

# KIC 008476245

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008476245-01	OBS	No	171.781853	262.492977	11.4	16.305	14.9	3.3	26.91	4947	10.55	594.60
008476245-03	OBS	No	451.977931	202.664717	812.4	17.450	11.3	10.9	26.91	4947	96.93	163.70
008476245-04	OBS	No	298.796728	230.706789	1568.9	20.247	11.6	18.1	26.91	4947	207.28	284.25
008476245-05	OBS	No	30.687156	160.412224	27.5	1.006	10.3	23.2	26.91	4947	17.06	5909.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008476245-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_SATURATED
008476245-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-05	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED

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

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

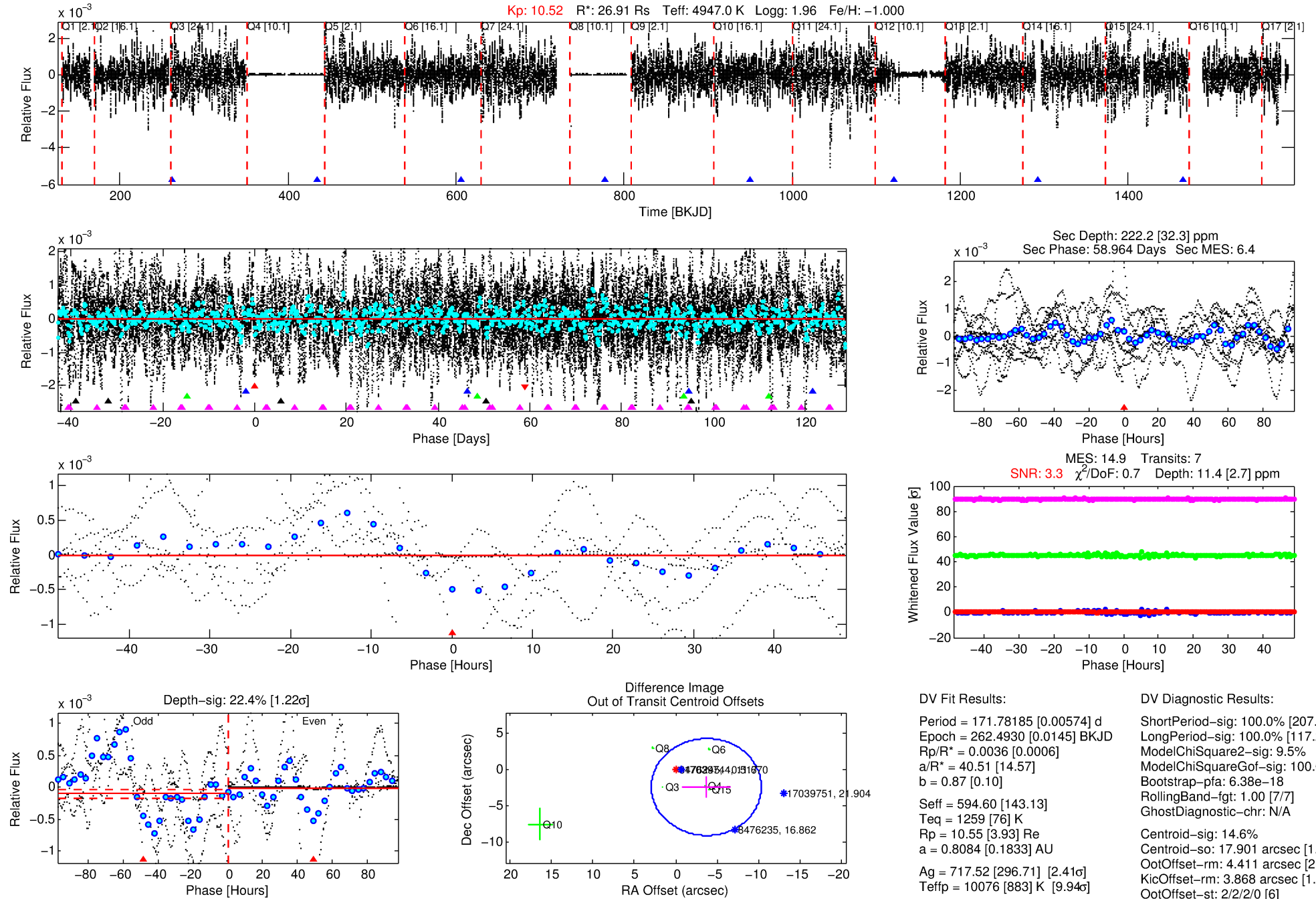
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008476245-01

No Significant Match Found

# DV One-Page Summary

KIC: 8476245 Candidate: 1 of 5 Period: 171.782 d



## DV Fit Results:

Period = 171.78185 [0.00574] d  
Epoch = 262.4930 [0.0145] BKJD  
Rp/R\* = 0.0036 [0.0006]  
a/R\* = 40.51 [14.57]  
b = 0.87 [0.10]  
Seff = 594.60 [143.13]  
Teff = 1259 [76] K  
Rp = 10.55 [3.93] Re  
a = 0.8084 [0.1833] AU  
Ag = 717.52 [296.71] [2.41σ]  
Teffp = 10076 [883] K [9.94σ]

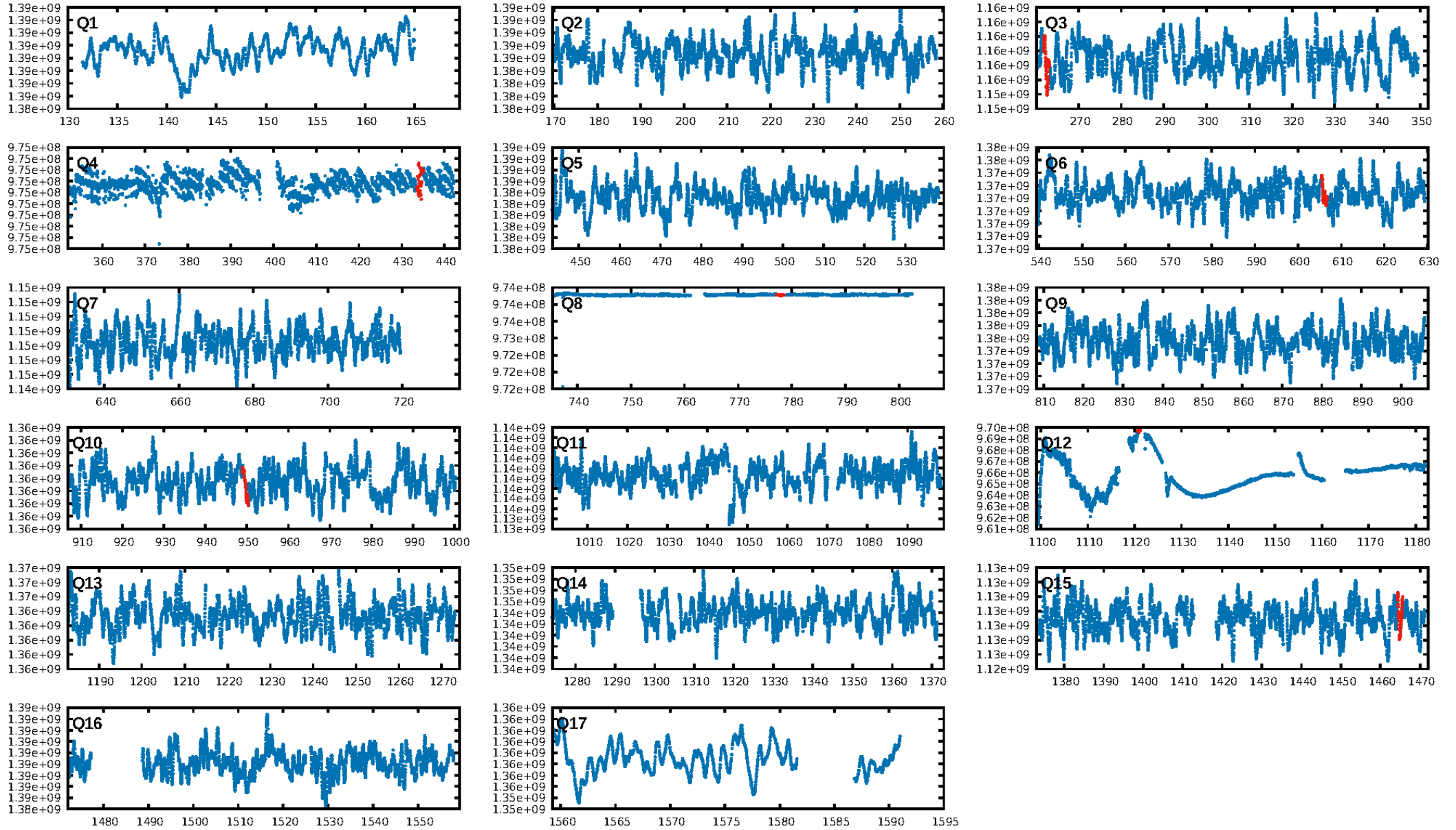
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [207.30σ]  
LongPeriod-sig: 100.0% [117.26σ]  
ModelChiSquare2-sig: 9.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 6.38e-18  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 14.6%  
Centroid-so: 17.901 arcsec [1.17σ]  
OotOffset-rm: 4.411 arcsec [2.00σ]  
KicOffset-rm: 3.868 arcsec [1.92σ]  
OotOffset-st: 2/2/2/0 [6]  
KicOffset-st: 2/2/2/0 [6]  
DiffImageQuality-fgm: 0.17 [1/6]  
DiffImageOverlap-fno: 1.00 [6/6]

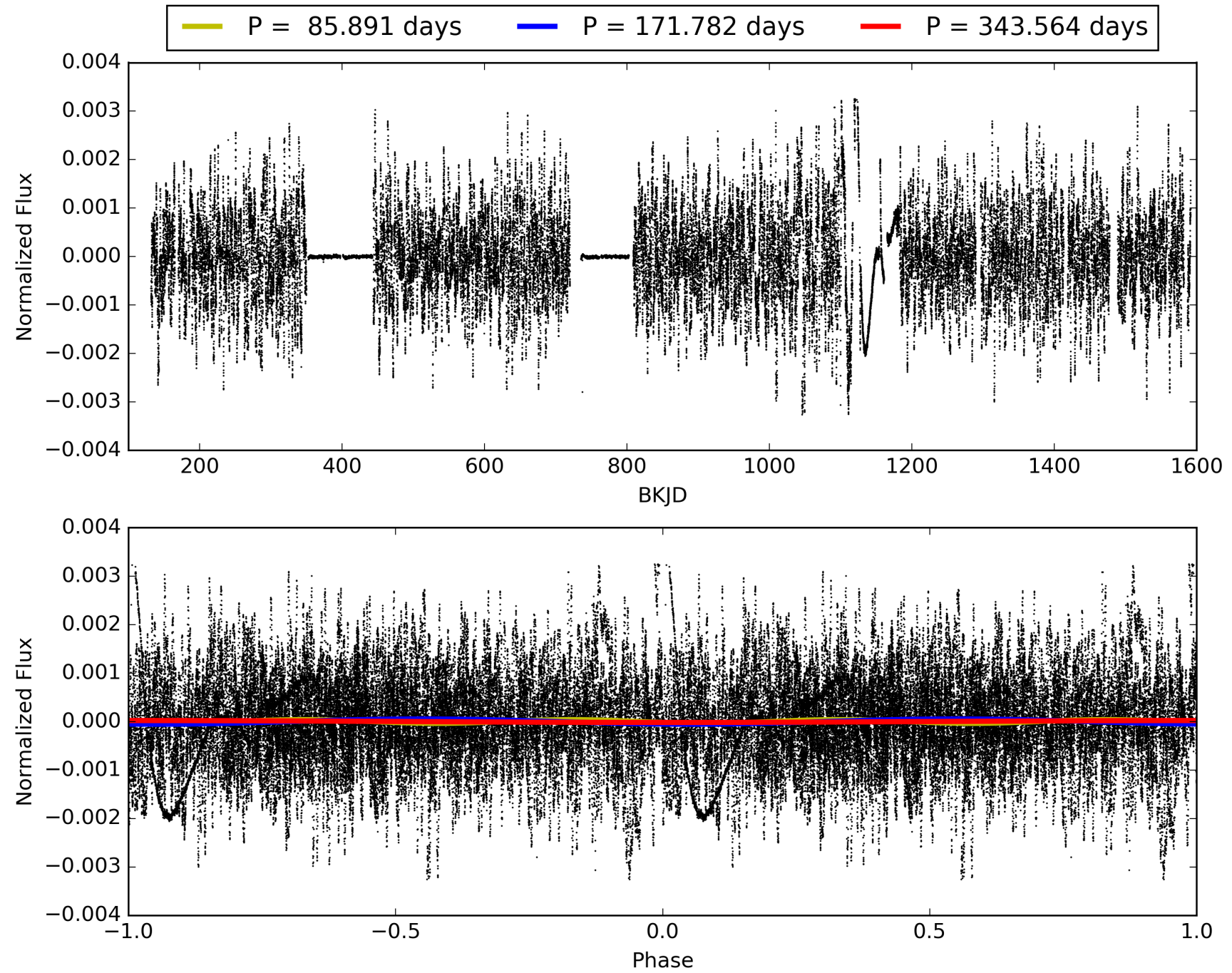
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 07:25:02 Z

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

# TCE 008476245-01, PDC Light Curves



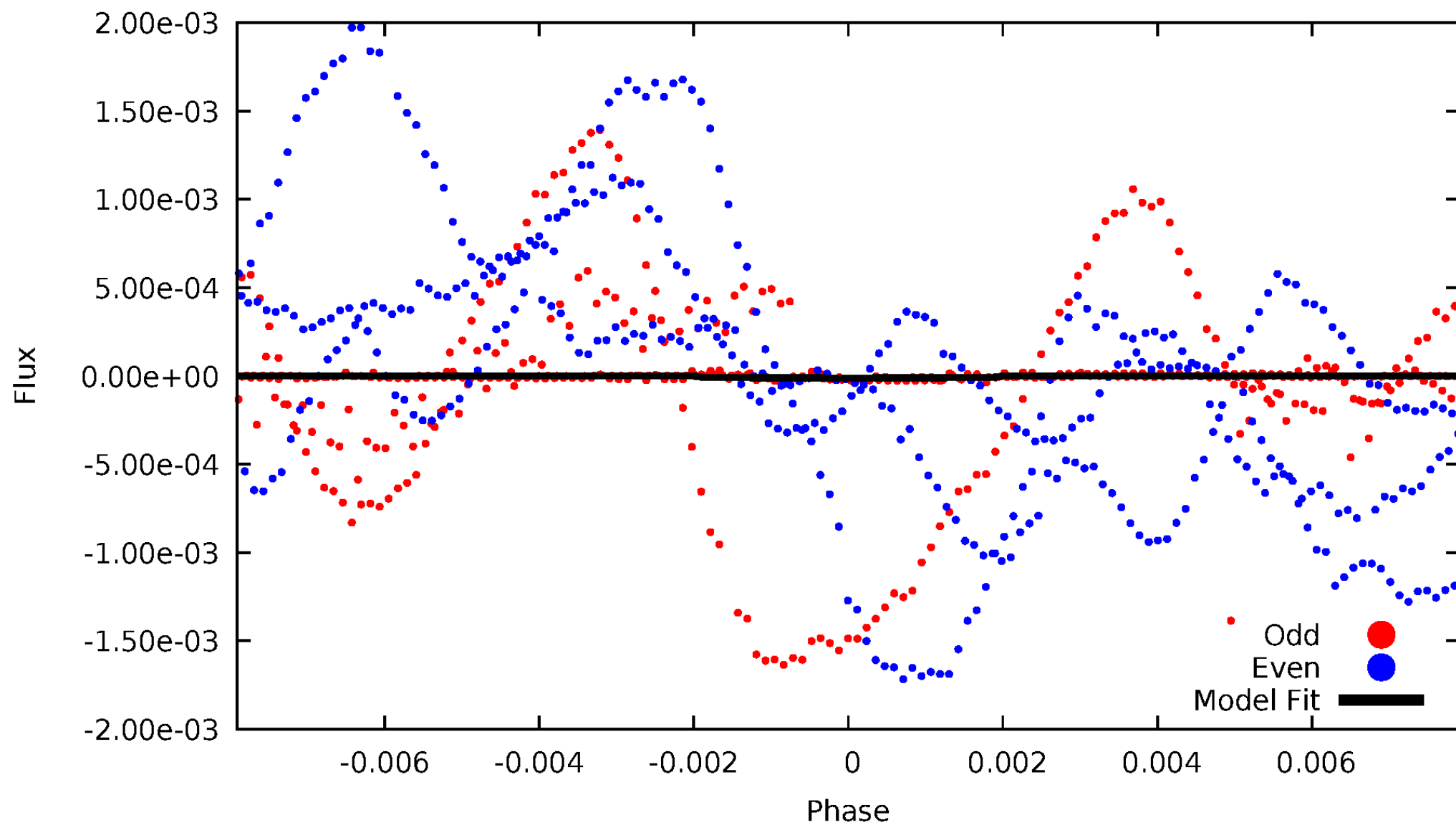
TCE 008476245-01





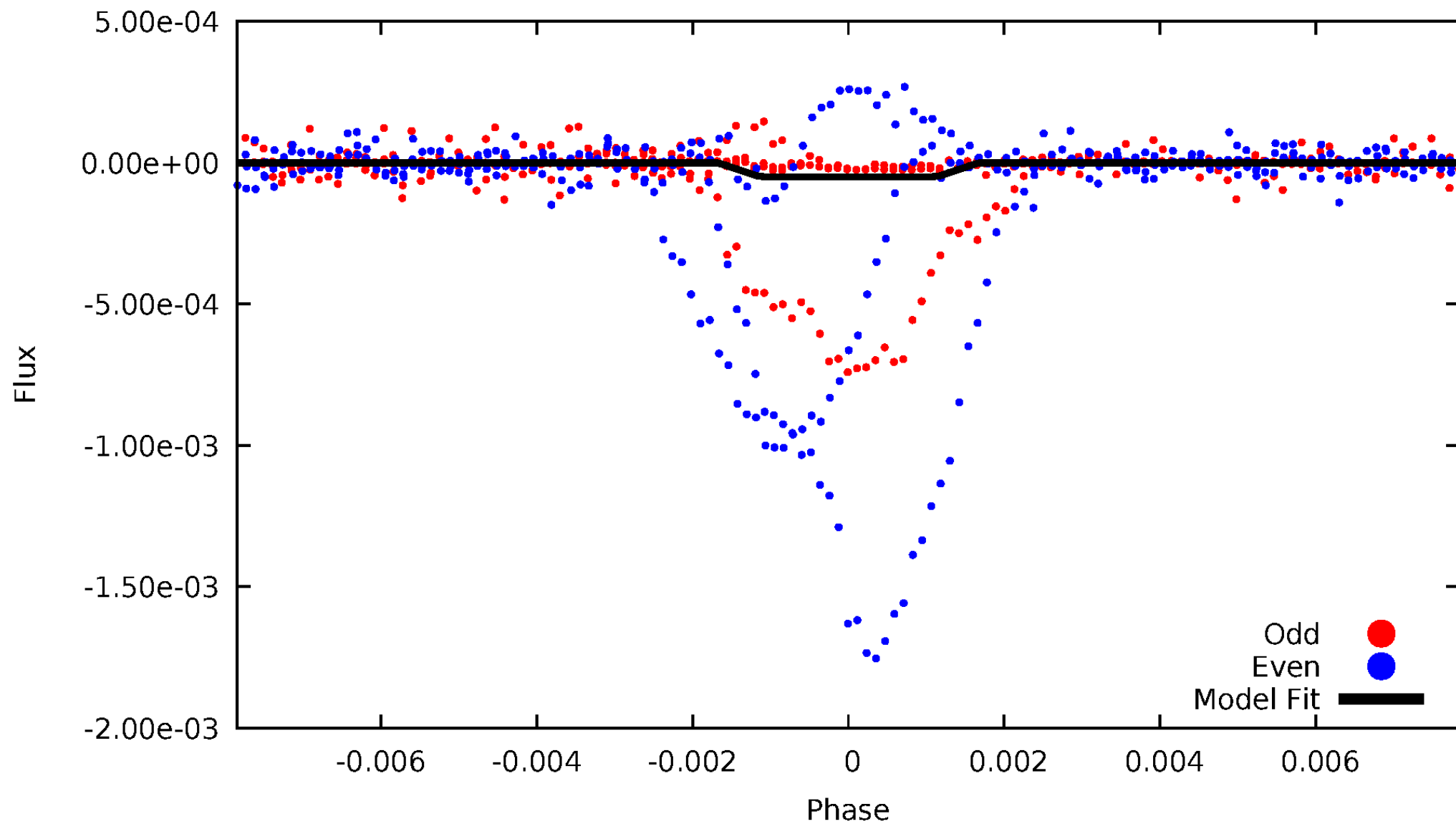
# DV Odd/Even

TCE 008476245-01



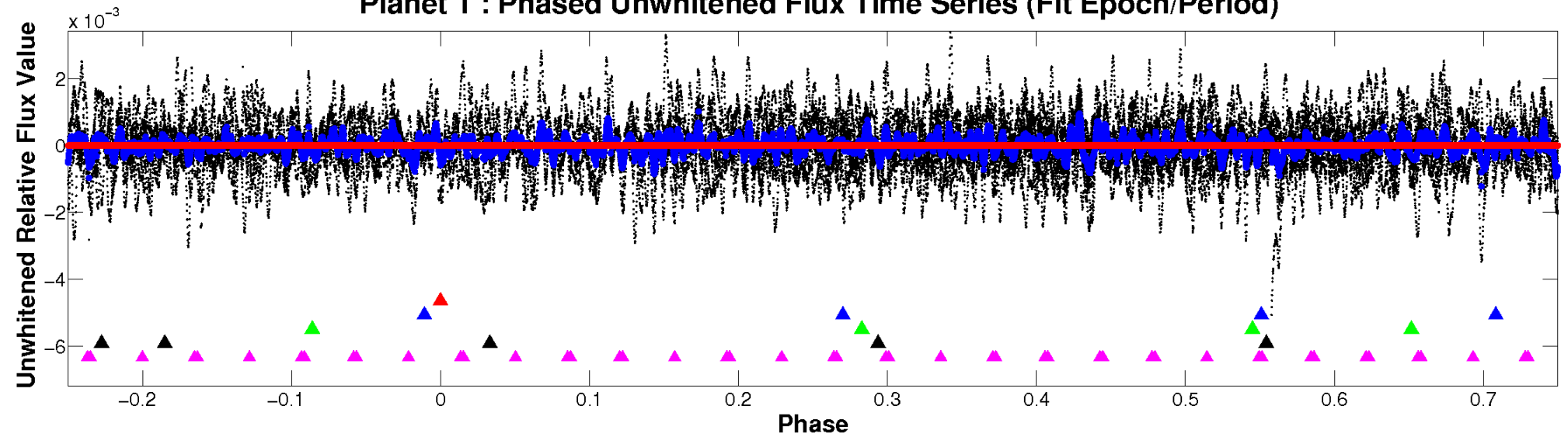
# ALT Odd/Even

TCE 008476245-01

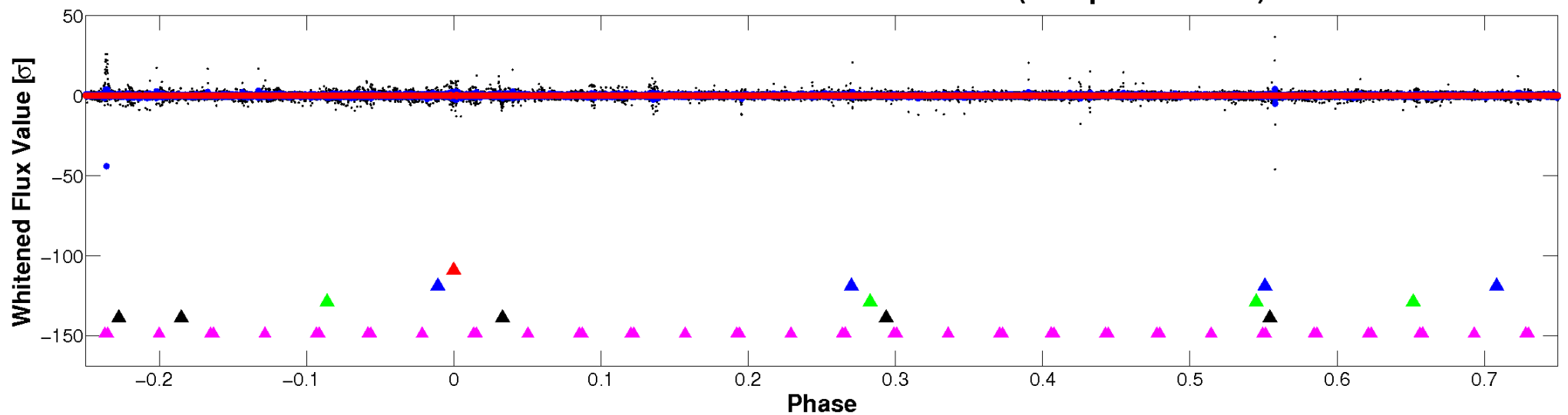


# Non-Whitened Vs. Whitened Light Curve

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



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



# PDC Quarter-Phased Transit Curves

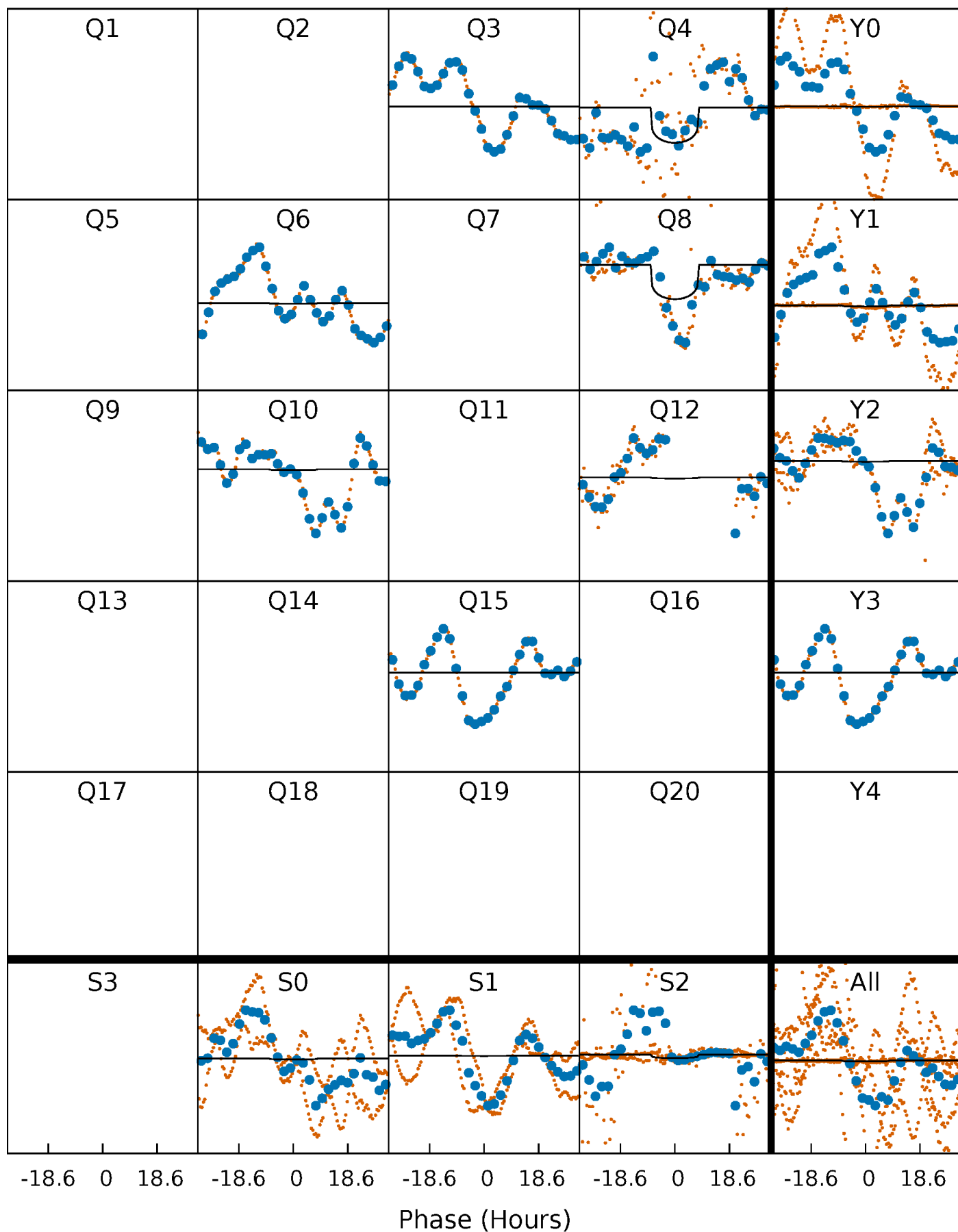
TCE 008476245-01 P=171.781853 Days  $T_0=262.492977$  (BKJD)





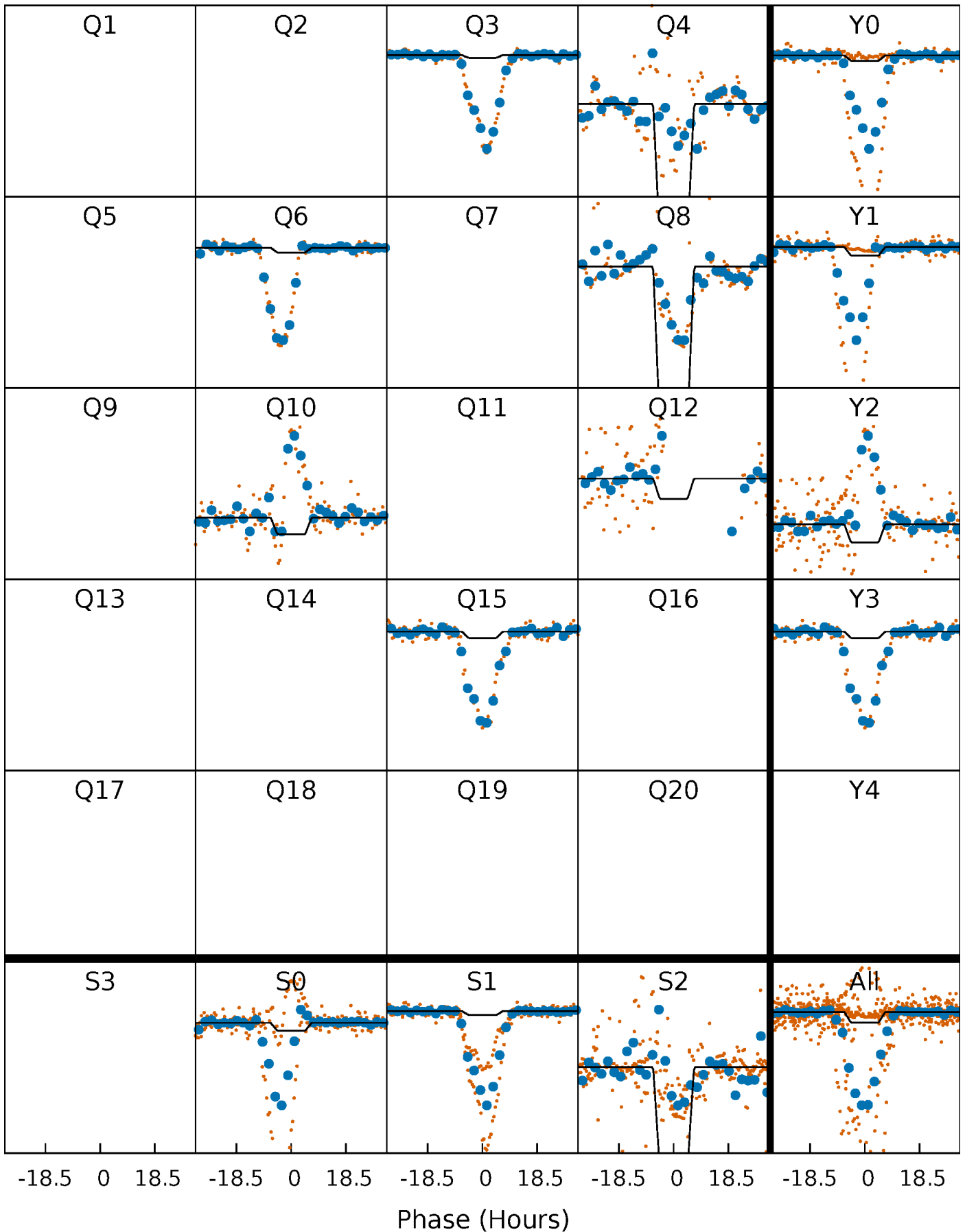
# DV Quarter-Phased Transit Curves

TCE 008476245-01 P=171.781853 Days  $T_0=262.492977$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

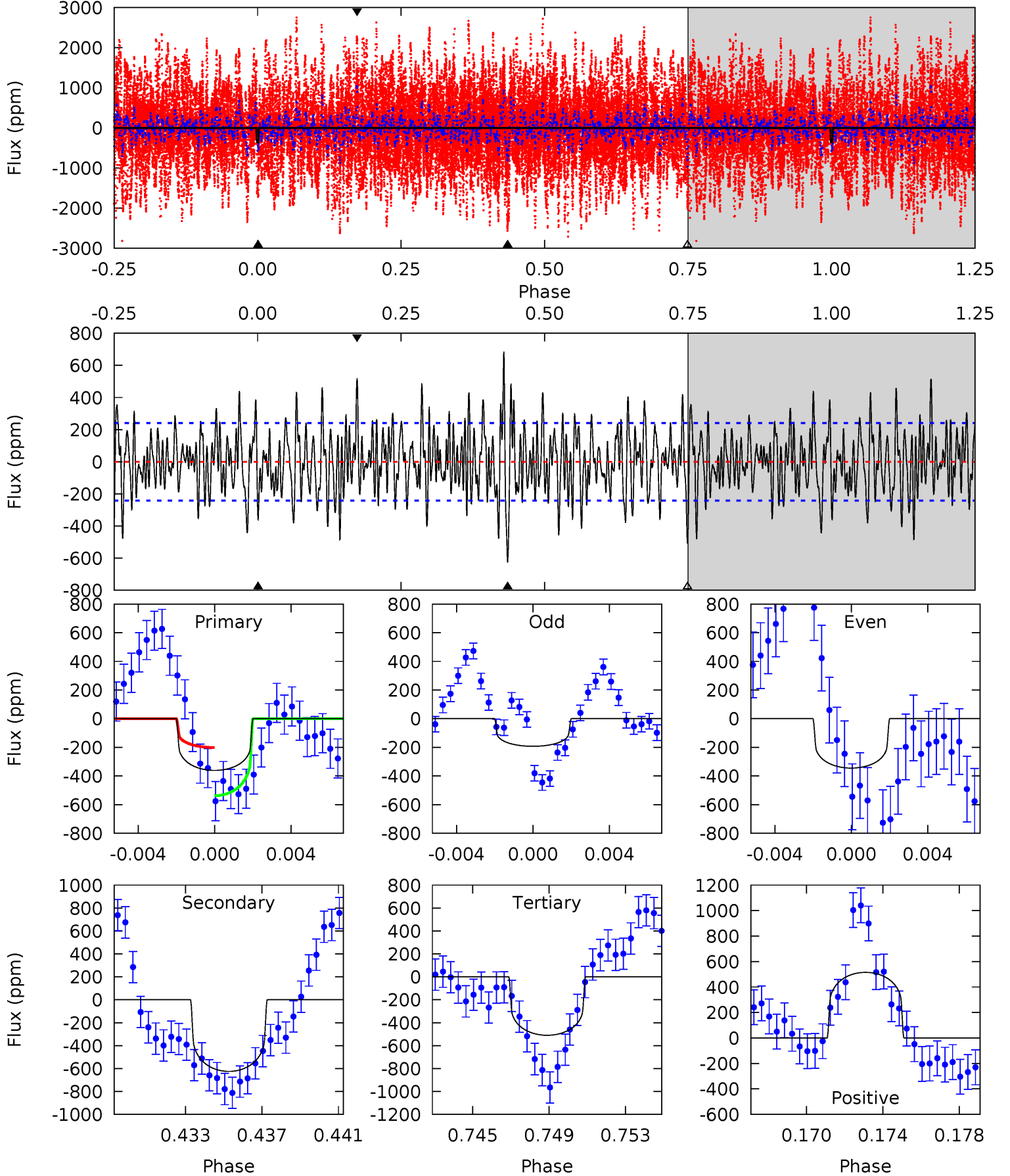
TCE 008476245-01 P=171.784939 Days  $T_0=262.492986$  (BKJD)



# DV Model-Shift Uniqueness Test

008476245-01,  $P = 171.781853$  Days,  $E = 90.711124$  Days

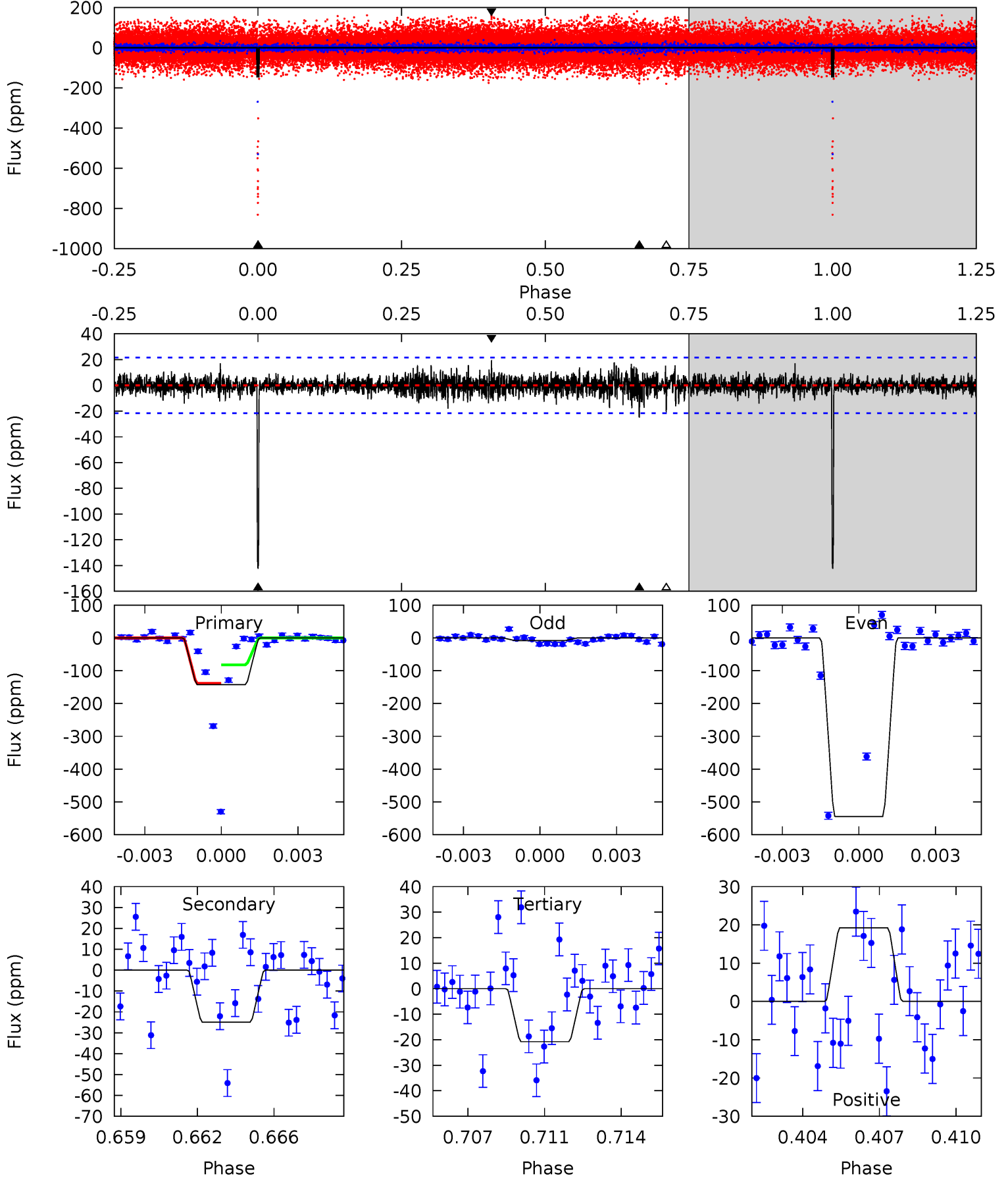
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.77	13.5	11.0	11.1	5.20	2.87	3.72	-3.21	-3.32	2.48	2.37	1.64	17.4	0.52	3.64



# Alt Model-Shift Uniqueness Test

008476245-01, P = 171.784939 Days, E = 90.708047 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
34.4	6.01	5.01	4.65	5.23	2.92	1.14	29.4	29.7	1.01	1.37	66.9	19.0	0.12	0





### Stellar Parameters For KIC 008476245

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4947^{+36}_{-87}$	$1.956^{+0.030}_{-0.027}$	$-1.000^{+0.100}_{-0.450}$	$26.909^{+3.252}_{-9.104}$	$2.387^{+0.707}_{-1.312}$	$0.000^{+0.000}_{-0.000}$
	+1%/-2%	+2%/-1%	+10%/-45%	+12%/-34%	+30%/-55%	+52%/-13%
Source	PHO56	AST56	PHO56	DSEP		

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

### Secondary Eclipse Parameters for KIC 008476245-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-625 \pm 46$	$10.84^{+1.99}_{-2.21}$	$1766^{+35}_{-55}$	$17815^{+3594}_{-2609}$	$2010^{+890}_{-545}$
Alt.	$-25 \pm 4$	$21.46^{+2.56}_{-3.12}$	$1760^{+41}_{-46}$	$4292^{+190}_{-189}$	$21^{+6}_{-4}$

$T_{\text{max}}$  = 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

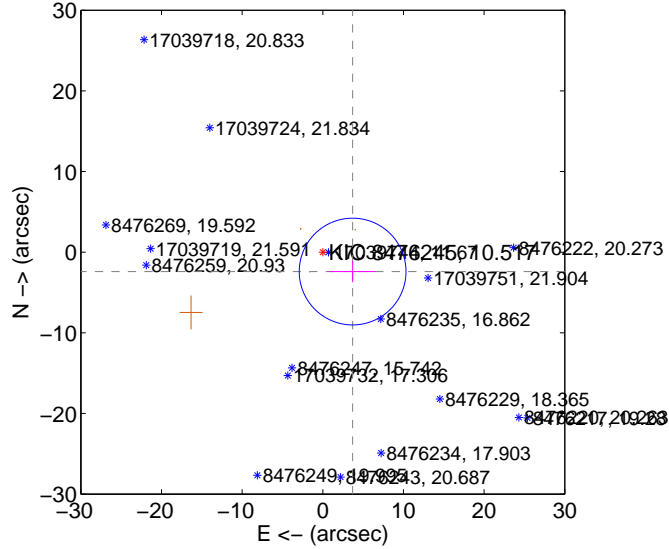
Supplemental centroid analysis for 008476245-01. **Kepler magnitude: 10.52.** Transit SNR 3.27

**There are 1 quarters with good PRF difference image offsets**

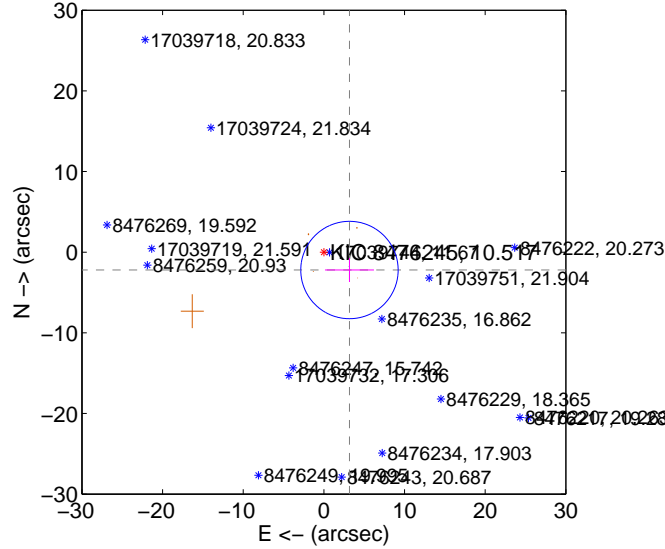
The direct PRF centroid is offset from the target star catalog position by about 0.40 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.411 \pm 2.206$	2.00	$-3.698 \pm 2.894$	$-2.405 \pm 1.317$
PRF-fit source offset from KIC position	$3.868 \pm 2.012$	1.92	$-3.172 \pm 3.033$	$-2.213 \pm 1.481$
photometric centroid source offset	$17.90 \pm 15.27$	1.17	$13.79 \pm 16.22$	$-11.42 \pm 13.76$

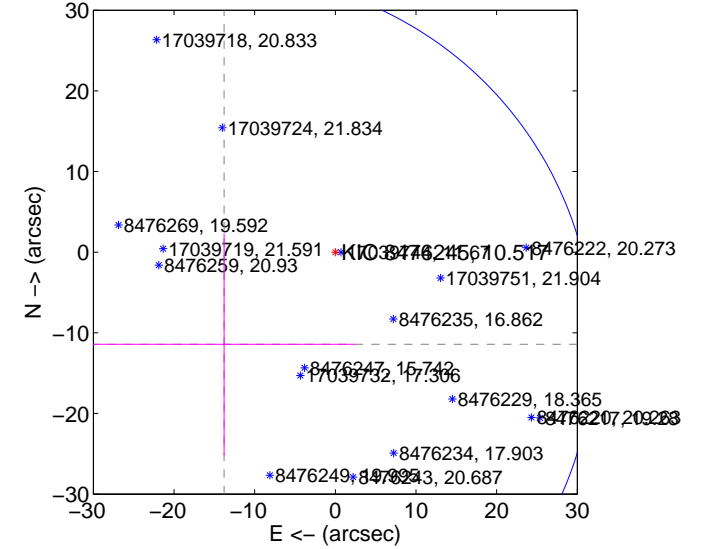
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

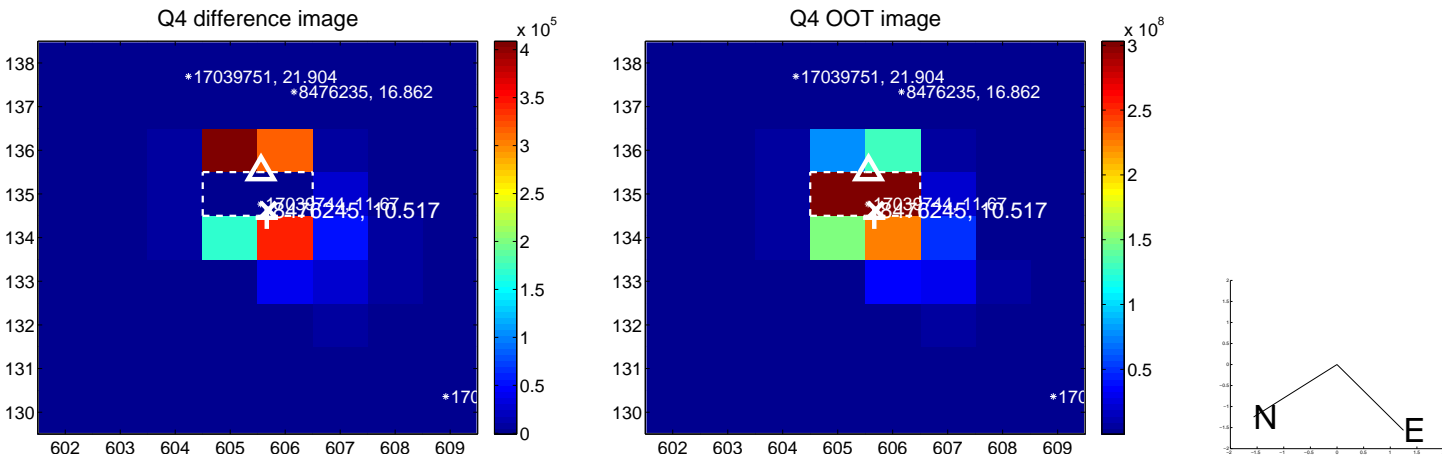
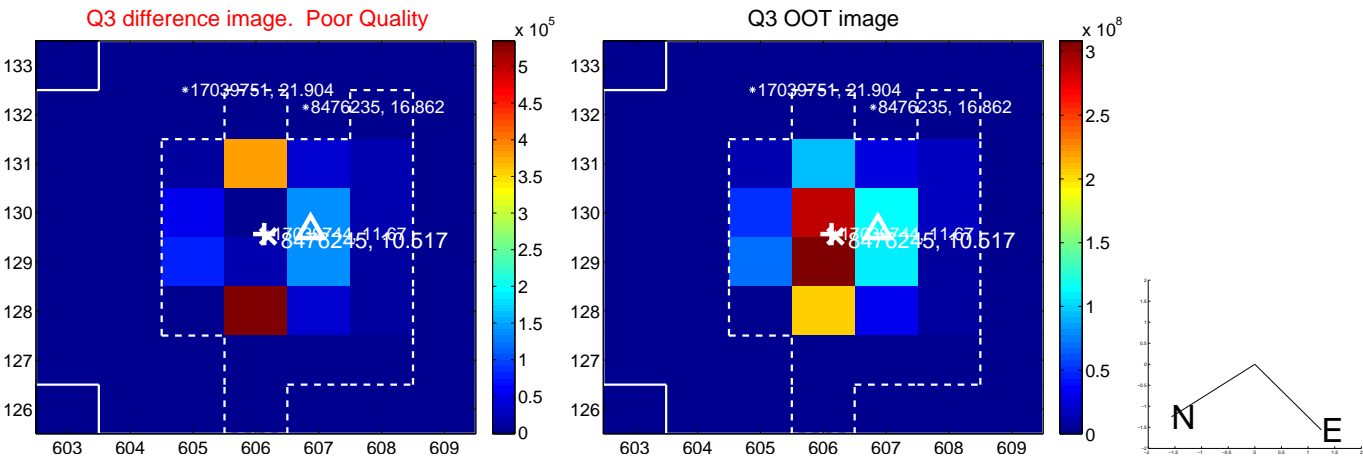
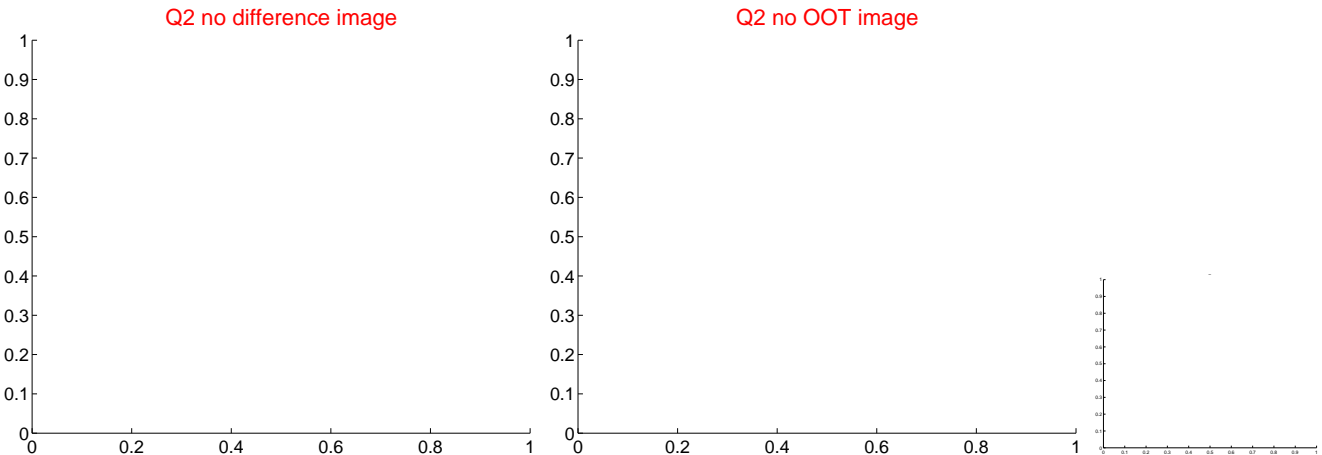
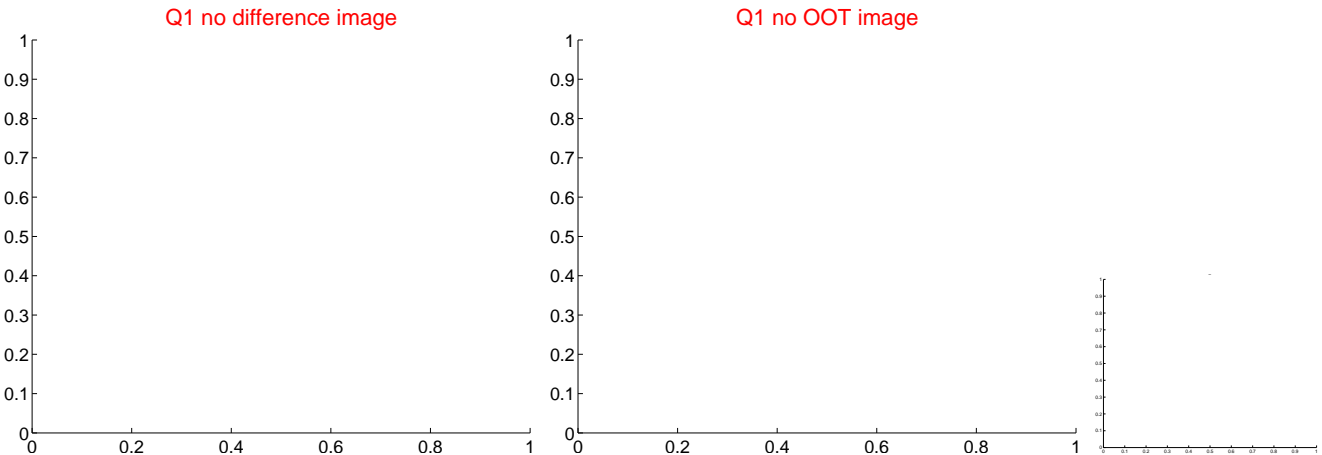


offset from photometric centroids



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  $\times$ : 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.

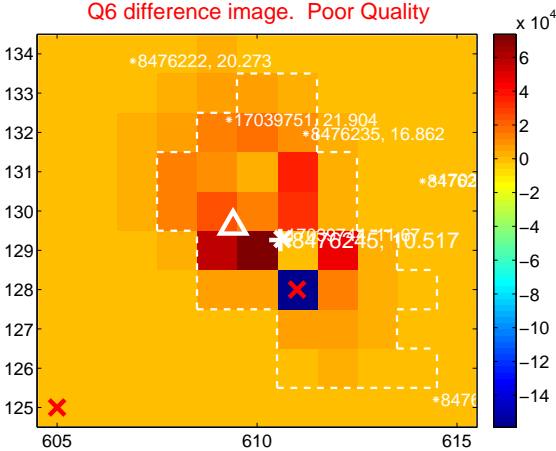
Q5 no difference image



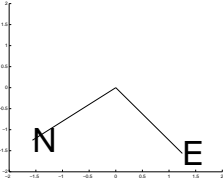
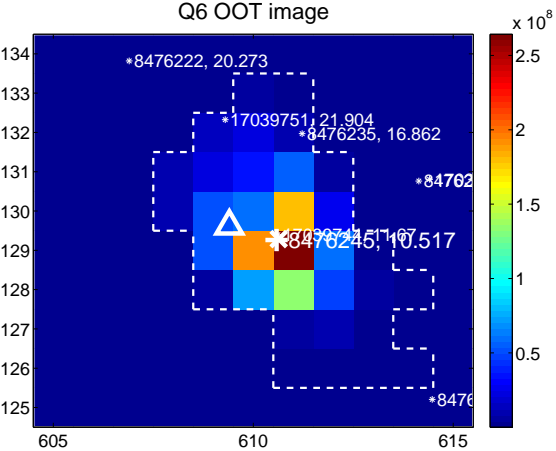
Q5 no OOT image



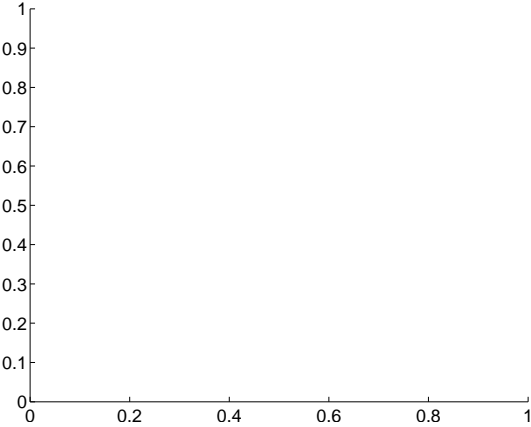
Q6 difference image. Poor Quality



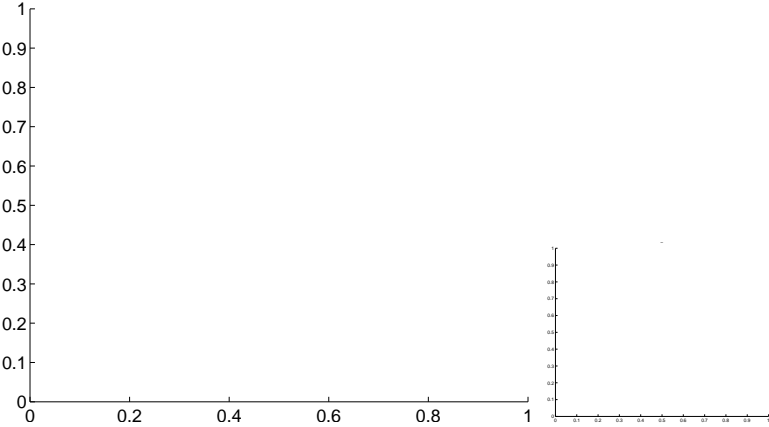
Q6 OOT image



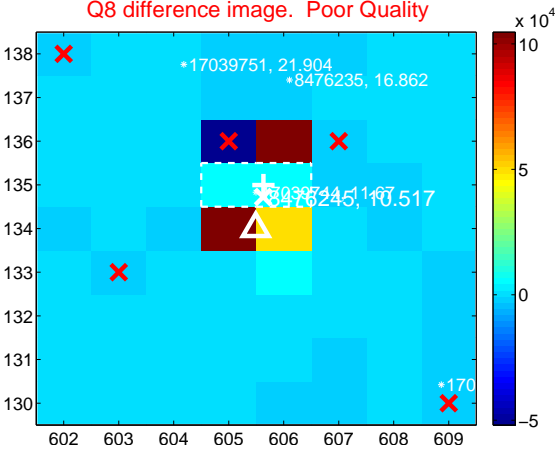
Q7 no difference image



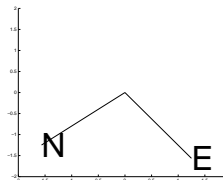
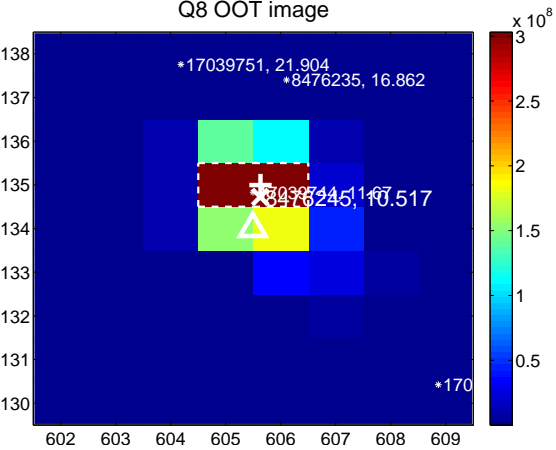
Q7 no OOT image



Q8 difference image. Poor Quality



Q8 OOT image





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

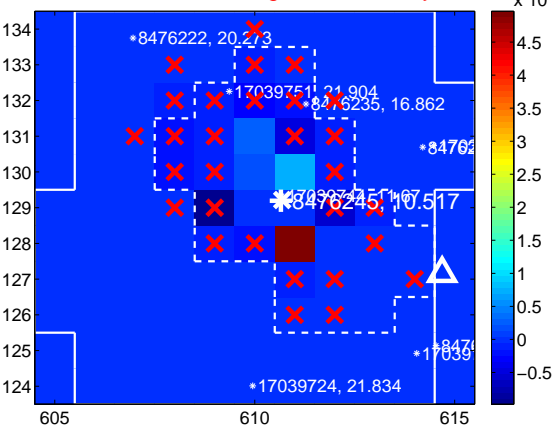
Q9 no difference image



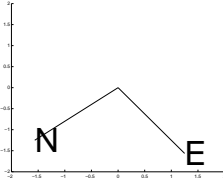
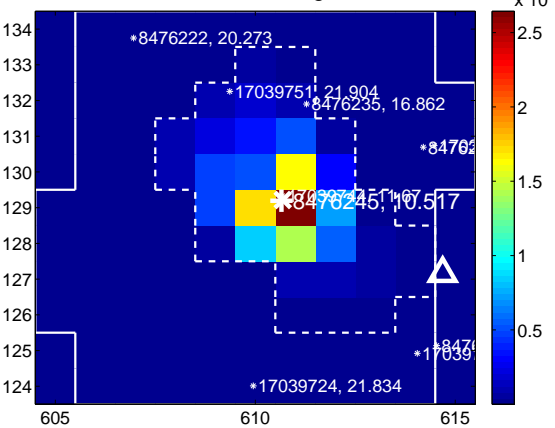
Q9 no OOT image



Q10 difference image. Poor Quality



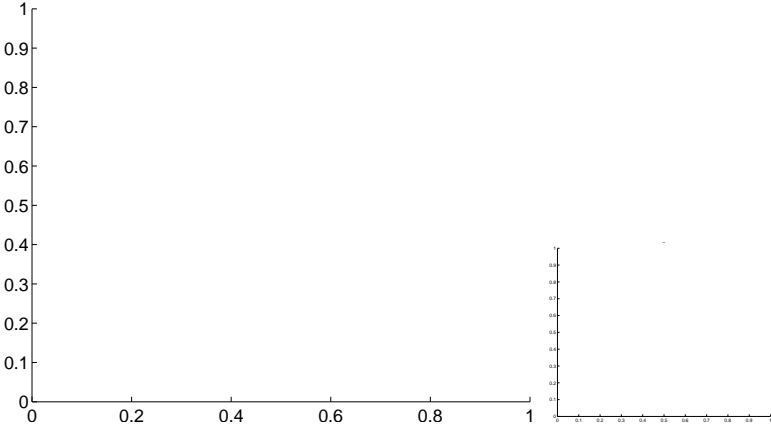
Q10 OOT image



Q11 no difference image



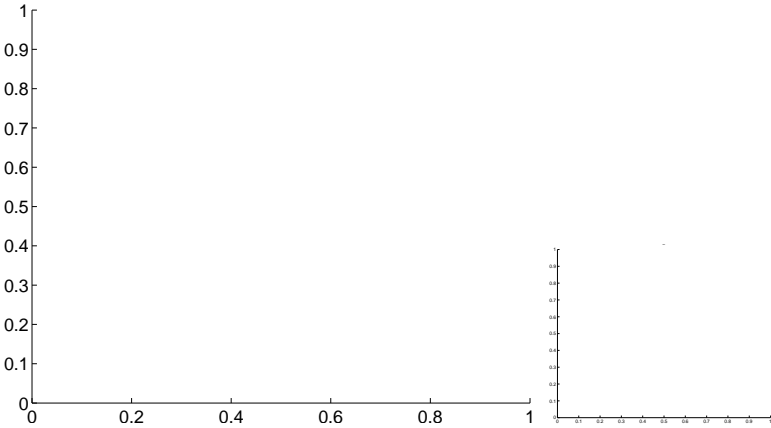
Q11 no OOT image



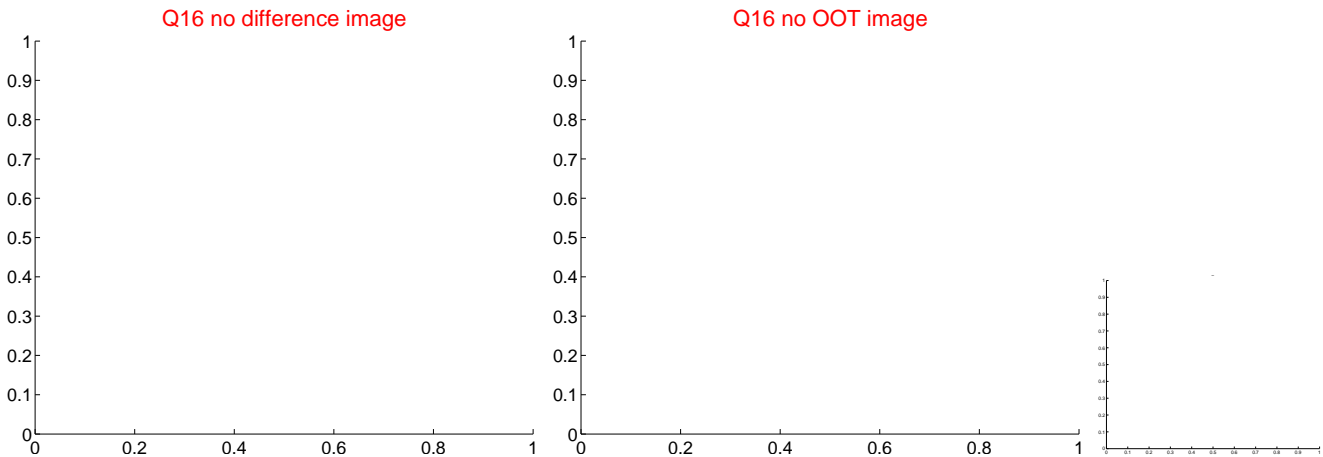
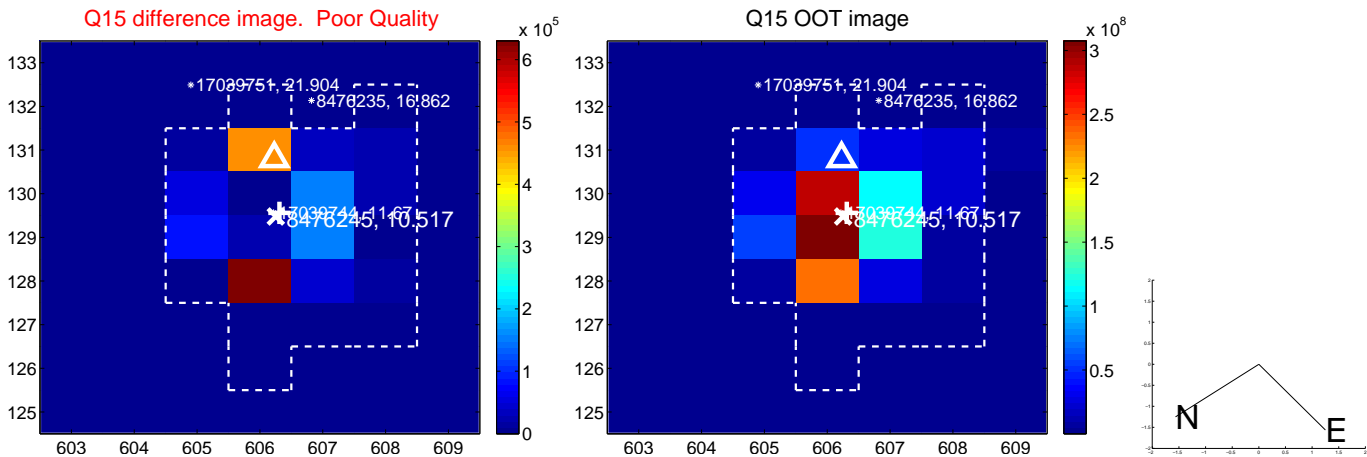
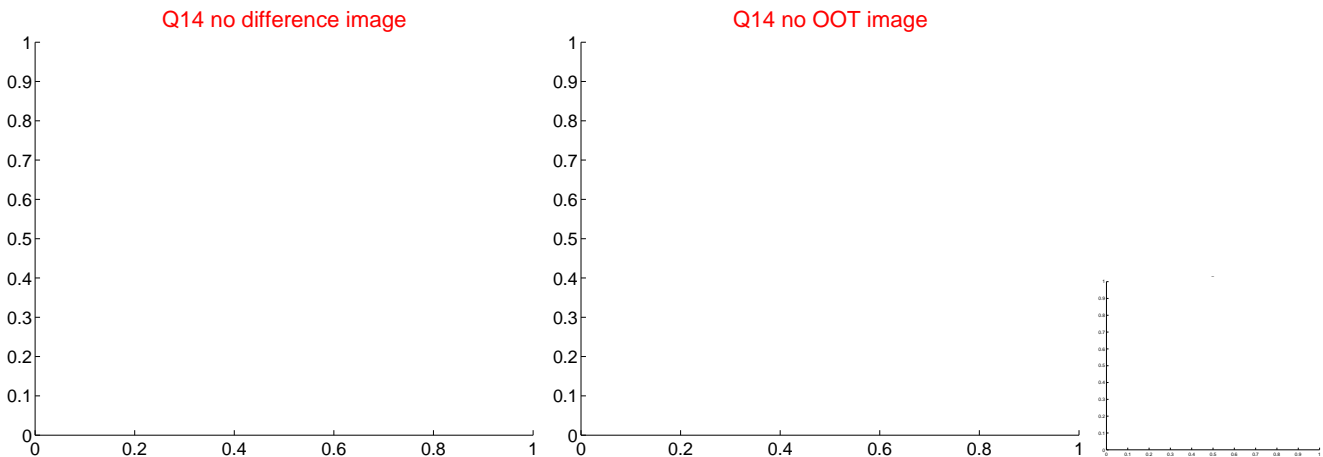
Q12 no difference image



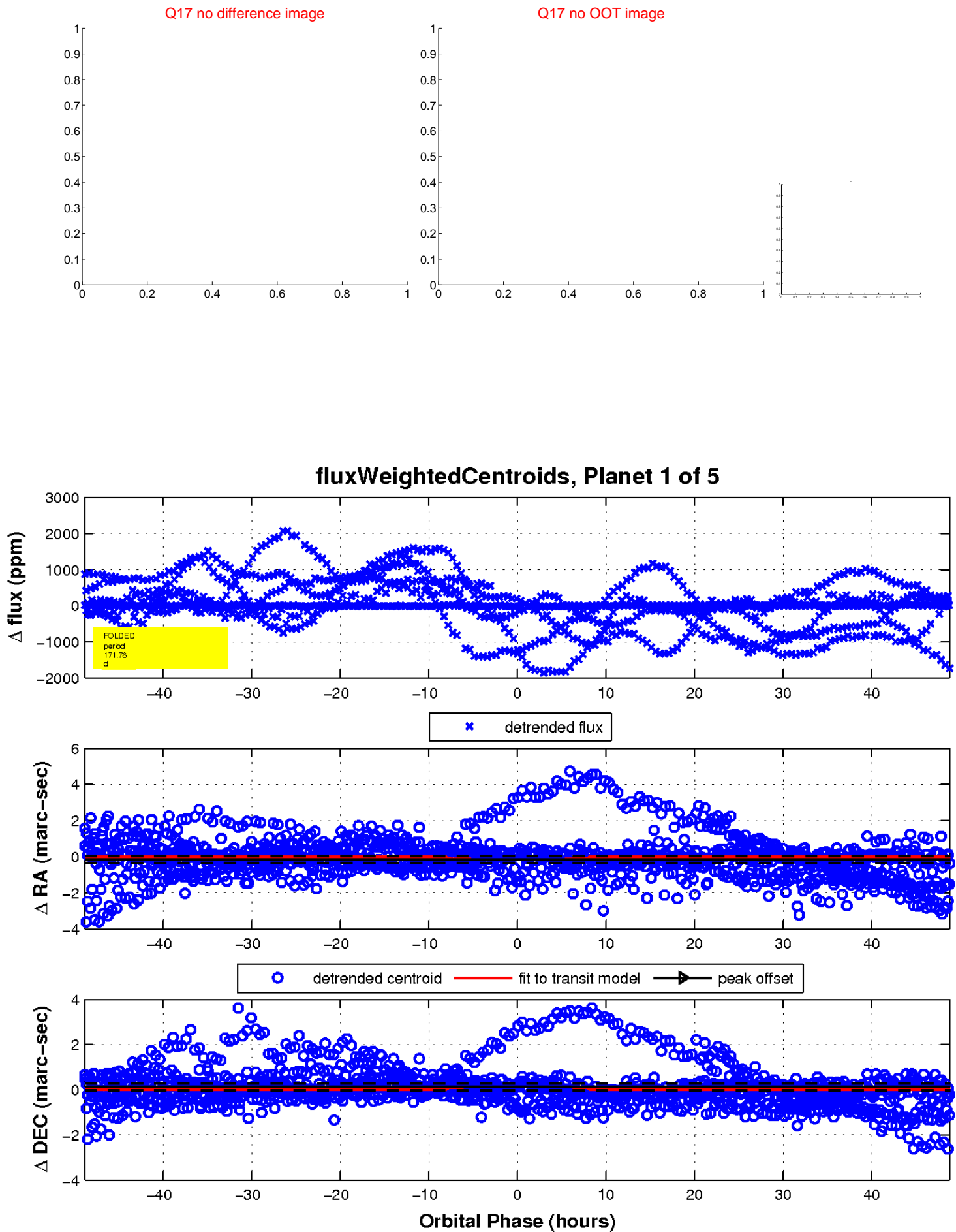
Q12 no OOT image



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

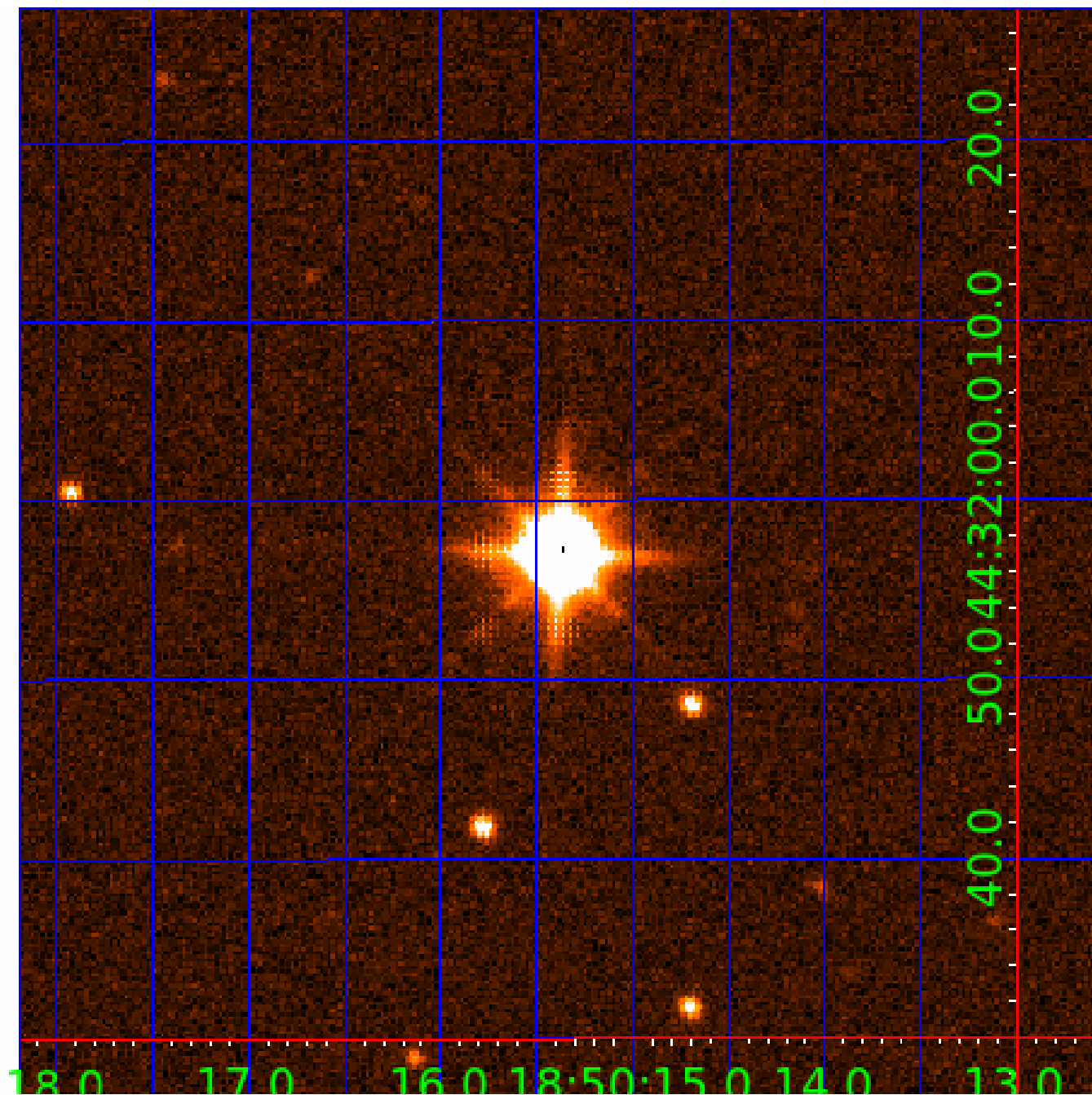


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 008476245

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

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008476245-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-05	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED

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

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

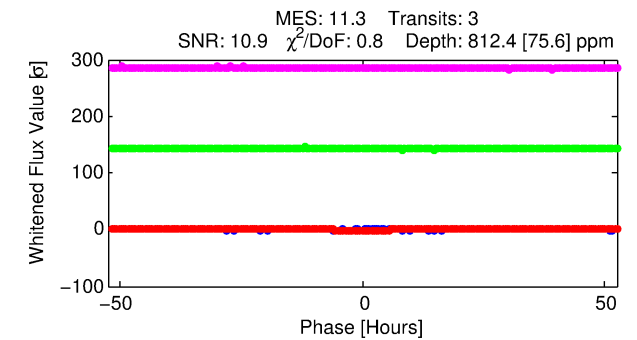
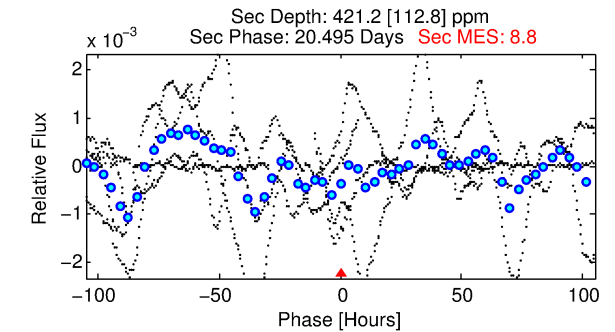
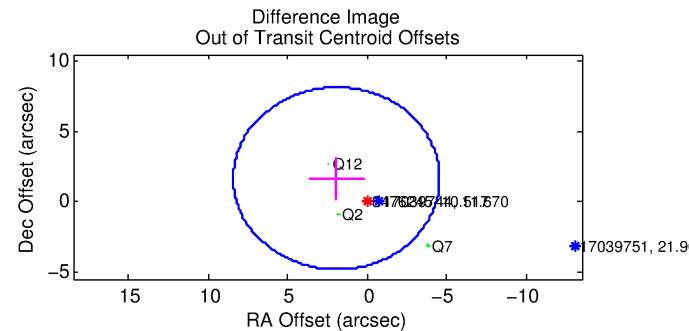
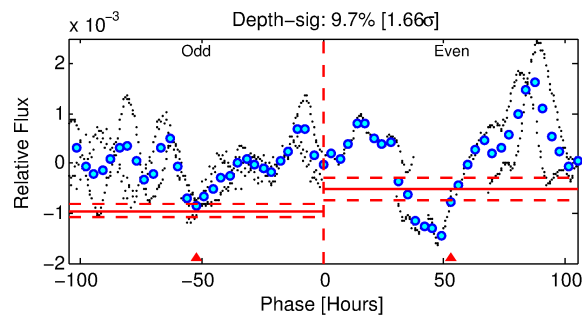
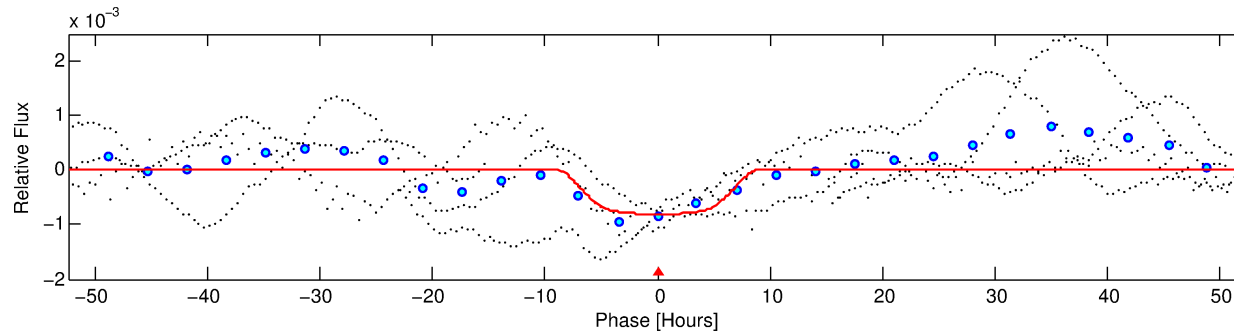
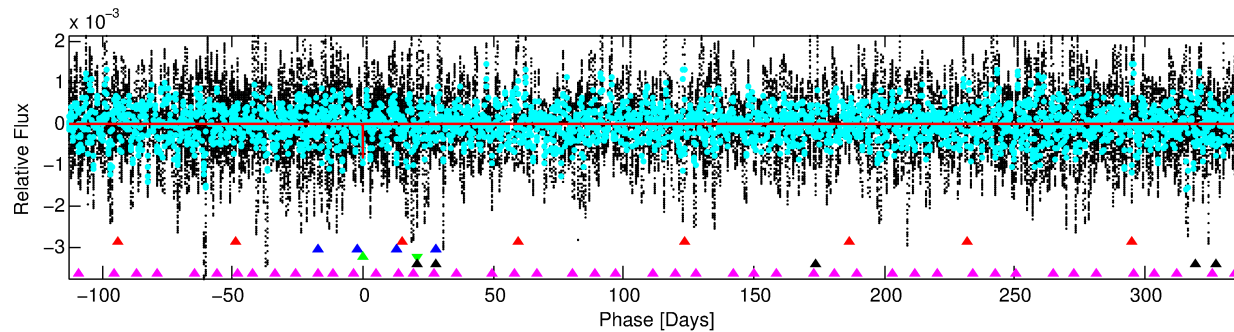
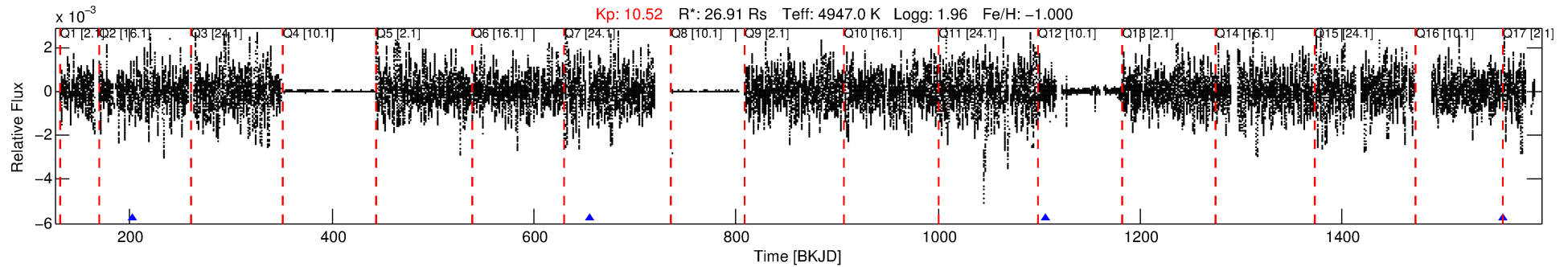
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008476245-03

No Significant Match Found

# DV One-Page Summary

KIC: 8476245 Candidate: 3 of 5 Period: 451.978 d



## DV Fit Results:

Period = 451.97793 [0.01031] d  
Epoch = 202.6647 [0.0142] BKJD  
Rp/R\* = 0.0330 [0.0016]  
a/R\* = 84.76 [5.09]  
b = 0.94 [0.01]  
Seff = 163.70 [39.40]  
Teq = 912 [55] K  
Rp = 96.93 [33.14] Re  
a = 1.5407 [0.3493] AU  
Ag = 58.54 [21.46] [2.68 $\sigma$ ]  
Teffp = 3901 [287] K [10.24 $\sigma$ ]

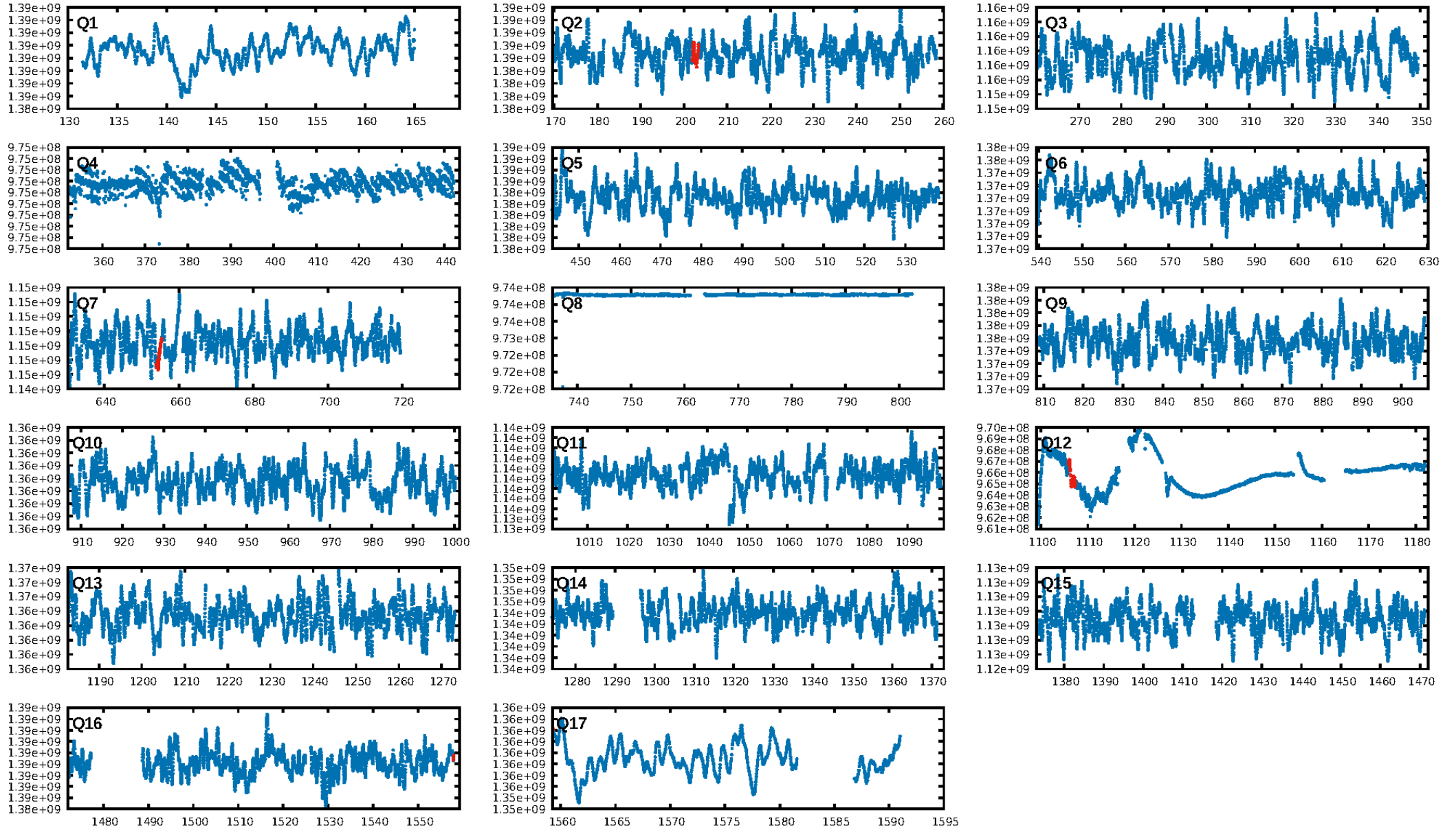
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [137.54 $\sigma$ ]  
LongPeriod-sig: 100.0% [13.95 $\sigma$ ]  
ModelChiSquare2-sig: 83.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.27e-12  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 18.4%  
Centroid-so: 0.314 arcsec [0.79 $\sigma$ ]  
OotOffset-rm: 2.554 arcsec [1.18 $\sigma$ ]  
OotOffset-st: 1/1/1/0 [3]  
KicOffset-rm: 2.093 arcsec [1.05 $\sigma$ ]  
KicOffset-st: 1/1/1/0 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

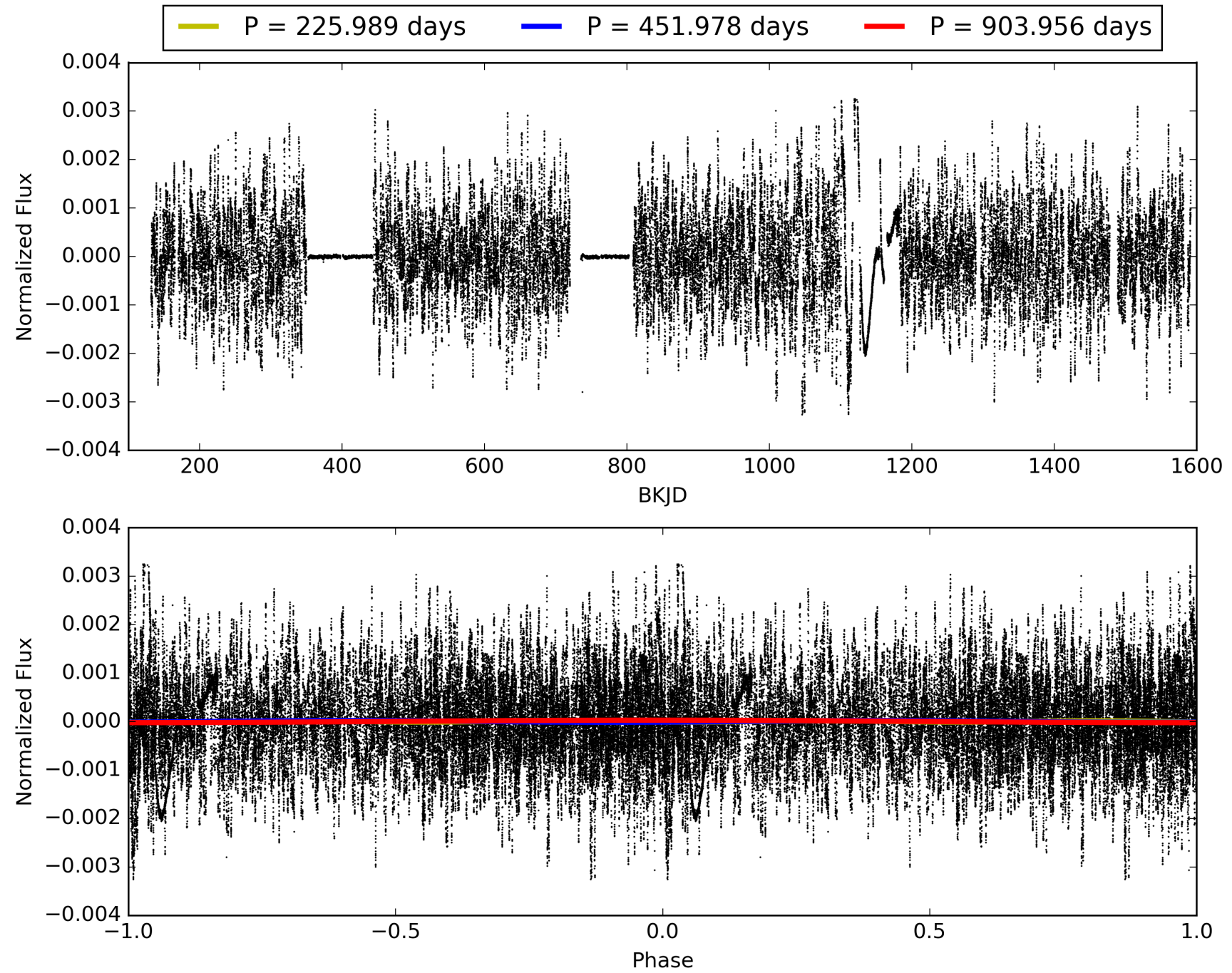
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 07:25:18 Z

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

# TCE 008476245-03, PDC Light Curves

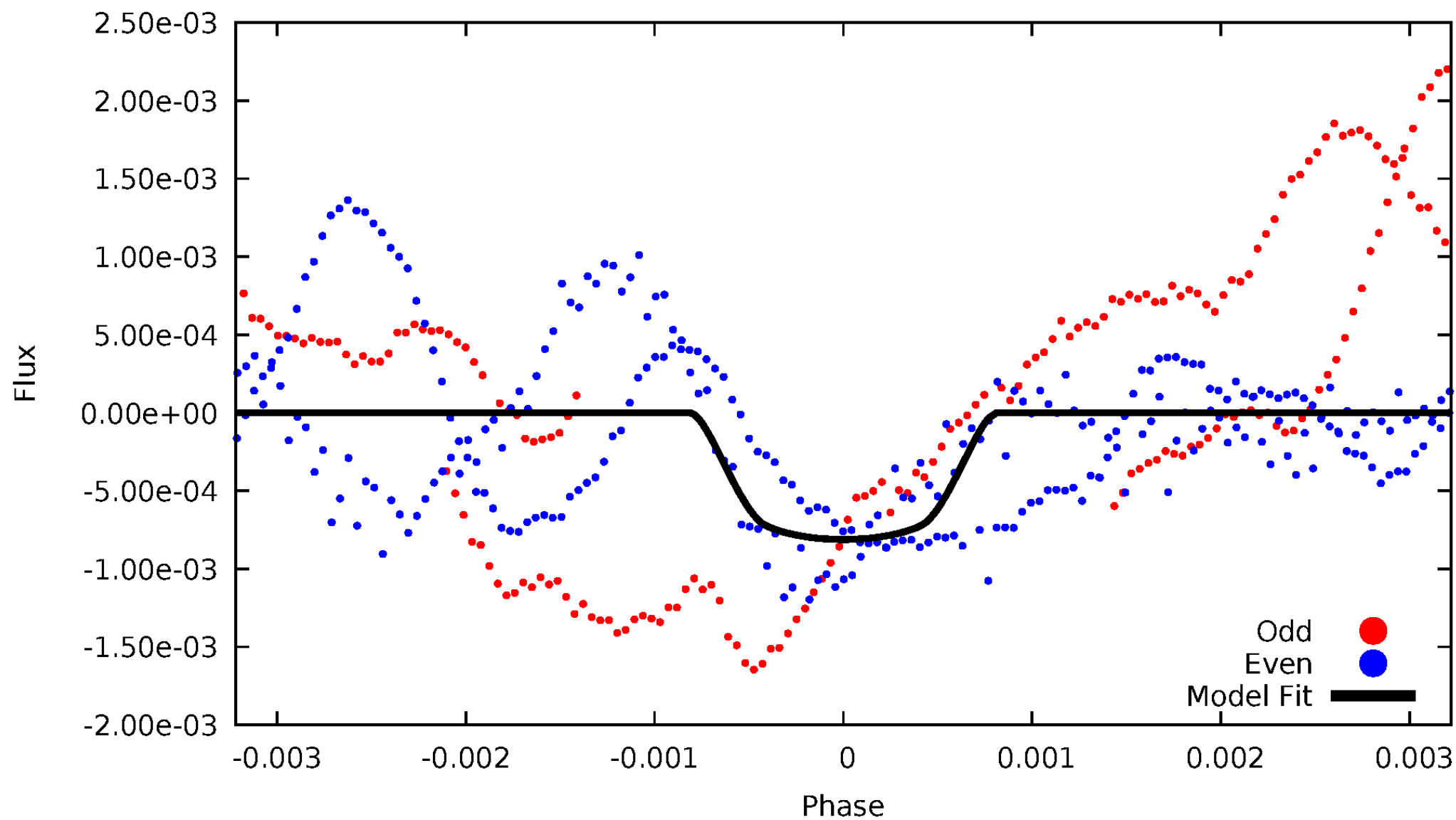


TCE 008476245-03



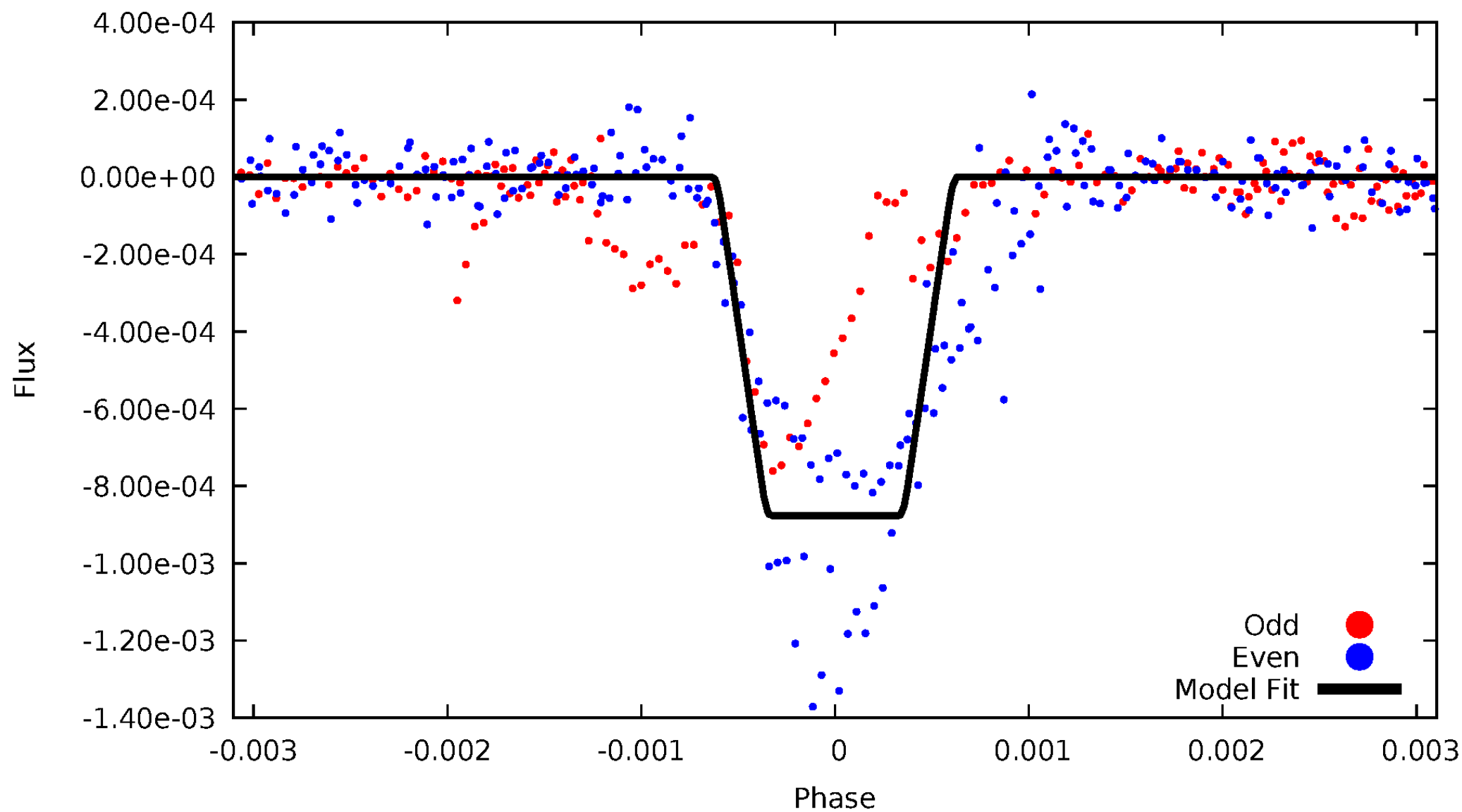
# DV Odd/Even

TCE 008476245-03



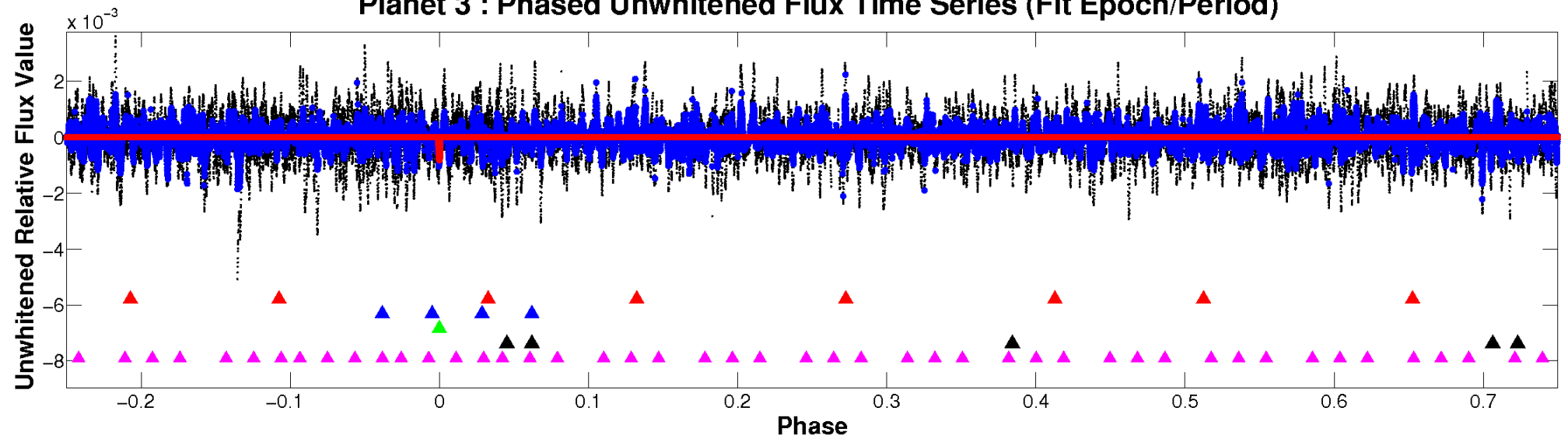
# ALT Odd/Even

TCE 008476245-03

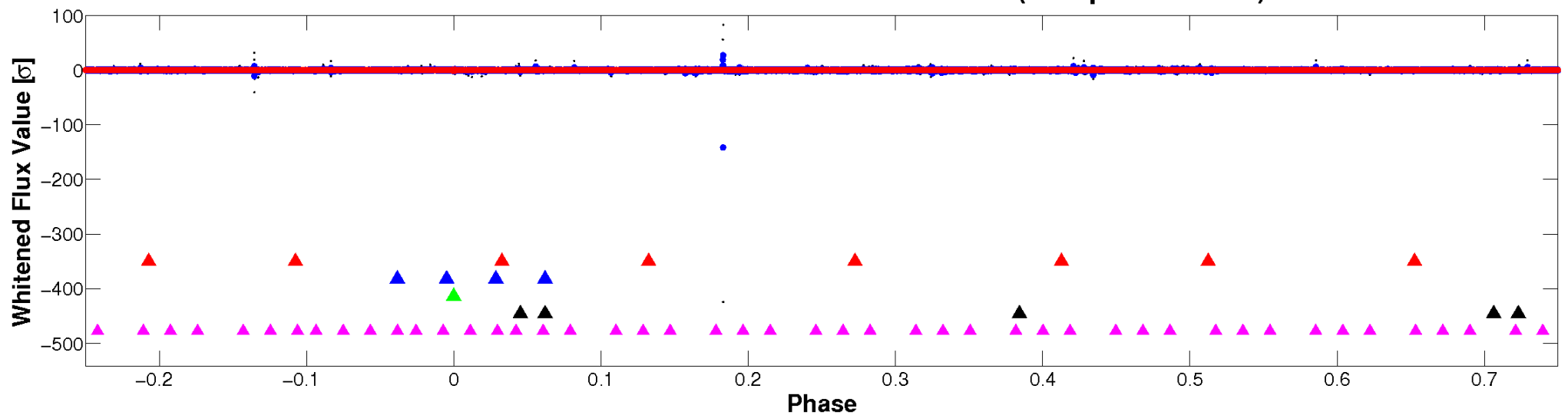


# Non-Whitened Vs. Whitened Light Curve

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



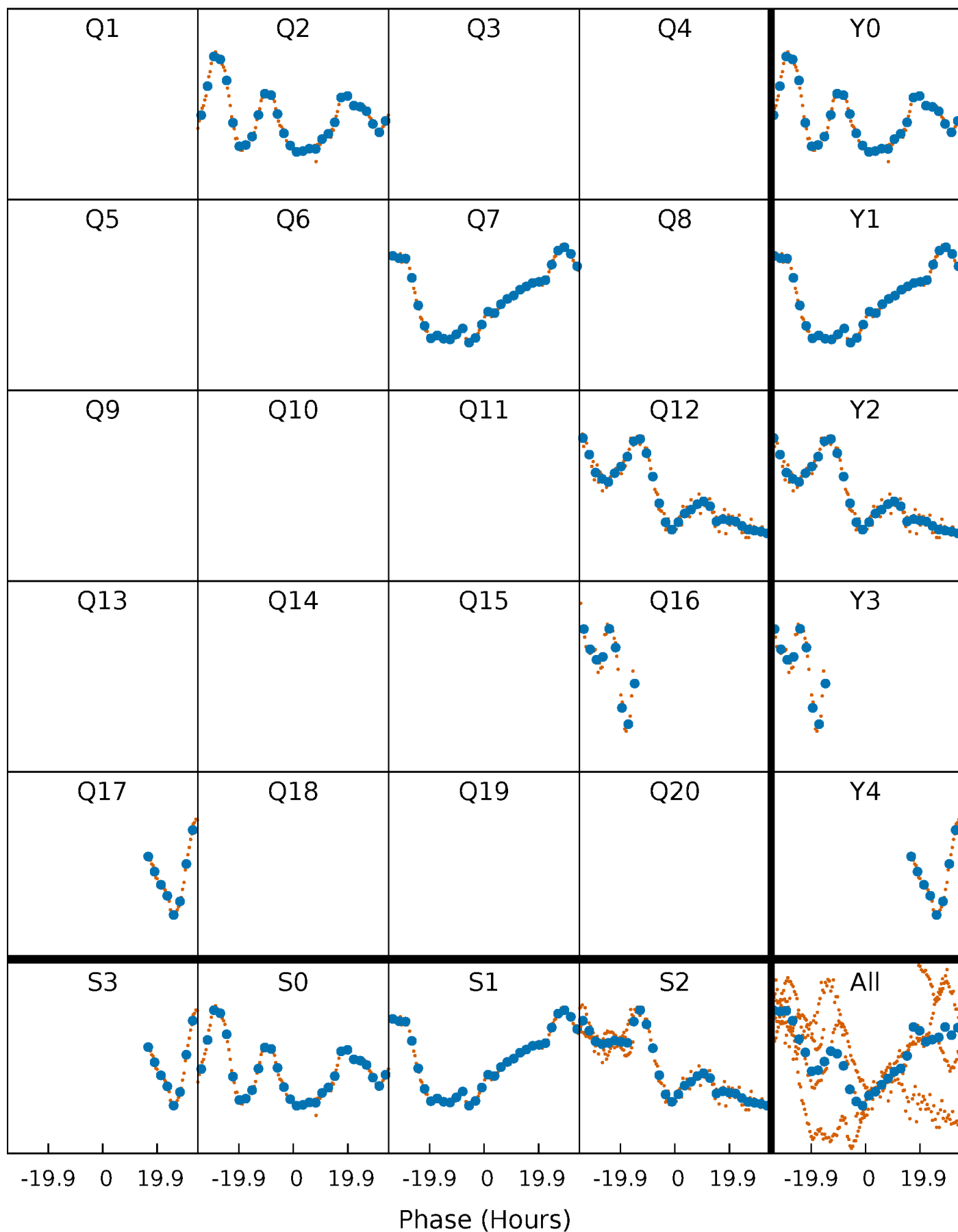
## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

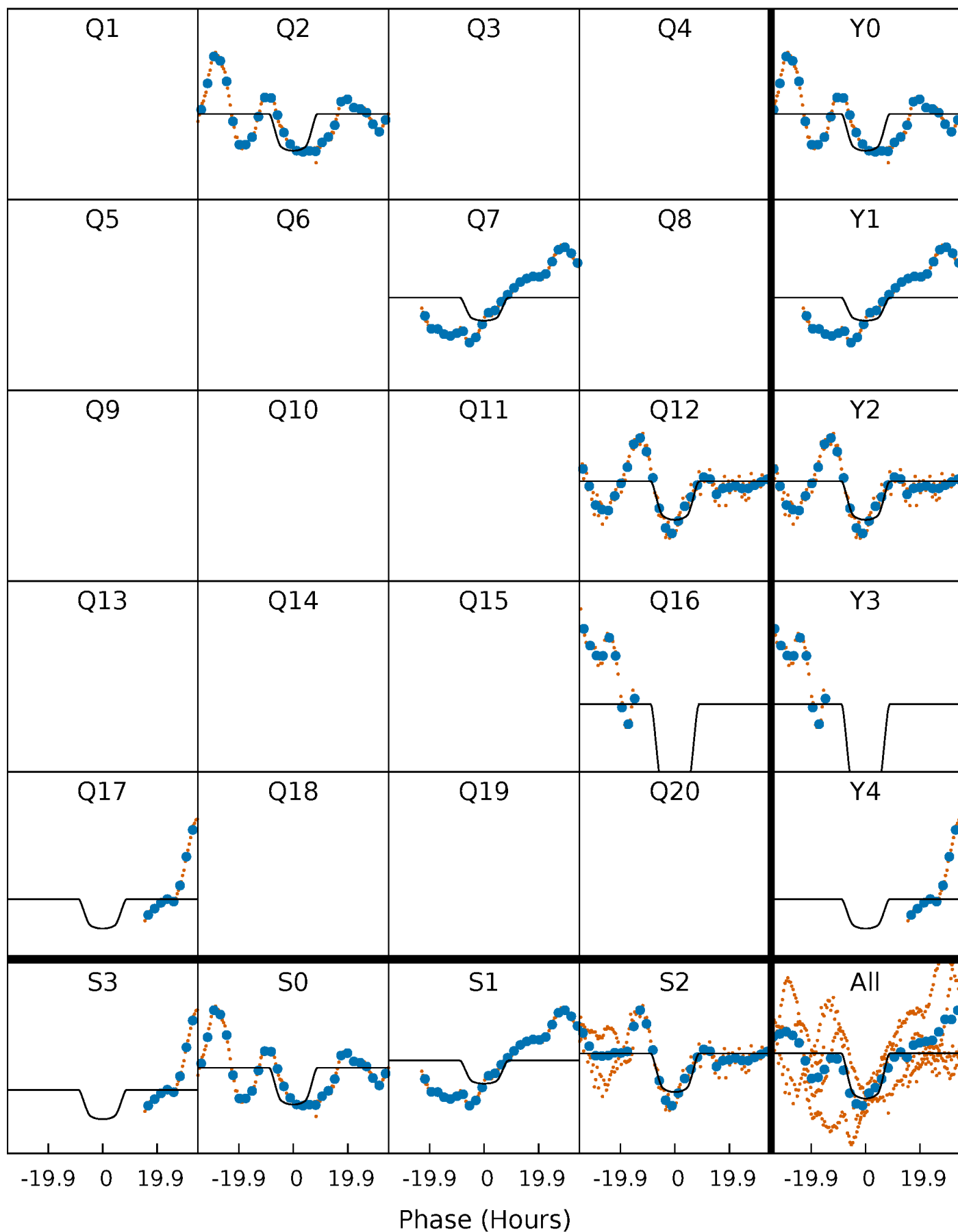
TCE 008476245-03 P=451.977931 Days  $T_0=202.664717$  (BKJD)





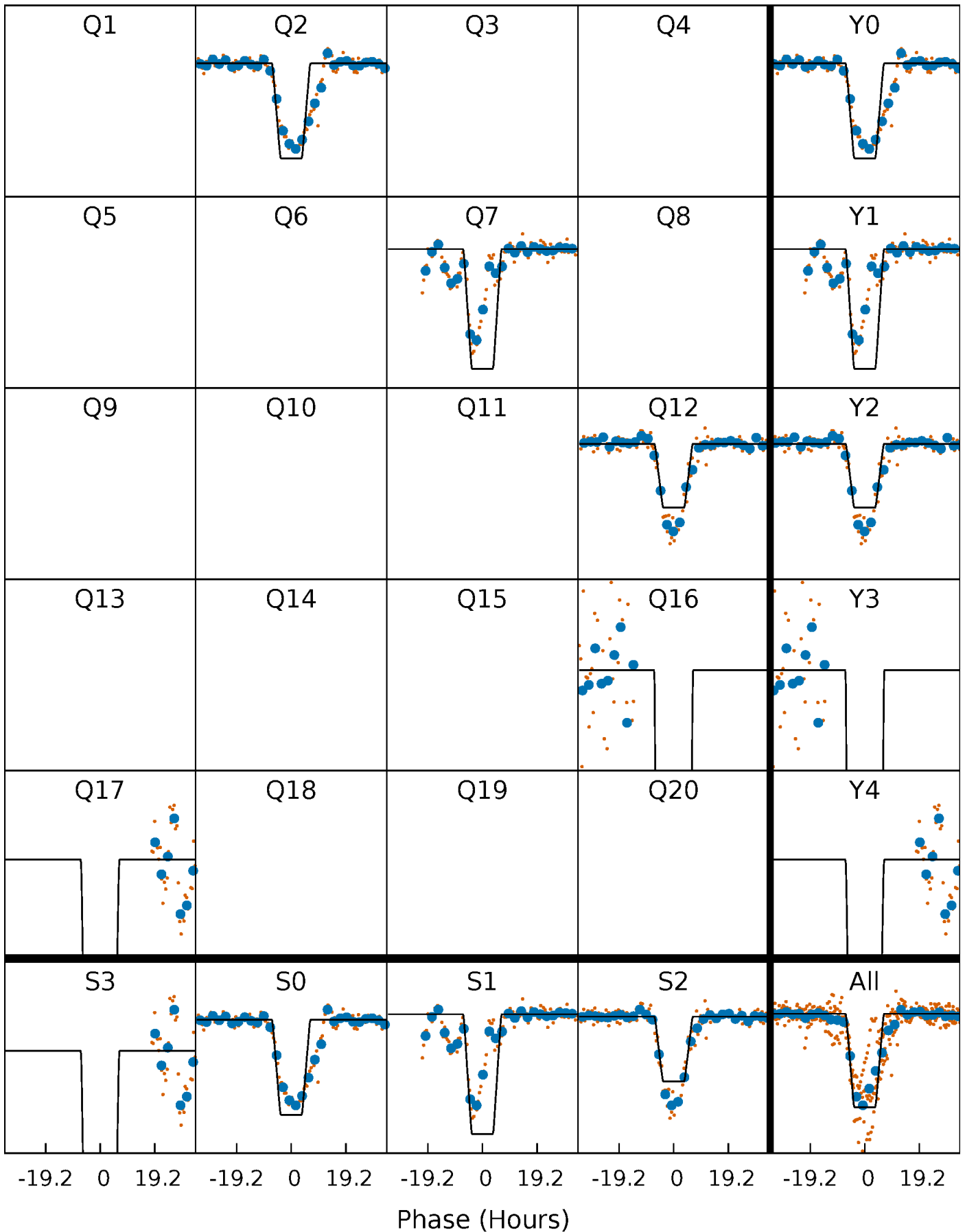
# DV Quarter-Phased Transit Curves

TCE 008476245-03     $P=451.977931$  Days     $T_0=202.664717$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

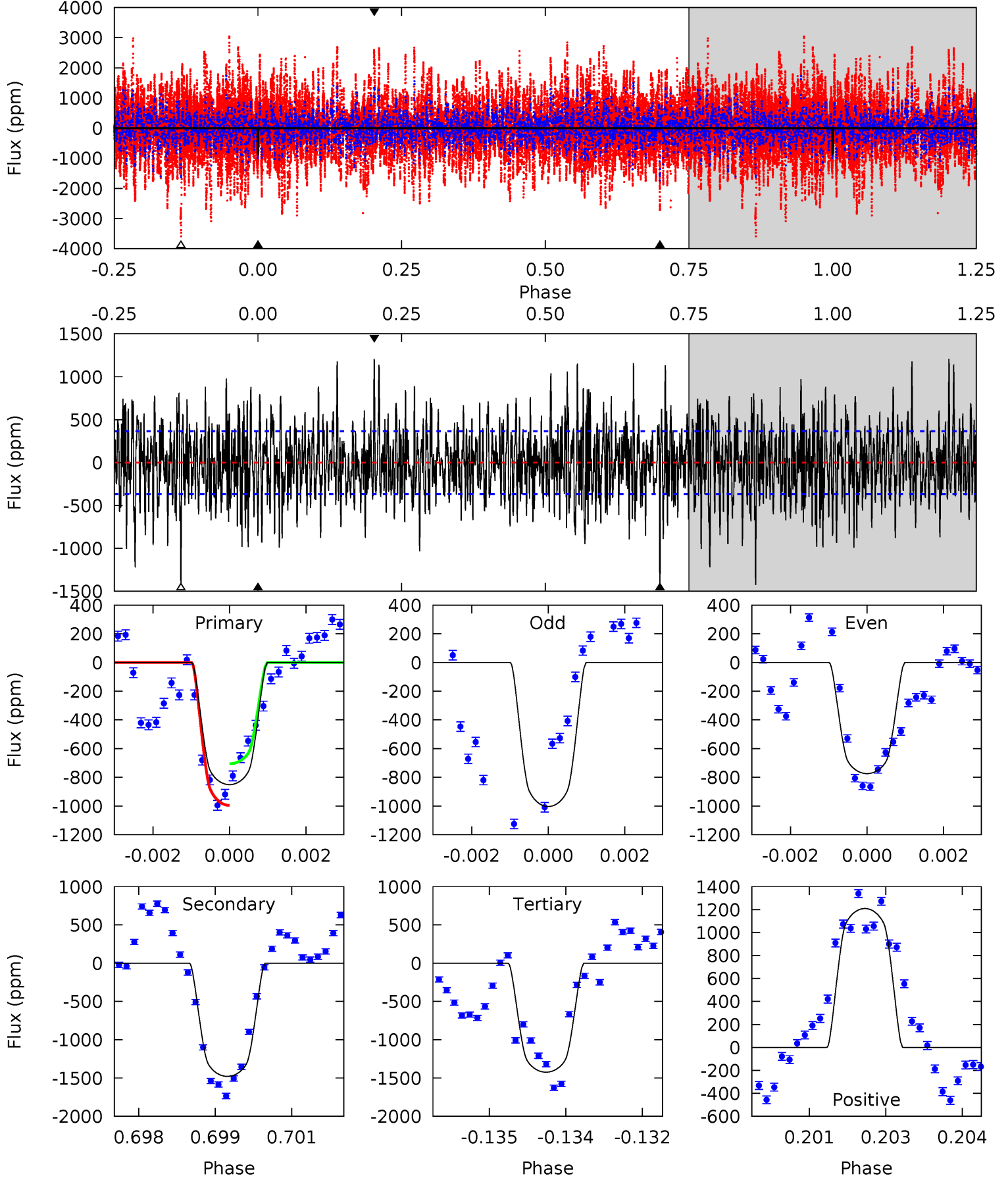
TCE 008476245-03     $P=451.956291$  Days     $T_0=202.617498$  (BKJD)



# DV Model-Shift Uniqueness Test

008476245-03, P = 451.977931 Days, E = 202.664717 Days

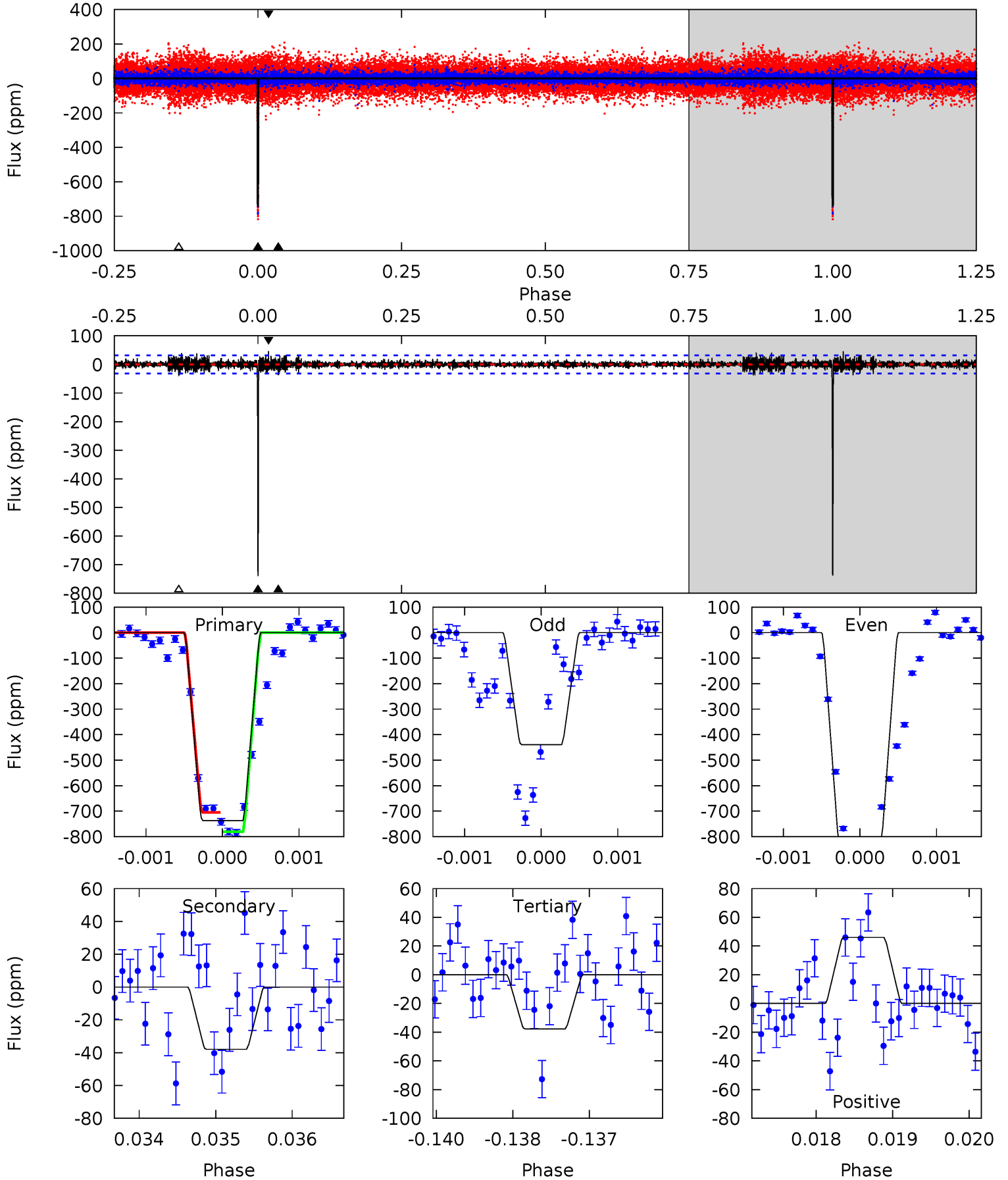
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.5	21.7	20.9	17.7	5.36	3.15	5.25	-8.39	-5.25	0.81	3.95	1.56	0.99	0.45	2.18



# Alt Model-Shift Uniqueness Test

008476245-03, P = 451.956291 Days, E = 202.617498 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
126.0	6.49	6.45	7.86	5.41	3.23	1.22	119.6	118.1	0.04	-1.37	38.4	1.01	0.06	0



### Stellar Parameters For KIC 008476245

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4947^{+36}_{-87}$	$1.956^{+0.030}_{-0.027}$	$-1.000^{+0.100}_{-0.450}$	$26.909^{+3.252}_{-9.104}$	$2.387^{+0.707}_{-1.312}$	$0.000^{+0.000}_{-0.000}$
	+1%/-2%	+2%/-1%	+10%/-45%	+12%/-34%	+30%/-55%	+52%/-13%
Source	PHO56	AST56	PHO56	DSEP		

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

### Secondary Eclipse Parameters for KIC 008476245-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1479 \pm 68$	$101.62^{+9.45}_{-12.96}$	$1279^{+26}_{-38}$	$5261^{+171}_{-141}$	$202^{+34}_{-26}$
Alt.	$-38 \pm 6$	$90.97^{+8.39}_{-11.80}$	$1280^{+25}_{-34}$	$2893^{+78}_{-81}$	$6.473^{+1.411}_{-1.219}$

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

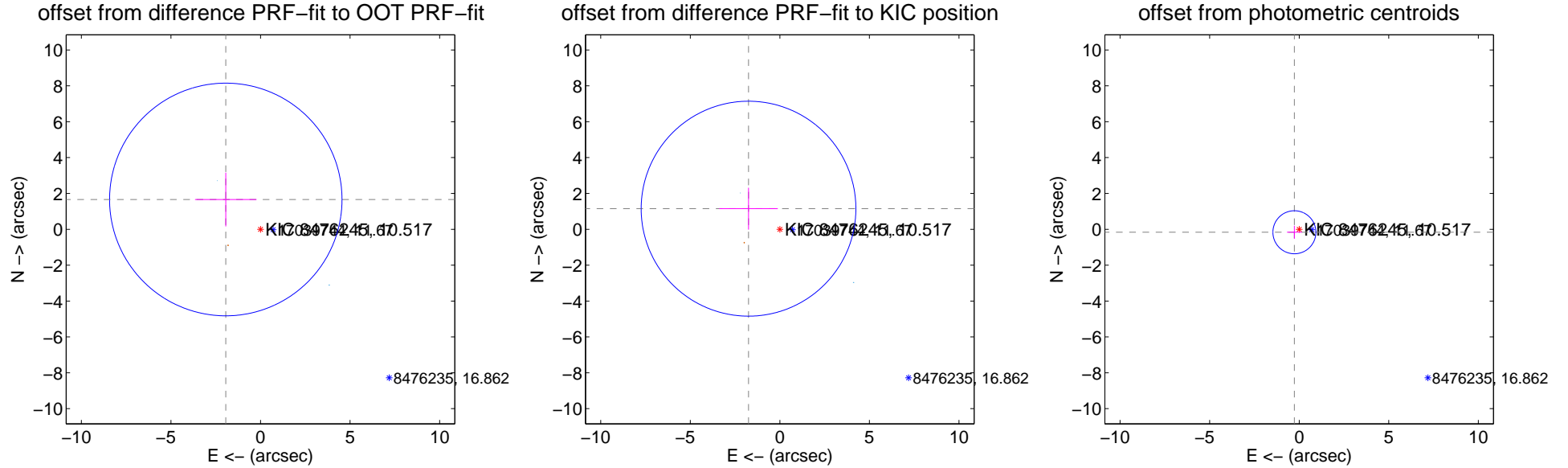
## DV Centroid Data

Supplemental centroid analysis for 008476245-03. **Kepler magnitude: 10.52.** Transit SNR 10.87

**There are 2 quarters with good PRF difference image offsets**

The direct PRF centroid is offset from the target star catalog position by about 0.71 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.554 \pm 2.162$	1.18	$1.938 \pm 1.715$	$1.663 \pm 1.499$
PRF-fit source offset from KIC position	$2.093 \pm 1.998$	1.05	$1.749 \pm 1.635$	$1.151 \pm 1.170$
photometric centroid source offset	$0.31 \pm 0.40$	0.79	$0.27 \pm 0.41$	$-0.16 \pm 0.36$



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.

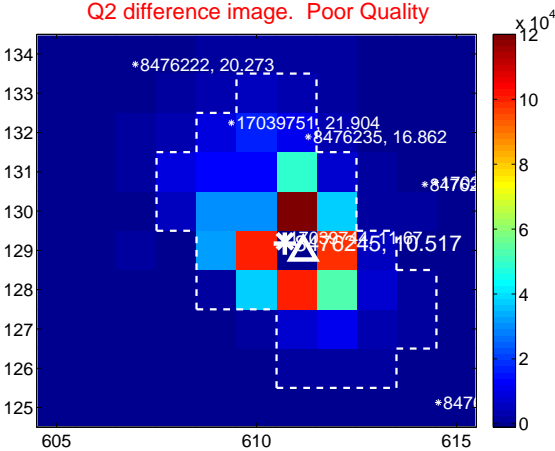
Q1 no difference image



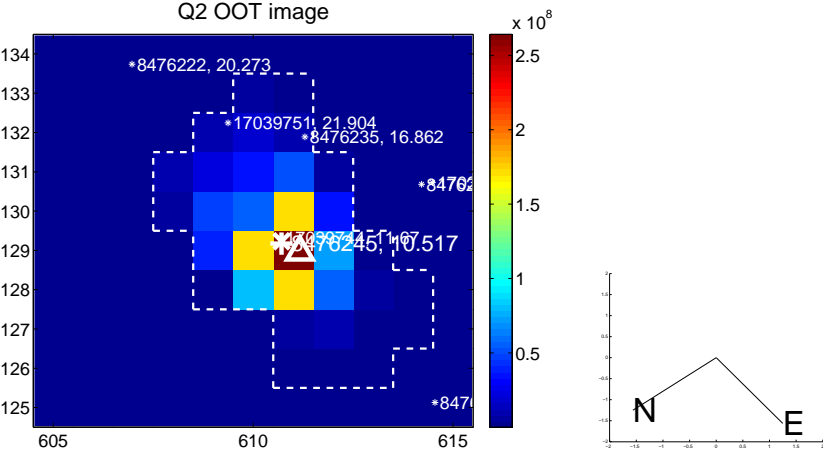
Q1 no OOT image



Q2 difference image. Poor Quality



Q2 OOT image



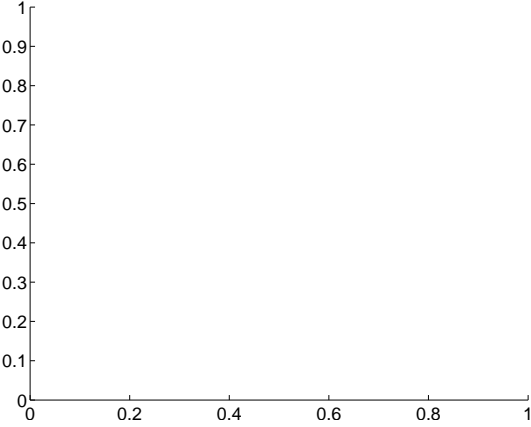
Q3 no difference image



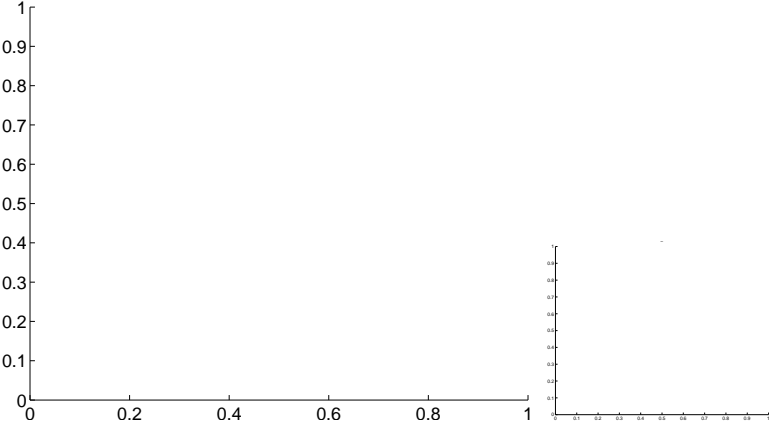
Q3 no OOT image



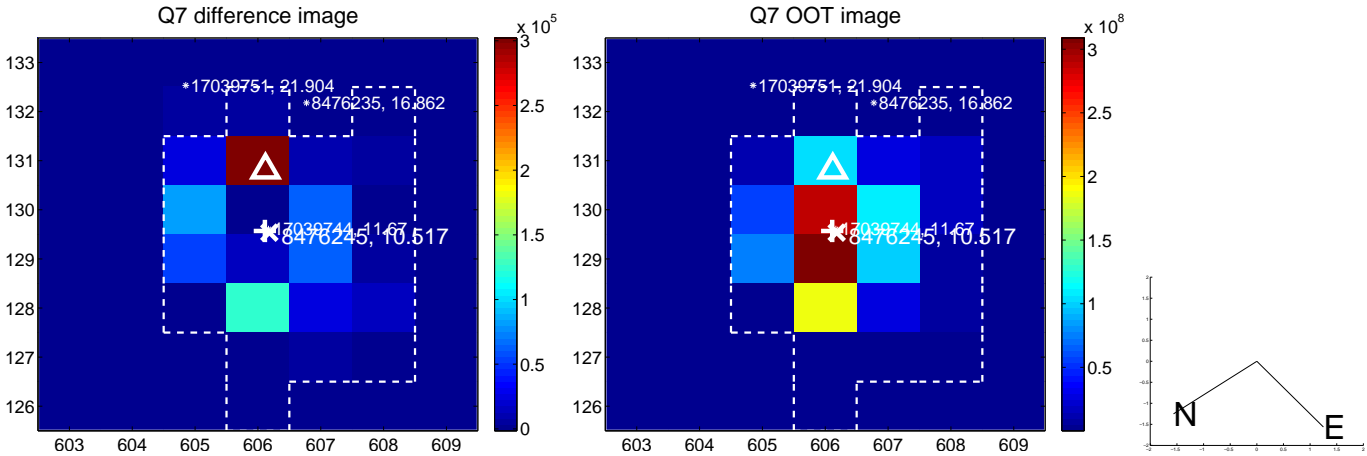
Q4 no difference image



Q4 no OOT image



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





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

Q9 no difference image



Q9 no OOT image



Q10 no difference image



Q10 no OOT image



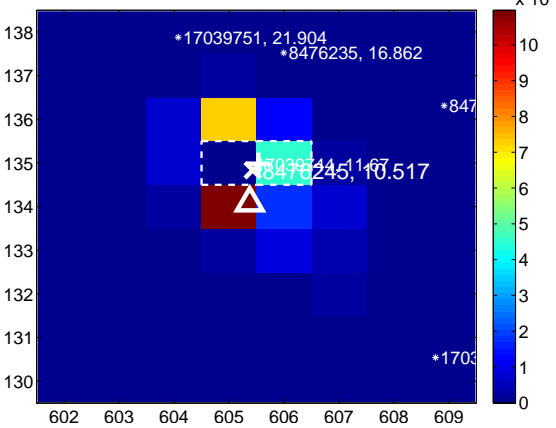
Q11 no difference image



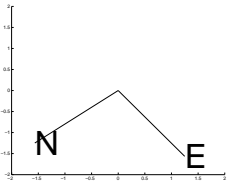
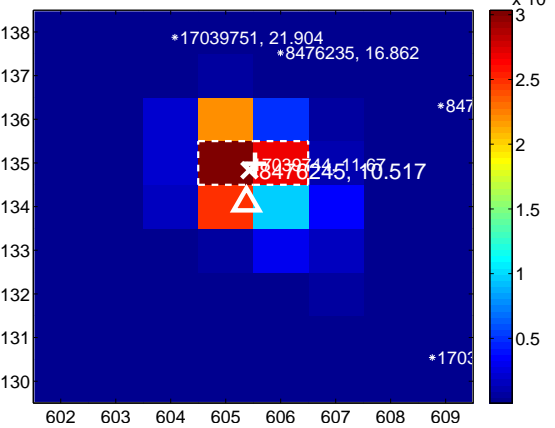
Q11 no OOT image



Q12 difference image



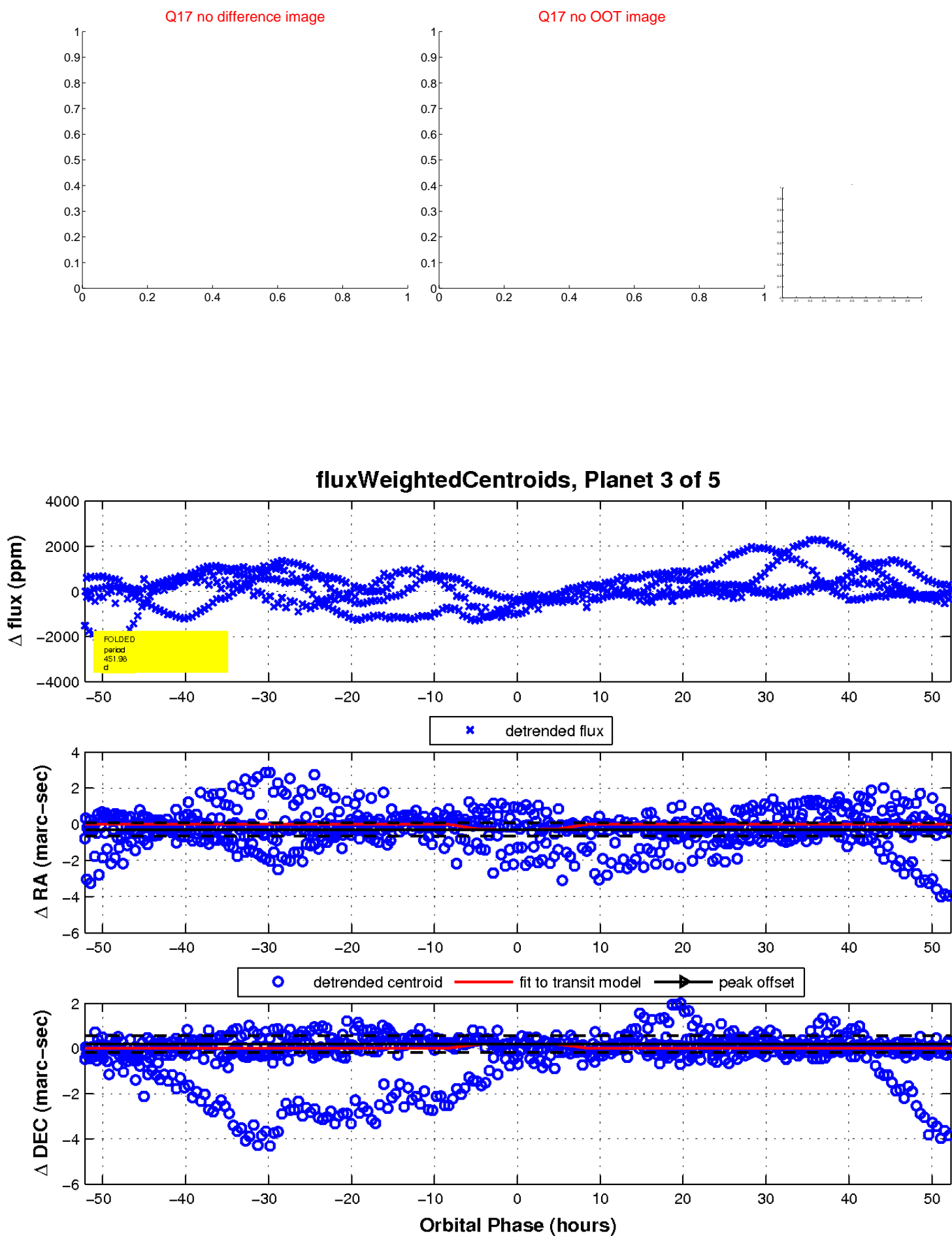
Q12 OOT image



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

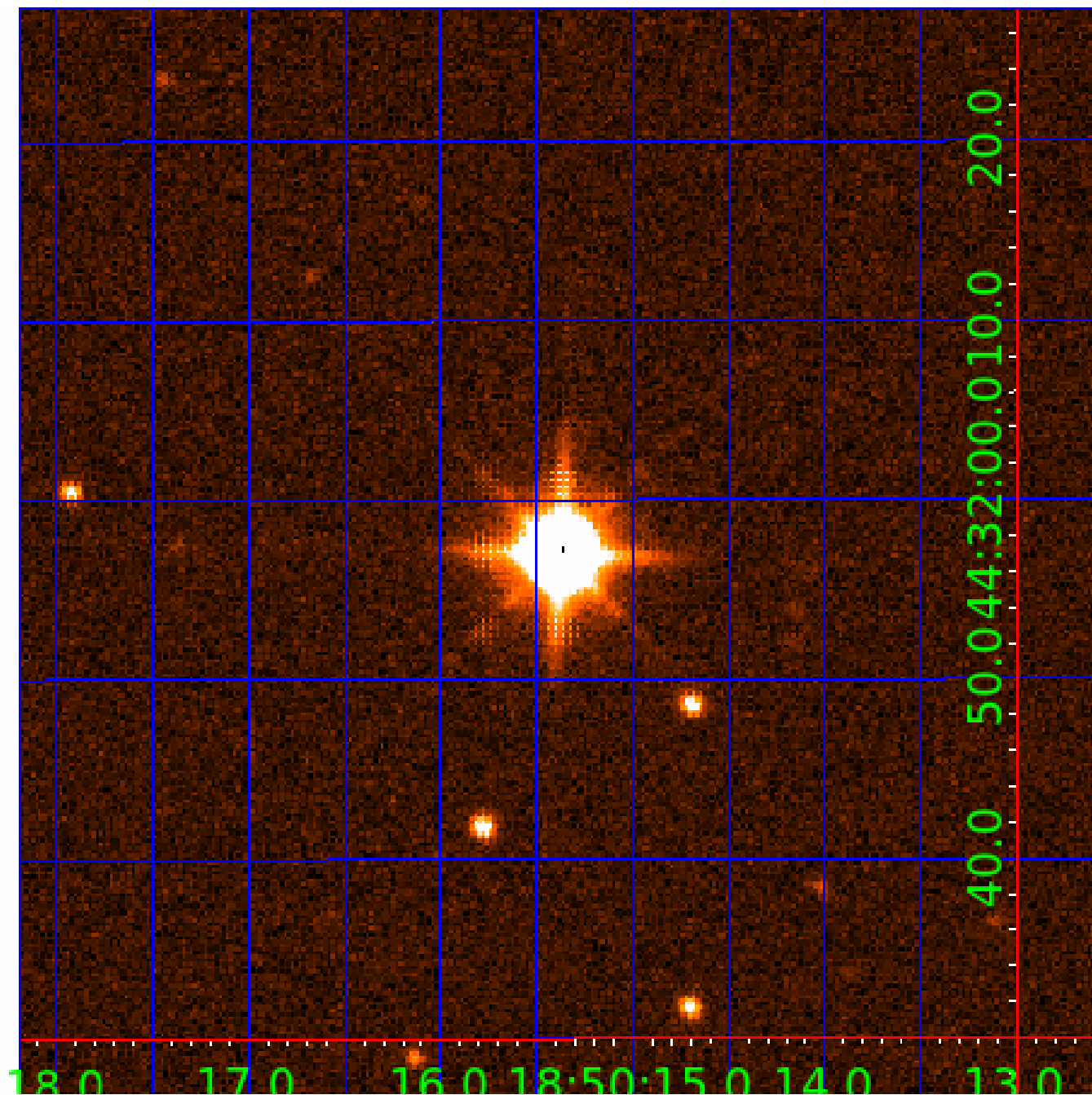


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008476245

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008476245-01	OBS	No	171.781853	262.492977	11.4	16.305	14.9	3.3	26.91	4947	10.55	594.60
008476245-03	OBS	No	451.977931	202.664717	812.4	17.450	11.3	10.9	26.91	4947	96.93	163.70
008476245-04	OBS	No	298.796728	230.706789	1568.9	20.247	11.6	18.1	26.91	4947	207.28	284.25
008476245-05	OBS	No	30.687156	160.412224	27.5	1.006	10.3	23.2	26.91	4947	17.06	5909.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008476245-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_SATURATED
008476245-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-05	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED

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

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

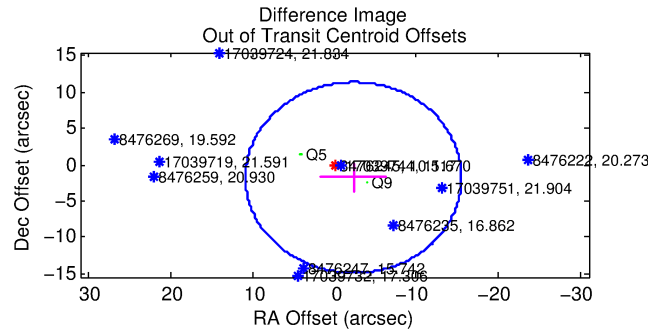
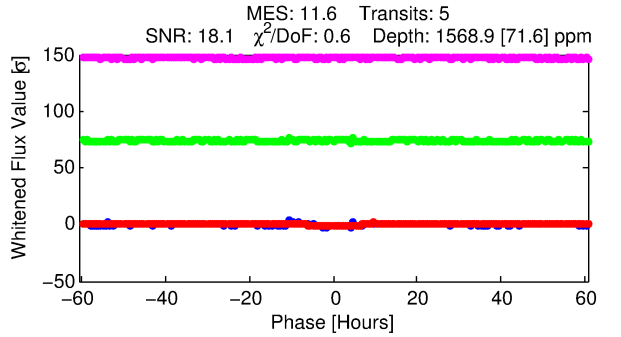
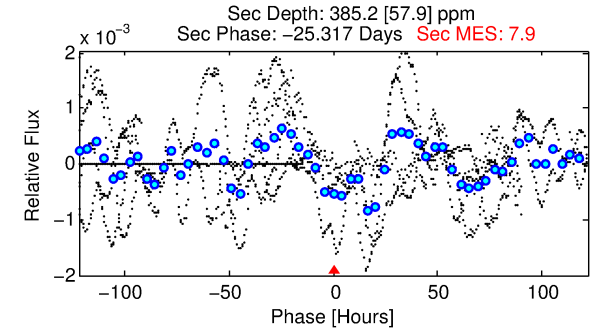
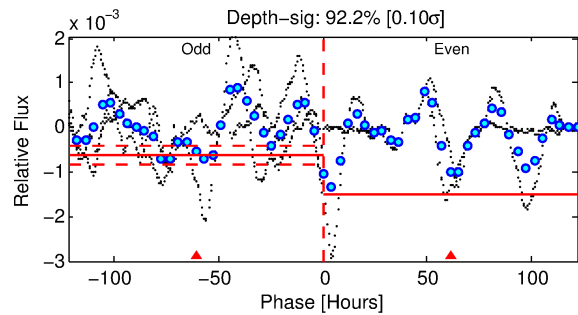
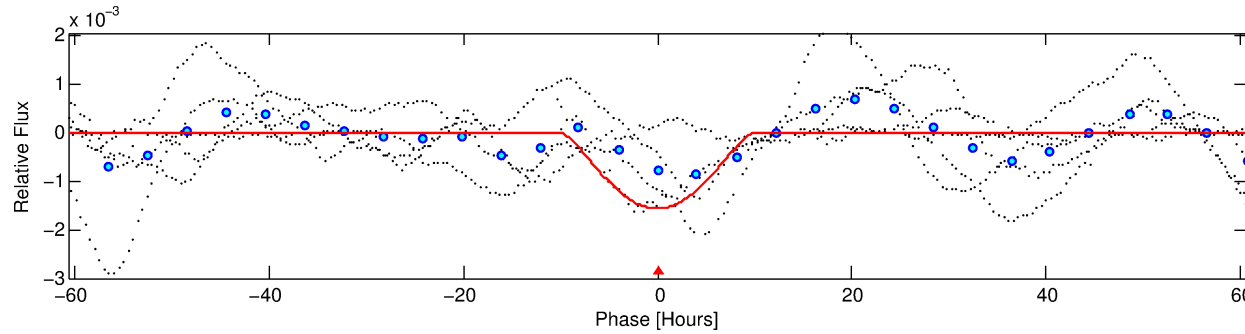
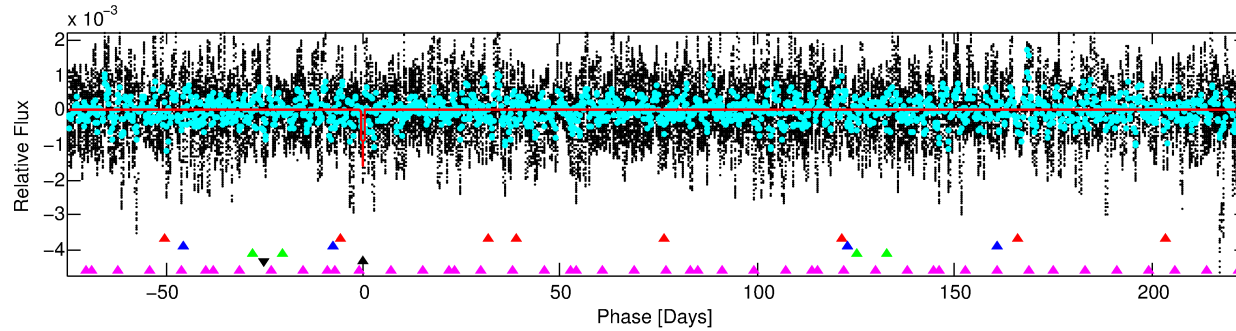
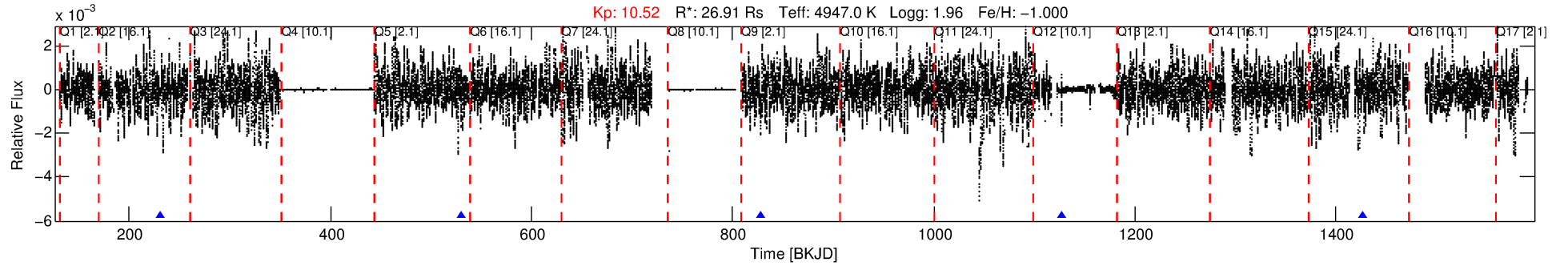
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008476245-04

No Significant Match Found

# DV One-Page Summary

KIC: 8476245 Candidate: 4 of 5 Period: 298.797 d



## DV Fit Results:

Period = 298.79673 [0.00755] d  
Epoch = 230.7068 [0.0220] BKJD  
Rp/R\* = 0.0706 [0.0337]  
a/R\* = 43.16 [4.26]  
b = 1.00 [0.05]  
Seff = 284.24 [68.42]  
Teq = 1047 [63] K  
Rp = 207.28 [121.17] Re  
a = 1.1692 [0.2651] AU  
Ag = 6.74 [6.69] [0.86 $\sigma$ ]  
Teffp = 2609 [631] K [2.46 $\sigma$ ]

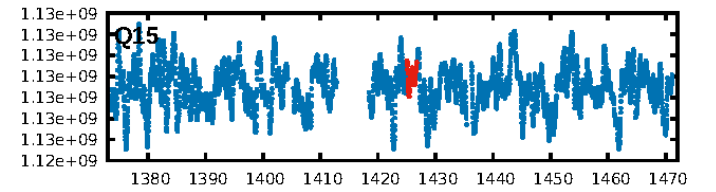
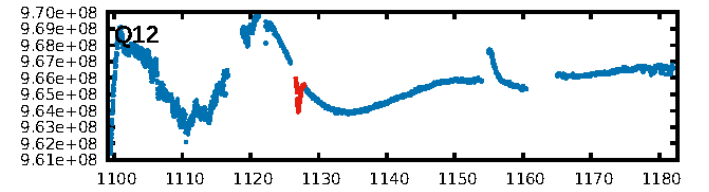
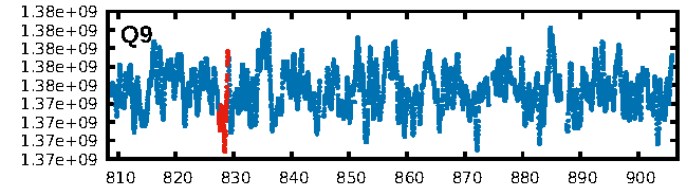
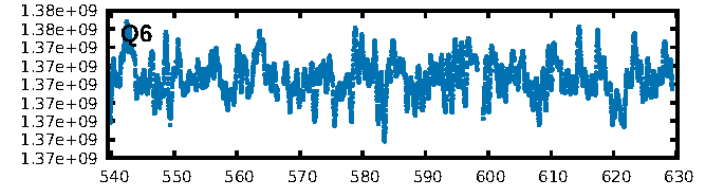
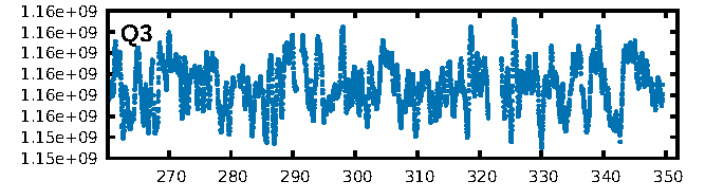
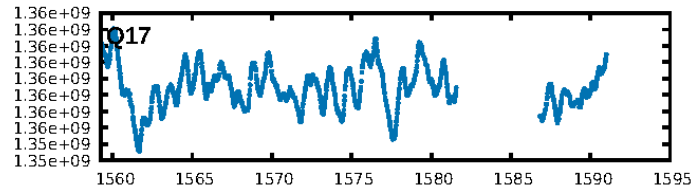
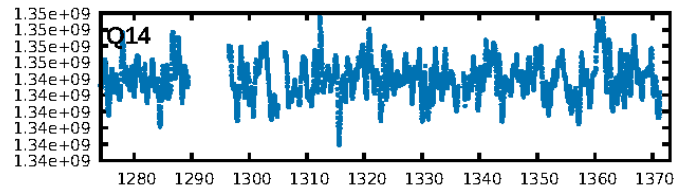
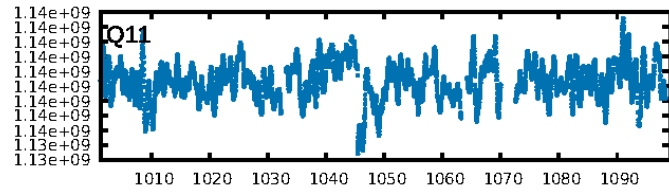
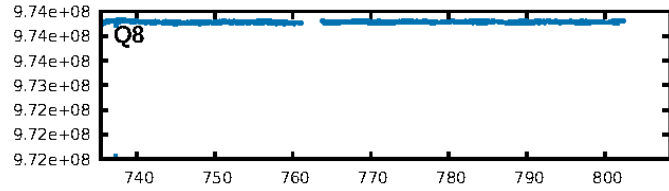
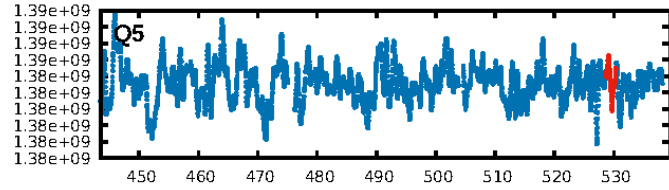
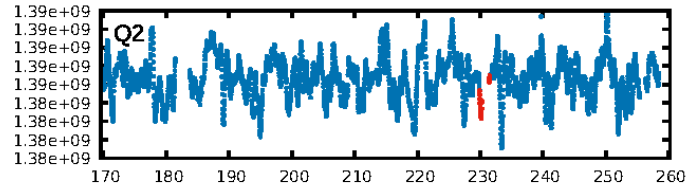
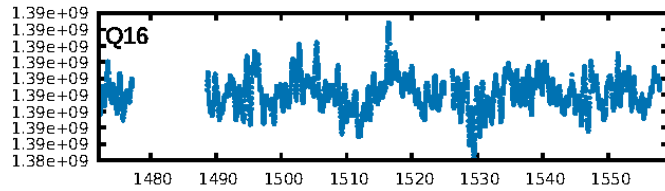
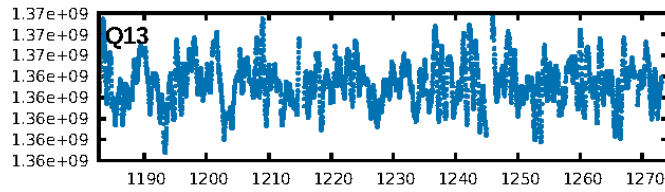
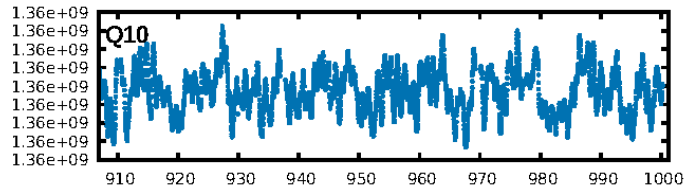
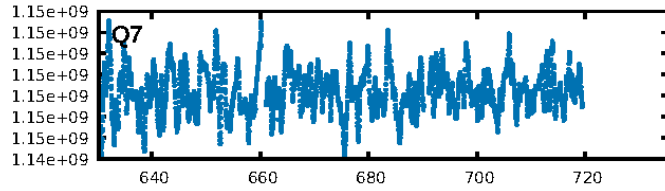
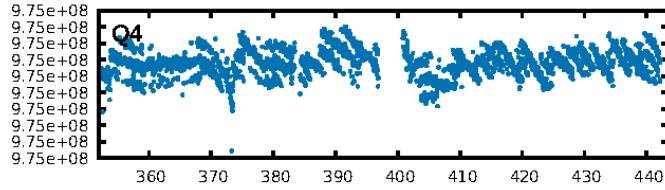
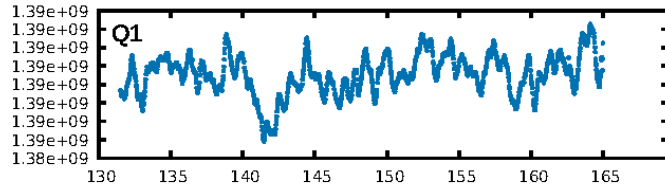
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [117.26 $\sigma$ ]  
LongPeriod-sig: 100.0% [137.54 $\sigma$ ]  
ModelChiSquare2-sig: 6.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.31e-11  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 8.5%  
Centroid-so: 0.383 arcsec [1.94 $\sigma$ ]  
OotOffset-rm: 2.922 arcsec [0.67 $\sigma$ ]  
KicOffset-rm: 3.046 arcsec [0.84 $\sigma$ ]  
OotOffset-st: 0/0/0/2 [2]  
KicOffset-st: 0/0/0/2 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 0.67 [2/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 07:25:25 Z

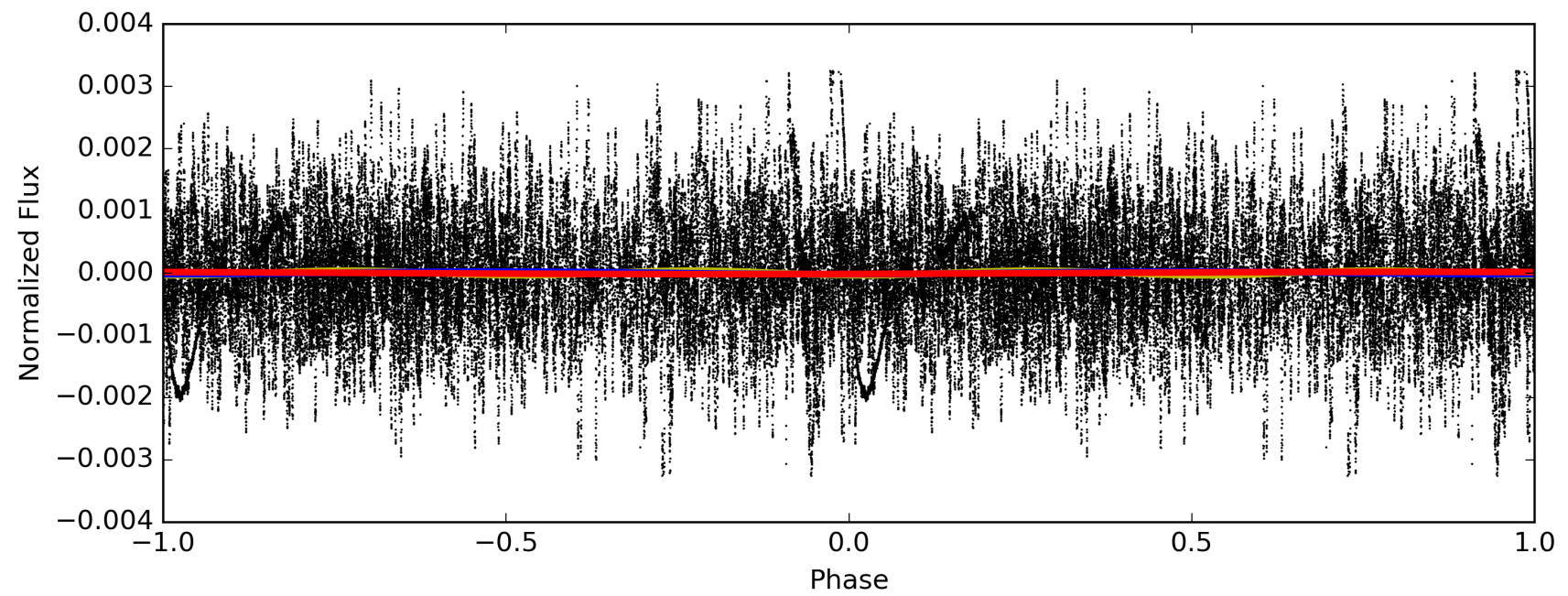
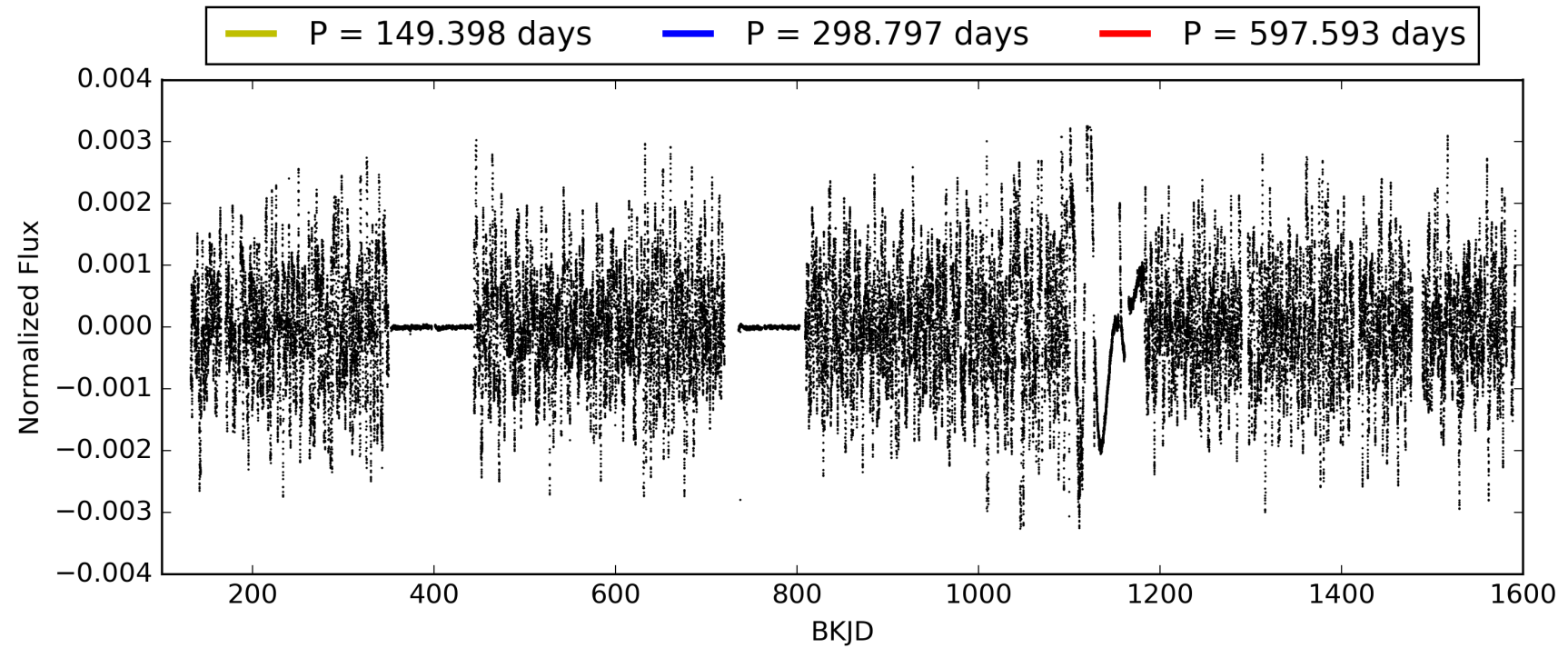
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008476245-04, PDC Light Curves





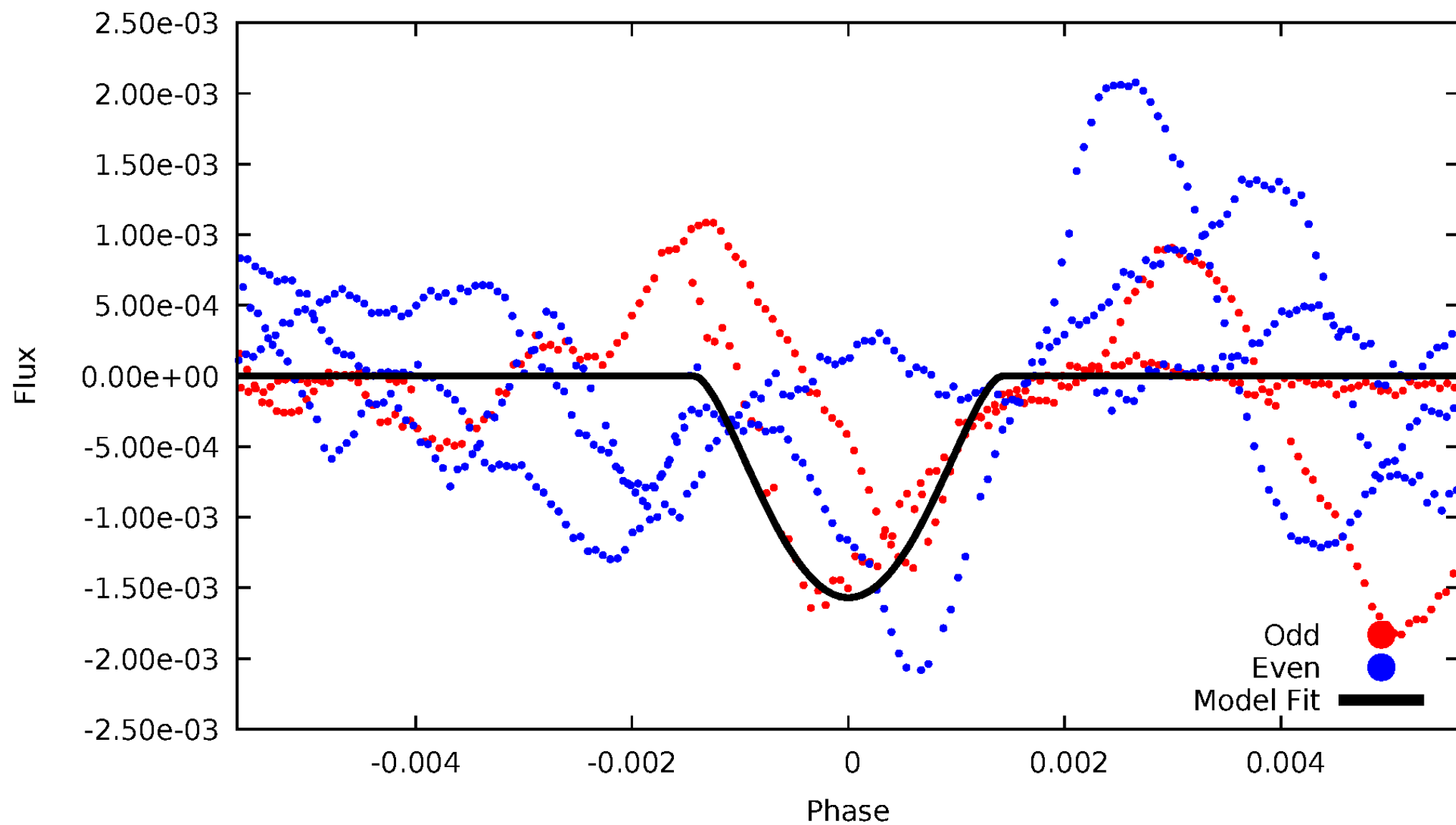
TCE 008476245-04





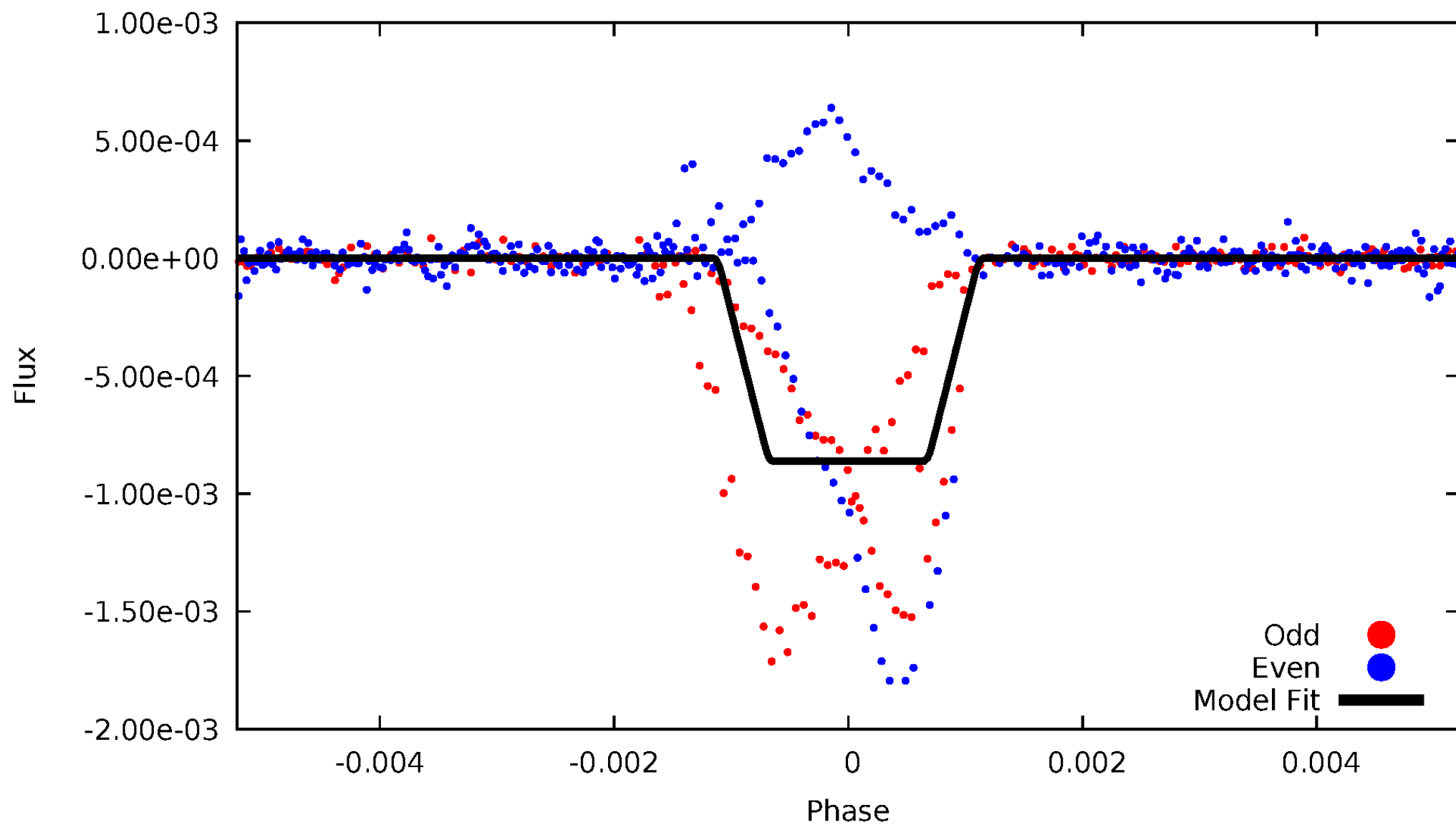
# DV Odd/Even

TCE 008476245-04



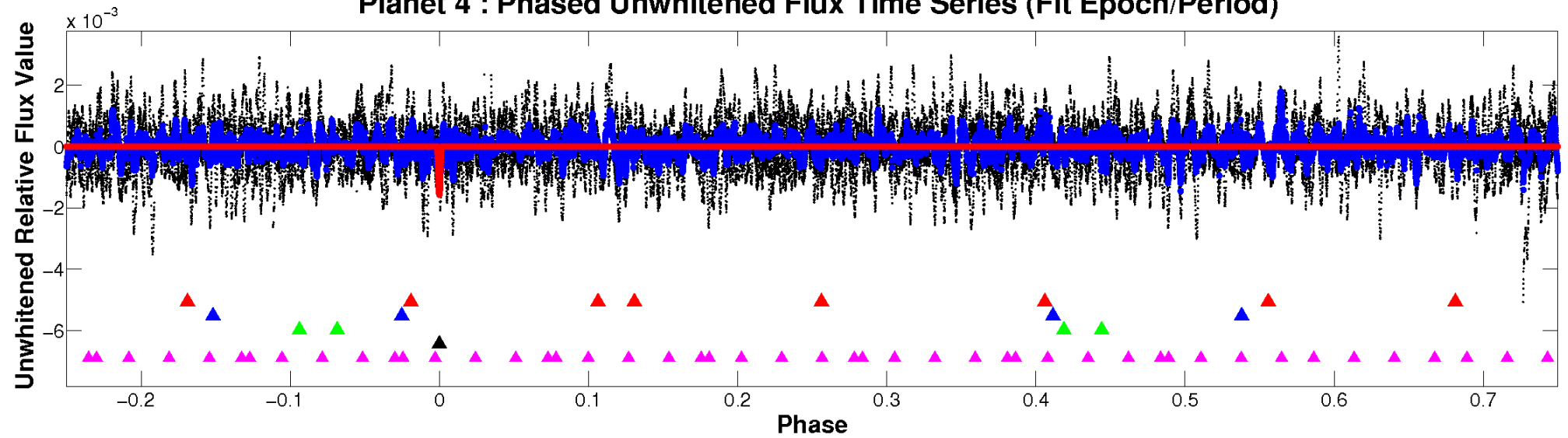
# ALT Odd/Even

TCE 008476245-04

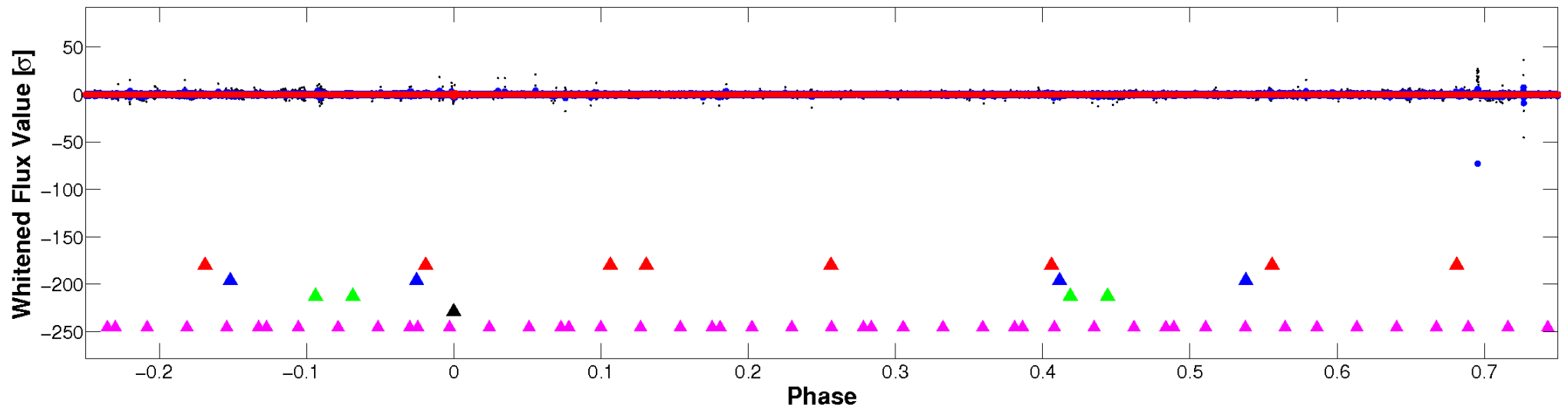


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

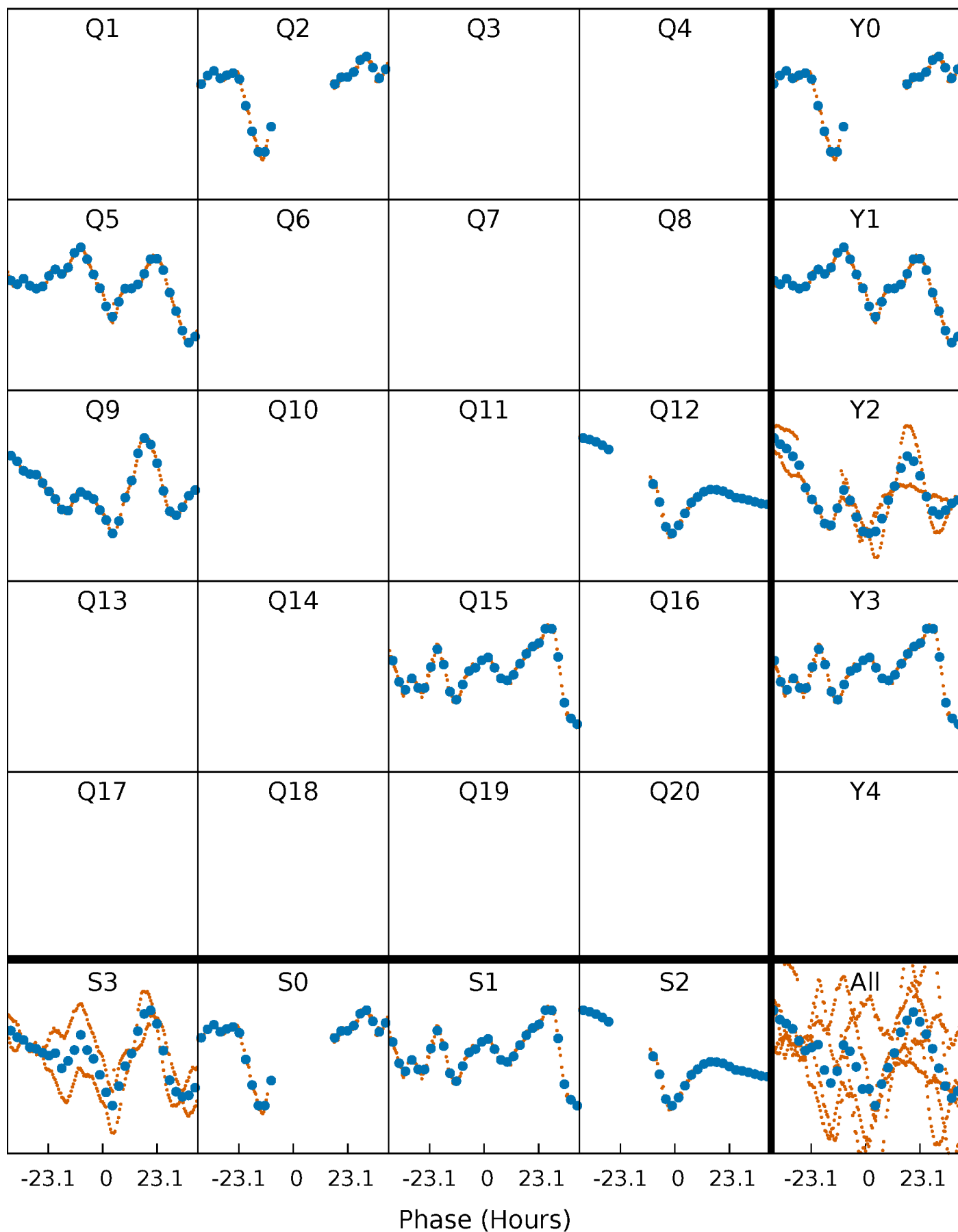


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



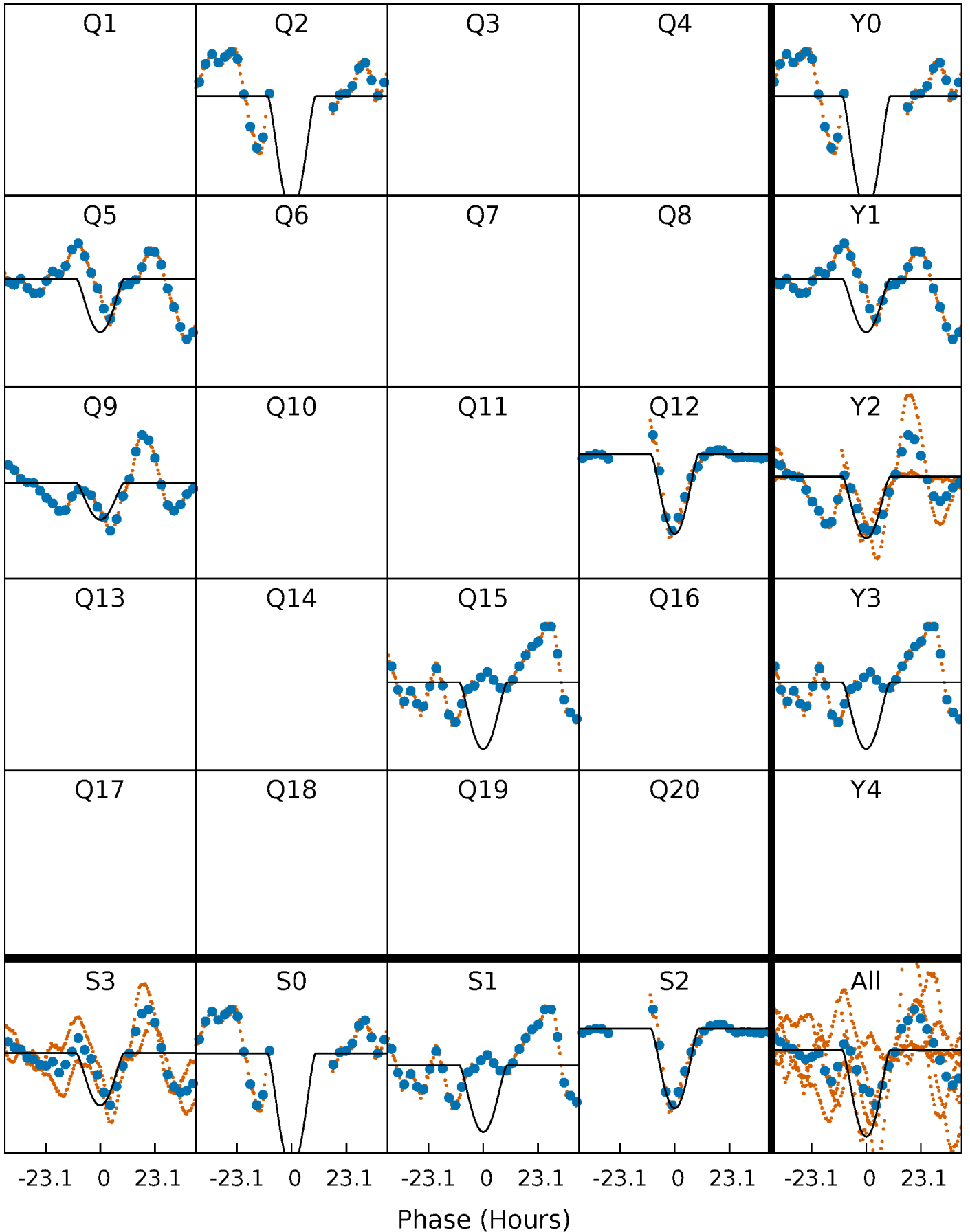
# PDC Quarter-Phased Transit Curves

TCE 008476245-04   P=298.796728 Days    $T_0=230.706789$  (BKJD)



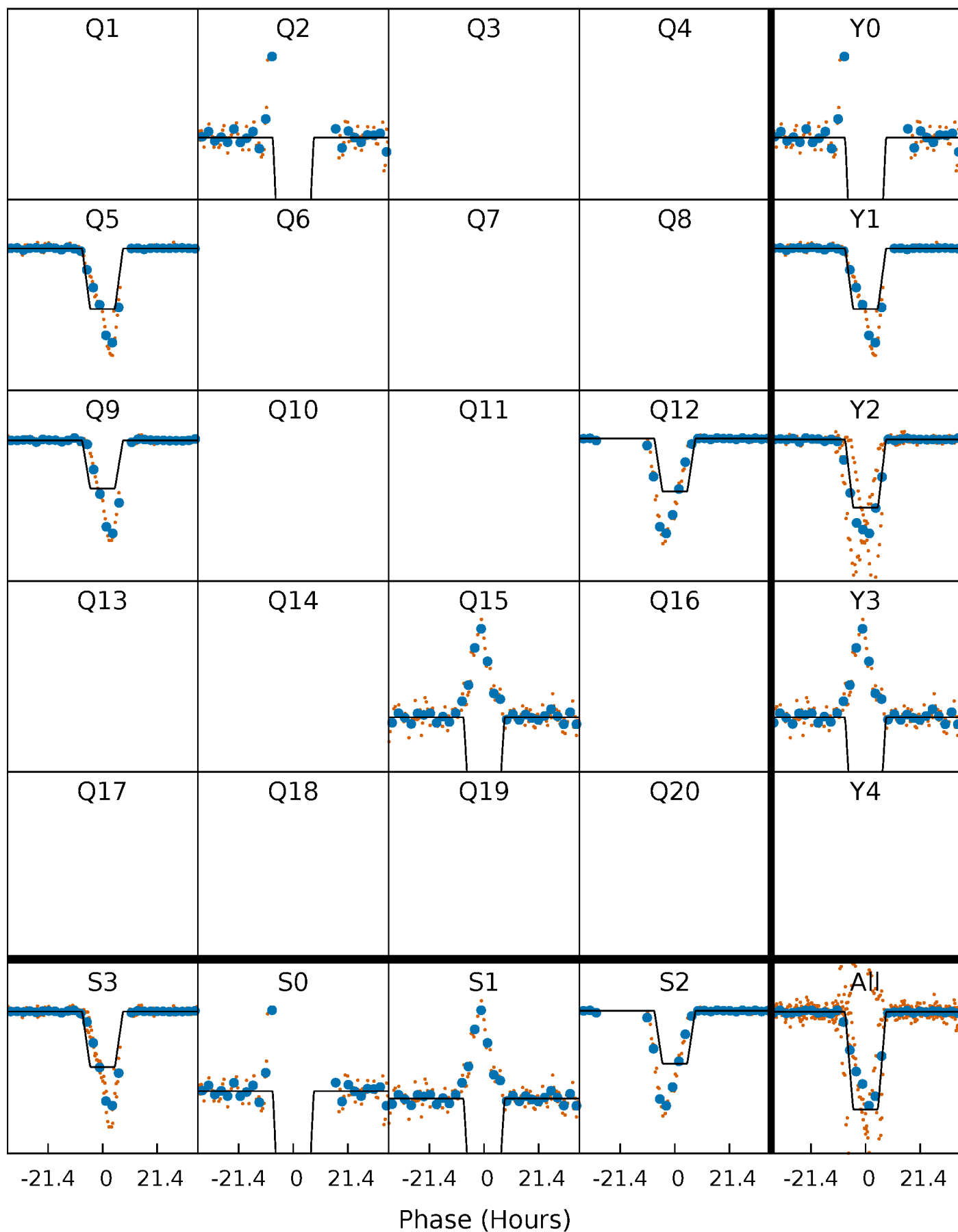
# DV Quarter-Phased Transit Curves

TCE 008476245-04     $P=298.796728$  Days     $T_0=230.706789$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

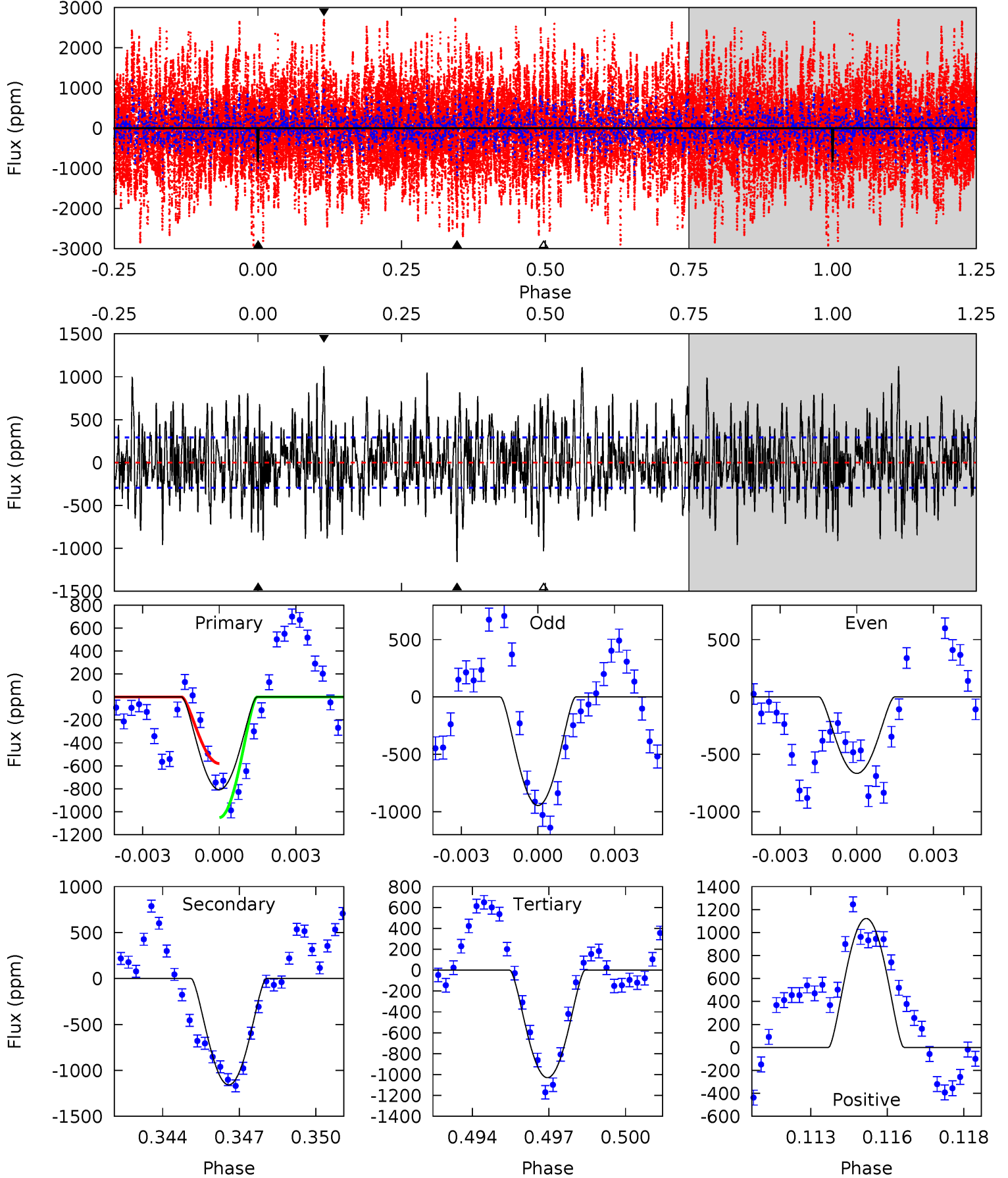
TCE 008476245-04     $P=298.834004$  Days     $T_0=230.687146$  (BKJD)



# DV Model-Shift Uniqueness Test

008476245-04, P = 298.796728 Days, E = 230.706789 Days

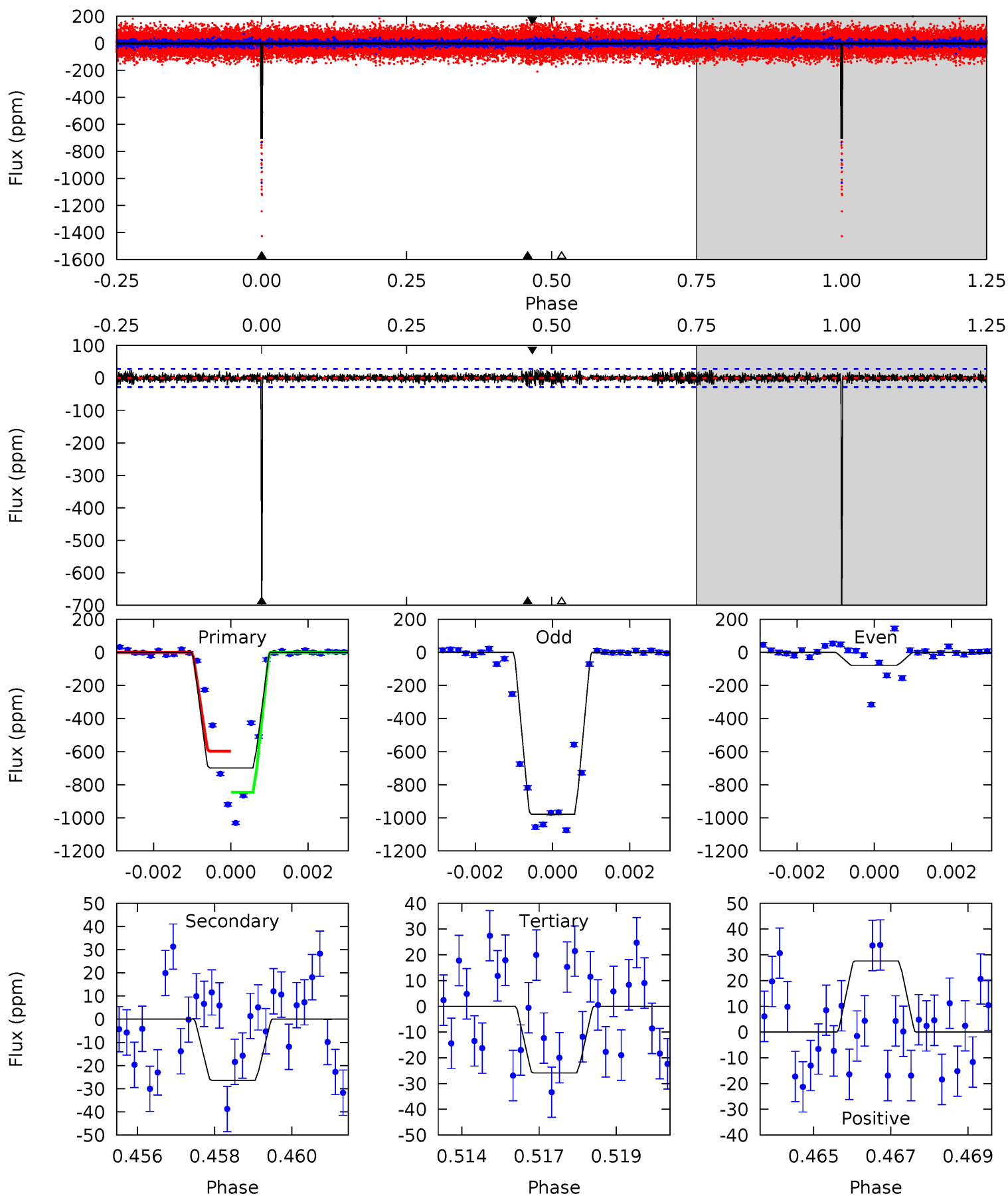
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.5	20.8	18.5	20.2	5.26	2.98	5.88	-4.00	-5.66	2.30	0.64	2.47	0.86	0.49	4.27



# Alt Model-Shift Uniqueness Test

008476245-04, P = 298.834004 Days, E = 230.687146 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
132.6	5.01	4.92	5.24	5.30	3.05	1.21	127.6	127.3	0.09	-0.23	107.0	0.68	0.04	23.3





### Stellar Parameters For KIC 008476245

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4947^{+36}_{-87}$	$1.956^{+0.030}_{-0.027}$	$-1.000^{+0.100}_{-0.450}$	$26.909^{+3.252}_{-9.104}$	$2.387^{+0.707}_{-1.312}$	$0.000^{+0.000}_{-0.000}$
	+1%/-2%	+2%/-1%	+10%/-45%	+12%/-34%	+30%/-55%	+52%/-13%
Source	PHO56	AST56	PHO56	DSEP		

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

### Secondary Eclipse Parameters for KIC 008476245-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-1158 \pm 56$	$213.86^{+110.24}_{-95.89}$	$1468^{+29}_{-44}$	$3731^{+877}_{-444}$	$20^{+44}_{-11}$
Alt.	$-26 \pm 5$	$110.59^{+94.28}_{-65.50}$	$1468^{+27}_{-42}$	$2536^{+822}_{-485}$	$1.617^{+9.317}_{-1.116}$

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

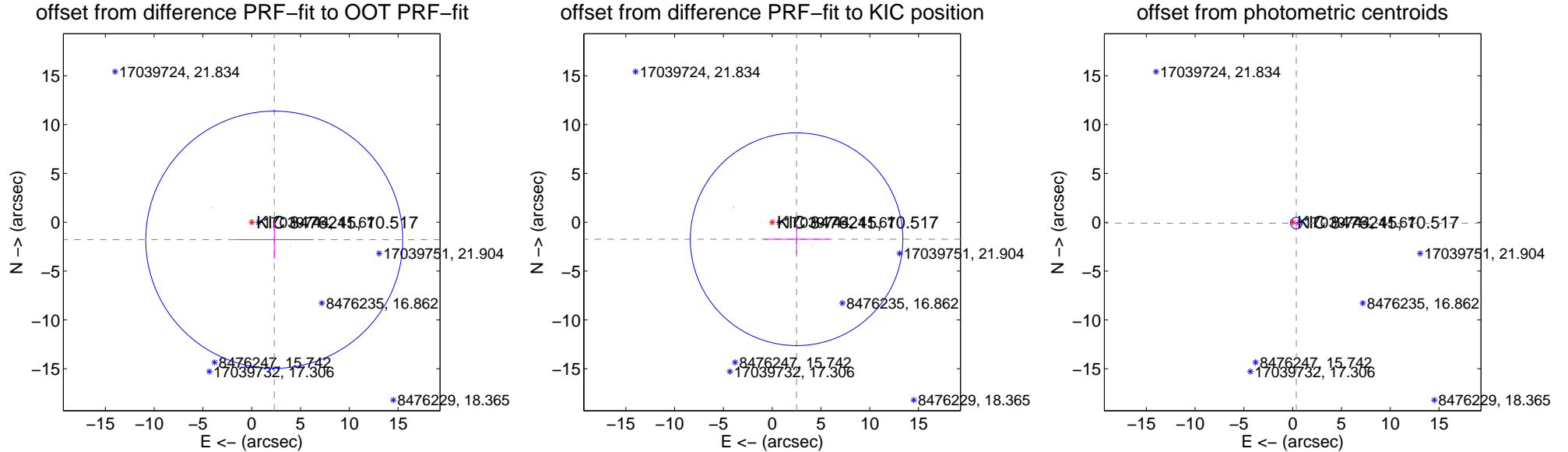
## DV Centroid Data

Supplemental centroid analysis for 008476245-04. **Kepler magnitude: 10.52.** Transit SNR 18.12

**There are 1 quarters with good PRF difference image offsets**

The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.922 \pm 4.389$	0.67	$-2.310 \pm 4.037$	$-1.790 \pm 1.958$
PRF-fit source offset from KIC position	$3.046 \pm 3.631$	0.84	$-2.500 \pm 3.315$	$-1.739 \pm 1.594$
photometric centroid source offset	$0.38 \pm 0.20$	1.94	$-0.37 \pm 0.20$	$-0.09 \pm 0.20$

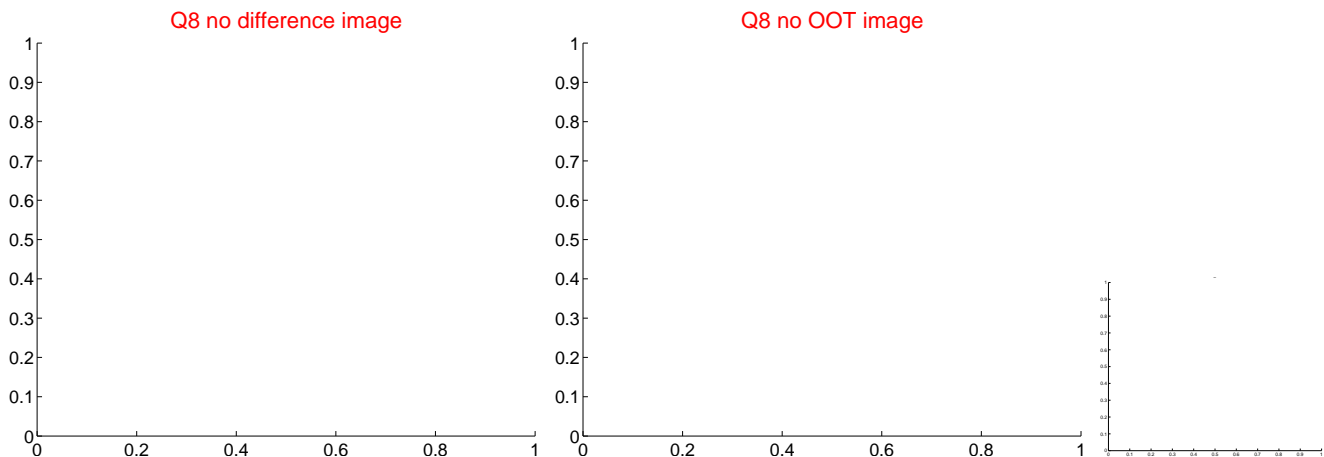
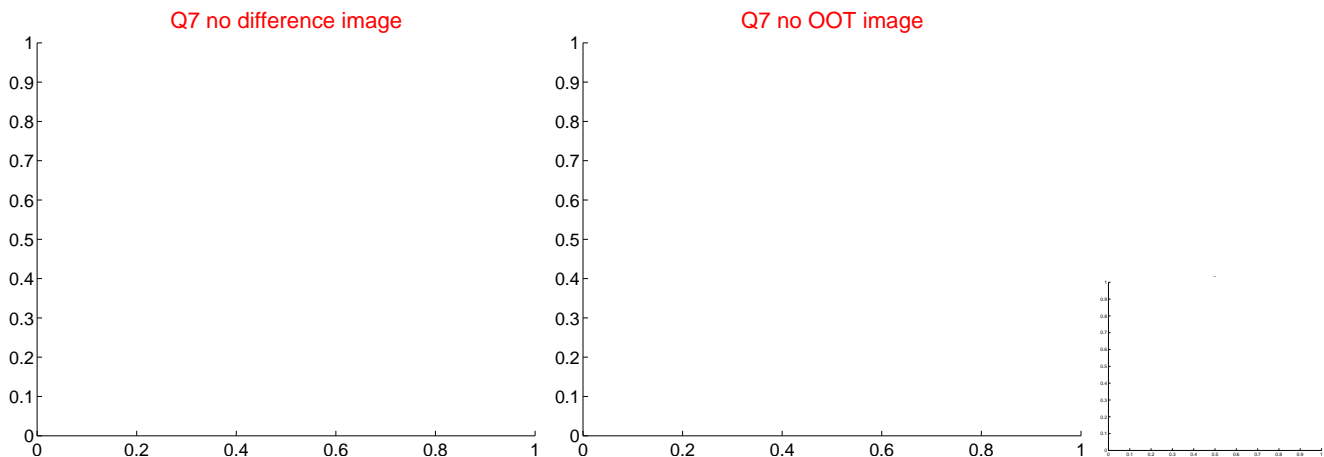
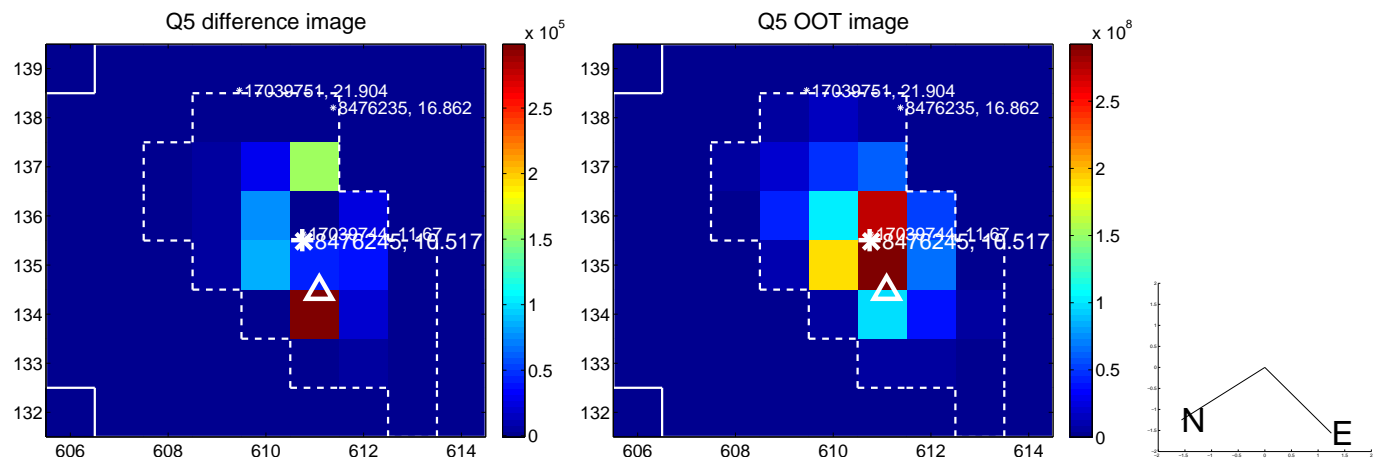


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

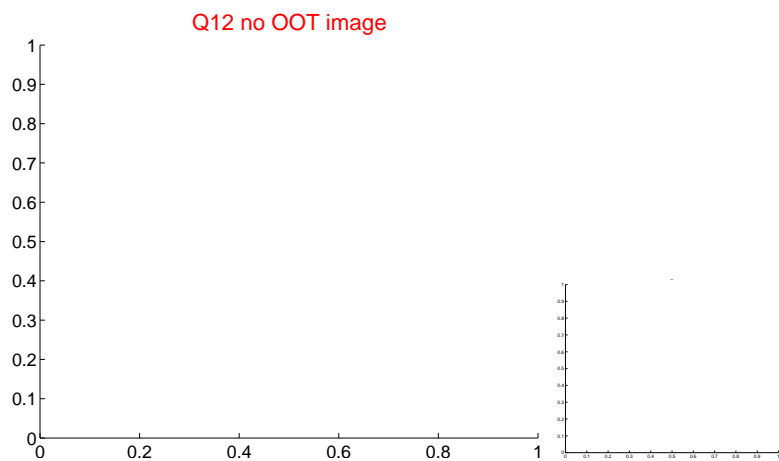
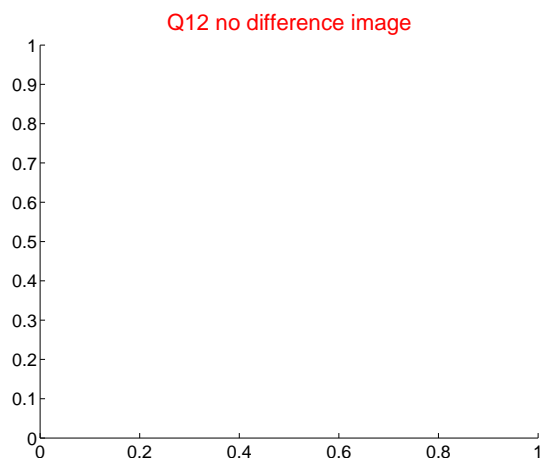
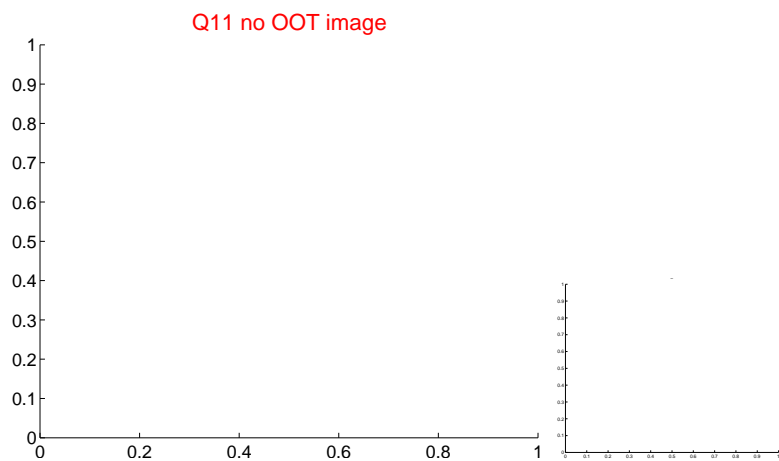
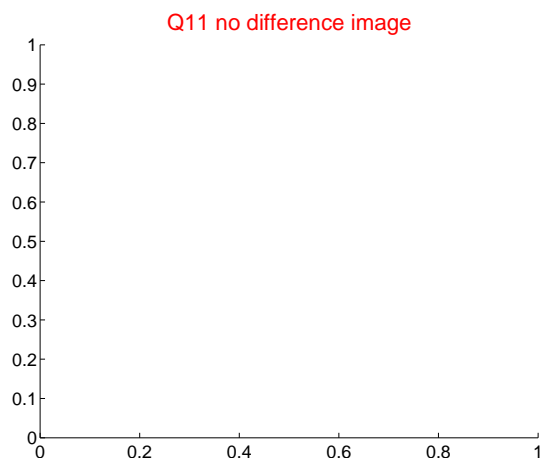
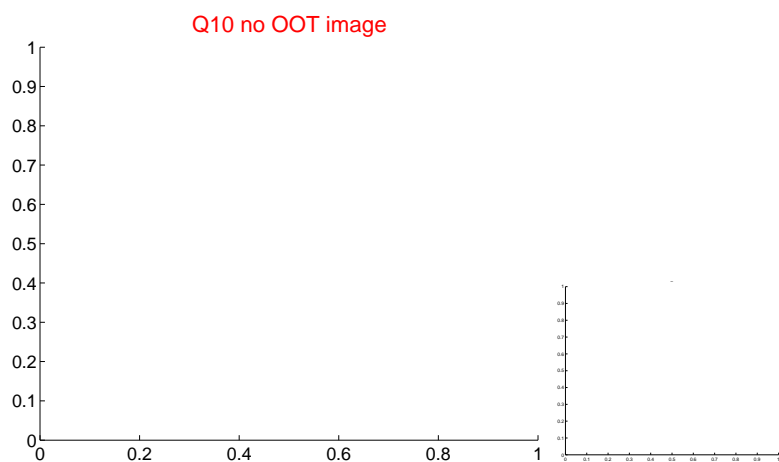
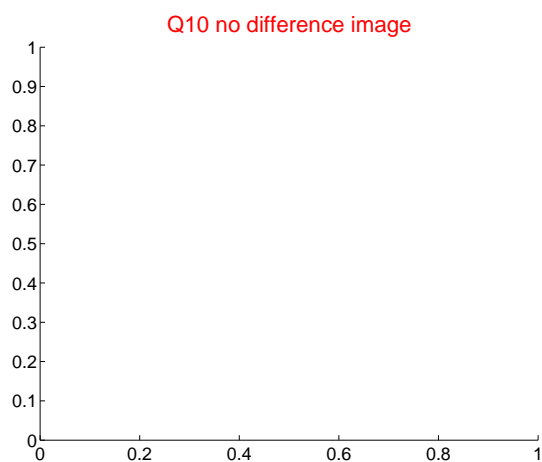
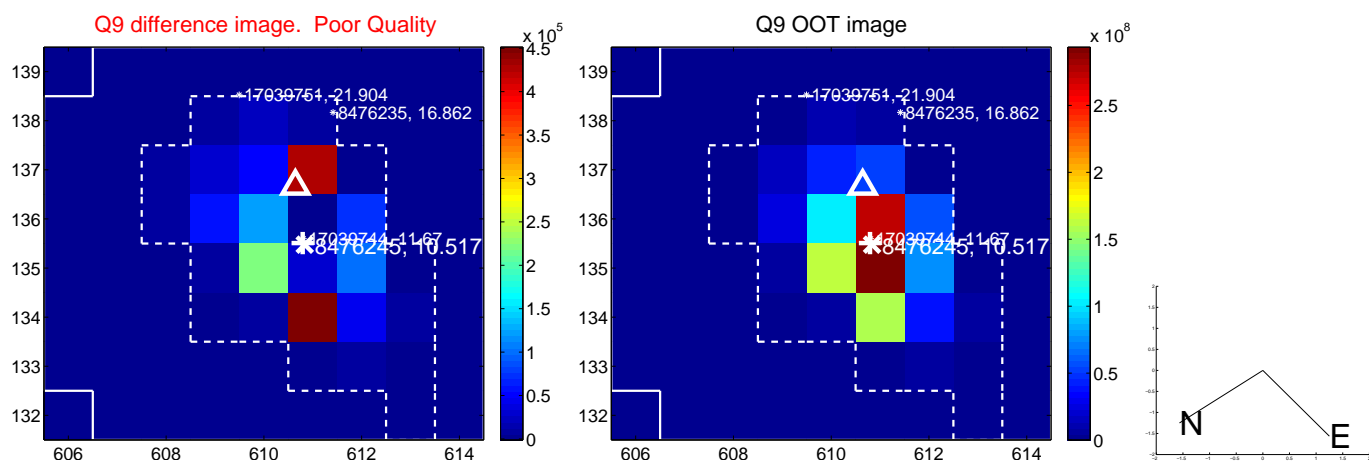
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



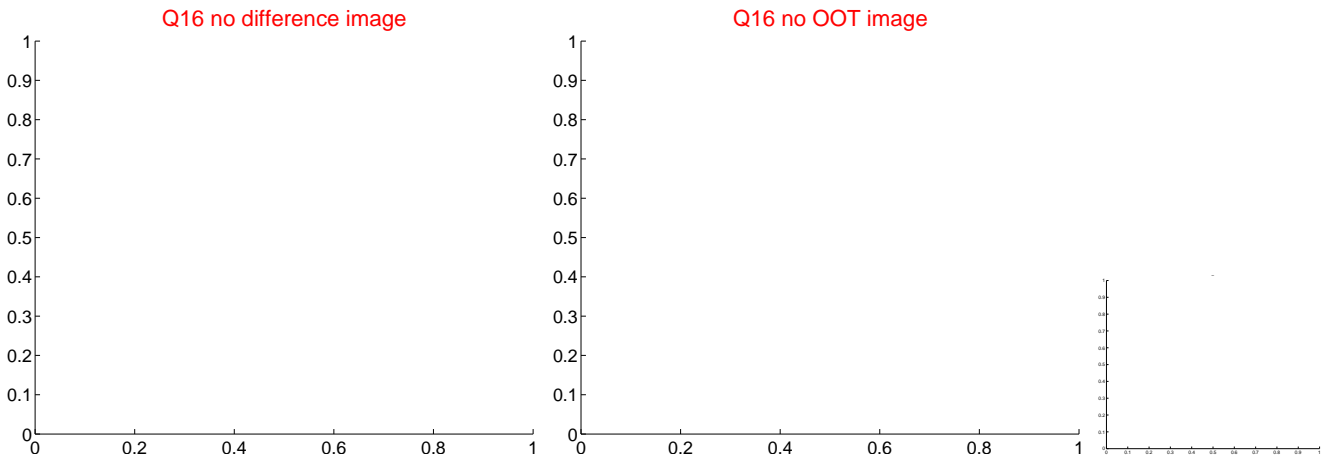
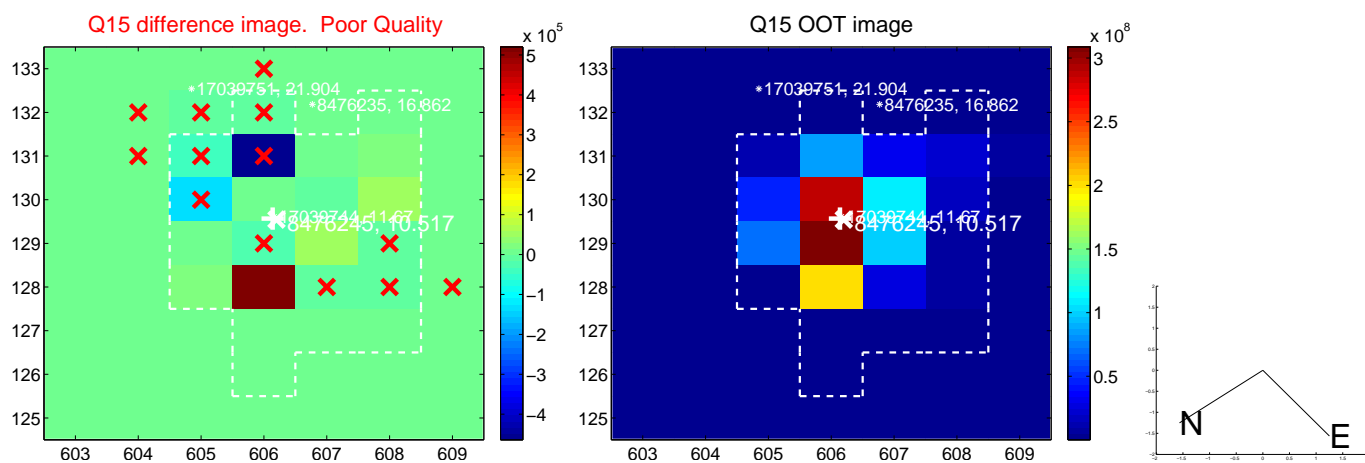
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



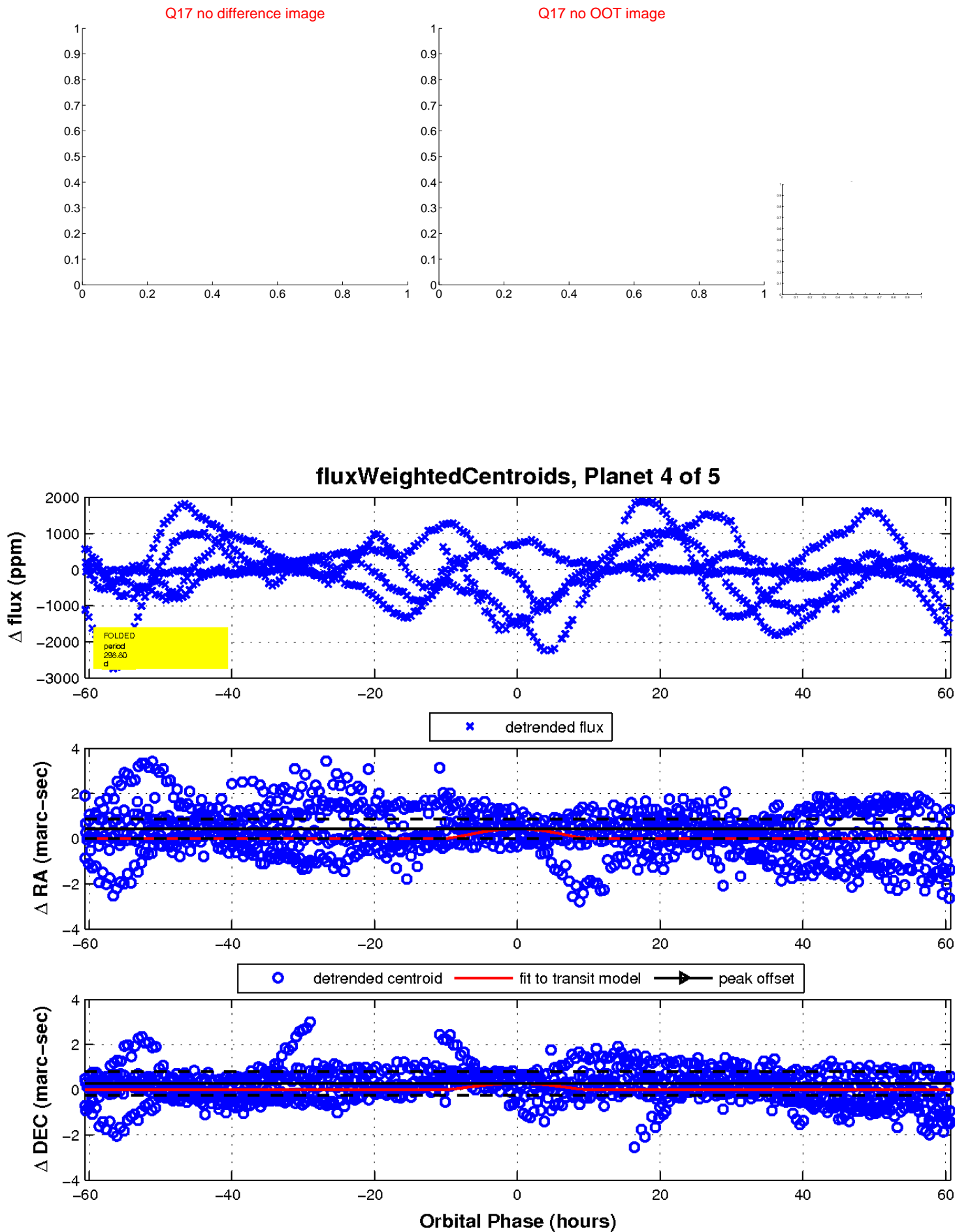
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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

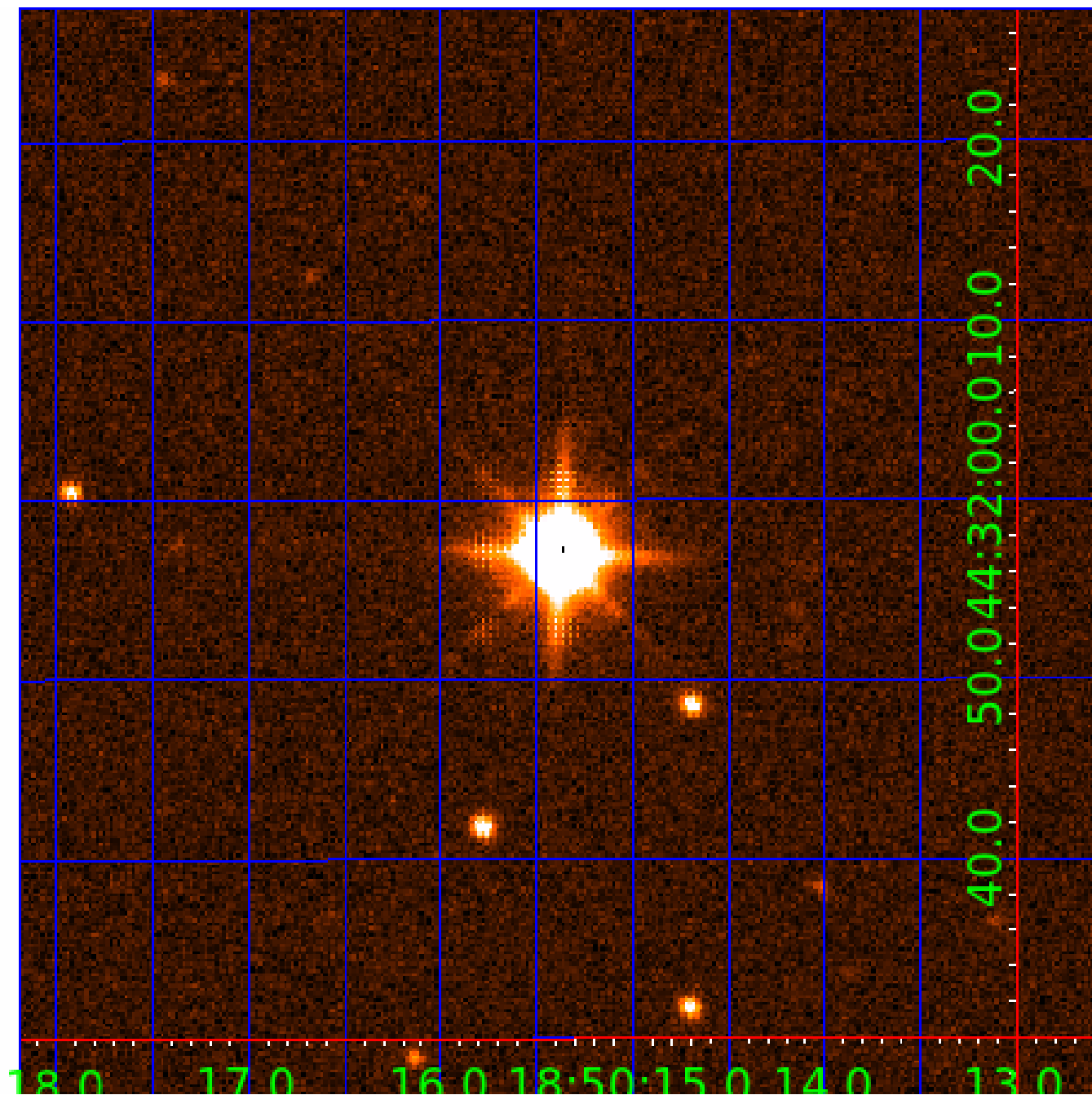


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 008476245

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008476245-01	OBS	No	171.781853	262.492977	11.4	16.305	14.9	3.3	26.91	4947	10.55	594.60
008476245-03	OBS	No	451.977931	202.664717	812.4	17.450	11.3	10.9	26.91	4947	96.93	163.70
008476245-04	OBS	No	298.796728	230.706789	1568.9	20.247	11.6	18.1	26.91	4947	207.28	284.25
008476245-05	OBS	No	30.687156	160.412224	27.5	1.006	10.3	23.2	26.91	4947	17.06	5909.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008476245-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_SATURATED
008476245-03	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
008476245-05	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED

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

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

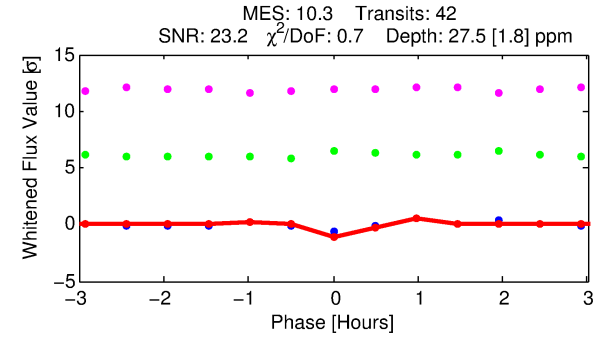
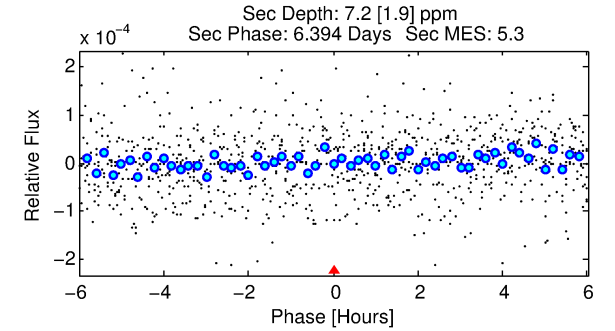
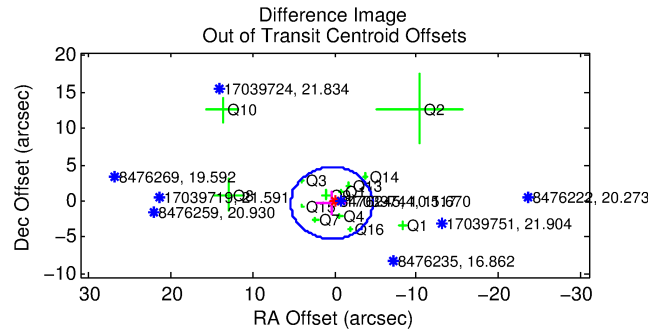
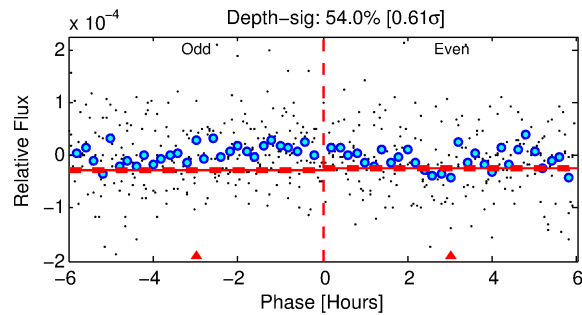
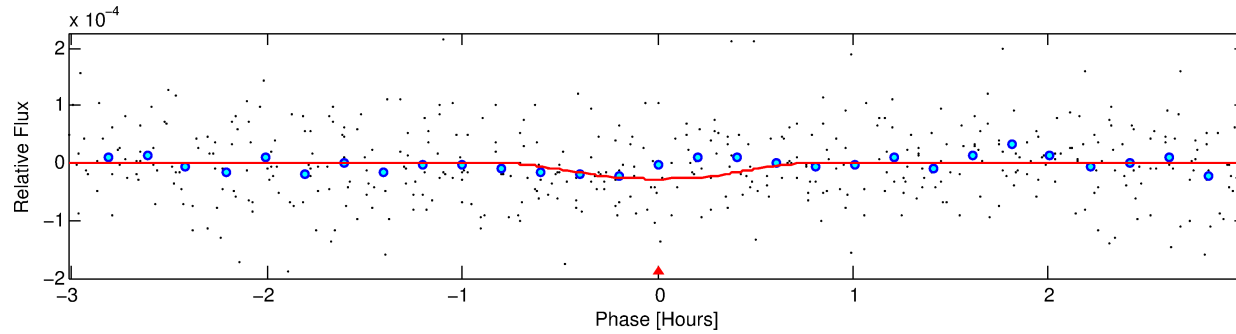
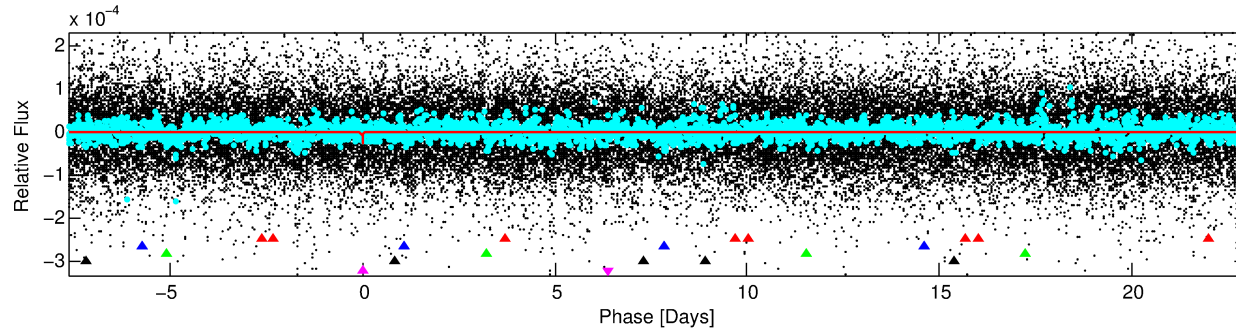
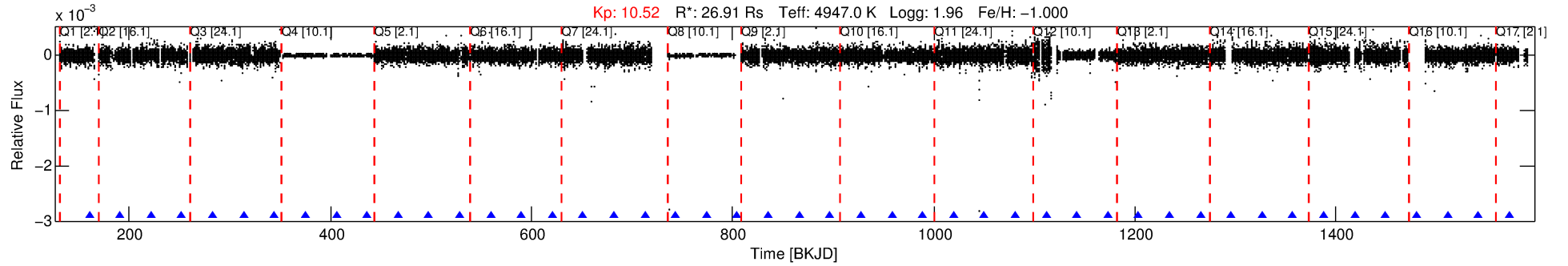
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008476245-05

No Significant Match Found

# DV One-Page Summary

KIC: 8476245 Candidate: 5 of 5 Period: 30.687 d



## DV Fit Results:

Period = 30.68716 [0.00009] d  
Epoch = 160.4122 [0.0016] BKJD  
Rp/R\* = 0.0058 [0.0013]  
a/R\* = 104.72 [114.89]  
b = 0.90 [0.23]  
Seff = 5909.96 [1422.60]  
Teq = 2236 [135] K  
Rp = 17.06 [6.86] Re  
a = 0.2564 [0.0581] AU  
Ag = 0.89 [0.50] [-0.22 $\sigma$ ]  
Teffp = 3356 [431] K [2.48 $\sigma$ ]

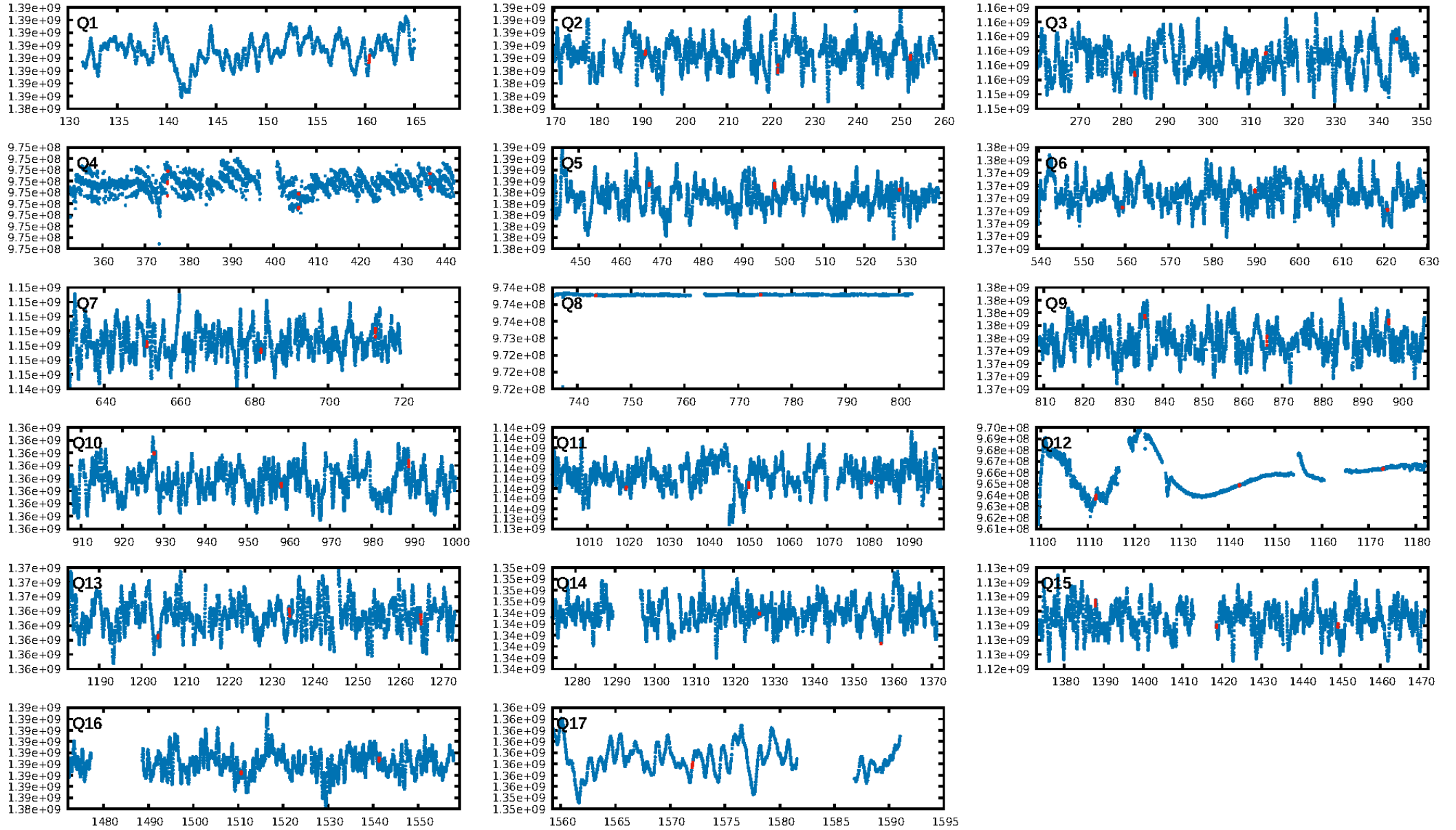
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [207.30 $\sigma$ ]  
ModelChiSquare2-sig: 99.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 5.89e-10**  
RollingBand-fgt: 1.00 [40/40]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 95.6%  
Centroid-so: 0.677 arcsec [0.18 $\sigma$ ]  
OotOffset-rm: 0.471 arcsec [0.28 $\sigma$ ]  
OotOffset-st: 3/4/3/3 [13]  
KicOffset-rm: 0.317 arcsec [0.20 $\sigma$ ]  
KicOffset-st: 3/4/3/3 [13]  
DiffImageQuality-fgm: 0.00 [0/13]  
DiffImageOverlap-fno: 1.00 [17/17]

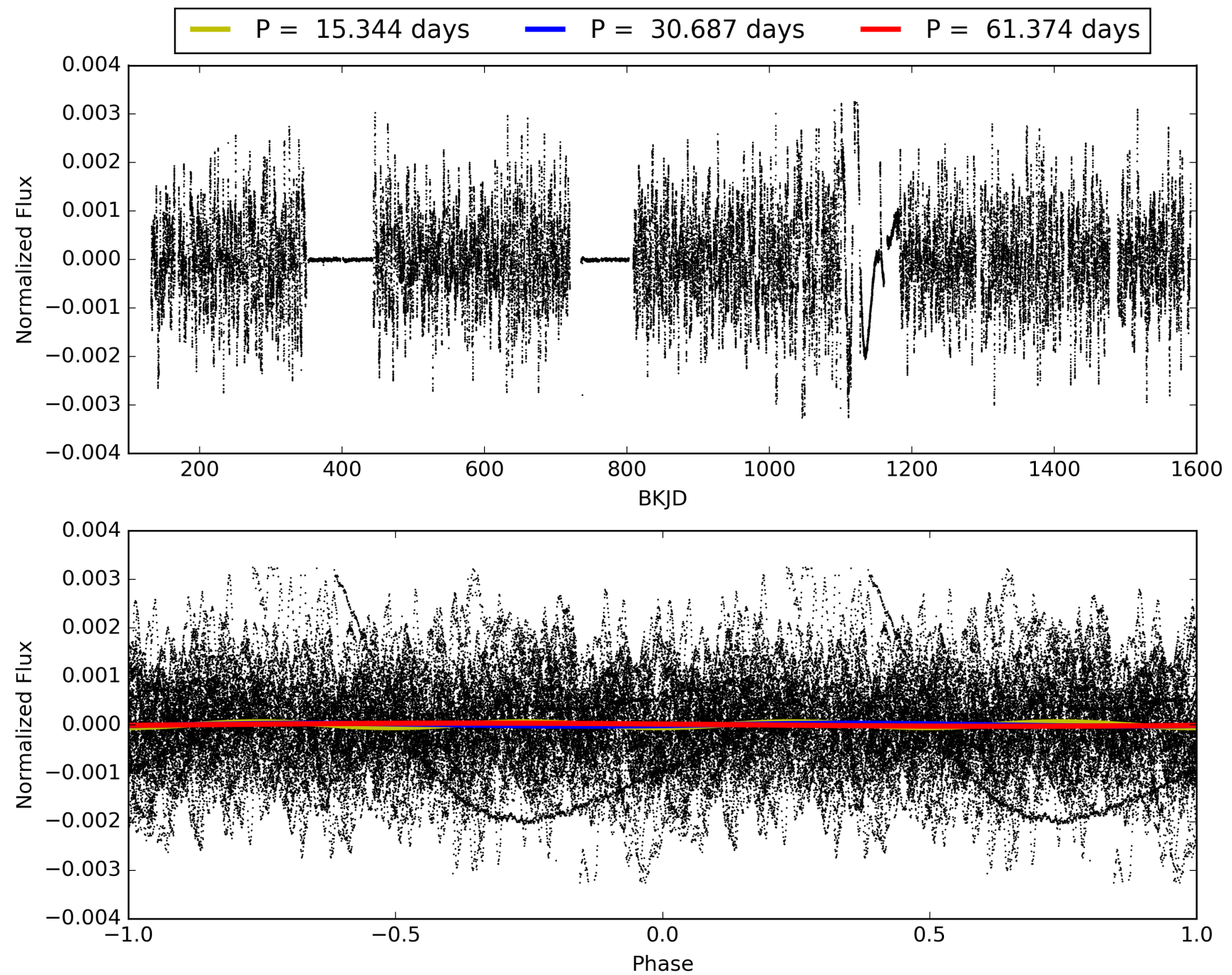
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 07:25:34 Z

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

# TCE 008476245-05, PDC Light Curves

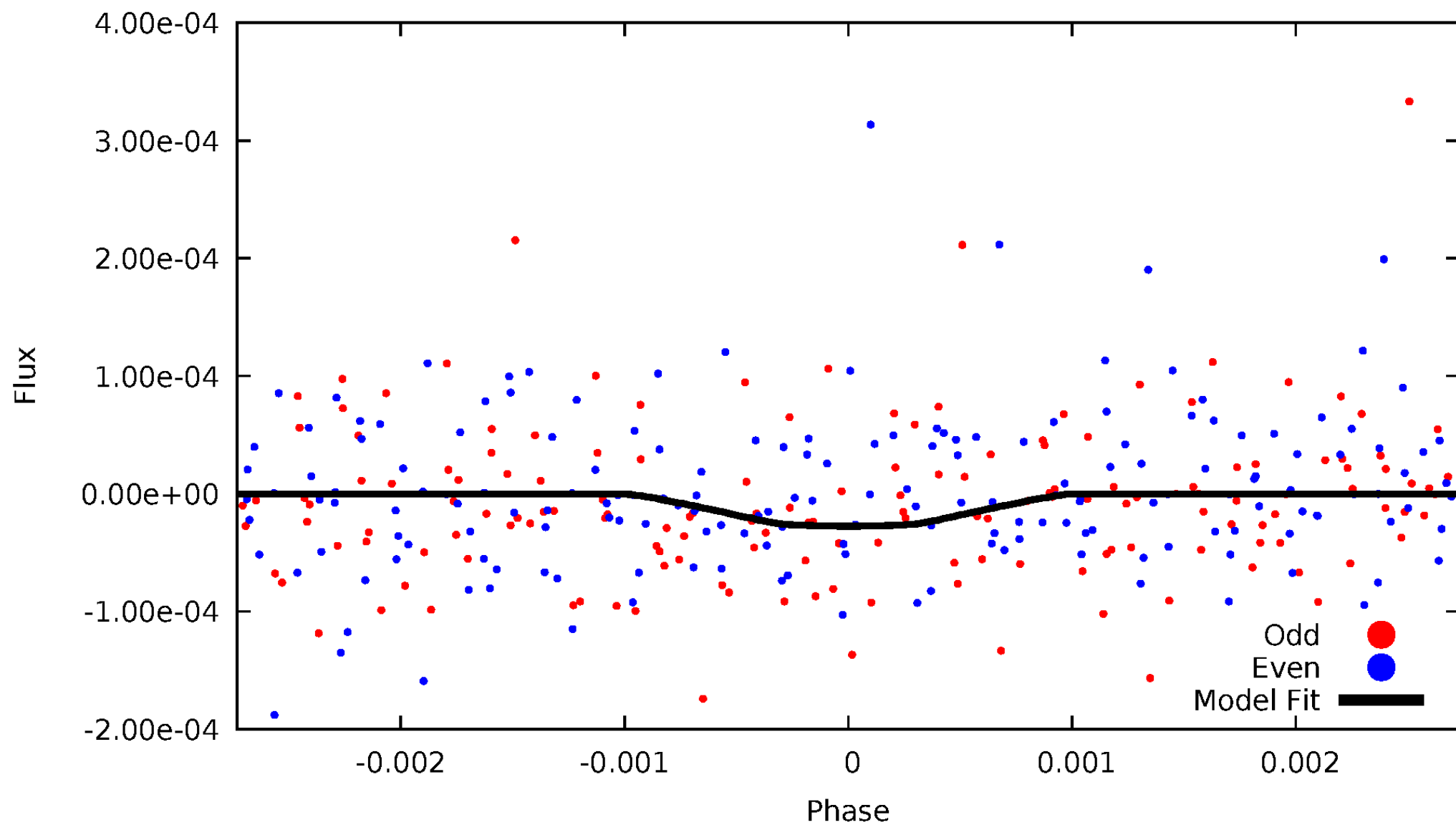


TCE 008476245-05



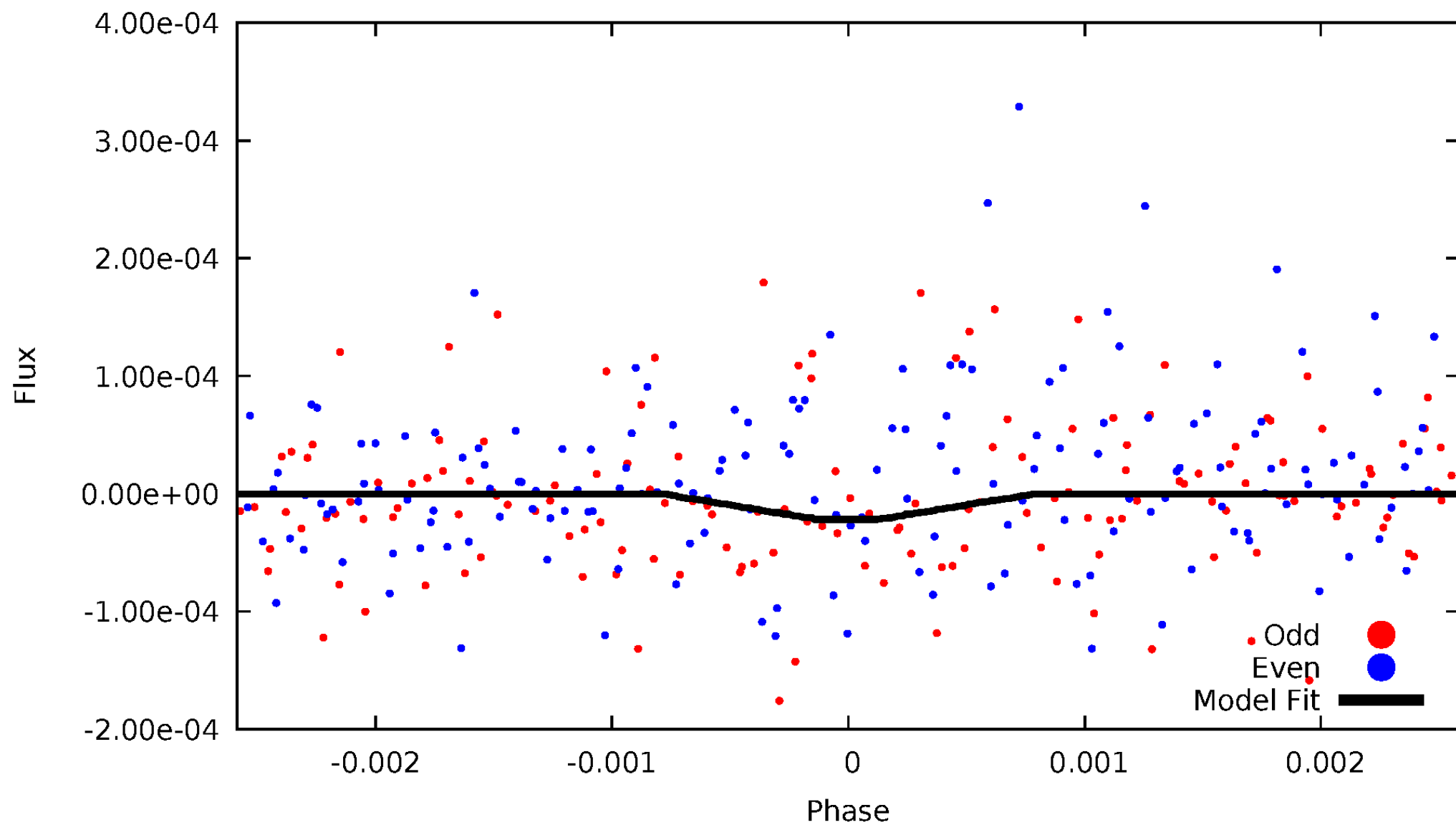
# DV Odd/Even

TCE 008476245-05



# ALT Odd/Even

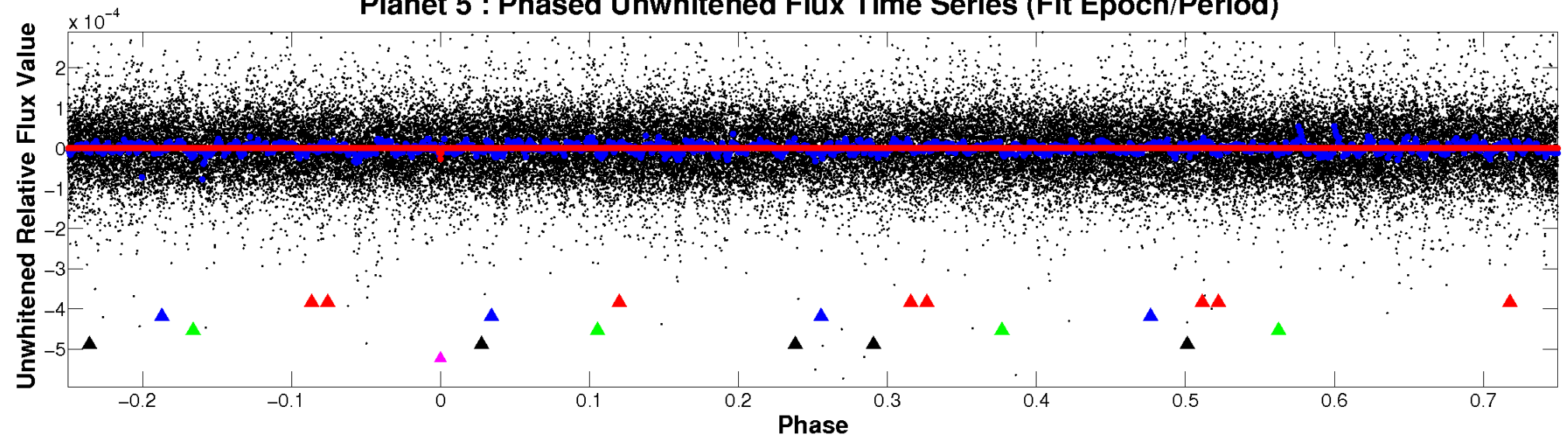
TCE 008476245-05



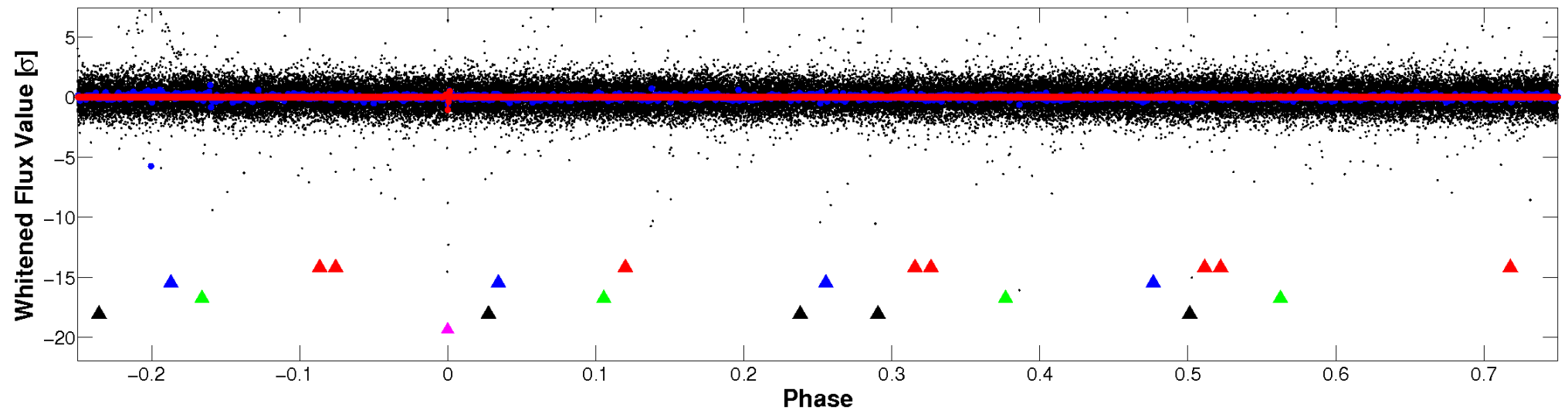


# Non-Whitened Vs. Whitened Light Curve

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

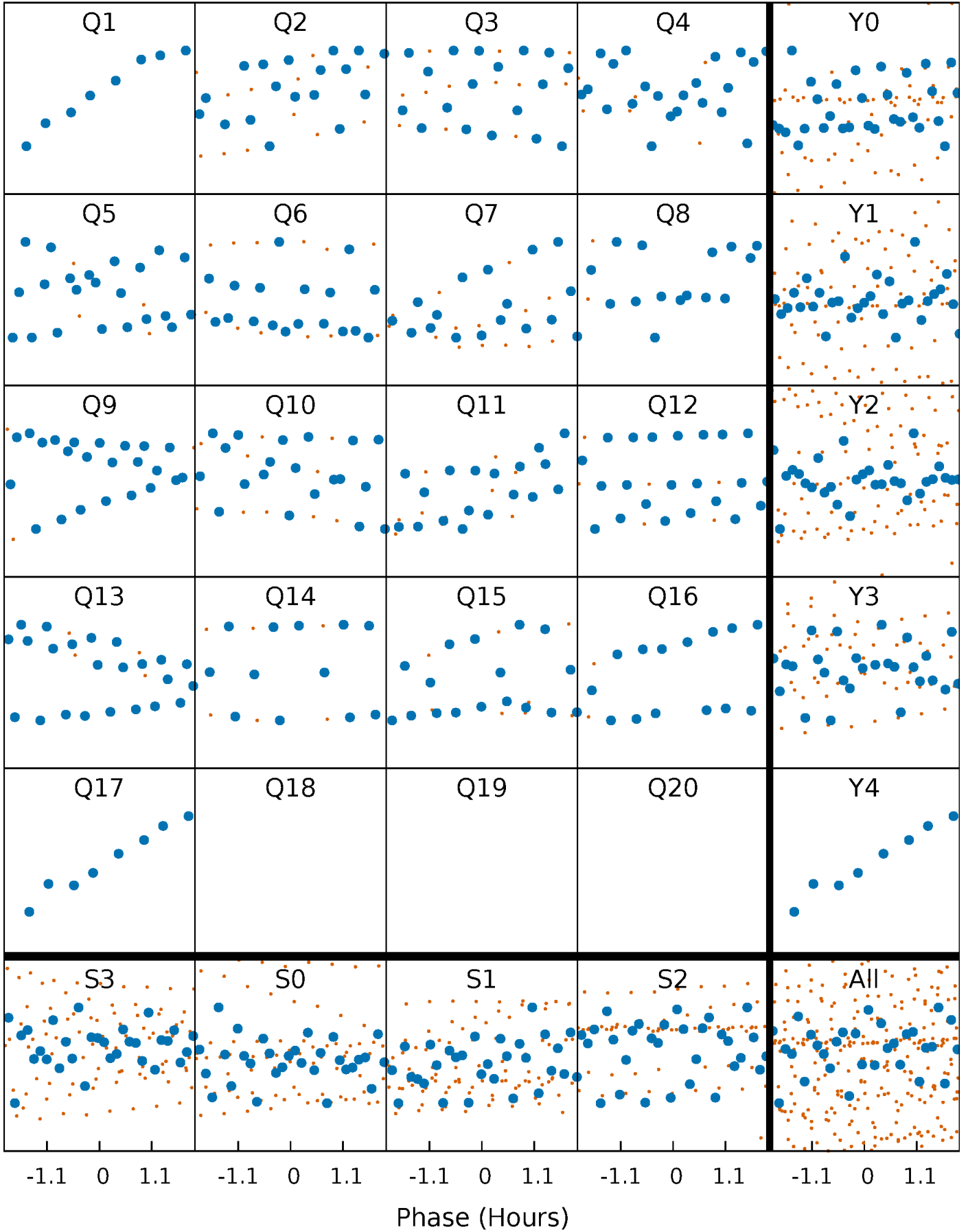


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

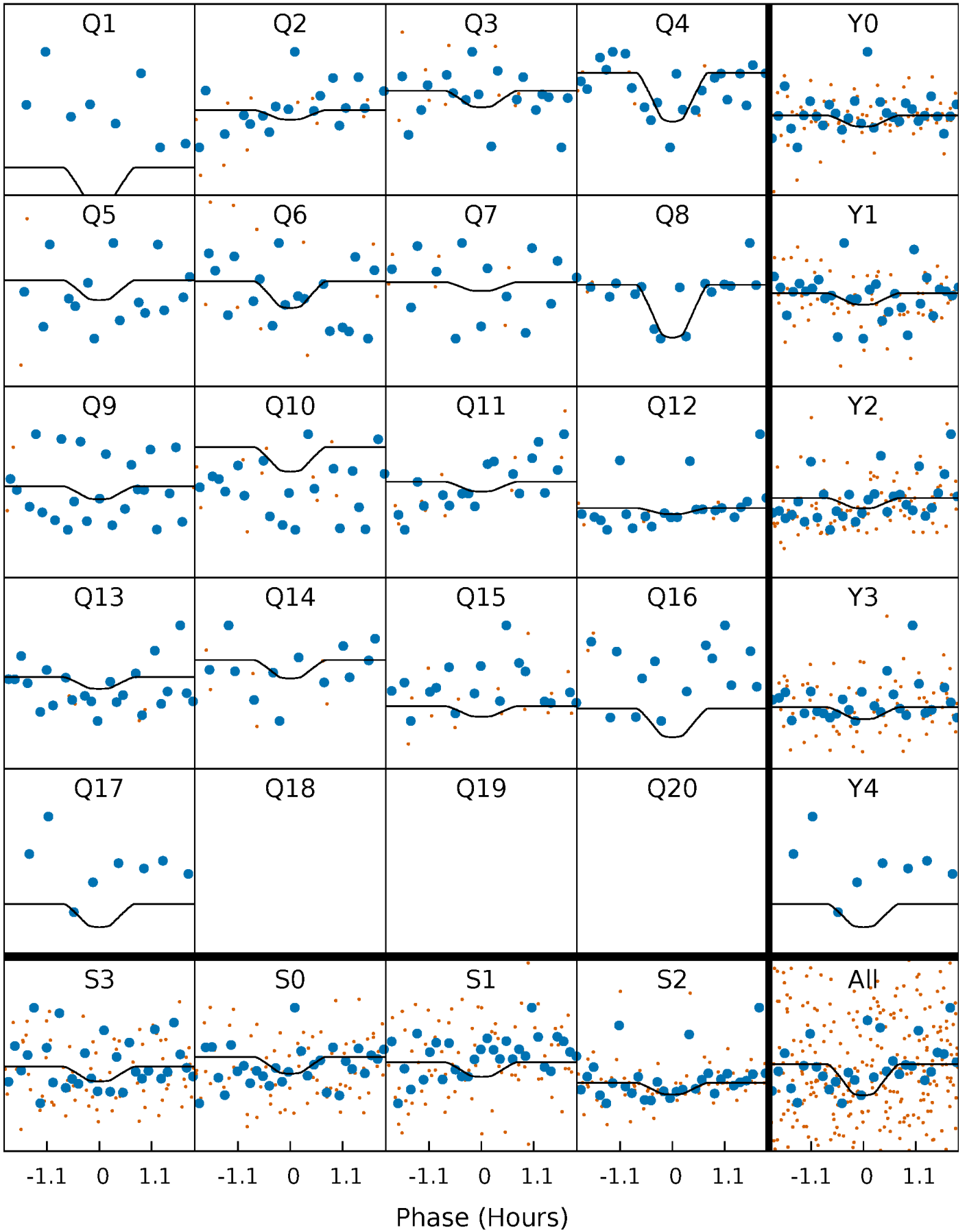
TCE 008476245-05     $P = 30.687156$  Days     $T_0 = 160.412225$  (BKJD)





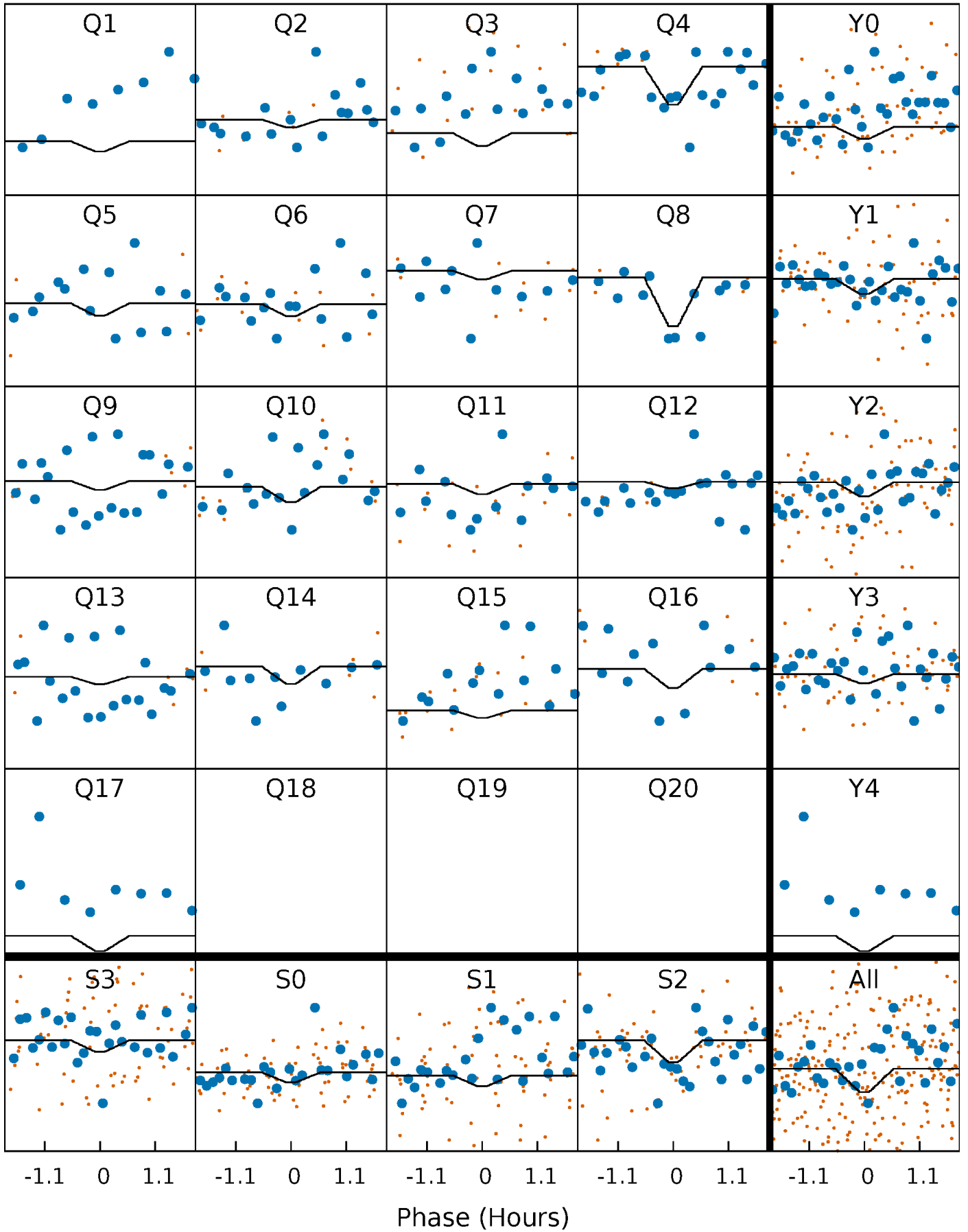
# DV Quarter-Phased Transit Curves

TCE 008476245-05   P= 30.687156 Days    $T_0=160.412225$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

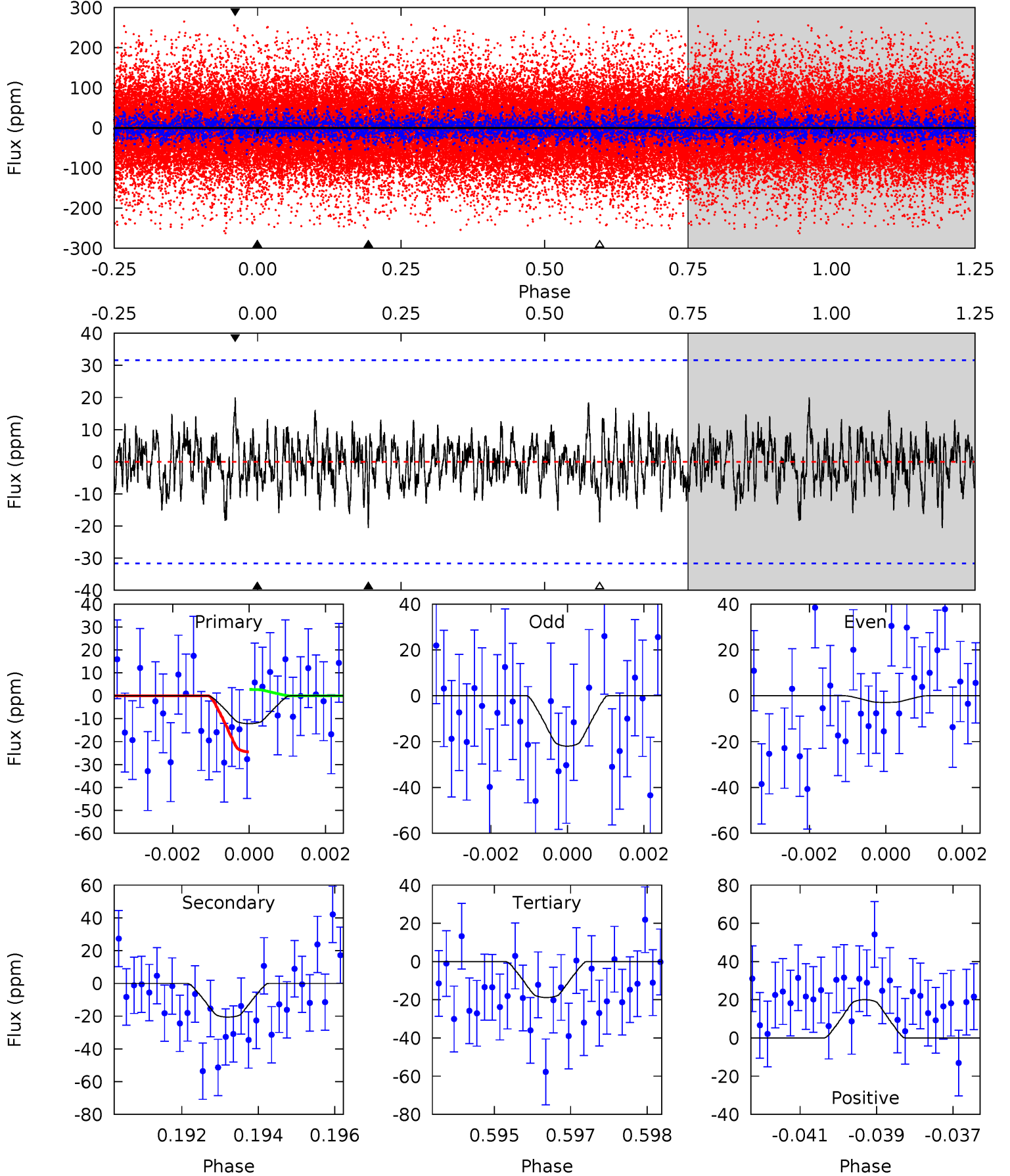
TCE 008476245-05     $P = 30.687699$  Days     $T_0 = 160.392004$  (BKJD)



# DV Model-Shift Uniqueness Test

008476245-05, P = 30.687156 Days, E = 129.725069 Days

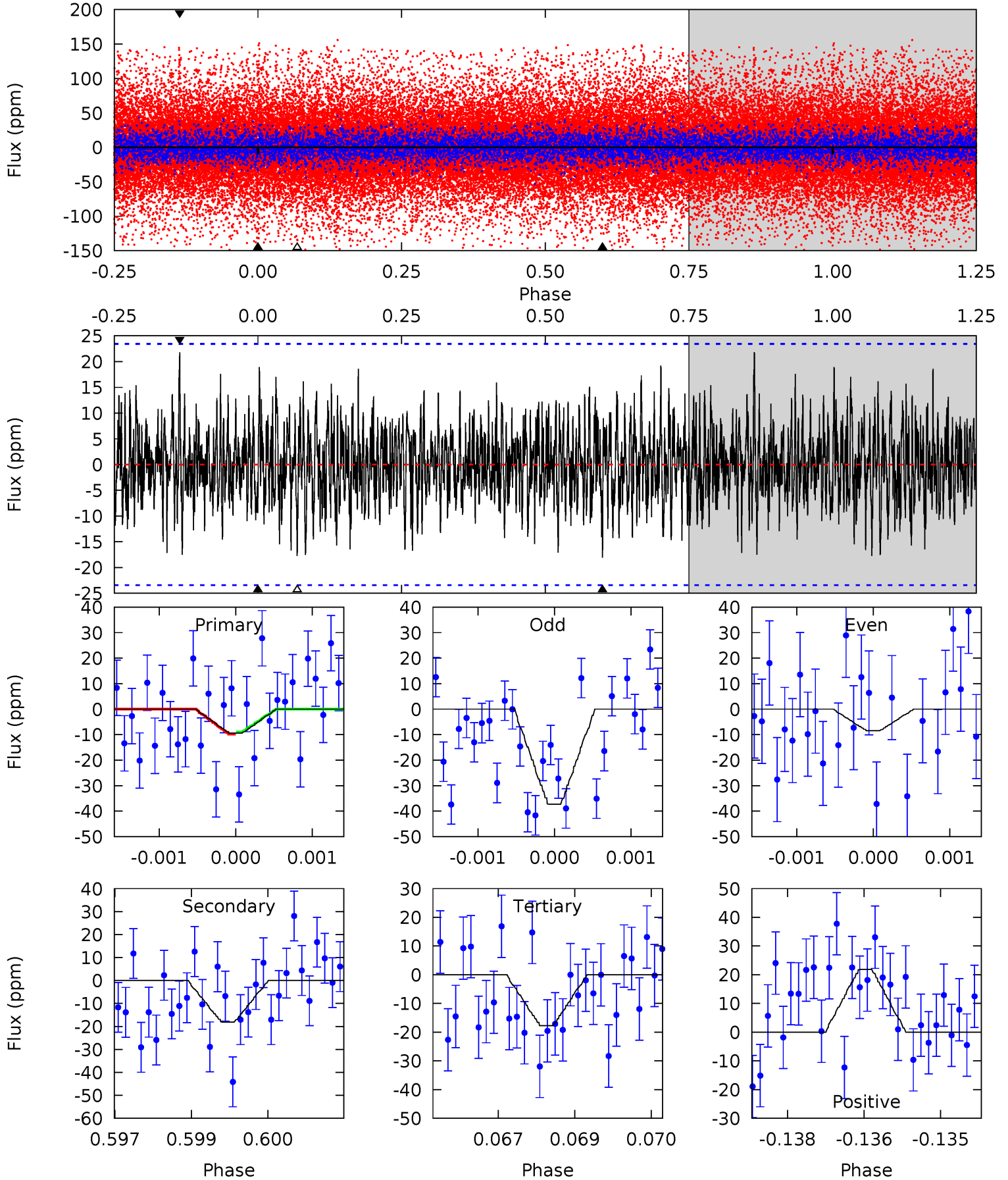
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.05	3.48	3.18	3.38	5.33	3.10	1.03	-1.13	-1.33	0.30	0.10	1.62	0.50	0.49	1.84



# Alt Model-Shift Uniqueness Test

008476245-05,  $P = 30.687699$  Days,  $E = 129.704305$  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
2.16	4.15	4.07	5.01	5.38	3.18	1.41	-1.91	-2.85	0.08	-0.86	3.31	-0.17	0.55	0.10



### Stellar Parameters For KIC 008476245

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4947^{+36}_{-87}$	$1.956^{+0.030}_{-0.027}$	$-1.000^{+0.100}_{-0.450}$	$26.909^{+3.252}_{-9.104}$	$2.387^{+0.707}_{-1.312}$	$0.000^{+0.000}_{-0.000}$
	+1%/-2%	+2%/-1%	+10%/-45%	+12%/-34%	+30%/-55%	+52%/-13%
Source	PHO56	AST56	PHO56	DSEP		

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

### Secondary Eclipse Parameters for KIC 008476245-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-21 \pm 6$	$17.28^{+4.61}_{-4.30}$	$3136^{+63}_{-96}$	$4378^{+607}_{-496}$	$2.559^{+2.141}_{-1.084}$
Alt.	$-18 \pm 4$	$14.09^{+4.19}_{-4.45}$	$3132^{+60}_{-84}$	$4650^{+860}_{-534}$	$3.425^{+3.634}_{-1.490}$

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

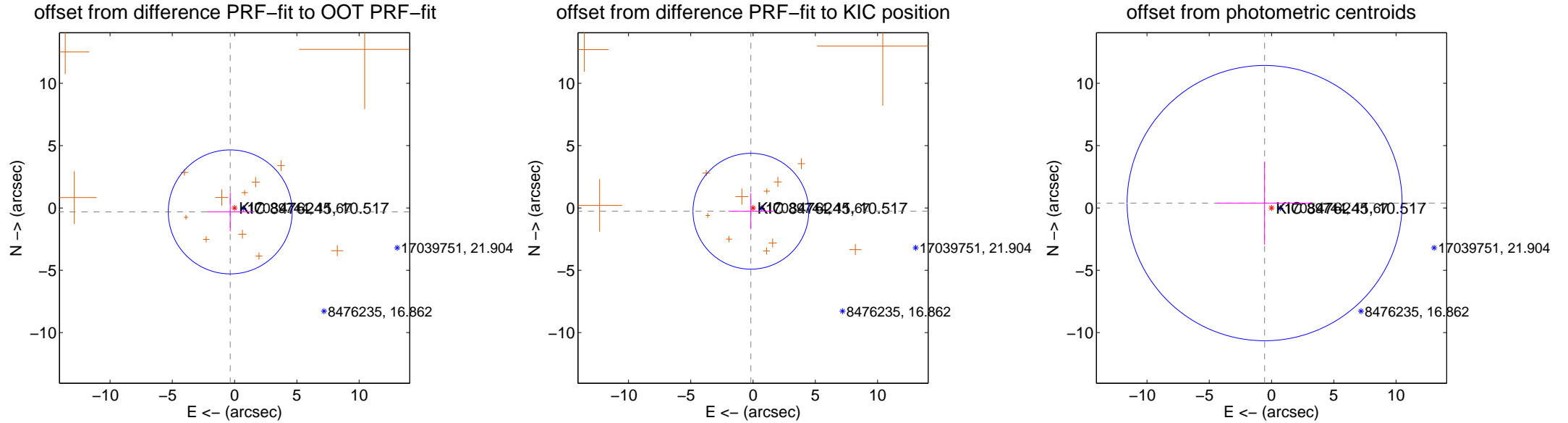
## DV Centroid Data

Supplemental centroid analysis for 008476245-05. **Kepler magnitude: 10.52.** Transit SNR 23.24

**There are 0 quarters with good PRF difference image offsets**

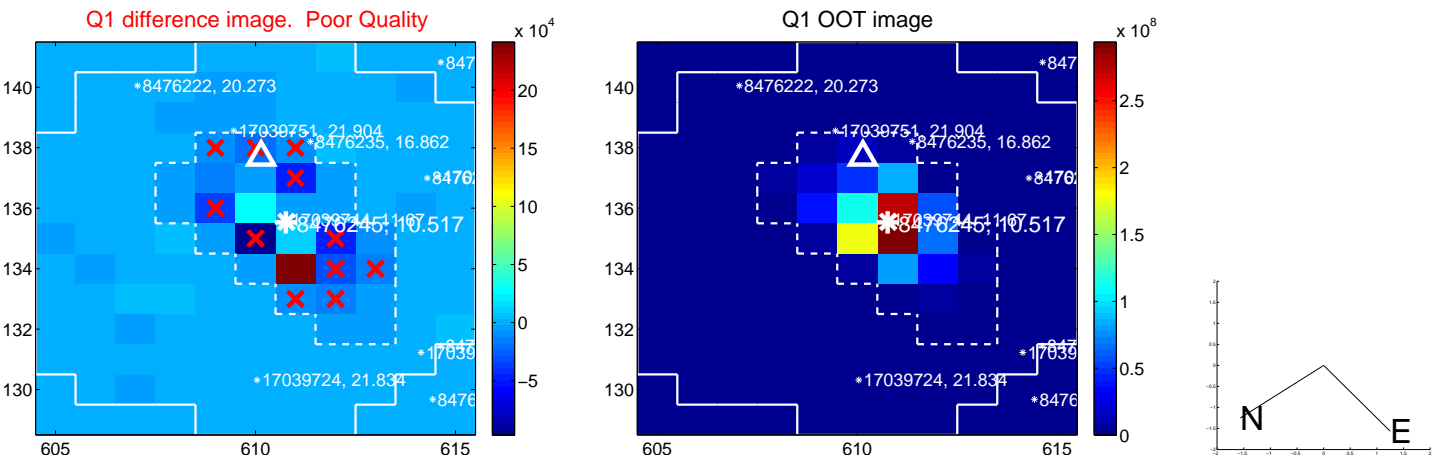
The direct PRF centroid is offset from the target star catalog position by about 0.96 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.471 \pm 1.658$	0.28	$0.348 \pm 1.855$	$-0.317 \pm 1.544$
PRF-fit source offset from KIC position	$0.317 \pm 1.549$	0.20	$0.175 \pm 1.783$	$-0.264 \pm 1.451$
photometric centroid source offset	$0.68 \pm 3.68$	0.18	$0.55 \pm 3.84$	$0.39 \pm 3.33$

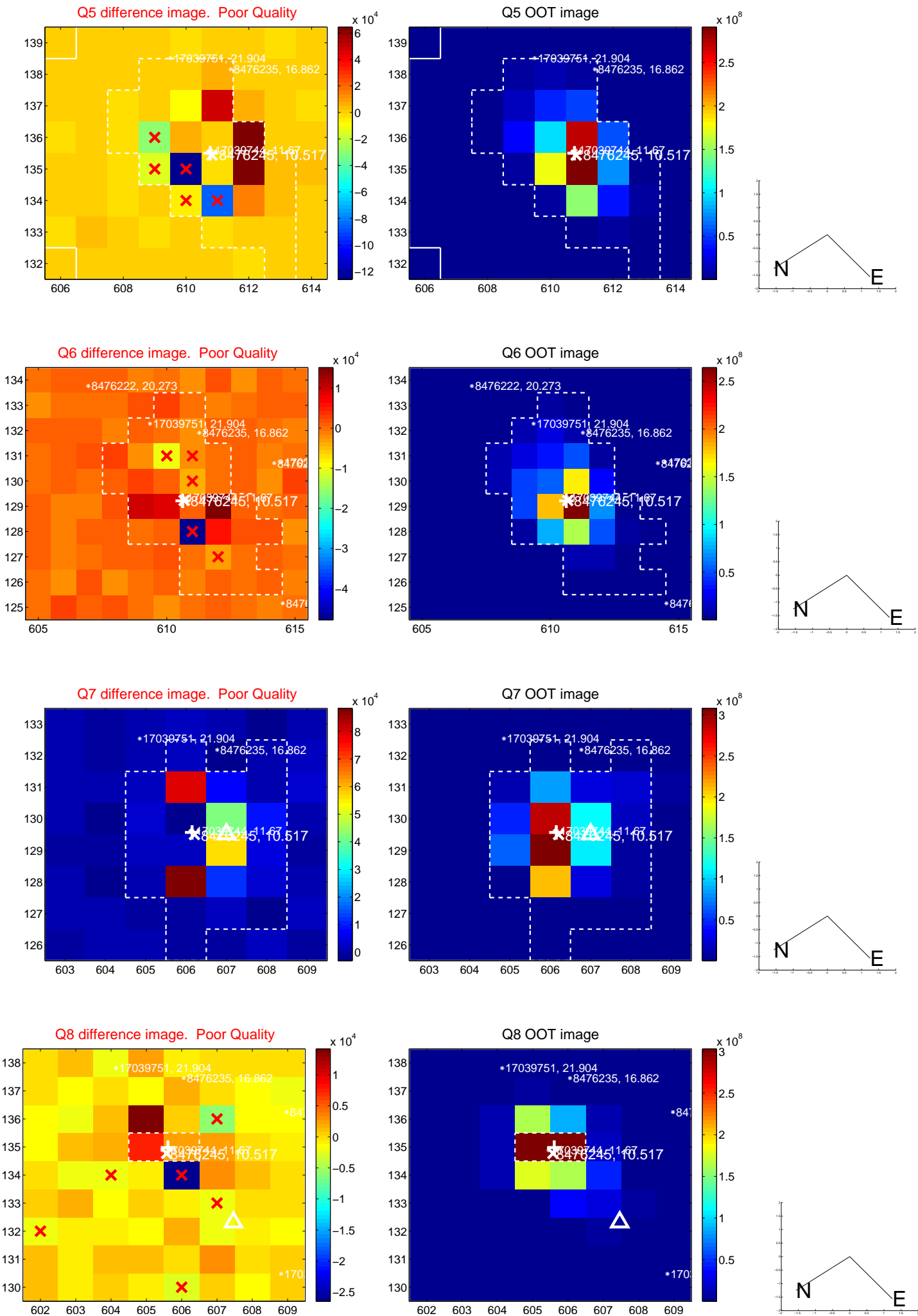


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

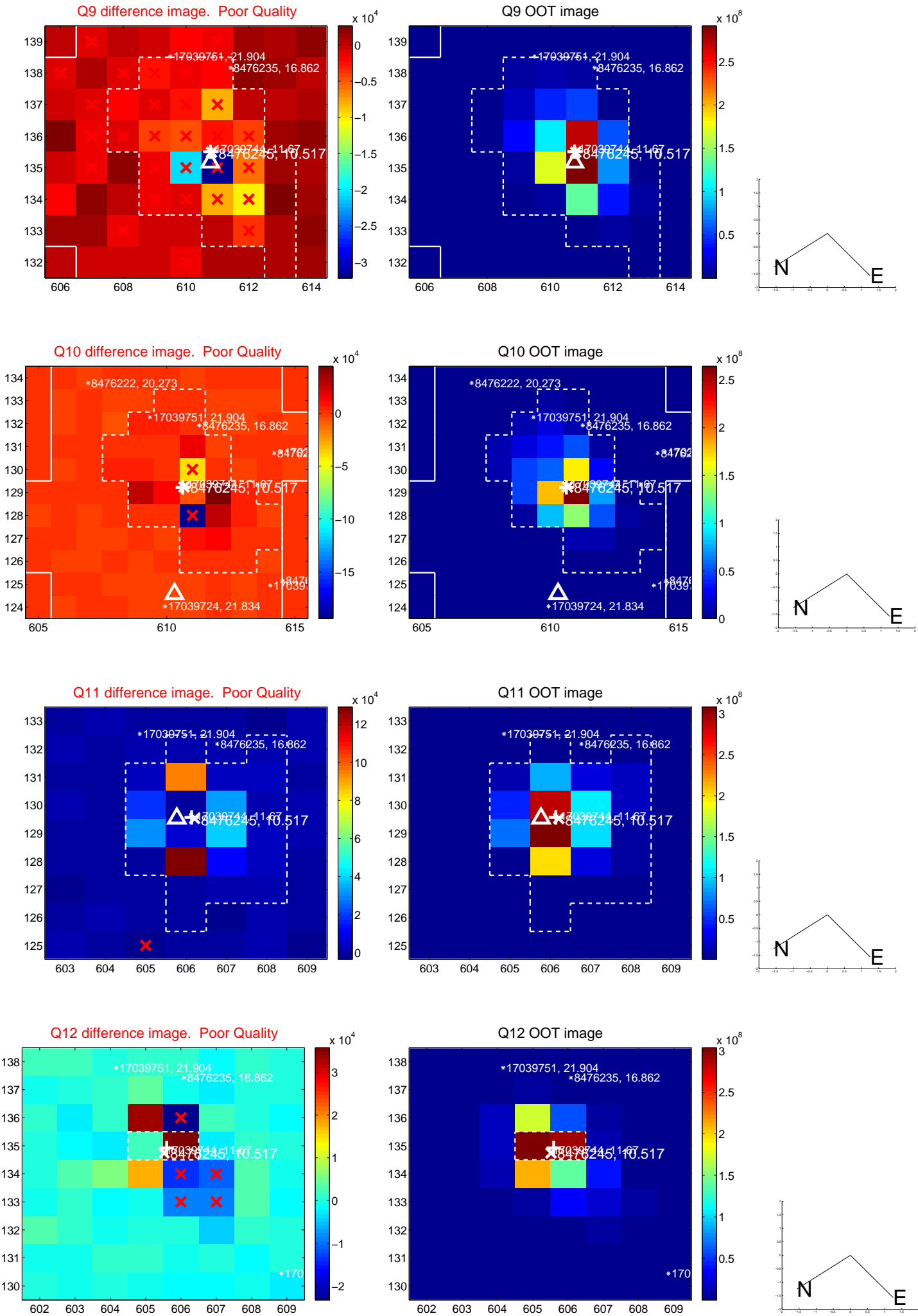


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

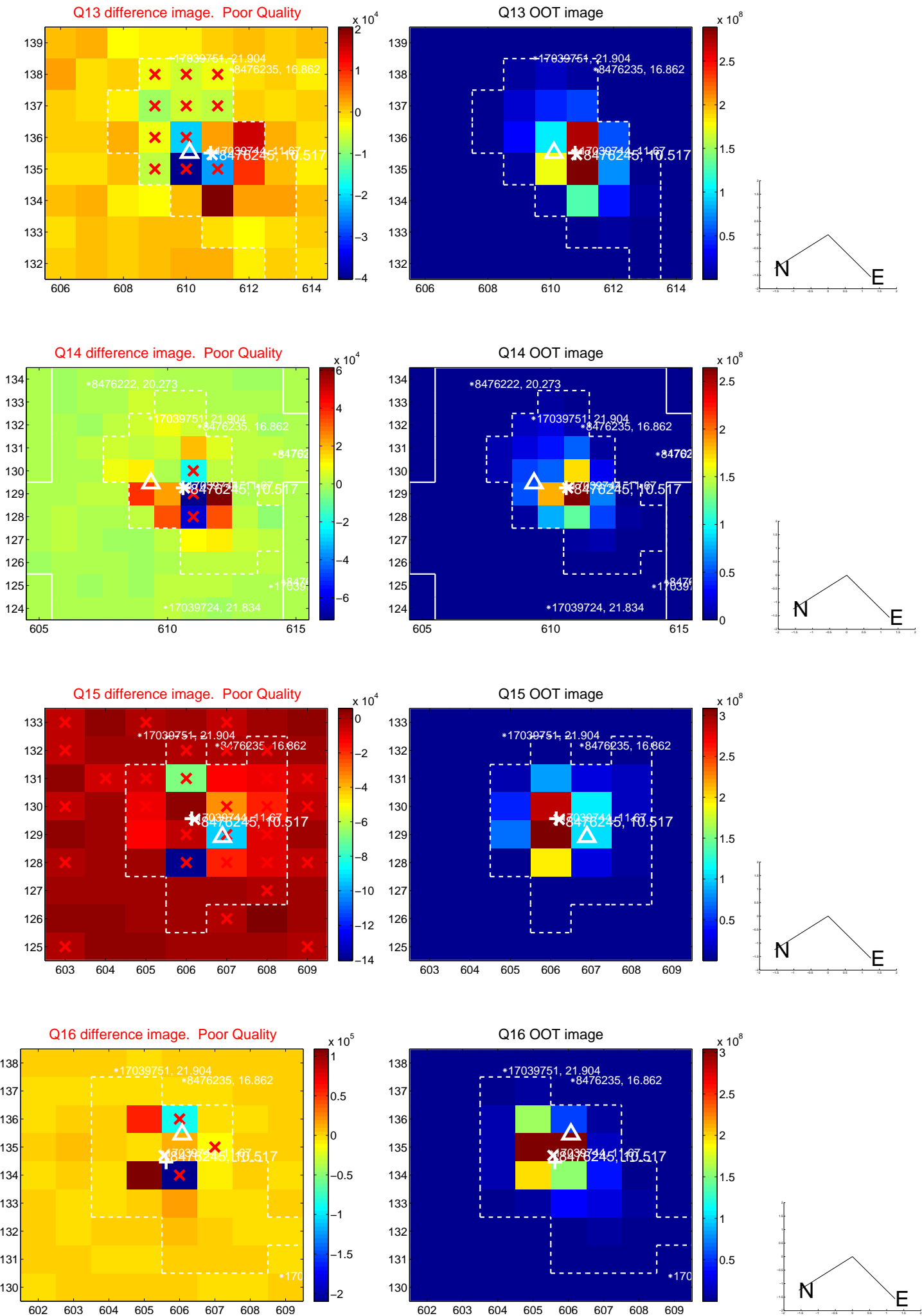




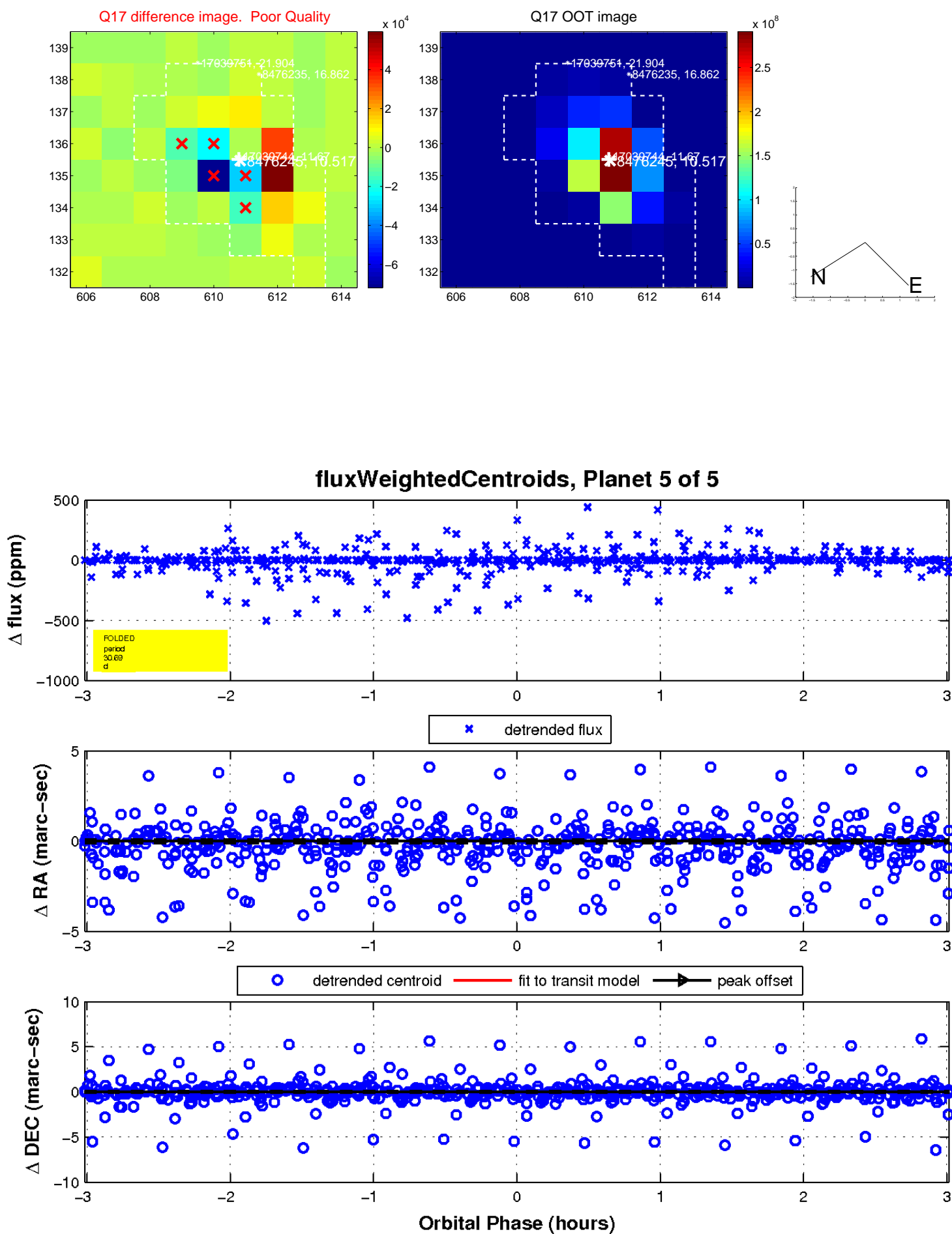
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

