

# KIC 009822703

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009822703-01	OBS	No	4.753282	134.243601	31.7	13.105	8.5	7.1	1.73	7098	1.25	1699.45
009822703-02	OBS	No	4.752949	132.695392	35.6	17.685	10.2	9.1	1.73	7098	1.16	1699.61

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009822703-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009822703-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

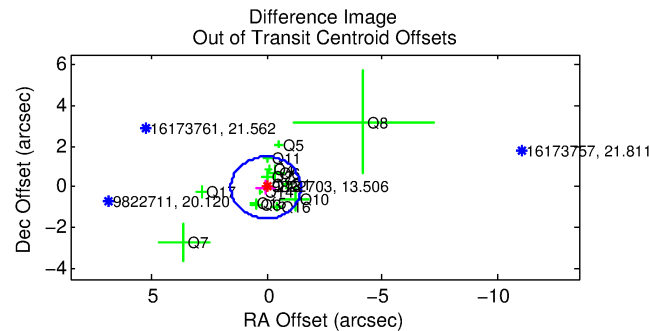
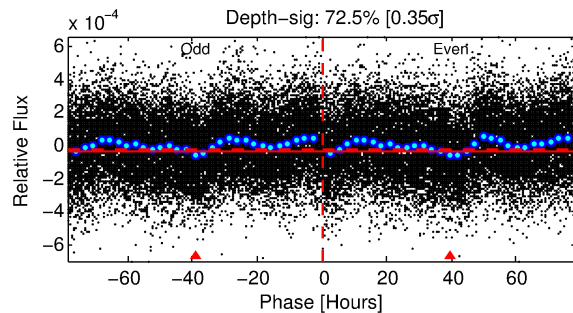
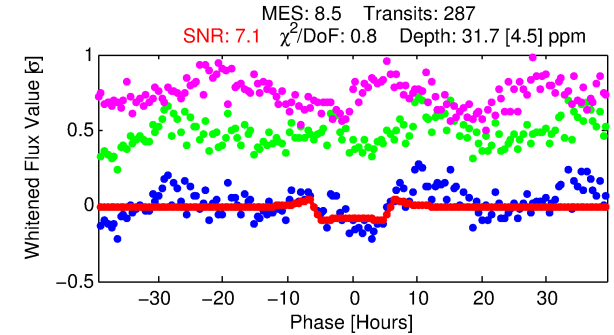
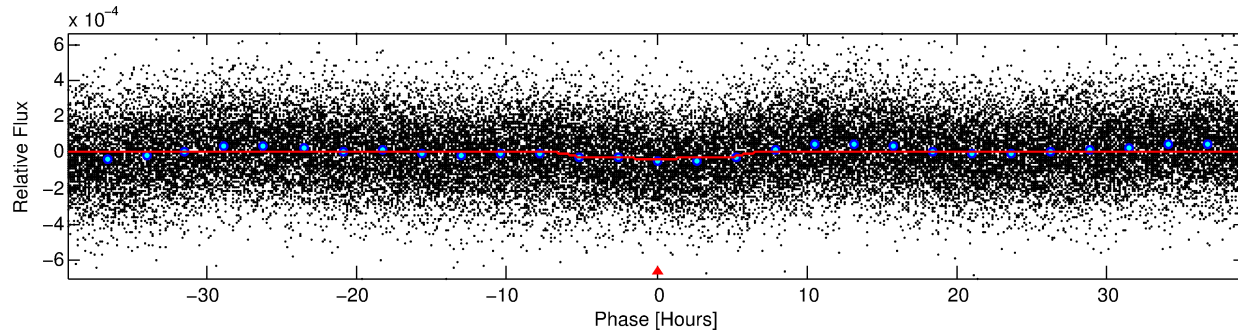
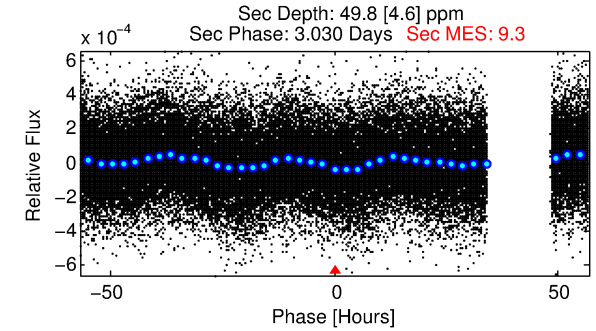
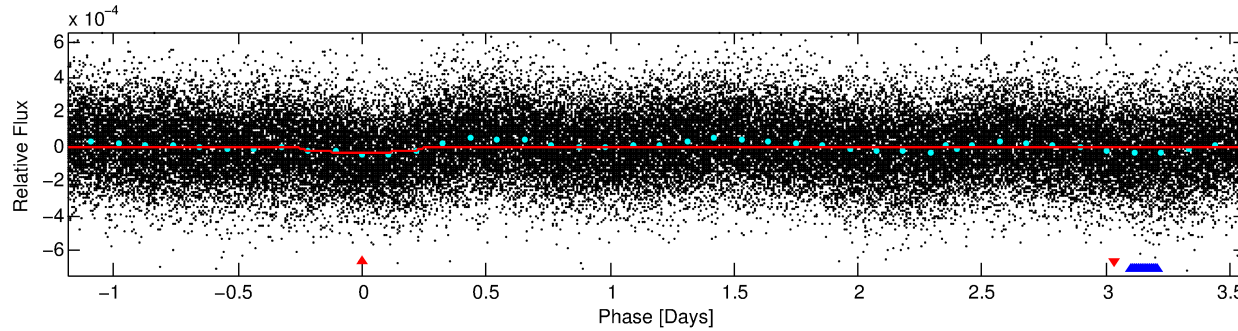
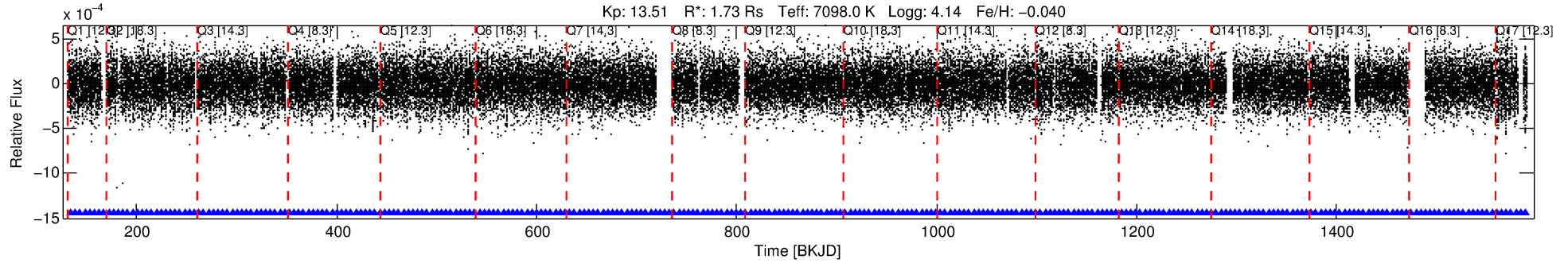
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009822703-01

No Significant Match Found

# DV One-Page Summary

KIC: 9822703 Candidate: 1 of 2 Period: 4.753 d



## DV Fit Results:

Period = 4.75328 [0.00012] d  
Epoch = 134.2436 [0.0190] BKJD  
Rp/R\* = 0.0066 [0.0006]  
a/R\* = 1.20 [0.11]  
b = 0.98 [0.02]  
Seff = 1699.45 [645.67]  
Teq = 1637 [156] K  
Rp = 1.25 [0.40] Re  
a = 0.0632 [0.0158] AU  
Ag = 69.80 [27.96] [2.46σ]  
**Teffp = 7317 [458] K [11.73σ]**

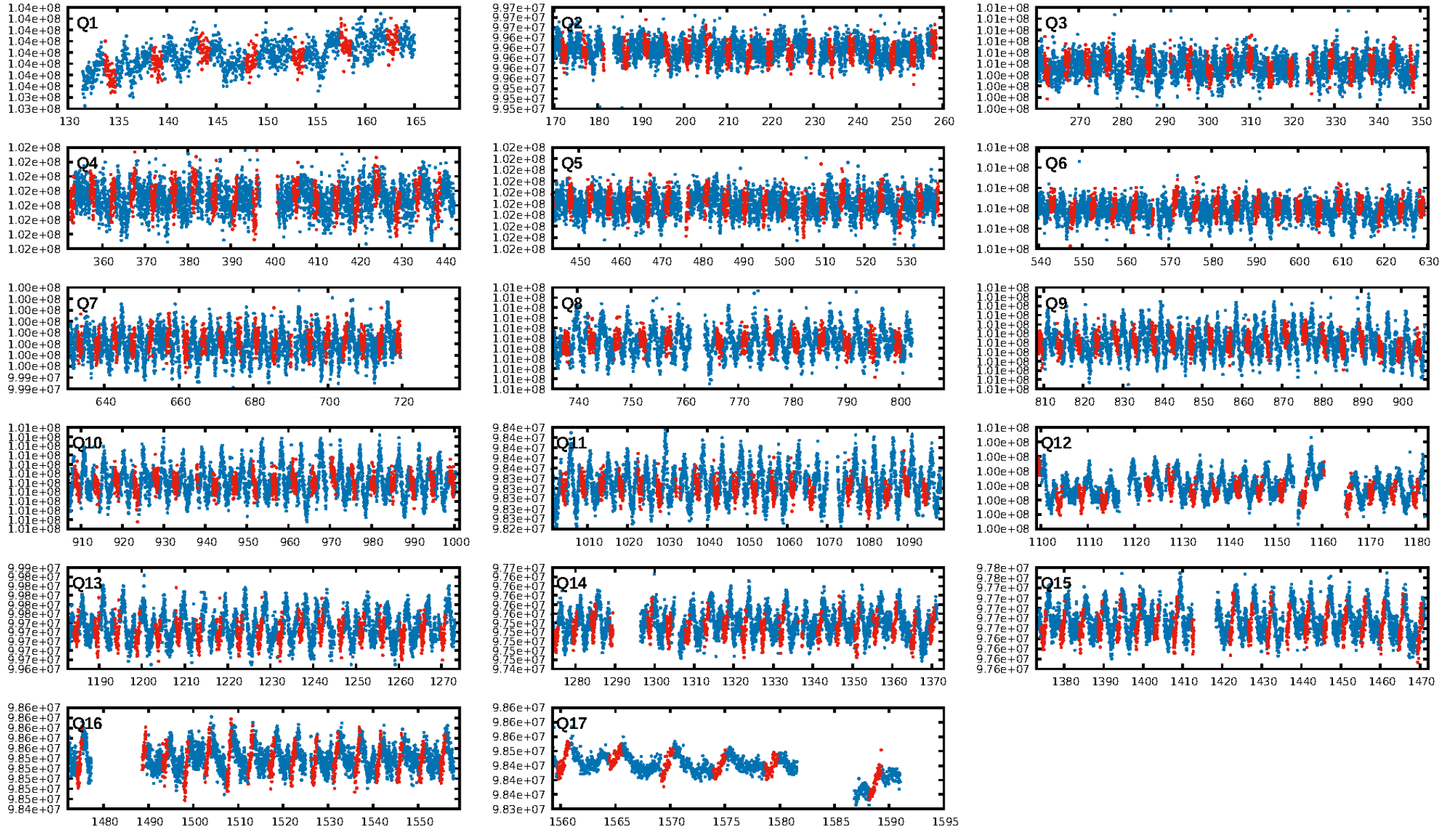
## DV Diagnostic Results:

**ShortPeriod-sig: 0.0% [0.00σ]**  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 4.41e-10**  
RollingBand-fgt: 1.00 [274/274]  
GhostDiagnostic-chr: 2.074  
Centroid-sig: 61.3%  
Centroid-so: 0.413 arcsec [0.62σ]  
OotOffset-rm: 0.052 arcsec [0.10σ]  
KicOffset-rm: 0.091 arcsec [0.40σ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.81 [13/16]  
DiffImageOverlap-fno: 1.00 [17/17]

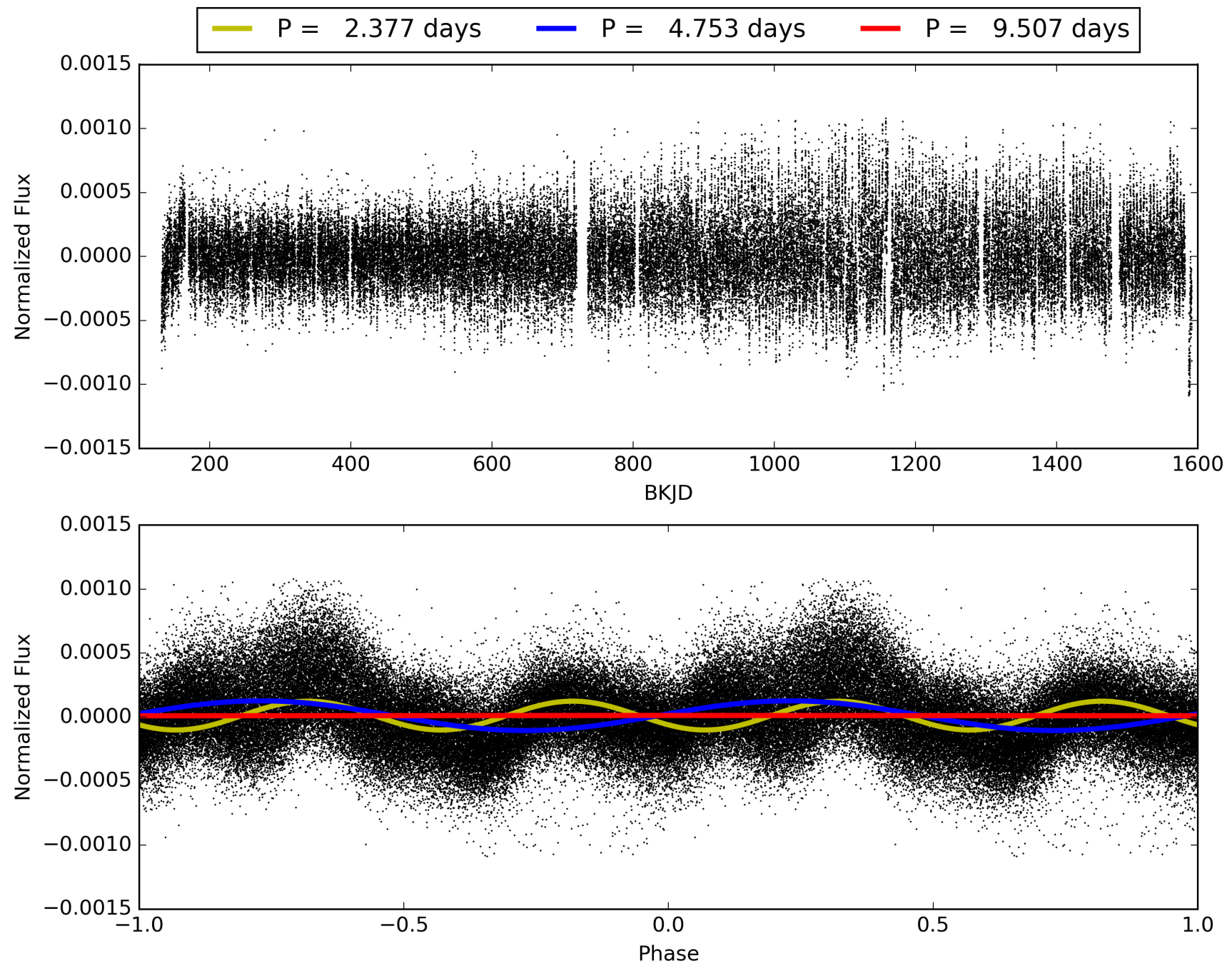
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 03:25:21 Z

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

# TCE 009822703-01, PDC Light Curves

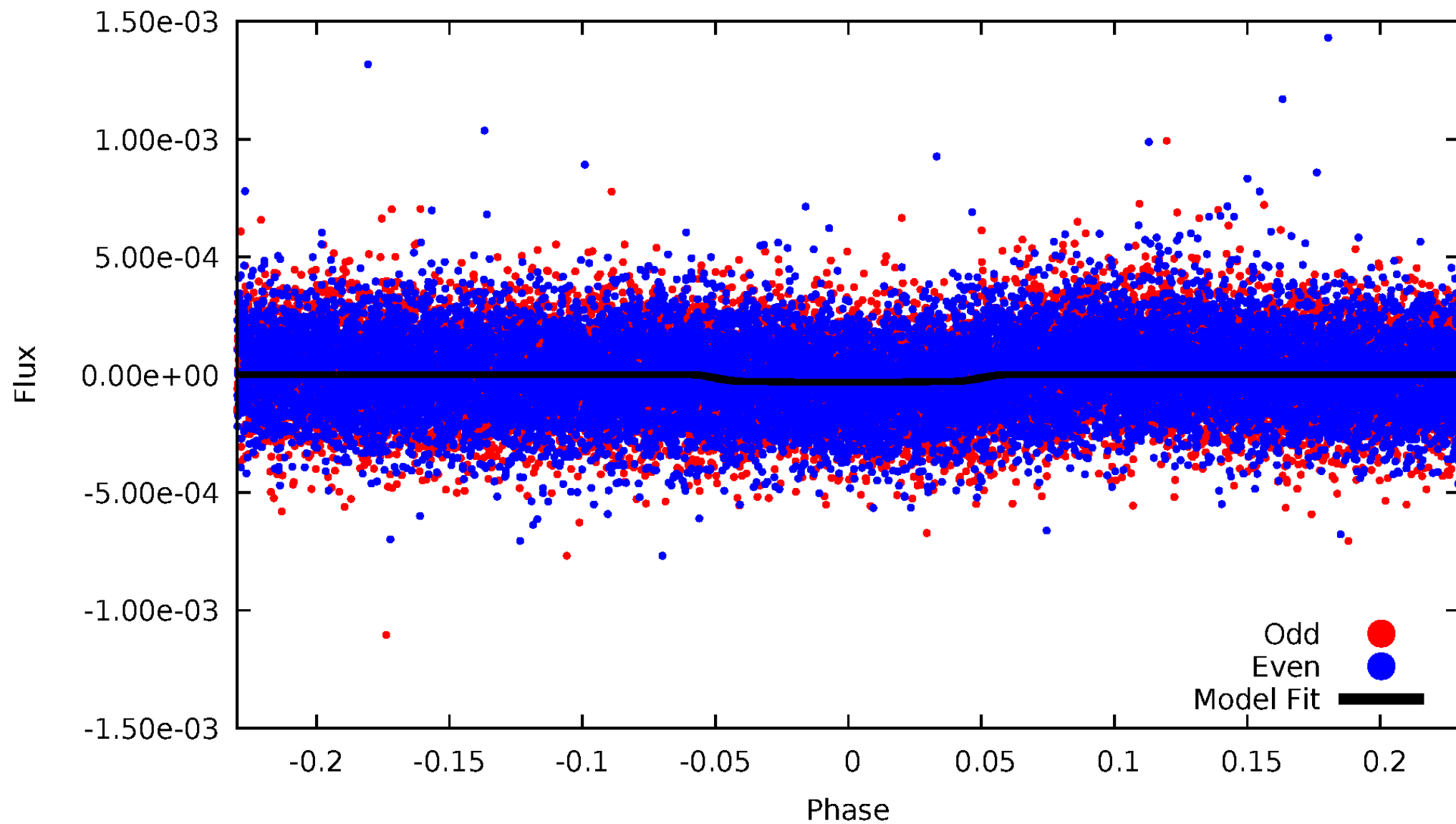


TCE 009822703-01



# DV Odd/Even

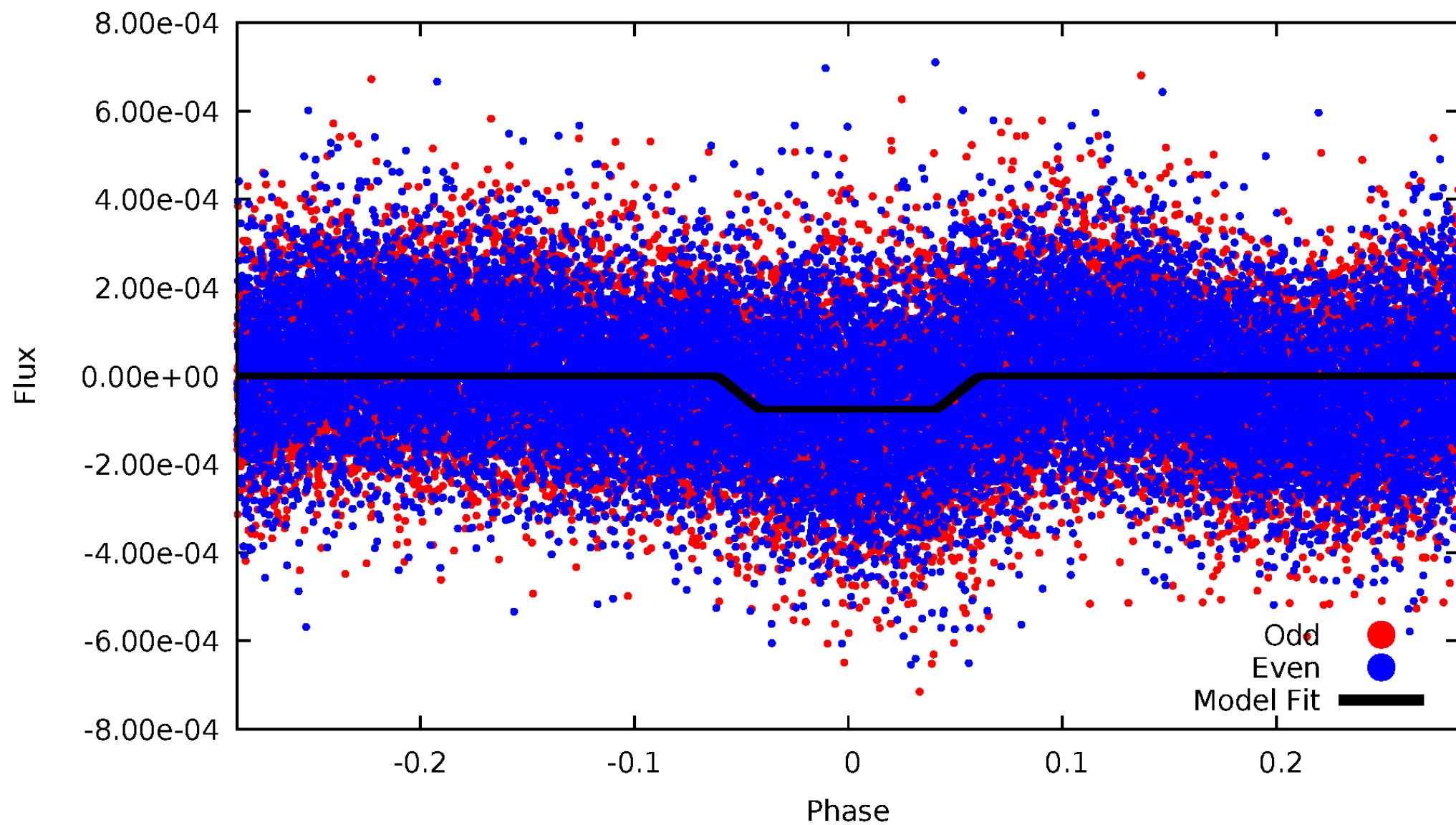
TCE 009822703-01



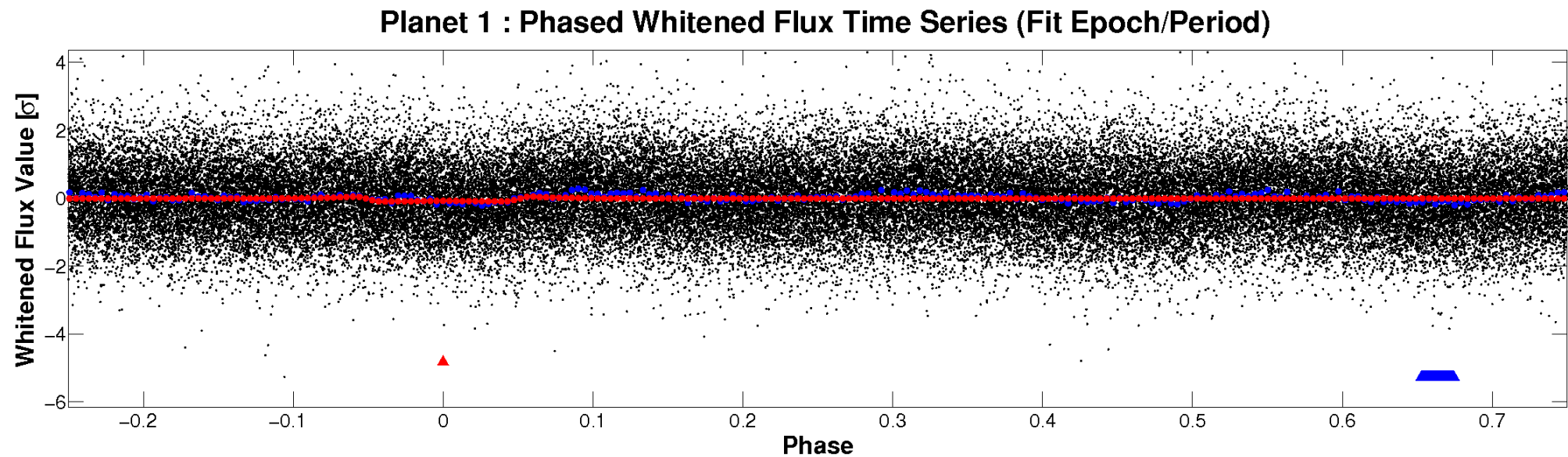
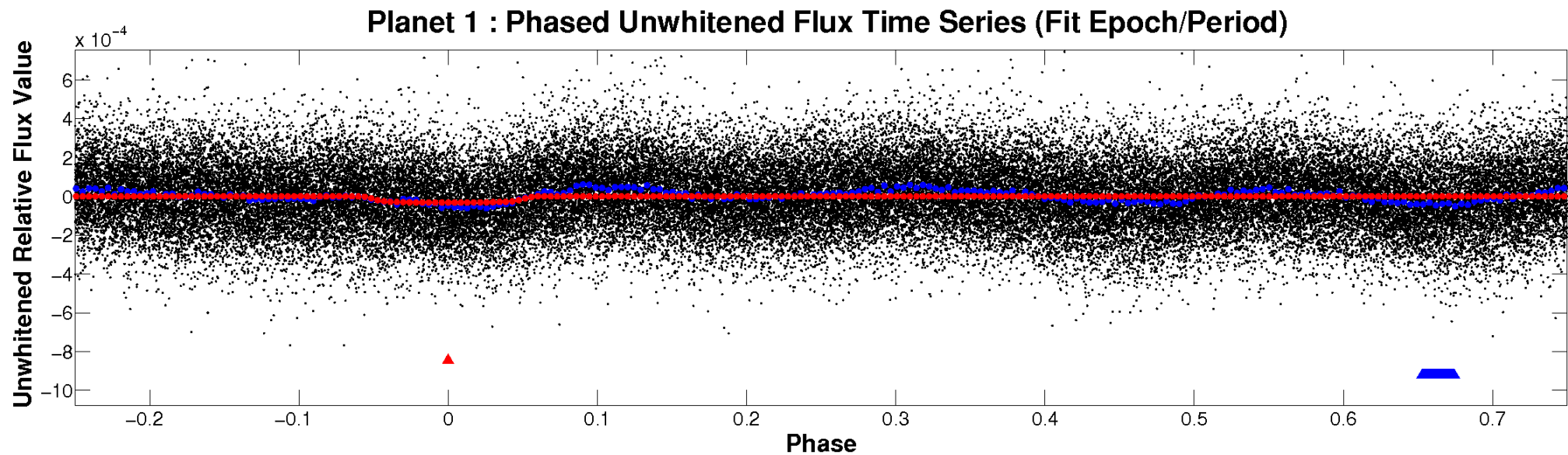


# ALT Odd/Even

TCE 009822703-01

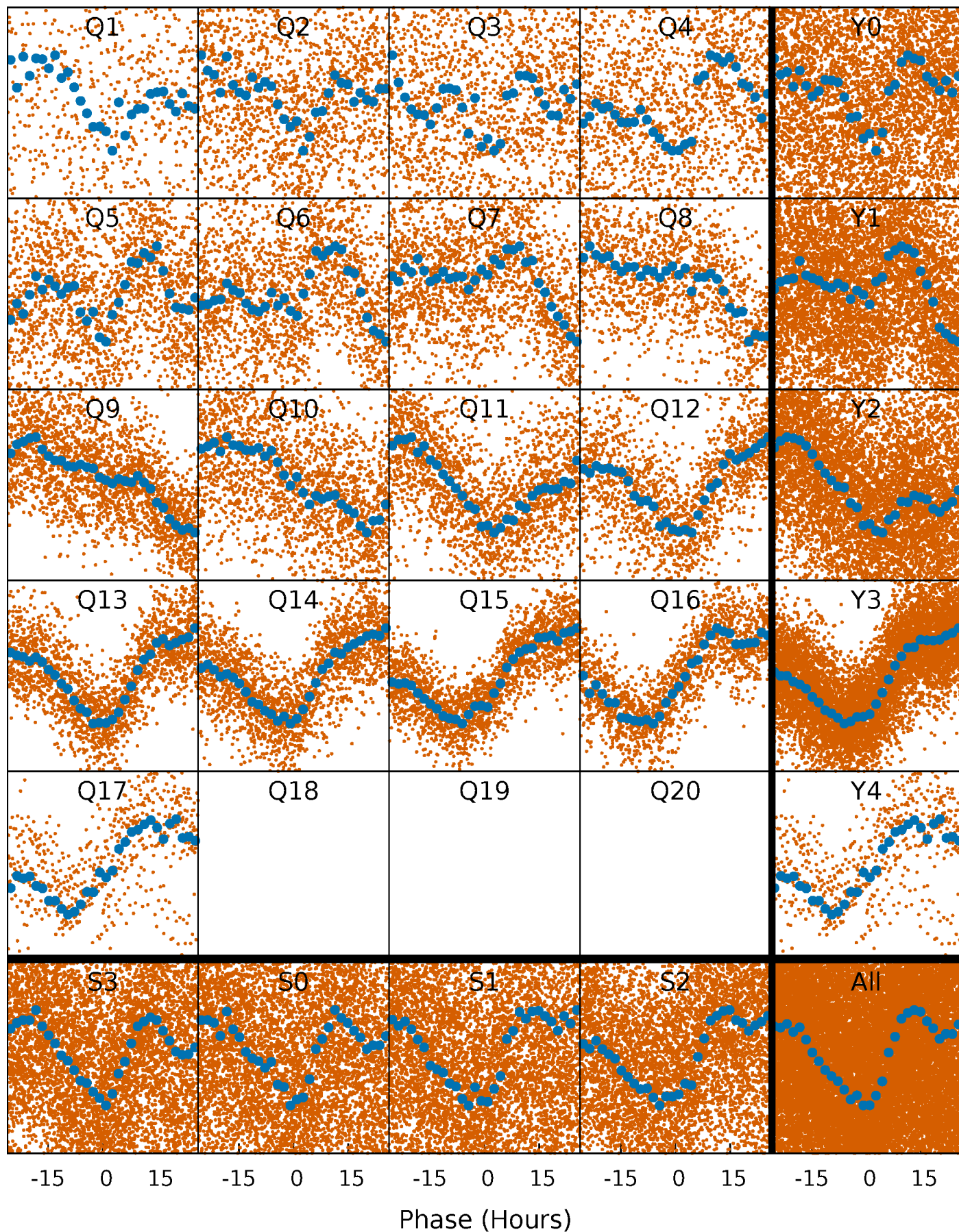


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

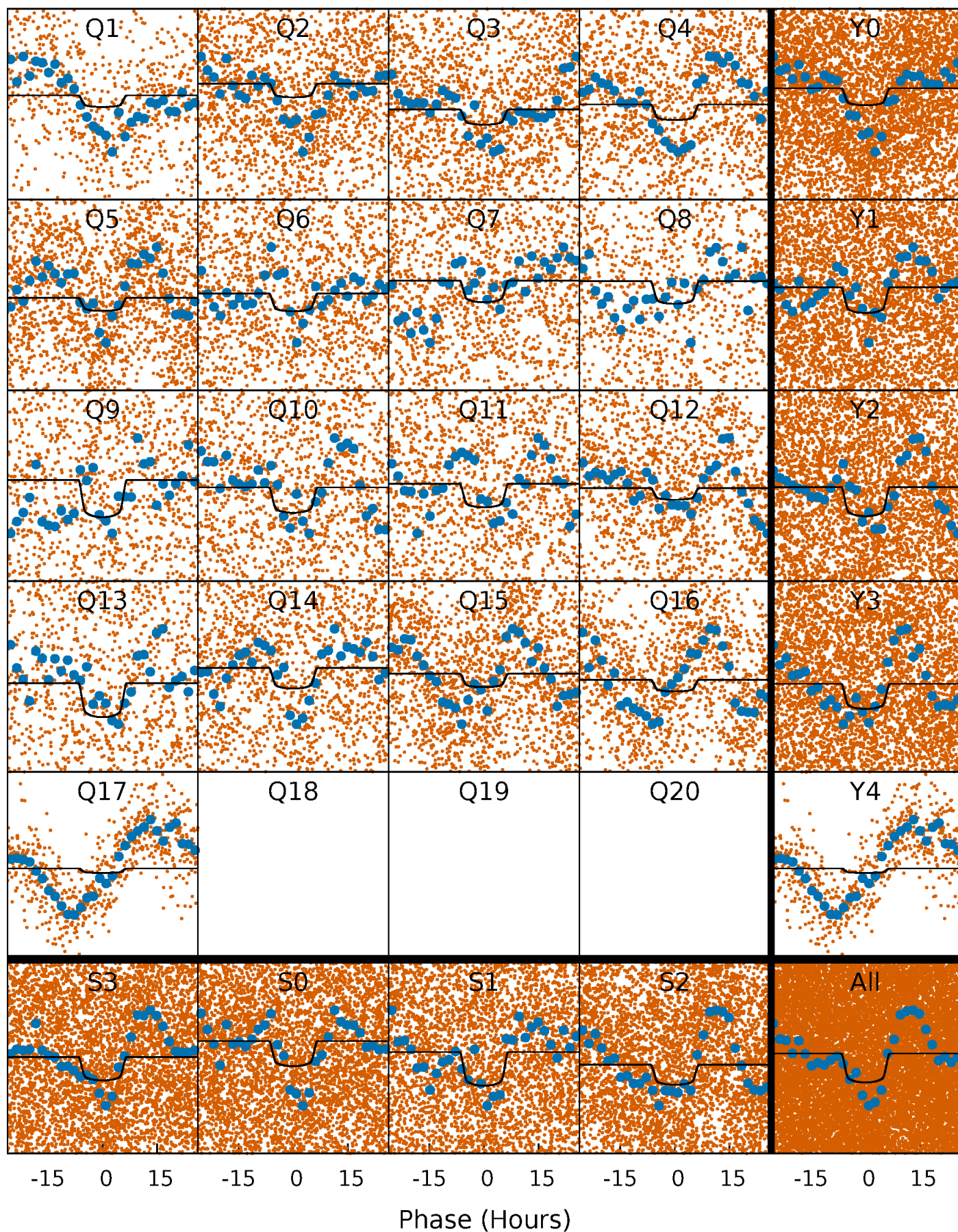
TCE 009822703-01 P= 4.753282 Days  $T_0=134.243601$  (BKJD)





# DV Quarter-Phased Transit Curves

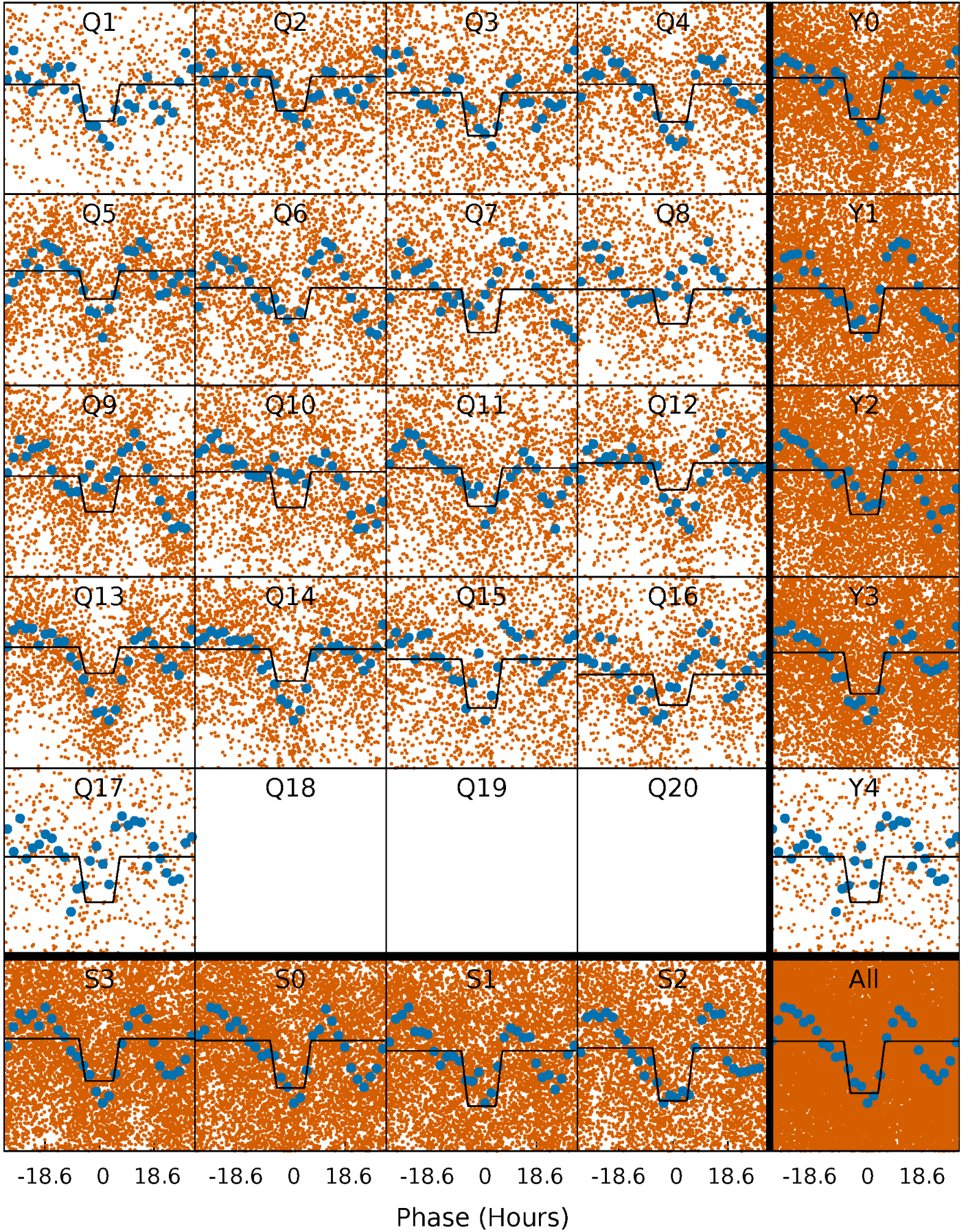
TCE 009822703-01 P= 4.753282 Days  $T_0=134.243601$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

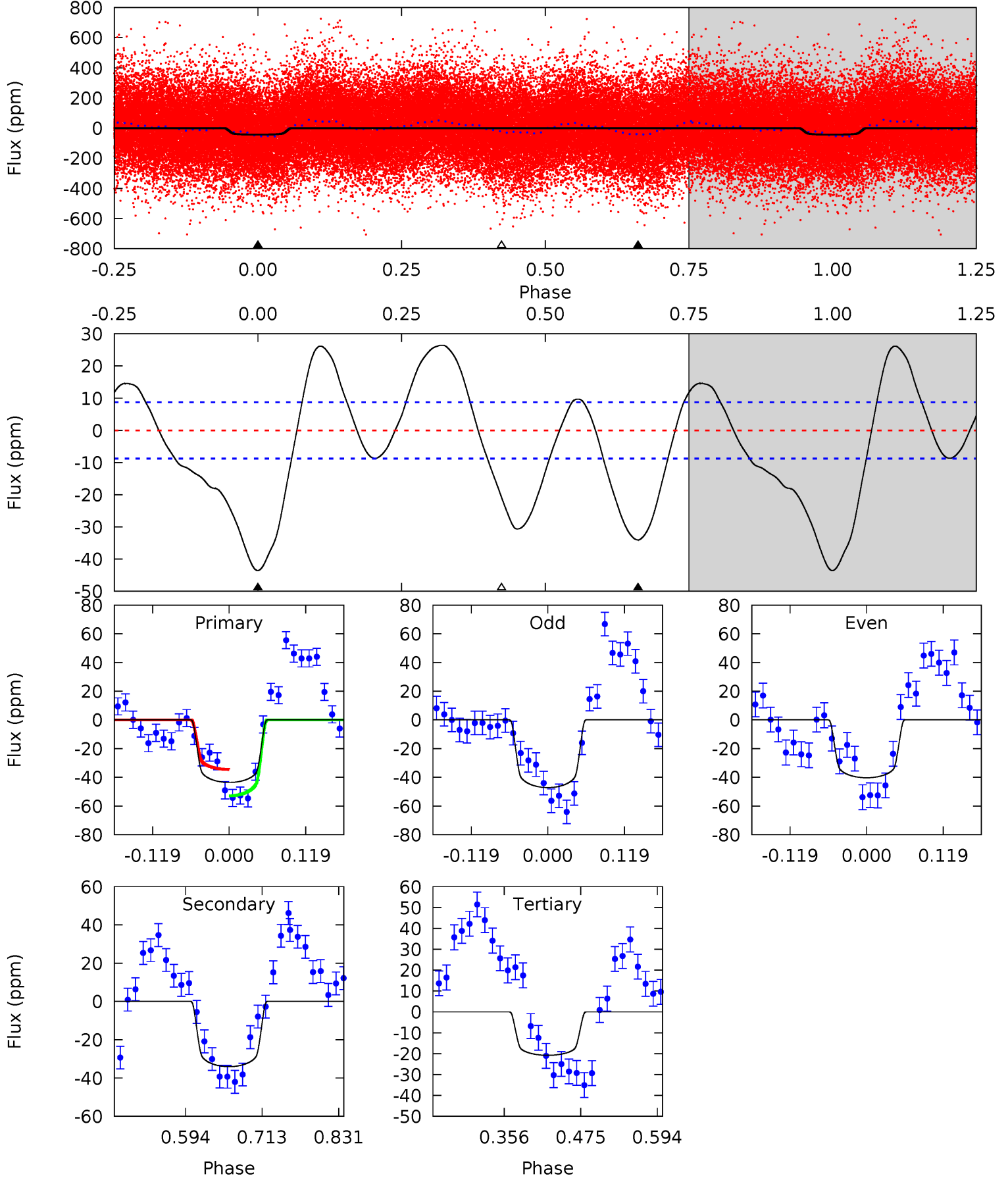
TCE 009822703-01 P= 4.753197 Days  $T_0=134.227798$  (BKJD)



# DV Model-Shift Uniqueness Test

009822703-01, P = 4.753282 Days, E = 129.490319 Days

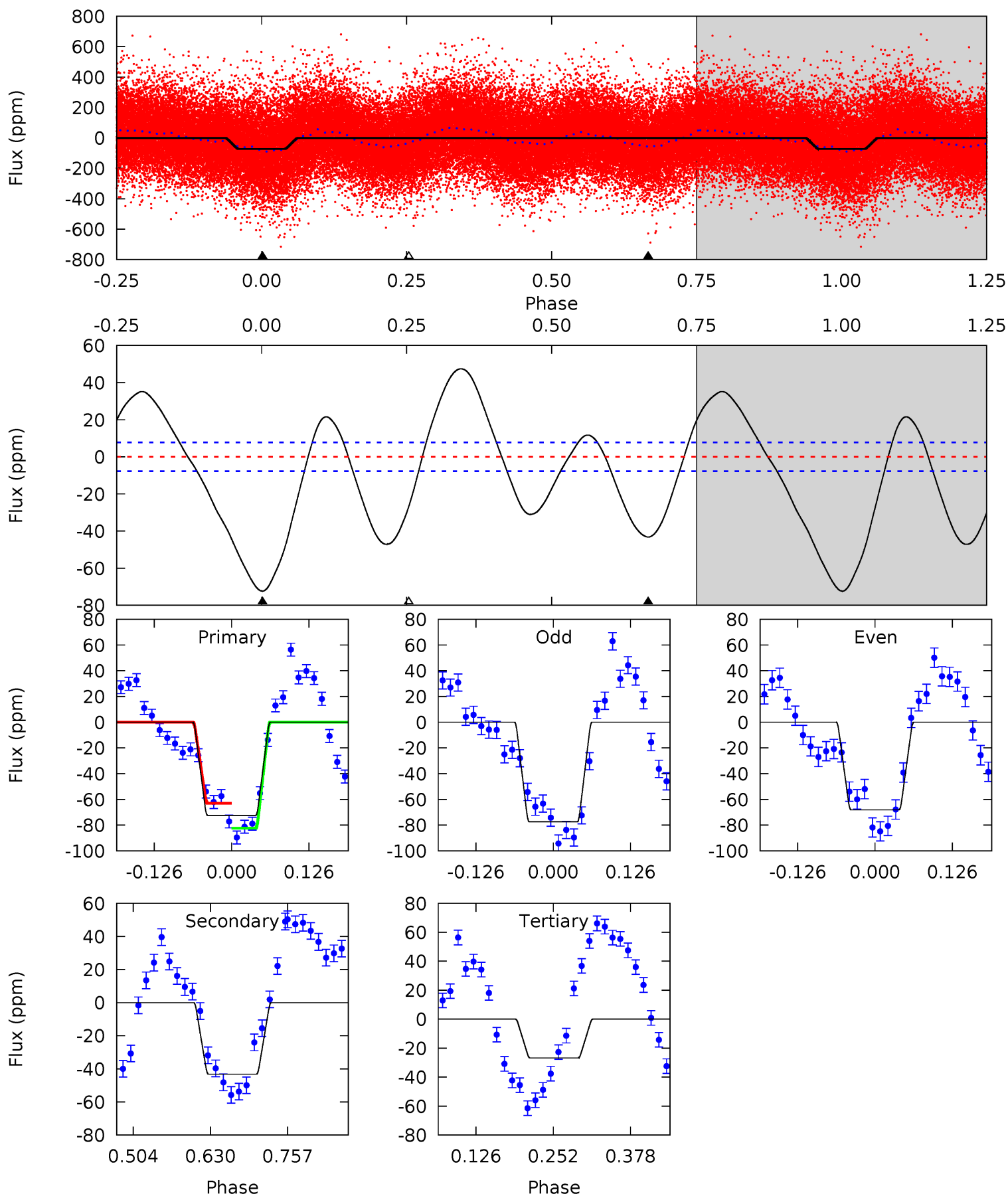
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
22.5	17.6	10.7	0	4.53	1.56	8.22	11.8	22.5	6.86	17.6	1.77	1.28	0.38	4.80



# Alt Model-Shift Uniqueness Test

009822703-01, P = 4.753197 Days, E = 129.474601 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
42.2	25.2	15.6	0	4.52	1.53	16.2	26.6	42.2	9.58	25.2	2.70	1.02	0.40	5.68





### Stellar Parameters For KIC 009822703

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7098^{+197}_{-271}$	$4.136^{+0.132}_{-0.182}$	$-0.040^{+0.250}_{-0.350}$	$1.727^{+0.537}_{-0.358}$	$1.486^{+0.220}_{-0.242}$	$0.407^{+0.296}_{-0.196}$
	+3%/-4%	+3%/-4%	+625%/-875%	+31%/-21%	+15%/-16%	+73%/-48%
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 009822703-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-34 \pm 2$	$1.26^{+0.23}_{-0.18}$	$2295^{+177}_{-149}$	$6563^{+431}_{-345}$	$46^{+15}_{-13}$
Alt.	$-43 \pm 2$	$1.65^{+0.29}_{-0.21}$	$2302^{+179}_{-141}$	$6089^{+296}_{-272}$	$34^{+10}_{-9}$

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

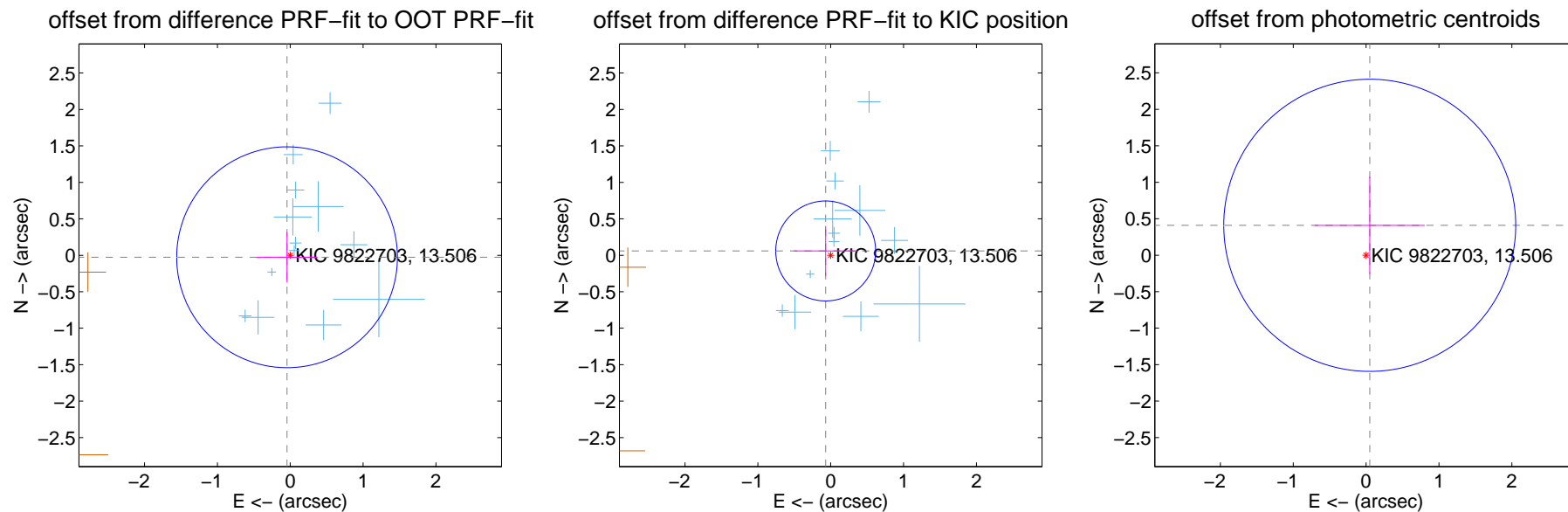
## DV Centroid Data

Supplemental centroid analysis for 009822703-01. Kepler magnitude: 13.51. Transit SNR 7.07

There are 13 quarters with good PRF difference image offsets

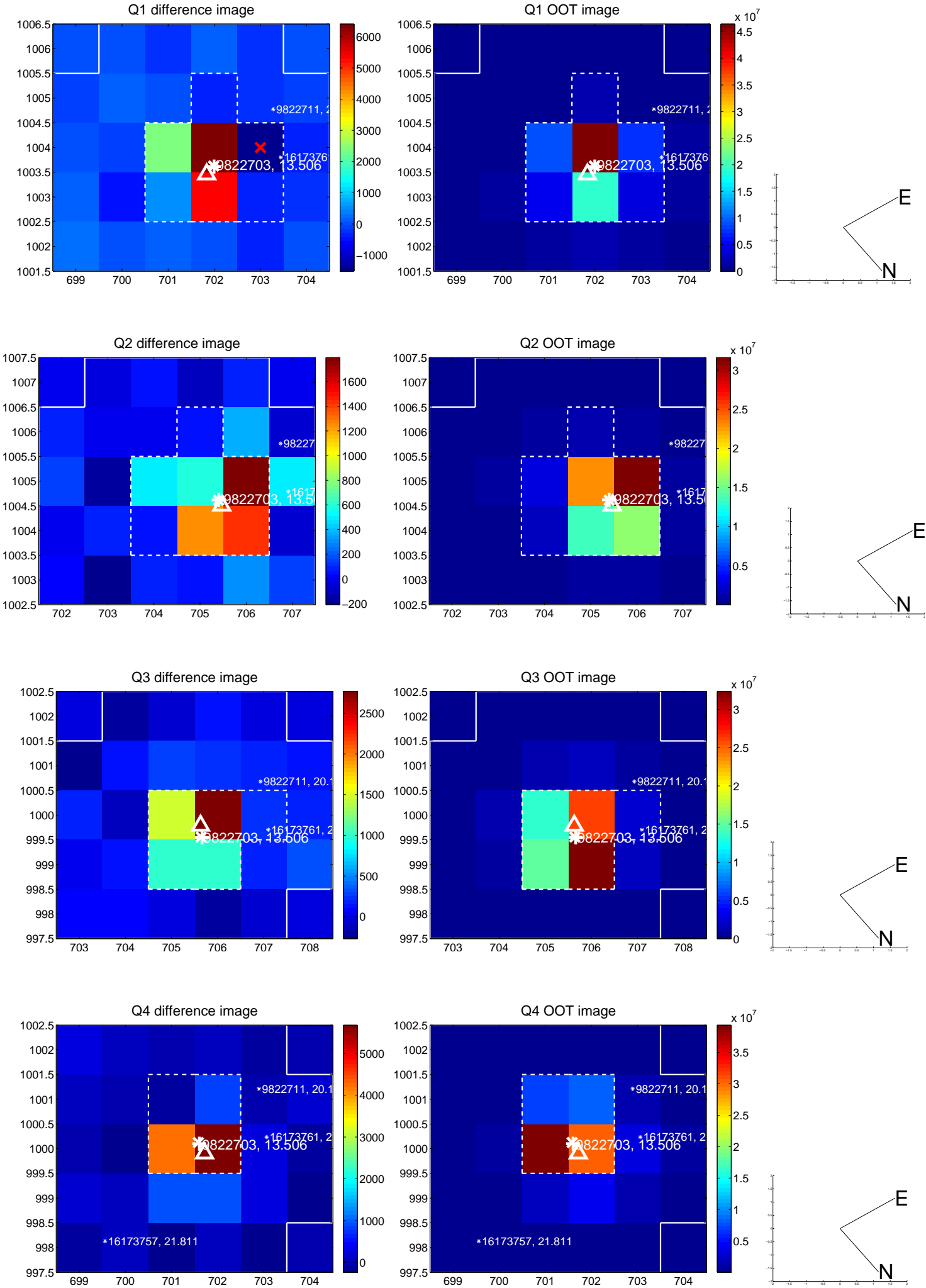
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.052 \pm 0.505$	0.10	$0.044 \pm 0.419$	$-0.027 \pm 0.346$
PRF-fit source offset from KIC position	$0.091 \pm 0.228$	0.40	$0.069 \pm 0.434$	$0.059 \pm 0.343$
photometric centroid source offset	$0.41 \pm 0.67$	0.62	$-0.05 \pm 0.76$	$0.41 \pm 0.67$

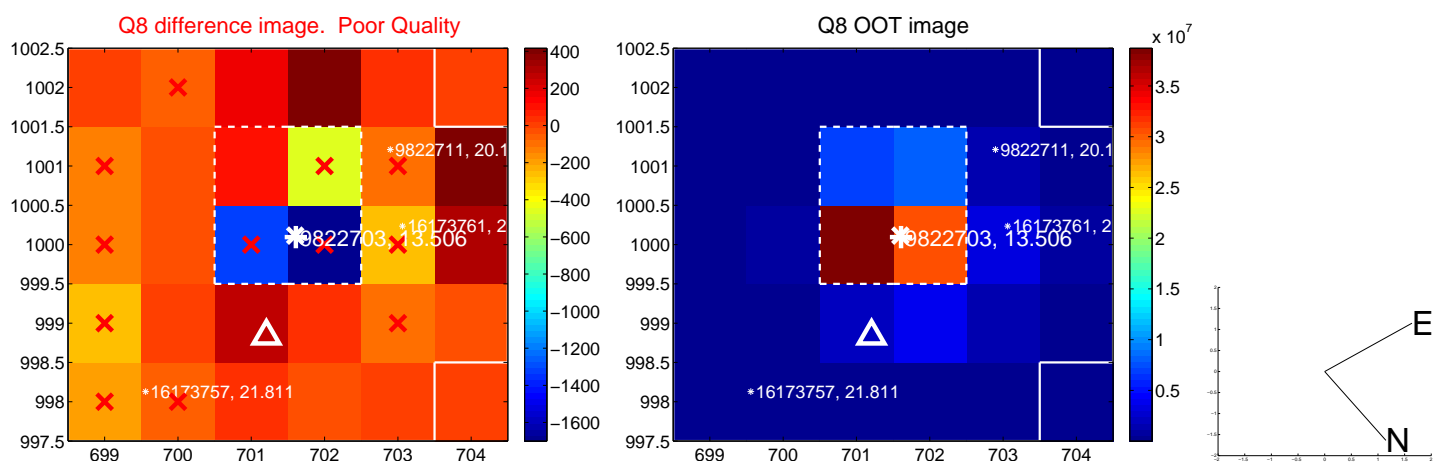
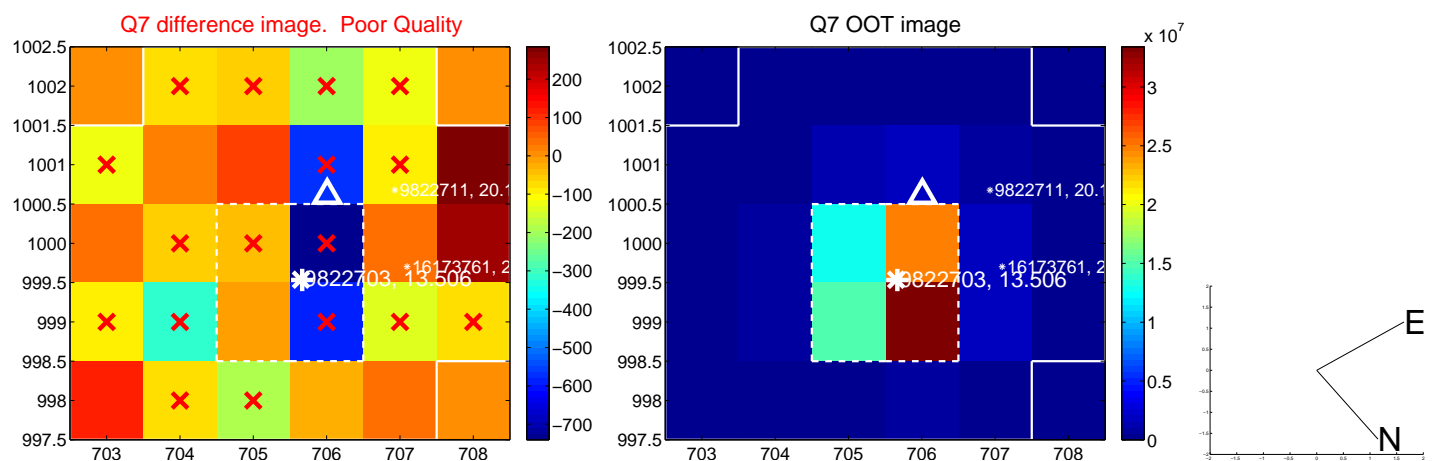
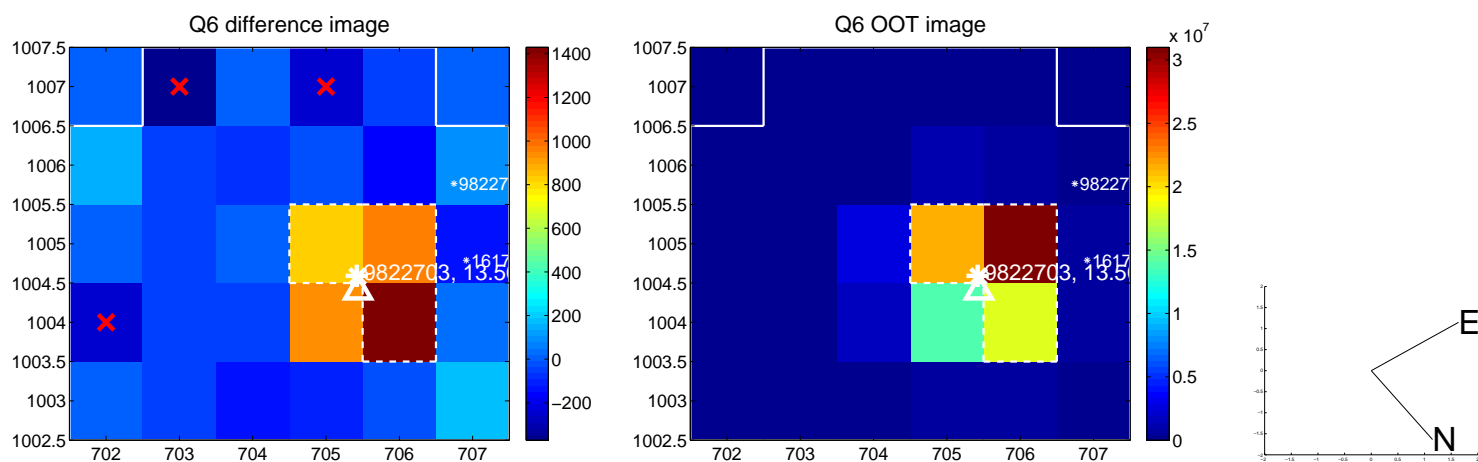
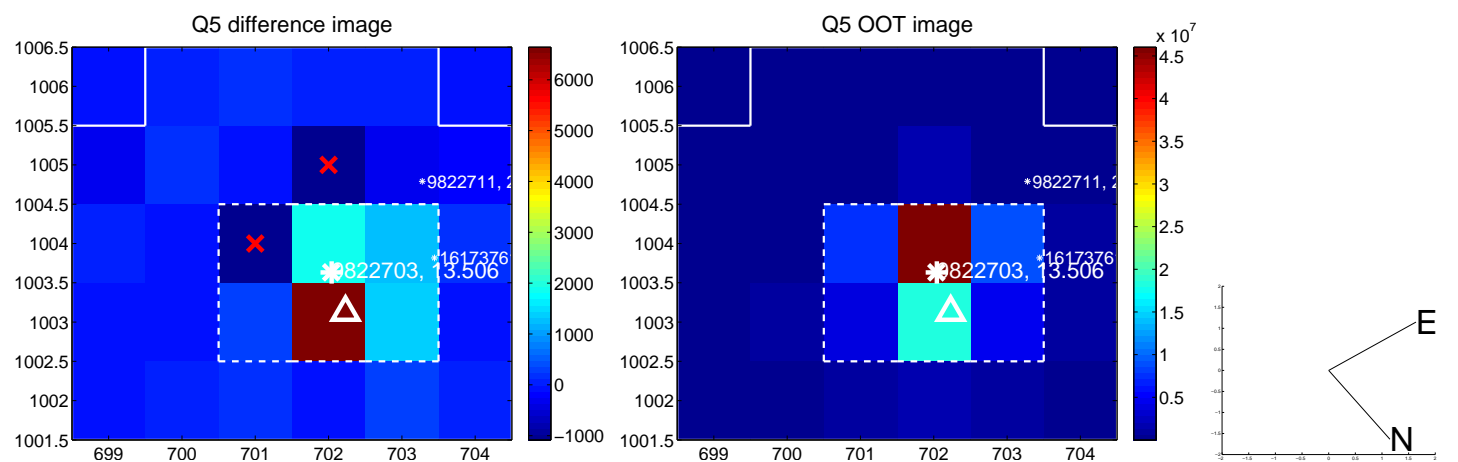


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

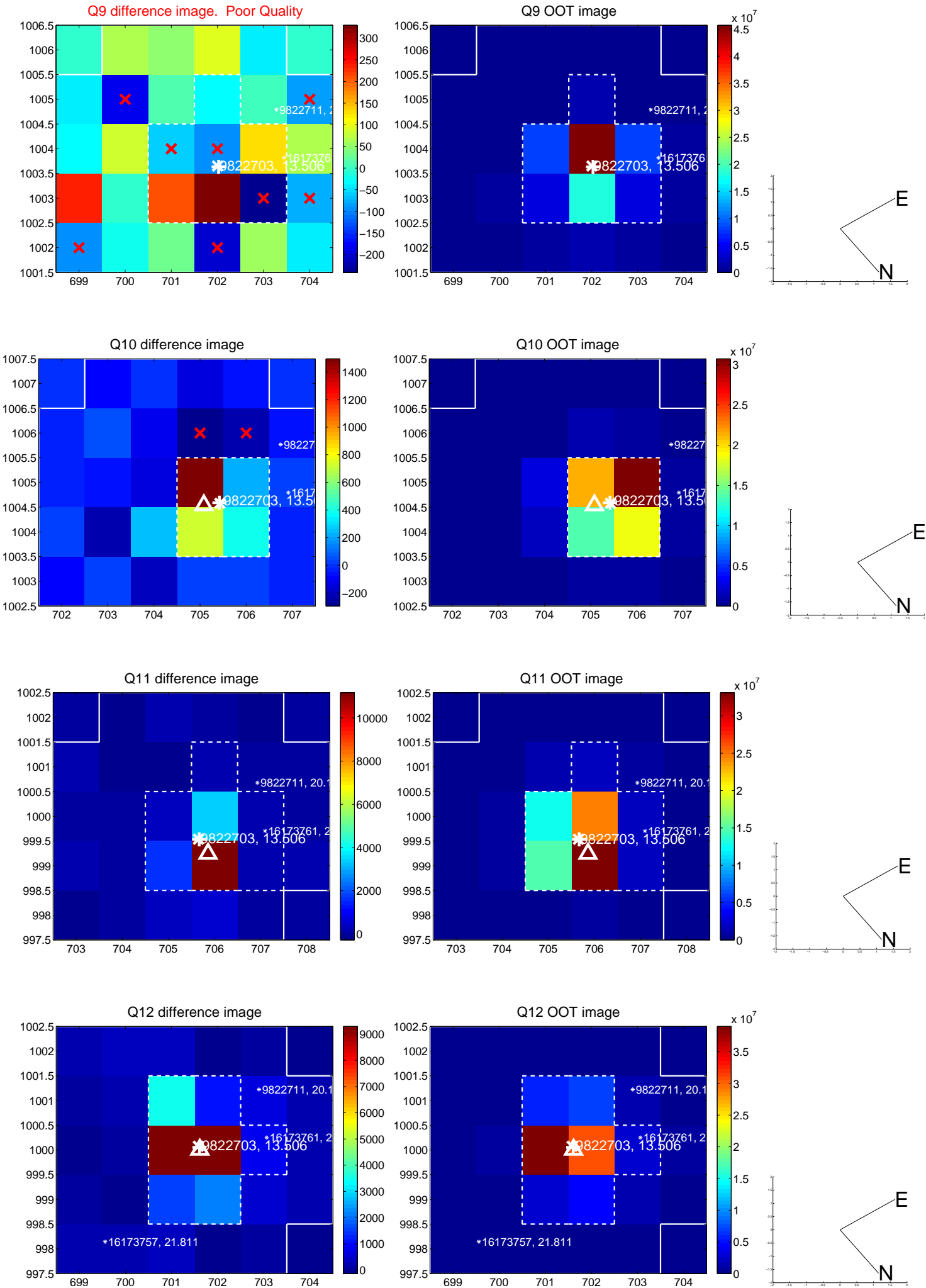


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

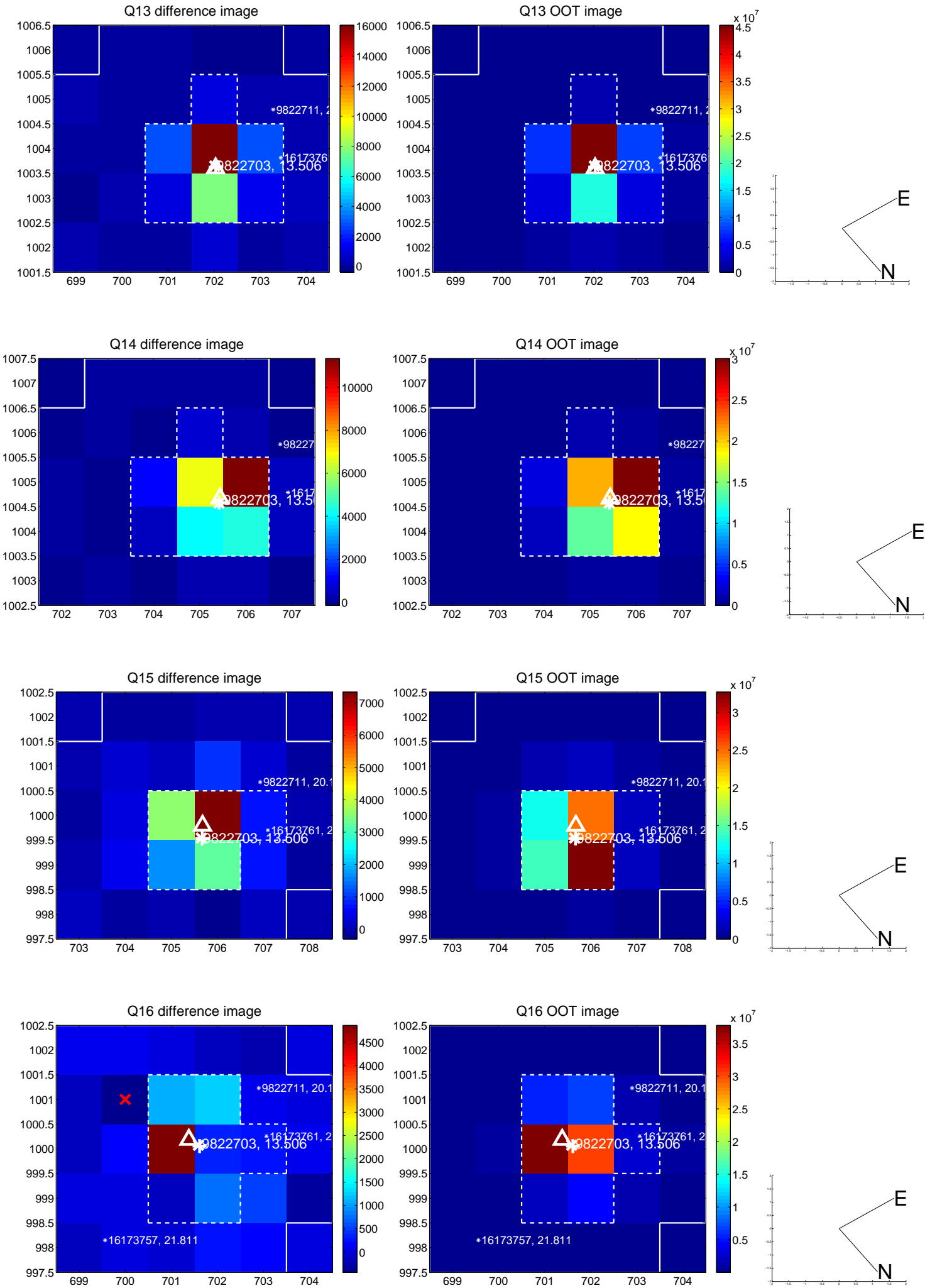




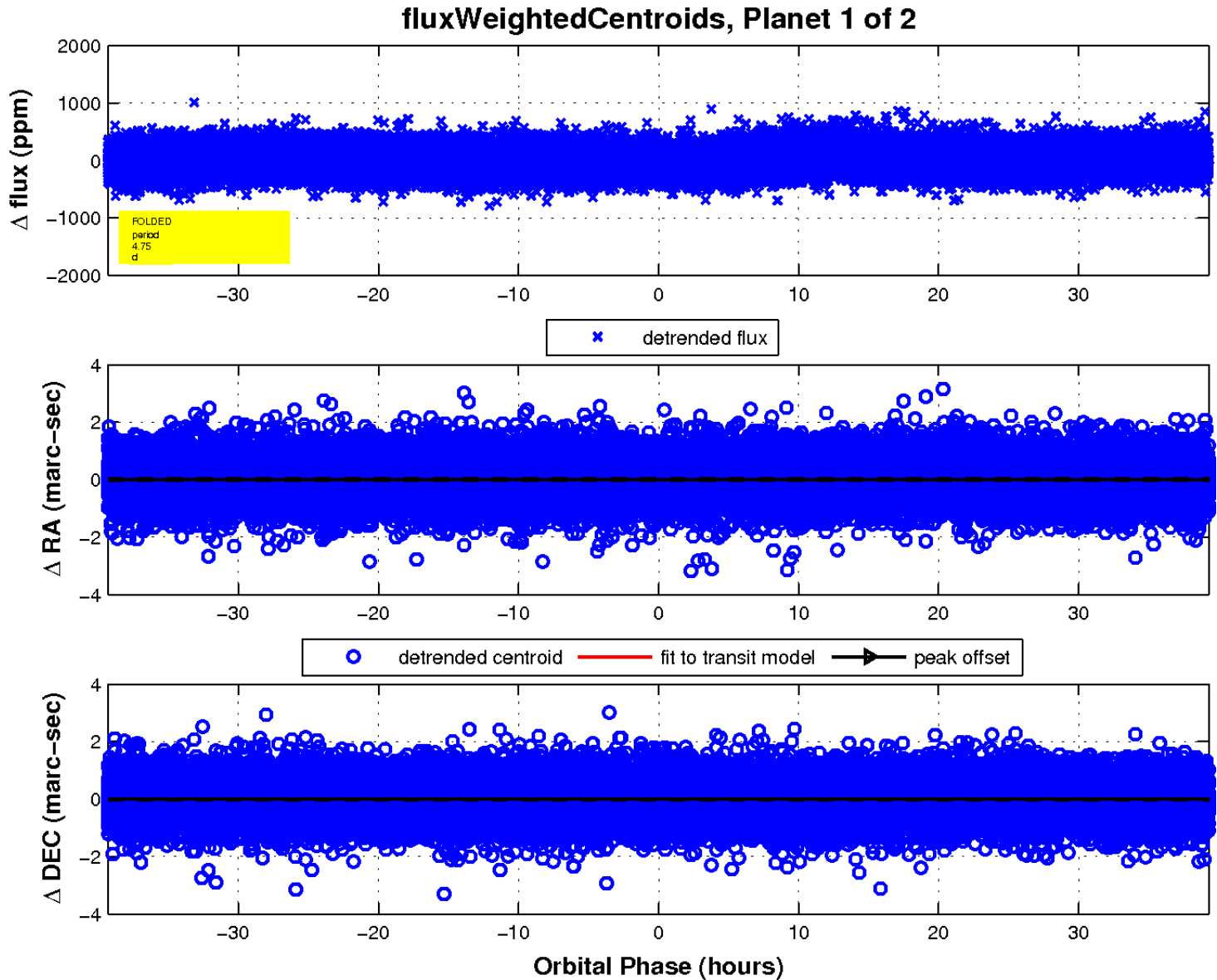
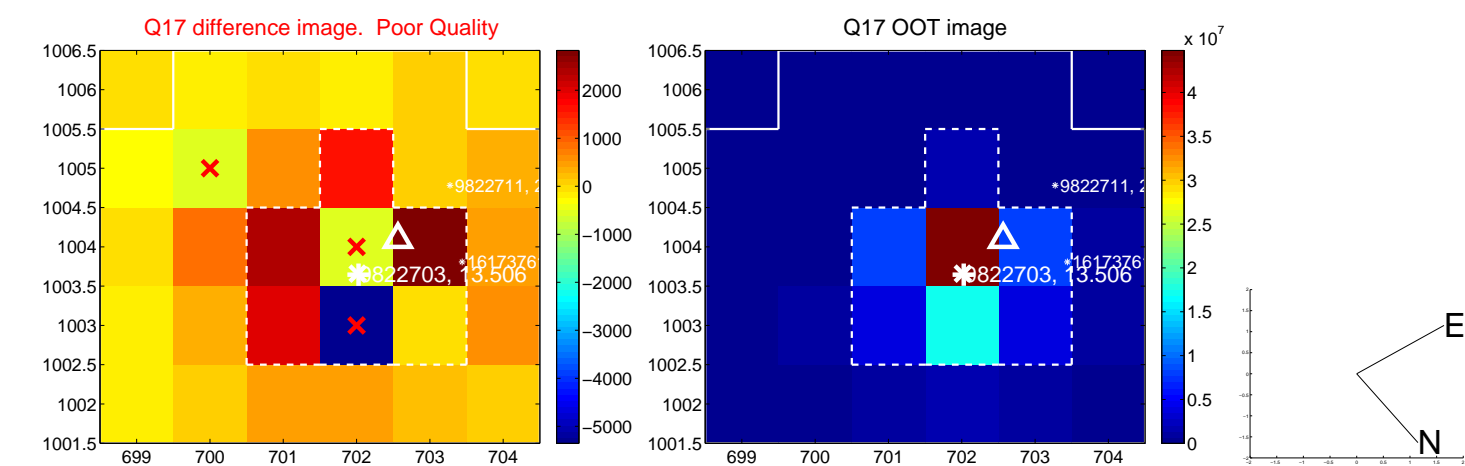
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



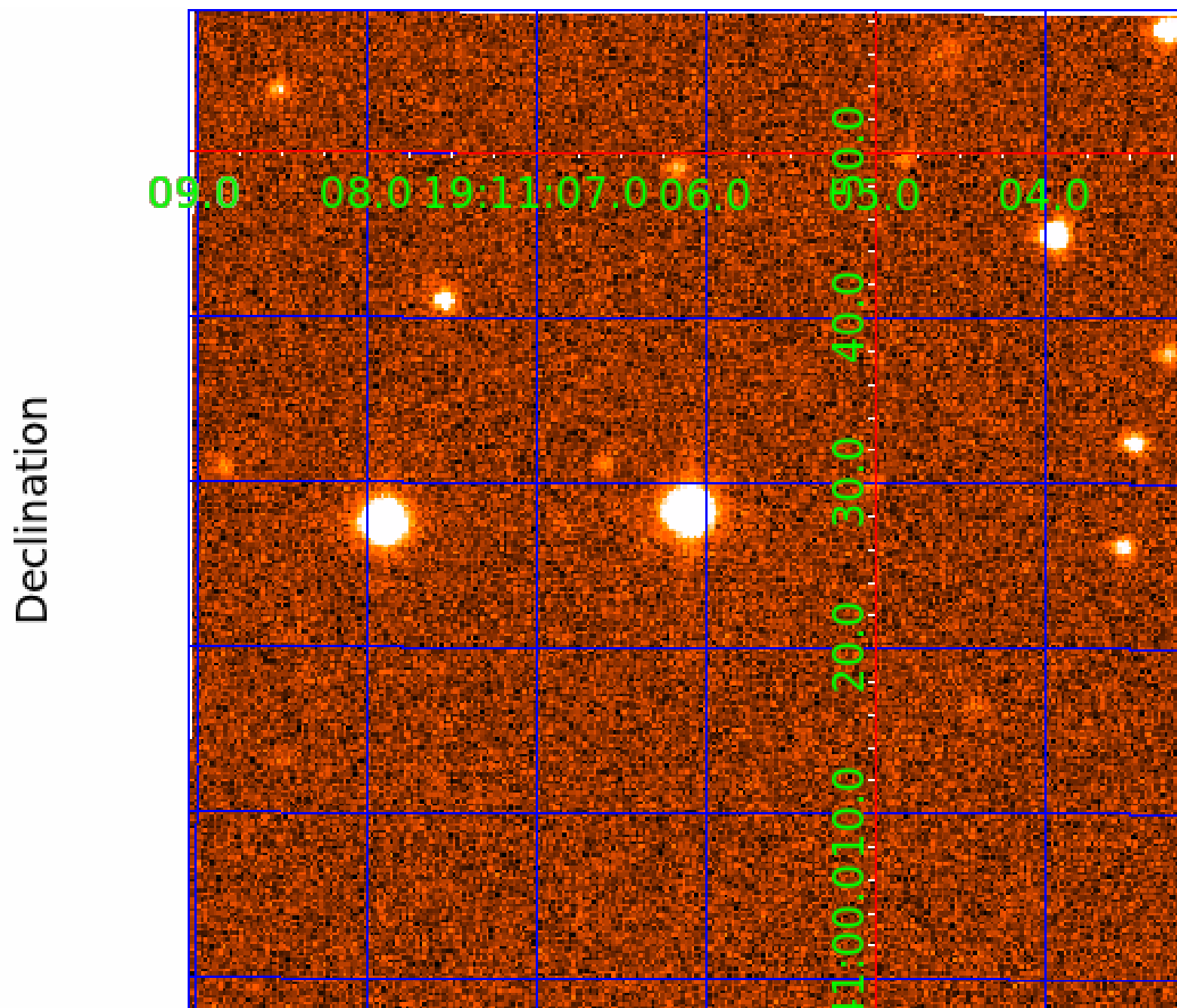
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 009822703

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009822703-01	OBS	No	4.753282	134.243601	31.7	13.105	8.5	7.1	1.73	7098	1.25	1699.45
009822703-02	OBS	No	4.752949	132.695392	35.6	17.685	10.2	9.1	1.73	7098	1.16	1699.61

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009822703-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009822703-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

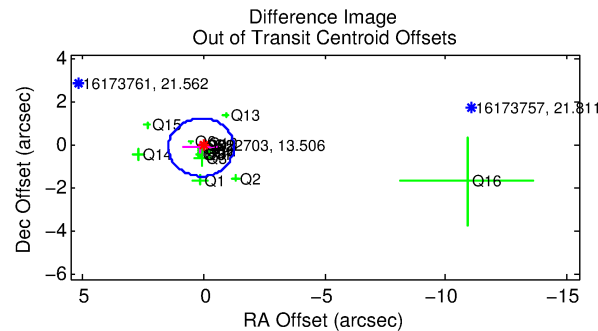
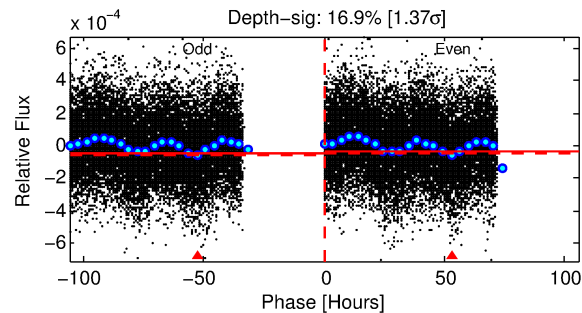
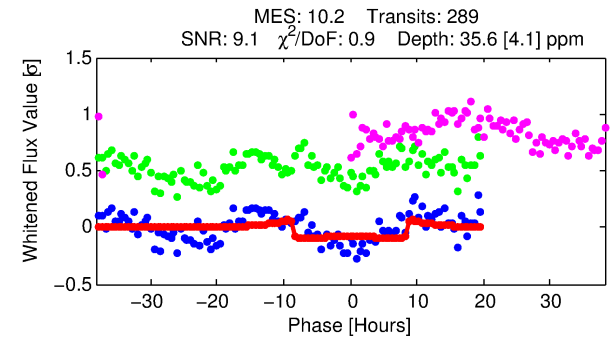
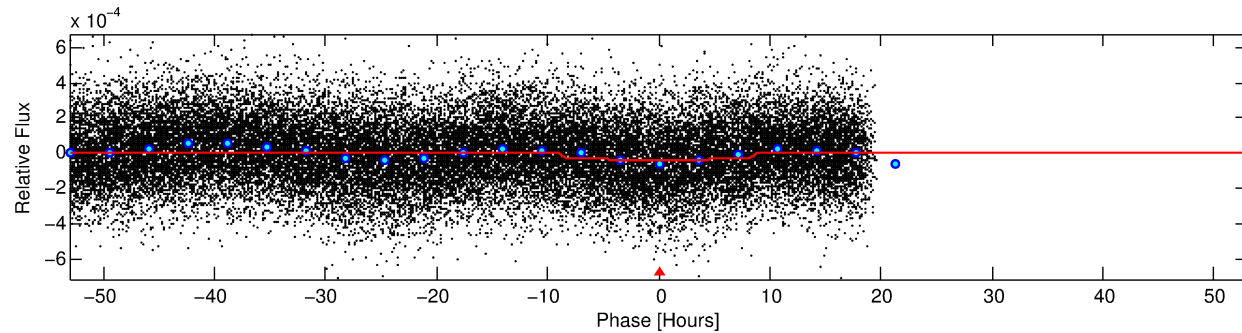
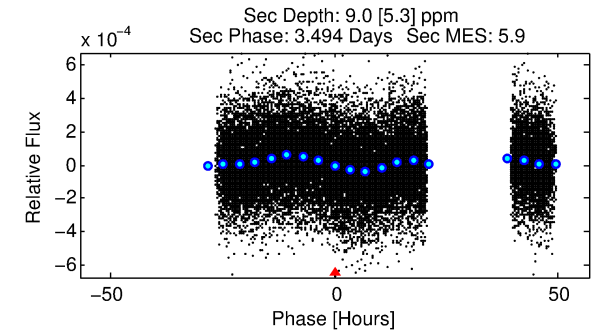
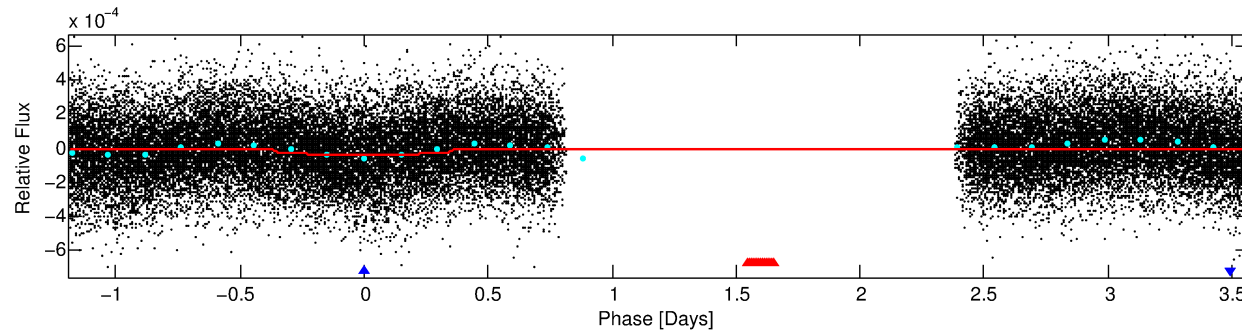
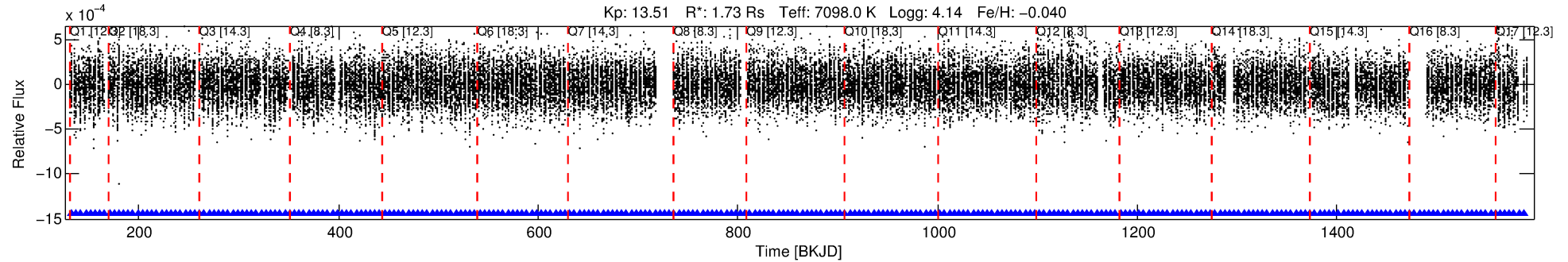
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009822703-02

No Significant Match Found

# DV One-Page Summary

KIC: 9822703 Candidate: 2 of 2 Period: 4.753 d



## DV Fit Results:

Period = 4.75295 [0.00006] d  
Epoch = 132.6954 [0.0091] BKJD  
Rp/R\* = 0.0061 [0.0008]  
a/R\* = 1.45 [0.55]  
b = 0.84 [0.25]  
Seff = 1699.61 [645.74]  
Teq = 1637 [156] K  
Rp = 1.15 [0.39] Re  
a = 0.0632 [0.0158] AU  
Ag = 14.77 [10.81] [1.27σ]  
Teffp = 4962 [821] K [3.98σ]

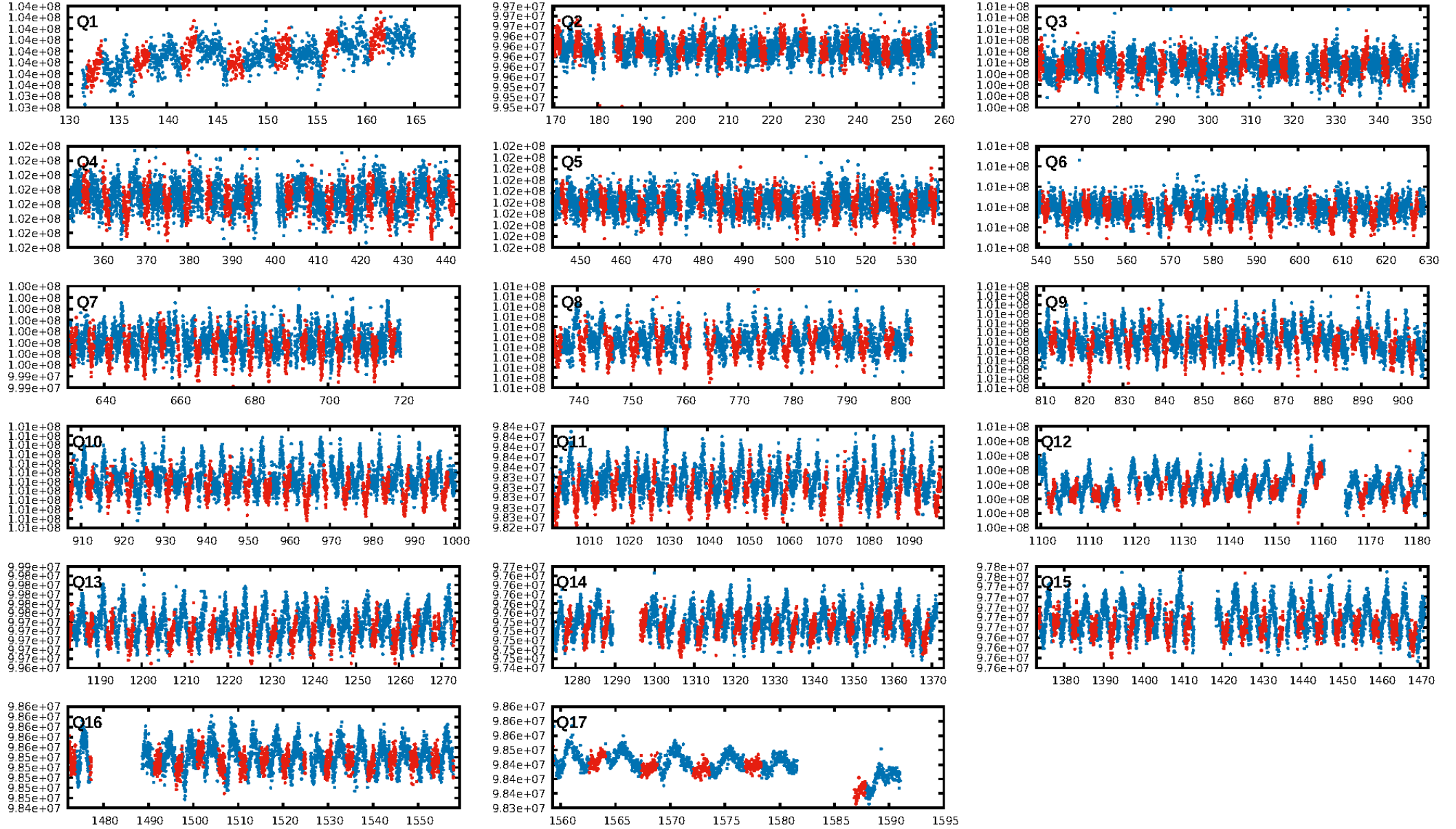
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.00e-12  
RollingBand-fgt: 1.00 [277/277]  
GhostDiagnostic-chr: 1.053  
Centroid-sig: 55.4%  
Centroid-so: 0.449 arcsec [0.85σ]  
OotOffset-rm: 0.141 arcsec [0.31σ]  
KicOffset-rm: 0.144 arcsec [0.25σ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.69 [11/16]  
DiffImageOverlap-fno: 1.00 [17/17]

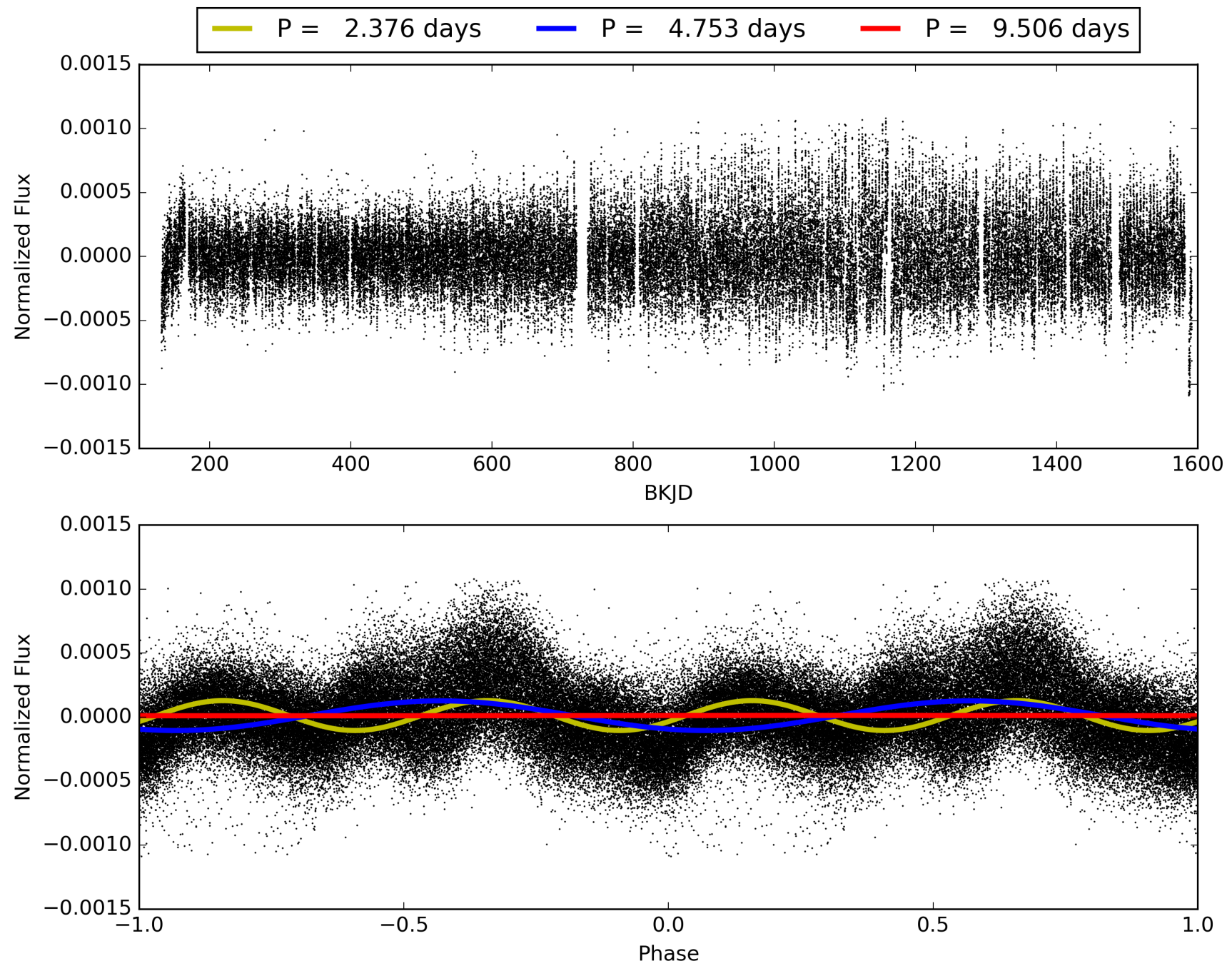
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 03:25:33 Z

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

# TCE 009822703-02, PDC Light Curves



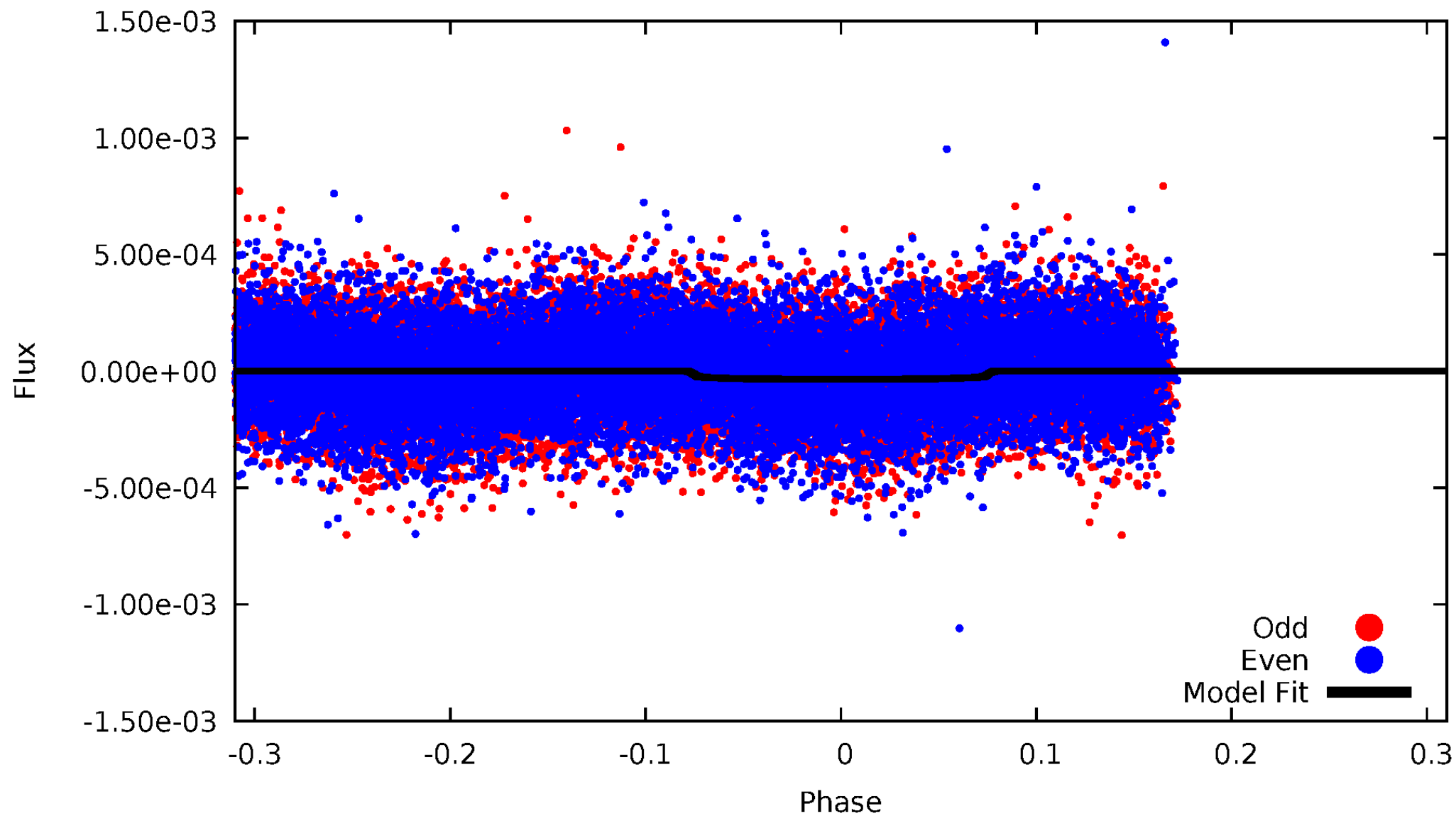
TCE 009822703-02





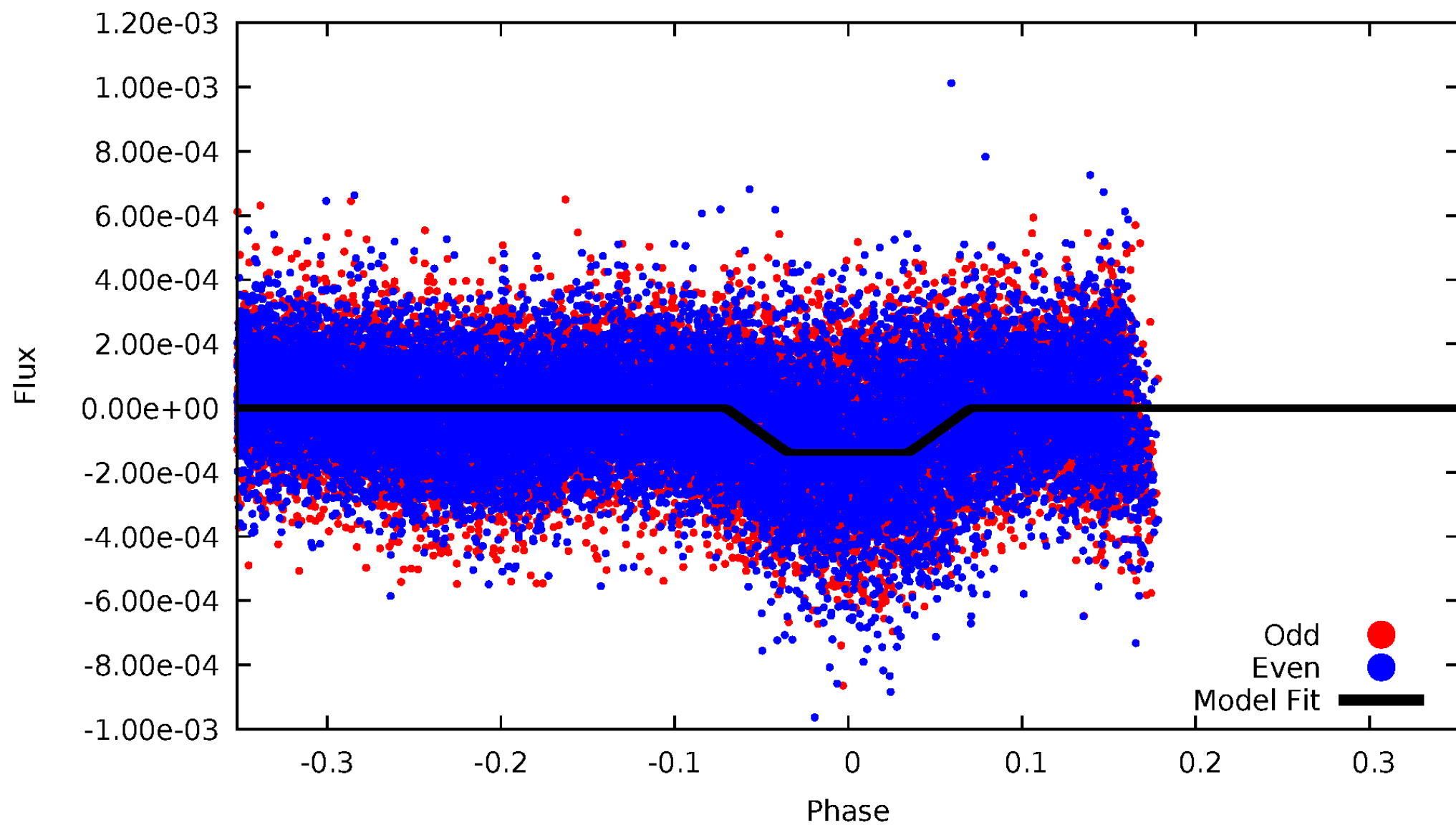
DV Odd/Even

TCE 009822703-02



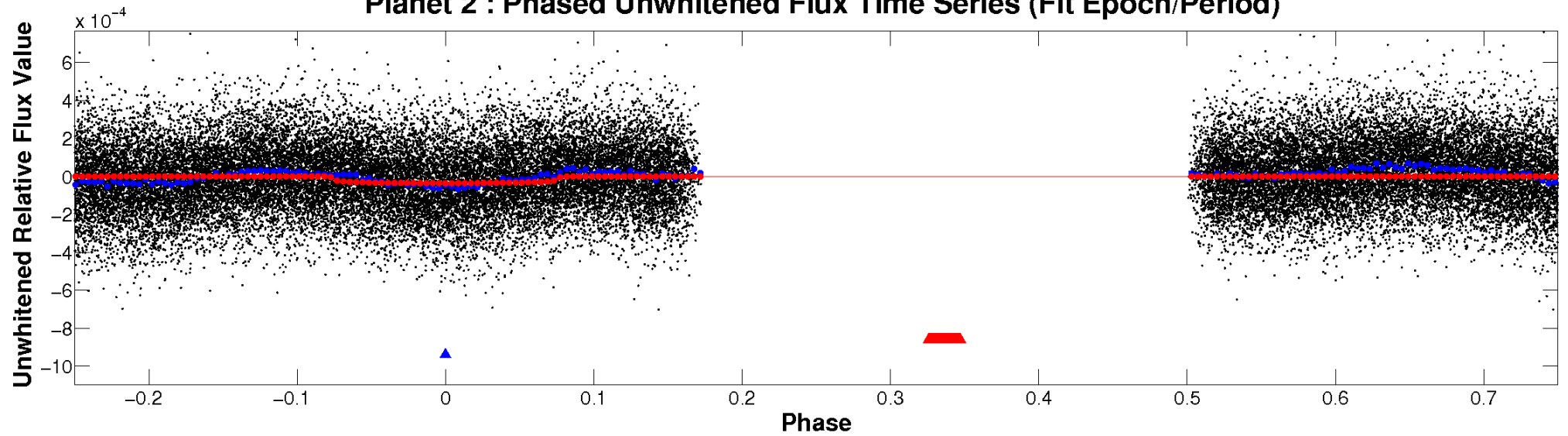
# ALT Odd/Even

TCE 009822703-02

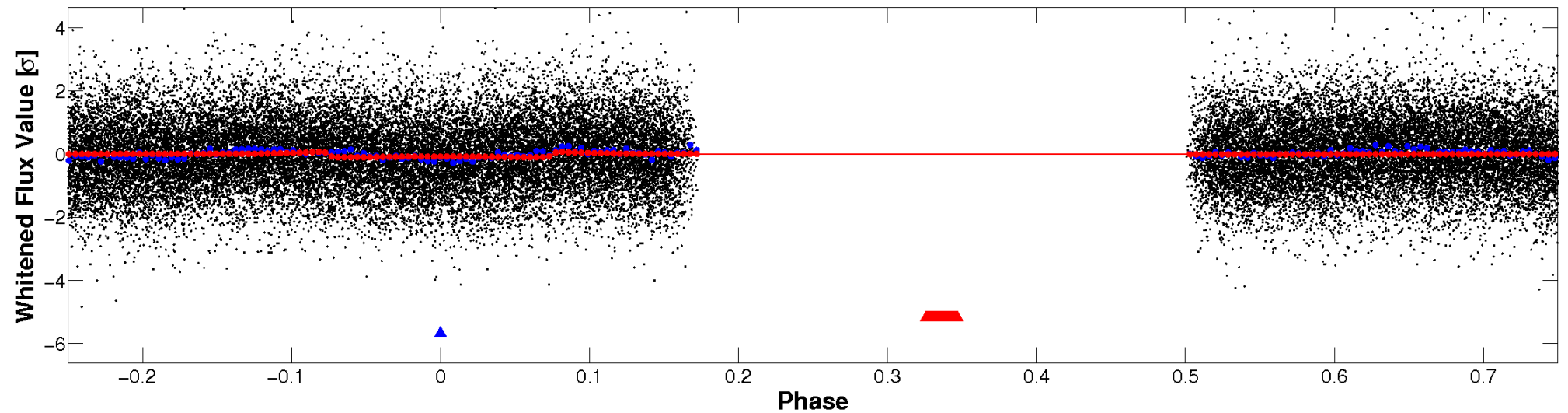


# Non-Whitened Vs. Whitened Light Curve

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

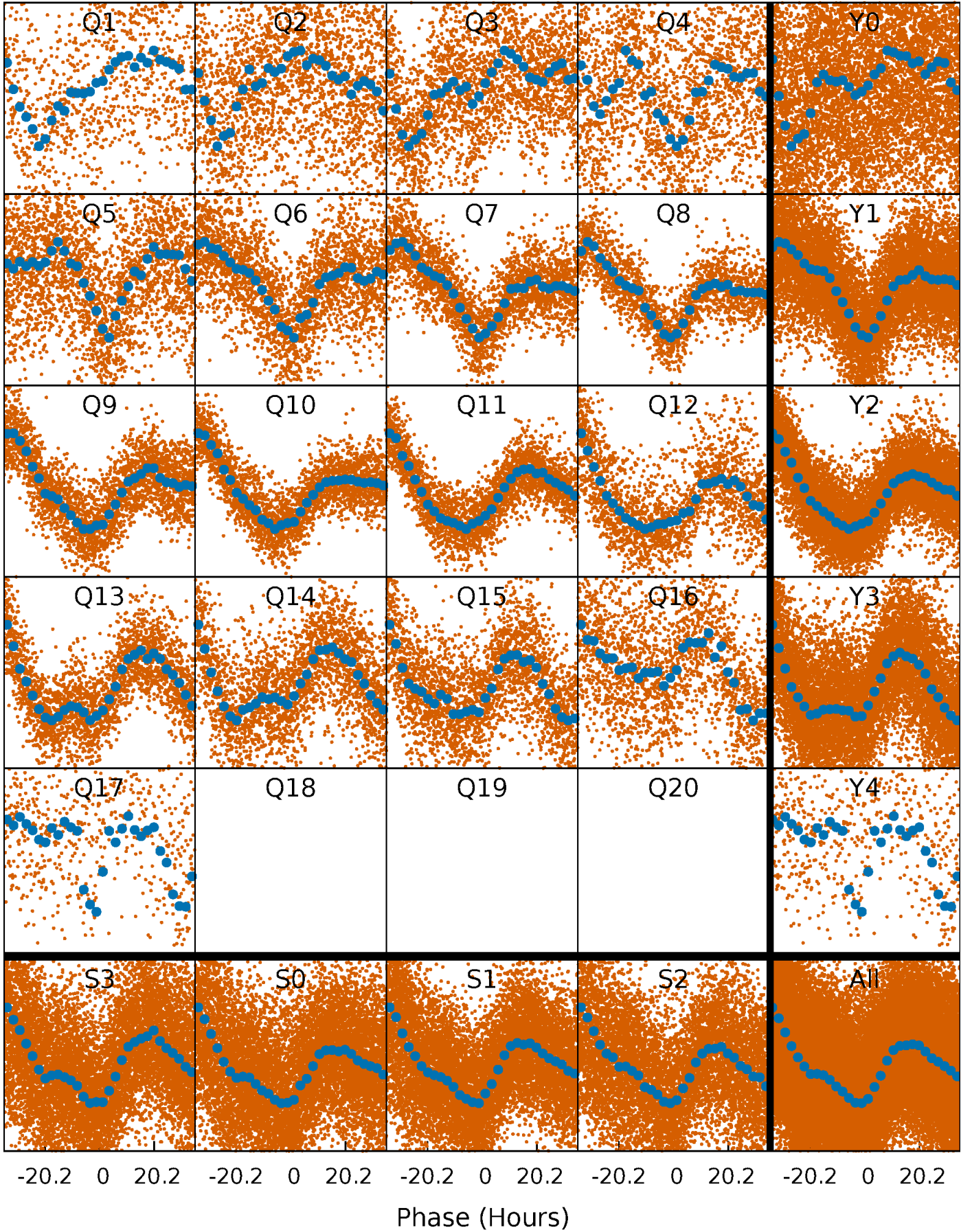


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

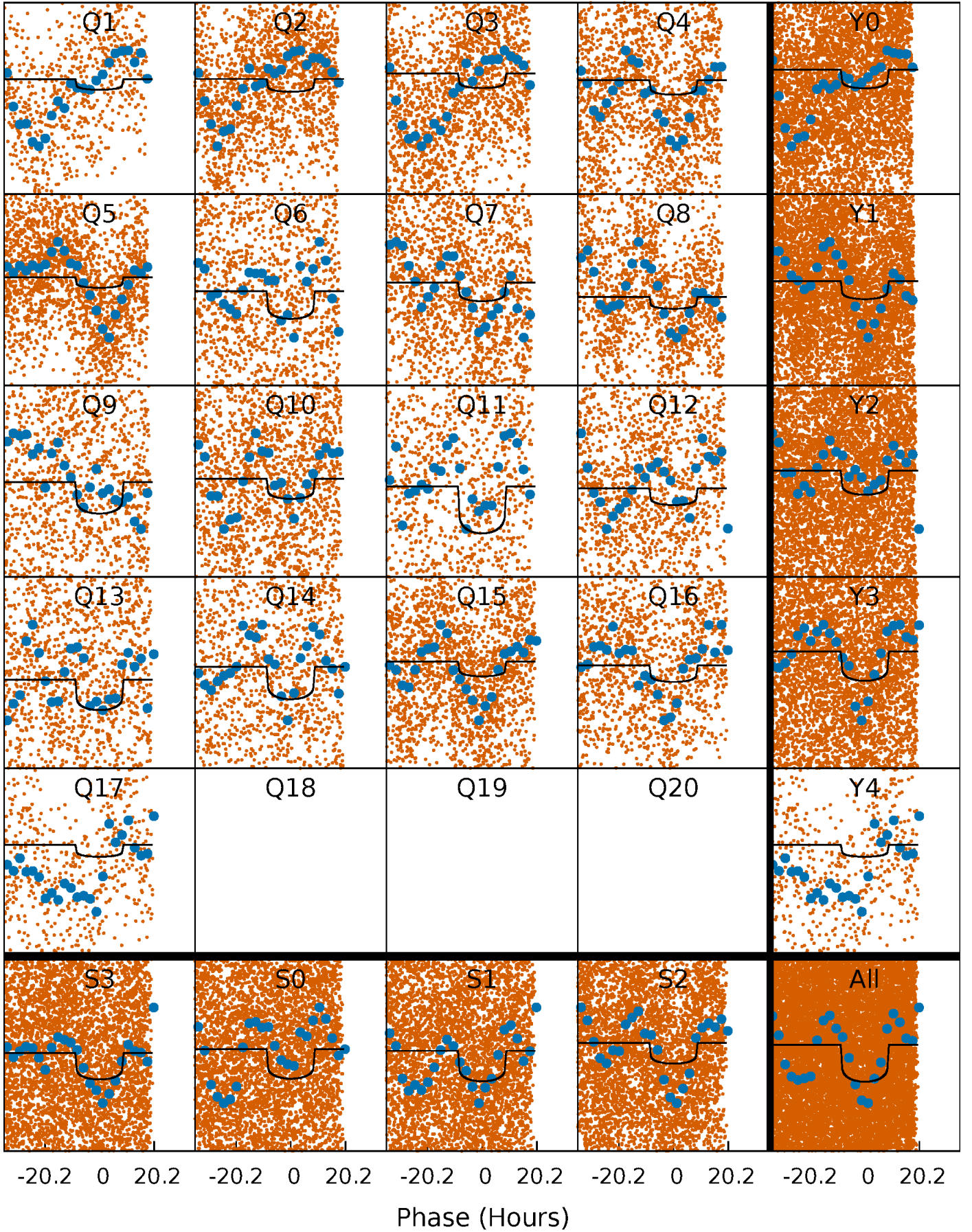
TCE 009822703-02   P= 4.752949 Days    $T_0=132.695392$  (BKJD)





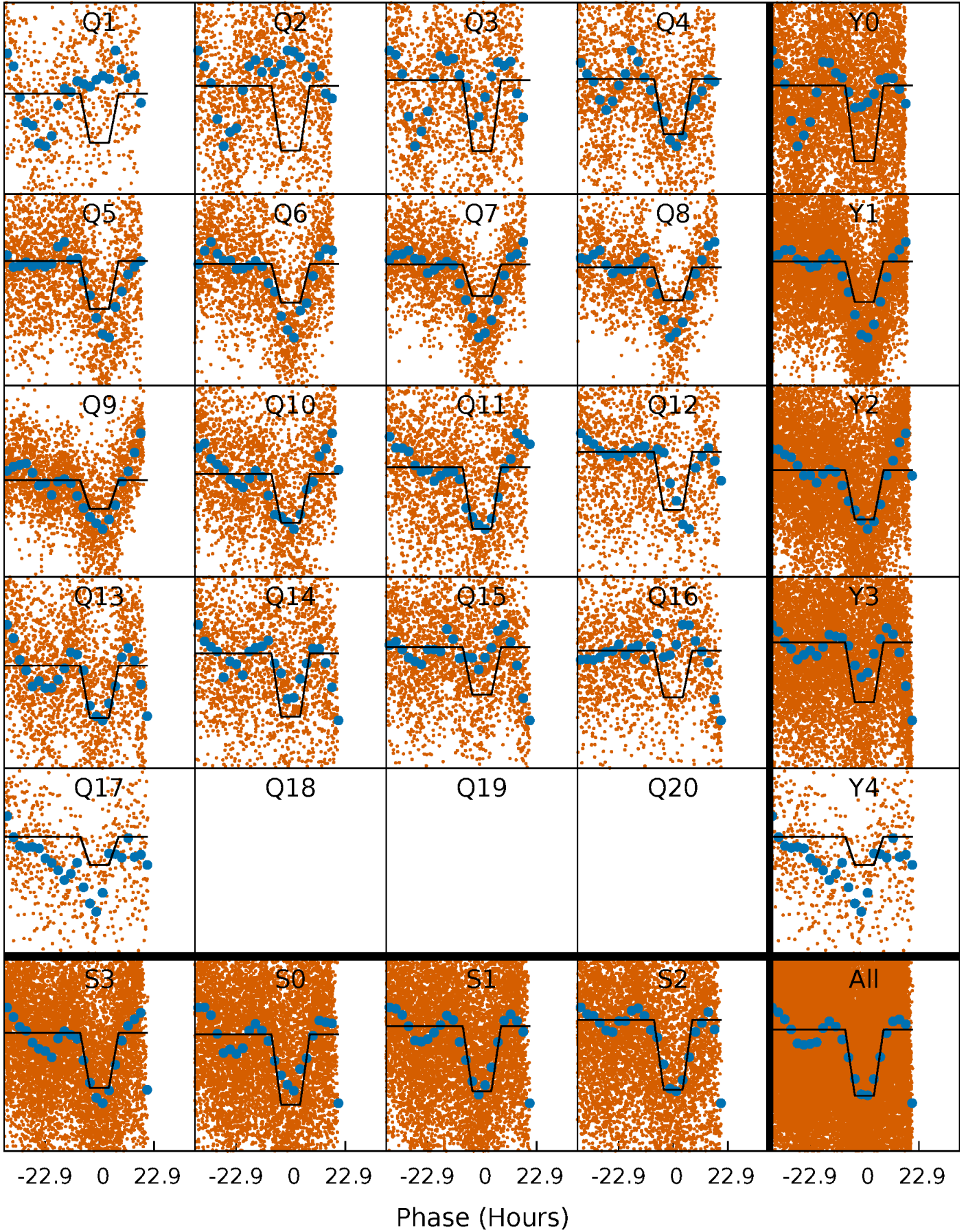
# DV Quarter-Phased Transit Curves

TCE 009822703-02   P= 4.752949 Days    $T_0=132.695392$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009822703-02   P= 4.752782 Days    $T_0=132.716751$  (BKJD)

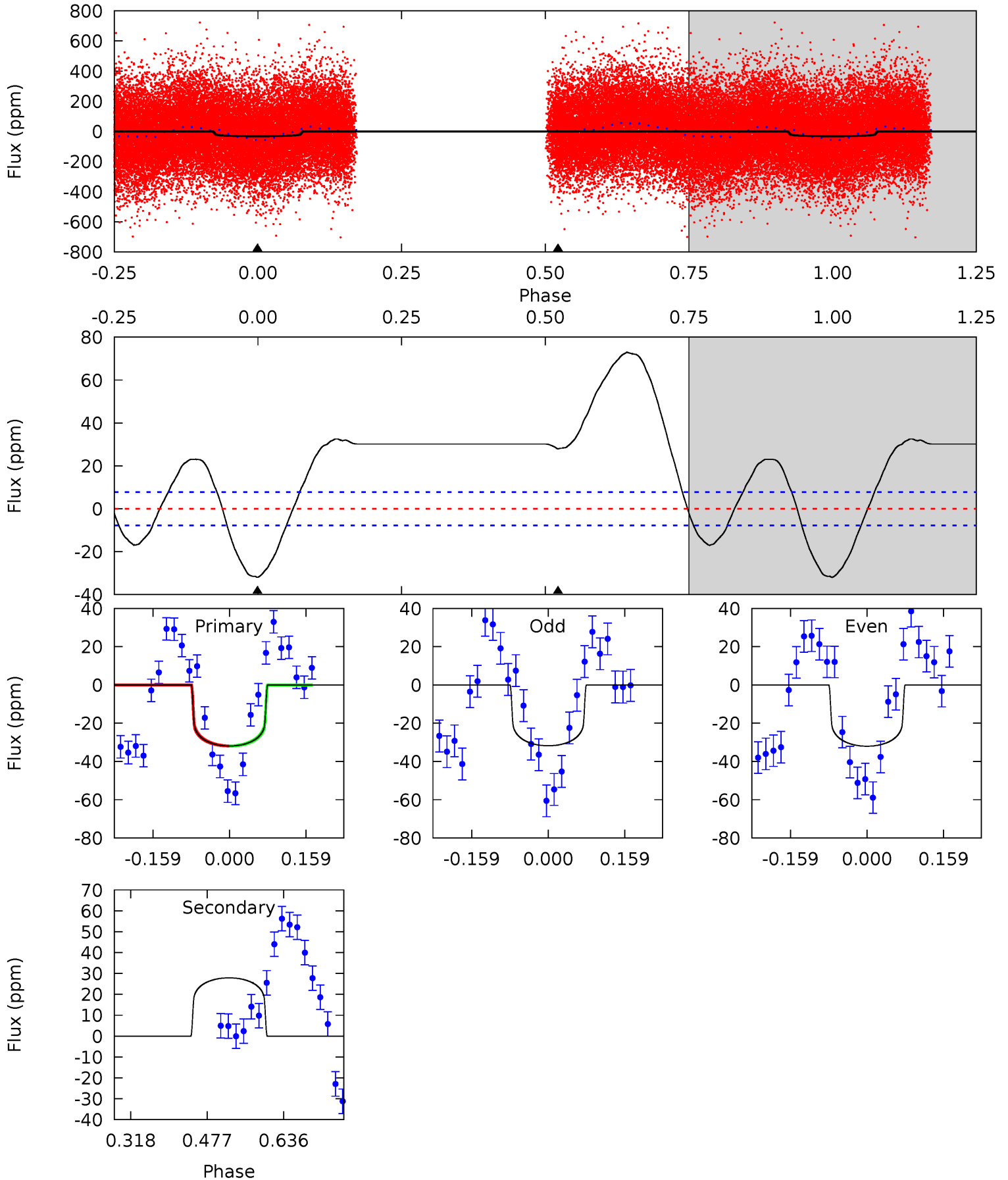




# DV Model-Shift Uniqueness Test

009822703-02, P = 4.752949 Days, E = 127.942443 Days

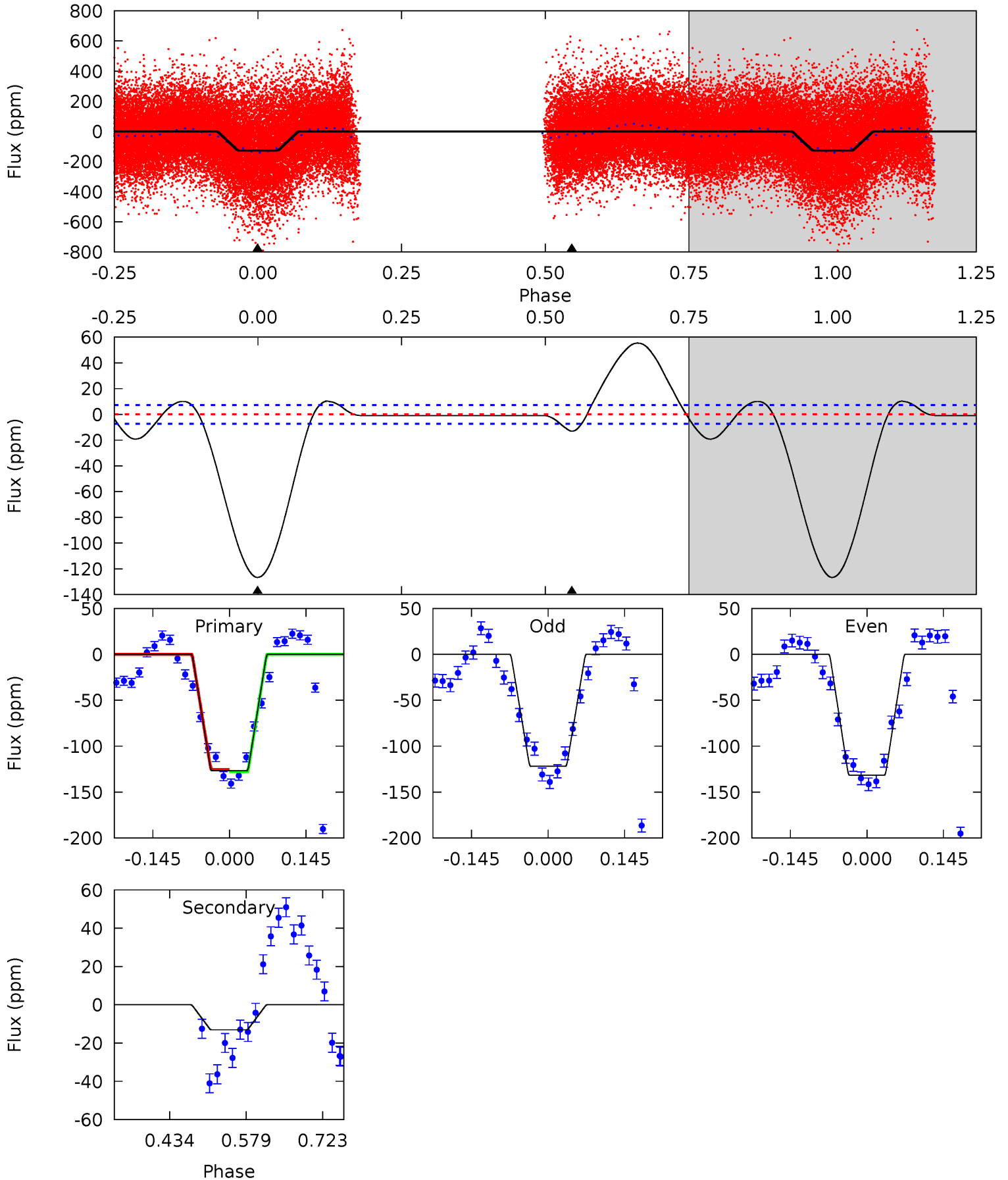
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.4	-16.1	0	0	4.47	1.41	13.7	18.4	18.4	-16.1	-16.1	0.07	1.29	0.70	0.01



# Alt Model-Shift Uniqueness Test

009822703-02, P = 4.752782 Days, E = 127.963969 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
77.9	8.06	0	0	4.49	1.46	10.3	77.9	77.9	8.06	8.06	2.99	1.02	0.30	0.65



### Stellar Parameters For KIC 009822703

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7098^{+197}_{-271}$	$4.136^{+0.132}_{-0.182}$	$-0.040^{+0.250}_{-0.350}$	$1.727^{+0.537}_{-0.358}$	$1.486^{+0.220}_{-0.242}$	$0.407^{+0.296}_{-0.196}$
	+3%/-4%	+3%/-4%	+625%/-875%	+31%/-21%	+15%/-16%	+73%/-48%
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 009822703-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$28 \pm 2$	$1.16^{+0.24}_{-0.20}$	$2302^{+173}_{-139}$	$-6540^{+445}_{-612}$	$-44.903^{+14.265}_{-20.858}$
Alt.	$-13 \pm 2$	$2.23^{+0.40}_{-0.28}$	$2296^{+169}_{-142}$	$4140^{+169}_{-174}$	$5.750^{+1.817}_{-1.660}$

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

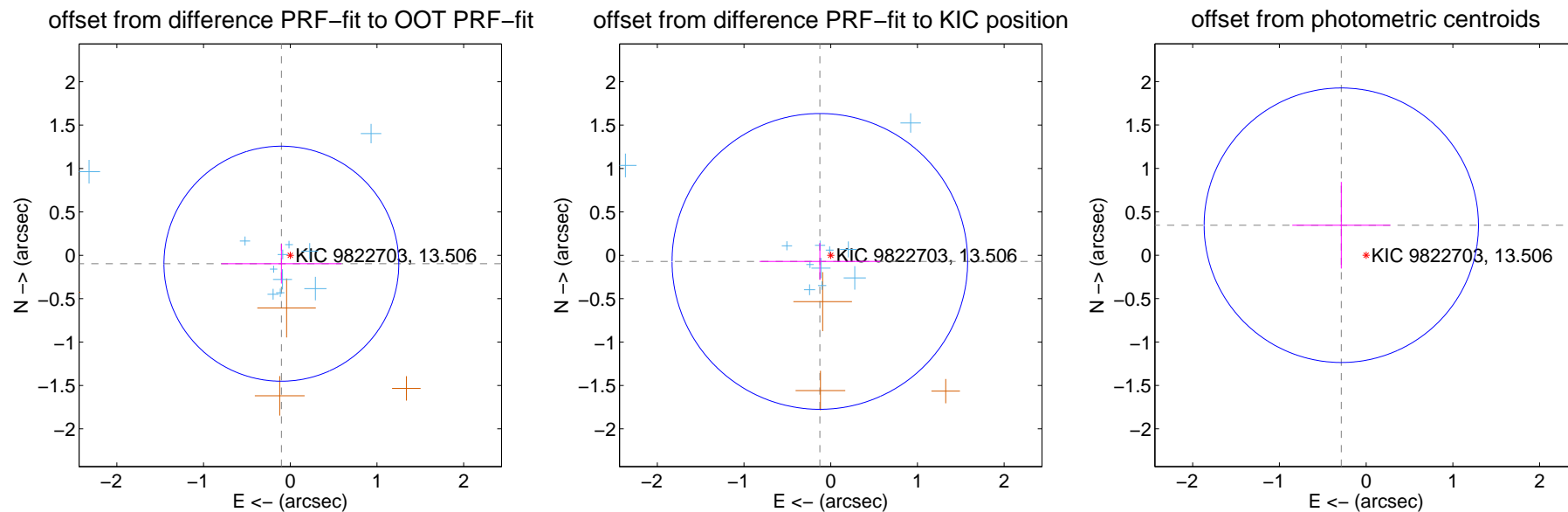
## DV Centroid Data

Supplemental centroid analysis for 009822703-02. Kepler magnitude: 13.51. Transit SNR 9.13

There are 11 quarters with good PRF difference image offsets

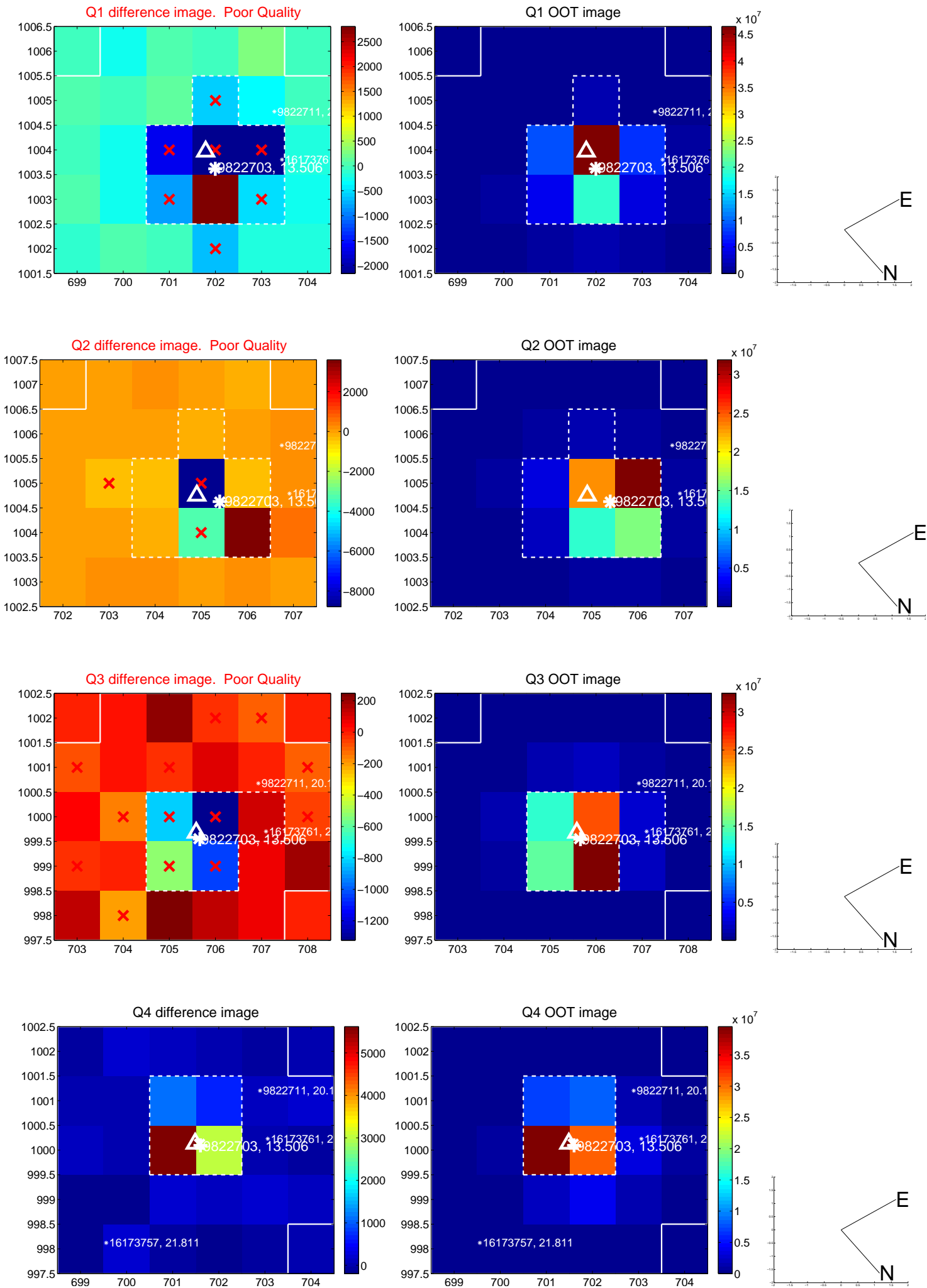
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.141 \pm 0.451$	0.31	$0.102 \pm 0.692$	$-0.097 \pm 0.228$
PRF-fit source offset from KIC position	$0.144 \pm 0.568$	0.25	$0.125 \pm 0.696$	$-0.071 \pm 0.212$
photometric centroid source offset	$0.45 \pm 0.53$	0.85	$0.29 \pm 0.57$	$0.35 \pm 0.50$

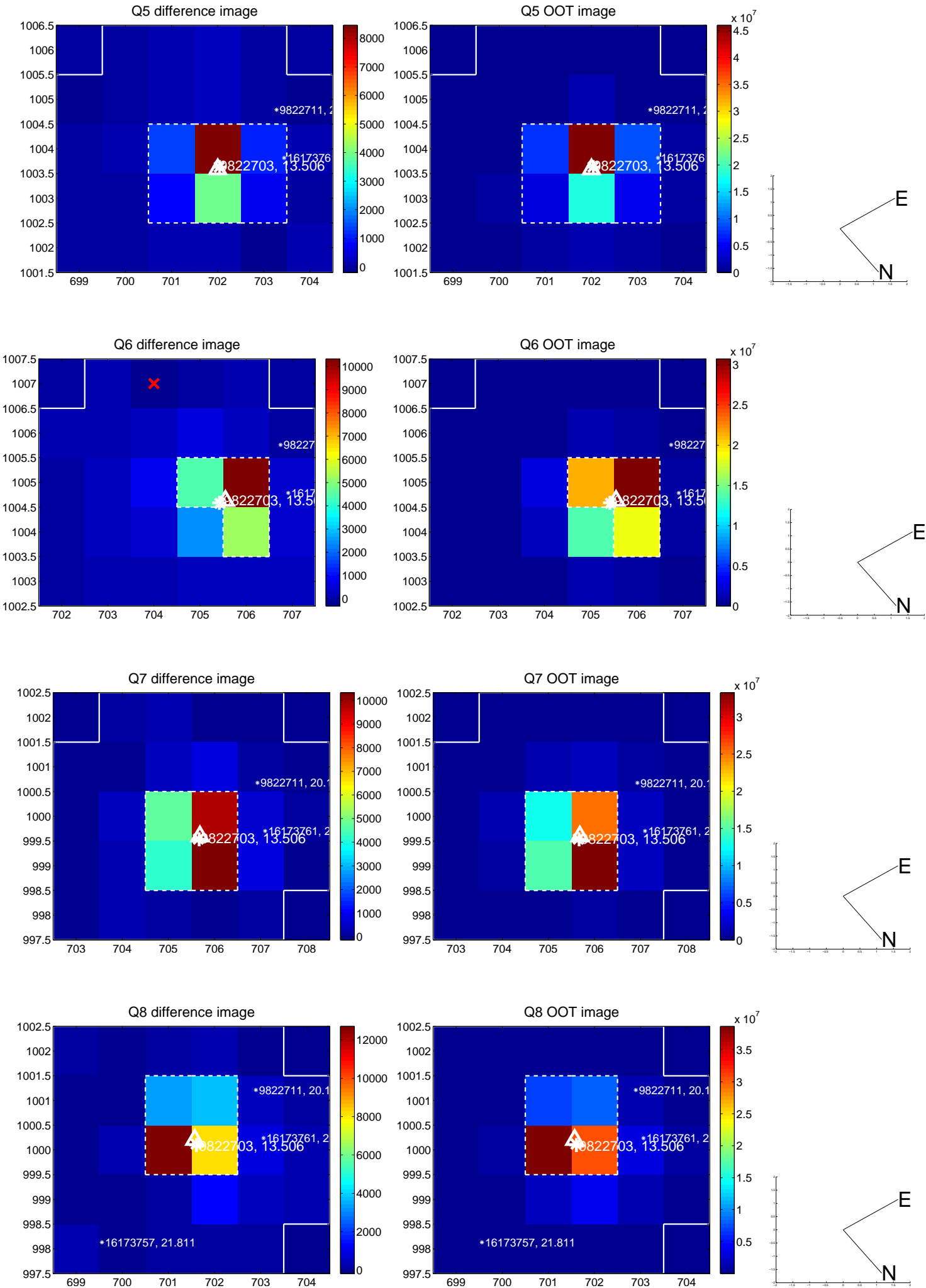


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

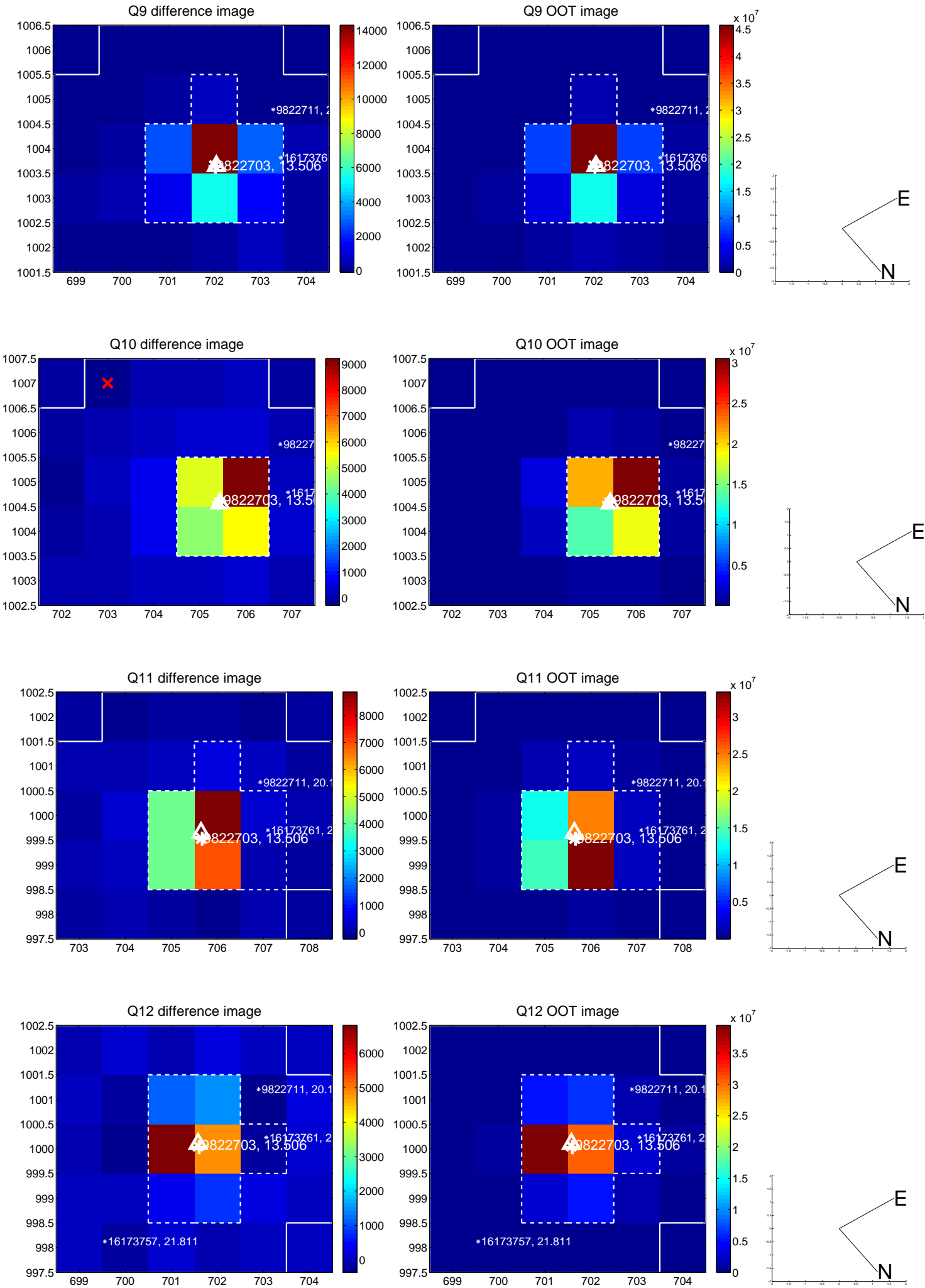


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

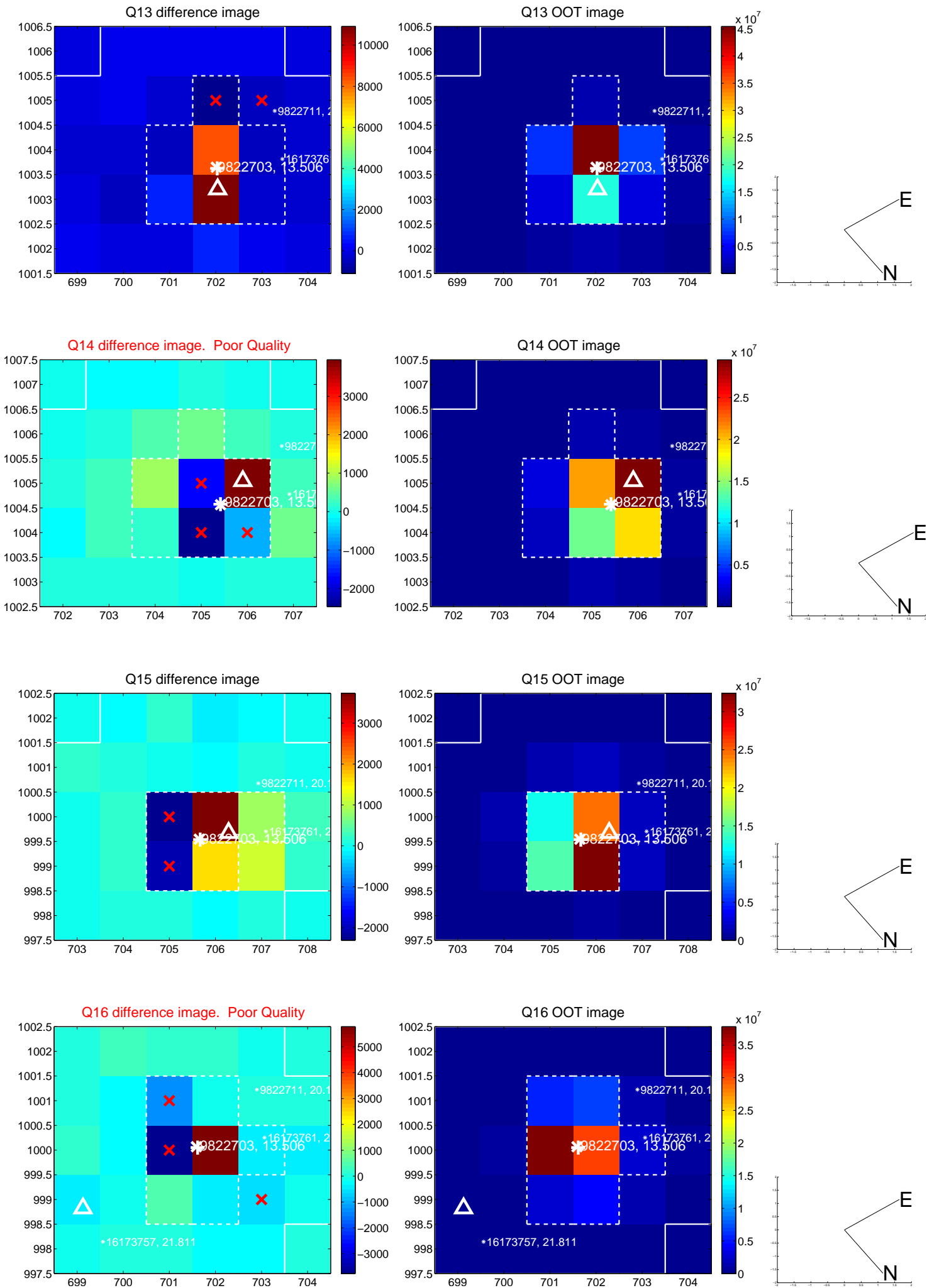




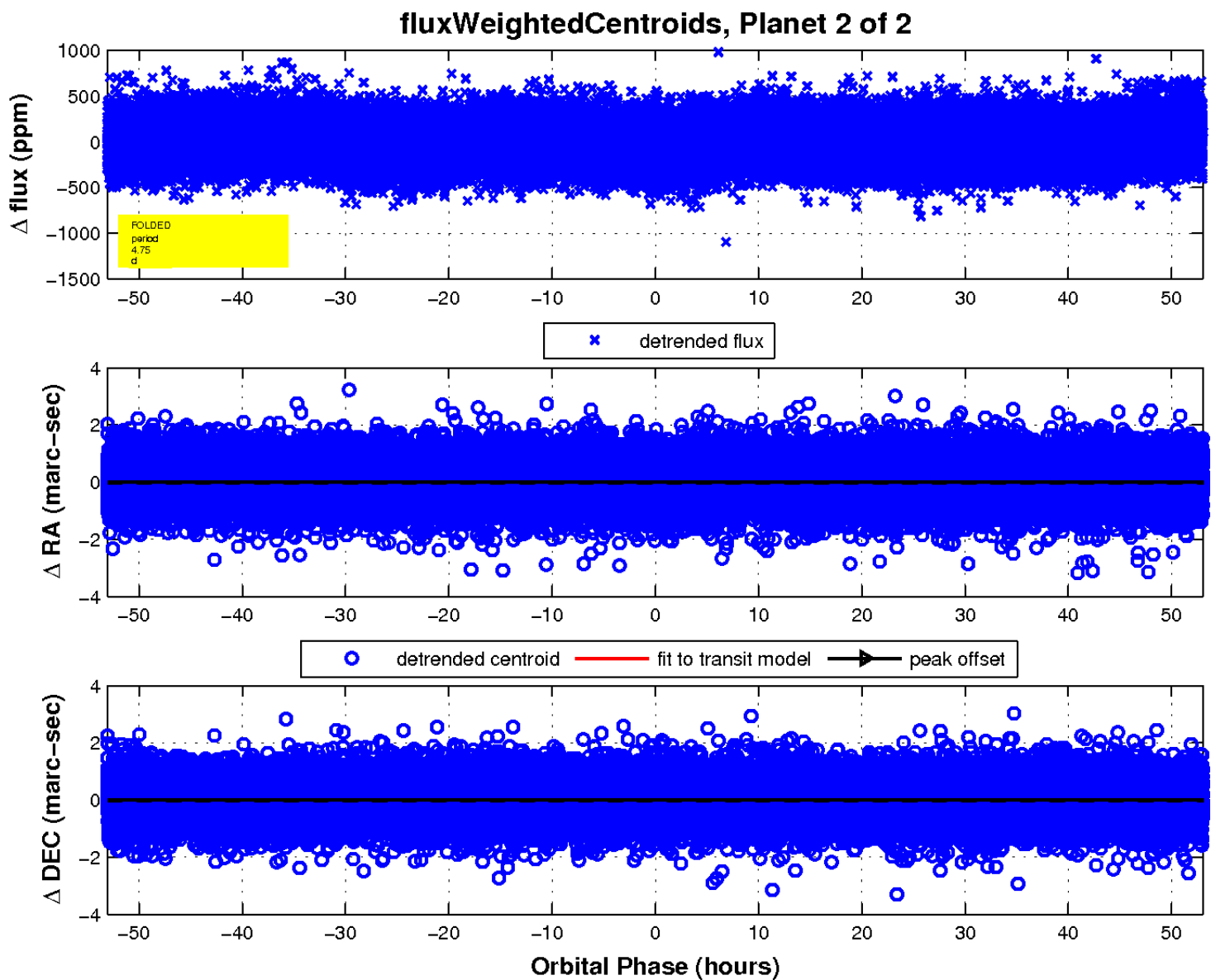
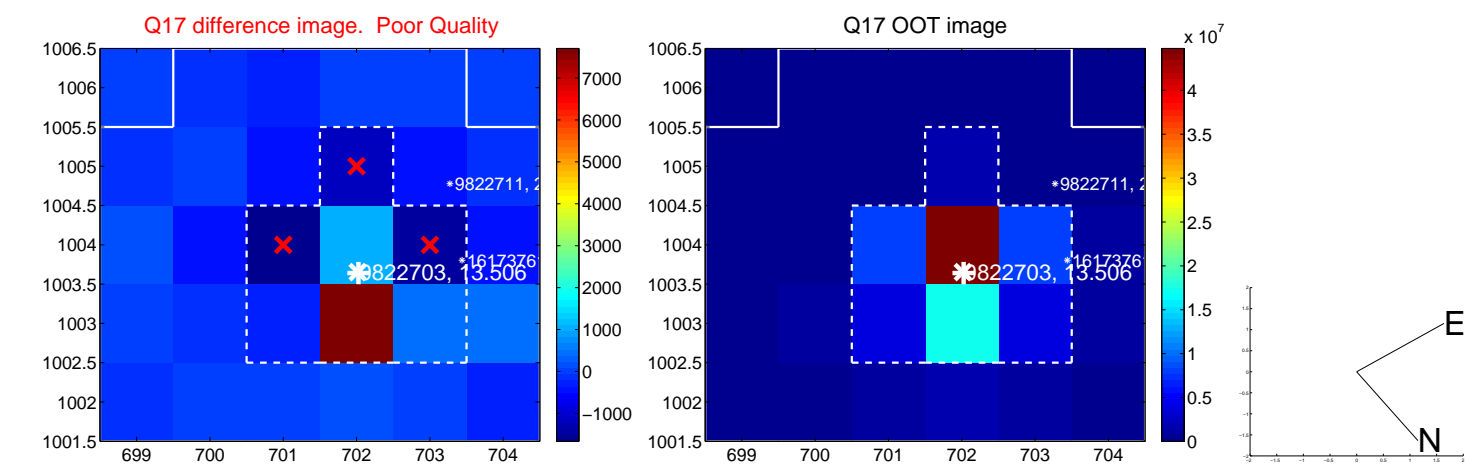
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

