

# KIC 009028154

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009028154-01	OBS	No	0.719949	131.954822	613.4	1.250	13.5	19.3	3.17	8311	9.17	108572.46
009028154-02	OBS	No	0.719918	131.646848	234.5	5.332	14.5	14.7	3.17	8311	5.20	108578.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009028154-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
009028154-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD

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

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

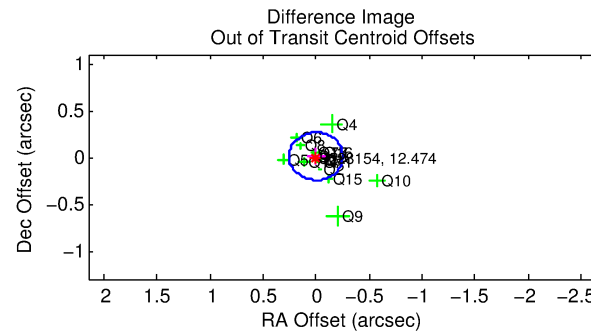
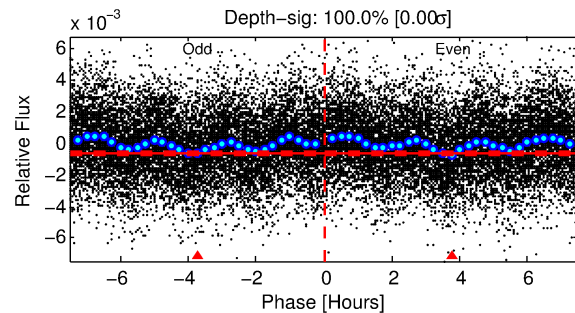
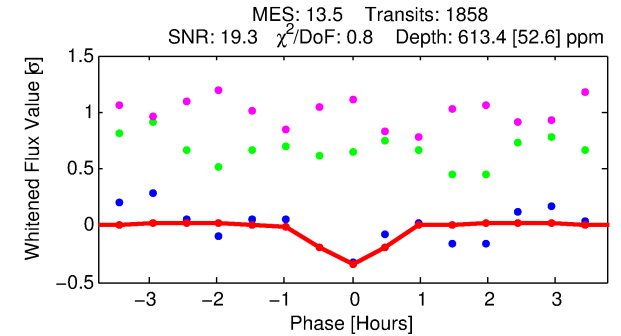
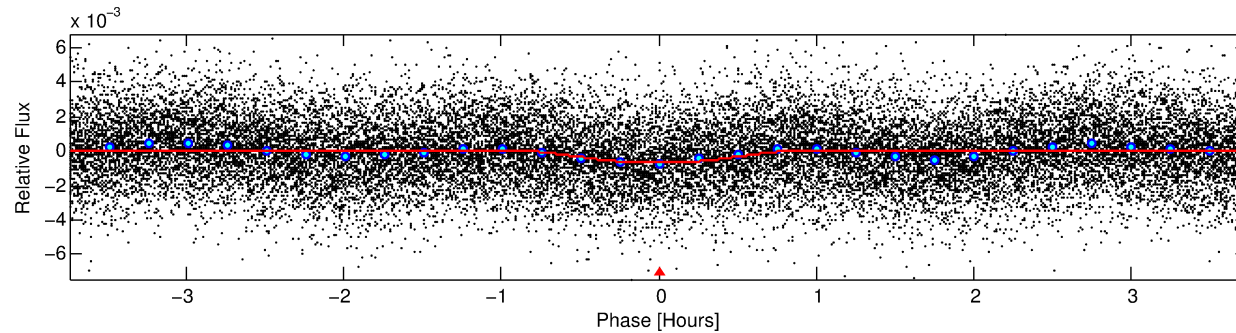
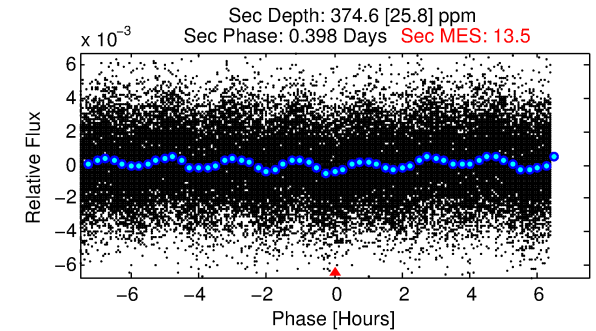
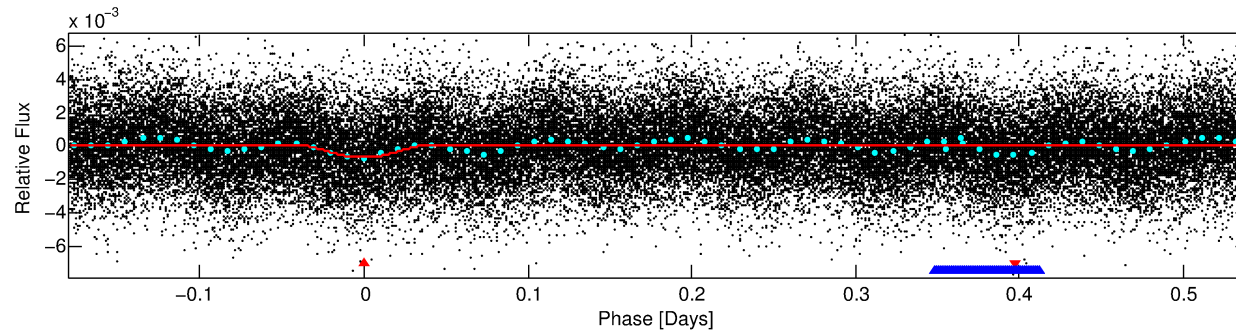
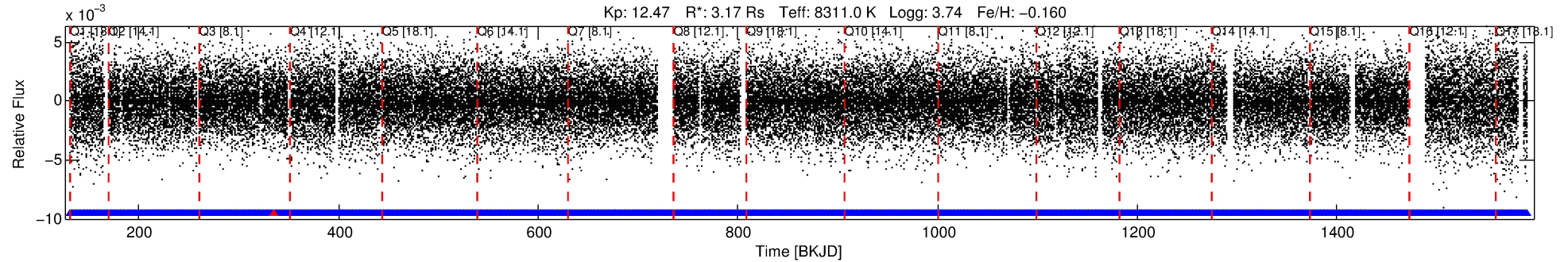
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009028154-01

No Significant Match Found

# DV One-Page Summary

KIC: 9028154 Candidate: 1 of 2 Period: 0.720 d



## DV Fit Results:

Period = 0.71995 [0.00001] d  
Epoch = 131.9548 [0.0011] BKJD  
Rp/R\* = 0.0265 [0.0068]  
a/R\* = 2.37 [2.98]  
b = 0.90 [0.33]  
Seff = 108572.46 [81322.35]  
Teq = 4629 [867] K  
Rp = 9.17 [4.73] Re  
a = 0.0199 [0.0089] AU  
Ag = 0.97 [0.86] [-0.04σ]  
Teffp = 7099 [973] K [1.90σ]

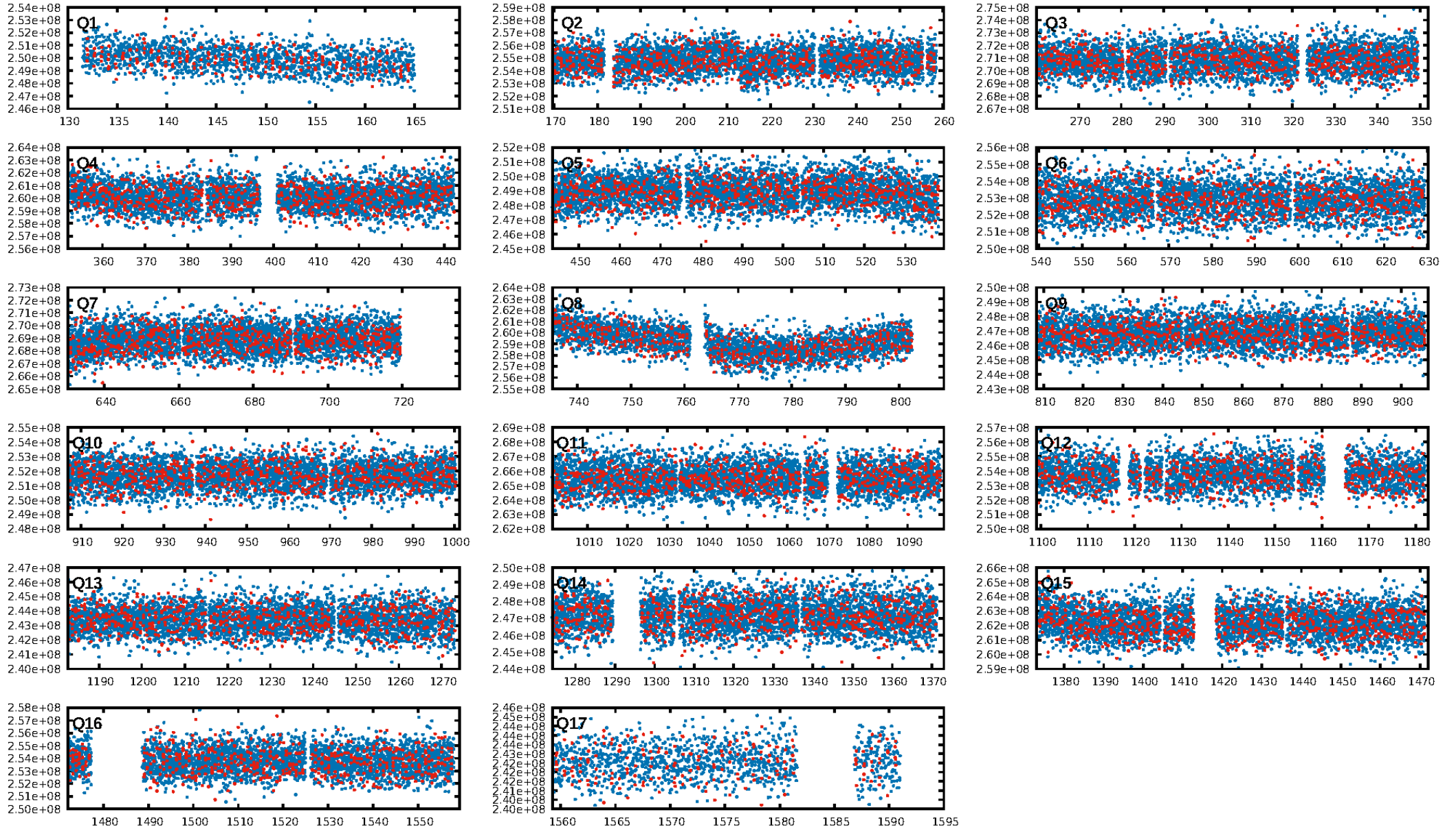
## DV Diagnostic Results:

**ShortPeriod-sig: 0.0% [0.00σ]**  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1774/1775]  
GhostDiagnostic-chr: 2.135  
Centroid-sig: 5.2%  
**Centroid-so: 0.127 arcsec [4.46σ]**  
OotOffset-rm: 0.011 arcsec [0.13σ]  
KicOffset-rm: 0.049 arcsec [0.56σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.71 [12/17]  
DiffImageOverlap-fno: 0.71 [12/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 16:12:36 Z

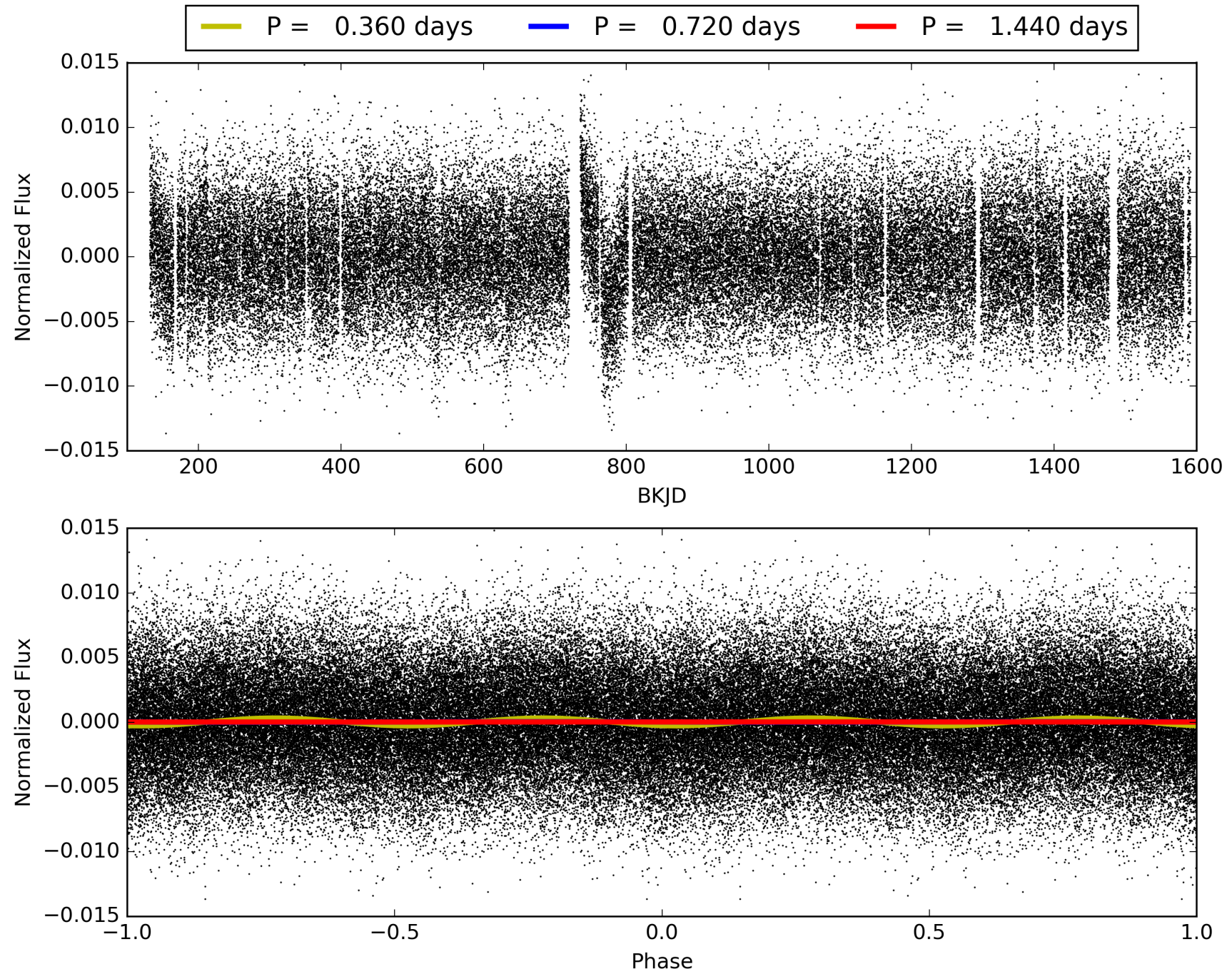
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009028154-01, PDC Light Curves



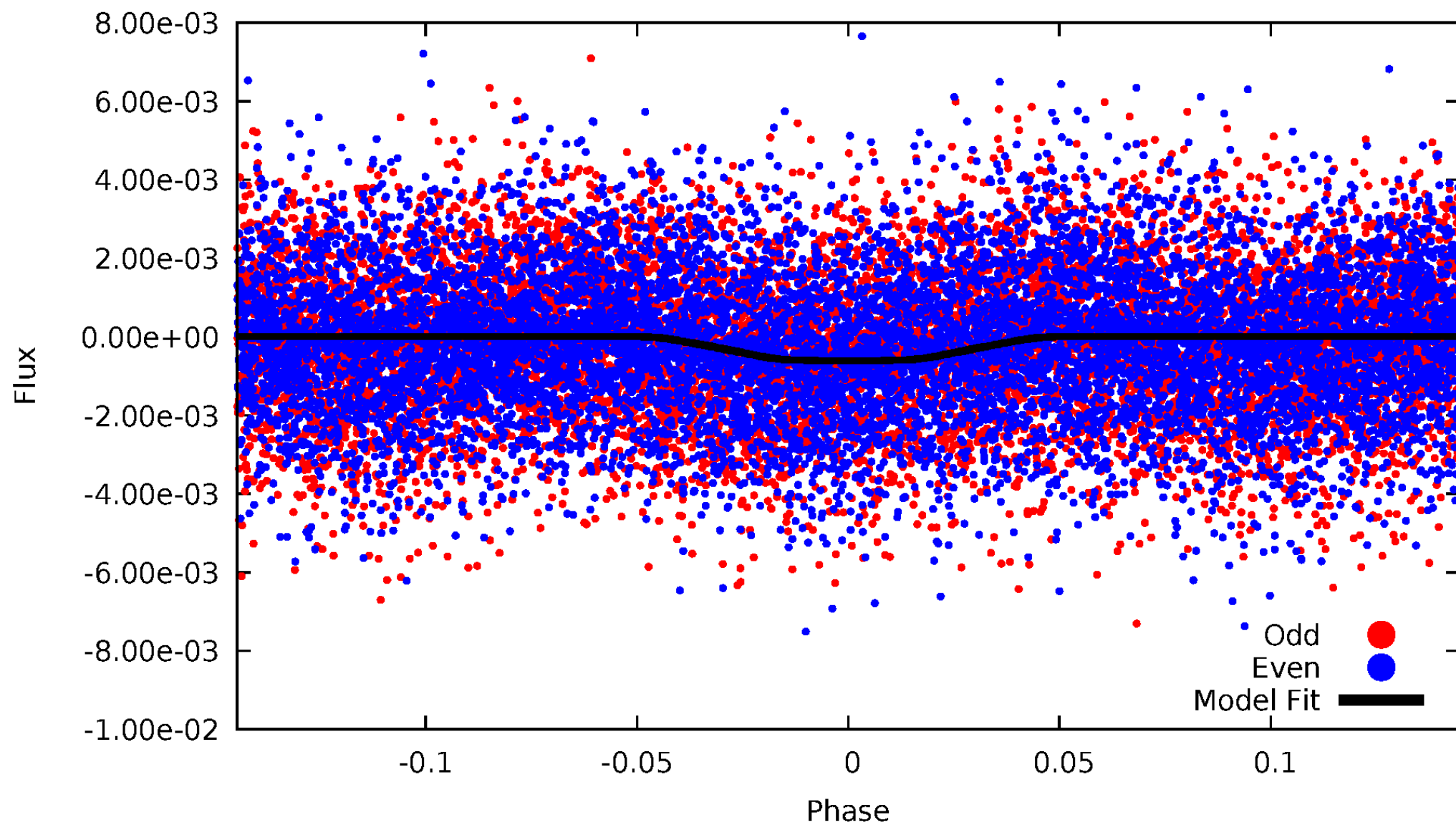


TCE 009028154-01



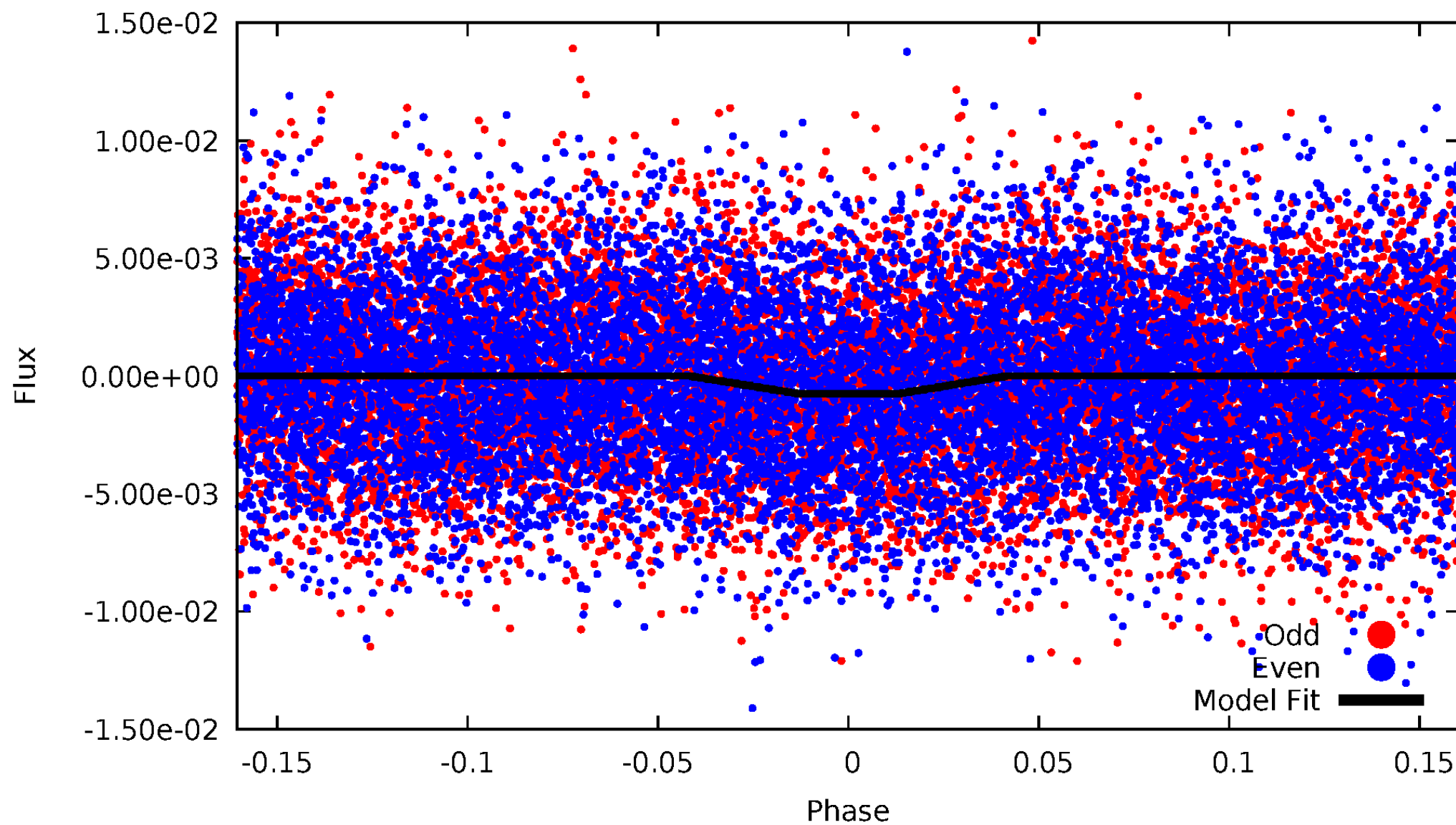
DV Odd/Even

TCE 009028154-01



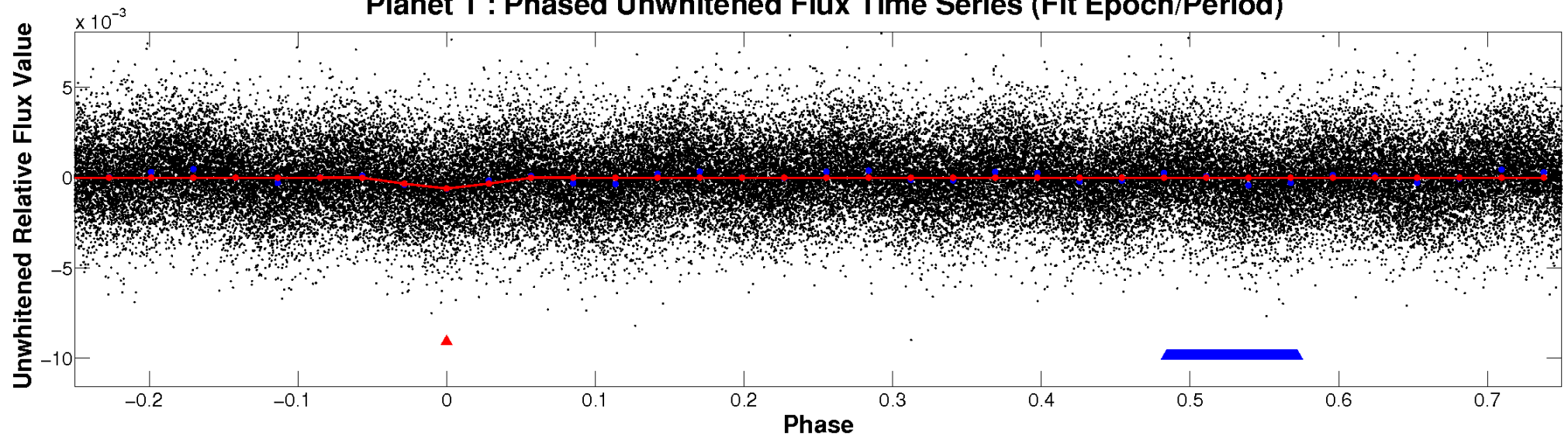
# ALT Odd/Even

TCE 009028154-01

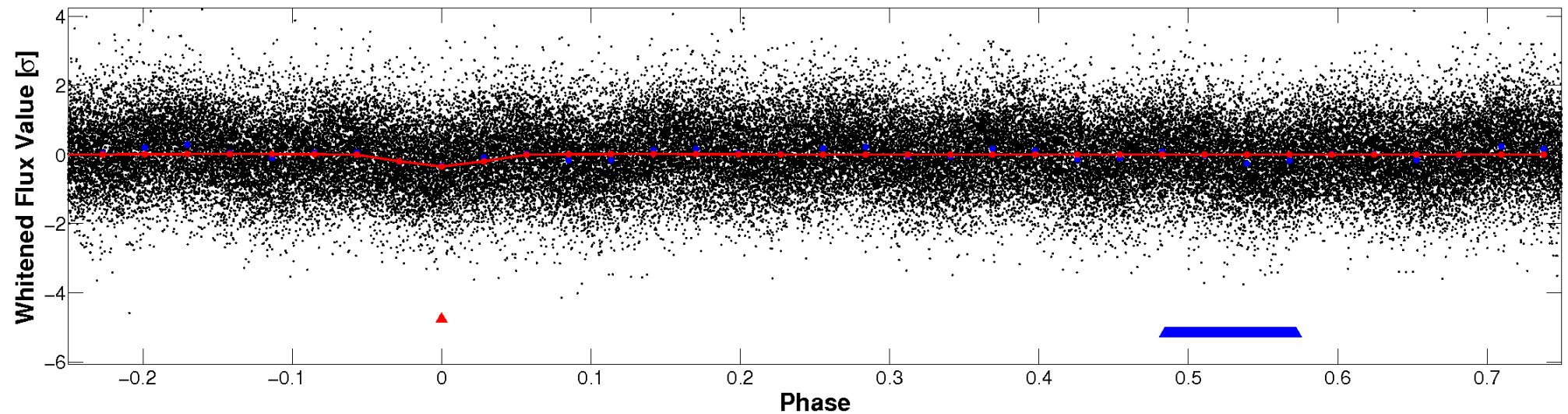


# Non-Whitened Vs. Whitened Light Curve

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



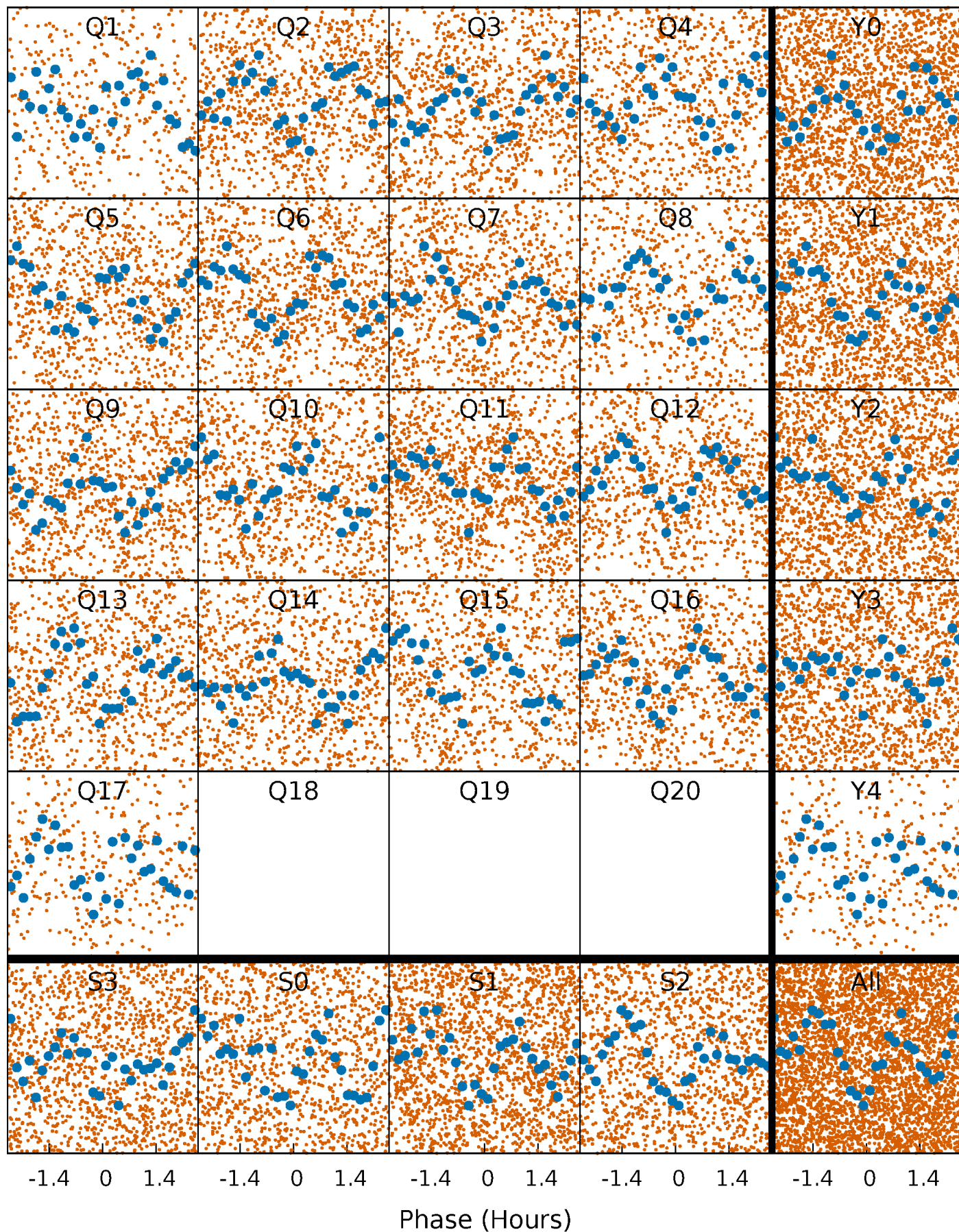
## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

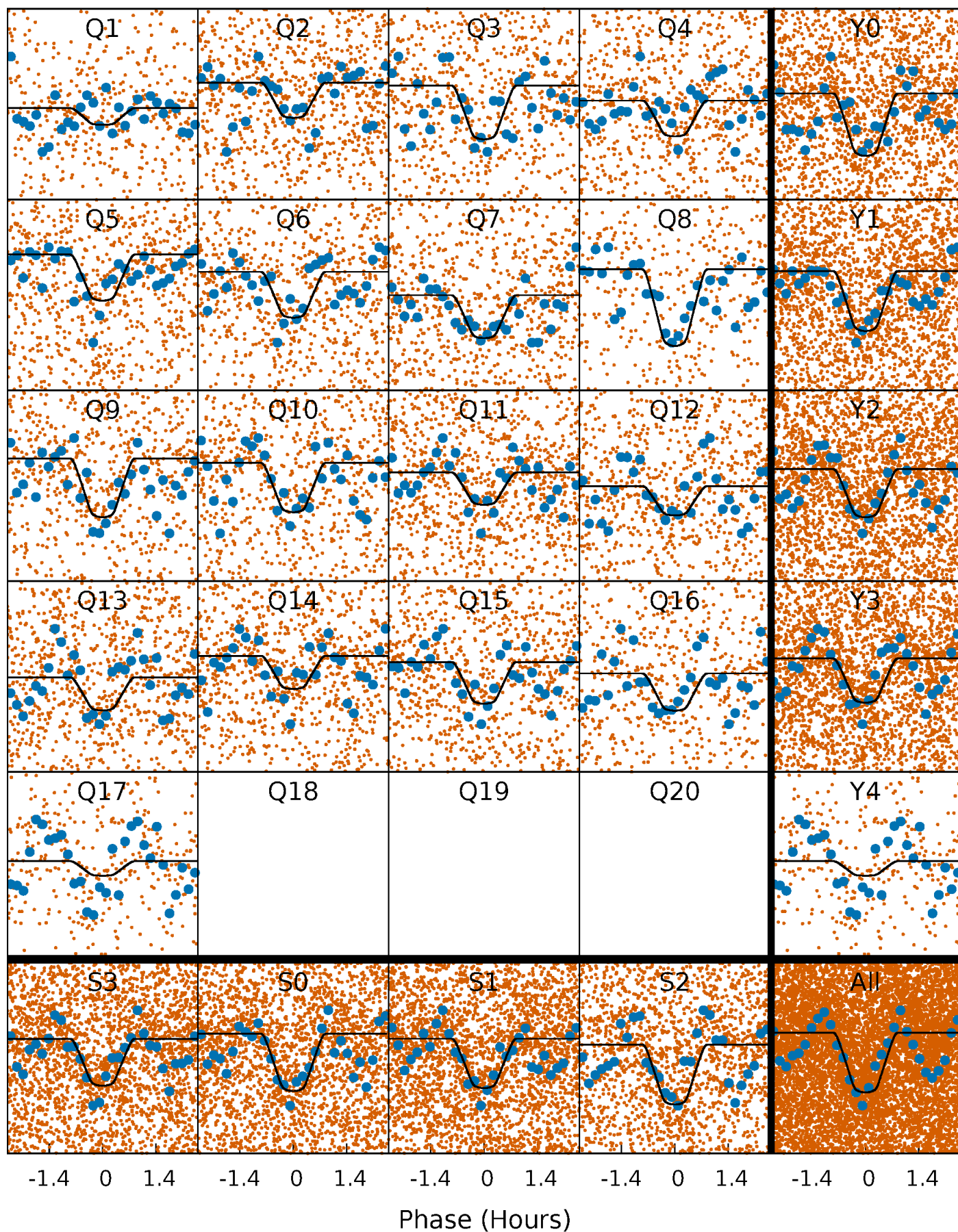
TCE 009028154-01 P= 0.719949 Days  $T_0=131.954822$  (BKJD)





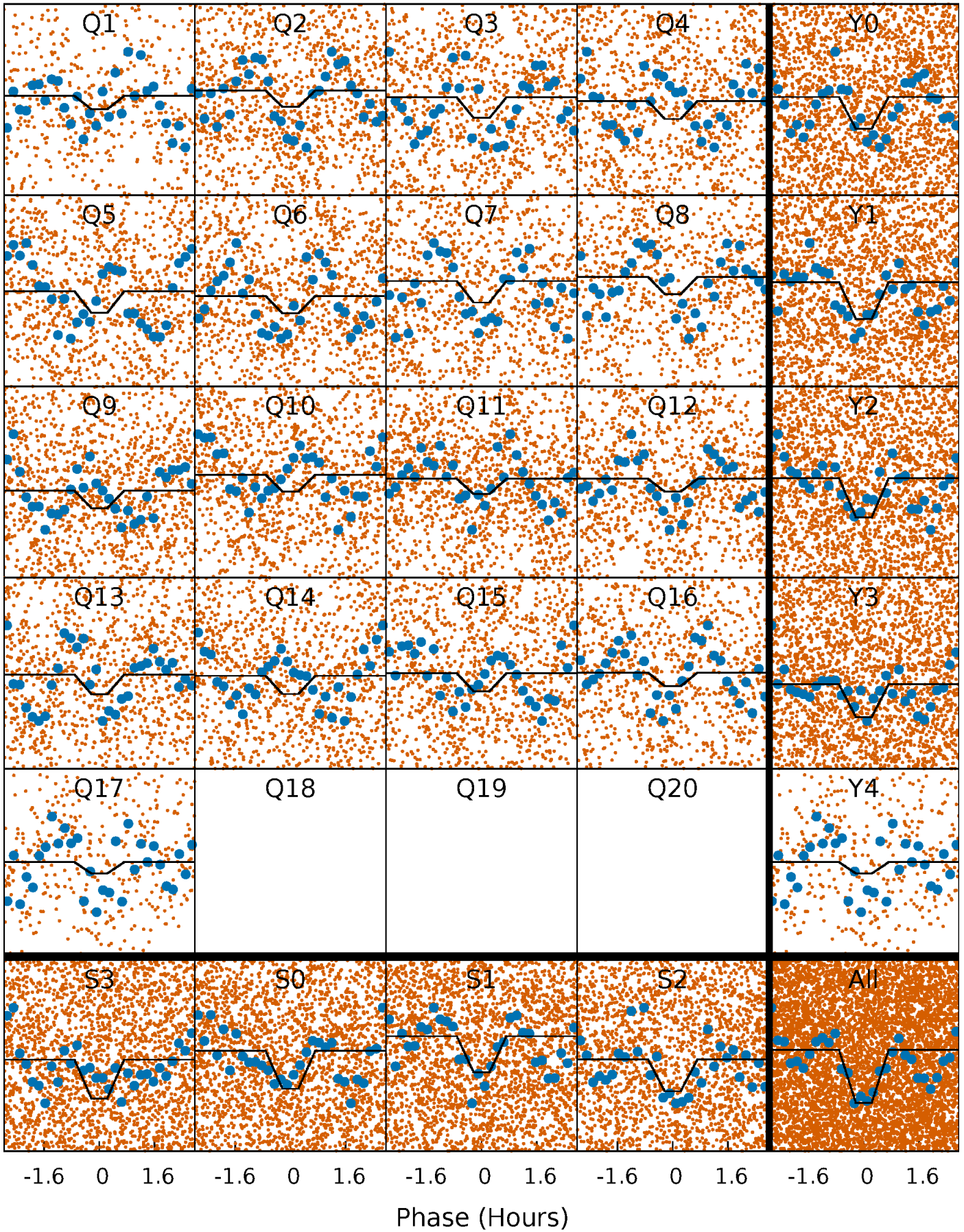
# DV Quarter-Phased Transit Curves

TCE 009028154-01   P= 0.719949 Days    $T_0=131.954822$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009028154-01 P= 0.719945 Days  $T_0=131.954496$  (BKJD)

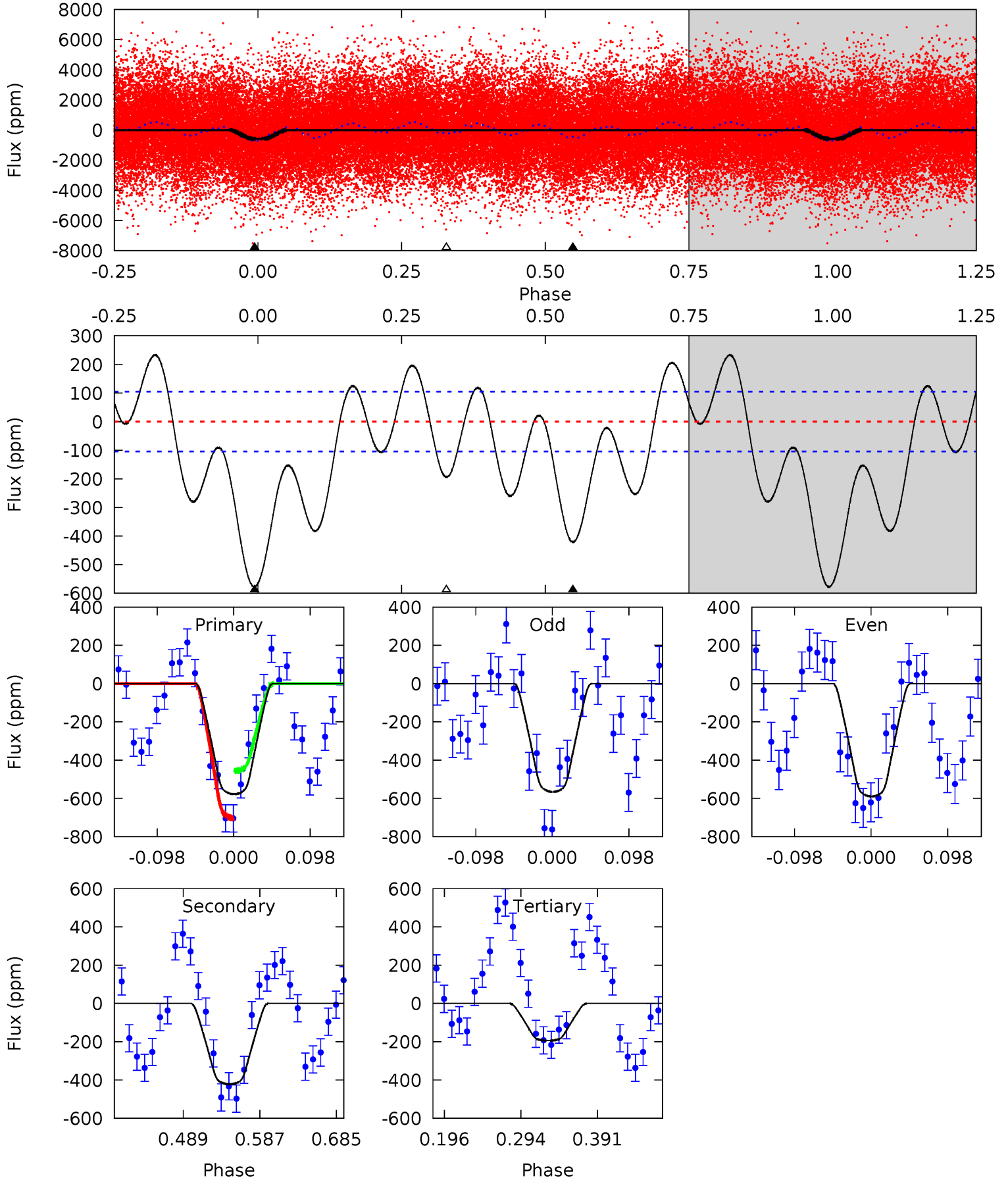




# DV Model-Shift Uniqueness Test

009028154-01, P = 0.719949 Days, E = 131.234873 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
25.2	18.4	8.49	0	4.57	1.66	7.05	16.7	25.2	9.92	18.4	0.52	0.97	0.29	5.40

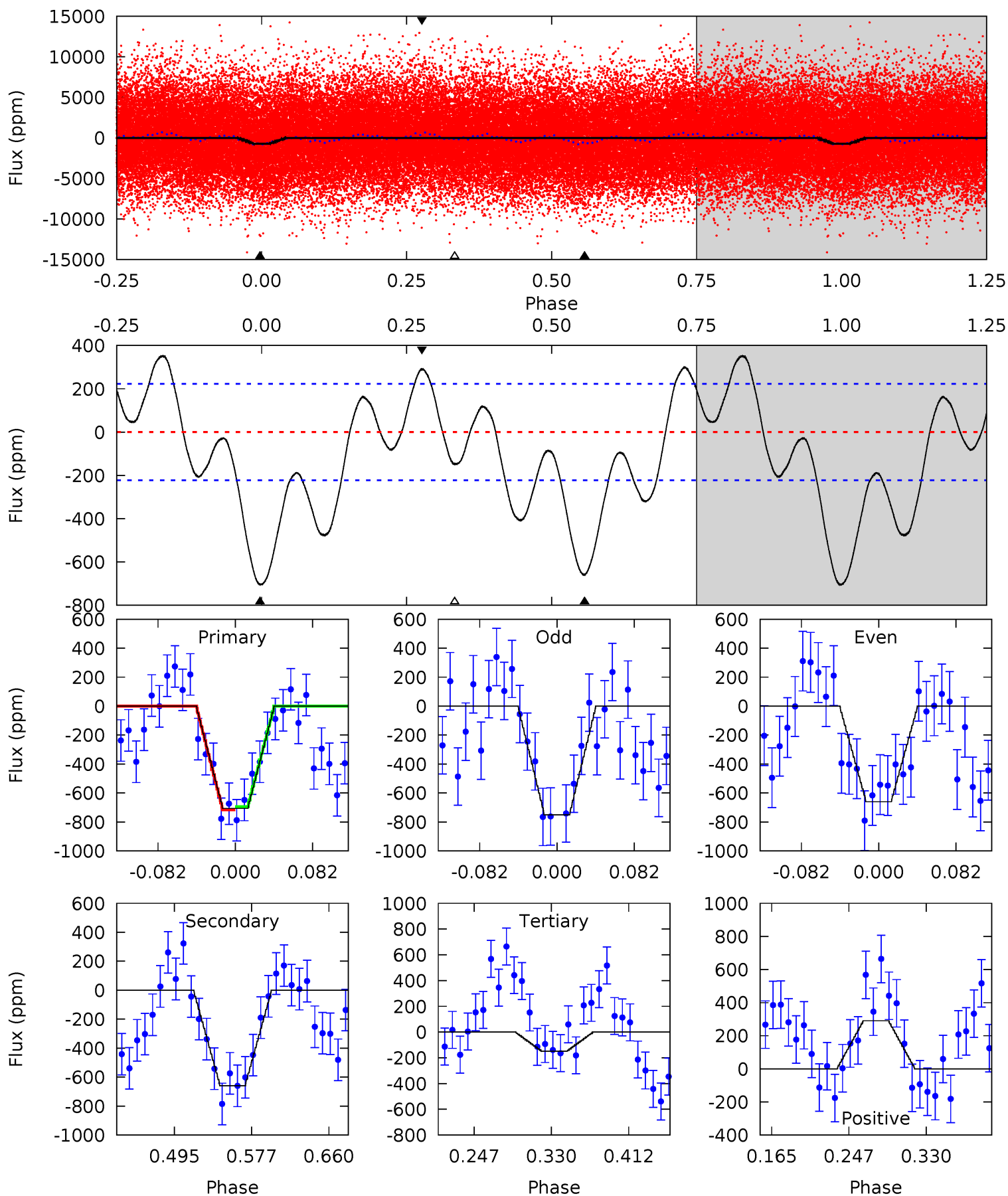




# Alt Model-Shift Uniqueness Test

009028154-01, P = 0.719945 Days, E = 131.234551 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
14.6	13.6	3.09	6.02	4.61	1.74	4.60	11.5	8.57	10.5	7.61	0.94	0.93	0.33	0.23



### Stellar Parameters For KIC 009028154

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$8311^{+201}_{-374}$	$3.742^{+0.432}_{-0.135}$	$-0.160^{+0.250}_{-0.350}$	$3.169^{+0.826}_{-1.417}$	$2.024^{+0.387}_{-0.473}$	$0.090^{+0.345}_{-0.036}$
	+2%/-5%	+12%/-4%	+156%/-219%	+26%/-45%	+19%/-23%	+385%/-41%
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 009028154-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-422 \pm 23$	$8.81^{+3.09}_{-2.99}$	$6286^{+529}_{-717}$	$6464^{+1487}_{-1042}$	$1.222^{+1.402}_{-0.559}$
Alt.	$-660 \pm 48$	$8.87^{+3.03}_{-2.96}$	$6276^{+535}_{-735}$	$7529^{+1707}_{-1154}$	$1.848^{+2.250}_{-0.798}$

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

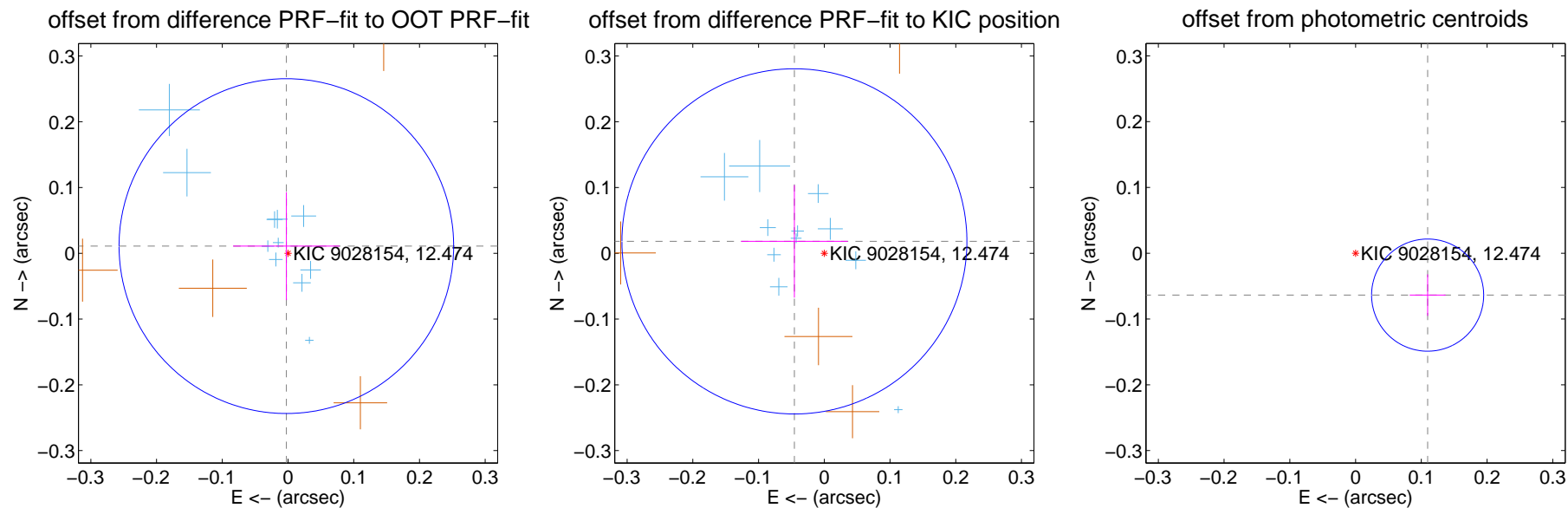
## DV Centroid Data

Supplemental centroid analysis for 009028154-01. Kepler magnitude: 12.47. Transit SNR 19.32

There are 12 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

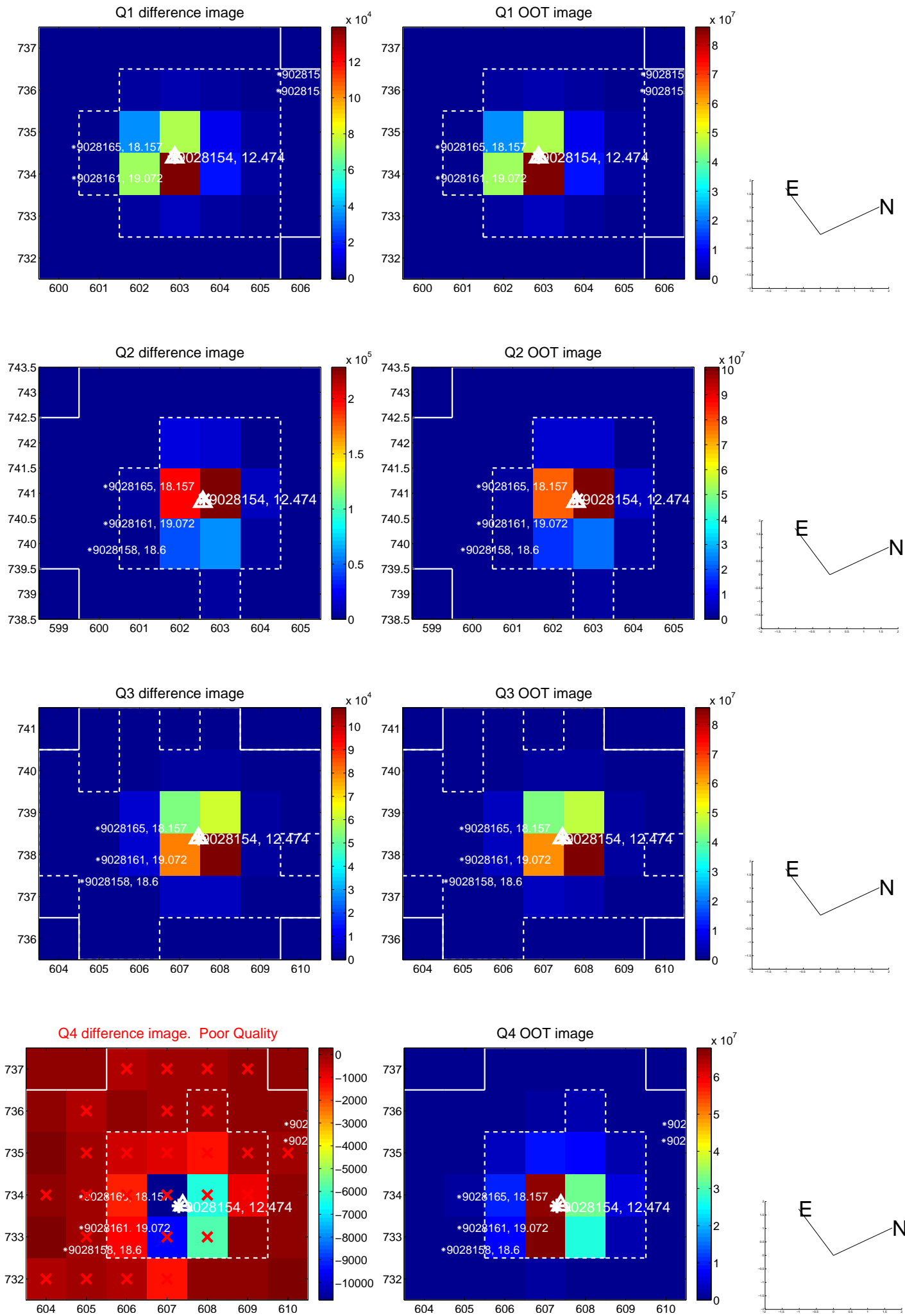
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.011 \pm 0.085$	0.13	$0.003 \pm 0.081$	$0.011 \pm 0.082$
PRF-fit source offset from KIC position	$0.049 \pm 0.087$	0.56	$0.045 \pm 0.081$	$0.018 \pm 0.085$
photometric centroid source offset	$0.13 \pm 0.03$	4.46	$-0.11 \pm 0.03$	$-0.06 \pm 0.03$



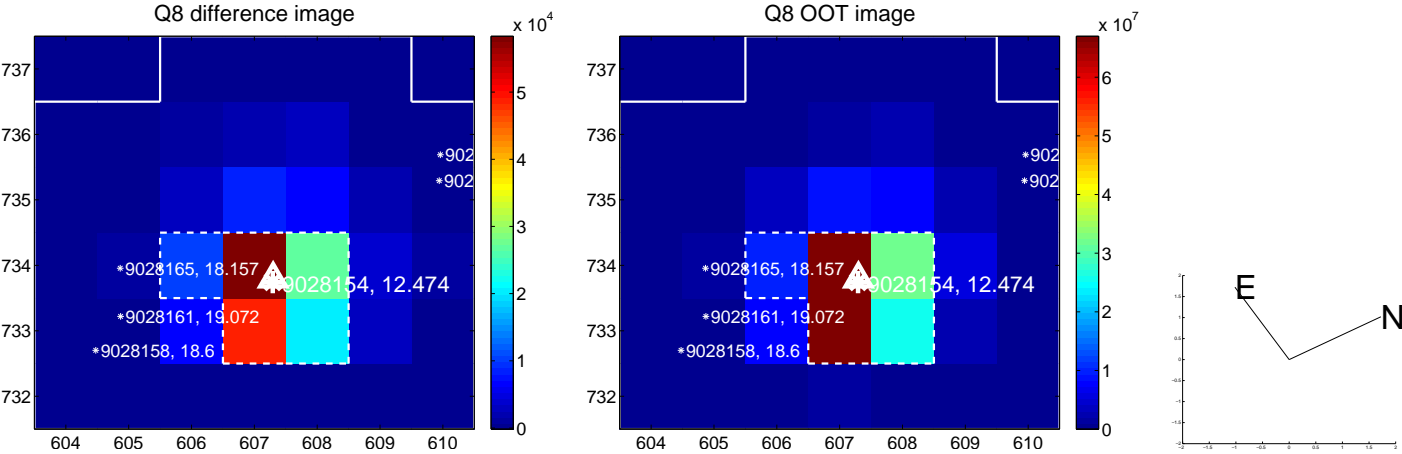
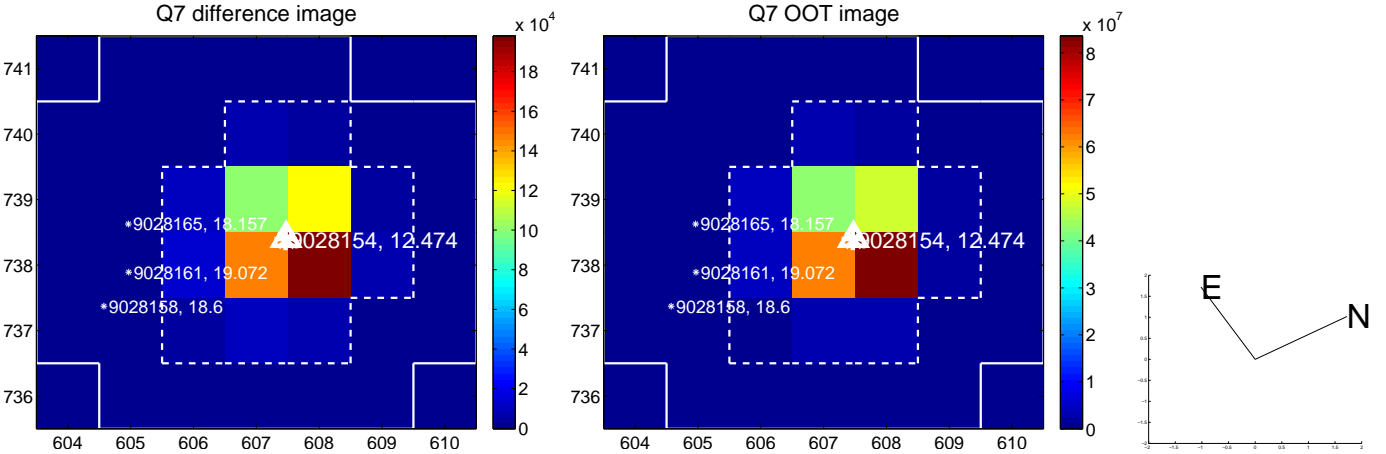
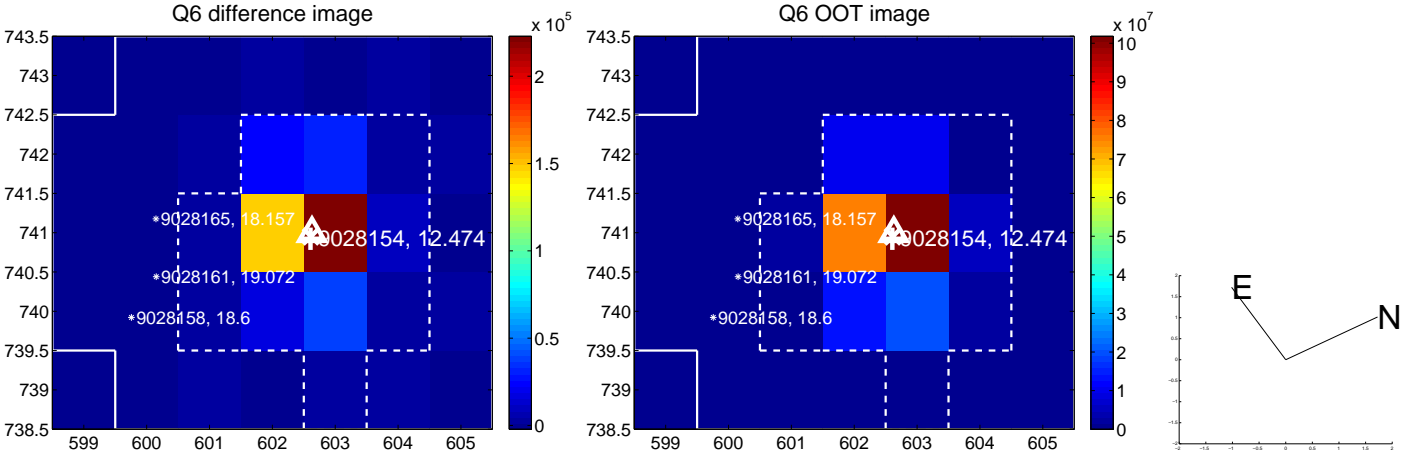
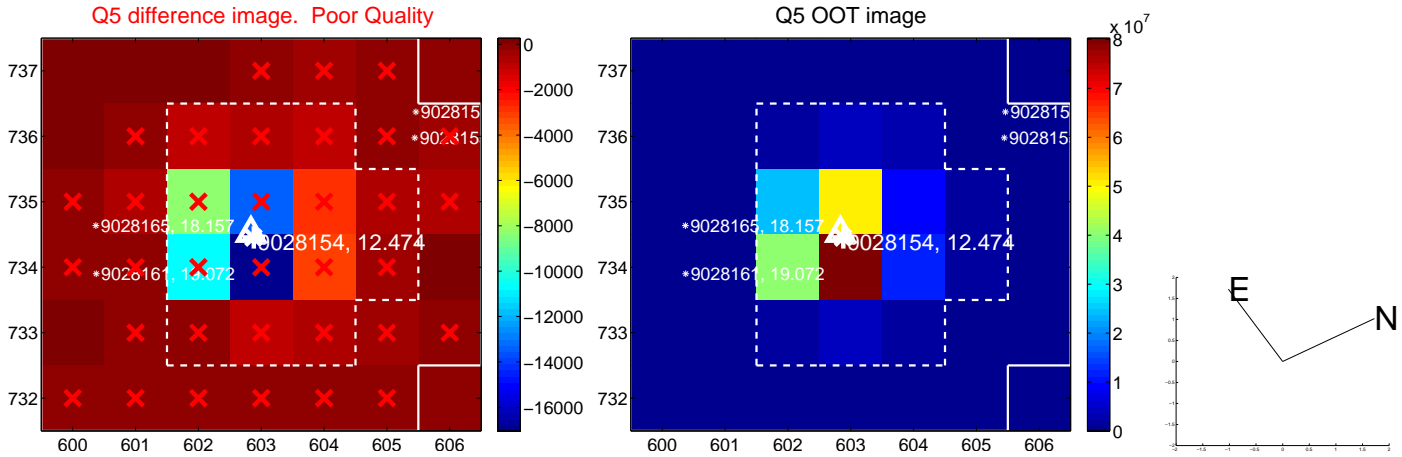
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



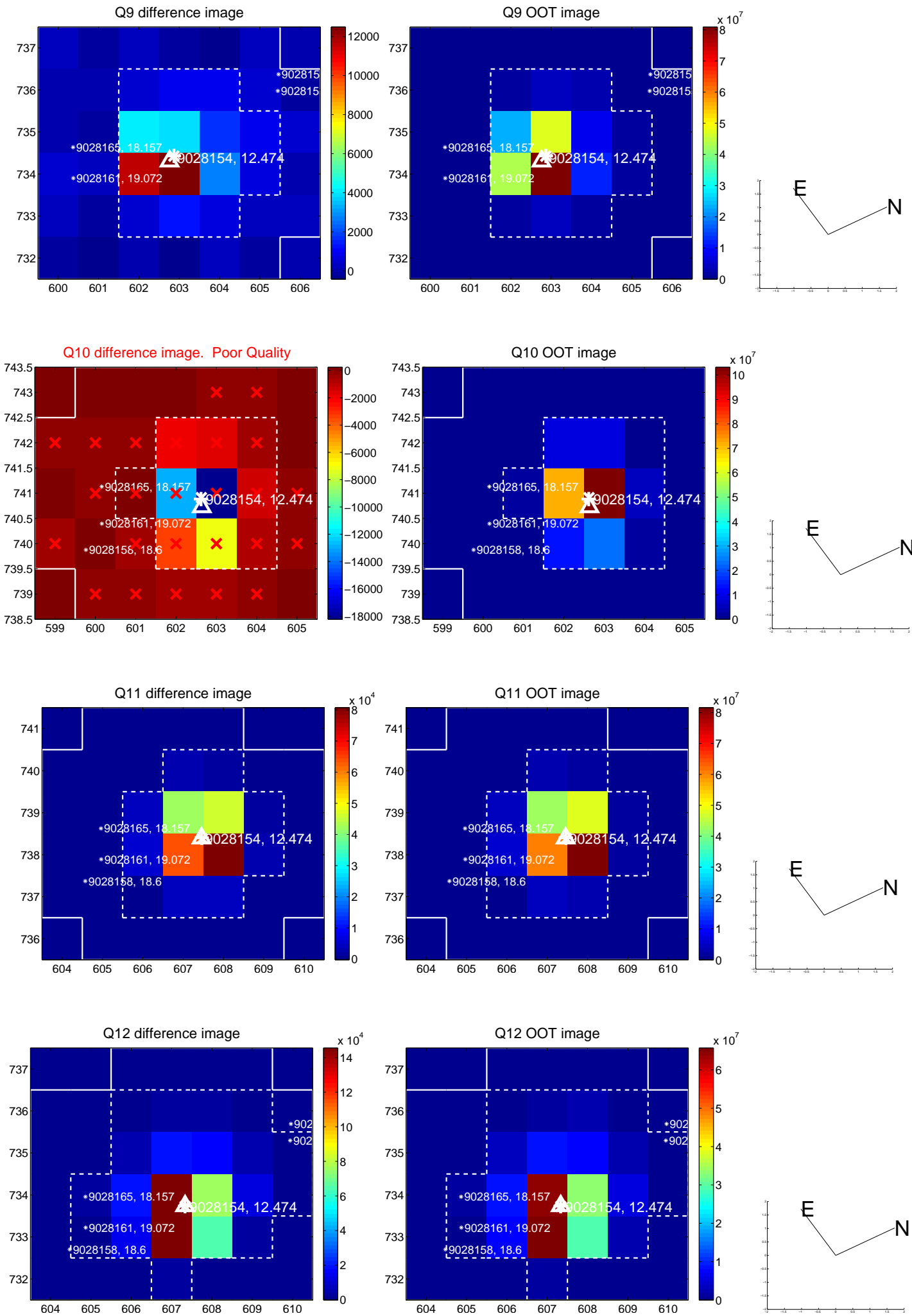
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

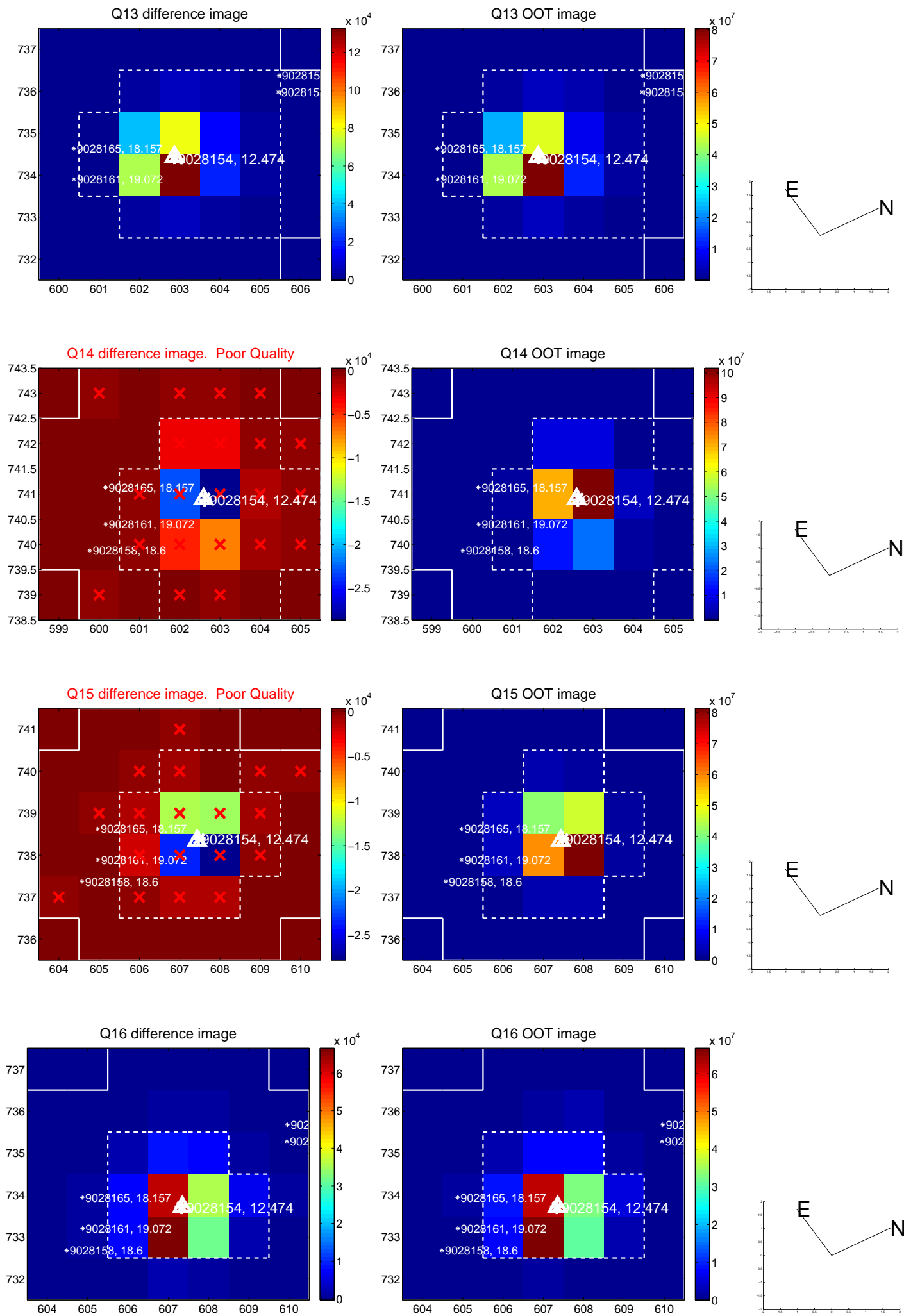


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

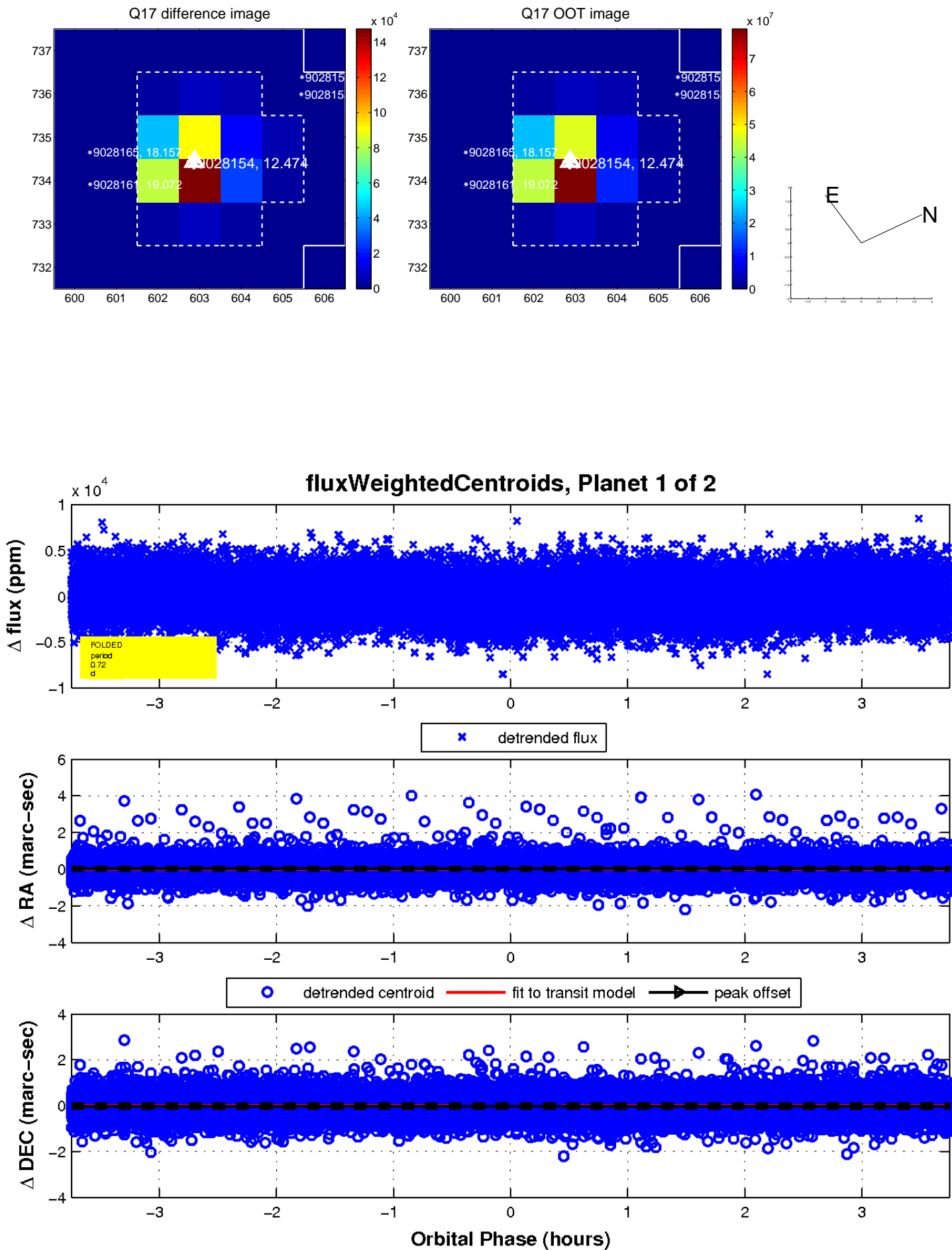




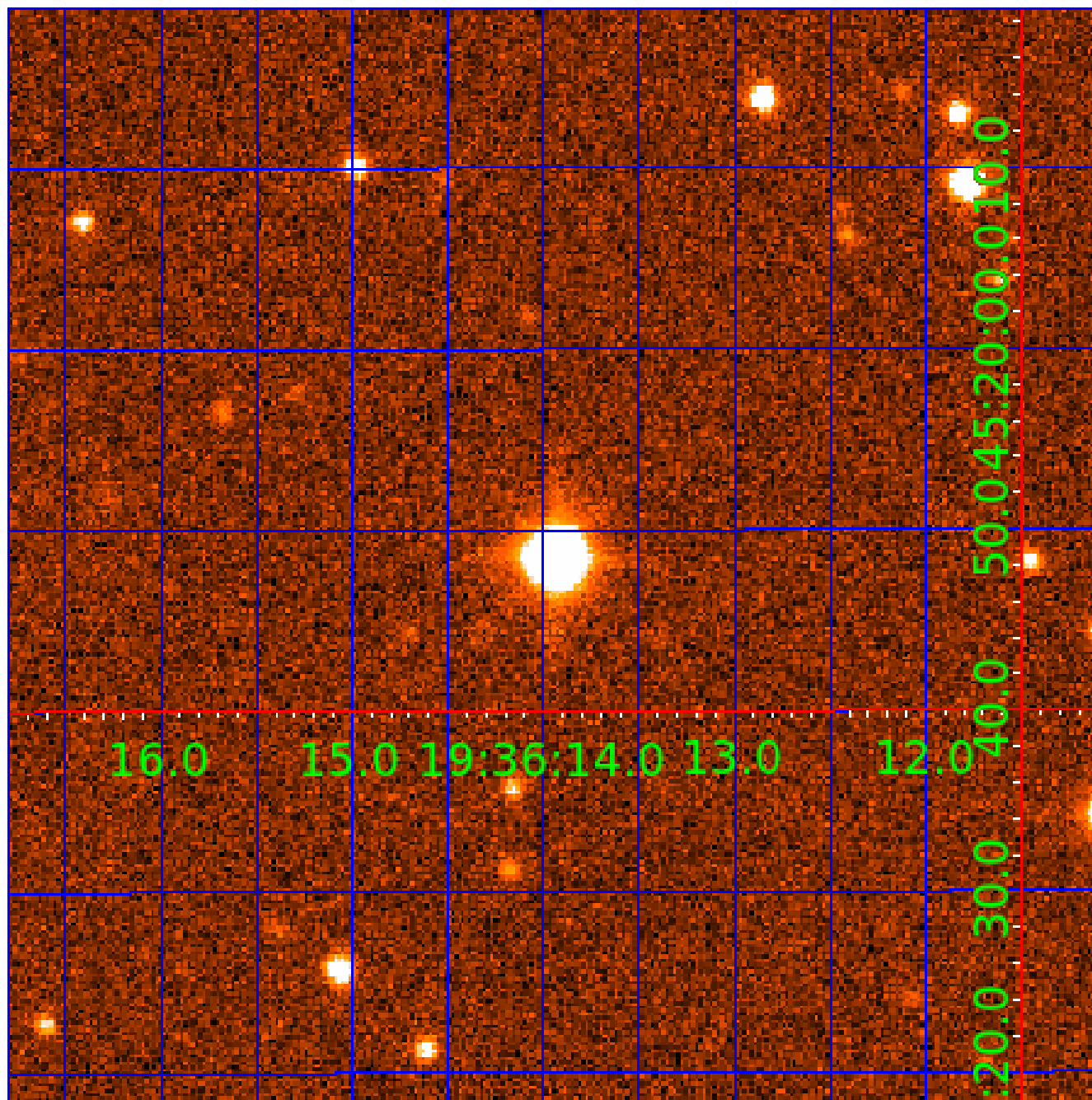
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 009028154

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009028154-01	OBS	No	0.719949	131.954822	613.4	1.250	13.5	19.3	3.17	8311	9.17	108572.46
009028154-02	OBS	No	0.719918	131.646848	234.5	5.332	14.5	14.7	3.17	8311	5.20	108578.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009028154-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT
009028154-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD

**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.

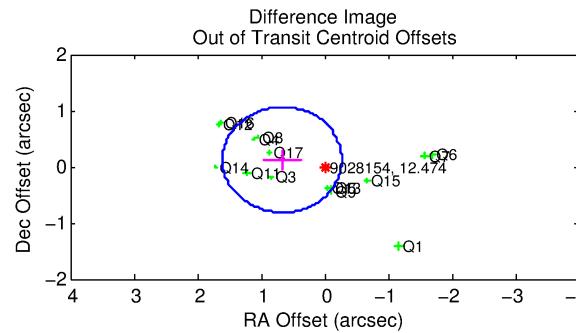
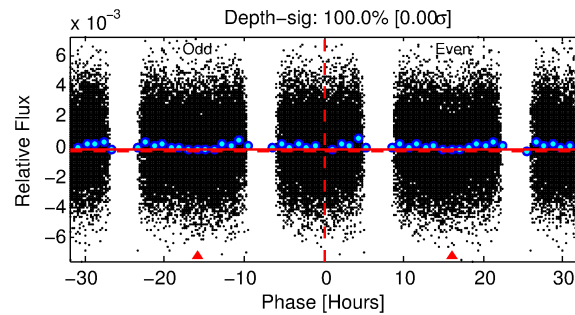
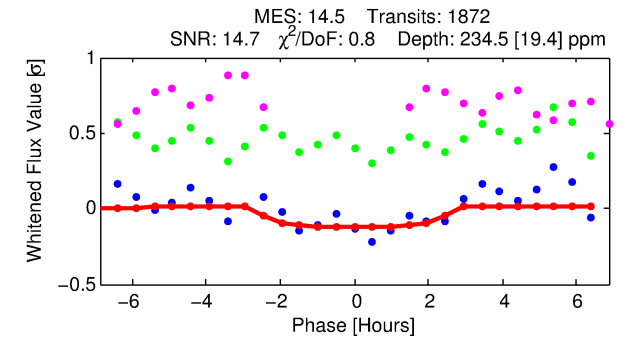
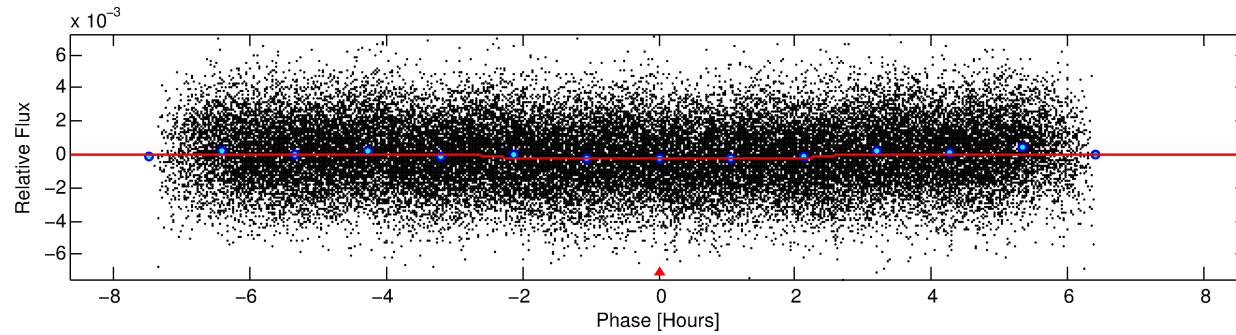
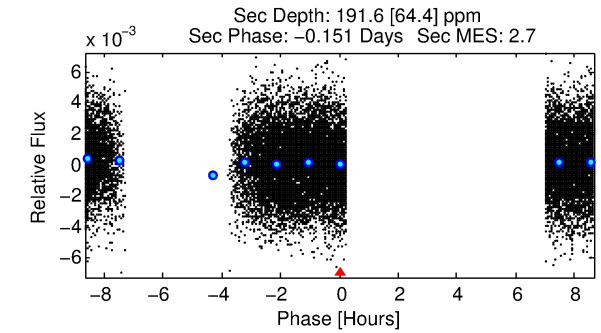
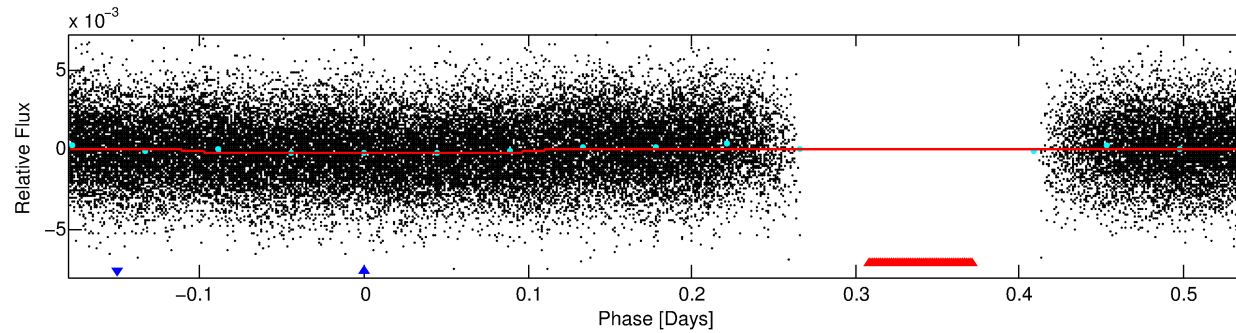
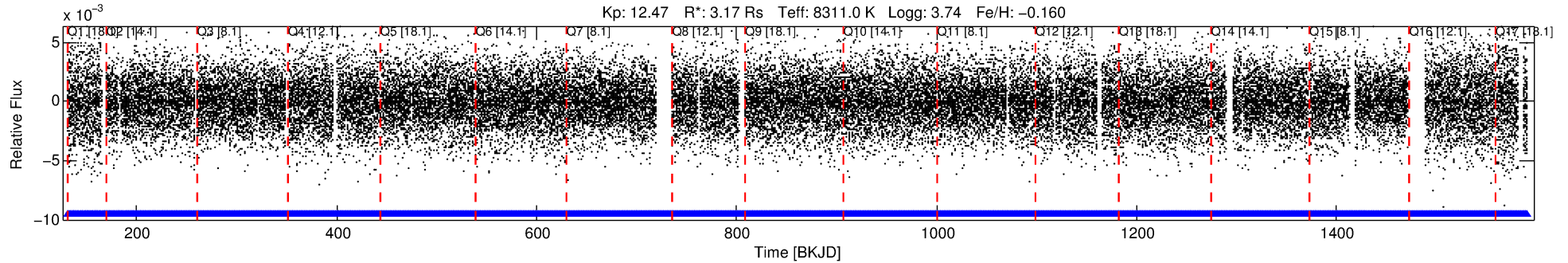
## Ephemeris Match Information For 009028154-02

No Significant Match Found



# DV One-Page Summary

KIC: 9028154 Candidate: 2 of 2 Period: 0.720 d



## DV Fit Results:

Period = 0.71992 [0.00001] d  
Epoch = 131.6468 [0.0037] BKJD  
Rp/R\* = 0.0150 [0.0076]  
a/R\* = 1.13 [0.74]  
b = 0.70 [2.21]  
Seff = 108578.75 [81327.06]  
Teq = 4629 [867] K  
Rp = 5.20 [3.52] Re  
a = 0.0199 [0.0089] AU  
Ag = 1.54 [1.99] [0.27σ]  
Teffp = 7972 [2164] K [1.43σ]

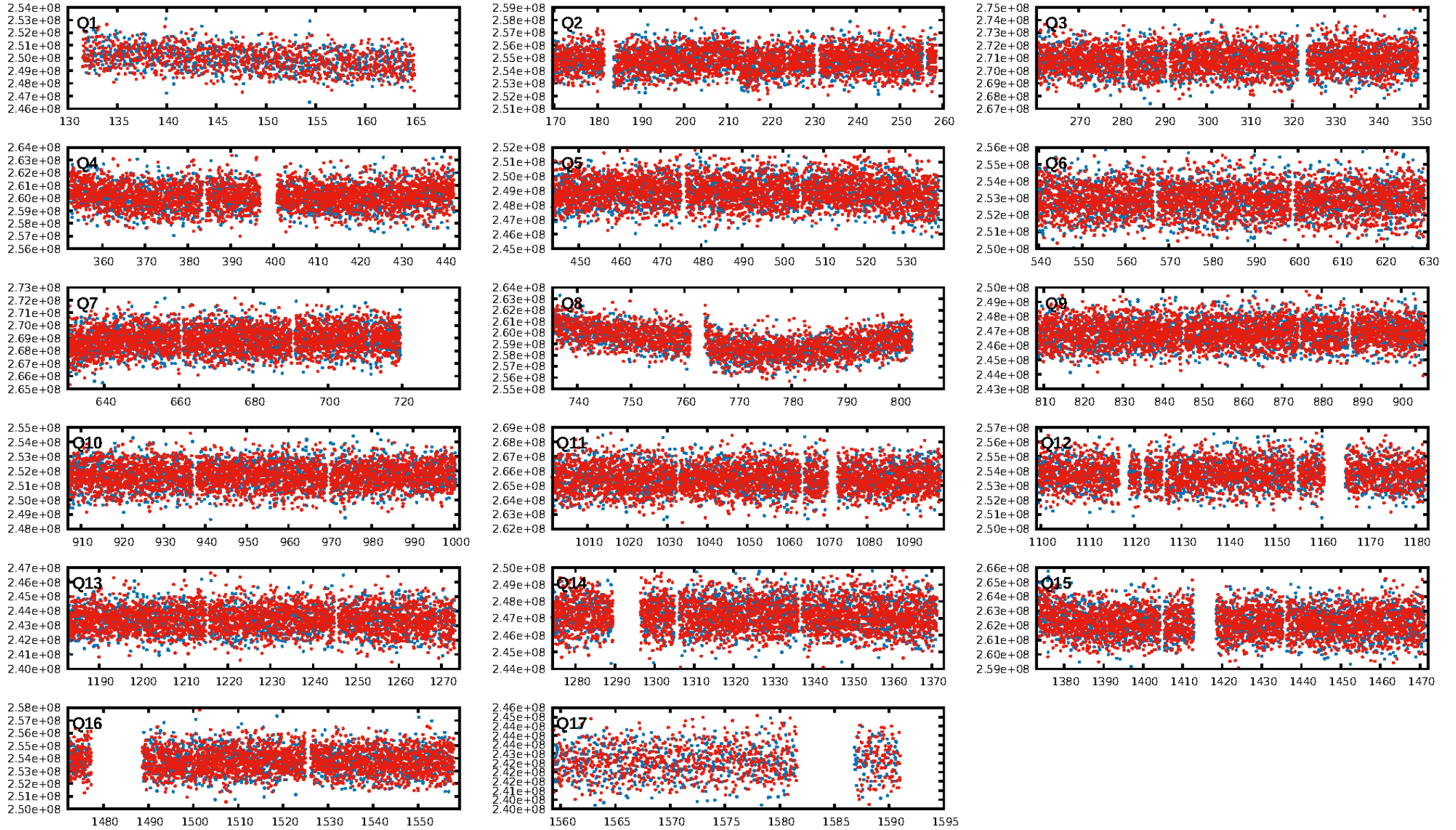
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1787/1787]  
GhostDiagnostic-chr: 1.415  
Centroid-sig: 1.7%  
Centroid-so: 0.073 arcsec [2.08σ]  
OotOffset-rm: 0.680 arcsec [2.17σ]  
OotOffset-st: 2/4/4/5 [15]  
KicOffset-rm: 0.684 arcsec [2.30σ]  
KicOffset-st: 2/4/4/5 [15]  
DiffImageQuality-fgm: 0.80 [12/15]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 16:12:49 Z

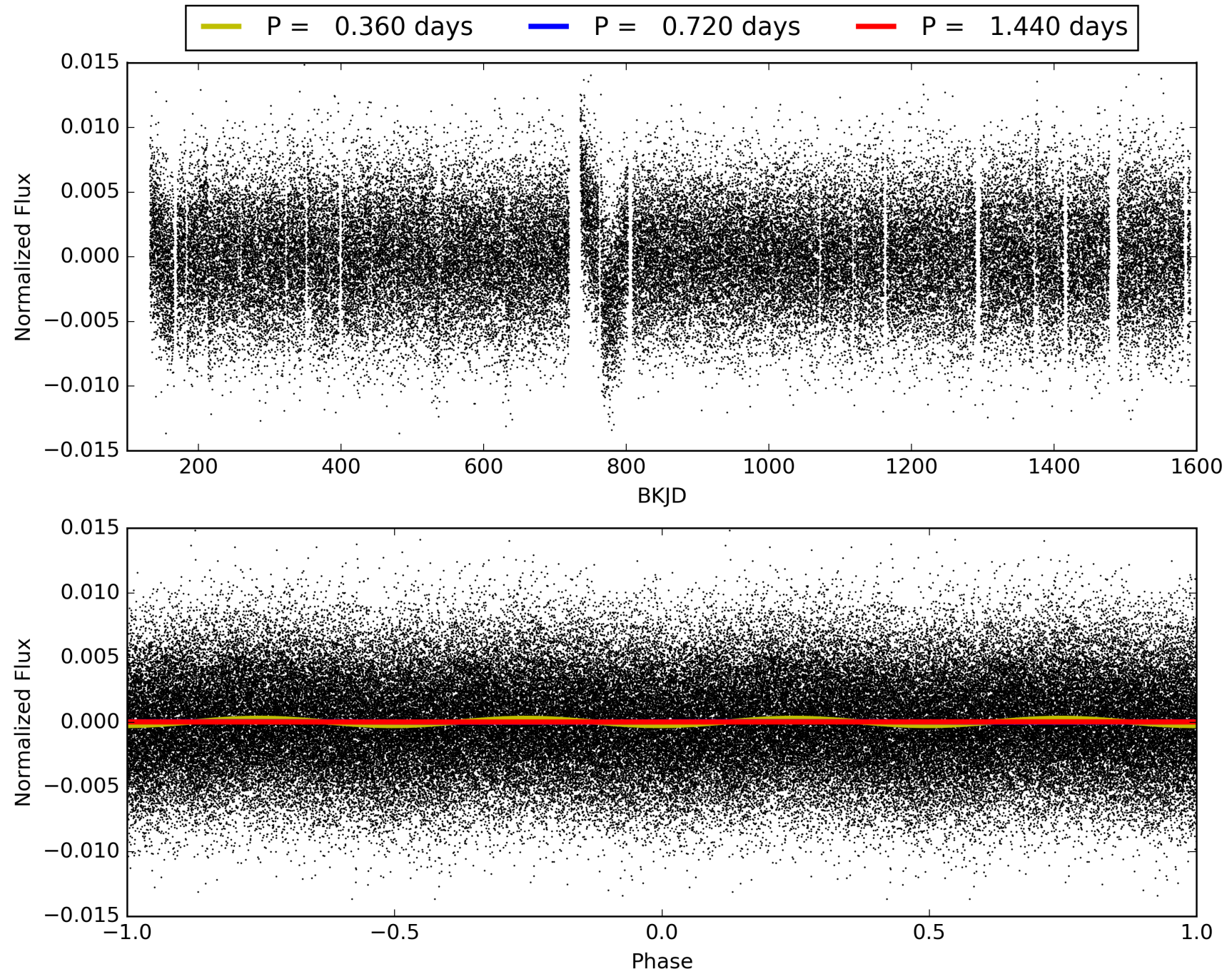
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009028154-02, PDC Light Curves



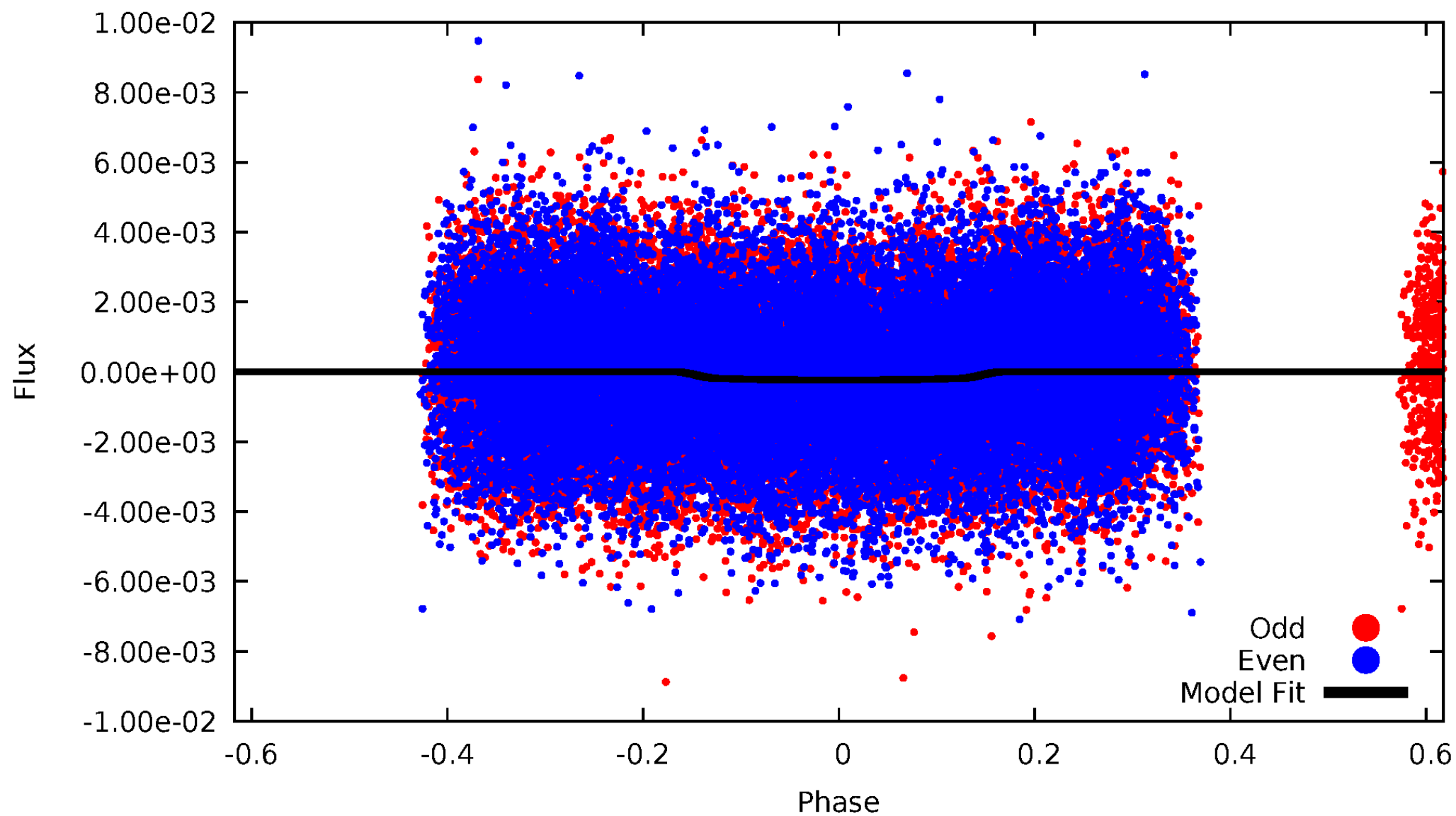


TCE 009028154-02



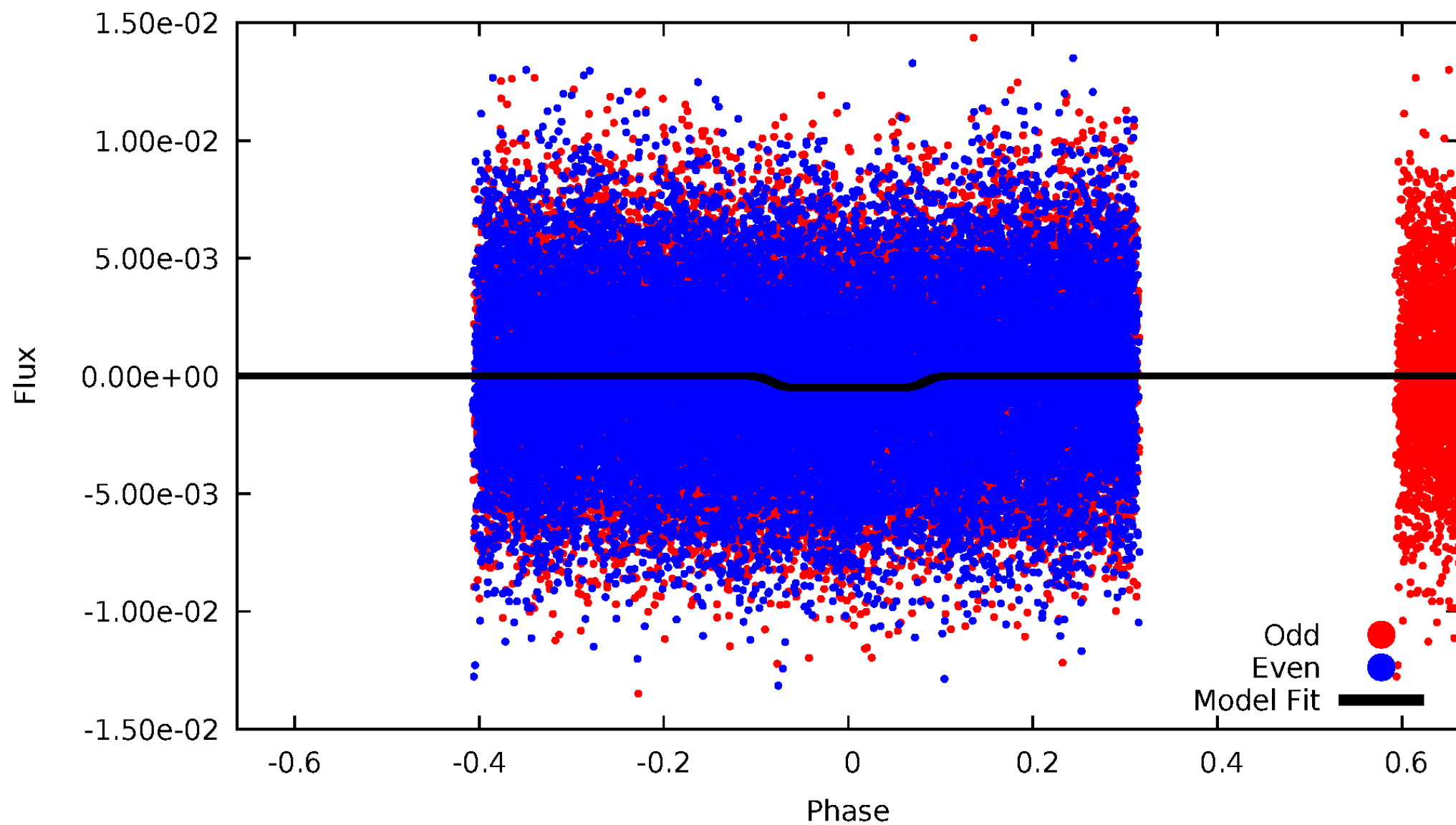
# DV Odd/Even

TCE 009028154-02



# ALT Odd/Even

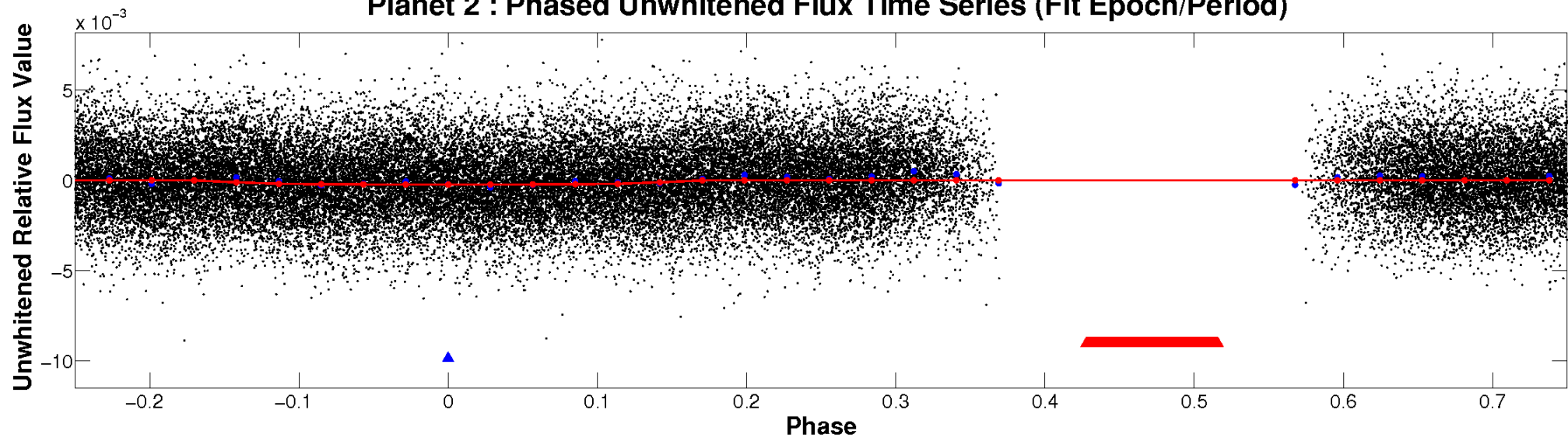
TCE 009028154-02



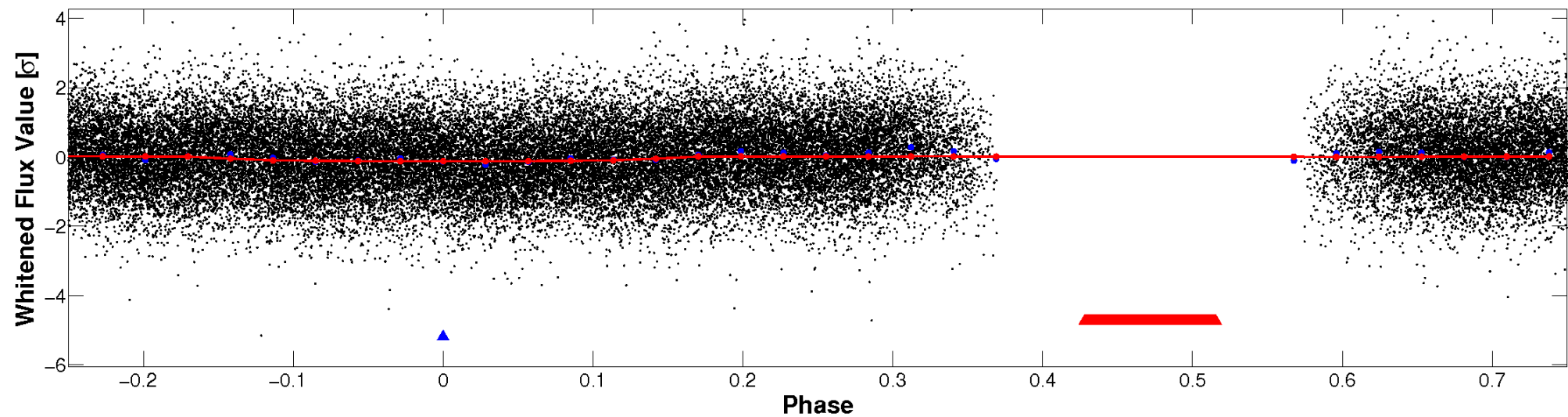


# Non-Whitened Vs. Whitened Light Curve

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

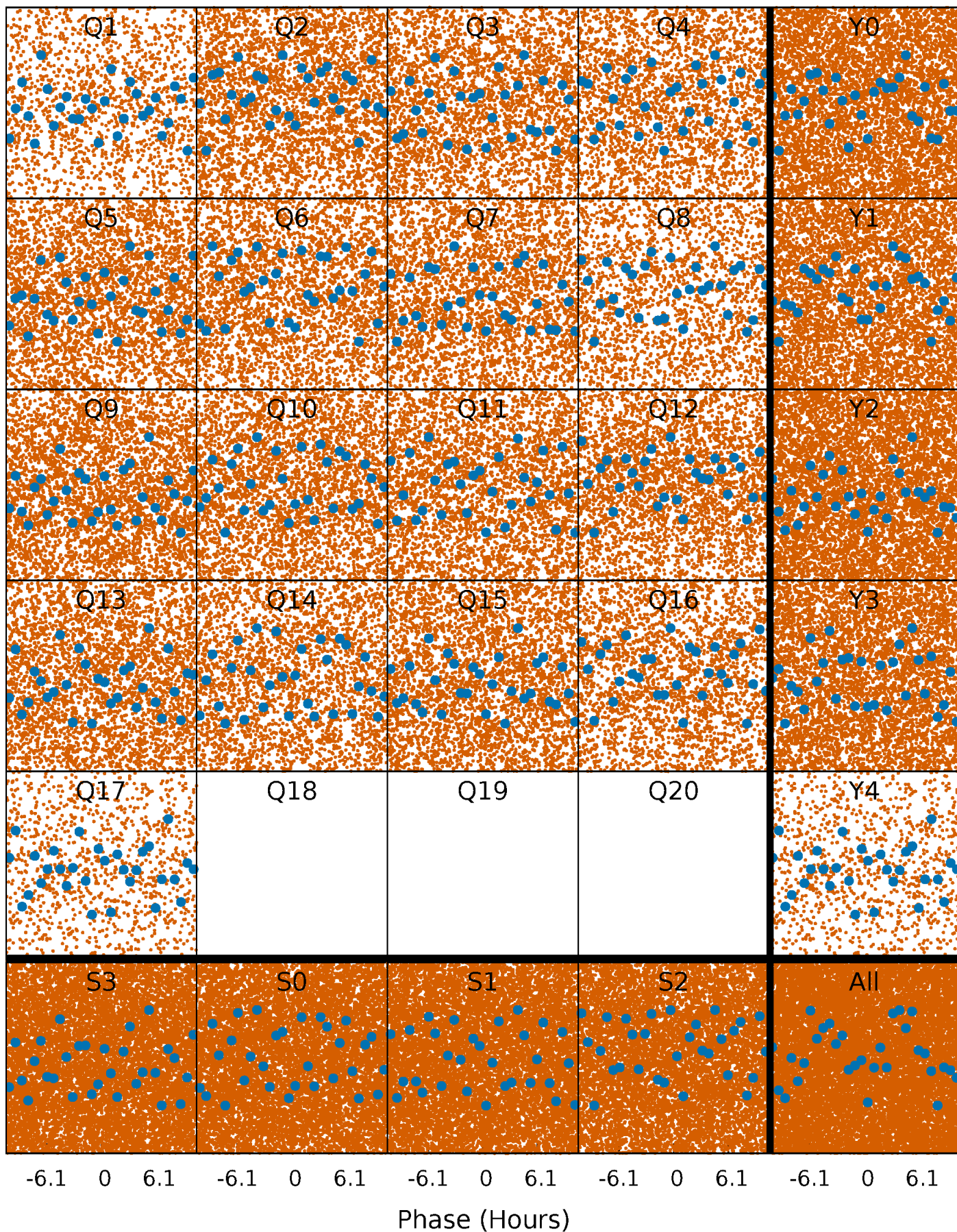


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

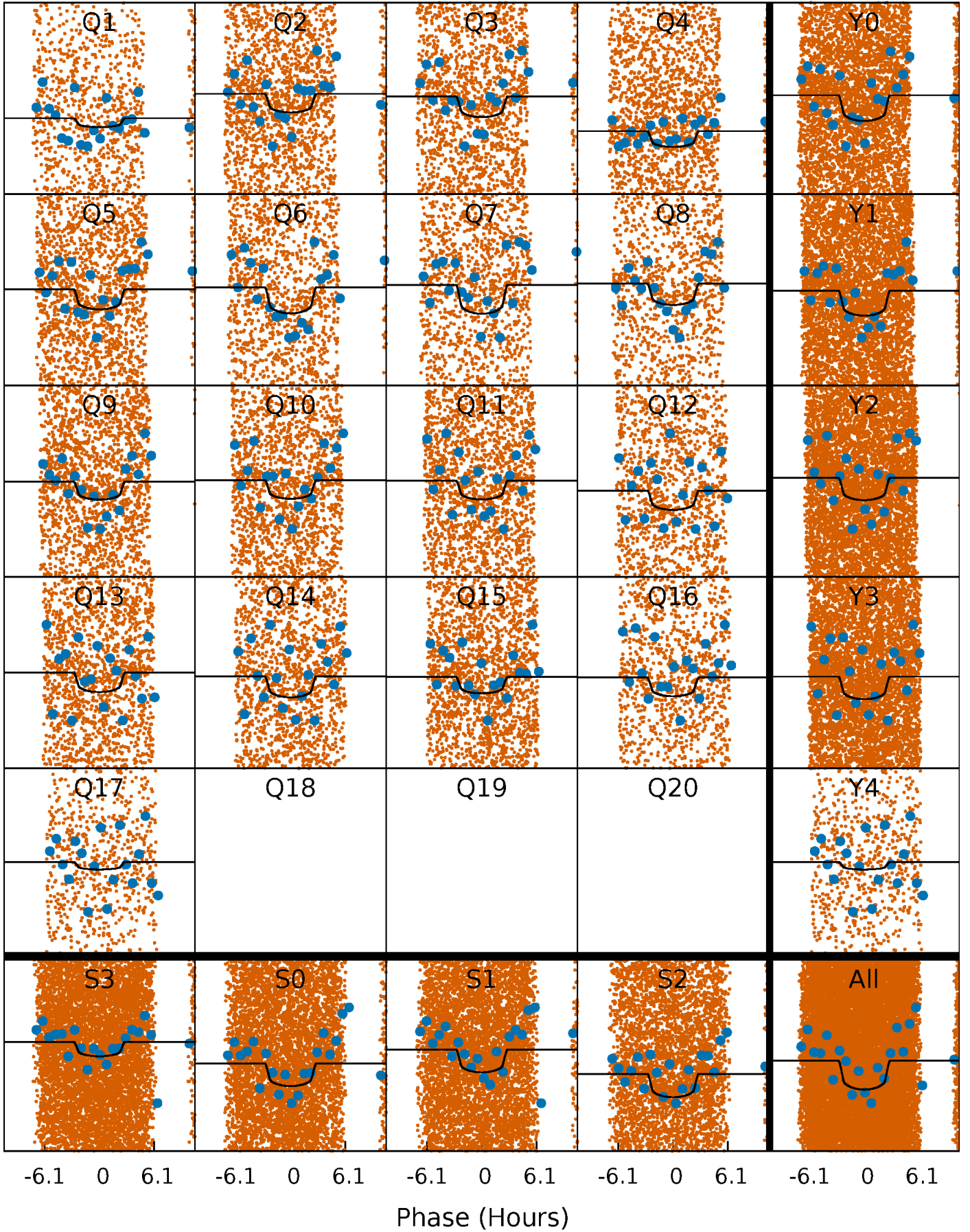
TCE 009028154-02 P= 0.719918 Days  $T_0=131.646848$  (BKJD)





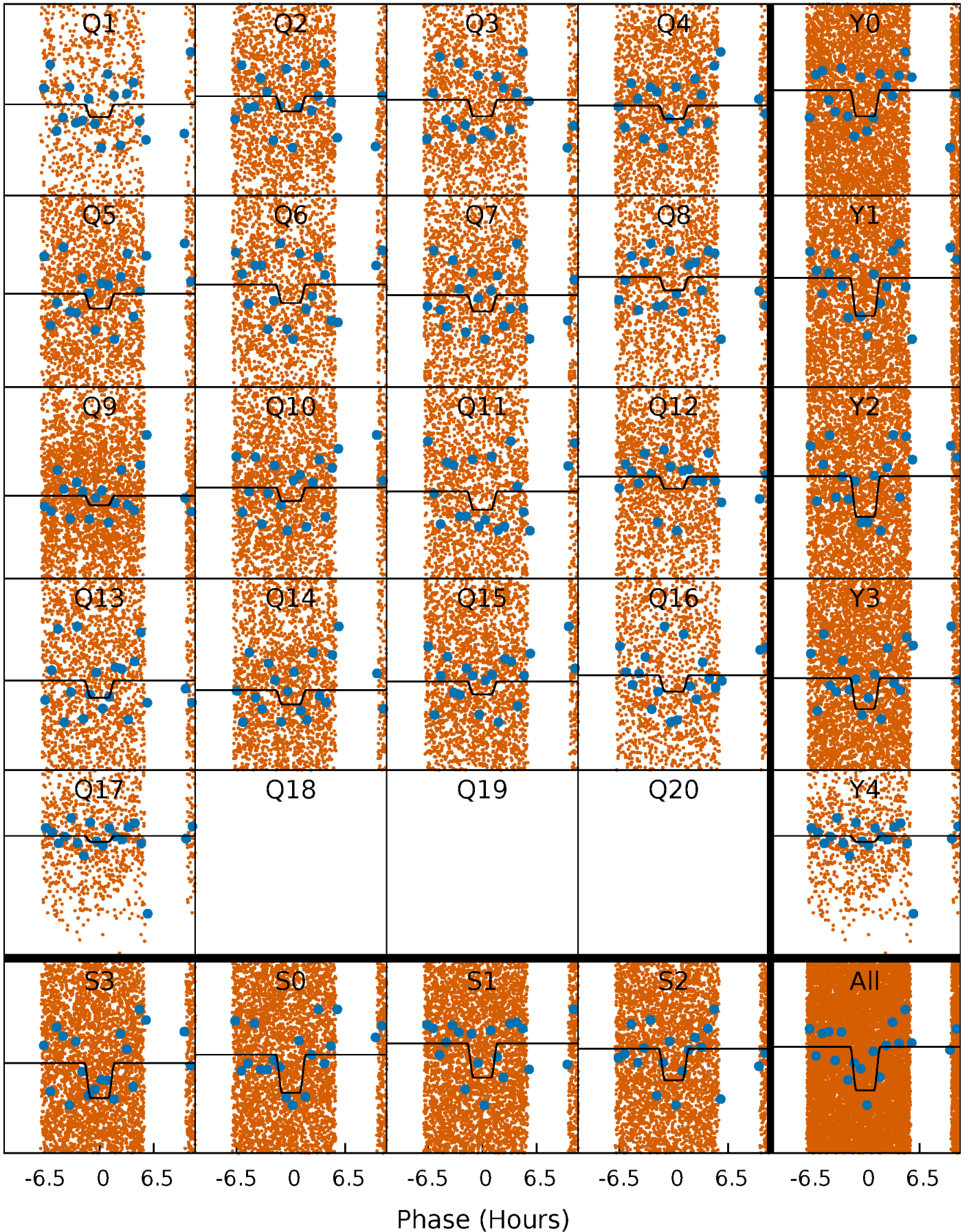
# DV Quarter-Phased Transit Curves

TCE 009028154-02   P= 0.719918 Days    $T_0=131.646848$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

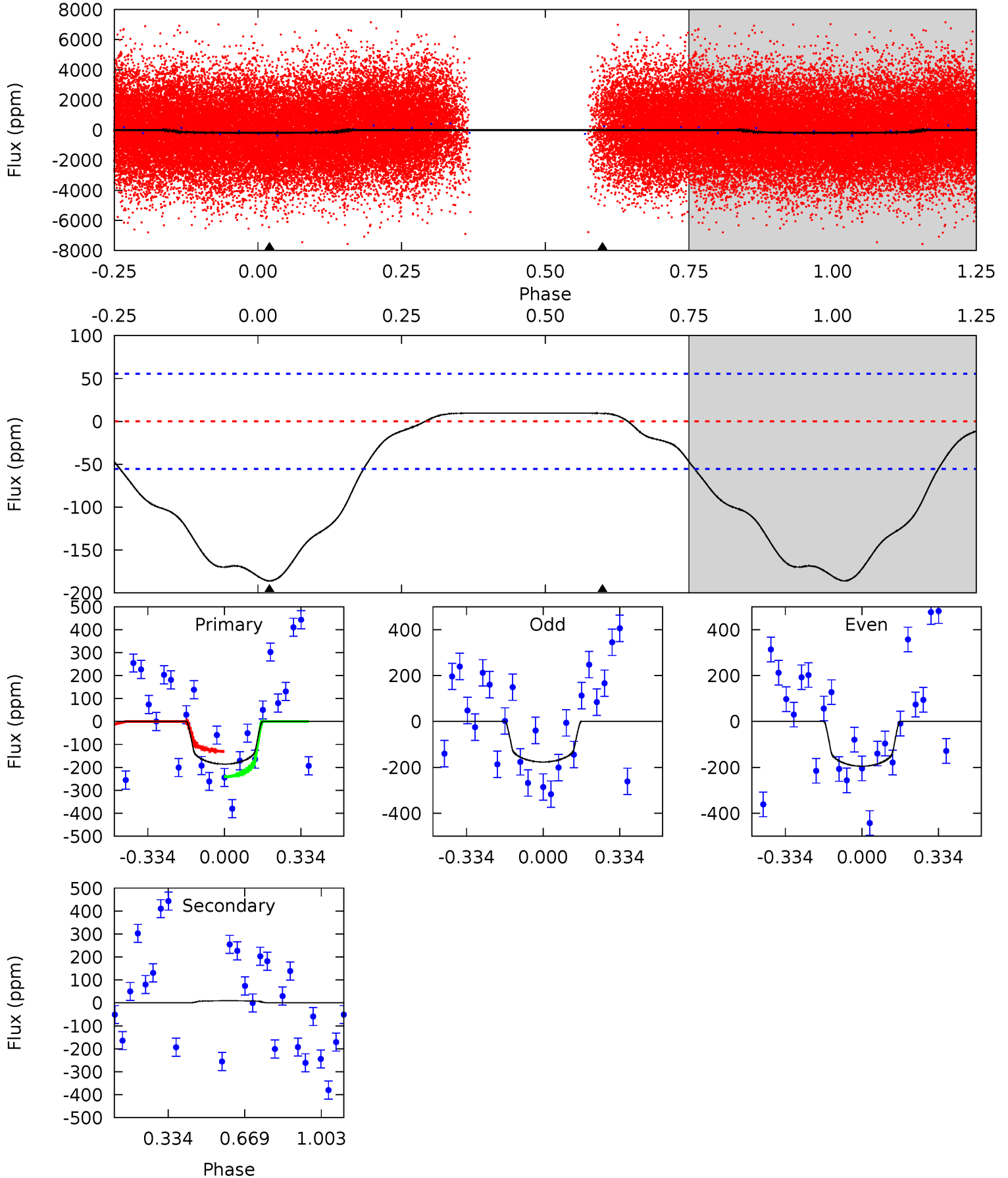
TCE 009028154-02   P= 0.719945 Days    $T_0=131.632132$  (BKJD)



# DV Model-Shift Uniqueness Test

009028154-02, P = 0.719918 Days, E = 130.926930 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	-0.72	0	0	4.30	0.97	0.50	14.4	14.4	-0.72	-0.72	0.71	1.01	0.05	4.40

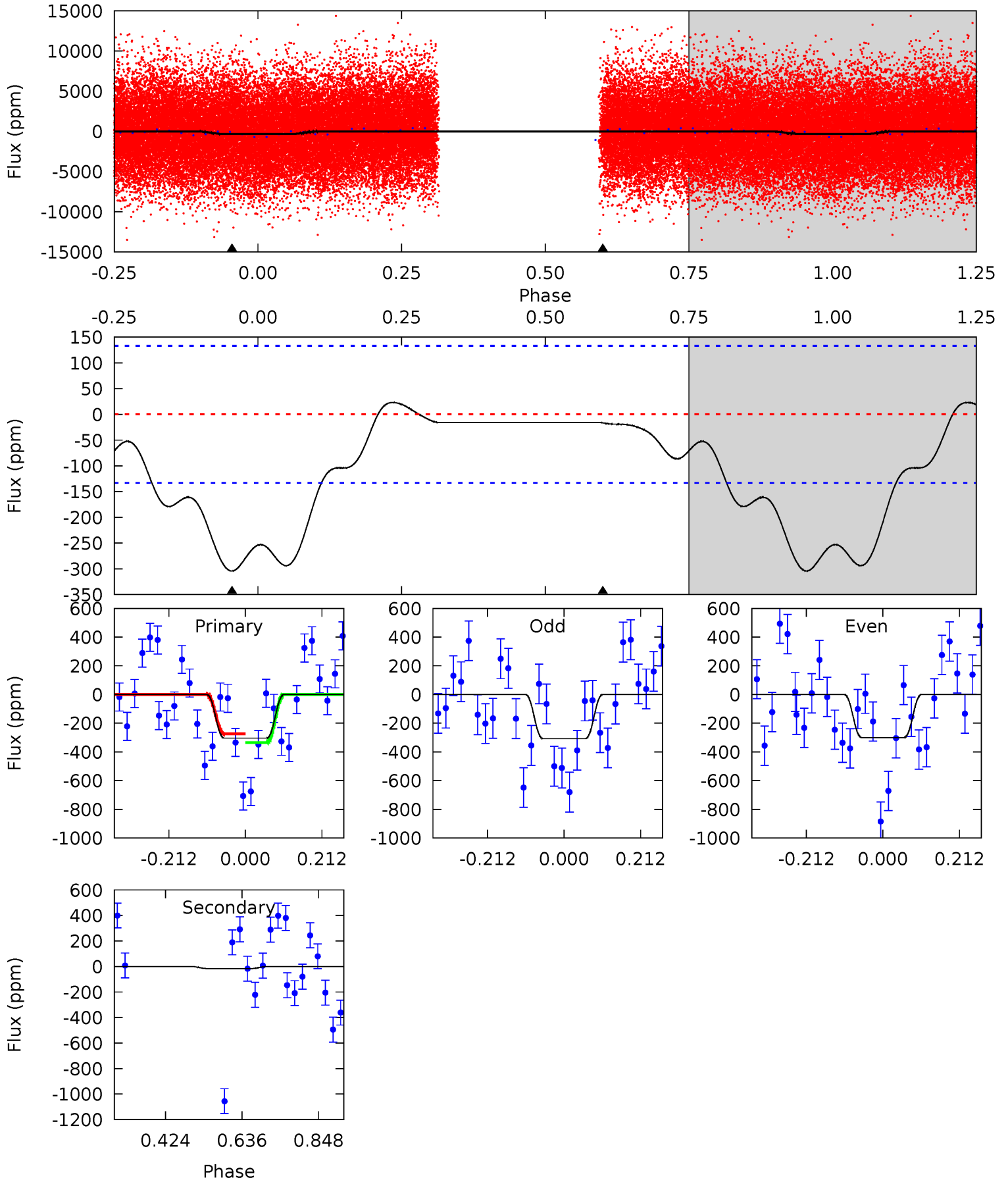




# Alt Model-Shift Uniqueness Test

009028154-02, P = 0.719945 Days, E = 130.912187 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
10.1	0.54	0	0	4.40	1.25	1.12	10.1	10.1	0.54	0.54	0.12	1.04	0.07	1.04



### Stellar Parameters For KIC 009028154

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$8311^{+201}_{-374}$	$3.742^{+0.432}_{-0.135}$	$-0.160^{+0.250}_{-0.350}$	$3.169^{+0.826}_{-1.417}$	$2.024^{+0.387}_{-0.473}$	$0.090^{+0.345}_{-0.036}$
	+2%/-5%	+12%/-4%	+156%/-219%	+26%/-45%	+19%/-23%	+385%/-41%
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 009028154-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$9 \pm 13$	$4.81^{+2.72}_{-2.40}$	$6215^{+532}_{-660}$	$-5324^{+689}_{-726}$	$-0.071^{+0.094}_{-0.327}$
Alt.	$-16 \pm 30$	$7.20^{+3.14}_{-2.90}$	$6261^{+527}_{-749}$	$-4760^{+1555}_{-638}$	$0.057^{+0.211}_{-0.110}$

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

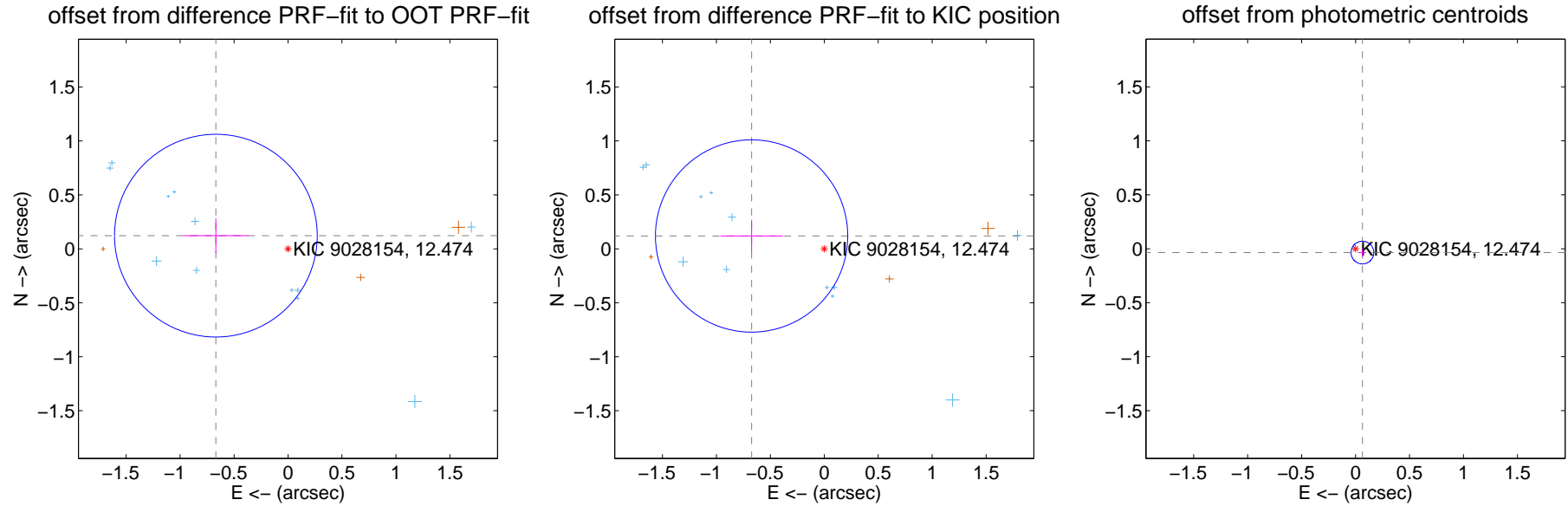
## DV Centroid Data

Supplemental centroid analysis for 009028154-02. Kepler magnitude: 12.47. Transit SNR 14.75

There are 12 quarters with good PRF difference image offsets

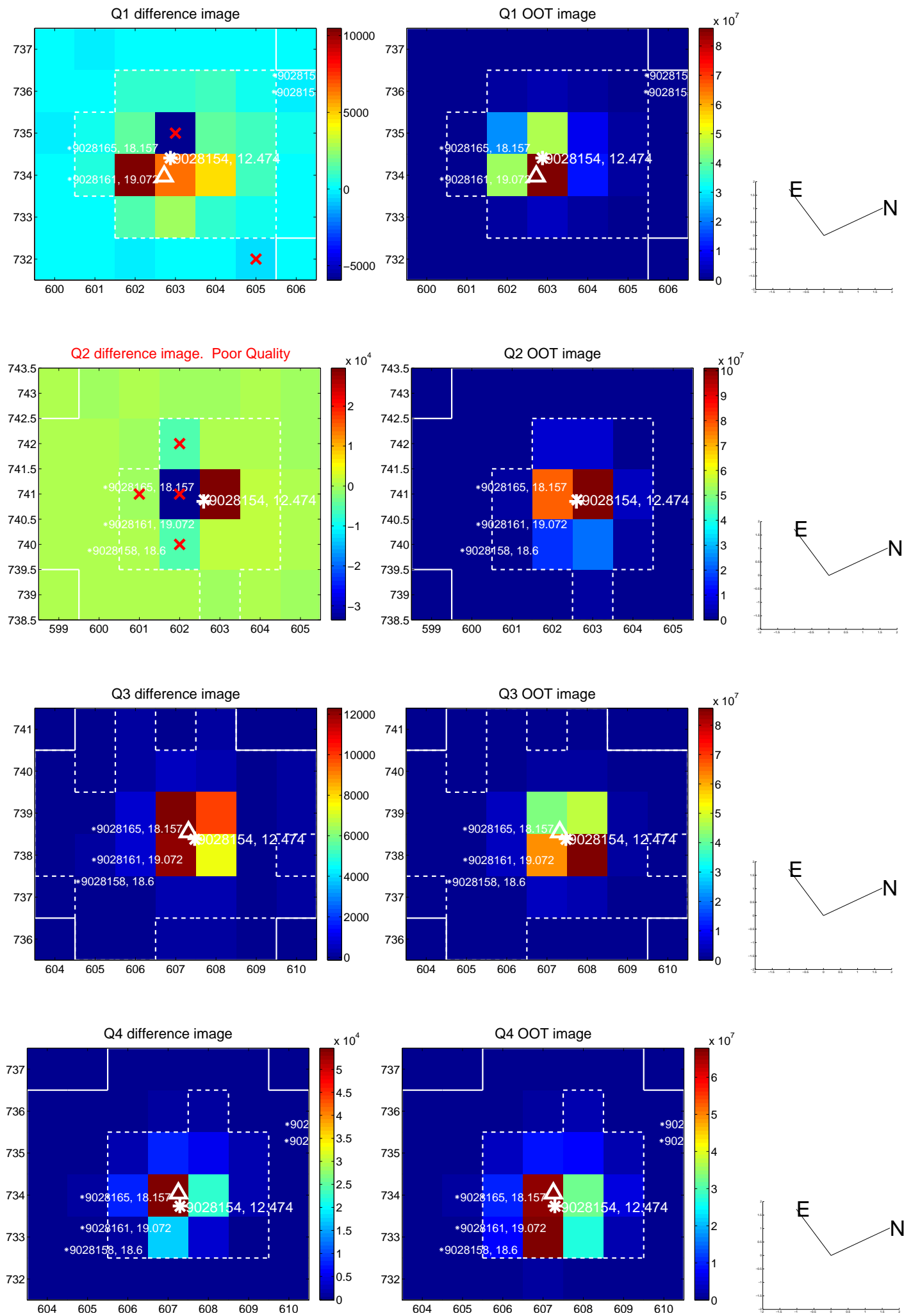
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.680 \pm 0.313$	2.17	$0.669 \pm 0.302$	$0.122 \pm 0.160$
PRF-fit source offset from KIC position	$0.684 \pm 0.297$	2.30	$0.674 \pm 0.290$	$0.119 \pm 0.151$
photometric centroid source offset	$0.07 \pm 0.04$	2.08	$-0.06 \pm 0.03$	$-0.04 \pm 0.04$



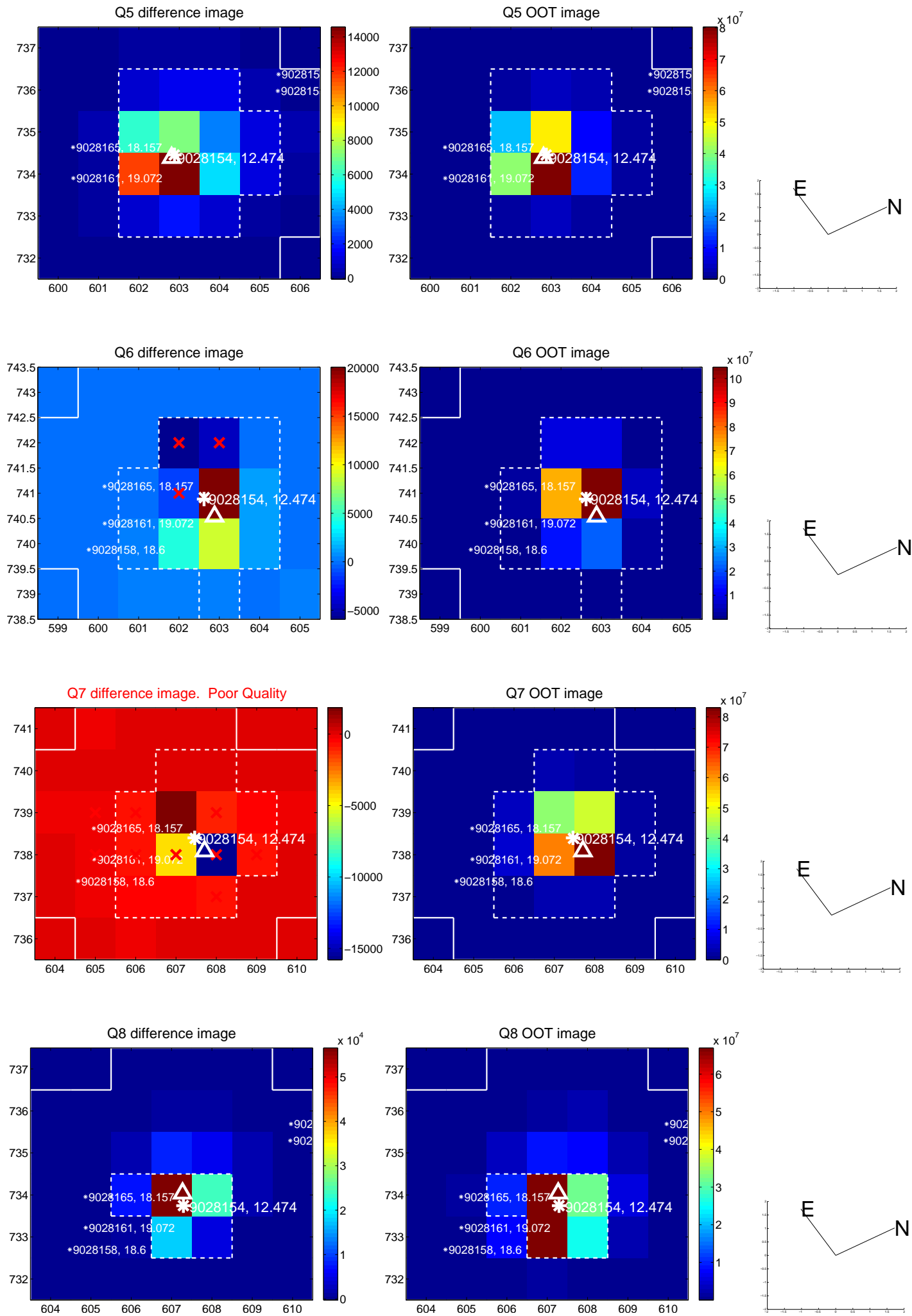
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

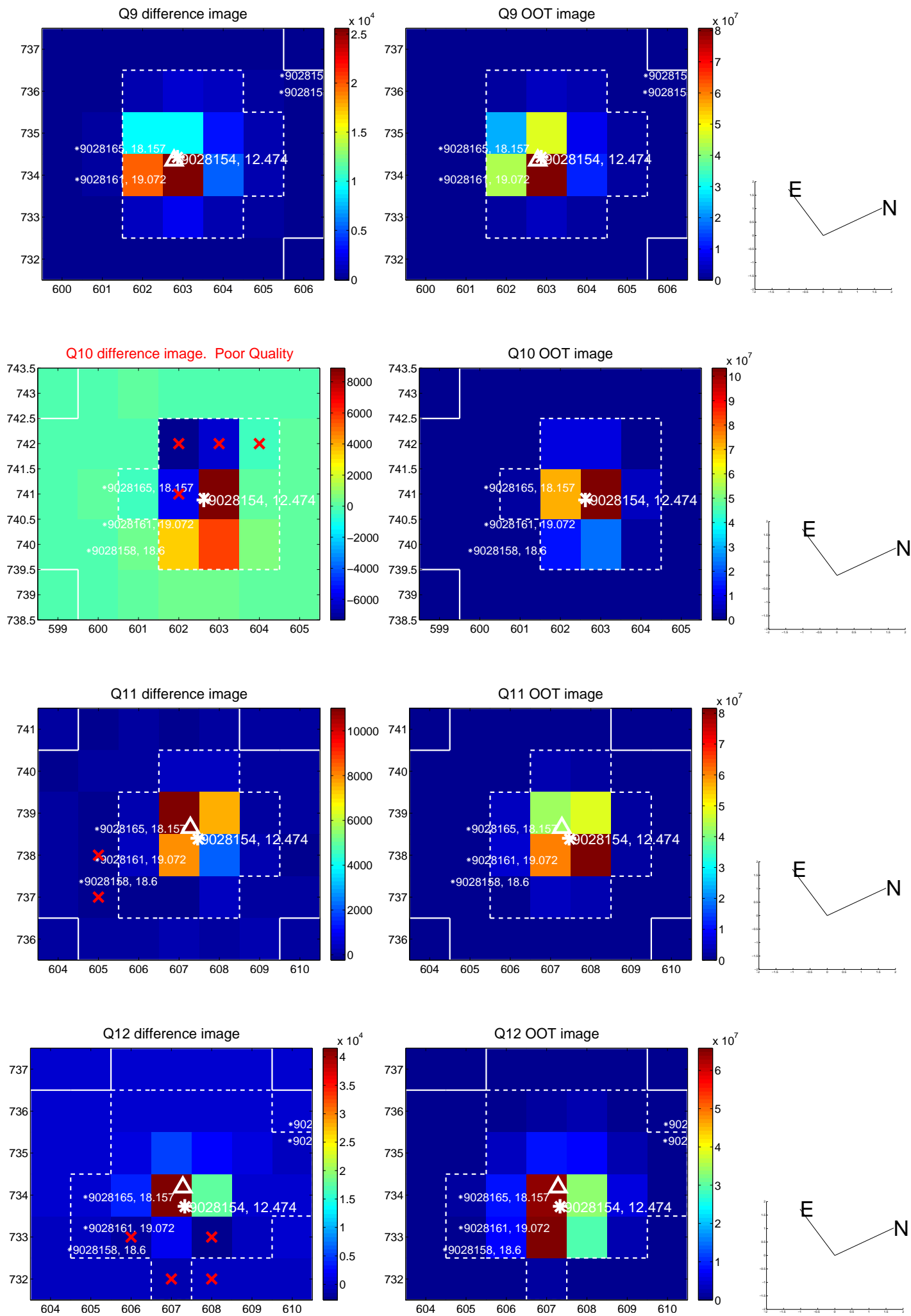




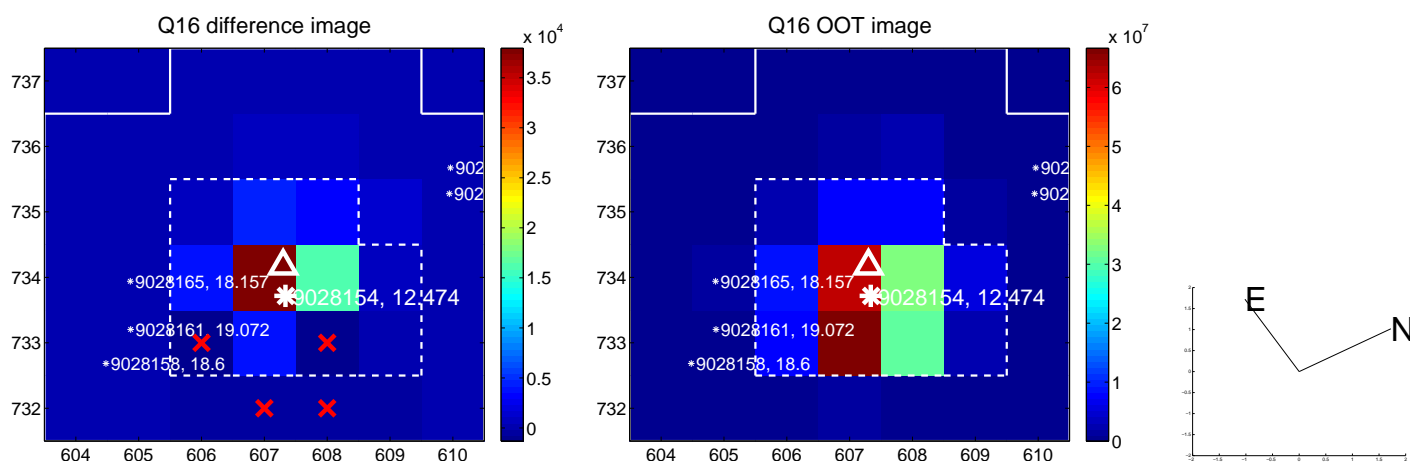
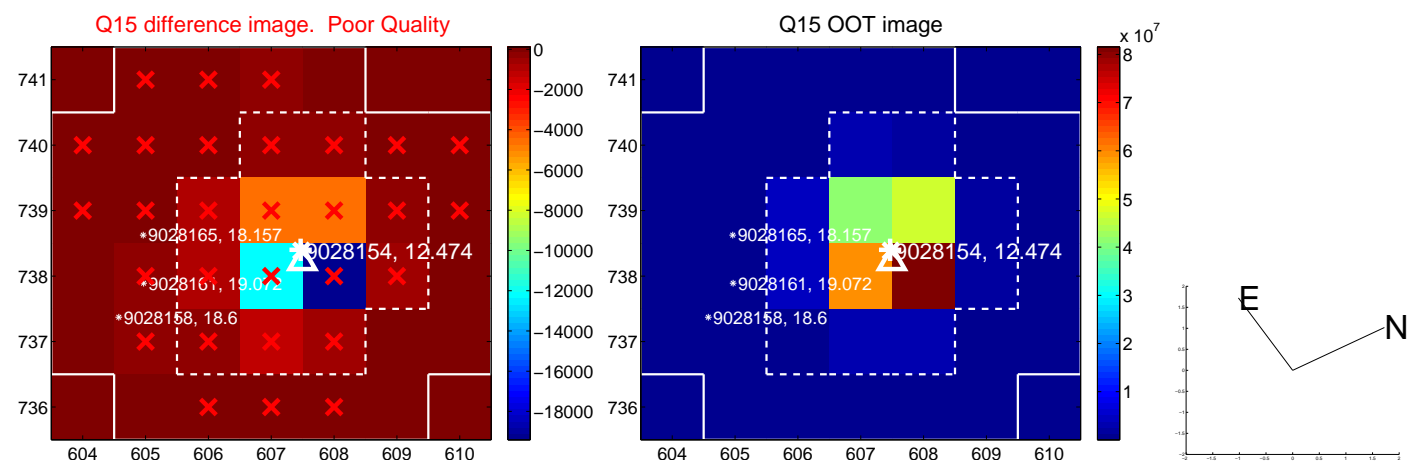
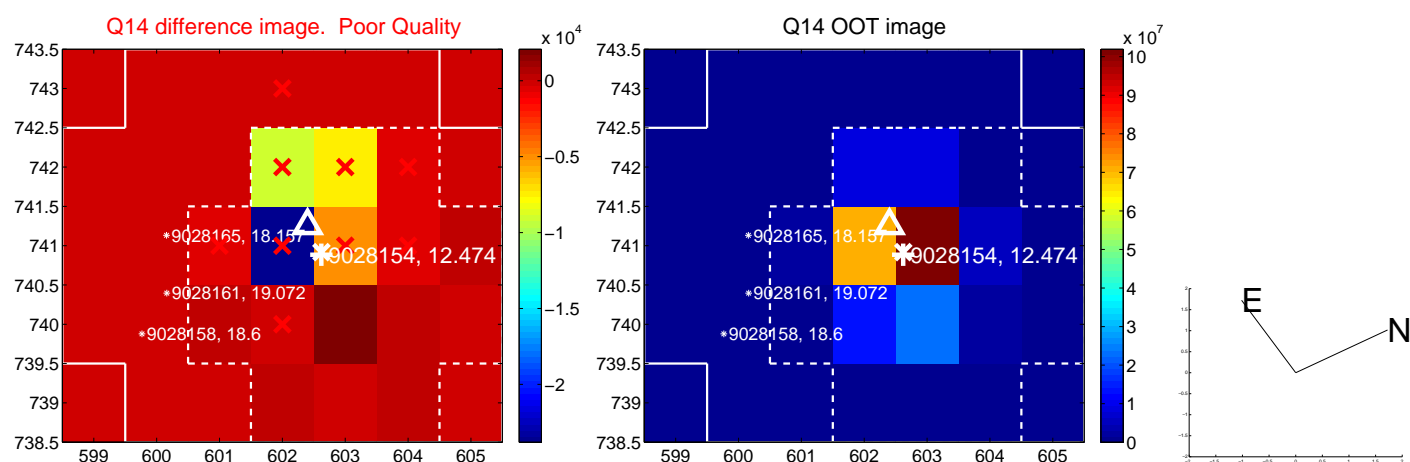
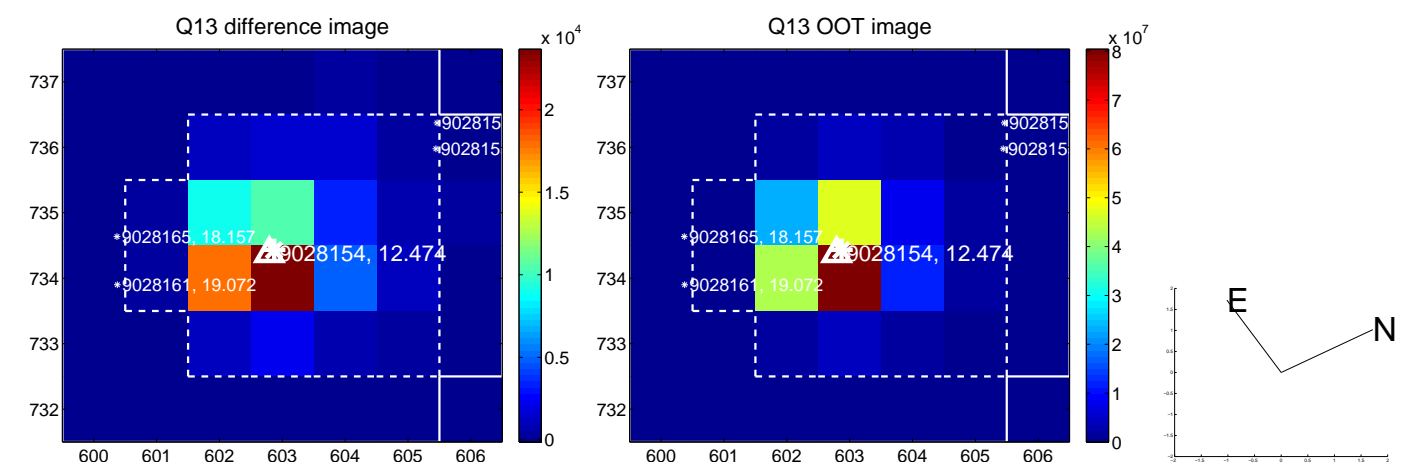
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



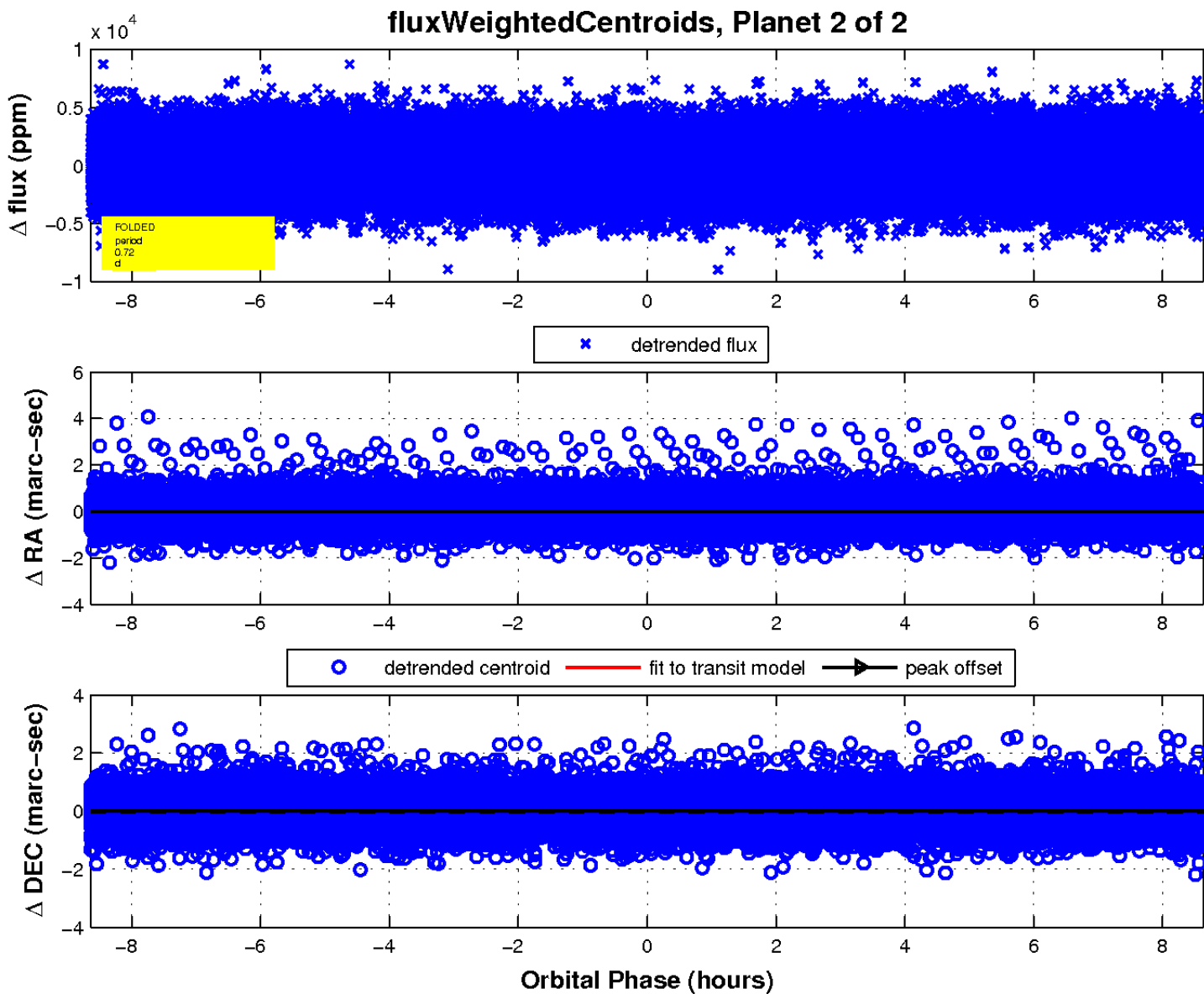
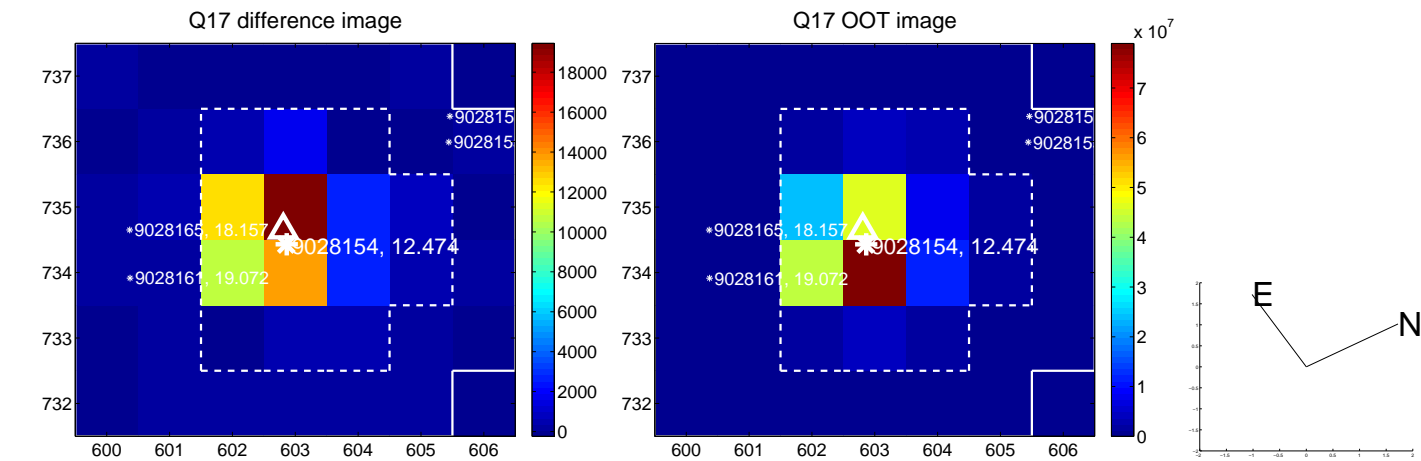
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



This astronomical image shows a field of stars against a dark, noisy background. A blue grid is overlaid on the image, with green text labels indicating coordinates. The labels are arranged in two rows: the top row shows '16.0', '15.0', '19:36:14.0', '13.0', and '12.0'; the bottom row shows ':20.0', '30.0', '40.0', and '50.045:20:00.010.0'. A bright, large star is visible near the center of the image, and several other smaller stars are scattered throughout the field.

Declination