

# KIC 012645761

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012645761-01	OBS	5976.01	2.709584	134.081635	12886.1	5.510	504.5	570.5	5.21	5030	108.40	8211.27
012645761-02	OBS	No	232.039800	281.442887	1369.1	5.924	8.7	8.0	5.21	5030	23.93	21.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012645761-01	OBS	FP	0.00	0	1	0	0	MOD_ODDEVEN_DV—MOD_ODDEVEN_ALT—DEEP_V_SHAPED
012645761-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—MOD_NONUNIQ_DV—INCONSISTENT_TRANS

**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.

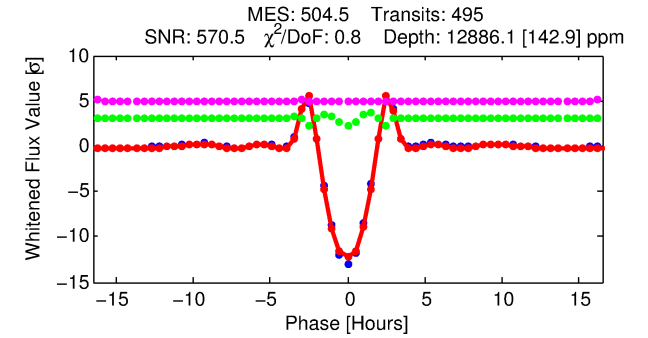
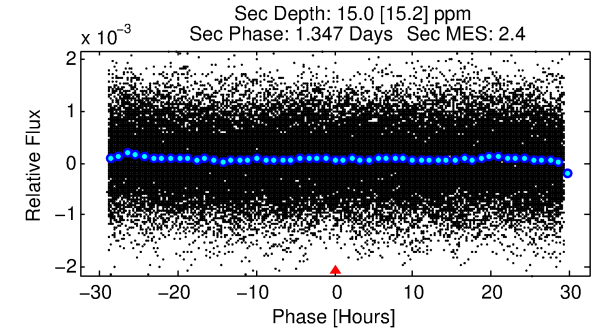
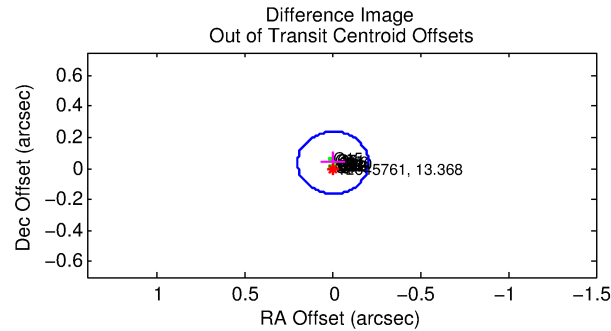
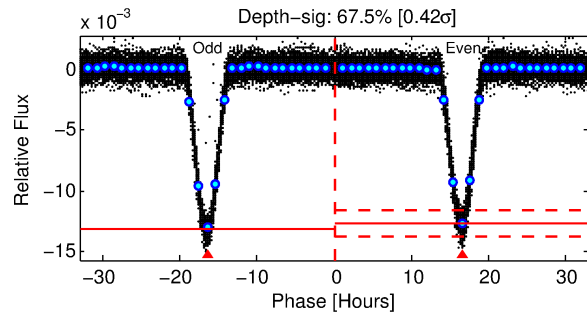
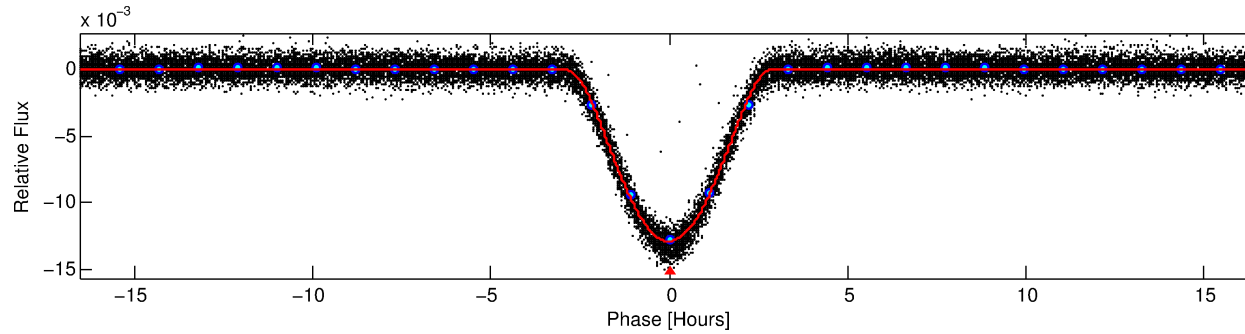
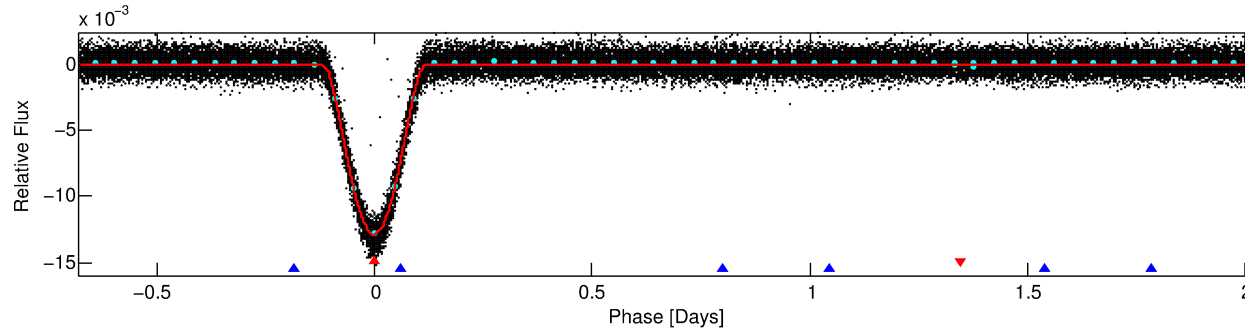
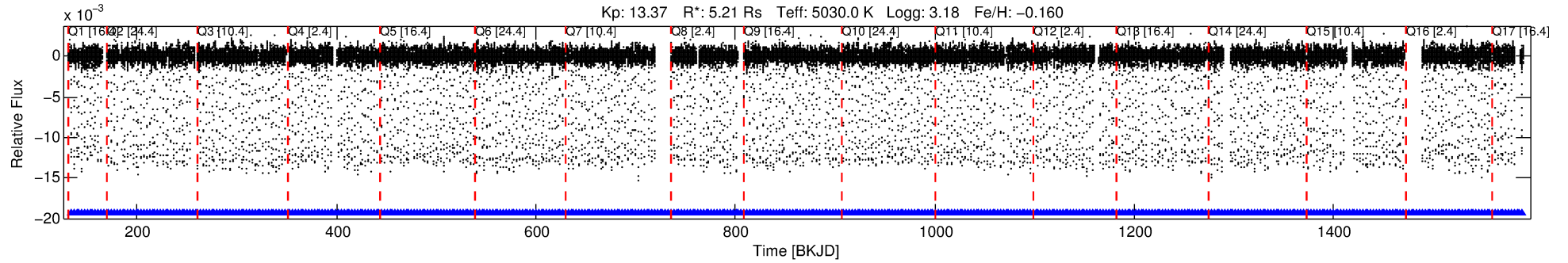
## Ephemeris Match Information For 012645761-01

No Significant Match Found

# DV One-Page Summary

KIC: 12645761 Candidate: 1 of 2 Period: 2.710 d

KOI: K05976.01 Corr: 0.991



## DV Fit Results:

Period = 2.70958 [0.00000] d  
Epoch = 134.0816 [0.0001] BKJD  
Rp/R\* = 0.1907 [0.0049]  
a/R\* = 2.65 [0.00]  
b = 1.00 [0.01]  
Seff = 8211.27 [5457.53]  
Teq = 2427 [403] K  
Rp = 108.40 [50.24] Re  
a = 0.0435 [0.0184] AU  
Ag = 0.00 [0.00] [-620.55σ]  
Teffp = 716 [183] K [-3.86σ]

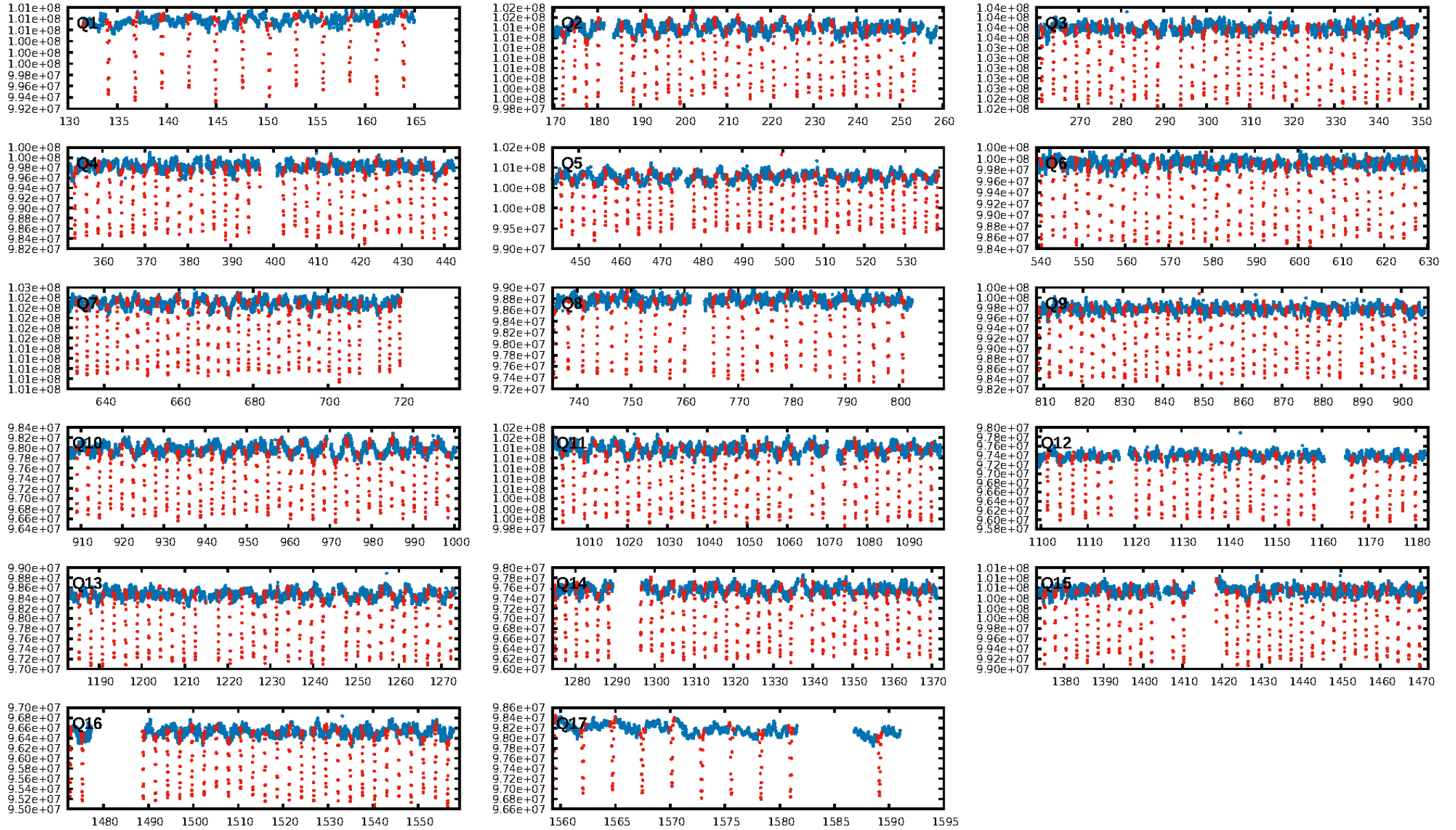
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [680.35σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [473/473]  
GhostDiagnostic-chr: 1.344  
Centroid-sig: 0.0%  
Centroid-so: 0.643 arcsec [170.47σ]  
OotOffset-rm: 0.038 arcsec [0.56σ]  
KicOffset-rm: 0.072 arcsec [1.06σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

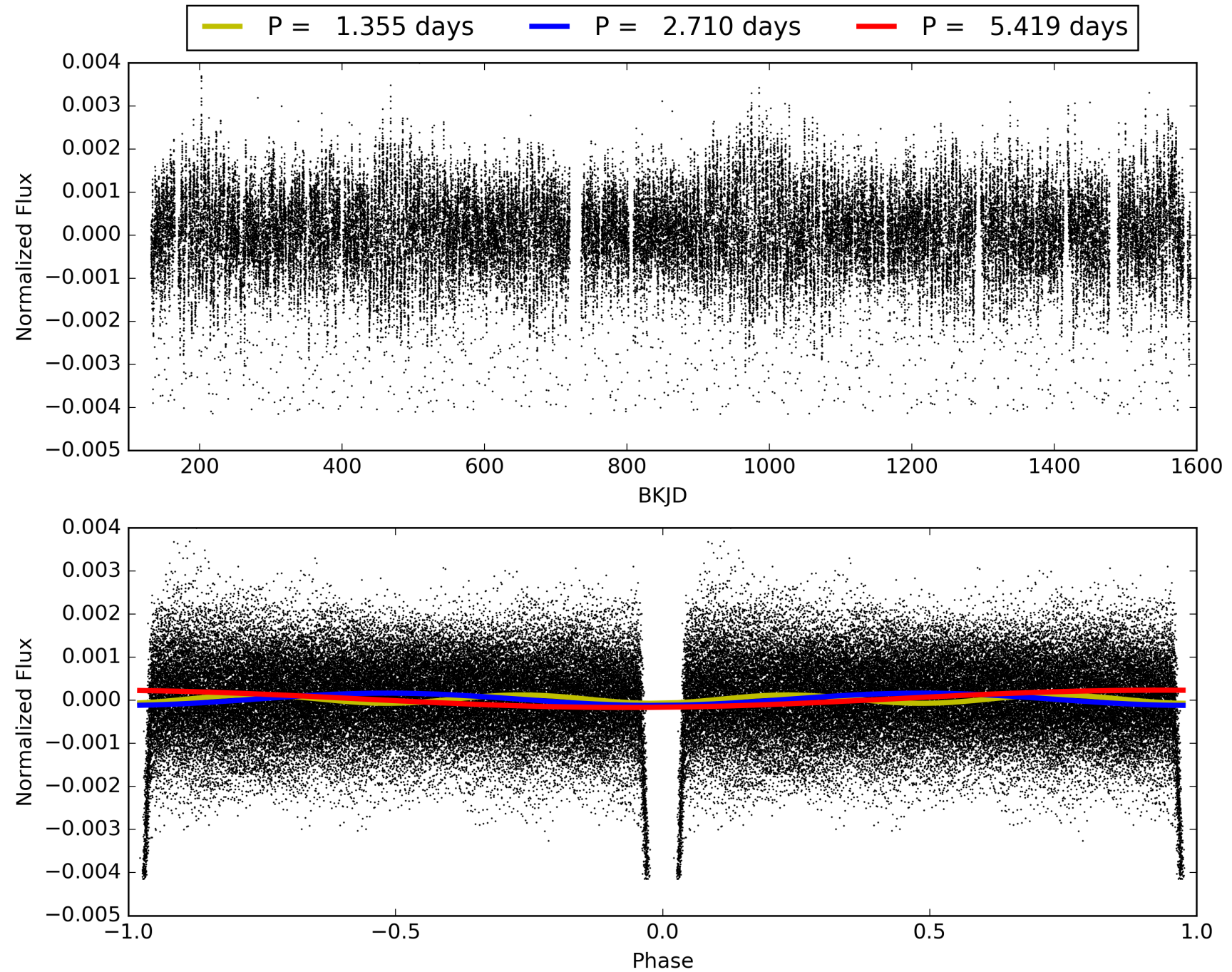
Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 07:28:42 Z

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

# TCE 012645761-01, PDC Light Curves

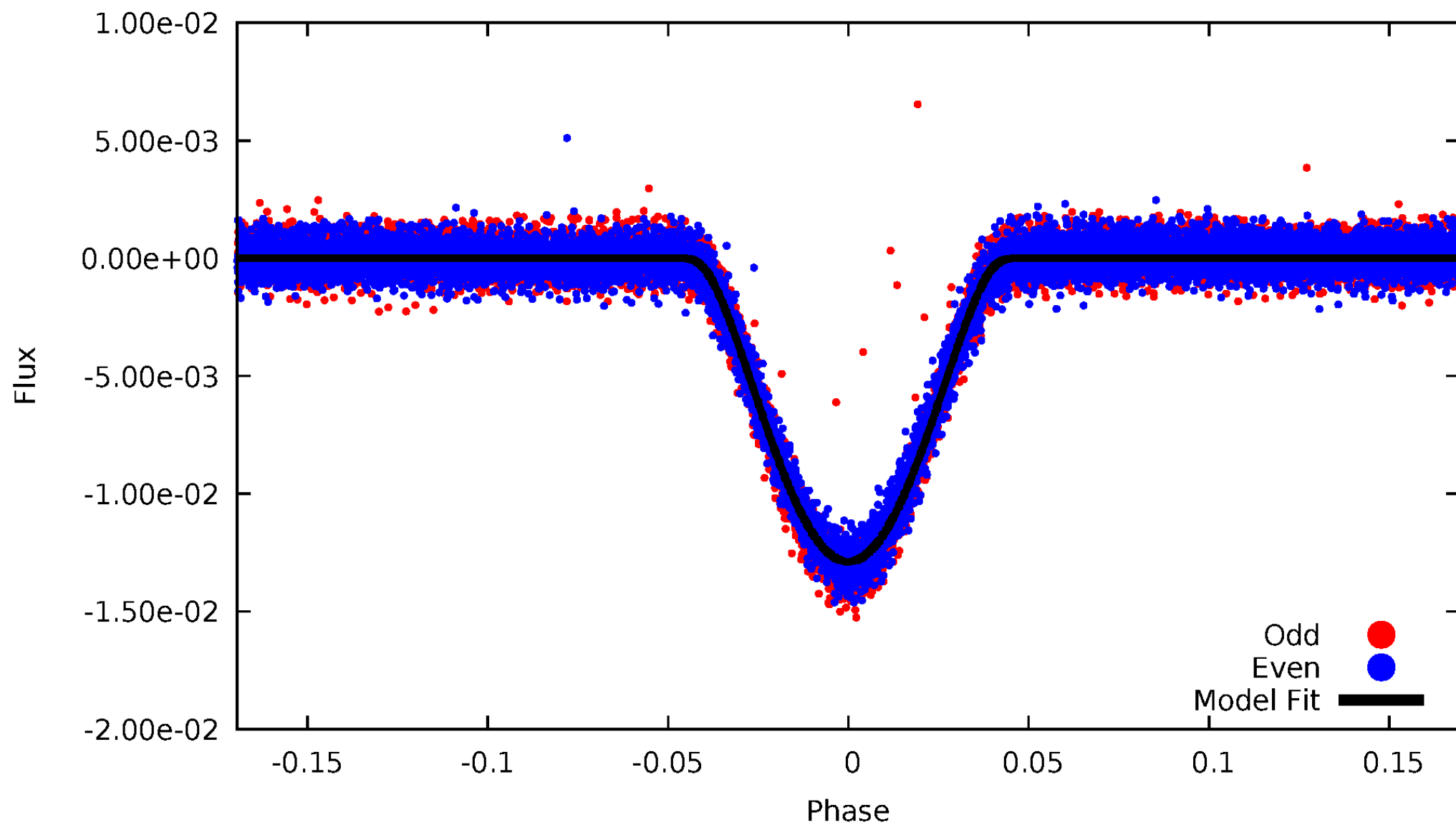


# TCE 012645761-01



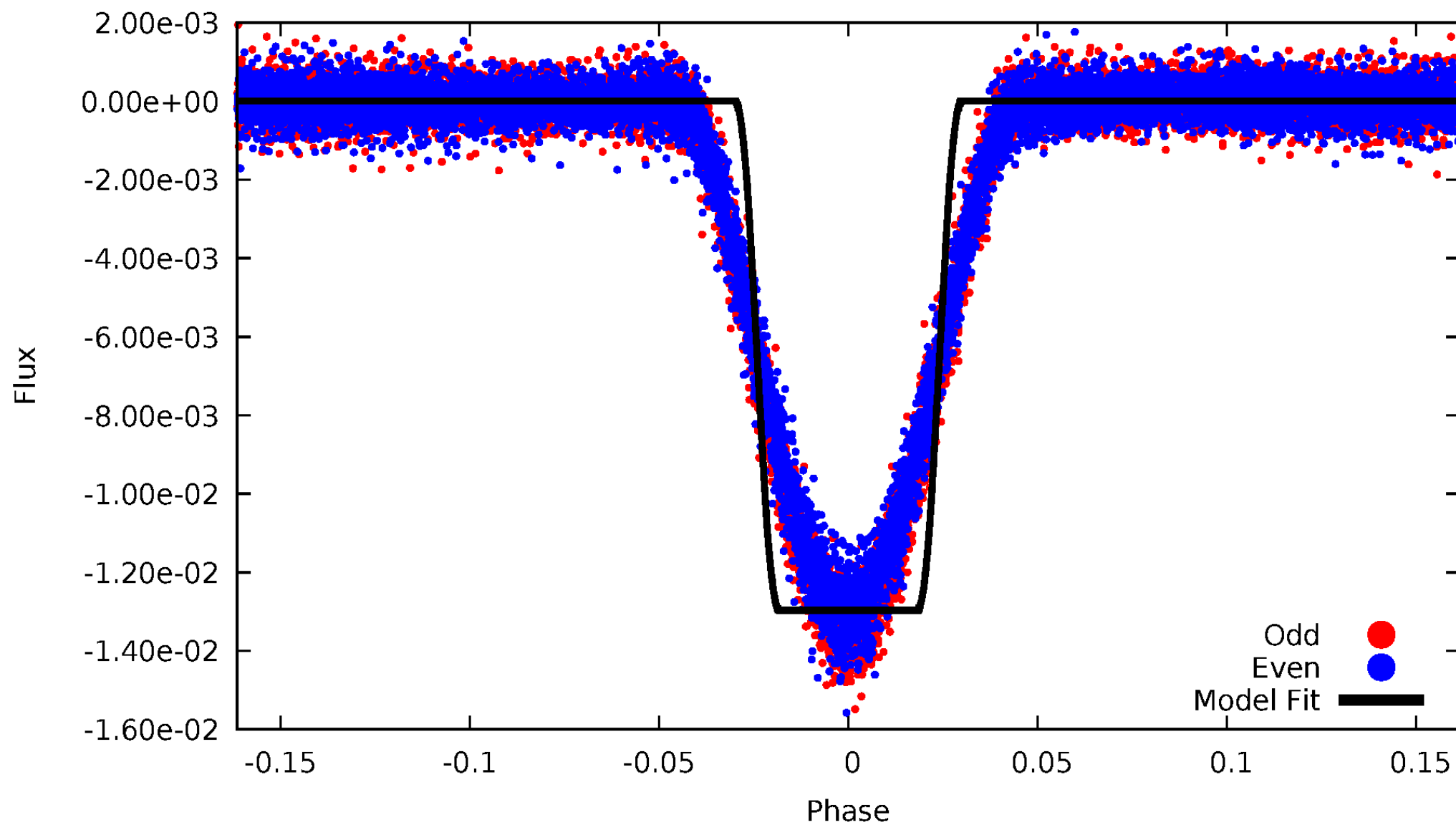
# DV Odd/Even

TCE 012645761-01



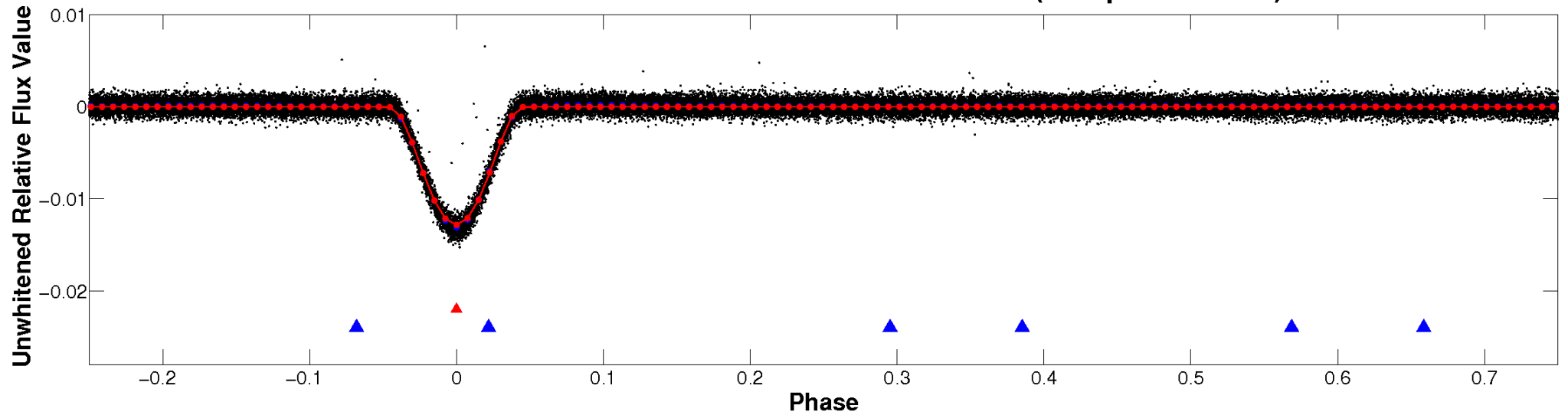
# ALT Odd/Even

TCE 012645761-01

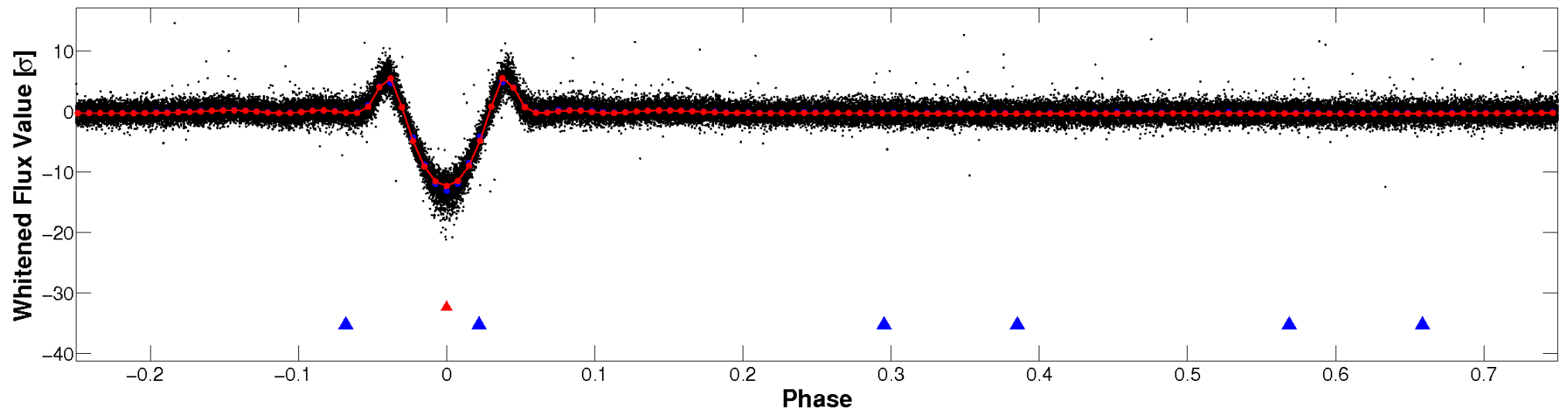


# Non-Whitened Vs. Whitened Light Curve

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



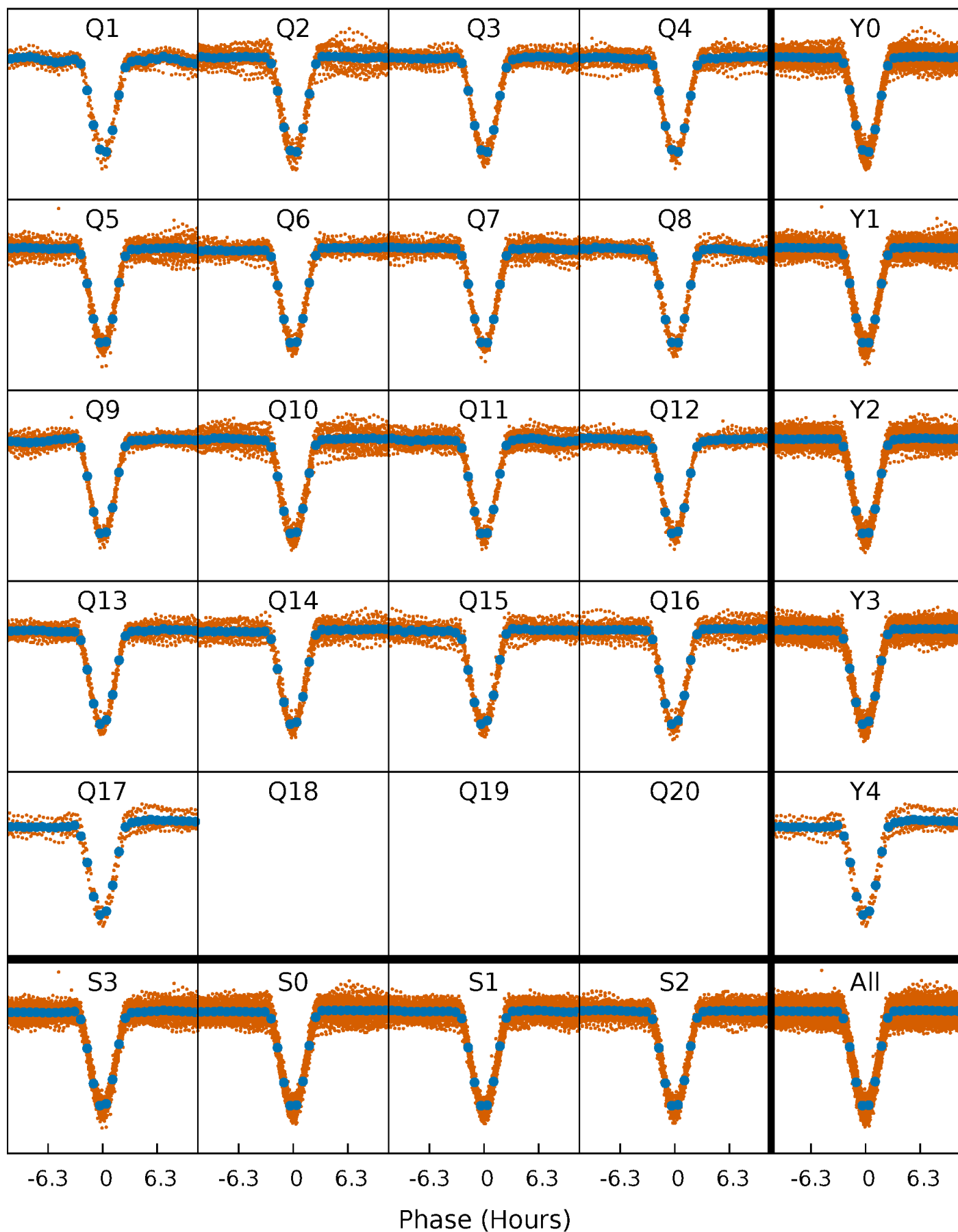
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

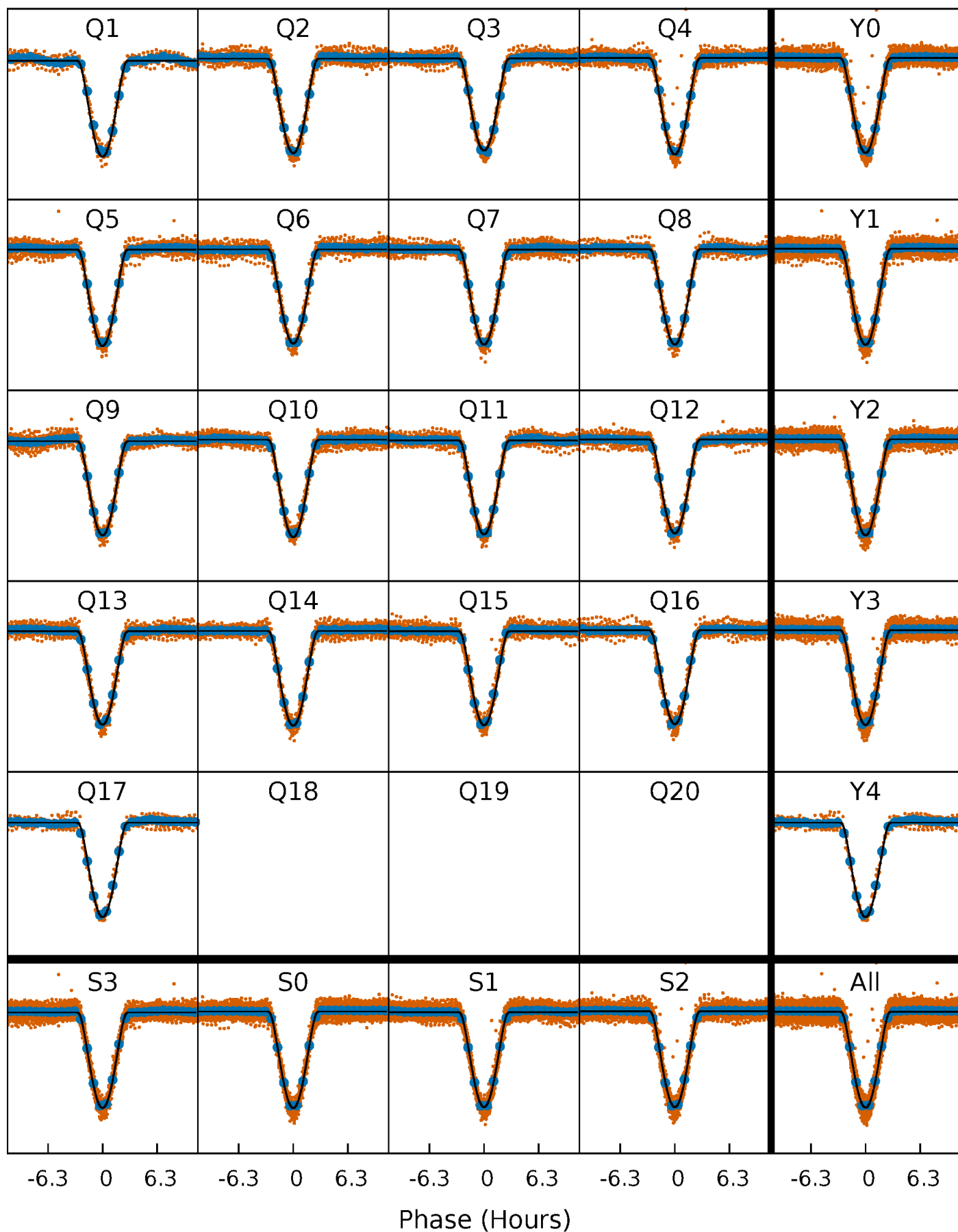
TCE 012645761-01 P= 2.709584 Days  $T_0=134.081635$  (BKJD)





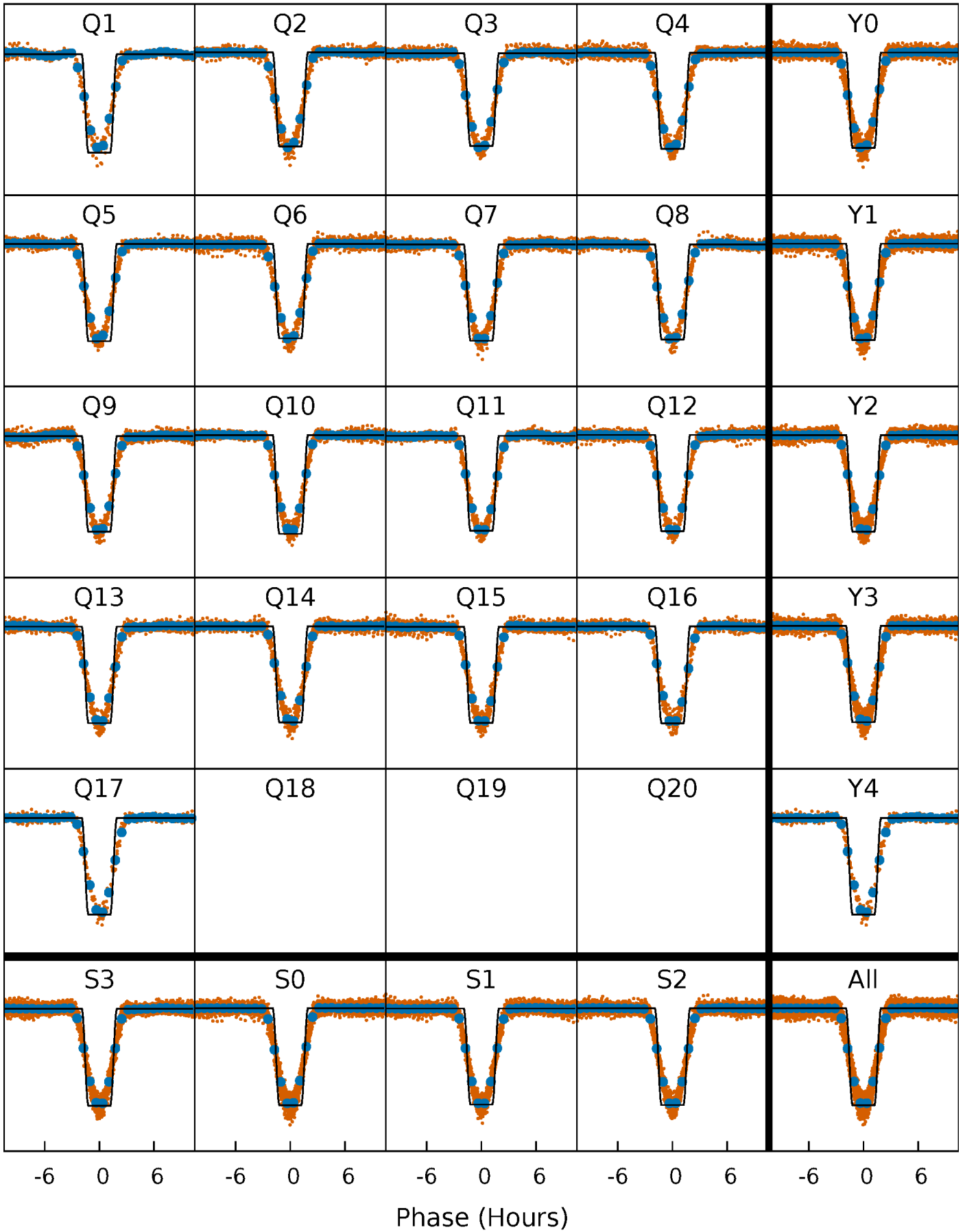
# DV Quarter-Phased Transit Curves

TCE 012645761-01 P= 2.709584 Days  $T_0=134.081635$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

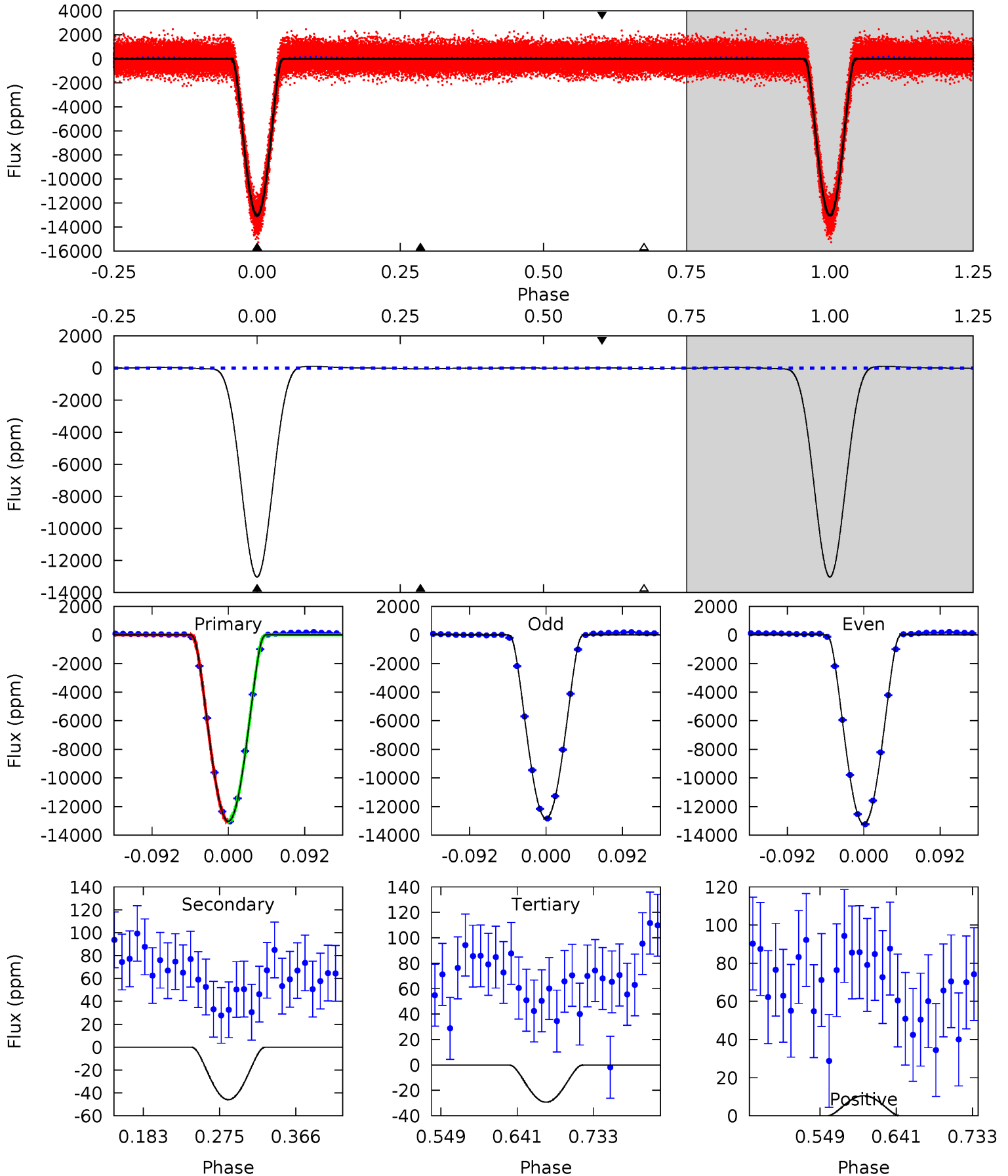
TCE 012645761-01 P= 2.709559 Days  $T_0=134.087936$  (BKJD)



# DV Model-Shift Uniqueness Test

012645761-01, P = 2.709584 Days, E = 131.372051 Days

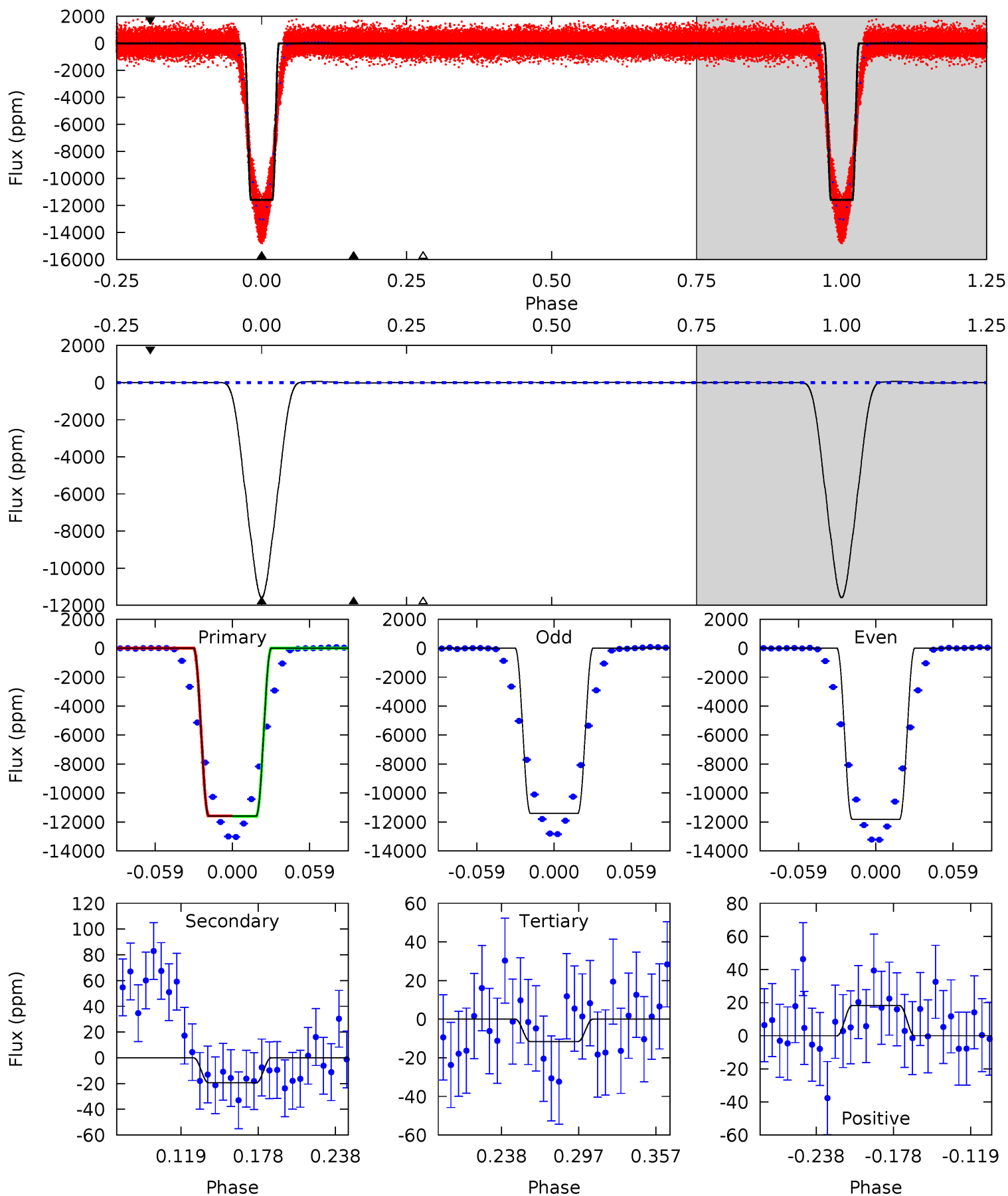
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1708	6.02	3.84	1.38	4.58	1.69	3.89	1705	1707	2.18	4.64	26.0	1.00	0.01	3.68



# Alt Model-Shift Uniqueness Test

012645761-01, P = 2.709559 Days, E = 131.378377 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
1645	2.75	1.65	2.58	4.67	1.88	2.04	1644	1643	1.10	0.17	28.4	1.00	0.01	1.47



### Stellar Parameters For KIC 012645761

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5030^{+113}_{-125}$	$3.180^{+0.378}_{-0.252}$	$-0.160^{+0.250}_{-0.250}$	$5.208^{+1.807}_{-2.410}$	$1.498^{+0.224}_{-0.523}$	$0.015^{+0.046}_{-0.009}$
	+2%/-2%	+12%/-8%	+156%/-156%	+35%/-46%	+15%/-35%	+306%/-63%
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 012645761-01 / KOI 5976.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-46 \pm 8$	$107.31^{+24.32}_{-25.53}$	$3388^{+366}_{-396}$	$-3279^{+229}_{-221}$	$0.004^{+0.003}_{-0.001}$
Alt.	$-19 \pm 7$	$64.20^{+14.71}_{-15.79}$	$3403^{+327}_{-404}$	$-3288^{+242}_{-199}$	$0.005^{+0.004}_{-0.002}$

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

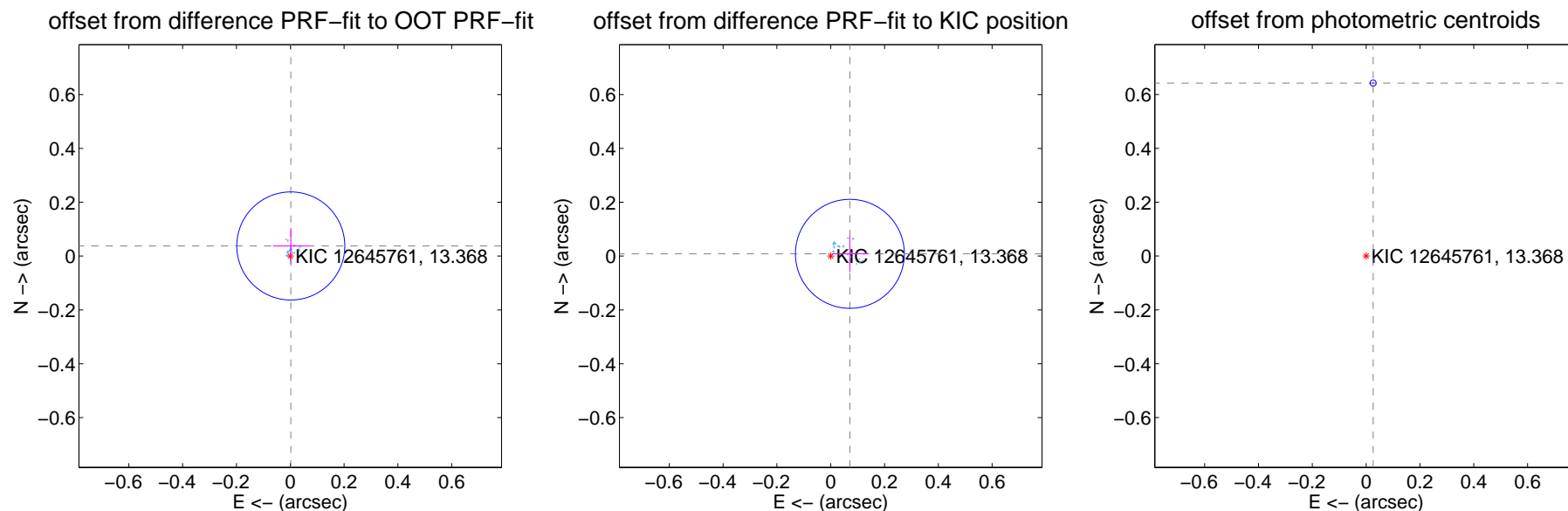
## DV Centroid Data

Supplemental centroid analysis for 012645761-01. Kepler magnitude: 13.37. Transit SNR 570.48

There are 17 quarters with good PRF difference image offsets

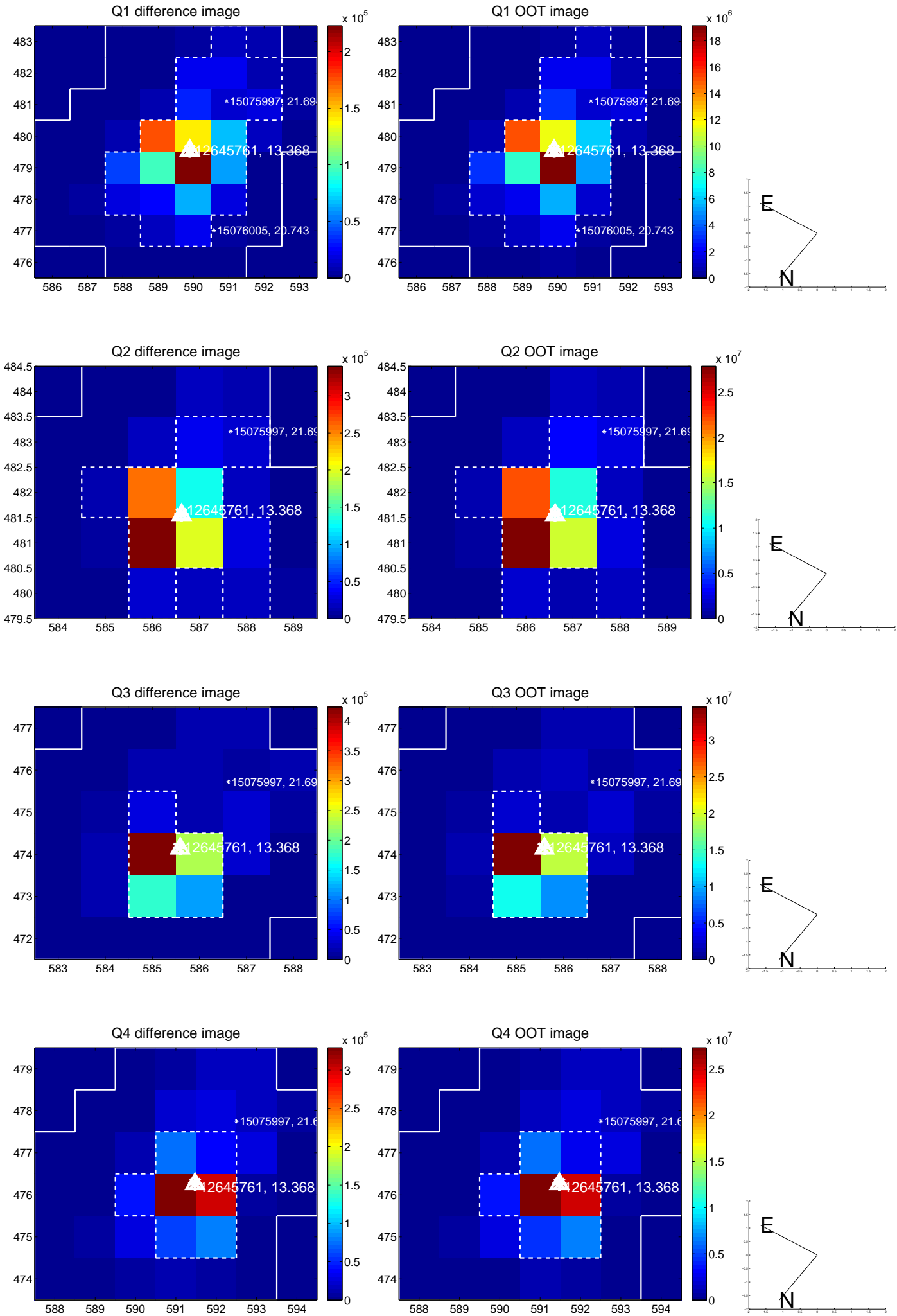
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.038 \pm 0.067$	0.56	$-0.002 \pm 0.067$	$0.038 \pm 0.067$
PRF-fit source offset from KIC position	$0.072 \pm 0.067$	1.06	$-0.071 \pm 0.067$	$0.008 \pm 0.067$
photometric centroid source offset	$0.64 \pm 0.00$	170.47	$-0.03 \pm 0.00$	$0.64 \pm 0.00$



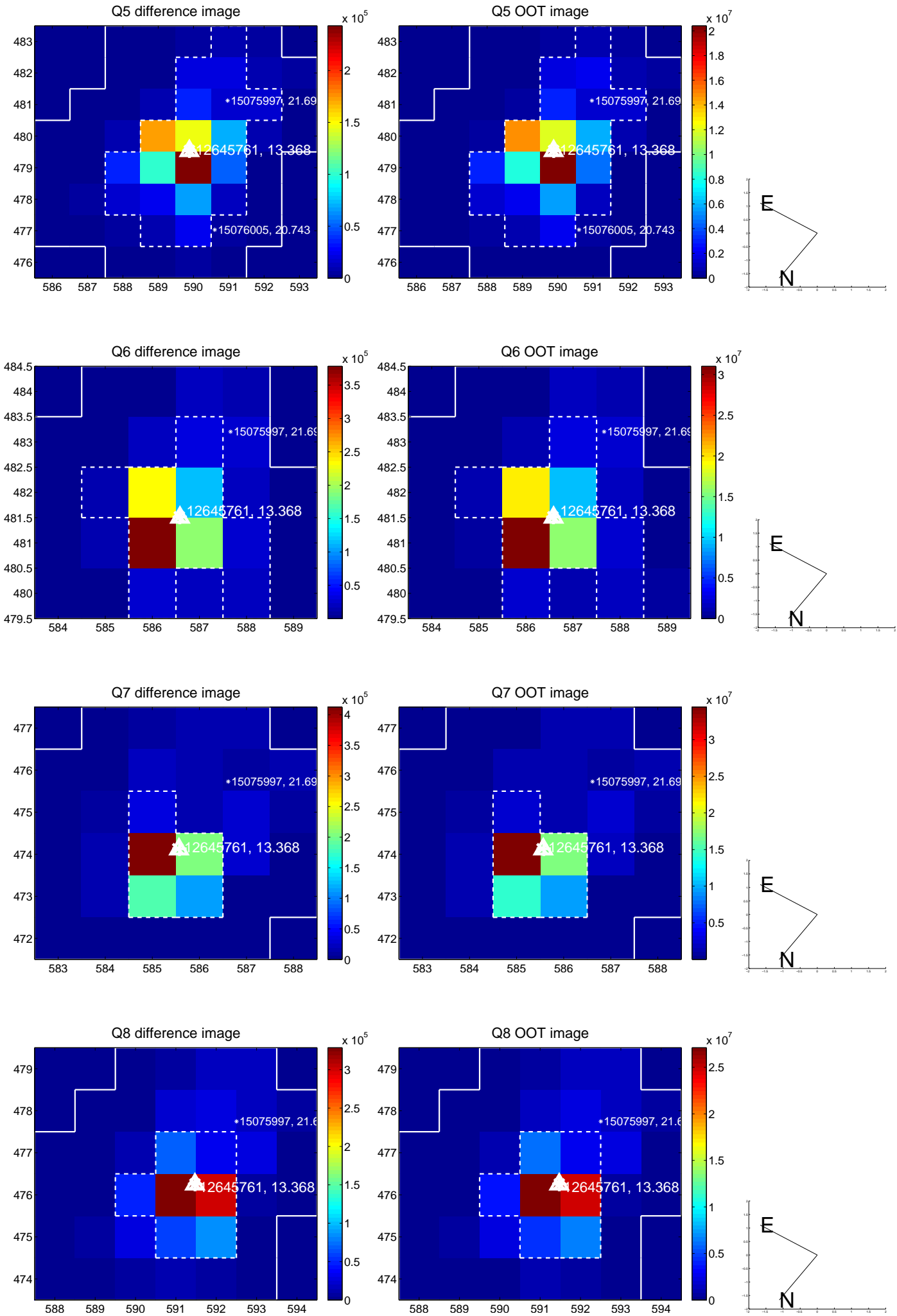
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

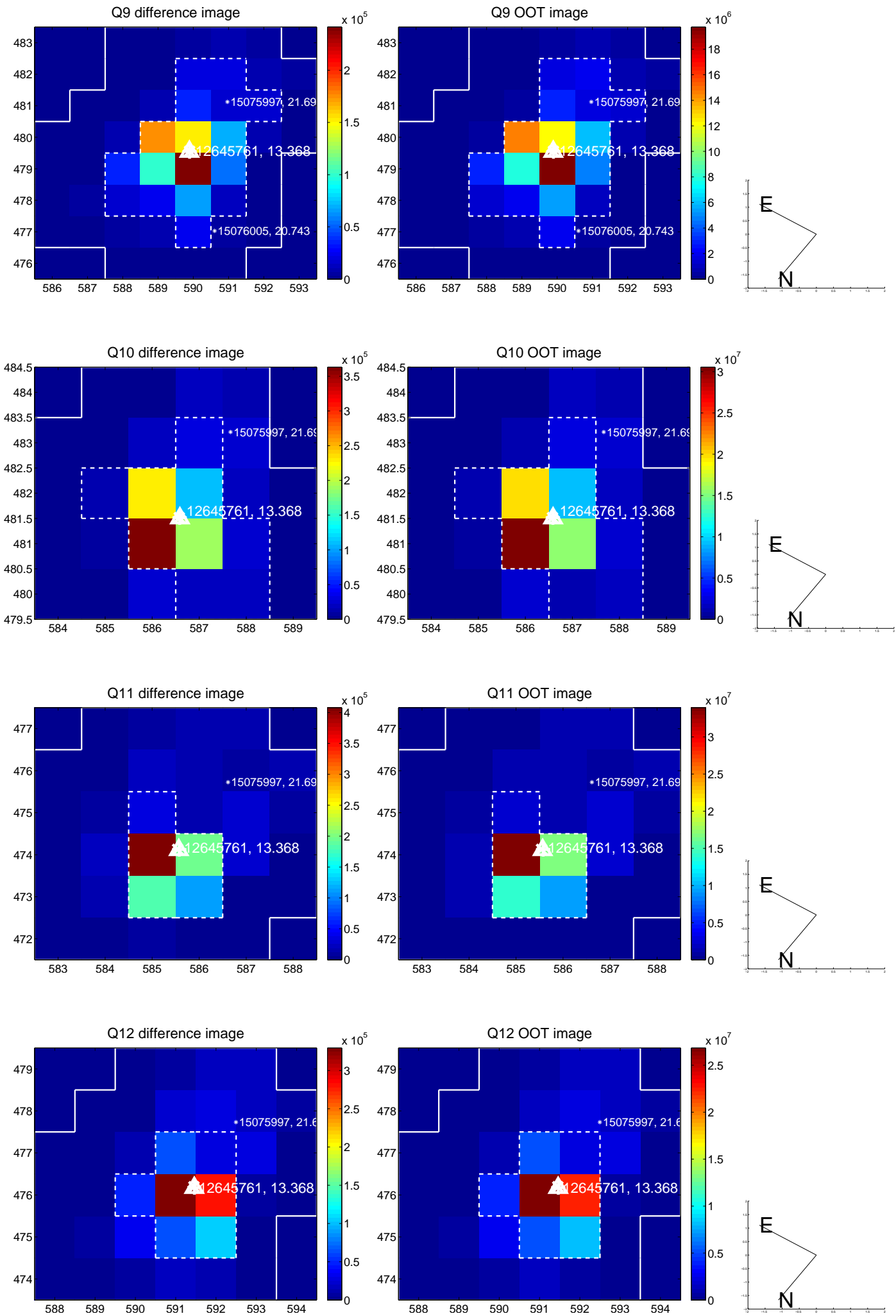




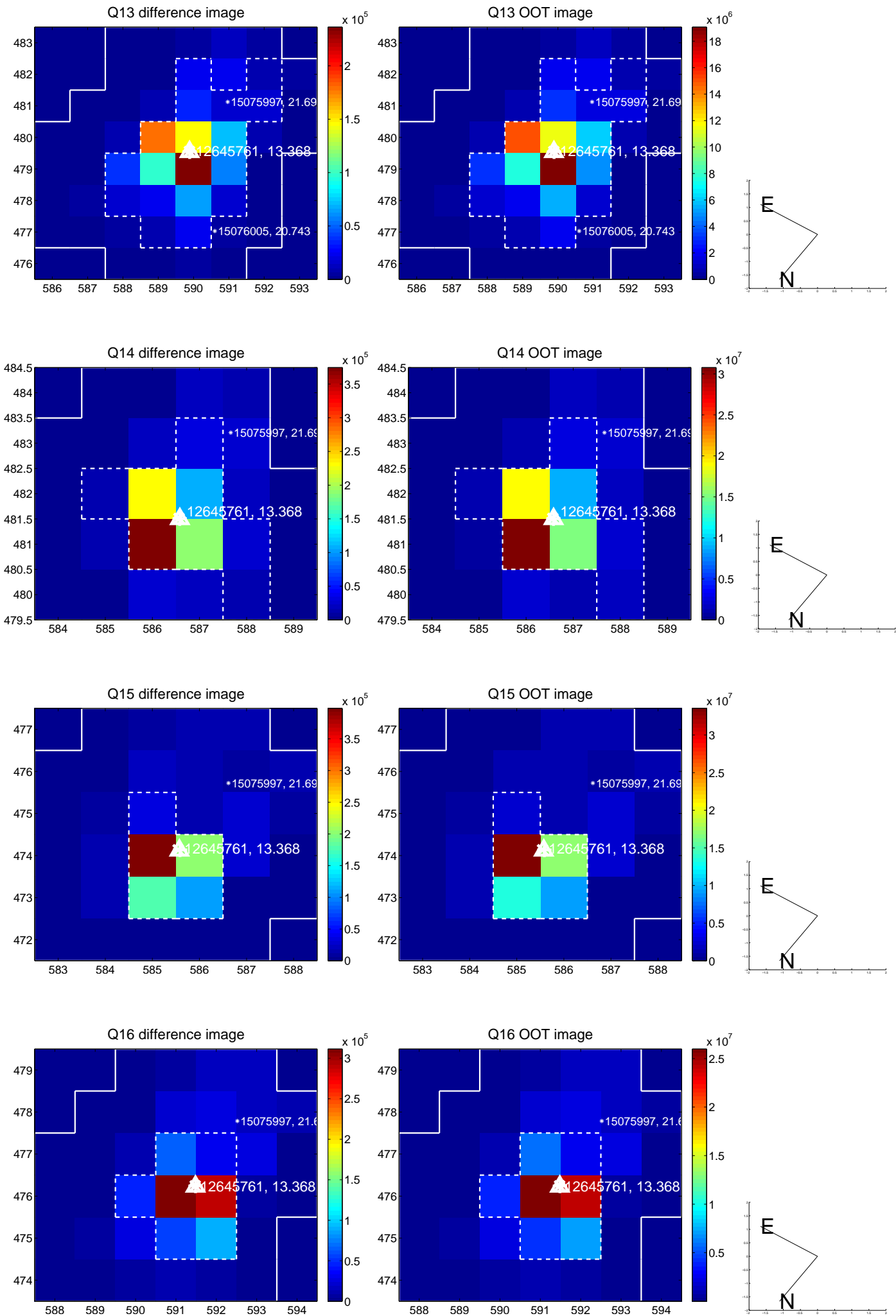
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



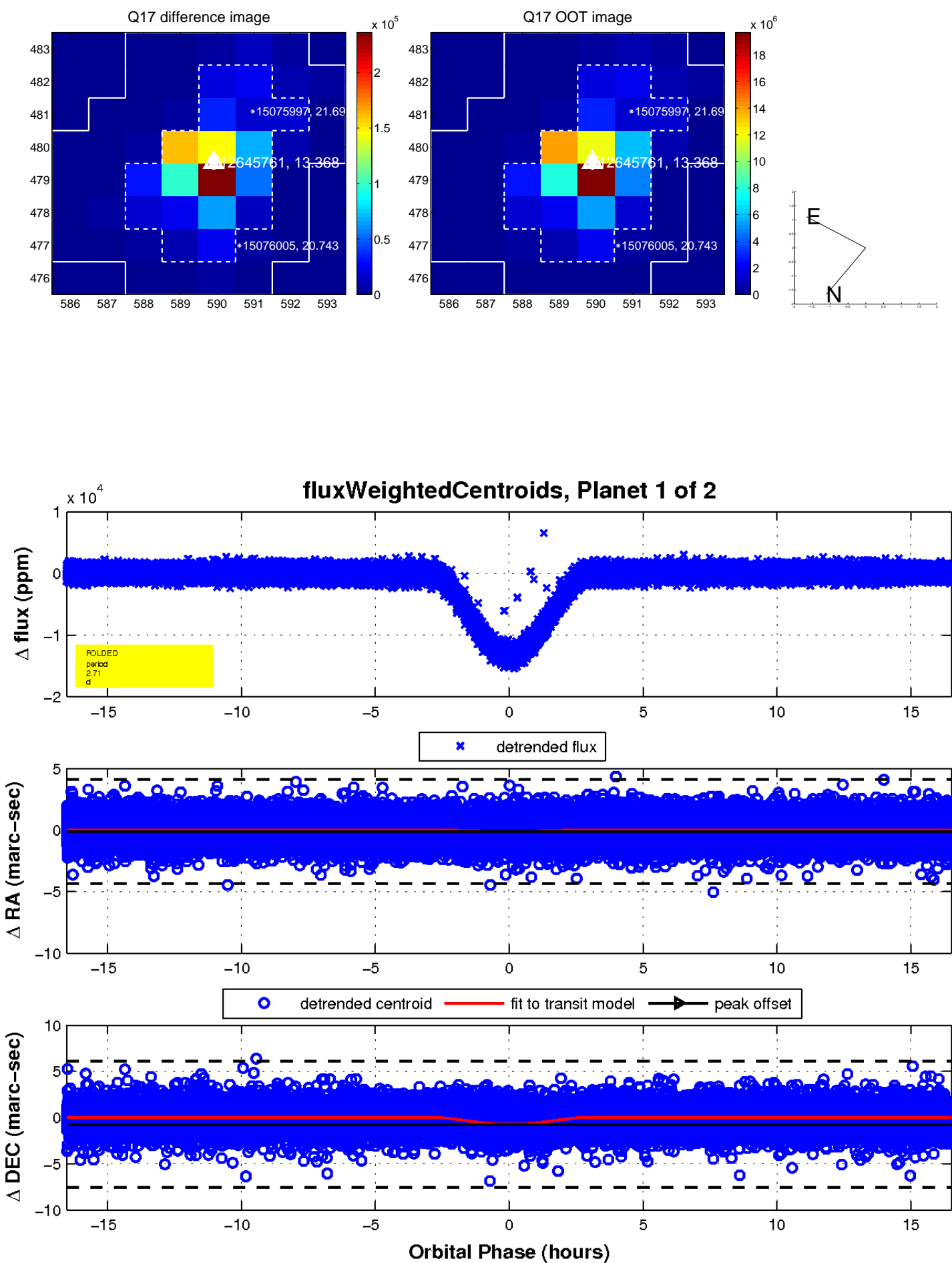
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

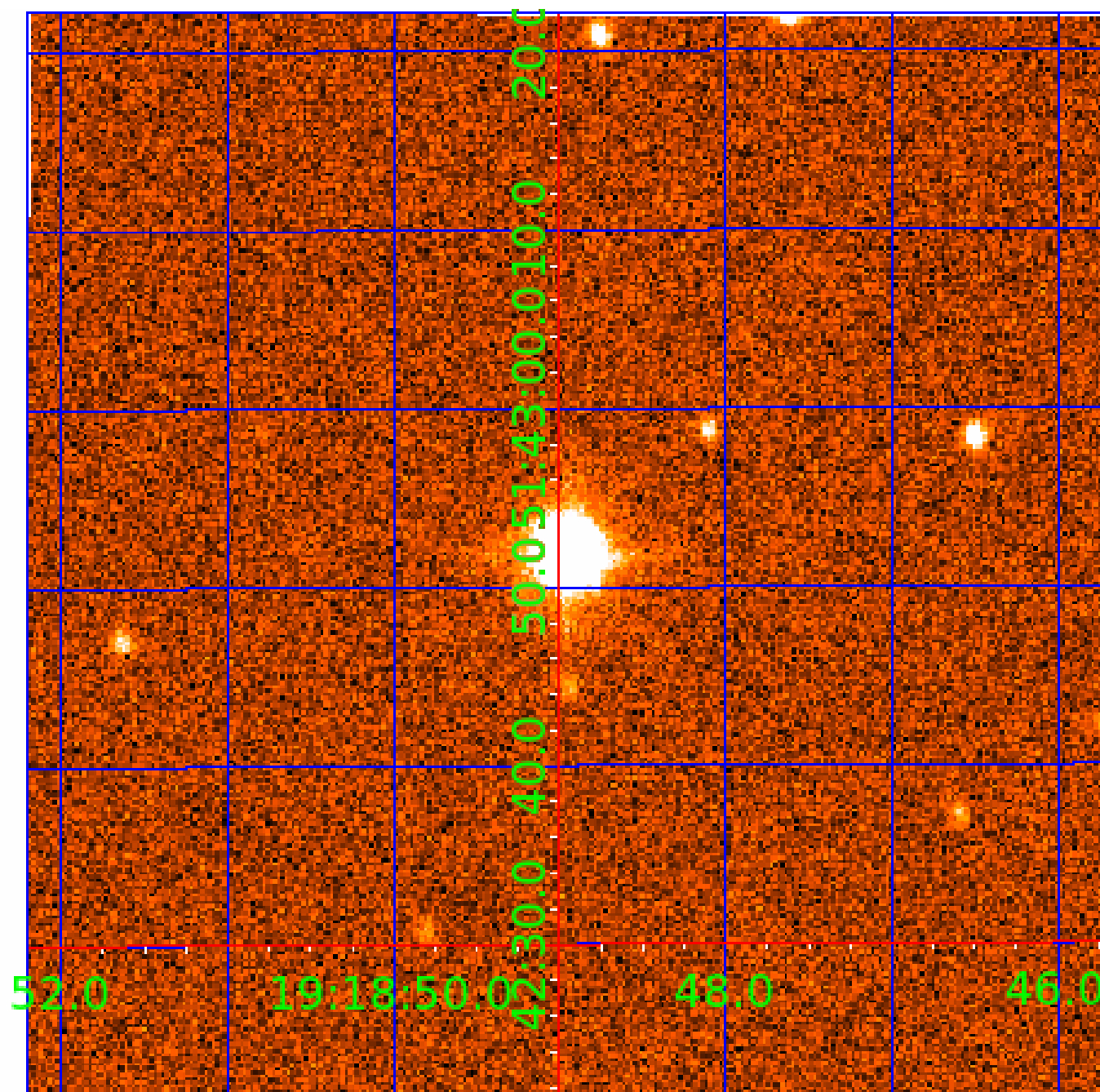


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 012645761

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012645761-01	OBS	5976.01	2.709584	134.081635	12886.1	5.510	504.5	570.5	5.21	5030	108.40	8211.27
012645761-02	OBS	No	232.039800	281.442887	1369.1	5.924	8.7	8.0	5.21	5030	23.93	21.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012645761-01	OBS	FP	0.00	0	1	0	0	MOD_ODDEVEN_DV—MOD_ODDEVEN_ALT—DEEP_V_SHAPED
012645761-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—MOD_NONUNIQ_DV—INCONSISTENT_TRANS

**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.

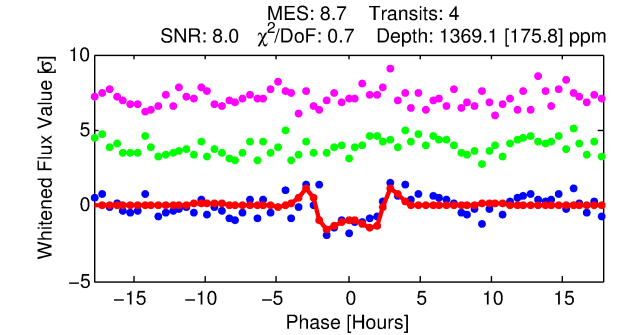
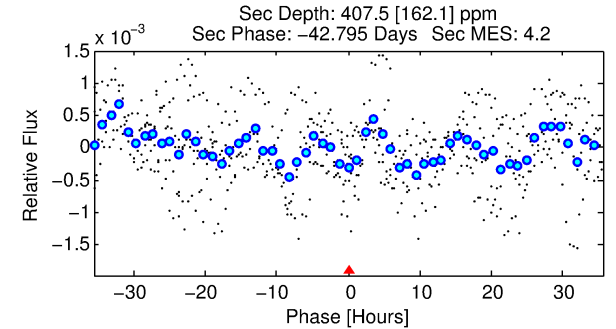
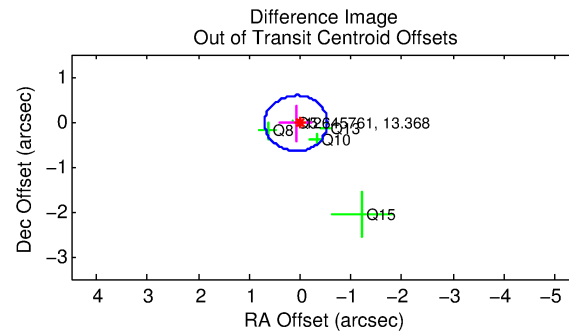
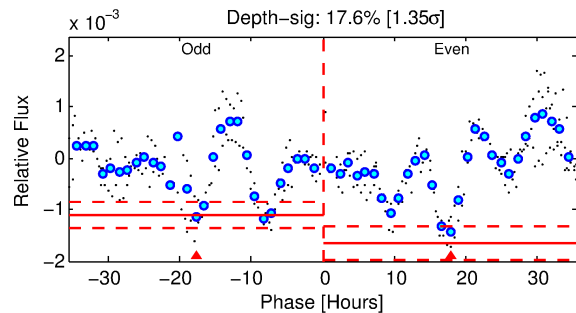
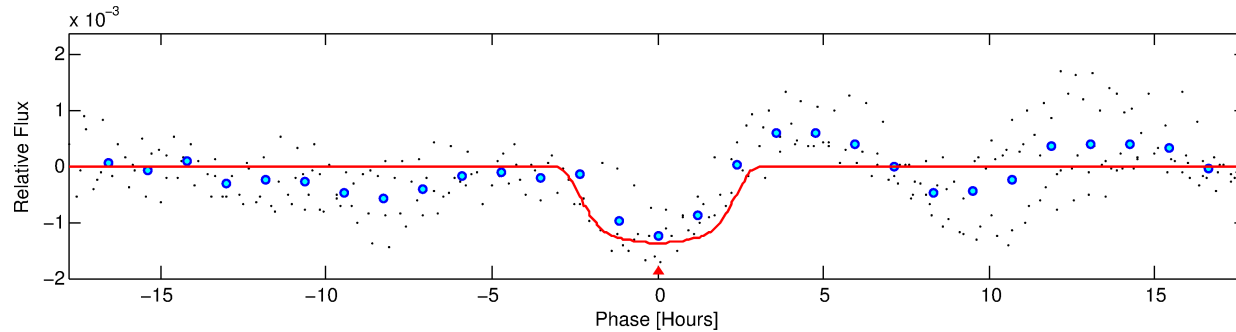
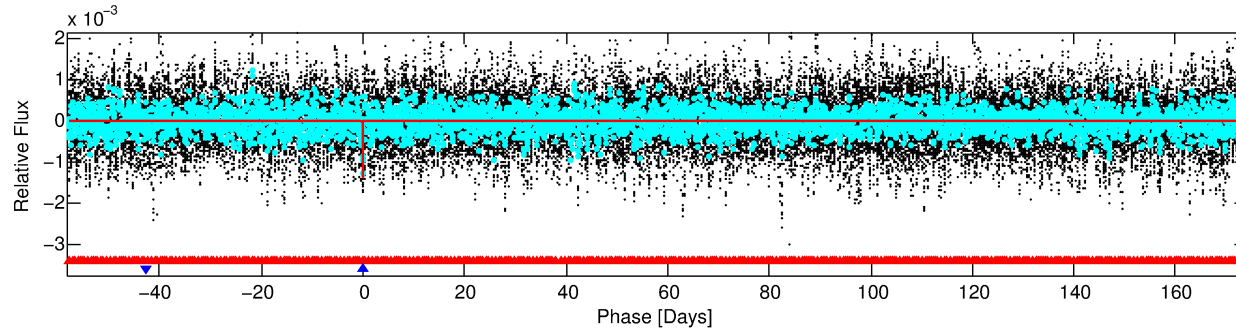
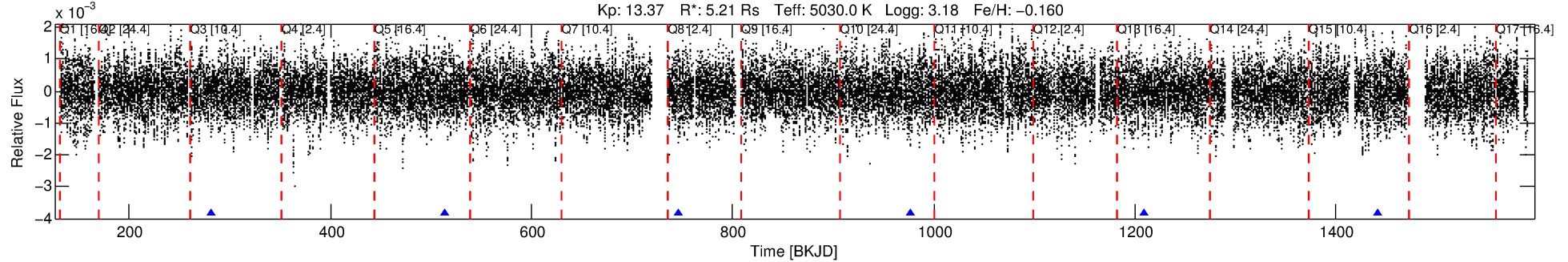
## Ephemeris Match Information For 012645761-02

No Significant Match Found

# DV One-Page Summary

KIC: 12645761 Candidate: 2 of 2 Period: 232.040 d  
KOI: K05976 Corr: No Ephemeris Match

Kp: 13.37 R\*: 5.21 Rs Teff: 5030.0 K Logg: 3.18 Fe/H: -0.160



## DV Fit Results:

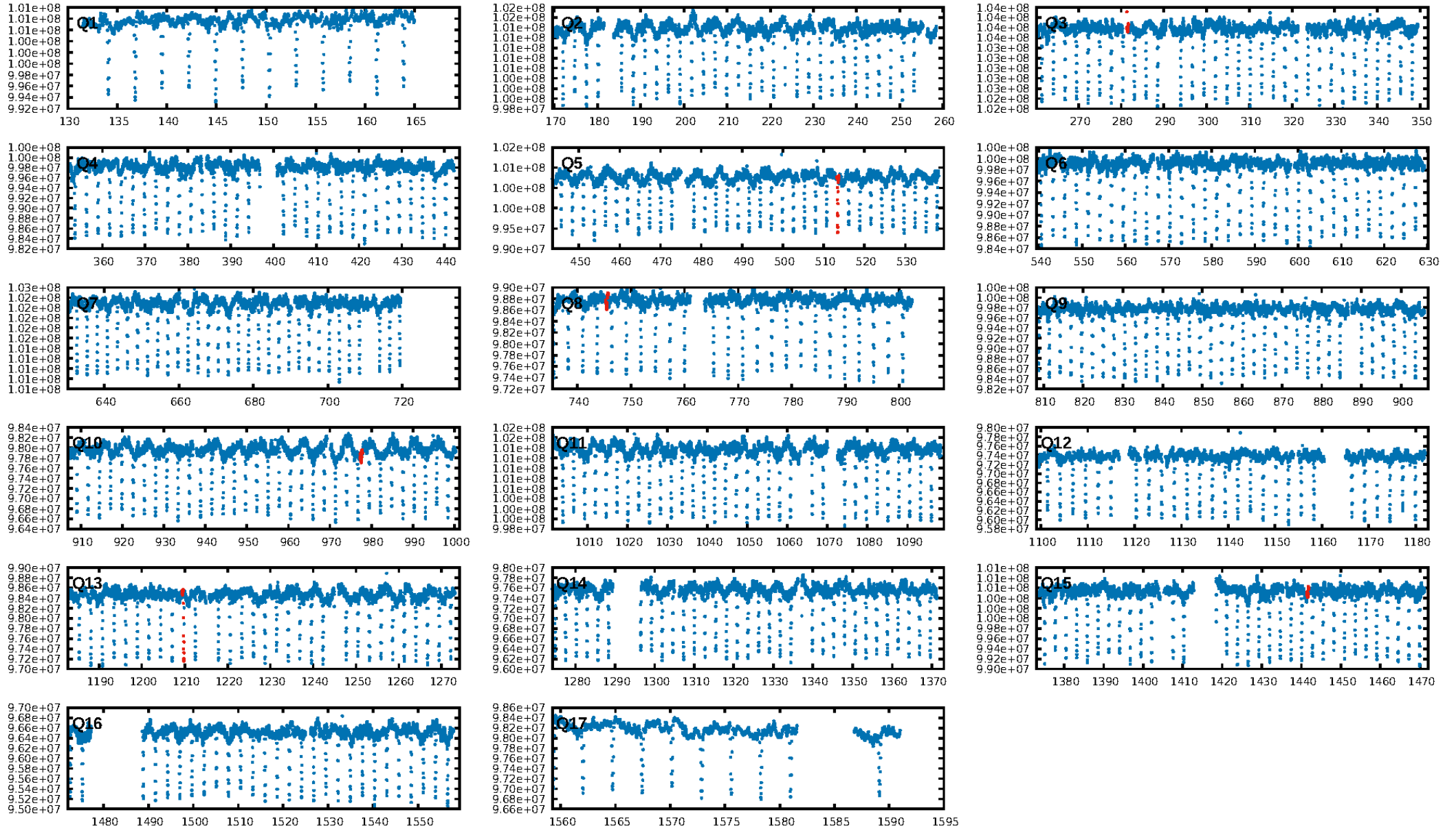
Period = 232.03980 [0.00187] d  
Epoch = 281.4429 [0.0063] BKJD  
Rp/R\* = 0.0421 [0.0031]  
a/R\* = 147.89 [15.34]  
b = 0.92 [0.02]  
Seff = 21.75 [14.46]  
Teq = 551 [92] K  
Rp = 23.93 [11.22] Re  
a = 0.8456 [0.3581] AU  
Ag = 280.03 [219.11] [1.27σ]  
Teffp = 3483 [380] K [7.51σ]

## DV Diagnostic Results:

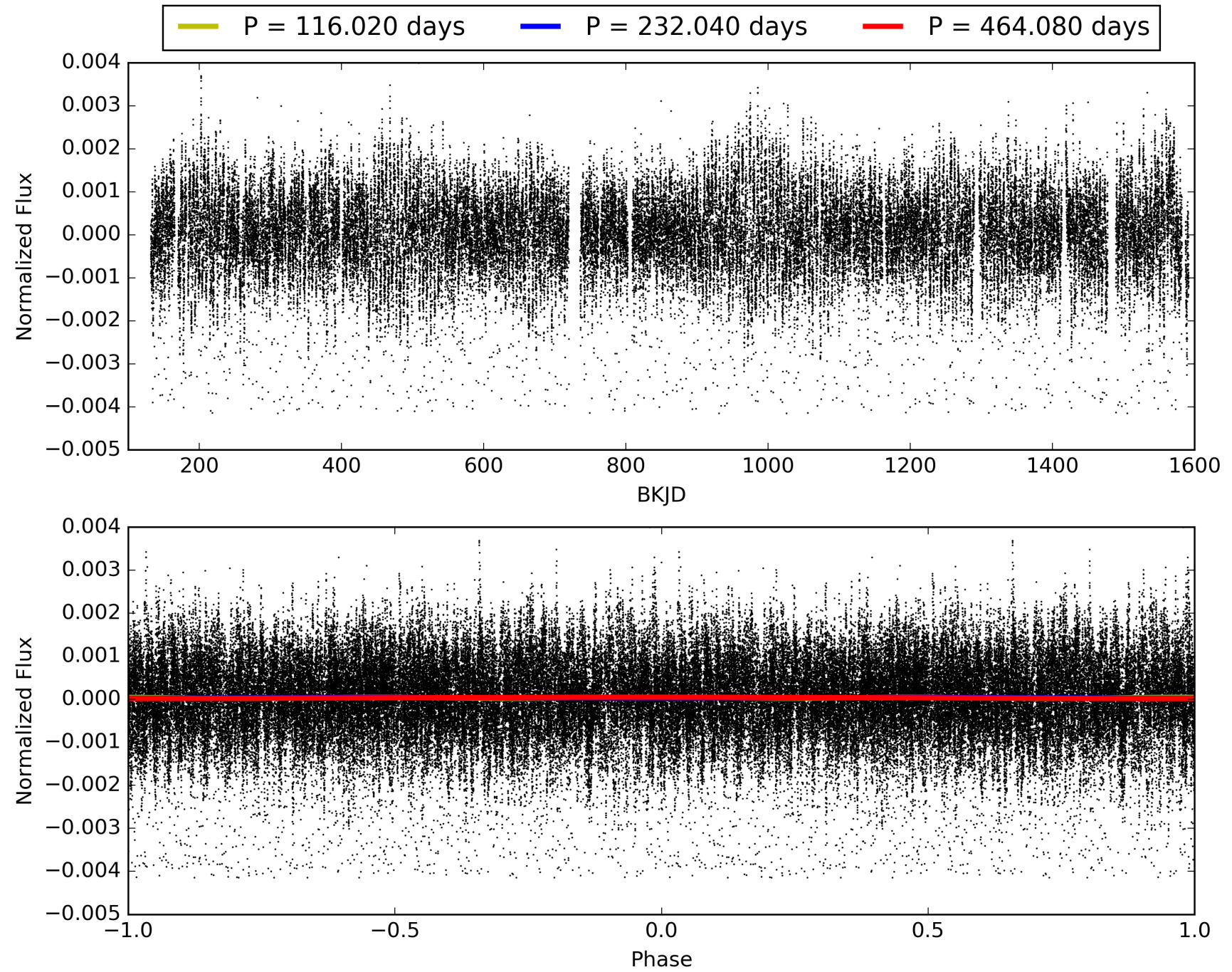
ShortPeriod-sig: 100.0% [680.35σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 99.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.70e-11  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.56  
Centroid-sig: 44.2%  
Centroid-so: 0.403 arcsec [1.58σ]  
OotOffset-rm: 0.088 arcsec [0.42σ]  
OotOffset-st: 1/1/1/2 [5]  
KicOffset-rm: 0.064 arcsec [0.21σ]  
KicOffset-st: 1/1/1/2 [5]  
DiffImageQuality-fgm: 0.80 [4/5]  
DiffImageOverlap-fno: 0.60 [3/5]



# TCE 012645761-02, PDC Light Curves

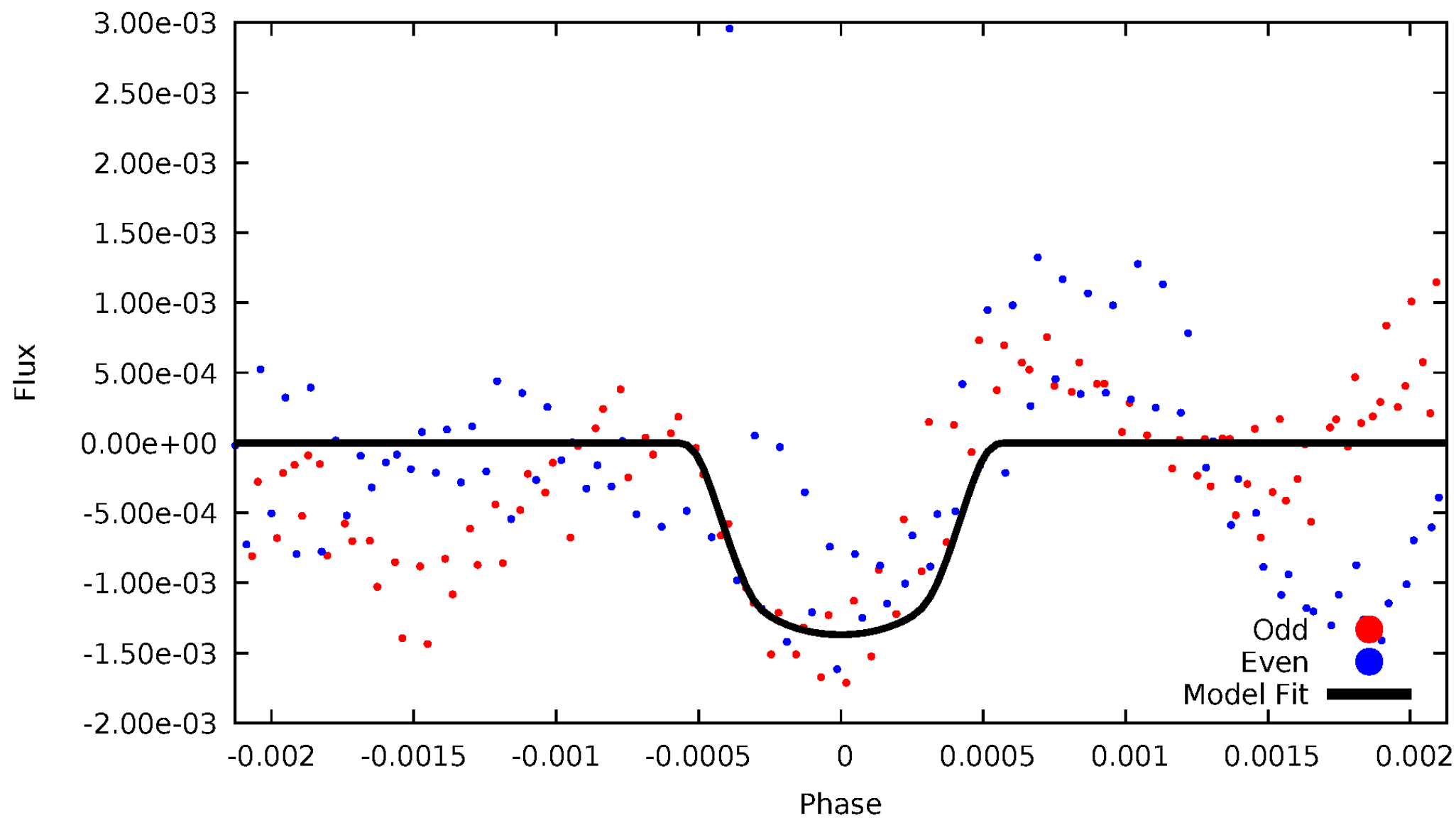


# TCE 012645761-02



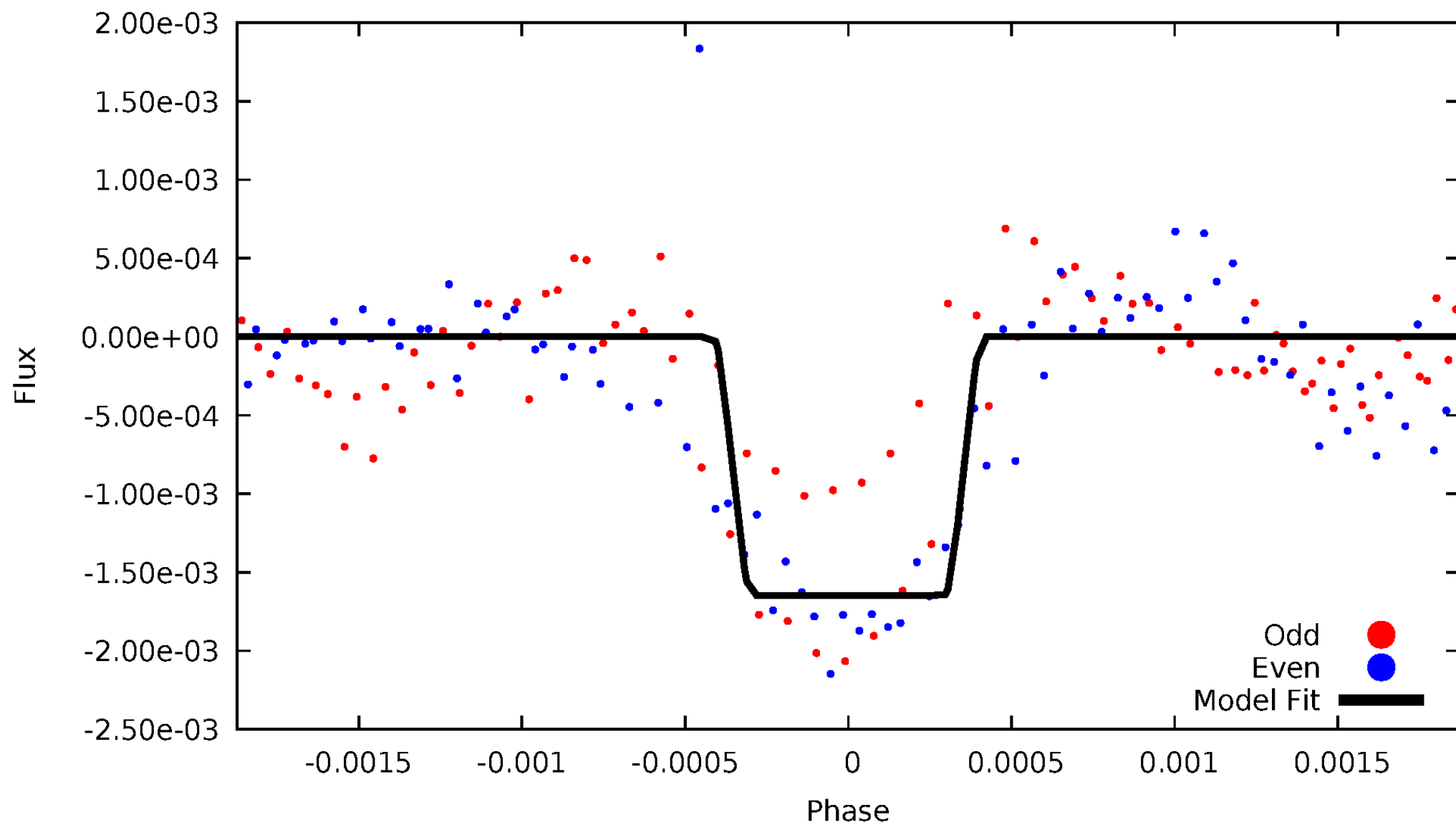
# DV Odd/Even

TCE 012645761-02



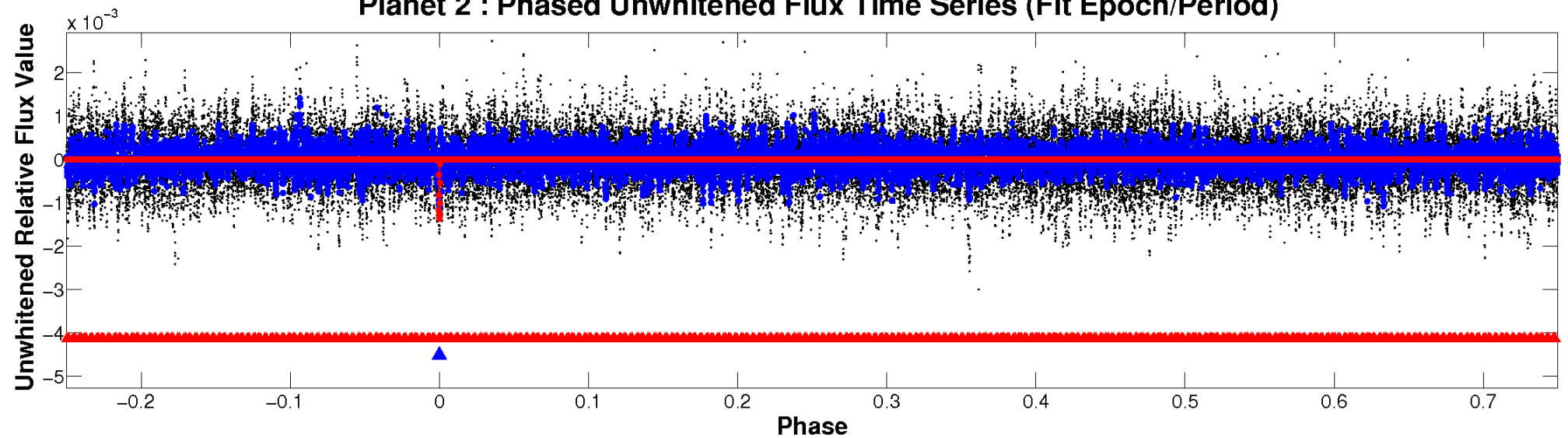
# ALT Odd/Even

TCE 012645761-02

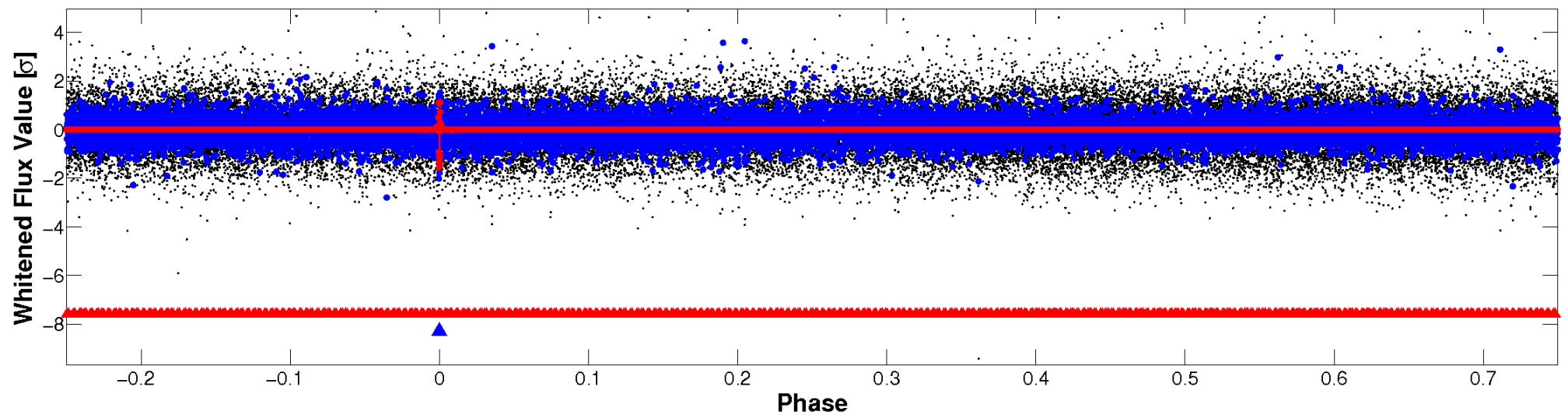


# Non-Whitened Vs. Whitened Light Curve

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

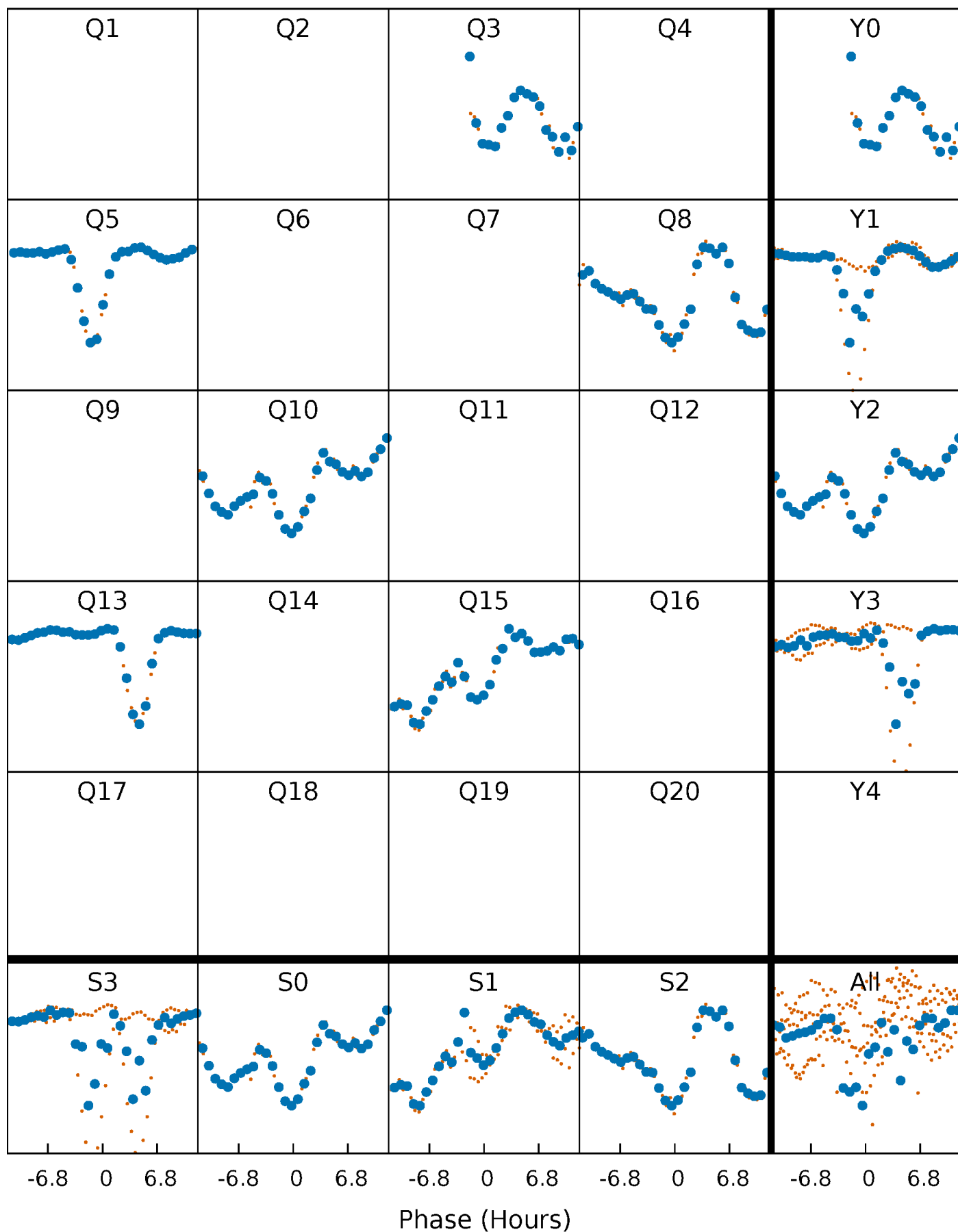


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



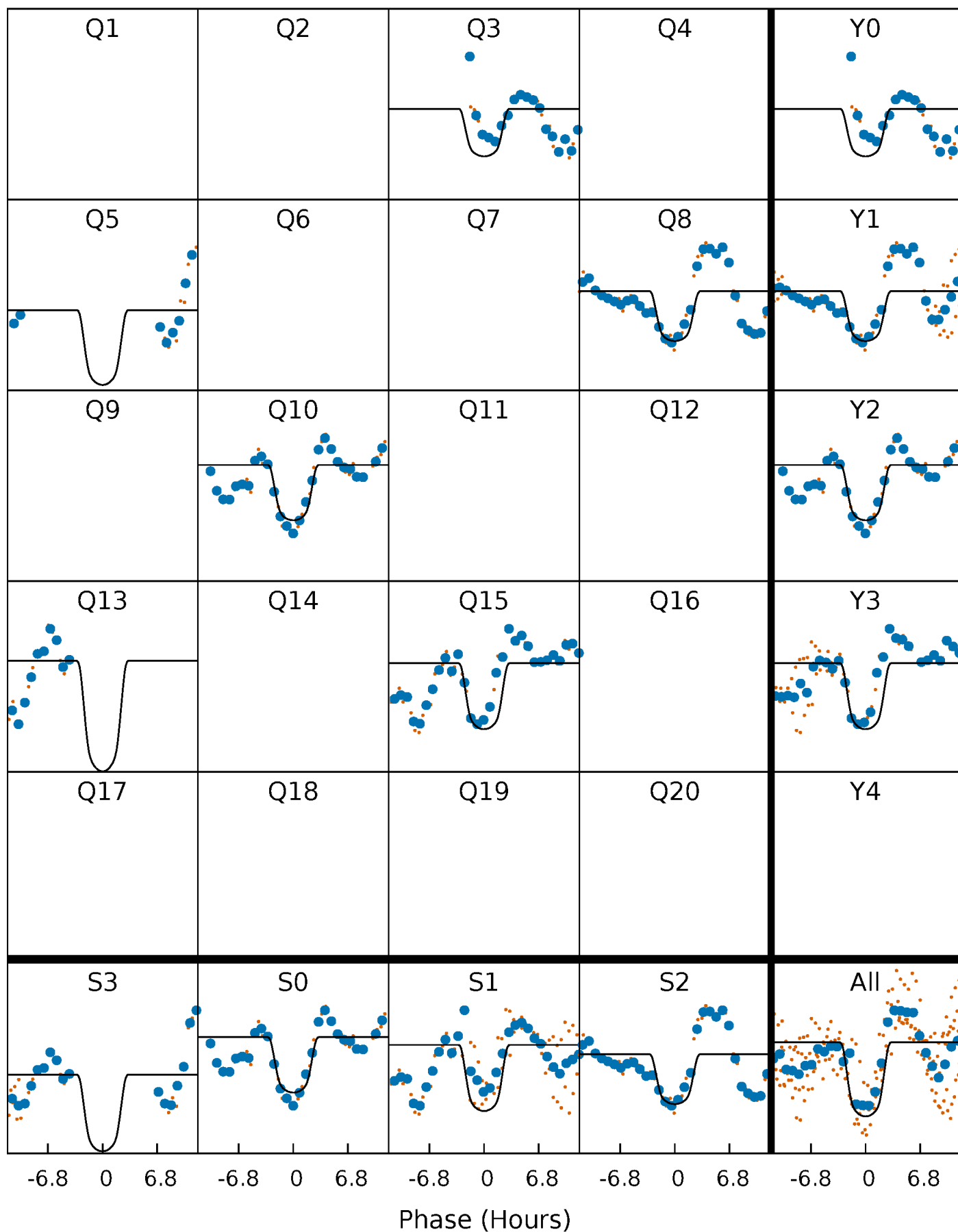
# PDC Quarter-Phased Transit Curves

TCE 012645761-02 P=232.039800 Days  $T_0=281.442887$  (BKJD)



# DV Quarter-Phased Transit Curves

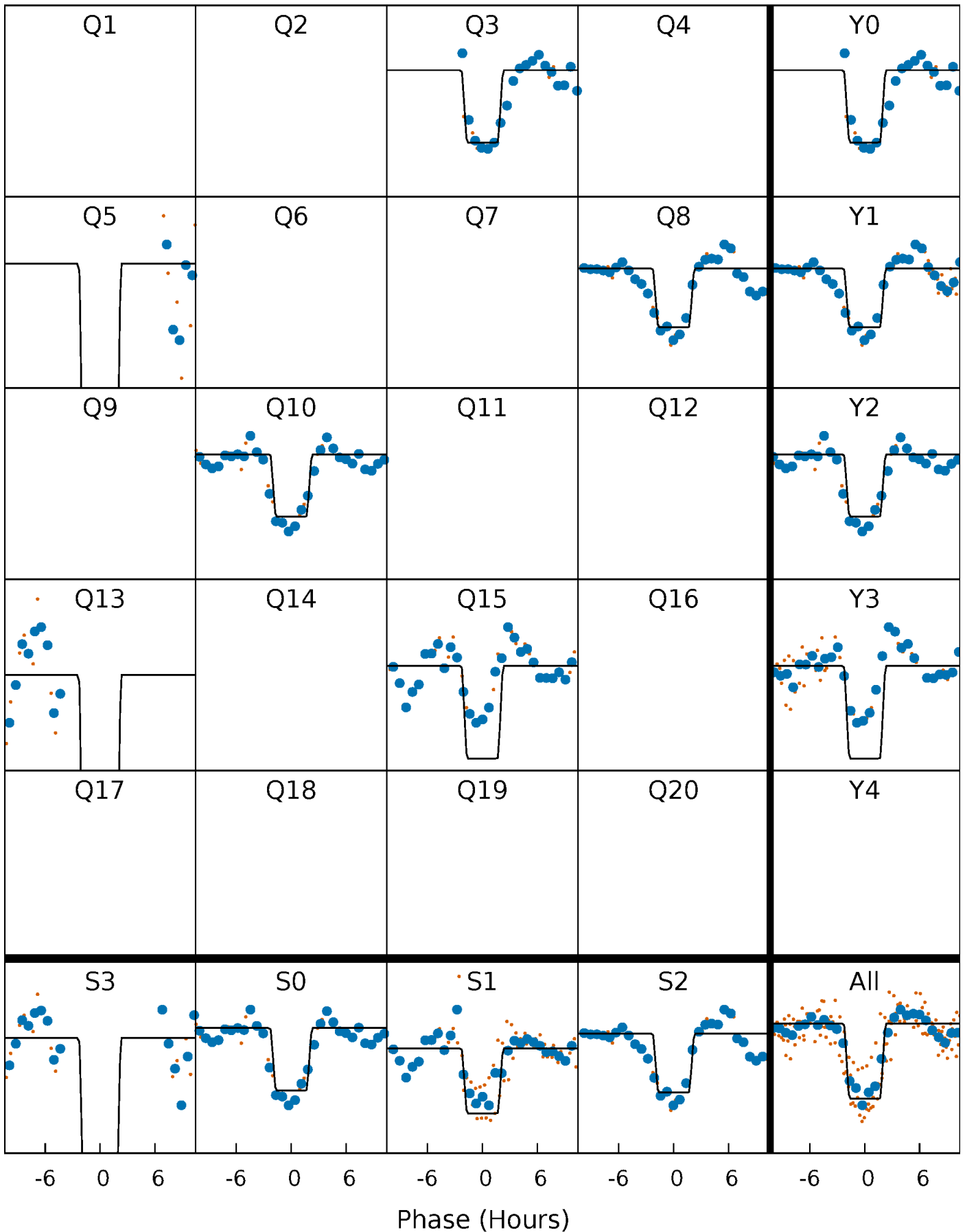
TCE 012645761-02     $P=232.039800$  Days     $T_0=281.442887$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

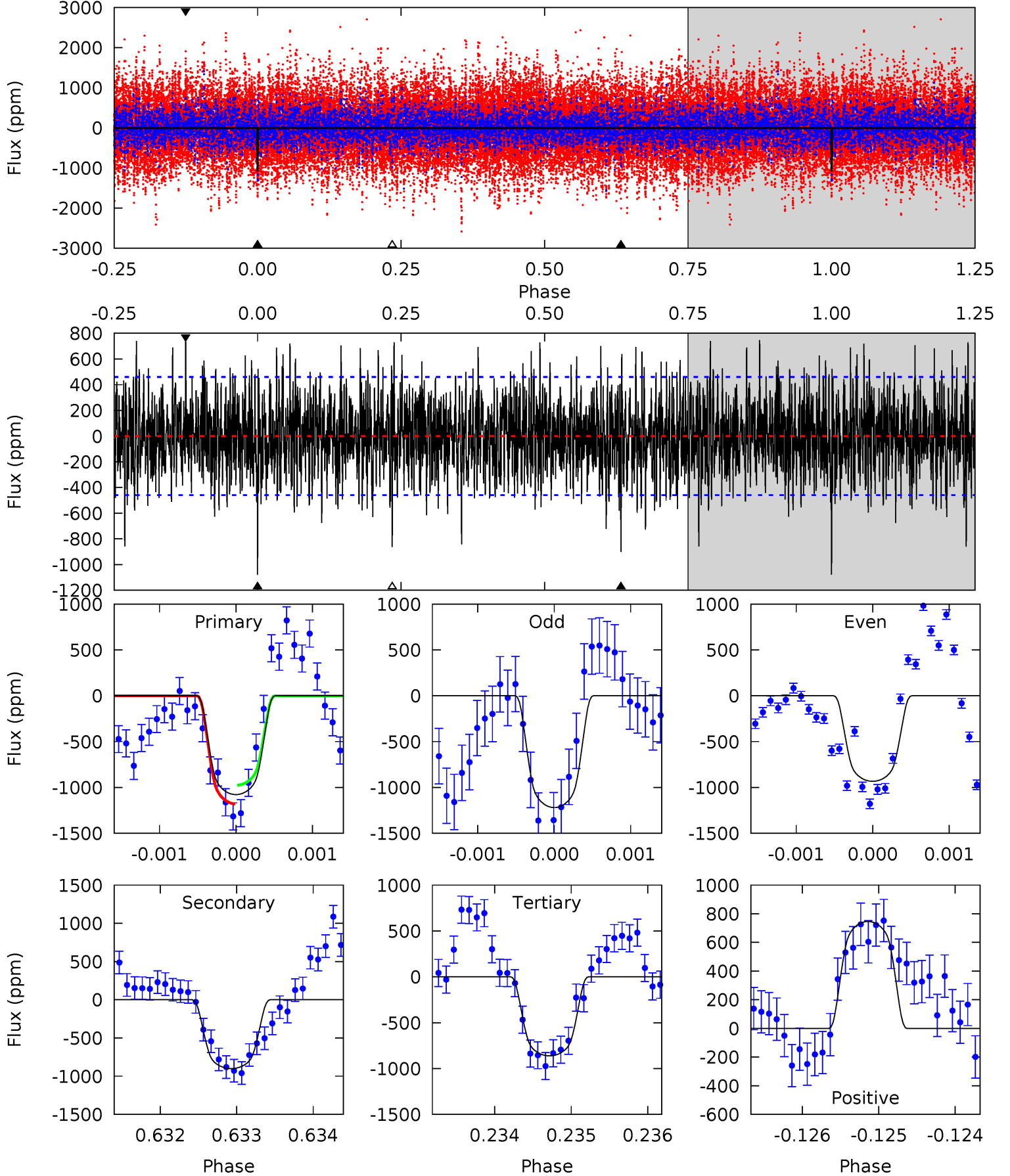
TCE 012645761-02     $P=232.036934$  Days     $T_0=281.458132$  (BKJD)



# DV Model-Shift Uniqueness Test

012645761-02,  $P = 232.039800$  Days,  $E = 49.403087$  Days

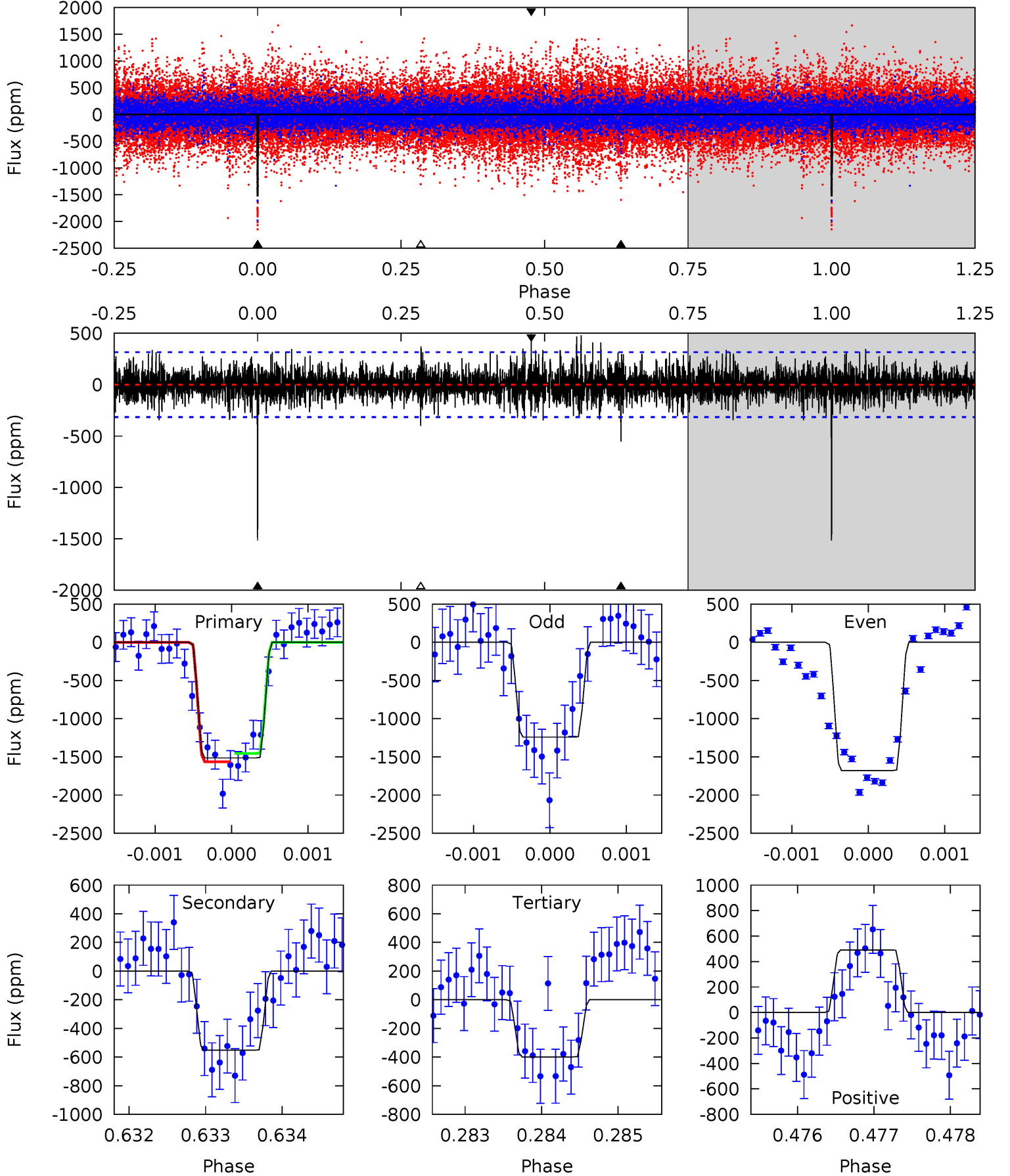
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.7	10.6	10.2	8.82	5.43	3.26	2.83	2.56	3.92	0.46	1.83	1.70	0.94	0.41	1.21



# Alt Model-Shift Uniqueness Test

012645761-02,  $P = 232.036934$  Days,  $E = 49.421198$  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
26.4	9.62	6.95	8.56	5.49	3.35	1.87	19.4	17.8	2.67	1.06	3.85	0.87	0.24	0.94



### Stellar Parameters For KIC 012645761

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5030^{+113}_{-125}$	$3.180^{+0.378}_{-0.252}$	$-0.160^{+0.250}_{-0.250}$	$5.208^{+1.807}_{-2.410}$	$1.498^{+0.224}_{-0.523}$	$0.015^{+0.046}_{-0.009}$
	+2%/-2%	+12%/-8%	+156%/-156%	+35%/-46%	+15%/-35%	+306%/-63%
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 012645761-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-901 \pm 85$	$23.56^{+5.85}_{-6.20}$	$770^{+78}_{-94}$	$4382^{+194}_{-161}$	$624^{+447}_{-219}$
Alt.	$-552 \pm 57$	$22.66^{+5.58}_{-5.57}$	$765^{+81}_{-92}$	$4058^{+166}_{-153}$	$422^{+279}_{-159}$

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

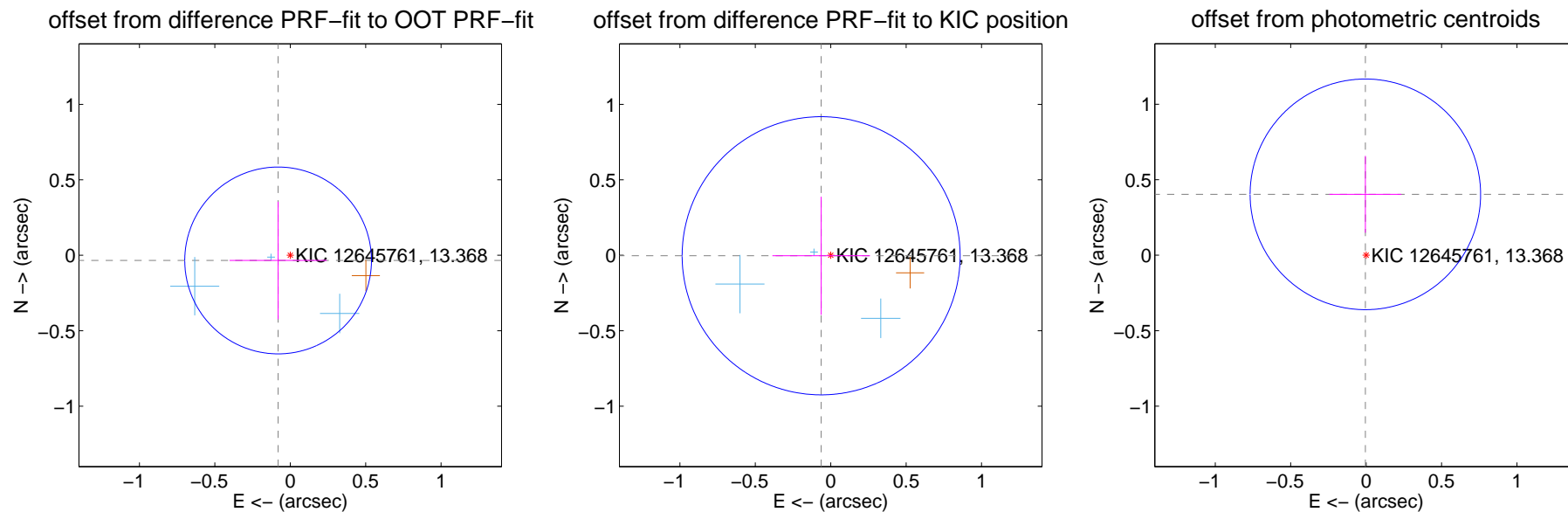
## DV Centroid Data

Supplemental centroid analysis for 012645761-02. Kepler magnitude: 13.37. Transit SNR 8.02

There are 4 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.088 \pm 0.206$	0.42	$0.081 \pm 0.322$	$-0.034 \pm 0.389$
PRF-fit source offset from KIC position	$0.064 \pm 0.307$	0.21	$0.064 \pm 0.323$	$-0.003 \pm 0.391$
photometric centroid source offset	$0.40 \pm 0.25$	1.58	$0.01 \pm 0.24$	$0.40 \pm 0.25$

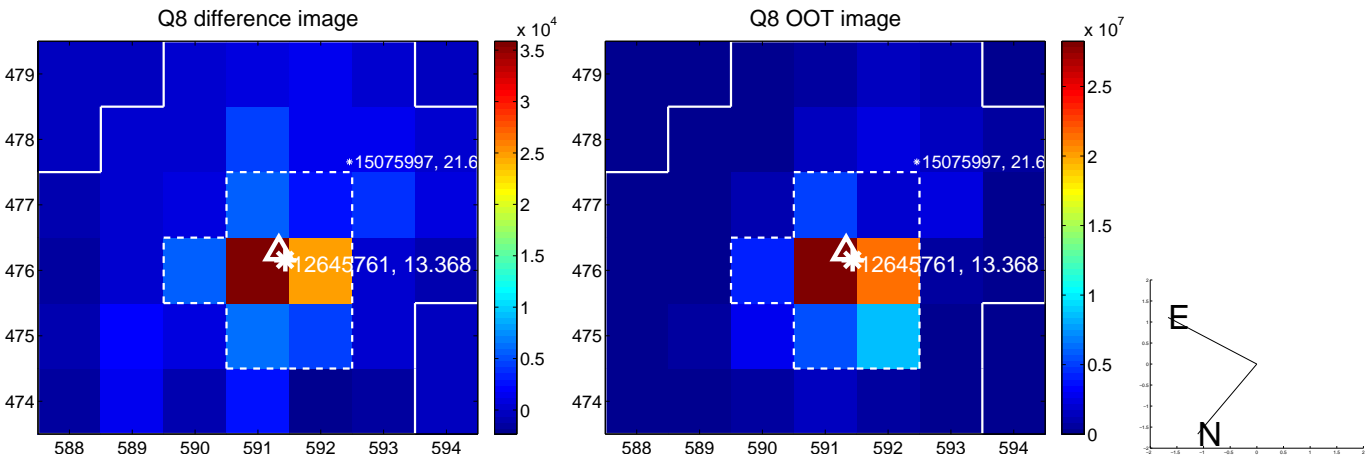
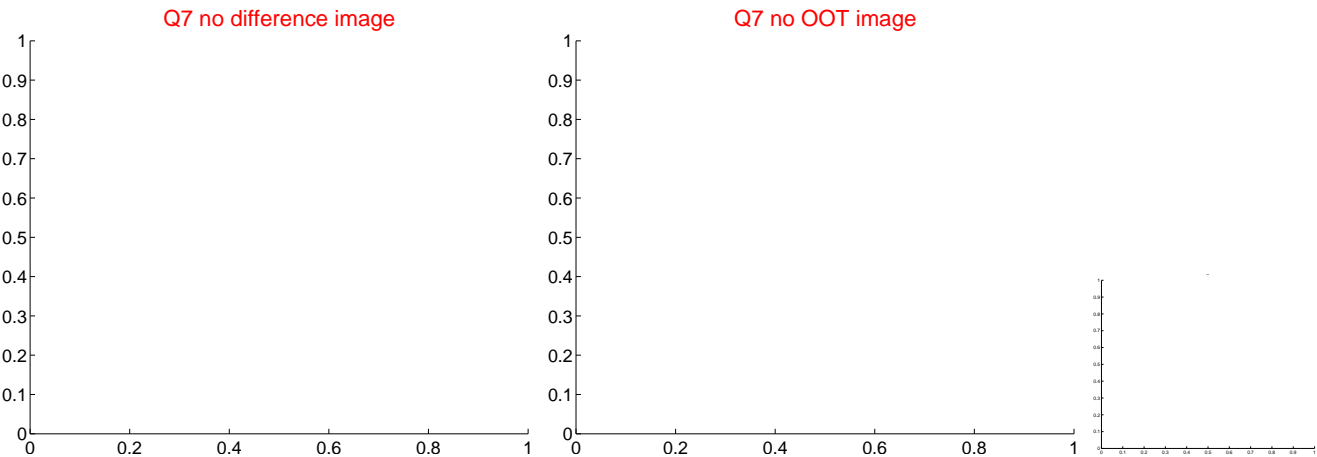
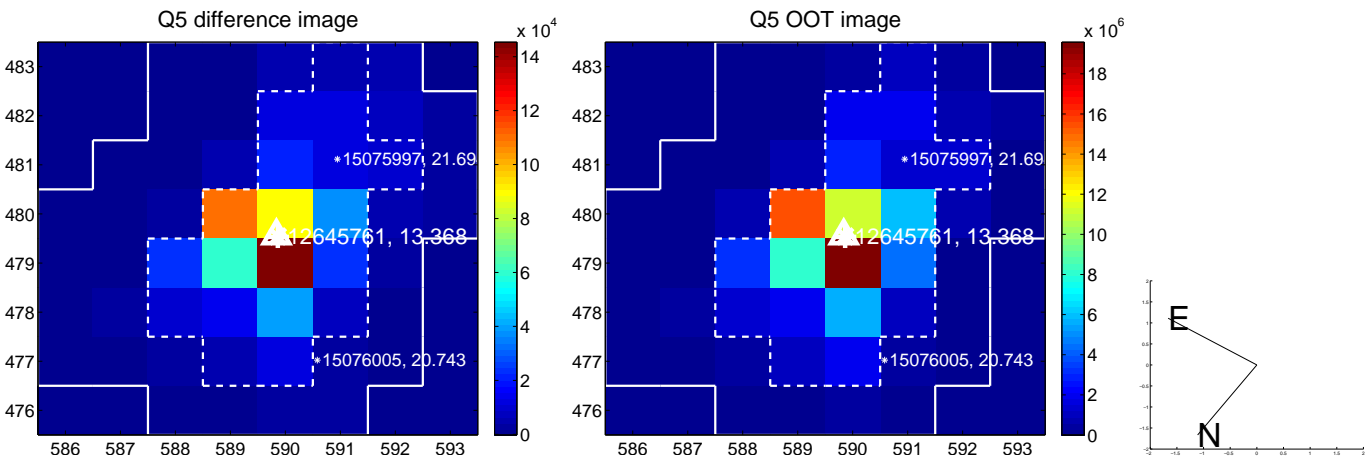


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

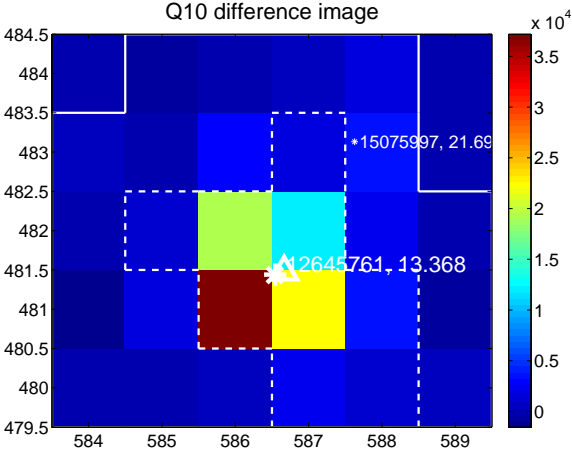
Q9 no difference image



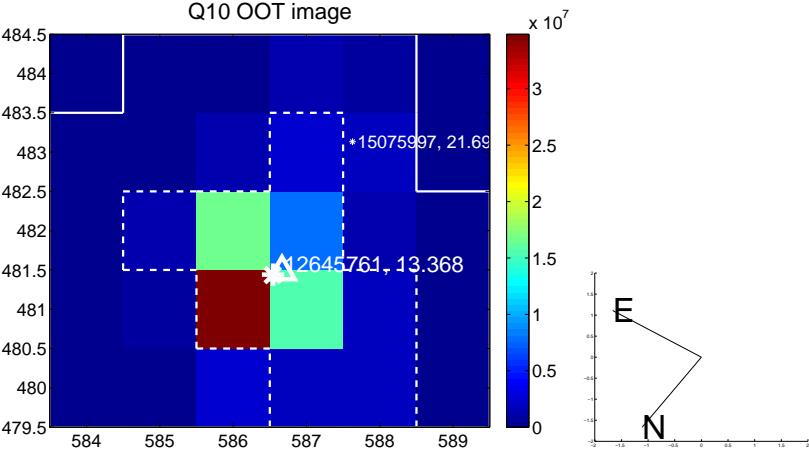
Q9 no OOT image



Q10 difference image



Q10 OOT image



Q11 no difference image



Q11 no OOT image



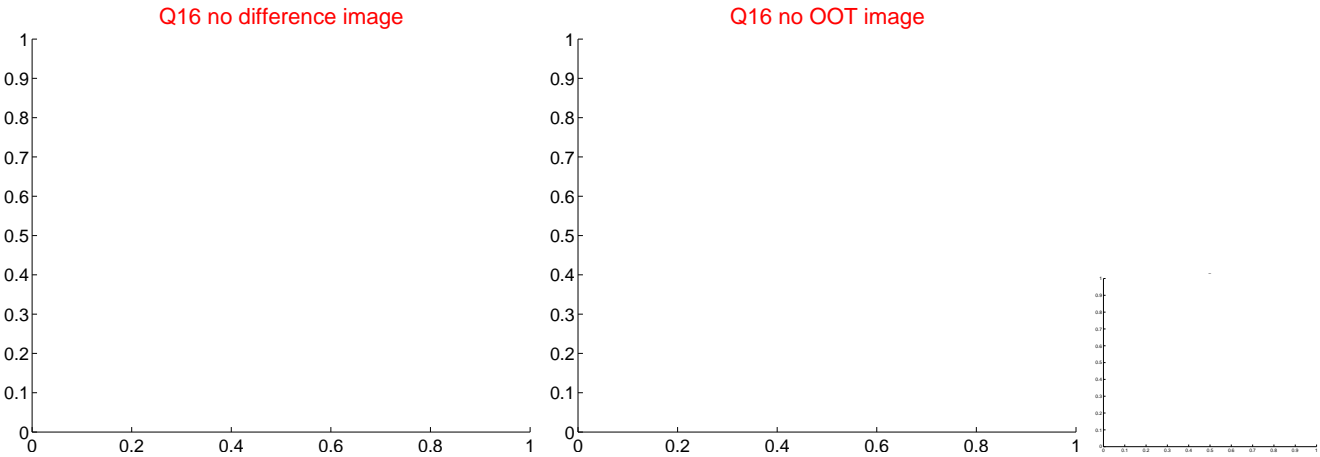
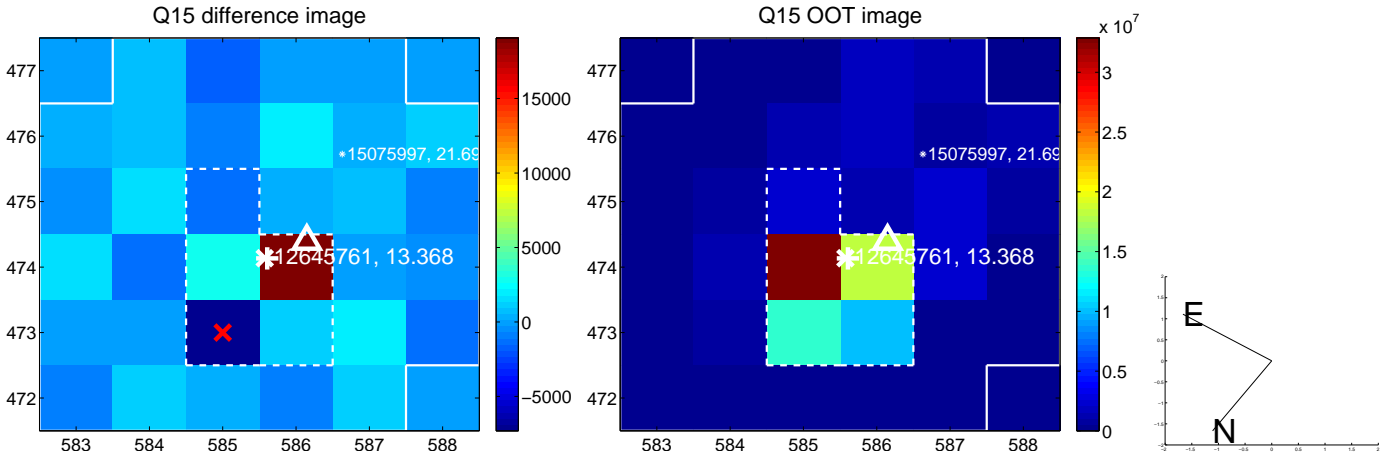
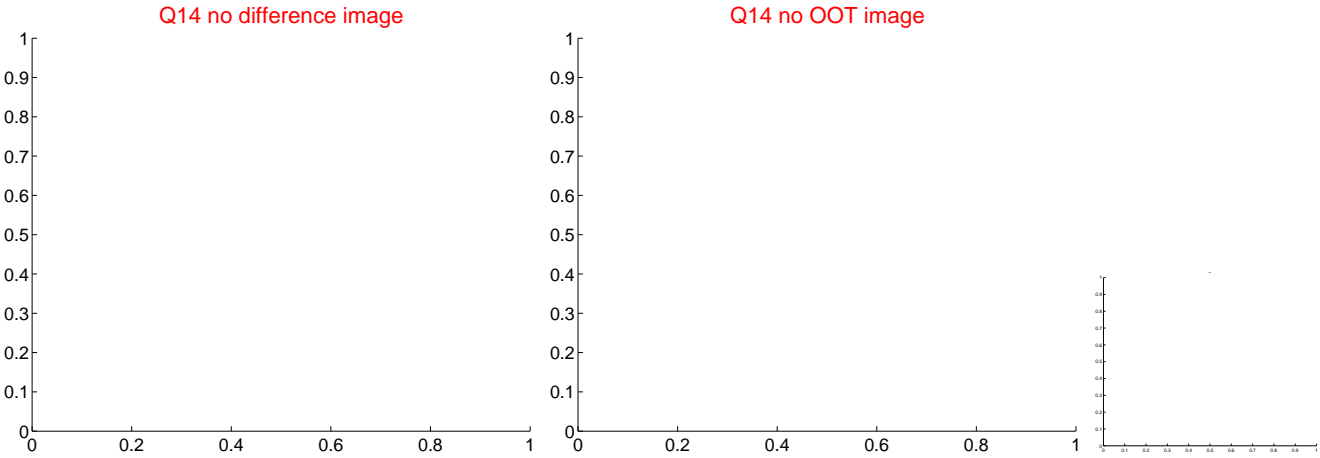
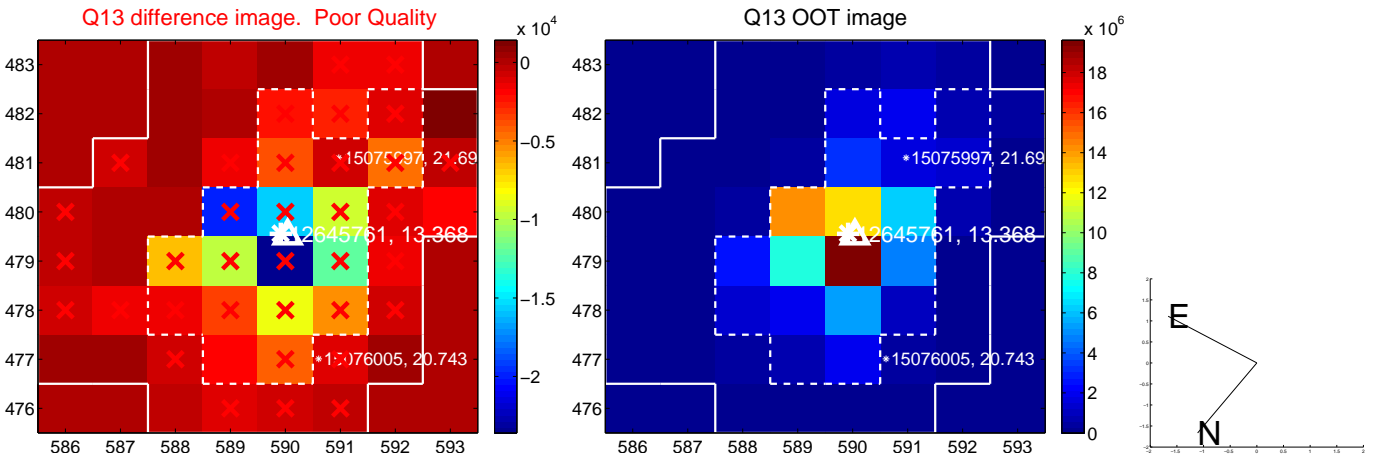
Q12 no difference image



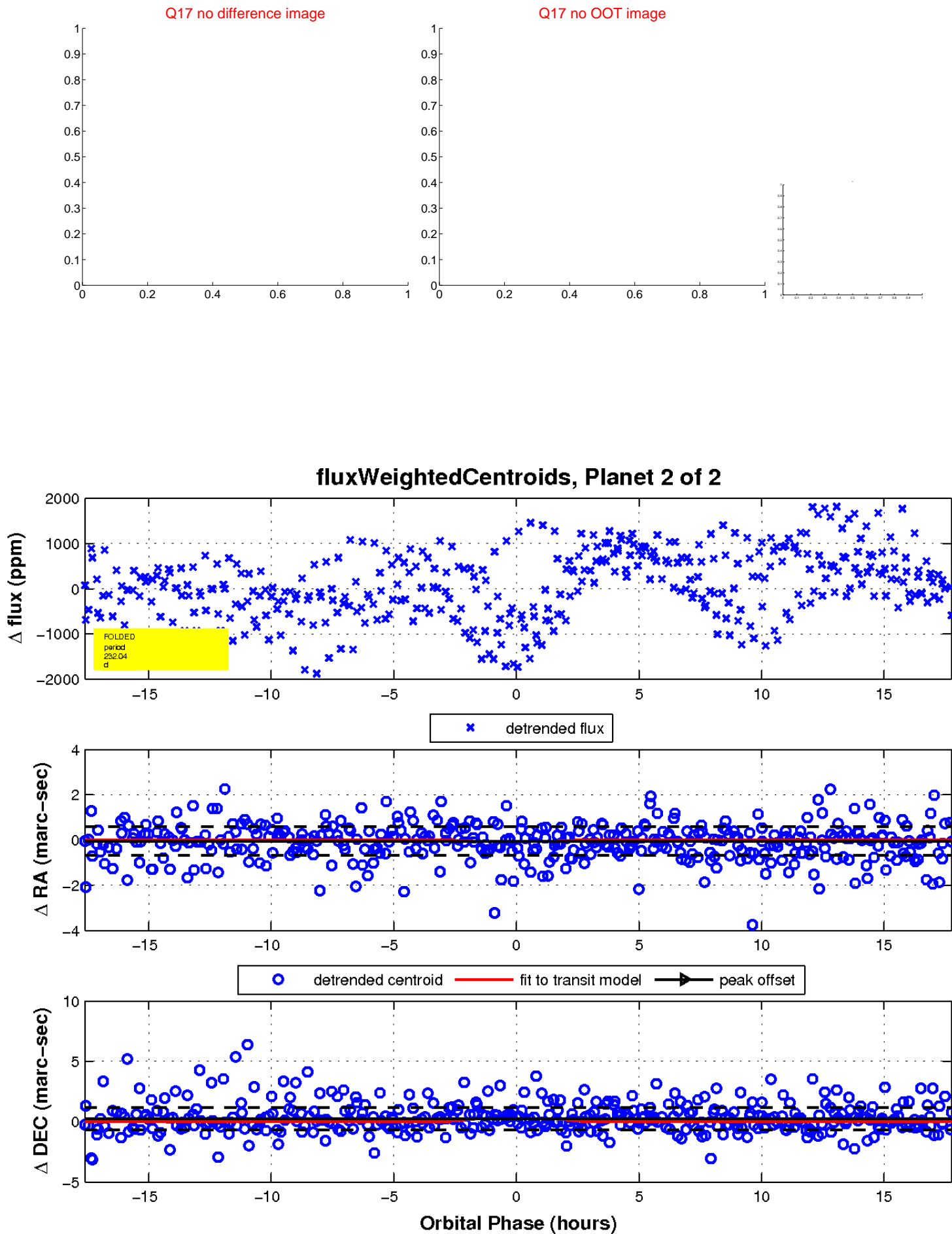
Q12 no OOT image



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



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



# UKIRT Image

Declination

