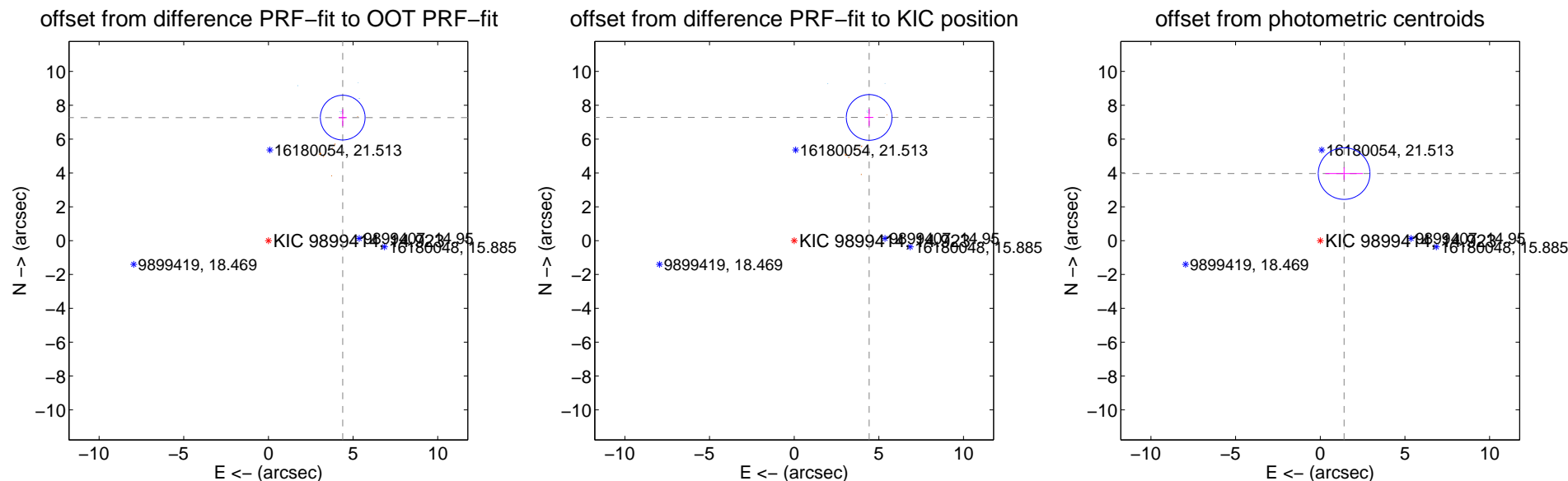
## DV Centroid Data

Supplemental centroid analysis for 009899414-01. Kepler magnitude: 14.92. Transit SNR 25.20

There are 6 quarters with good PRF difference image offsets

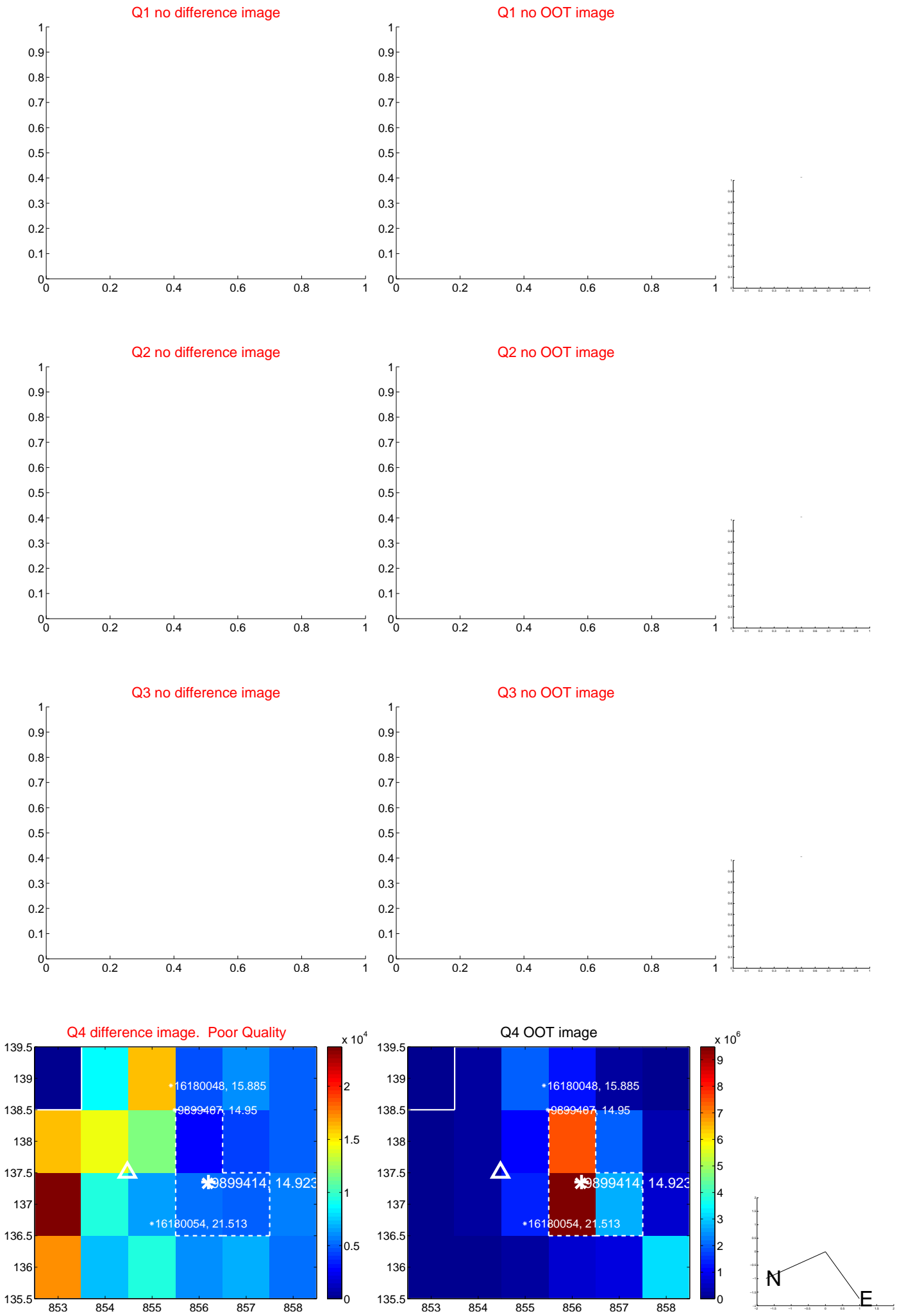
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$8.489 \pm 0.440$	$19.28$	$-4.387 \pm 0.239$	$7.268 \pm 0.494$
PRF-fit source offset from KIC position	$8.520 \pm 0.450$	$18.94$	$-4.427 \pm 0.250$	$7.279 \pm 0.504$
photometric centroid source offset	$4.21 \pm 0.51$	$8.27$	$-1.41 \pm 1.11$	$3.96 \pm 0.37$

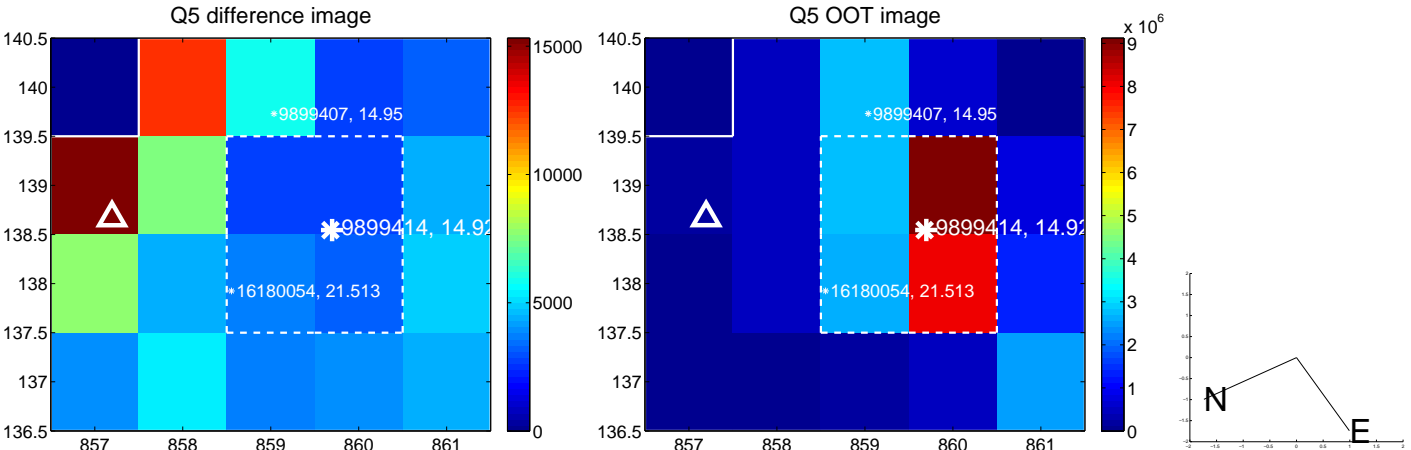


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

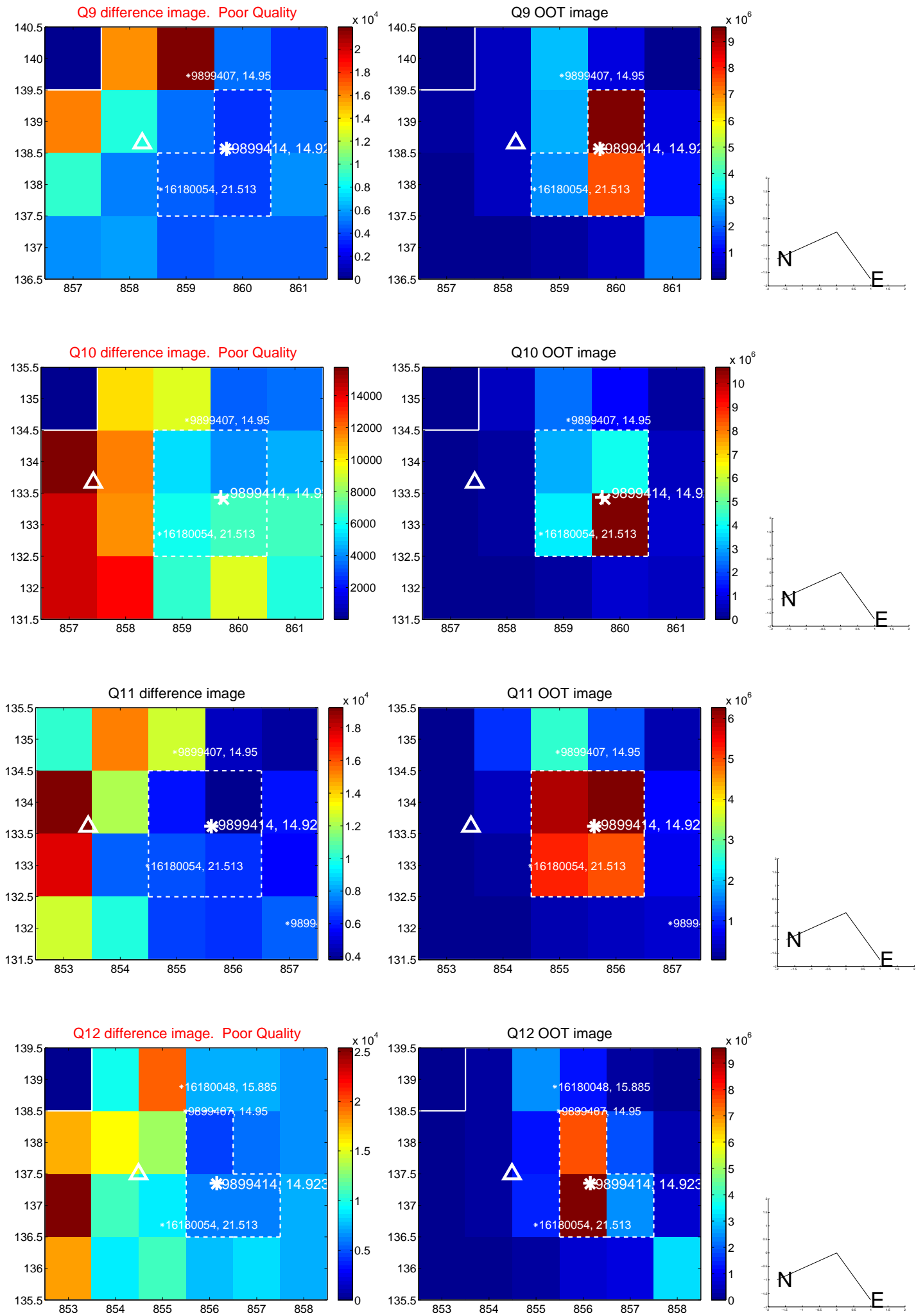
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



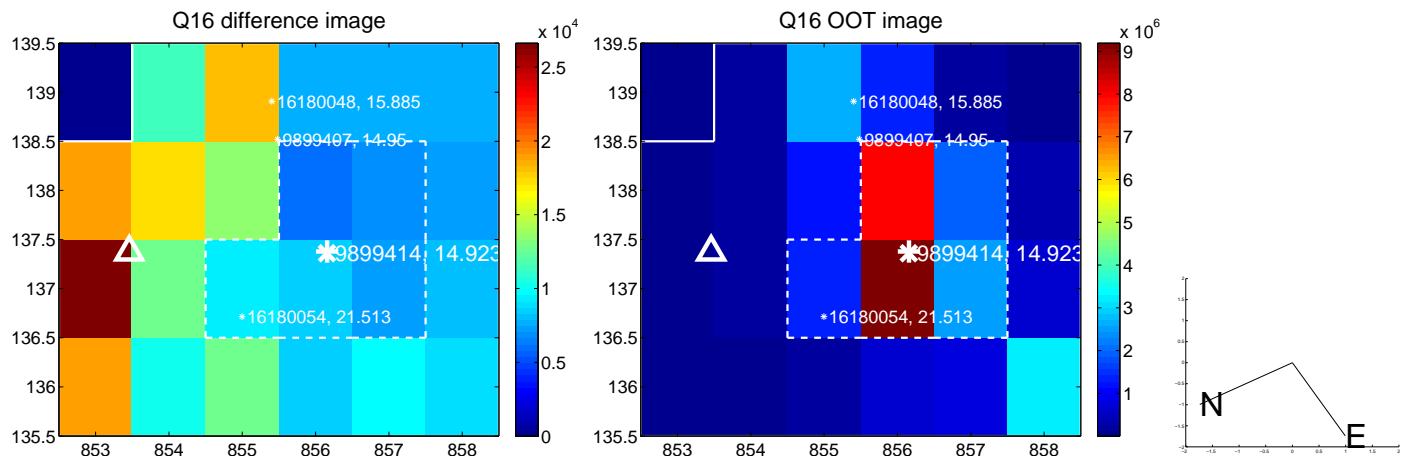
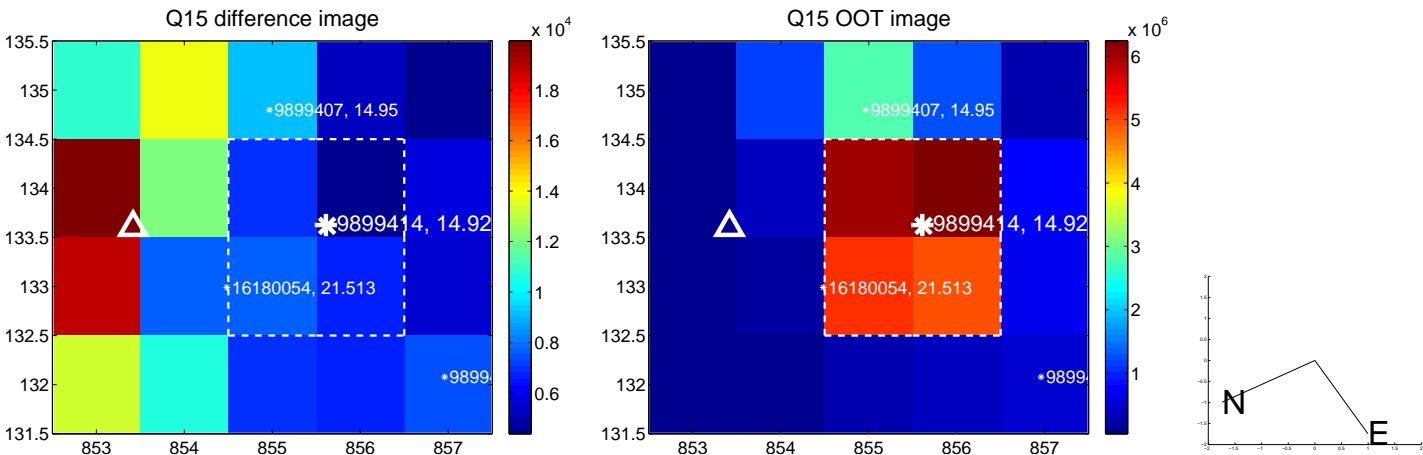
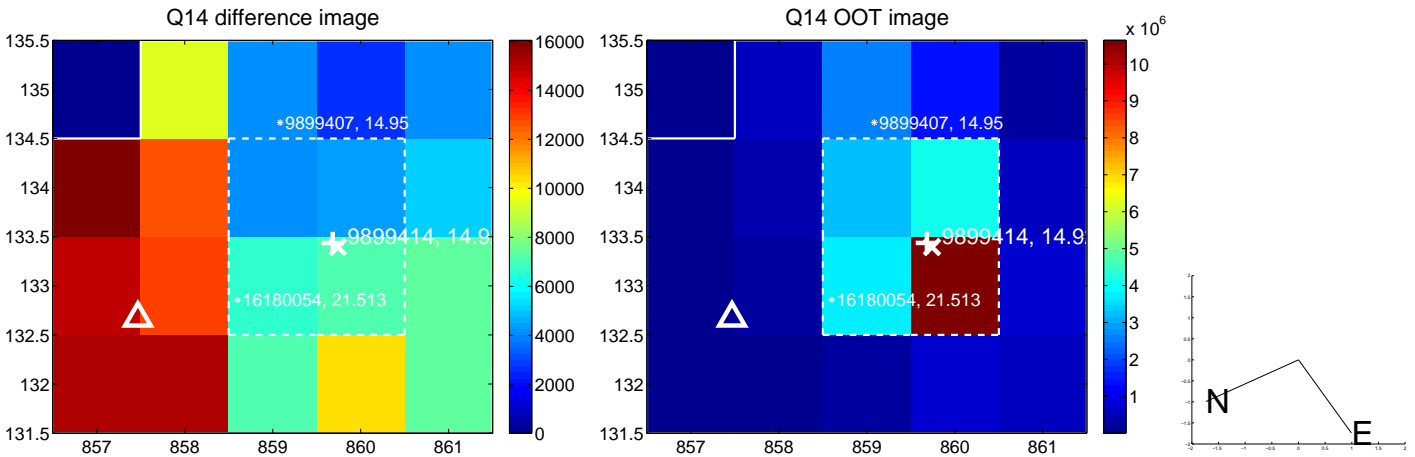
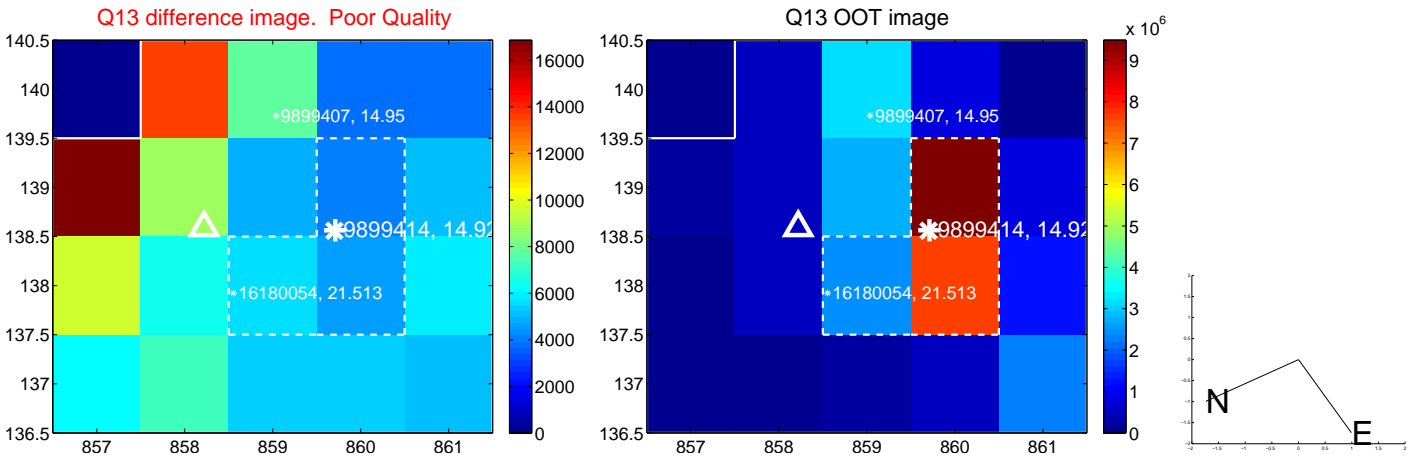
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

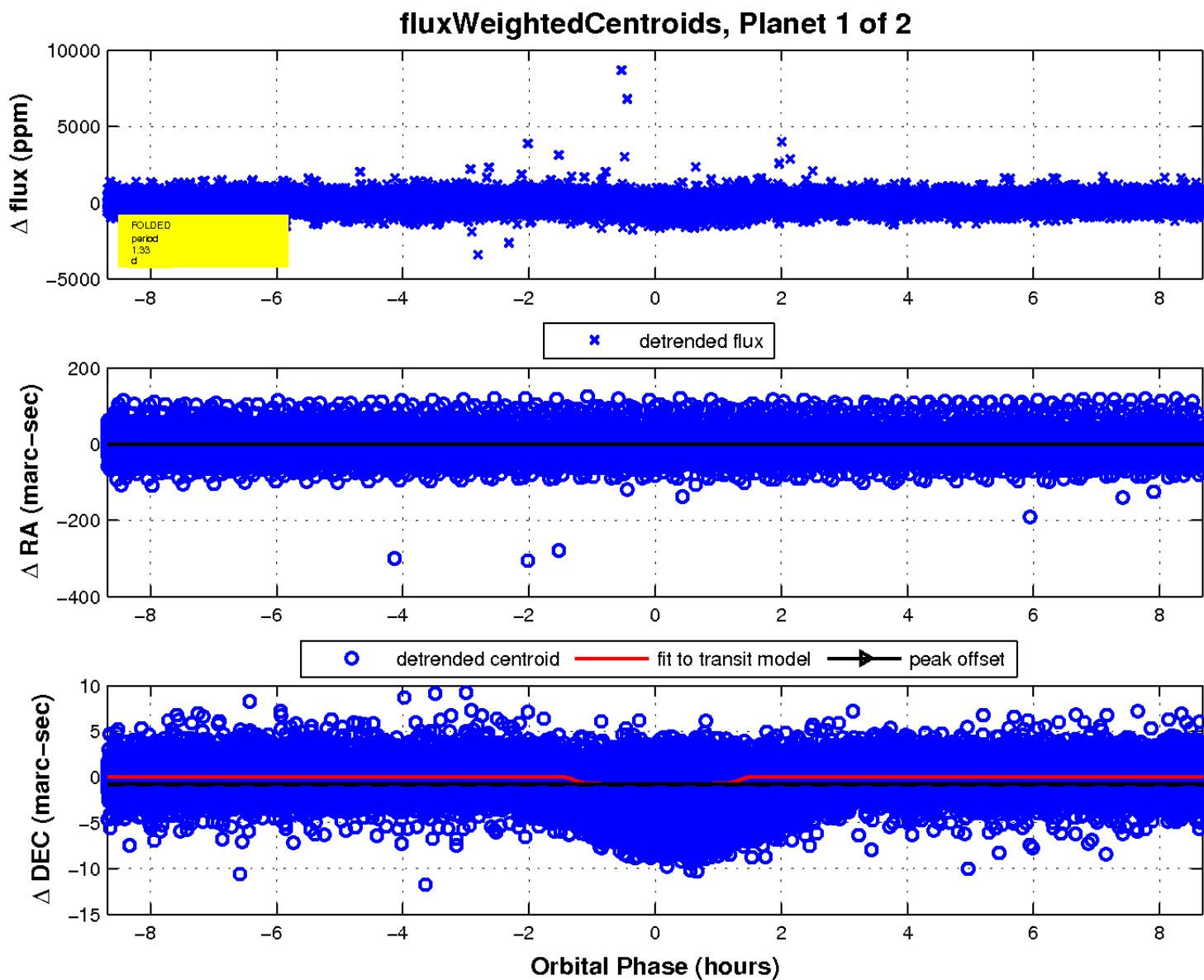
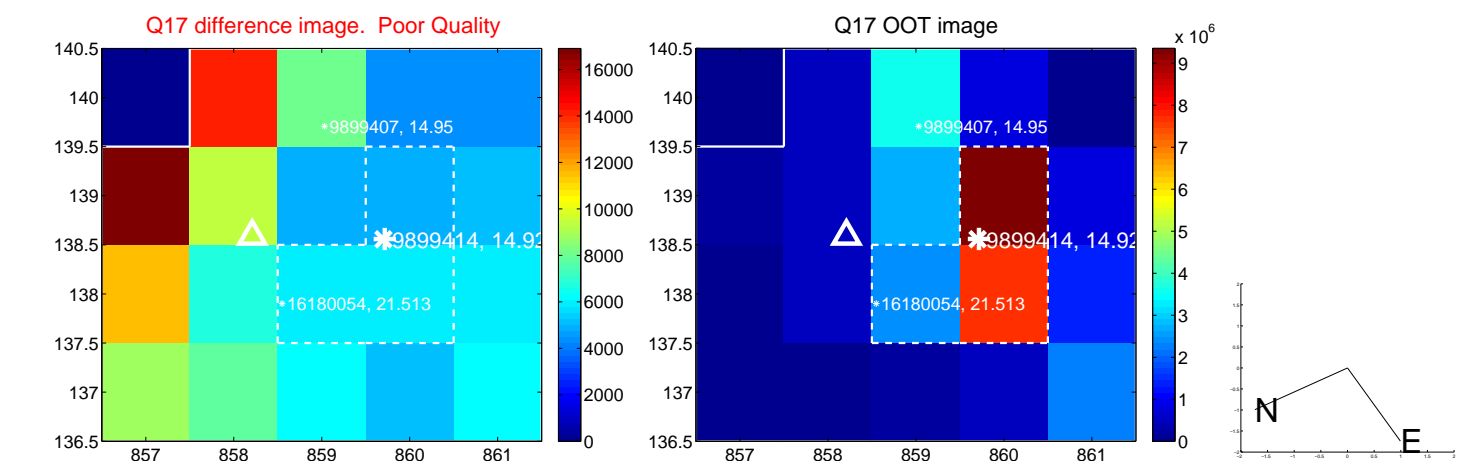


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



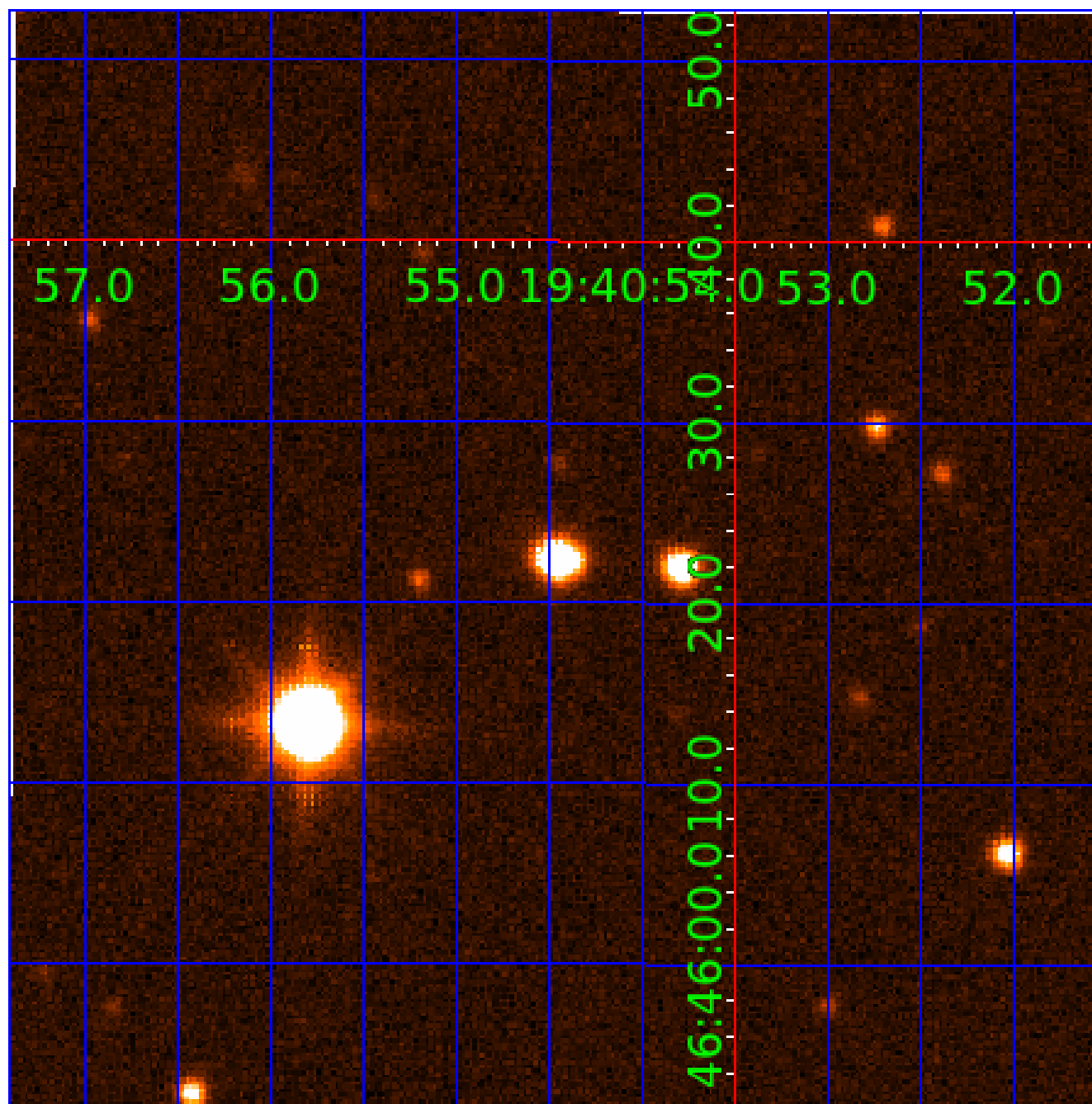


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009899414

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009899414-01	OBS	3955.01	1.332532	132.065081	190.4	2.895	24.8	25.2	0.97	6046	1.59	1942.26
009899414-02	OBS	No	232.165051	137.987958	770.8	2.767	14.8	5.7	0.97	6046	2.99	2.00

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009899414-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—EPHEM_MATCH
009899414-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—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.

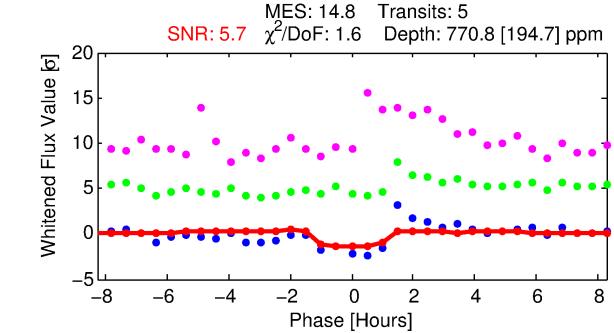
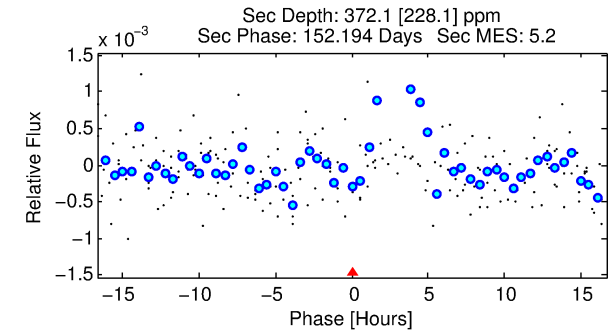
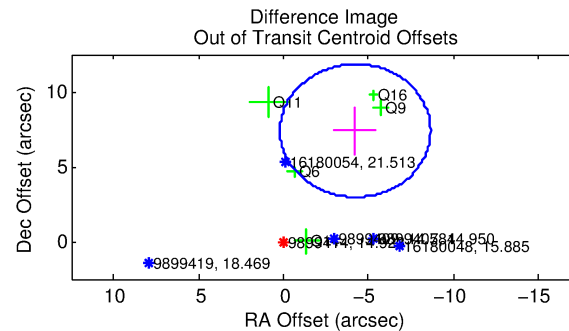
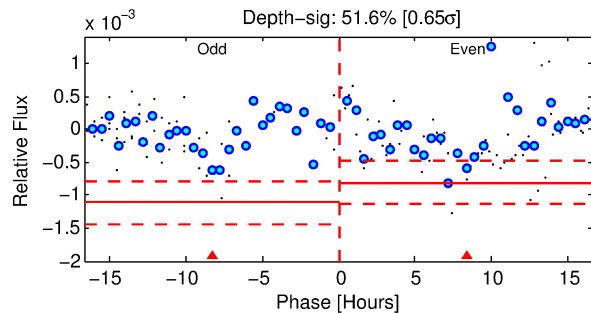
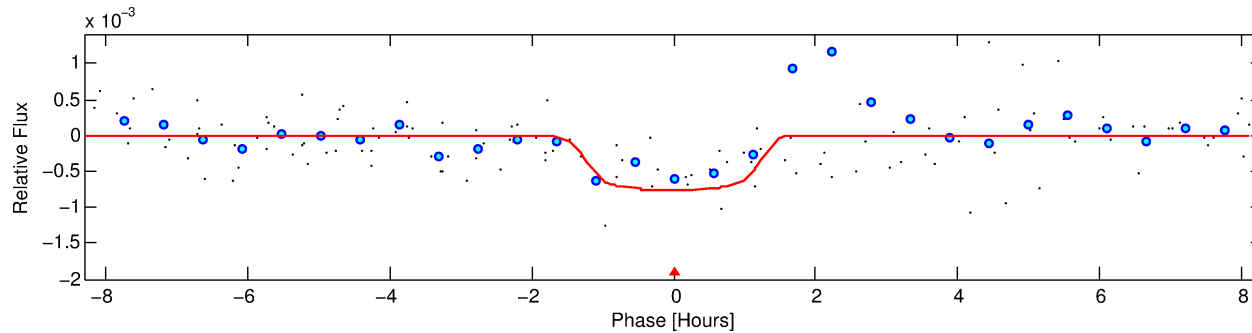
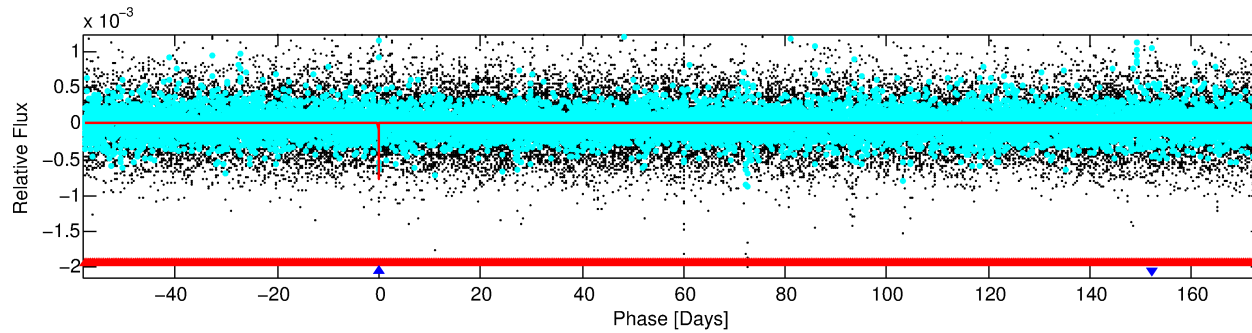
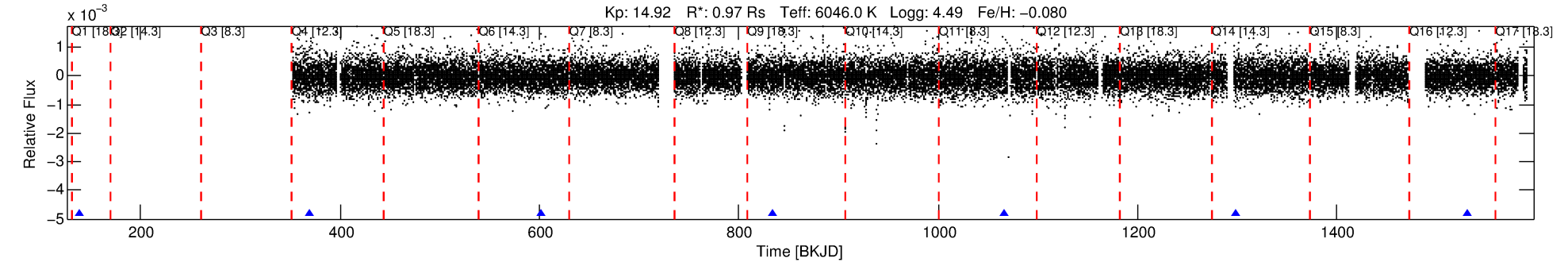
## Ephemeris Match Information For 009899414-02

No Significant Match Found

# DV One-Page Summary

KIC: 9899414 Candidate: 2 of 2 Period: 232.165 d  
KOI: K03955 Corr: No Ephemeris Match

Kp: 14.92 R\*: 0.97 Rs Teff: 6046.0 K Logg: 4.49 Fe/H: -0.080



## DV Fit Results:

Period = 232.16505 [0.00419] d  
Epoch = 137.9880 [0.0190] BKJD  
Rp/R\* = 0.0282 [0.0441]  
a/R\* = 416.89 [3141.63]  
b = 0.80 [3.52]  
Seff = 2.00 [0.88]  
Teq = 303 [33] K  
Rp = 2.99 [4.78] Re  
a = 0.7528 [0.2097] AU  
Ag = 13005.67 [41895.57] [0.31σ]  
Teffp = 5004 [4001] K [1.17σ]

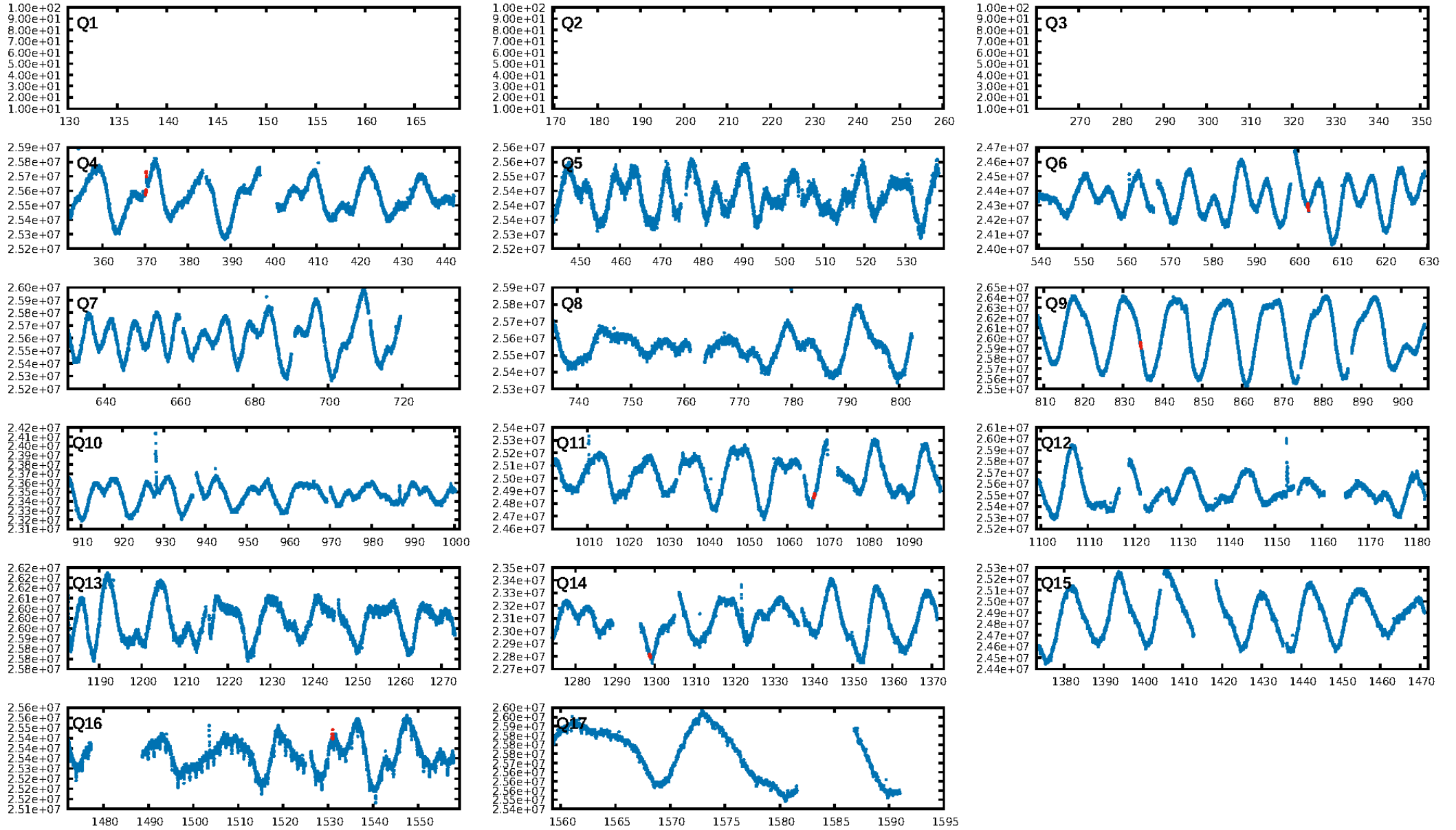
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1383.47σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 50.8%  
Bootstrap-pfa: 2.39e-23  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -1.123  
Centroid-sig: 88.9%  
Centroid-so: 0.843 arcsec [0.29σ]  
OotOffset-rm: 8.532 arcsec [5.77σ]  
KicOffset-rm: 8.569 arcsec [4.19σ]  
OotOffset-st: 2/1/1/1 [5]  
KicOffset-st: 2/1/1/1 [5]  
DiffImageQuality-fgm: 0.00 [0/5]  
DiffImageOverlap-fno: 0.50 [3/6]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 13:26:16 Z

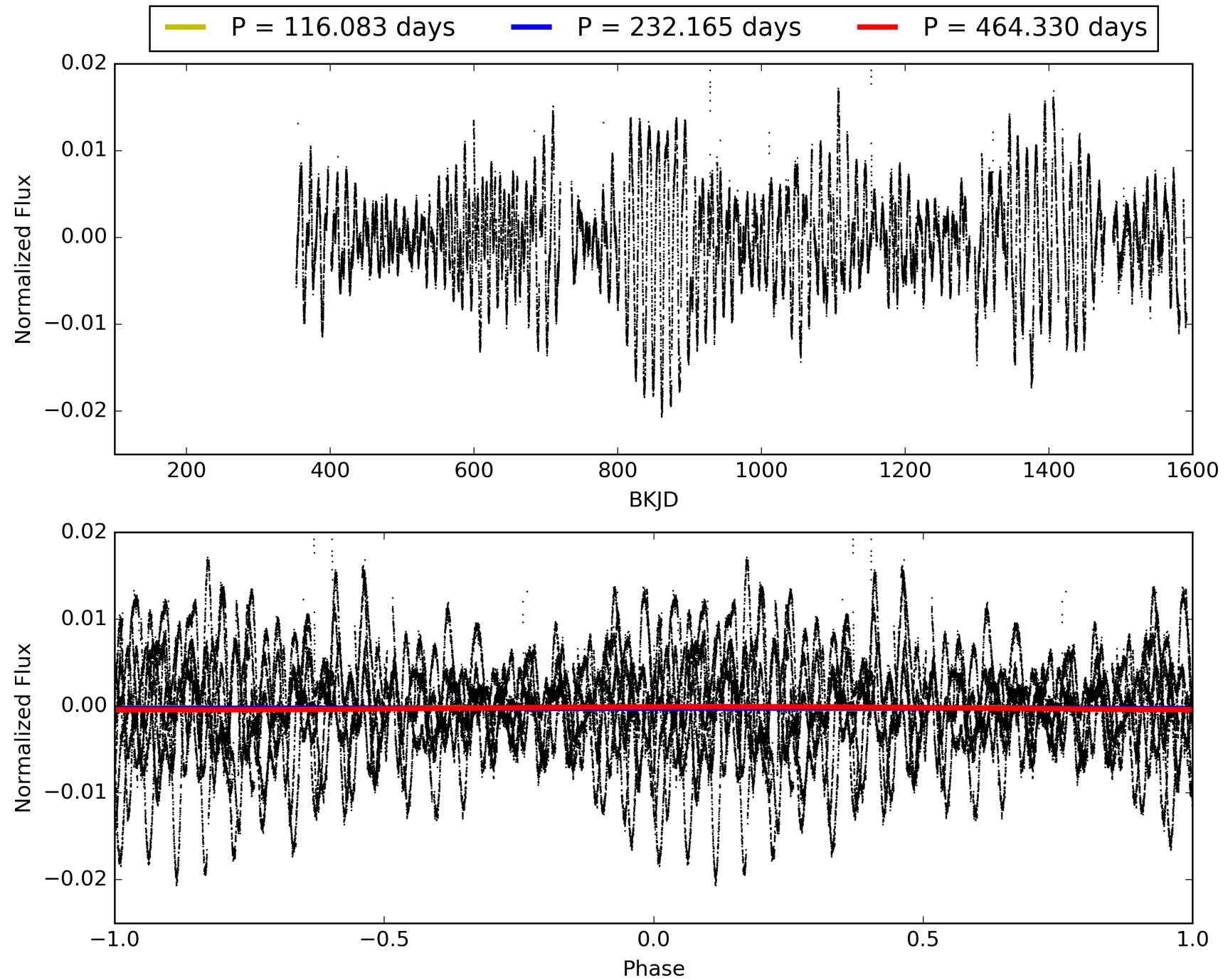
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009899414-02, PDC Light Curves



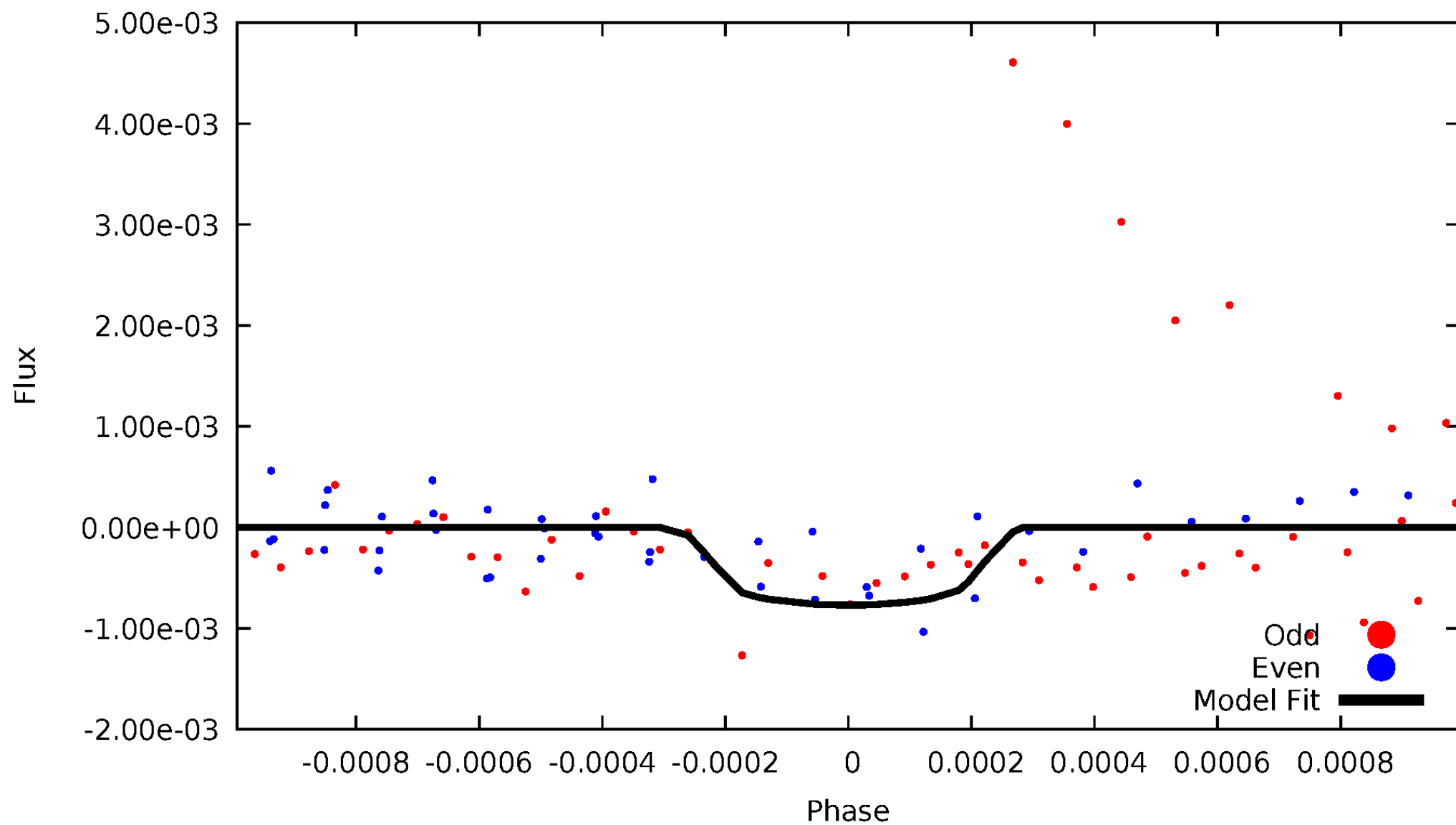


TCE 009899414-02



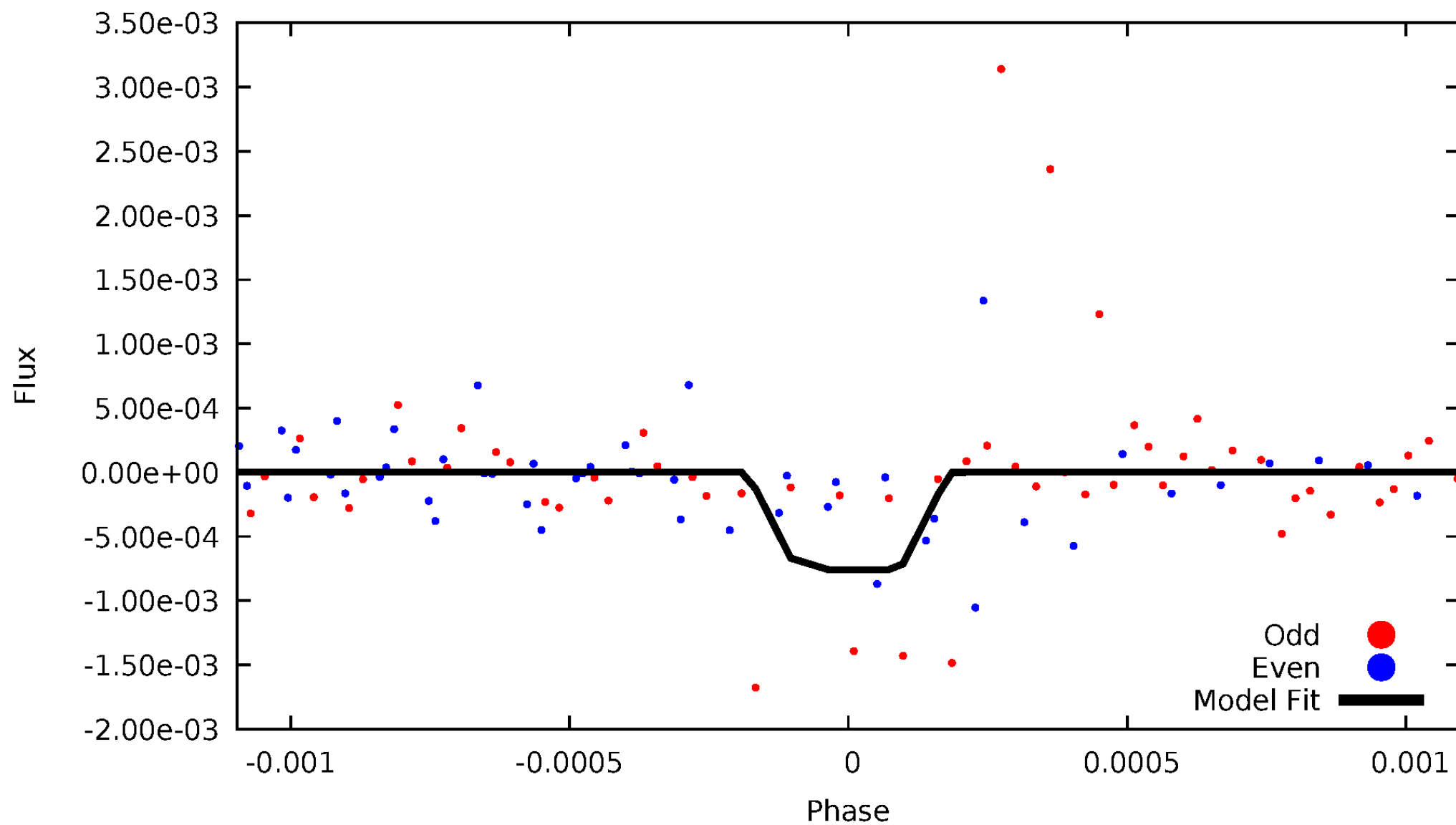
# DV Odd/Even

TCE 009899414-02



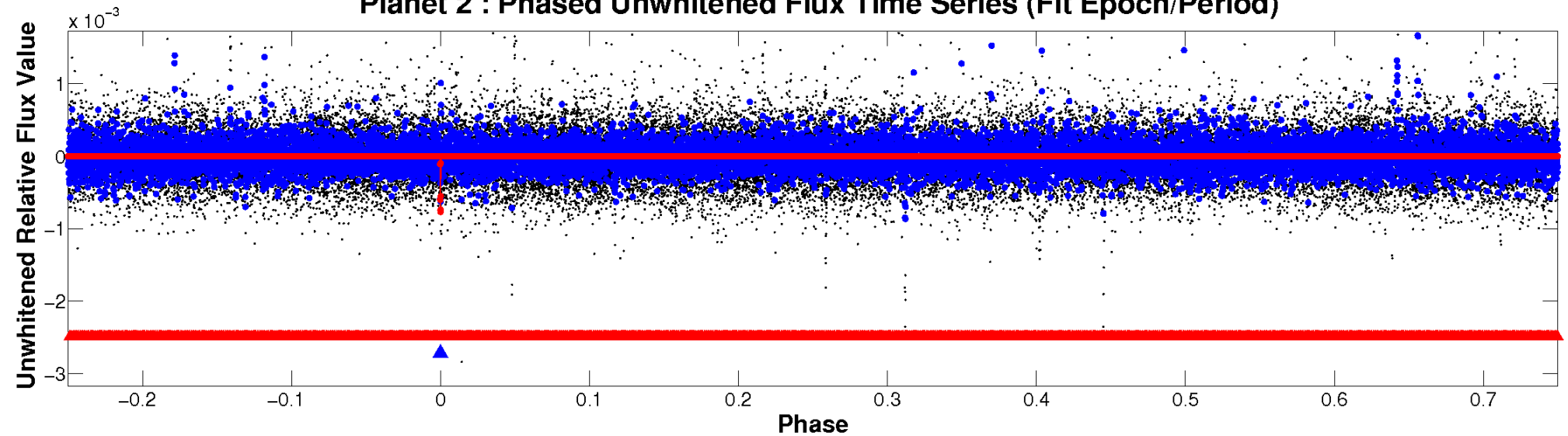
# ALT Odd/Even

TCE 009899414-02

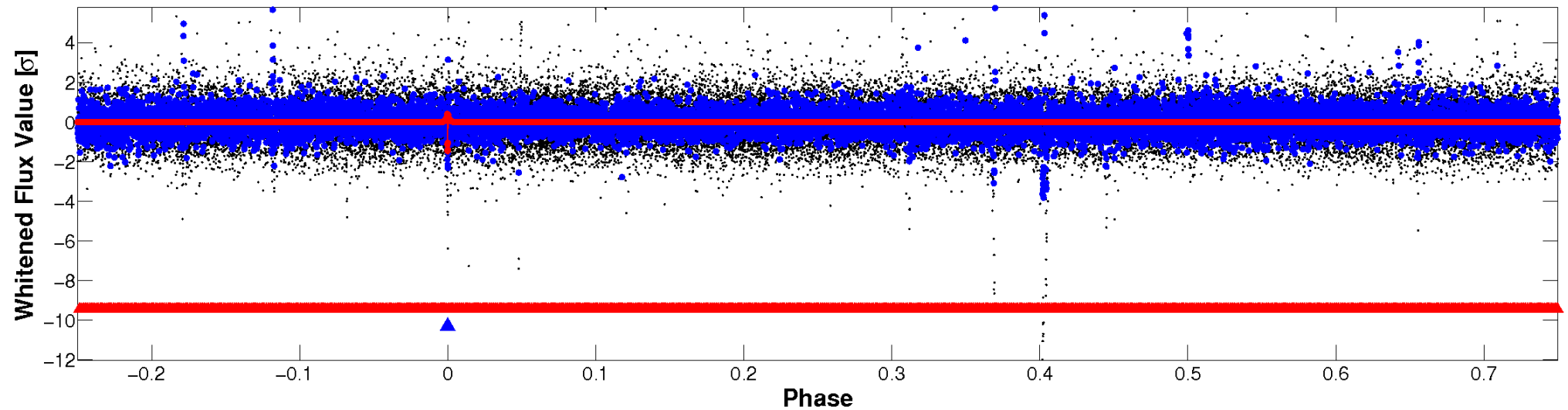


# Non-Whitened Vs. Whitened Light Curve

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

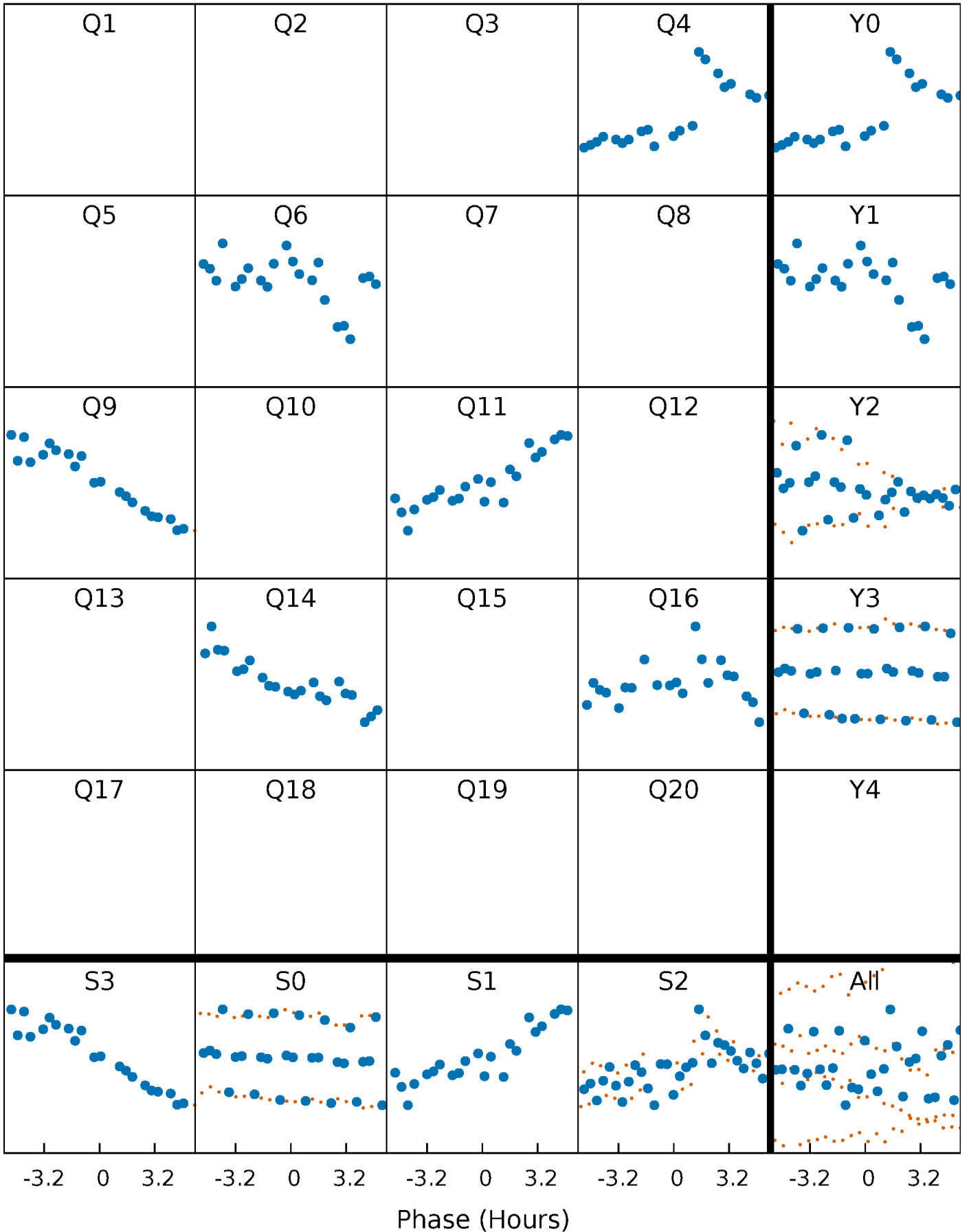


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

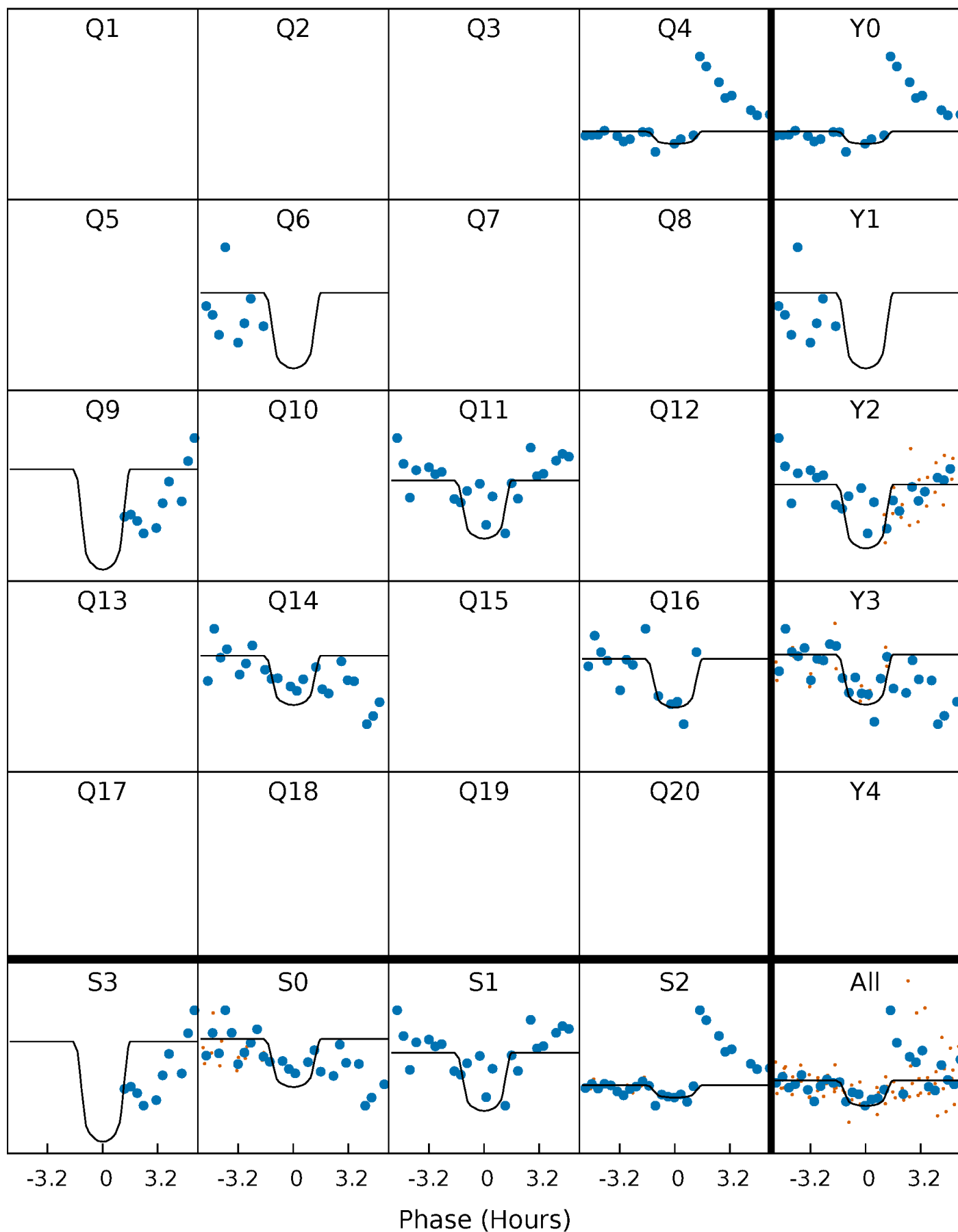
TCE 009899414-02 P=232.165051 Days  $T_0=137.987958$  (BKJD)





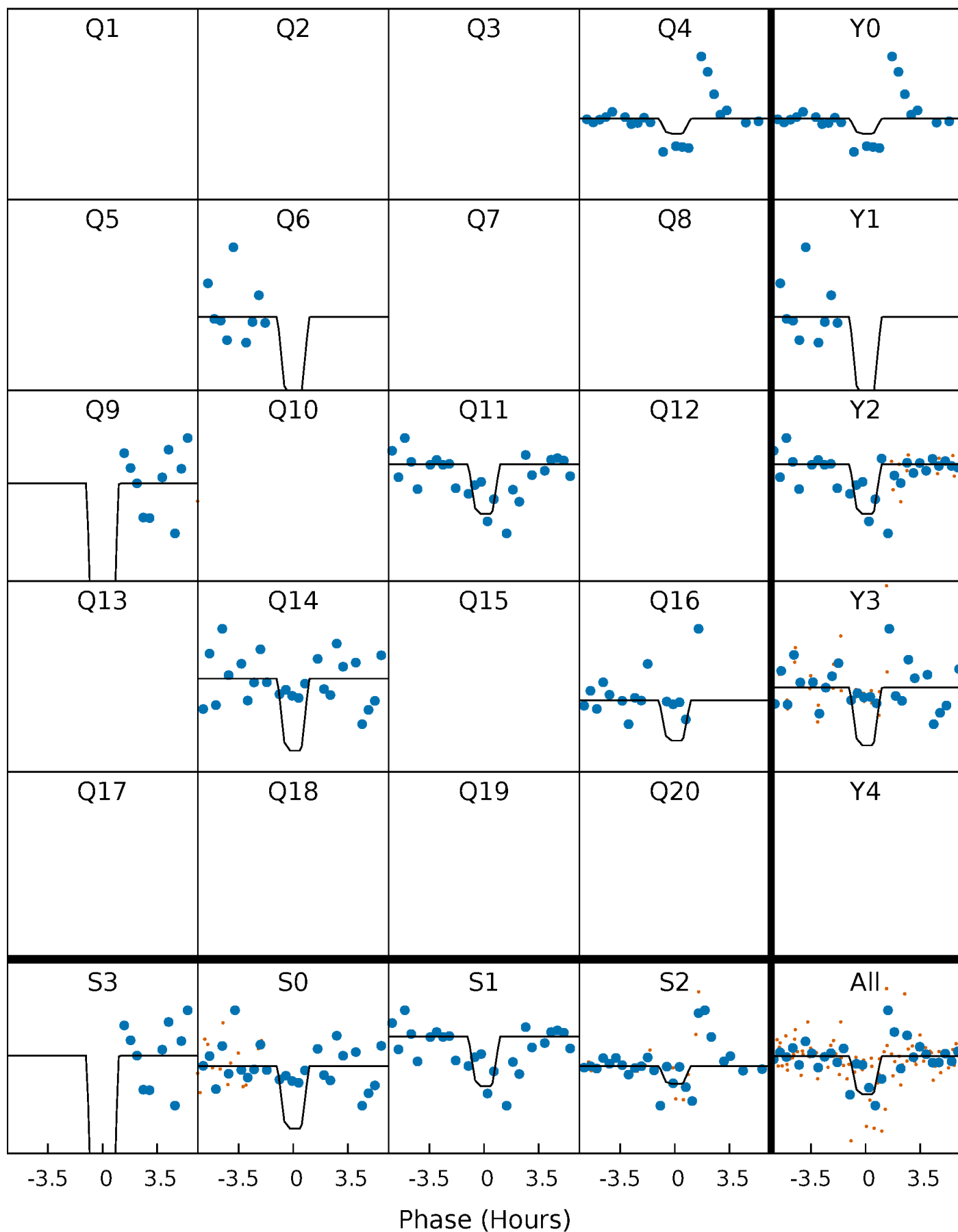
# DV Quarter-Phased Transit Curves

TCE 009899414-02 P=232.165051 Days  $T_0=137.987958$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

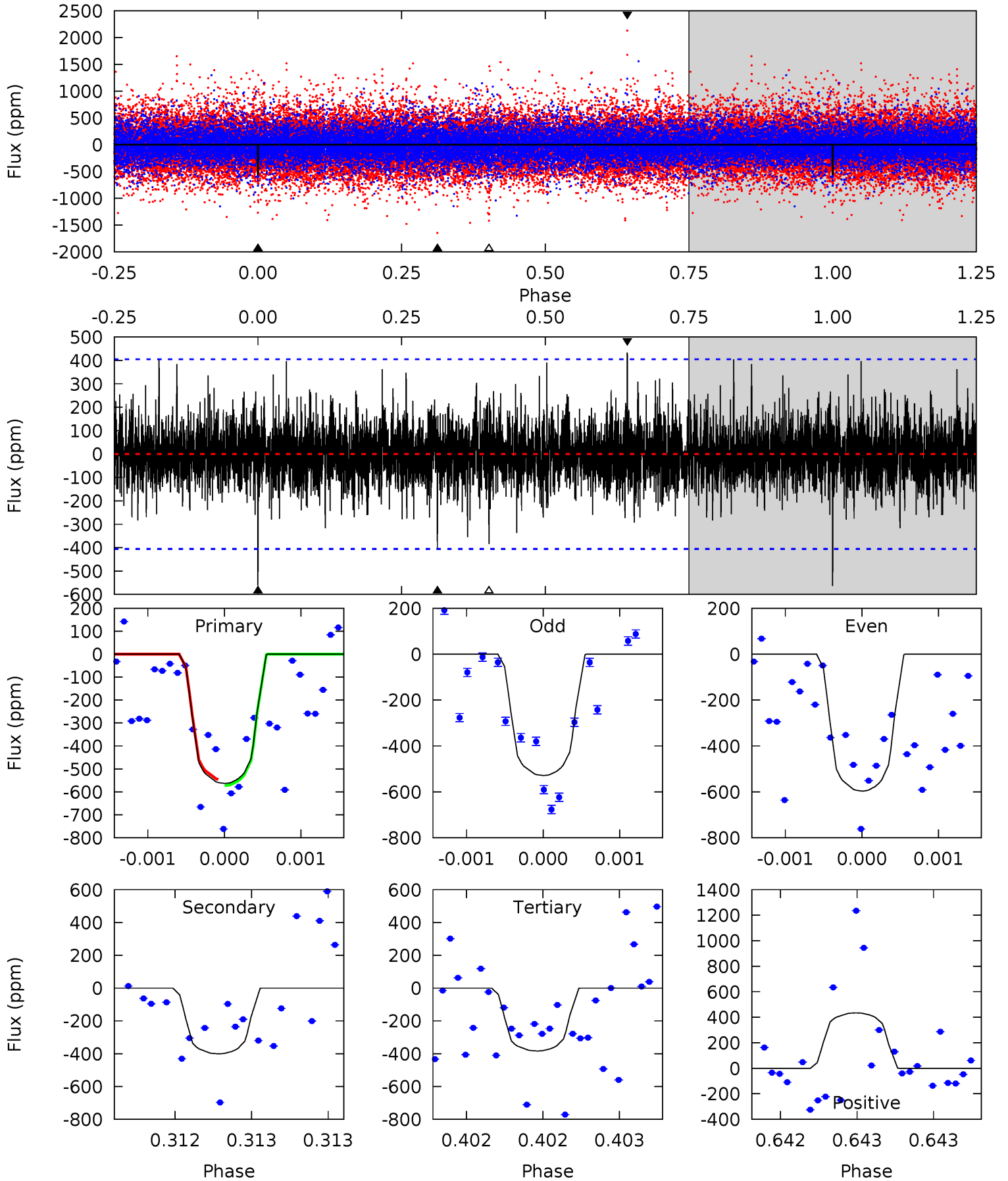
TCE 009899414-02 P=232.163869 Days  $T_0=137.987645$  (BKJD)



# DV Model-Shift Uniqueness Test

009899414-02, P = 232.165051 Days, E = 137.987958 Days

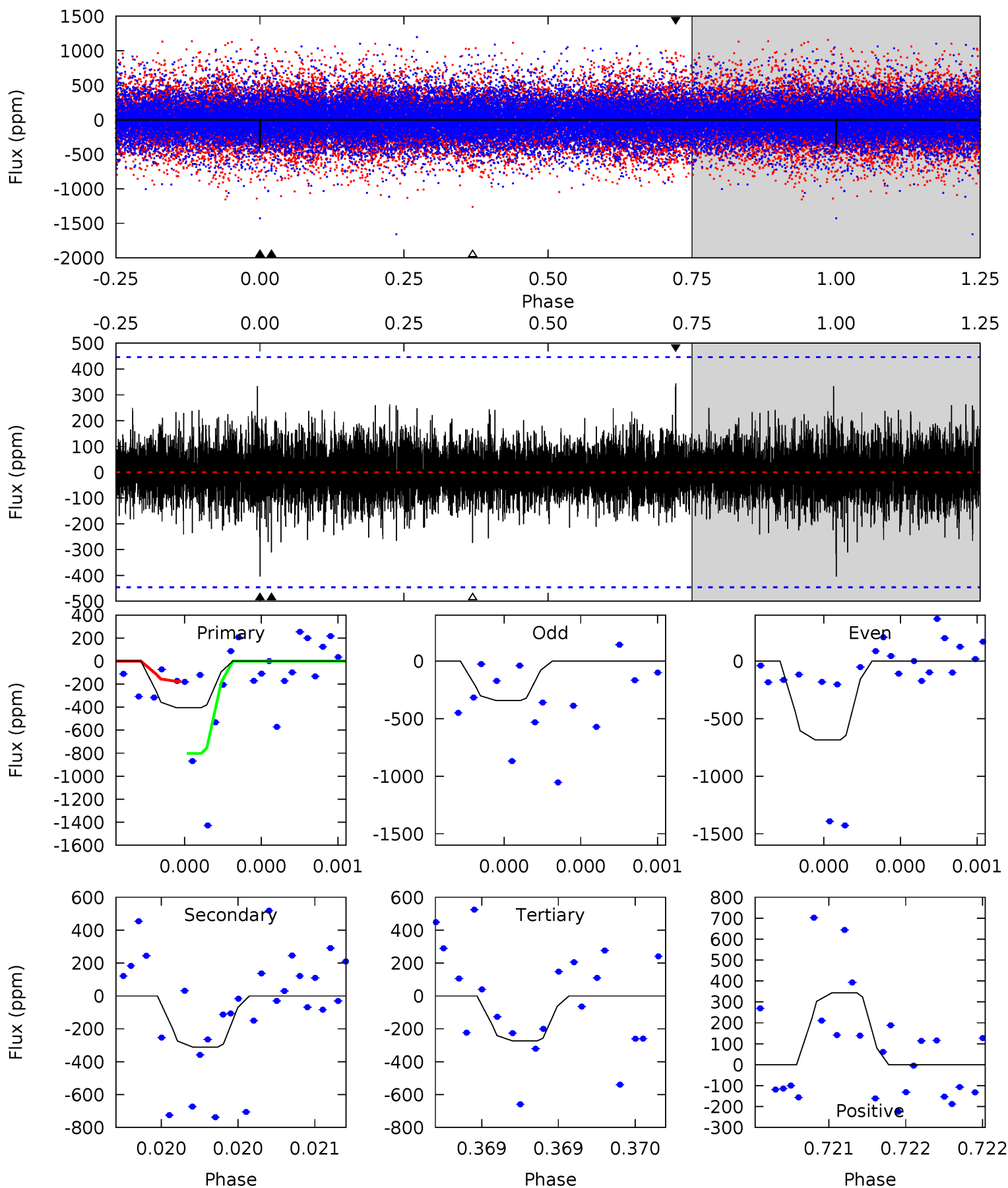
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.74	5.51	5.27	5.97	5.57	3.47	1.30	2.47	1.77	0.24	-0.46	0.44	1.05	0.44	0.18



# Alt Model-Shift Uniqueness Test

009899414-02, P = 232.163869 Days, E = 137.987645 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
5.12	3.93	3.46	4.34	5.64	3.59	0.87	1.66	0.78	0.47	-0.41	2.26	1.57	0.46	4.03



### Stellar Parameters For KIC 009899414

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6046^{+189}_{-232}$	$4.486^{+0.054}_{-0.229}$	$-0.080^{+0.250}_{-0.300}$	$0.972^{+0.315}_{-0.105}$	$1.053^{+0.135}_{-0.150}$	$1.615^{+0.461}_{-0.889}$
	+3%/-4%	+1%/-5%	+312%/-375%	+32%/-11%	+13%/-14%	+29%/-55%
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 009899414-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-401 \pm 73$	$4.59^{+4.97}_{-3.00}$	$434^{+34}_{-25}$	$4378^{+2582}_{-917}$	$5611^{+39638}_{-4282}$
Alt.	$-311 \pm 79$	$4.71^{+4.36}_{-3.21}$	$431^{+32}_{-23}$	$4171^{+2762}_{-831}$	$4296^{+34036}_{-3157}$

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

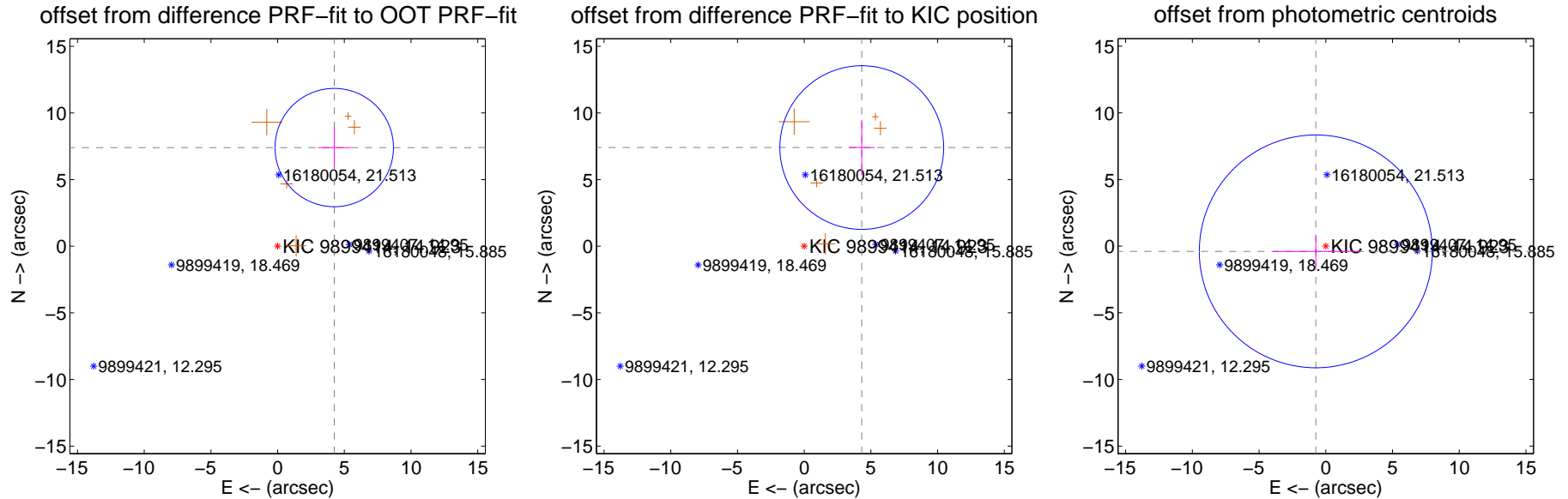
## DV Centroid Data

Supplemental centroid analysis for 009899414-02. Kepler magnitude: 14.92. Transit SNR 5.67

There are 0 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$8.532 \pm 1.480$	$5.77$	$-4.243 \pm 1.218$	$7.402 \pm 1.556$
PRF-fit source offset from KIC position	$8.569 \pm 2.046$	$4.19$	$-4.316 \pm 0.970$	$7.403 \pm 2.076$
photometric centroid source offset	$0.84 \pm 2.91$	$0.29$	$0.75 \pm 3.23$	$-0.39 \pm 1.16$



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

Q1 no difference image



Q1 no OOT image



Q2 no difference image



Q2 no OOT image



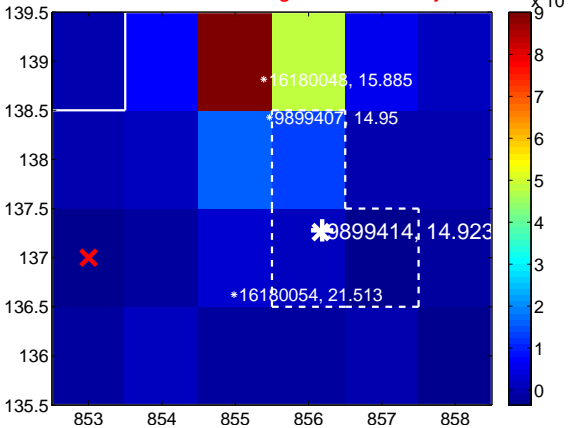
Q3 no difference image



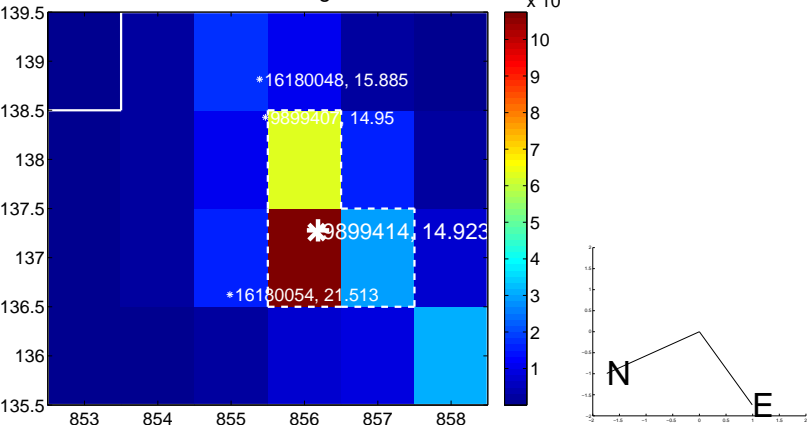
Q3 no OOT image



Q4 difference image. Poor Quality

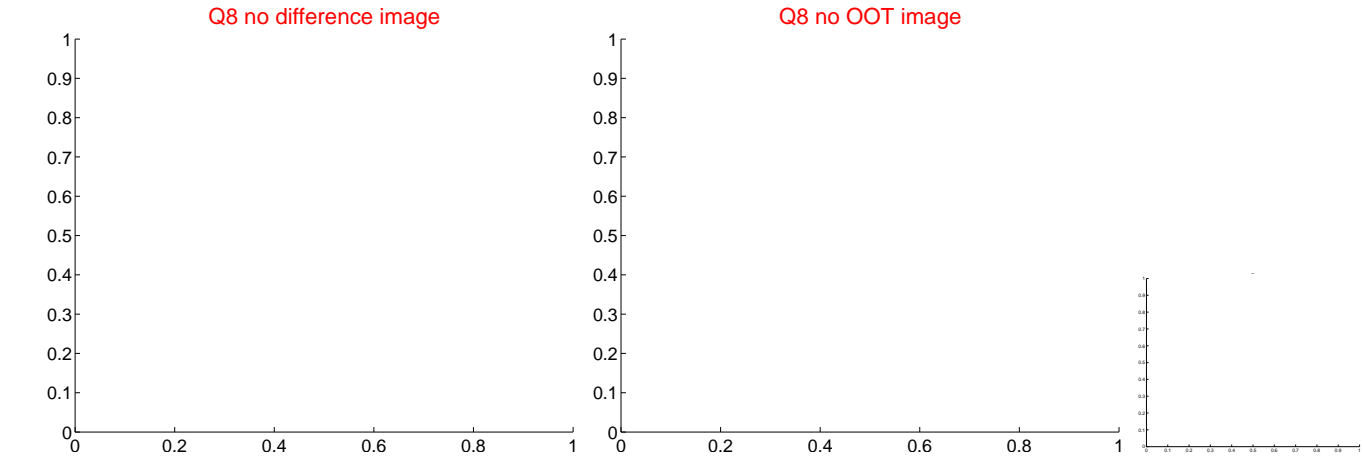
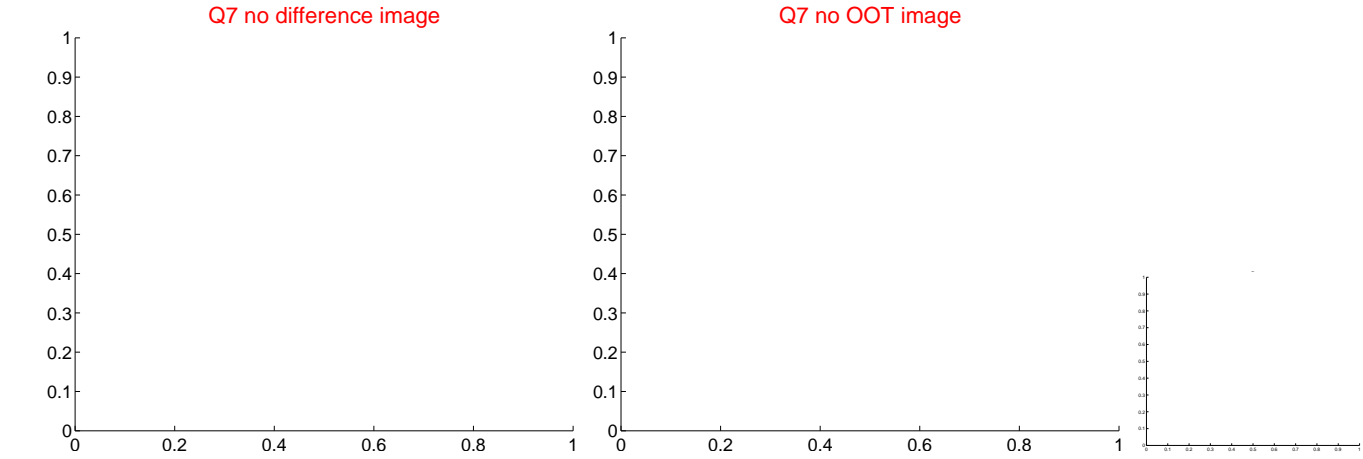
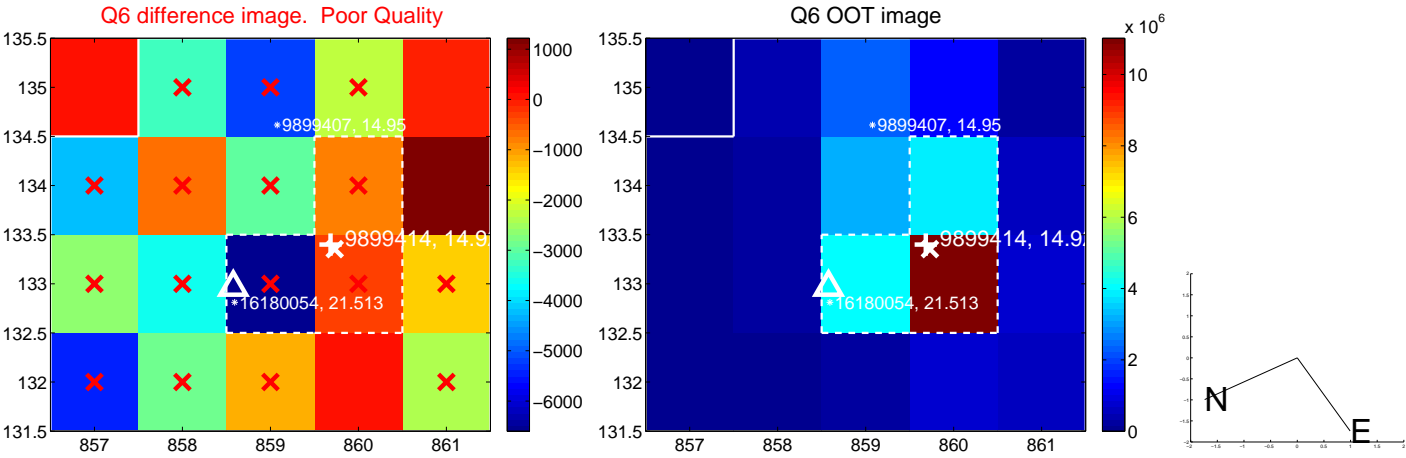
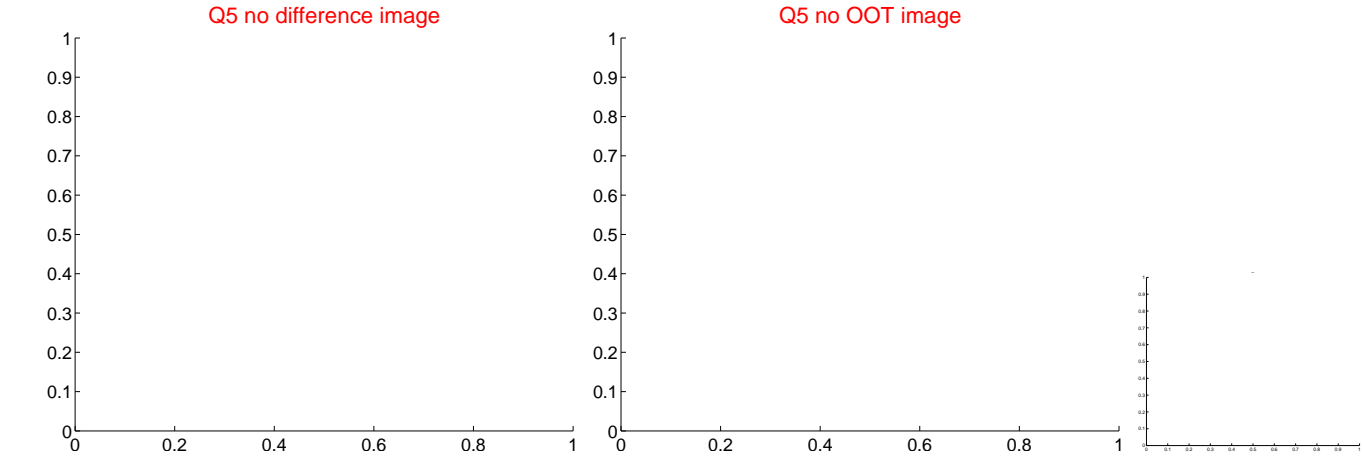


Q4 OOT image

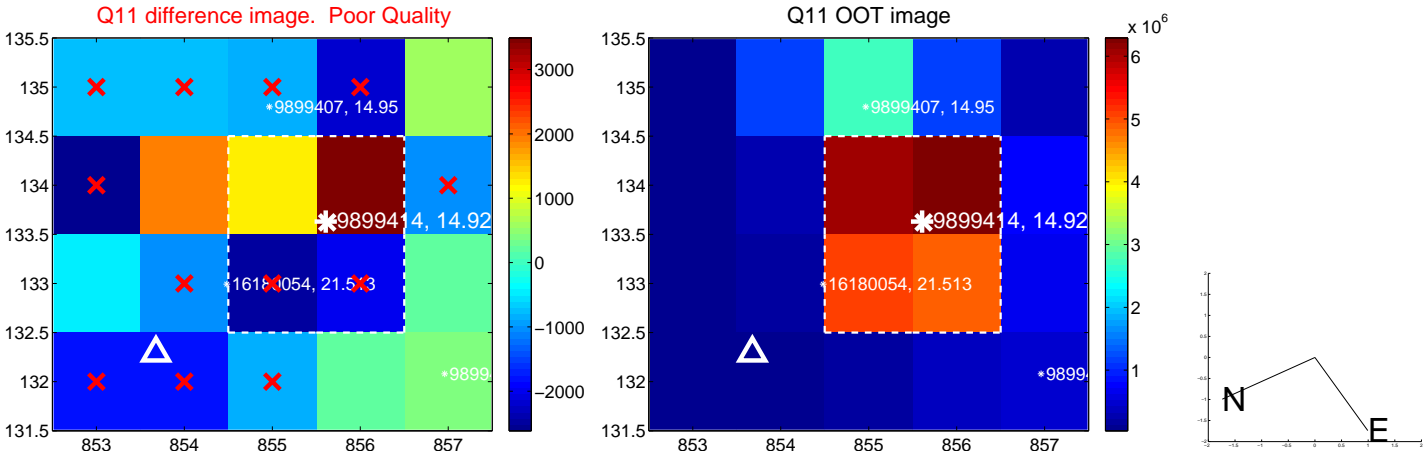
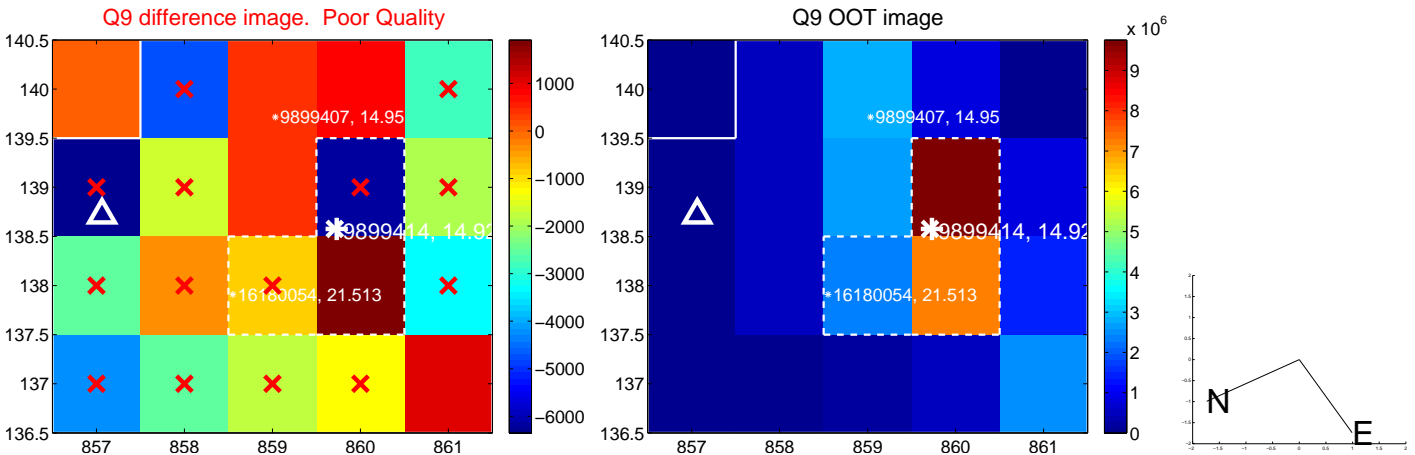




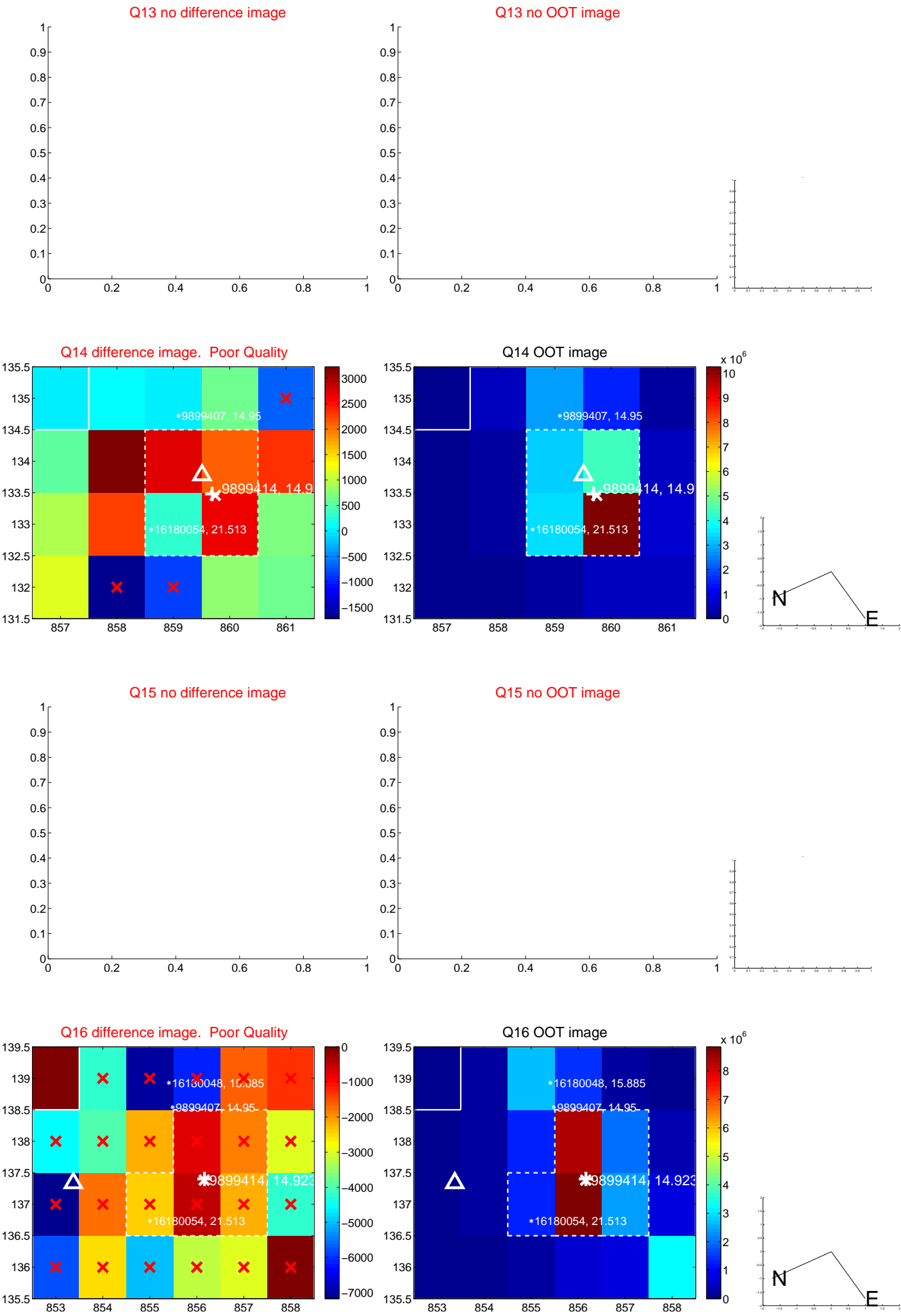
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



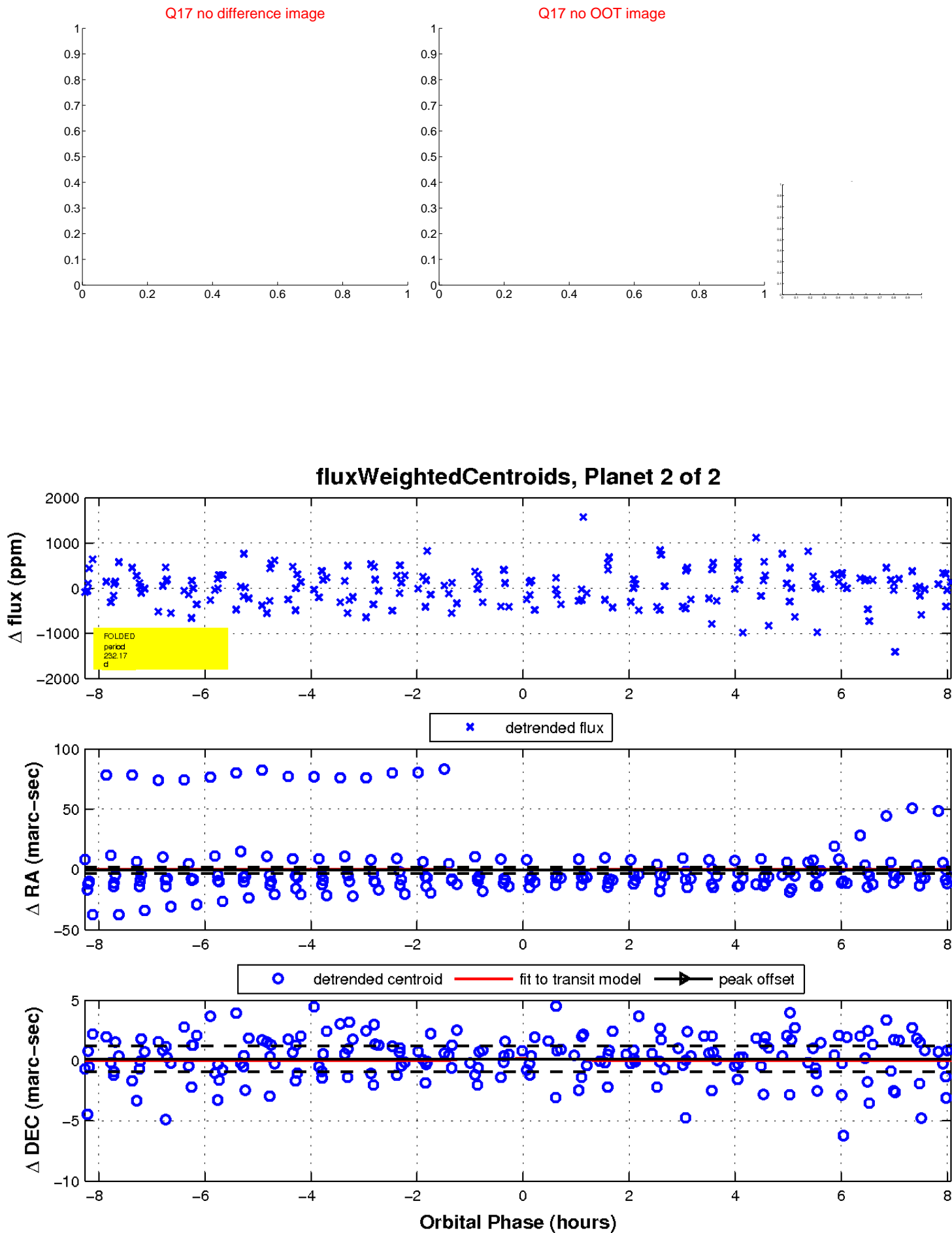
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

