

# KIC 010019708

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010019708-01	OBS	0199.01	3.268693	134.213279	10122.6	3.553	1341.5	1342.7	1.69	5927	17.39	1541.10
010019708-02	OBS	0199.02	8.784764	135.369899	214.0	9.345	17.7	20.0	1.69	5927	3.41	412.44

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010019708-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010019708-02	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—CENT_RESOLVED_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.

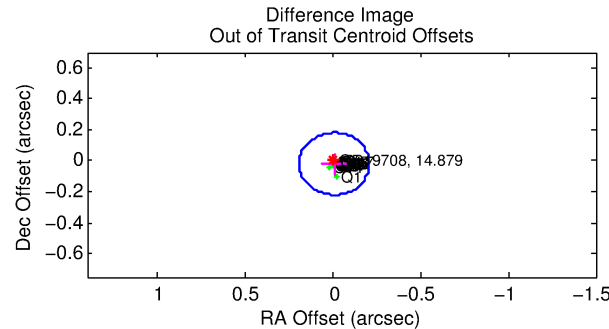
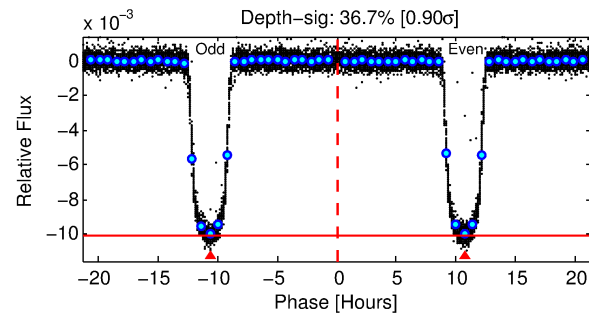
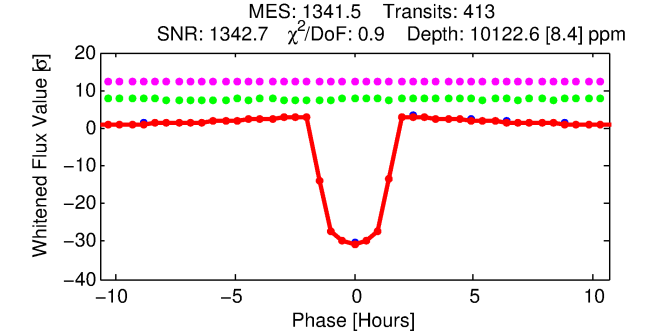
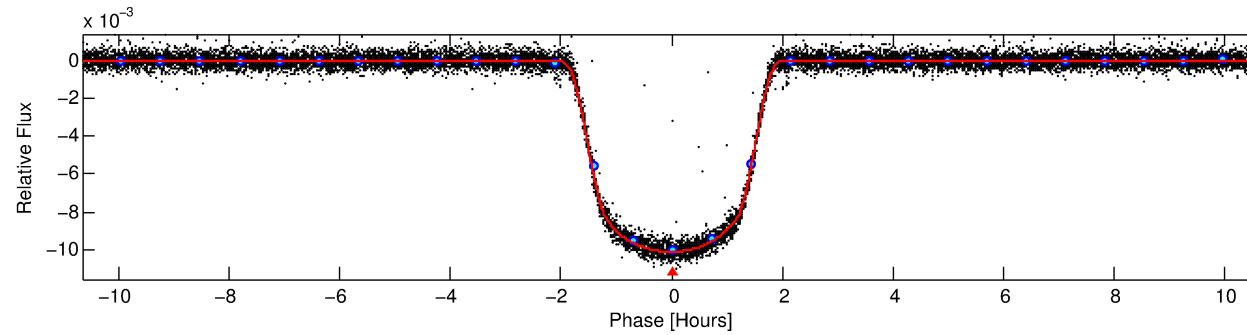
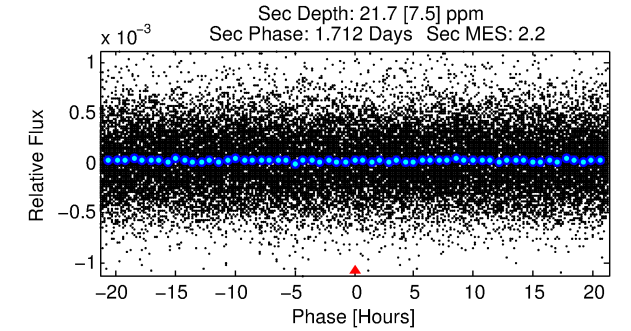
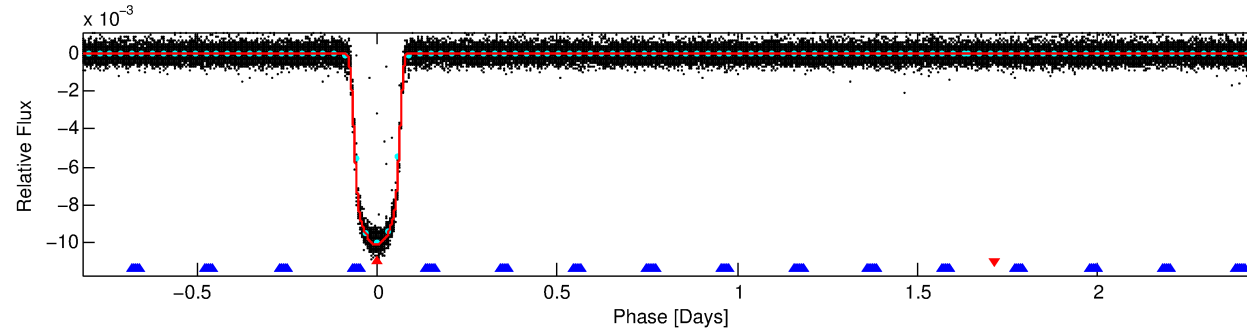
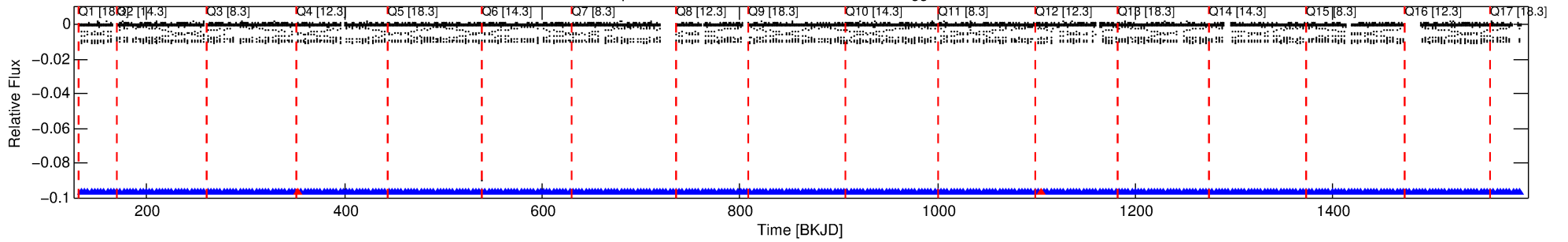
## Ephemeris Match Information For 010019708-01

No Significant Match Found

# DV One-Page Summary

KIC: 10019708 Candidate: 1 of 2 Period: 3.269 d  
KOI: K00199.01 Corr: 0.986

Kp: 14.88 R\*: 1.69 Rs Teff: 5927.0 K Logg: 4.05 Fe/H: 0.140



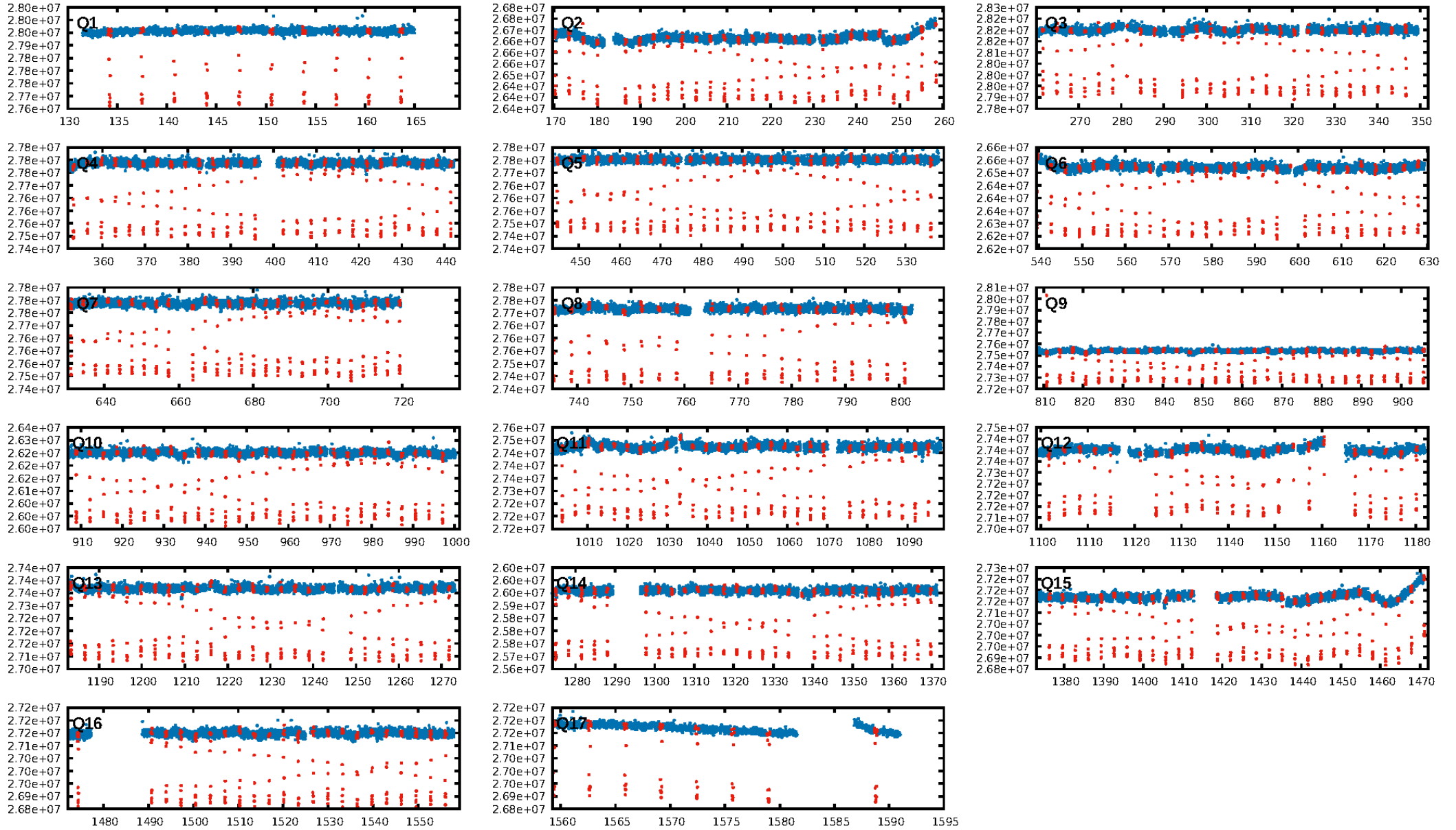
## DV Fit Results:

Period = 3.26869 [0.00000] d  
Epoch = 134.2133 [0.0000] BKJD  
Rp/R\* = 0.0942 [0.0002]  
a/R\* = 6.96 [0.07]  
b = 0.48 [0.02]  
Seff = 1541.10 [499.02]  
Teff = 1598 [129] K  
Rp = 17.39 [4.03] Re  
a = 0.0453 [0.0094] AU  
Ag = 0.08 [0.04] [-24.05σ]  
Teffp = 1318 [116] K [-1.61σ]

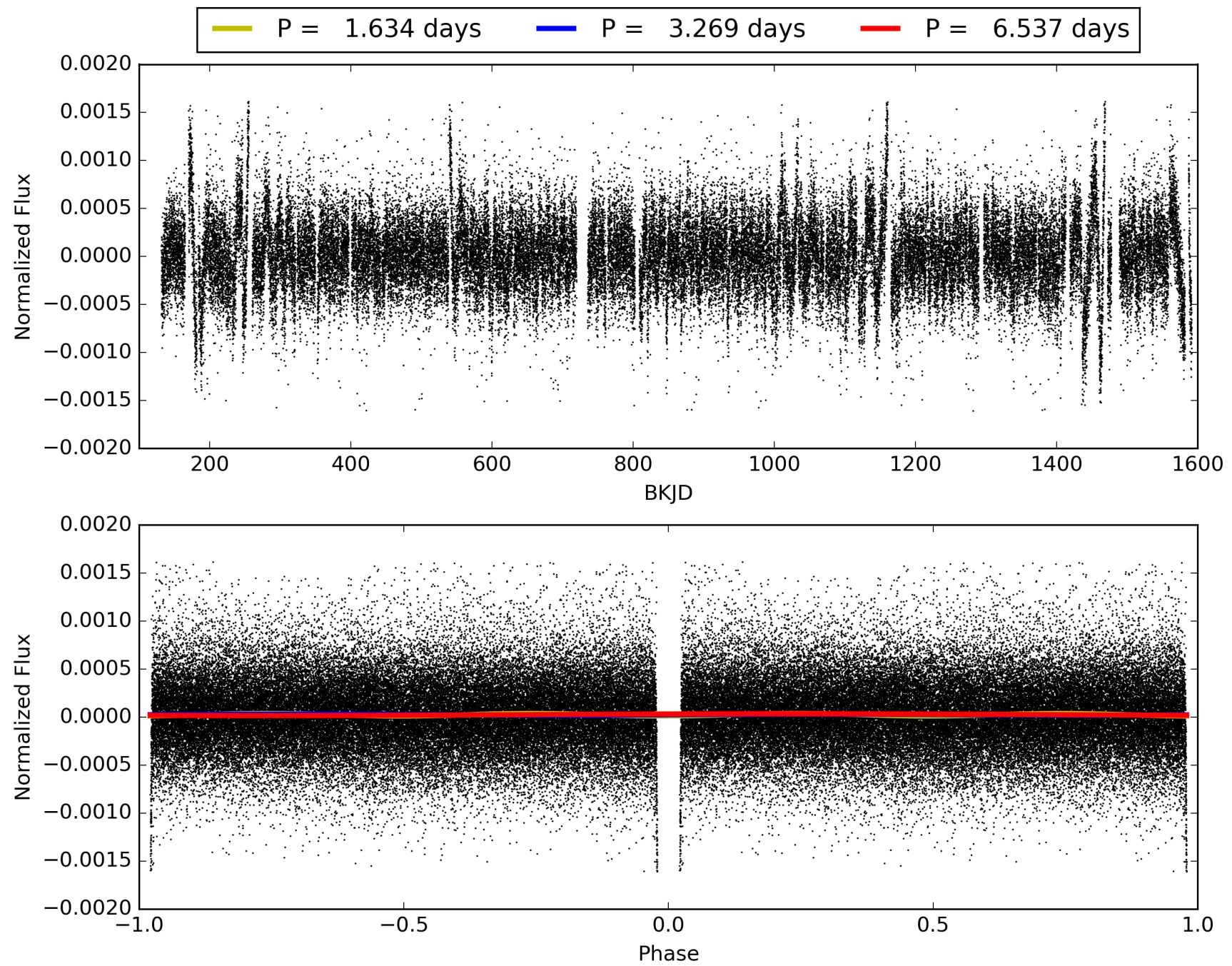
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [13.24σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.99 [393/395]  
GhostDiagnostic-chr: 6.904  
Centroid-sig: 0.0%  
Centroid-so: 0.189 arcsec [17.63σ]  
OotOffset-rm: 0.021 arcsec [0.32σ]  
KicOffset-rm: 0.119 arcsec [1.77σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010019708-01, PDC Light Curves

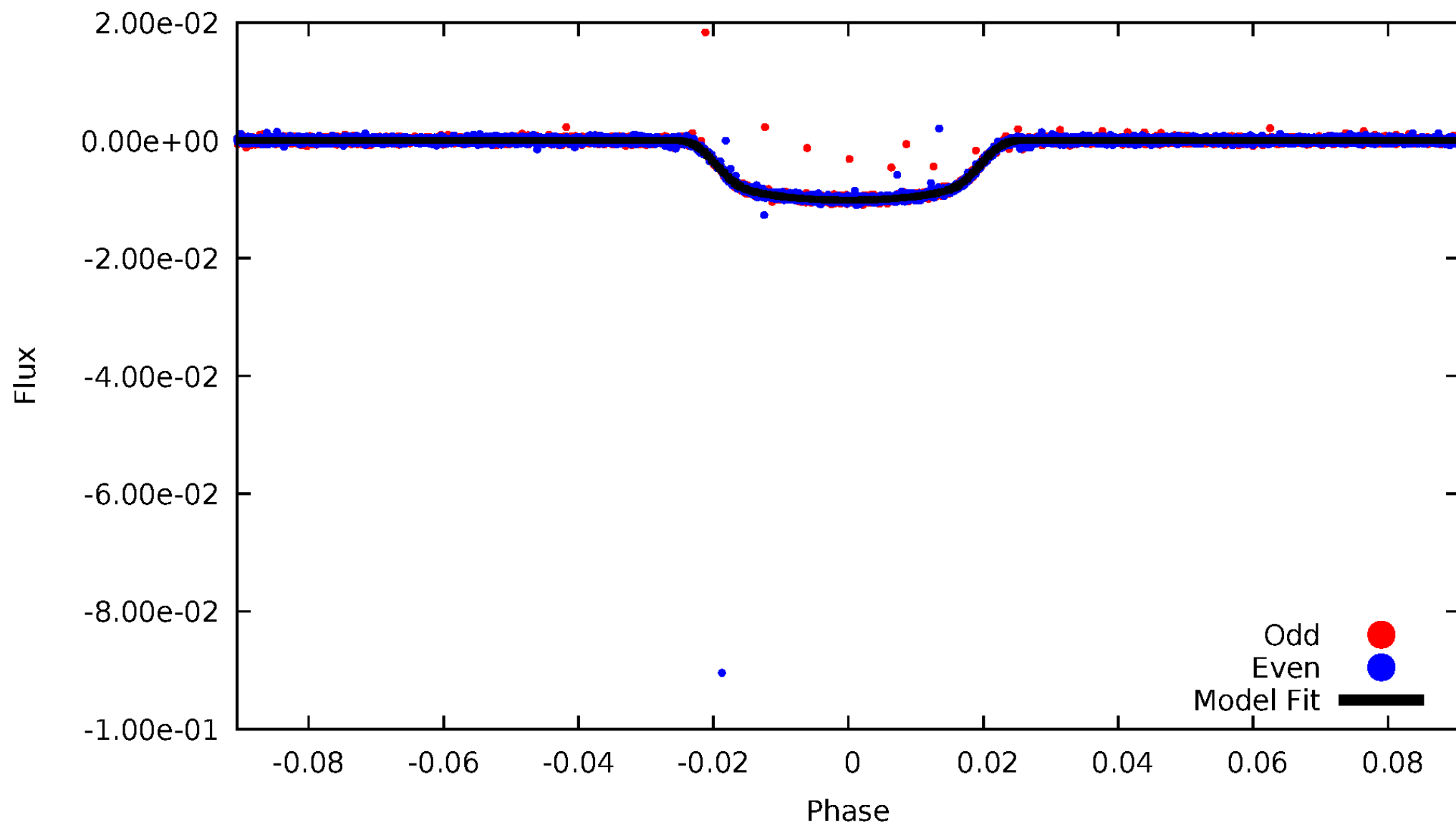


TCE 010019708-01



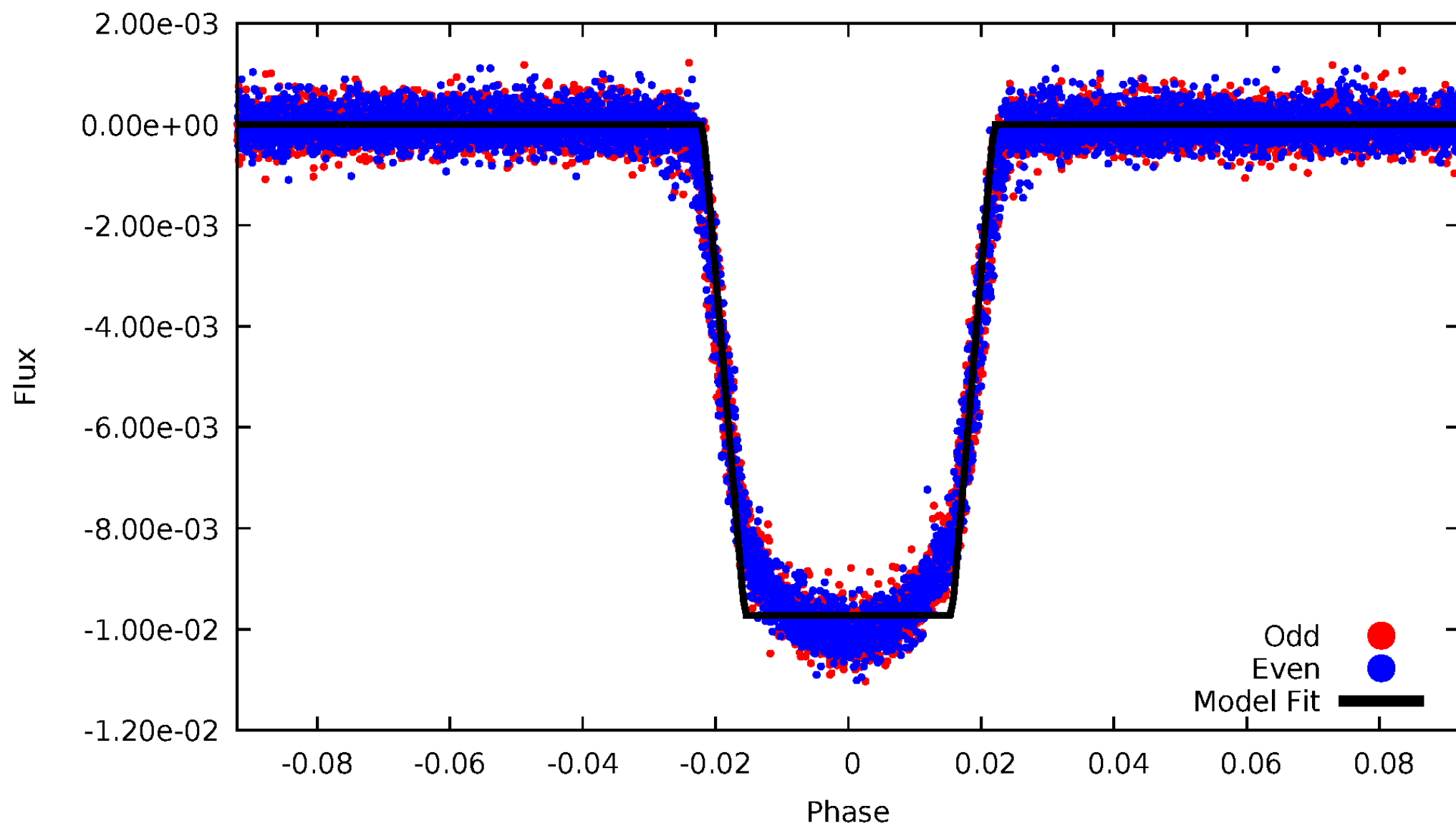
# DV Odd/Even

TCE 010019708-01



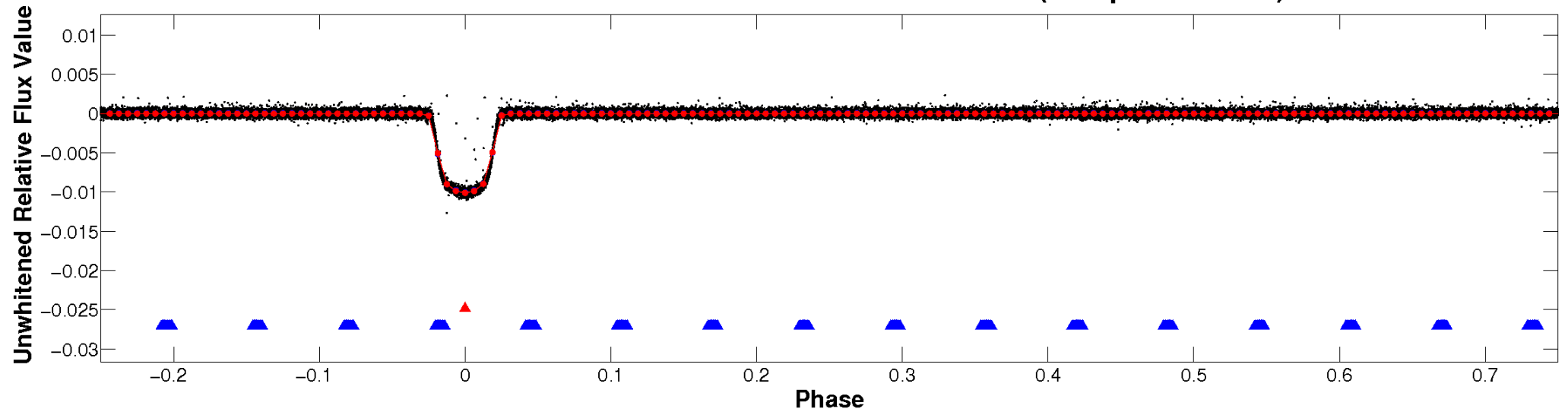
# ALT Odd/Even

TCE 010019708-01

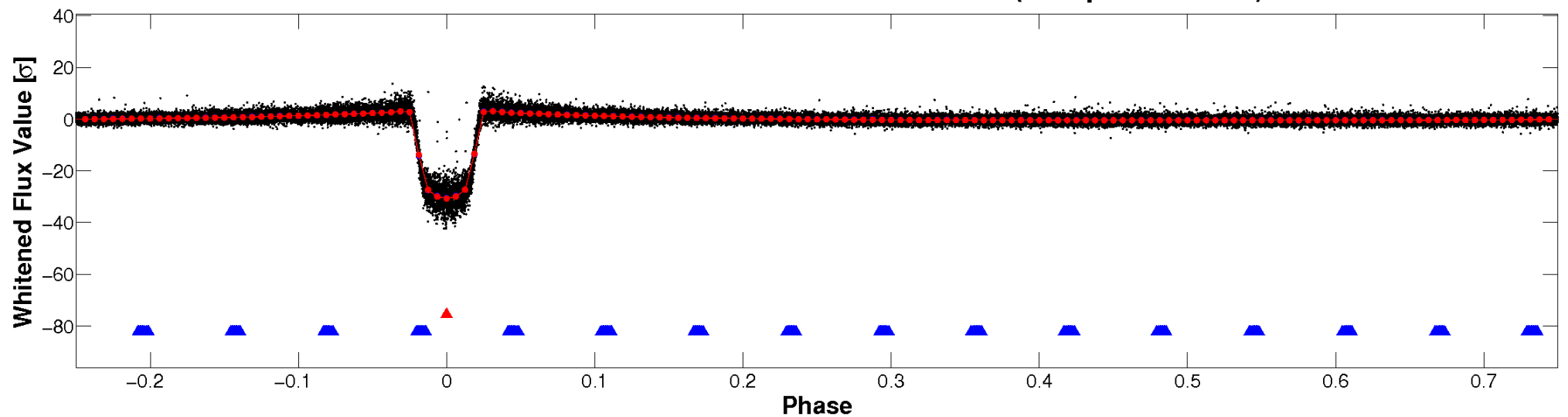


# Non-Whitened Vs. Whitened Light Curve

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

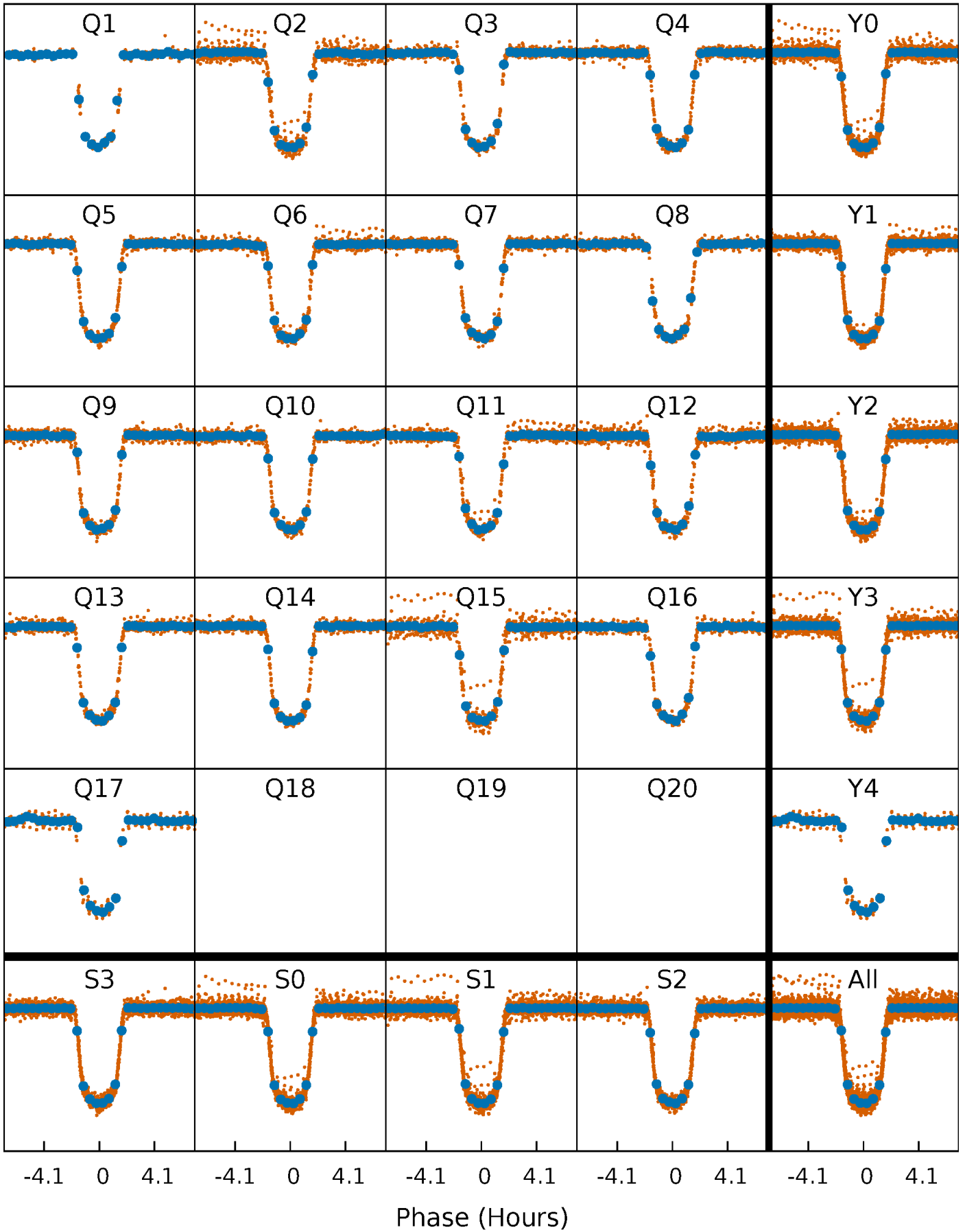


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

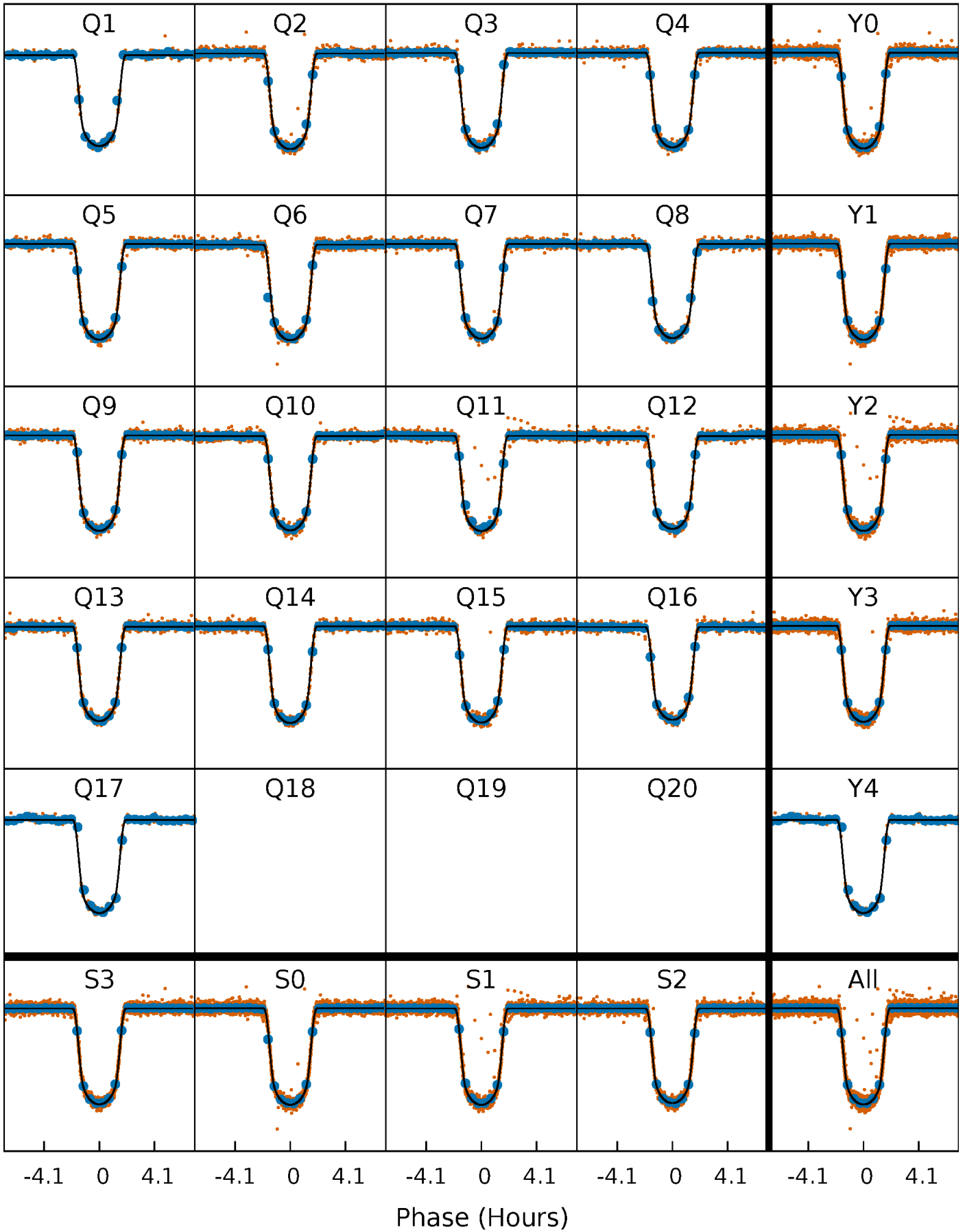
TCE 010019708-01   P= 3.268693 Days    $T_0=134.213279$  (BKJD)





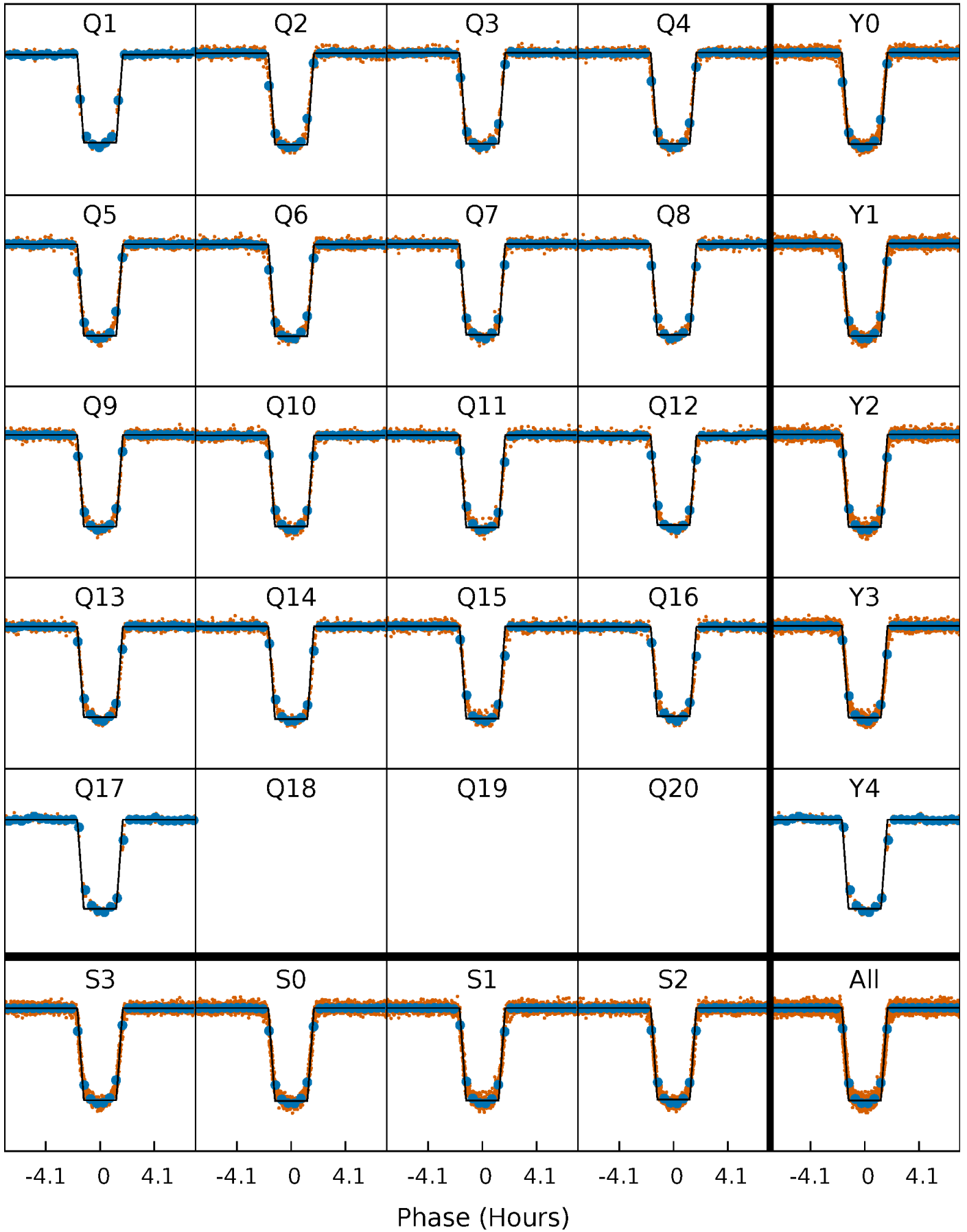
# DV Quarter-Phased Transit Curves

TCE 010019708-01 P= 3.268693 Days  $T_0=134.213279$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

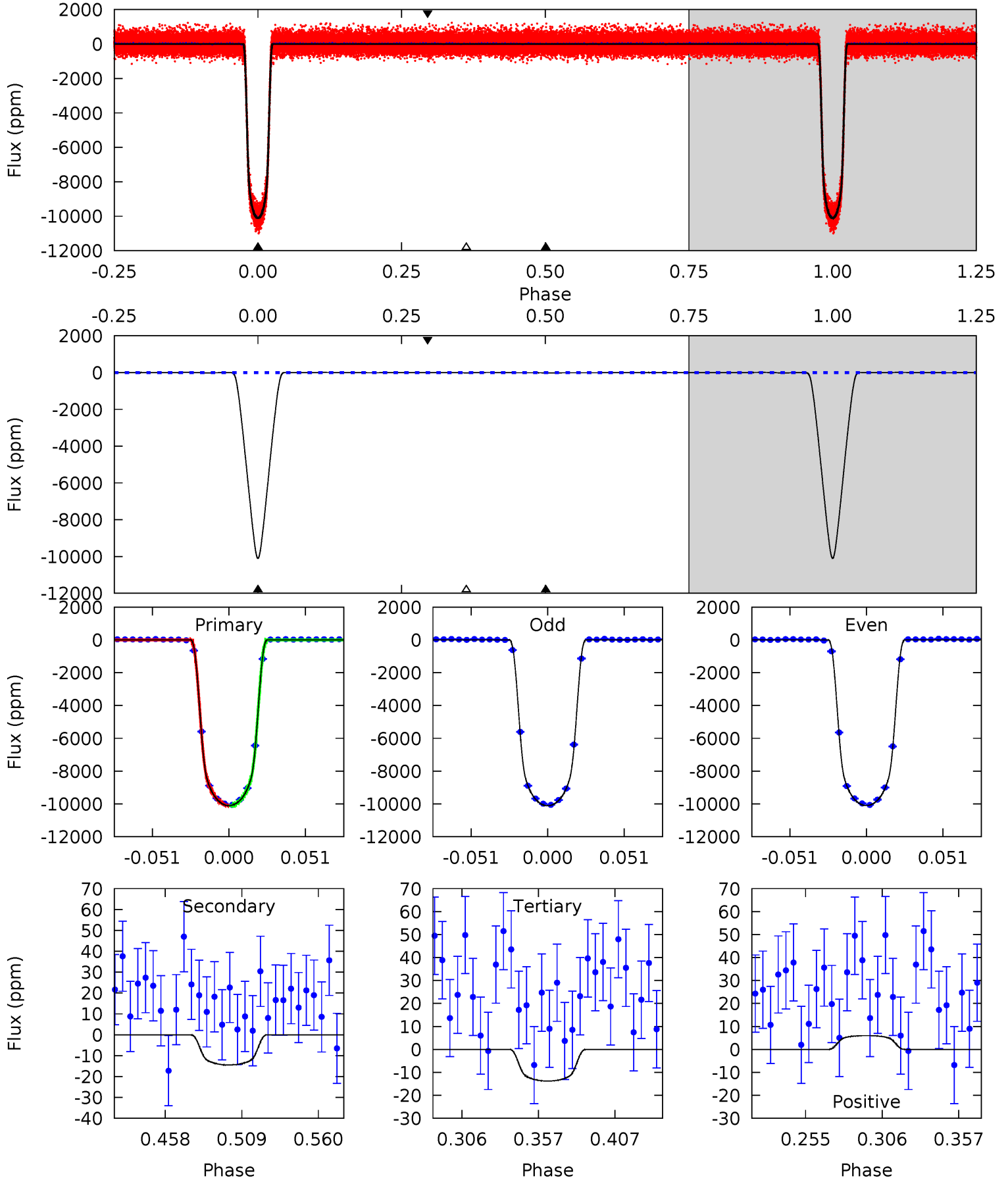
TCE 010019708-01 P= 3.268677 Days  $T_0=134.216858$  (BKJD)



# DV Model-Shift Uniqueness Test

010019708-01, P = 3.268693 Days, E = 130.944586 Days

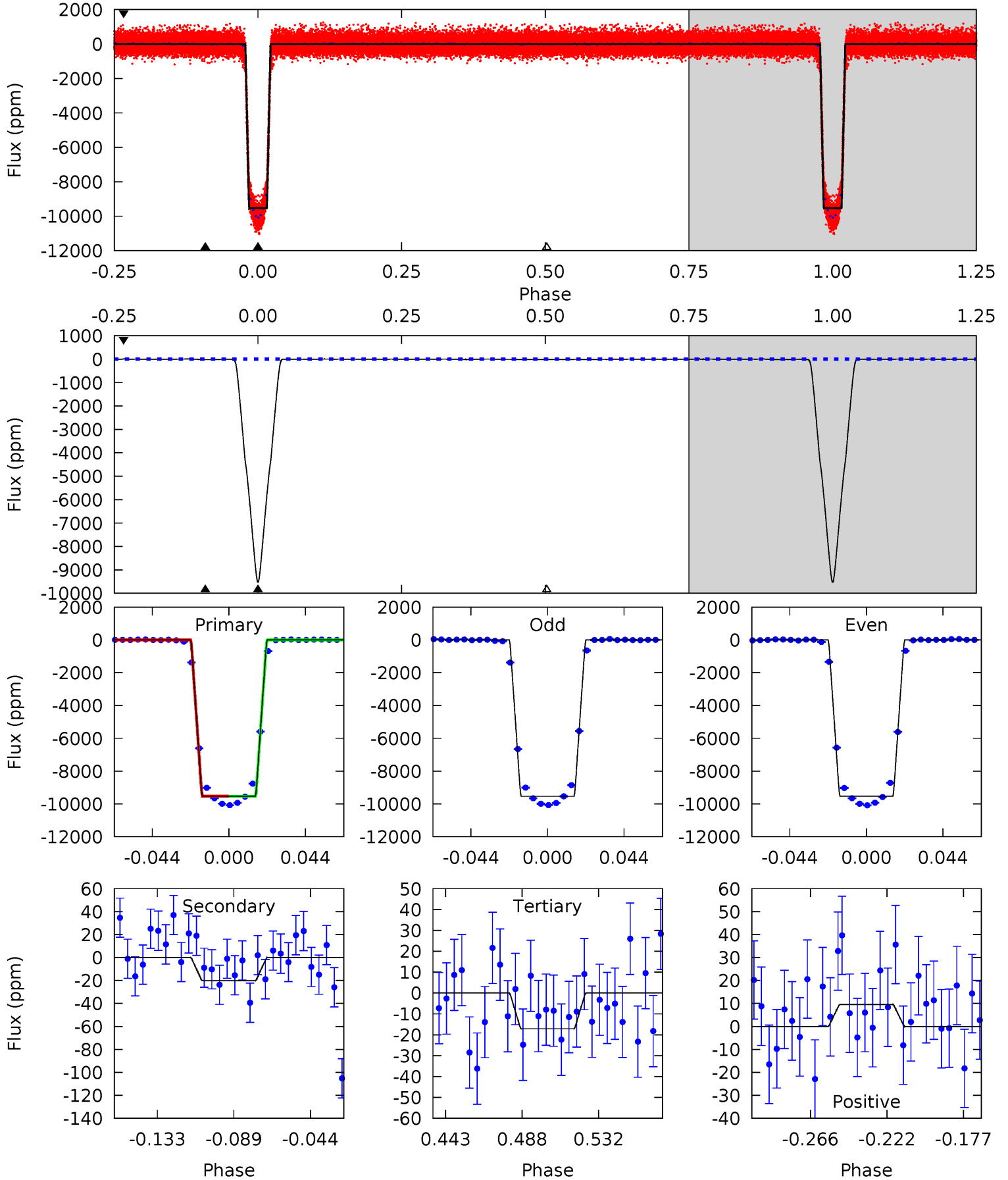
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1986	2.84	2.71	1.18	4.70	1.95	1.15	1983	1985	0.13	1.66	1.00	1.00	0.00	2.81



# Alt Model-Shift Uniqueness Test

010019708-01, P = 3.268677 Days, E = 130.948181 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
1676	3.56	3.01	1.68	4.73	2.01	1.15	1673	1674	0.55	1.87	0.99	1.00	0.00	1.28



### Stellar Parameters For KIC 010019708

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5927^{+80}_{-80}$	$4.046^{+0.182}_{-0.098}$	$0.140^{+0.150}_{-0.150}$	$1.691^{+0.261}_{-0.392}$	$1.161^{+0.132}_{-0.096}$	$0.338^{+0.329}_{-0.103}$
	+1%/-1%	+4%/-2%	+107%/-107%	+15%/-23%	+11%/-8%	+97%/-30%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 010019708-01 / KOI 0199.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-14 \pm 5$	$17.34^{+1.56}_{-2.10}$	$2219^{+100}_{-136}$	$-2562^{+99}_{-73}$	$0.057^{+0.027}_{-0.022}$
Alt.	$-20 \pm 6$	$18.11^{+1.60}_{-2.18}$	$2216^{+104}_{-126}$	$-2540^{+101}_{-75}$	$0.071^{+0.029}_{-0.024}$

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

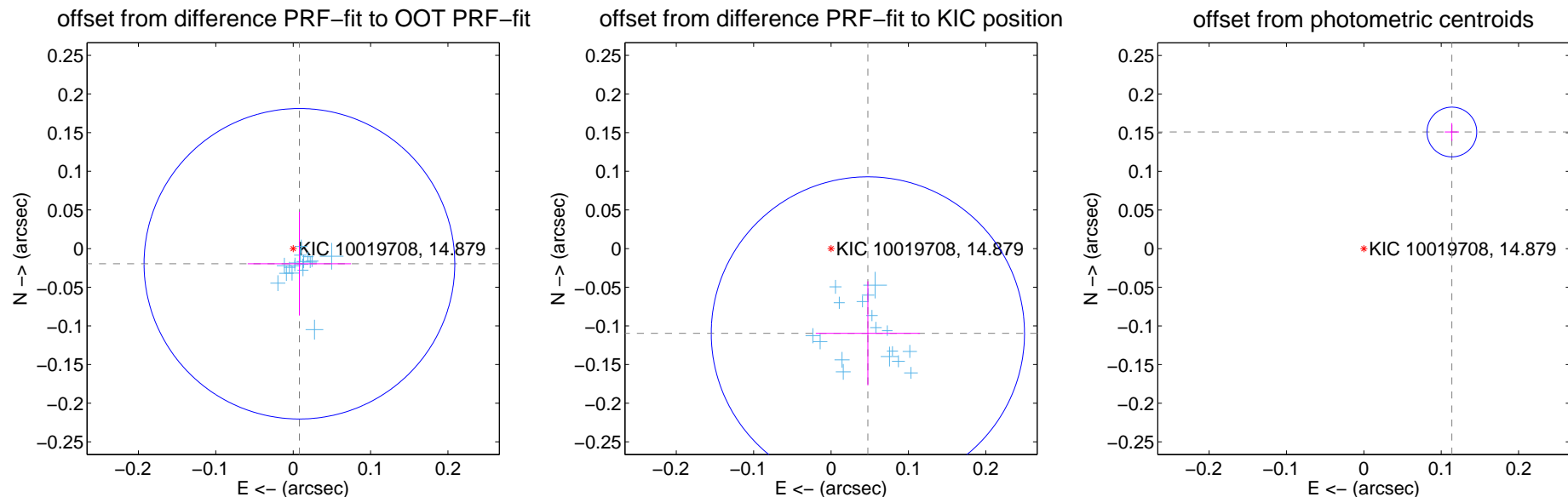
## DV Centroid Data

Supplemental centroid analysis for 010019708-01. Kepler magnitude: 14.88. Transit SNR 1342.73

There are 17 quarters with good PRF difference image offsets

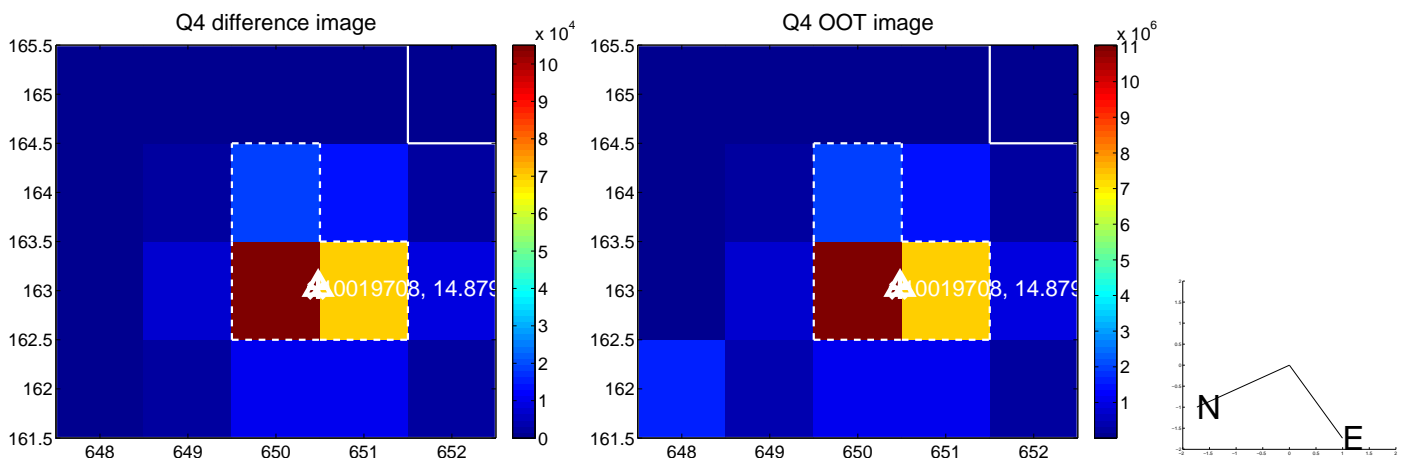
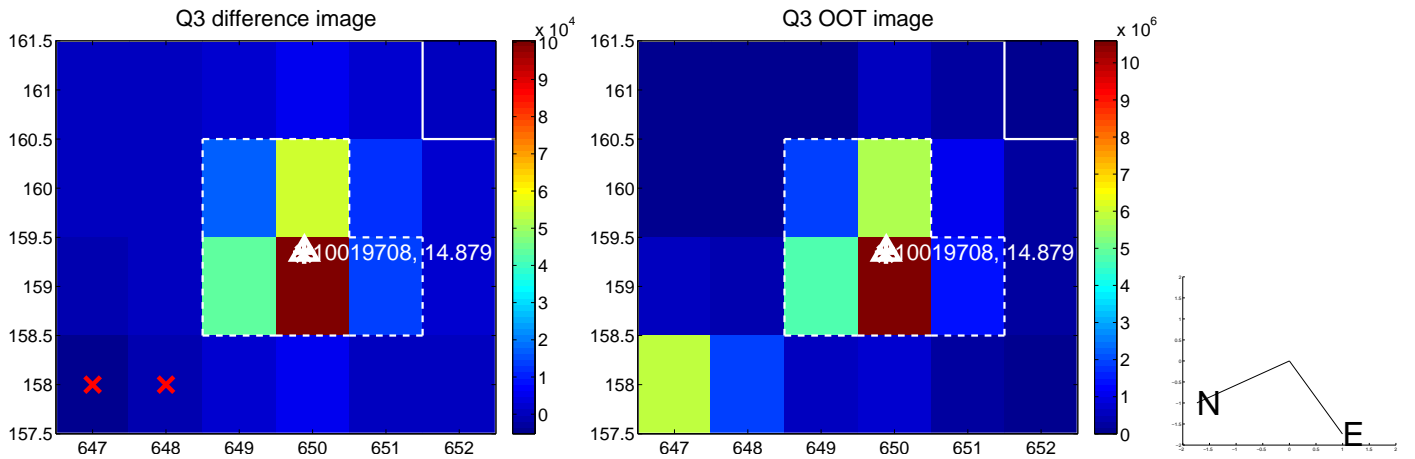
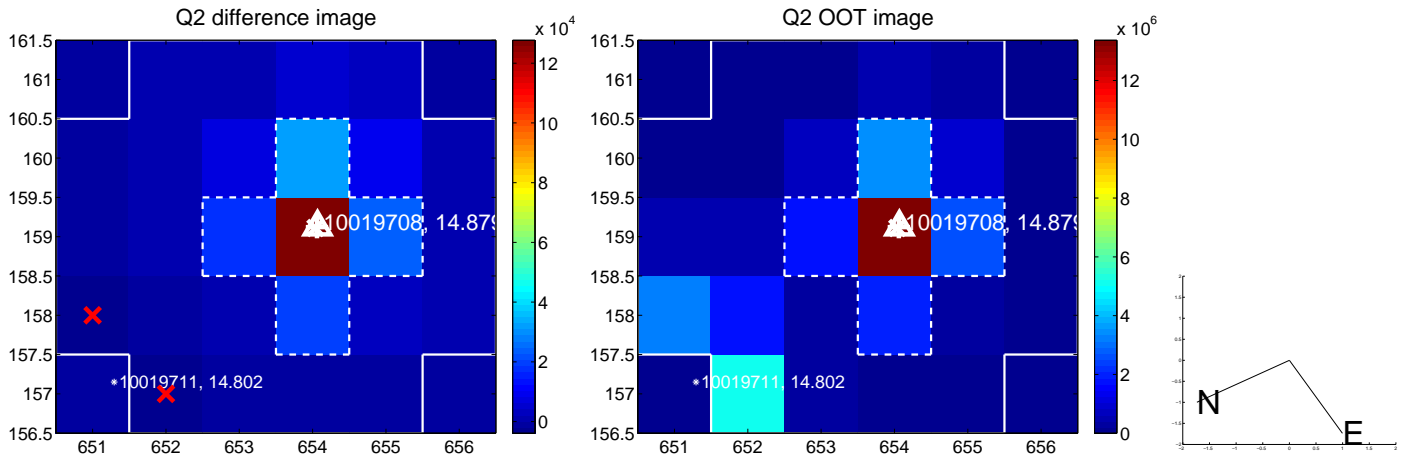
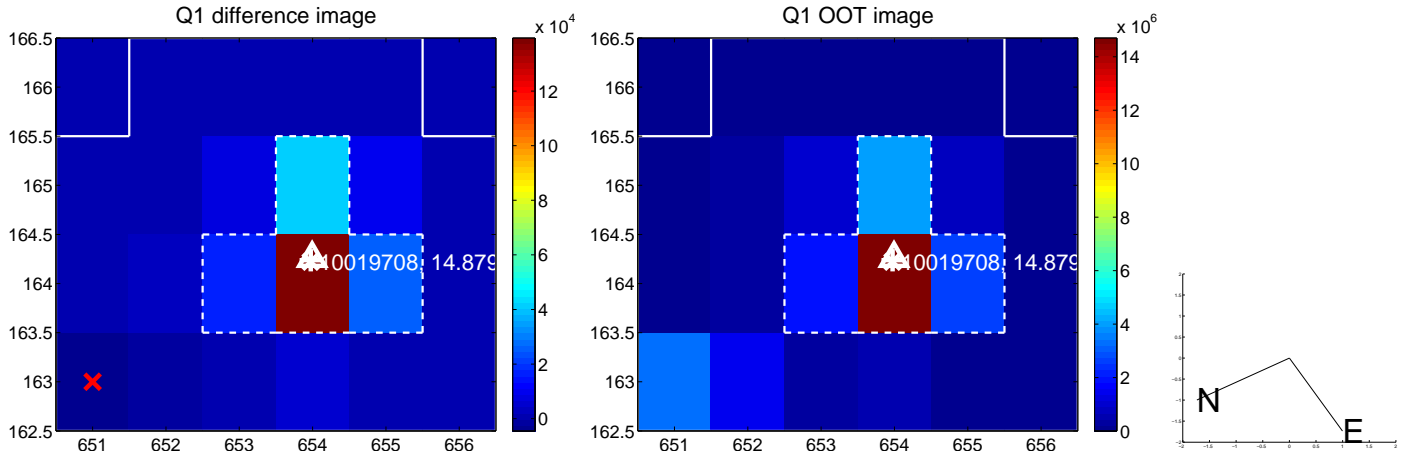
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.021 \pm 0.067$	0.32	$-0.008 \pm 0.067$	$-0.020 \pm 0.067$
PRF-fit source offset from KIC position	$0.119 \pm 0.067$	1.77	$-0.048 \pm 0.067$	$-0.110 \pm 0.067$
photometric centroid source offset	$0.19 \pm 0.01$	17.63	$-0.11 \pm 0.01$	$0.15 \pm 0.01$



Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

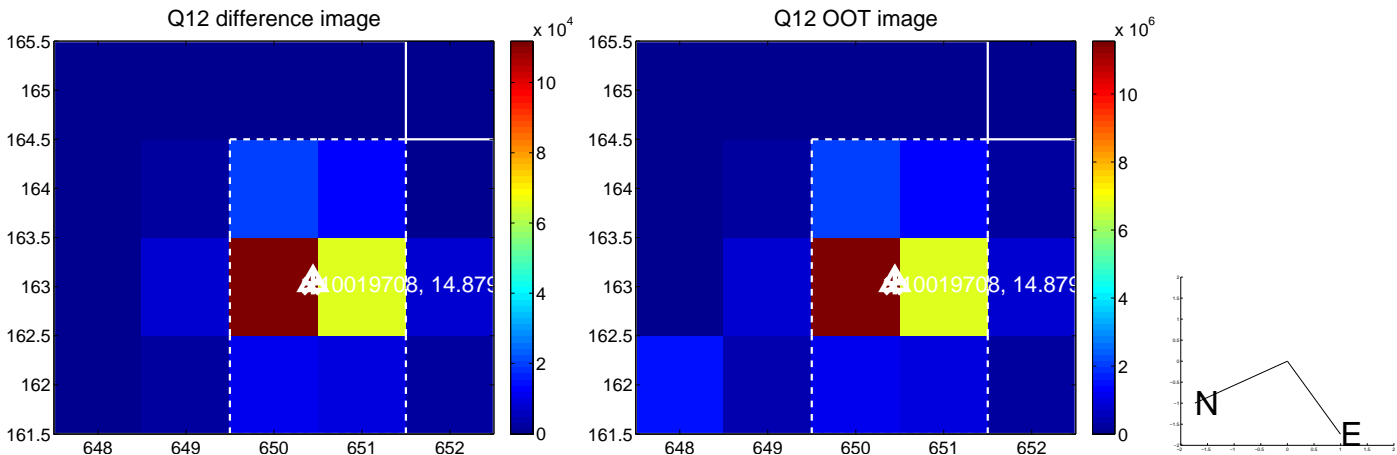
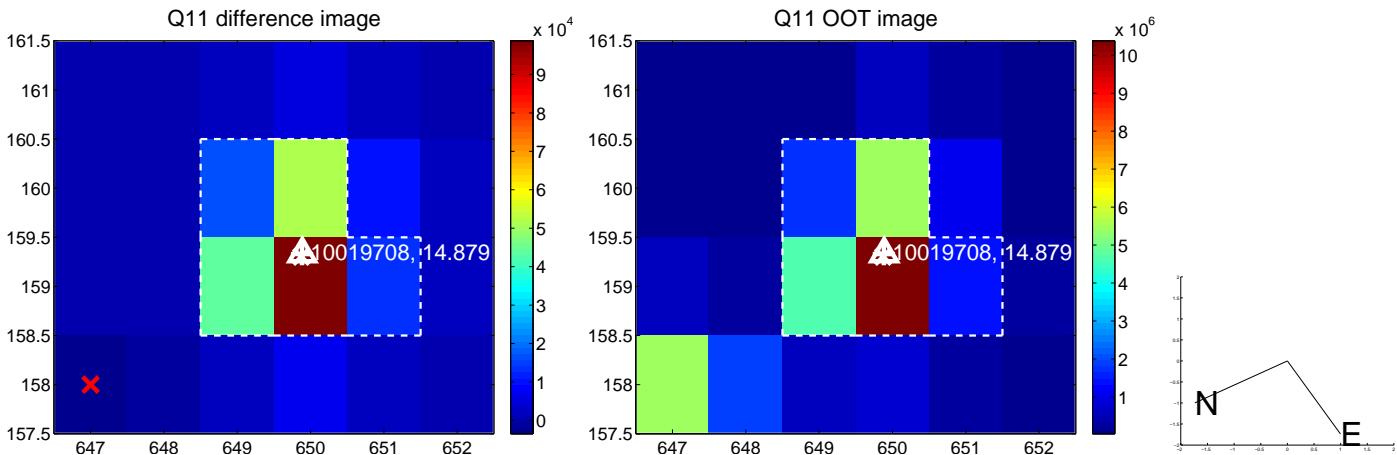
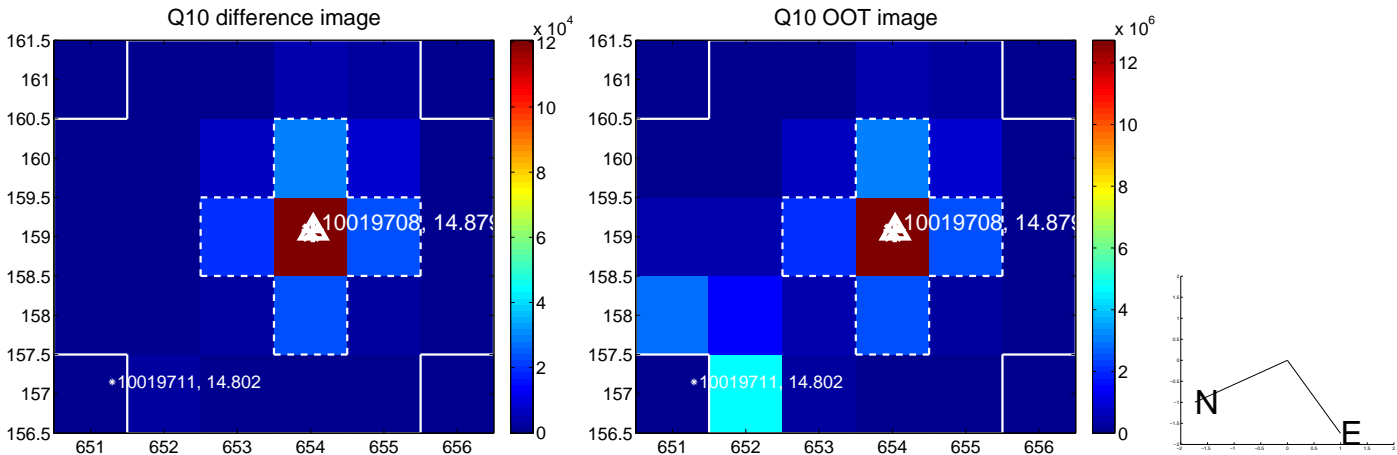
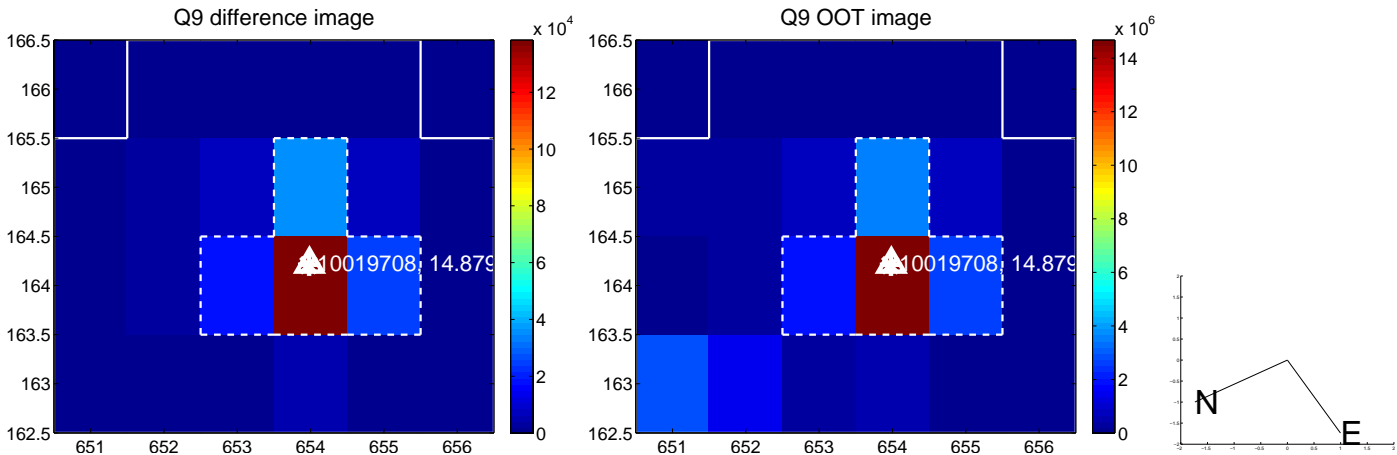
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



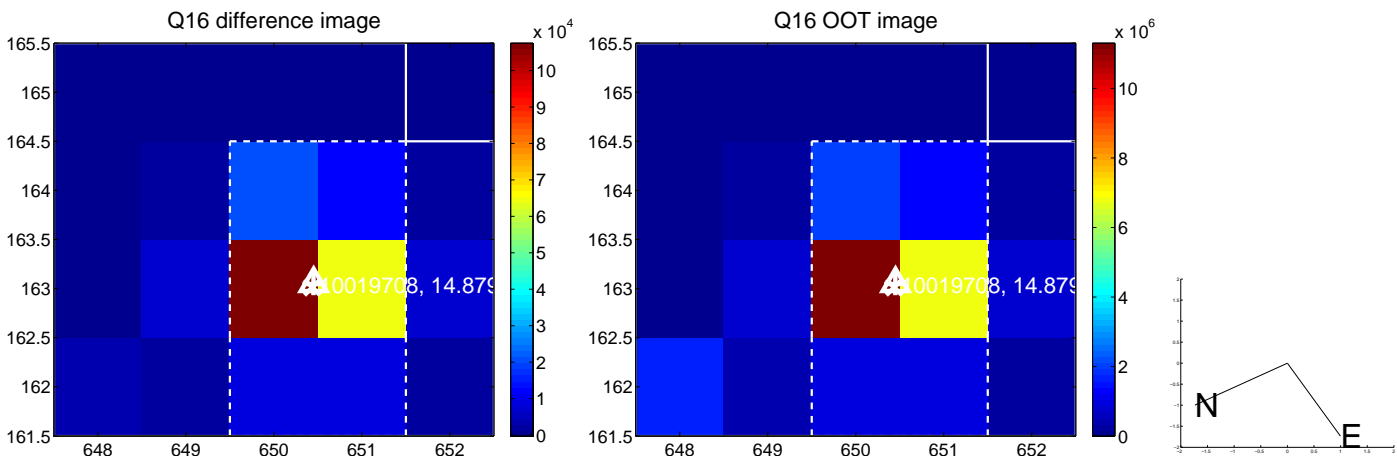
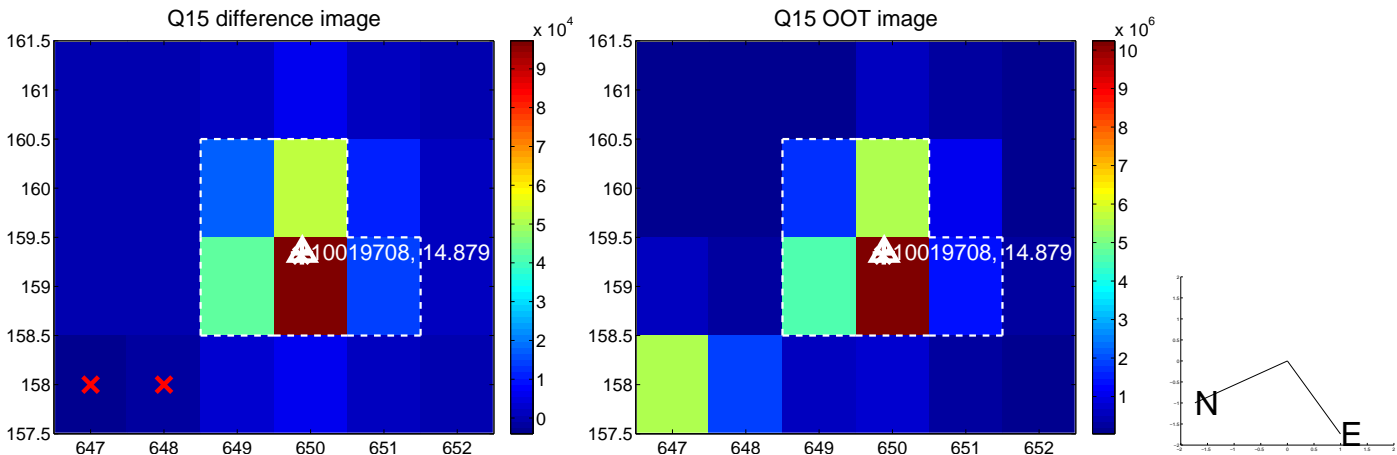
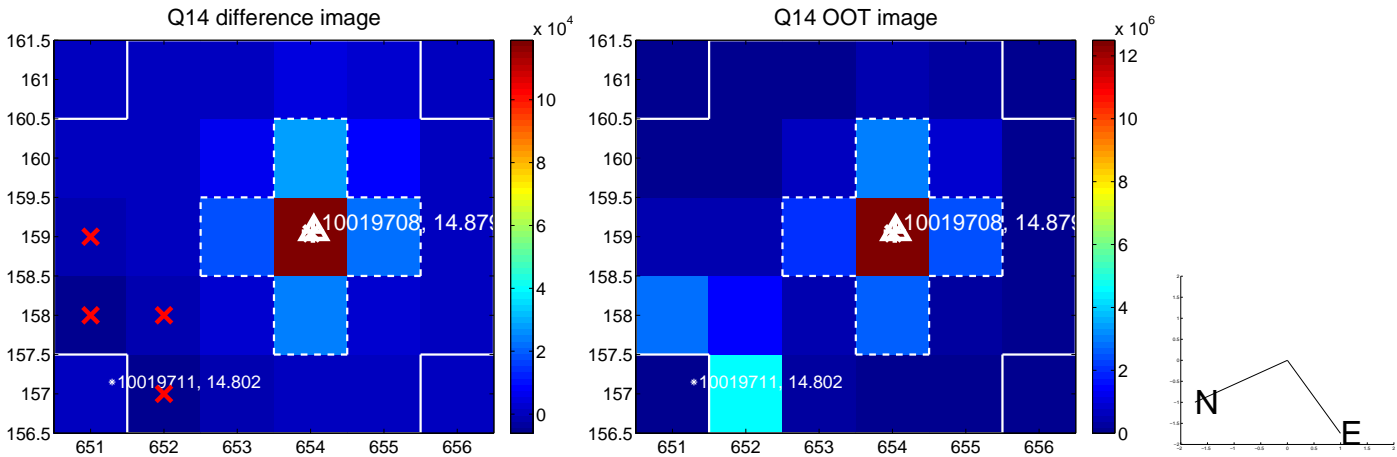
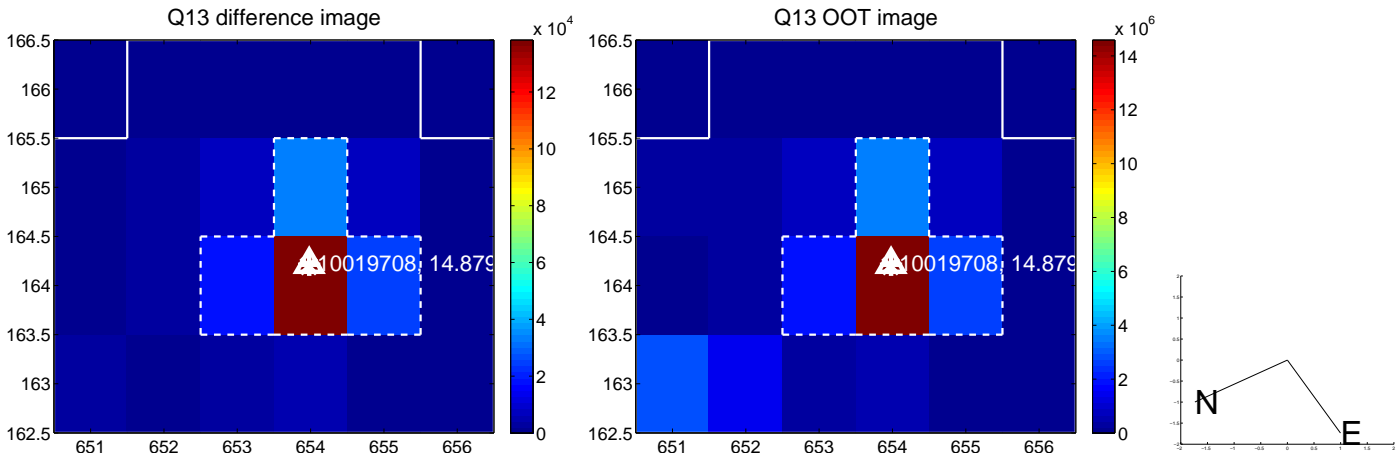




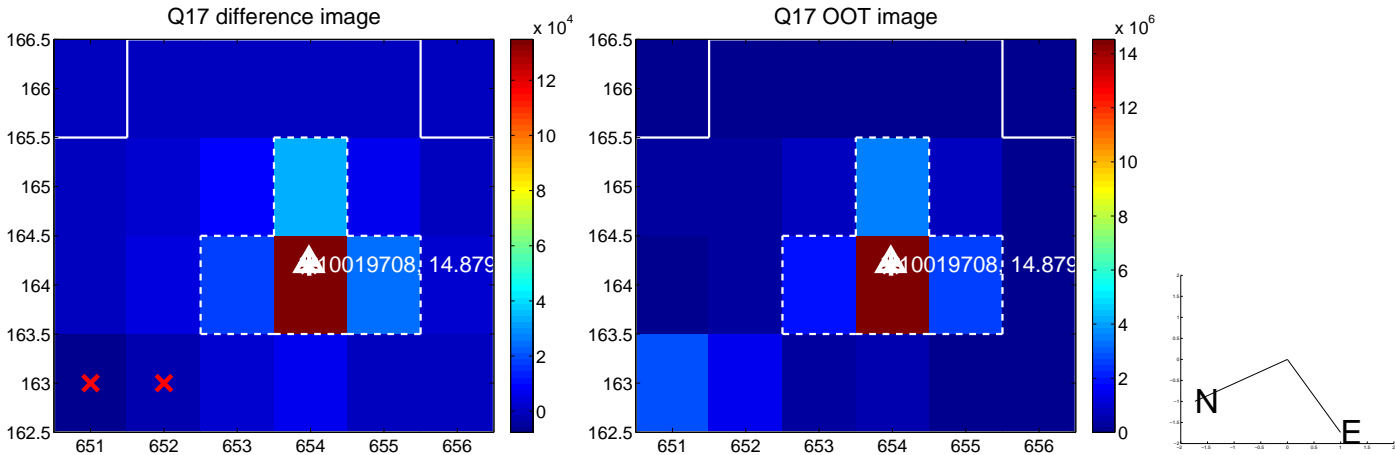
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



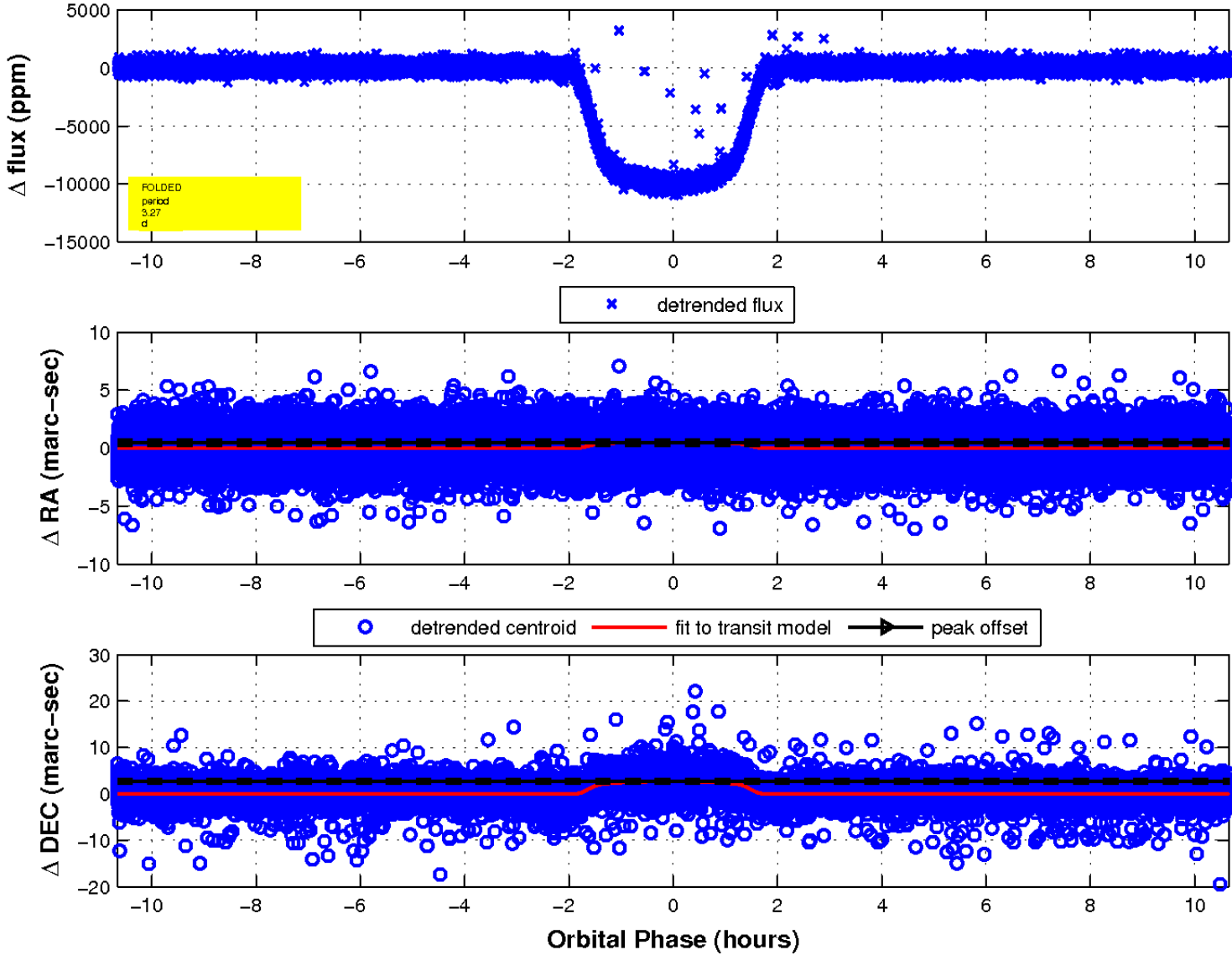
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



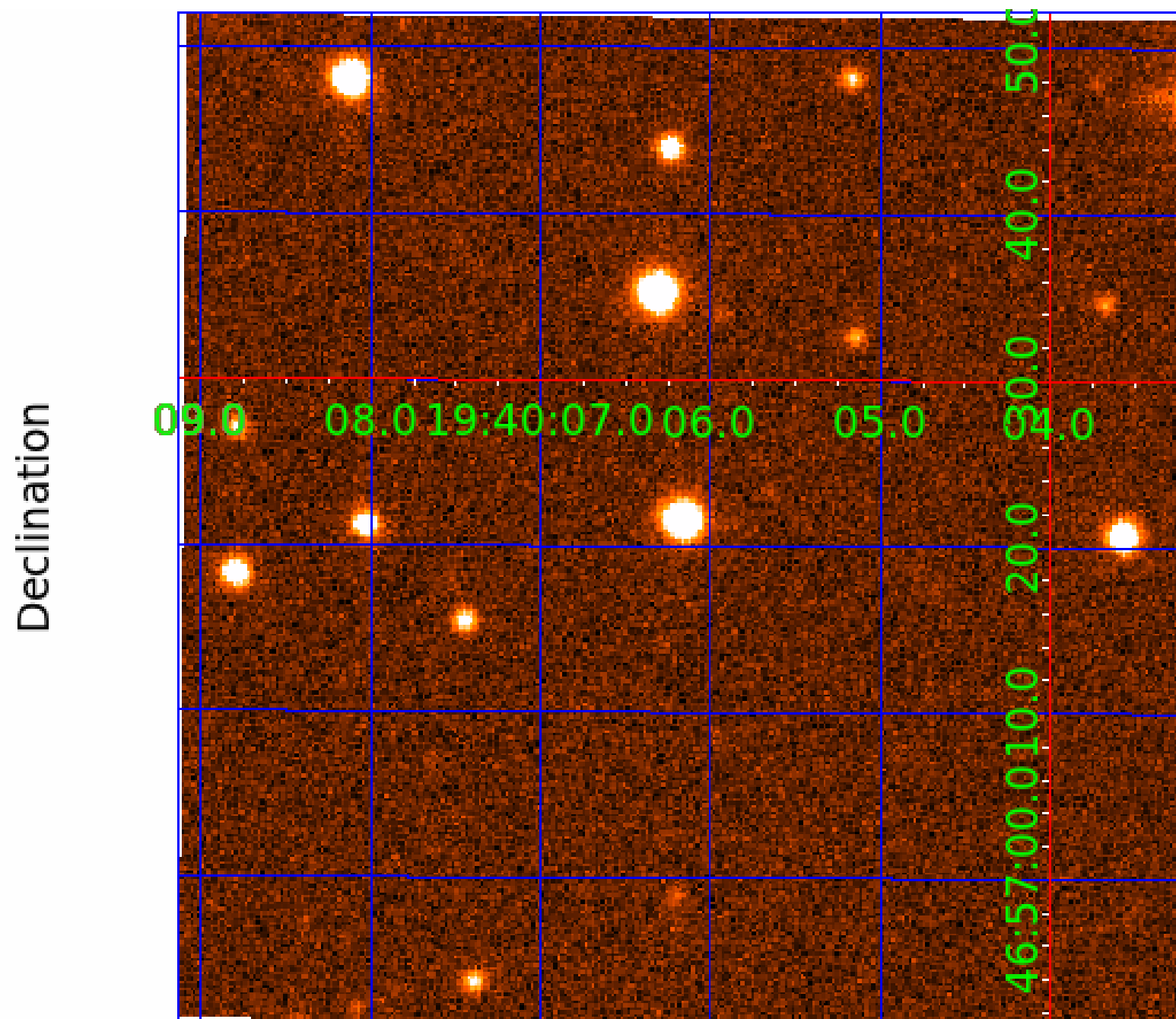
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image



# KIC 010019708

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010019708-01	OBS	0199.01	3.268693	134.213279	10122.6	3.553	1341.5	1342.7	1.69	5927	17.39	1541.10
010019708-02	OBS	0199.02	8.784764	135.369899	214.0	9.345	17.7	20.0	1.69	5927	3.41	412.44

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010019708-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010019708-02	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—CENT_RESOLVED_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 010019708-02

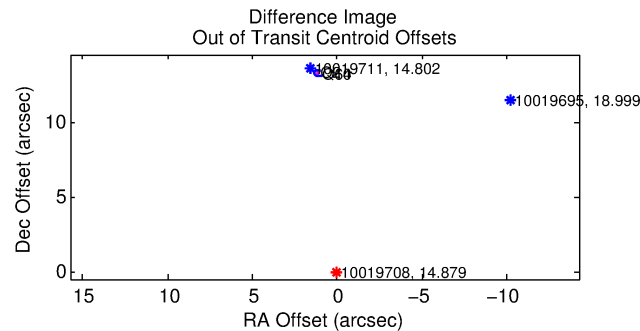
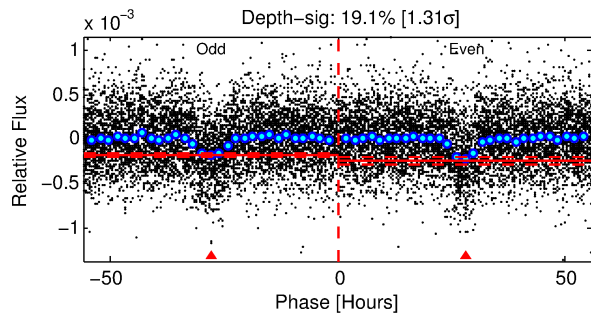
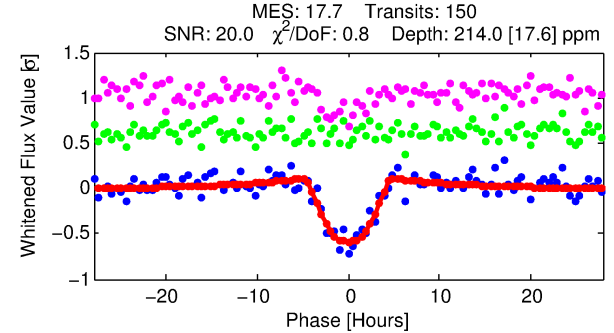
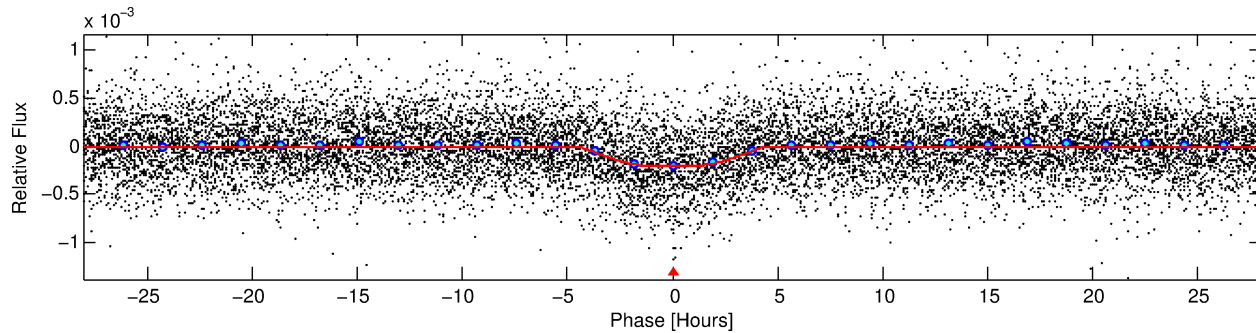
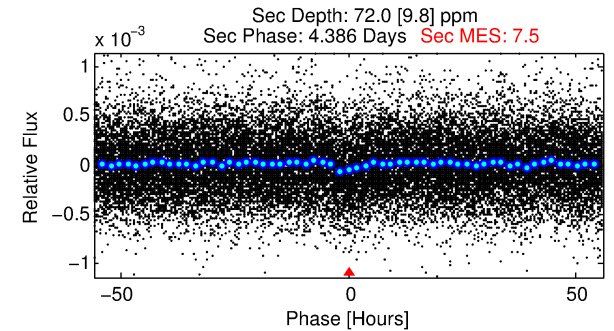
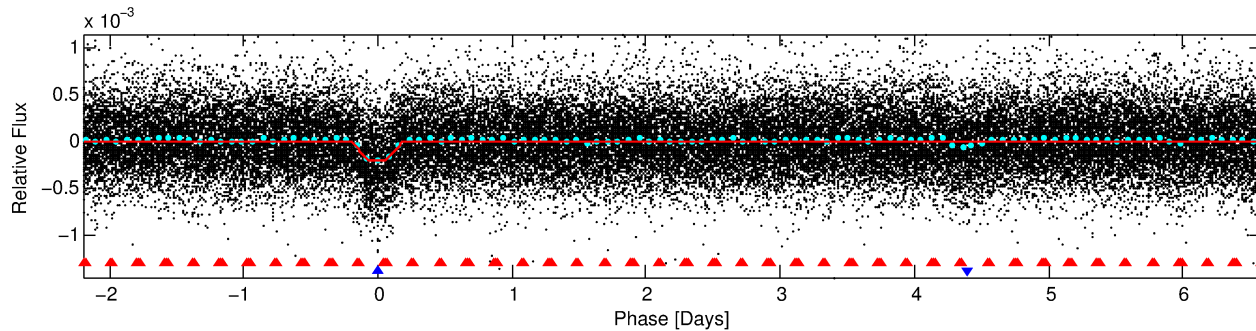
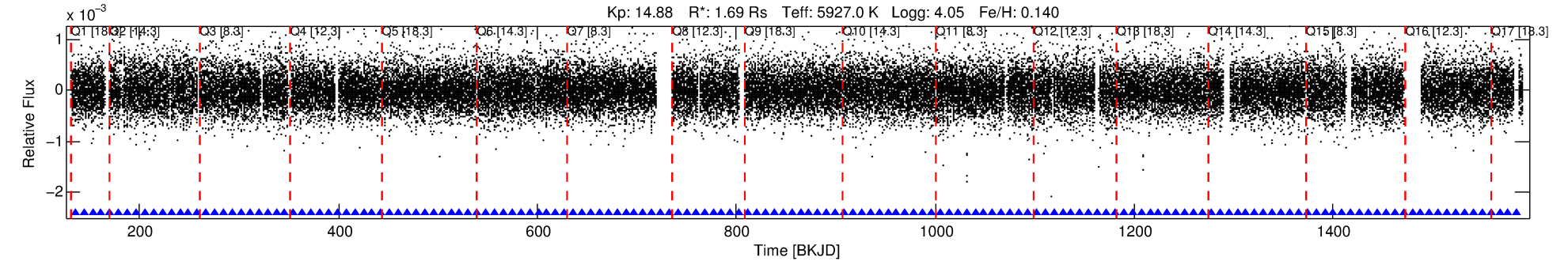
No Significant Match Found

# DV One-Page Summary

KIC: 10019708 Candidate: 2 of 2 Period: 8.785 d

KOI: K00199.02 Corr: 0.820

Kp: 14.88 R\*: 1.69 Rs Teff: 5927.0 K Logg: 4.05 Fe/H: 0.140



## DV Fit Results:

Period = 8.78476 [0.00011] d  
Epoch = 135.3699 [0.0097] BKJD  
Rp/R\* = 0.0185 [0.0011]  
a/R\* = 2.21 [0.16]  
b = 0.98 [0.00]  
Seff = 412.44 [133.55]  
Teq = 1149 [93] K  
Rp = 3.41 [0.81] Re  
a = 0.0876 [0.0182] AU  
Ag = 26.14 [9.58] [2.63σ]  
Teff = 4017 [188] K [13.65σ]

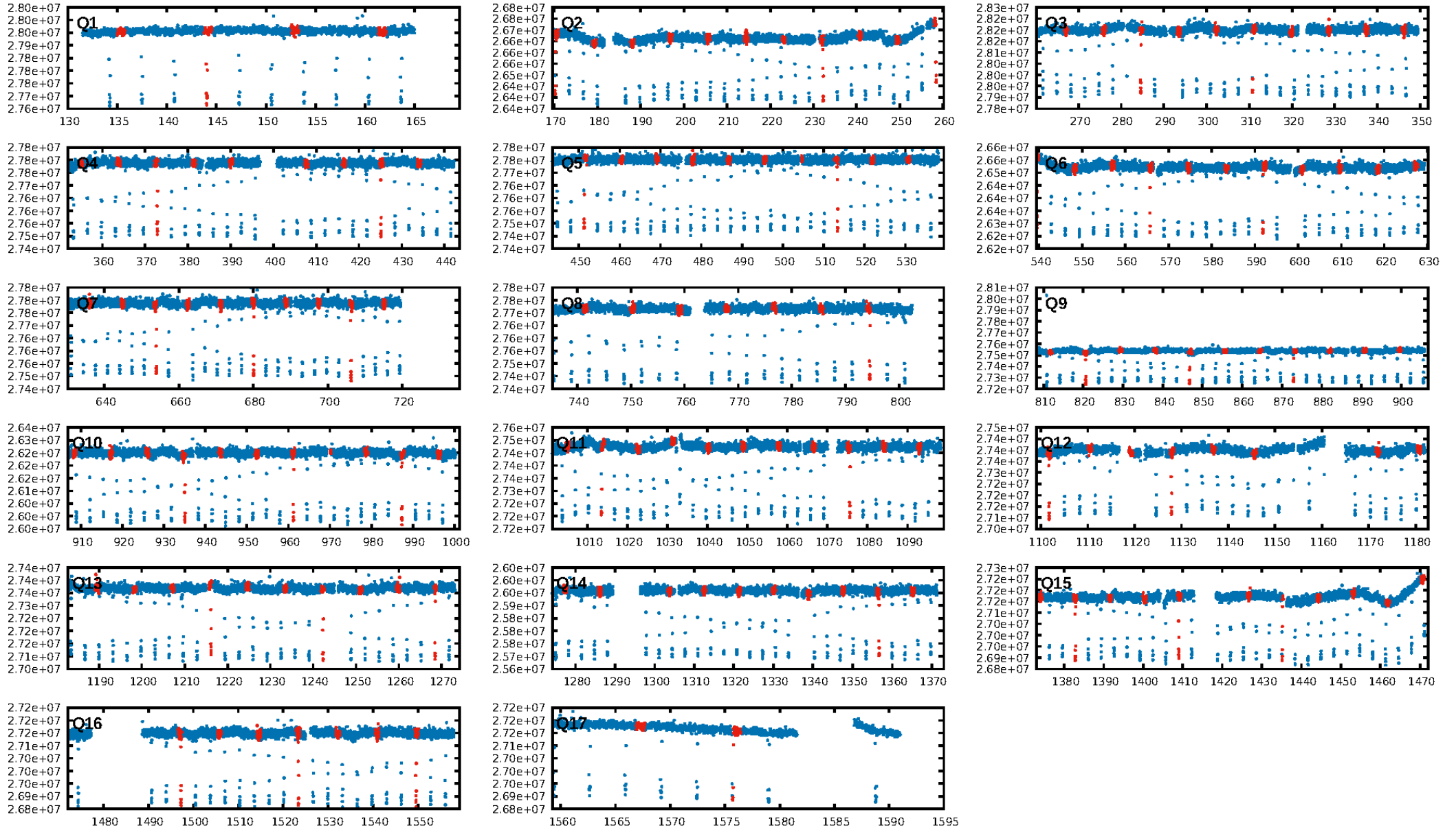
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [13.24σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.41e-62  
RollingBand-fgt: 1.00 [144/144]  
GhostDiagnostic-chr: -0.4352  
Centroid-sig: 0.0%  
Centroid-so: N/A  
OotOffset-rm: 13.290 arcsec [177.03σ]  
KicOffset-rm: 13.188 arcsec [176.61σ]  
OotOffset-st: 4/0/0/0 [4]  
KicOffset-st: 4/0/0/0 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 10:00:48 Z

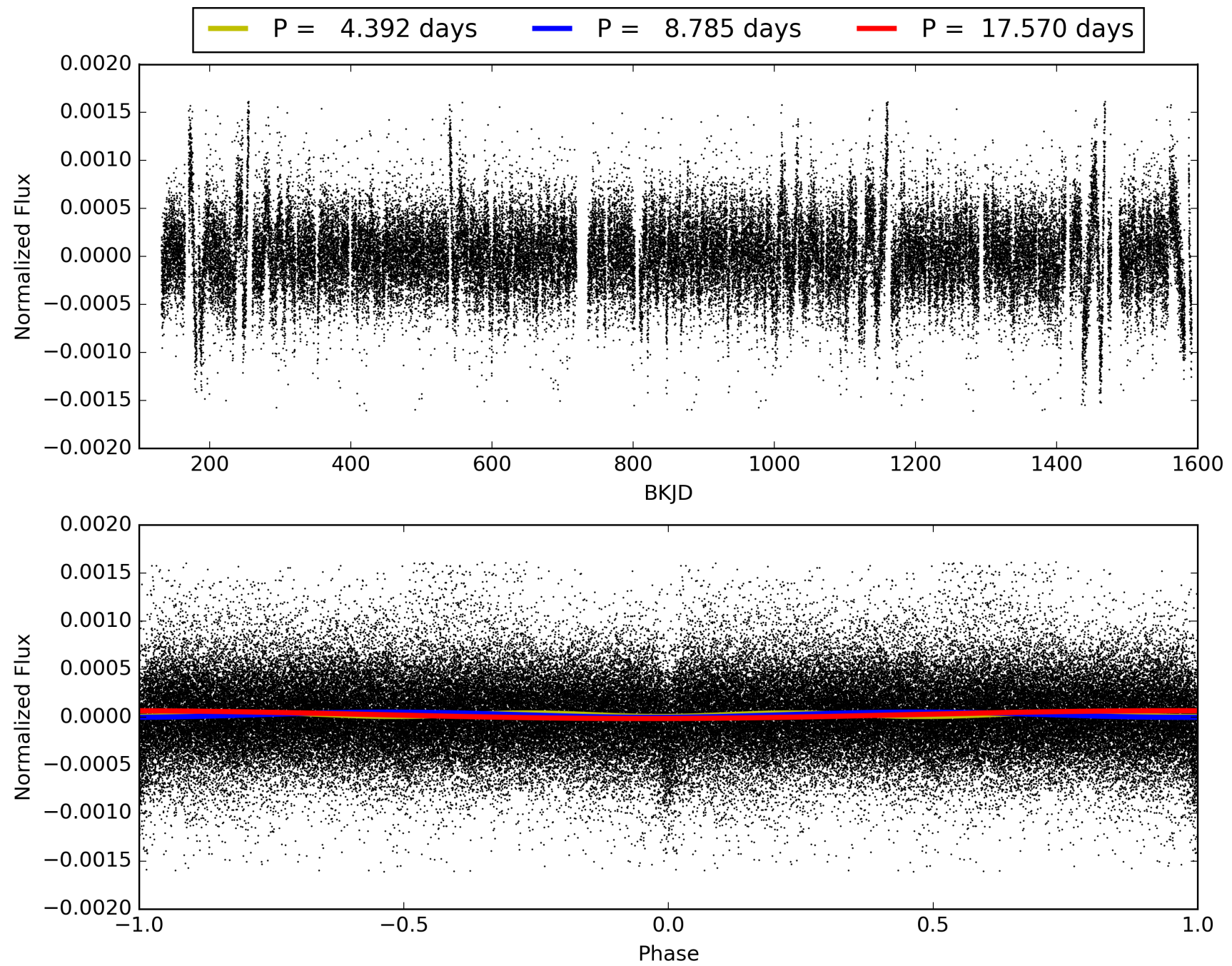
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010019708-02, PDC Light Curves





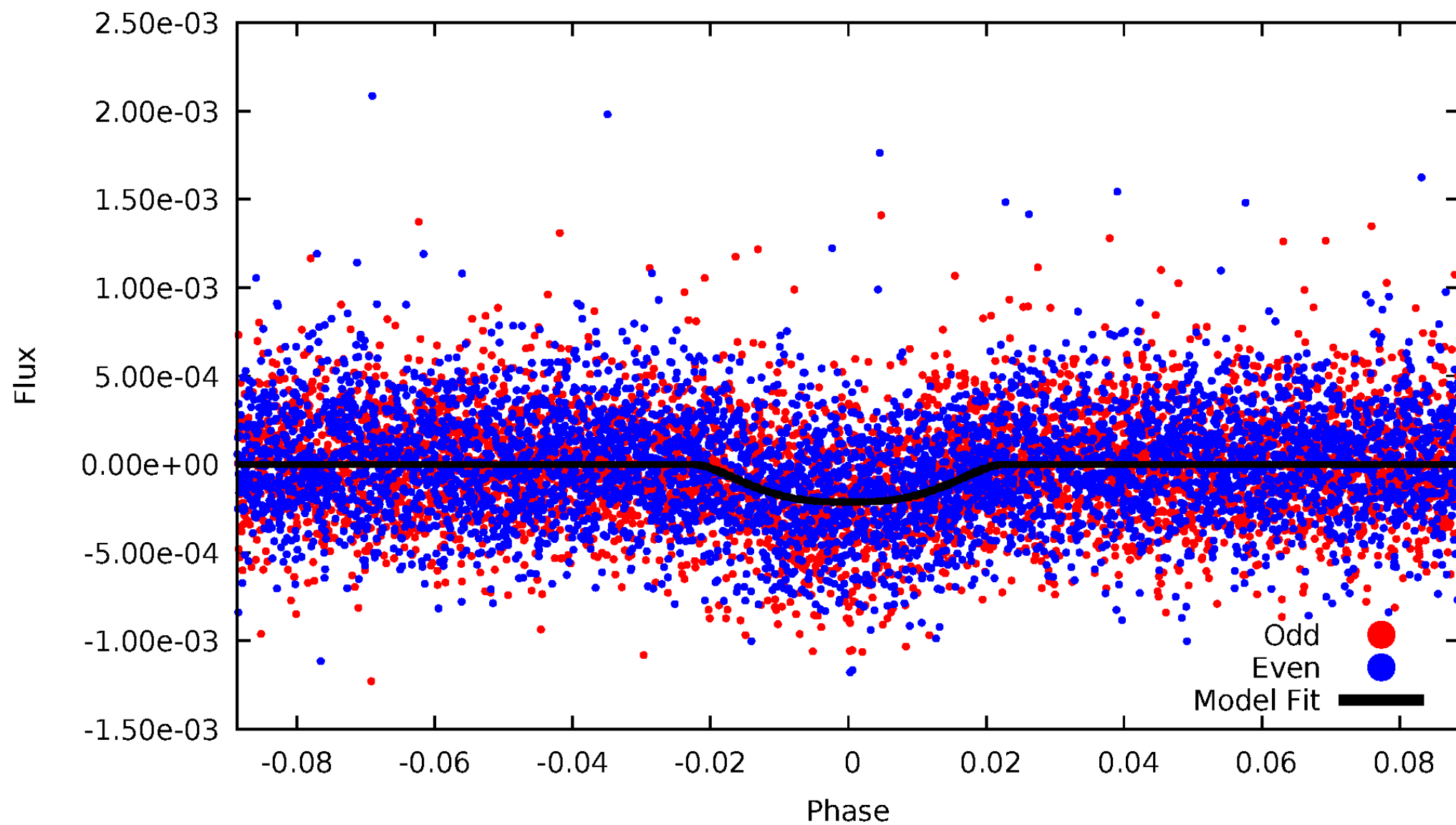
TCE 010019708-02





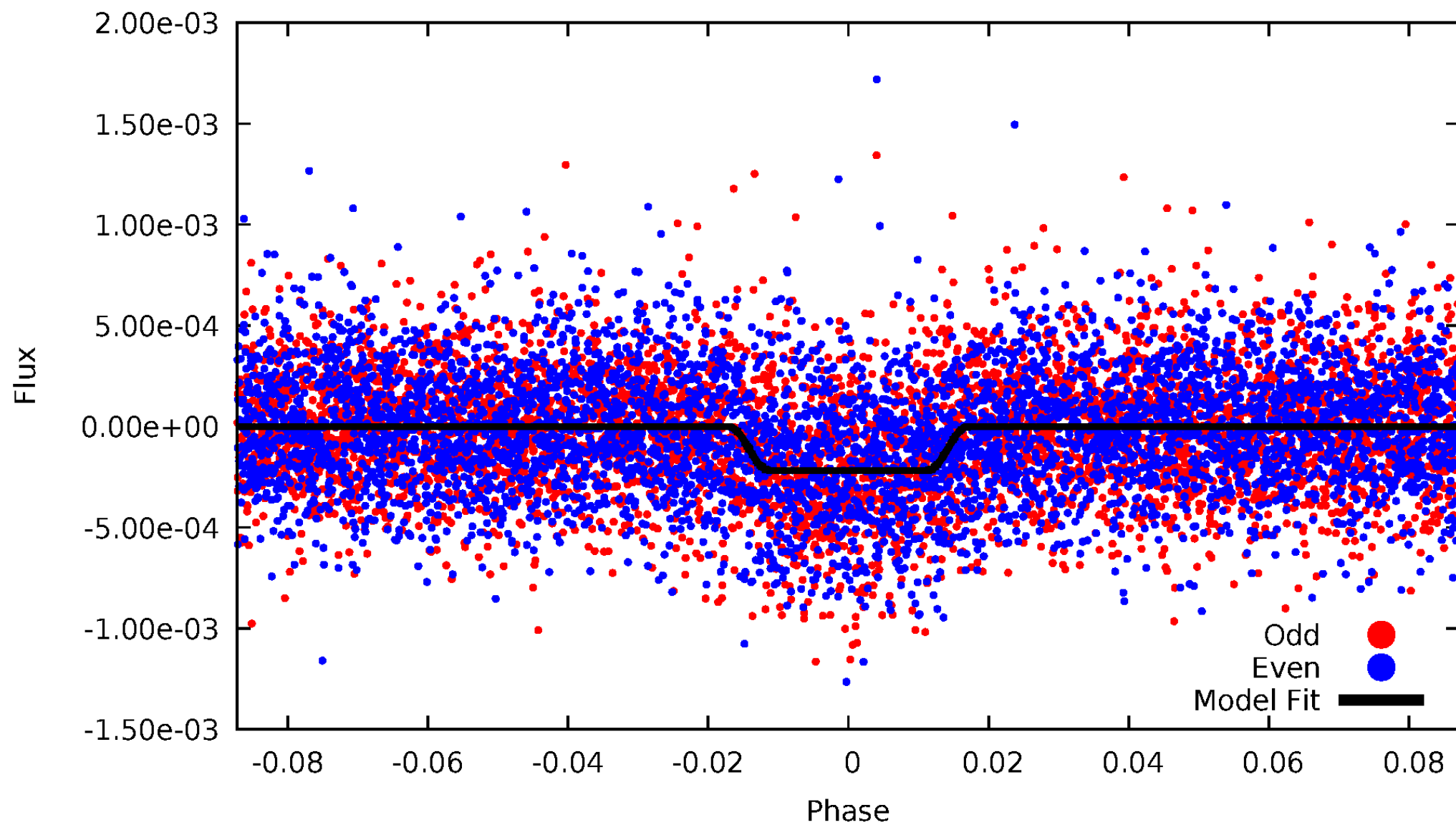
# DV Odd/Even

TCE 010019708-02



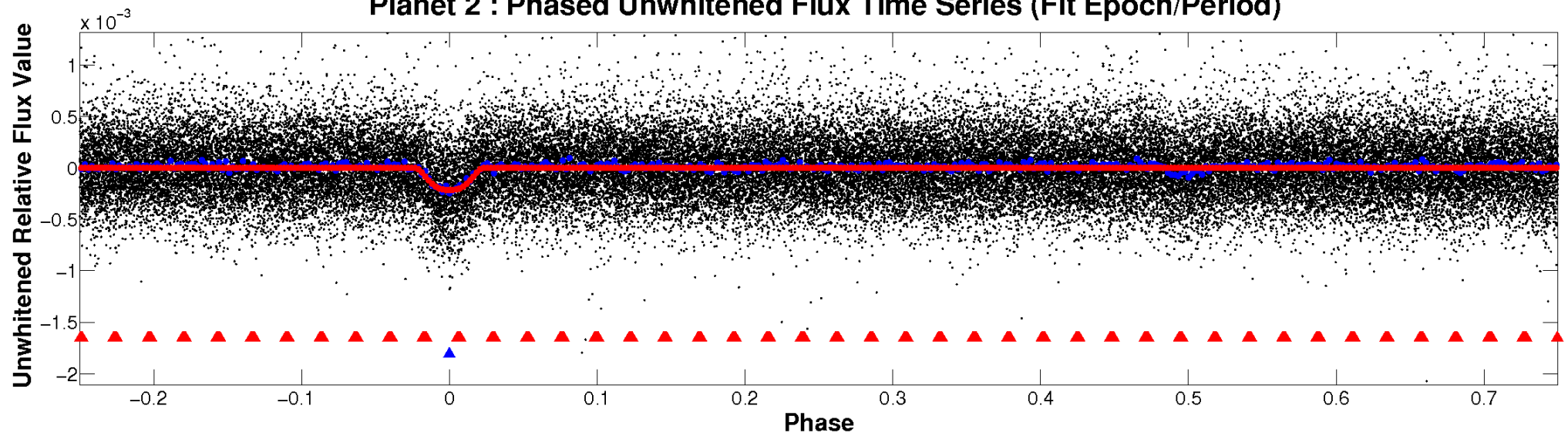
# ALT Odd/Even

TCE 010019708-02

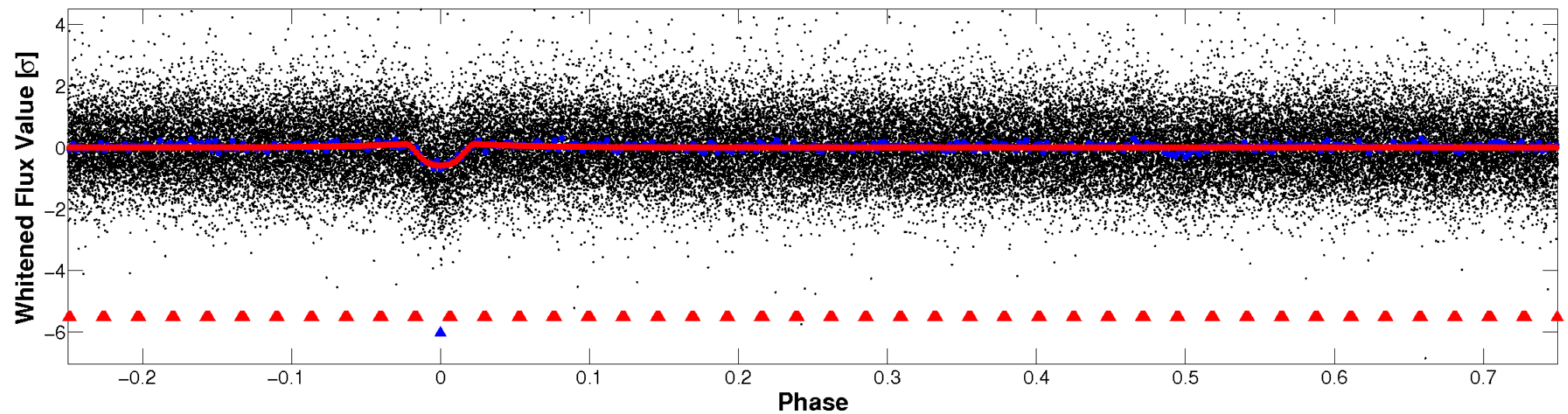


# Non-Whitened Vs. Whitened Light Curve

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

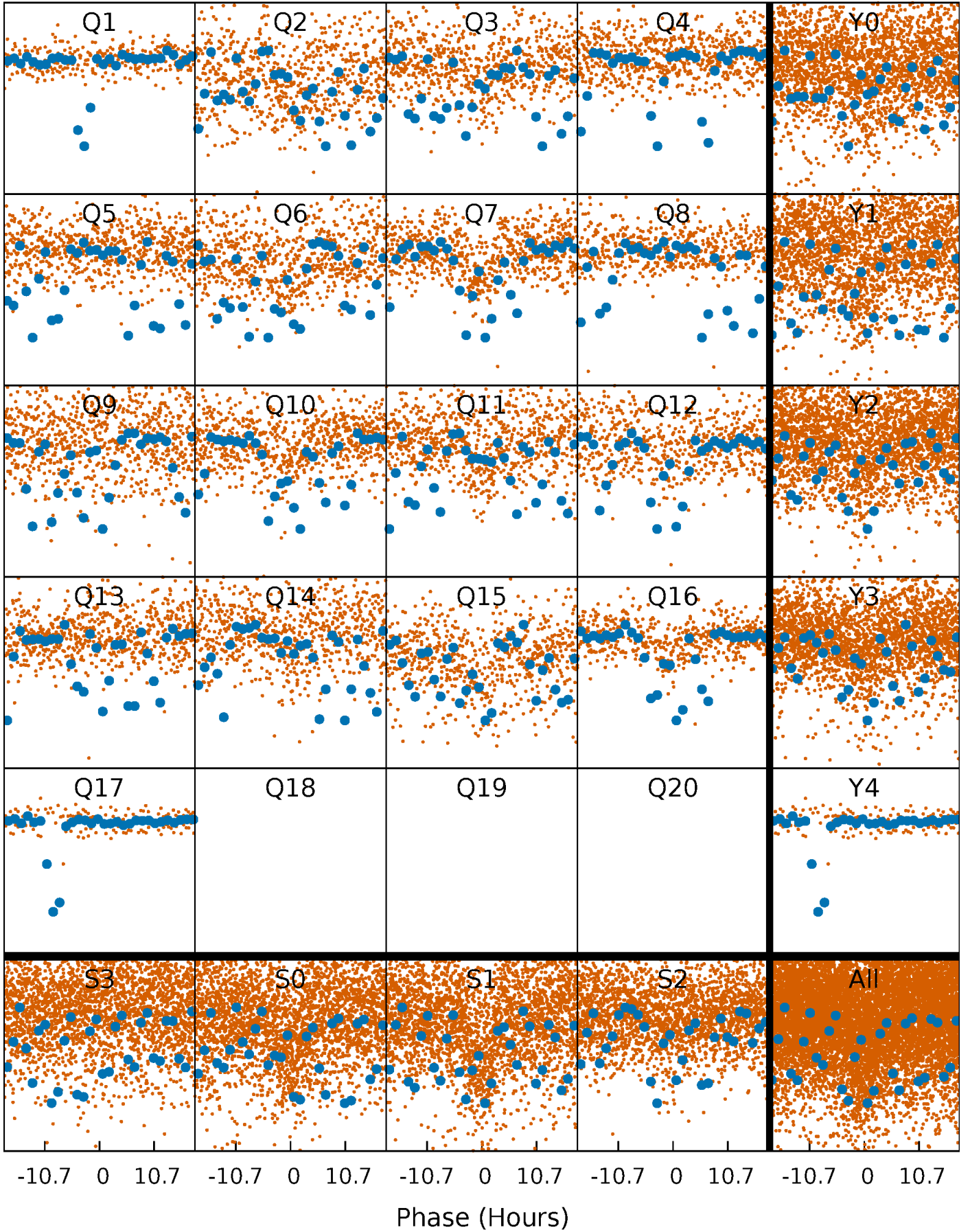


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

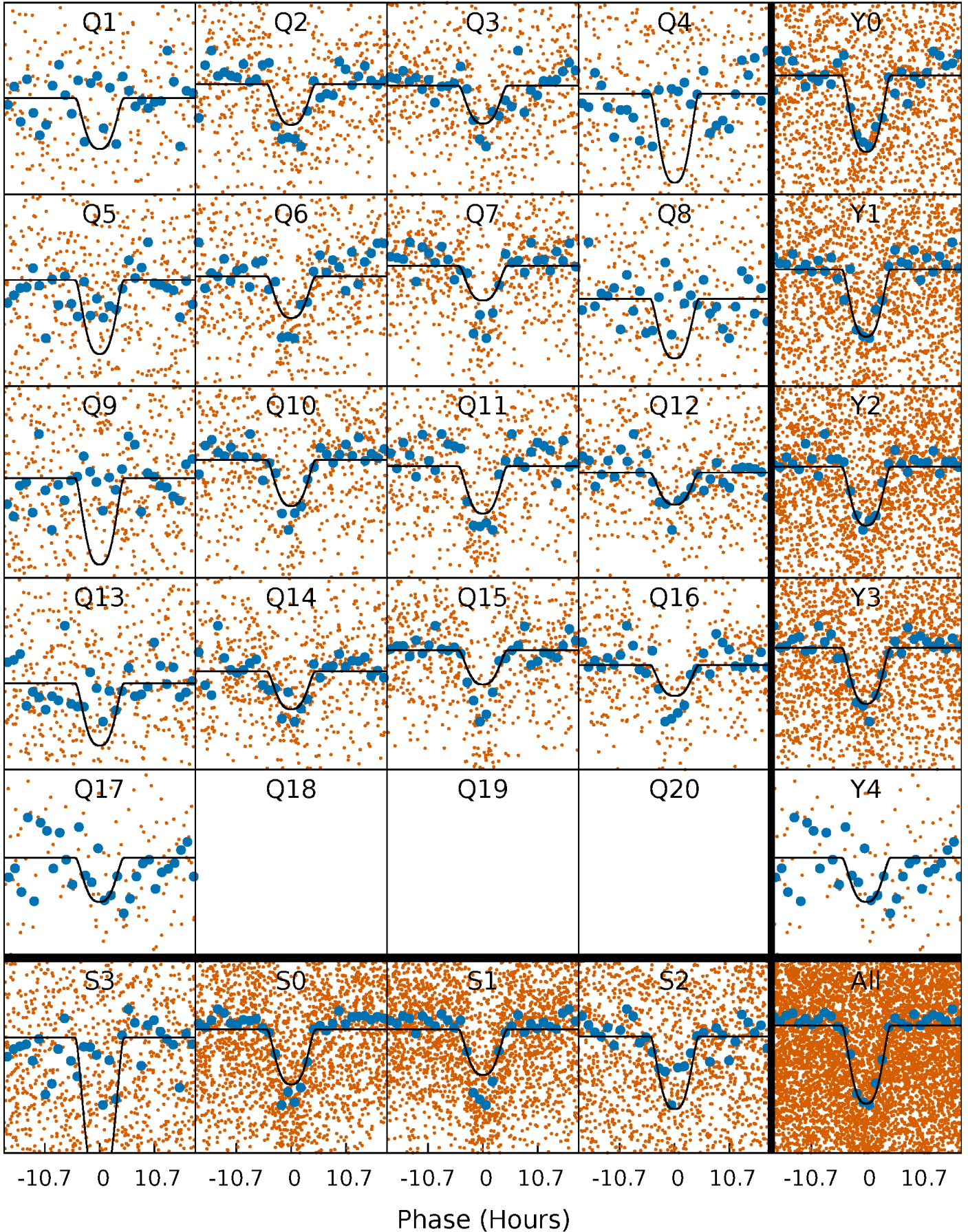
TCE 010019708-02     $P = 8.784764$  Days     $T_0 = 135.369899$  (BKJD)





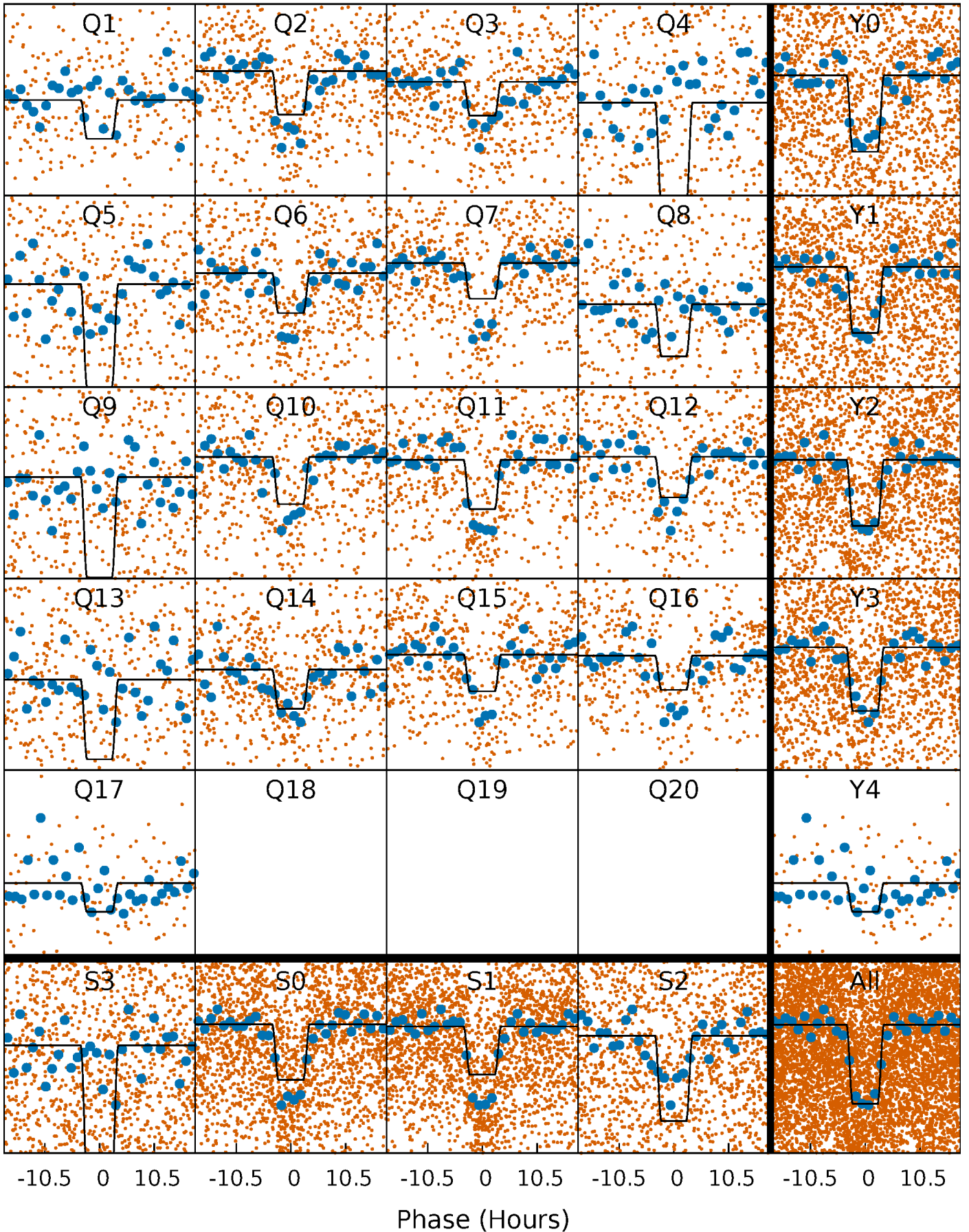
# DV Quarter-Phased Transit Curves

TCE 010019708-02   P= 8.784764 Days    $T_0=135.369899$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

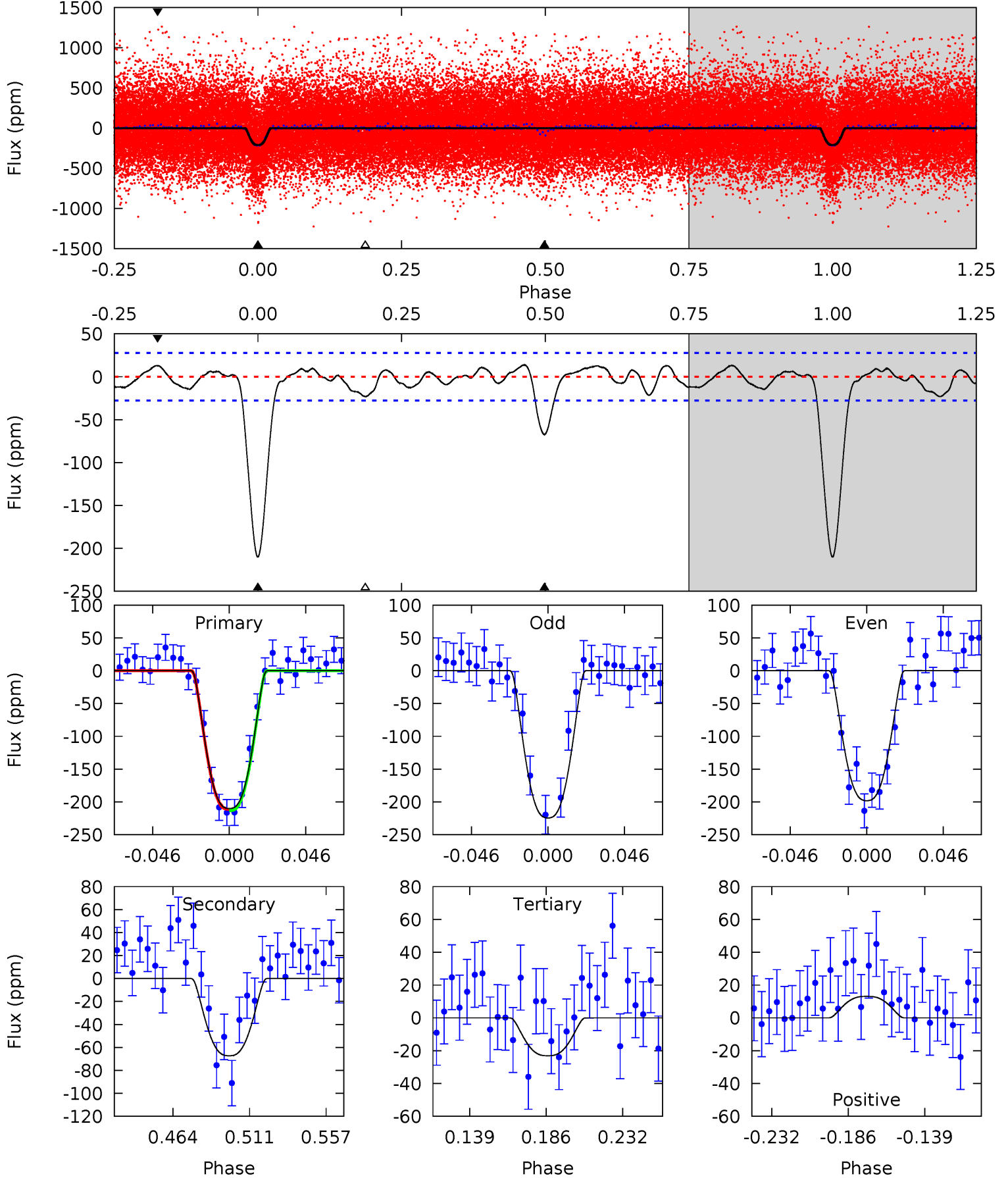
TCE 010019708-02   P= 8.784630 Days    $T_0=135.377570$  (BKJD)



# DV Model-Shift Uniqueness Test

010019708-02, P = 8.784764 Days, E = 126.585135 Days

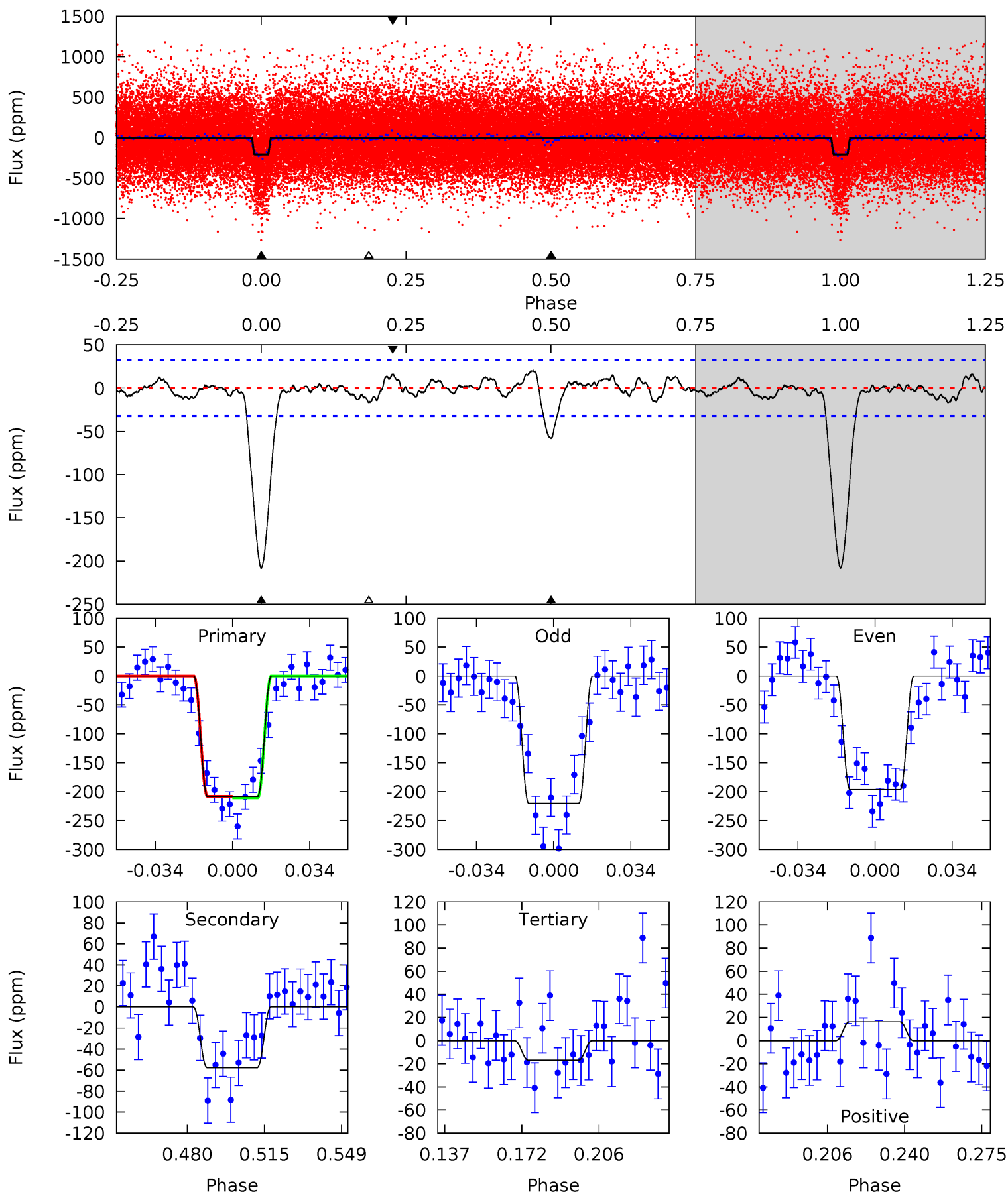
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
35.8	11.5	3.93	2.23	4.72	1.99	1.48	31.8	33.5	7.53	9.23	2.25	1.34	0.06	0.16



# Alt Model-Shift Uniqueness Test

010019708-02, P = 8.784630 Days, E = 126.592940 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
31.0	8.58	2.52	2.43	4.78	2.12	1.09	28.5	28.6	6.06	6.15	1.75	0.88	0.09	0.18





### Stellar Parameters For KIC 010019708

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5927^{+80}_{-80}$	$4.046^{+0.182}_{-0.098}$	$0.140^{+0.150}_{-0.150}$	$1.691^{+0.261}_{-0.392}$	$1.161^{+0.132}_{-0.096}$	$0.338^{+0.329}_{-0.103}$
	+1%/-1%	+4%/-2%	+107%/-107%	+15%/-23%	+11%/-8%	+97%/-30%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 010019708-02 / KOI 0199.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-67 \pm 6$	$3.39^{+0.38}_{-0.47}$	$1601^{+72}_{-99}$	$4193^{+134}_{-115}$	$25^{+8}_{-5}$
Alt.	$-58 \pm 7$	$2.70^{+0.36}_{-0.36}$	$1596^{+74}_{-87}$	$4433^{+179}_{-158}$	$34^{+11}_{-8}$

$T_{\text{max}}$  = 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

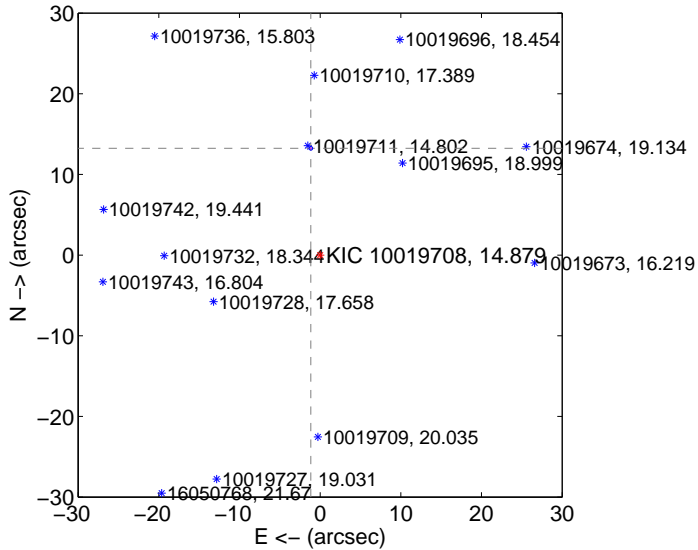
Supplemental centroid analysis for 010019708-02. Kepler magnitude: 14.88. Transit SNR 19.99

There are 4 quarters with good PRF difference image offsets

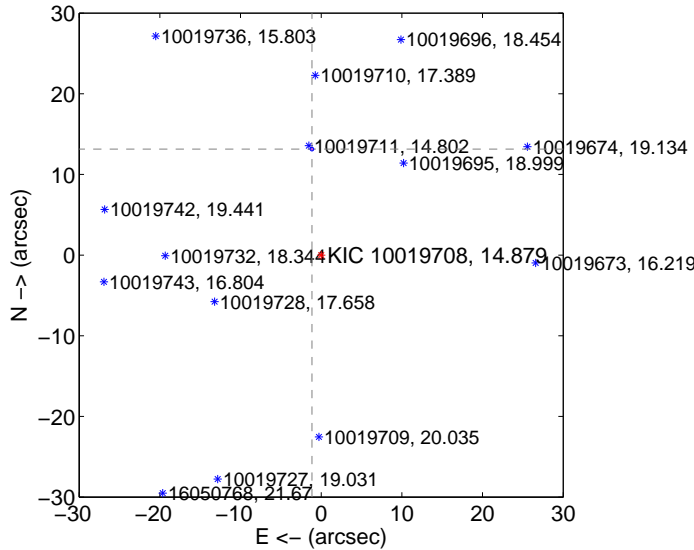
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>13.290 <math>\pm</math> 0.075</b>	<b>177.03</b>	1.156 $\pm$ 0.073	13.240 $\pm$ 0.075
PRF-fit source offset from KIC position	<b>13.188 <math>\pm</math> 0.075</b>	<b>176.61</b>	1.146 $\pm$ 0.076	13.138 $\pm$ 0.075
photometric centroid source offset	—	—	—	—

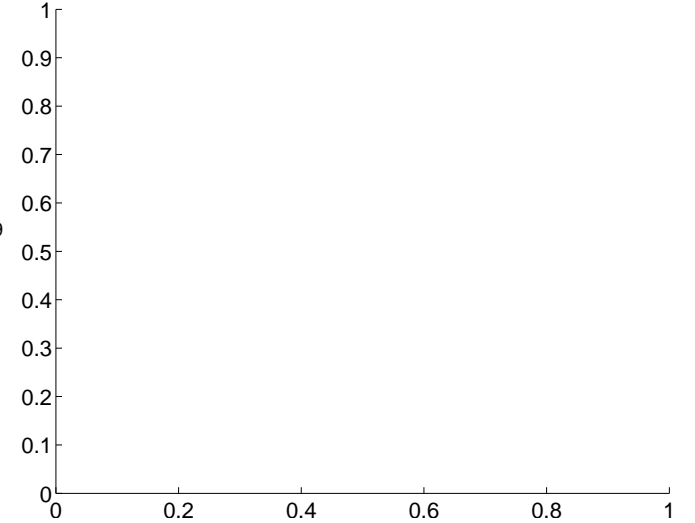
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

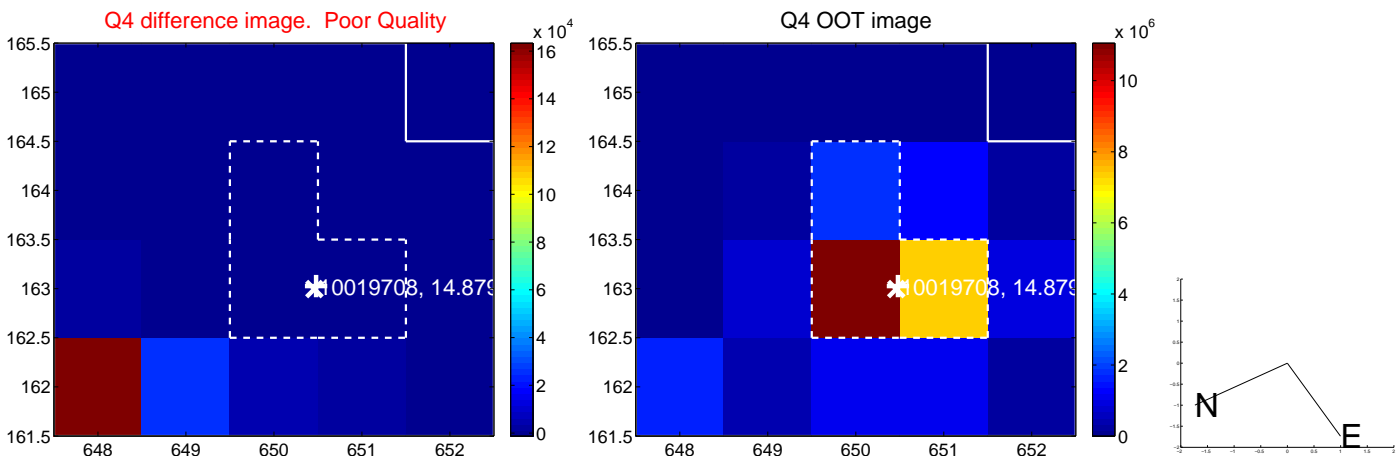
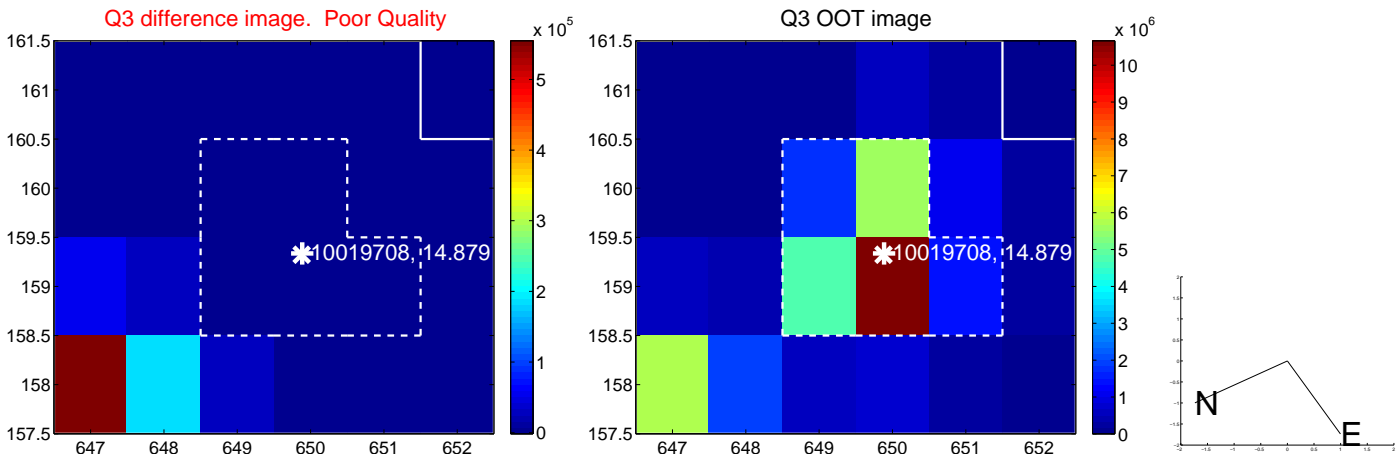
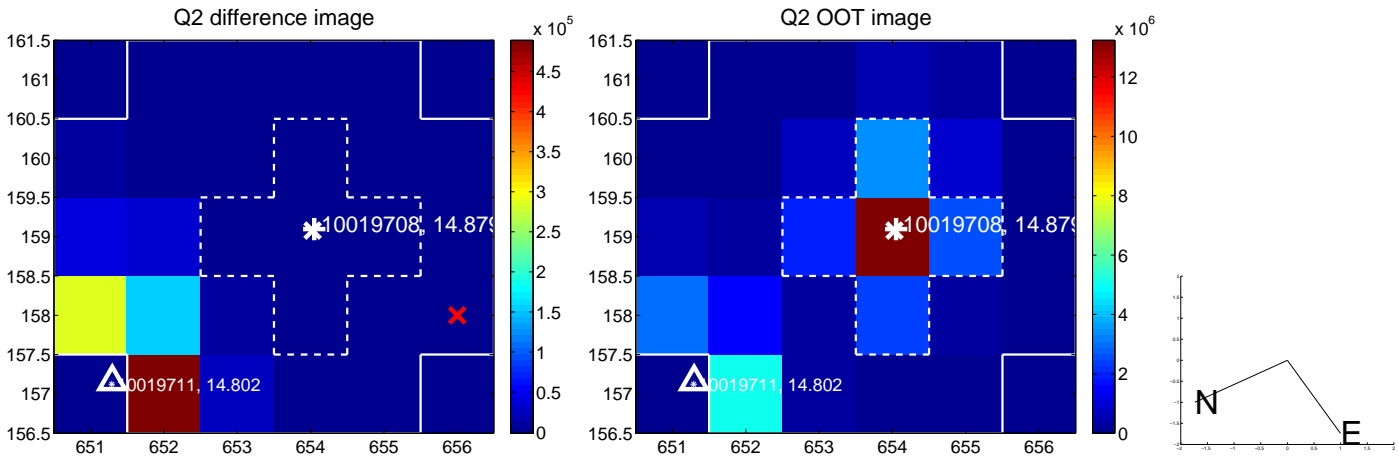
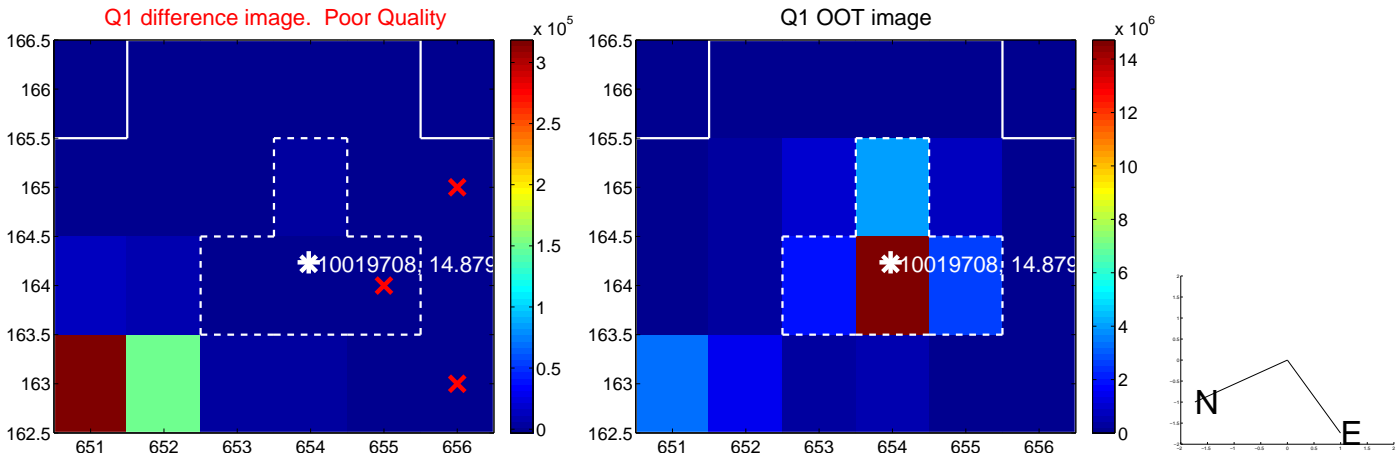


There are no photometric centroids

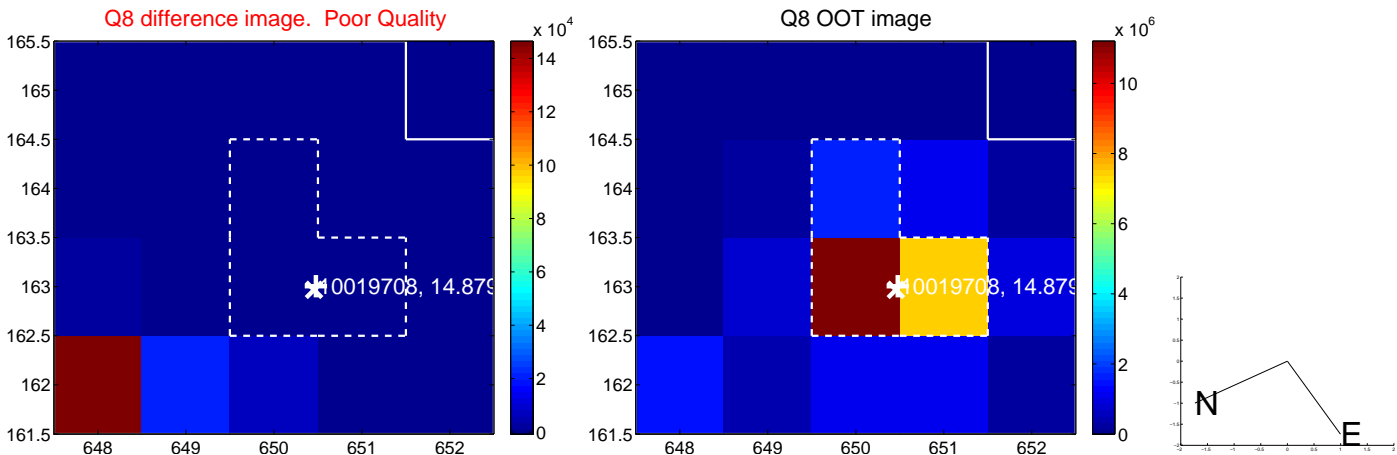
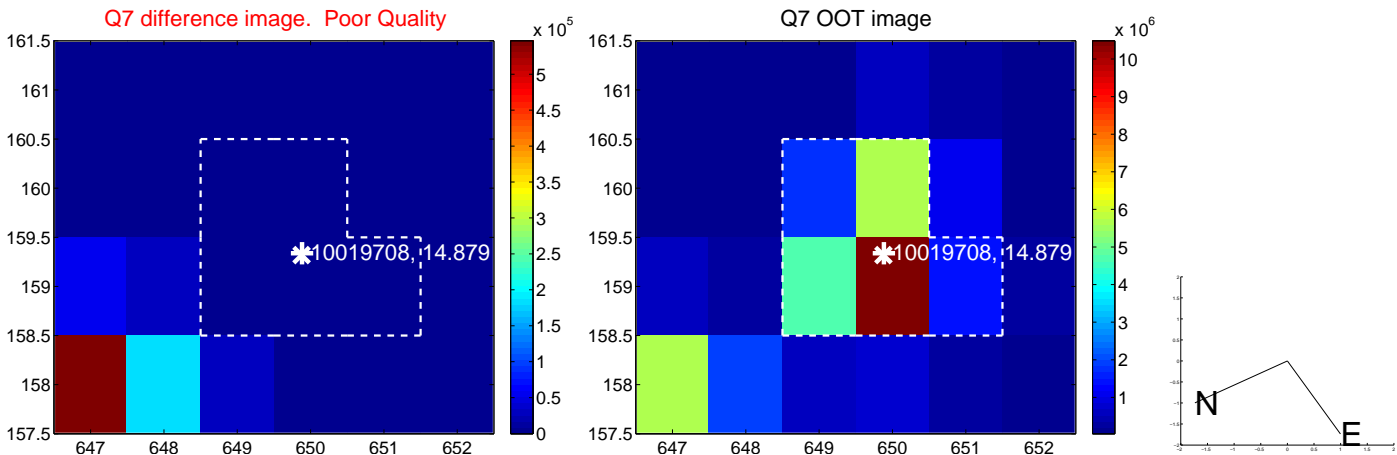
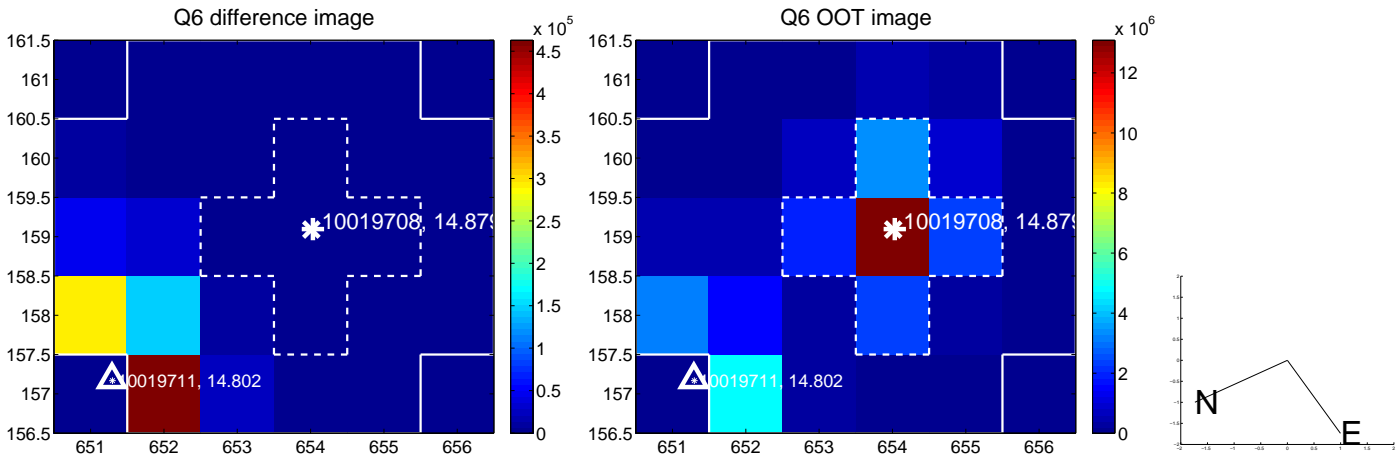
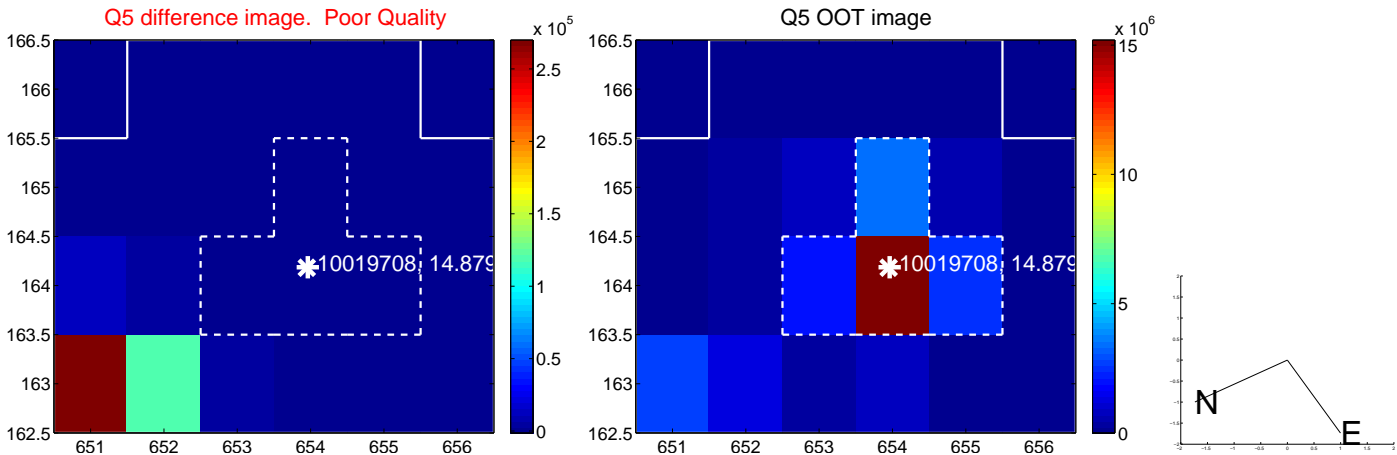


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

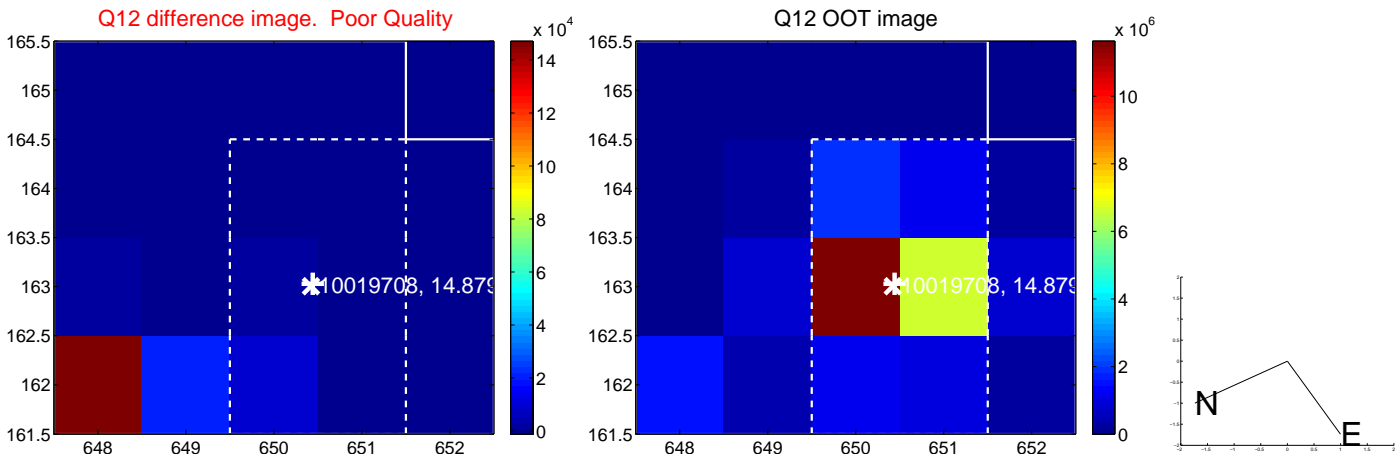
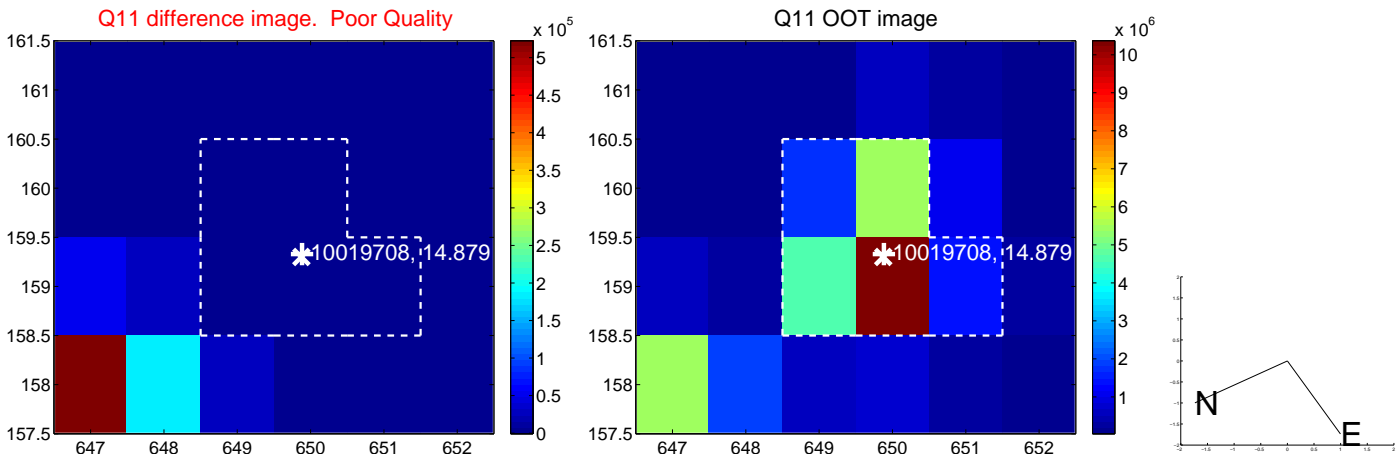
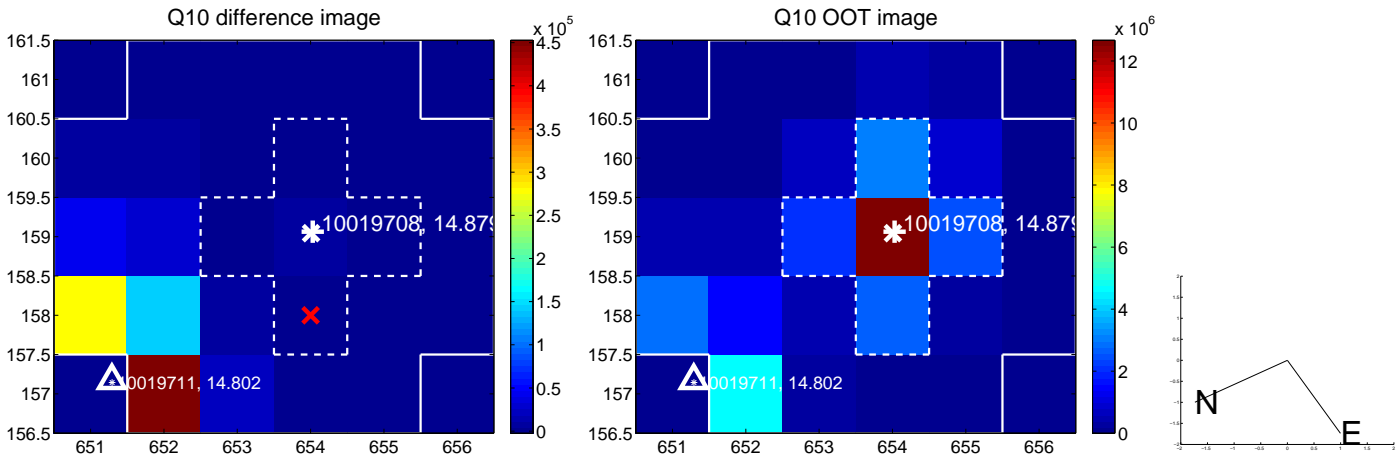
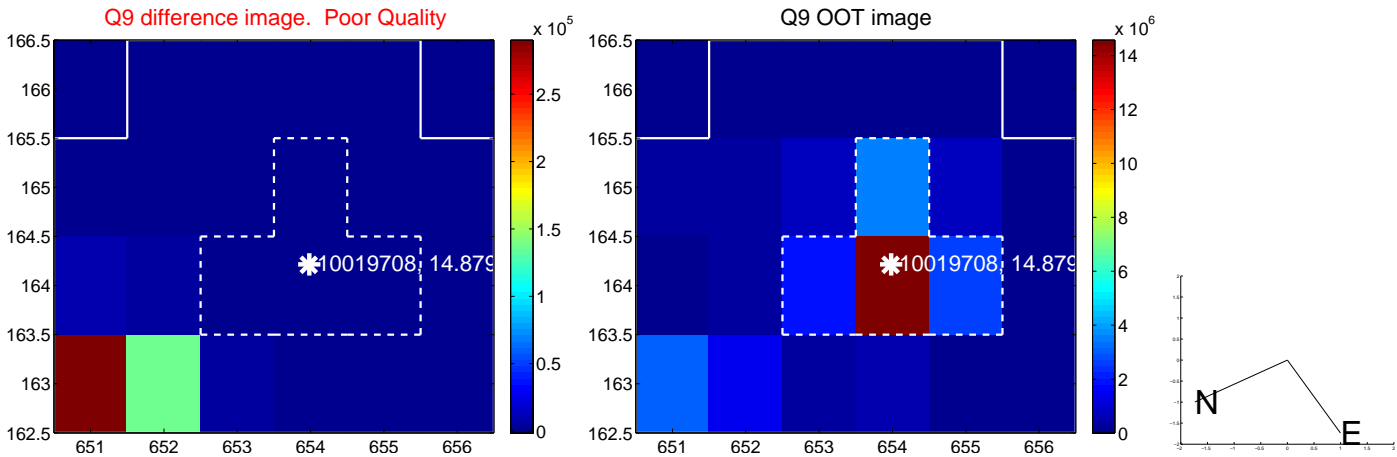
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



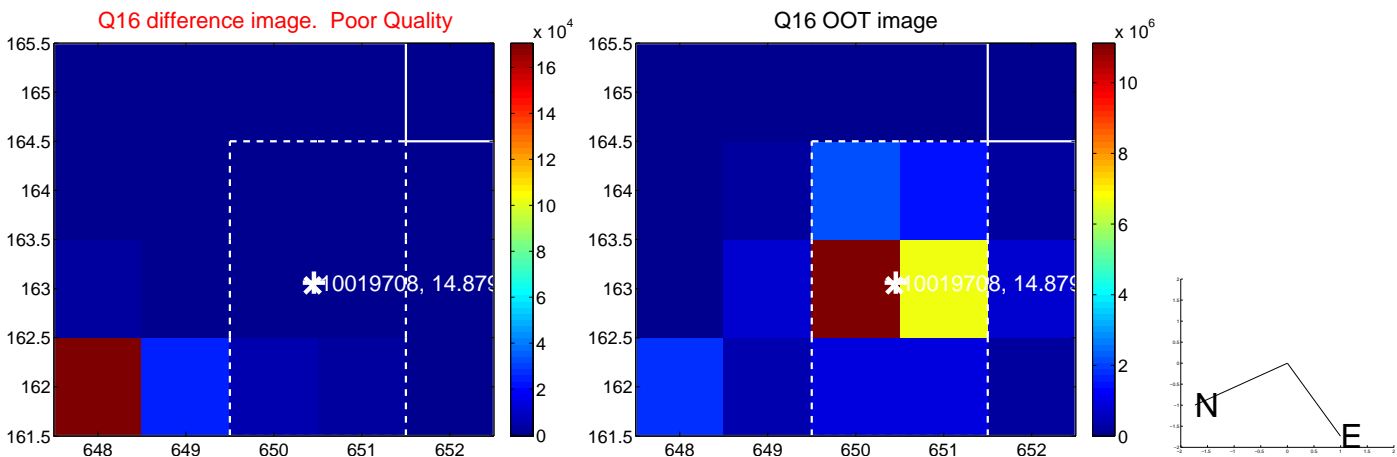
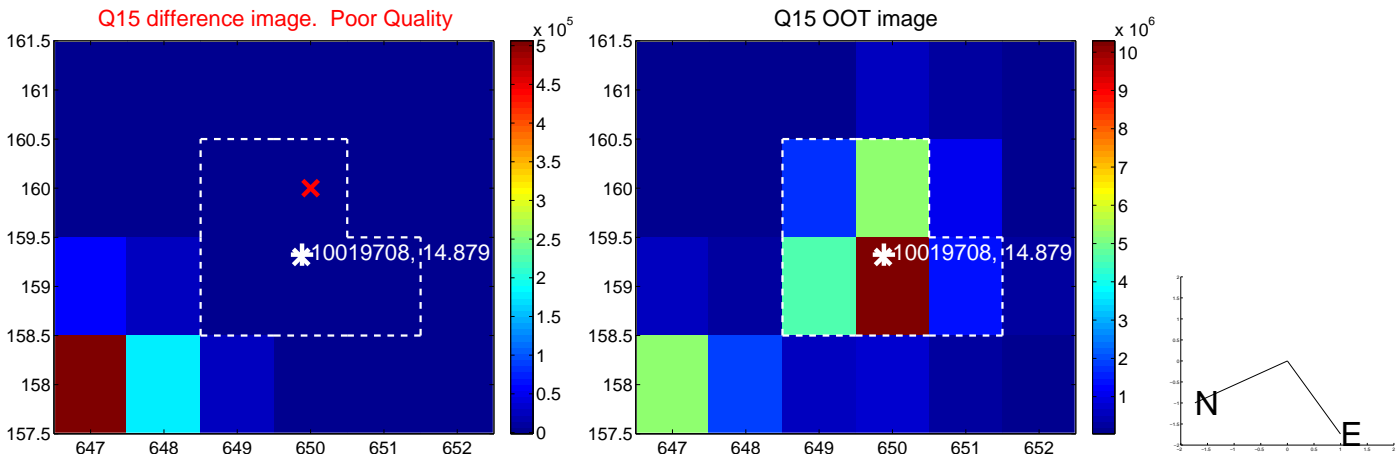
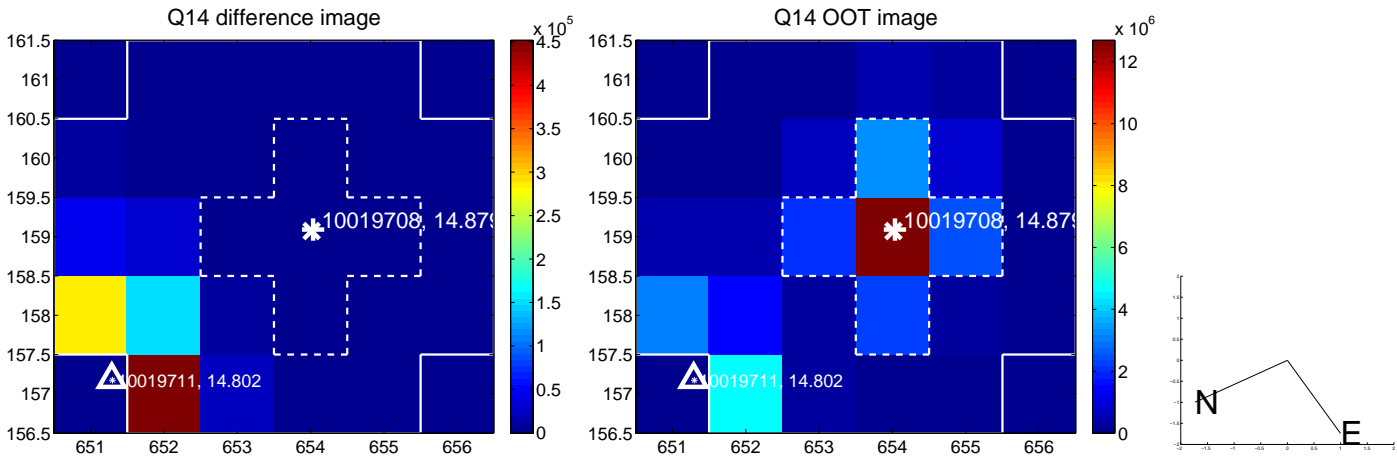
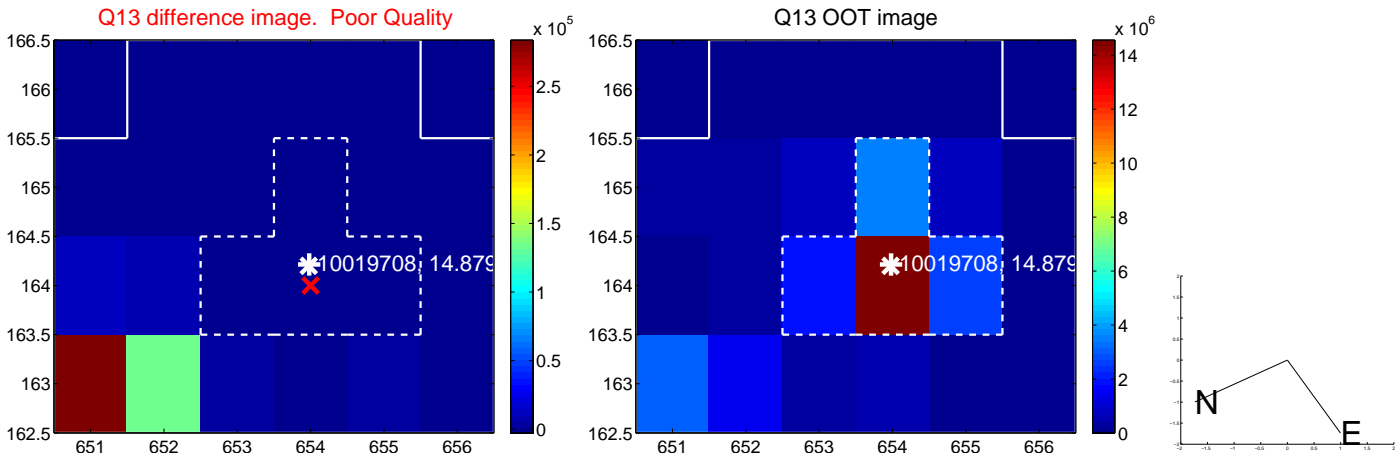
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



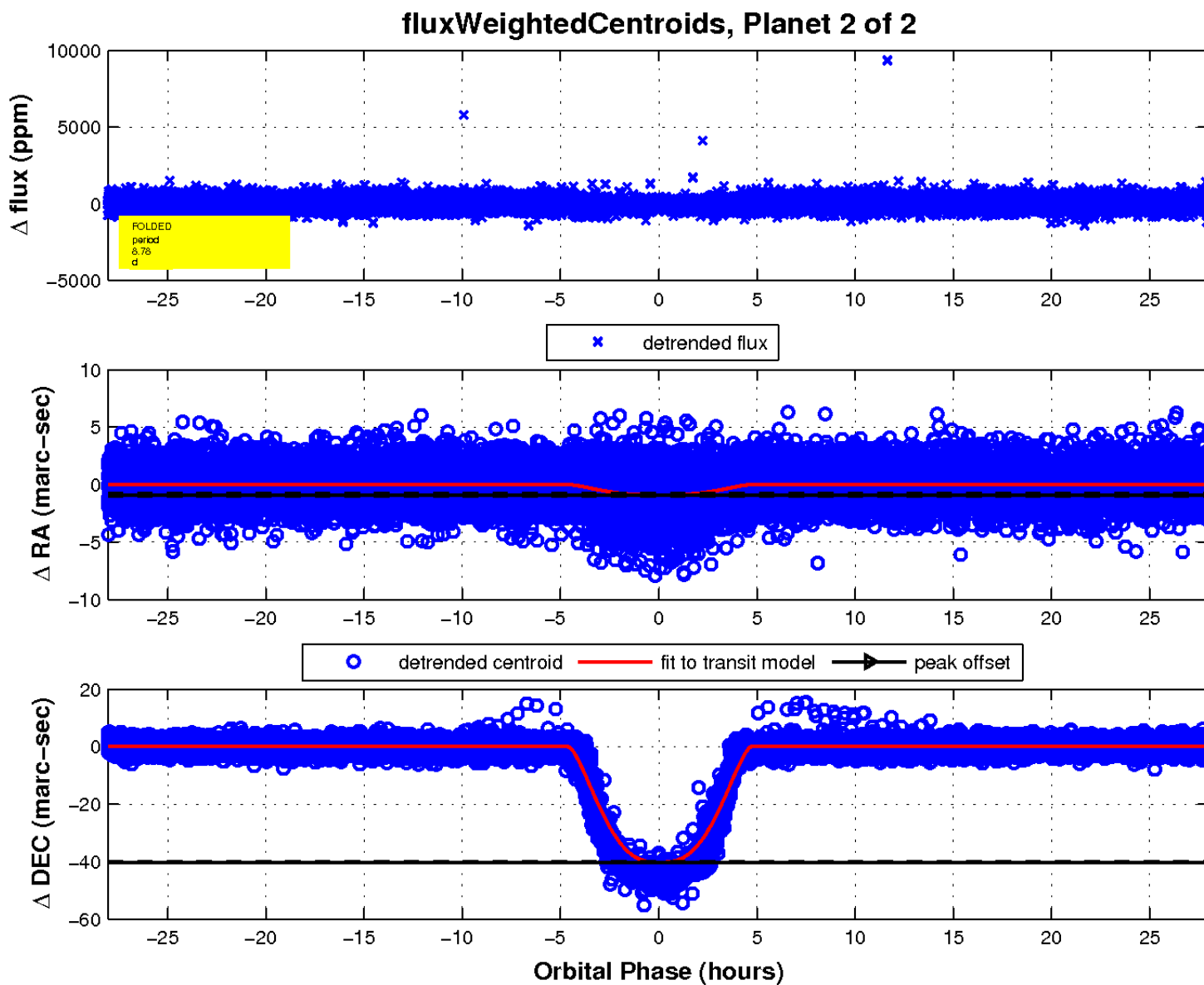
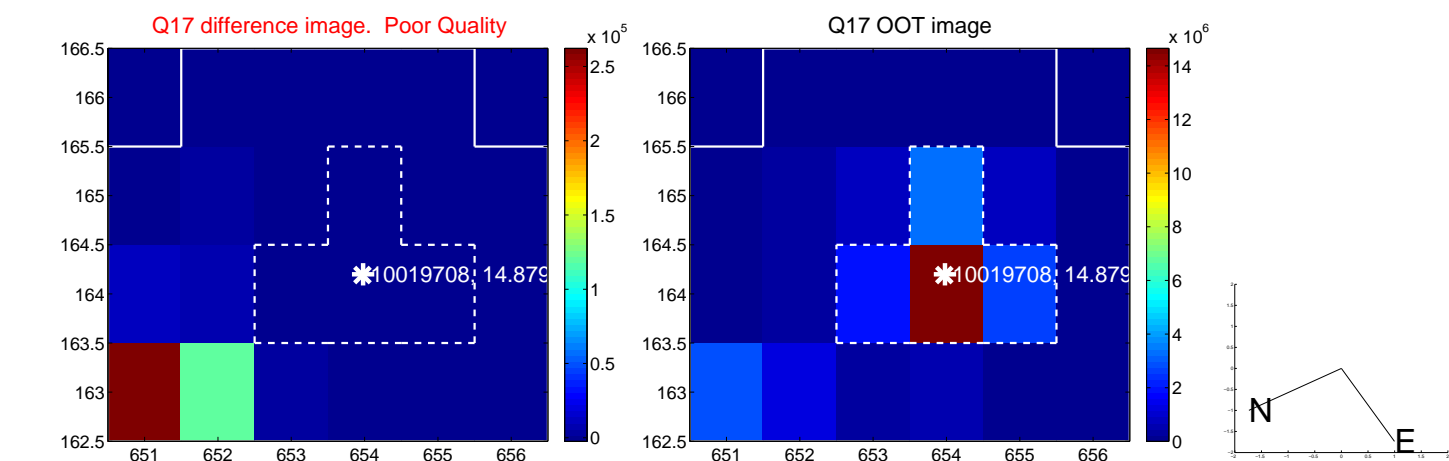
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

