

# KIC 002161623

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002161623-01	OBS	6094.01	2.283501	132.321525	163664.0	4.500	6511.7	-1.0	1.72	6723	70.67	3895.19
002161623-02	OBS	No	2.283340	133.552661	122172.9	2.500	3096.1	-1.0	1.72	6723	61.04	3895.56

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002161623-01	OBS	FP	0.00	0	1	0	0	SWEET_EB—MOD_SEC_ALT—DEPTH_ODDEVEN_DV—MOD_ODDEVEN_ALT—HAS_SEC_TCE—SEASONAL_DEPTH_DV—CENT_NOFITS
002161623-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS

**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 002161623-01

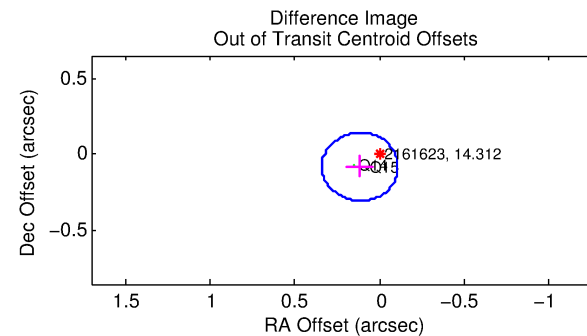
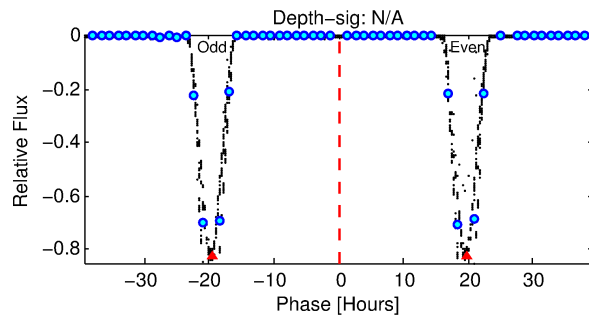
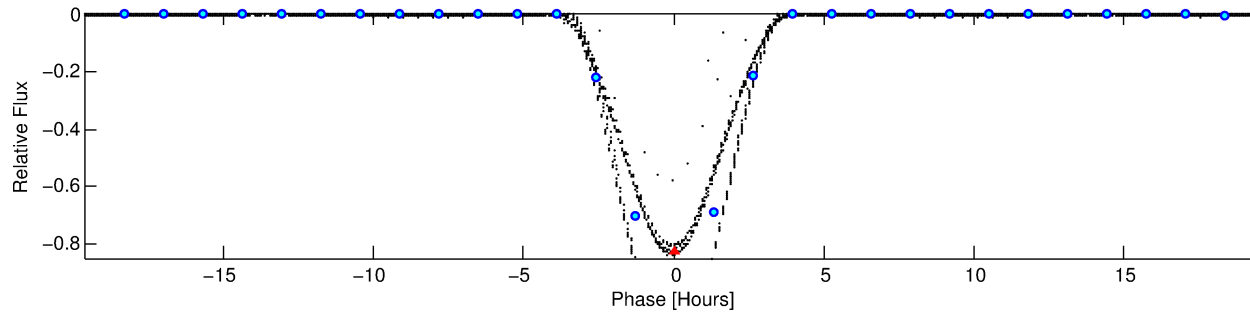
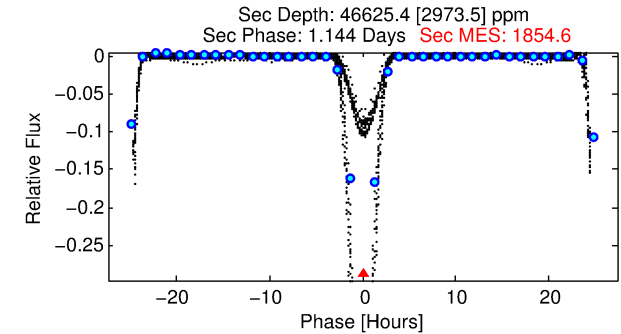
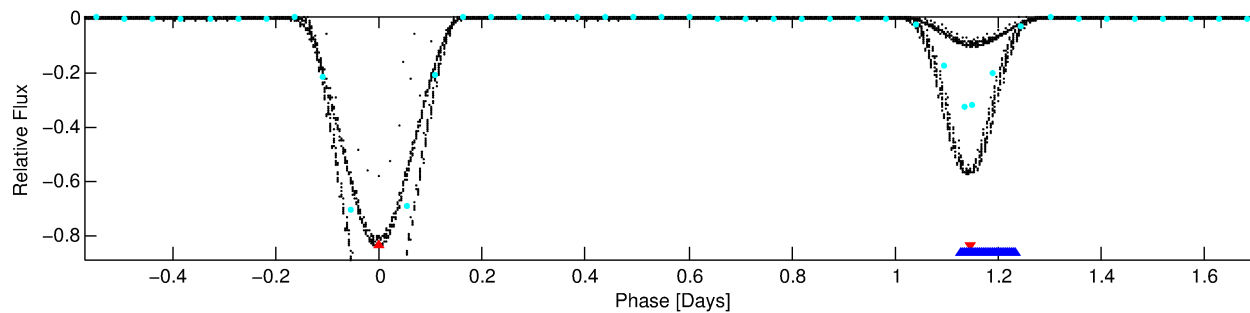
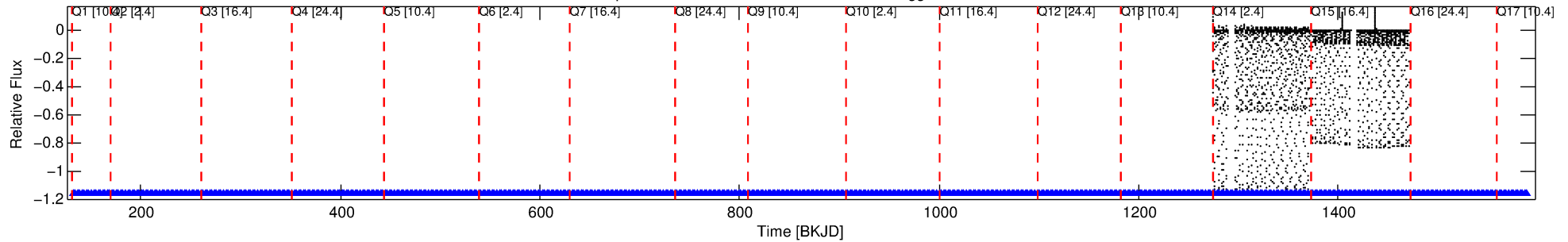
No Significant Match Found

# DV One-Page Summary

KIC: 2161623 Candidate: 1 of 2 Period: 2.284 d

KOI: K06094.01 Corr: 0.763

Kp: 14.31 R\*: 1.72 Rs Teff: 6723.0 K Logg: 4.09 Fe/H: -0.240



TPS TCE Results:

Period = 2.28350 d  
Epoch = 132.3215 BKJD

DV fit results are unavailable

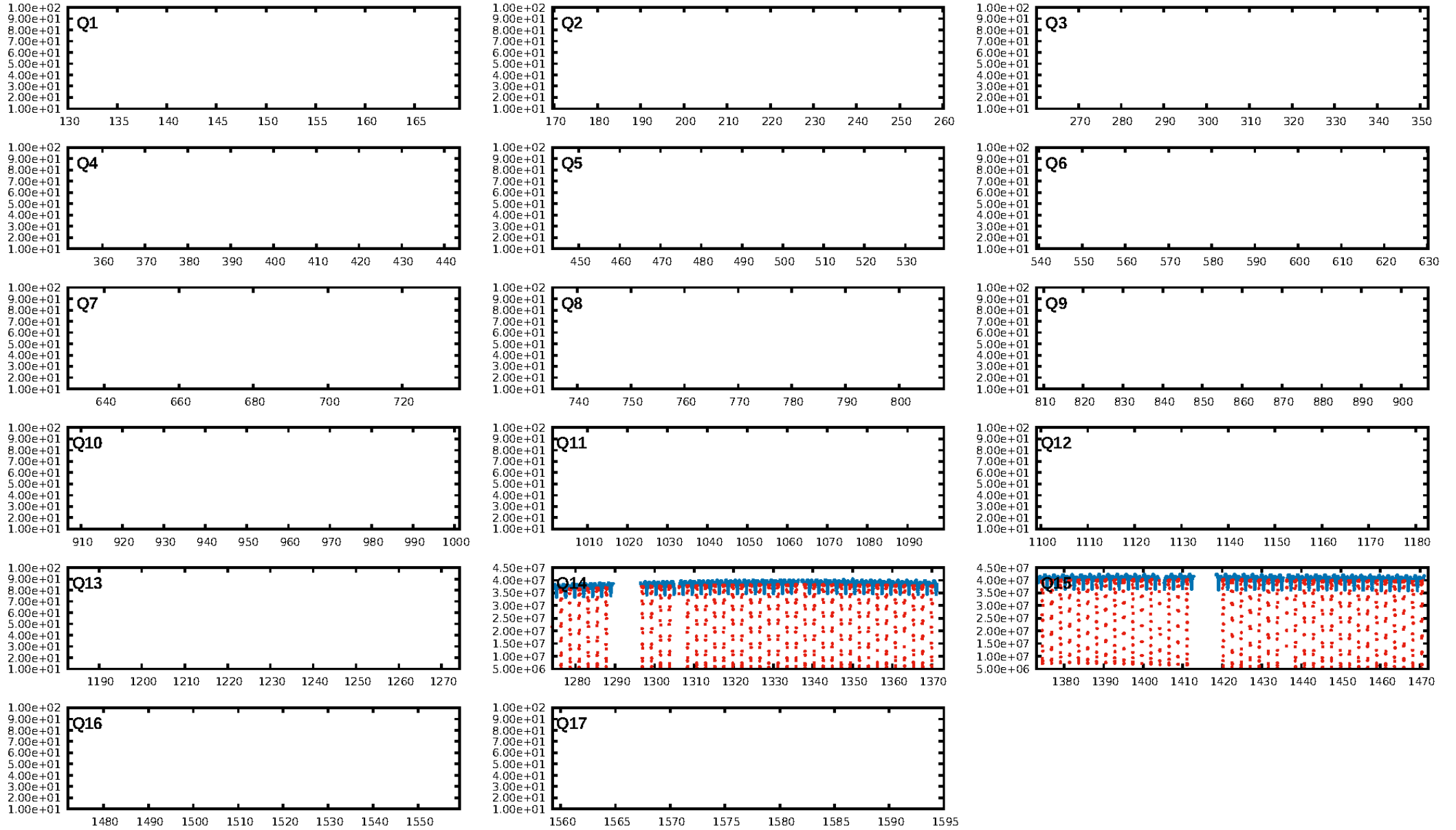
DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [80/80]  
GhostDiagnostic-chr: 2.157  
Centroid-sig: 0.0%  
Centroid-so: 1.536 arcsec [1012.60 $\sigma$ ]  
OotOffset-rm: 0.141 arcsec [1.89 $\sigma$ ]  
KicOffset-rm: 0.172 arcsec [2.10 $\sigma$ ]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [2/2]

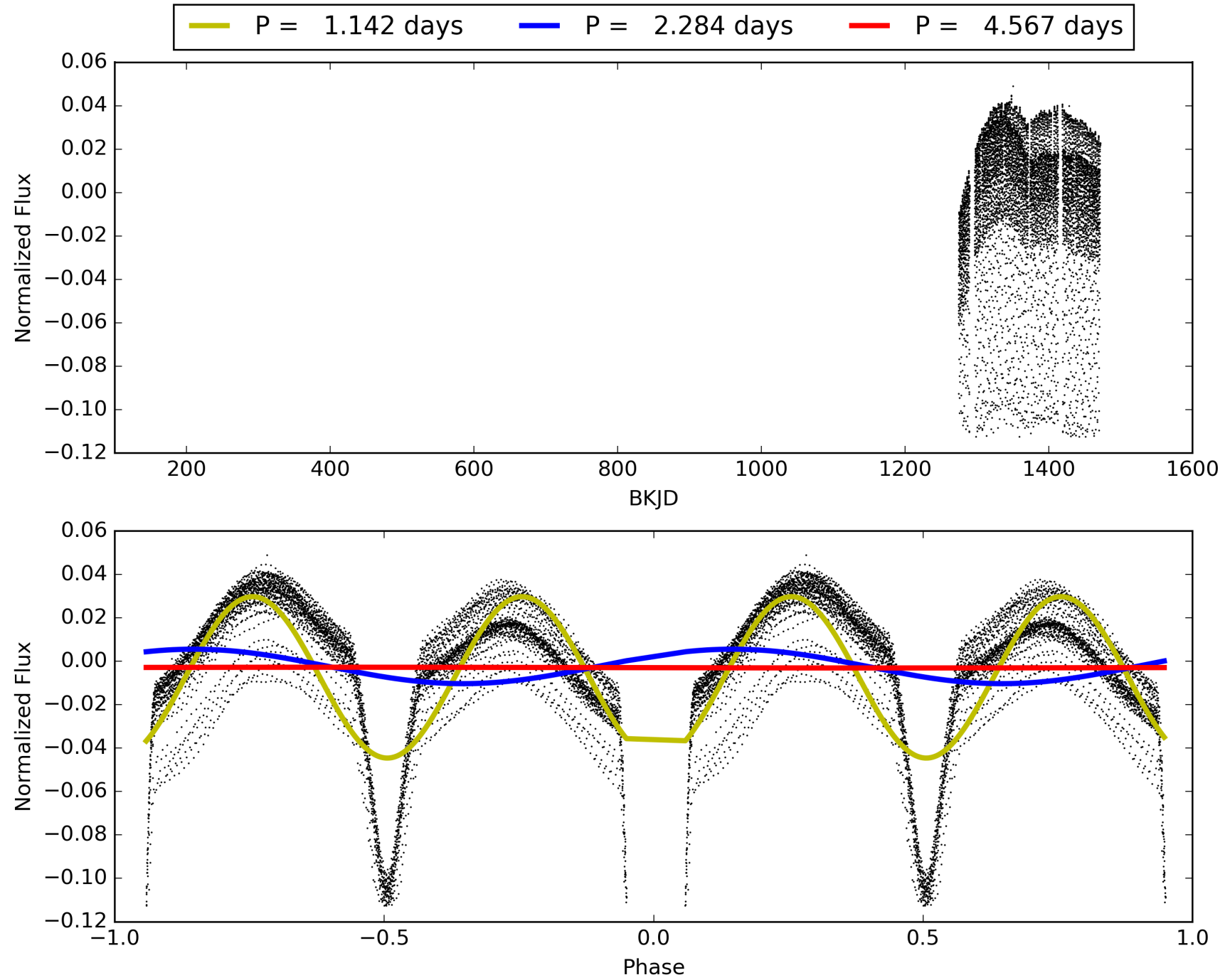
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:55:41 Z

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

# TCE 002161623-01, PDC Light Curves

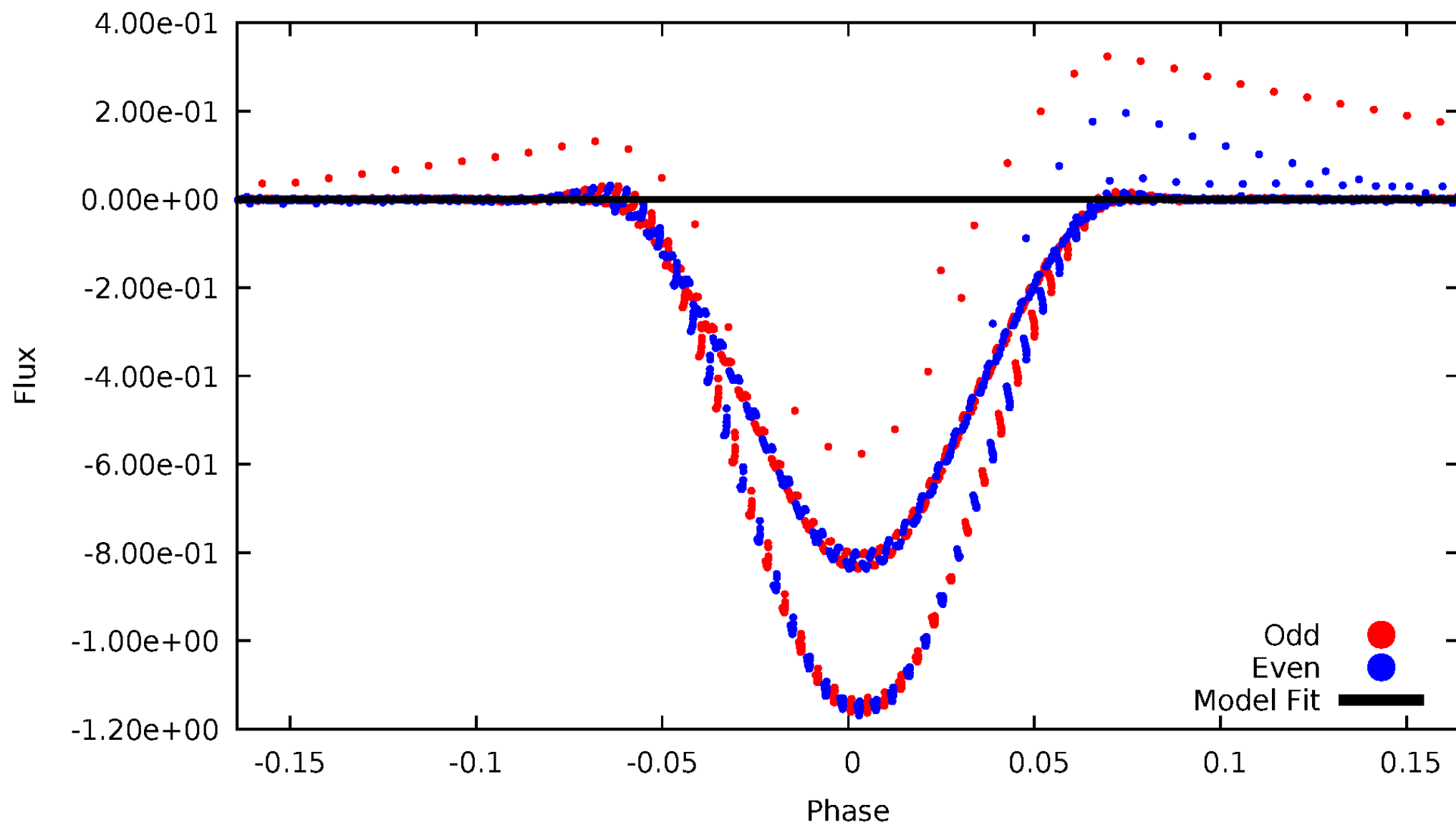


TCE 002161623-01



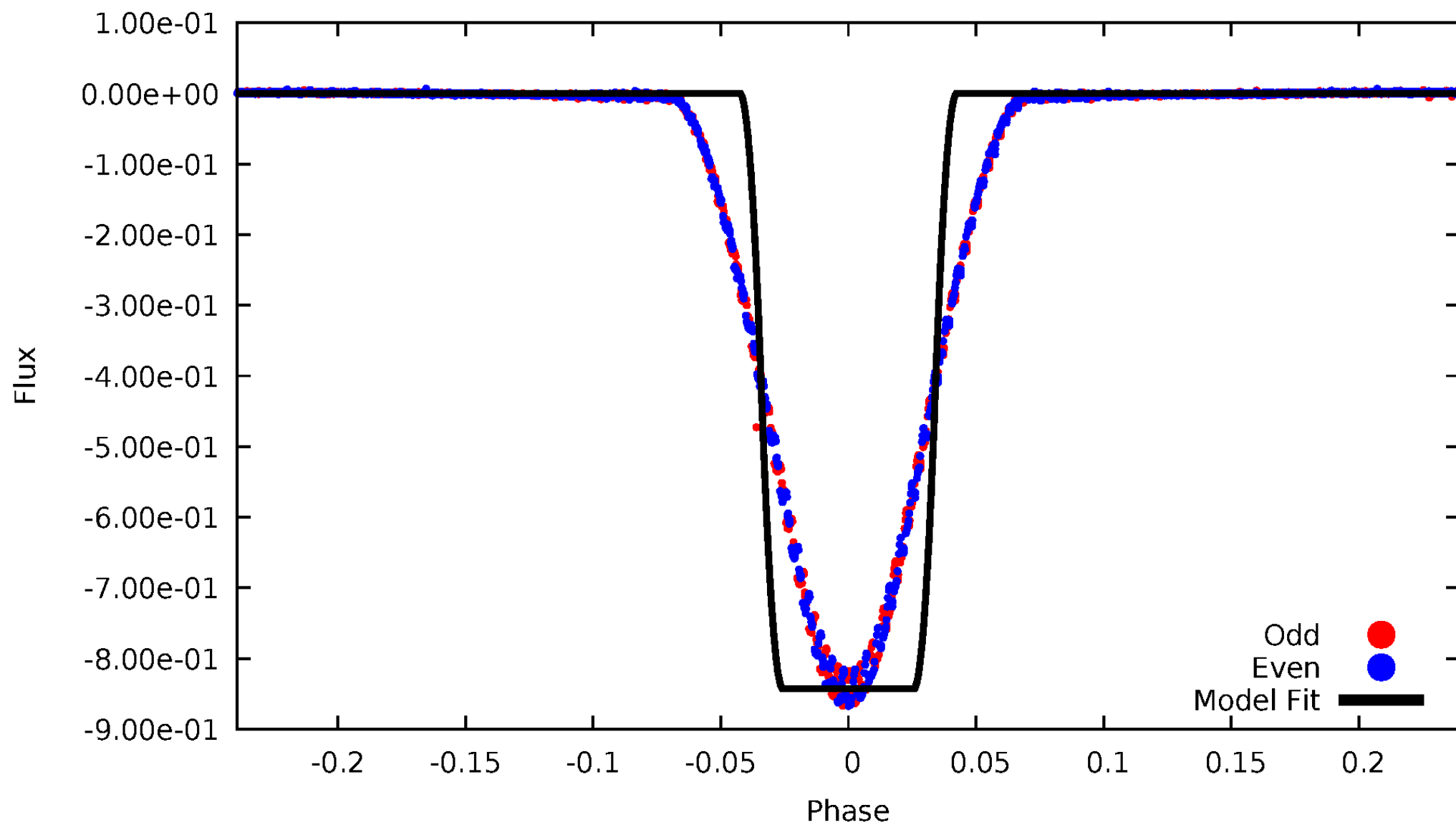
# DV Odd/Even

TCE 002161623-01



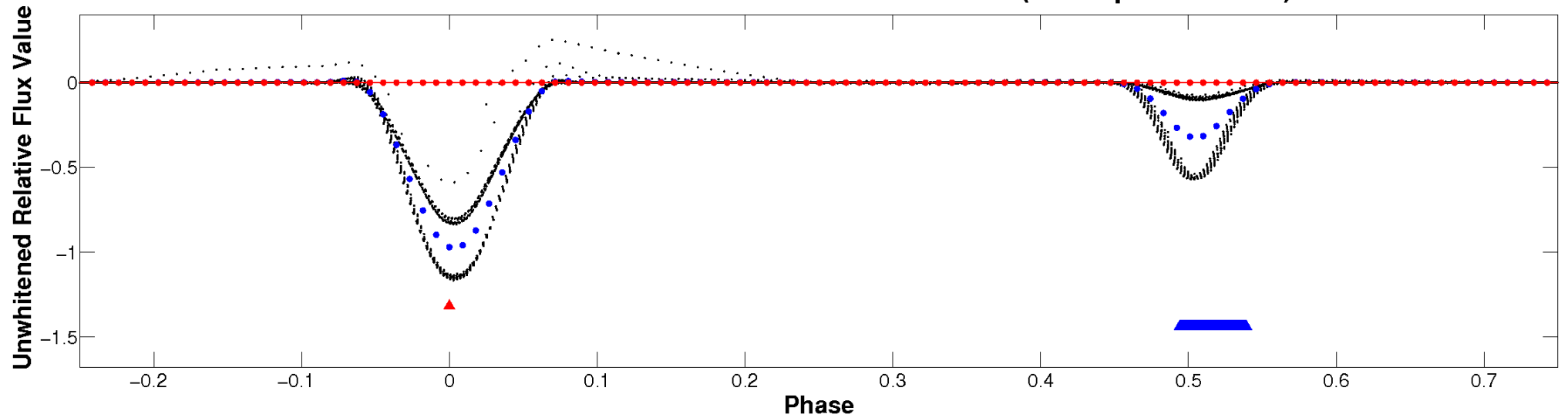
# ALT Odd/Even

TCE 002161623-01



# Non-Whitened Vs. Whitened Light Curve

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

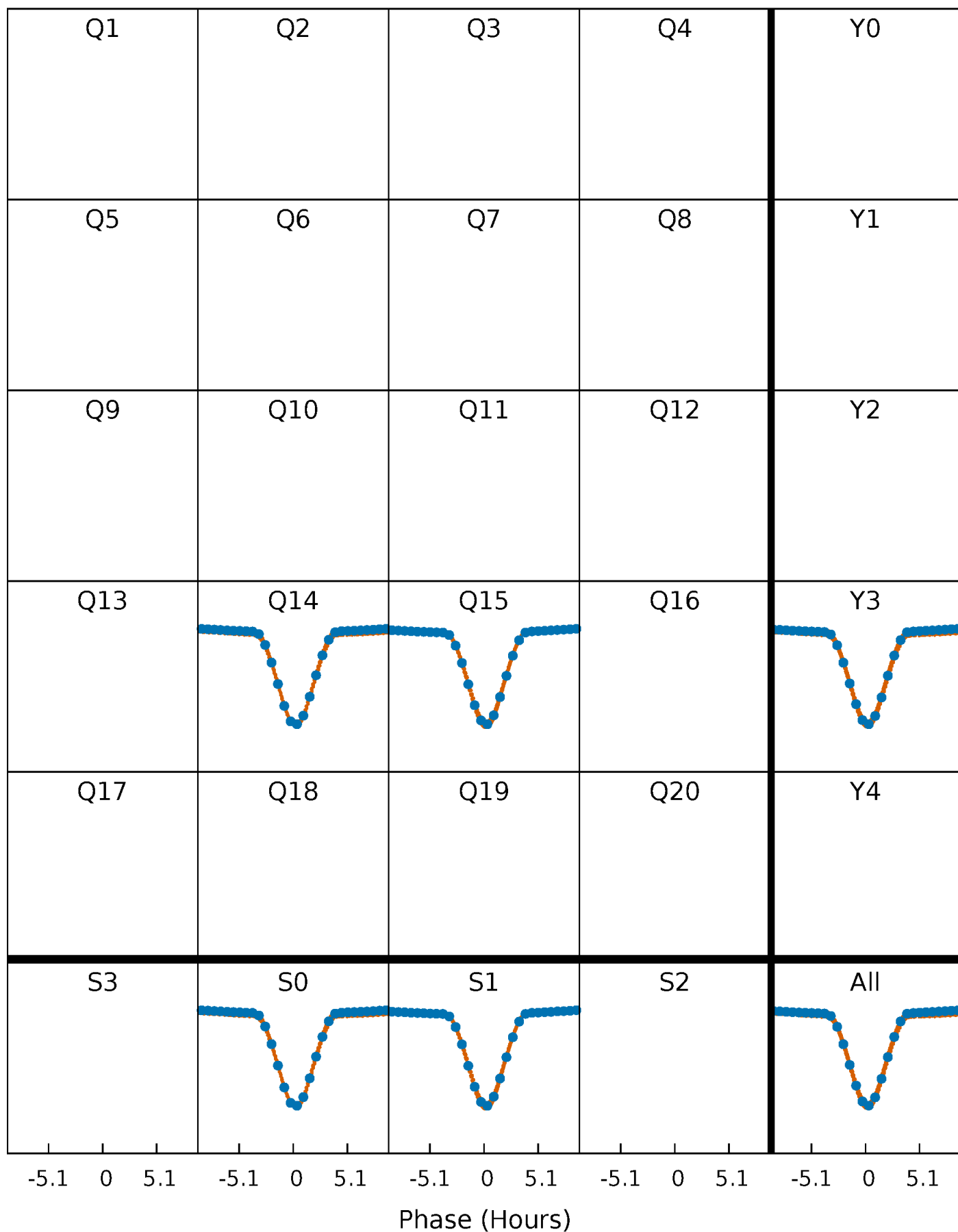


**Planet 1 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

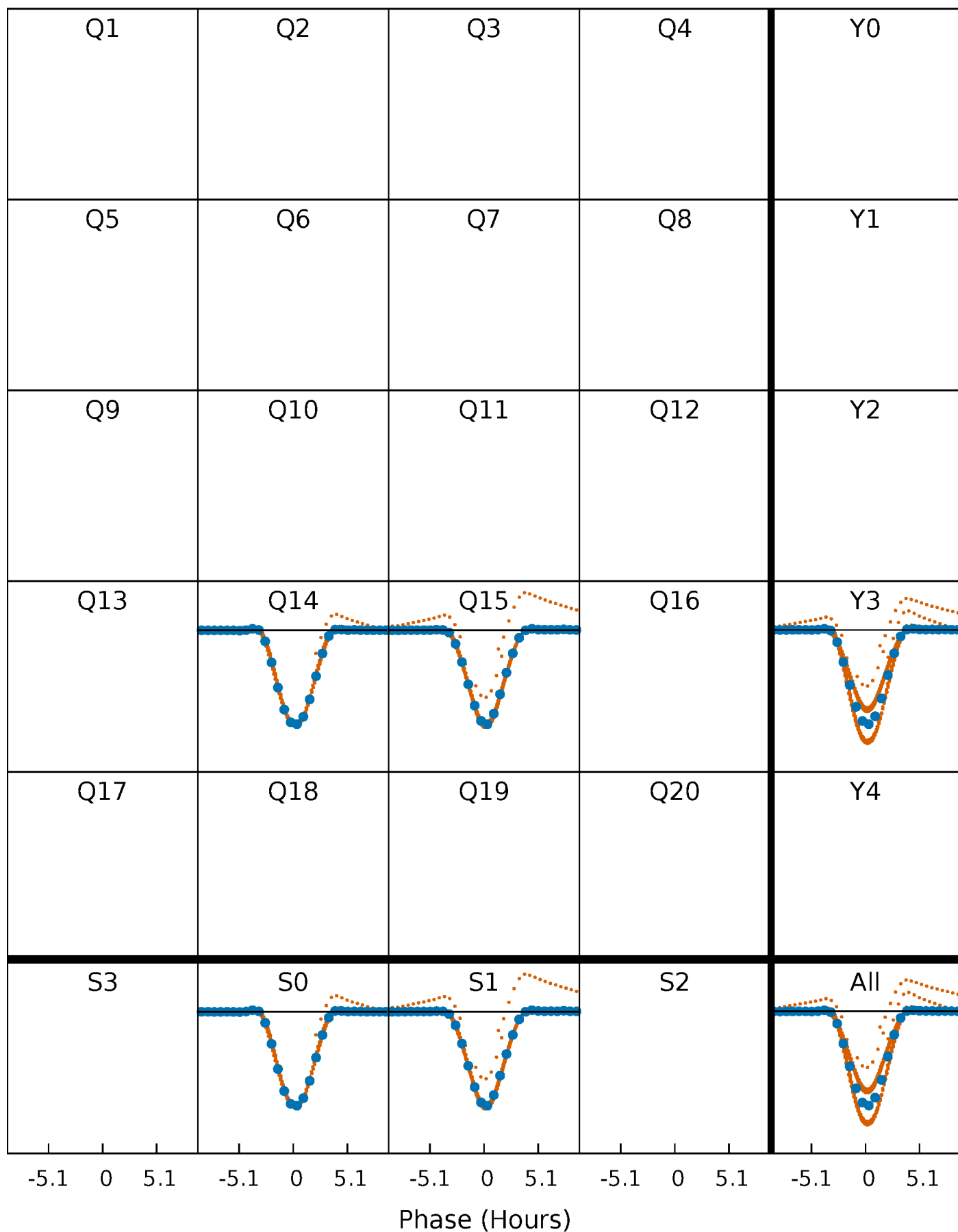
TCE 002161623-01 P= 2.283501 Days  $T_0=132.321525$  (BKJD)





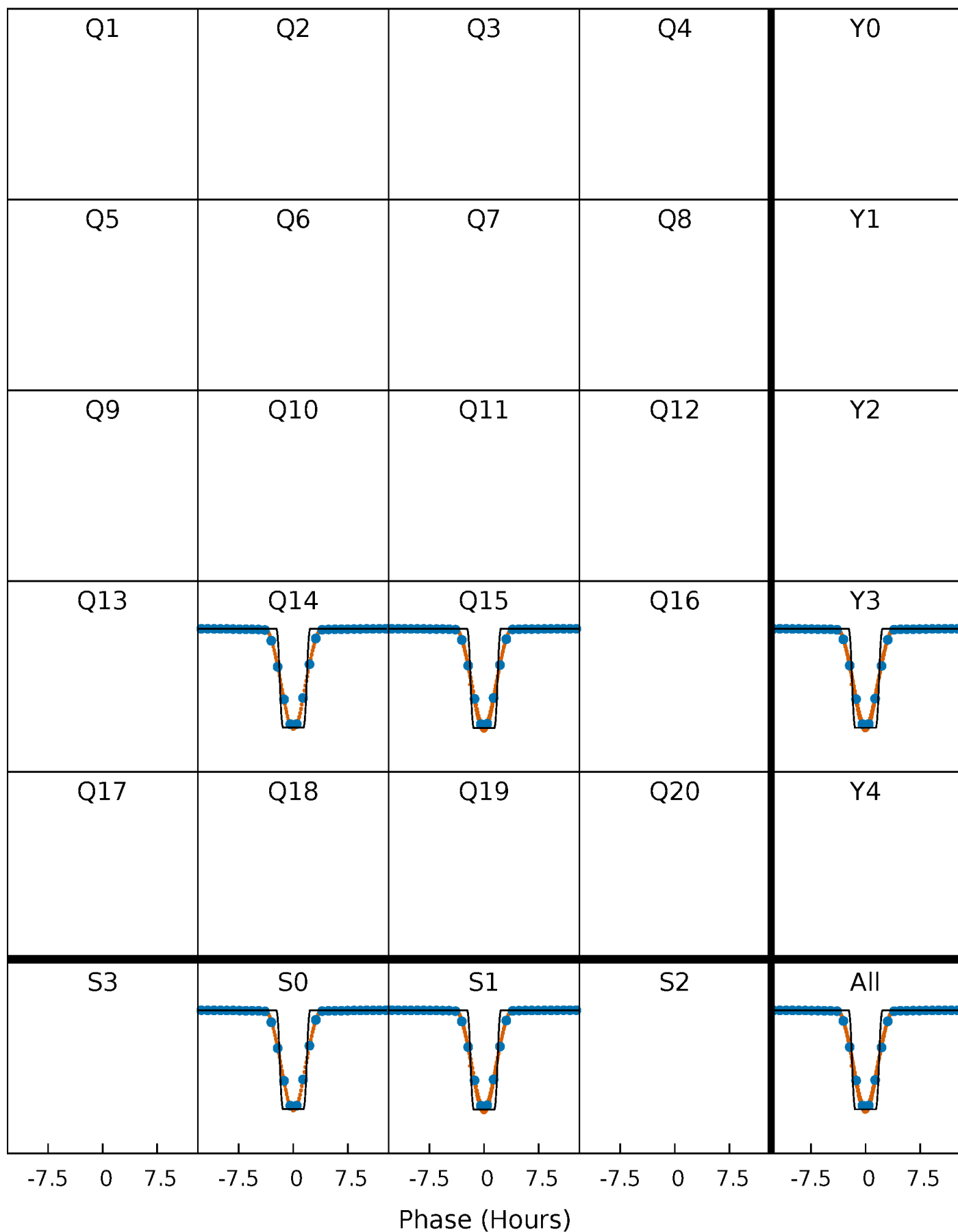
# DV Quarter-Phased Transit Curves

TCE 002161623-01 P= 2.283501 Days  $T_0=132.321525$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

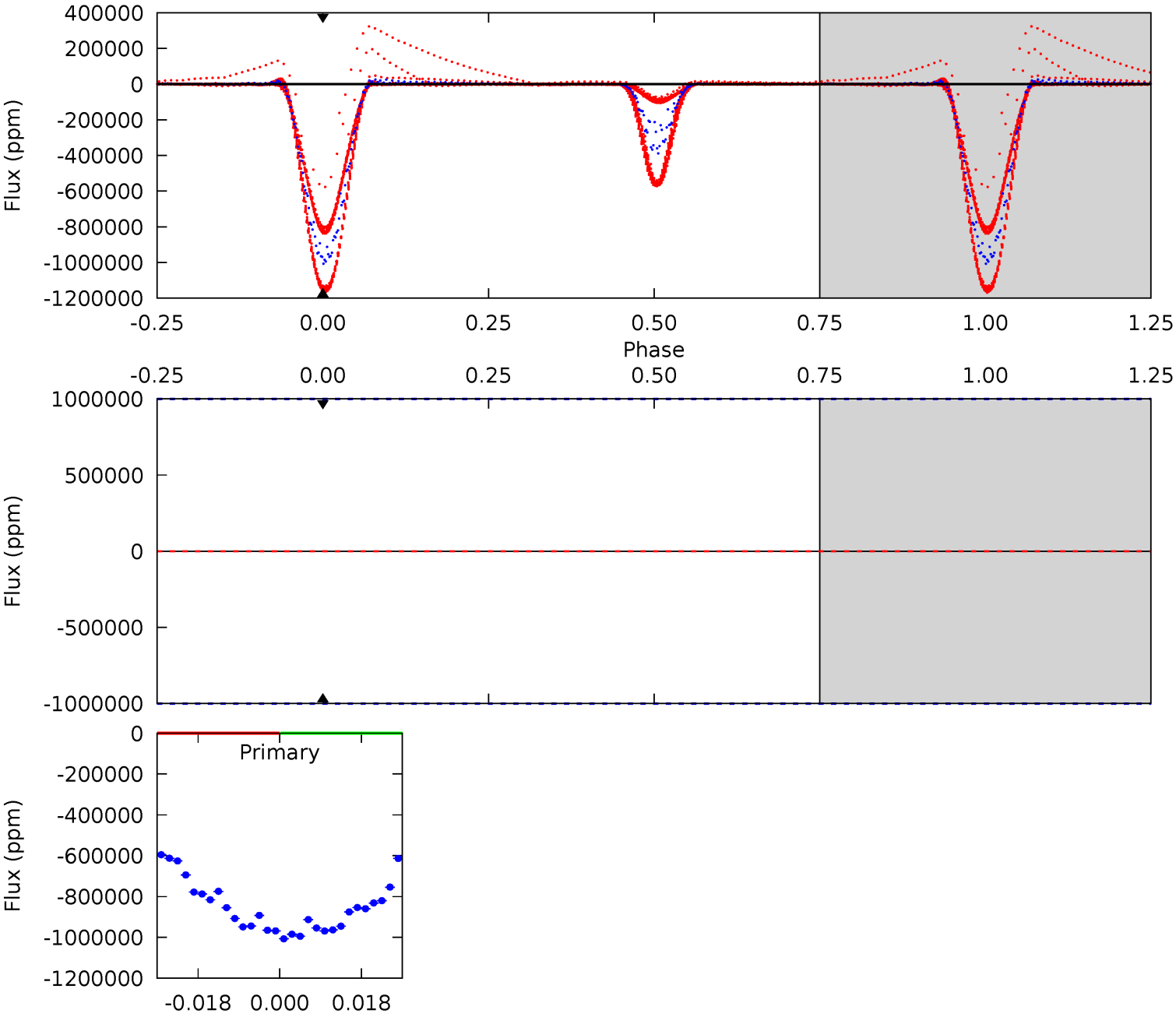
TCE 002161623-01 P= 2.283501 Days  $T_0=132.330092$  (BKJD)



DV Model-Shift Uniqueness Test

002161623-01, P = 2.283501 Days, E = 132.321525 Days

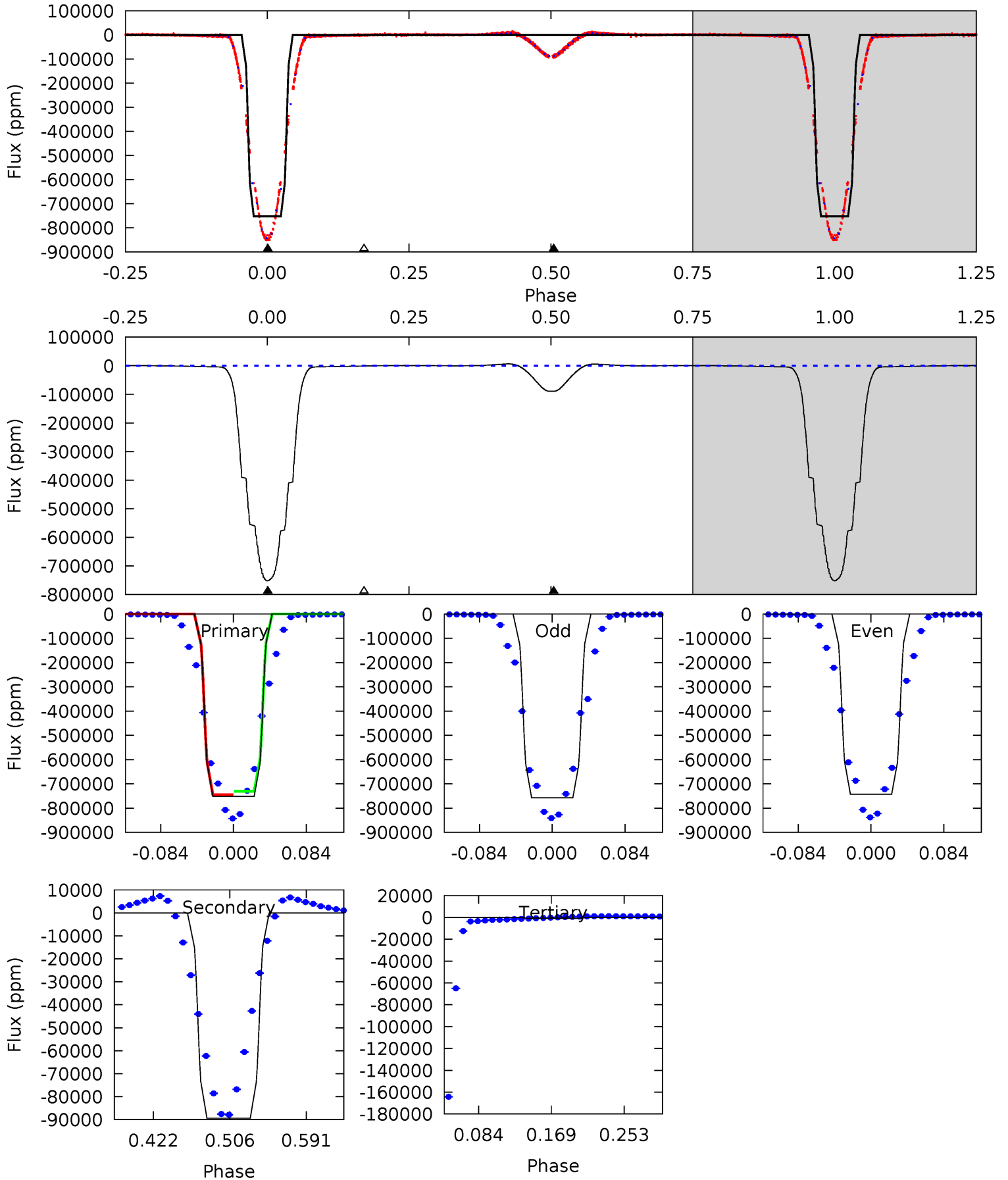
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

002161623-01, P = 2.283501 Days, E = 132.330092 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
5916	703.5	7.02	0	4.60	1.73	14.0	5909	5916	696.5	703.5	59.2	0.99	0.01	59.2



### Stellar Parameters For KIC 002161623

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6723^{+189}_{-260}$	$4.089^{+0.240}_{-0.180}$	$-0.240^{+0.250}_{-0.300}$	$1.719^{+0.503}_{-0.503}$	$1.327^{+0.194}_{-0.259}$	$0.368^{+0.532}_{-0.163}$
	+3%/-4%	+6%/-4%	+104%/-125%	+29%/-29%	+15%/-20%	+144%/-44%
Source	KIC0	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 002161623-01 / KOI 6094.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$67.43^{+21.28}_{-19.68}$	$2782^{+221}_{-235}$	$-2490^{+8840}_{-3609}$	$0.228^{+18.101}_{-16.506}$
Alt.	$-89400 \pm 127$	$167.30^{+37.65}_{-32.64}$	$2791^{+232}_{-247}$	$4092^{+212}_{-201}$	$2.630^{+1.324}_{-0.819}$

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

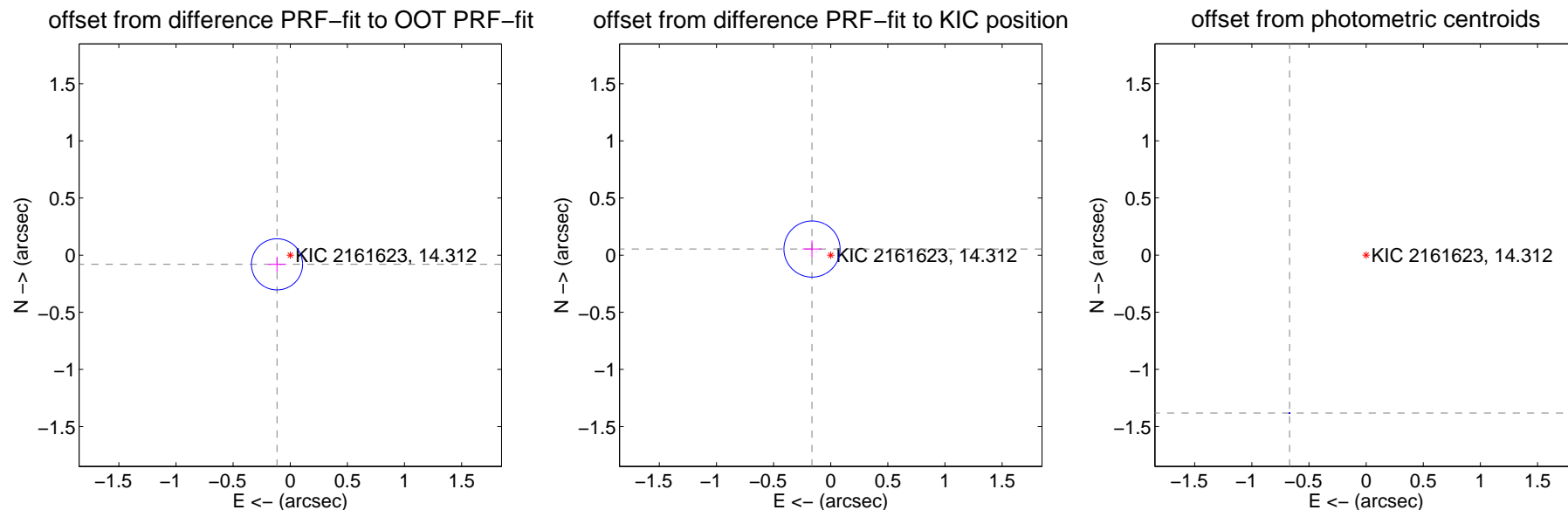
## DV Centroid Data

Supplemental centroid analysis for 002161623-01. Kepler magnitude: 14.31. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.141 \pm 0.075$	1.89	$0.116 \pm 0.078$	$-0.080 \pm 0.067$
PRF-fit source offset from KIC position	$0.172 \pm 0.082$	2.10	$0.164 \pm 0.083$	$0.053 \pm 0.074$
photometric centroid source offset	$1.54 \pm 0.00$	1012.61	$0.67 \pm 0.00$	$-1.38 \pm 0.00$



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.

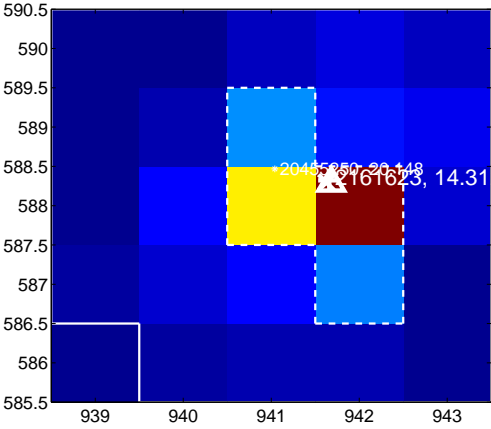
Q13 no difference image



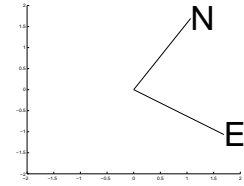
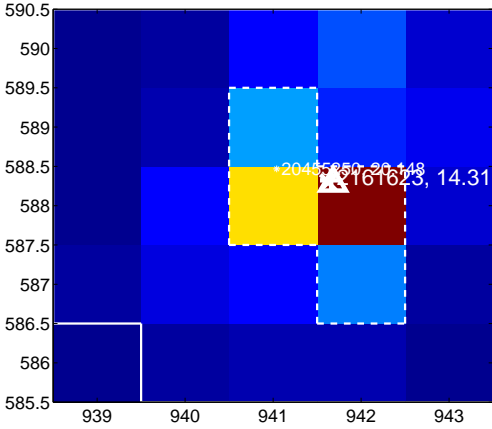
Q13 no OOT image



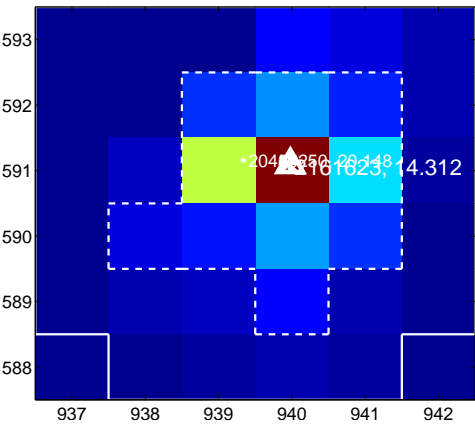
Q14 difference image



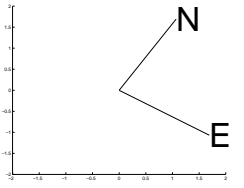
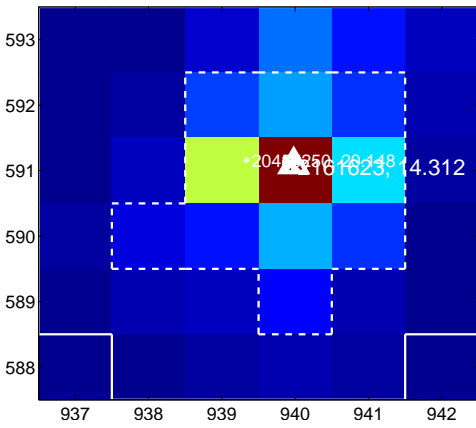
Q14 OOT image



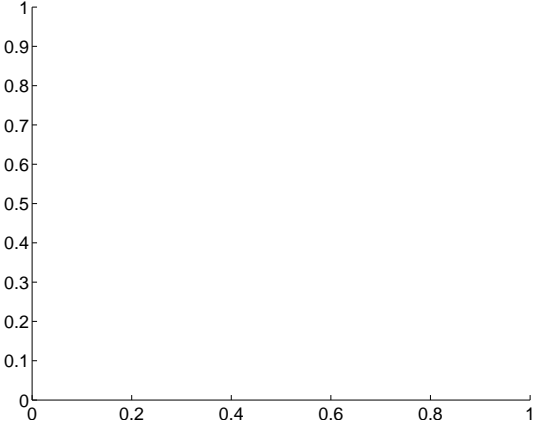
Q15 difference image



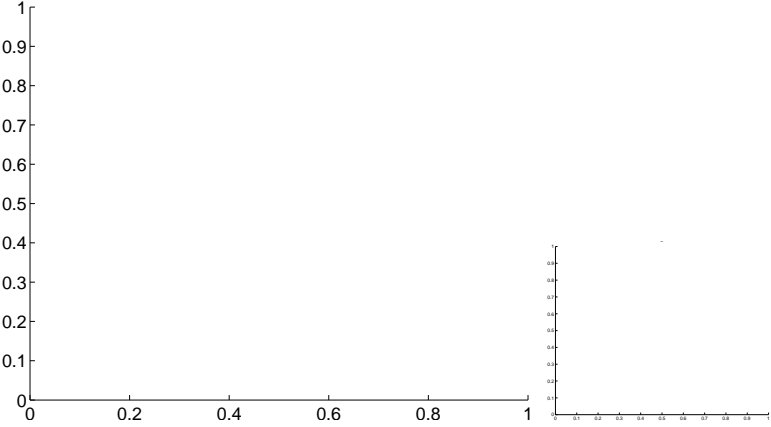
Q15 OOT image



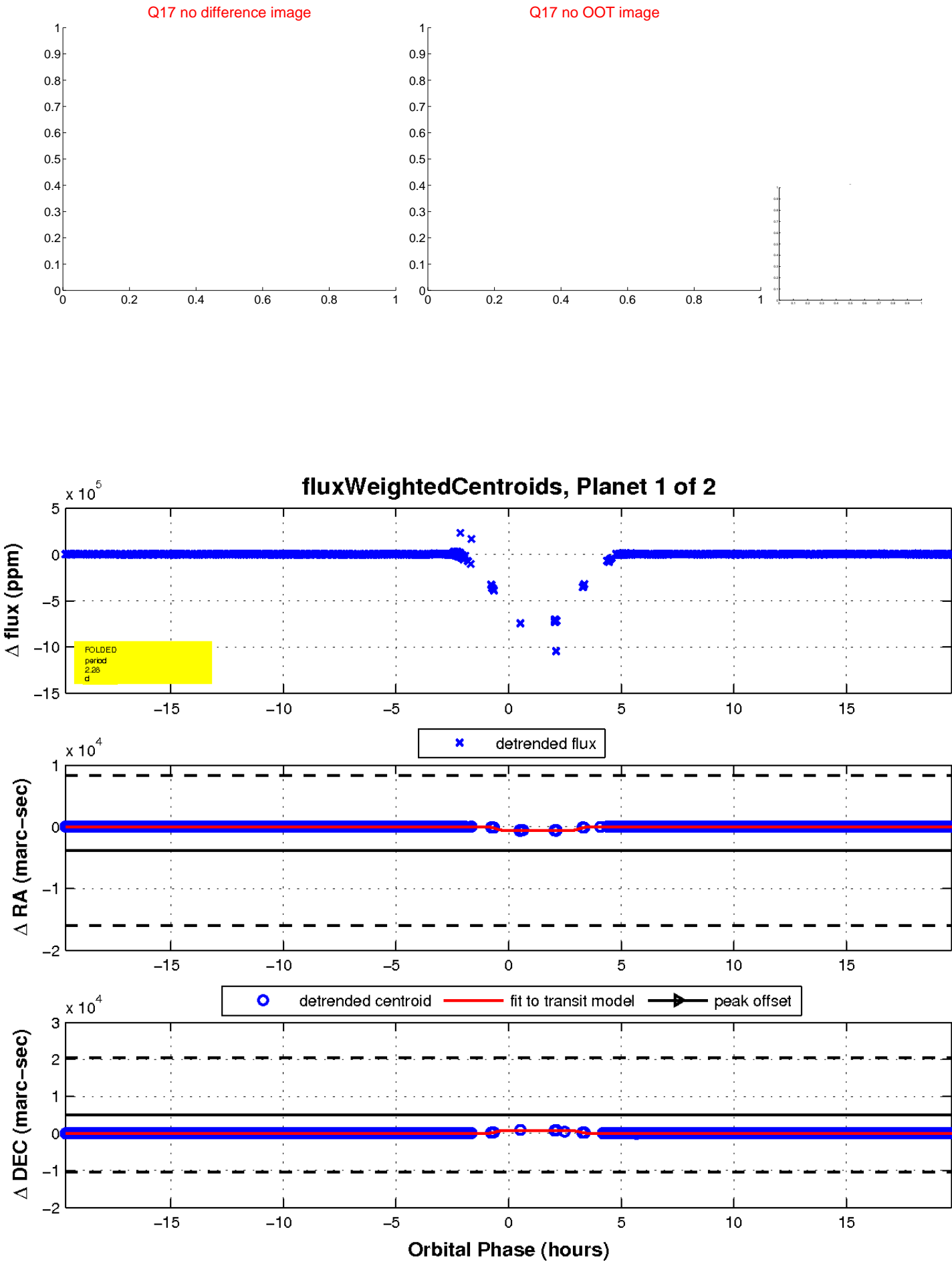
Q16 no difference image



Q16 no OOT image

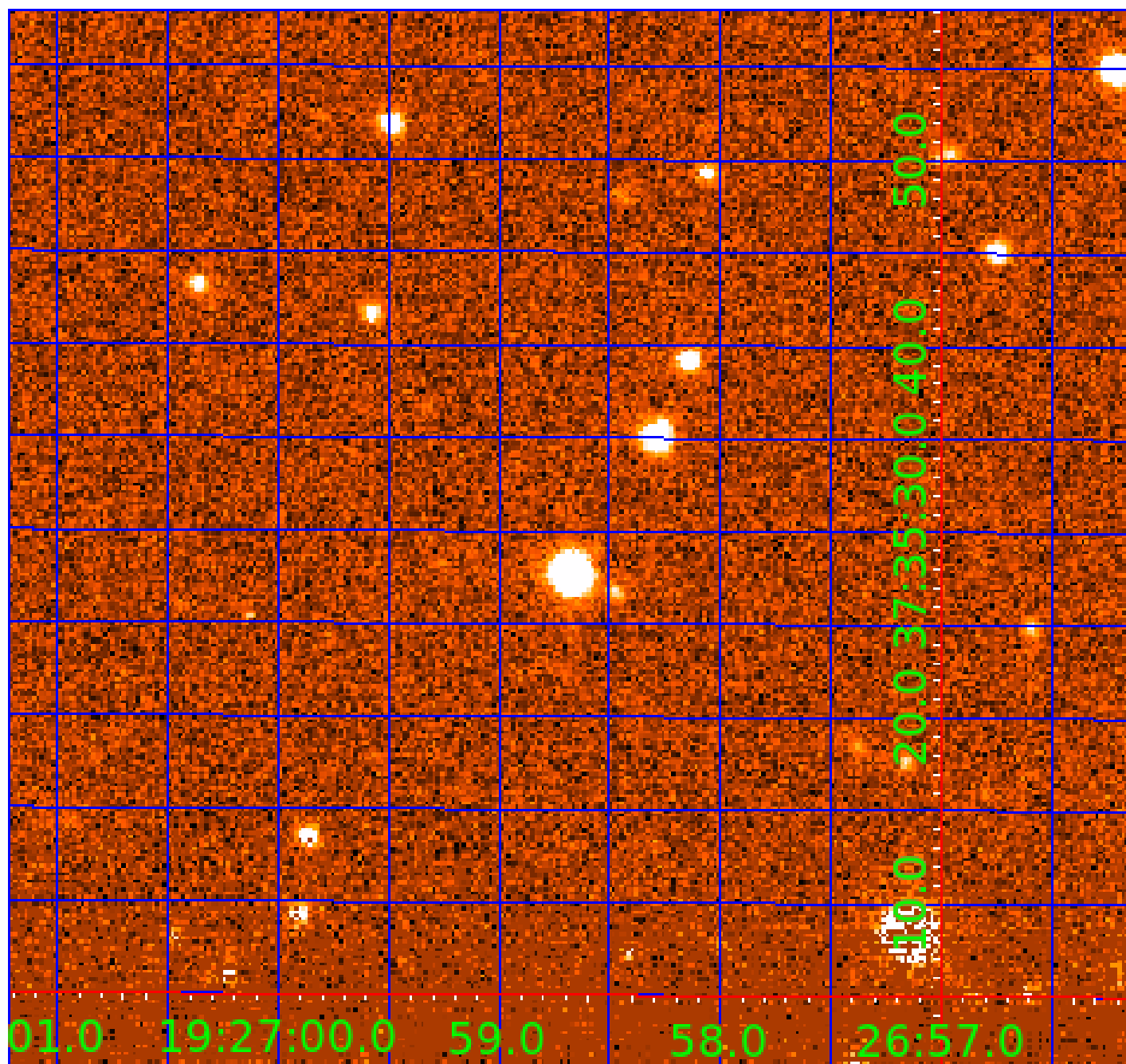


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 002161623

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002161623-01	OBS	6094.01	2.283501	132.321525	163664.0	4.500	6511.7	-1.0	1.72	6723	70.67	3895.19
002161623-02	OBS	No	2.283340	133.552661	122172.9	2.500	3096.1	-1.0	1.72	6723	61.04	3895.56

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002161623-01	OBS	FP	0.00	0	1	0	0	SWEET_EB—MOD_SEC_ALT—DEPTH_ODDEVEN_DV—MOD_ODDEVEN_ALT—HAS_SEC_TCE—SEASONAL_DEPTH_DV—CENT_NOFITS
002161623-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS

**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.

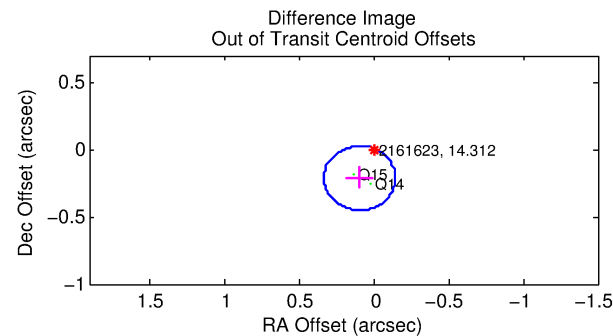
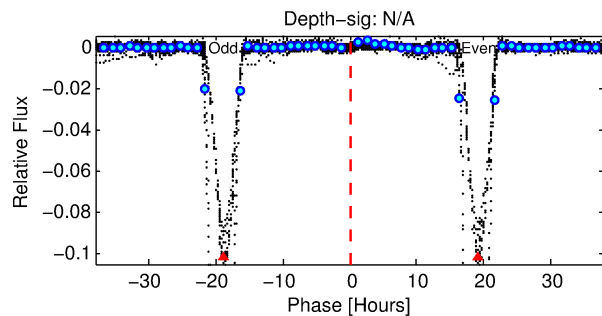
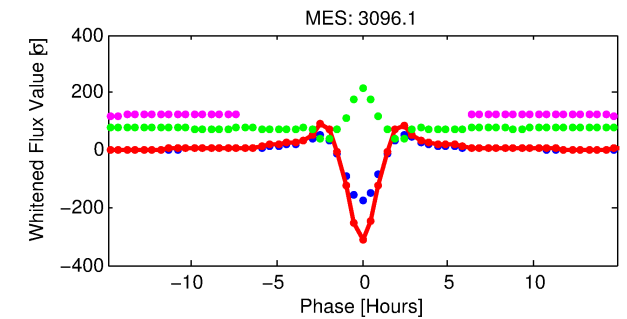
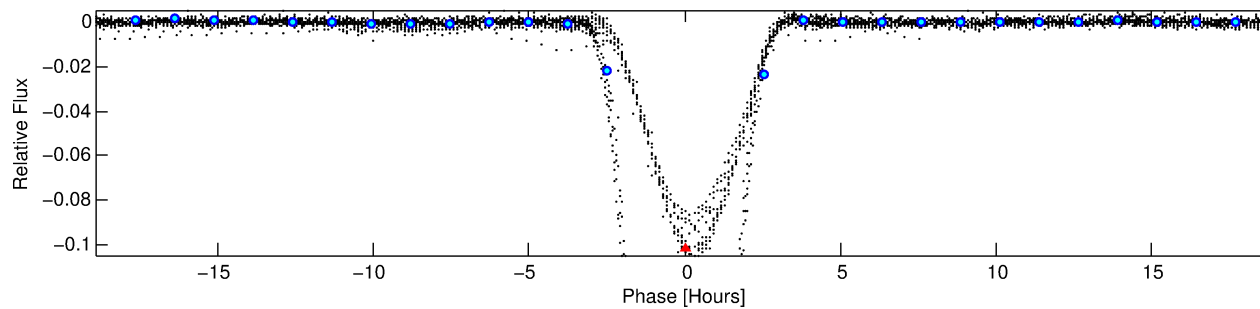
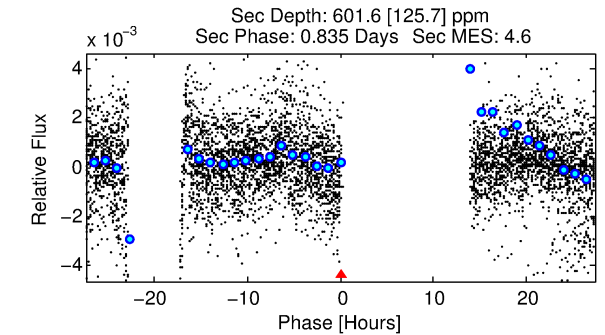
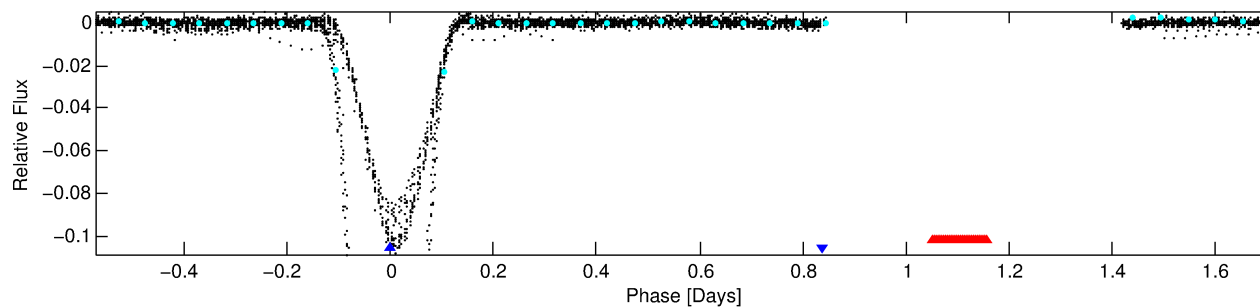
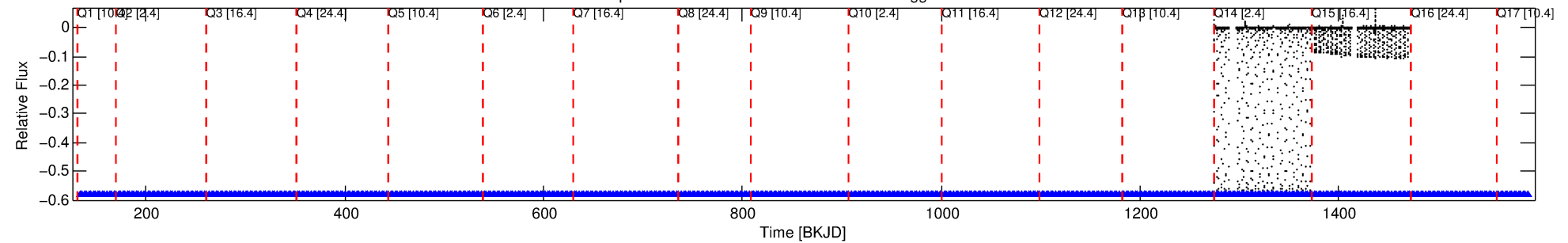
## Ephemeris Match Information For 002161623-02

No Significant Match Found

# DV One-Page Summary

KIC: 2161623 Candidate: 2 of 2 Period: 2.283 d  
KOI: K06094 Corr: No Ephemeris Match

Kp: 14.31 R\*: 1.72 Rs Teff: 6723.0 K Logg: 4.09 Fe/H: -0.240



TPS TCE Results:

Period = 2.28334 d  
Epoch = 133.5527 BKJD

DV fit results are unavailable

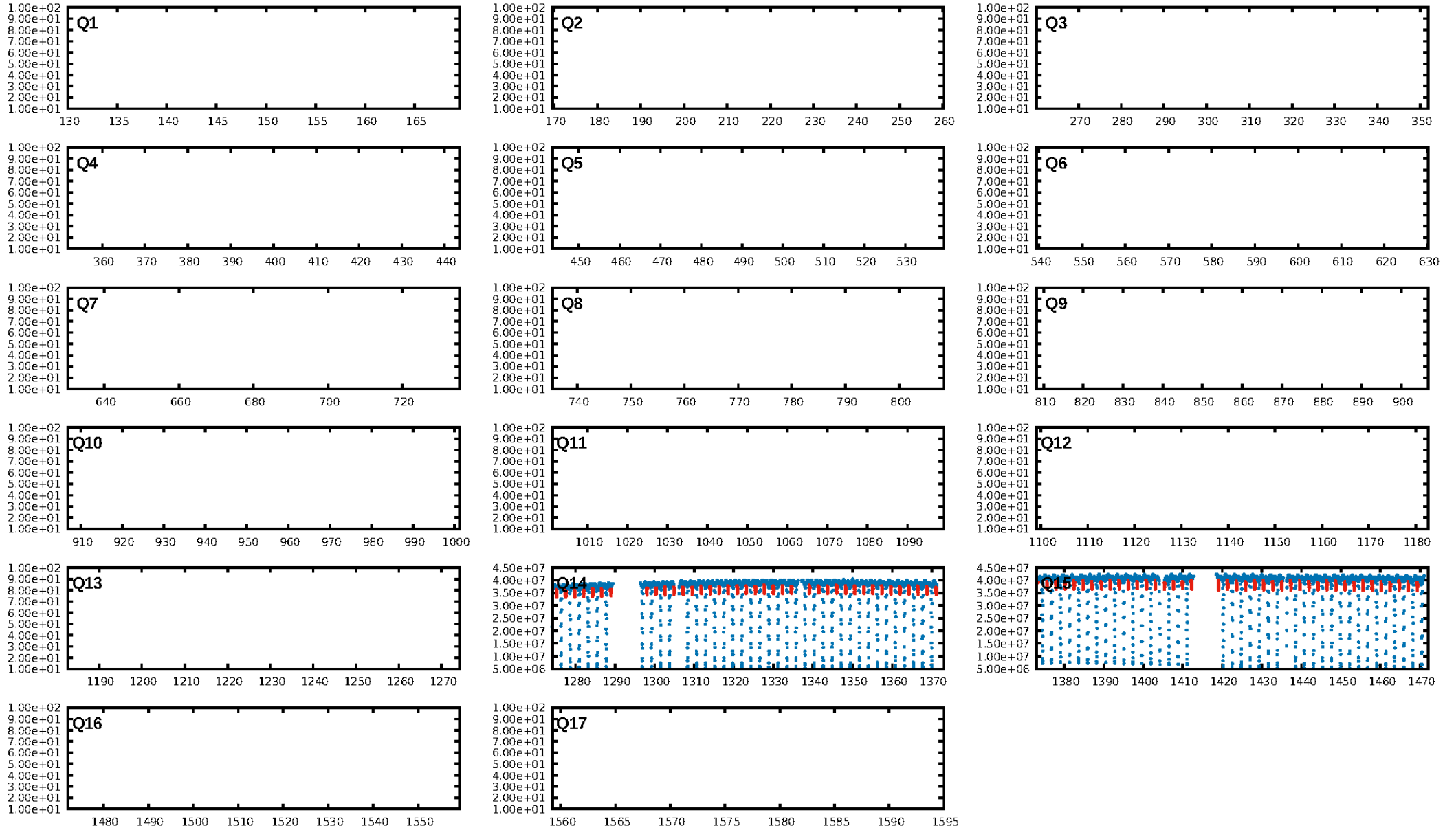
DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.1% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [80/80]  
GhostDiagnostic-chr: 0.7044  
Centroid-sig: 0.0%  
Centroid-so: 0.516 arcsec [55.87σ]  
OotOffset-rm: 0.231 arcsec [2.90σ]  
KicOffset-rm: 0.171 arcsec [2.16σ]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [2/2]

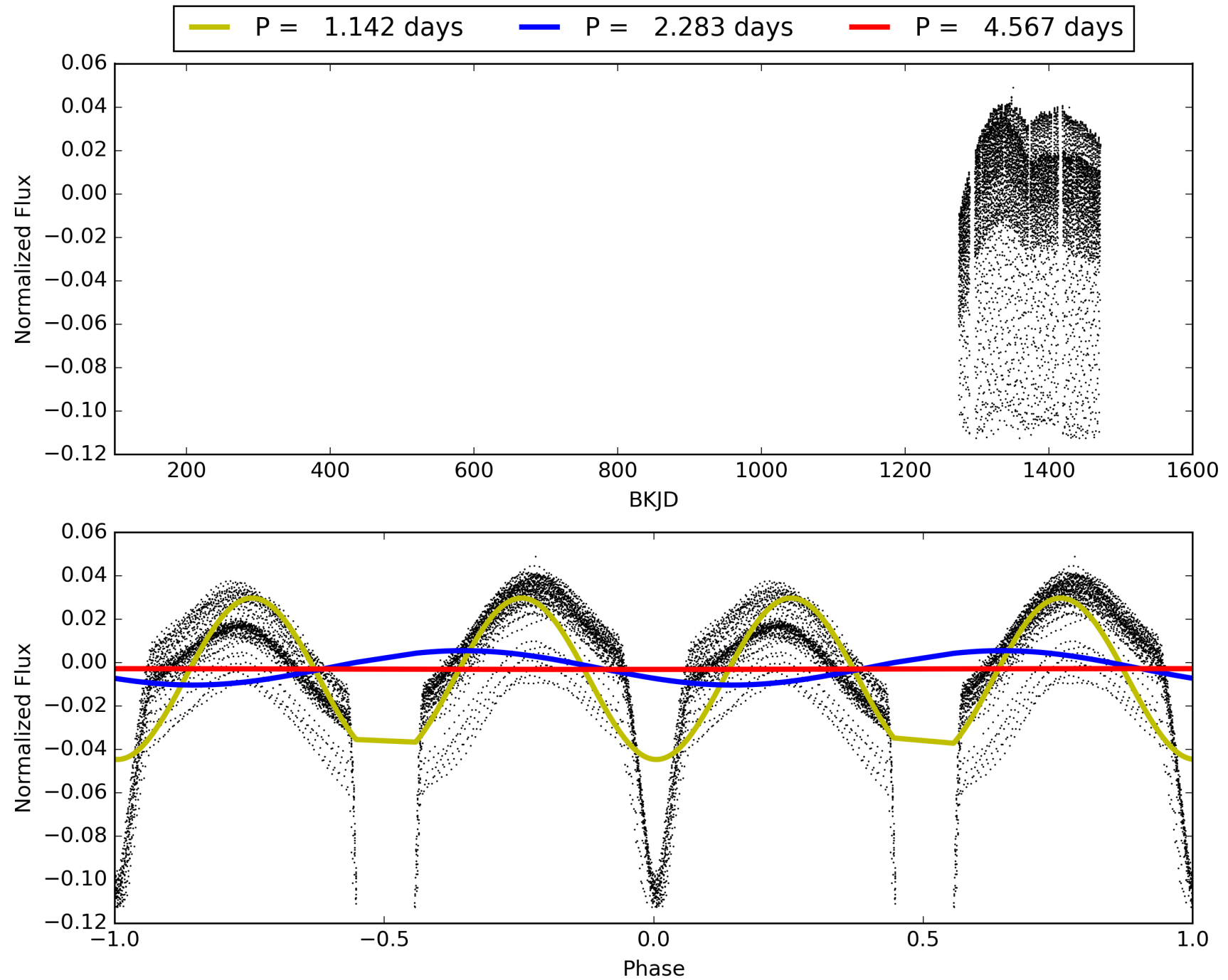
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:55:45 Z

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

# TCE 002161623-02, PDC Light Curves



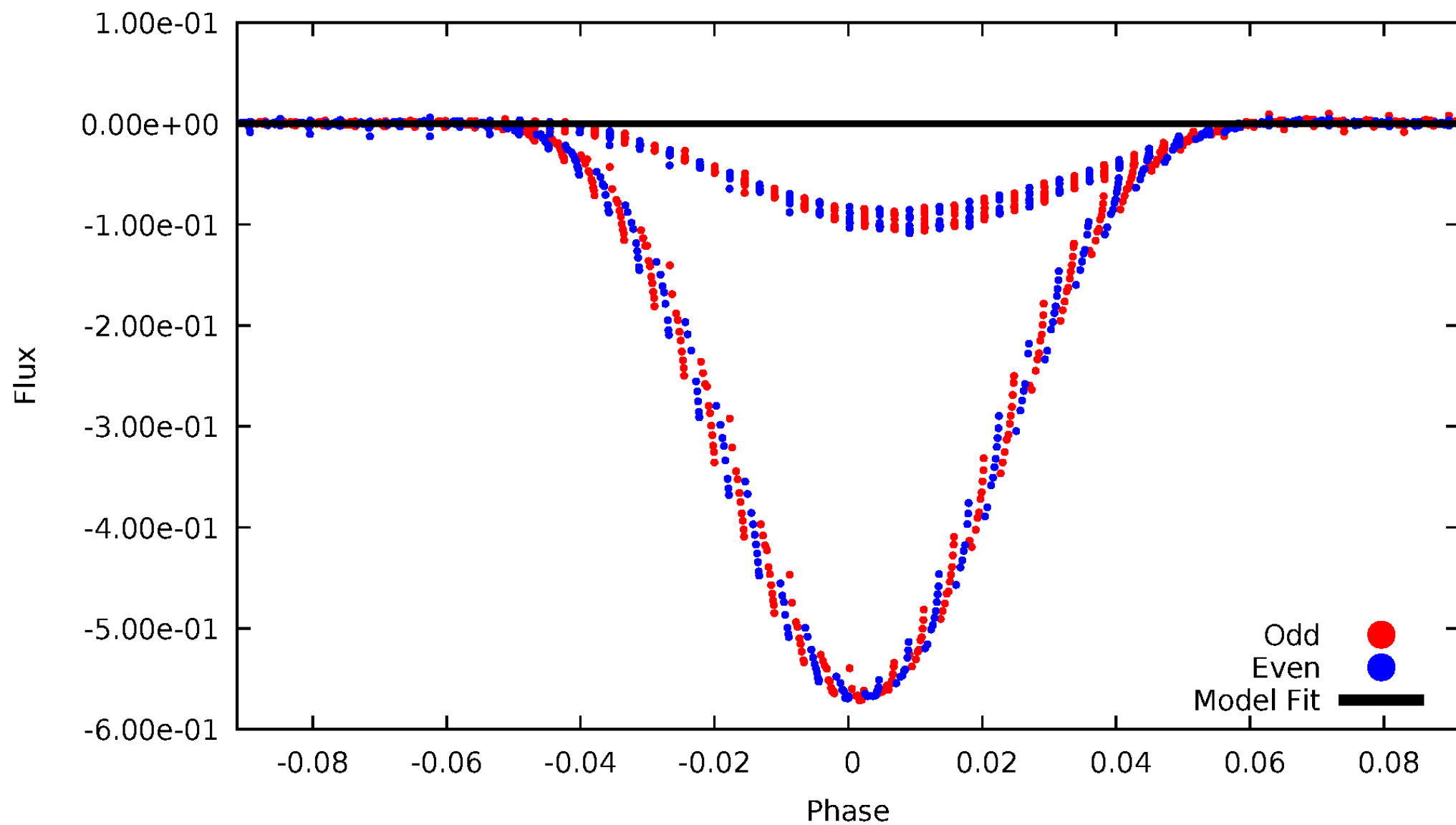
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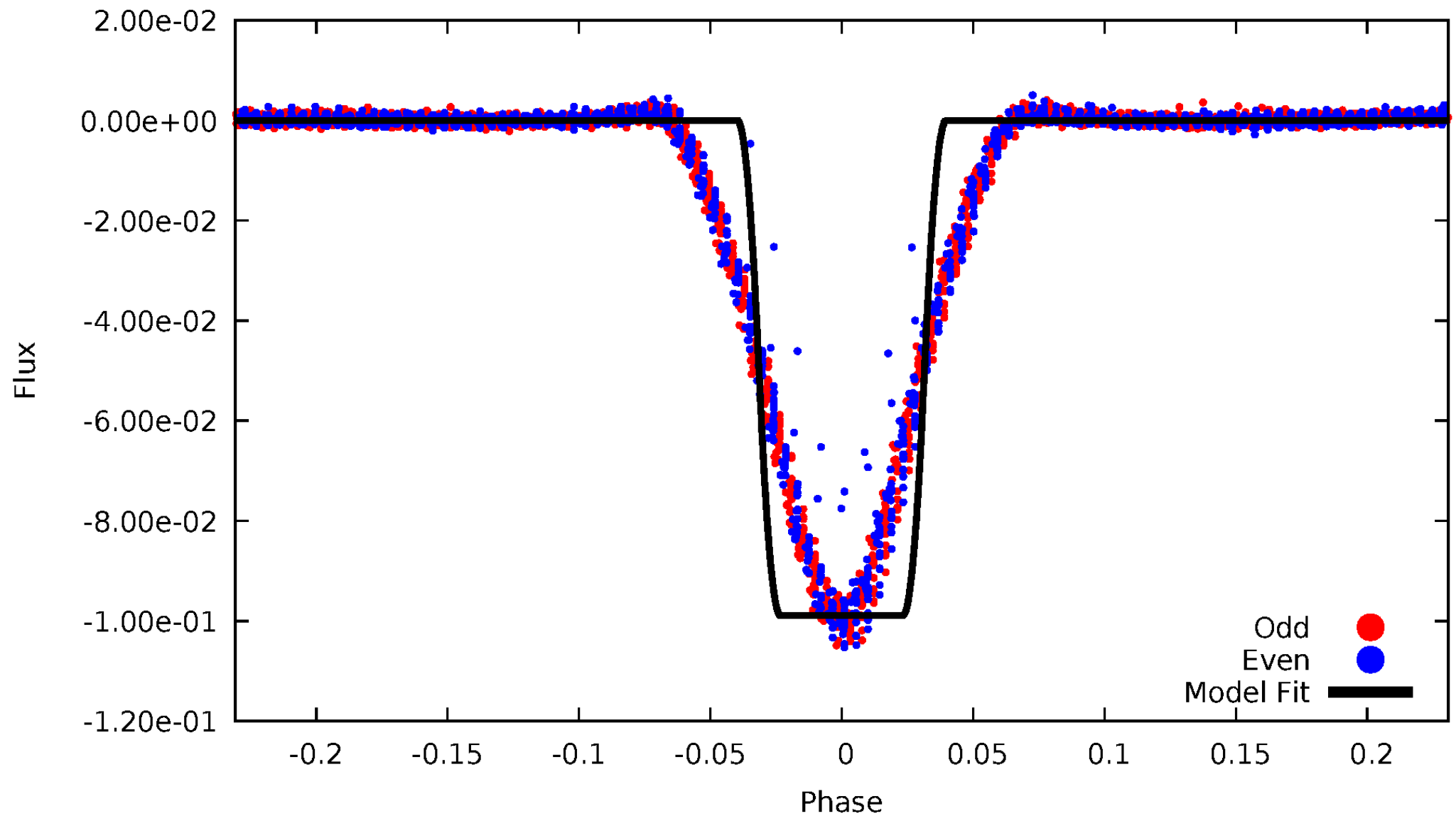
# DV Odd/Even

TCE 002161623-02



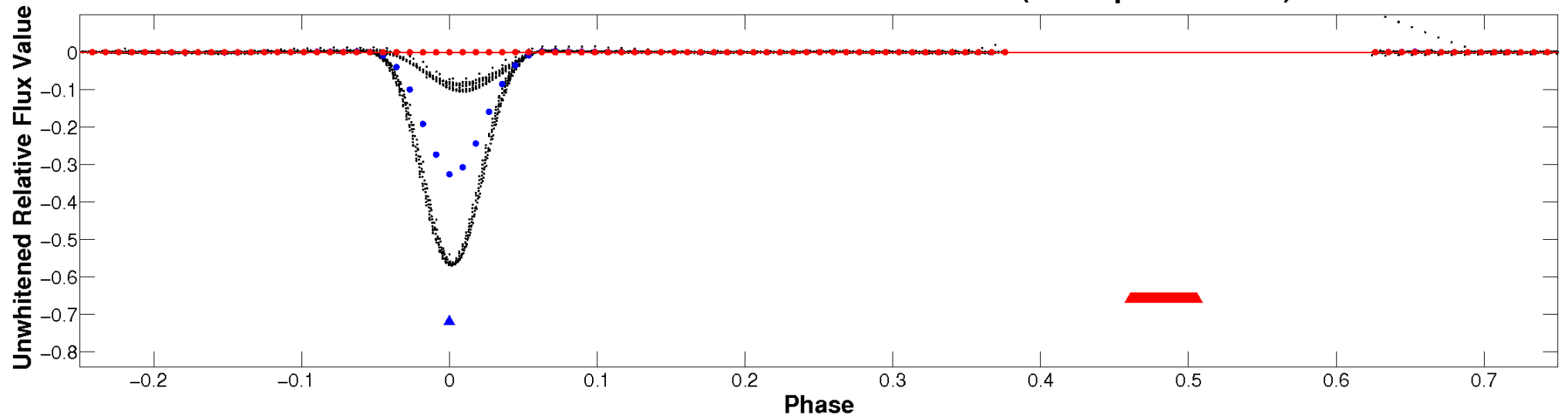
# ALT Odd/Even

TCE 002161623-02



# Non-Whitened Vs. Whitened Light Curve

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

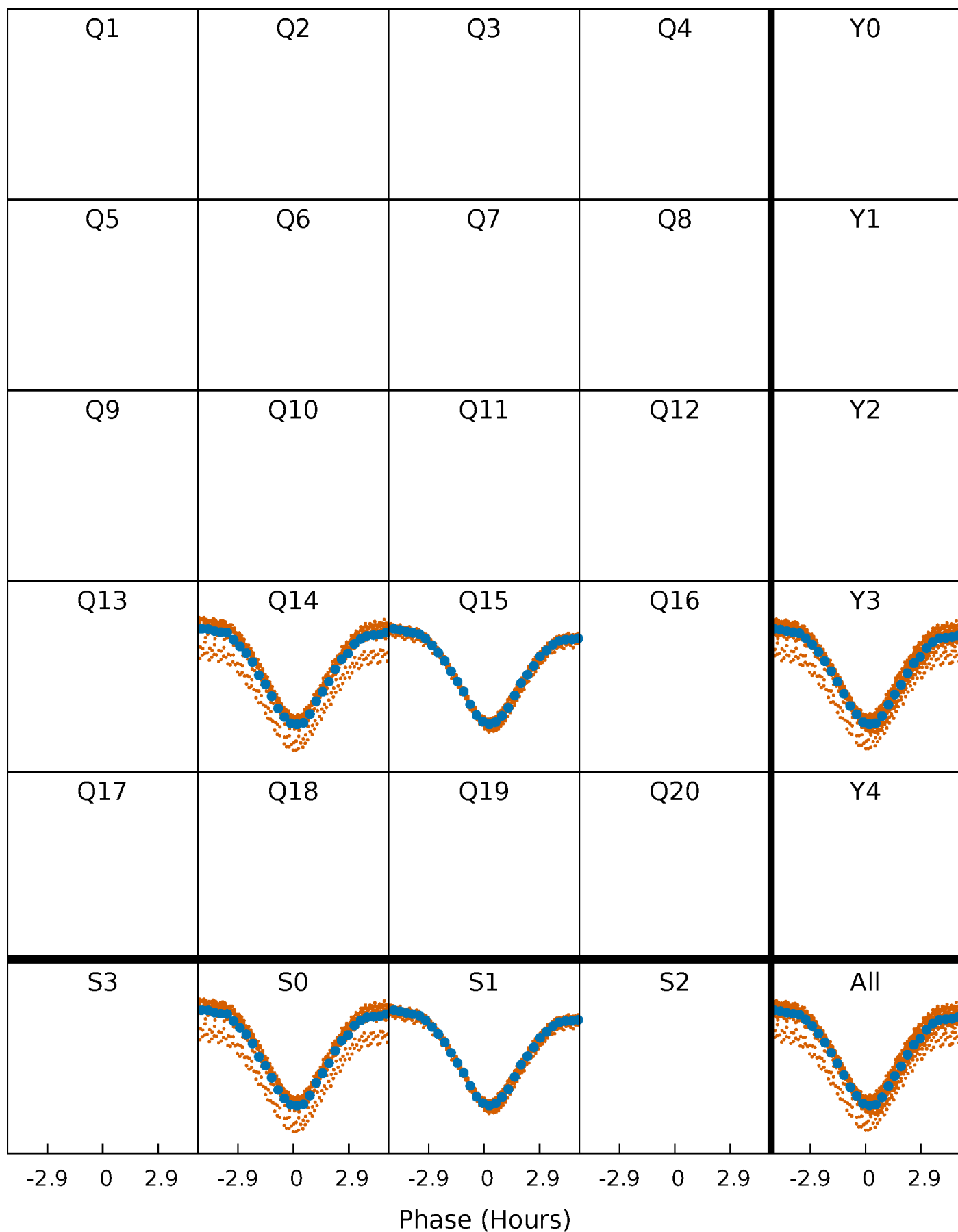


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



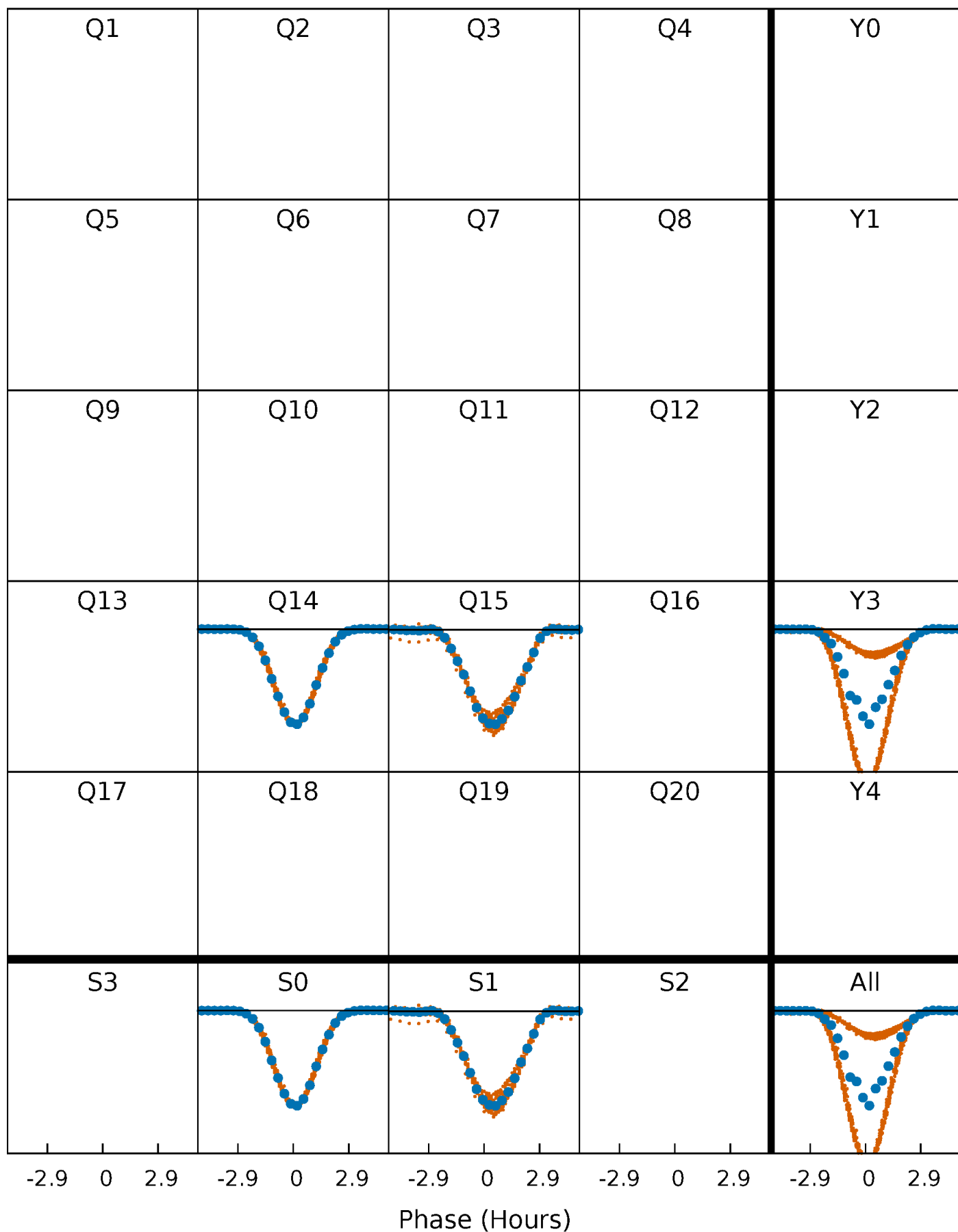
# PDC Quarter-Phased Transit Curves

TCE 002161623-02 P= 2.283340 Days  $T_0=133.552661$  (BKJD)



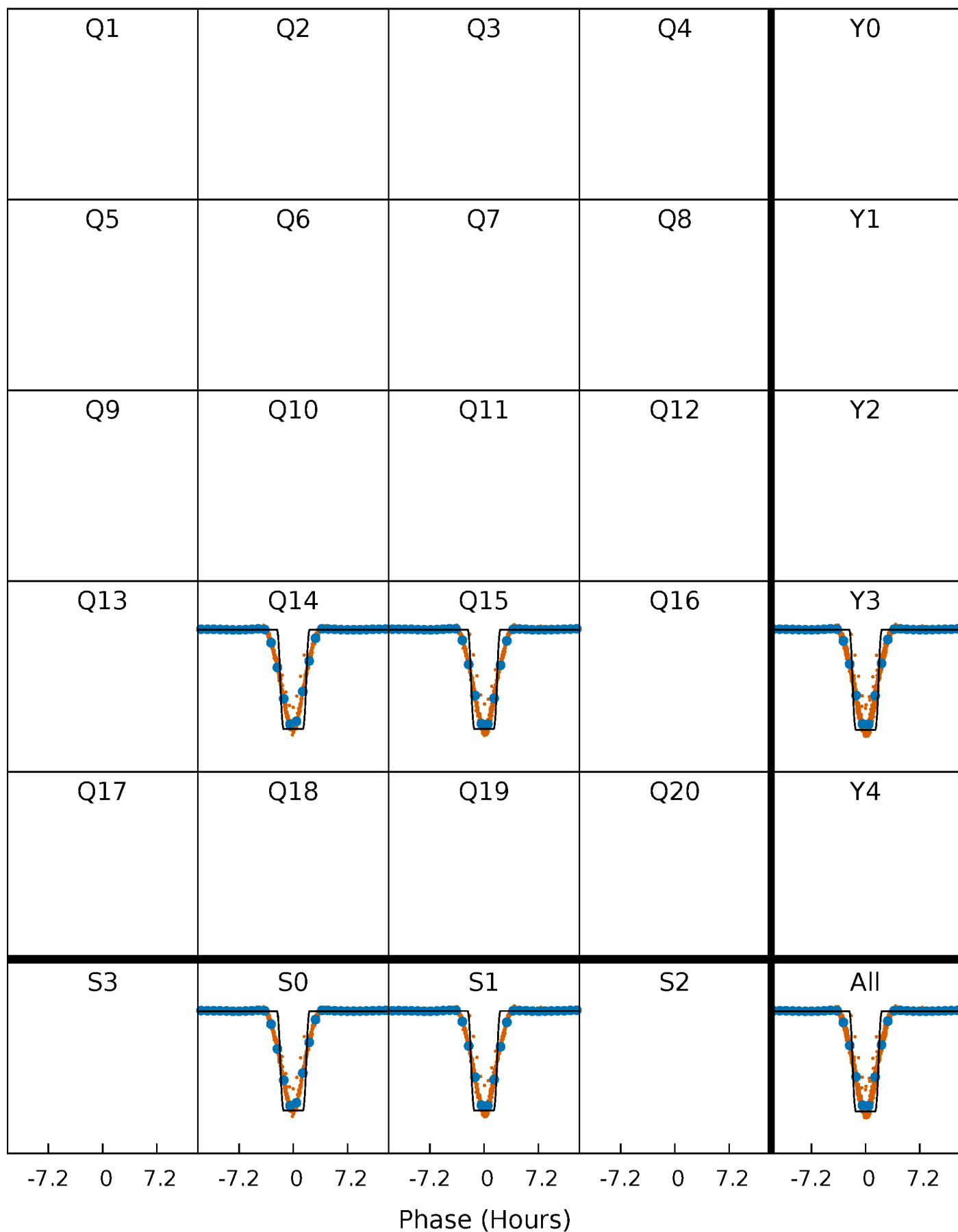
# DV Quarter-Phased Transit Curves

TCE 002161623-02 P= 2.283340 Days  $T_0=133.552661$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

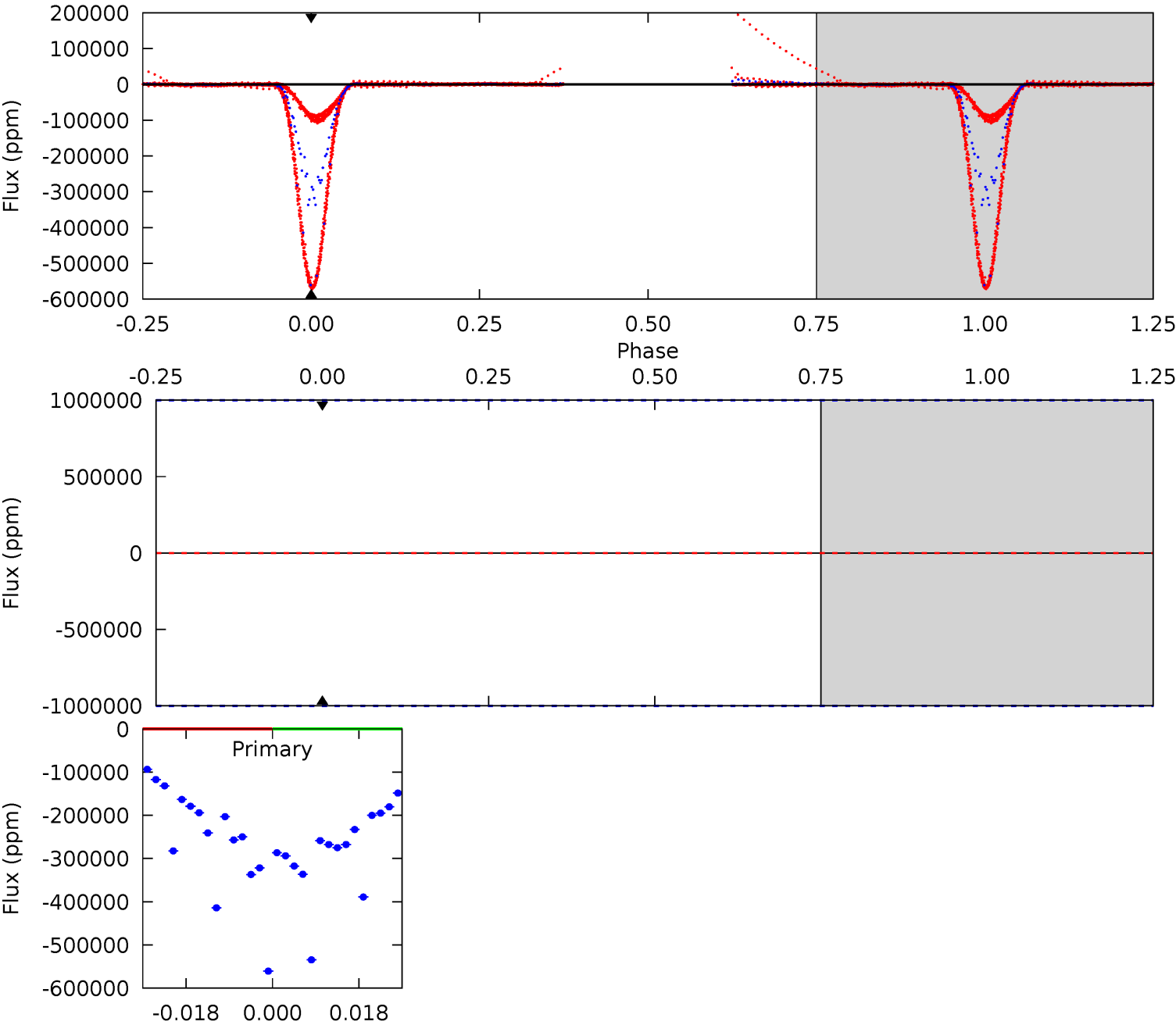
TCE 002161623-02 P= 2.283340 Days  $T_0=133.560933$  (BKJD)



DV Model-Shift Uniqueness Test

002161623-02, P = 2.283340 Days, E = 133.552661 Days

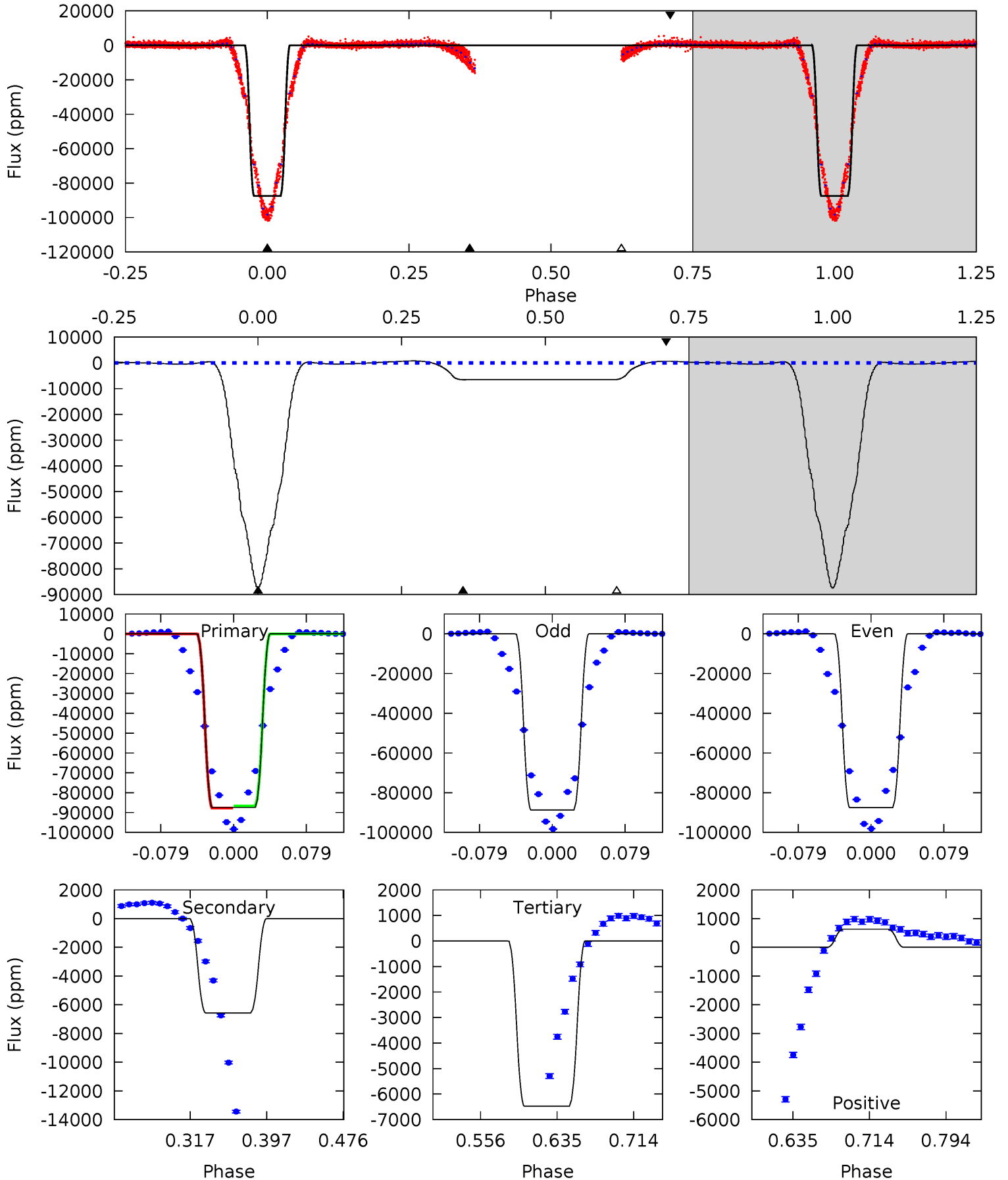
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

002161623-02, P = 2.283340 Days, E = 133.560933 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
1340	100.6	99.2	9.68	4.61	1.75	18.4	1241	1331	1.37	90.9	7.87	0.99	0.01	0





### Stellar Parameters For KIC 002161623

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6723^{+189}_{-260}$	$4.089^{+0.240}_{-0.180}$	$-0.240^{+0.250}_{-0.300}$	$1.719^{+0.503}_{-0.503}$	$1.327^{+0.194}_{-0.259}$	$0.368^{+0.532}_{-0.163}$
	+3%/-4%	+6%/-4%	+104%/-125%	+29%/-29%	+15%/-20%	+144%/-44%
Source	KIC0	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 002161623-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$59.41^{+22.06}_{-20.19}$	$2785^{+232}_{-215}$	$-2841^{+9649}_{-3719}$	$0.080^{+23.358}_{-20.405}$
Alt.	$-6563 \pm 65$	$56.83^{+22.76}_{-18.25}$	$2795^{+209}_{-223}$	$3645^{+620}_{-442}$	$1.535^{+1.809}_{-0.729}$

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

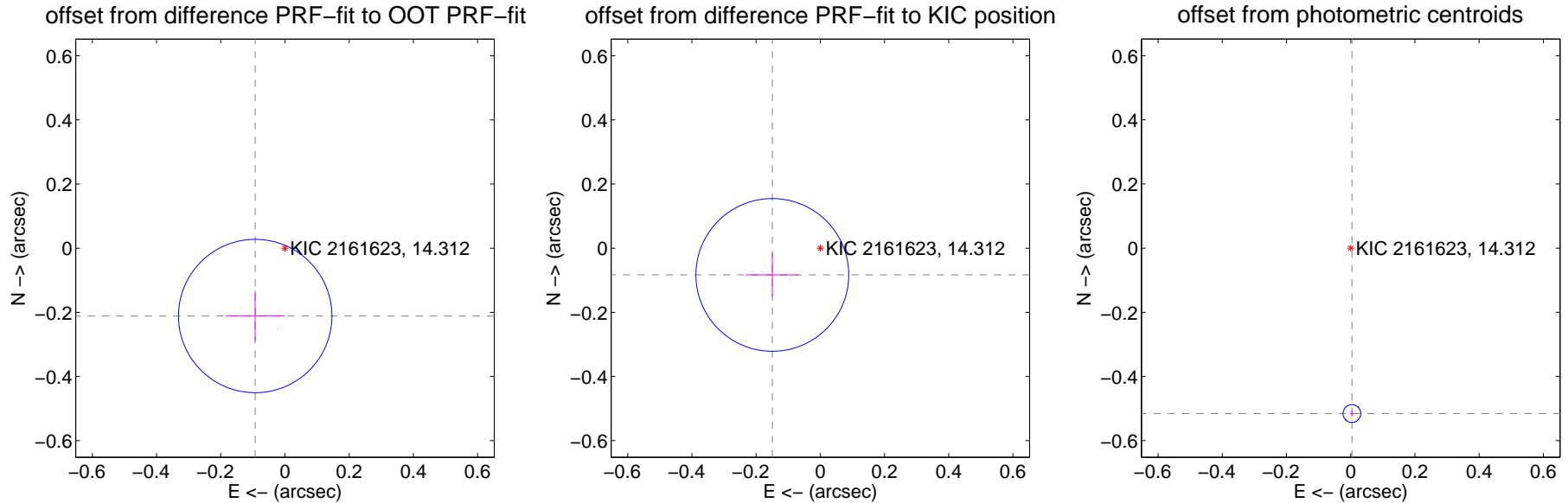
## DV Centroid Data

Supplemental centroid analysis for 002161623-02. Kepler magnitude: 14.31. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.231 \pm 0.080$	2.90	$0.093 \pm 0.092$	$-0.212 \pm 0.077$
PRF-fit source offset from KIC position	$0.171 \pm 0.079$	2.16	$0.150 \pm 0.083$	$-0.083 \pm 0.068$
photometric centroid source offset	$0.52 \pm 0.01$	55.87	$-0.00 \pm 0.01$	$-0.52 \pm 0.01$



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.

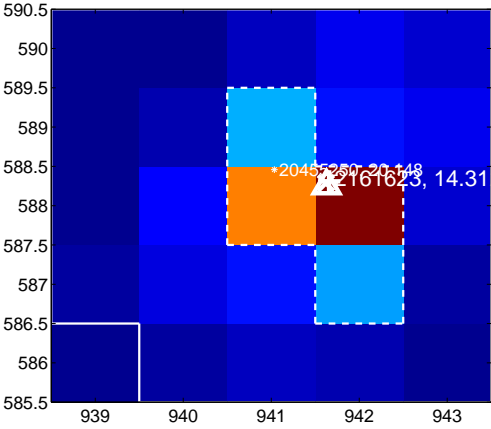
Q13 no difference image



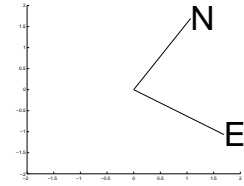
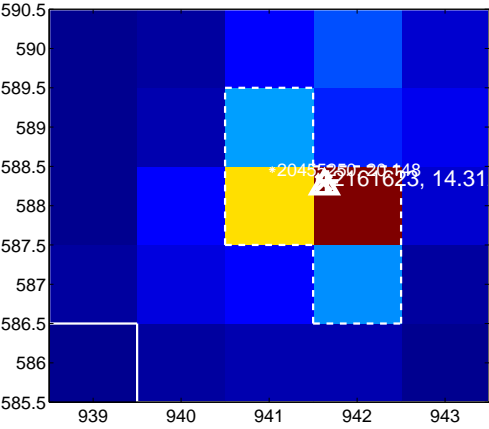
Q13 no OOT image



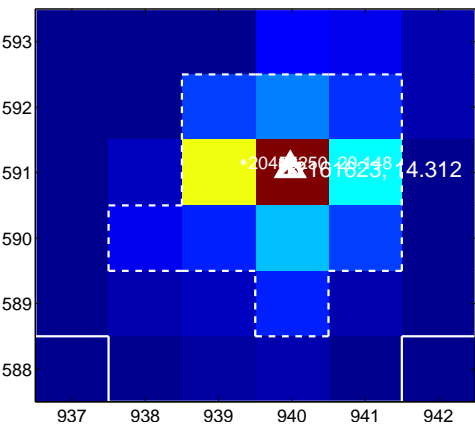
Q14 difference image



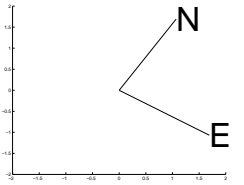
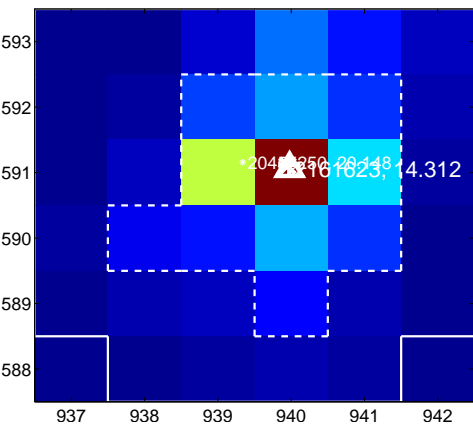
Q14 OOT image



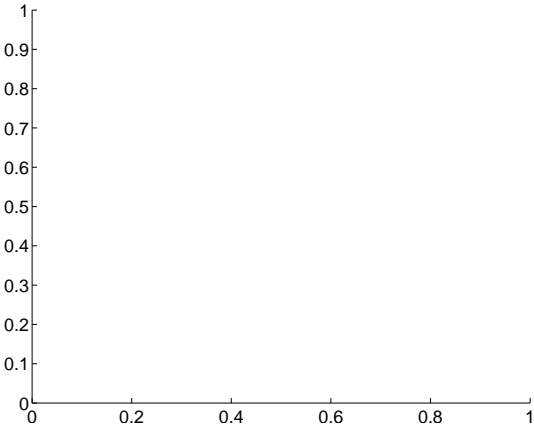
Q15 difference image



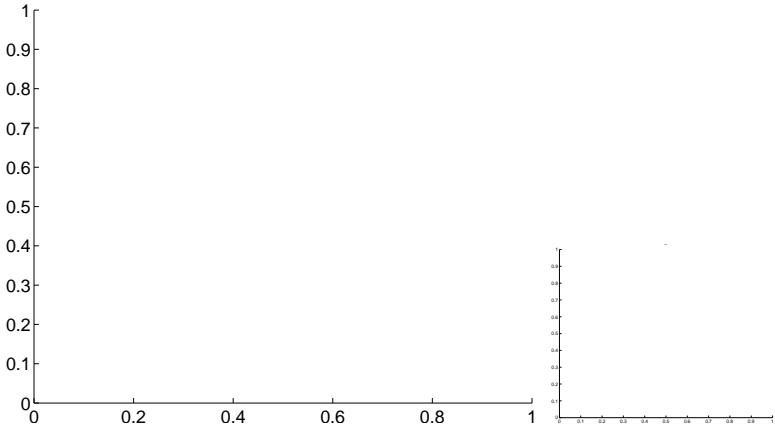
Q15 OOT image



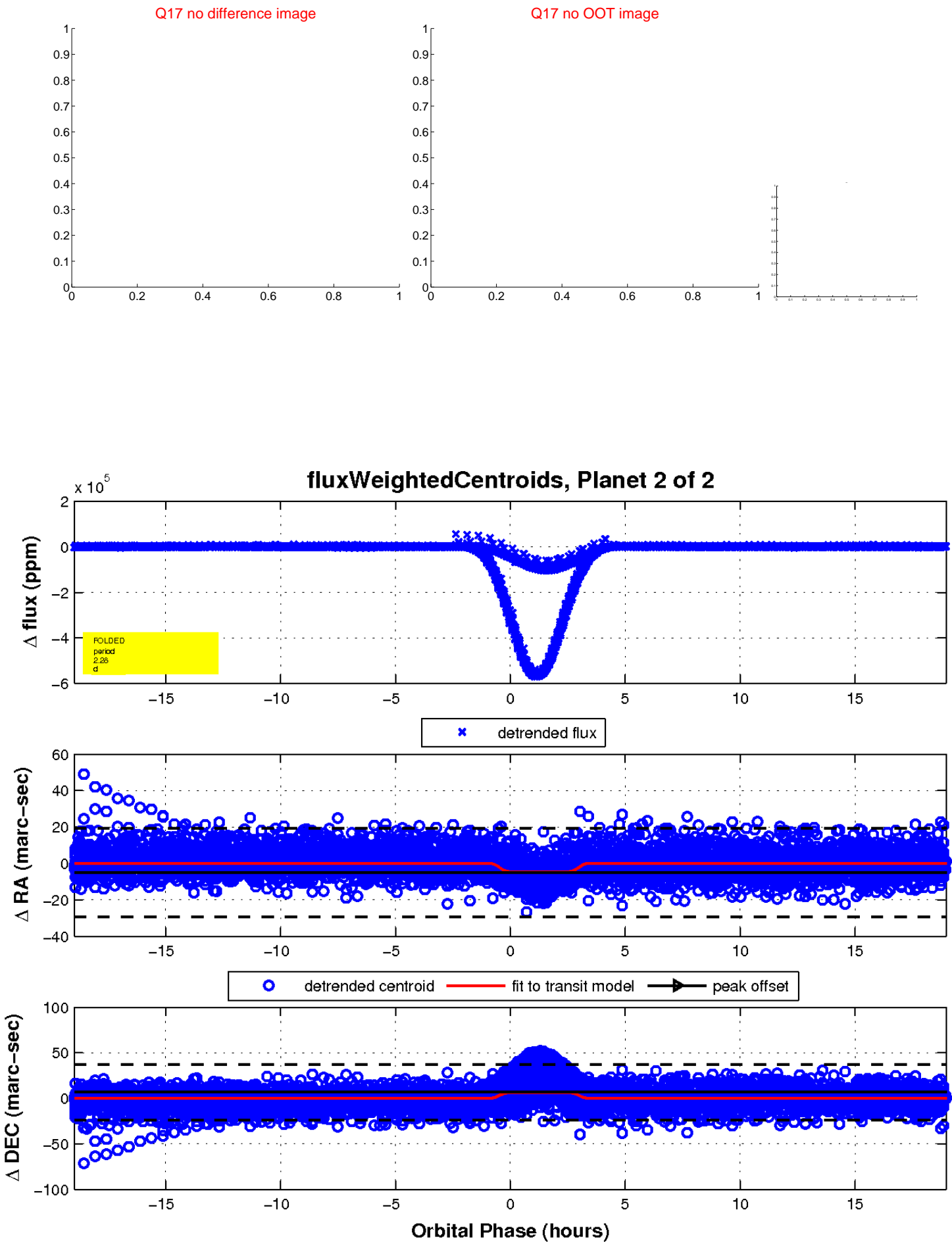
Q16 no difference image



Q16 no OOT image



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



# UKIRT Image

Declination

