

# KIC 009710611

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009710611-01	OBS	No	631.952610	227.627074	114.7	5.390	9.2	4.8	1.18	6165	1.41	0.83
009710611-02	OBS	7958.01	386.355147	359.094141	148.9	9.905	7.5	7.5	1.18	6165	1.59	1.61

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009710611-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009710611-02	OBS	FP	0.19	1	0	0	0	ALL_TRANS_CHASES

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

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

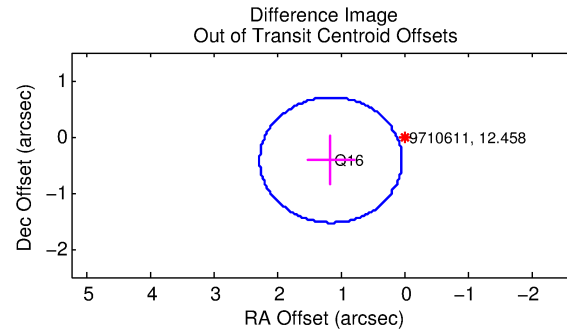
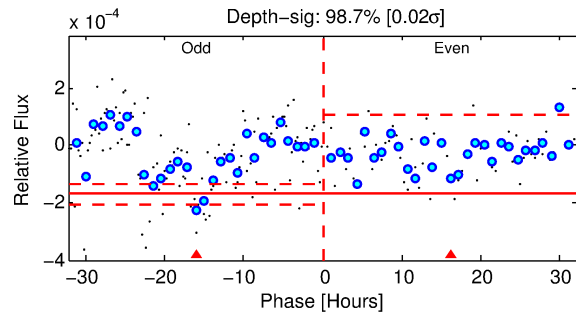
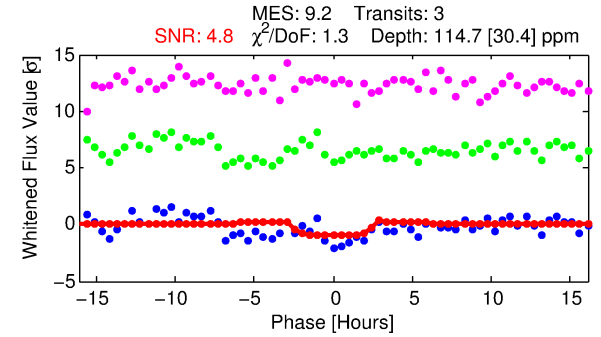
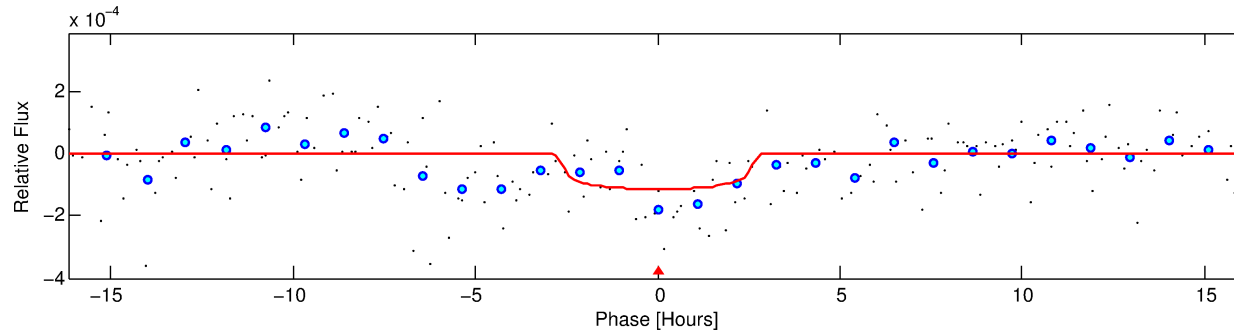
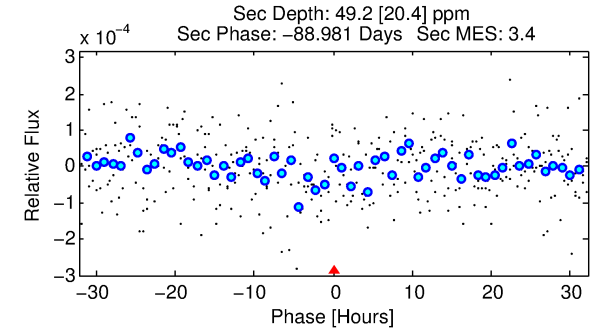
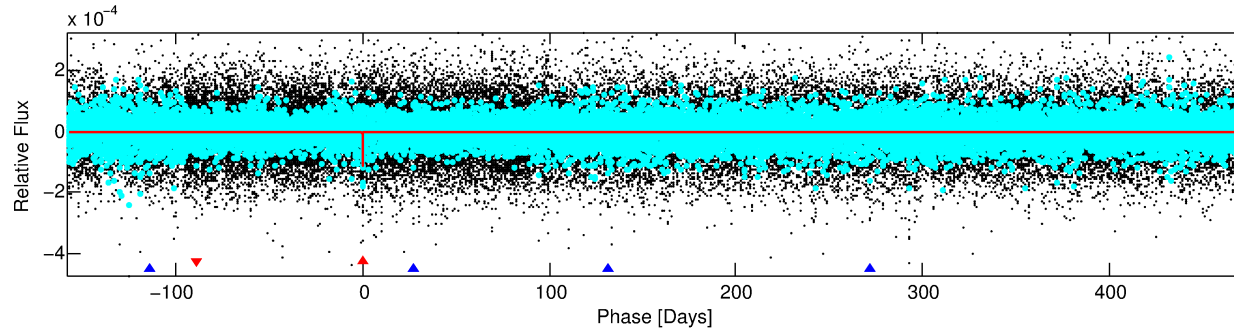
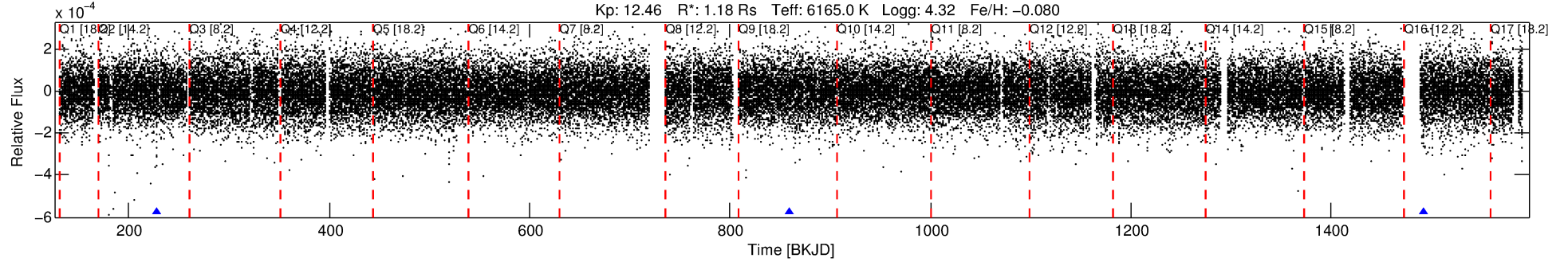
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009710611-01

No Significant Match Found

# DV One-Page Summary

KIC: 9710611 Candidate: 1 of 2 Period: 631.953 d



## DV Fit Results:

Period = 631.95261 [0.01444] d  
Epoch = 227.6271 [0.0182] BKJD  
Rp/R\* = 0.0110 [0.0119]  
a/R\* = 528.43 [2911.28]  
b = 0.82 [2.21]  
Seff = 0.83 [0.25]  
Teq = 244 [18] K  
Rp = 1.41 [1.56] Re  
a = 1.4667 [0.2761] AU  
Ag = 29348.37 [65252.45] [0.45σ]  
Teff = 4930 [2724] K [1.72σ]

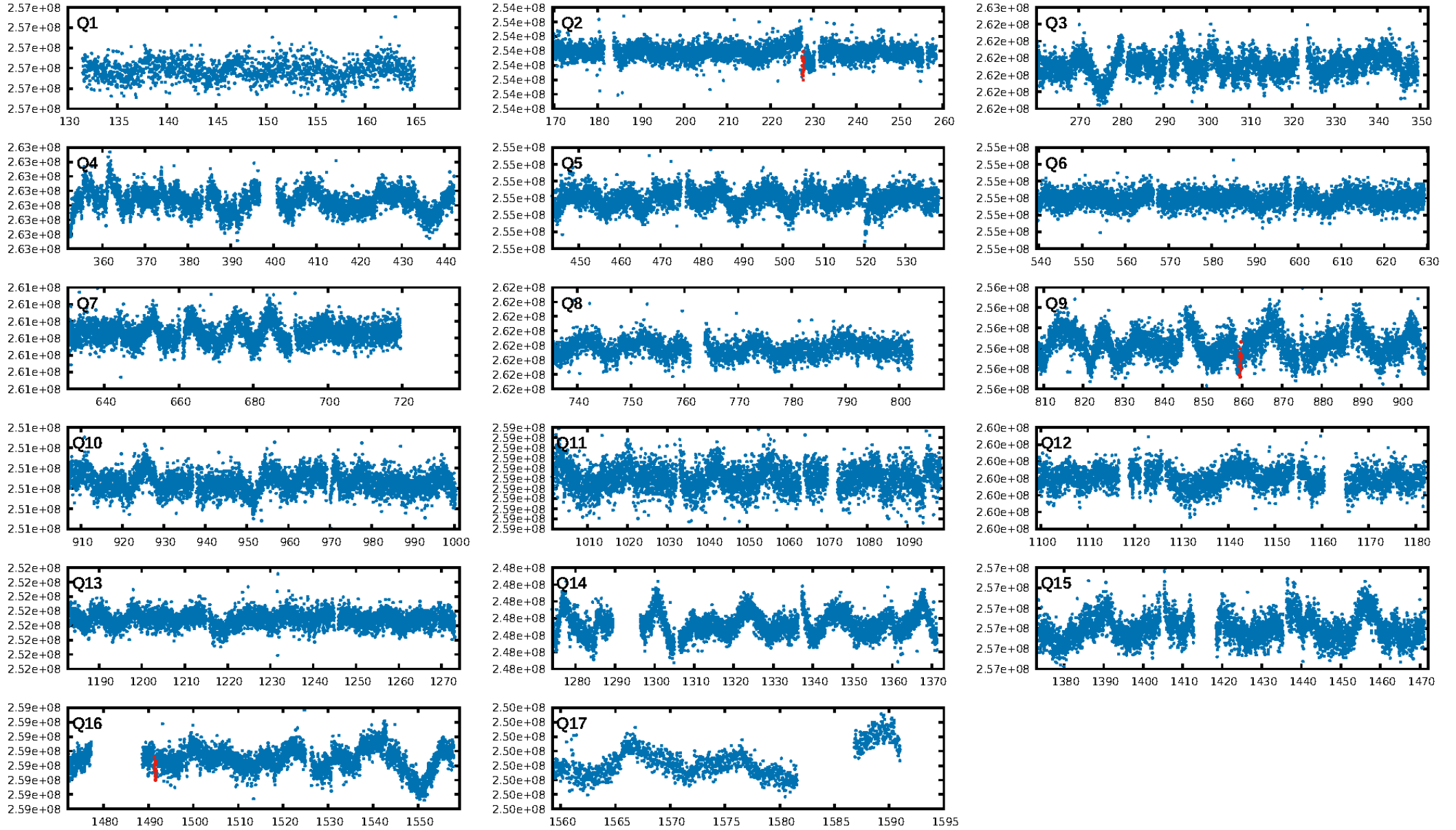
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [522.71σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 43.4%  
ModelChiSquareGof-sig: 83.3%  
Bootstrap-pfa: 2.35e-15  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -3.283  
Centroid-sig: 23.8%  
Centroid-so: 1.604 arcsec [0.79σ]  
OotOffset-rm: 1.240 arcsec [3.33σ]  
KicOffset-rm: 1.351 arcsec [3.51σ]  
OotOffset-st: 0/0/1/0 [1]  
KicOffset-st: 0/0/1/0 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 1.00 [3/3]

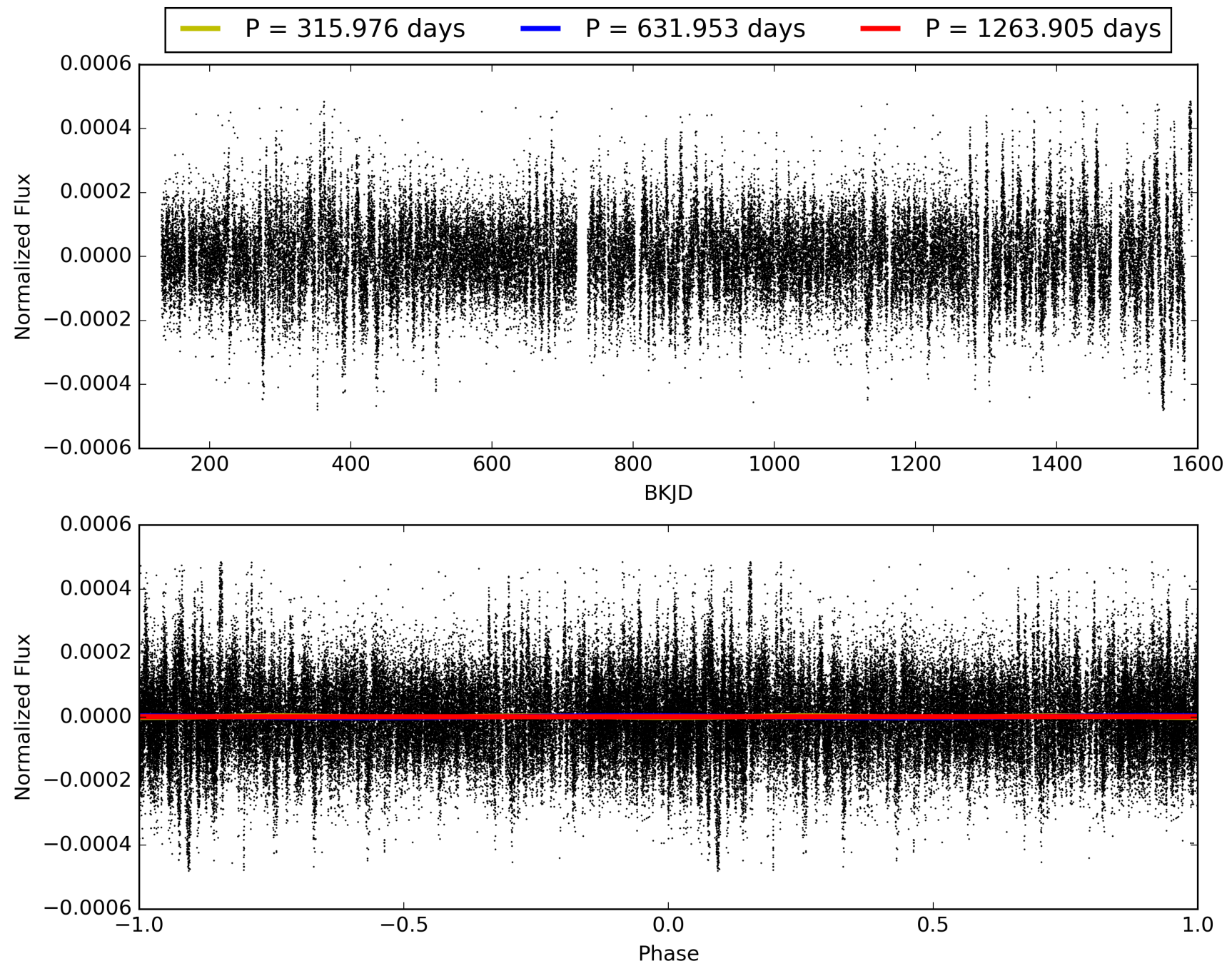
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:29:47 Z

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

# TCE 009710611-01, PDC Light Curves

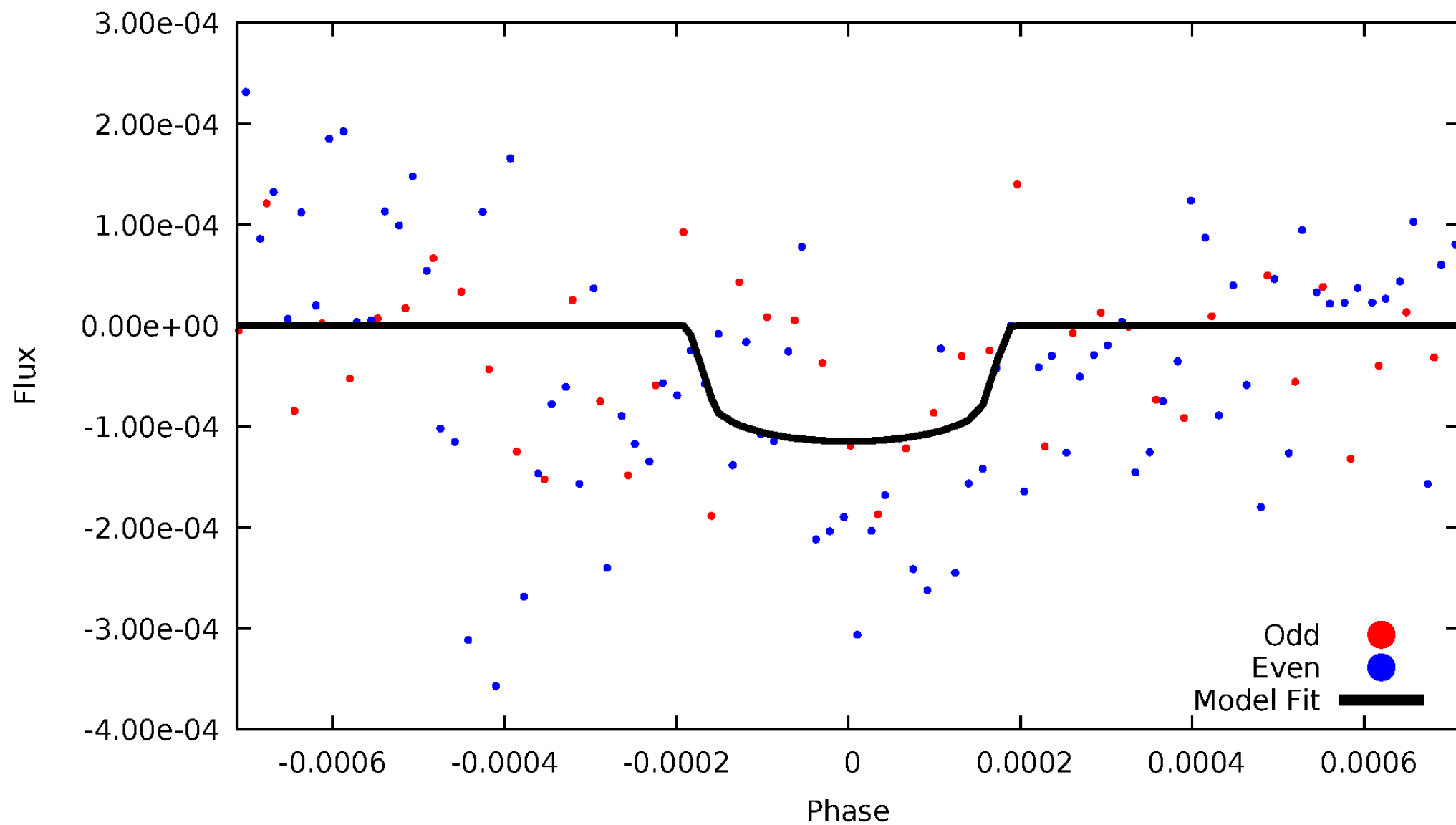


# TCE 009710611-01



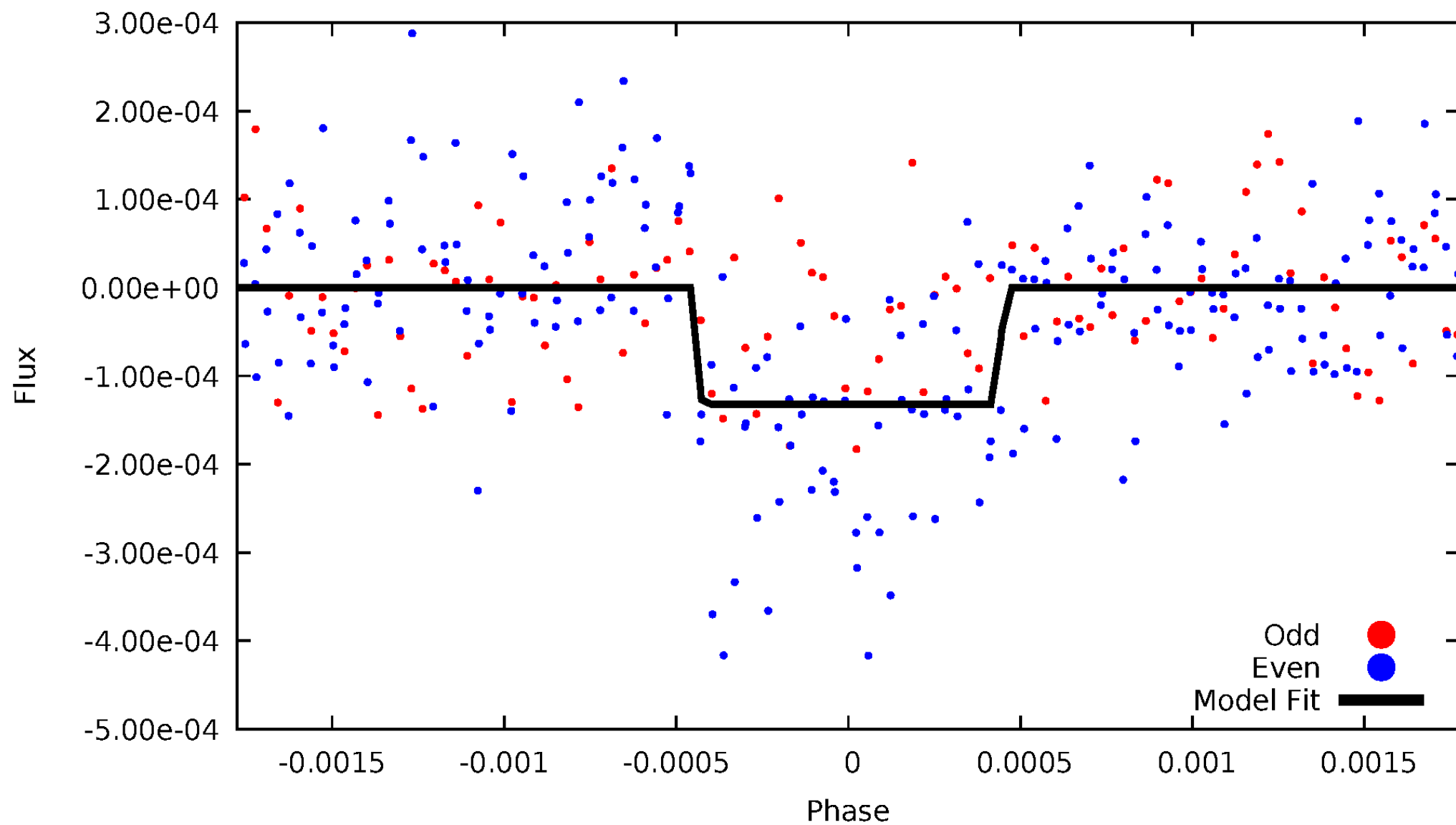
# DV Odd/Even

TCE 009710611-01



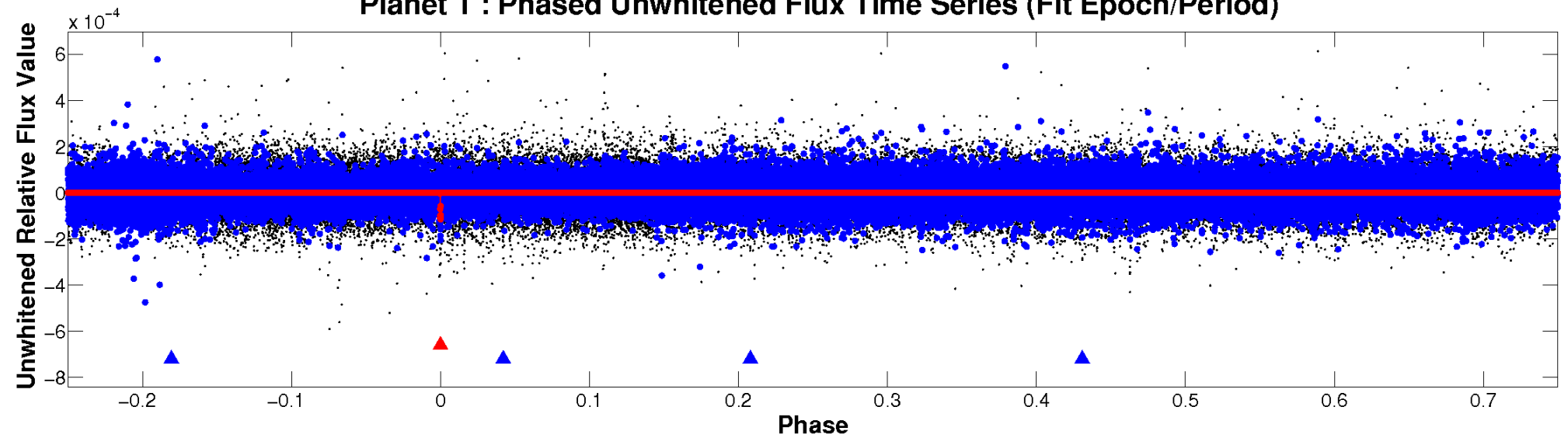
# ALT Odd/Even

TCE 009710611-01

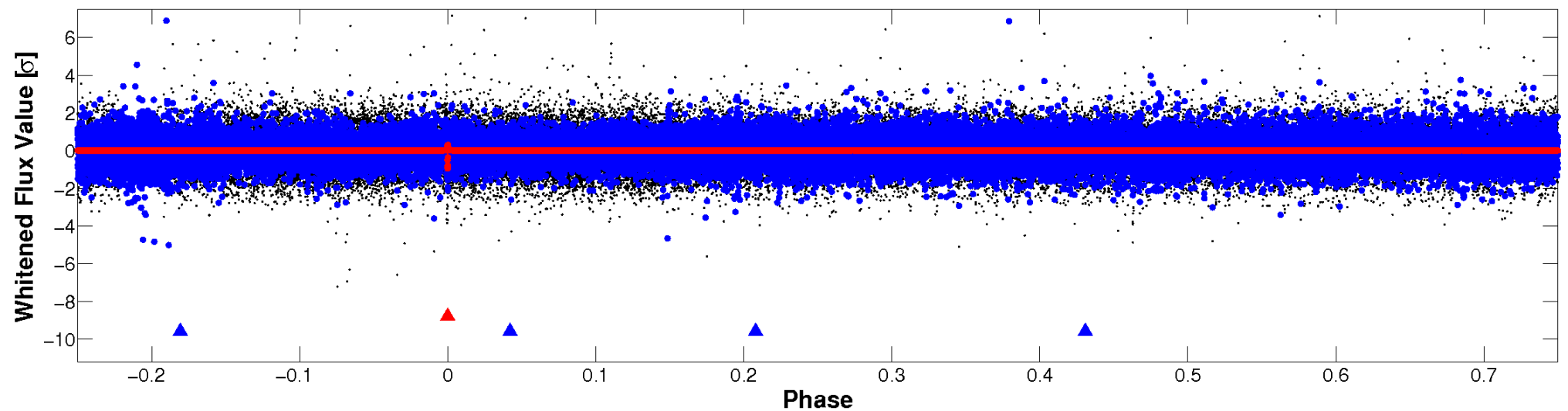


# Non-Whitened Vs. Whitened Light Curve

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

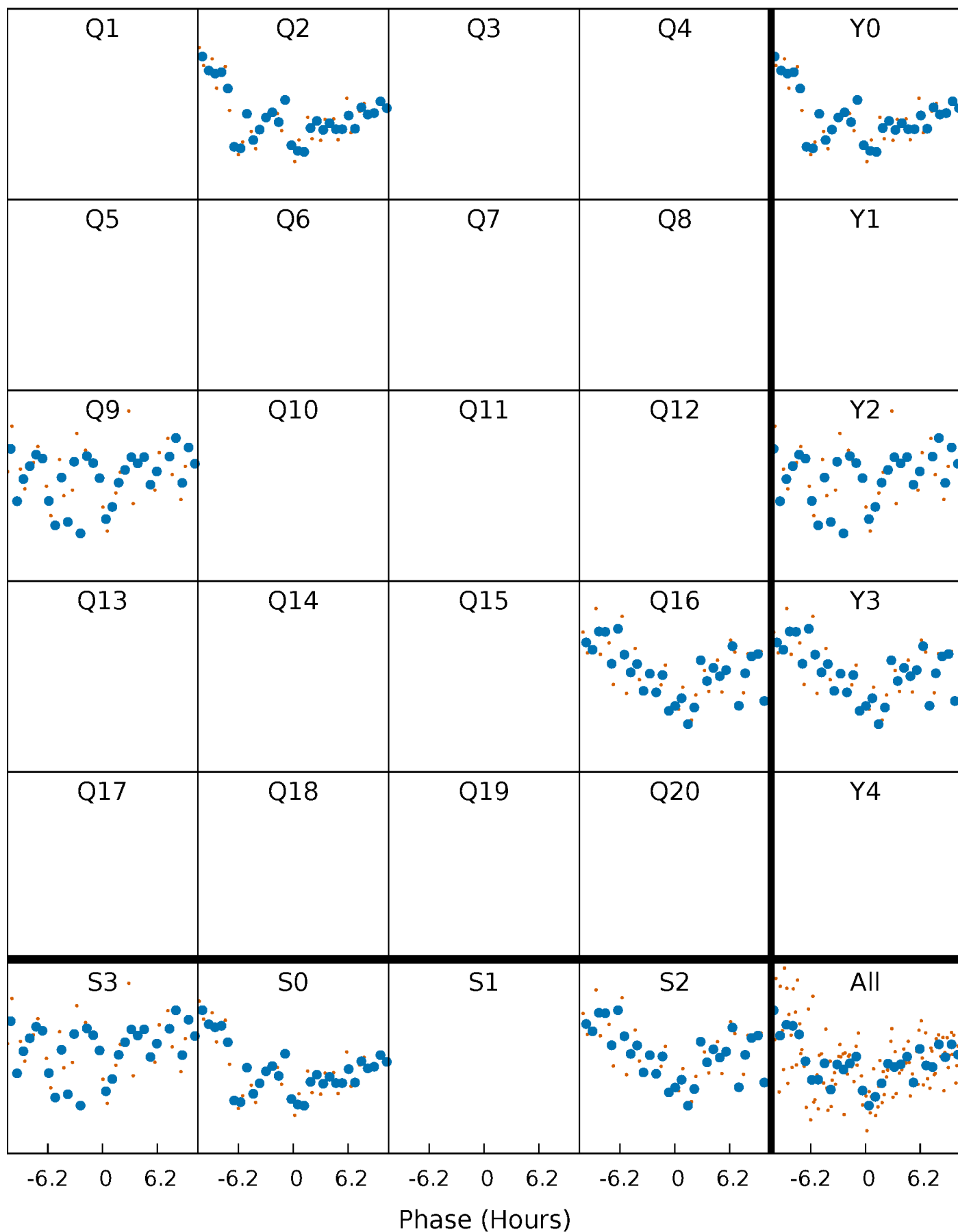


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

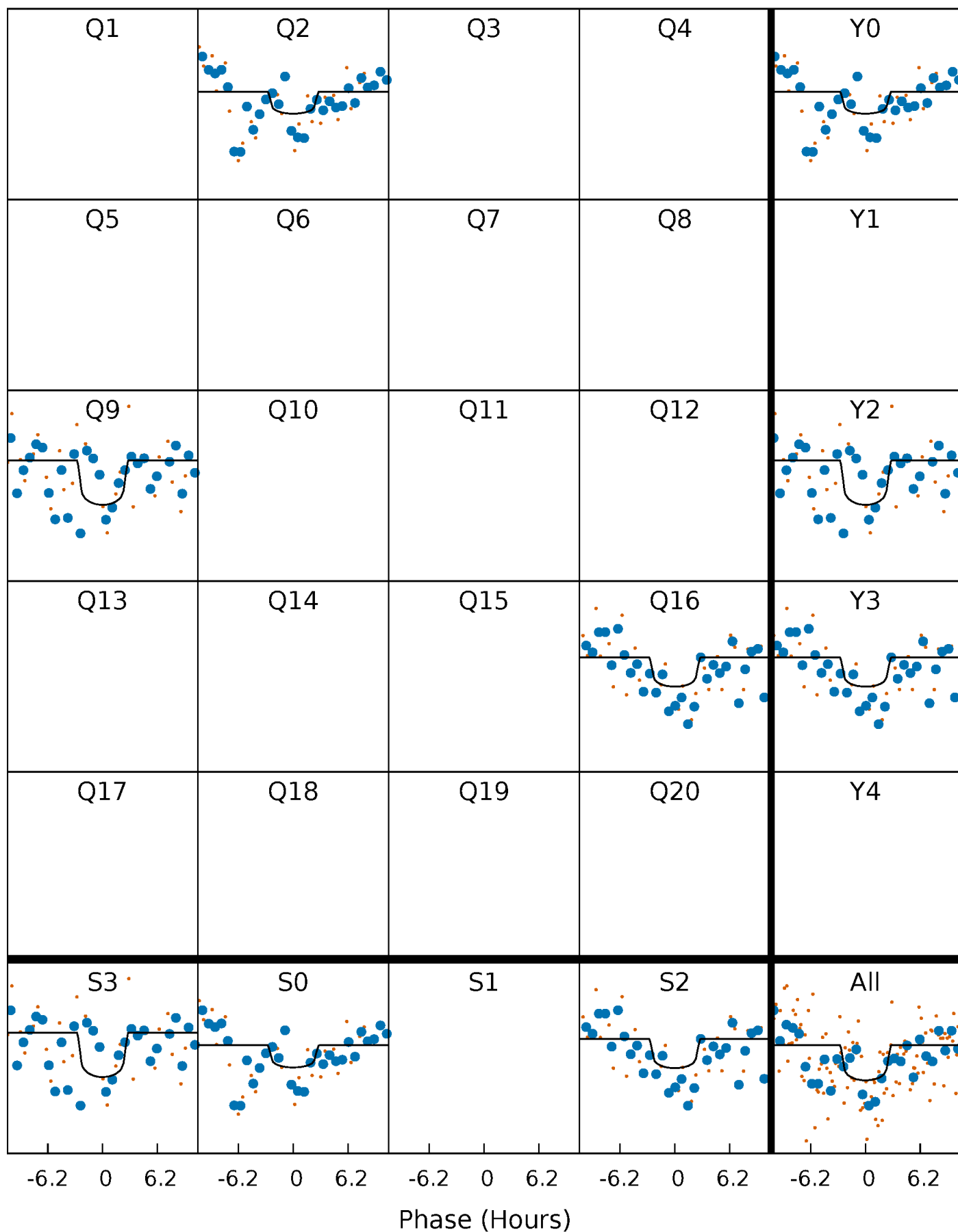
TCE 009710611-01 P=631.952609 Days  $T_0=227.627074$  (BKJD)





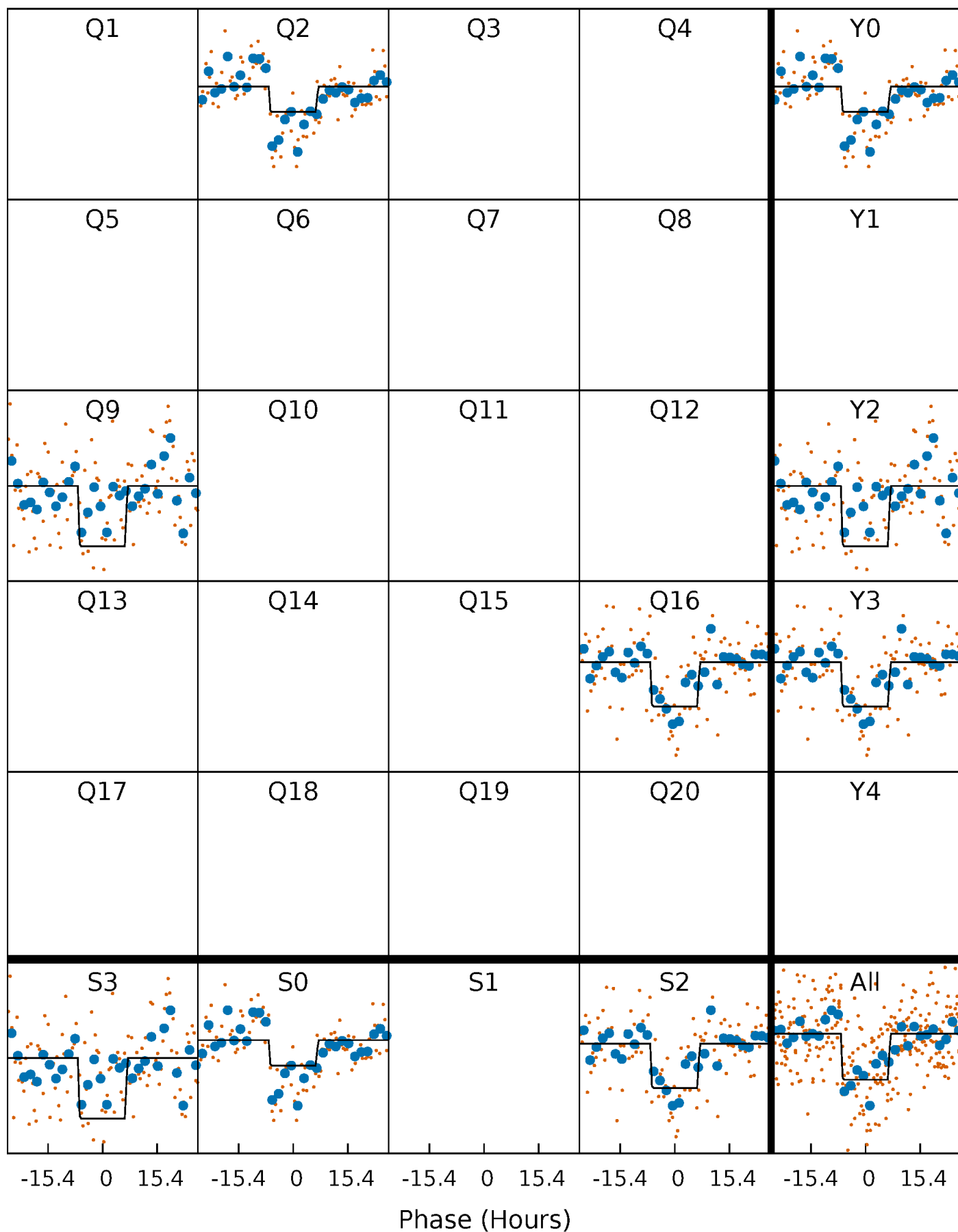
# DV Quarter-Phased Transit Curves

TCE 009710611-01 P=631.952609 Days  $T_0=227.627074$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

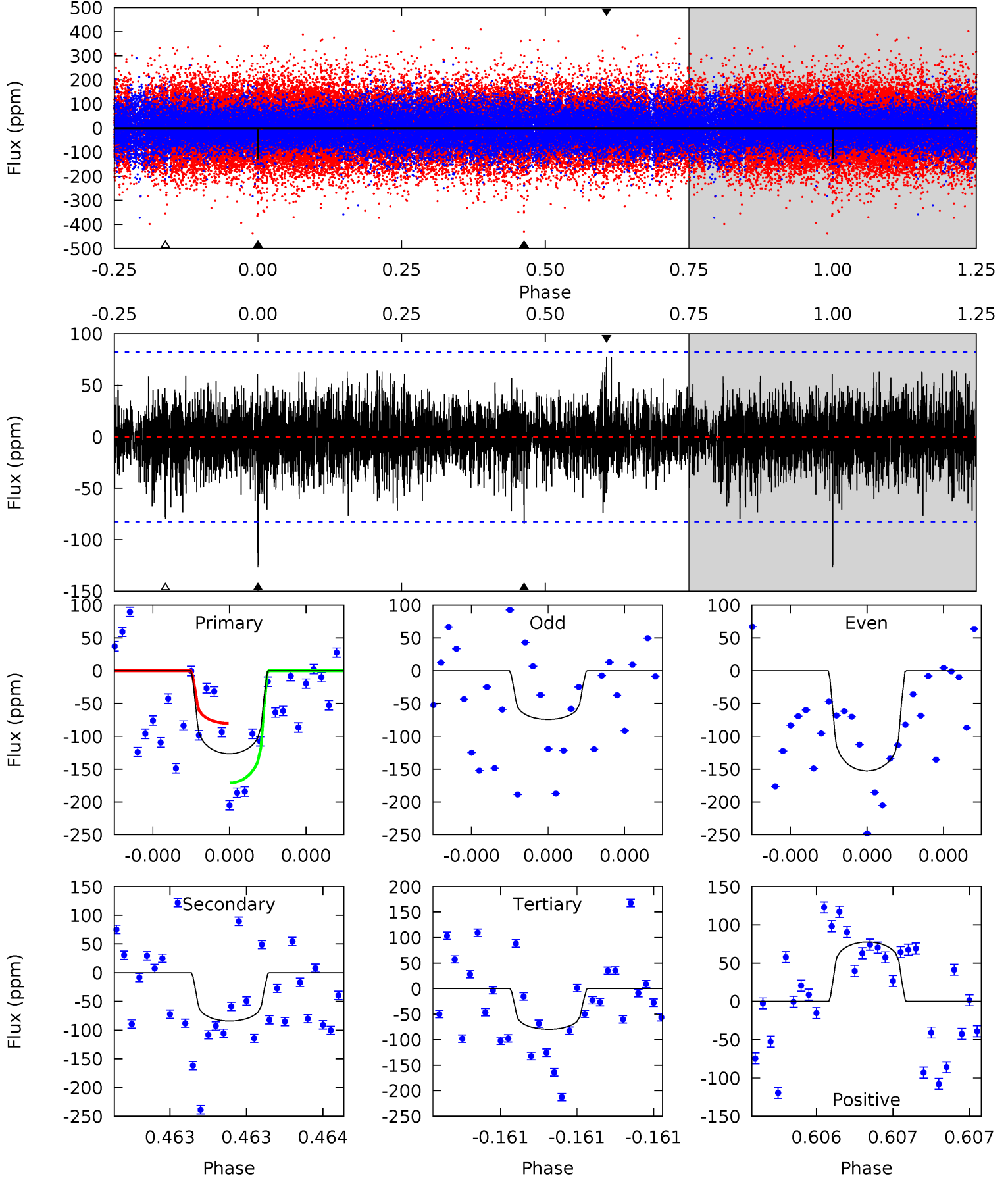
TCE 009710611-01 P=631.989577 Days  $T_0=227.596945$  (BKJD)



# DV Model-Shift Uniqueness Test

009710611-01, P = 631.952609 Days, E = 227.627074 Days

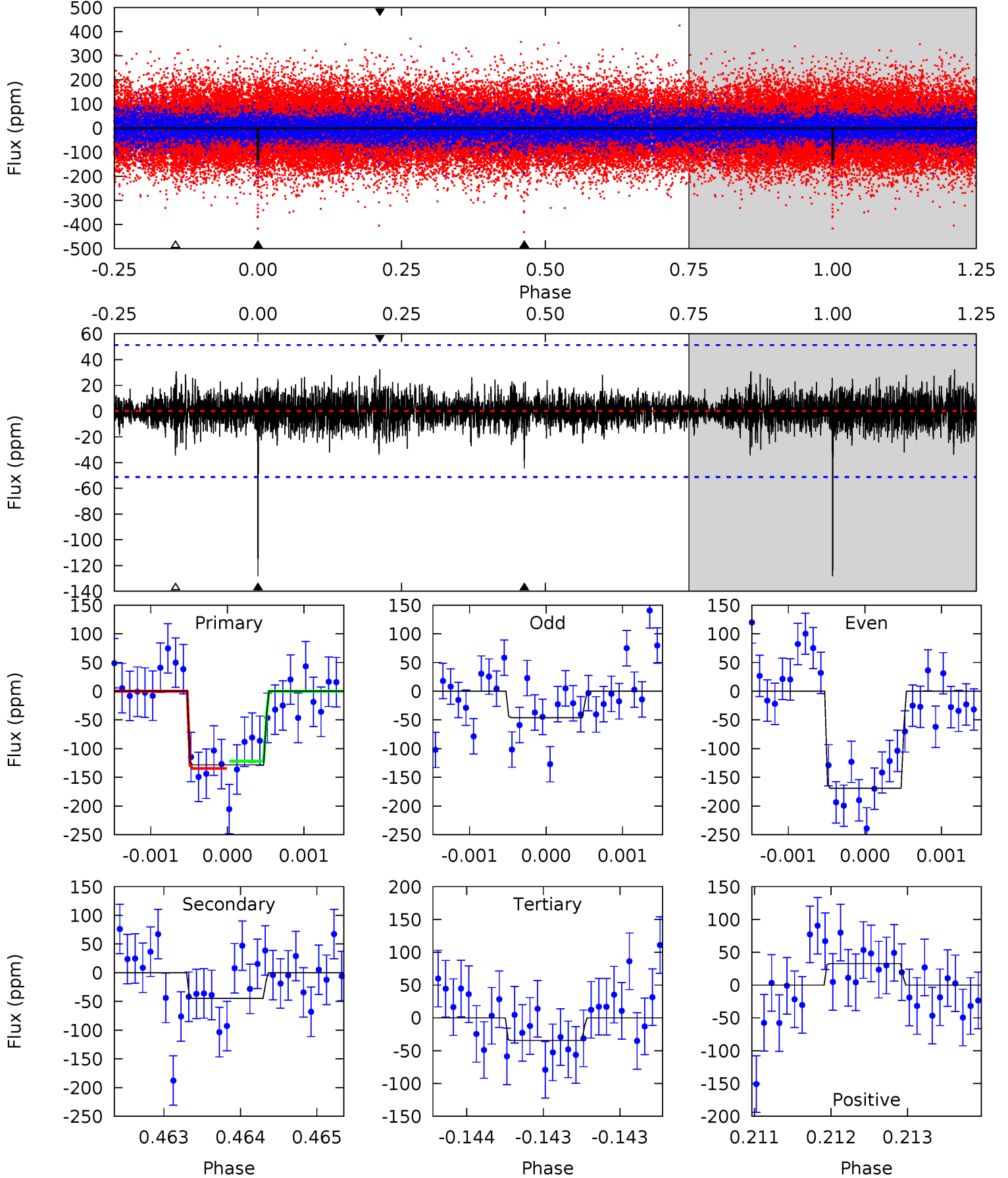
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.65	5.75	5.44	5.31	5.62	3.55	1.33	3.21	3.34	0.31	0.44	2.52	0.98	0.38	3.11



# Alt Model-Shift Uniqueness Test

009710611-01, P = 631.989577 Days, E = 227.596945 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
13.7	4.76	3.68	3.47	5.48	3.33	0.85	10.0	10.2	1.07	1.28	6.21	1.13	0.20	0.68



### Stellar Parameters For KIC 009710611

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6165^{+154}_{-185}$	$4.319^{+0.121}_{-0.148}$	$-0.080^{+0.250}_{-0.300}$	$1.177^{+0.265}_{-0.177}$	$1.051^{+0.155}_{-0.129}$	$0.907^{+0.498}_{-0.377}$
	+2%/-3%	+3%/-3%	+312%/-375%	+23%/-15%	+15%/-12%	+55%/-42%
Source	PHO1	FLK73	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 009710611-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-84 \pm 15$	$1.78^{+1.47}_{-1.15}$	$340^{+21}_{-19}$	$5144^{+3494}_{-1136}$	$30812^{+199128}_{-21854}$
Alt.	$-45 \pm 9$	$1.78^{+1.38}_{-1.10}$	$342^{+19}_{-19}$	$4468^{+2488}_{-803}$	$16982^{+91795}_{-11789}$

$T_{max}$  = 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

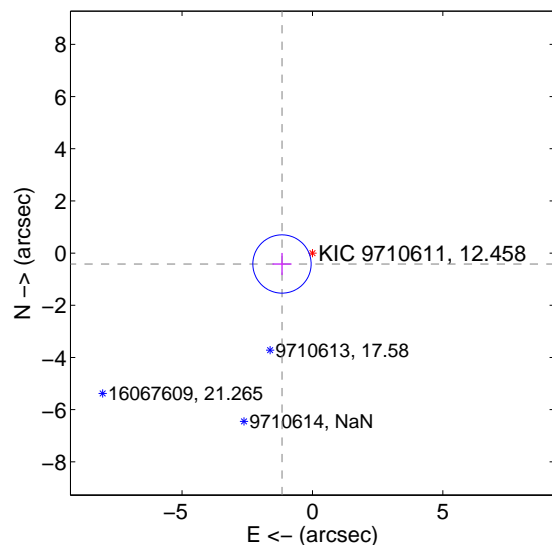
Supplemental centroid analysis for 009710611-01. Kepler magnitude: 12.46. Transit SNR 4.84

There are 1 quarters with good PRF difference image offsets

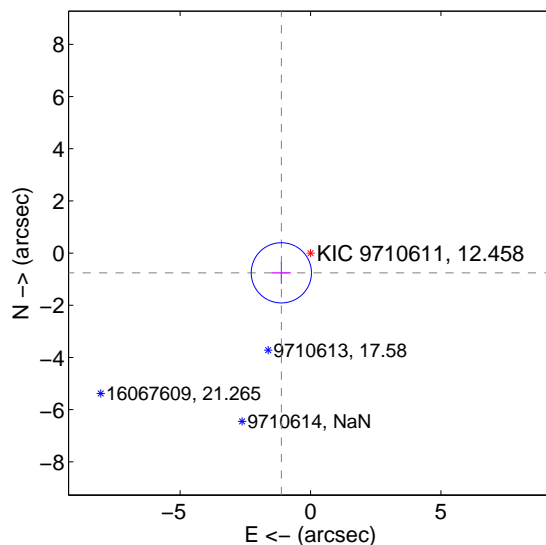
The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.240 \pm 0.372$	3.33	$1.167 \pm 0.365$	$-0.418 \pm 0.424$
PRF-fit source offset from KIC position	$1.351 \pm 0.385$	3.51	$1.119 \pm 0.365$	$-0.757 \pm 0.424$
photometric centroid source offset	$1.60 \pm 2.04$	0.79	$-0.53 \pm 2.17$	$1.51 \pm 2.03$

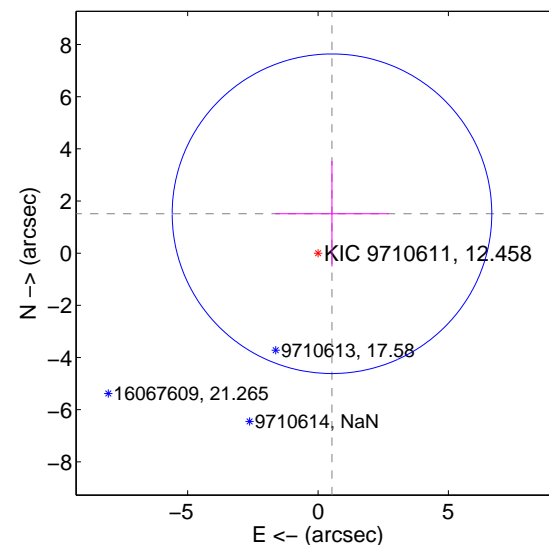
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



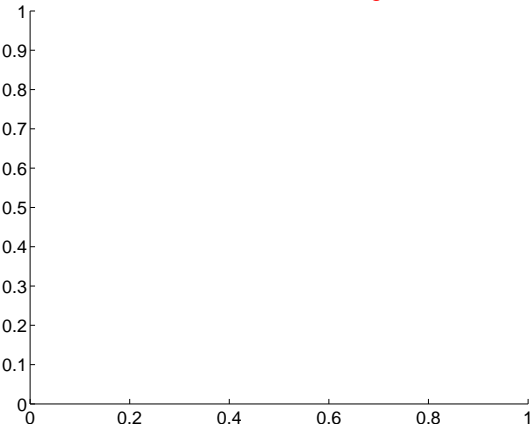
offset from photometric centroids



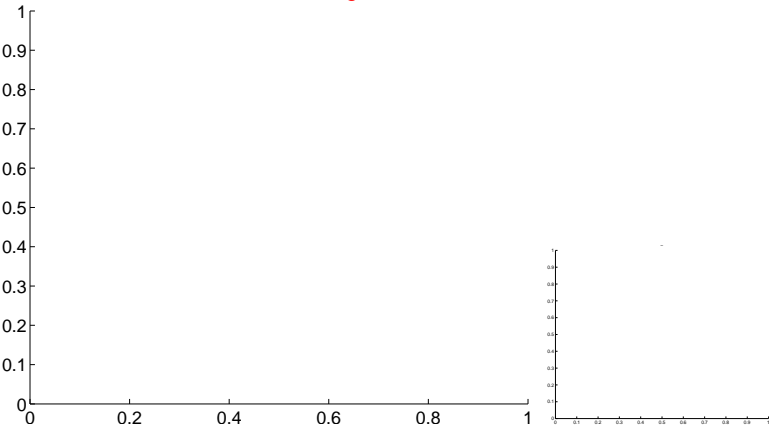
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

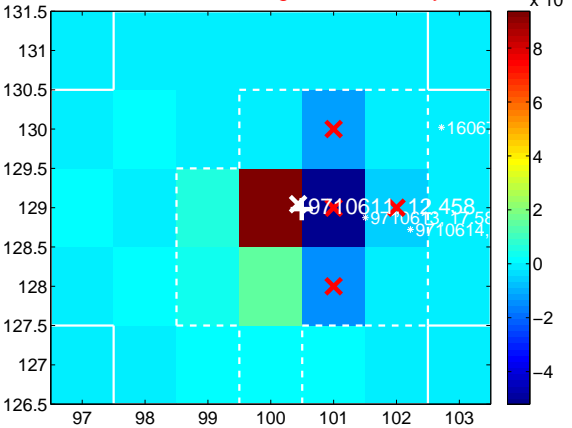
Q1 no difference image



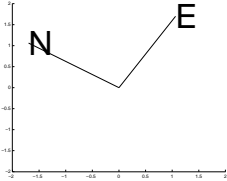
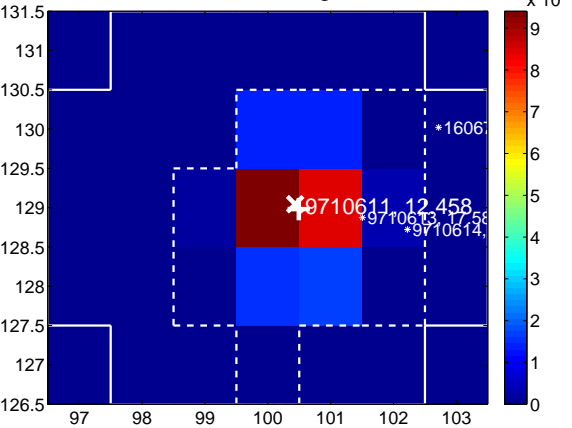
Q1 no OOT image



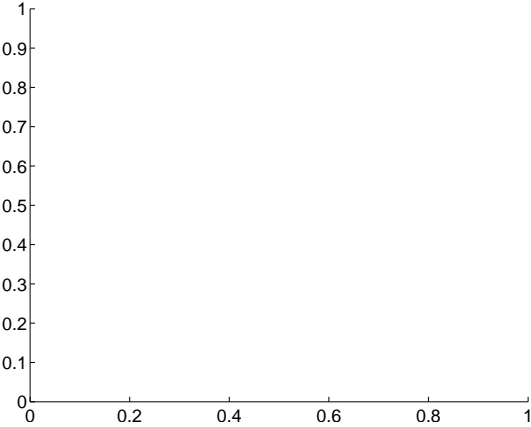
Q2 difference image. Poor Quality



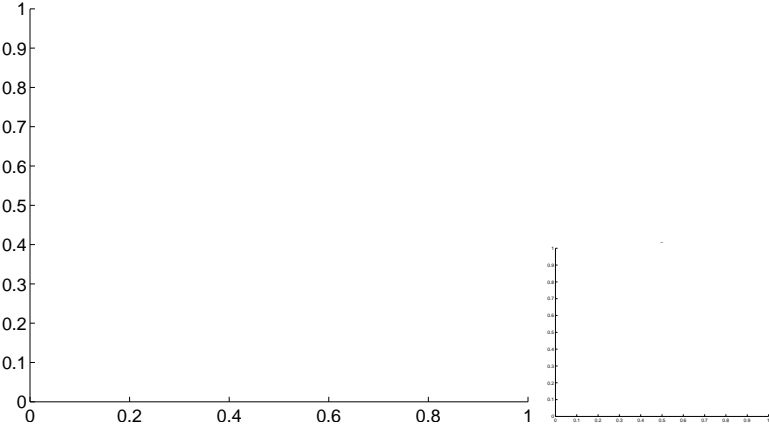
Q2 OOT image



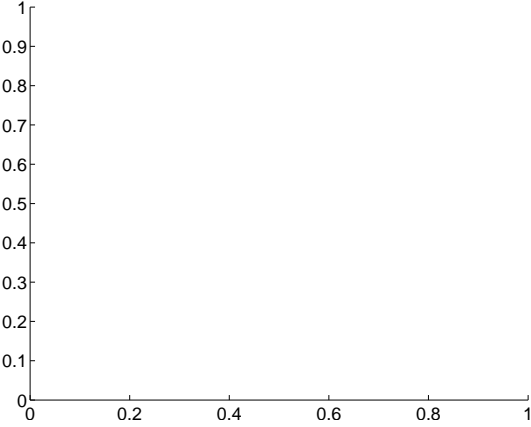
Q3 no difference image



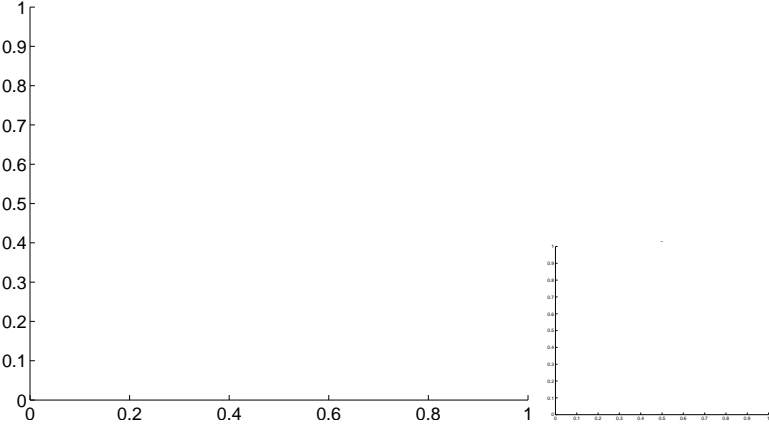
Q3 no OOT image



Q4 no difference image



Q4 no OOT image

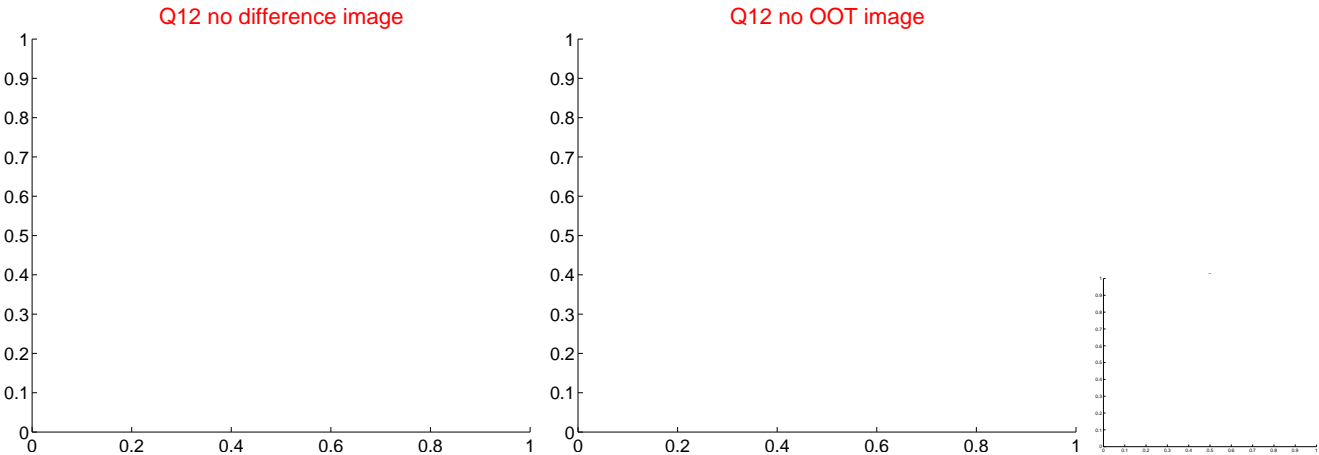
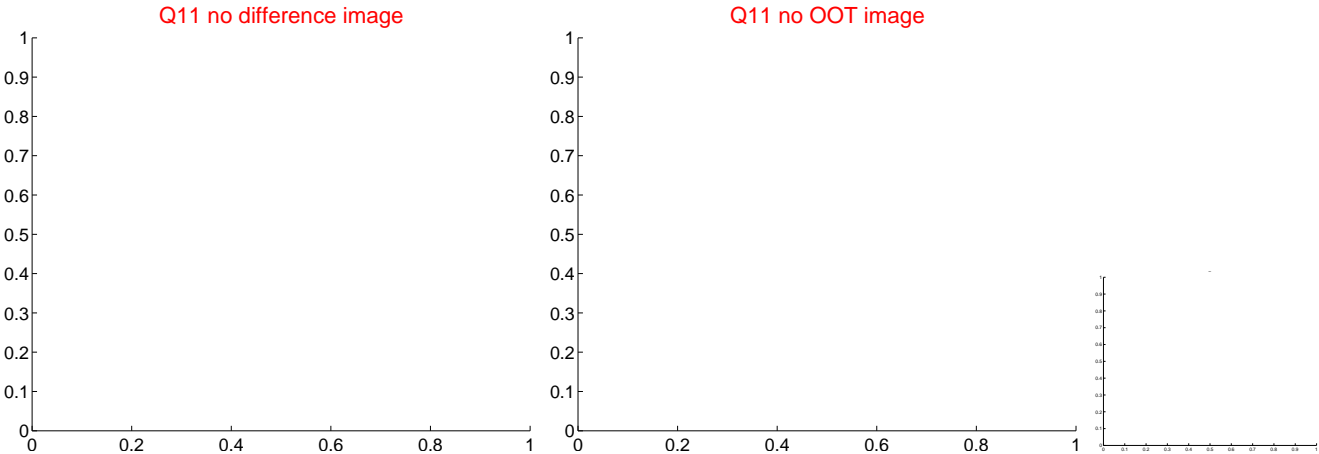
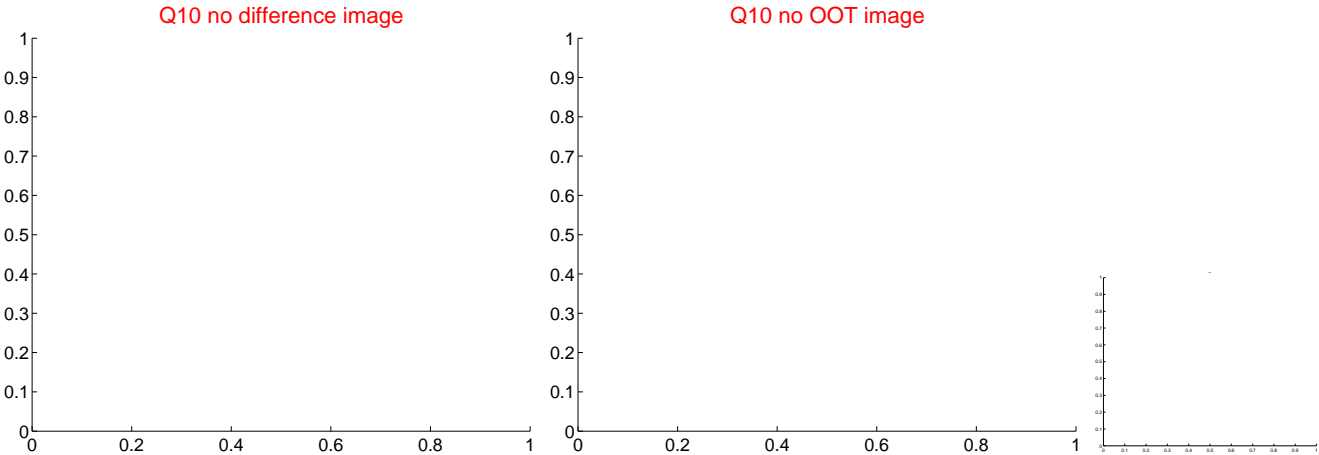
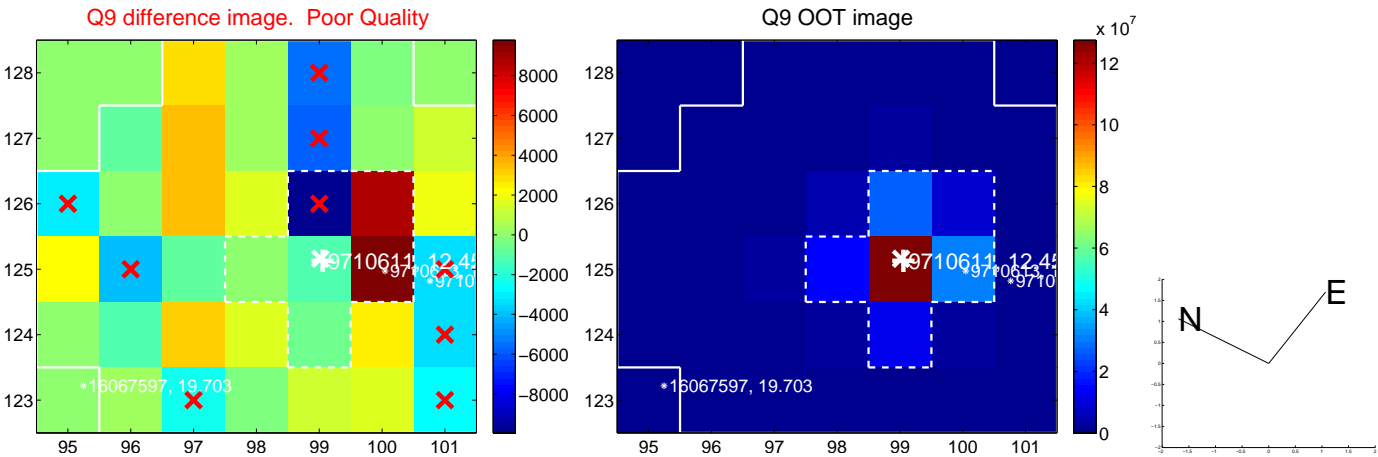


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

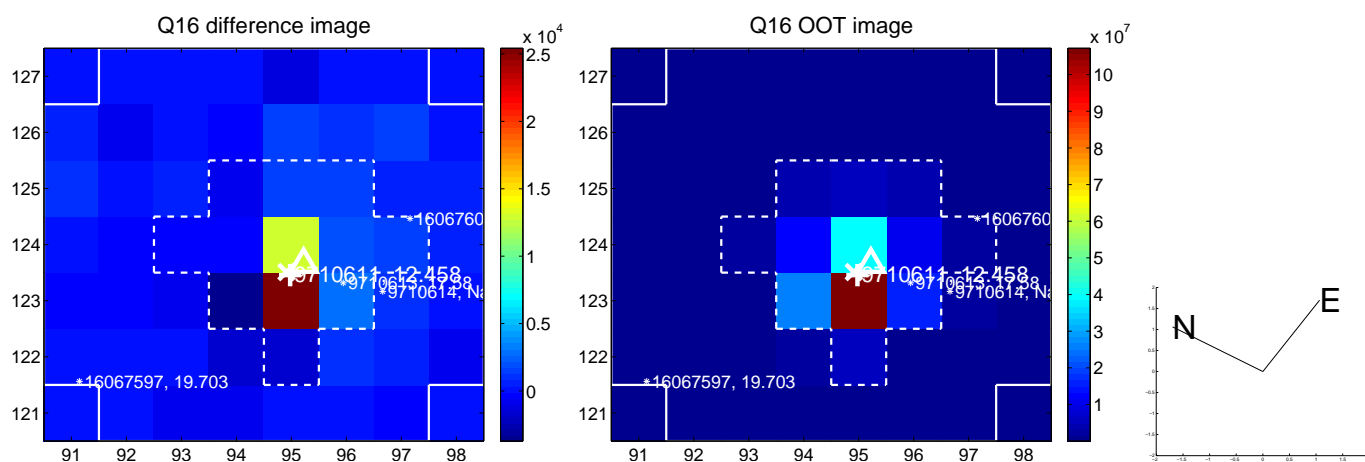
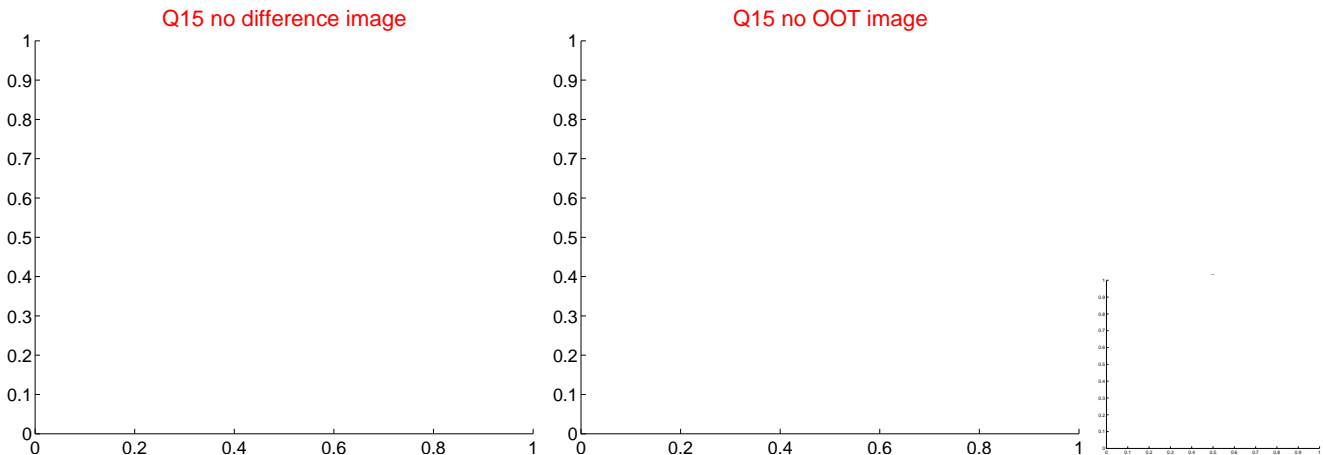
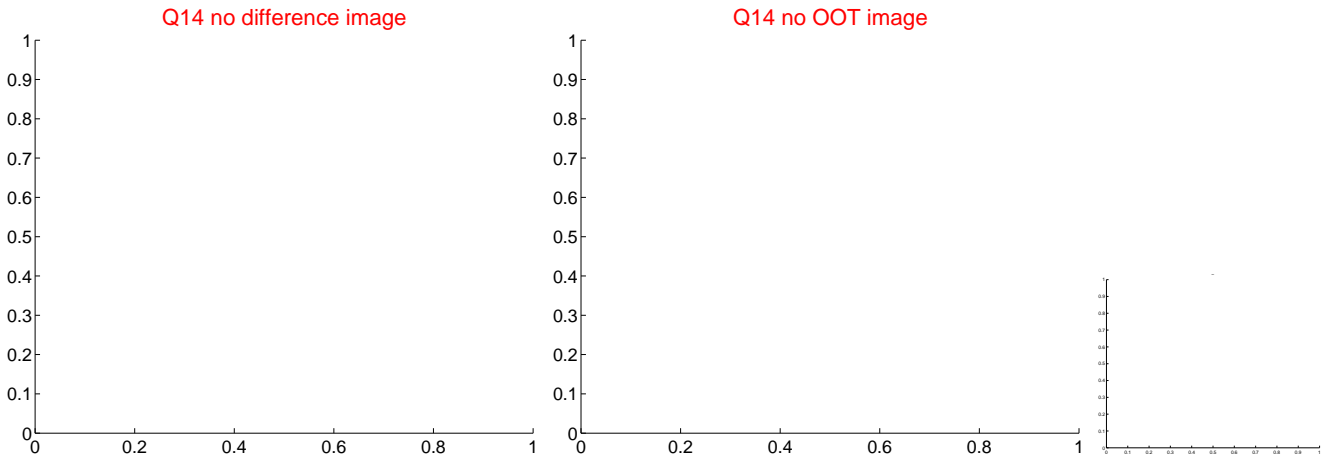
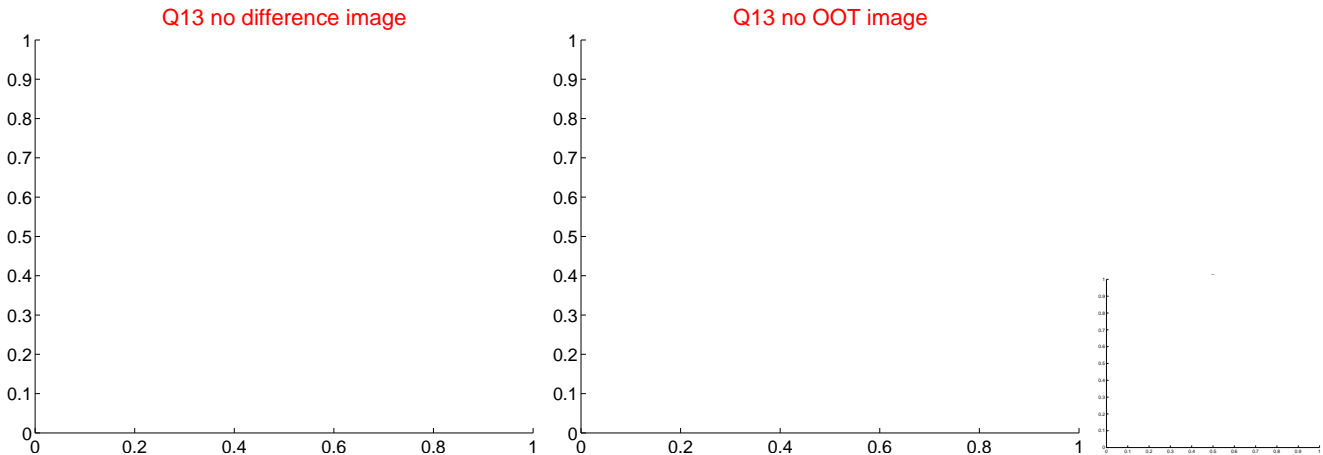




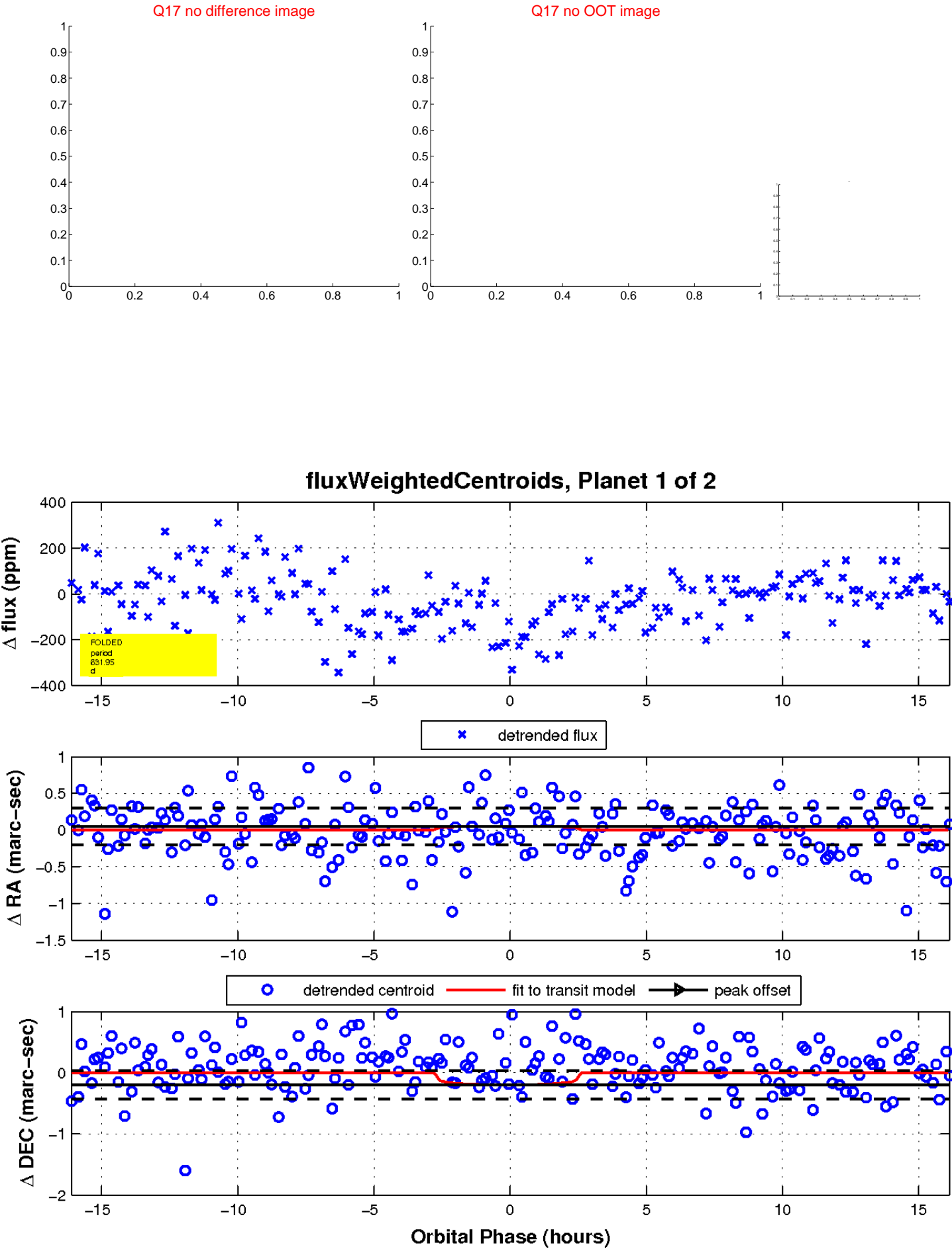
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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

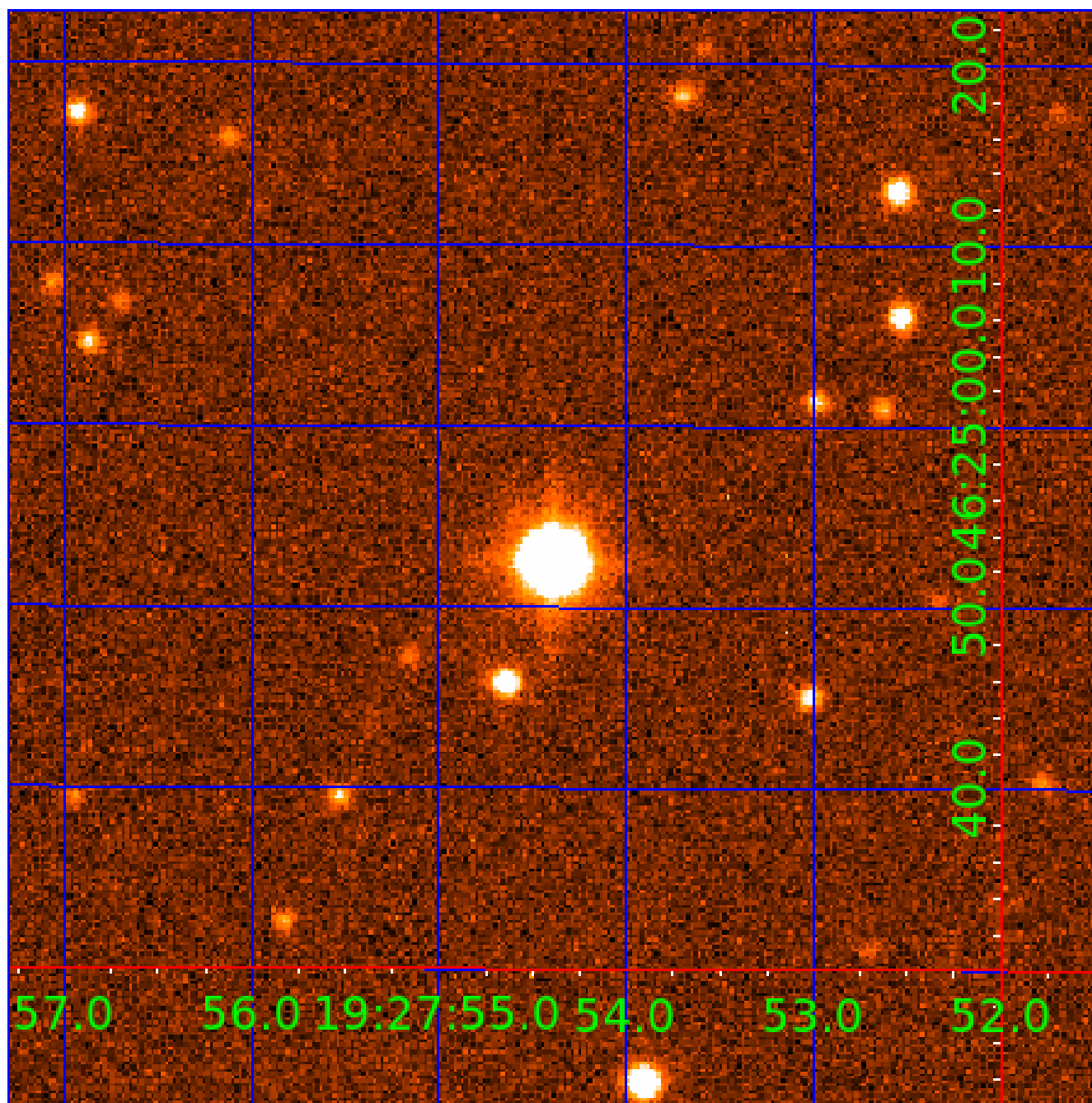


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009710611

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009710611-01	OBS	No	631.952610	227.627074	114.7	5.390	9.2	4.8	1.18	6165	1.41	0.83
009710611-02	OBS	7958.01	386.355147	359.094141	148.9	9.905	7.5	7.5	1.18	6165	1.59	1.61

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009710611-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009710611-02	OBS	FP	0.19	1	0	0	0	ALL_TRANS_CHASES

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

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

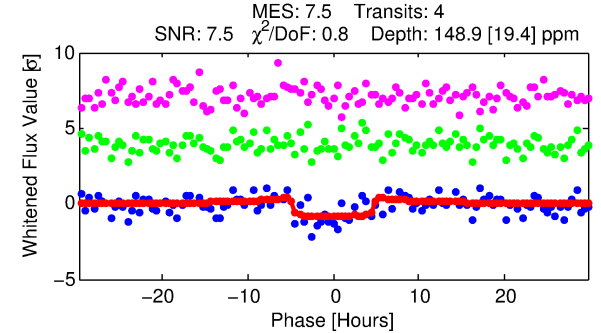
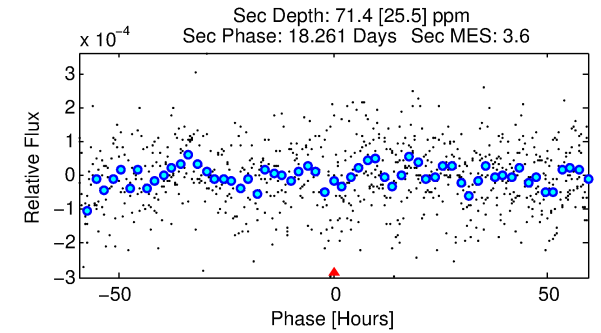
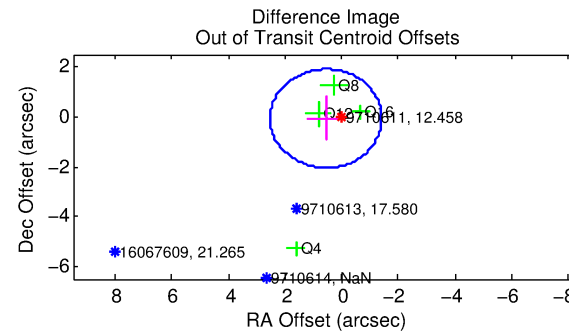
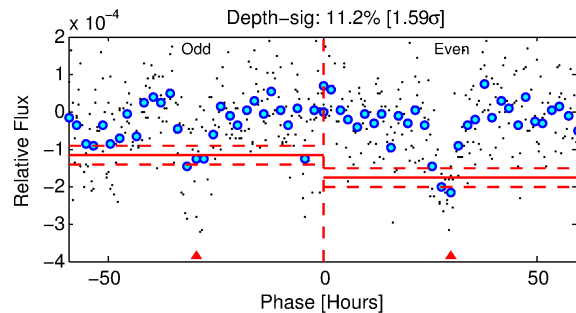
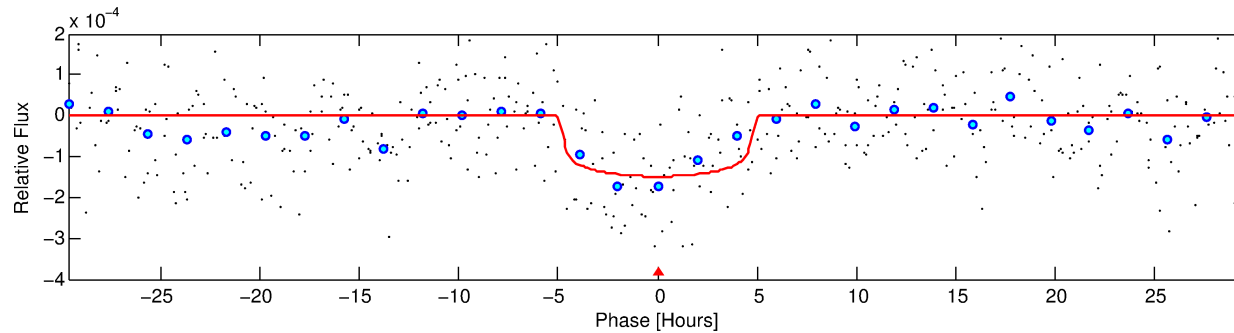
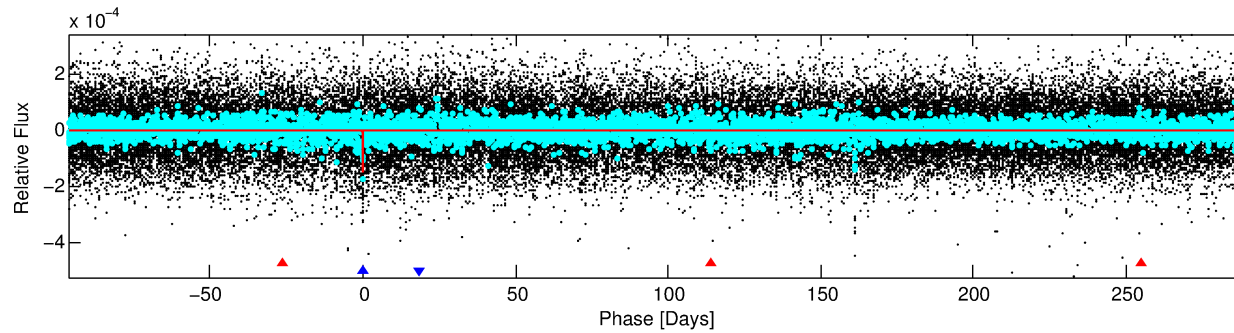
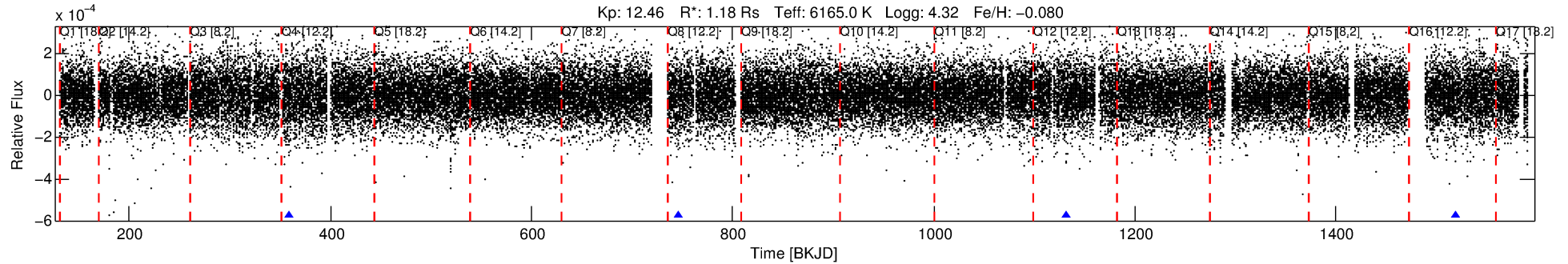
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009710611-02

No Significant Match Found

# DV One-Page Summary

KIC: 9710611 Candidate: 2 of 2 Period: 386.355 d



## DV Fit Results:

Period = 386.35515 [0.00646] d  
Epoch = 359.0941 [0.0125] BKJD  
Rp/R\* = 0.0124 [0.0038]  
a/R\* = 184.78 [282.72]  
b = 0.80 [0.69]  
Seff = 1.61 [0.48]  
Teq = 287 [21] K  
Rp = 1.59 [0.61] Re  
a = 1.0565 [0.1989] AU  
Ag = 17369.60 [13228.61] [1.31 $\sigma$ ]  
Teffp = 5095 [919] K [5.23 $\sigma$ ]

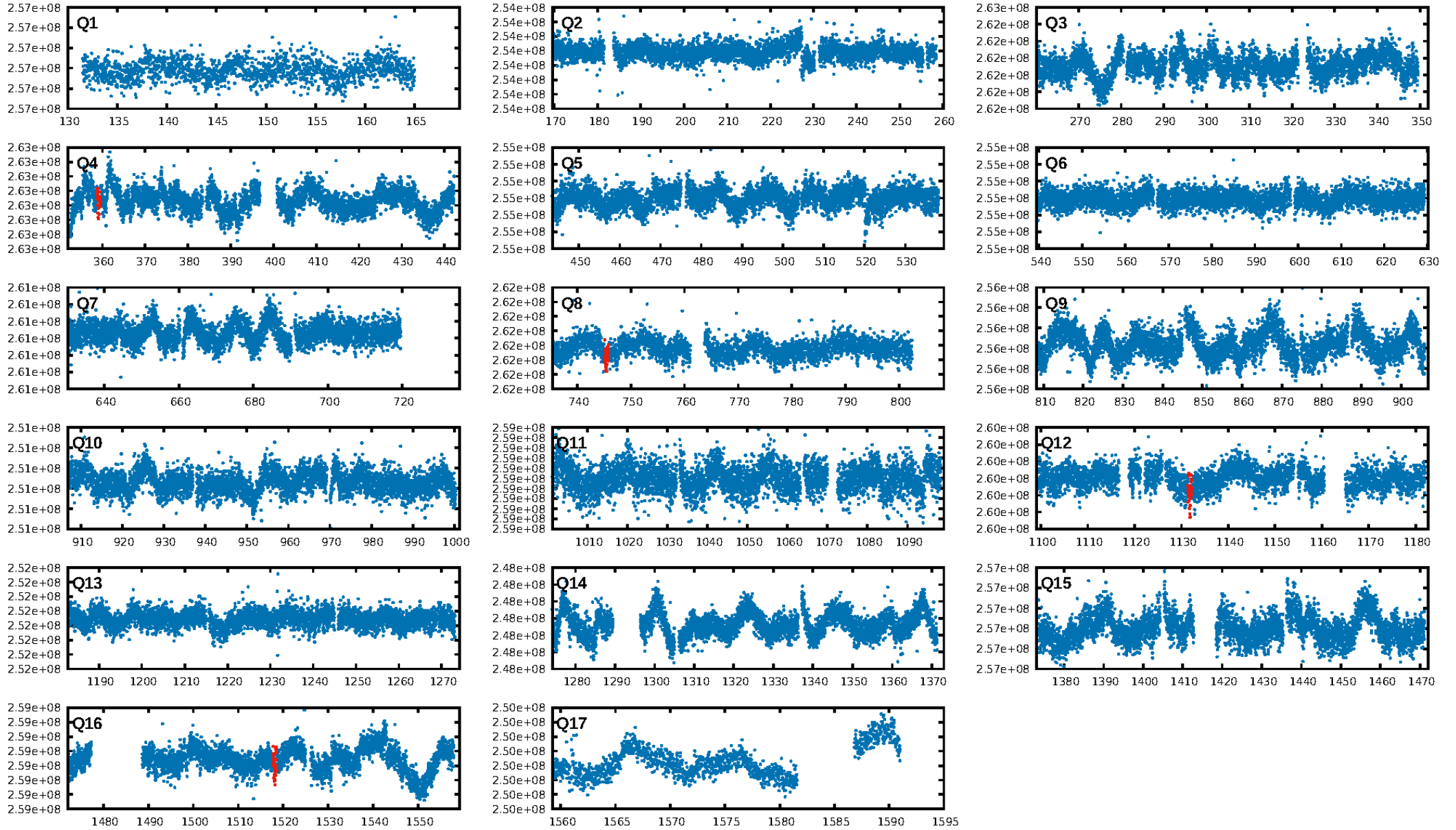
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [522.71 $\sigma$ ]  
ModelChiSquare2-sig: 25.4%  
ModelChiSquareGof-sig: 97.8%  
**Bootstrap-pfa: 6.41e-11**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.4645  
Centroid-sig: 0.4%  
Centroid-so: 3.077 arcsec [2.10 $\sigma$ ]  
OotOffset-rm: 0.566 arcsec [0.86 $\sigma$ ]  
OotOffset-st: 0/0/4/0 [4]  
KicOffset-rm: 1.392 arcsec [0.77 $\sigma$ ]  
KicOffset-st: 0/0/4/0 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 1.00 [4/4]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:29:58 Z

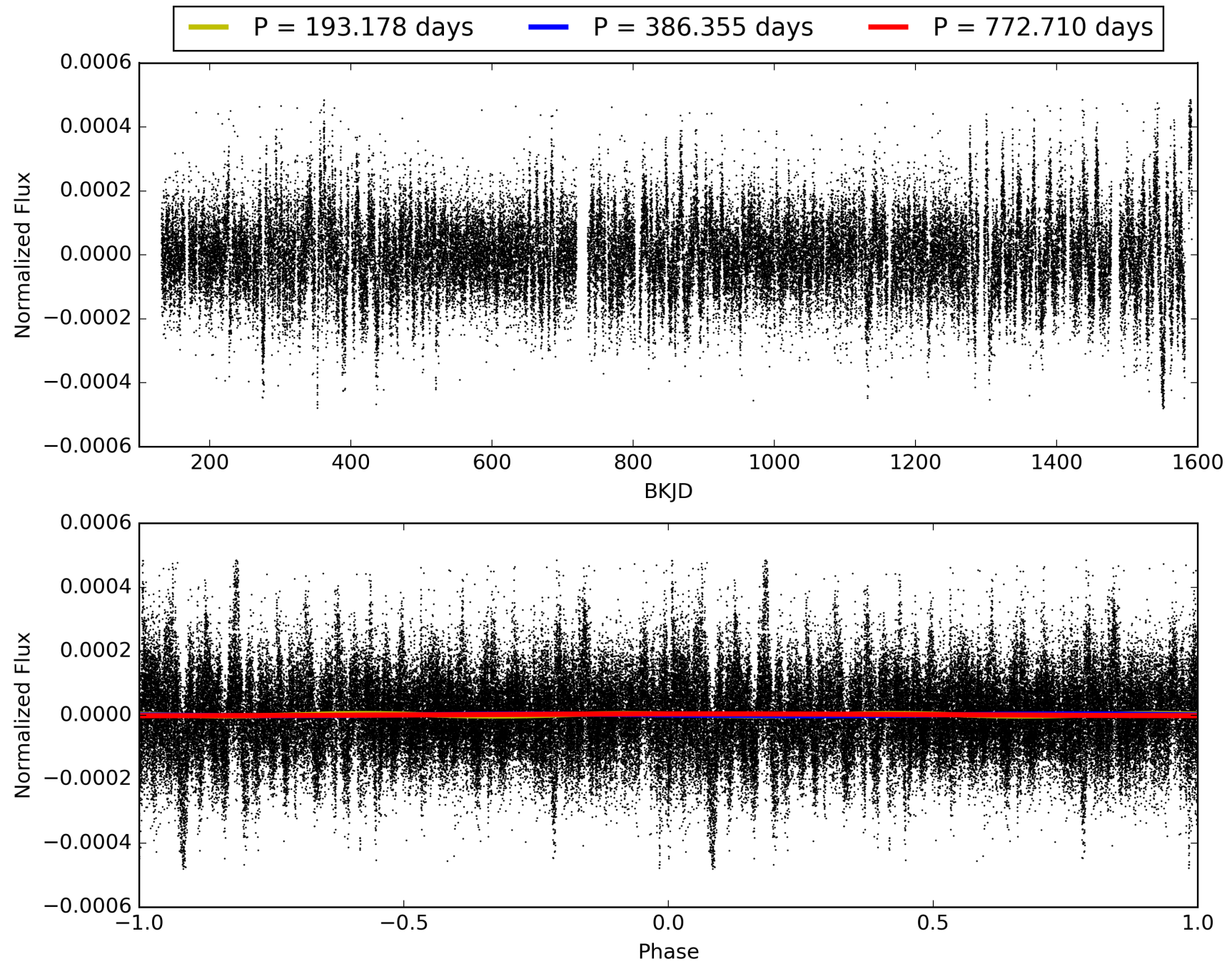
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009710611-02, PDC Light Curves





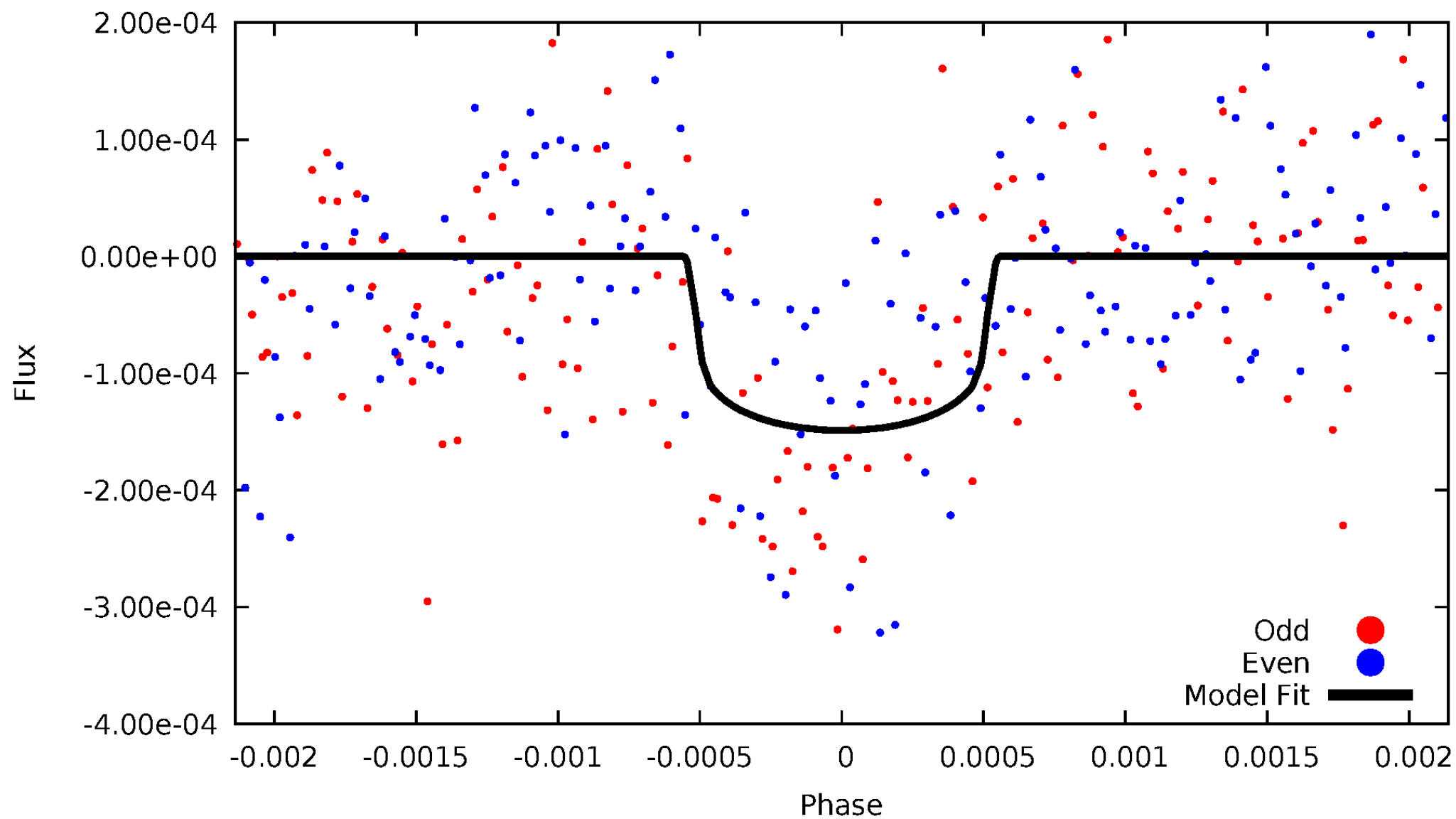
TCE 009710611-02





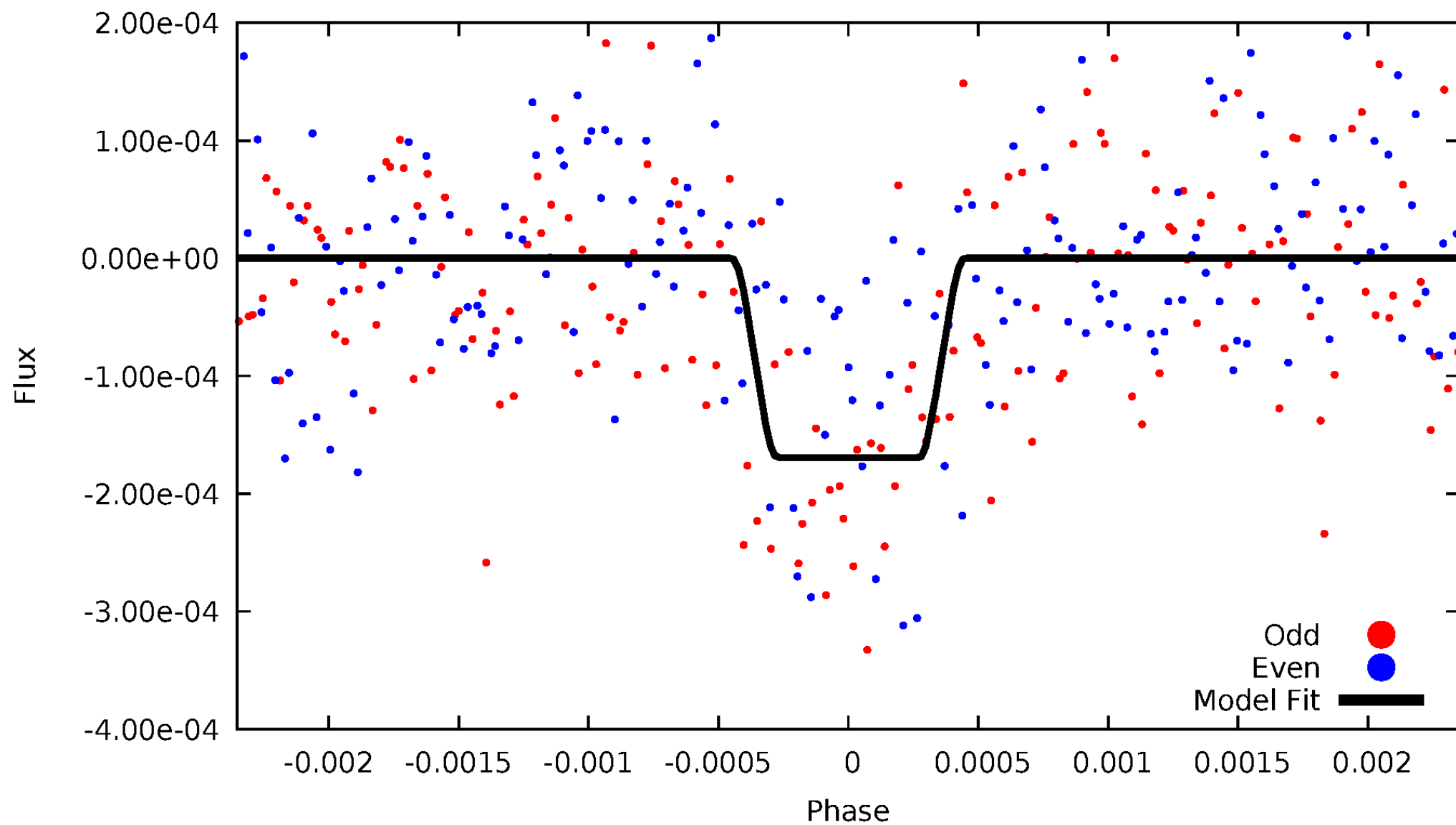
# DV Odd/Even

TCE 009710611-02



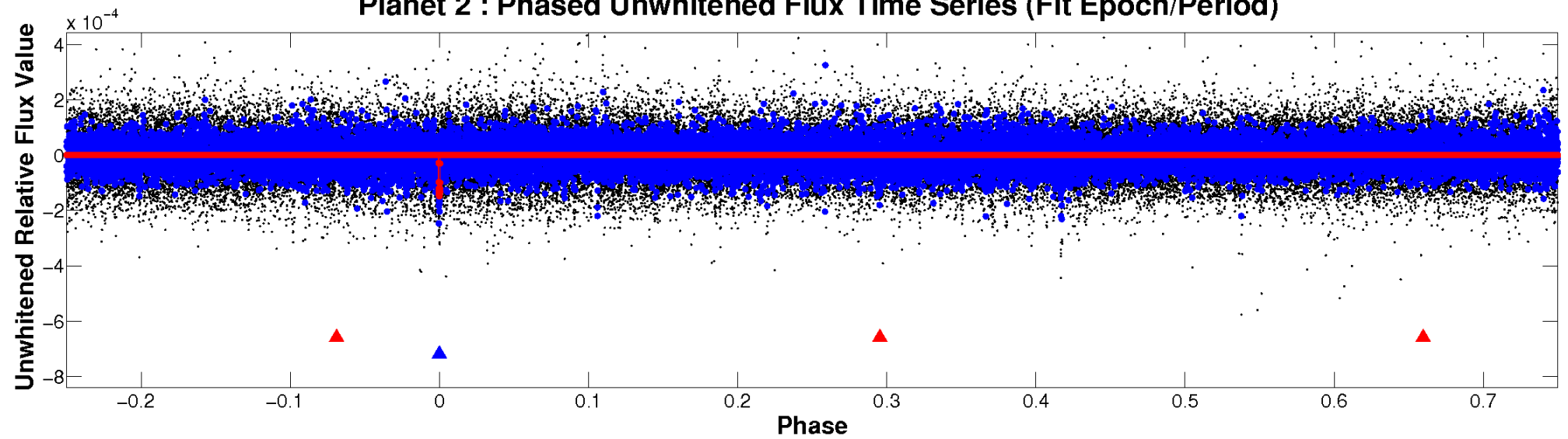
# ALT Odd/Even

TCE 009710611-02

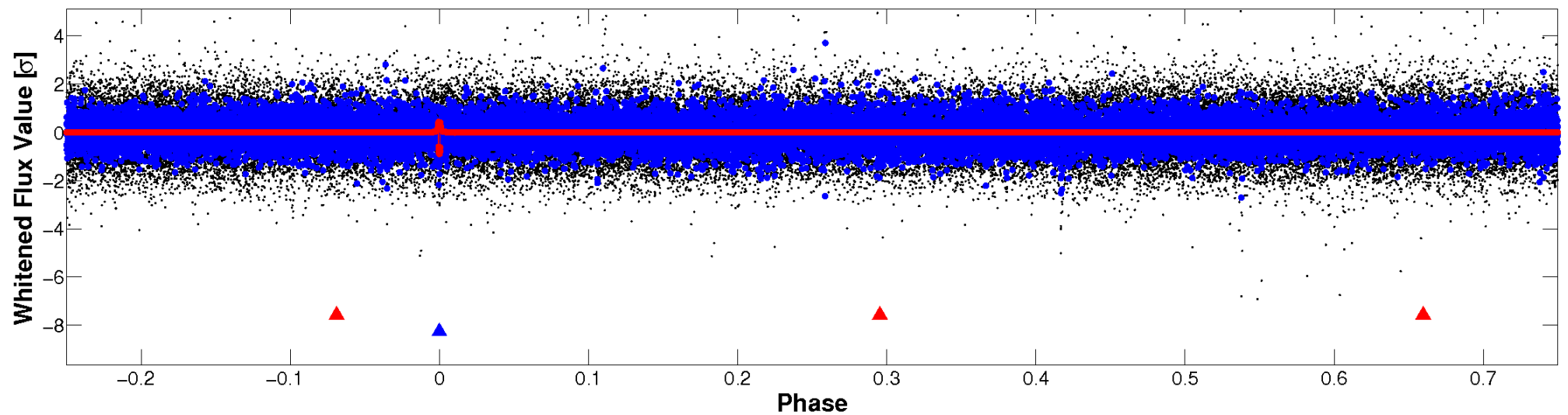


# Non-Whitened Vs. Whitened Light Curve

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



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



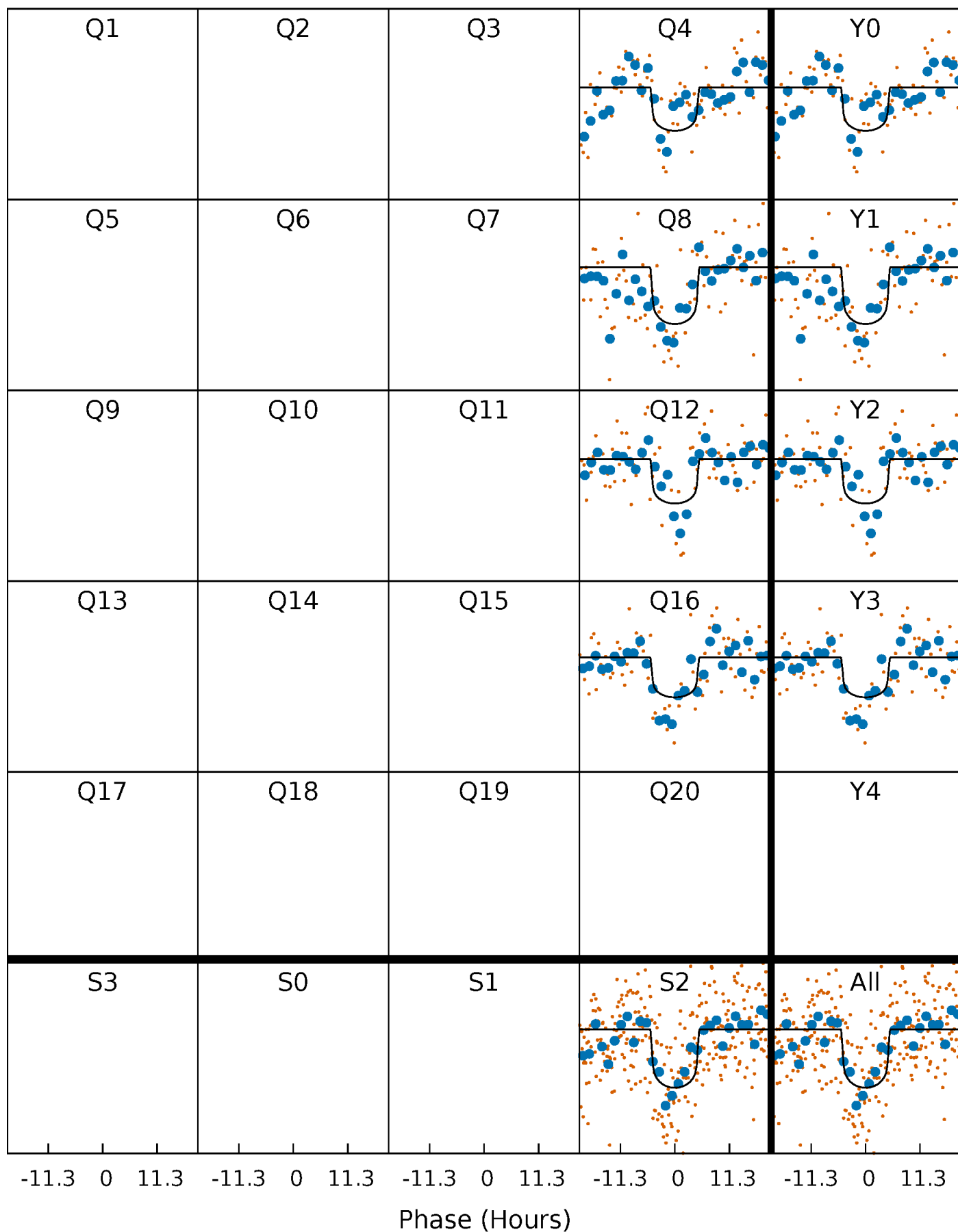
# PDC Quarter-Phased Transit Curves

TCE 009710611-02 P=386.355147 Days  $T_0=359.094141$  (BKJD)



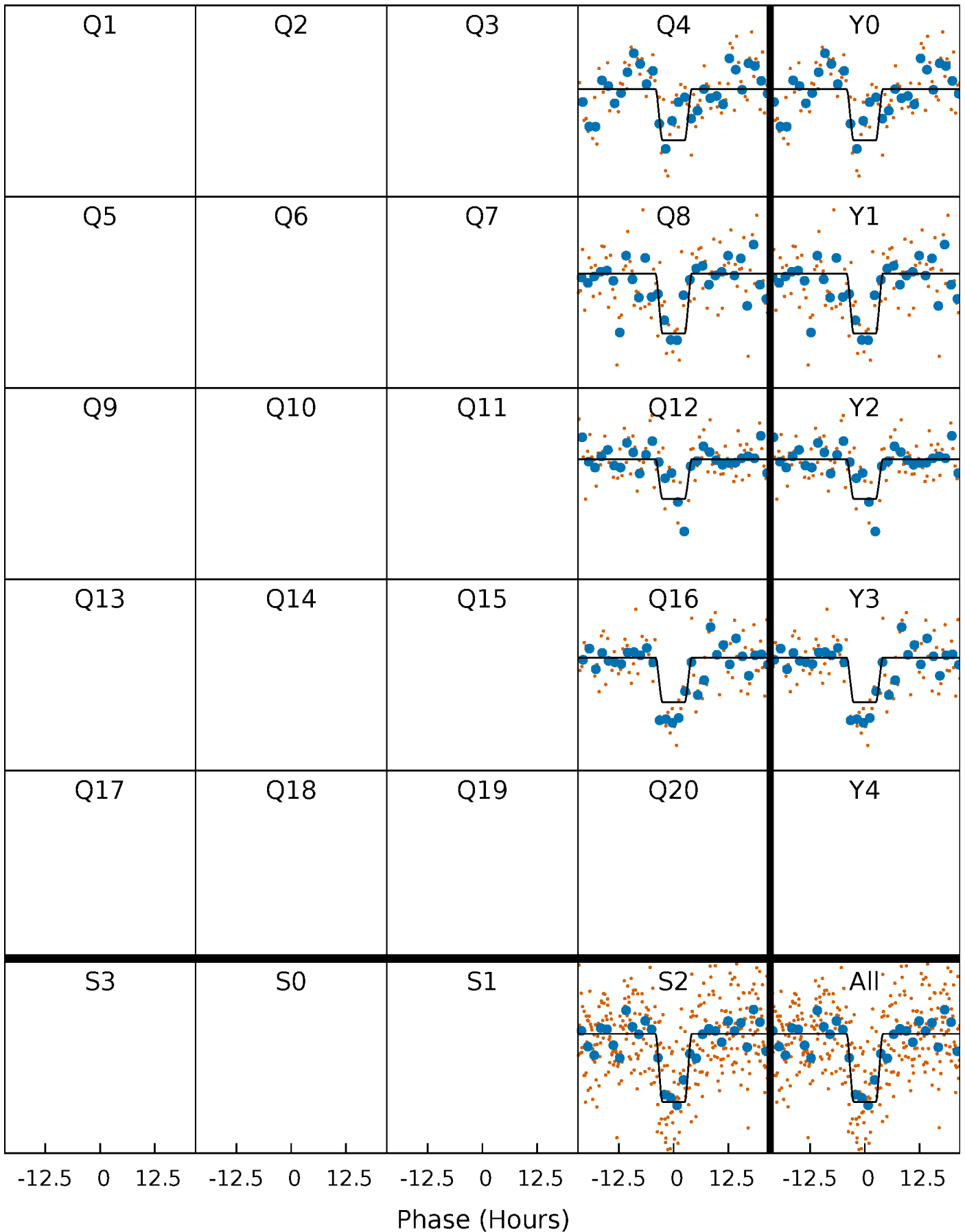
# DV Quarter-Phased Transit Curves

TCE 009710611-02 P=386.355147 Days  $T_0=359.094141$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

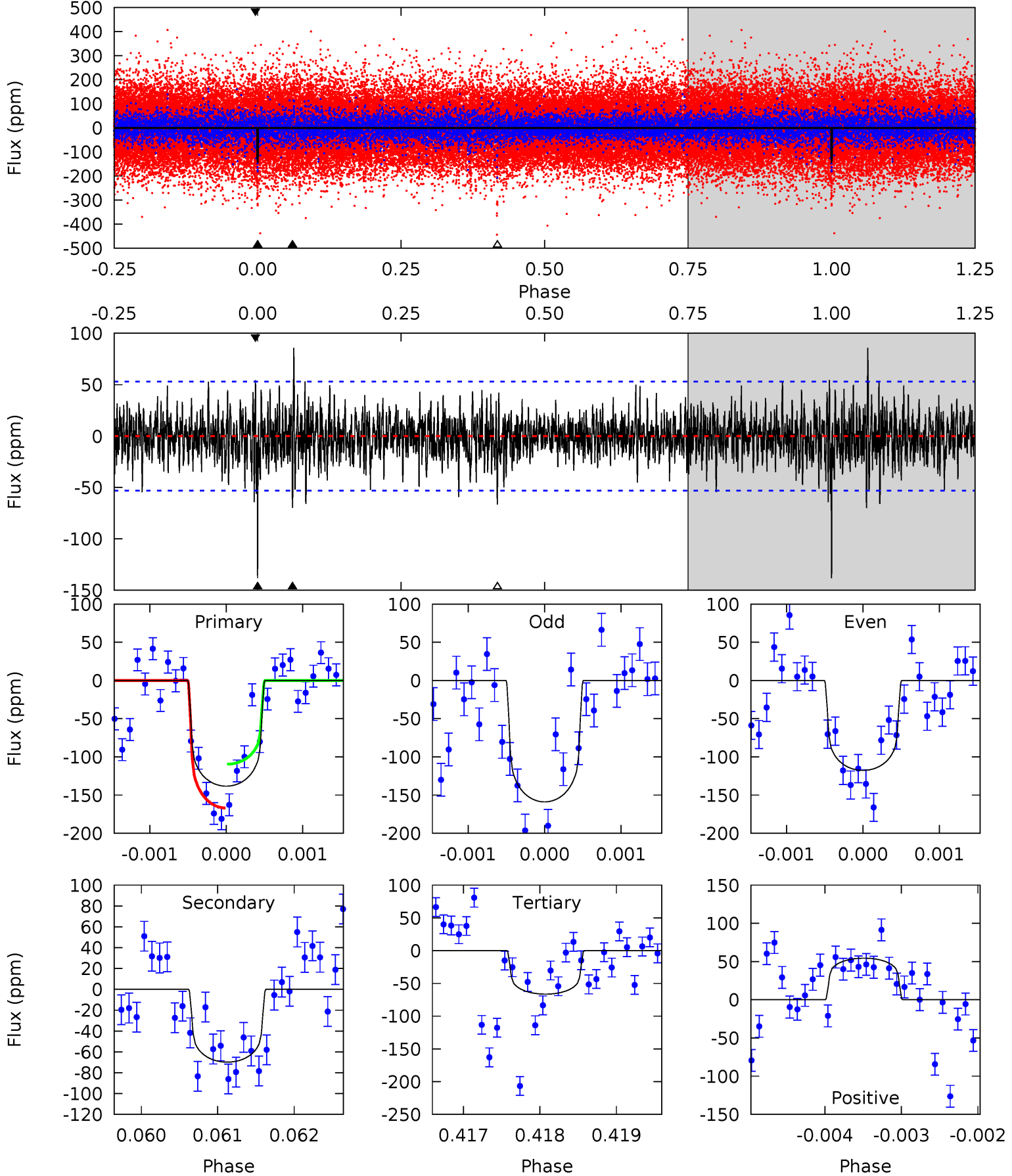
TCE 009710611-02 P=386.350941 Days  $T_0=359.072956$  (BKJD)



# DV Model-Shift Uniqueness Test

009710611-02, P = 386.355147 Days, E = 359.094141 Days

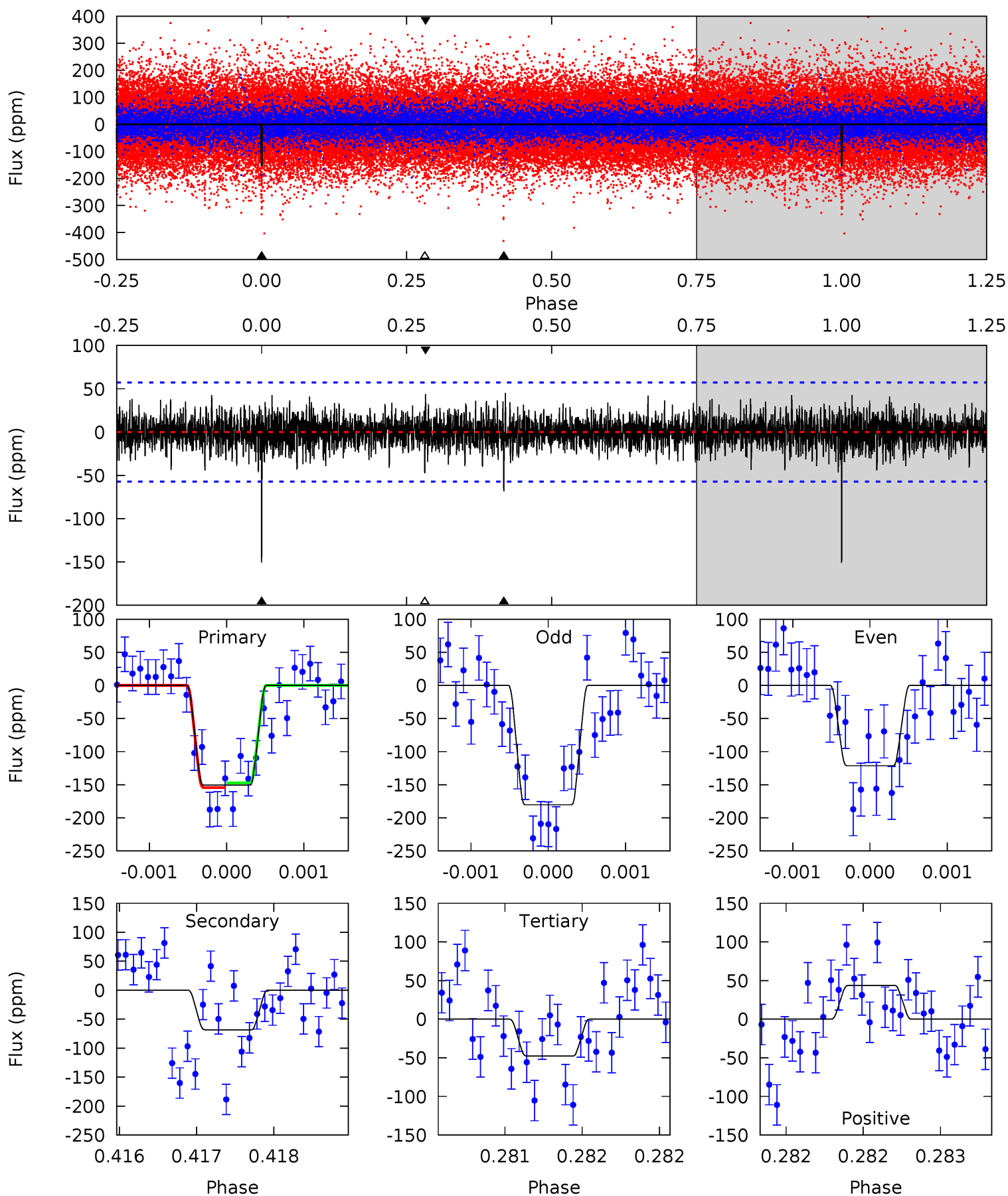
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.2	7.15	6.80	5.57	5.43	3.26	1.69	7.36	8.59	0.35	1.58	2.12	1.05	0.38	2.94



# Alt Model-Shift Uniqueness Test

009710611-02,  $P = 386.350941$  Days,  $E = 359.072956$  Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.4	6.52	4.55	4.18	5.47	3.33	1.22	9.85	10.2	1.97	2.35	2.82	1.10	0.23	0.34





### Stellar Parameters For KIC 009710611

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6165^{+154}_{-185}$	$4.319^{+0.121}_{-0.148}$	$-0.080^{+0.250}_{-0.300}$	$1.177^{+0.265}_{-0.177}$	$1.051^{+0.155}_{-0.129}$	$0.907^{+0.498}_{-0.377}$
	+2%/-3%	+3%/-3%	+312%/-375%	+23%/-15%	+15%/-12%	+55%/-42%
Source	PHO1	FLK73	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 009710611-02 / KOI 7958.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-70 \pm 10$	$1.62^{+0.55}_{-0.50}$	$402^{+26}_{-20}$	$5112^{+911}_{-553}$	$16147^{+18213}_{-7266}$
Alt.	$-68 \pm 10$	$1.69^{+0.53}_{-0.49}$	$401^{+24}_{-20}$	$4960^{+830}_{-501}$	$14594^{+14402}_{-6432}$

$T_{\text{max}}$  = 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

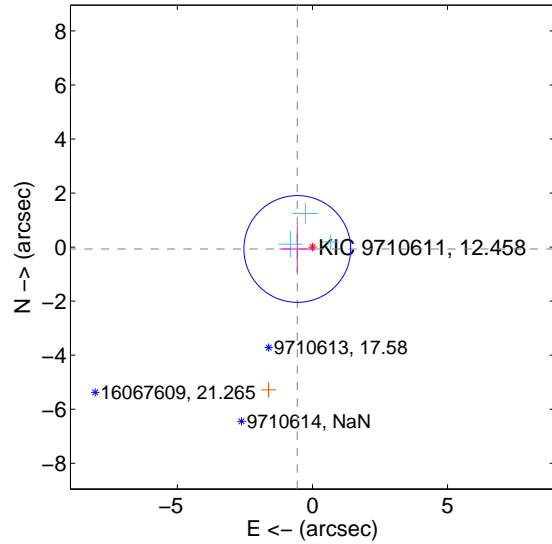
Supplemental centroid analysis for 009710611-02. Kepler magnitude: 12.46. Transit SNR 7.45

There are 3 quarters with good PRF difference image offsets

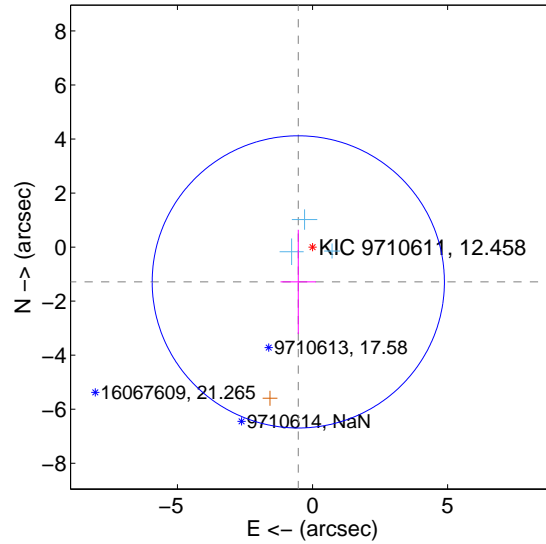
The direct PRF centroid is offset from the target star catalog position by about 0.34 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.566 \pm 0.659$	0.86	$0.561 \pm 0.655$	$-0.070 \pm 0.859$
PRF-fit source offset from KIC position	$1.392 \pm 1.803$	0.77	$0.527 \pm 0.657$	$-1.288 \pm 1.929$
photometric centroid source offset	$3.08 \pm 1.46$	2.10	$-2.18 \pm 1.60$	$-2.17 \pm 1.31$

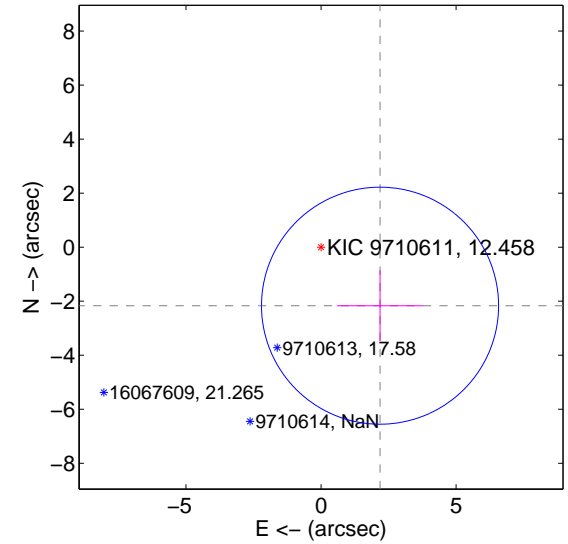
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

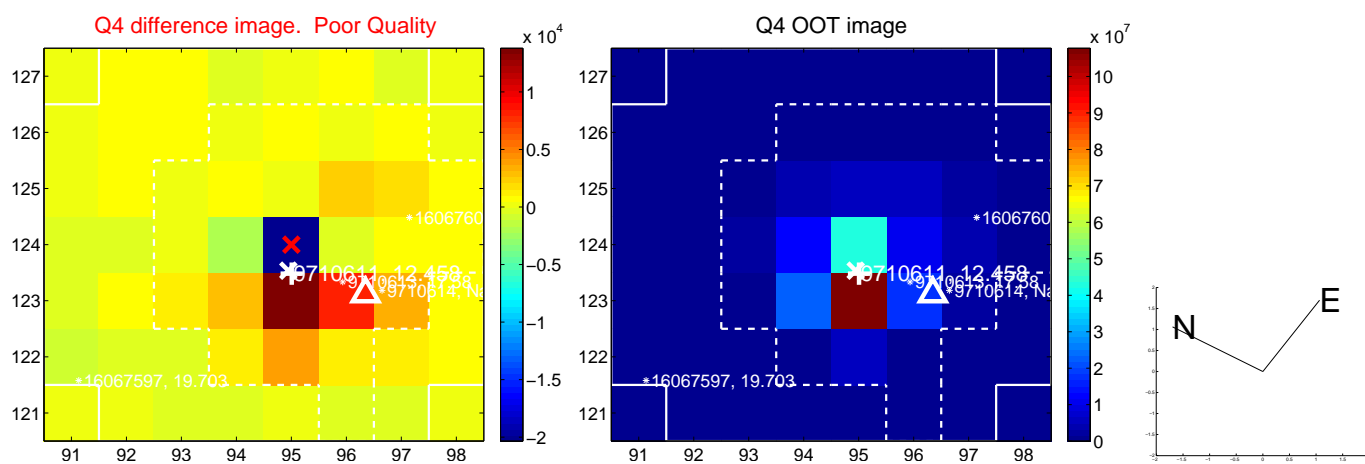
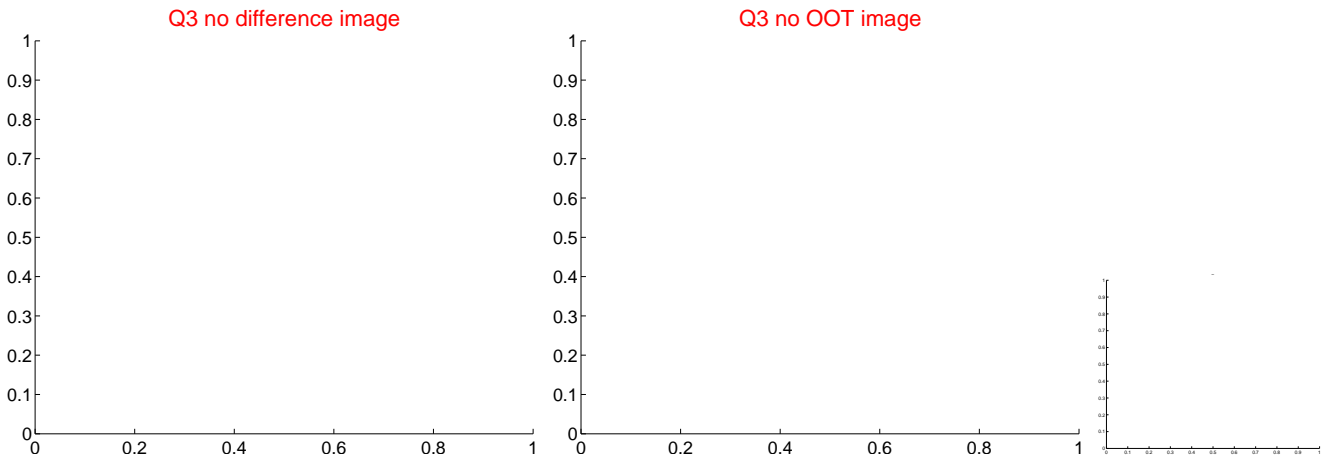
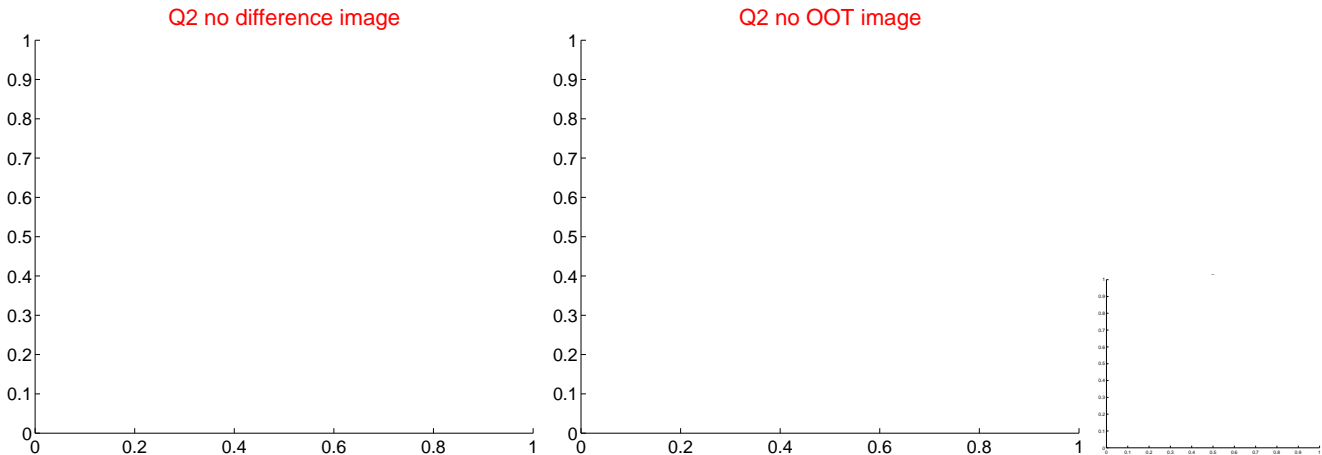
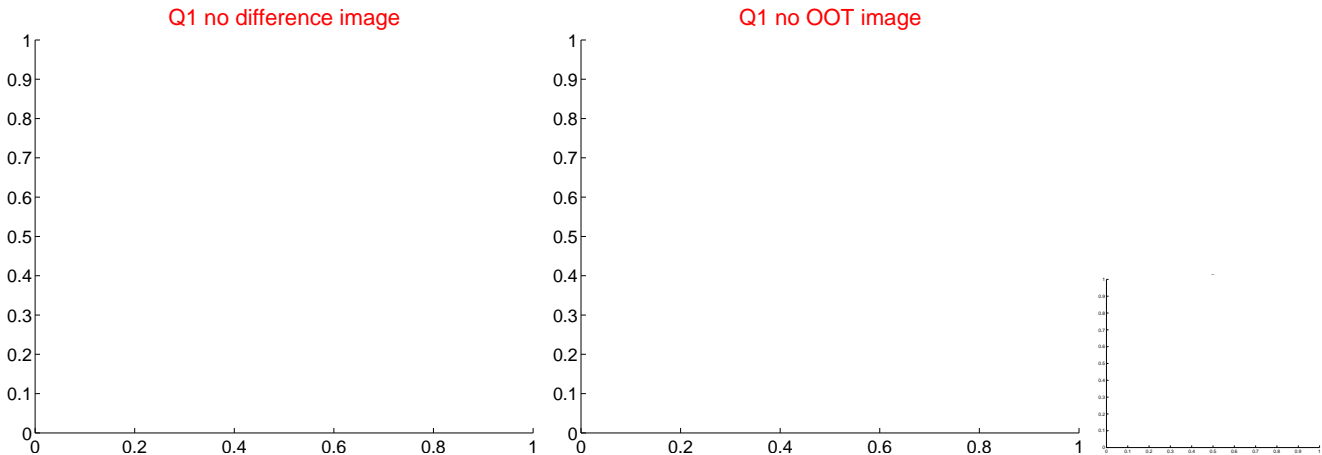


offset from photometric centroids

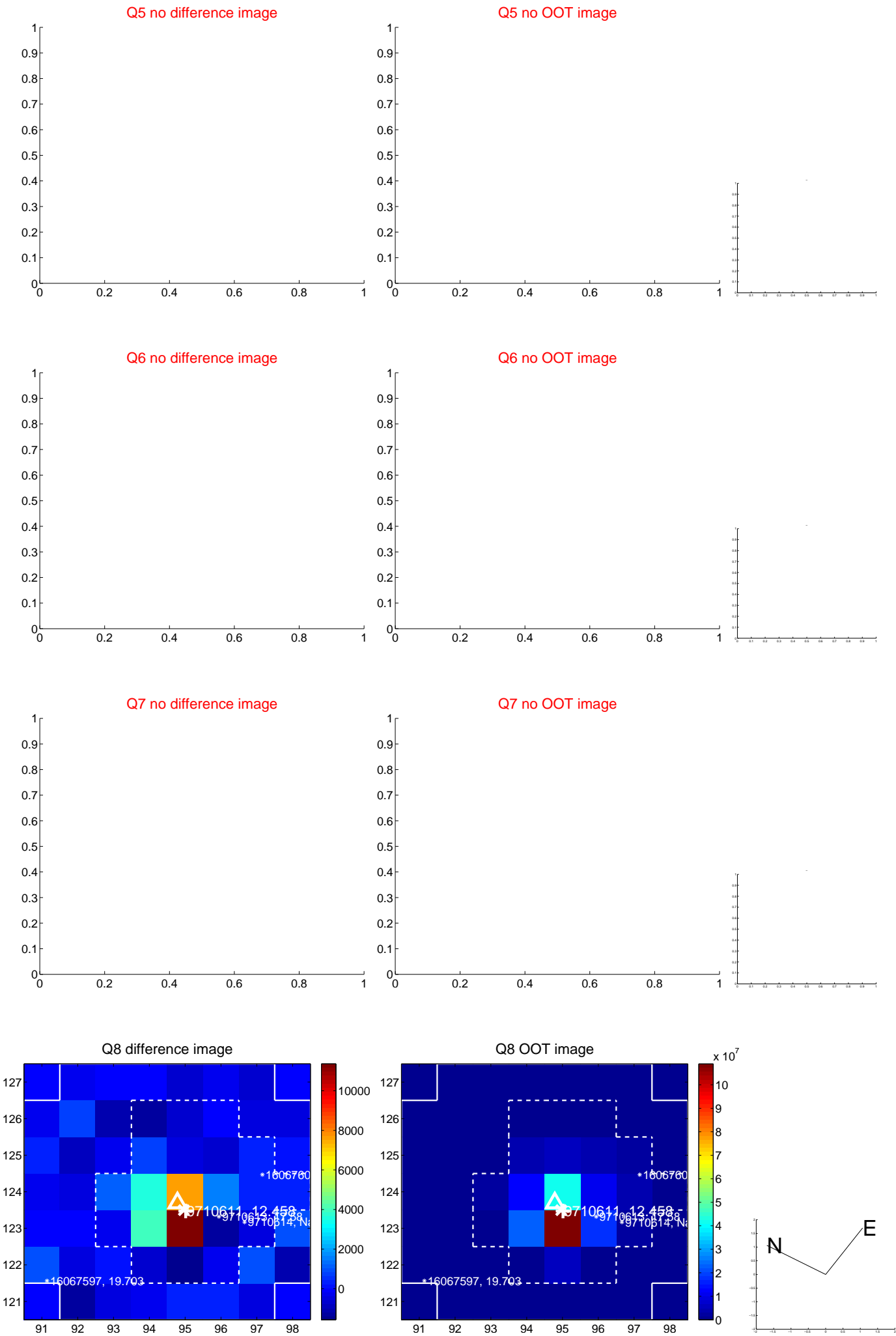


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

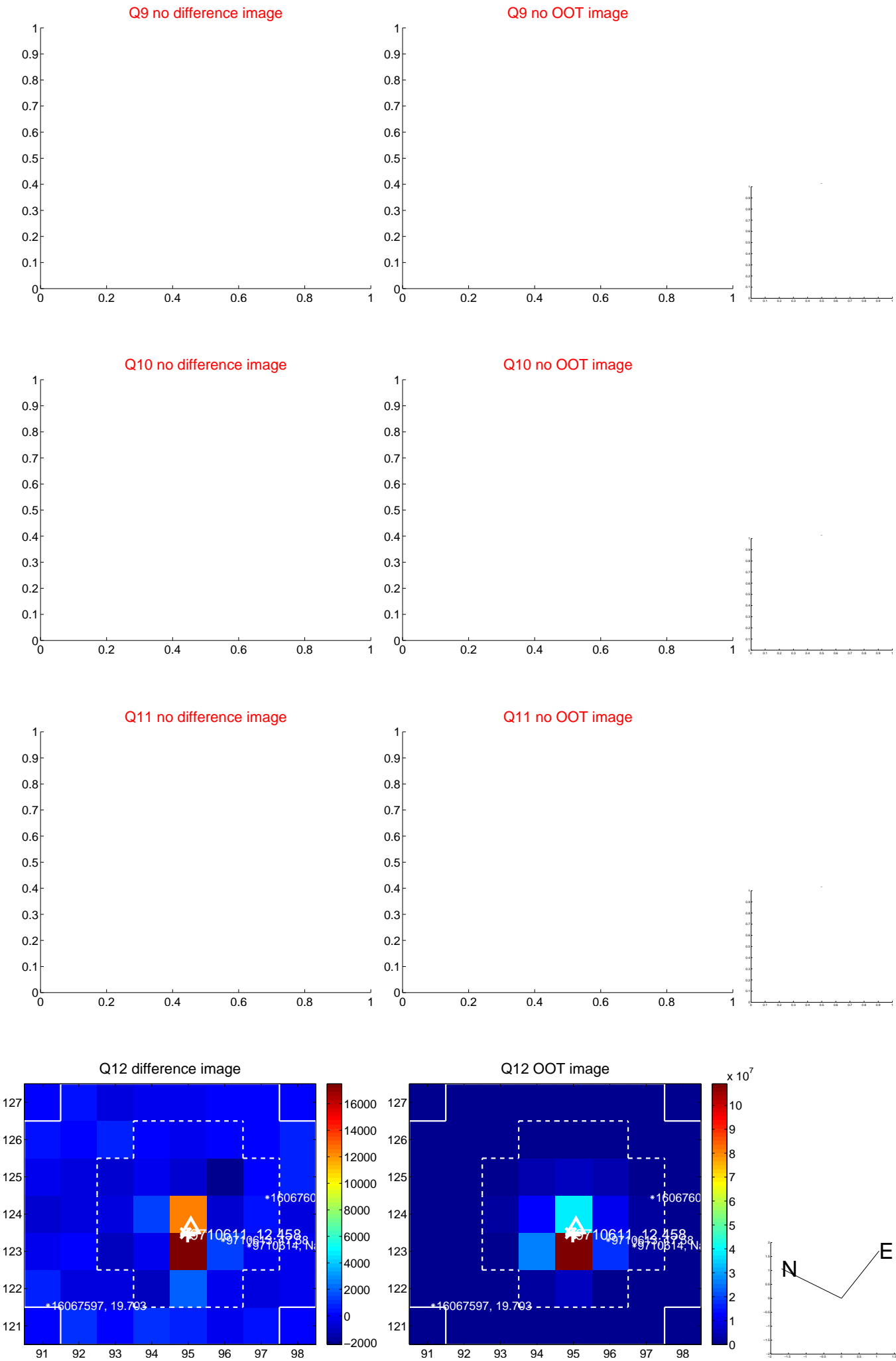
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



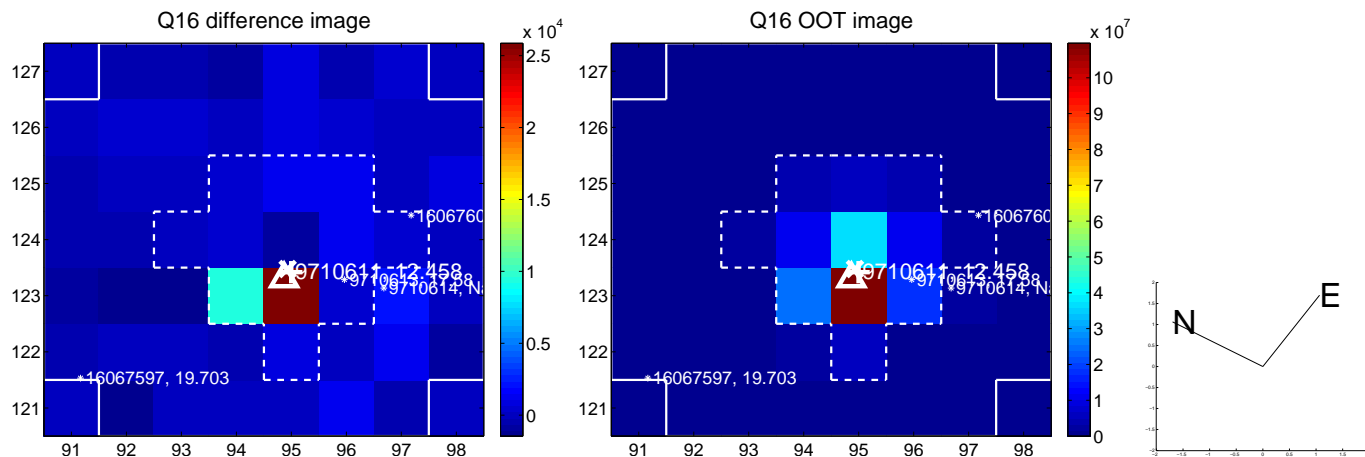
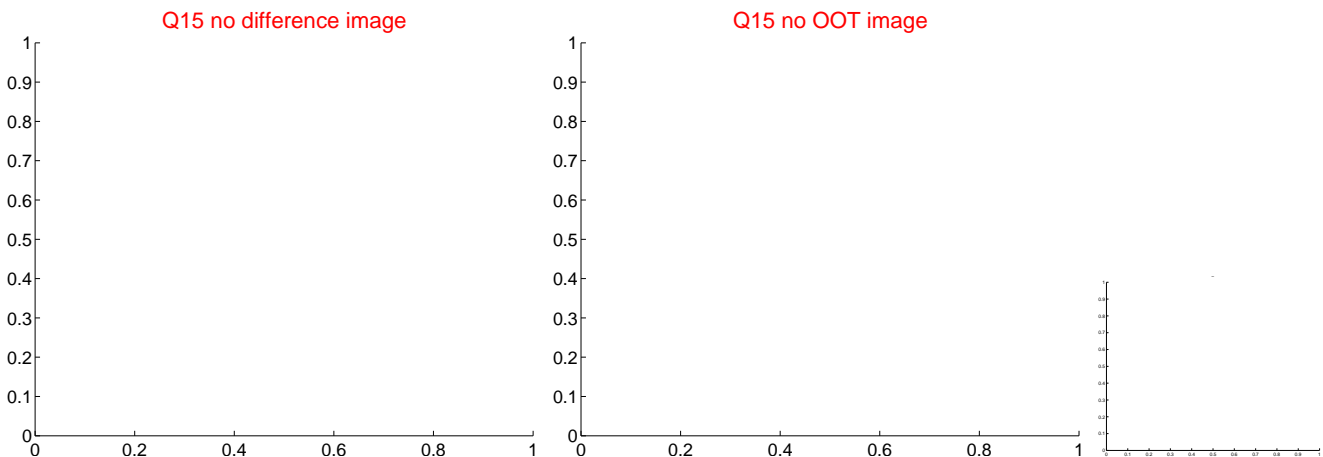
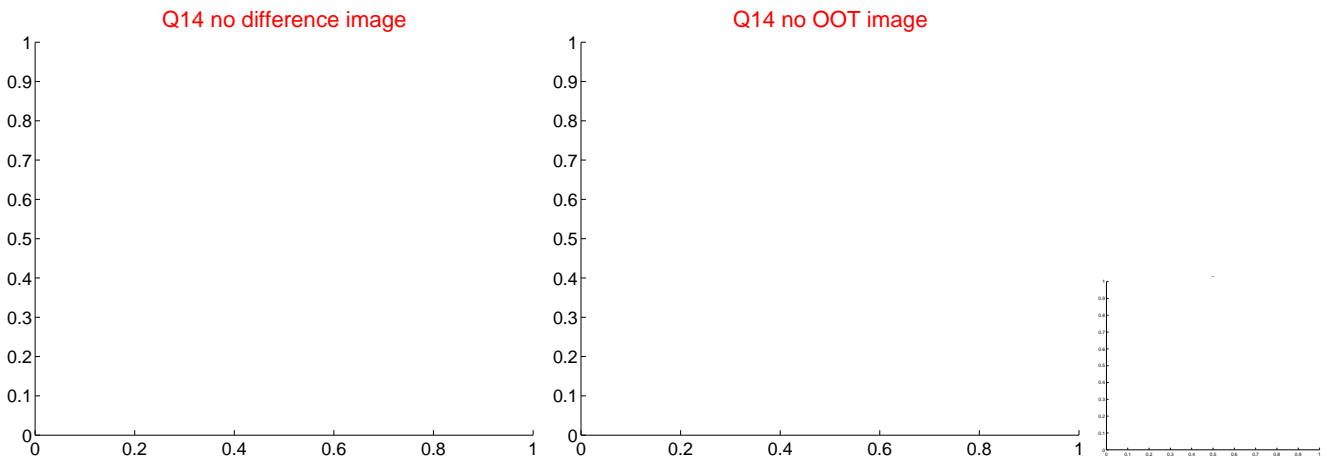
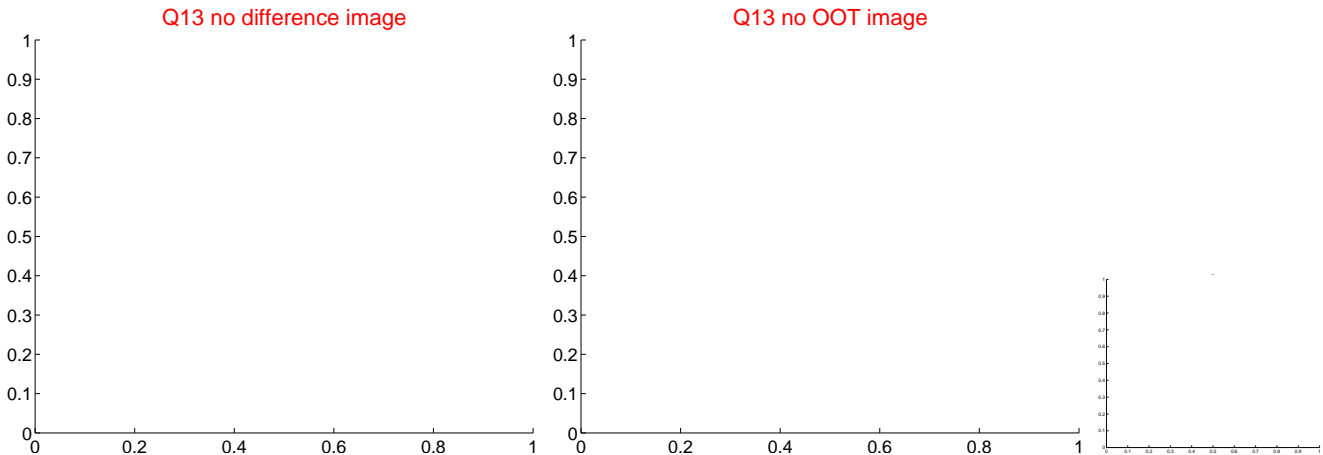
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



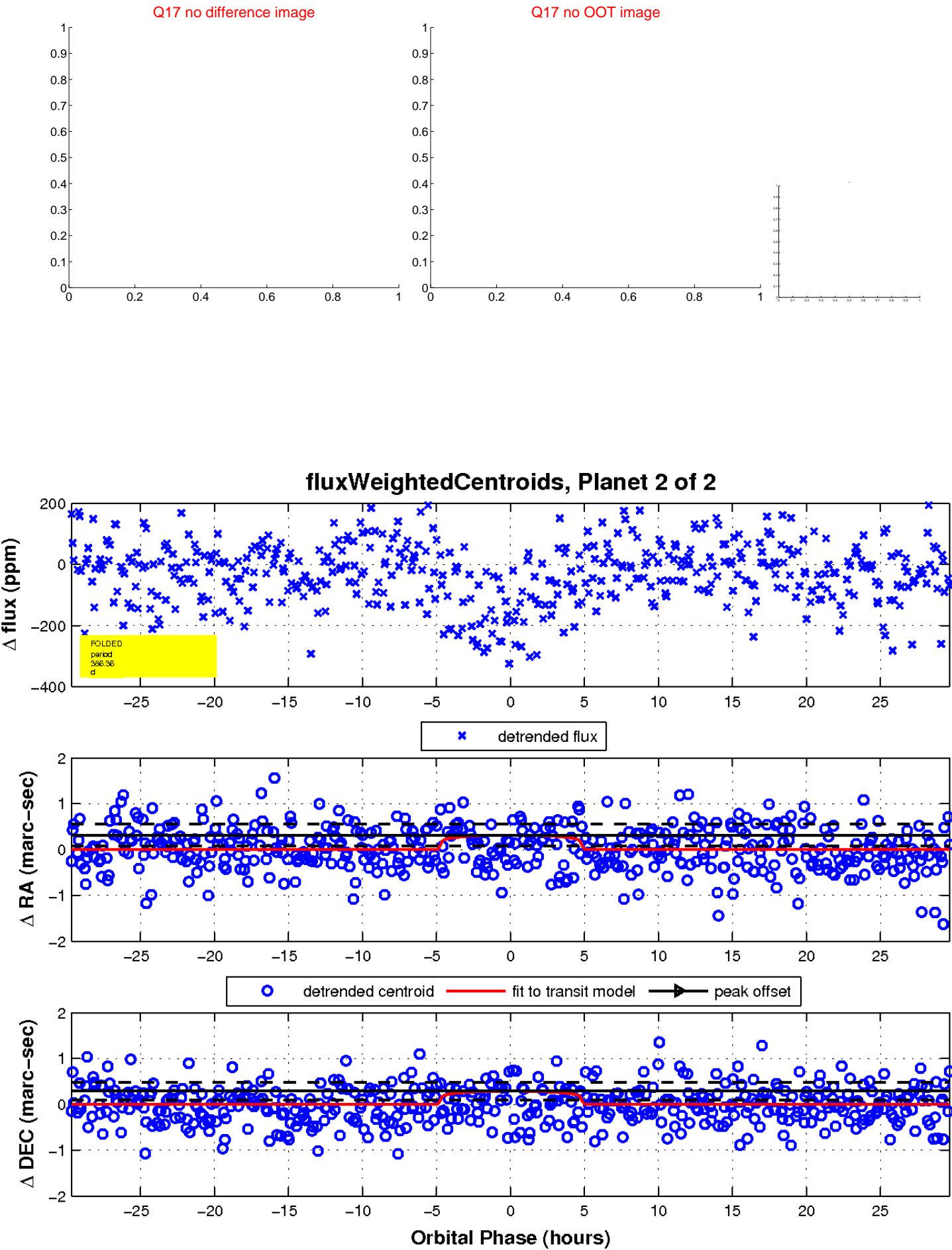
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

