

# KIC 012459725

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012459725-01	OBS	No	340.331273	228.217097	1256.6	2.989	8.1	9.4	0.88	5799	3.35	0.87
012459725-02	OBS	No	368.675936	214.044871	1587.8	2.321	7.8	8.4	0.88	5799	3.99	0.79

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012459725-01	OBS	FP	0.01	0	0	1	0	PERIOD_ALIAS_DV—PERIOD_ALIAS_ALT—CENT_RESOLVED_OFFSET
012459725-02	OBS	FP	0.00	1	0	1	0	ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST

**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 012459725-01

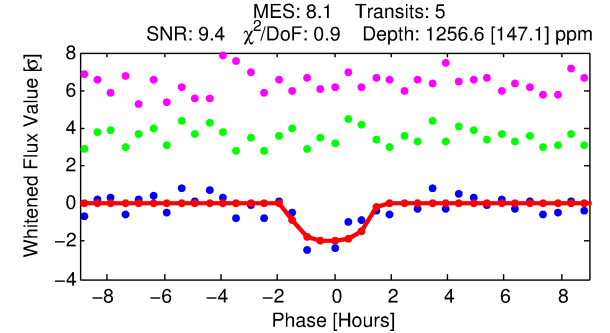
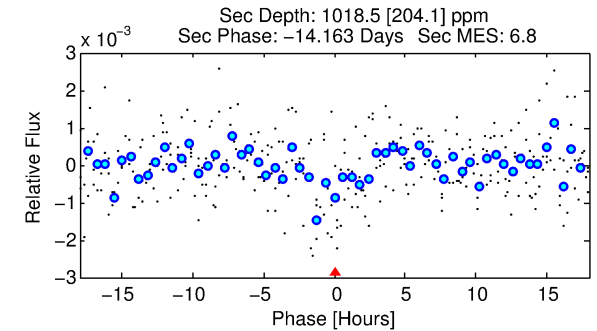
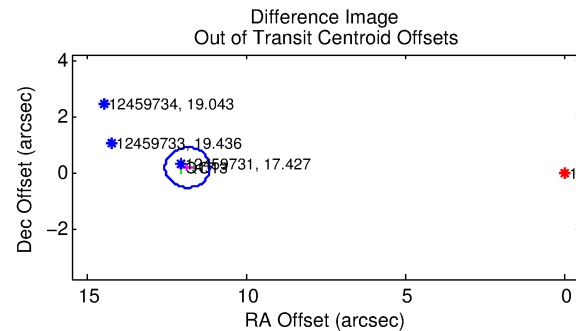
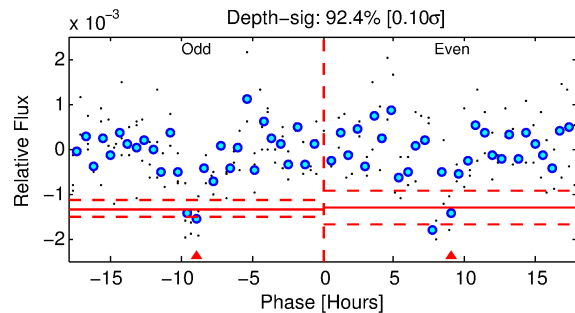
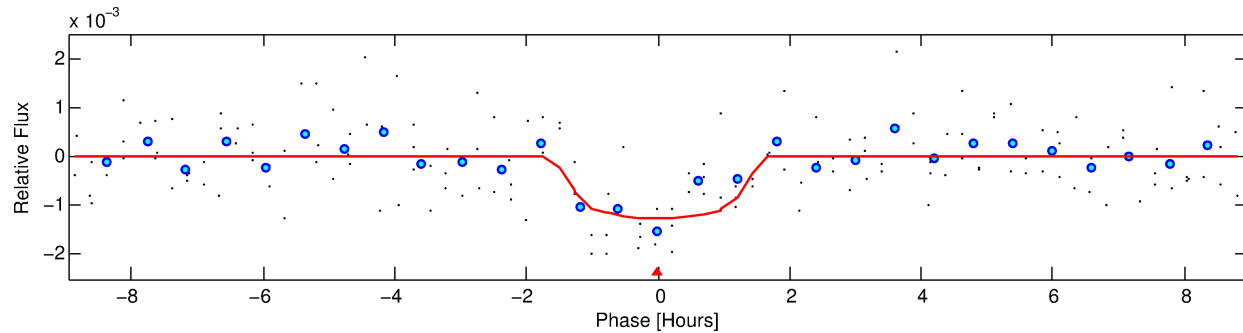
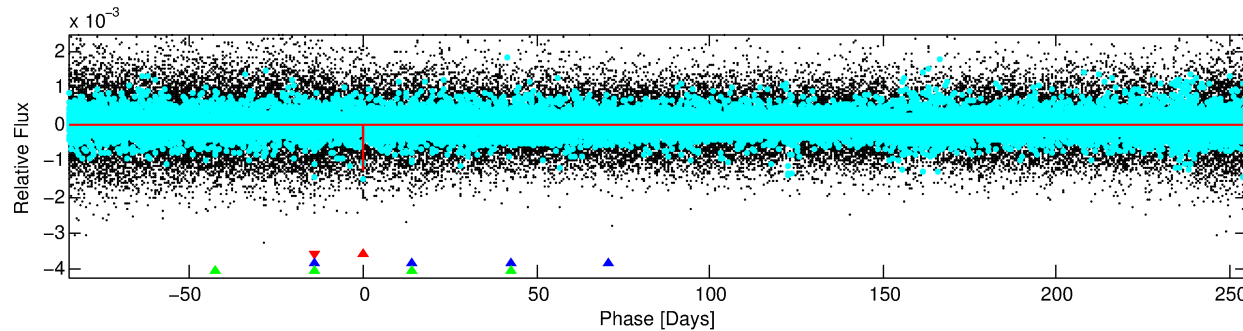
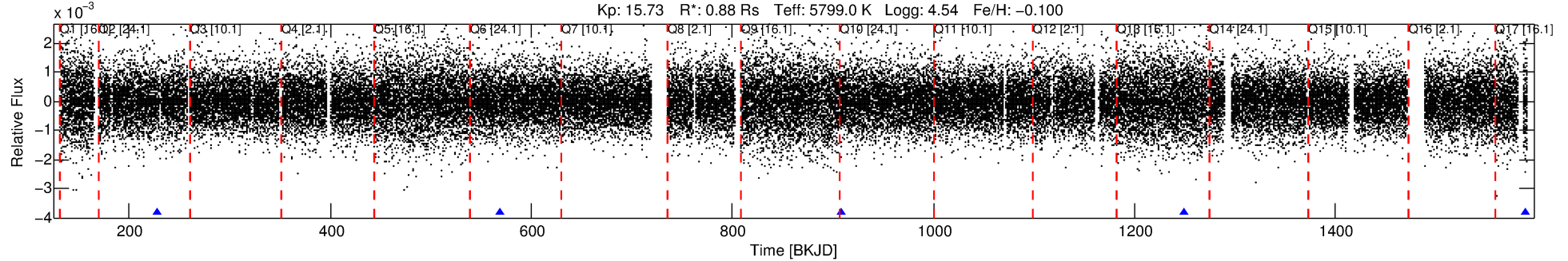
No Significant Match Found

# DV One-Page Summary

KIC: 12459725 Candidate: 1 of 3 Period: 340.331 d

KOI: K00789 Corr: No Ephemeris Match

Kp: 15.73 R\*: 0.88 Rs Teff: 5799.0 K Logg: 4.54 Fe/H: -0.100



## DV Fit Results:

Period = 340.33127 [0.00308] d  
Epoch = 228.2171 [0.0063] BKJD  
Rp/R\* = 0.0349 [0.0498]  
a/R\* = 646.75 [4138.66]  
b = 0.72 [4.33]  
Seff = 0.87 [0.32]  
Teq = 247 [22] K  
Rp = 3.35 [4.86] Re  
a = 0.9454 [0.2233] AU  
Ag = 44680.27 [128527.48] [0.35σ]  
Teff = 5542 [3961] K [1.34σ]

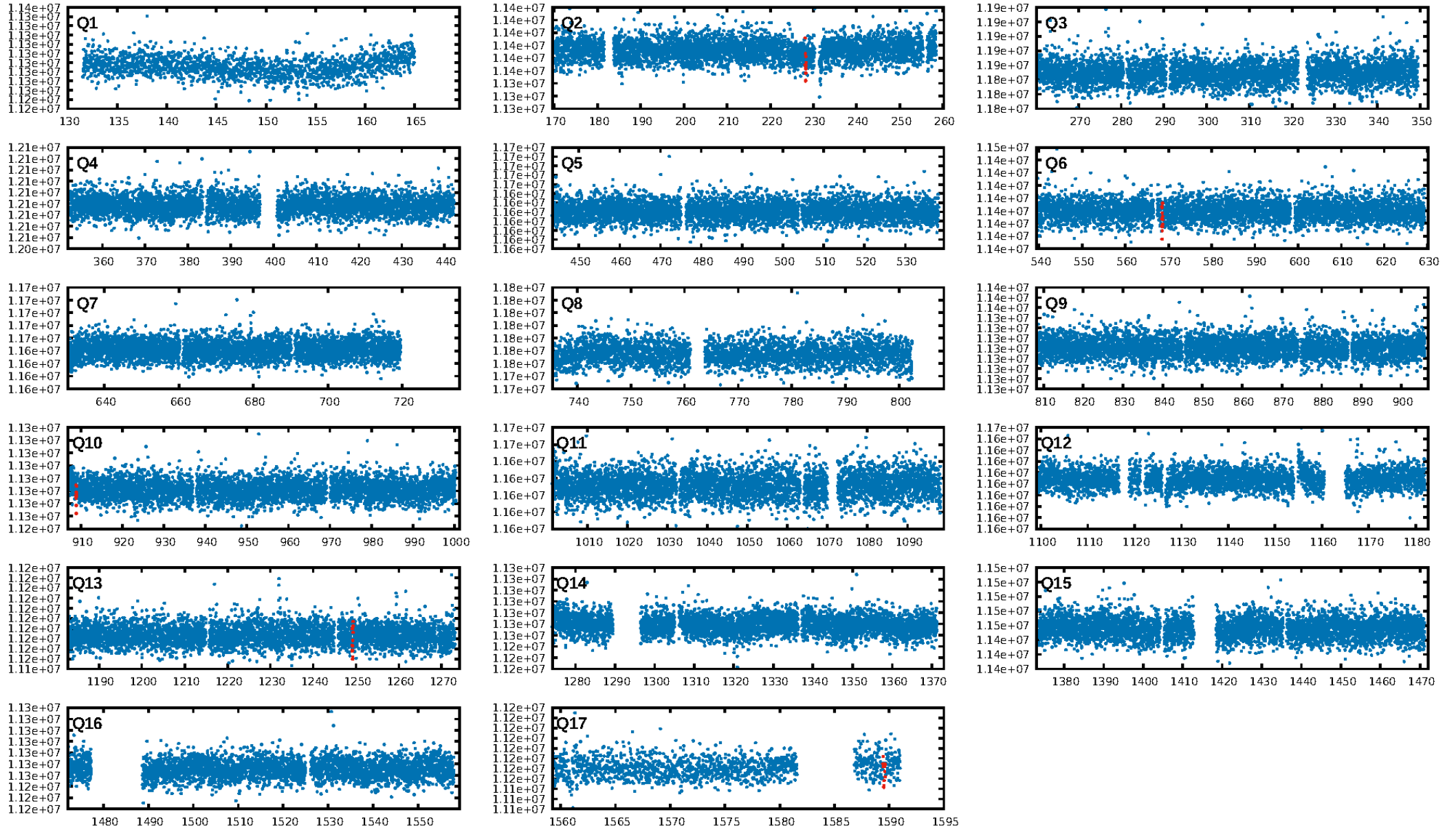
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [164.49σ]  
ModelChiSquare2-sig: 58.8%  
ModelChiSquareGof-sig: 97.5%  
Bootstrap-pfa: 9.31e-16  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.2892  
Centroid-sig: 0.0%  
Centroid-so: 38.178 arcsec [19.64σ]  
OotOffset-rm: 11.862 arcsec [49.84σ]  
KicOffset-rm: 11.828 arcsec [41.23σ]  
OotOffset-st: 0/0/0/2 [2]  
KicOffset-st: 0/0/0/2 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [4/4]

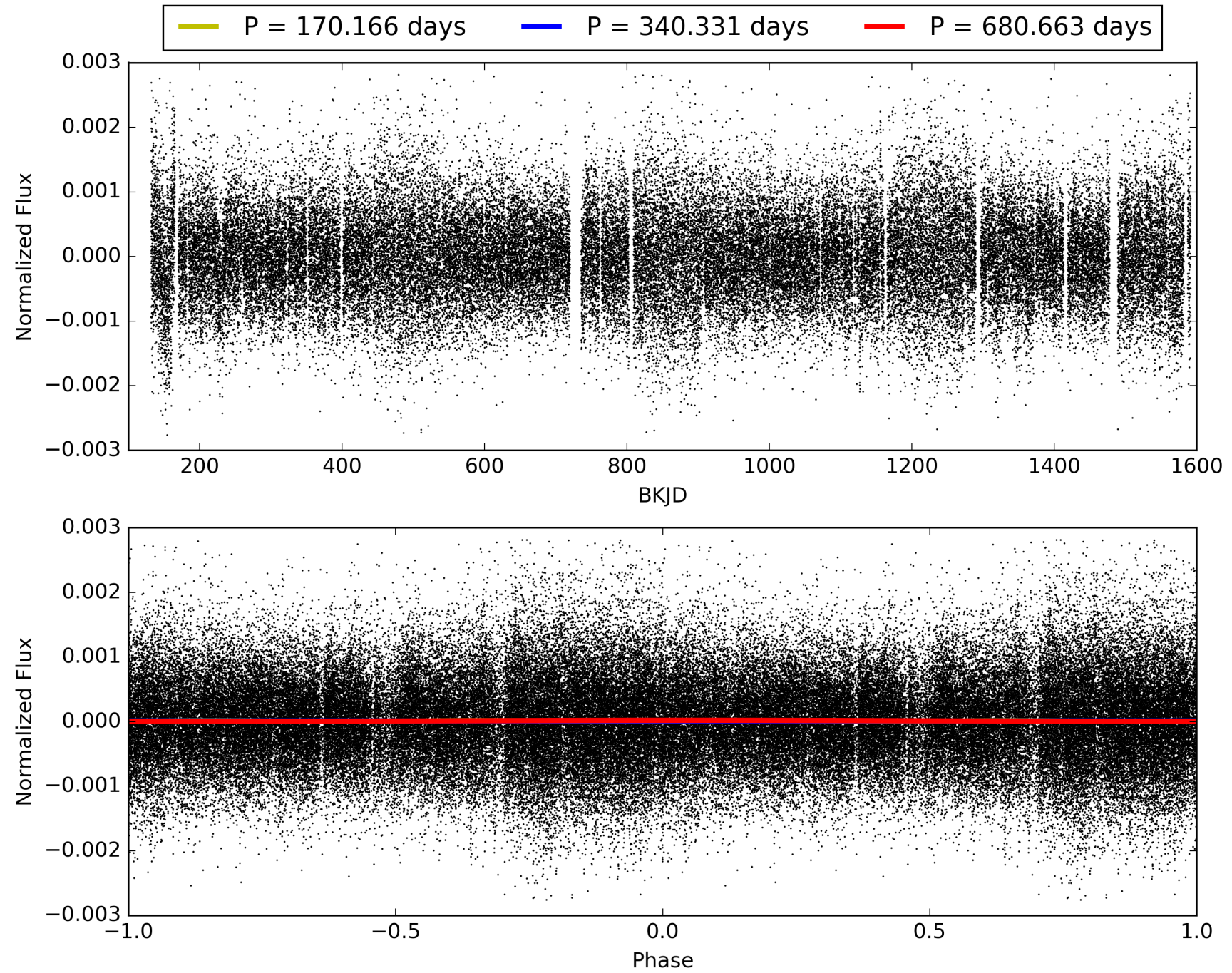
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 04:13:40 Z

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

# TCE 012459725-01, PDC Light Curves

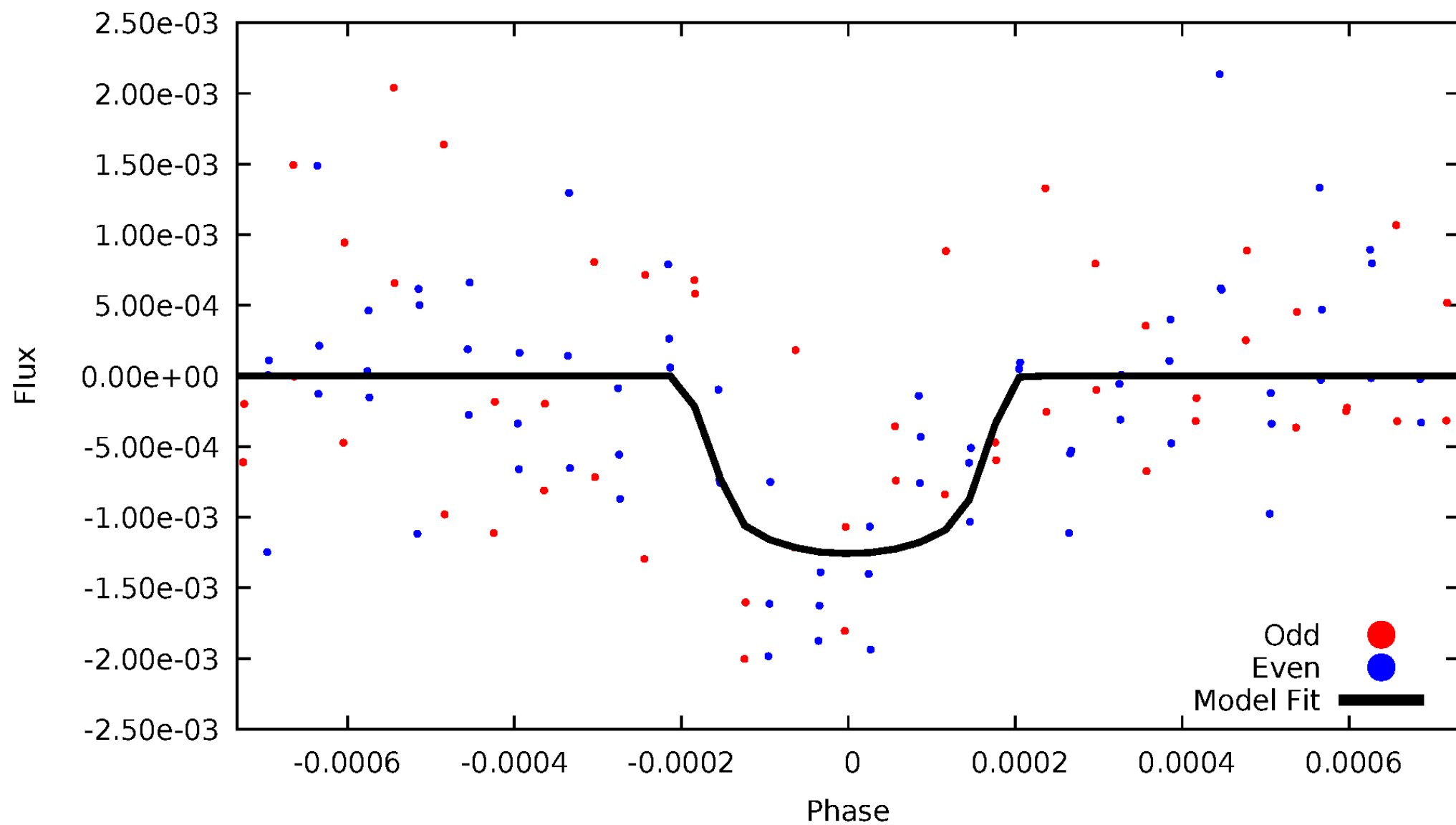


TCE 012459725-01



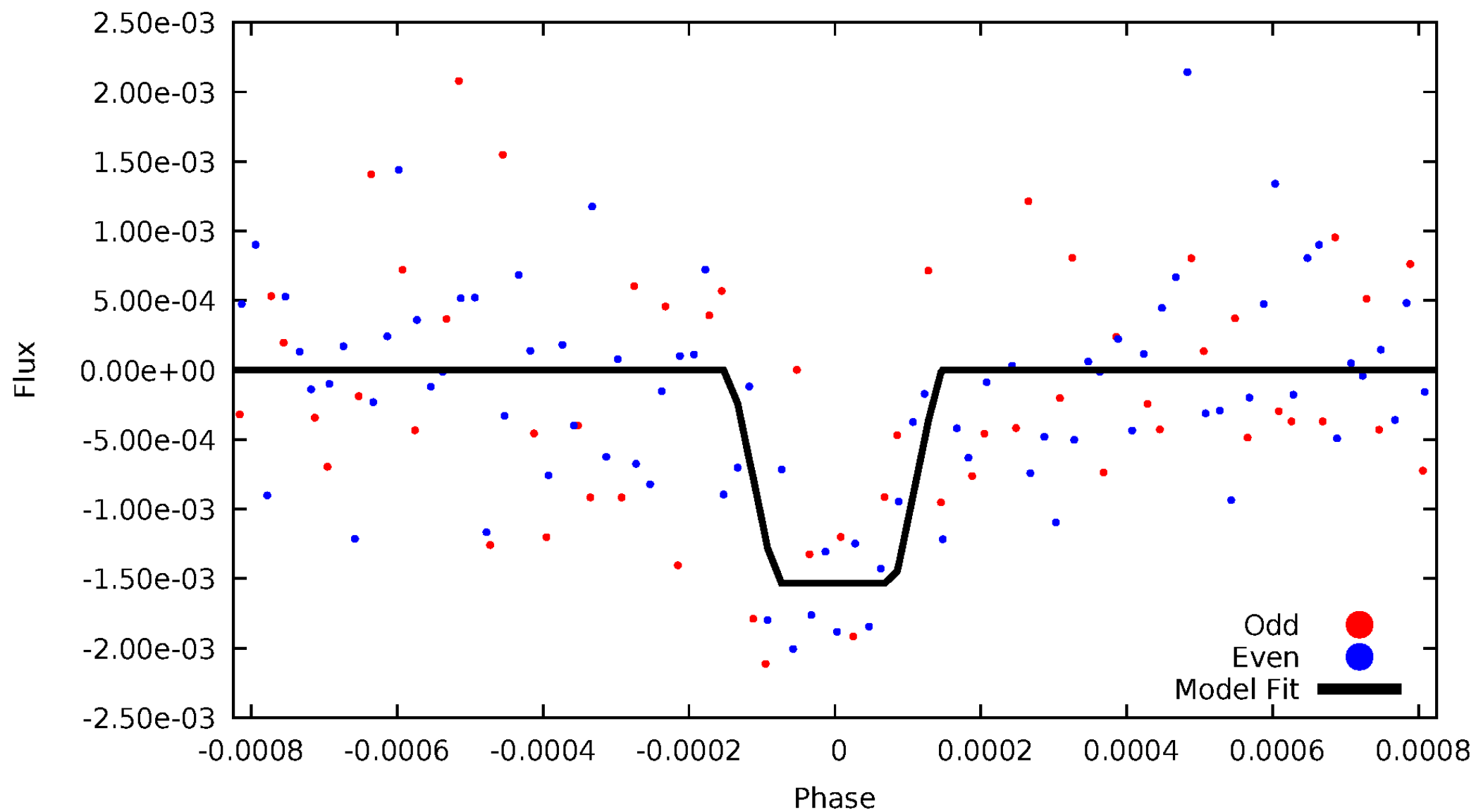
# DV Odd/Even

TCE 012459725-01



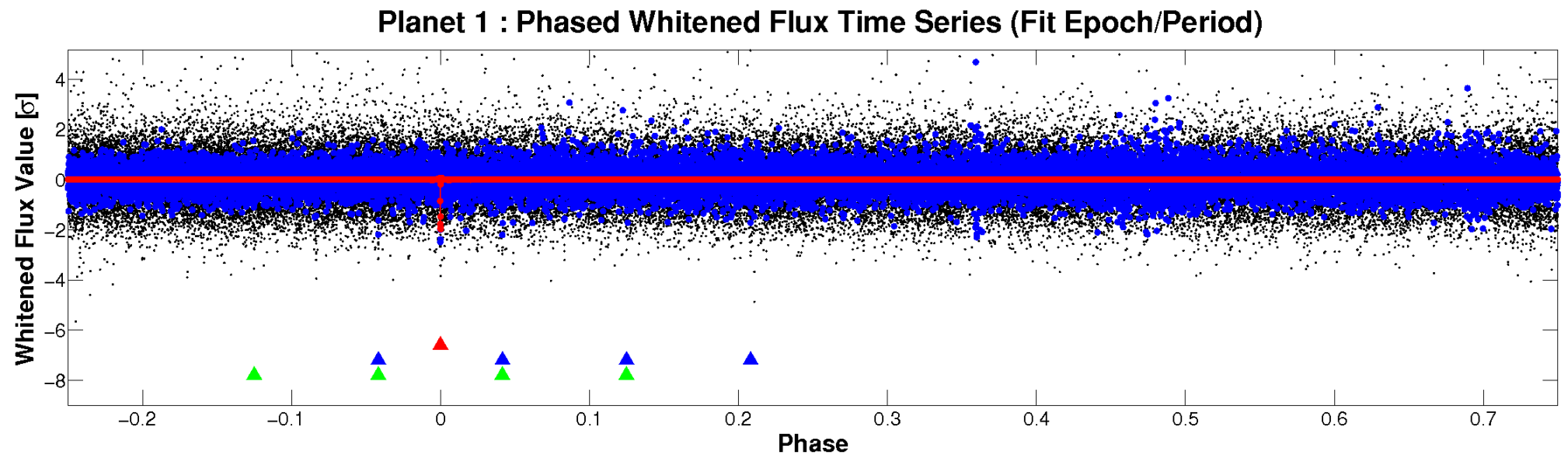
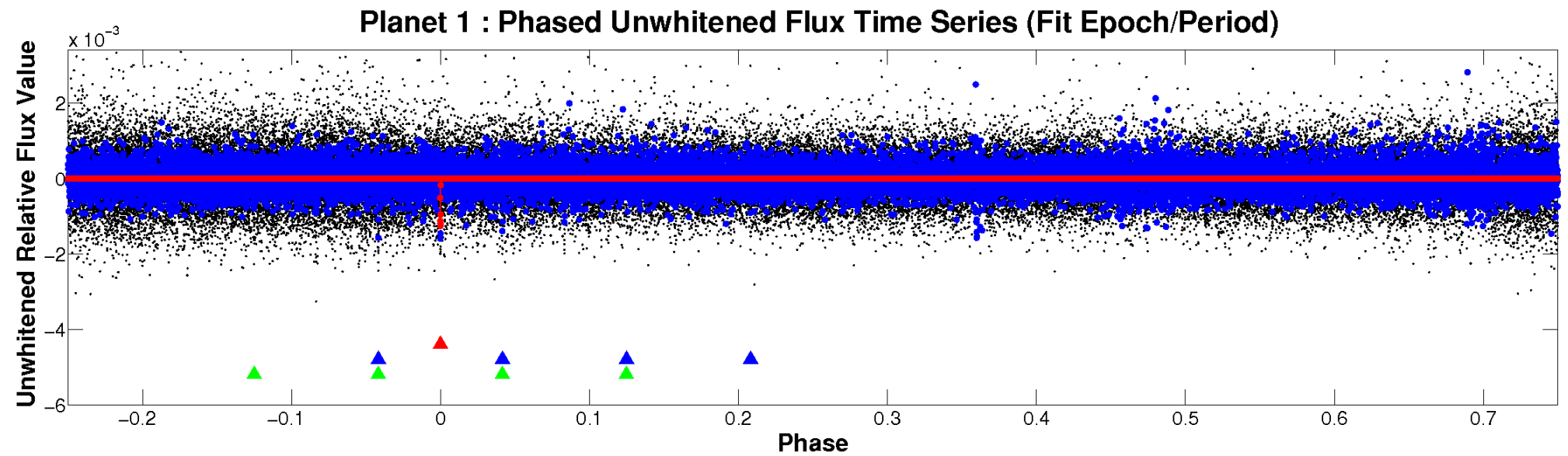
# ALT Odd/Even

TCE 012459725-01



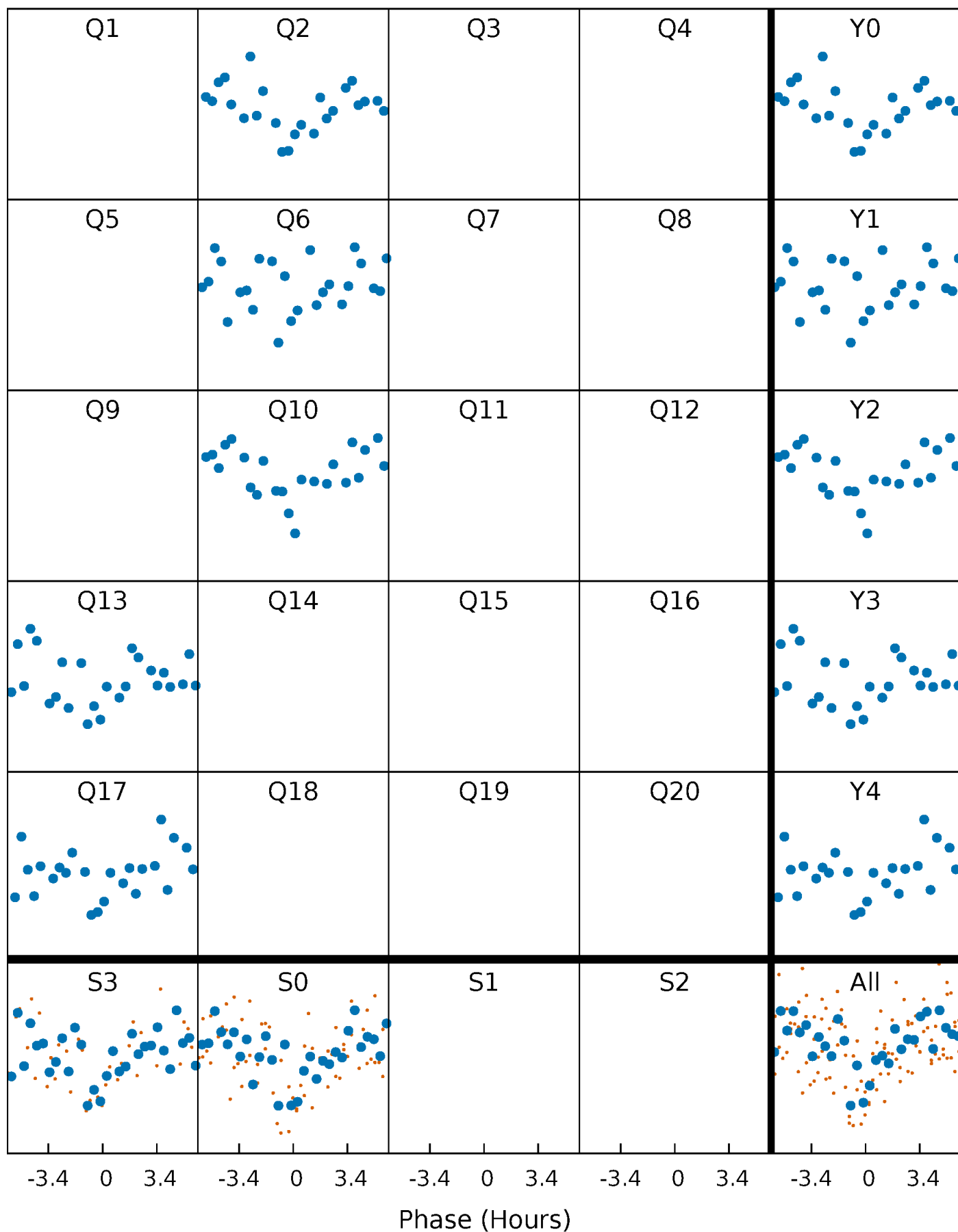


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

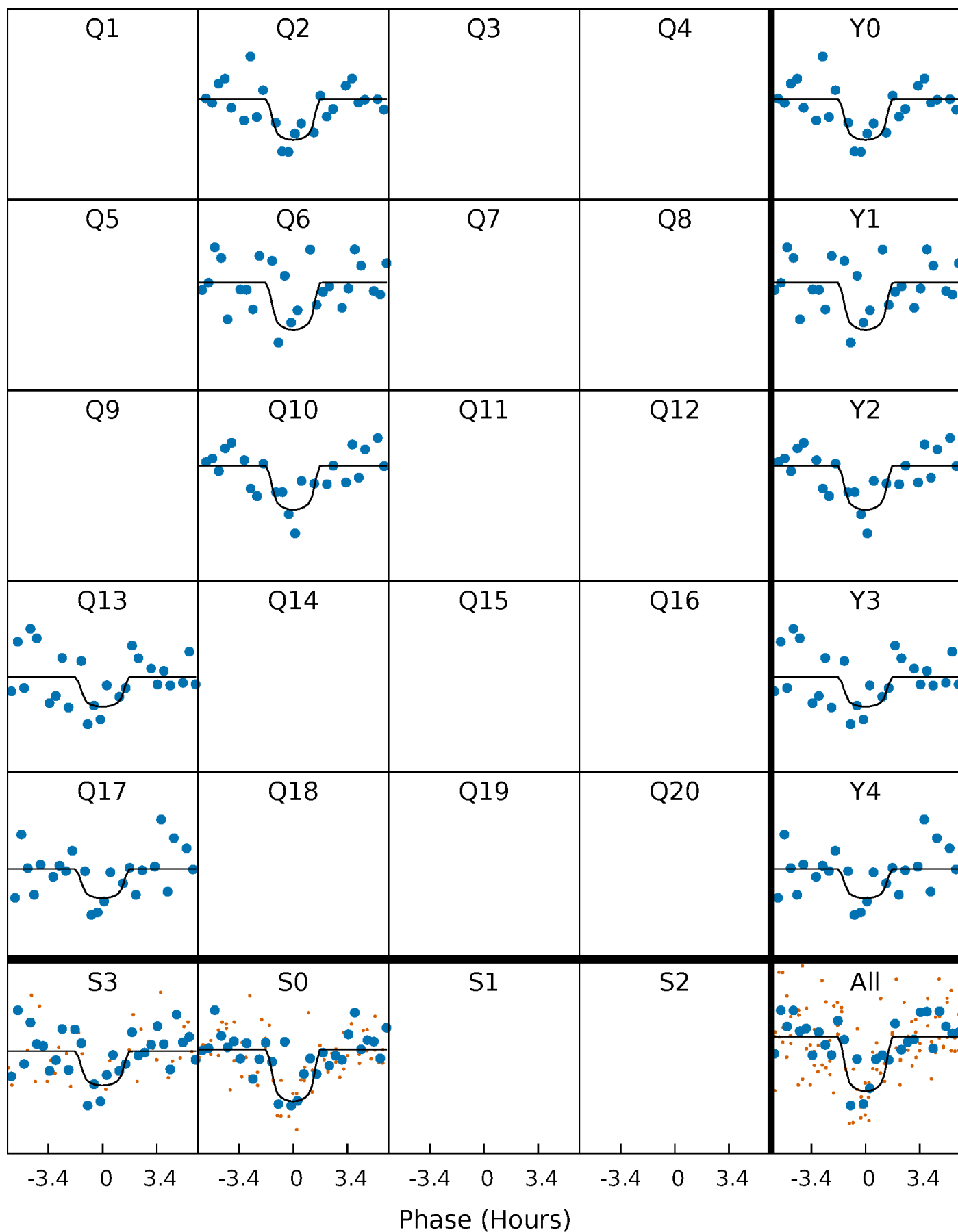
TCE 012459725-01 P=340.331273 Days  $T_0=228.217097$  (BKJD)





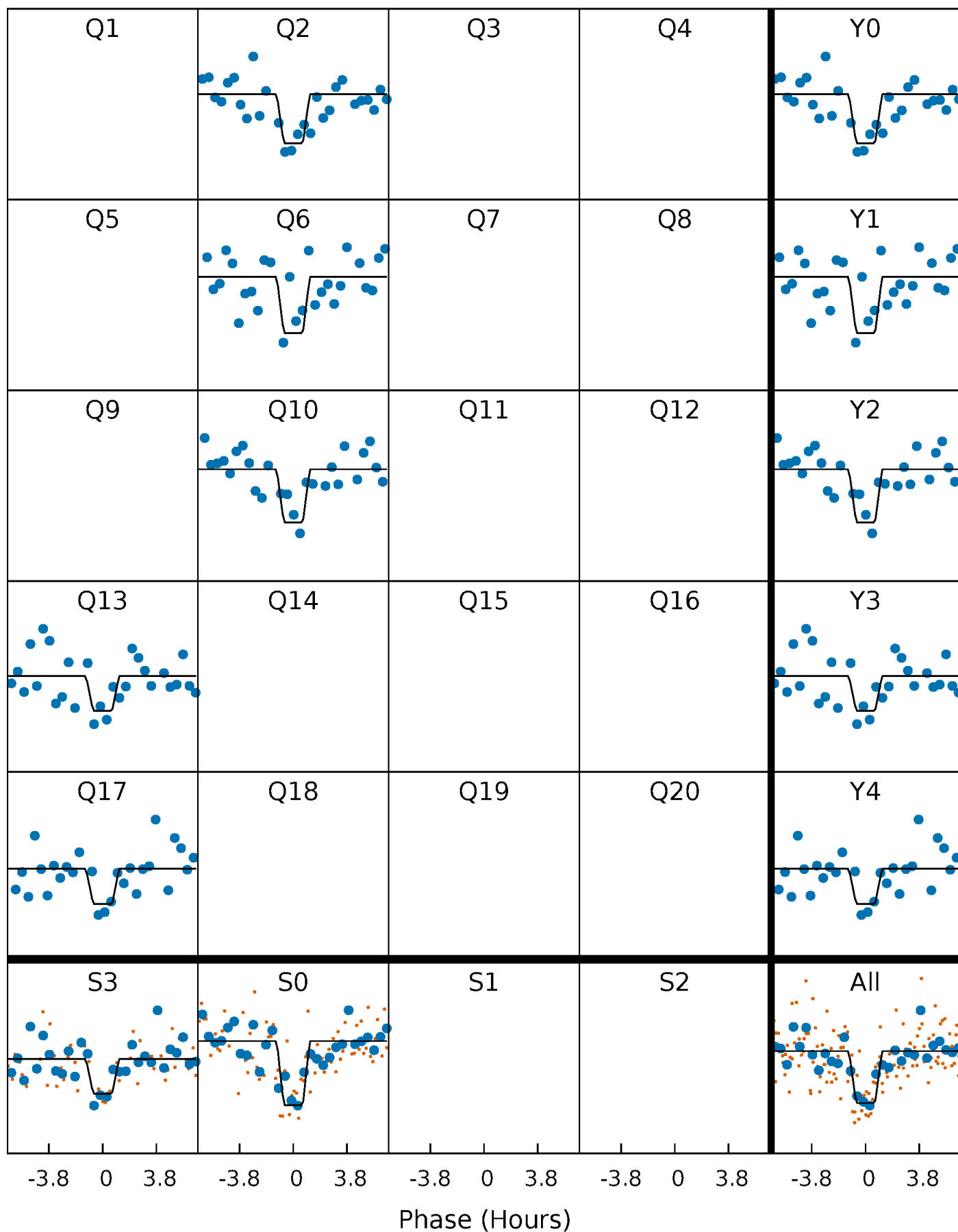
# DV Quarter-Phased Transit Curves

TCE 012459725-01 P=340.331273 Days  $T_0=228.217097$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

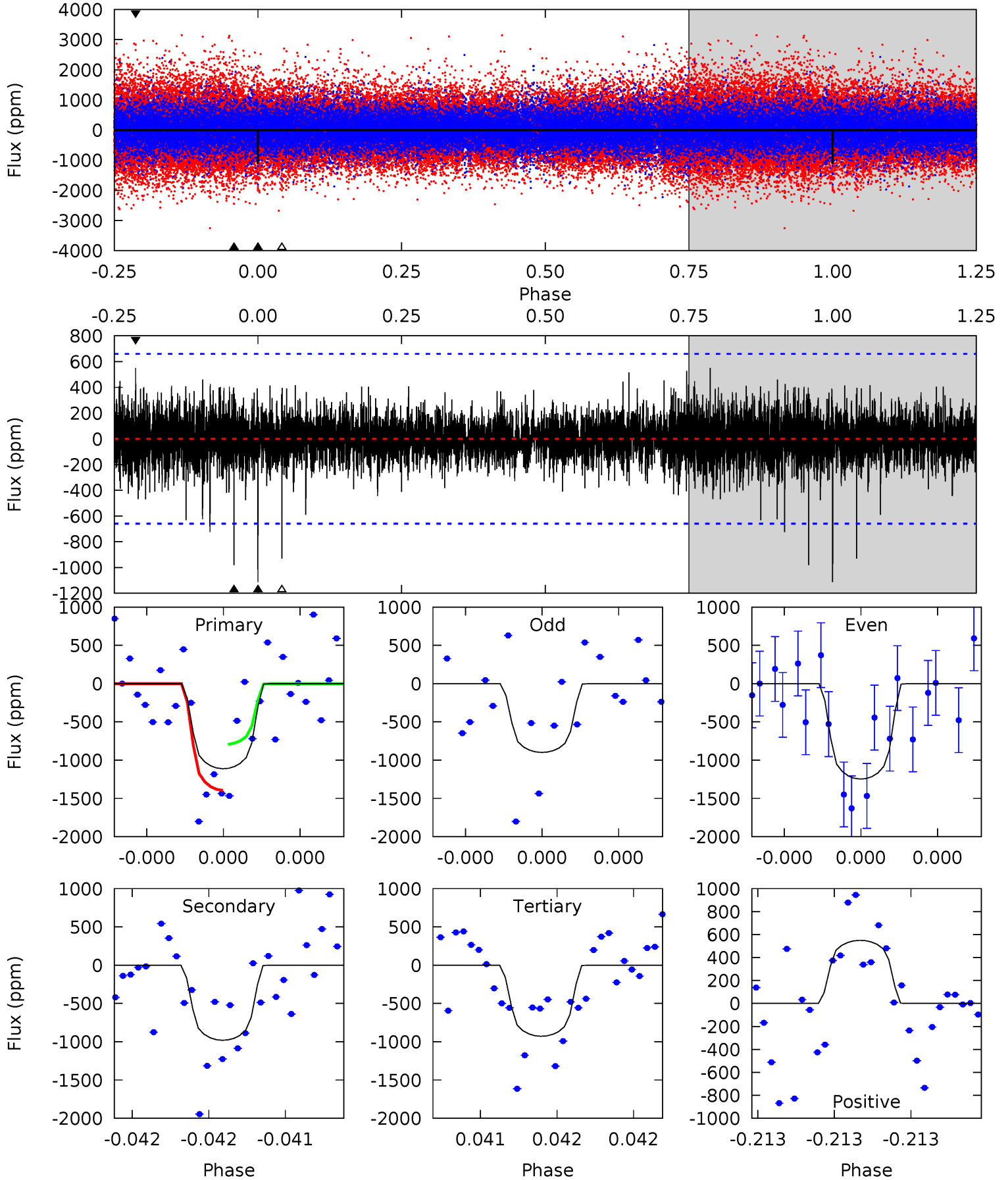
TCE 012459725-01 P=340.328181 Days  $T_0=228.216408$  (BKJD)



# DV Model-Shift Uniqueness Test

012459725-01, P = 340.331273 Days, E = 228.217097 Days

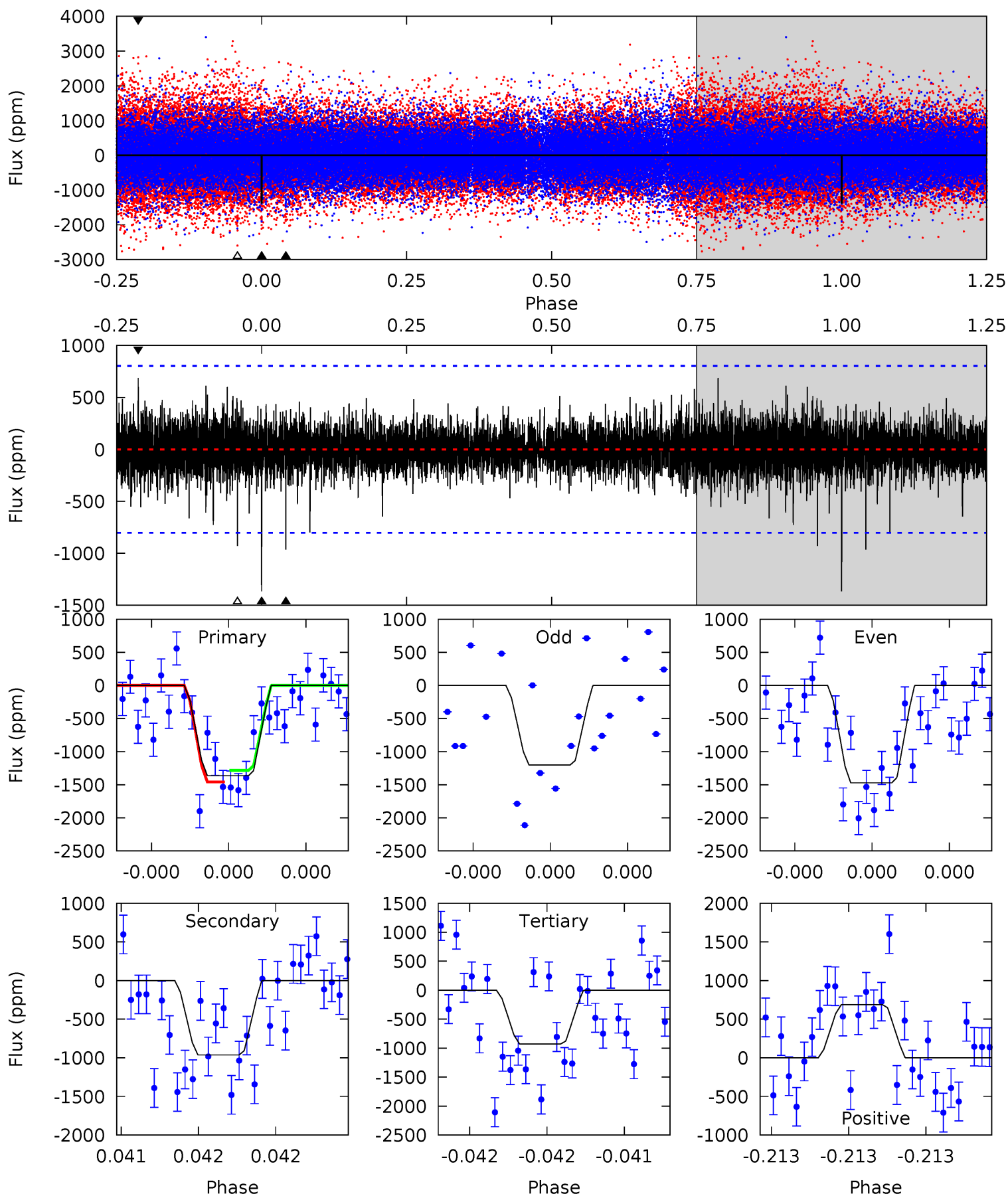
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.47	8.36	7.91	4.68	5.62	3.55	1.10	1.56	4.79	0.44	3.68	1.46	0.88	0.33	2.57



# Alt Model-Shift Uniqueness Test

012459725-01, P = 340.328181 Days, E = 228.216408 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
9.65	6.82	6.57	4.87	5.68	3.65	1.05	3.08	4.78	0.25	1.95	0.97	0.89	0.34	0.60



### Stellar Parameters For KIC 012459725

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5799^{+157}_{-175}$	$4.539^{+0.033}_{-0.187}$	$-0.100^{+0.300}_{-0.300}$	$0.878^{+0.247}_{-0.077}$	$0.975^{+0.105}_{-0.116}$	$2.026^{+0.376}_{-1.000}$
	+3%/-3%	+1%/-4%	+300%/-300%	+28%/-9%	+11%/-12%	+19%/-49%
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 012459725-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-981 \pm 117$	$5.03^{+4.60}_{-3.36}$	$354^{+23}_{-16}$	$4720^{+3278}_{-1004}$	$18164^{+143622}_{-13225}$
Alt.	$-963 \pm 141$	$5.43^{+4.40}_{-3.22}$	$354^{+23}_{-16}$	$4573^{+2350}_{-906}$	$16201^{+79470}_{-11582}$

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

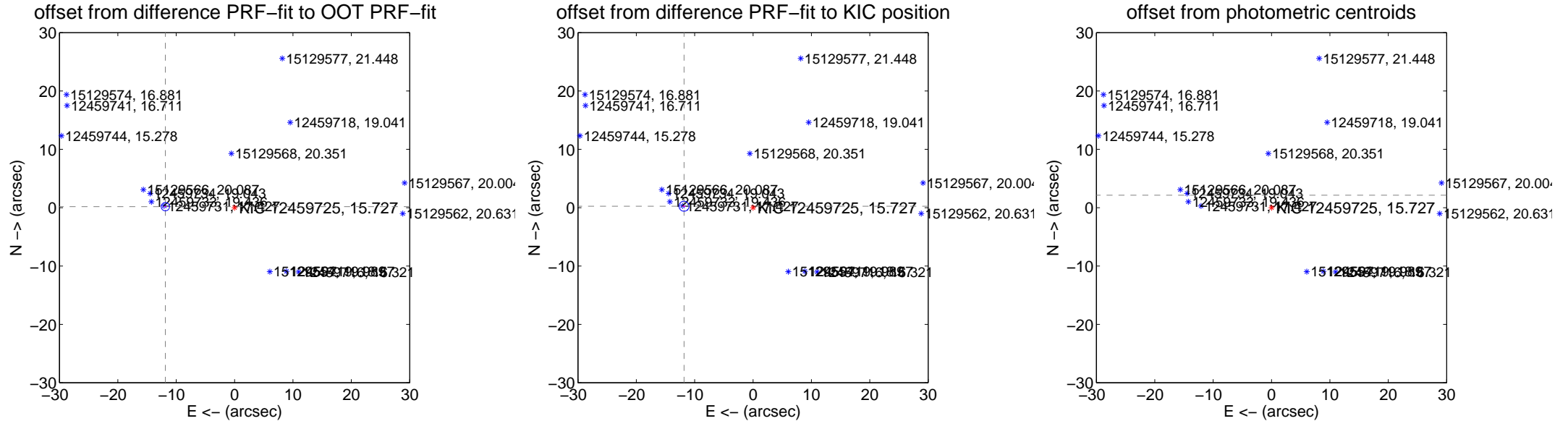
## DV Centroid Data

Supplemental centroid analysis for 012459725-01. Kepler magnitude: 15.73. Transit SNR 9.36

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

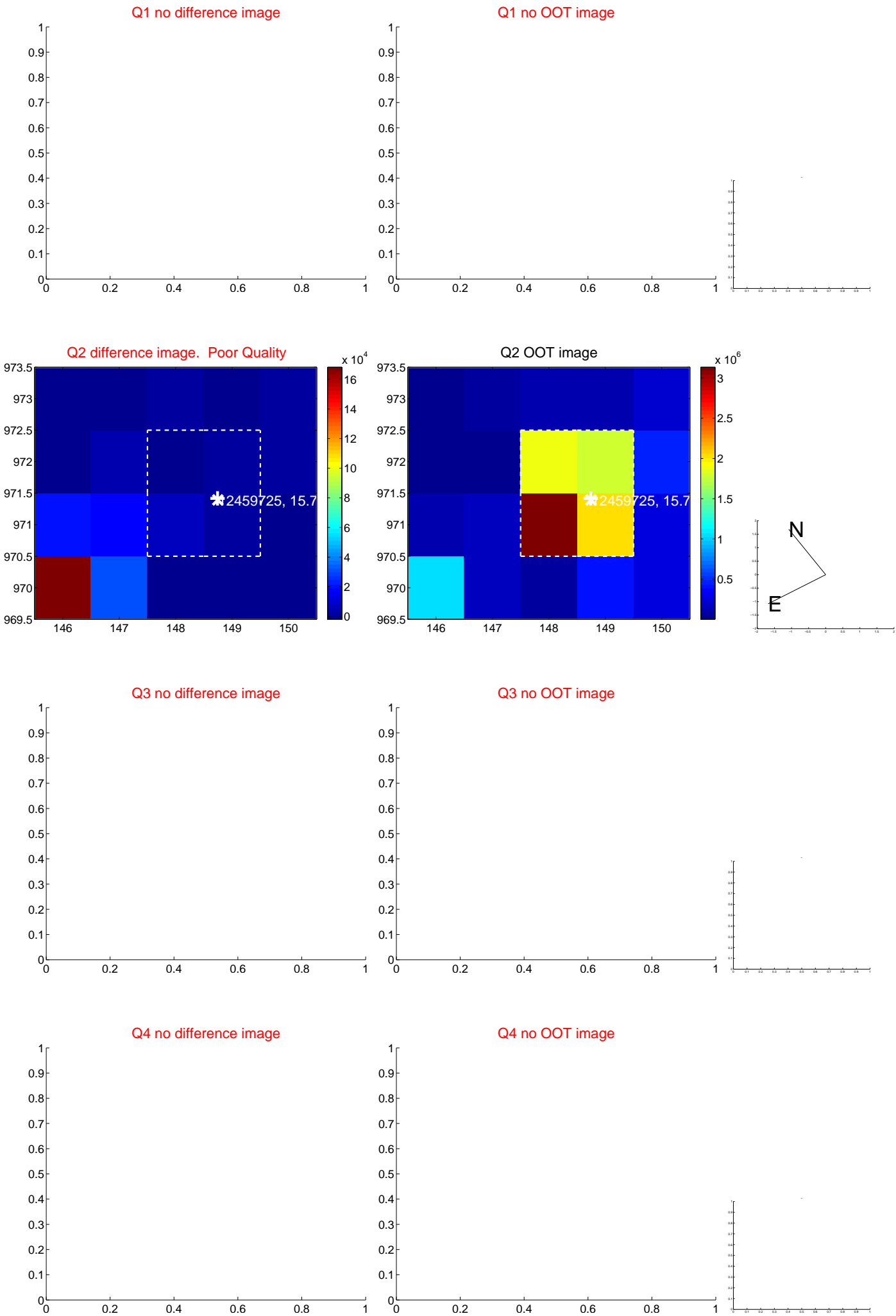
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$11.862 \pm 0.238$	49.84	$11.860 \pm 0.238$	$0.171 \pm 0.071$
PRF-fit source offset from KIC position	$11.828 \pm 0.287$	41.23	$11.826 \pm 0.287$	$0.249 \pm 0.141$
photometric centroid source offset	$38.18 \pm 1.94$	19.64	$38.12 \pm 1.94$	$2.14 \pm 1.86$



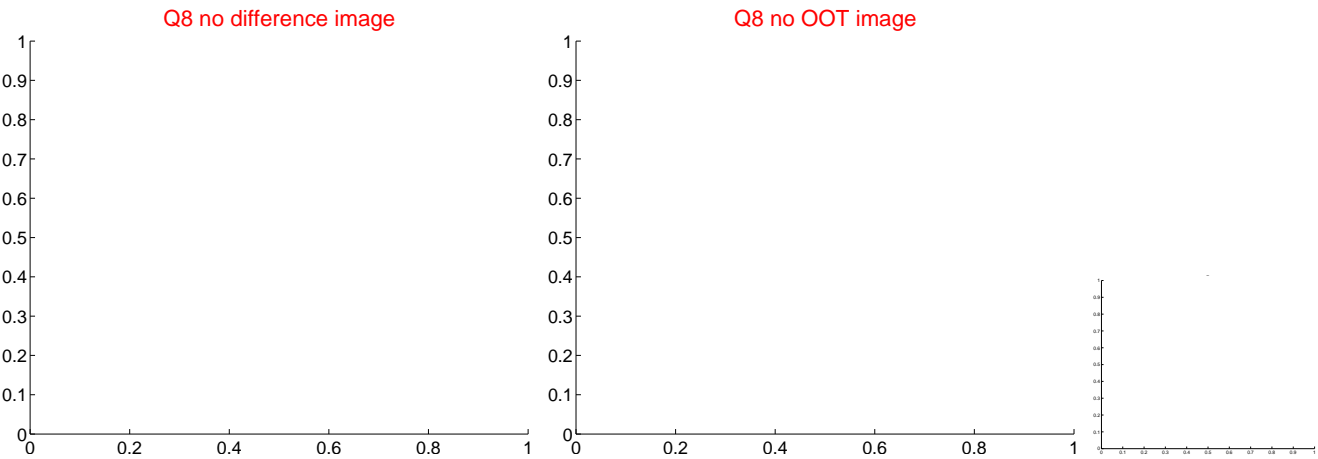
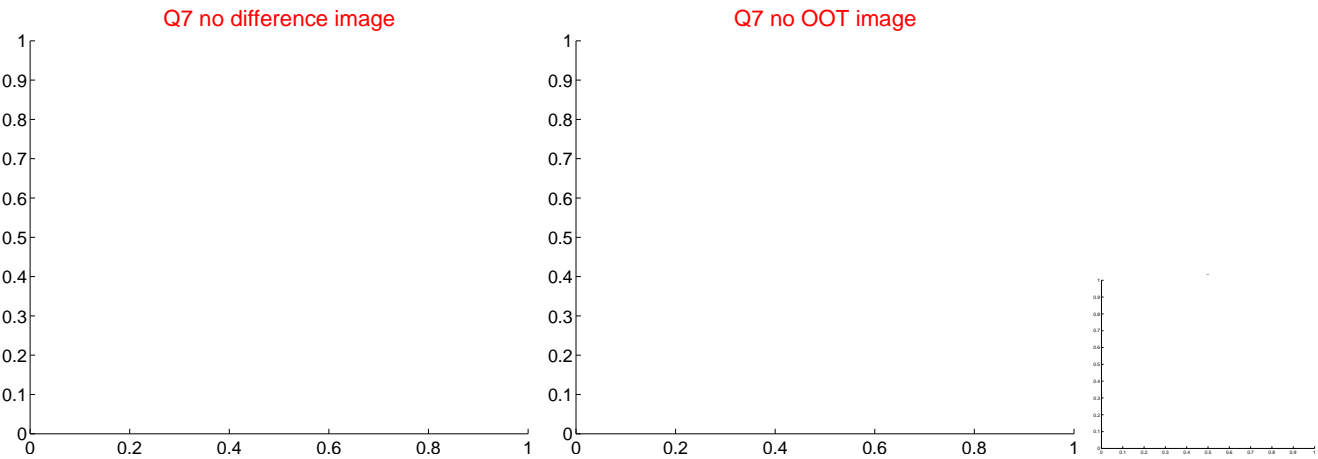
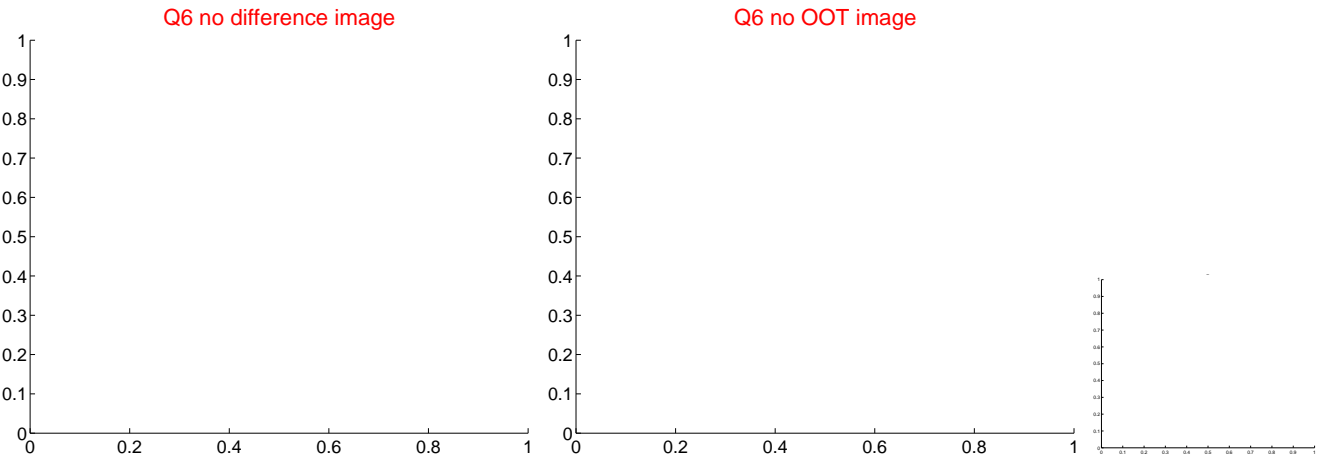
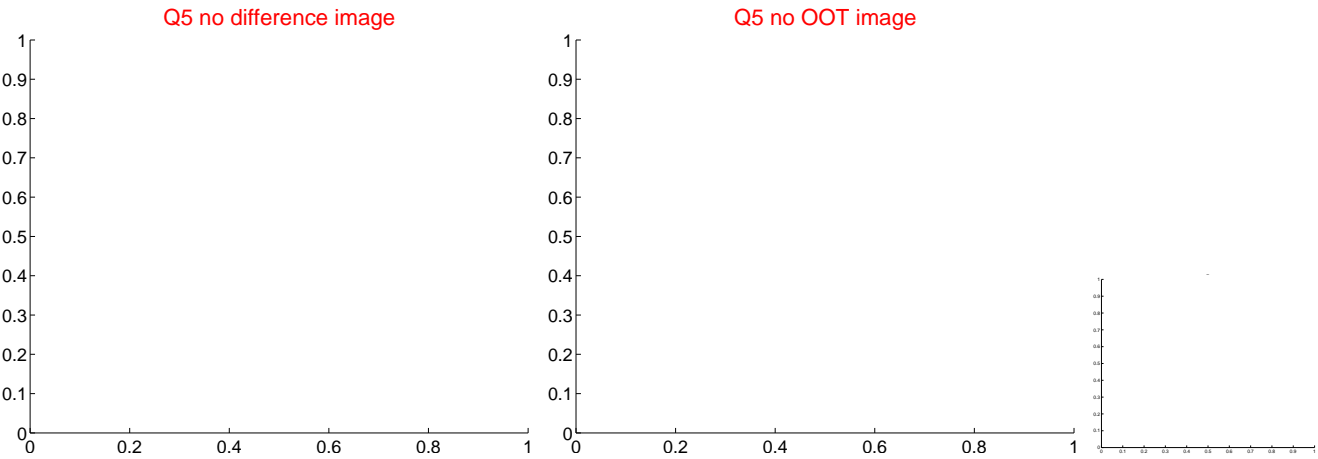
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



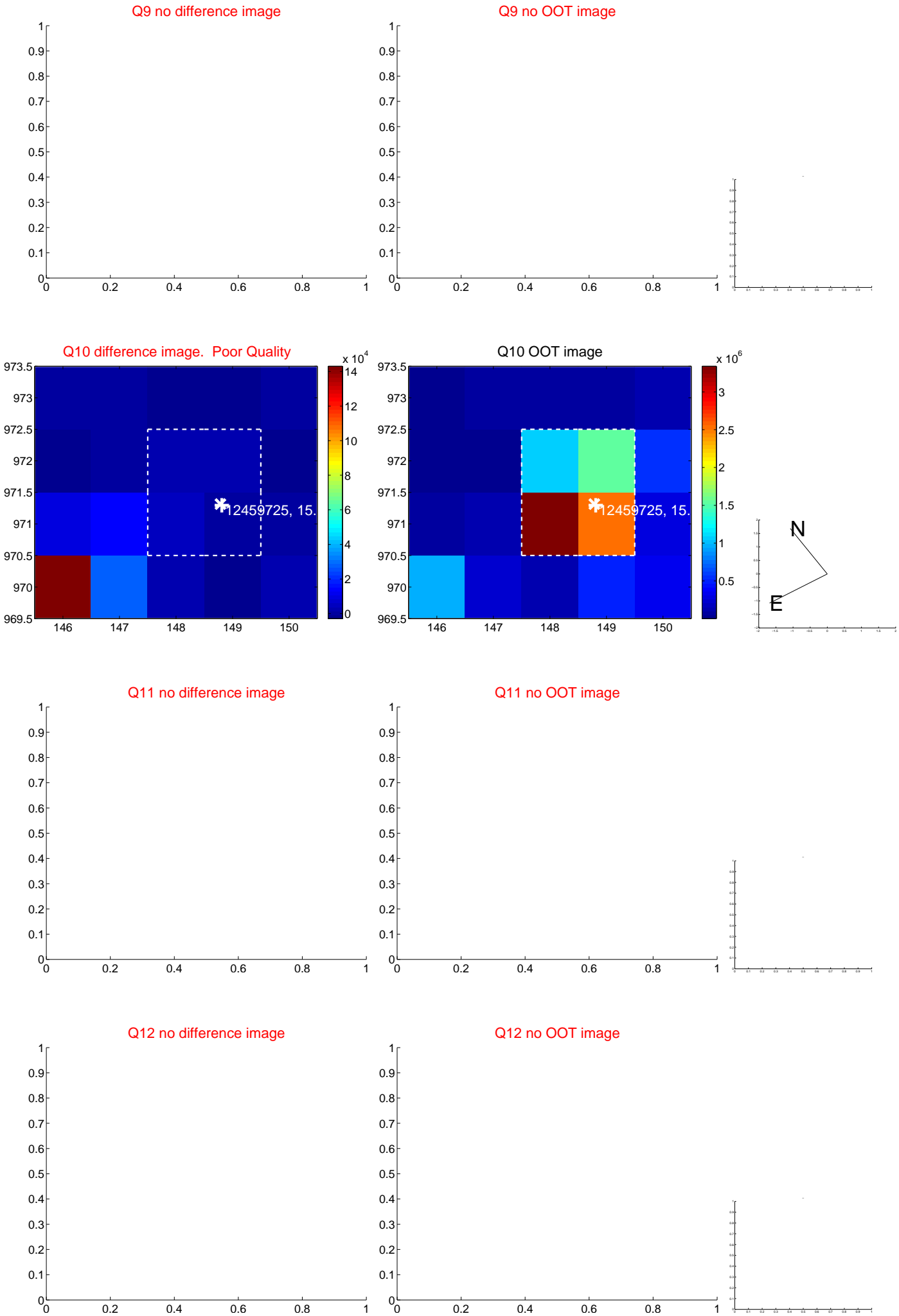
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



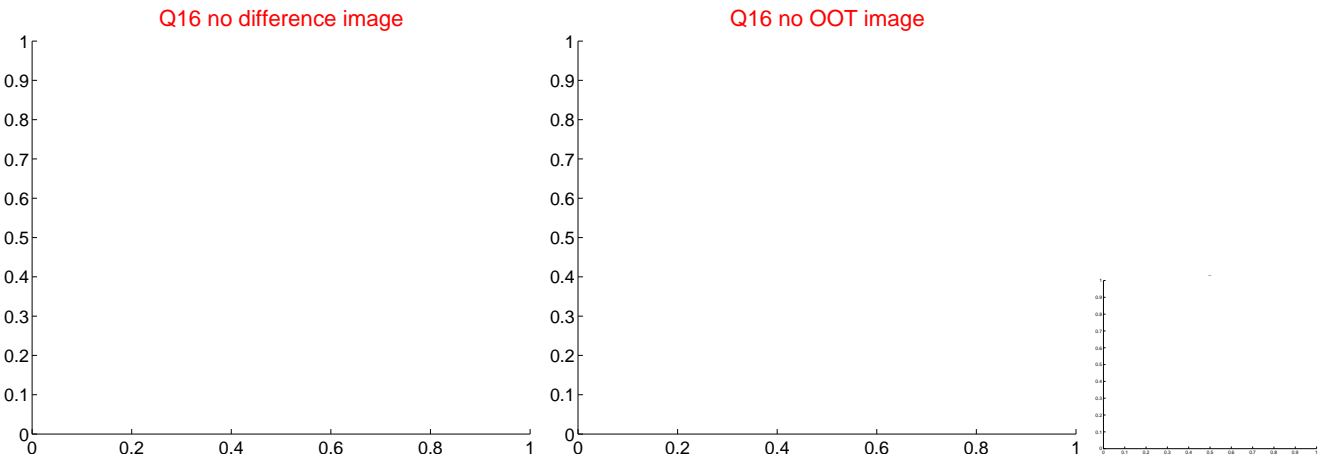
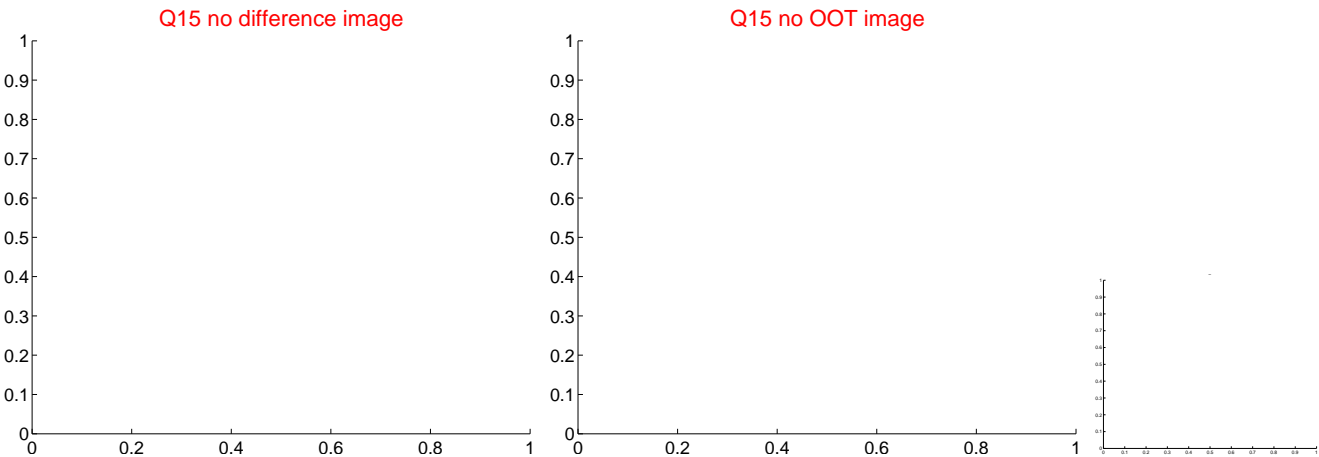
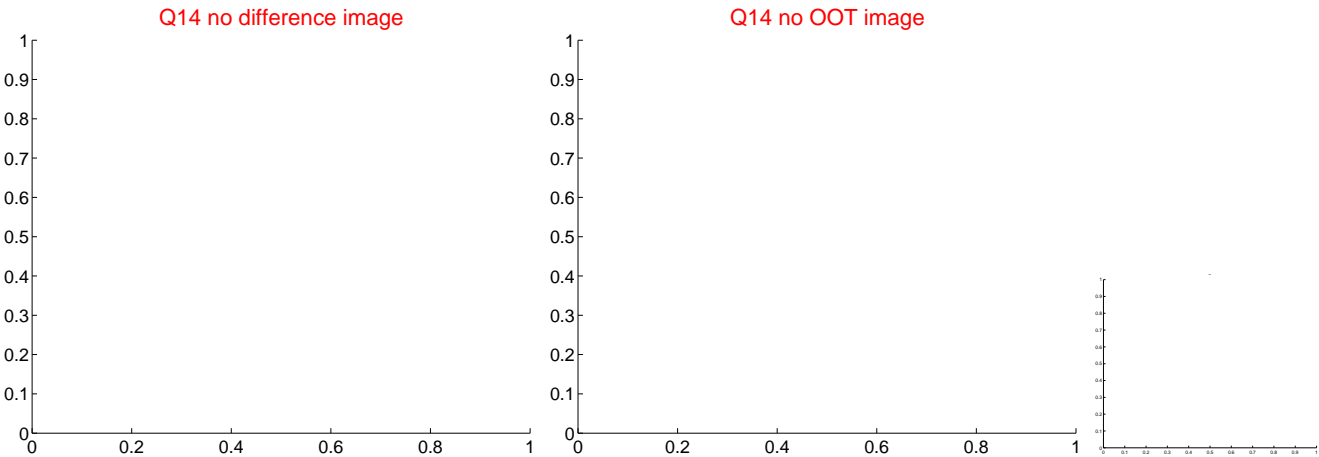
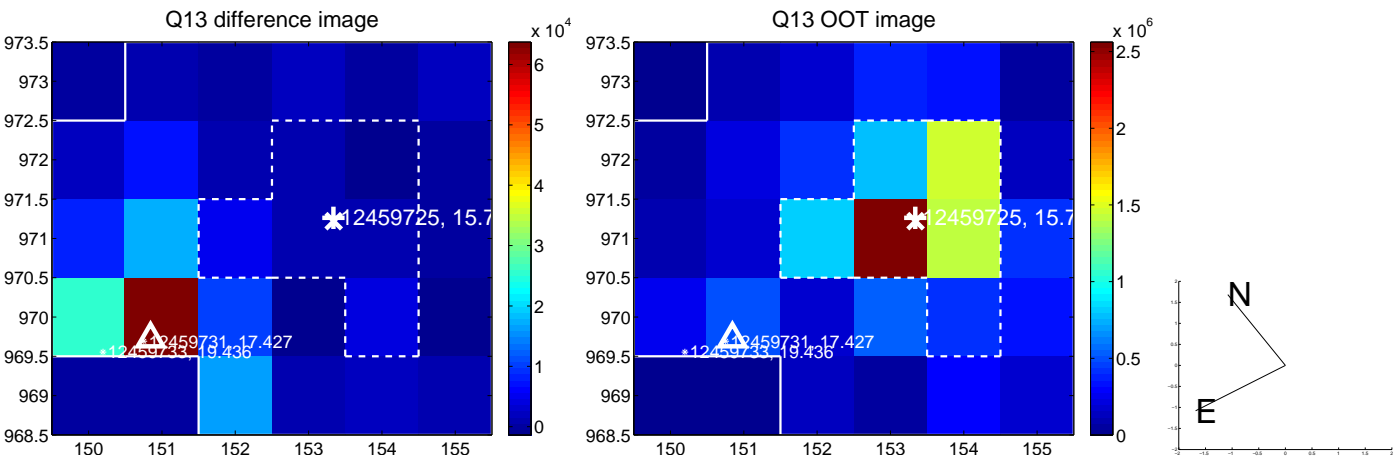
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



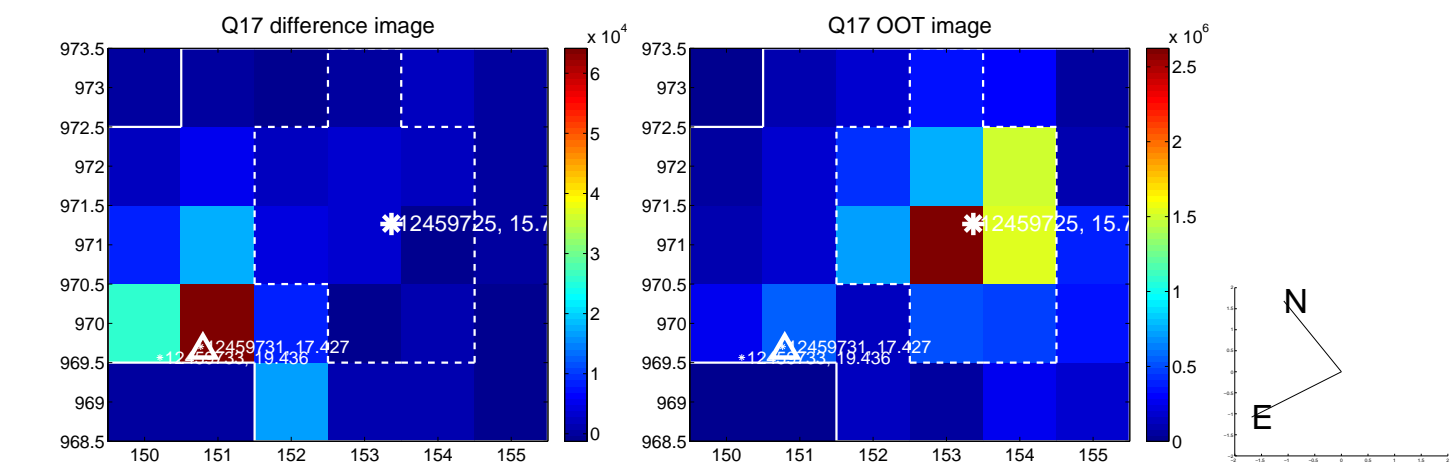
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



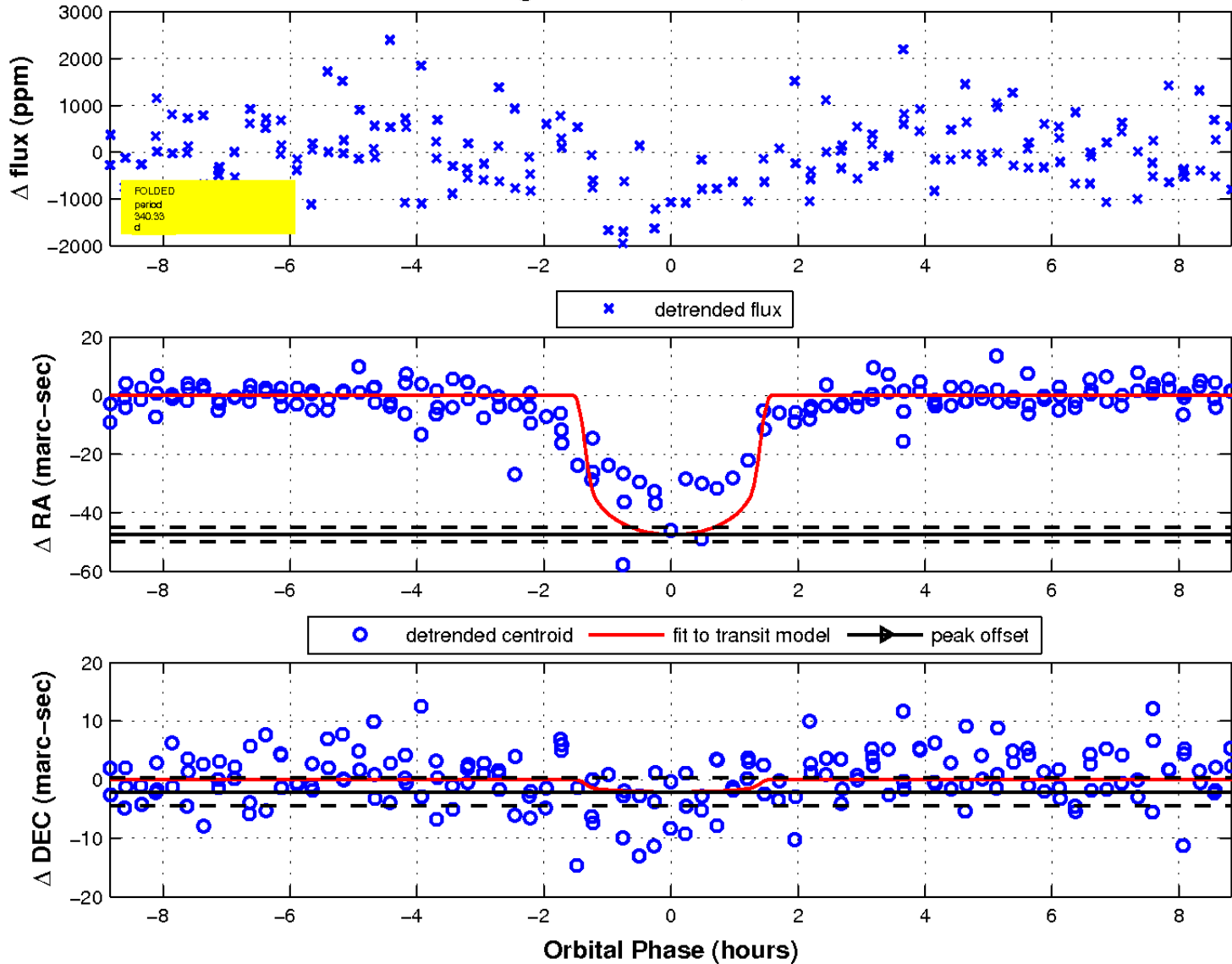
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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

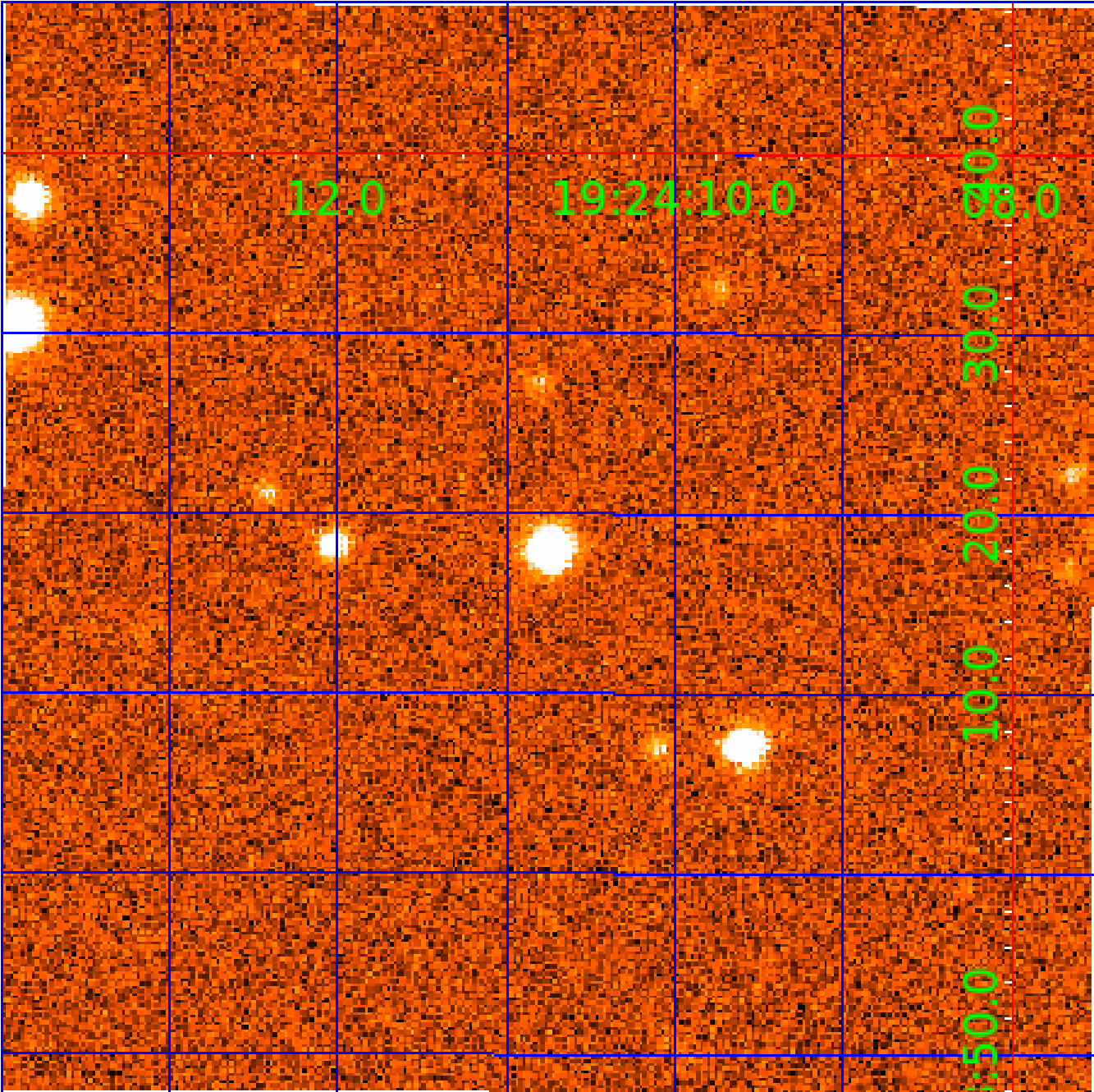


fluxWeightedCentroids, Planet 1 of 3



UKIRT Image

Declination





# KIC 012459725

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012459725-01	OBS	No	340.331273	228.217097	1256.6	2.989	8.1	9.4	0.88	5799	3.35	0.87
012459725-02	OBS	No	368.675936	214.044871	1587.8	2.321	7.8	8.4	0.88	5799	3.99	0.79

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012459725-01	OBS	FP	0.01	0	0	1	0	PERIOD_ALIAS_DV—PERIOD_ALIAS_ALT—CENT_RESOLVED_OFFSET
012459725-02	OBS	FP	0.00	1	0	1	0	ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST

**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 012459725-02

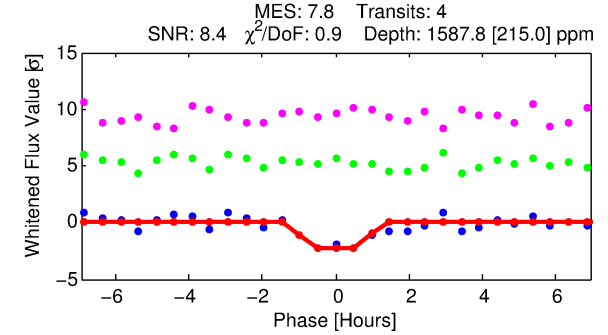
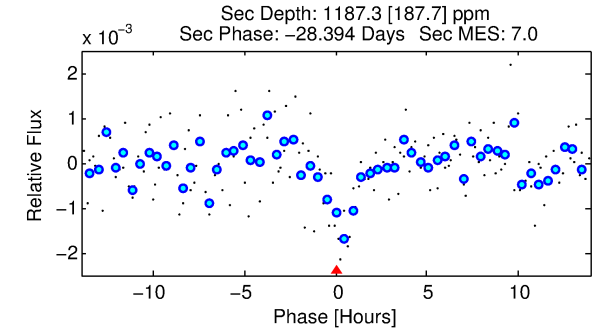
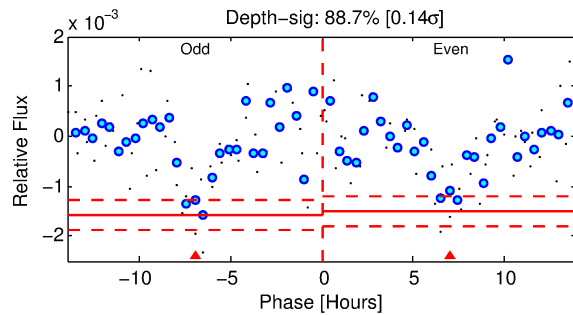
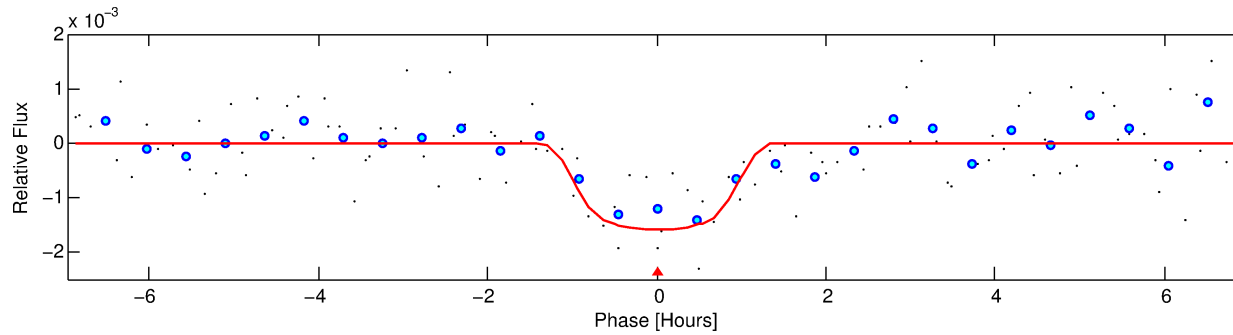
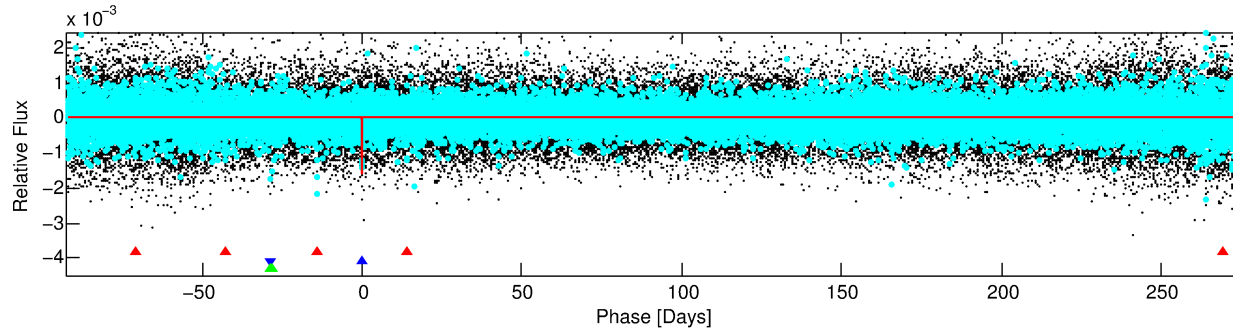
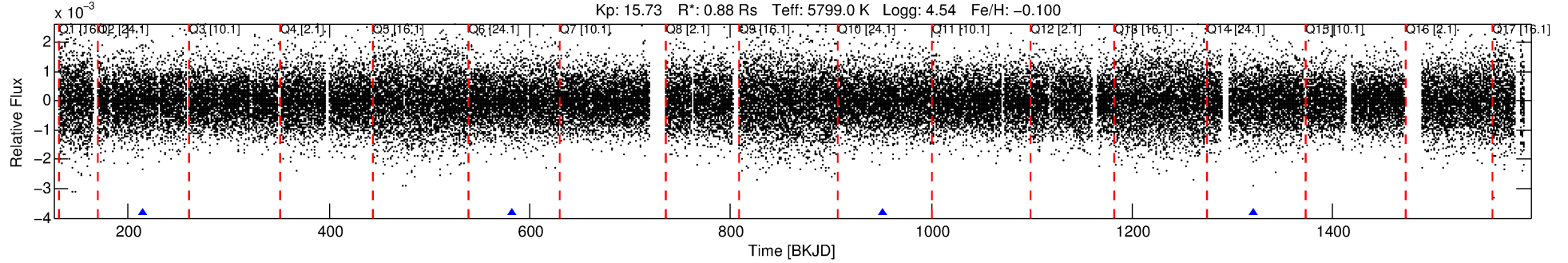
No Significant Match Found

# DV One-Page Summary

KIC: 12459725 Candidate: 2 of 3 Period: 368.676 d

KOI: K00789 Corr: No Ephemeris Match

Kp: 15.73 R\*: 0.88 Rs Teff: 5799.0 K Logg: 4.54 Fe/H: -0.100



## DV Fit Results:

Period = 368.67594 [0.00303] d  
Epoch = 214.0449 [0.0062] BKJD  
Rp/R\* = 0.0417 [0.0247]  
a/R\* = 734.92 [1961.74]  
b = 0.85 [0.90]  
Seff = 0.79 [0.29]  
Teq = 240 [22] K  
Rp = 3.99 [2.62] Re  
a = 0.9972 [0.2355] AU  
Ag = 40711.65 [50666.06] [0.80σ]  
Teff = 5272 [1585] K [3.17σ]

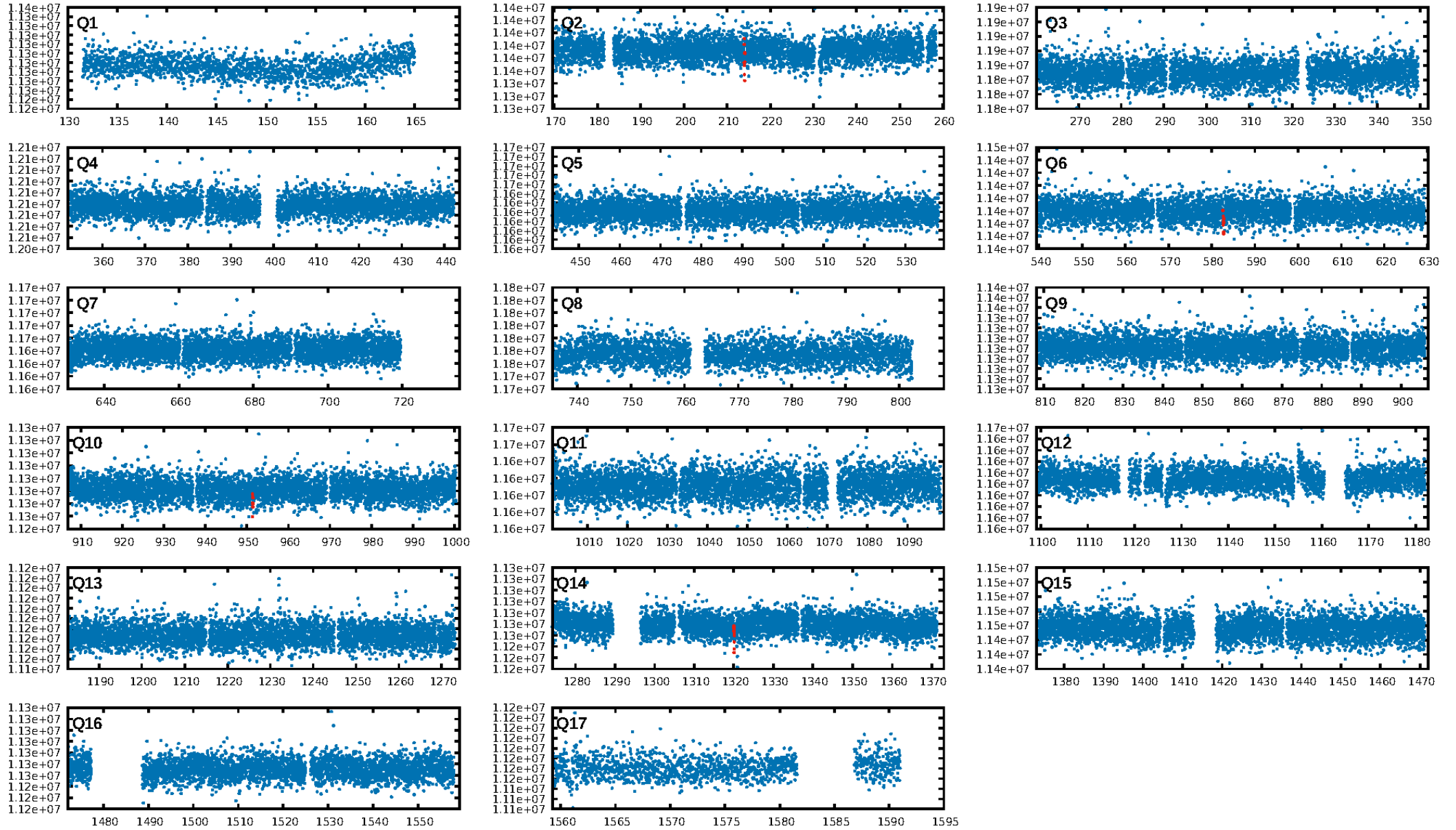
## DV Diagnostic Results:

ShortPeriod-sig: 1.1% [0.01σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 80.5%  
ModelChiSquareGof-sig: 99.4%  
Bootstrap-pfa: 8.89e-15  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.2009  
Centroid-sig: 0.0%  
Centroid-so: 23.096 arcsec [11.66σ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0/0 [0]  
KicOffset-st: 0/0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 1.00 [4/4]

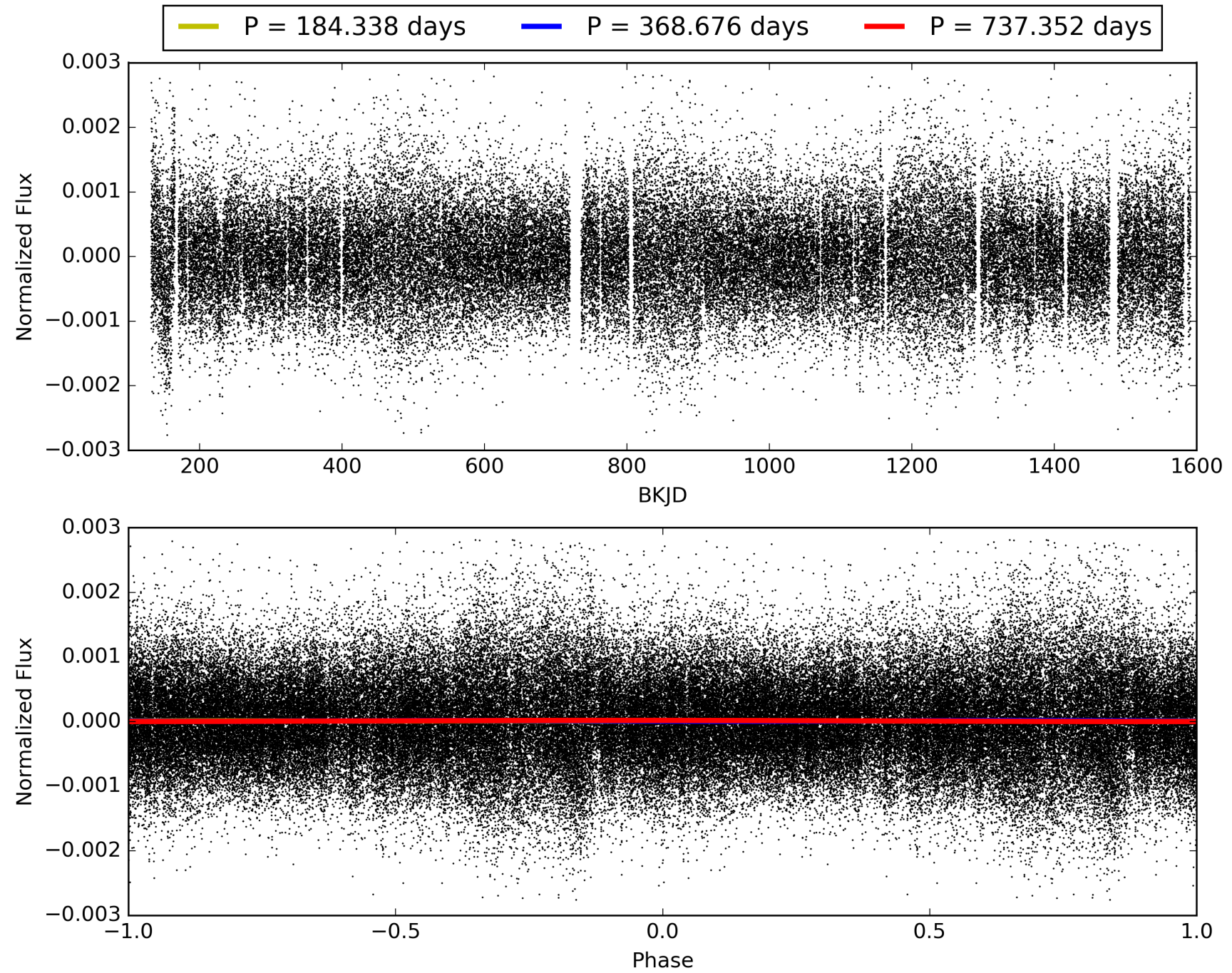
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 04:14:02 Z

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

# TCE 012459725-02, PDC Light Curves

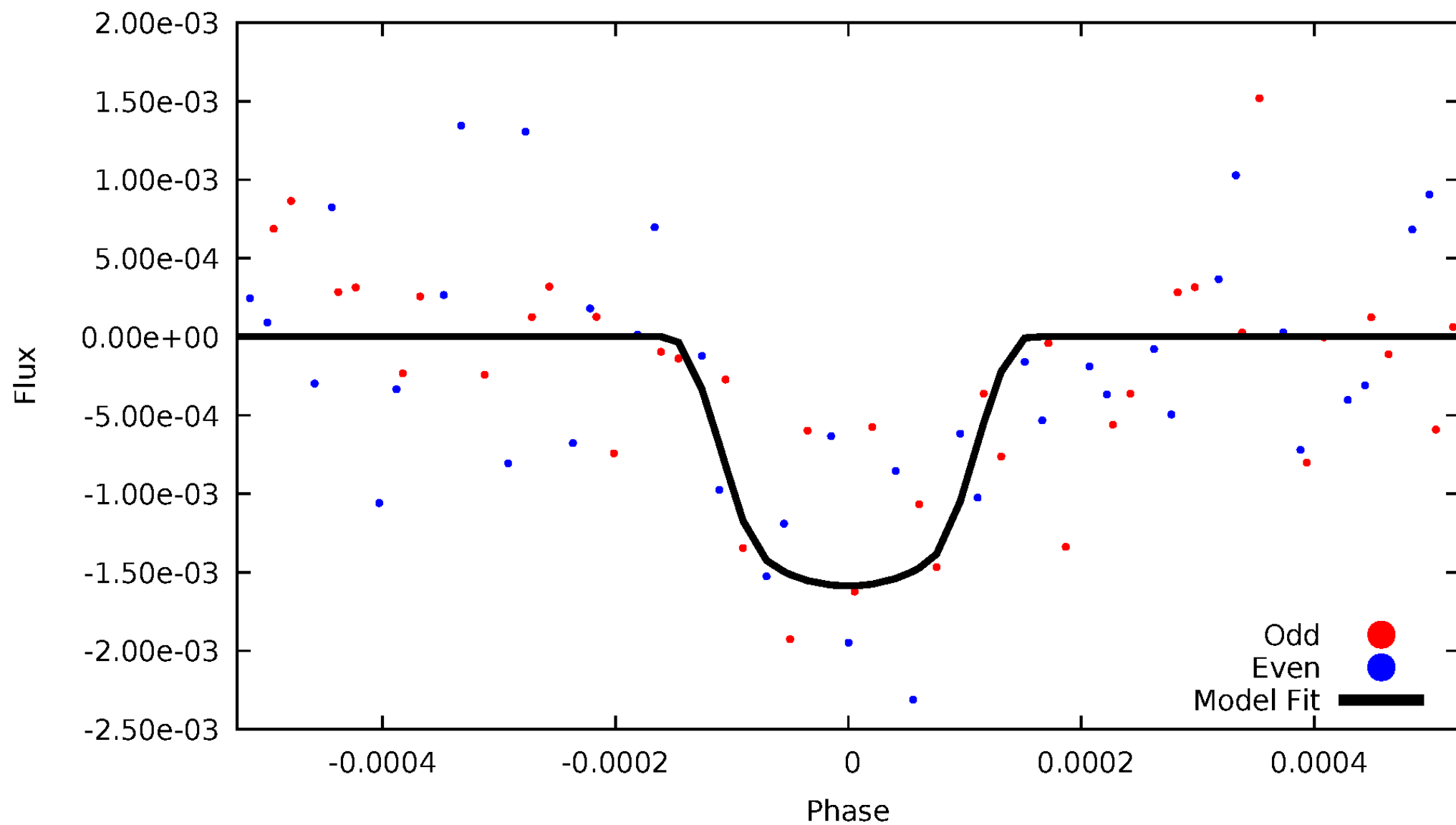


TCE 012459725-02



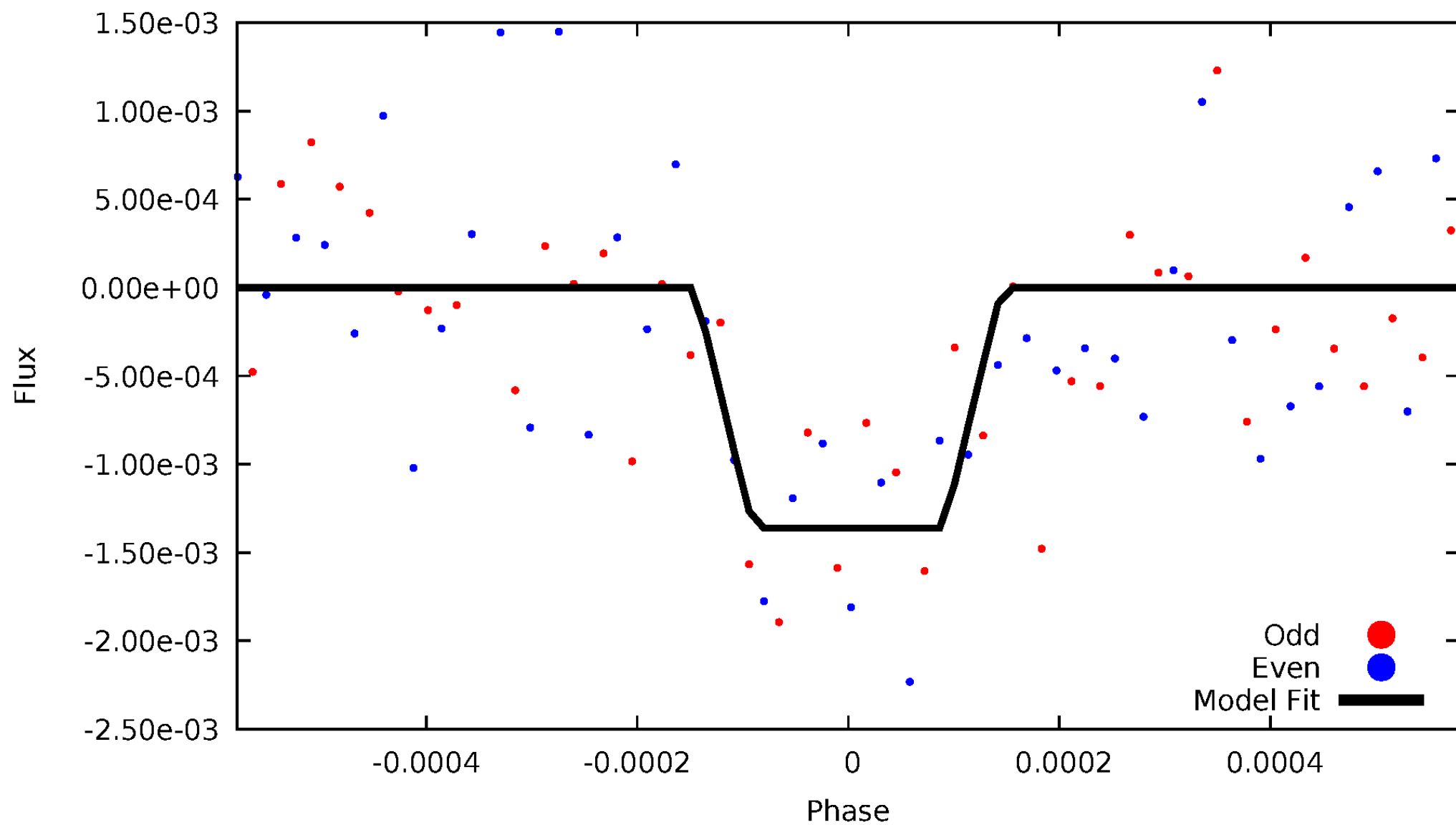
# DV Odd/Even

TCE 012459725-02



# ALT Odd/Even

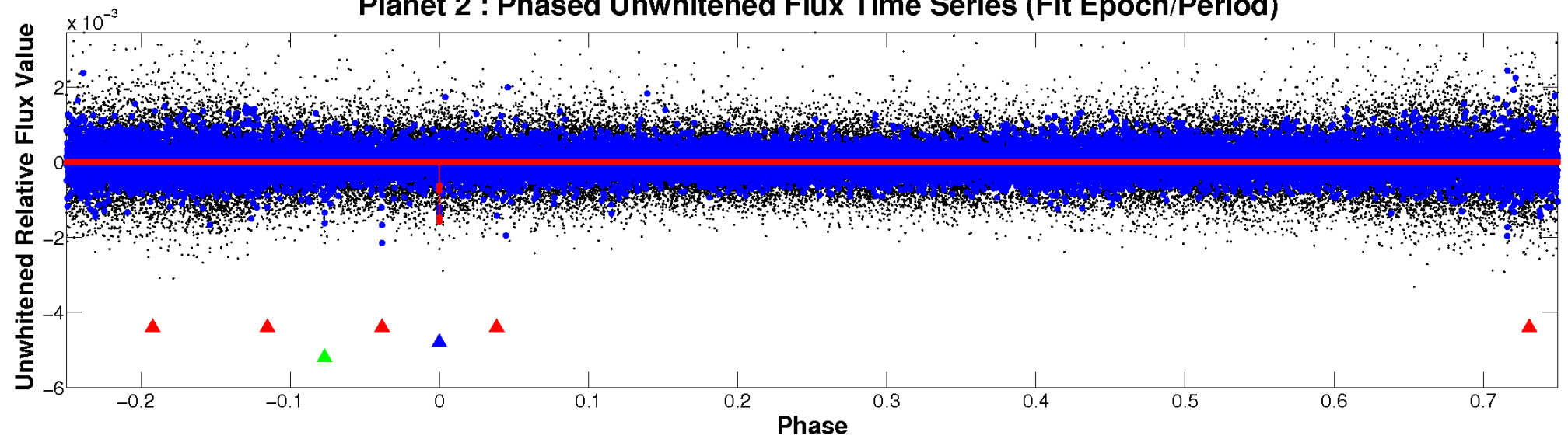
TCE 012459725-02



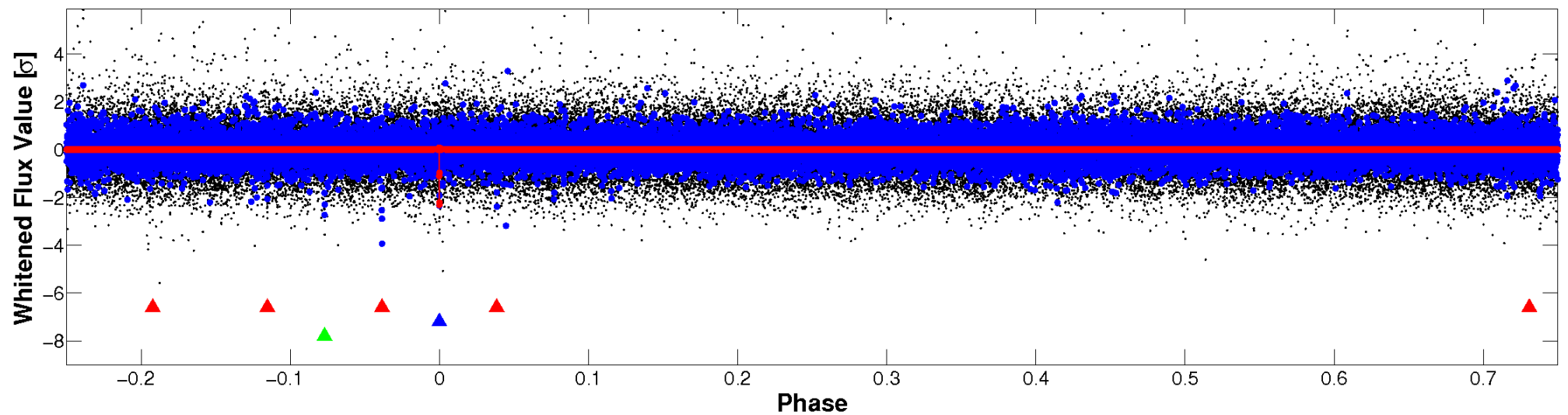


# Non-Whitened Vs. Whitened Light Curve

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

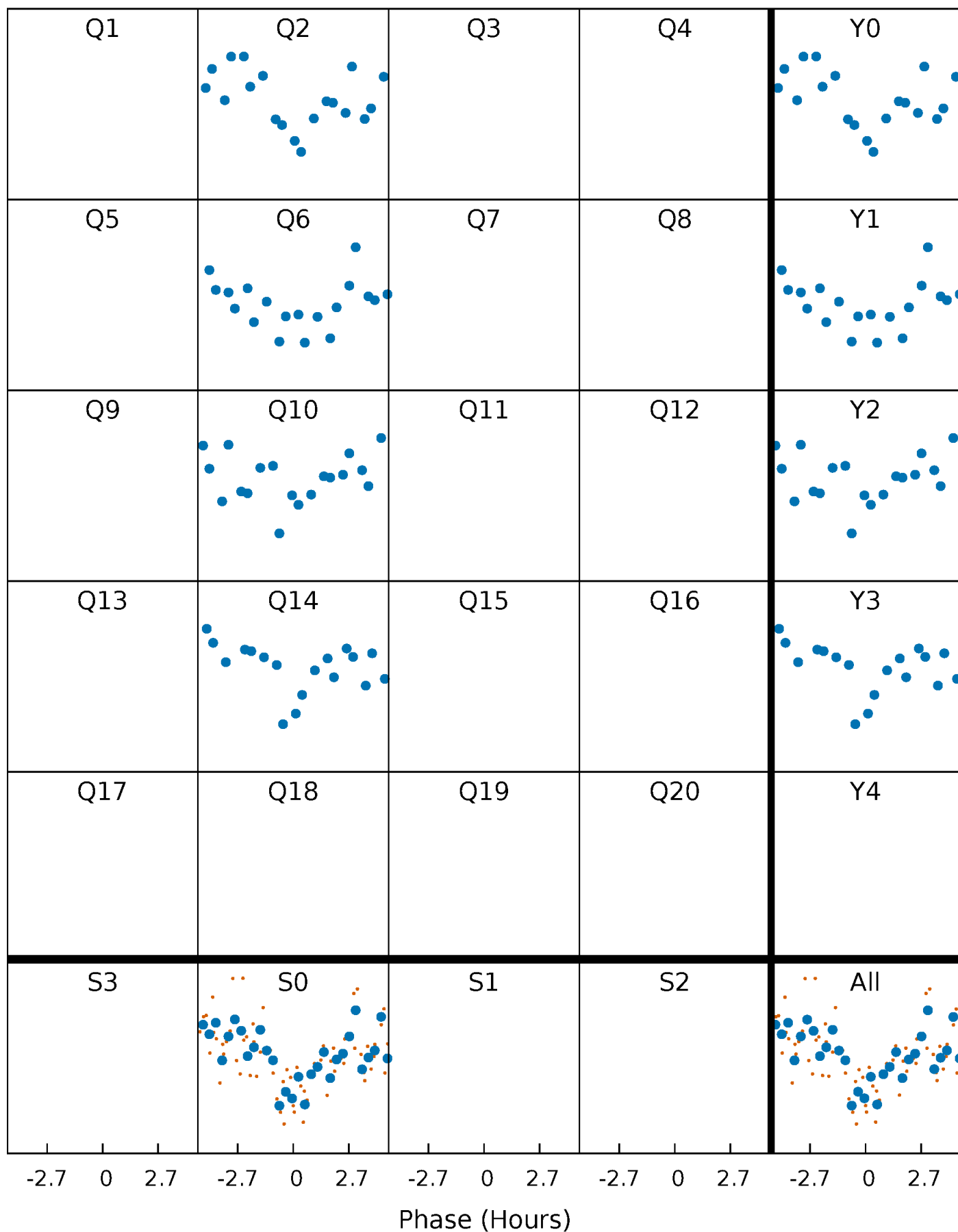


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



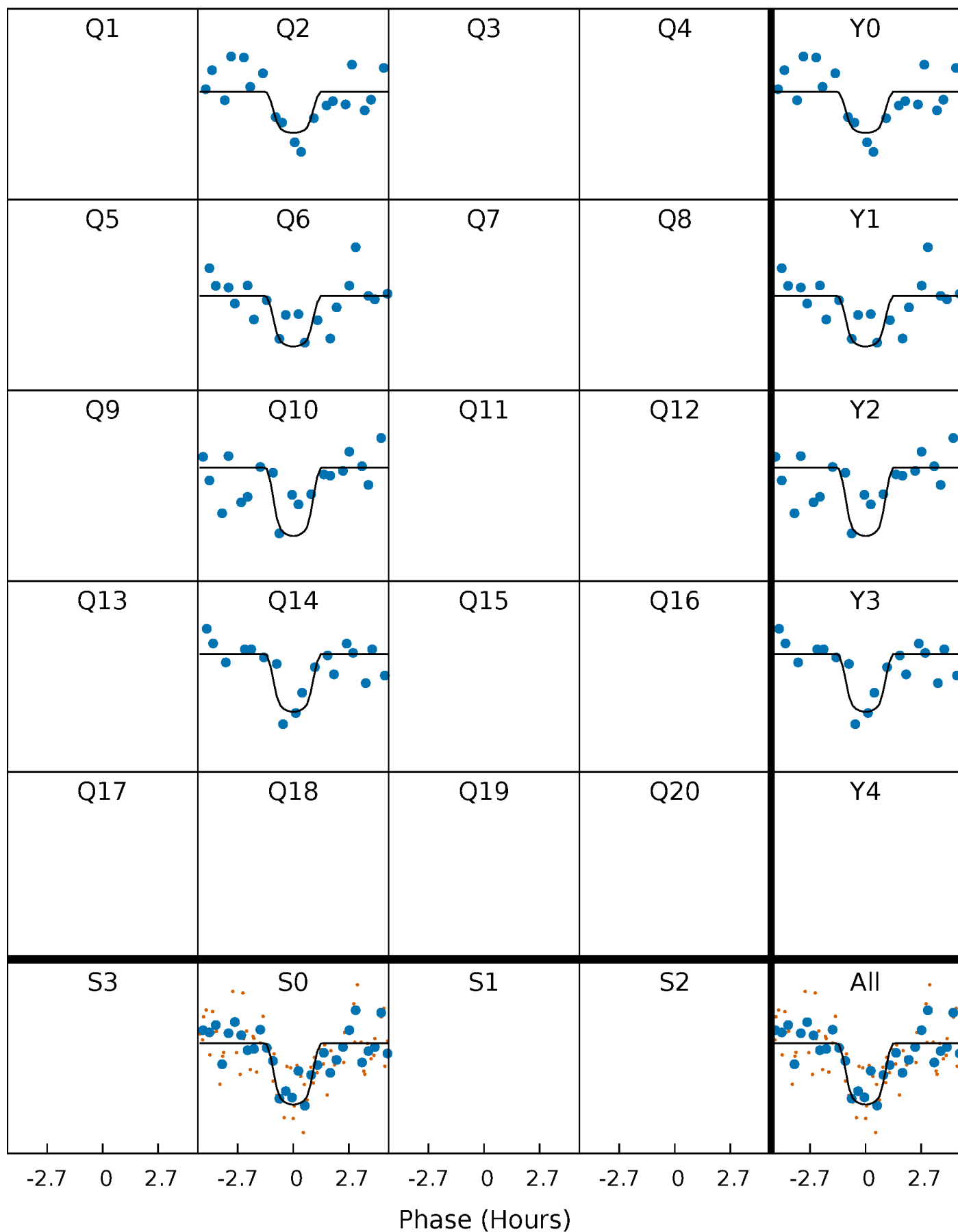
# PDC Quarter-Phased Transit Curves

TCE 012459725-02     $P=368.675936$  Days     $T_0=214.044871$  (BKJD)



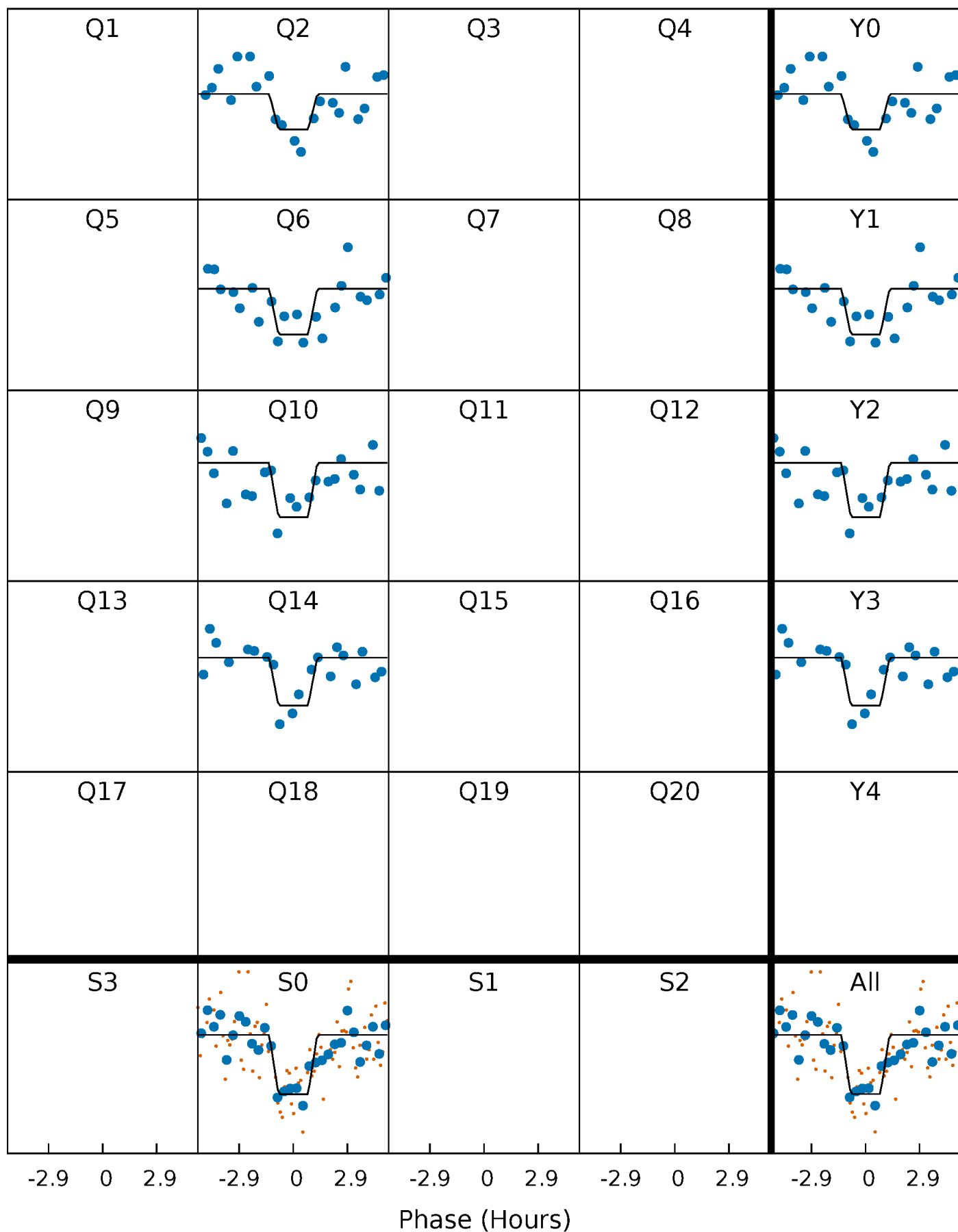
# DV Quarter-Phased Transit Curves

TCE 012459725-02 P=368.675936 Days  $T_0=214.044871$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

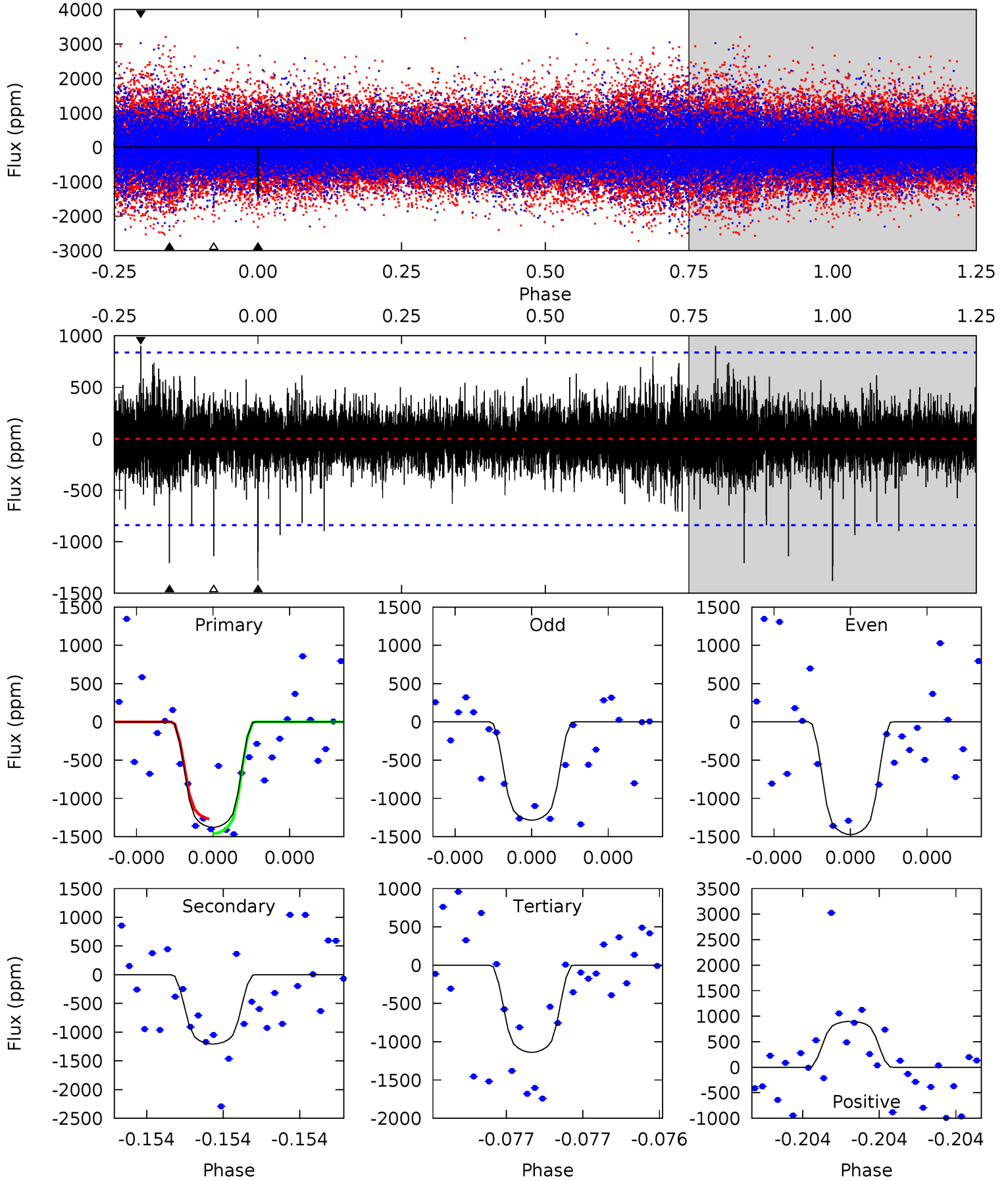
TCE 012459725-02 P=368.678188 Days  $T_0=214.043920$  (BKJD)



# DV Model-Shift Uniqueness Test

012459725-02, P = 368.675936 Days, E = 214.044871 Days

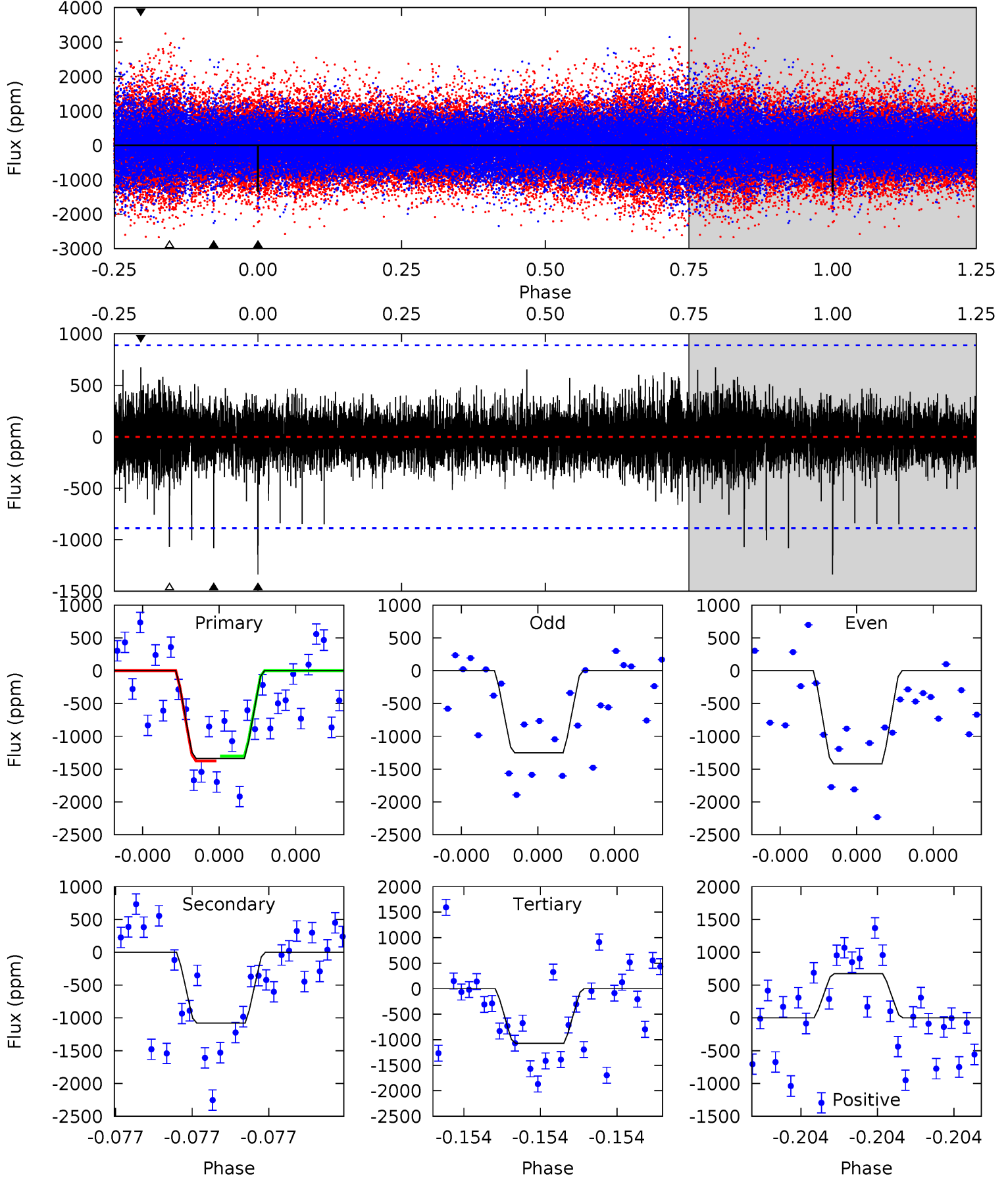
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.32	8.16	7.70	6.09	5.67	3.62	1.19	1.62	3.23	0.46	2.07	0.67	1.07	0.40	0.62



# Alt Model-Shift Uniqueness Test

012459725-02, P = 368.678188 Days, E = 214.043920 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
8.56	6.91	6.83	4.31	5.68	3.65	1.05	1.72	4.25	0.08	2.60	0.54	1.07	0.33	0.24





### Stellar Parameters For KIC 012459725

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5799^{+157}_{-175}$	$4.539^{+0.033}_{-0.187}$	$-0.100^{+0.300}_{-0.300}$	$0.878^{+0.247}_{-0.077}$	$0.975^{+0.105}_{-0.116}$	$2.026^{+0.376}_{-1.000}$
	+3%/-3%	+1%/-4%	+300%/-300%	+28%/-9%	+11%/-12%	+19%/-49%
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 012459725-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1207 \pm 148$	$4.28^{+2.56}_{-2.13}$	$343^{+23}_{-14}$	$5293^{+2124}_{-913}$	$34973^{+104152}_{-20961}$
Alt.	$-1080 \pm 156$	$3.87^{+2.61}_{-2.22}$	$343^{+22}_{-15}$	$5352^{+3163}_{-984}$	$38716^{+164759}_{-24355}$

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

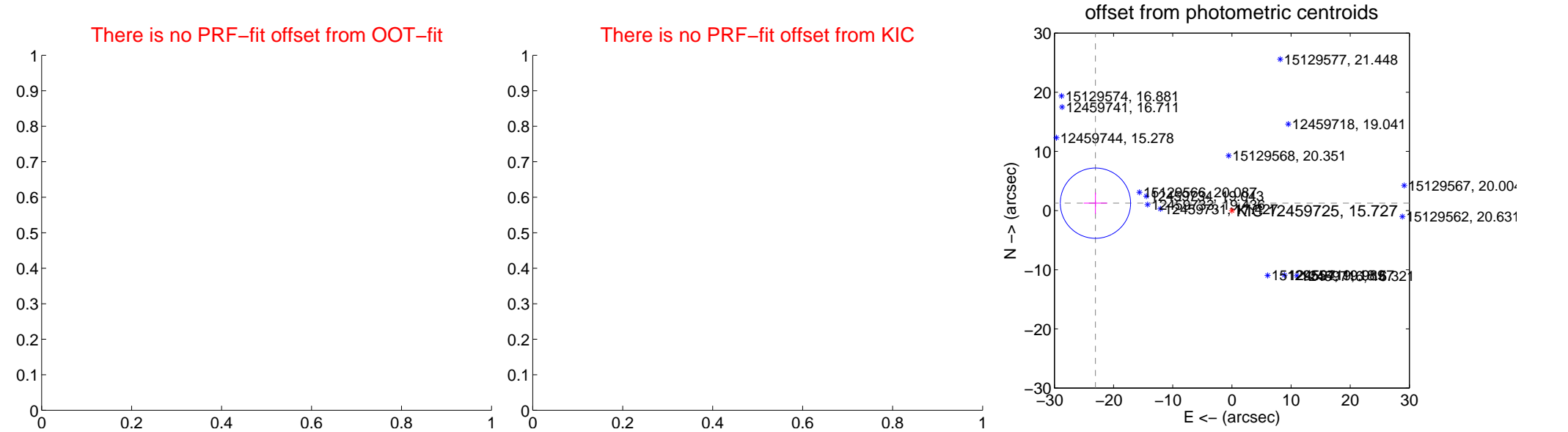
## DV Centroid Data

Supplemental centroid analysis for 012459725-02. Kepler magnitude: 15.73. Transit SNR 8.37

There are 0 quarters with good PRF difference image offsets

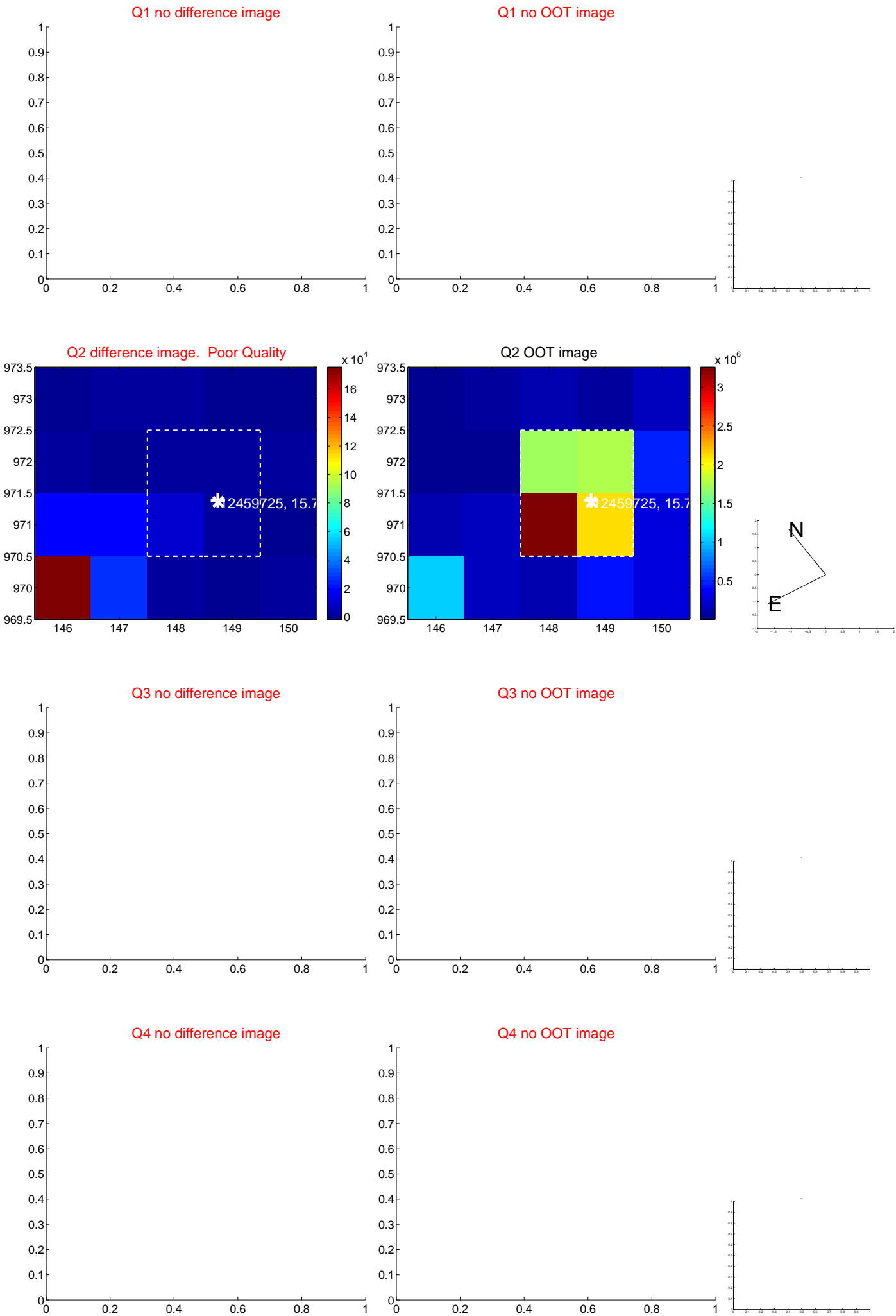
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$23.10 \pm 1.98$	11.66	$23.06 \pm 1.98$	$1.25 \pm 1.80$

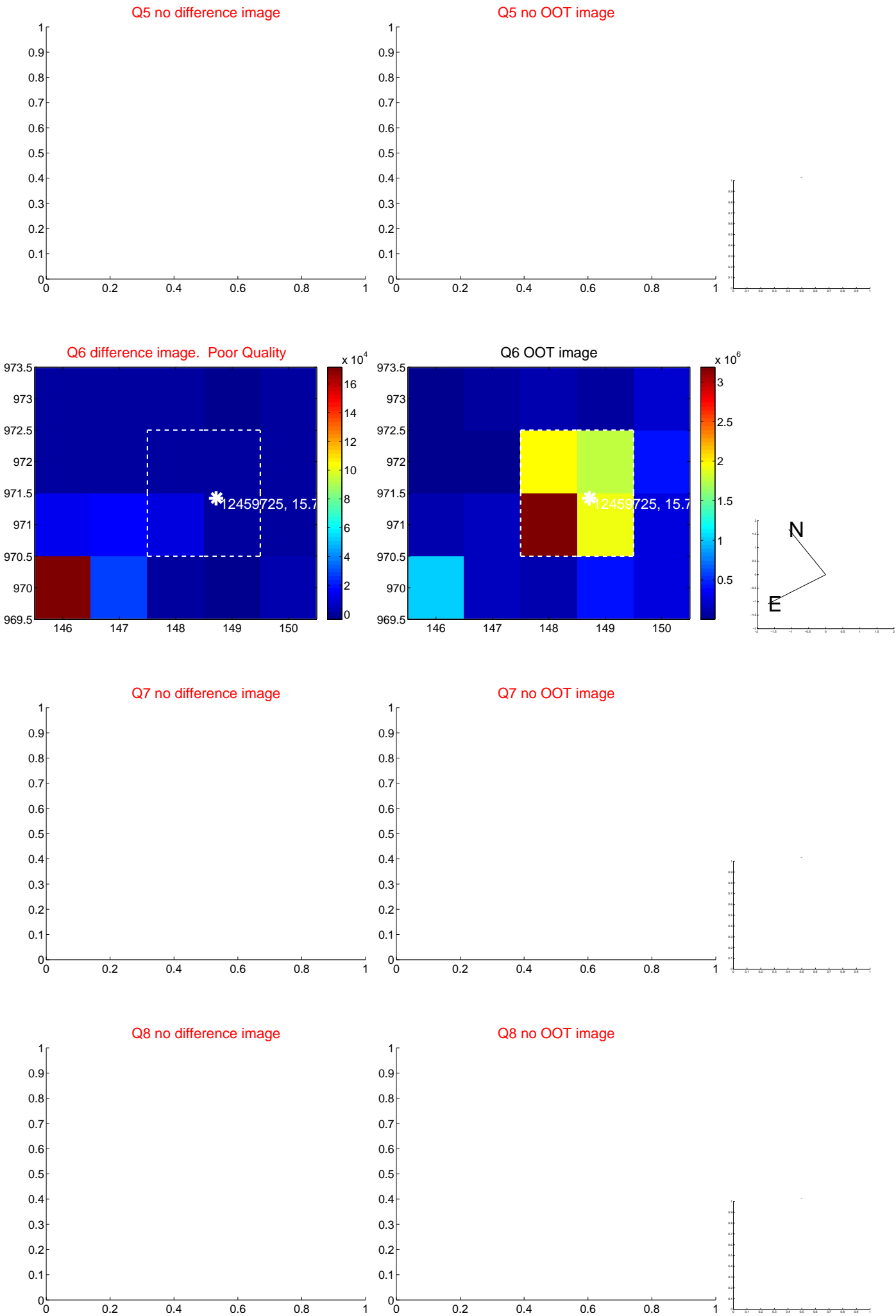


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

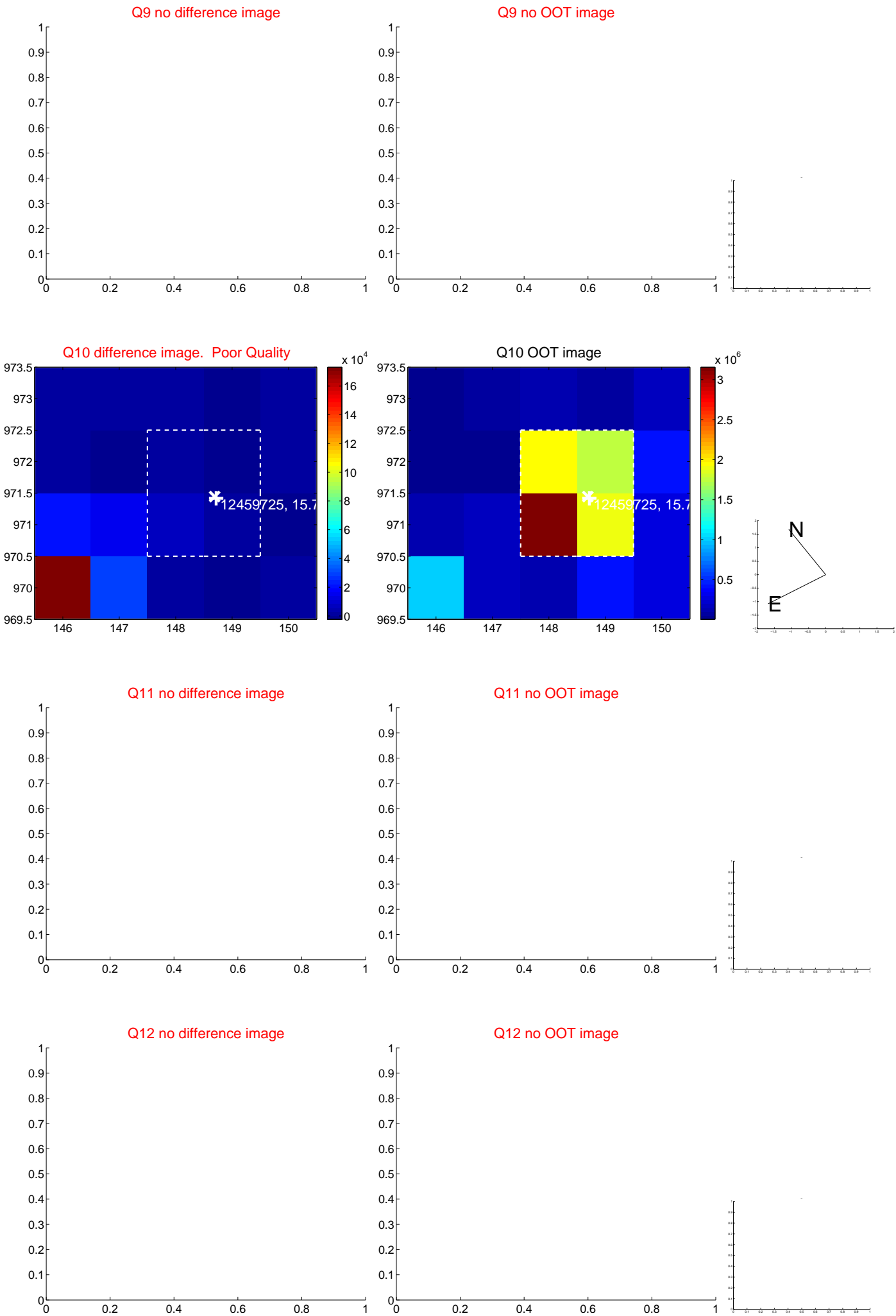
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



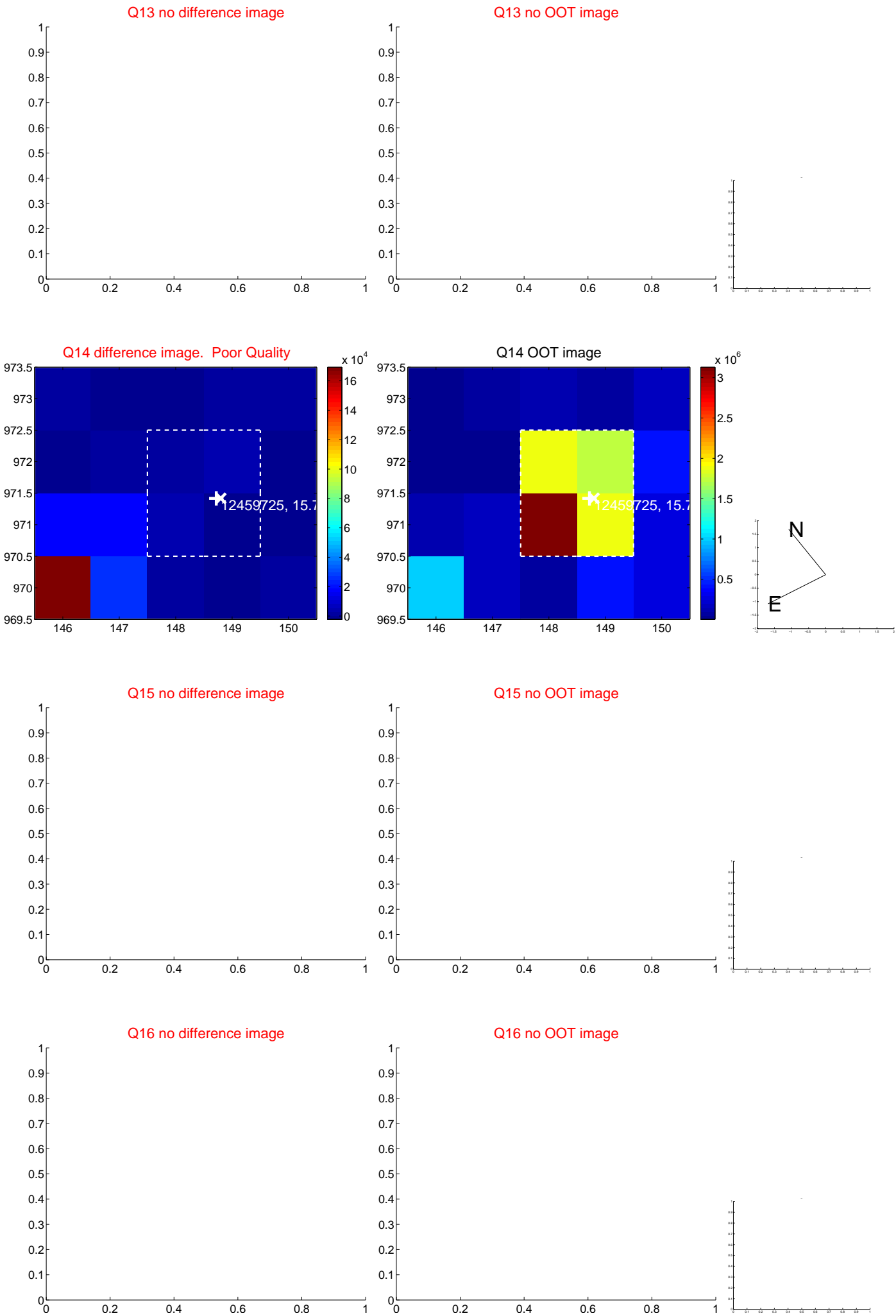
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



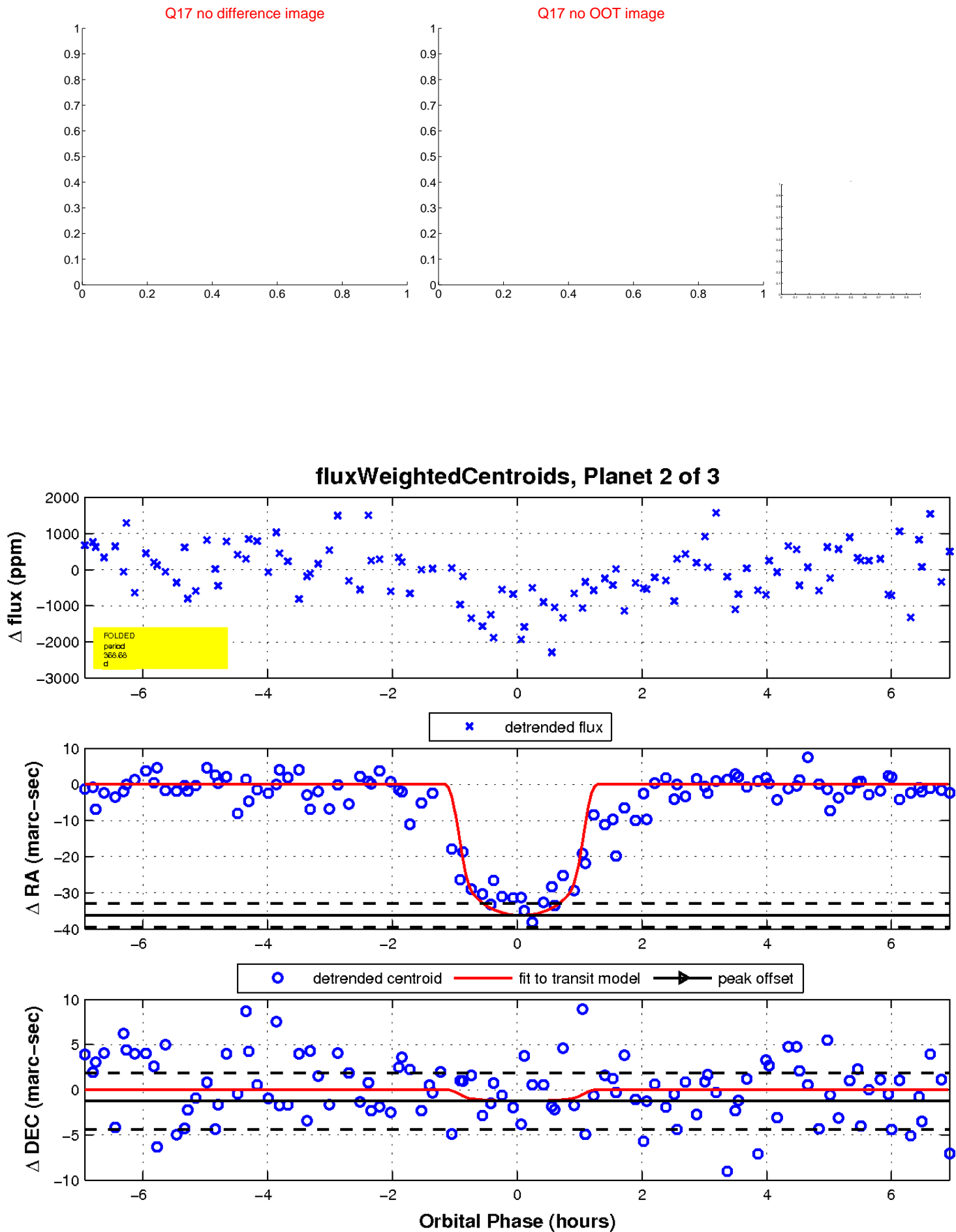
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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

