

# KIC 002021100

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002021100-01	OBS	No	1.731396	132.145676	29.5	5.775	8.1	6.0	1.77	6811	1.13	6014.39
002021100-02	OBS	No	1.734392	132.144690	42.9	9.043	9.1	8.6	1.77	6811	1.34	6000.54

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002021100-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_KIC_POS
002021100-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT

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

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

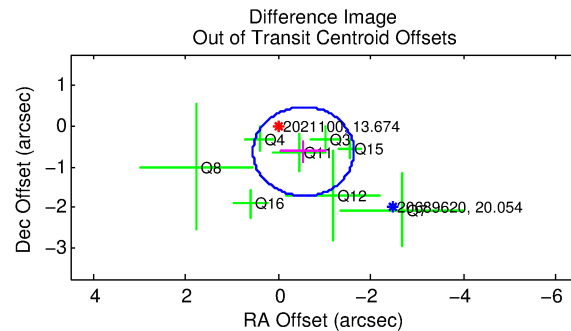
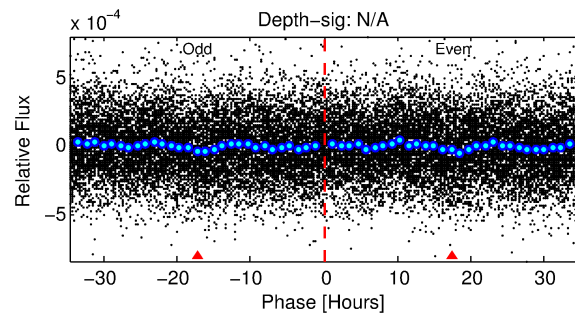
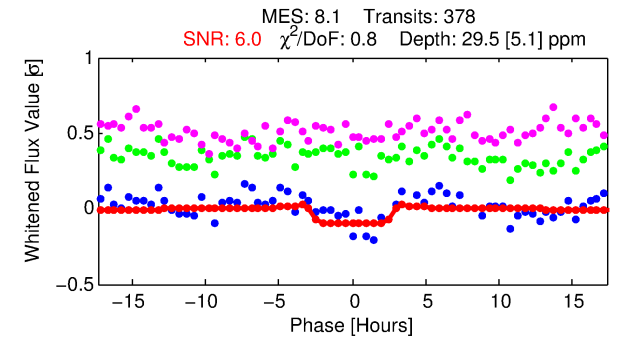
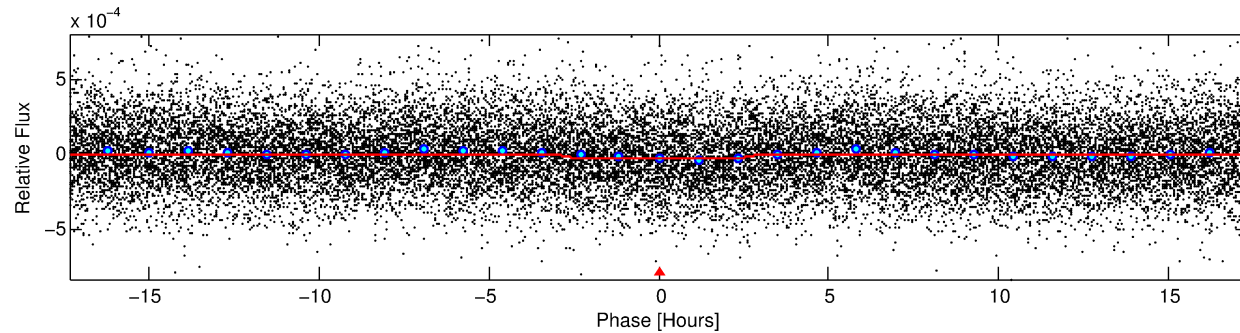
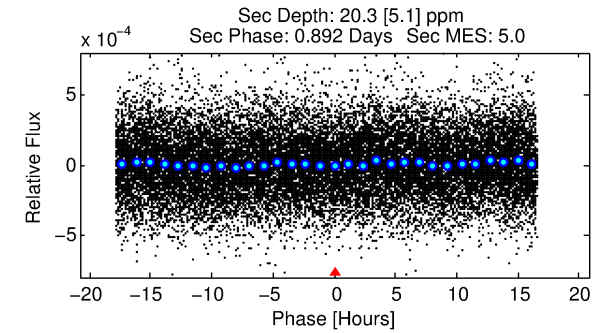
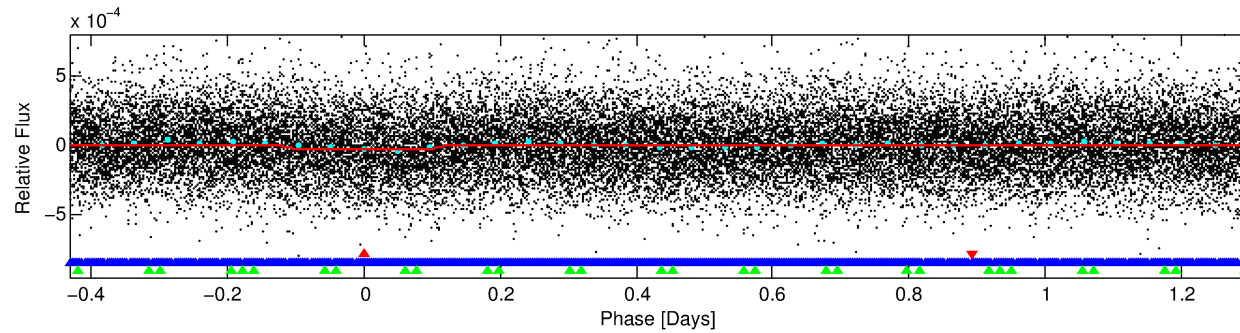
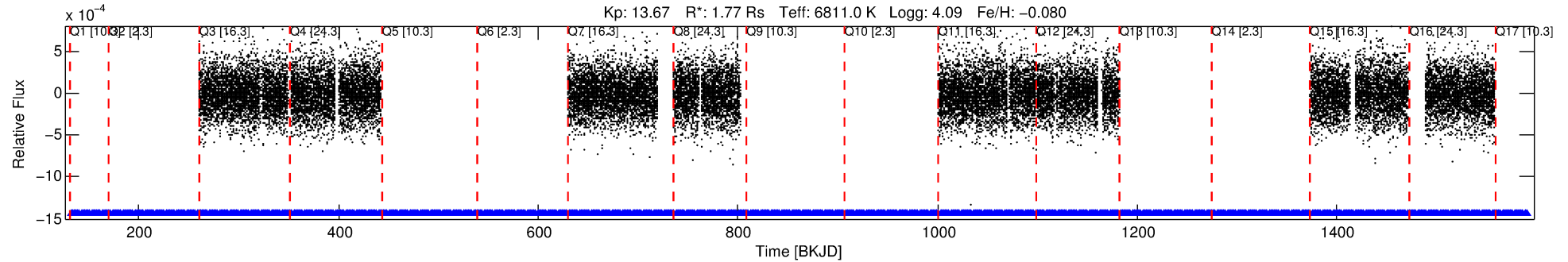
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002021100-01

No Significant Match Found

# DV One-Page Summary

KIC: 2021100 Candidate: 1 of 3 Period: 1.731 d



## DV Fit Results:

Period = 1.73140 [0.00003] d  
Epoch = 132.1457 [0.0081] BKJD  
Rp/R\* = 0.0058 [0.0027]  
a/R\* = 1.35 [1.71]  
b = 0.91 [0.52]  
Seff = 6014.39 [1580.68]  
Teq = 2246 [148] K  
Rp = 1.13 [0.56] Re  
a = 0.0317 [0.0052] AU  
Ag = 8.78 [8.71] [0.89σ]  
Teffp = 5976 [1435] K [2.59σ]

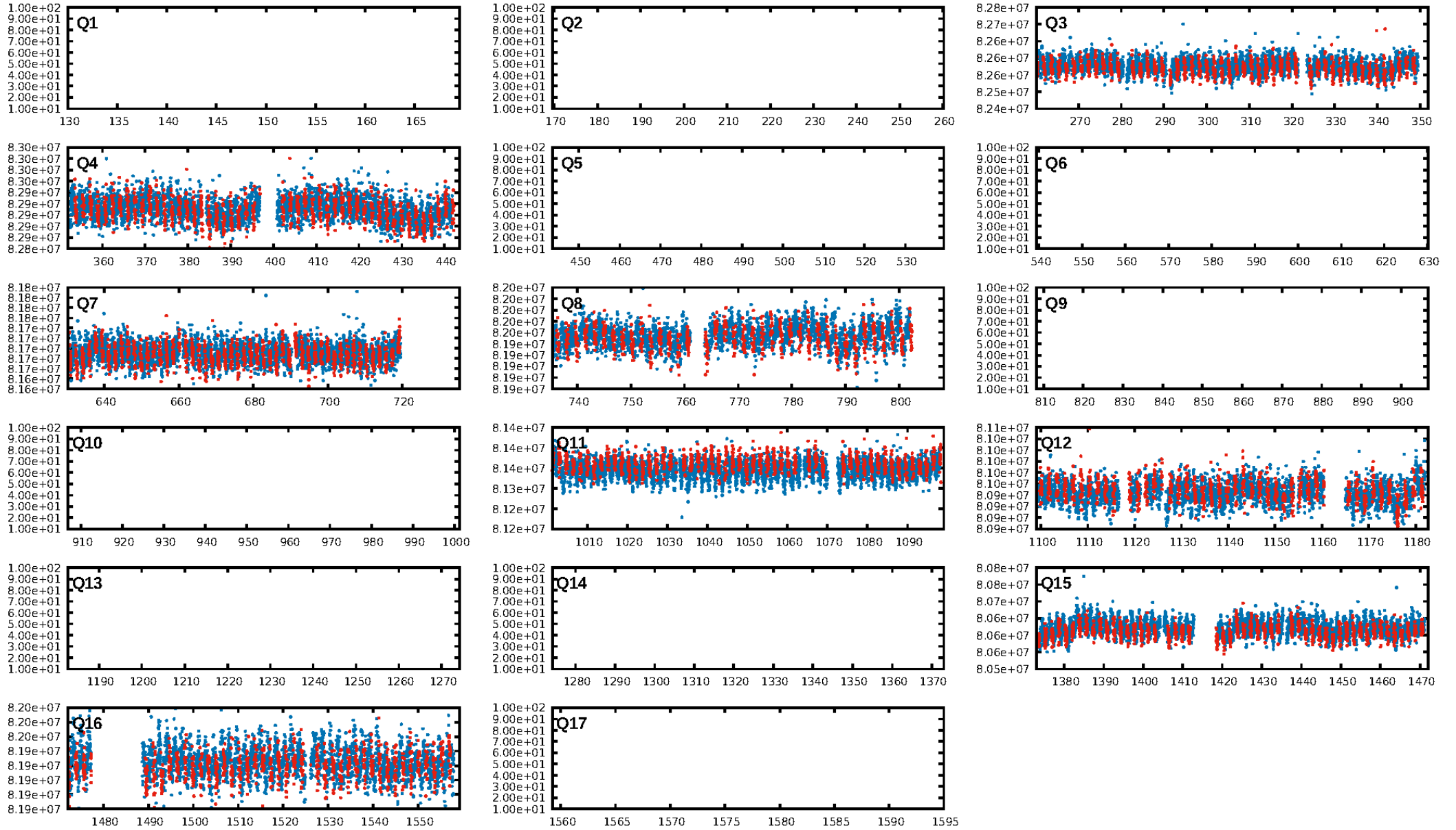
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.5% [0.01σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.69e-16  
RollingBand-fgt: 1.00 [378/378]  
GhostDiagnostic-chr: 2.163  
Centroid-sig: 0.0%  
Centroid-so: 5.336 arcsec [2.69σ]  
OotOffset-rm: 0.832 arcsec [2.29σ]  
KicOffset-rm: 0.333 arcsec [1.17σ]  
OotOffset-st: 0/4/4/0 [8]  
KicOffset-st: 0/4/4/0 [8]  
DiffImageQuality-fgm: 0.50 [4/8]  
DiffImageOverlap-fno: 0.38 [3/8]

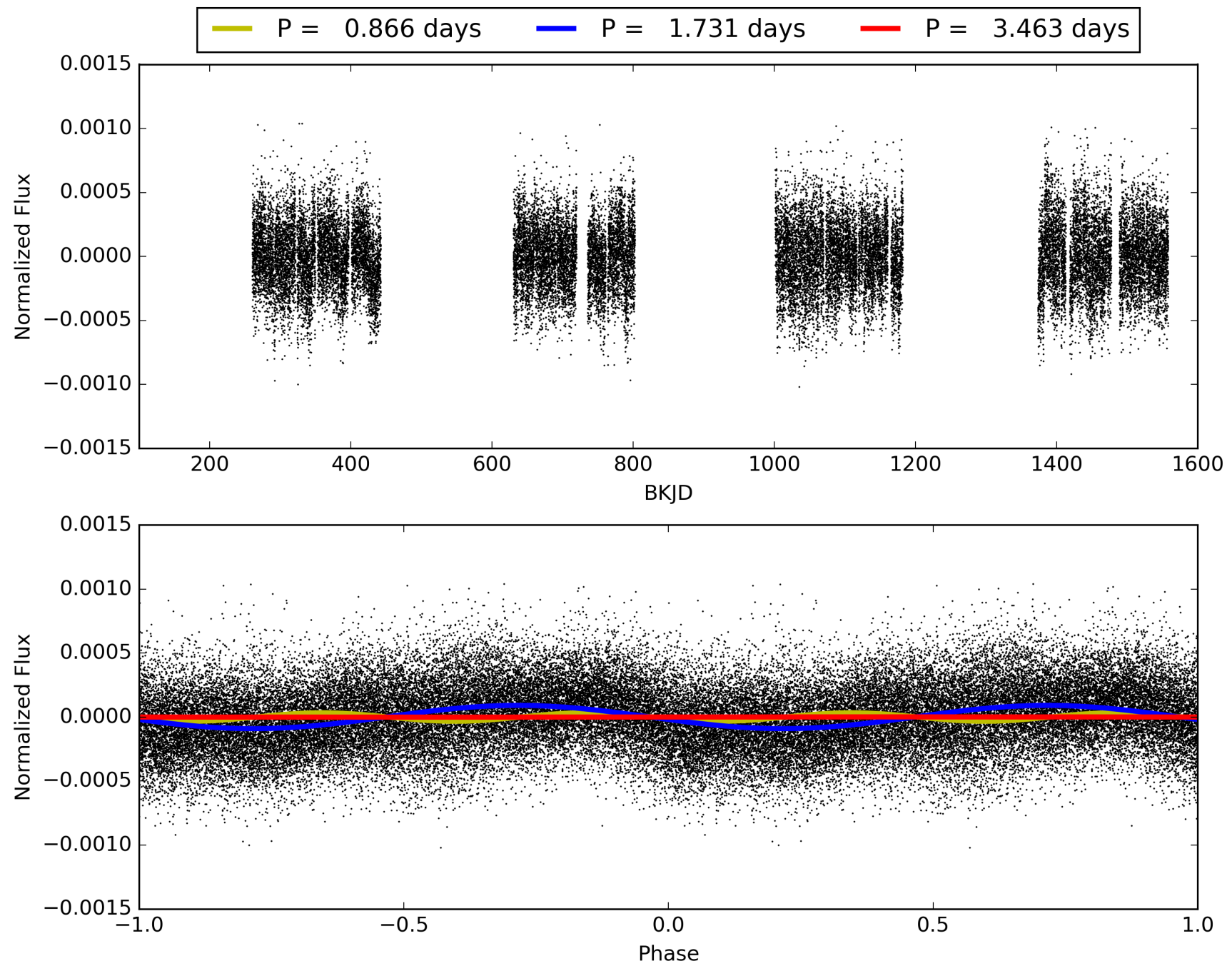
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 07:43:16 Z

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

# TCE 002021100-01, PDC Light Curves

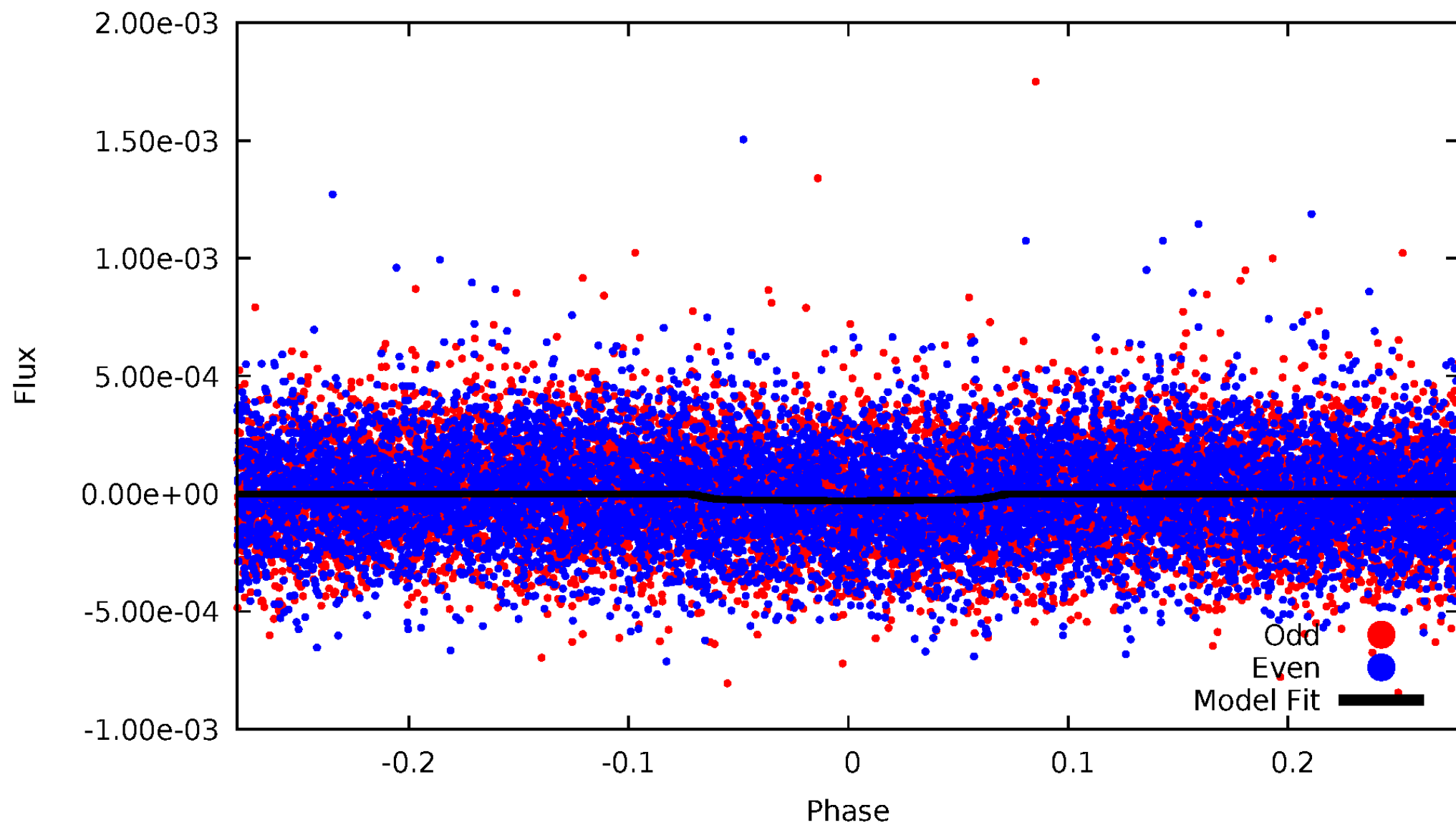


TCE 002021100-01



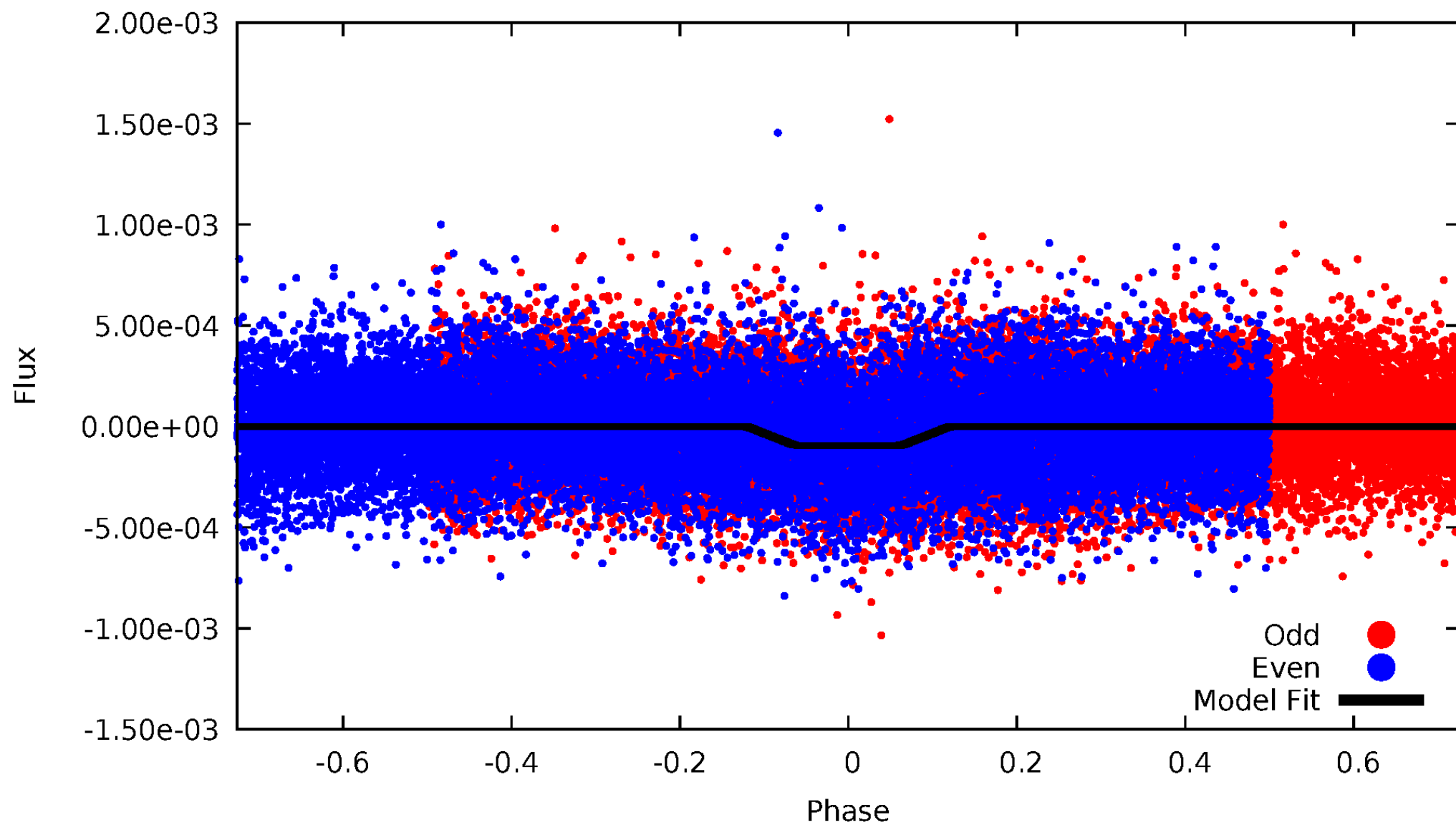
# DV Odd/Even

TCE 002021100-01



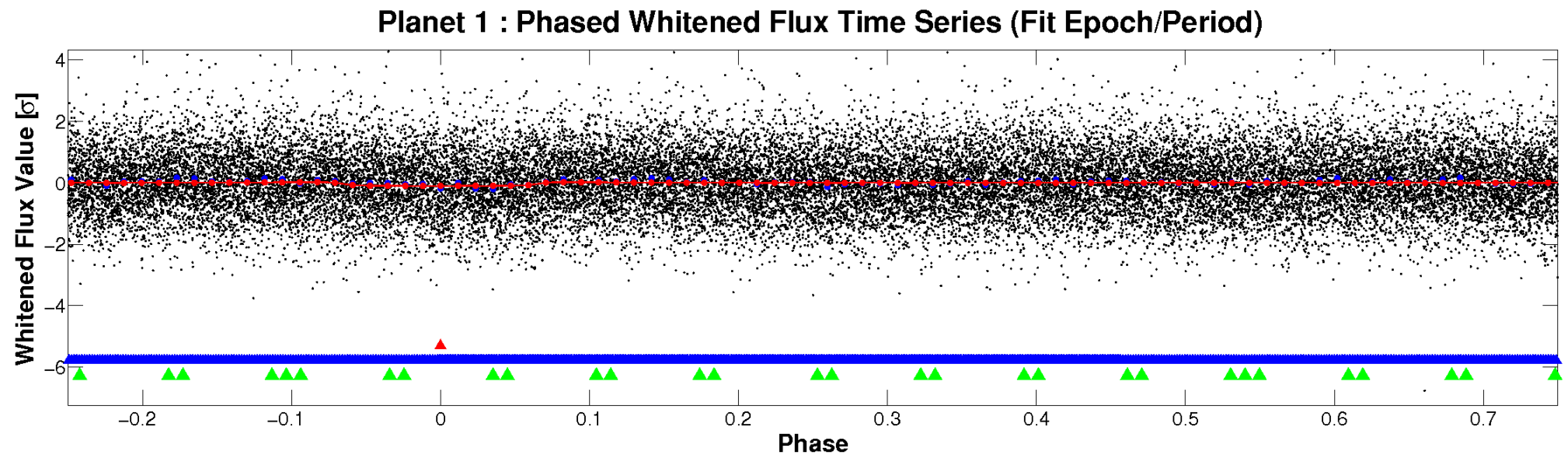
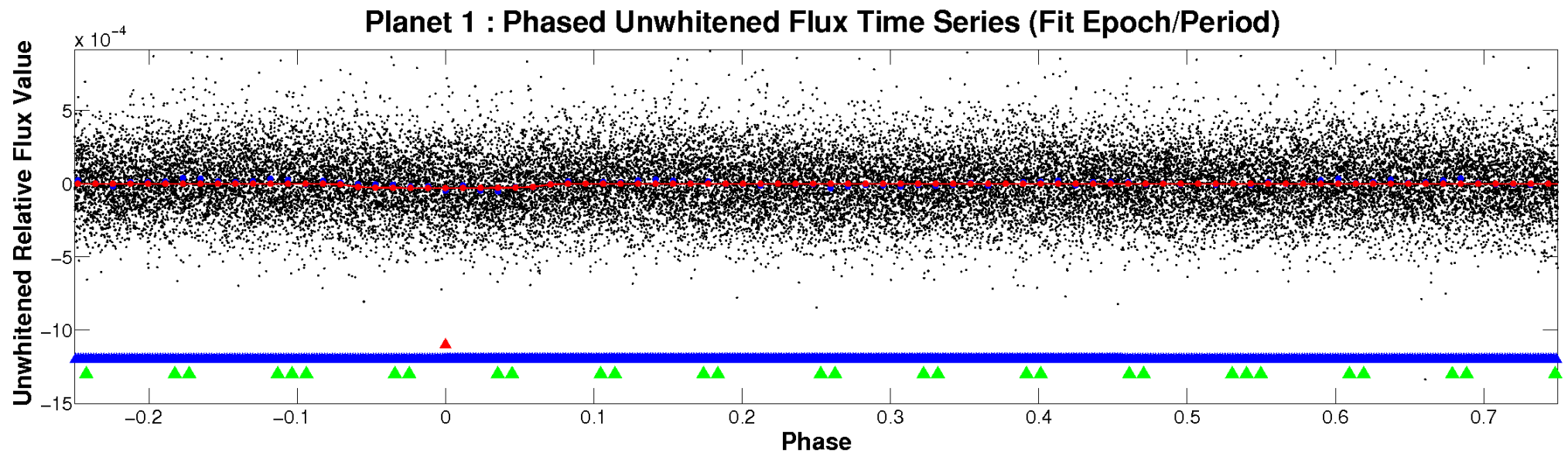
# ALT Odd/Even

TCE 002021100-01



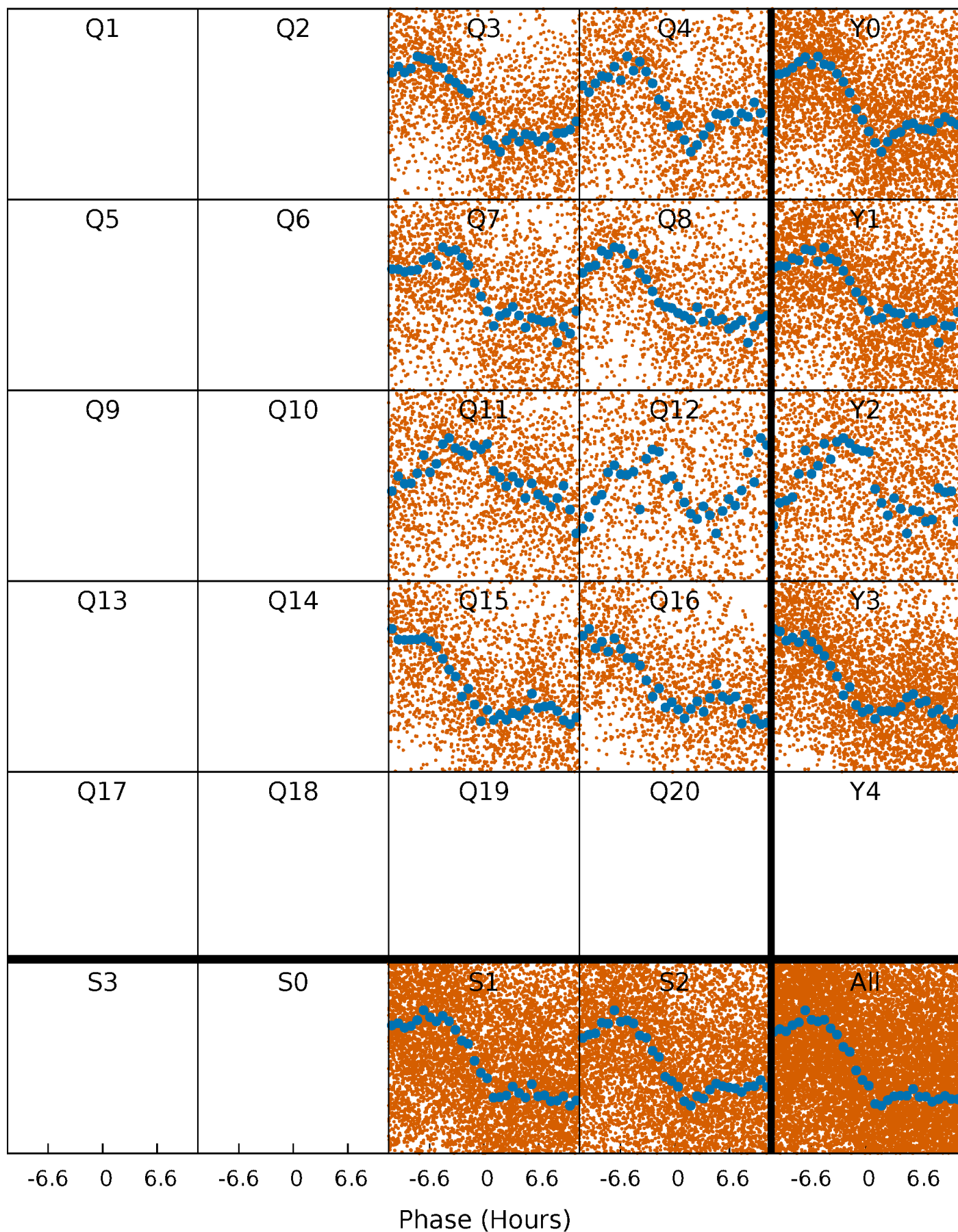


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

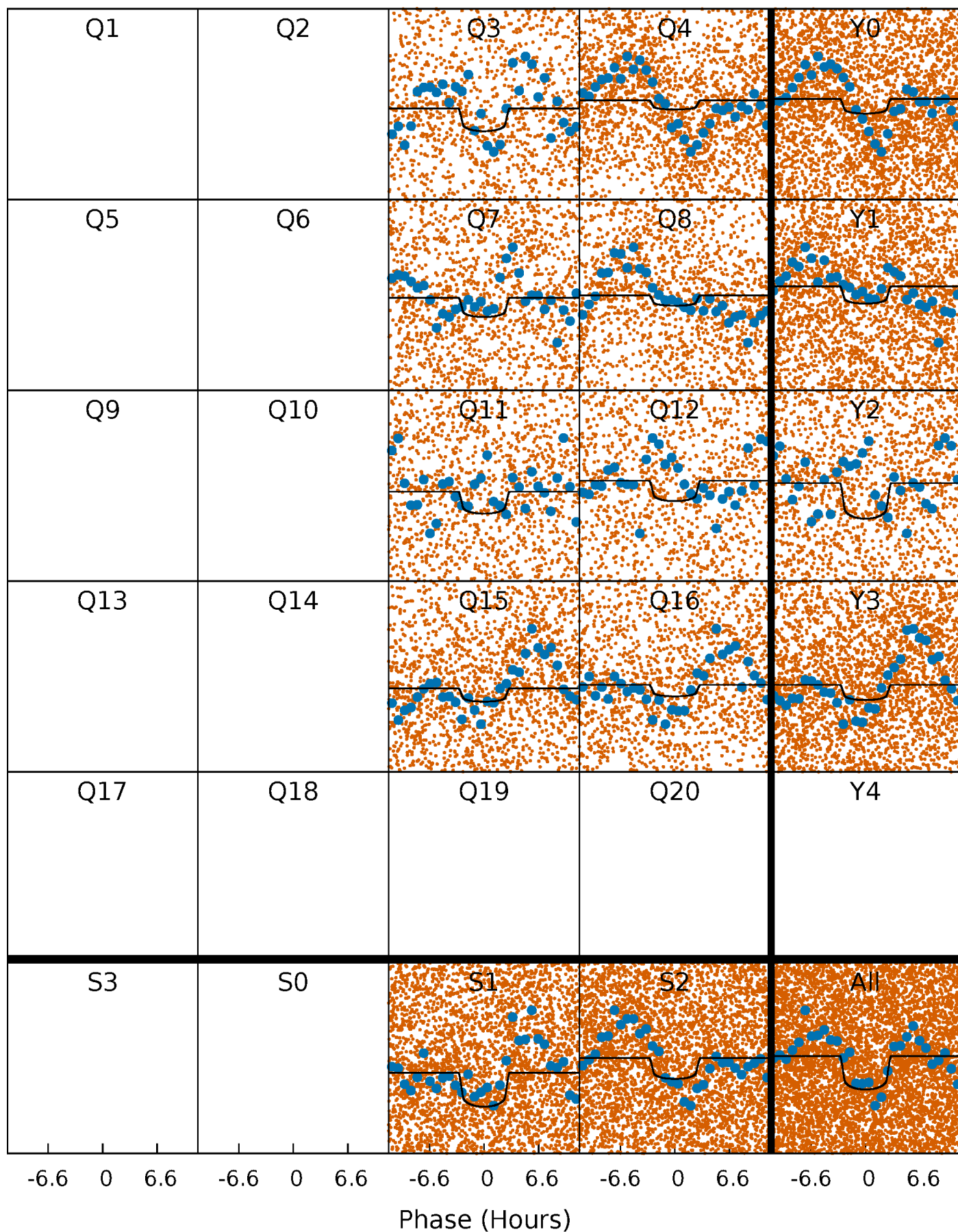
TCE 002021100-01   P= 1.731396 Days    $T_0=132.145676$  (BKJD)





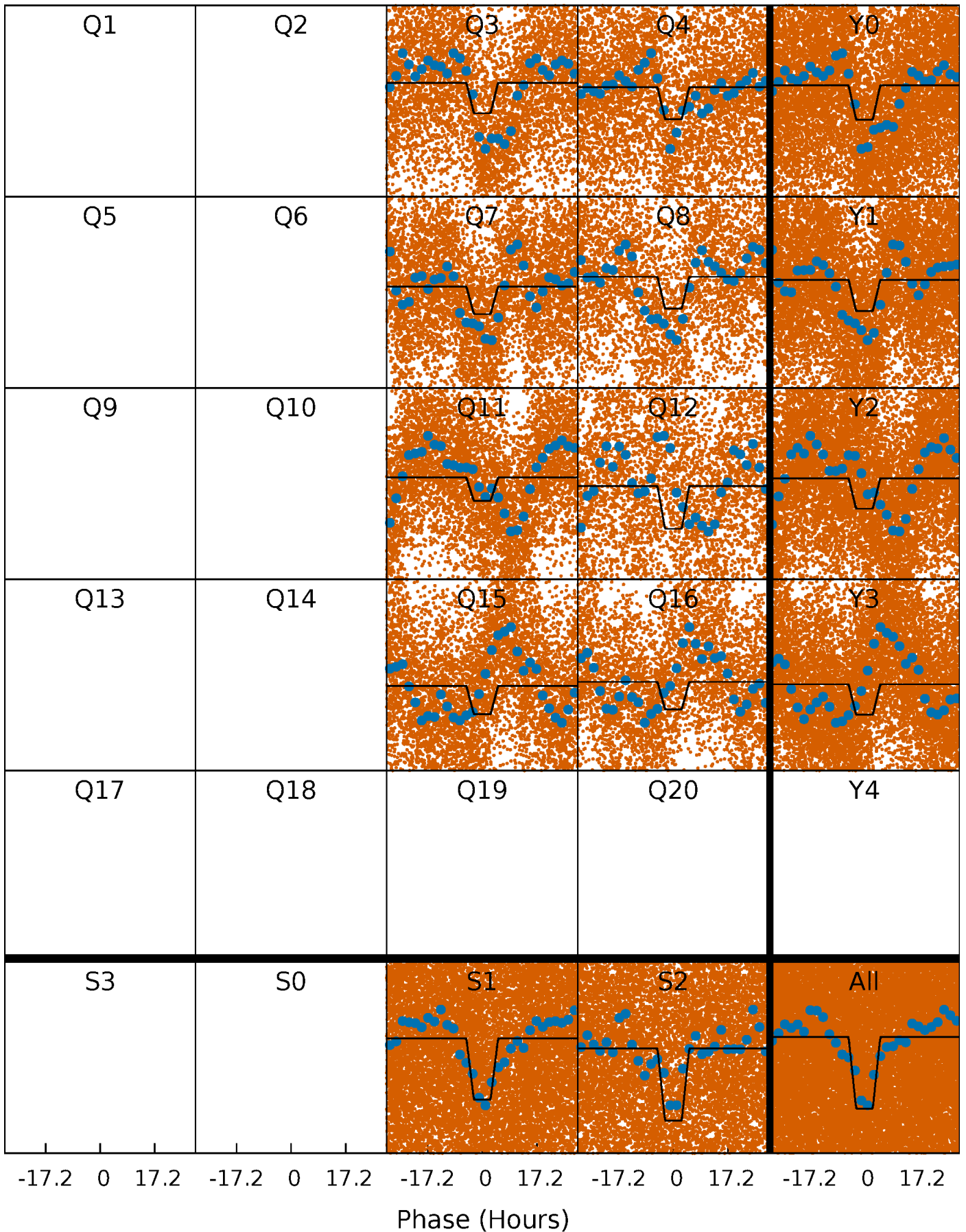
# DV Quarter-Phased Transit Curves

TCE 002021100-01 P= 1.731396 Days  $T_0=132.145676$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

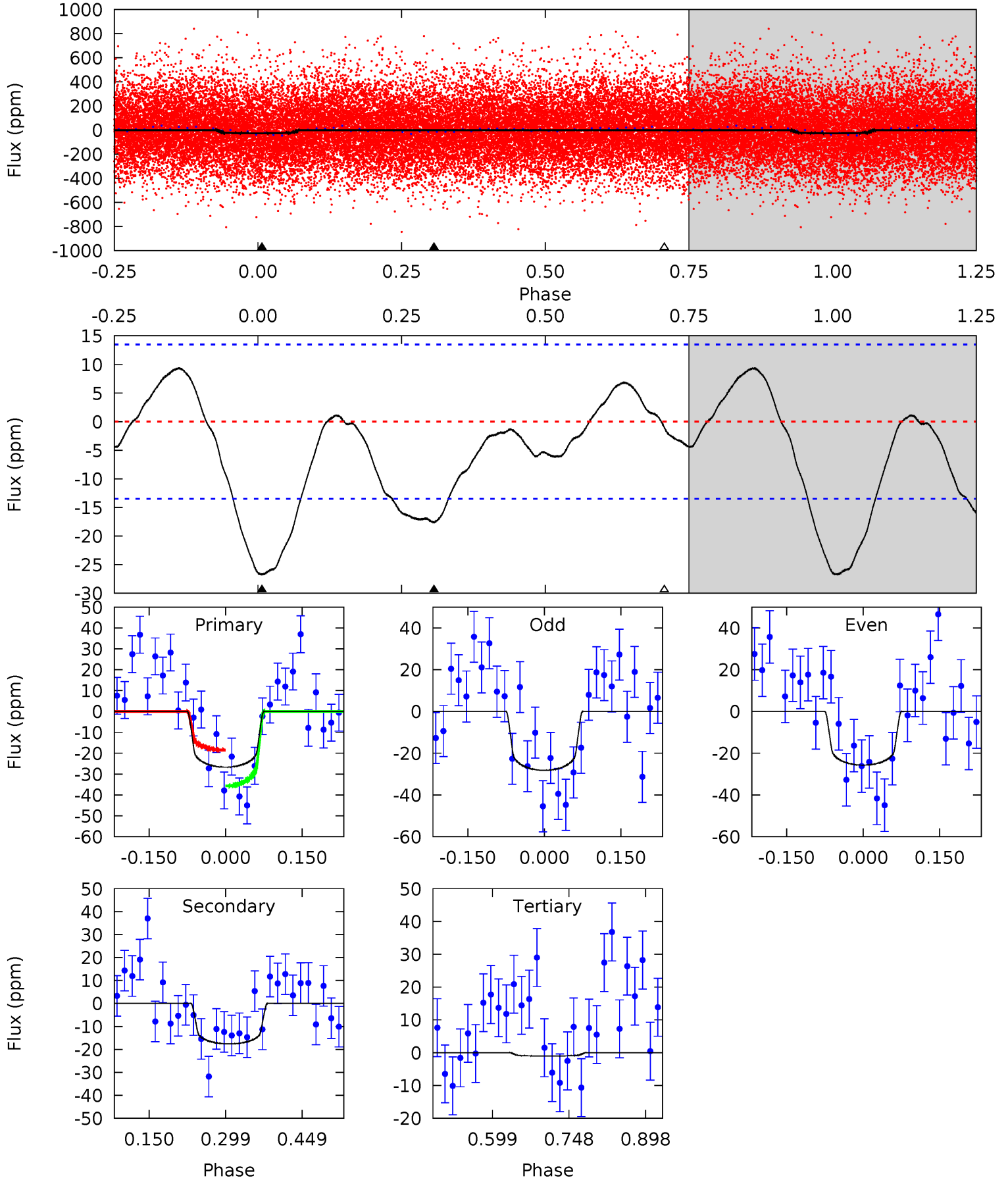
TCE 002021100-01 P= 1.732548 Days  $T_0=132.069717$  (BKJD)



# DV Model-Shift Uniqueness Test

002021100-01, P = 1.731396 Days, E = 132.145676 Days

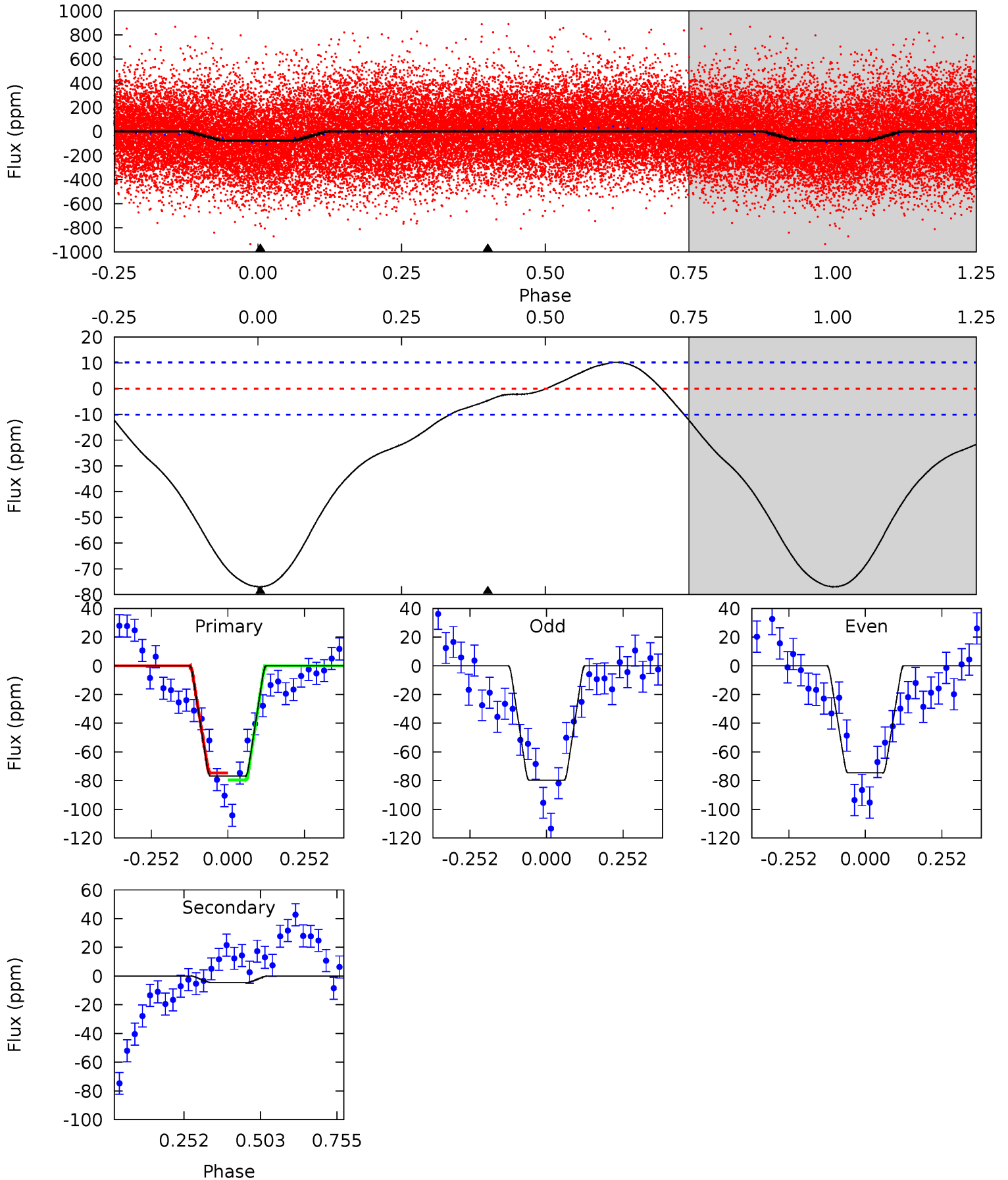
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.87	5.85	0.34	0	4.48	1.44	1.51	8.53	8.87	5.50	5.85	0.42	0.90	0.26	2.86



# Alt Model-Shift Uniqueness Test

002021100-01, P = 1.732548 Days, E = 132.069717 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
33.1	1.99	0	0	4.37	1.15	2.82	33.1	33.1	1.99	1.99	1.09	0.89	0.12	0.97



### Stellar Parameters For KIC 002021100

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6811^{+71}_{-91}$	$4.093^{+0.150}_{-0.100}$	$-0.080^{+0.150}_{-0.150}$	$1.770^{+0.274}_{-0.305}$	$1.421^{+0.092}_{-0.115}$	$0.361^{+0.242}_{-0.124}$
	+1%/-1%	+4%/-2%	+188%/-188%	+15%/-17%	+6%/-8%	+67%/-34%
Source	SPE68	SPE68	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 002021100-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-18 \pm 3$	$1.10^{+0.58}_{-0.46}$	$3128^{+130}_{-157}$	$5723^{+1864}_{-1010}$	$8.177^{+15.568}_{-4.913}$
Alt.	$-5 \pm 2$	$1.83^{+0.57}_{-0.53}$	$3118^{+138}_{-153}$	$3299^{+688}_{-1178}$	$0.718^{+0.921}_{-0.405}$

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



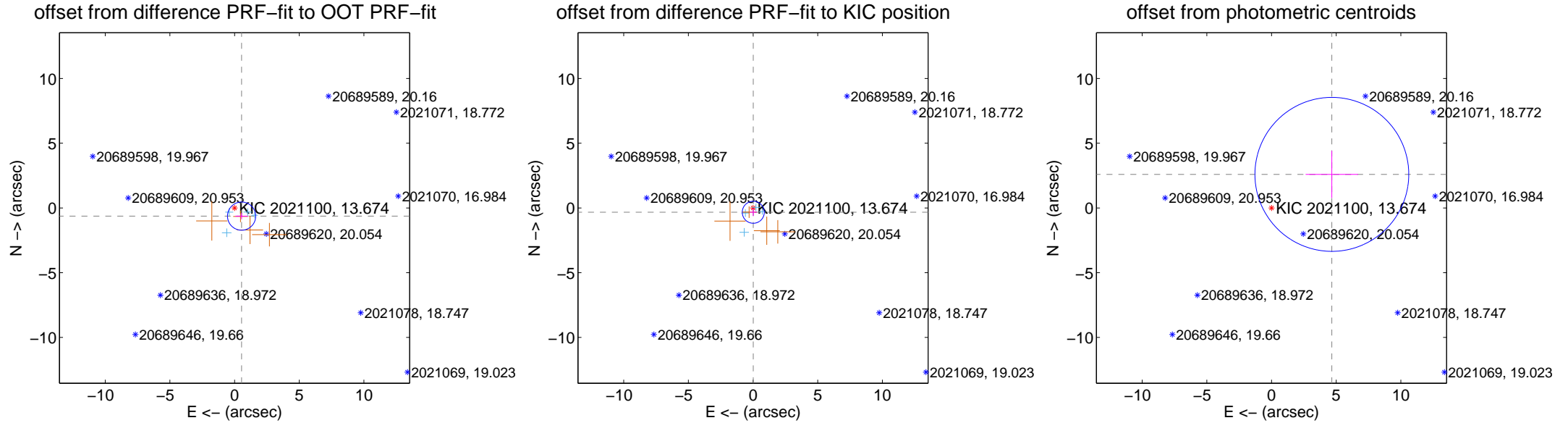
## DV Centroid Data

Supplemental centroid analysis for 002021100-01. Kepler magnitude: 13.67. Transit SNR 5.96

There are 4 quarters with good PRF difference image offsets

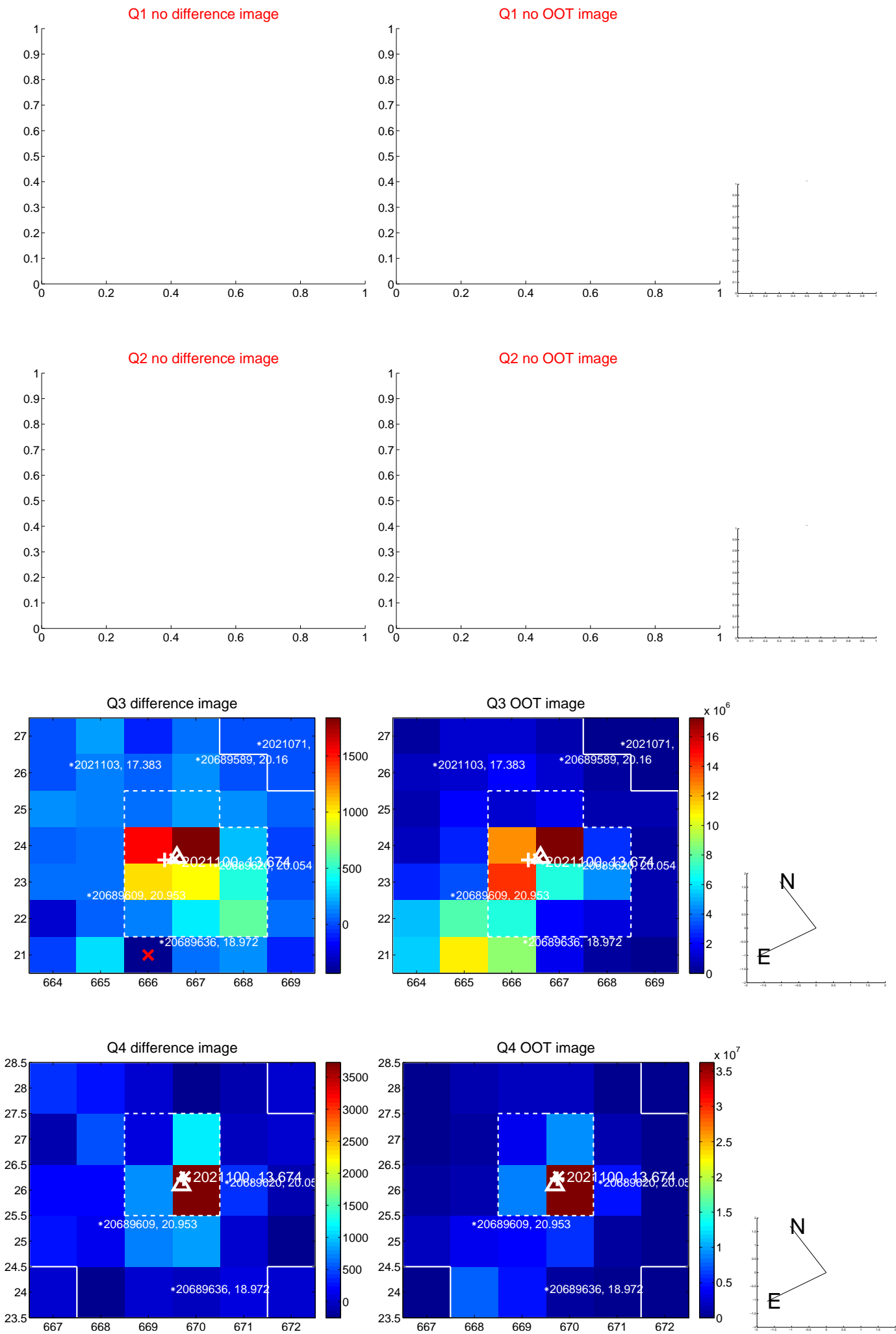
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.832 \pm 0.363$	2.29	$-0.543 \pm 0.491$	$-0.630 \pm 0.244$
PRF-fit source offset from KIC position	$0.333 \pm 0.283$	1.17	$-0.018 \pm 0.287$	$-0.332 \pm 0.283$
photometric centroid source offset	$5.34 \pm 1.98$	2.69	$-4.66 \pm 2.03$	$2.59 \pm 1.82$

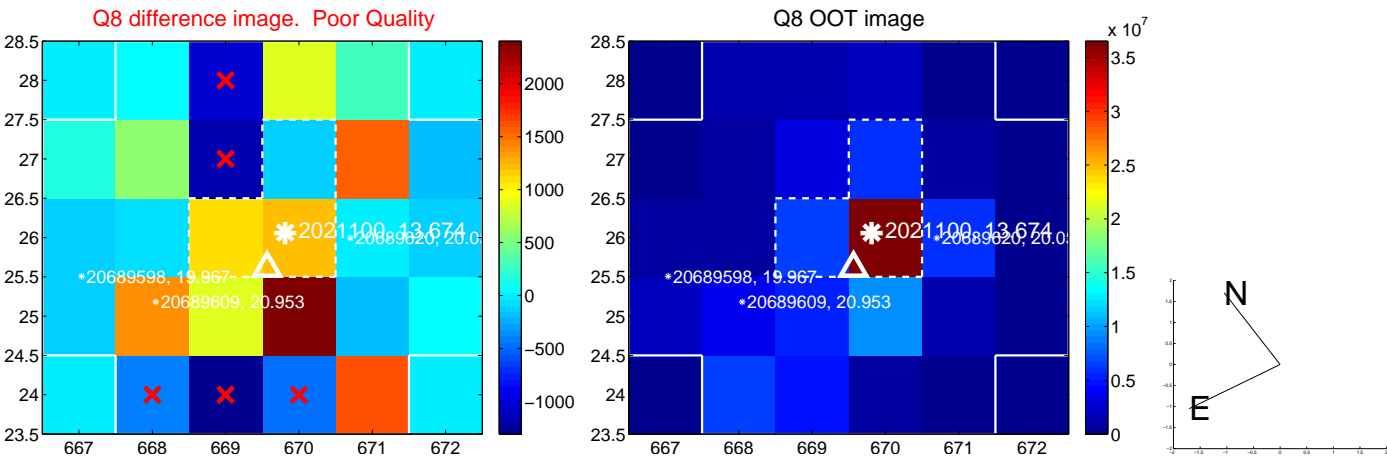
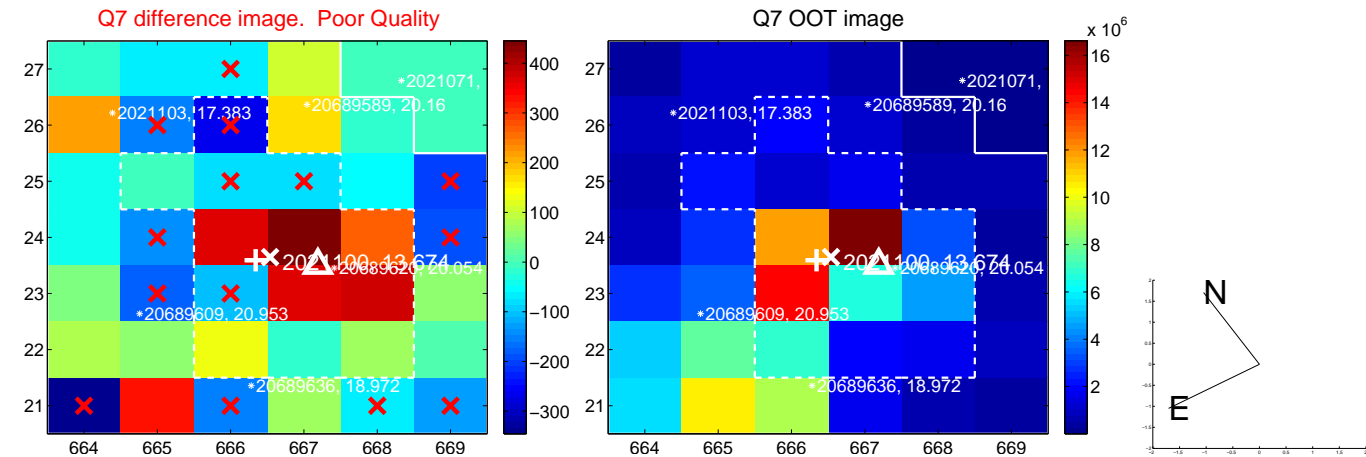
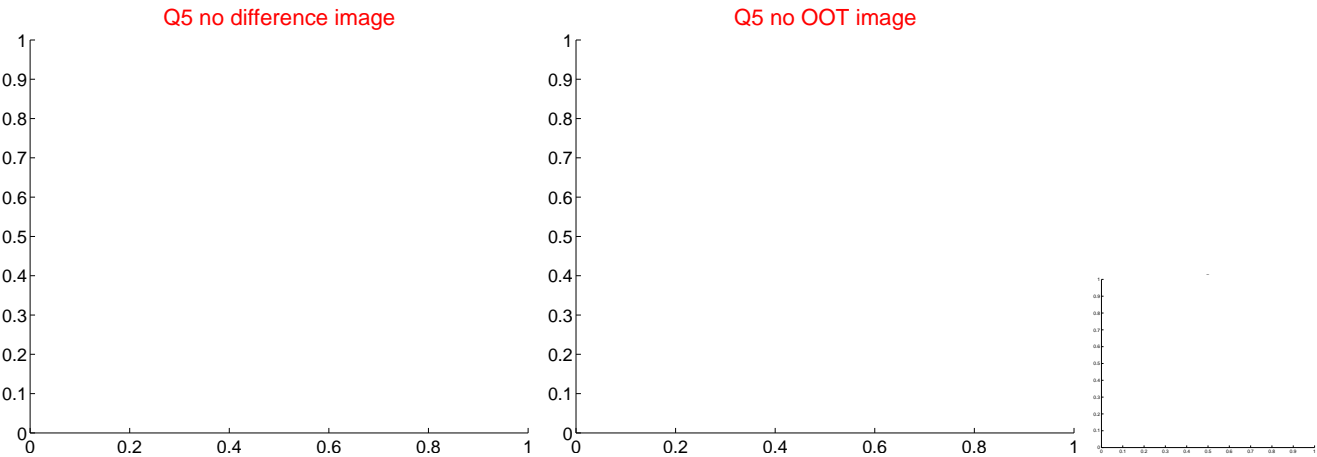


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

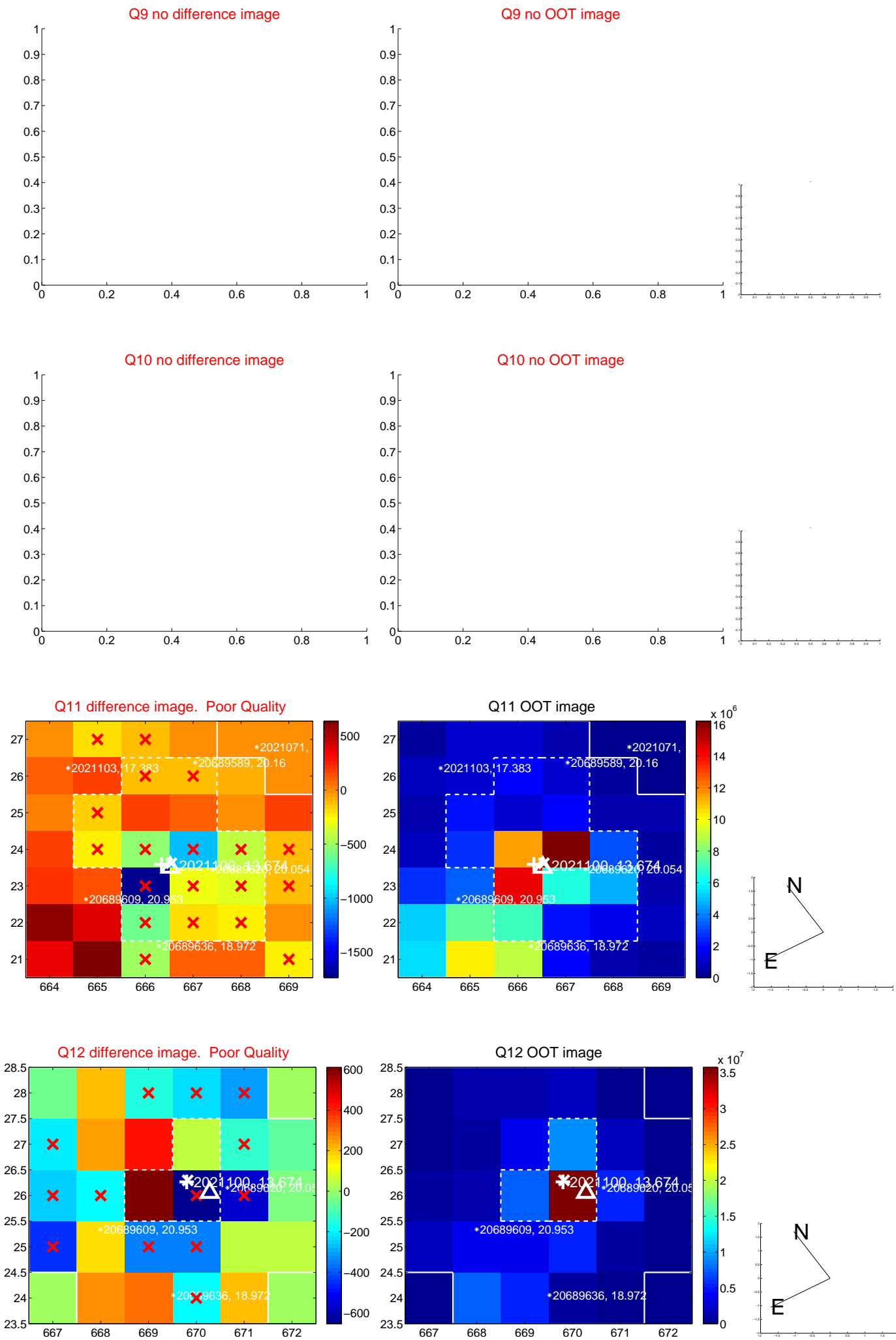
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



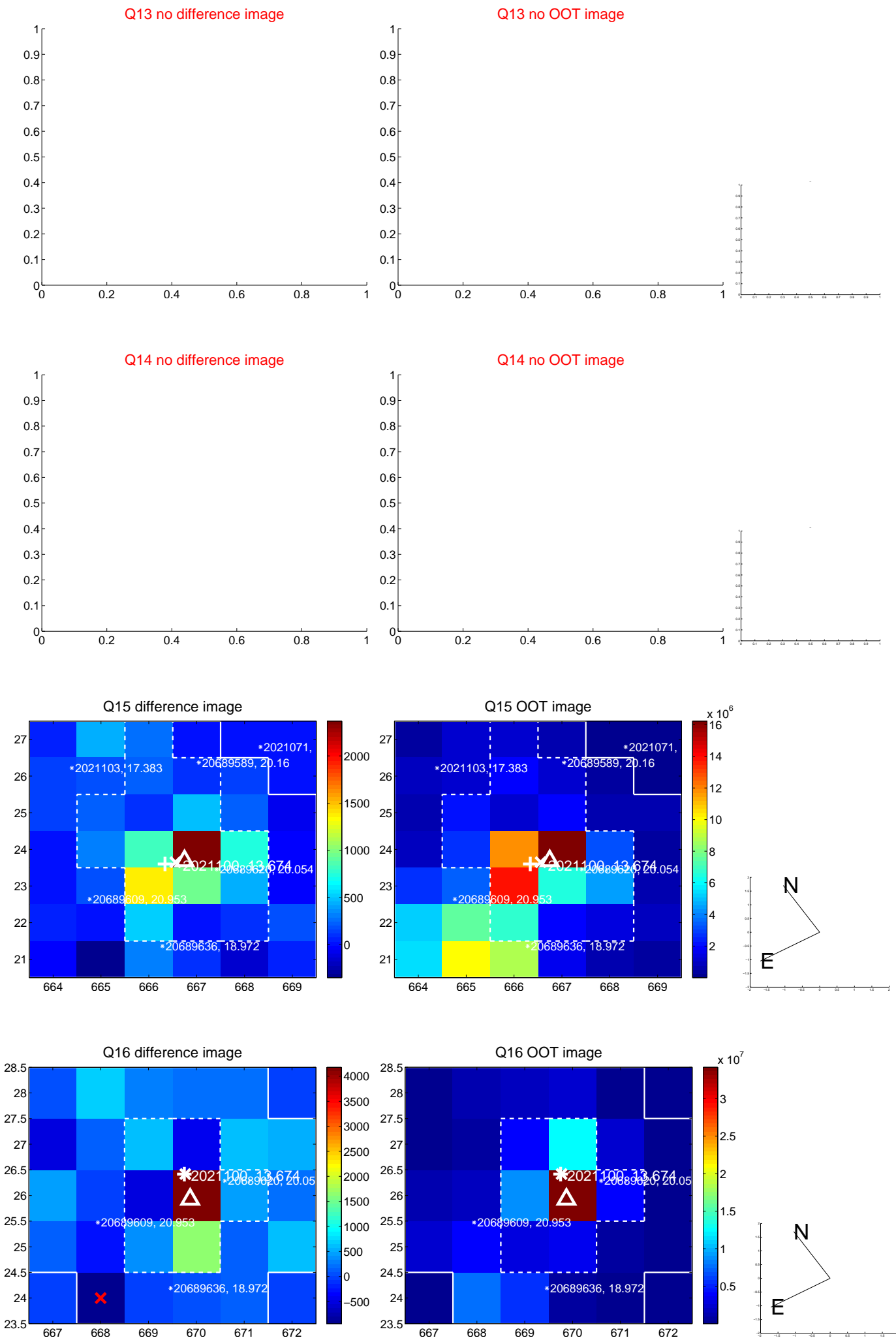
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

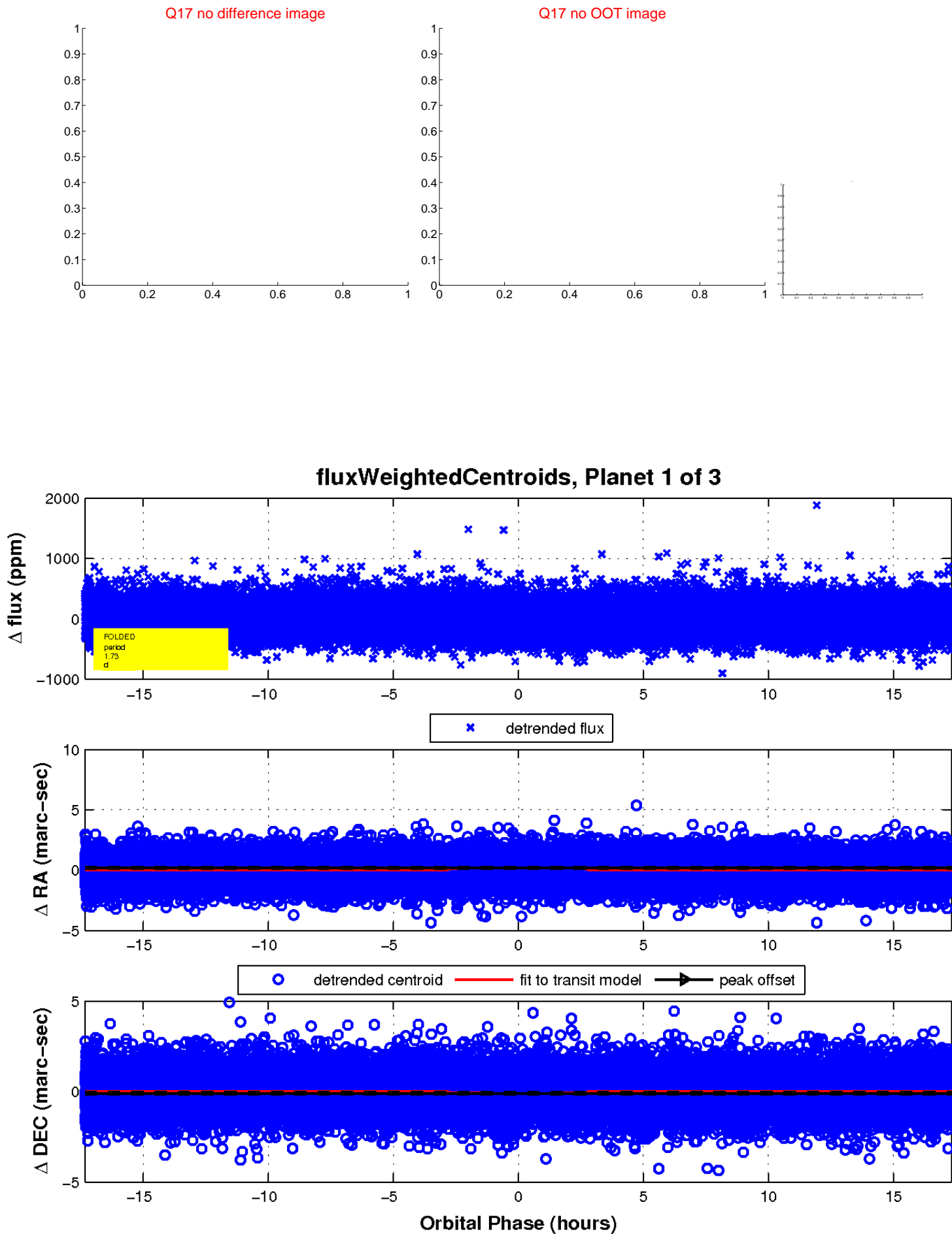


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

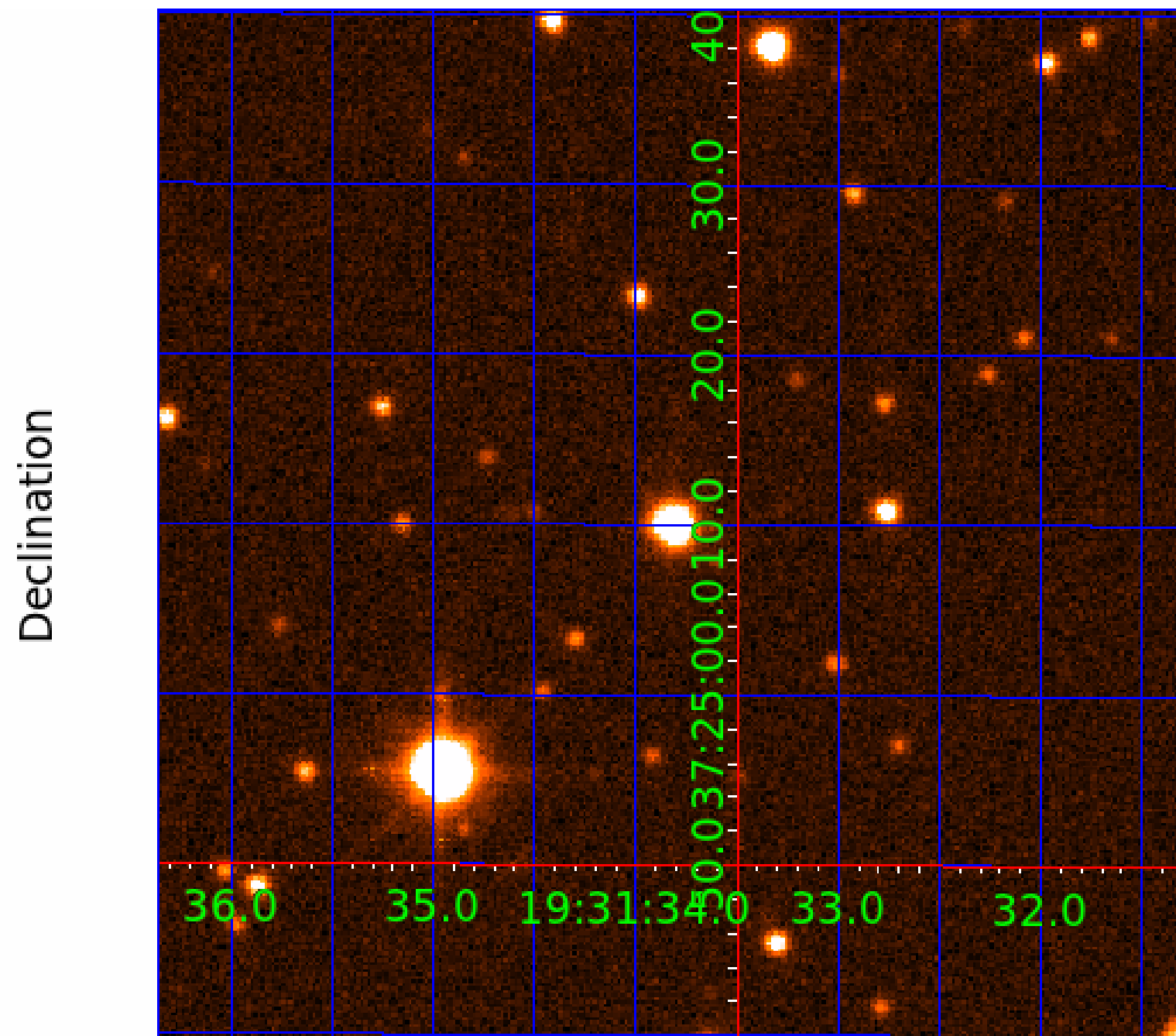




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image



# KIC 002021100

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002021100-01	OBS	No	1.731396	132.145676	29.5	5.775	8.1	6.0	1.77	6811	1.13	6014.39
002021100-02	OBS	No	1.734392	132.144690	42.9	9.043	9.1	8.6	1.77	6811	1.34	6000.54

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002021100-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_KIC_POS
002021100-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT

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

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

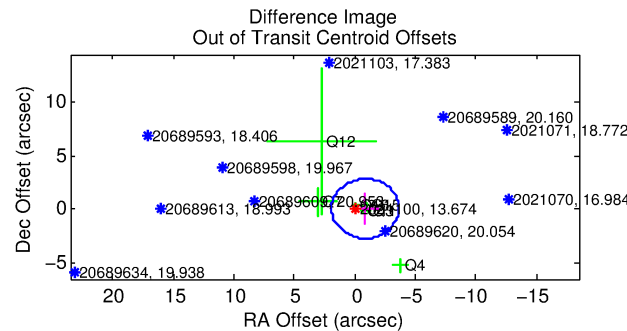
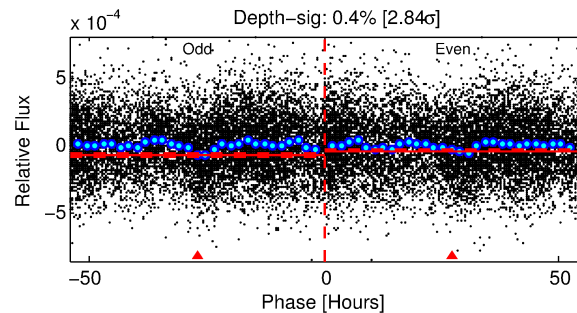
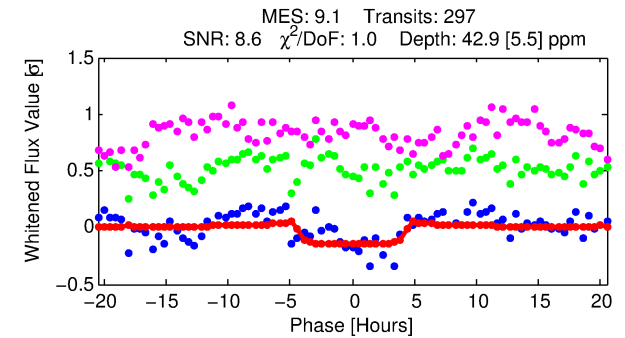
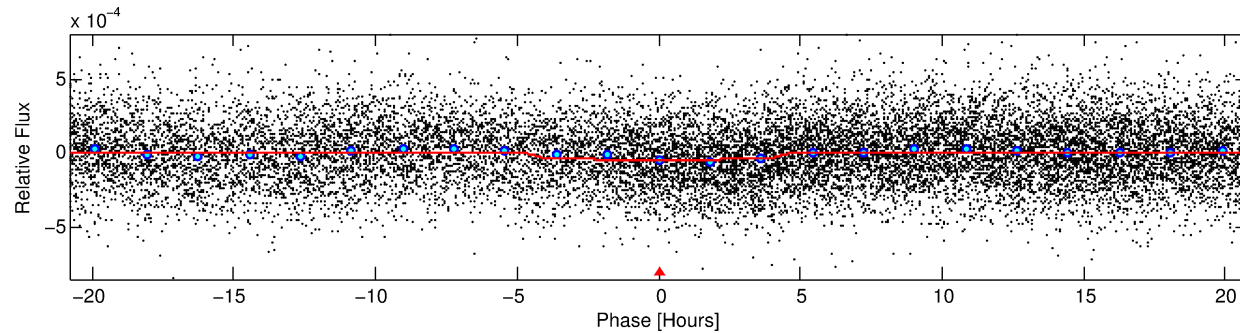
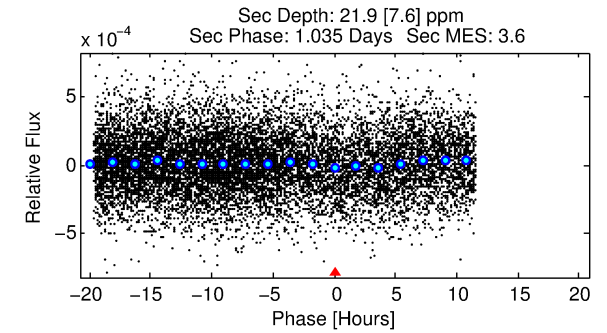
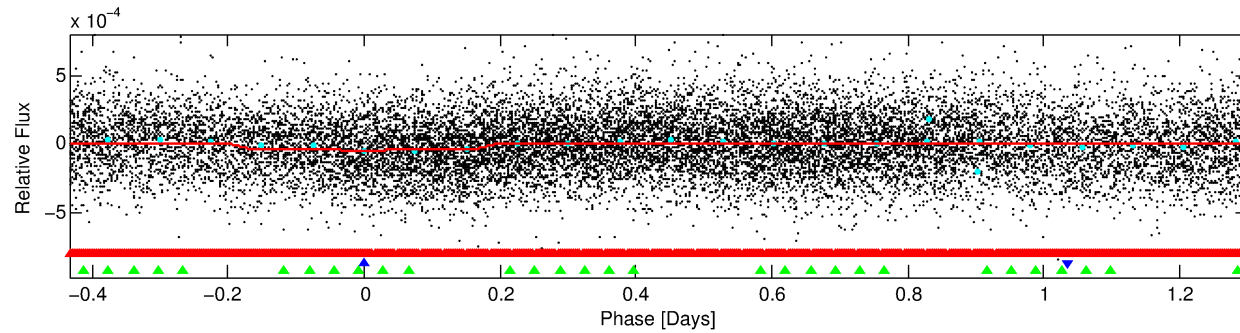
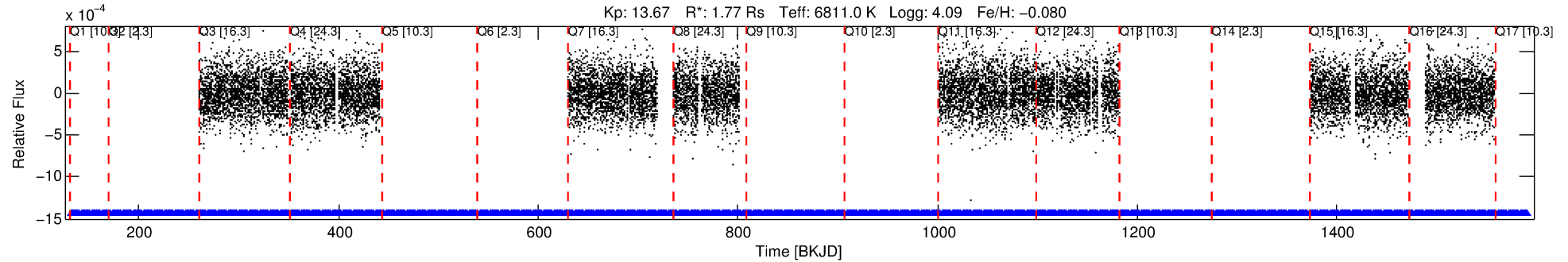
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002021100-02

No Significant Match Found

# DV One-Page Summary

KIC: 2021100 Candidate: 2 of 3 Period: 1.734 d



## DV Fit Results:

Period = 1.73439 [0.00003] d  
Epoch = 132.1447 [0.0086] BKJD  
Rp/R\* = 0.0070 [0.0021]  
a/R\* = 1.16 [0.53]  
b = 0.89 [0.41]  
Seff = 6000.54 [1577.03]  
Teq = 2244 [147] K  
Rp = 1.34 [0.47] Re  
a = 0.0317 [0.0052] AU  
Ag = 6.70 [4.99] [1.14σ]  
Teffp = 5583 [978] K [3.38σ]

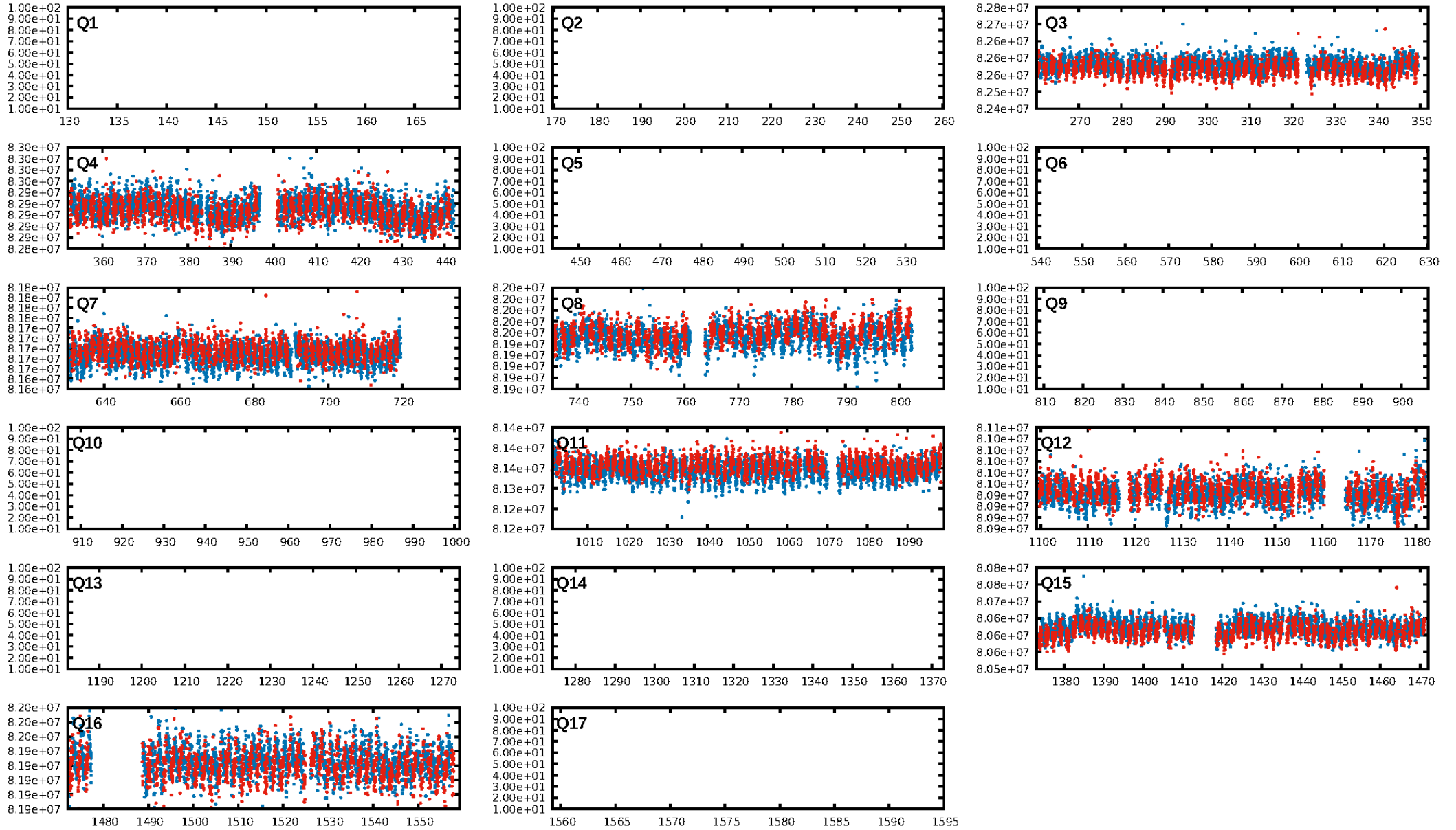
## DV Diagnostic Results:

ShortPeriod-sig: 0.5% [0.01σ]  
LongPeriod-sig: 100.0% [117.36σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.72e-22  
RollingBand-fgt: 1.00 [297/297]  
GhostDiagnostic-chr: 1.213  
Centroid-sig: 61.3%  
Centroid-so: 1.372 arcsec [1.24σ]  
OotOffset-rm: 0.838 arcsec [0.90σ]  
OotOffset-st: 0/4/3/0 [7]  
KicOffset-rm: 0.381 arcsec [0.39σ]  
KicOffset-st: 0/4/3/0 [7]  
DiffImageQuality-fgm: 0.43 [3/7]  
DiffImageOverlap-fno: 0.12 [1/8]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 07:43:26 Z

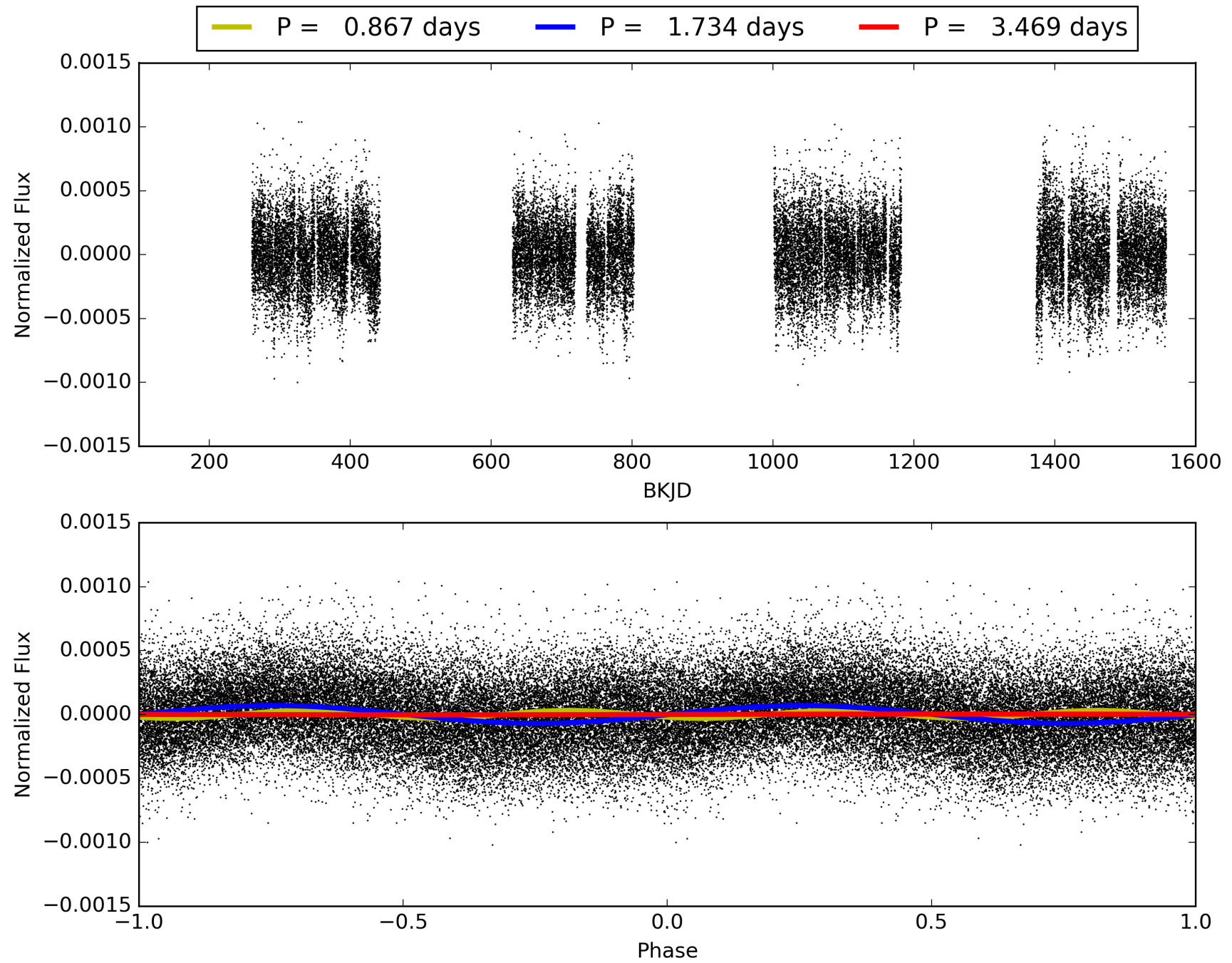
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 002021100-02, PDC Light Curves



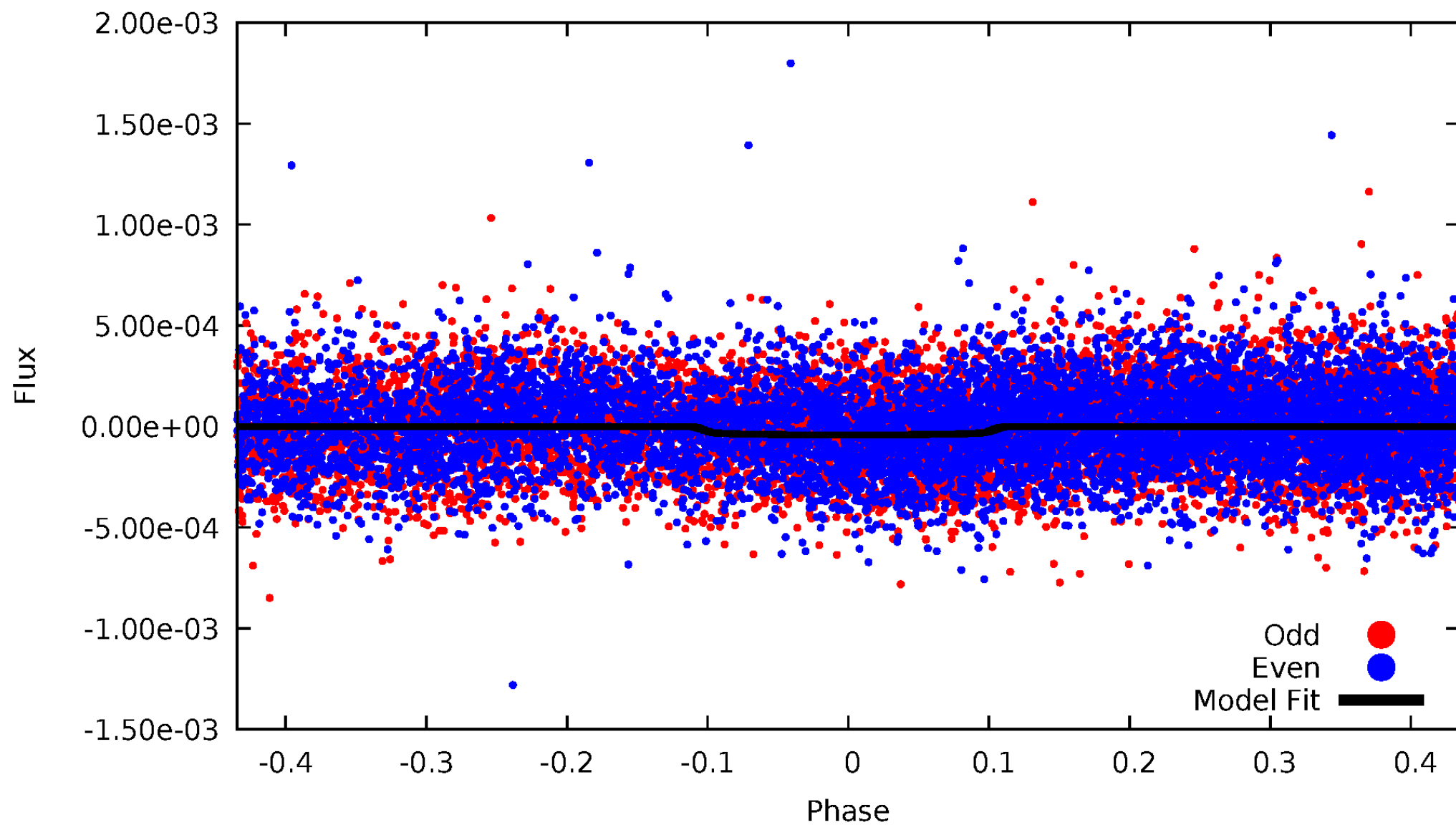


TCE 002021100-02



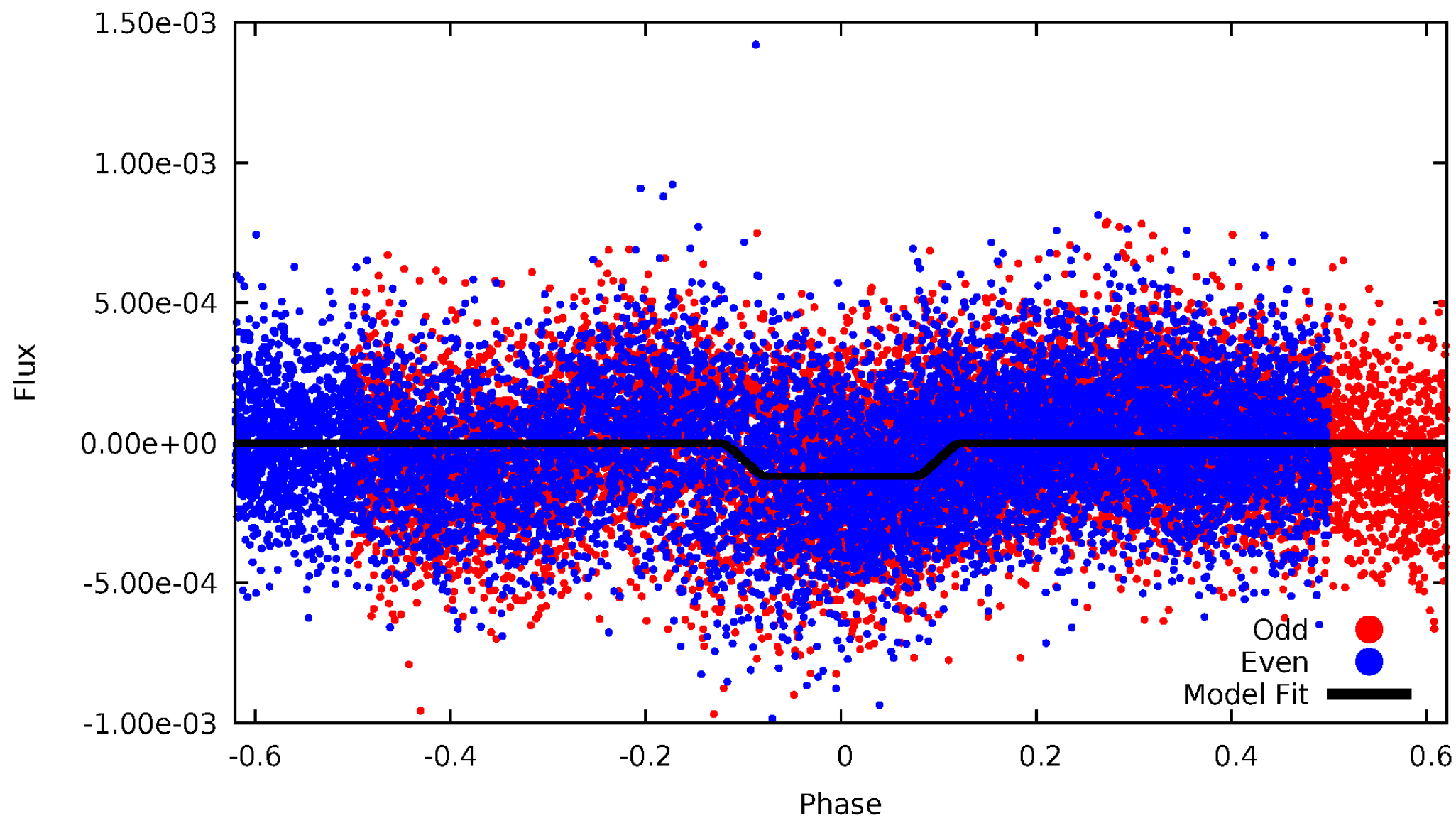
# DV Odd/Even

TCE 002021100-02



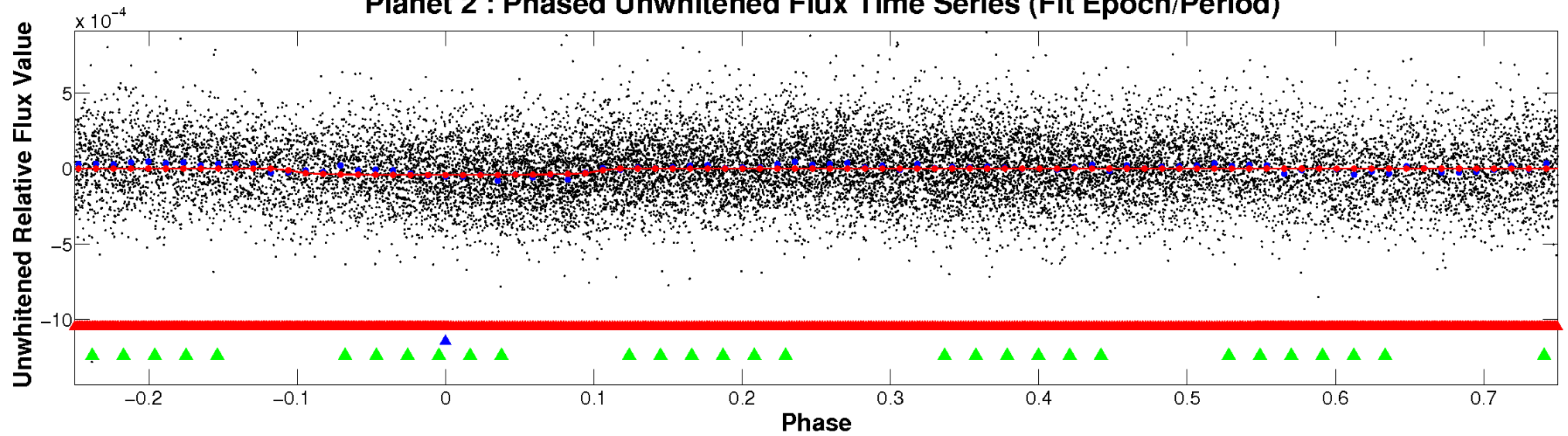
# ALT Odd/Even

TCE 002021100-02

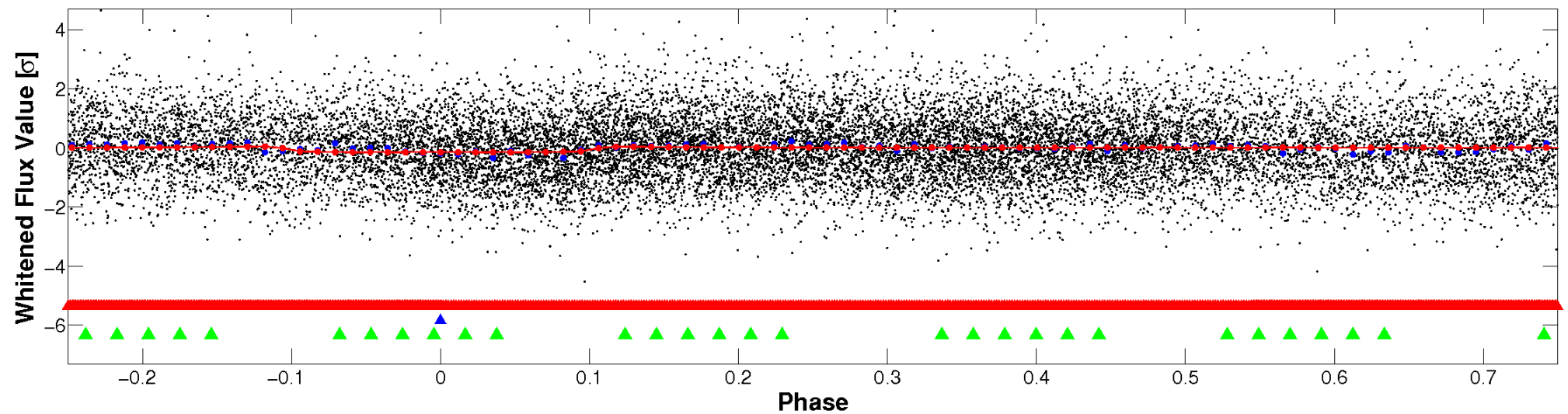


# Non-Whitened Vs. Whitened Light Curve

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

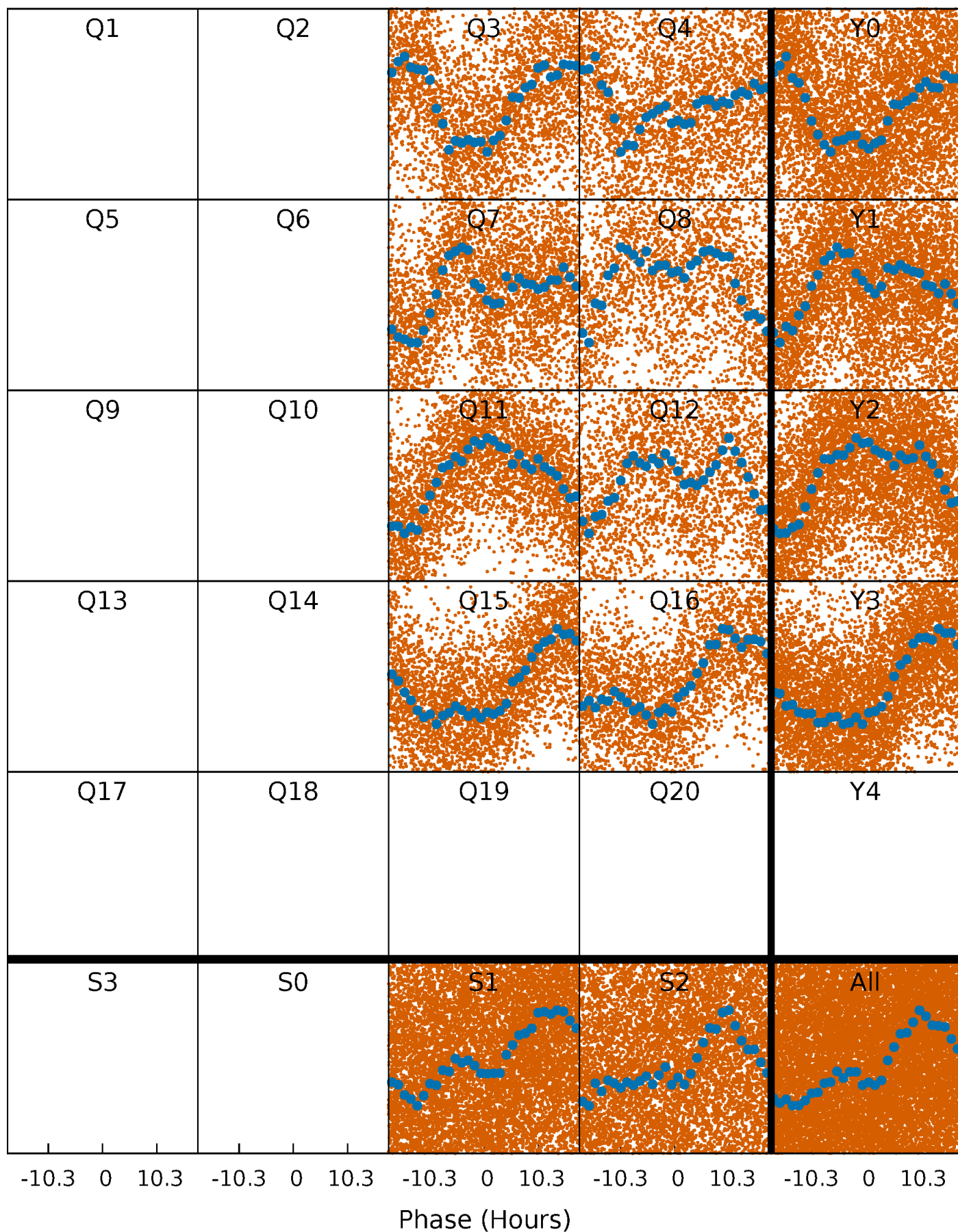


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

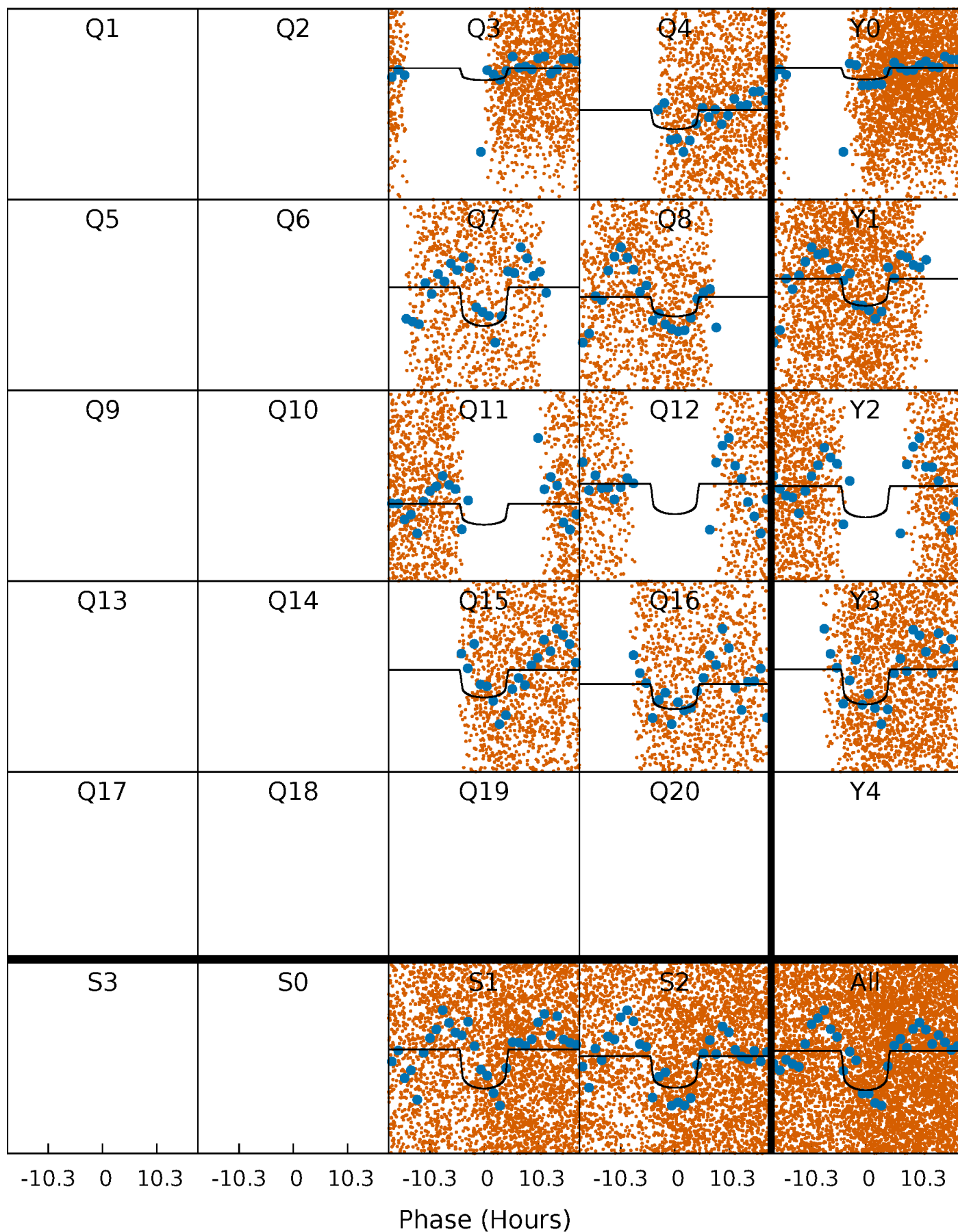
TCE 002021100-02 P= 1.734392 Days  $T_0=132.144690$  (BKJD)





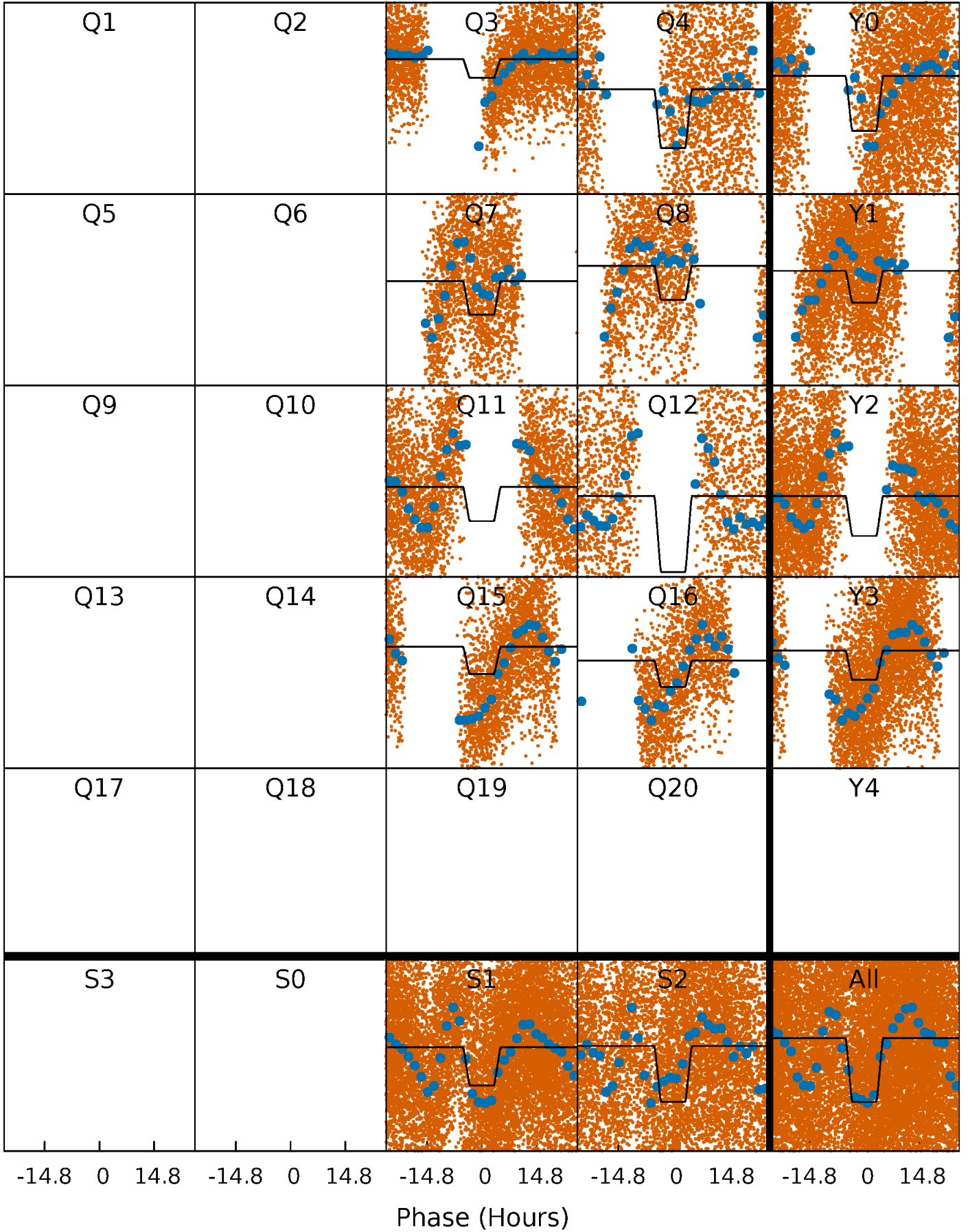
# DV Quarter-Phased Transit Curves

TCE 002021100-02   P= 1.734392 Days    $T_0=132.144690$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

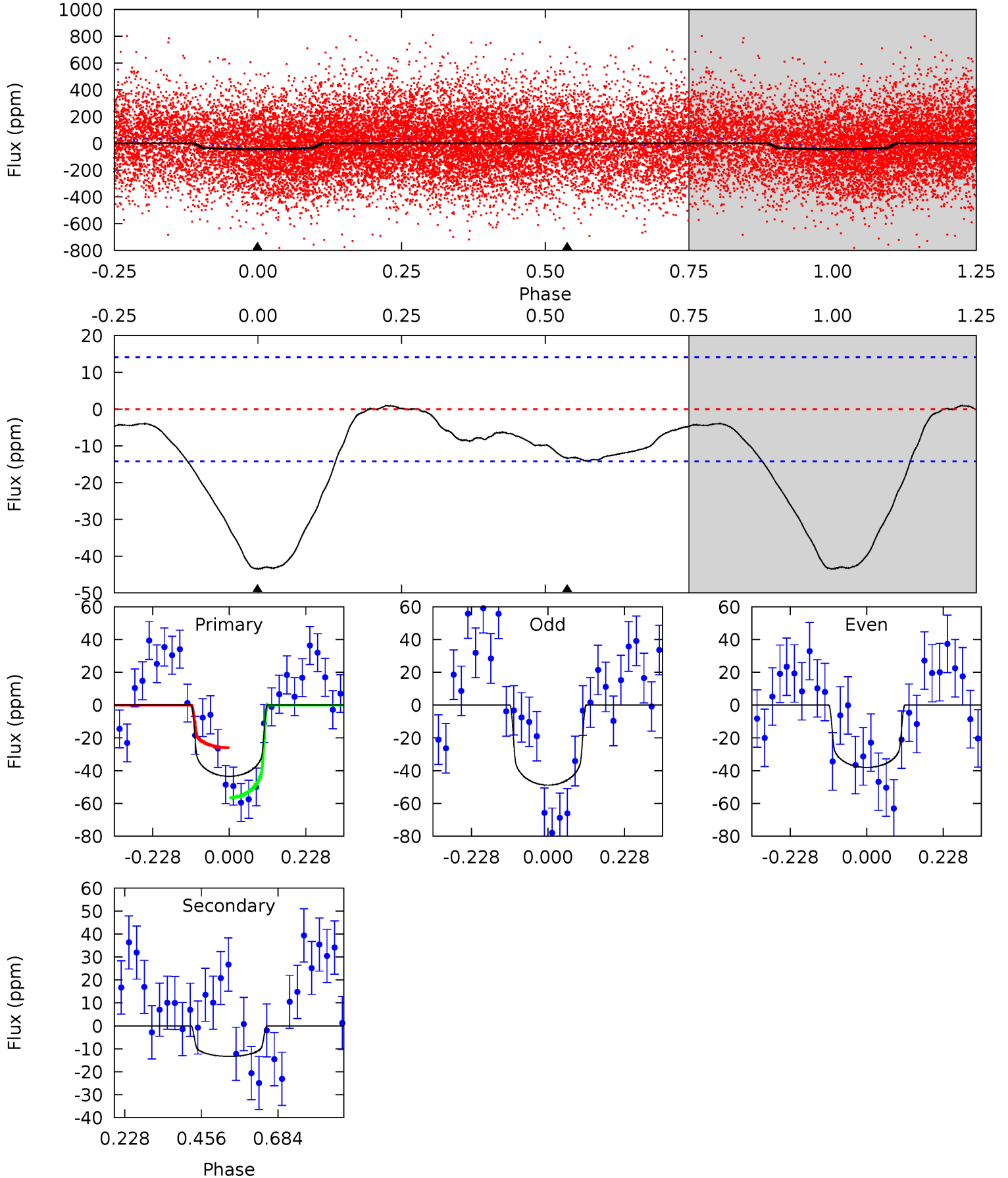
TCE 002021100-02     $P = 1.734491$  Days     $T_0 = 132.140089$  (BKJD)



# DV Model-Shift Uniqueness Test

002021100-02, P = 1.734392 Days, E = 132.144690 Days

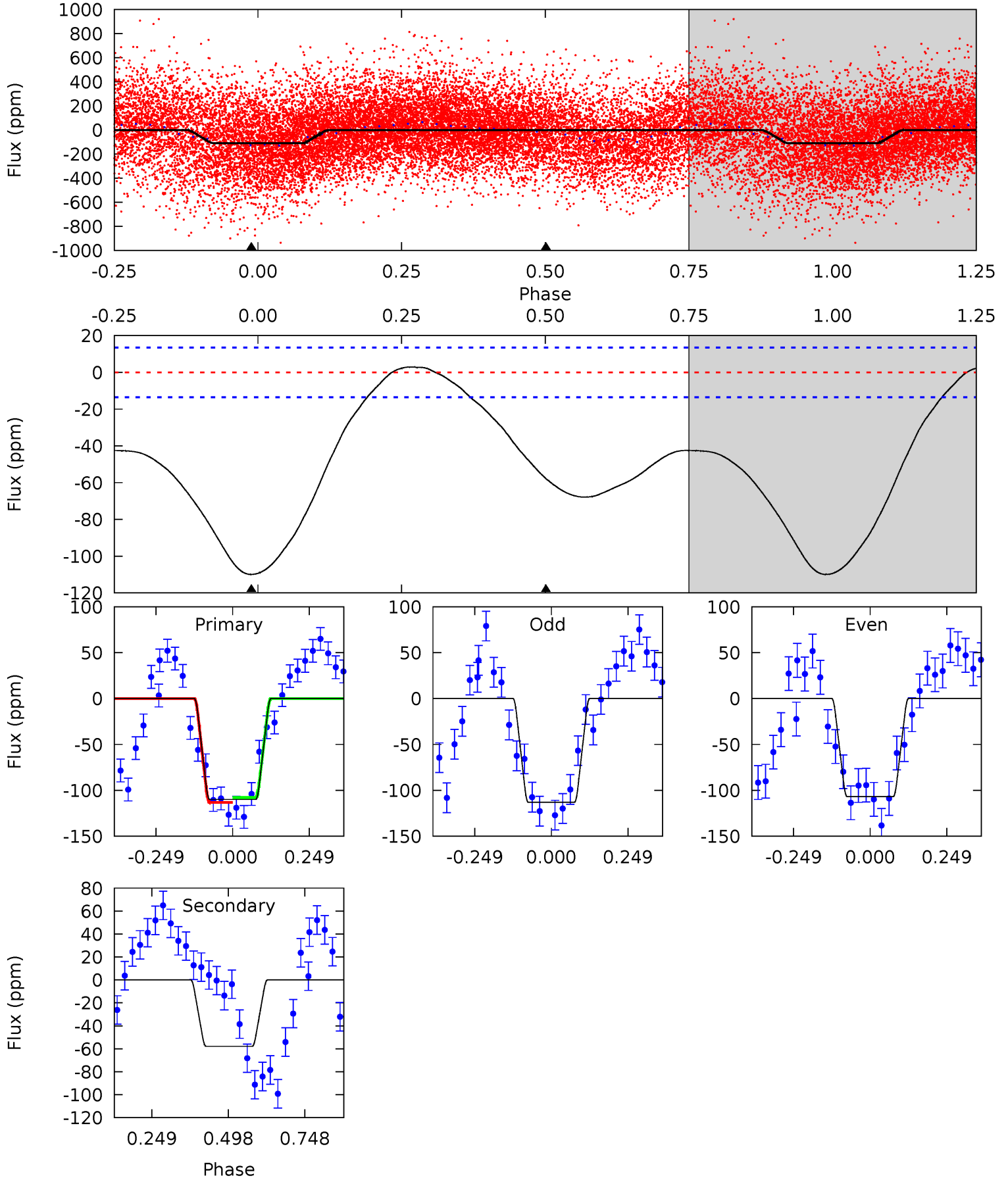
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.4	4.12	0	0	4.39	1.21	0.37	13.4	13.4	4.12	4.12	1.65	1.03	0.02	4.59



# Alt Model-Shift Uniqueness Test

002021100-02, P = 1.734491 Days, E = 132.140089 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
35.6	18.7	0	0	4.37	1.15	6.27	35.6	35.6	18.7	18.7	1.01	1.04	0.03	0.84



### Stellar Parameters For KIC 002021100

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6811^{+71}_{-91}$	$4.093^{+0.150}_{-0.100}$	$-0.080^{+0.150}_{-0.150}$	$1.770^{+0.274}_{-0.305}$	$1.421^{+0.092}_{-0.115}$	$0.361^{+0.242}_{-0.124}$
	+1%/-1%	+4%/-2%	+188%/-188%	+15%/-17%	+6%/-8%	+67%/-34%
Source	SPE68	SPE68	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 002021100-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-13 \pm 3$	$1.31^{+0.44}_{-0.40}$	$3121^{+128}_{-144}$	$4886^{+980}_{-540}$	$4.145^{+4.772}_{-1.865}$
Alt.	$-58 \pm 3$	$2.11^{+0.43}_{-0.43}$	$3130^{+134}_{-138}$	$5602^{+640}_{-434}$	$7.269^{+3.947}_{-2.309}$

$T_{max}$  = 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

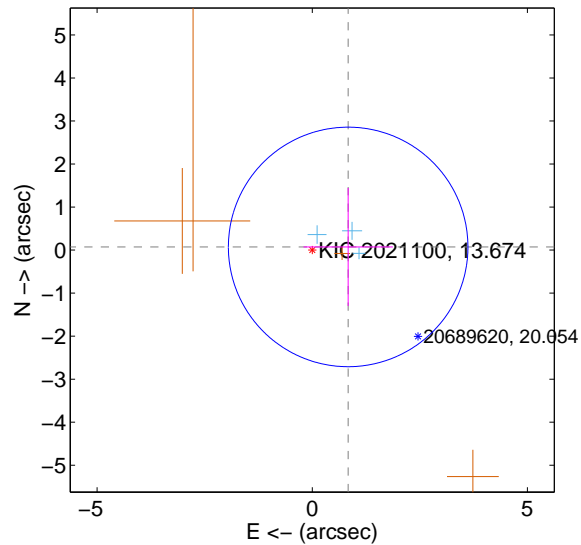
Supplemental centroid analysis for 002021100-02. Kepler magnitude: 13.67. Transit SNR 8.58

There are 3 quarters with good PRF difference image offsets

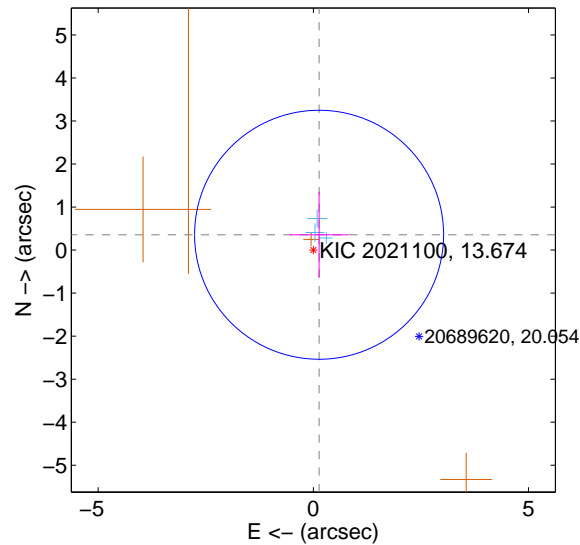
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.838 \pm 0.928$	0.90	$-0.834 \pm 1.037$	$0.073 \pm 1.370$
PRF-fit source offset from KIC position	$0.381 \pm 0.964$	0.39	$-0.134 \pm 0.686$	$0.356 \pm 0.997$
photometric centroid source offset	$1.37 \pm 1.10$	1.24	$0.92 \pm 1.18$	$-1.02 \pm 1.04$

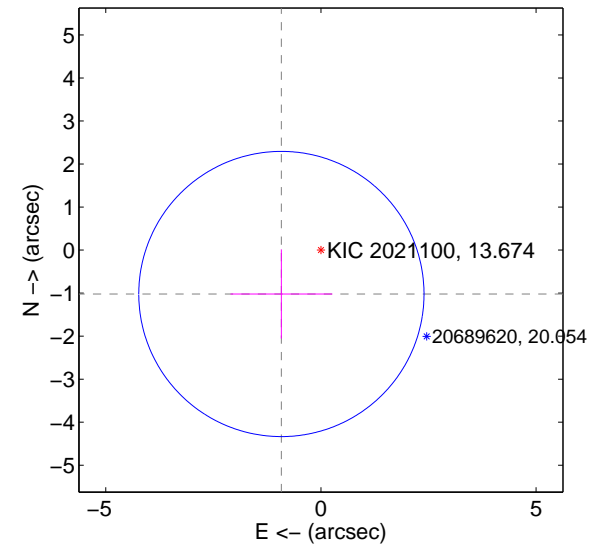
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



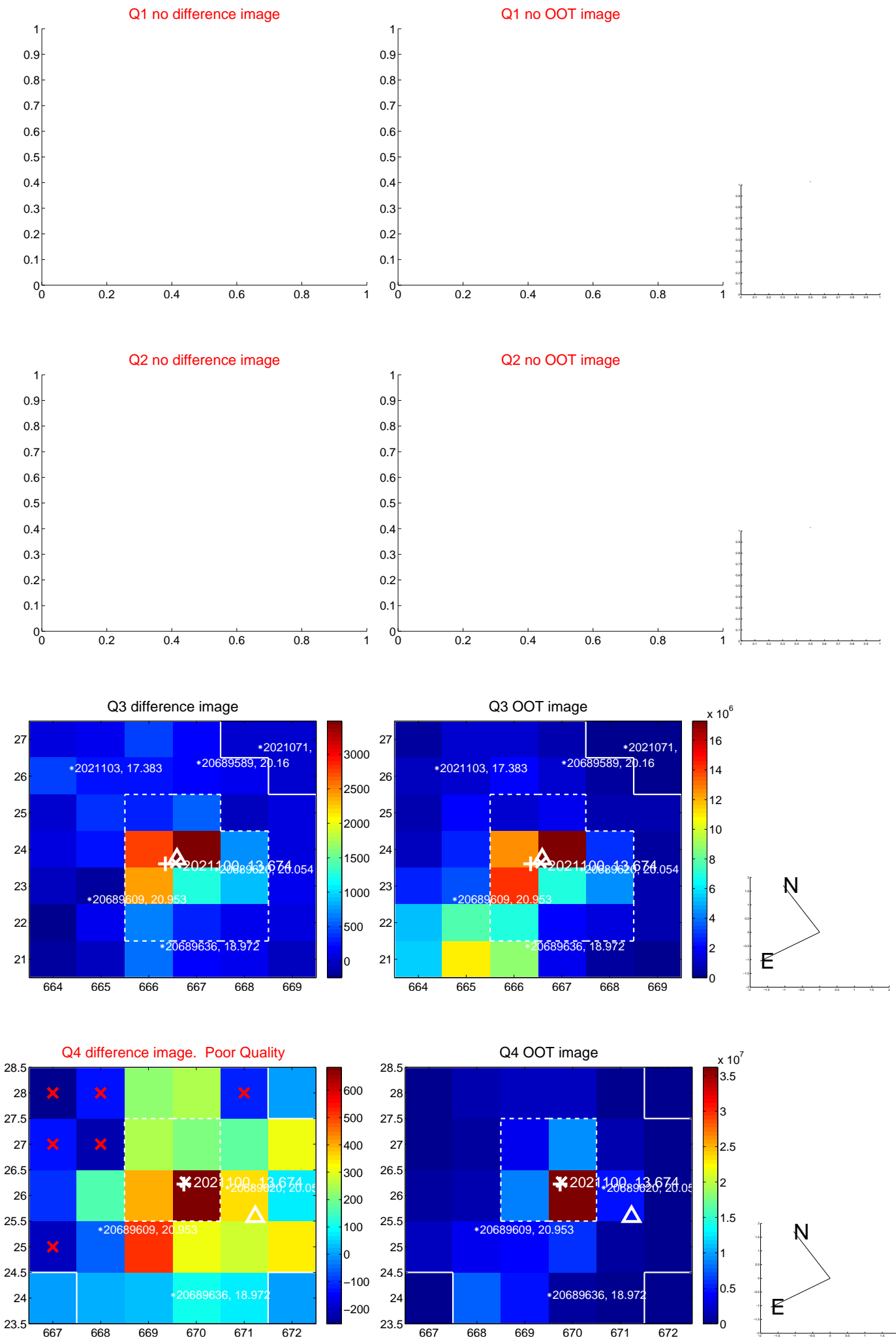
offset from photometric centroids



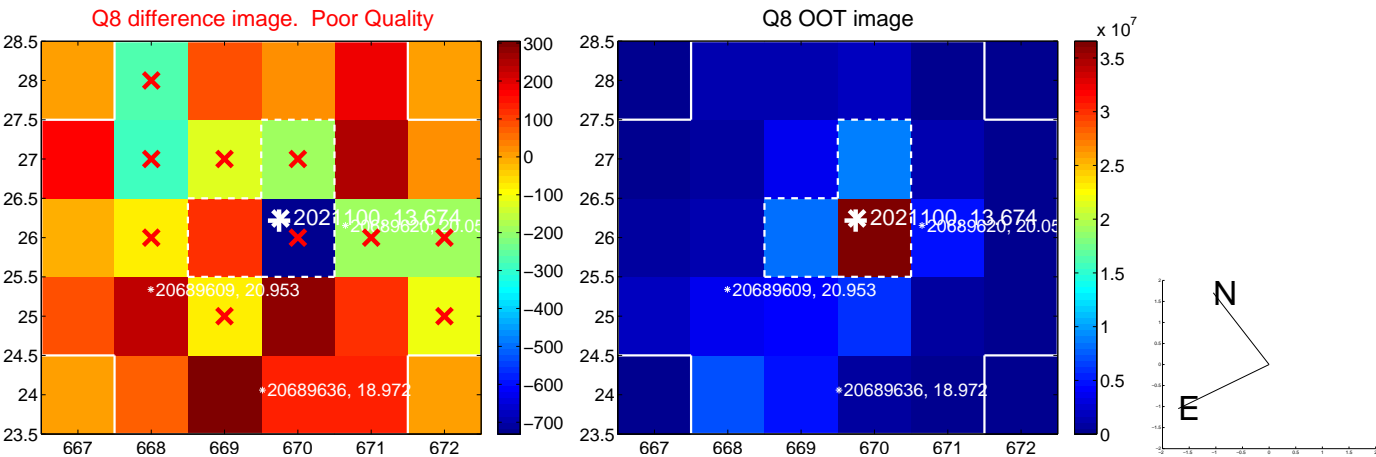
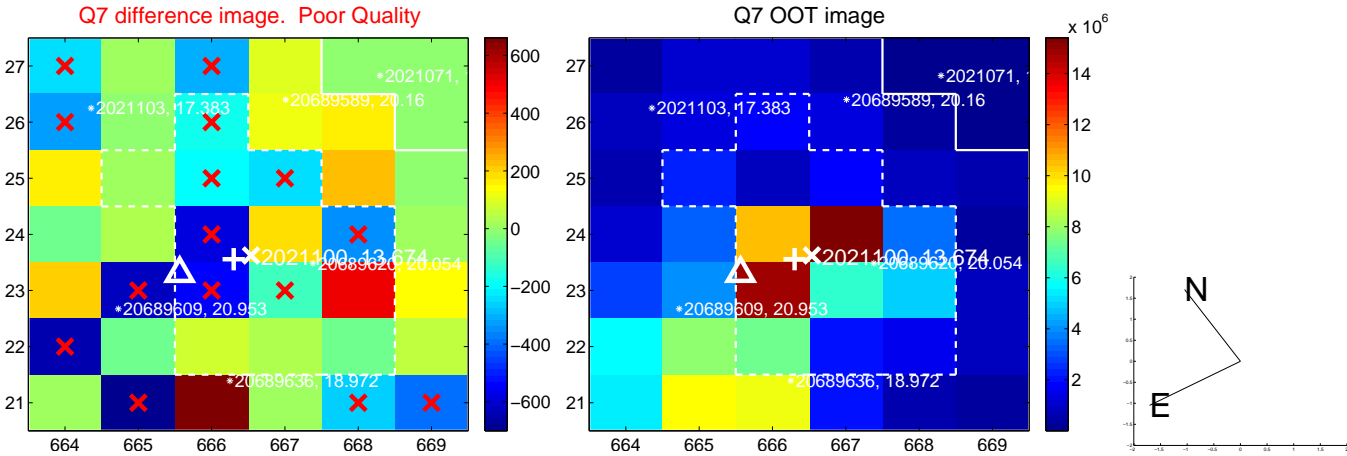
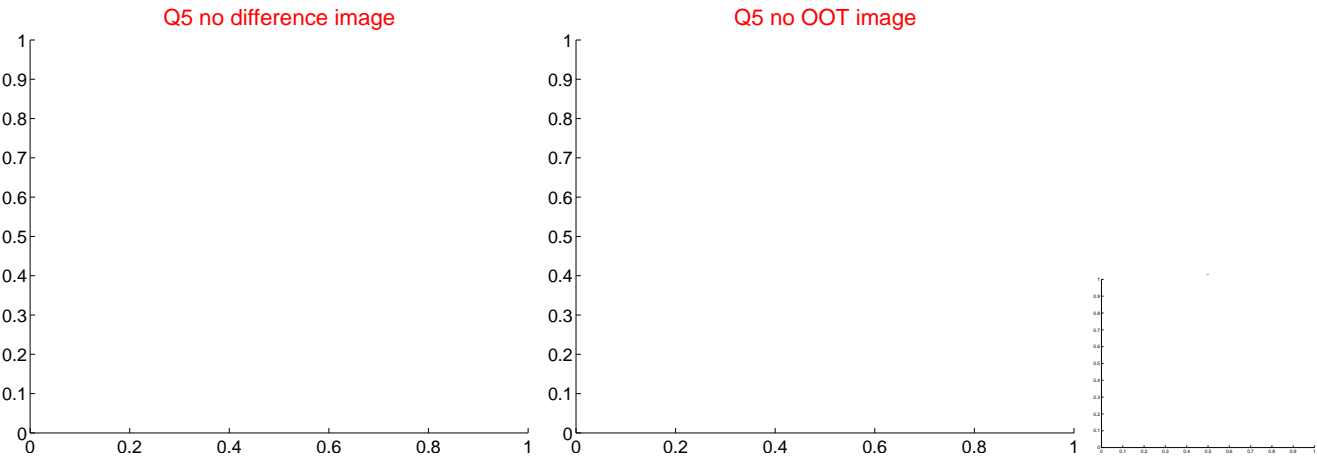
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



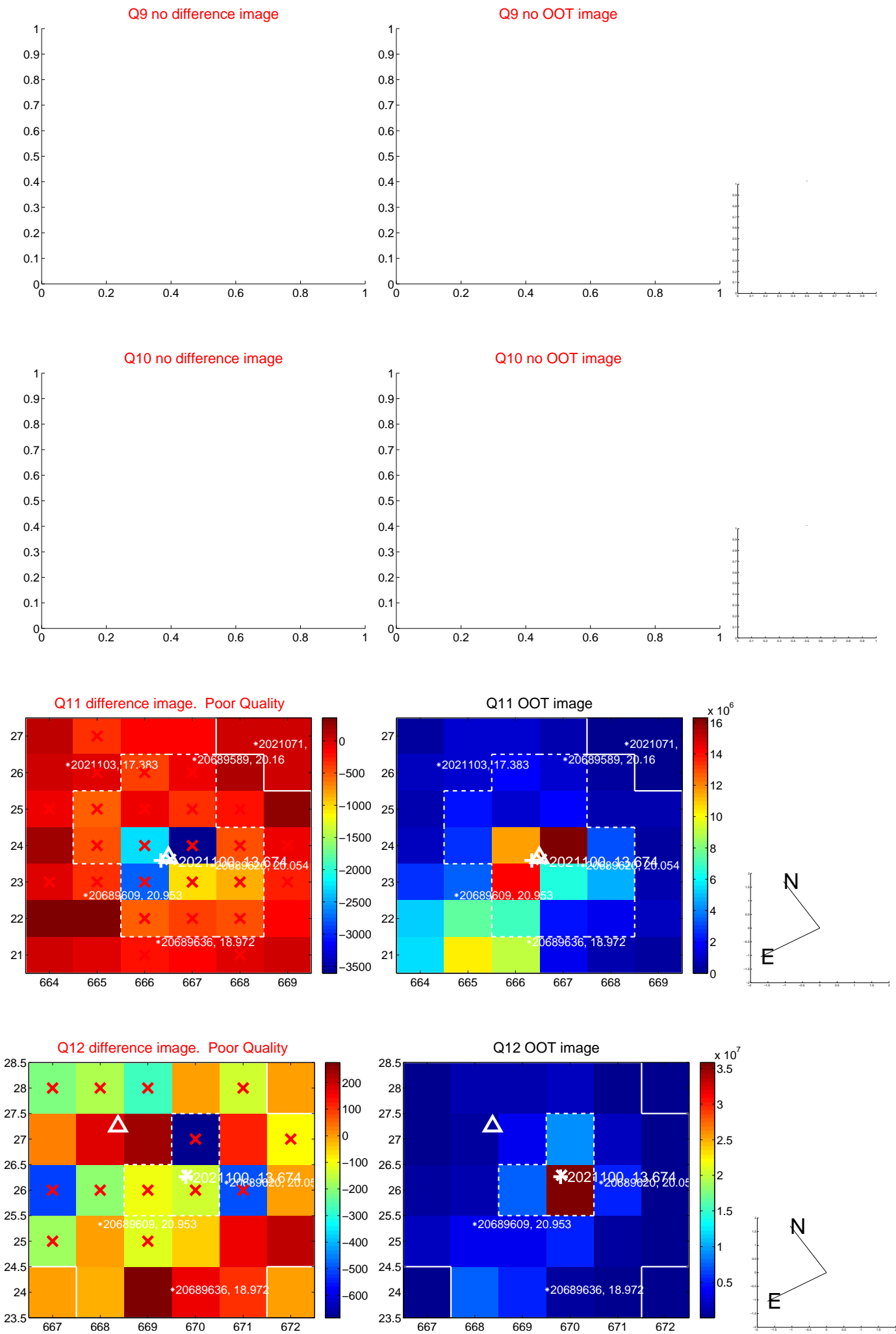
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



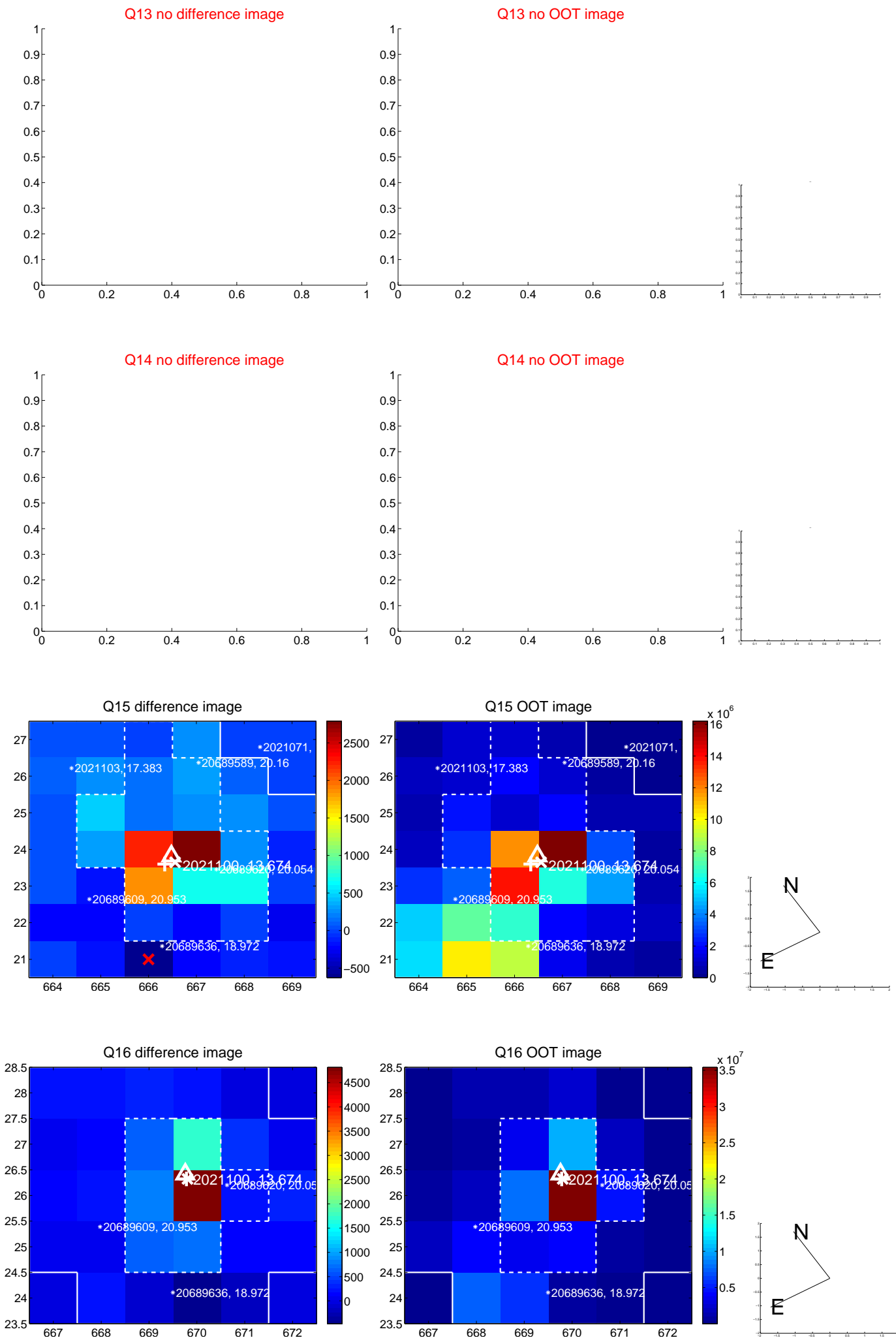
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



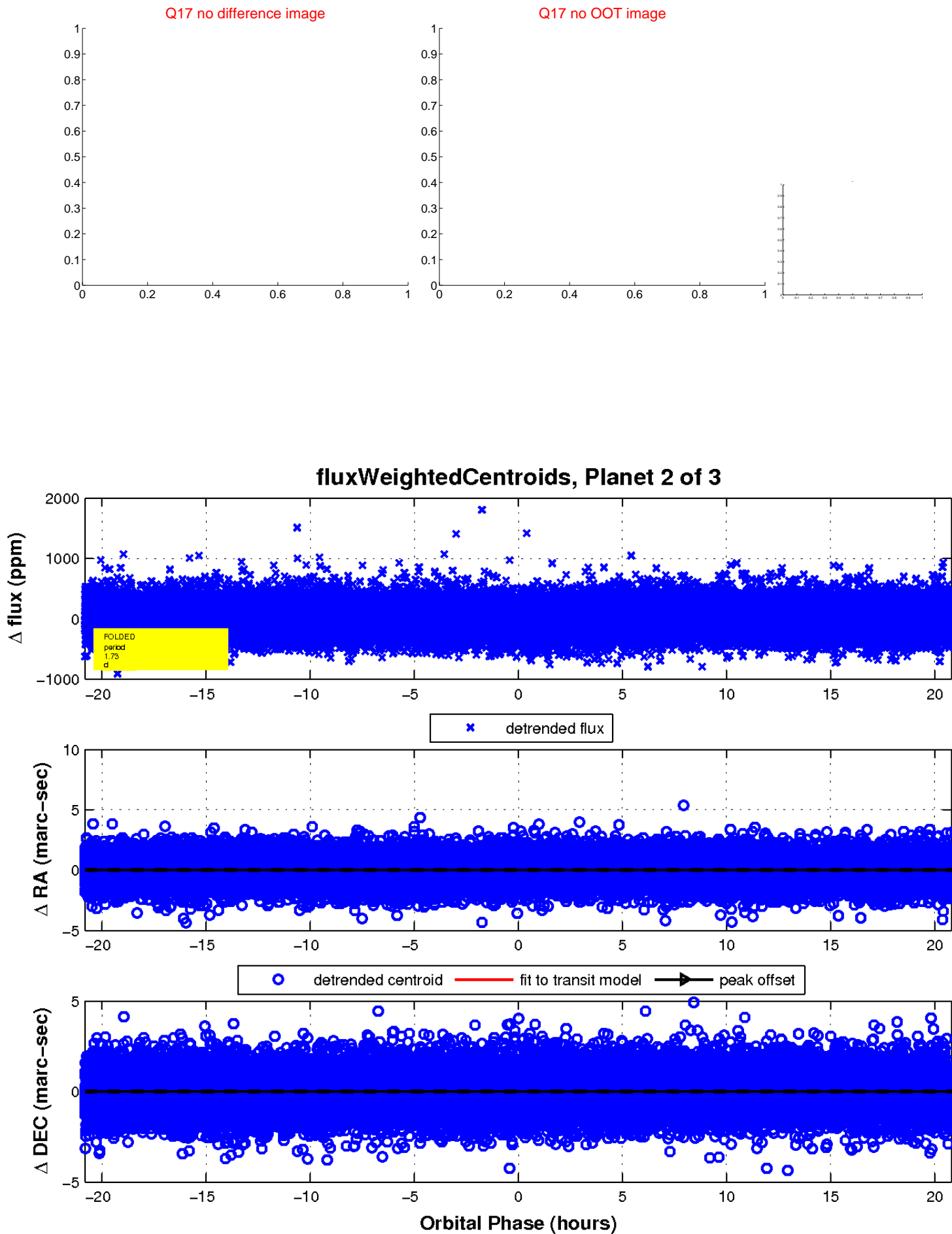
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

