

# KIC 012401644

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012401644-02	OBS	No	342.181691	410.861651	6331.5	59.277	31.6	9.2	0.60	5068	8.91	0.33
012401644-03	OBS	No	308.857651	221.623847	2171.1	25.015	16.3	9.5	0.60	5068	3.50	0.38
012401644-05	OBS	No	372.532793	366.150217	1211.3	7.071	15.7	7.5	0.60	5068	2.19	0.29
012401644-06	OBS	No	548.808394	158.562553	1158.0	3.346	15.1	8.4	0.60	5068	2.14	0.18
012401644-07	OBS	No	503.616269	193.981537	1102.4	12.459	13.9	6.7	0.60	5068	2.04	0.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012401644-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS
012401644-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS
012401644-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

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

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

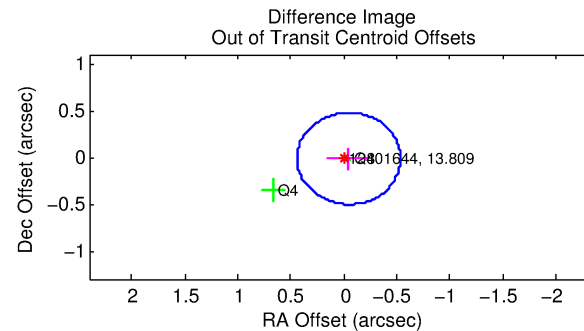
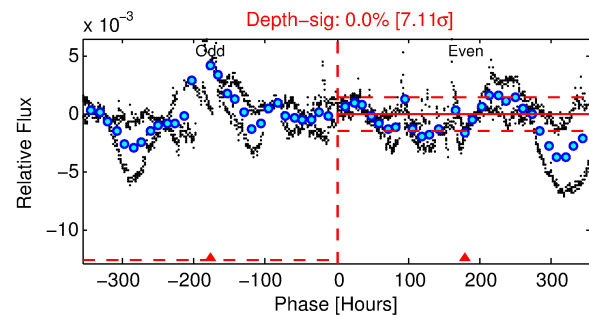
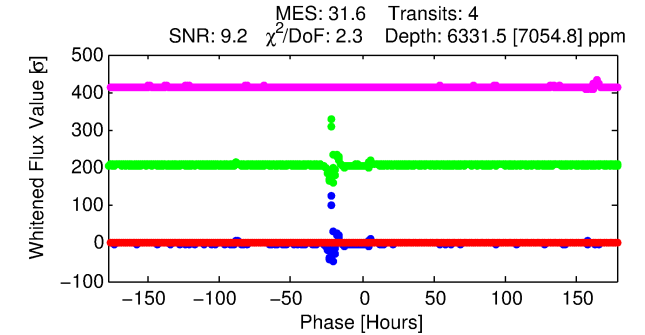
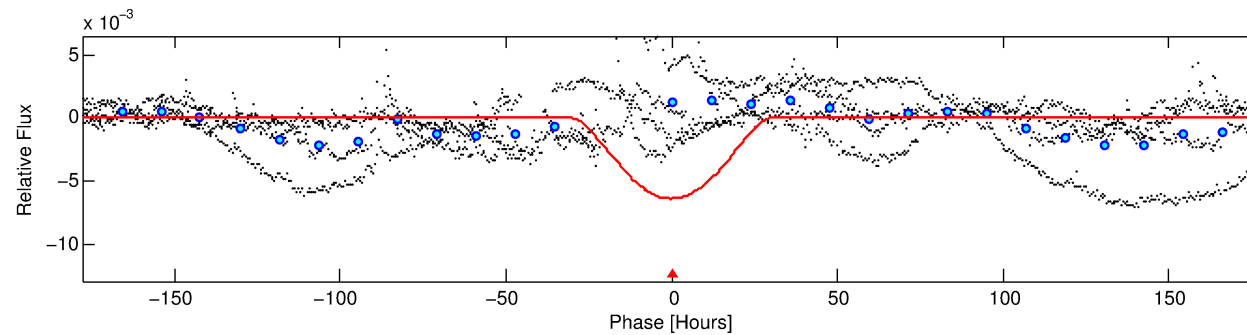
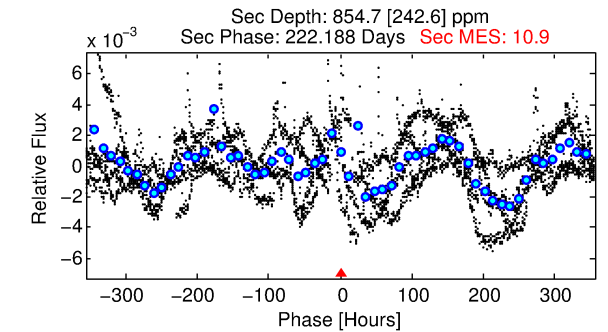
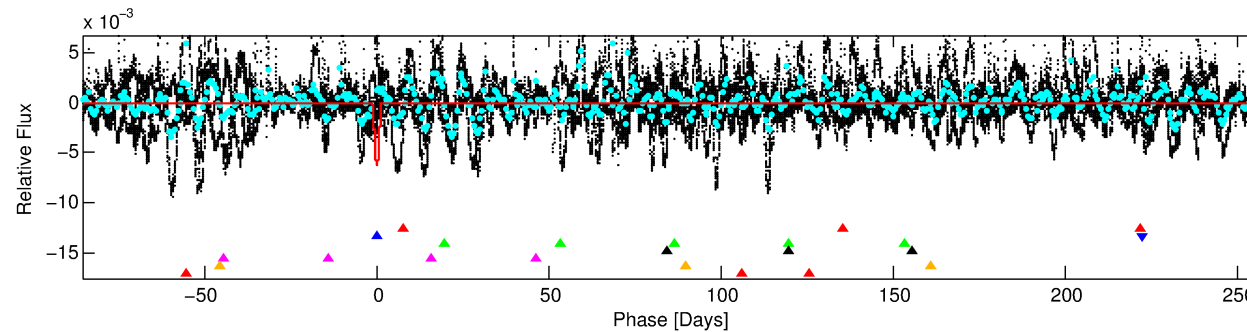
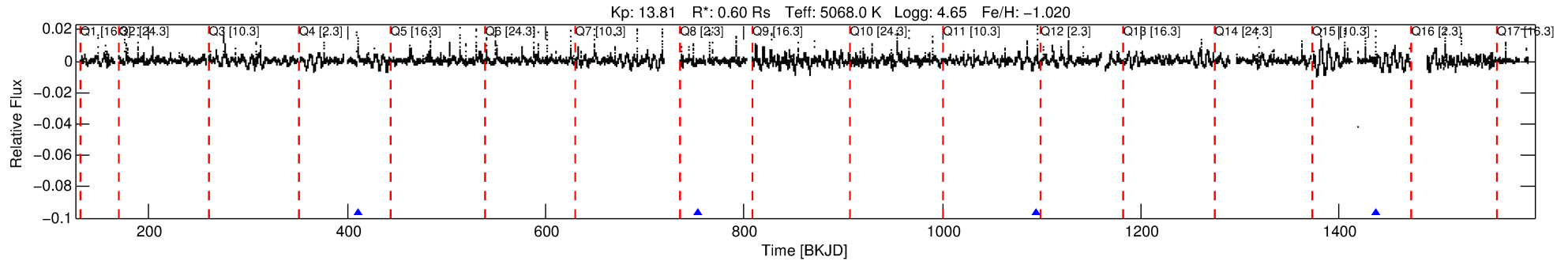
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 012401644-02

No Significant Match Found

# DV One-Page Summary

KIC: 12401644 Candidate: 2 of 7 Period: 342.182 d



## DV Fit Results:

Period = 342.18169 [0.18268] d  
Epoch = 410.8617 [0.3593] BKJD  
Rp/R\* = 0.1350 [0.4477]  
a/R\* = 23.70 [12.36]  
b = 1.00 [0.72]  
Seff = 0.33 [0.06]  
Teq = 193 [8] K  
Rp = 8.91 [29.57] Re  
a = 0.8085 [0.0560] AU  
Ag = 3871.96 [25715.86] [0.15 $\sigma$ ]  
Teffp = 2359 [3917] K [0.55 $\sigma$ ]

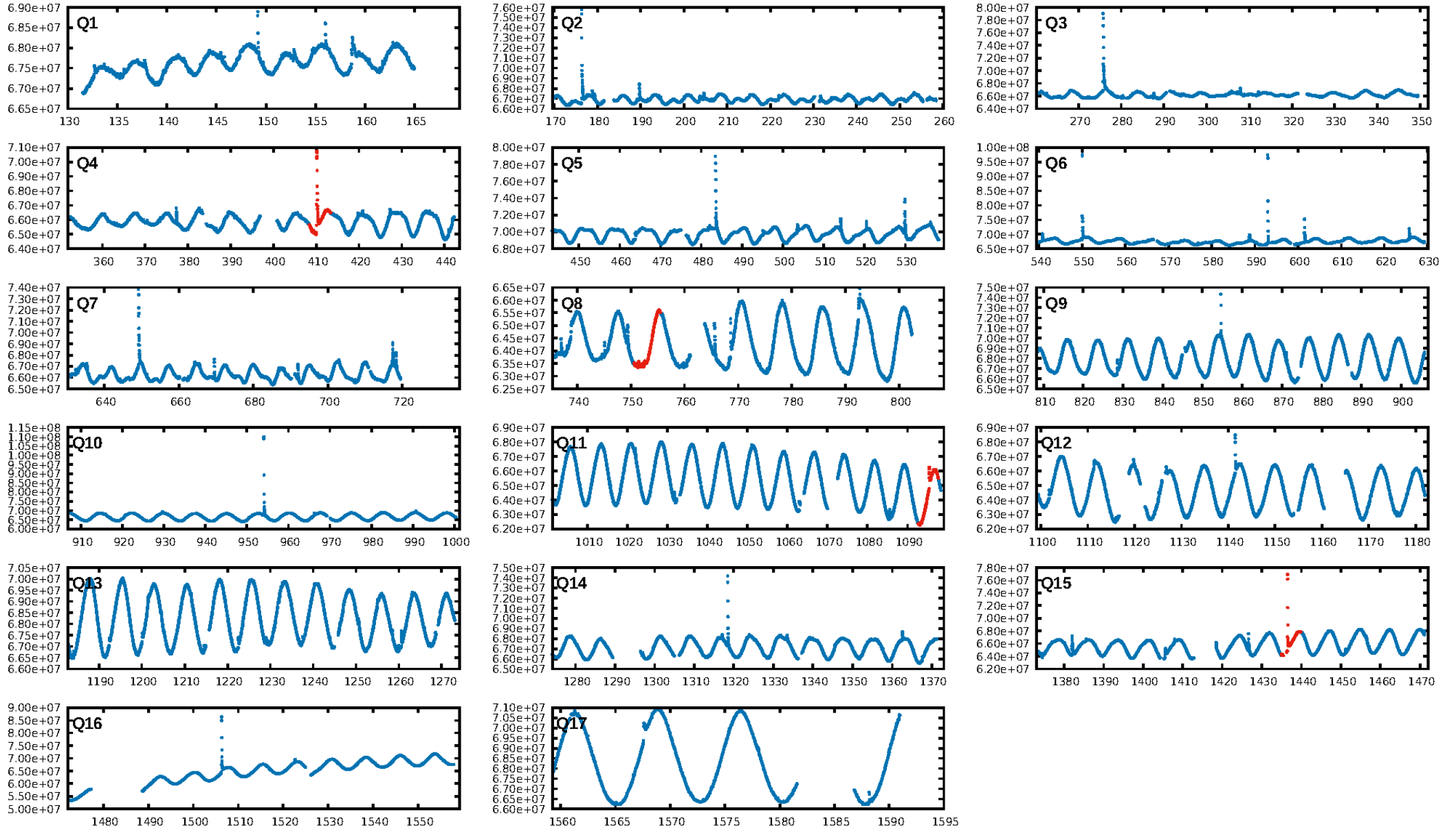
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [12.43 $\sigma$ ]  
LongPeriod-sig: 100.0% [12.20 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 99.2%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 3.388  
Centroid-sig: 12.3%  
Centroid-so: 0.384 arcsec [6.69 $\sigma$ ]  
OotOffset-rm: 0.051 arcsec [0.31 $\sigma$ ]  
KicOffset-rm: 0.121 arcsec [0.49 $\sigma$ ]  
OotOffset-st: 0/0/2/0 [2]  
KicOffset-st: 0/0/2/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [2/2]

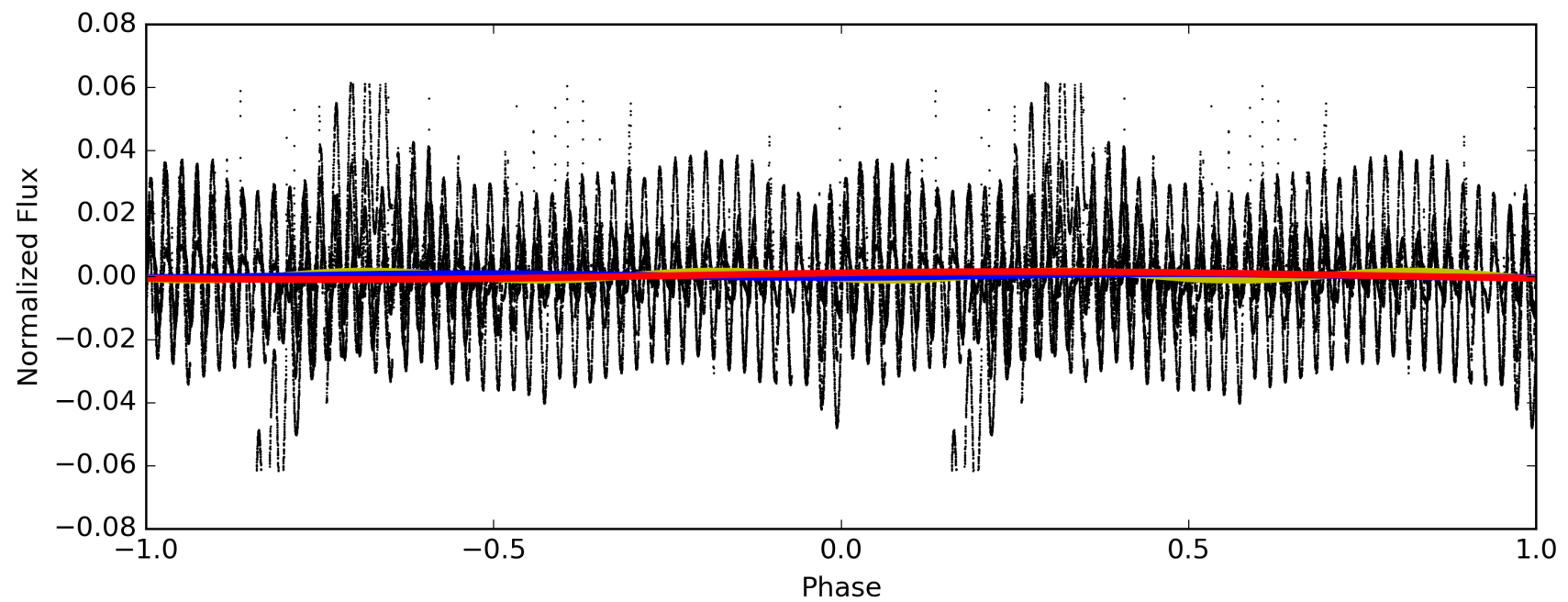
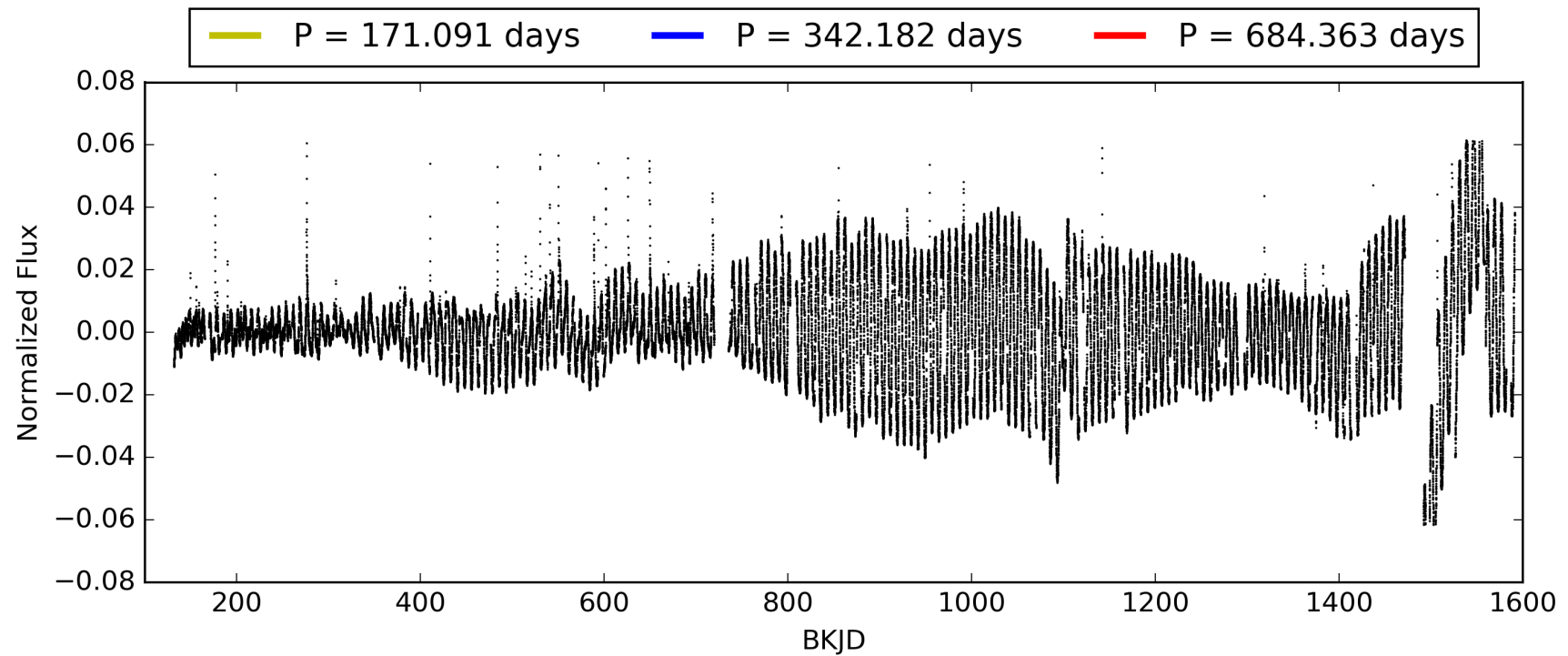
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:16:09 Z

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

# TCE 012401644-02, PDC Light Curves



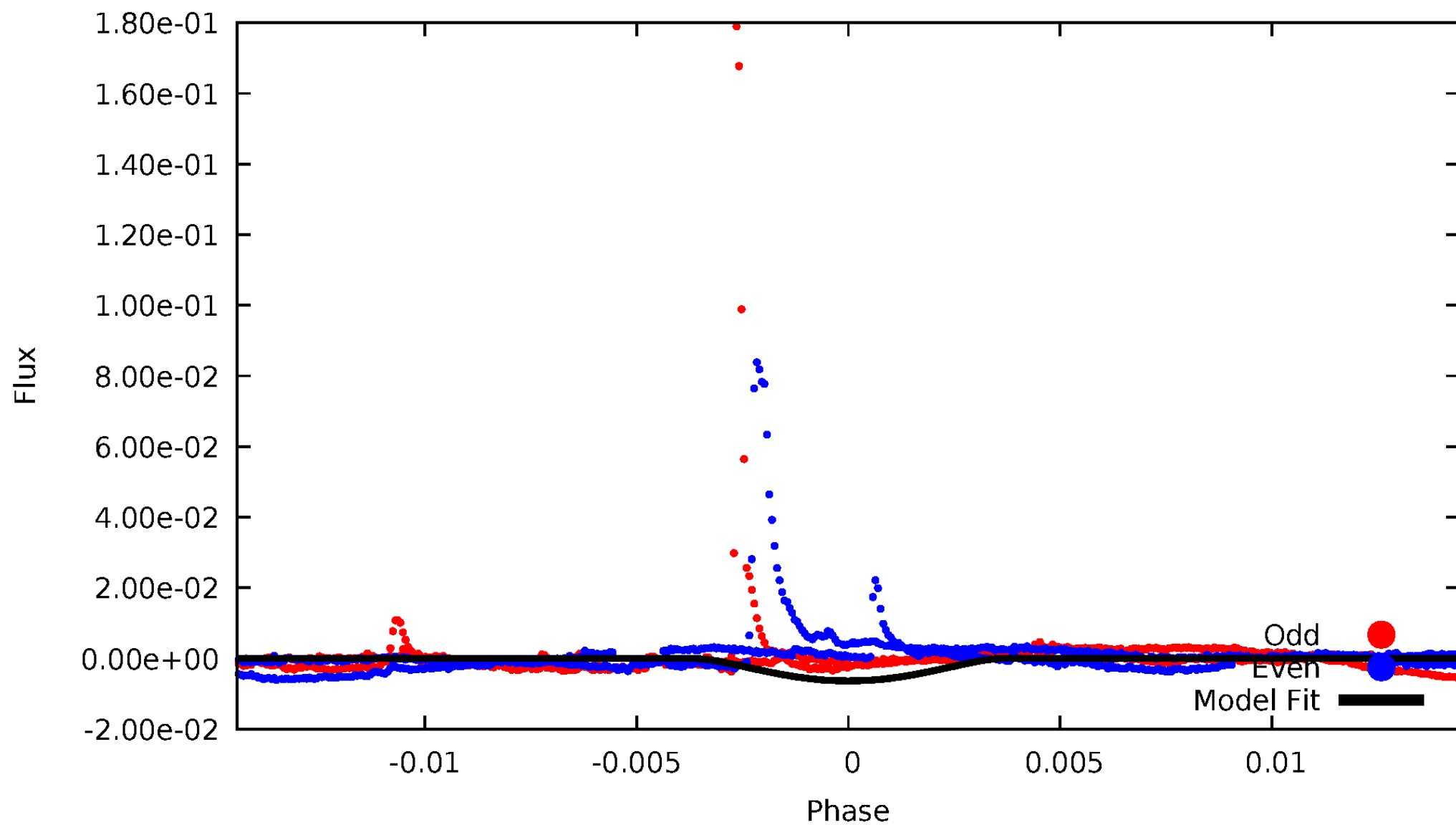
TCE 012401644-02





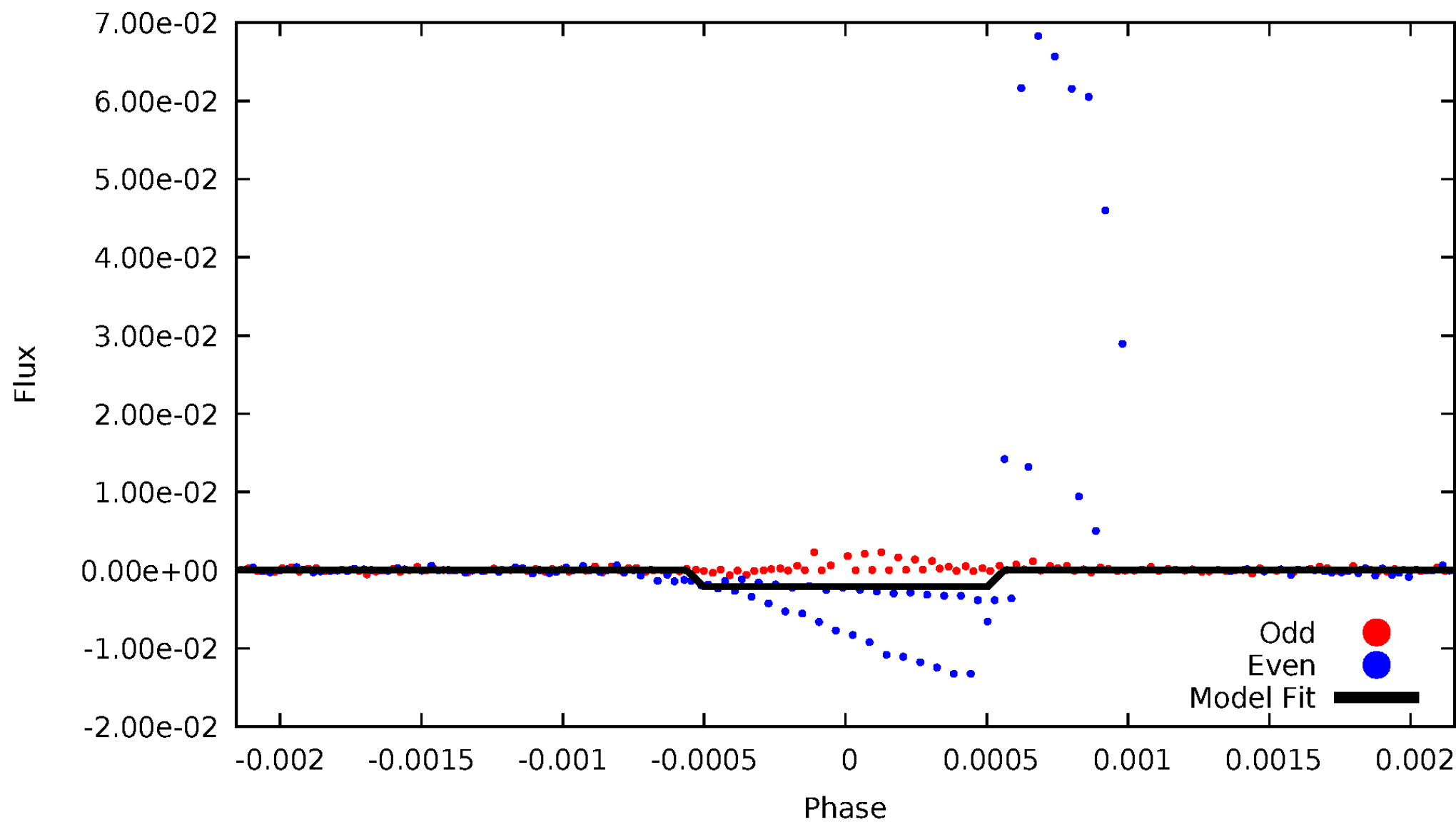
# DV Odd/Even

TCE 012401644-02



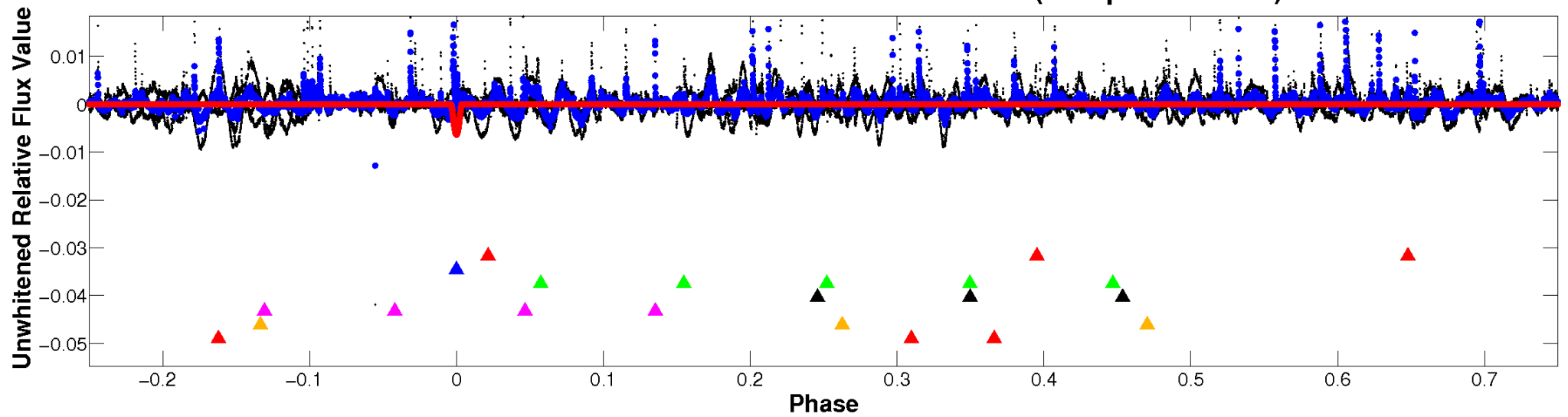
# ALT Odd/Even

TCE 012401644-02

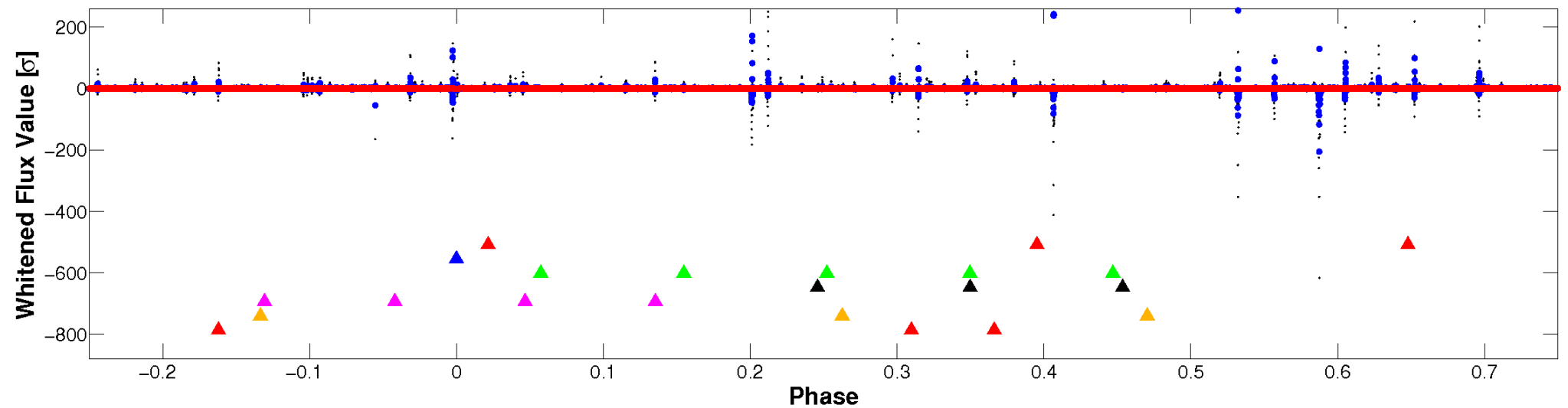


# Non-Whitened Vs. Whitened Light Curve

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

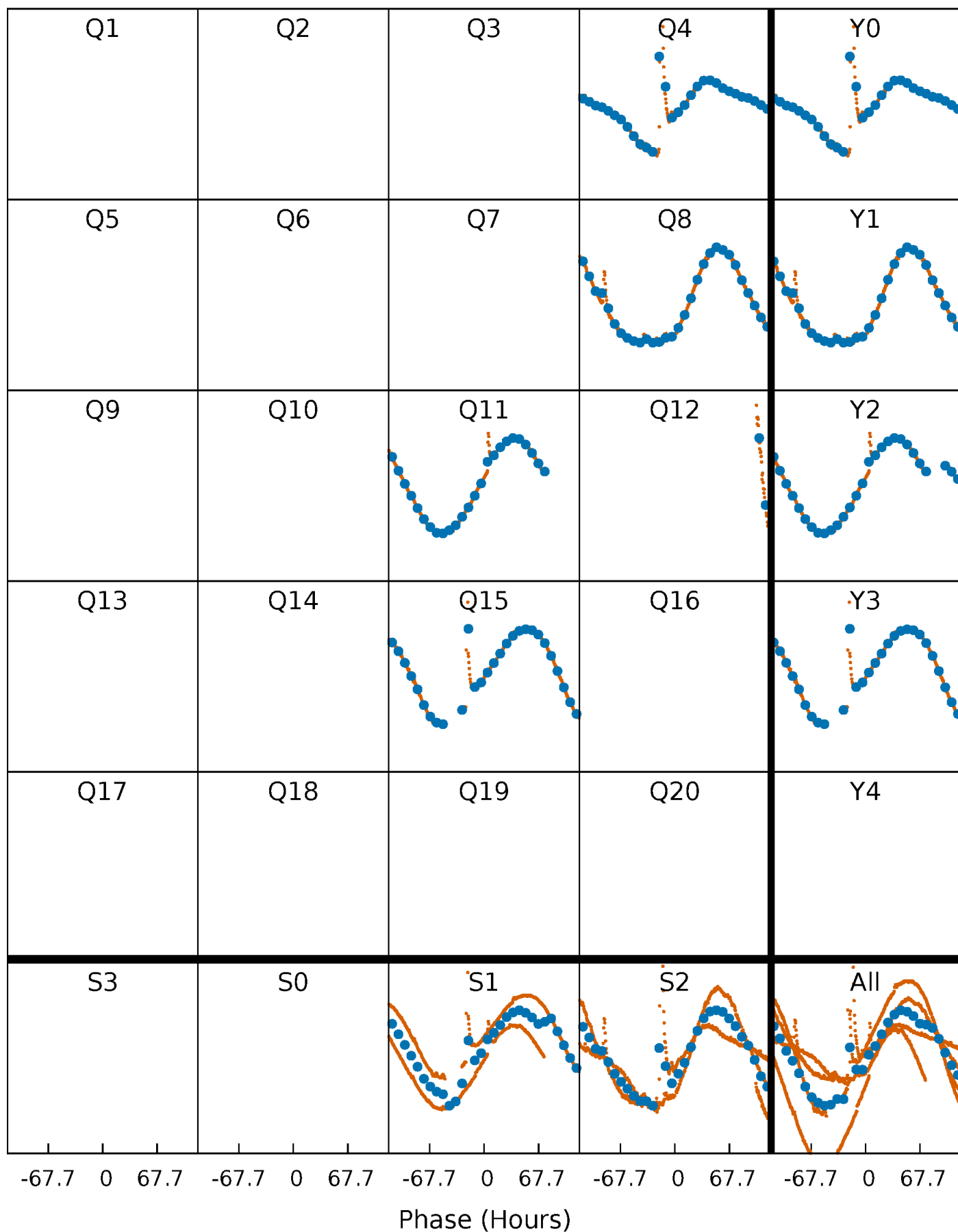


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



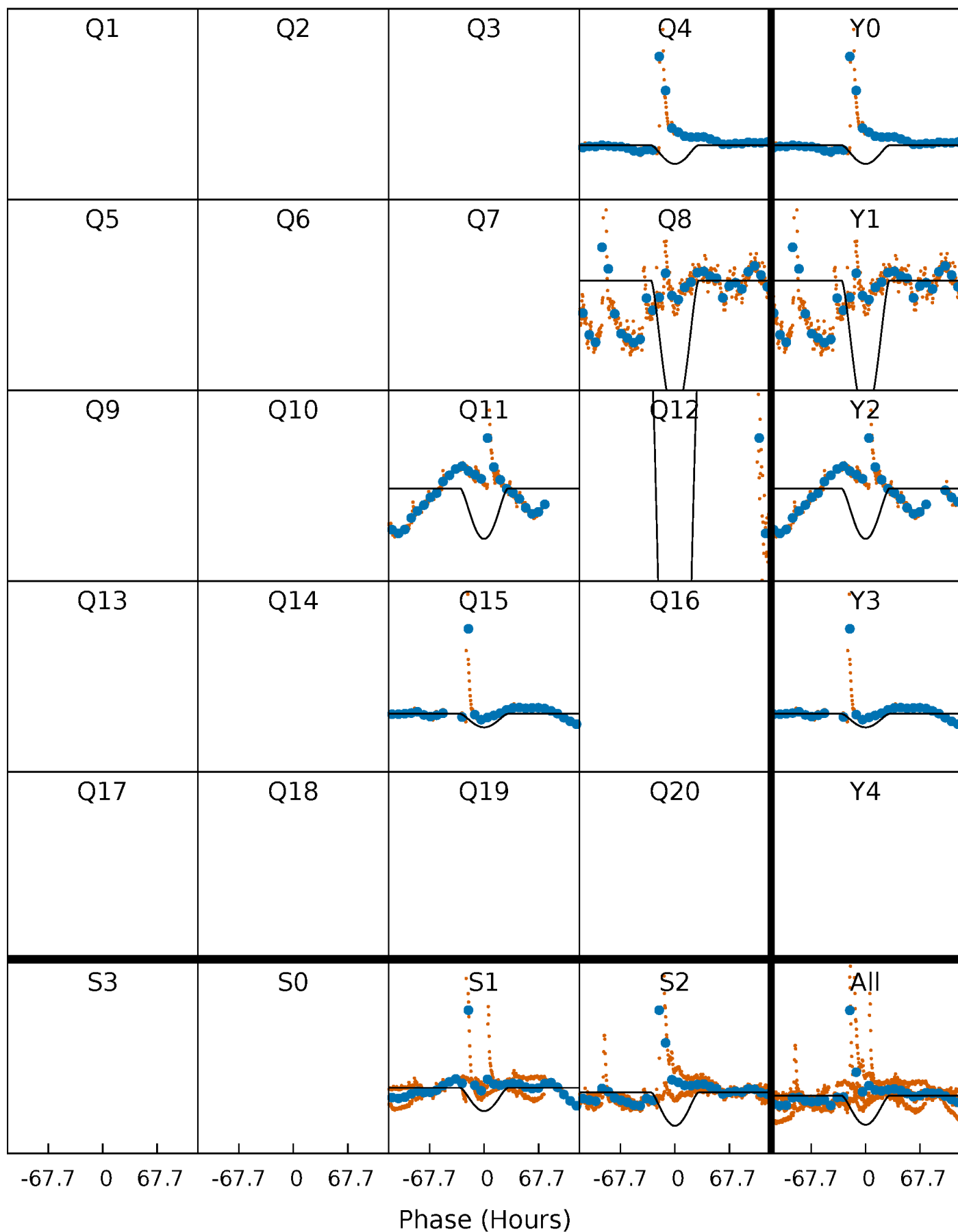
# PDC Quarter-Phased Transit Curves

TCE 012401644-02     $P=342.181691$  Days     $T_0=410.861651$  (BKJD)



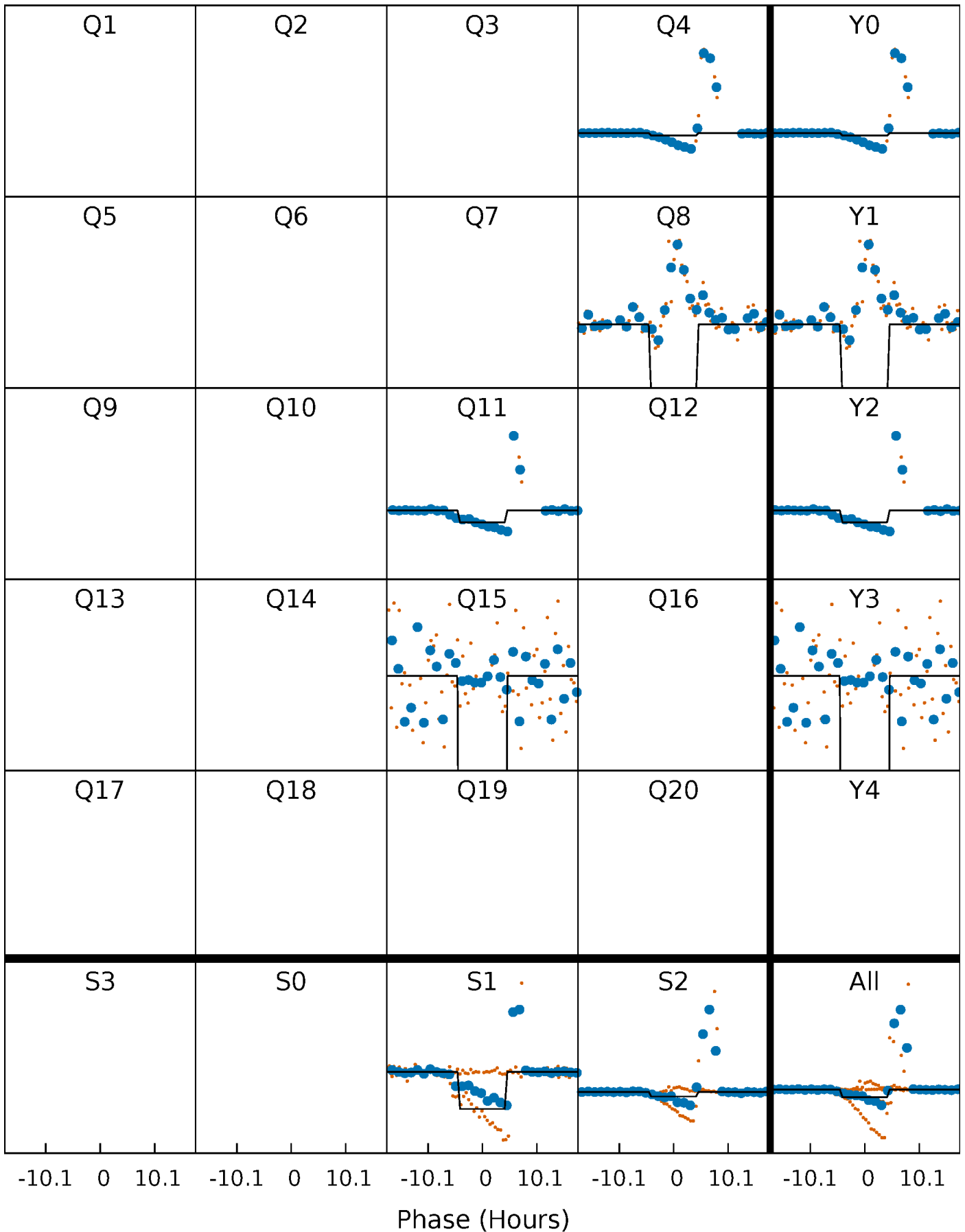
# DV Quarter-Phased Transit Curves

TCE 012401644-02 P=342.181691 Days  $T_0=410.861651$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 012401644-02     $P=342.657179$  Days     $T_0=409.888489$  (BKJD)

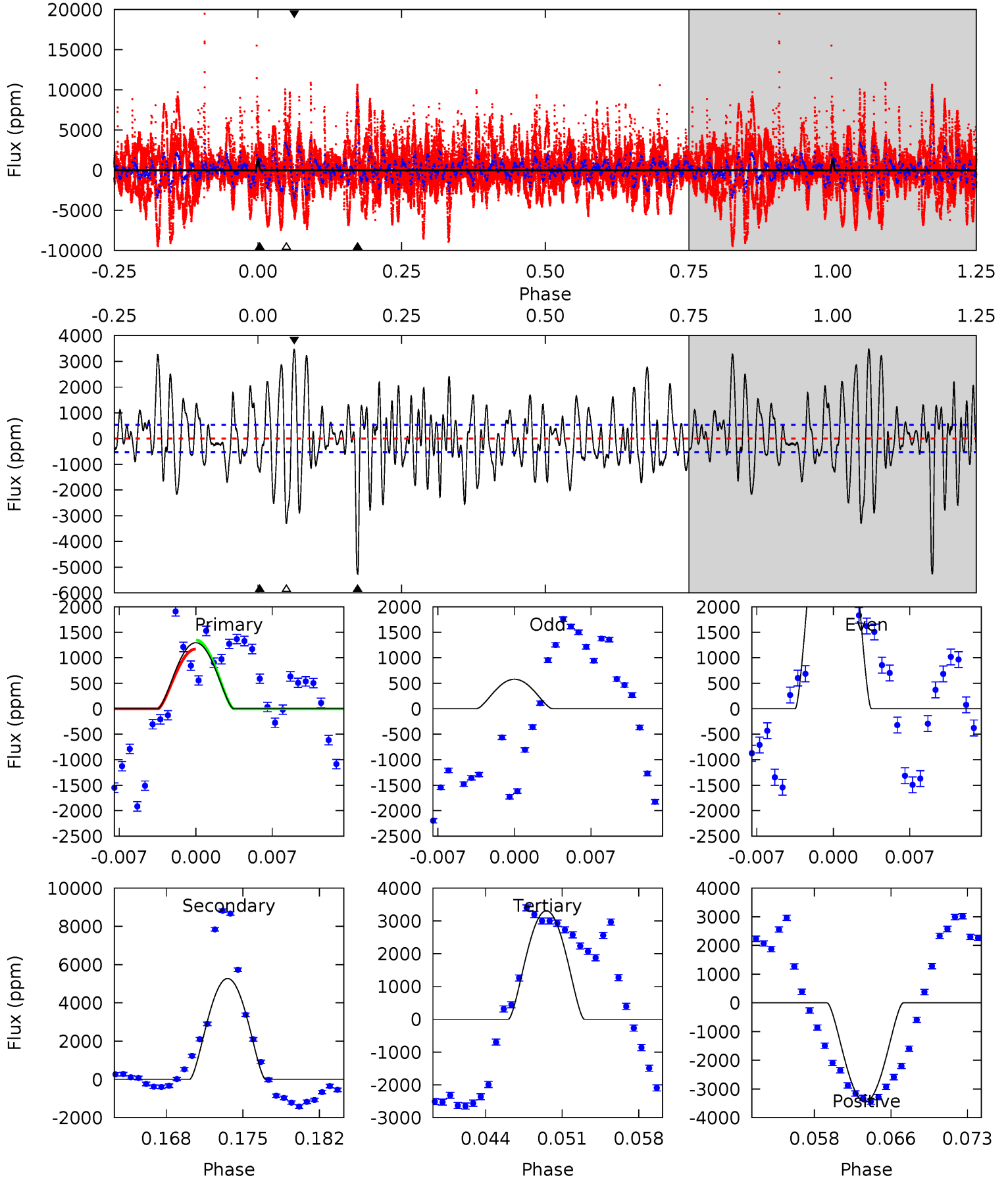




# DV Model-Shift Uniqueness Test

012401644-02,  $P = 342.181691$  Days,  $E = 68.679960$  Days

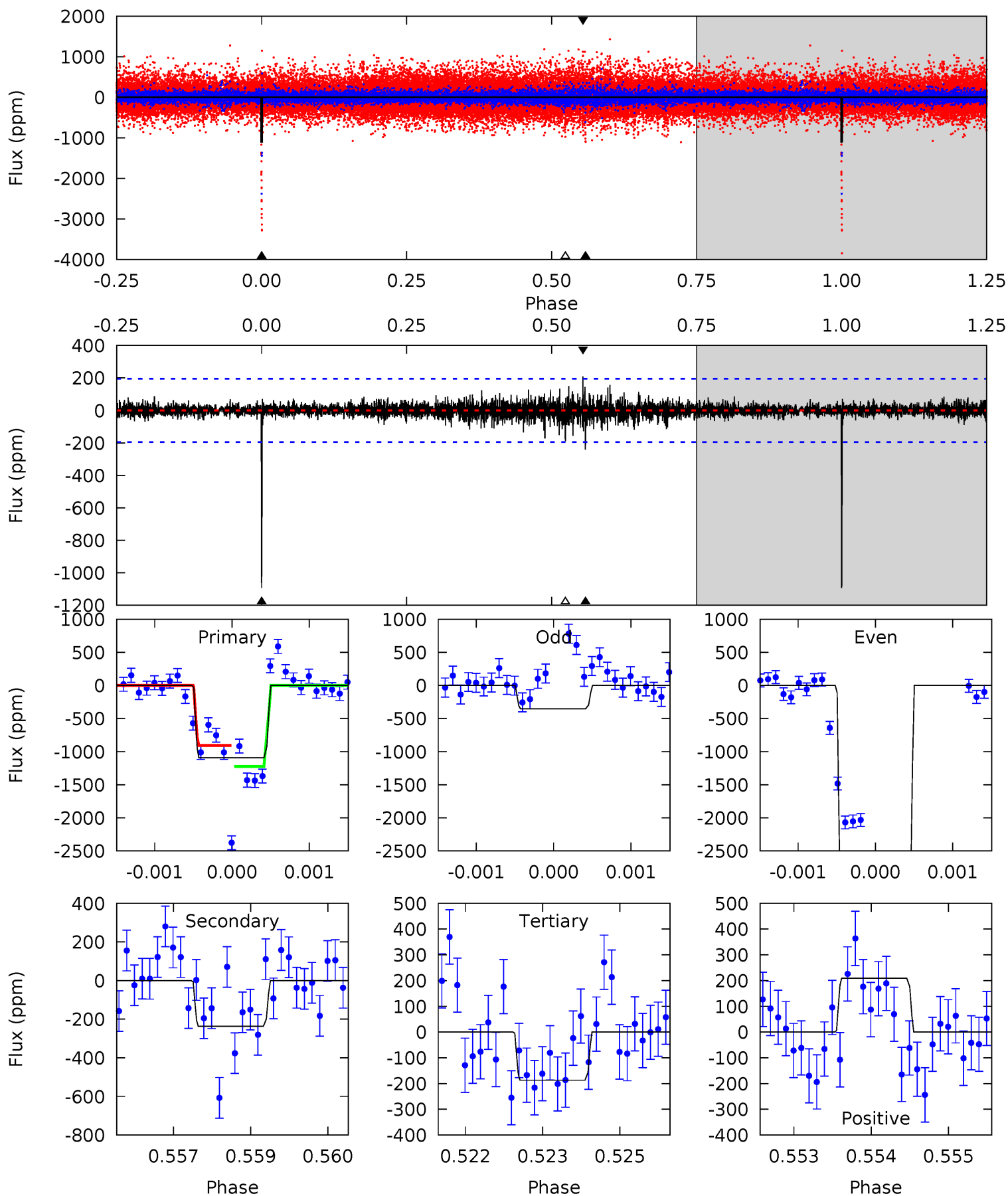
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.4	50.5	31.7	33.1	5.09	2.68	10.6	-19.3	-20.7	18.8	17.4	23.7	1.50	0.40	0.86



# Alt Model-Shift Uniqueness Test

012401644-02, P = 342.657179 Days, E = 67.231310 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
30.4	6.60	5.20	5.83	5.43	3.26	0.82	25.2	24.6	1.40	0.77	53.6	1.85	0.16	4.35



### Stellar Parameters For KIC 012401644

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5068^{+166}_{-151}$	$4.654^{+0.060}_{-0.040}$	$-1.020^{+0.300}_{-0.300}$	$0.605^{+0.047}_{-0.042}$	$0.601^{+0.052}_{-0.021}$	$3.832^{+0.868}_{-0.590}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-7%	+9%/-3%	+23%/-15%
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 012401644-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-5275 \pm 104$	$22.31^{+24.54}_{-15.42}$	$269^{+9}_{-9}$	$2988^{+1381}_{-523}$	$3852^{+35913}_{-2975}$
Alt.	$-237 \pm 36$	$20.92^{+21.38}_{-14.82}$	$269^{+10}_{-9}$	$2081^{+683}_{-274}$	$197^{+2119}_{-150}$

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

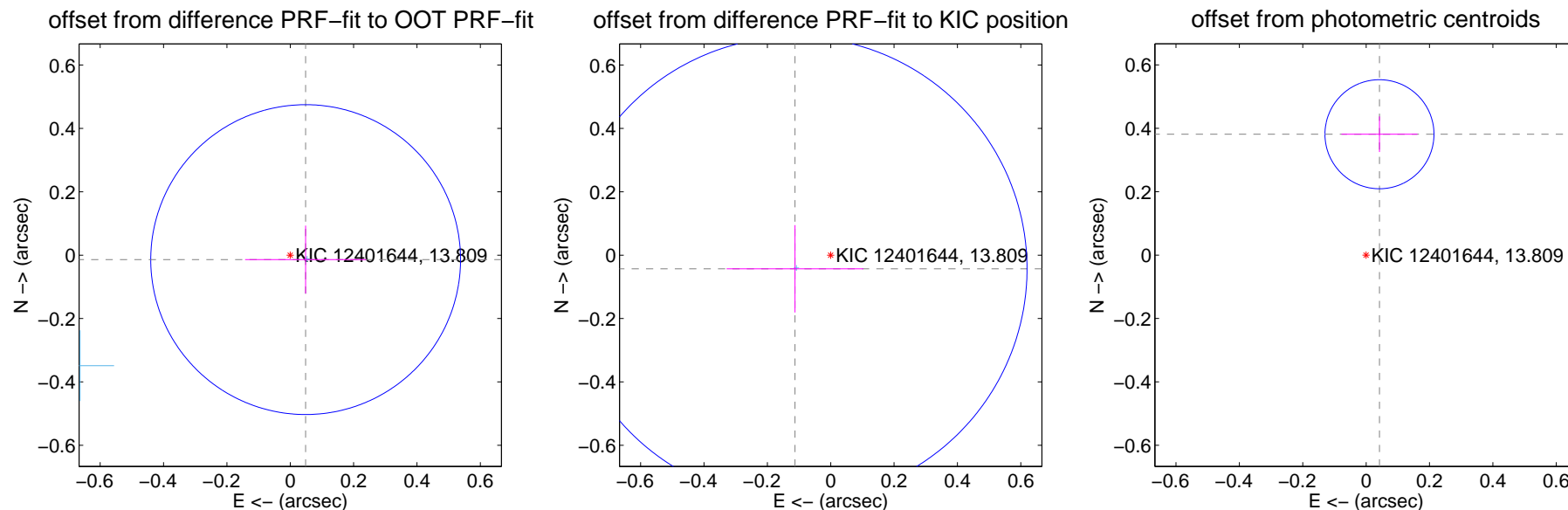
## DV Centroid Data

Supplemental centroid analysis for 012401644-02. Kepler magnitude: 13.81. Transit SNR 9.23

There are 2 quarters with good PRF difference image offsets

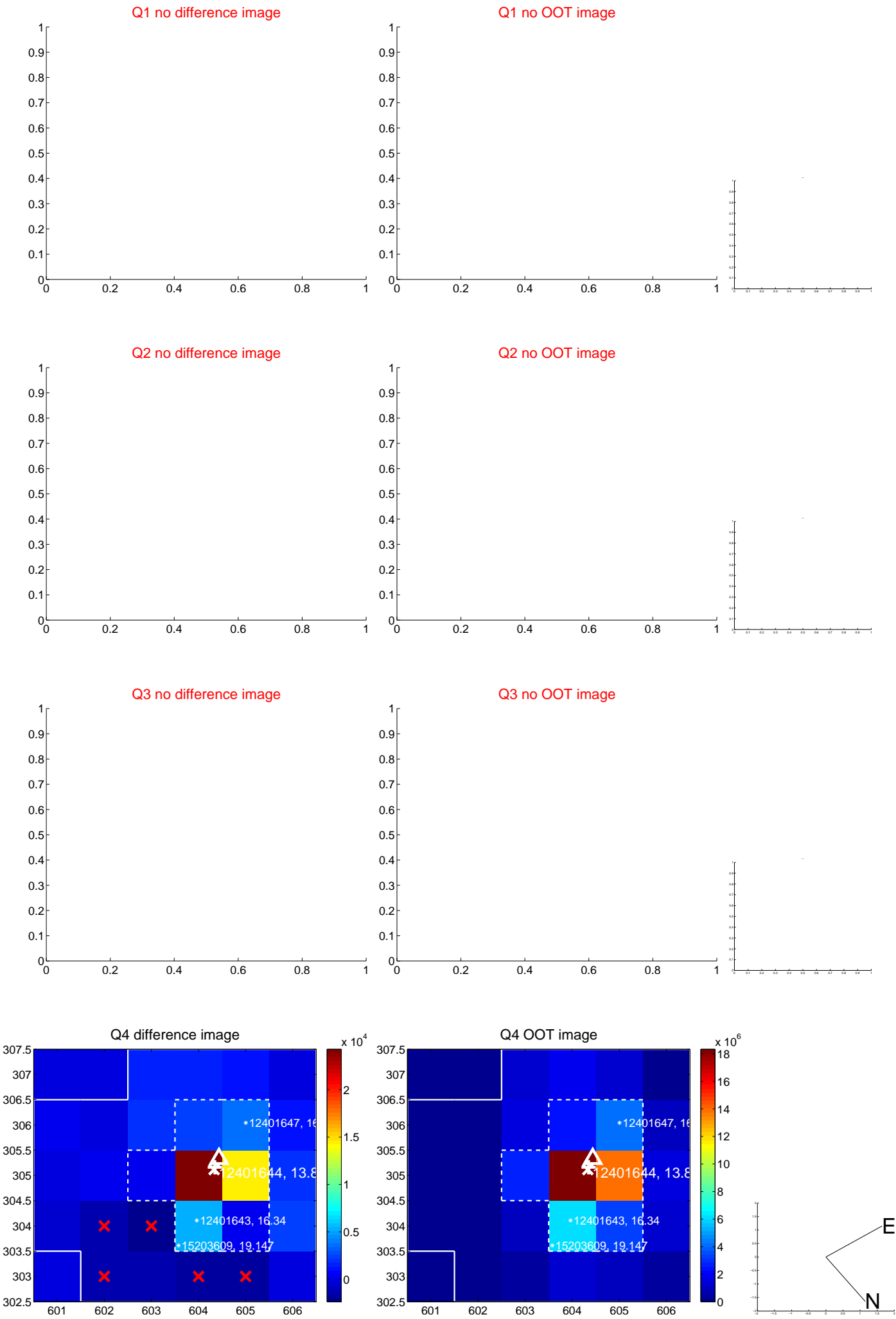
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.051 \pm 0.163$	0.31	$-0.049 \pm 0.191$	$-0.014 \pm 0.107$
PRF-fit source offset from KIC position	$0.121 \pm 0.244$	0.49	$0.113 \pm 0.216$	$-0.043 \pm 0.138$
photometric centroid source offset	$0.38 \pm 0.06$	6.69	$-0.04 \pm 0.12$	$0.38 \pm 0.06$

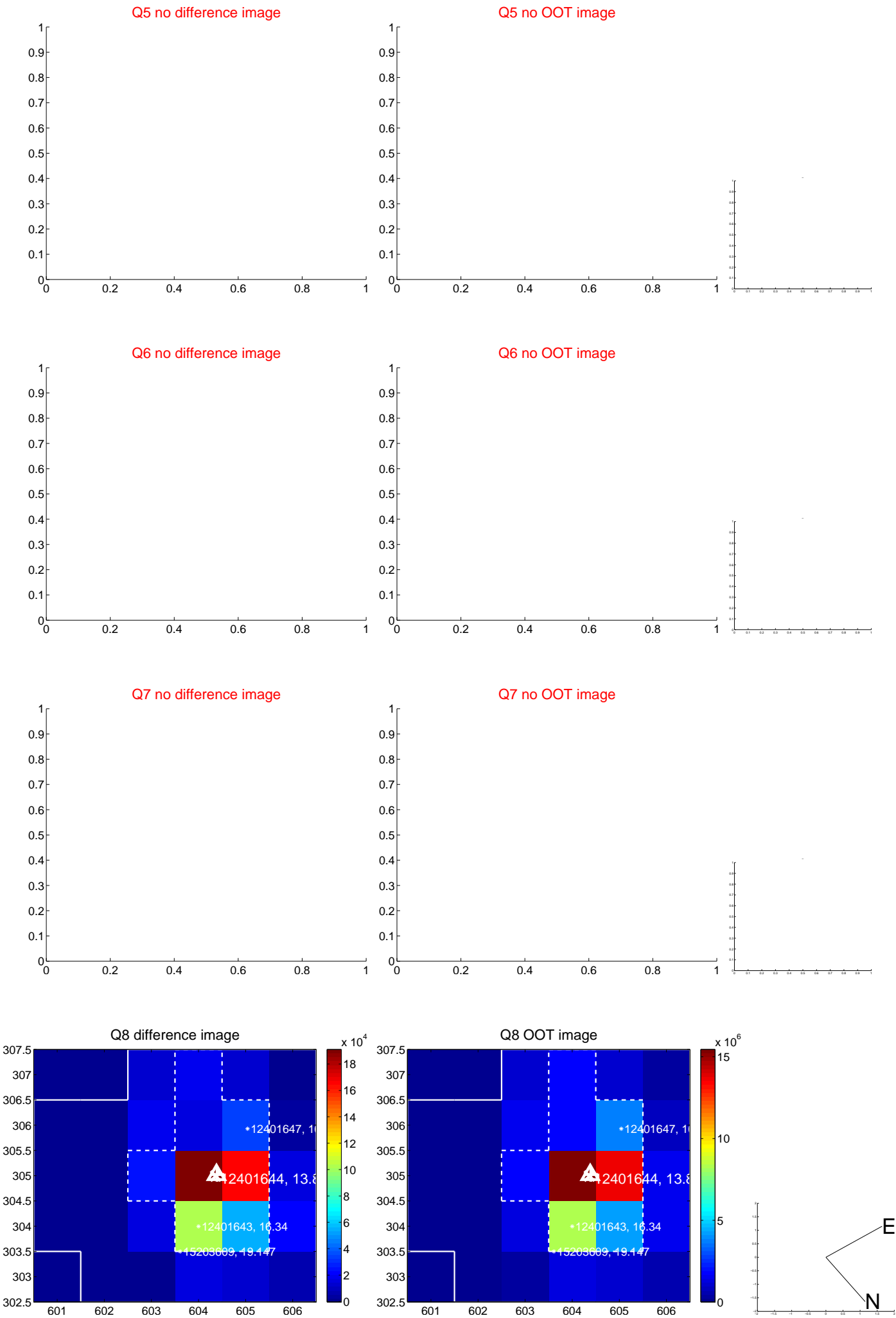


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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





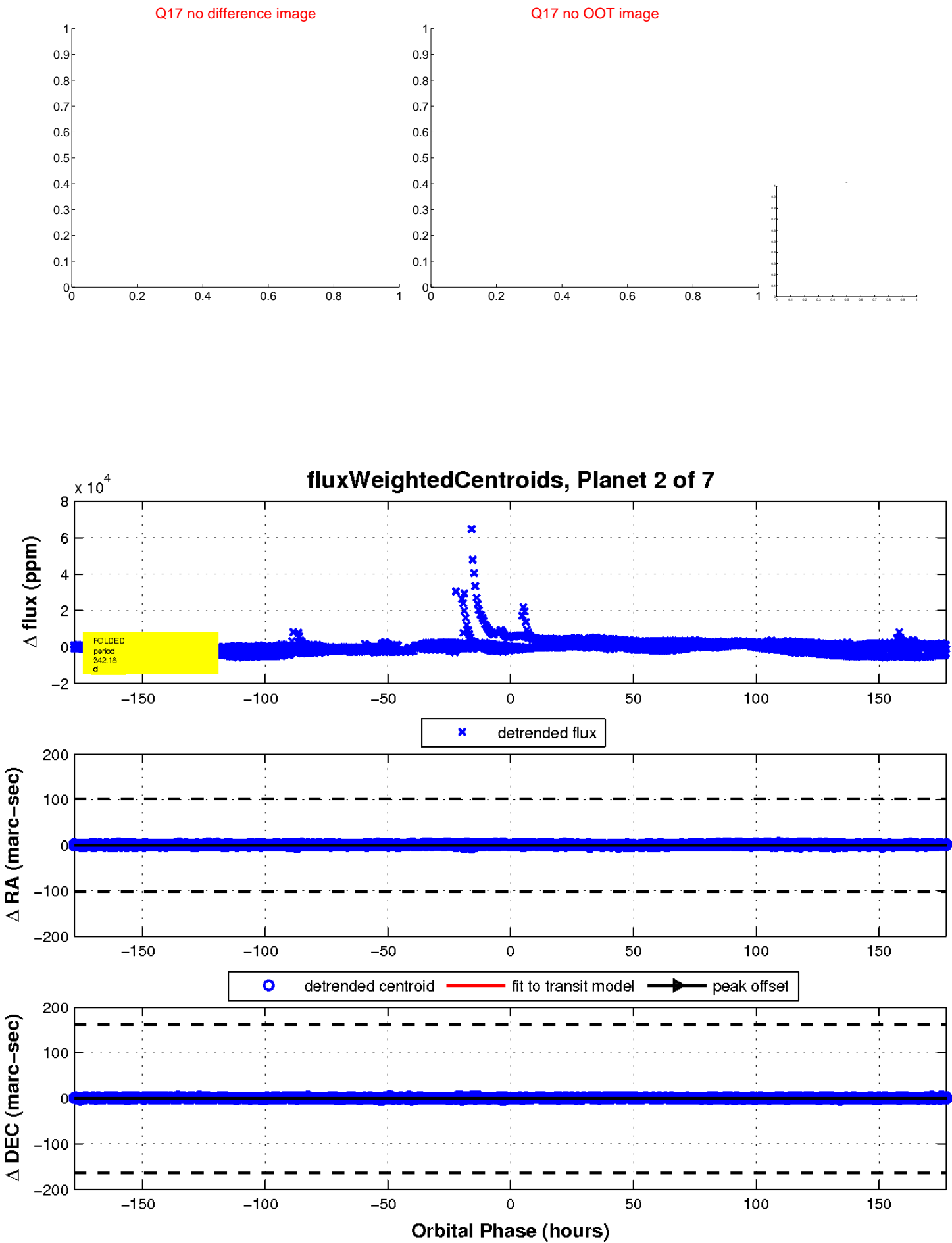
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



Declination

# KIC 012401644

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012401644-02	OBS	No	342.181691	410.861651	6331.5	59.277	31.6	9.2	0.60	5068	8.91	0.33
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012401644-07	OBS	No	503.616269	193.981537	1102.4	12.459	13.9	6.7	0.60	5068	2.04	0.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012401644-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS
012401644-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS
012401644-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

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

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

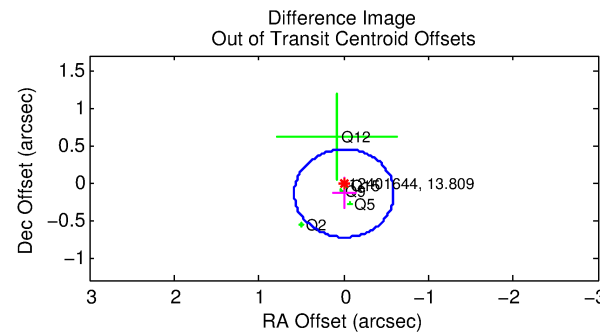
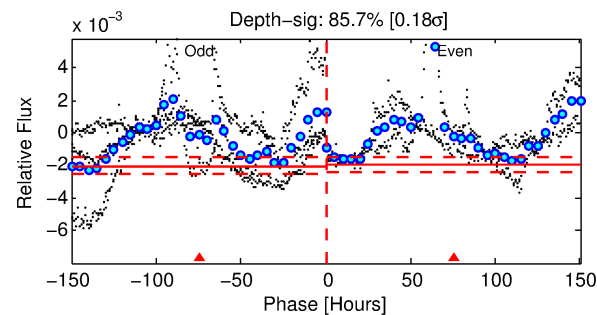
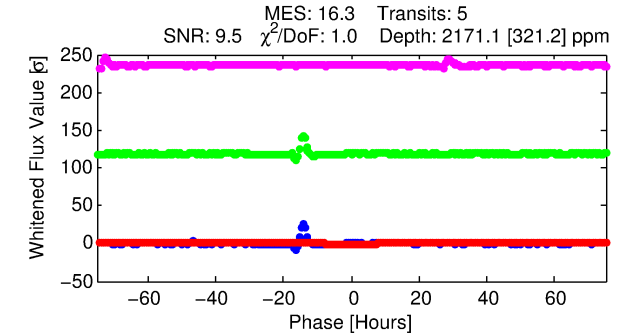
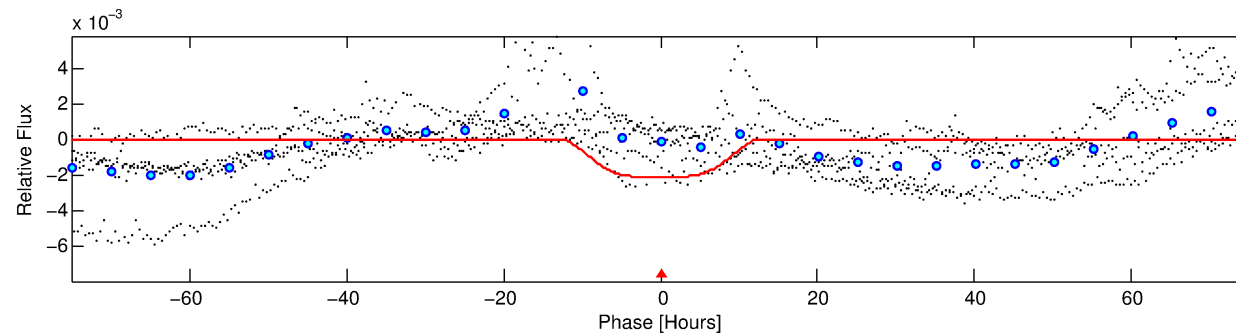
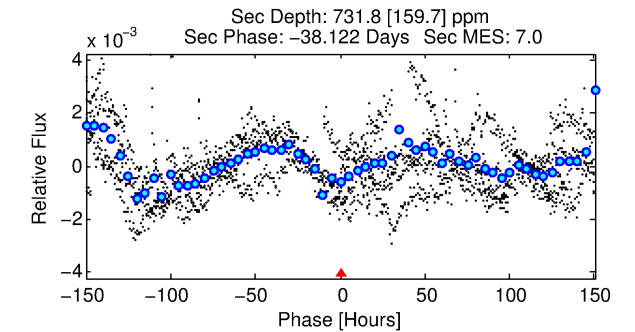
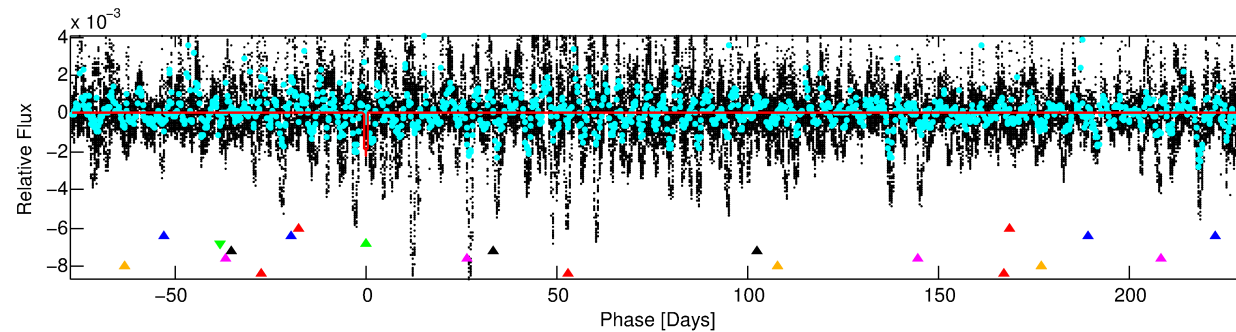
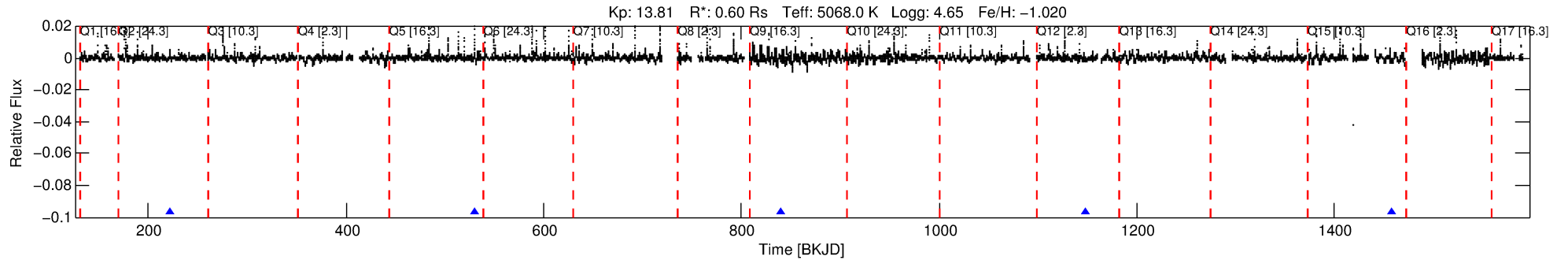
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012401644-03

No Significant Match Found

# DV One-Page Summary

KIC: 12401644 Candidate: 3 of 7 Period: 308.858 d



## DV Fit Results:

Period = 308.85765 [0.01033] d  
Epoch = 221.6238 [0.0261] BKJD  
Rp/R\* = 0.0530 [0.0041]  
a/R\* = 47.27 [3.34]  
b = 0.93 [0.01]  
Seff = 0.38 [0.06]  
Teq = 200 [8] K  
Rp = 3.50 [0.39] Re  
a = 0.7552 [0.0523] AU  
Ag = 18787.57 [5422.15] [3.46σ]  
Teffp = 3622 [271] K [12.64σ]

## DV Diagnostic Results:

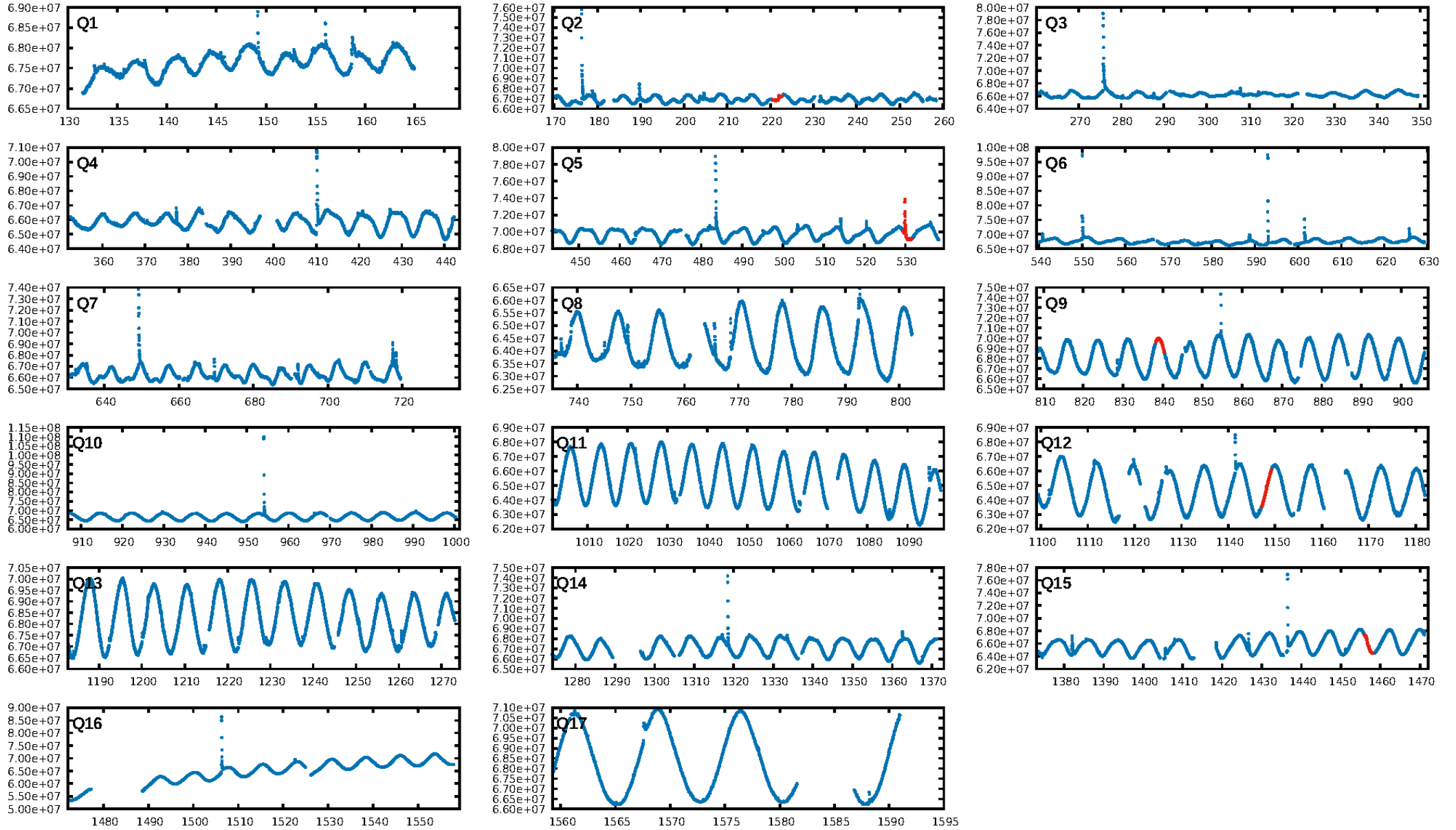
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [12.43σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 1.438  
Centroid-sig: 9.4%  
Centroid-so: 0.556 arcsec [2.29σ]  
OotOffset-rm: 0.142 arcsec [0.72σ]  
KicOffset-rm: 0.145 arcsec [0.67σ]  
OotOffset-st: 1/1/1/2 [5]  
KicOffset-st: 1/1/1/2 [5]  
DiffImageQuality-fgm: 0.60 [3/5]  
DiffImageOverlap-fno: 1.00 [5/5]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:16:15 Z

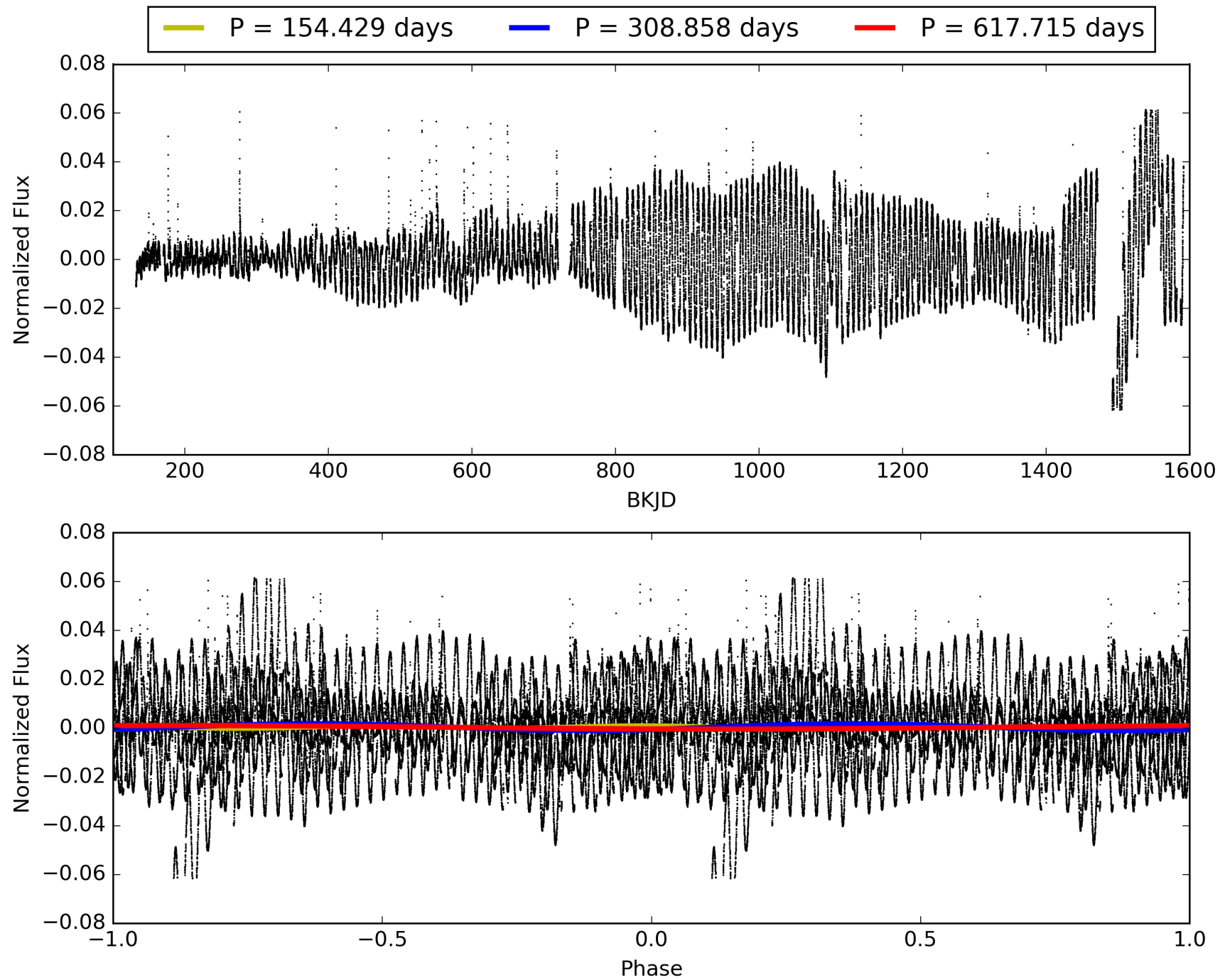
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 012401644-03, PDC Light Curves

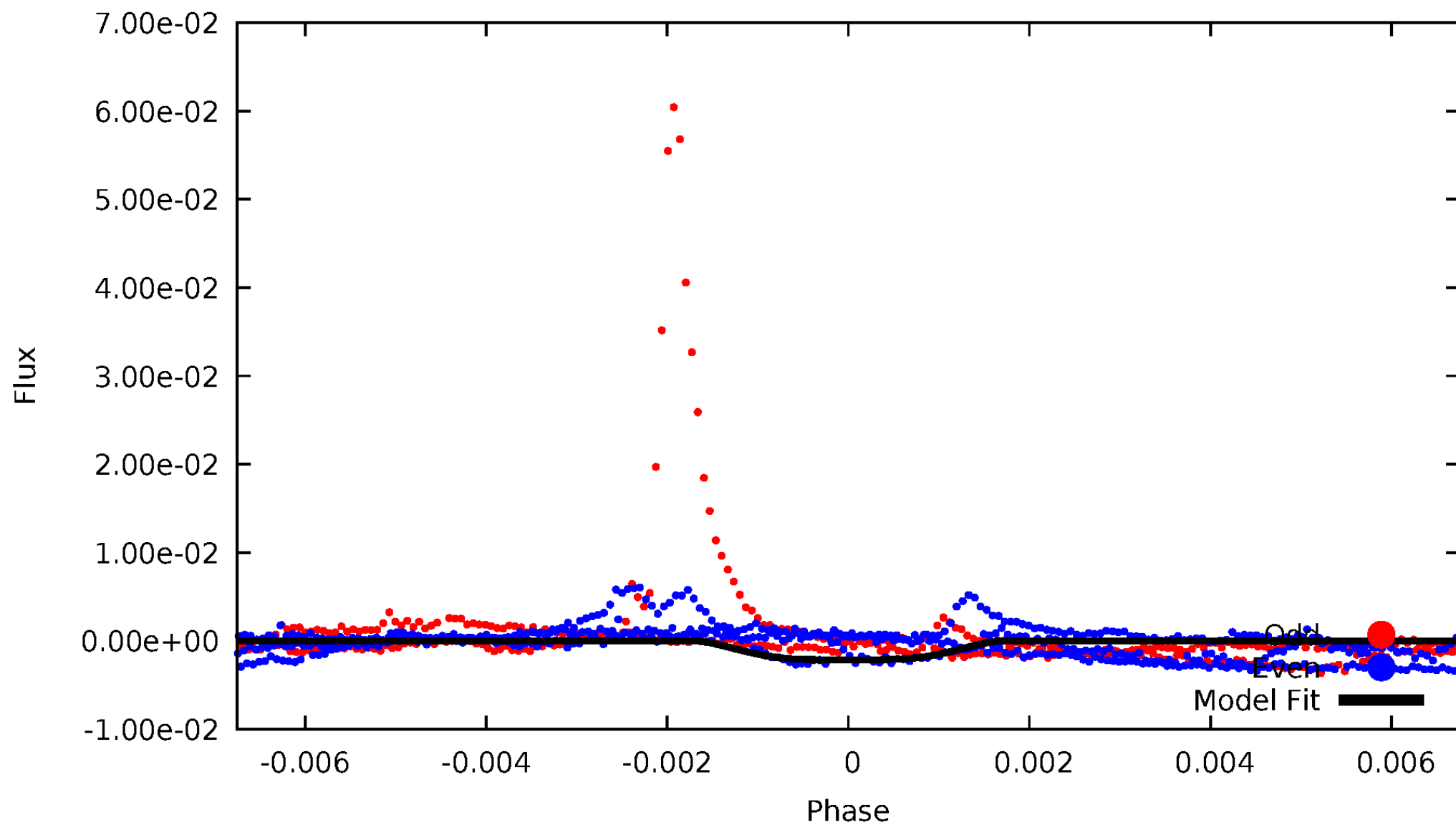


# TCE 012401644-03



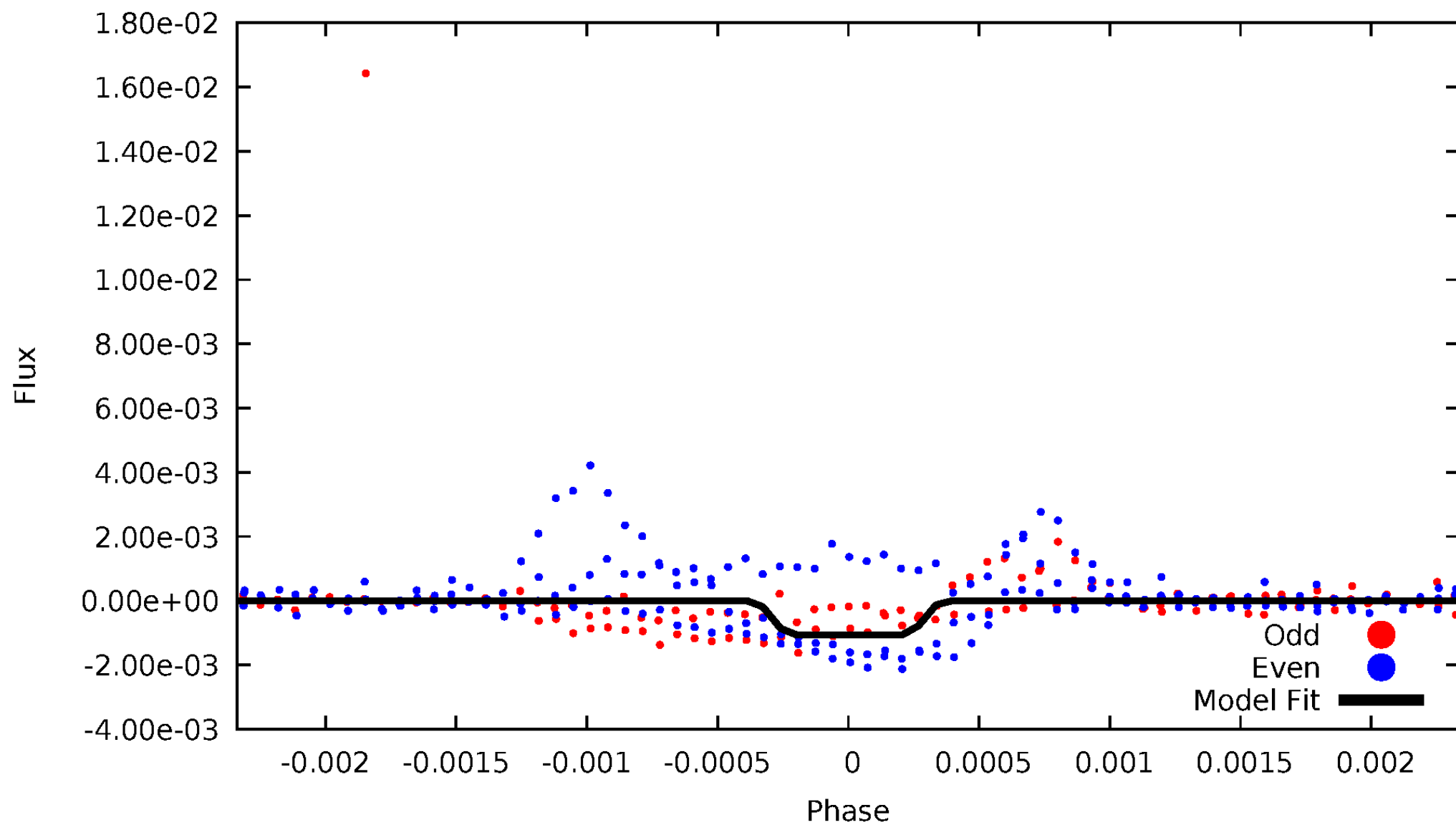
# DV Odd/Even

TCE 012401644-03



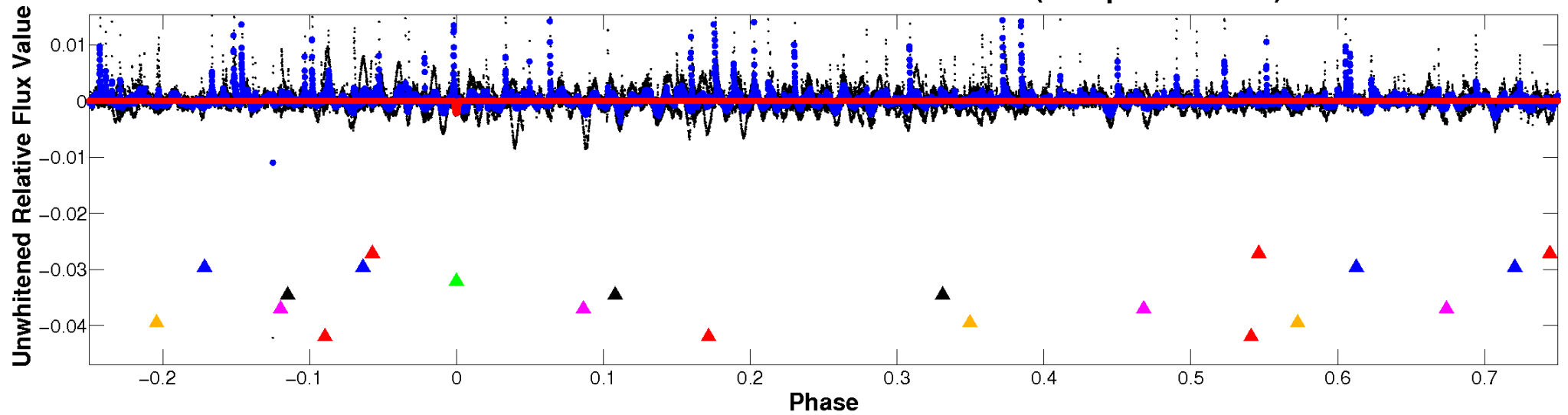
# ALT Odd/Even

TCE 012401644-03

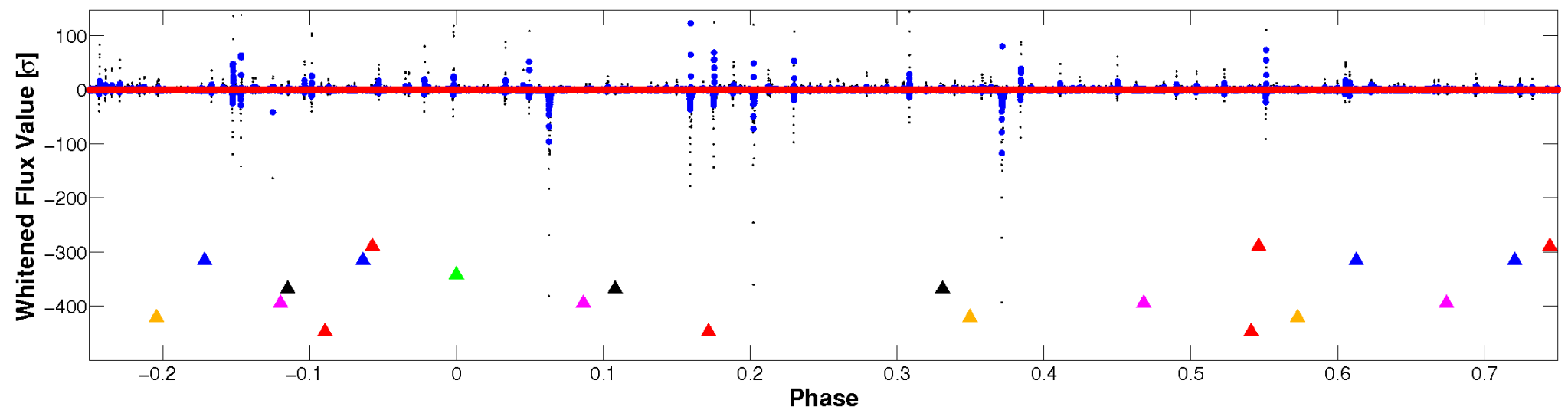


# Non-Whitened Vs. Whitened Light Curve

## Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

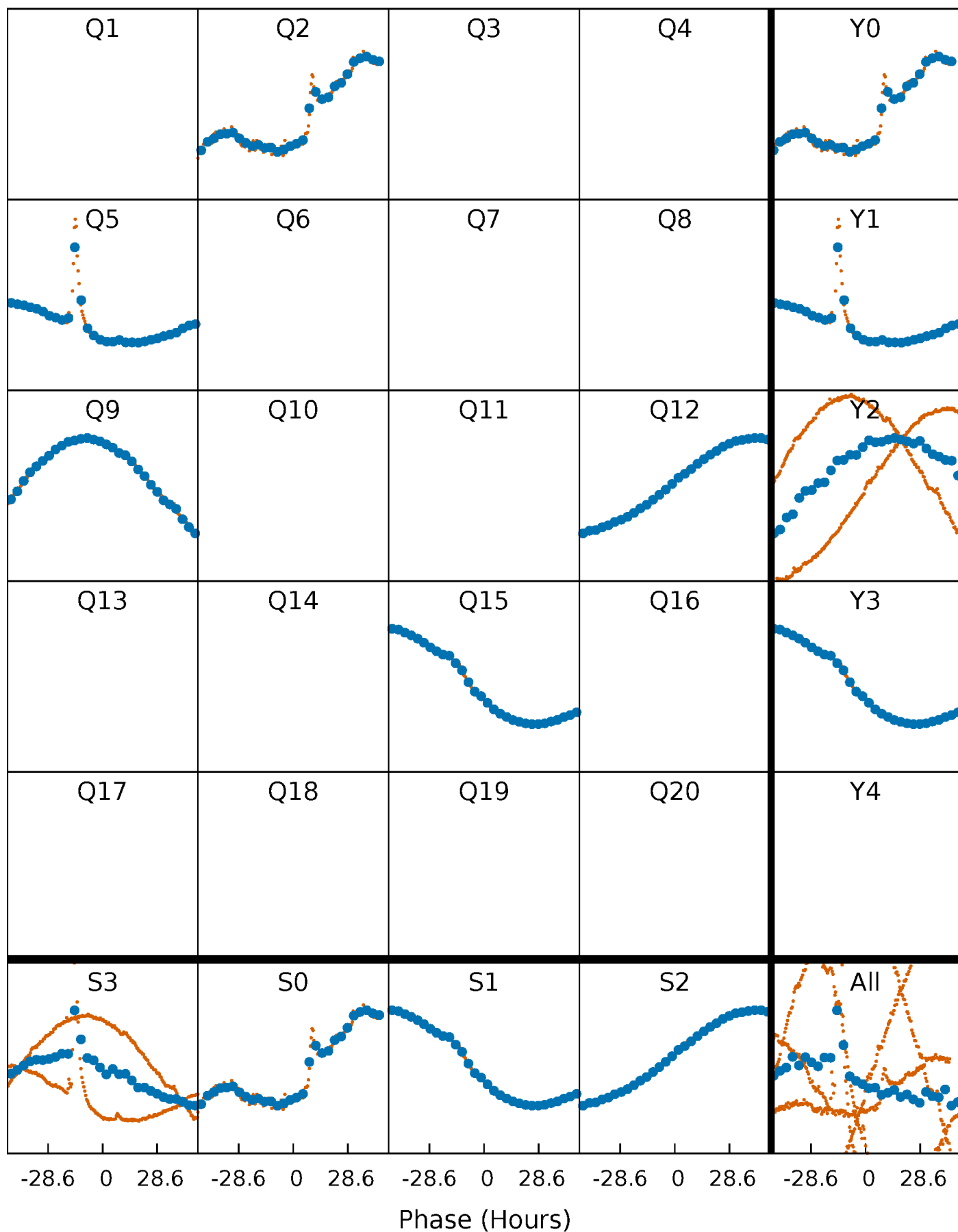


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

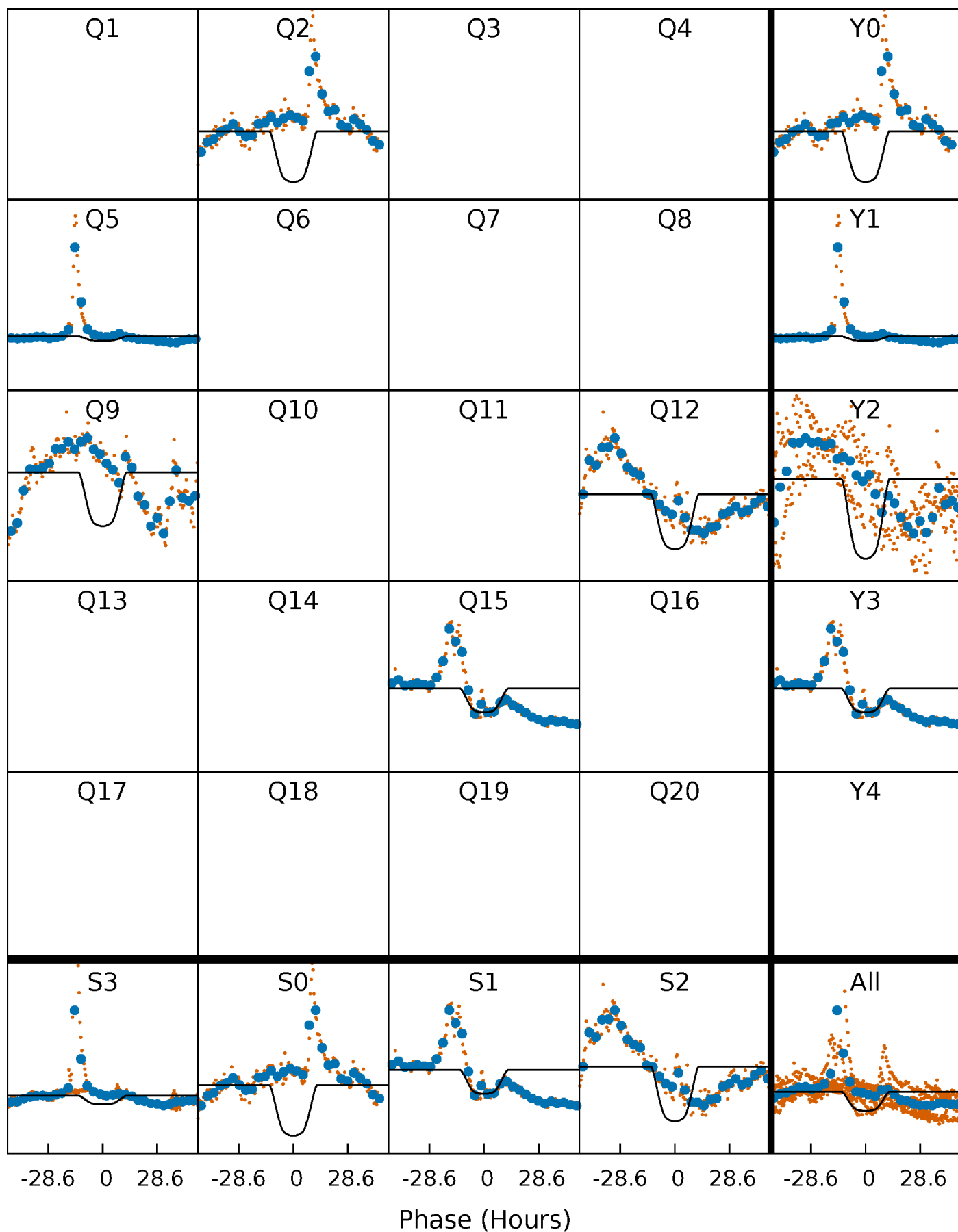
TCE 012401644-03 P=308.857651 Days  $T_0=221.623847$  (BKJD)





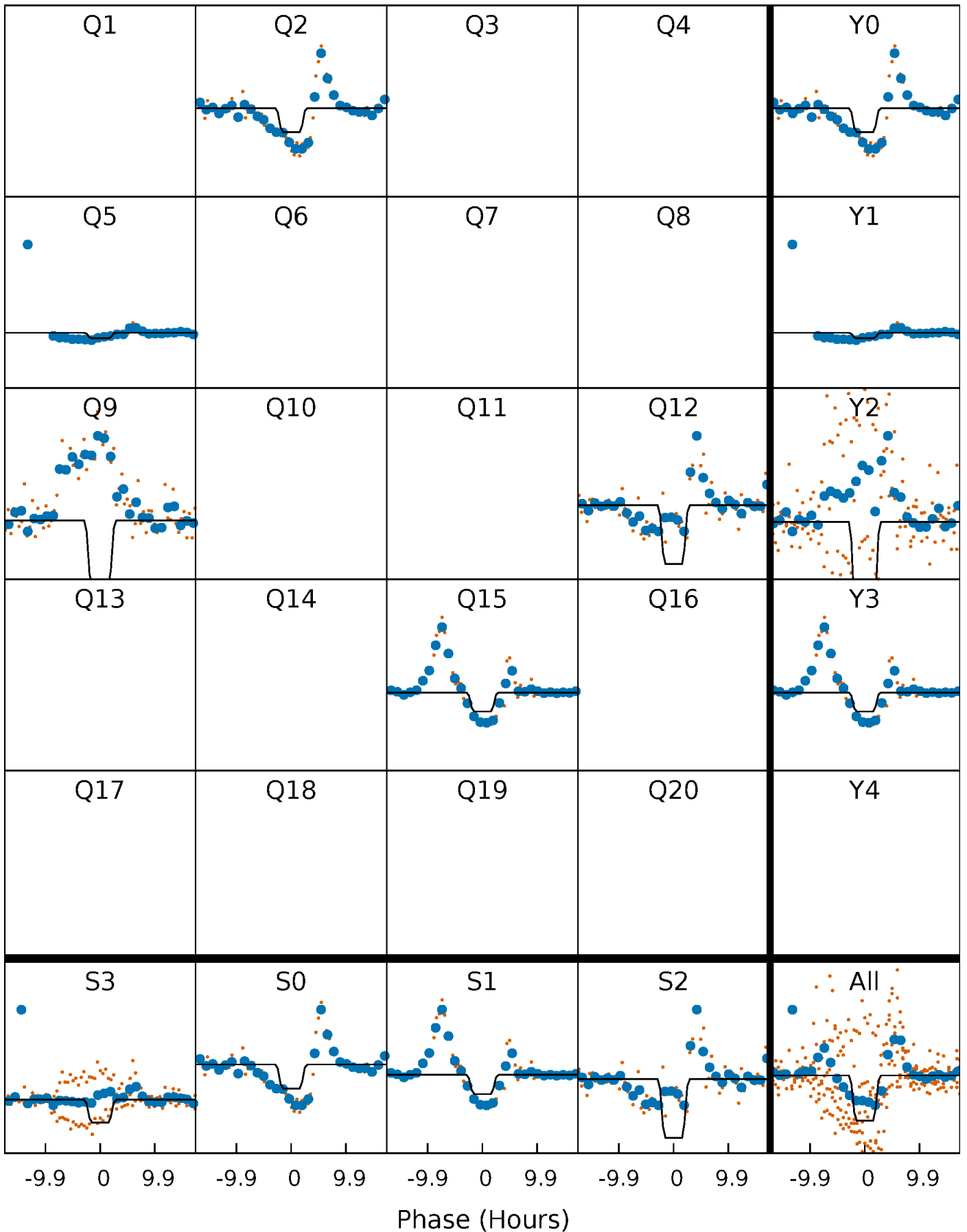
# DV Quarter-Phased Transit Curves

TCE 012401644-03 P=308.857651 Days  $T_0=221.623847$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

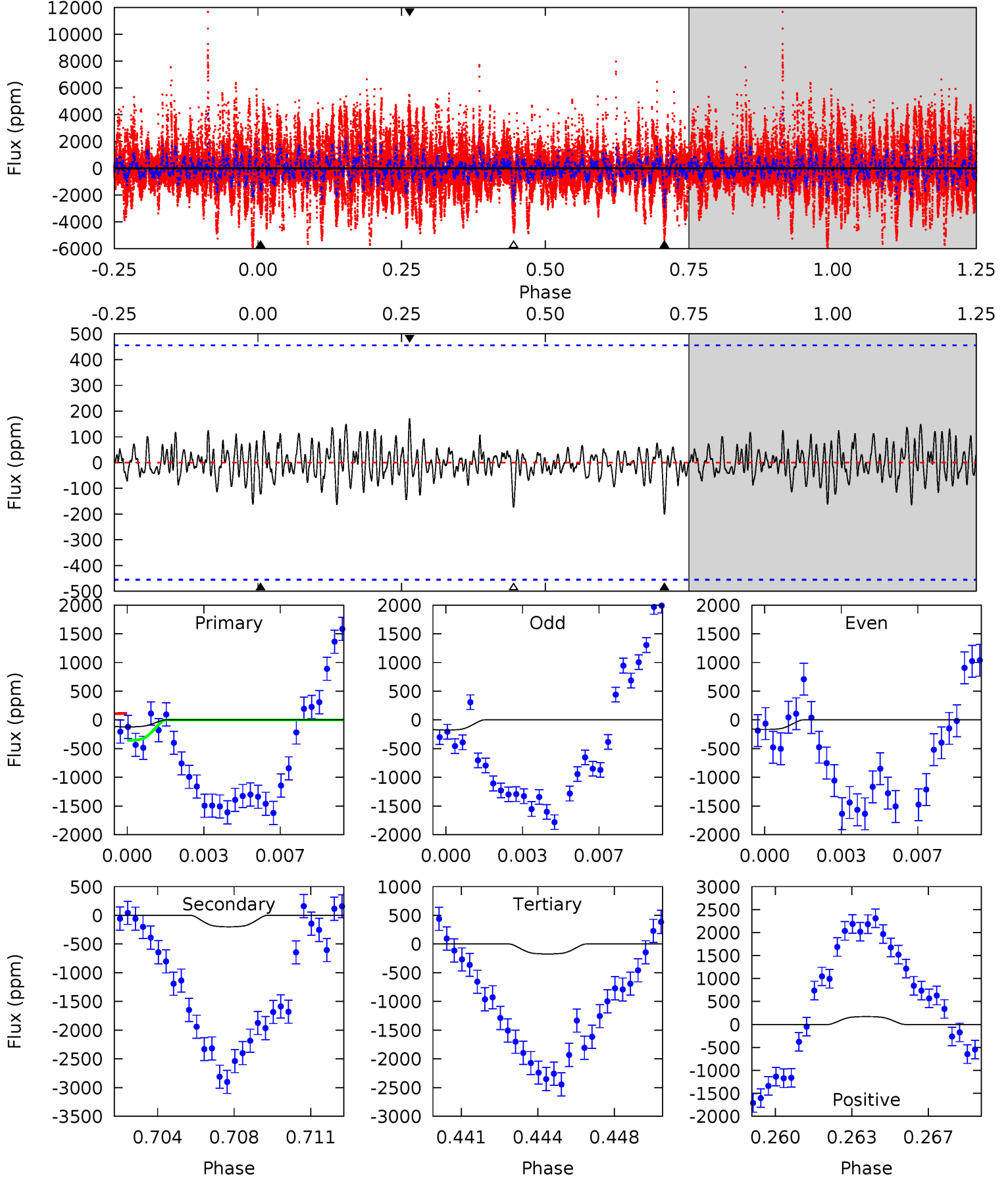
TCE 012401644-03 P=308.751092 Days  $T_0=221.807264$  (BKJD)



# DV Model-Shift Uniqueness Test

012401644-03, P = 308.857651 Days, E = 221.623847 Days

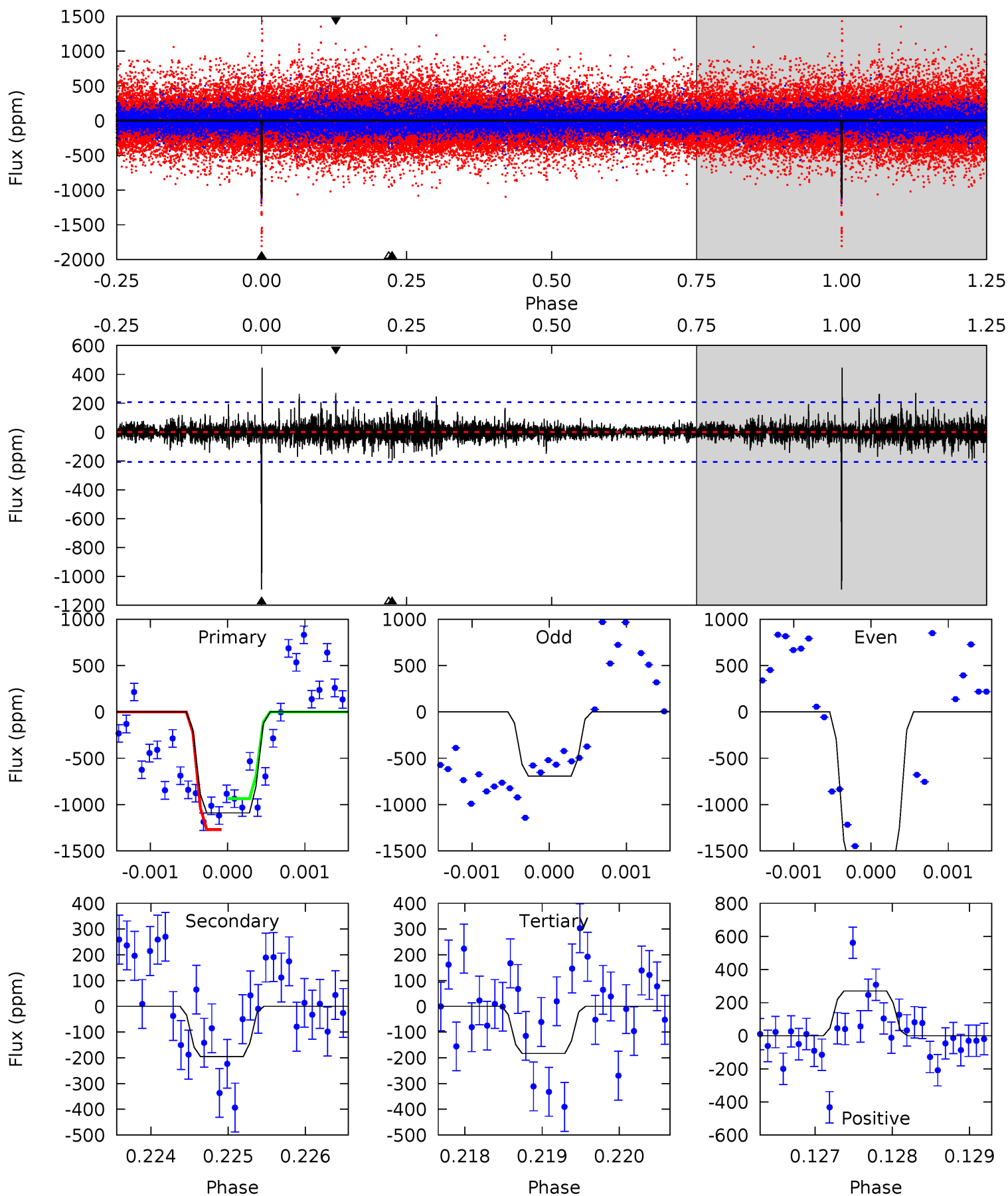
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.40	2.31	1.99	1.96	5.23	2.93	0.59	-0.59	-0.56	0.32	0.35	0.05	0.02	0.46	1.42



# Alt Model-Shift Uniqueness Test

012401644-03, P = 308.751092 Days, E = 221.807264 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
29.0	5.20	4.88	7.21	5.51	3.38	1.05	24.1	21.8	0.32	-2.01	13.6	0.68	0.29	4.36



### Stellar Parameters For KIC 012401644

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5068^{+166}_{-151}$	$4.654^{+0.060}_{-0.040}$	$-1.020^{+0.300}_{-0.300}$	$0.605^{+0.047}_{-0.042}$	$0.601^{+0.052}_{-0.021}$	$3.832^{+0.868}_{-0.590}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-7%	+9%/-3%	+23%/-15%
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 012401644-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-201 \pm 87$	$3.49^{+0.31}_{-0.30}$	$279^{+10}_{-10}$	$3173^{+215}_{-266}$	$5083^{+2677}_{-2249}$
Alt.	$-195 \pm 38$	$2.17^{+0.28}_{-0.30}$	$279^{+10}_{-10}$	$3686^{+234}_{-206}$	$13134^{+5709}_{-3620}$

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

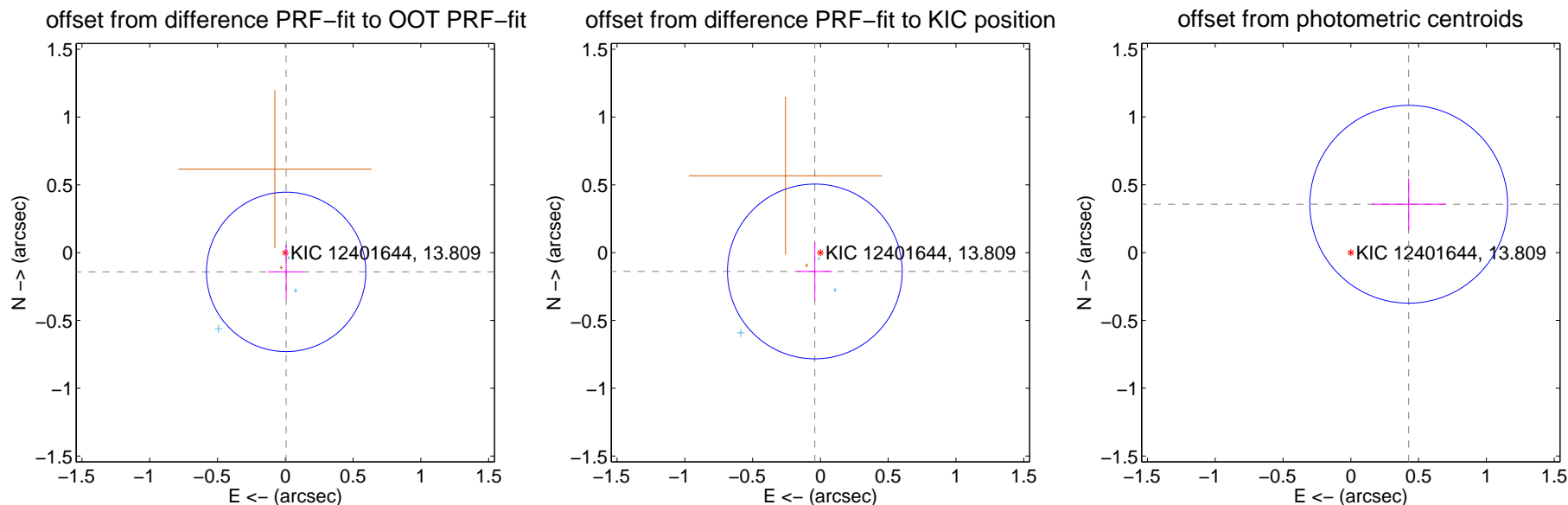
## DV Centroid Data

Supplemental centroid analysis for 012401644-03. Kepler magnitude: 13.81. Transit SNR 9.53

There are 3 quarters with good PRF difference image offsets

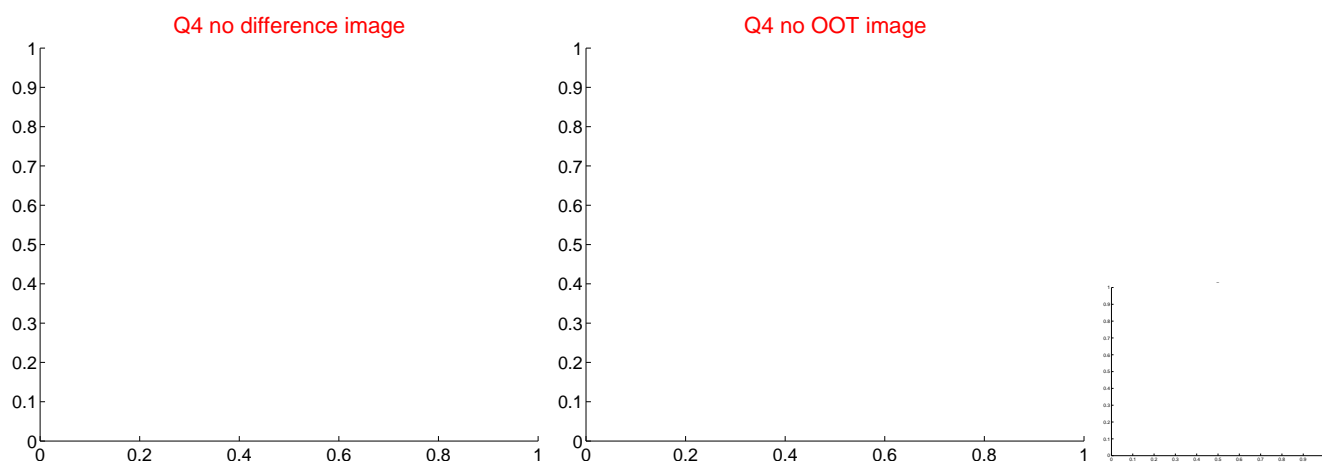
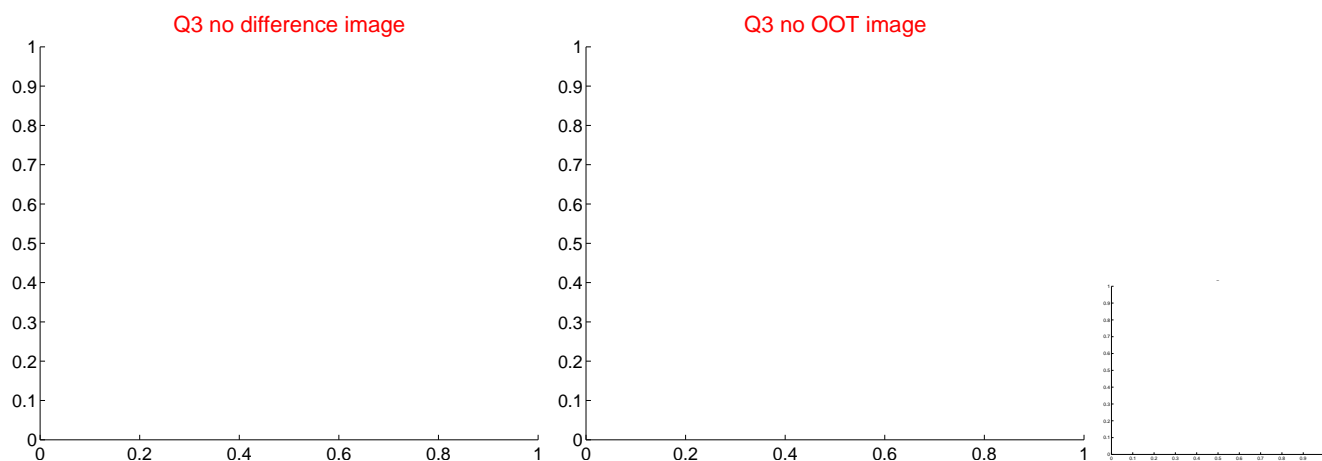
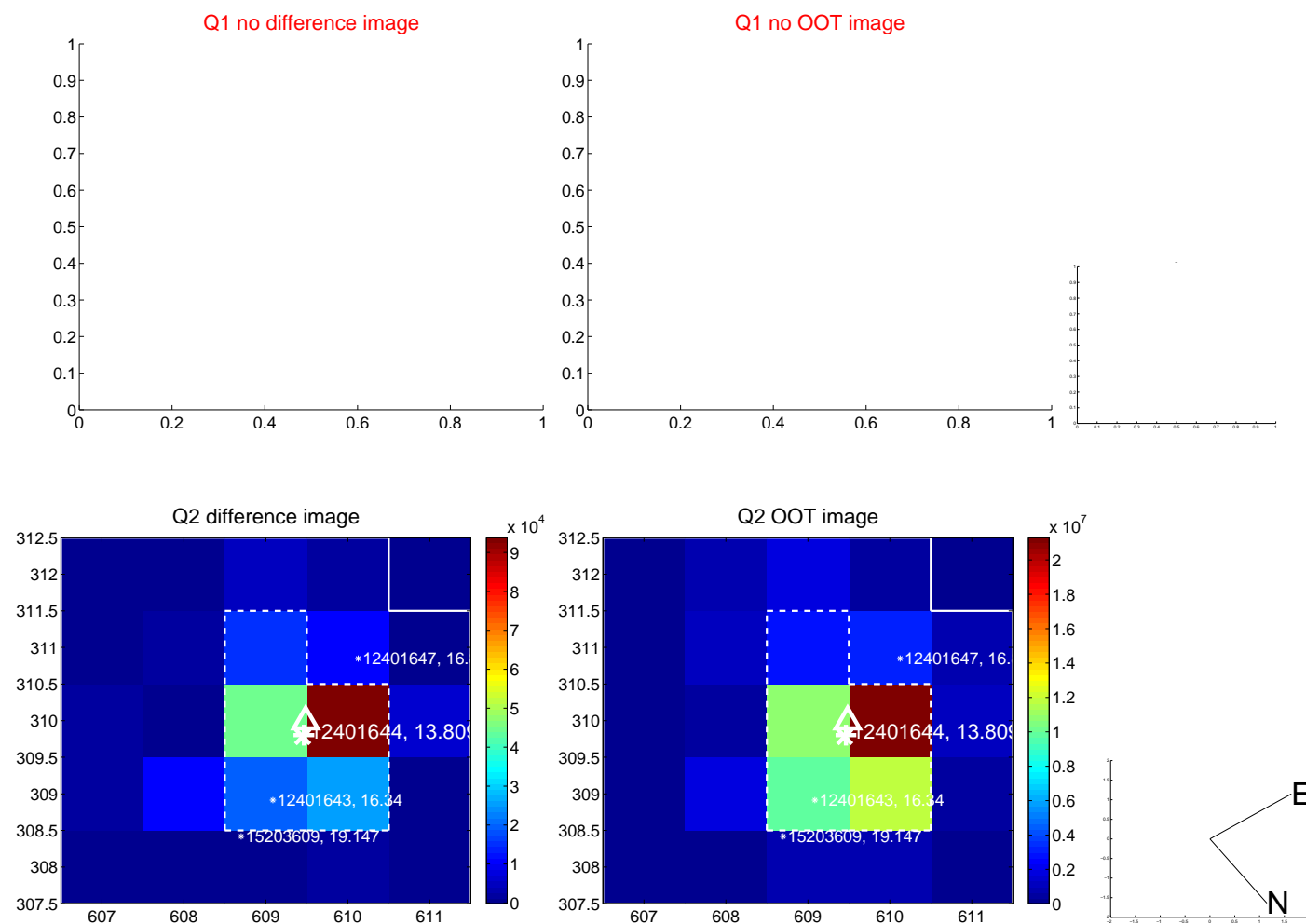
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.142 \pm 0.196$	0.72	$-0.006 \pm 0.133$	$-0.142 \pm 0.199$
PRF-fit source offset from KIC position	$0.145 \pm 0.215$	0.67	$0.041 \pm 0.129$	$-0.139 \pm 0.216$
photometric centroid source offset	$0.56 \pm 0.24$	2.29	$-0.43 \pm 0.27$	$0.36 \pm 0.19$

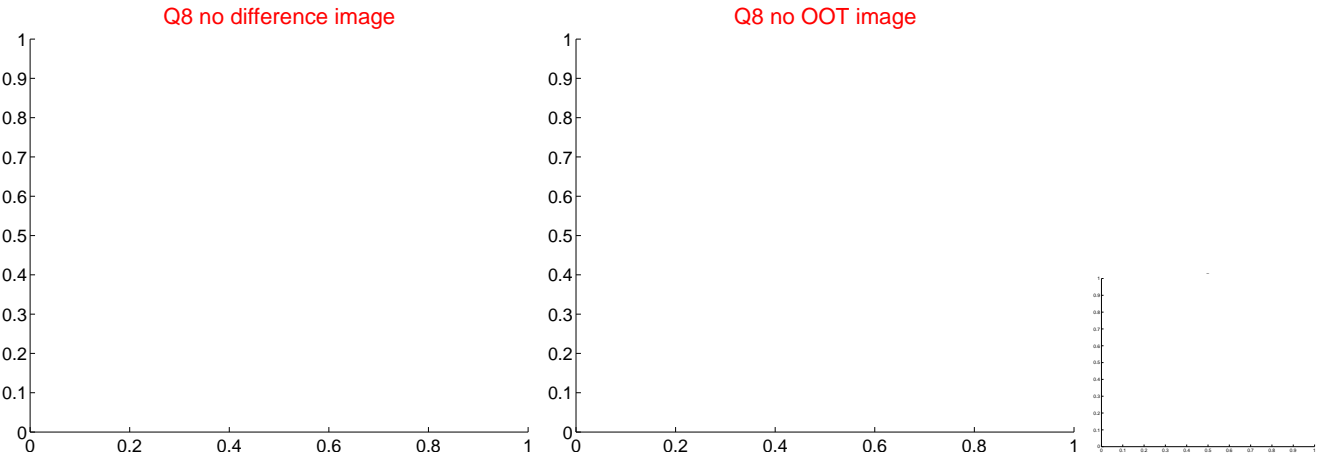
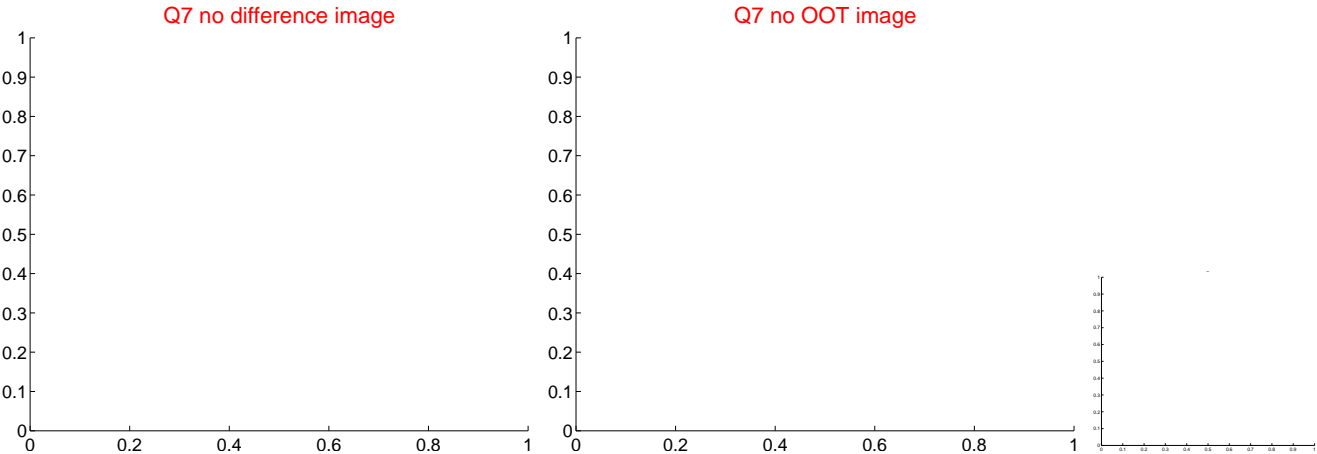
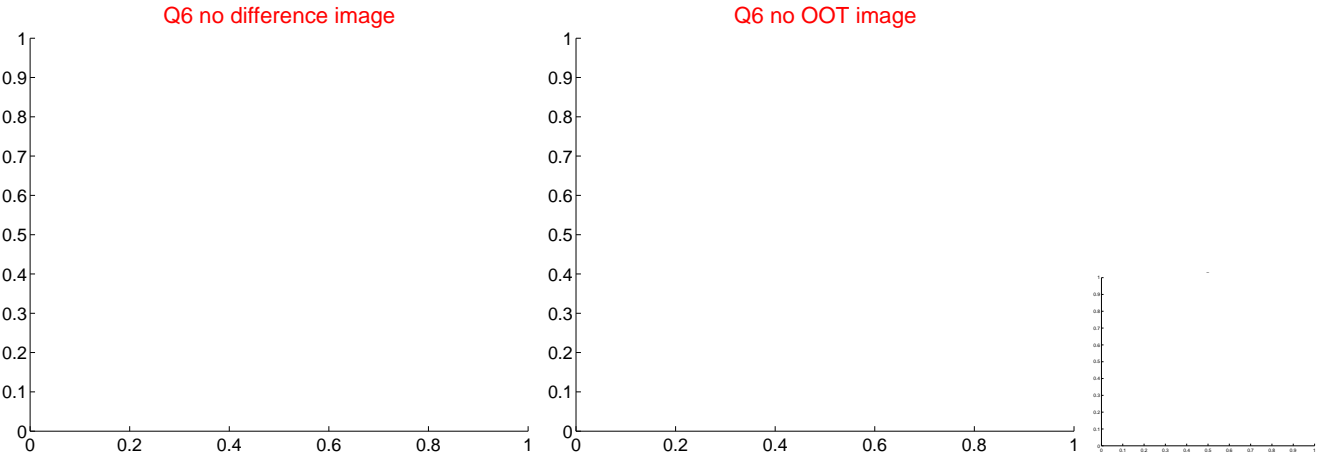
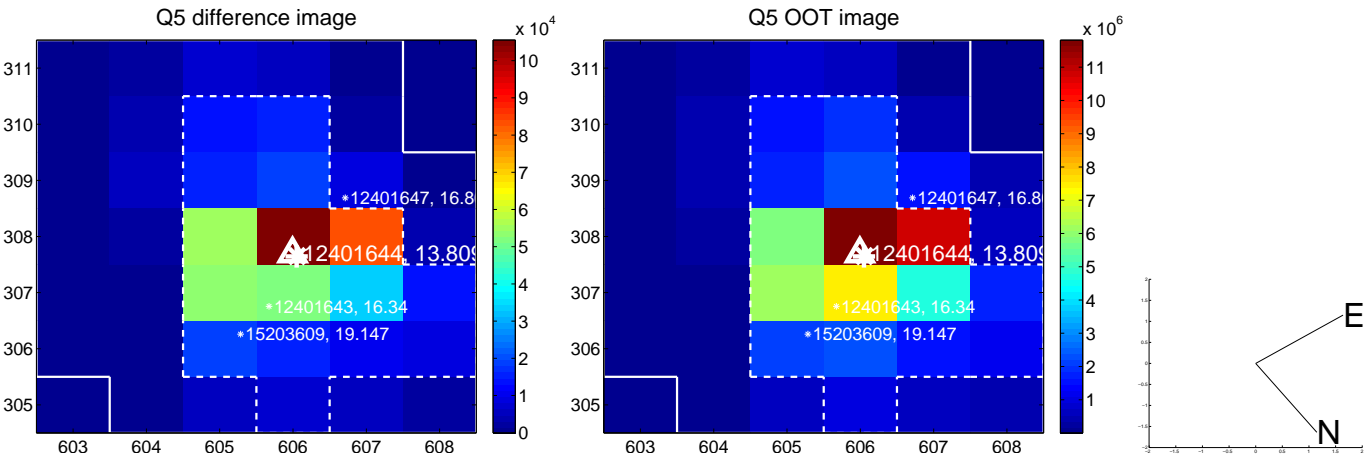


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

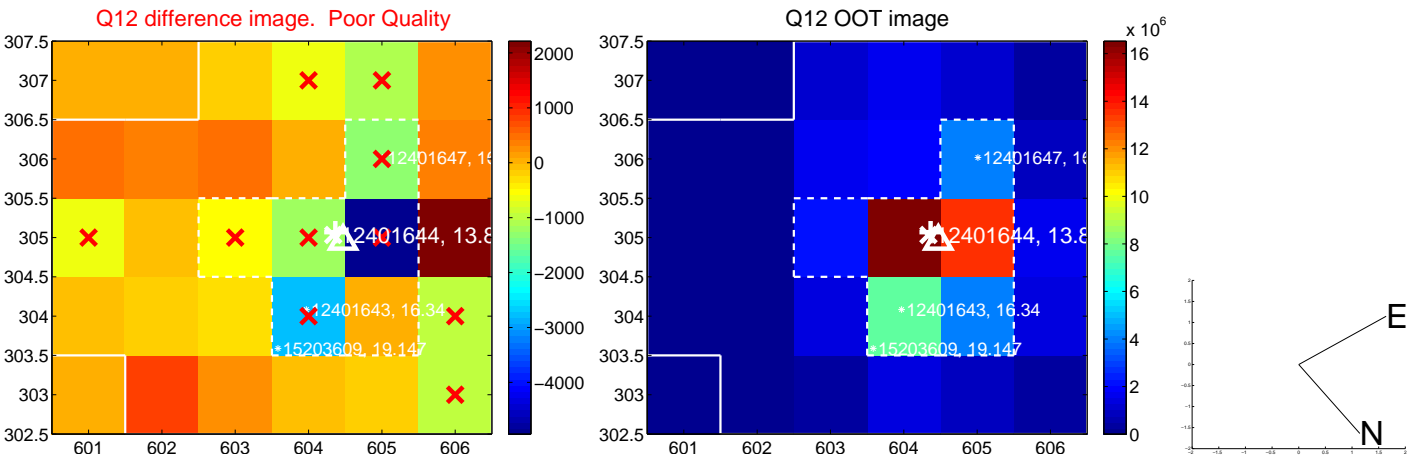
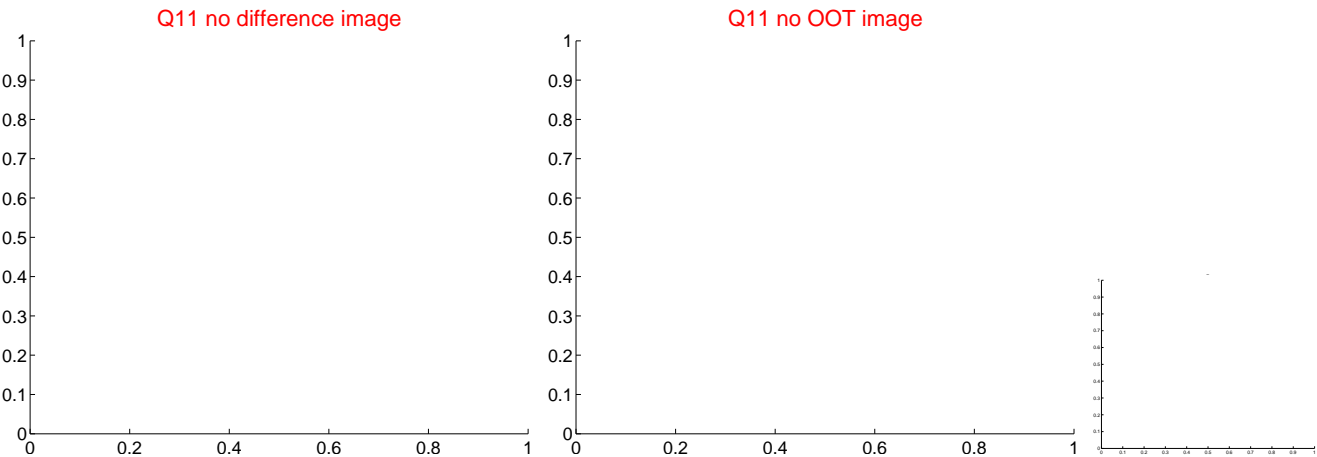
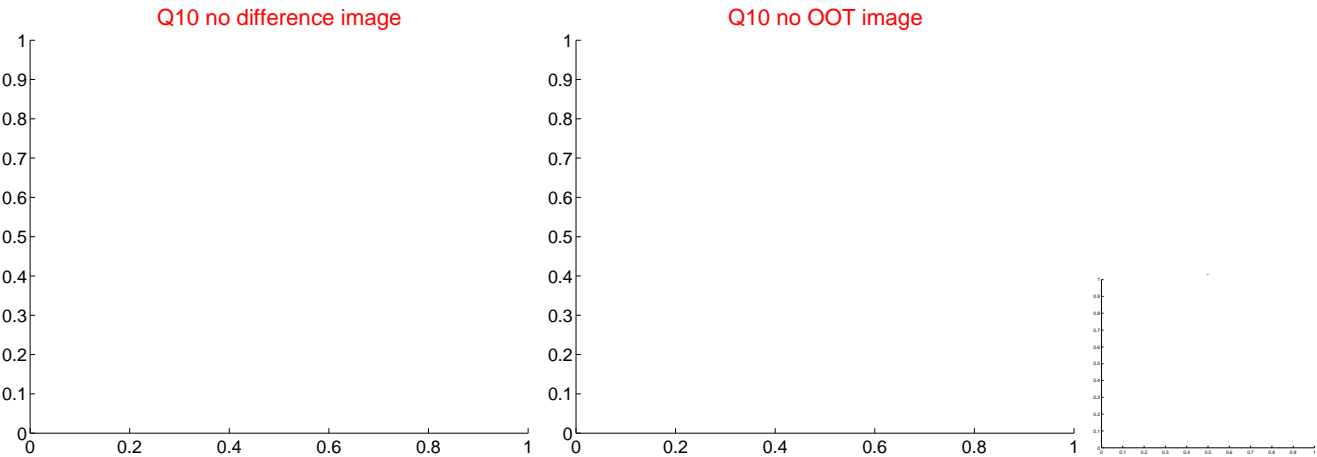
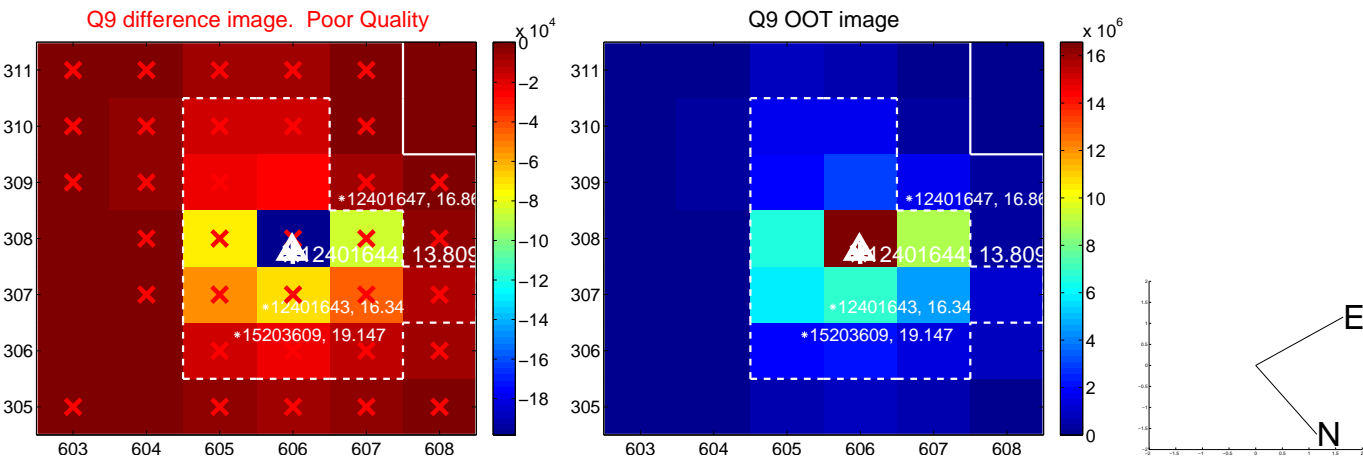


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

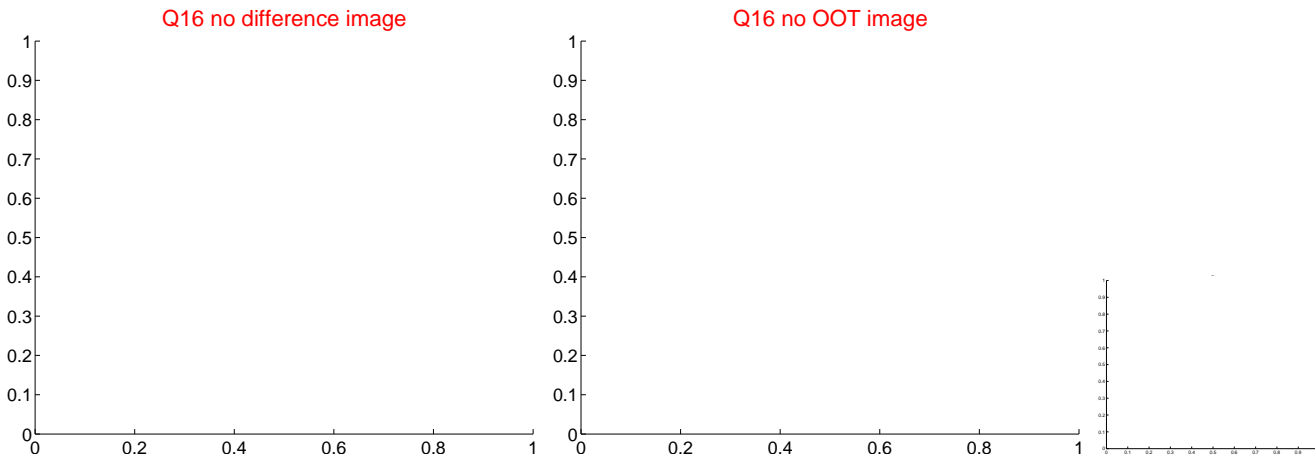
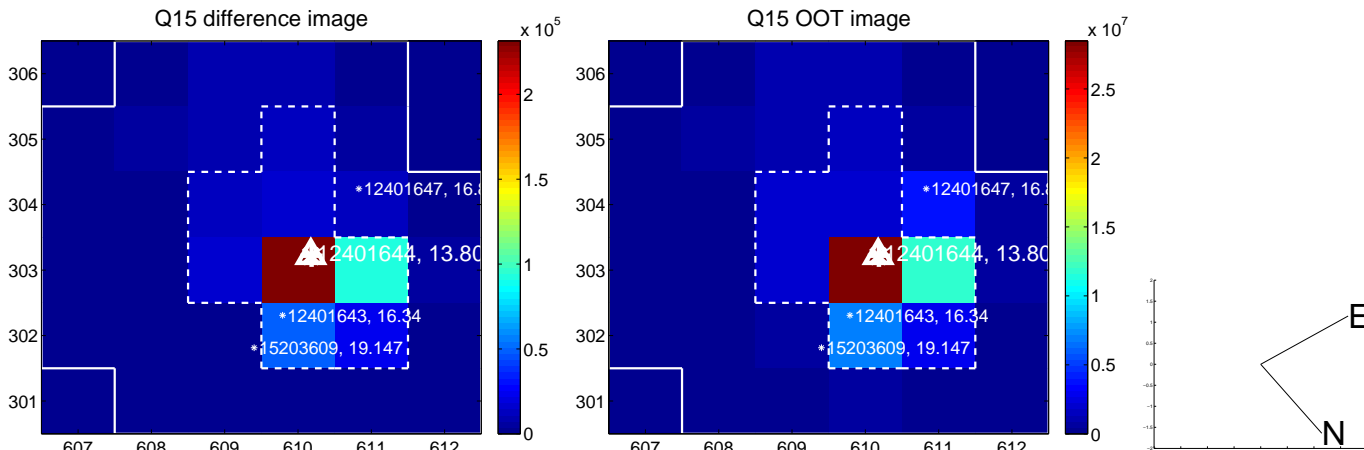
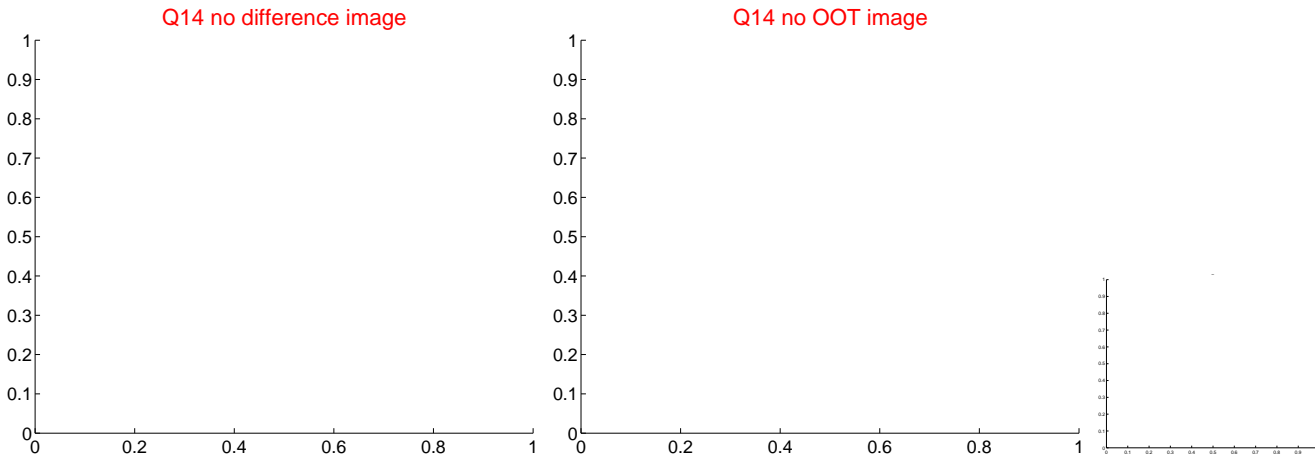
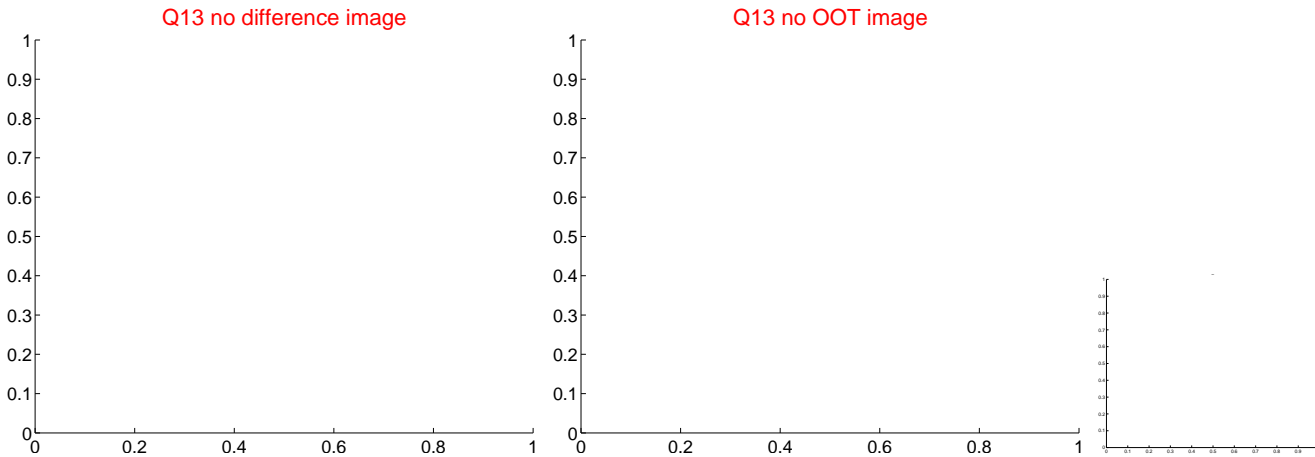




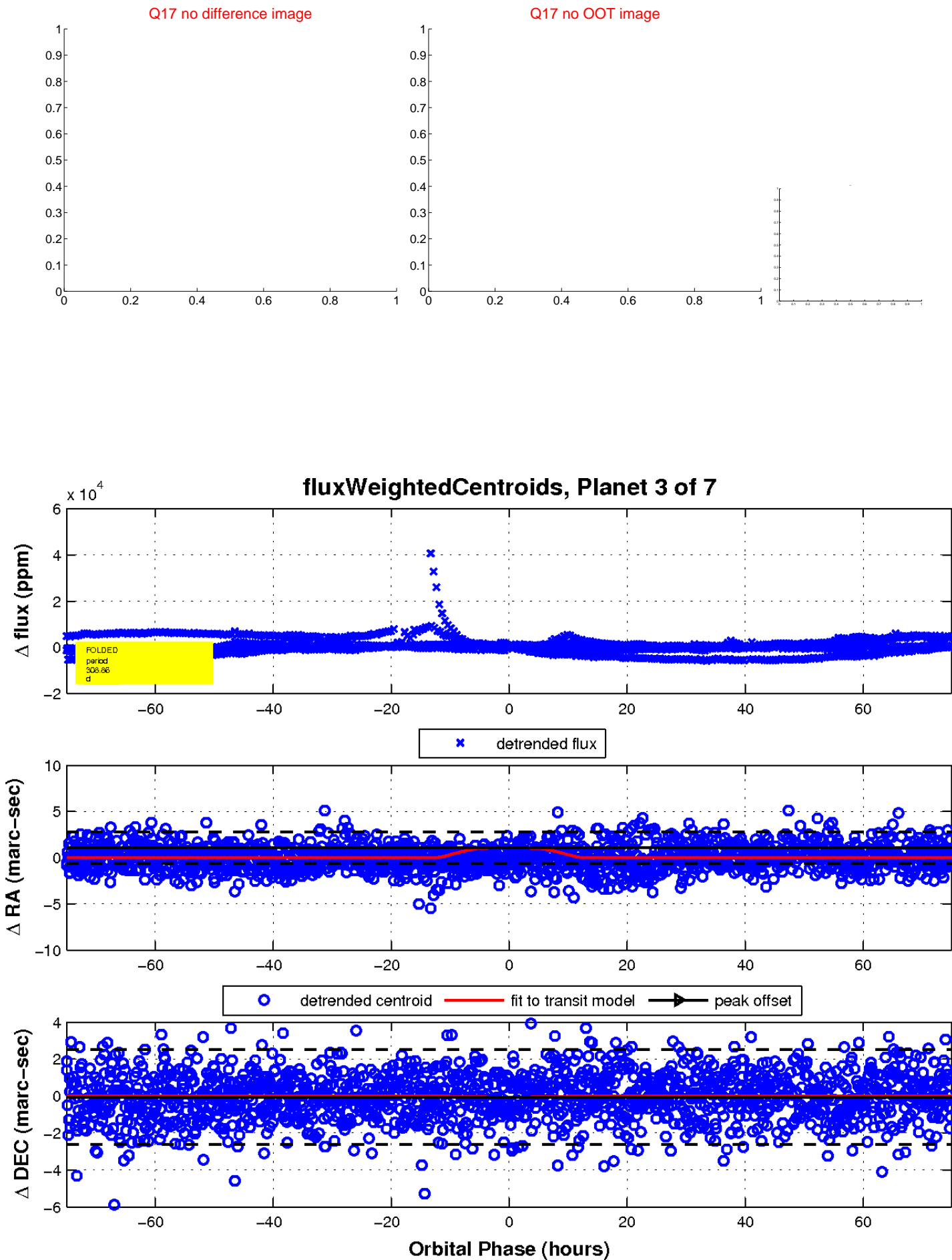
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



Declination

# KIC 012401644

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012401644-02	OBS	No	342.181691	410.861651	6331.5	59.277	31.6	9.2	0.60	5068	8.91	0.33
012401644-03	OBS	No	308.857651	221.623847	2171.1	25.015	16.3	9.5	0.60	5068	3.50	0.38
012401644-05	OBS	No	372.532793	366.150217	1211.3	7.071	15.7	7.5	0.60	5068	2.19	0.29
012401644-06	OBS	No	548.808394	158.562553	1158.0	3.346	15.1	8.4	0.60	5068	2.14	0.18
012401644-07	OBS	No	503.616269	193.981537	1102.4	12.459	13.9	6.7	0.60	5068	2.04	0.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012401644-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS
012401644-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS
012401644-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

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

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

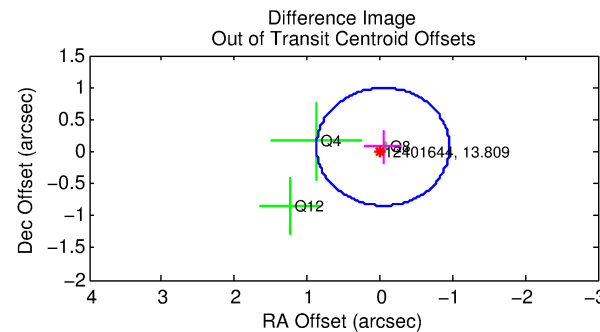
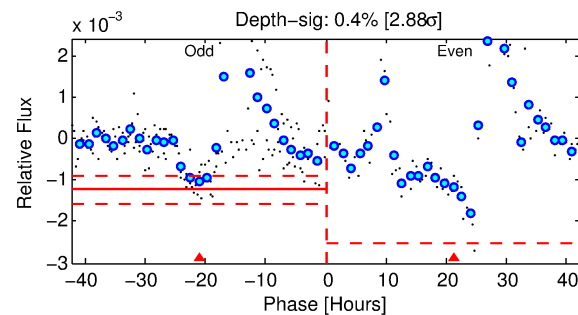
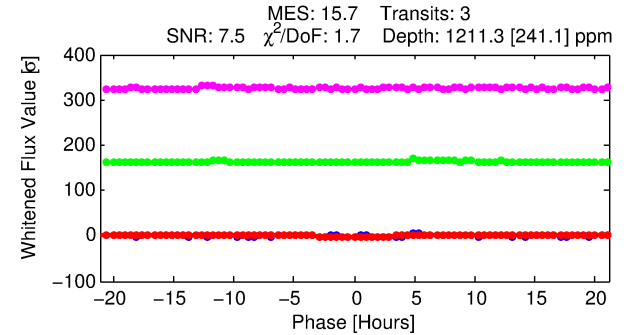
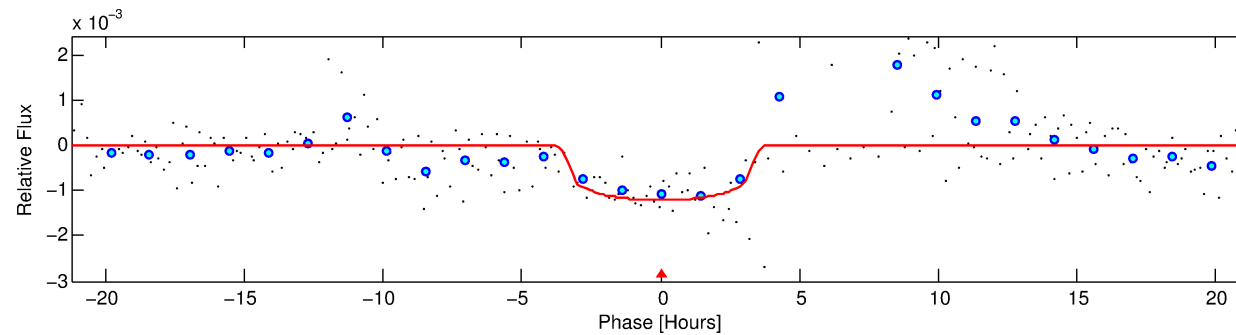
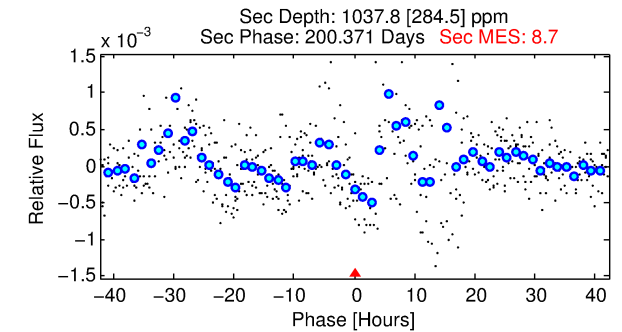
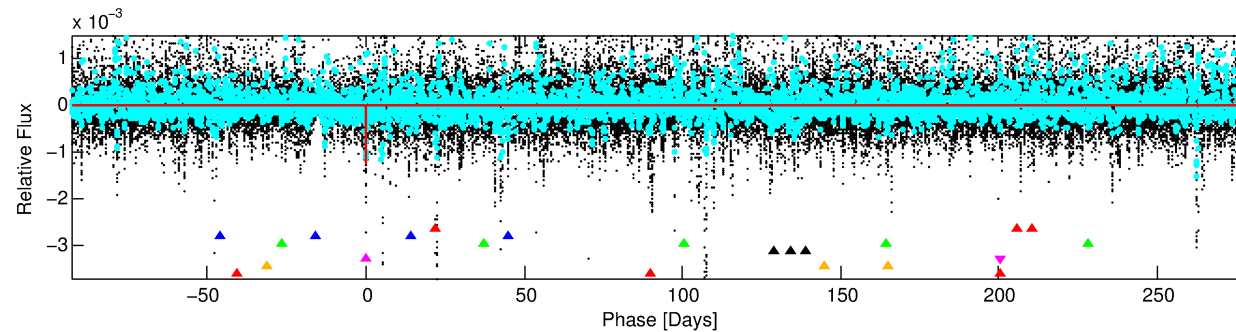
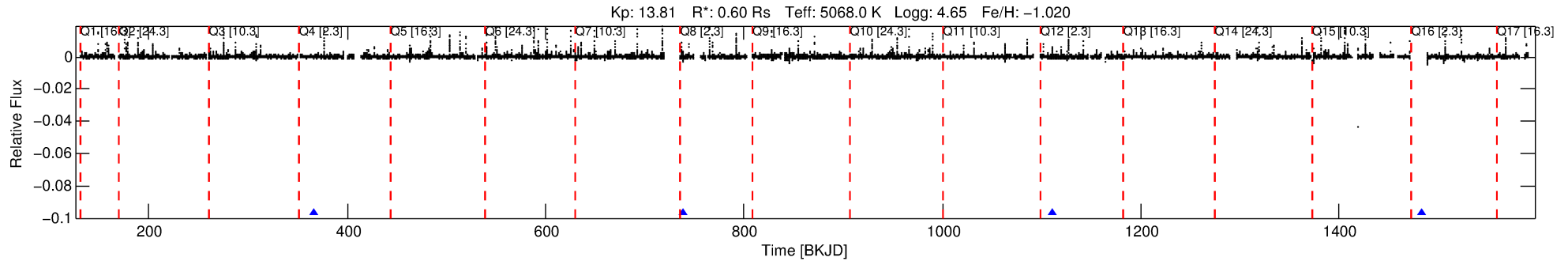
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012401644-05

No Significant Match Found

# DV One-Page Summary

KIC: 12401644 Candidate: 5 of 7 Period: 372.533 d



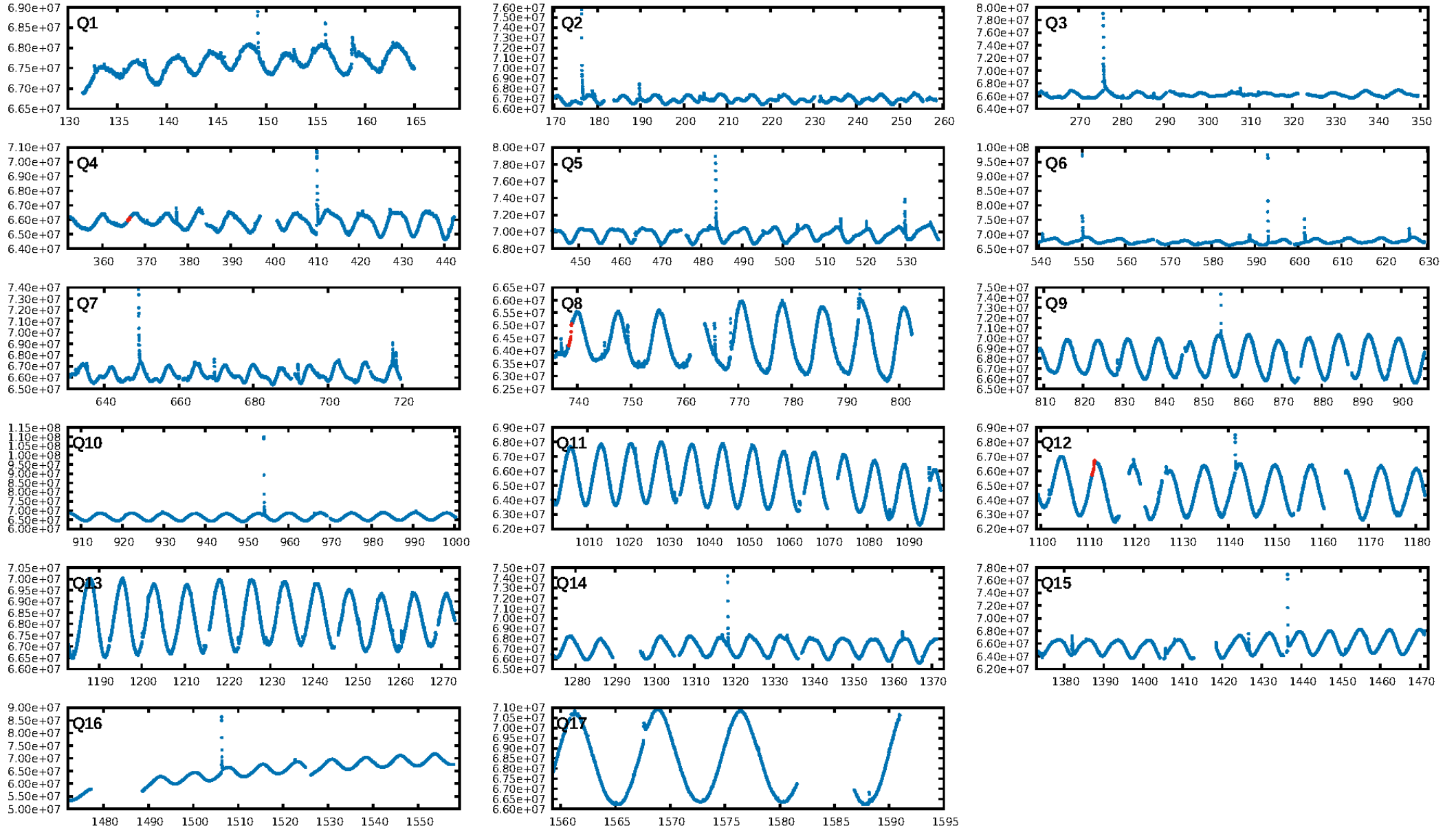
## DV Fit Results:

Period = 372.53279 [0.00658] d  
Epoch = 366.1502 [0.0083] BKJD  
Rp/R\* = 0.0332 [0.0189]  
a/R\* = 334.62 [745.01]  
b = 0.61 [2.29]  
Seff = 0.30 [0.05]  
Teq = 188 [8] K  
Rp = 2.19 [1.26] Re  
a = 0.8557 [0.0593] AU  
Ag = 87042.53 [102556.78] [0.85 $\sigma$ ]  
Teffp = 4993 [1474] K [3.26 $\sigma$ ]

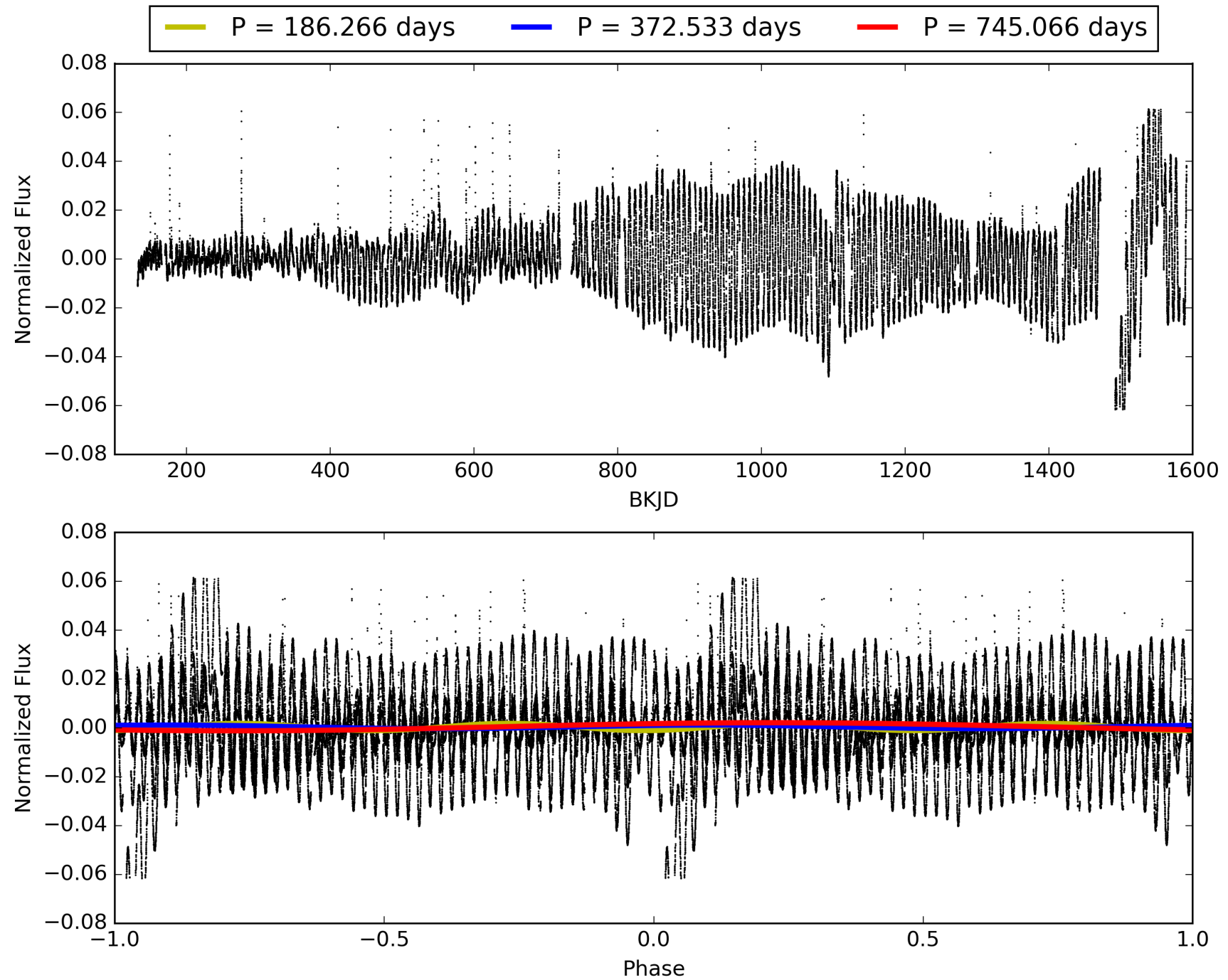
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [12.20 $\sigma$ ]  
LongPeriod-sig: 100.0% [14.89 $\sigma$ ]  
ModelChiSquare2-sig: 1.0%  
ModelChiSquareGof-sig: 71.9%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 3.295  
Centroid-sig: 2.8%  
Centroid-so: 0.843 arcsec [1.21 $\sigma$ ]  
OotOffset-rm: 0.086 arcsec [0.28 $\sigma$ ]  
OotOffset-st: 0/0/3/0 [3]  
KicOffset-rm: 0.124 arcsec [0.49 $\sigma$ ]  
KicOffset-st: 0/0/3/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 012401644-05, PDC Light Curves



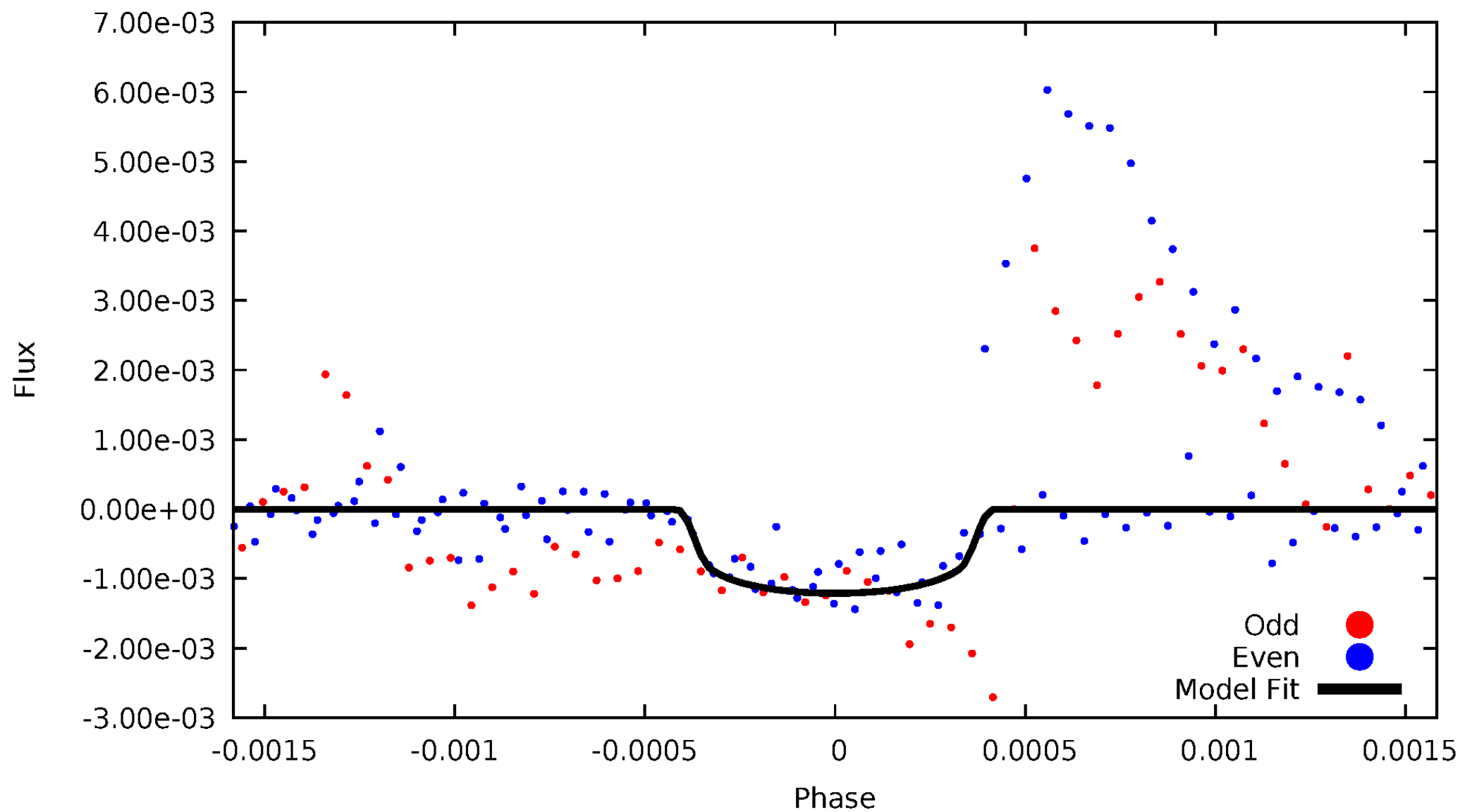
# TCE 012401644-05





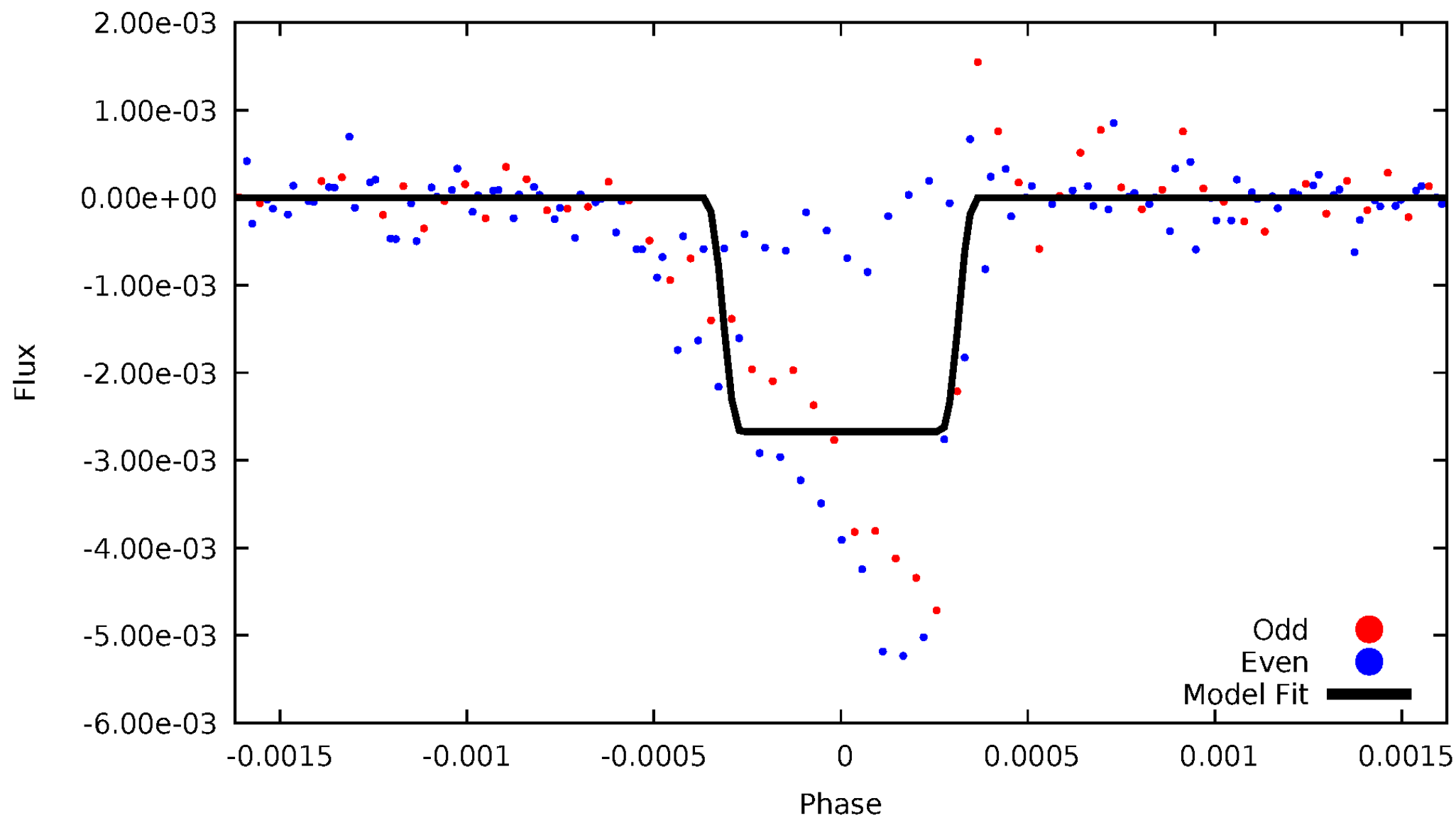
# DV Odd/Even

TCE 012401644-05



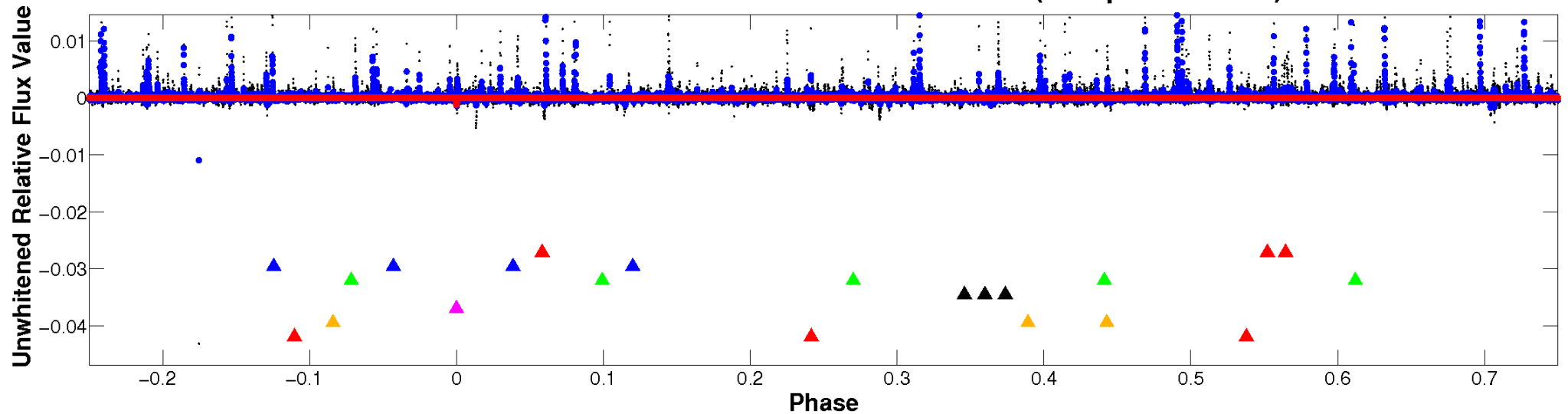
# ALT Odd/Even

TCE 012401644-05

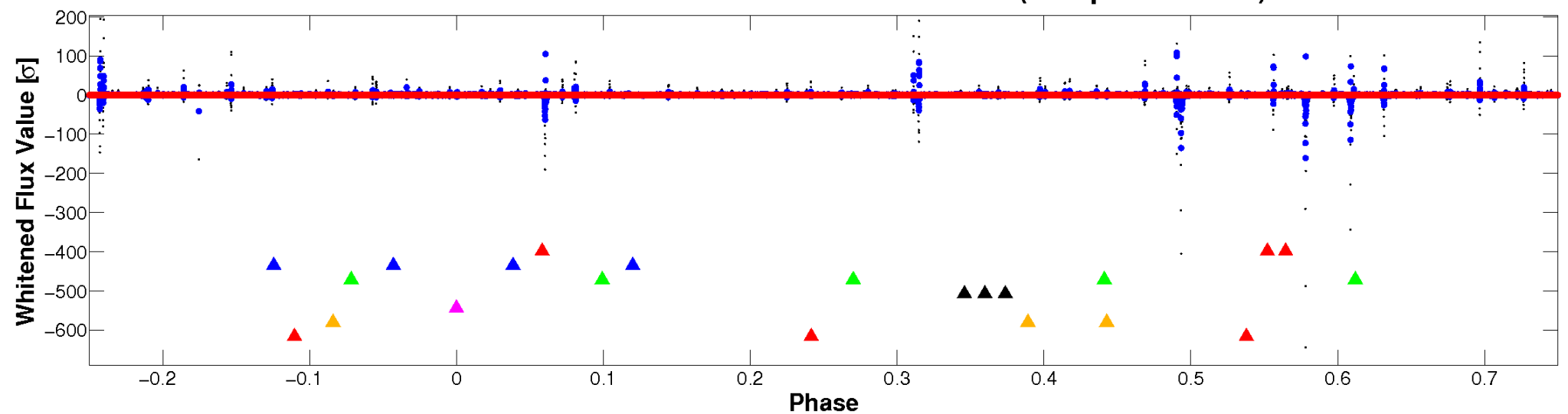


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

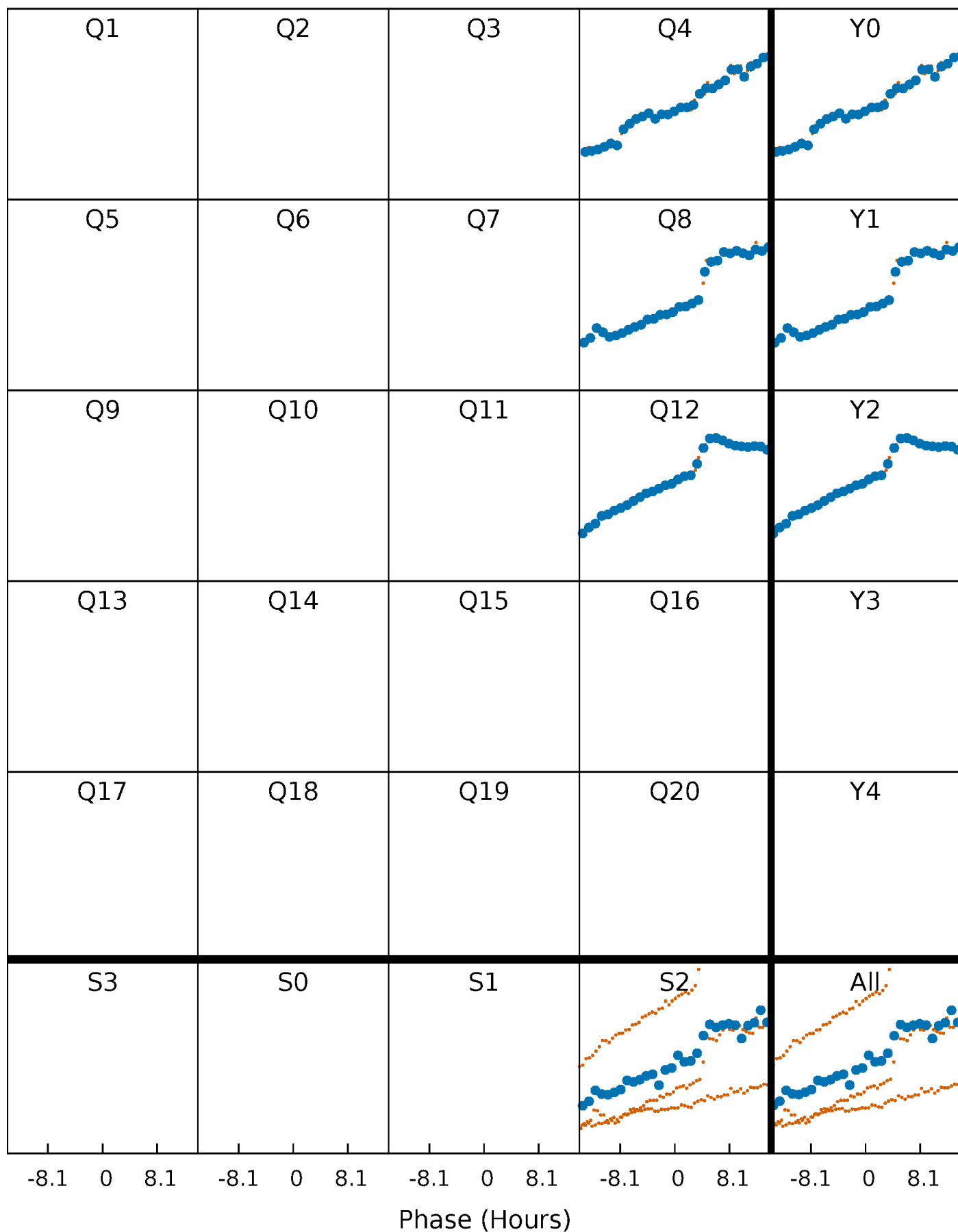


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 012401644-05     $P=372.532793$  Days     $T_0=366.150217$  (BKJD)



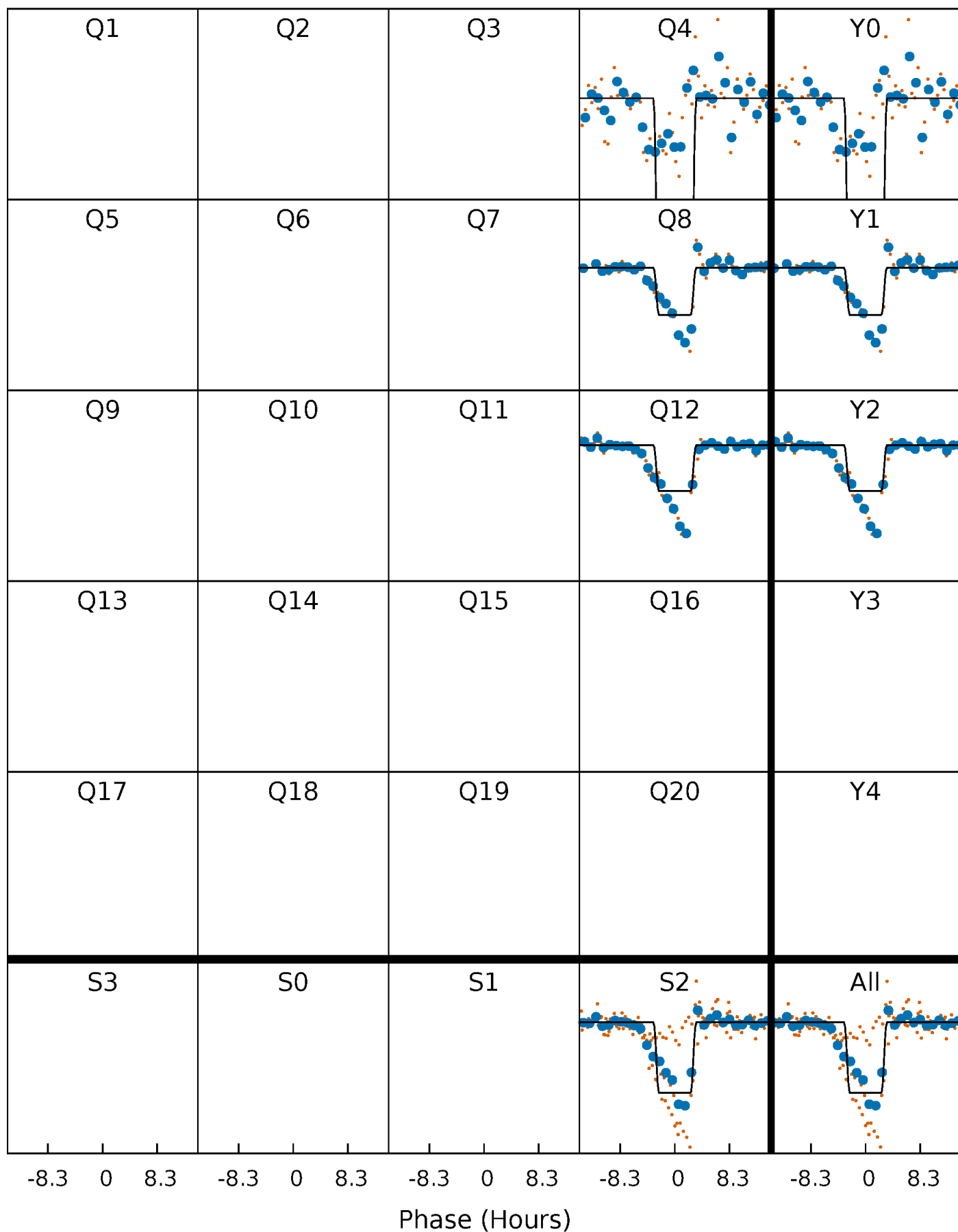
# DV Quarter-Phased Transit Curves

TCE 012401644-05     $P=372.532793$  Days     $T_0=366.150217$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

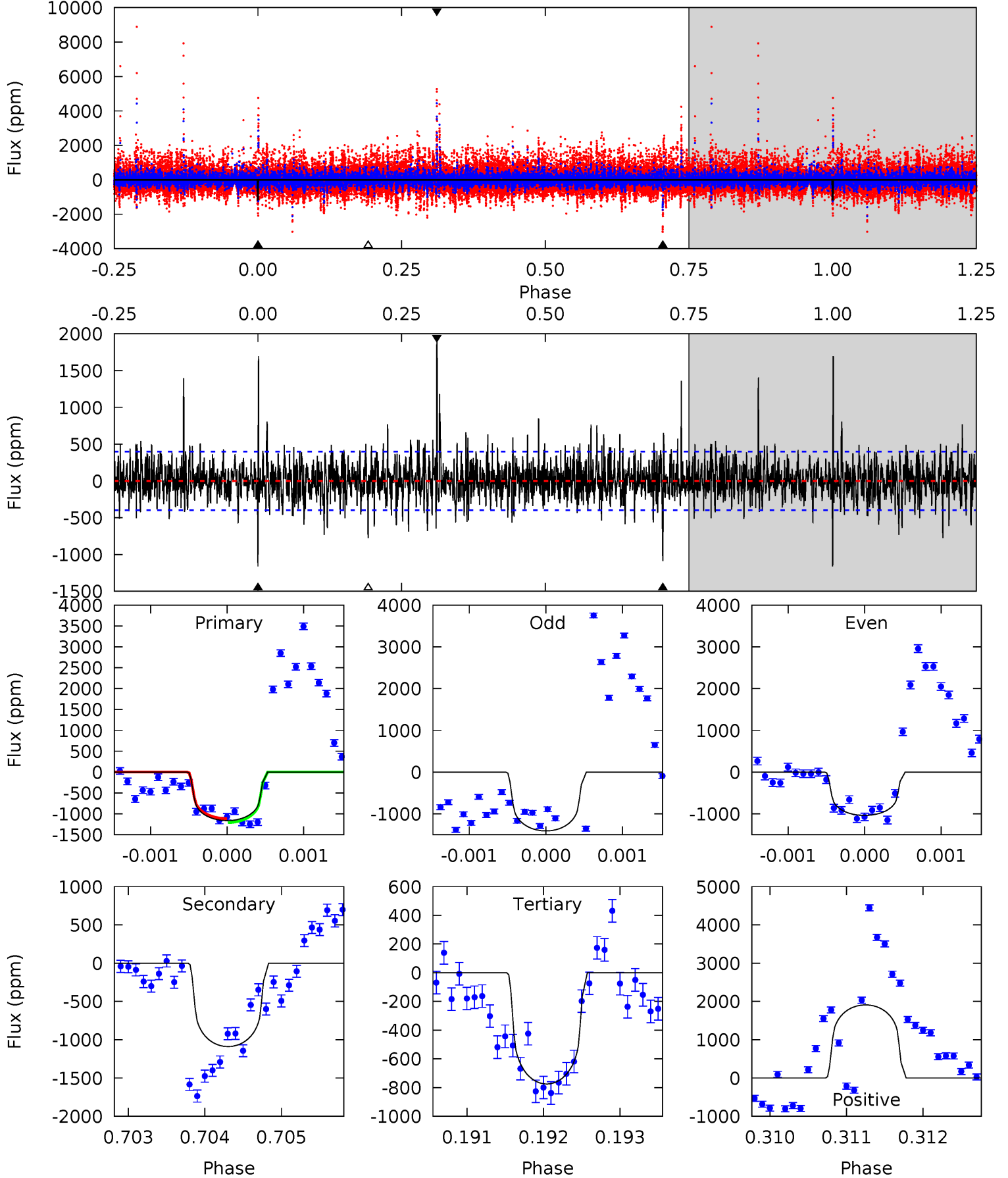
TCE 012401644-05 P=372.517421 Days  $T_0=366.224750$  (BKJD)



# DV Model-Shift Uniqueness Test

012401644-05, P = 372.532793 Days, E = 366.150217 Days

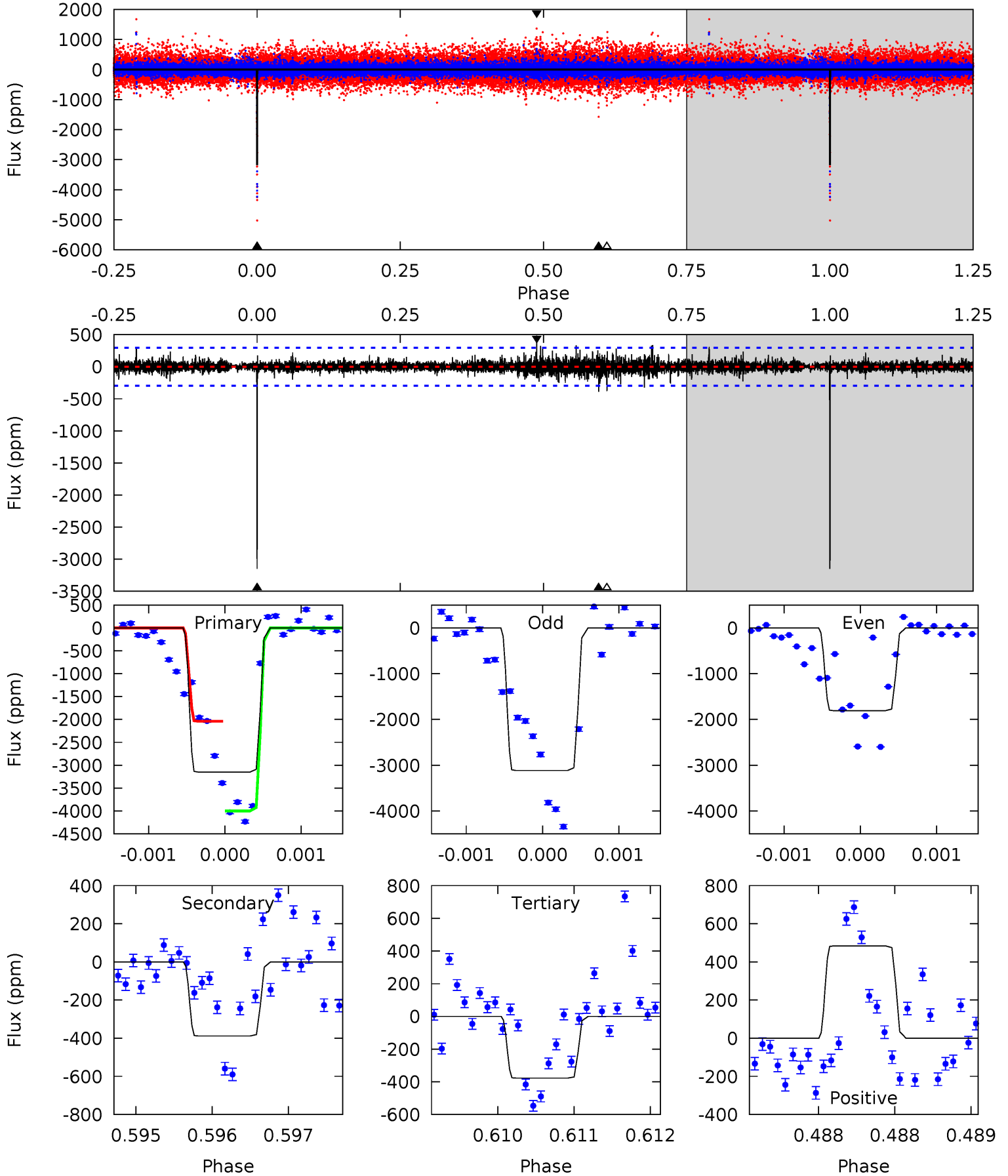
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.0	15.0	10.7	26.3	5.49	3.35	2.88	5.33	-10.3	4.32	-11.3	0.44	0.94	0.62	0.66



# Alt Model-Shift Uniqueness Test

012401644-05, P = 372.517421 Days, E = 366.224750 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
59.0	7.27	7.07	9.06	5.52	3.40	1.00	51.9	49.9	0.20	-1.79	7.38	0.77	0.13	17.5





### Stellar Parameters For KIC 012401644

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5068^{+166}_{-151}$	$4.654^{+0.060}_{-0.040}$	$-1.020^{+0.300}_{-0.300}$	$0.605^{+0.047}_{-0.042}$	$0.601^{+0.052}_{-0.021}$	$3.832^{+0.868}_{-0.590}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-7%	+9%/-3%	+23%/-15%
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 012401644-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1089 \pm 73$	$2.19^{+1.22}_{-1.14}$	$262^{+10}_{-9}$	$5080^{+2221}_{-855}$	$92716^{+319966}_{-54931}$
Alt.	$-388 \pm 53$	$3.49^{+1.30}_{-1.27}$	$261^{+10}_{-9}$	$3517^{+592}_{-336}$	$12812^{+19157}_{-6188}$

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

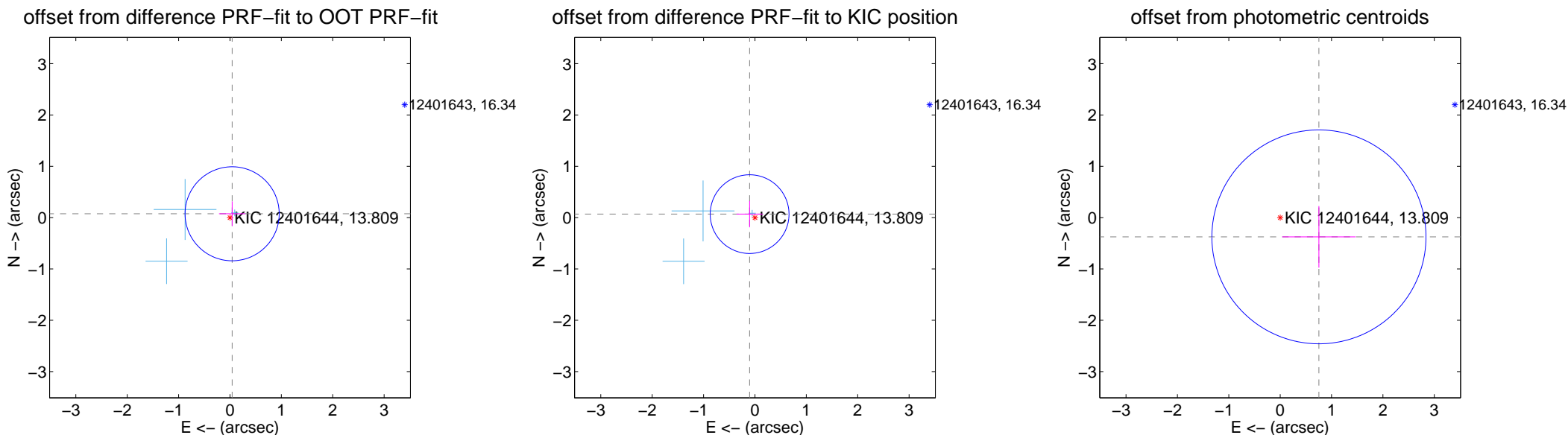
## DV Centroid Data

Supplemental centroid analysis for 012401644-05. Kepler magnitude: 13.81. Transit SNR 7.52

There are 3 quarters with good PRF difference image offsets

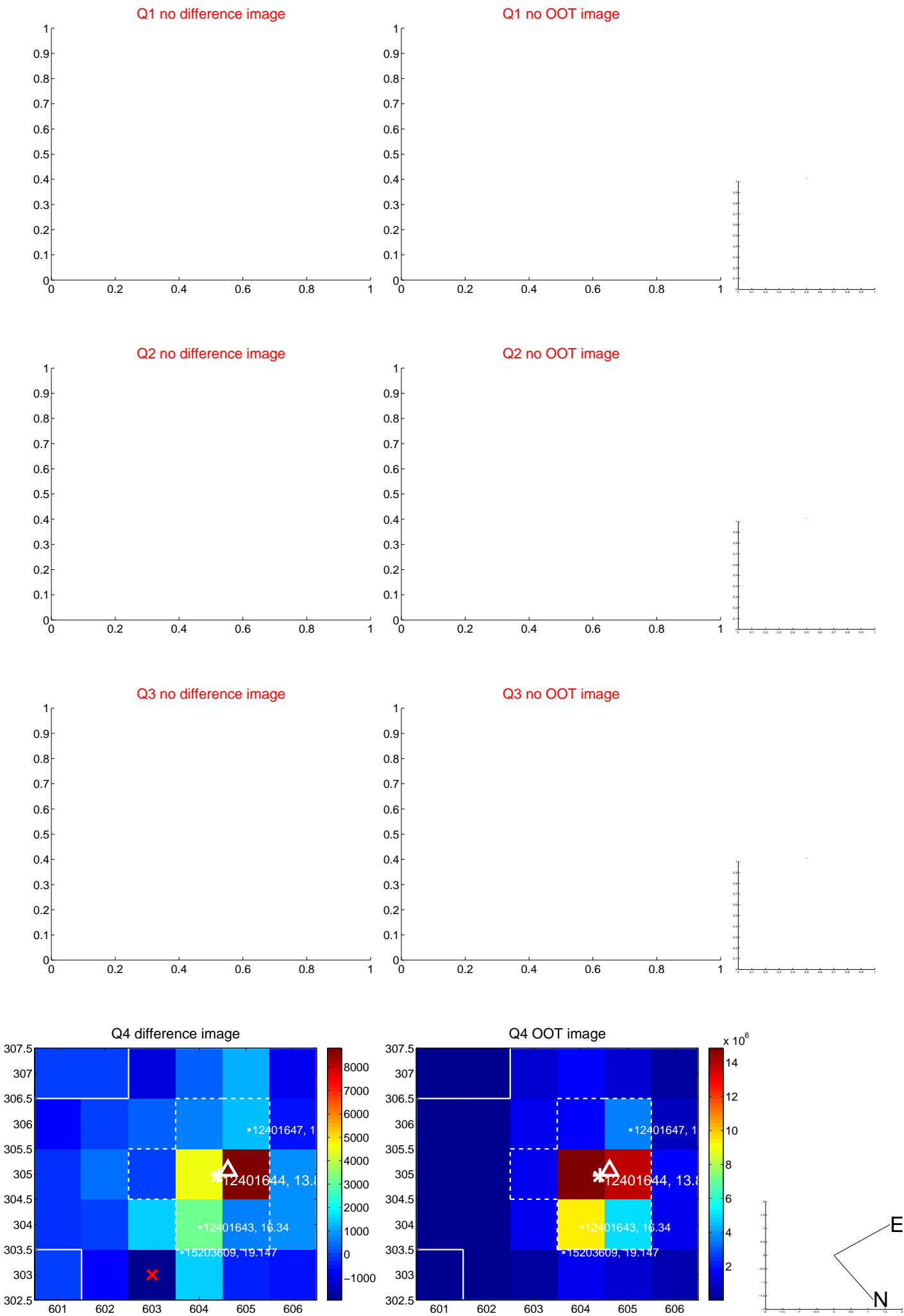
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.086 \pm 0.305$	0.28	$-0.042 \pm 0.255$	$0.075 \pm 0.241$
PRF-fit source offset from KIC position	$0.124 \pm 0.256$	0.49	$0.104 \pm 0.255$	$0.068 \pm 0.257$
photometric centroid source offset	$0.84 \pm 0.69$	1.21	$-0.75 \pm 0.72$	$-0.37 \pm 0.60$

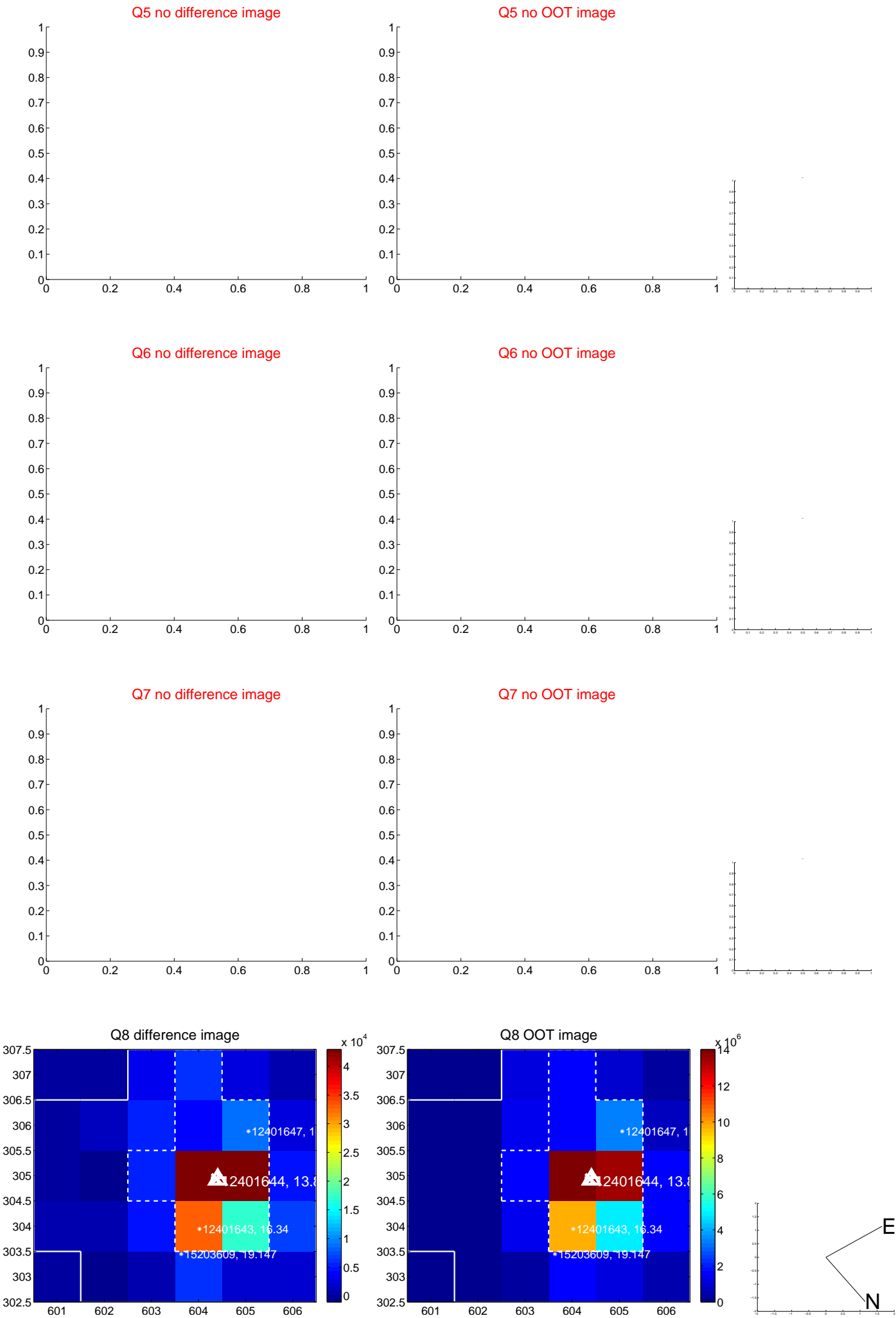


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

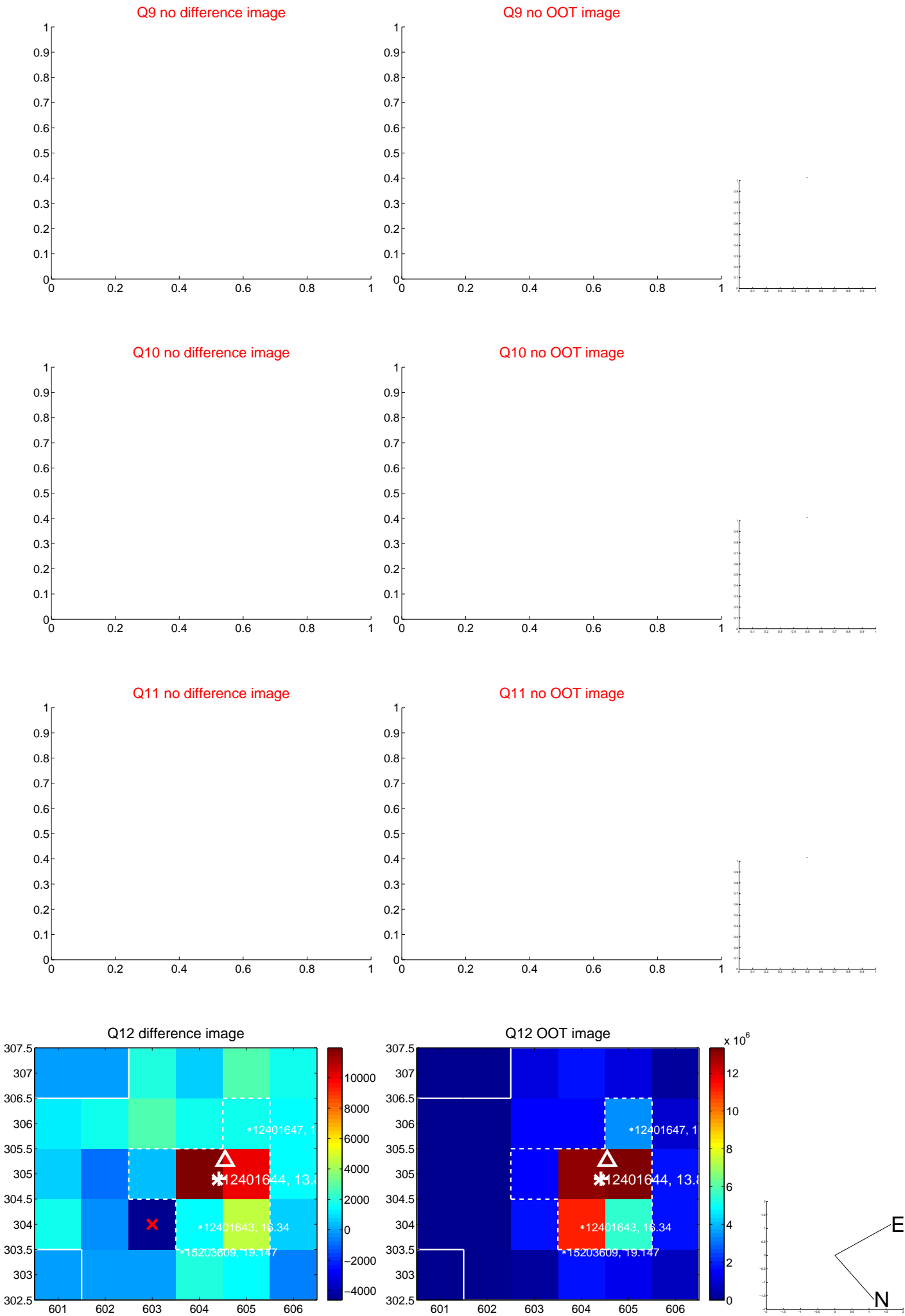
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



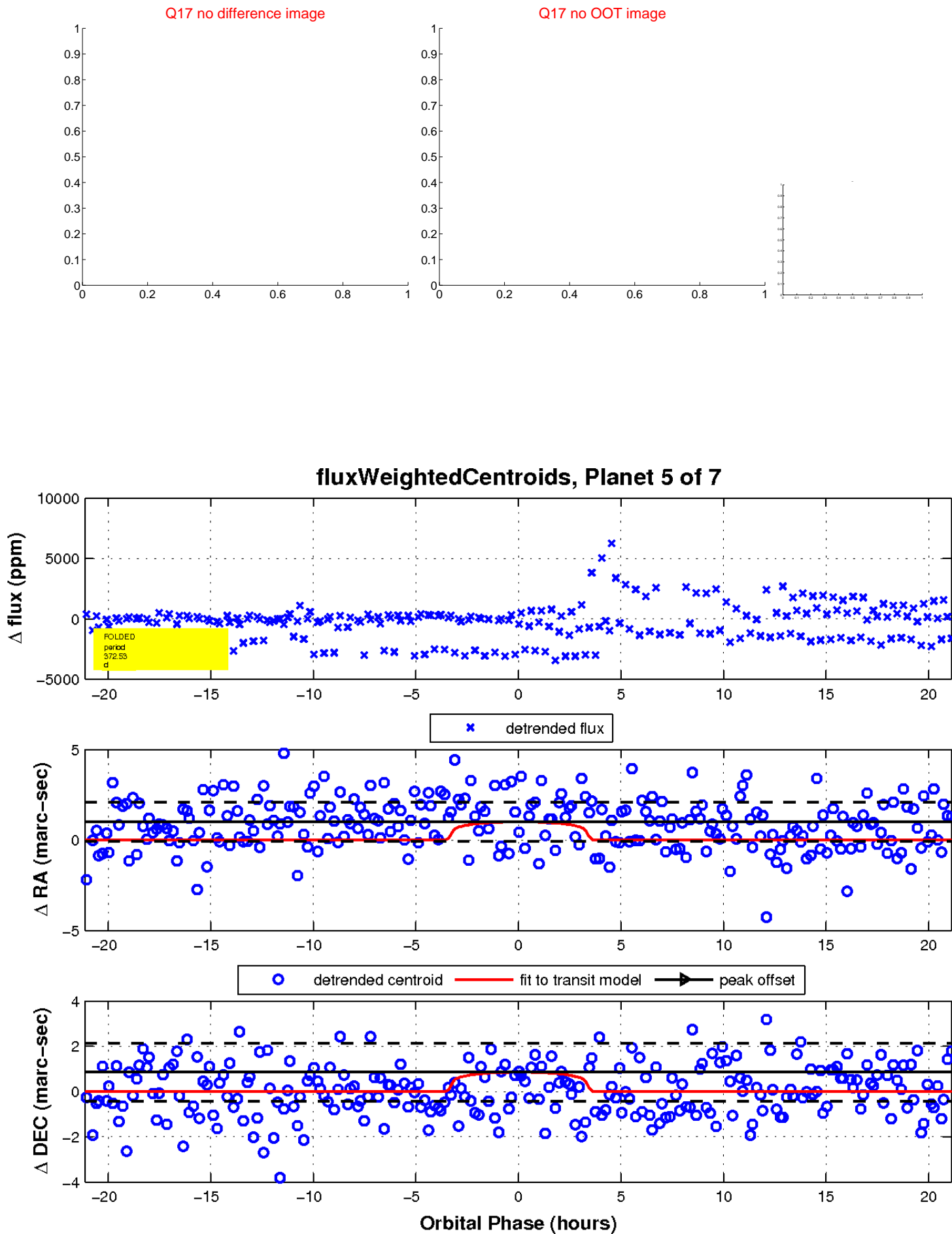
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

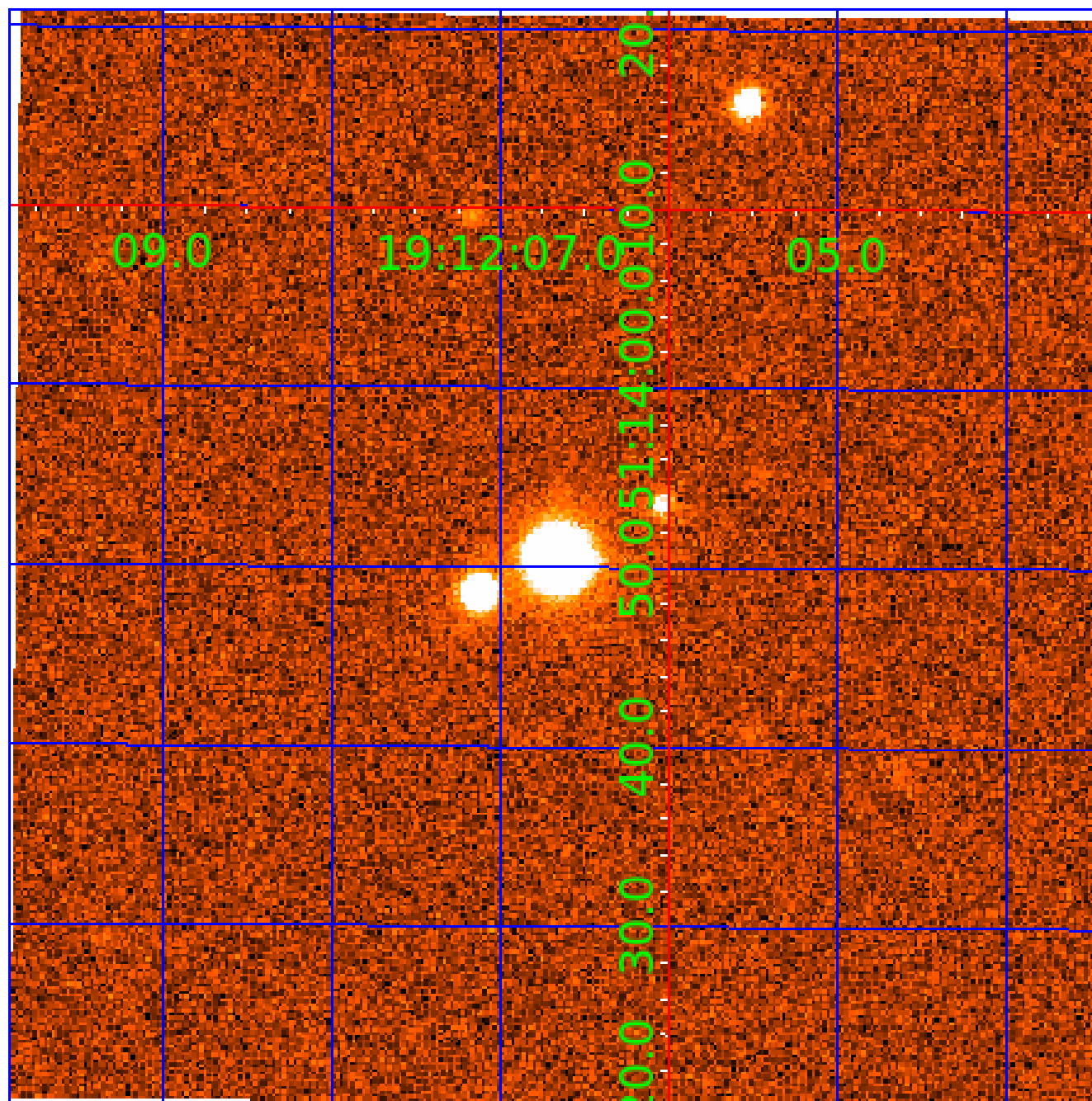


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 012401644

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012401644-02	OBS	No	342.181691	410.861651	6331.5	59.277	31.6	9.2	0.60	5068	8.91	0.33
012401644-03	OBS	No	308.857651	221.623847	2171.1	25.015	16.3	9.5	0.60	5068	3.50	0.38
012401644-05	OBS	No	372.532793	366.150217	1211.3	7.071	15.7	7.5	0.60	5068	2.19	0.29
012401644-06	OBS	No	548.808394	158.562553	1158.0	3.346	15.1	8.4	0.60	5068	2.14	0.18
012401644-07	OBS	No	503.616269	193.981537	1102.4	12.459	13.9	6.7	0.60	5068	2.04	0.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012401644-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS
012401644-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS
012401644-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

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

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

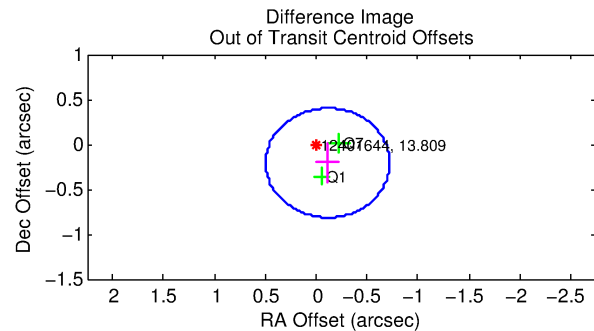
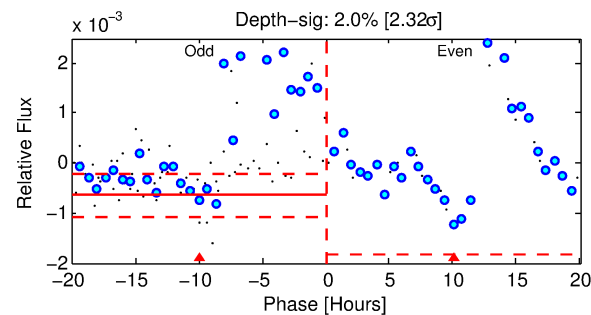
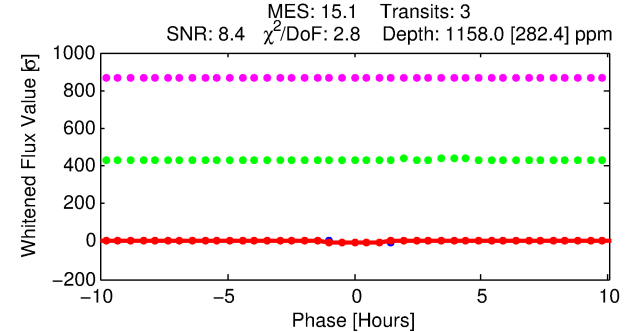
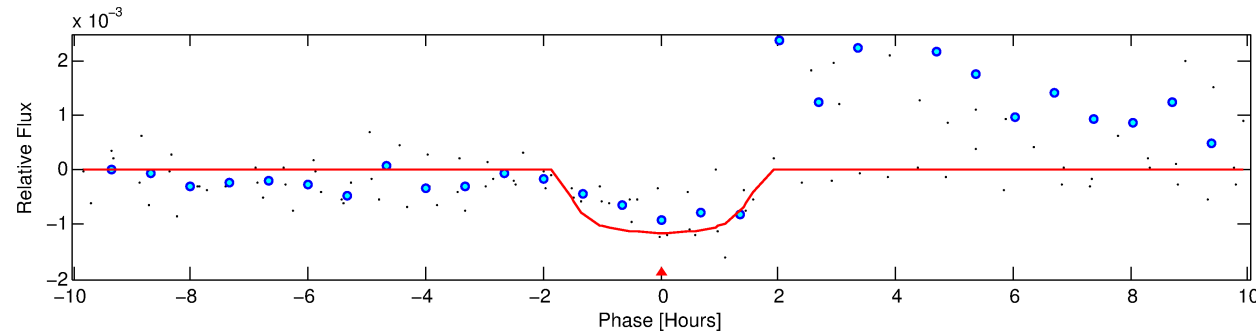
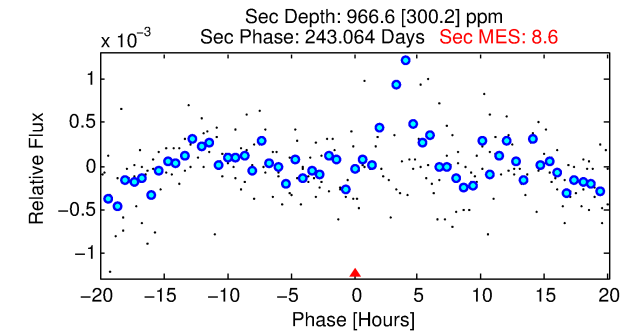
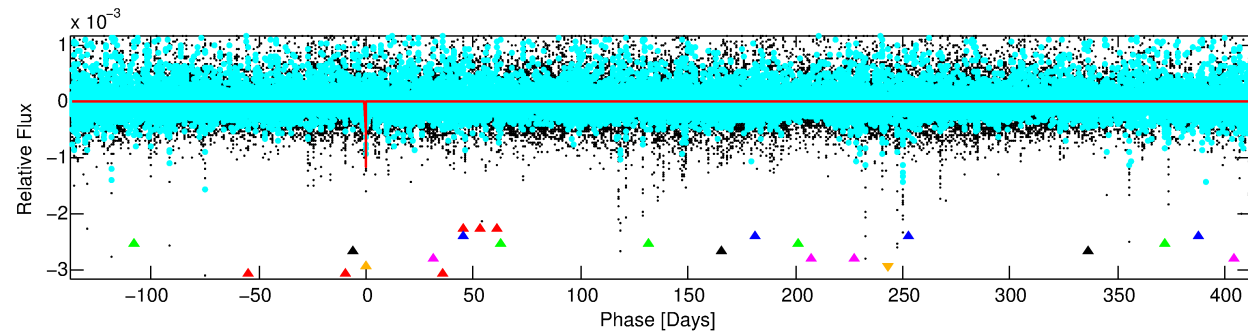
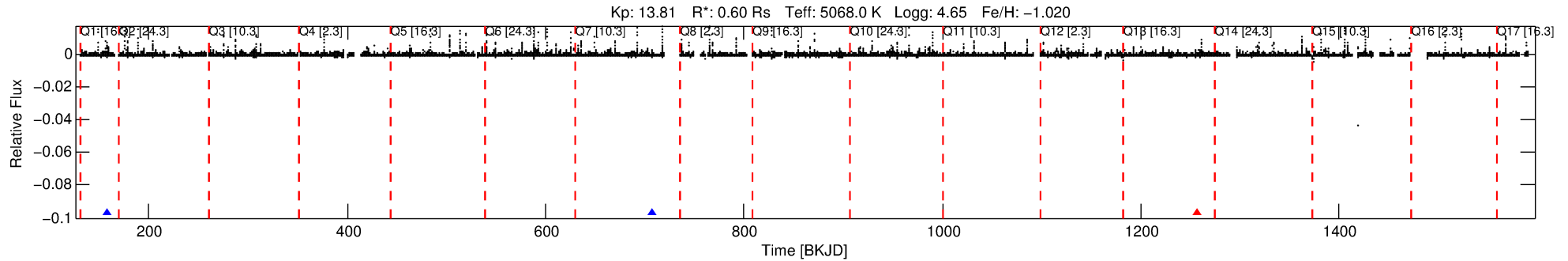
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012401644-06

No Significant Match Found

# DV One-Page Summary

KIC: 12401644 Candidate: 6 of 7 Period: 548.808 d



## DV Fit Results:

Period = 548.80839 [0.00641] d  
Epoch = 158.5626 [0.0099] BKJD  
Rp/R\* = 0.0324 [0.1255]  
a/R\* = 1049.83 [16674.69]  
b = 0.60 [16.97]  
Seff = 0.18 [0.03]  
Teq = 165 [7] K  
Rp = 2.14 [8.29] Re  
a = 1.1079 [0.0768] AU  
Ag = 142615.04 [1105613.29] [0.13 $\sigma$ ]  
Teffp = 4964 [9622] K [0.50 $\sigma$ ]

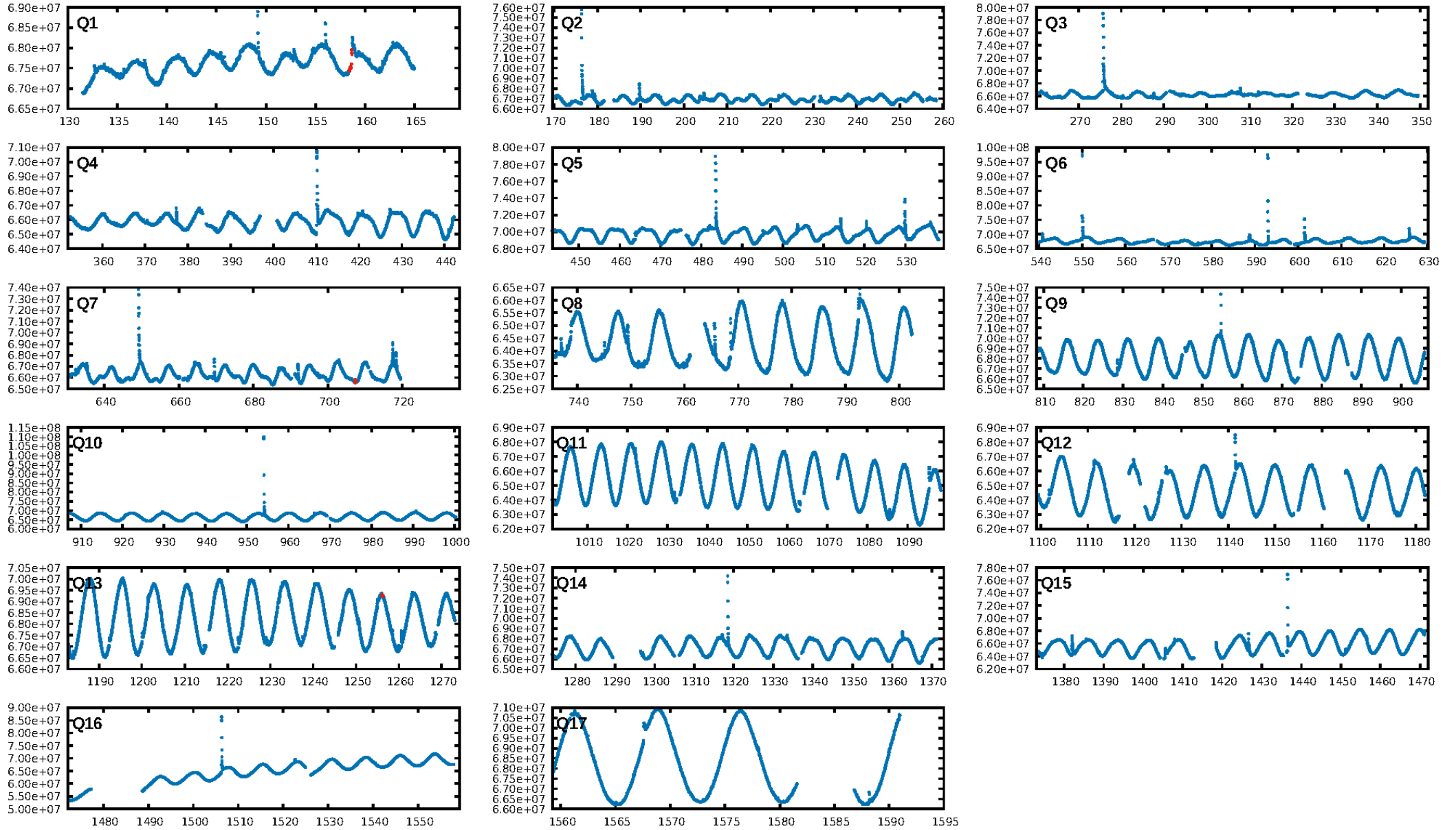
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [84.08 $\sigma$ ]  
LongPeriod-sig: 100.0% [44.01 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
a/R\* = 1049.83 [16674.69]  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.50 [1/2]  
GhostDiagnostic-chr: 0.5205  
Centroid-sig: 44.4%  
Centroid-so: 0.743 arcsec [1.01 $\sigma$ ]  
OotOffset-rm: 0.237 arcsec [1.17 $\sigma$ ]  
KicOffset-rm: 0.230 arcsec [1.19 $\sigma$ ]  
OotOffset-st: 0/1/0/1 [2]  
KicOffset-st: 0/1/0/1 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [3/3]

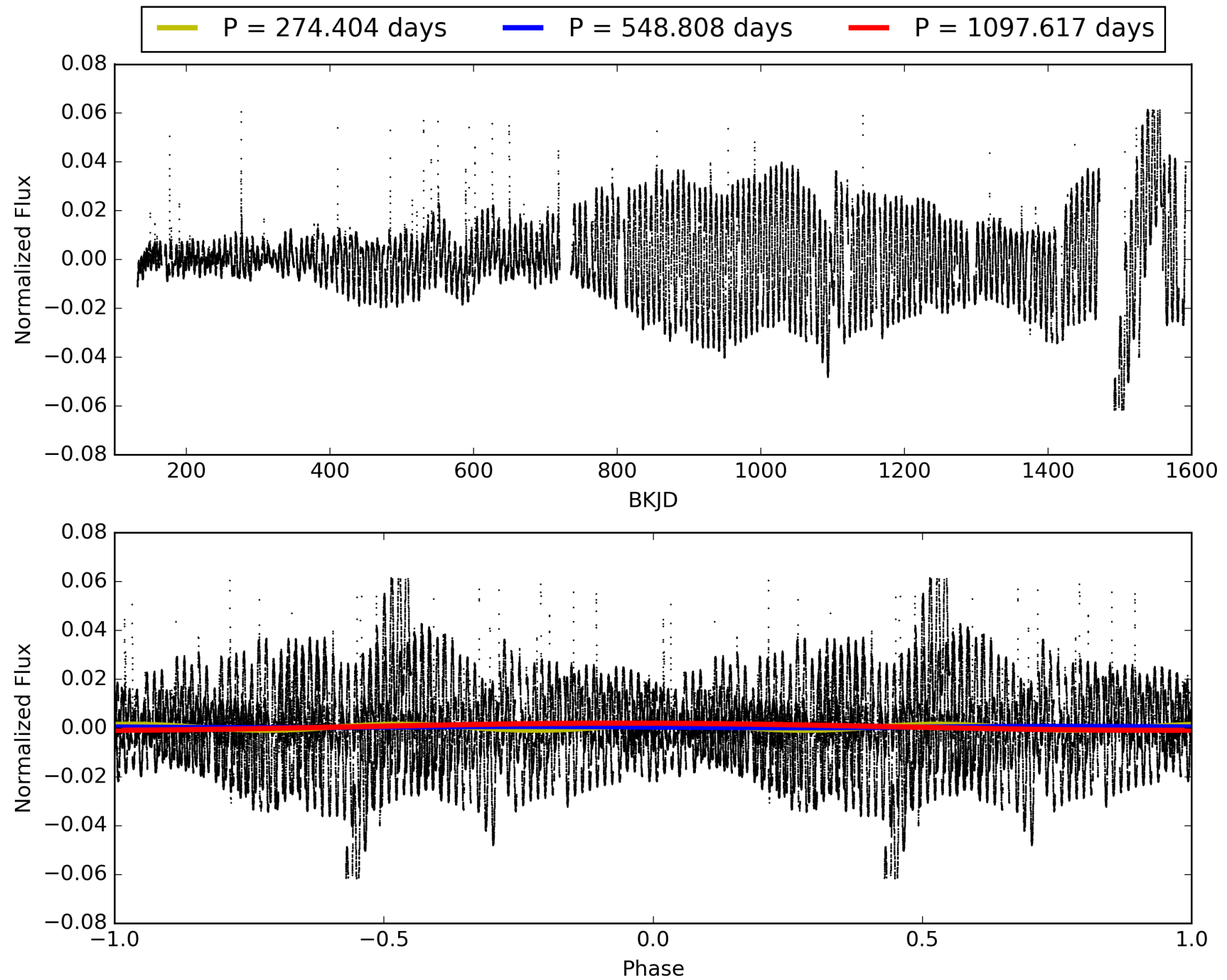
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:16:58 Z

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

# TCE 012401644-06, PDC Light Curves

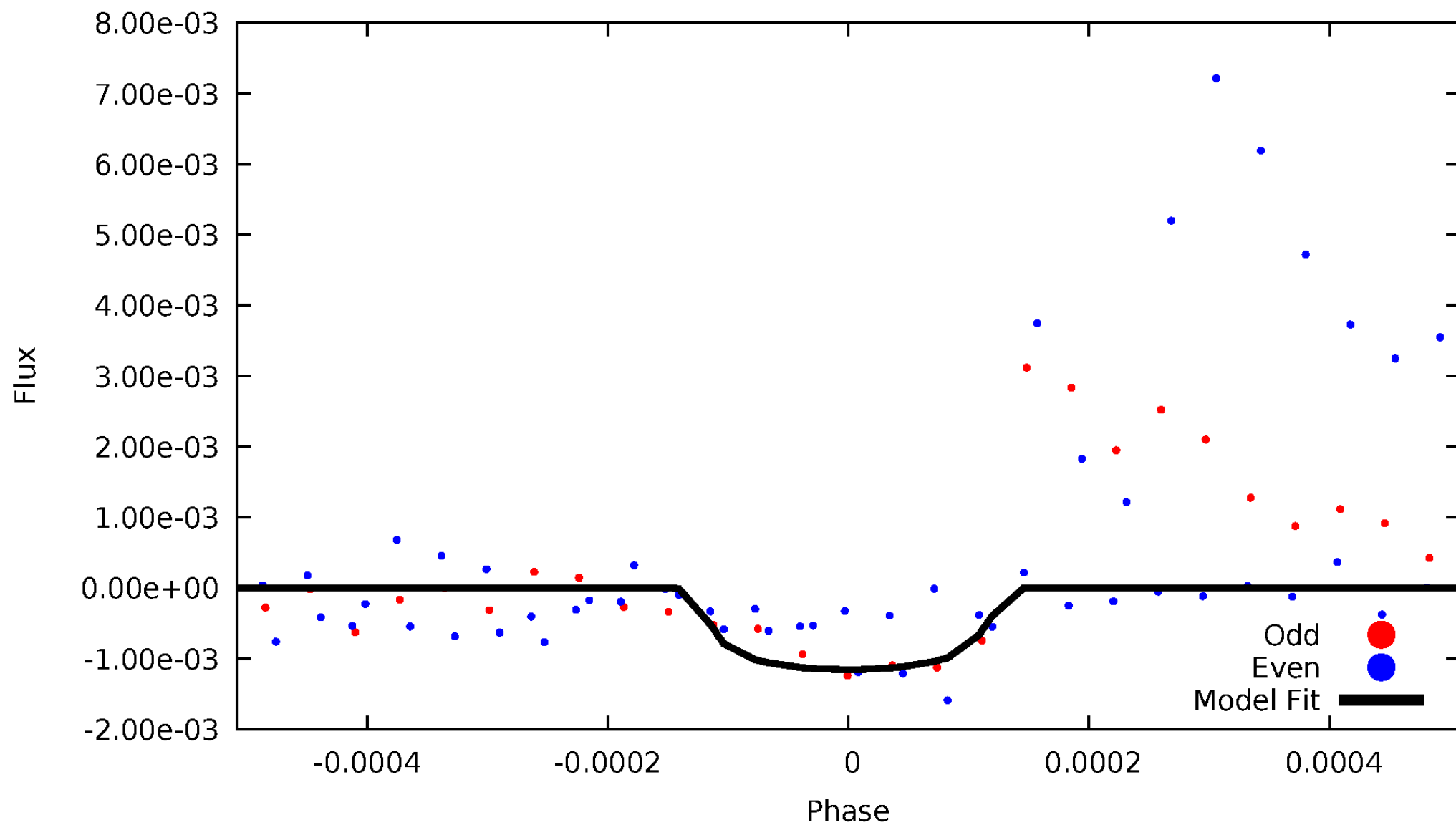


# TCE 012401644-06



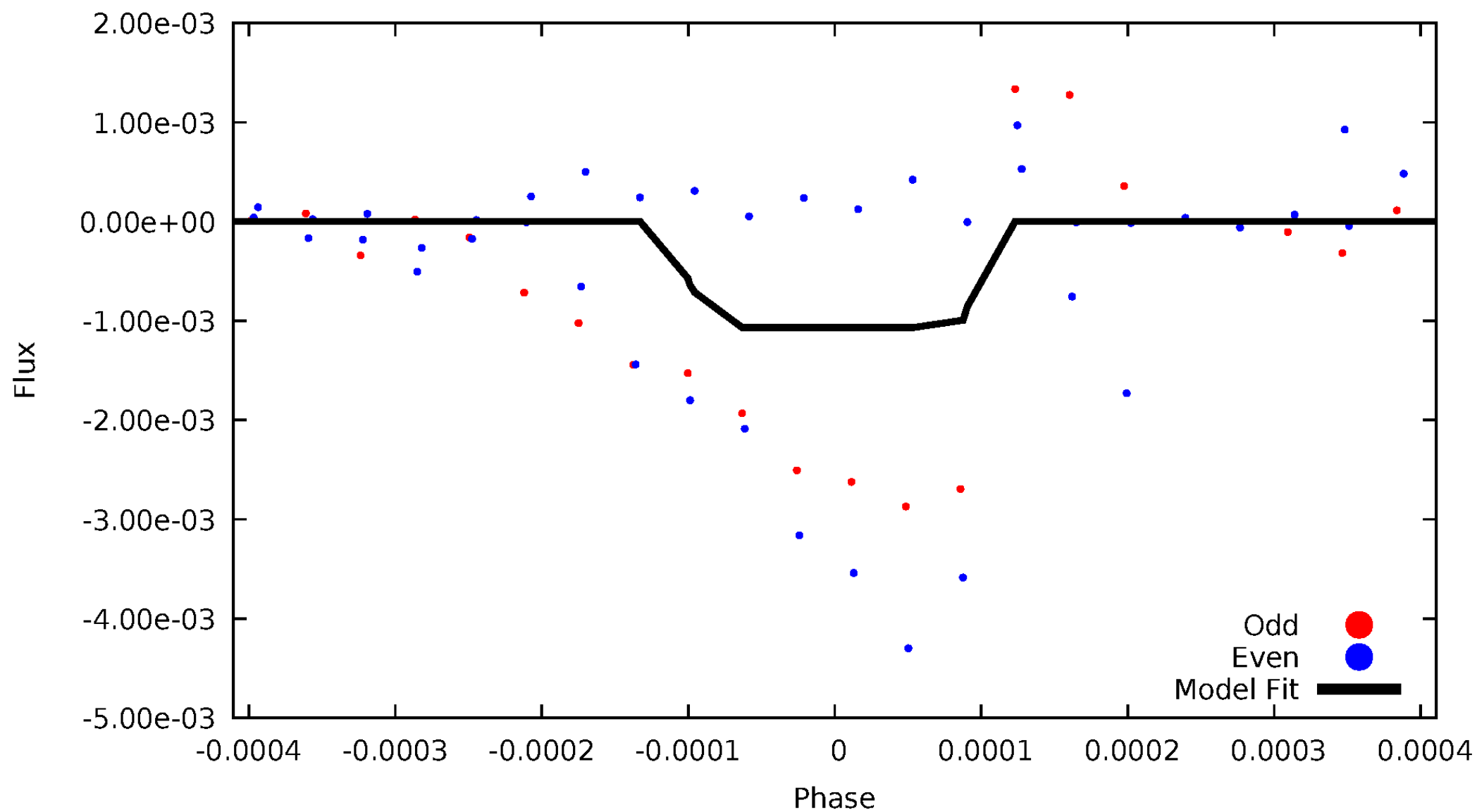
# DV Odd/Even

TCE 012401644-06



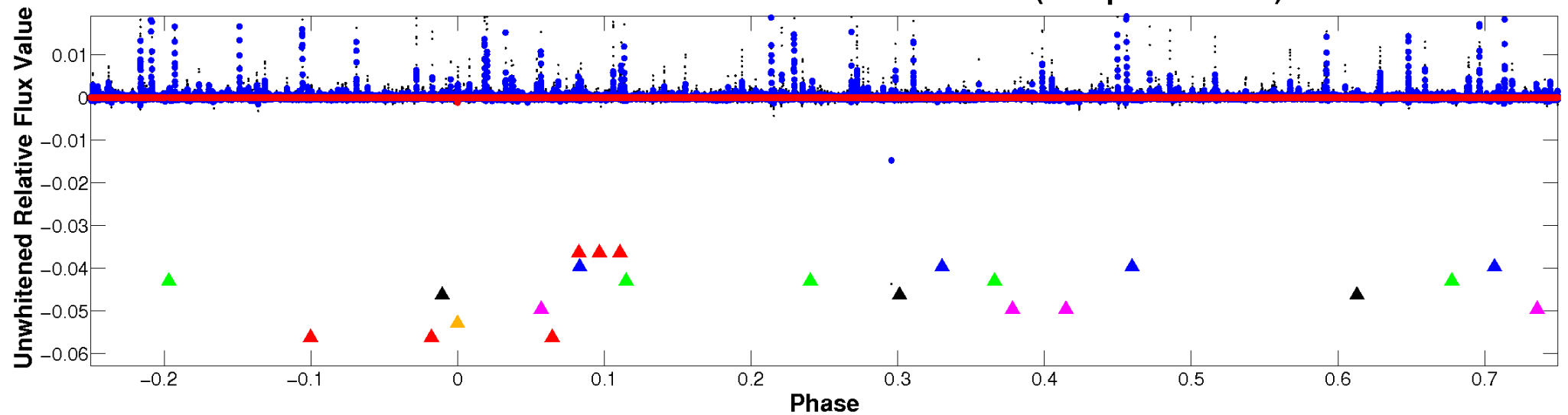
# ALT Odd/Even

TCE 012401644-06

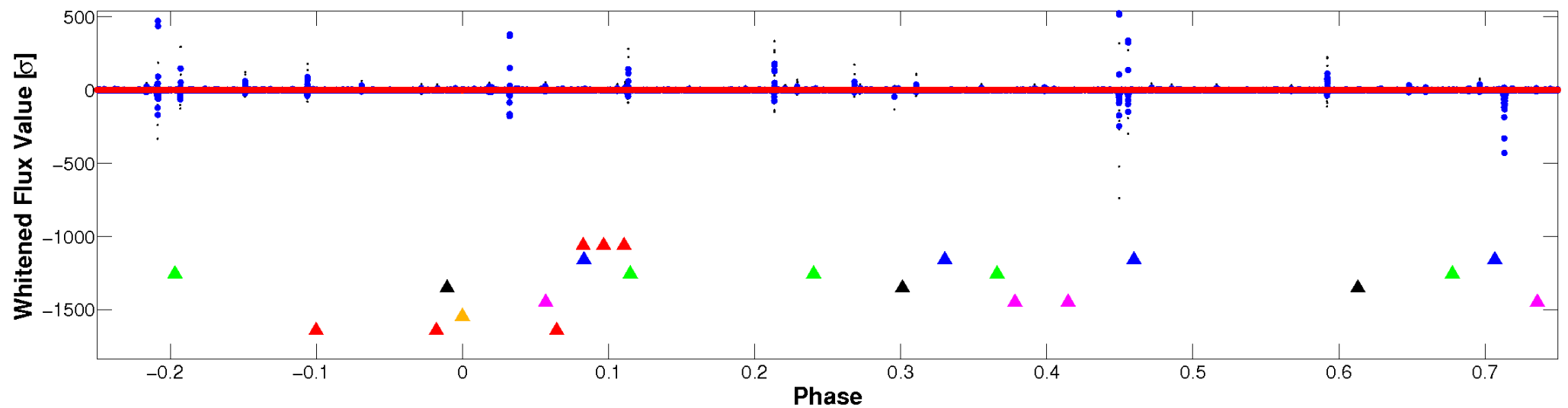


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

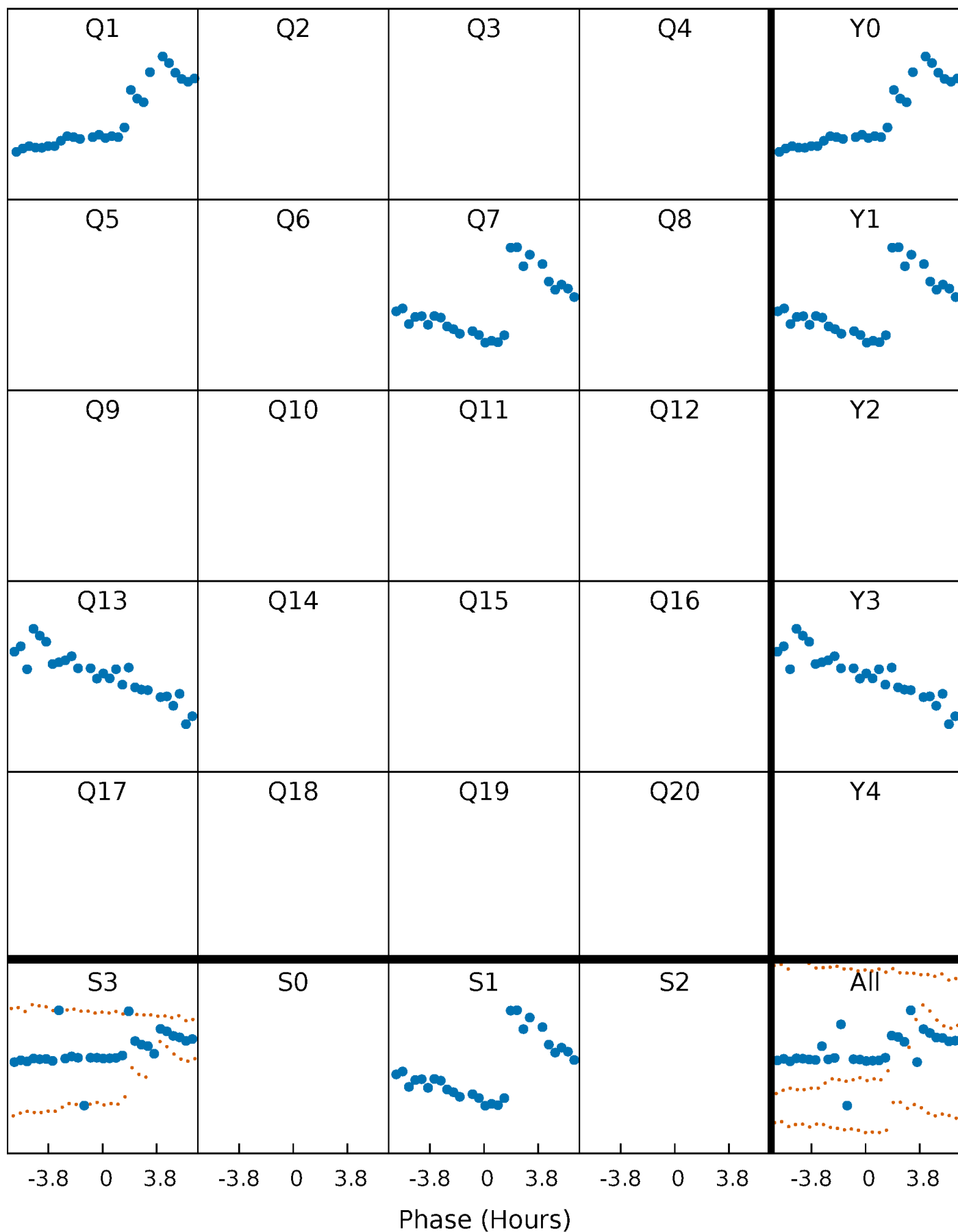


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

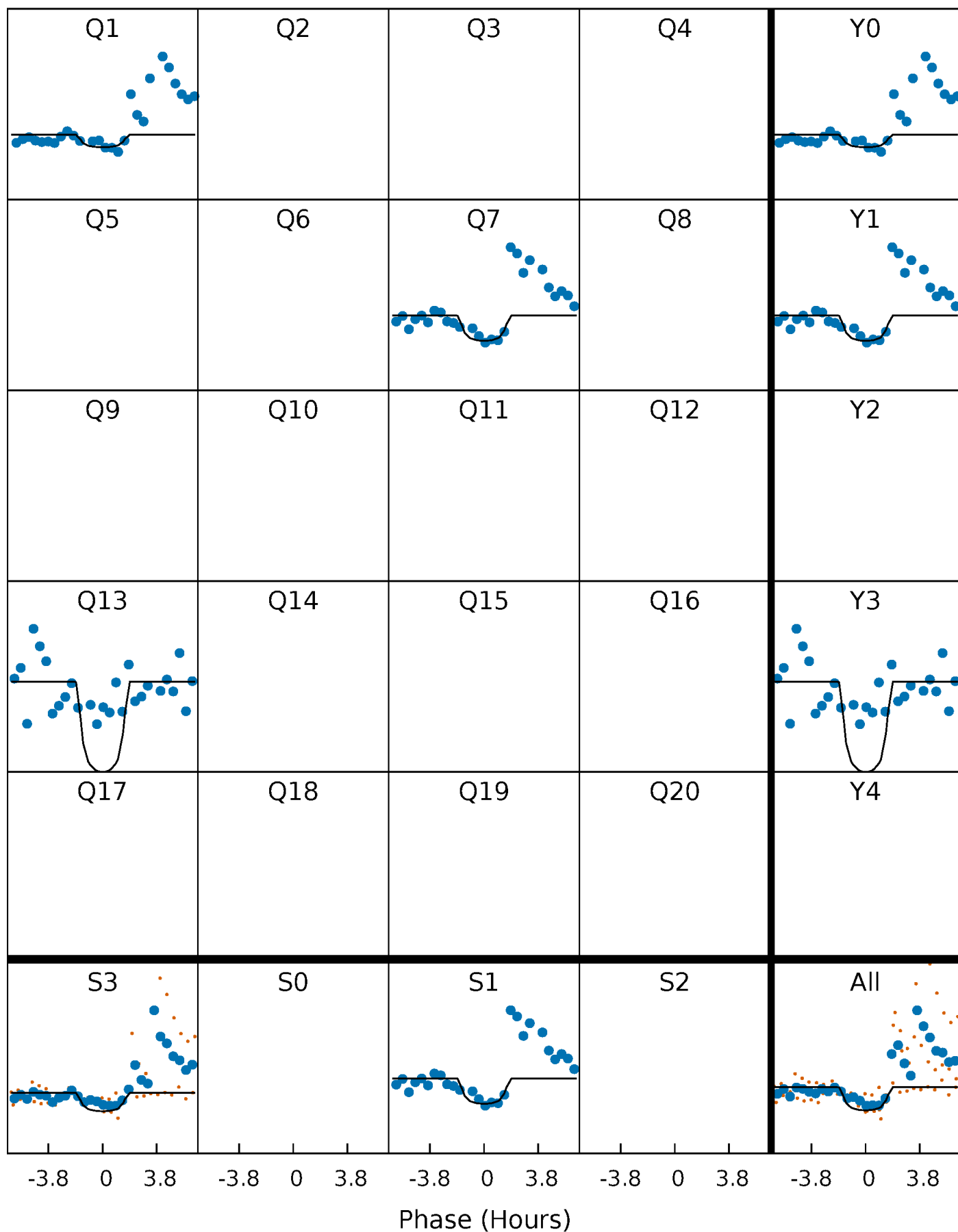
TCE 012401644-06 P=548.808394 Days  $T_0=158.562553$  (BKJD)





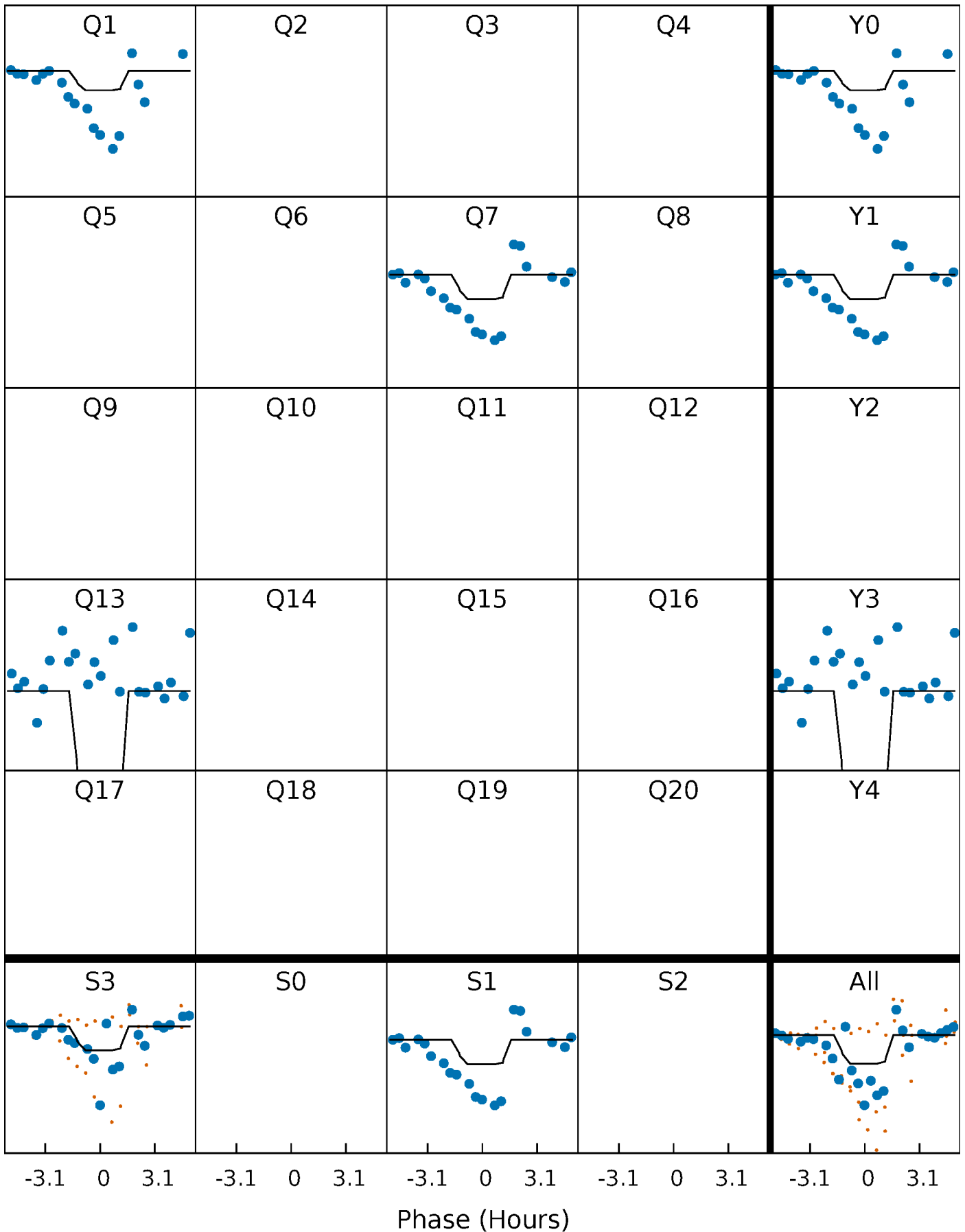
# DV Quarter-Phased Transit Curves

TCE 012401644-06     $P=548.808394$  Days     $T_0=158.562553$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

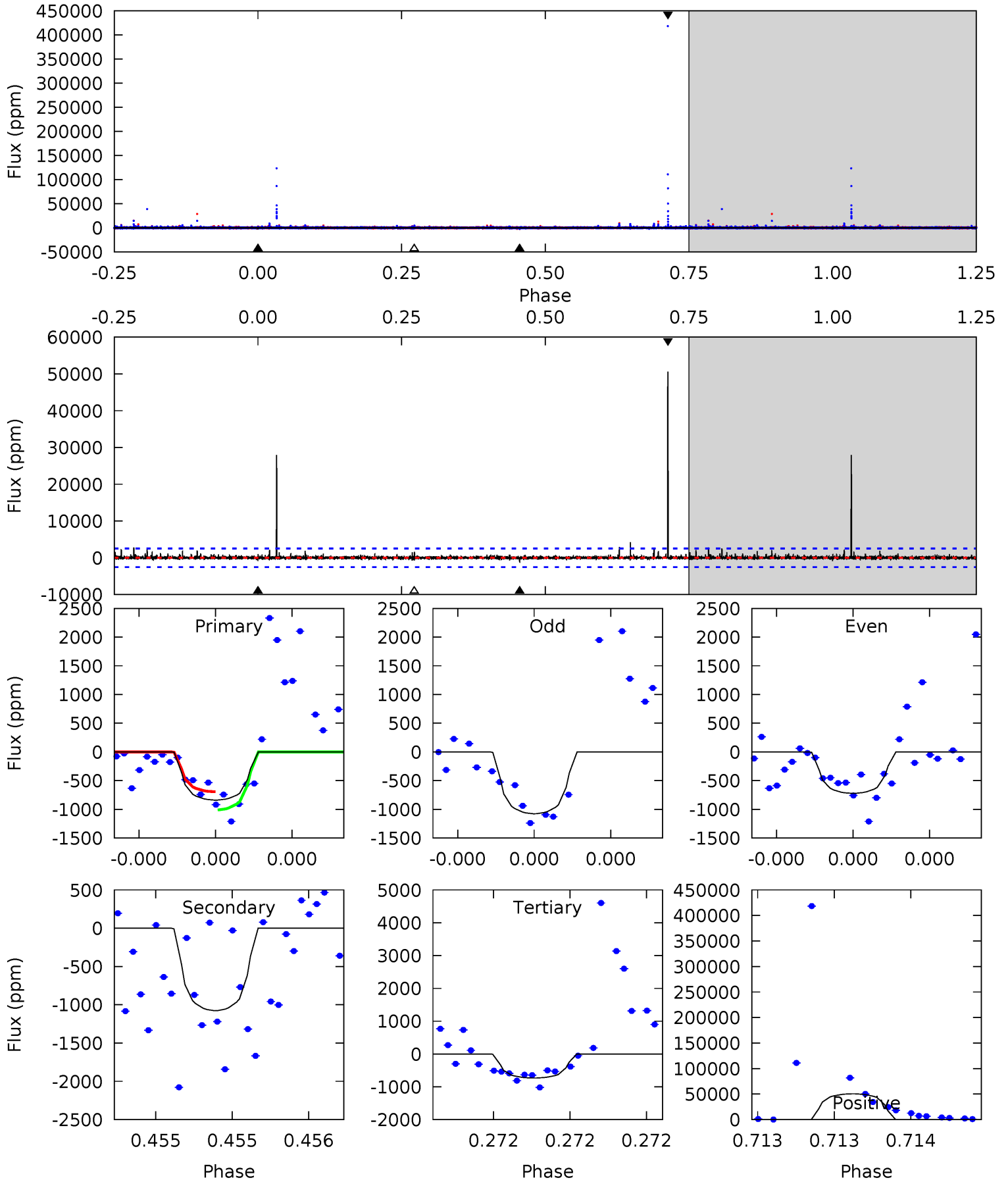
TCE 012401644-06 P=548.804554 Days  $T_0=158.580227$  (BKJD)



# DV Model-Shift Uniqueness Test

012401644-06, P = 548.808394 Days, E = 158.562553 Days

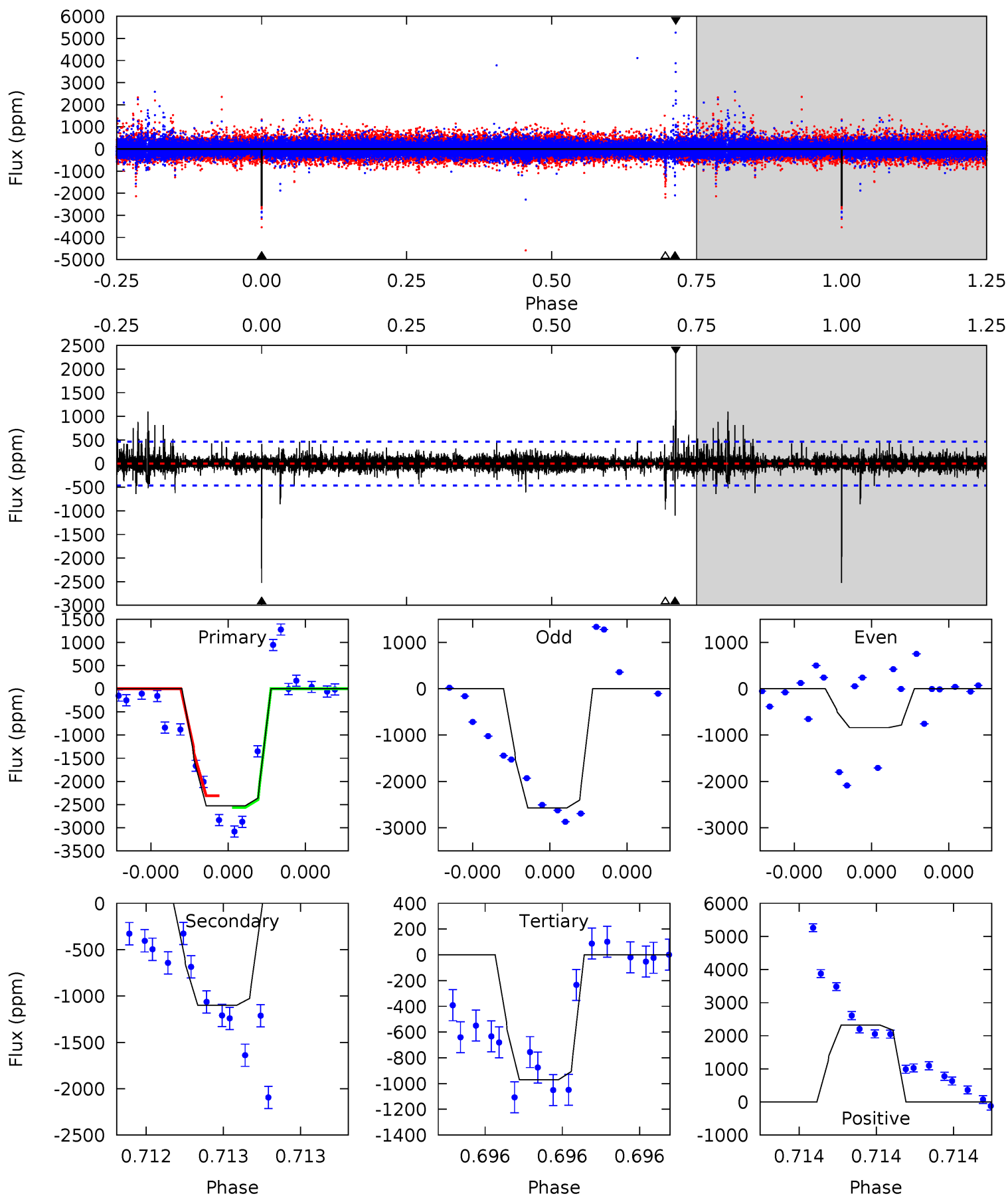
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.88	2.41	1.64	113.2	5.69	3.65	2.05	0.24	-111.3	0.77	-110.8	0.14	0.79	0.98	0.34



# Alt Model-Shift Uniqueness Test

012401644-06, P = 548.804554 Days, E = 158.580227 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
31.0	13.5	11.9	28.4	5.71	3.69	1.10	19.1	2.53	1.57	-15.0	10.2	0.74	0.48	0



### Stellar Parameters For KIC 012401644

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5068^{+166}_{-151}$	$4.654^{+0.060}_{-0.040}$	$-1.020^{+0.300}_{-0.300}$	$0.605^{+0.047}_{-0.042}$	$0.601^{+0.052}_{-0.021}$	$3.832^{+0.868}_{-0.590}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-7%	+9%/-3%	+23%/-15%
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 012401644-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-1078 \pm 447$	$6.09^{+6.79}_{-4.15}$	$230^{+9}_{-8}$	$3417^{+1790}_{-674}$	$18080^{+168423}_{-14372}$
Alt.	$-1100 \pm 82$	$6.66^{+6.68}_{-4.77}$	$230^{+9}_{-8}$	$3408^{+1964}_{-620}$	$17150^{+190362}_{-12764}$

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

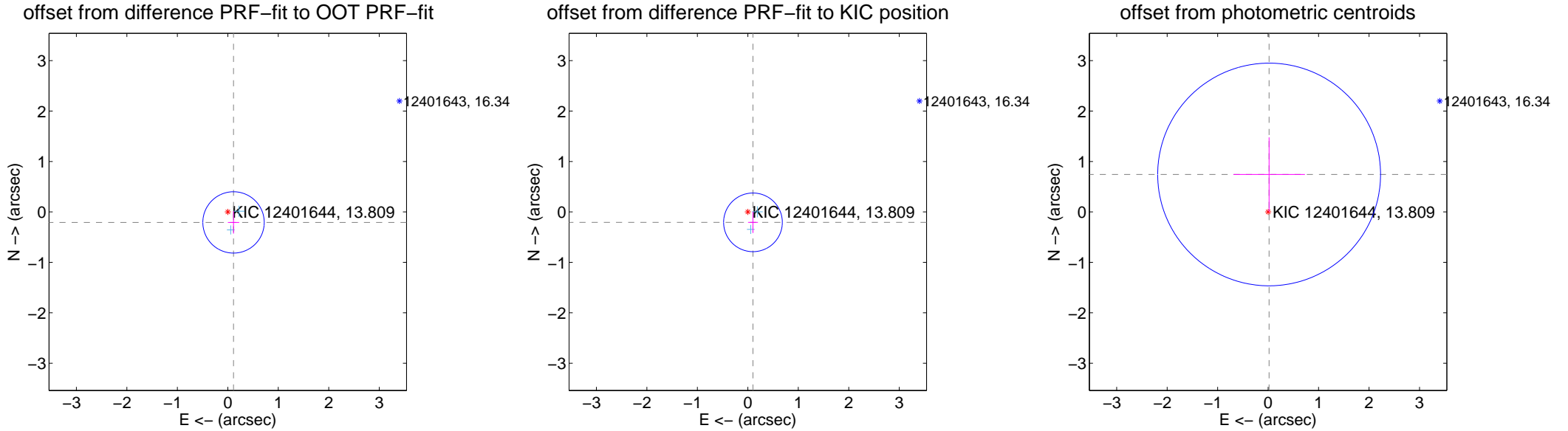
## DV Centroid Data

Supplemental centroid analysis for 012401644-06. Kepler magnitude: 13.81. Transit SNR 8.42

There are 2 quarters with good PRF difference image offsets

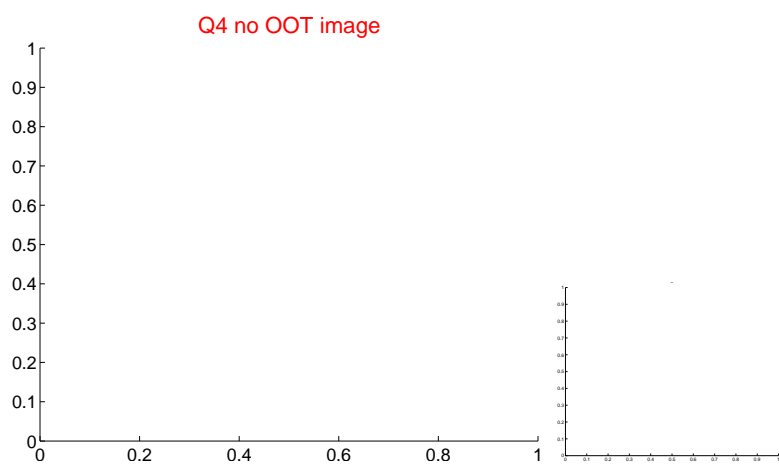
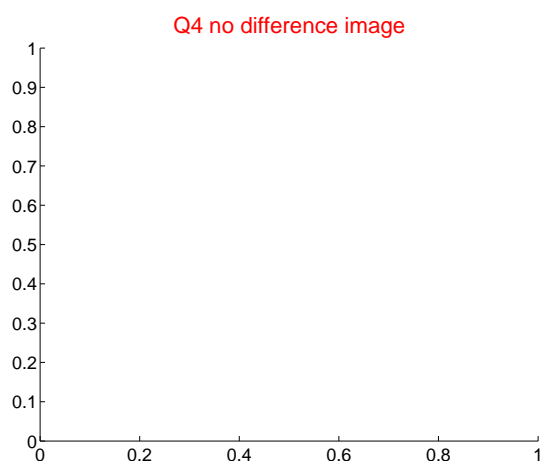
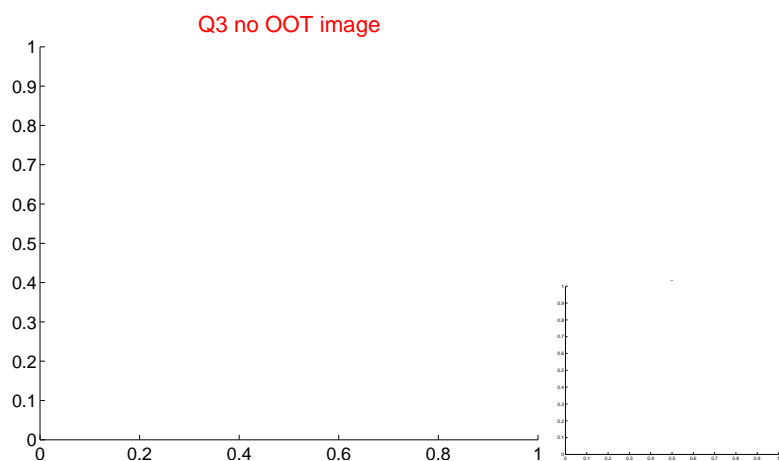
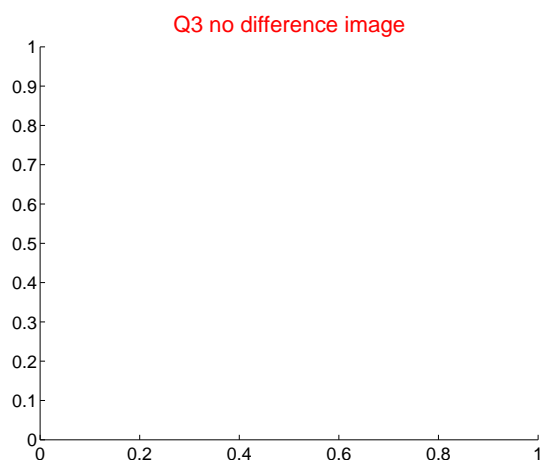
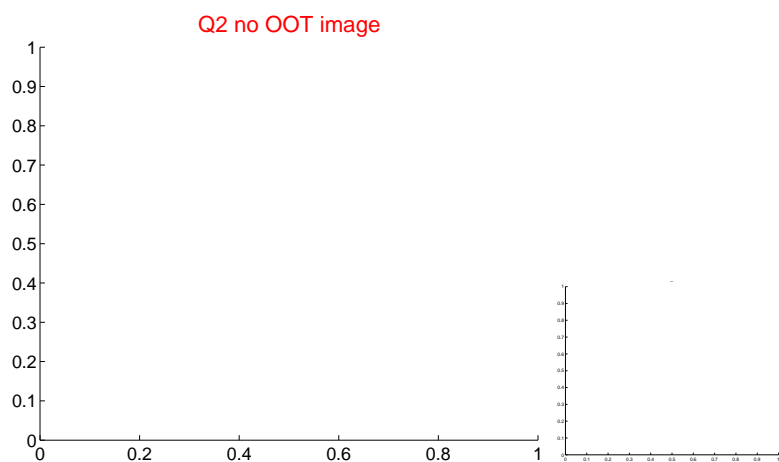
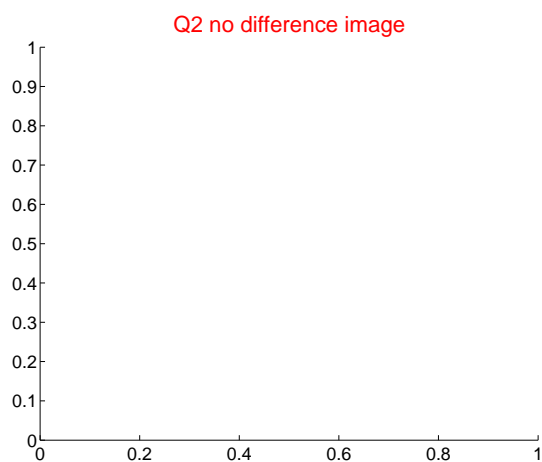
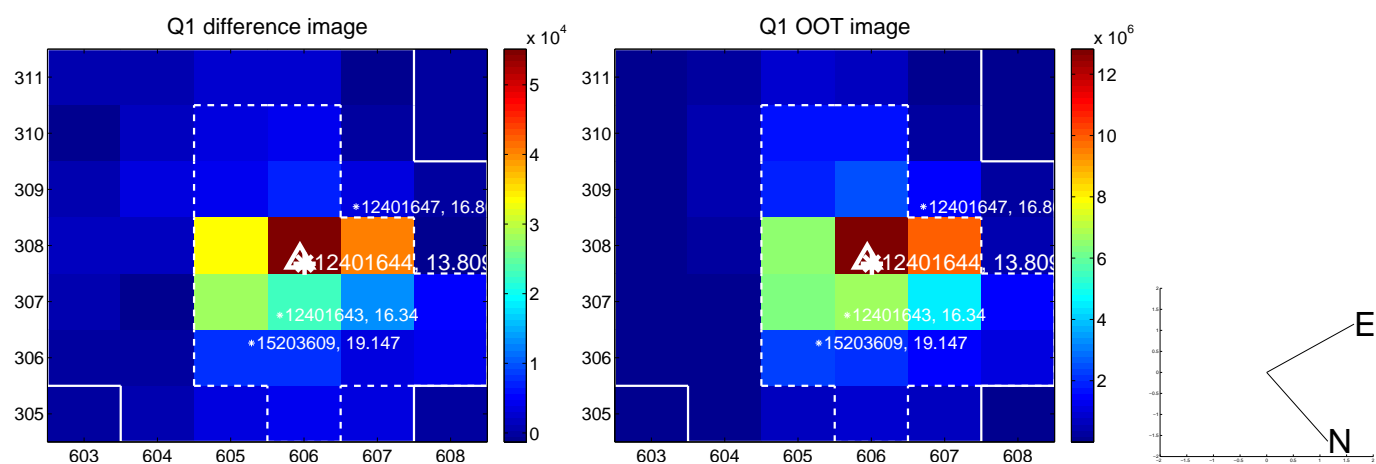
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.237 \pm 0.203$	1.17	$-0.113 \pm 0.113$	$-0.208 \pm 0.223$
PRF-fit source offset from KIC position	$0.230 \pm 0.194$	1.19	$-0.102 \pm 0.098$	$-0.207 \pm 0.211$
photometric centroid source offset	$0.74 \pm 0.74$	1.01	$-0.02 \pm 0.71$	$0.74 \pm 0.74$

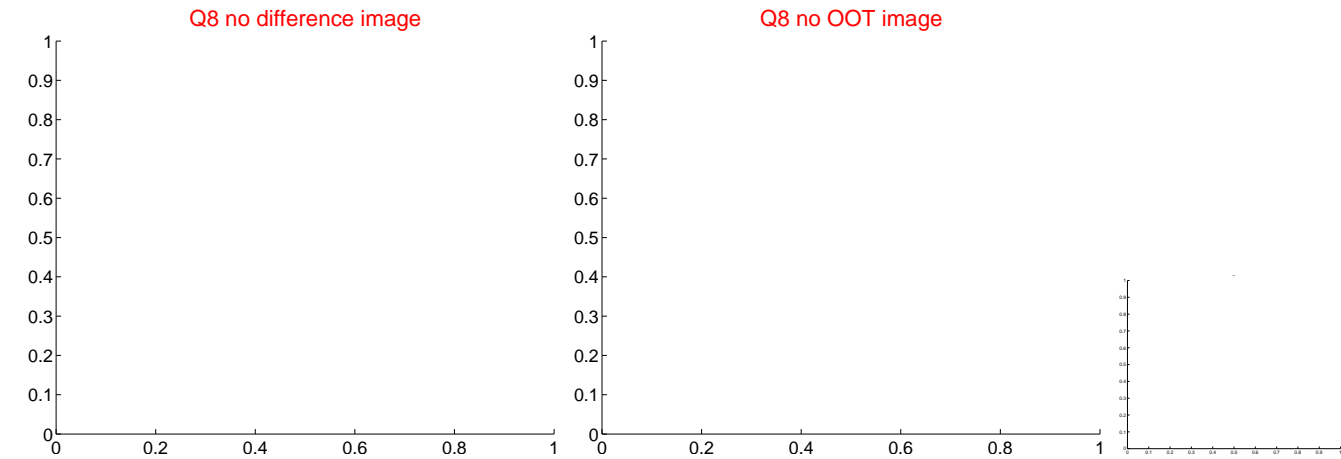
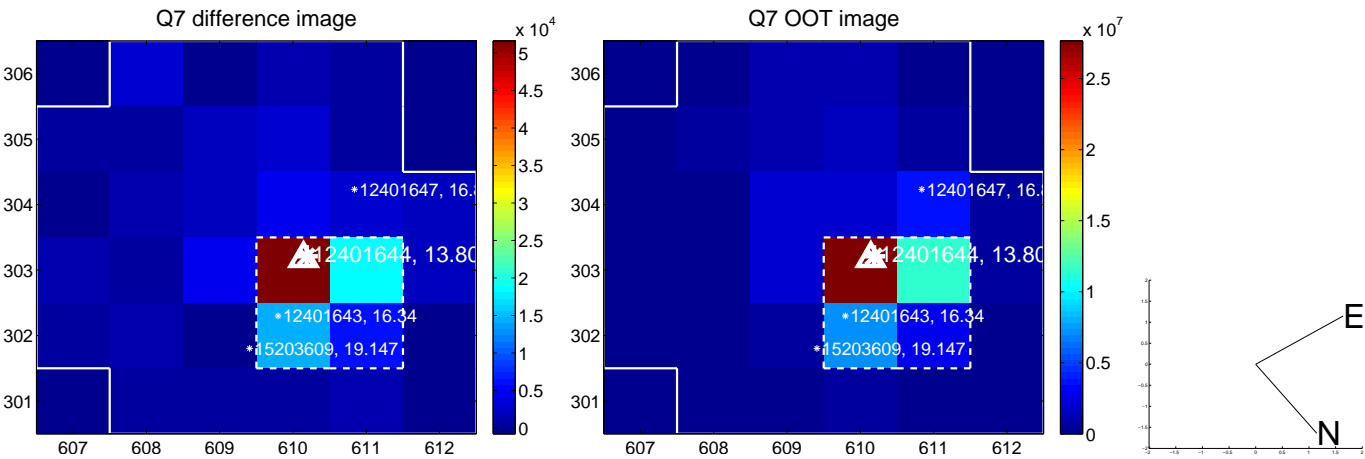
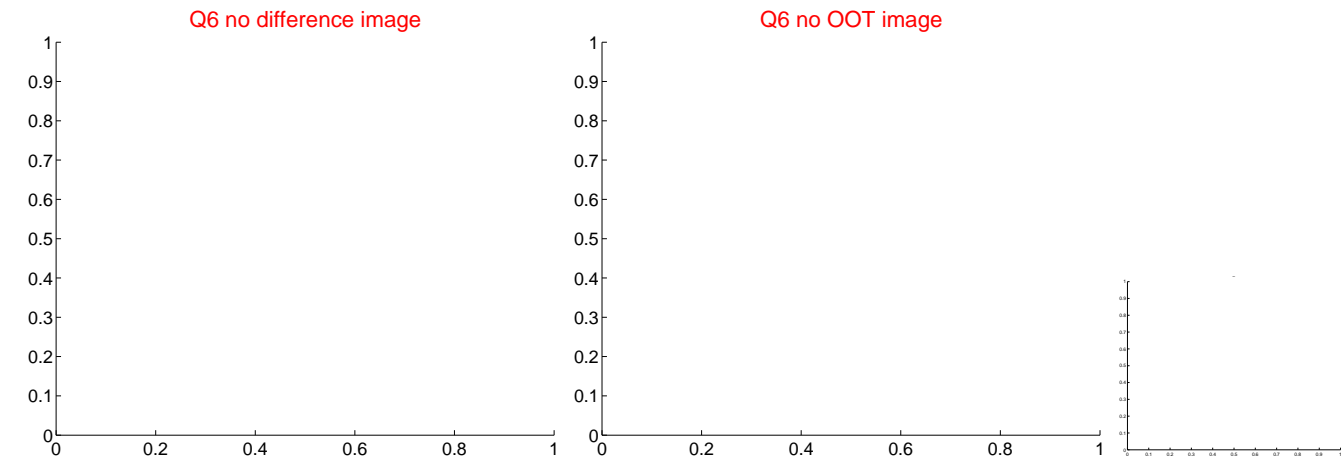
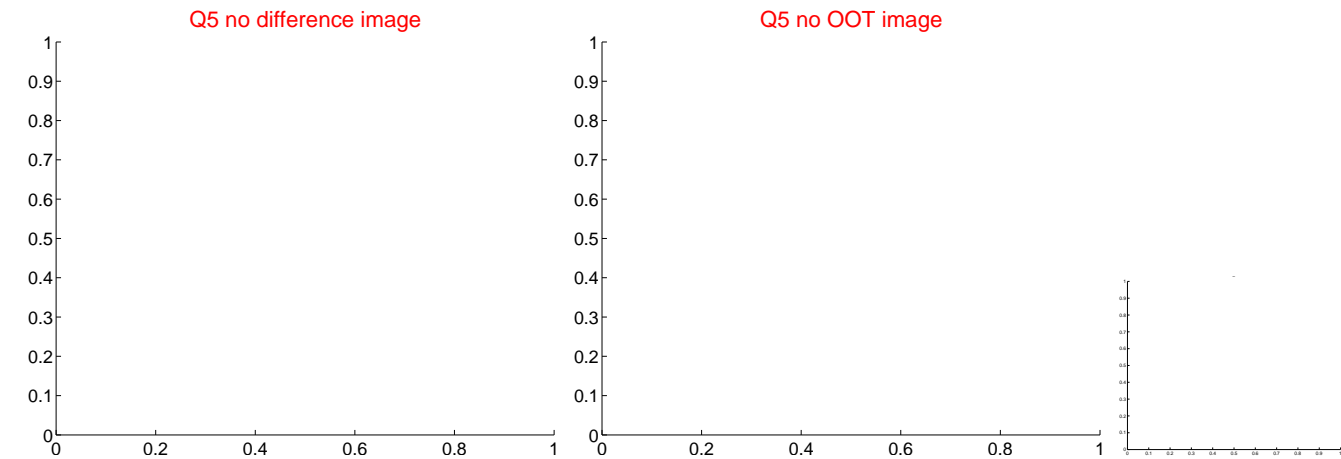


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

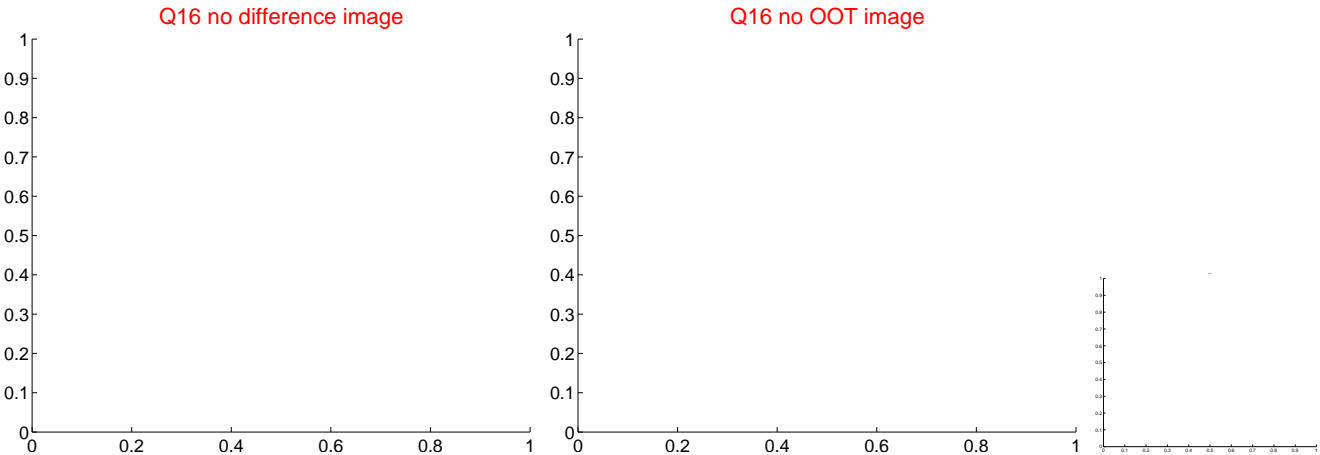
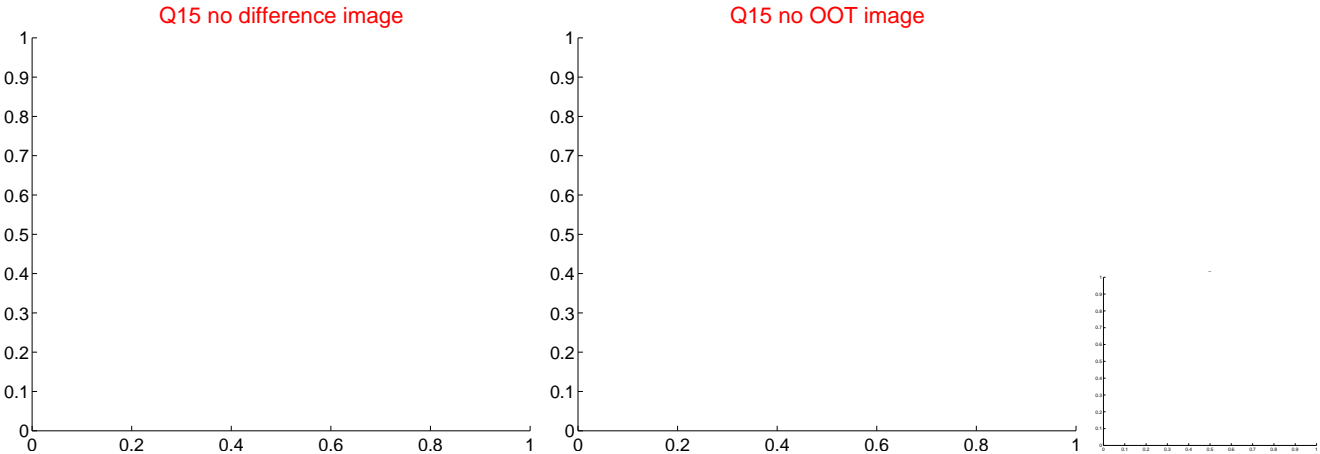
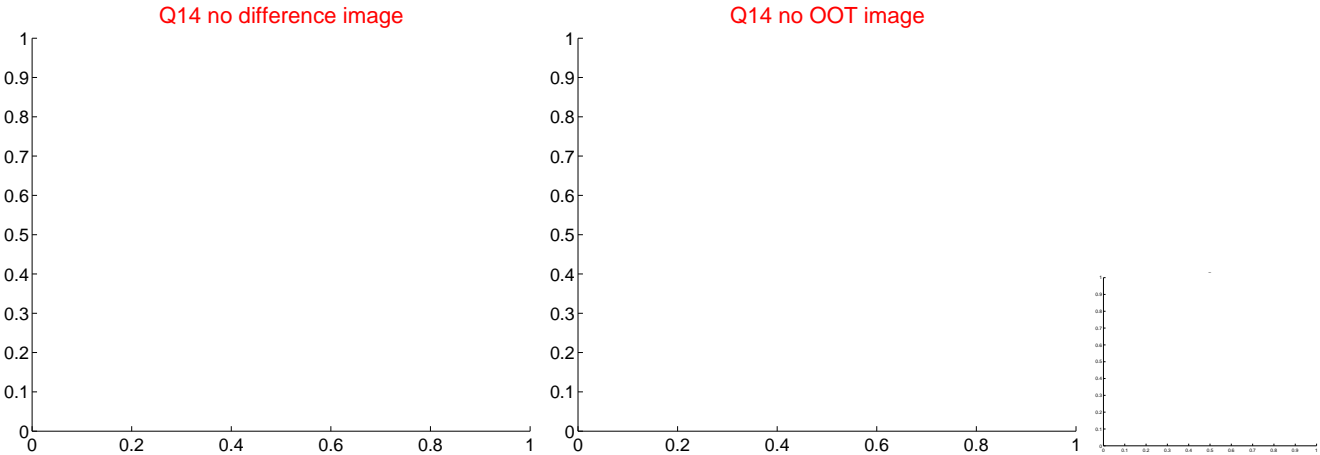
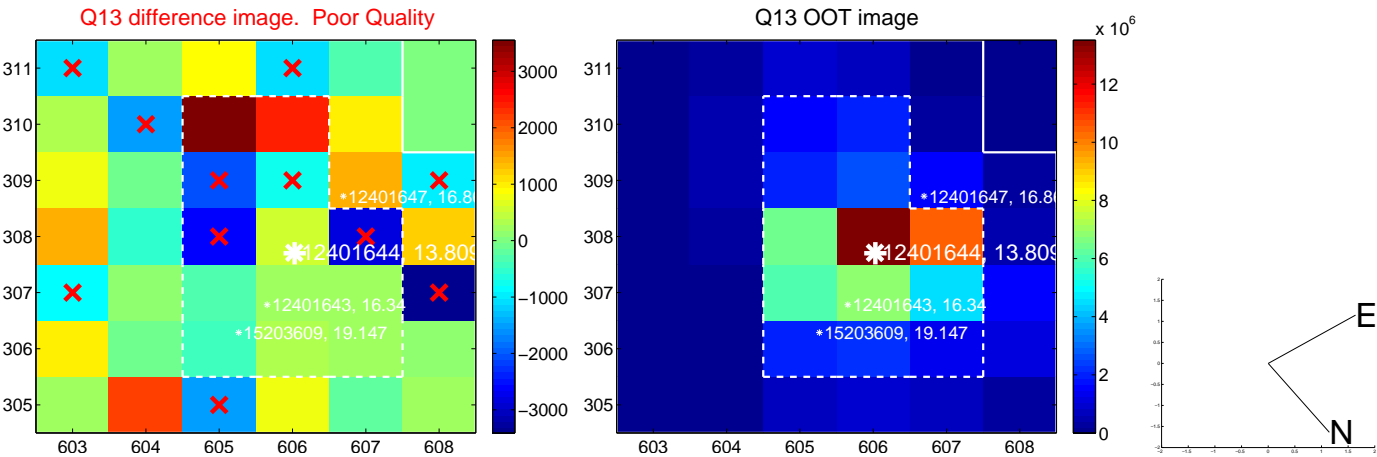




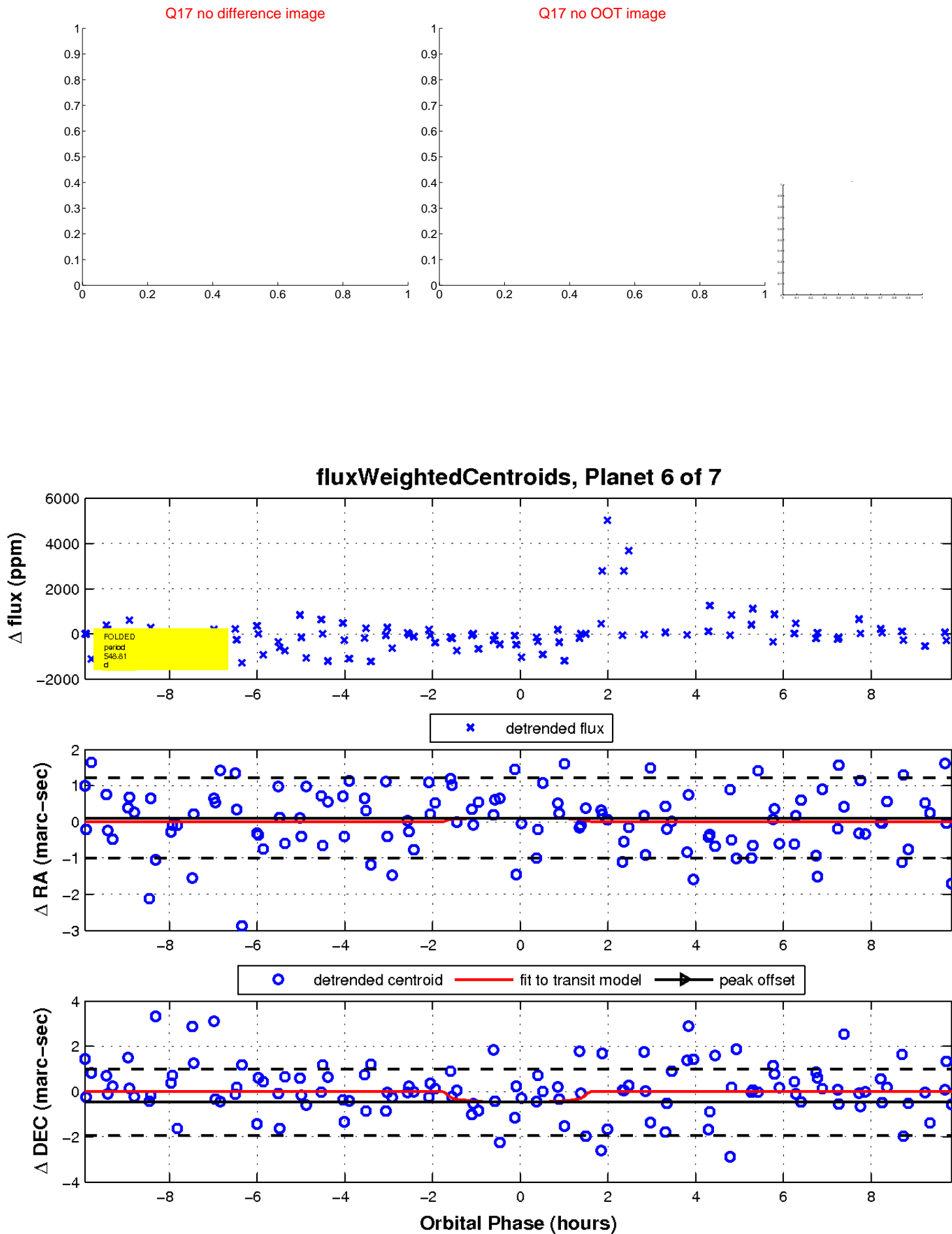
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

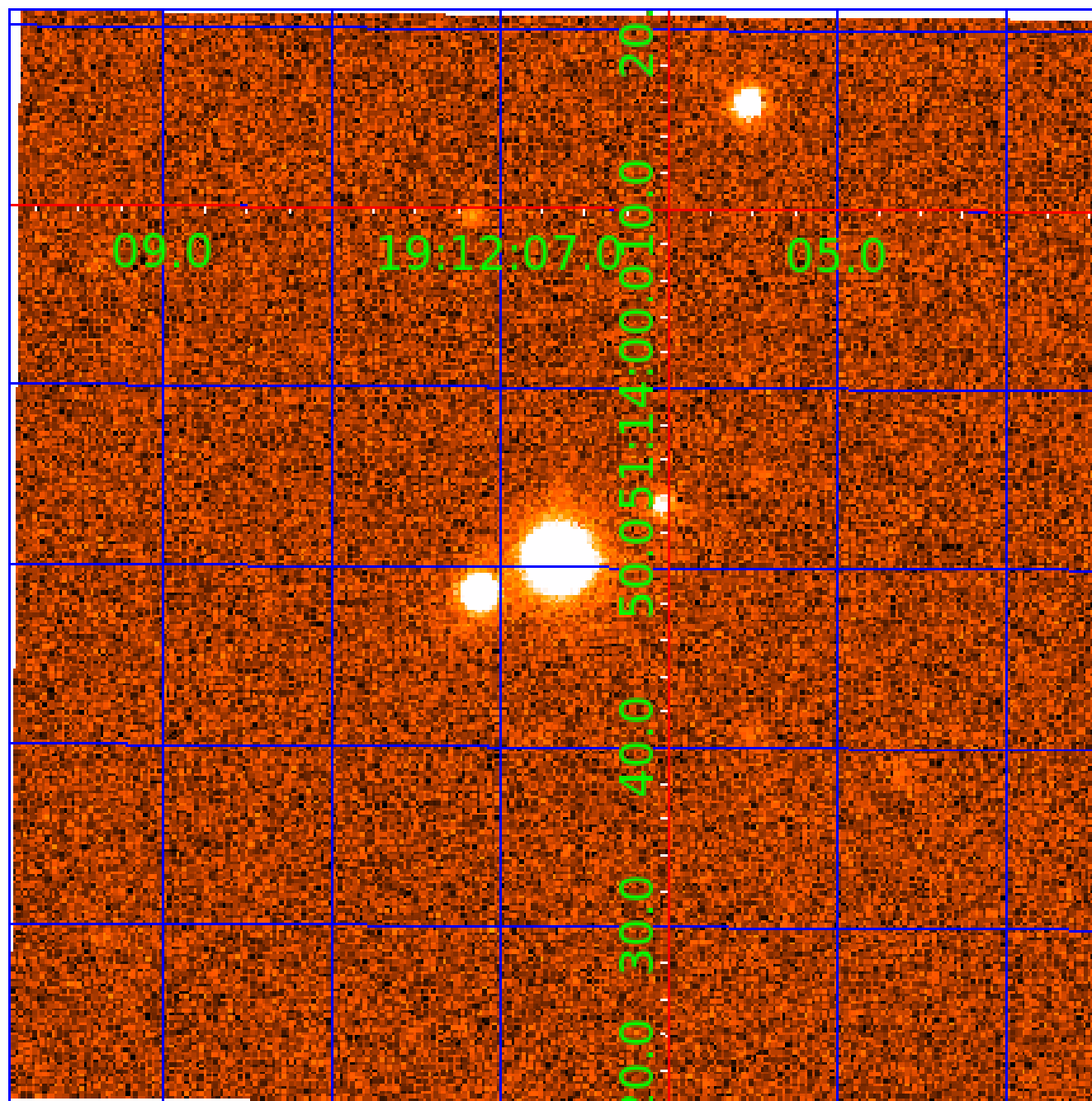


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 012401644

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012401644-02	OBS	No	342.181691	410.861651	6331.5	59.277	31.6	9.2	0.60	5068	8.91	0.33
012401644-03	OBS	No	308.857651	221.623847	2171.1	25.015	16.3	9.5	0.60	5068	3.50	0.38
012401644-05	OBS	No	372.532793	366.150217	1211.3	7.071	15.7	7.5	0.60	5068	2.19	0.29
012401644-06	OBS	No	548.808394	158.562553	1158.0	3.346	15.1	8.4	0.60	5068	2.14	0.18
012401644-07	OBS	No	503.616269	193.981537	1102.4	12.459	13.9	6.7	0.60	5068	2.04	0.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012401644-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS
012401644-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV—INCONSISTENT_TRANS
012401644-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012401644-07	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS

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

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

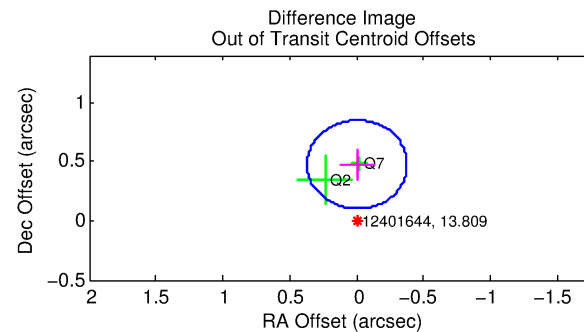
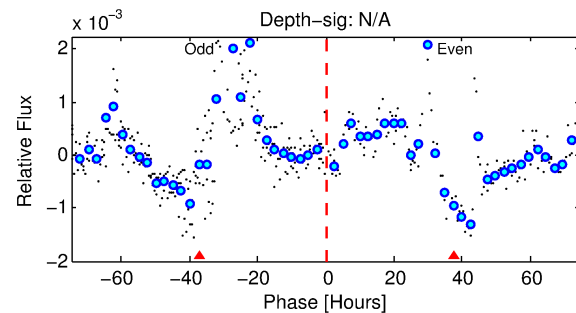
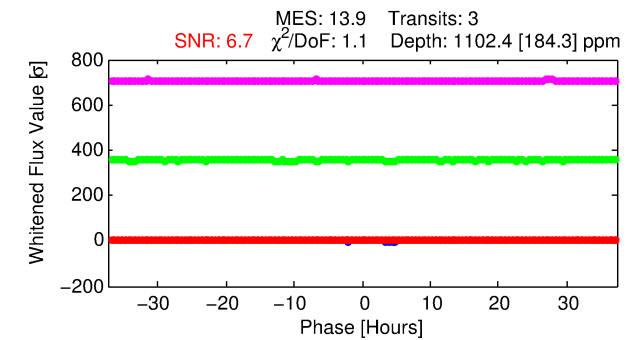
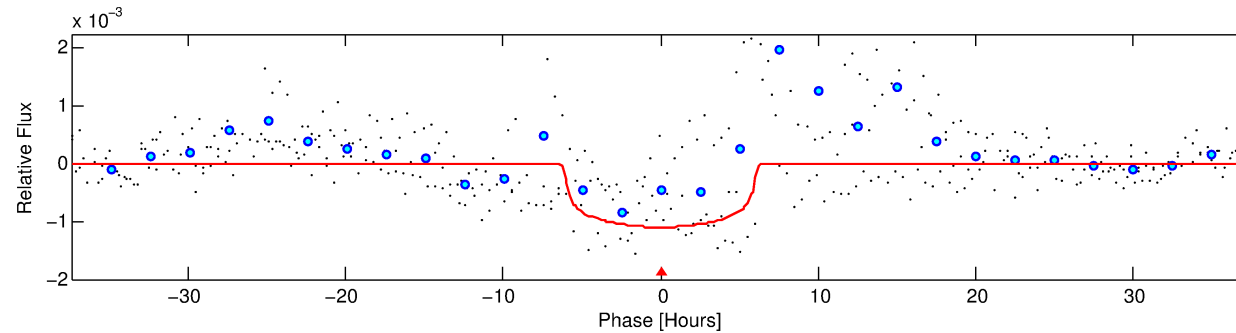
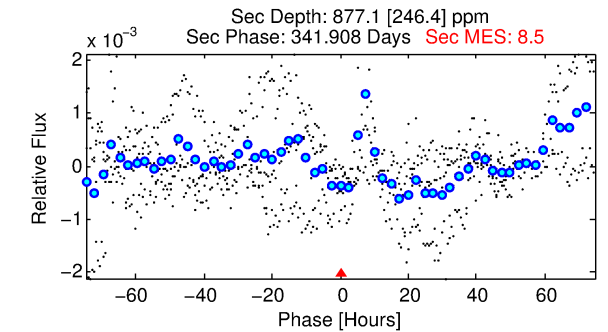
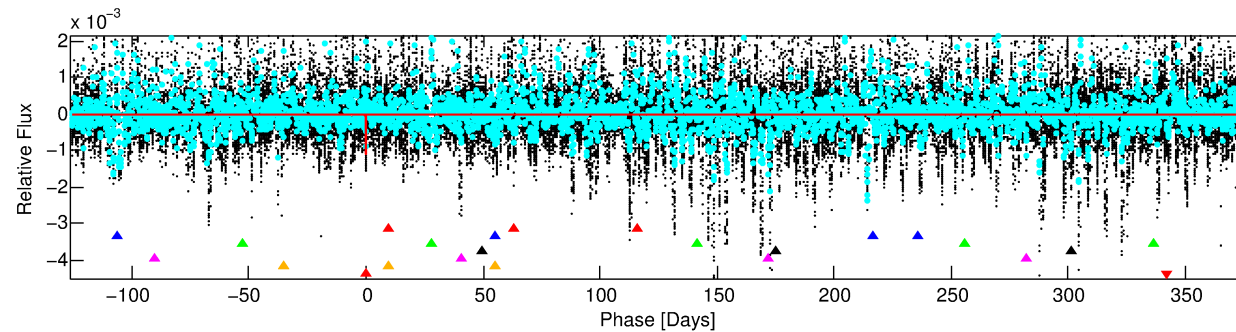
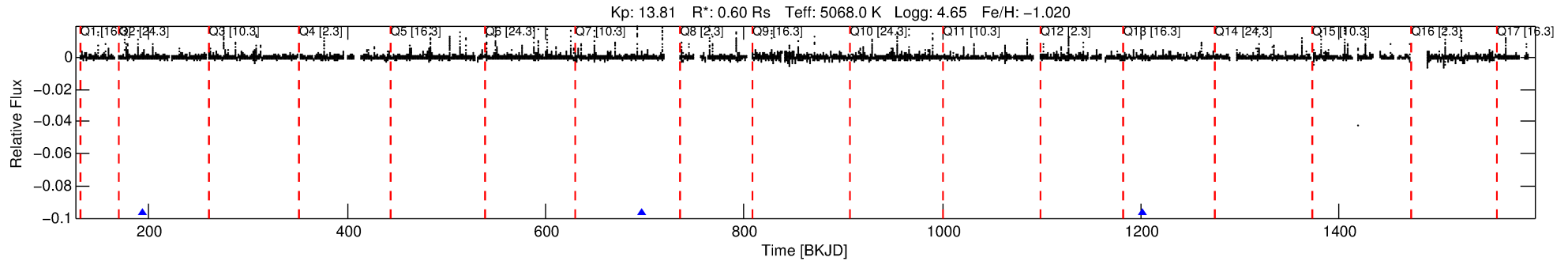
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 012401644-07

No Significant Match Found

# DV One-Page Summary

KIC: 12401644 Candidate: 7 of 7 Period: 503.616 d



## DV Fit Results:

Period = 503.61627 [0.00621] d  
Epoch = 193.9815 [0.0082] BKJD  
Rp/R\* = 0.0309 [0.0093]  
a/R\* = 281.00 [316.13]  
b = 0.48 [1.78]  
Seff = 0.20 [0.03]  
Teff = 170 [7] K  
Rp = 2.04 [0.63] Re  
a = 1.0462 [0.0725] AU  
Ag = 126899.07 [85106.19] [1.49 $\sigma$ ]  
**Teffp = 4962 [837] K [5.7 $\sigma$ ]**

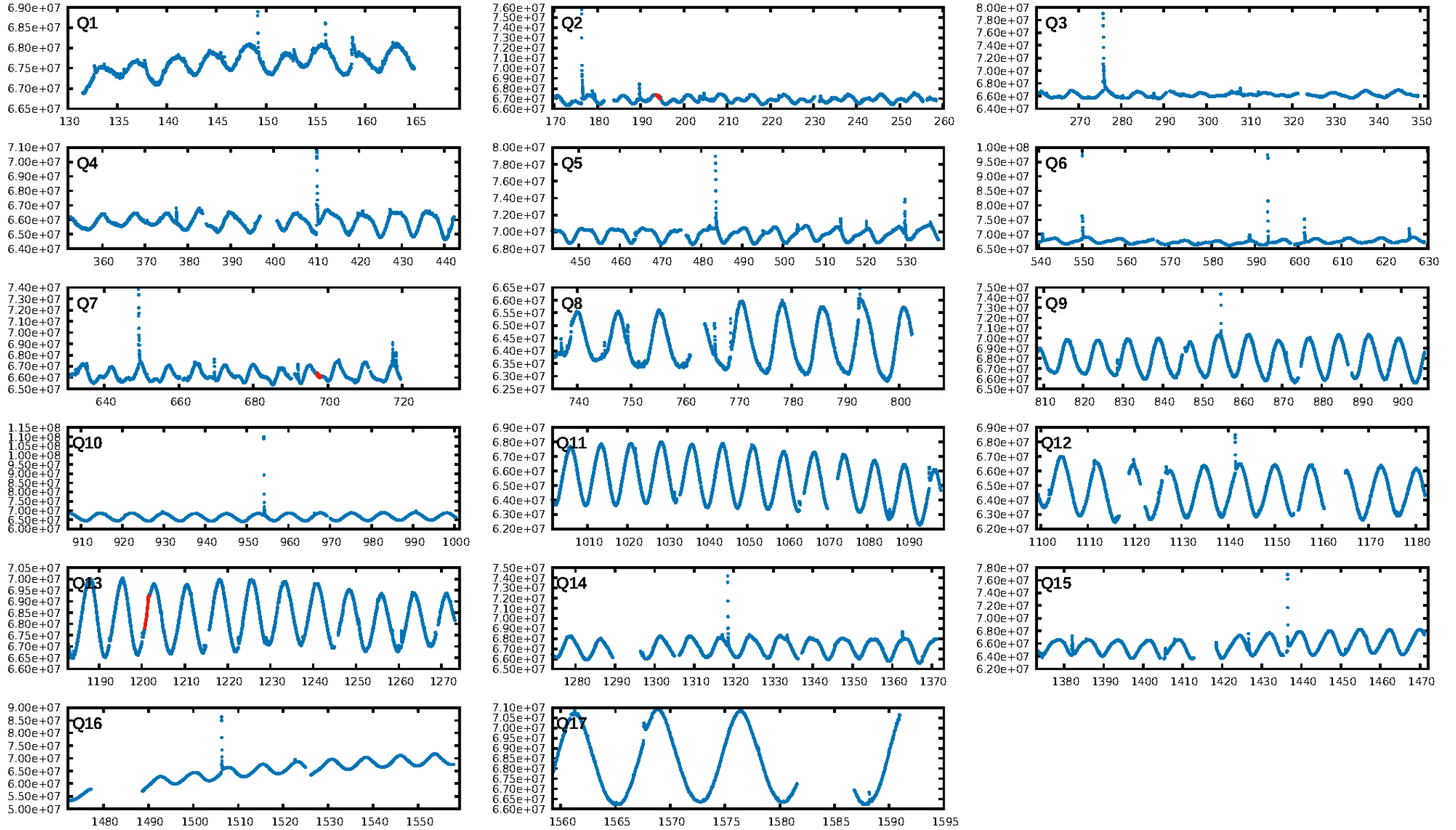
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [228.27 $\sigma$ ]  
LongPeriod-sig: 100.0% [84.08 $\sigma$ ]  
ModelChiSquare2-sig: 81.1%  
ModelChiSquareGof-sig: 73.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 5.535  
Centroid-sig: 53.3%  
Centroid-so: 0.697 arcsec [1.40 $\sigma$ ]  
**OotOffset-rm: 0.476 arcsec [3.82 $\sigma$ ]**  
**KicOffset-rm: 0.472 arcsec [3.79 $\sigma$ ]**  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [2/2]

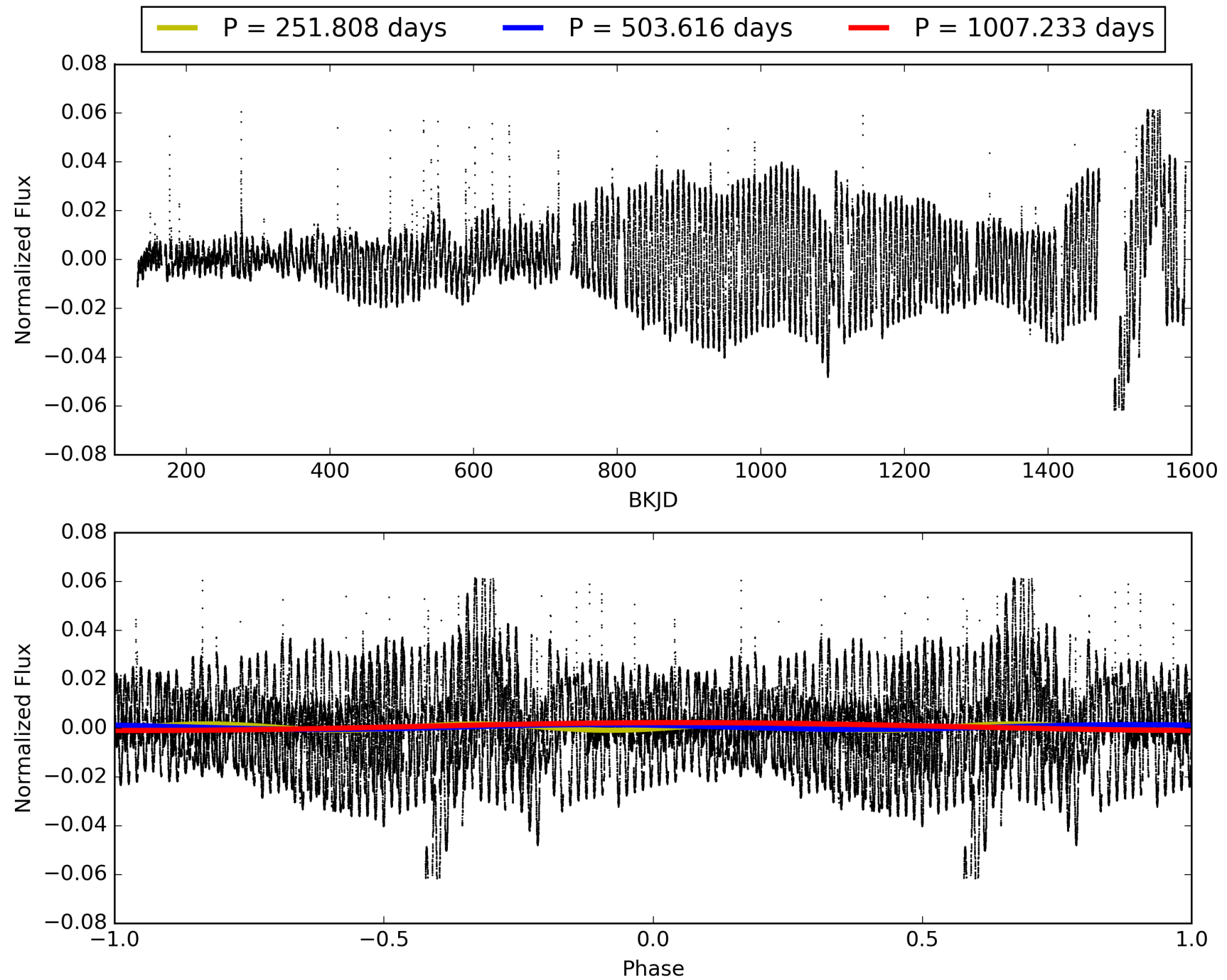
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:17:07 Z

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

# TCE 012401644-07, PDC Light Curves



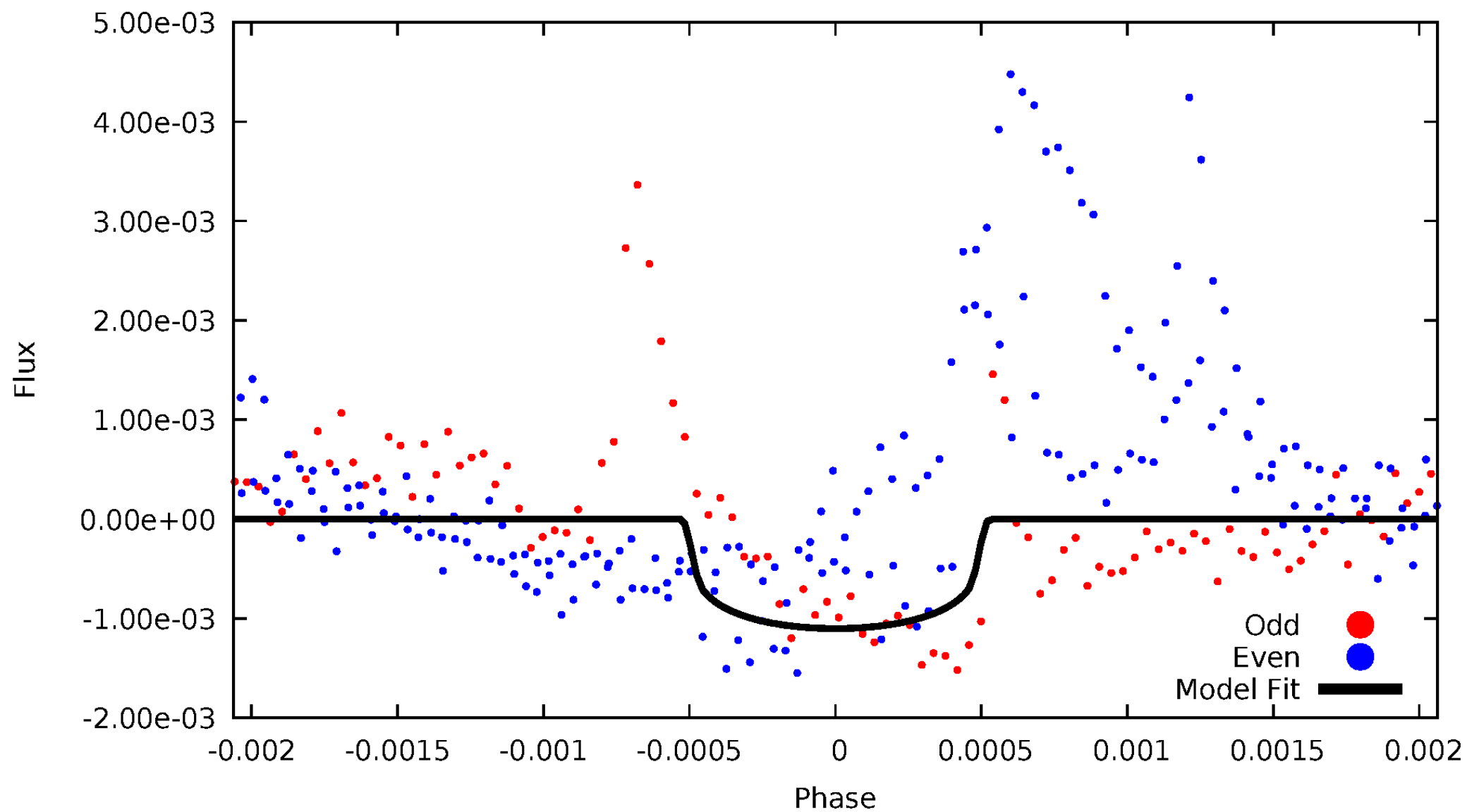
# TCE 012401644-07





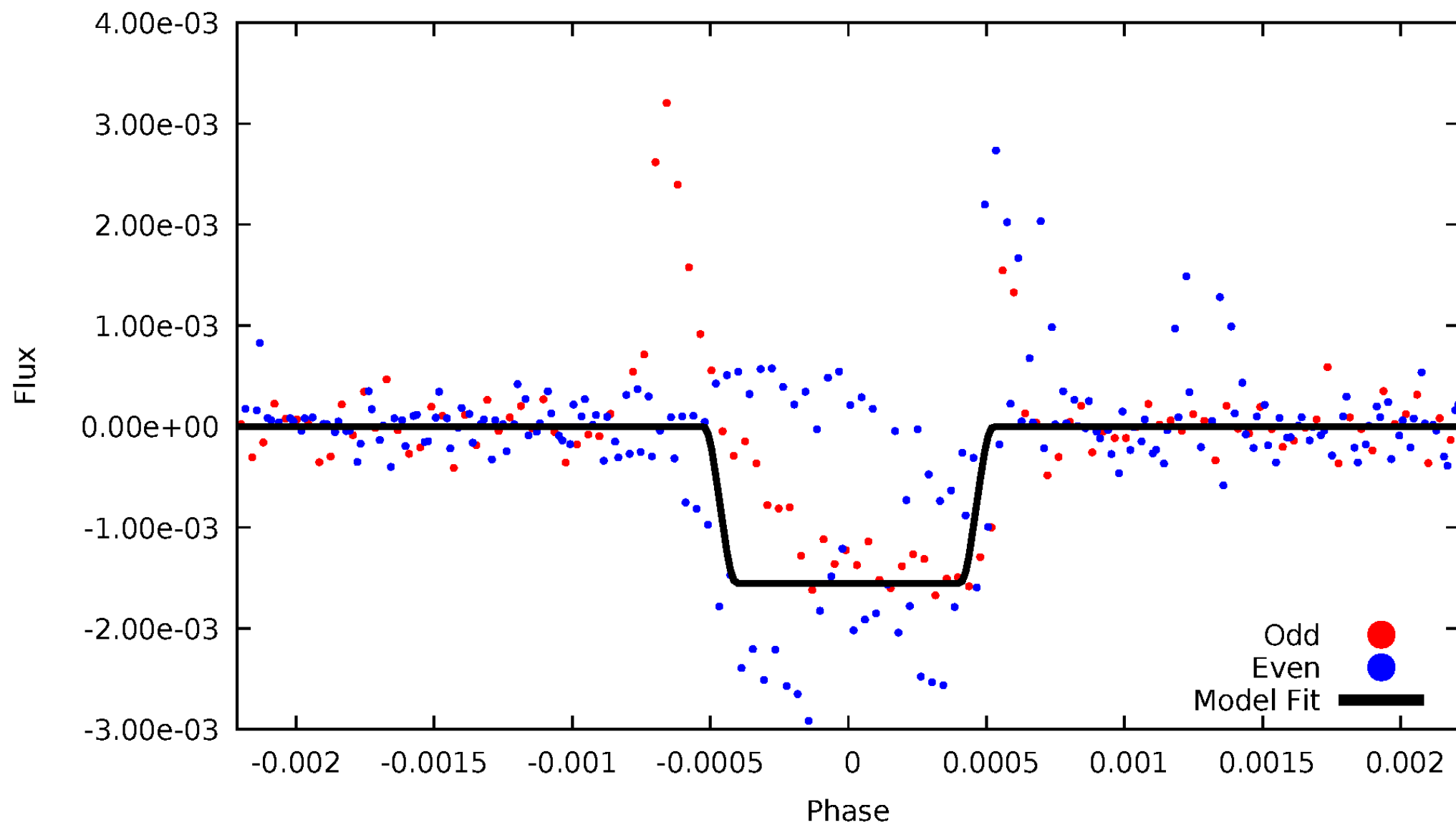
# DV Odd/Even

TCE 012401644-07



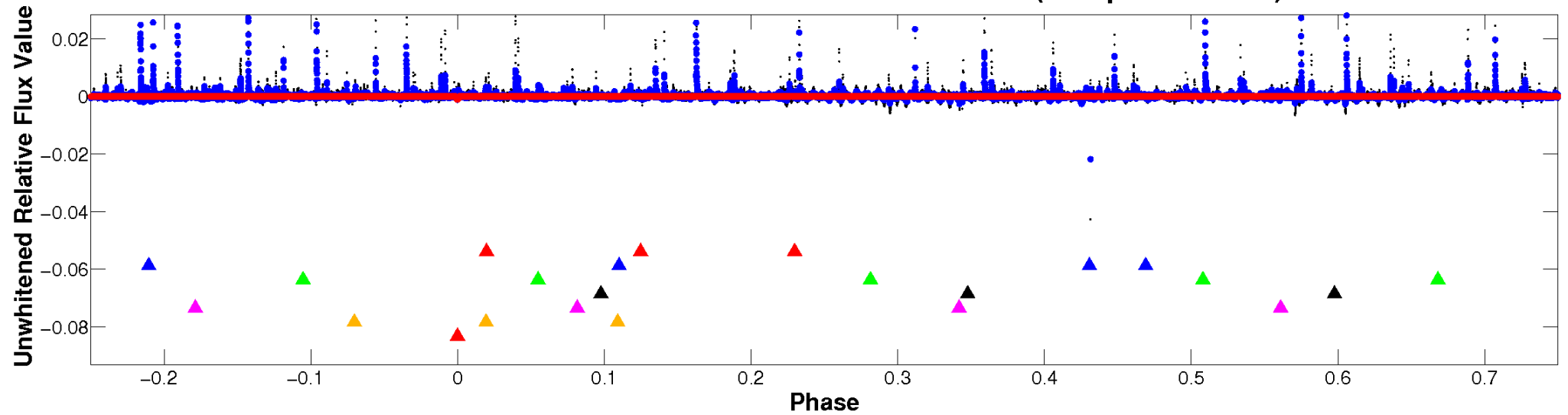
# ALT Odd/Even

TCE 012401644-07

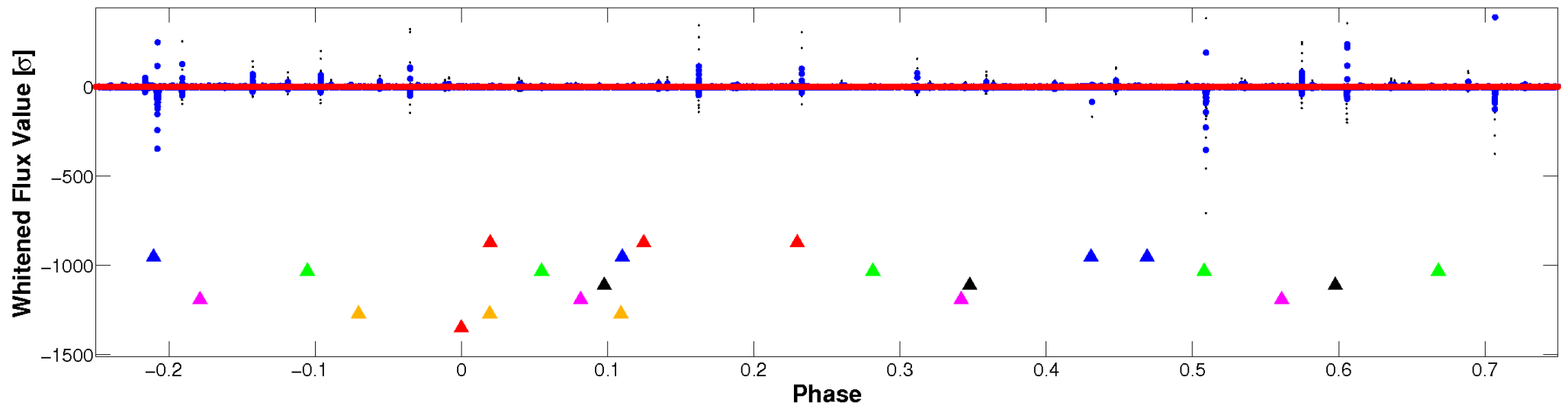


# Non-Whitened Vs. Whitened Light Curve

Planet 7 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

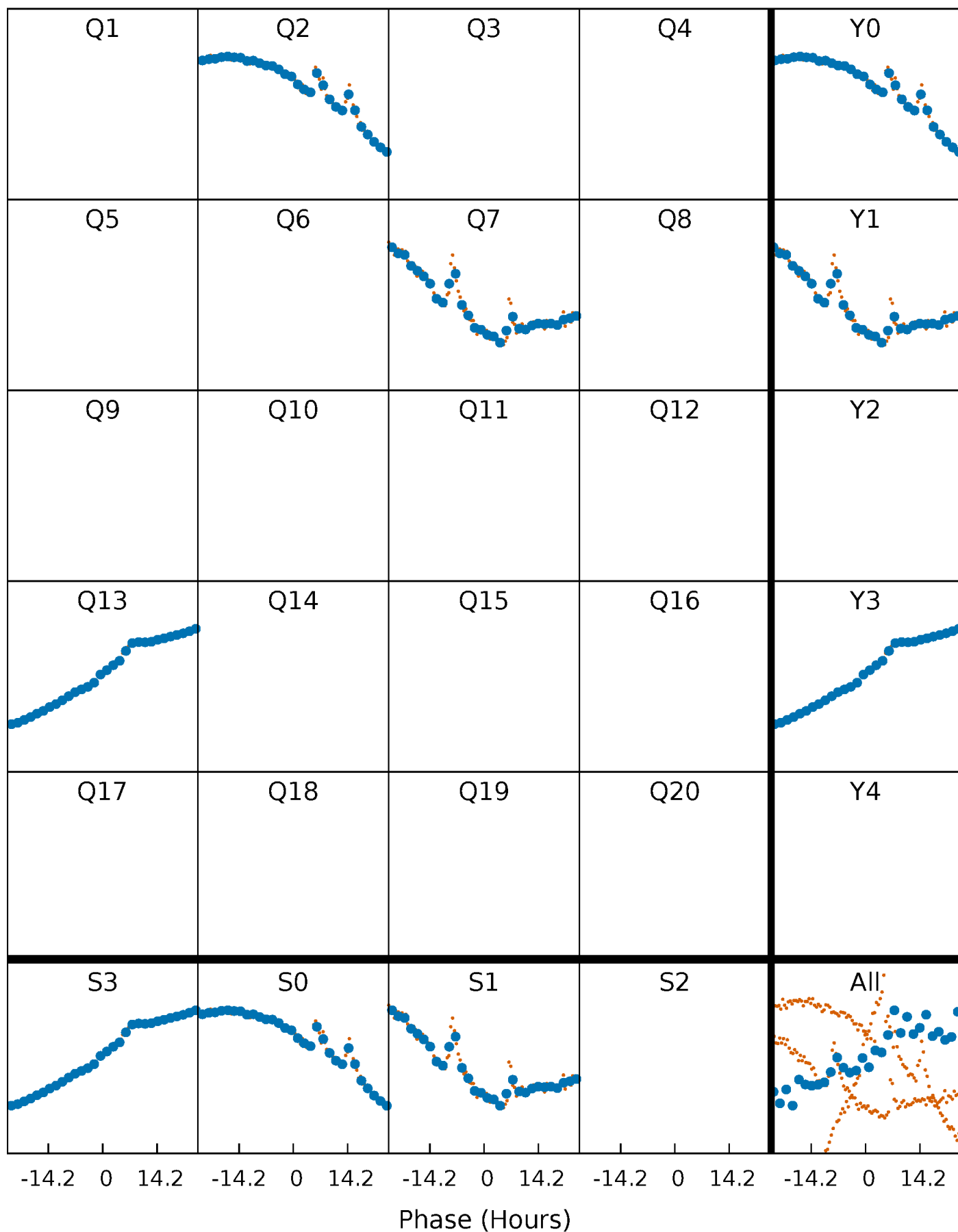


Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



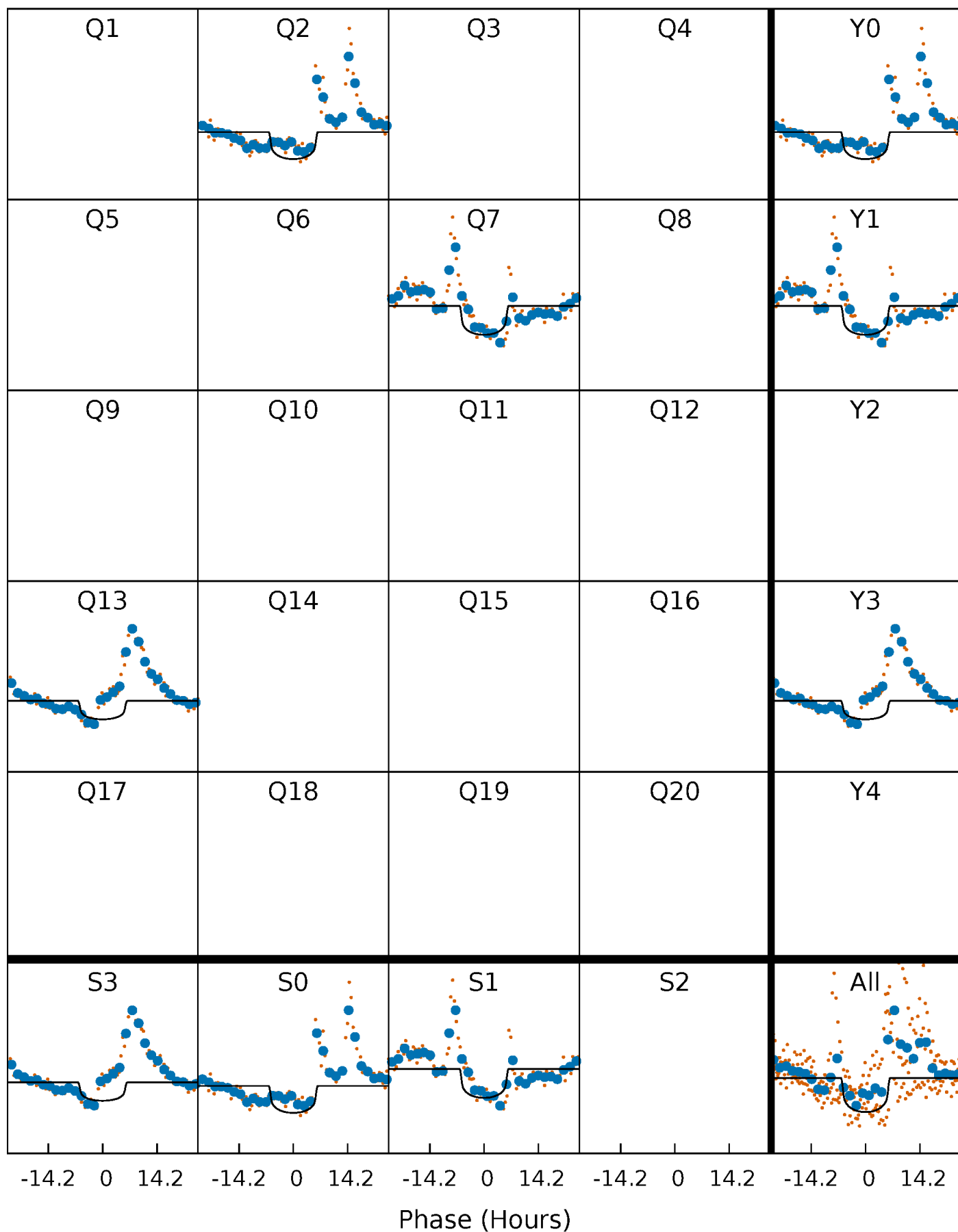
# PDC Quarter-Phased Transit Curves

TCE 012401644-07     $P=503.616269$  Days     $T_0=193.981537$  (BKJD)



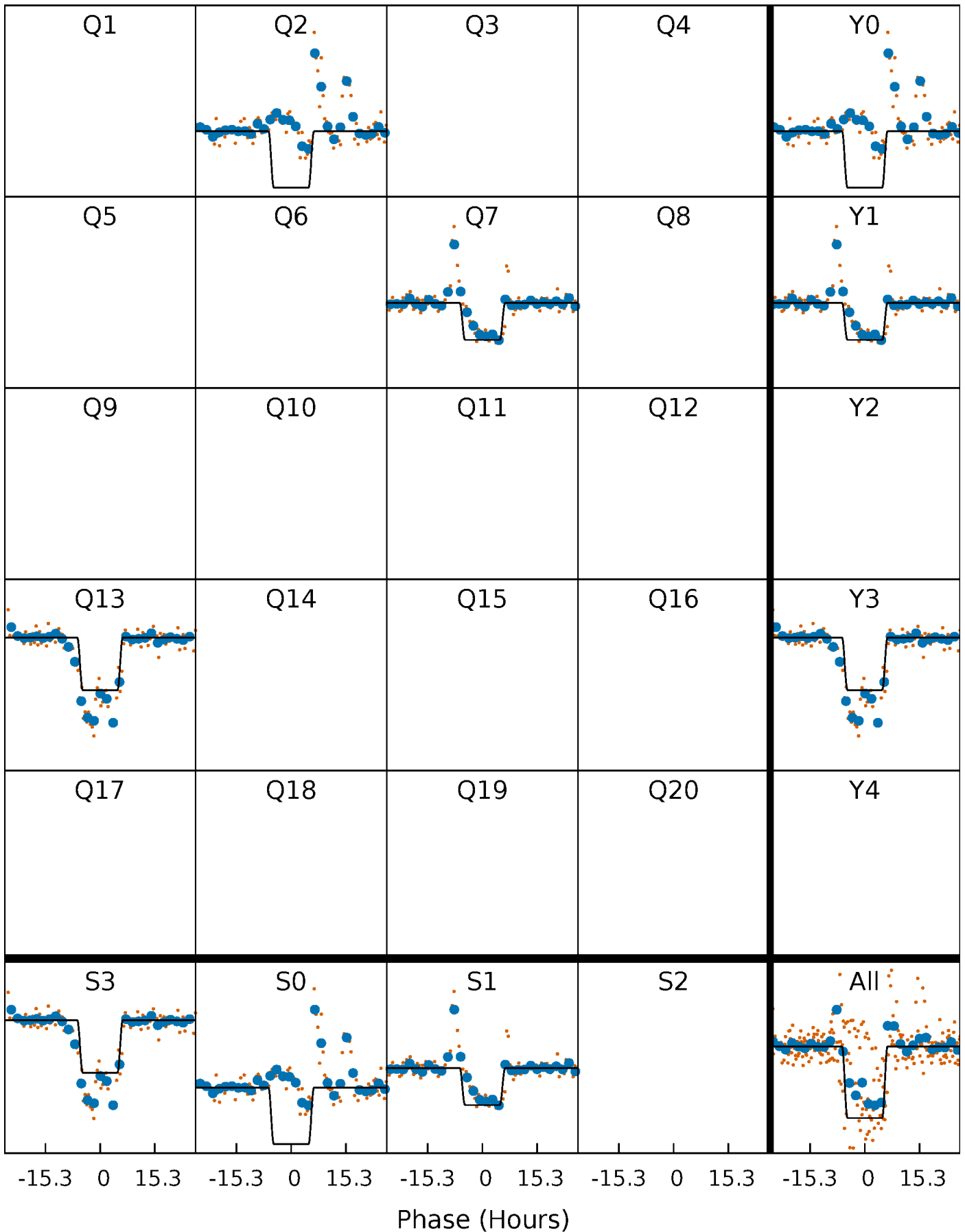
# DV Quarter-Phased Transit Curves

TCE 012401644-07 P=503.616269 Days  $T_0=193.981537$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

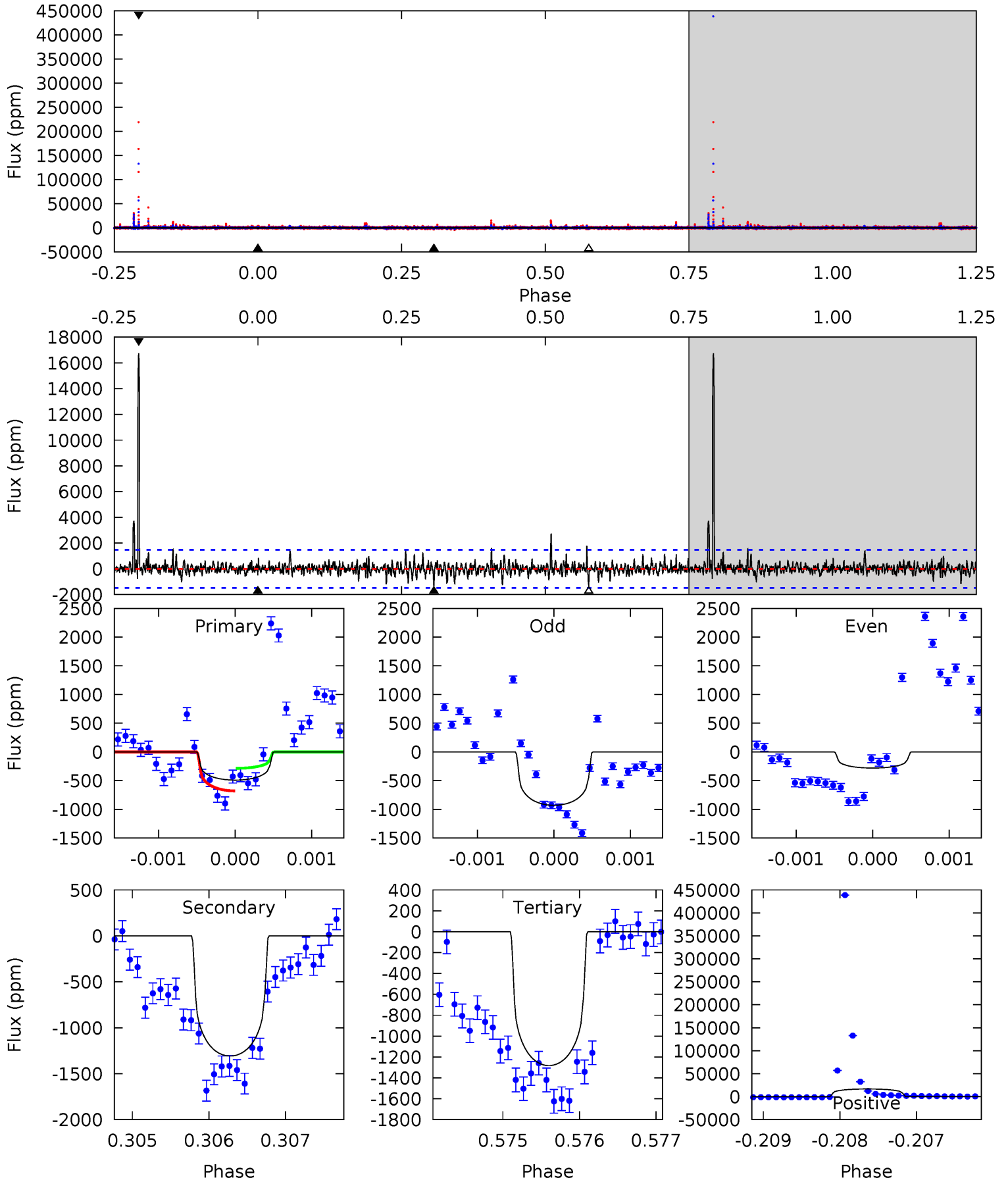
TCE 012401644-07     $P=503.632765$  Days     $T_0=193.954944$  (BKJD)



# DV Model-Shift Uniqueness Test

012401644-07, P = 503.616269 Days, E = 193.981537 Days

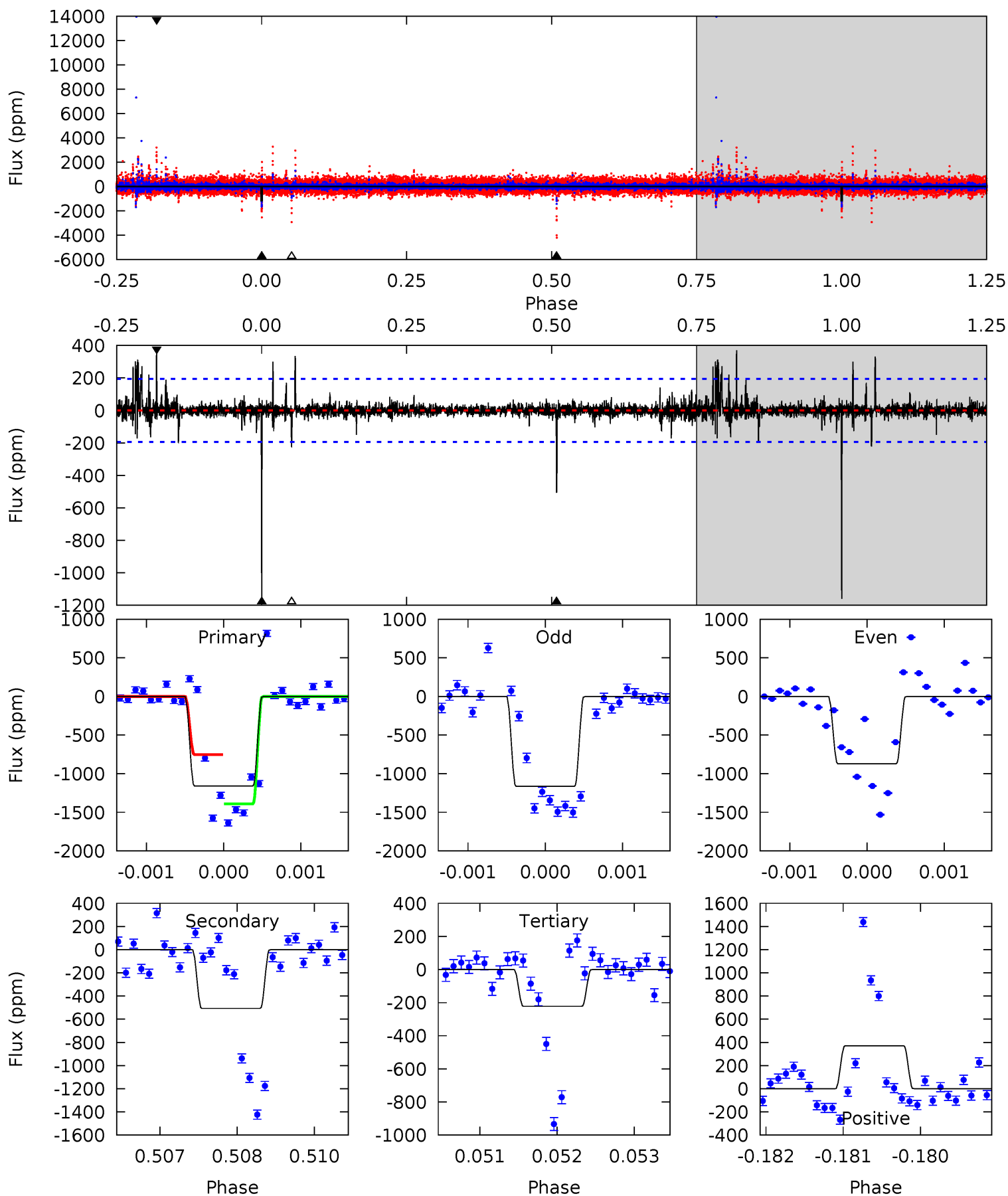
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.80	4.80	4.71	61.4	5.44	3.28	2.25	-2.90	-59.6	0.09	-56.6	0.67	1.10	0.93	0.73



# Alt Model-Shift Uniqueness Test

012401644-07, P = 503.632765 Days, E = 193.954944 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
32.5	14.2	6.24	10.4	5.44	3.28	0.86	26.3	22.1	7.99	3.83	3.68	0.90	0.24	8.60





### Stellar Parameters For KIC 012401644

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (g \cdot cm^{-3})$
	$5068^{+166}_{-151}$	$4.654^{+0.060}_{-0.040}$	$-1.020^{+0.300}_{-0.300}$	$0.605^{+0.047}_{-0.042}$	$0.601^{+0.052}_{-0.021}$	$3.832^{+0.868}_{-0.590}$
	+3%/-3%	+1%/-1%	+29%/-29%	+8%/-7%	+9%/-3%	+23%/-15%
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 012401644-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1308 \pm 272$	$2.05^{+0.62}_{-0.63}$	$237^{+9}_{-8}$	$5438^{+1114}_{-678}$	$188934^{+219053}_{-83775}$
Alt.	$-507 \pm 36$	$2.63^{+0.59}_{-0.65}$	$237^{+9}_{-8}$	$4069^{+471}_{-309}$	$44882^{+35251}_{-15273}$

$T_{max}$  = 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

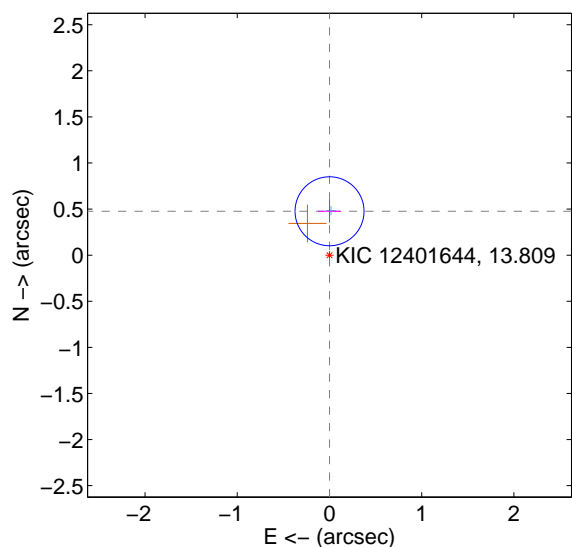
Supplemental centroid analysis for 012401644-07. Kepler magnitude: 13.81. Transit SNR 6.70

There are 1 quarters with good PRF difference image offsets

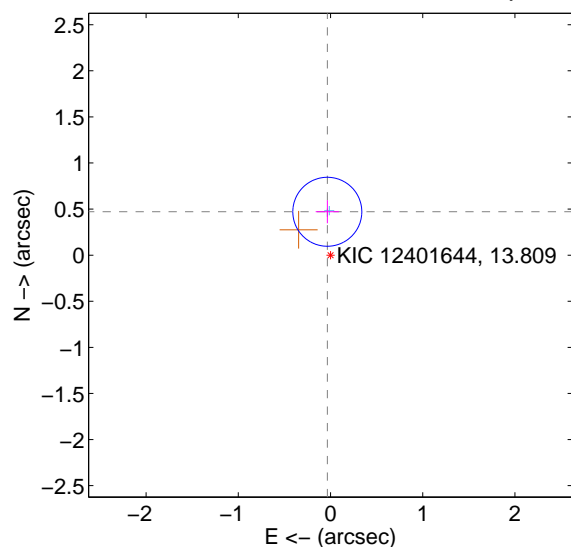
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.476 \pm 0.125$	3.82	$-0.001 \pm 0.126$	$0.476 \pm 0.125$
PRF-fit source offset from KIC position	$0.472 \pm 0.125$	3.79	$0.035 \pm 0.126$	$0.471 \pm 0.125$
photometric centroid source offset	$0.70 \pm 0.50$	1.40	$0.57 \pm 0.53$	$0.39 \pm 0.43$

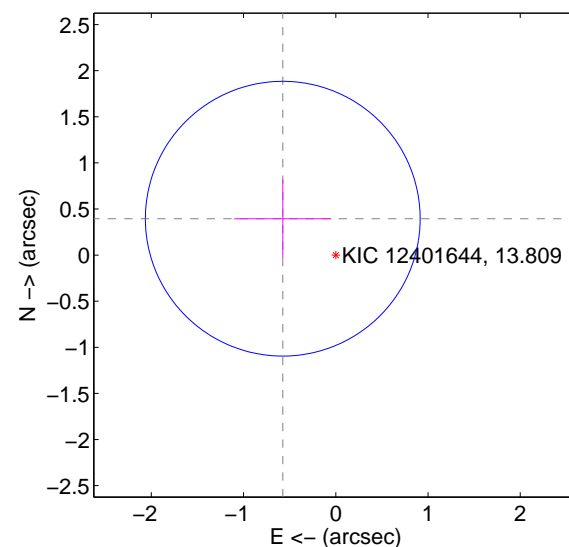
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



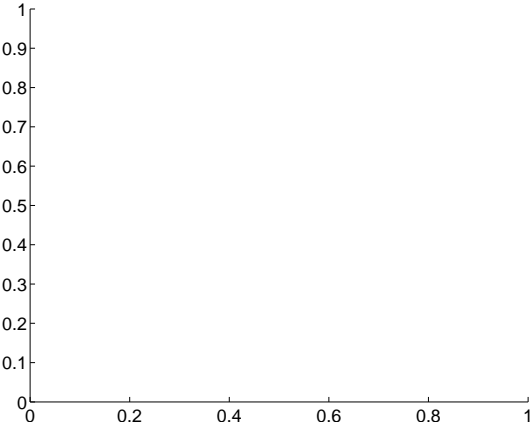
offset from photometric centroids



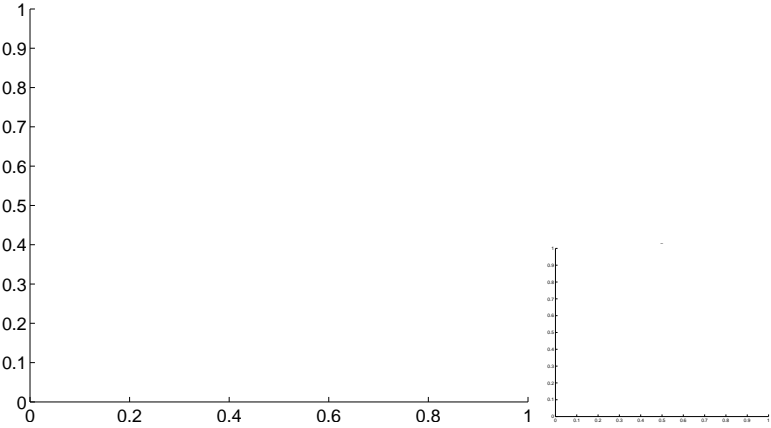
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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 ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.

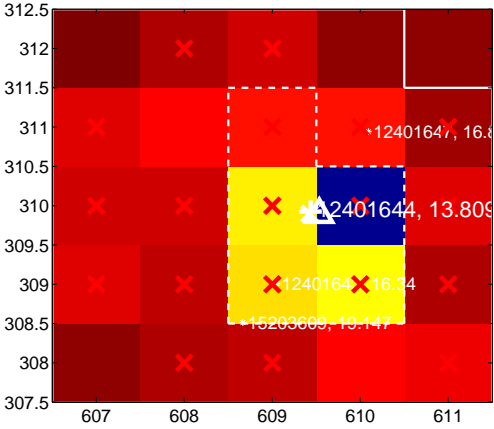
Q1 no difference image



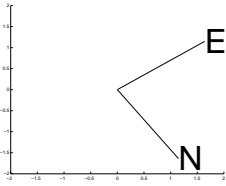
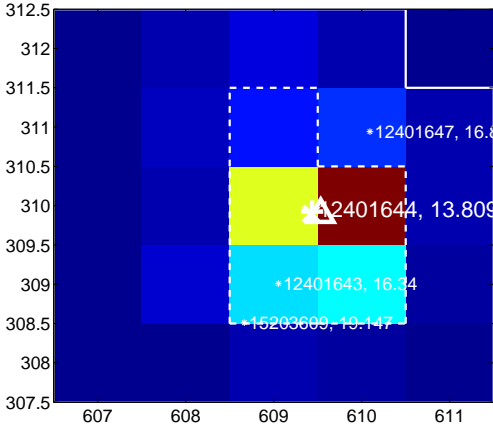
Q1 no OOT image



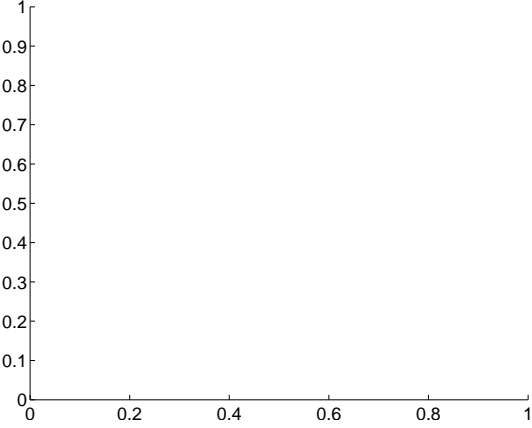
Q2 difference image. Poor Quality



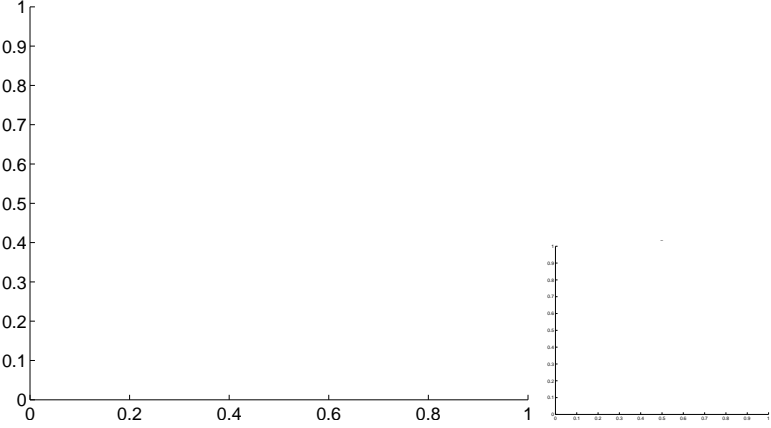
Q2 OOT image



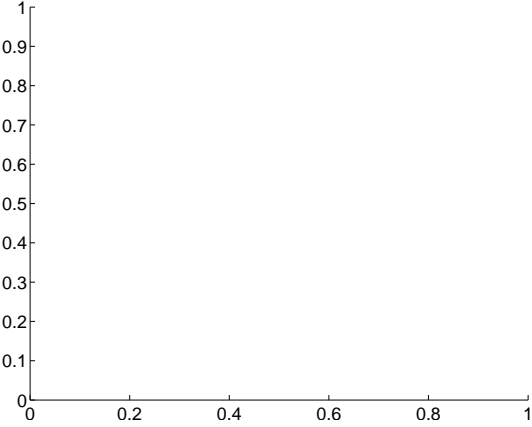
Q3 no difference image



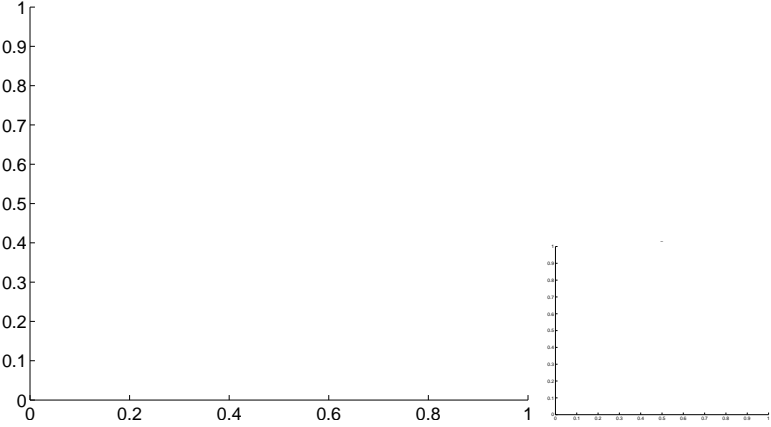
Q3 no OOT image



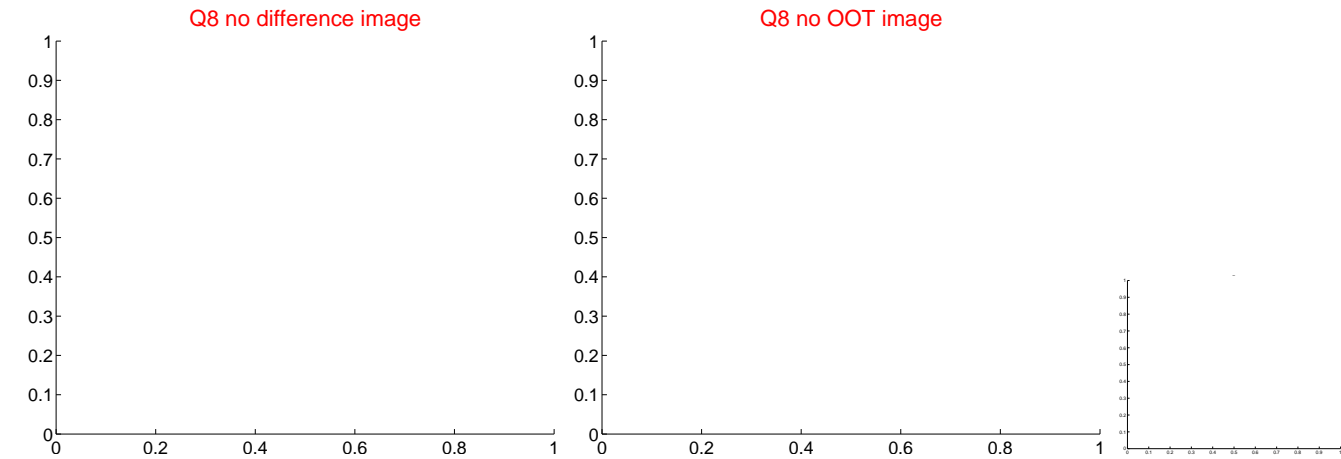
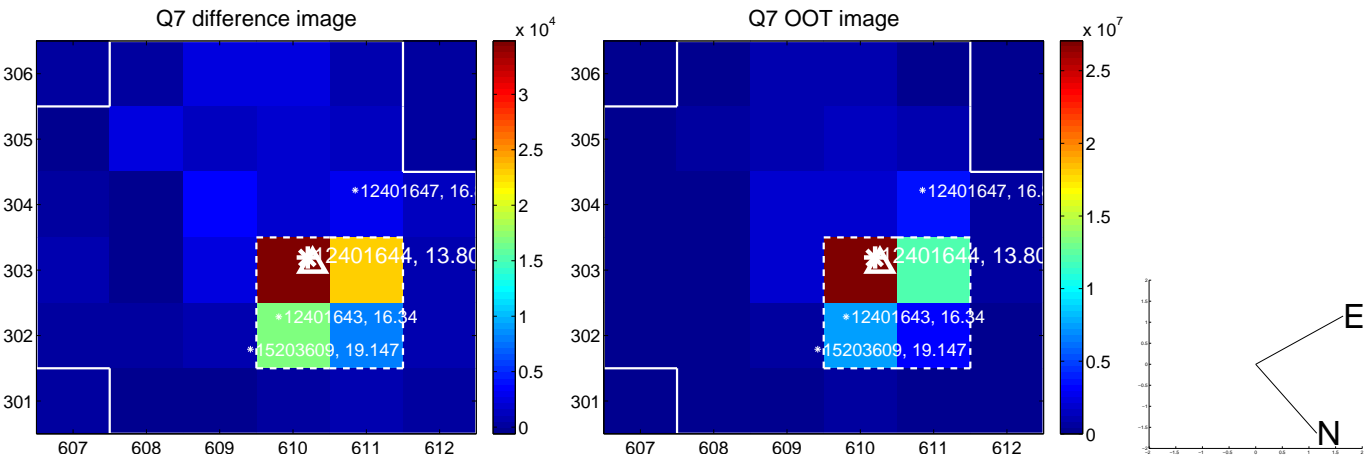
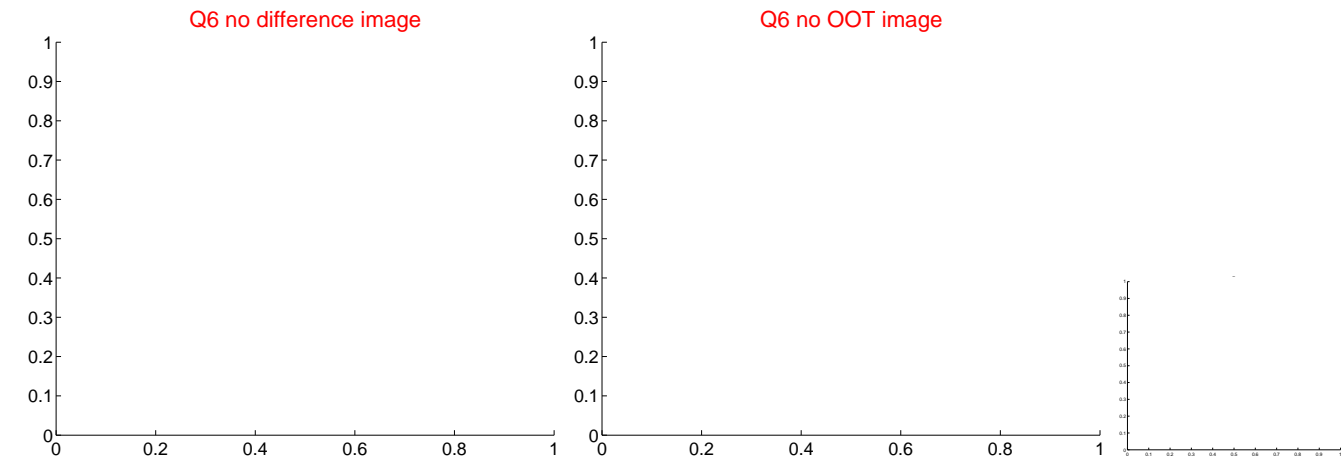
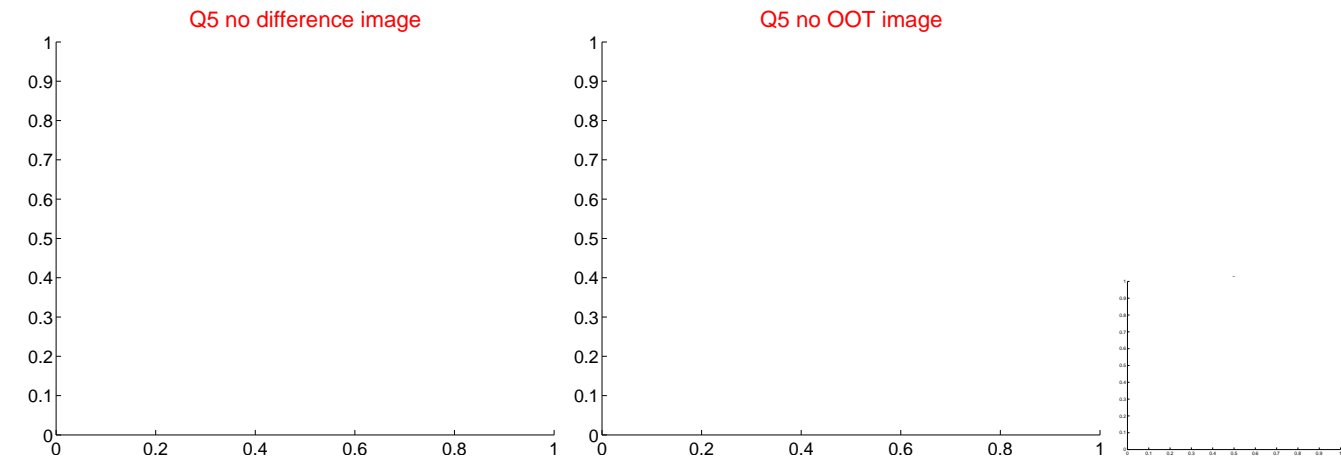
Q4 no difference image



Q4 no OOT image



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



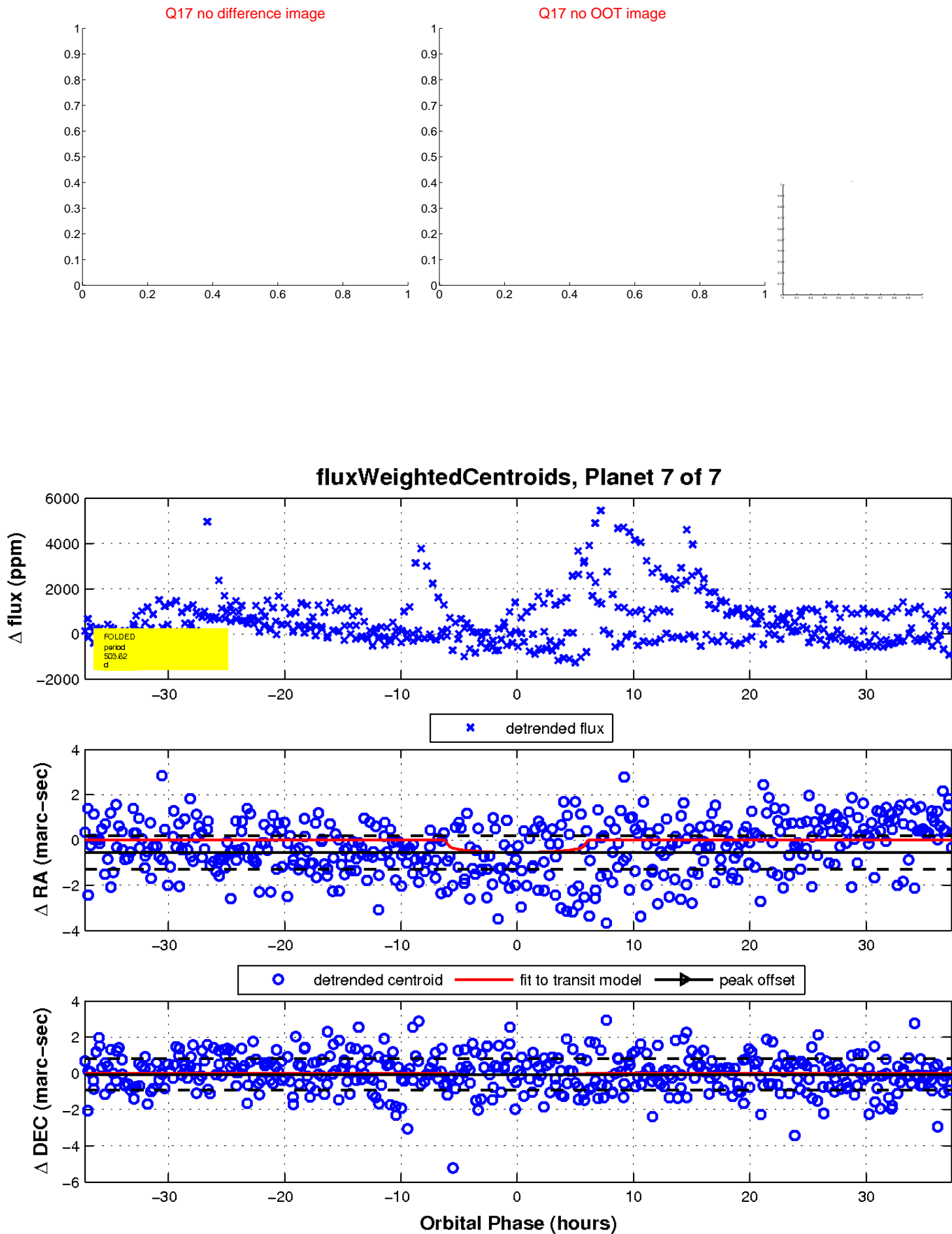
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

