

# KIC 007121016

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007121016-01	OBS	No	2.690847	132.701560	11.7	6.836	10.0	4.5	1.58	7141	0.55	3251.61
007121016-02	OBS	No	5.384677	137.245455	12.5	43.675	9.9	4.9	1.58	7141	0.60	1289.45

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007121016-01	OBS	FP	0.00	1	0	0	0	LPP_DV
007121016-02	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—CENT_UNRESOLVED_OFFSET

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

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

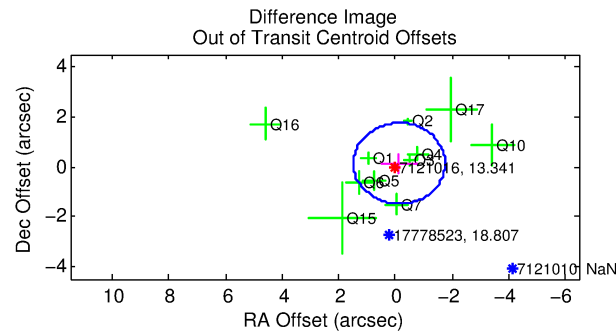
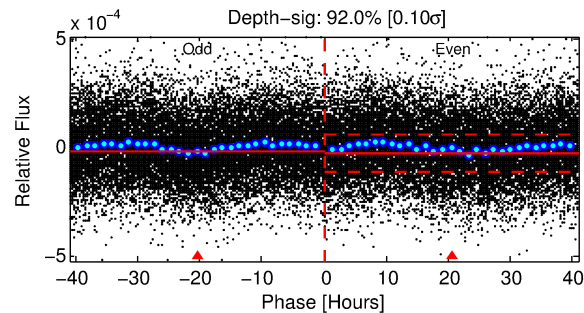
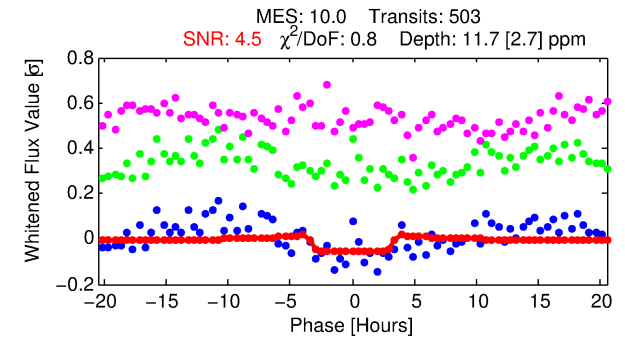
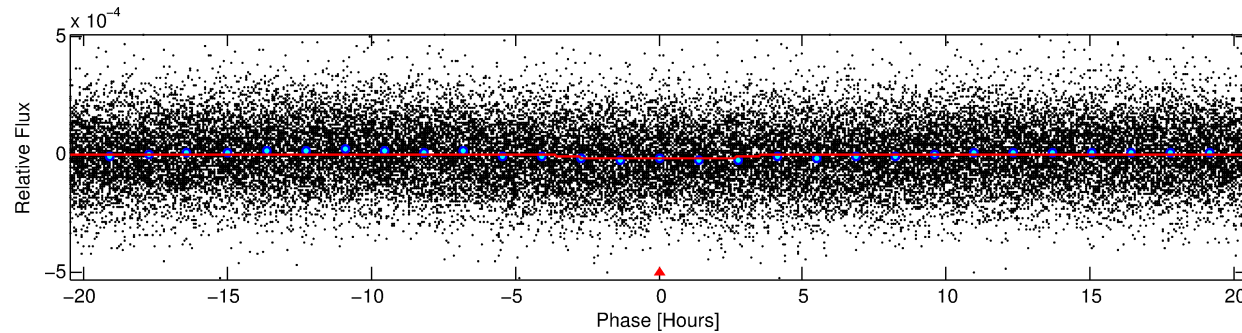
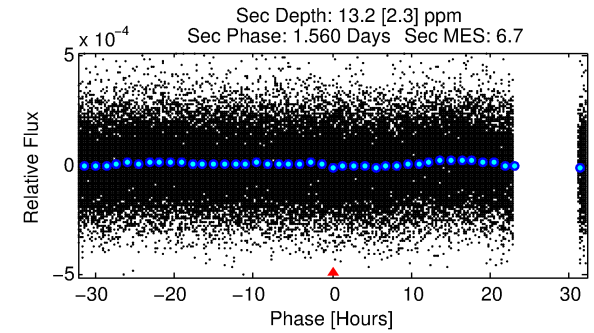
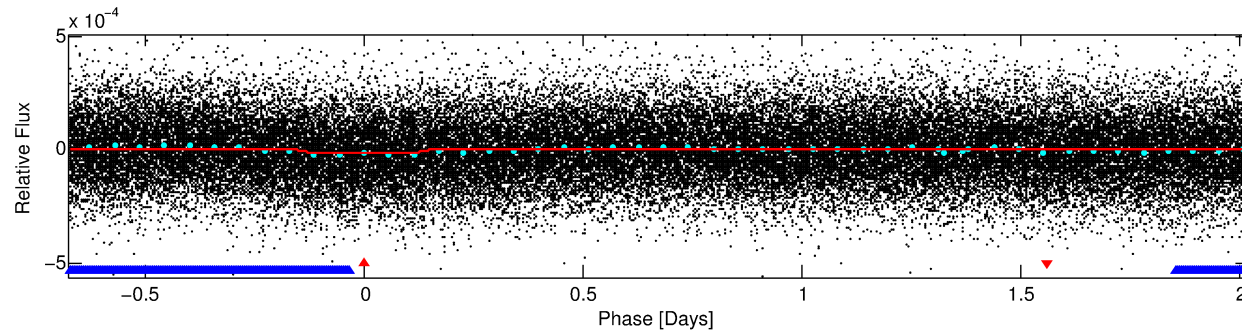
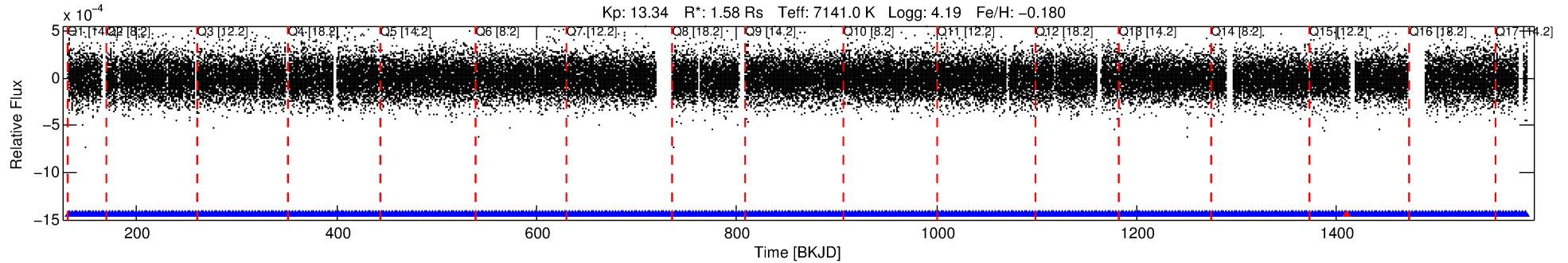
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 007121016-01

No Significant Match Found

# DV One-Page Summary

KIC: 7121016 Candidate: 1 of 2 Period: 2.691 d



## DV Fit Results:

Period = 2.69085 [0.00006] d  
Epoch = 132.7016 [0.0121] BKJD  
Rp/R\* = 0.0032 [0.0038]  
a/R\* = 3.02 [18.58]  
b = 0.20 [33.90]  
Seff = 3251.61 [1300.82]  
Teq = 1926 [193] K  
Rp = 0.55 [0.68] Re  
a = 0.0424 [0.0110] AU  
Ag = 43.29 [104.54] [0.40σ]  
Teffp = 7636 [4570] K [1.25σ]

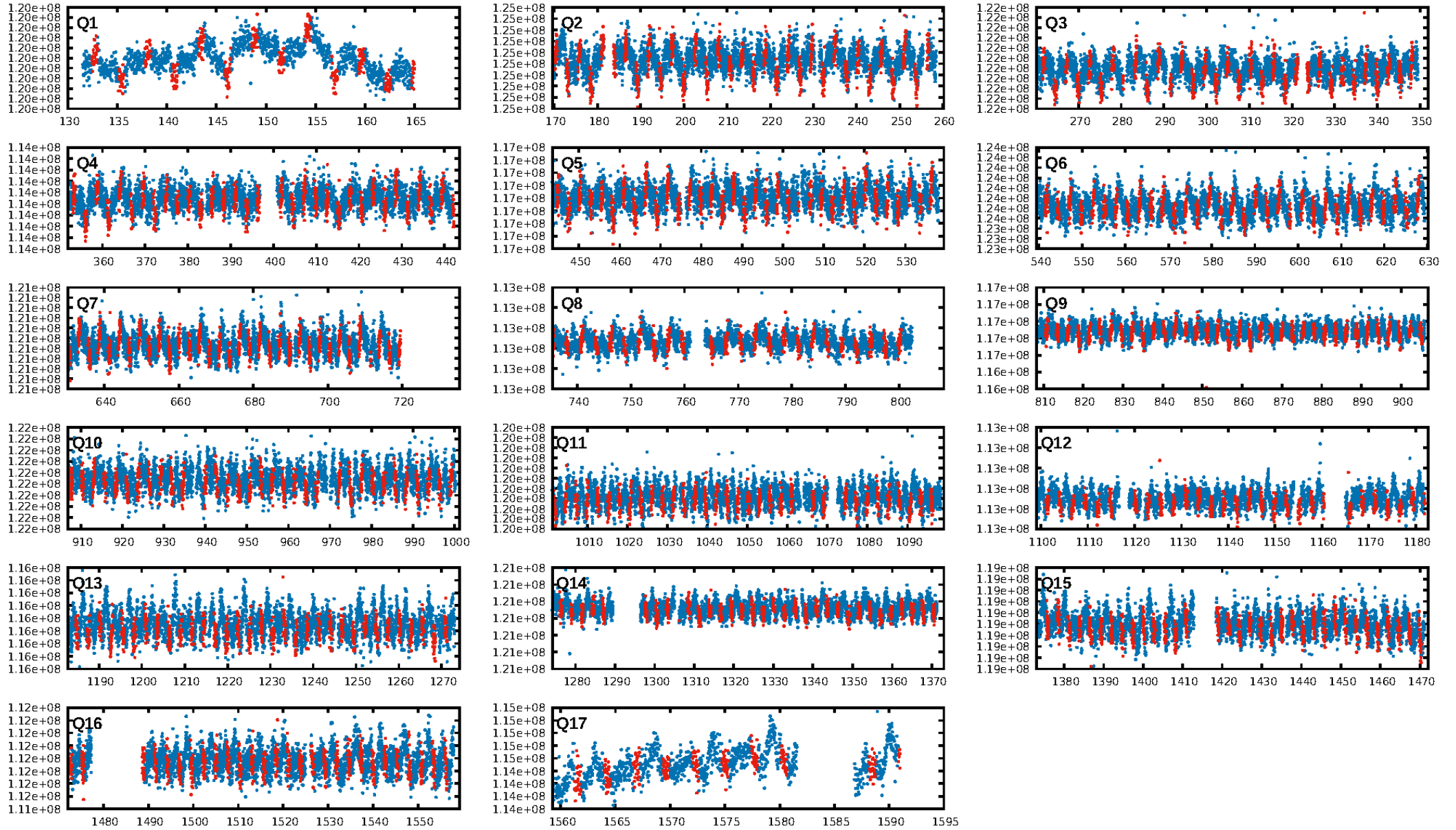
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 85.6% [1.46σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [479/480]  
GhostDiagnostic-chr: 32.49  
Centroid-sig: 85.0%  
Centroid-so: 0.487 arcsec [0.23σ]  
OotOffset-rm: 0.189 arcsec [0.35σ]  
KicOffset-rm: 0.225 arcsec [0.36σ]  
OotOffset-st: 3/3/2/3 [11]  
KicOffset-st: 3/3/2/3 [11]  
DiffImageQuality-fgm: 0.64 [7/11]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:23:11 Z

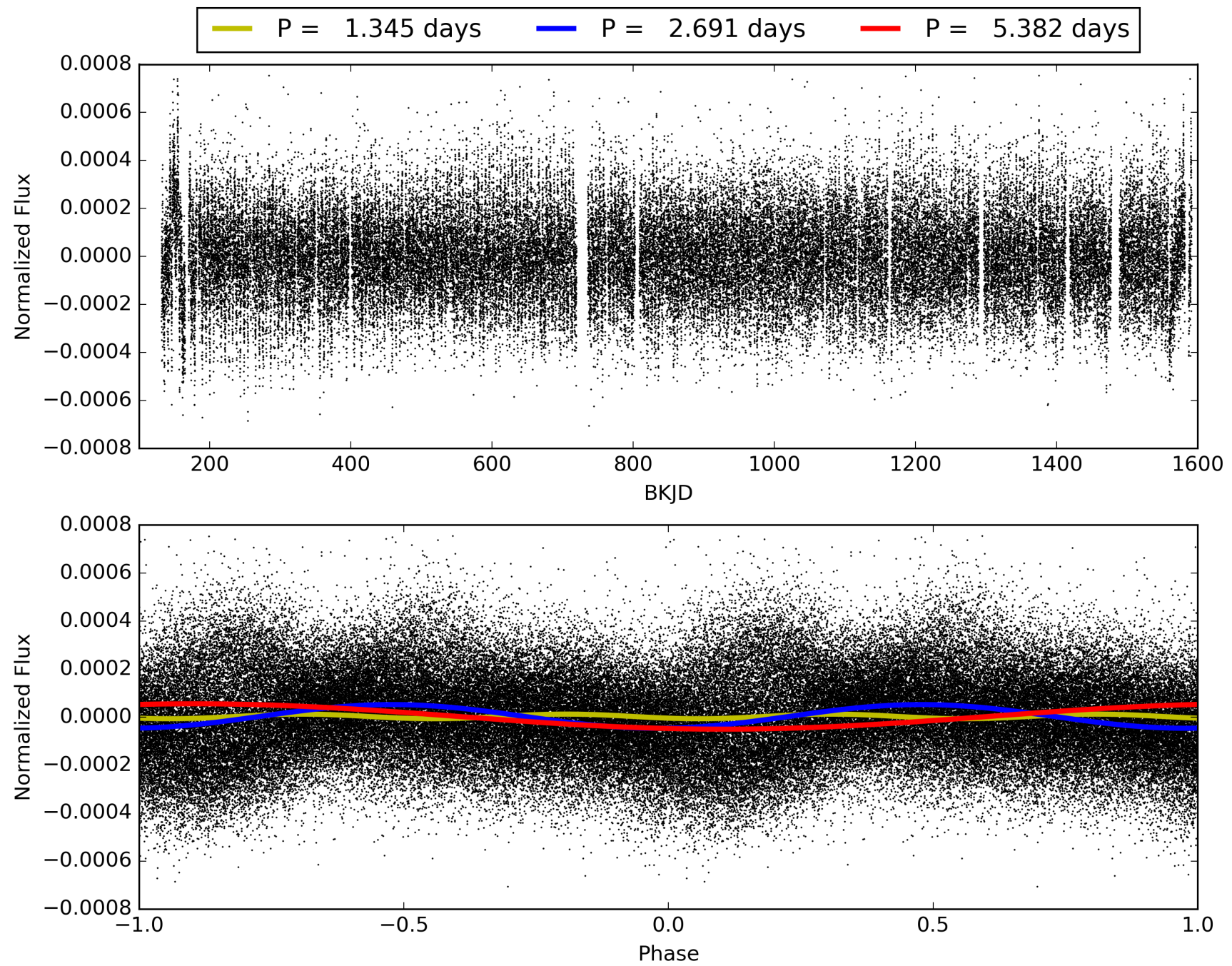
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 007121016-01, PDC Light Curves



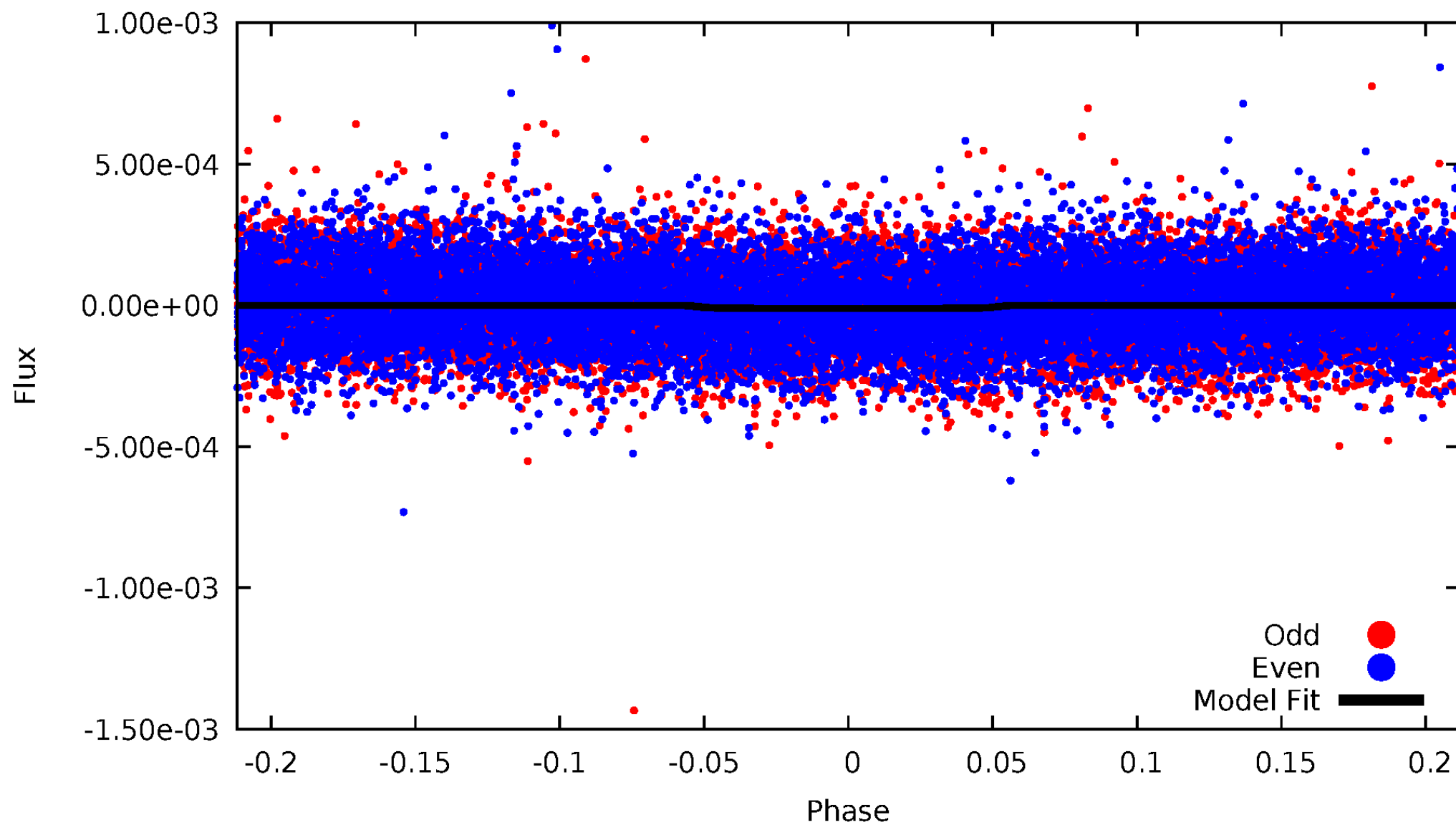


TCE 007121016-01



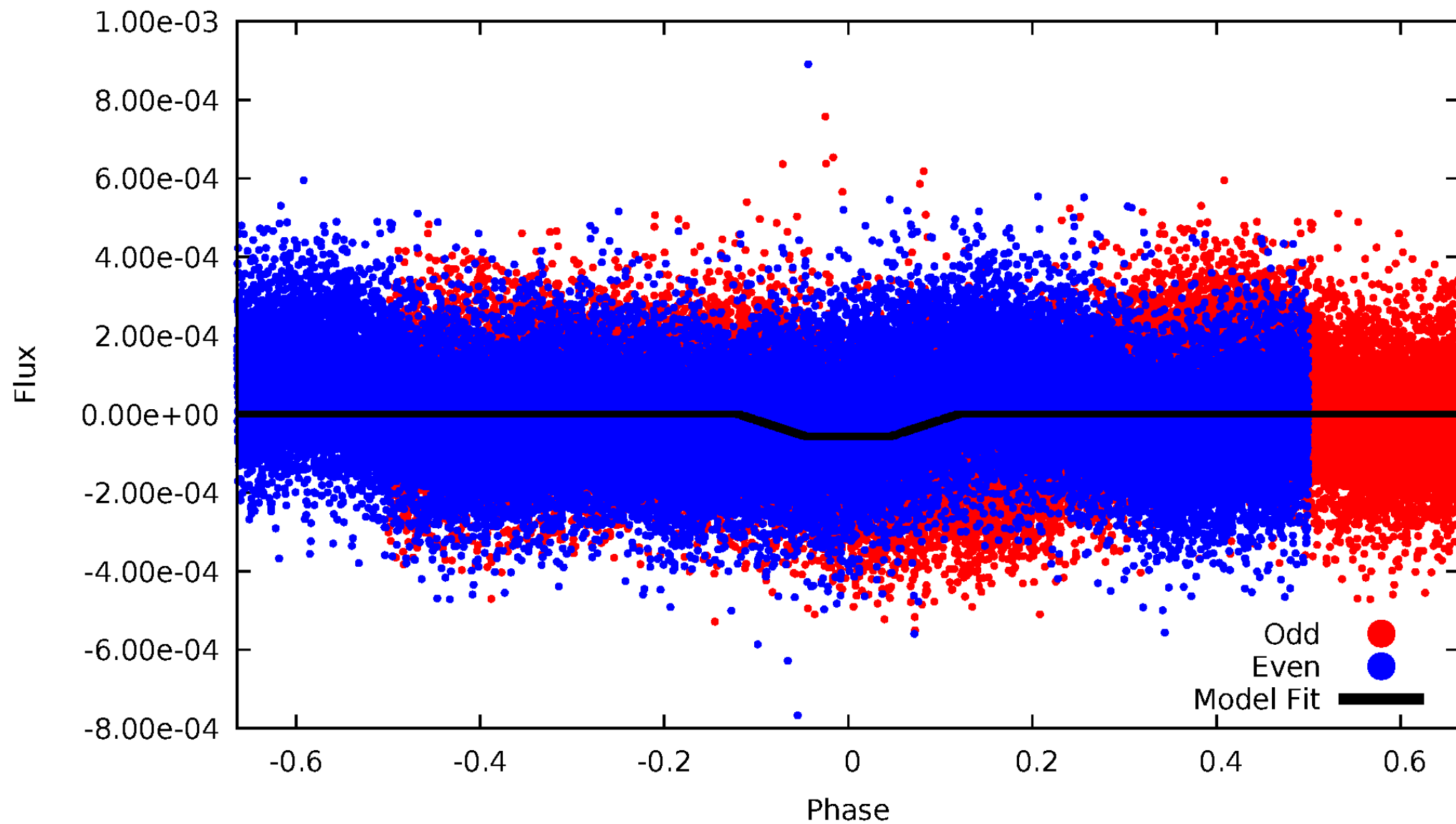
# DV Odd/Even

TCE 007121016-01

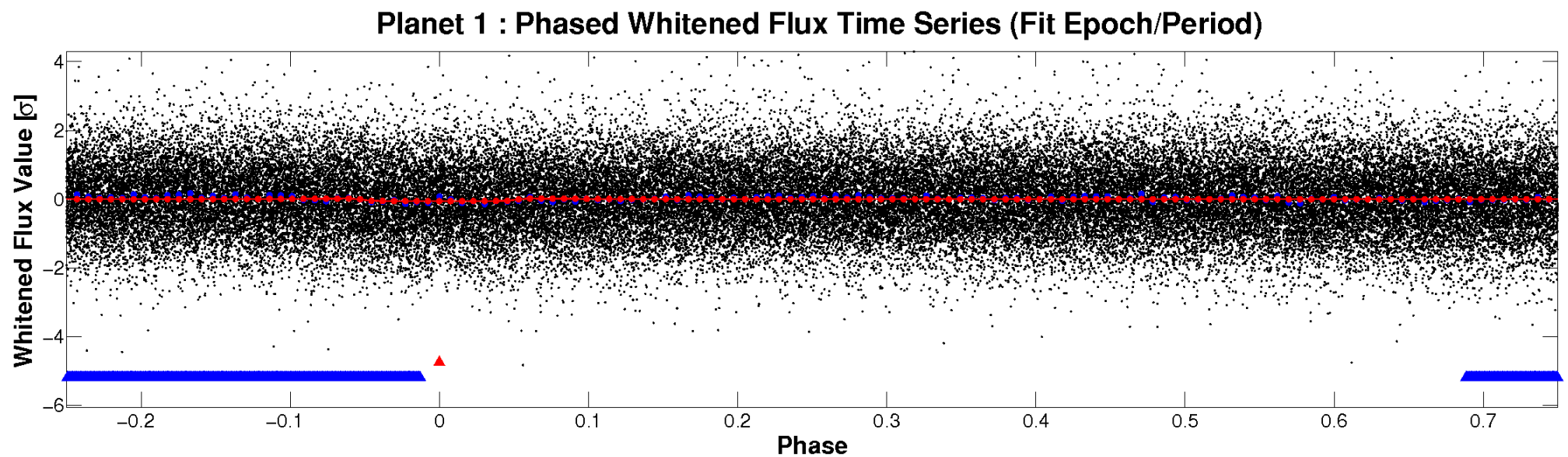
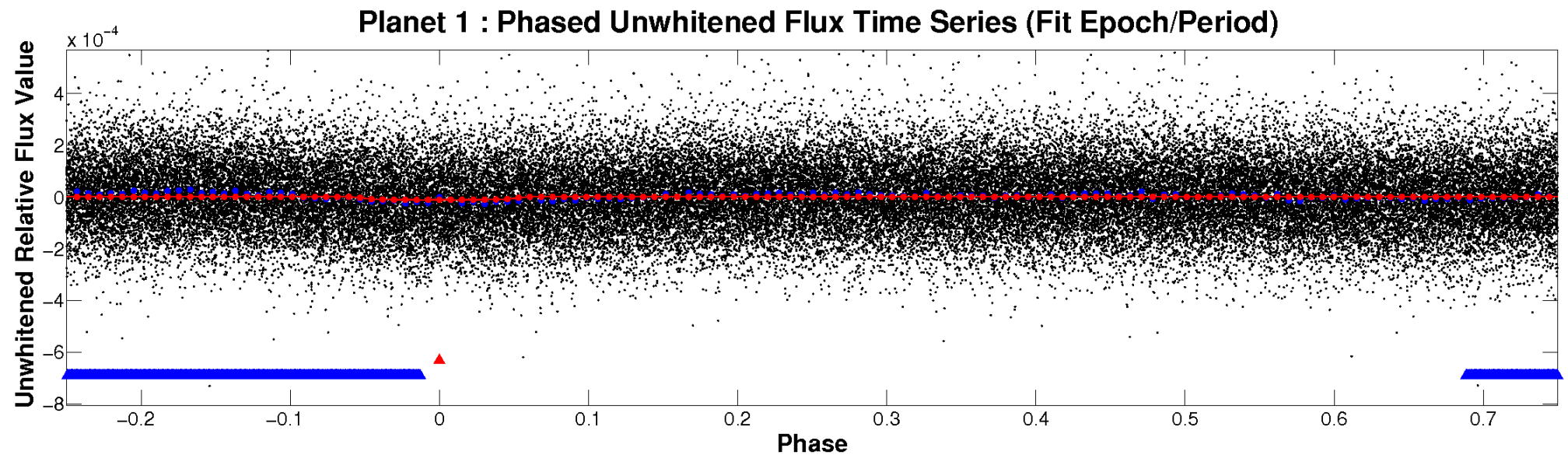


# ALT Odd/Even

TCE 007121016-01



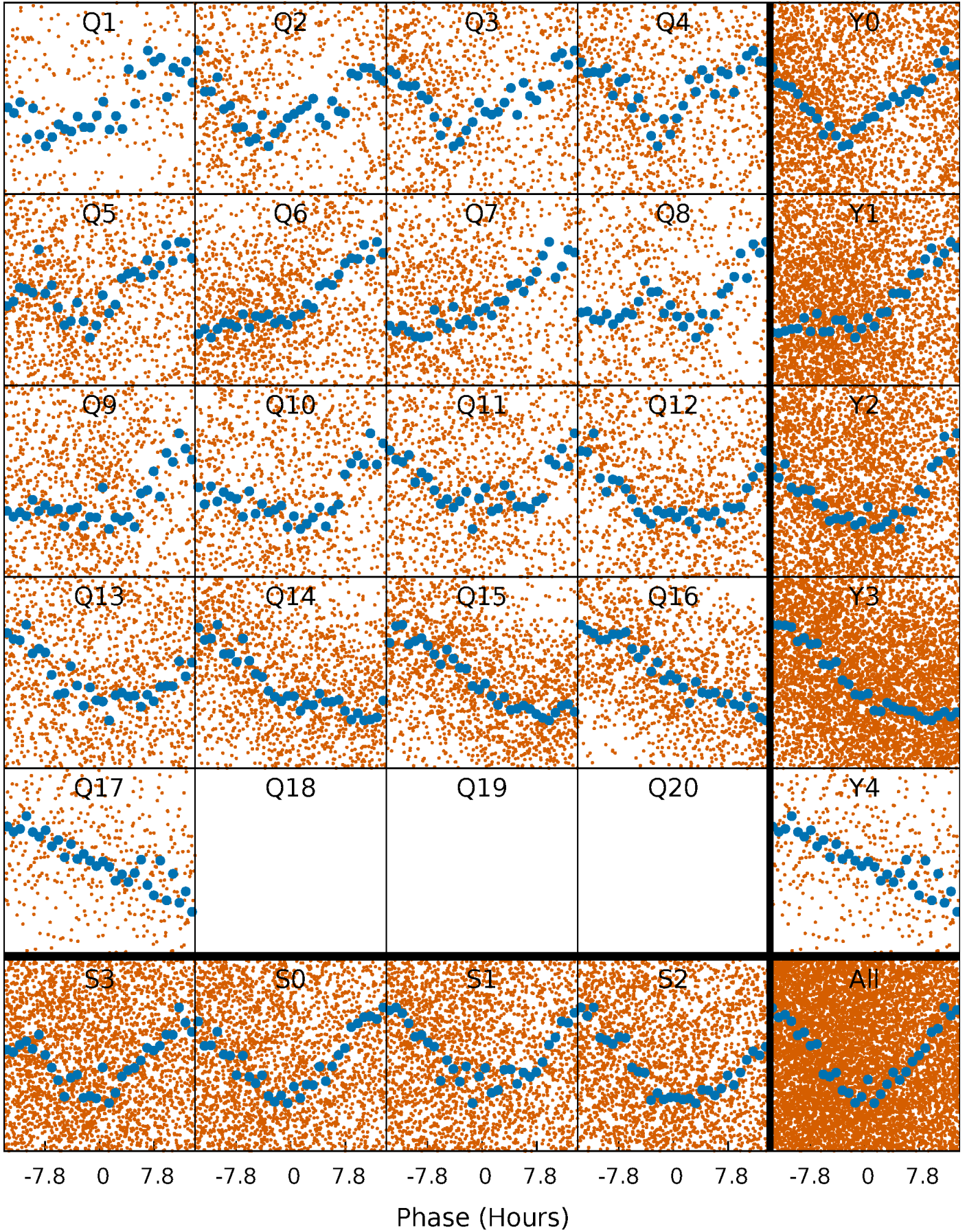
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

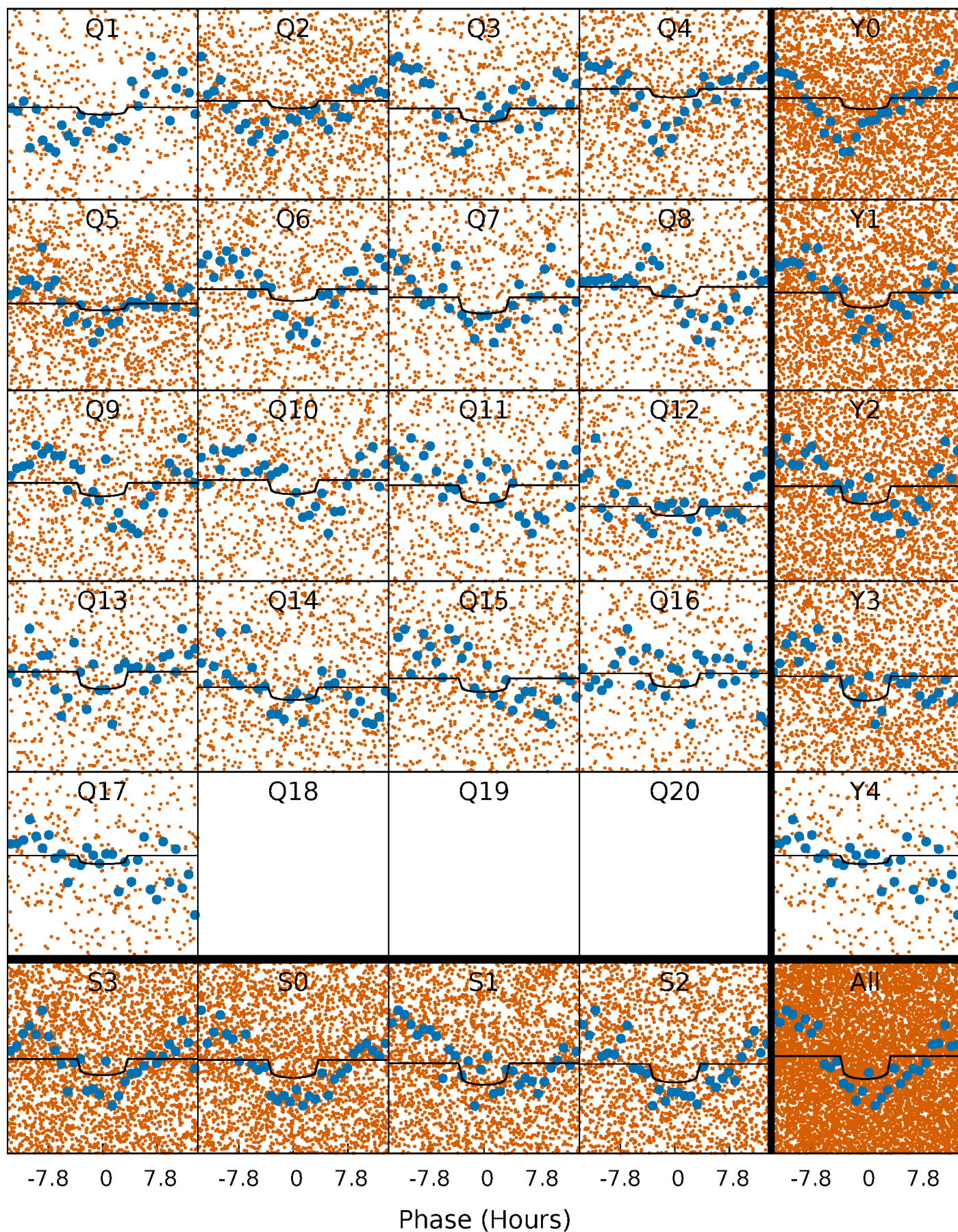
TCE 007121016-01 P= 2.690847 Days  $T_0=132.701560$  (BKJD)





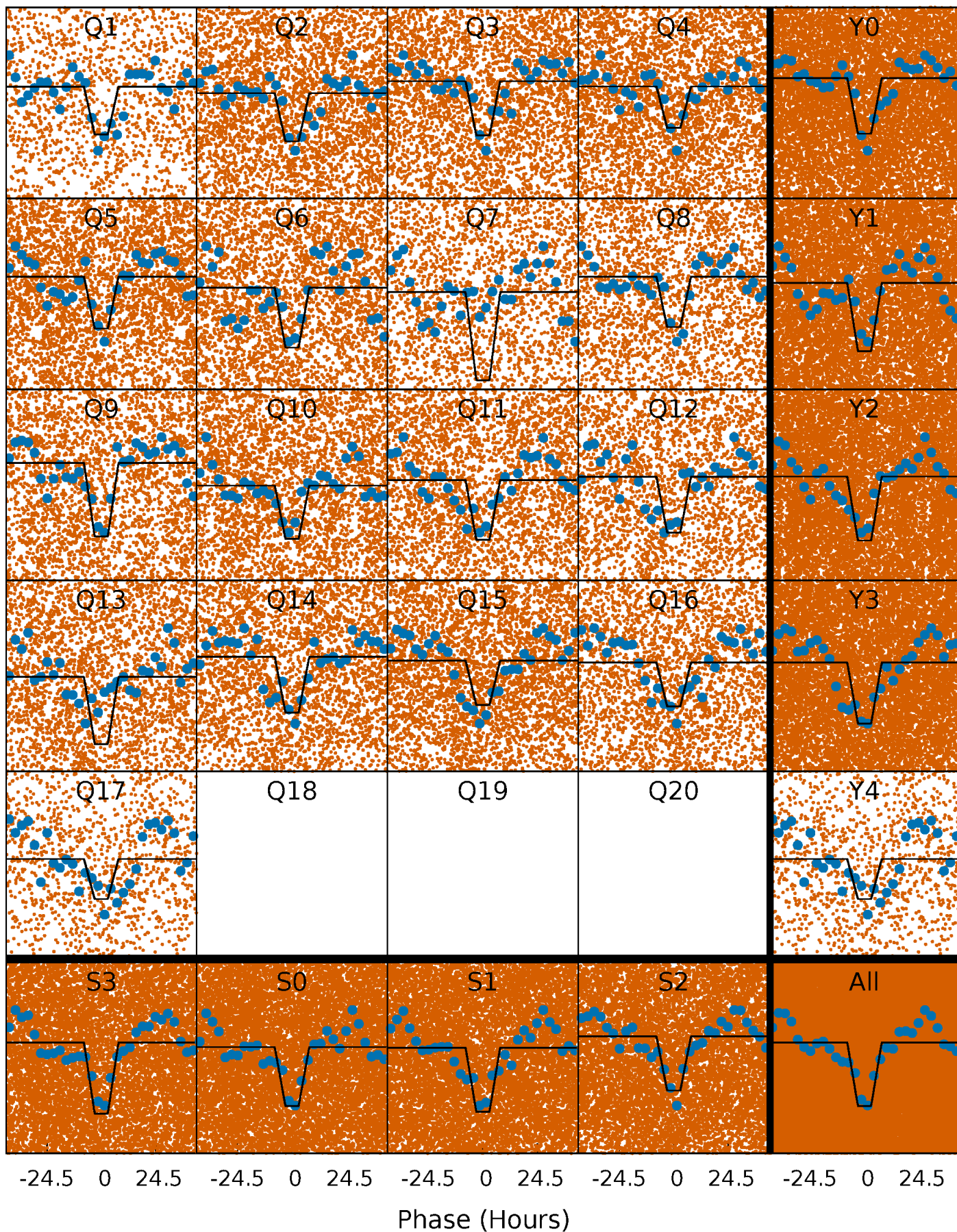
# DV Quarter-Phased Transit Curves

TCE 007121016-01 P= 2.690847 Days  $T_0=132.701560$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 007121016-01 P= 2.692382 Days  $T_0=132.426048$  (BKJD)

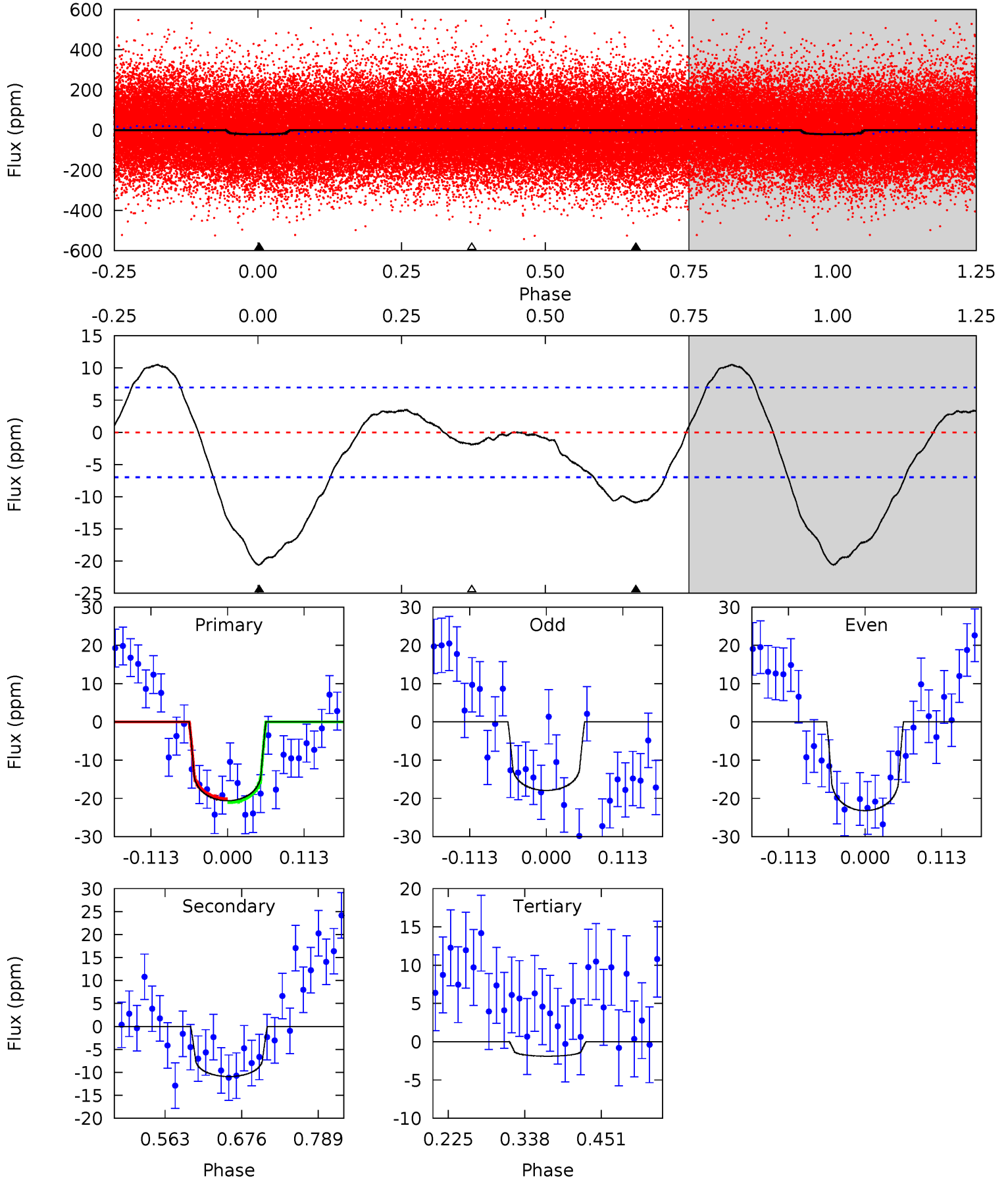




# DV Model-Shift Uniqueness Test

007121016-01, P = 2.690847 Days, E = 130.010713 Days

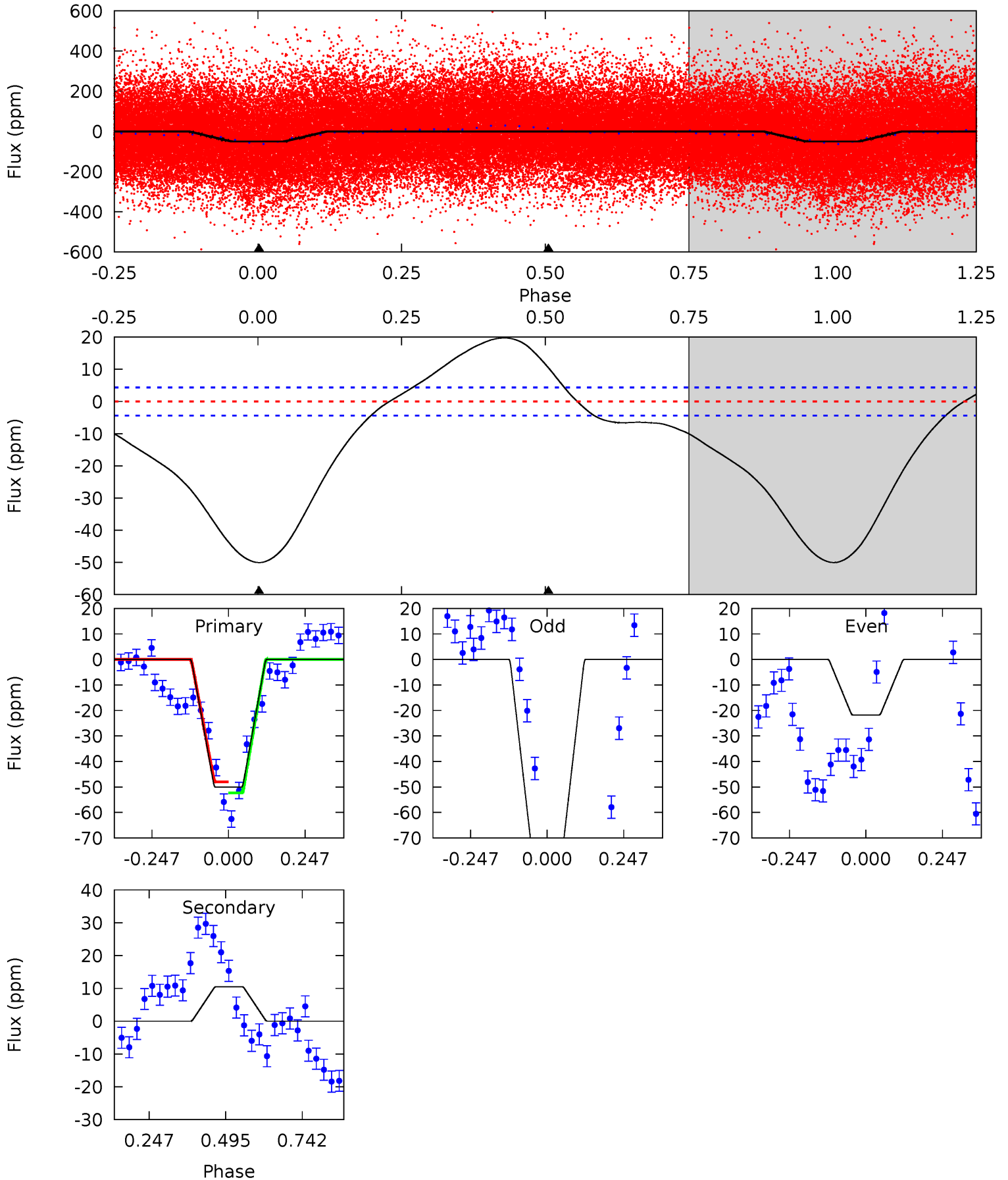
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.4	7.11	1.23	0	4.54	1.59	2.80	12.2	13.4	5.88	7.11	1.73	1.08	0.34	0.31



# Alt Model-Shift Uniqueness Test

007121016-01, P = 2.692382 Days, E = 129.733666 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
50.0	-10.5	0	0	4.37	1.16	6.80	50.0	50.0	-10.5	-10.5	27.0	1.00	0.28	2.15





### Stellar Parameters For KIC 007121016

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7141^{+200}_{-300}$	$4.186^{+0.128}_{-0.192}$	$-0.180^{+0.250}_{-0.350}$	$1.585^{+0.504}_{-0.336}$	$1.409^{+0.218}_{-0.218}$	$0.498^{+0.304}_{-0.251}$
	+3%/-4%	+3%/-5%	+139%/-194%	+32%/-21%	+15%/-15%	+61%/-50%
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 007121016-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-11 \pm 2$	$0.68^{+0.56}_{-0.44}$	$2700^{+217}_{-170}$	$6408^{+6743}_{-1520}$	$23^{+145}_{-15}$
Alt.	$10 \pm 1$	$1.33^{+0.73}_{-0.62}$	$2697^{+219}_{-179}$	$-4790^{+672}_{-1565}$	$-5.507^{+3.110}_{-14.101}$

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

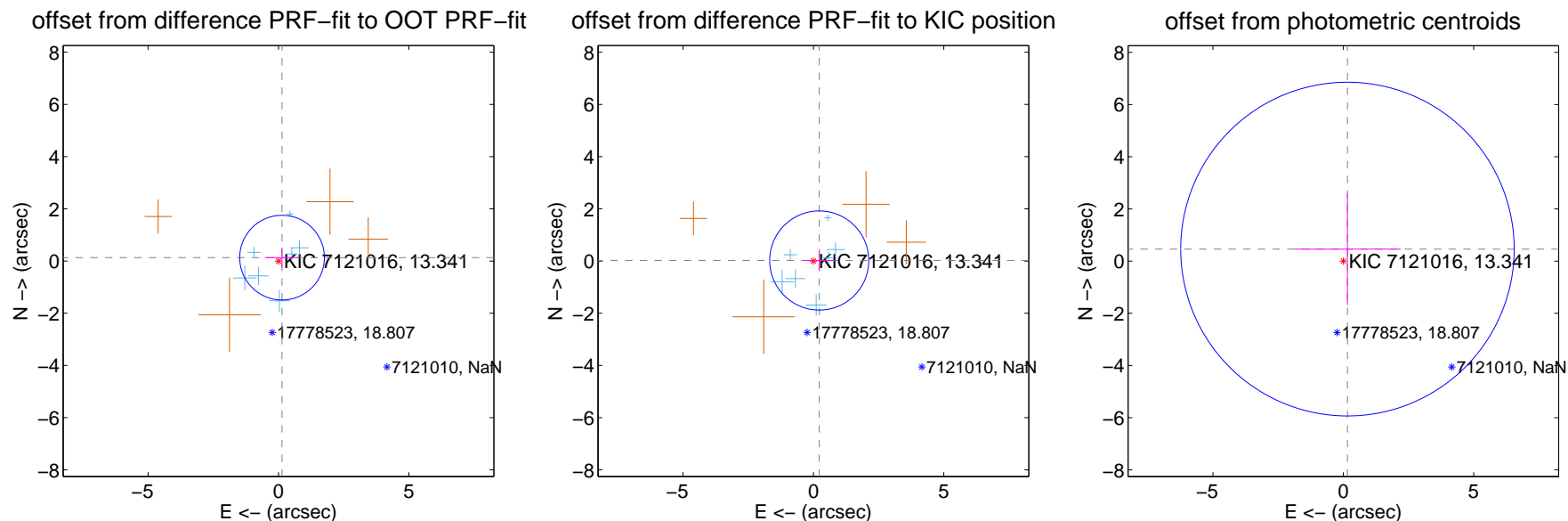
## DV Centroid Data

Supplemental centroid analysis for 007121016-01. Kepler magnitude: 13.34. Transit SNR 4.53

There are 7 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

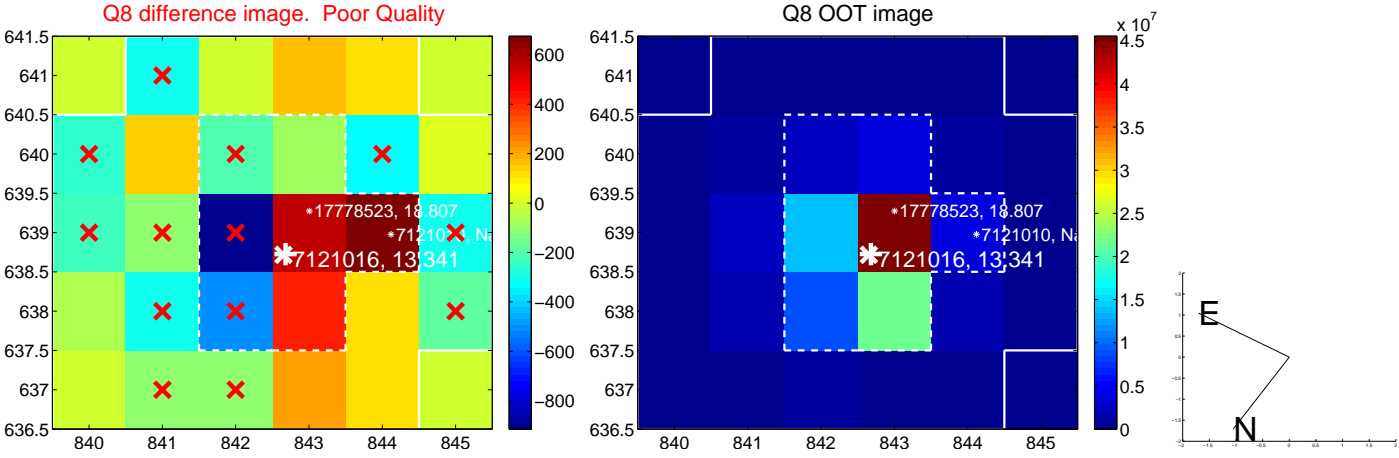
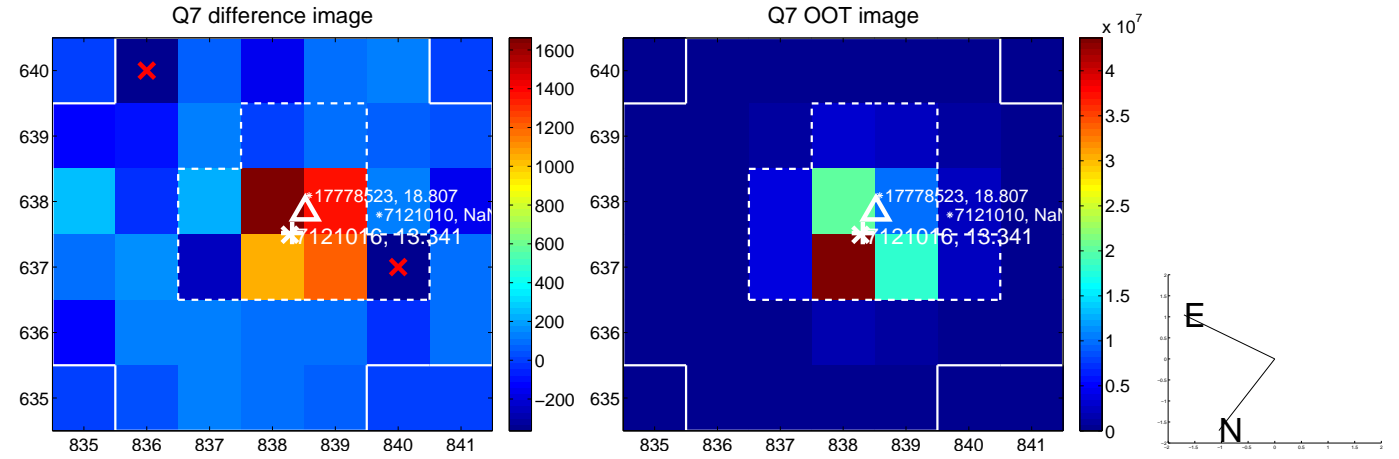
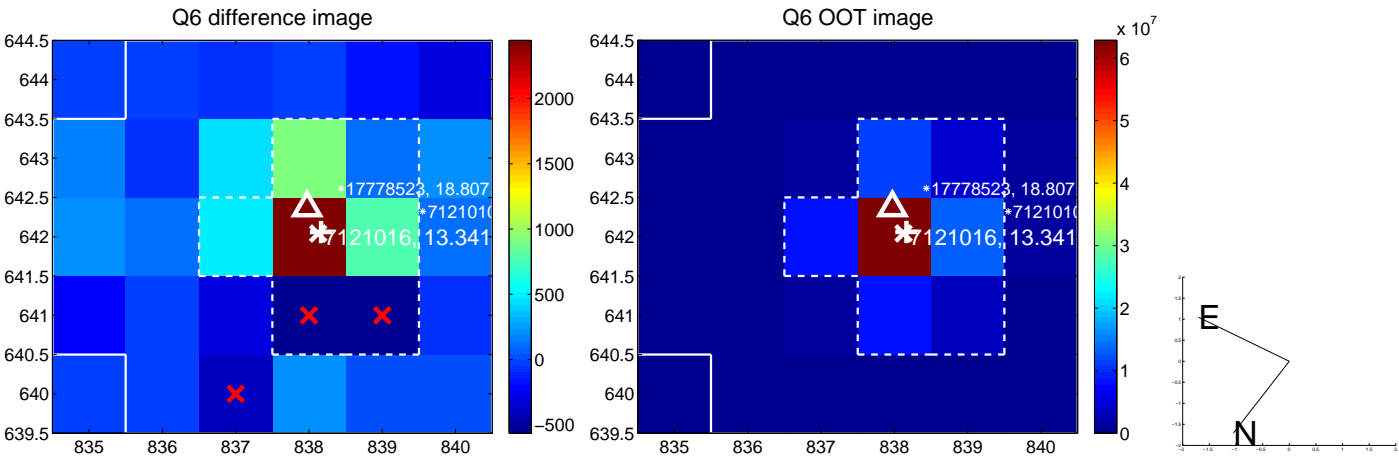
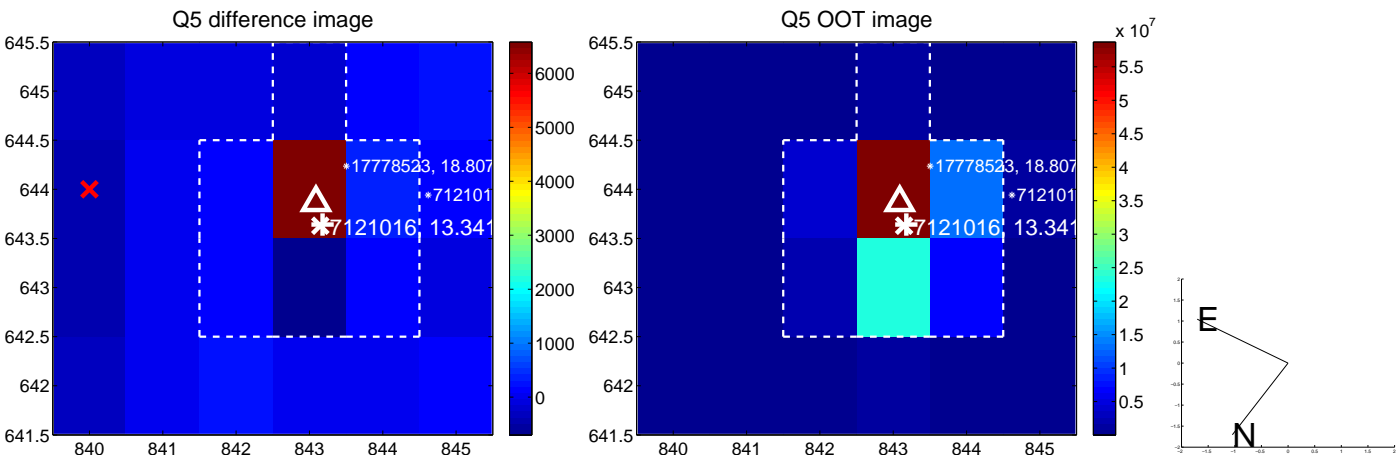
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.189 \pm 0.541$	0.35	$-0.136 \pm 0.646$	$0.130 \pm 0.388$
PRF-fit source offset from KIC position	$0.225 \pm 0.633$	0.36	$-0.224 \pm 0.623$	$0.021 \pm 0.393$
photometric centroid source offset	$0.49 \pm 2.13$	0.23	$-0.16 \pm 2.04$	$0.46 \pm 2.14$



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.

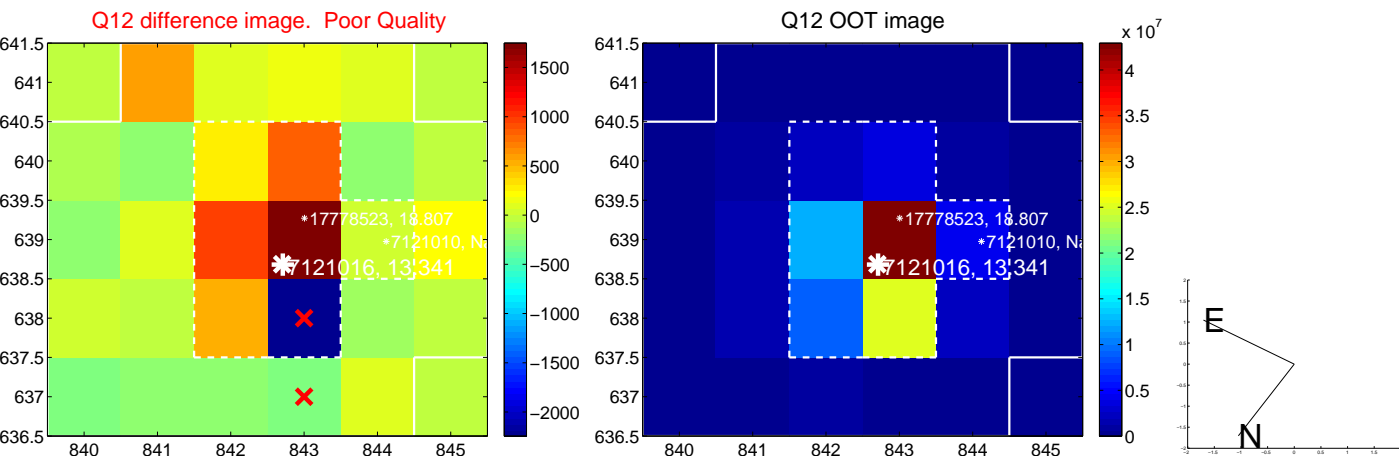
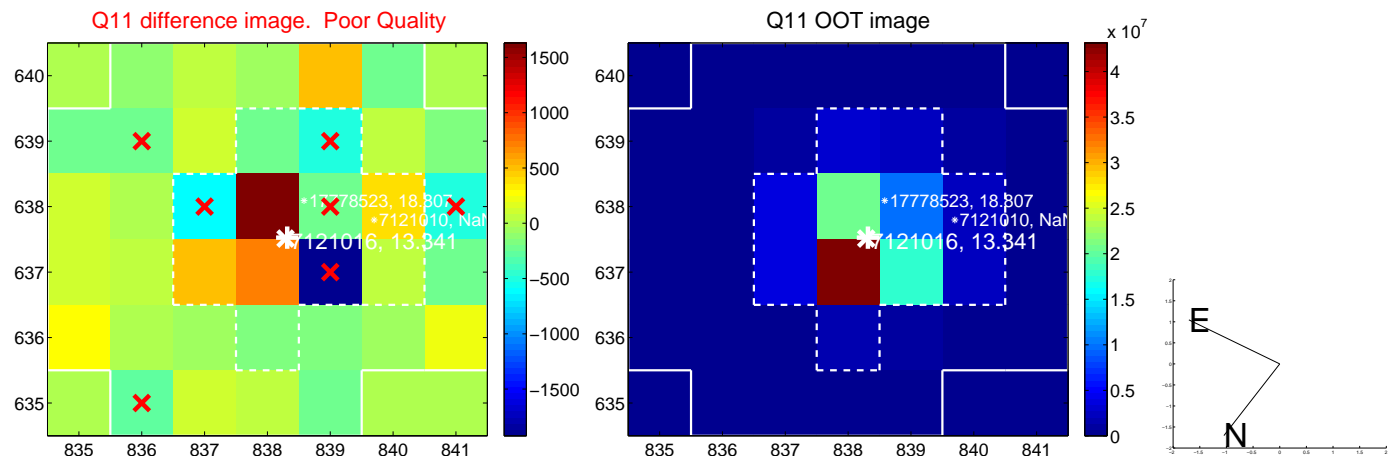
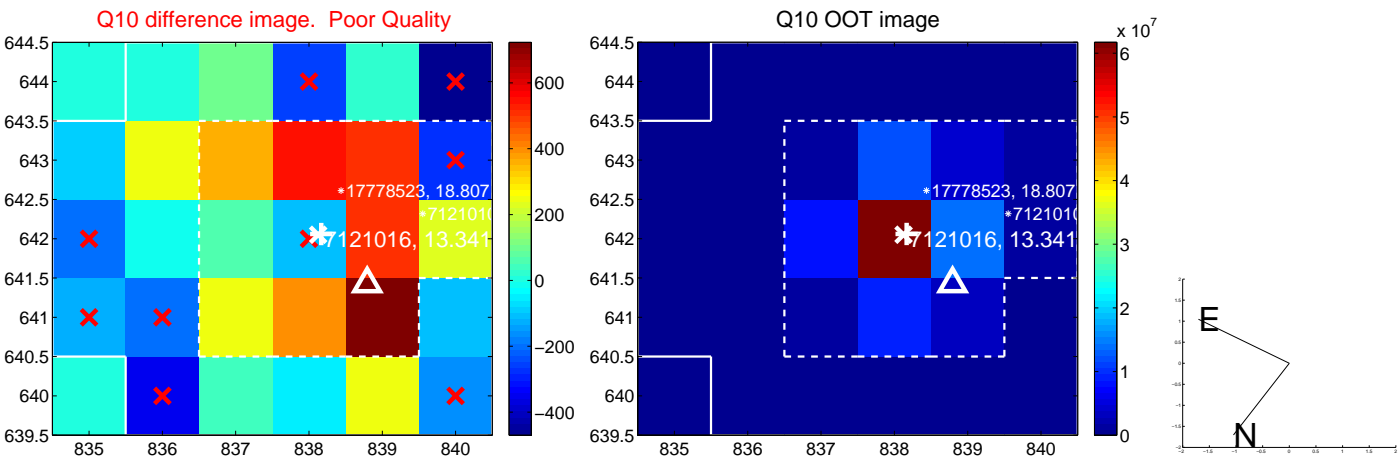
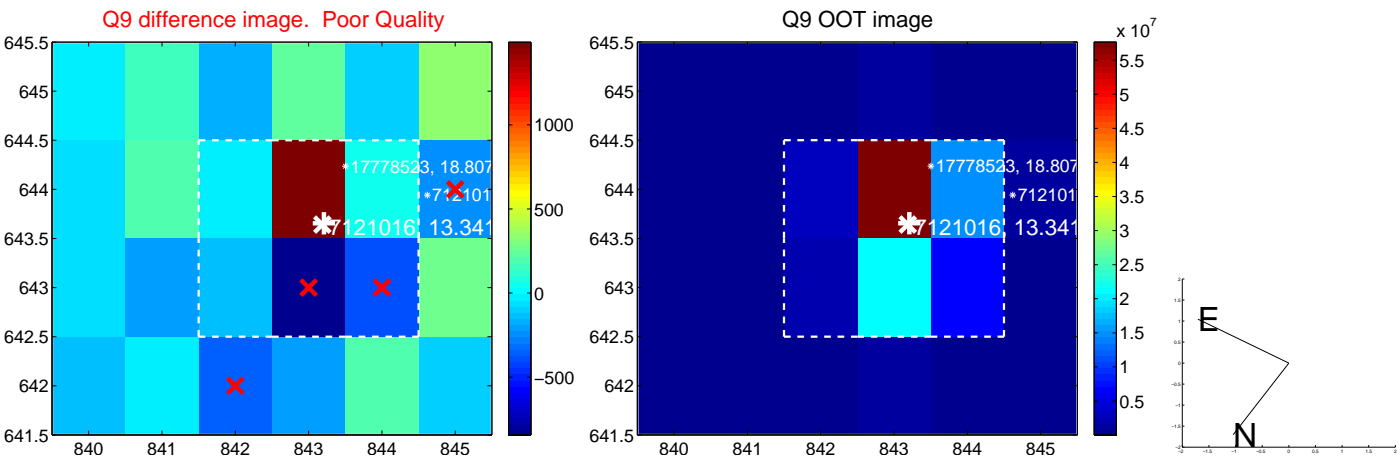


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

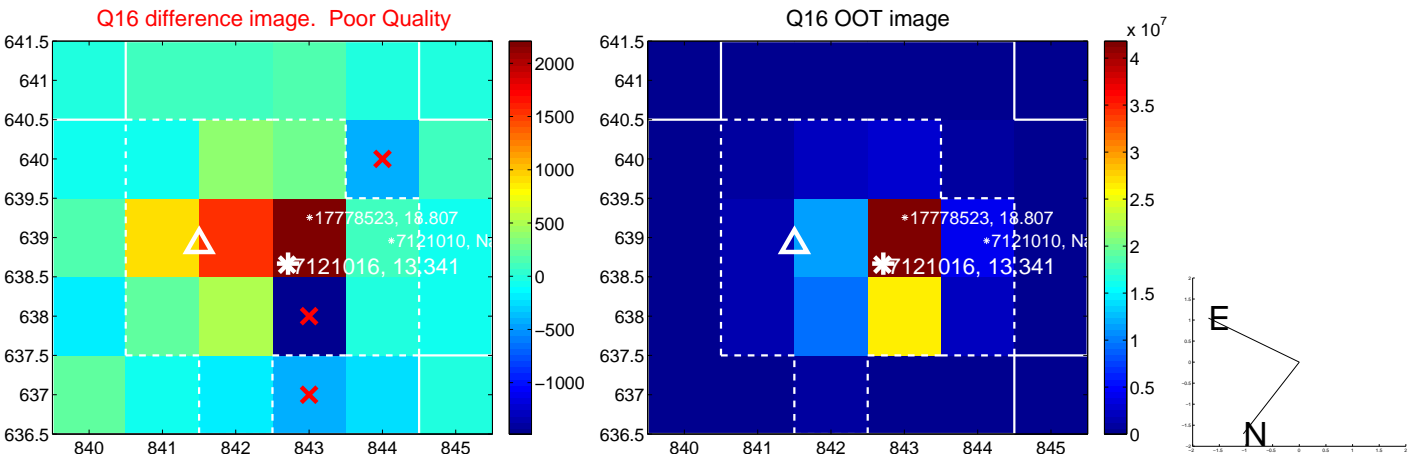
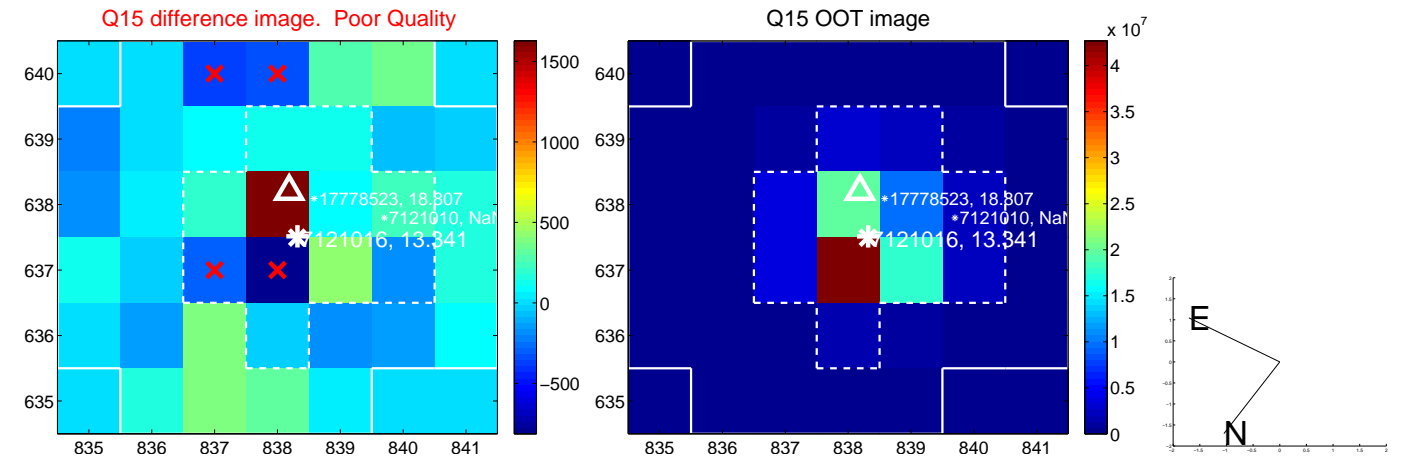
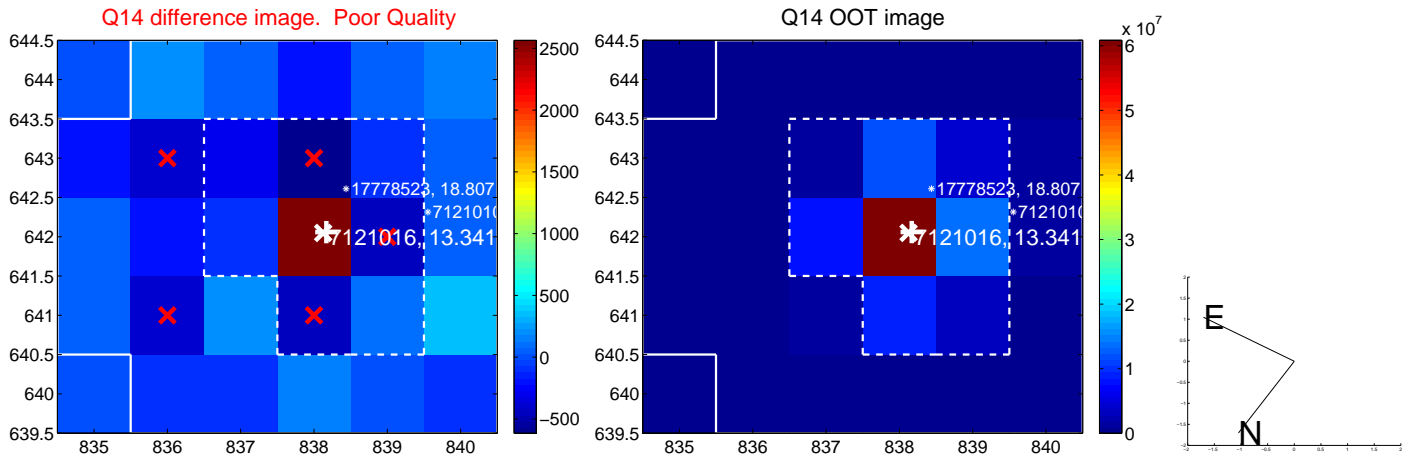
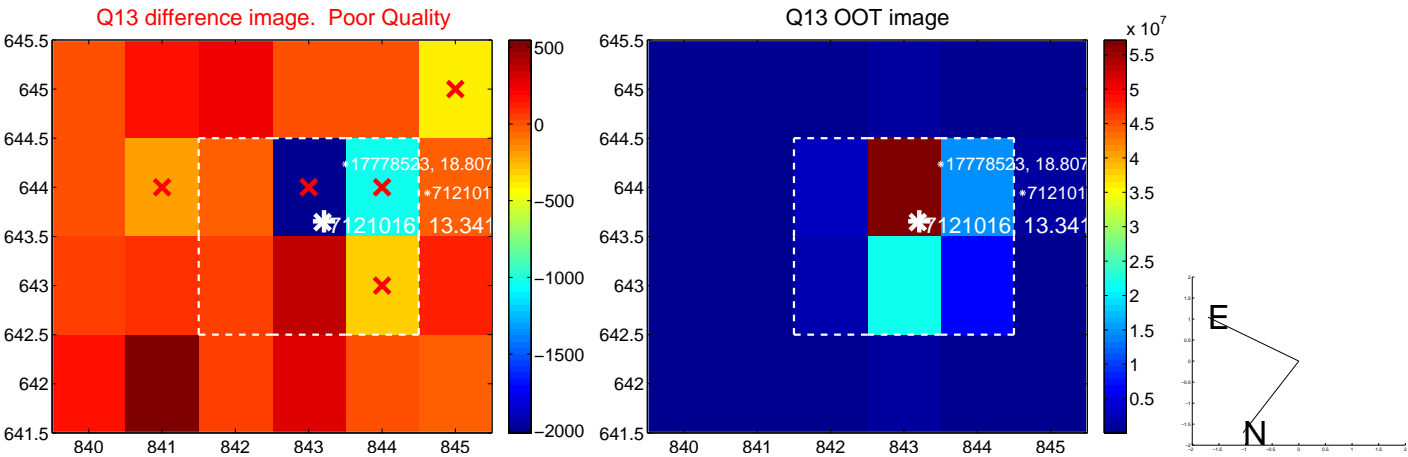




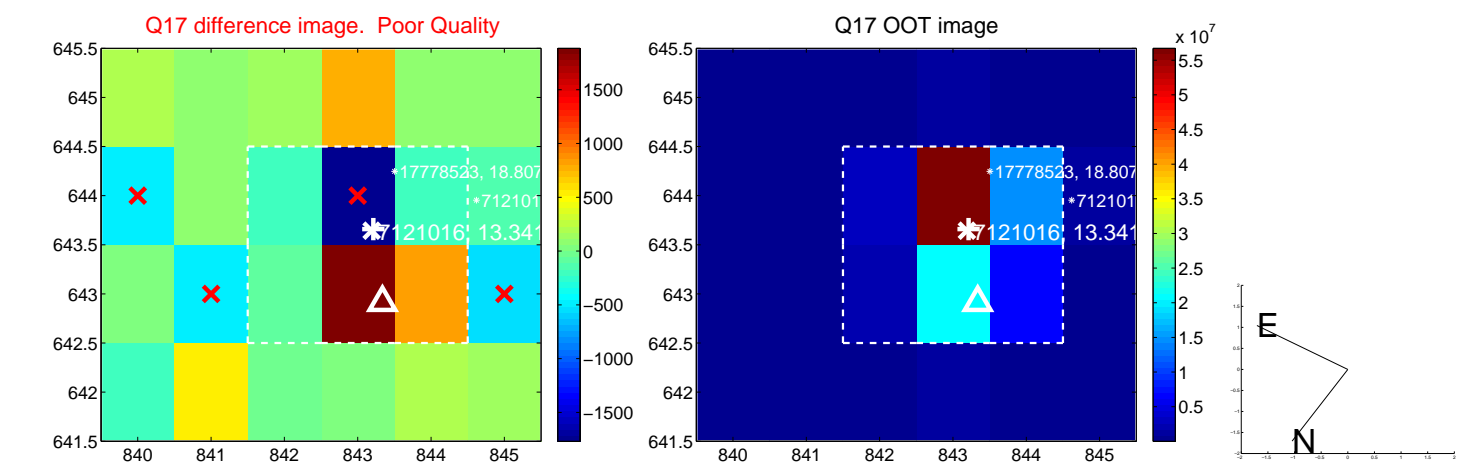
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



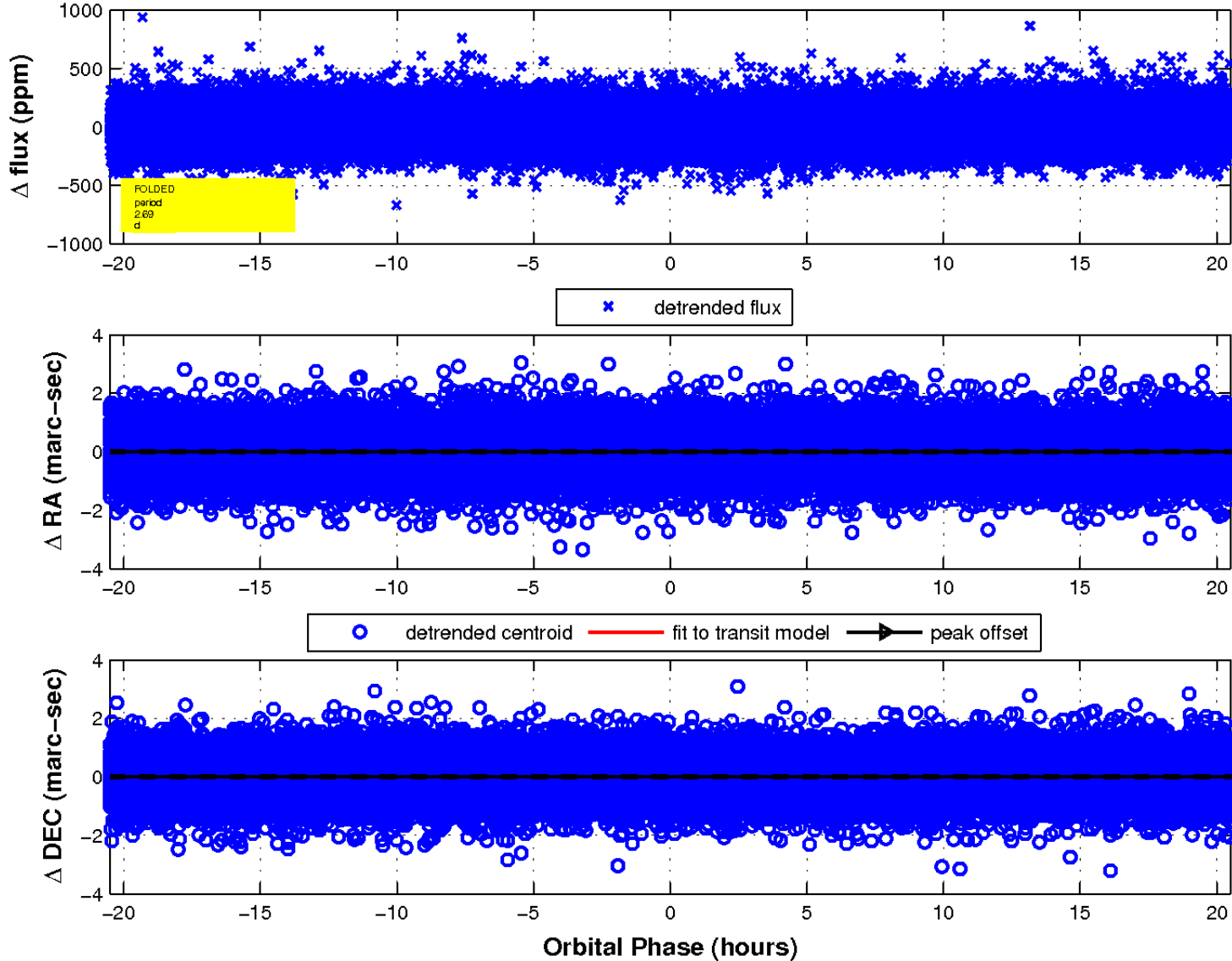
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



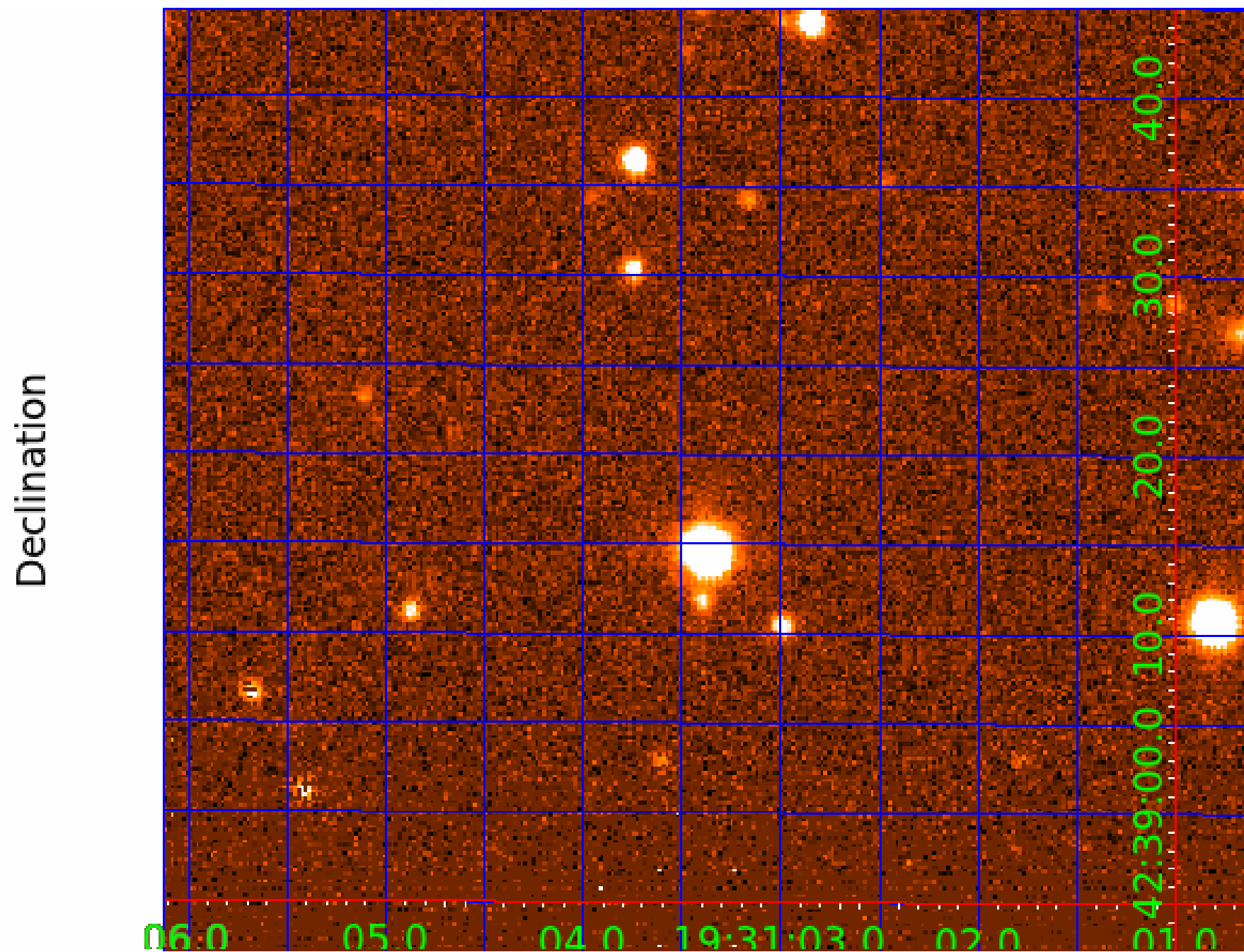
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image





# KIC 007121016

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007121016-01	OBS	No	2.690847	132.701560	11.7	6.836	10.0	4.5	1.58	7141	0.55	3251.61
007121016-02	OBS	No	5.384677	137.245455	12.5	43.675	9.9	4.9	1.58	7141	0.60	1289.45

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007121016-01	OBS	FP	0.00	1	0	0	0	LPP_DV
007121016-02	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—CENT_UNRESOLVED_OFFSET

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

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

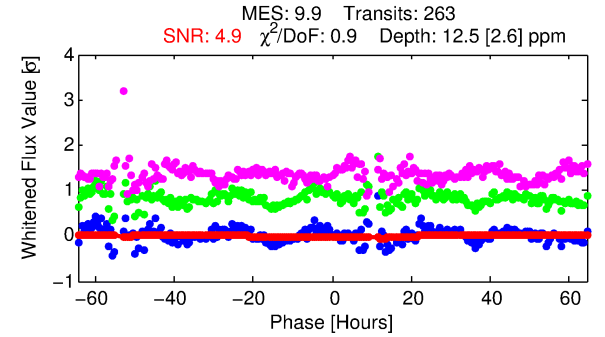
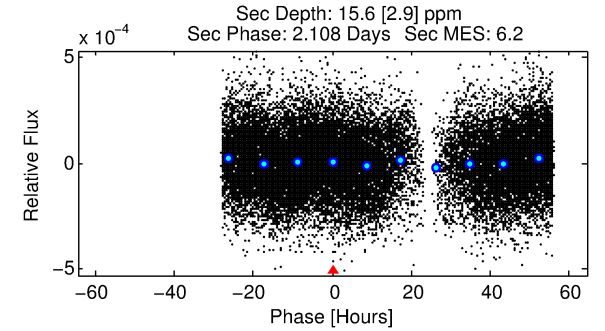
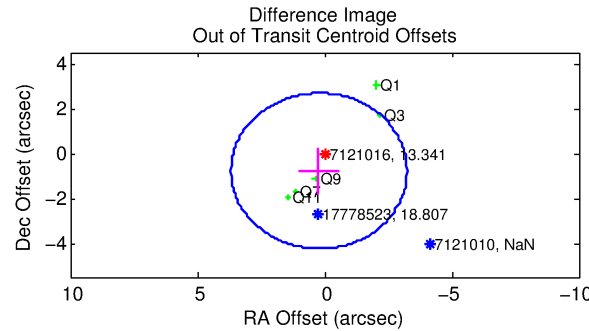
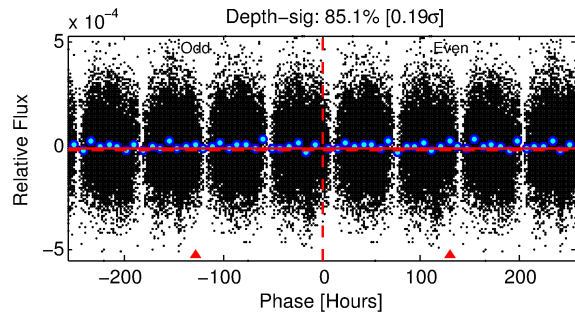
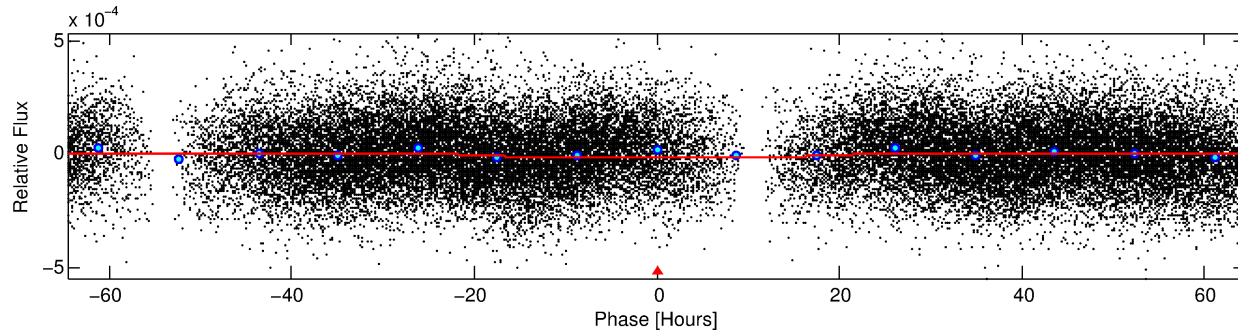
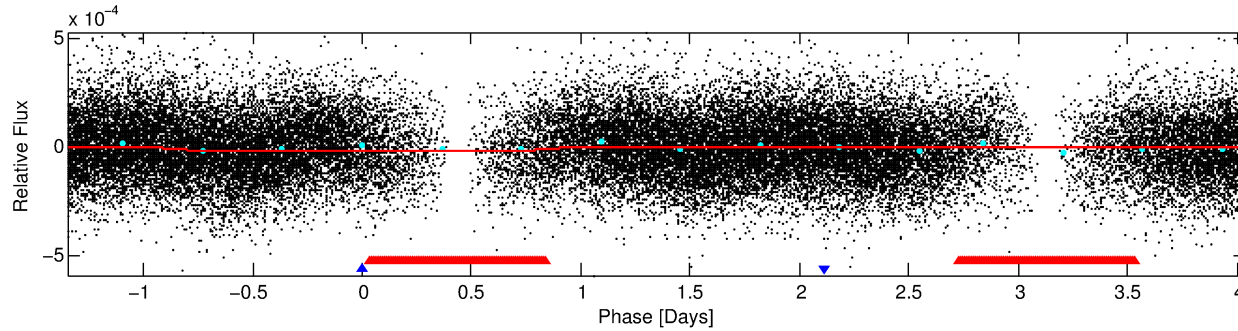
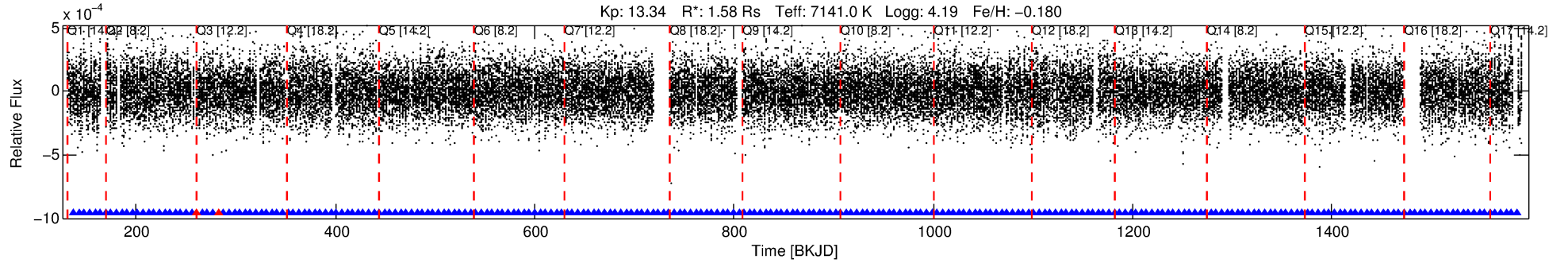
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007121016-02

No Significant Match Found

# DV One-Page Summary

KIC: 7121016 Candidate: 2 of 2 Period: 5.385 d



## DV Fit Results:

Period = 5.38468 [0.00026] d  
Epoch = 137.2455 [0.0402] BKJD  
Rp/R\* = 0.0035 [0.0018]  
a/R\* = 1.08 [0.51]  
b = 0.69 [2.41]  
Seff = 1289.45 [515.85]  
Teq = 1528 [153] K  
Rp = 0.60 [0.37] Re  
a = 0.0674 [0.0174] AU  
Ag = 108.55 [121.82] [0.88 $\sigma$ ]  
Teffp = 7626 [2050] K [2.97 $\sigma$ ]

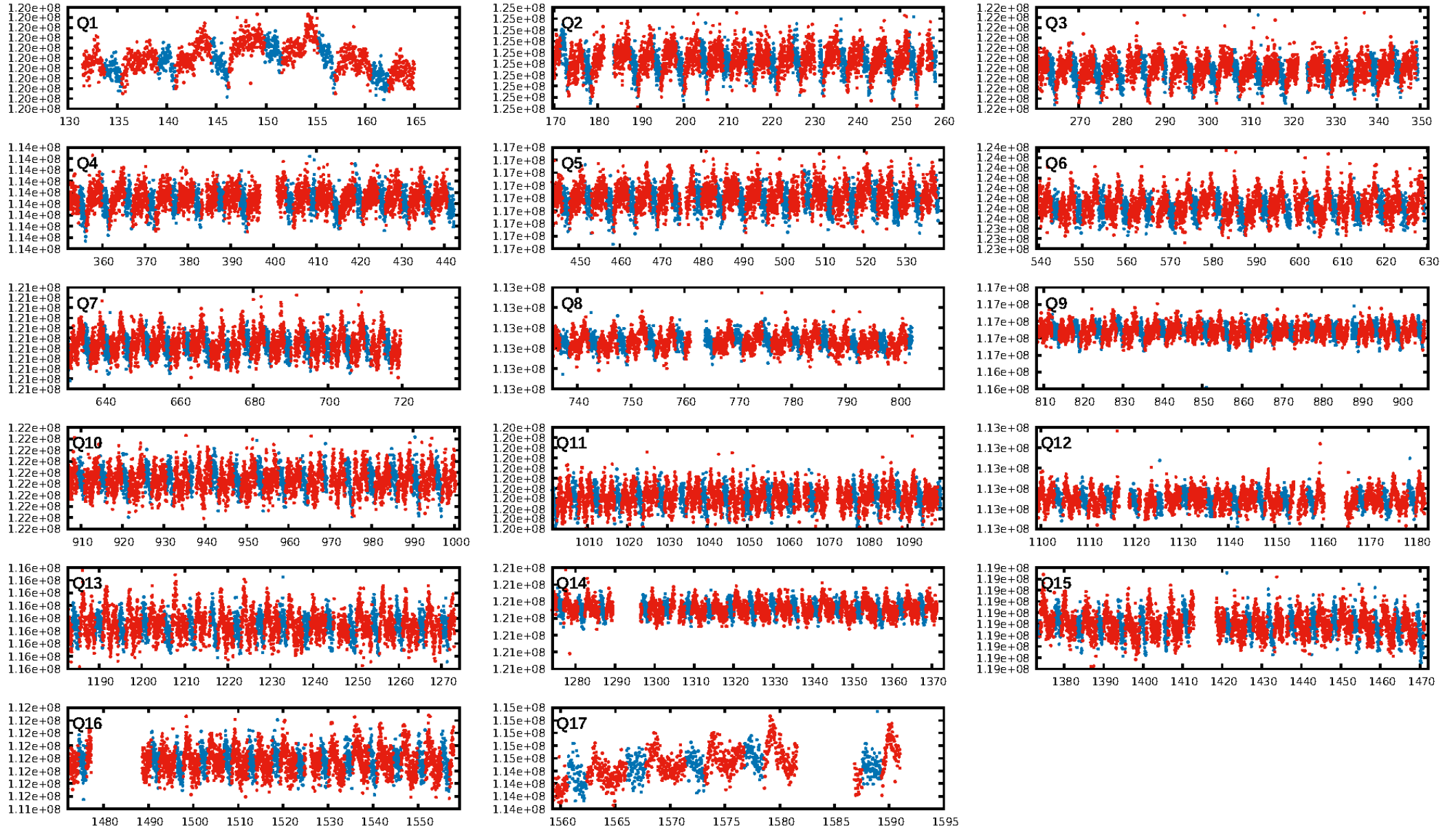
## DV Diagnostic Results:

ShortPeriod-sig: 85.6% [1.46 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.99 [249/251]  
GhostDiagnostic-chr: 2.741  
Centroid-sig: 23.4%  
Centroid-so: 1.420 arcsec [1.17 $\sigma$ ]  
OotOffset-rm: 0.812 arcsec [0.70 $\sigma$ ]  
KicOffset-rm: 0.921 arcsec [0.97 $\sigma$ ]  
OotOffset-st: 0/3/0/2 [5]  
KicOffset-st: 0/3/0/2 [5]  
DiffImageQuality-fgm: 0.60 [3/5]  
DiffImageOverlap-fno: 0.00 [0/17]

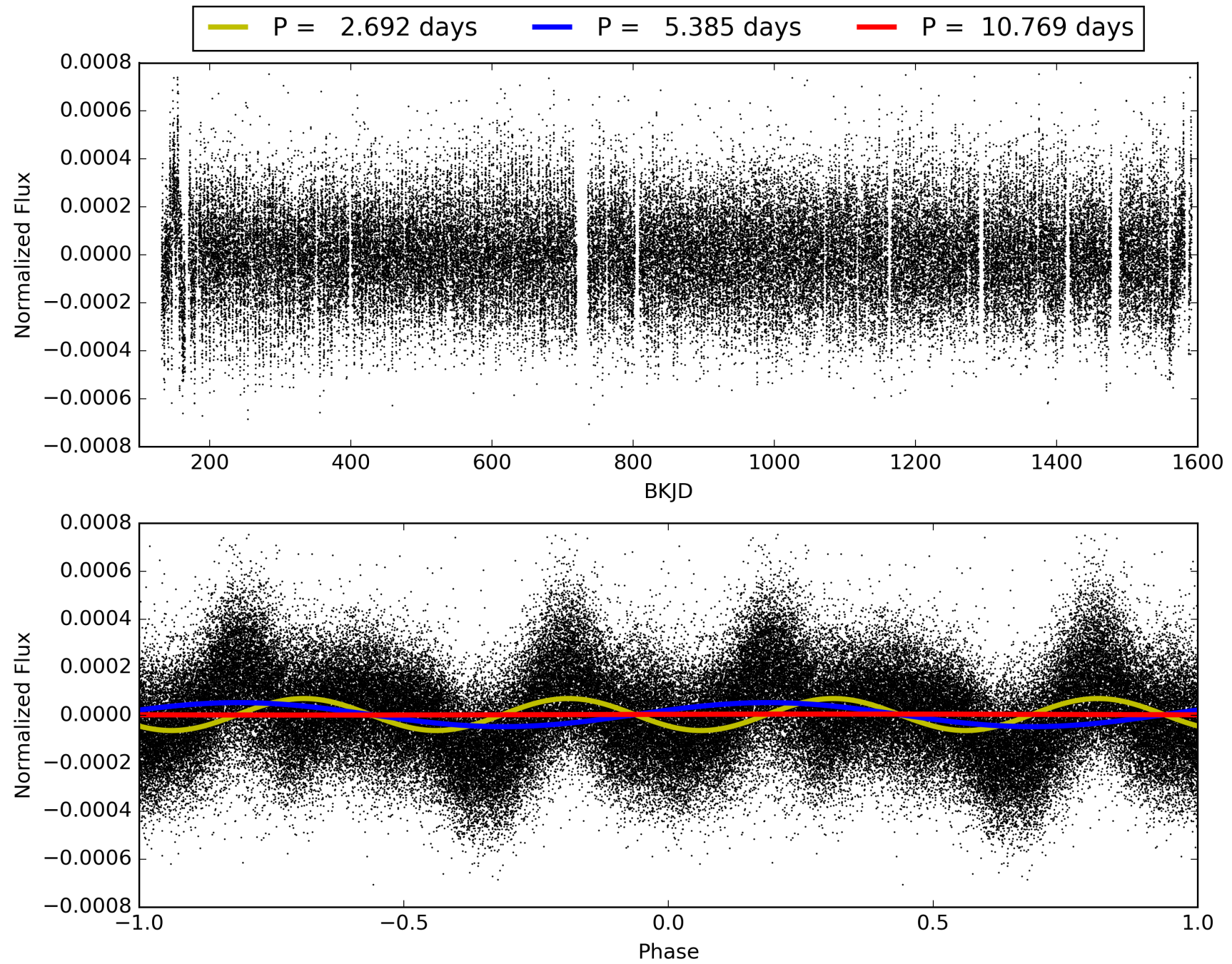
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:23:25 Z

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

# TCE 007121016-02, PDC Light Curves



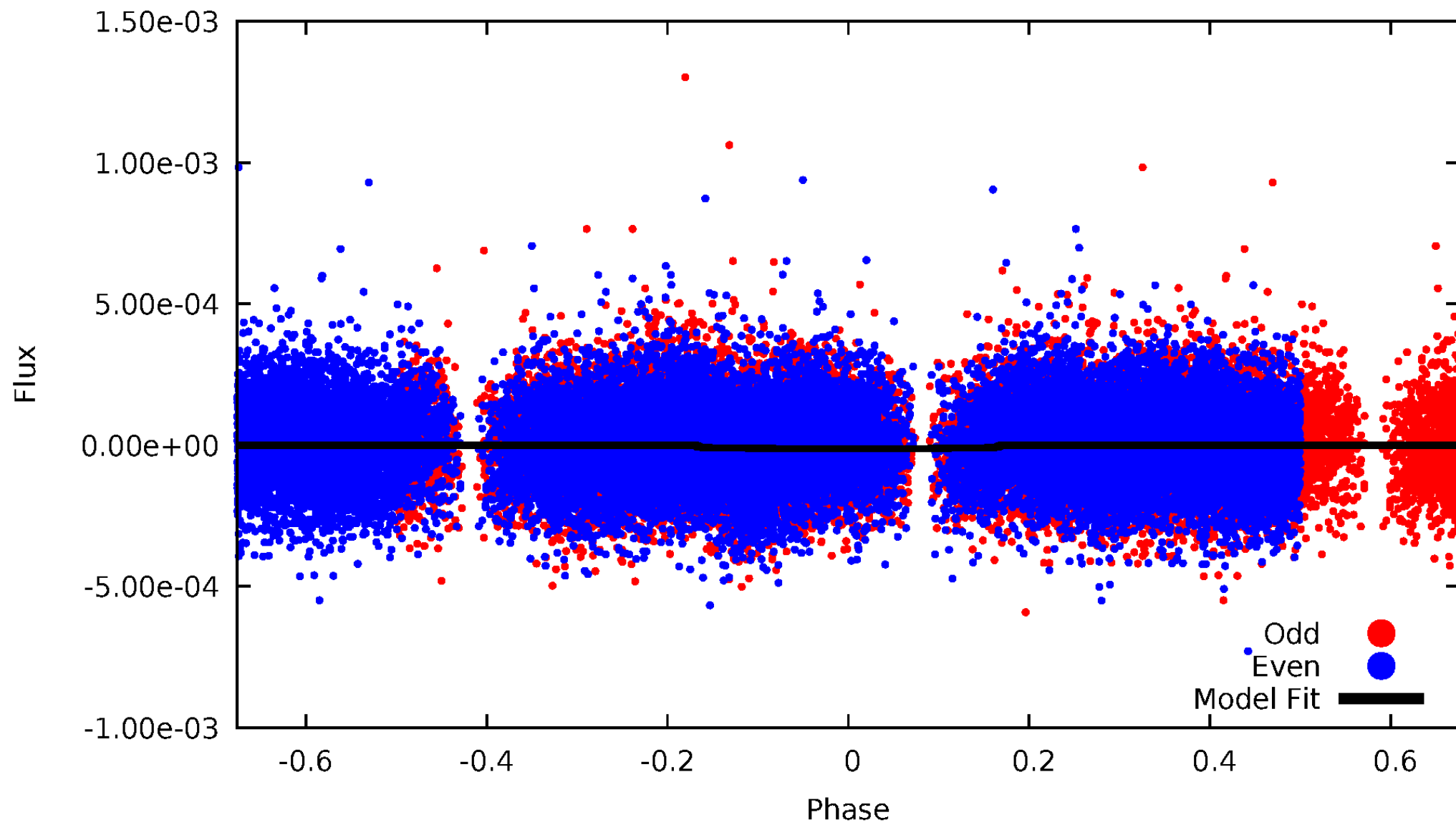
TCE 007121016-02





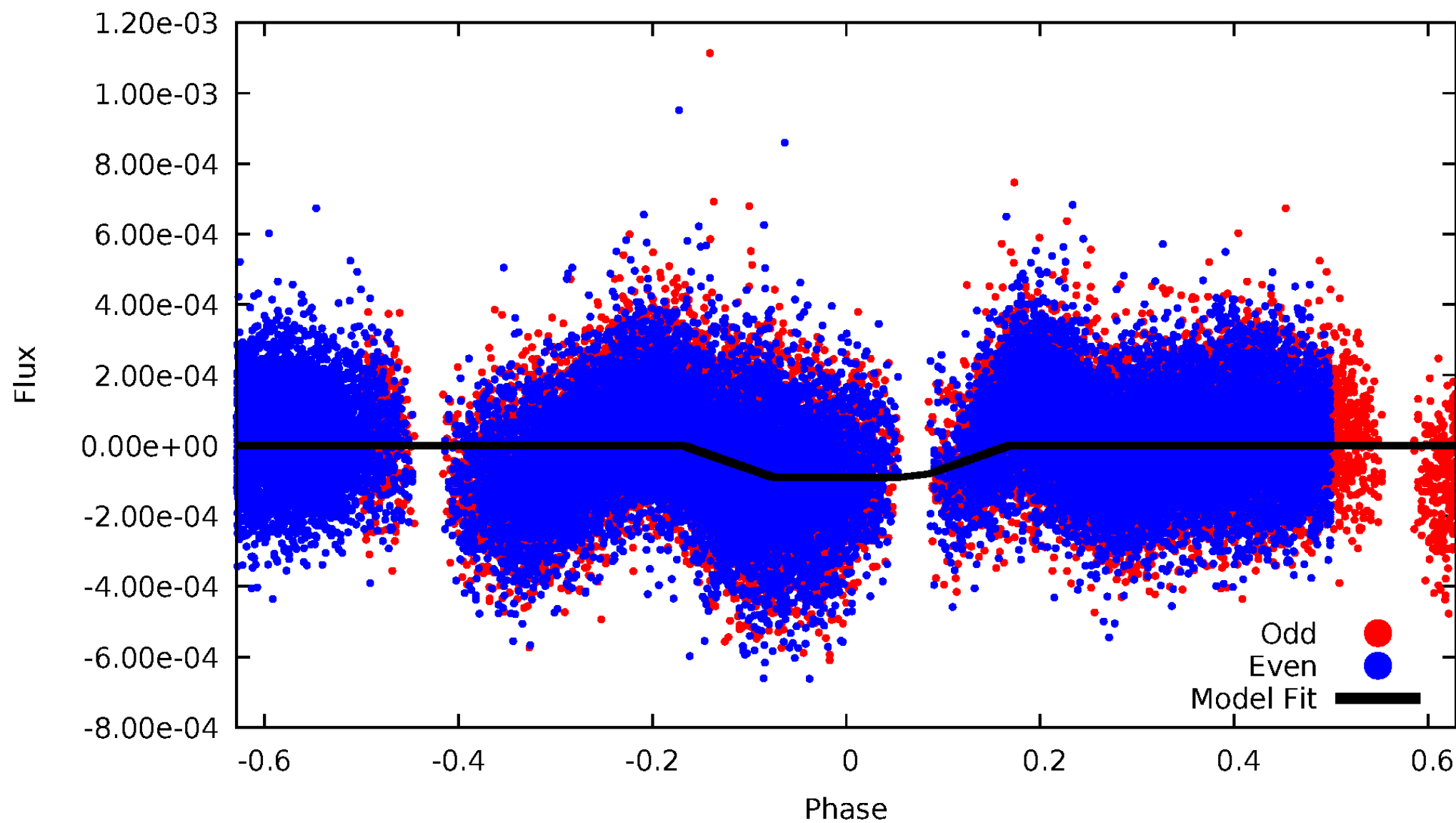
# DV Odd/Even

TCE 007121016-02



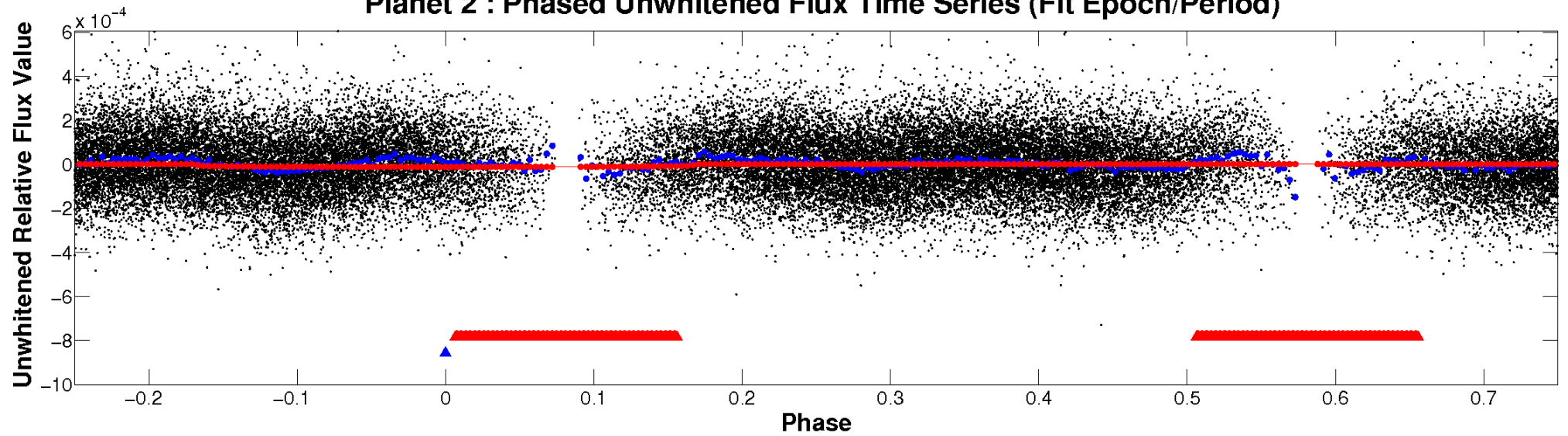
# ALT Odd/Even

TCE 007121016-02

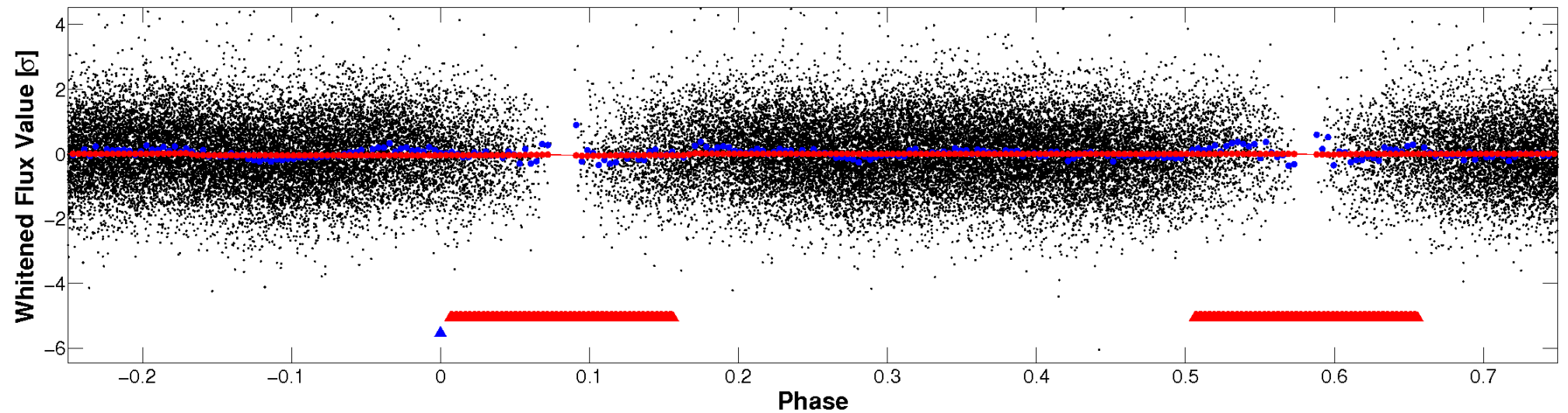


# Non-Whitened Vs. Whitened Light Curve

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

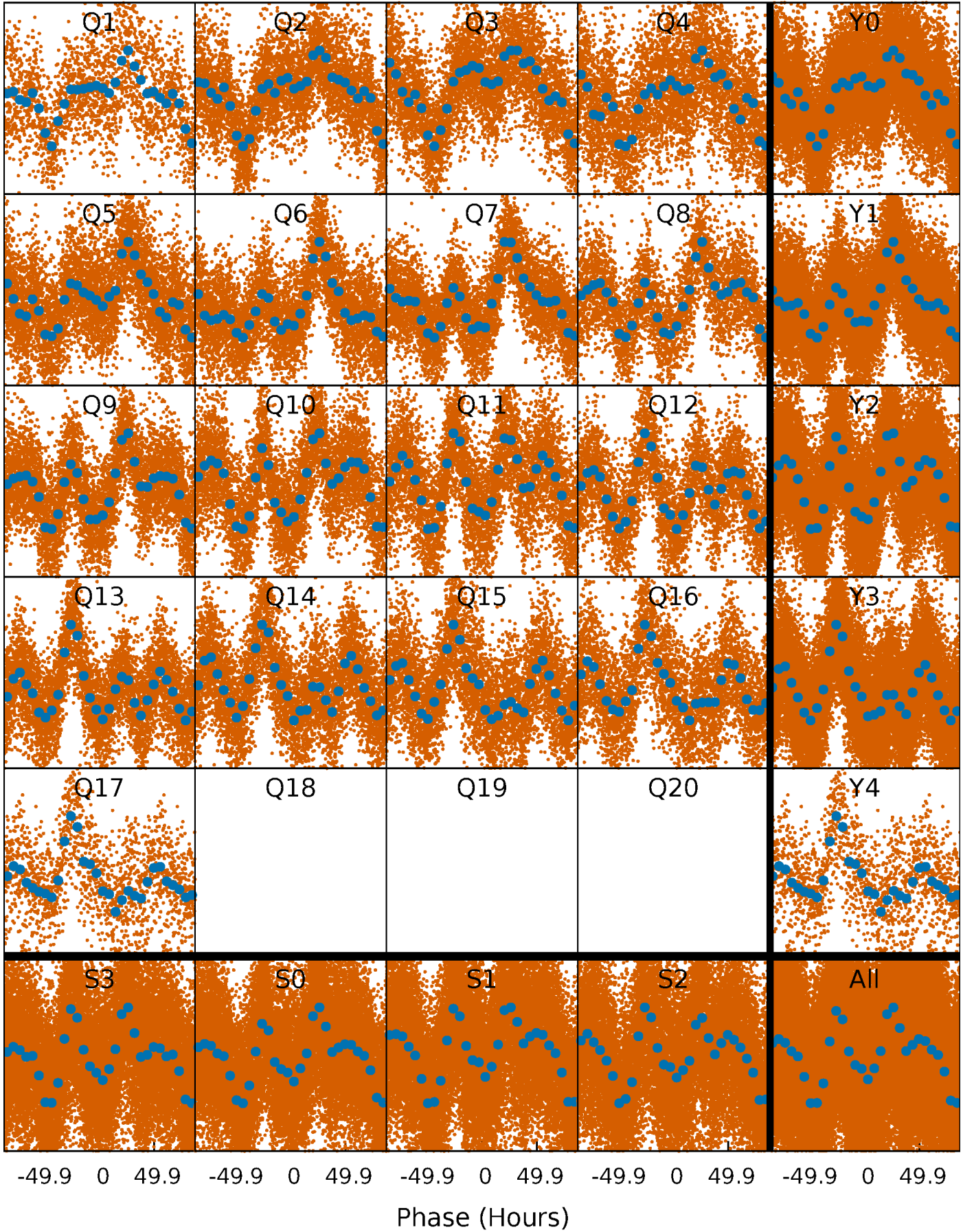


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

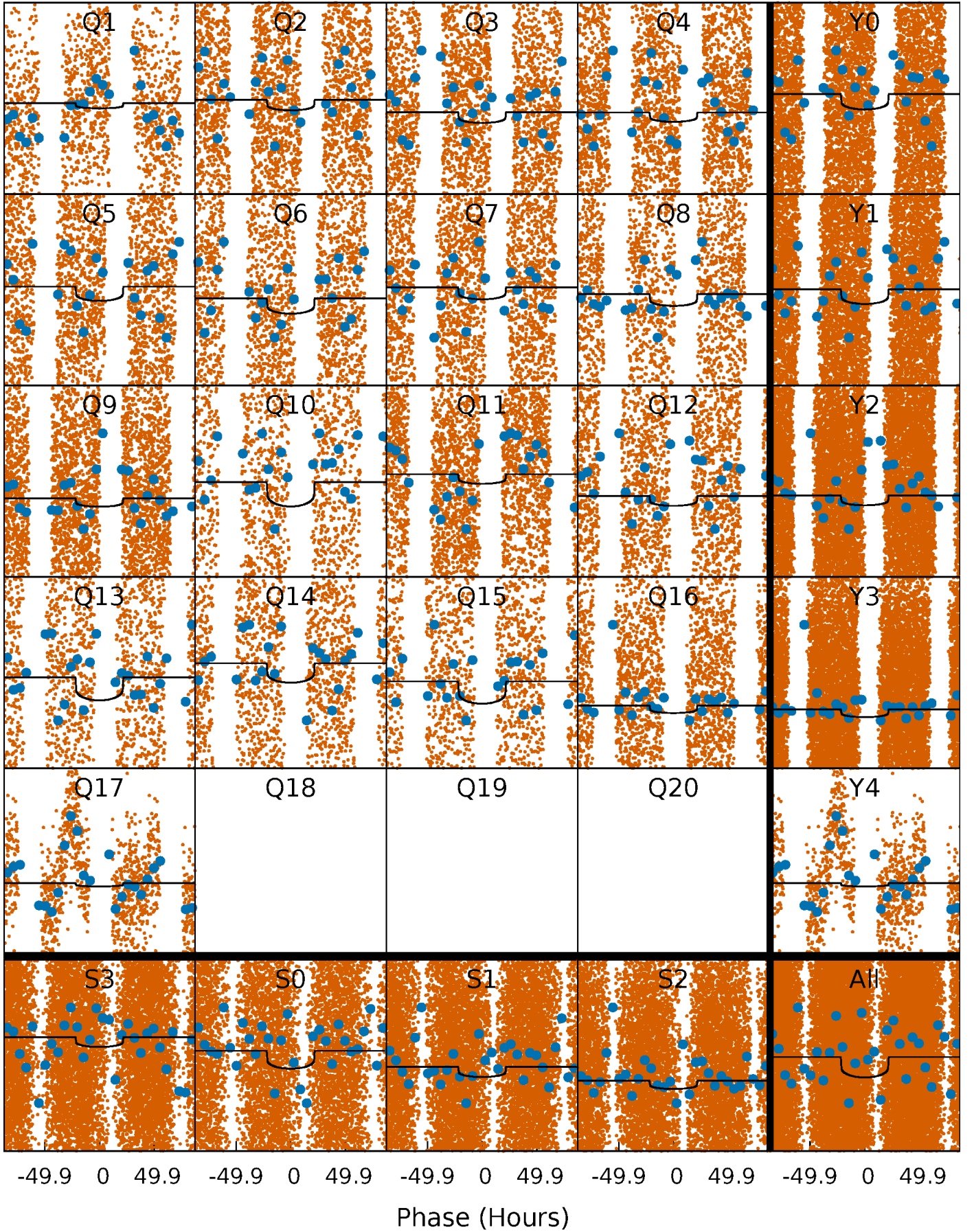
TCE 007121016-02    P= 5.384677 Days     $T_0=137.245455$  (BKJD)





# DV Quarter-Phased Transit Curves

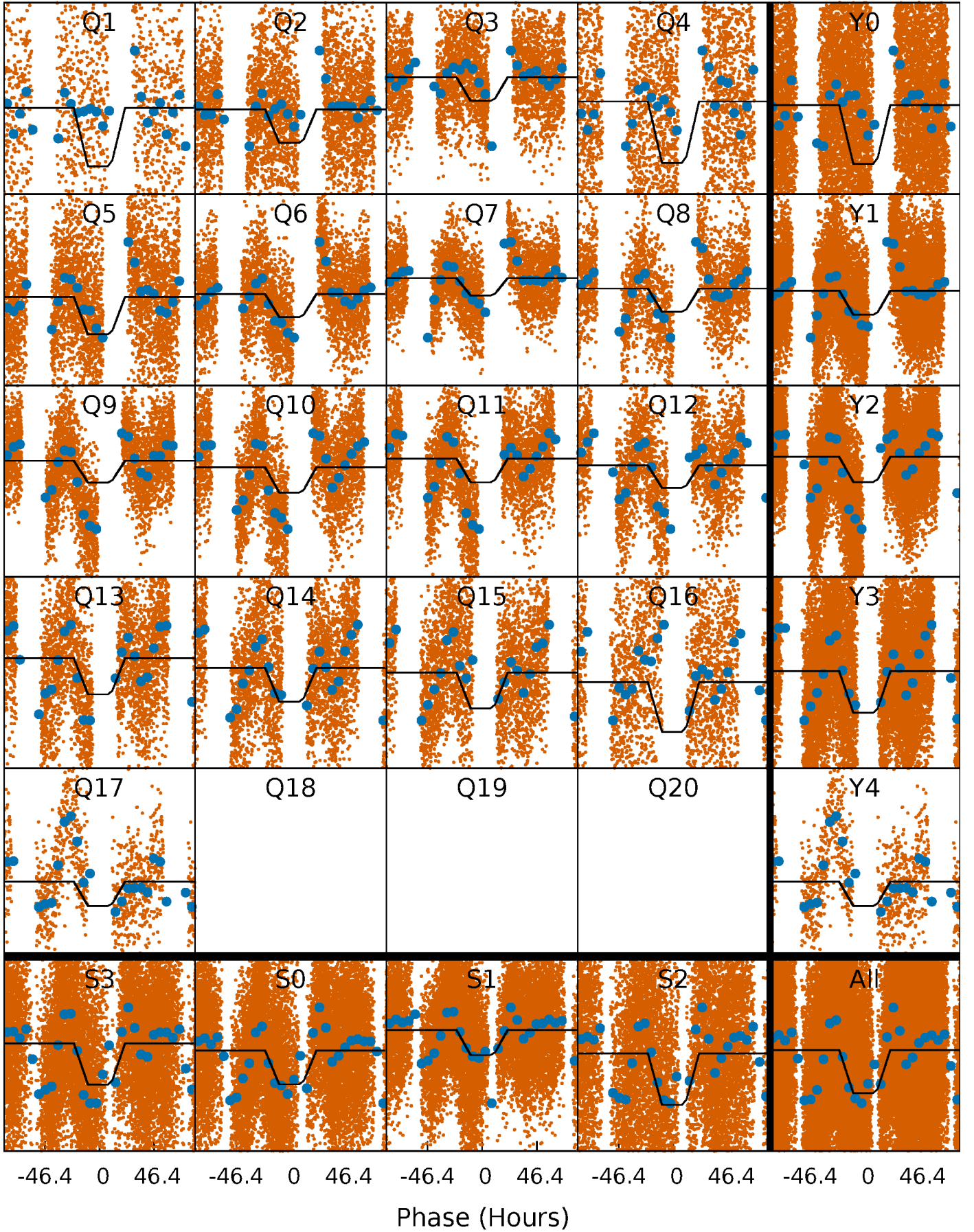
TCE 007121016-02   P= 5.384677 Days    $T_0=137.245455$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

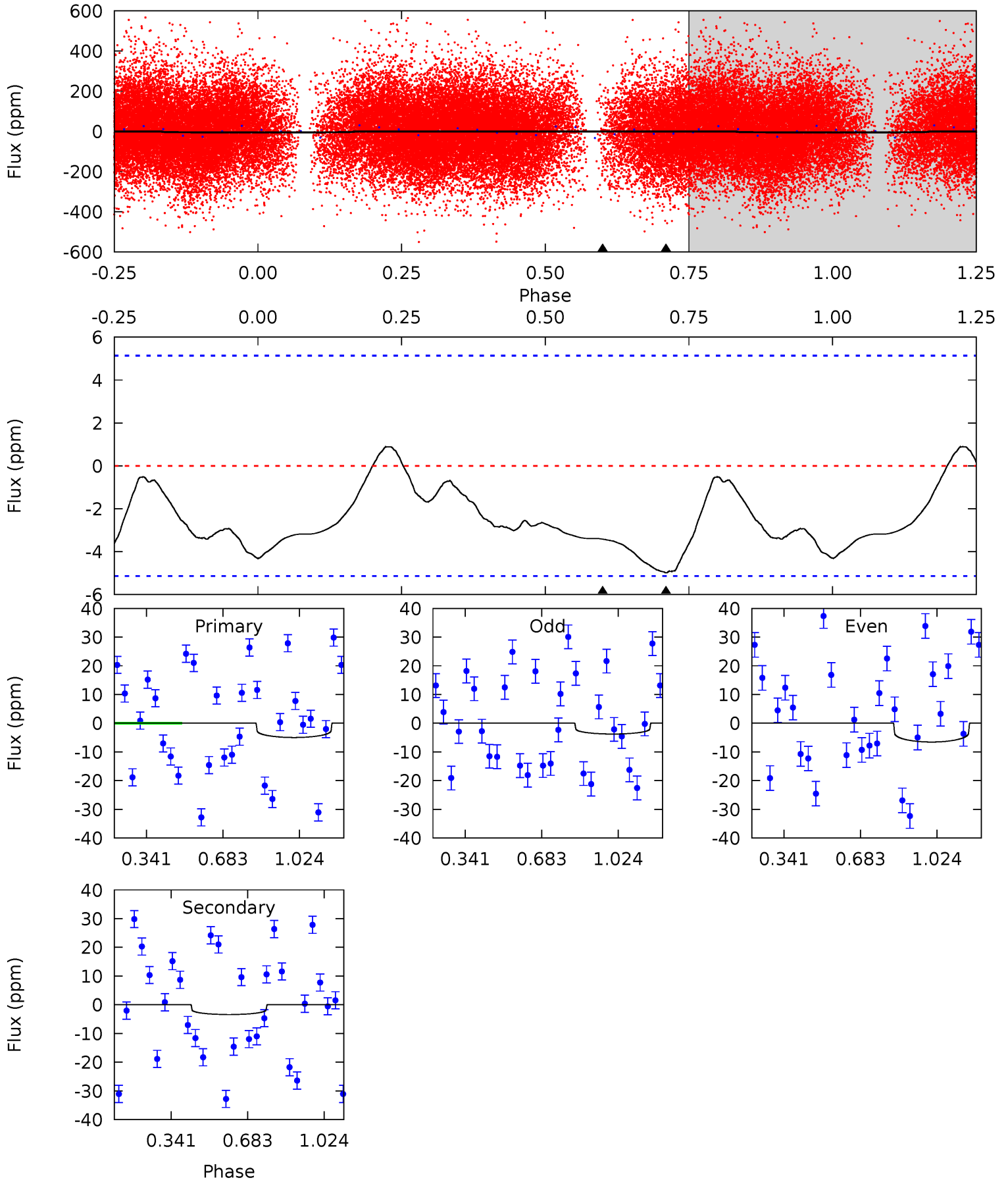
TCE 007121016-02   P= 5.384412 Days    $T_0=137.344424$  (BKJD)



# DV Model-Shift Uniqueness Test

007121016-02, P = 5.384677 Days, E = 126.476101 Days

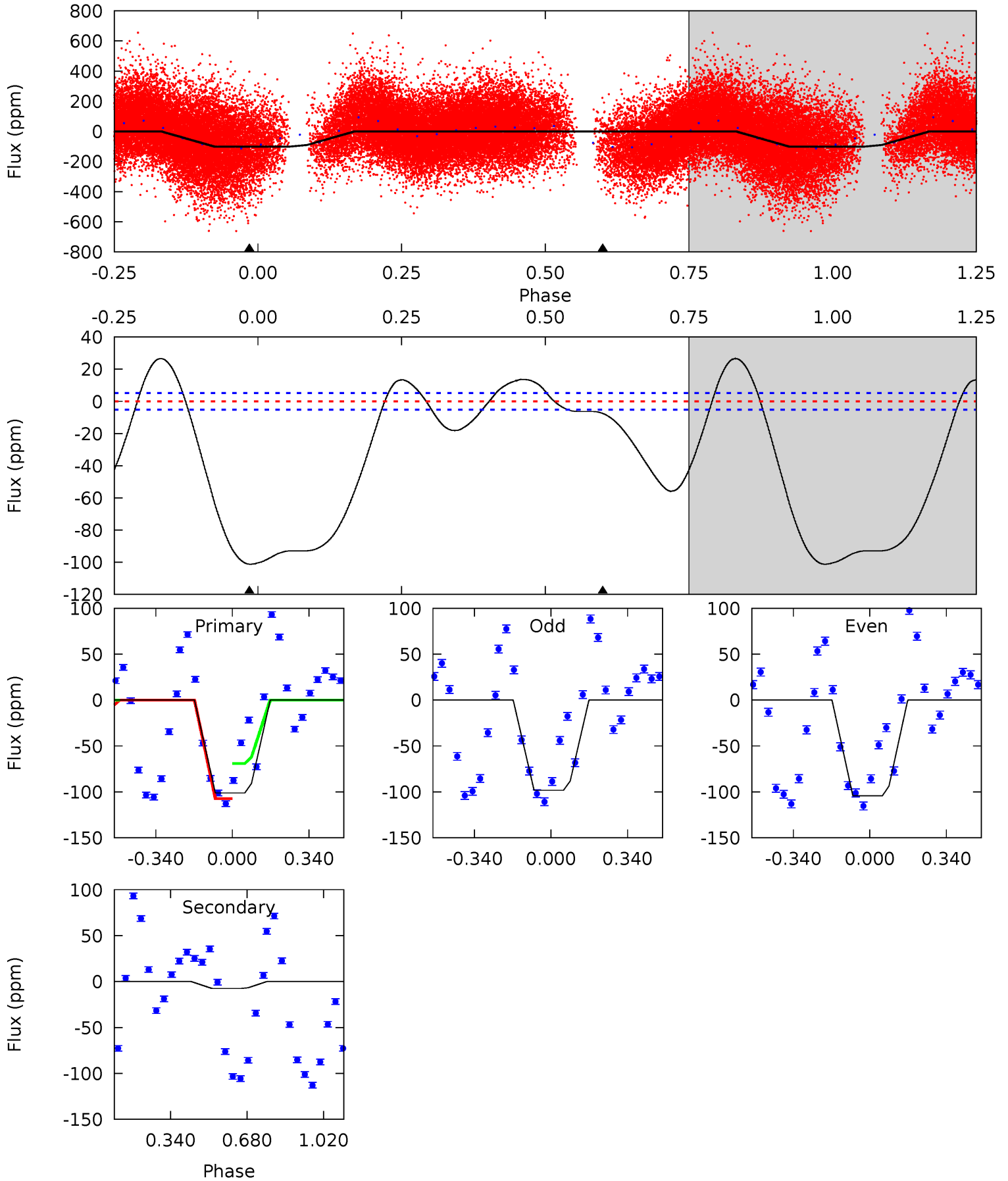
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.18	2.86	0	0	4.30	0.95	1.10	4.18	4.18	2.86	2.86	1.16	0.63	0.15	0.29



# Alt Model-Shift Uniqueness Test

007121016-02, P = 5.384412 Days, E = 126.575600 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
83.5	6.22	0	0	4.30	0.95	7.51	83.5	83.5	6.22	6.22	2.50	1.25	0.21	13.3



### Stellar Parameters For KIC 007121016

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7141^{+200}_{-300}$	$4.186^{+0.128}_{-0.192}$	$-0.180^{+0.250}_{-0.350}$	$1.585^{+0.504}_{-0.336}$	$1.409^{+0.218}_{-0.218}$	$0.498^{+0.304}_{-0.251}$
	+3%/-4%	+3%/-5%	+139%/-194%	+32%/-21%	+15%/-15%	+61%/-50%
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 007121016-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-3 \pm 1$	$0.61^{+0.33}_{-0.31}$	$2140^{+145}_{-141}$	$5146^{+2256}_{-948}$	$22^{+68}_{-14}$
Alt.	$-8 \pm 1$	$1.67^{+0.44}_{-0.38}$	$2135^{+173}_{-131}$	$4026^{+382}_{-295}$	$6.480^{+4.674}_{-2.459}$

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

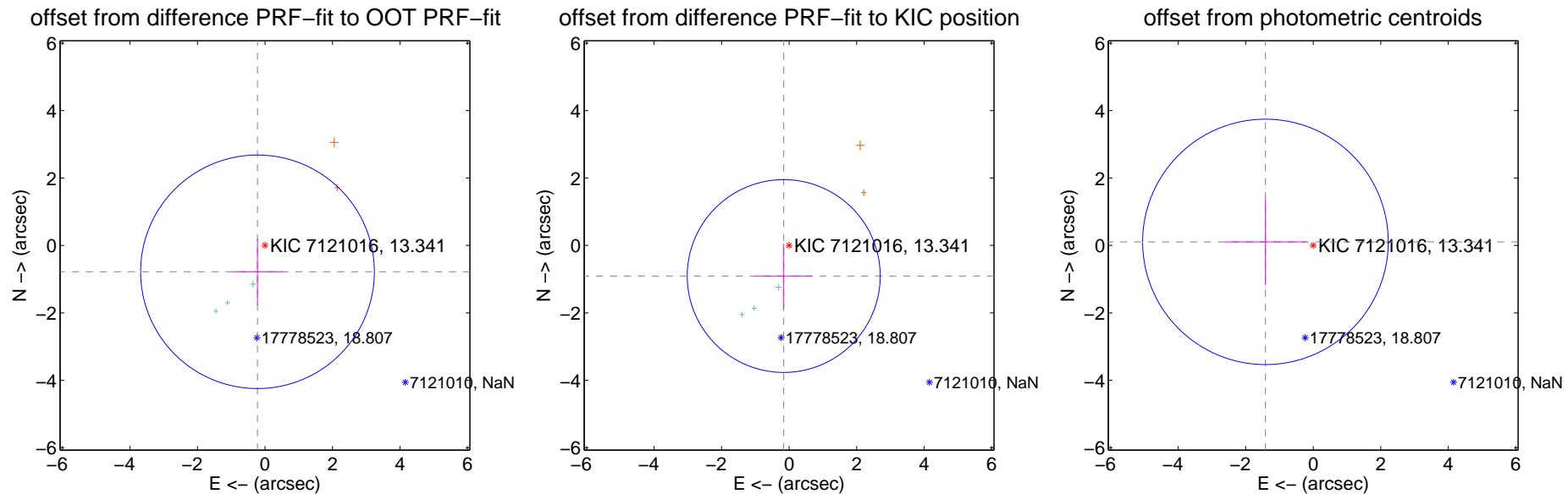
## DV Centroid Data

Supplemental centroid analysis for 007121016-02. Kepler magnitude: 13.34. Transit SNR 4.91

There are 3 quarters with good PRF difference image offsets

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

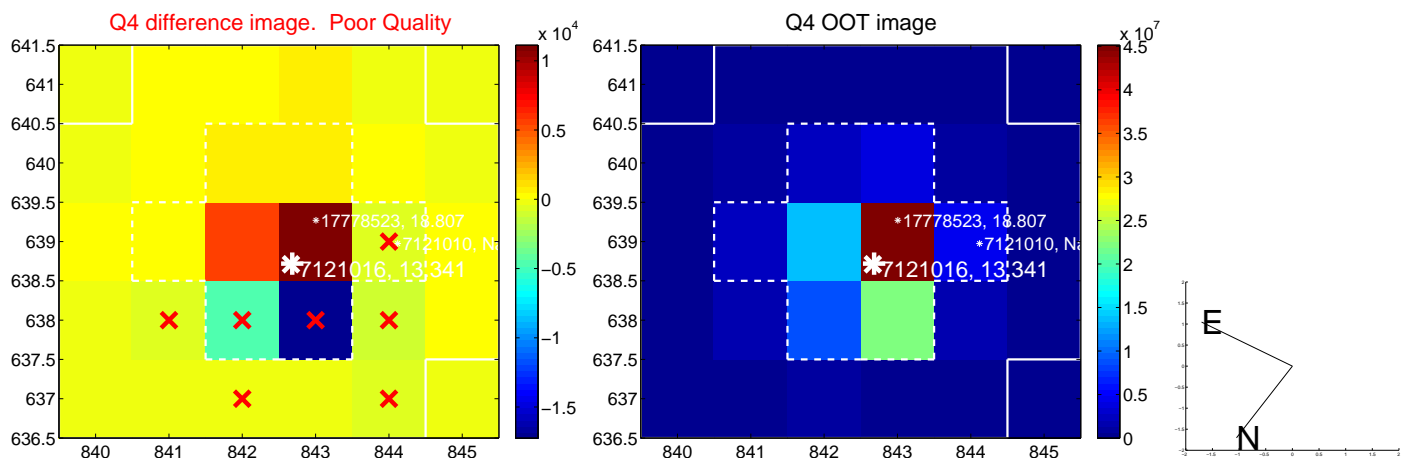
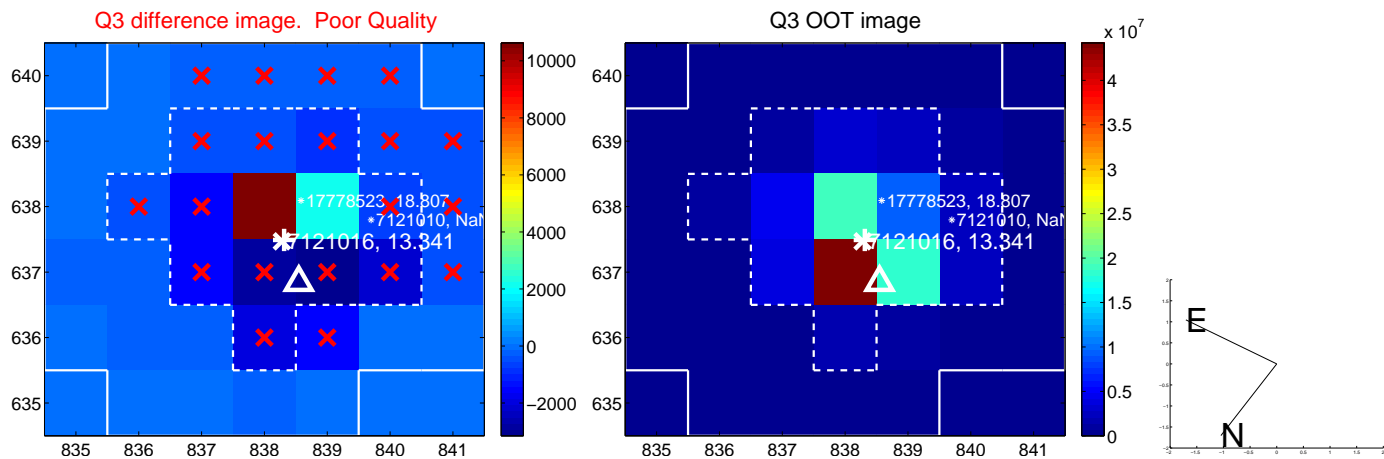
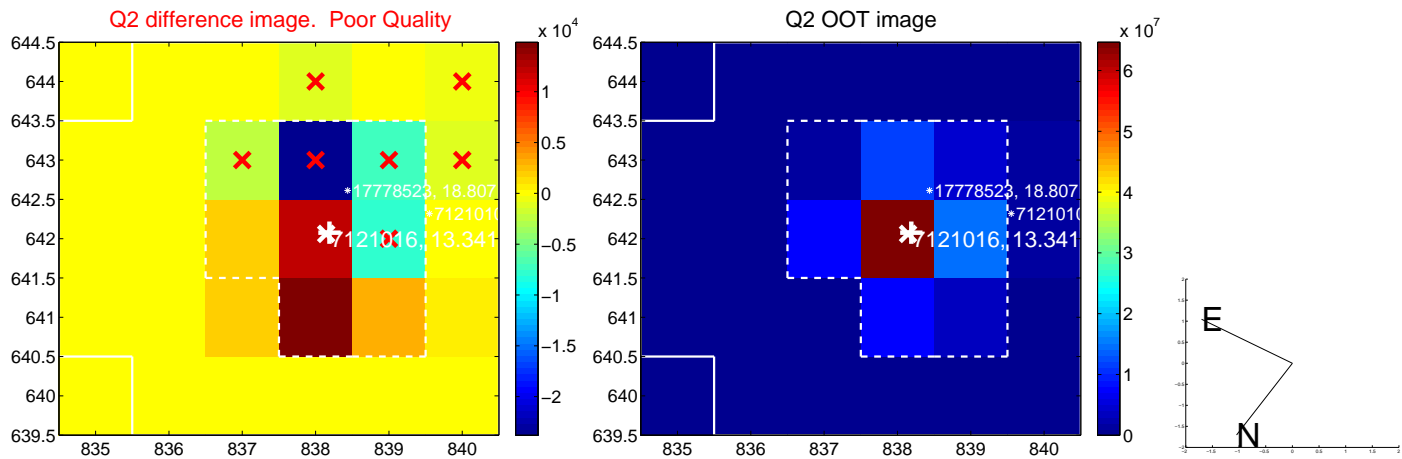
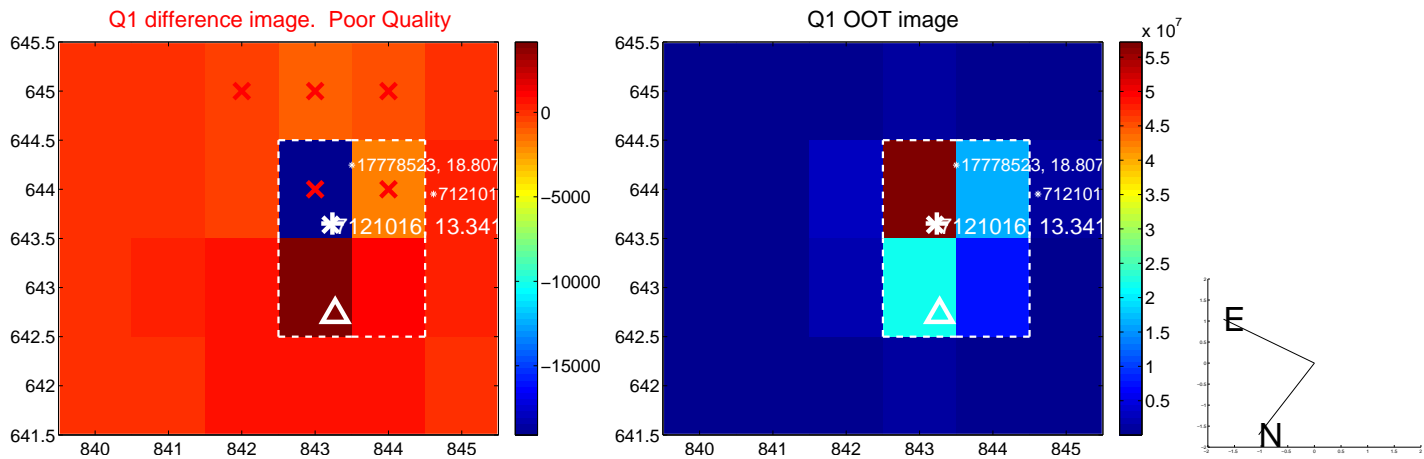
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.812 \pm 1.154$	0.70	$0.222 \pm 0.756$	$-0.781 \pm 0.991$
PRF-fit source offset from KIC position	$0.921 \pm 0.953$	0.97	$0.159 \pm 0.848$	$-0.907 \pm 0.956$
photometric centroid source offset	$1.42 \pm 1.21$	1.17	$1.42 \pm 1.21$	$0.11 \pm 1.29$



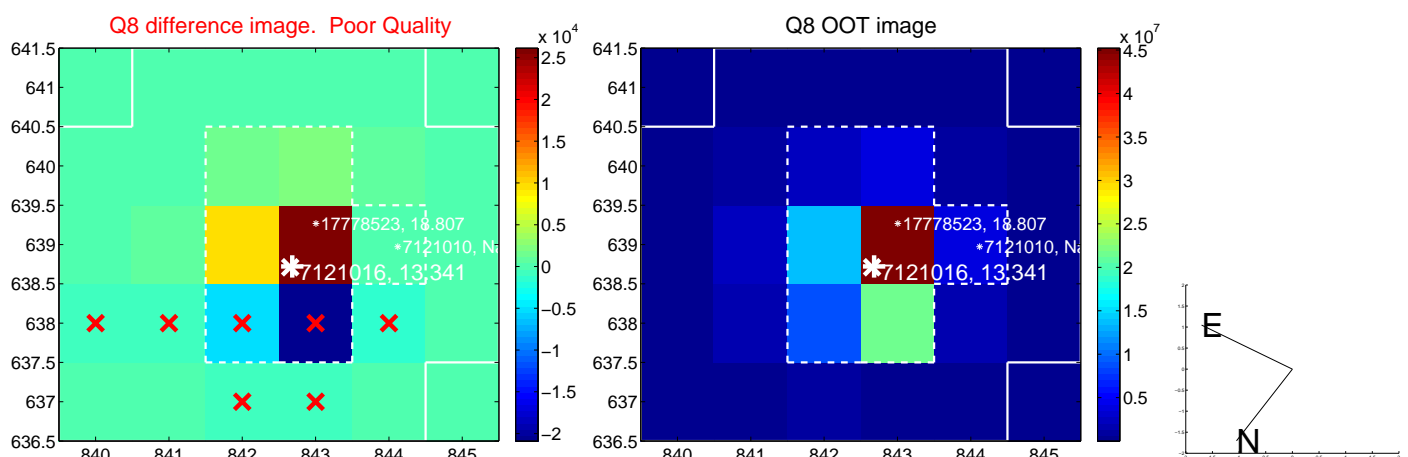
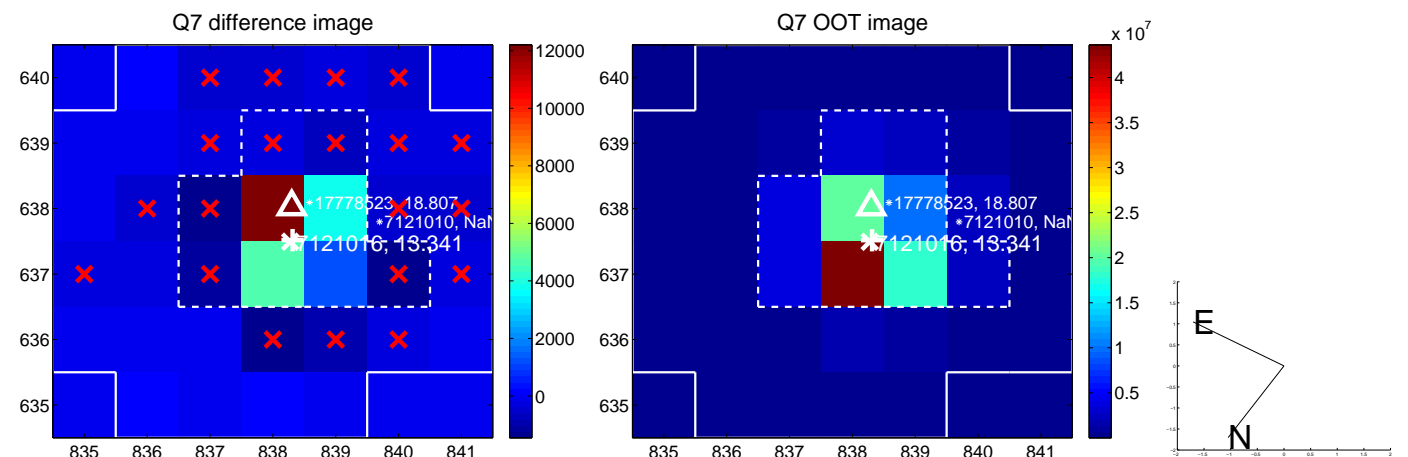
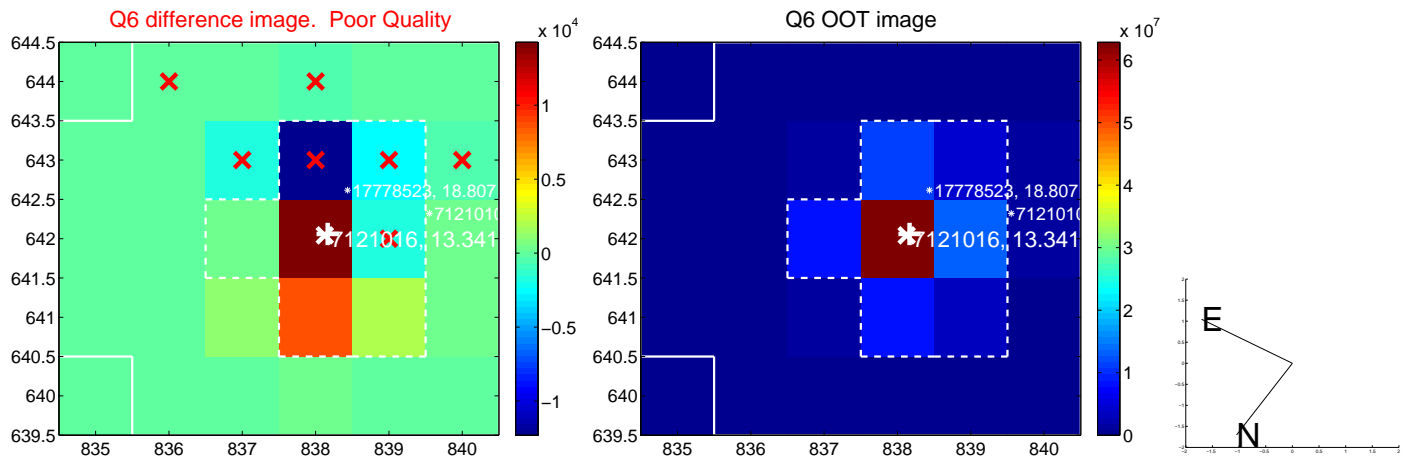
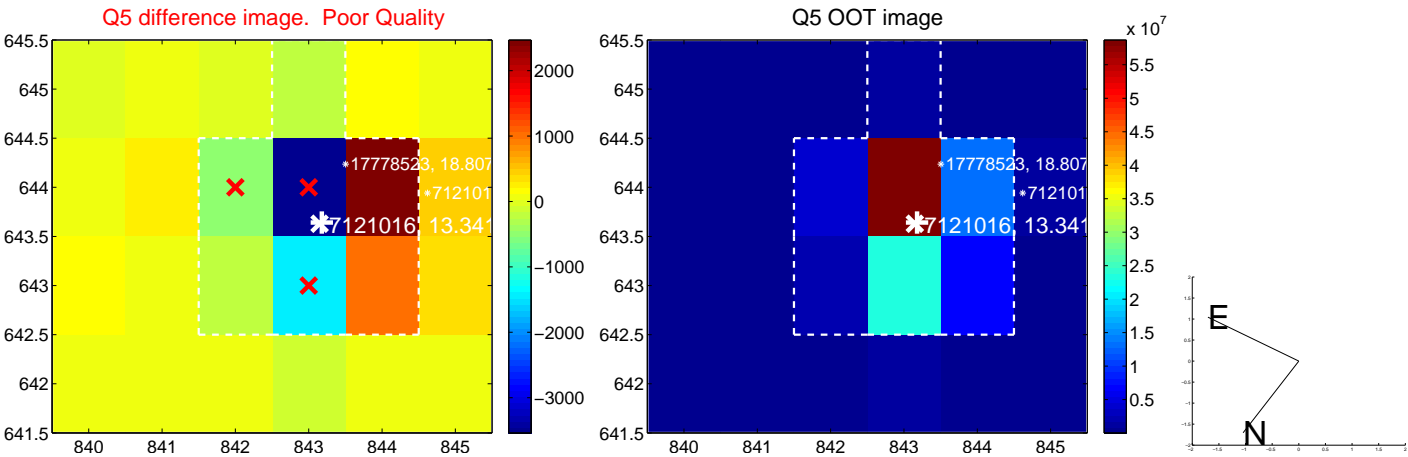
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



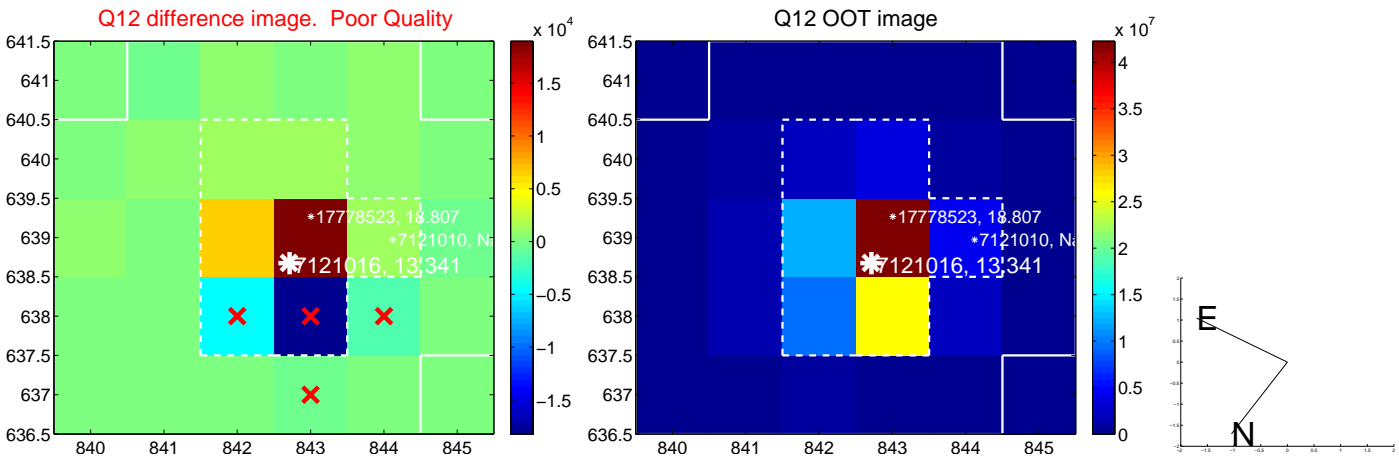
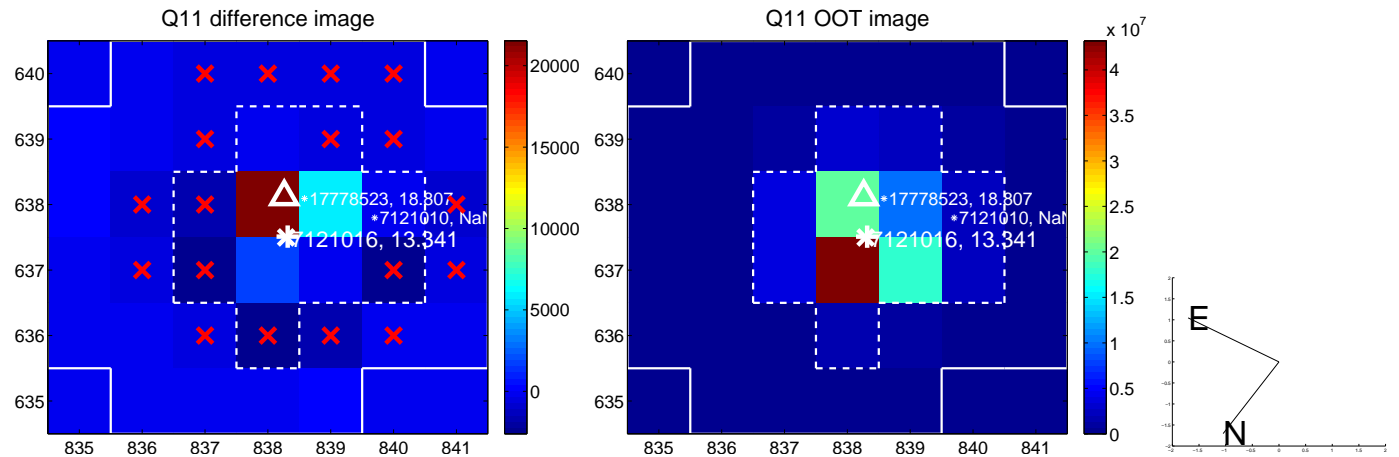
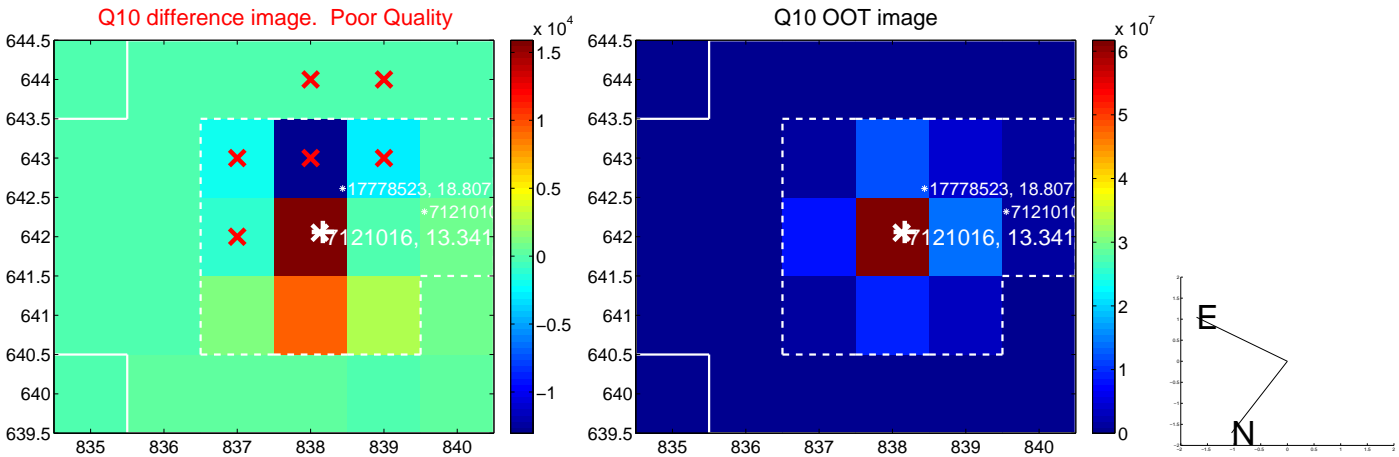
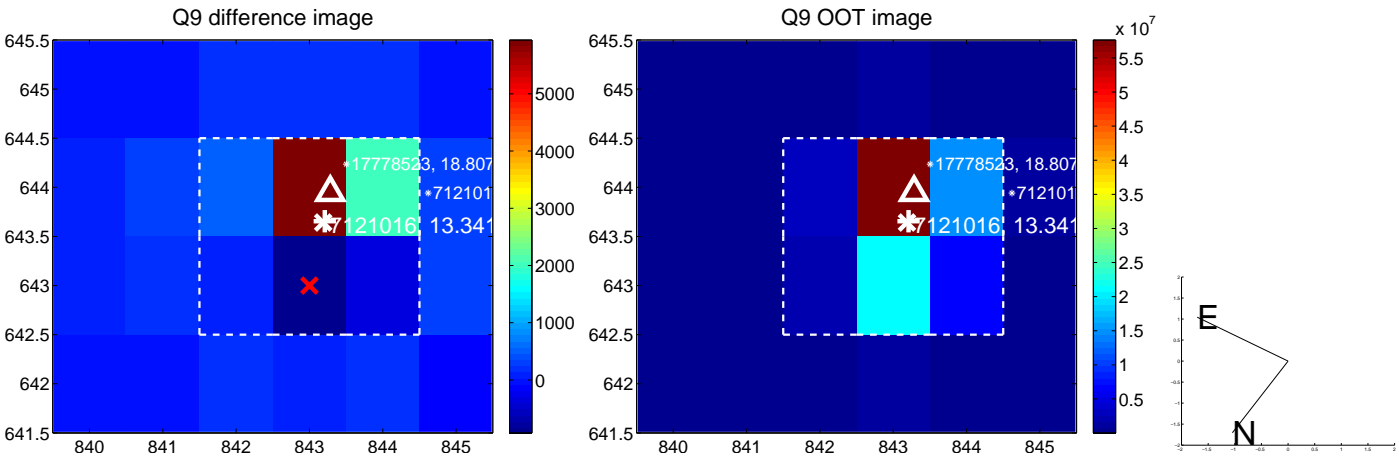
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



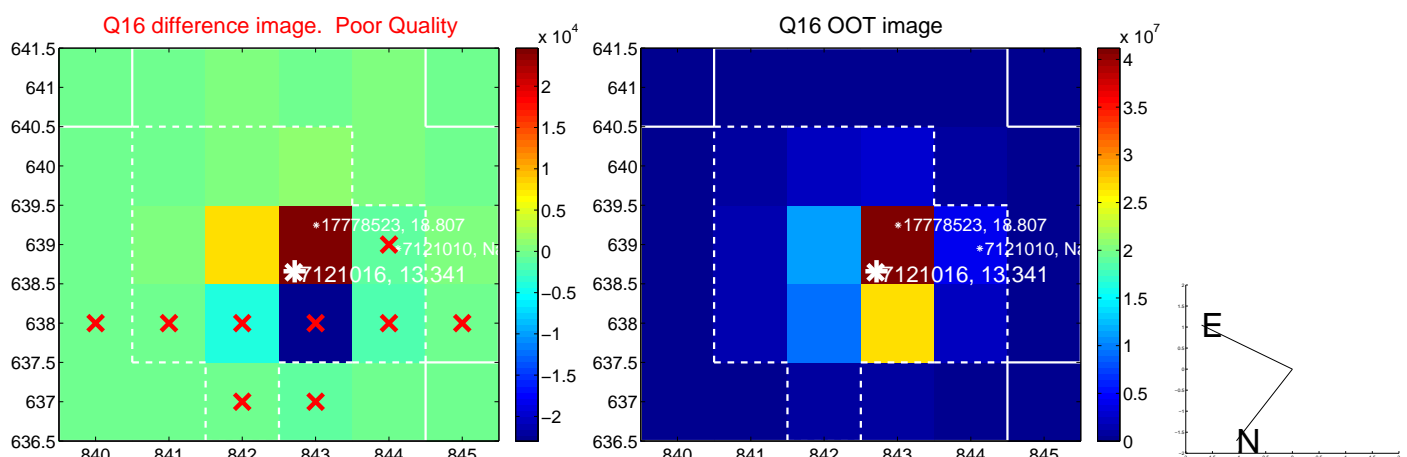
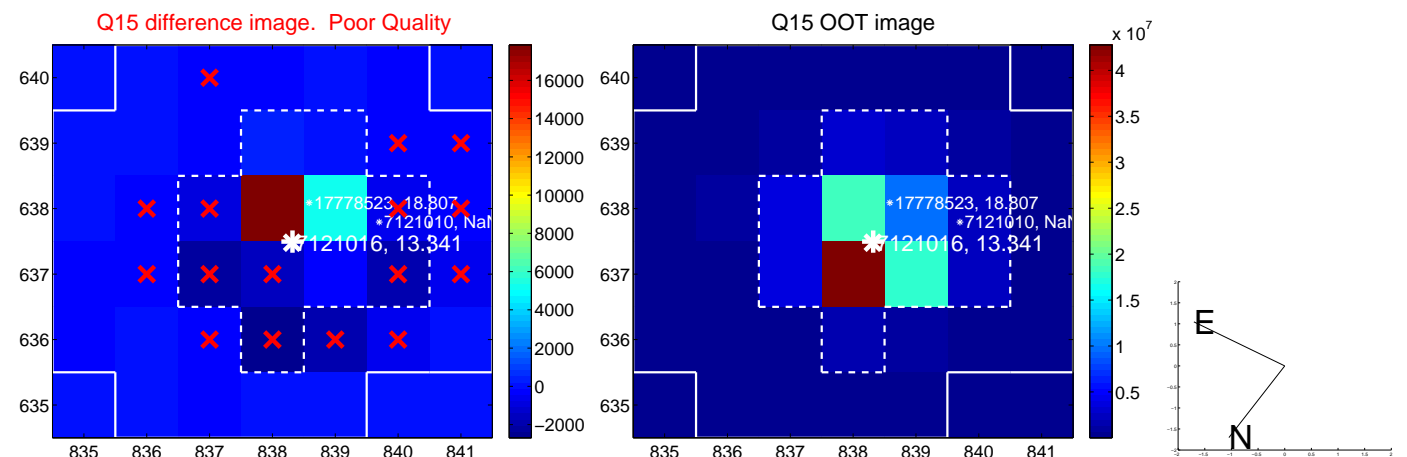
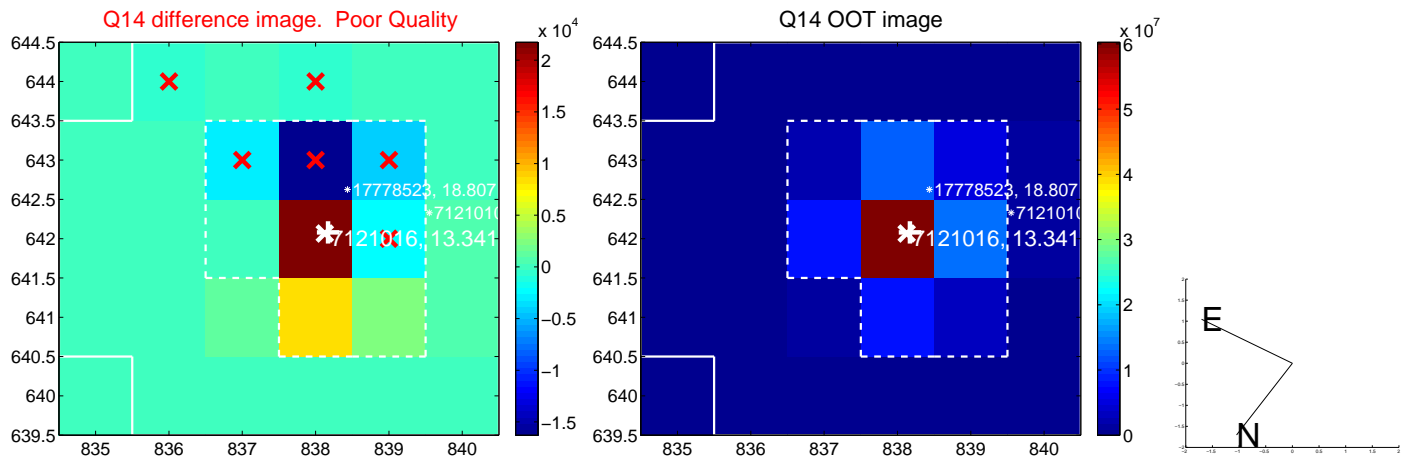
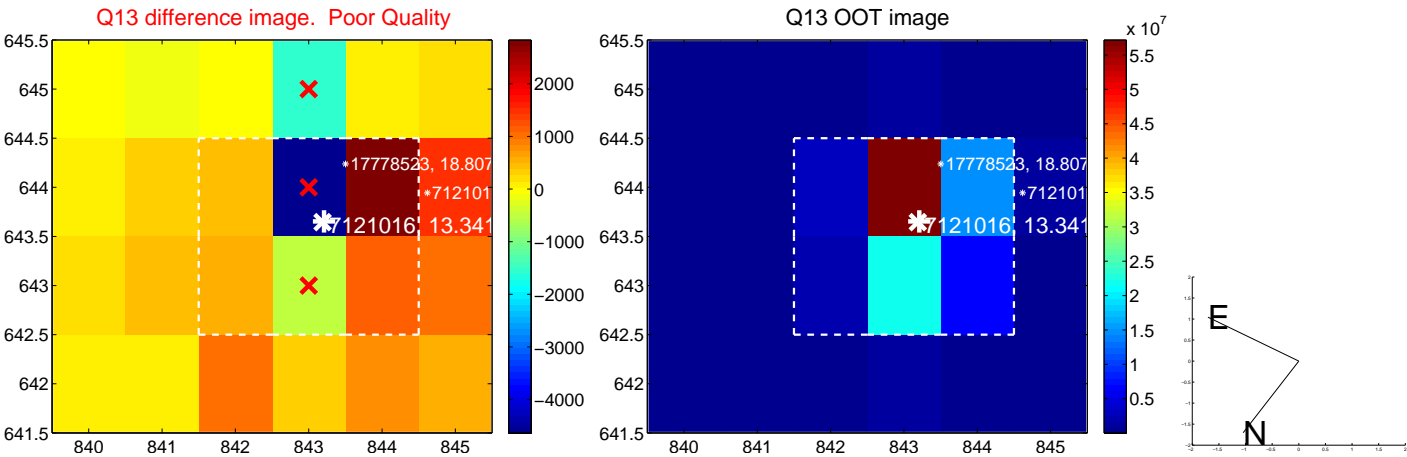
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



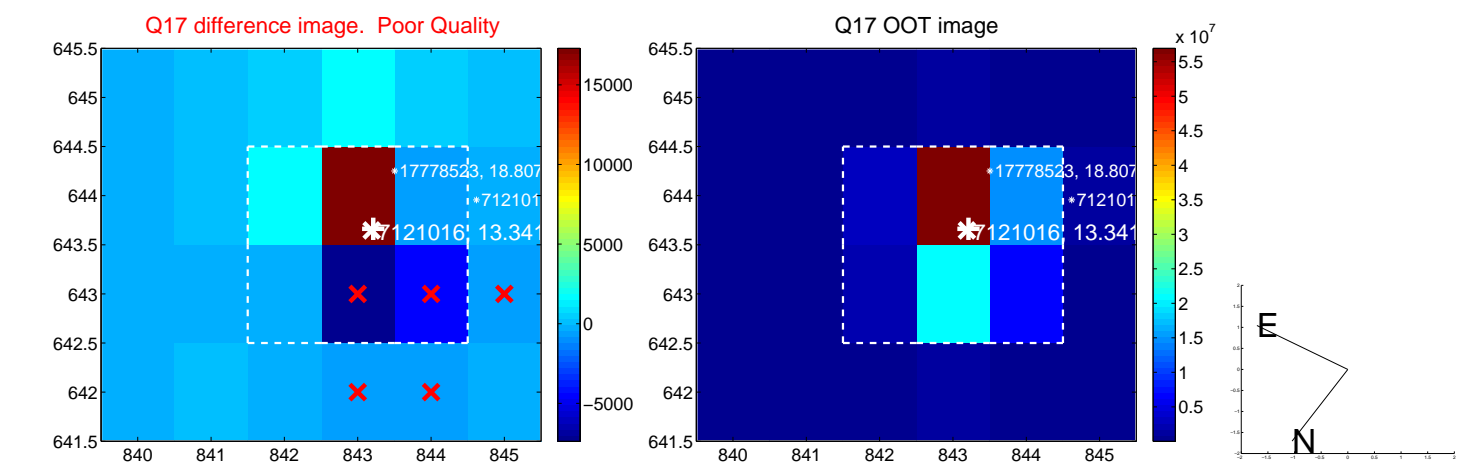
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



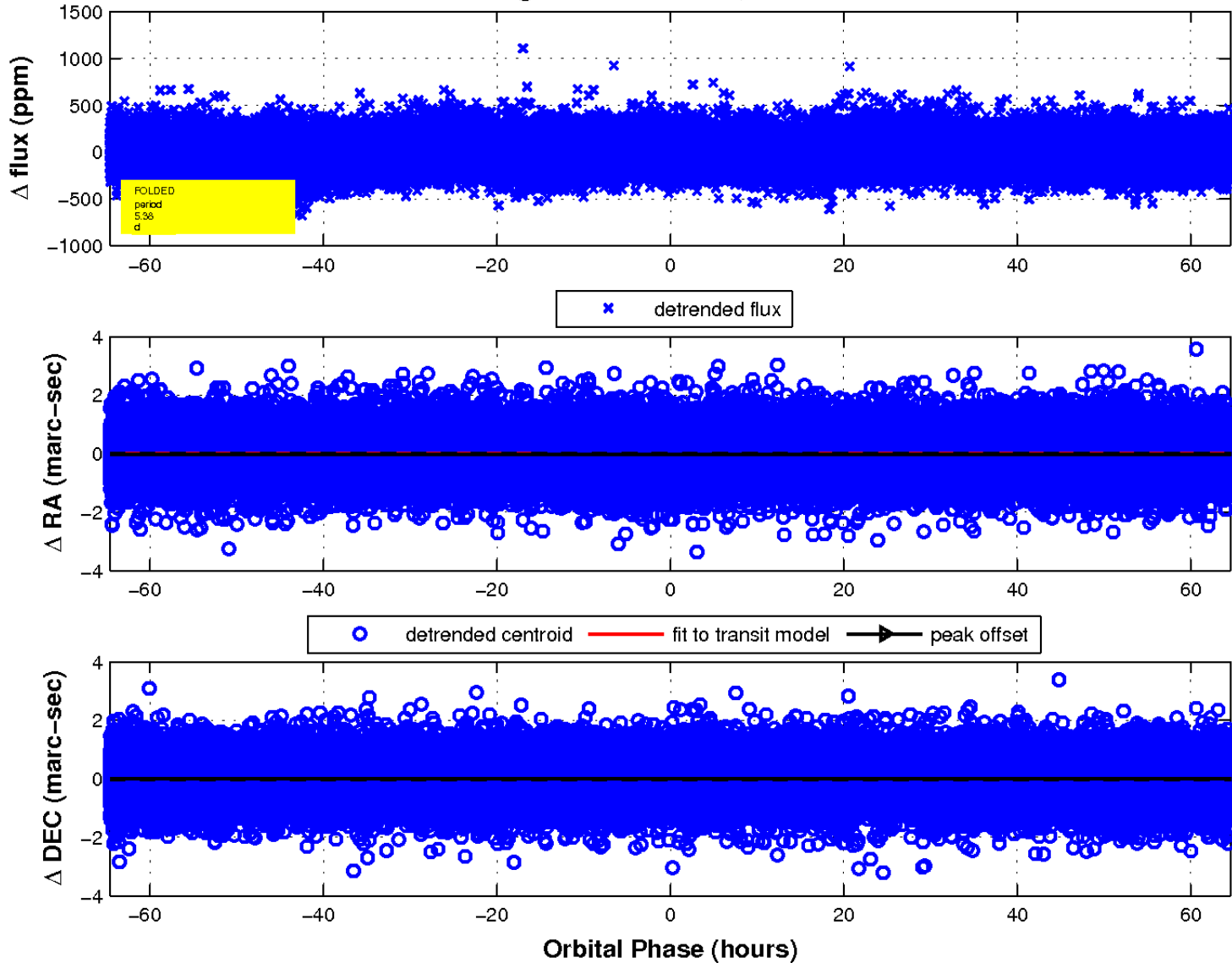
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2





UKIRT Image

