

# KIC 011516242

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011516242-01	OBS	No	194.806227	147.778719	316.5	2.472	14.7	10.9	1.73	5099	3.63	4.42
011516242-02	OBS	No	370.490303	205.004311	643.6	2.285	9.5	9.3	1.73	5099	4.76	1.88

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011516242-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_SATURATED
011516242-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_SATURATED

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

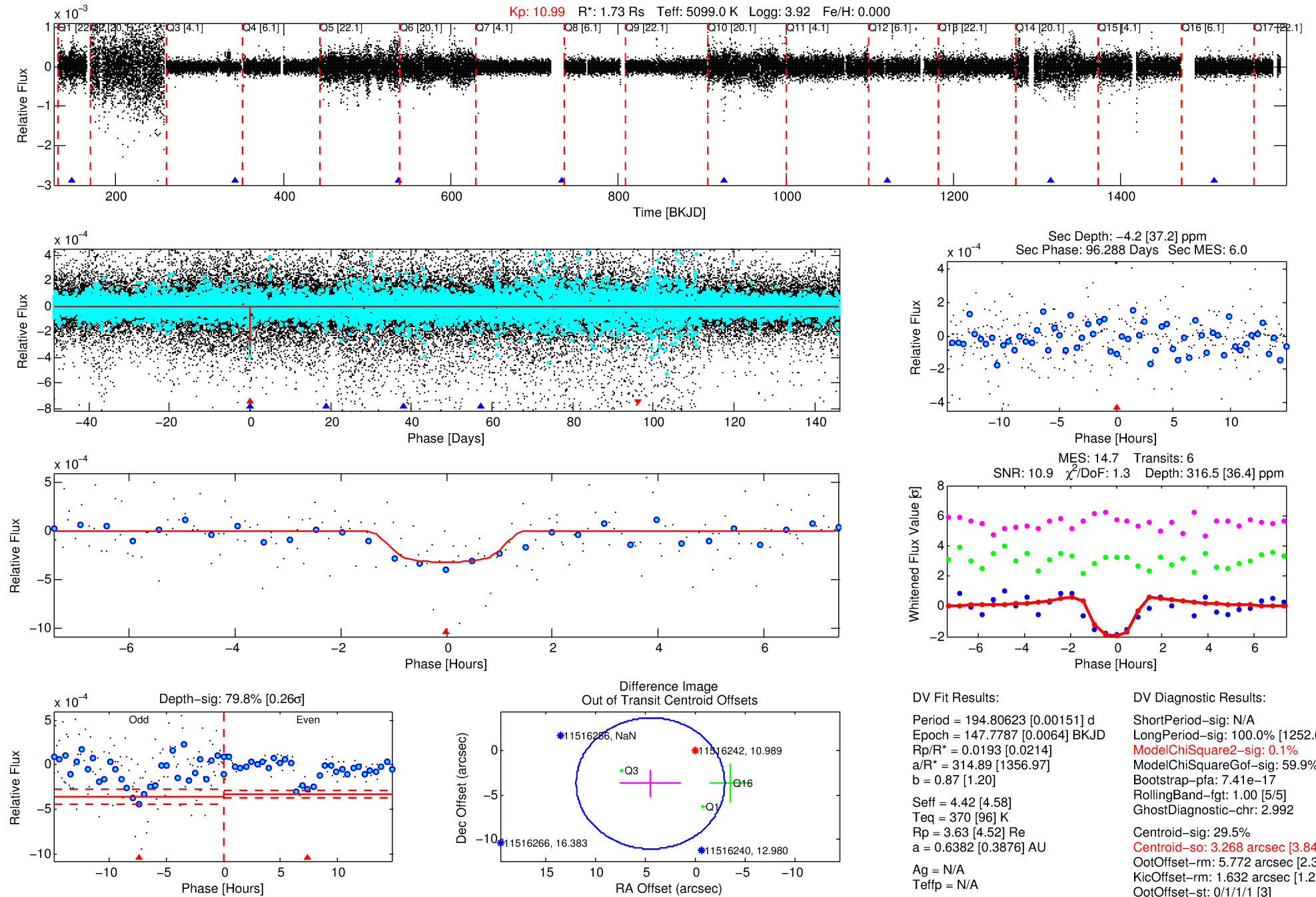
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011516242-01

No Significant Match Found

# DV One-Page Summary

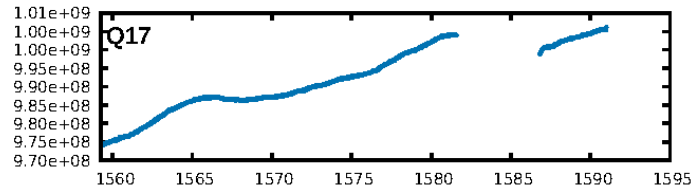
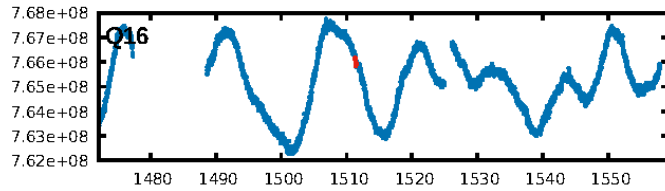
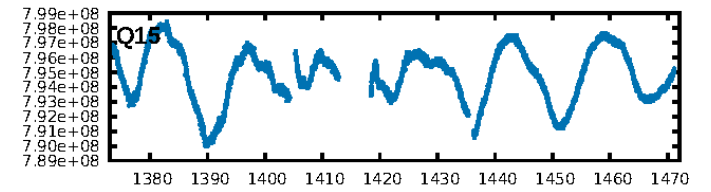
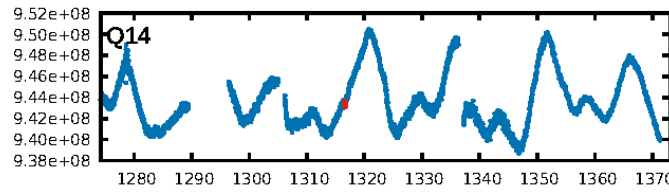
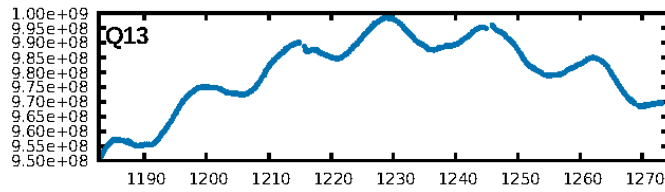
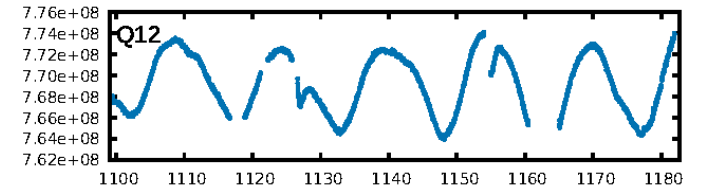
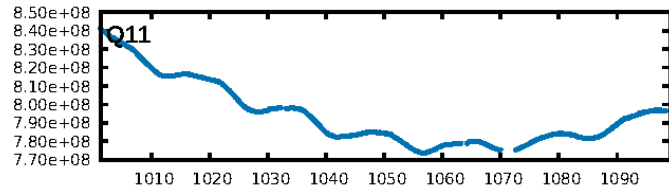
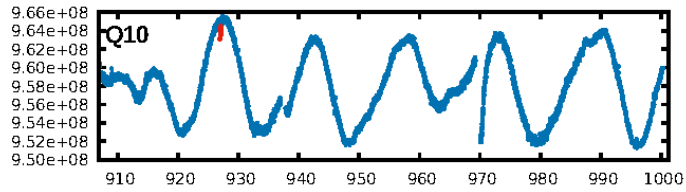
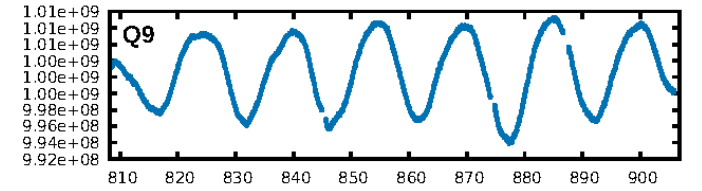
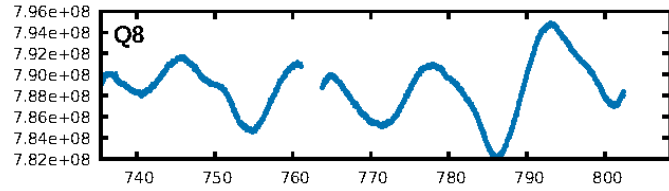
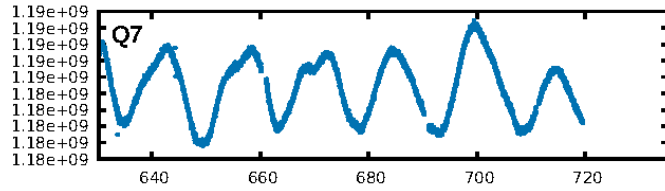
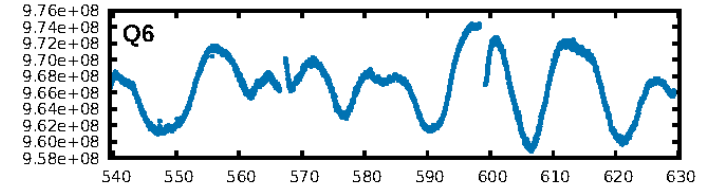
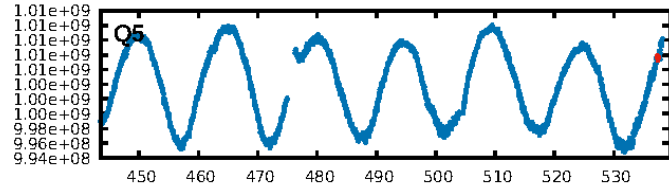
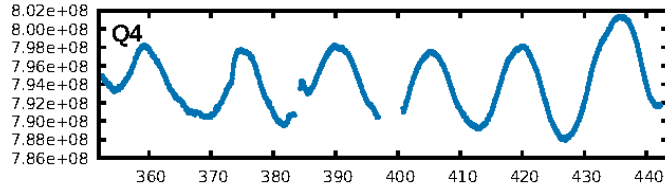
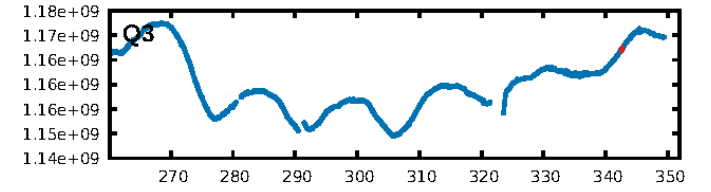
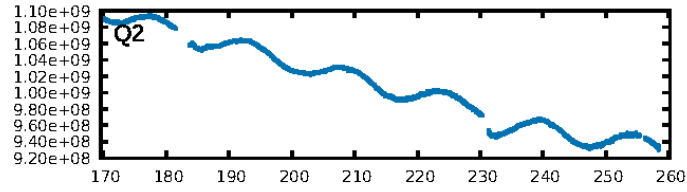
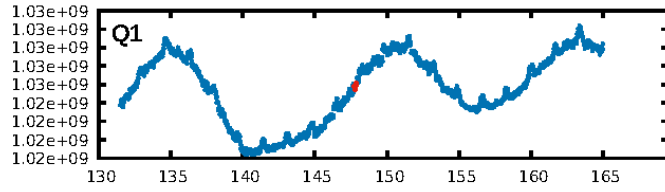
KIC: 11516242 Candidate: 1 of 2 Period: 194.806 d



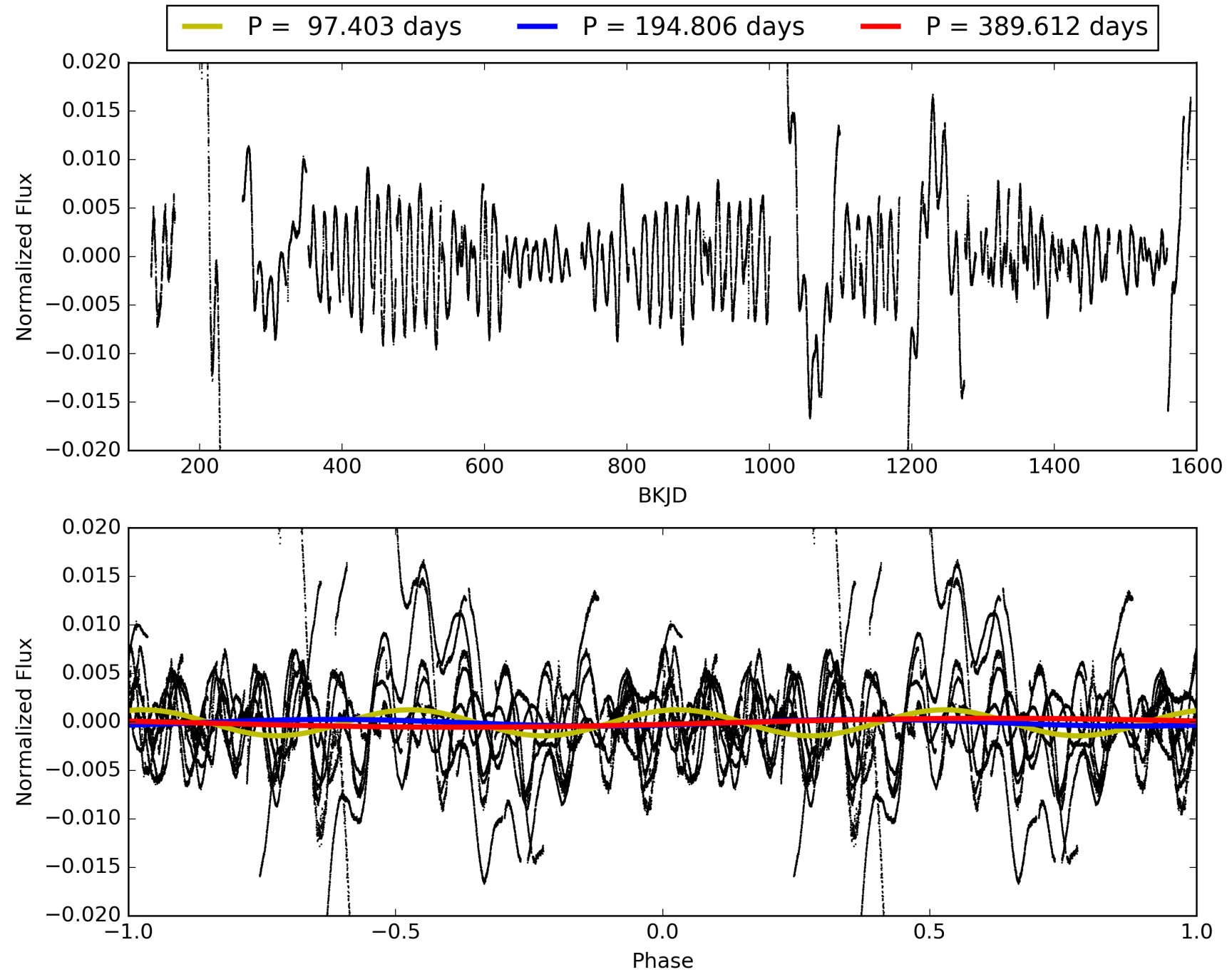
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 03:32:42 Z

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

# TCE 011516242-01, PDC Light Curves

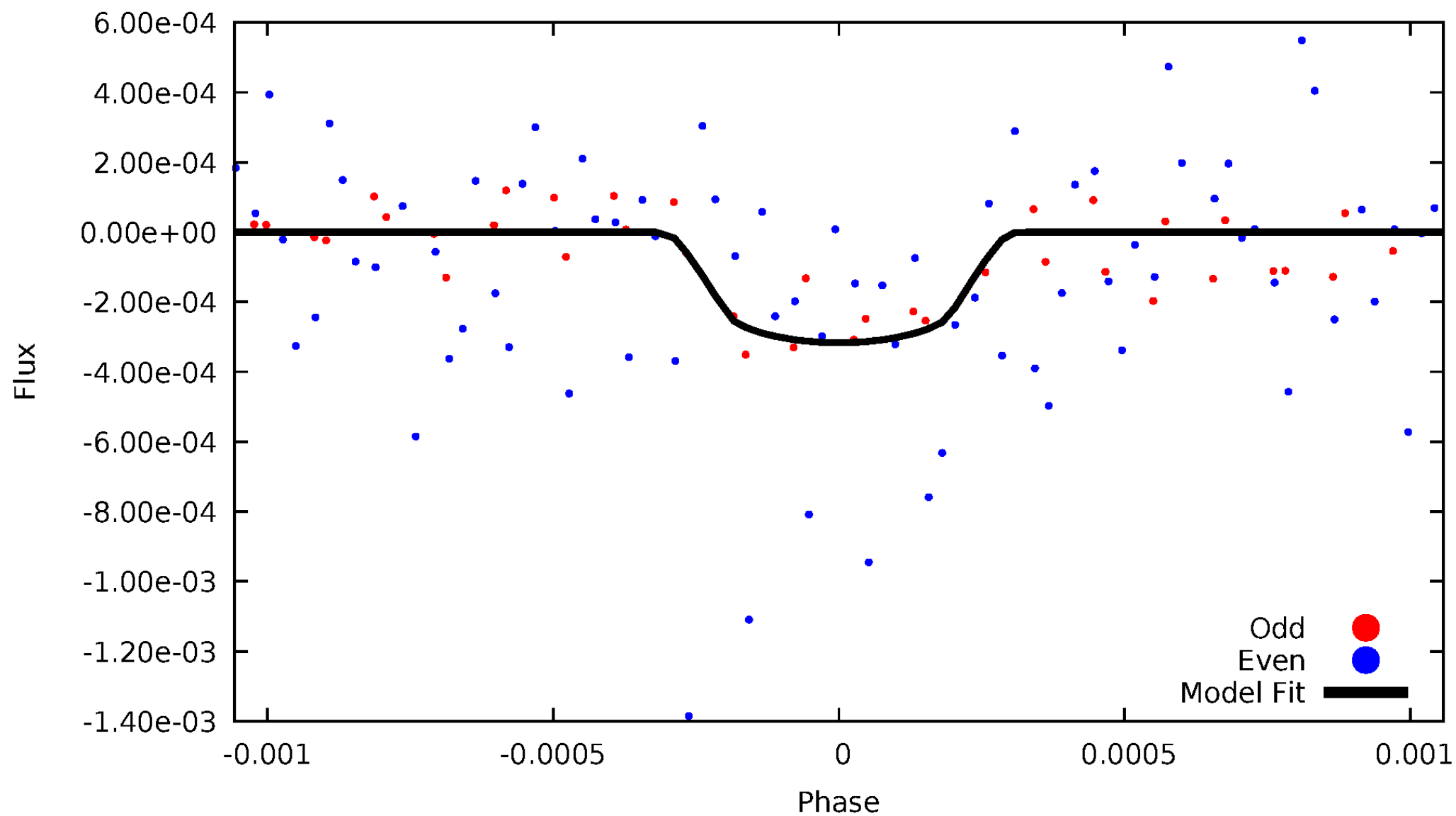


# TCE 011516242-01



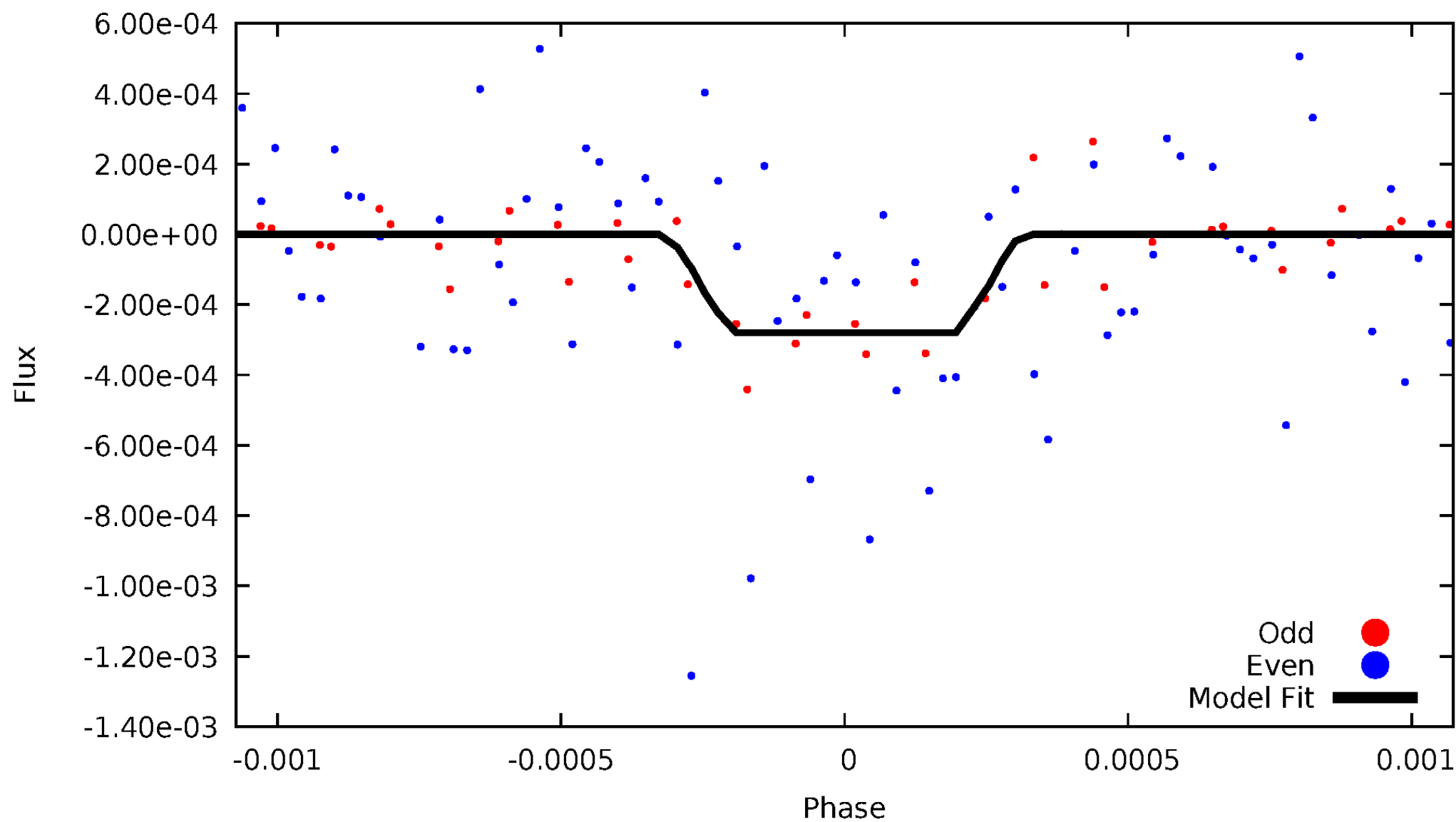
# DV Odd/Even

TCE 011516242-01



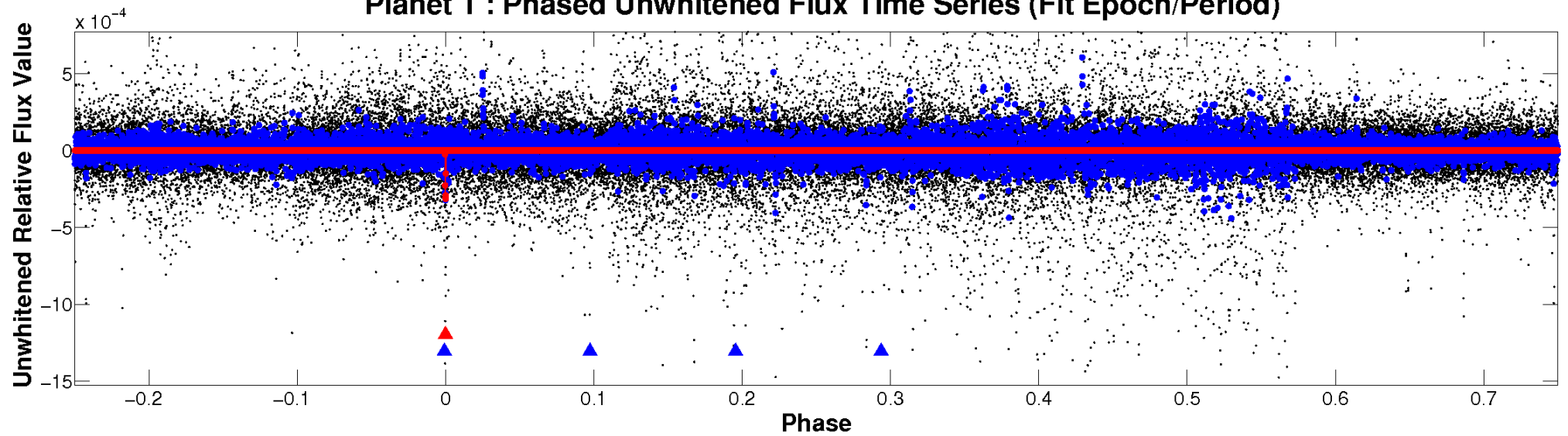
# ALT Odd/Even

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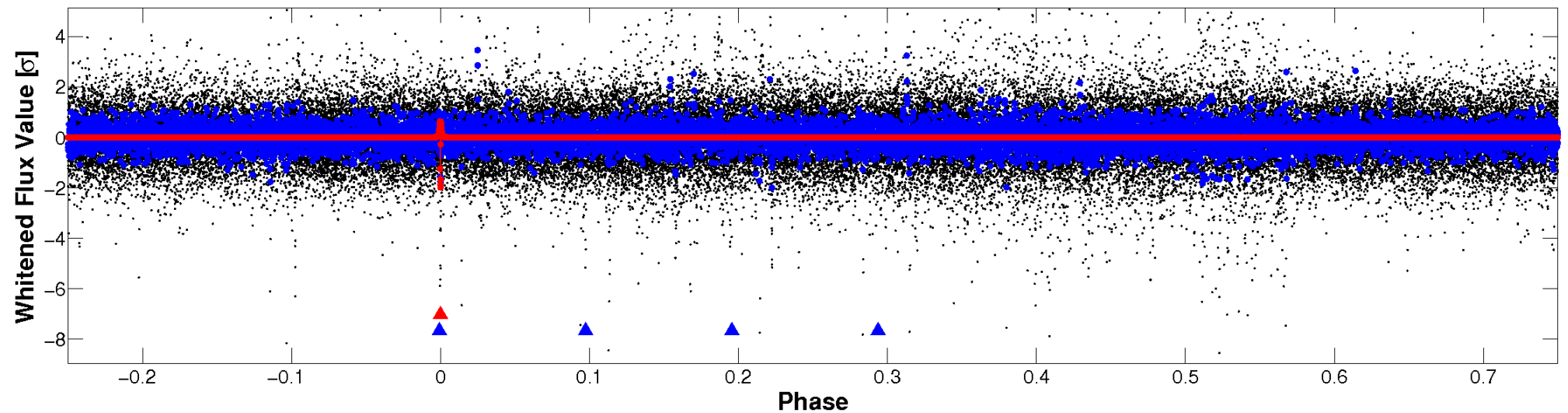


# Non-Whitened Vs. Whitened Light Curve

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

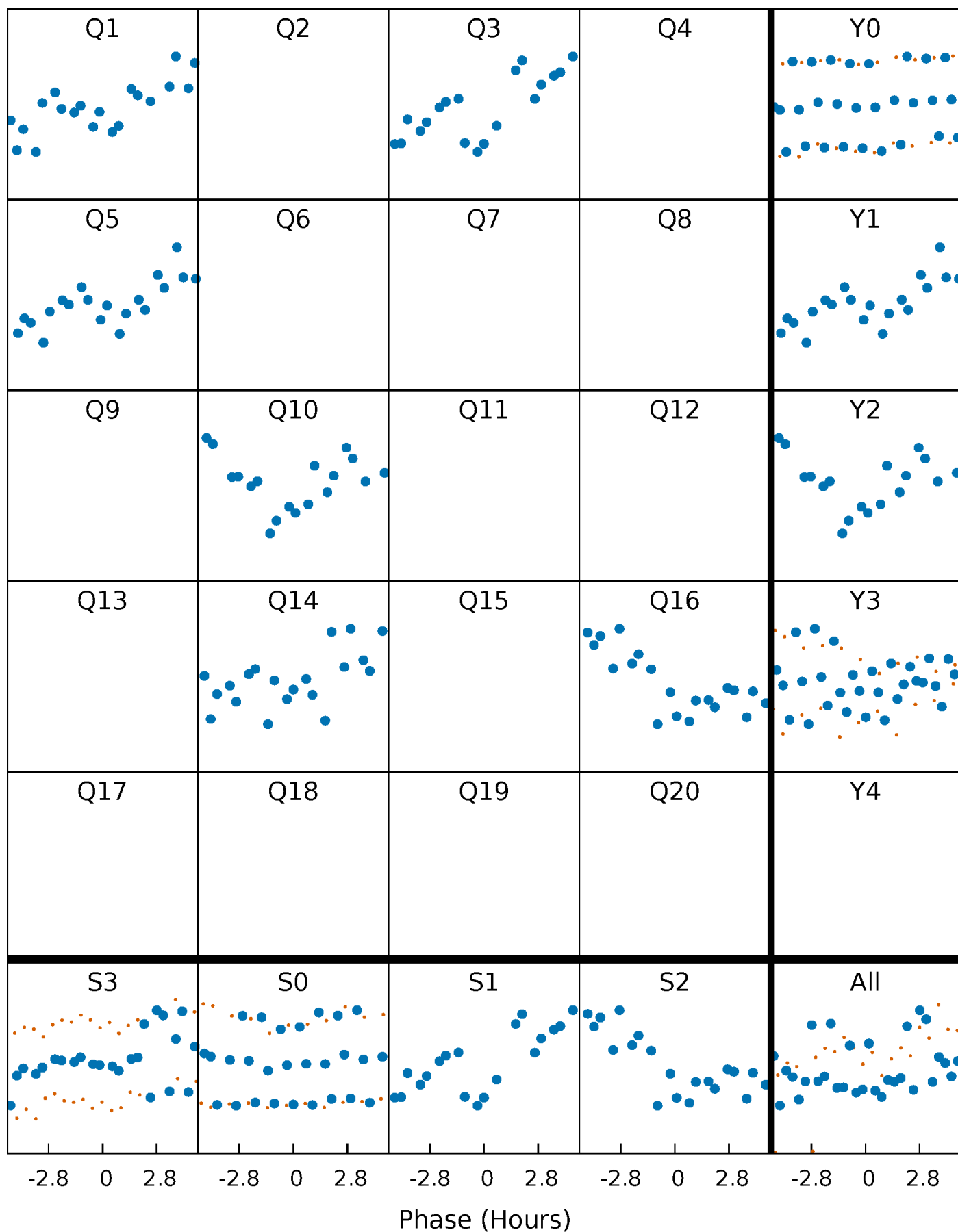


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

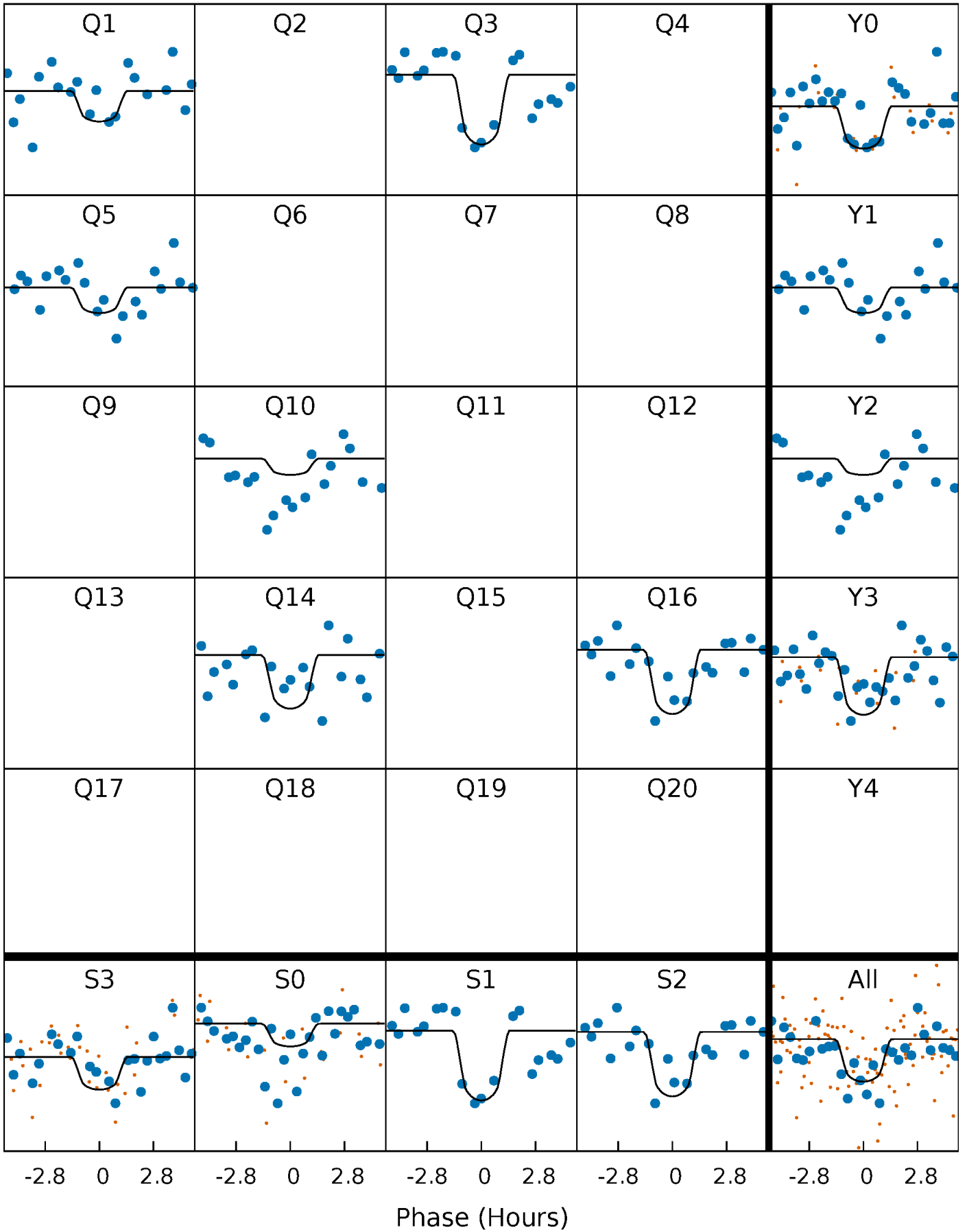
TCE 011516242-01 P=194.806227 Days  $T_0=147.778719$  (BKJD)





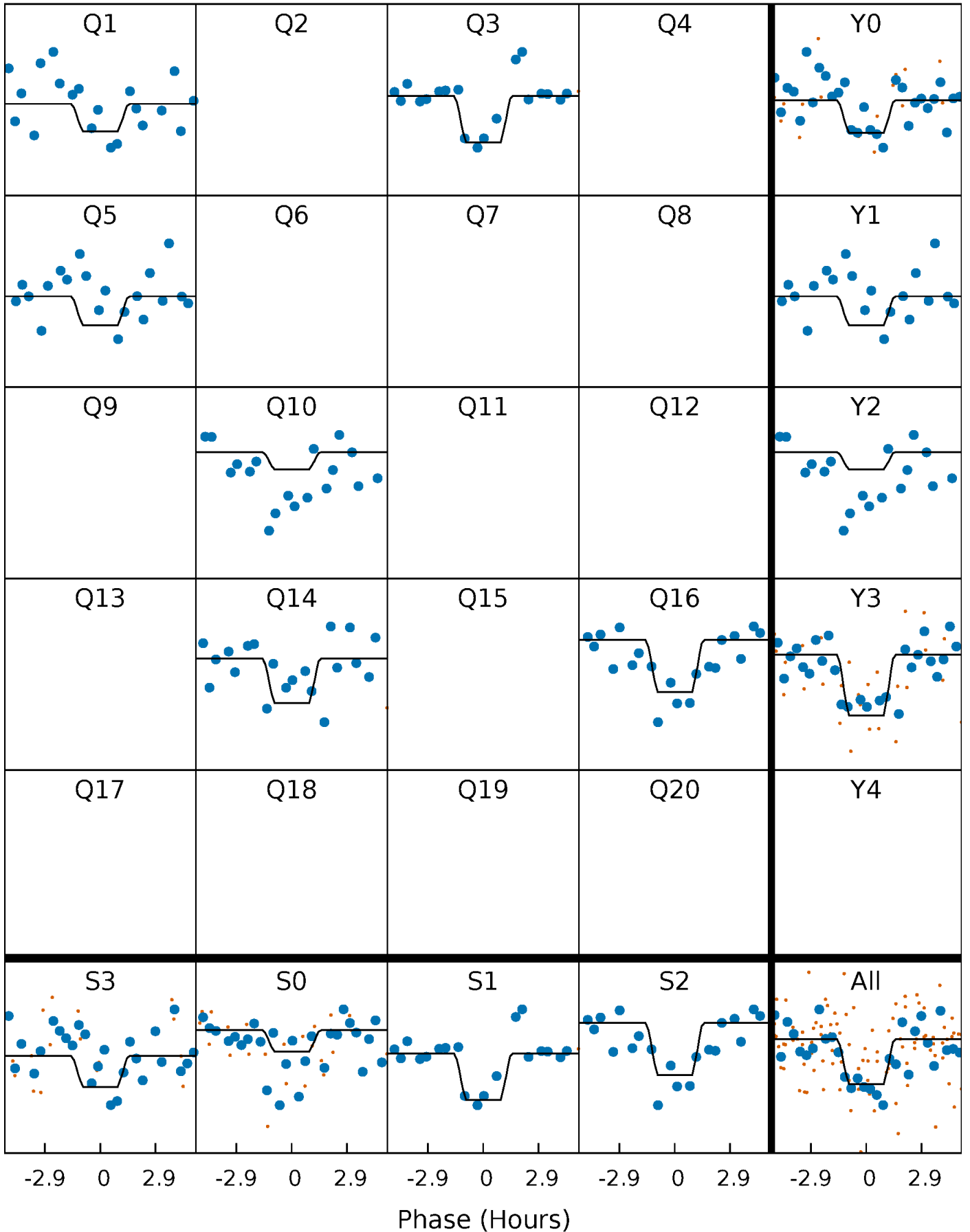
# DV Quarter-Phased Transit Curves

TCE 011516242-01 P=194.806227 Days  $T_0=147.778719$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

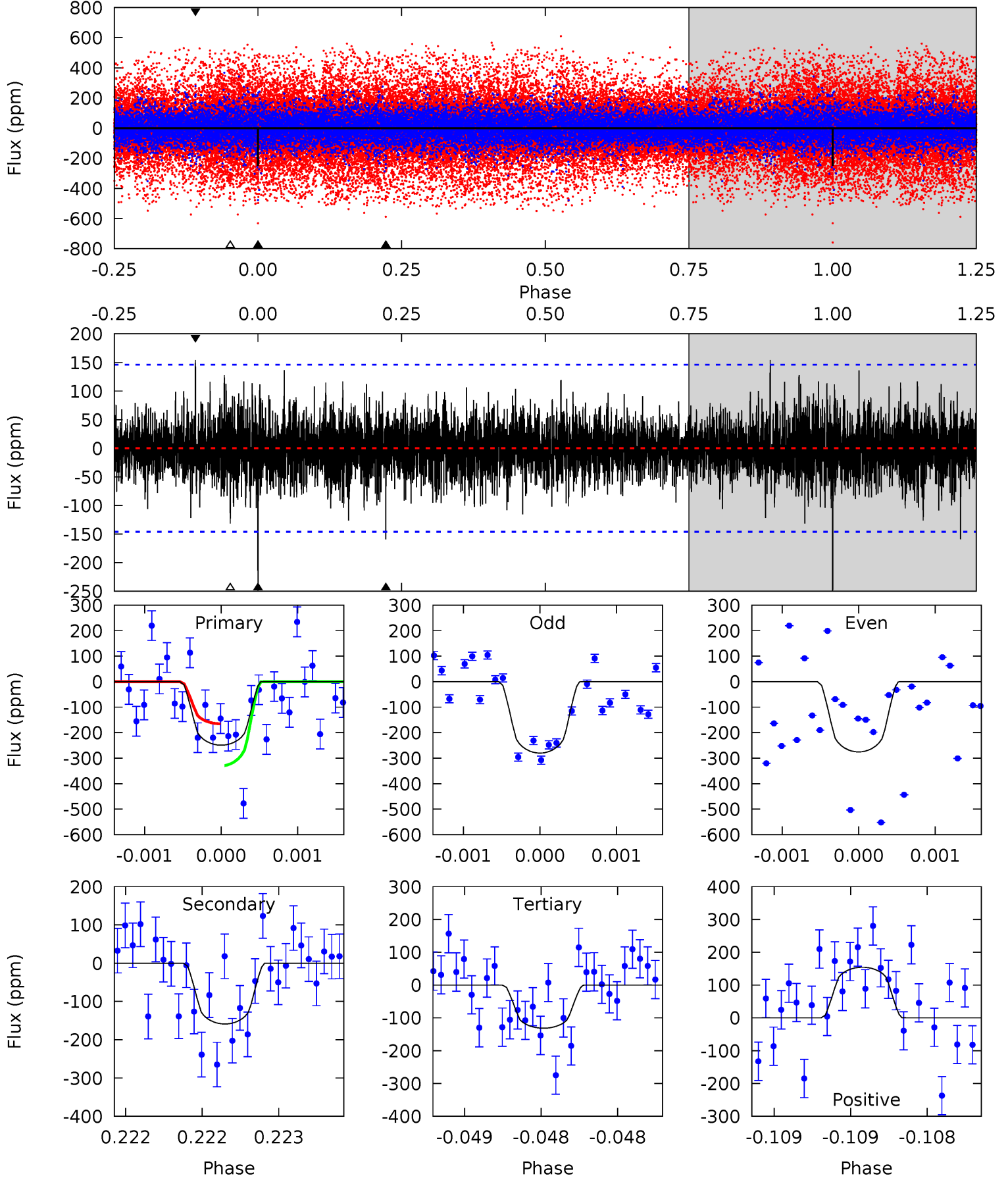
TCE 011516242-01 P=194.806271 Days  $T_0=147.780095$  (BKJD)



# DV Model-Shift Uniqueness Test

011516242-01, P = 194.806227 Days, E = 147.778719 Days

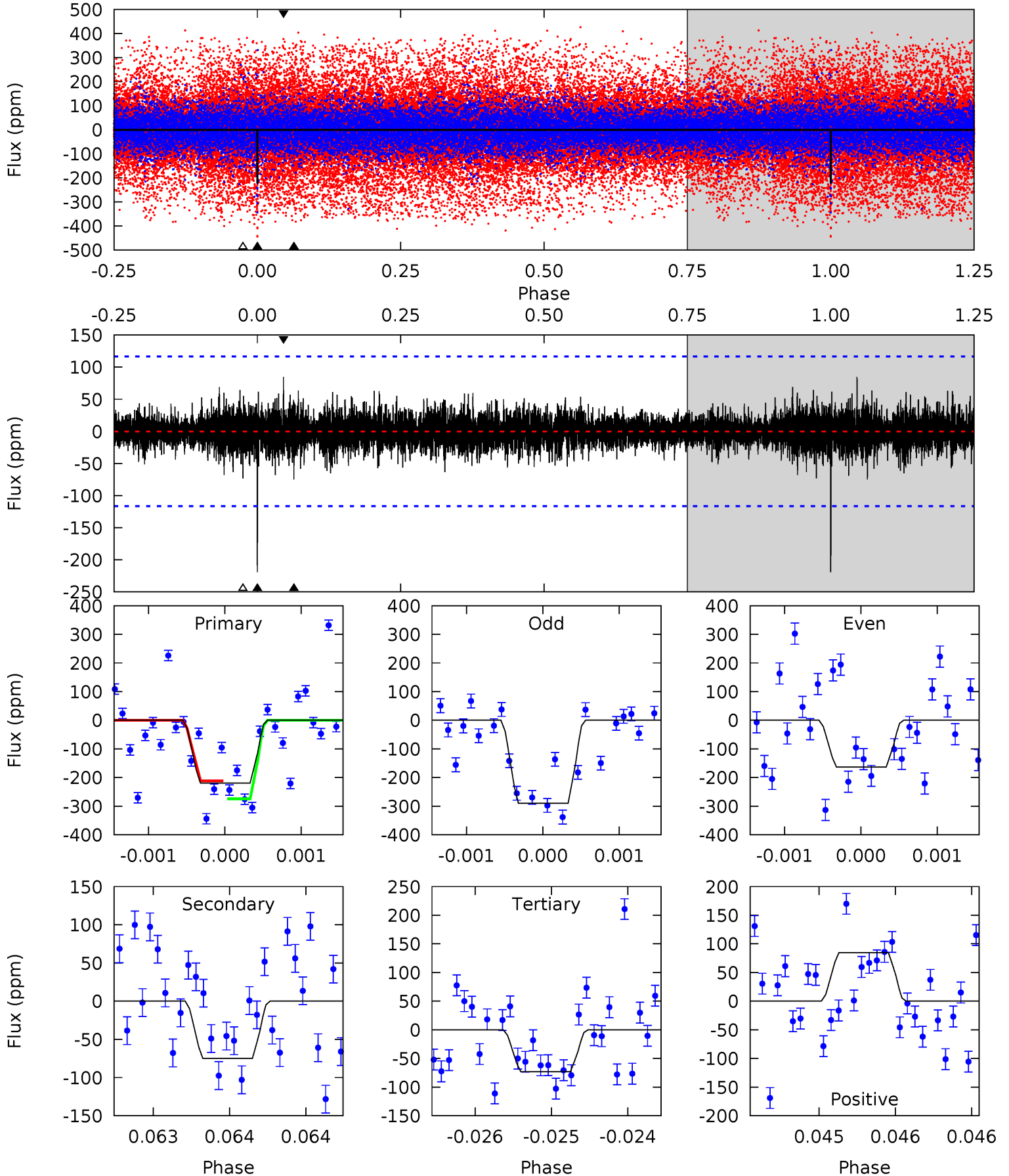
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.46	6.03	4.99	5.86	5.54	3.43	1.28	4.47	3.60	1.04	0.17	0.08	1.46	0.38	3.14



# Alt Model-Shift Uniqueness Test

011516242-01,  $P = 194.806271$  Days,  $E = 147.780095$  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
10.4	3.56	3.48	4.02	5.54	3.43	0.79	6.94	6.40	0.08	-0.46	3.02	1.30	0.28	1.45



### Stellar Parameters For KIC 011516242

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5099^{+153}_{-138}$	$3.925^{+0.624}_{-0.336}$	$0.000^{+0.300}_{-0.250}$	$1.725^{+0.966}_{-0.966}$	$0.914^{+0.161}_{-0.147}$	$0.251^{+2.506}_{-0.170}$
	+3%/-3%	+16%/-9%	+inf%/-inf%	+56%/-56%	+18%/-16%	+1000%/-68%
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 011516242-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-159 \pm 26$	$4.36^{+4.35}_{-2.85}$	$515^{+78}_{-83}$	$3911^{+1860}_{-664}$	$1784^{+12560}_{-1307}$
Alt.	$-75 \pm 21$	$3.97^{+3.84}_{-2.78}$	$517^{+76}_{-92}$	$3525^{+1881}_{-560}$	$997^{+9692}_{-737}$

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

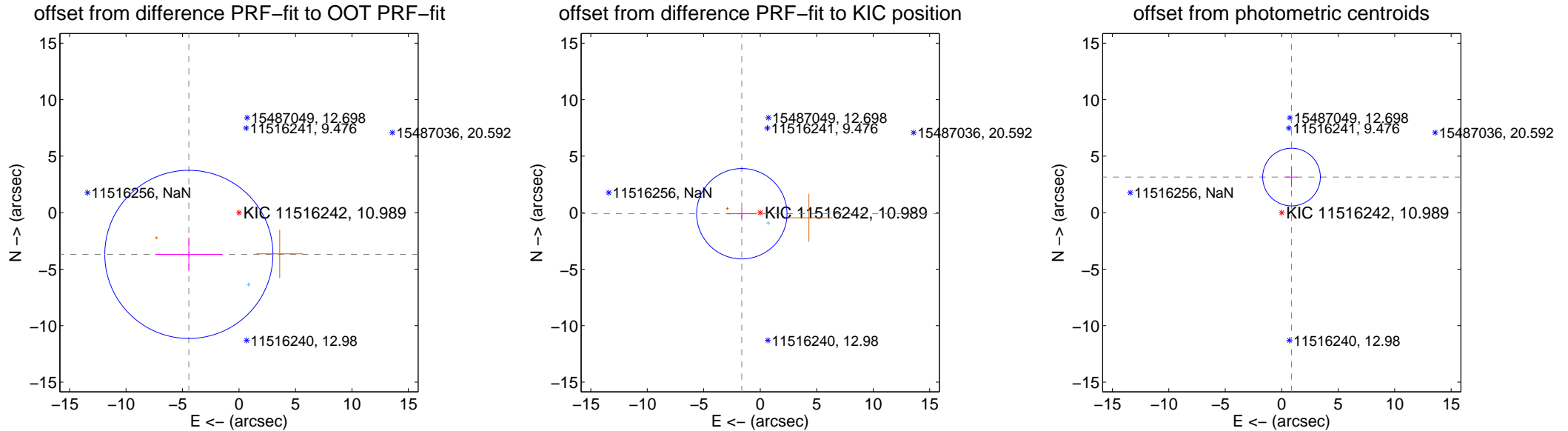
## DV Centroid Data

Supplemental centroid analysis for 011516242-01. **Kepler magnitude: 10.99.** Transit SNR 10.95

There are 1 quarters with good PRF difference image offsets

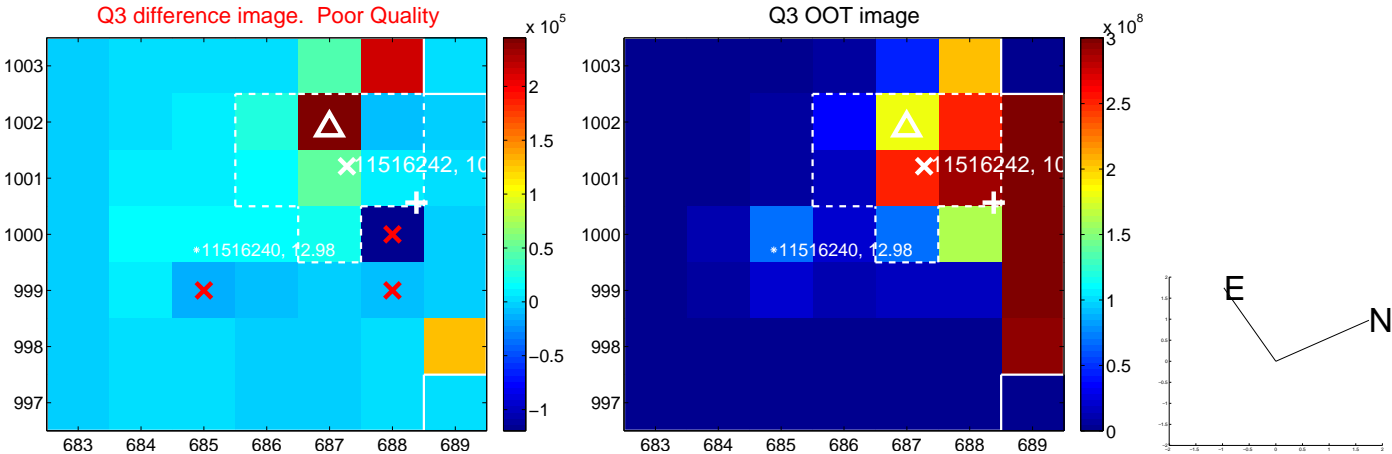
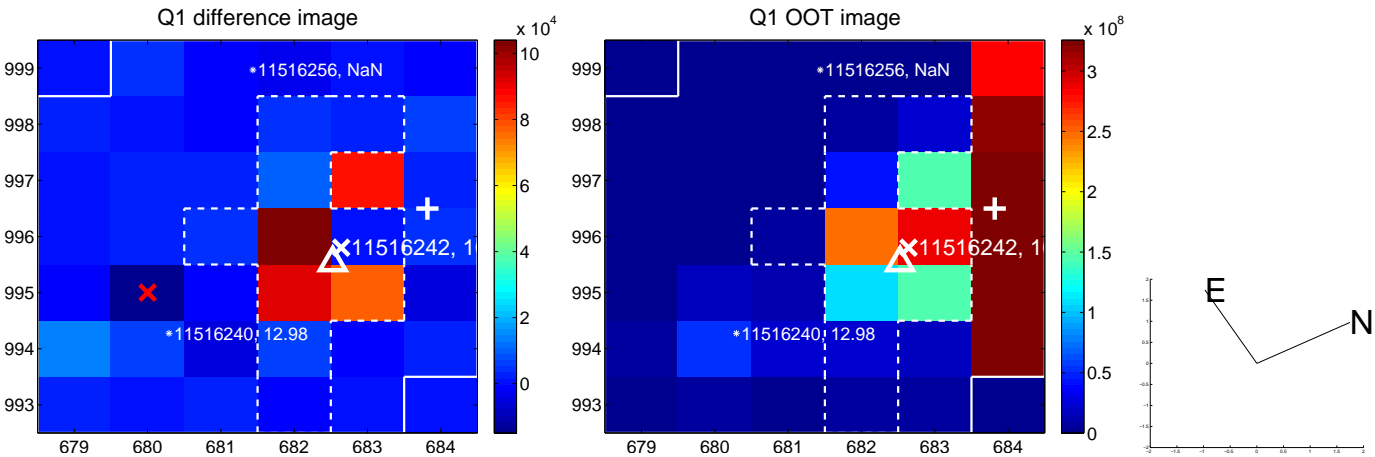
The OOT PRF centroid is offset from the target star catalog position by about 3.27 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.772 \pm 2.480$	2.33	$4.437 \pm 2.975$	$-3.692 \pm 1.503$
PRF-fit source offset from KIC position	$1.632 \pm 1.333$	1.22	$1.629 \pm 1.335$	$-0.096 \pm 0.470$
photometric centroid source offset	$3.27 \pm 0.85$	3.84	$-0.87 \pm 0.50$	$3.15 \pm 0.87$

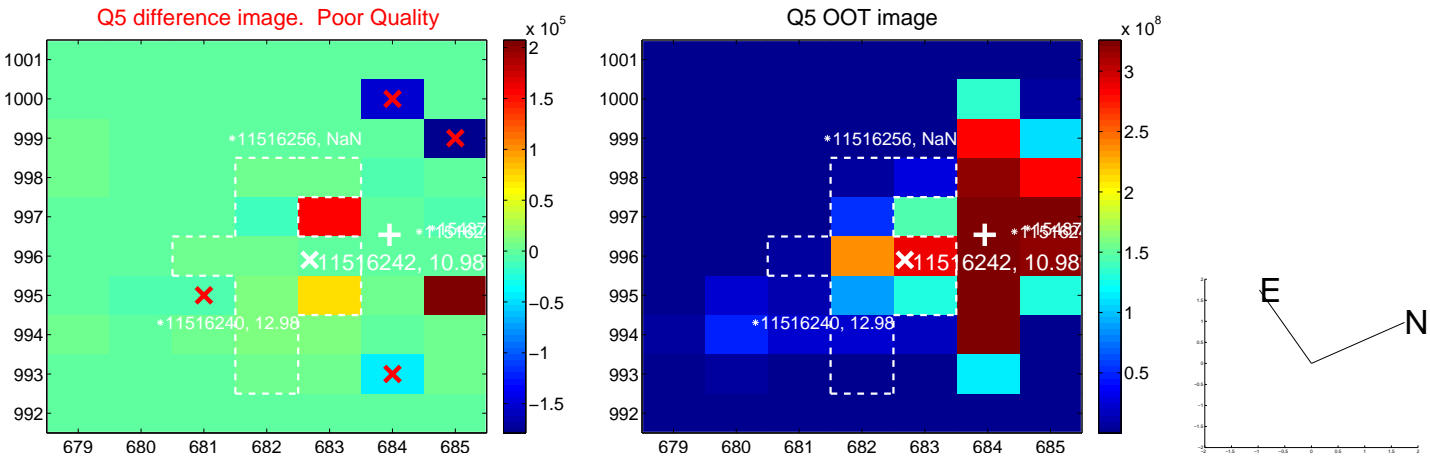


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



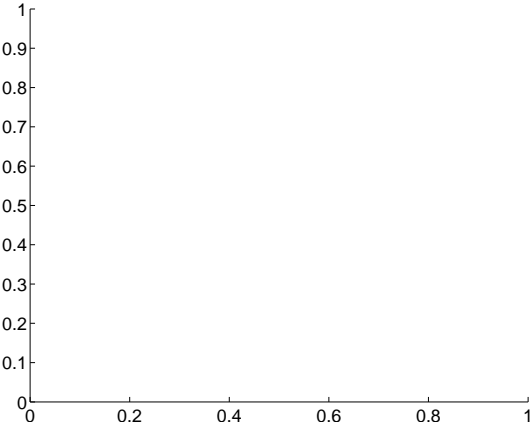
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



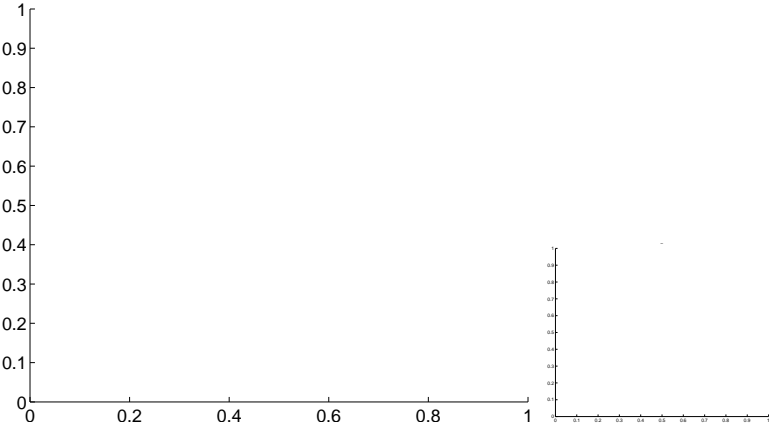


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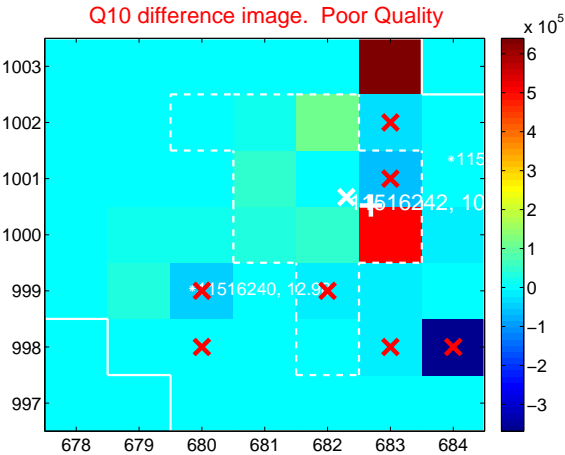
Q9 no difference image



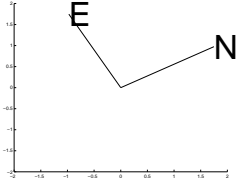
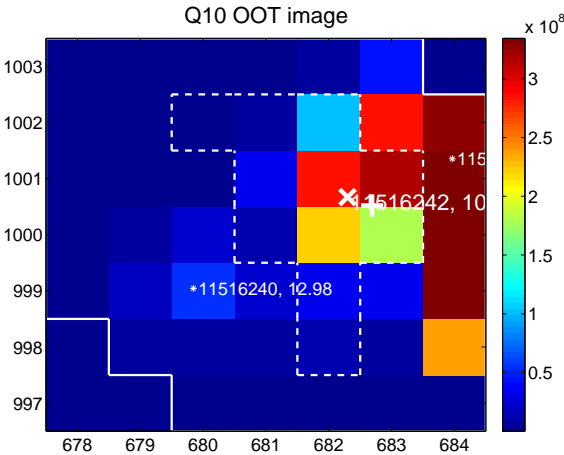
Q9 no OOT image



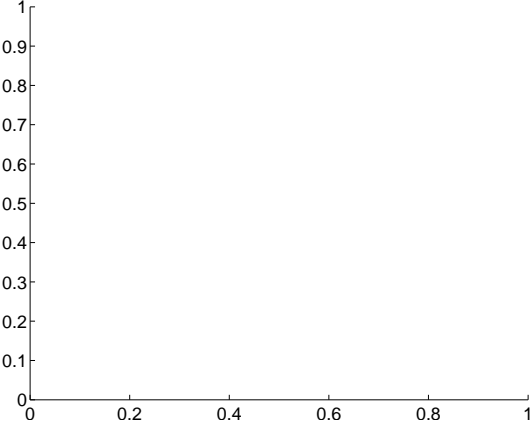
Q10 difference image. Poor Quality



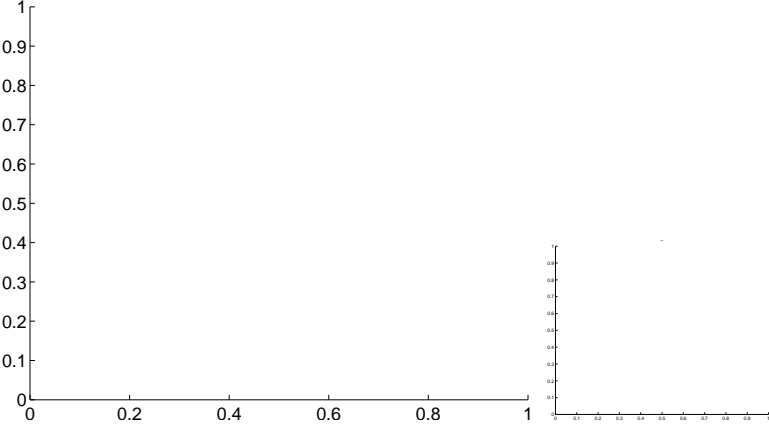
Q10 OOT image



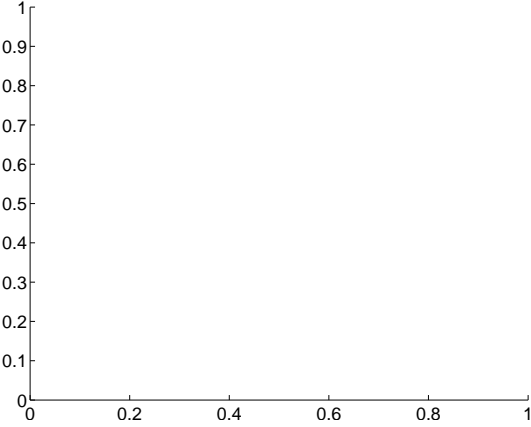
Q11 no difference image



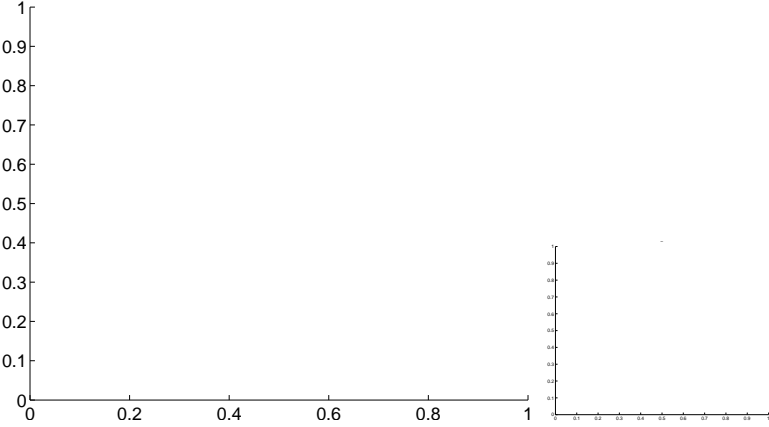
Q11 no OOT image



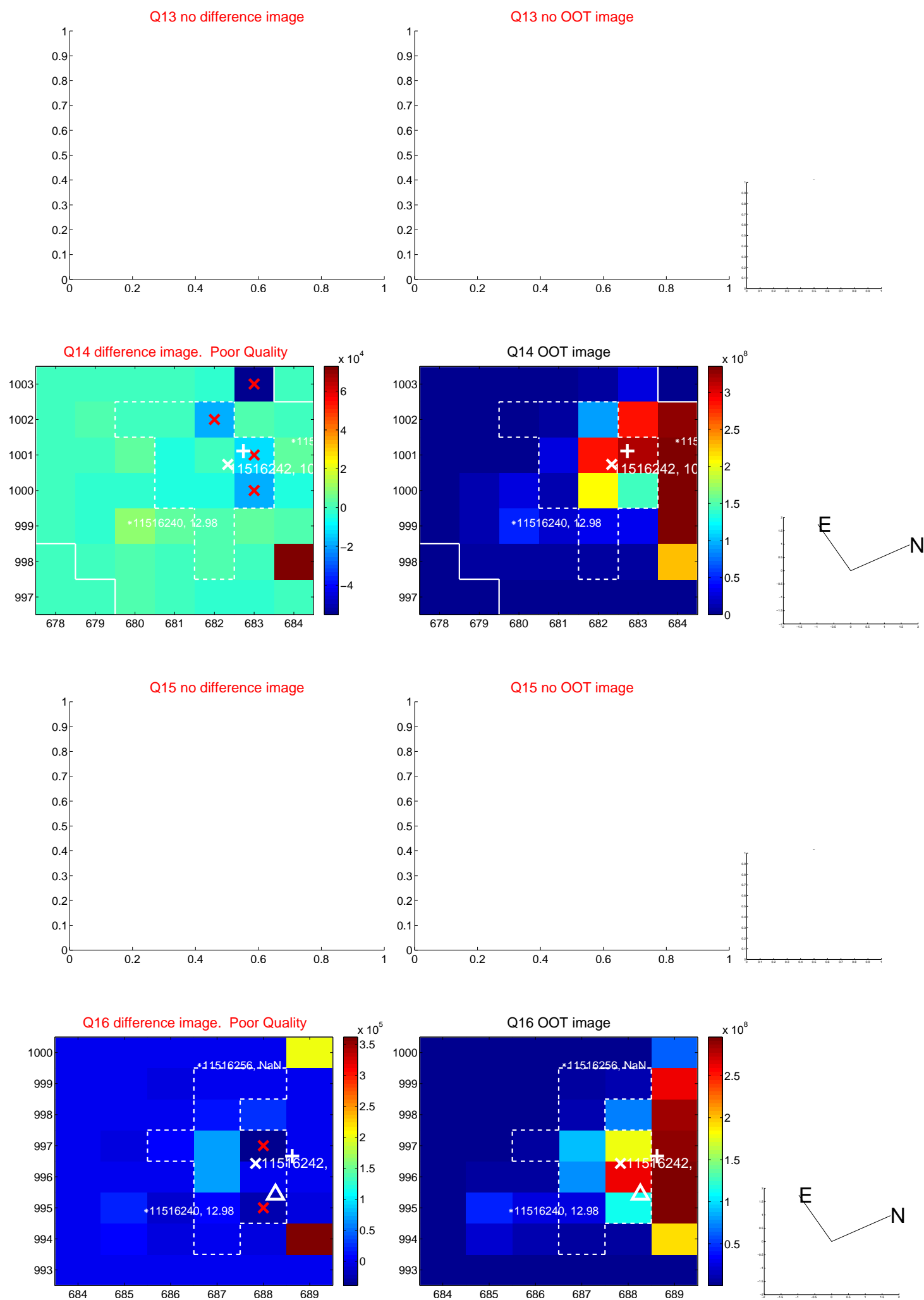
Q12 no difference image



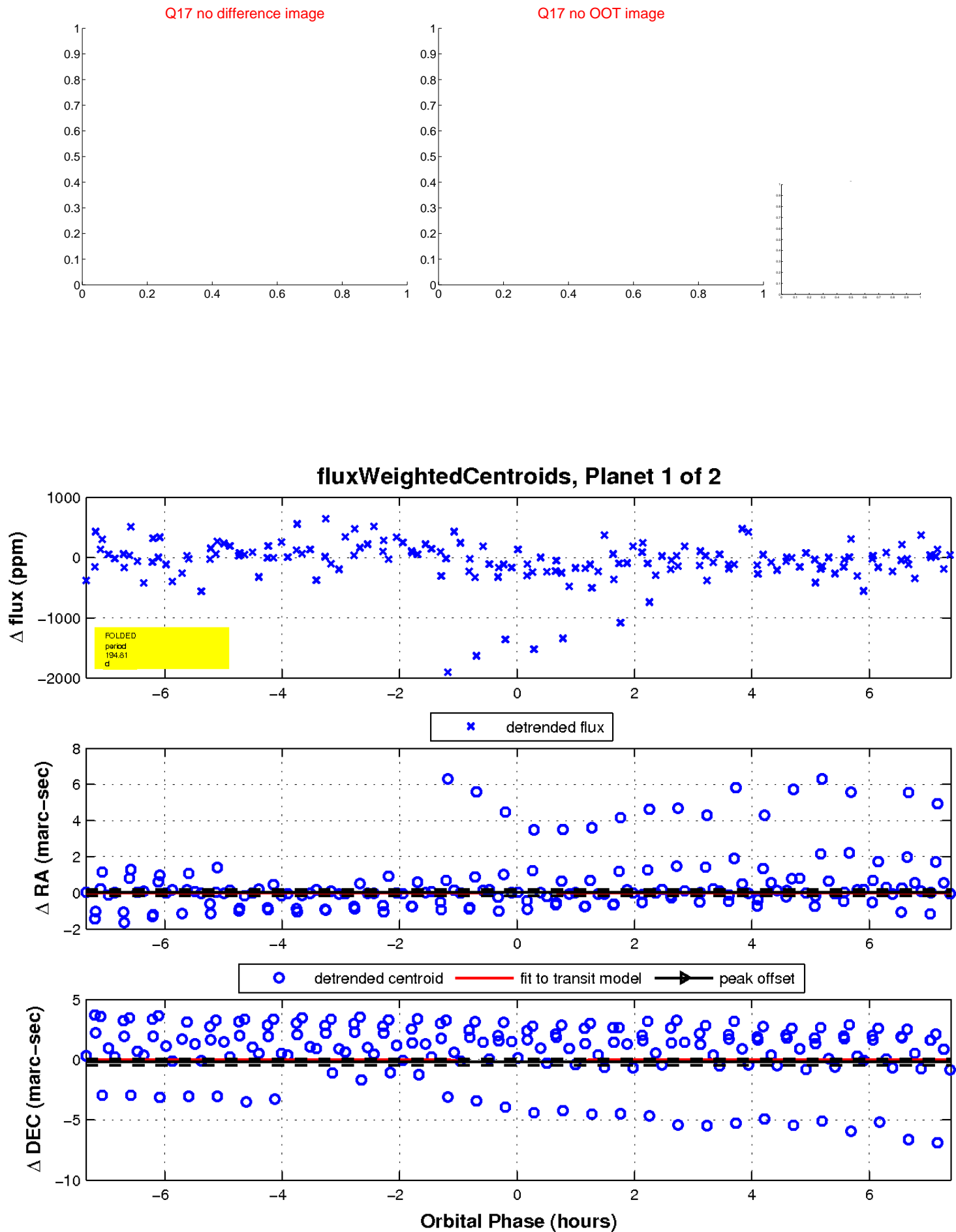
Q12 no OOT image



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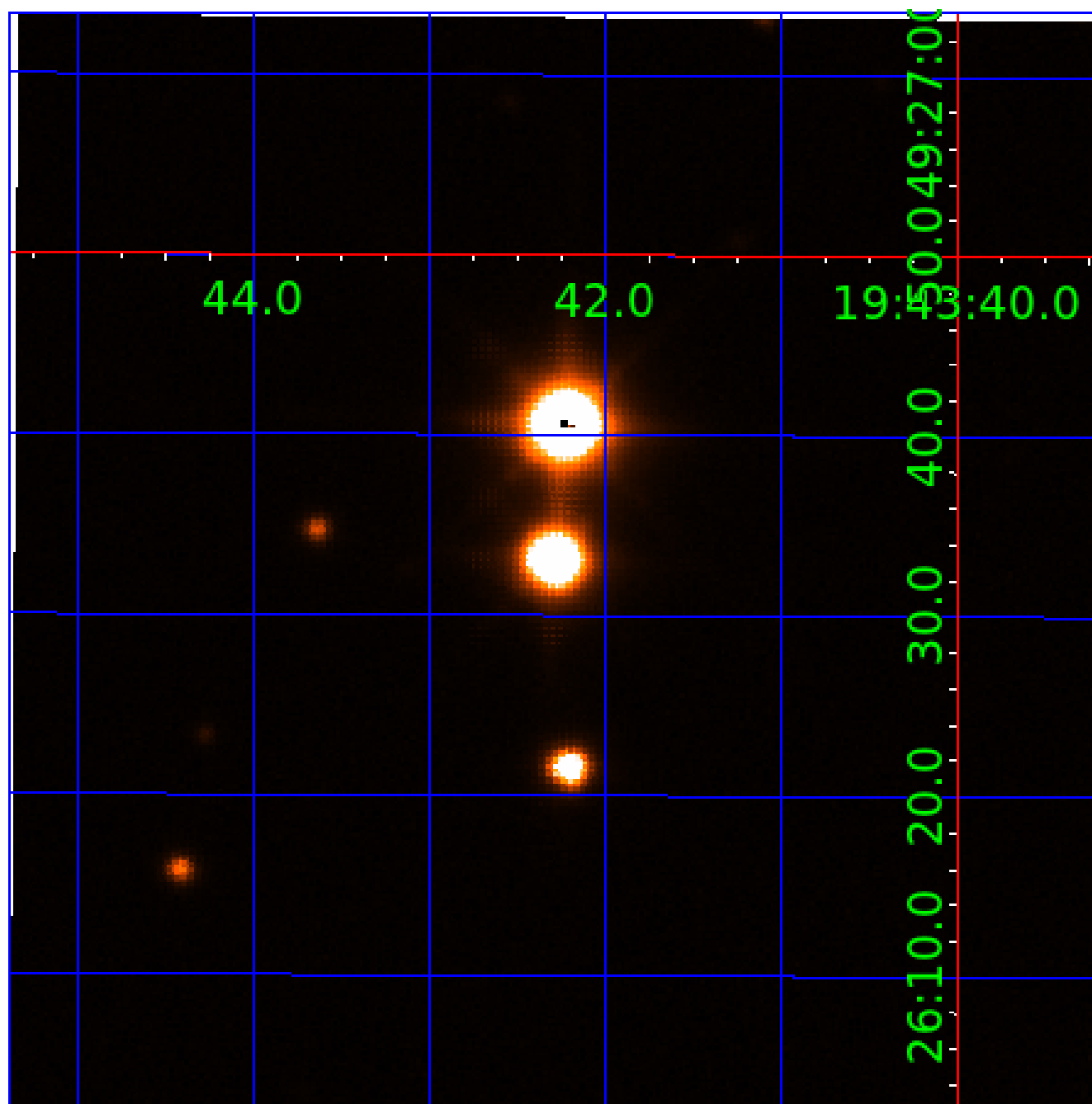


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 011516242

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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011516242-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_SATURATED

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

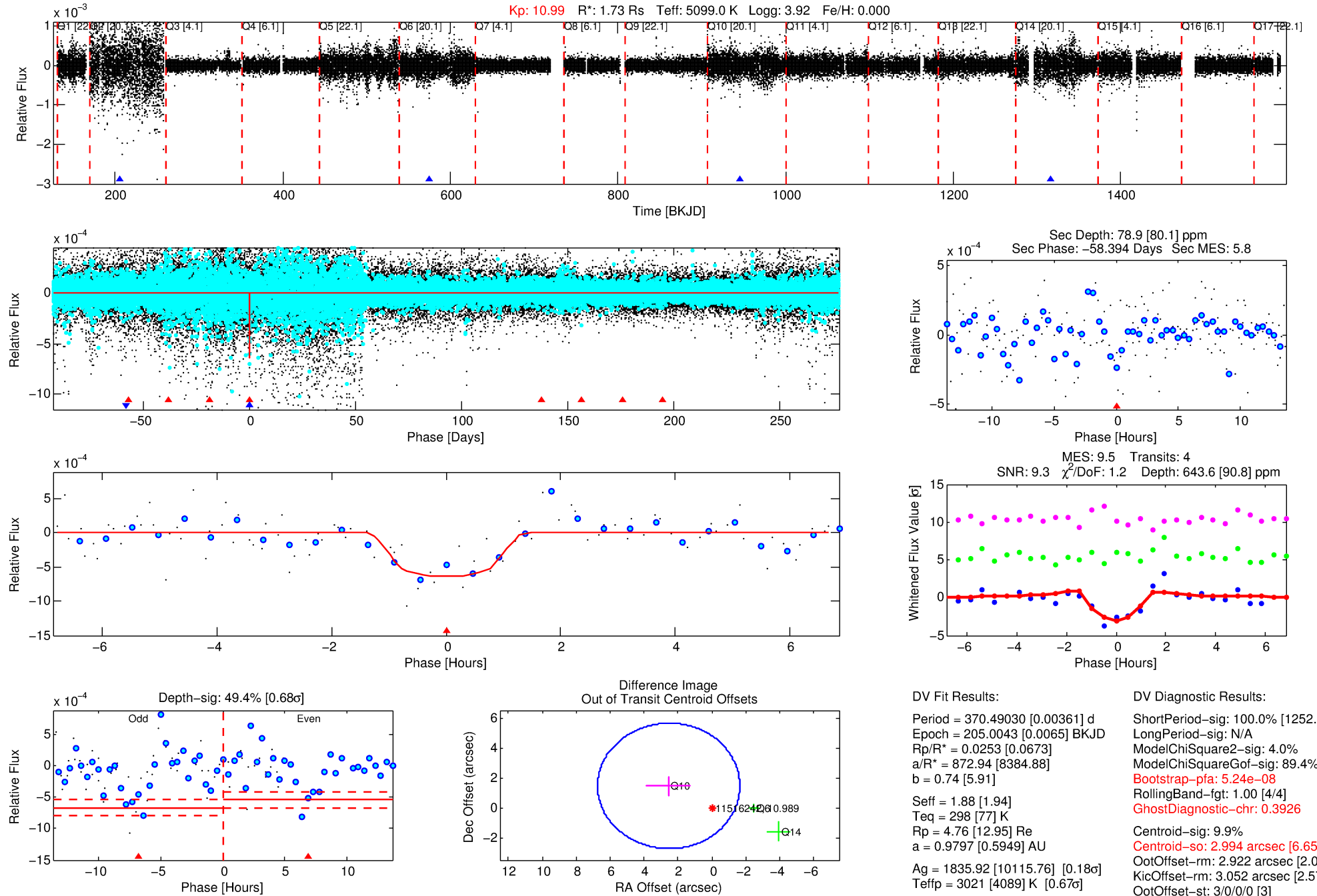
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011516242-02

No Significant Match Found

# DV One-Page Summary

KIC: 11516242 Candidate: 2 of 2 Period: 370.490 d



## DV Fit Results:

Period = 370.49030 [0.00361] d  
Epoch = 205.0043 [0.0065] BKJD  
Rp/R\* = 0.0253 [0.0673]  
a/R\* = 872.94 [8384.88]  
b = 0.74 [5.91]  
Seff = 1.88 [1.94]  
Teq = 298 [77] K  
Rp = 4.76 [12.95] Re  
a = 0.9797 [0.5949] AU  
Ag = 1835.92 [10115.76] [0.18σ]  
Teffp = 3021 [4089] K [0.67σ]

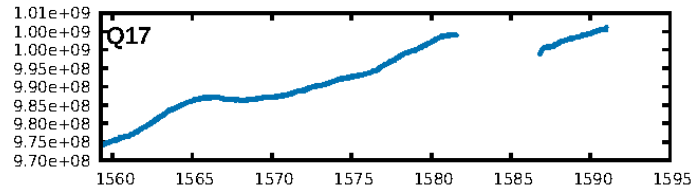
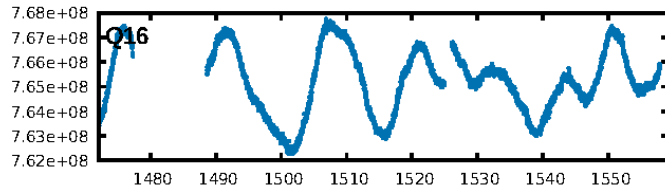
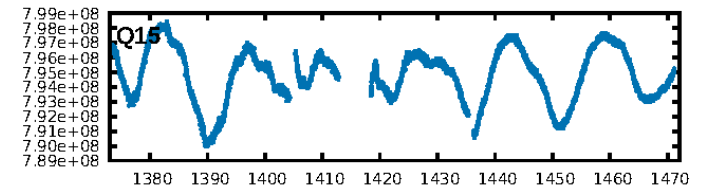
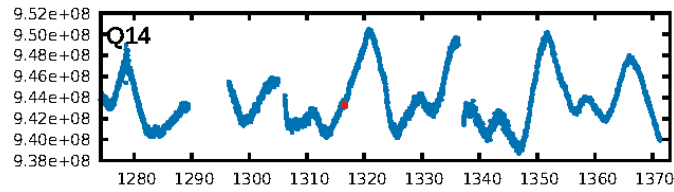
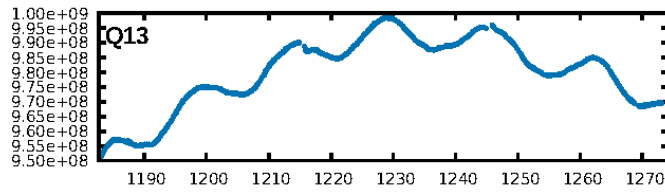
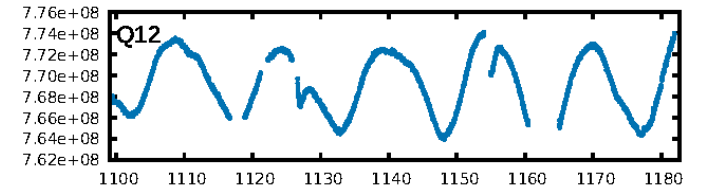
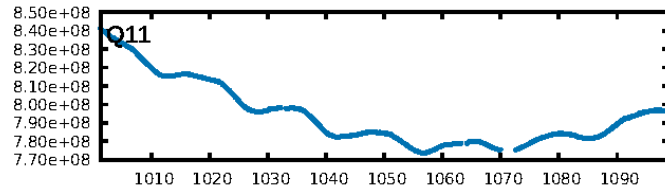
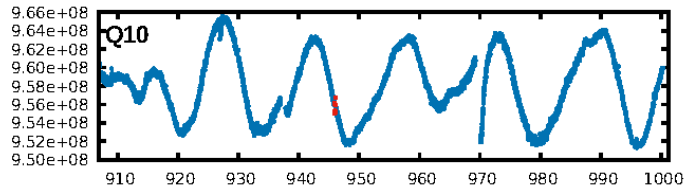
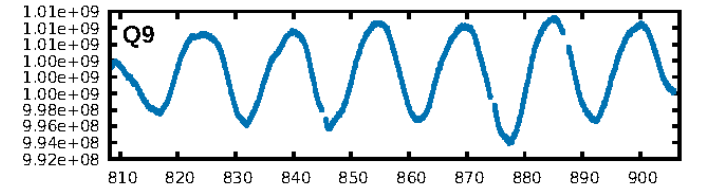
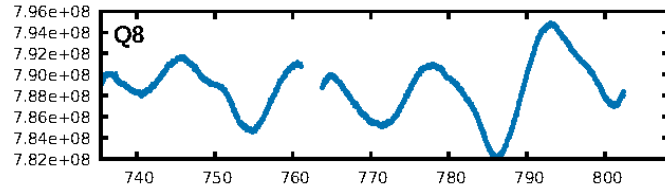
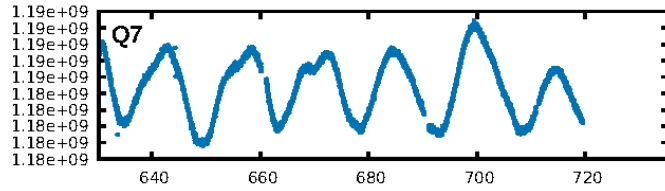
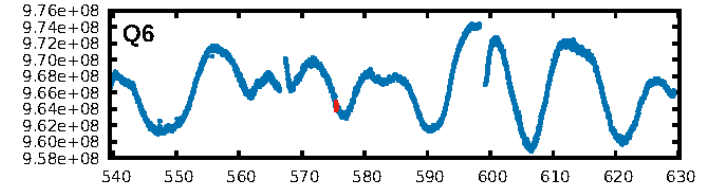
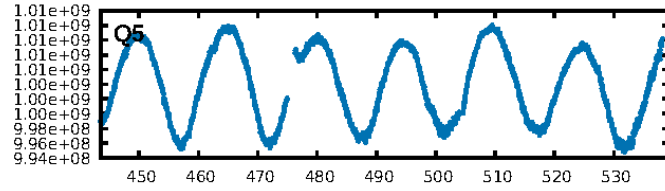
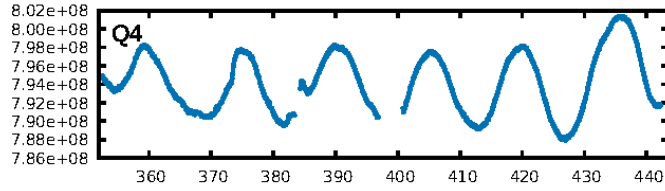
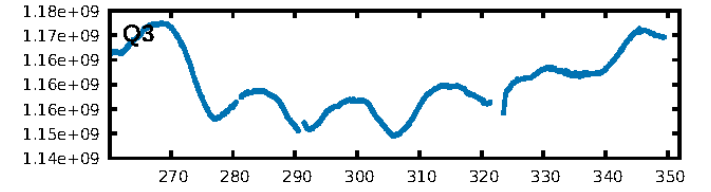
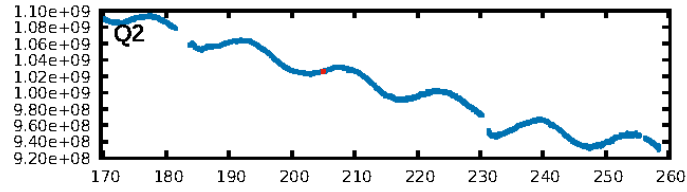
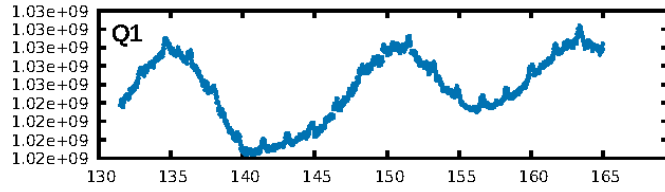
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1252.68σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 4.0%  
ModelChiSquareGof-sig: 89.4%  
**Bootstrap-pfa: 5.24e-08**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: 0.3926**  
Centroid-sig: 9.9%  
**Centroid-so: 2.994 arcsec [6.65σ]**  
OotOffset-rm: 2.922 arcsec [2.09σ]  
KicOffset-rm: 3.052 arcsec [2.57σ]  
OotOffset-st: 3/0/0/0 [3]  
KicOffset-st: 3/0/0/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.75 [3/4]

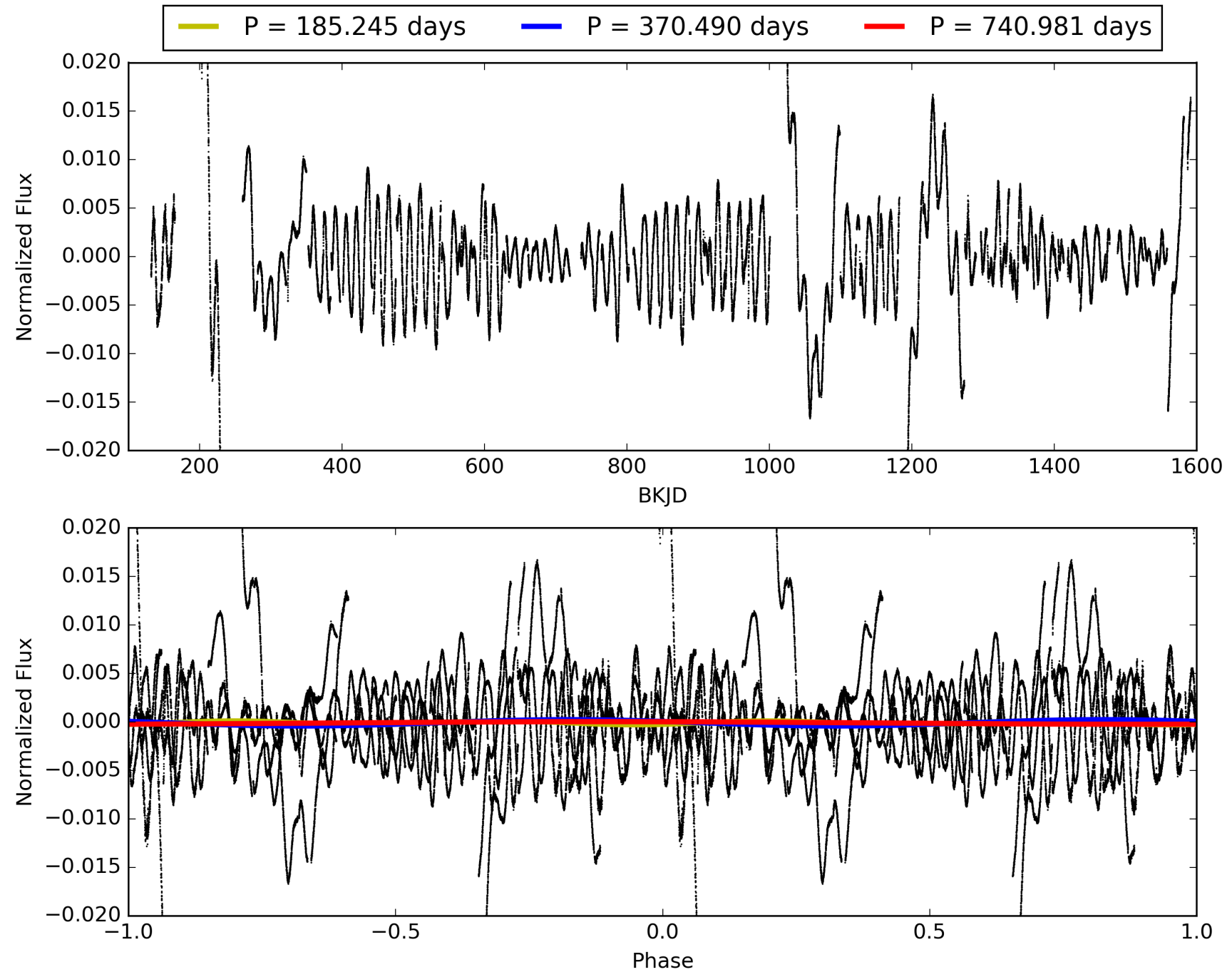
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 03:33:04 Z

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

# TCE 011516242-02, PDC Light Curves



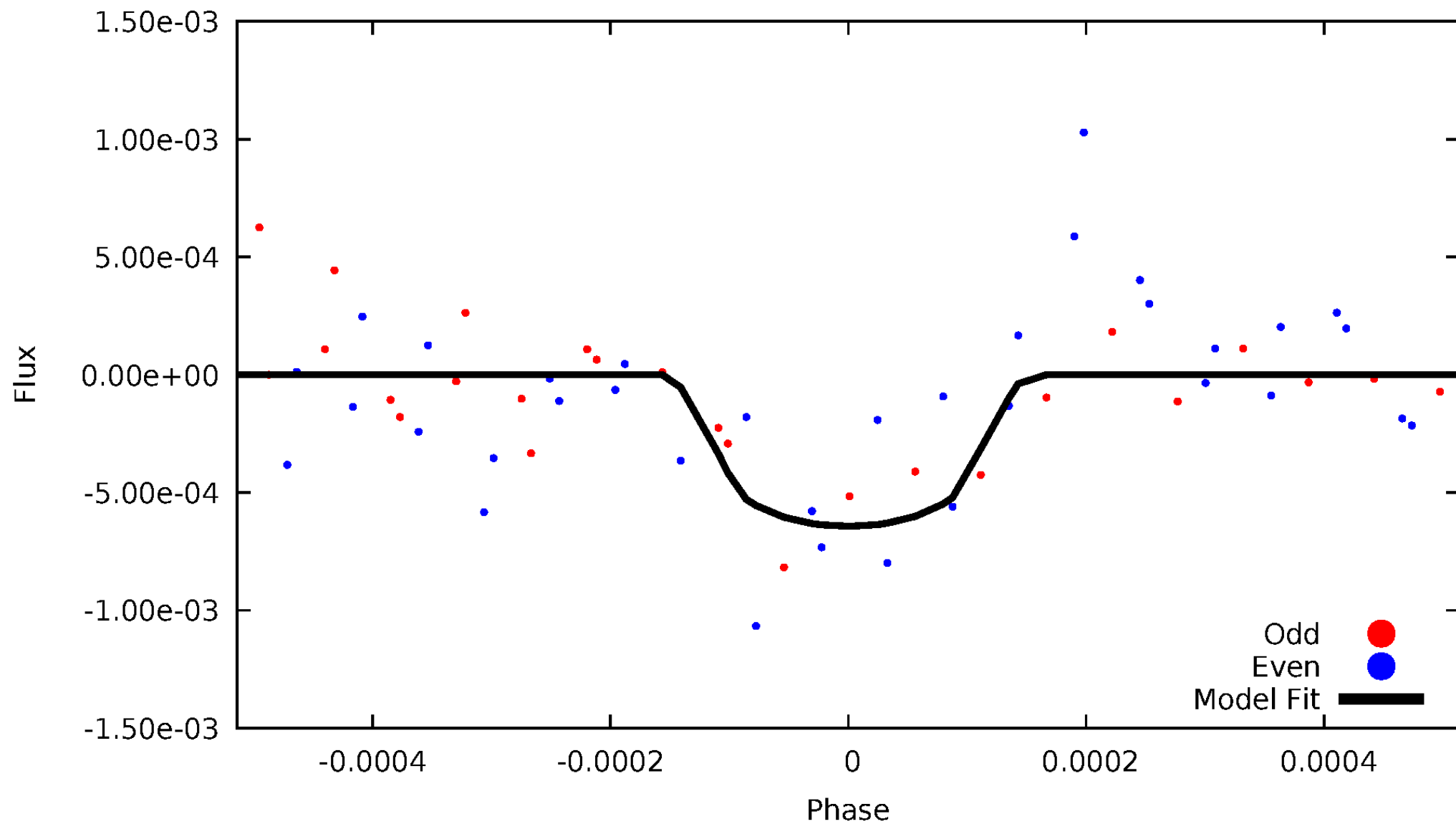
# TCE 011516242-02





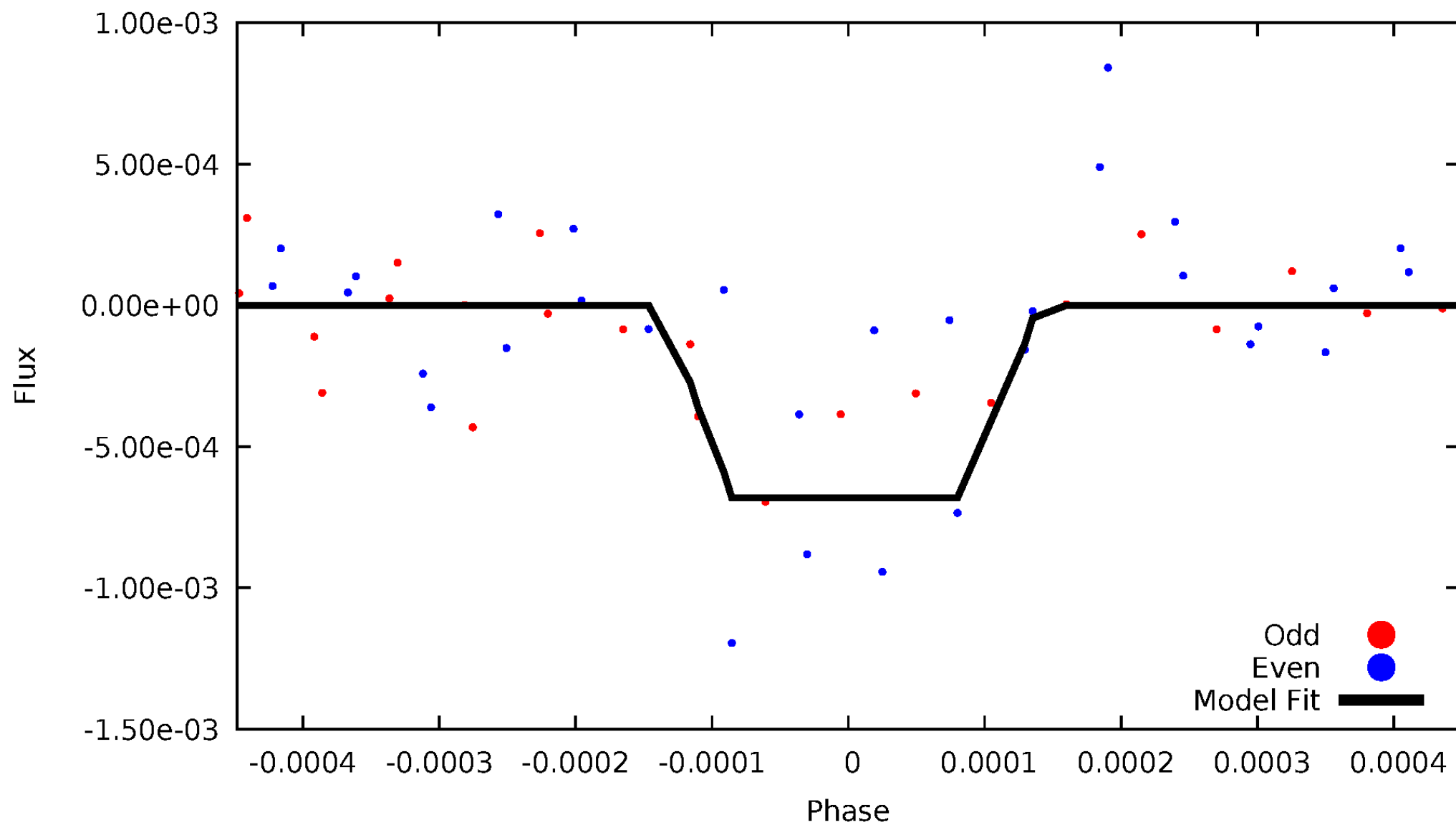
# DV Odd/Even

TCE 011516242-02



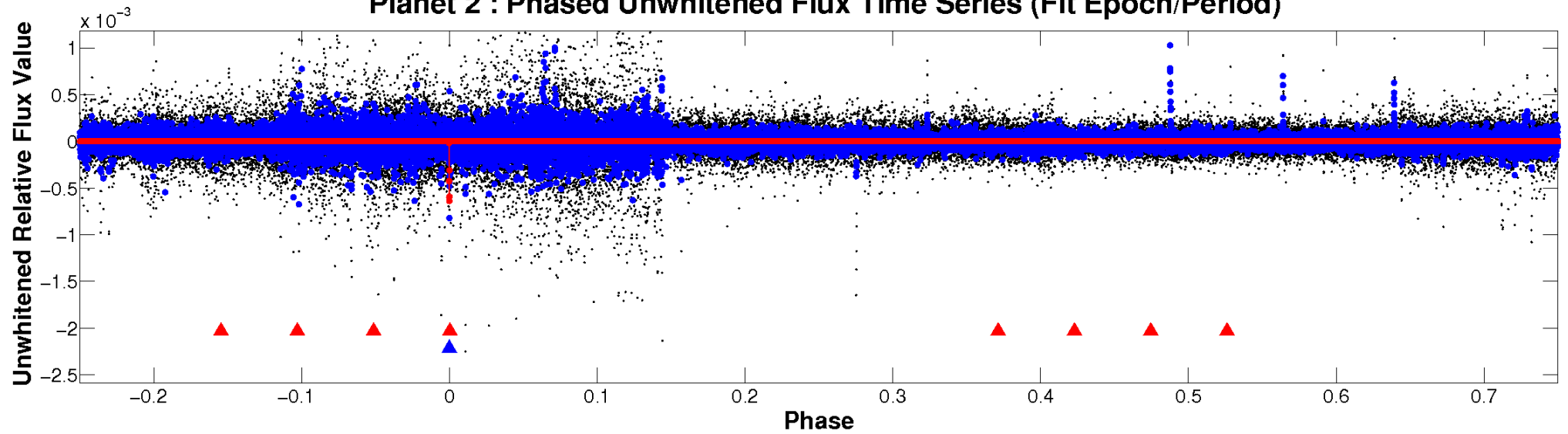
# ALT Odd/Even

TCE 011516242-02

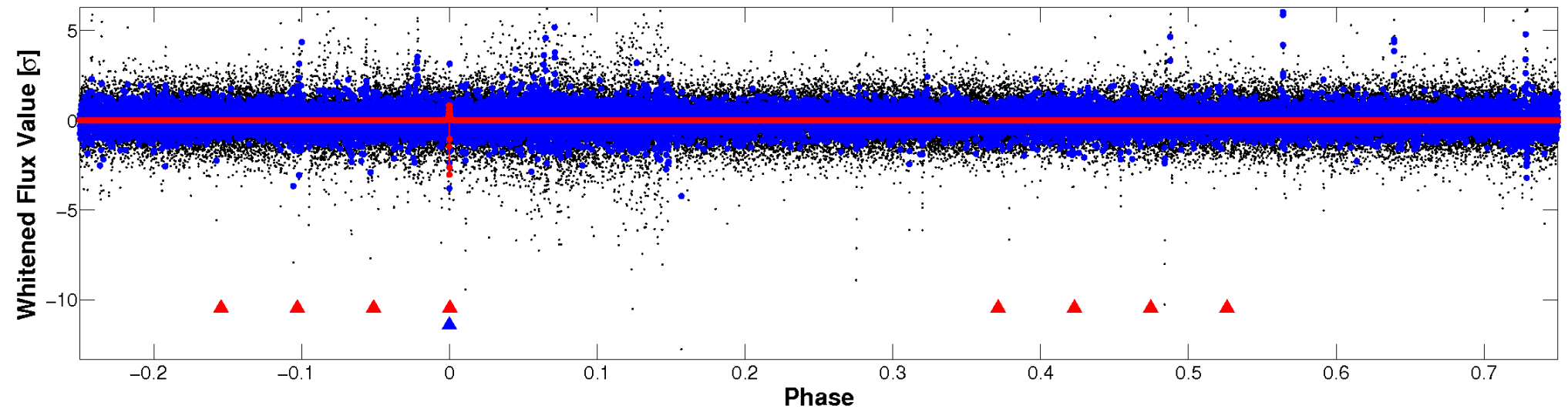


# Non-Whitened Vs. Whitened Light Curve

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

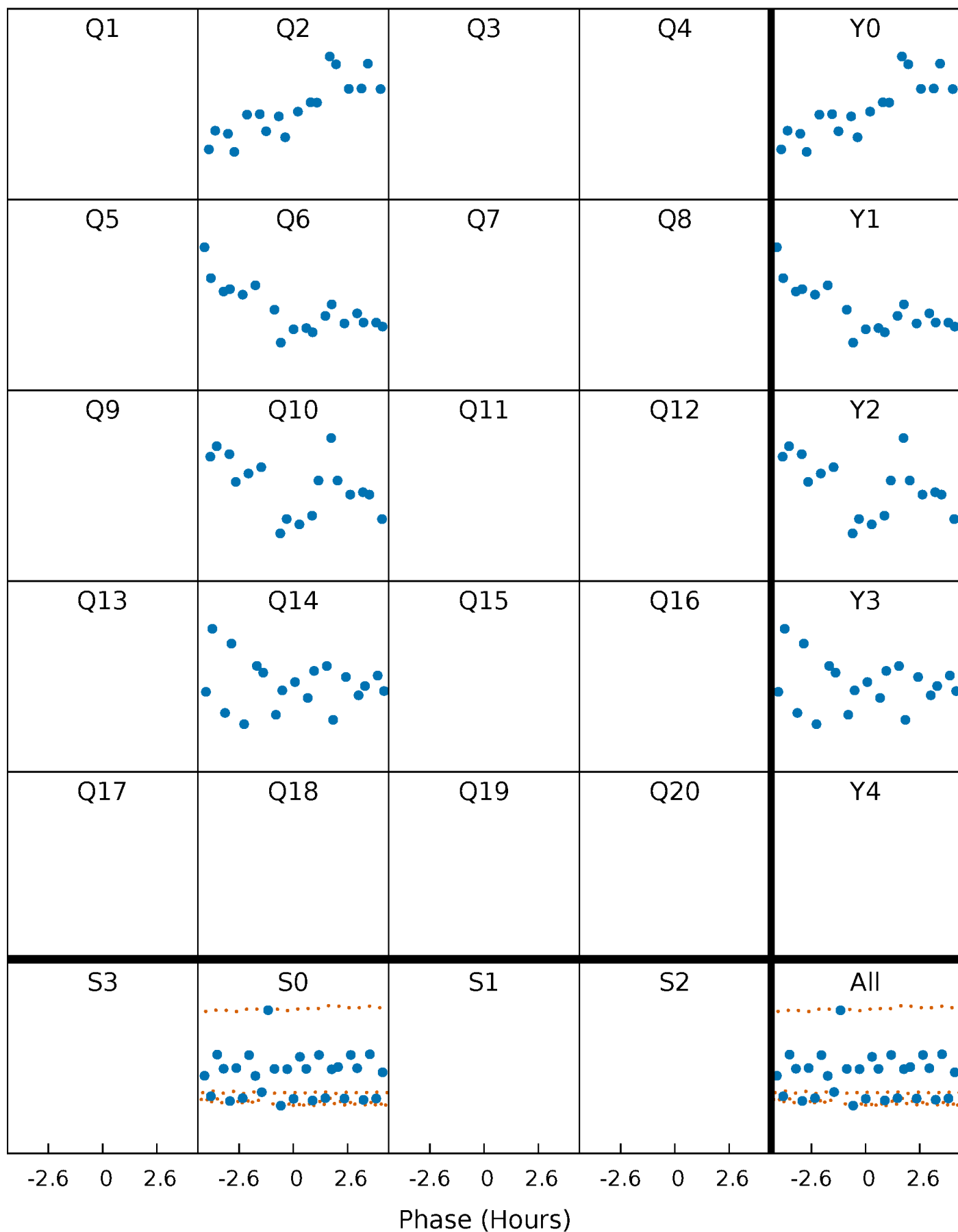


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



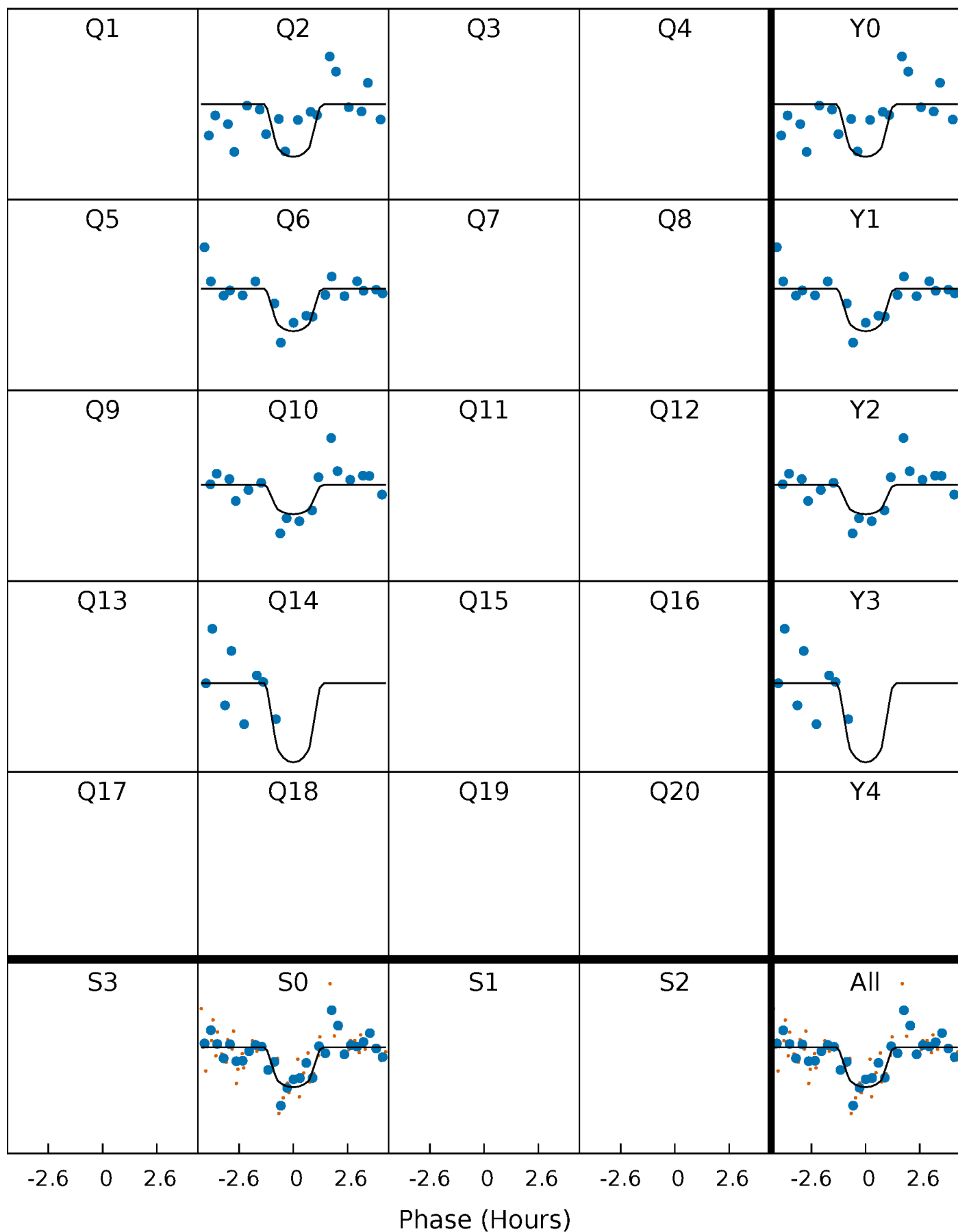
# PDC Quarter-Phased Transit Curves

TCE 011516242-02 P=370.490303 Days  $T_0=205.004311$  (BKJD)



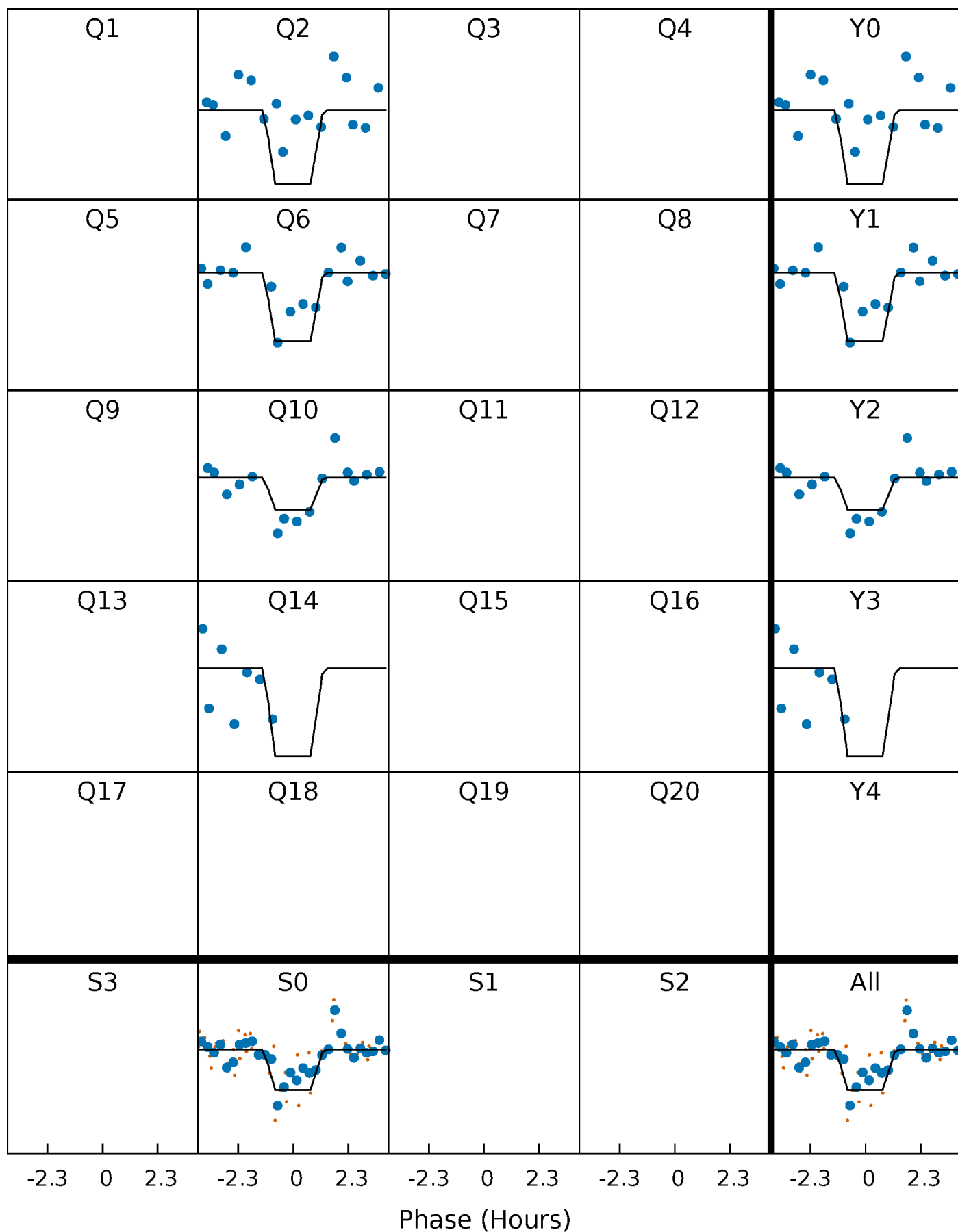
# DV Quarter-Phased Transit Curves

TCE 011516242-02 P=370.490303 Days  $T_0=205.004311$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

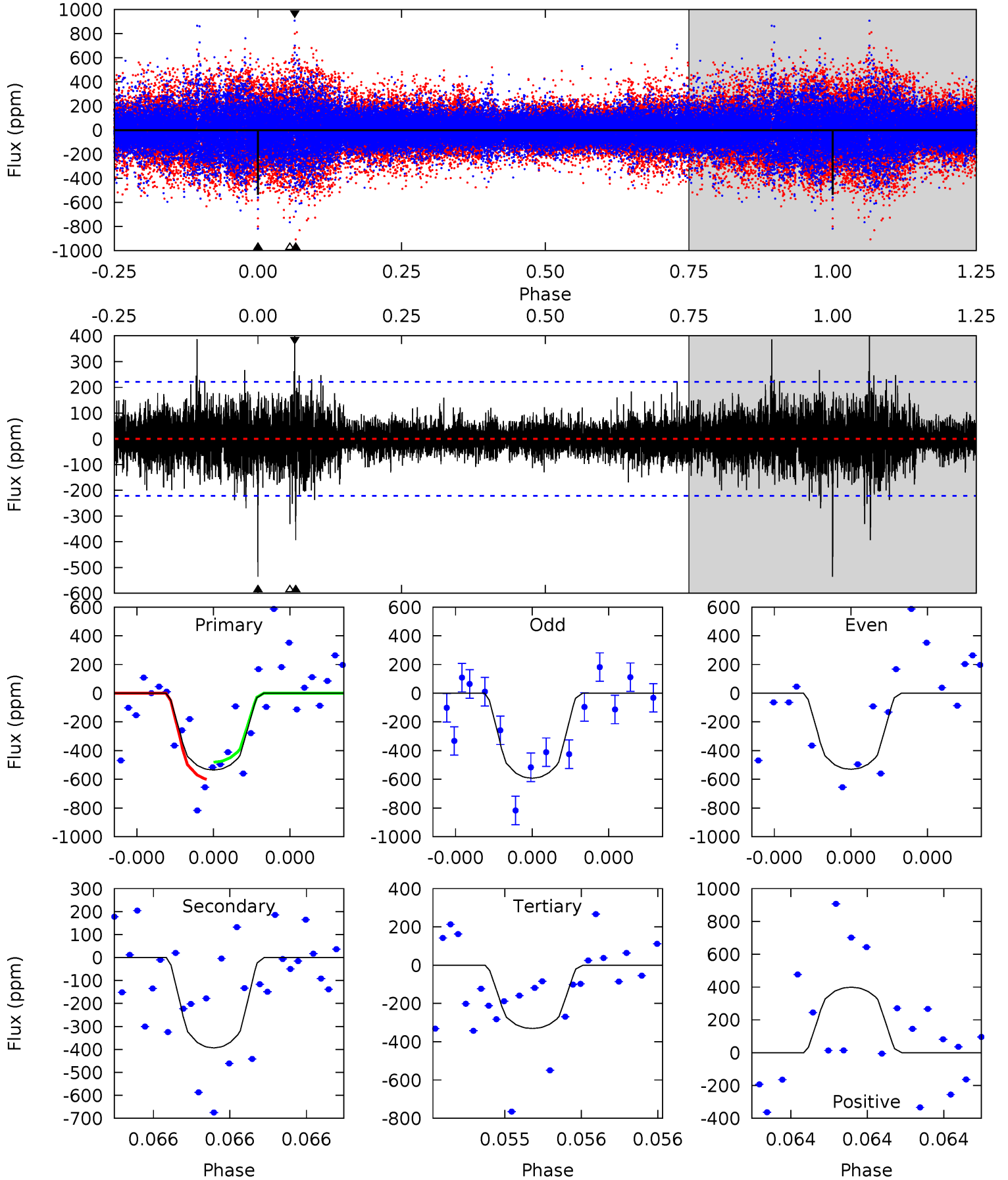
TCE 011516242-02 P=370.490688 Days  $T_0=205.006387$  (BKJD)



# DV Model-Shift Uniqueness Test

011516242-02, P = 370.490303 Days, E = 205.004311 Days

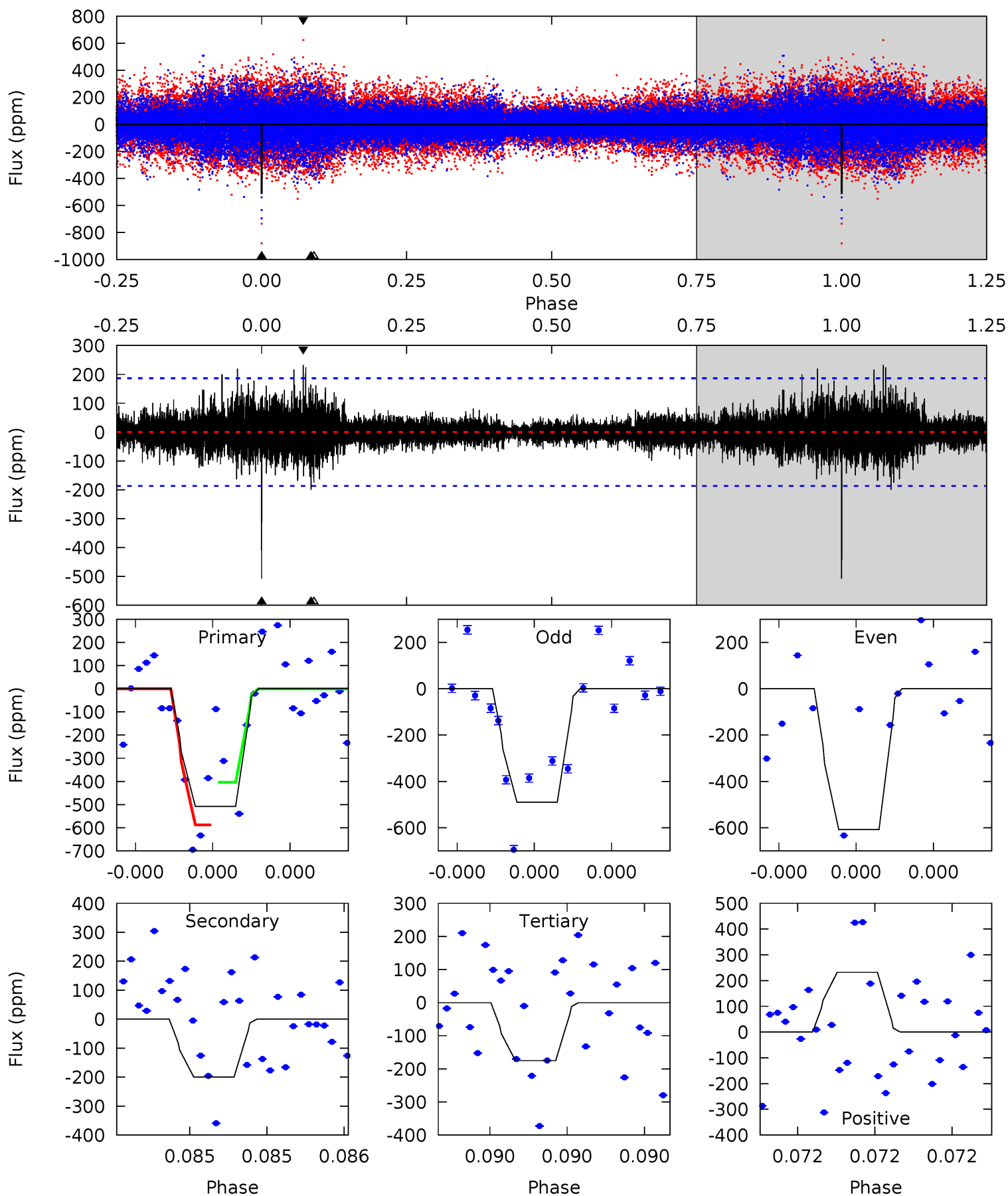
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.8	10.1	8.50	10.3	5.69	3.66	1.28	5.25	3.50	1.61	-0.14	0.70	0.97	0.43	1.51



# Alt Model-Shift Uniqueness Test

011516242-02, P = 370.490688 Days, E = 205.006387 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
15.4	6.07	5.33	7.05	5.68	3.64	0.92	10.1	8.39	0.74	-0.98	1.80	1.09	0.31	2.81





### Stellar Parameters For KIC 011516242

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5099^{+153}_{-138}$	$3.925^{+0.624}_{-0.336}$	$0.000^{+0.300}_{-0.250}$	$1.725^{+0.966}_{-0.966}$	$0.914^{+0.161}_{-0.147}$	$0.251^{+2.506}_{-0.170}$
	+3%/-3%	+16%/-9%	+inf%/-inf%	+56%/-56%	+18%/-16%	+1000%/-68%
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 011516242-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-394 \pm 39$	$10.20^{+11.49}_{-7.03}$	$412^{+60}_{-60}$	$3432^{+1861}_{-605}$	$1985^{+19244}_{-1549}$
Alt.	$-200 \pm 33$	$10.18^{+10.93}_{-7.14}$	$414^{+59}_{-61}$	$3125^{+1477}_{-523}$	$1027^{+10442}_{-795}$

$T_{max}$  = 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

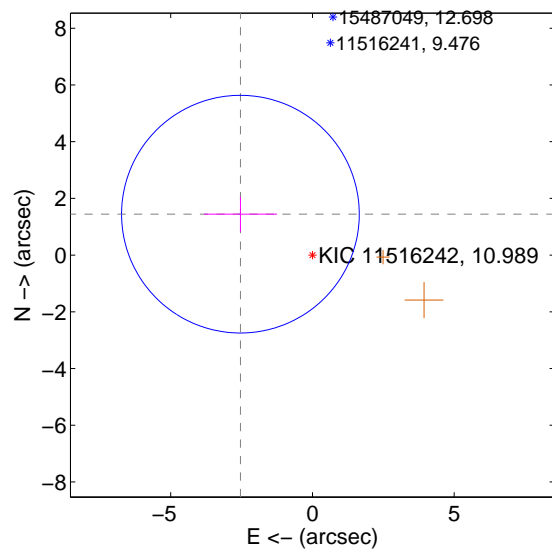
Supplemental centroid analysis for 011516242-02. **Kepler magnitude: 10.99.** Transit SNR 9.34

There are 1 quarters with good PRF difference image offsets

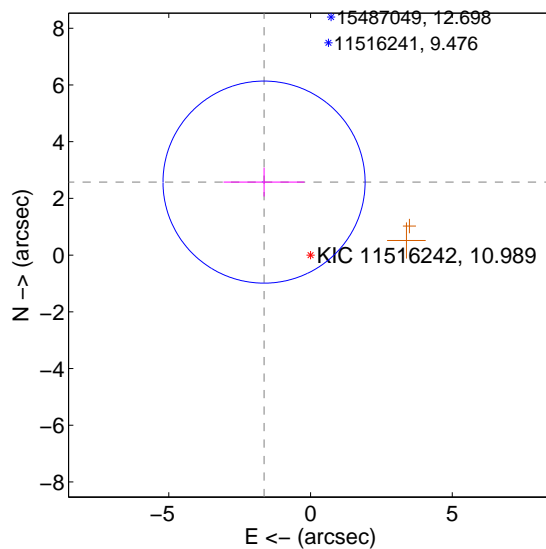
The OOT PRF centroid is offset from the target star catalog position by about 2.17 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.922 \pm 1.397$	2.09	$2.540 \pm 1.289$	$1.444 \pm 0.612$
PRF-fit source offset from KIC position	$3.052 \pm 1.188$	2.57	$1.639 \pm 1.429$	$2.575 \pm 0.509$
photometric centroid source offset	<b><math>2.99 \pm 0.45</math></b>	<b>6.65</b>	$-0.52 \pm 0.51$	$2.95 \pm 0.45$

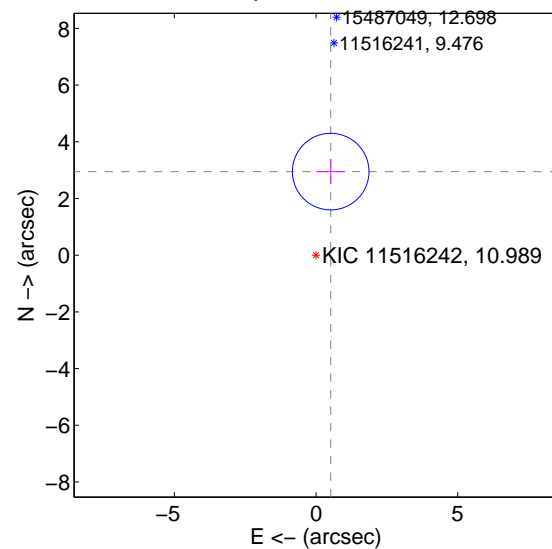
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

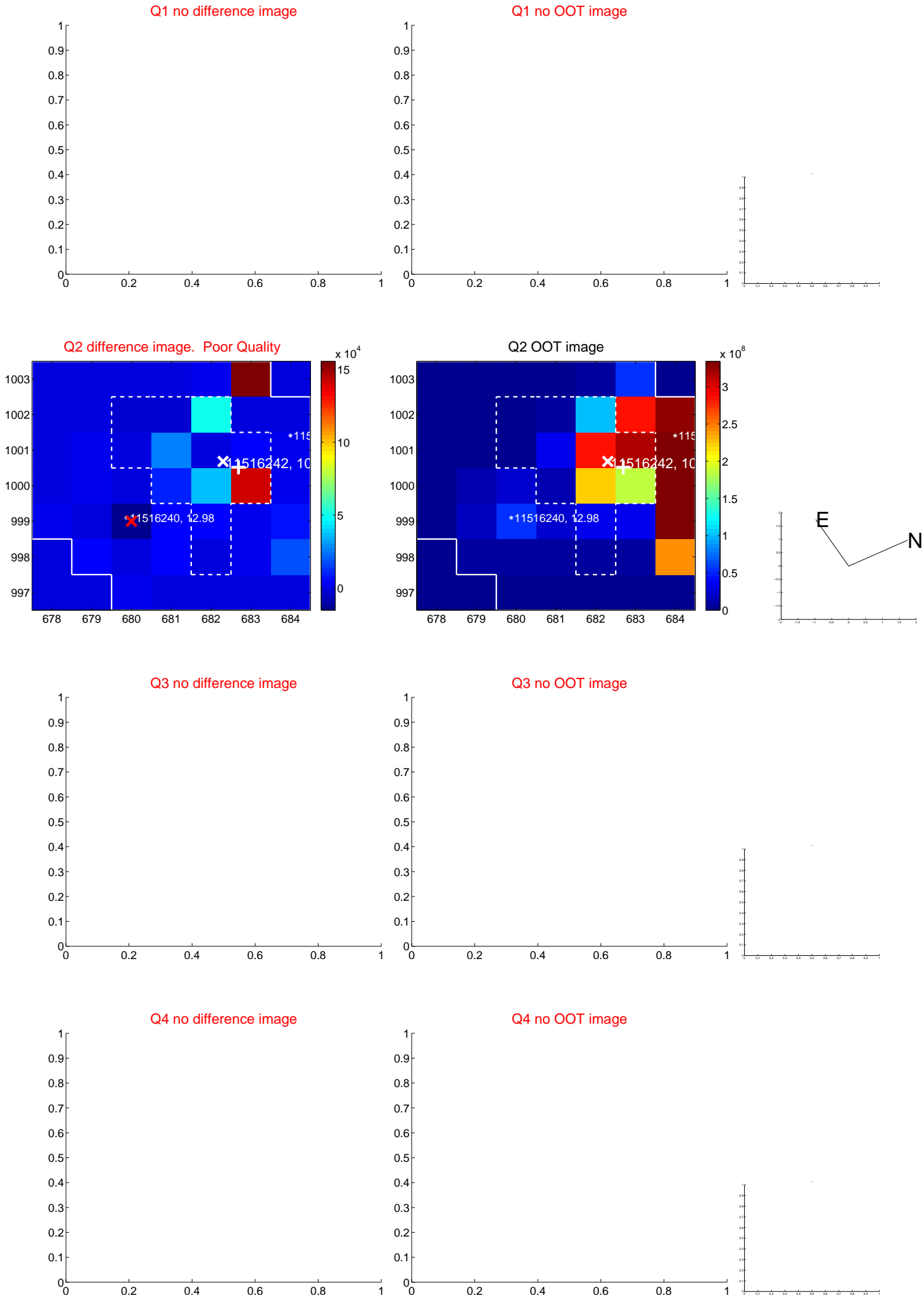


offset from photometric centroids

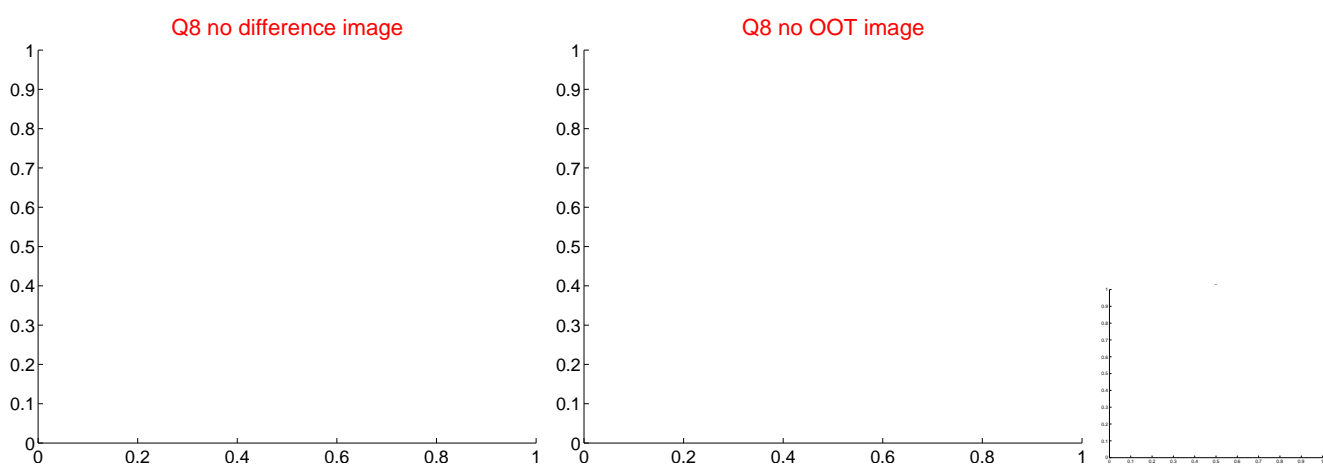
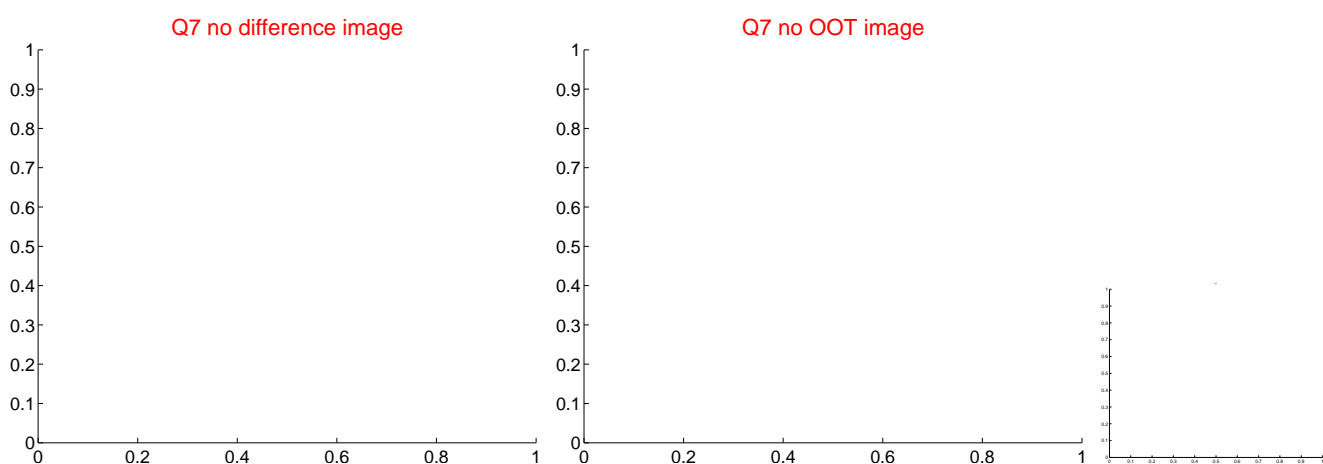
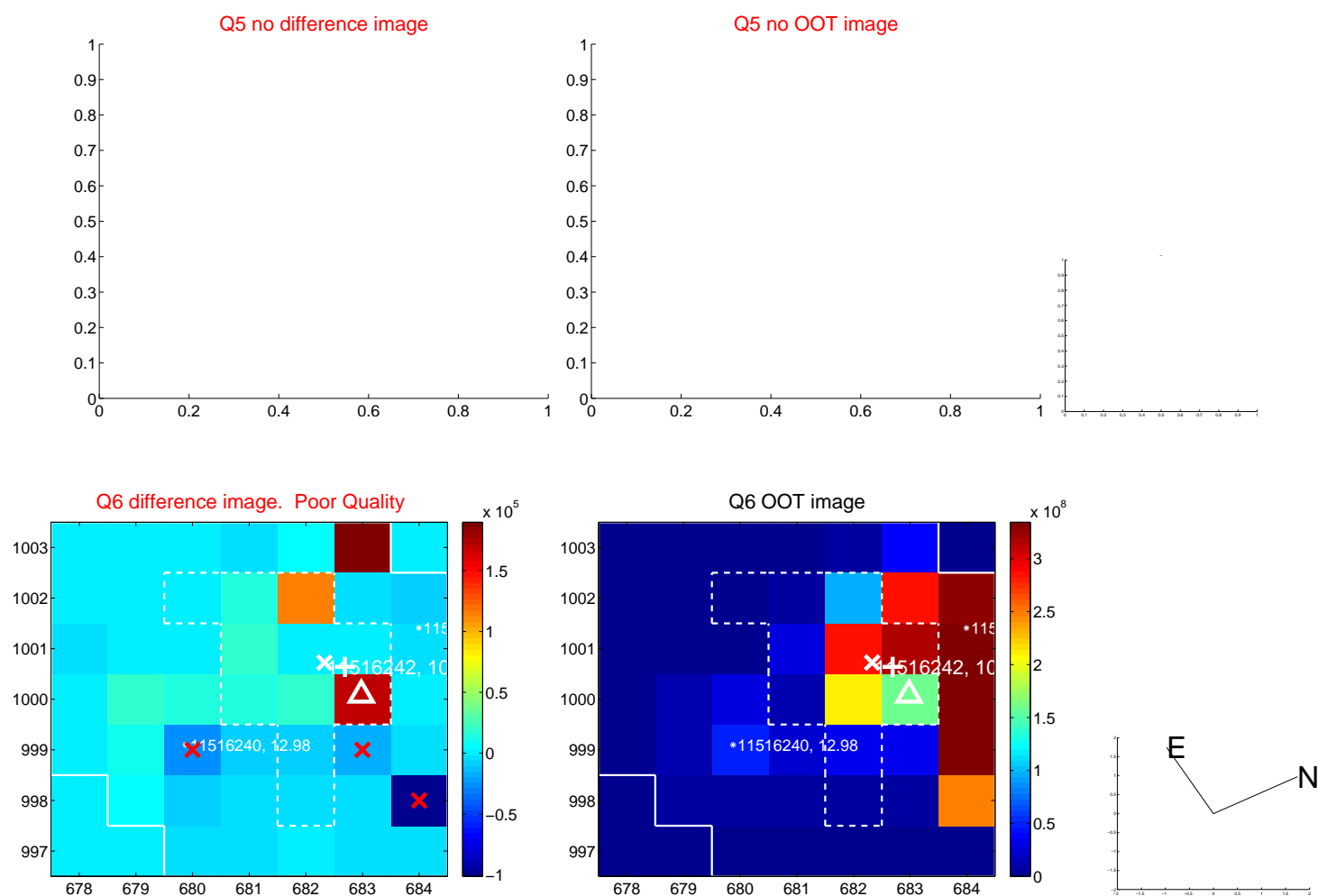


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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



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



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

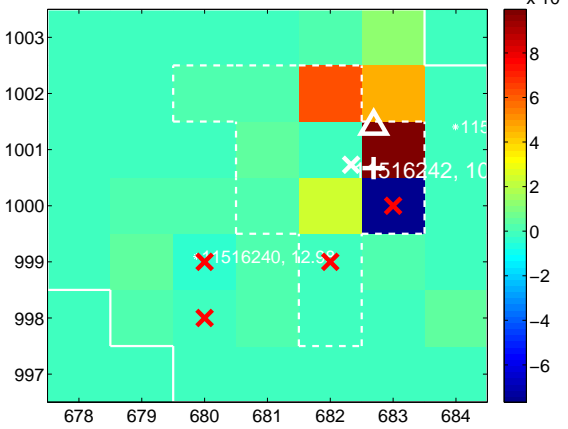
Q9 no difference image



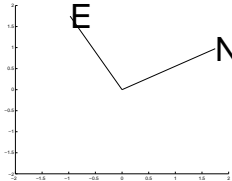
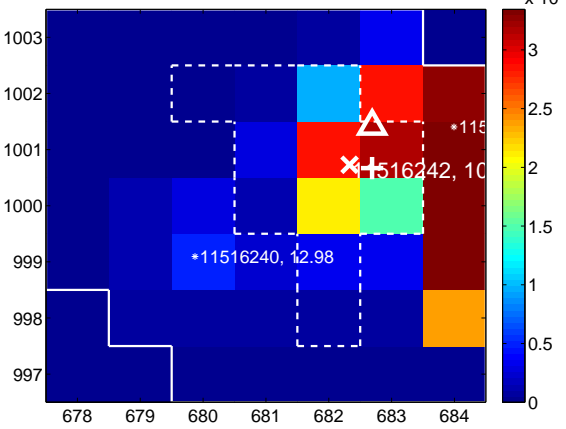
Q9 no OOT image



Q10 difference image



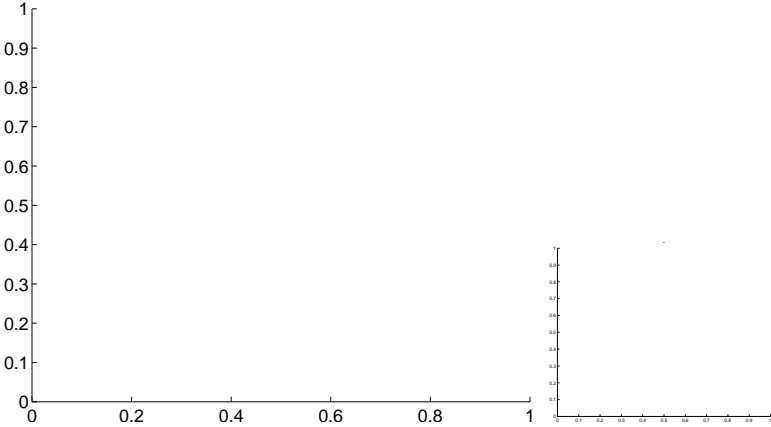
Q10 OOT image



Q11 no difference image



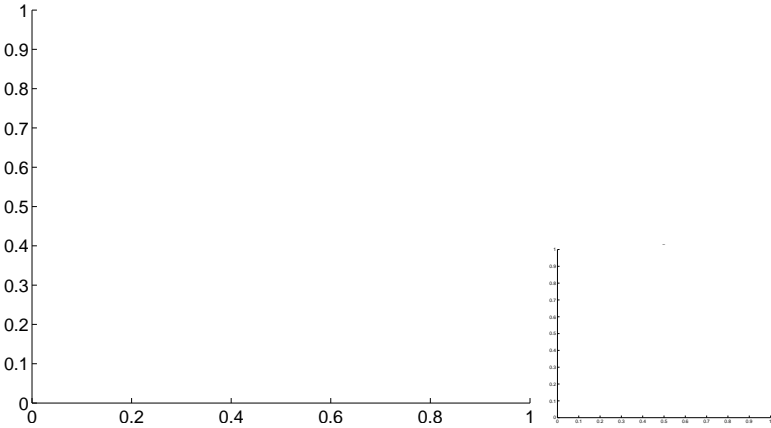
Q11 no OOT image



Q12 no difference image



Q12 no OOT image

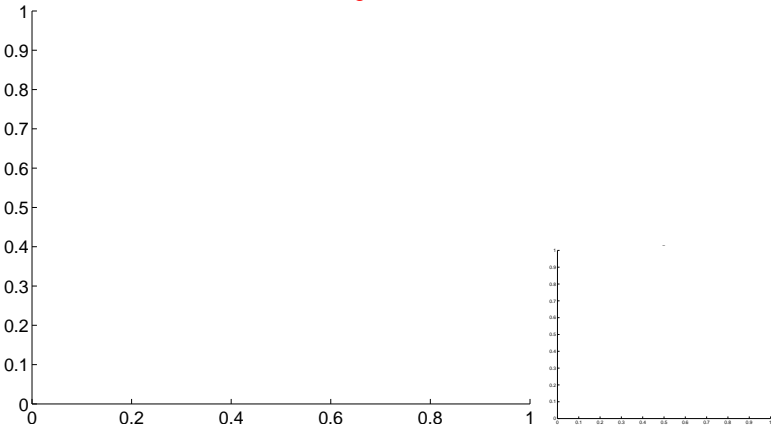


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

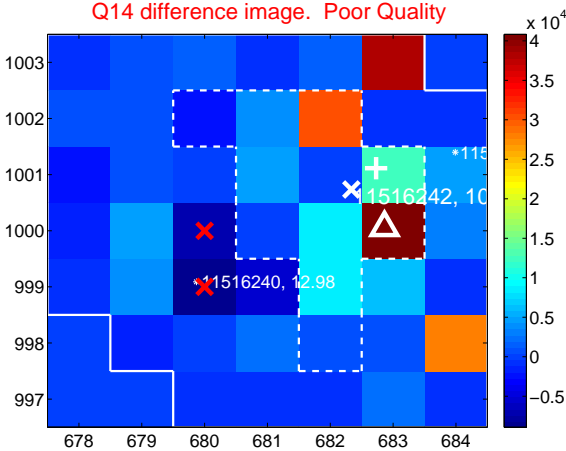
Q13 no difference image



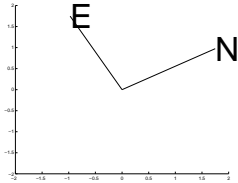
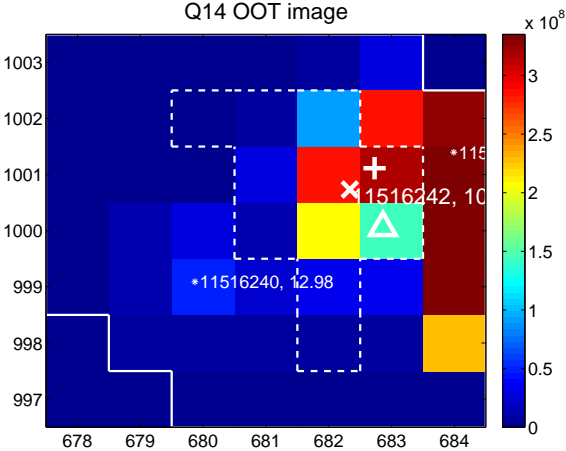
Q13 no OOT image



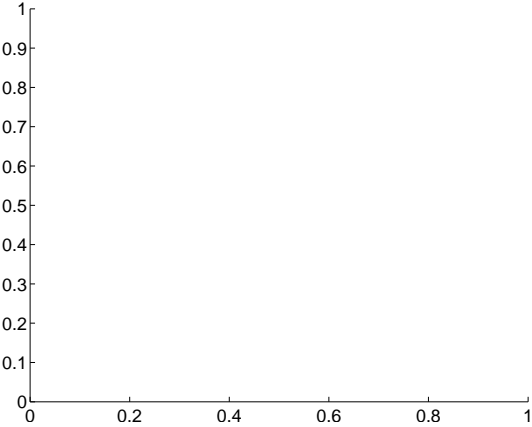
Q14 difference image. Poor Quality



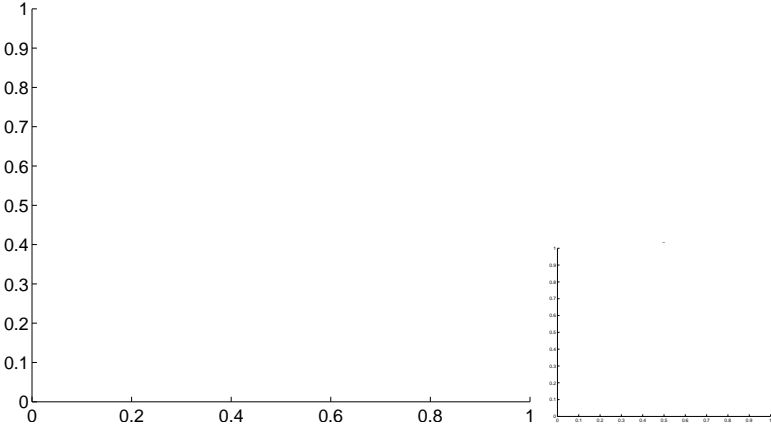
Q14 OOT image



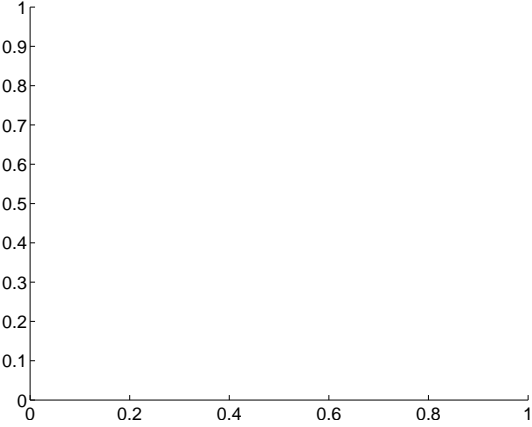
Q15 no difference image



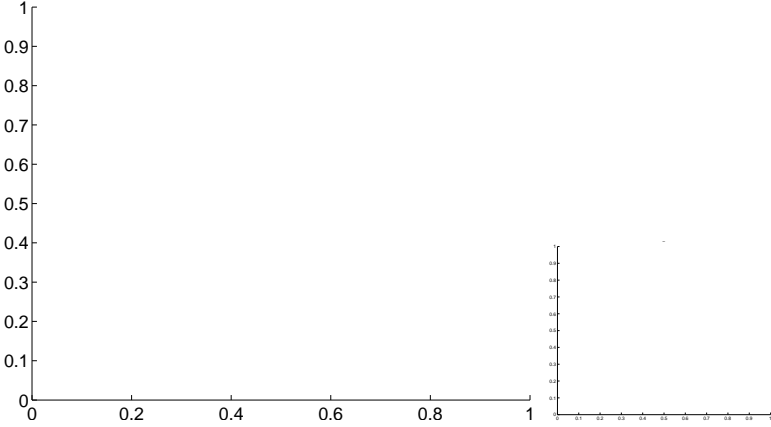
Q15 no OOT image



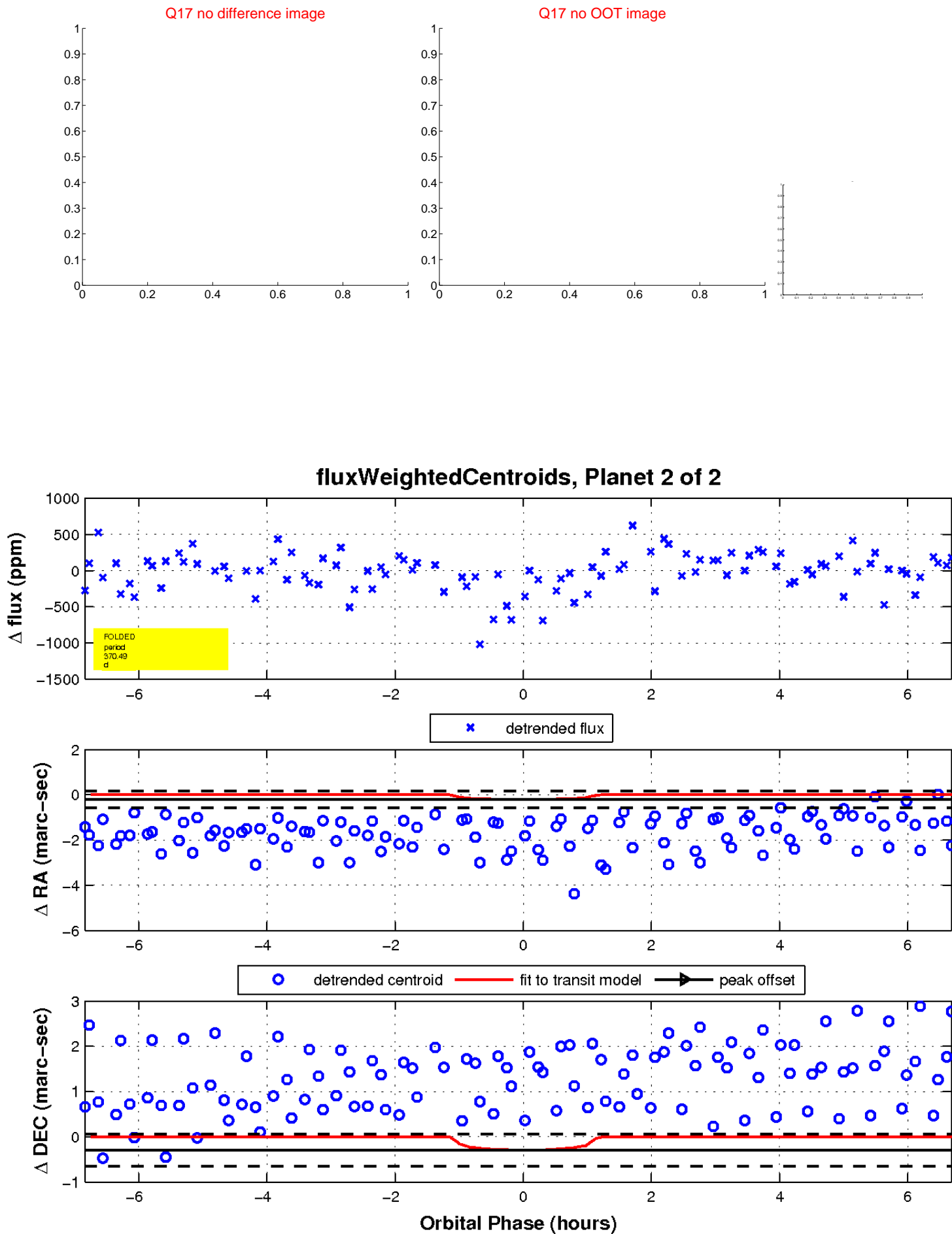
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

