

# KIC 010407221

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010407221-01	OBS	2605.01	0.933706	131.539843	131.6	3.748	19.7	16.8	0.66	4643	0.82	695.27
010407221-02	OBS	No	279.419496	381.472572	637.1	4.851	13.3	3.7	0.66	4643	1.95	0.35
010407221-04	OBS	No	147.692370	170.627181	662.2	14.253	8.7	6.3	0.66	4643	2.23	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010407221-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—EPHEM_MATCH
010407221-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010407221-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—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 010407221-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
010407221-01	10407221	2823.01	10341917	1:1	387.6	56	-11	15.81	15.65	5.05	Col-Anomaly	1	4.21	1.54

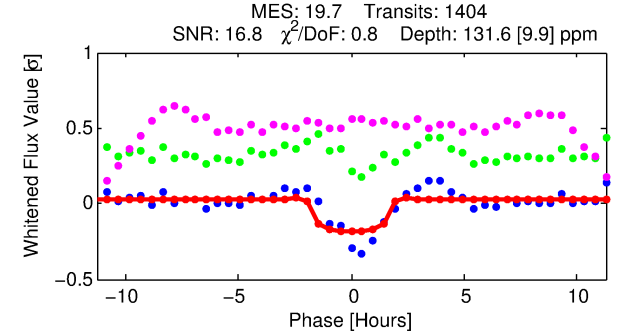
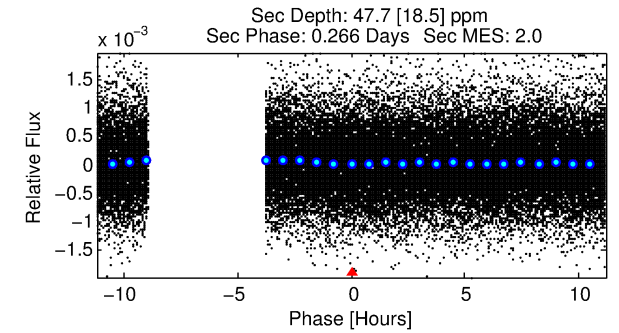
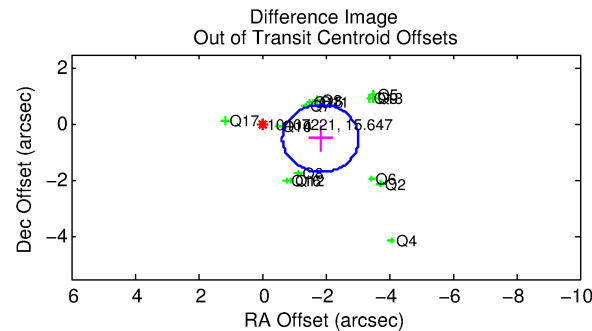
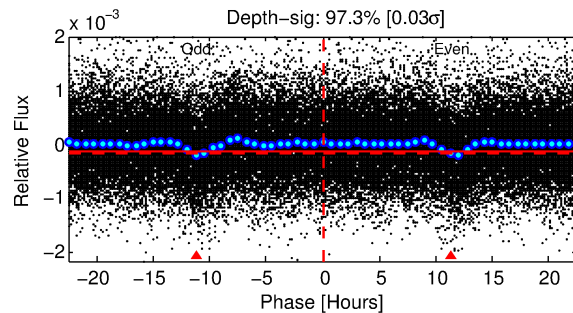
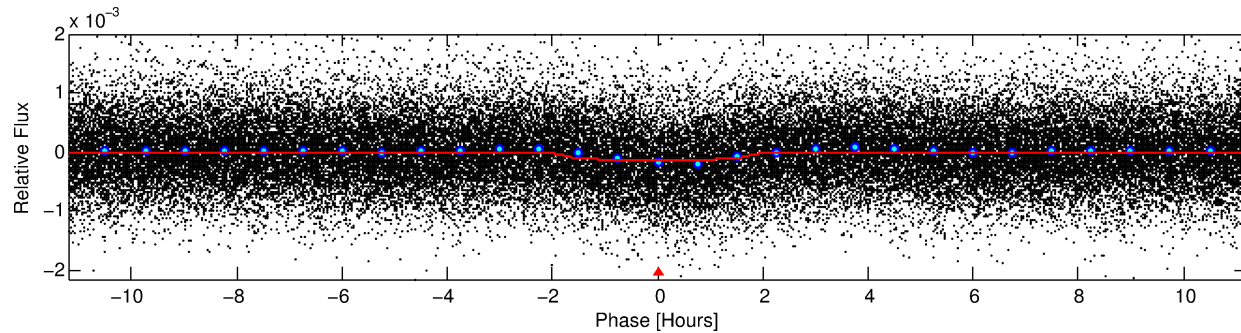
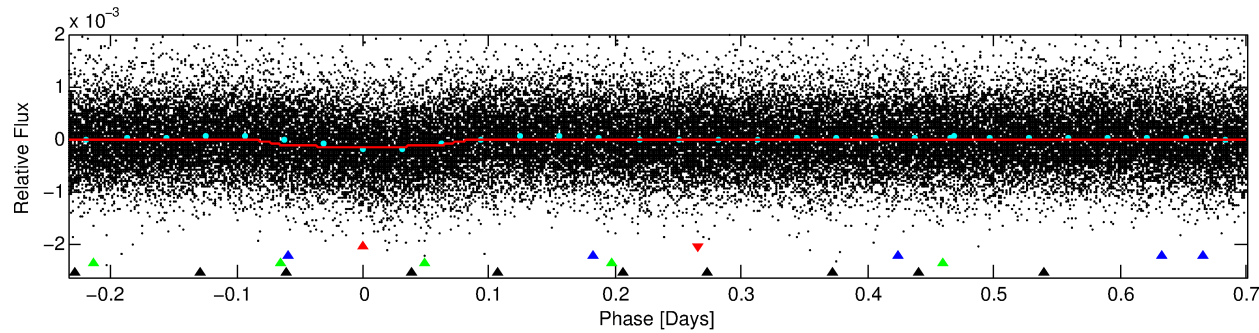
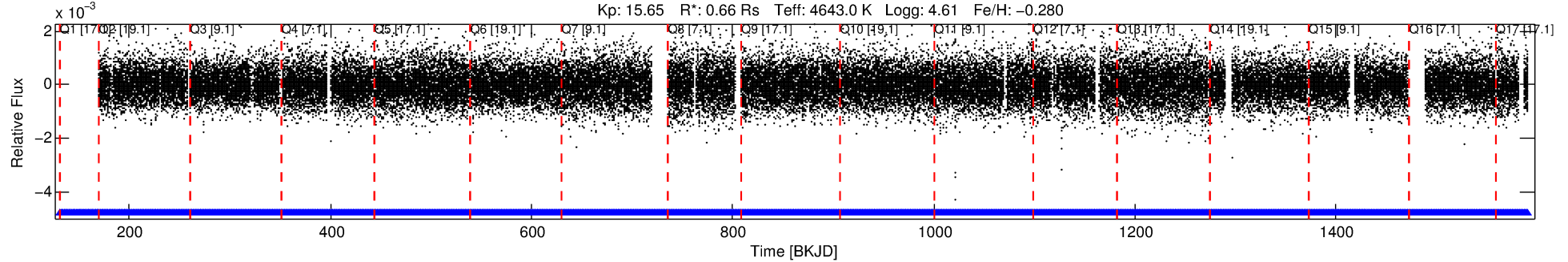
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 10407221 Candidate: 1 of 4 Period: 0.934 d

KOI: K02605.01 Corr: 0.879

Kp: 15.65 R\*: 0.66 Rs Teff: 4643.0 K Logg: 4.61 Fe/H: -0.280



## DV Fit Results:

Period = 0.93371 [0.00001] d  
Epoch = 131.5398 [0.0023] BKJD  
Rp/R\* = 0.0114 [0.0052]  
a/R\* = 1.58 [1.43]  
b = 0.73 [1.01]  
Seff = 695.27 [108.17]  
Teq = 1309 [51] K  
Rp = 0.82 [0.39] Re  
a = 0.0162 [0.0011] AU  
Ag = 10.22 [10.28] [0.90σ]  
Teffp = 3620 [912] K [2.53σ]

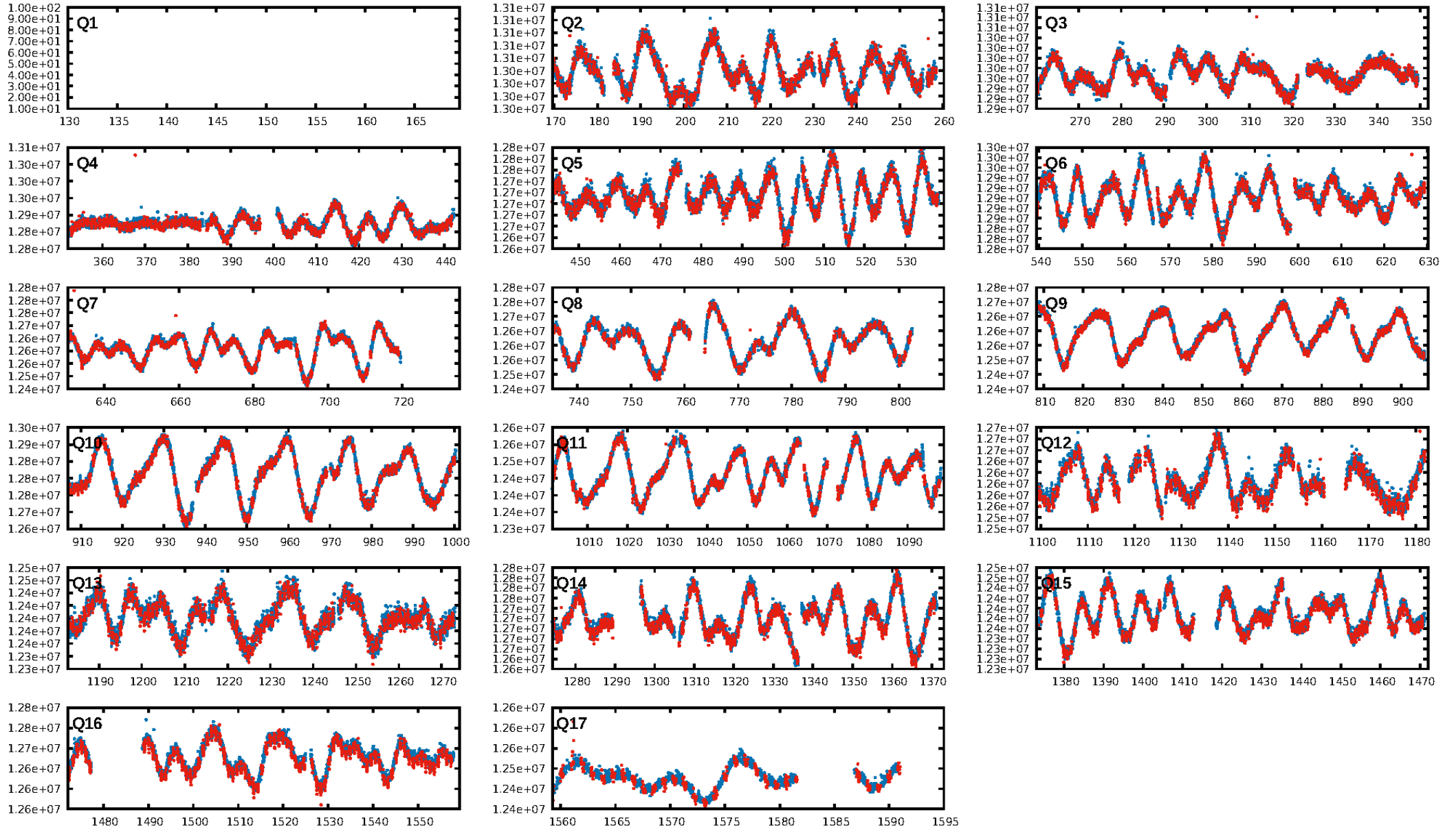
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [238.99σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.04e-76  
RollingBand-fgt: 1.00 [1374/1374]  
**GhostDiagnostic-chr: 0.5124**  
Centroid-sig: 0.0%  
Centroid-so: 4.083 arcsec [6.31σ]  
OotOffset-rm: 1.907 arcsec [4.77σ]  
KicOffset-rm: 1.961 arcsec [5.26σ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.06 [1/16]  
DiffImageOverlap-fno: 1.00 [16/16]

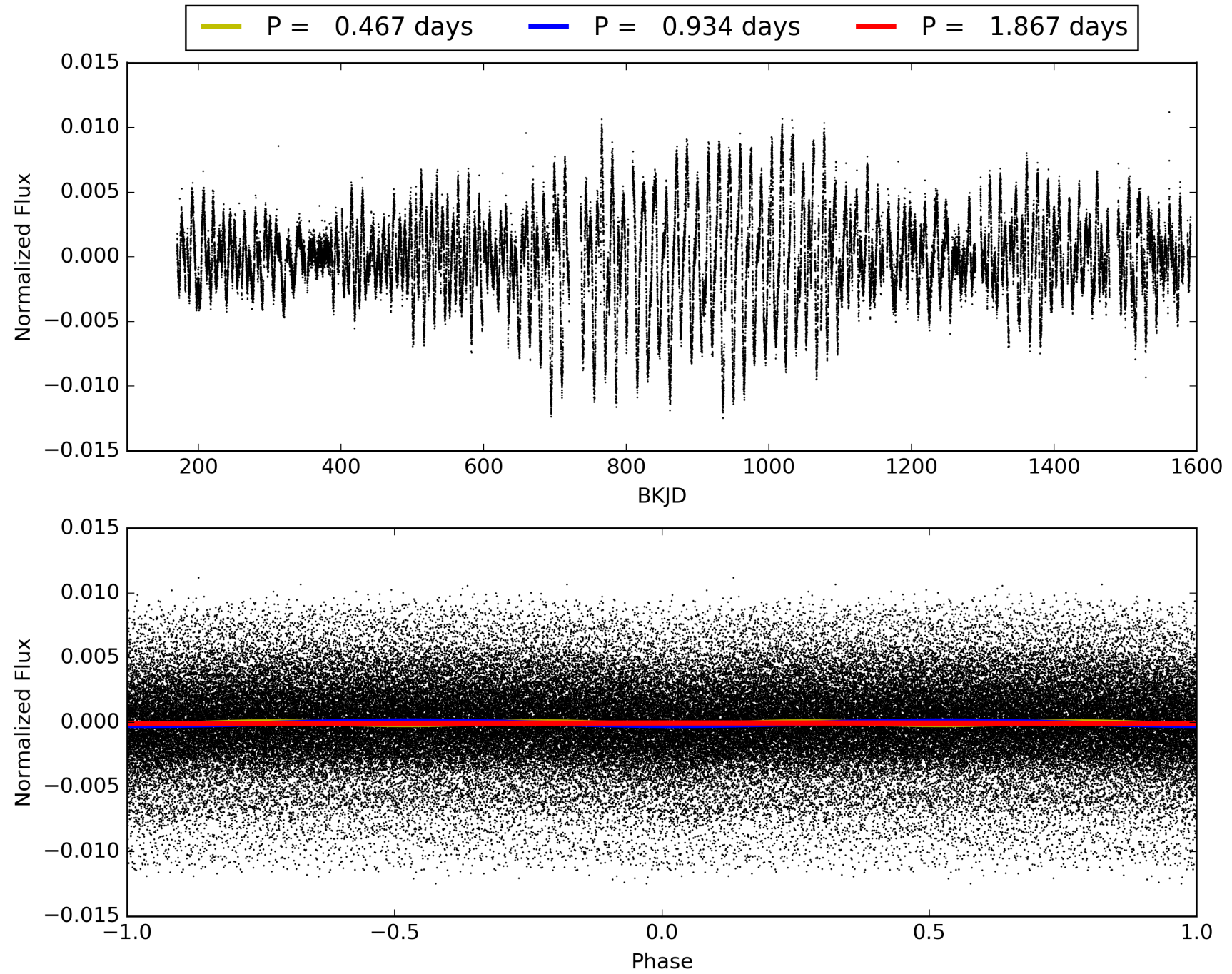
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 09:07:23 Z

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

# TCE 010407221-01, PDC Light Curves

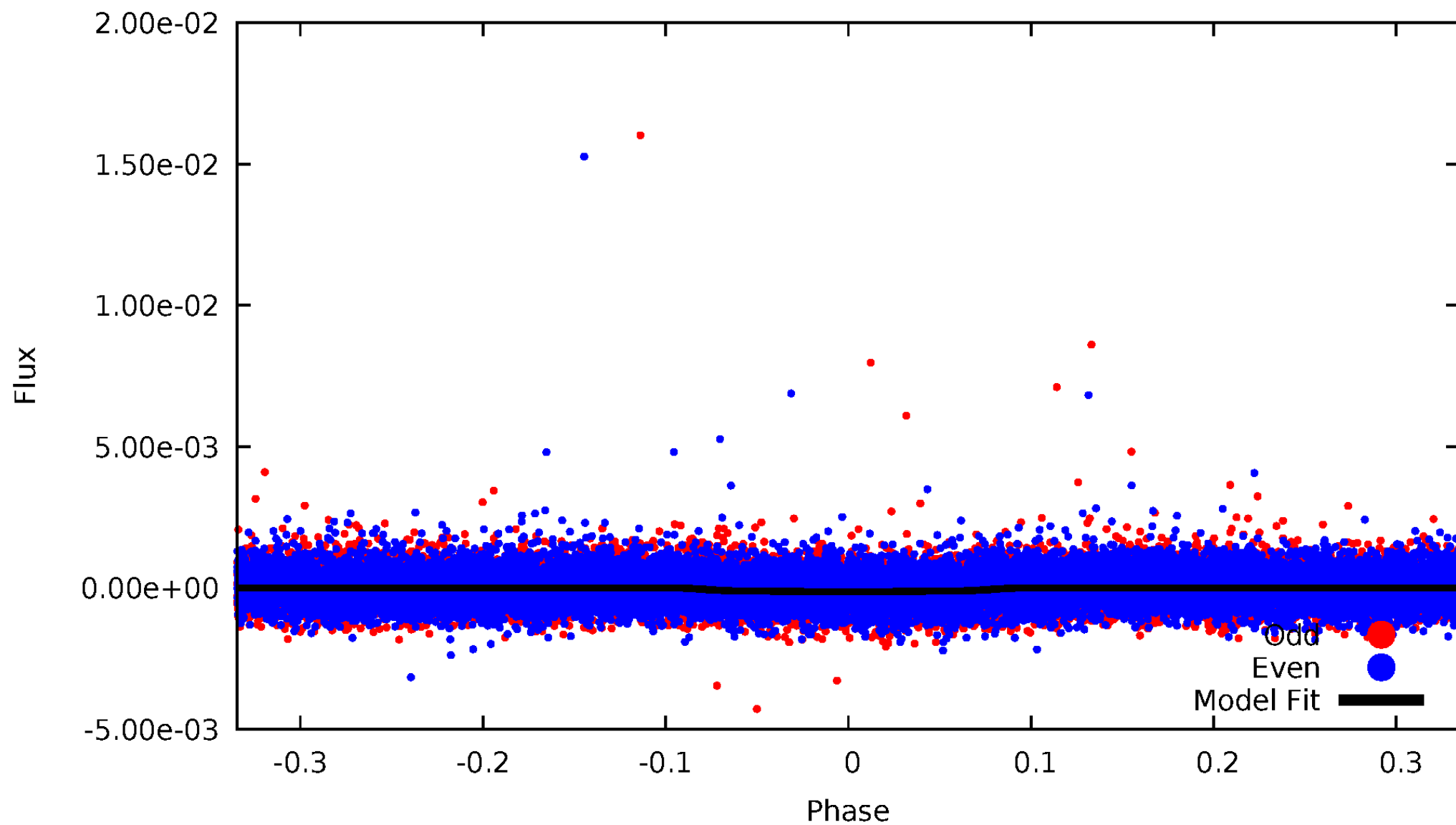


TCE 010407221-01



# DV Odd/Even

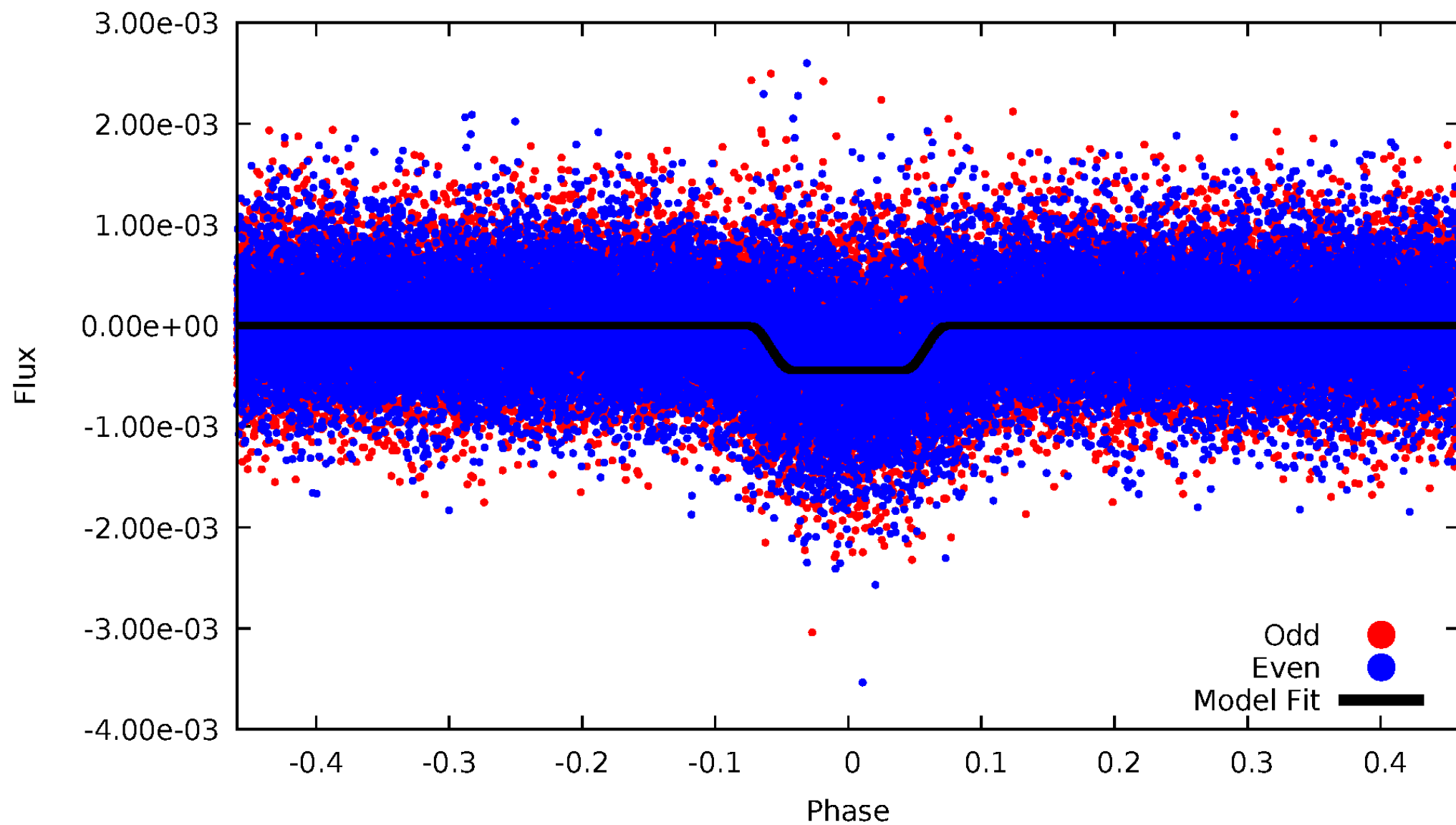
TCE 010407221-01



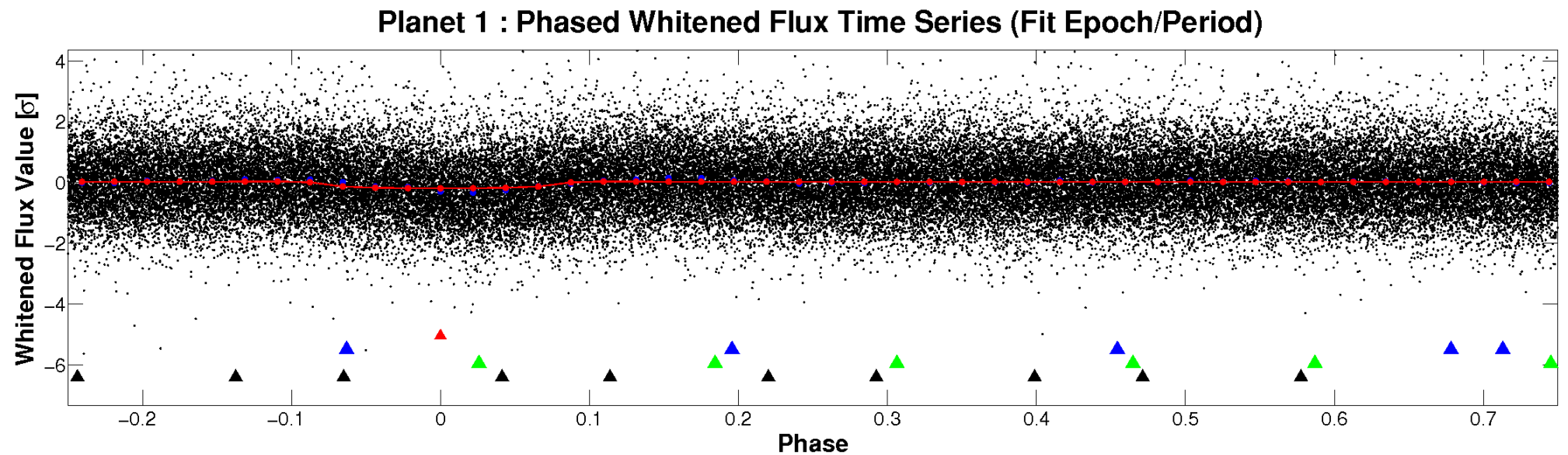
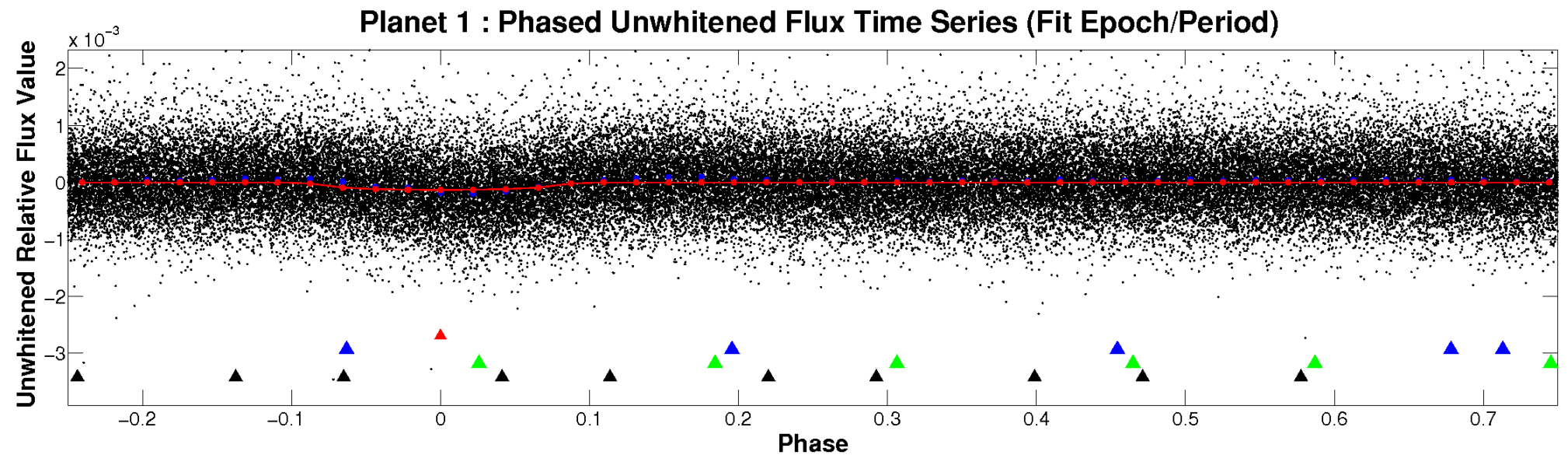


# ALT Odd/Even

TCE 010407221-01

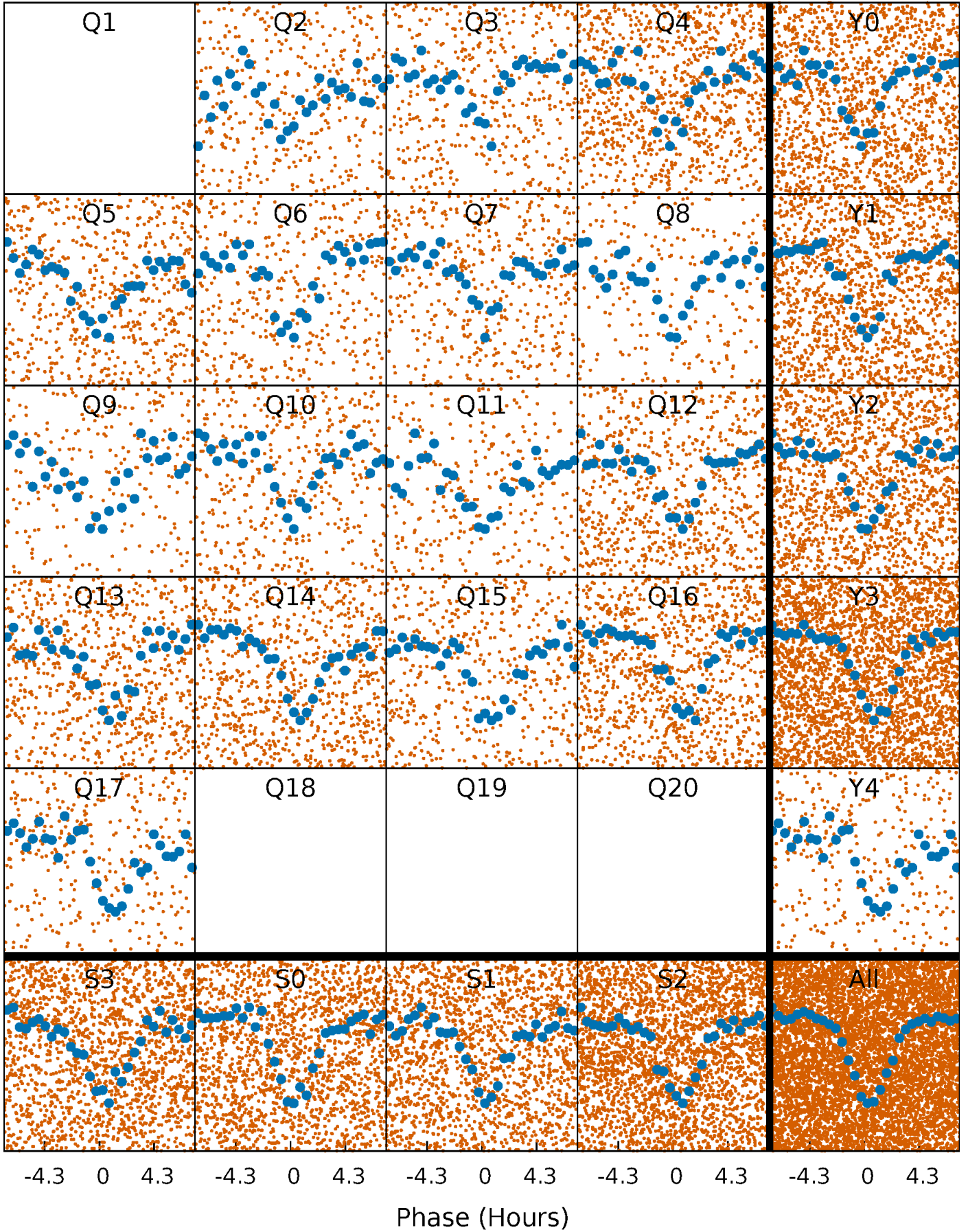


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

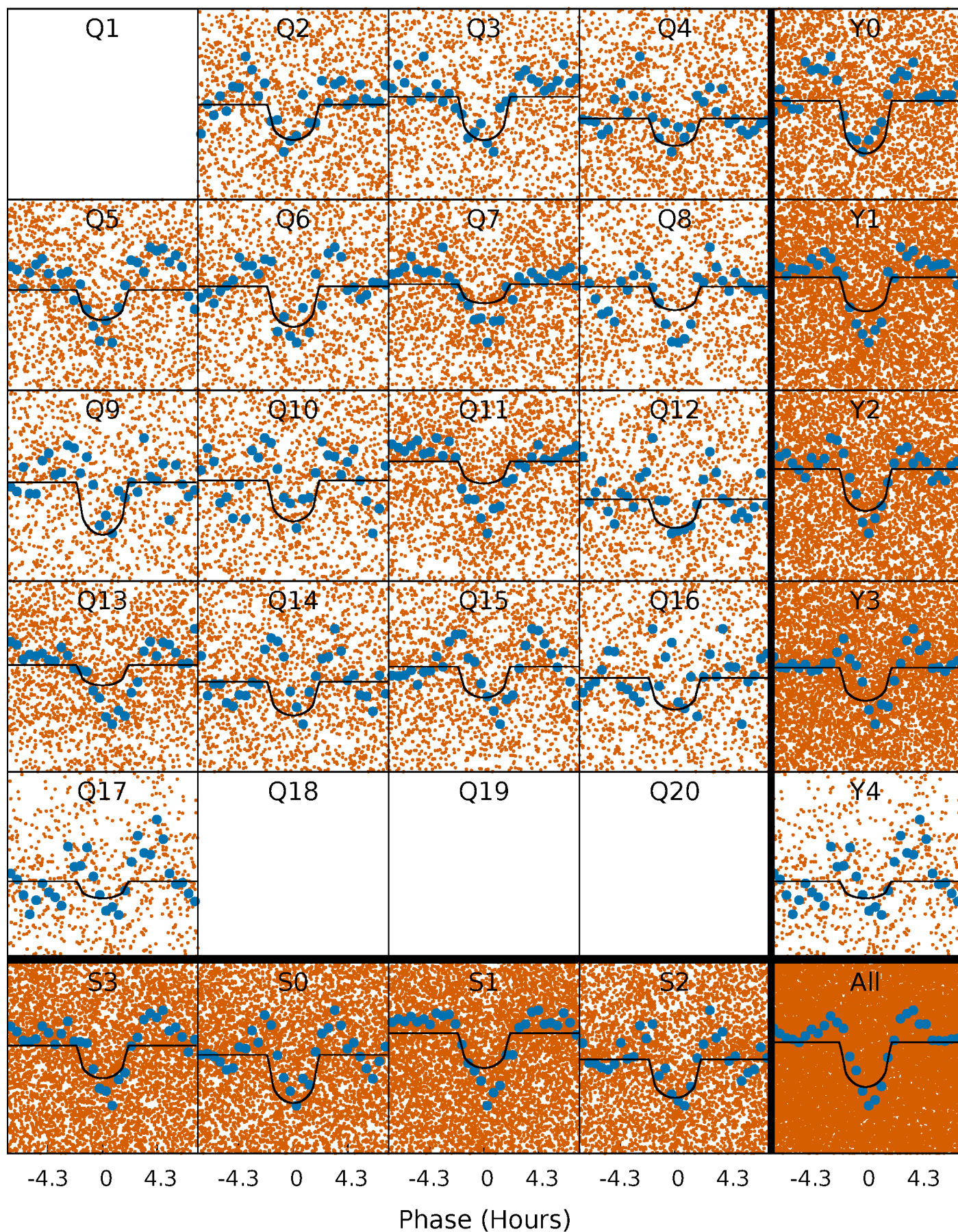
TCE 010407221-01 P= 0.933706 Days  $T_0=131.539843$  (BKJD)





# DV Quarter-Phased Transit Curves

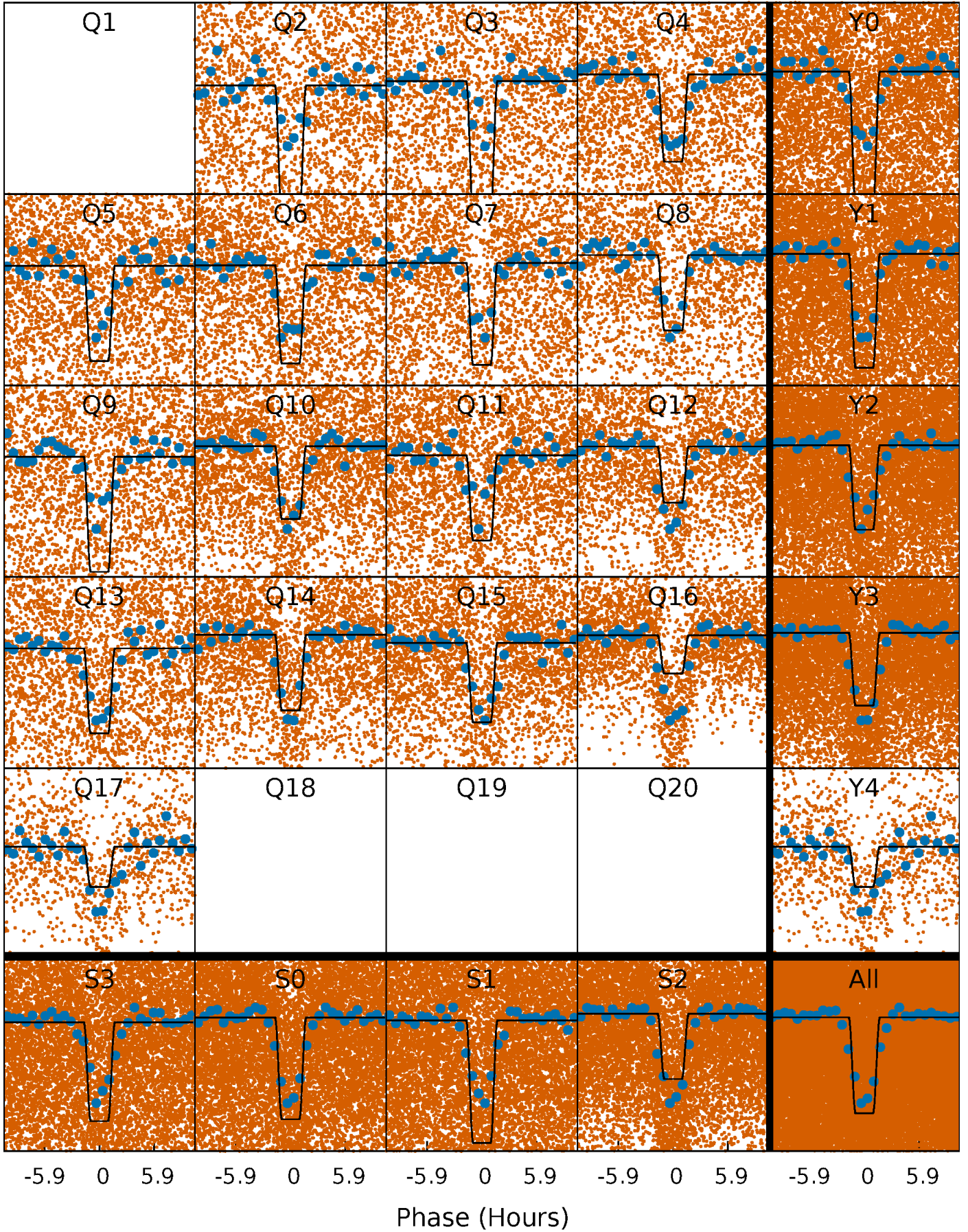
TCE 010407221-01   P= 0.933706 Days    $T_0=131.539843$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

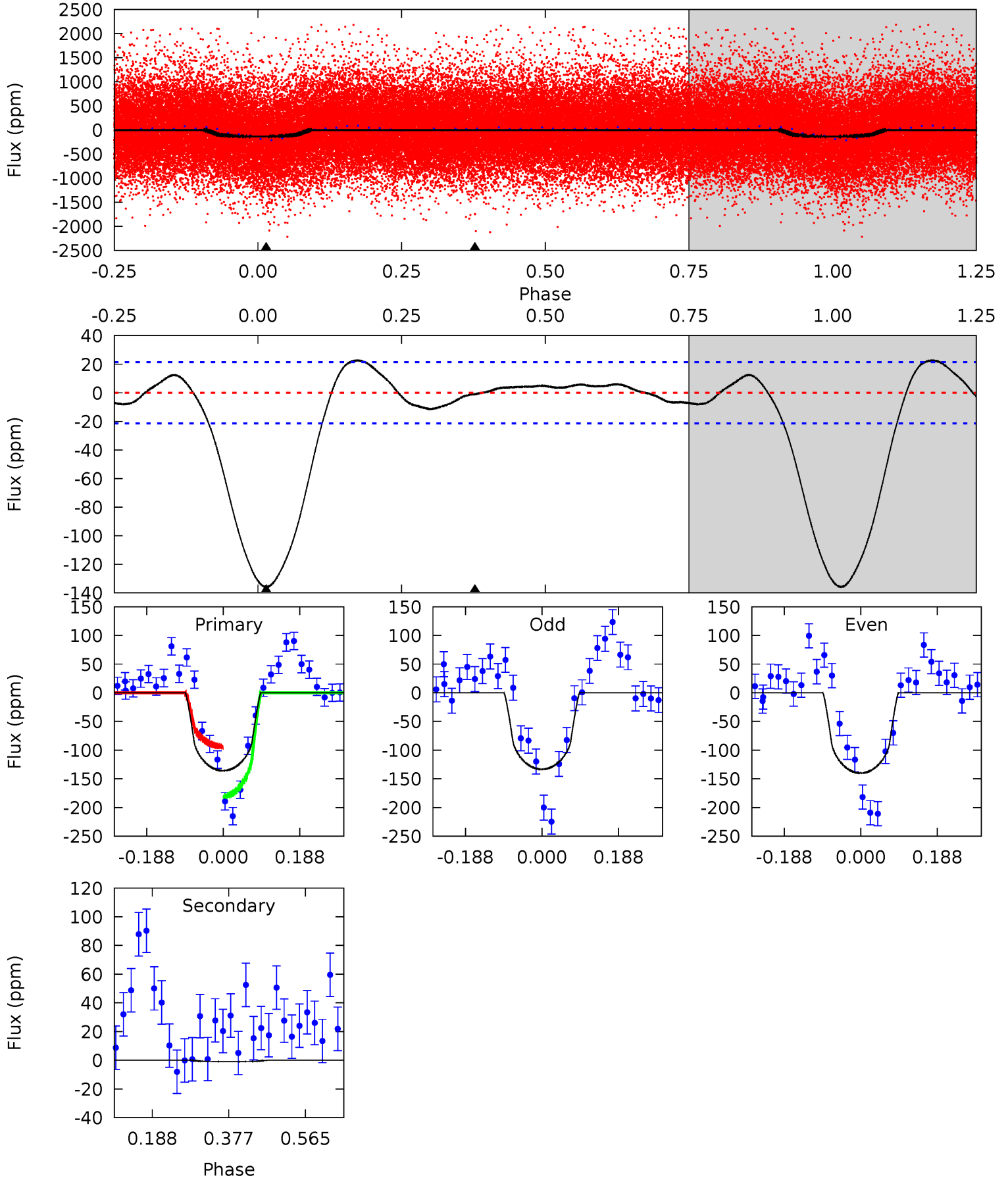
TCE 010407221-01 P= 0.933740 Days  $T_0=131.526531$  (BKJD)



# DV Model-Shift Uniqueness Test

010407221-01, P = 0.933706 Days, E = 131.539843 Days

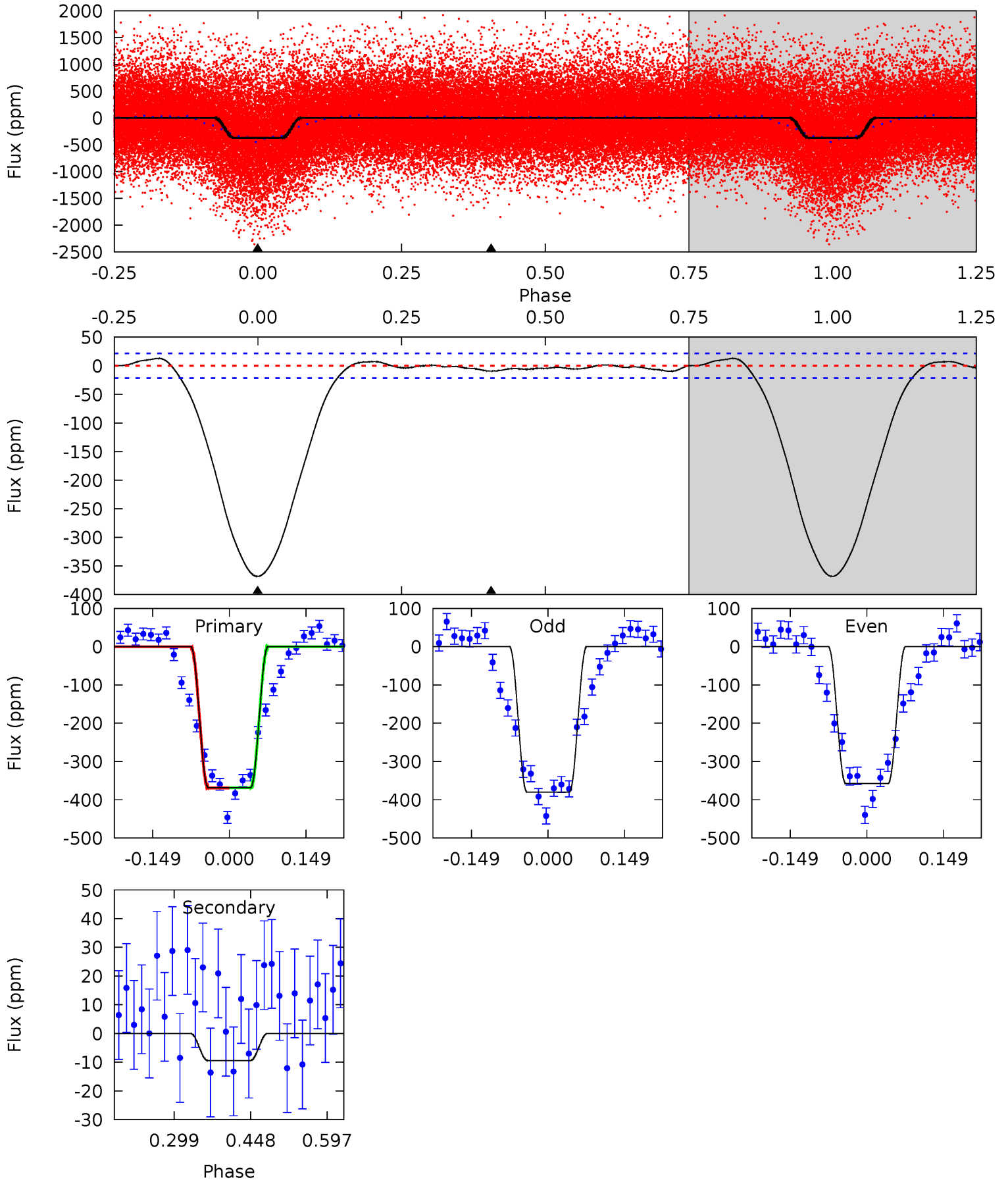
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
28.1	0.21	0	0	4.43	1.32	1.05	28.1	28.1	0.21	0.21	0.69	1.07	0.14	9.02



# Alt Model-Shift Uniqueness Test

010407221-01, P = 0.933740 Days, E = 131.526531 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
76.7	1.96	0	0	4.48	1.44	1.20	76.7	76.7	1.96	1.96	2.34	1.05	0.03	0.08





### Stellar Parameters For KIC 010407221

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4643^{+126}_{-140}$	$4.610^{+0.052}_{-0.028}$	$-0.280^{+0.300}_{-0.300}$	$0.663^{+0.052}_{-0.057}$	$0.652^{+0.080}_{-0.046}$	$3.158^{+0.730}_{-0.409}$
	+3%/-3%	+1%/-1%	+107%/-107%	+8%/-9%	+12%/-7%	+23%/-13%
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 010407221-01 / KOI 2605.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1 \pm 5$	$0.84^{+0.36}_{-0.40}$	$1818^{+54}_{-63}$	$-2214^{+5071}_{-604}$	$0.120^{+1.575}_{-1.122}$
Alt.	$-9 \pm 5$	$1.52^{+0.38}_{-0.40}$	$1823^{+60}_{-59}$	$2348^{+350}_{-4301}$	$0.601^{+0.612}_{-0.360}$

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

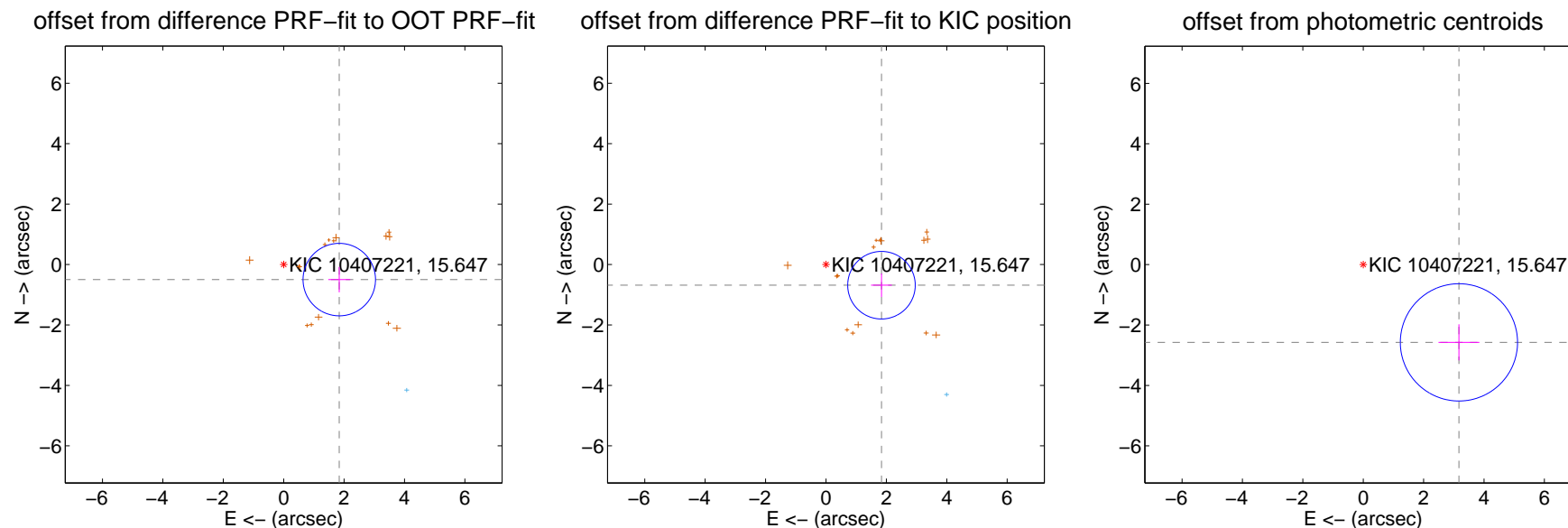
## DV Centroid Data

Supplemental centroid analysis for 010407221-01. Kepler magnitude: 15.65. Transit SNR 16.76

There are 1 quarters with good PRF difference image offsets

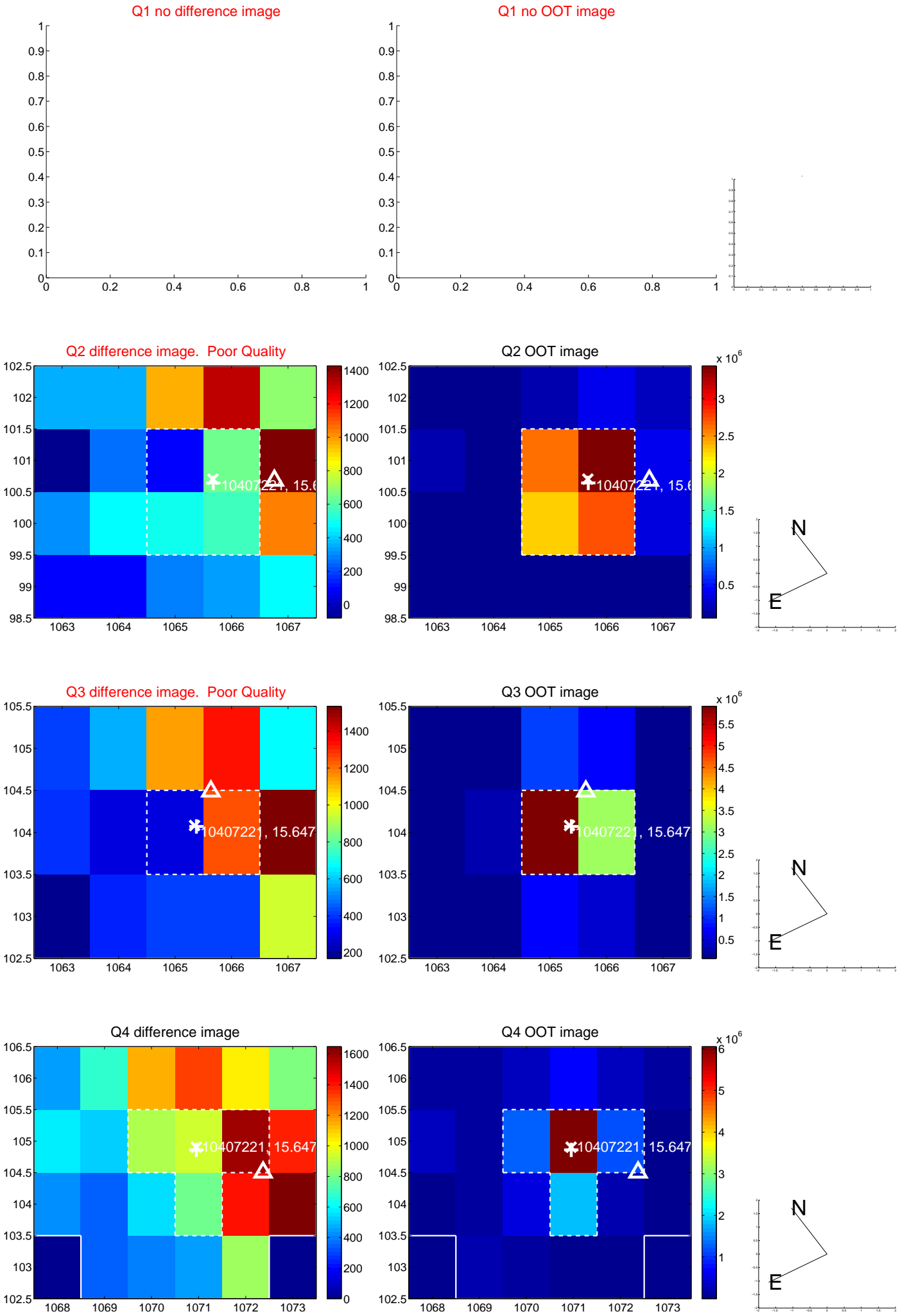
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.907 \pm 0.400$	4.77	$-1.841 \pm 0.363$	$-0.498 \pm 0.422$
PRF-fit source offset from KIC position	$1.961 \pm 0.373$	5.26	$-1.838 \pm 0.344$	$-0.684 \pm 0.389$
photometric centroid source offset	$4.08 \pm 0.65$	6.31	$-3.17 \pm 0.68$	$-2.57 \pm 0.60$

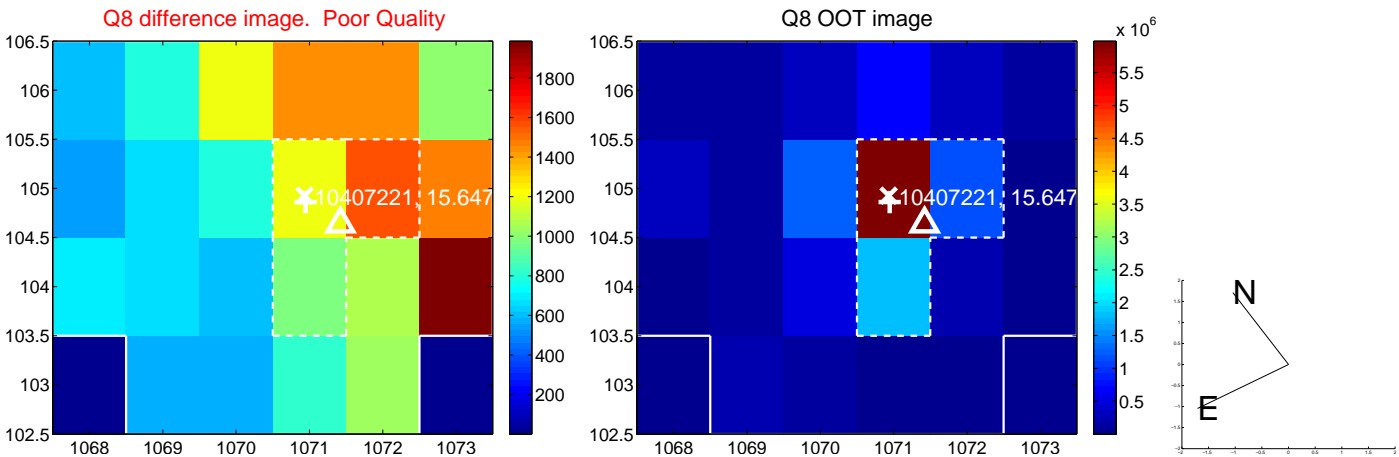
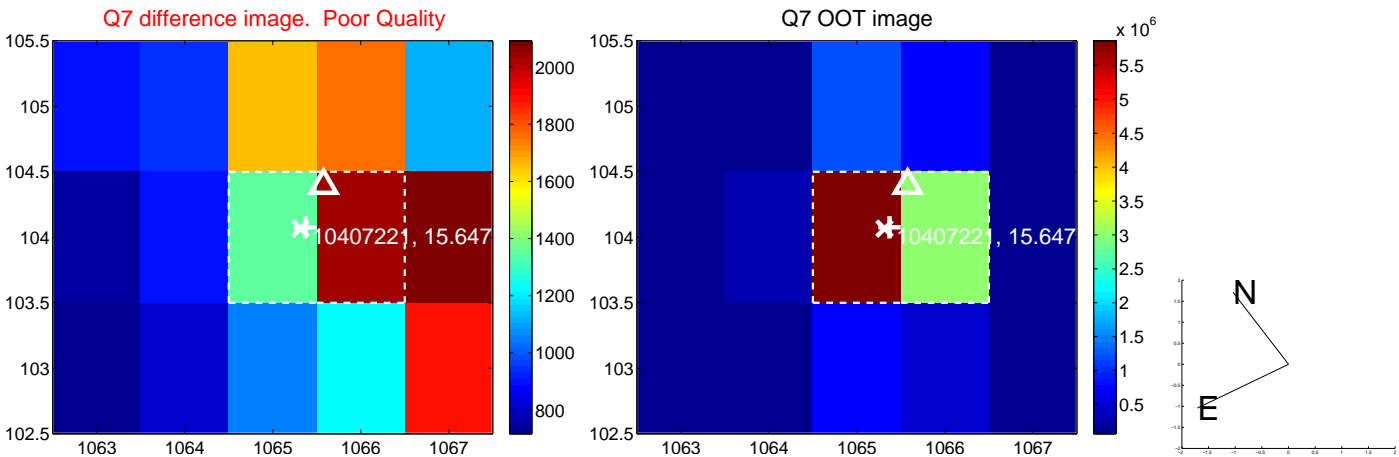
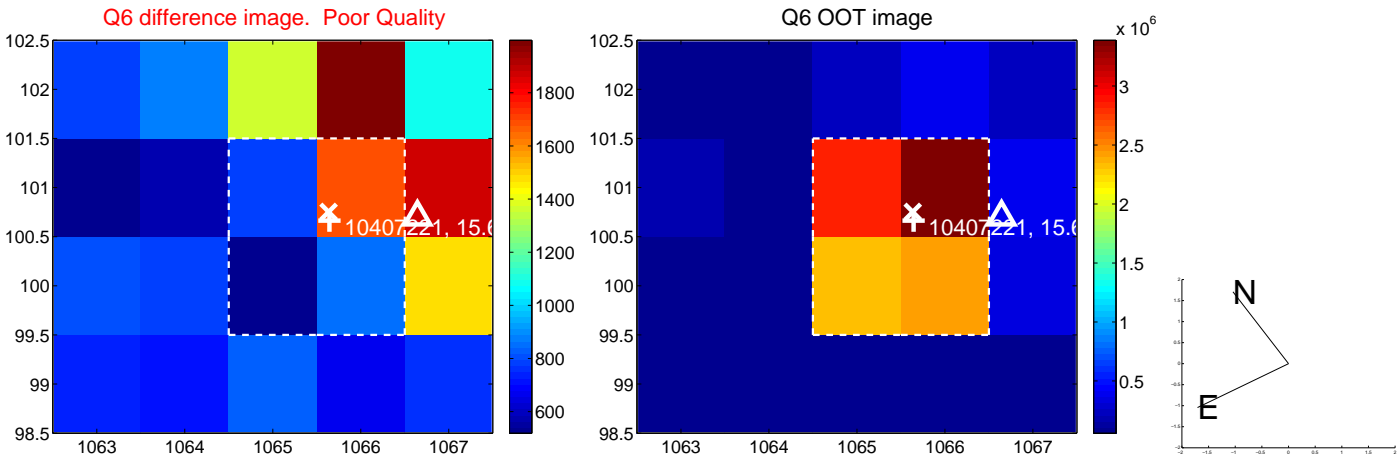
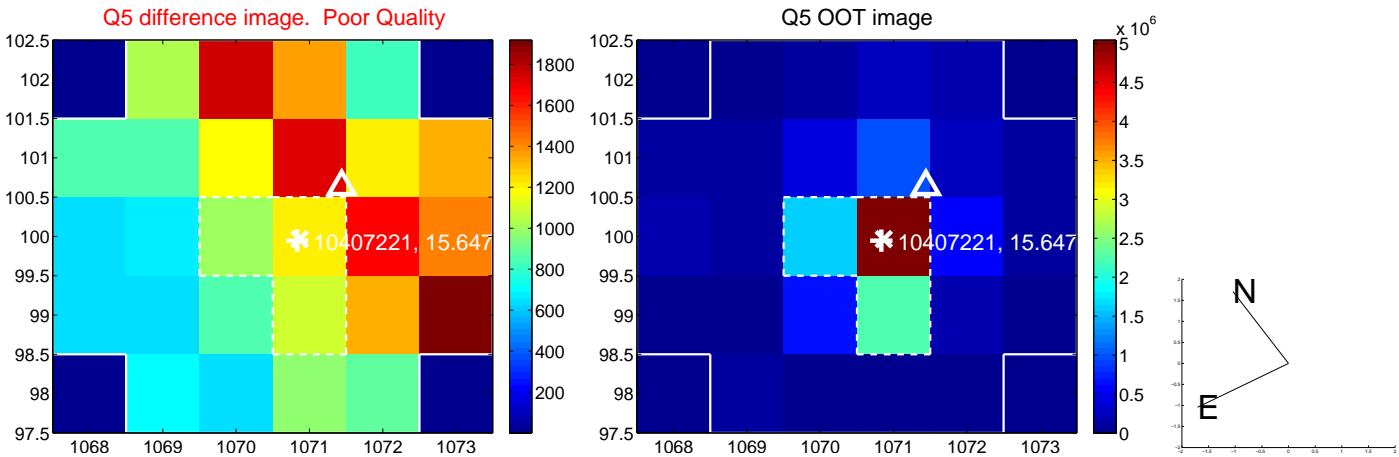


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

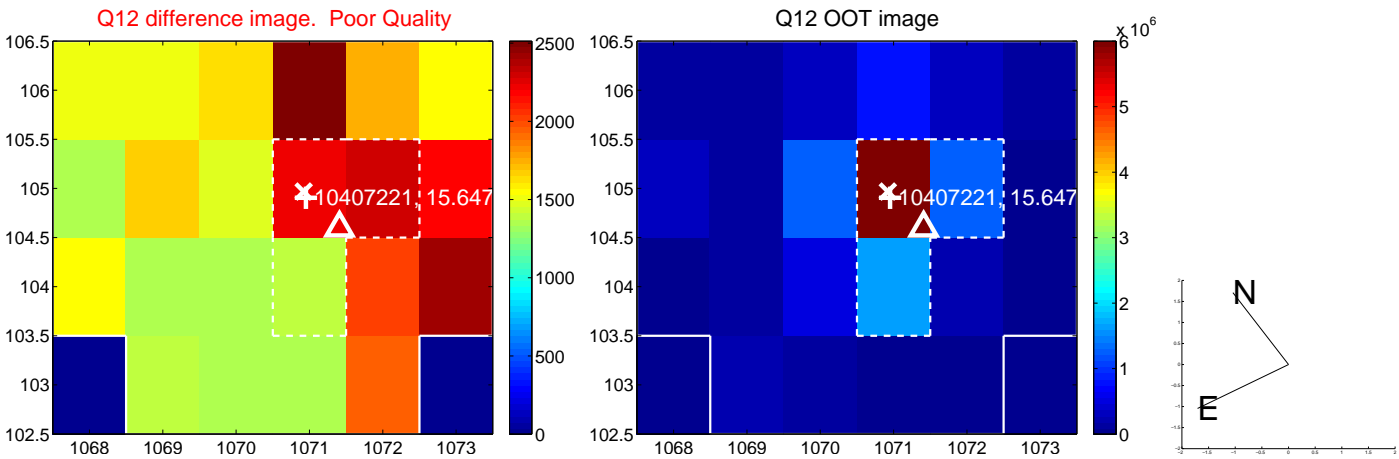
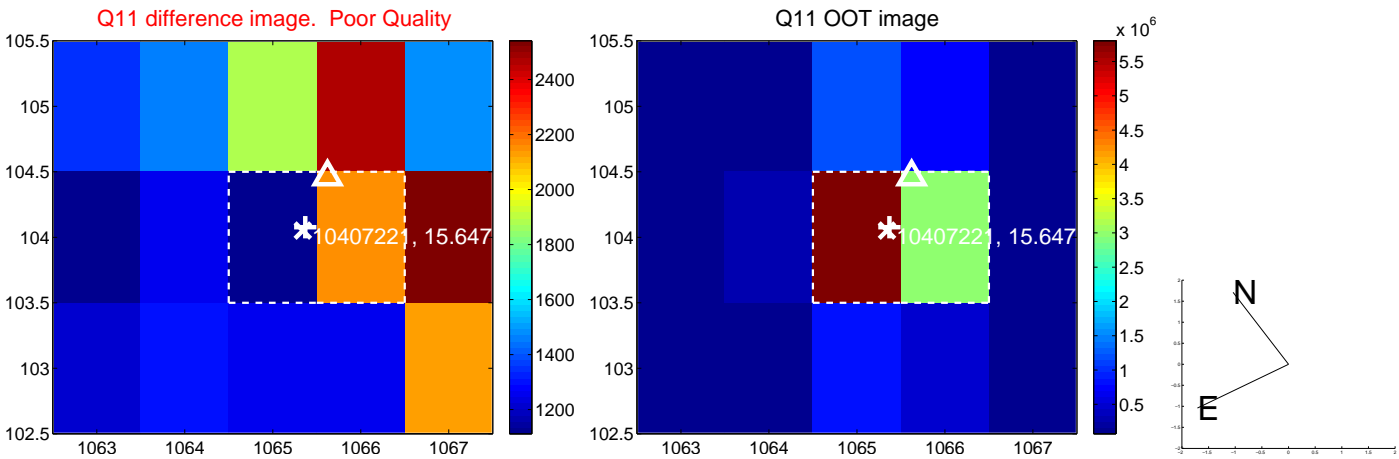
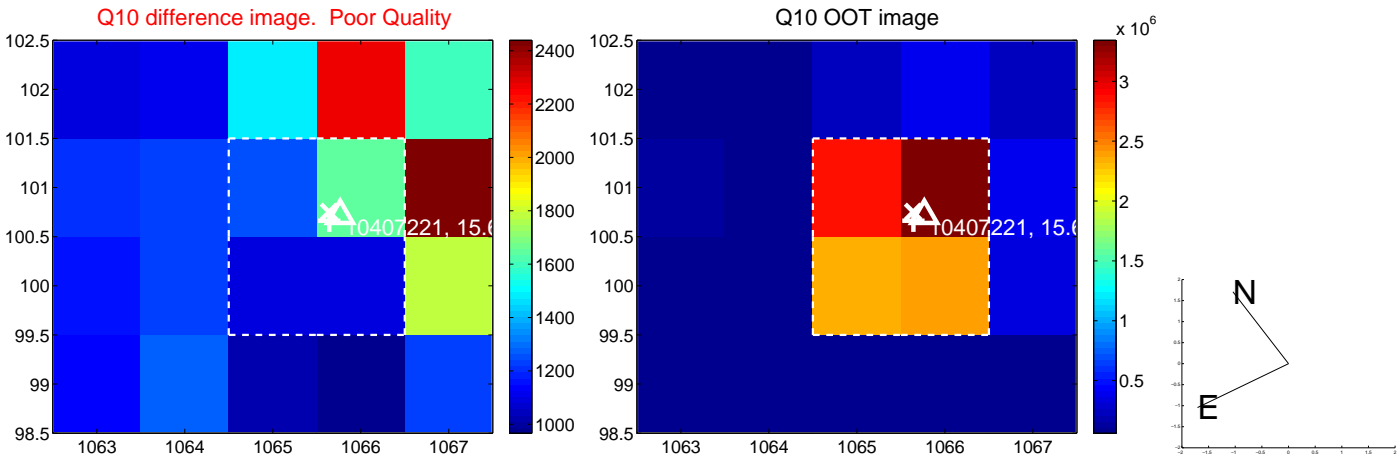
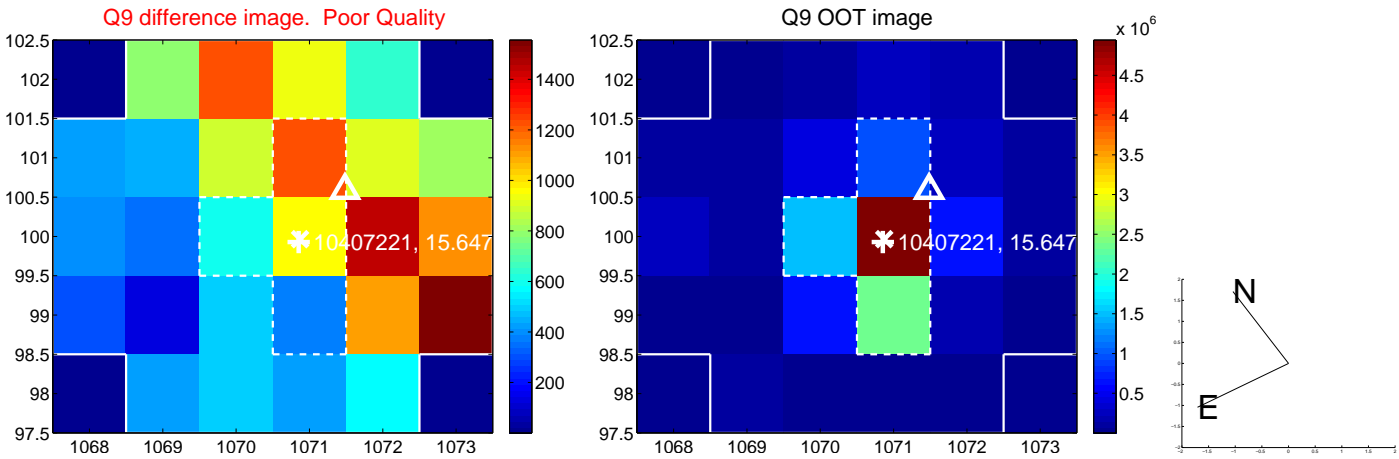


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

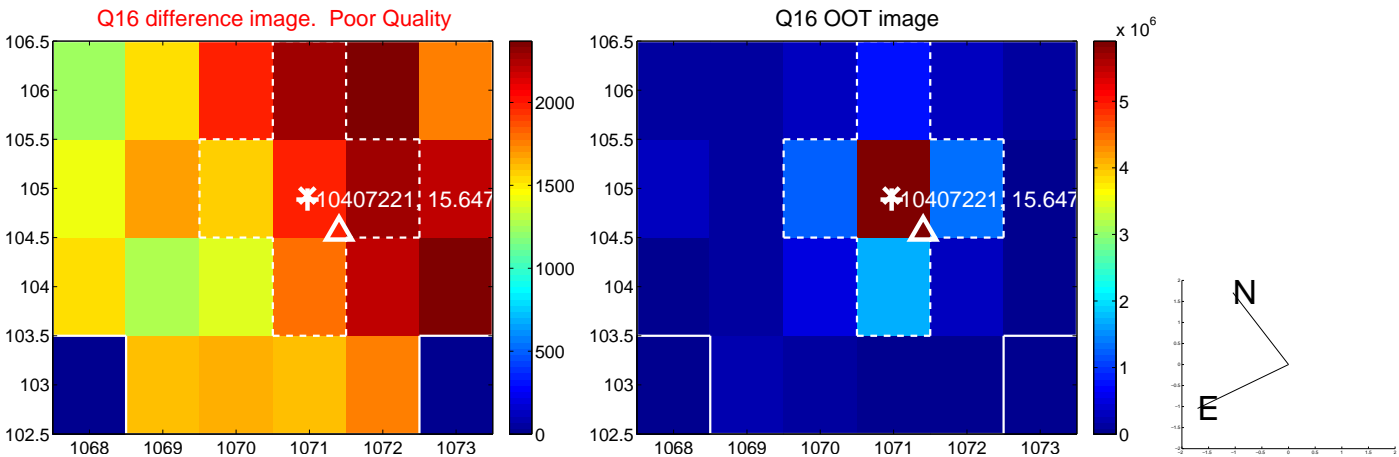
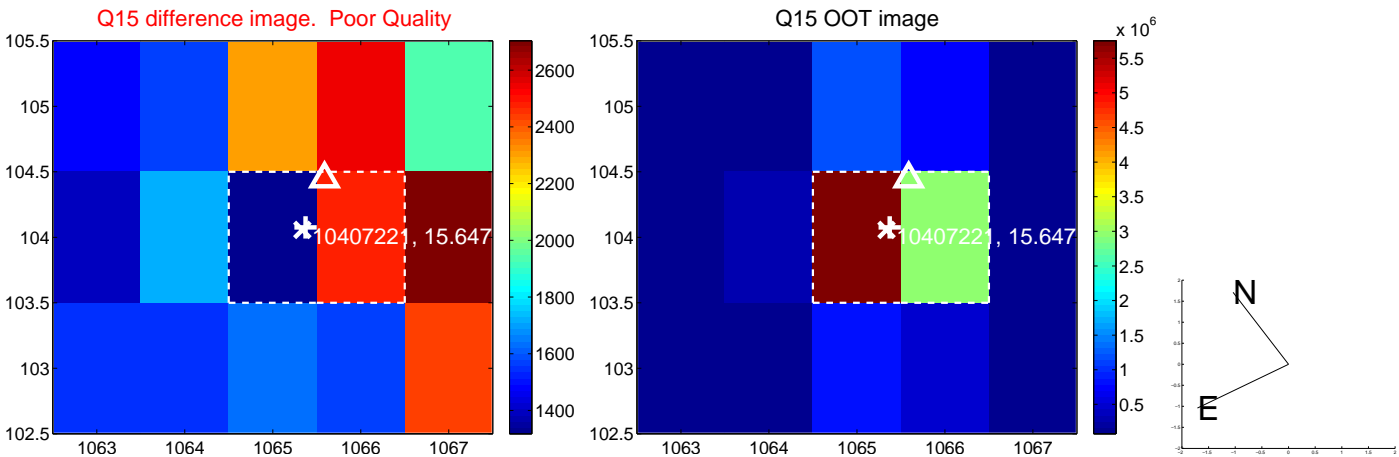
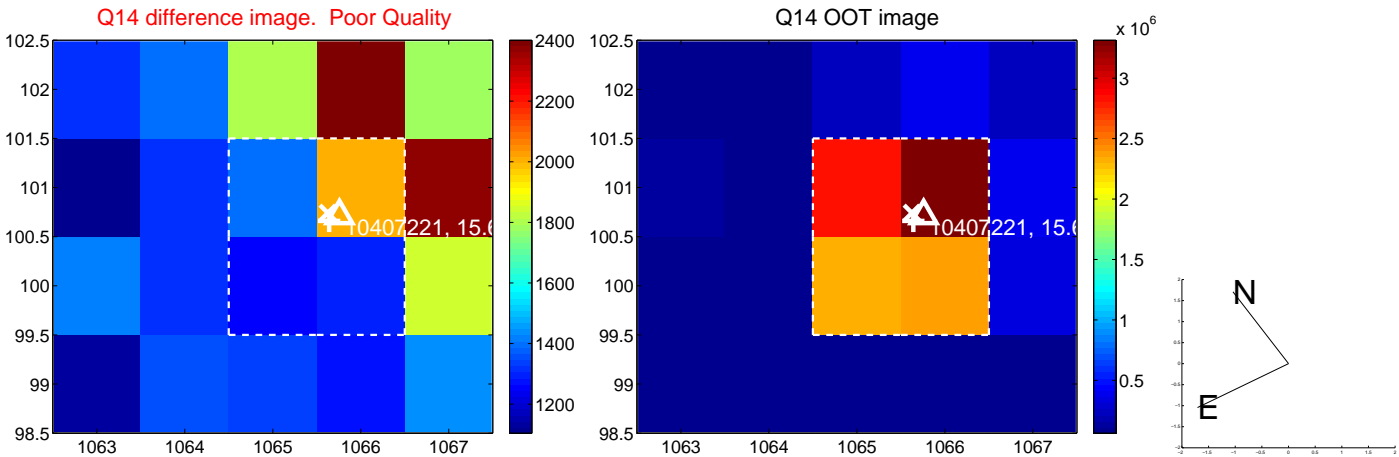
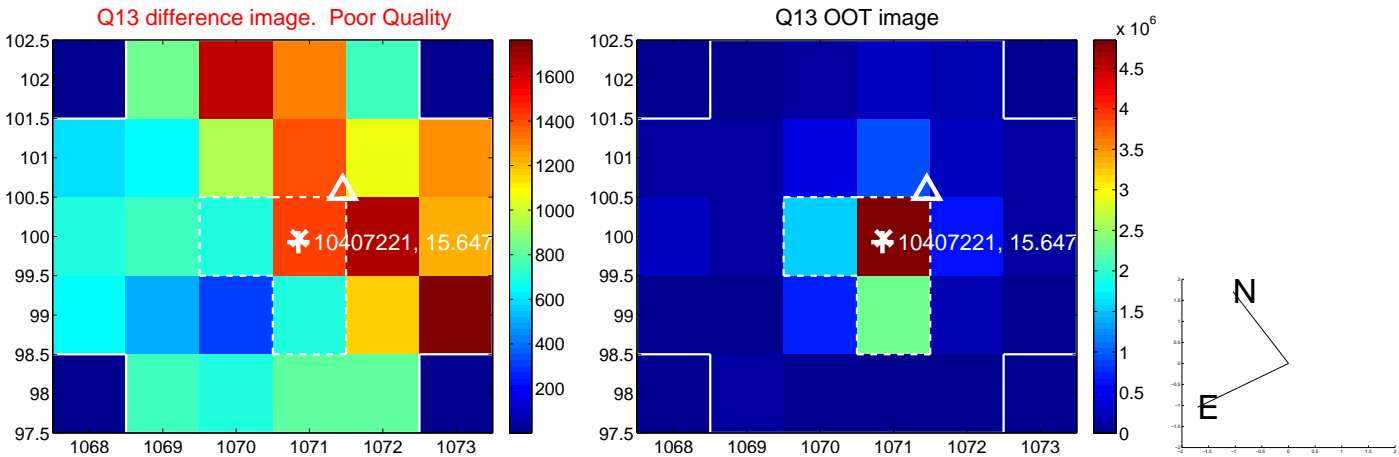




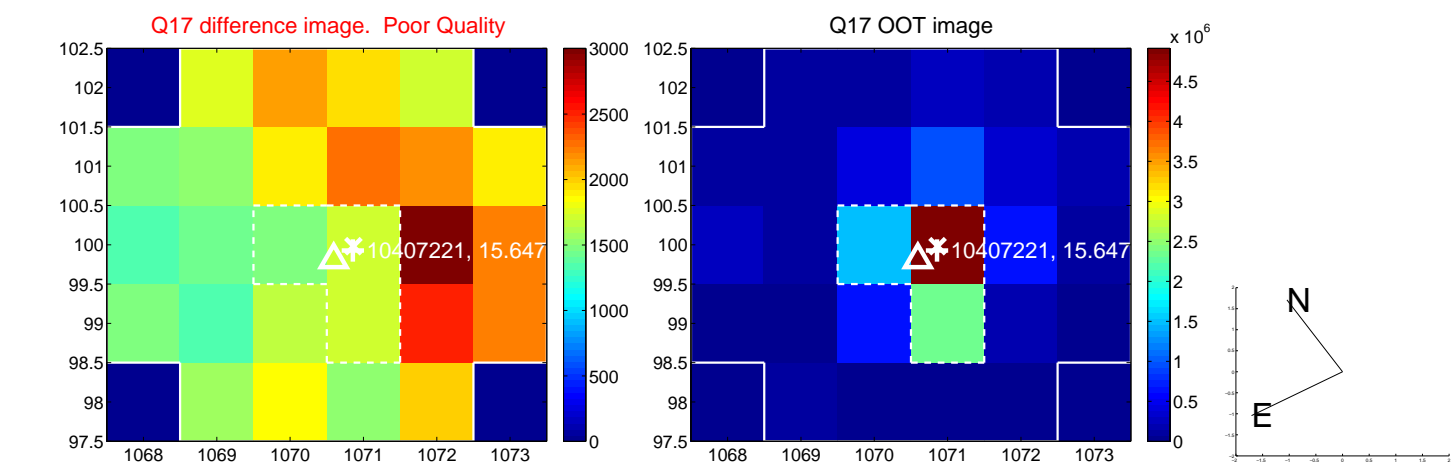
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



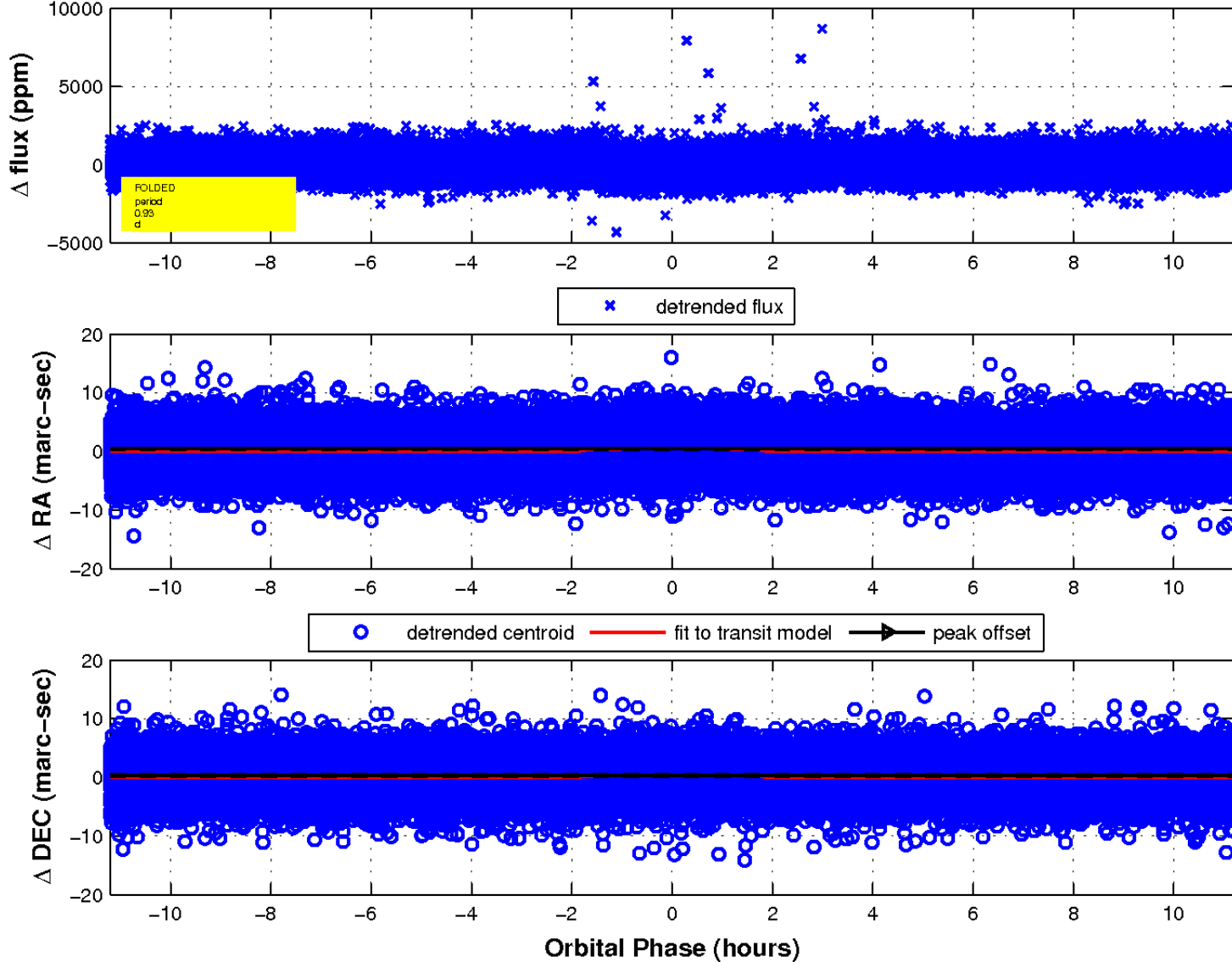
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

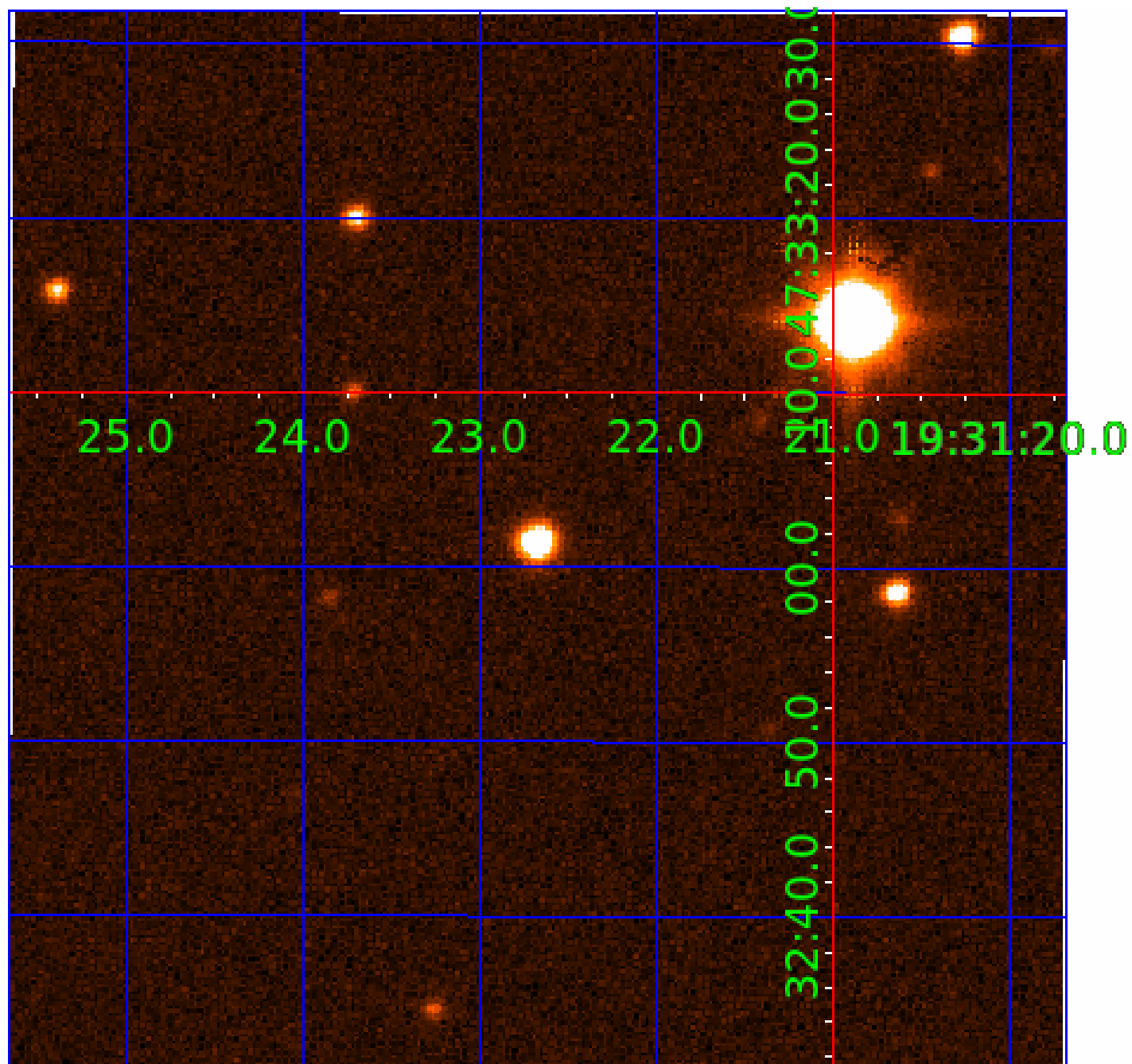


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination





# KIC 010407221

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010407221-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—EPHEM_MATCH
010407221-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010407221-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—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.

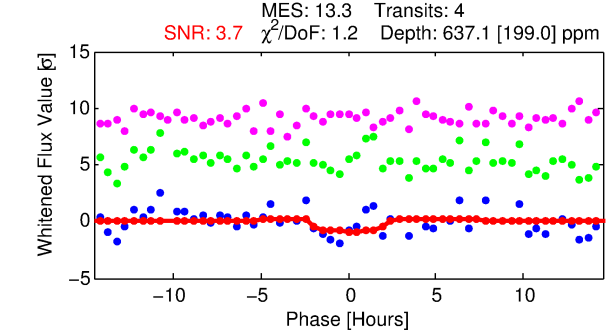
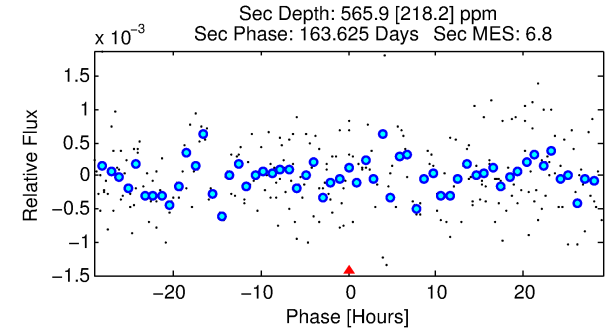
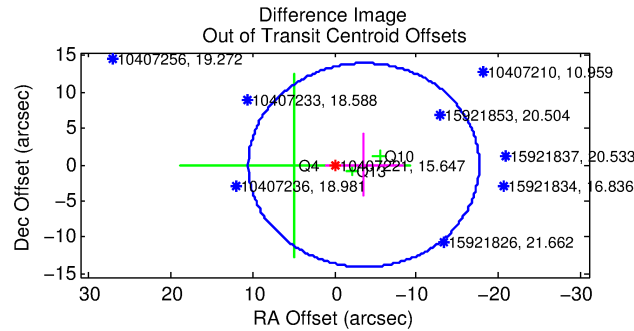
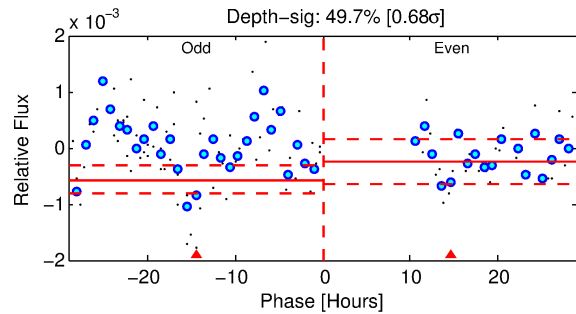
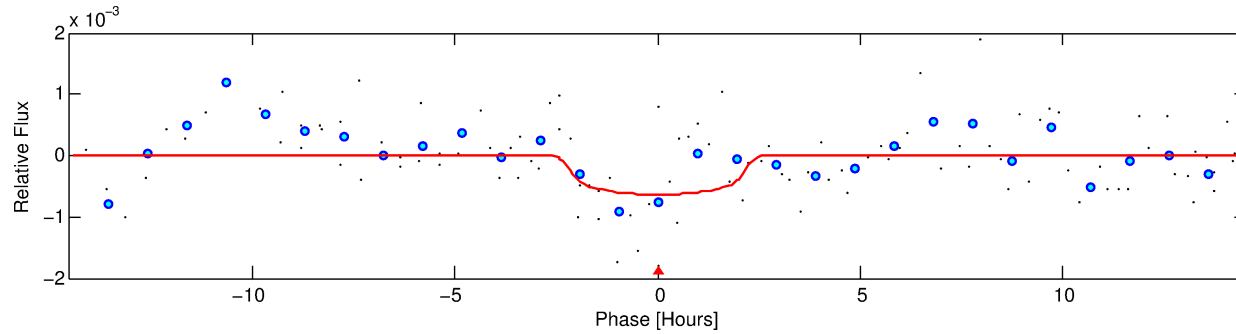
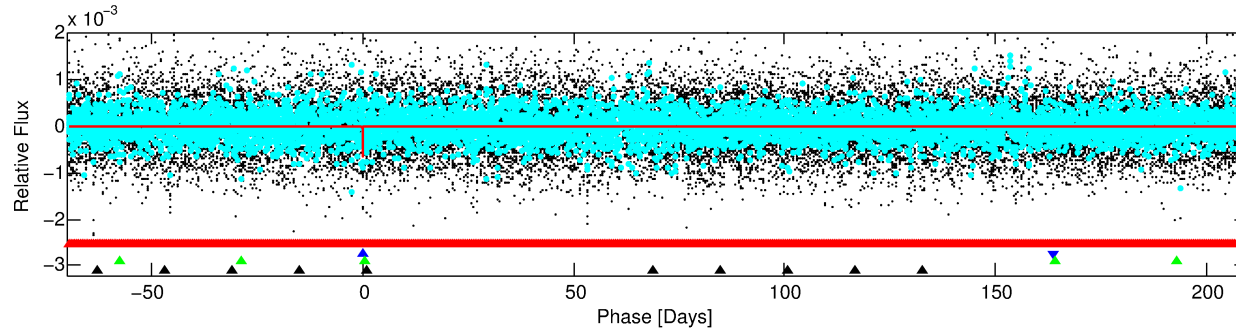
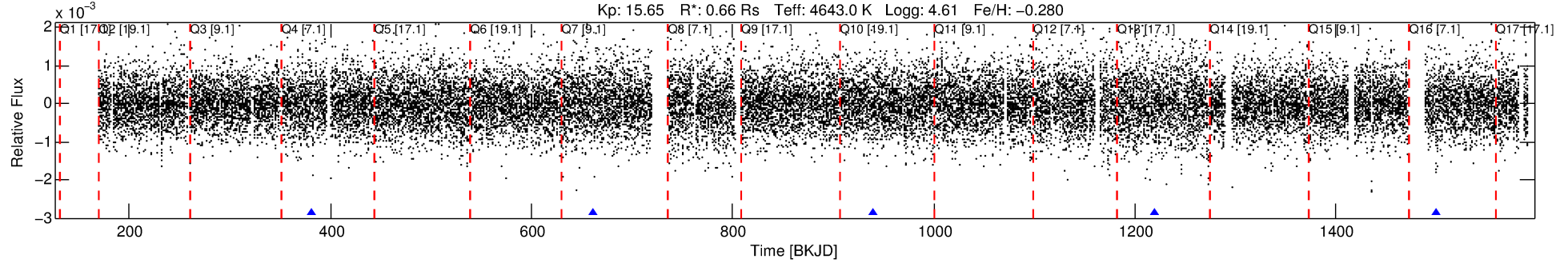
Ephemeris Match Information For 010407221-02

No Significant Match Found

# DV One-Page Summary

KIC: 10407221 Candidate: 2 of 4 Period: 279.419 d  
KOI: K02605 Corr: No Ephemeris Match

Kp: 15.65 R\*: 0.66 Rs Teff: 4643.0 K Logg: 4.61 Fe/H: -0.280



## DV Fit Results:

Period = 279.41950 [0.01074] d  
Epoch = 381.4726 [0.0301] BKJD  
Rp/R\* = 0.0269 [0.0290]  
a/R\* = 255.50 [949.56]  
b = 0.85 [1.27]  
Seff = 0.35 [0.05]  
Teq = 196 [8] K  
Rp = 1.95 [2.10] Re  
a = 0.7259 [0.0507] AU  
Ag = 43267.02 [94716.63] [0.46σ]  
Teffp = 4365 [2390] K [1.74σ]

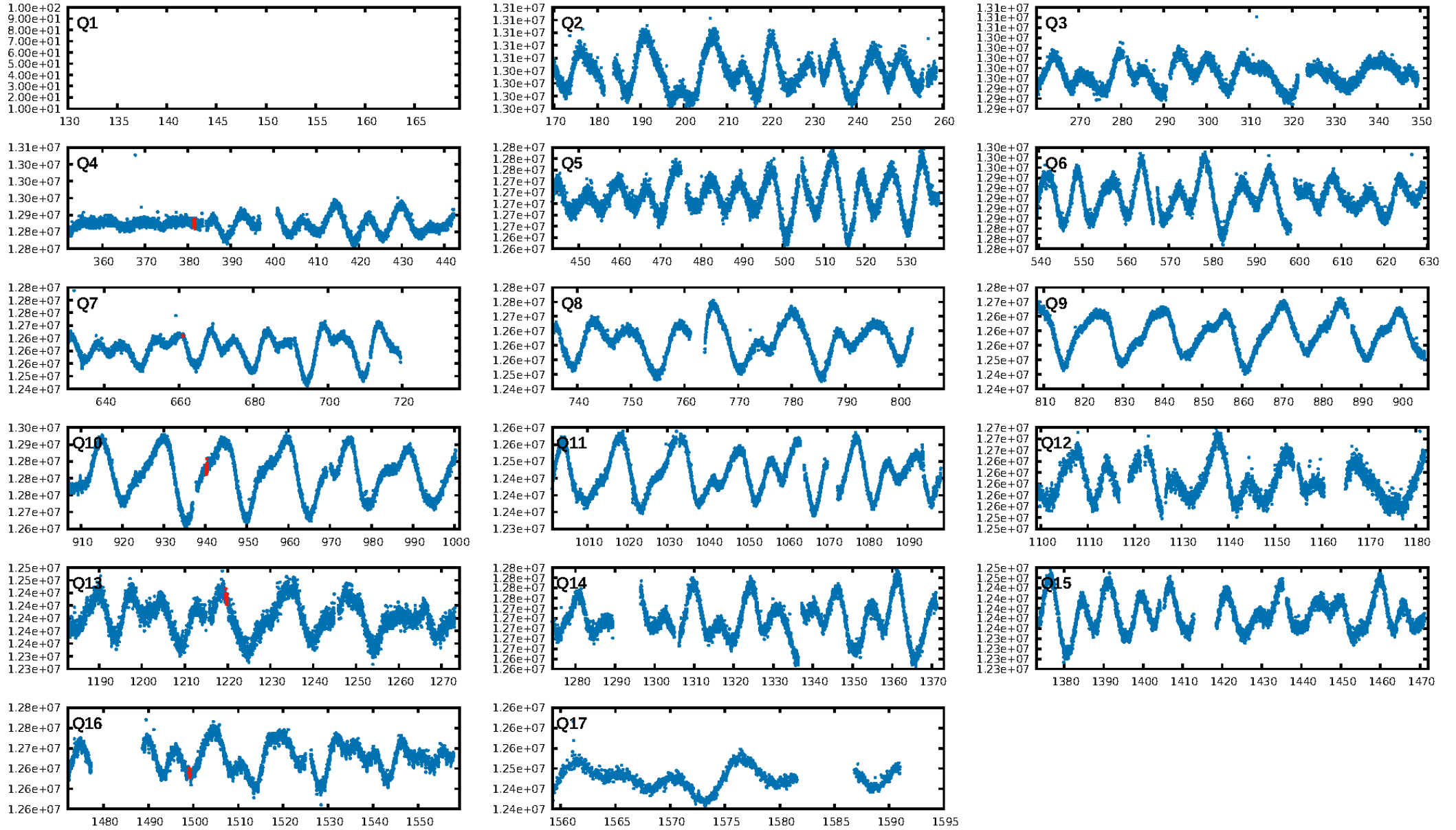
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [53.63σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.8%  
ModelChiSquareGof-sig: 97.8%  
Bootstrap-pfa: 2.59e-16  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -3.794  
Centroid-sig: 99.6%  
Centroid-so: 0.247 arcsec [0.10σ]  
OotOffset-rm: 3.570 arcsec [0.76σ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-rm: 3.443 arcsec [0.73σ]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 0.00 [0/3]

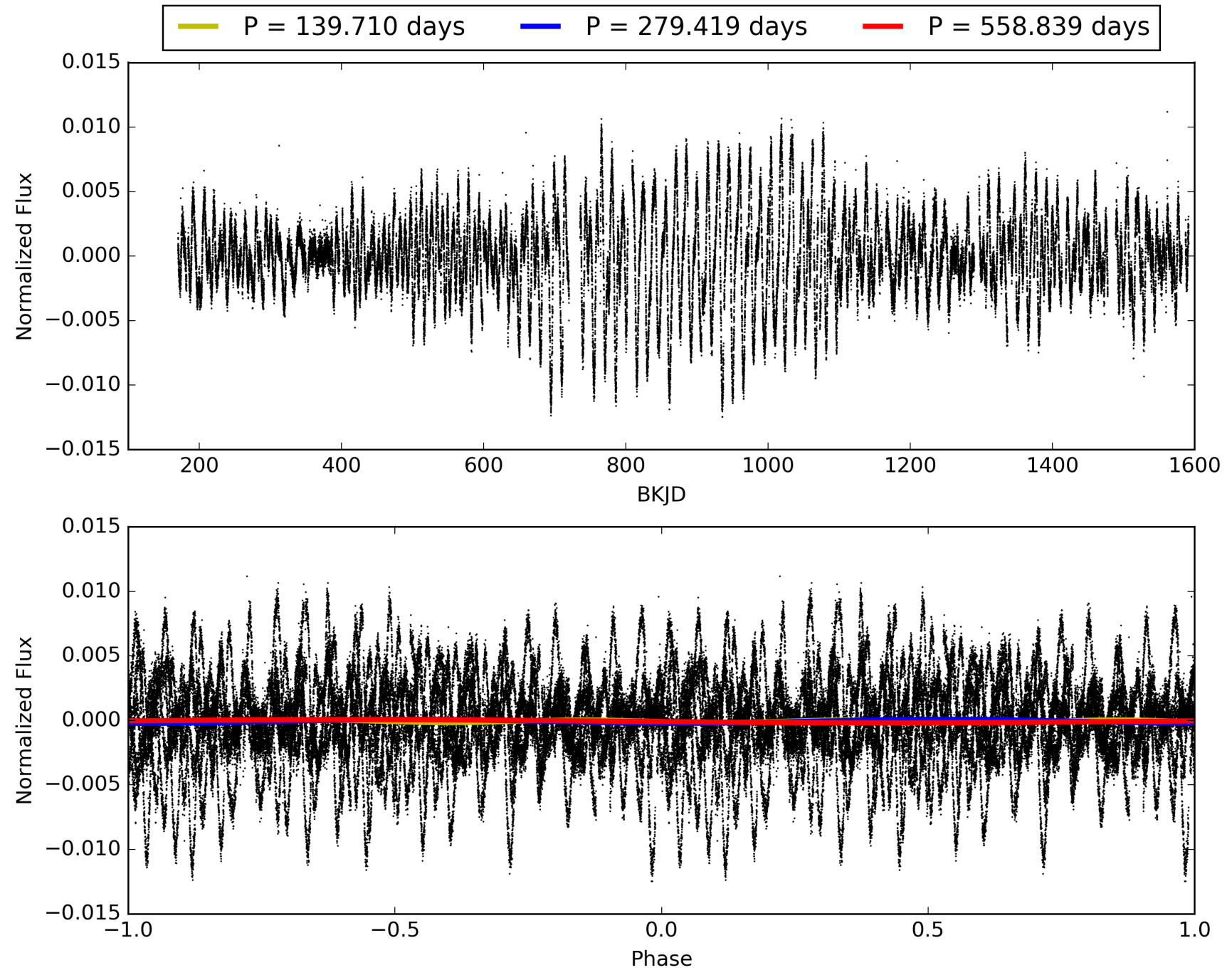
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 09:07:36 Z

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

# TCE 010407221-02, PDC Light Curves



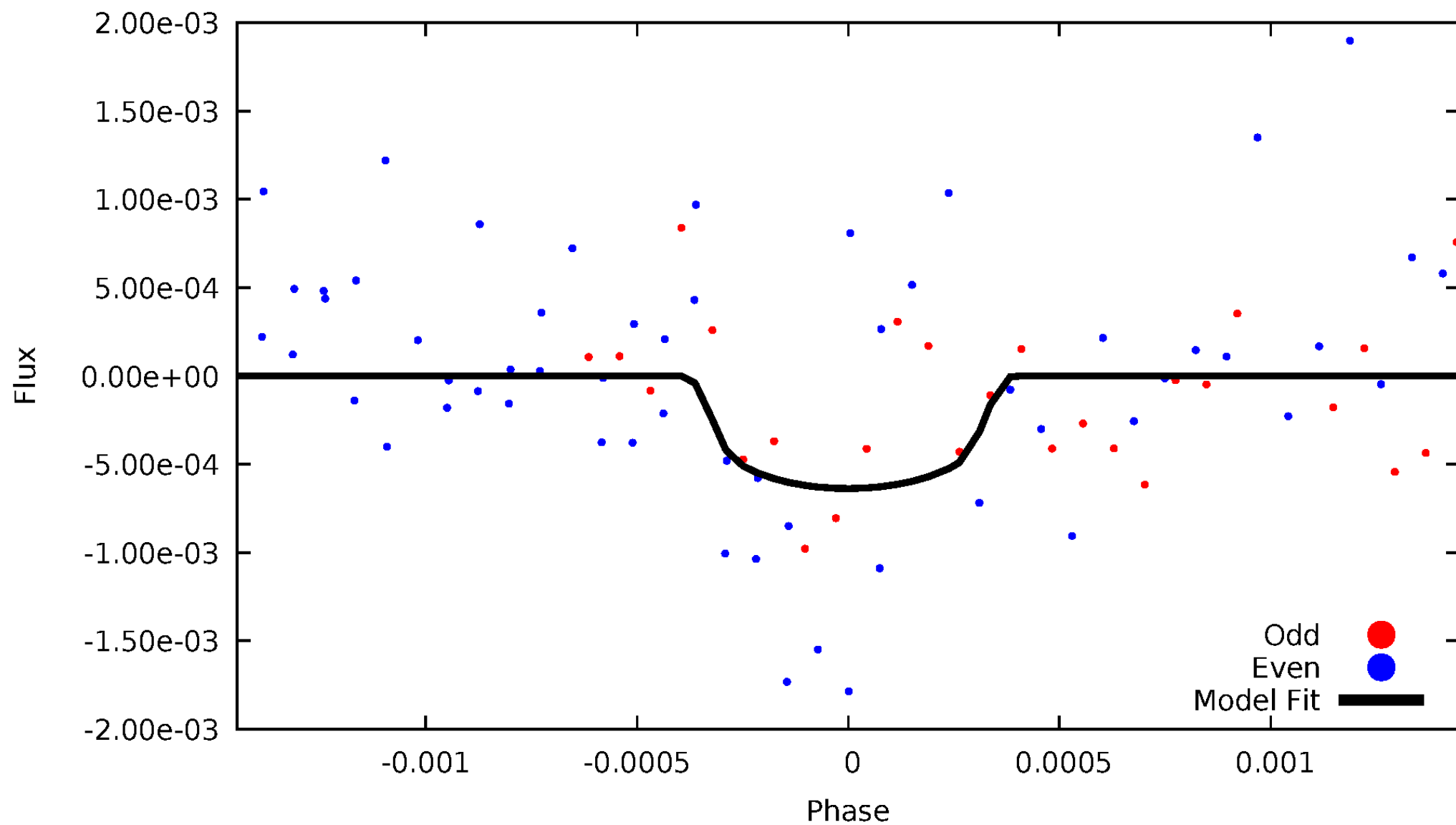
# TCE 010407221-02





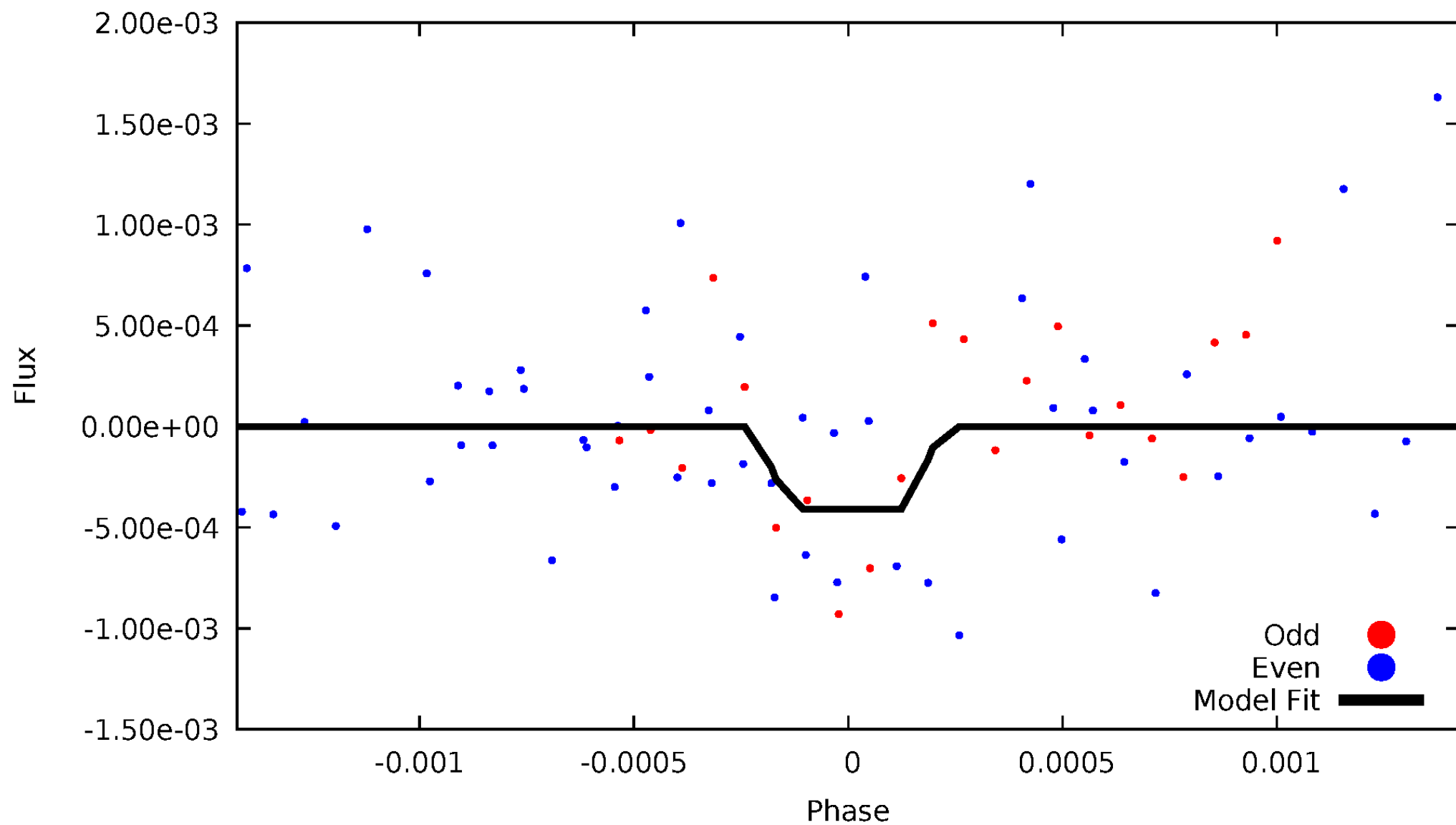
# DV Odd/Even

TCE 010407221-02



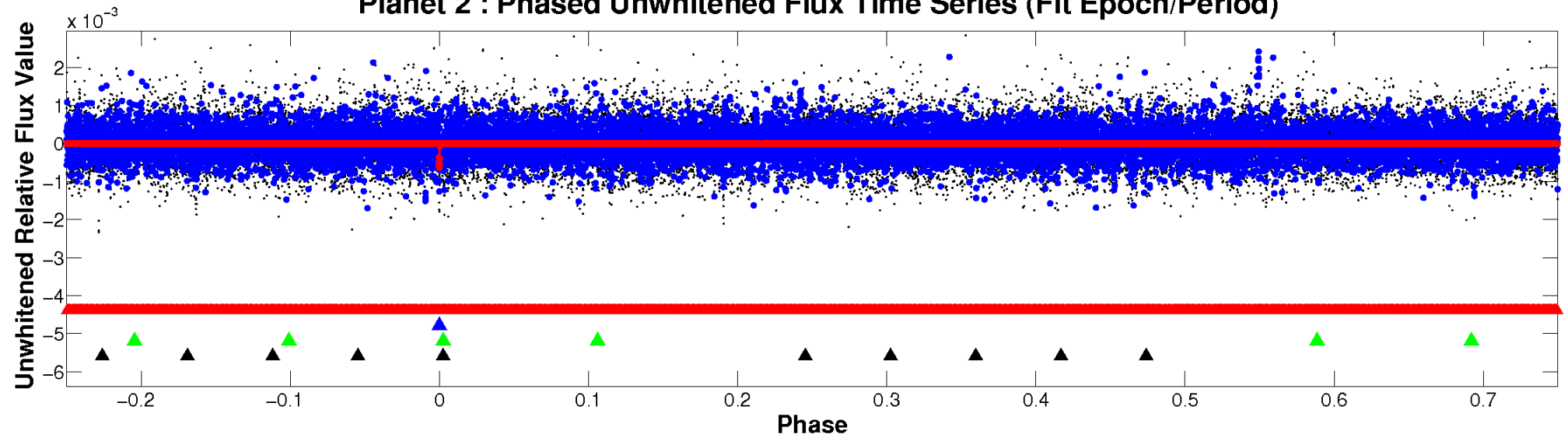
# ALT Odd/Even

TCE 010407221-02

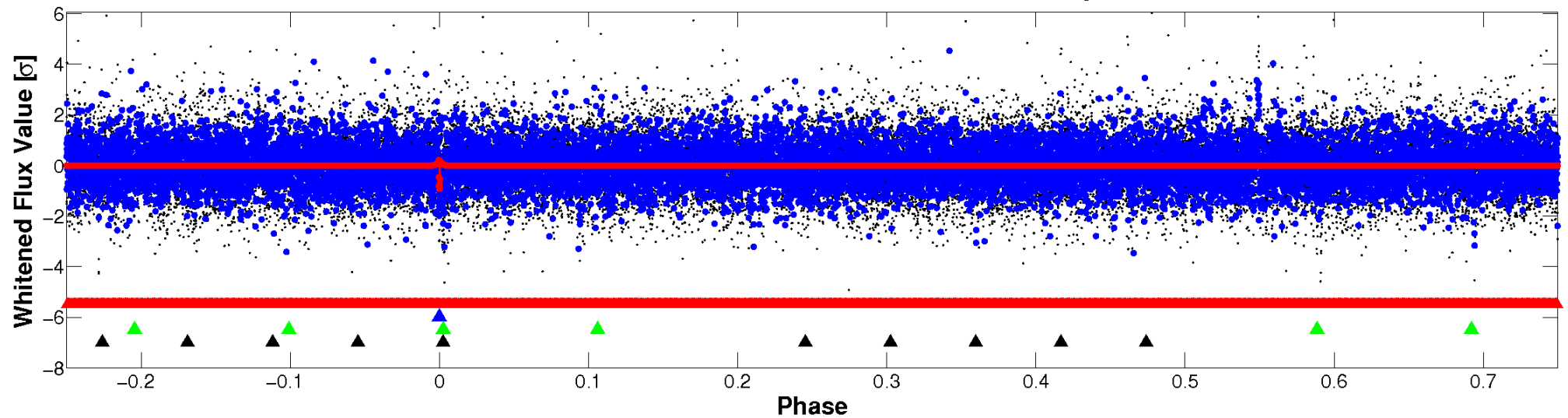


# Non-Whitened Vs. Whitened Light Curve

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

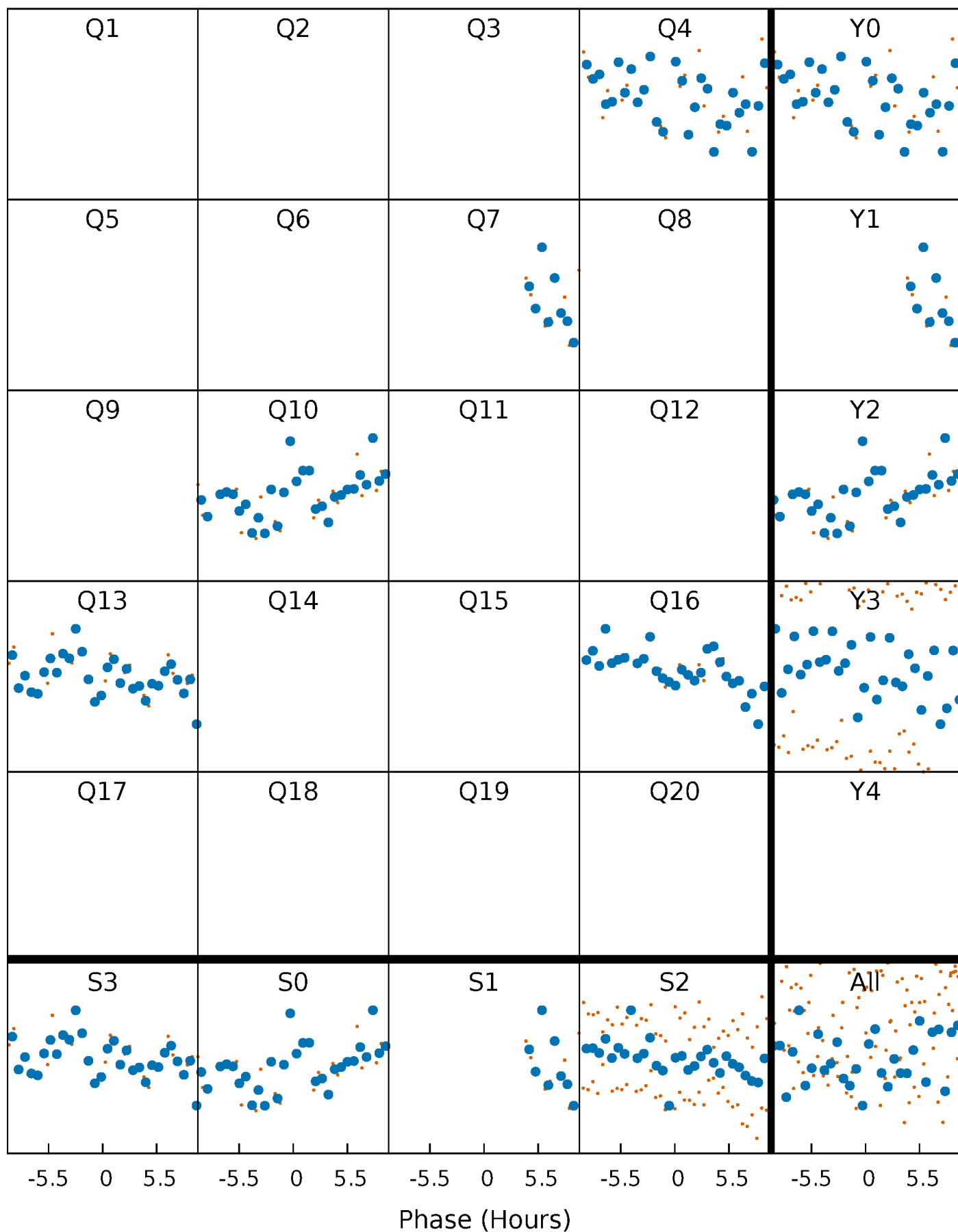


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



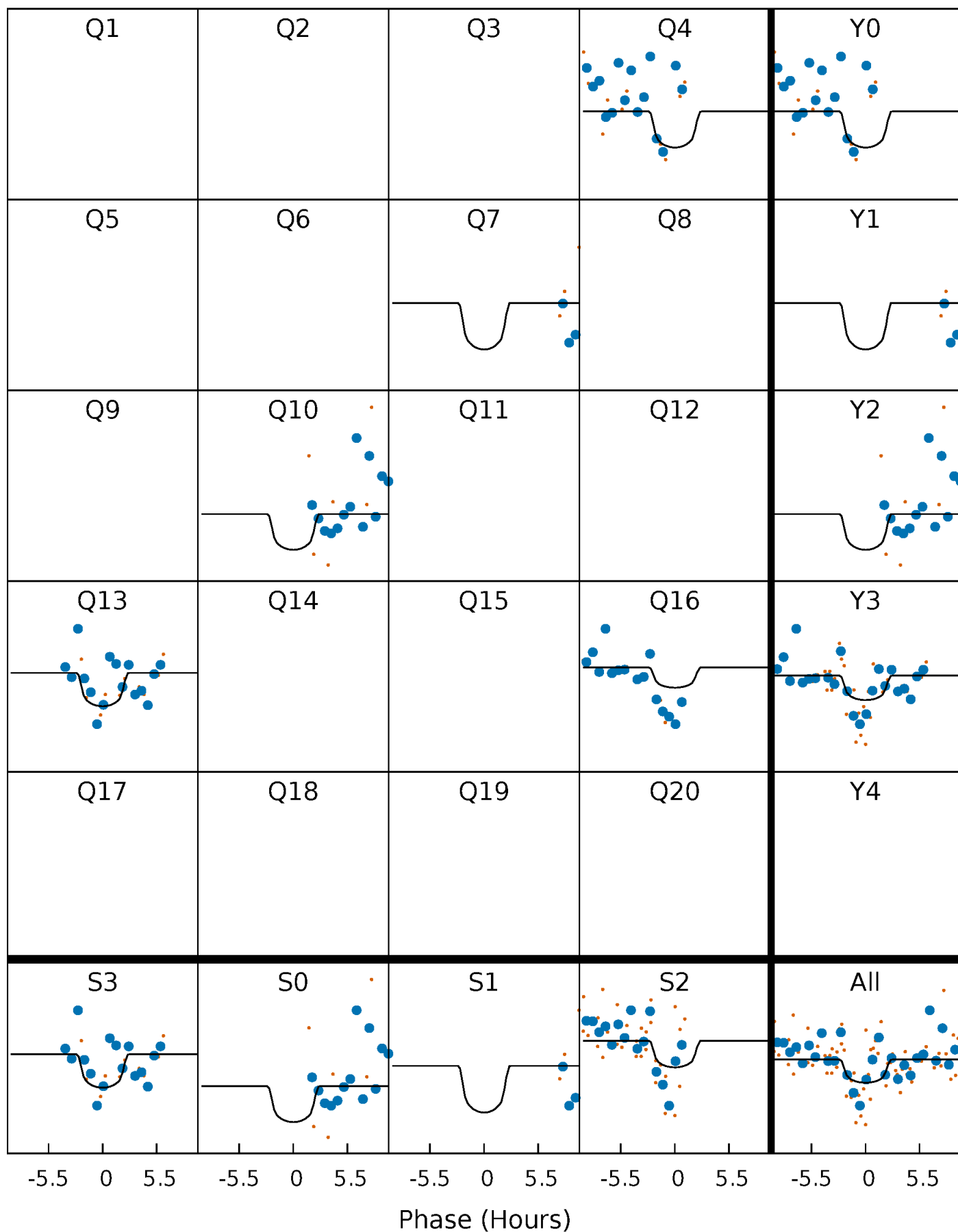
# PDC Quarter-Phased Transit Curves

TCE 010407221-02     $P=279.419496$  Days     $T_0=381.472572$  (BKJD)



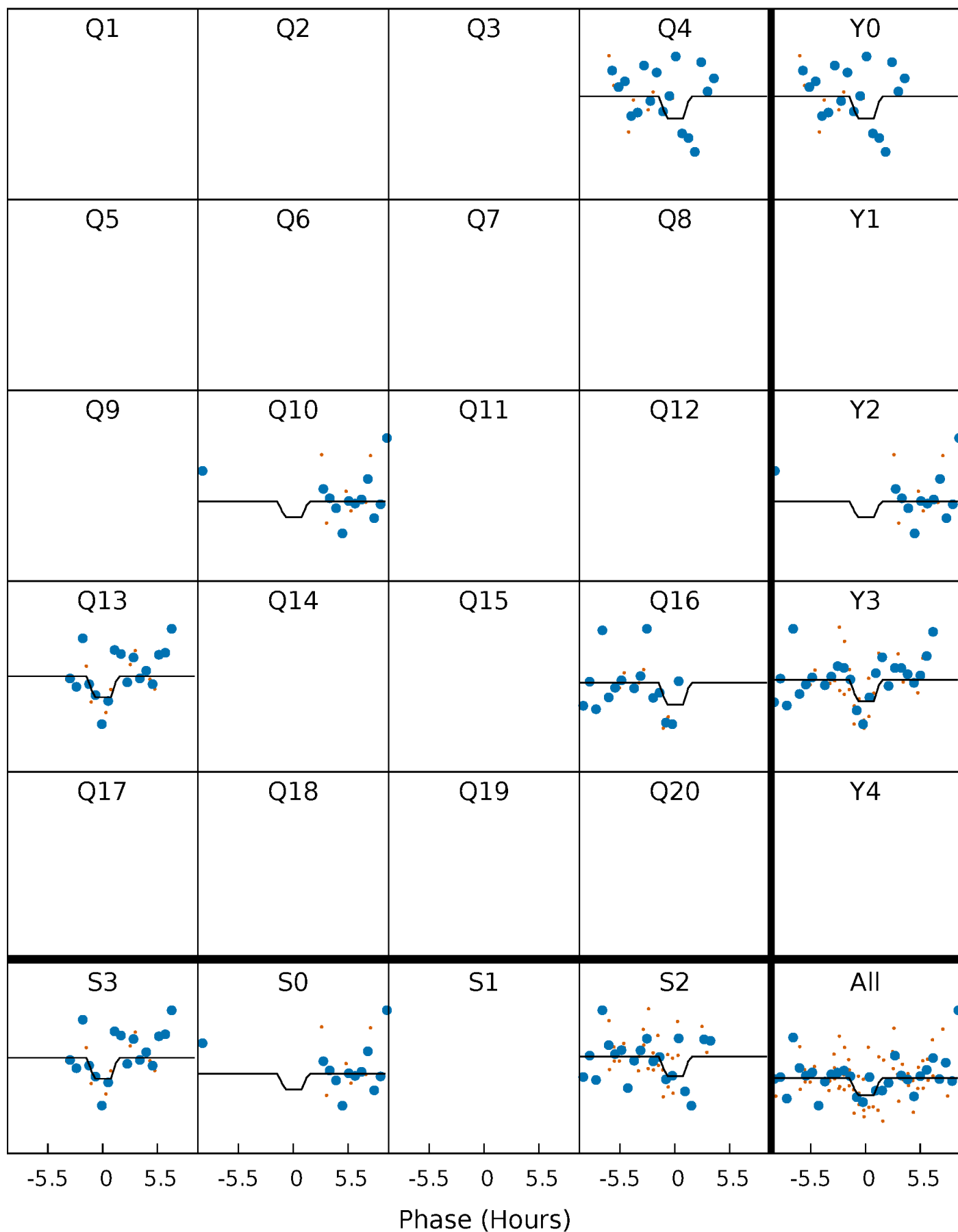
# DV Quarter-Phased Transit Curves

TCE 010407221-02     $P=279.419496$  Days     $T_0=381.472572$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

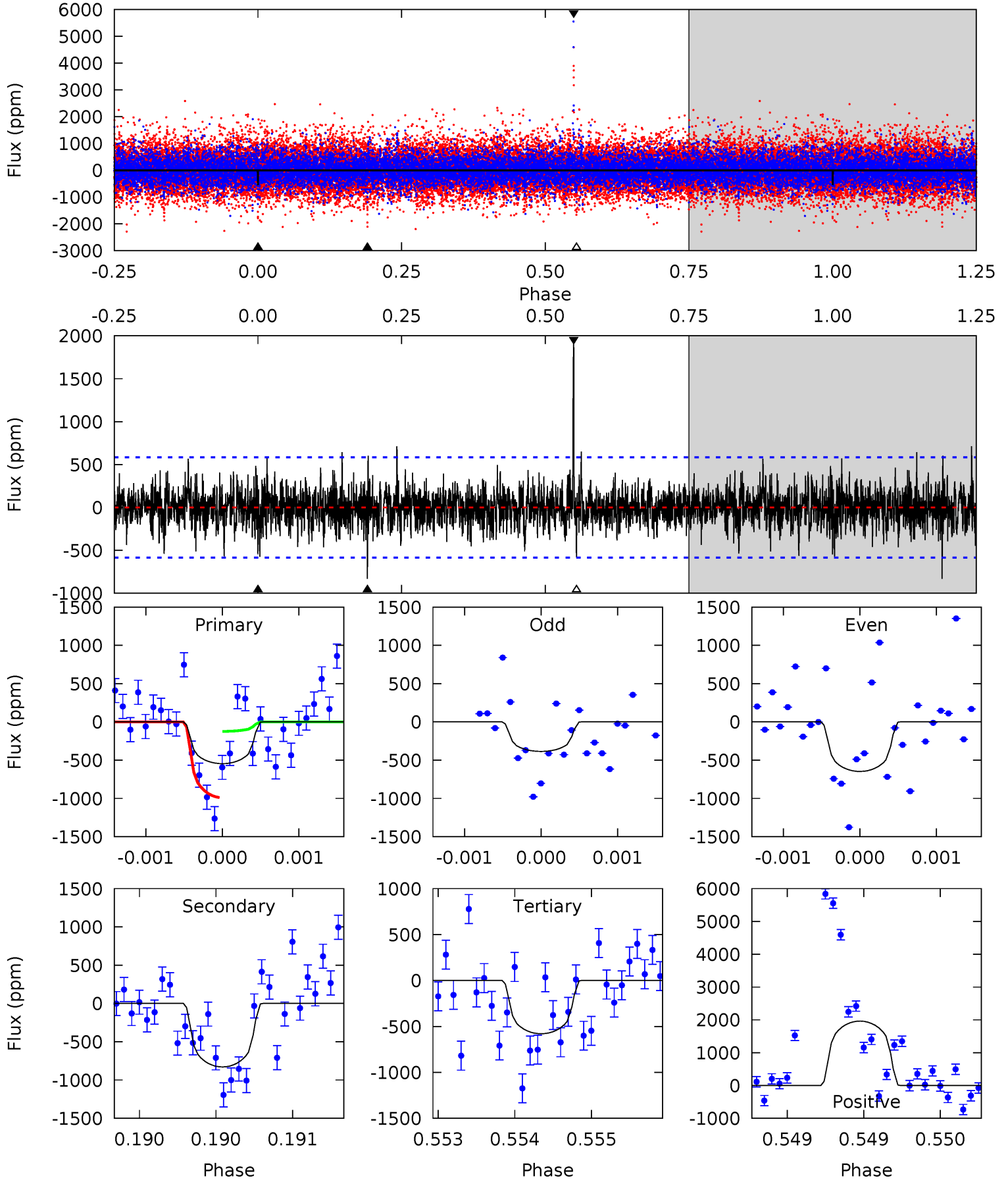
TCE 010407221-02     $P=279.449366$  Days     $T_0=381.360574$  (BKJD)



# DV Model-Shift Uniqueness Test

010407221-02, P = 279.419496 Days, E = 102.053076 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
5.13	7.79	5.45	18.4	5.50	3.36	1.54	-0.32	-13.3	2.34	-10.6	1.17	1.76	0.70	4.07

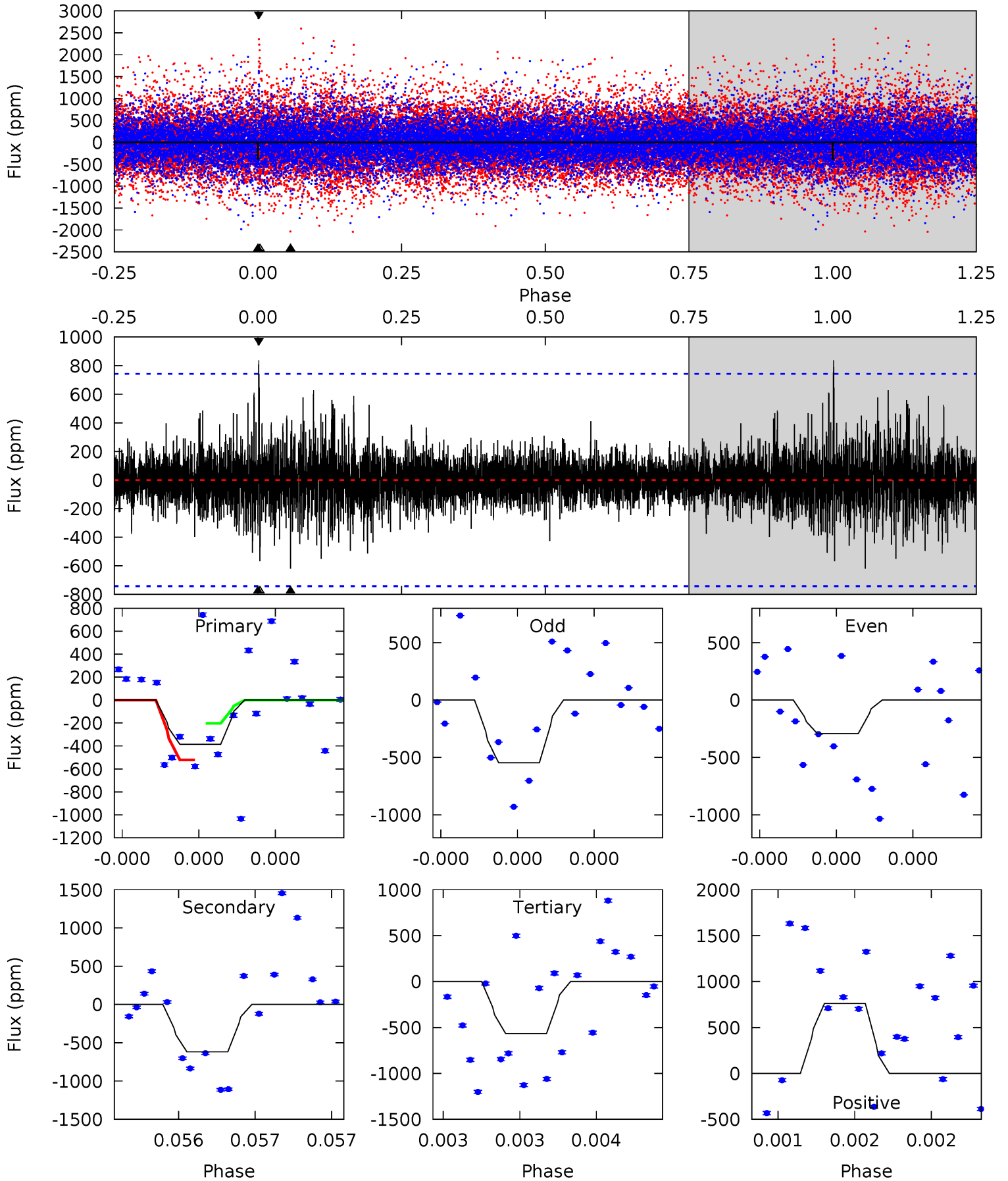




# Alt Model-Shift Uniqueness Test

010407221-02, P = 279.449366 Days, E = 101.911208 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
2.91	4.67	4.27	5.74	5.60	3.52	0.93	-1.36	-2.83	0.40	-1.07	0.96	0.73	0.57	1.21



### Stellar Parameters For KIC 010407221

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4643^{+126}_{-140}$	$4.610^{+0.052}_{-0.028}$	$-0.280^{+0.300}_{-0.300}$	$0.663^{+0.052}_{-0.057}$	$0.652^{+0.080}_{-0.046}$	$3.158^{+0.730}_{-0.409}$
	+3%/-3%	+1%/-1%	+107%/-107%	+8%/-9%	+12%/-7%	+23%/-13%
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 010407221-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-829 \pm 106$	$2.37^{+1.83}_{-1.45}$	$272^{+8}_{-9}$	$4435^{+2370}_{-843}$	$44528^{+248861}_{-30780}$
Alt.	$-619 \pm 133$	$2.18^{+1.93}_{-1.48}$	$272^{+8}_{-9}$	$4322^{+2633}_{-863}$	$39311^{+289223}_{-28645}$

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

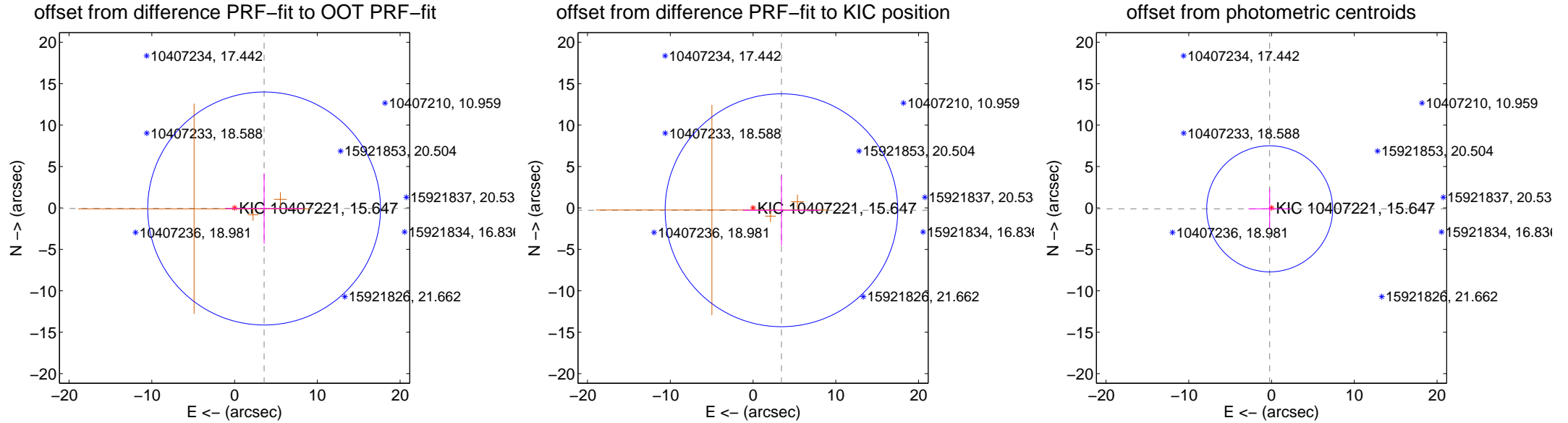
## DV Centroid Data

Supplemental centroid analysis for 010407221-02. Kepler magnitude: 15.65. Transit SNR 3.66

There are 0 quarters with good PRF difference image offsets

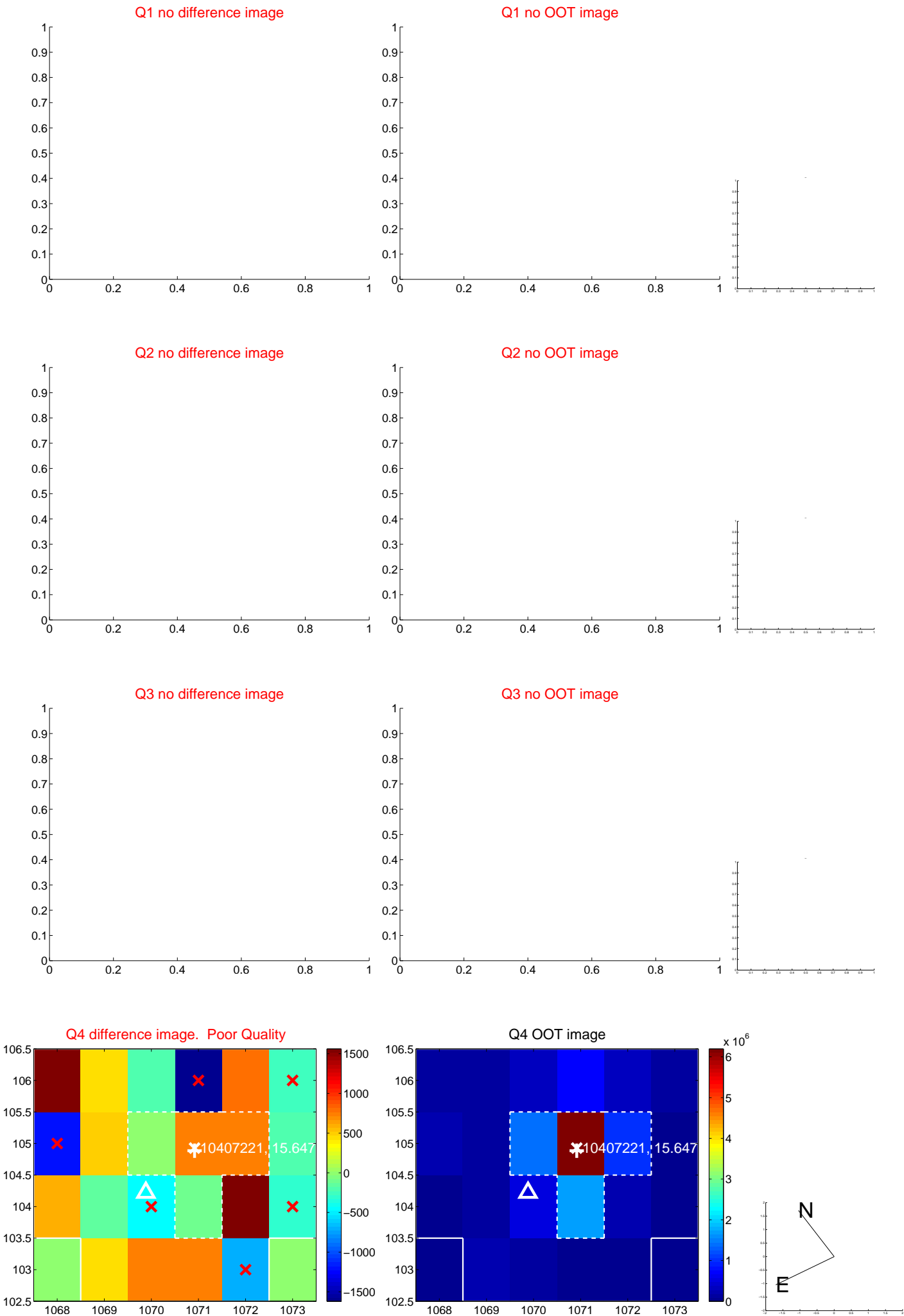
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.570 \pm 4.688$	0.76	$-3.570 \pm 4.688$	$-0.067 \pm 4.250$
PRF-fit source offset from KIC position	$3.443 \pm 4.685$	0.73	$-3.431 \pm 4.688$	$-0.280 \pm 4.250$
photometric centroid source offset	$0.25 \pm 2.54$	0.10	$0.22 \pm 2.57$	$-0.11 \pm 2.40$

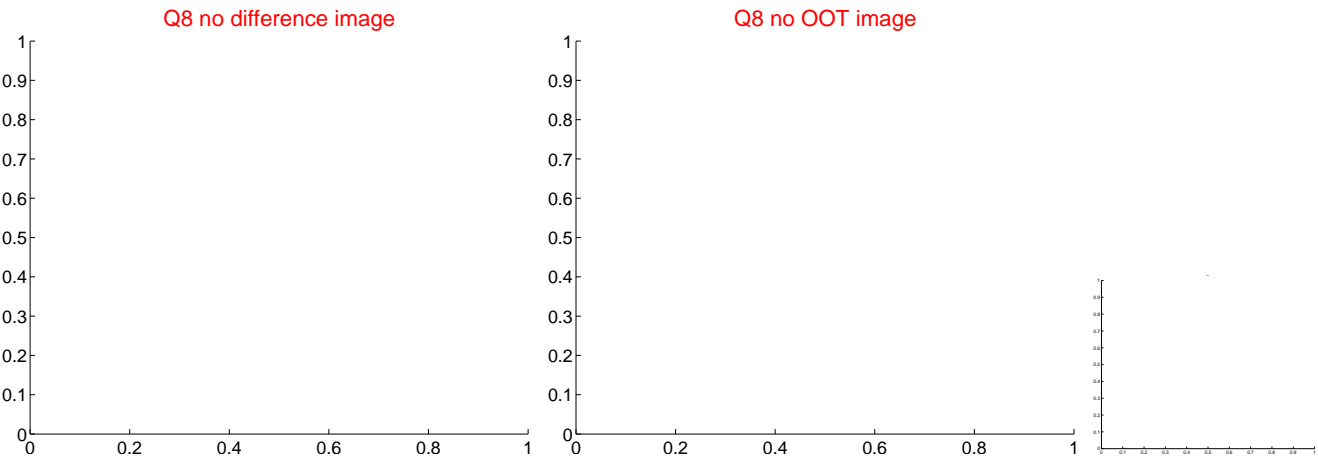
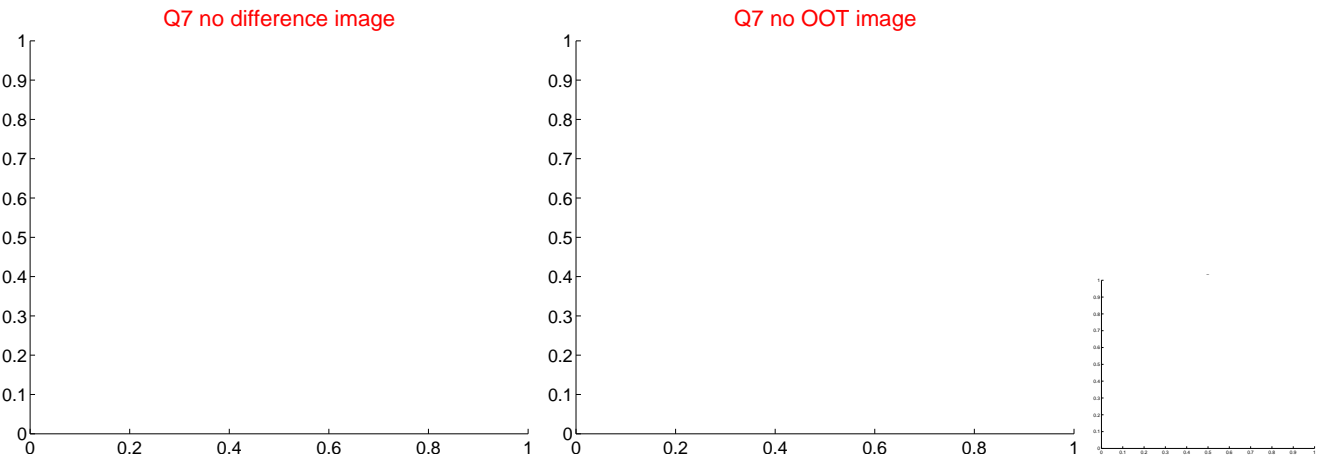
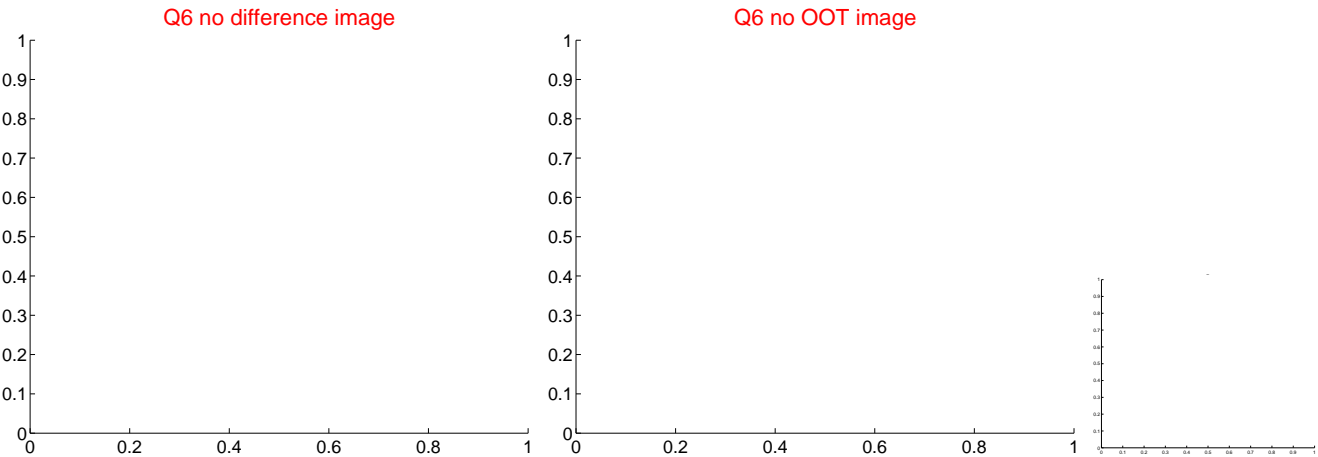
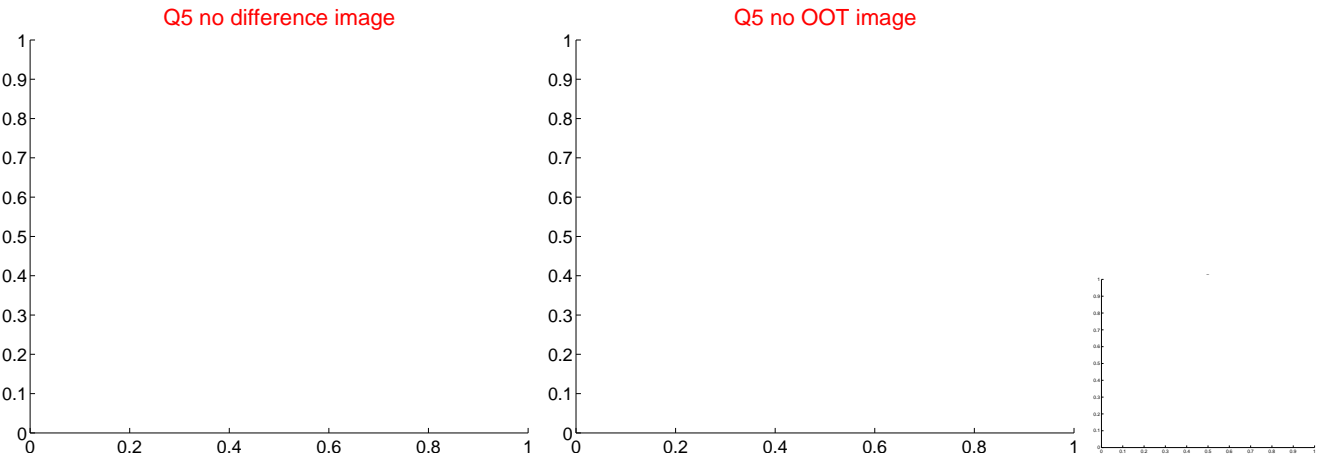


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

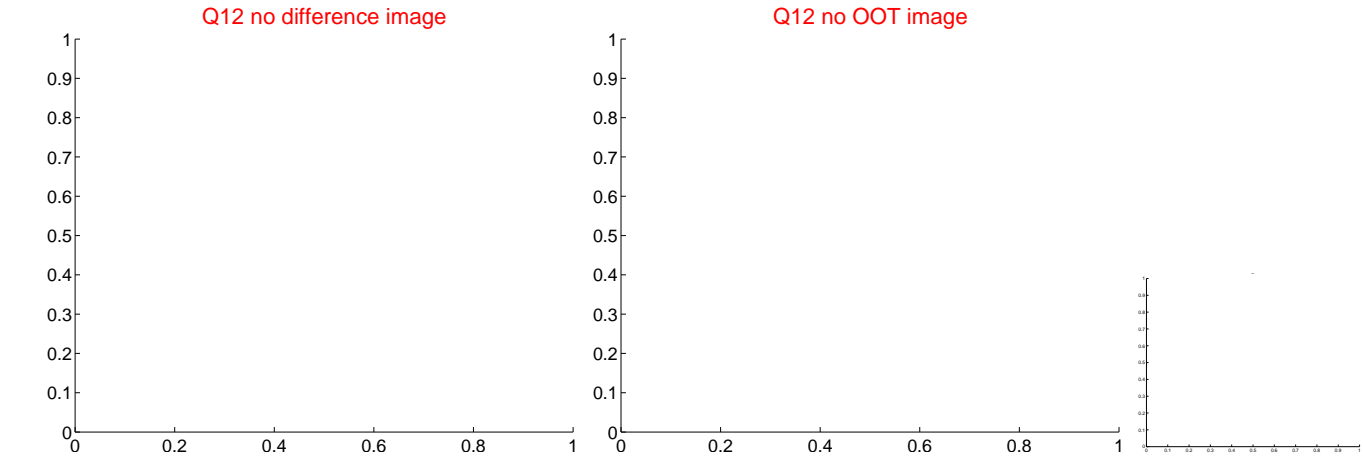
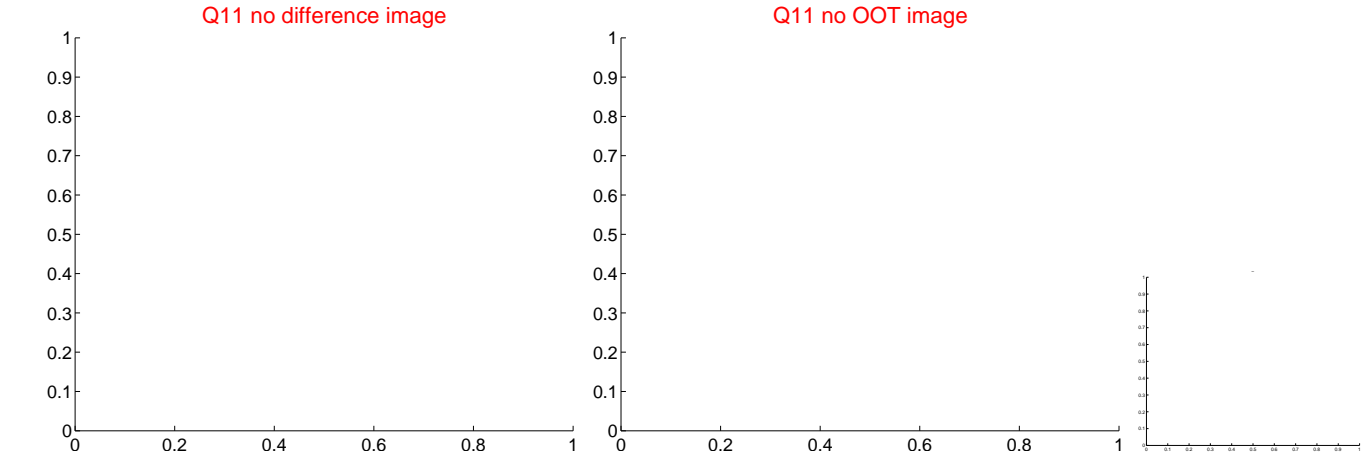
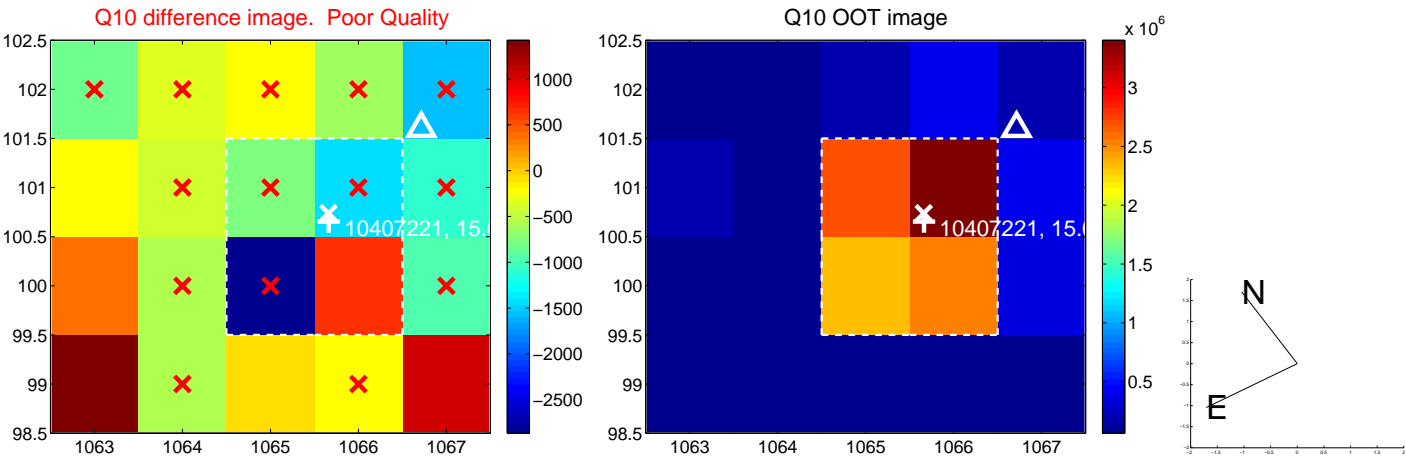
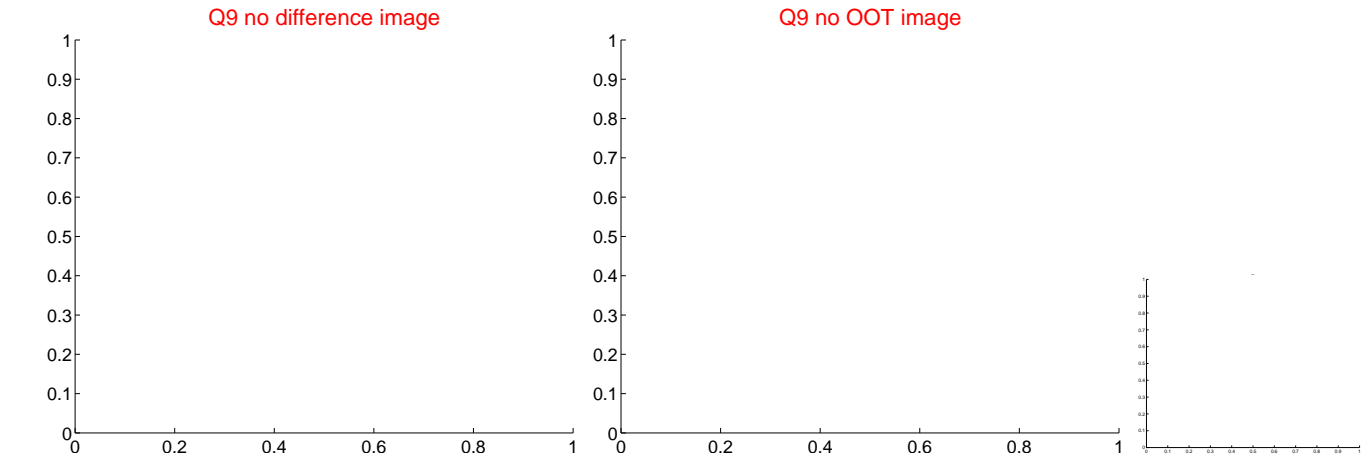
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



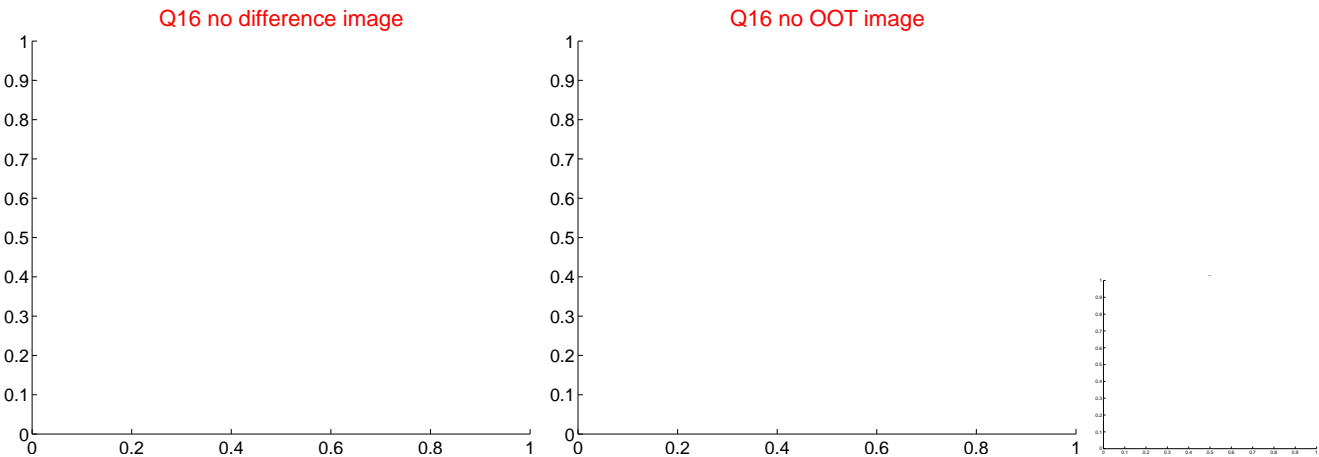
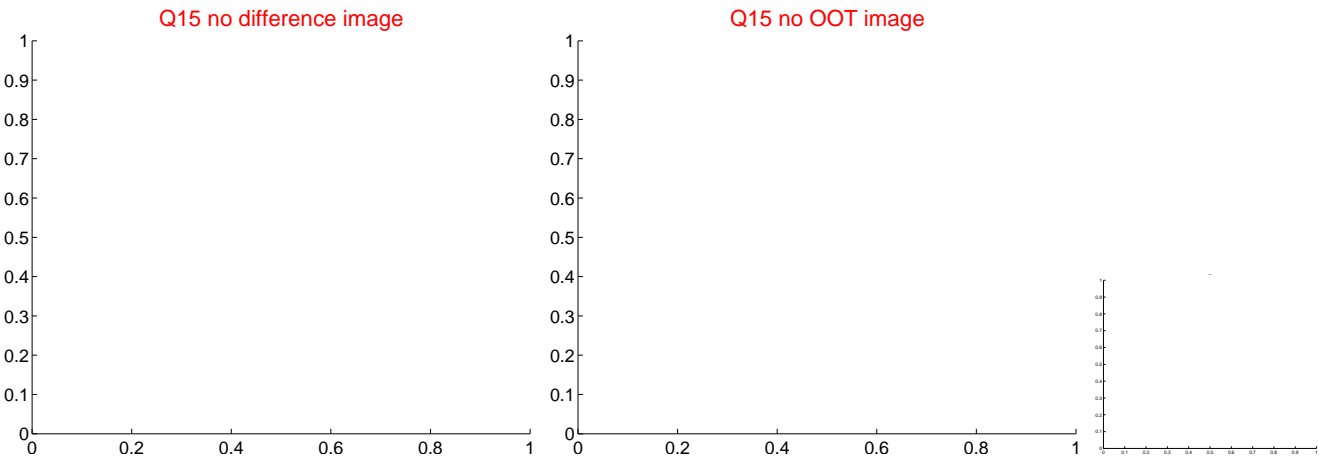
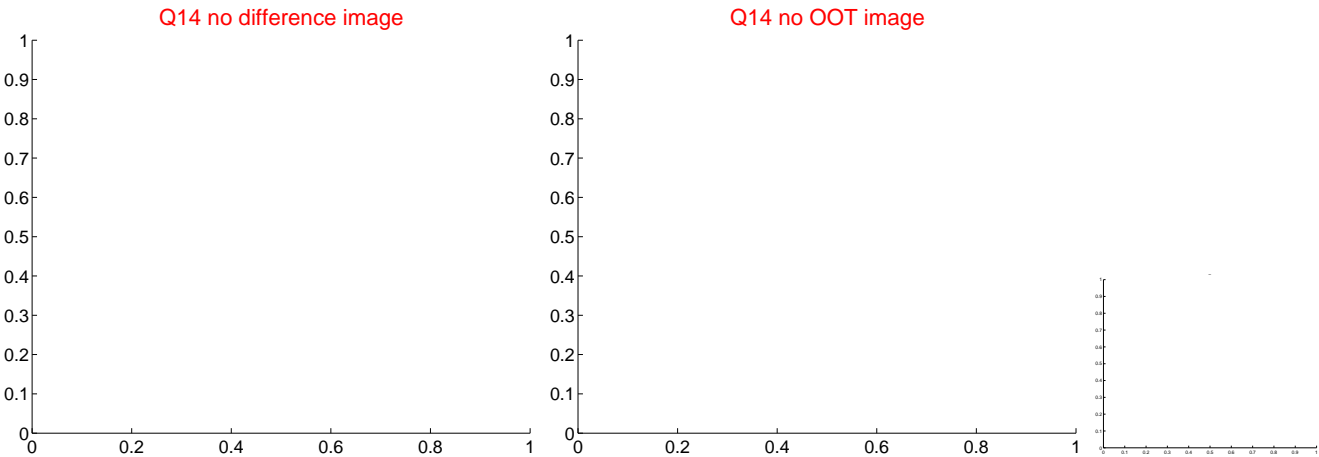
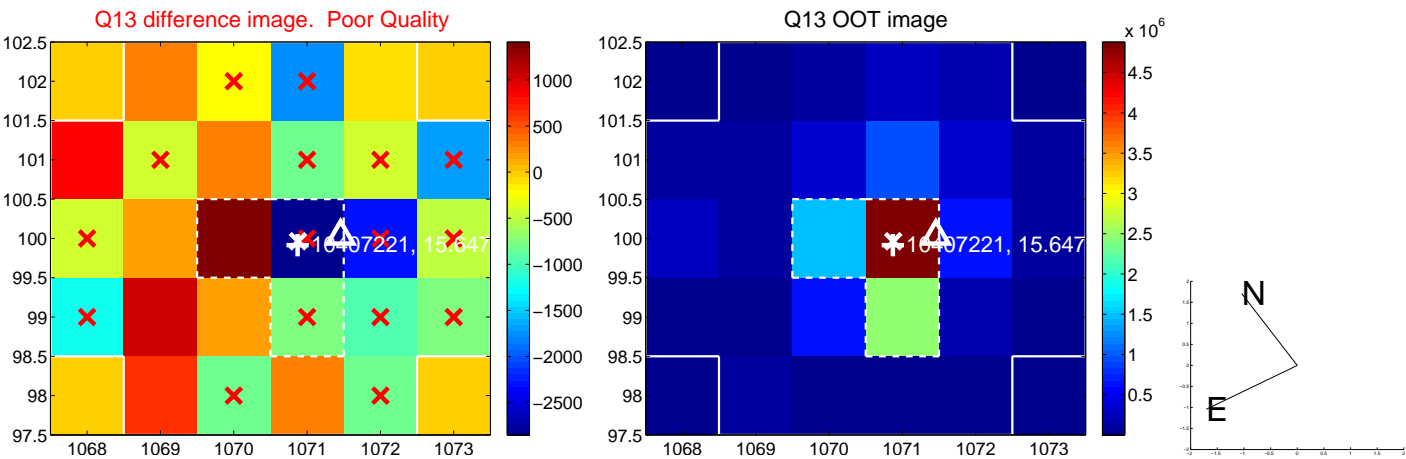
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

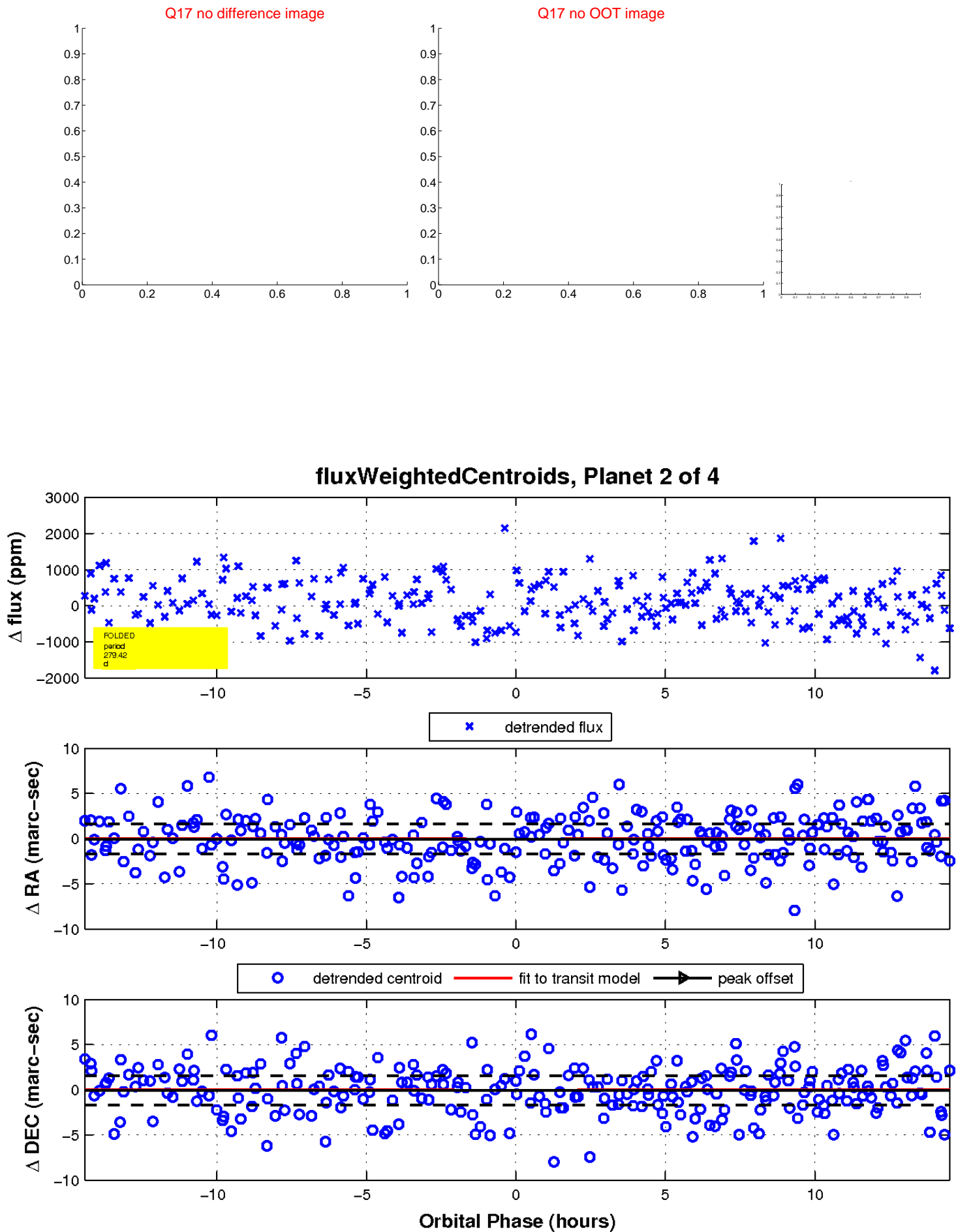


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



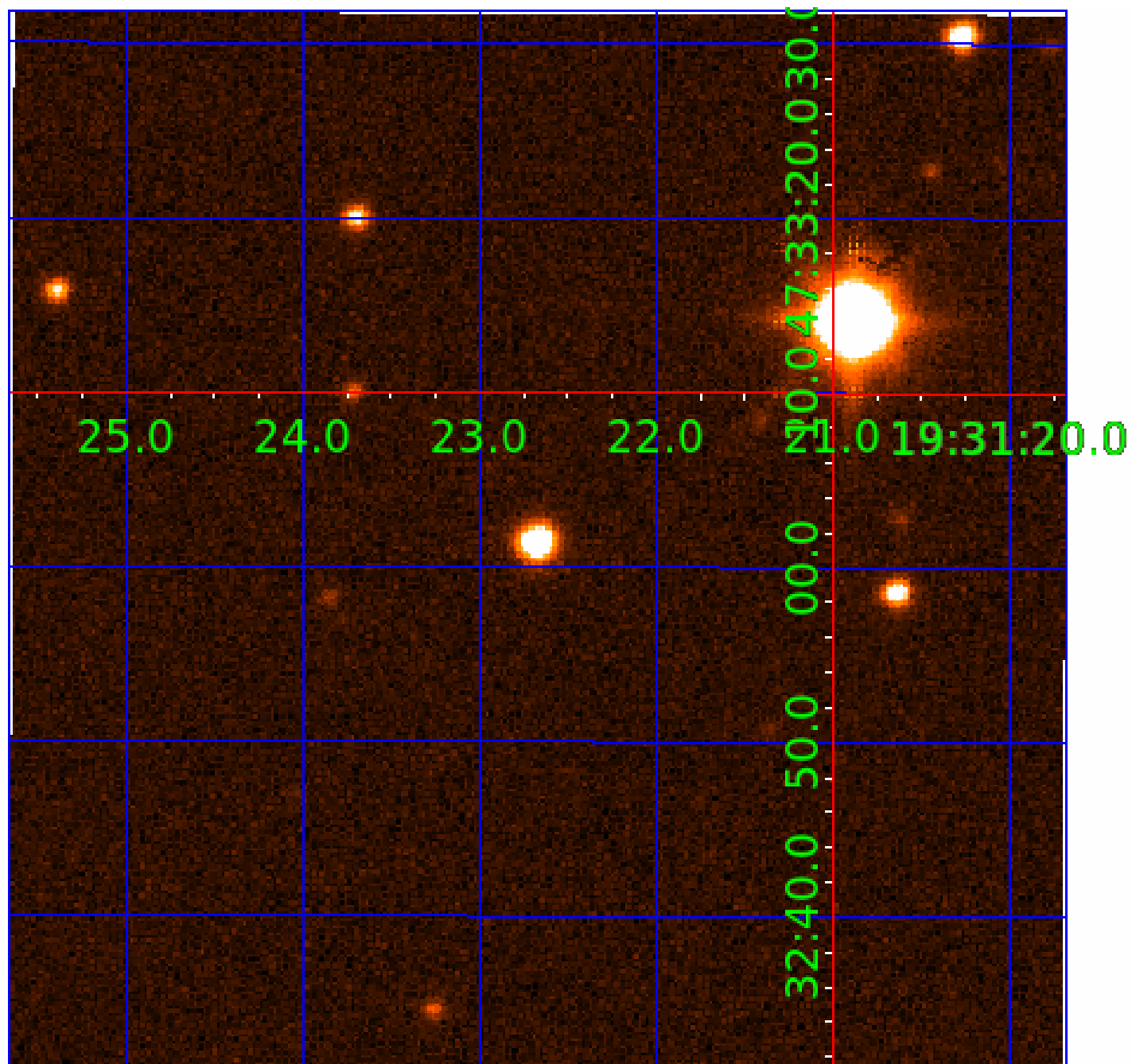


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010407221

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010407221-01	OBS	2605.01	0.933706	131.539843	131.6	3.748	19.7	16.8	0.66	4643	0.82	695.27
010407221-02	OBS	No	279.419496	381.472572	637.1	4.851	13.3	3.7	0.66	4643	1.95	0.35
010407221-04	OBS	No	147.692370	170.627181	662.2	14.253	8.7	6.3	0.66	4643	2.23	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010407221-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—EPHEM_MATCH
010407221-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010407221-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—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.

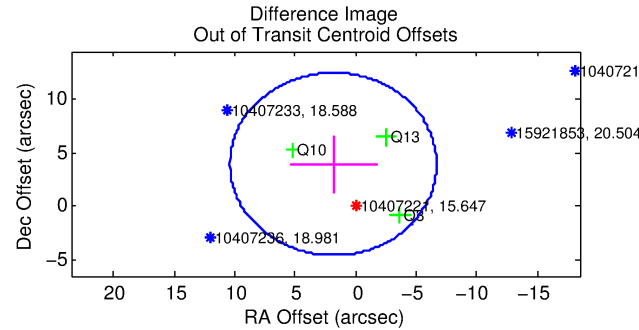
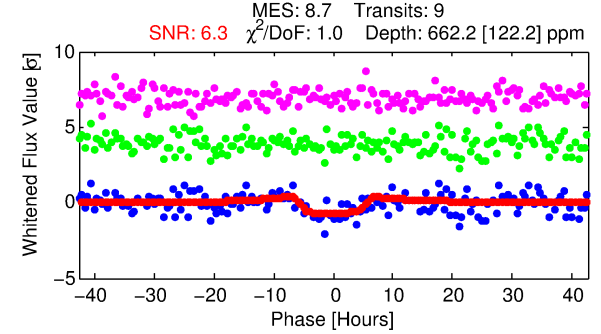
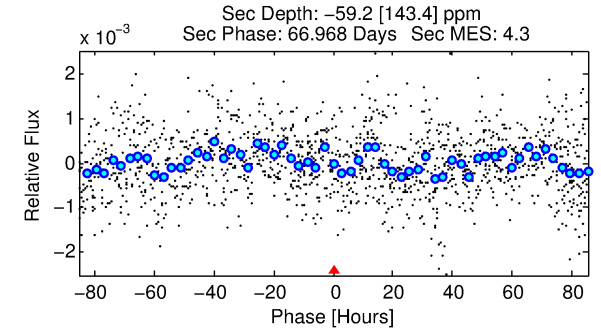
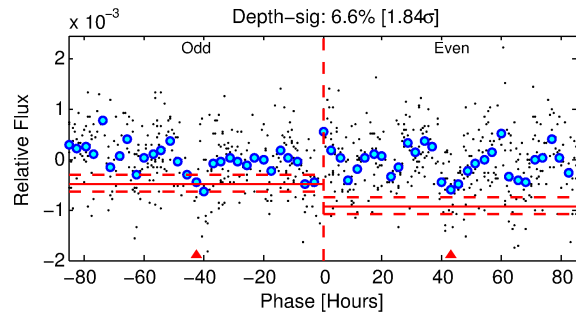
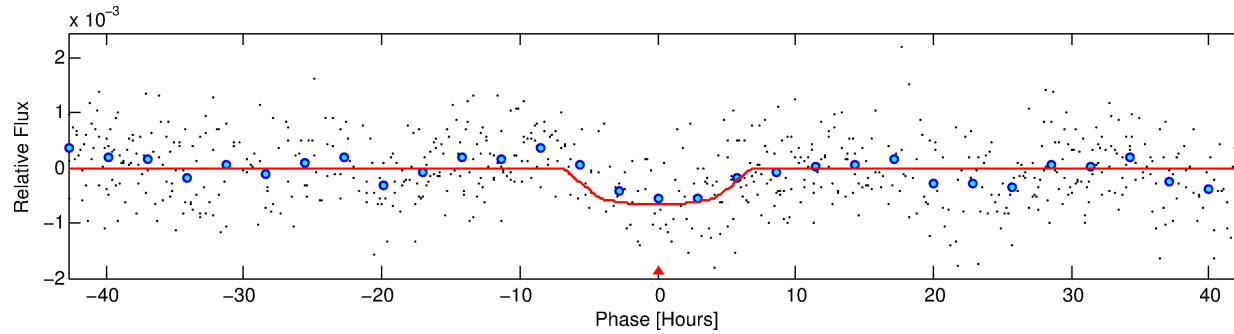
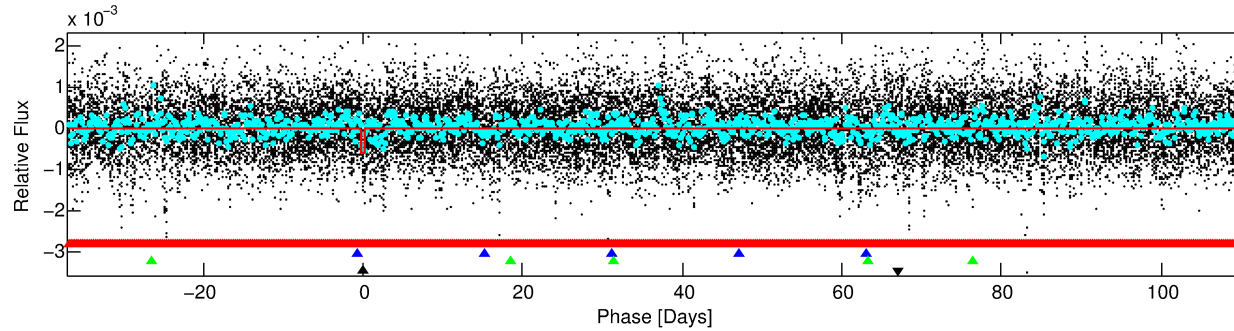
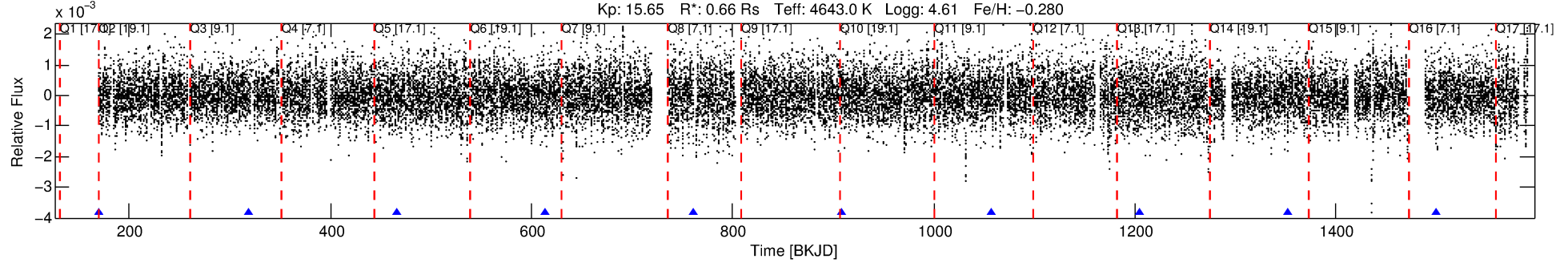
Ephemeris Match Information For 010407221-04

No Significant Match Found

# DV One-Page Summary

KIC: 10407221 Candidate: 4 of 4 Period: 147.692 d  
KOI: K02605 Corr: No Ephemeris Match

Kp: 15.65 R\*: 0.66 Rs Teff: 4643.0 K Logg: 4.61 Fe/H: -0.280



## DV Fit Results:

Period = 147.69237 [0.00645] d  
Epoch = 170.6272 [0.0322] BKJD  
Rp/R\* = 0.0309 [0.0044]  
a/R\* = 33.29 [11.49]  
b = 0.94 [0.04]  
Seff = 0.81 [0.13]  
Teq = 242 [9] K  
Rp = 2.23 [0.37] Re  
a = 0.4745 [0.0331] AU  
Ag = N/A  
Teffp = N/A

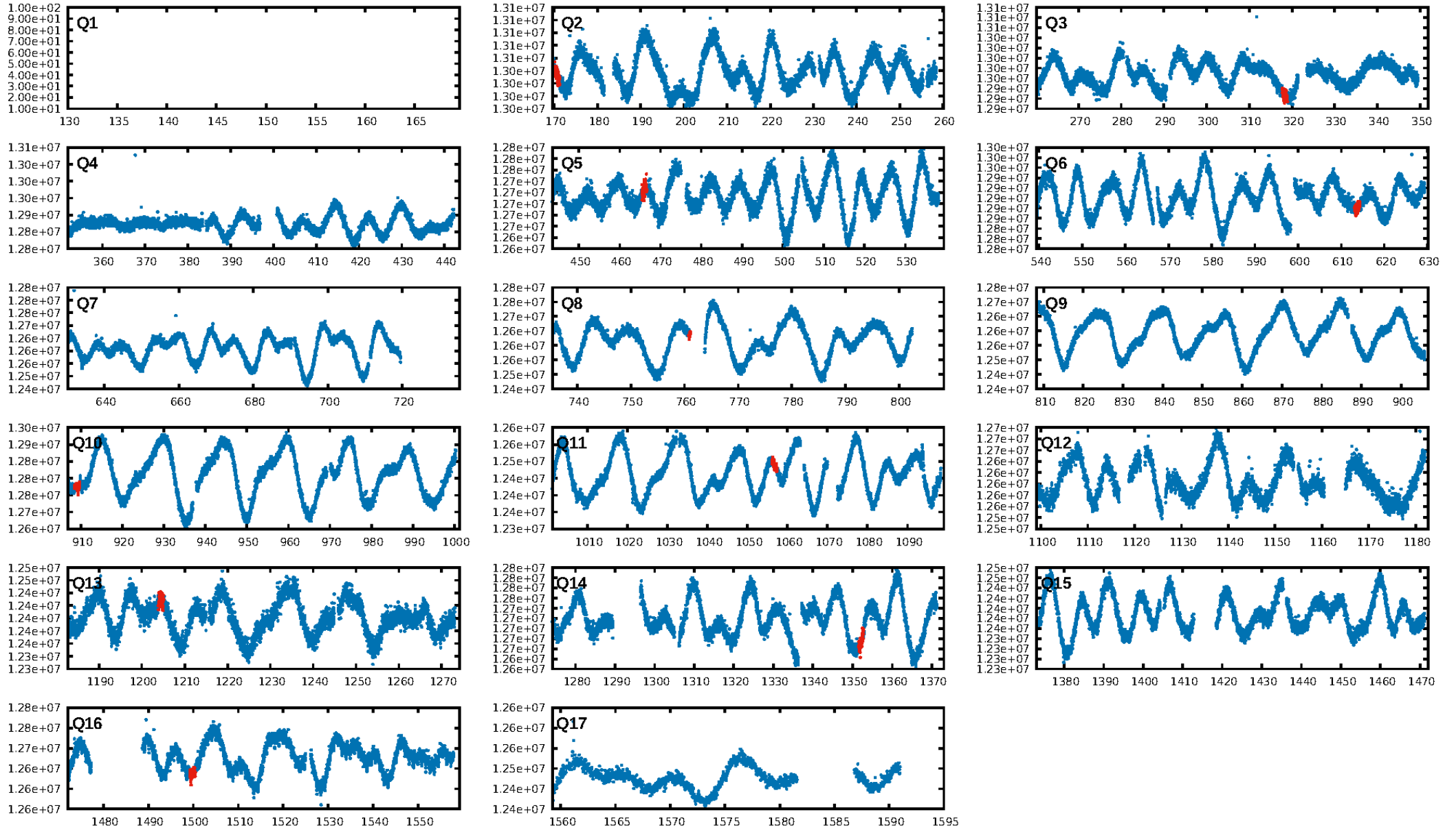
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [238.99σ]  
LongPeriod-sig: 100.0% [132.42σ]  
ModelChiSquare2-sig: 14.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.64e-11  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: -0.2892  
Centroid-sig: 44.1%  
Centroid-so: 0.766 arcsec [0.86σ]  
OotOffset-rm: 4.375 arcsec [1.54σ]  
KicOffset-rm: 4.249 arcsec [1.50σ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 0.00 [0/7]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 09:07:47 Z

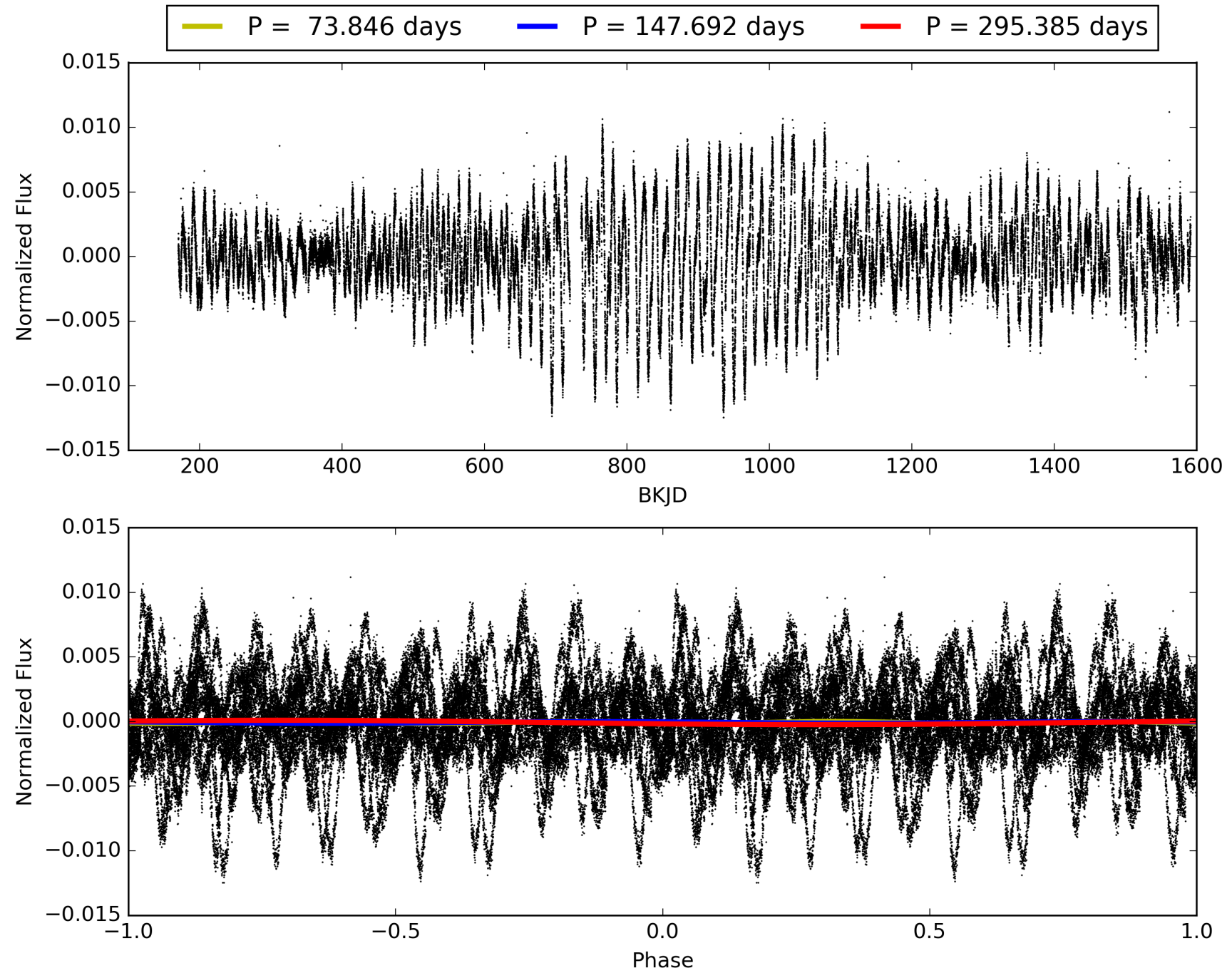
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010407221-04, PDC Light Curves



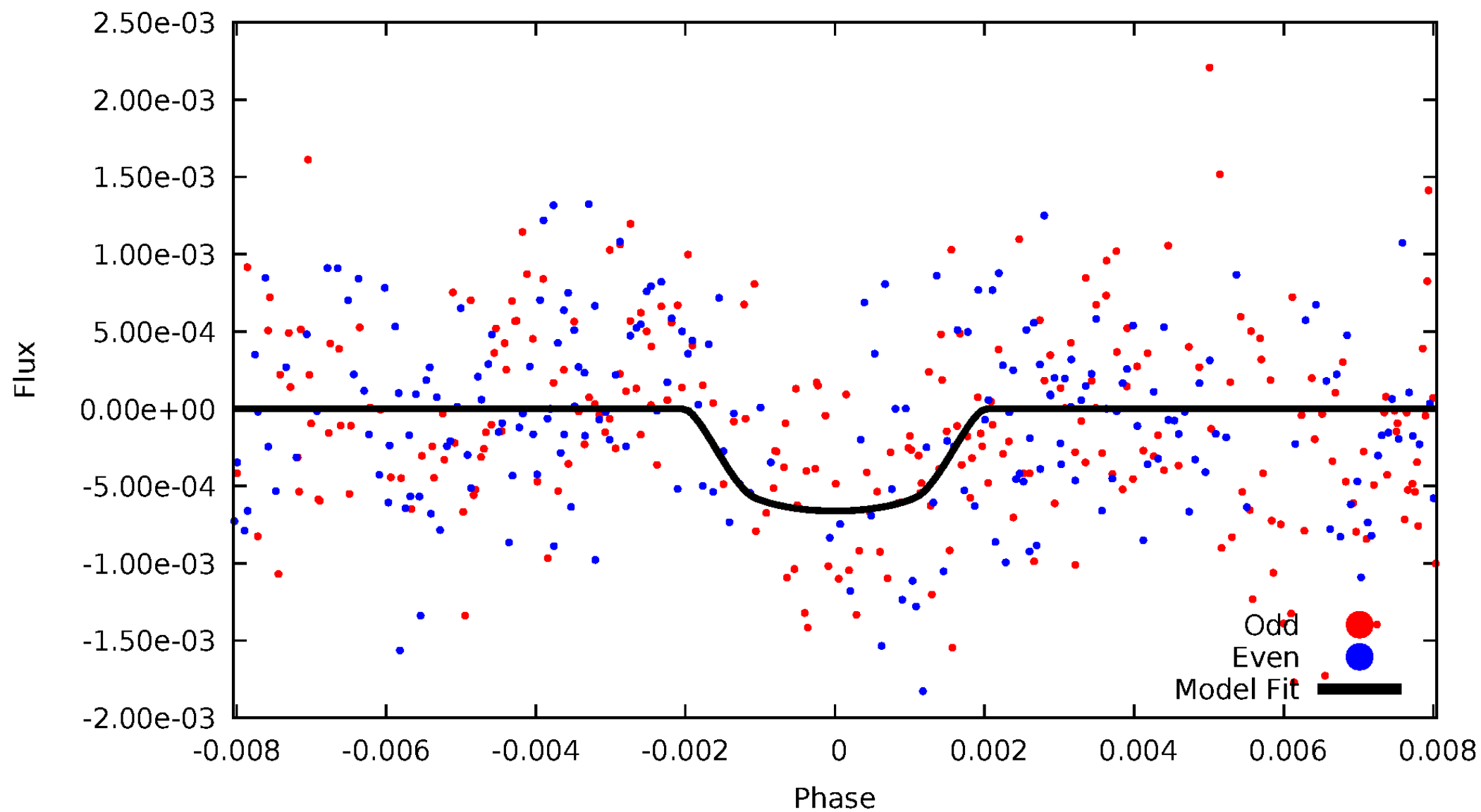


# TCE 010407221-04



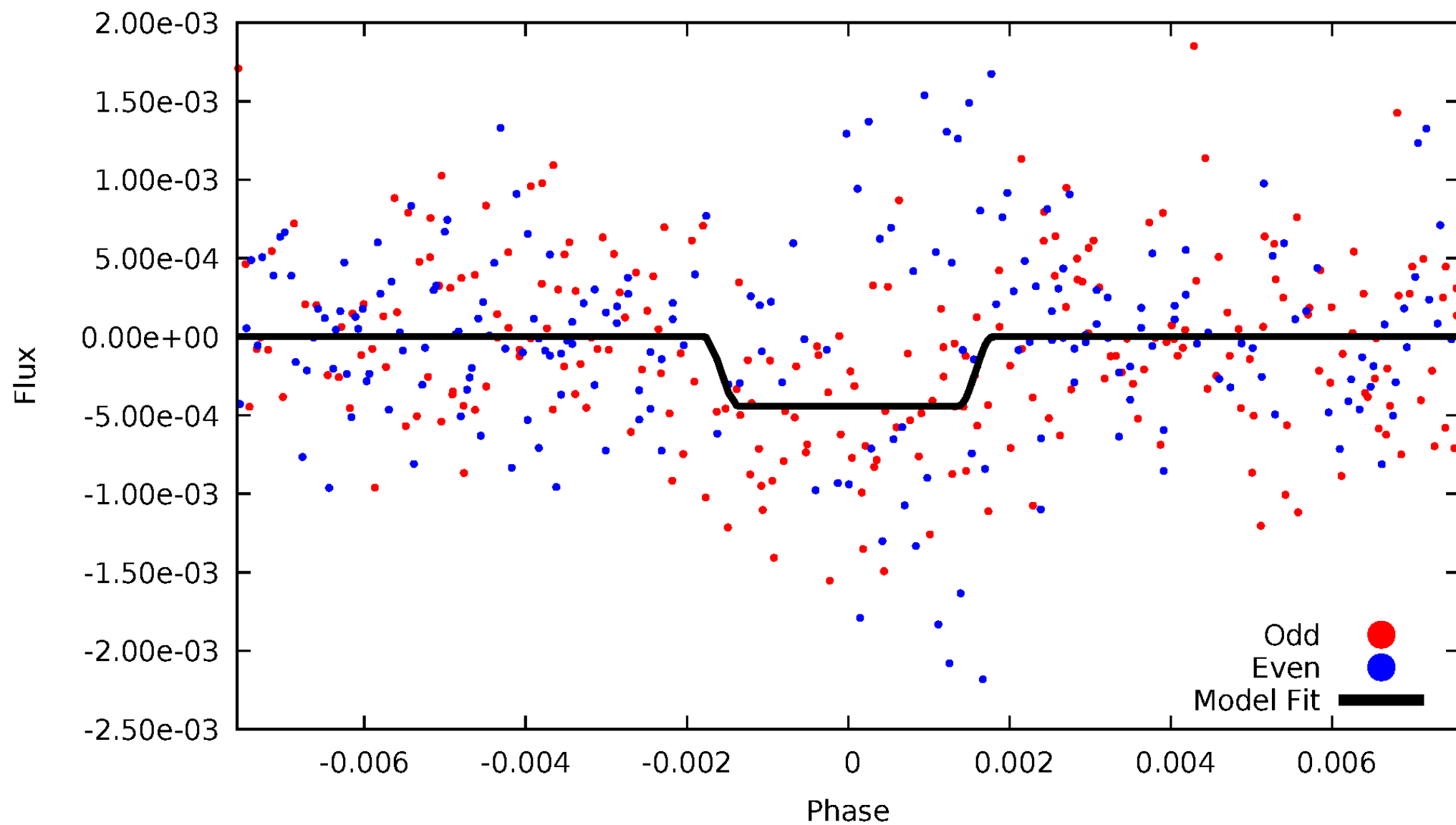
# DV Odd/Even

TCE 010407221-04



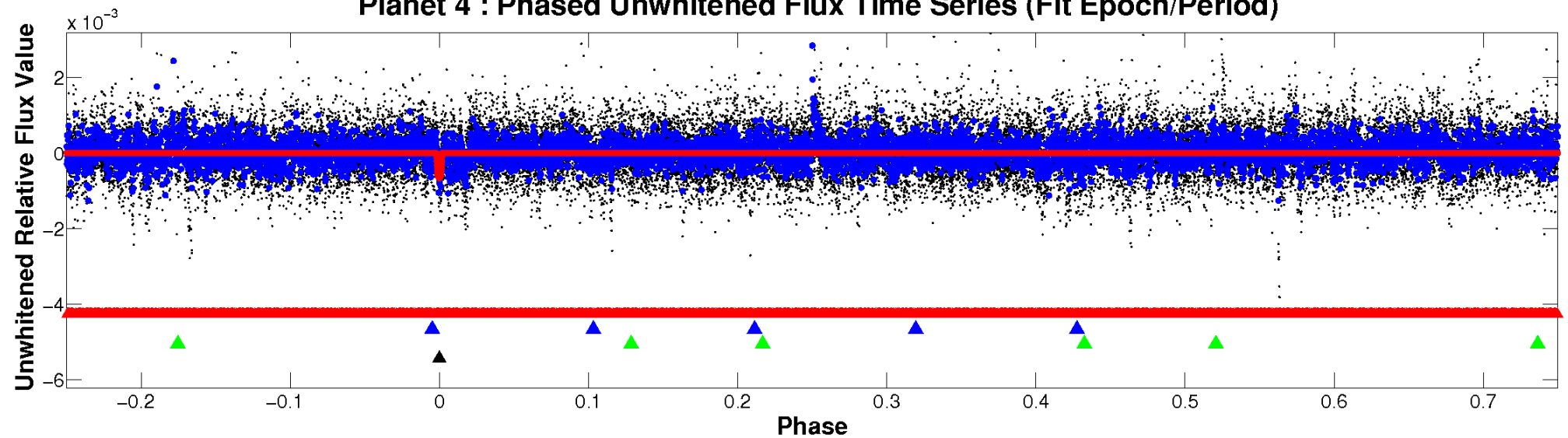
# ALT Odd/Even

TCE 010407221-04

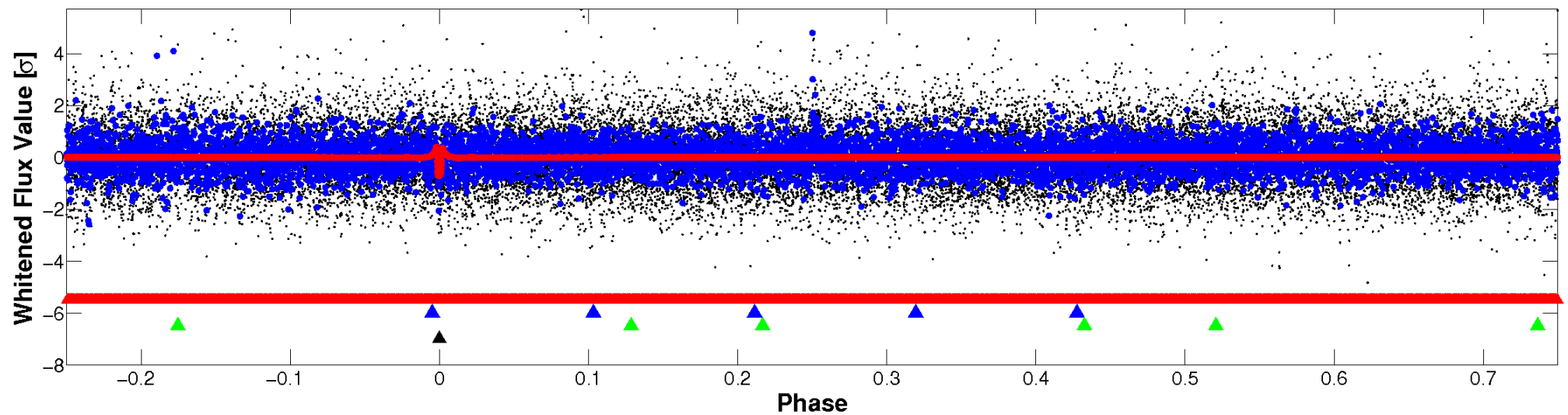


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

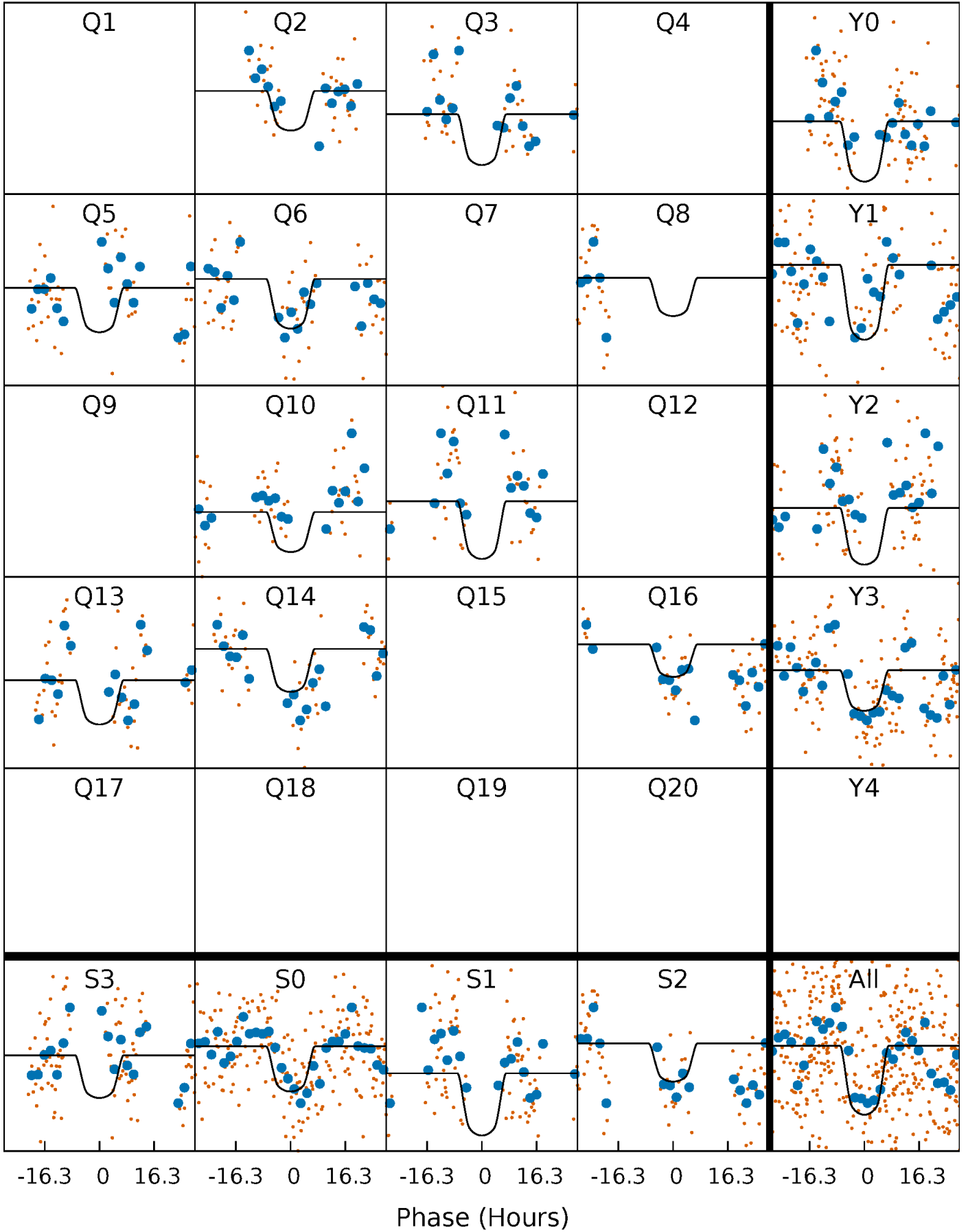
TCE 010407221-04     $P=147.692370$  Days     $T_0=170.627181$  (BKJD)





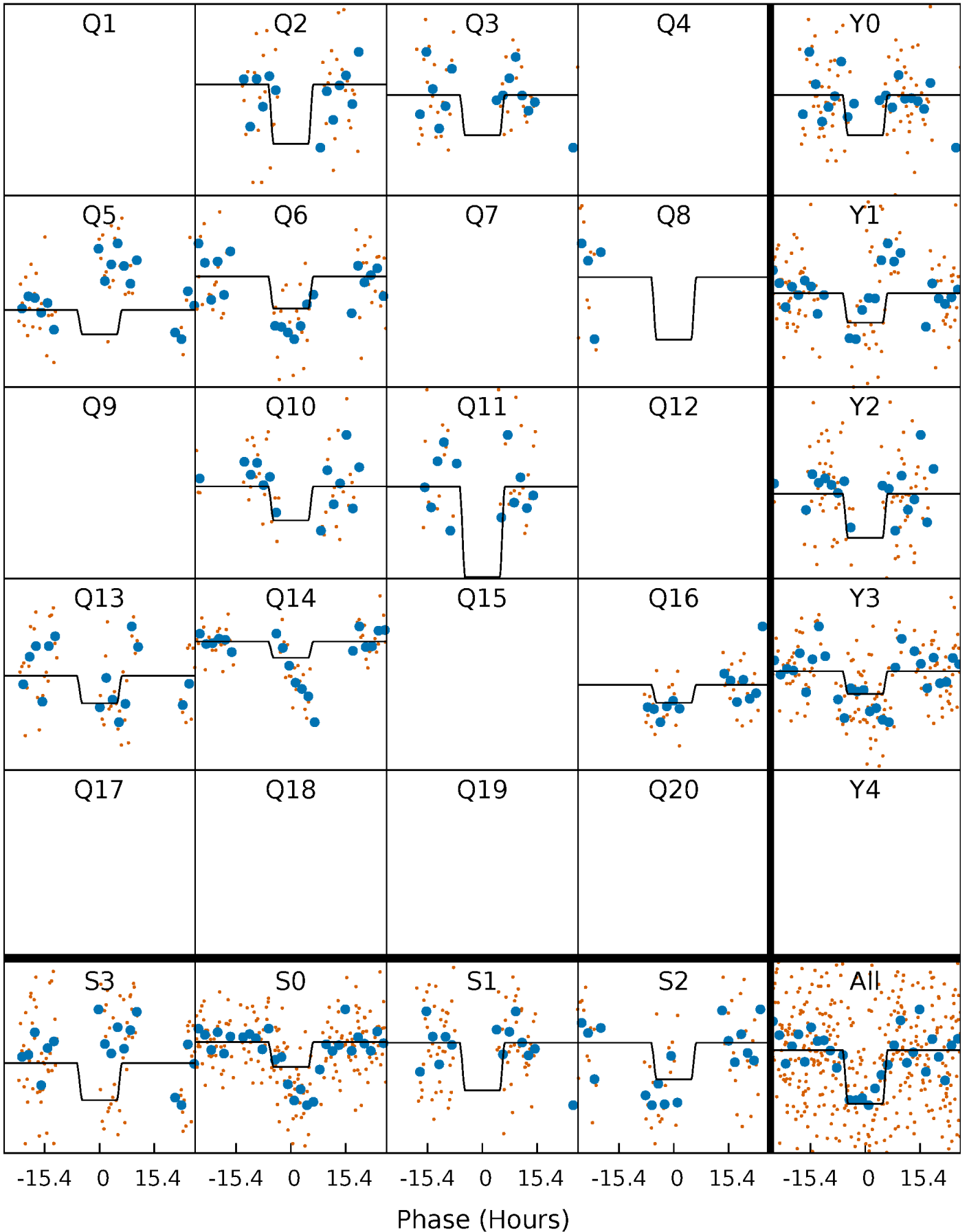
# DV Quarter-Phased Transit Curves

TCE 010407221-04 P=147.692370 Days  $T_0=170.627181$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

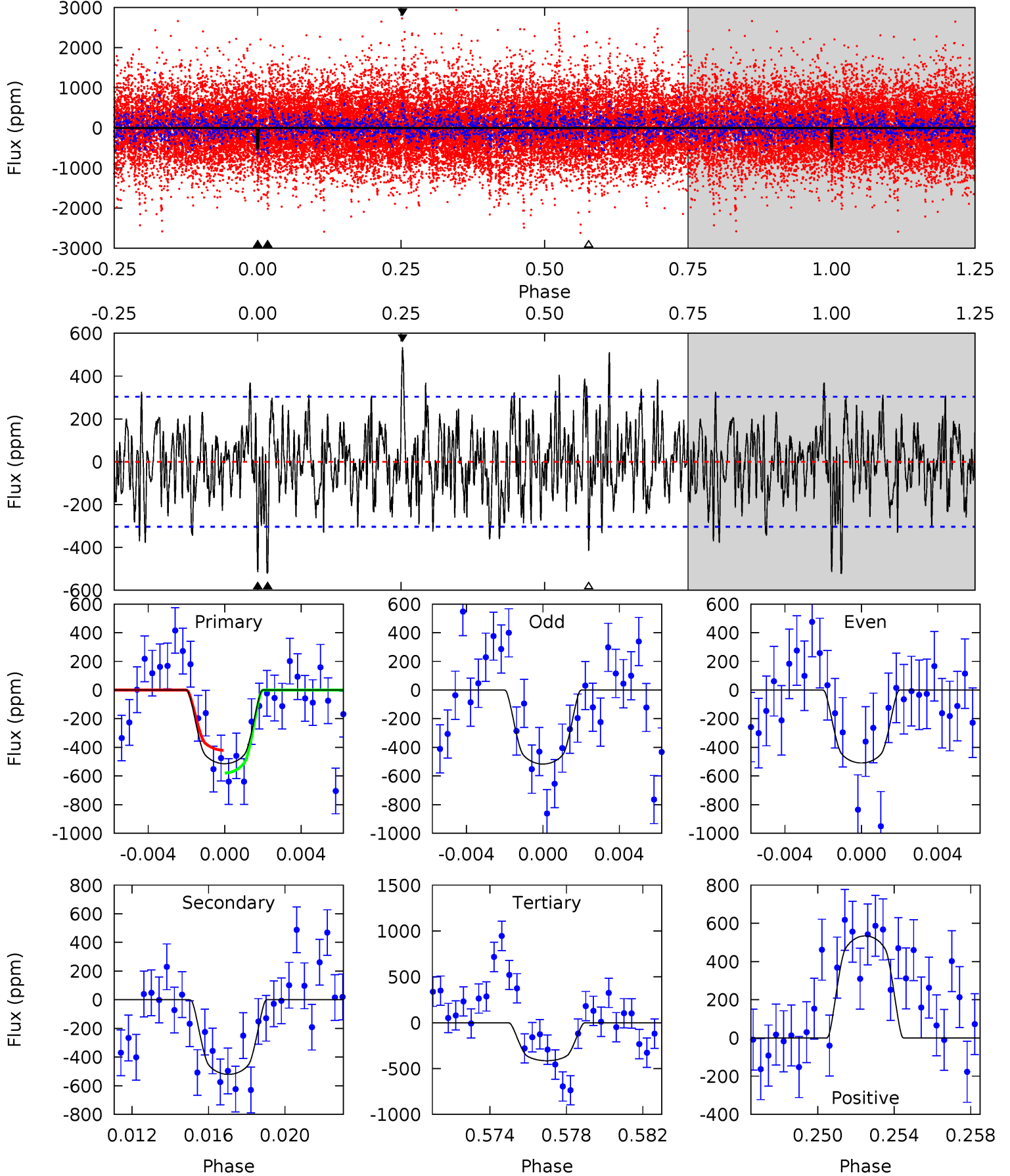
TCE 010407221-04     $P=147.707394$  Days     $T_0=170.658902$  (BKJD)



# DV Model-Shift Uniqueness Test

010407221-04, P = 147.692370 Days, E = 22.934811 Days

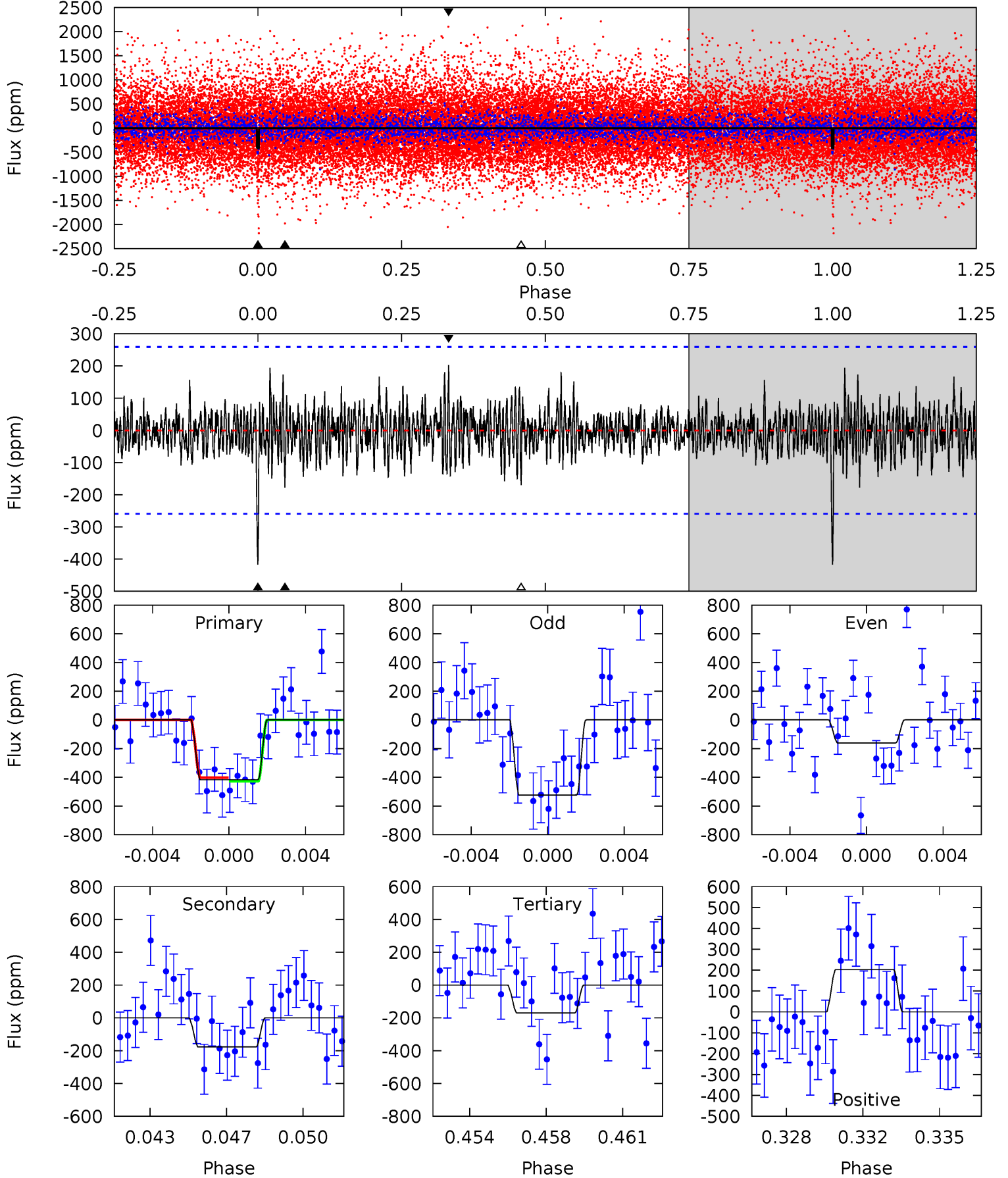
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.80	8.91	7.10	9.14	5.19	2.87	2.41	1.70	-0.34	1.81	-0.24	0.06	1.19	0.51	1.33



# Alt Model-Shift Uniqueness Test

010407221-04, P = 147.707394 Days, E = 22.951508 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
8.39	3.57	3.42	4.08	5.22	2.91	1.06	4.97	4.31	0.15	-0.51	3.66	0.65	0.33	0.25



### Stellar Parameters For KIC 010407221

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (g \cdot \text{cm}^{-3})$
	$4643^{+126}_{-140}$	$4.610^{+0.052}_{-0.028}$	$-0.280^{+0.300}_{-0.300}$	$0.663^{+0.052}_{-0.057}$	$0.652^{+0.080}_{-0.046}$	$3.158^{+0.730}_{-0.409}$
	+3%/-3%	+1%/-1%	+107%/-107%	+8%/-9%	+12%/-7%	+23%/-13%
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 010407221-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-521 \pm 58$	$2.23^{+0.32}_{-0.33}$	$336^{+11}_{-12}$	$4118^{+309}_{-226}$	$12947^{+5517}_{-3204}$
Alt.	$-177 \pm 50$	$1.49^{+0.36}_{-0.29}$	$337^{+11}_{-12}$	$3908^{+419}_{-331}$	$9697^{+7030}_{-3933}$

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

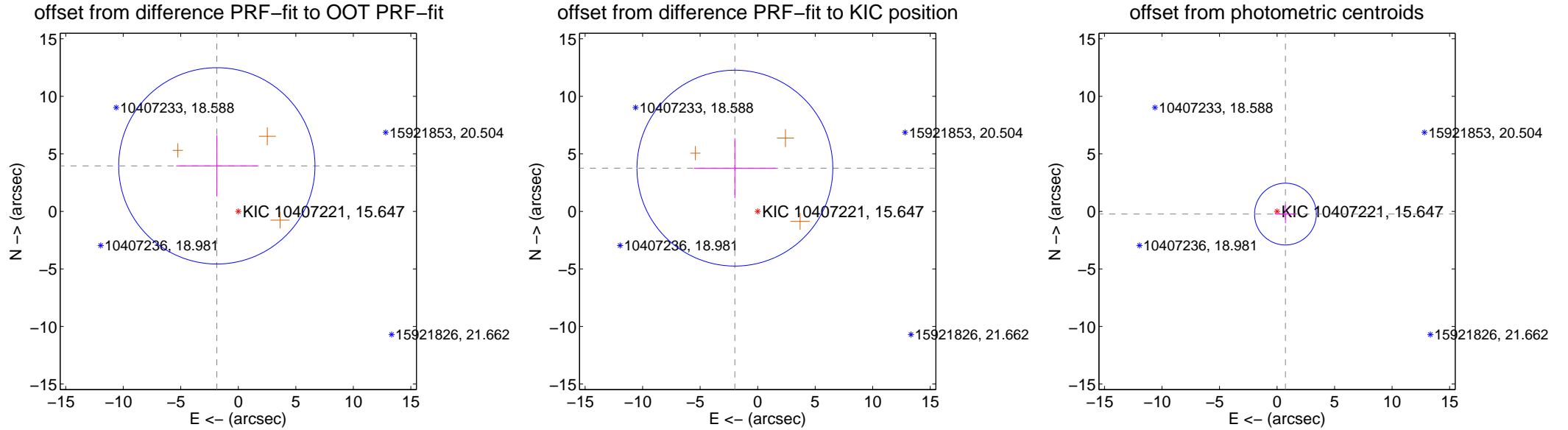
## DV Centroid Data

Supplemental centroid analysis for 010407221-04. Kepler magnitude: 15.65. Transit SNR 6.27

There are 0 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

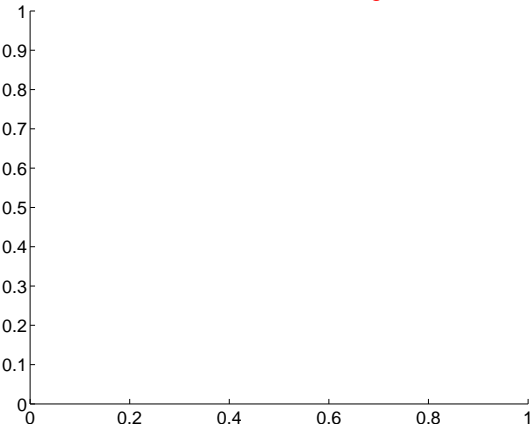
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.375 \pm 2.844$	1.54	$1.864 \pm 3.536$	$3.958 \pm 2.667$
PRF-fit source offset from KIC position	$4.249 \pm 2.838$	1.50	$1.980 \pm 3.565$	$3.760 \pm 2.600$
photometric centroid source offset	$0.77 \pm 0.90$	0.86	$-0.73 \pm 0.91$	$-0.23 \pm 0.79$



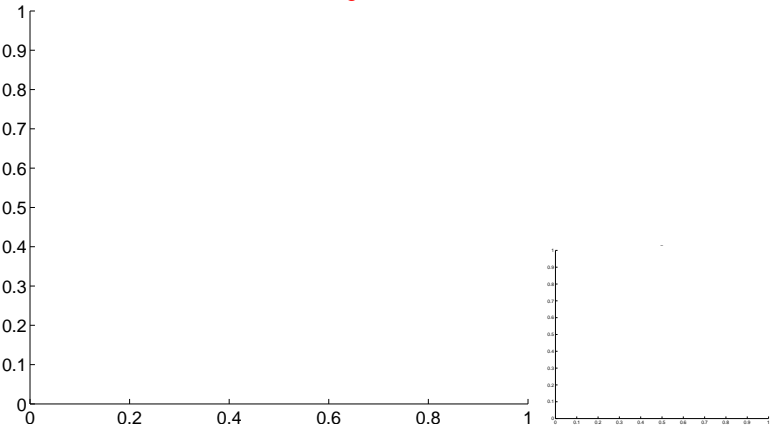
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

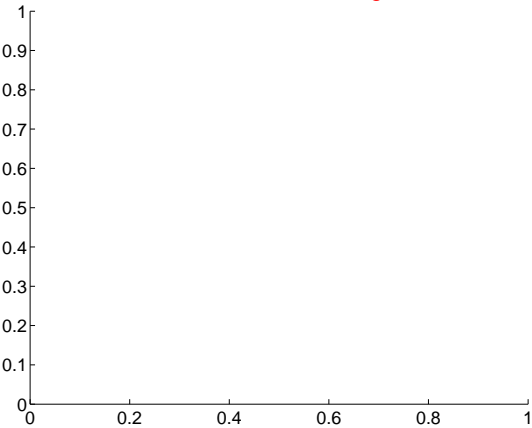
Q1 no difference image



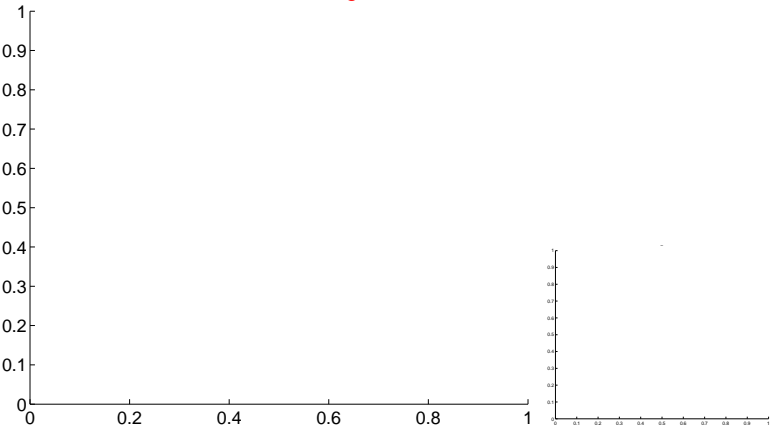
Q1 no OOT image



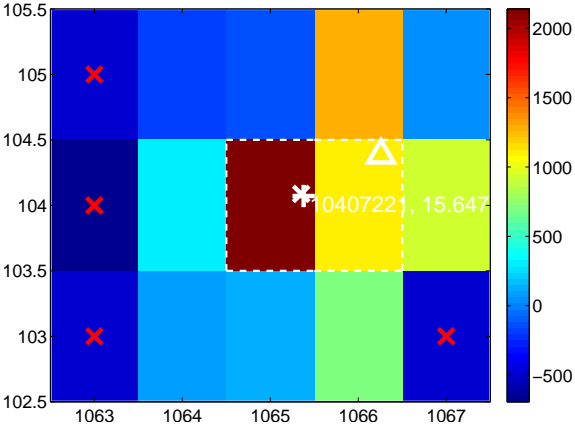
Q2 no difference image



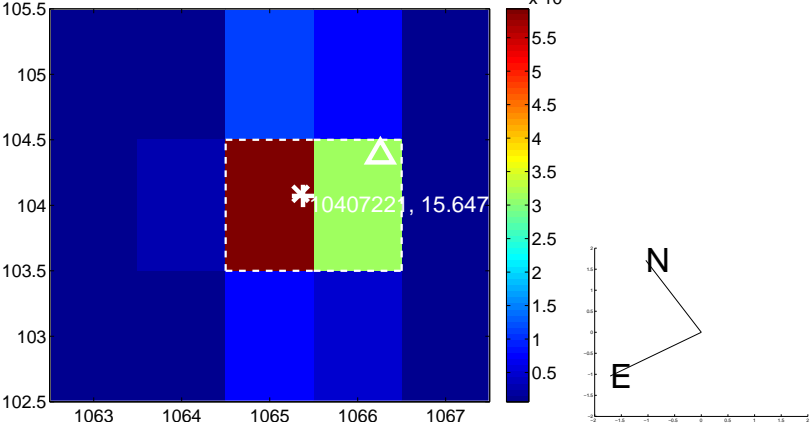
Q2 no OOT image



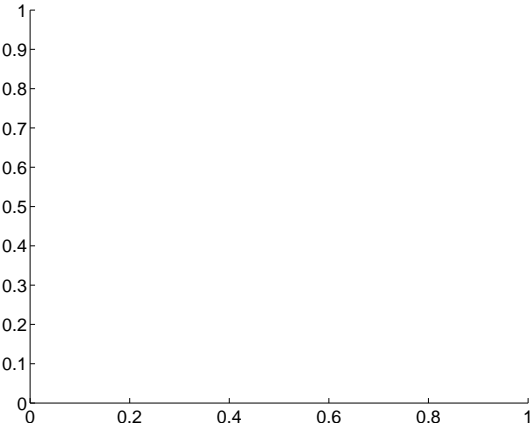
Q3 difference image. Poor Quality



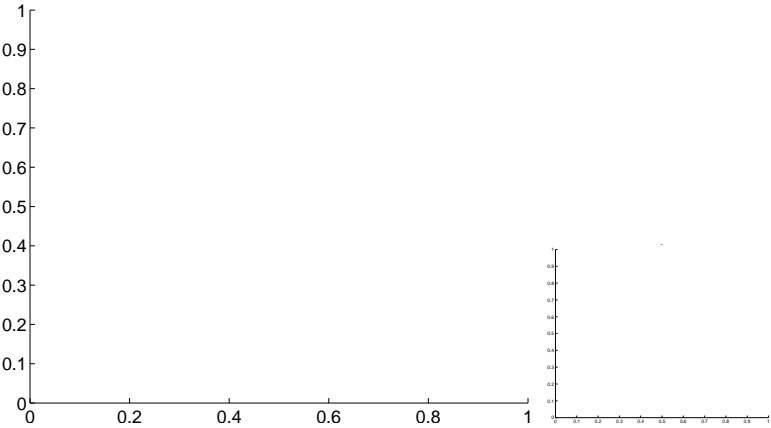
Q3 OOT image



Q4 no difference image

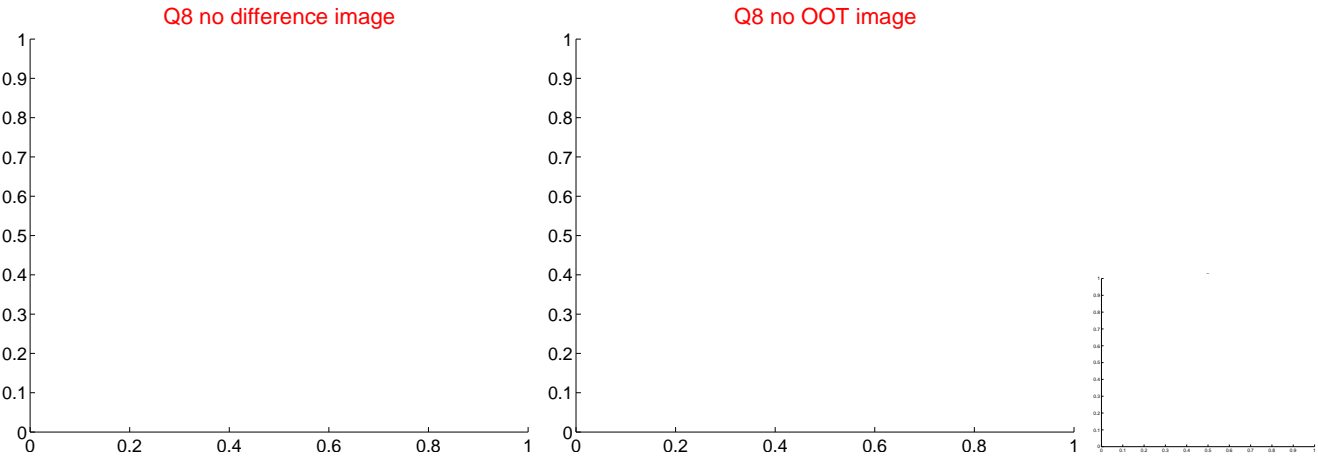
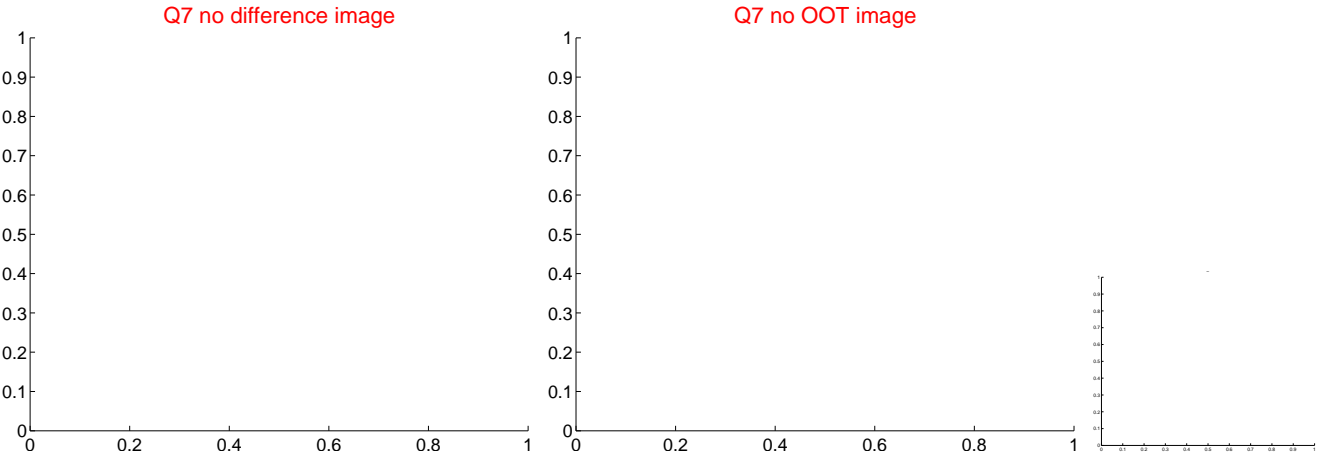
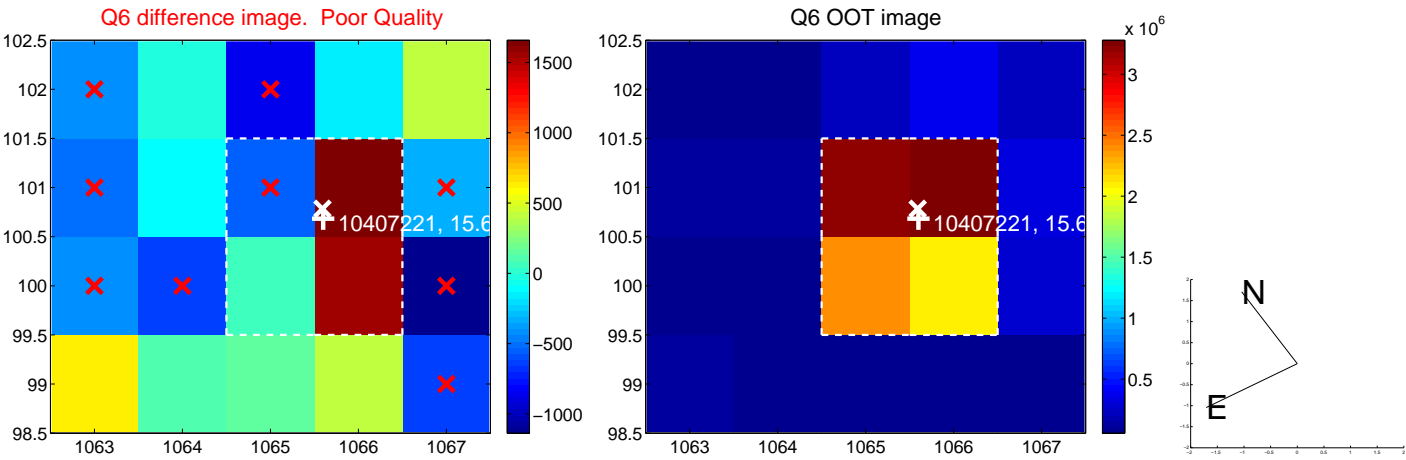
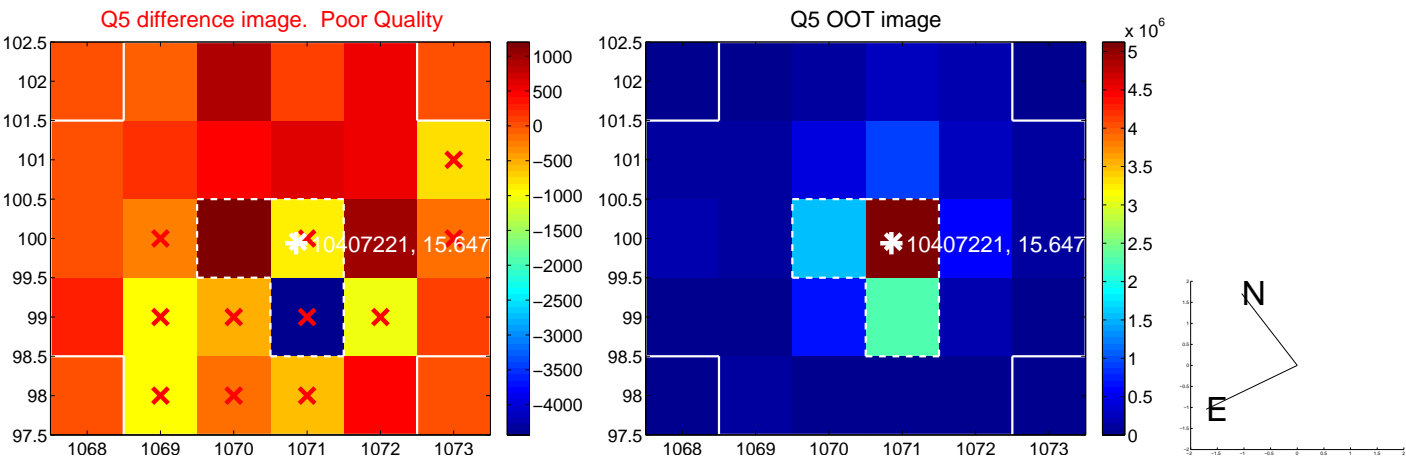


Q4 no OOT image

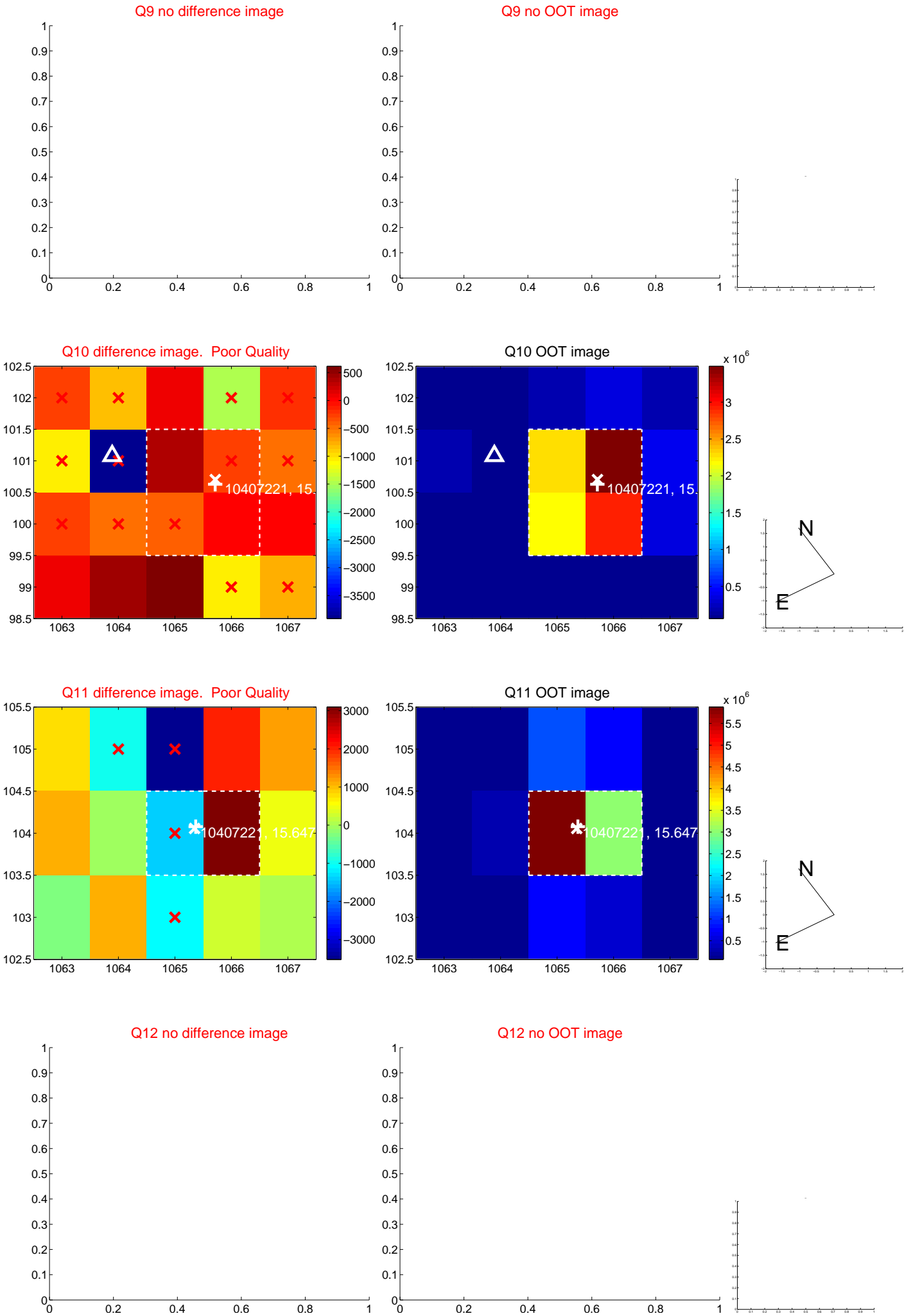




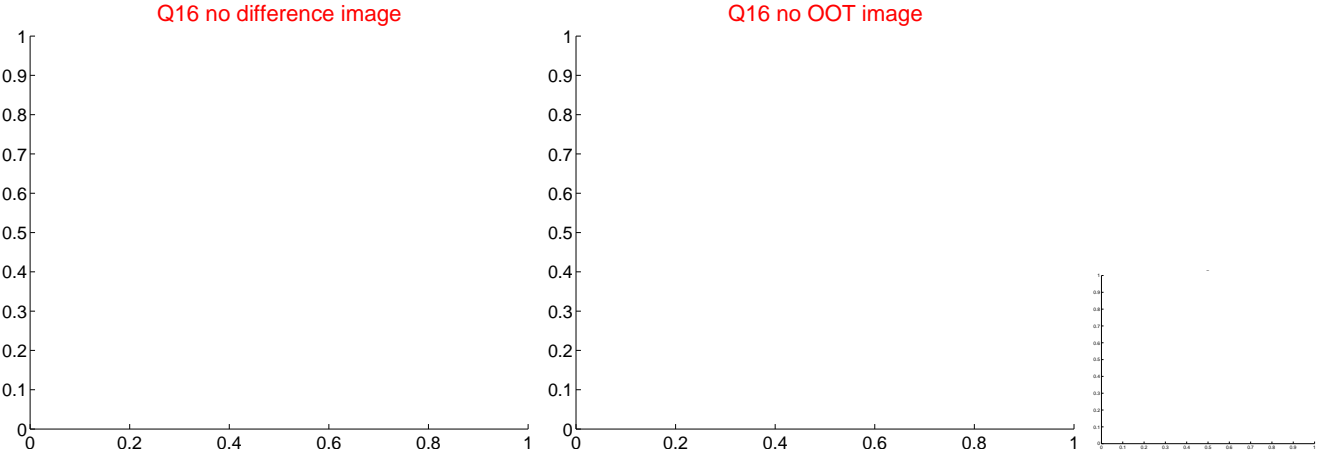
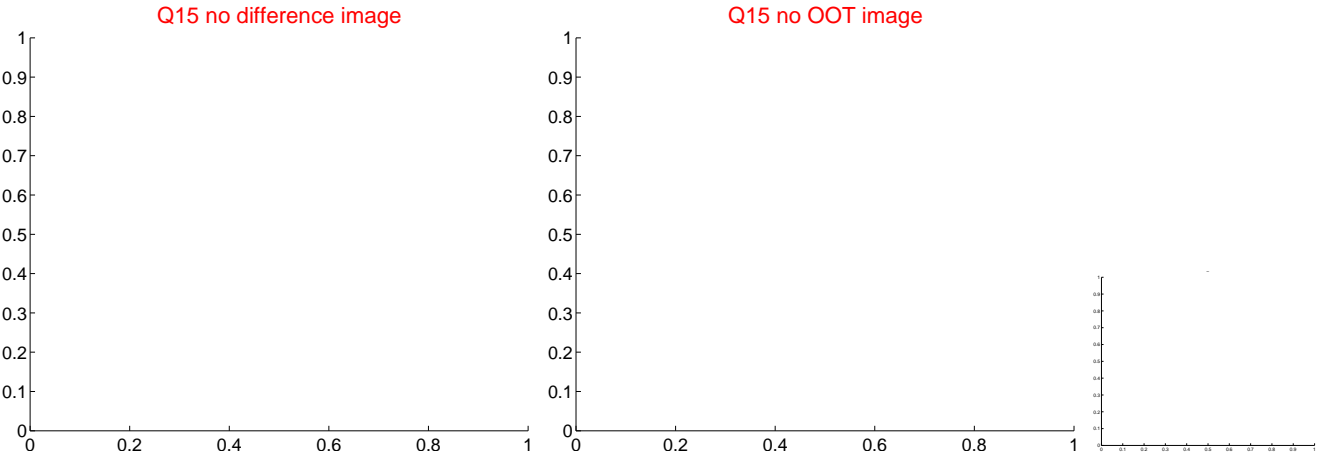
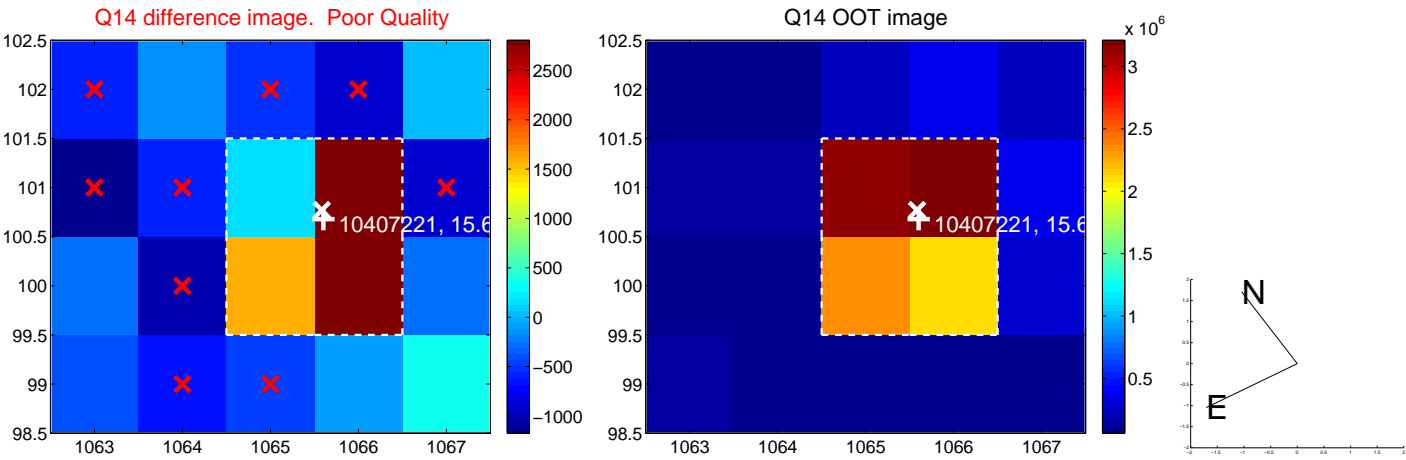
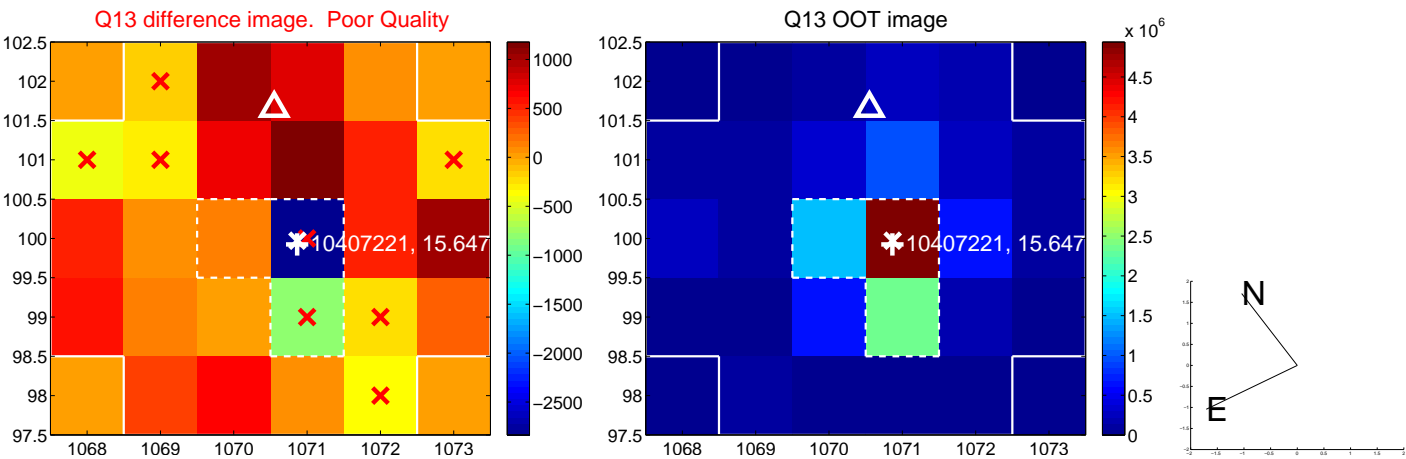
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



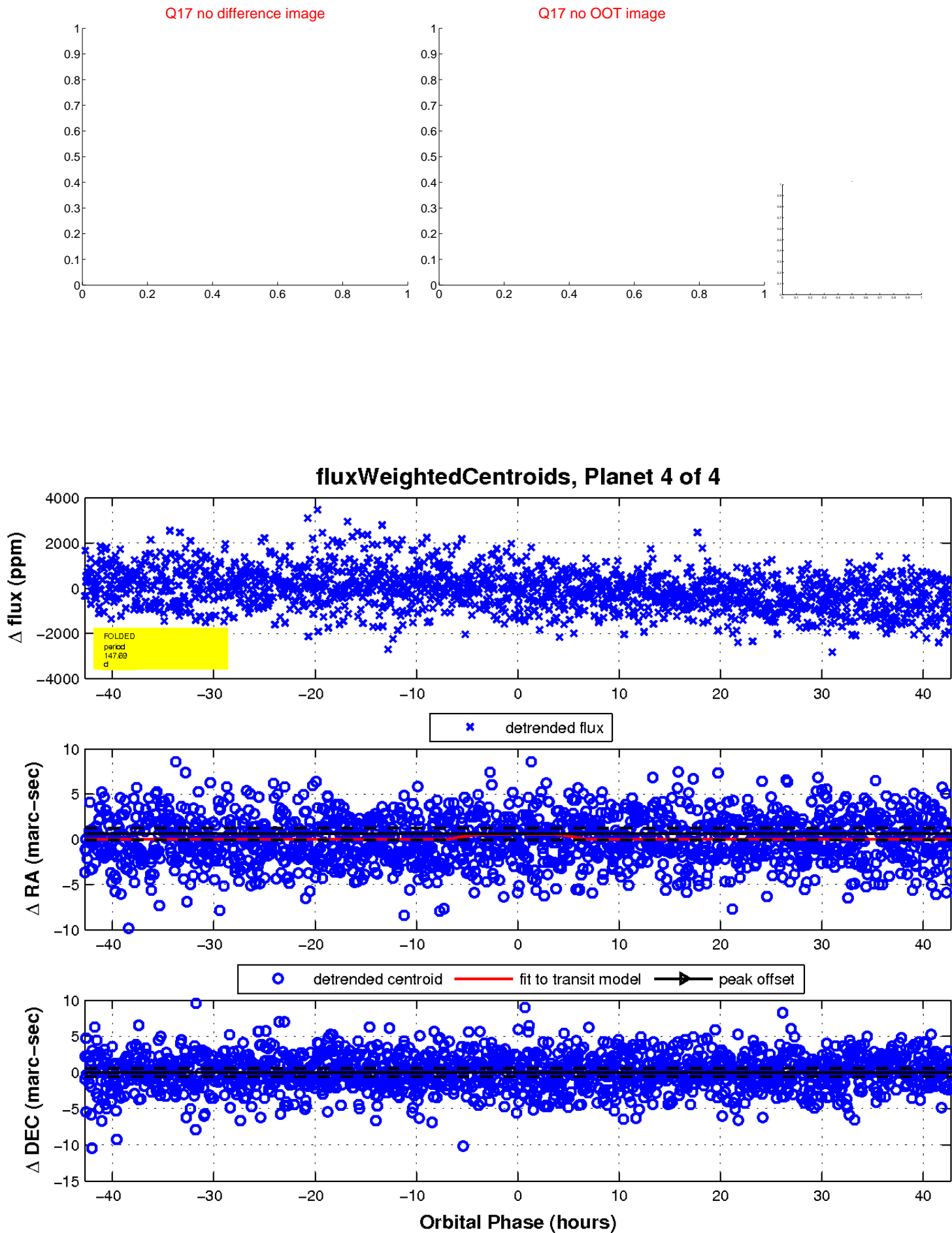
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

