

# KIC 009528112

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009528112-01	OBS	No	388.335284	150.573277	598.4	2.182	68.7	32.5	184.93	3015	415.00	2401.25
009528112-02	OBS	No	314.748175	408.888343	243.6	3.000	103.6	-1.0	184.93	3015	264.92	3177.58

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009528112-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED
009528112-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED

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

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

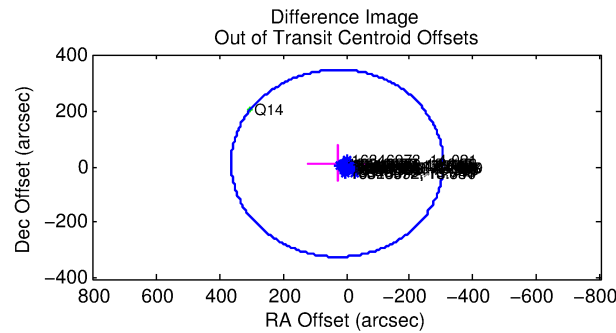
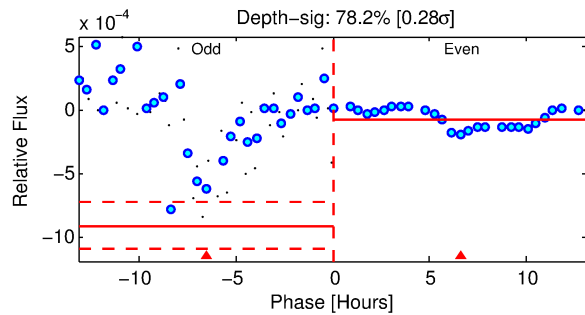
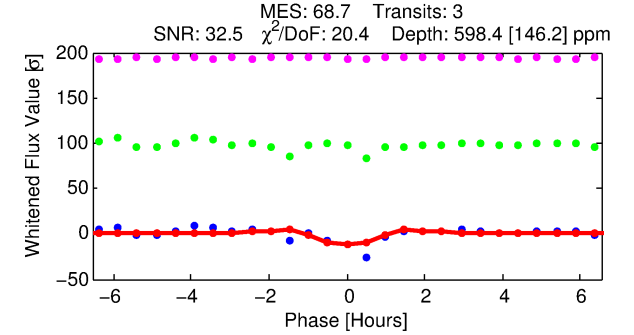
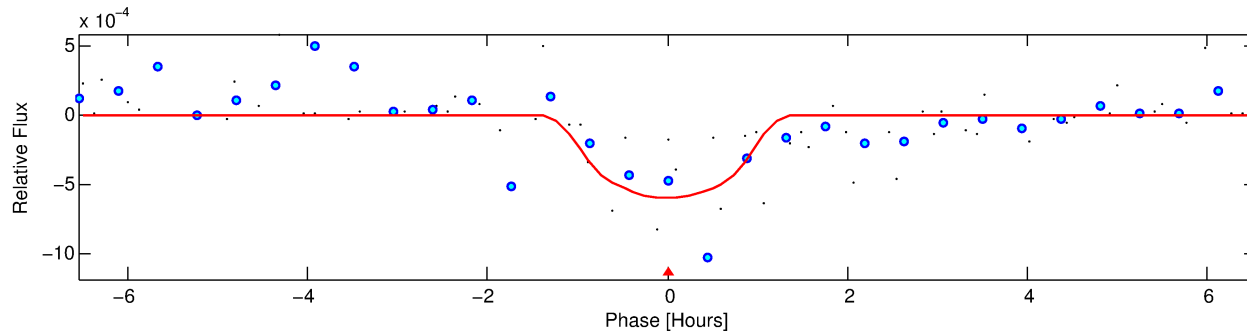
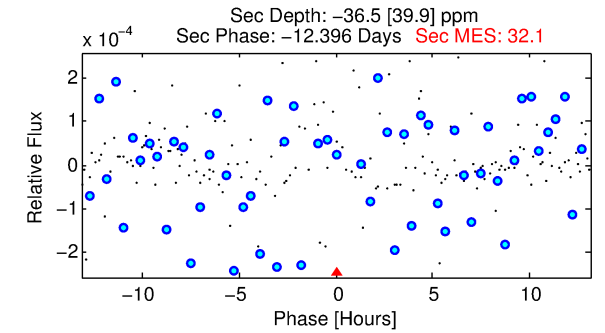
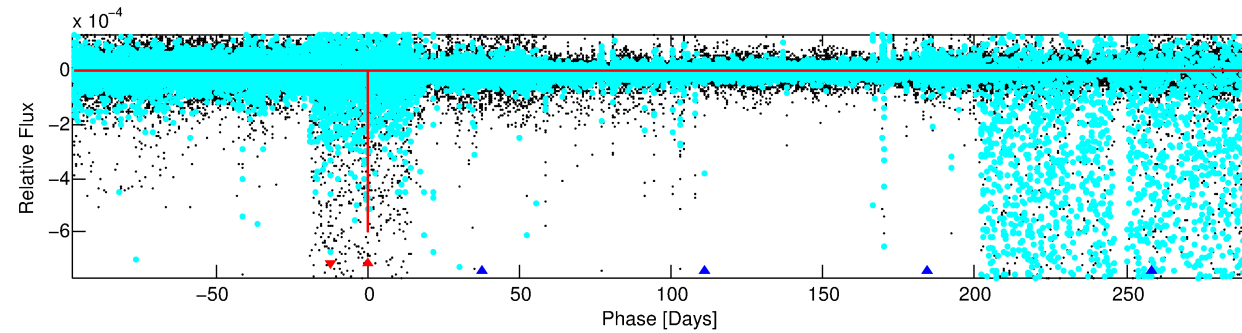
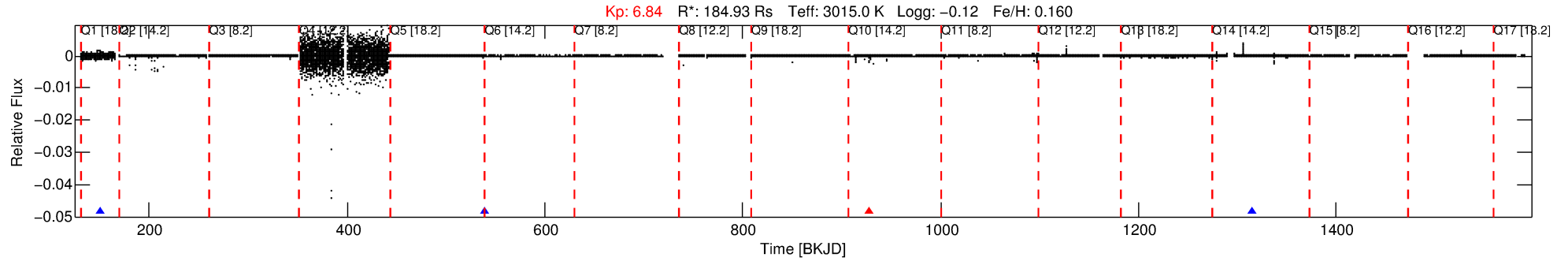
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009528112-01

No Significant Match Found

# DV One-Page Summary

KIC: 9528112 Candidate: 1 of 2 Period: 388.335 d



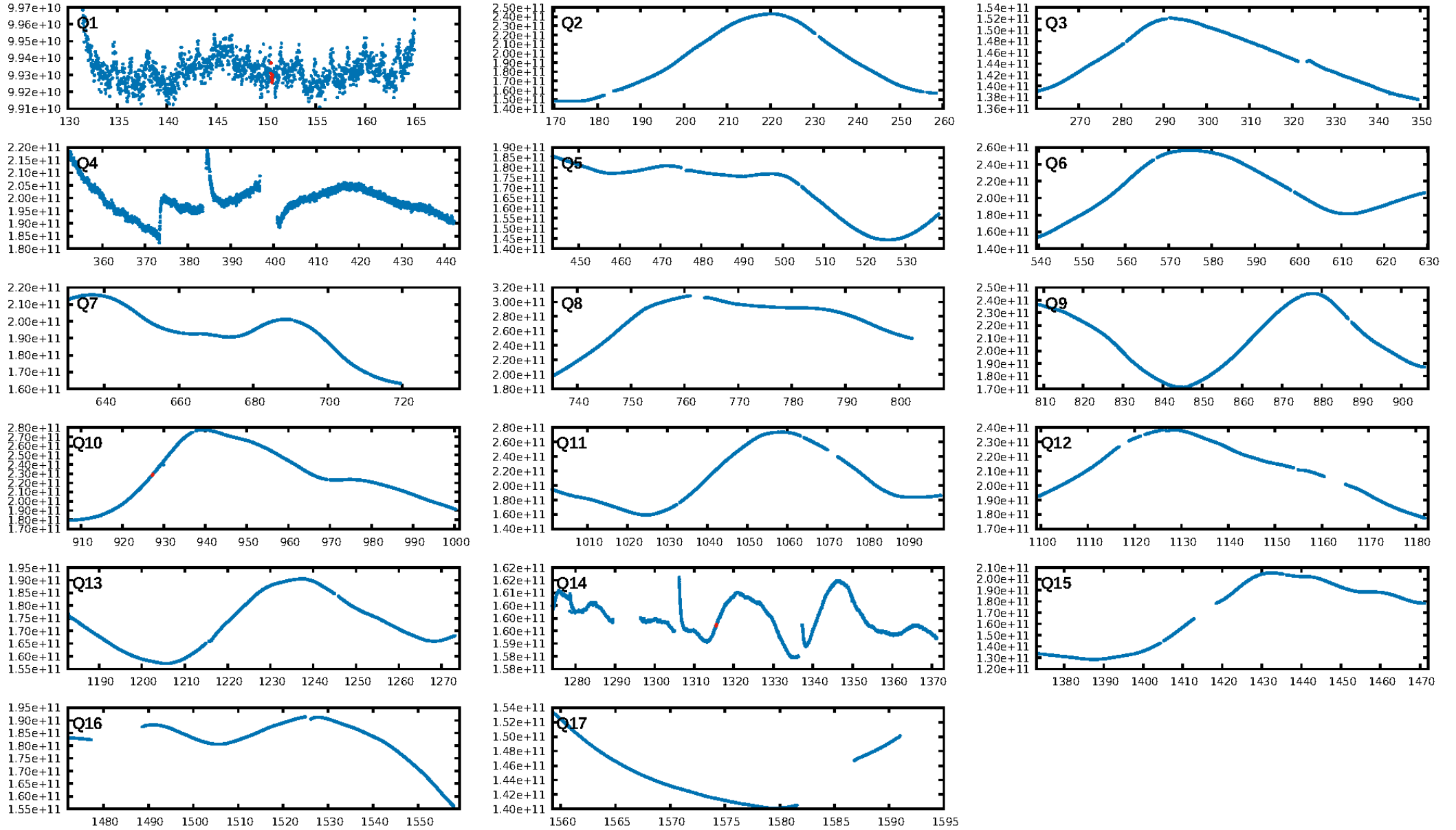
## DV Fit Results:

Period = 388.33528 [0.00414] d  
Epoch = 150.5733 [0.0099] BKJD  
Rp/R\* = 0.0206 [0.0515]  
a/R\* = 1387.75 [6499.19]  
b = 0.01 [767.77]  
Seff = 2401.25 [823.08]  
Teq = 1785 [153] K  
Rp = 414.99 [1040.60] Re  
a = 1.0268 [0.1755] AU  
Ag = N/A  
Teffp = N/A

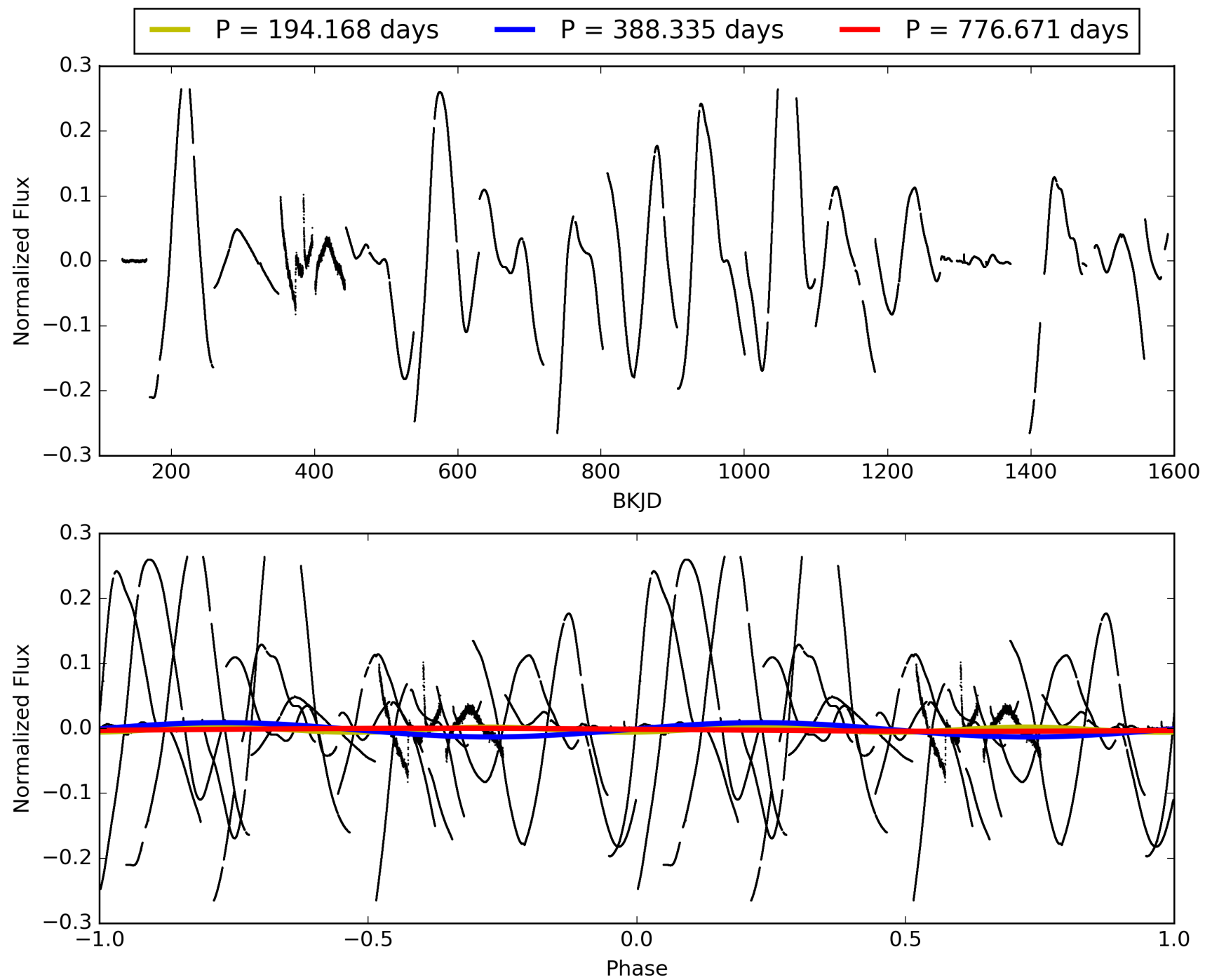
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [476.11σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 8.91e-09  
RollingBand-fgt: 0.50 [1/2]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 89.2%  
Centroid-so: 6.136 arcsec [2.16σ]  
OotOffset-rm: 30.966 arcsec [0.28σ]  
KicOffset-rm: 29.986 arcsec [0.39σ]  
OotOffset-st: 2/0/0/1 [3]  
KicOffset-st: 2/0/0/1 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 009528112-01, PDC Light Curves

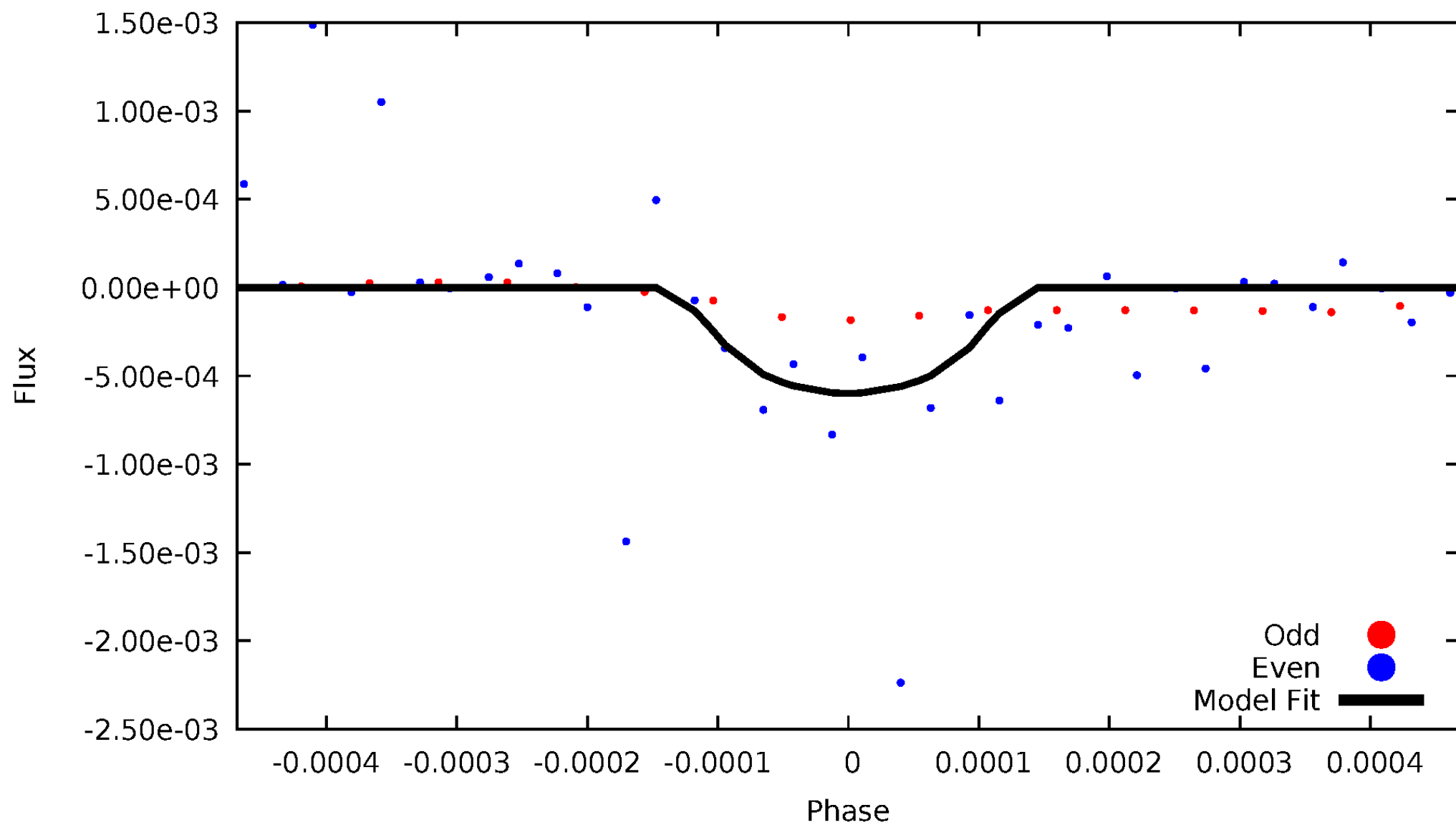


TCE 009528112-01



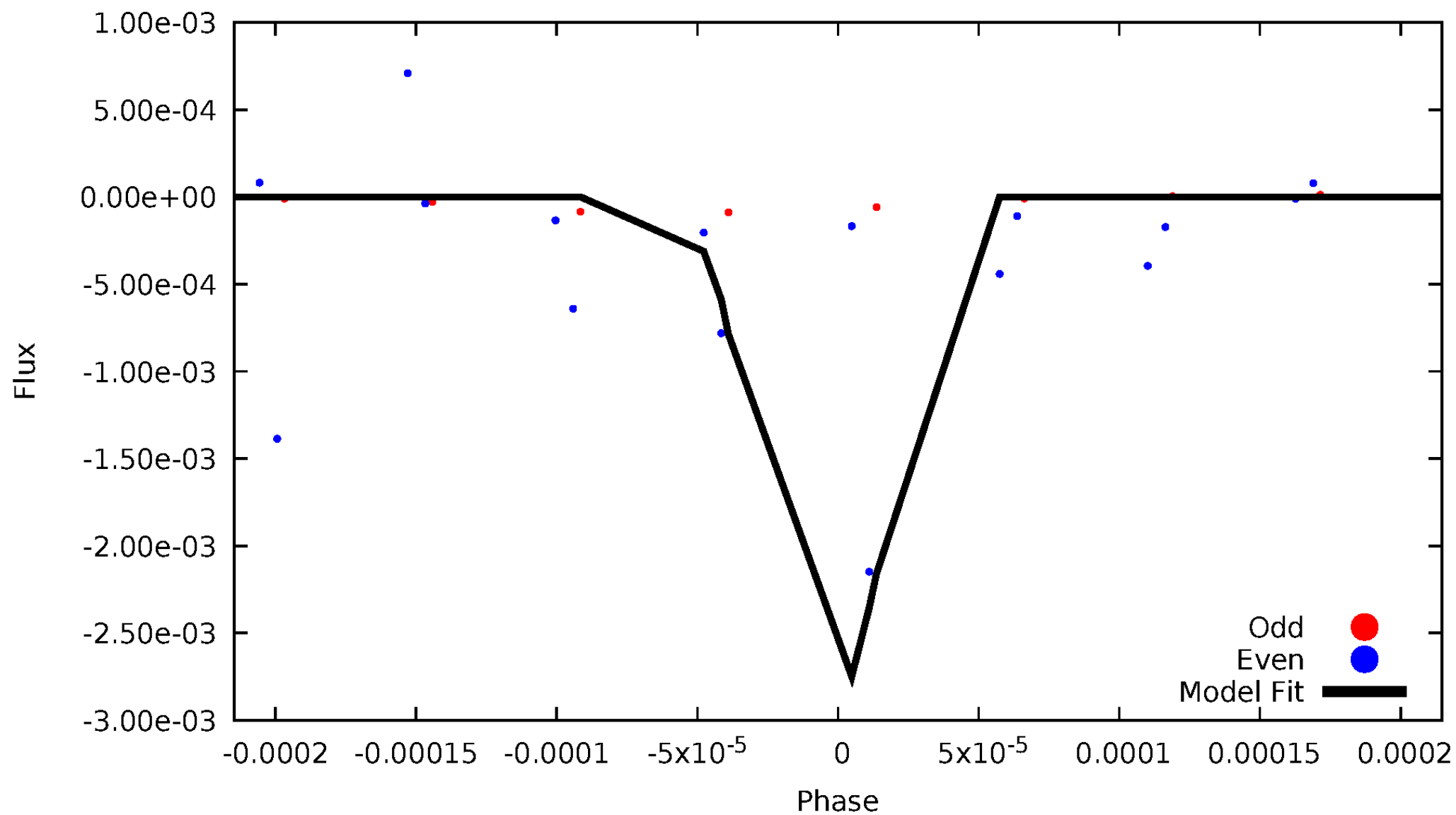
# DV Odd/Even

TCE 009528112-01



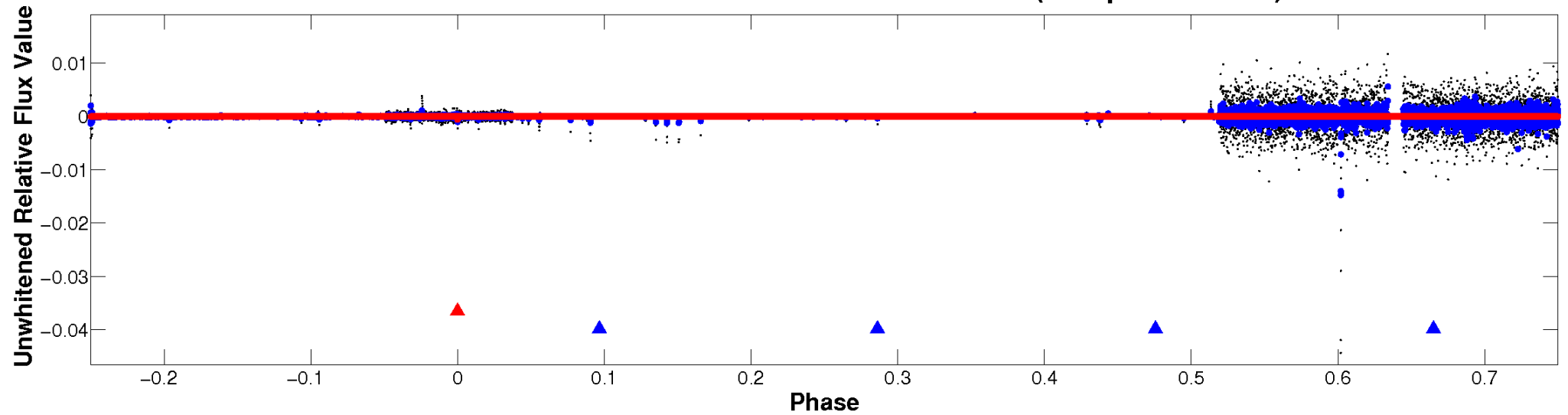
# ALT Odd/Even

TCE 009528112-01

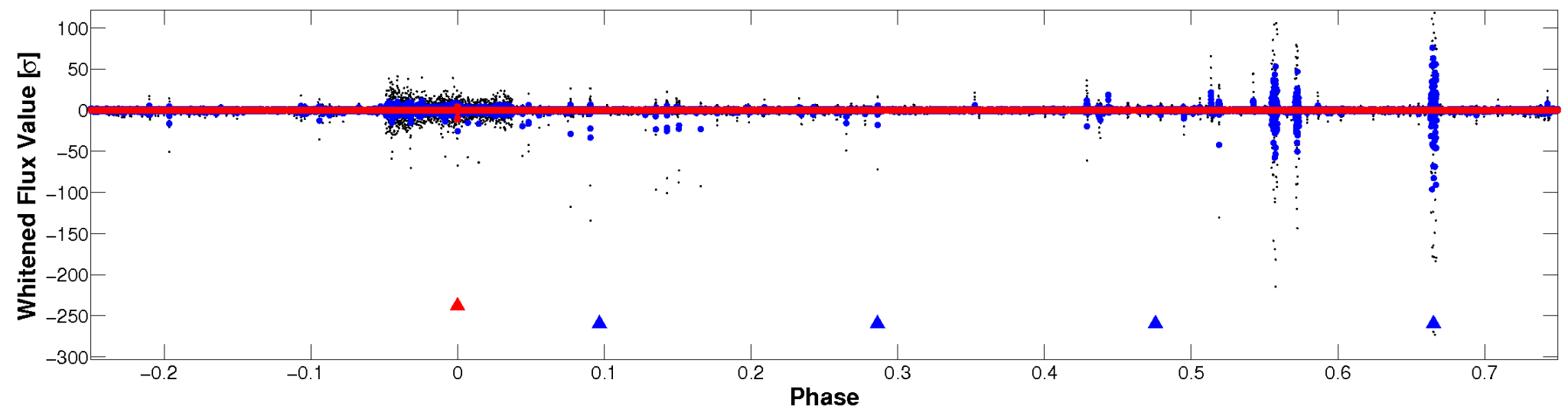


# Non-Whitened Vs. Whitened Light Curve

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

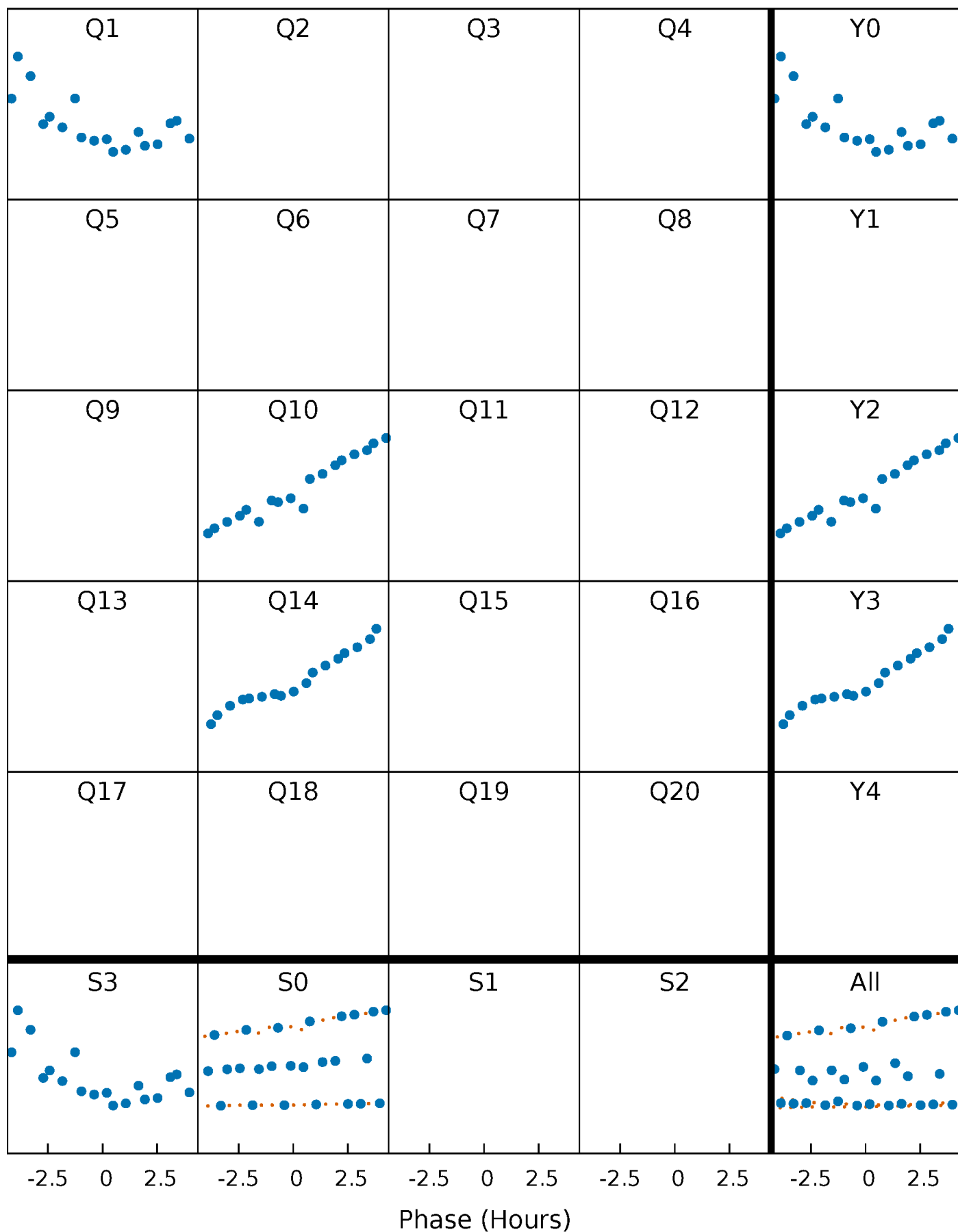


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

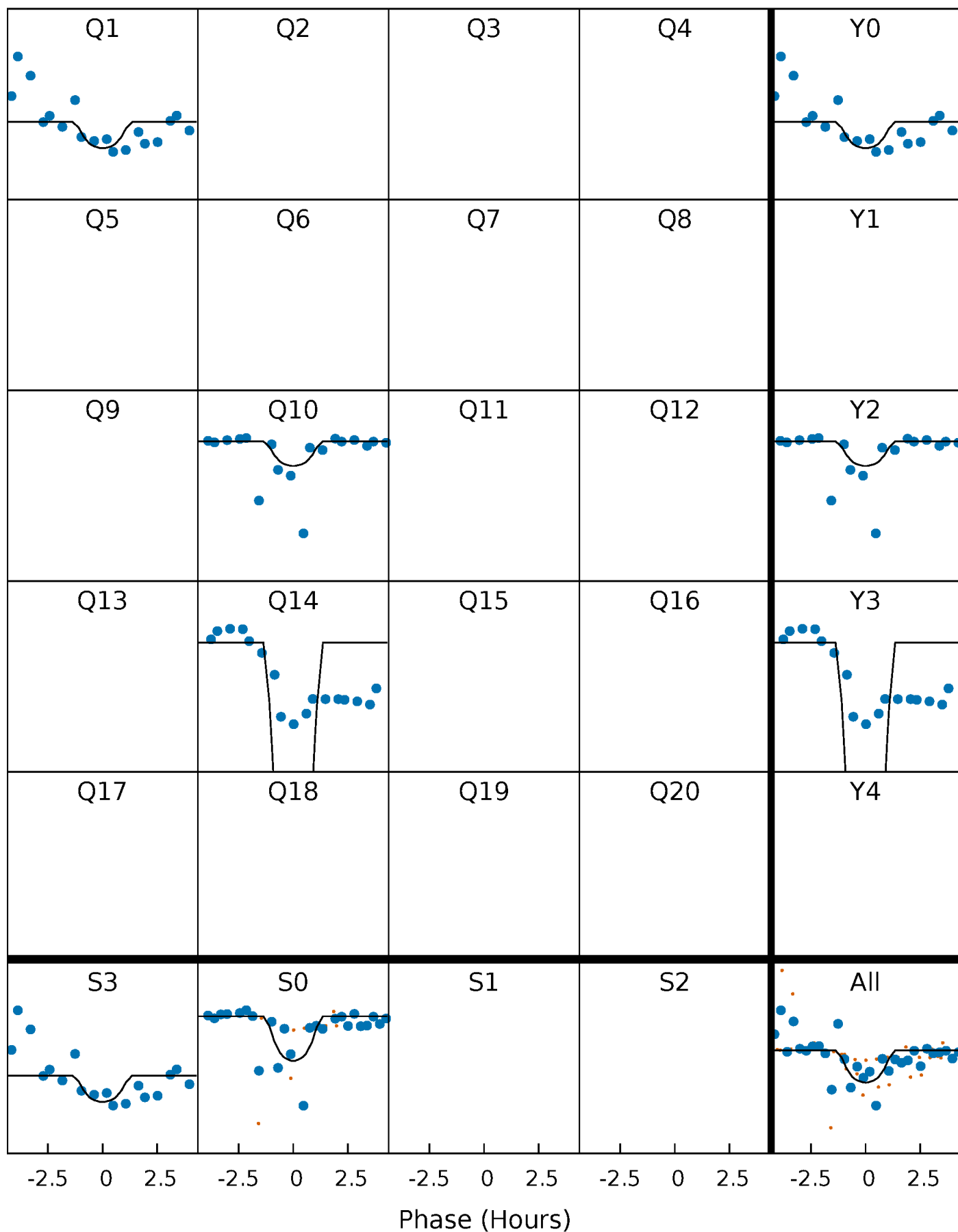
TCE 009528112-01 P=388.335284 Days  $T_0=150.573276$  (BKJD)





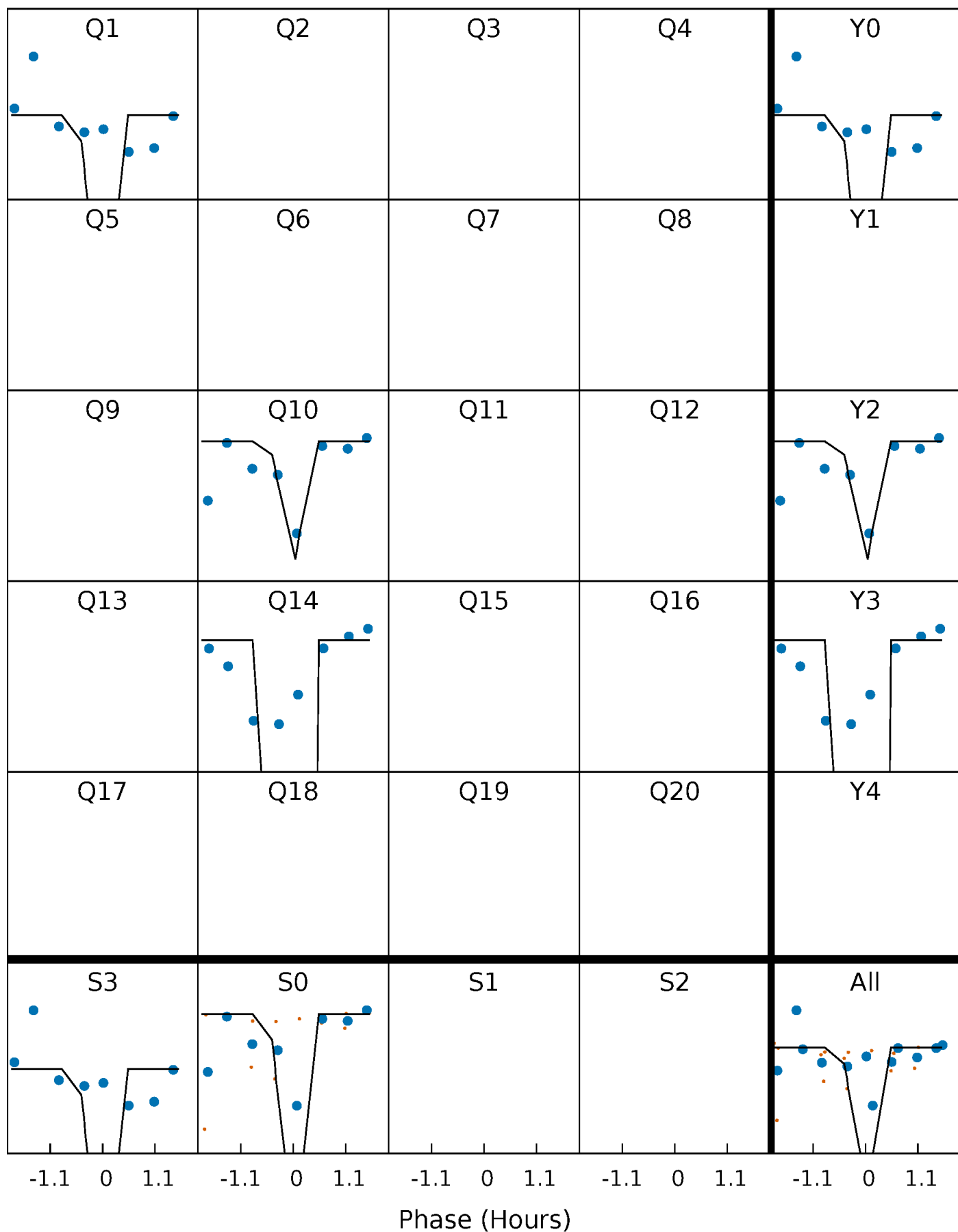
# DV Quarter-Phased Transit Curves

TCE 009528112-01 P=388.335284 Days  $T_0=150.573276$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

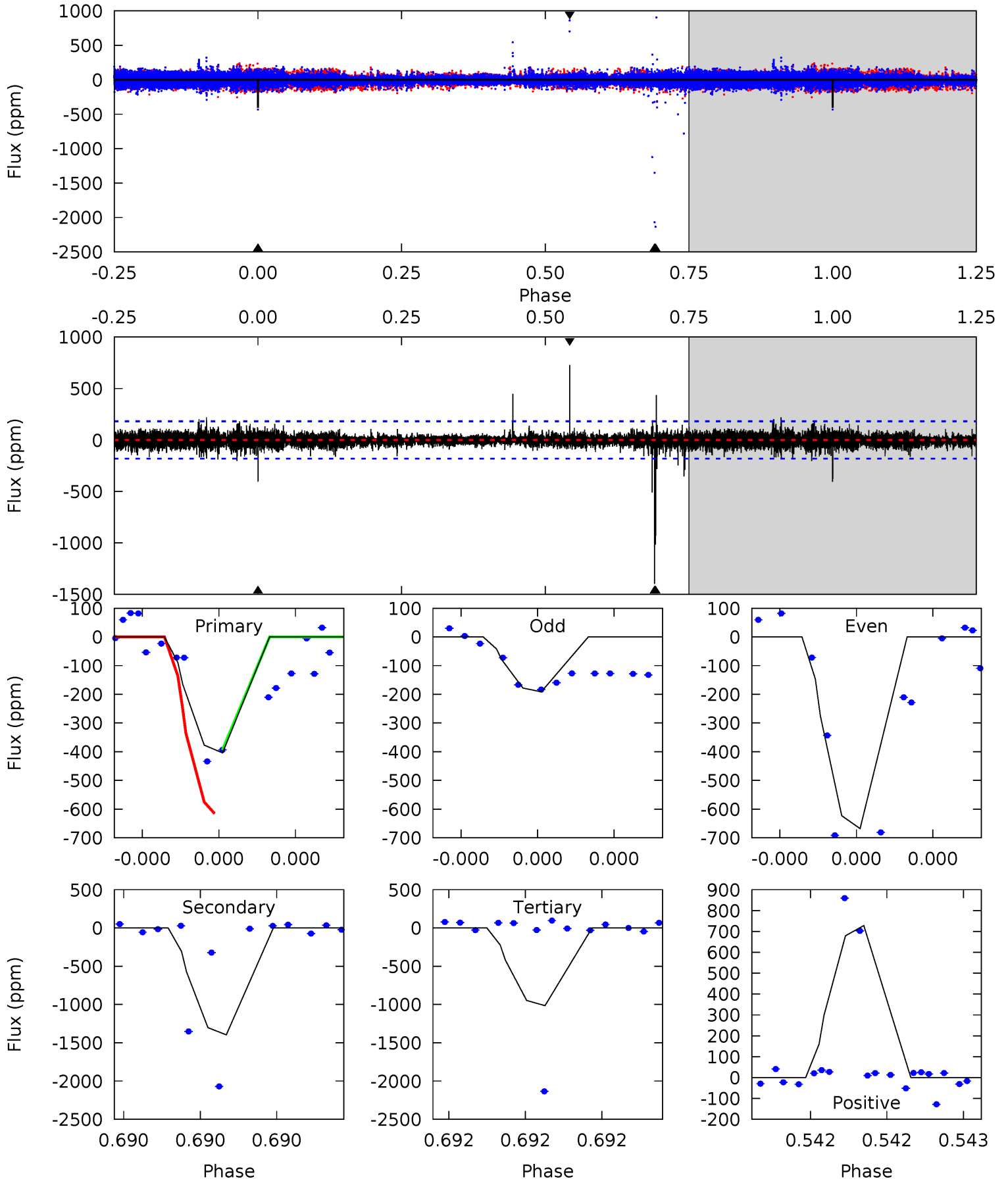
TCE 009528112-01 P=388.339808 Days  $T_0=150.575511$  (BKJD)



# DV Model-Shift Uniqueness Test

009528112-01, P = 388.335284 Days, E = 150.573276 Days

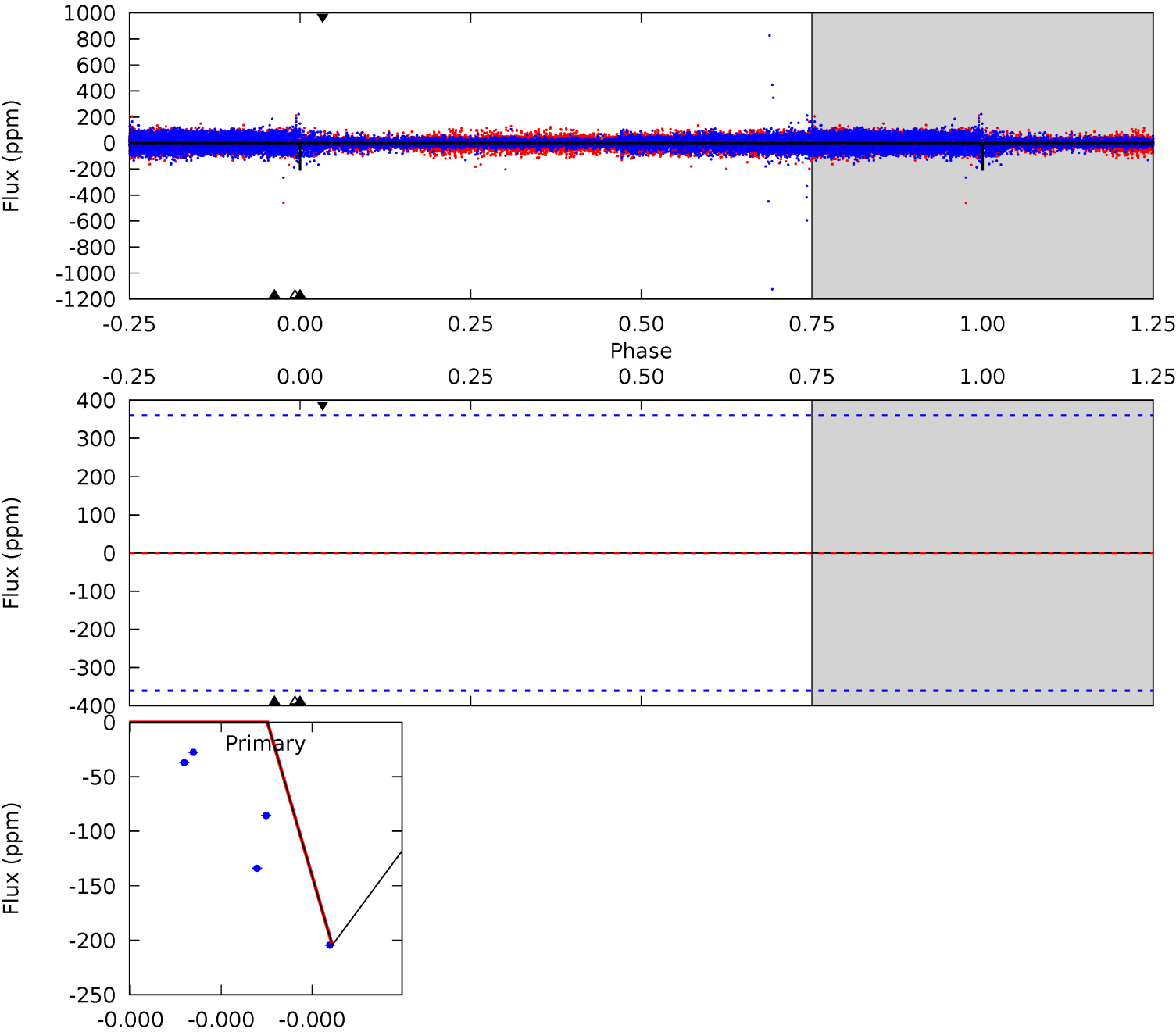
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.8	44.1	32.1	23.0	5.72	3.70	1.00	-19.3	-10.2	12.1	21.1	5.12	1.14	0.34	4.72



Alt Model-Shift Uniqueness Test

009528112-01, P = 388.339808 Days, E = 150.575511 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
0	0	0	0	5.93	4.01	0	0	0	0	0	0	5.07	0.56	0



### Stellar Parameters For KIC 009528112

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3015^{+100}_{-61}$	$-0.115^{+0.200}_{-0.037}$	$0.160^{+0.200}_{-0.100}$	$184.929^{+7.349}_{-20.823}$	$0.957^{+0.282}_{-0.015}$	$0.000^{+0.000}_{-0.000}$
	+3%/-2%	+174%/-32%	+125%/-62%	+4%/-11%	+29%/-2%	+81%/-10%
Source	SPE14	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 009528112-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-1397 \pm 32$	$901.30^{+838.45}_{-614.25}$	$2451^{+95}_{-99}$	$2744^{+1377}_{-4439}$	$1.065^{+9.346}_{-0.775}$
Alt.	$-0 \pm 61$	$1263.44^{+928.13}_{-794.89}$	$2454^{+91}_{-105}$	$-2443^{+87}_{-103}$	$-0.000^{+0.033}_{-0.036}$

$T_{\text{max}}$  = 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

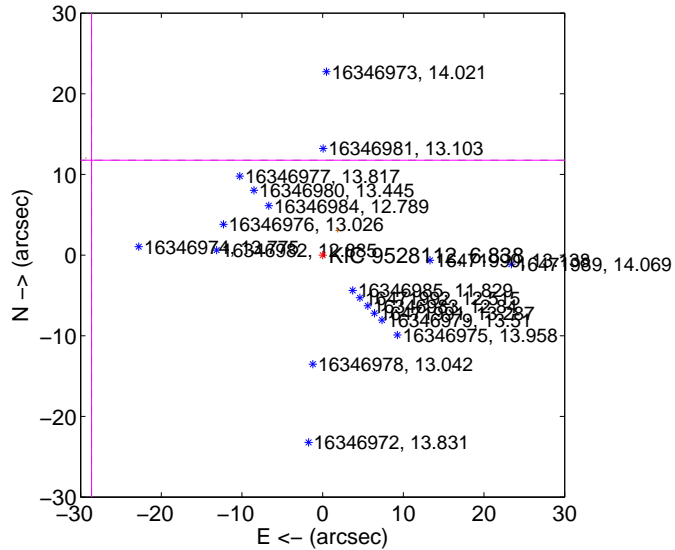
Supplemental centroid analysis for 009528112-01. **Kepler magnitude: 6.84.** Transit SNR 32.54

There are 0 quarters with good PRF difference image offsets

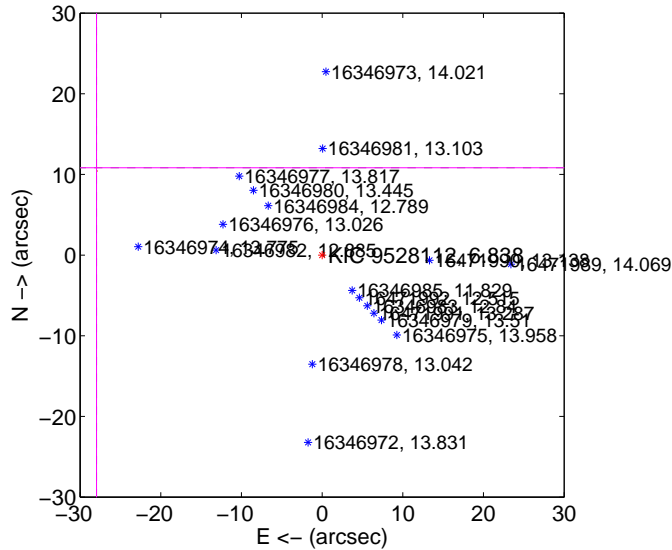
The OOT PRF centroid is offset from the target star catalog position by about 26.78 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$30.966 \pm 111.310$	0.28	$28.647 \pm 94.289$	$11.758 \pm 63.461$
PRF-fit source offset from KIC position	$29.986 \pm 77.646$	0.39	$27.964 \pm 66.097$	$10.825 \pm 44.372$
photometric centroid source offset	$6.14 \pm 2.84$	2.16	$-5.01 \pm 3.22$	$-3.54 \pm 1.84$

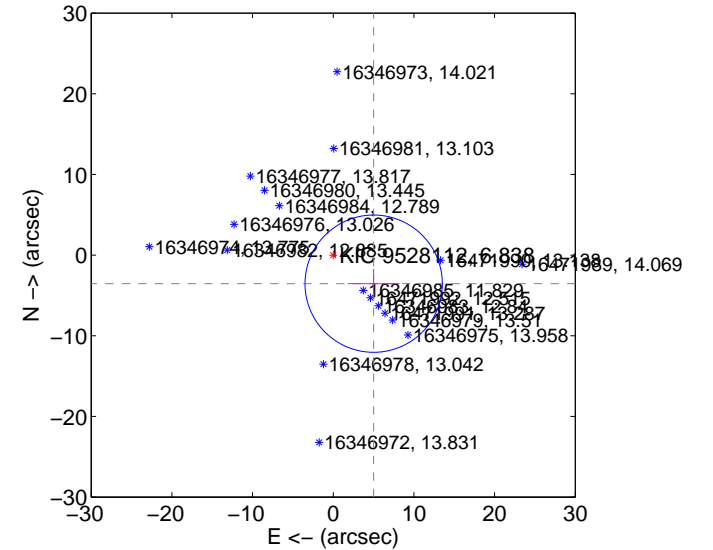
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

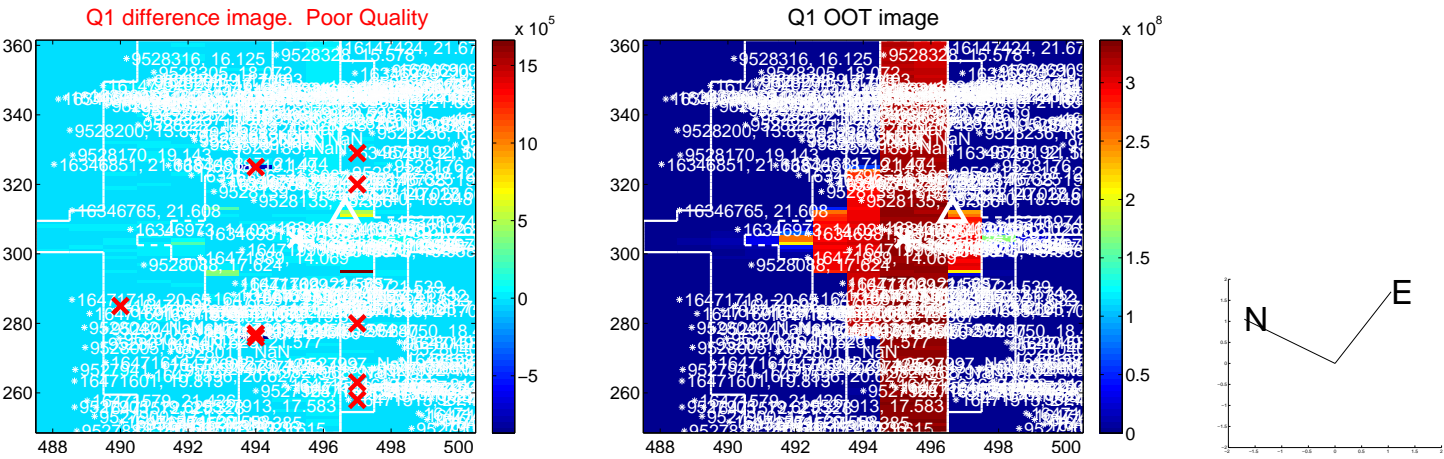


offset from photometric centroids



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.



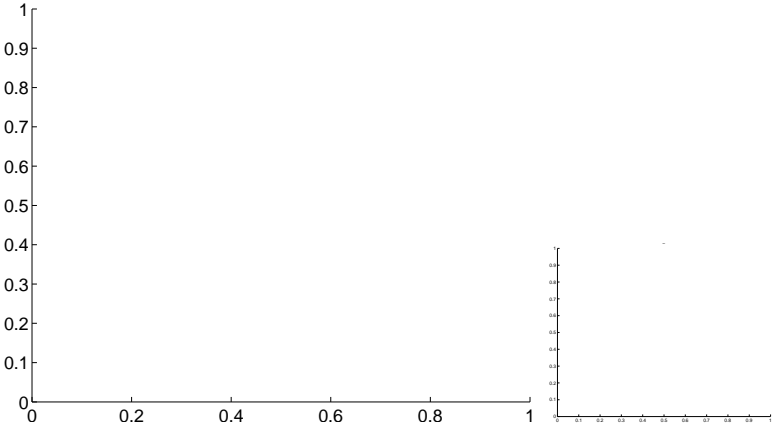


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

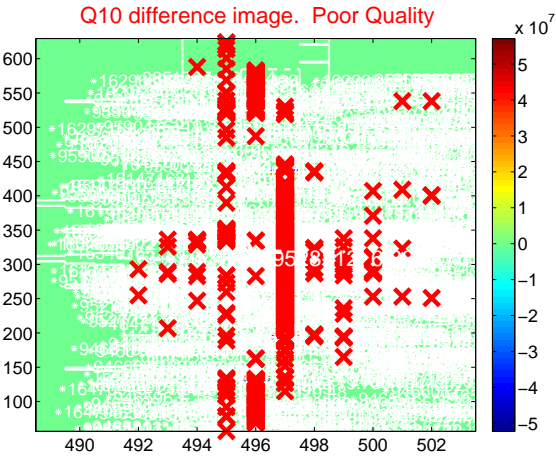
Q9 no difference image



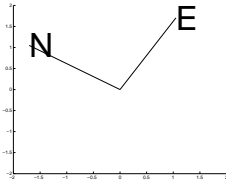
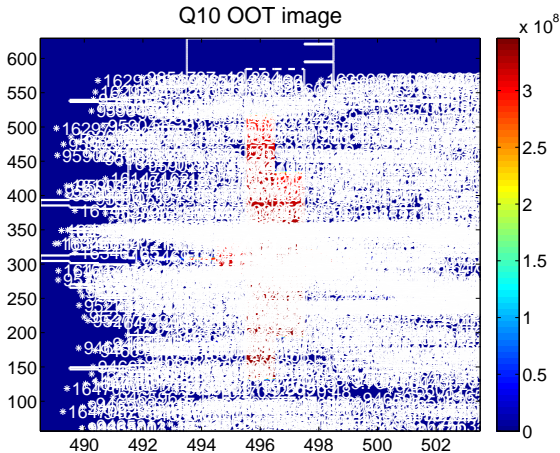
Q9 no OOT image



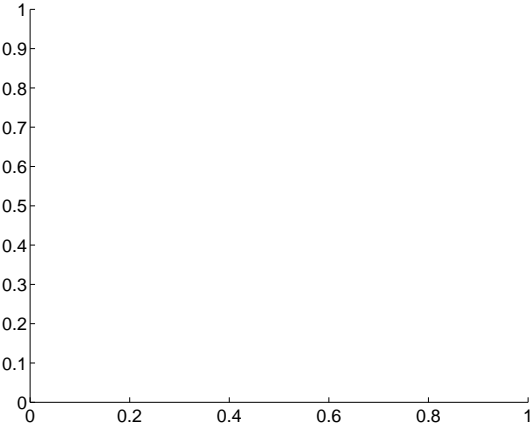
Q10 difference image. Poor Quality



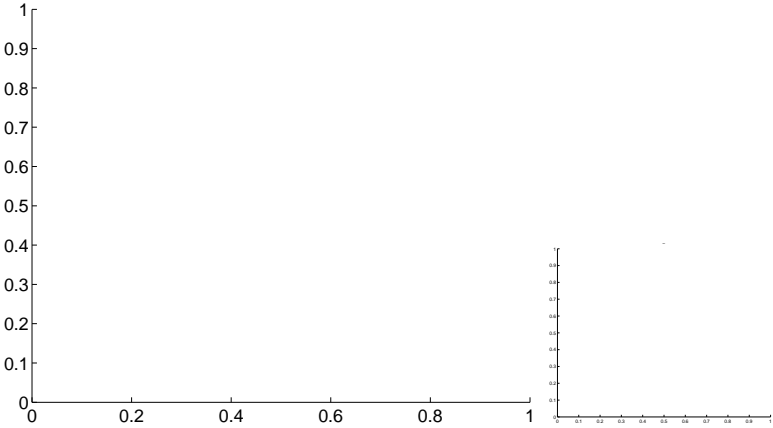
Q10 OOT image



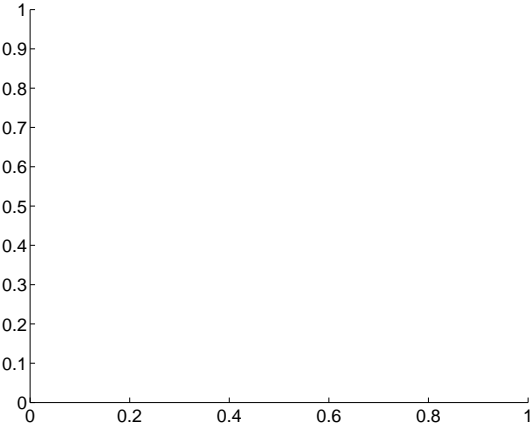
Q11 no difference image



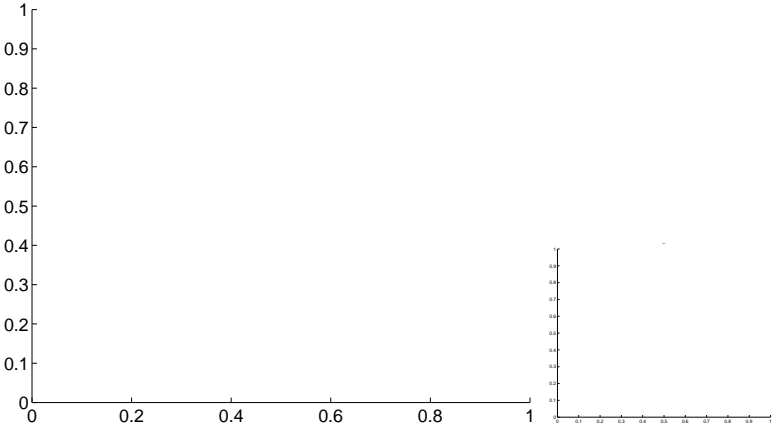
Q11 no OOT image



Q12 no difference image



Q12 no OOT image

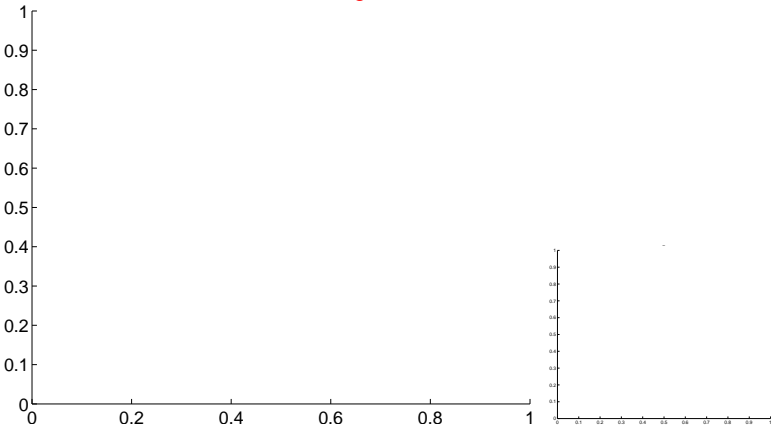


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

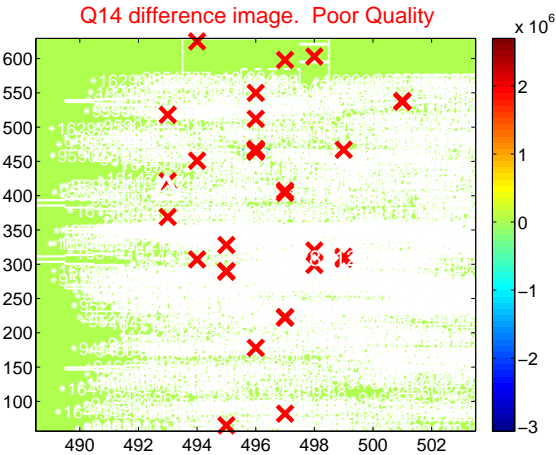
Q13 no difference image



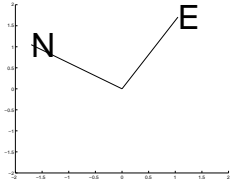
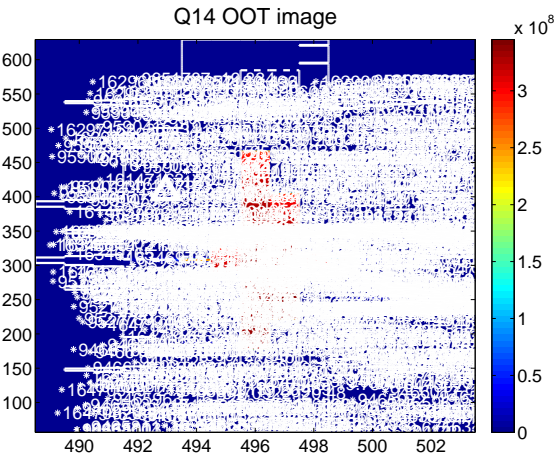
Q13 no OOT image



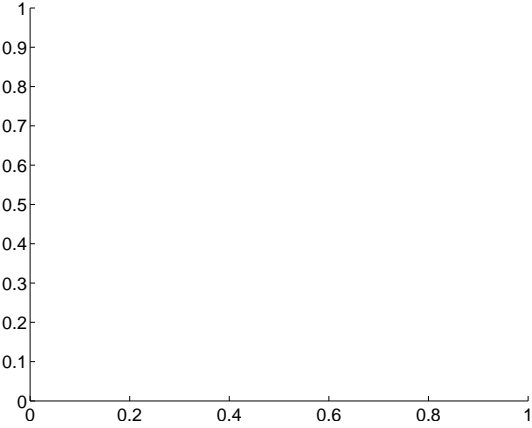
Q14 difference image. Poor Quality



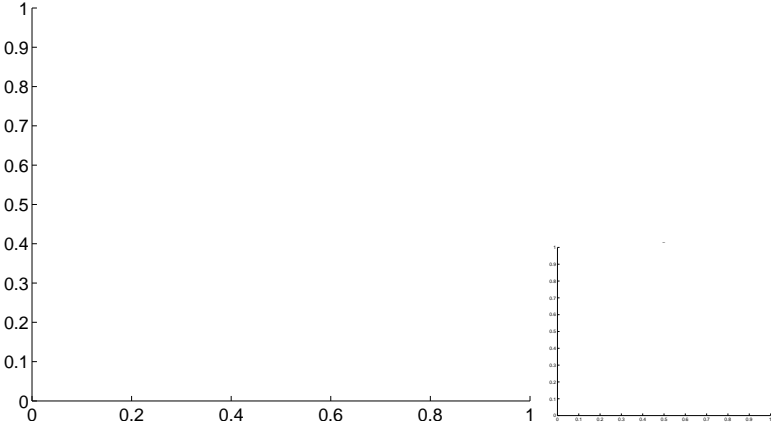
Q14 OOT image



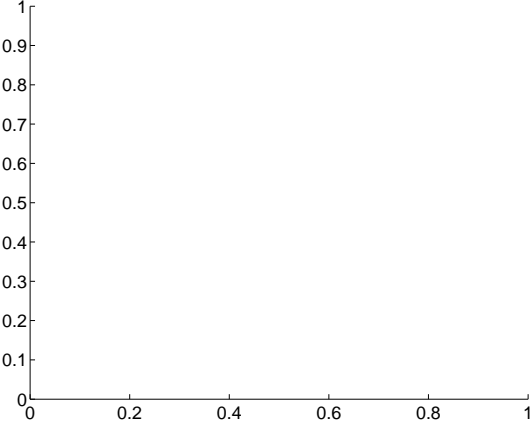
Q15 no difference image



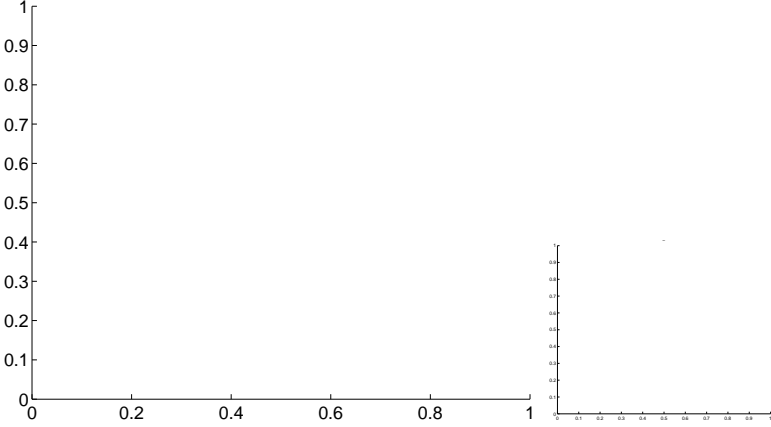
Q15 no OOT image



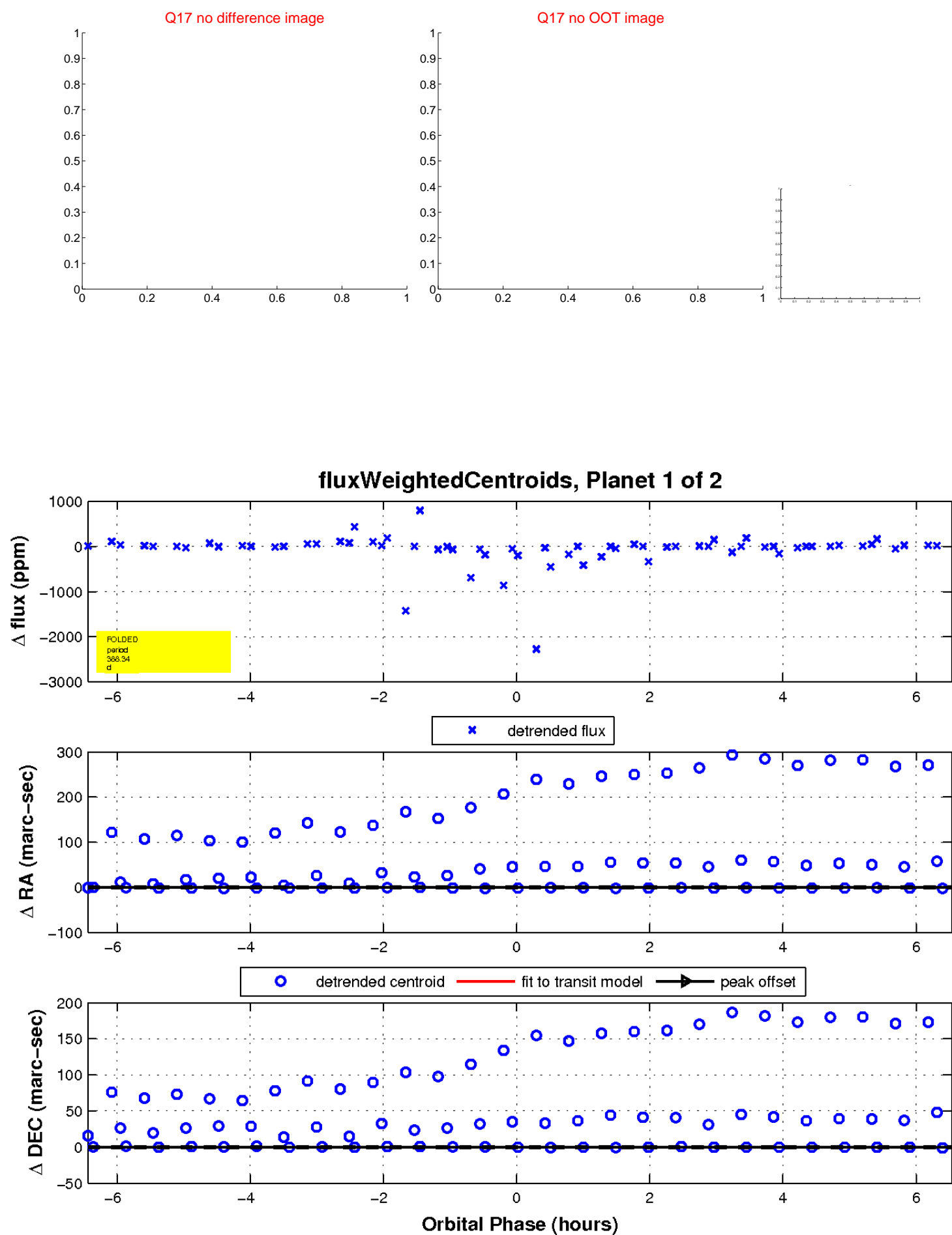
Q16 no difference image



Q16 no OOT image

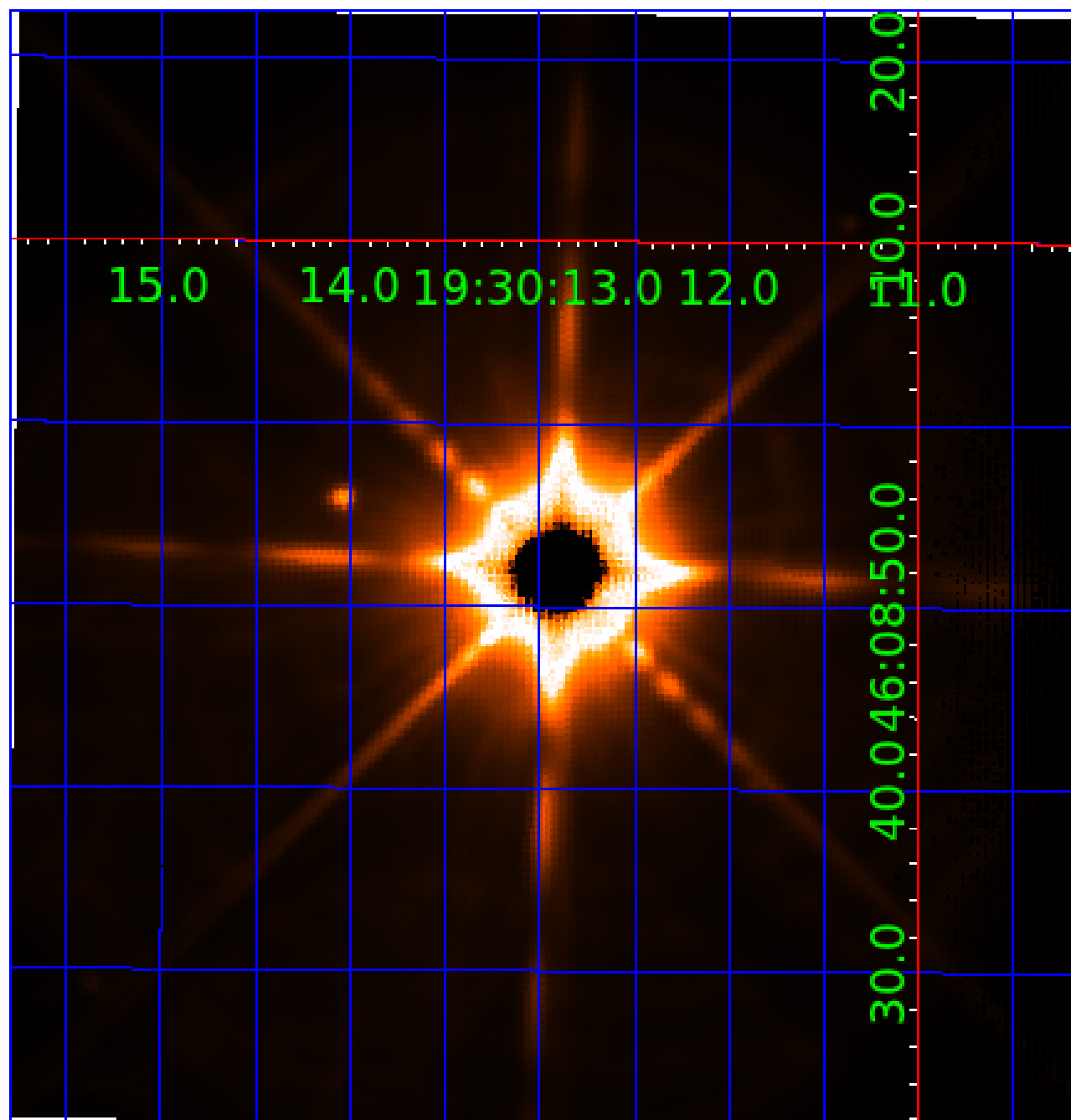


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009528112

## 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

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009528112-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED

**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.

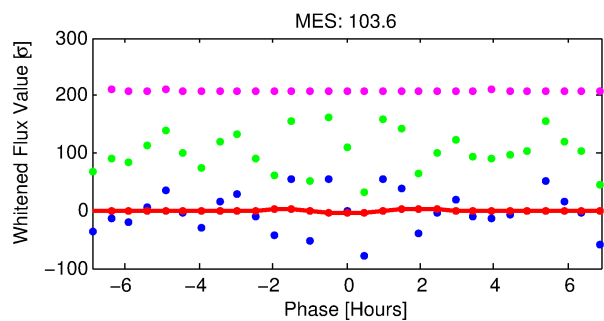
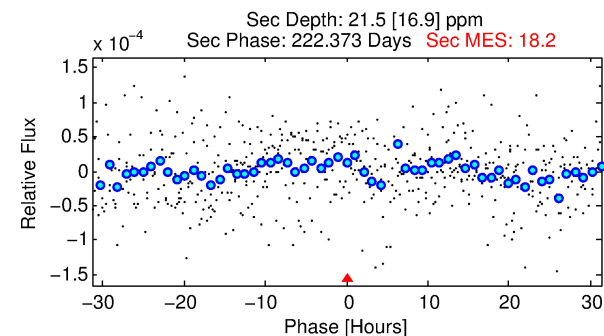
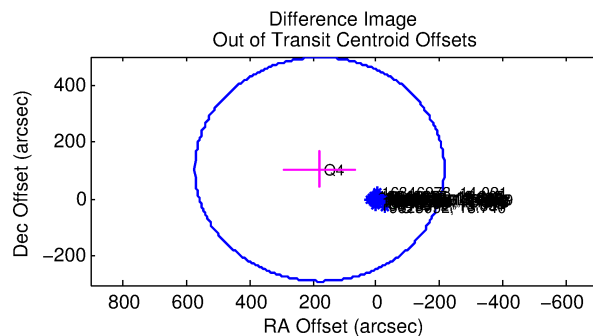
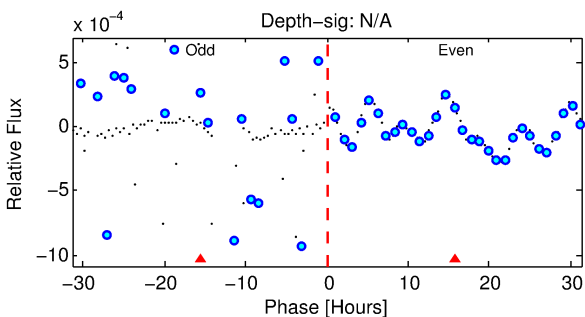
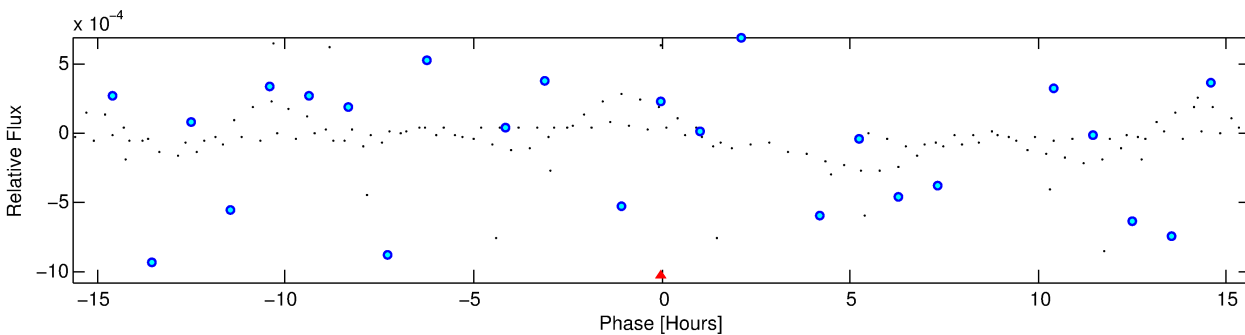
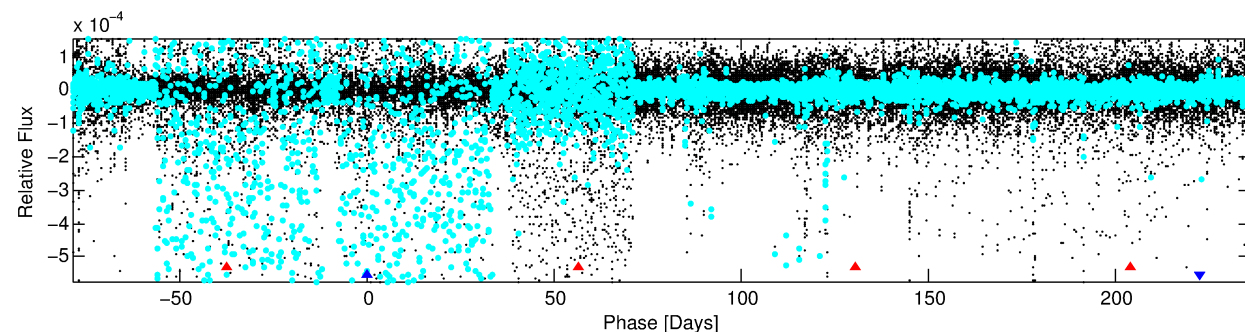
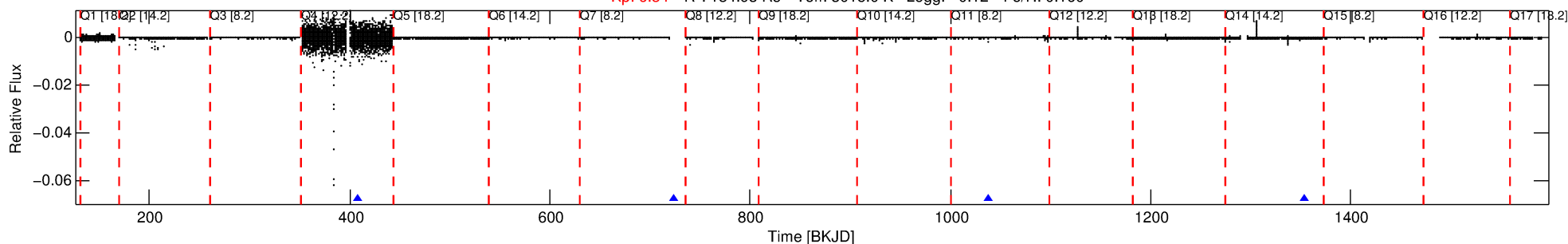
## Ephemeris Match Information For 009528112-02

No Significant Match Found

# DV One-Page Summary

KIC: 9528112 Candidate: 2 of 2 Period: 314.748 d

Kp: 6.84 R\*: 184.93 Rs Teff: 3015.0 K Logg: -0.12 Fe/H: 0.160



## TPS TCE Results:

Period = 314.74817 d  
Epoch = 408.8883 BKJD

DV fit results are unavailable

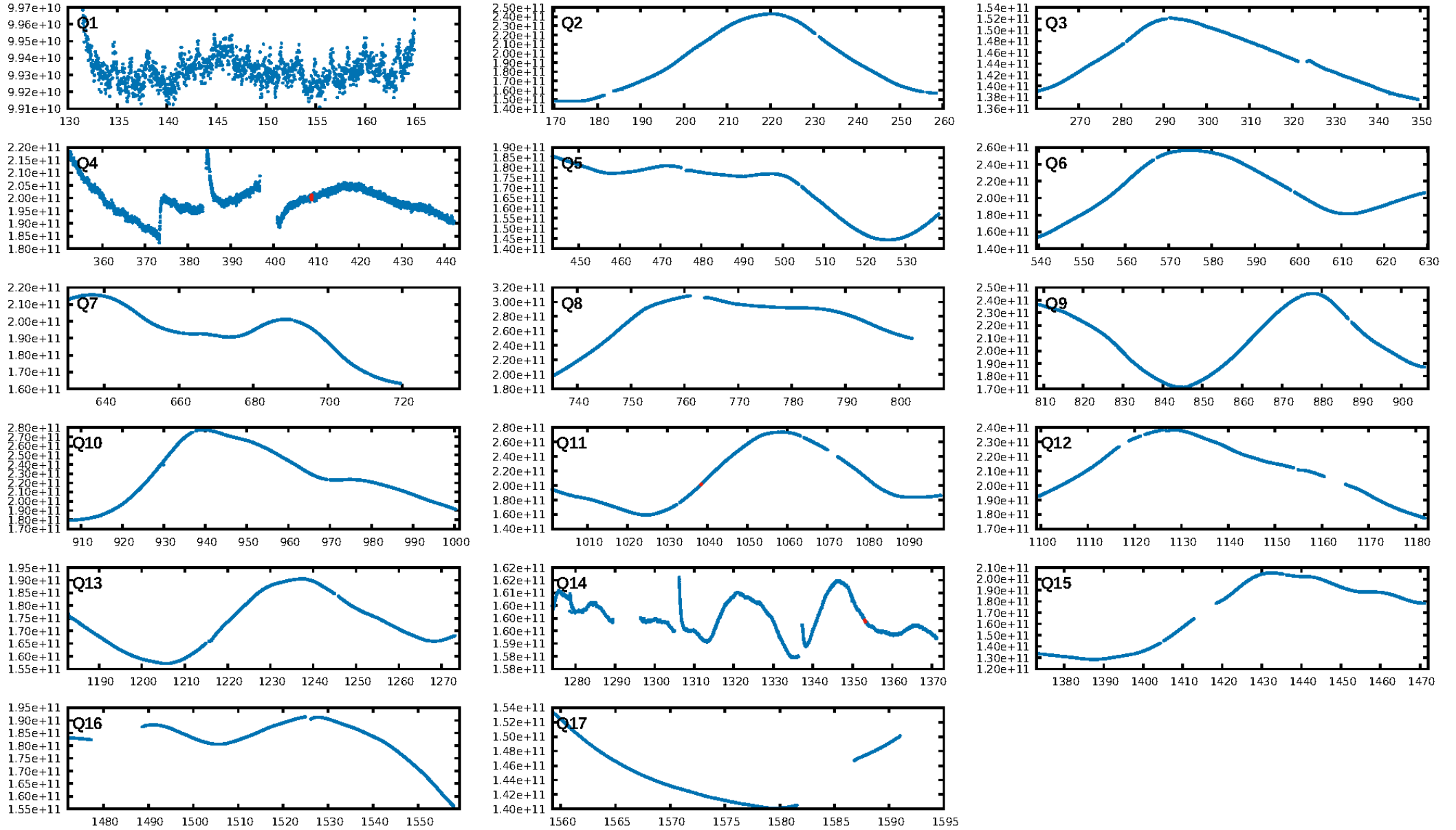
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [476.11σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.15e-15  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 44.7%  
Centroid-so: 37.715 arcsec [0.79σ]  
OotOffset-rm: 207.721 arcsec [1.59σ]  
KicOffset-rm: 259.974 arcsec [2.93σ]  
OotOffset-st: 1/0/1/0 [2]  
KicOffset-st: 1/0/1/0 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 1.00 [2/2]

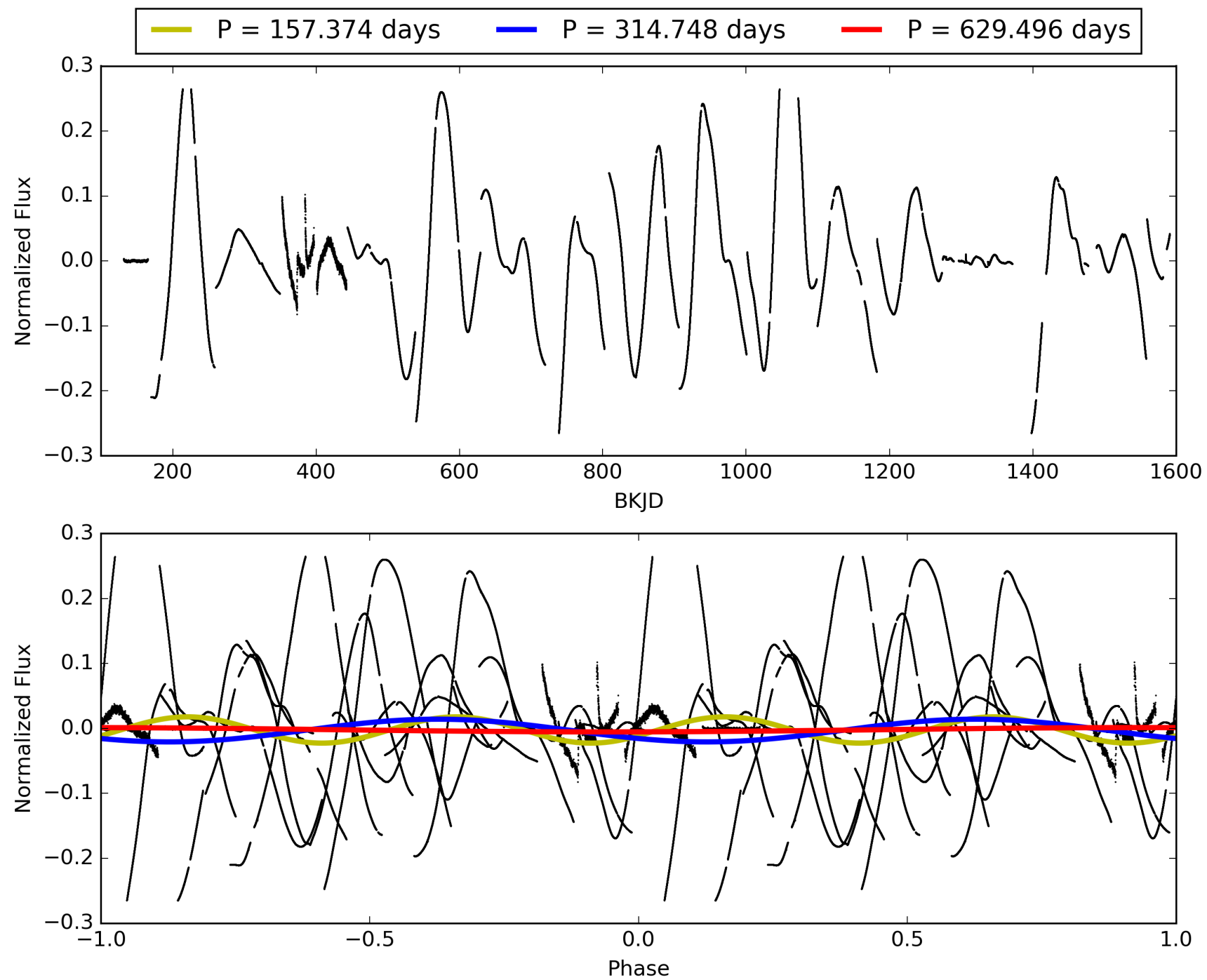
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 20:14:03 Z

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

# TCE 009528112-02, PDC Light Curves



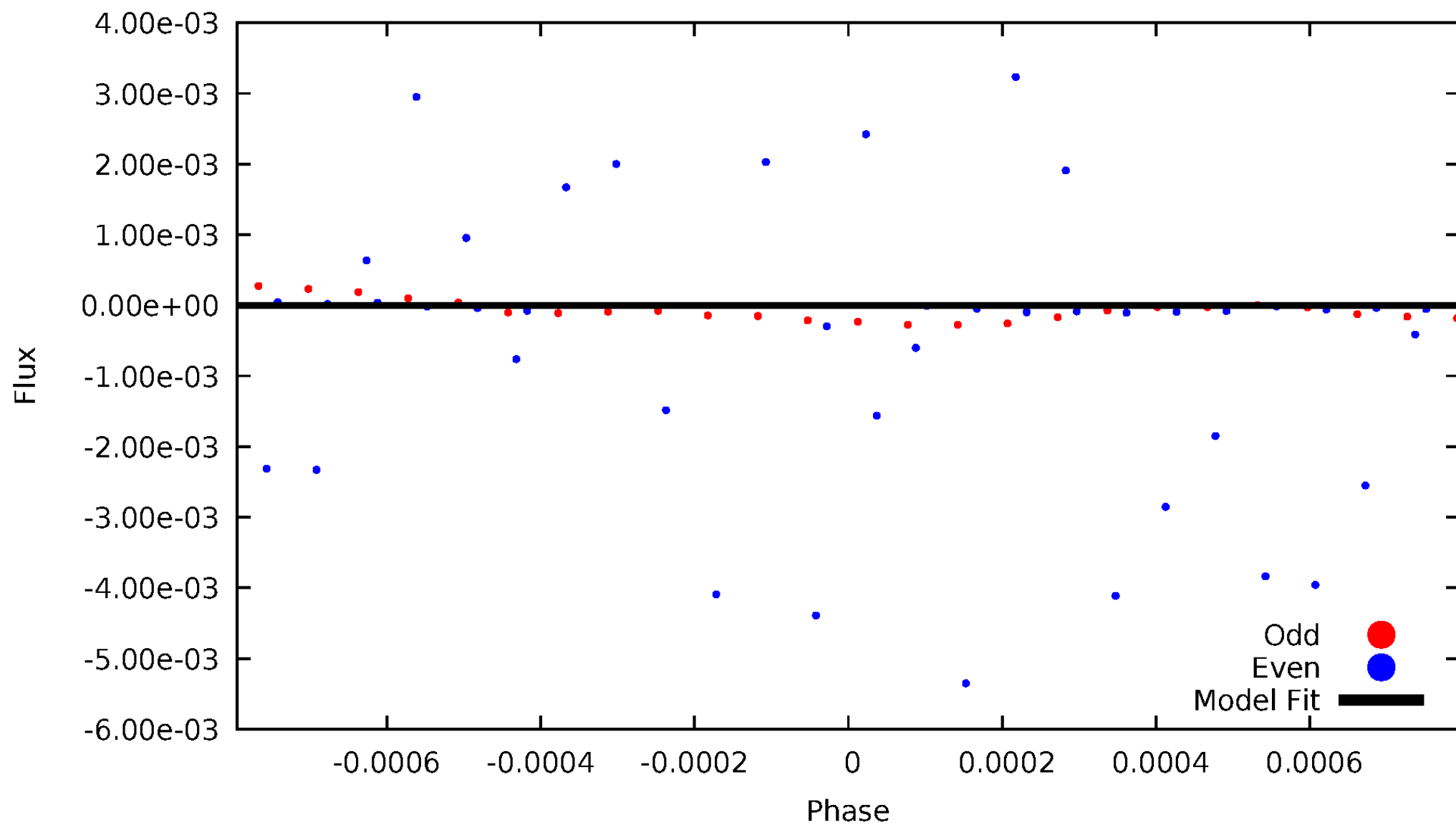
TCE 009528112-02





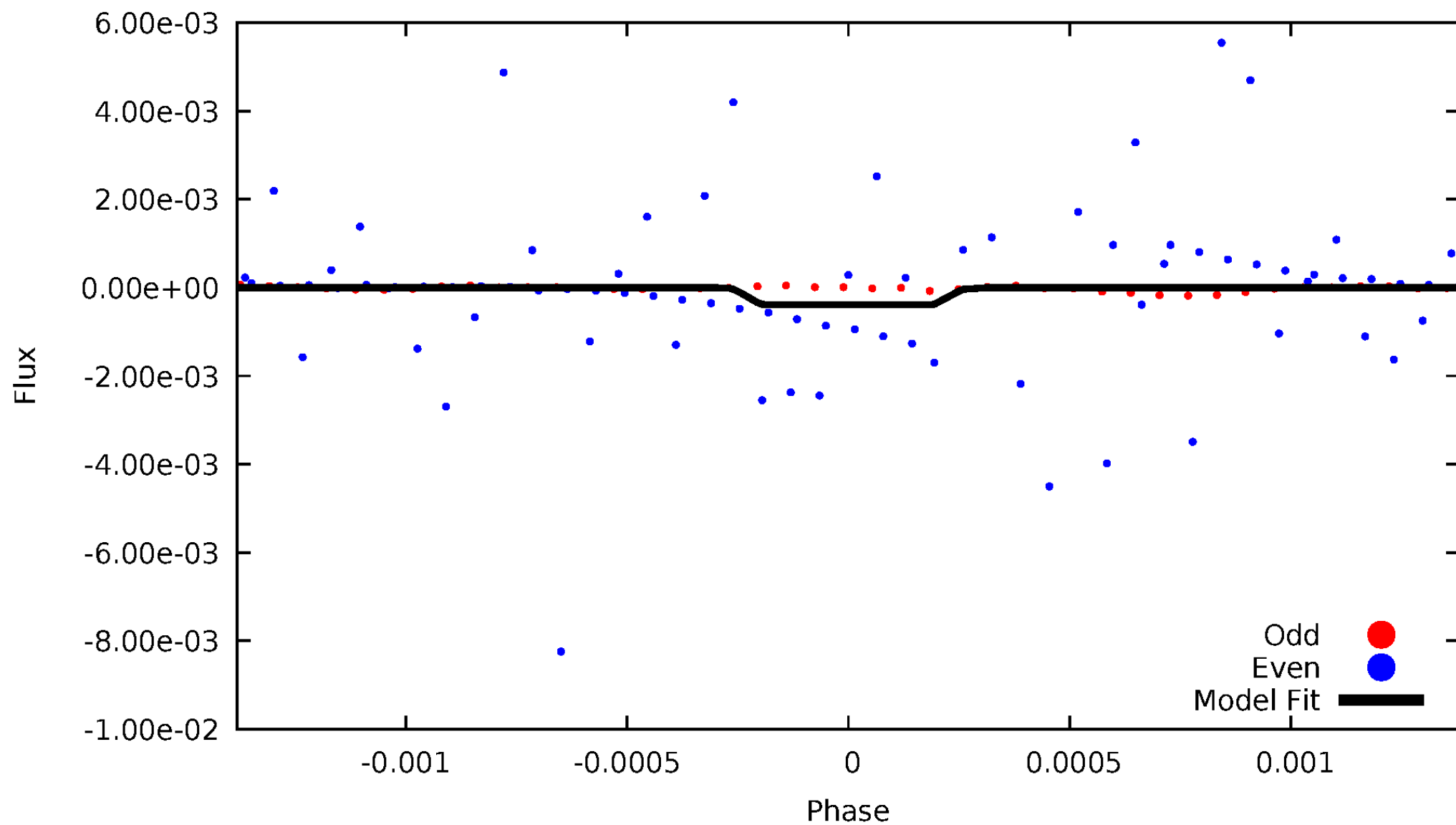
# DV Odd/Even

TCE 009528112-02



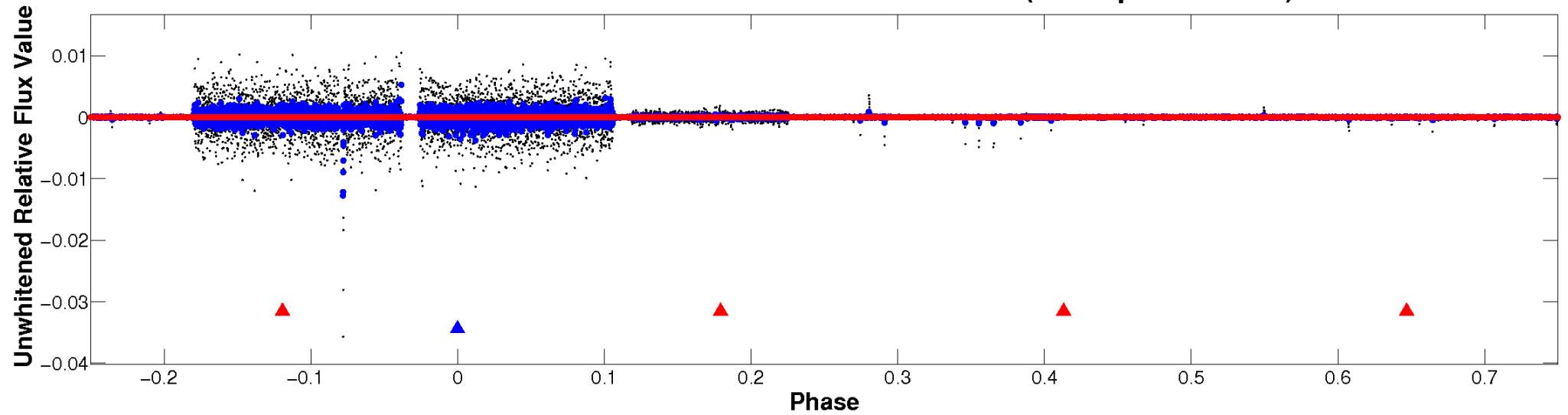
# ALT Odd/Even

TCE 009528112-02



# Non-Whitened Vs. Whitened Light Curve

**Planet 2 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

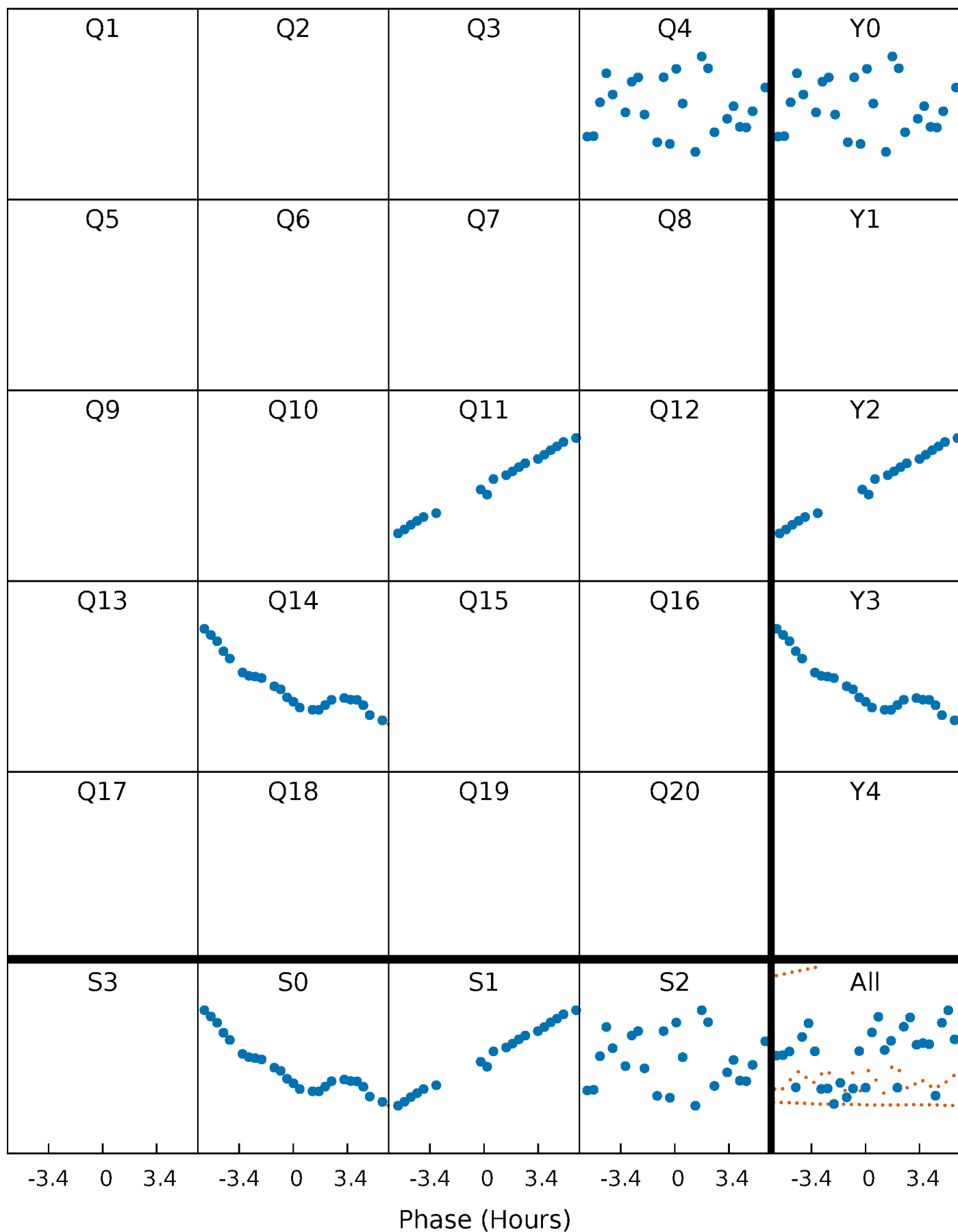


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

TCE 009528112-02 P=314.748175 Days  $T_0=408.888343$  (BKJD)



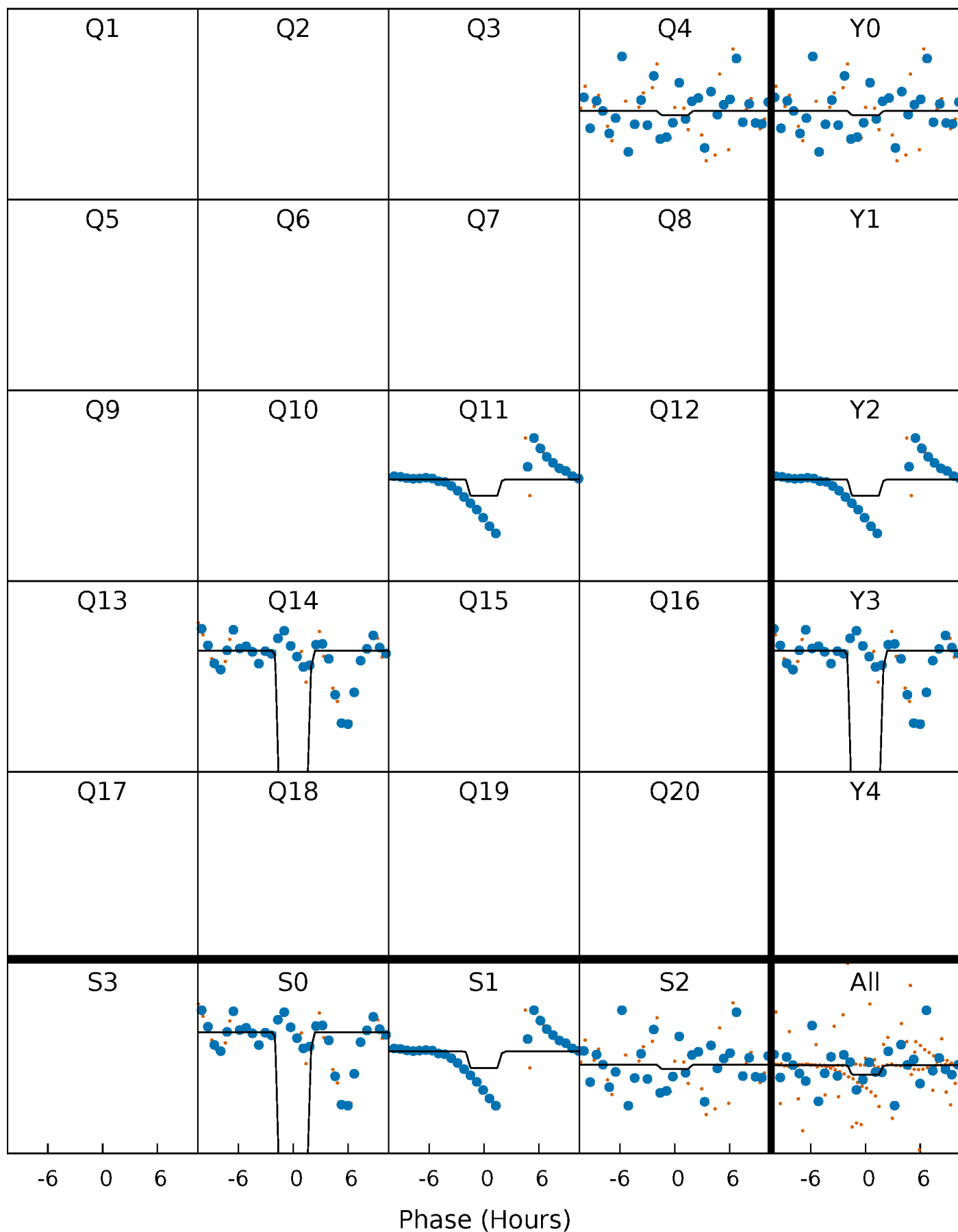
# DV Quarter-Phased Transit Curves

TCE 009528112-02     $P=314.748175$  Days     $T_0=408.888343$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

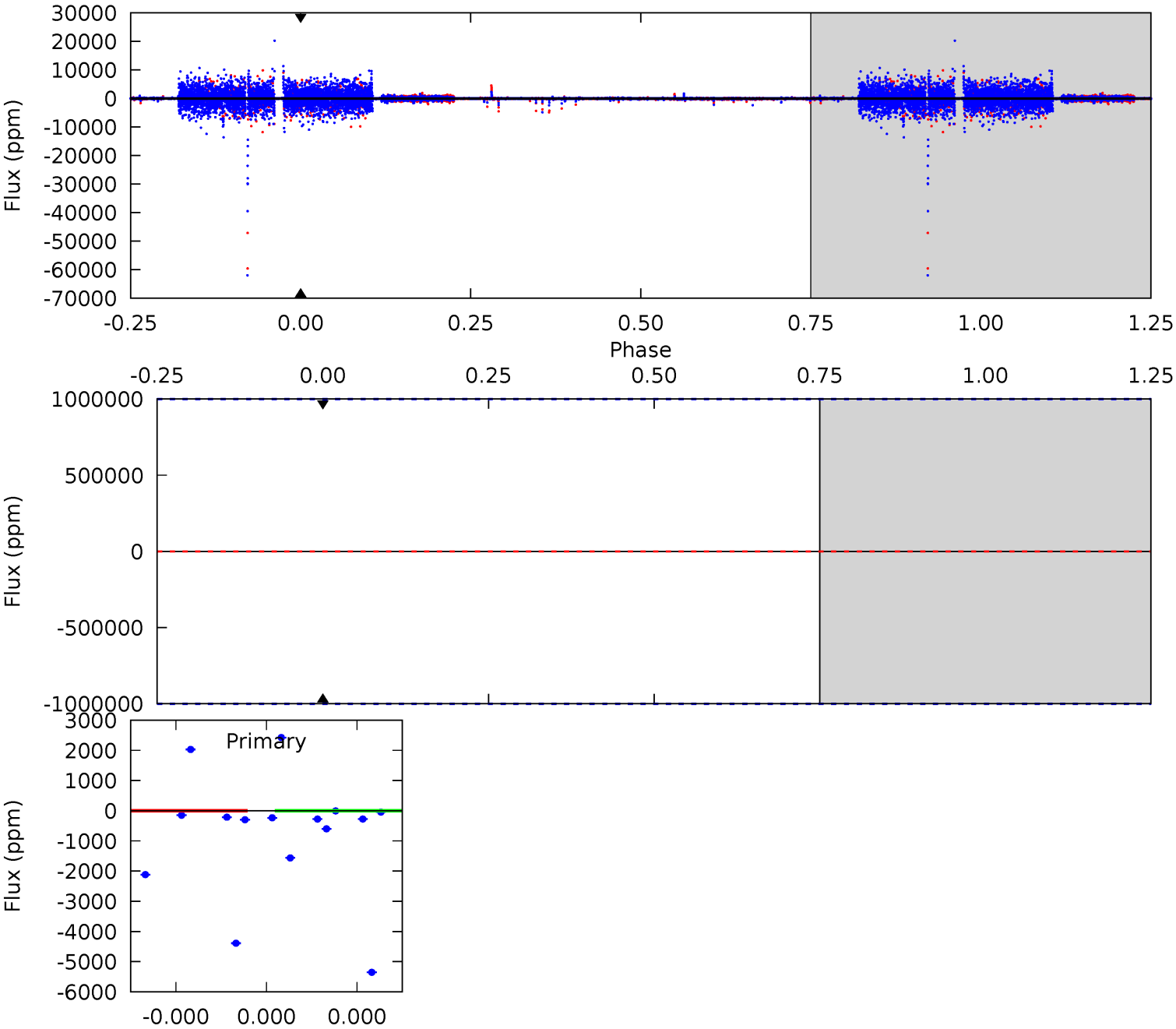
TCE 009528112-02     $P=314.748175$  Days     $T_0=408.691262$  (BKJD)



# DV Model-Shift Uniqueness Test

009528112-02, P = 314.748175 Days, E = 94.140168 Days

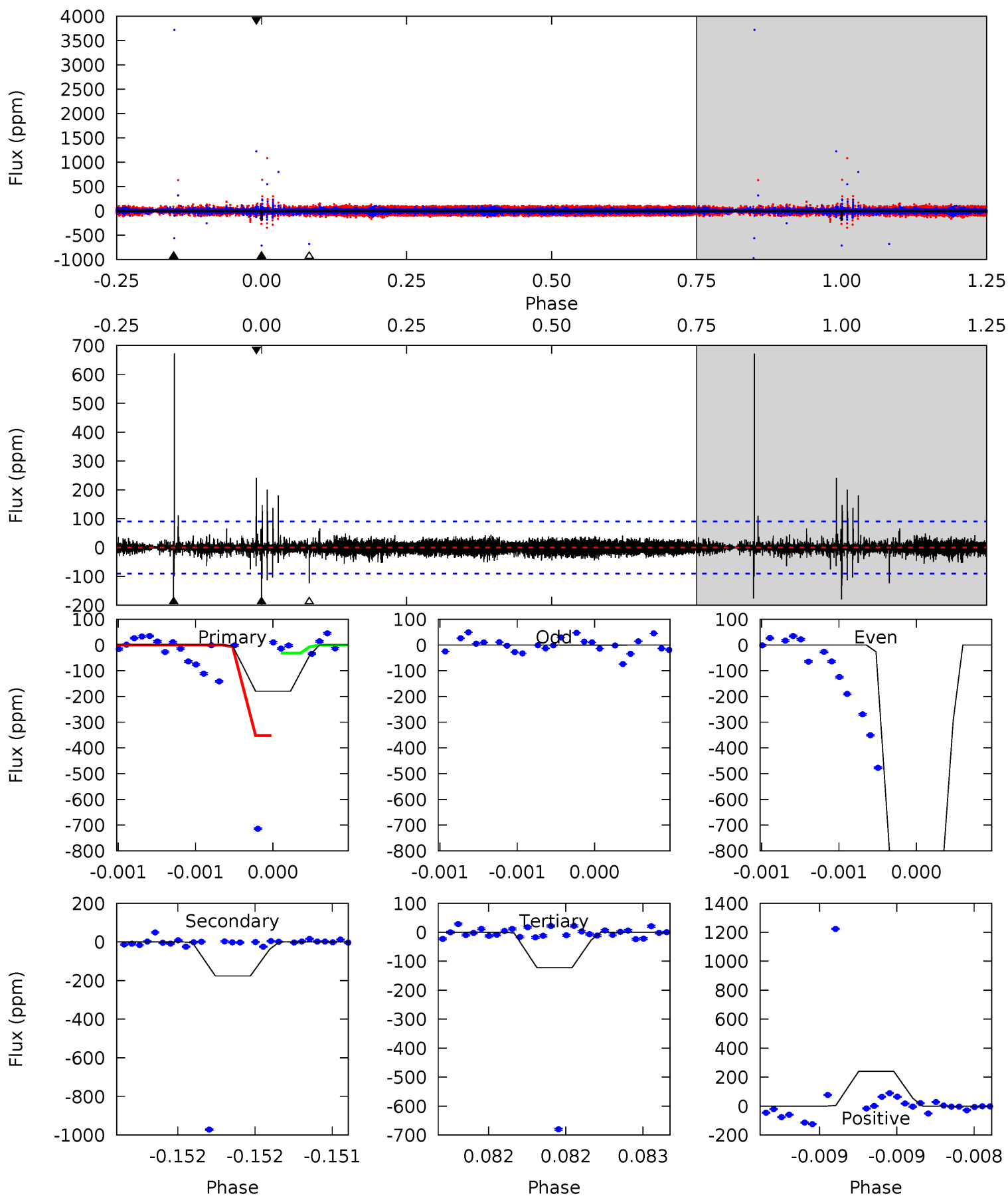
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009528112-02, P = 314.748175 Days, E = 93.943087 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
11.0	10.8	7.54	14.8	5.57	3.47	0.81	3.50	-3.76	3.29	-3.97	26.1	0.72	0.79	0





### Stellar Parameters For KIC 009528112

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3015^{+100}_{-61}$	$-0.115^{+0.200}_{-0.037}$	$0.160^{+0.200}_{-0.100}$	$184.929^{+7.349}_{-20.823}$	$0.957^{+0.282}_{-0.015}$	$0.000^{+0.000}_{-0.000}$
	+3%/-2%	+174%/-32%	+125%/-62%	+4%/-11%	+29%/-2%	+81%/-10%
Source	SPE14	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 009528112-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$1450.27^{+1588.37}_{-980.54}$	$2628^{+103}_{-111}$	$-2718^{+8362}_{-2908}$	$-0.229^{+38.560}_{-35.544}$
Alt.	$-176 \pm 16$	$1469.88^{+1605.43}_{-989.19}$	$2629^{+105}_{-115}$	$-2455^{+4543}_{-98}$	$0.038^{+0.318}_{-0.029}$

$T_{max}$  = 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

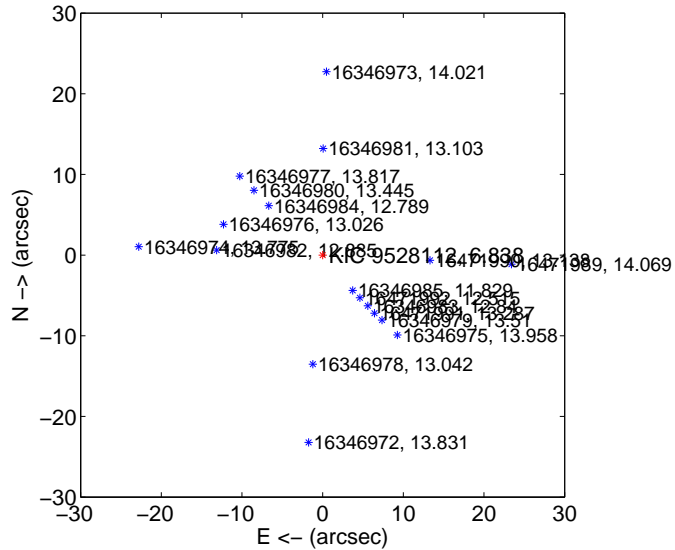
Supplemental centroid analysis for 009528112-02. **Kepler magnitude: 6.84.** Transit SNR -1.00

There are 0 quarters with good PRF difference image offsets

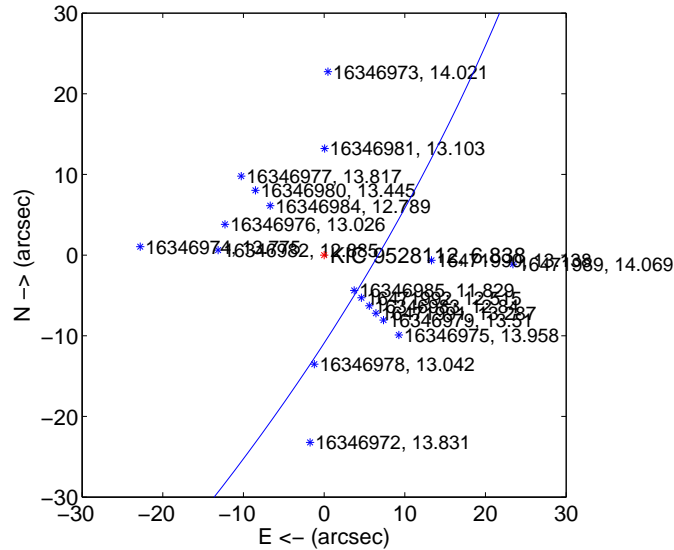
The OOT PRF centroid is offset from the target star catalog position by about 18.68 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$207.721 \pm 130.838$	1.59	$179.265 \pm 114.485$	$104.940 \pm 63.416$
PRF-fit source offset from KIC position	$259.974 \pm 88.584$	2.93	$222.877 \pm 76.920$	$133.838 \pm 43.978$
photometric centroid source offset	$37.71 \pm 47.79$	0.79	$-35.66 \pm 49.13$	$12.27 \pm 34.53$

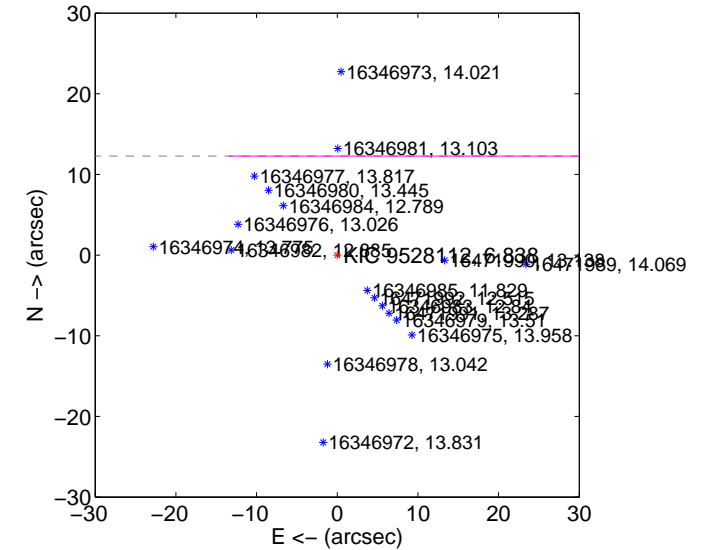
offset from difference PRF-fit to OOT PRF-fit



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.

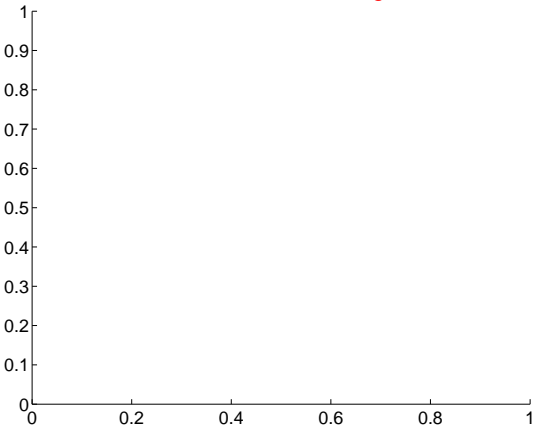
Q1 no difference image



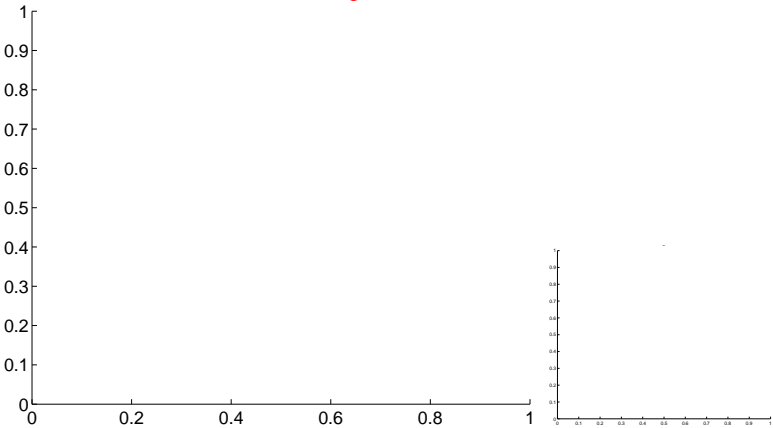
Q1 no OOT image



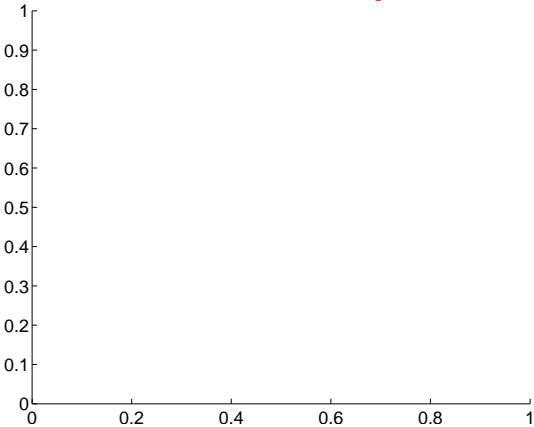
Q2 no difference image



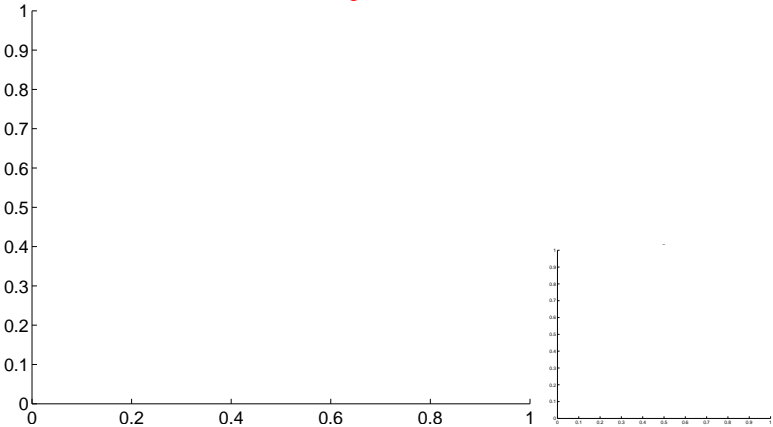
Q2 no OOT image



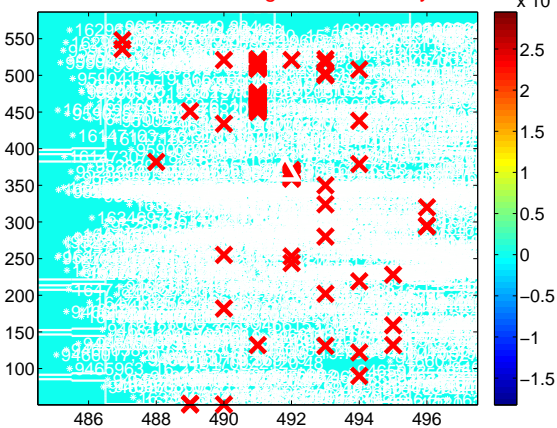
Q3 no difference image



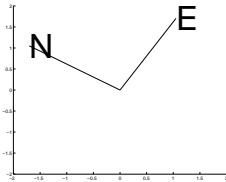
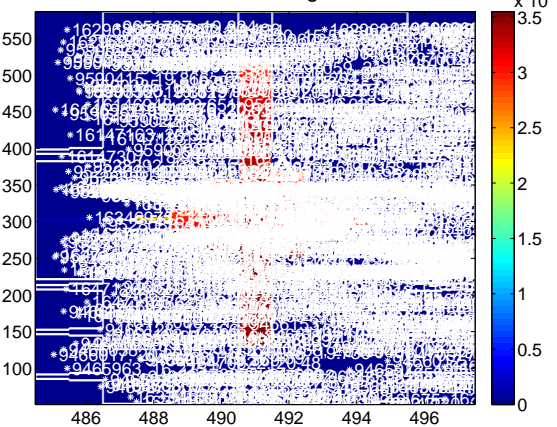
Q3 no OOT image



Q4 difference image. Poor Quality



Q4 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.

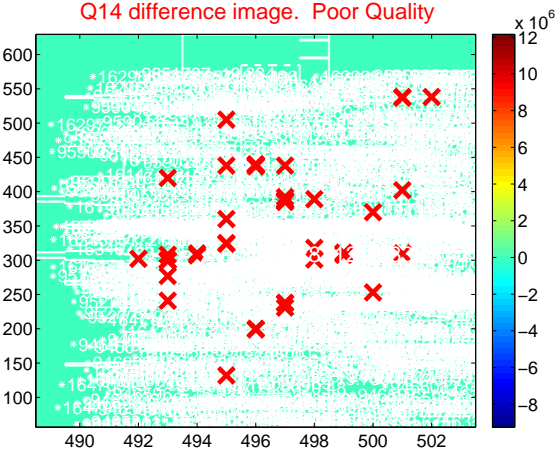
Q13 no difference image



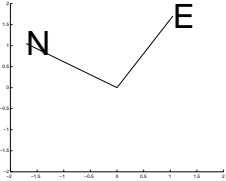
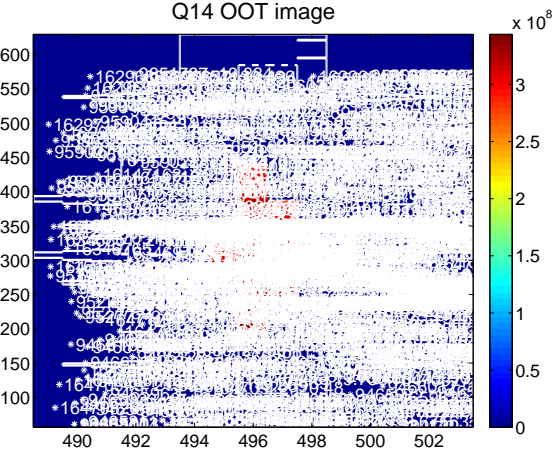
Q13 no OOT image



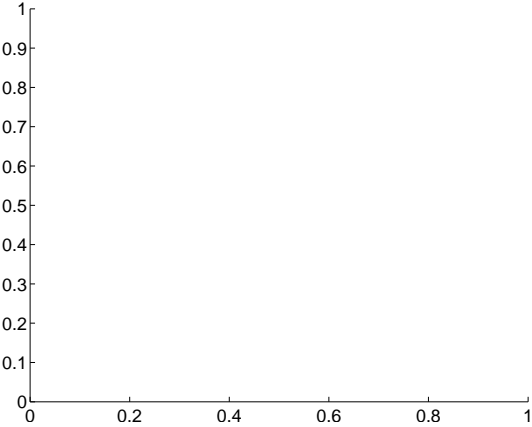
Q14 difference image. Poor Quality



Q14 OOT image



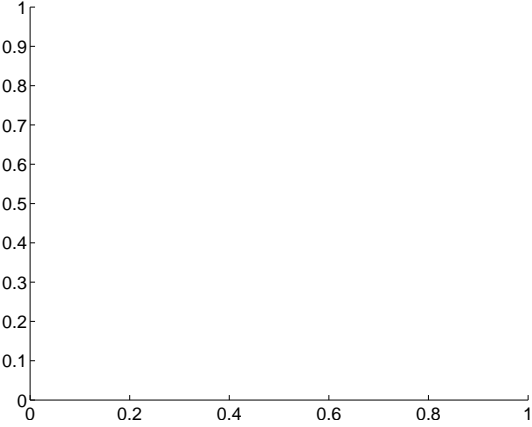
Q15 no difference image



Q15 no OOT image



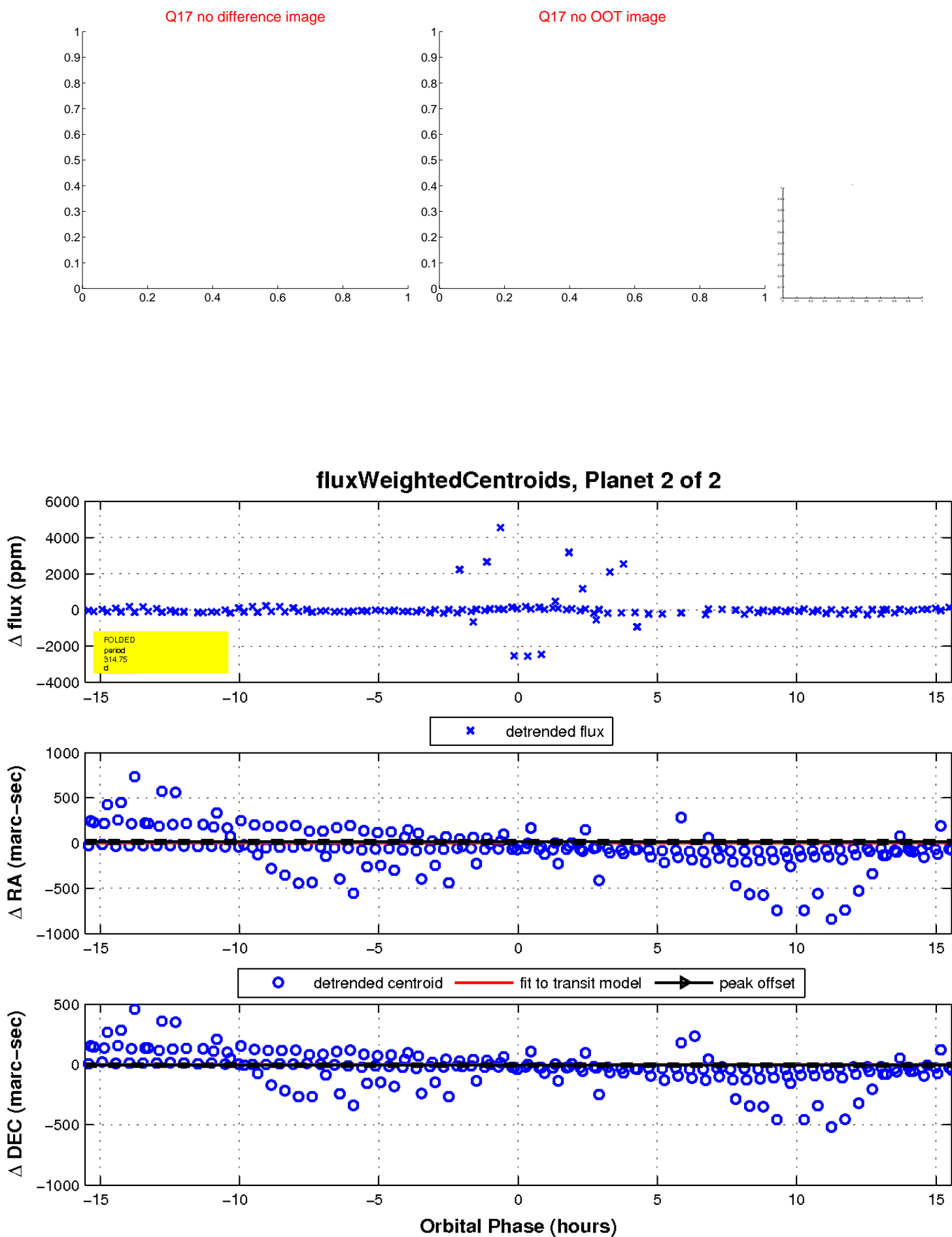
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

