

# KIC 004458172

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004458172-01	OBS	No	1.054923	131.665948	15.8	2.160	14.2	15.7	1.89	7719	0.87	18782.96
004458172-02	OBS	No	0.527460	131.555093	14.4	1.385	11.6	12.0	1.89	7719	0.77	47330.26

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004458172-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_SATURATED
004458172-02	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

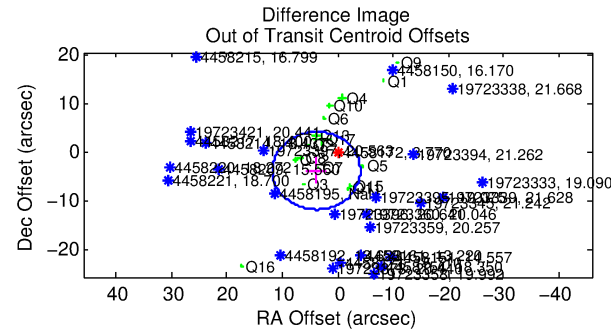
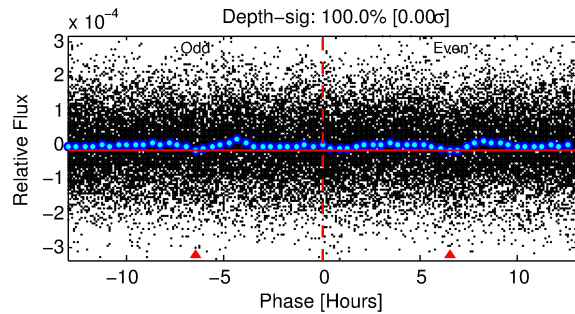
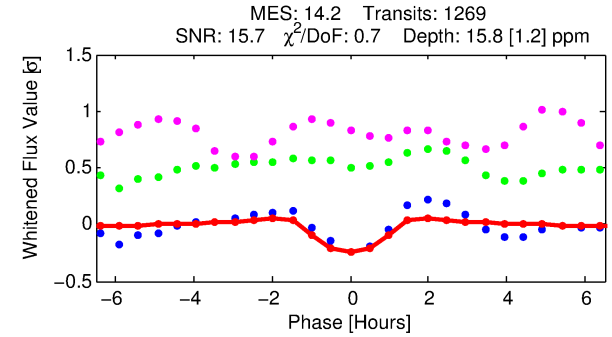
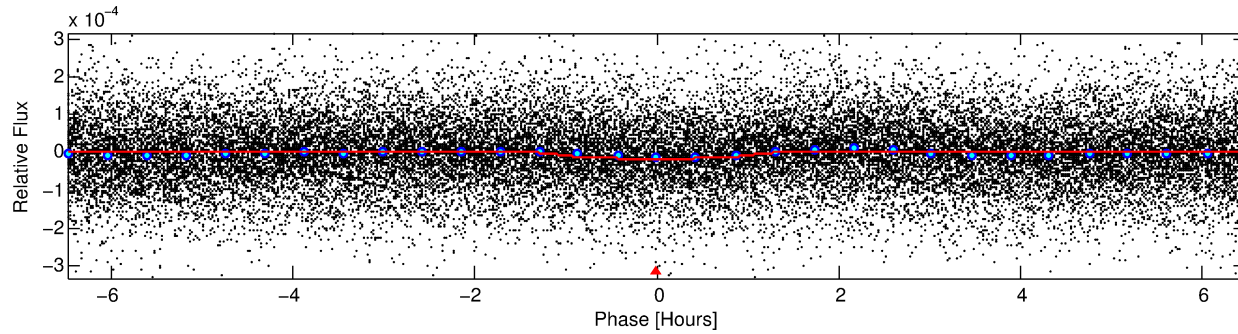
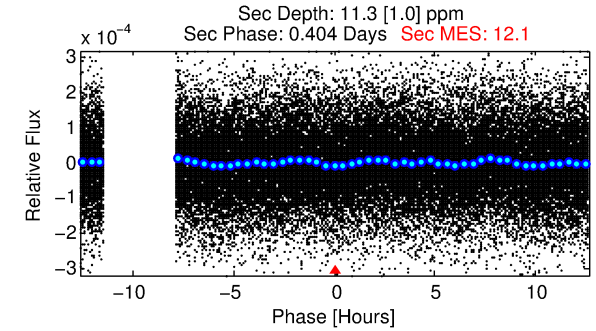
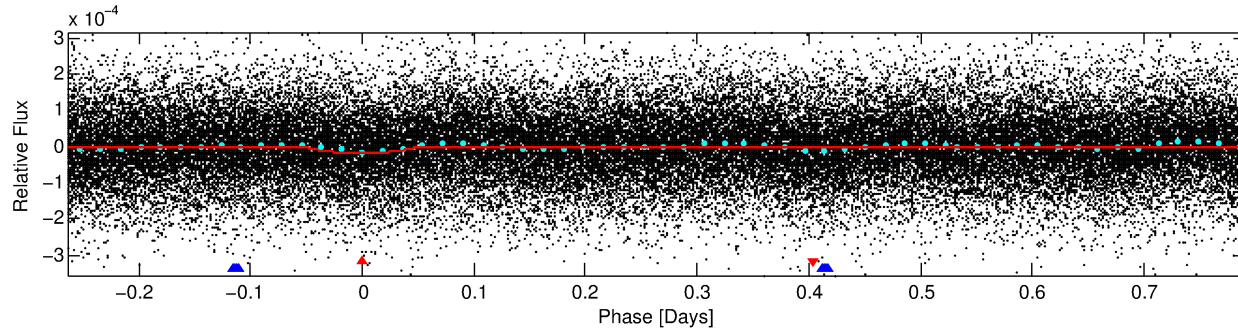
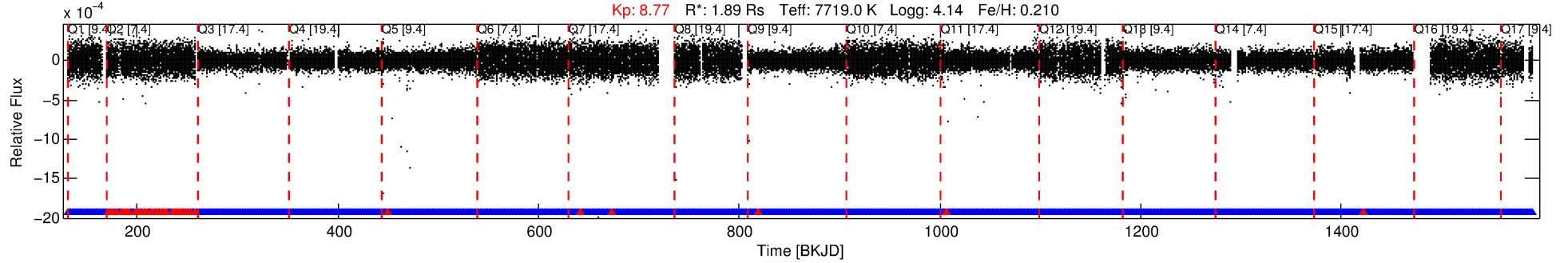
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004458172-01

No Significant Match Found

# DV One-Page Summary

KIC: 4458172 Candidate: 1 of 2 Period: 1.055 d



## DV Fit Results:

Period = 1.05492 [0.00001] d  
Epoch = 131.6659 [0.0017] BKJD  
Rp/R\* = 0.0042 [0.0007]  
a/R\* = 1.91 [1.36]  
b = 0.90 [0.21]  
Seff = 18782.96 [7053.01]  
Teq = 2985 [280] K  
Rp = 0.87 [0.28] Re  
a = 0.0246 [0.0057] AU  
Ag = 4.95 [2.28] [1.73σ]  
Teffp = 6884 [635] K [5.62σ]

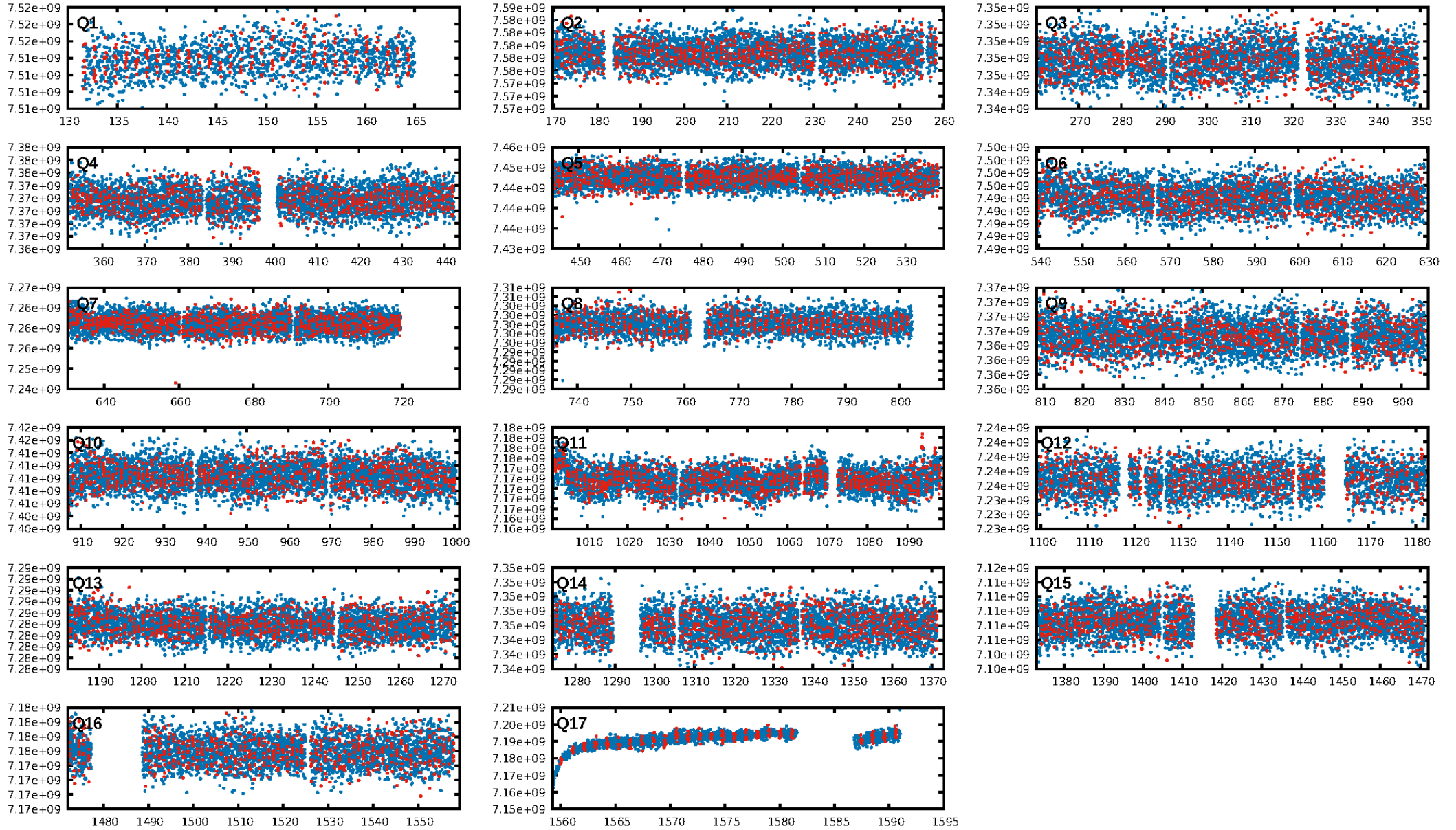
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [4.93σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 6.14e-48  
RollingBand-fgt: 0.96 [1165/1212]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 44.2%  
Centroid-so: 0.940 arcsec [0.95σ]  
OotOffset-rm: 5.379 arcsec [2.03σ]  
OotOffset-st: 3/4/4/5 [16]  
KicOffset-rm: 6.914 arcsec [2.53σ]  
KicOffset-st: 3/4/4/5 [16]  
DiffImageQuality-fgm: 0.00 [0/16]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:02:21 Z

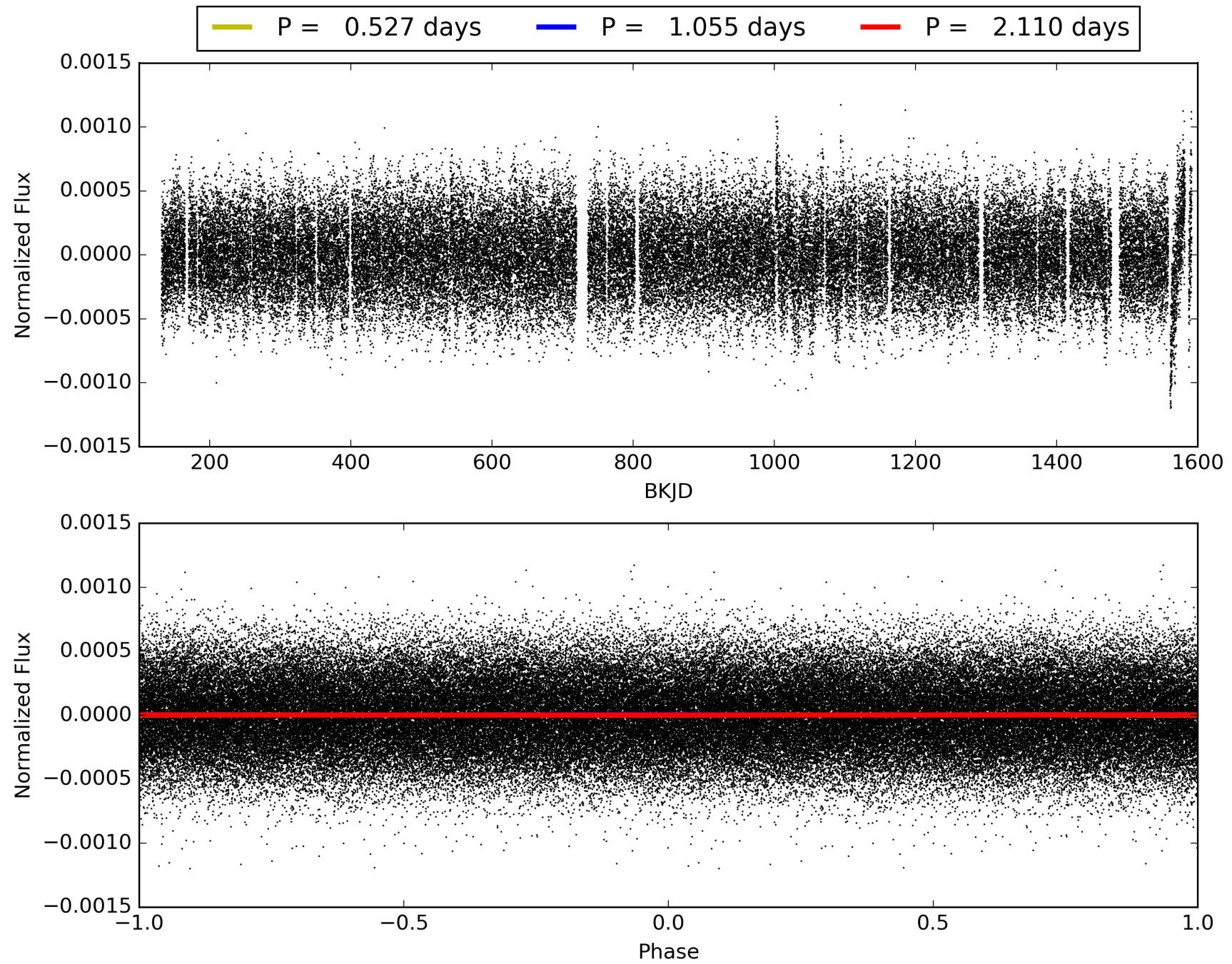
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004458172-01, PDC Light Curves



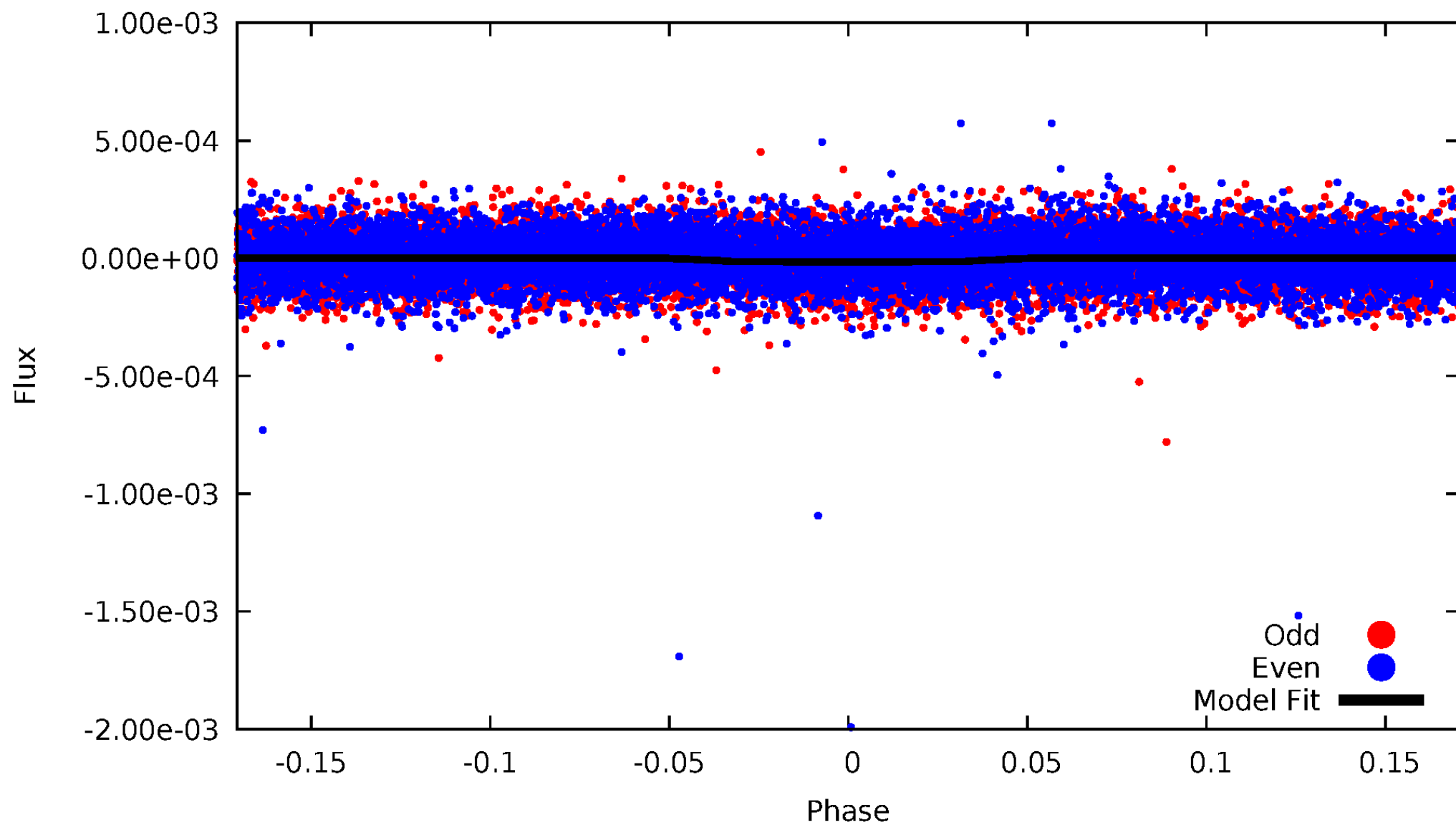


TCE 004458172-01



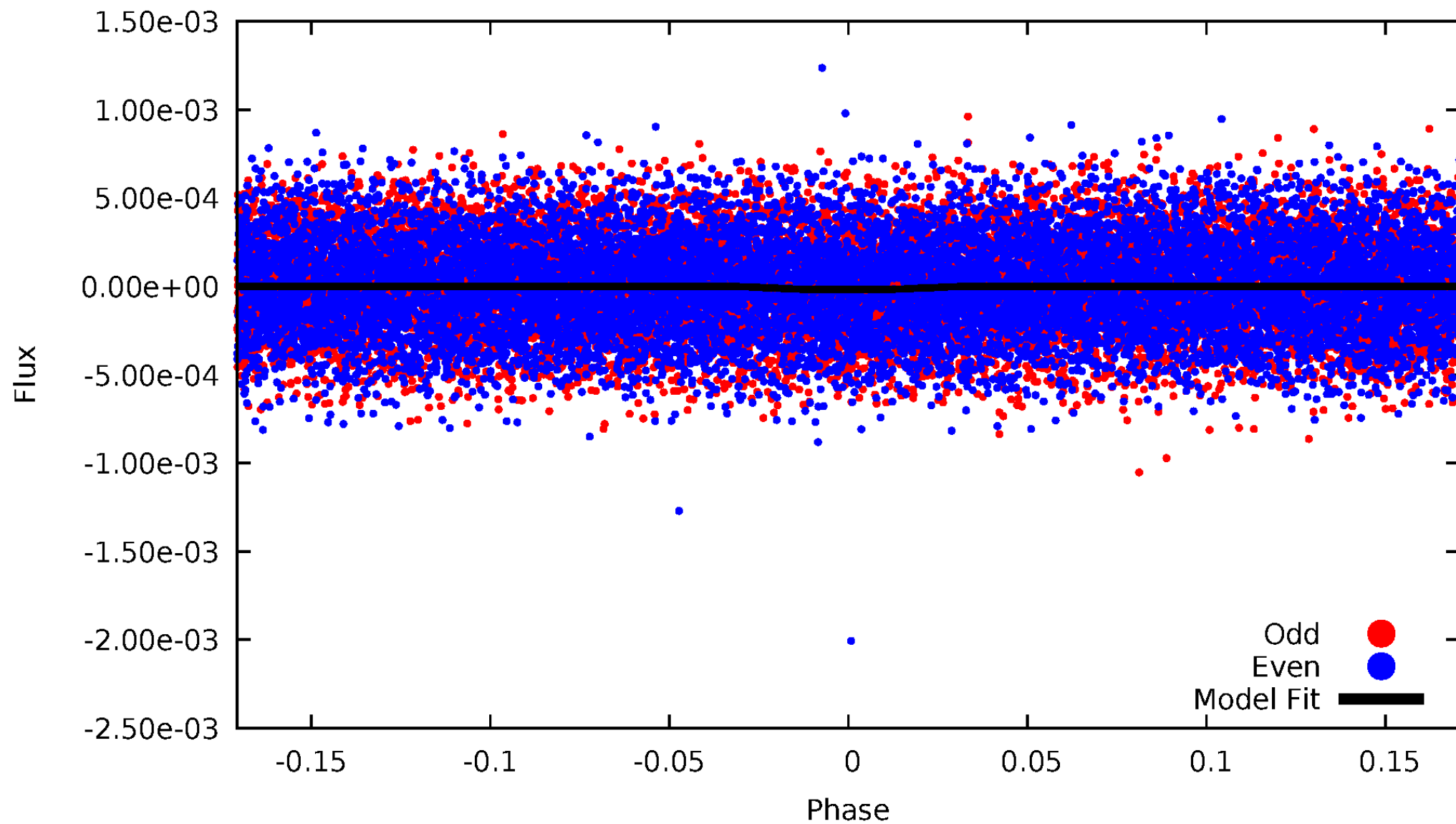
# DV Odd/Even

TCE 004458172-01



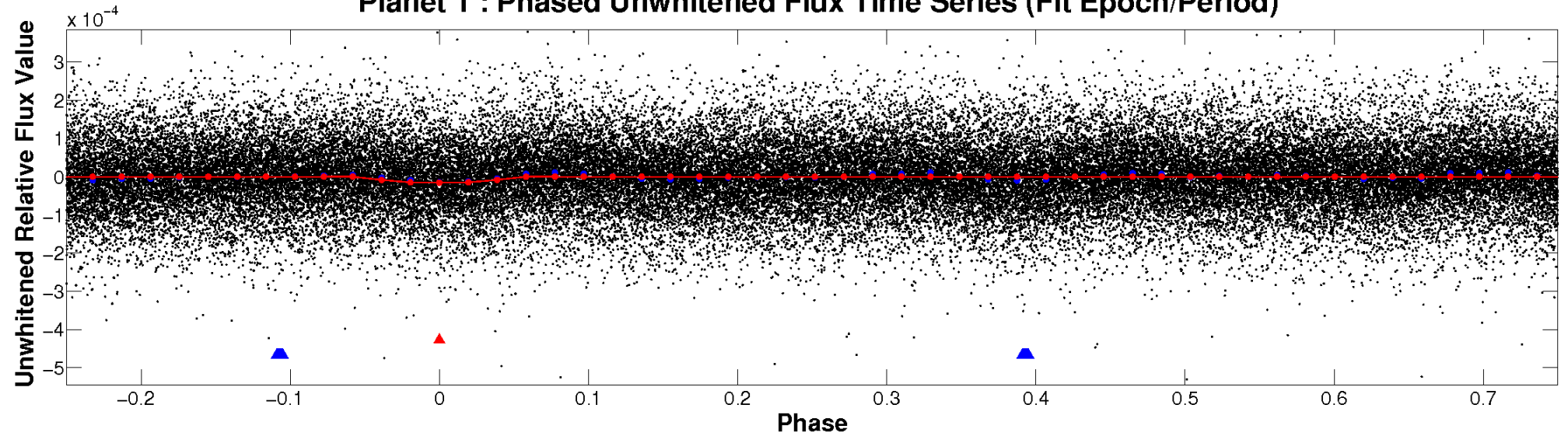
# ALT Odd/Even

TCE 004458172-01

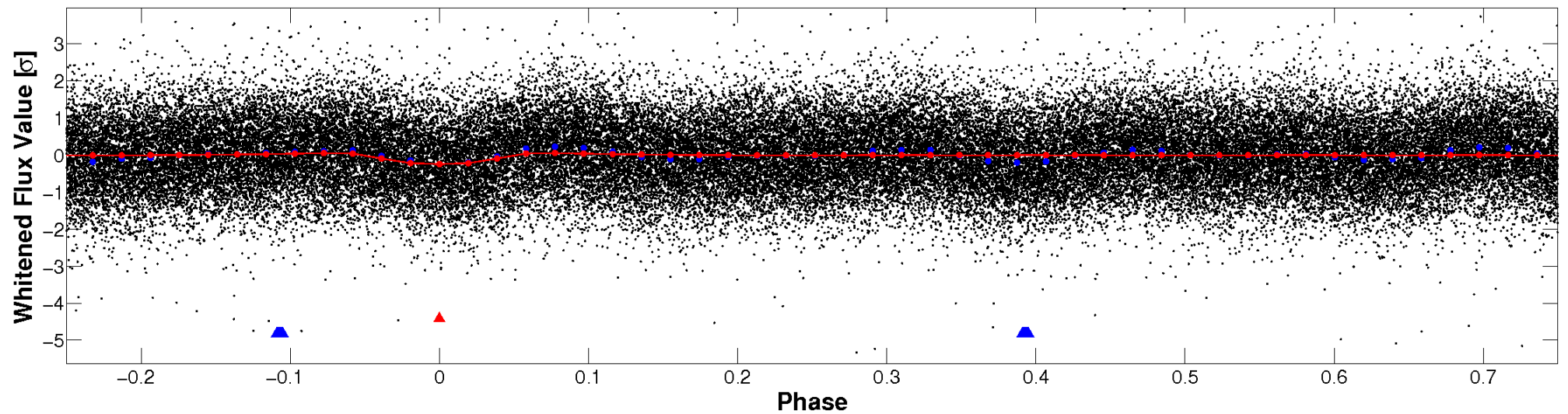


# Non-Whitened Vs. Whitened Light Curve

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



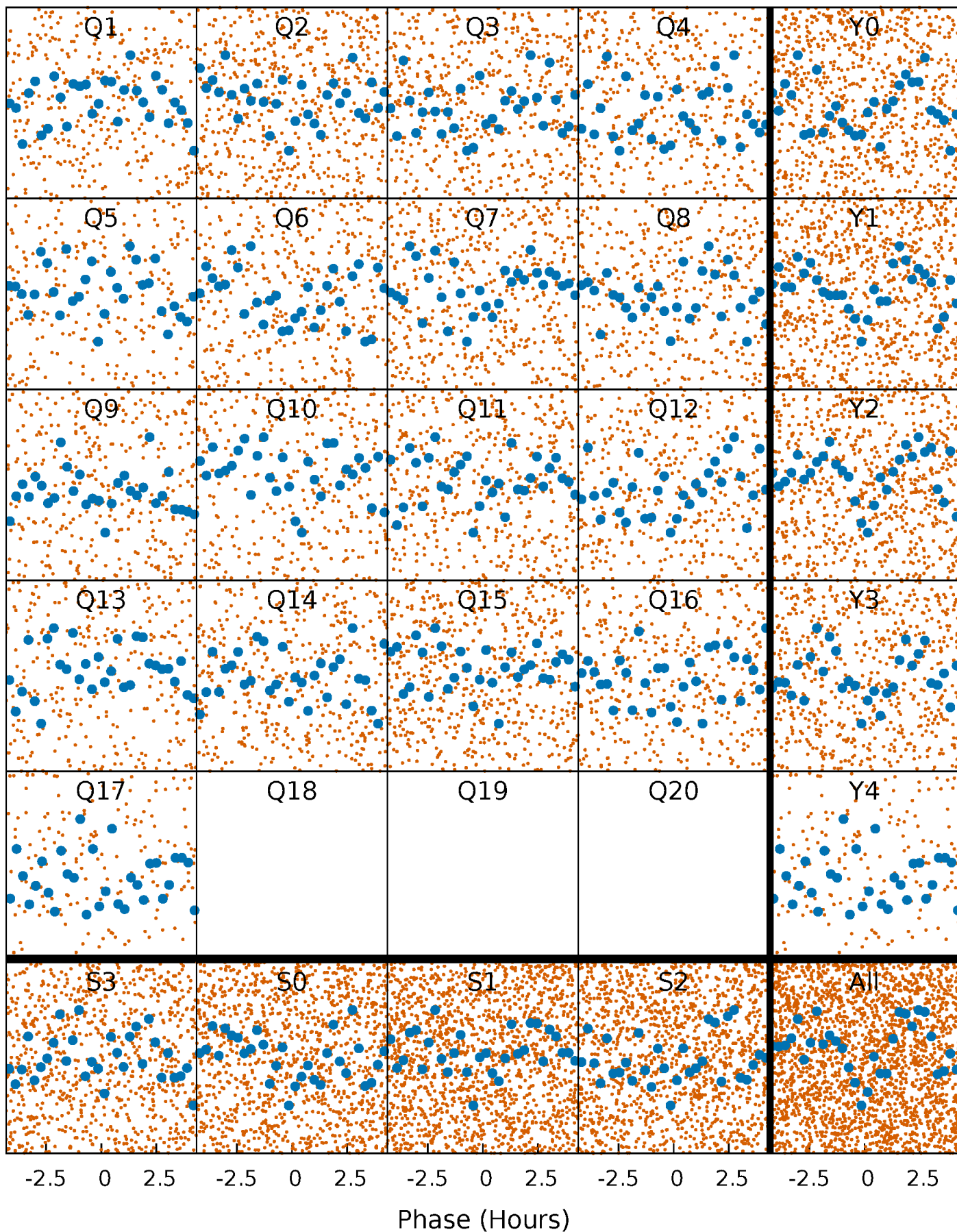
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

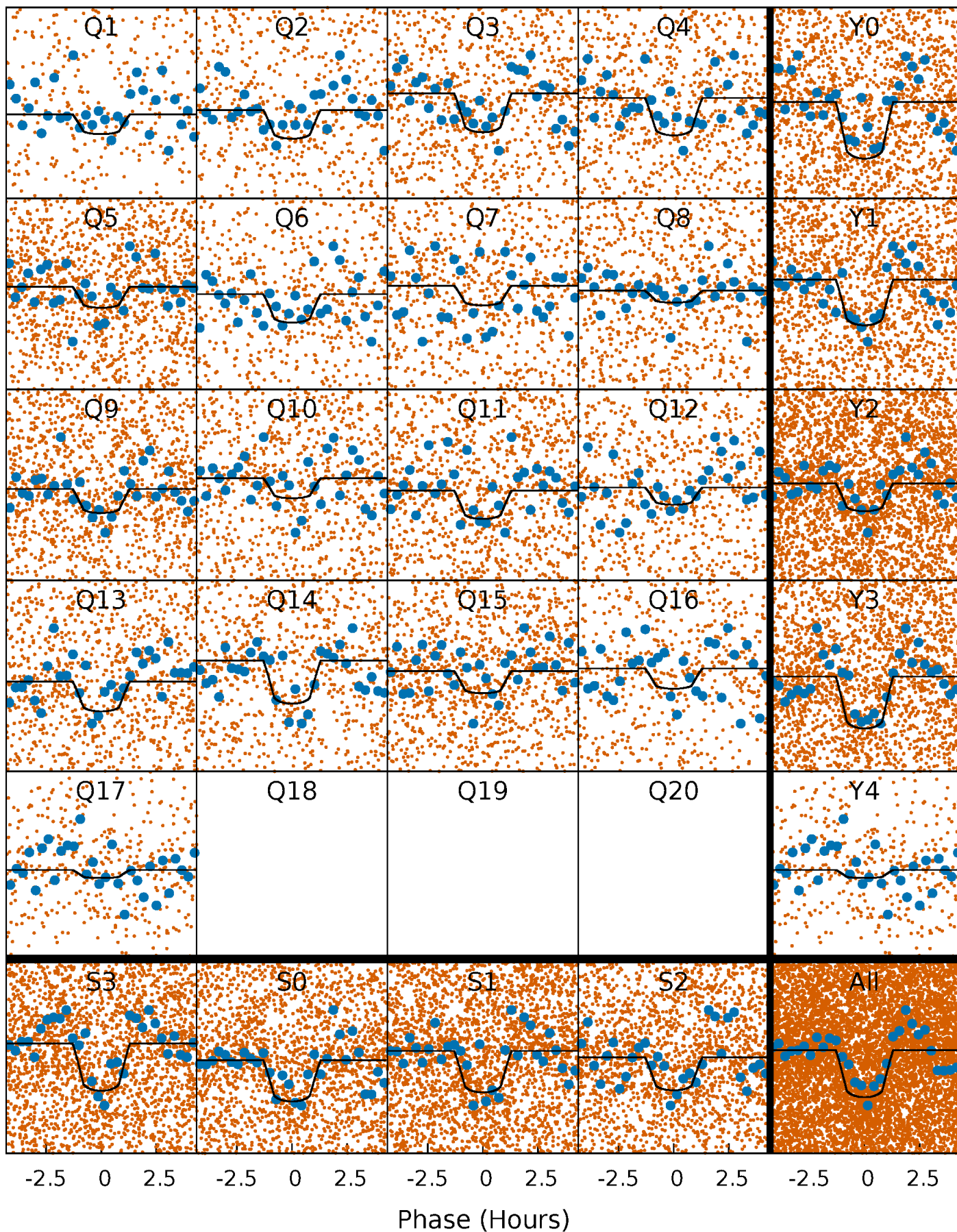
TCE 004458172-01 P= 1.054923 Days  $T_0=131.665948$  (BKJD)





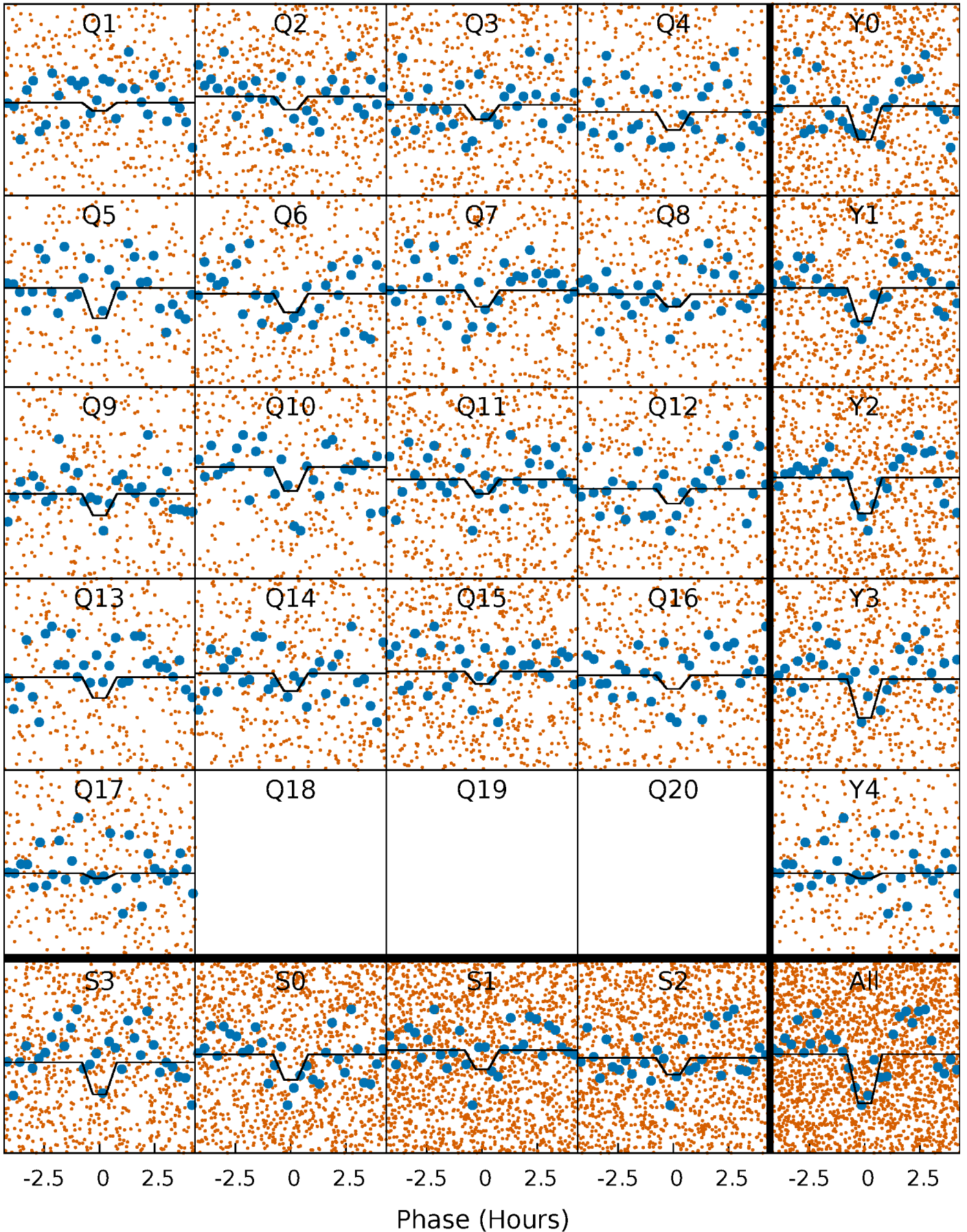
# DV Quarter-Phased Transit Curves

TCE 004458172-01 P= 1.054923 Days  $T_0=131.665948$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

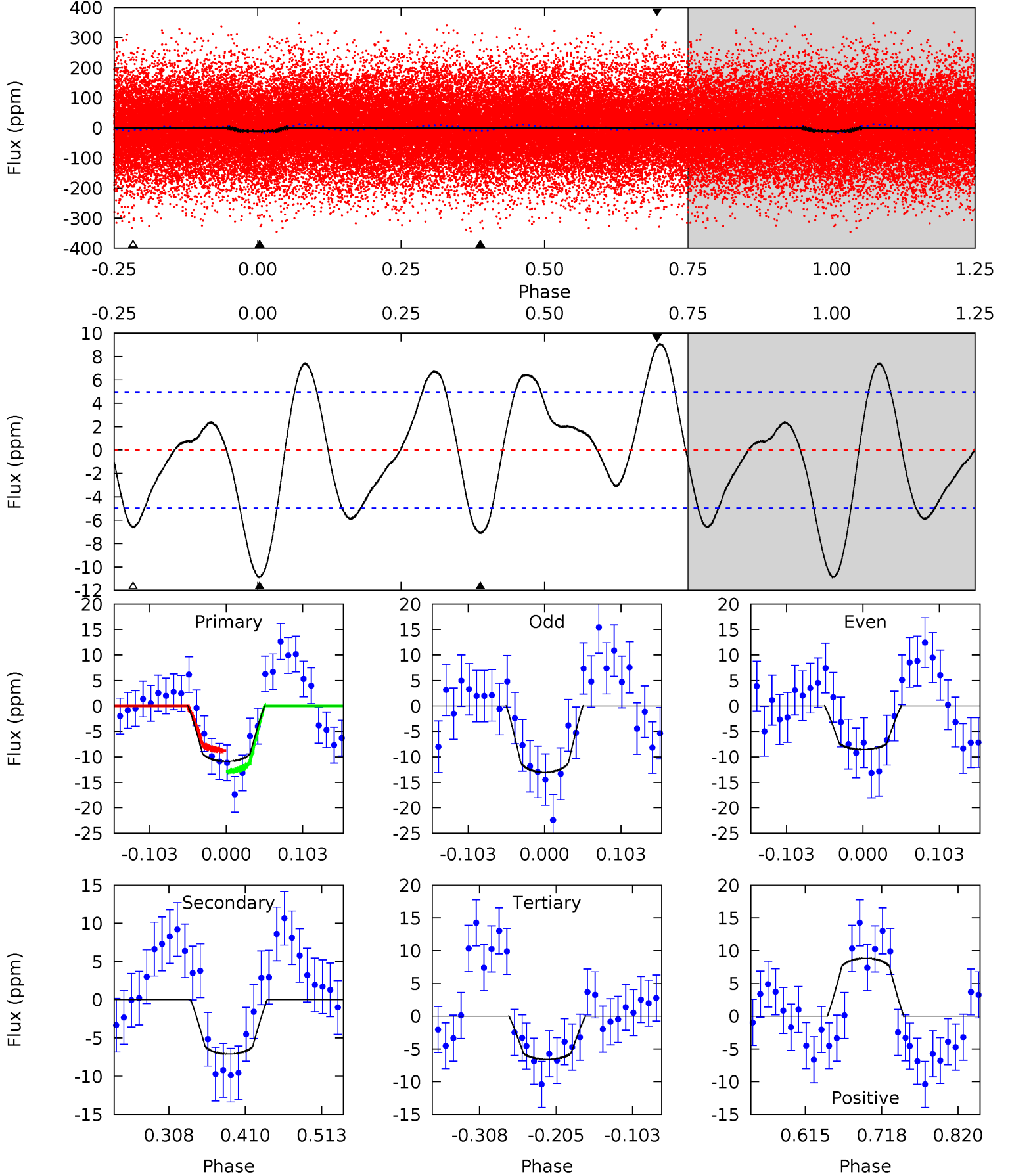
TCE 004458172-01 P= 1.054923 Days  $T_0=131.665948$  (BKJD)



# DV Model-Shift Uniqueness Test

004458172-01, P = 1.054923 Days, E = 130.611025 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
10.00	6.52	6.05	8.11	4.56	1.63	3.45	3.94	1.89	0.47	-1.59	2.07	0.97	0.45	1.87

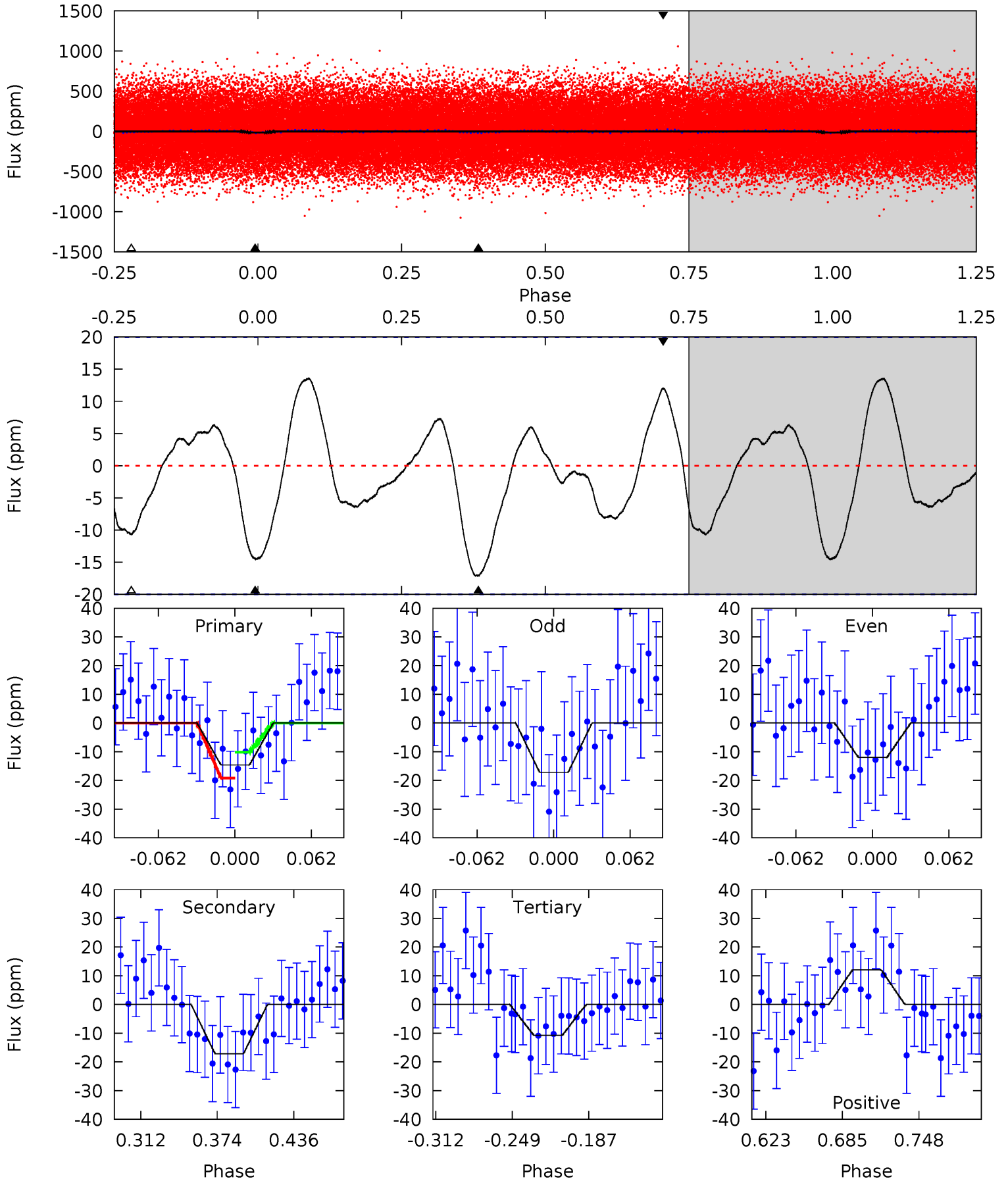




# Alt Model-Shift Uniqueness Test

004458172-01, P = 1.054923 Days, E = 130.611025 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
3.41	4.01	2.50	2.83	4.66	1.86	1.42	0.91	0.58	1.51	1.18	0.61	1.11	0.44	1.05





### Stellar Parameters For KIC 004458172

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7719^{+214}_{-349}$	$4.137^{+0.094}_{-0.175}$	$0.210^{+0.150}_{-0.400}$	$1.894^{+0.540}_{-0.291}$	$1.792^{+0.181}_{-0.271}$	$0.372^{+0.167}_{-0.187}$
	+3%/-5%	+2%/-4%	+71%/-190%	+29%/-15%	+10%/-15%	+45%/-50%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 004458172-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-7 \pm 1$	$0.89^{+0.19}_{-0.17}$	$4203^{+320}_{-243}$	$5825^{+612}_{-550}$	$2.917^{+1.495}_{-1.018}$
Alt.	$-17 \pm 4$	$0.88^{+0.18}_{-0.15}$	$4187^{+297}_{-238}$	$7454^{+1079}_{-871}$	$7.182^{+3.494}_{-2.640}$

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

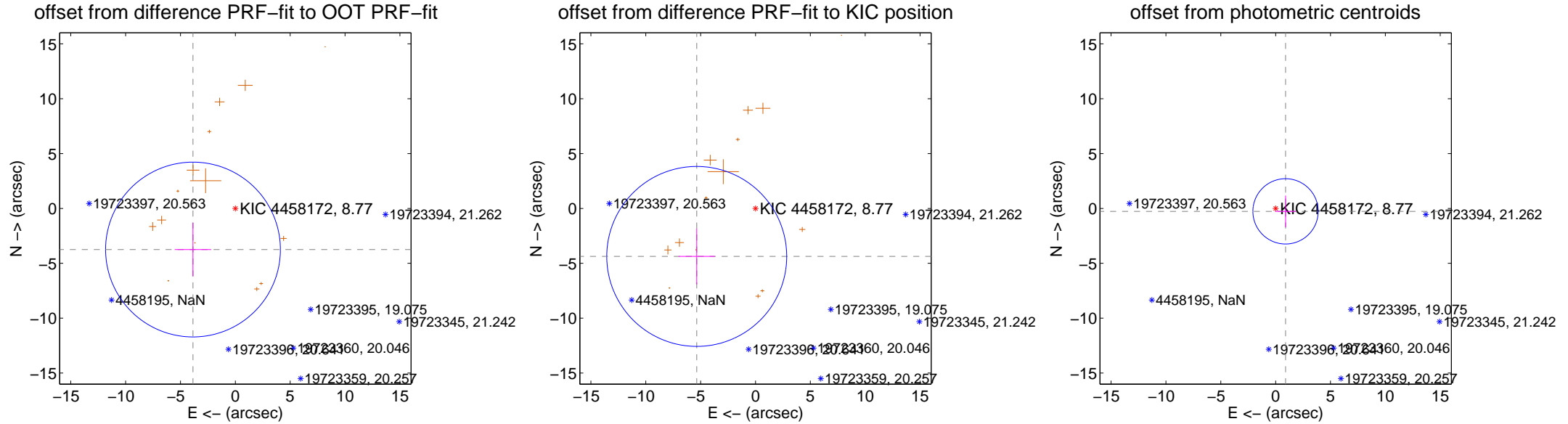
## DV Centroid Data

Supplemental centroid analysis for 004458172-01. **Kepler magnitude: 8.77.** Transit SNR 15.72

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

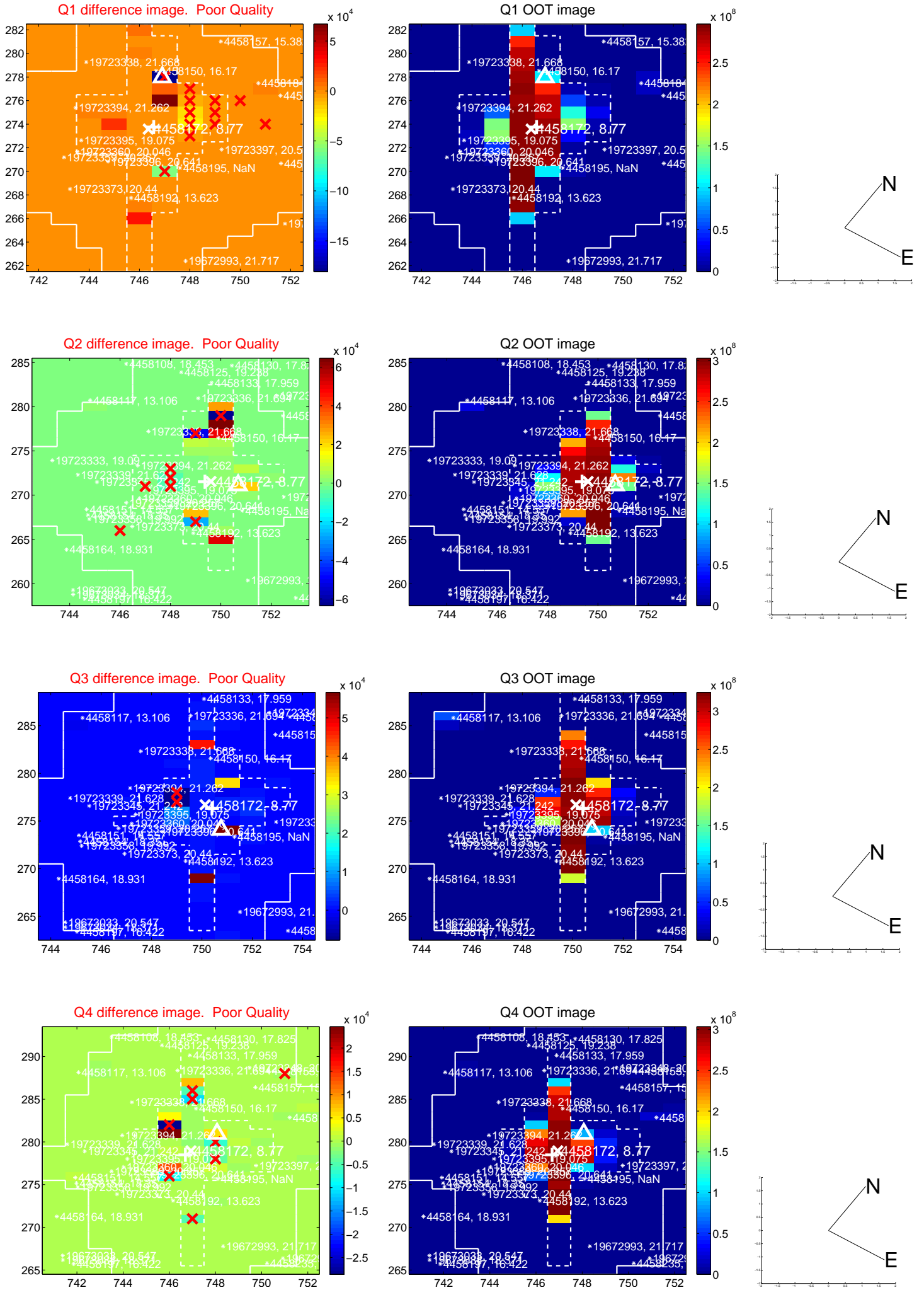
The direct PRF centroid is offset from the target star catalog position by about 0.86 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.379 \pm 2.656$	2.03	$3.860 \pm 1.658$	$-3.746 \pm 2.445$
PRF-fit source offset from KIC position	$6.914 \pm 2.734$	2.53	$5.356 \pm 1.653$	$-4.373 \pm 2.548$
photometric centroid source offset	$0.94 \pm 0.99$	0.95	$-0.90 \pm 0.94$	$-0.27 \pm 1.44$



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.

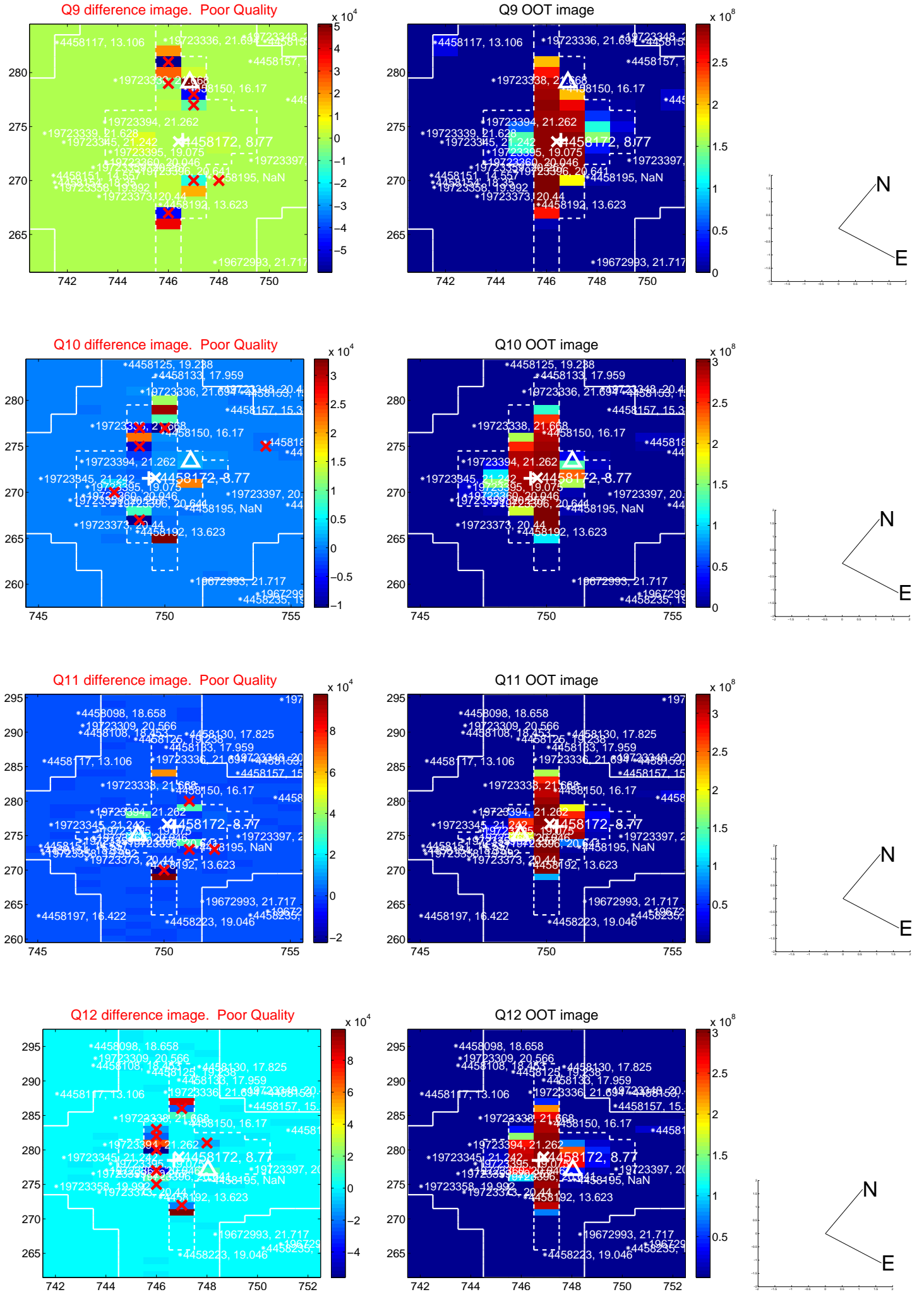
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



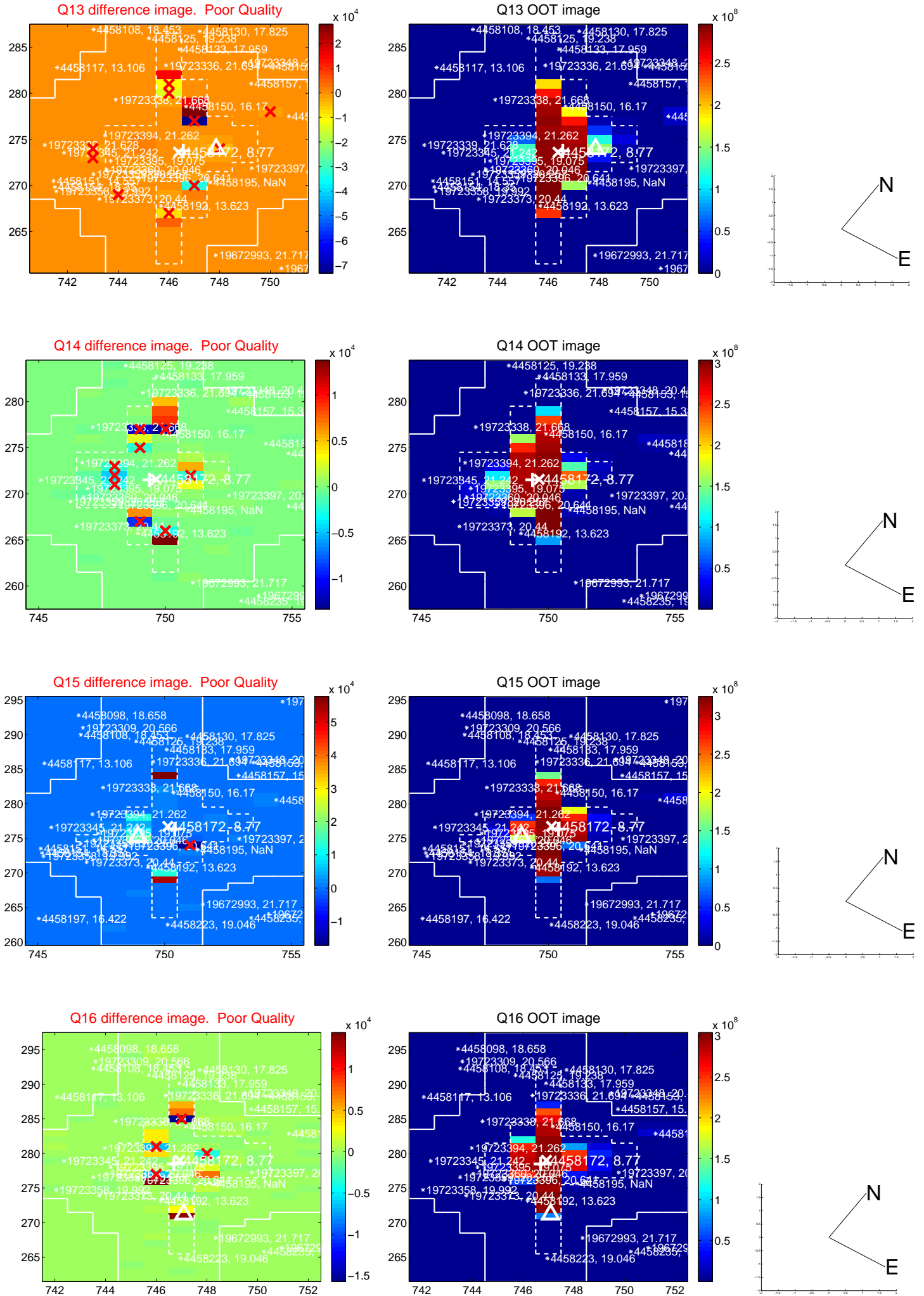




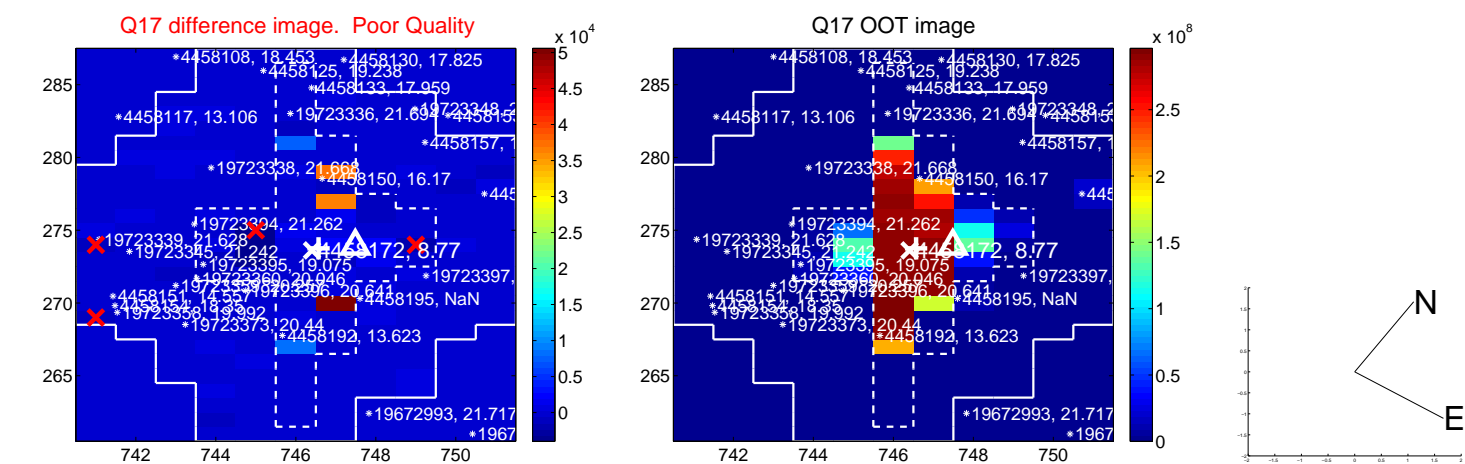
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



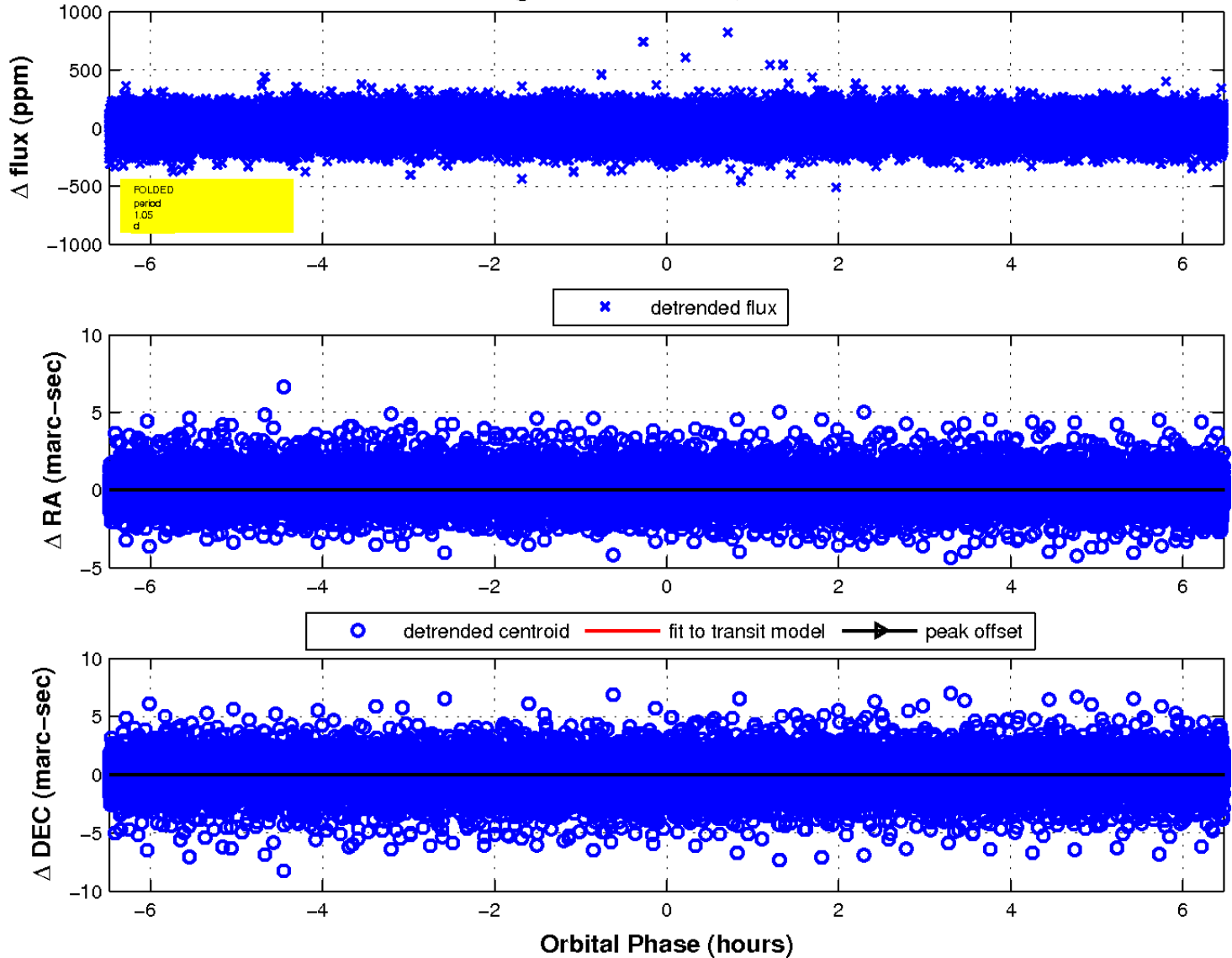
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



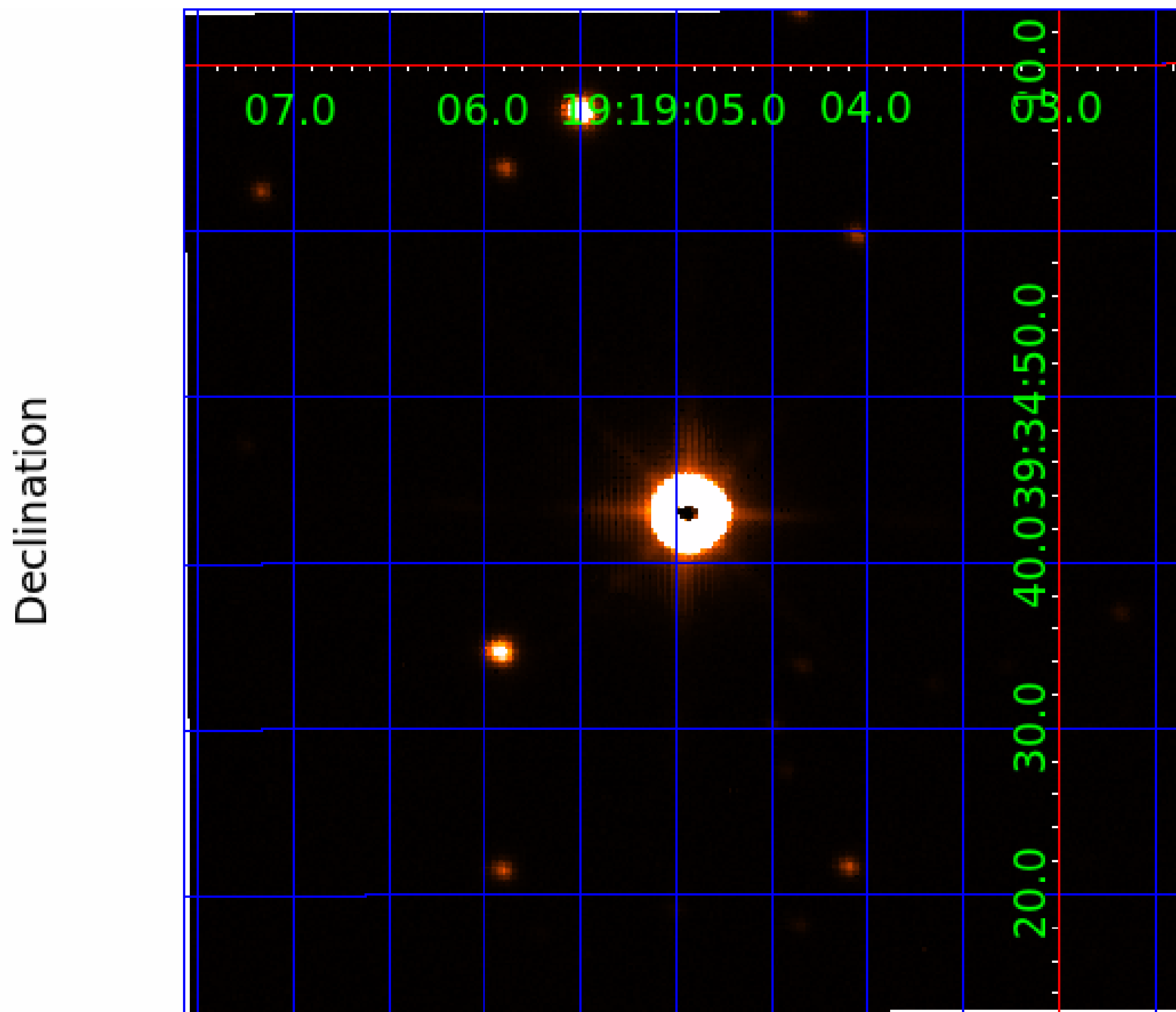
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image





# KIC 004458172

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004458172-01	OBS	No	1.054923	131.665948	15.8	2.160	14.2	15.7	1.89	7719	0.87	18782.96
004458172-02	OBS	No	0.527460	131.555093	14.4	1.385	11.6	12.0	1.89	7719	0.77	47330.26

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004458172-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_SATURATED
004458172-02	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

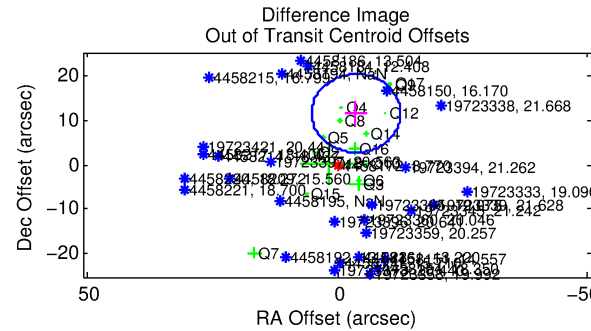
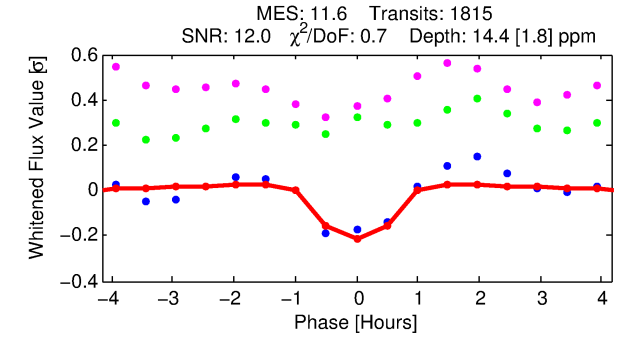
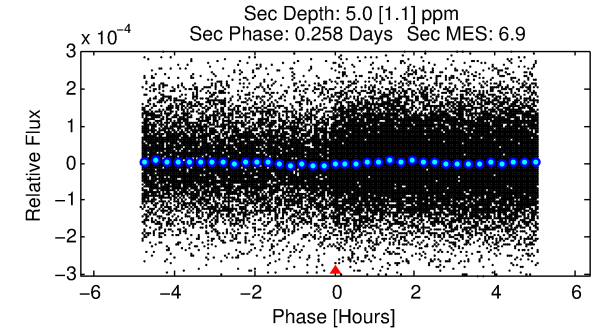
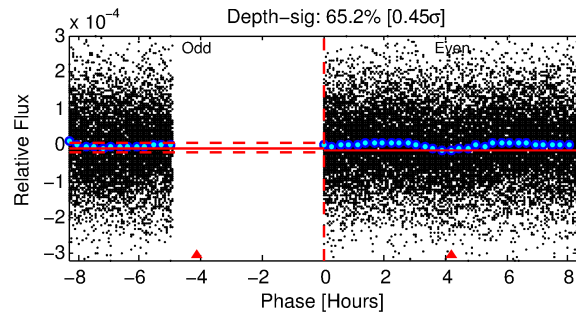
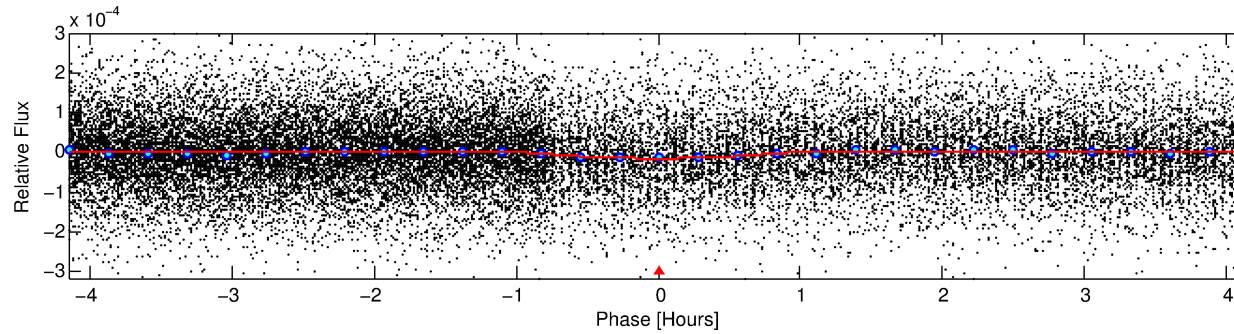
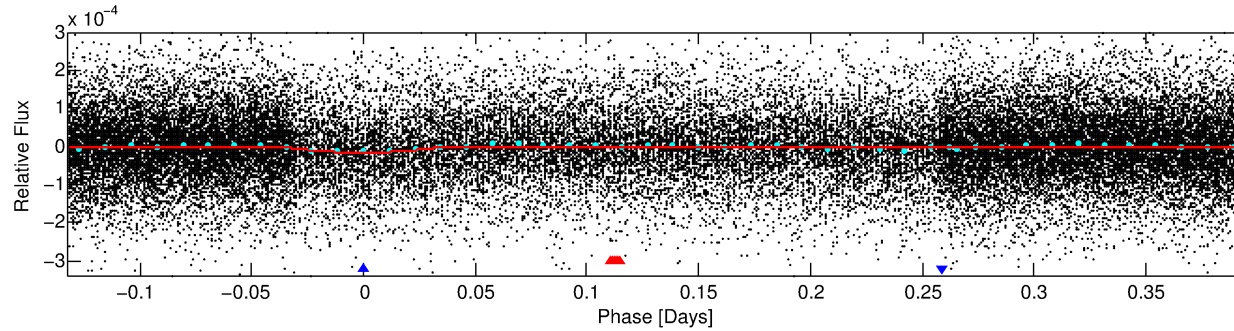
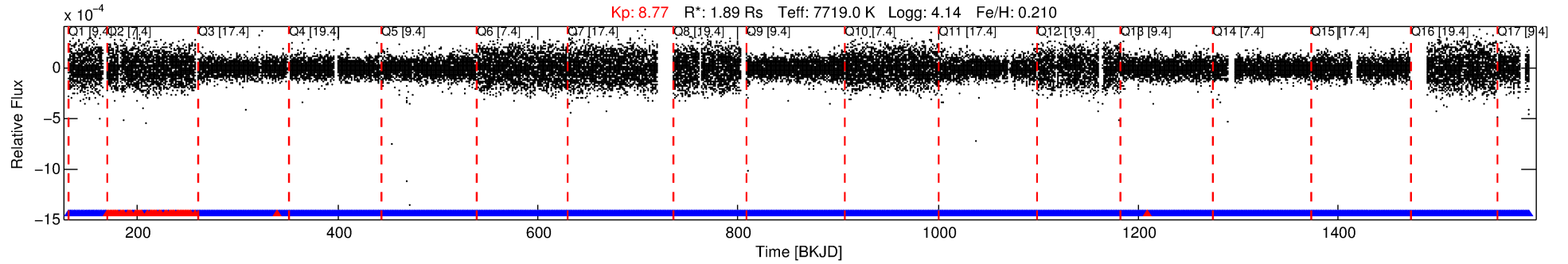
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004458172-02

No Significant Match Found

# DV One-Page Summary

KIC: 4458172 Candidate: 2 of 2 Period: 0.527 d



## DV Fit Results:

Period = 0.52746 [0.00001] d  
Epoch = 131.5551 [0.0017] BKJD  
Rp/R\* = 0.0037 [0.0005]  
a/R\* = 2.25 [1.32]  
b = 0.70 [0.54]  
Seff = 47330.27 [17772.53]  
Teq = 3761 [353] K  
Rp = 0.77 [0.24] Re  
a = 0.0155 [0.0036] AU  
Ag = 1.12 [0.53] [0.22 $\sigma$ ]  
Teffp = 5976 [581] K [3.26 $\sigma$ ]

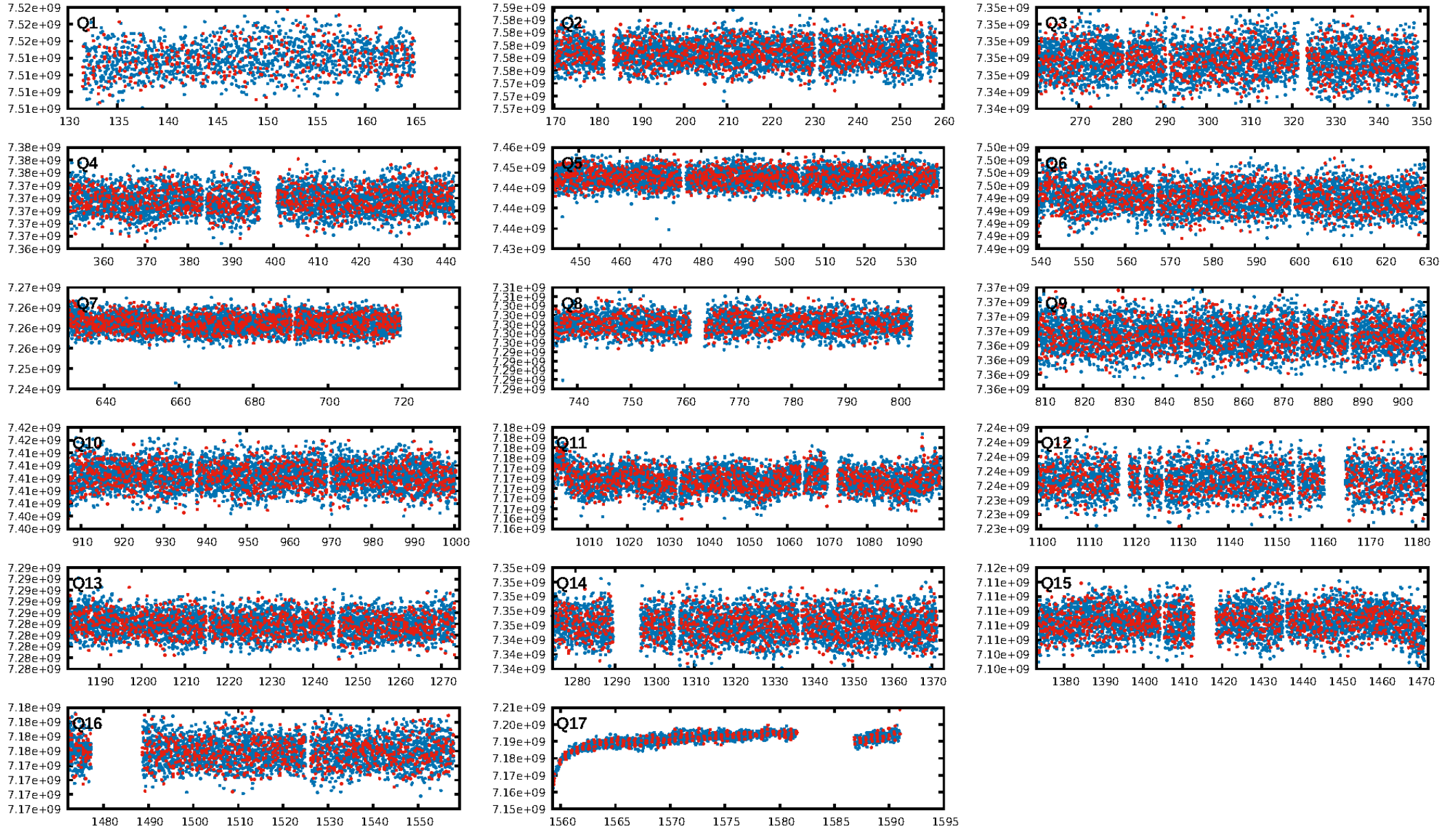
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [4.93 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 8.07e-34  
RollingBand-fgt: 0.97 [1677/1732]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.0%  
Centroid-so: 2.301 arcsec [2.30 $\sigma$ ]  
OotOffset-rm: 12.243 arcsec [4.13 $\sigma$ ]  
KicOffset-rm: 9.923 arcsec [3.51 $\sigma$ ]  
OotOffset-st: 4/3/4/4 [15]  
KicOffset-st: 4/3/4/4 [15]  
DiffImageQuality-fgm: 0.00 [0/15]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:02:32 Z

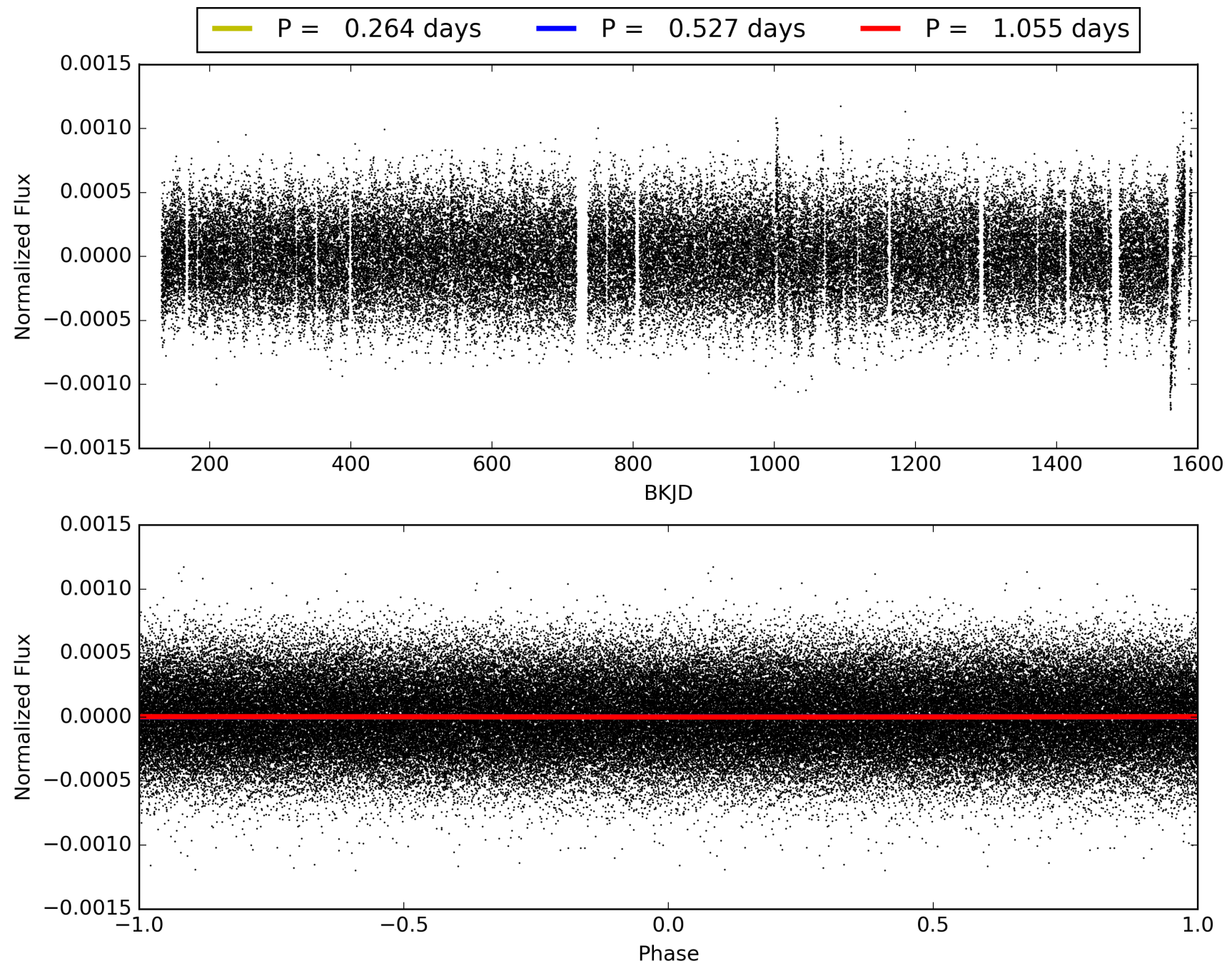
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004458172-02, PDC Light Curves





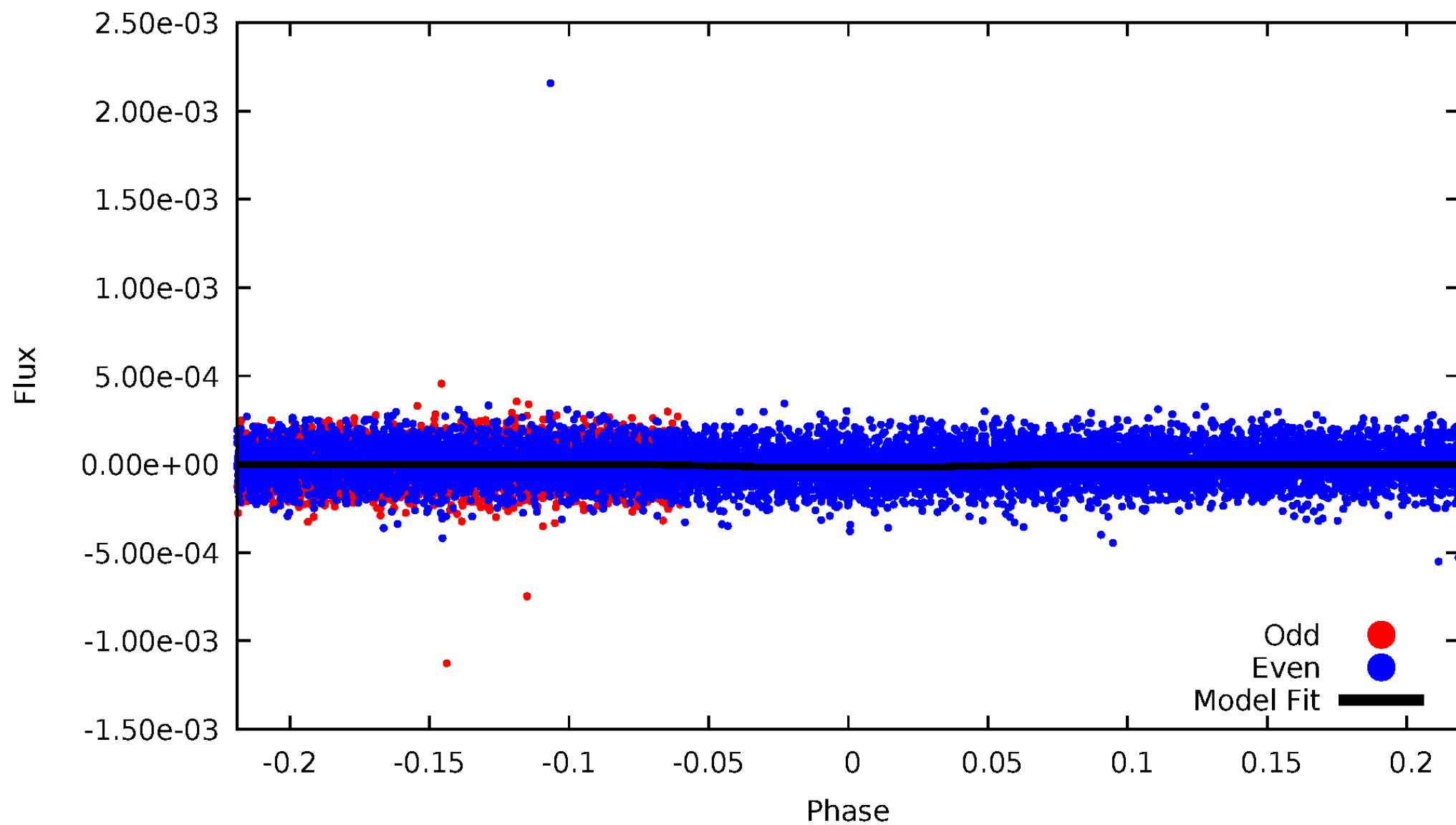
TCE 004458172-02





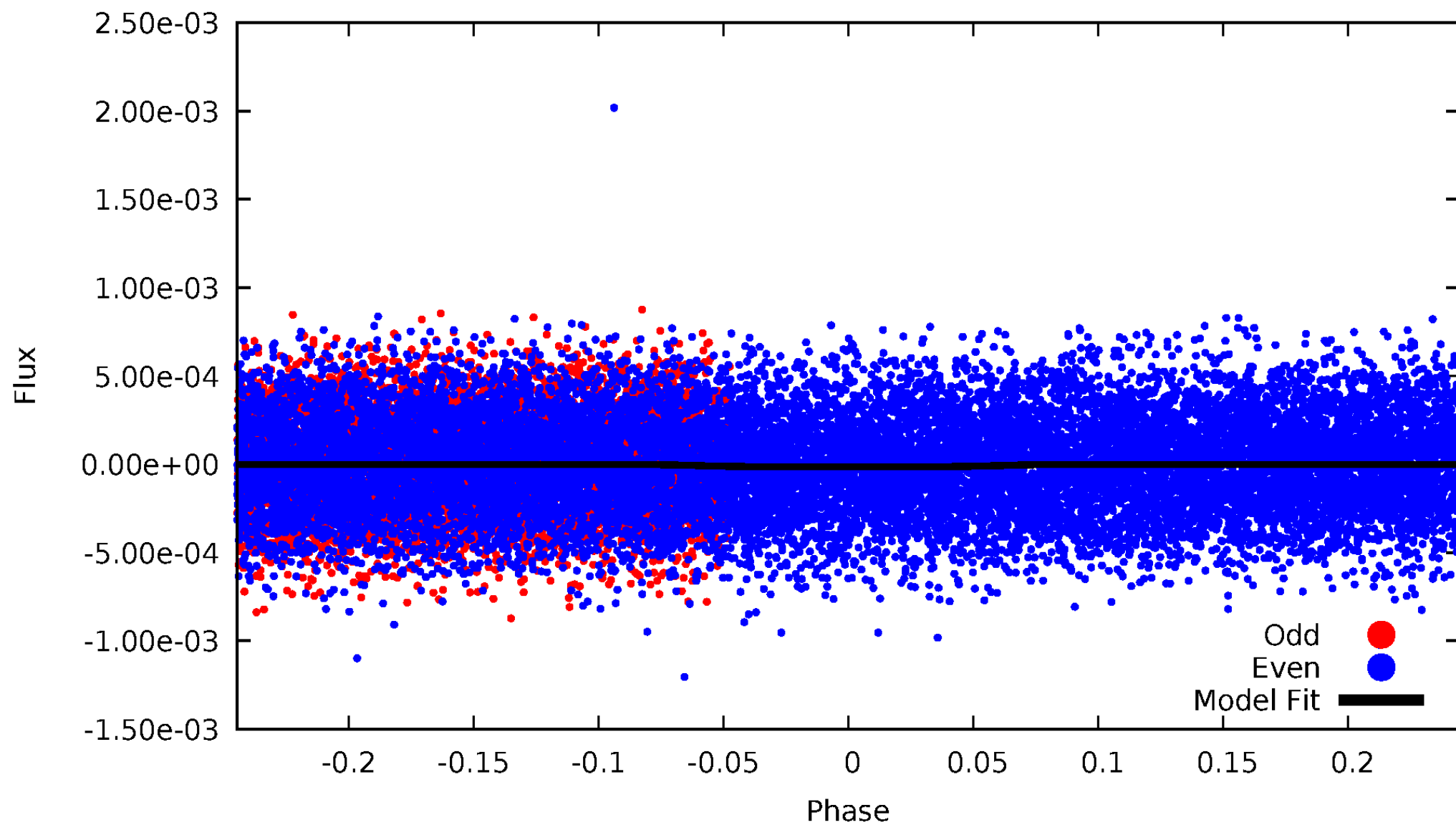
DV Odd/Even

TCE 004458172-02



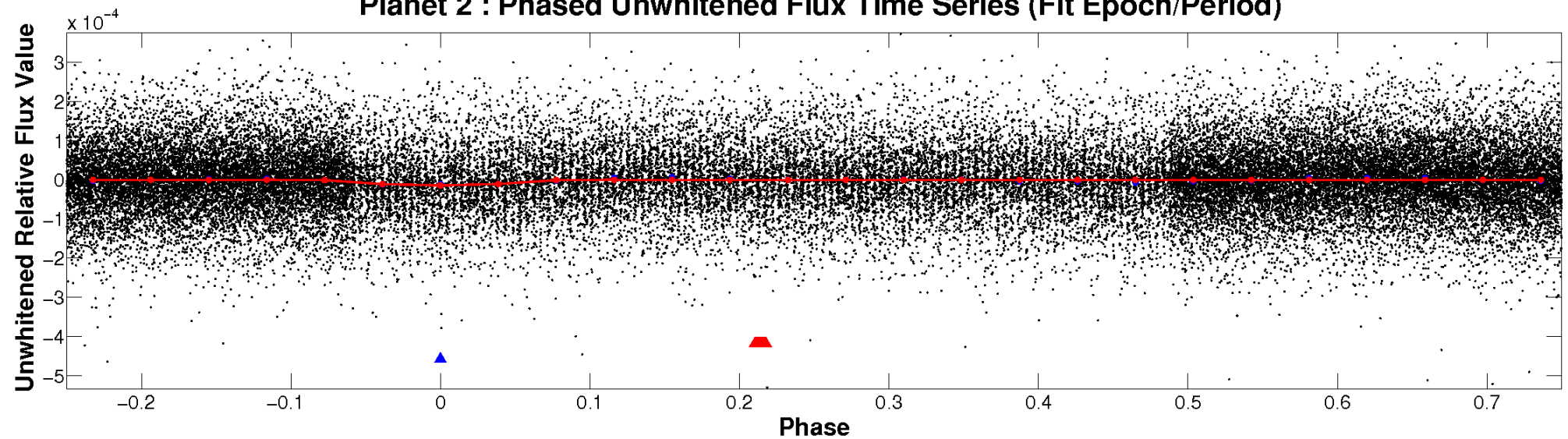
# ALT Odd/Even

TCE 004458172-02

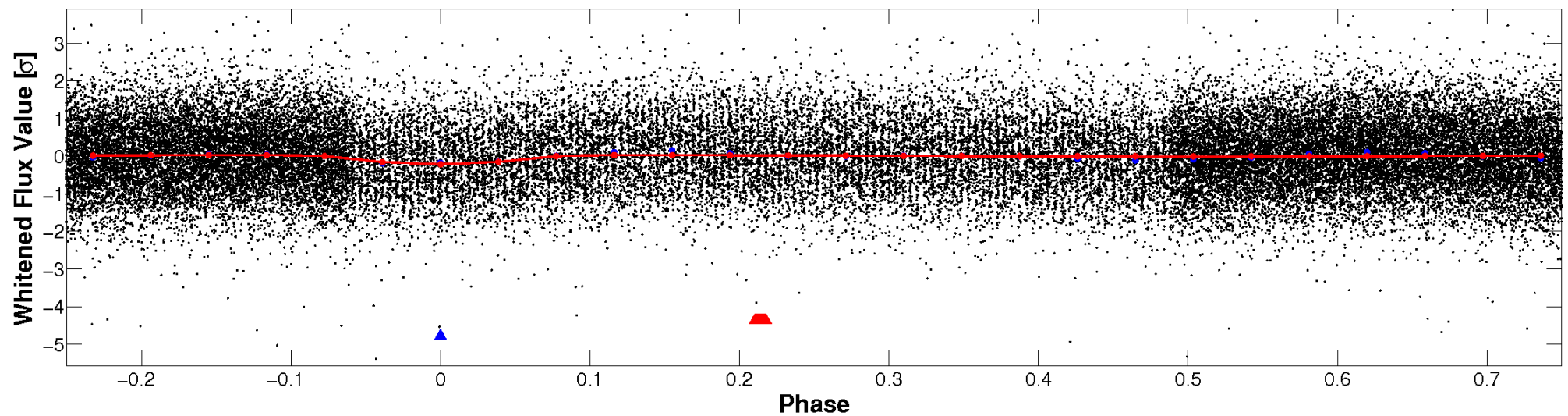


# Non-Whitened Vs. Whitened Light Curve

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

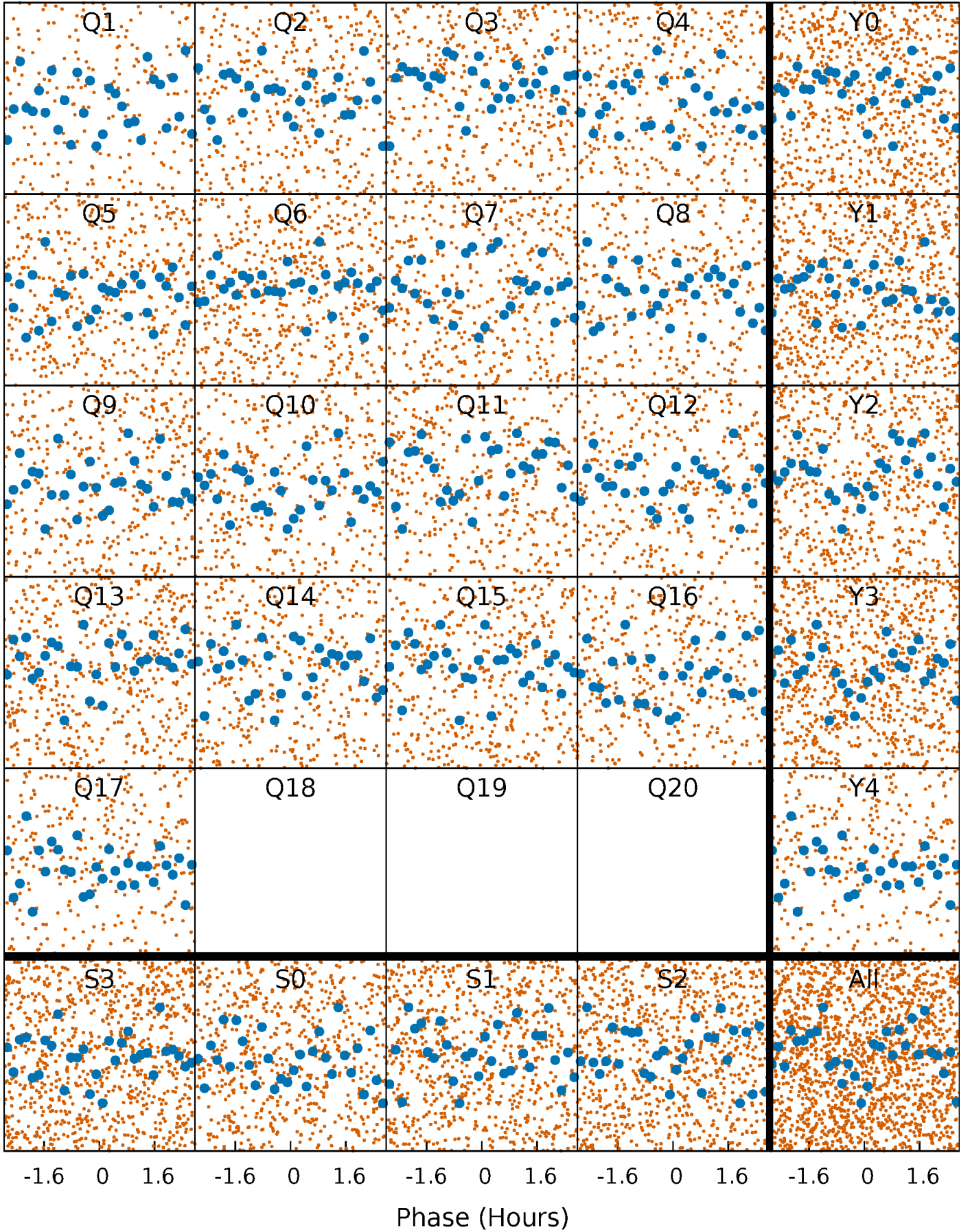


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

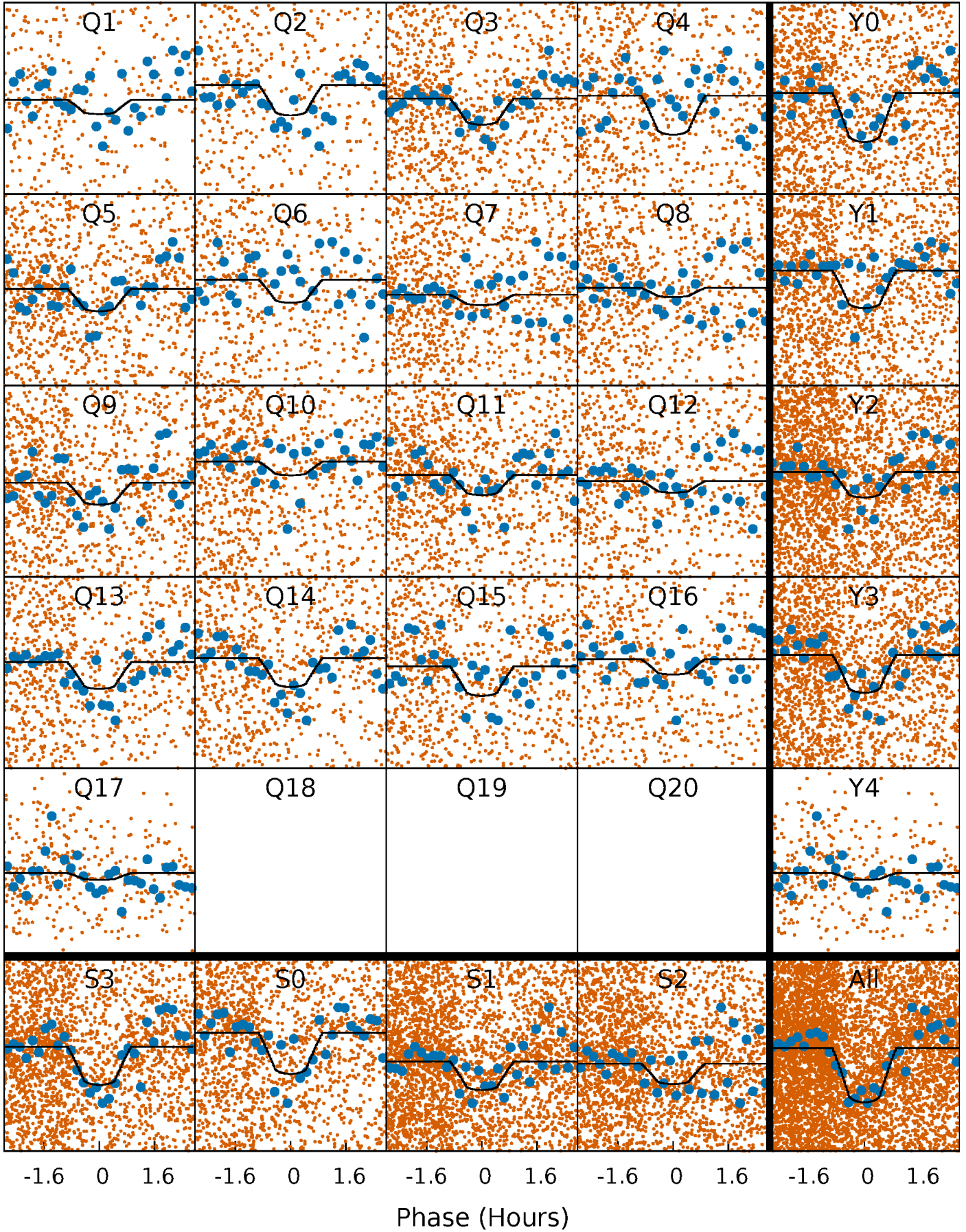
TCE 004458172-02   P= 0.527460 Days    $T_0=131.555093$  (BKJD)





# DV Quarter-Phased Transit Curves

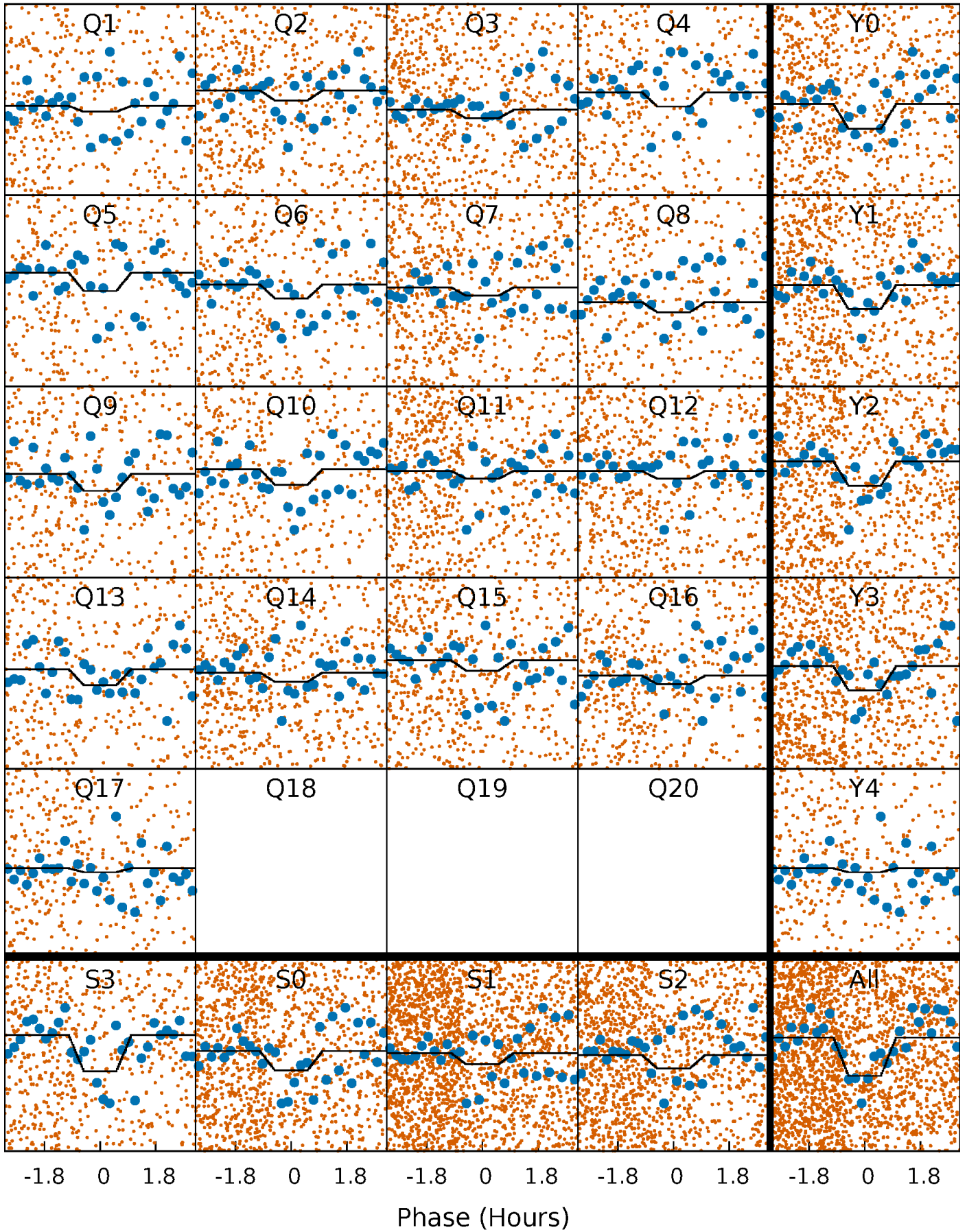
TCE 004458172-02   P= 0.527460 Days    $T_0=131.555093$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

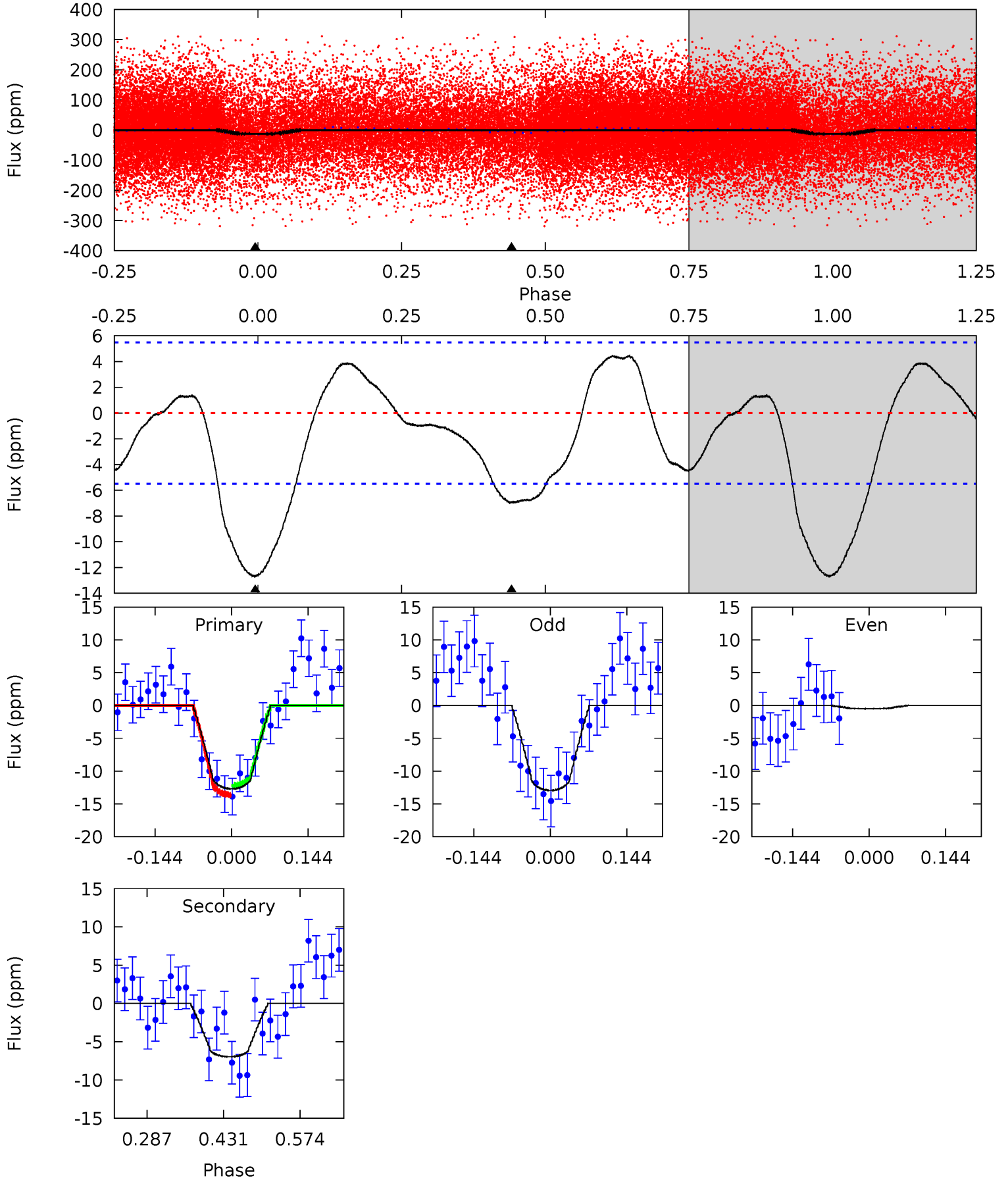
TCE 004458172-02     $P = 0.527458$  Days     $T_0 = 131.554657$  (BKJD)



# DV Model-Shift Uniqueness Test

004458172-02, P = 0.527460 Days, E = 131.027633 Days

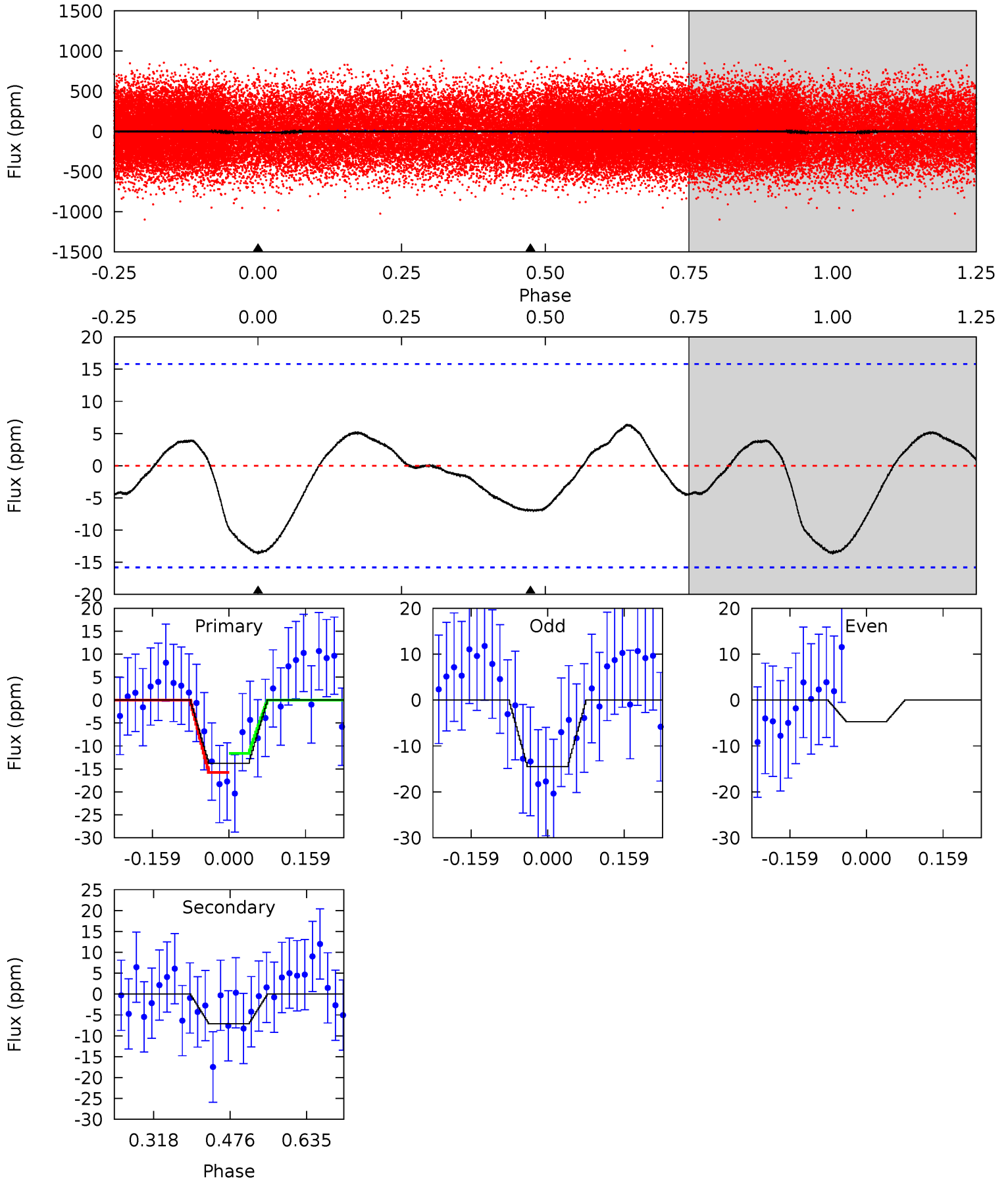
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.4	5.70	0	0	4.49	1.46	2.42	10.4	10.4	5.70	5.70	2.65	1.23	0.26	0.59



# Alt Model-Shift Uniqueness Test

004458172-02, P = 0.527458 Days, E = 131.027199 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
3.89	2.01	0	0	4.47	1.41	0.96	3.89	3.89	2.01	2.01	0.95	1.21	0.32	0.58



### Stellar Parameters For KIC 004458172

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7719^{+214}_{-349}$	$4.137^{+0.094}_{-0.175}$	$0.210^{+0.150}_{-0.400}$	$1.894^{+0.540}_{-0.291}$	$1.792^{+0.181}_{-0.271}$	$0.372^{+0.167}_{-0.187}$
	+3%/-5%	+2%/-4%	+71%/-190%	+29%/-15%	+10%/-15%	+45%/-50%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 004458172-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-7 \pm 1$	$0.79^{+0.14}_{-0.12}$	$5288^{+363}_{-328}$	$5919^{+633}_{-569}$	$1.421^{+0.662}_{-0.447}$
Alt.	$-7 \pm 4$	$0.78^{+0.14}_{-0.13}$	$5285^{+343}_{-301}$	$6011^{+1089}_{-1293}$	$1.496^{+1.133}_{-0.783}$

$T_{max}$  = 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

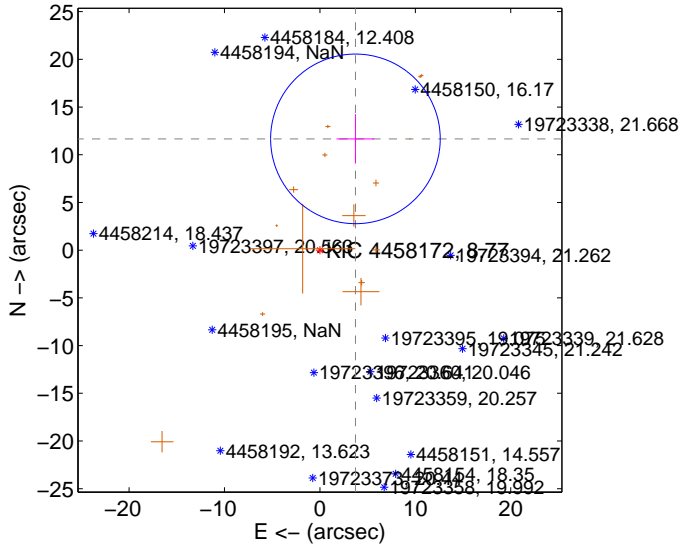
Supplemental centroid analysis for 004458172-02. **Kepler magnitude: 8.77.** Transit SNR 11.96

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

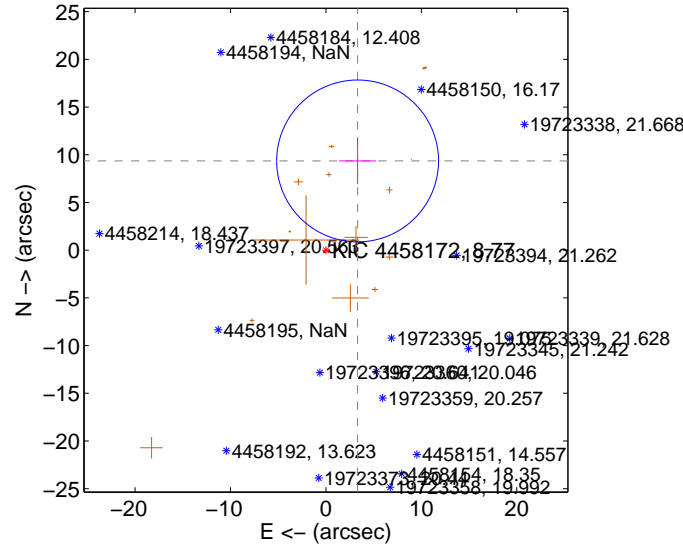
The direct PRF centroid is offset from the target star catalog position by about 0.87 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>12.243 \pm 2.962</math></b>	<b>4.13</b>	$-3.723 \pm 1.972$	$11.663 \pm 2.591$
PRF-fit source offset from KIC position	<b><math>9.923 \pm 2.827</math></b>	<b>3.51</b>	$-3.319 \pm 1.947$	$9.351 \pm 2.445$
photometric centroid source offset	$2.30 \pm 1.00$	2.30	$1.86 \pm 0.83$	$-1.36 \pm 1.26$

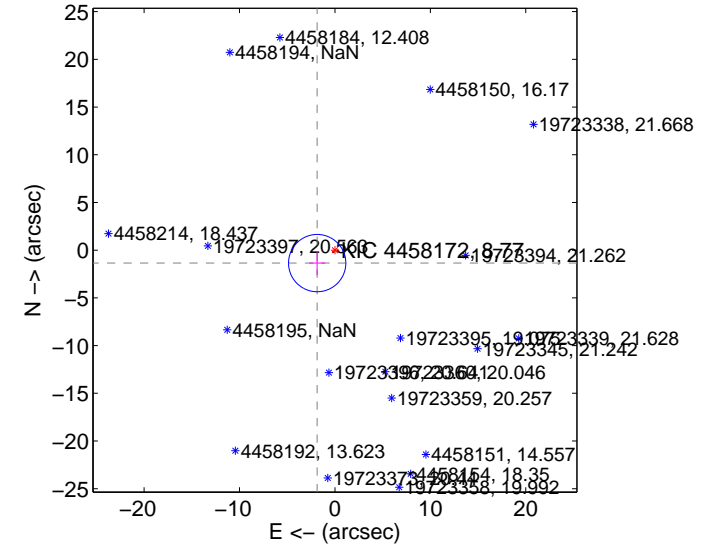
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



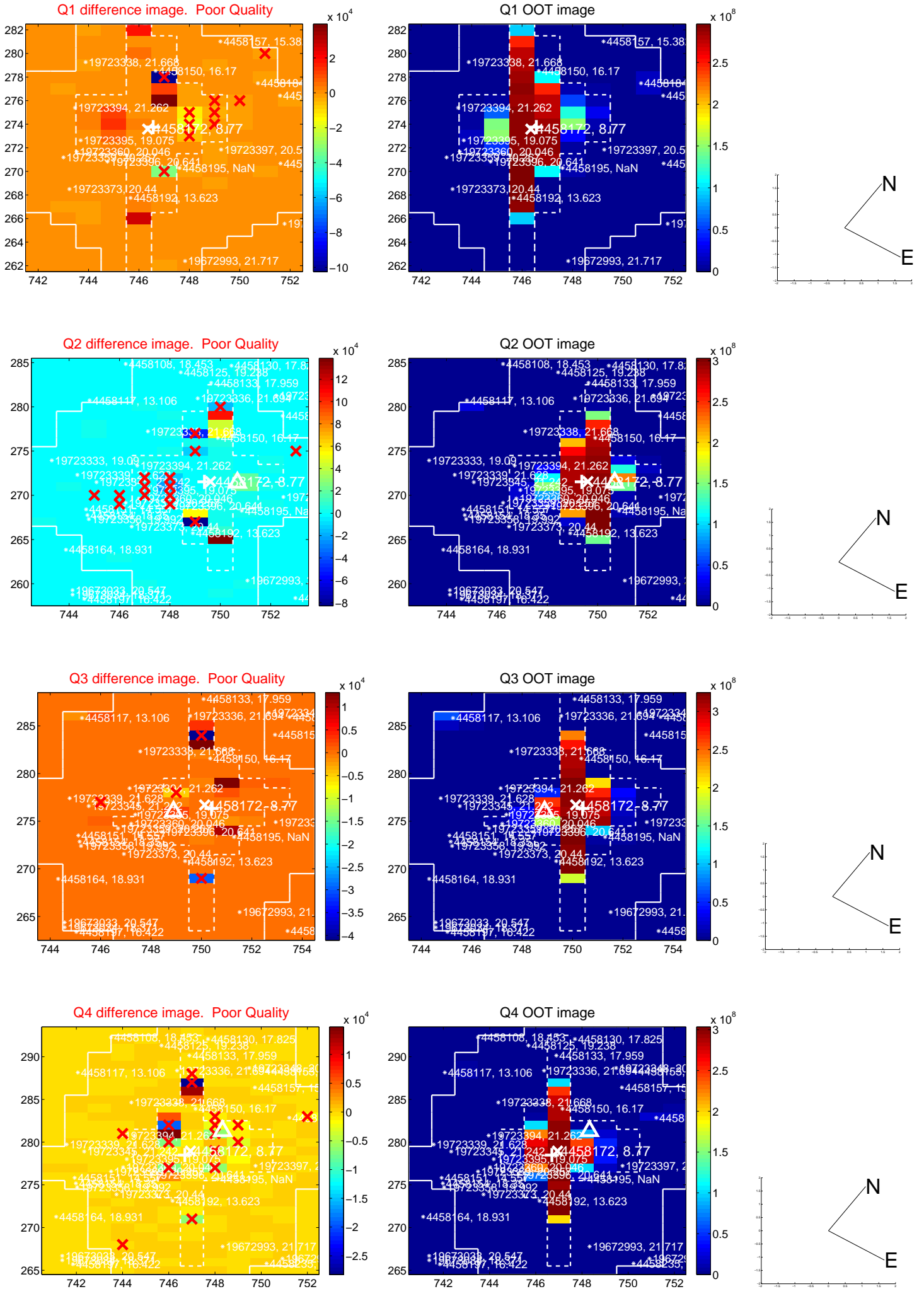
offset from photometric centroids



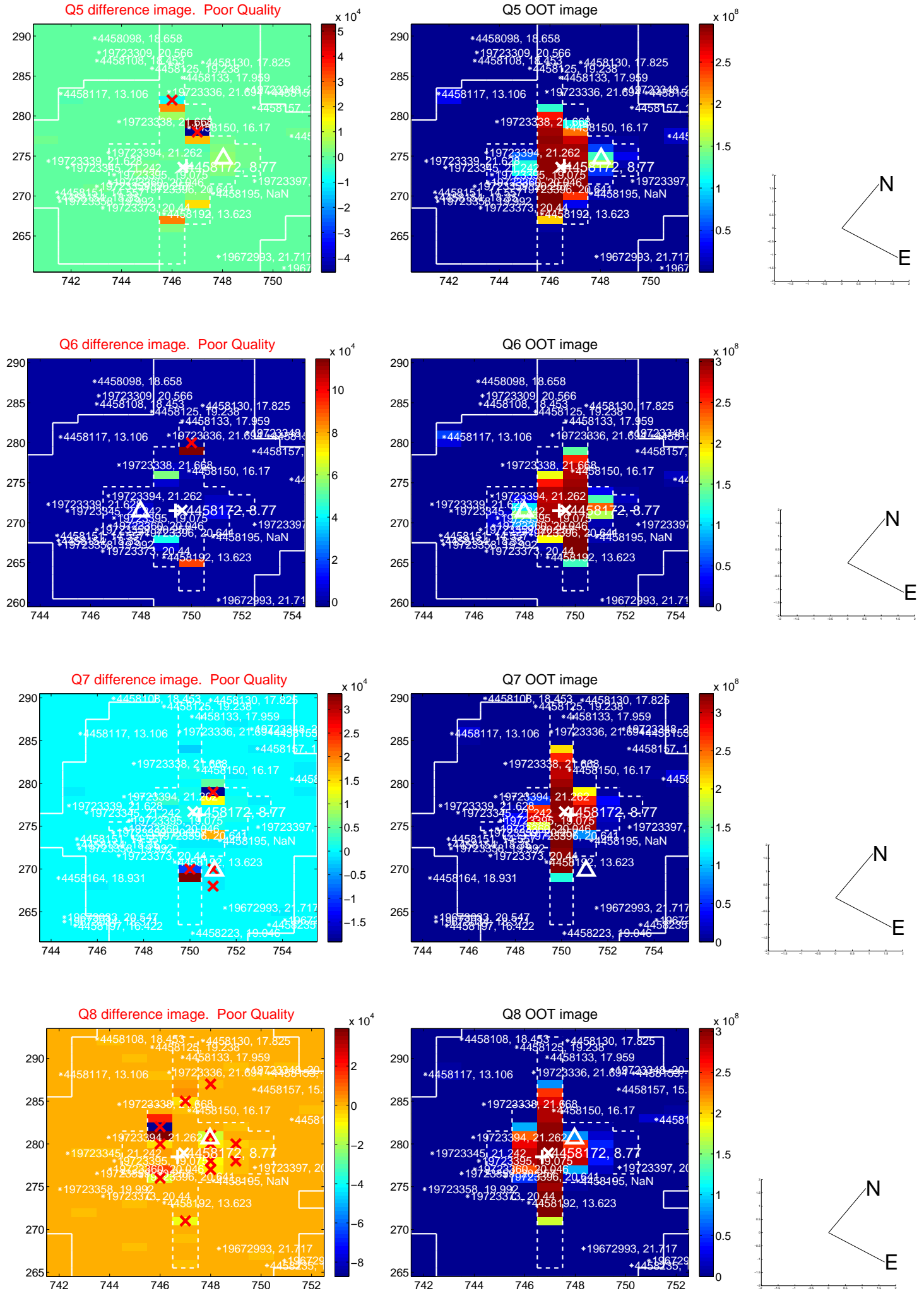
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



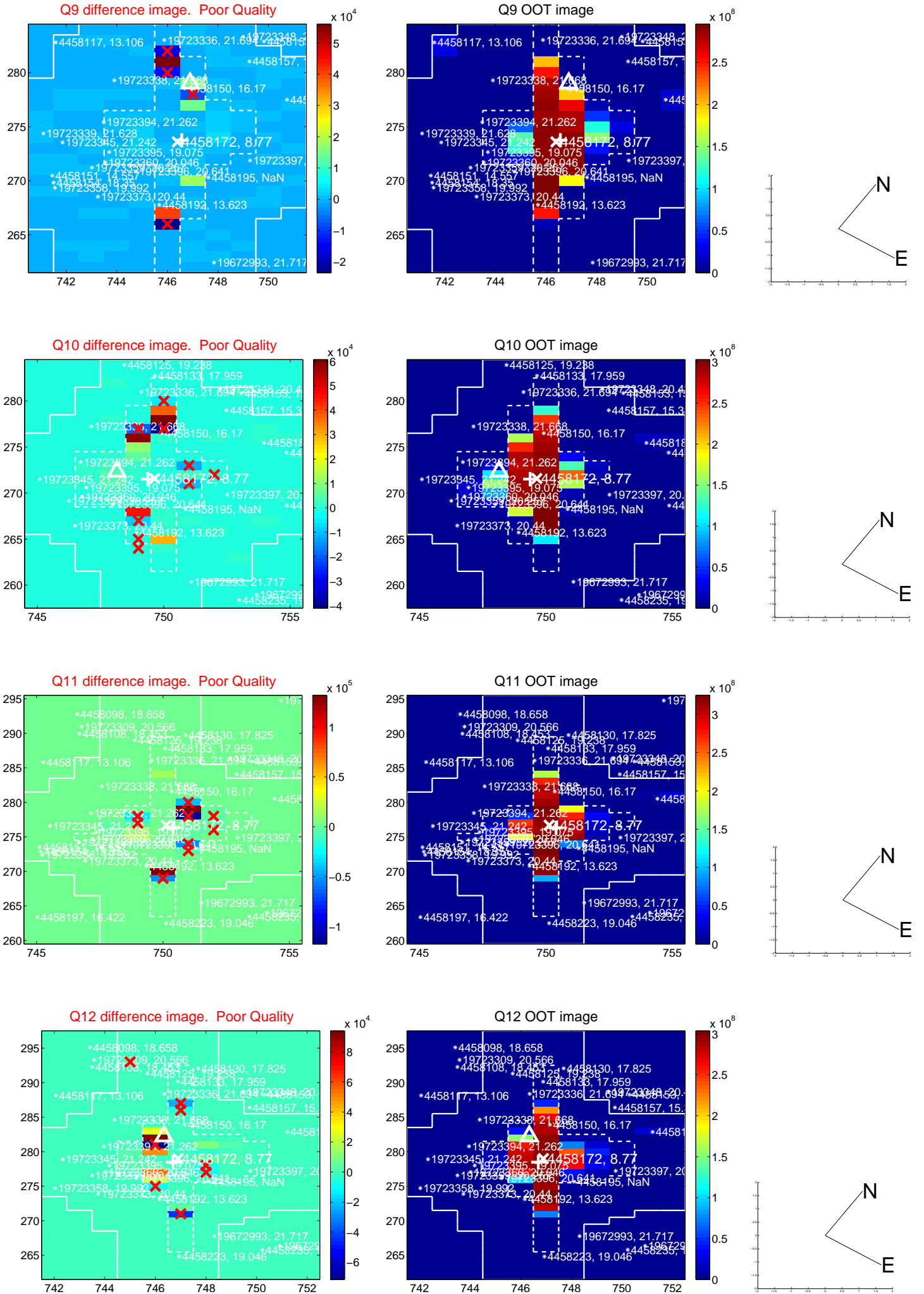
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



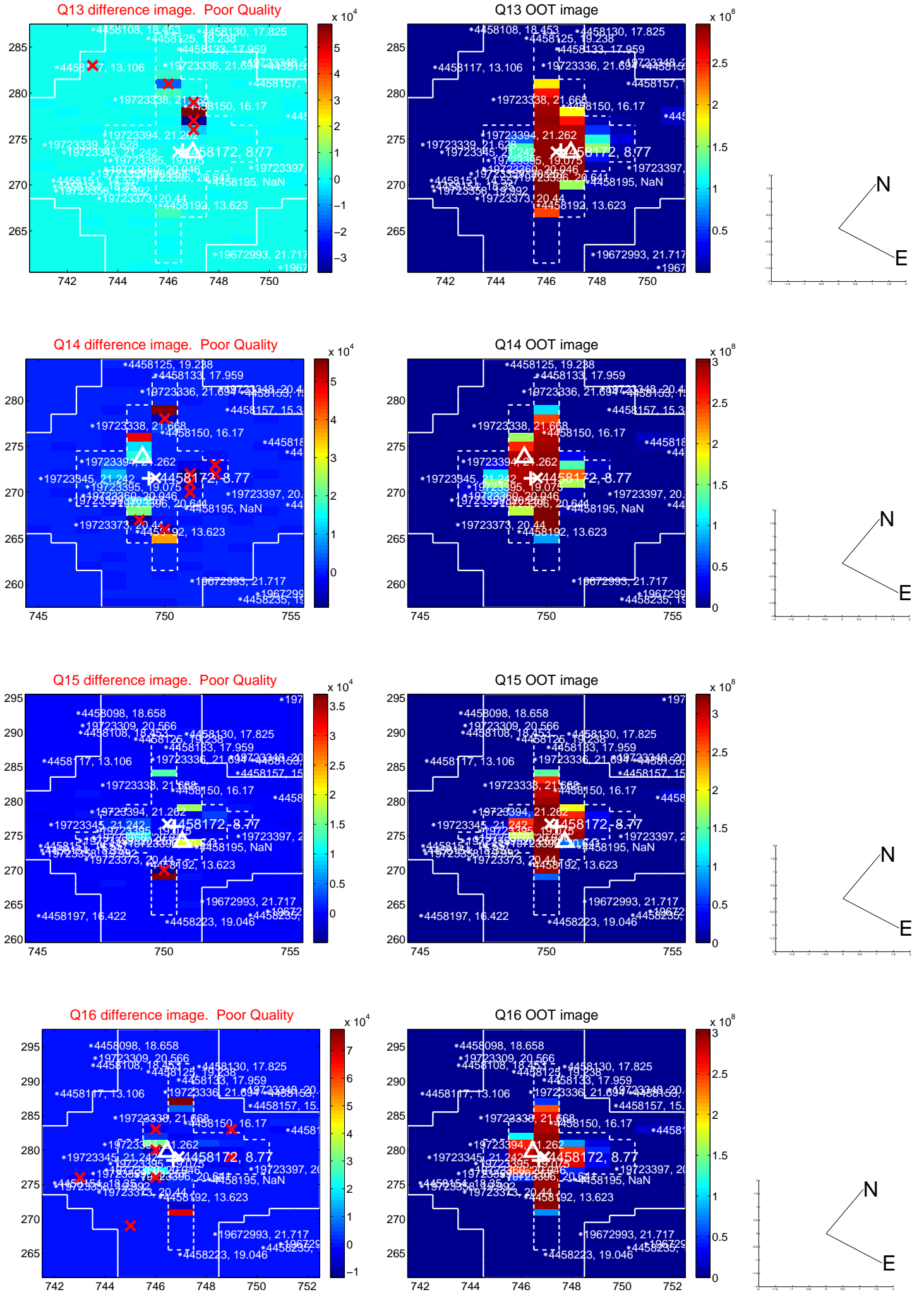
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



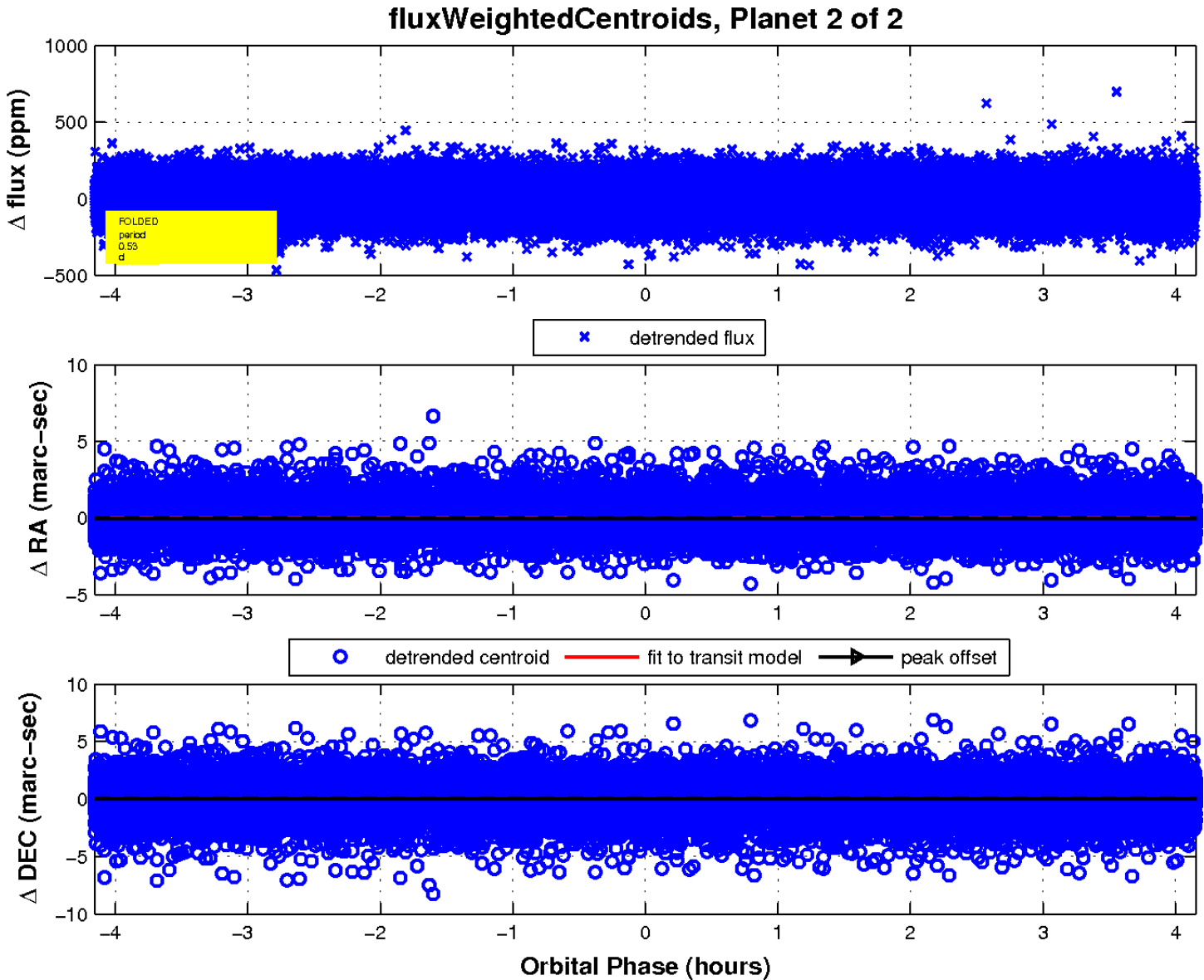
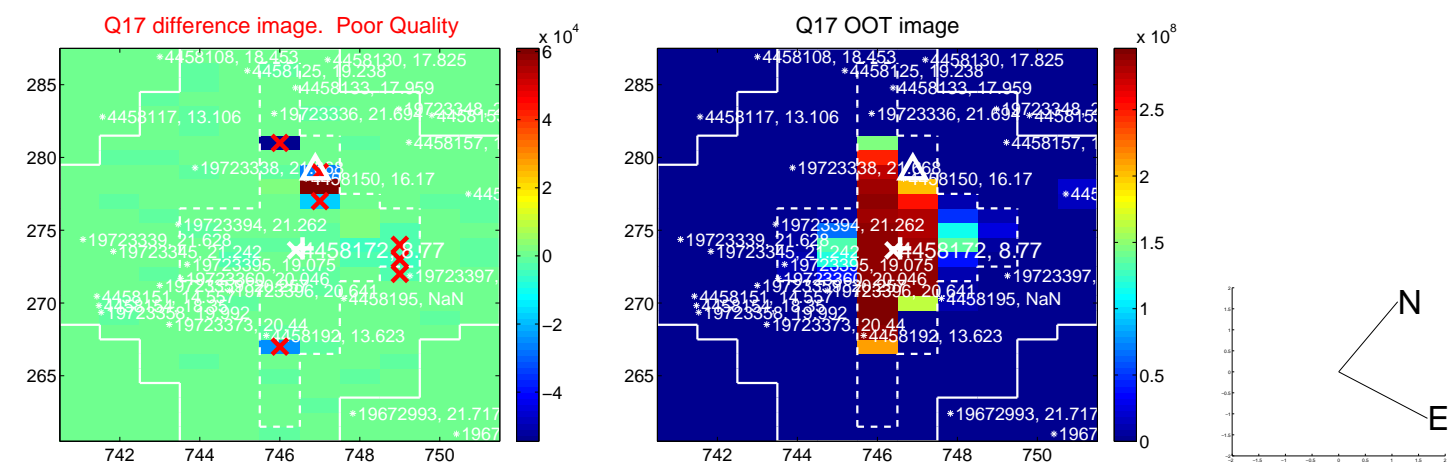
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

