

# KIC 009851142

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009851142-01	OBS	3513.01	8.480304	135.854566	83067.7	7.443	15362.6	15606.0	2.21	7059	64.82	1212.22
009851142-02	OBS	No	8.480300	132.711055	9980.1	8.790	2141.5	1589.4	2.21	7059	23.94	1212.22

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009851142-01	OBS	FP	0.00	0	1	0	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_SATURATED—EPHEM_MATCH
009851142-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_SATURATED

**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 009851142-01

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	$\sigma_P$	$\sigma_T$
009851142-01	9851142	3592.01	9851126	1:1	21.4	-1	-5	13.18	7.63	1.01	Direct-PRF	1	0.01	0.00

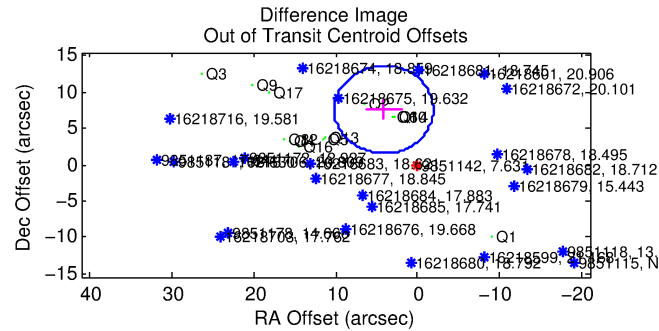
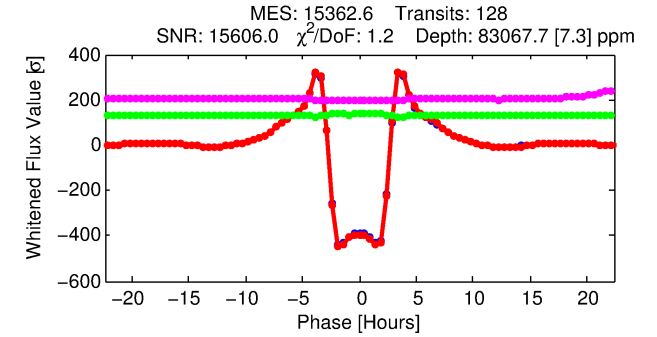
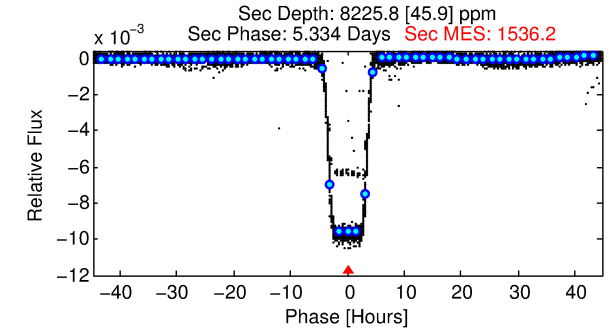
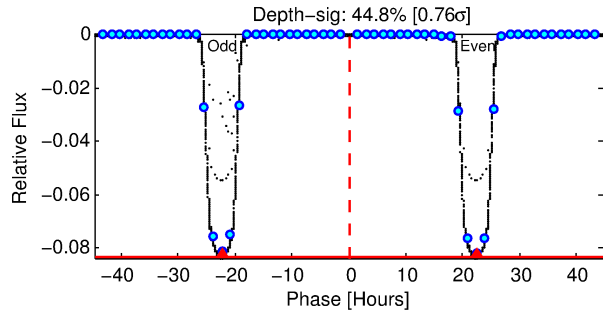
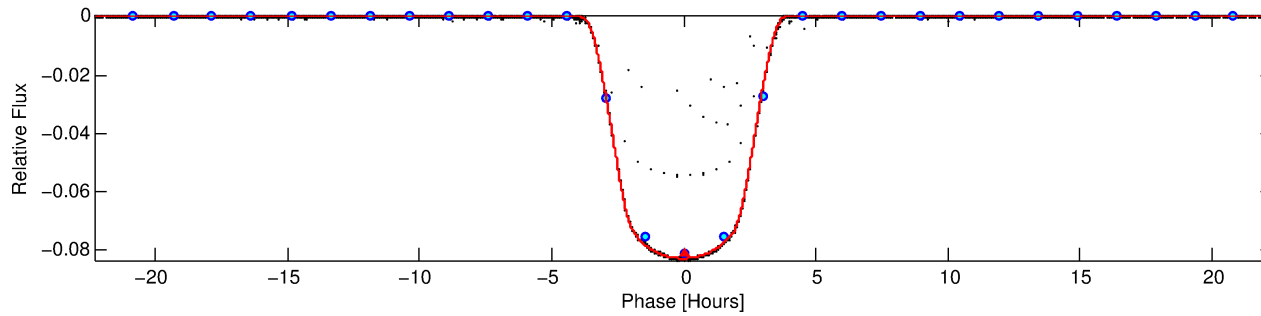
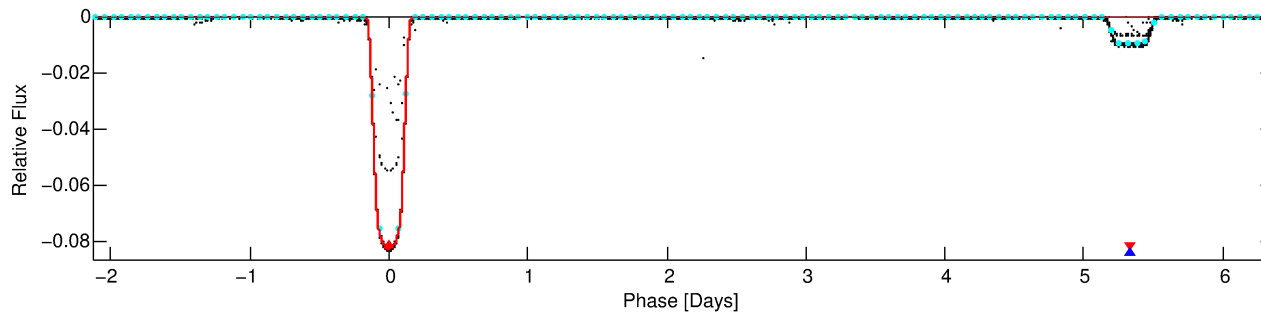
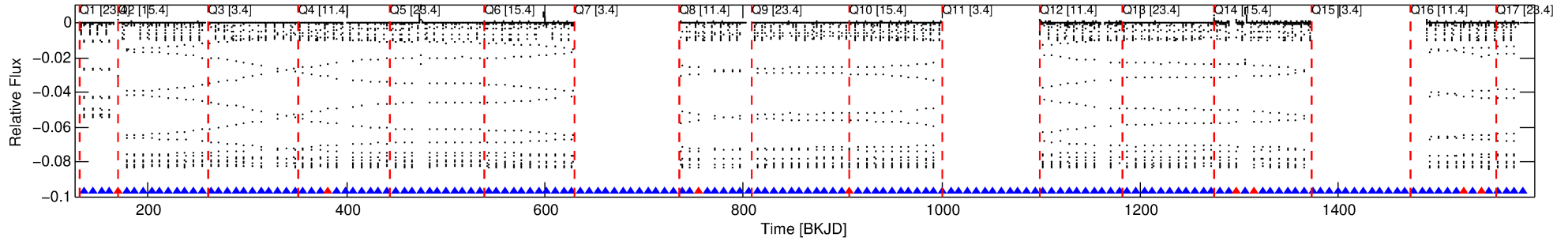
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  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: 9851142 Candidate: 1 of 2 Period: 8.480 d

KOI: K03513.01 Corr: 0.999

Kp: 7.63 R\*: 2.21 Rs Teff: 7059.0 K Logg: 3.95 Fe/H: -0.140



## DV Fit Results:

Period = 8.48030 [0.00000] d  
Epoch = 135.8546 [0.0000] BKJD  
Rp/R\* = 0.2688 [0.0000]  
a/R\* = 10.89 [0.00]  
b = 0.23 [0.00]  
Seff = 1212.22 [433.05]  
Teq = 1505 [134] K  
Rp = 64.82 [16.51] Re  
a = 0.0947 [0.0214] AU  
Ag = 9.65 [3.32] [2.60σ]  
Teffp = 4100 [98] K [15.59σ]

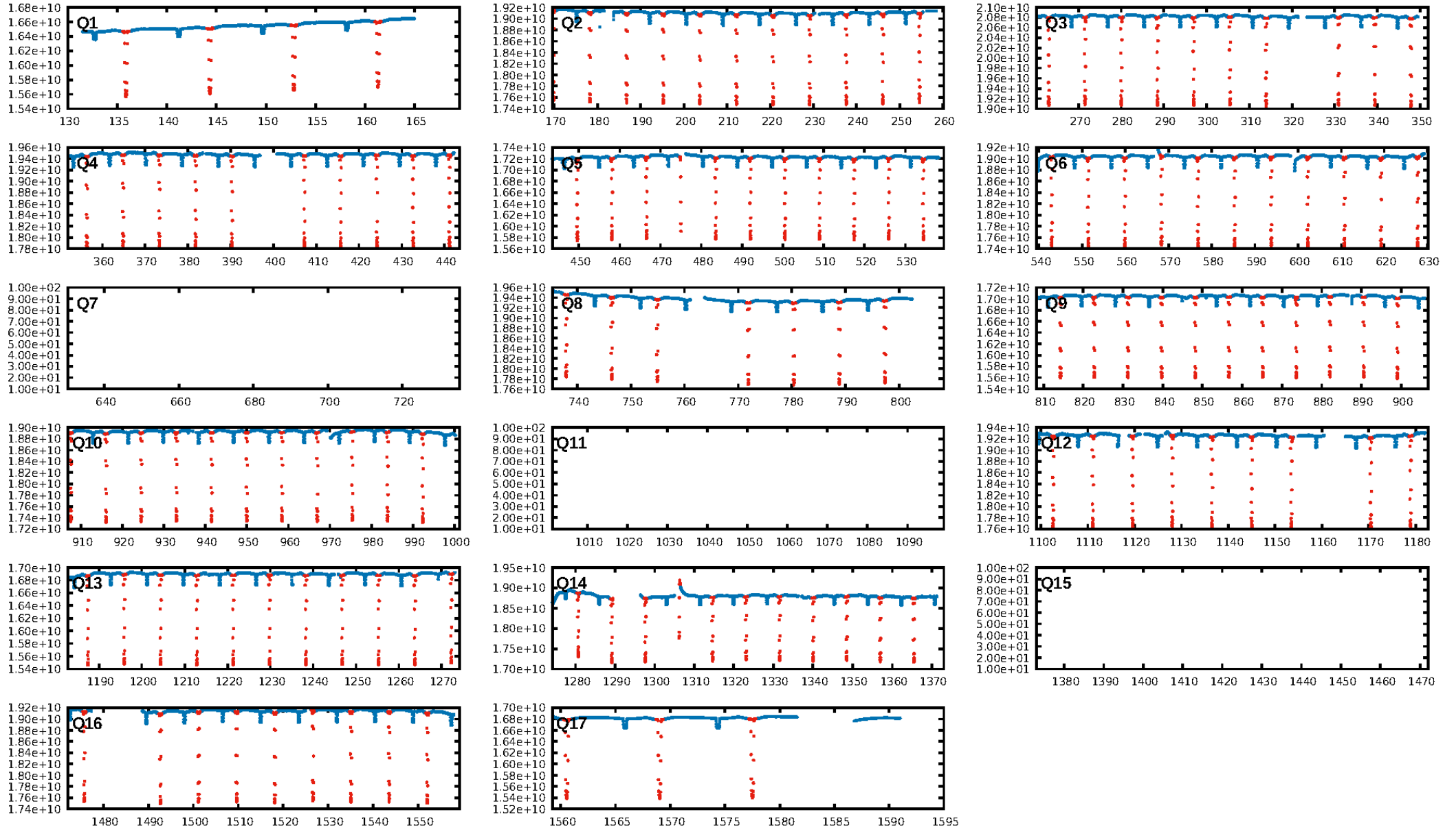
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.93 [113/121]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.0%  
Centroid-so: 13.730 arcsec [4600.10σ]  
OotOffset-rm: 8.649 arcsec [4.30σ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-rm: 18.746 arcsec [7.19σ]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 0.00 [0/14]  
DiffImageOverlap-fno: 1.00 [14/14]

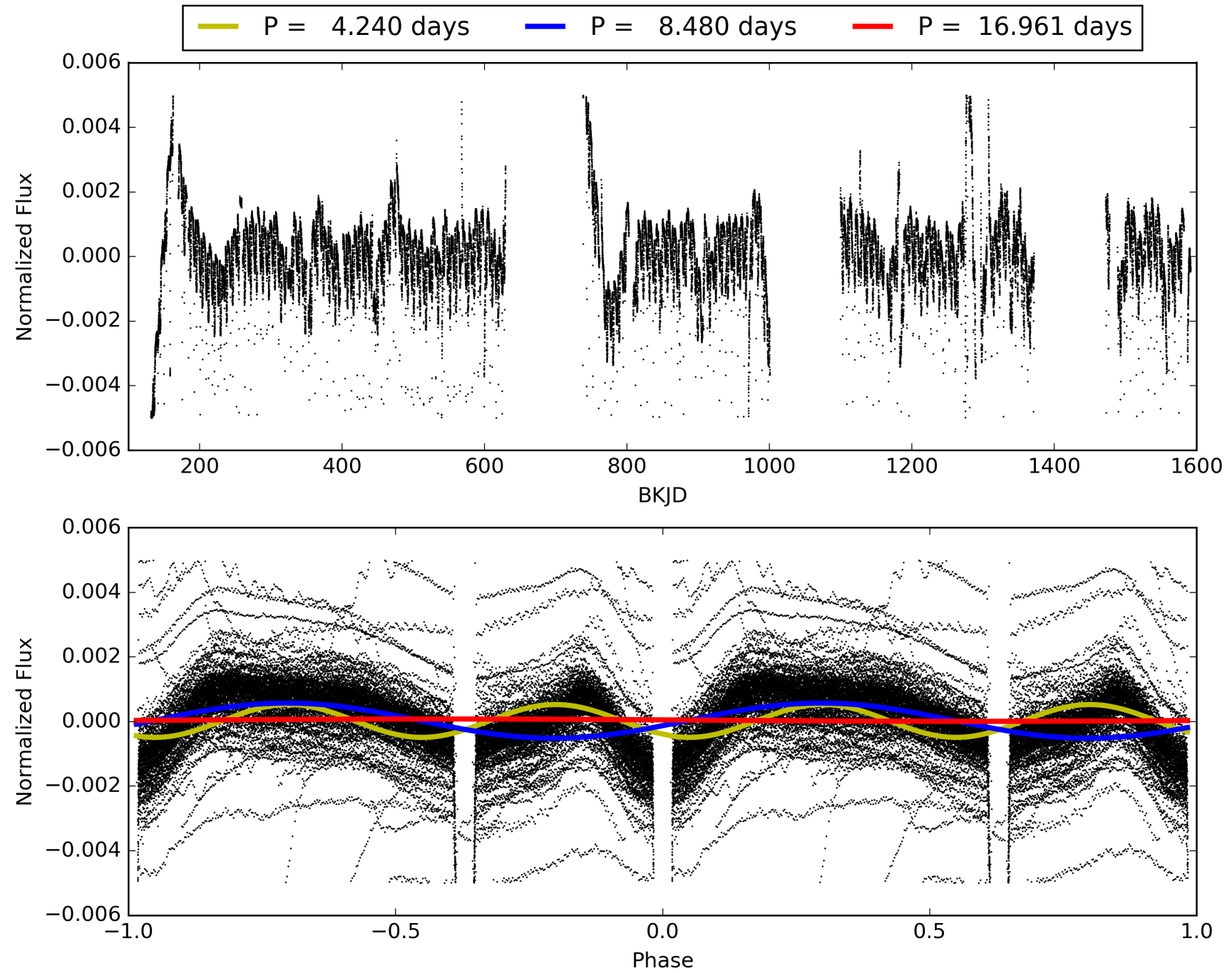
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 16:06:46 Z

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

# TCE 009851142-01, PDC Light Curves

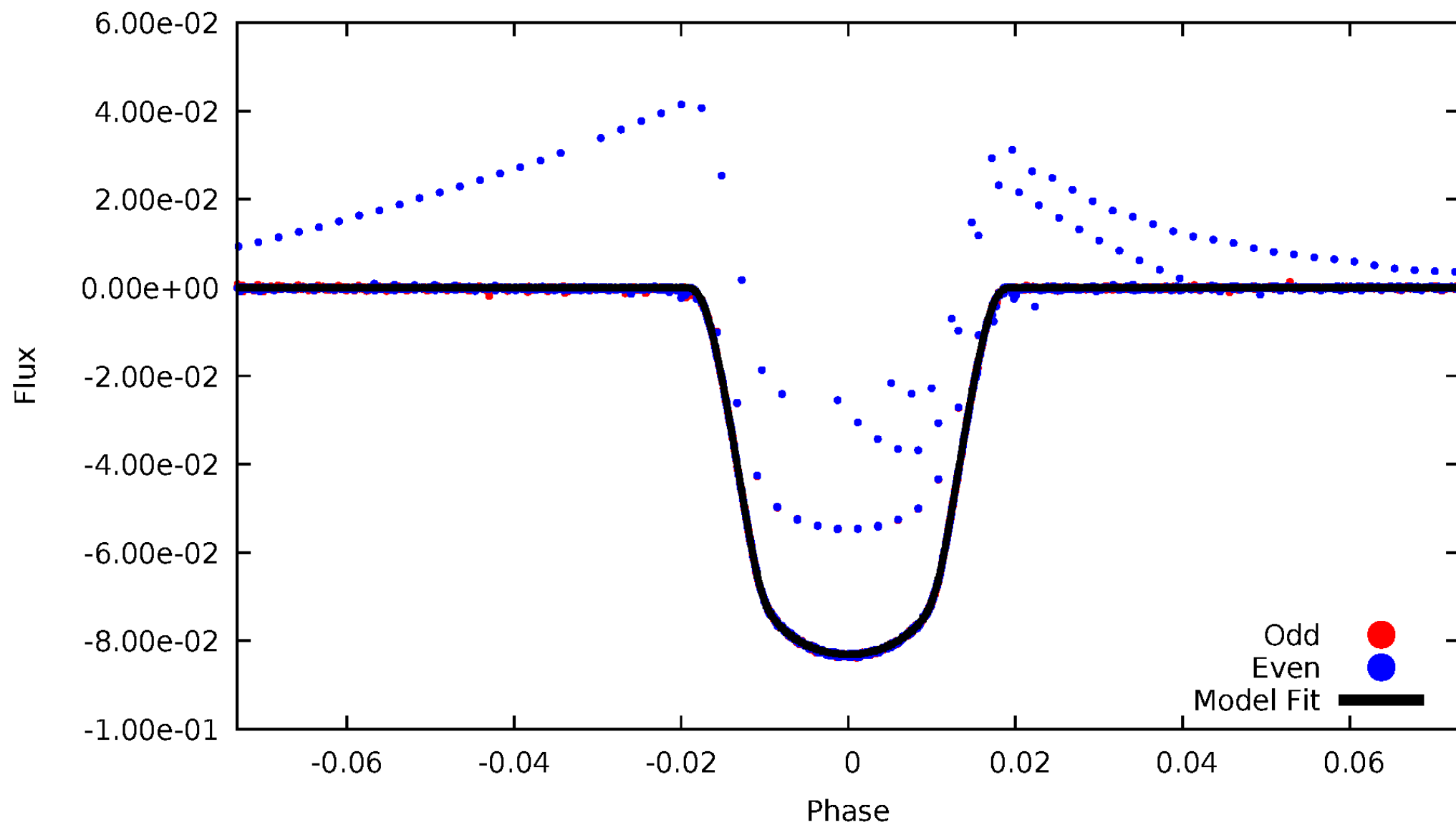


TCE 009851142-01



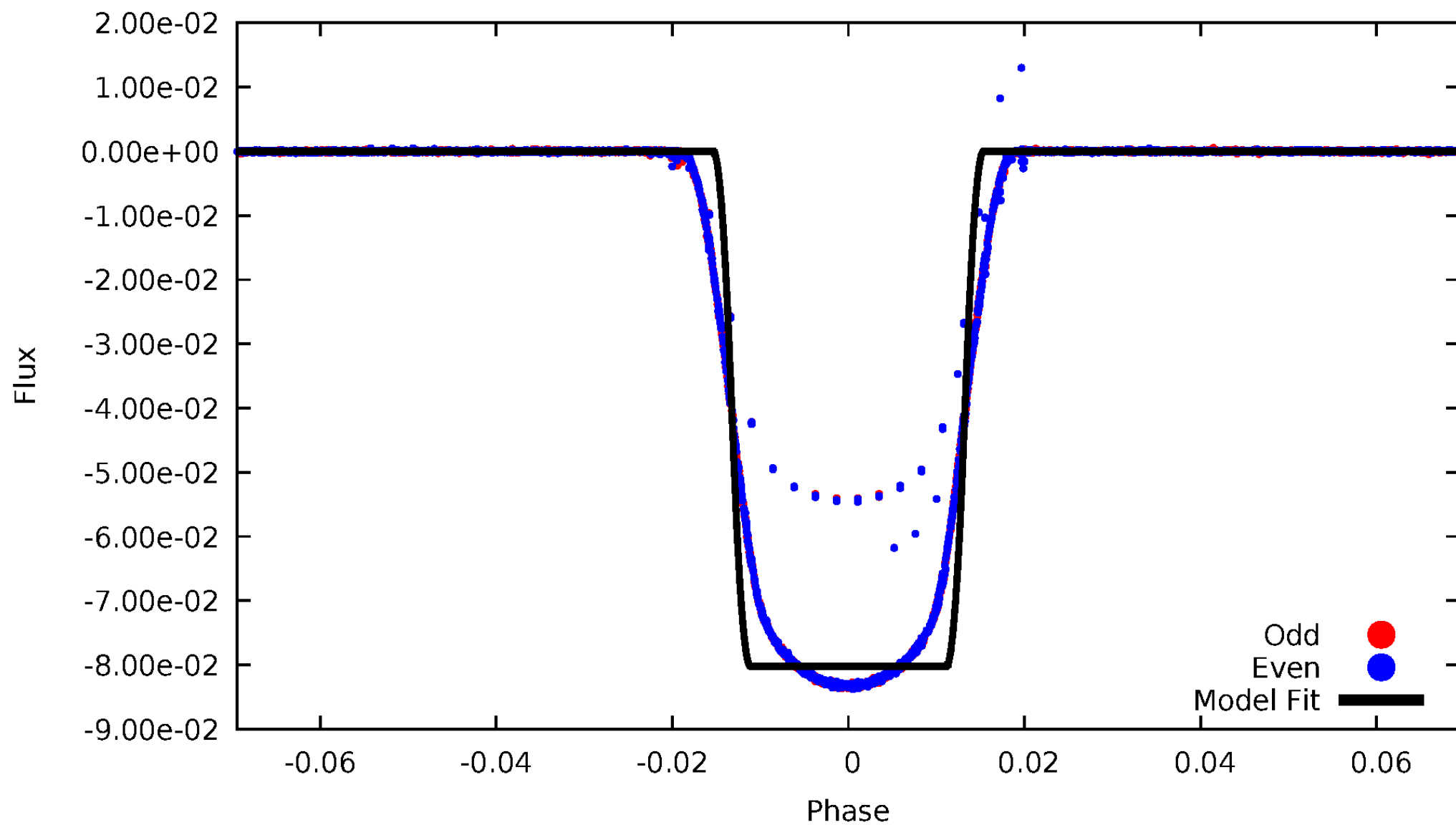
# DV Odd/Even

TCE 009851142-01



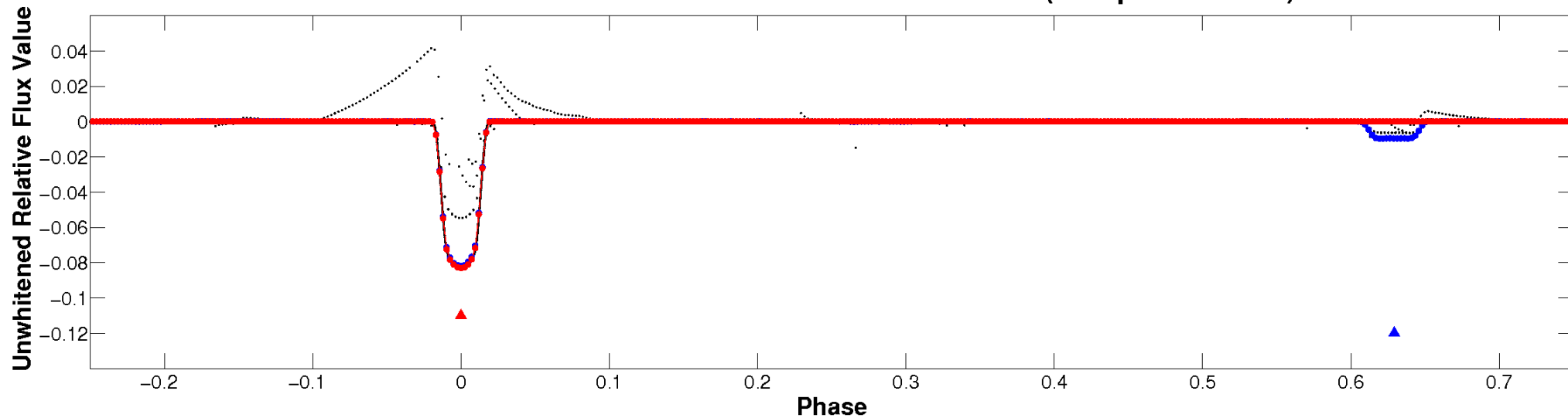
# ALT Odd/Even

TCE 009851142-01

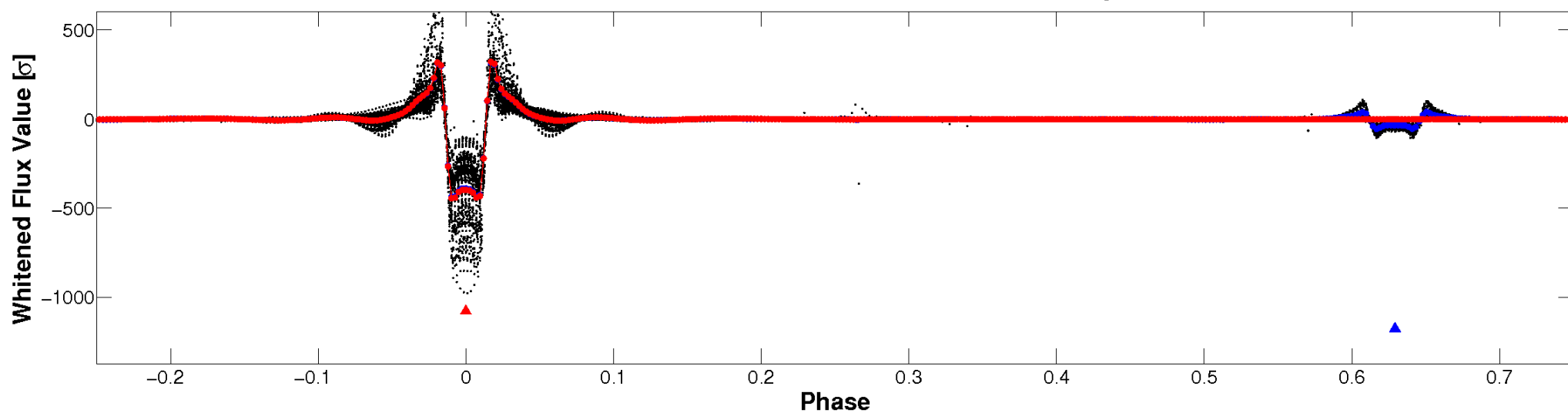


# Non-Whitened Vs. Whitened Light Curve

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

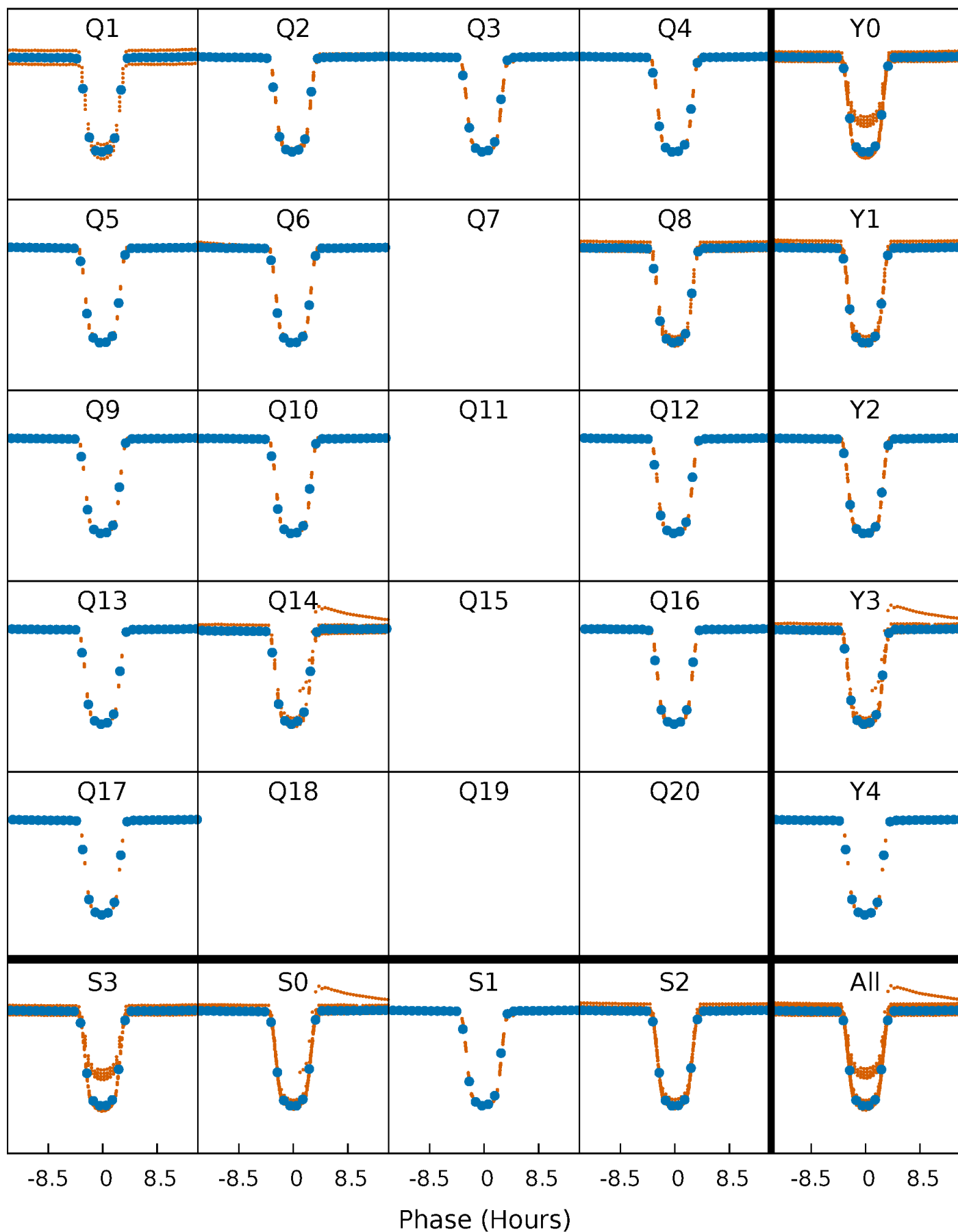


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

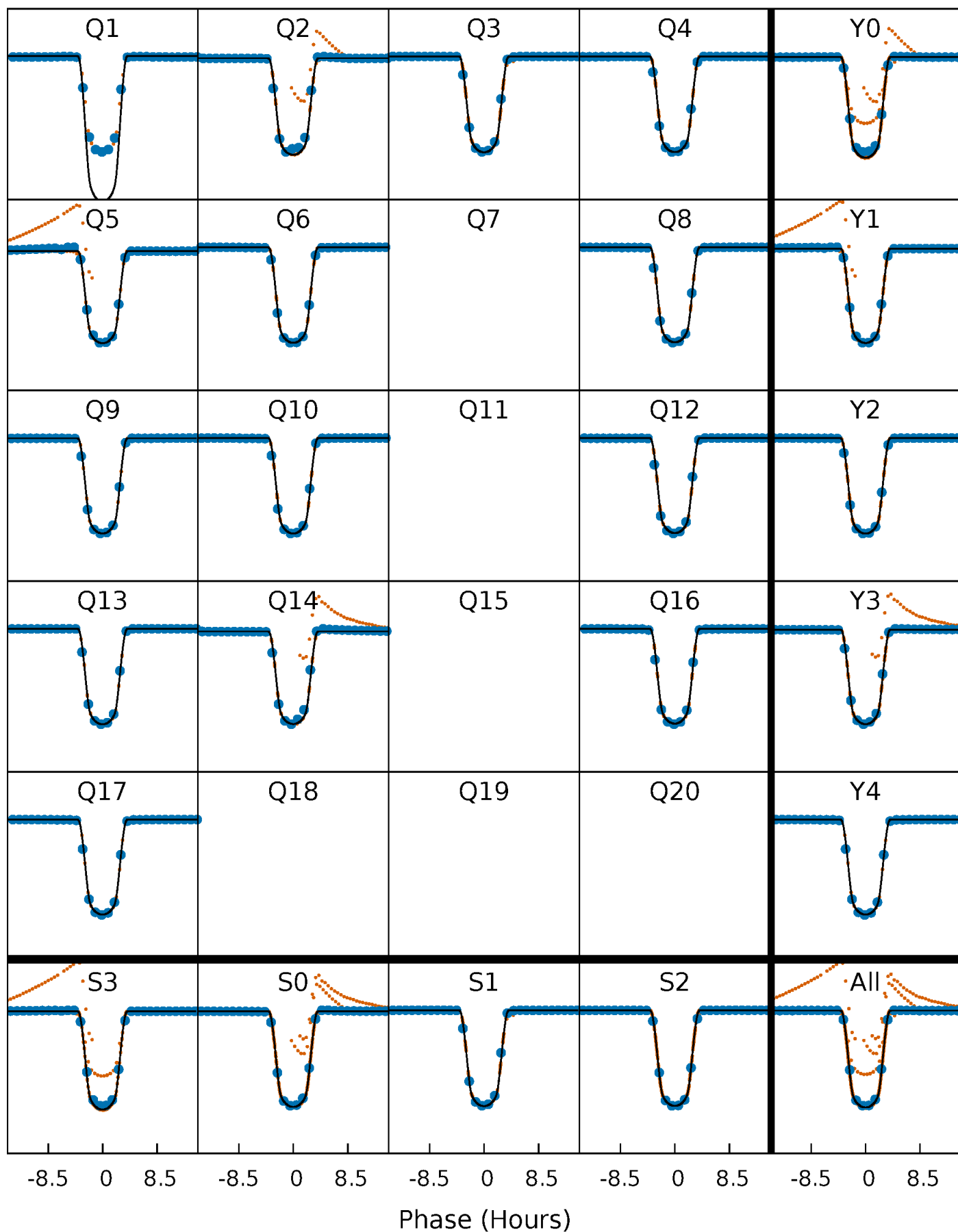
TCE 009851142-01 P= 8.480304 Days  $T_0=135.854566$  (BKJD)





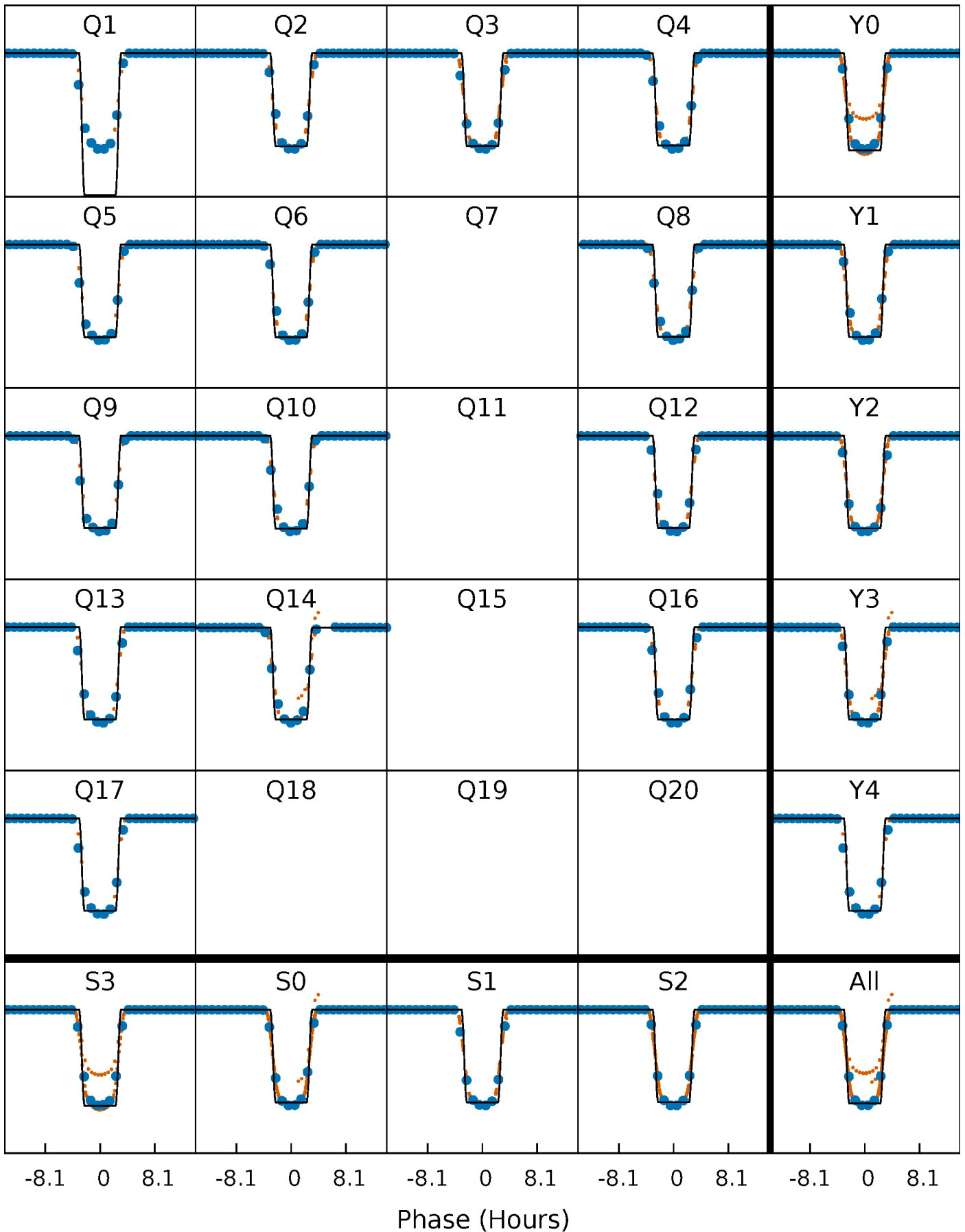
# DV Quarter-Phased Transit Curves

TCE 009851142-01 P= 8.480304 Days  $T_0=135.854566$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

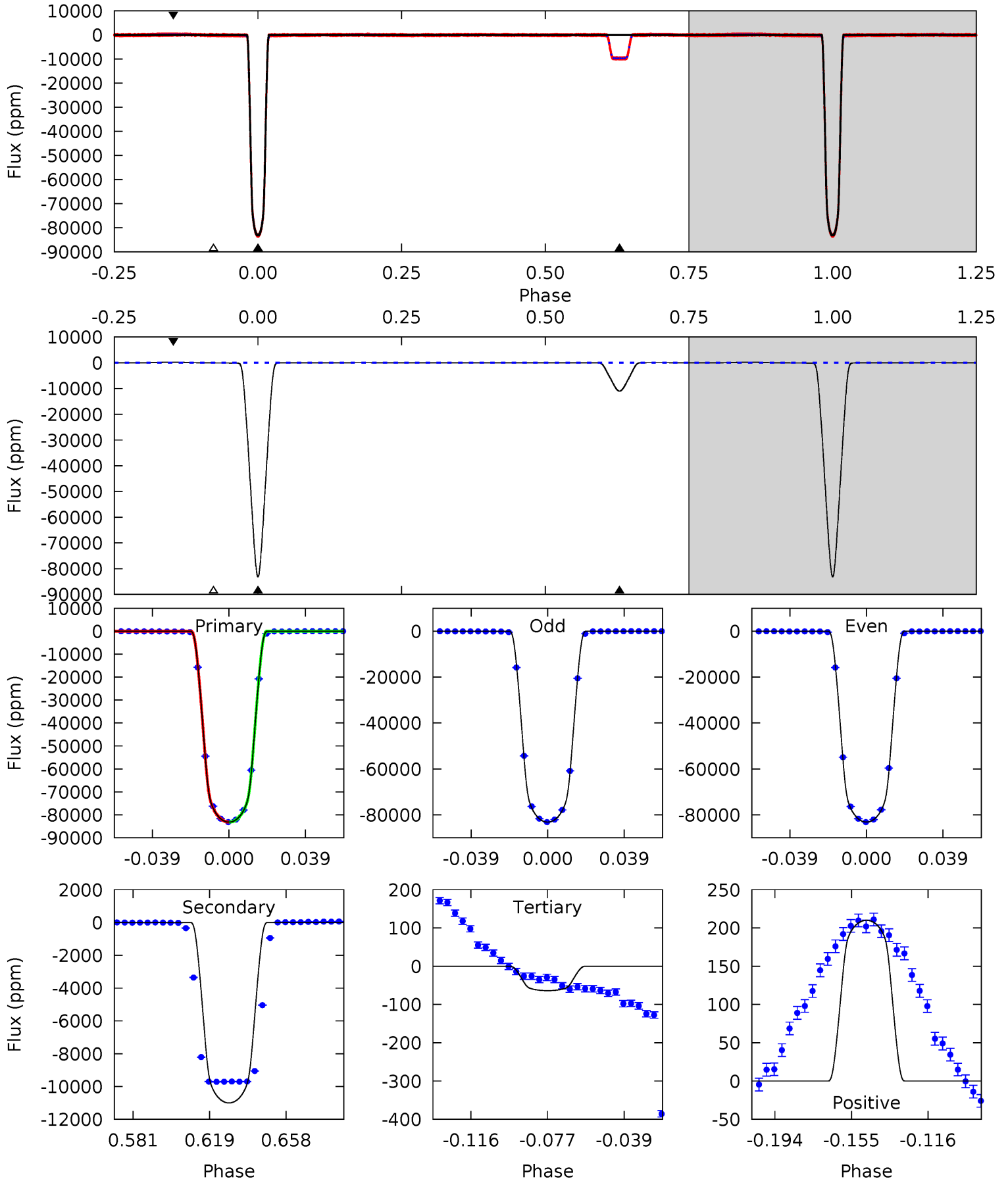
TCE 009851142-01 P= 8.480296 Days  $T_0=135.855160$  (BKJD)



# DV Model-Shift Uniqueness Test

009851142-01, P = 8.480304 Days, E = 127.374262 Days

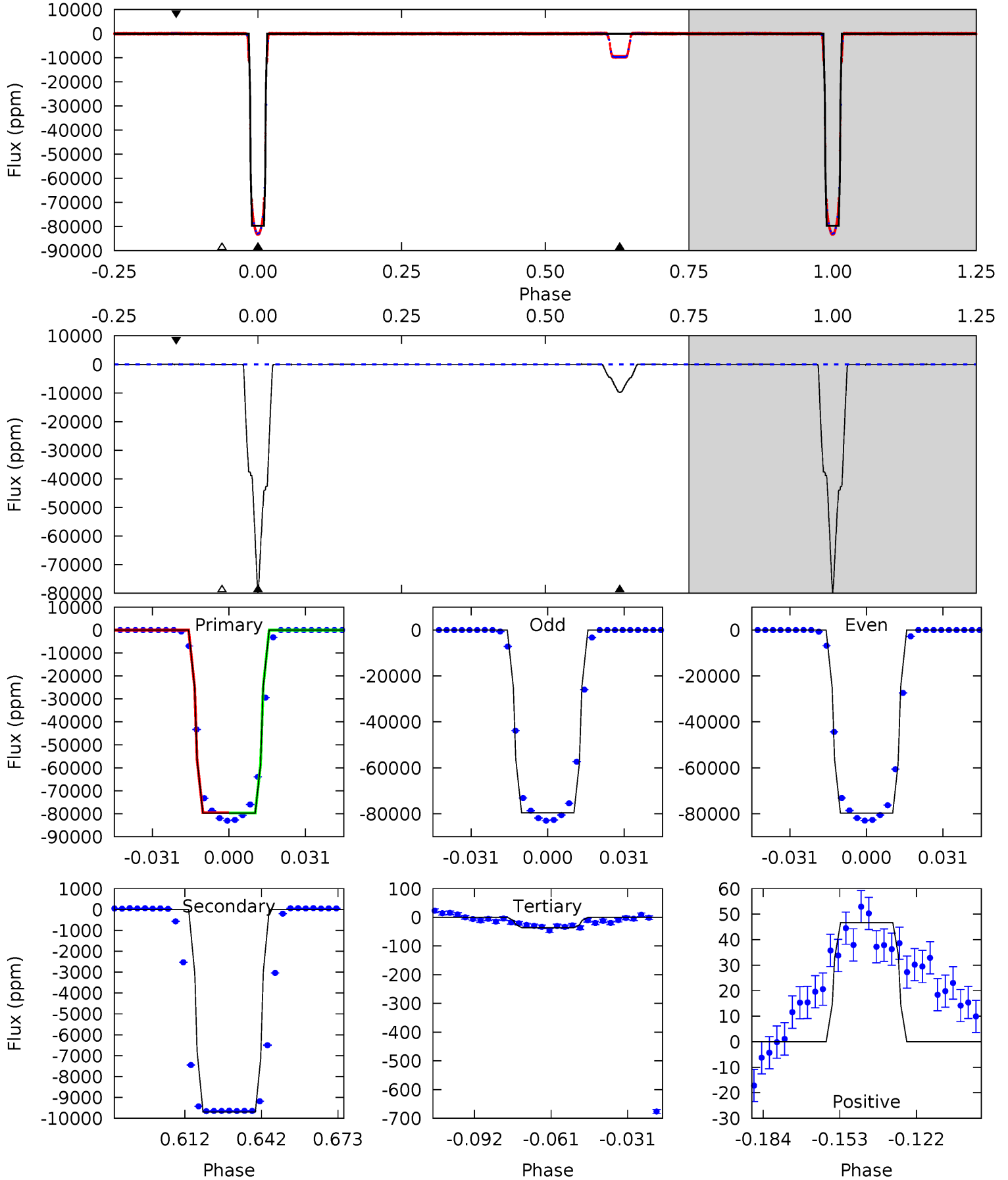
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
26539	3510	20.4	67.0	4.76	2.07	17.7	26519	26472	3490	3443	4.15	0.97	0.00	0.60



# Alt Model-Shift Uniqueness Test

009851142-01, P = 8.480296 Days, E = 127.374864 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
25683	3126	11.6	15.0	4.81	2.16	5.34	25672	25668	3114	3111	10.5	0.99	0.00	0



### Stellar Parameters For KIC 009851142

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7059^{+126}_{-169}$	$3.946^{+0.195}_{-0.105}$	$-0.140^{+0.150}_{-0.150}$	$2.210^{+0.375}_{-0.563}$	$1.571^{+0.127}_{-0.191}$	$0.205^{+0.219}_{-0.066}$
	+2%/-2%	+5%/-3%	+107%/-107%	+17%/-25%	+8%/-12%	+107%/-32%
Source	SPE4	SPE4	SPE4	DSEP		

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

### Secondary Eclipse Parameters for KIC 009851142-01 / KOI 3513.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	-11002±3	$64.23^{+6.17}_{-8.06}$	$2082^{+109}_{-127}$	$4546^{+57}_{-78}$	$13^{+4}_{-2}$
Alt.	-9702±3	$68.03^{+6.78}_{-9.19}$	$2083^{+114}_{-142}$	$4336^{+56}_{-71}$	$11^{+3}_{-2}$

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

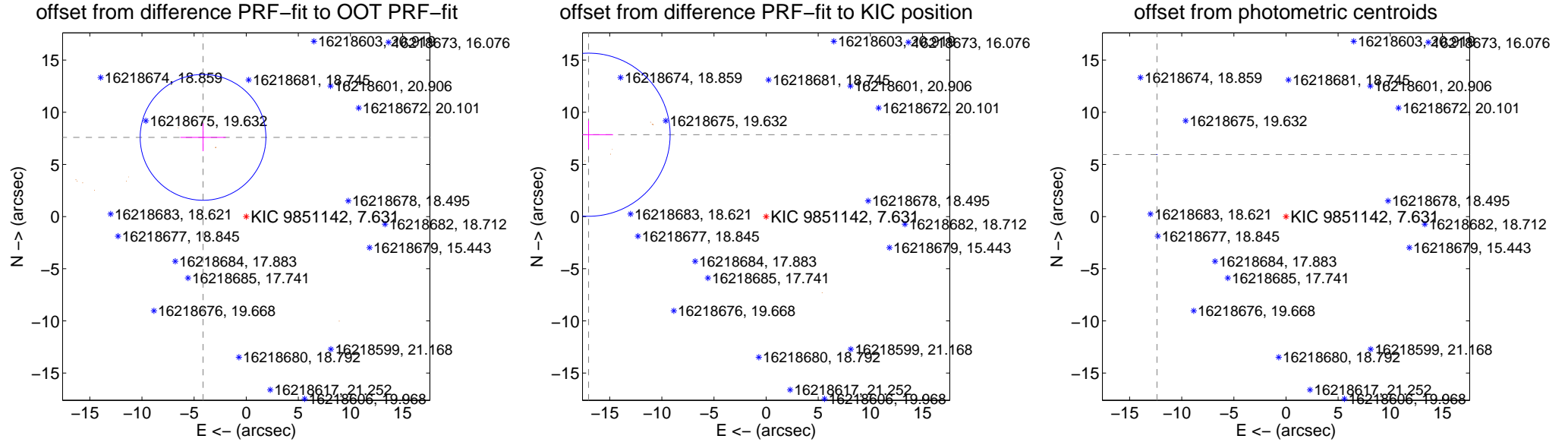
## DV Centroid Data

Supplemental centroid analysis for 009851142-01. **Kepler magnitude: 7.63.** Transit SNR 15605.97

There are 0 quarters with good PRF difference image offsets

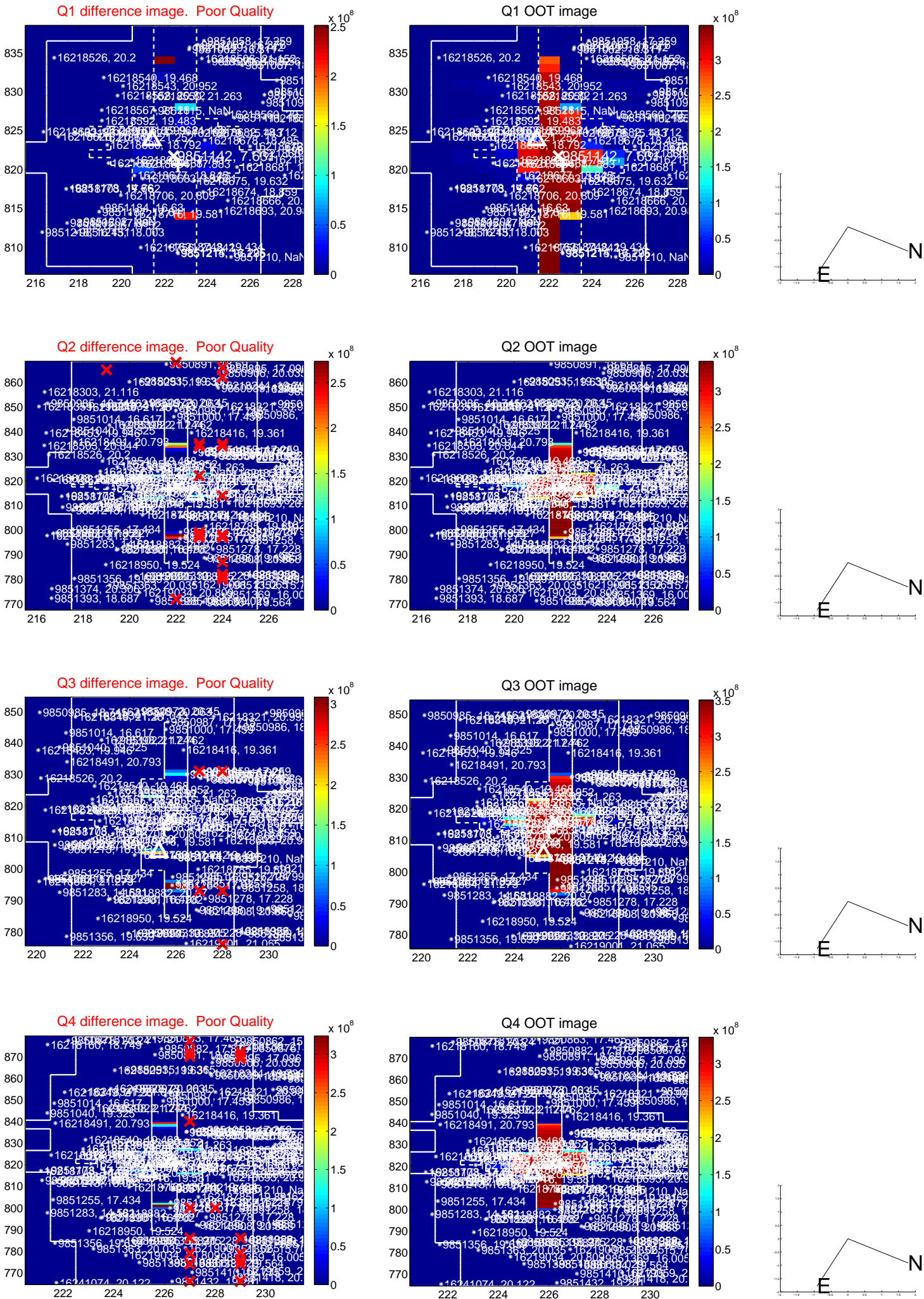
The OOT PRF centroid is offset from the target star catalog position by about 4.32 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>8.649 \pm 2.010</math></b>	<b>4.30</b>	$4.140 \pm 2.176$	$7.593 \pm 1.329$
PRF-fit source offset from KIC position	<b><math>18.746 \pm 2.606</math></b>	<b>7.19</b>	$17.025 \pm 2.350$	$7.846 \pm 1.339$
photometric centroid source offset	<b><math>13.73 \pm 0.00</math></b>	<b>4600.14</b>	$12.37 \pm 0.00$	$5.95 \pm 0.00$



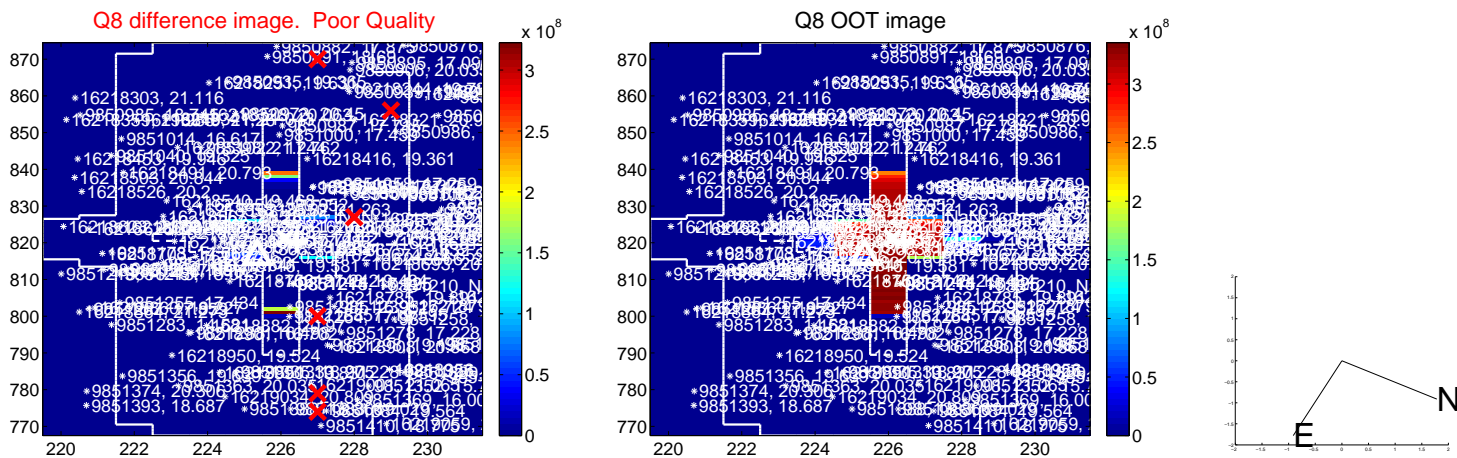
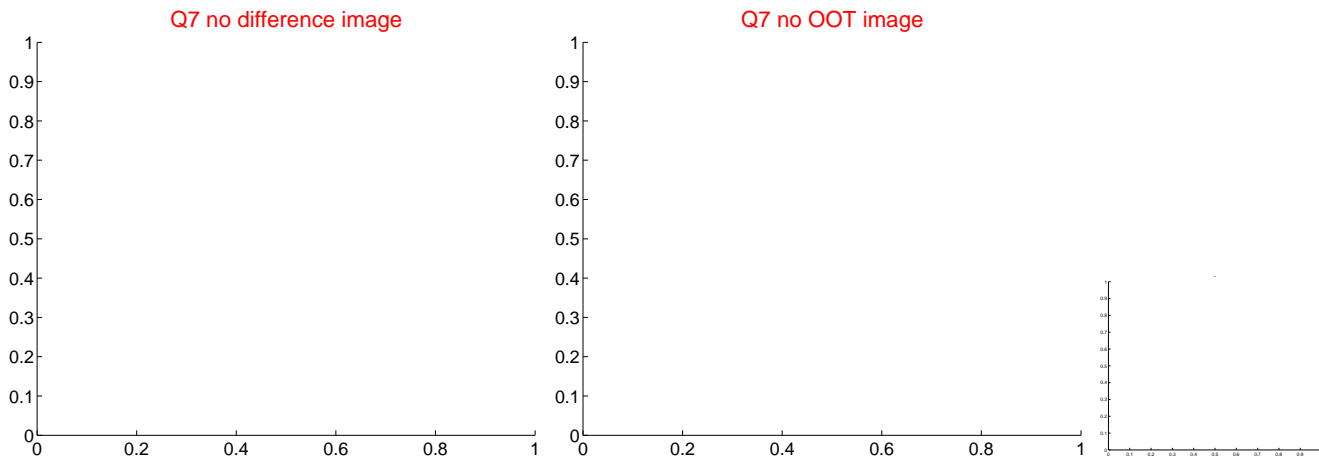
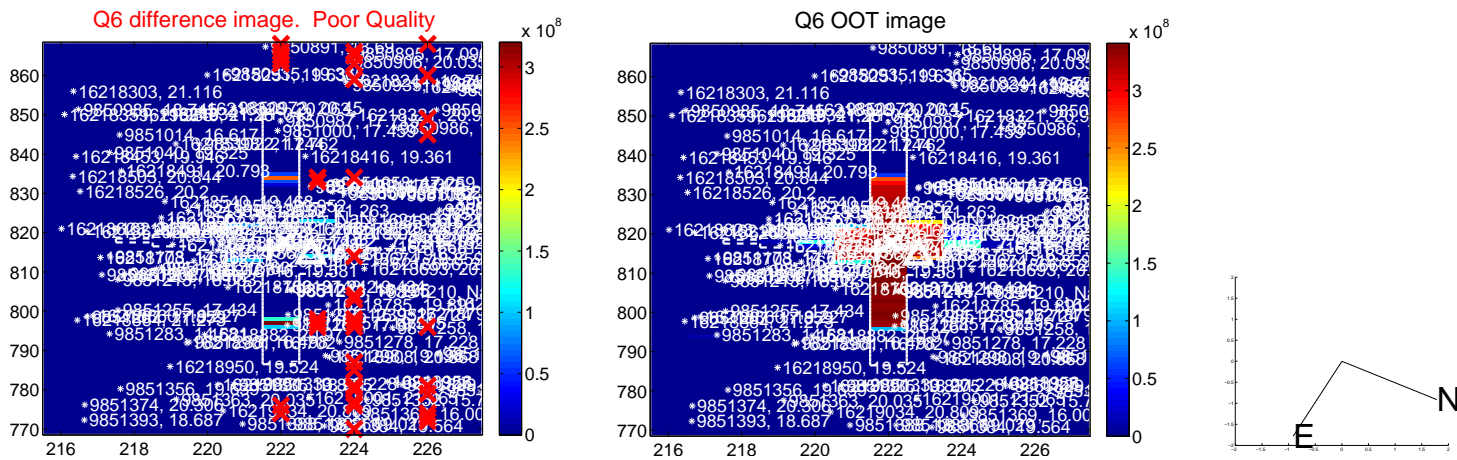
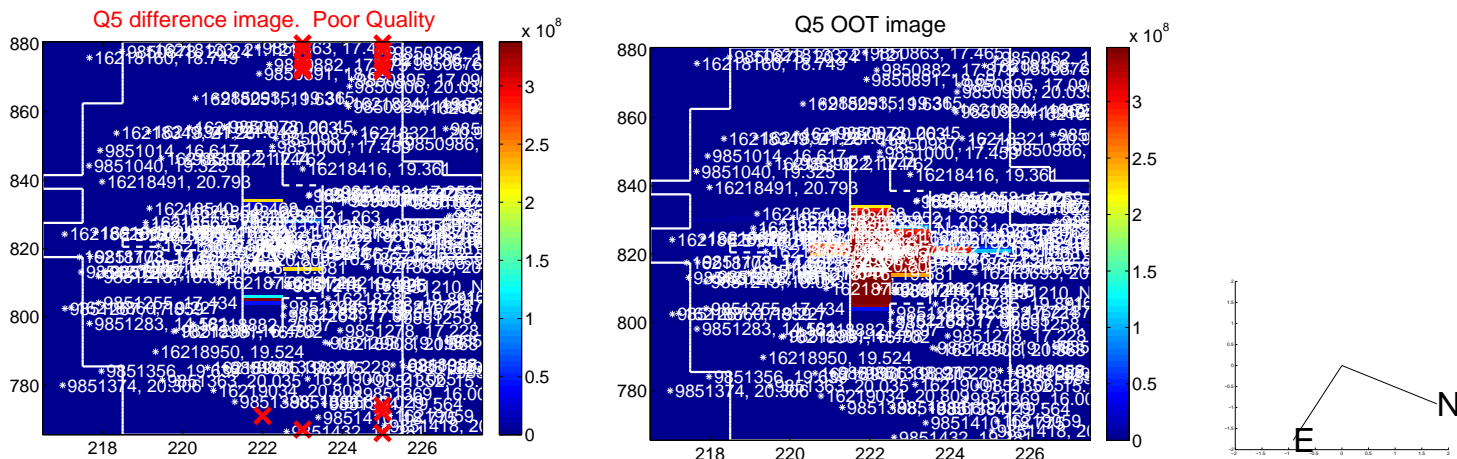
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



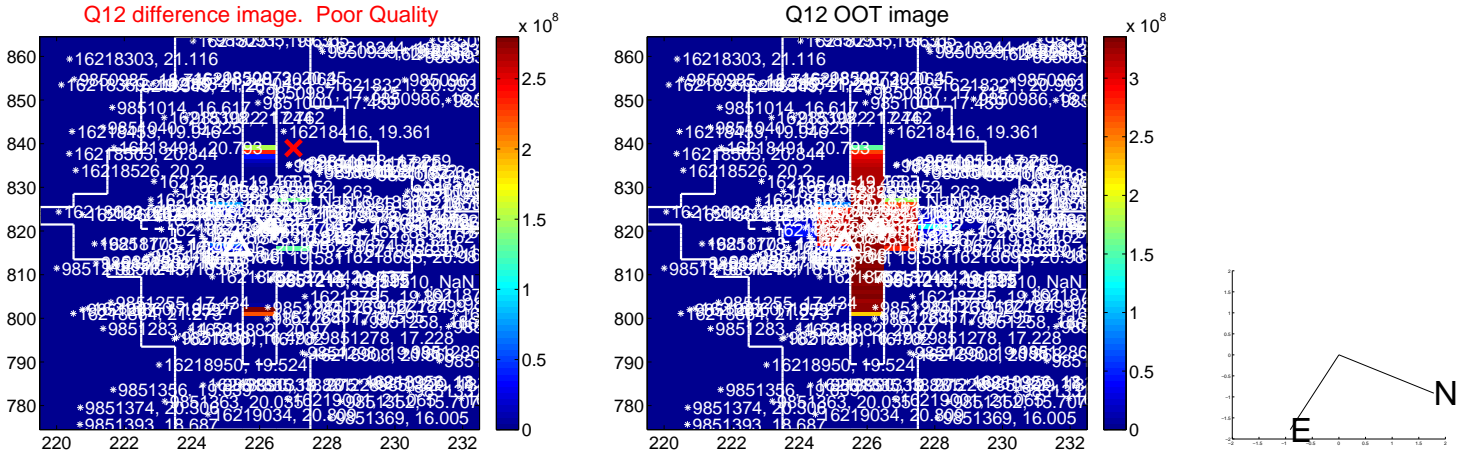
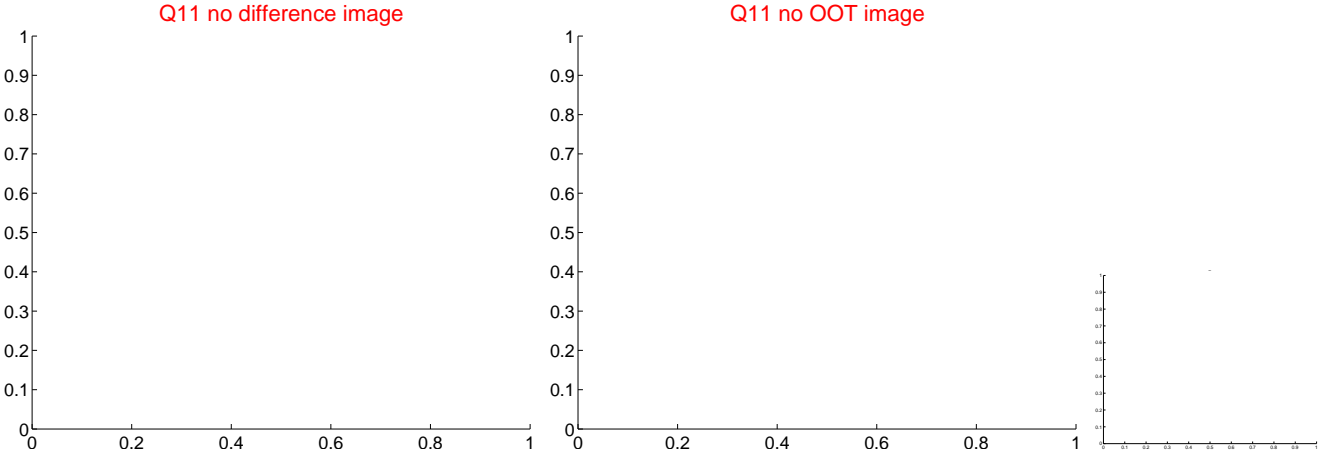
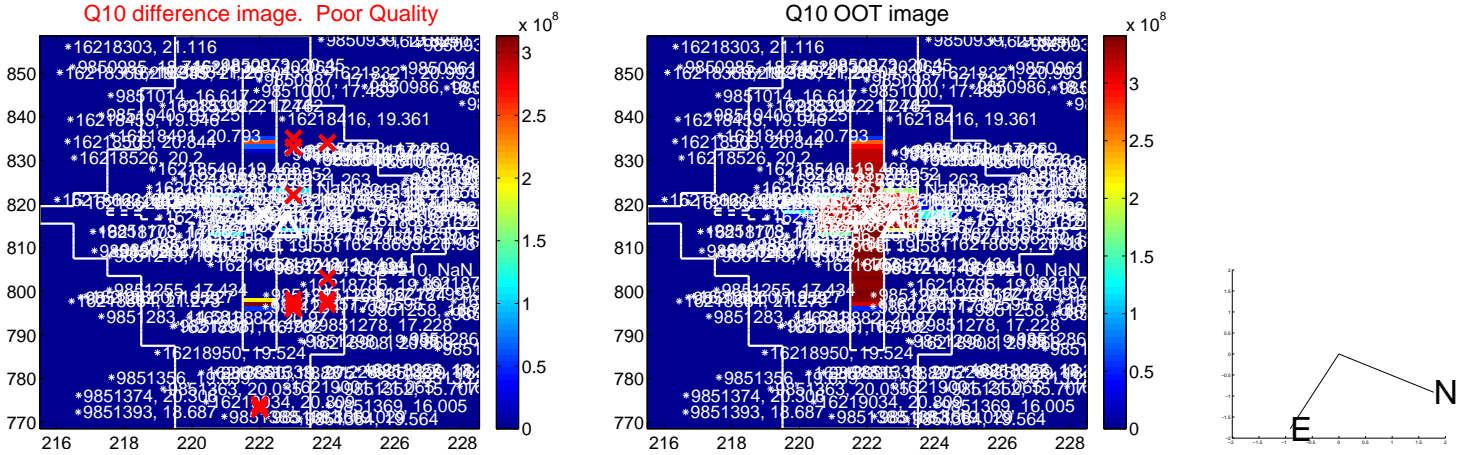
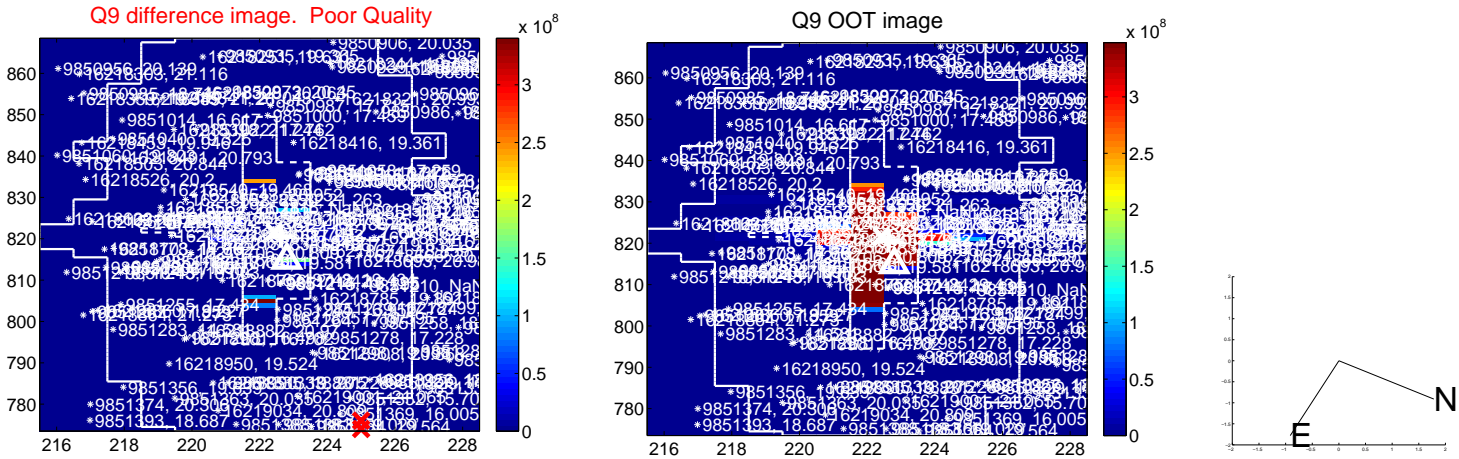


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

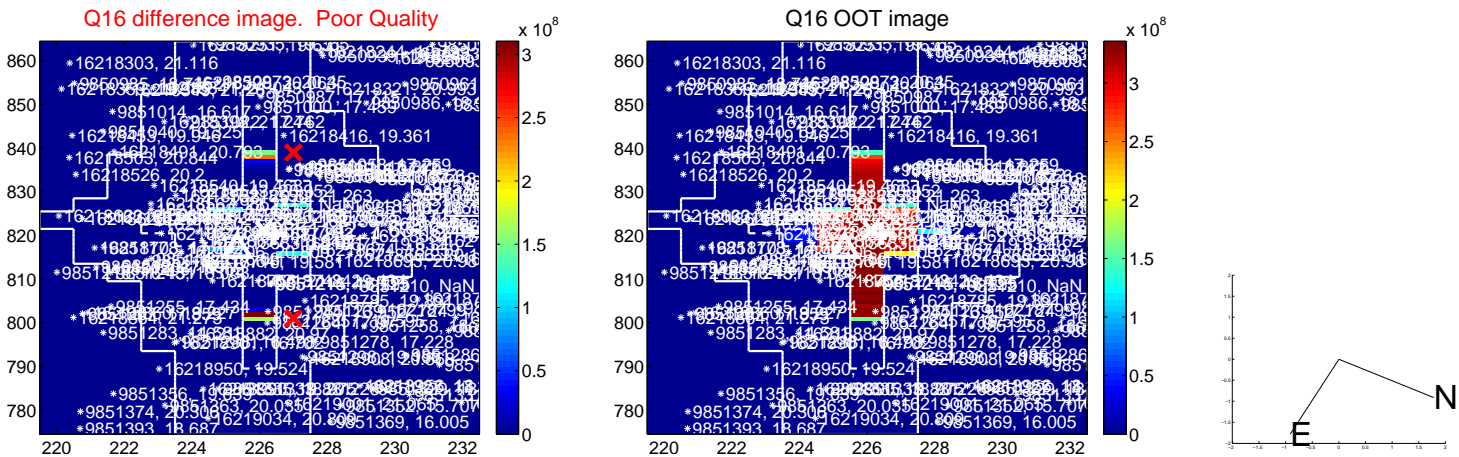
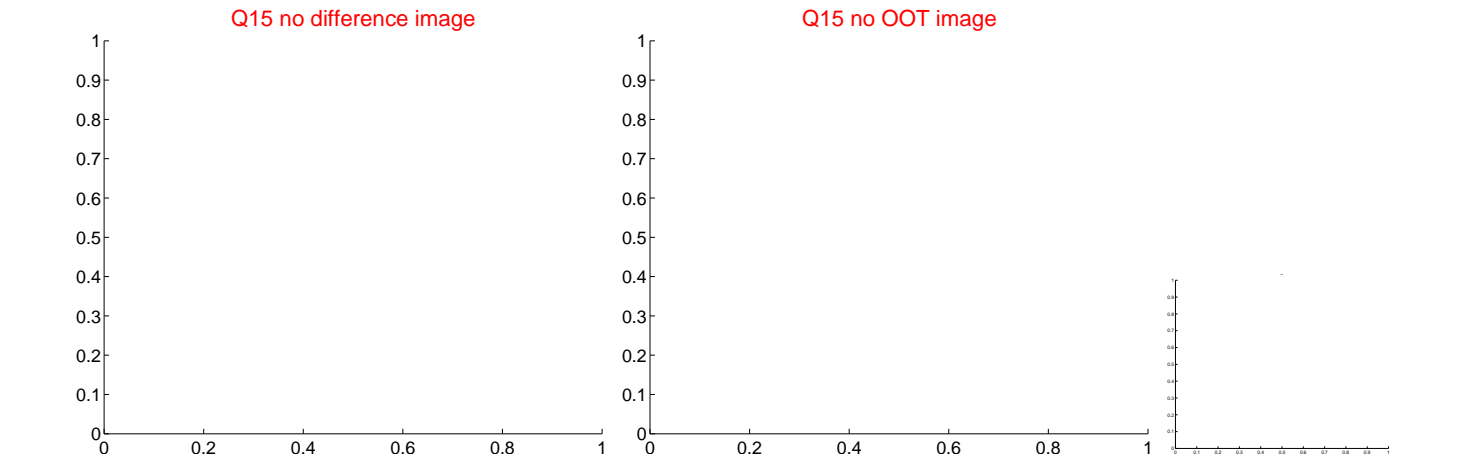
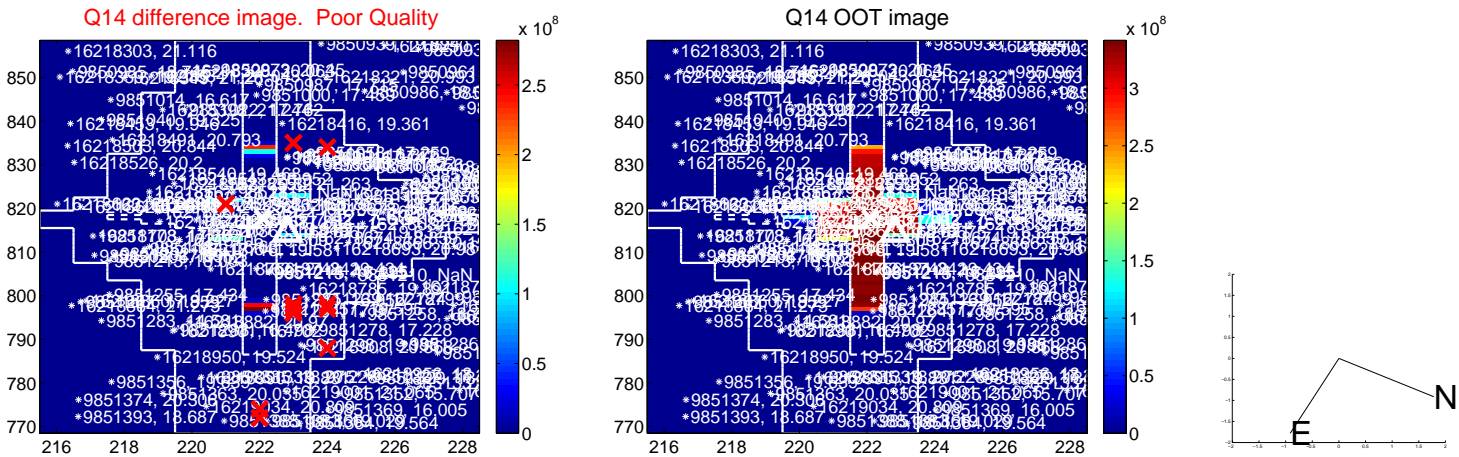
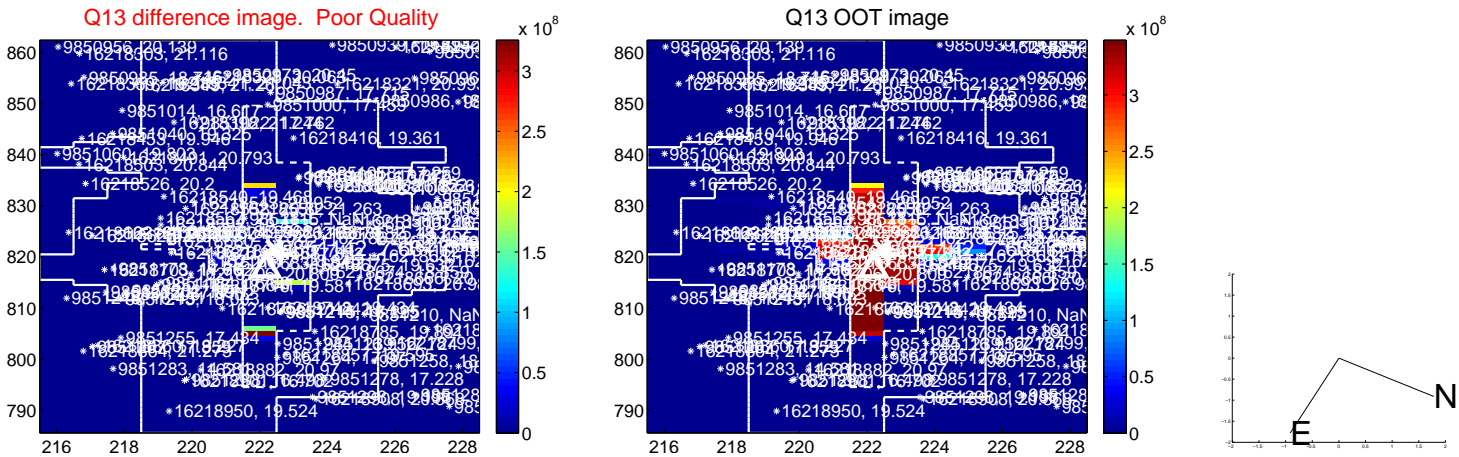




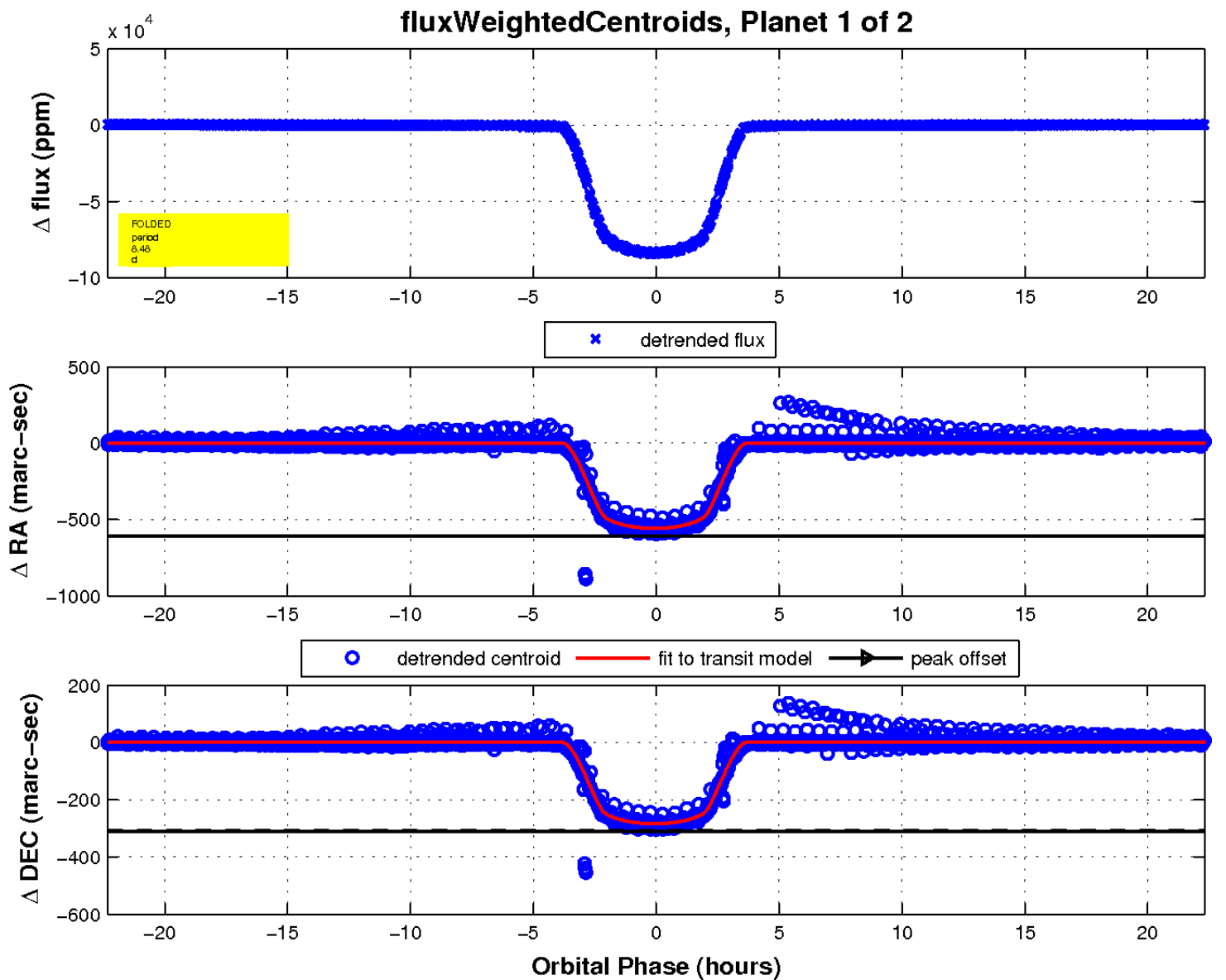
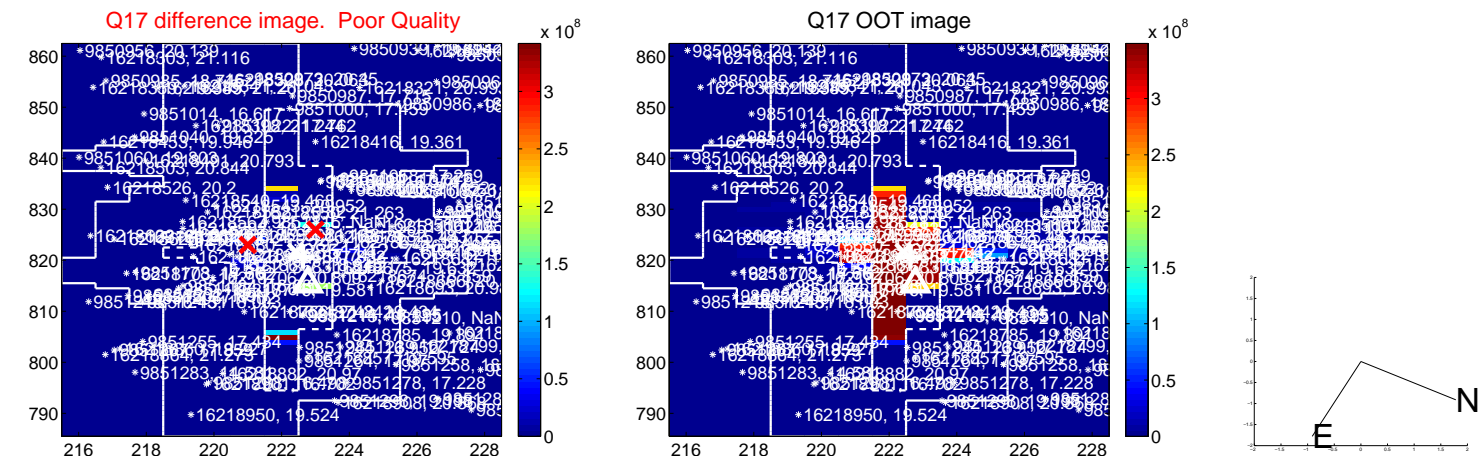
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

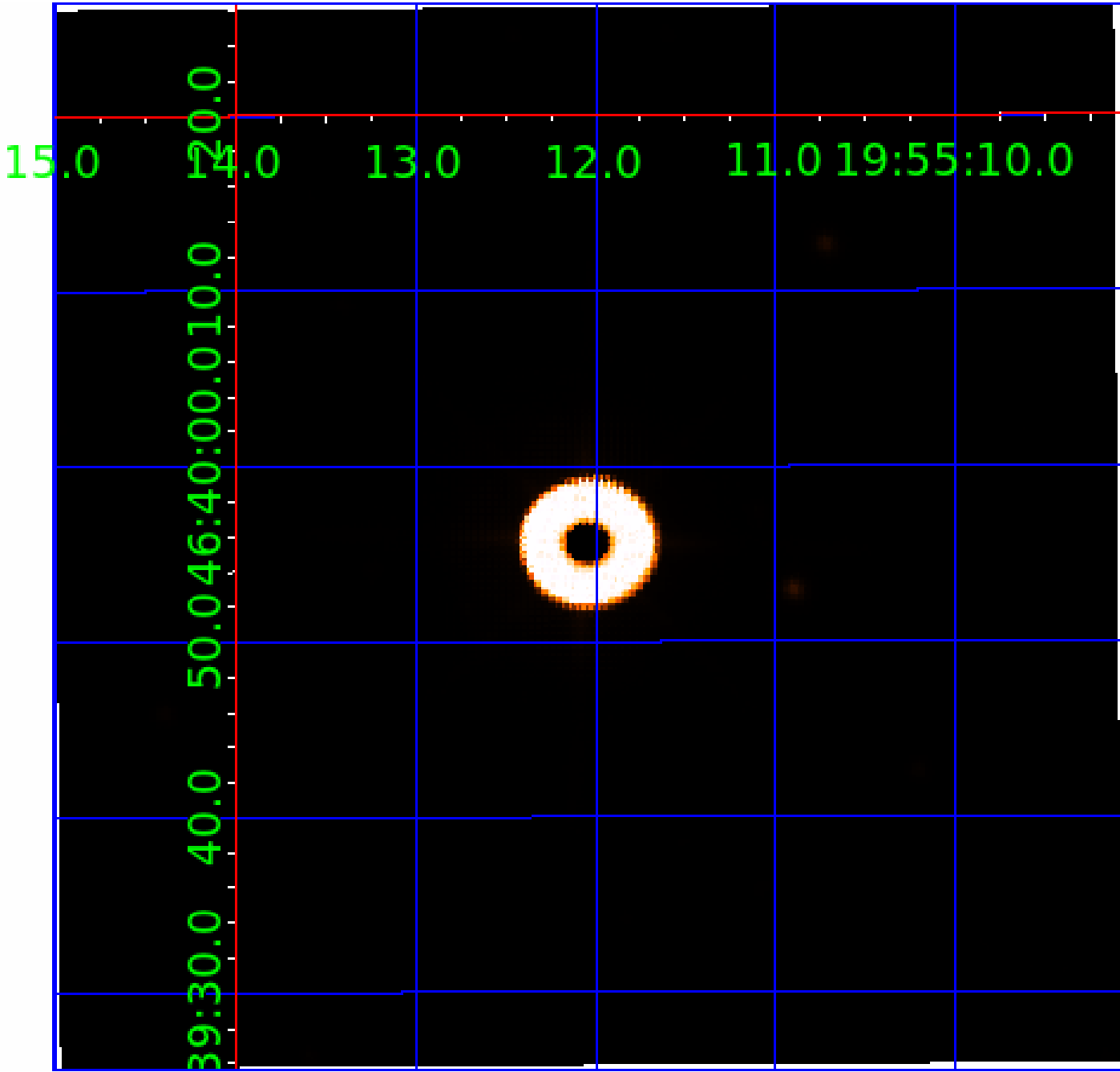


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009851142

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009851142-01	OBS	3513.01	8.480304	135.854566	83067.7	7.443	15362.6	15606.0	2.21	7059	64.82	1212.22
009851142-02	OBS	No	8.480300	132.711055	9980.1	8.790	2141.5	1589.4	2.21	7059	23.94	1212.22

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009851142-01	OBS	FP	0.00	0	1	0	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_SATURATED—EPHEM_MATCH
009851142-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_SATURATED

**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 009851142-02

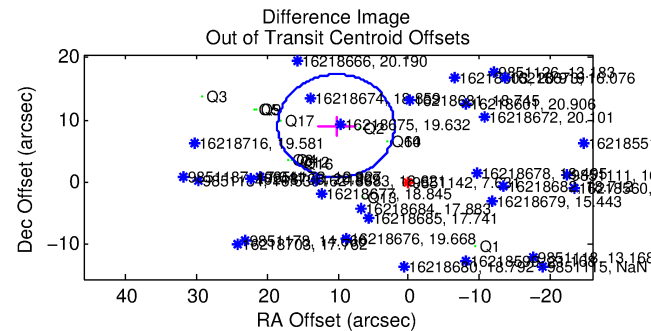
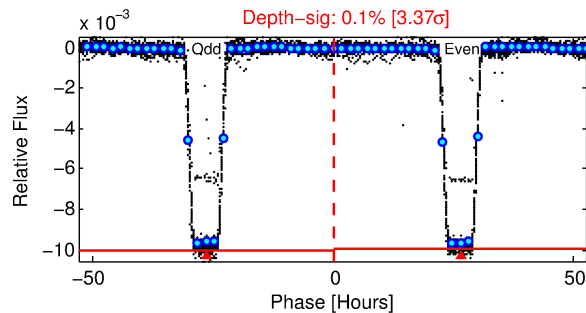
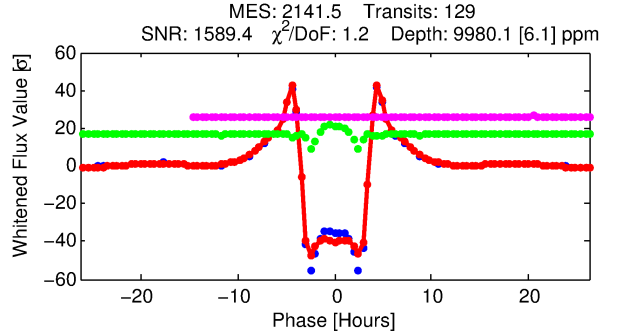
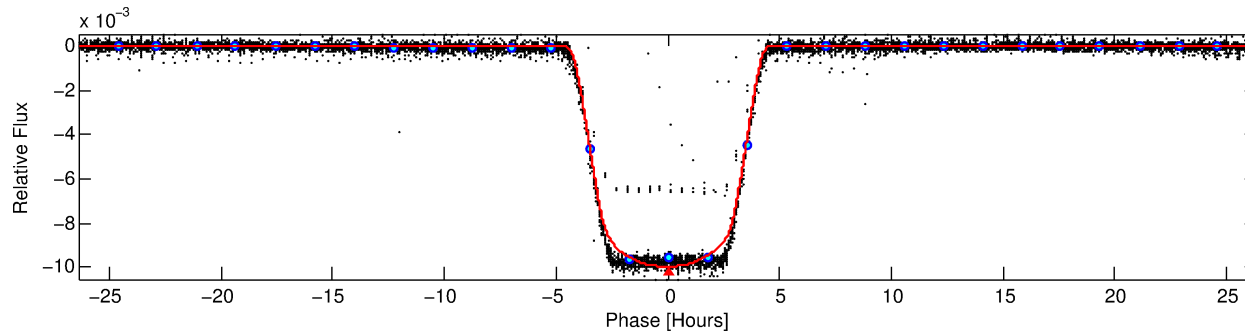
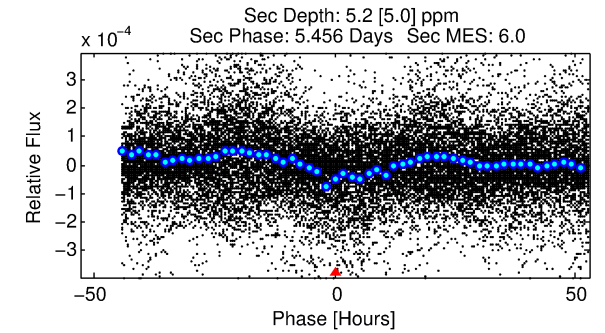
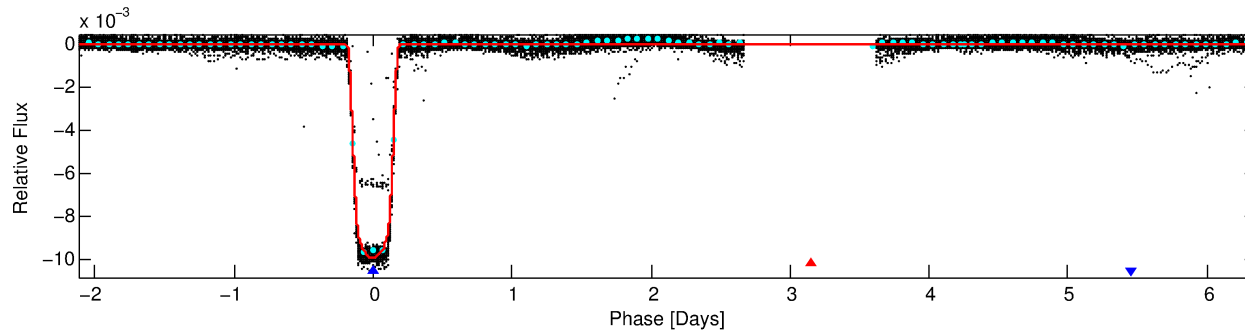
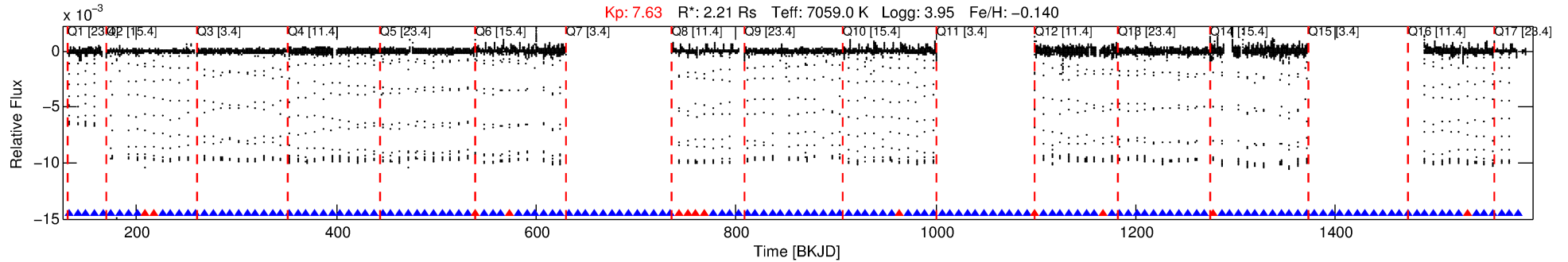
No Significant Match Found



# DV One-Page Summary

KIC: 9851142 Candidate: 2 of 2 Period: 8.480 d  
KOI: K03513 Corr: No Ephemeris Match

Kp: 7.63 R\*: 2.21 Rs Teff: 7059.0 K Logg: 3.95 Fe/H: -0.140



## DV Fit Results:

Period = 8.48030 [0.00000] d  
Epoch = 132.7111 [0.0000] BKJD  
Rp/R\* = 0.0993 [0.0000]  
a/R\* = 6.05 [0.00]  
b = 0.74 [0.00]  
Teff = 1212.22 [433.05]  
Teq = 1505 [134] K  
Rp = 23.94 [6.10] Re  
a = 0.0947 [0.0214] AU  
Ag = 0.05 [0.05] [-20.83σ]  
Teffp = 1072 [258] K [-1.49σ]

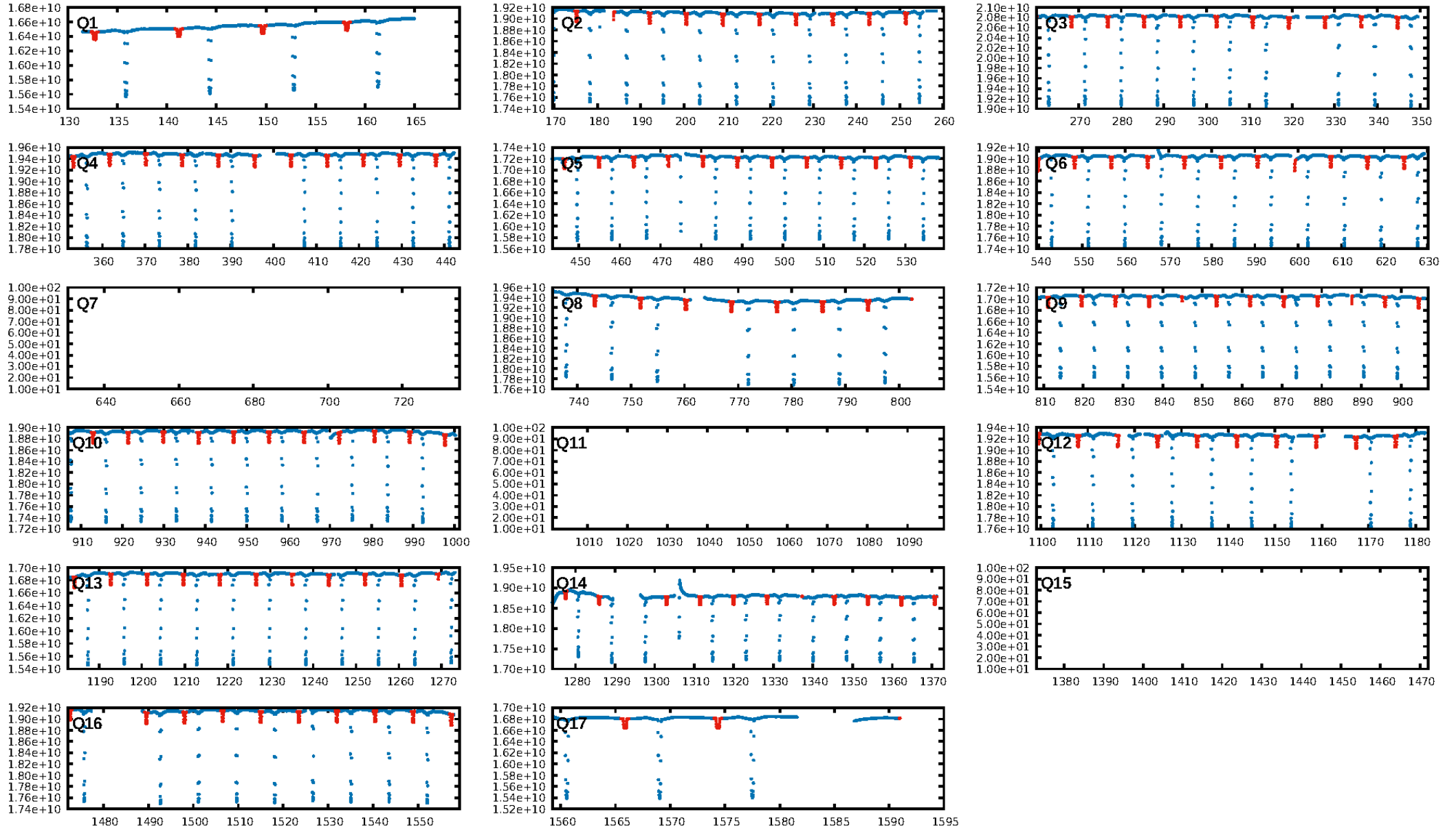
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 91.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.89 [110/123]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.0%  
Centroid-so: 14.125 arcsec [561.74σ]  
OotOffset-rm: 13.659 arcsec [4.97σ]  
KicOffset-rm: 22.176 arcsec [7.38σ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 0.00 [0/14]  
DiffImageOverlap-fno: 1.00 [14/14]

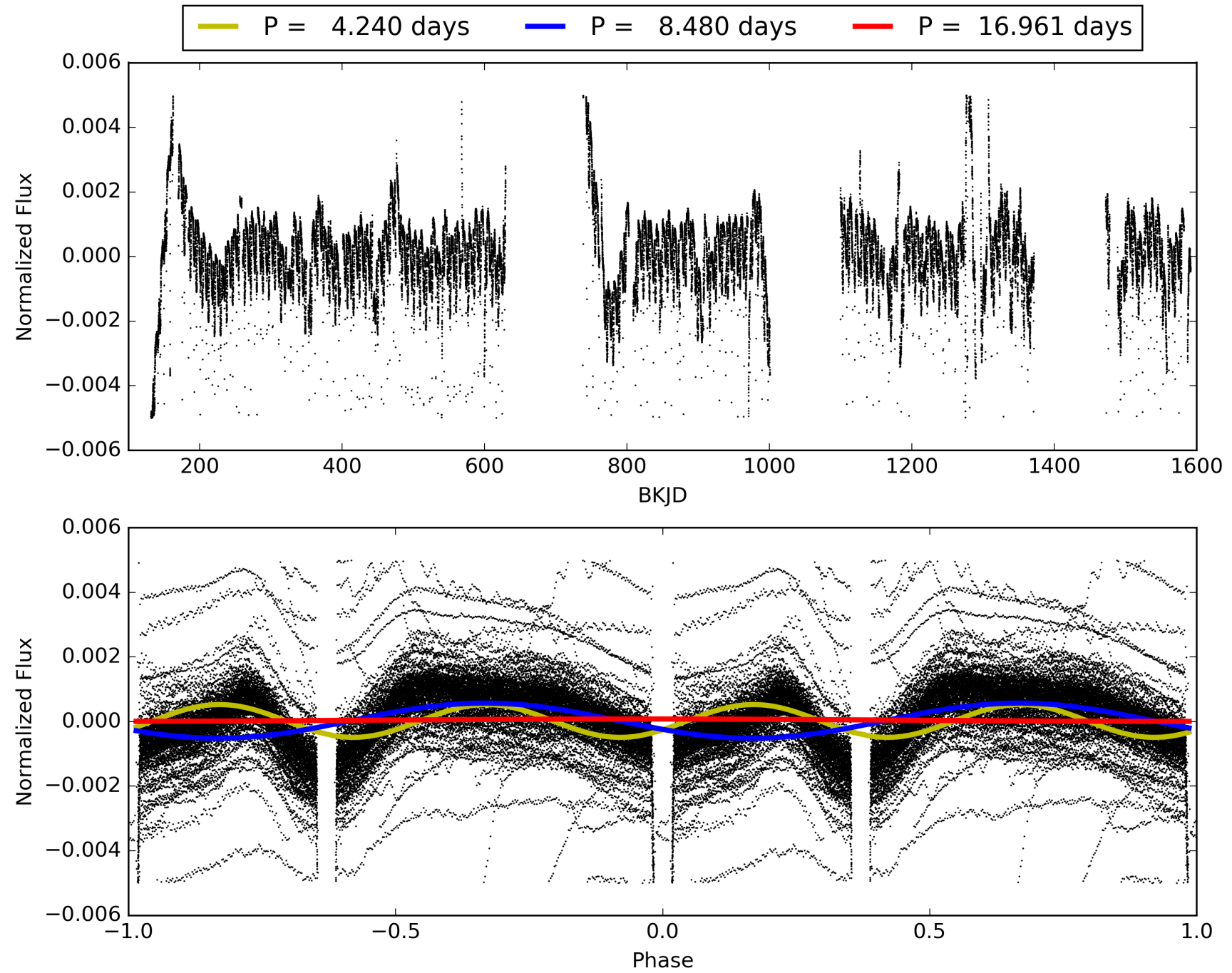
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 16:06:51 Z

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

# TCE 009851142-02, PDC Light Curves



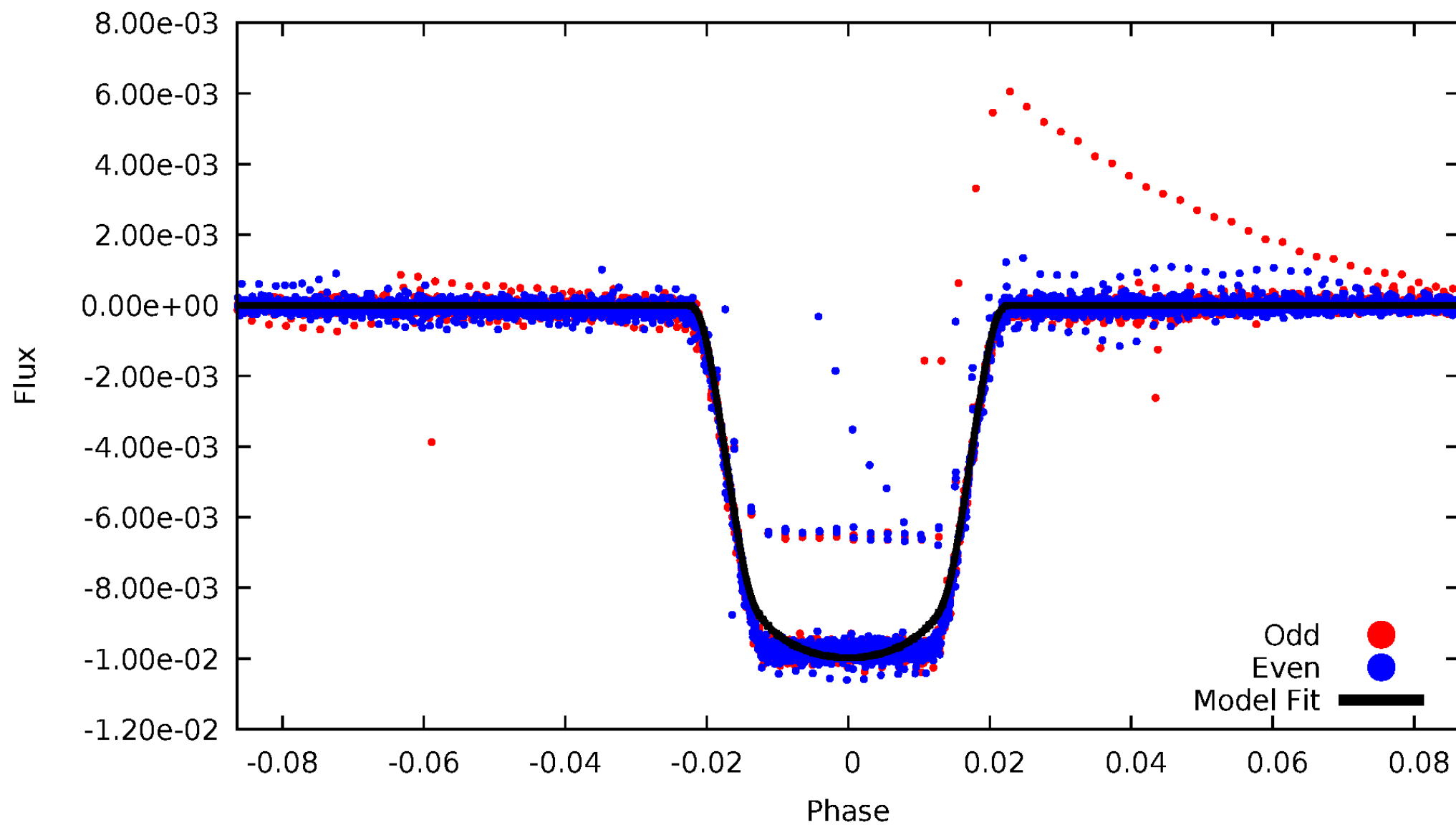
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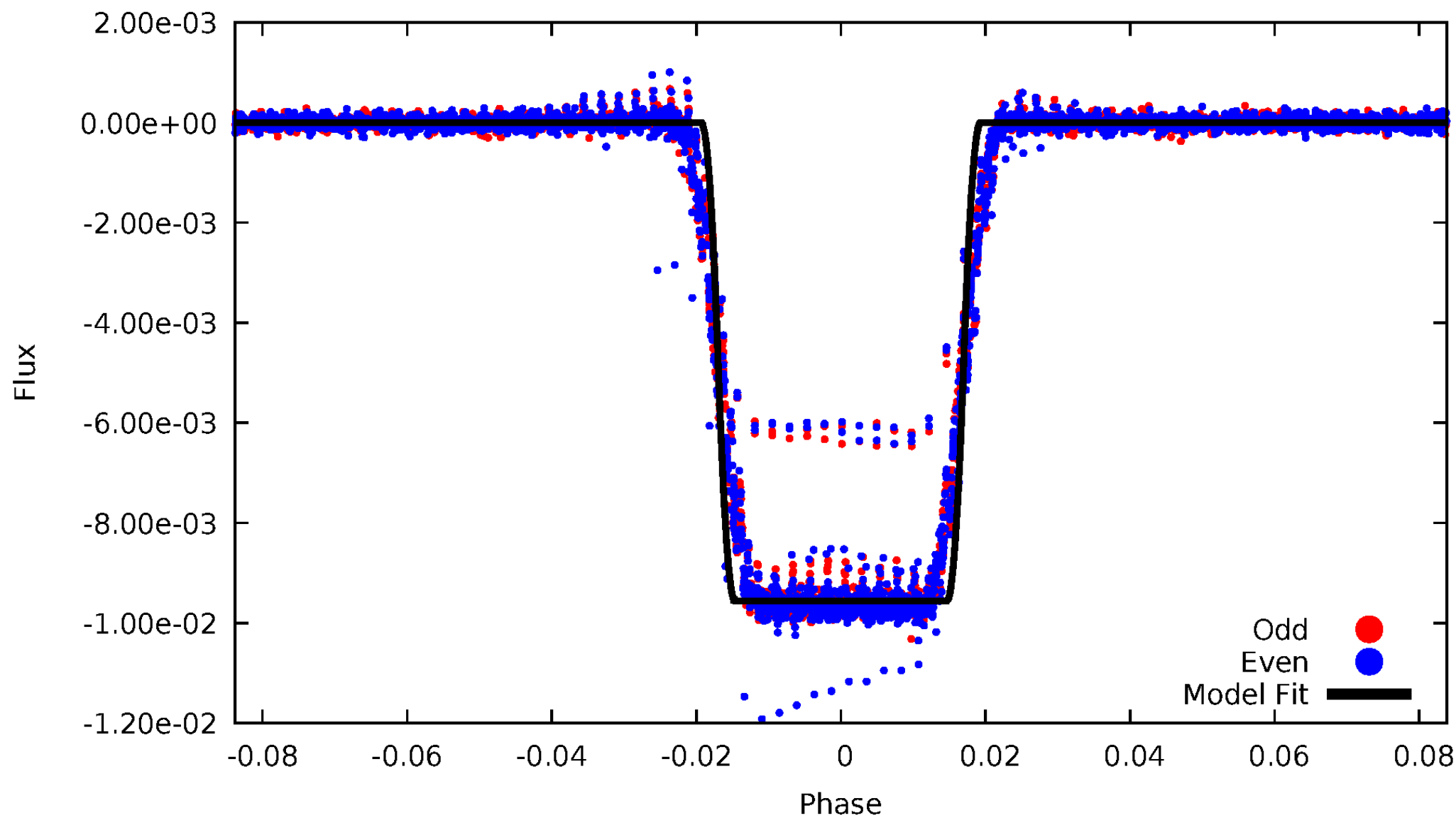
# DV Odd/Even

TCE 009851142-02



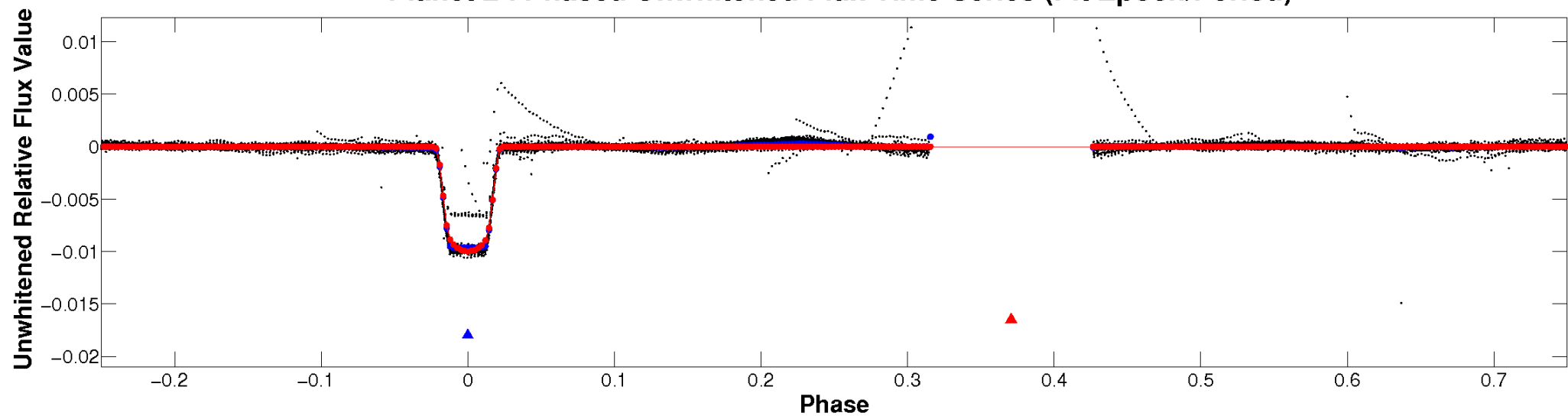
# ALT Odd/Even

TCE 009851142-02

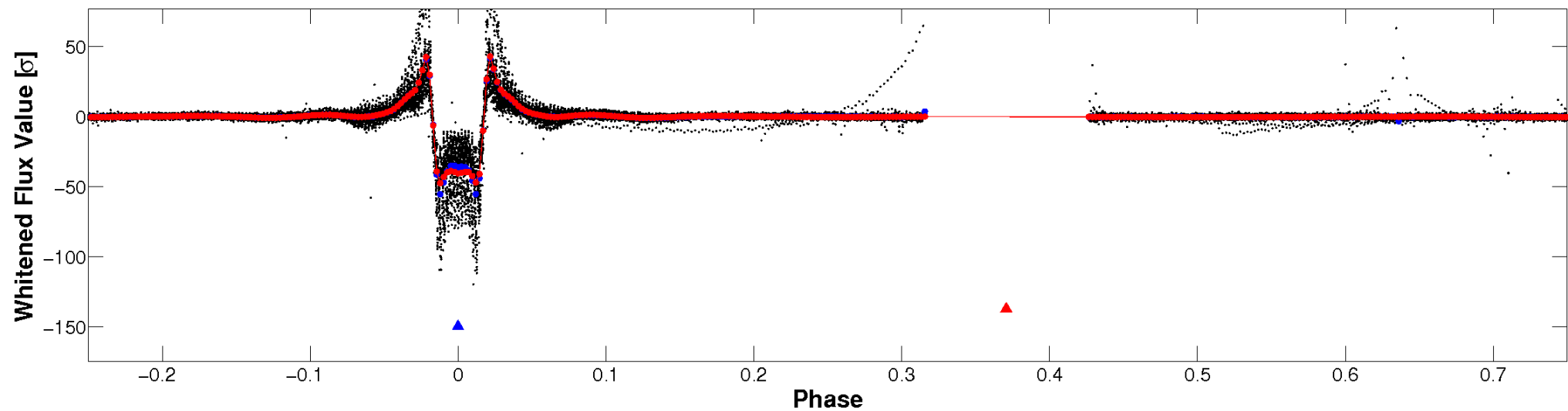


# Non-Whitened Vs. Whitened Light Curve

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

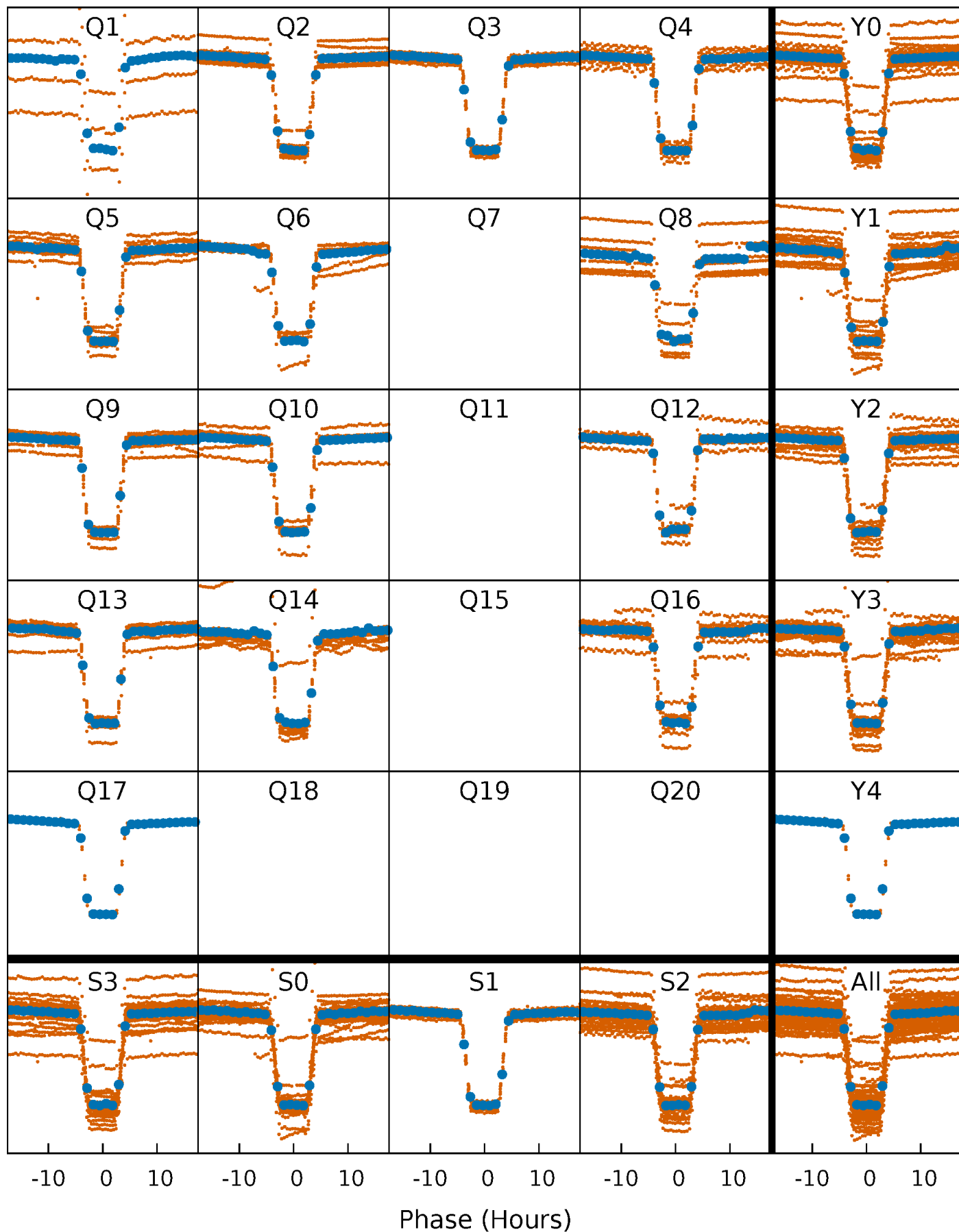


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



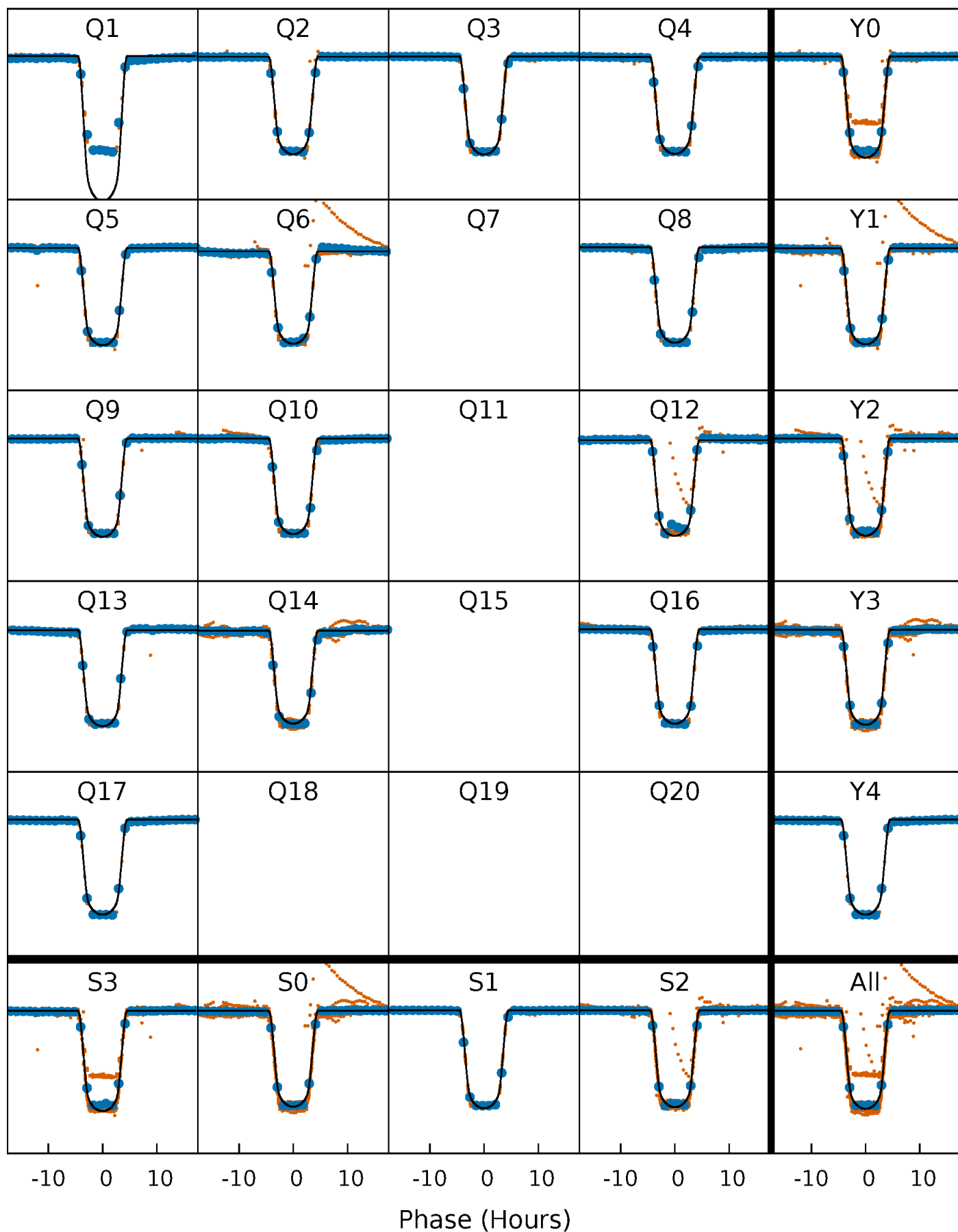
# PDC Quarter-Phased Transit Curves

TCE 009851142-02 P= 8.480300 Days  $T_0=132.711055$  (BKJD)



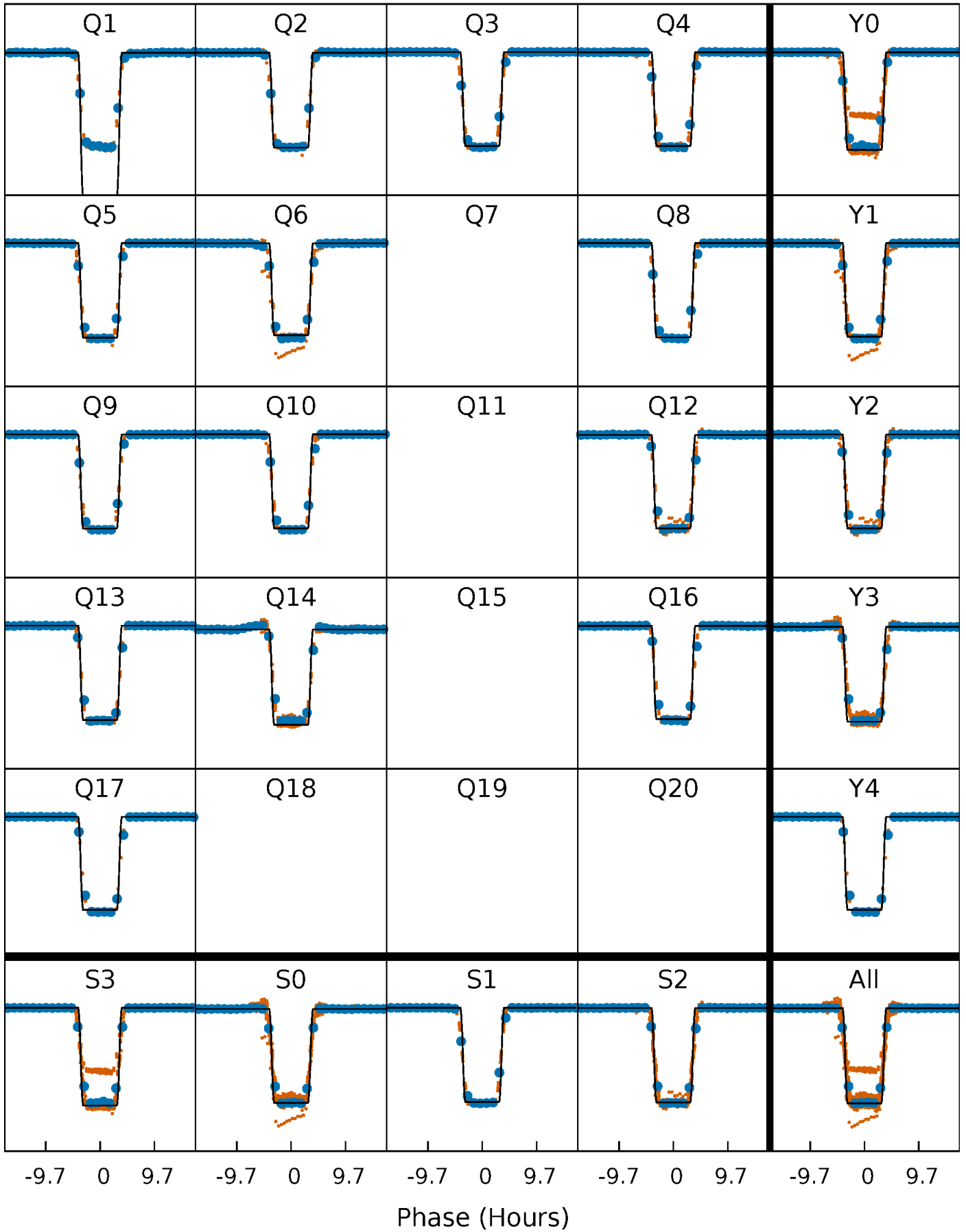
# DV Quarter-Phased Transit Curves

TCE 009851142-02 P= 8.480300 Days  $T_0=132.711055$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

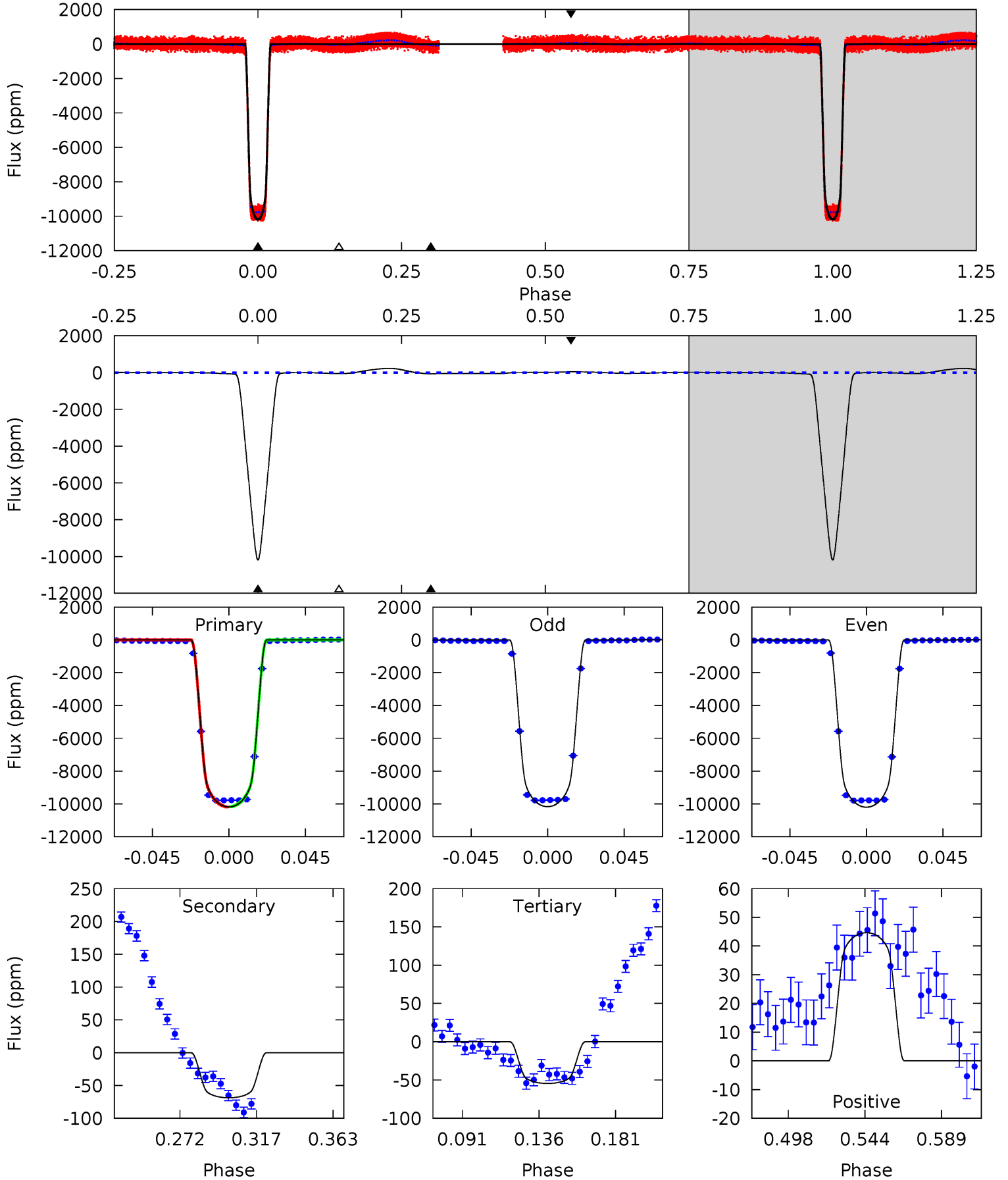
TCE 009851142-02   P= 8.480222 Days    $T_0=132.716259$  (BKJD)



# DV Model-Shift Uniqueness Test

009851142-02, P = 8.480300 Days, E = 124.230755 Days

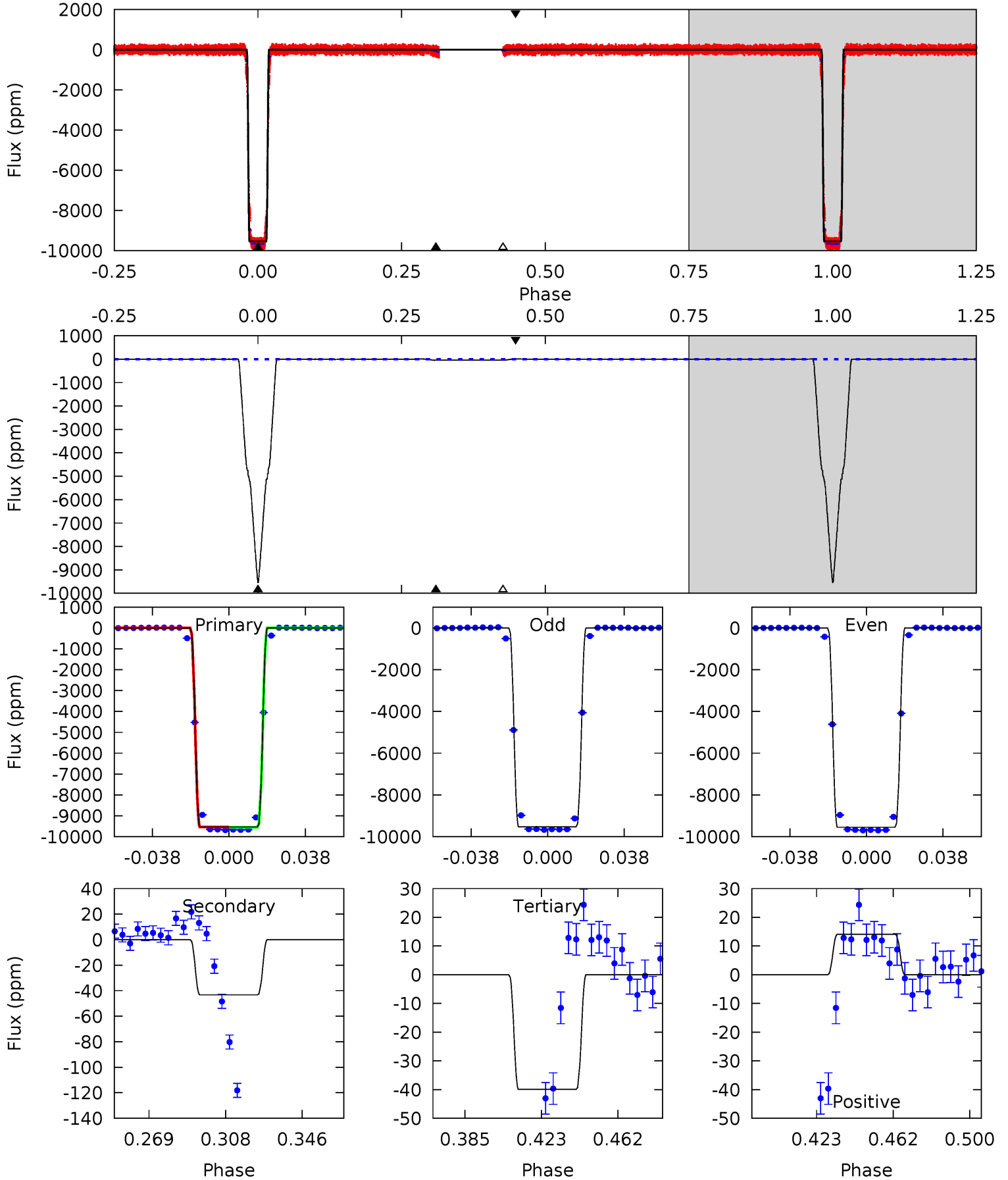
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3247	21.9	17.4	14.2	4.73	2.00	19.1	3229	3232	4.55	7.69	5.19	0.97	0.02	2.97



# Alt Model-Shift Uniqueness Test

009851142-02, P = 8.480222 Days, E = 124.236037 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
4587	20.8	19.2	6.76	4.76	2.07	2.08	4568	4581	1.59	14.0	5.88	0.98	0.00	2.78





### Stellar Parameters For KIC 009851142

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7059^{+126}_{-169}$	$3.946^{+0.195}_{-0.105}$	$-0.140^{+0.150}_{-0.150}$	$2.210^{+0.375}_{-0.563}$	$1.571^{+0.127}_{-0.191}$	$0.205^{+0.219}_{-0.066}$
	+2%/-2%	+5%/-3%	+107%/-107%	+17%/-25%	+8%/-12%	+107%/-32%
Source	SPE4	SPE4	SPE4	DSEP		

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

### Secondary Eclipse Parameters for KIC 009851142-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-69 \pm 3$	$23.88^{+2.15}_{-3.13}$	$2087^{+94}_{-130}$	$2545^{+69}_{-80}$	$0.601^{+0.173}_{-0.095}$
Alt.	$-43 \pm 2$	$23.25^{+2.30}_{-2.99}$	$2085^{+102}_{-136}$	$2221^{+146}_{-247}$	$0.394^{+0.120}_{-0.068}$

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

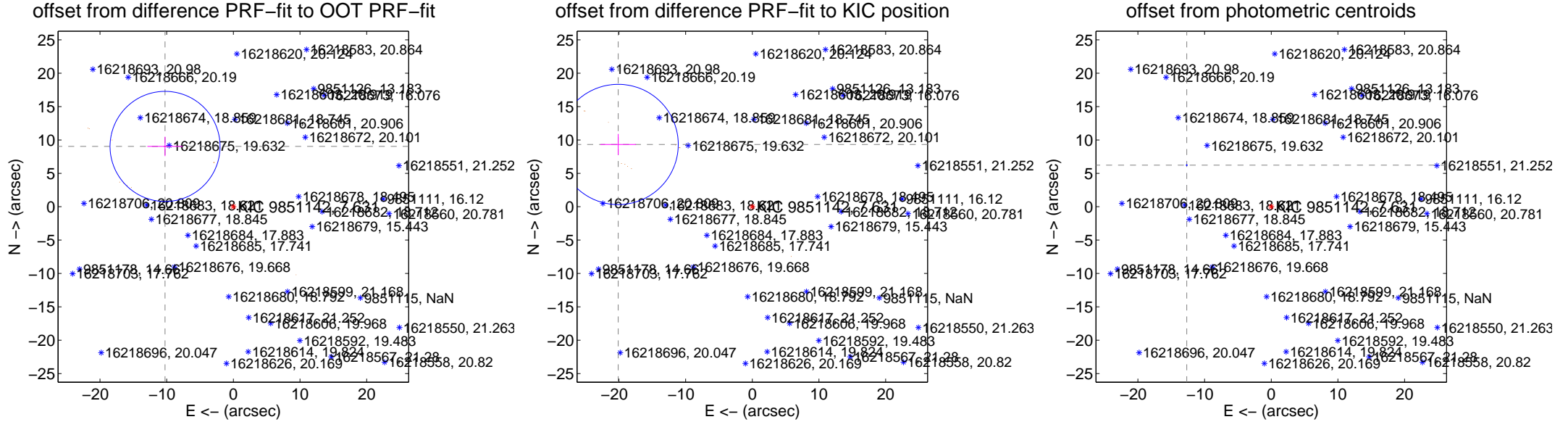
## DV Centroid Data

Supplemental centroid analysis for 009851142-02. **Kepler magnitude: 7.63.** Transit SNR 1589.39

There are 0 quarters with good PRF difference image offsets

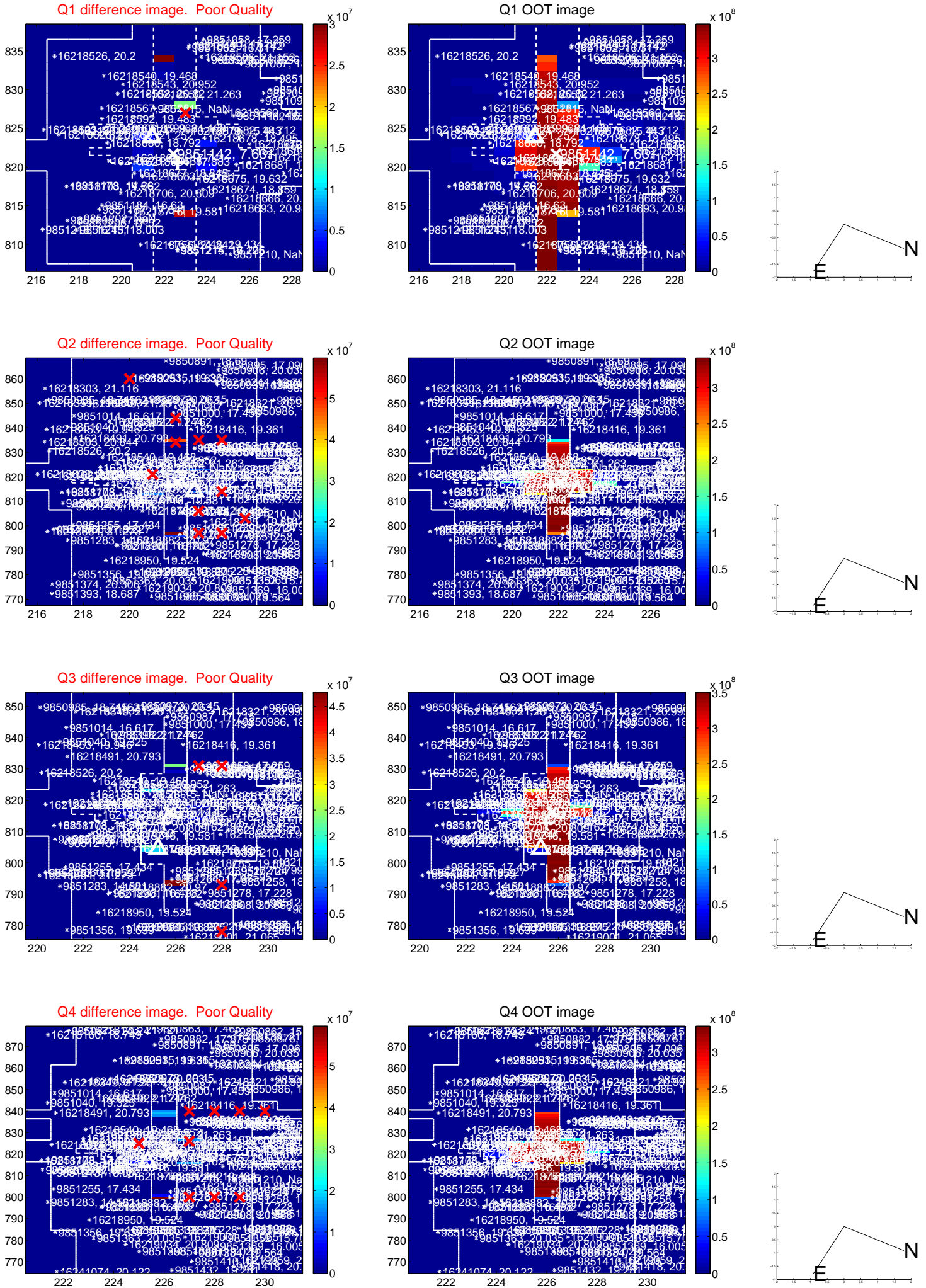
The OOT PRF centroid is offset from the target star catalog position by about 4.30 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>13.659 \pm 2.750</math></b>	<b>4.97</b>	$10.243 \pm 2.656$	$9.036 \pm 1.453$
PRF-fit source offset from KIC position	<b><math>22.176 \pm 3.003</math></b>	<b>7.38</b>	$20.118 \pm 2.660$	$9.330 \pm 1.580$
photometric centroid source offset	<b><math>14.12 \pm 0.03</math></b>	<b>561.74</b>	$12.68 \pm 0.03$	$6.23 \pm 0.01$



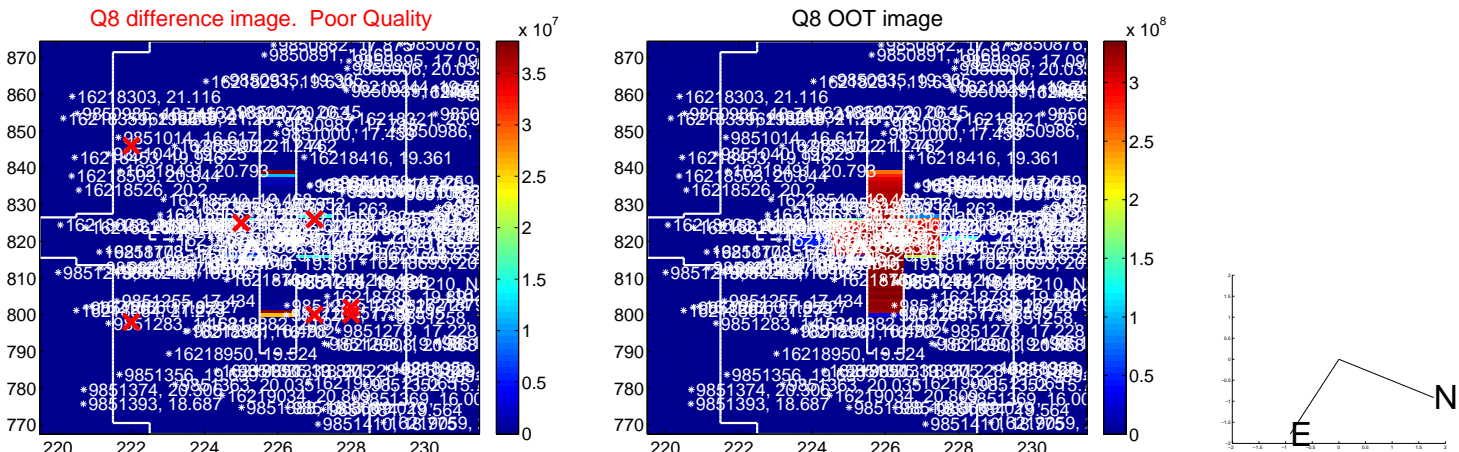
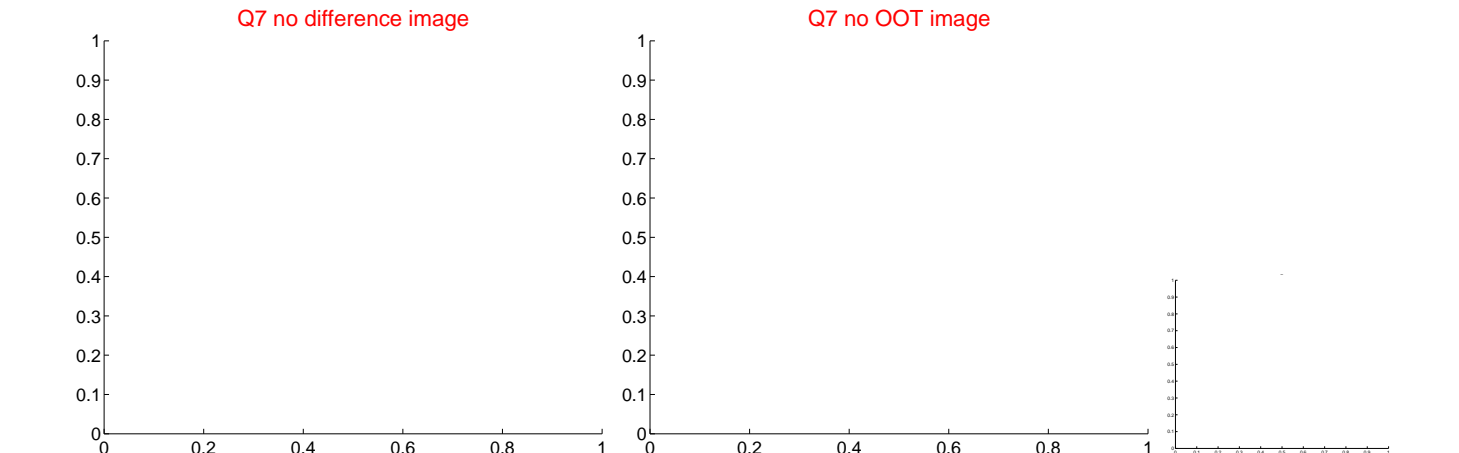
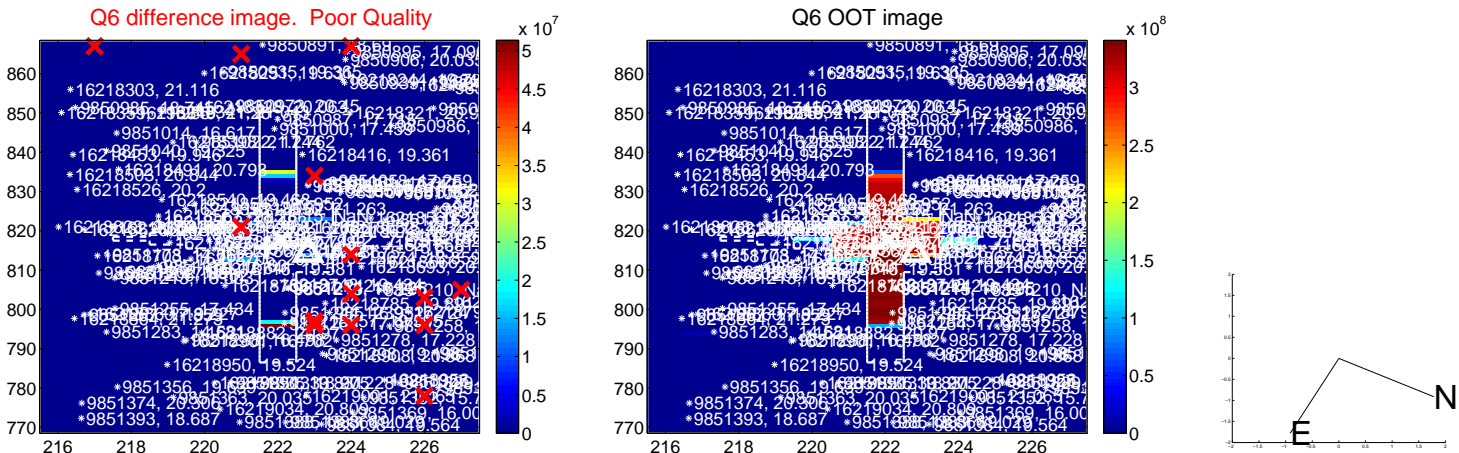
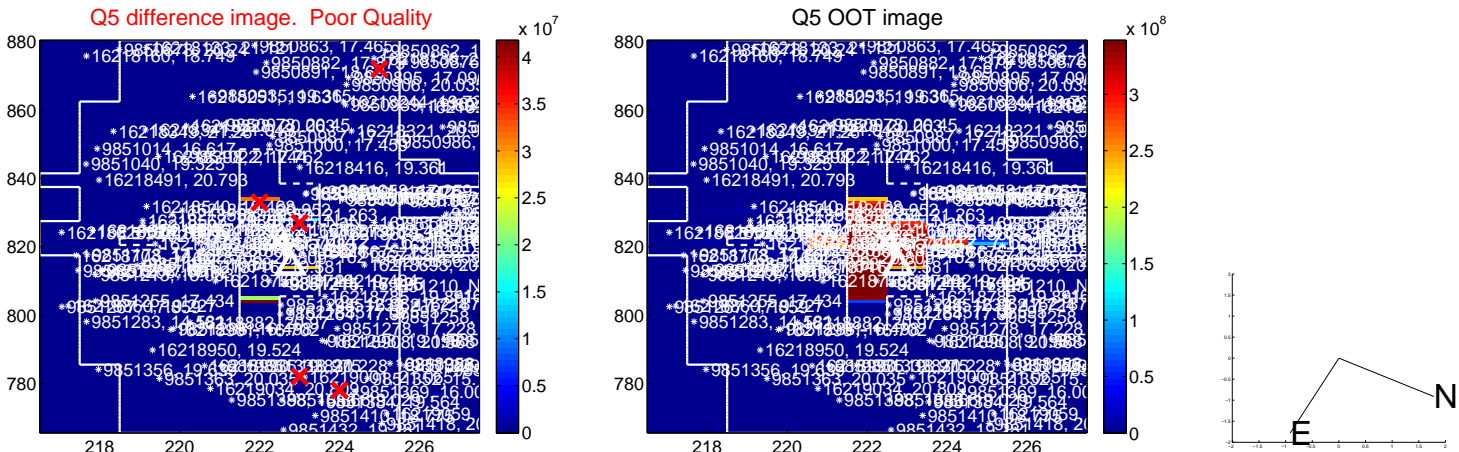
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

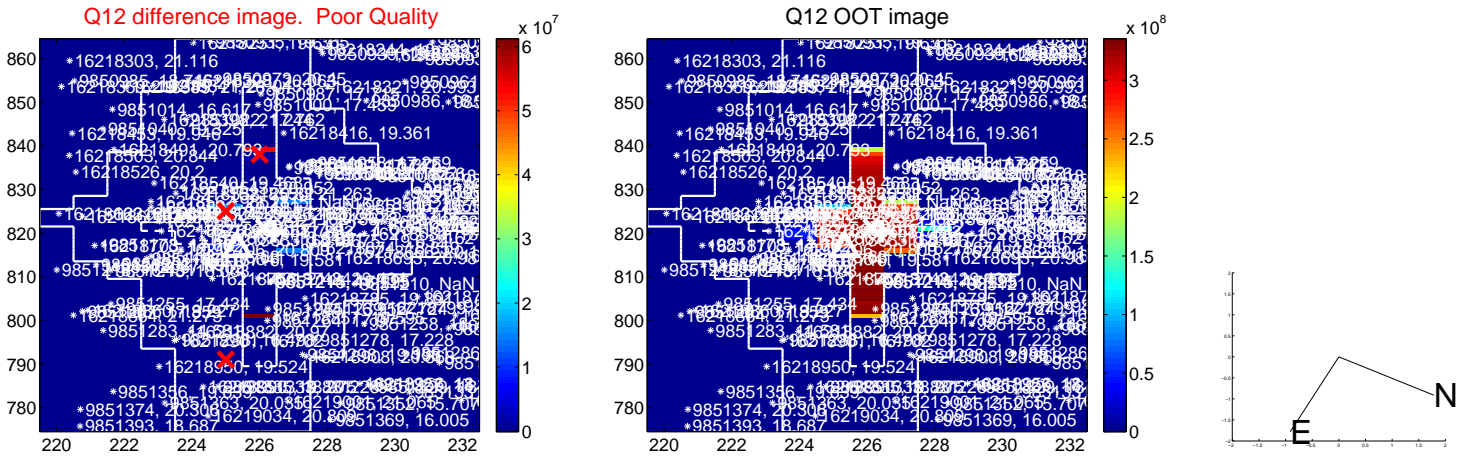
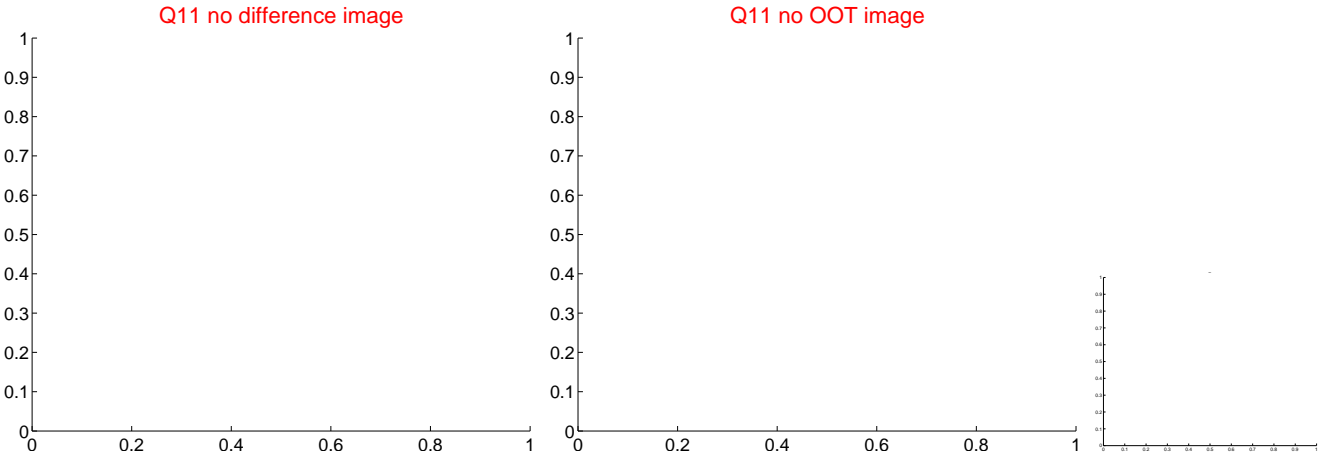
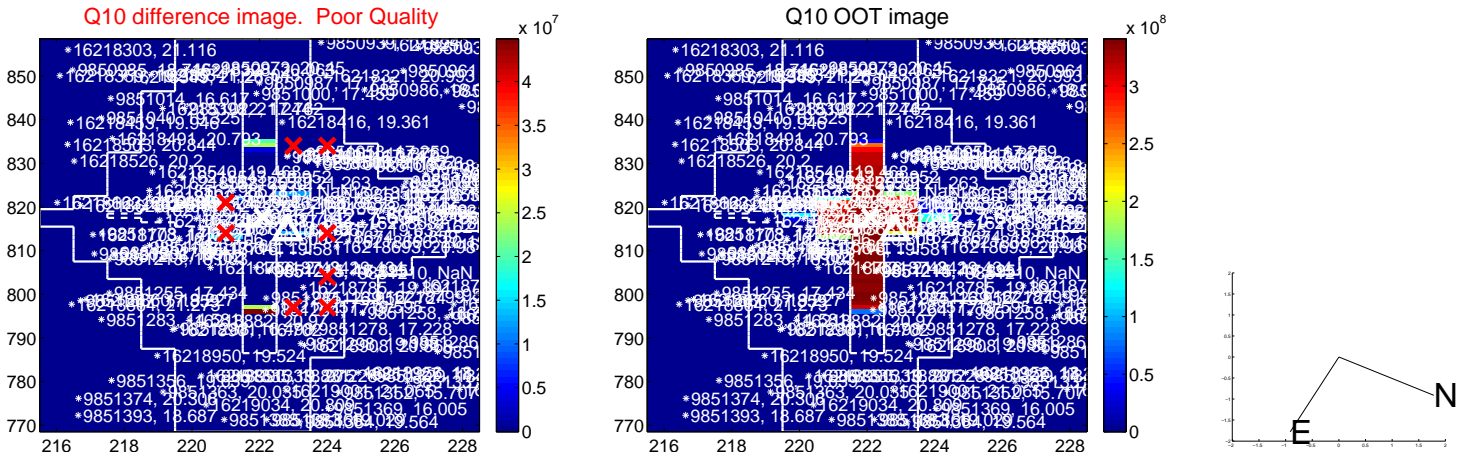
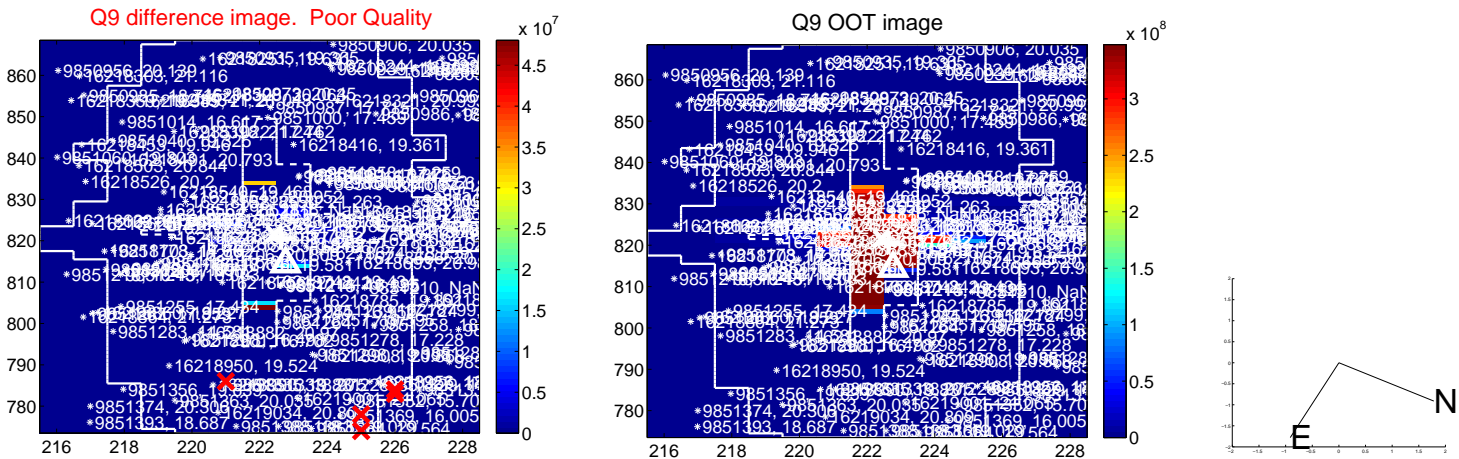




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

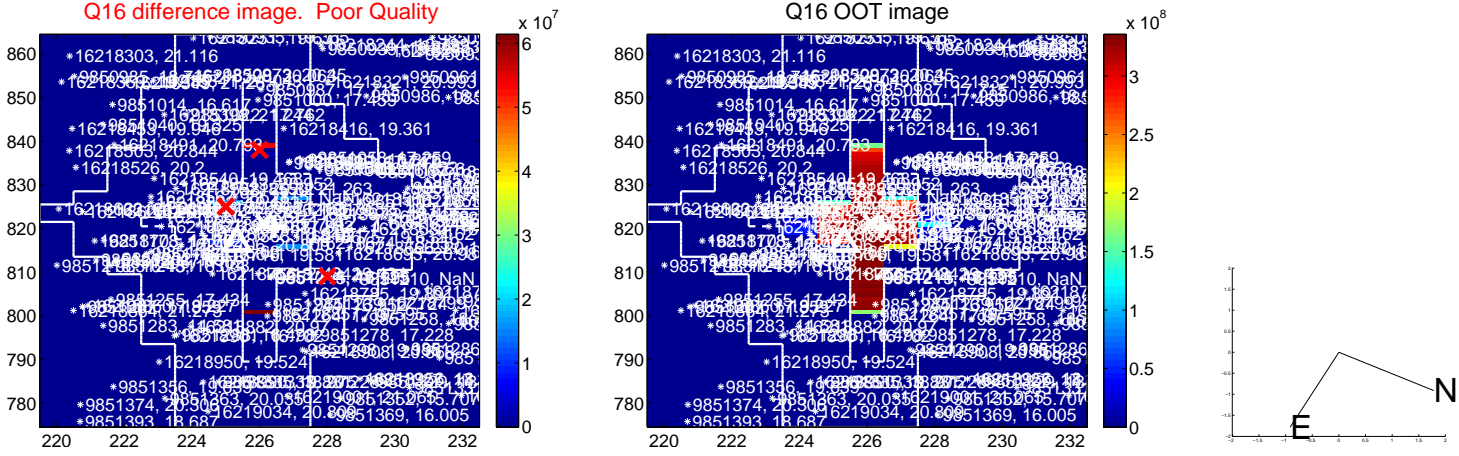
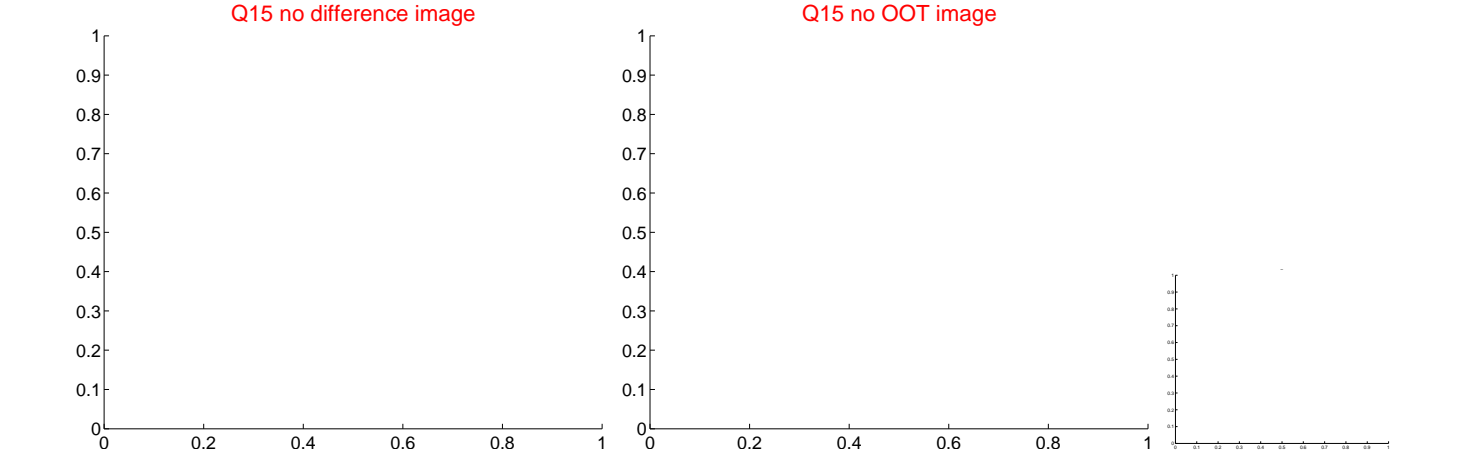
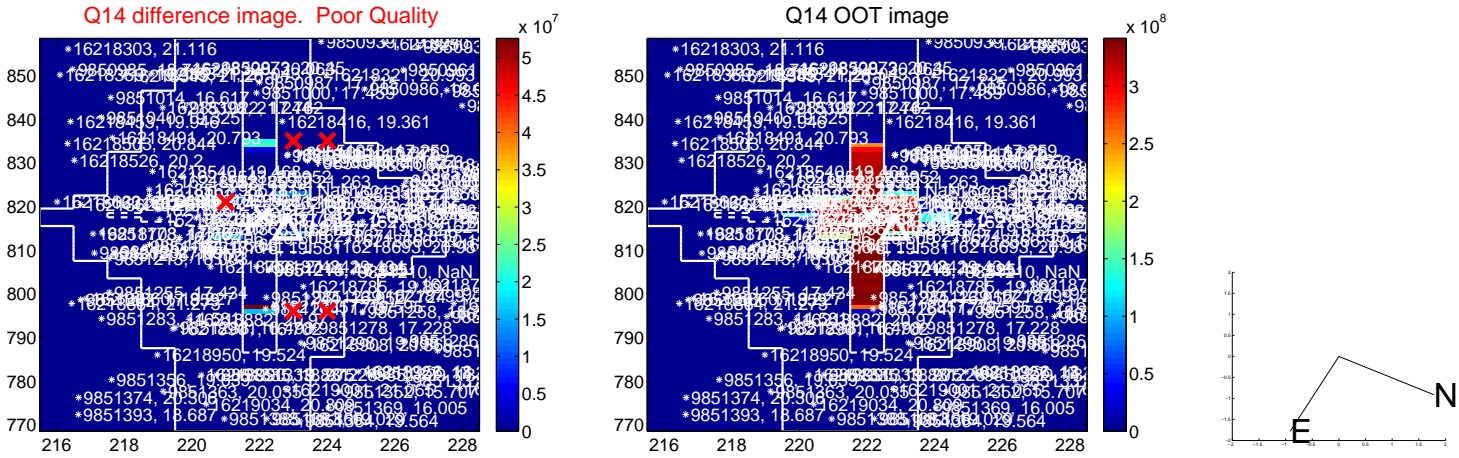
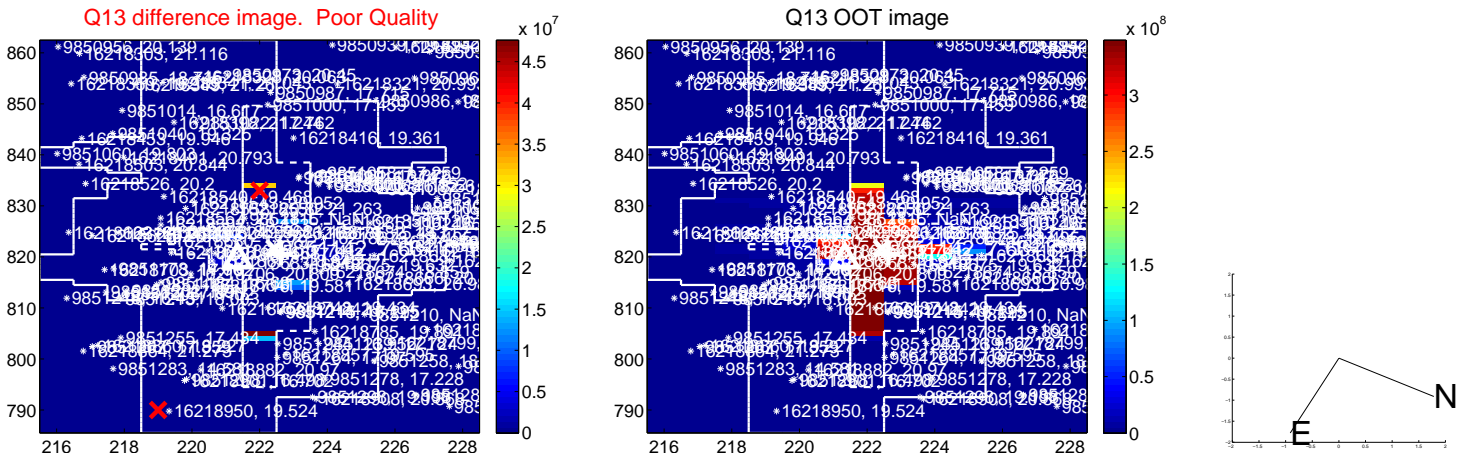


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

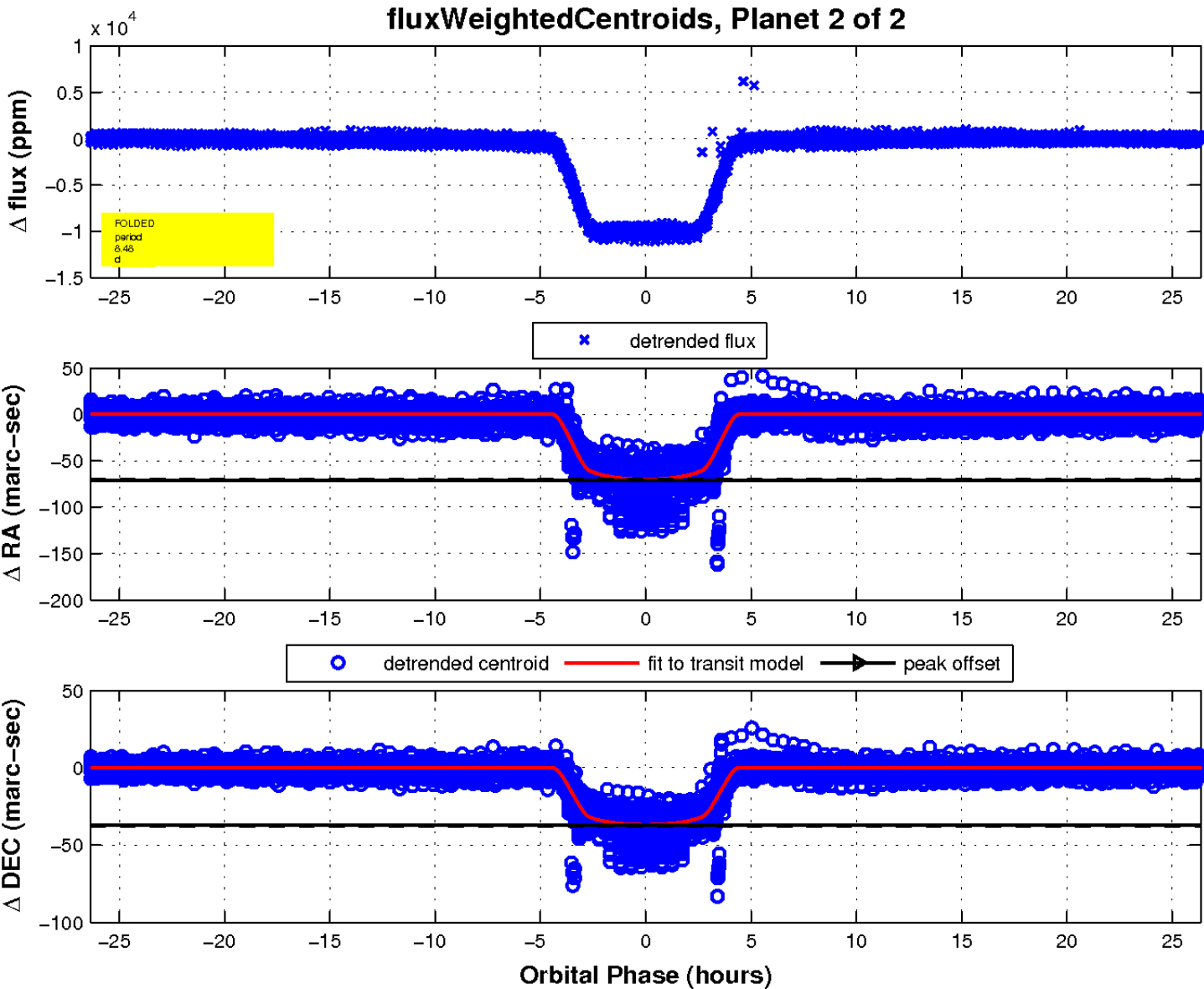
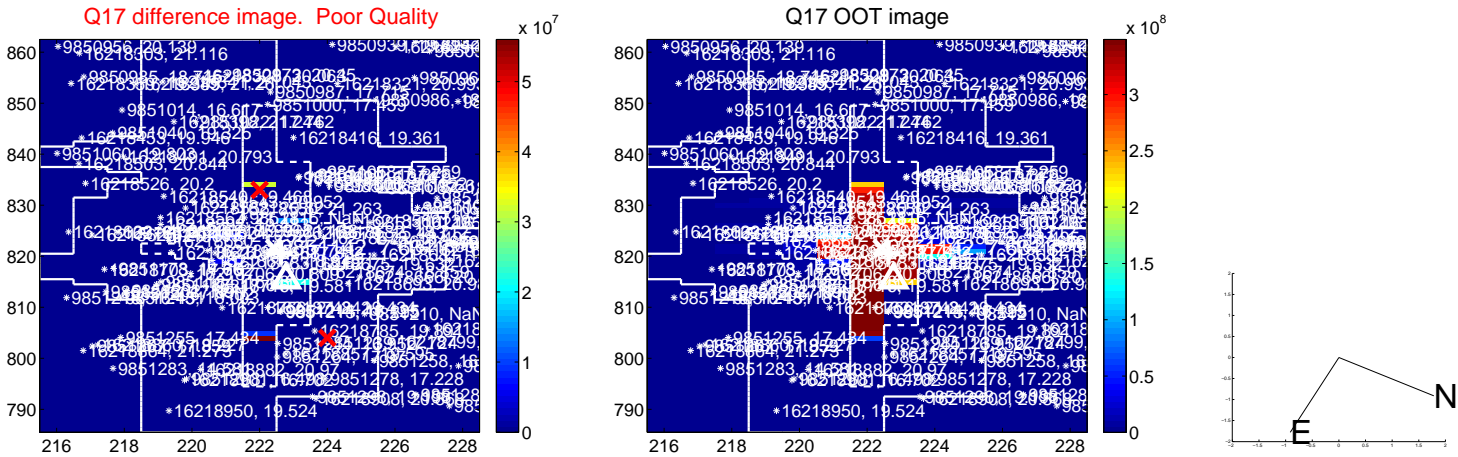




white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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



UKIRT Image

Declination

