

# KIC 003221310

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003221310-01	OBS	No	0.852288	131.672254	33.5	1.048	9.6	9.9	1.69	6274	1.05	10532.68
003221310-02	OBS	No	1.065355	132.101861	27.6	1.649	7.8	8.0	1.69	6274	1.04	7822.19
003221310-03	OBS	No	251.459350	235.074798	205.7	4.019	7.4	7.4	1.69	6274	2.63	5.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003221310-01	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
003221310-02	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
003221310-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS

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

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

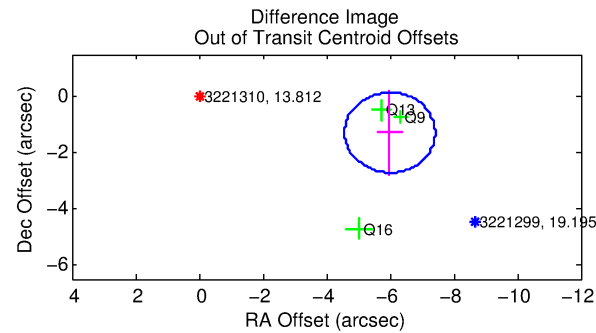
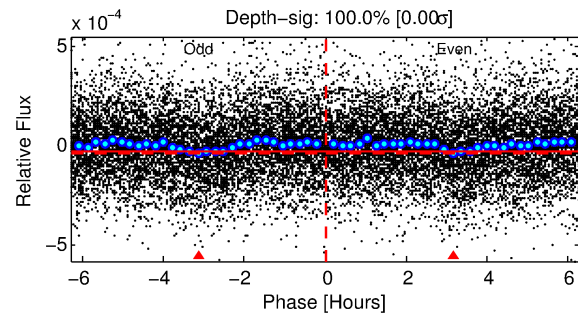
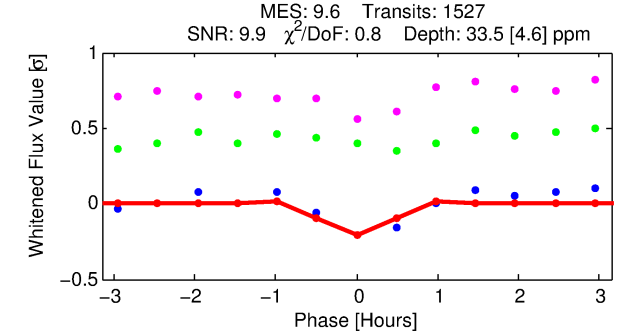
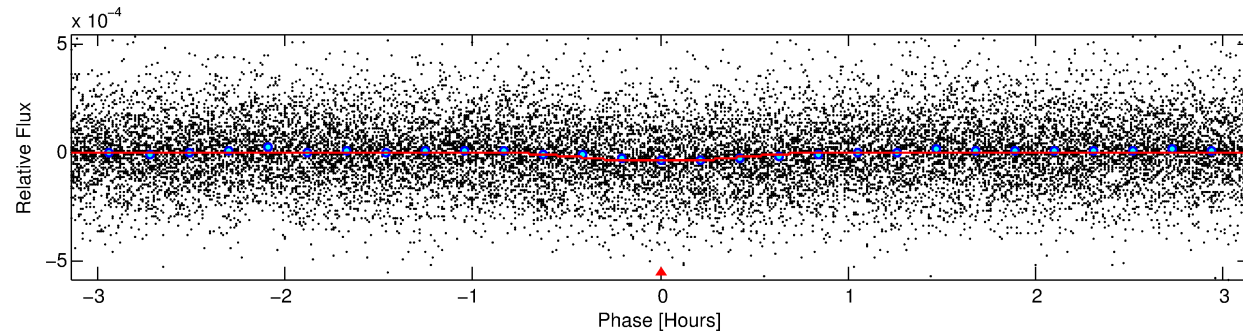
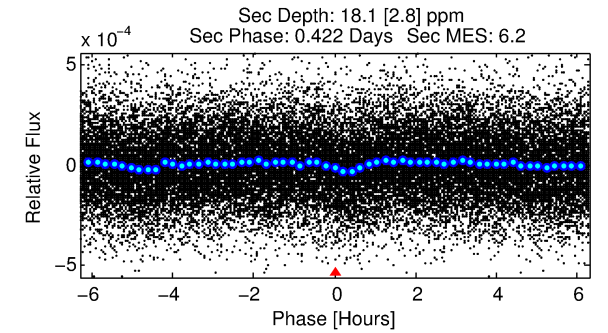
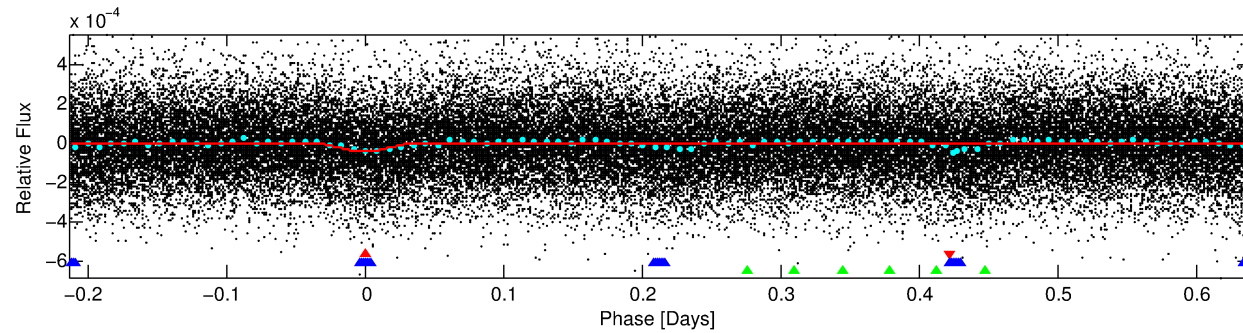
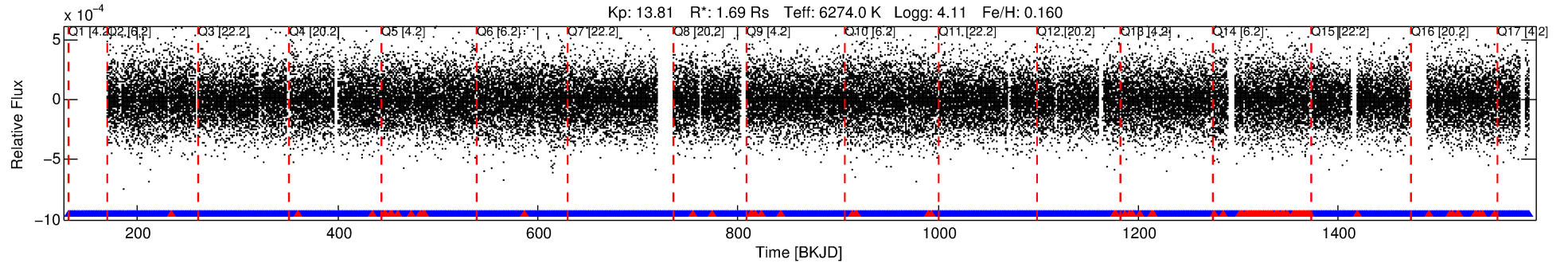
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003221310-01

No Significant Match Found

# DV One-Page Summary

KIC: 3221310 Candidate: 1 of 3 Period: 0.852 d



## DV Fit Results:

Period = 0.85229 [0.00001] d  
Epoch = 131.6723 [0.0018] BKJD  
Rp/R\* = 0.0057 [0.0016]  
a/R\* = 4.57 [5.83]  
b = 0.70 [0.99]  
Seff = 10532.68 [4564.11]  
Teq = 2583 [280] K  
Rp = 1.05 [0.44] Re  
a = 0.0194 [0.0053] AU  
Ag = 3.38 [2.36] [1.01σ]  
Teffp = 5416 [795] K [3.36σ]

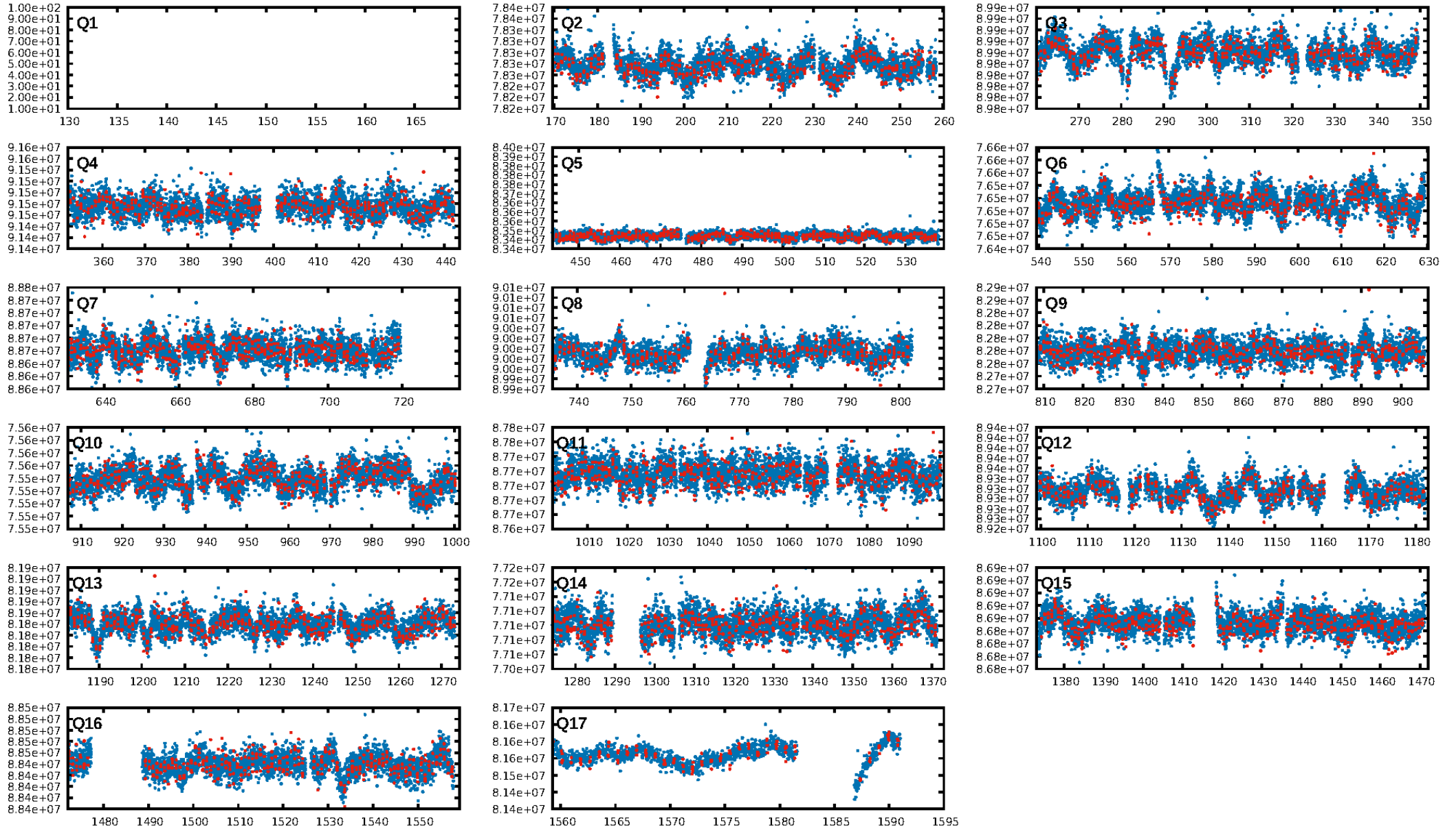
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 99.1% [2.62σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.90e-22  
RollingBand-fgt: 0.93 [1387/1495]  
GhostDiagnostic-chr: -1.161  
Centroid-sig: 0.0%  
Centroid-so: 7.536 arcsec [5.23σ]  
OotOffset-rm: 6.130 arcsec [12.92σ]  
KicOffset-rm: 6.048 arcsec [12.84σ]  
OotOffset-st: 0/0/1/2 [3]  
KicOffset-st: 0/0/1/2 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [16/16]

Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:21:09 Z

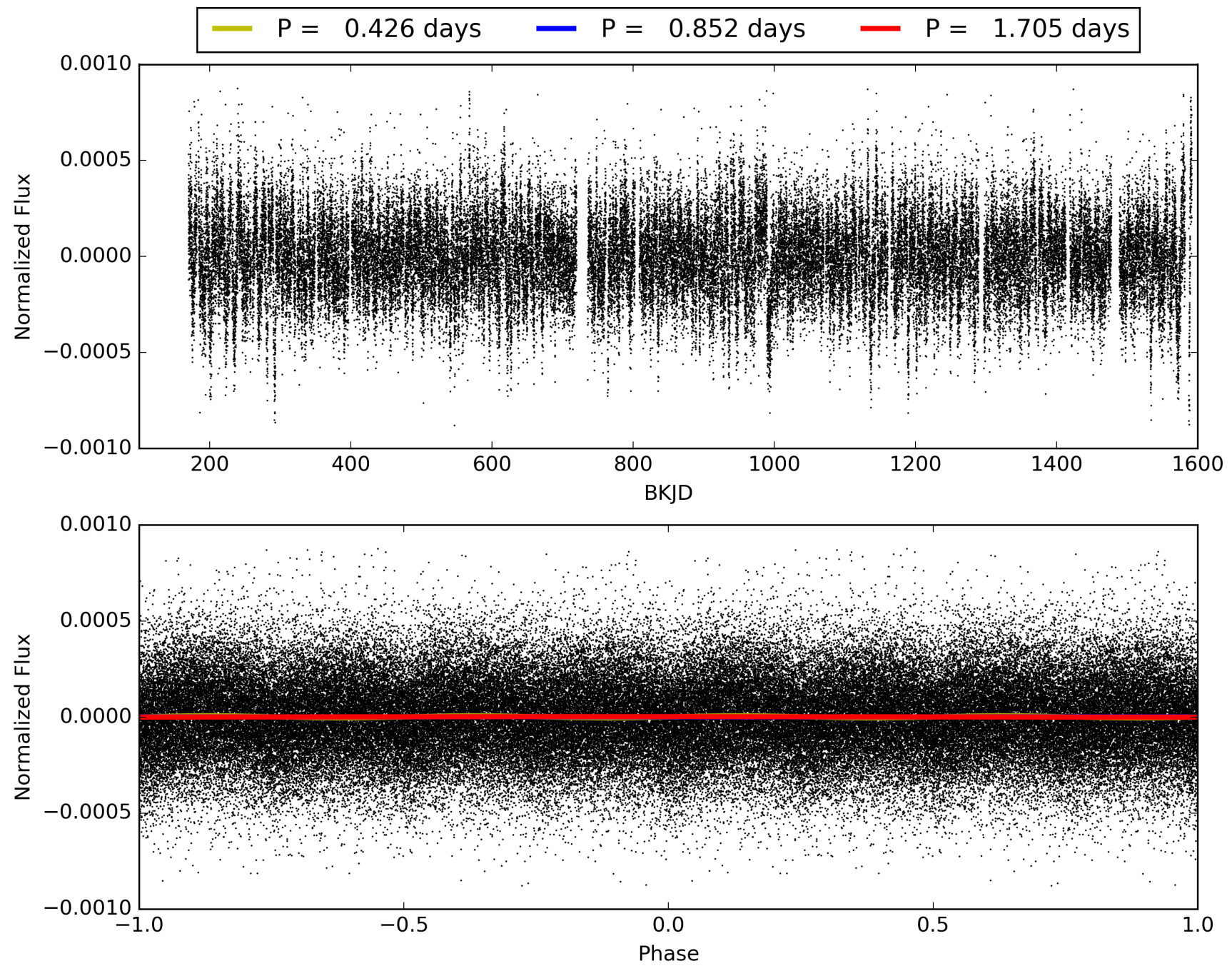
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003221310-01, PDC Light Curves





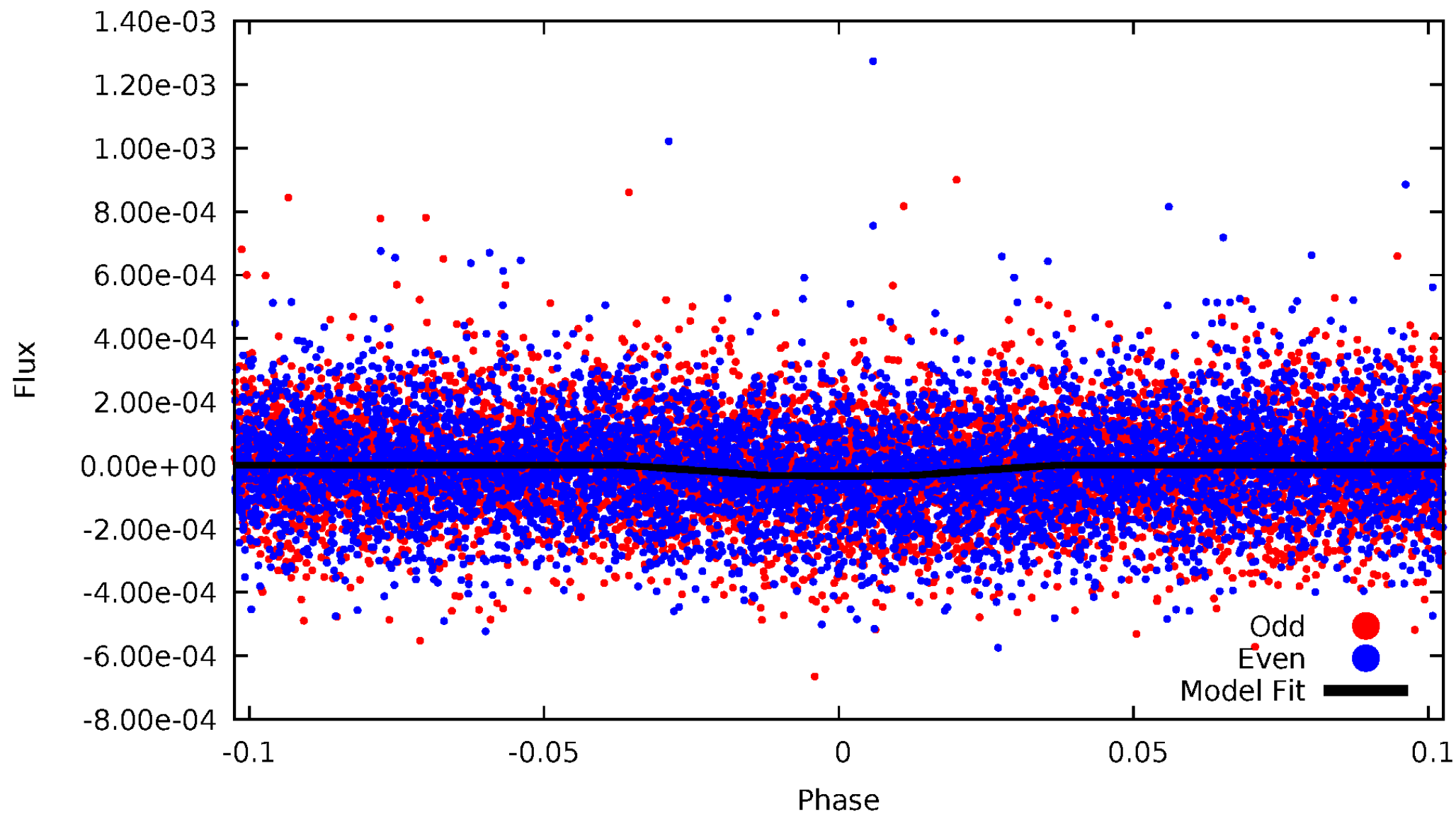
TCE 003221310-01





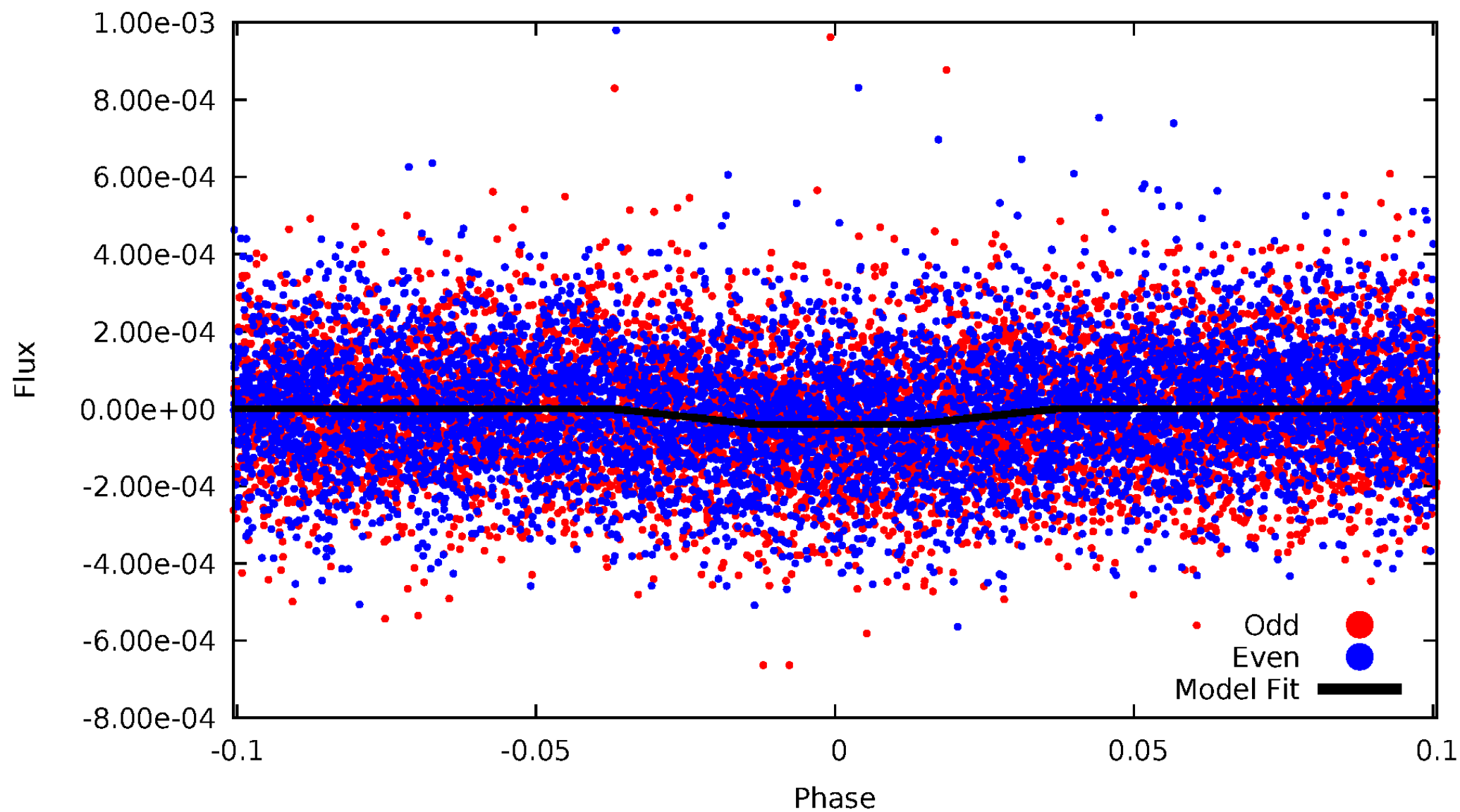
# DV Odd/Even

TCE 003221310-01



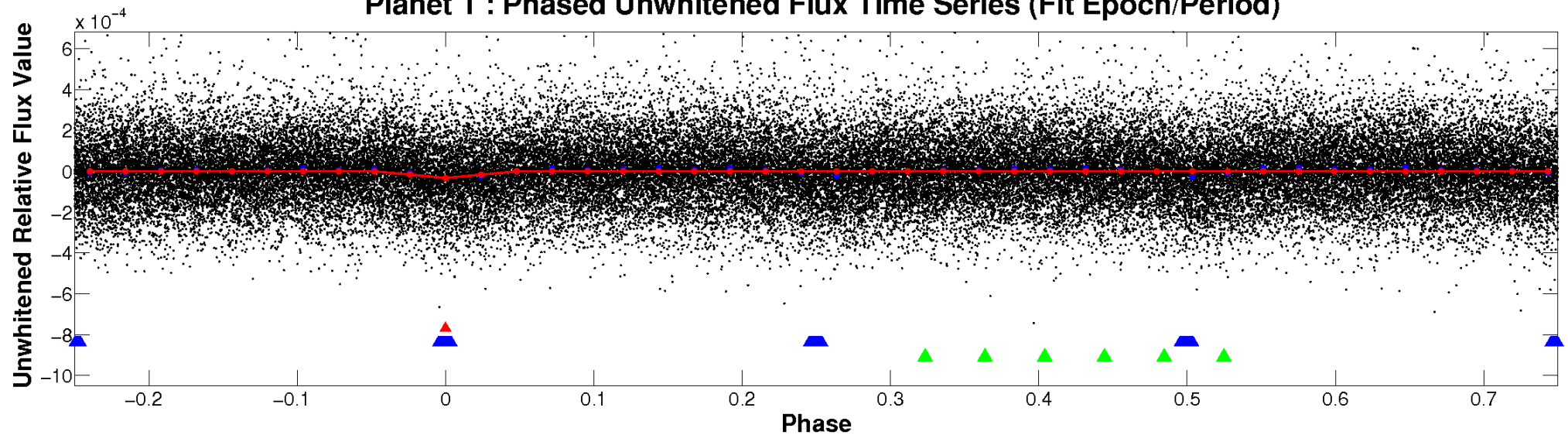
# ALT Odd/Even

TCE 003221310-01

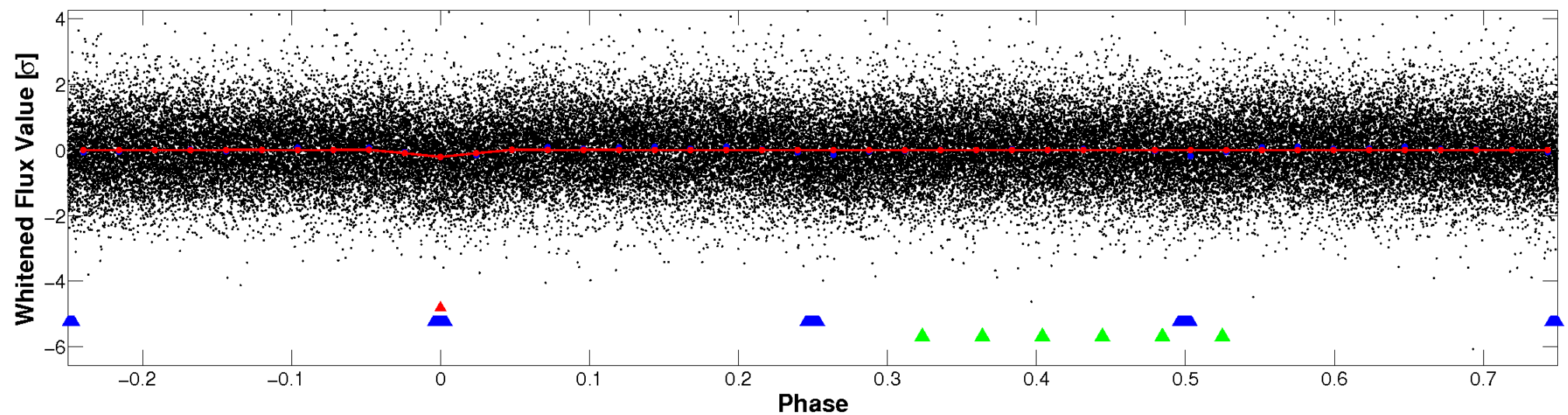


# Non-Whitened Vs. Whitened Light Curve

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



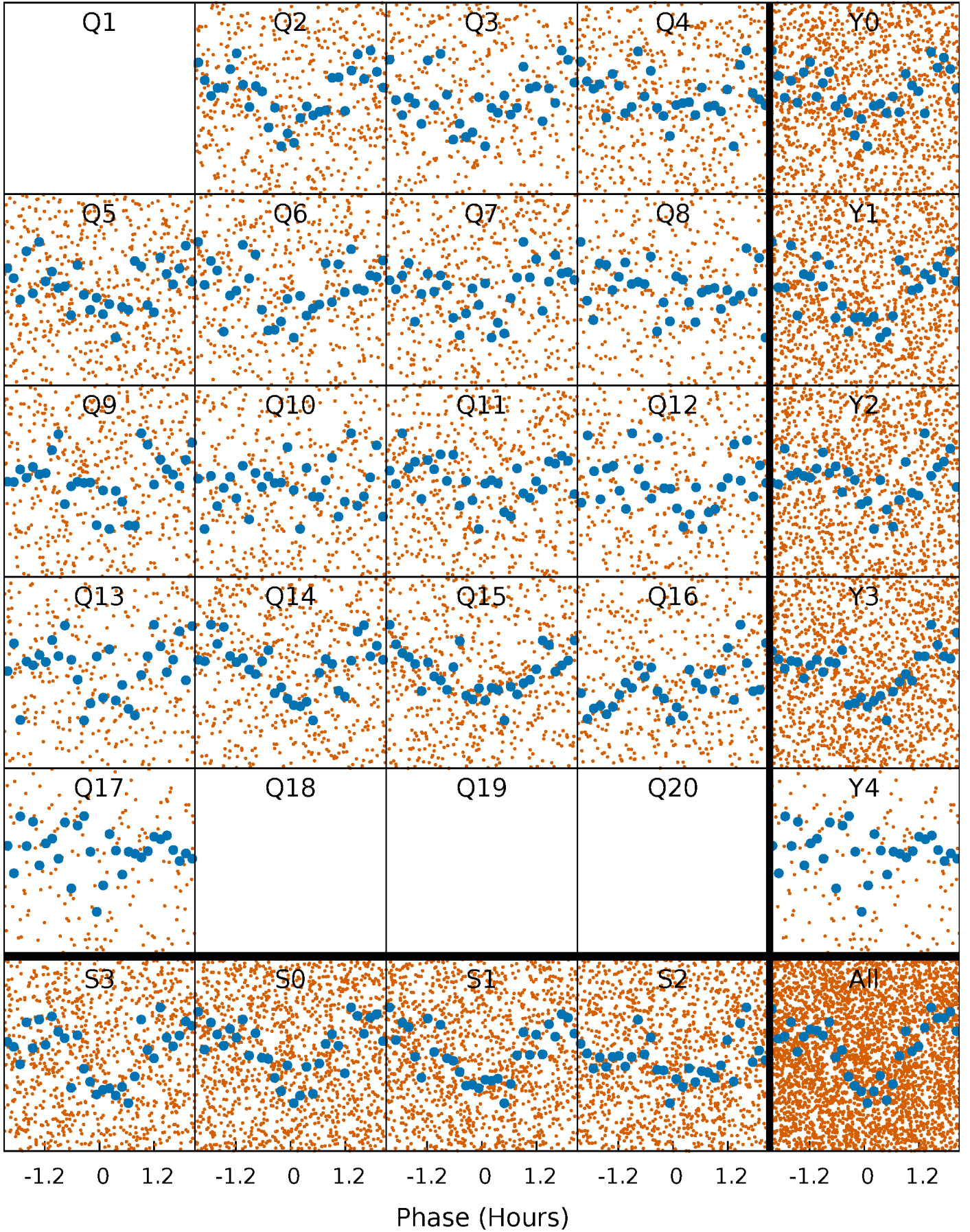
## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





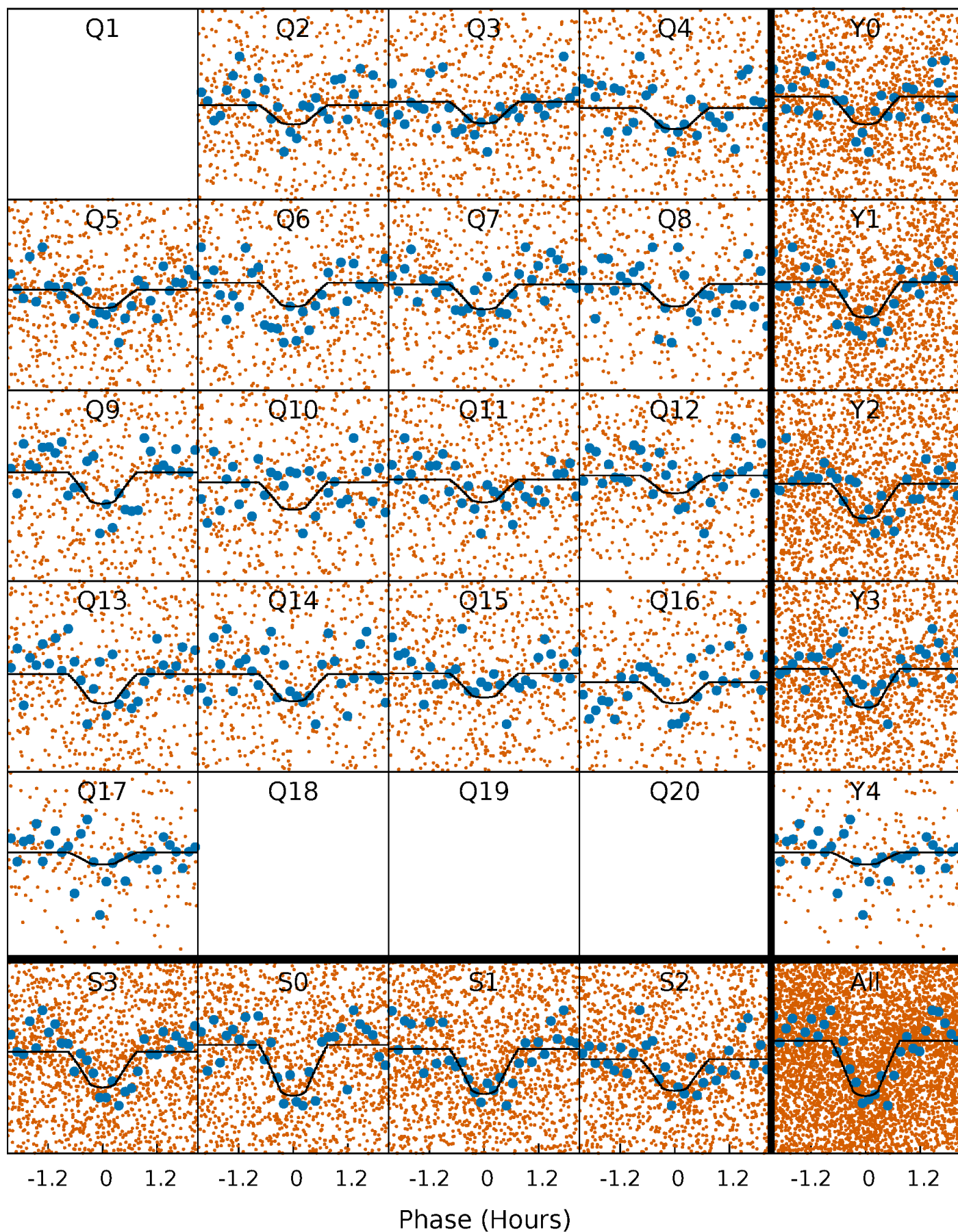
# PDC Quarter-Phased Transit Curves

TCE 003221310-01   P= 0.852288 Days    $T_0=131.672254$  (BKJD)



# DV Quarter-Phased Transit Curves

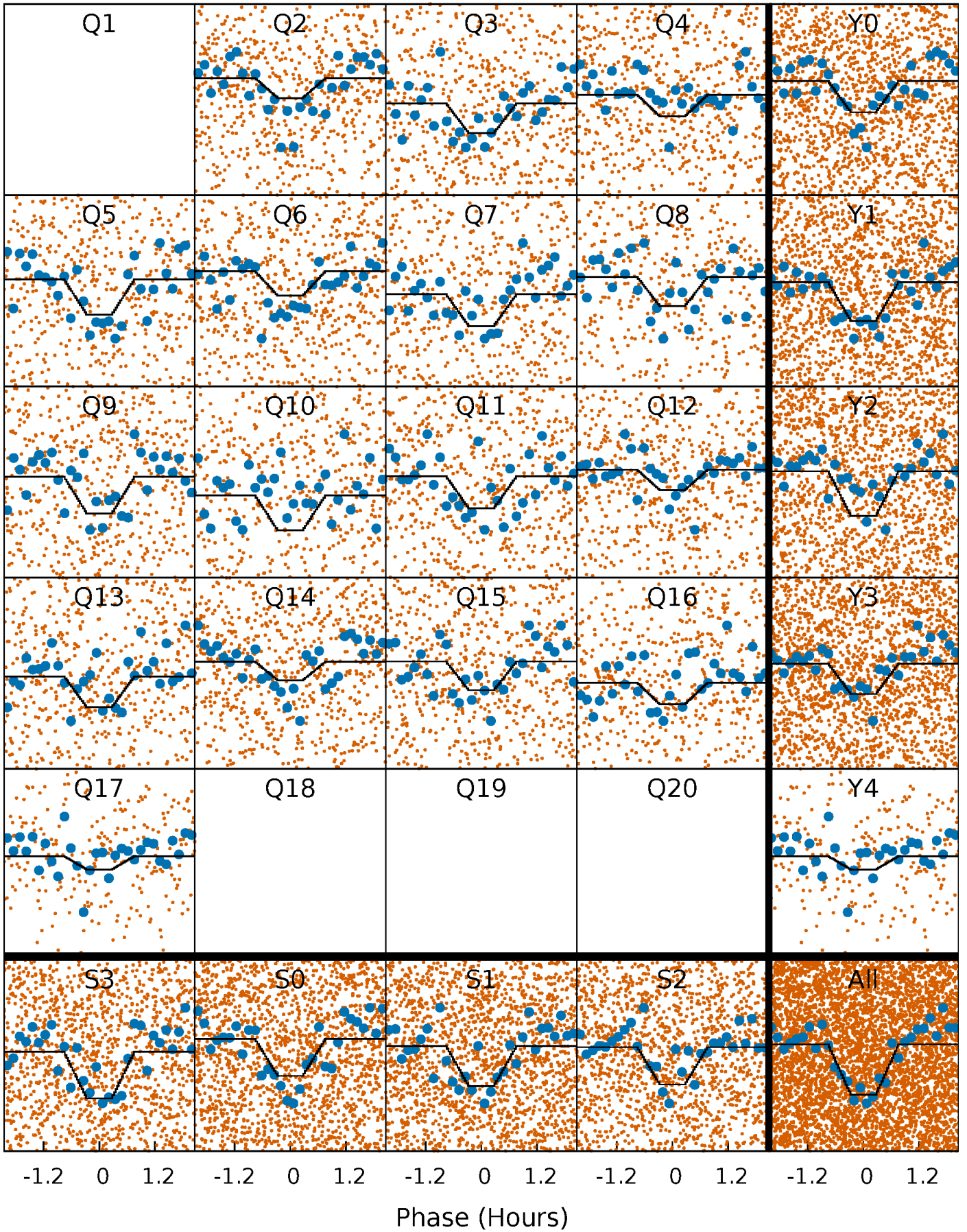
TCE 003221310-01 P= 0.852288 Days  $T_0=131.672254$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 003221310-01 P= 0.852298 Days  $T_0=131.670559$  (BKJD)

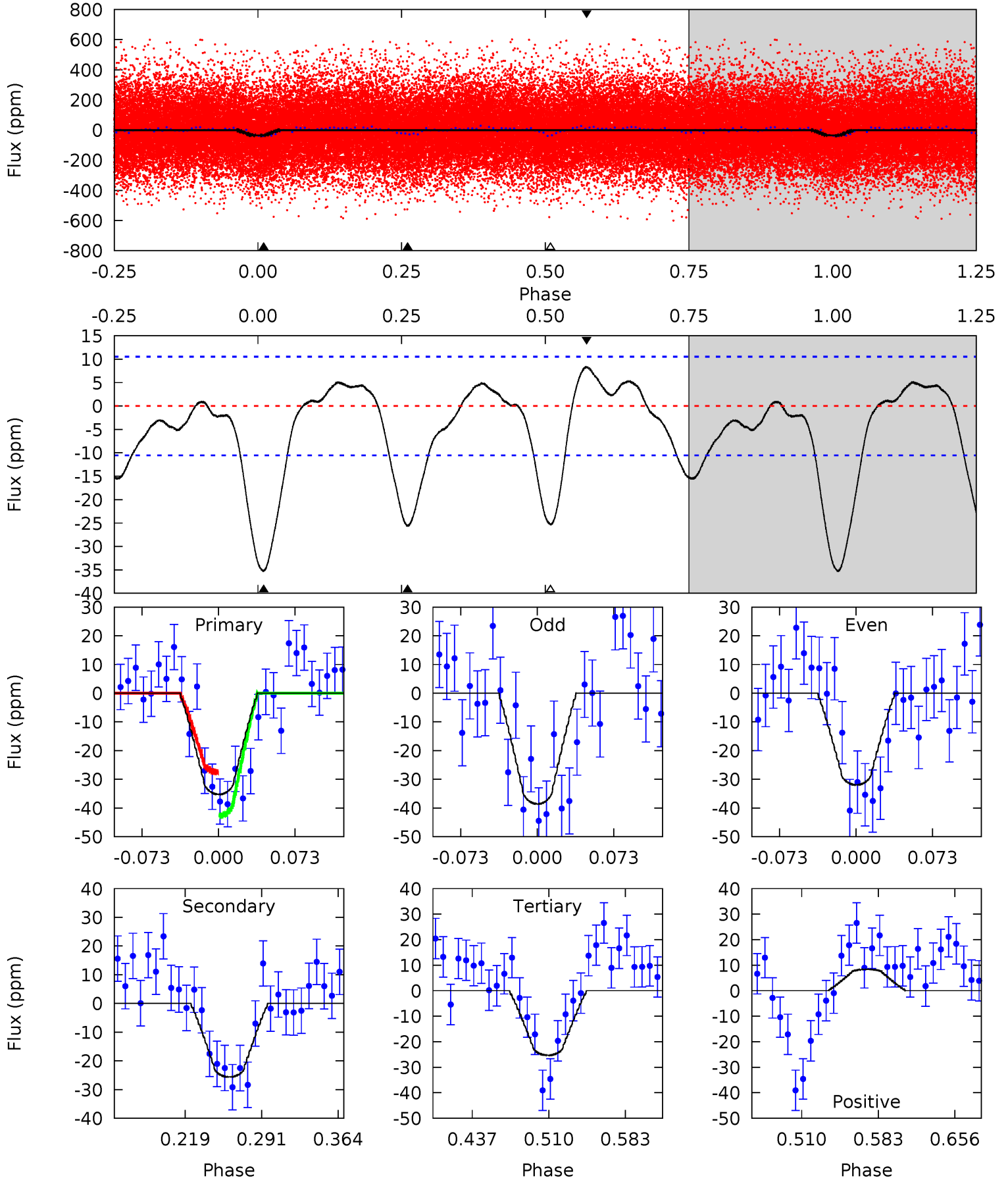




# DV Model-Shift Uniqueness Test

003221310-01, P = 0.852288 Days, E = 131.672254 Days

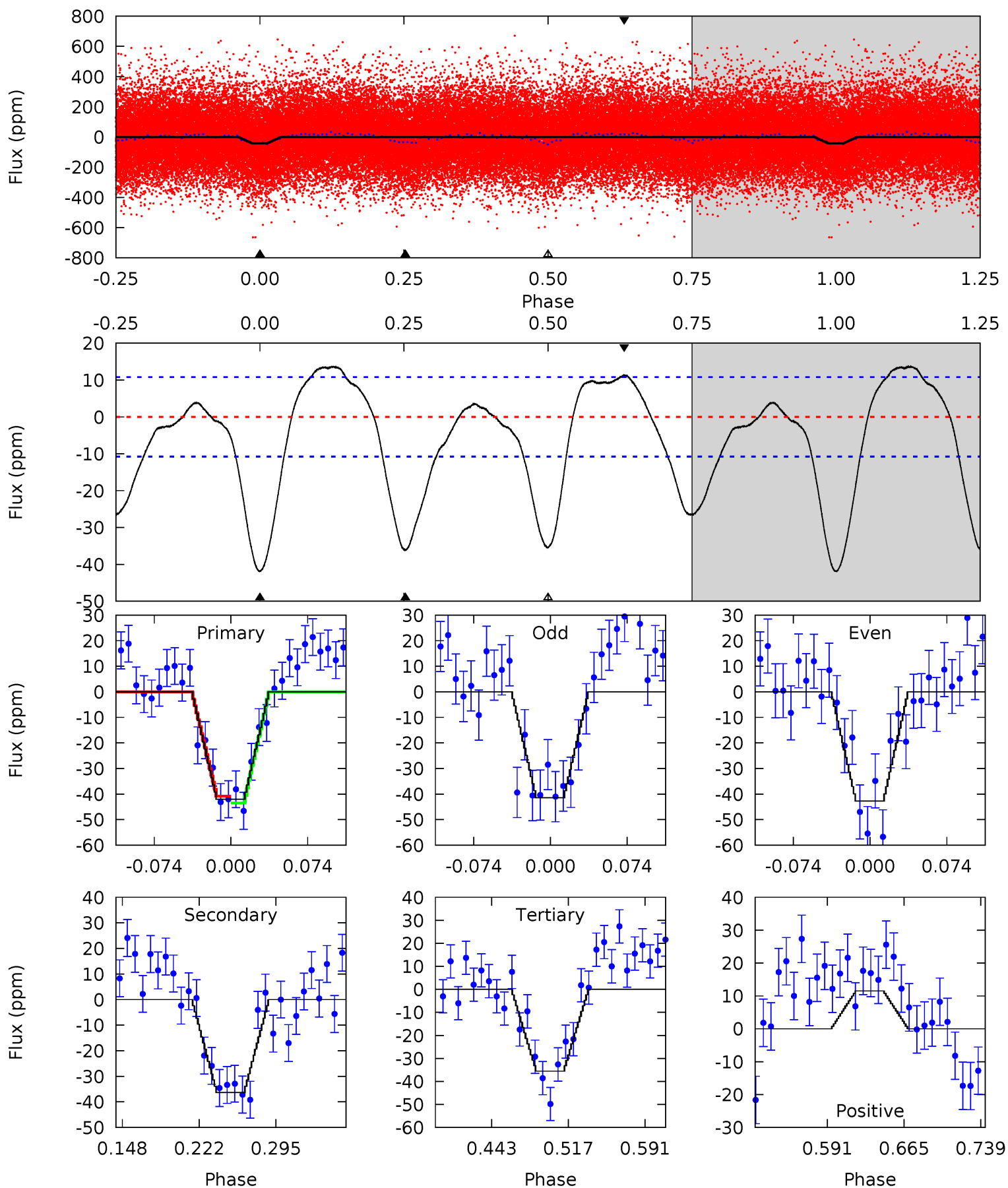
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.5	11.3	11.1	3.68	4.63	1.79	3.30	4.38	11.8	0.13	7.58	1.46	1.00	0.19	3.34



# Alt Model-Shift Uniqueness Test

003221310-01, P = 0.852298 Days, E = 131.670559 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
18.0	15.6	15.3	4.95	4.63	1.79	5.50	2.78	13.1	0.31	10.6	0.27	0.93	0.25	0.56



### Stellar Parameters For KIC 003221310

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6274^{+199}_{-243}$	$4.109^{+0.225}_{-0.184}$	$0.160^{+0.200}_{-0.300}$	$1.688^{+0.534}_{-0.486}$	$1.336^{+0.179}_{-0.246}$	$0.391^{+0.534}_{-0.200}$
	+3%/-4%	+5%/-4%	+125%/-188%	+32%/-29%	+13%/-18%	+137%/-51%
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 003221310-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-26 \pm 2$	$1.03^{+0.36}_{-0.33}$	$3568^{+320}_{-300}$	$5758^{+1197}_{-681}$	$4.854^{+5.759}_{-2.127}$
Alt.	$-36 \pm 2$	$1.14^{+0.37}_{-0.31}$	$3600^{+286}_{-294}$	$6025^{+1096}_{-649}$	$5.712^{+4.973}_{-2.448}$

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



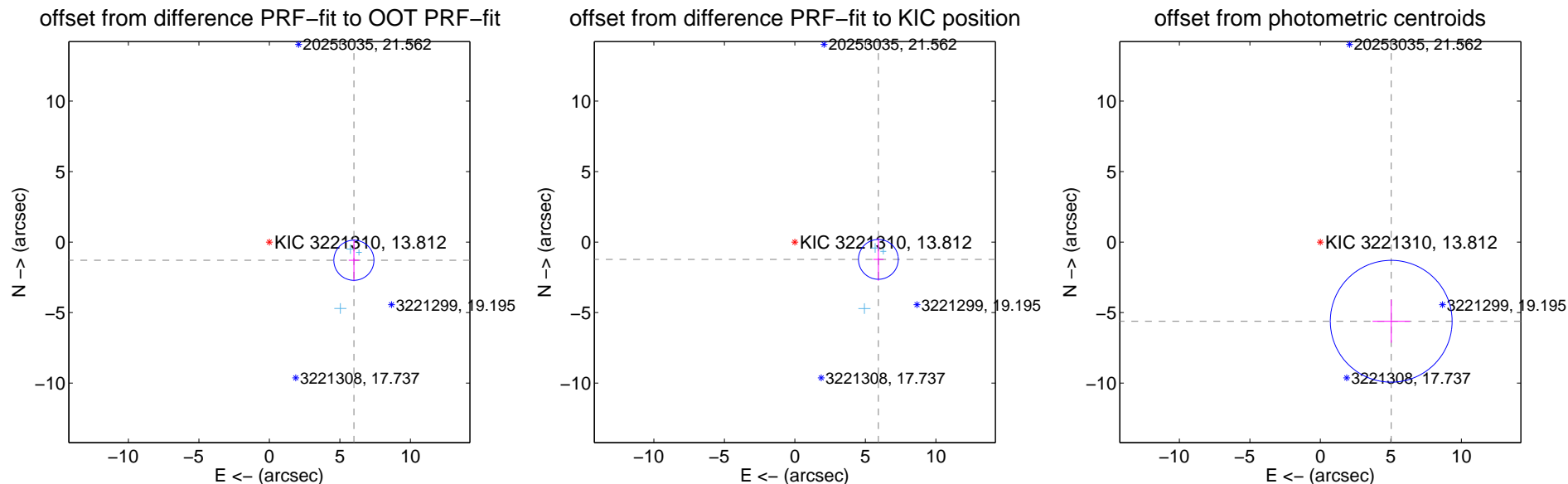
## DV Centroid Data

Supplemental centroid analysis for 003221310-01. Kepler magnitude: 13.81. Transit SNR 9.92

There are 3 quarters with good PRF difference image offsets

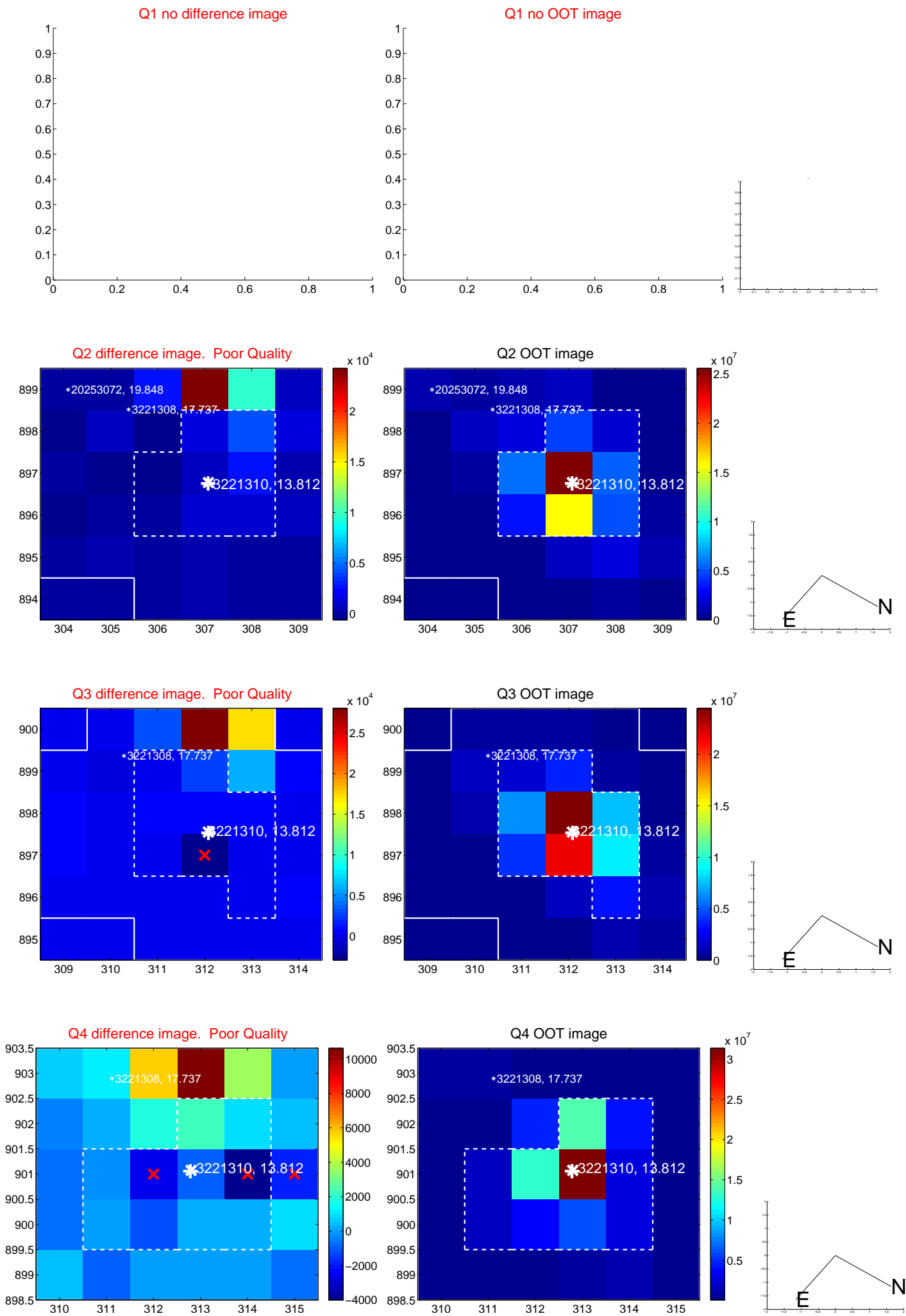
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$6.130 \pm 0.474$	12.92	$-5.993 \pm 0.365$	$-1.289 \pm 1.486$
PRF-fit source offset from KIC position	$6.048 \pm 0.471$	12.84	$-5.922 \pm 0.364$	$-1.226 \pm 1.519$
photometric centroid source offset	$7.54 \pm 1.44$	5.23	$-5.03 \pm 1.33$	$-5.62 \pm 1.52$

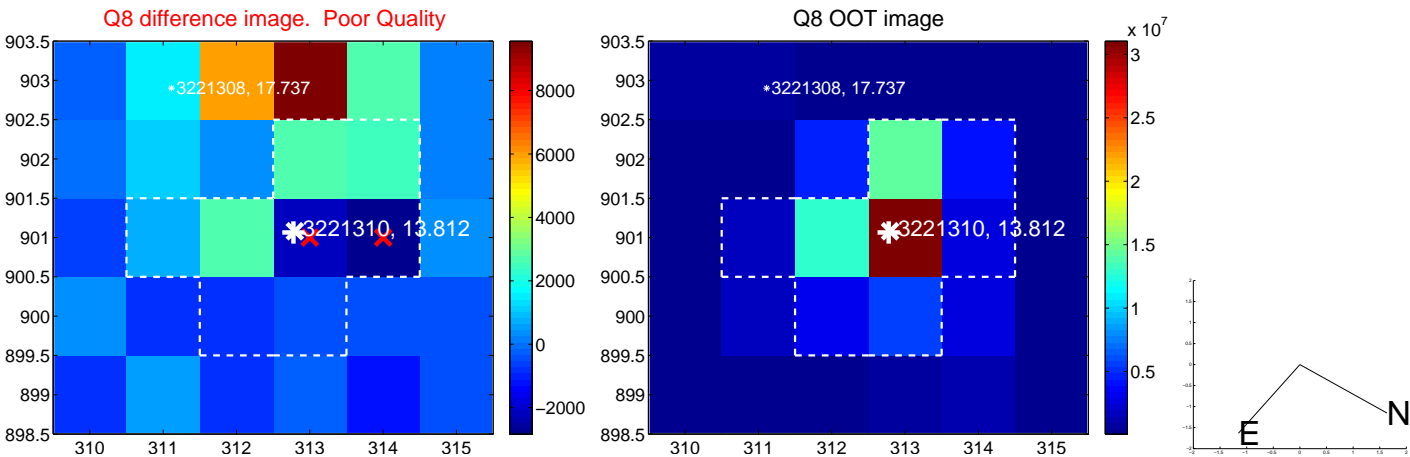
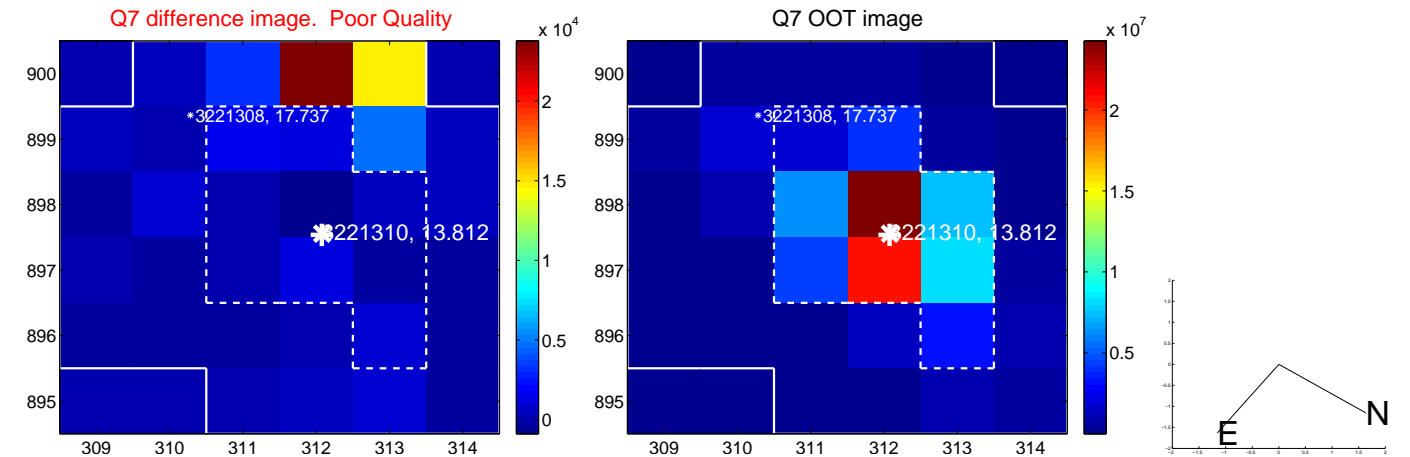
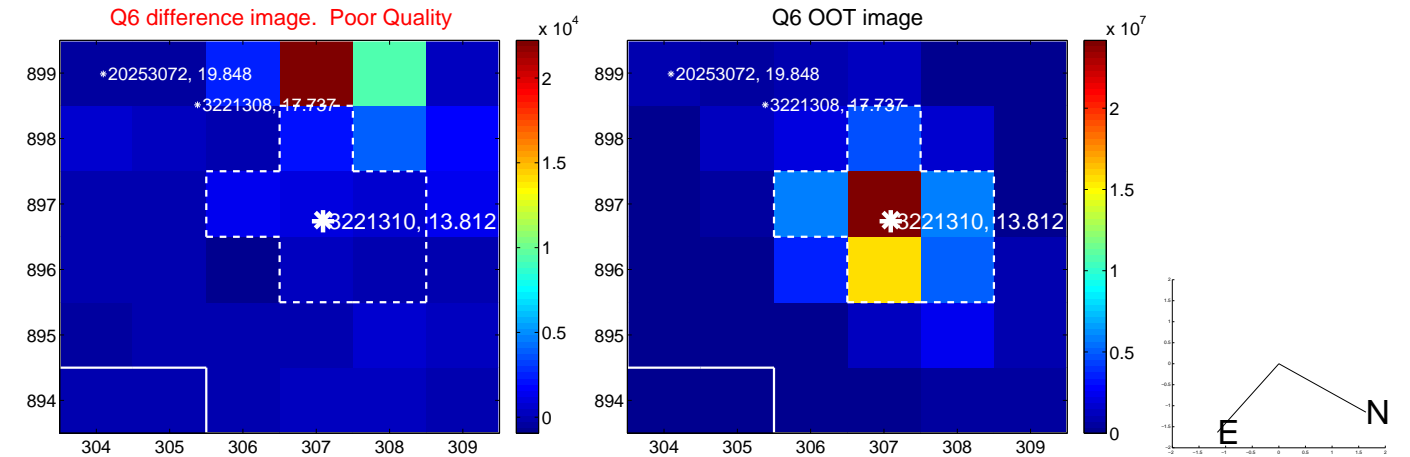
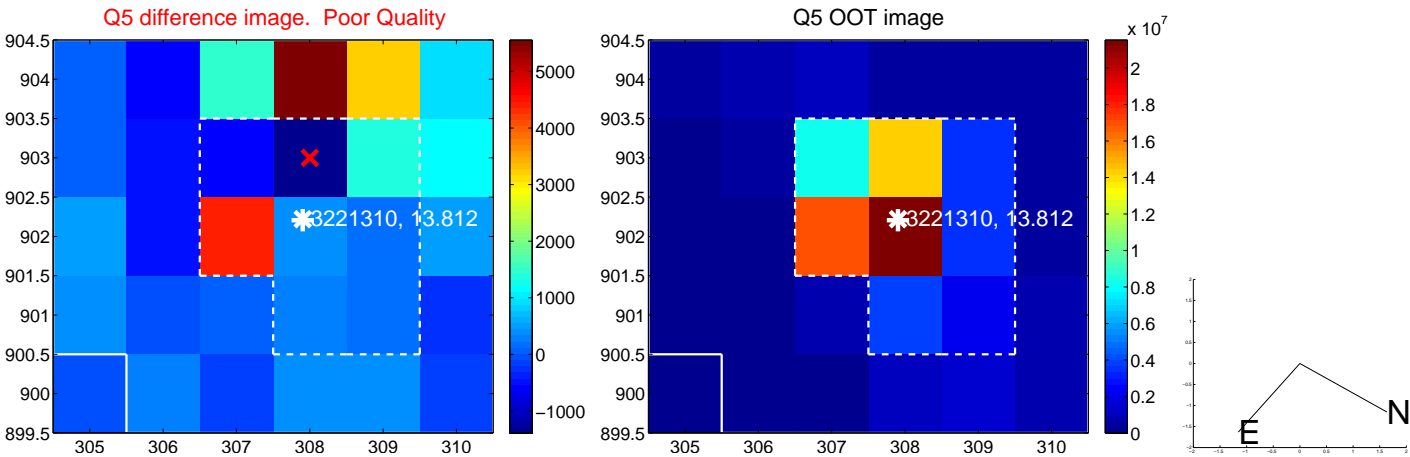


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

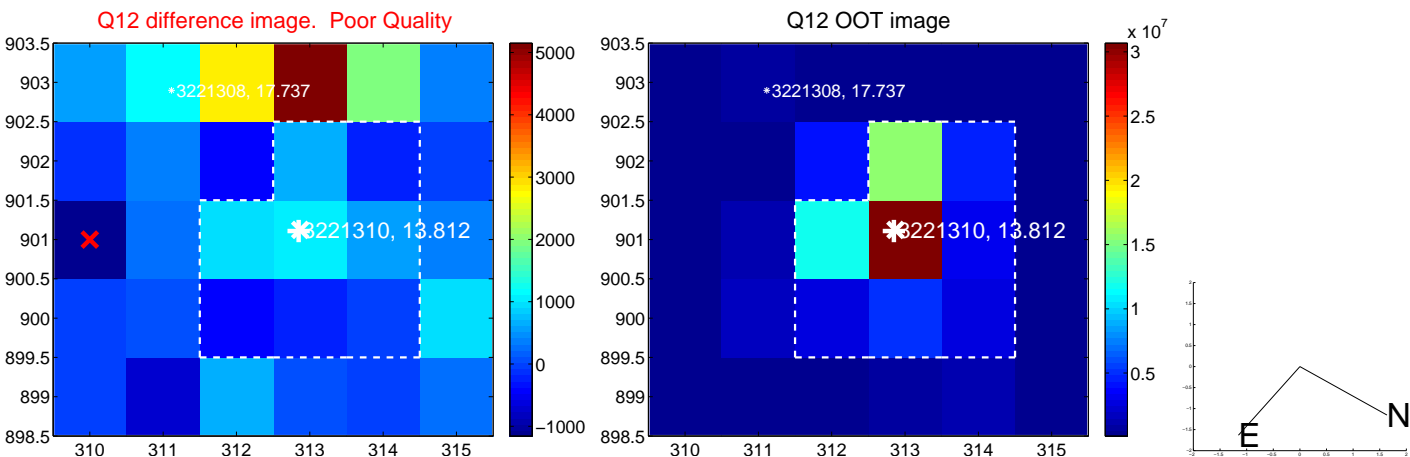
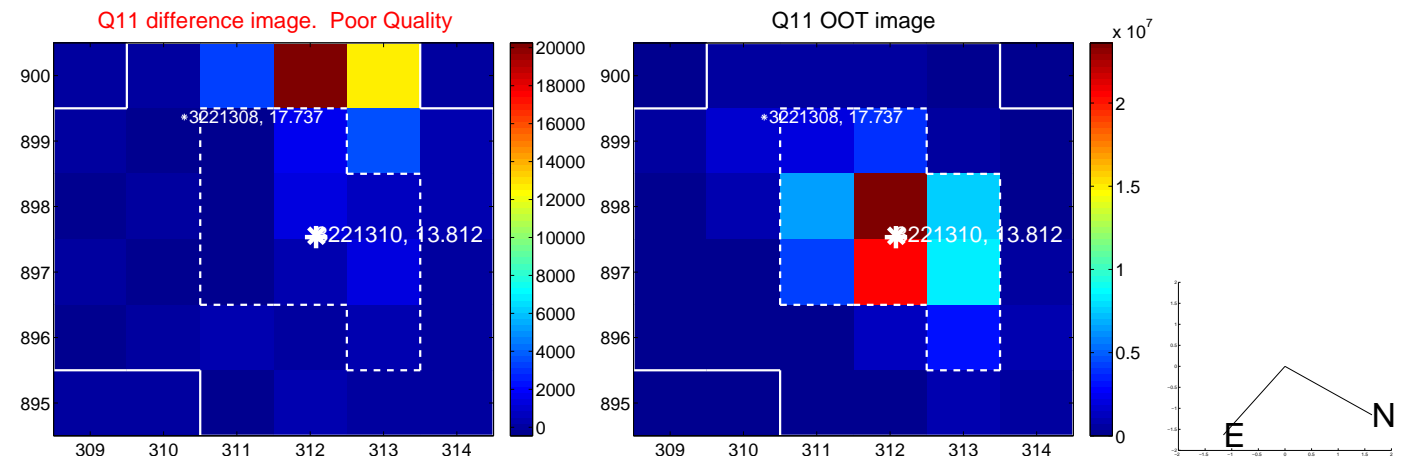
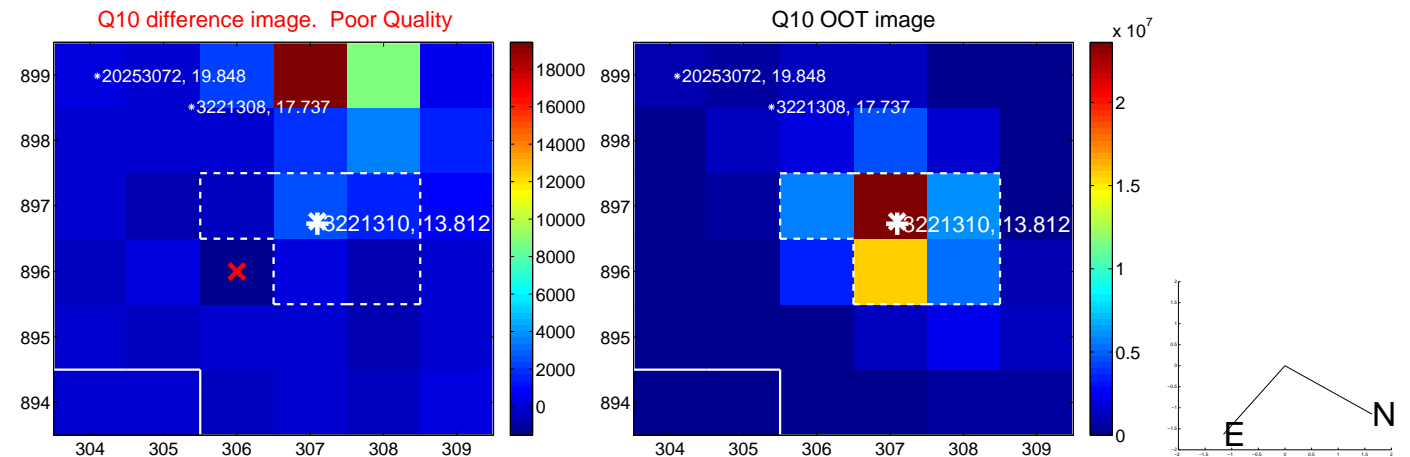
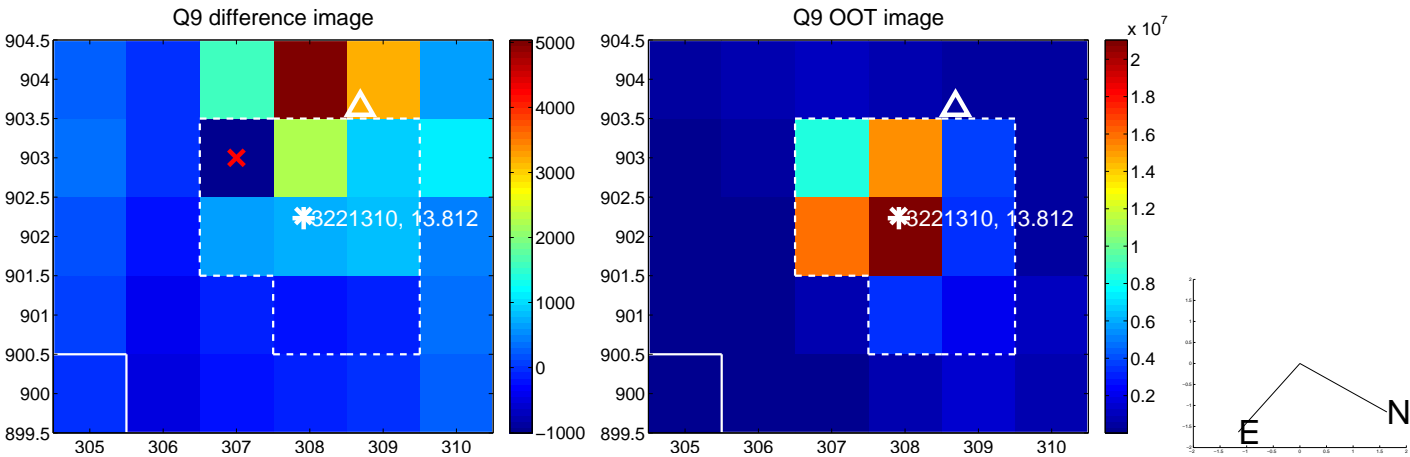


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

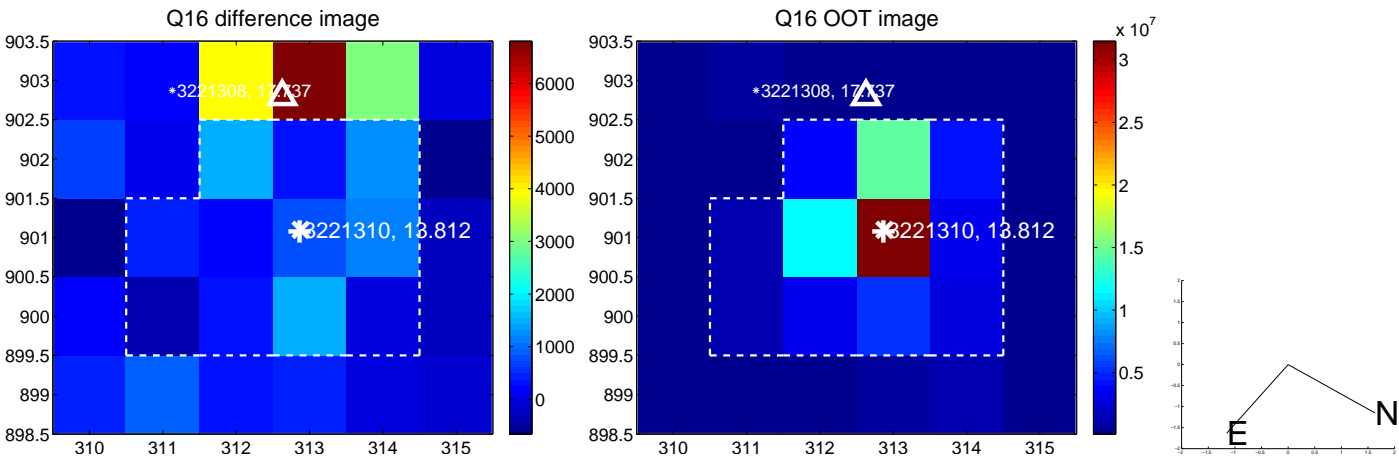
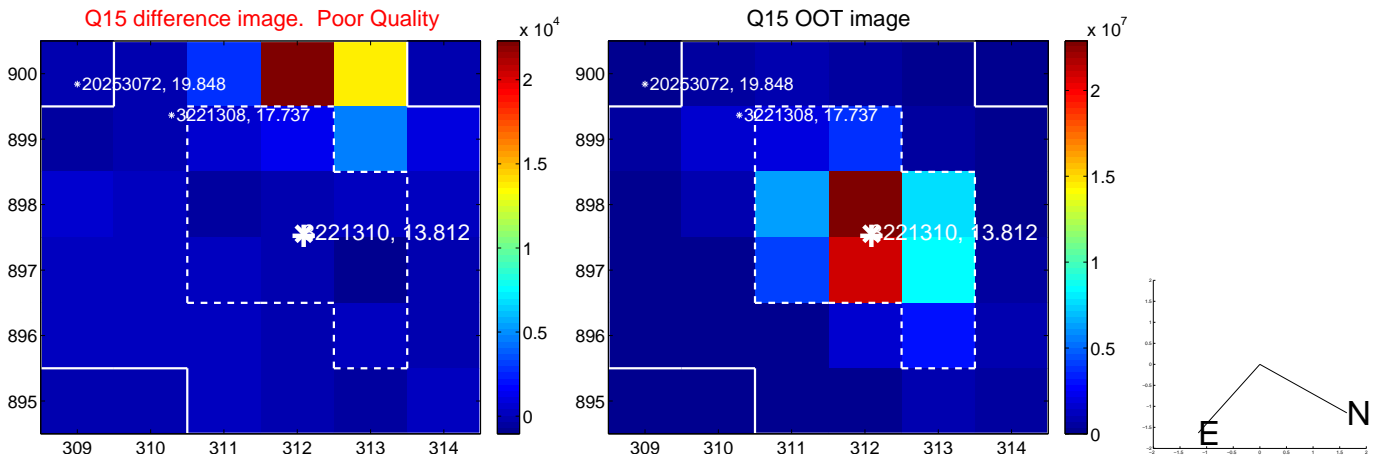
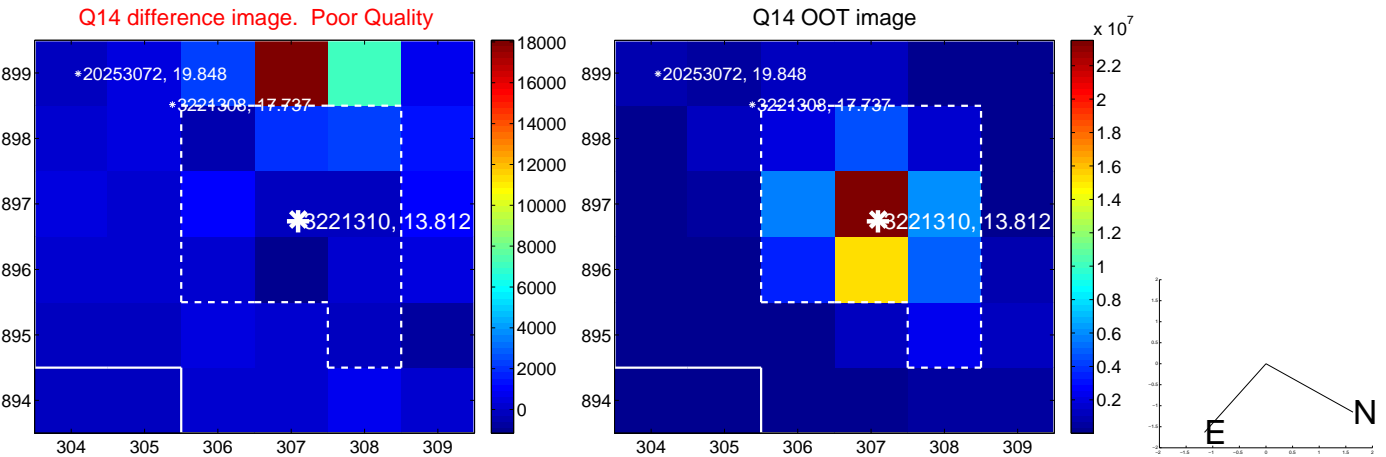
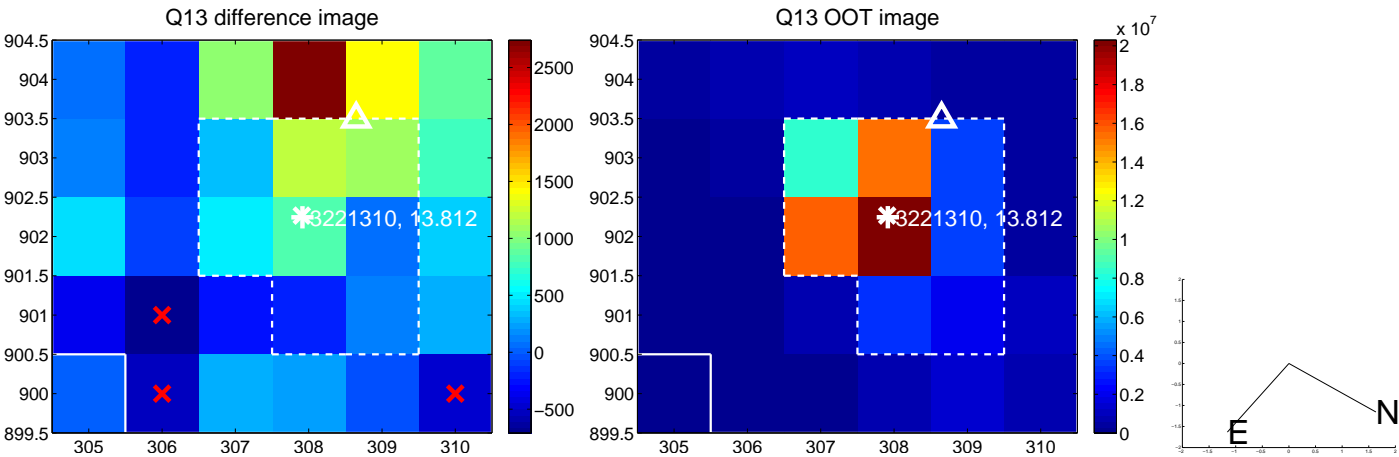




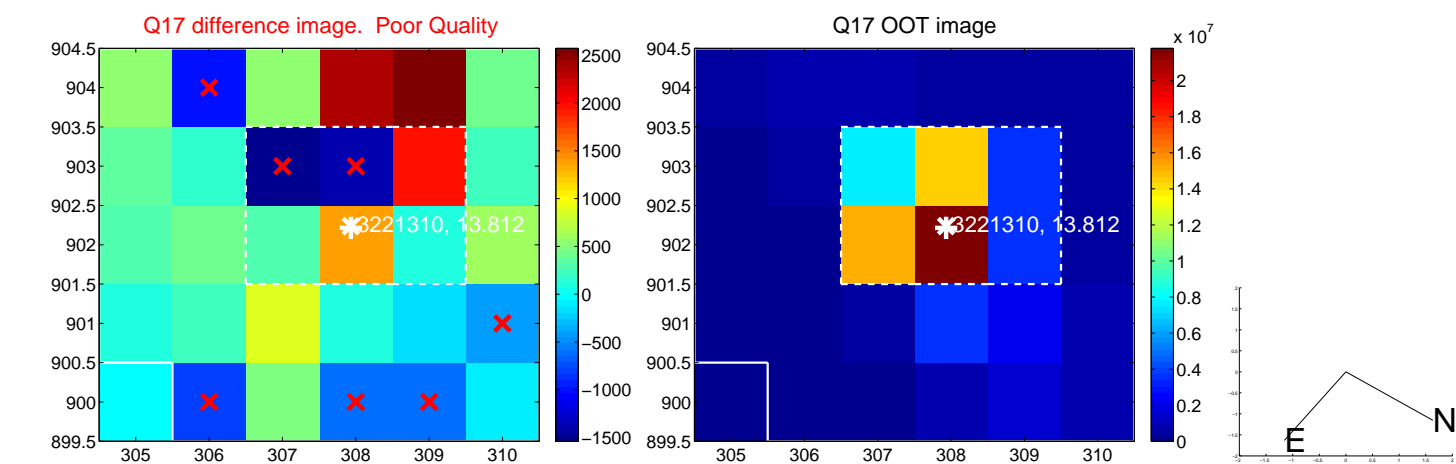
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



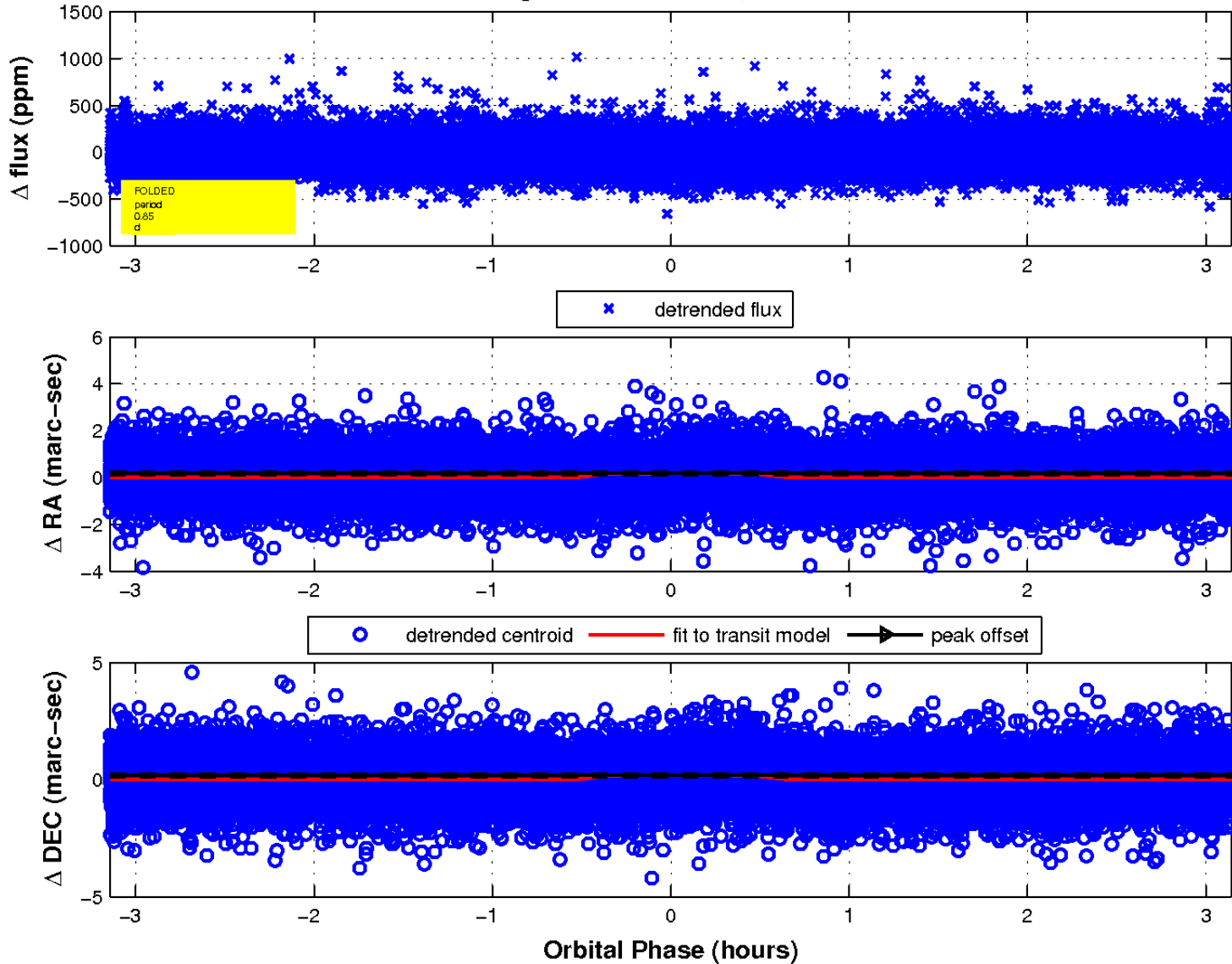
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

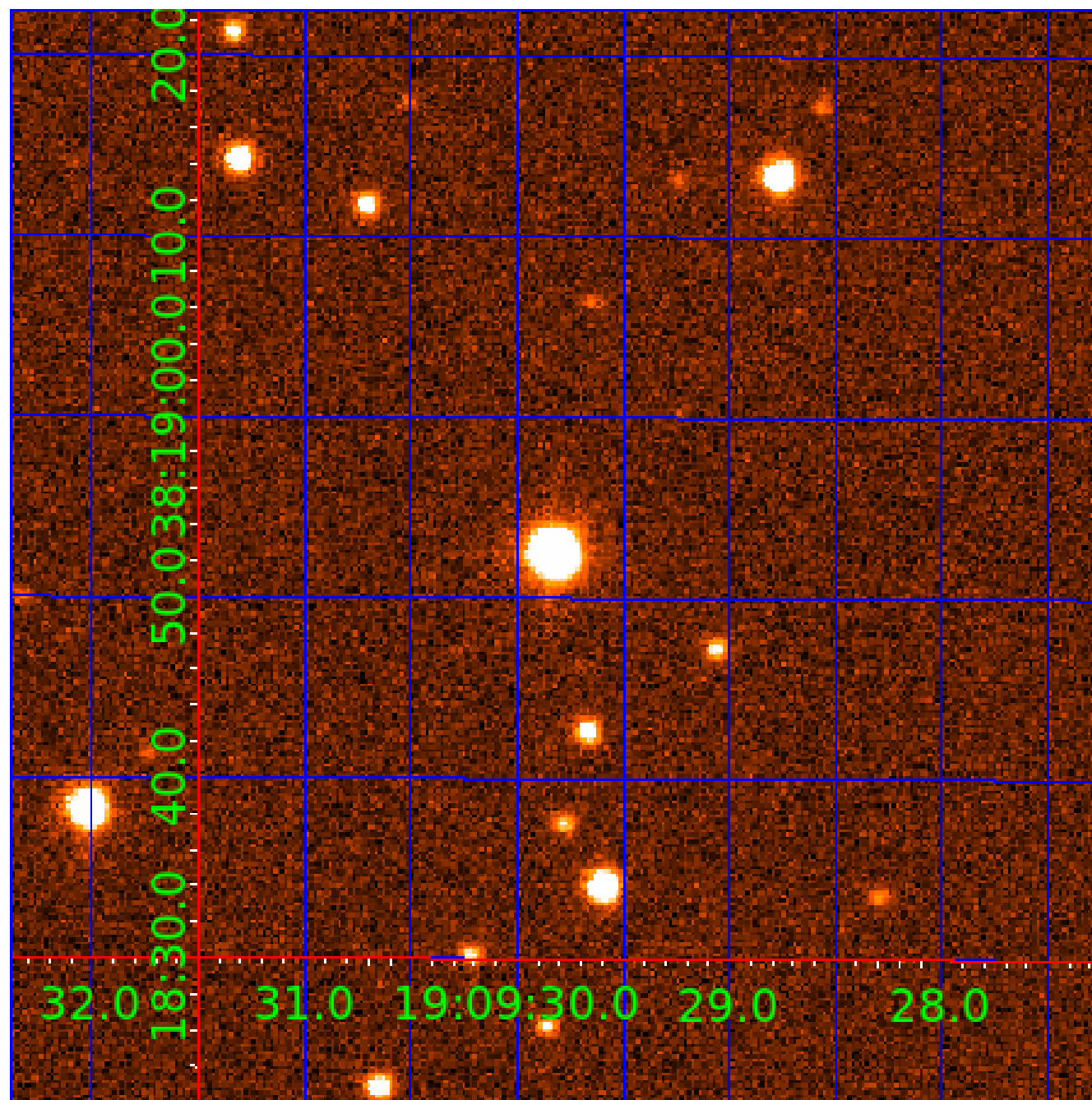


fluxWeightedCentroids, Planet 1 of 3



UKIRT Image

Declination



# KIC 003221310

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003221310-01	OBS	No	0.852288	131.672254	33.5	1.048	9.6	9.9	1.69	6274	1.05	10532.68
003221310-02	OBS	No	1.065355	132.101861	27.6	1.649	7.8	8.0	1.69	6274	1.04	7822.19
003221310-03	OBS	No	251.459350	235.074798	205.7	4.019	7.4	7.4	1.69	6274	2.63	5.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003221310-01	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
003221310-02	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
003221310-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS

**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.

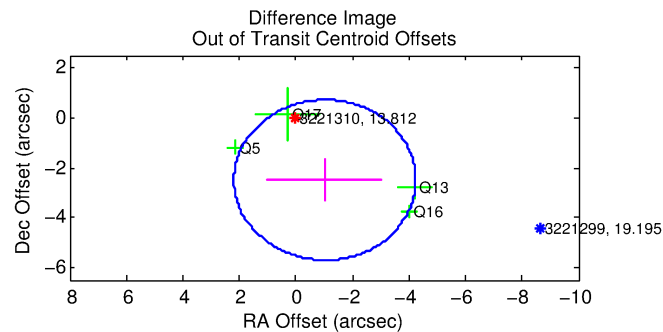
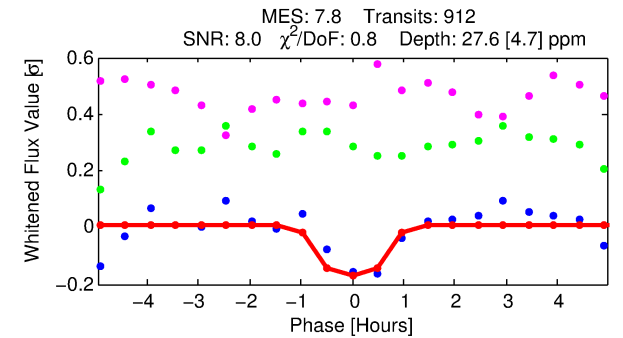
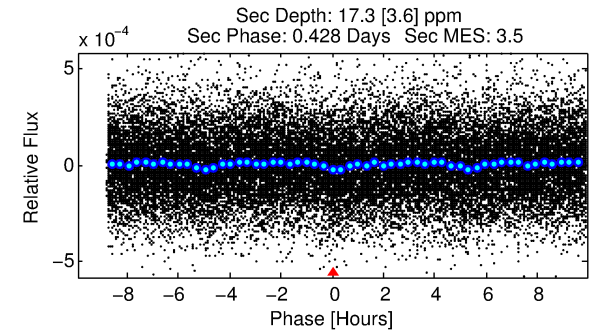
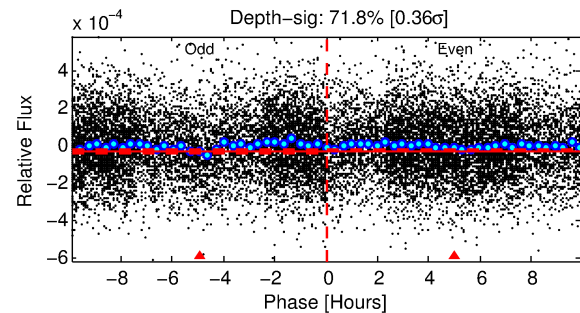
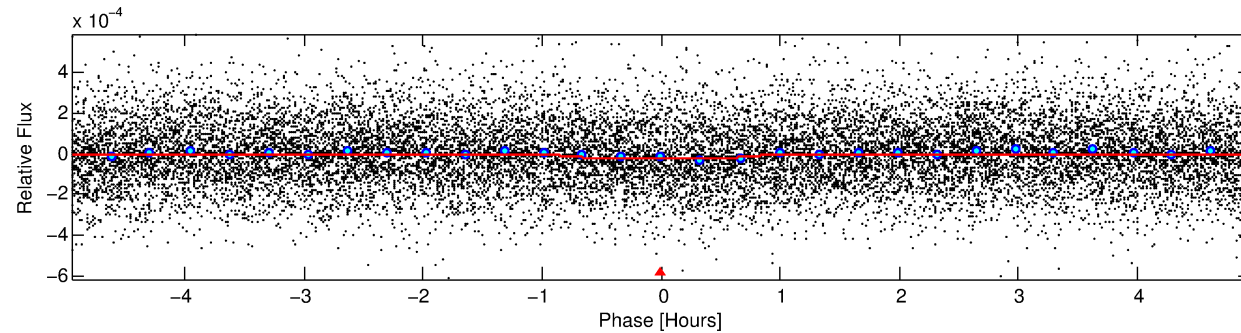
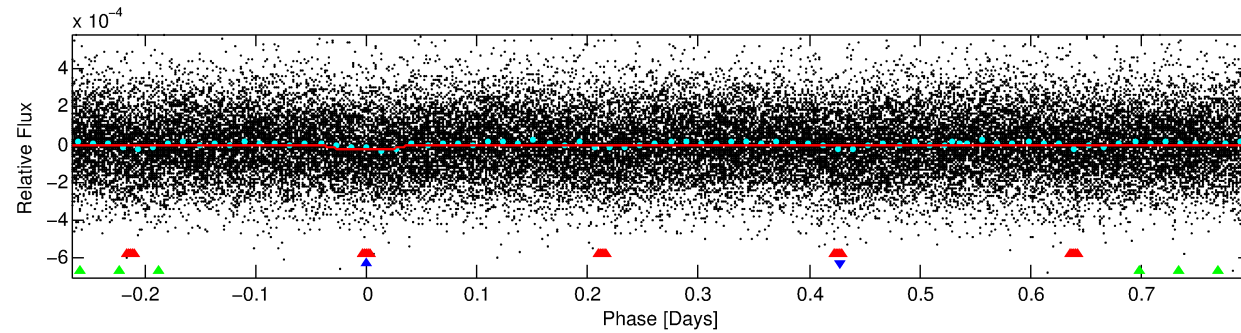
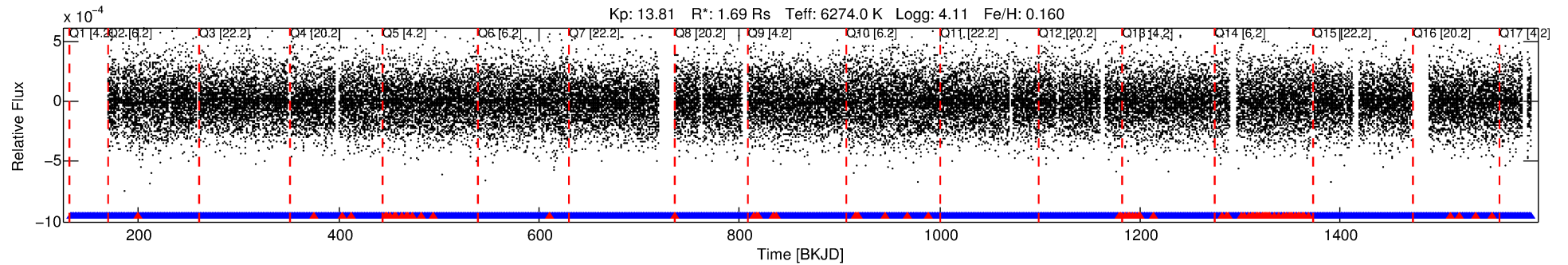
Ephemeris Match Information For 003221310-02

No Significant Match Found



# DV One-Page Summary

KIC: 3221310 Candidate: 2 of 3 Period: 1.065 d



## DV Fit Results:

Period = 1.06535 [0.00001] d  
Epoch = 132.1019 [0.0031] BKJD  
Rp/R\* = 0.0057 [0.0022]  
a/R\* = 2.43 [4.23]  
b = 0.90 [0.47]  
Seff = 7822.19 [3389.58]  
Teq = 2398 [260] K  
Rp = 1.04 [0.53] Re  
a = 0.0225 [0.0061] AU  
Ag = 4.45 [4.07] [0.85 $\sigma$ ]  
Teffp = 5384 [1125] K [2.59 $\sigma$ ]

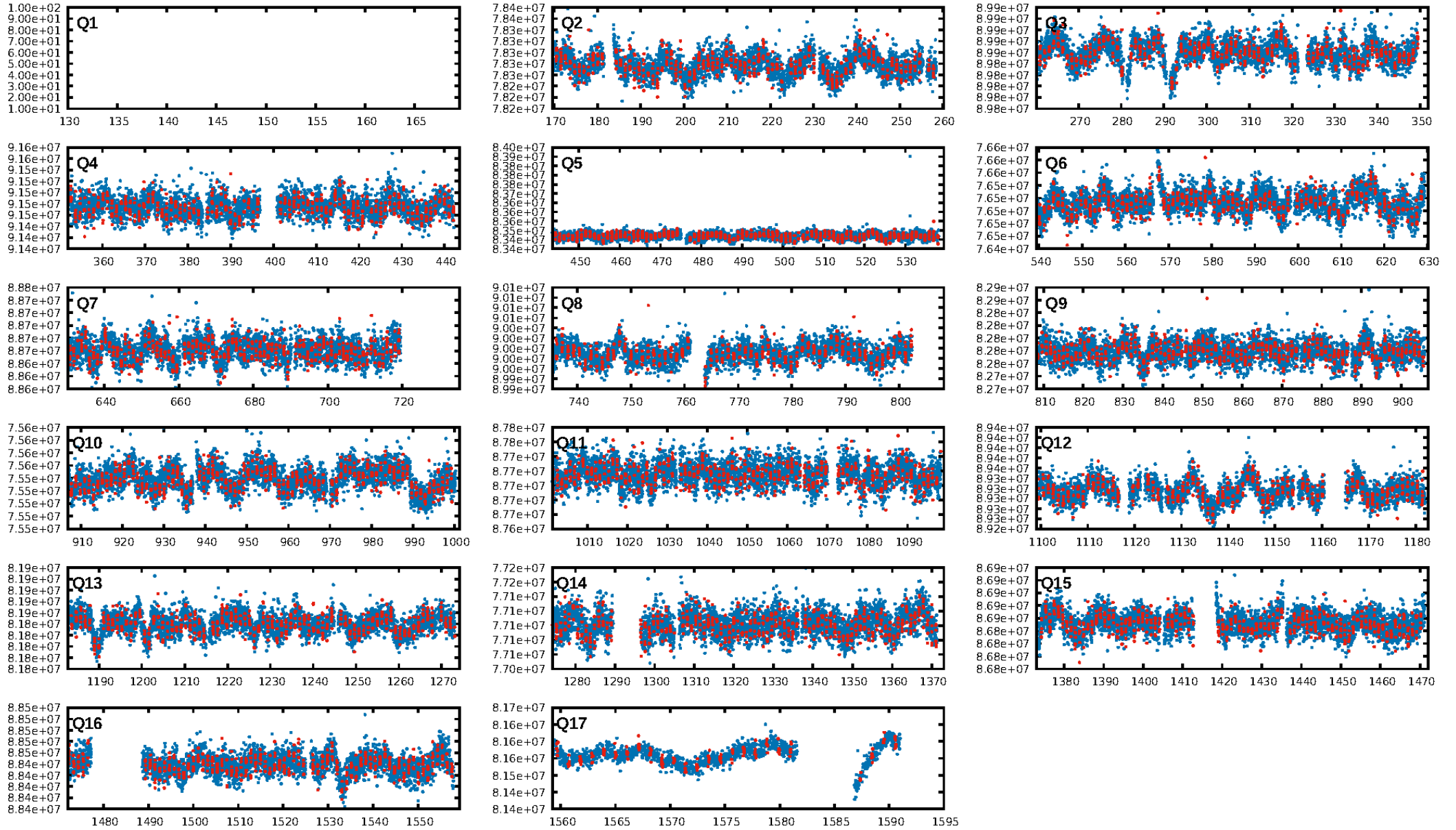
## DV Diagnostic Results:

ShortPeriod-sig: 99.1% [2.62 $\sigma$ ]  
LongPeriod-sig: 100.0% [1383.34 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.00e-15  
RollingBand-fgt: 0.91 [811/893]  
**GhostDiagnostic-chr: 0.3476**  
Centroid-sig: 21.3%  
Centroid-so: 1.437 arcsec [0.88 $\sigma$ ]  
OotOffset-rm: 2.697 arcsec [2.52 $\sigma$ ]  
OotOffset-st: 0/0/1/3 [4]  
KicOffset-rm: 2.658 arcsec [2.52 $\sigma$ ]  
KicOffset-st: 0/0/1/3 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 1.00 [16/16]

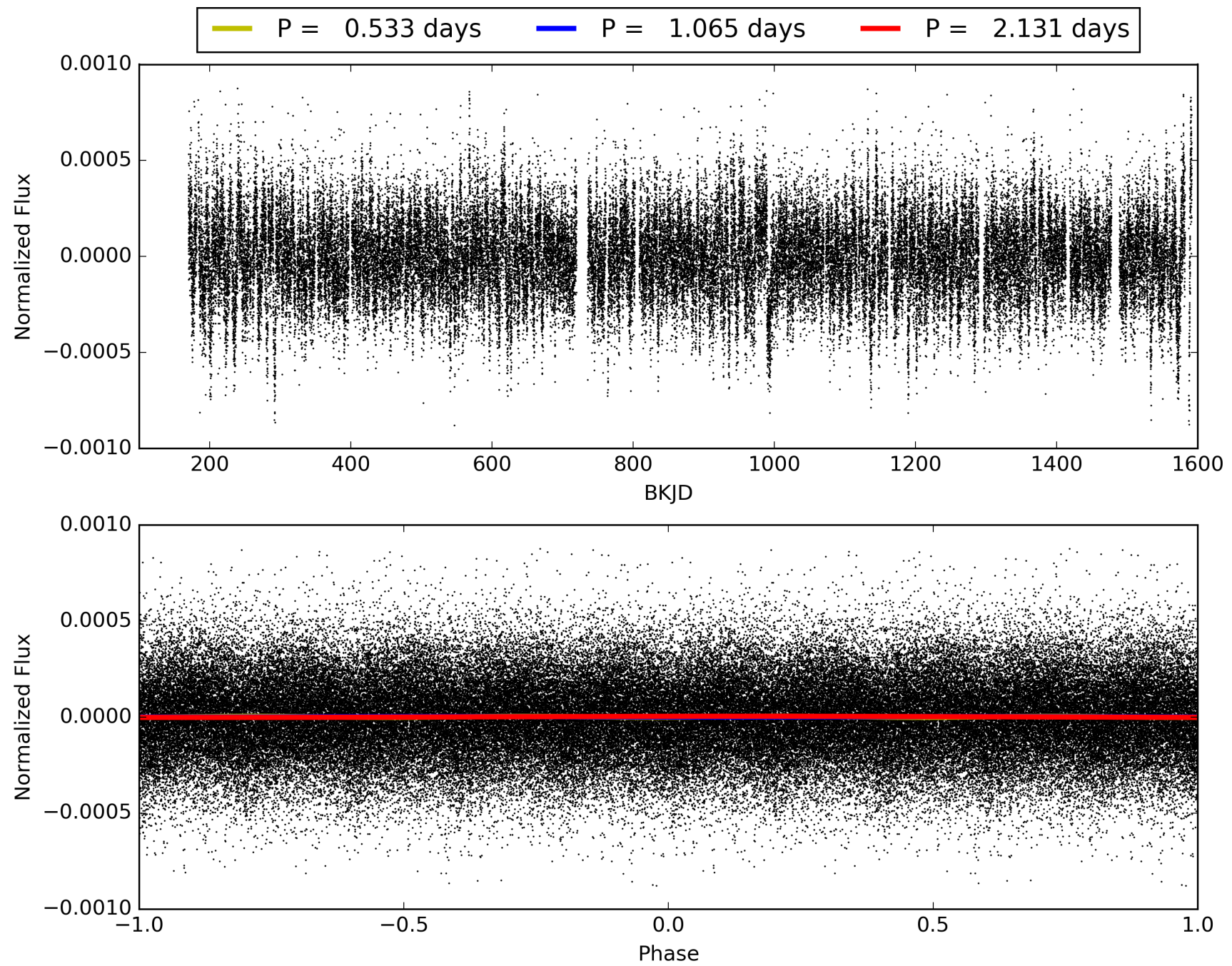
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:21:18 Z

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

# TCE 003221310-02, PDC Light Curves



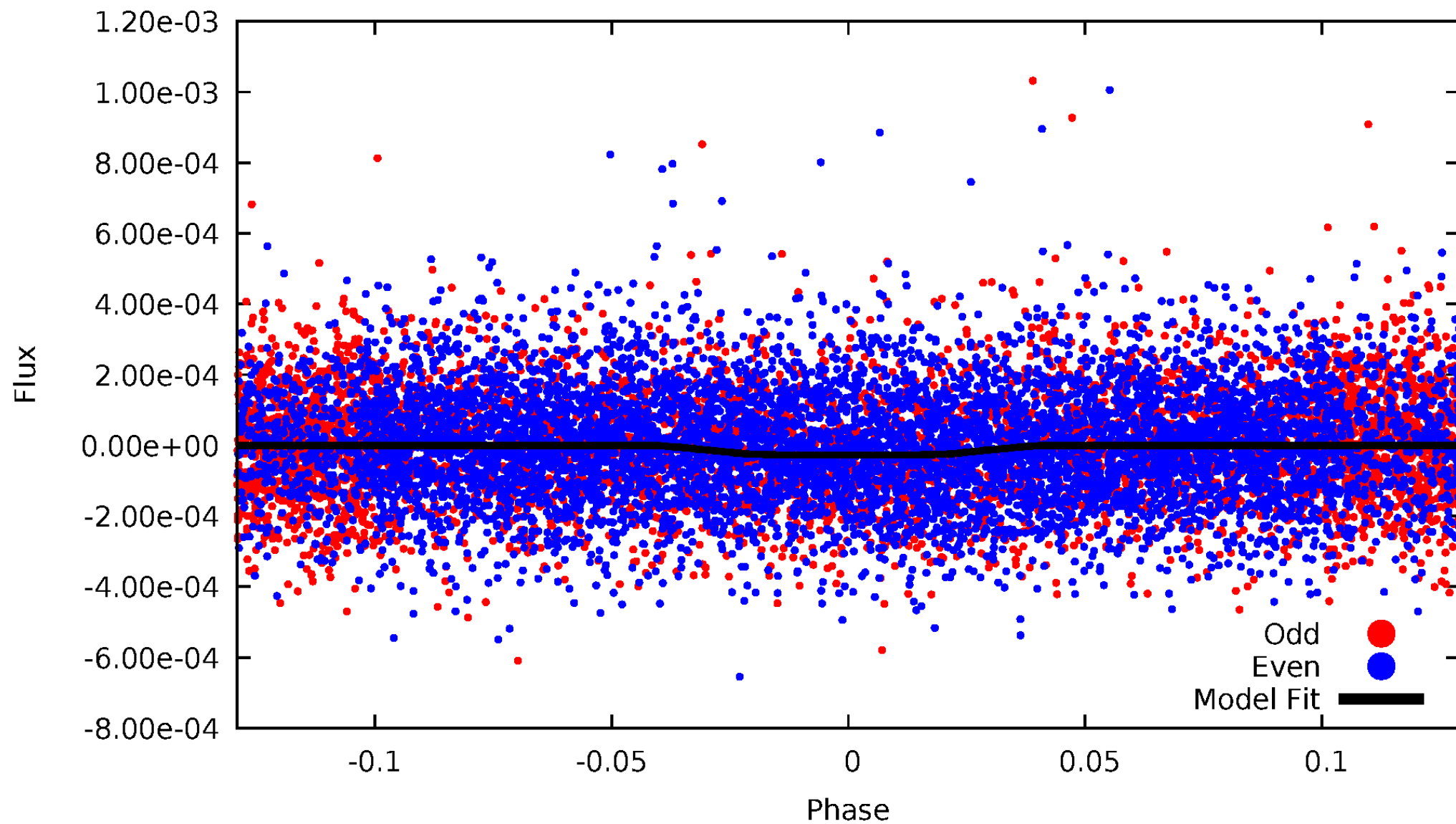
TCE 003221310-02





# DV Odd/Even

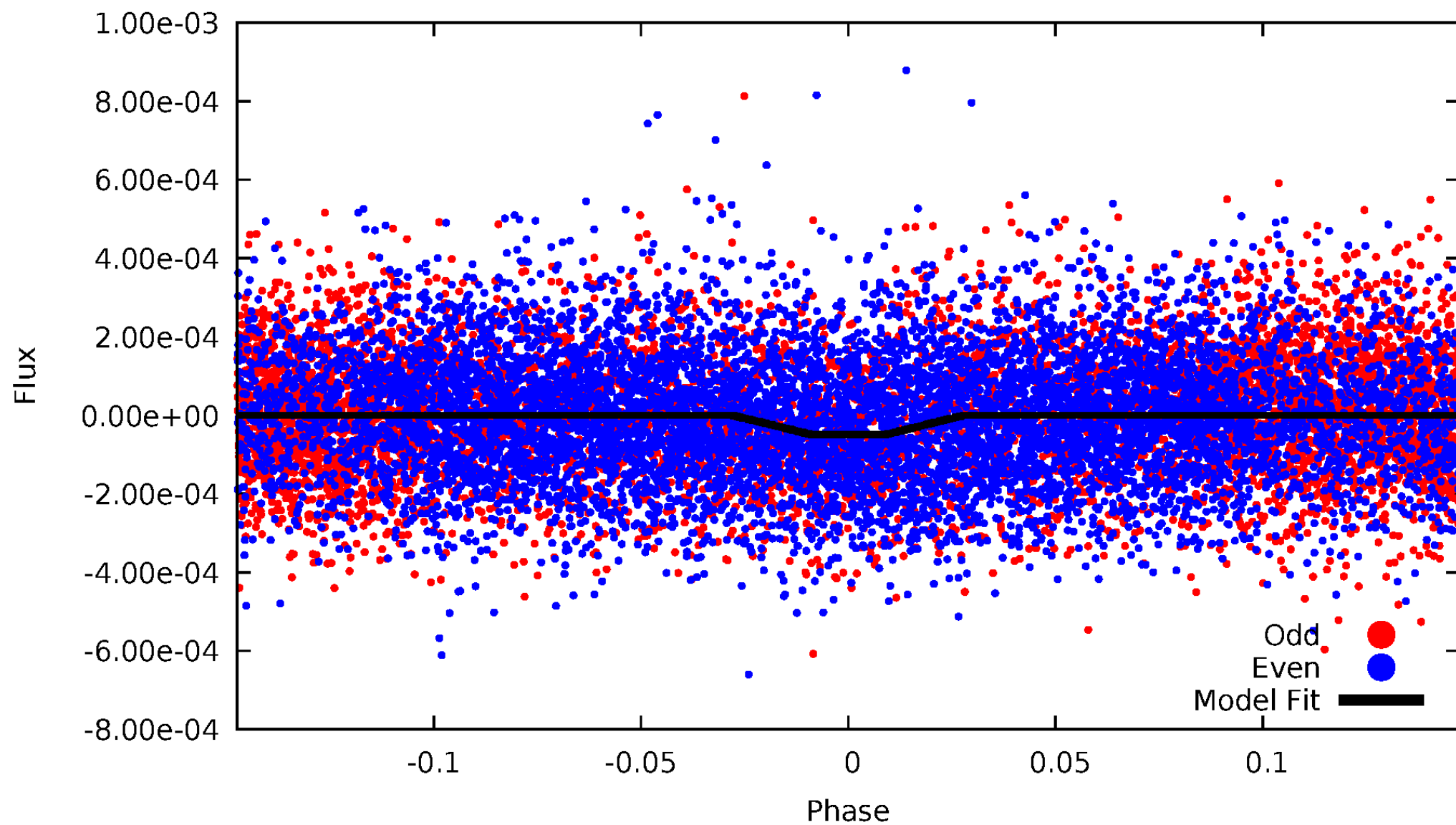
TCE 003221310-02





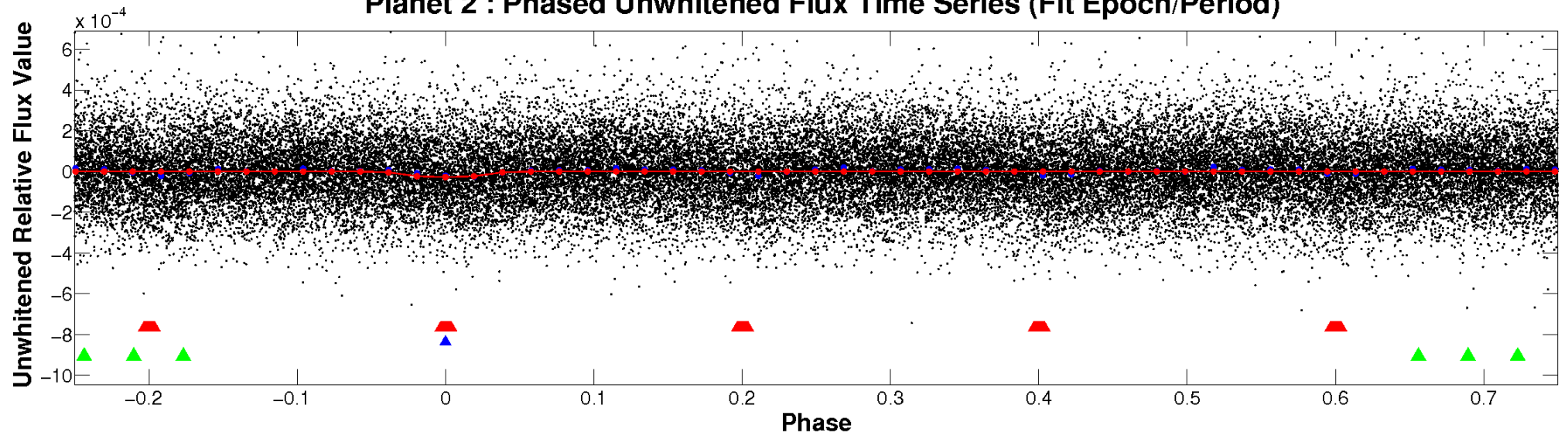
# ALT Odd/Even

TCE 003221310-02

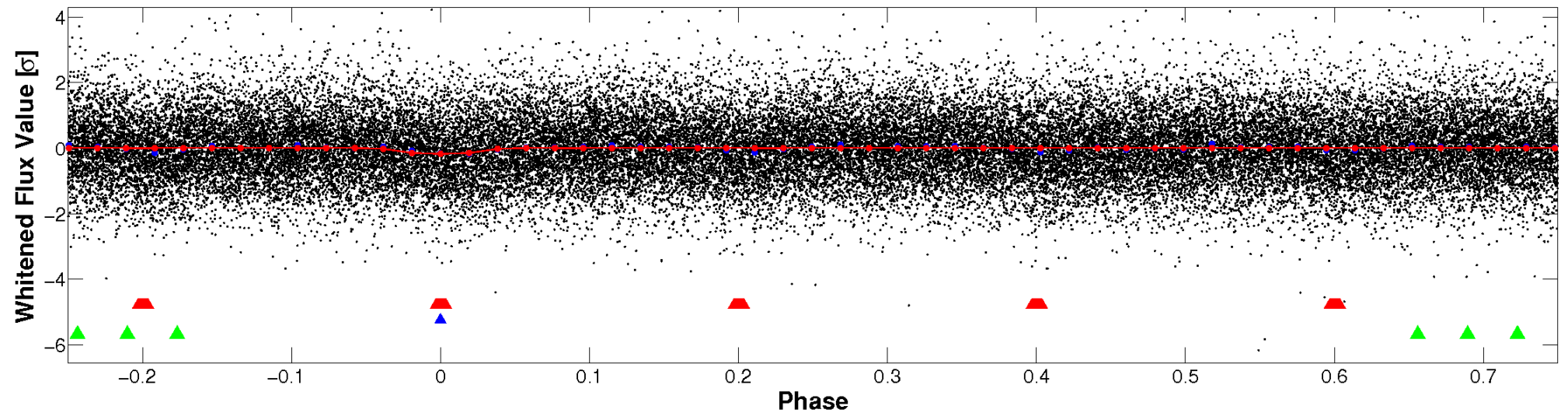


# Non-Whitened Vs. Whitened Light Curve

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

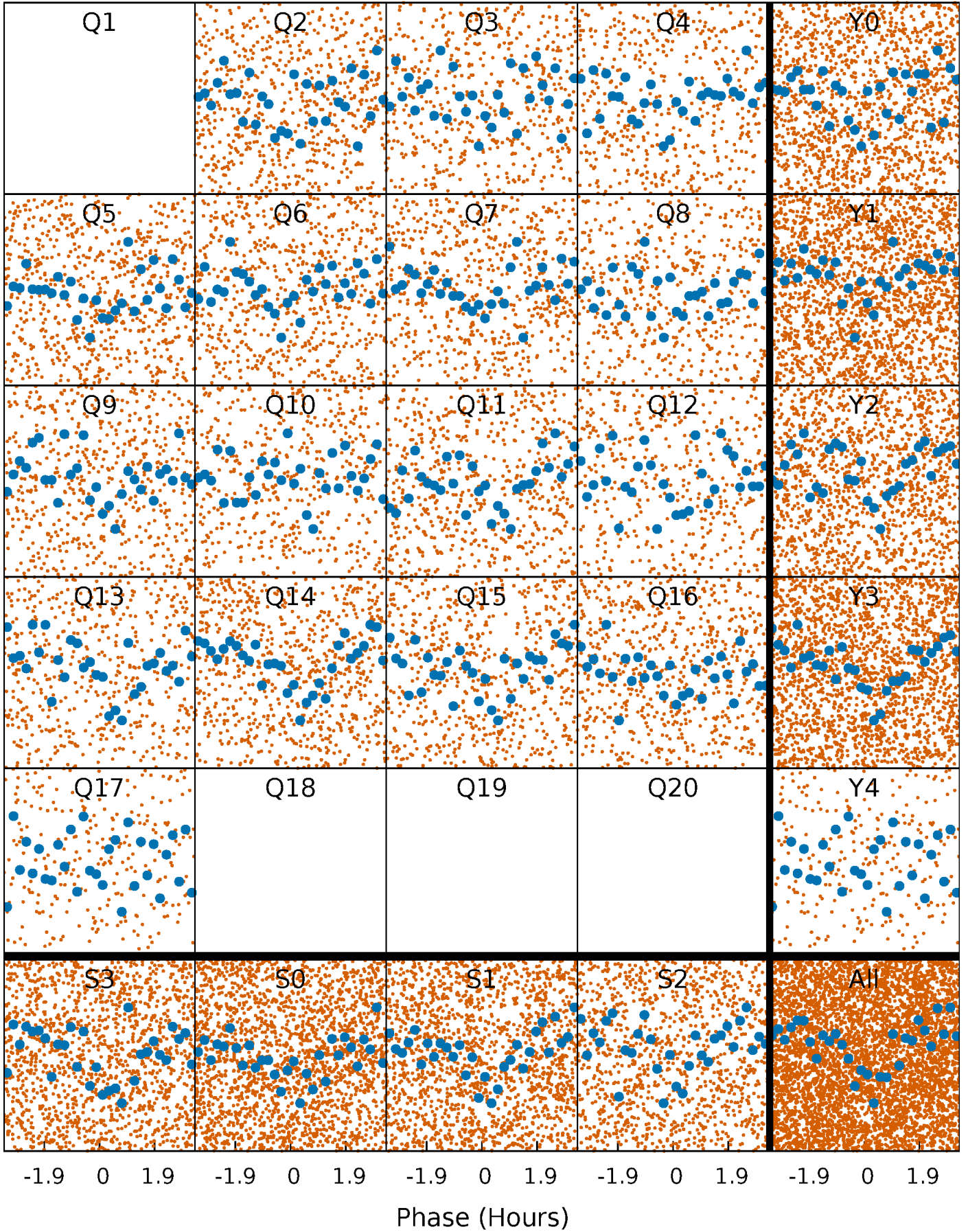


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

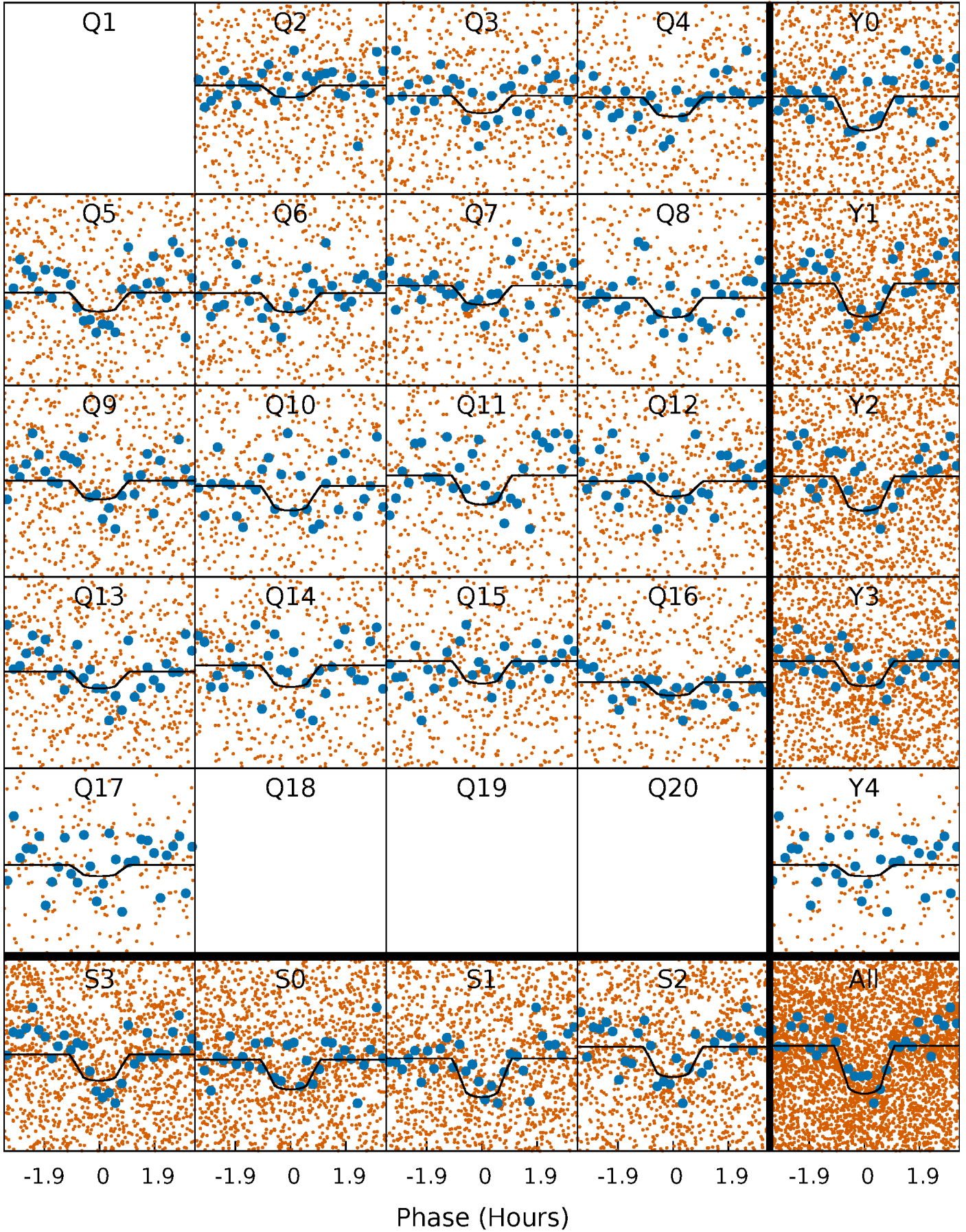
TCE 003221310-02 P= 1.065355 Days  $T_0=132.101861$  (BKJD)





# DV Quarter-Phased Transit Curves

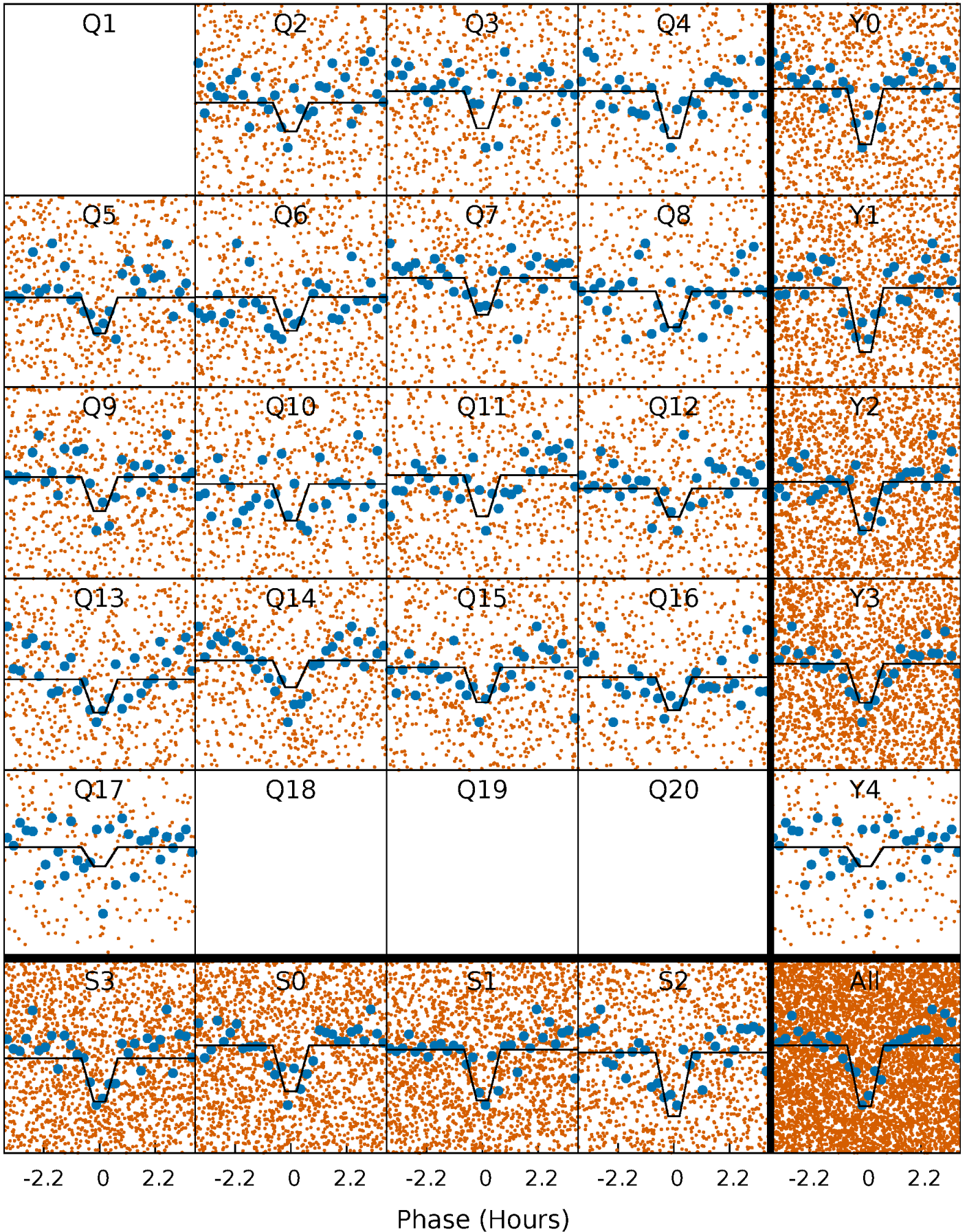
TCE 003221310-02 P= 1.065355 Days  $T_0=132.101861$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

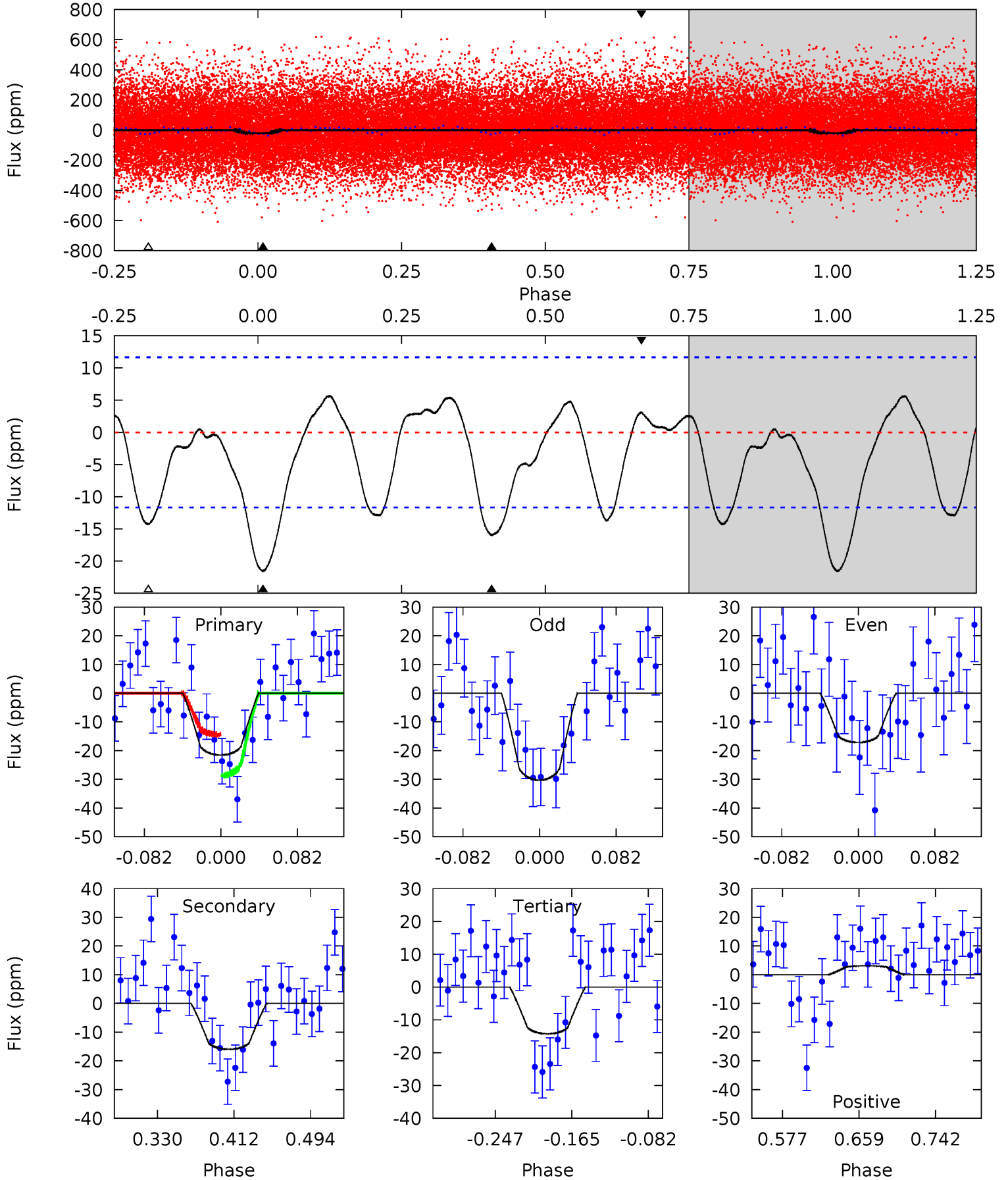
TCE 003221310-02 P= 1.065381 Days  $T_0=132.092855$  (BKJD)



# DV Model-Shift Uniqueness Test

003221310-02, P = 1.065355 Days, E = 132.101861 Days

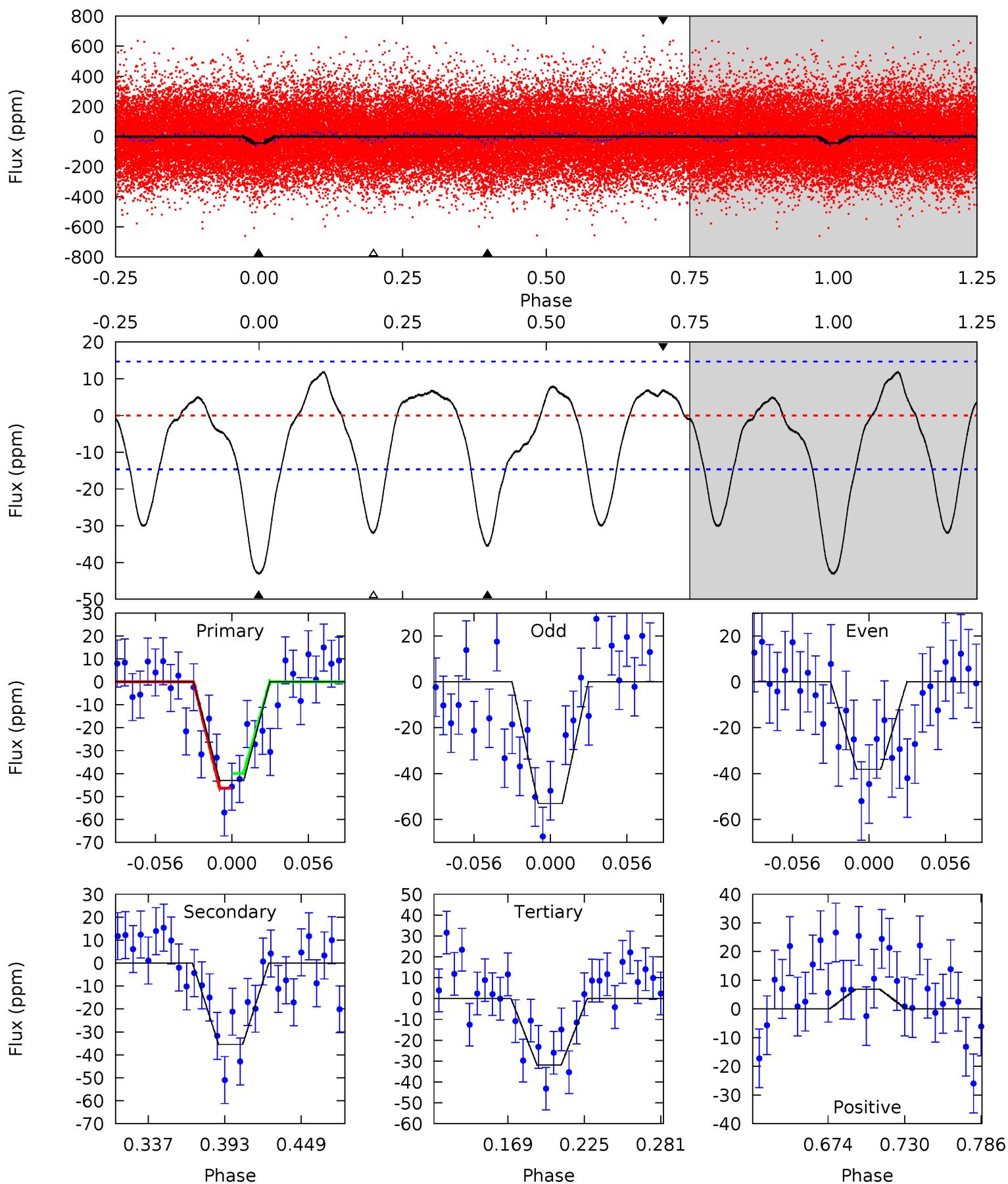
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.51	6.30	5.63	1.23	4.61	1.74	2.29	2.88	7.29	0.67	5.08	2.44	0.94	0.21	2.83



# Alt Model-Shift Uniqueness Test

003221310-02, P = 1.065381 Days, E = 132.092855 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
13.8	11.3	10.2	2.20	4.68	1.91	3.73	3.55	11.6	1.12	9.13	2.24	0.97	0.22	1.03



### Stellar Parameters For KIC 003221310

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6274^{+199}_{-243}$	$4.109^{+0.225}_{-0.184}$	$0.160^{+0.200}_{-0.300}$	$1.688^{+0.534}_{-0.486}$	$1.336^{+0.179}_{-0.246}$	$0.391^{+0.534}_{-0.200}$
	+3%/-4%	+5%/-4%	+125%/-188%	+32%/-29%	+13%/-18%	+137%/-51%
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 003221310-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-16 \pm 3$	$1.03^{+0.45}_{-0.42}$	$3330^{+276}_{-265}$	$5159^{+1773}_{-700}$	$4.078^{+8.697}_{-2.061}$
Alt.	$-35 \pm 3$	$1.29^{+0.49}_{-0.44}$	$3337^{+282}_{-261}$	$5666^{+1258}_{-750}$	$5.871^{+7.397}_{-2.818}$

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

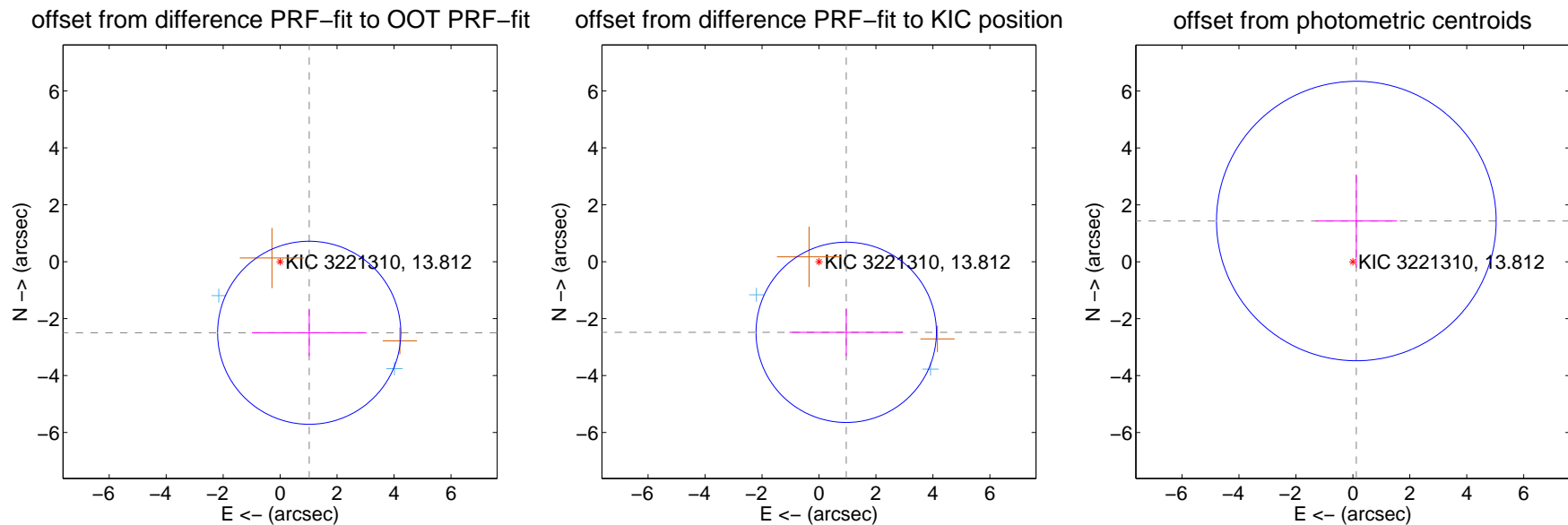
## DV Centroid Data

Supplemental centroid analysis for 003221310-02. Kepler magnitude: 13.81. Transit SNR 7.98

There are 2 quarters with good PRF difference image offsets

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

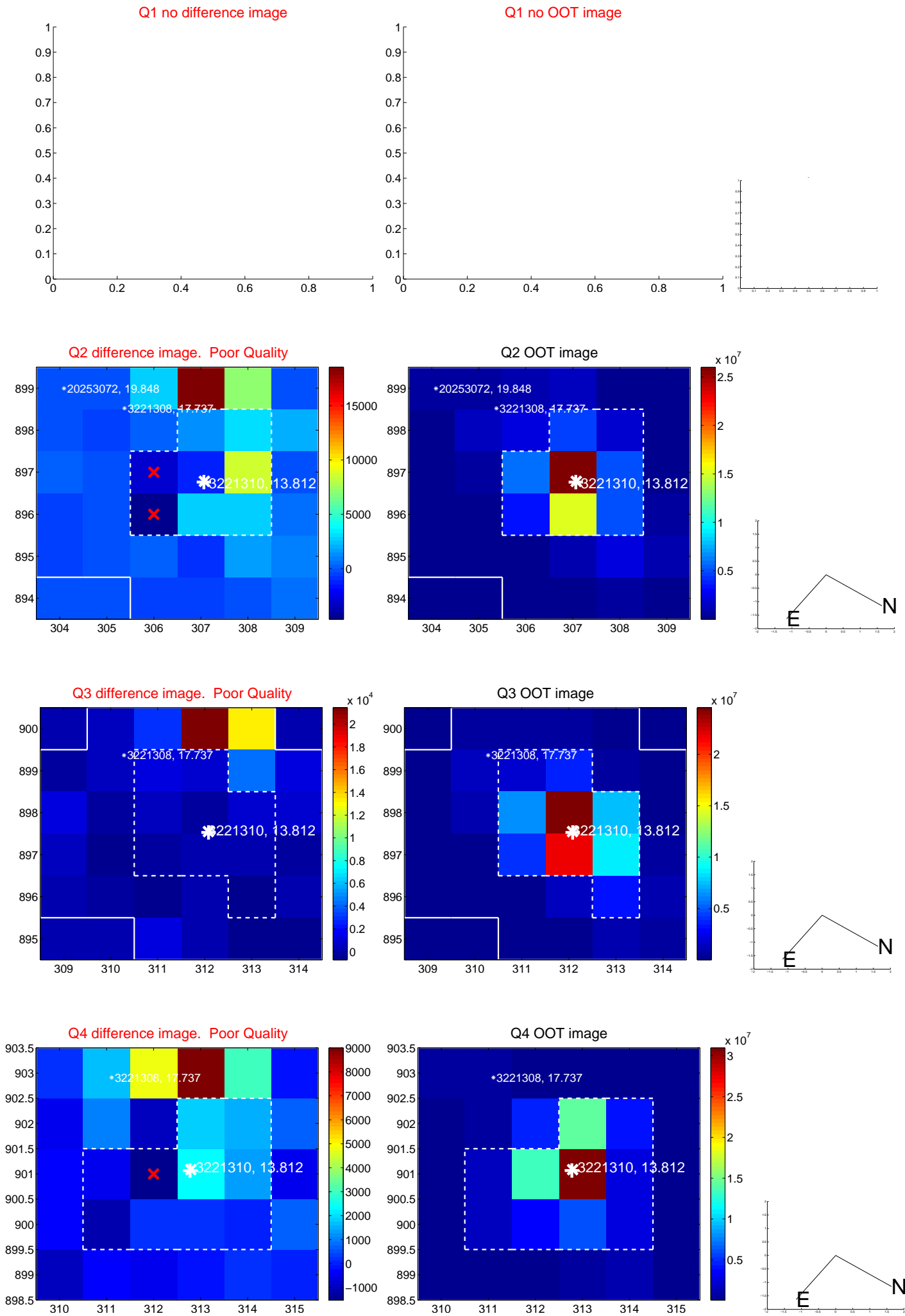
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.697 \pm 1.071$	2.52	$-1.022 \pm 2.012$	$-2.496 \pm 0.814$
PRF-fit source offset from KIC position	$2.658 \pm 1.055$	2.52	$-0.956 \pm 1.997$	$-2.480 \pm 0.828$
photometric centroid source offset	$1.44 \pm 1.64$	0.88	$-0.12 \pm 1.43$	$1.43 \pm 1.64$



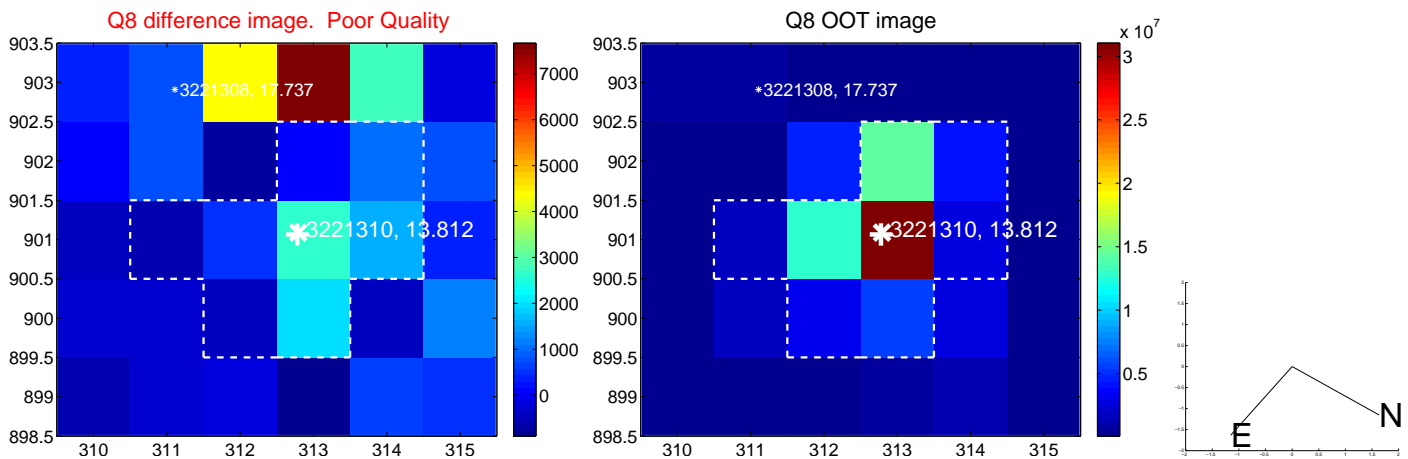
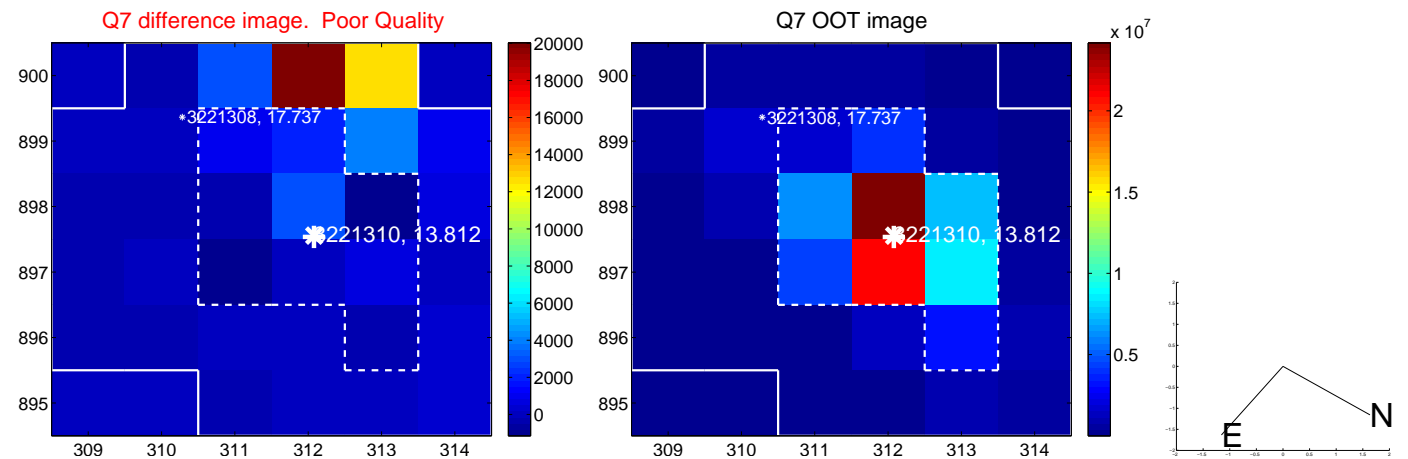
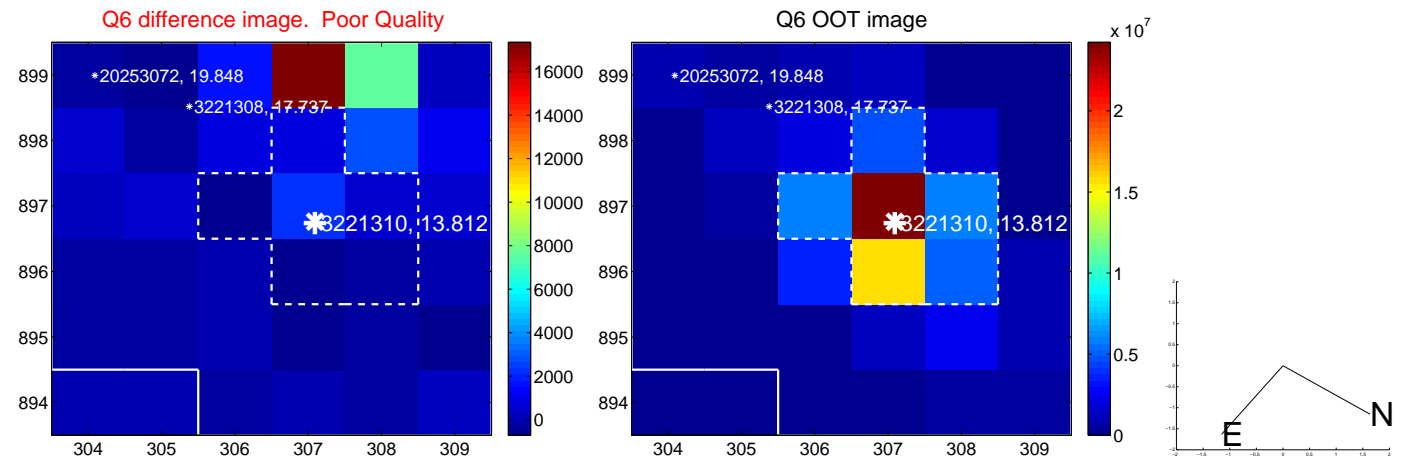
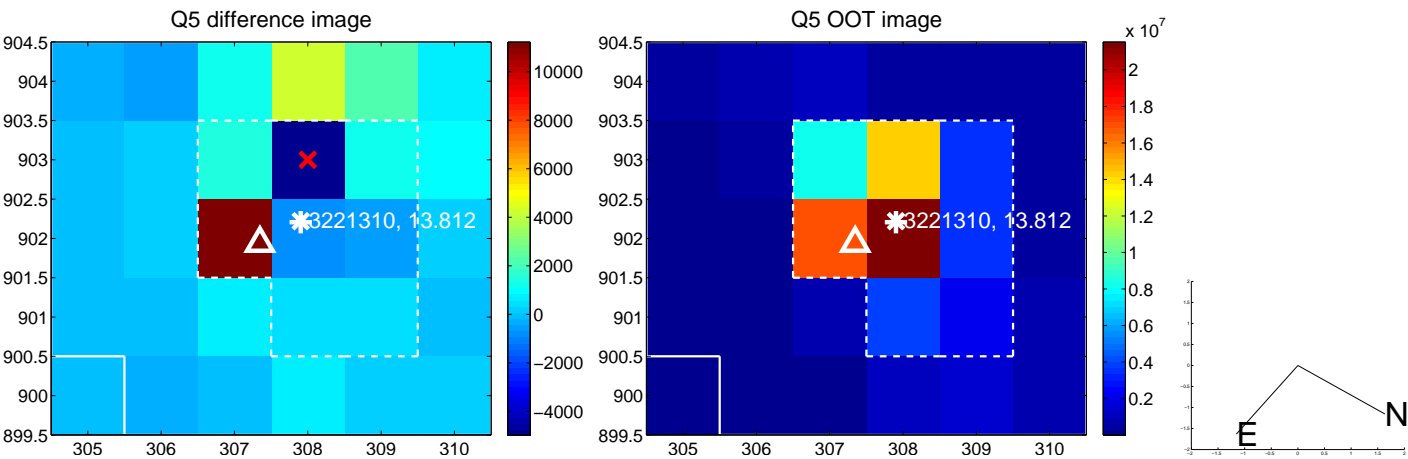
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



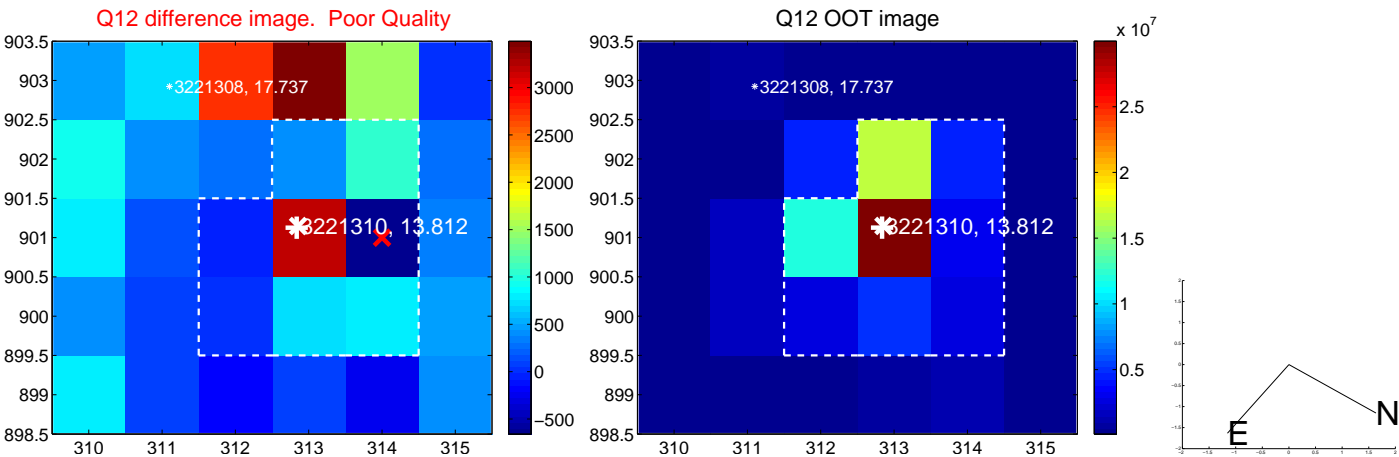
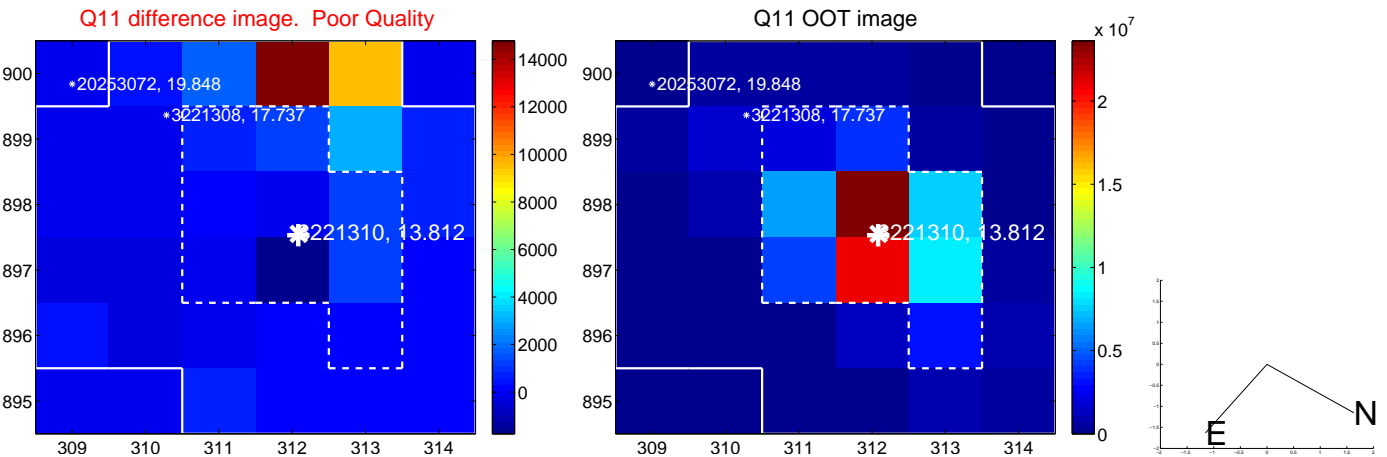
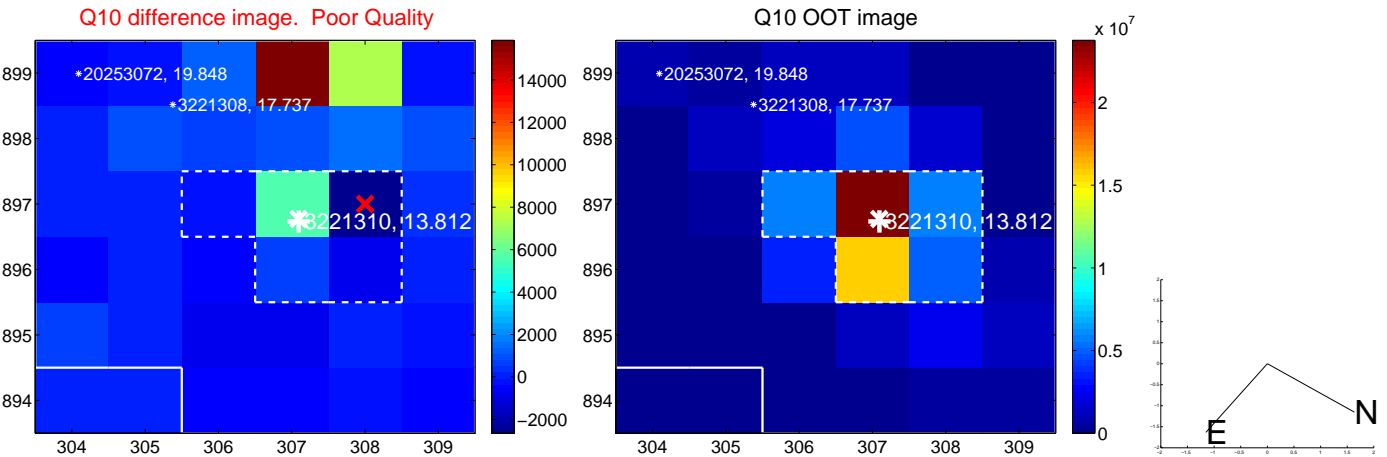
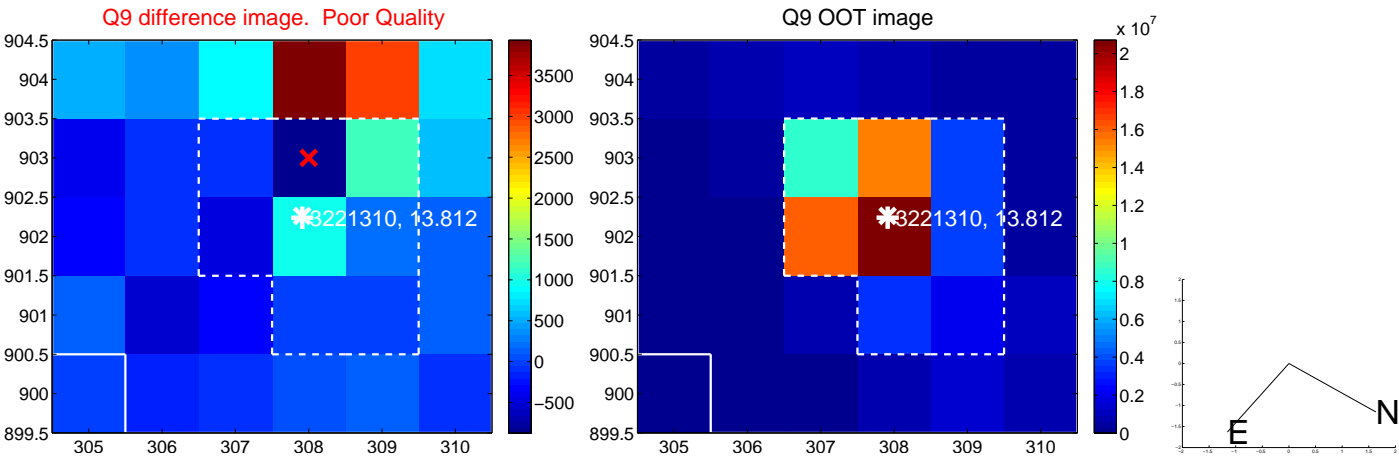
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



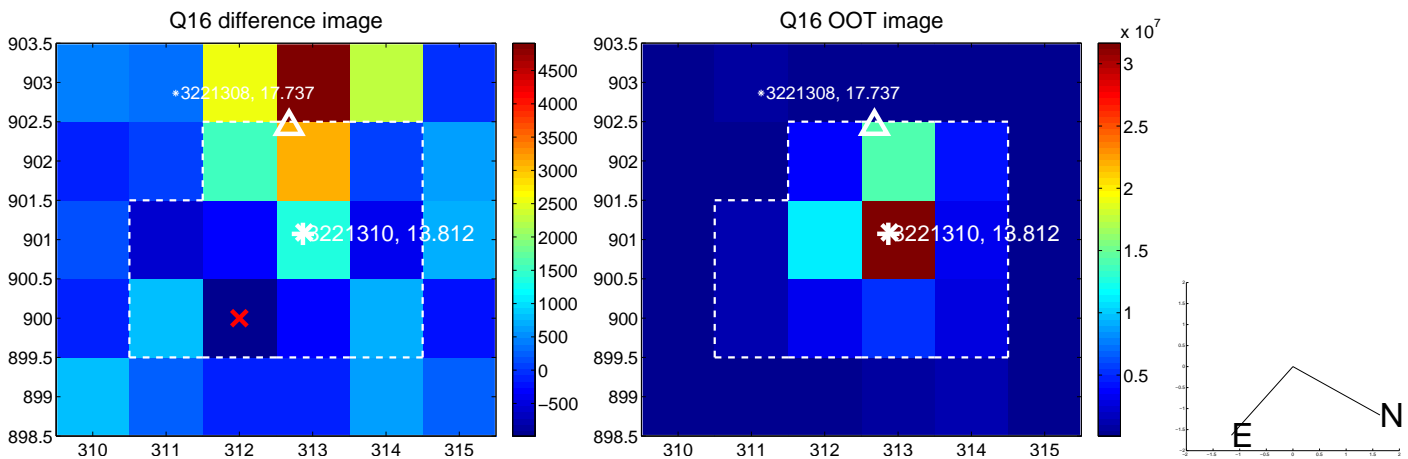
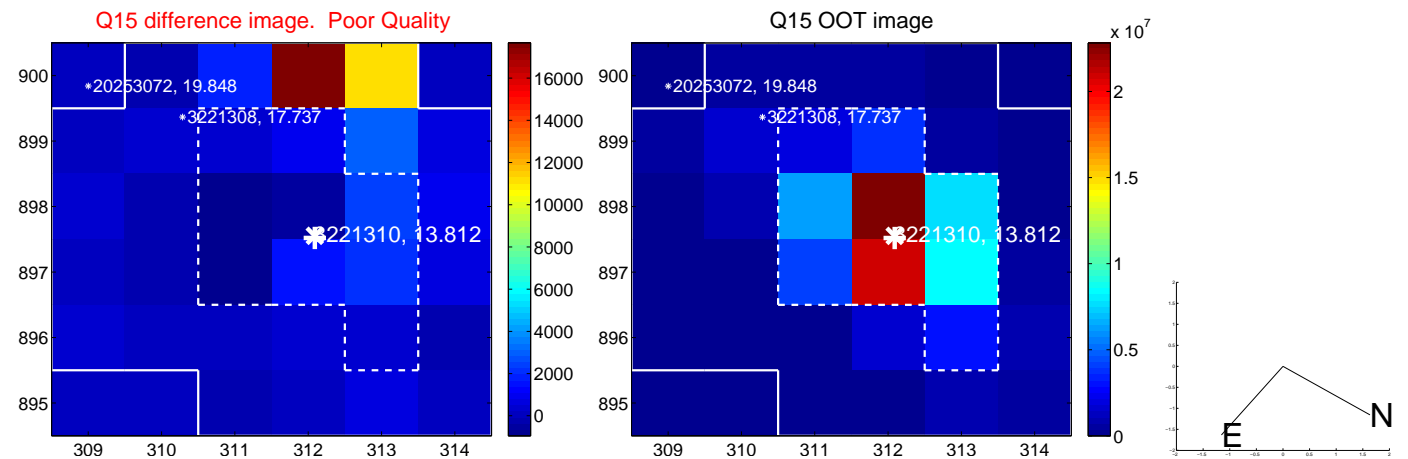
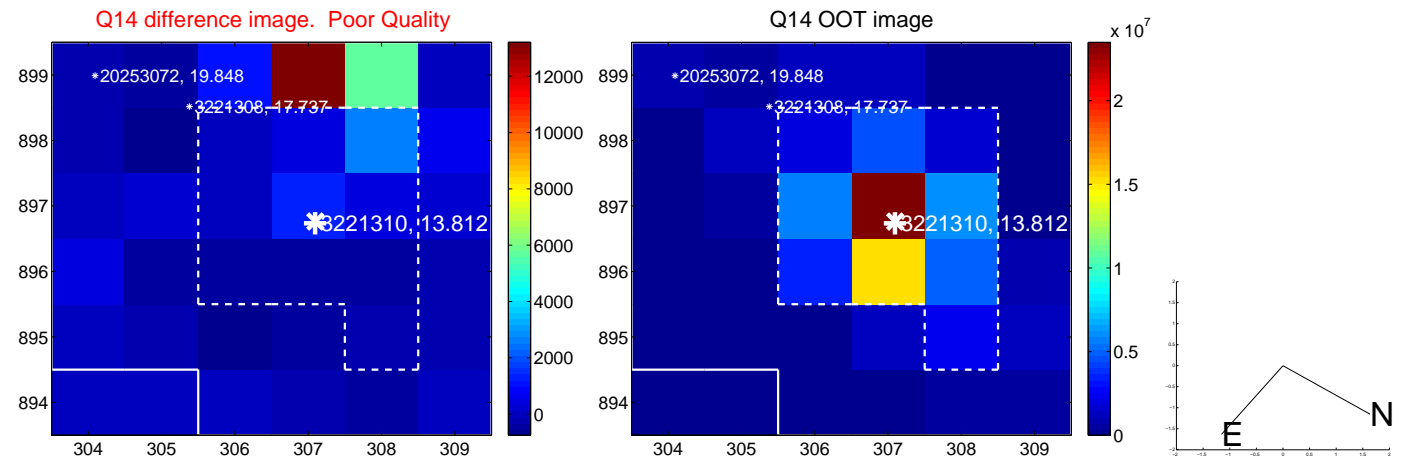
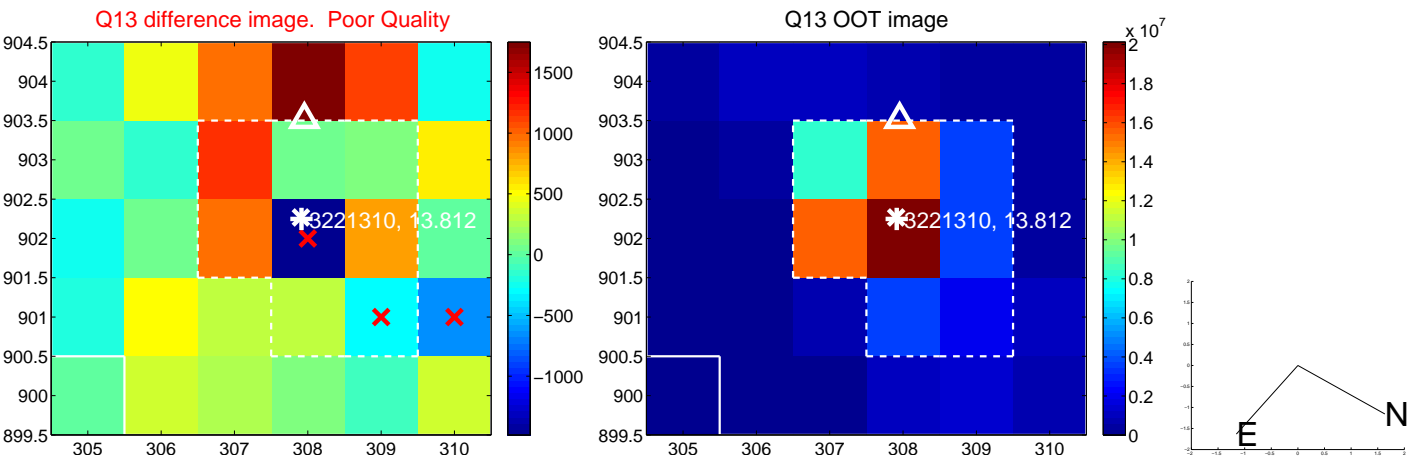
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



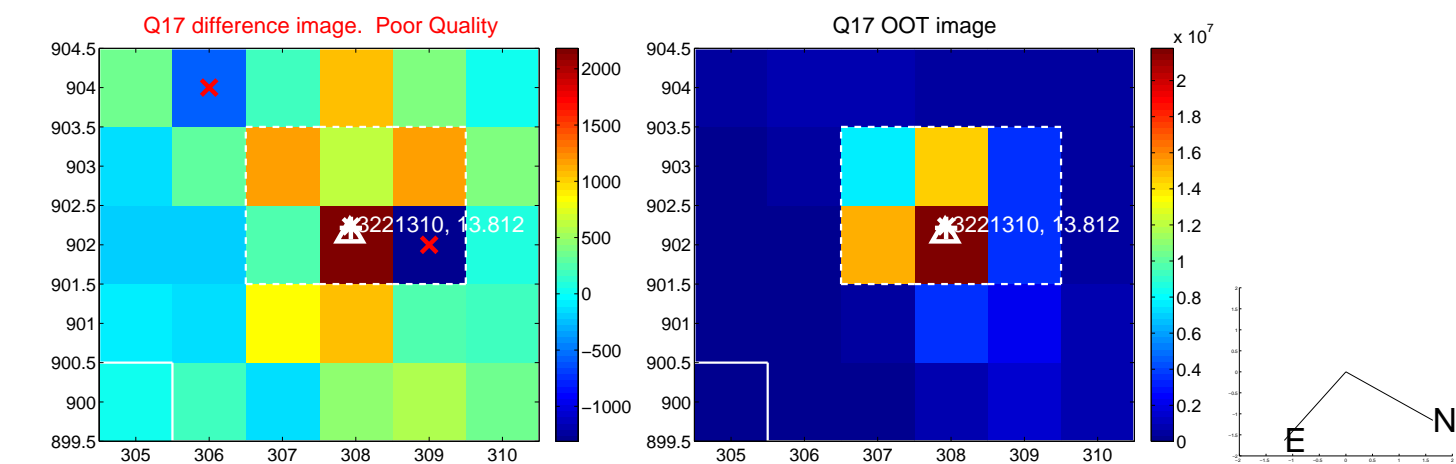
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



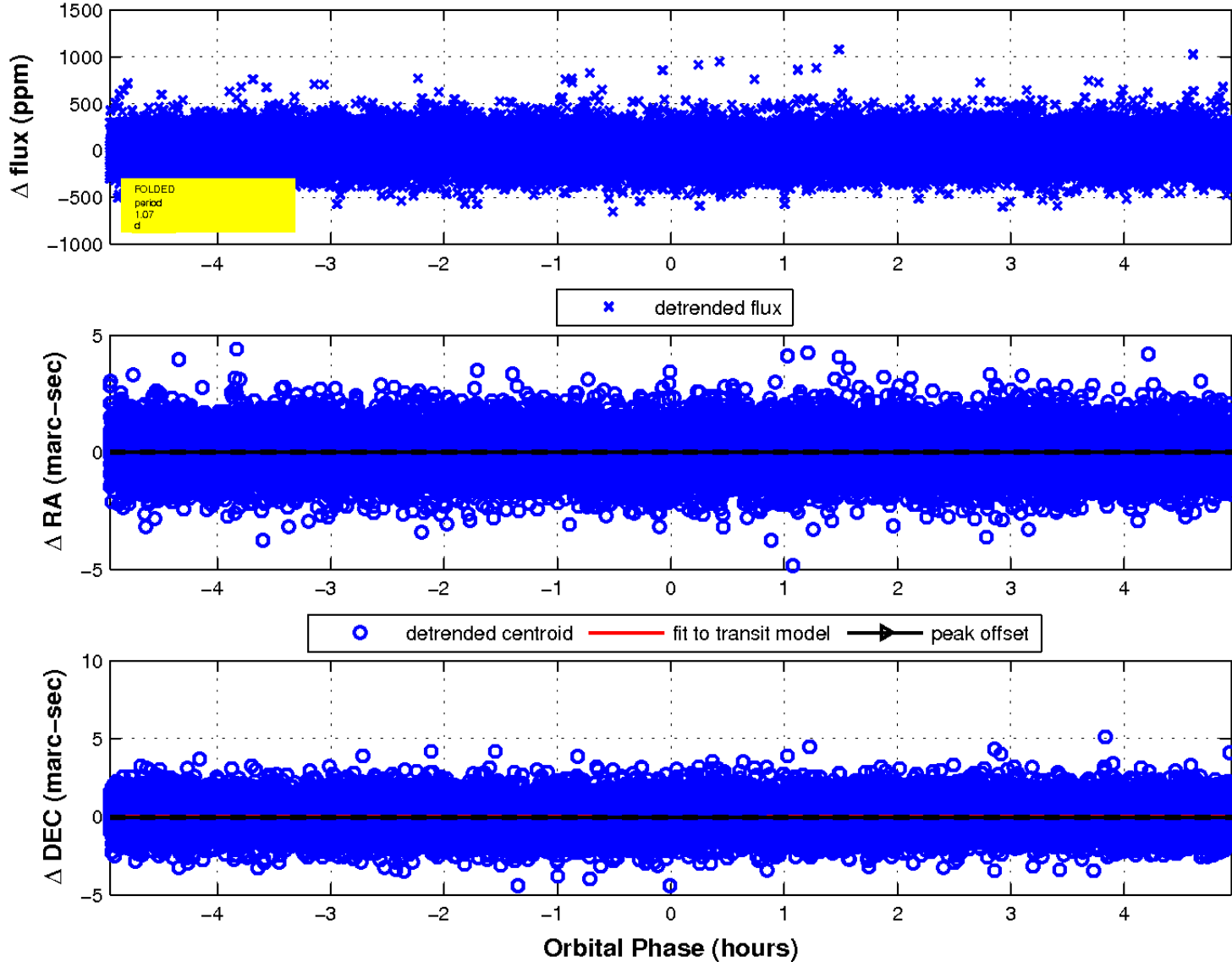
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



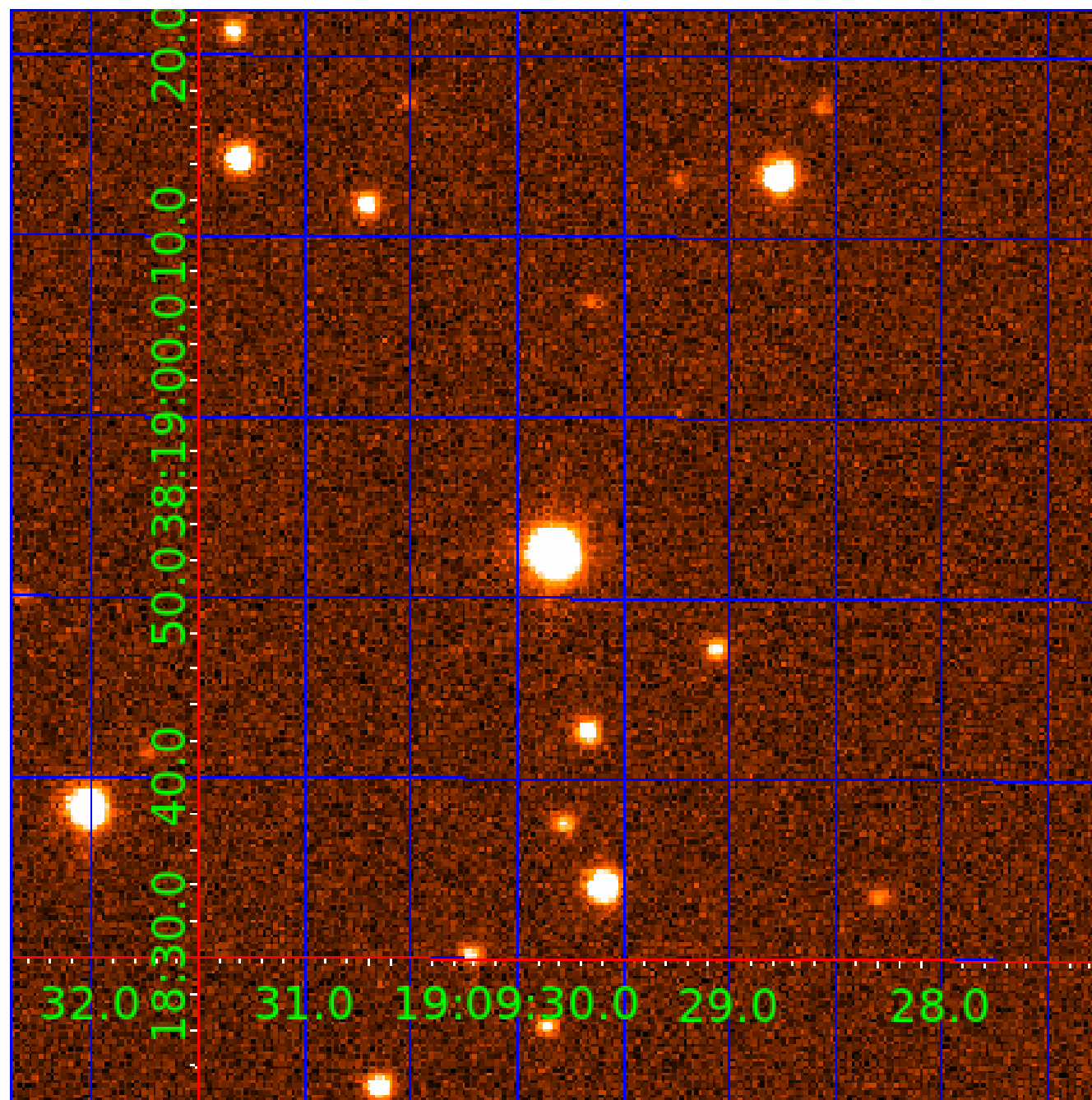
### fluxWeightedCentroids, Planet 2 of 3





UKIRT Image

Declination



# KIC 003221310

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003221310-01	OBS	No	0.852288	131.672254	33.5	1.048	9.6	9.9	1.69	6274	1.05	10532.68
003221310-02	OBS	No	1.065355	132.101861	27.6	1.649	7.8	8.0	1.69	6274	1.04	7822.19
003221310-03	OBS	No	251.459350	235.074798	205.7	4.019	7.4	7.4	1.69	6274	2.63	5.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003221310-01	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
003221310-02	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
003221310-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS

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

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

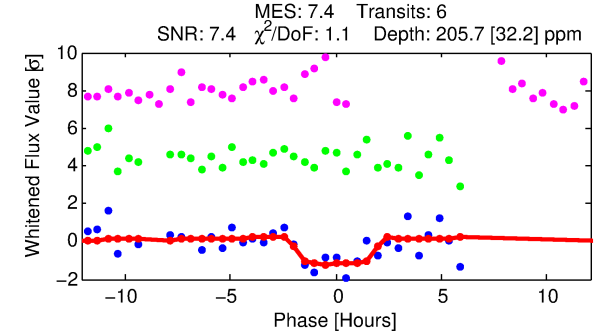
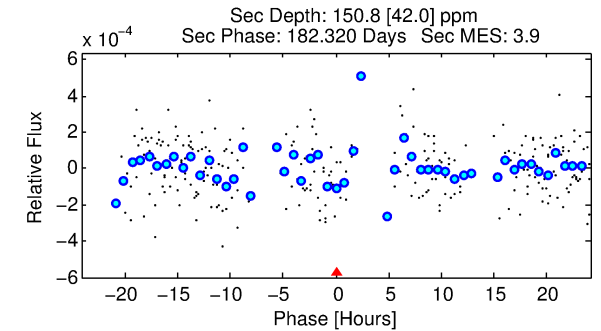
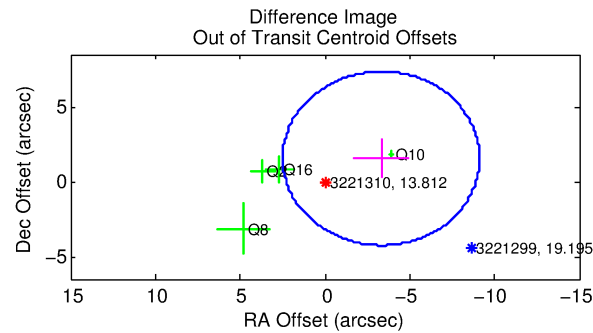
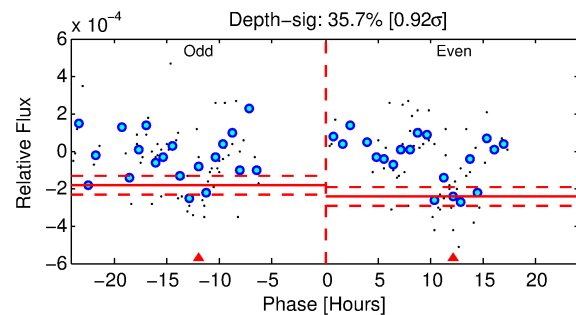
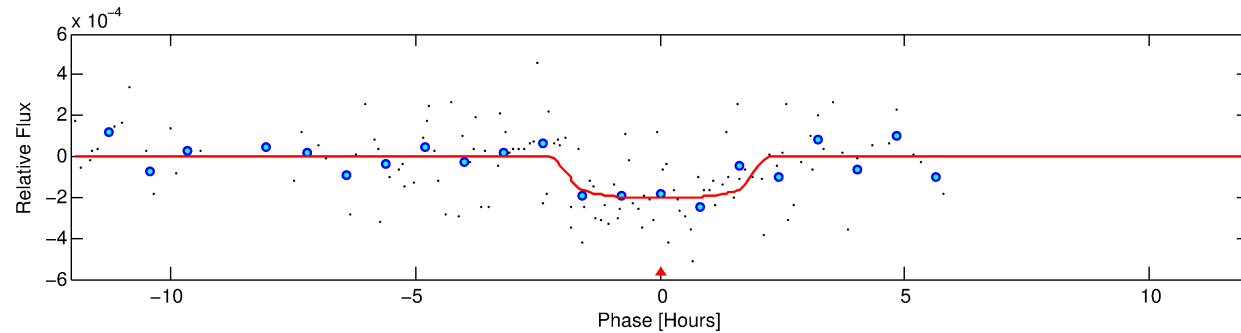
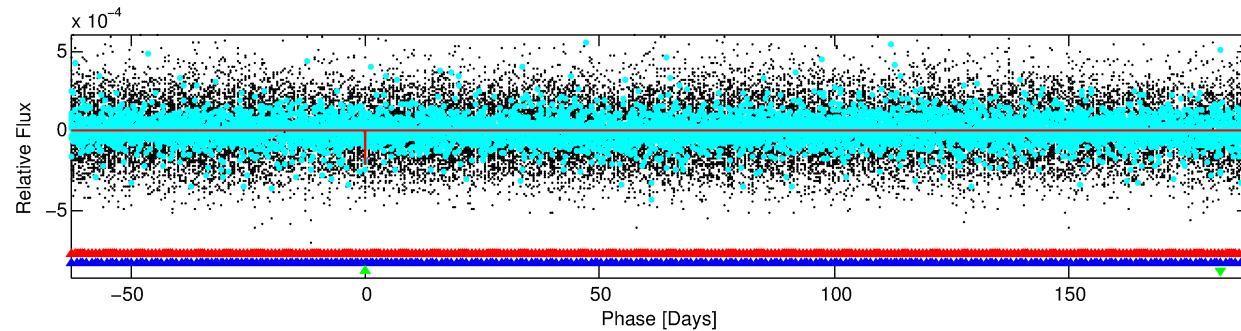
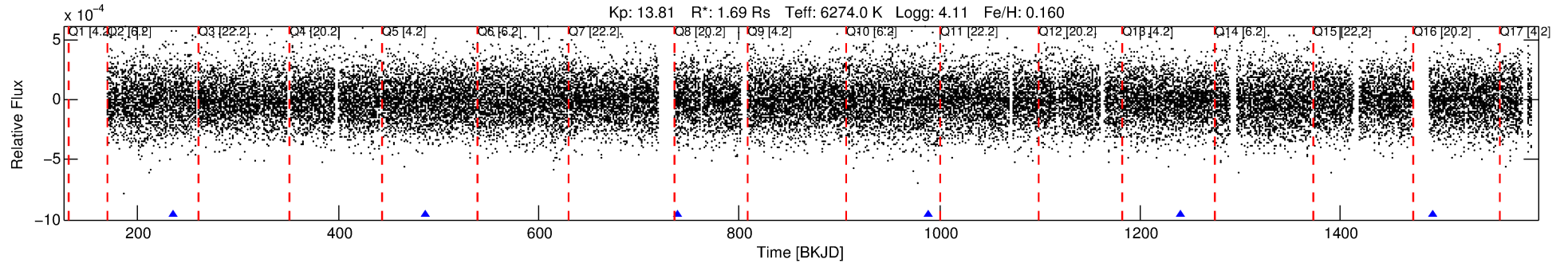
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003221310-03

No Significant Match Found

# DV One-Page Summary

KIC: 3221310 Candidate: 3 of 3 Period: 251.459 d



## DV Fit Results:

Period = 251.45935 [0.00409] d  
Epoch = 235.0748 [0.0117] BKJD  
Rp/R\* = 0.0143 [0.0198]  
a/R\* = 323.51 [2262.75]  
b = 0.76 [4.03]  
Seff = 5.36 [2.32]  
Teq = 388 [42] K  
Rp = 2.63 [3.73] Re  
a = 0.8589 [0.2341] AU  
Ag = 8826.15 [24769.80] [0.36σ]  
Teffp = 5815 [4043] K [1.34σ]

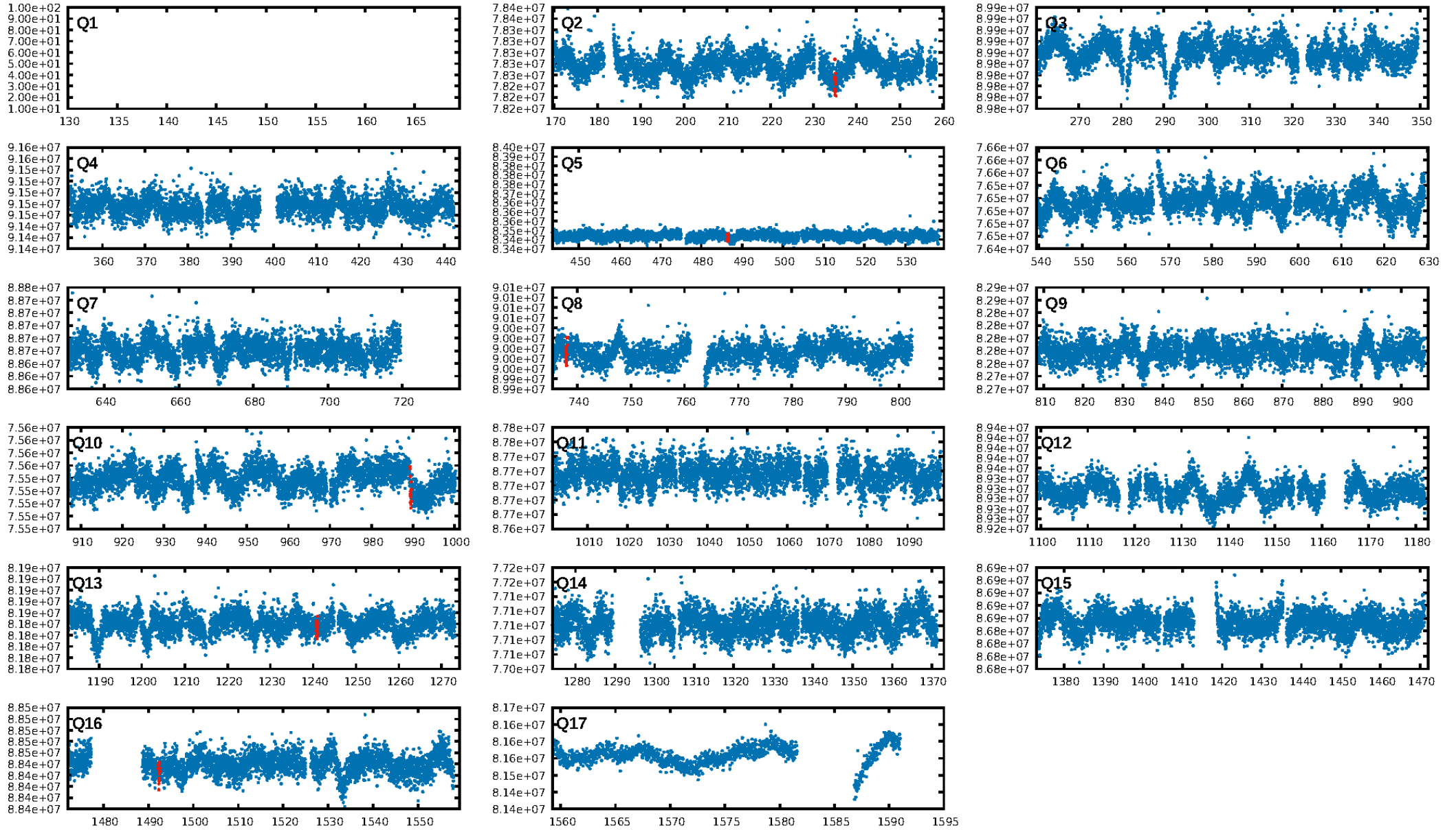
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1383.34σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 21.3%  
ModelChiSquareGof-sig: 96.3%  
Bootstrap-pfa: 6.31e-13  
RollingBand-fgt: 1.00 [6/6]  
**GhostDiagnostic-chr: 0.7271**  
Centroid-sig: 28.2%  
Centroid-so: 2.018 arcsec [0.95σ]  
OotOffset-rm: 3.657 arcsec [1.89σ]  
OotOffset-st: 2/0/2/0 [4]  
KicOffset-rm: 3.523 arcsec [1.74σ]  
KicOffset-st: 2/0/2/0 [4]  
DiffImageQuality-fgm: 0.25 [1/4]  
DiffImageOverlap-fno: 0.00 [0/6]

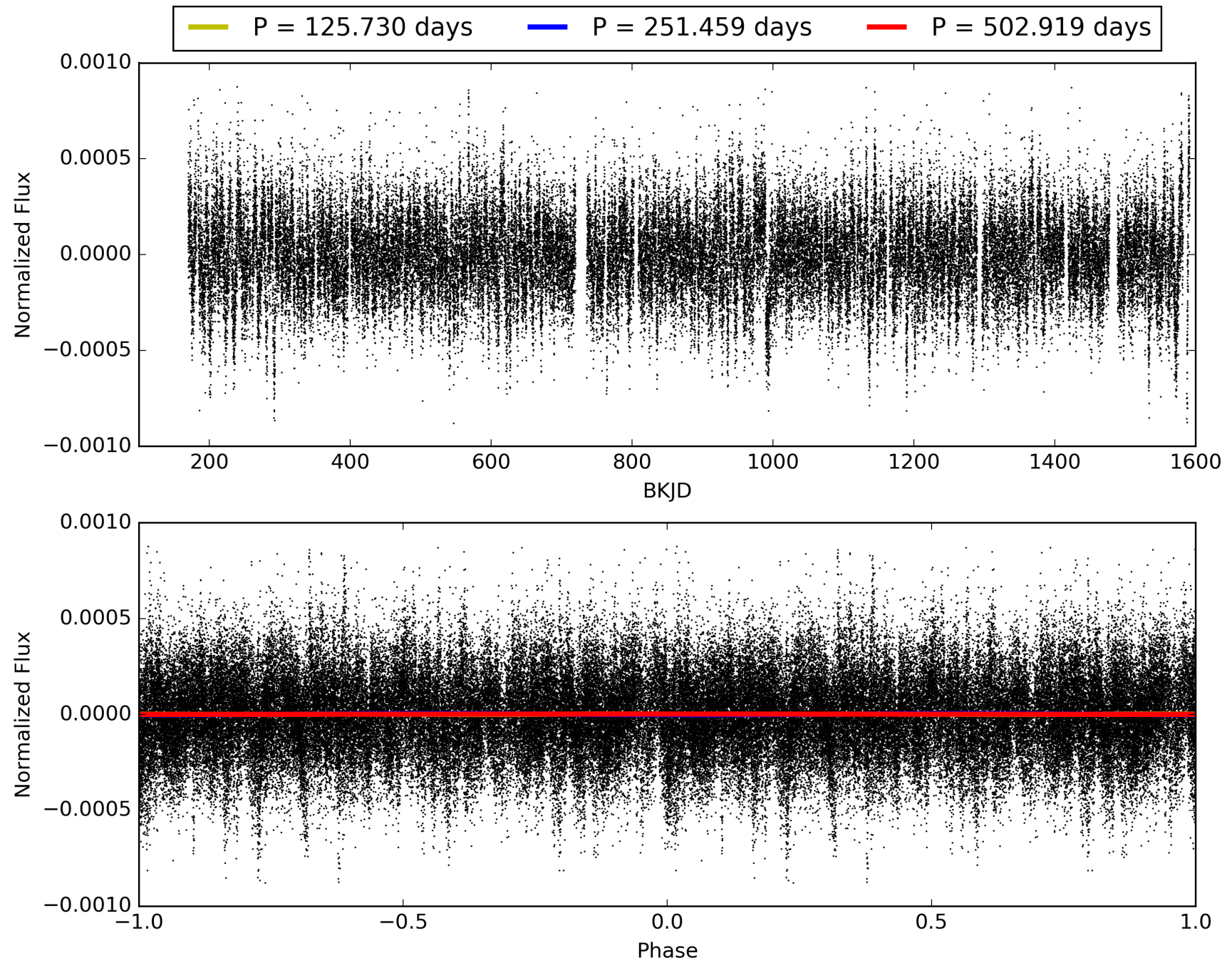
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:21:29 Z

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

# TCE 003221310-03, PDC Light Curves



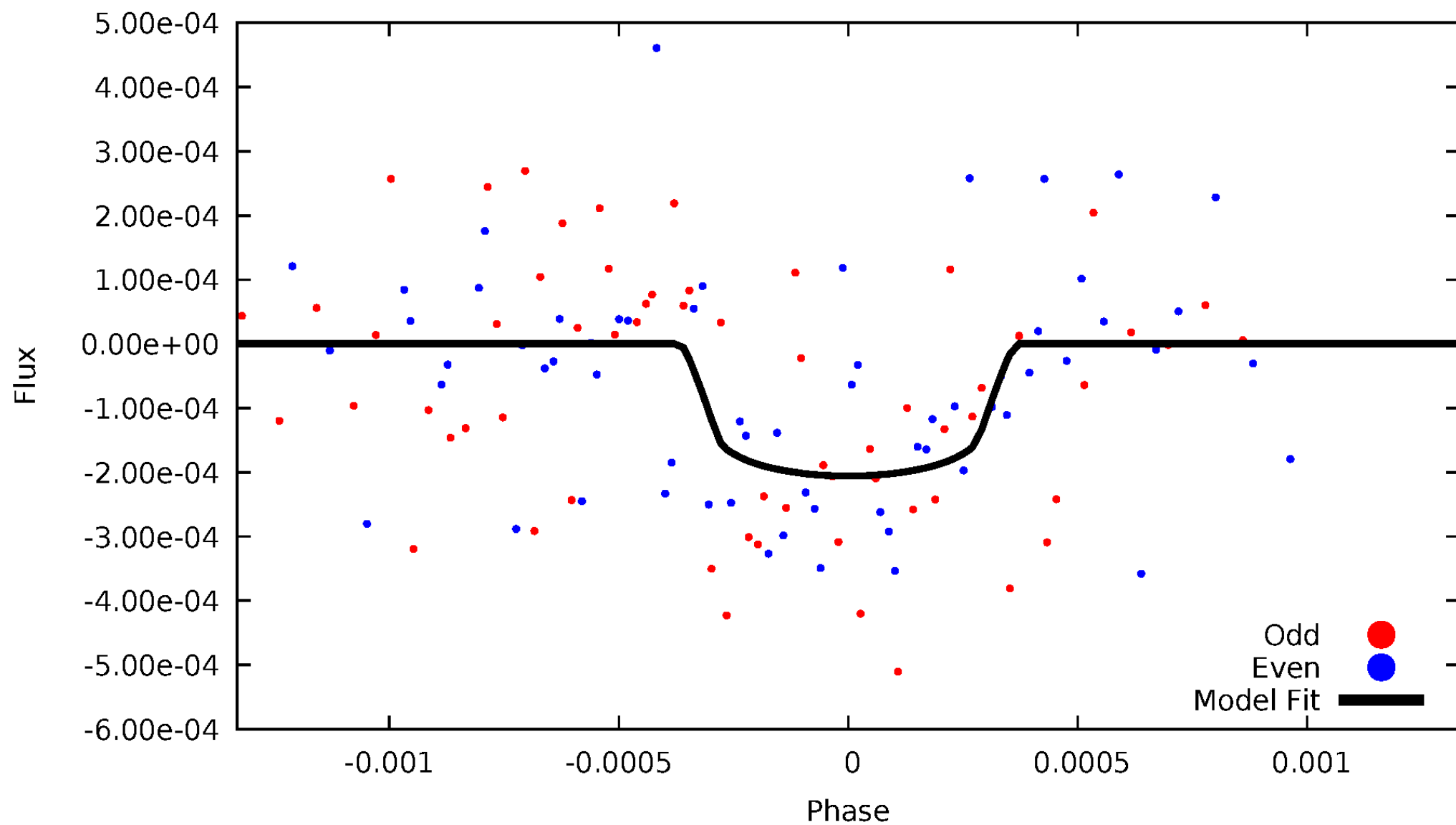
TCE 003221310-03





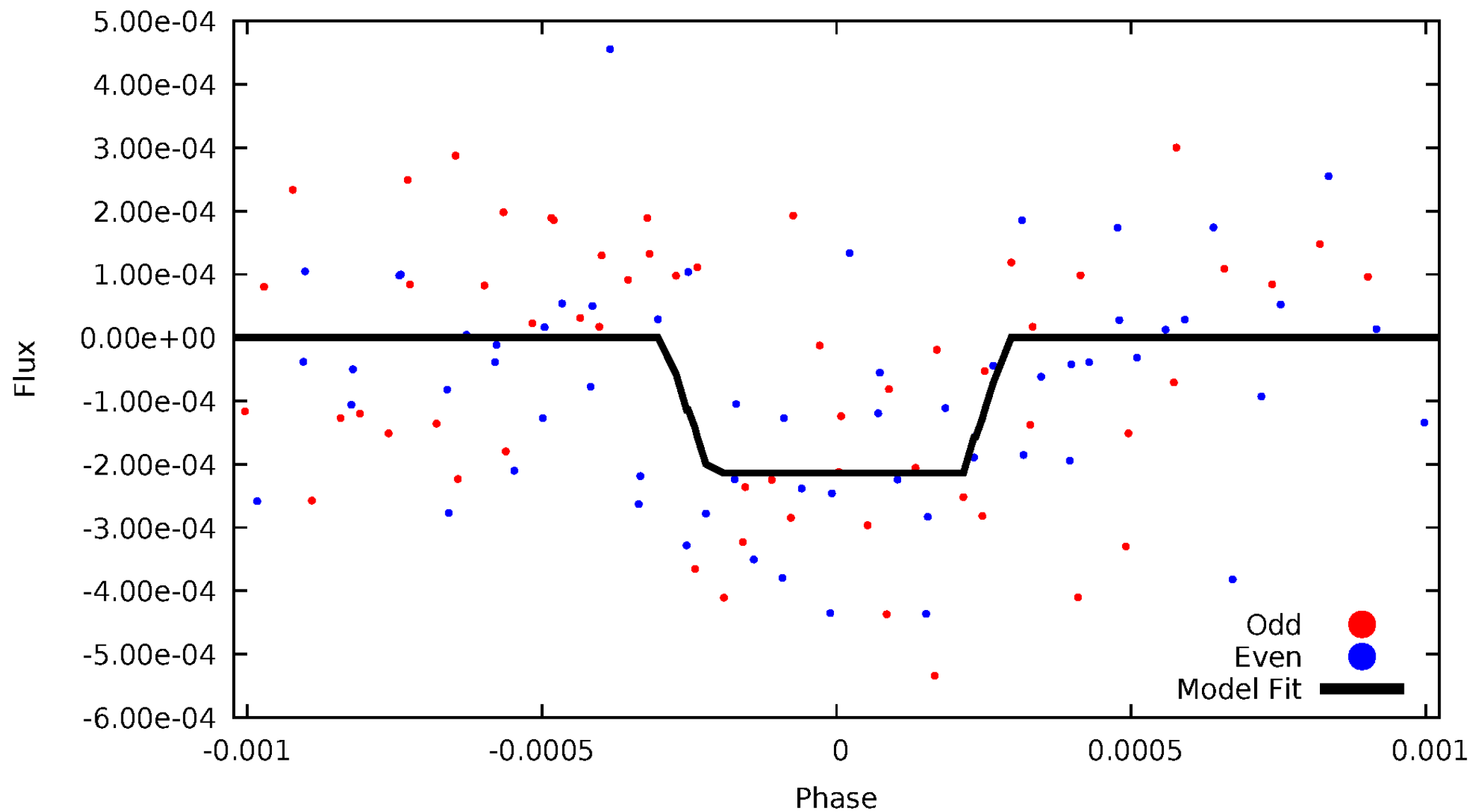
# DV Odd/Even

TCE 003221310-03



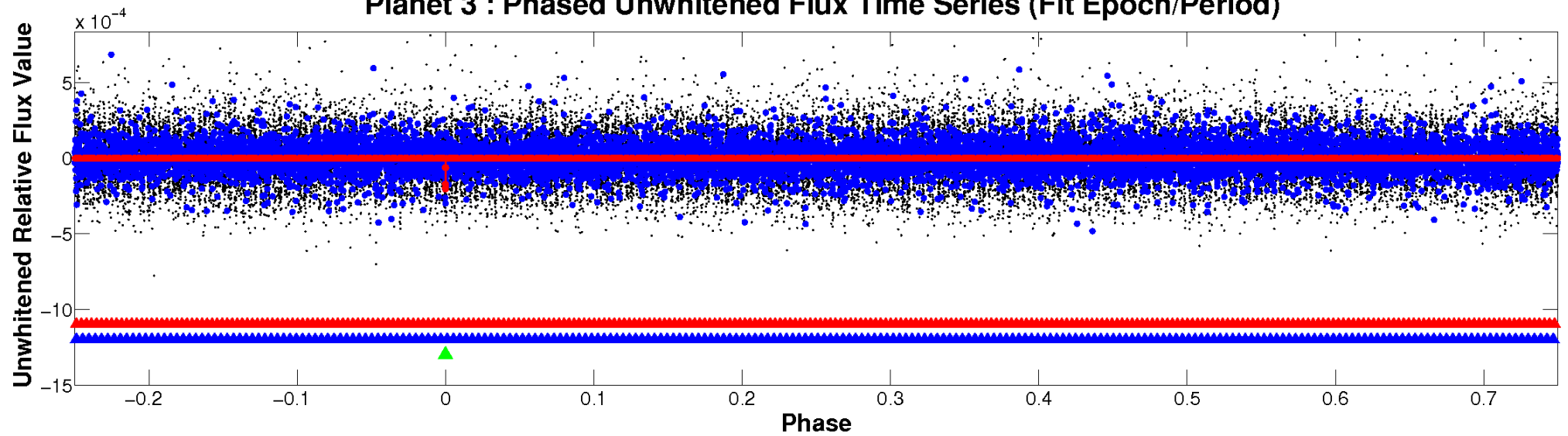
# ALT Odd/Even

TCE 003221310-03

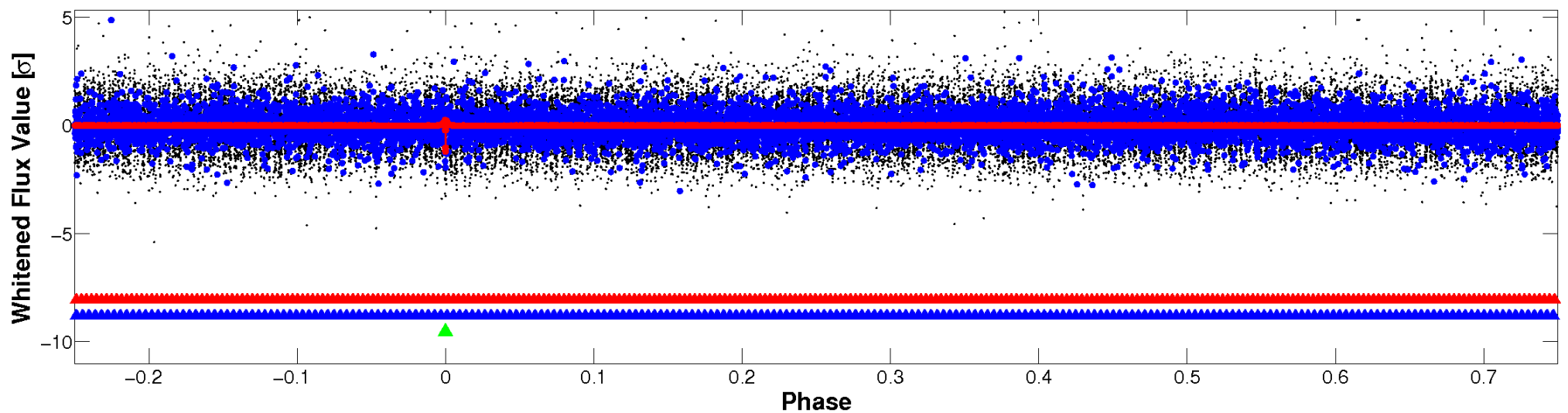


# Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

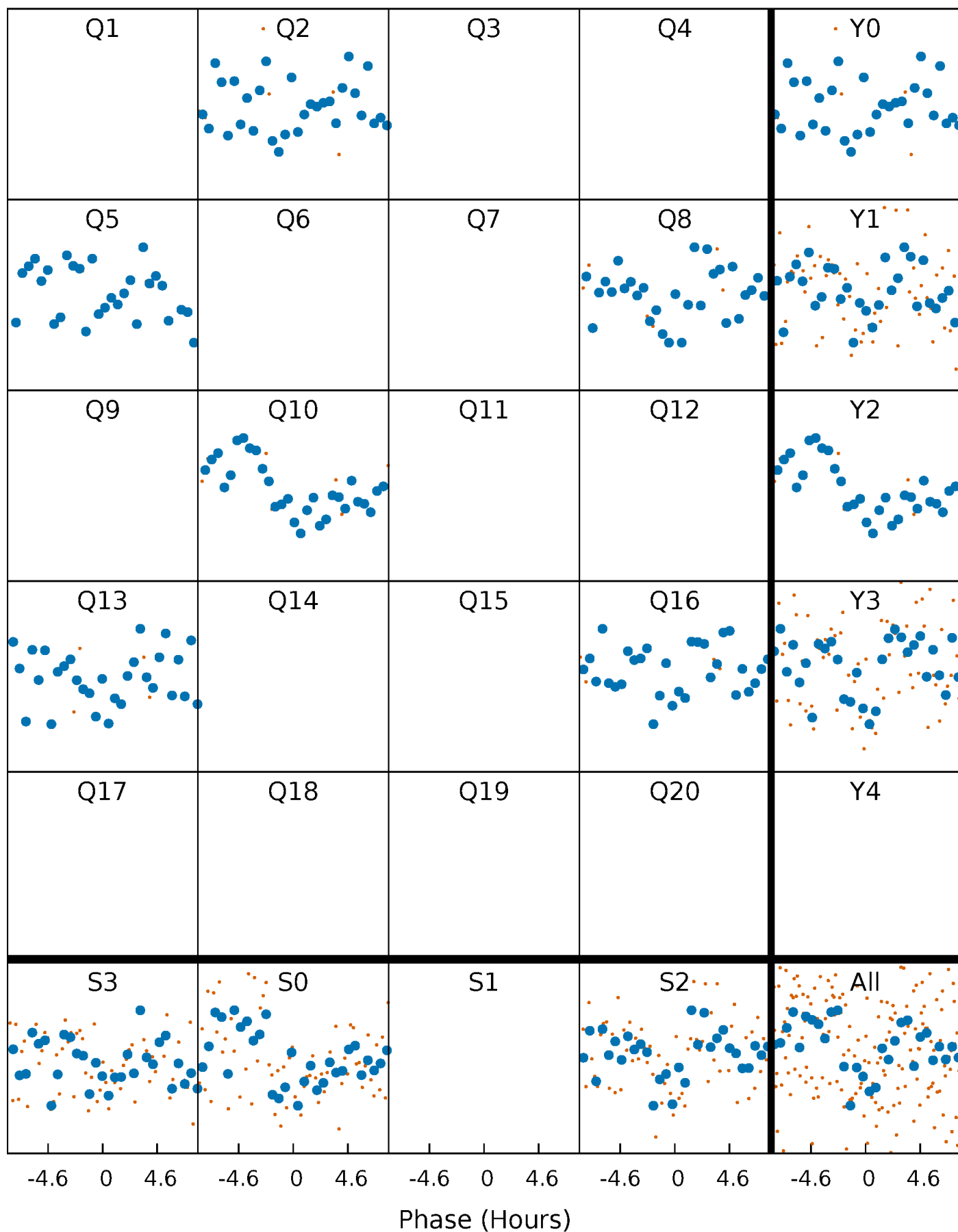


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



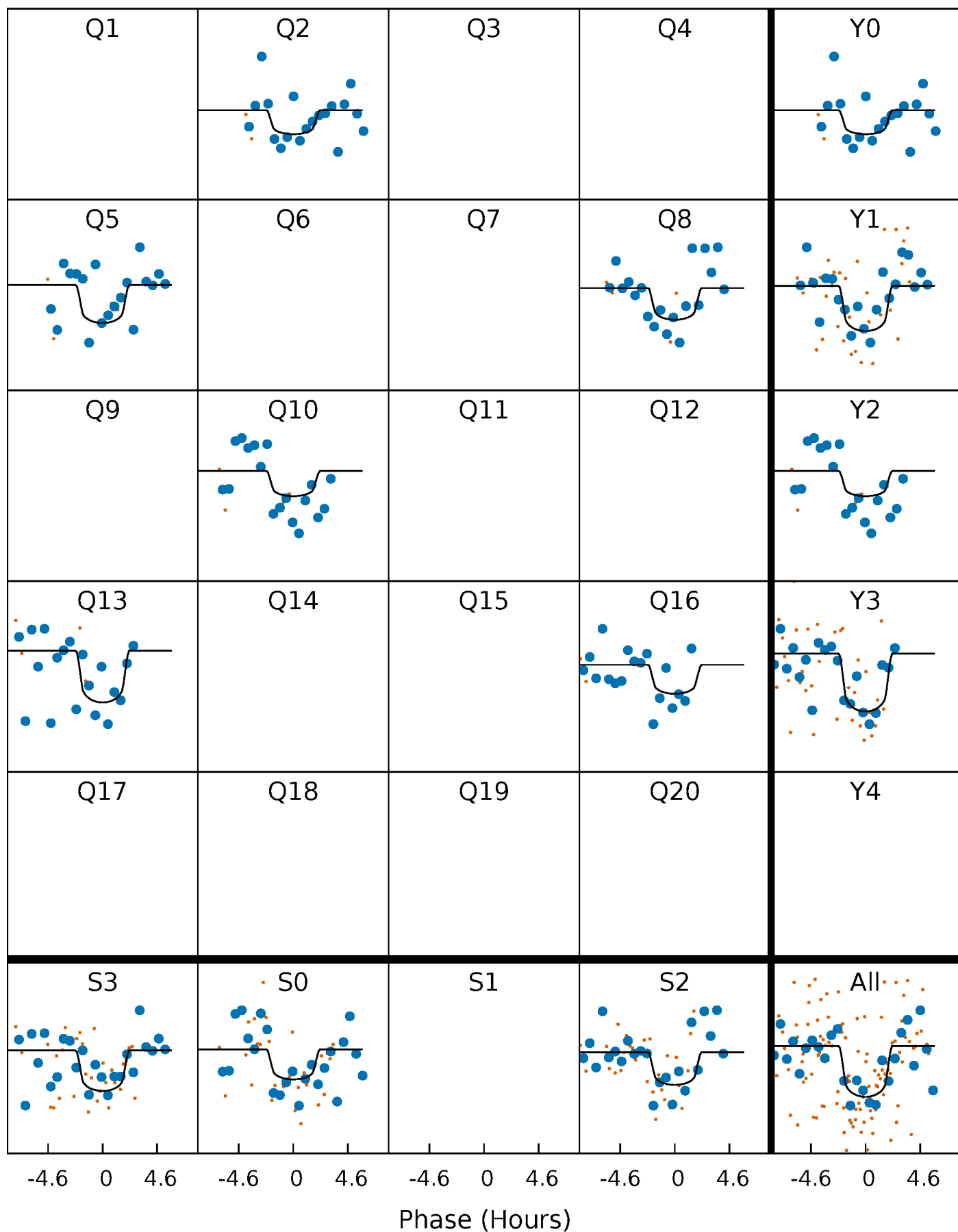
# PDC Quarter-Phased Transit Curves

TCE 003221310-03   P=251.459350 Days    $T_0=235.074798$  (BKJD)



# DV Quarter-Phased Transit Curves

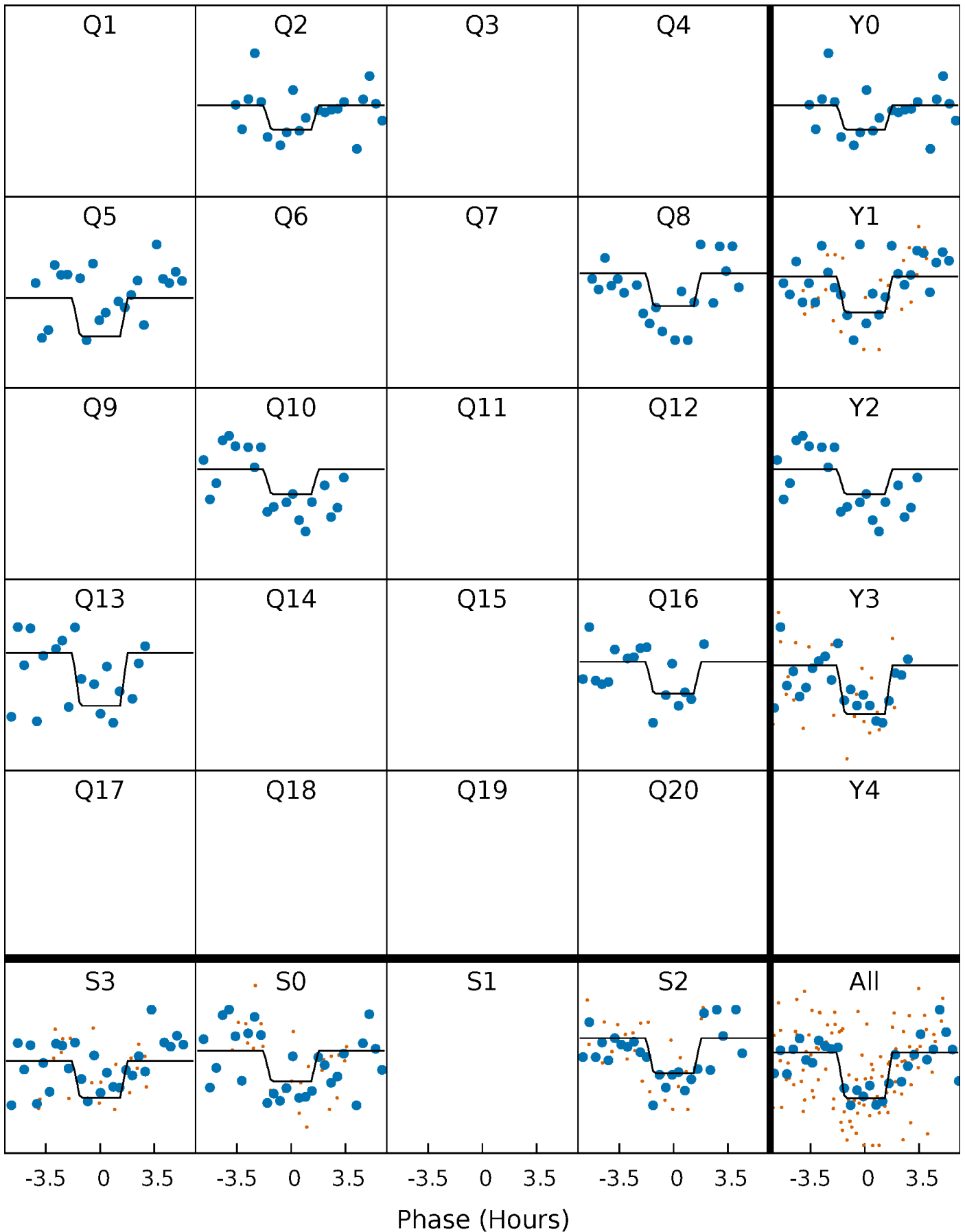
TCE 003221310-03   P=251.459350 Days    $T_0=235.074798$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

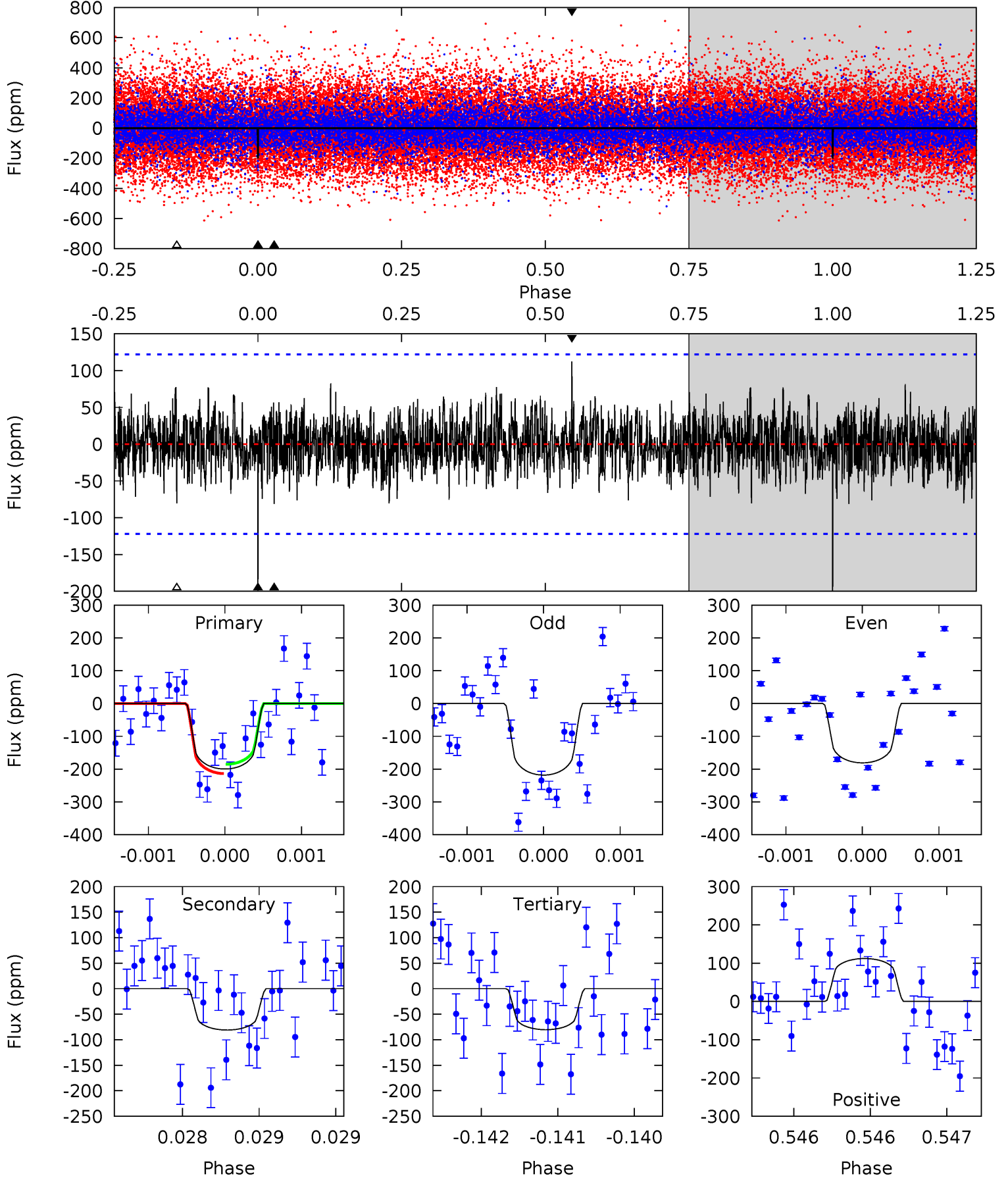
TCE 003221310-03 P=251.457326 Days  $T_0=235.066229$  (BKJD)



# DV Model-Shift Uniqueness Test

003221310-03, P = 251.459350 Days, E = 235.074798 Days

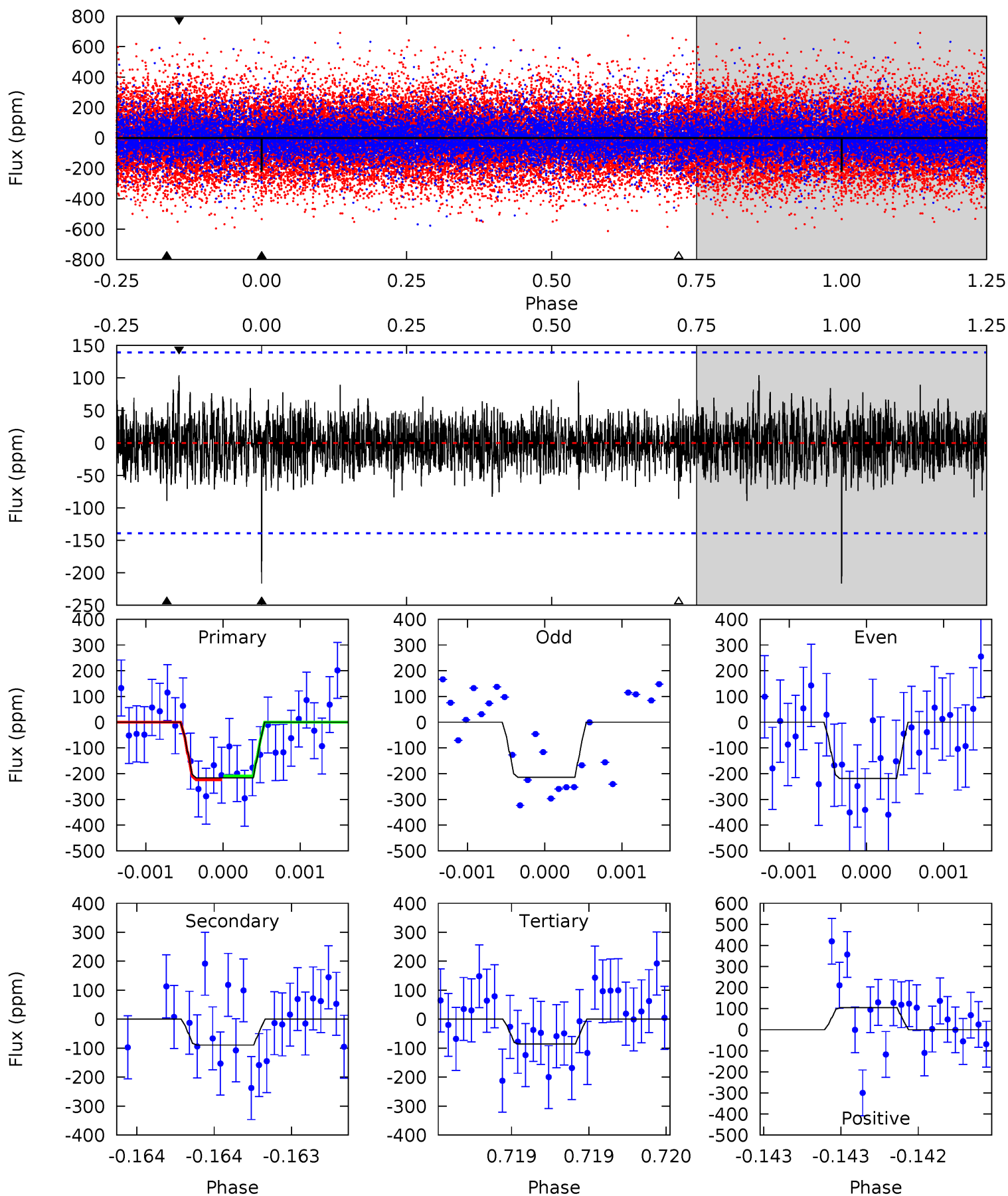
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.02	3.66	3.63	5.06	5.51	3.38	1.14	5.39	3.95	0.03	-1.41	0.84	1.10	0.36	0.64



# Alt Model-Shift Uniqueness Test

003221310-03, P = 251.457326 Days, E = 235.066229 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
8.64	3.56	3.43	4.16	5.56	3.45	1.00	5.21	4.48	0.13	-0.60	0.08	1.07	0.33	0.31



### Stellar Parameters For KIC 003221310

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6274^{+199}_{-243}$	$4.109^{+0.225}_{-0.184}$	$0.160^{+0.200}_{-0.300}$	$1.688^{+0.534}_{-0.486}$	$1.336^{+0.179}_{-0.246}$	$0.391^{+0.534}_{-0.200}$
	+3%/-4%	+5%/-4%	+125%/-188%	+32%/-29%	+13%/-18%	+137%/-51%
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 003221310-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-81 \pm 22$	$3.65^{+3.23}_{-2.29}$	$540^{+40}_{-48}$	$4337^{+2524}_{-811}$	$2275^{+16125}_{-1600}$
Alt.	$-89 \pm 25$	$3.68^{+3.31}_{-2.39}$	$542^{+44}_{-43}$	$4413^{+2994}_{-861}$	$2397^{+19271}_{-1700}$

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

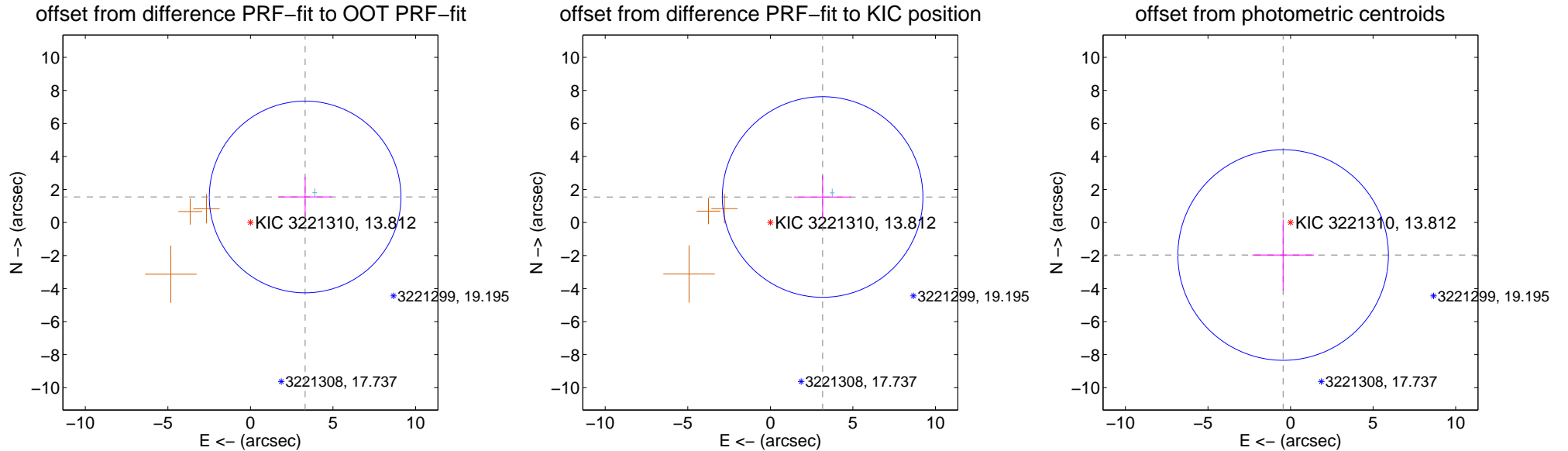
## DV Centroid Data

Supplemental centroid analysis for 003221310-03. Kepler magnitude: 13.81. Transit SNR 7.44

There are 1 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	$3.657 \pm 1.935$	1.89	$-3.312 \pm 1.629$	$1.549 \pm 1.220$
PRF-fit source offset from KIC position	$3.523 \pm 2.025$	1.74	$-3.166 \pm 1.735$	$1.546 \pm 1.296$
photometric centroid source offset	$2.02 \pm 2.13$	0.95	$0.45 \pm 1.87$	$-1.97 \pm 2.14$



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



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

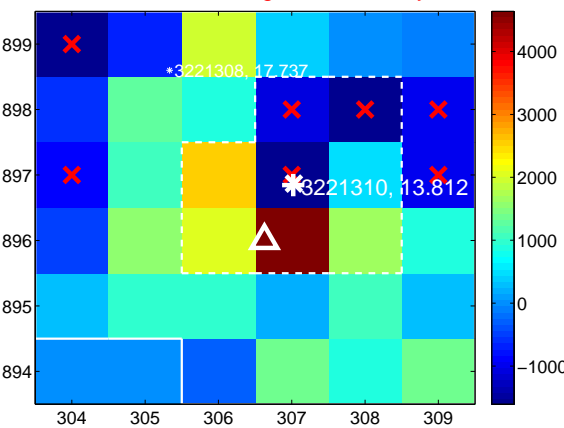
Q1 no difference image



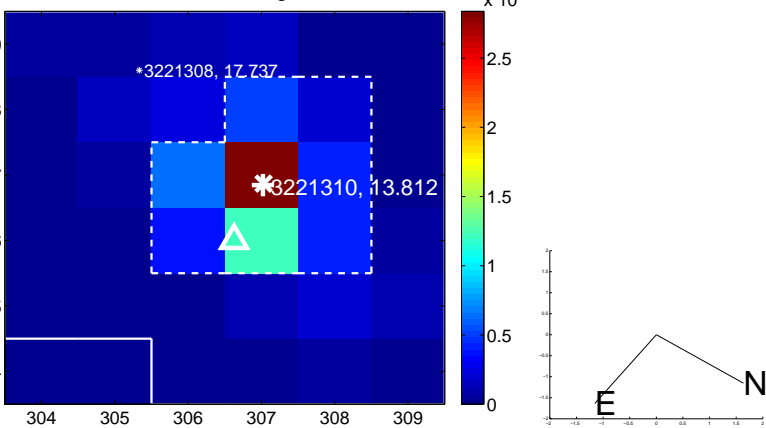
Q1 no OOT image



Q2 difference image. Poor Quality



Q2 OOT image



Q3 no difference image



Q3 no OOT image



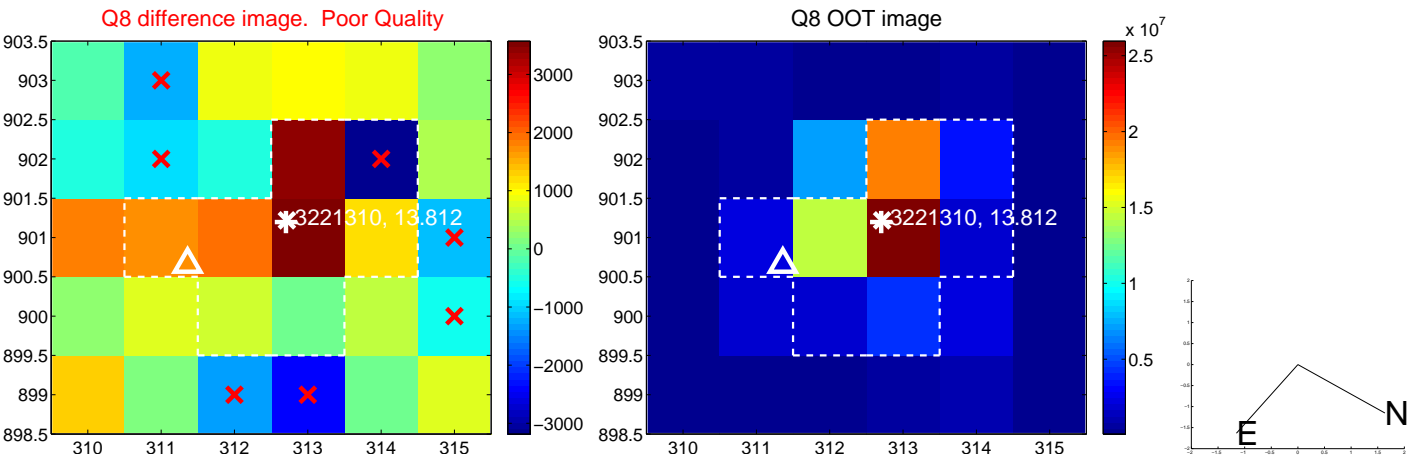
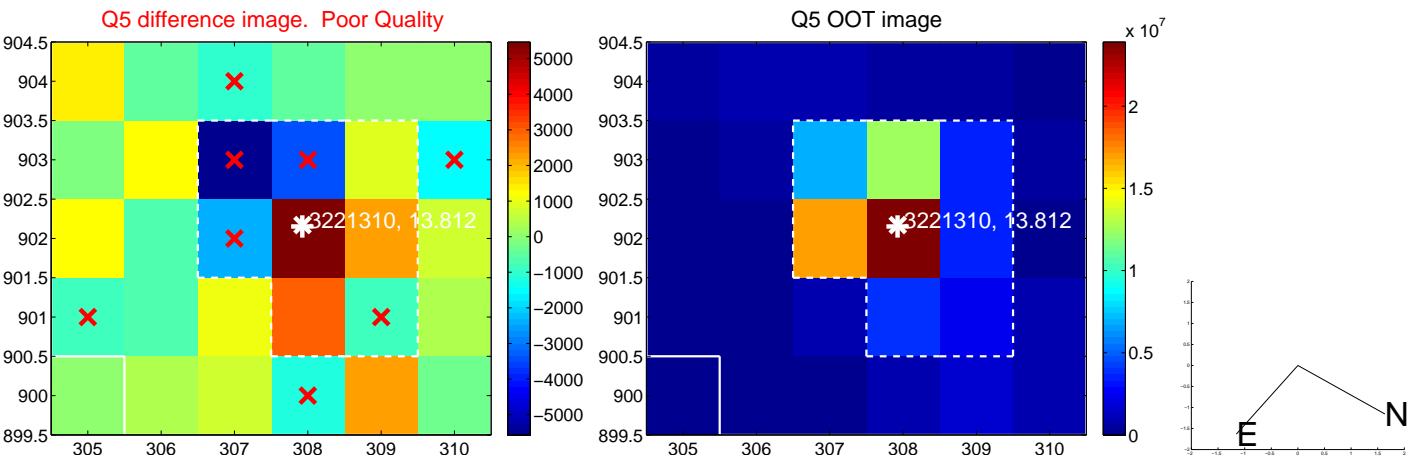
Q4 no difference image



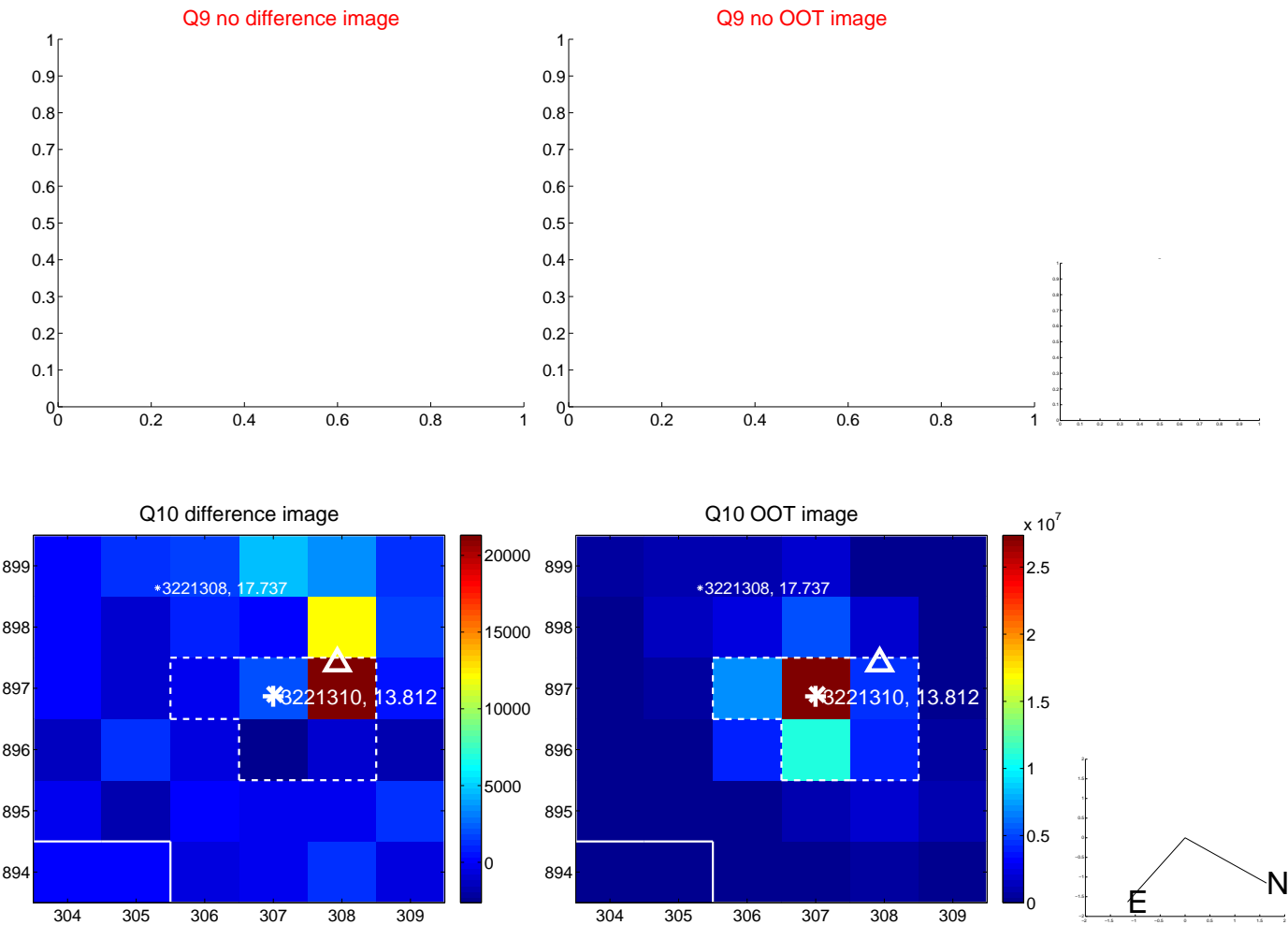
Q4 no OOT image



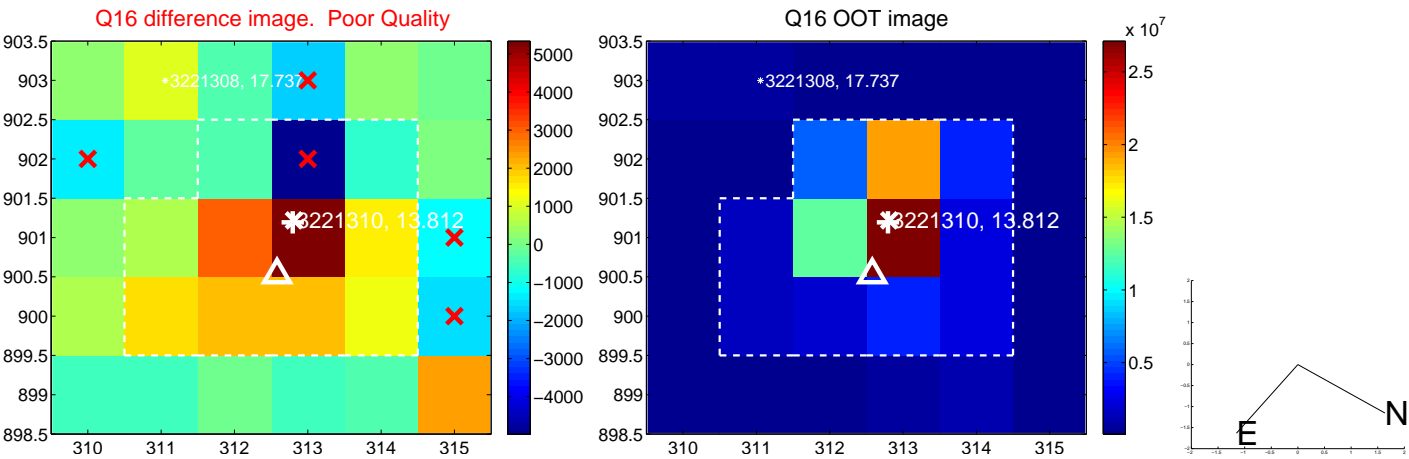
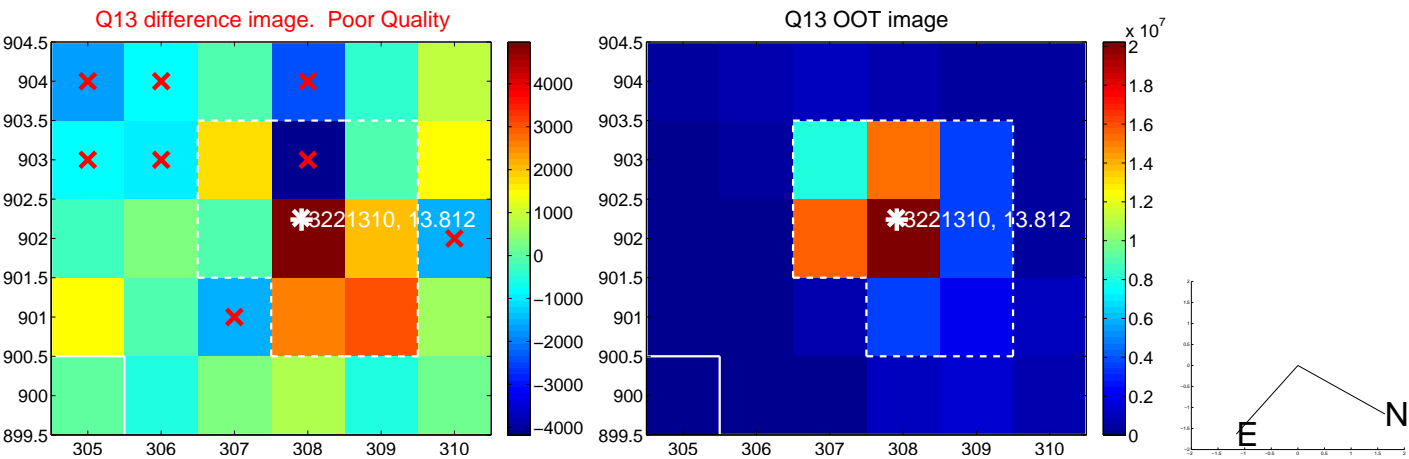
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



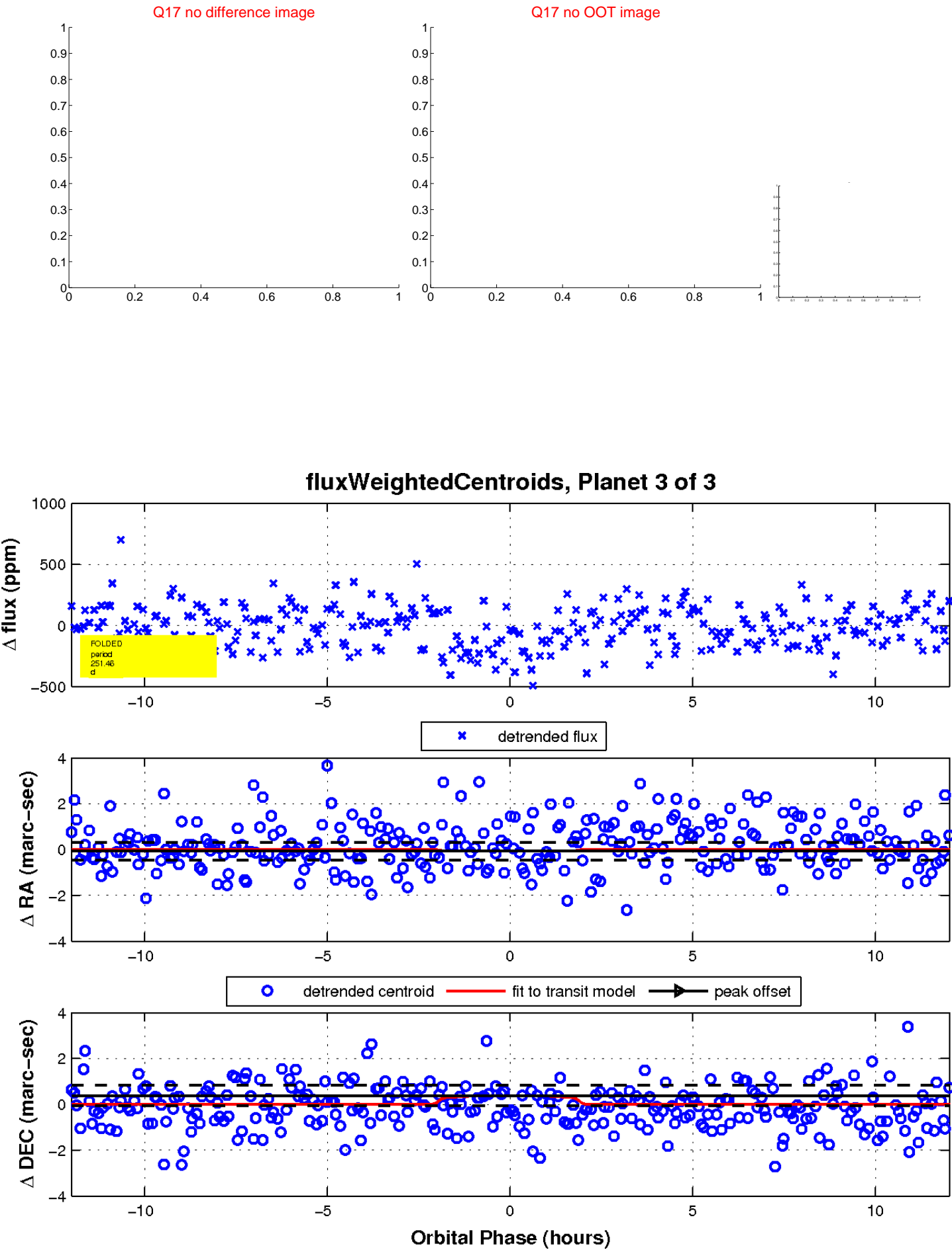
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

Declination

