

# KIC 009216367

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009216367-01	OBS	No	594.596093	218.977861	941.2	8.850	15.1	11.3	3.40	8061	18.09	14.56
009216367-02	OBS	No	478.046714	390.405015	577.3	9.670	14.1	9.2	3.40	8061	9.86	19.47
009216367-03	OBS	No	528.153153	144.791869	375.9	5.036	12.9	7.9	3.40	8061	7.35	17.05
009216367-04	OBS	No	471.785955	406.408997	405.6	5.628	12.4	9.0	3.40	8061	7.80	19.82
009216367-05	OBS	No	408.445669	290.784330	447.5	5.853	11.2	8.0	3.40	8061	8.04	24.02

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009216367-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
009216367-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

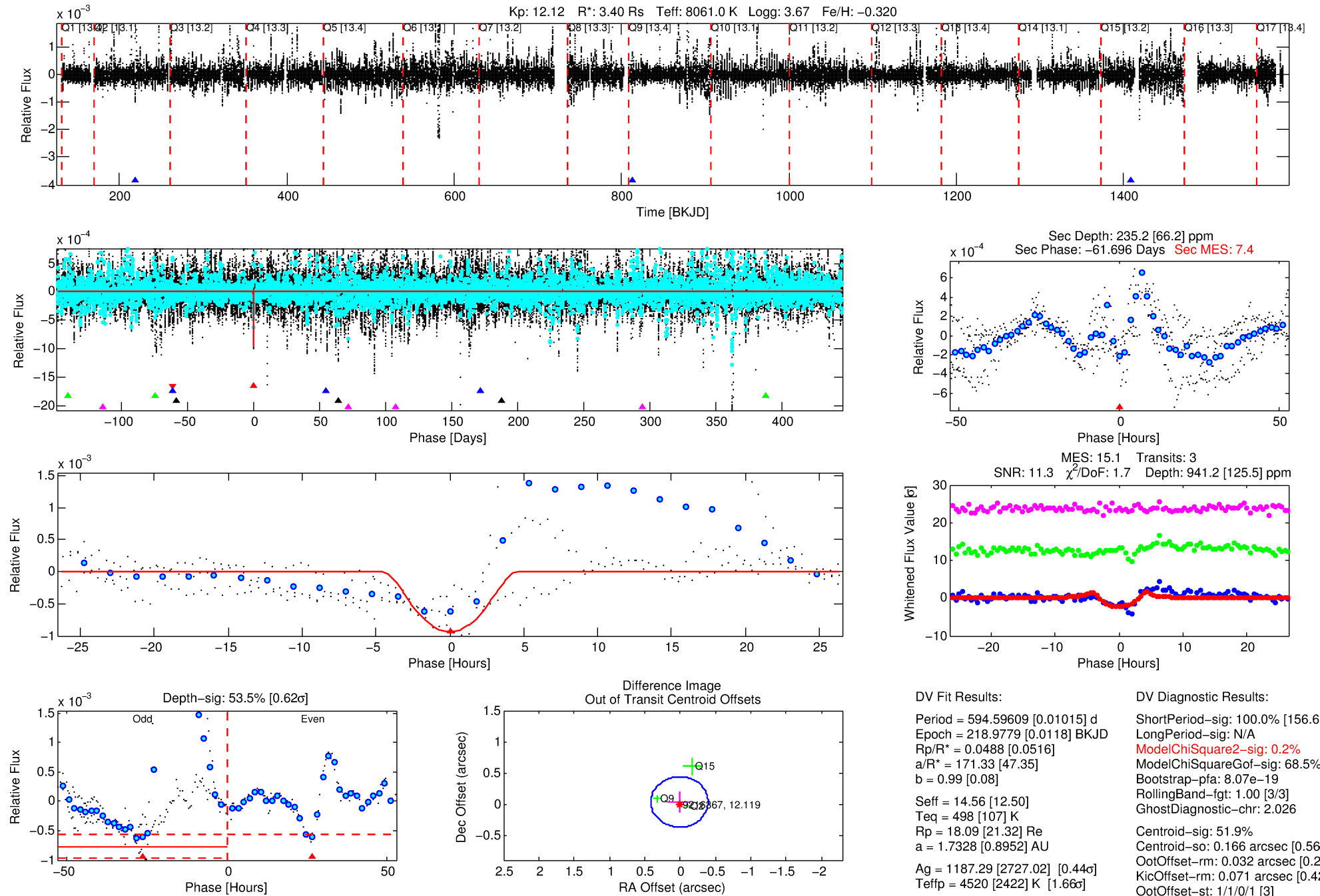
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009216367-01

No Significant Match Found

# DV One-Page Summary

KIC: 9216367 Candidate: 1 of 5 Period: 594.596 d



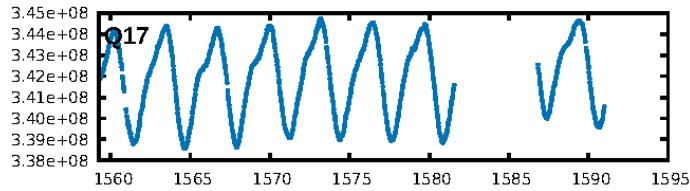
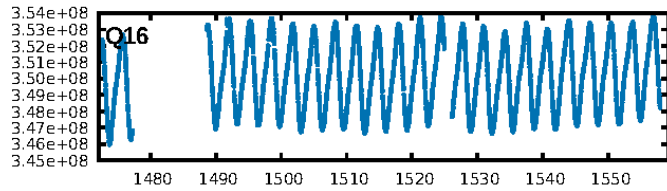
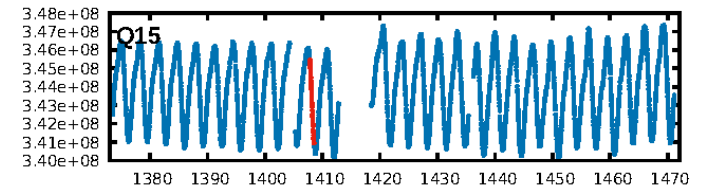
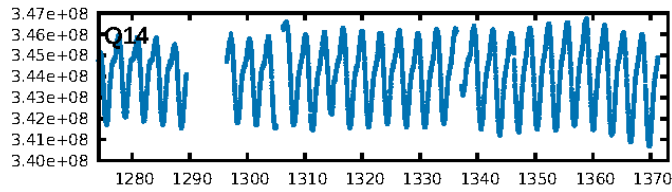
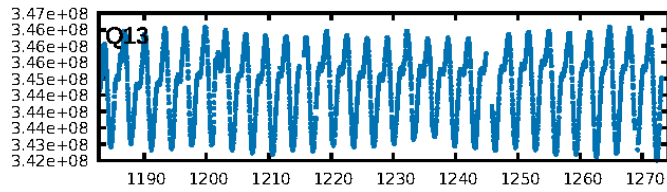
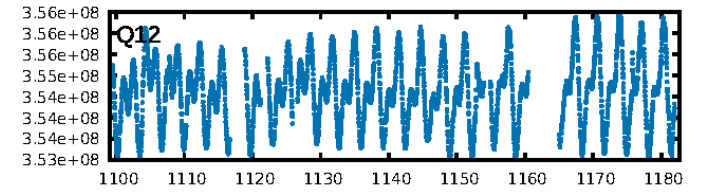
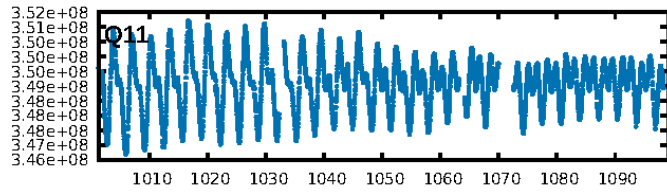
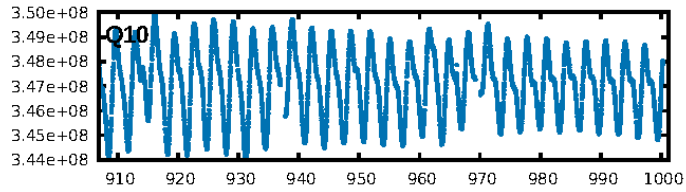
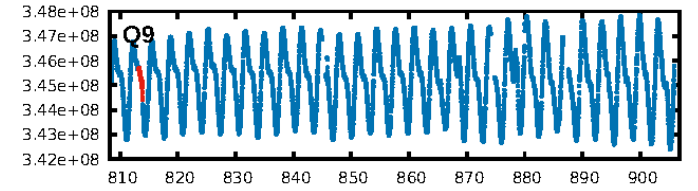
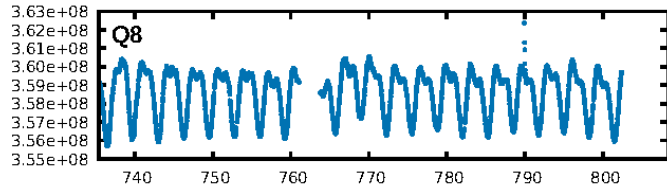
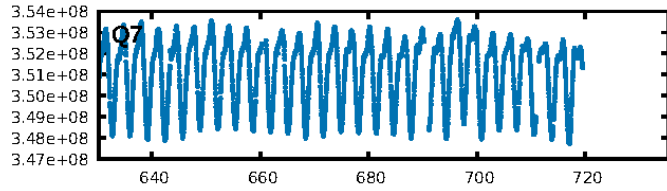
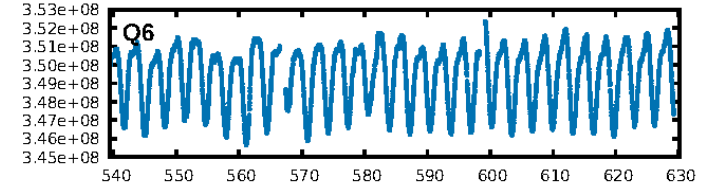
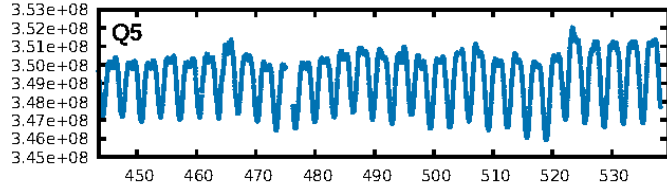
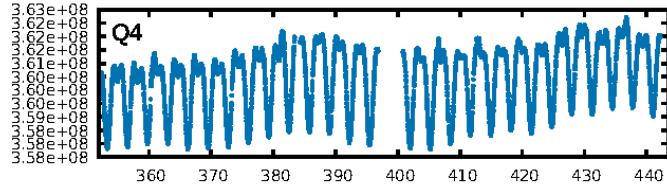
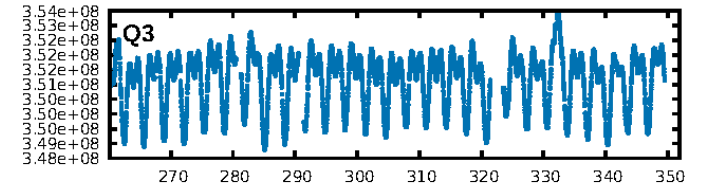
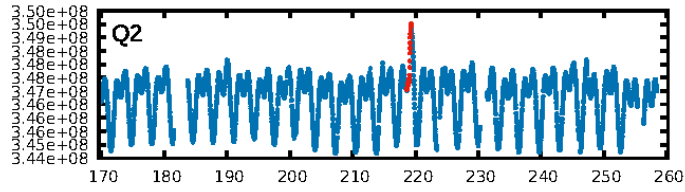
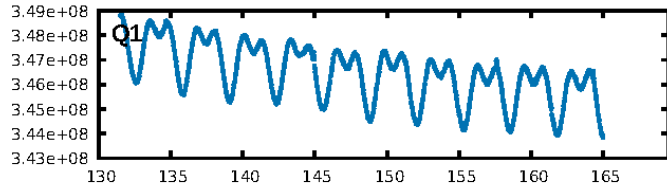
## DV Fit Results:

Period = 594.59609 [0.01015] d  
Epoch = 218.9779 [0.0118] BKJD  
Rp/R\* = 0.0488 [0.0516]  
a/R\* = 171.33 [47.35]  
b = 0.99 [0.08]  
Seff = 14.56 [12.50]  
Teq = 498 [107] K  
Rp = 18.09 [21.32] Re  
a = 1.7328 [0.8952] AU  
Ag = 1187.29 [2727.02] [0.44 $\sigma$ ]  
Teffp = 4520 [2422] K [1.66 $\sigma$ ]

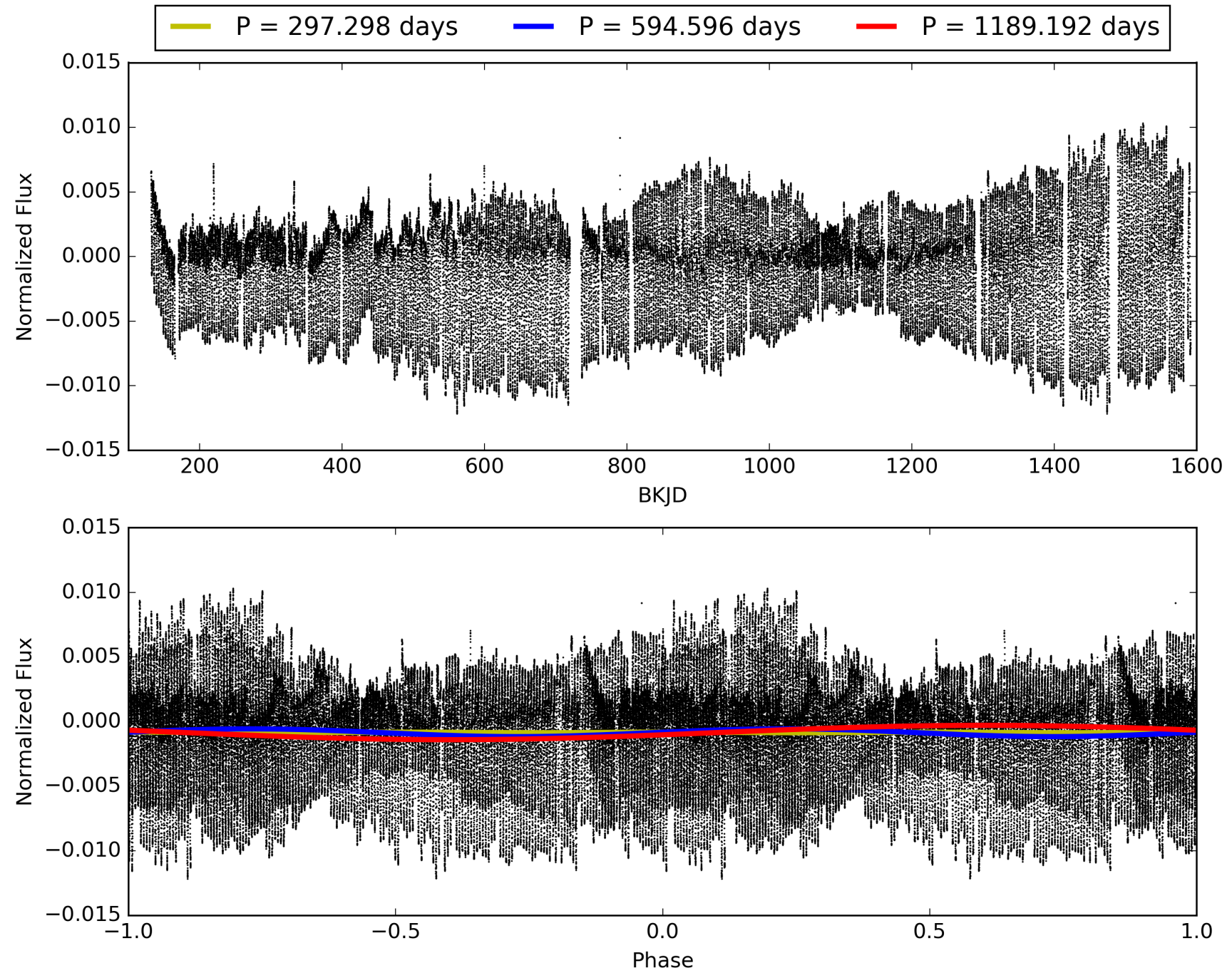
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [156.60 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.2%  
ModelChiSquareGof-sig: 68.5%  
Bootstrap-pfa: 8.07e-19  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 2.026  
Centroid-sig: 51.9%  
Centroid-so: 0.166 arcsec [0.56 $\sigma$ ]  
OotOffset-rm: 0.032 arcsec [0.24 $\sigma$ ]  
KicOffset-rm: 0.071 arcsec [0.42 $\sigma$ ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 009216367-01, PDC Light Curves



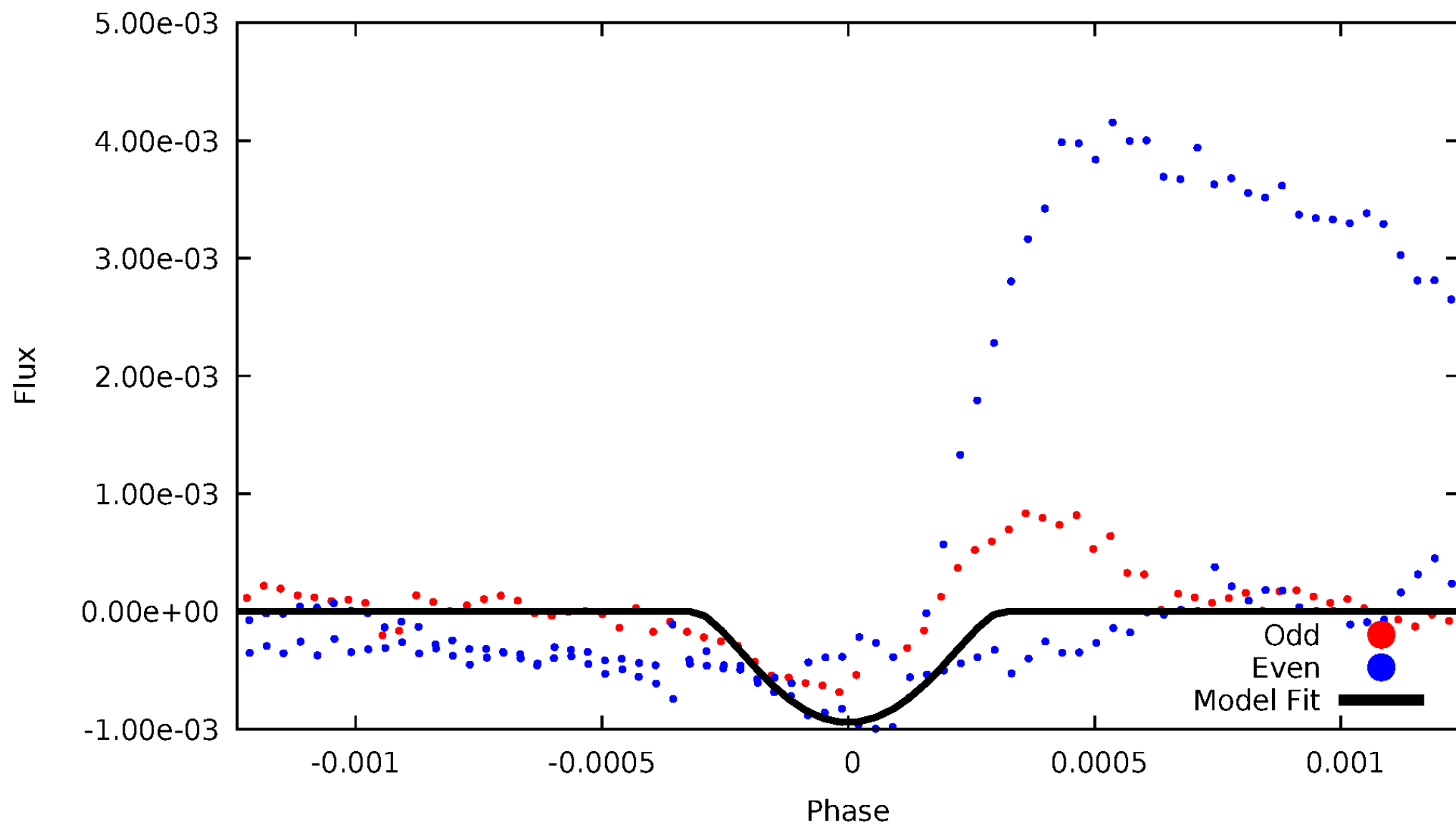
TCE 009216367-01





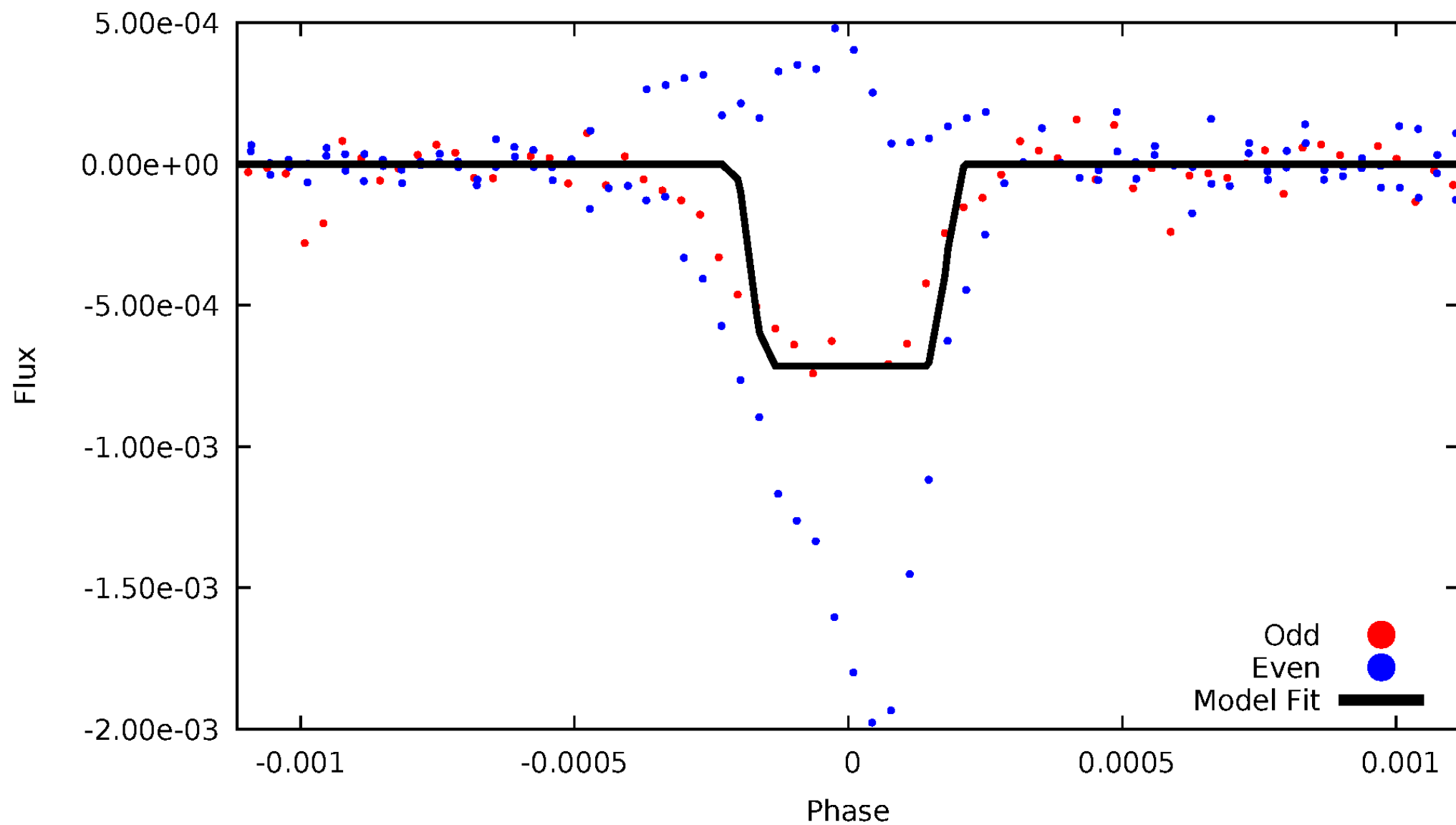
# DV Odd/Even

TCE 009216367-01



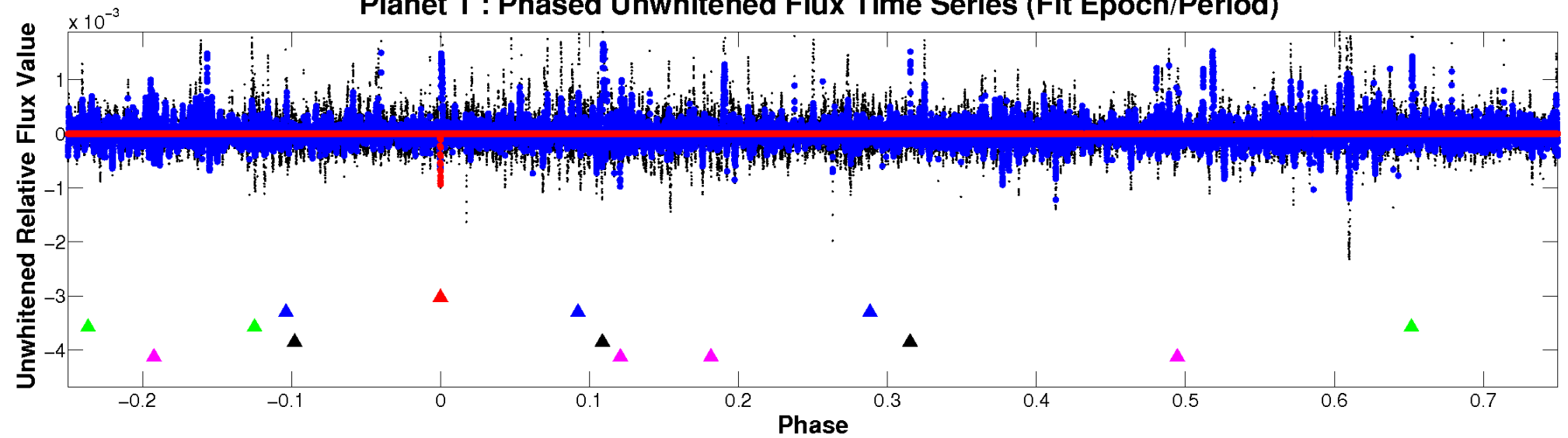
# ALT Odd/Even

TCE 009216367-01

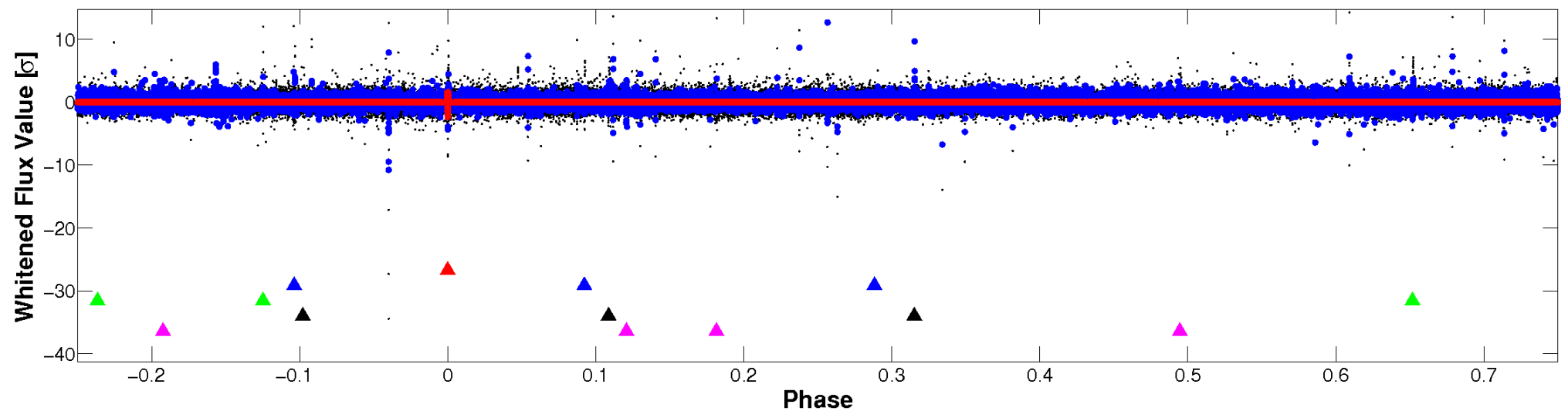


# Non-Whitened Vs. Whitened Light Curve

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

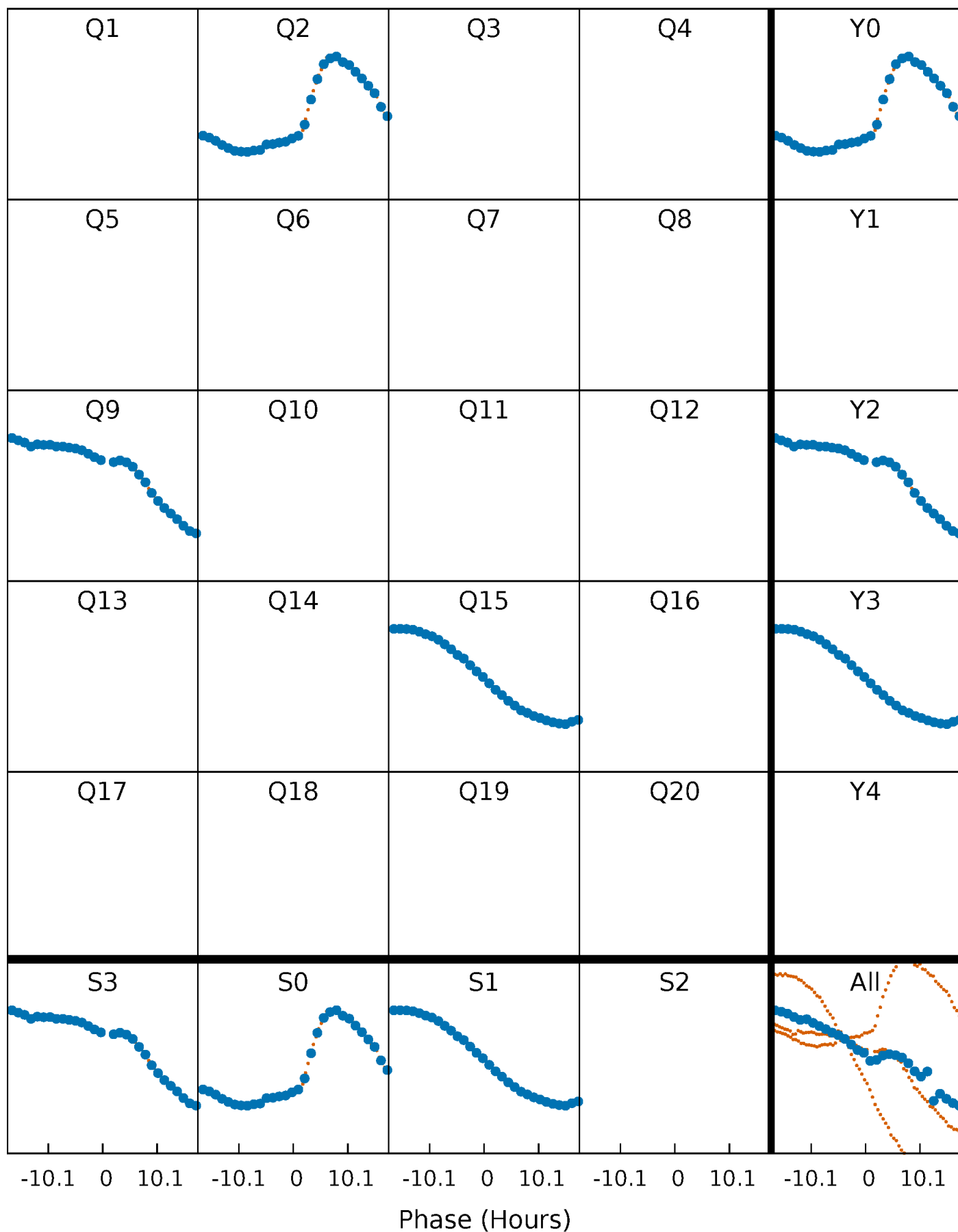


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

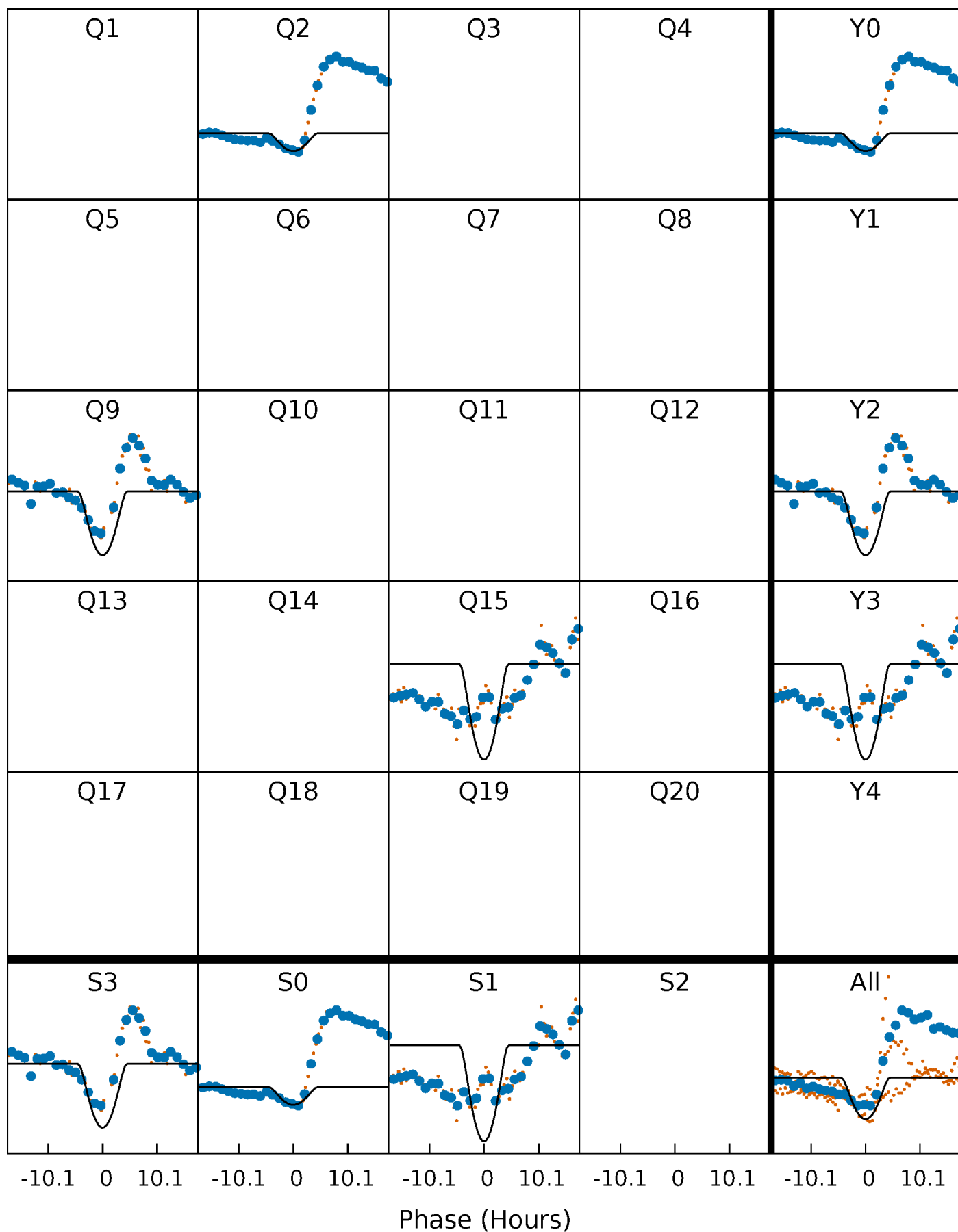
TCE 009216367-01 P=594.596093 Days  $T_0=218.977861$  (BKJD)





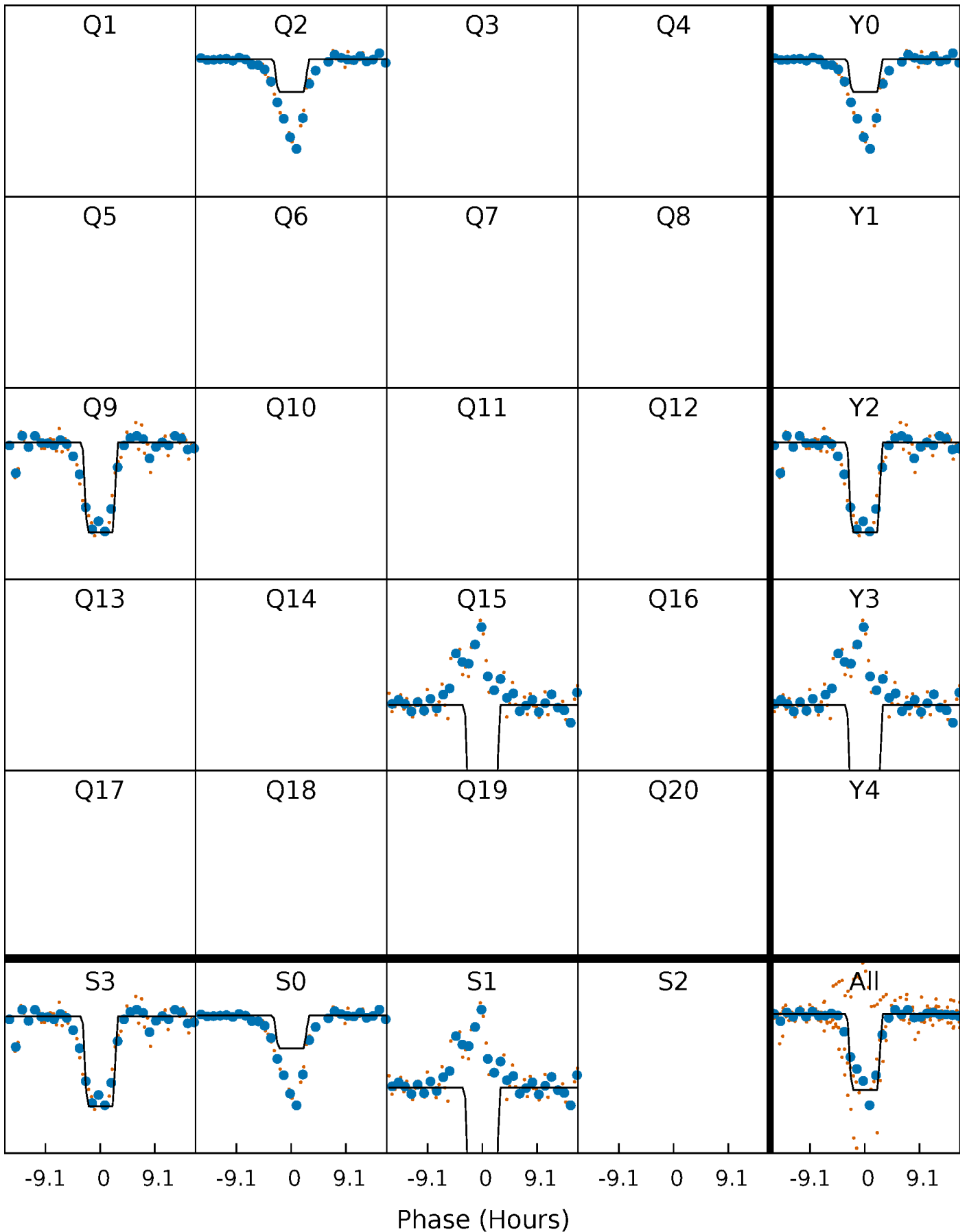
# DV Quarter-Phased Transit Curves

TCE 009216367-01   P=594.596093 Days    $T_0=218.977861$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

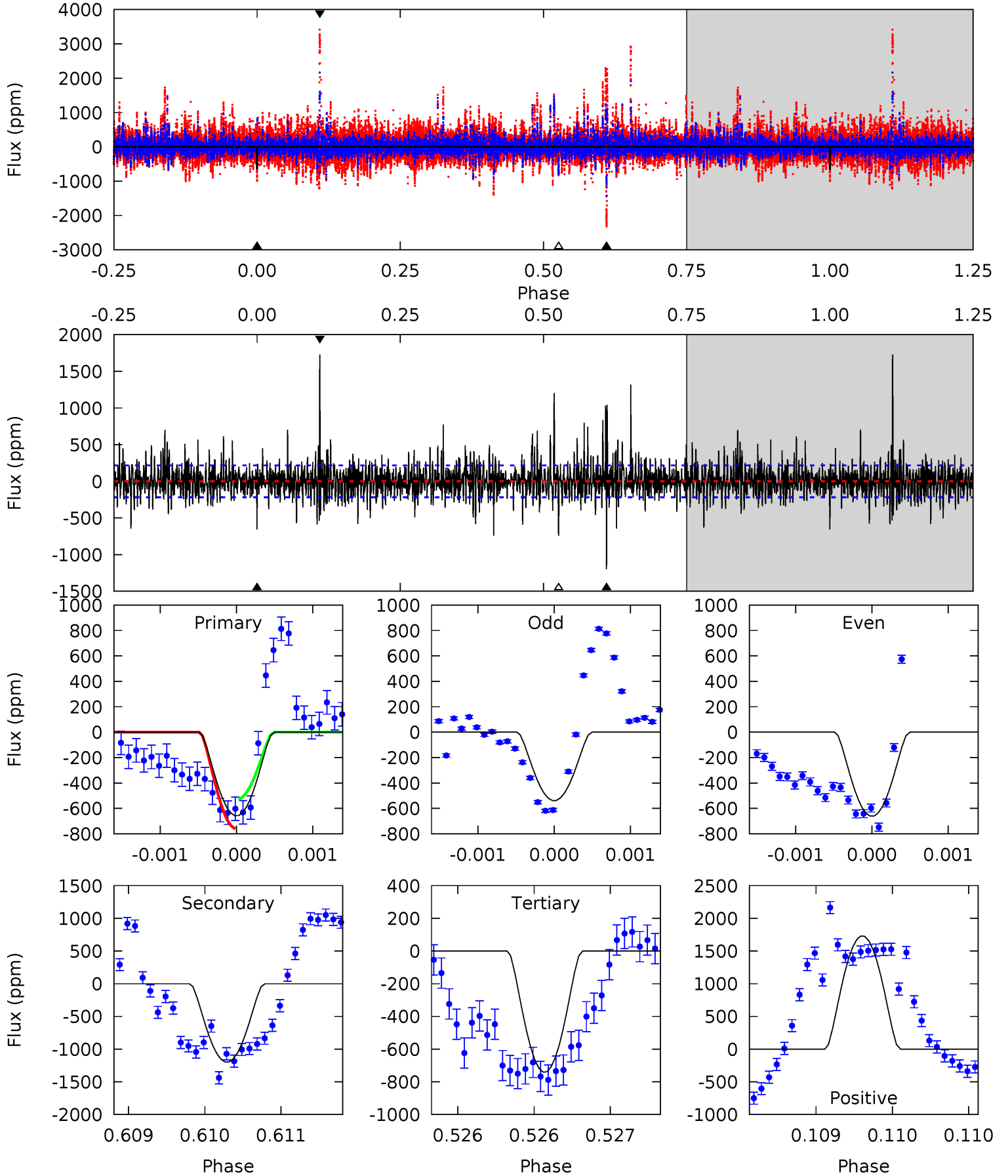
TCE 009216367-01 P=594.596162 Days  $T_0=219.005352$  (BKJD)



# DV Model-Shift Uniqueness Test

009216367-01, P = 594.596093 Days, E = 218.977861 Days

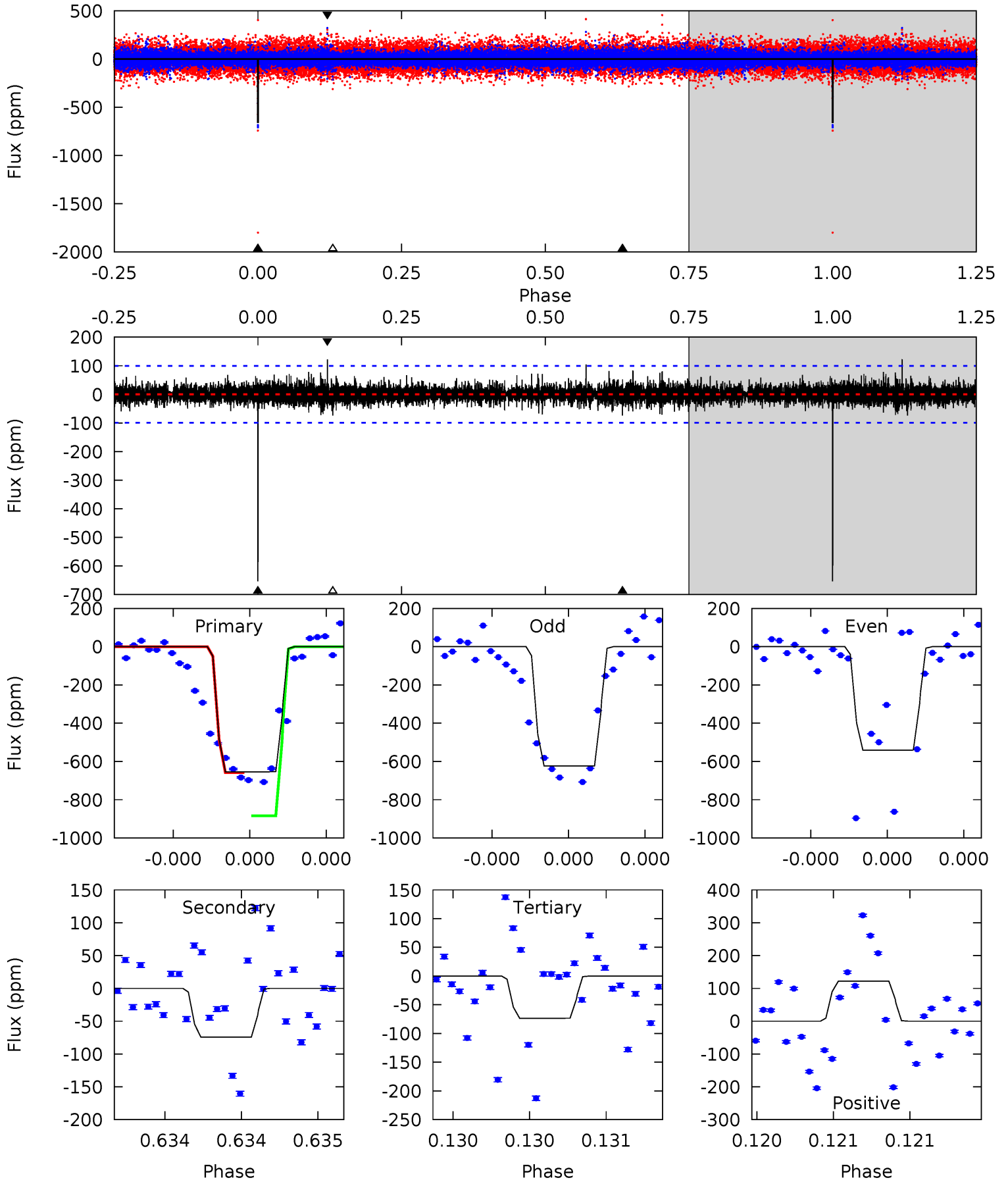
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.7	30.5	18.9	44.0	5.53	3.41	4.51	-2.12	-27.3	11.6	-13.5	1.32	1.11	0.59	2.89



# Alt Model-Shift Uniqueness Test

009216367-01, P = 594.596162 Days, E = 219.005352 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
36.9	4.19	4.14	6.89	5.60	3.53	0.89	32.7	30.0	0.05	-2.70	3.18	0.99	0.16	0





### Stellar Parameters For KIC 009216367

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8061^{+223}_{-334}$	$3.668^{+0.501}_{-0.088}$	$-0.320^{+0.200}_{-0.300}$	$3.399^{+0.586}_{-1.759}$	$1.964^{+0.204}_{-0.510}$	$0.070^{+0.388}_{-0.019}$
	+3%/-4%	+14%/-2%	+62%/-94%	+17%/-52%	+10%/-26%	+551%/-27%
Source	KIC0	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 009216367-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1197 \pm 39$	$17.80^{+17.70}_{-11.08}$	$668^{+51}_{-91}$	$6093^{+5114}_{-1407}$	$6178^{+34932}_{-4626}$
Alt.	$-74 \pm 18$	$15.48^{+14.70}_{-10.54}$	$674^{+47}_{-84}$	$3756^{+1935}_{-681}$	$512^{+4164}_{-382}$

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

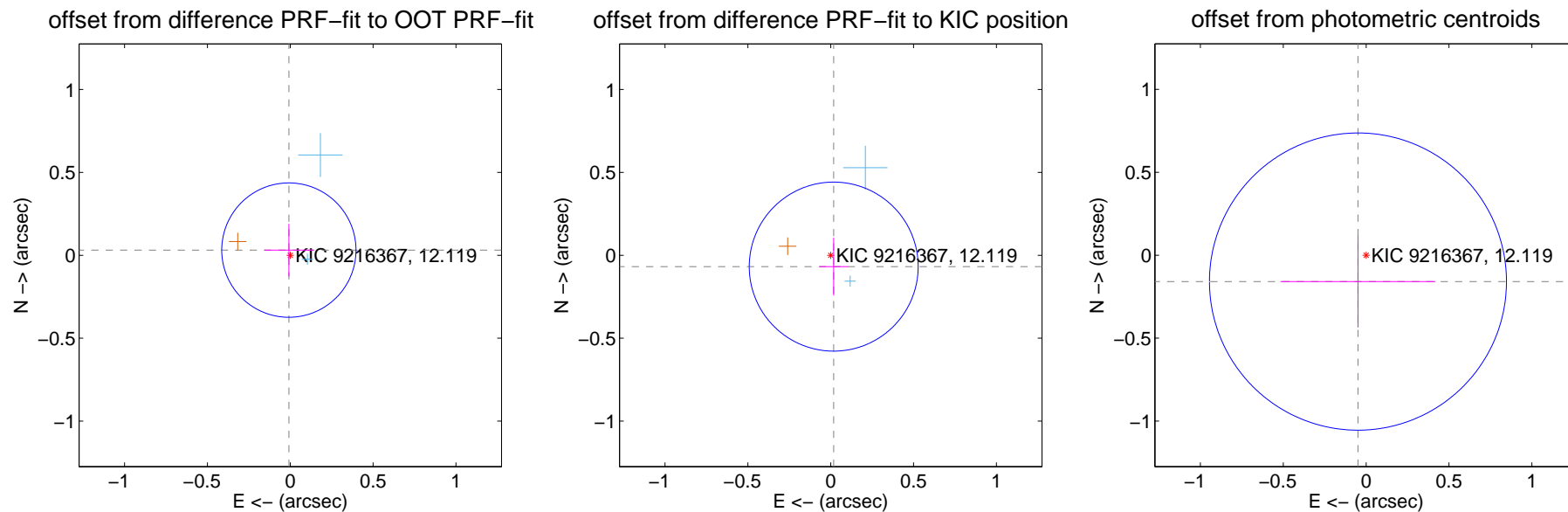
## DV Centroid Data

Supplemental centroid analysis for 009216367-01. Kepler magnitude: 12.12. Transit SNR 11.29

There are 2 quarters with good PRF difference image offsets

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

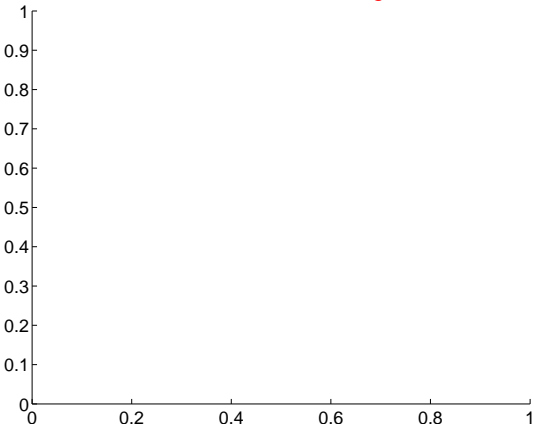
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.032 \pm 0.135$	0.24	$0.008 \pm 0.148$	$0.031 \pm 0.159$
PRF-fit source offset from KIC position	$0.071 \pm 0.170$	0.42	$-0.018 \pm 0.087$	$-0.068 \pm 0.174$
photometric centroid source offset	$0.17 \pm 0.30$	0.56	$0.05 \pm 0.47$	$-0.16 \pm 0.28$



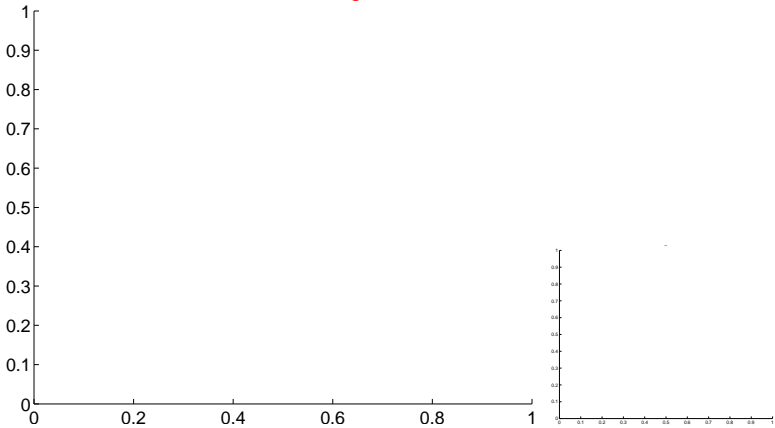
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

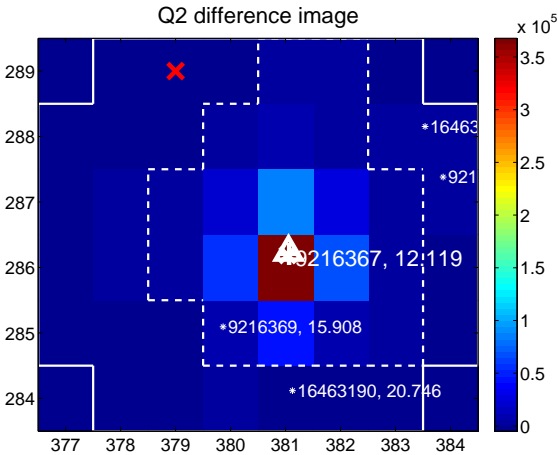
Q1 no difference image



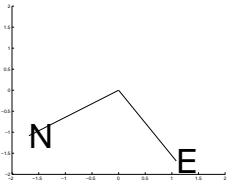
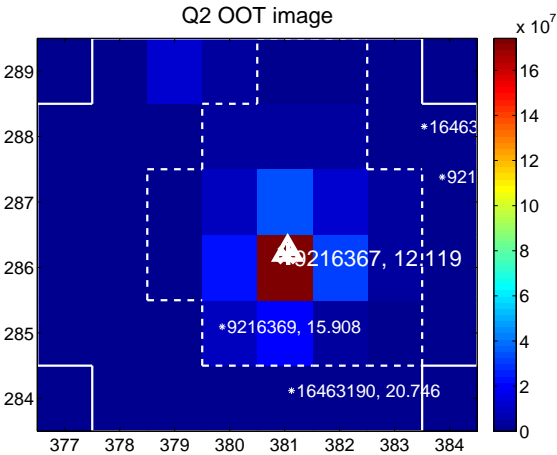
Q1 no OOT image



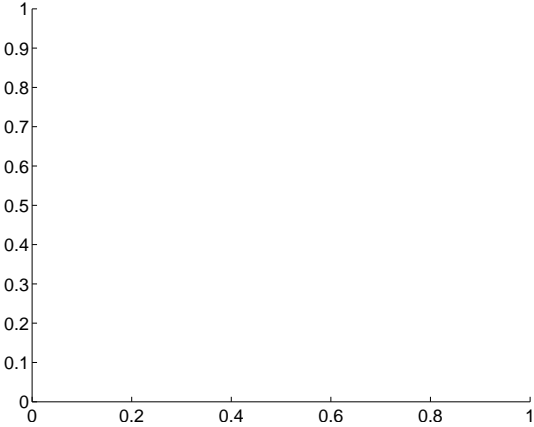
Q2 difference image



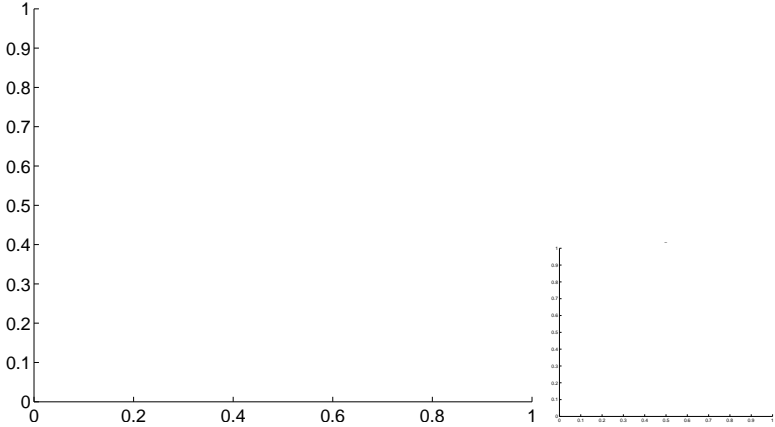
Q2 OOT image



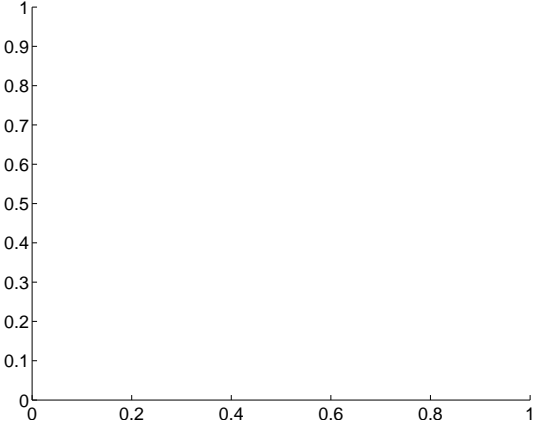
Q3 no difference image



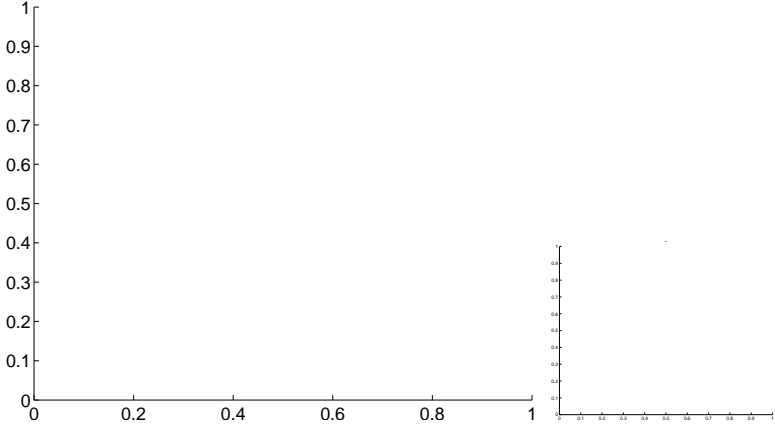
Q3 no OOT image



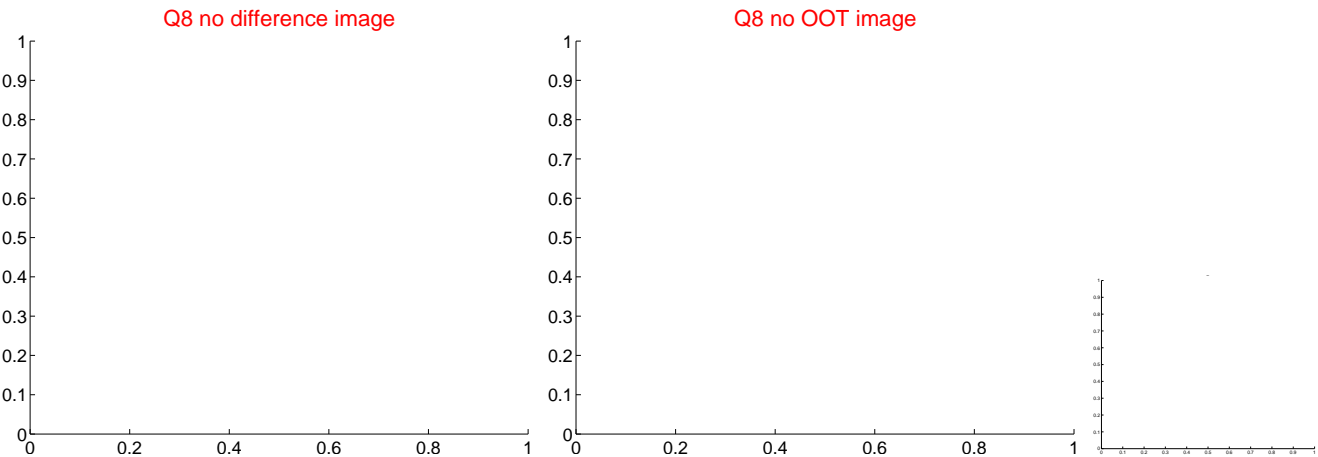
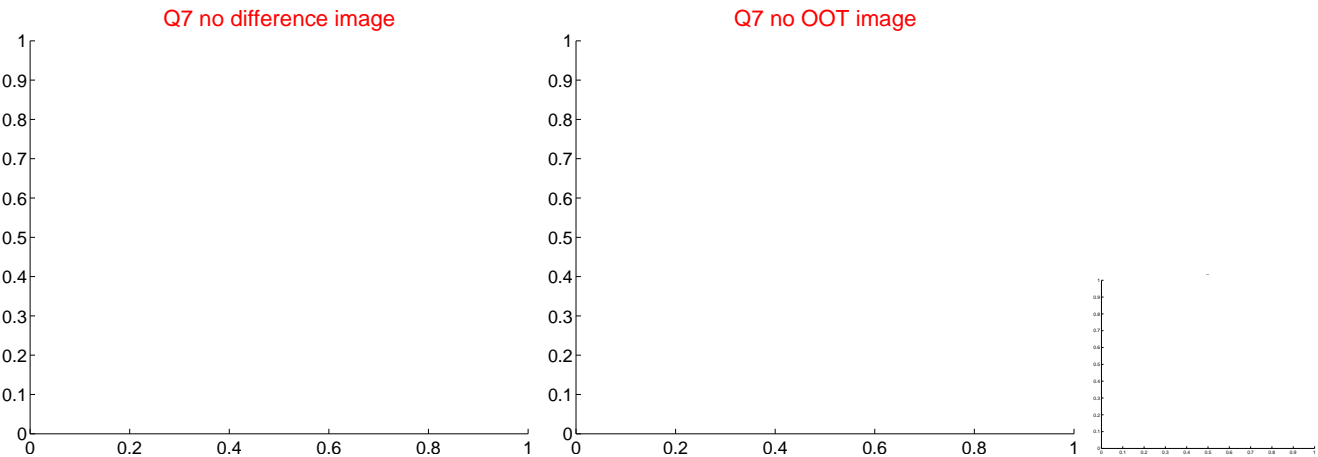
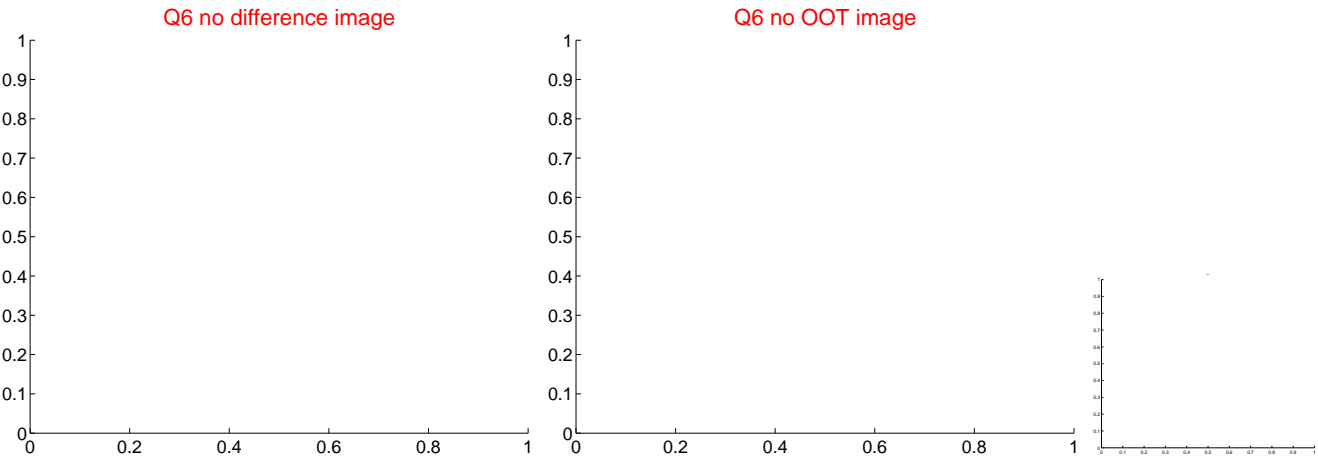
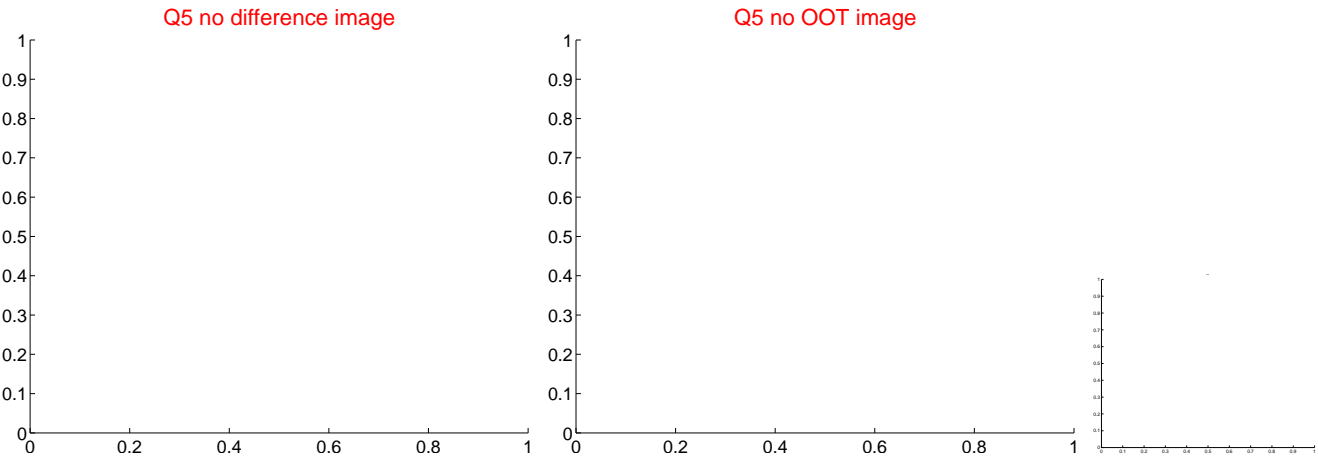
Q4 no difference image



Q4 no OOT image

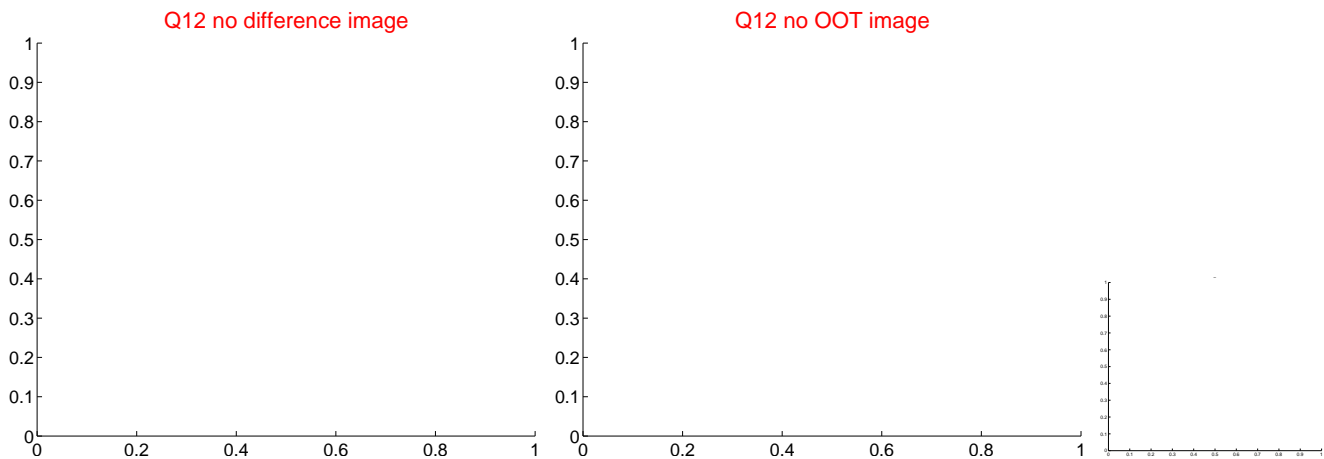
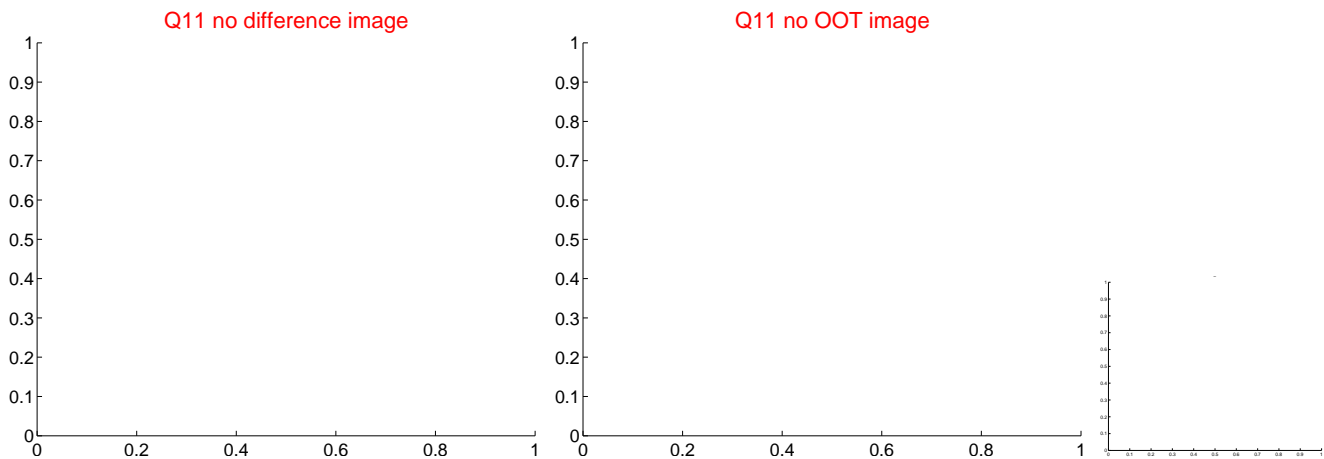
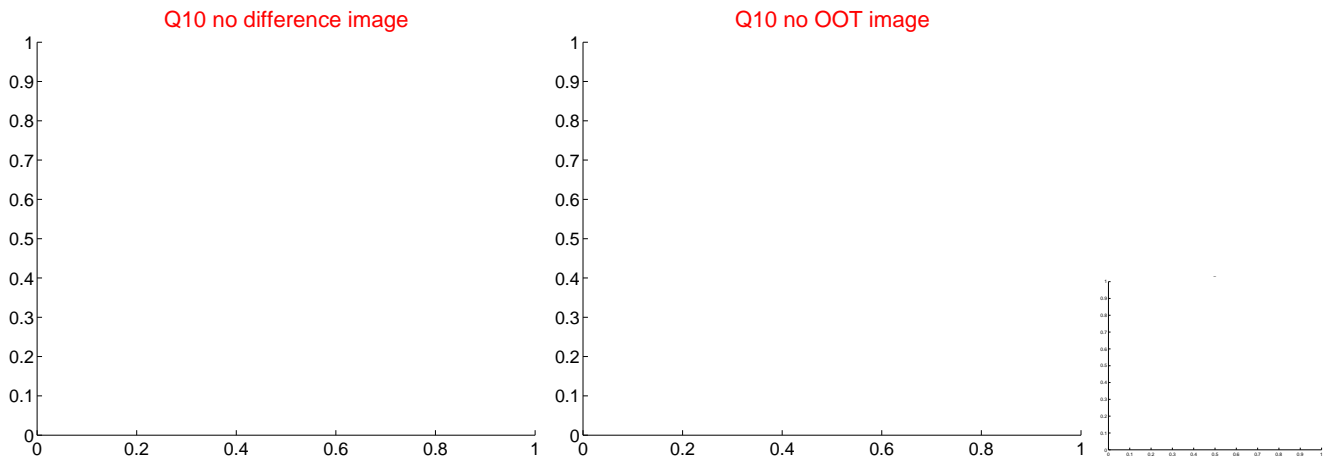
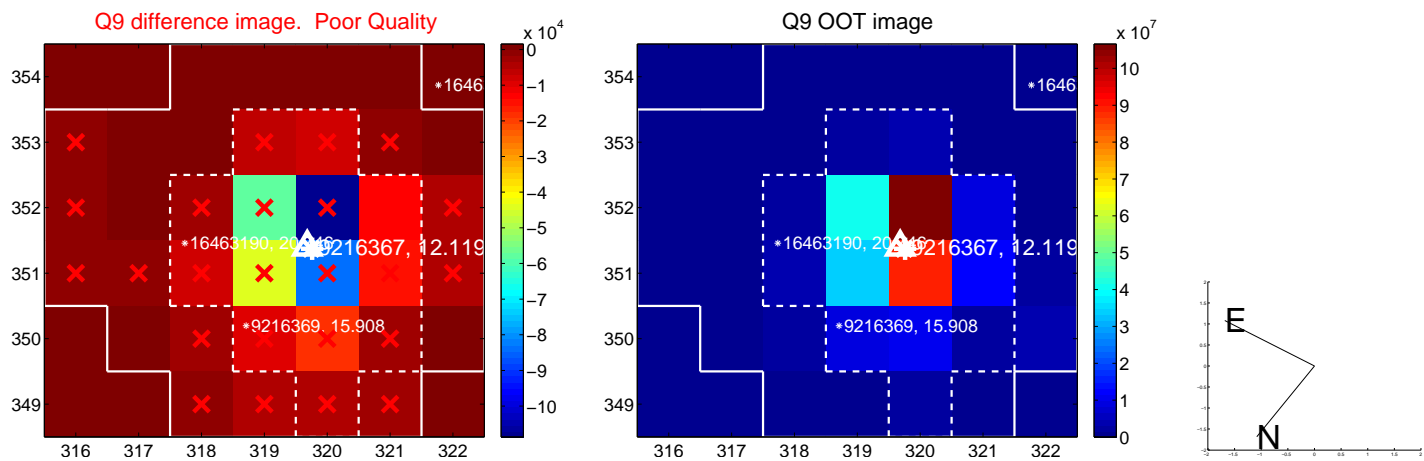


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

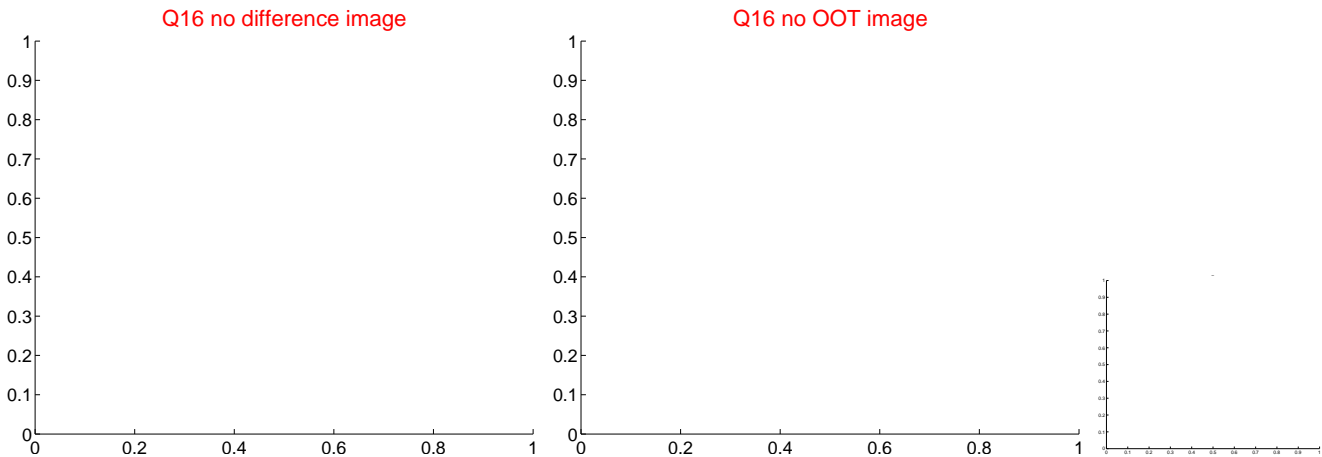
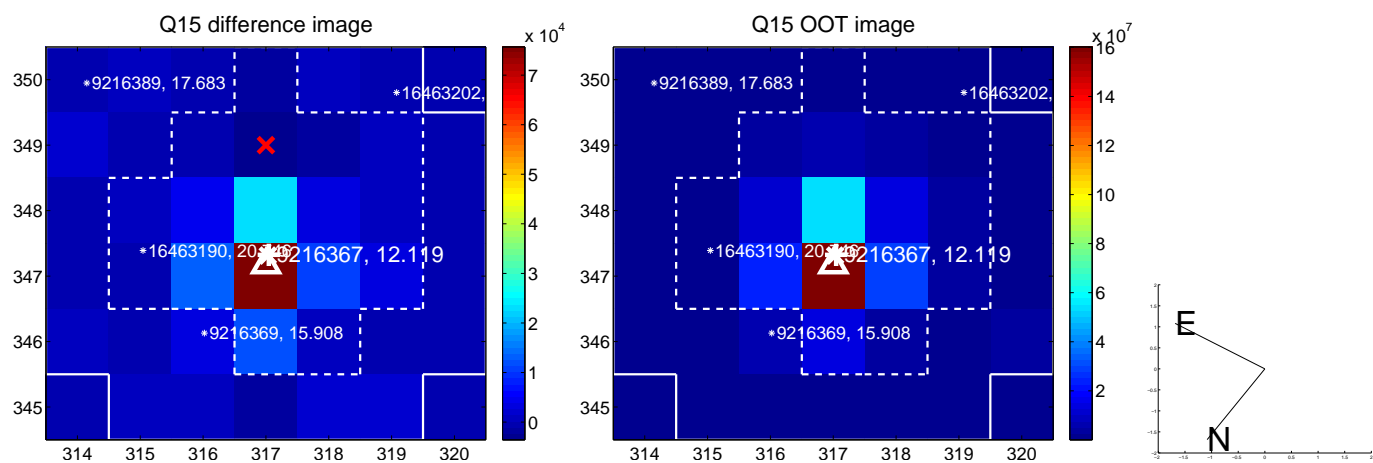
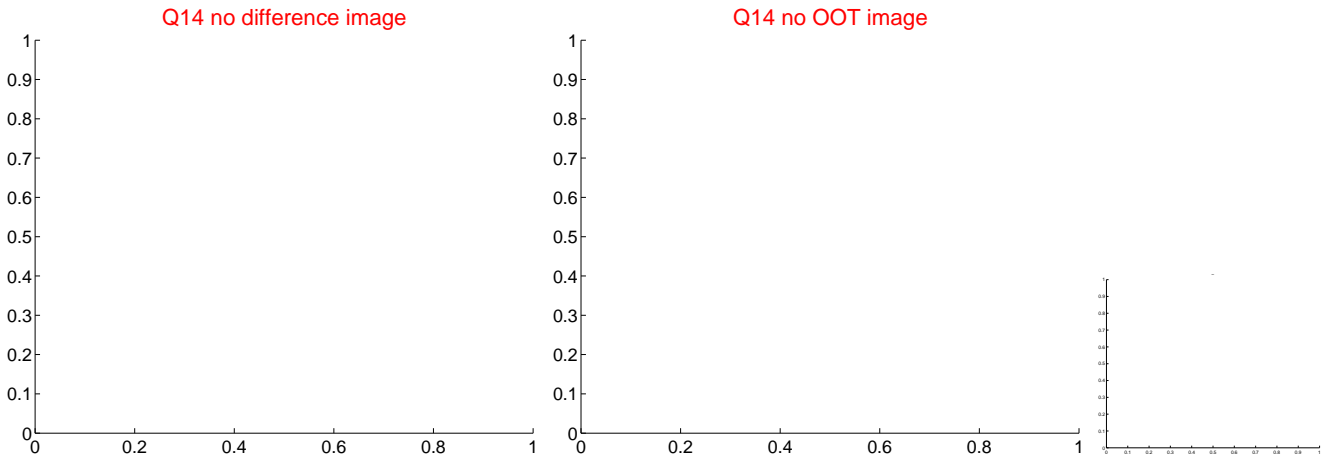
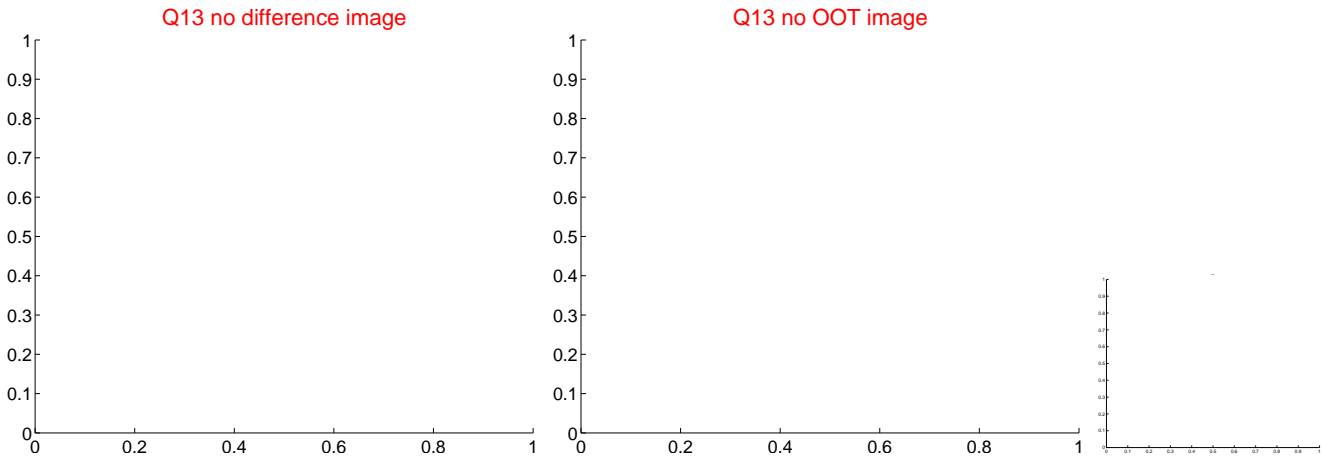




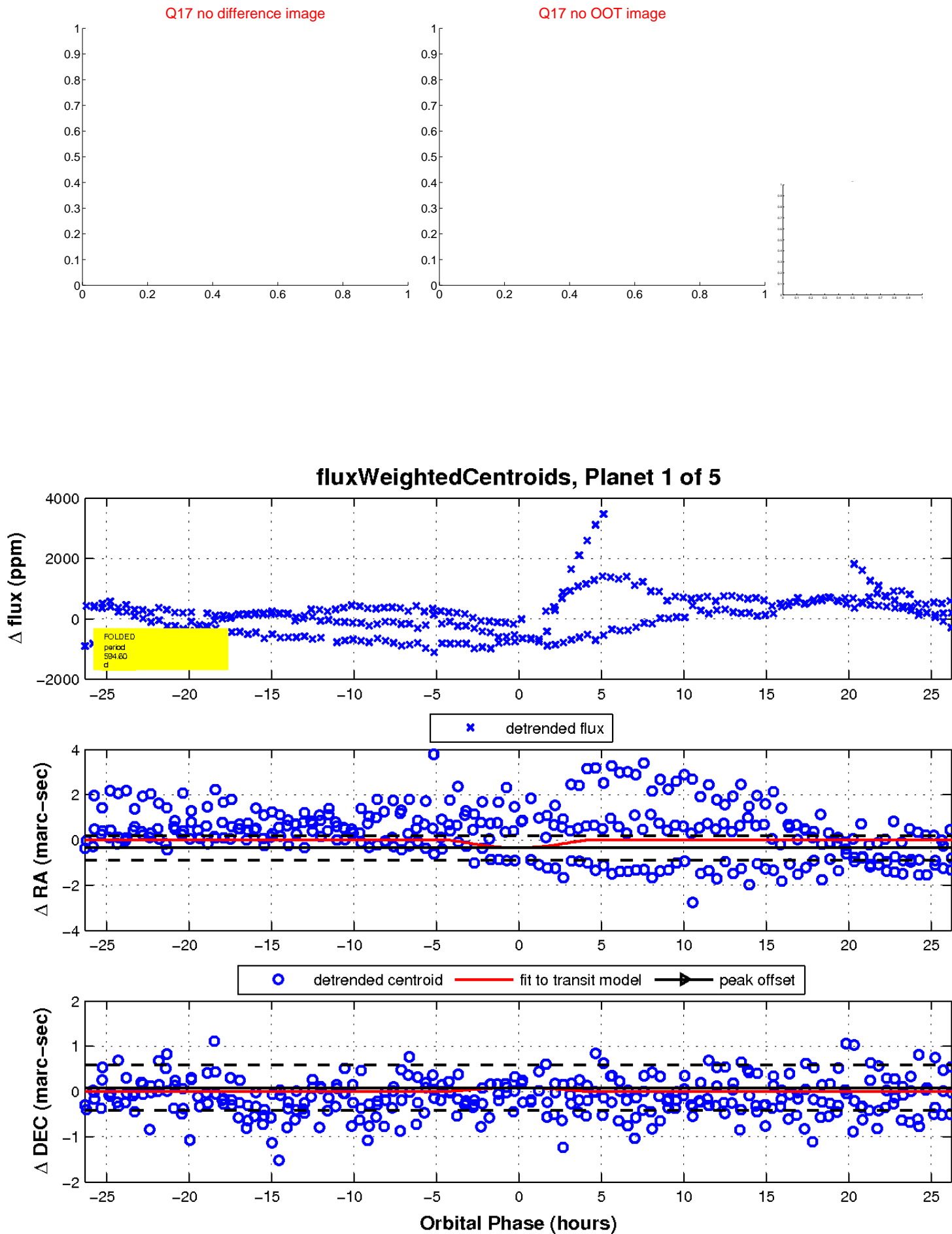
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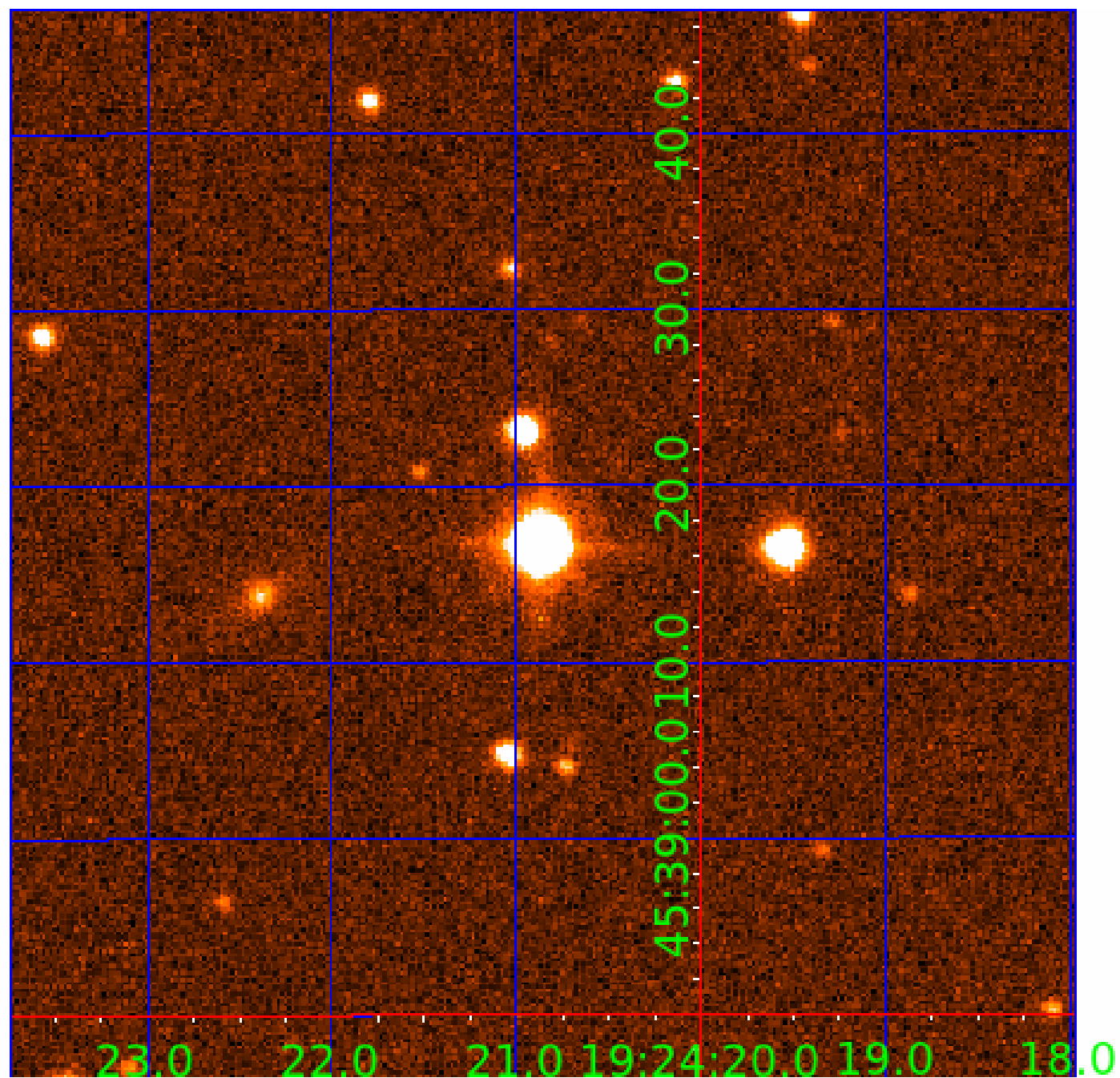


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UKIRT Image

Declination





# KIC 009216367

## Q1-17 DR25 TCE Parameters

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009216367-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
009216367-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

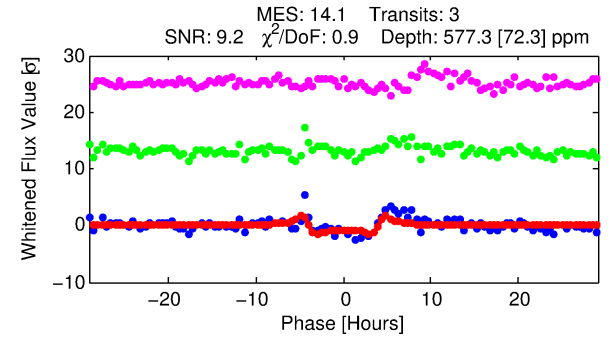
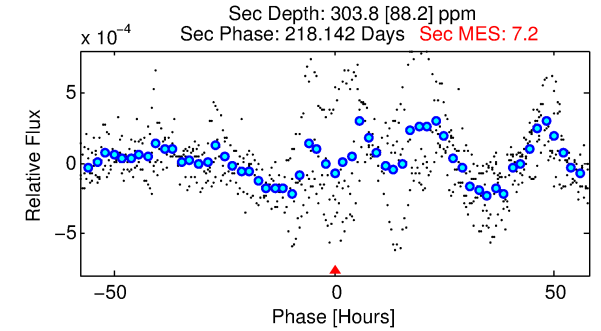
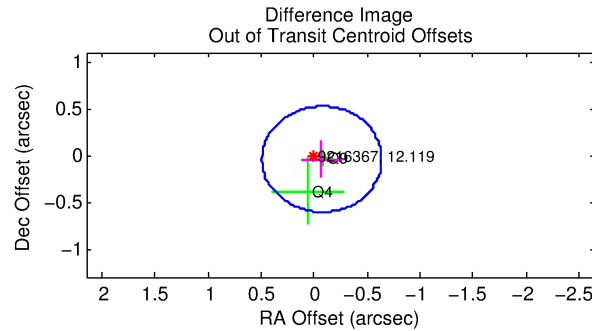
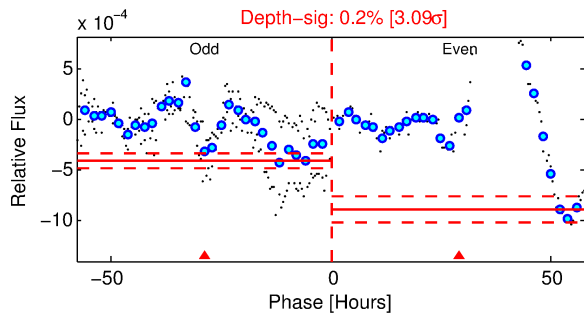
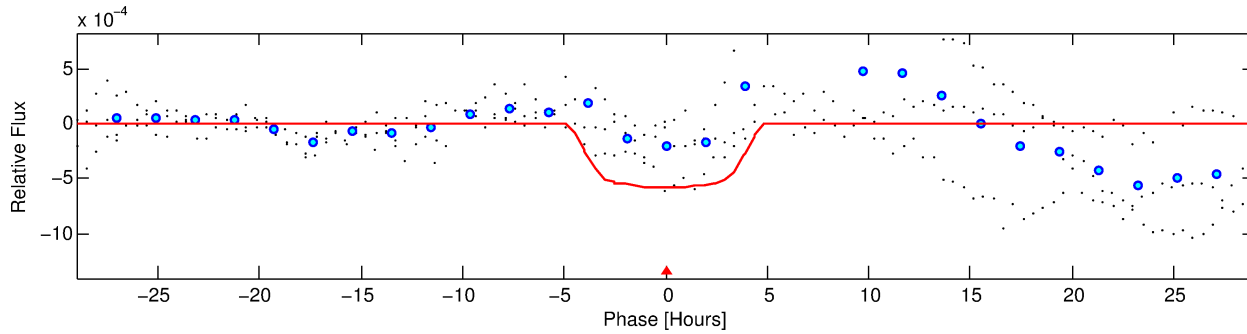
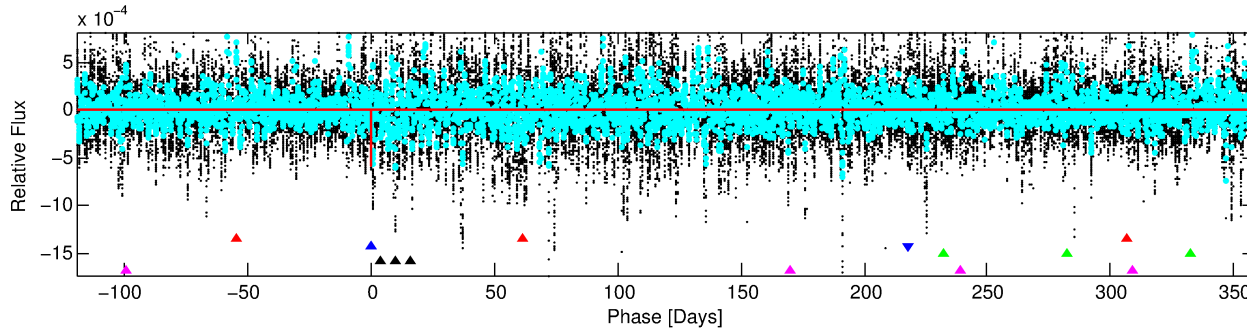
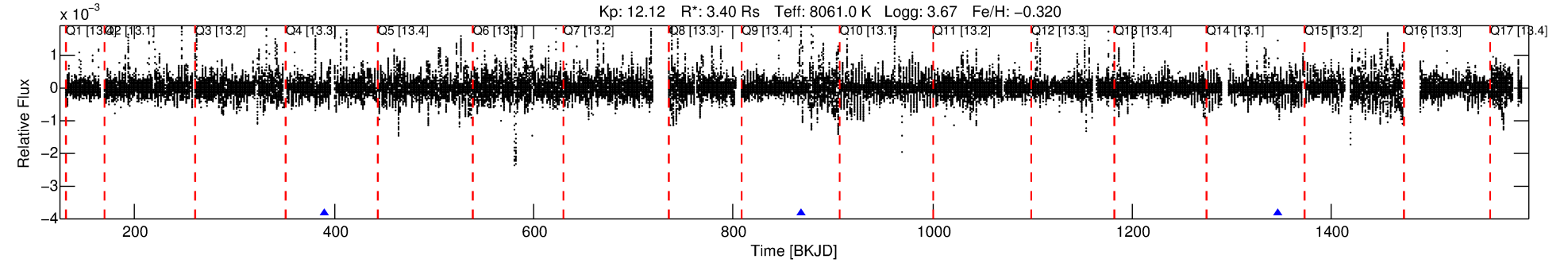
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009216367-02

No Significant Match Found

# DV One-Page Summary

KIC: 9216367 Candidate: 2 of 5 Period: 478.047 d



## DV Fit Results:

Period = 478.04671 [0.00536] d  
Epoch = 390.4050 [0.0068] BKJD  
Rp/R\* = 0.0266 [0.0018]  
a/R\* = 158.60 [15.73]  
b = 0.94 [0.01]  
Seff = 19.47 [16.73]  
Teq = 536 [115] K  
Rp = 9.86 [5.15] Re  
a = 1.4982 [0.7740] AU  
Ag = 3857.52 [3478.55] [1.11σ]  
Teffp = 6527 [589] K [9.99σ]

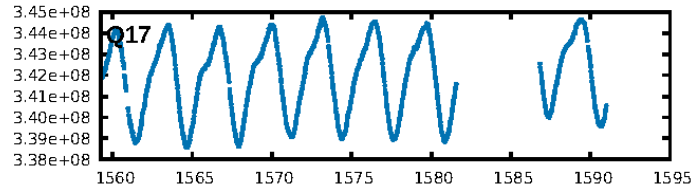
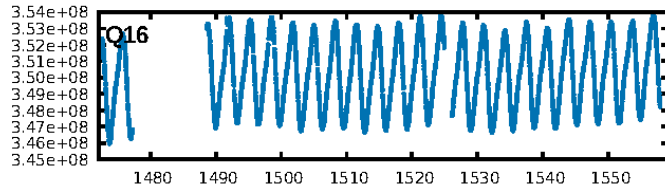
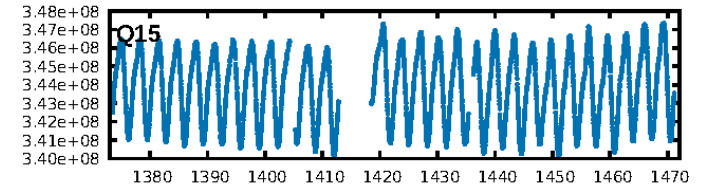
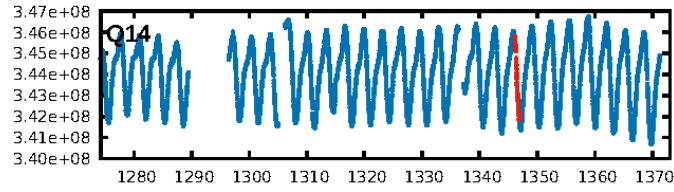
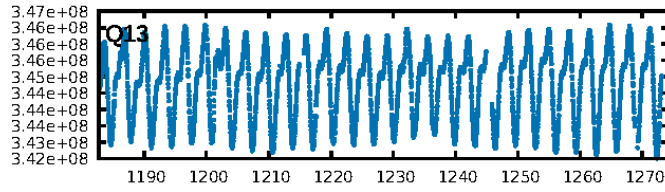
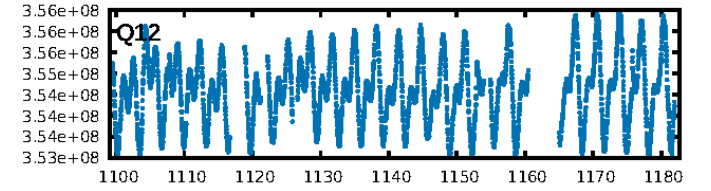
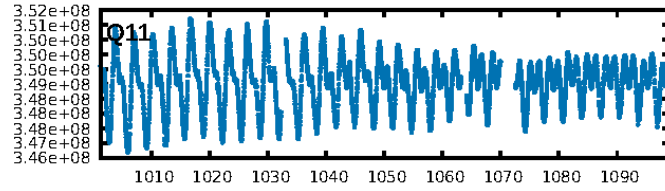
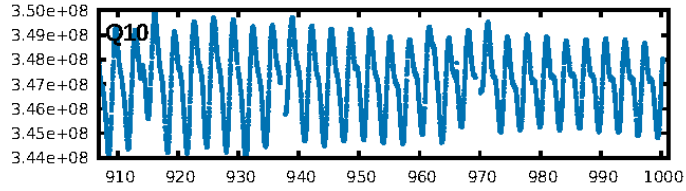
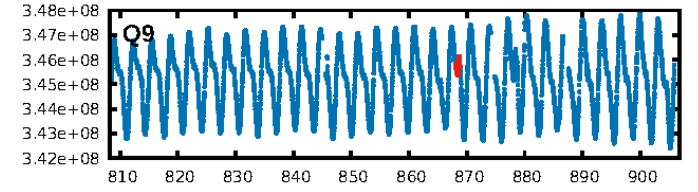
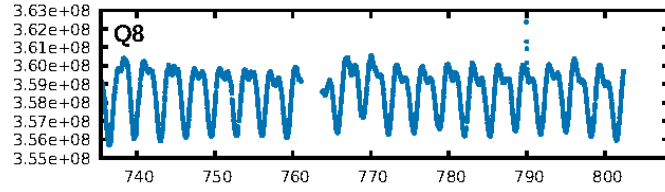
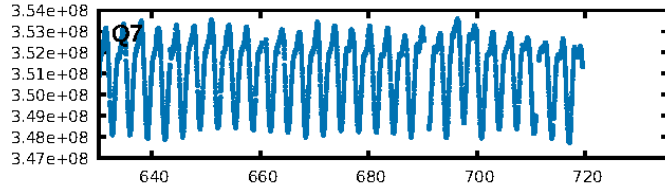
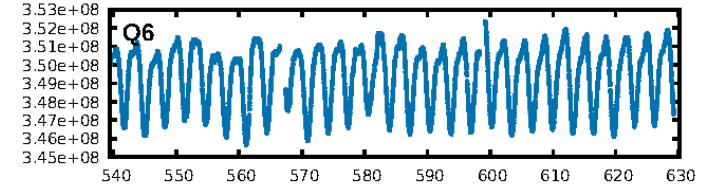
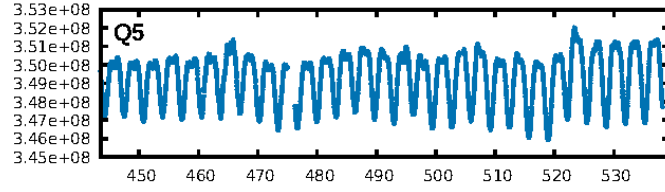
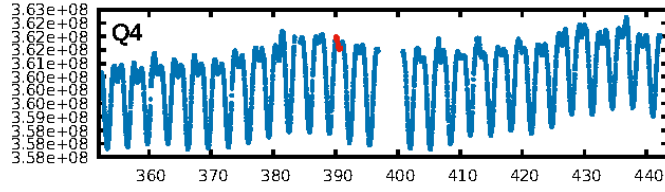
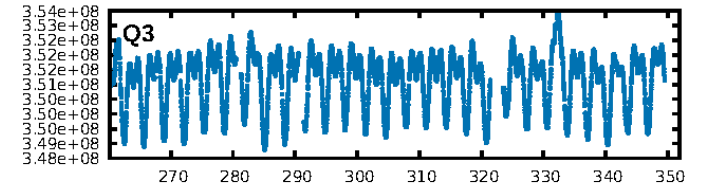
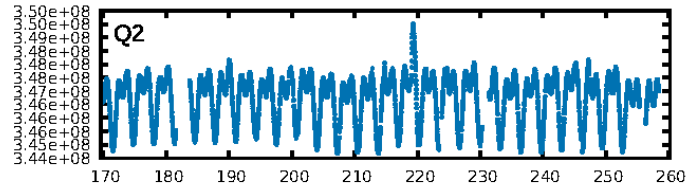
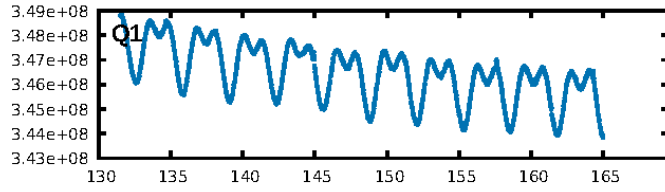
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [13.43σ]  
LongPeriod-sig: 100.0% [110.30σ]  
ModelChiSquare2-sig: 2.1%  
ModelChiSquareGof-sig: 97.0%  
Bootstrap-pfa: 1.25e-14  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.8894  
Centroid-sig: 0.1%  
Centroid-so: 1.069 arcsec [2.34σ]  
OotOffset-rm: 0.084 arcsec [0.45σ]  
KicOffset-rm: 0.155 arcsec [0.83σ]  
OotOffset-st: 0/0/1/1 [2]  
KicOffset-st: 0/0/1/1 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [3/3]

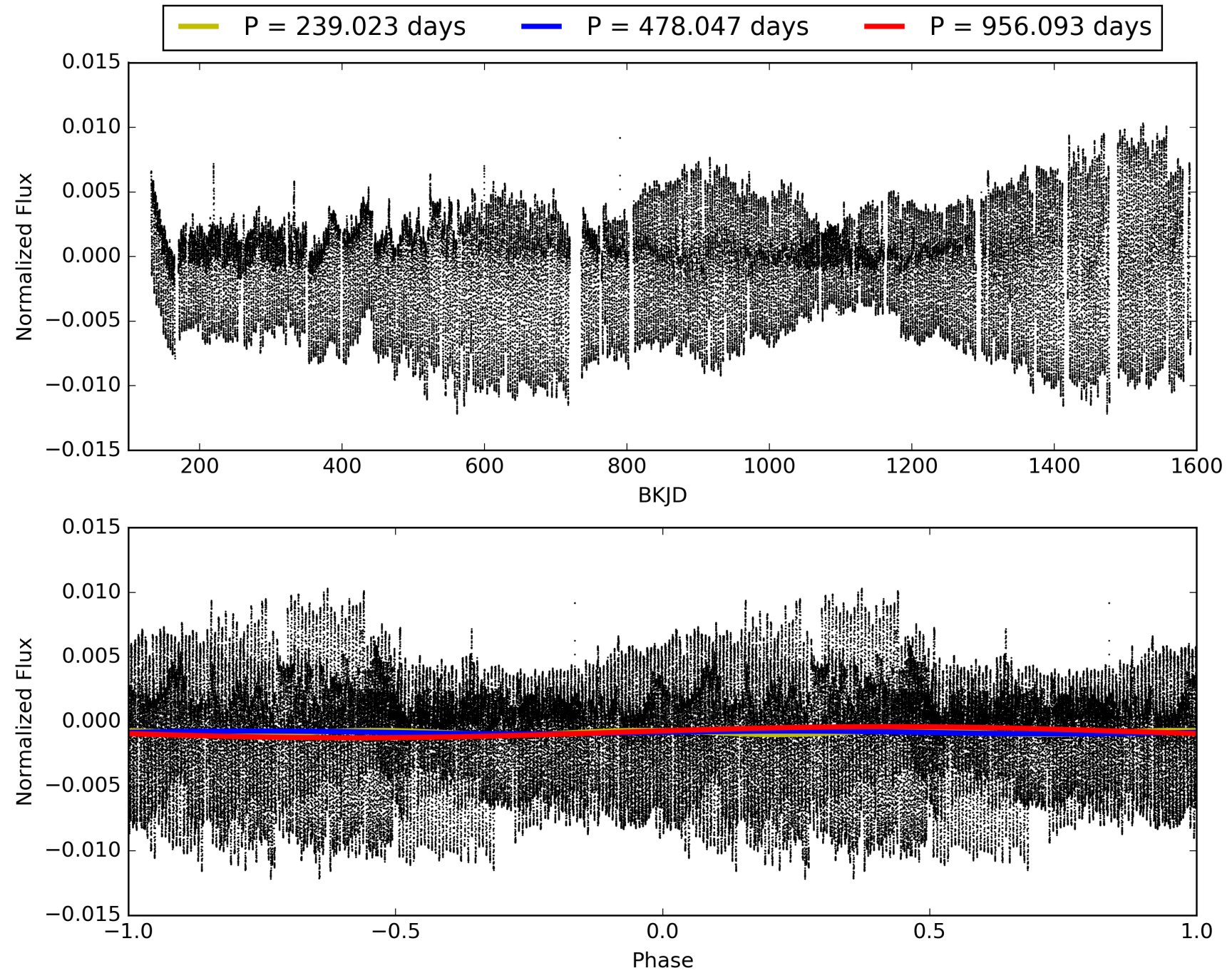
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:49:00 Z

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

# TCE 009216367-02, PDC Light Curves

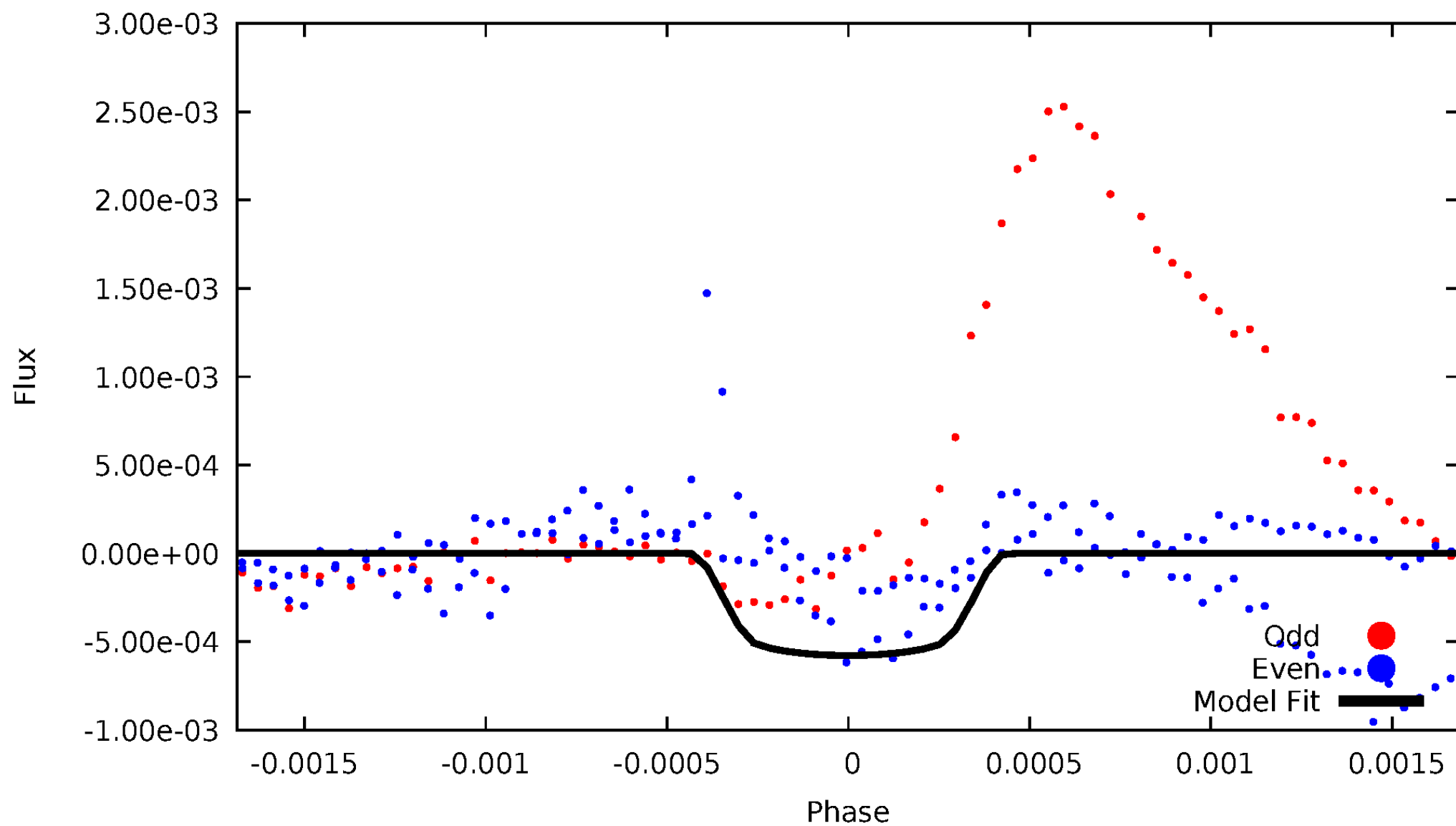


TCE 009216367-02



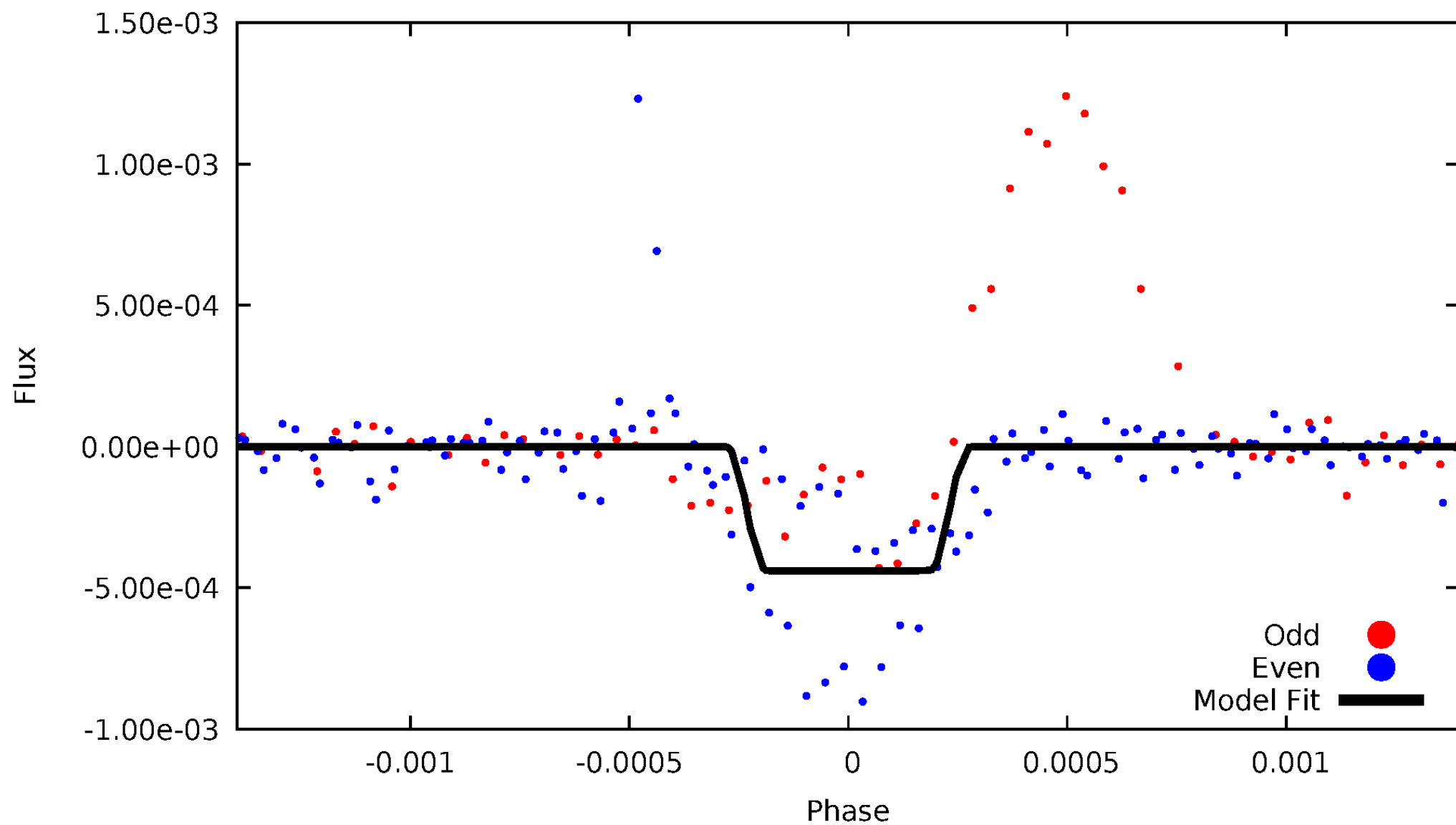
# DV Odd/Even

TCE 009216367-02



# ALT Odd/Even

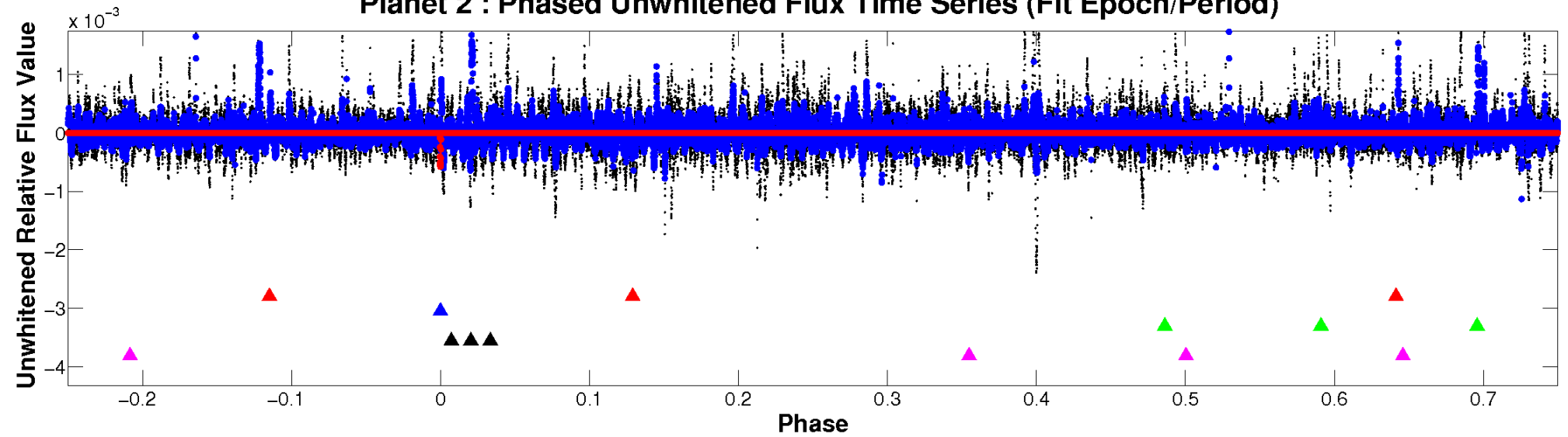
TCE 009216367-02



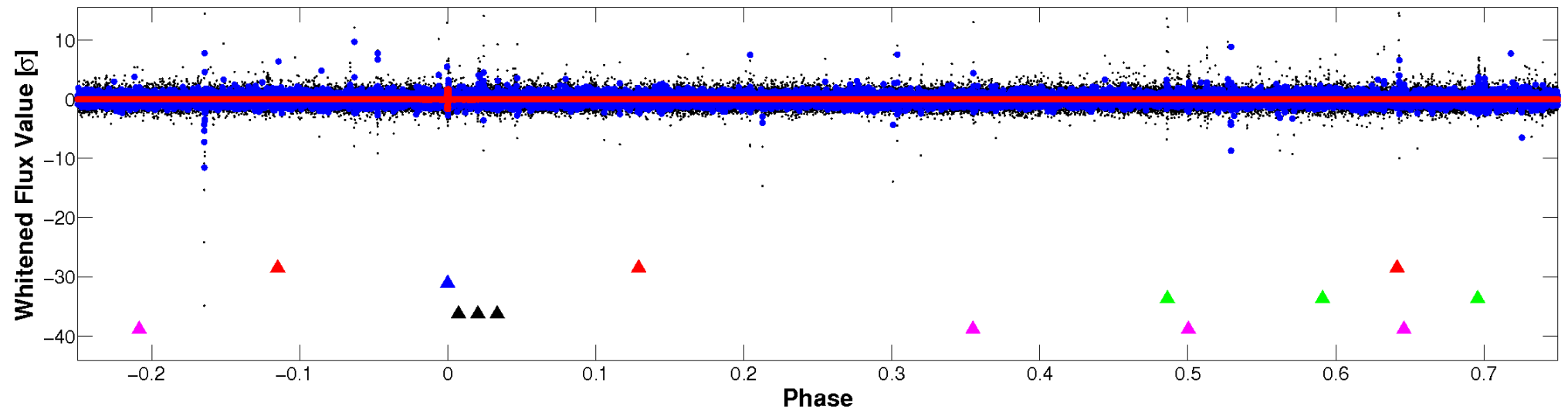


# Non-Whitened Vs. Whitened Light Curve

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



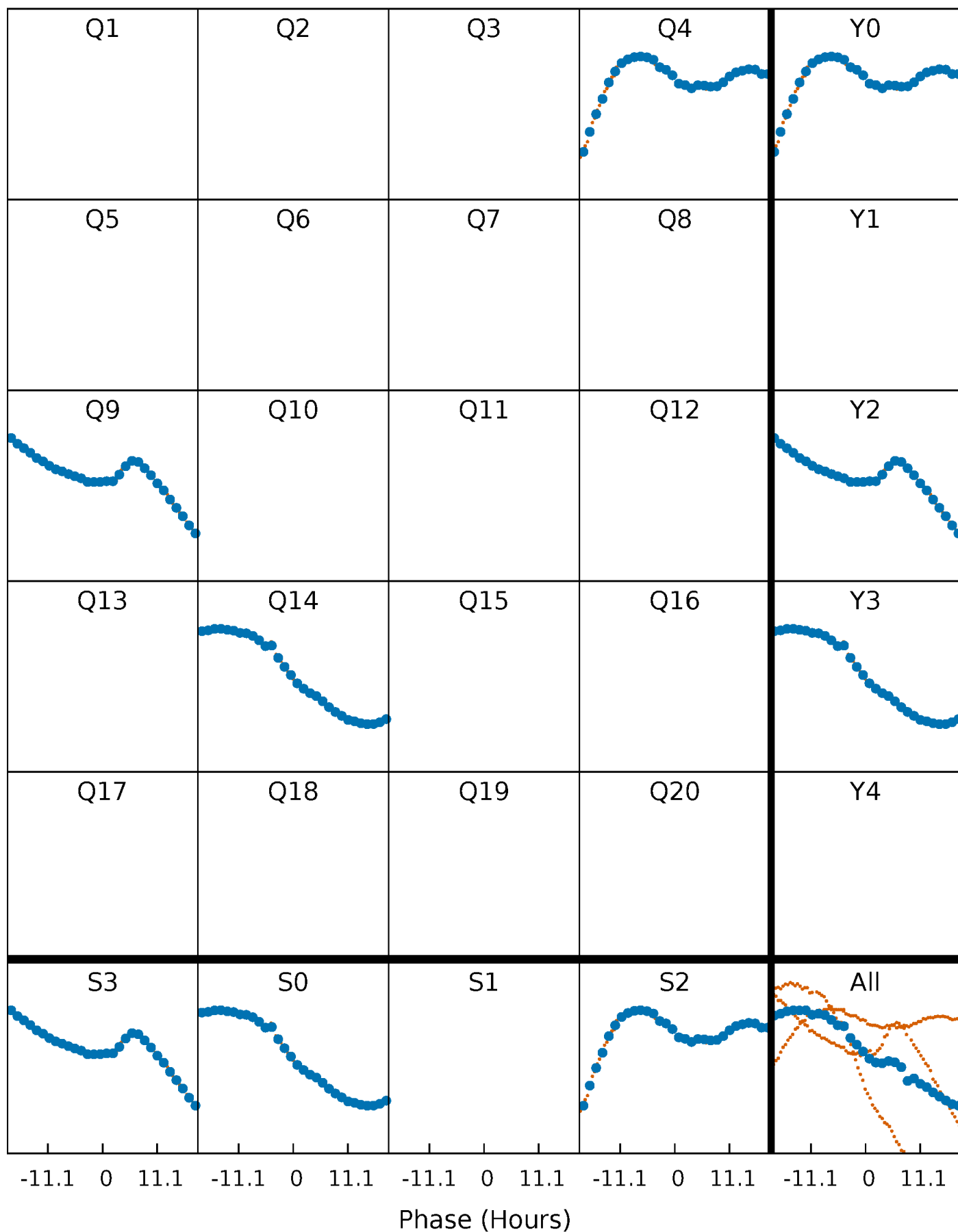
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





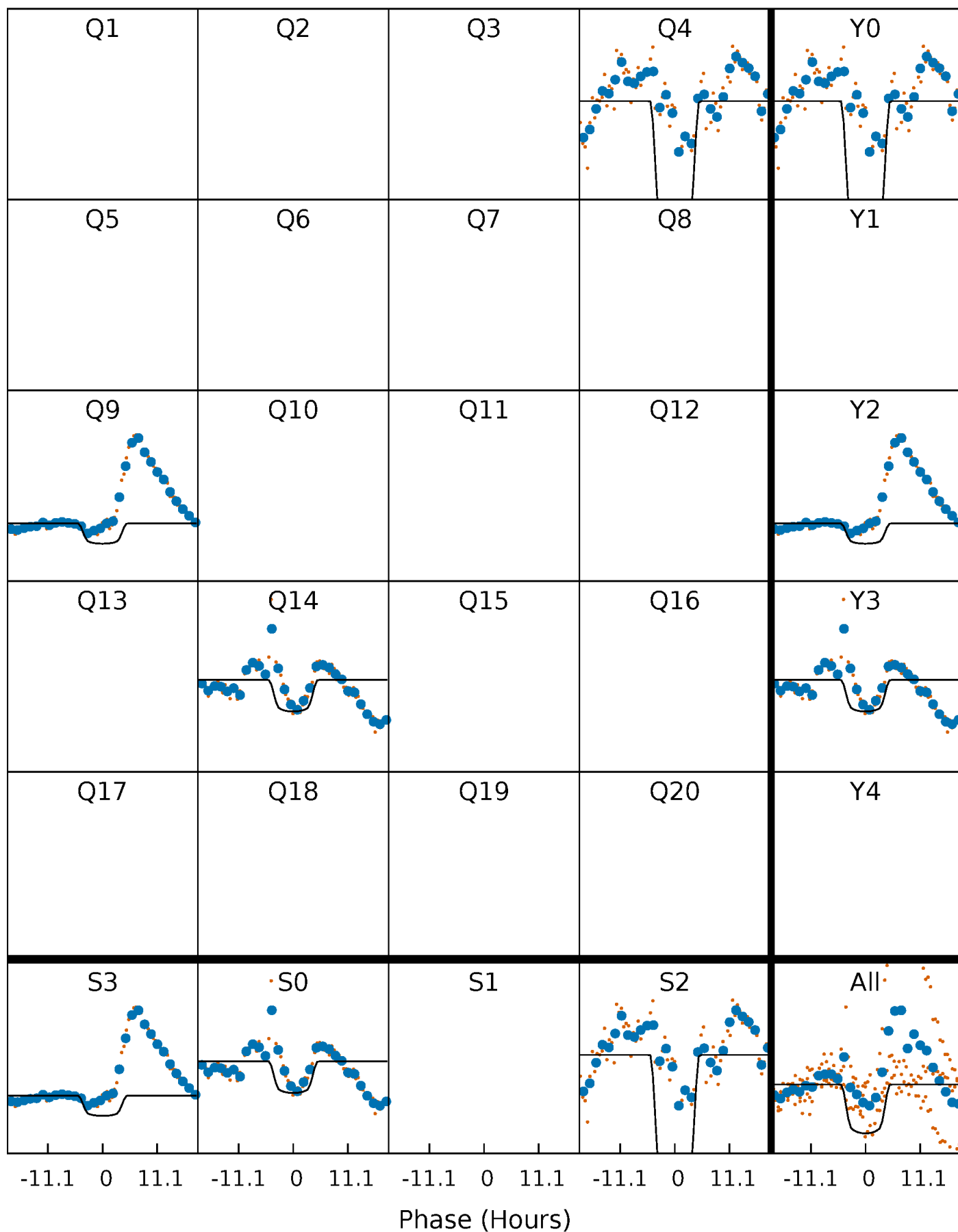
# PDC Quarter-Phased Transit Curves

TCE 009216367-02 P=478.046714 Days  $T_0=390.405015$  (BKJD)



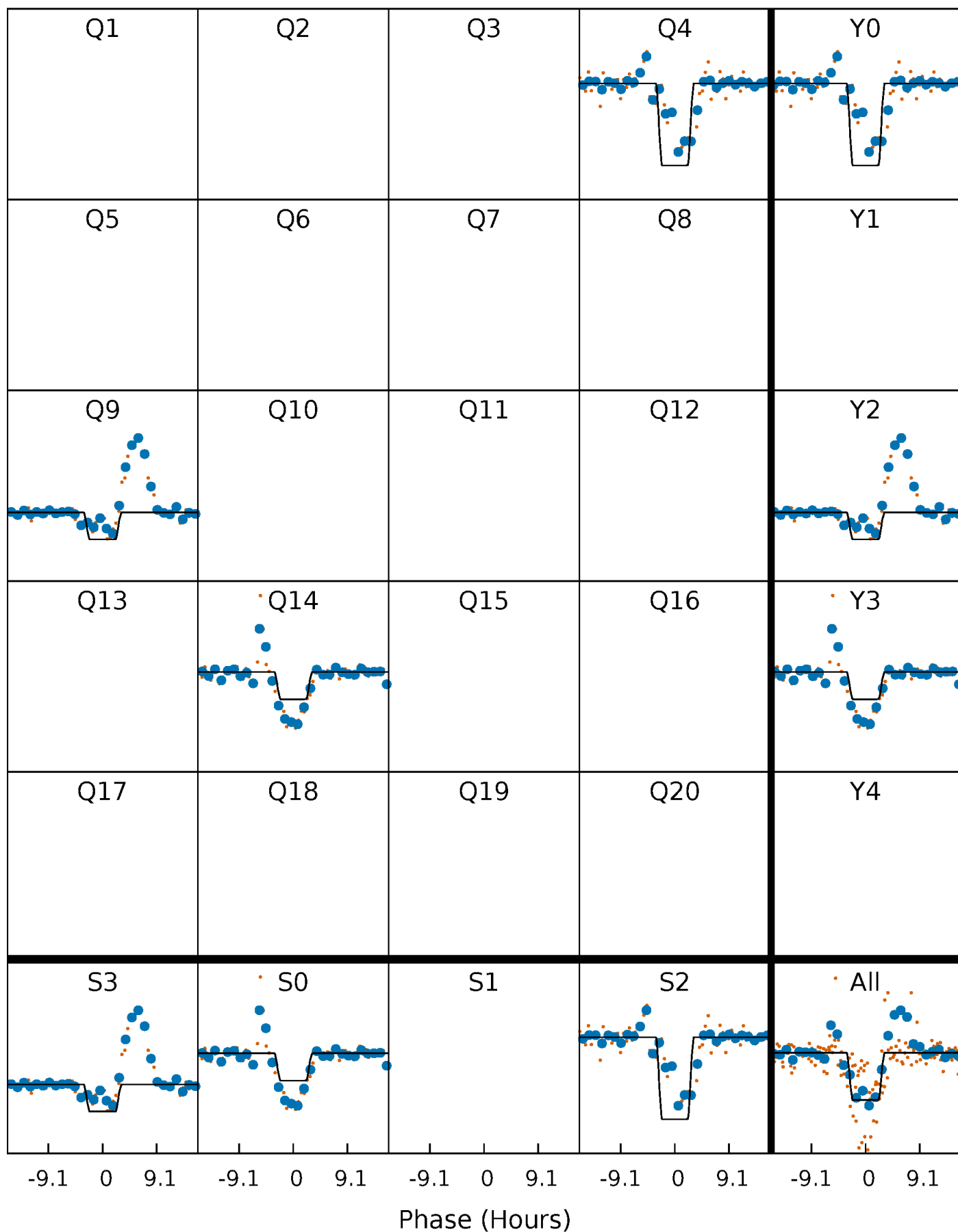
# DV Quarter-Phased Transit Curves

TCE 009216367-02     $P=478.046714$  Days     $T_0=390.405015$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

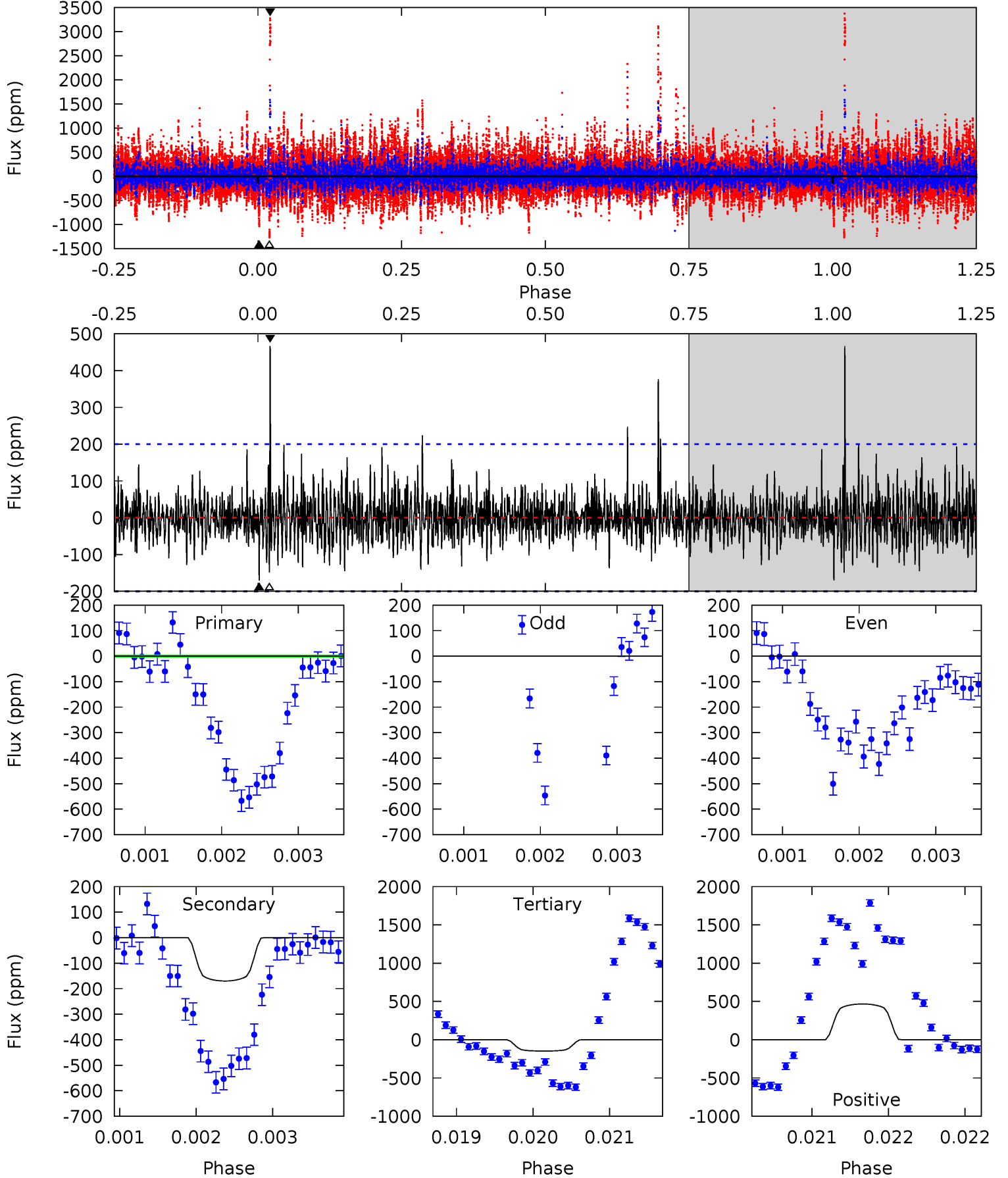
TCE 009216367-02 P=478.063570 Days  $T_0=390.414348$  (BKJD)



# DV Model-Shift Uniqueness Test

009216367-02, P = 478.046714 Days, E = 390.405015 Days

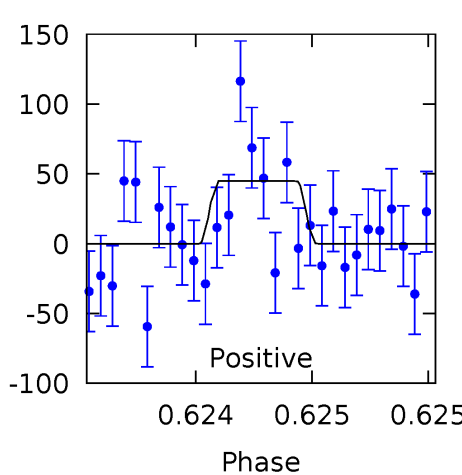
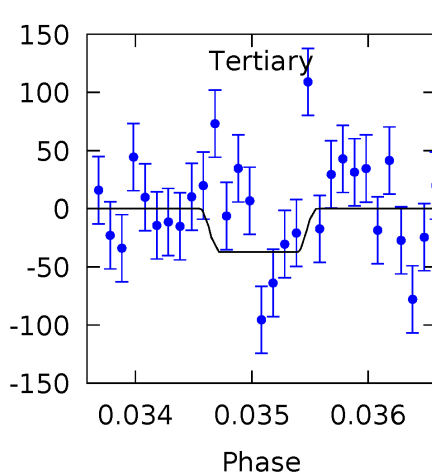
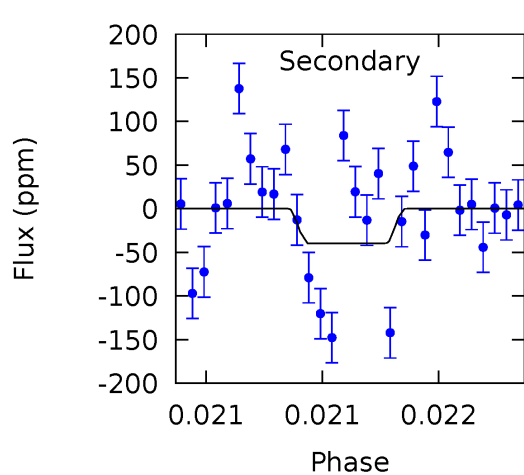
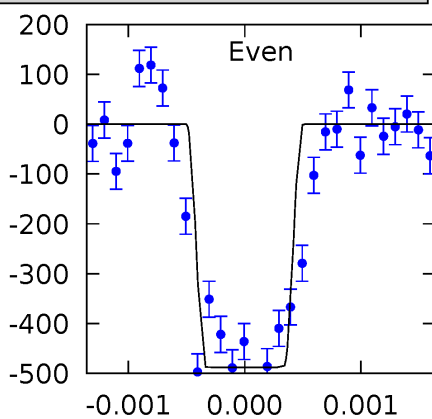
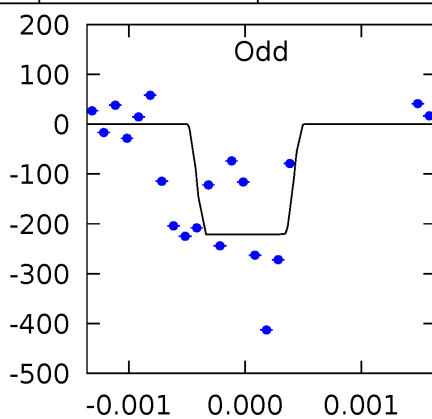
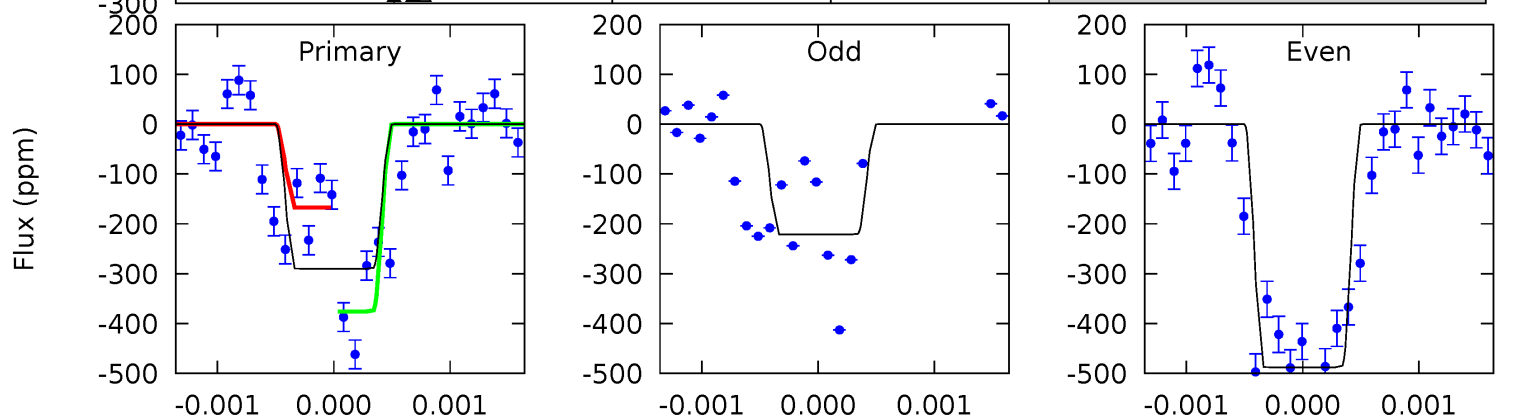
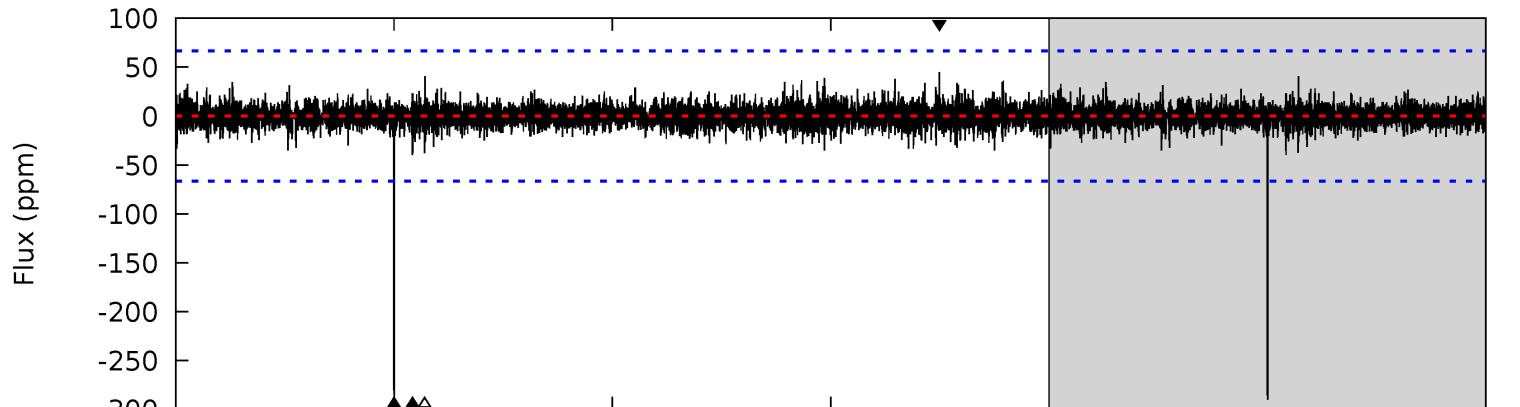
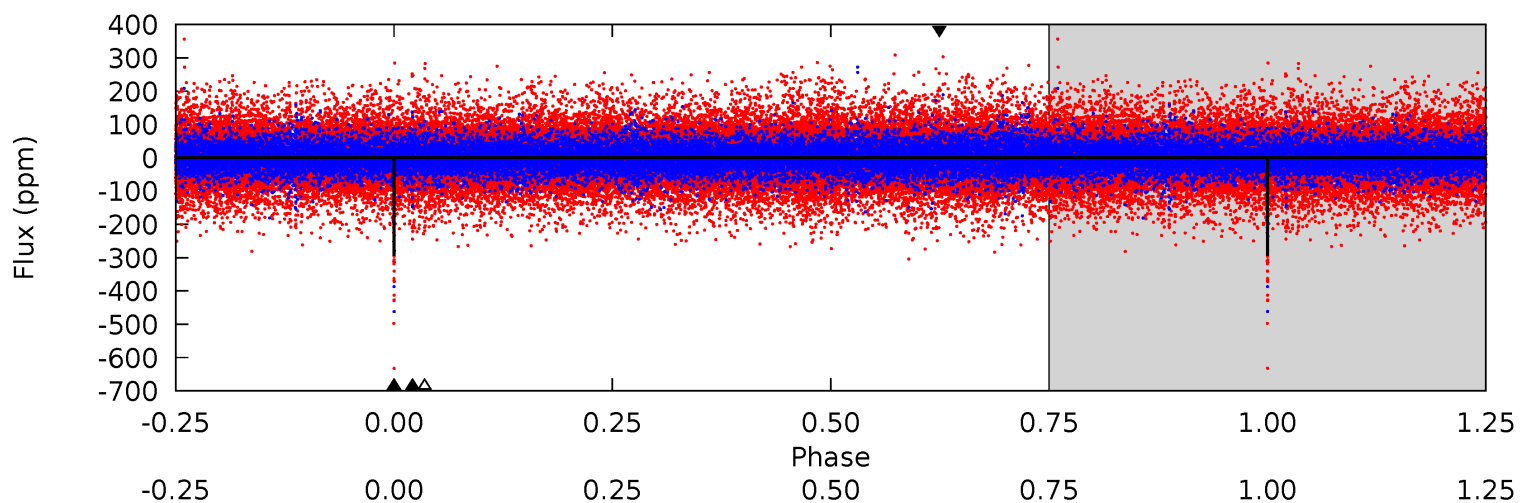
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.73	4.65	4.07	12.8	5.47	3.32	1.31	-0.34	-9.05	0.58	-8.13	1.94	1.09	0.73	0.52



# Alt Model-Shift Uniqueness Test

009216367-02,  $P = 478.063570$  Days,  $E = 390.414348$  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
24.2	3.31	3.11	3.75	5.55	3.45	0.67	21.1	20.5	0.20	-0.44	11.2	1.65	0.13	0



### Stellar Parameters For KIC 009216367

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8061^{+223}_{-334}$	$3.668^{+0.501}_{-0.088}$	$-0.320^{+0.200}_{-0.300}$	$3.399^{+0.586}_{-1.759}$	$1.964^{+0.204}_{-0.510}$	$0.070^{+0.388}_{-0.019}$
	+3%/-4%	+14%/-2%	+62%/-94%	+17%/-52%	+10%/-26%	+551%/-27%
Source	KIC0	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 009216367-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-170 \pm 37$	$9.28^{+1.56}_{-2.47}$	$719^{+54}_{-87}$	$5481^{+361}_{-368}$	$2460^{+1865}_{-817}$
Alt.	$-40 \pm 12$	$7.15^{+1.38}_{-1.82}$	$719^{+53}_{-93}$	$4464^{+326}_{-307}$	$965^{+706}_{-370}$

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

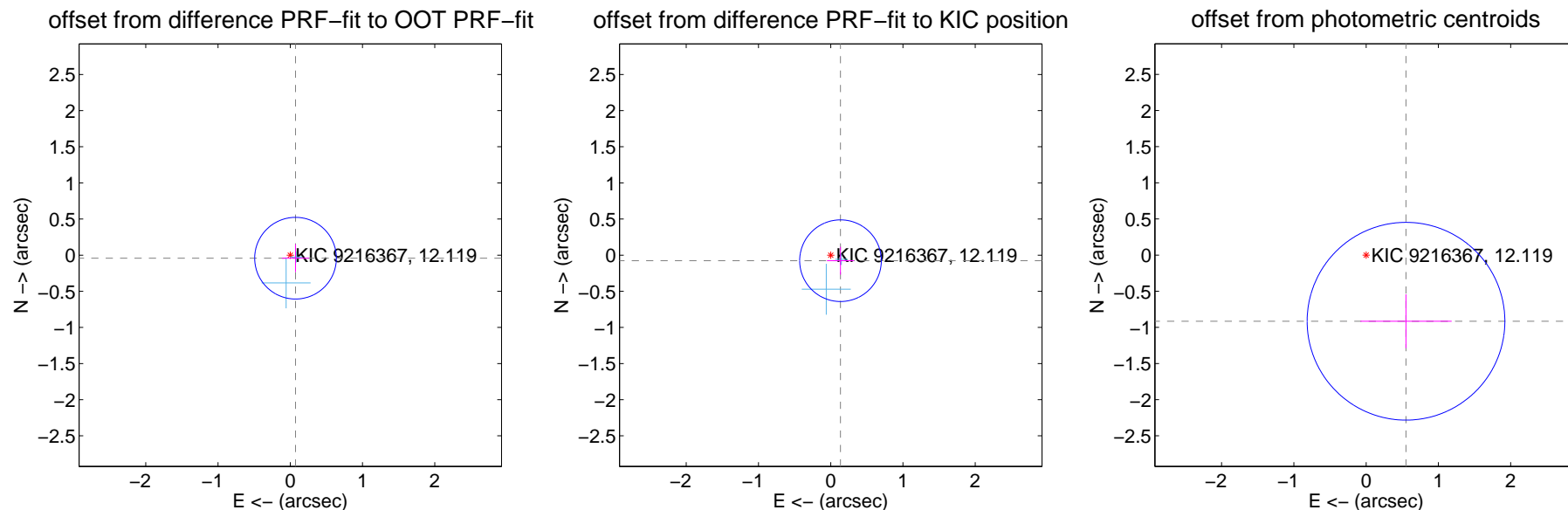
## DV Centroid Data

Supplemental centroid analysis for 009216367-02. Kepler magnitude: 12.12. Transit SNR 9.17

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

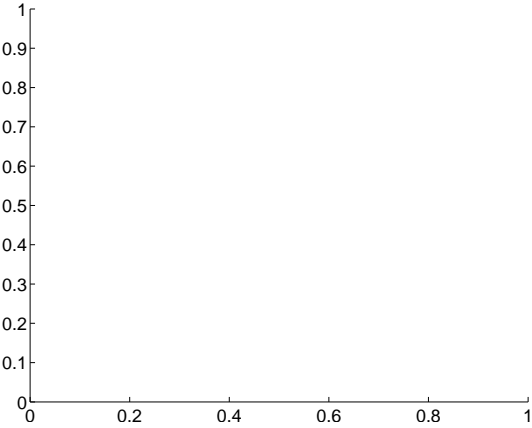
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.084 \pm 0.188$	0.45	$-0.073 \pm 0.187$	$-0.042 \pm 0.192$
PRF-fit source offset from KIC position	$0.155 \pm 0.188$	0.83	$-0.135 \pm 0.187$	$-0.077 \pm 0.192$
photometric centroid source offset	$1.07 \pm 0.46$	2.34	$-0.55 \pm 0.63$	$-0.92 \pm 0.37$



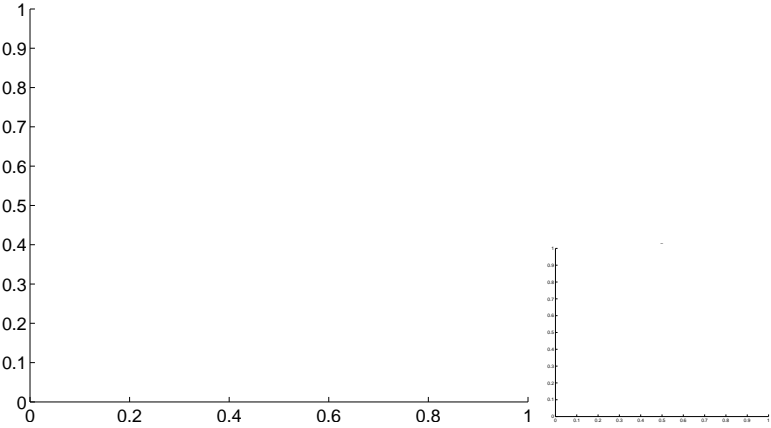
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

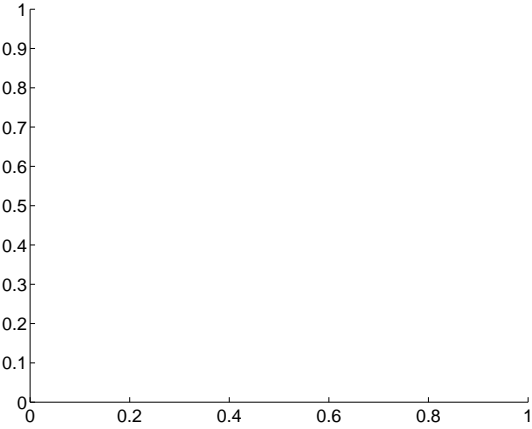
Q1 no difference image



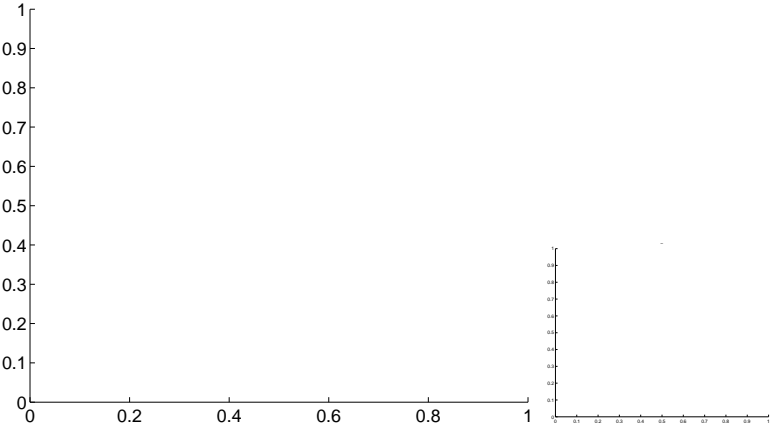
Q1 no OOT image



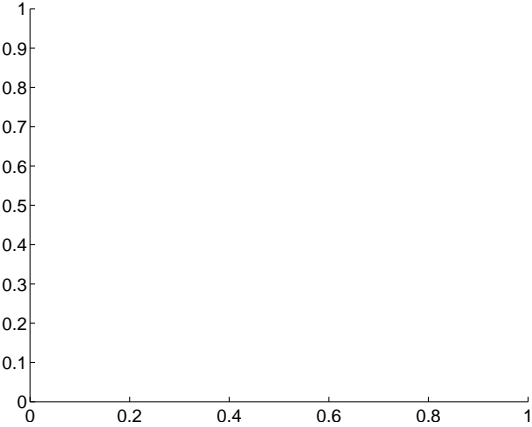
Q2 no difference image



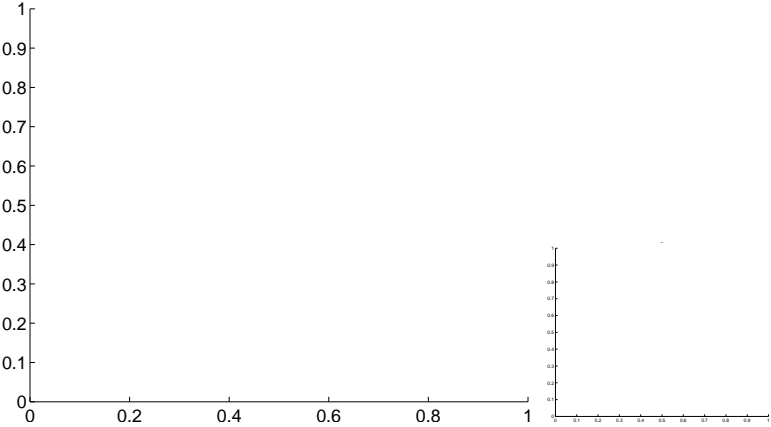
Q2 no OOT image



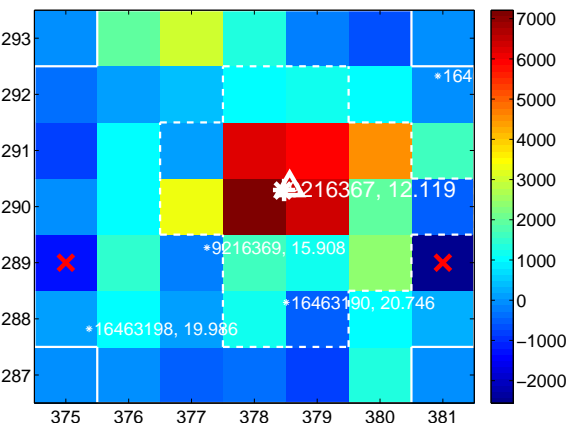
Q3 no difference image



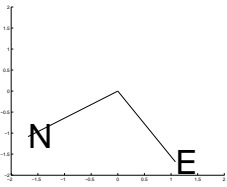
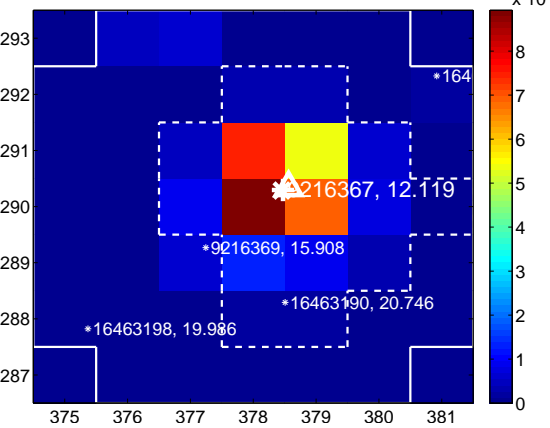
Q3 no OOT image



Q4 difference image

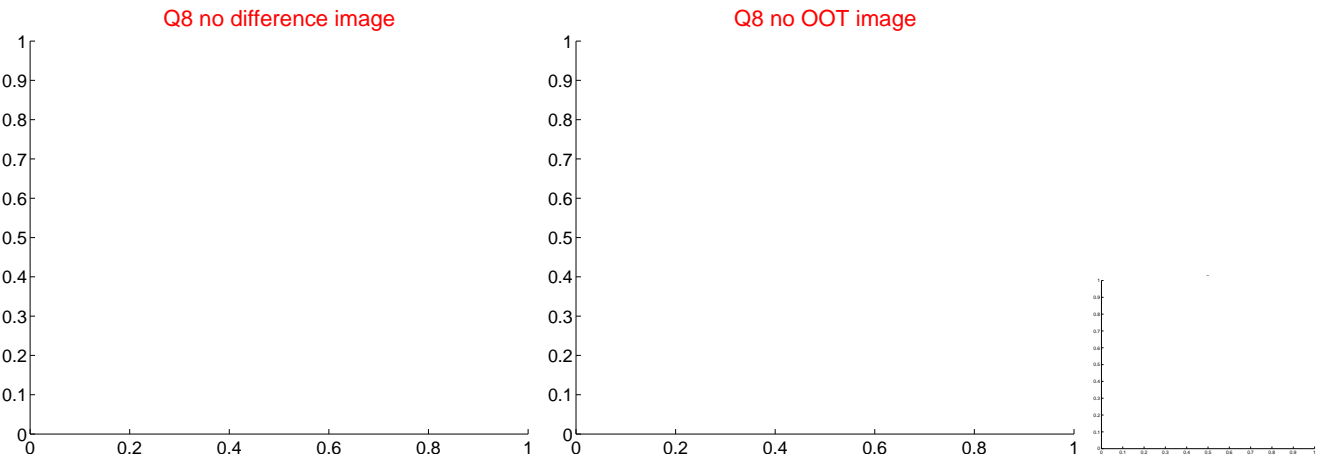
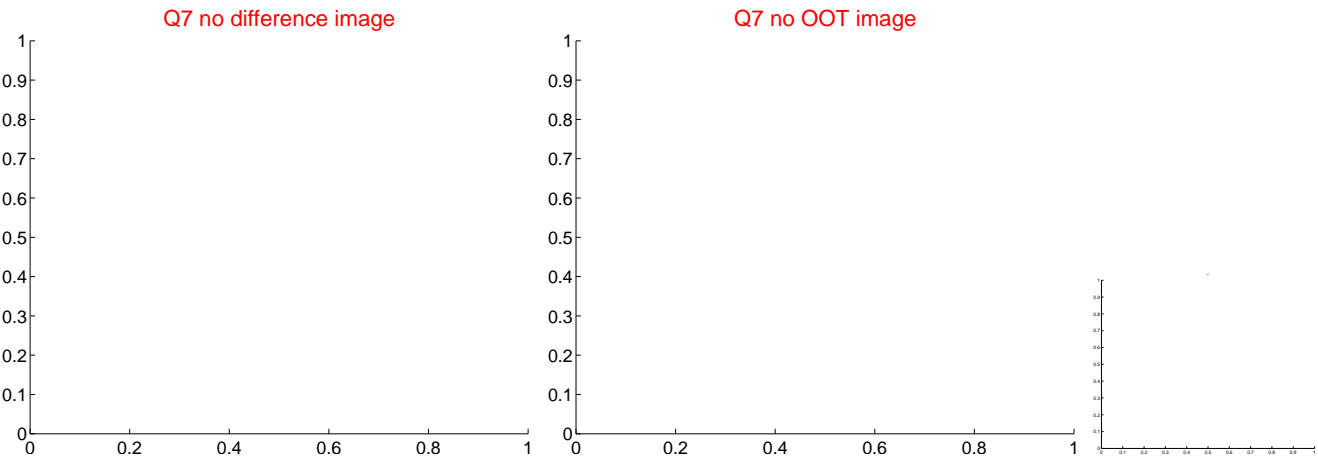
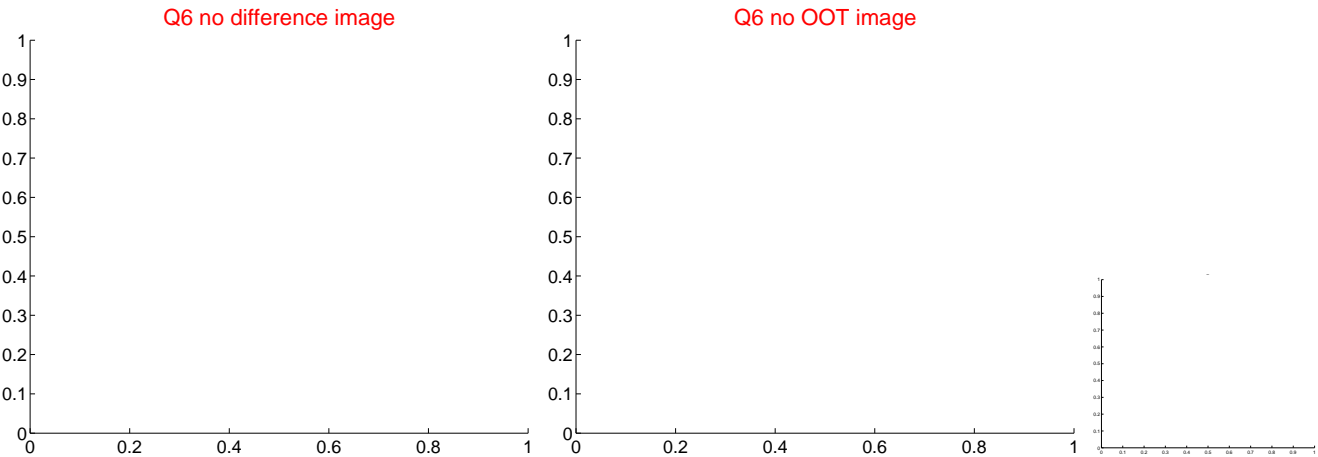
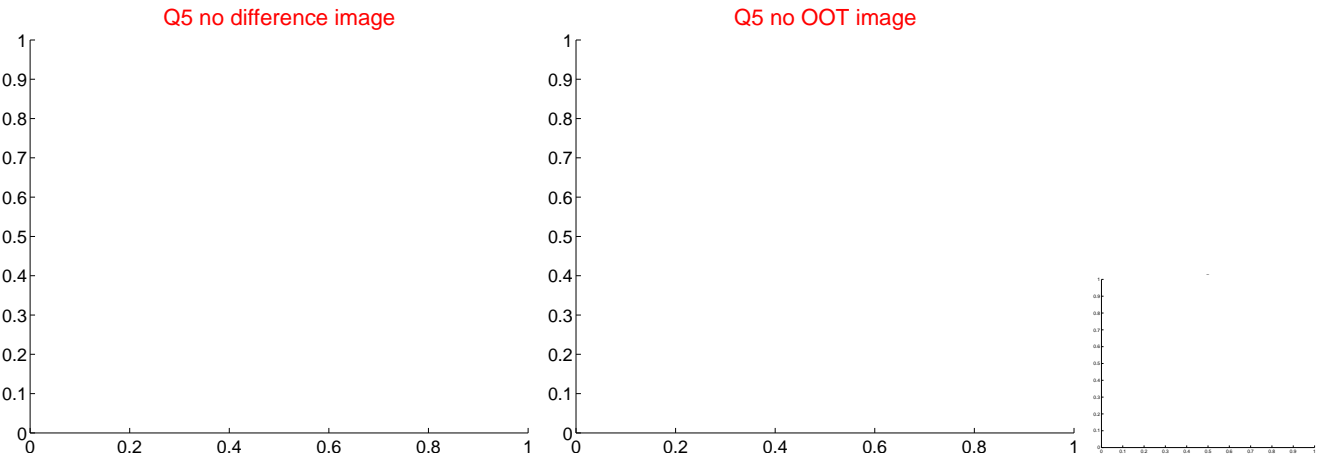


Q4 OOT image

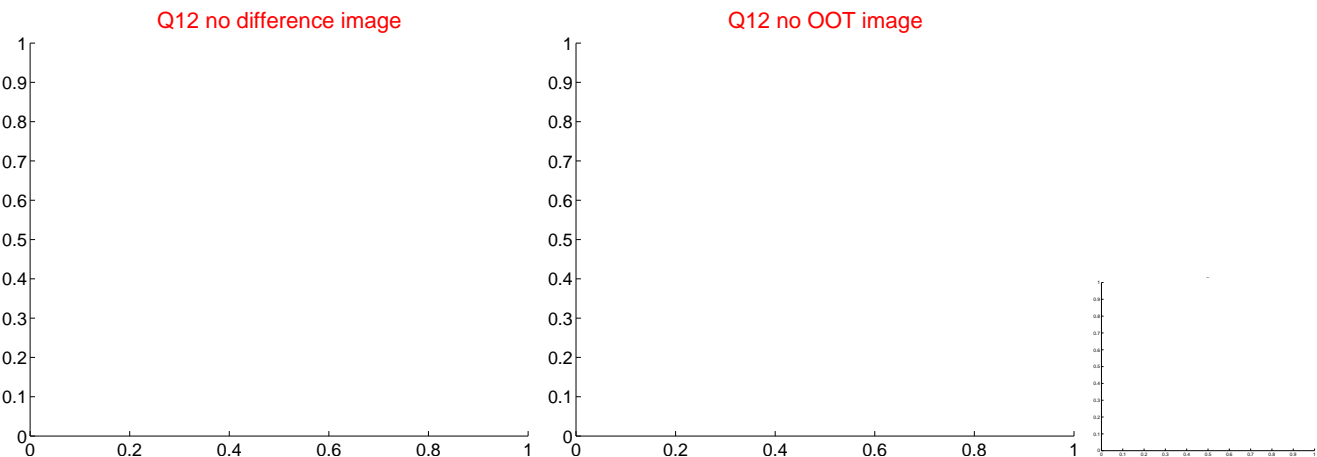
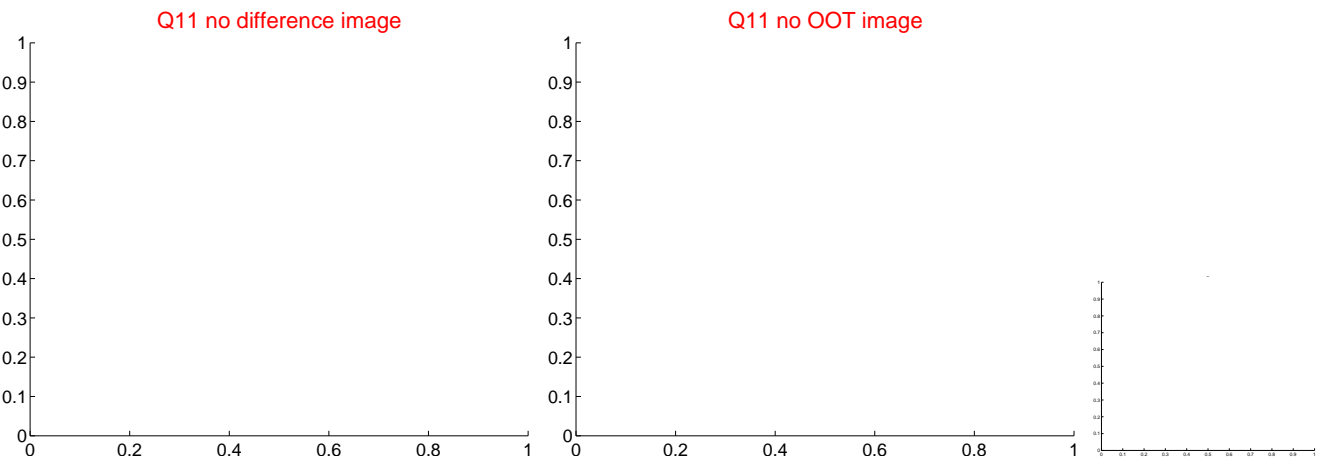
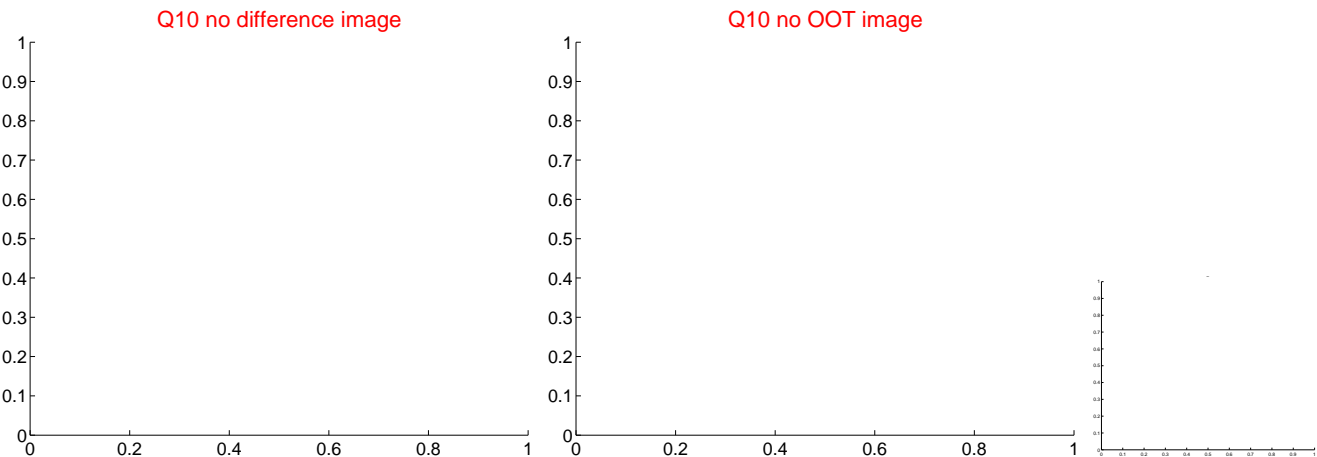
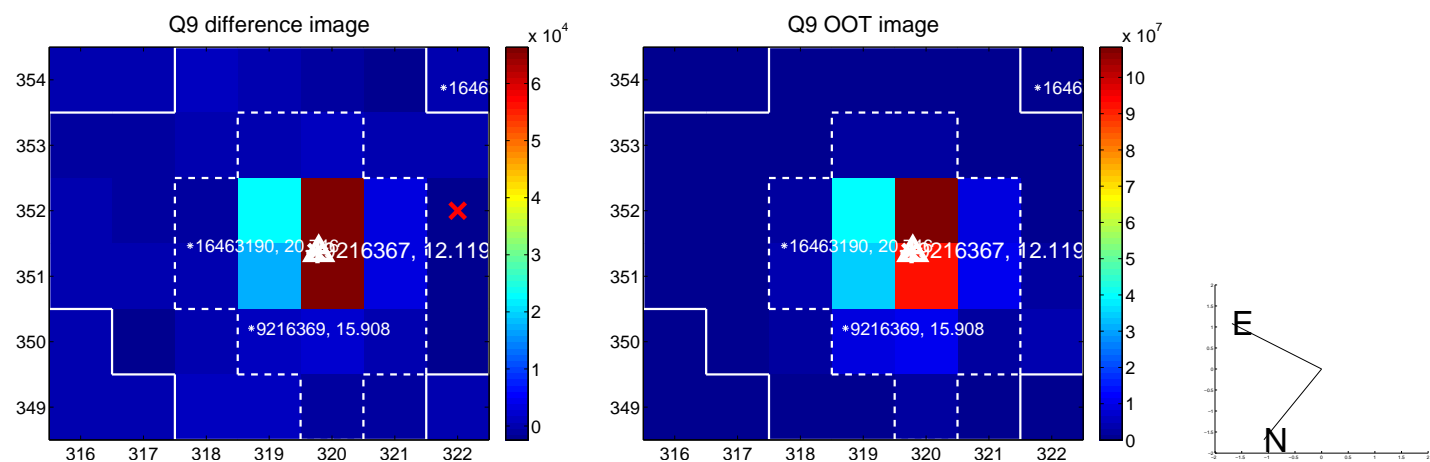




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

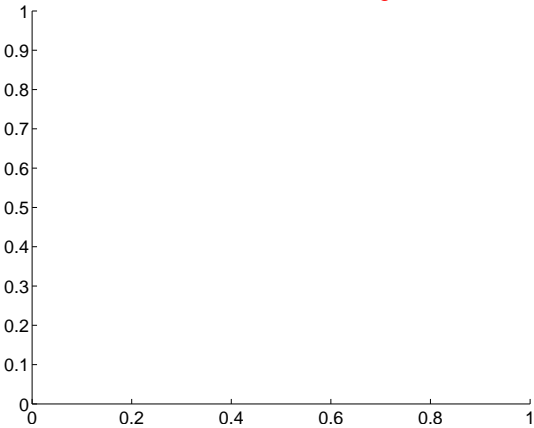


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

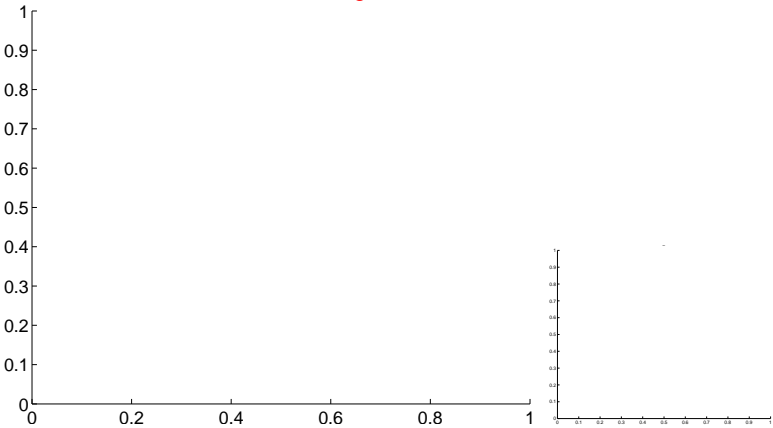


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

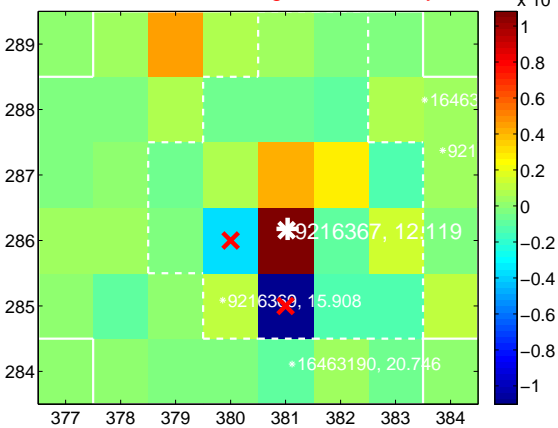
Q13 no difference image



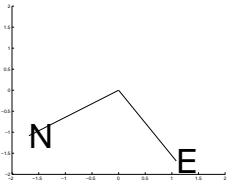
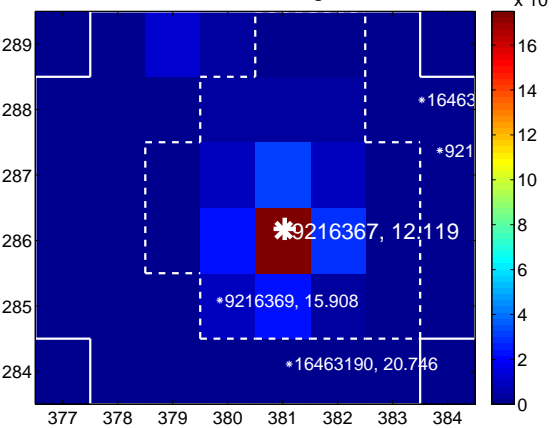
Q13 no OOT image



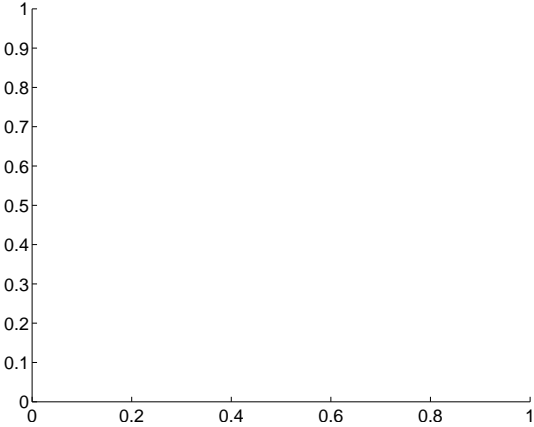
Q14 difference image. Poor Quality



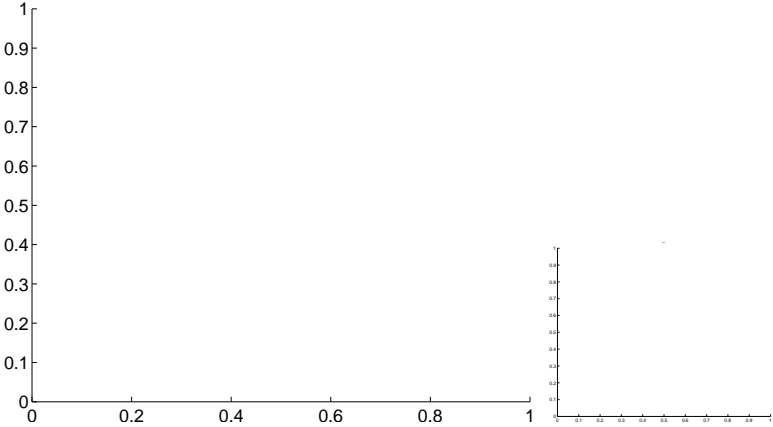
Q14 OOT image



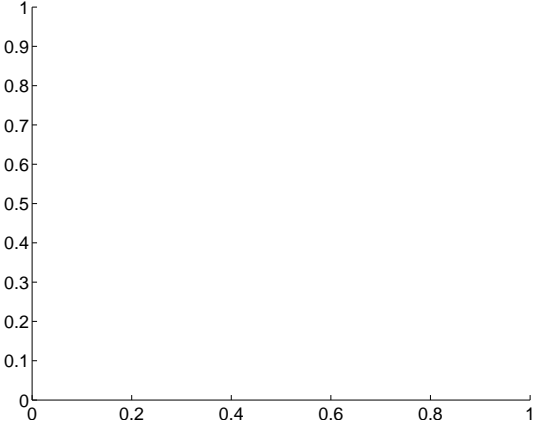
Q15 no difference image



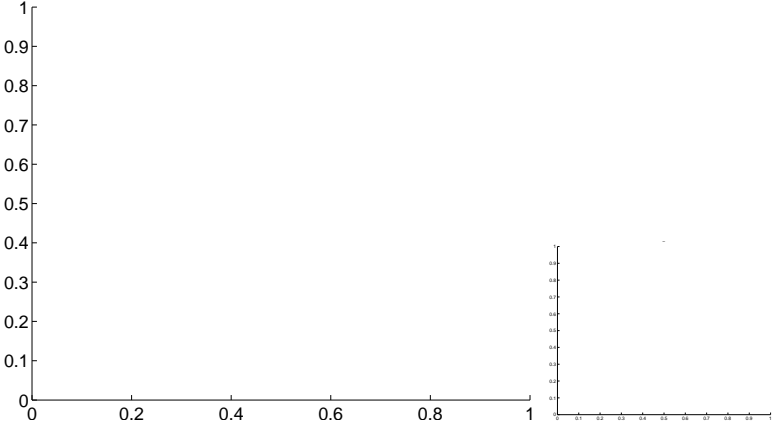
Q15 no OOT image



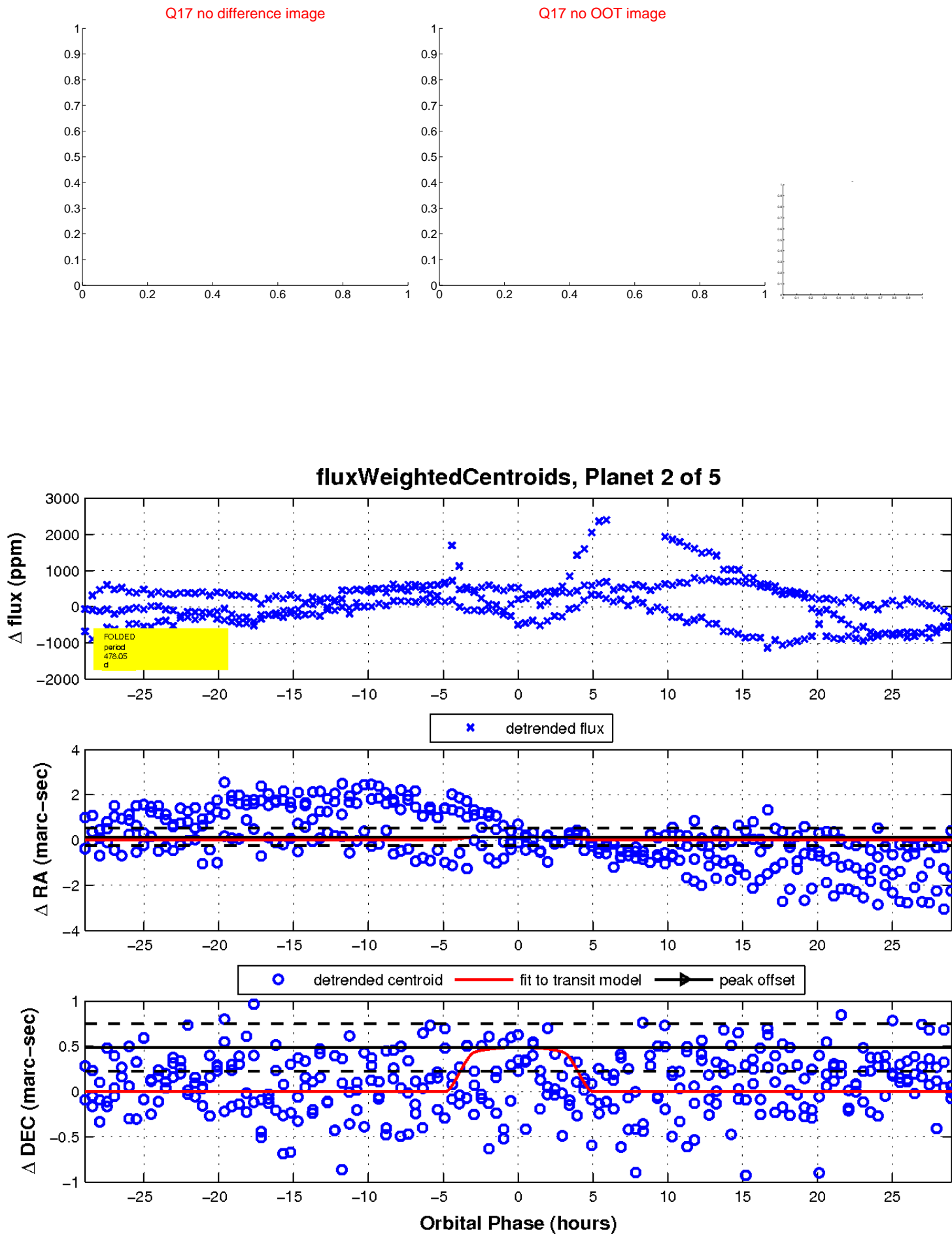
Q16 no difference image



Q16 no OOT image

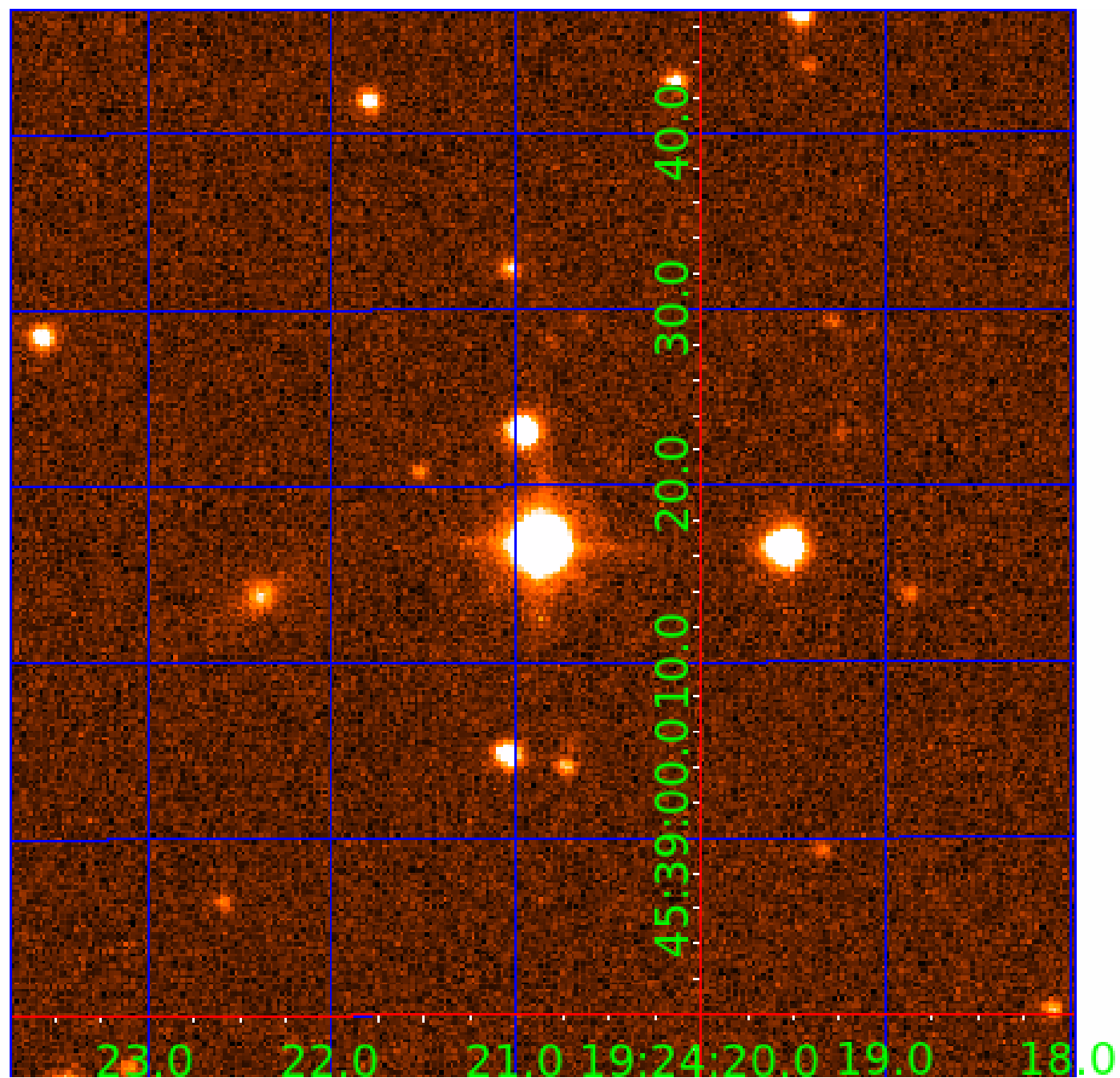


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009216367

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009216367-01	OBS	No	594.596093	218.977861	941.2	8.850	15.1	11.3	3.40	8061	18.09	14.56
009216367-02	OBS	No	478.046714	390.405015	577.3	9.670	14.1	9.2	3.40	8061	9.86	19.47
009216367-03	OBS	No	528.153153	144.791869	375.9	5.036	12.9	7.9	3.40	8061	7.35	17.05
009216367-04	OBS	No	471.785955	406.408997	405.6	5.628	12.4	9.0	3.40	8061	7.80	19.82
009216367-05	OBS	No	408.445669	290.784330	447.5	5.853	11.2	8.0	3.40	8061	8.04	24.02

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009216367-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
009216367-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

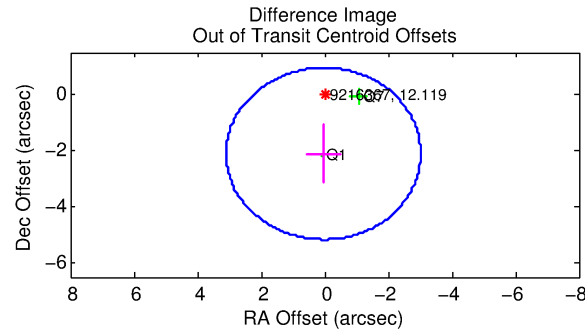
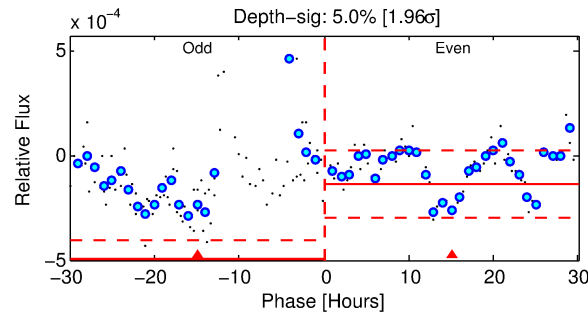
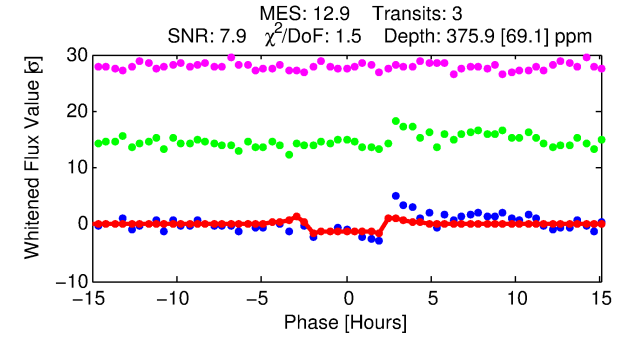
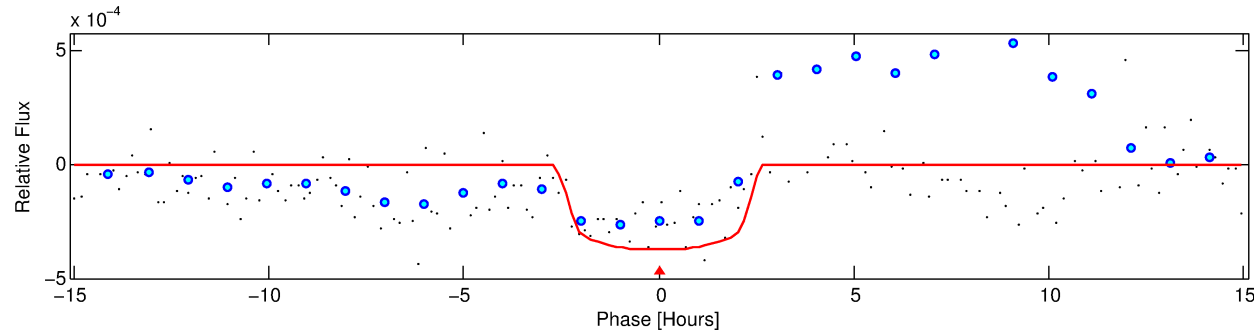
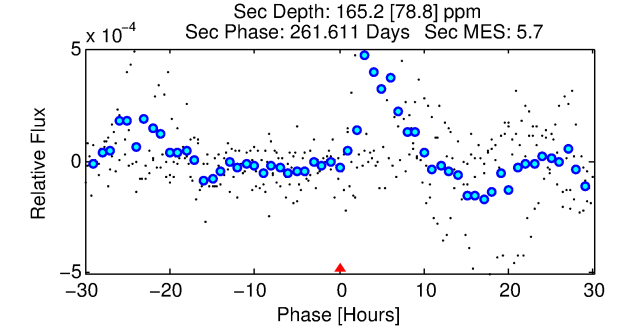
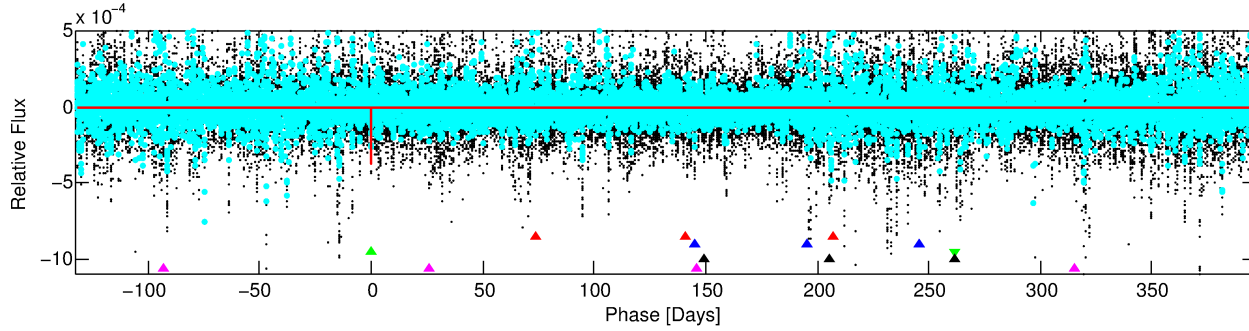
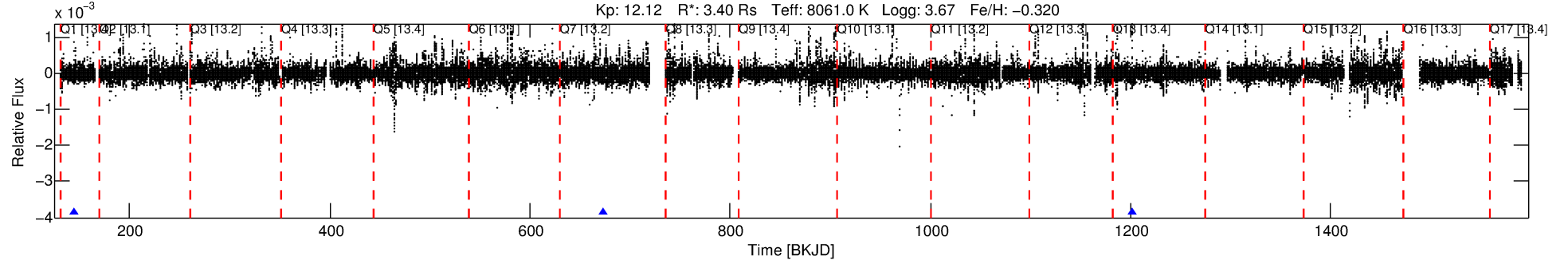
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009216367-03

No Significant Match Found

# DV One-Page Summary

KIC: 9216367 Candidate: 3 of 5 Period: 528.153 d



## DV Fit Results:

Period = 528.15315 [0.00504] d  
Epoch = 144.7919 [0.0053] BKJD  
Rp/R\* = 0.0198 [0.0061]  
a/R\* = 482.18 [758.47]  
b = 0.82 [0.62]  
Seff = 17.05 [14.64]  
Teq = 518 [111] K  
Rp = 7.35 [4.42] Re  
a = 1.6012 [0.8272] AU  
Ag = 4314.08 [4944.75] [0.87 $\sigma$ ]  
Teffp = 6492 [1289] K [4.62 $\sigma$ ]

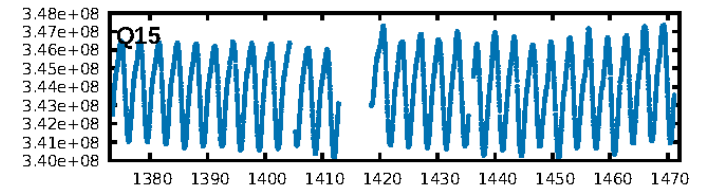
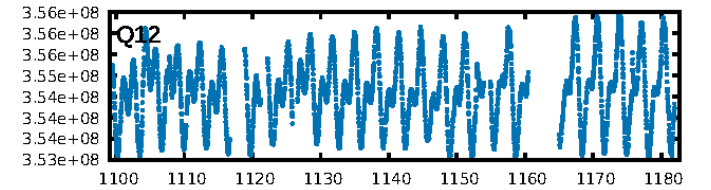
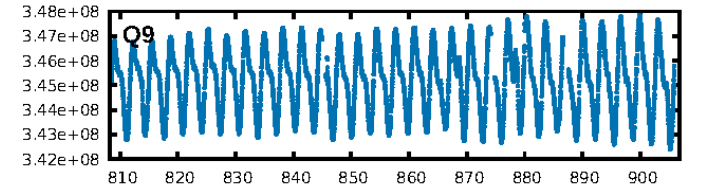
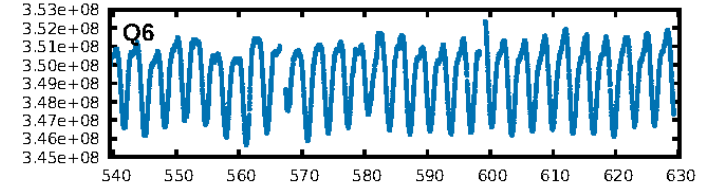
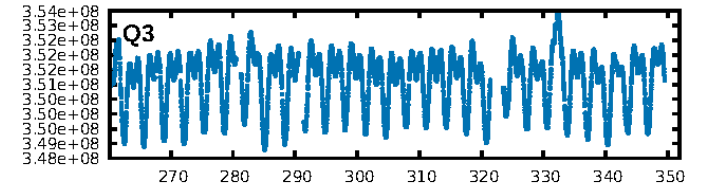
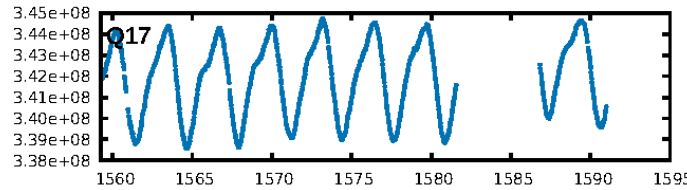
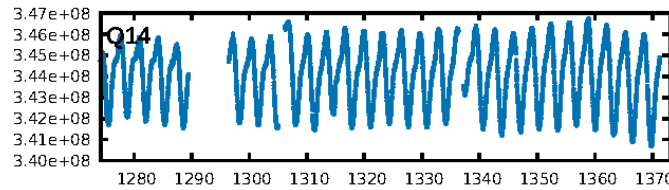
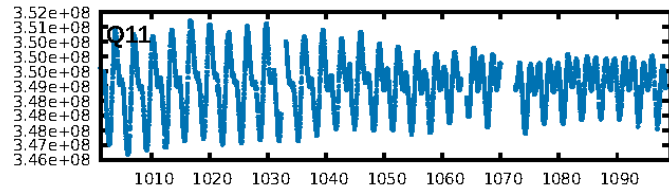
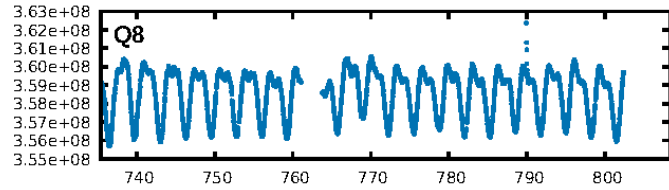
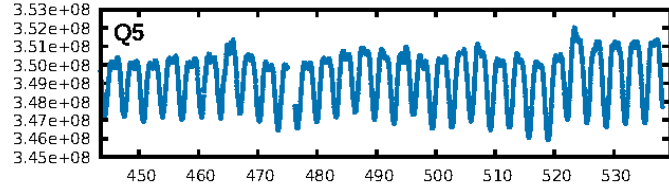
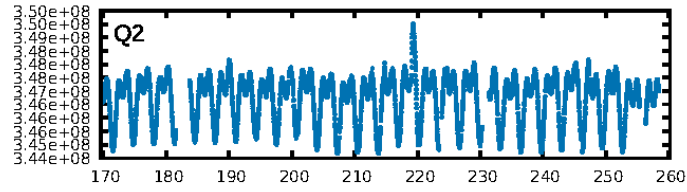
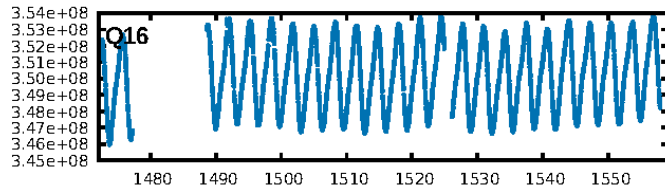
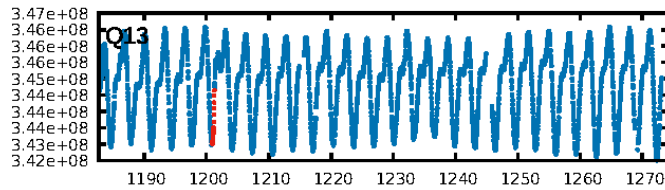
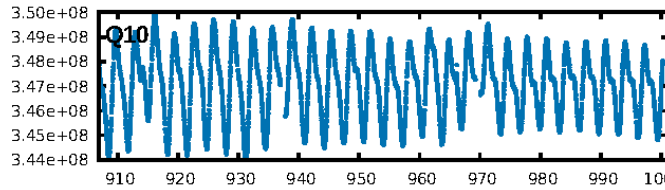
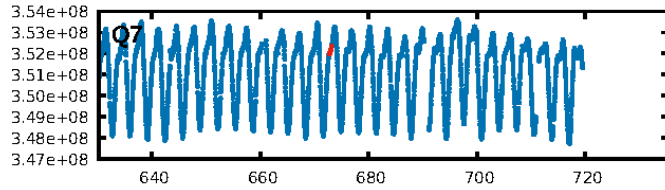
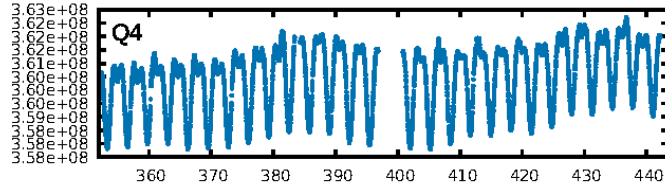
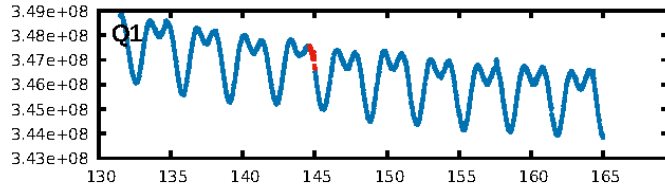
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [110.30 $\sigma$ ]  
LongPeriod-sig: 100.0% [156.60 $\sigma$ ]  
ModelChiSquare2-sig: 2.1%  
ModelChiSquareGof-sig: 73.4%  
Bootstrap-pfa: 2.72e-13  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: -10.84  
Centroid-sig: 64.7%  
Centroid-so: 0.512 arcsec [0.68 $\sigma$ ]  
OotOffset-rm: 2.109 arcsec [2.07 $\sigma$ ]  
KicOffset-rm: 2.118 arcsec [2.21 $\sigma$ ]  
OotOffset-st: 0/1/0/1 [2]  
KicOffset-st: 0/1/0/1 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [2/2]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:49:16 Z

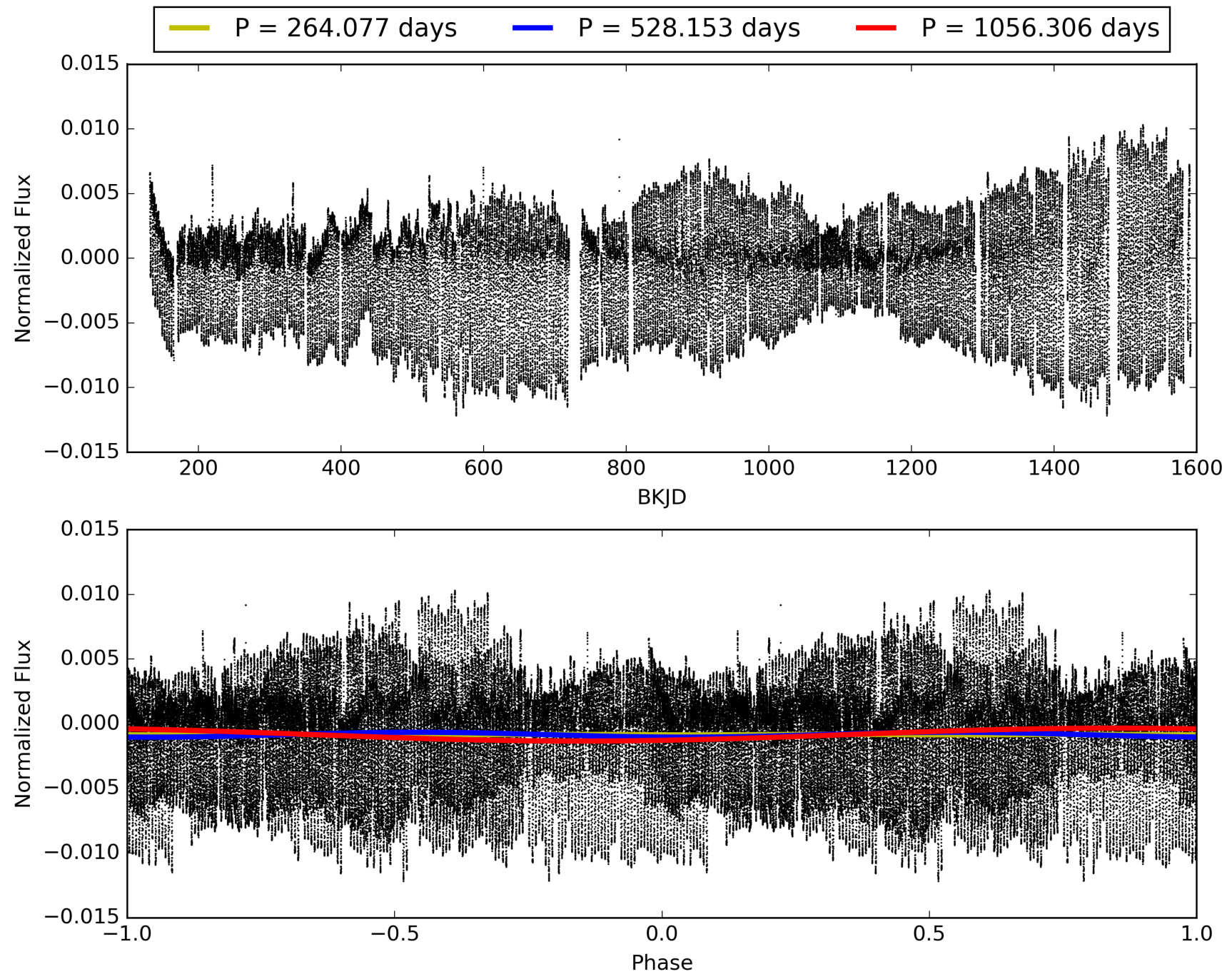
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009216367-03, PDC Light Curves



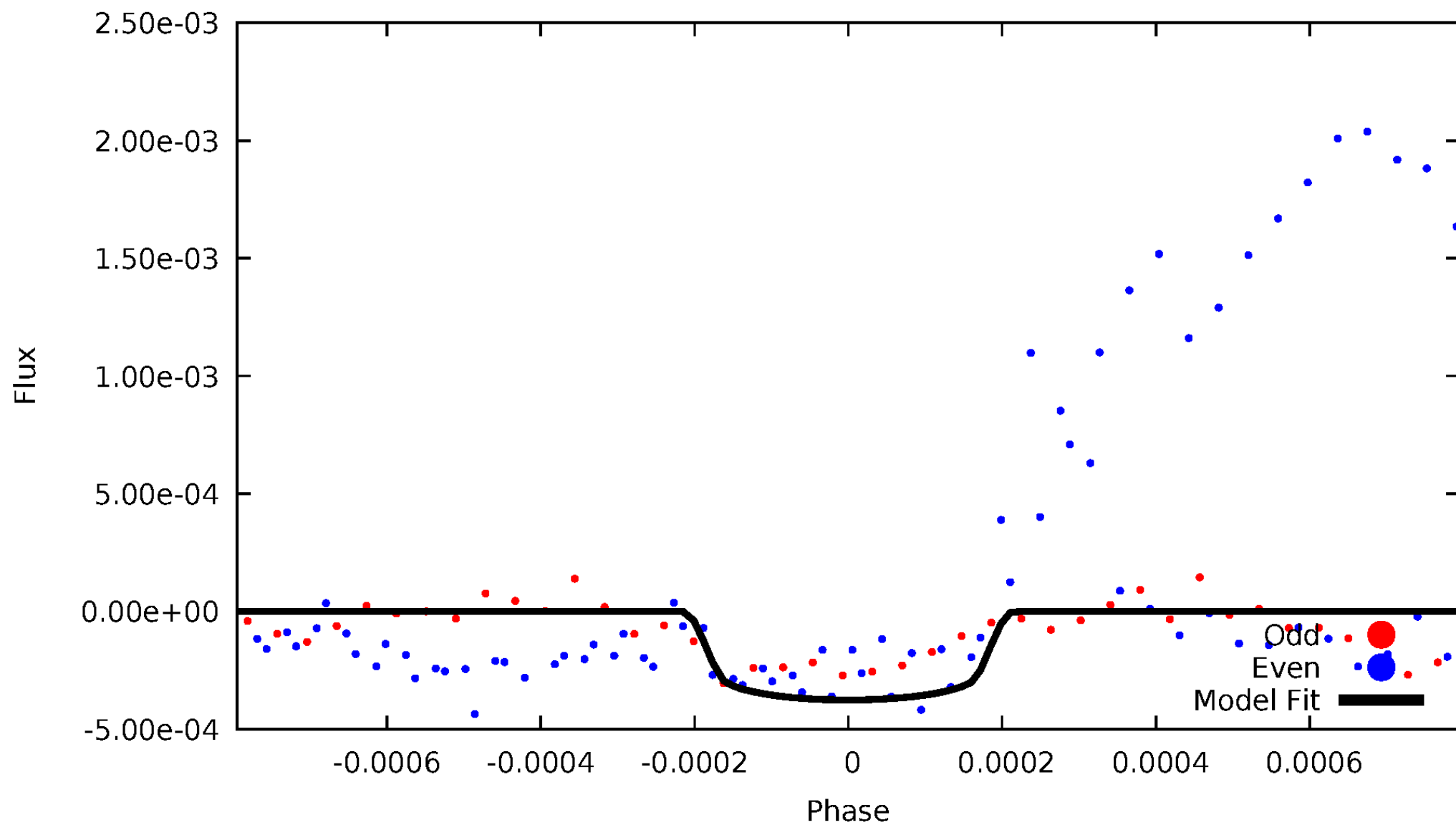


TCE 009216367-03



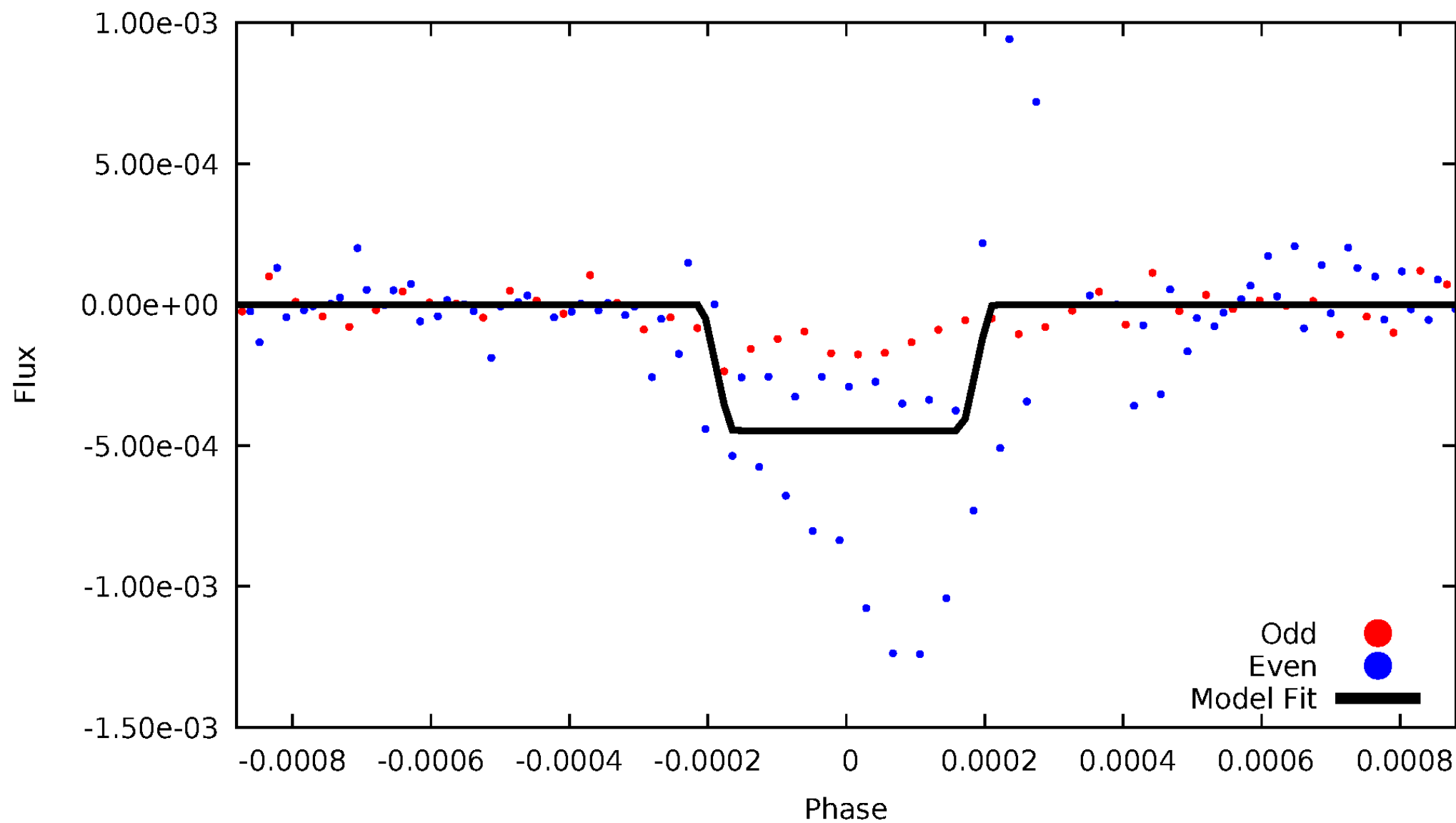
# DV Odd/Even

TCE 009216367-03



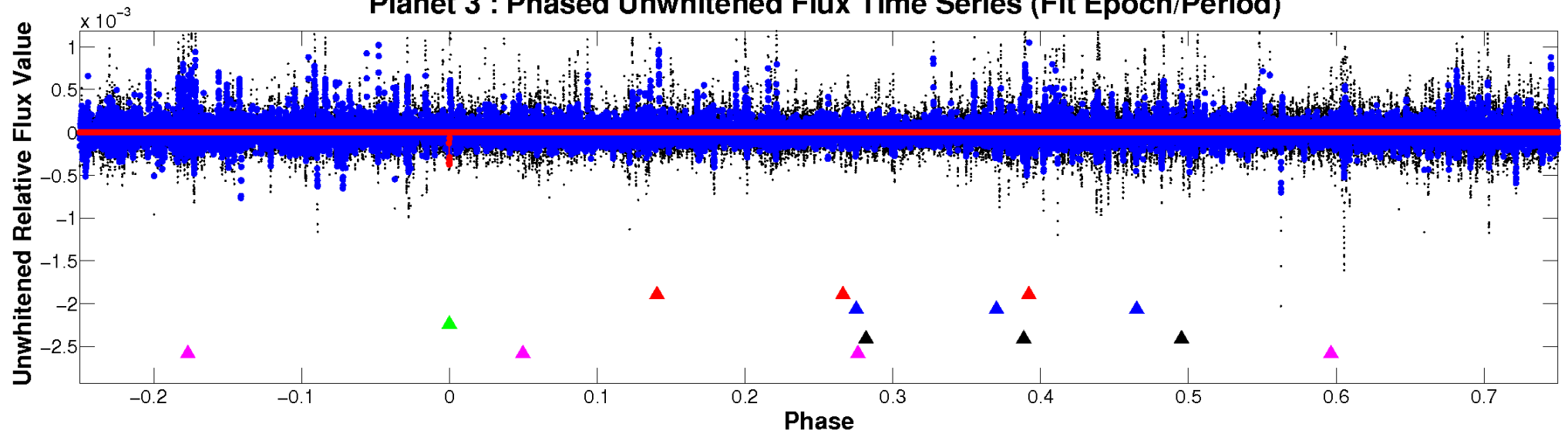
# ALT Odd/Even

TCE 009216367-03

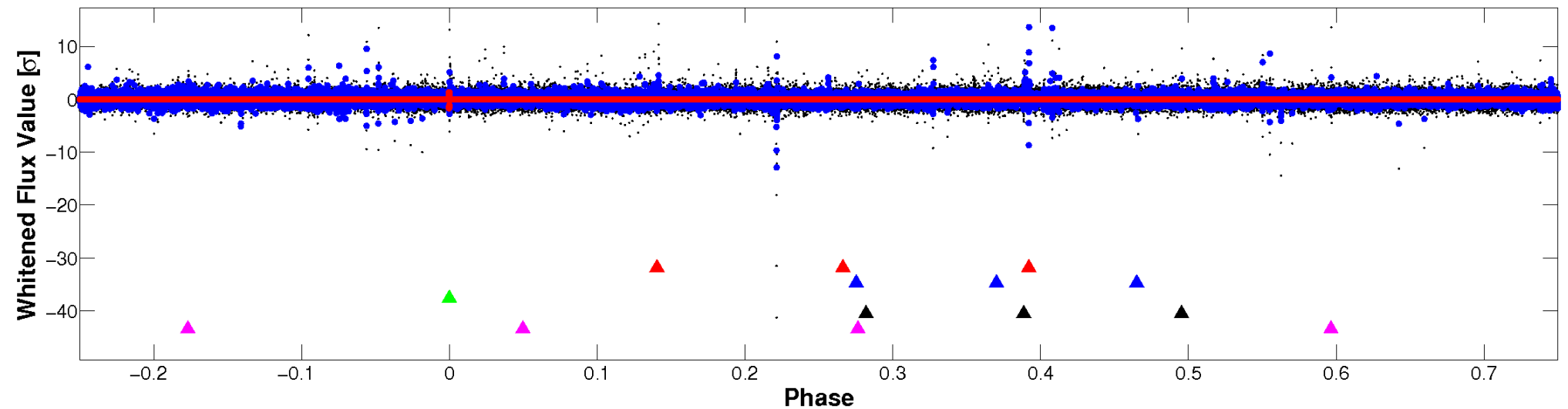


# Non-Whitened Vs. Whitened Light Curve

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

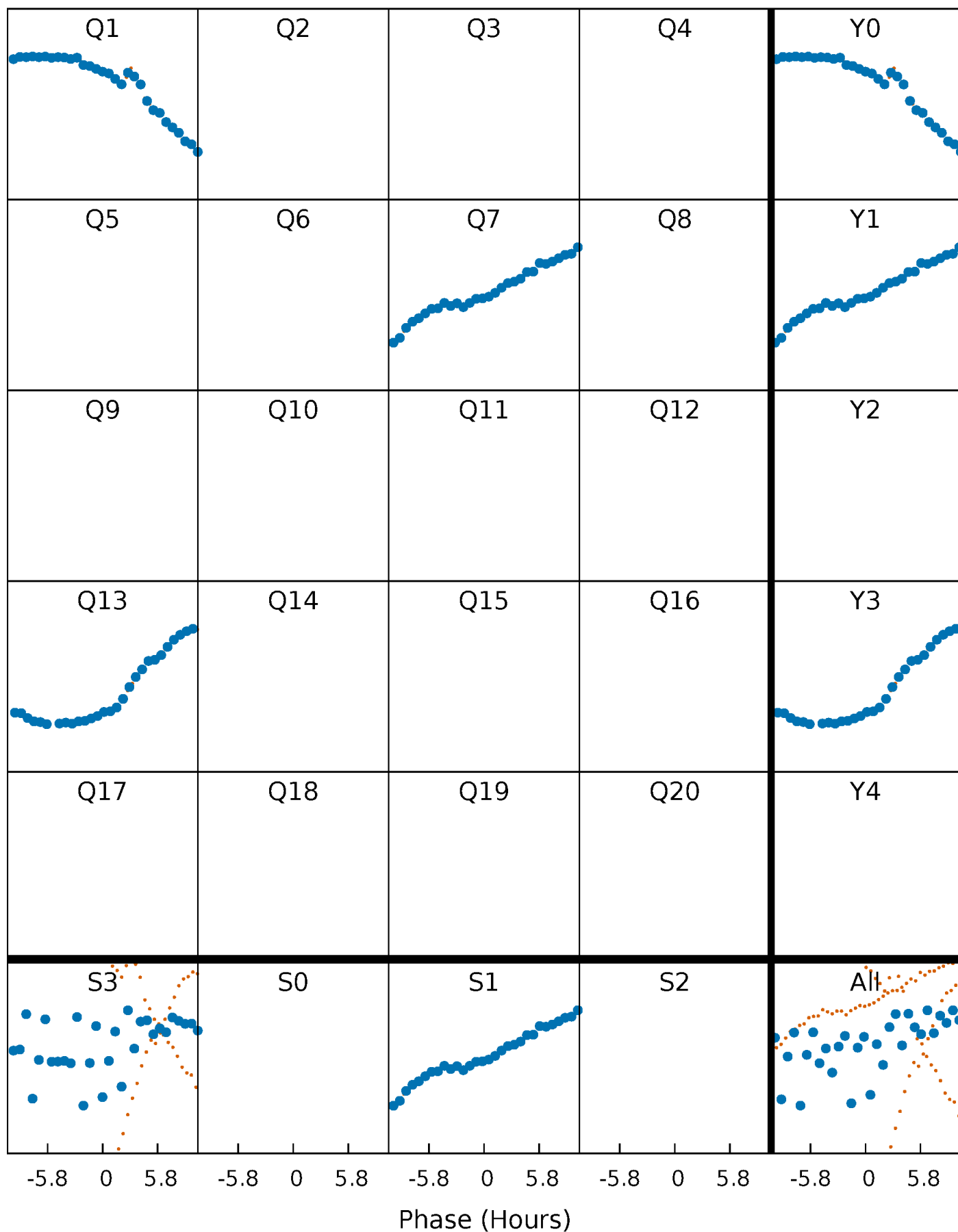


**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



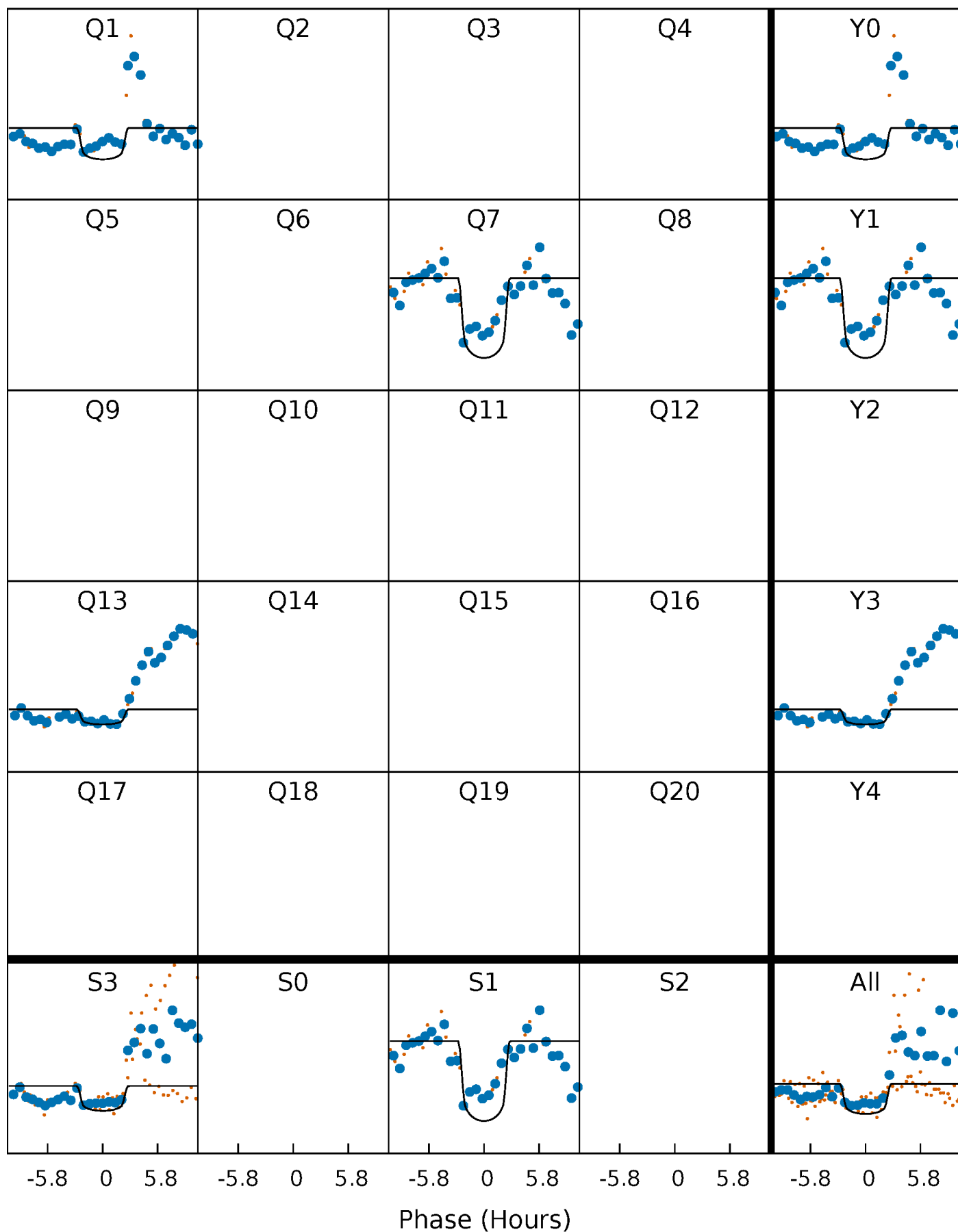
# PDC Quarter-Phased Transit Curves

TCE 009216367-03 P=528.153153 Days  $T_0=144.791869$  (BKJD)



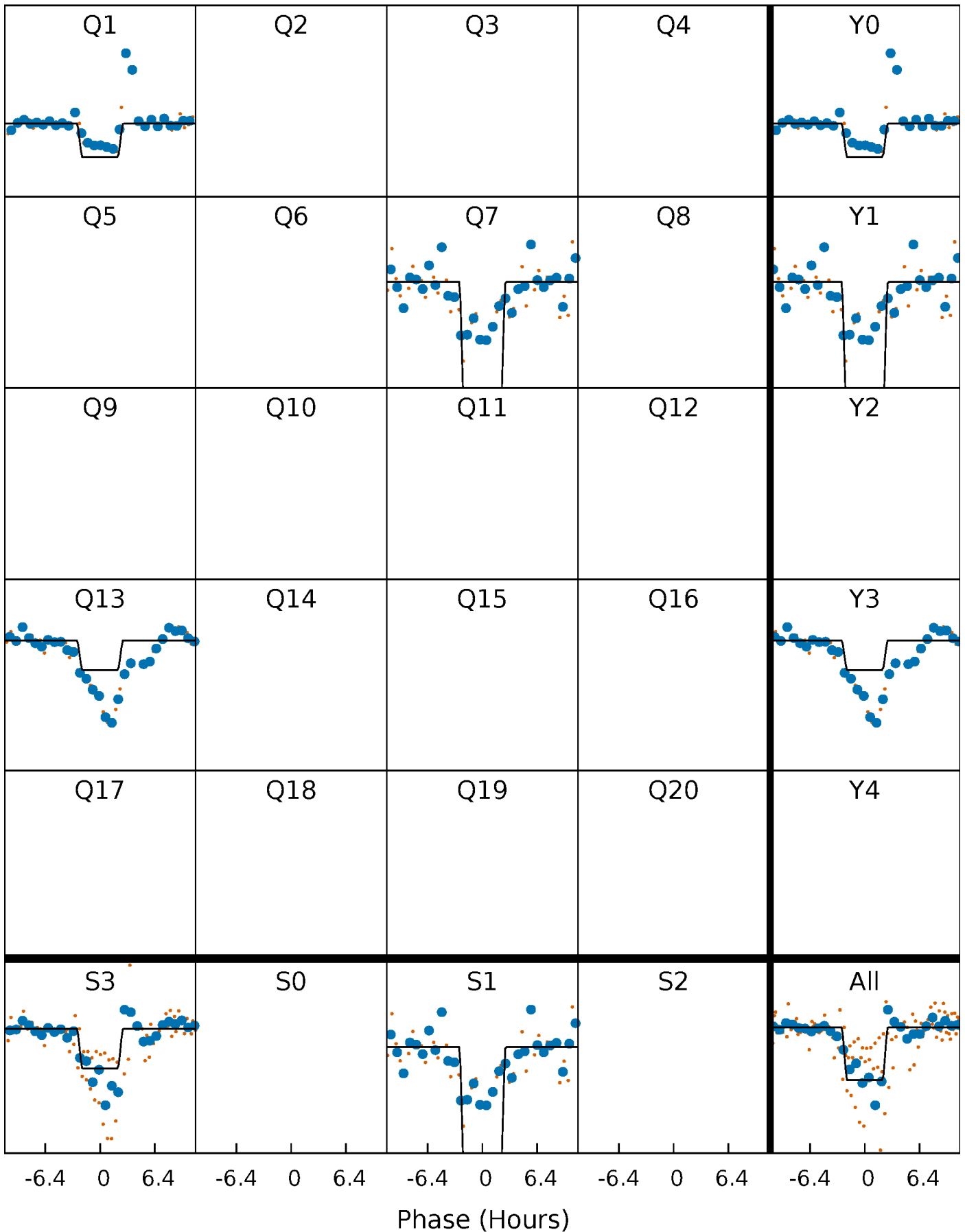
# DV Quarter-Phased Transit Curves

TCE 009216367-03   P=528.153153 Days    $T_0=144.791869$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

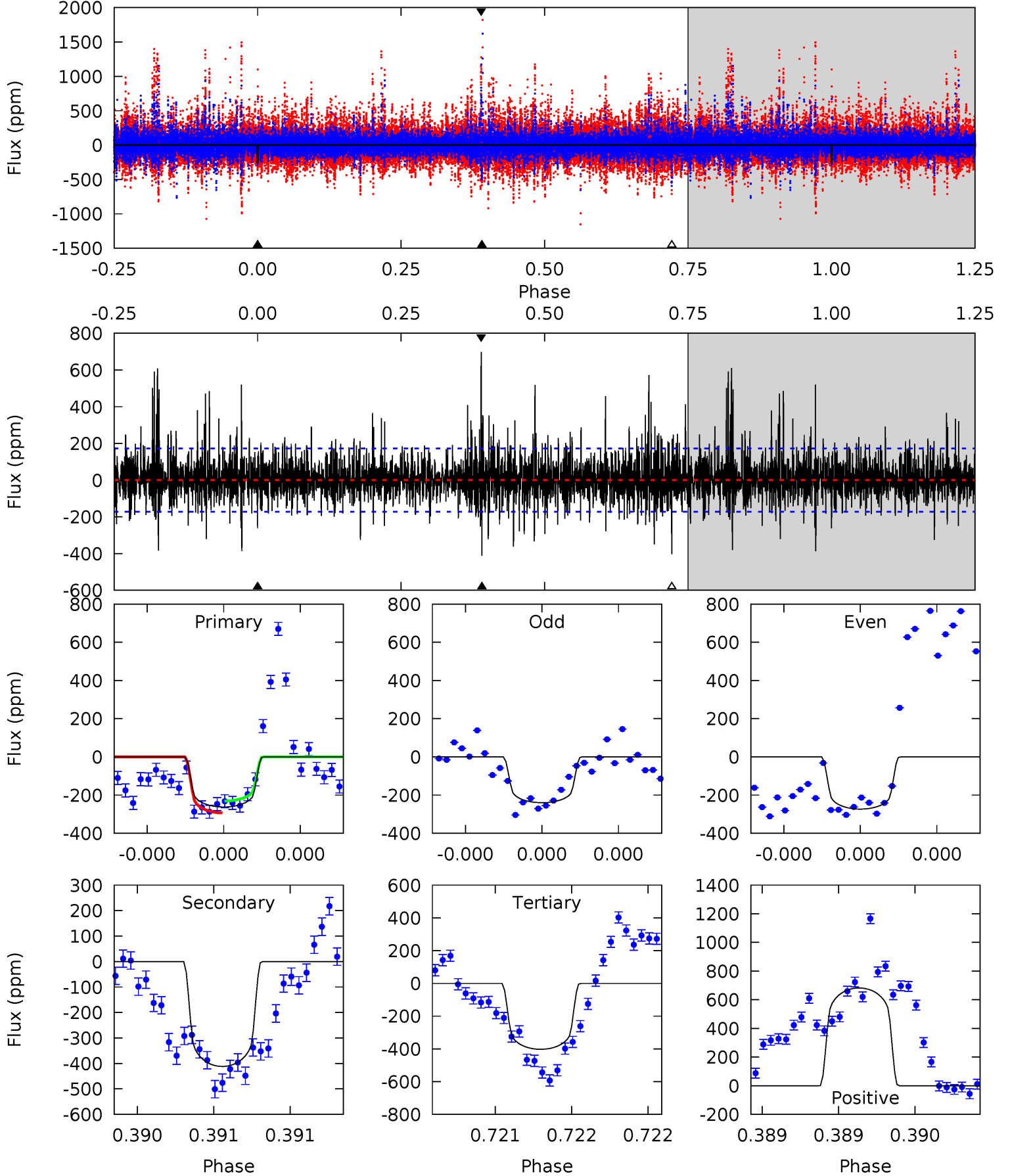
TCE 009216367-03     $P=528.159848$  Days     $T_0=144.792729$  (BKJD)



# DV Model-Shift Uniqueness Test

009216367-03, P = 528.153153 Days, E = 144.791869 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
8.52	13.4	13.1	22.2	5.60	3.52	3.02	-4.56	-13.6	0.30	-8.79	0.42	1.09	0.63	1.02

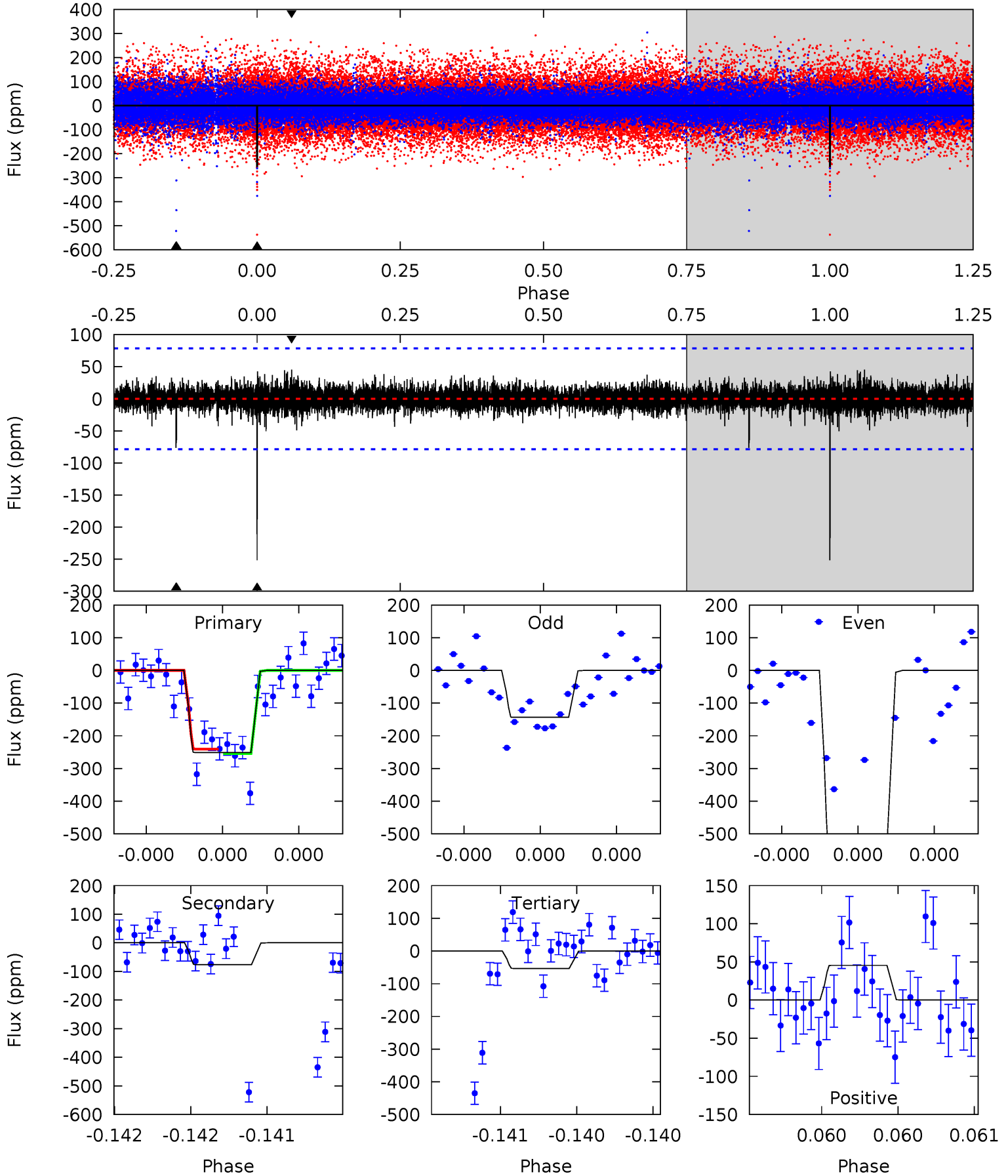




# Alt Model-Shift Uniqueness Test

009216367-03, P = 528.159848 Days, E = 144.792729 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
17.9	5.42	3.80	3.24	5.60	3.52	0.68	14.1	14.7	1.63	2.18	18.2	1.55	0.15	0



### Stellar Parameters For KIC 009216367

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8061^{+223}_{-334}$	$3.668^{+0.501}_{-0.088}$	$-0.320^{+0.200}_{-0.300}$	$3.399^{+0.586}_{-1.759}$	$1.964^{+0.204}_{-0.510}$	$0.070^{+0.388}_{-0.019}$
	+3%/-4%	+14%/-2%	+62%/-94%	+17%/-52%	+10%/-26%	+551%/-27%
Source	KIC0	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 009216367-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-412 \pm 31$	$6.48^{+2.57}_{-2.40}$	$695^{+53}_{-88}$	$8155^{+2335}_{-1150}$	$13737^{+18682}_{-6488}$
Alt.	$-76 \pm 14$	$7.00^{+2.86}_{-2.62}$	$694^{+56}_{-94}$	$5074^{+904}_{-596}$	$2151^{+3186}_{-1086}$

$T_{\text{max}}$  = 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

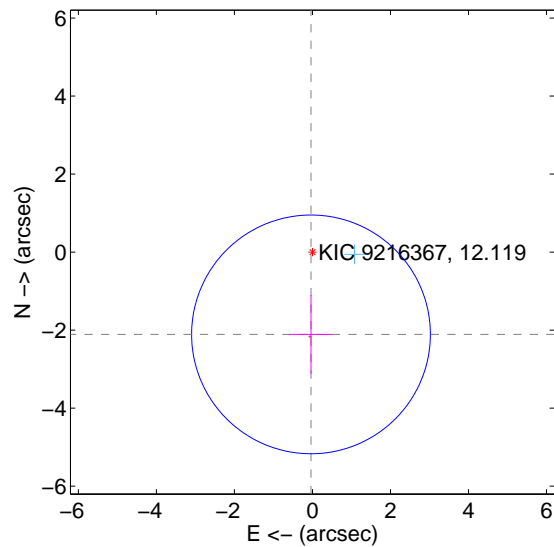
Supplemental centroid analysis for 009216367-03. Kepler magnitude: 12.12. Transit SNR 7.89

There are 1 quarters with good PRF difference image offsets

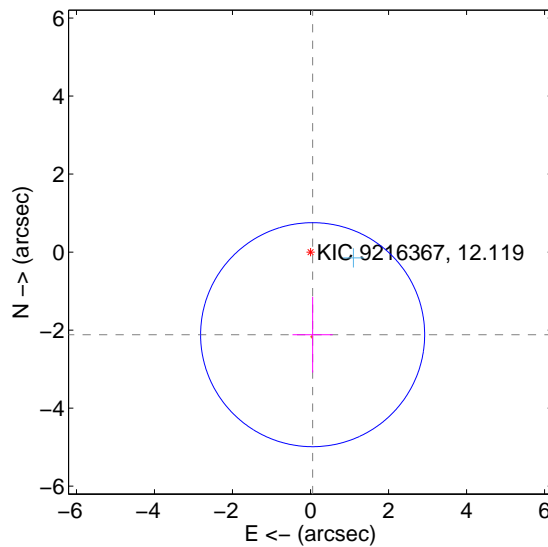
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.109 \pm 1.020$	2.07	$0.037 \pm 0.550$	$-2.109 \pm 1.010$
PRF-fit source offset from KIC position	$2.118 \pm 0.957$	2.21	$-0.054 \pm 0.516$	$-2.117 \pm 0.970$
photometric centroid source offset	$0.51 \pm 0.75$	0.68	$-0.32 \pm 0.88$	$-0.40 \pm 0.64$

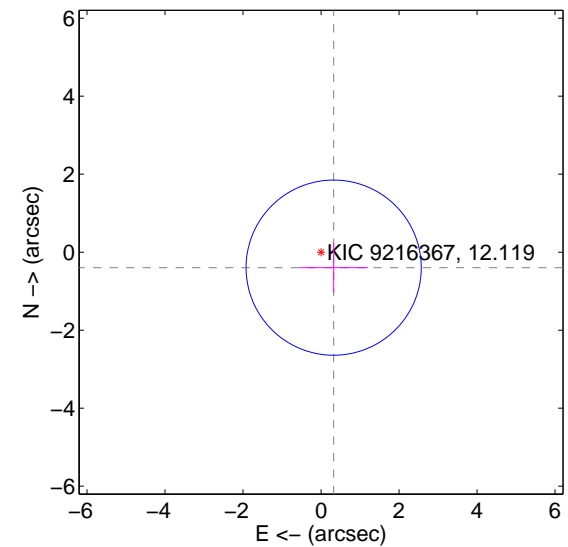
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

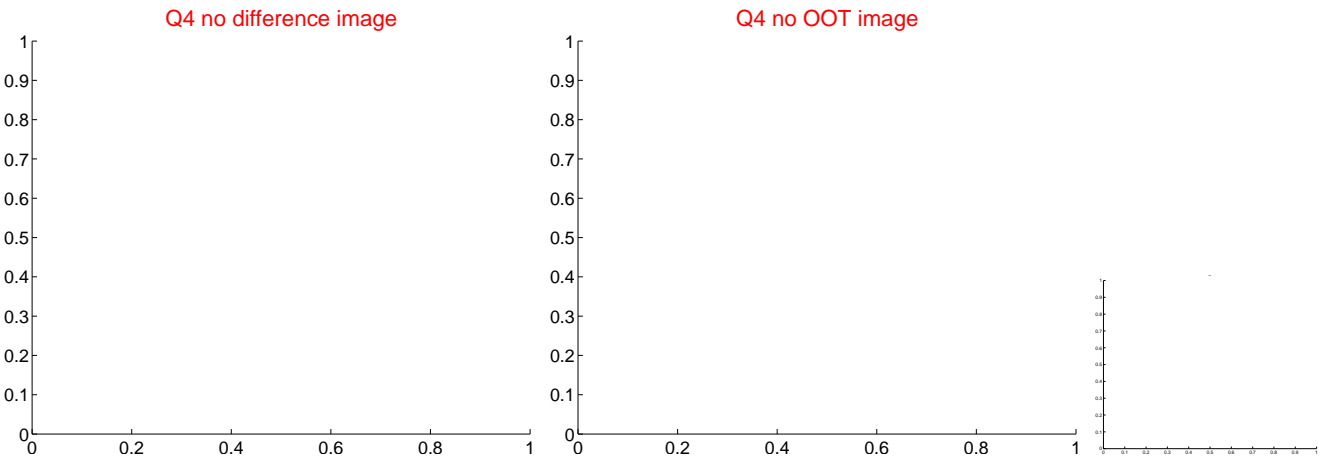
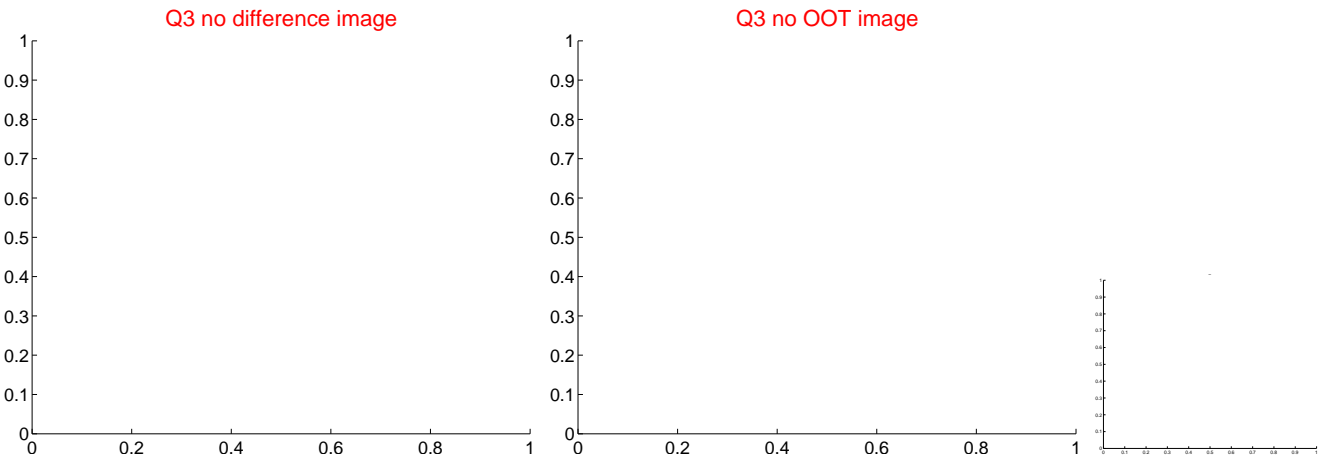
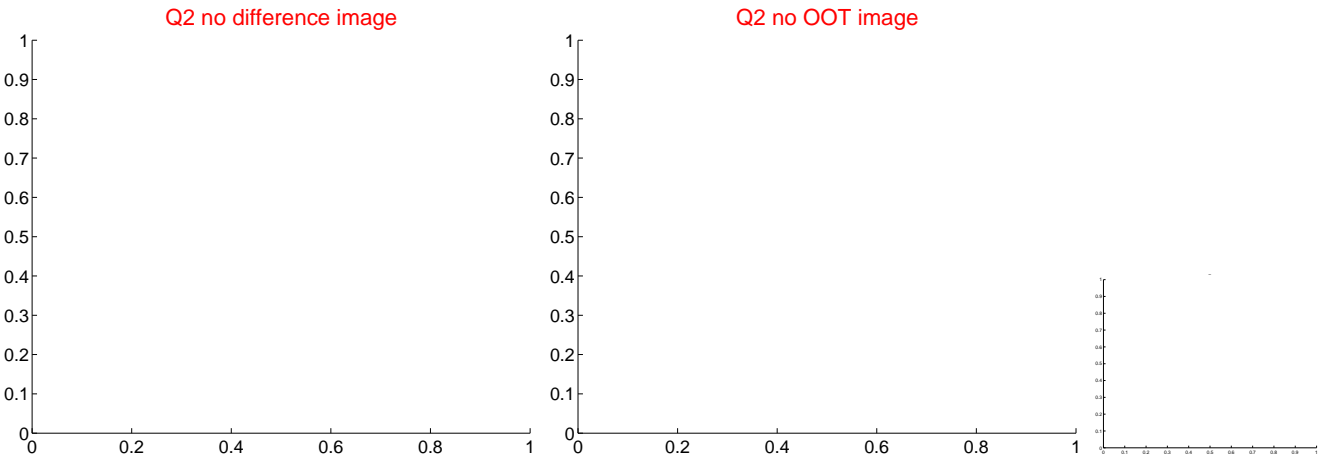
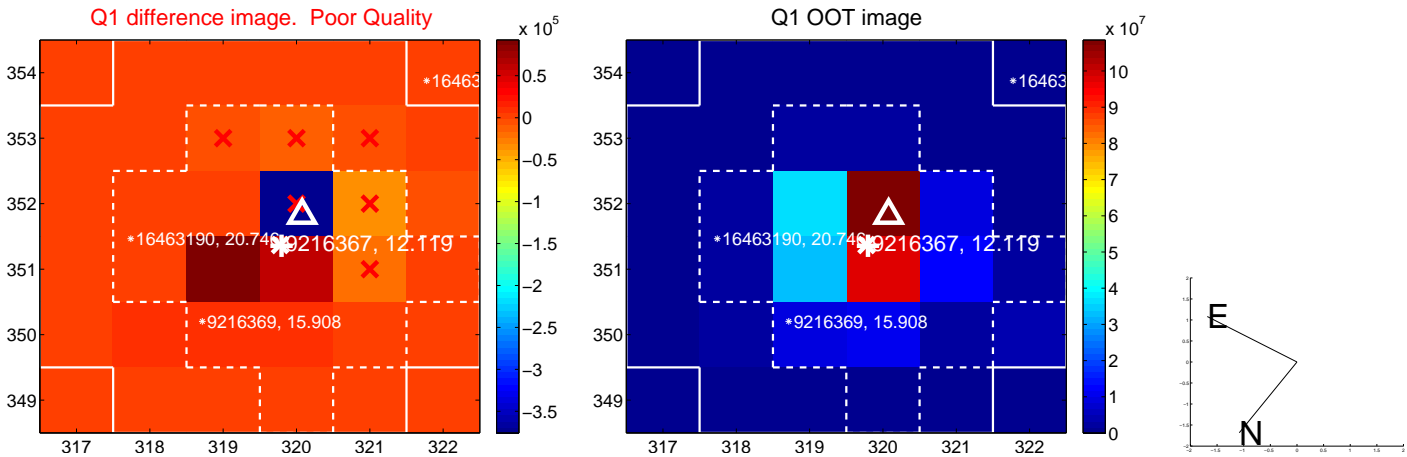


offset from photometric centroids

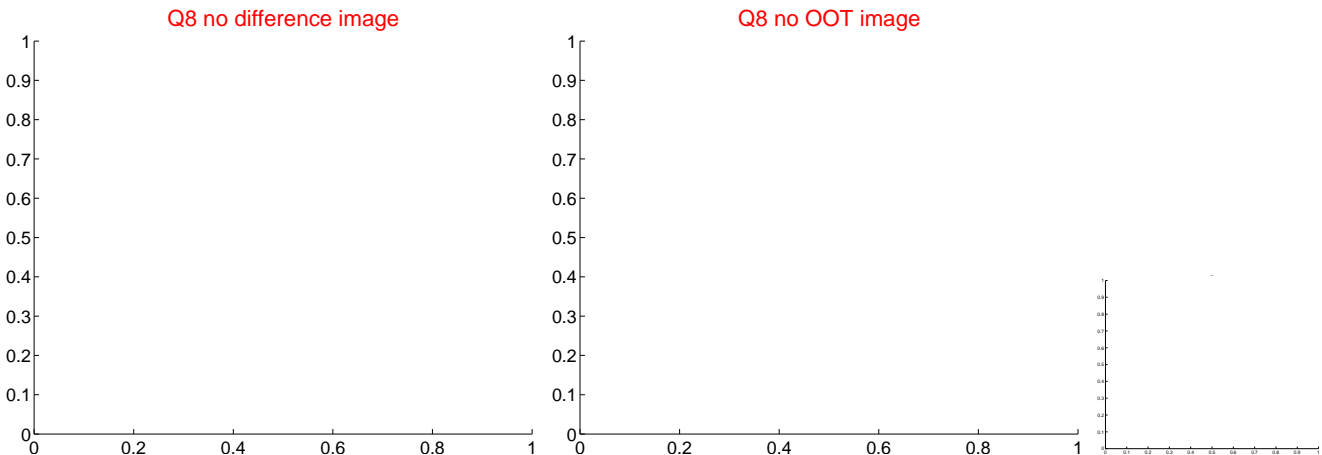
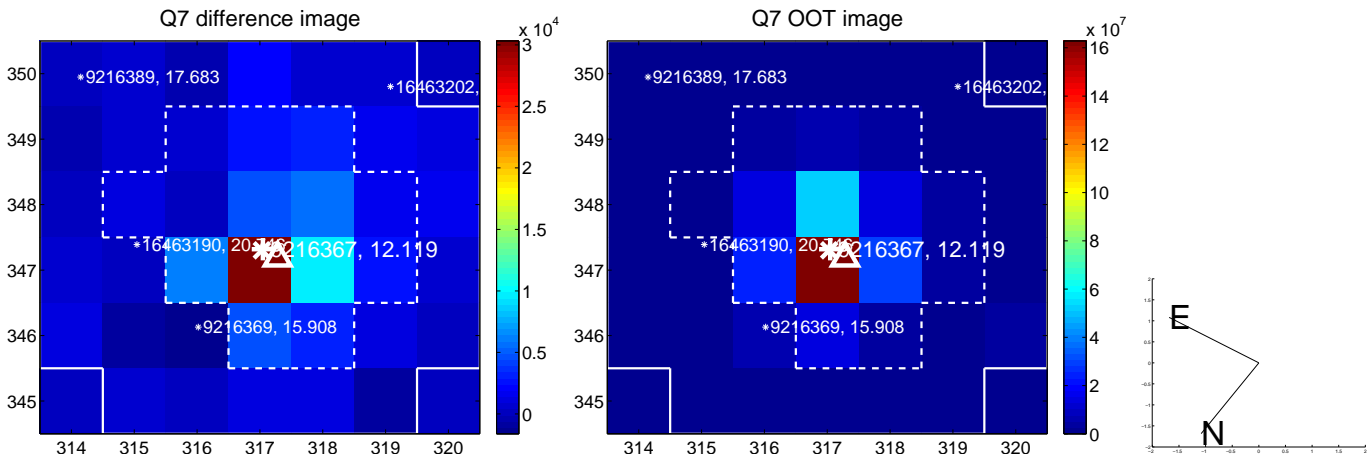
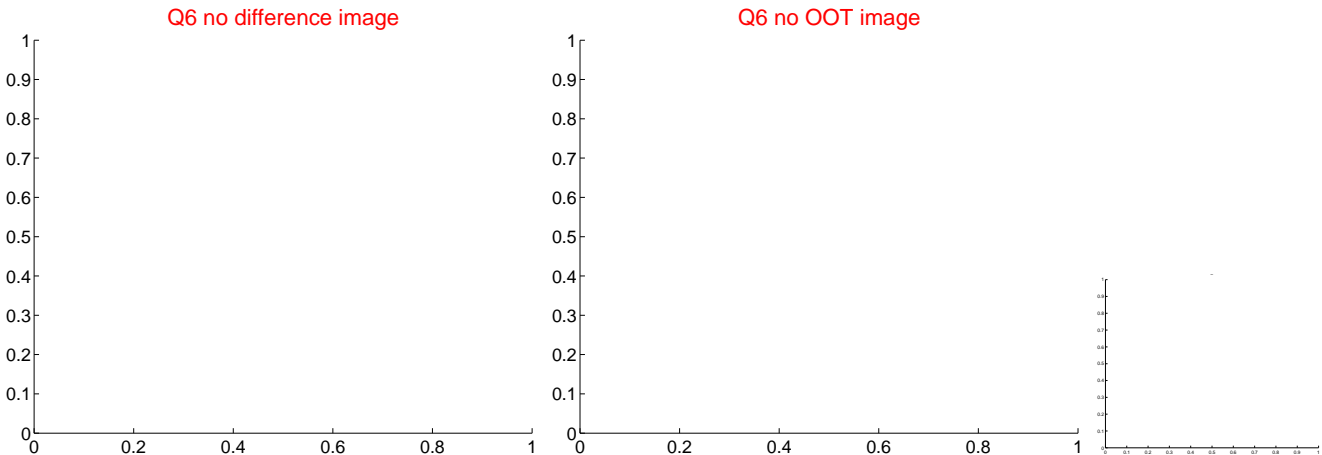
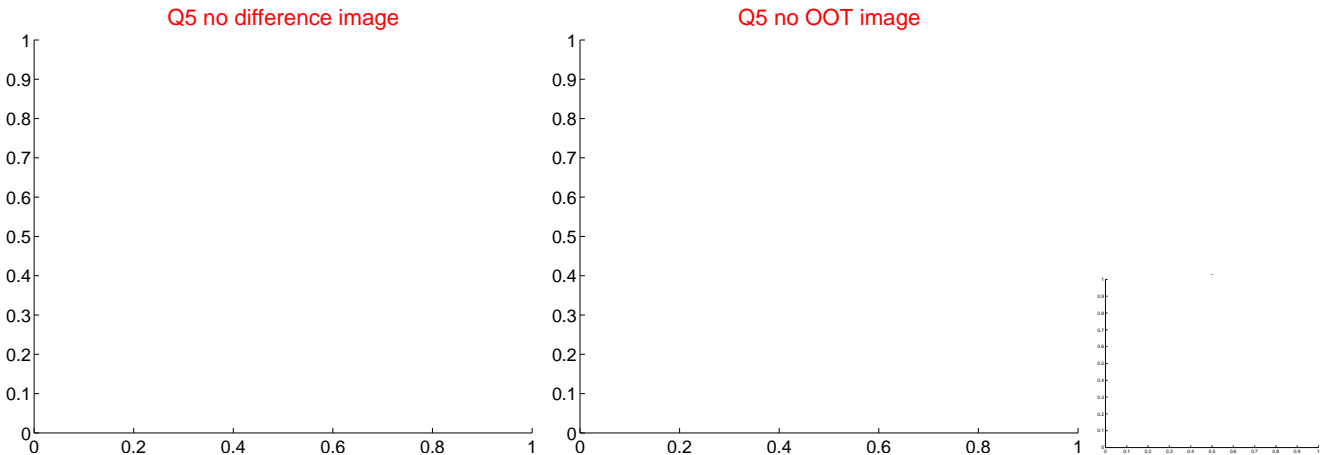


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

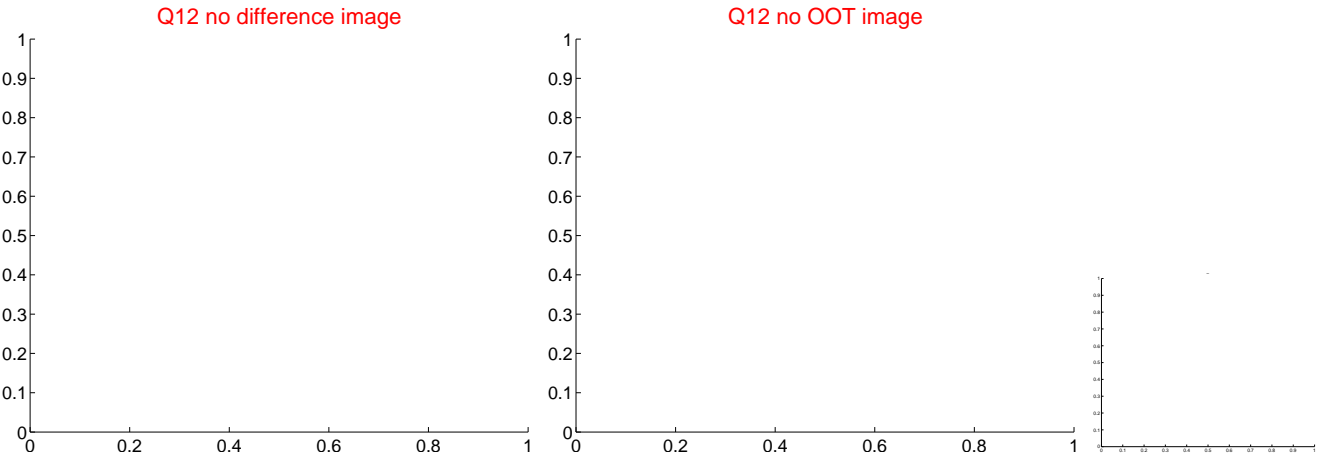
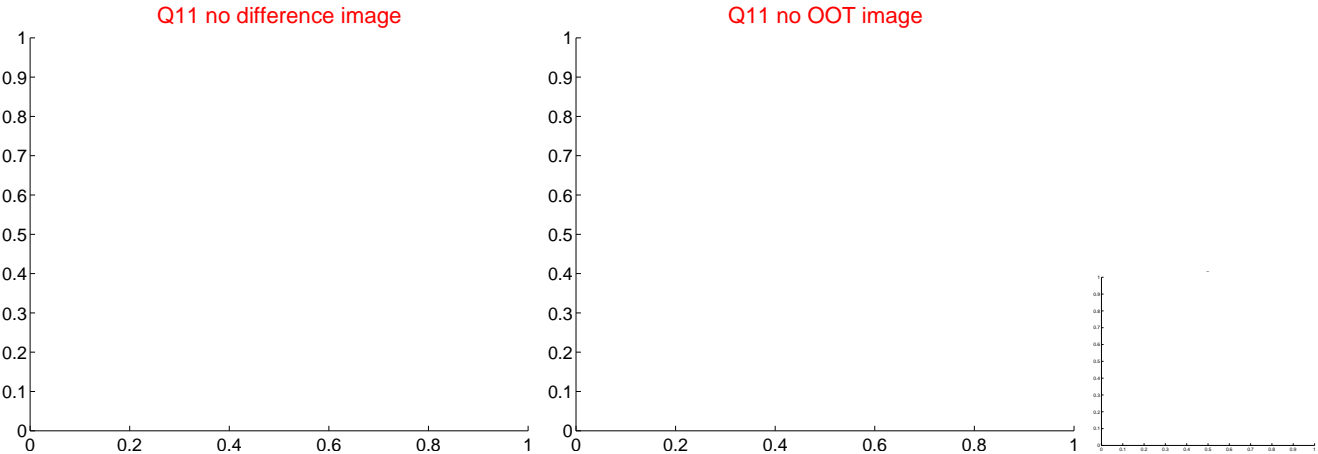
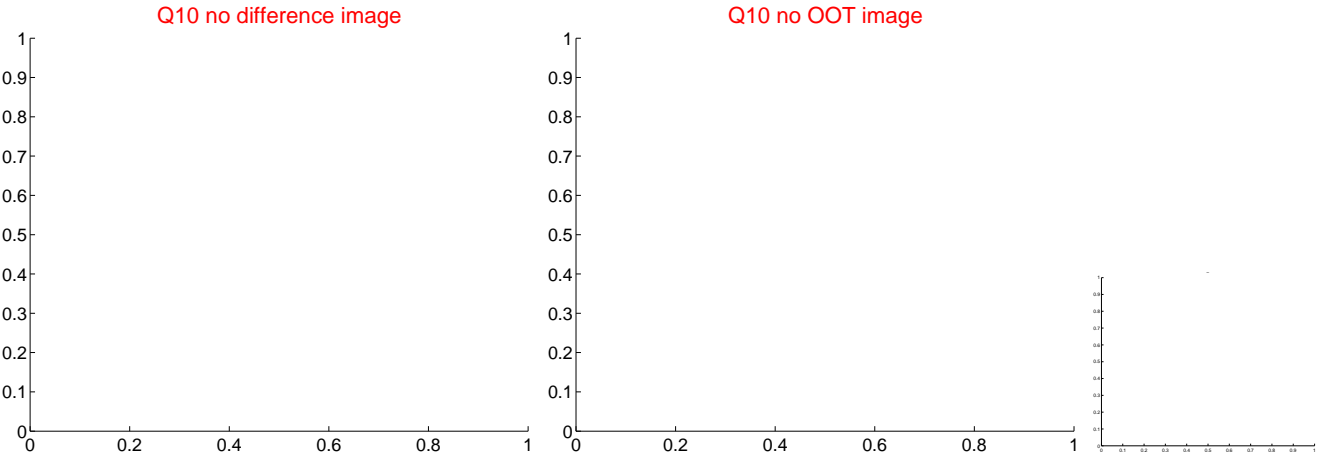
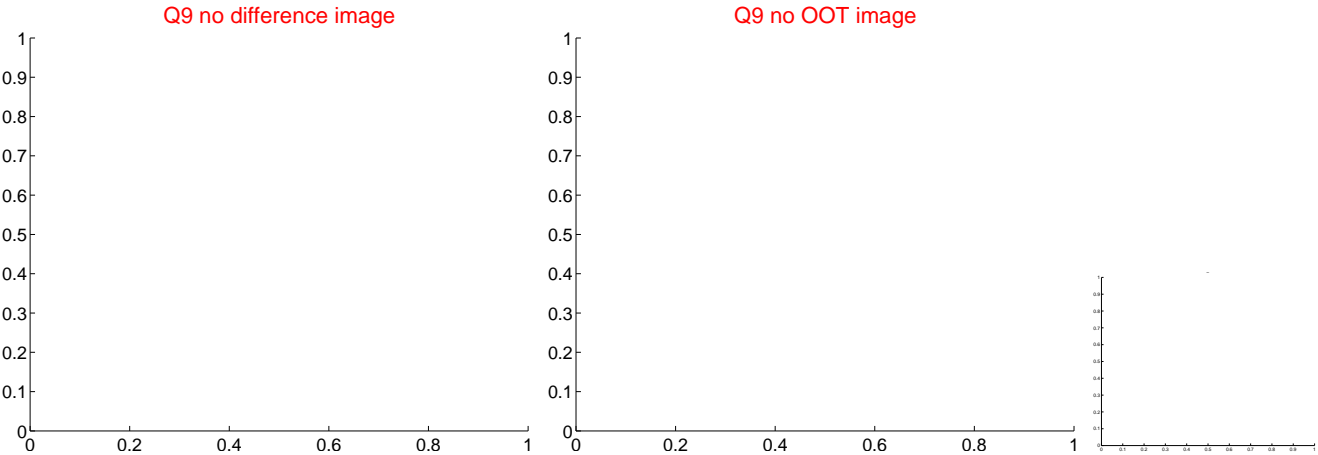
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



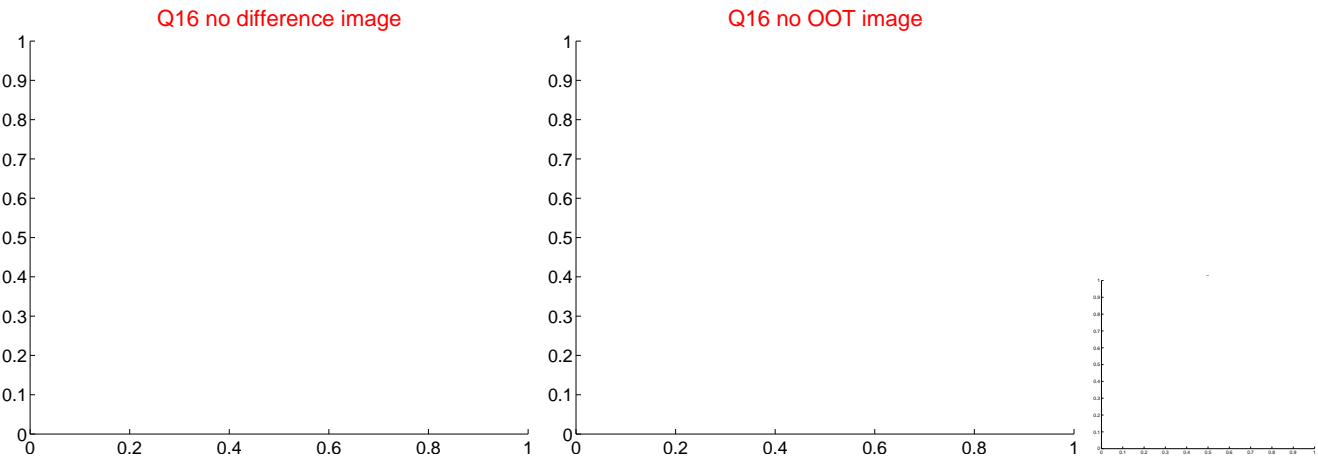
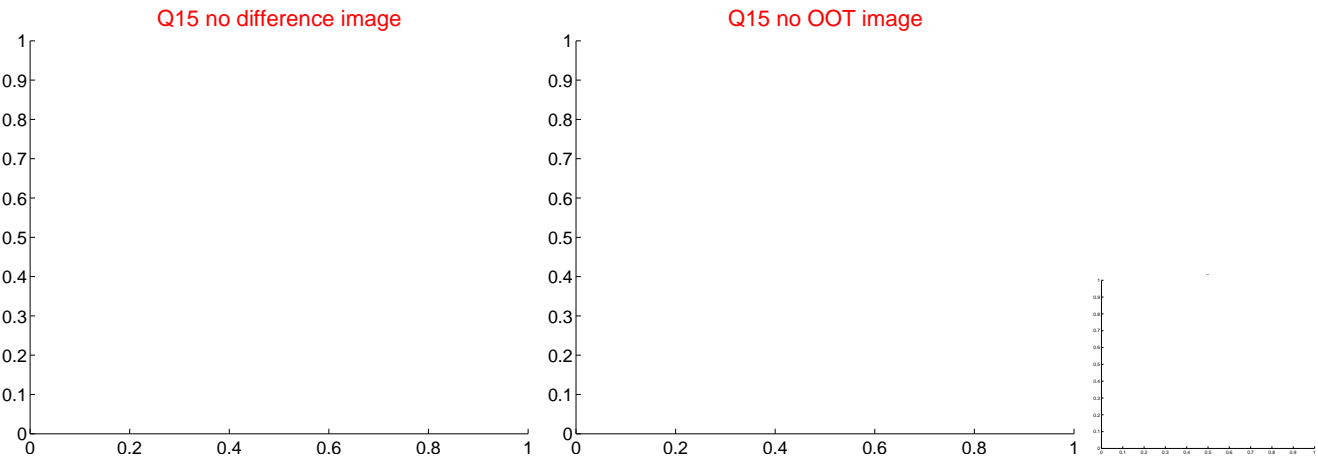
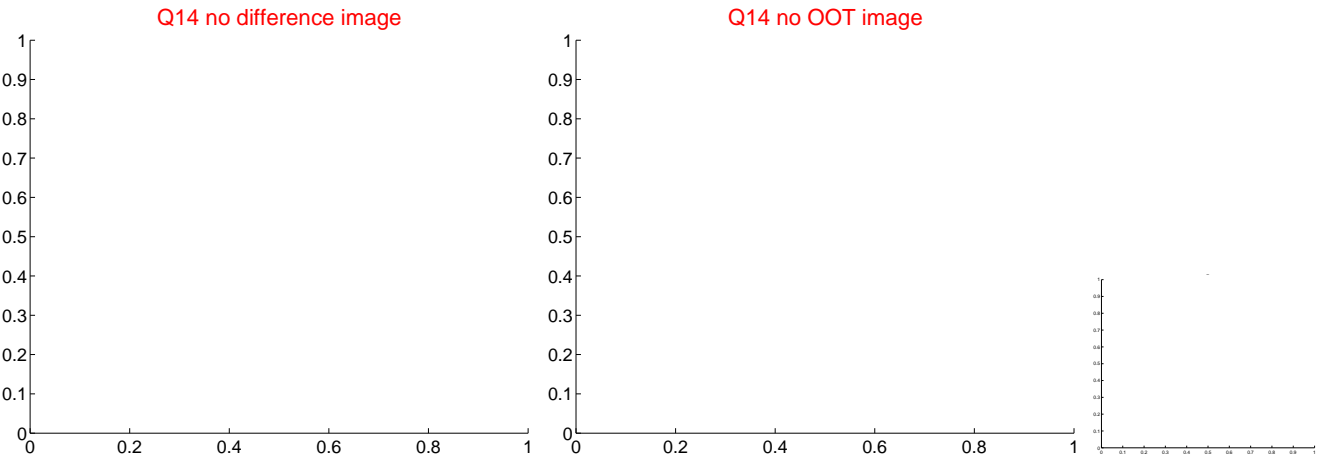
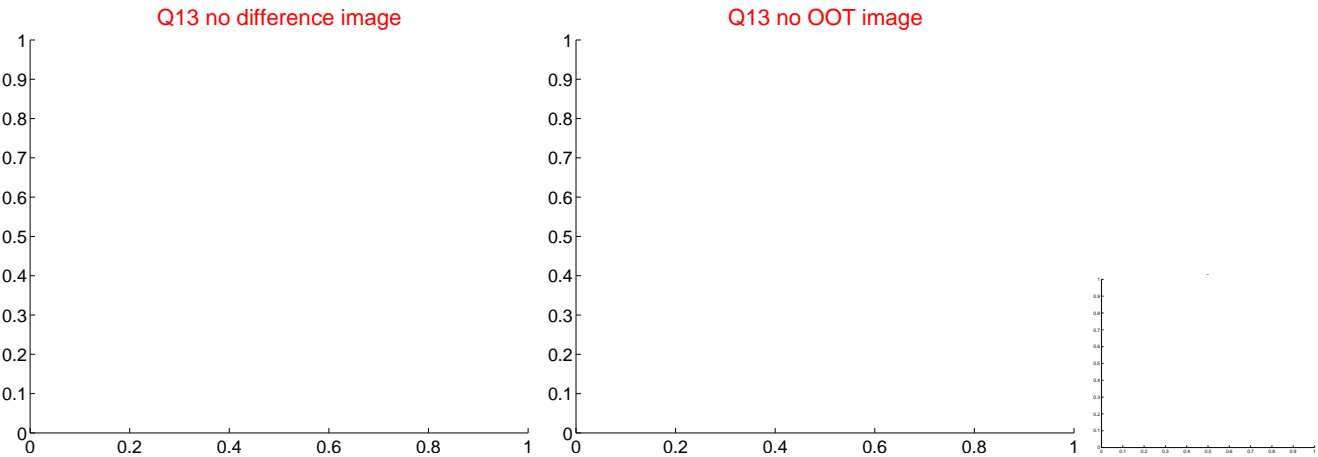
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



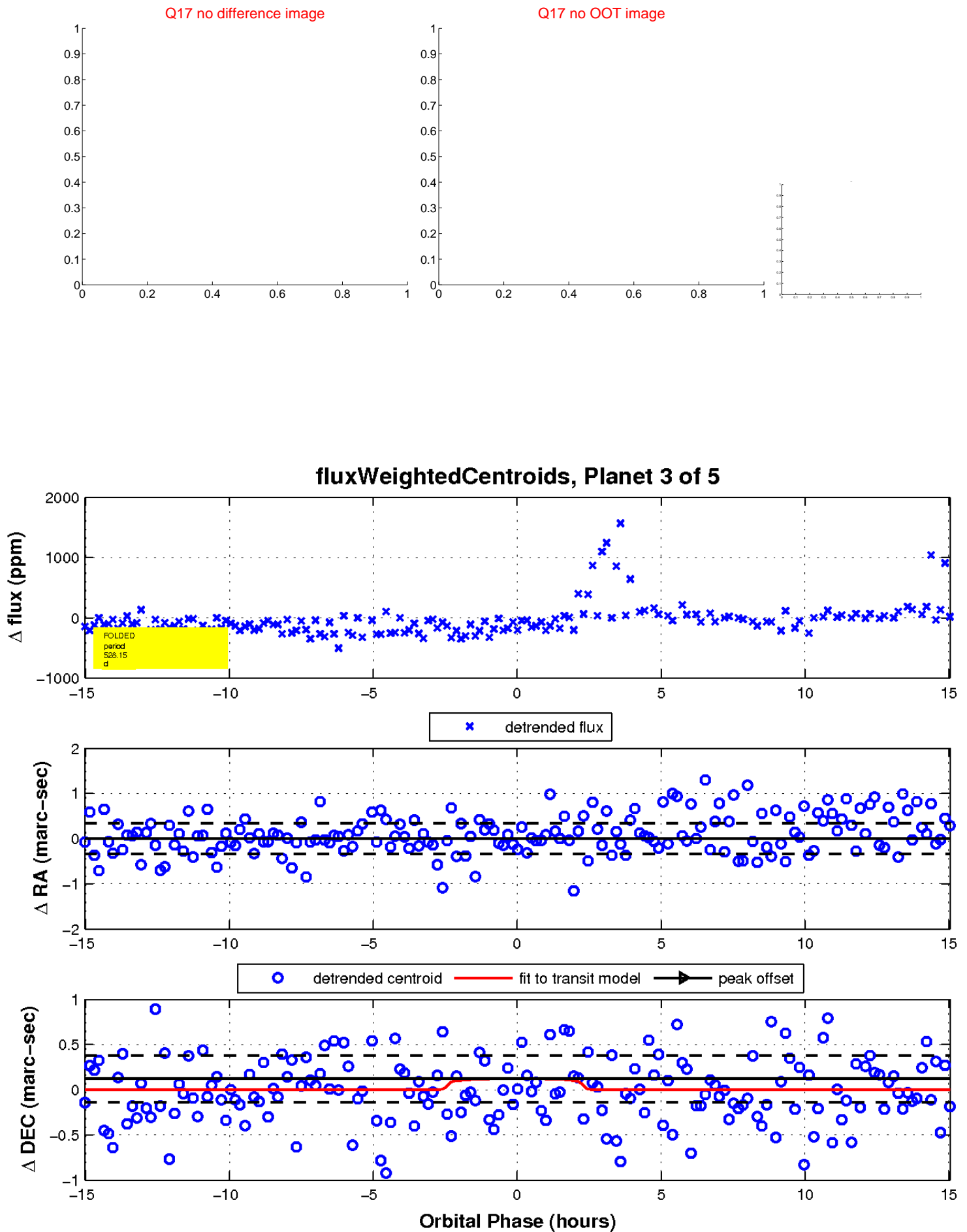
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



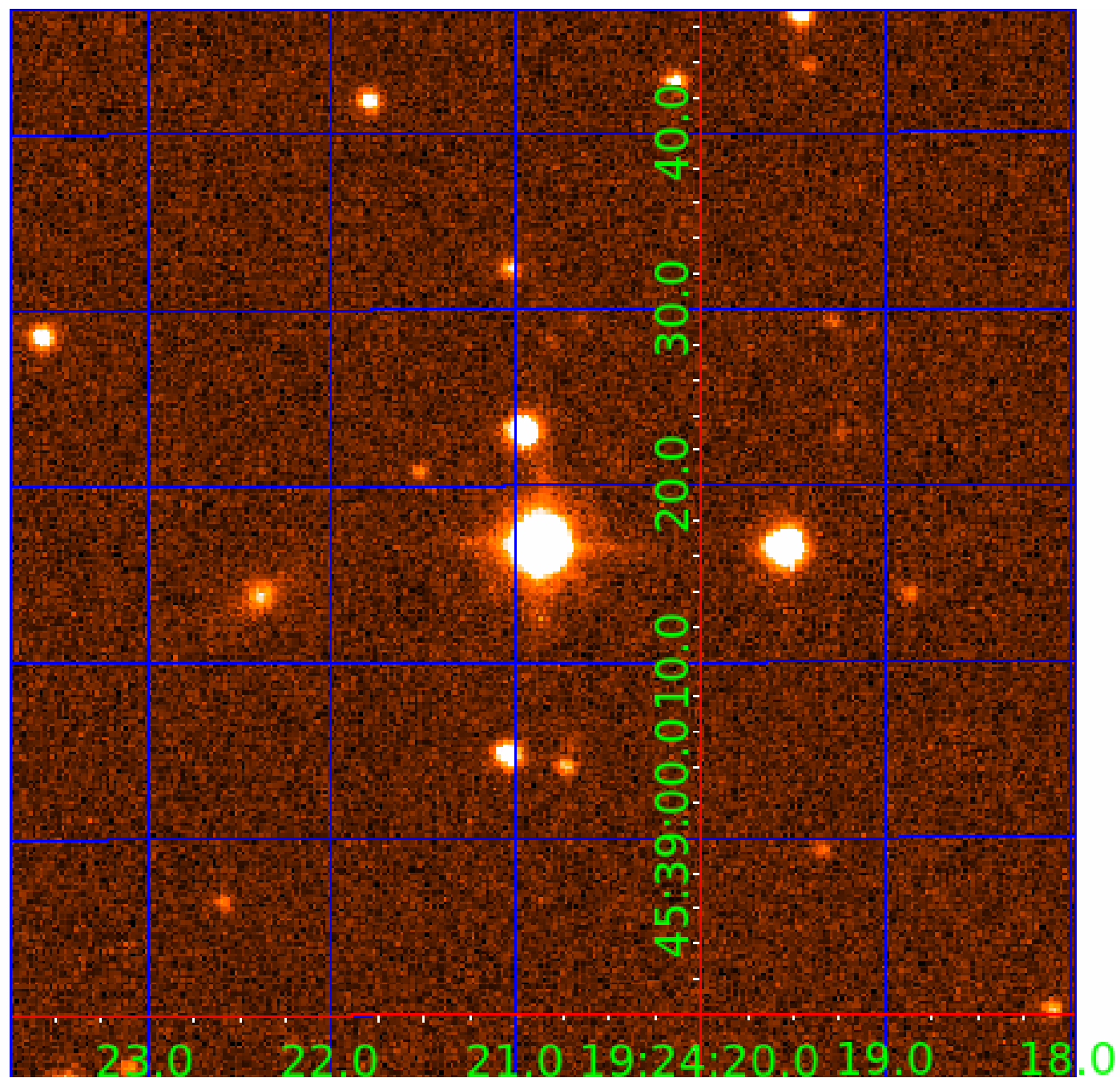
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 009216367

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009216367-01	OBS	No	594.596093	218.977861	941.2	8.850	15.1	11.3	3.40	8061	18.09	14.56
009216367-02	OBS	No	478.046714	390.405015	577.3	9.670	14.1	9.2	3.40	8061	9.86	19.47
009216367-03	OBS	No	528.153153	144.791869	375.9	5.036	12.9	7.9	3.40	8061	7.35	17.05
009216367-04	OBS	No	471.785955	406.408997	405.6	5.628	12.4	9.0	3.40	8061	7.80	19.82
009216367-05	OBS	No	408.445669	290.784330	447.5	5.853	11.2	8.0	3.40	8061	8.04	24.02

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009216367-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
009216367-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

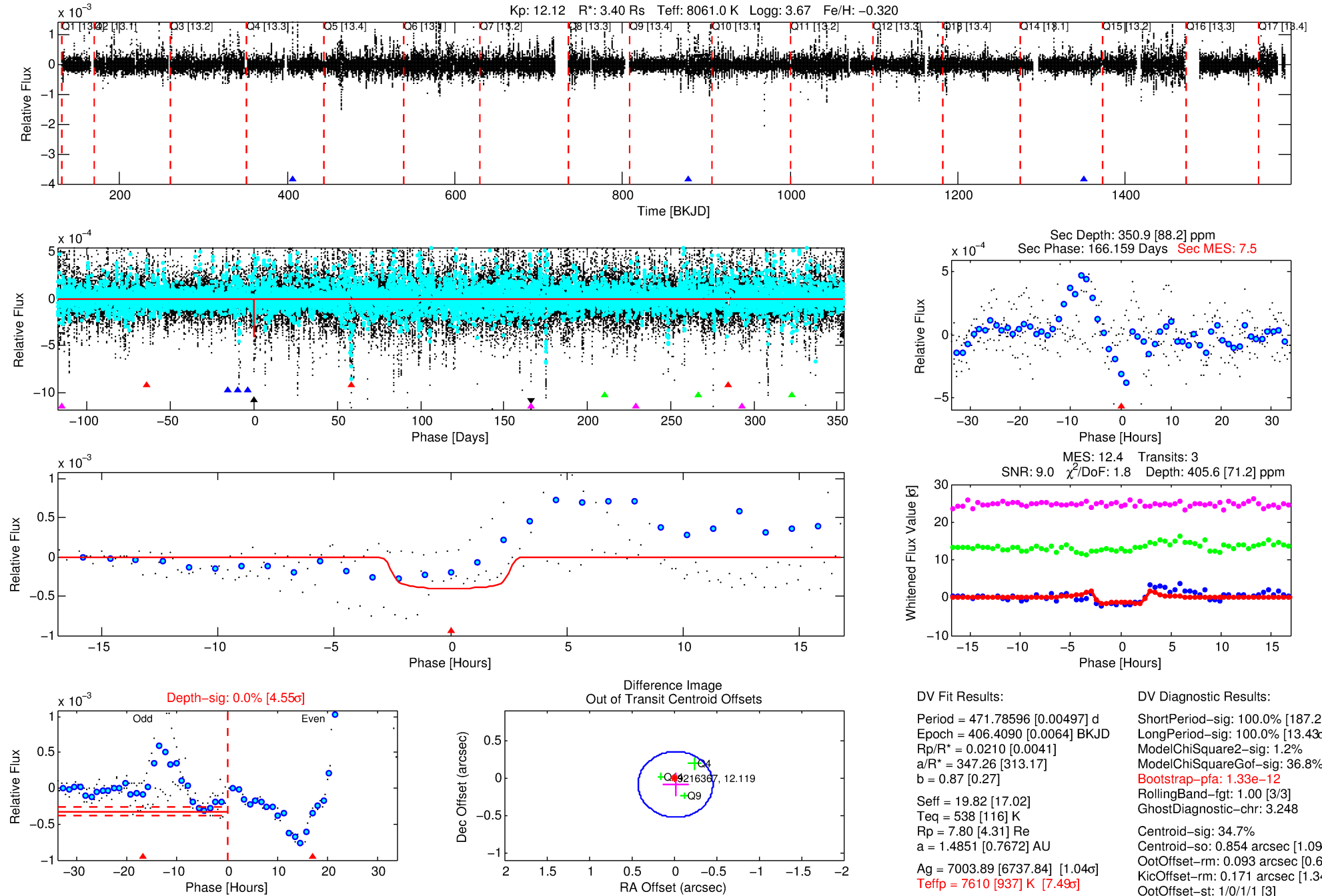
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009216367-04

No Significant Match Found

# DV One-Page Summary

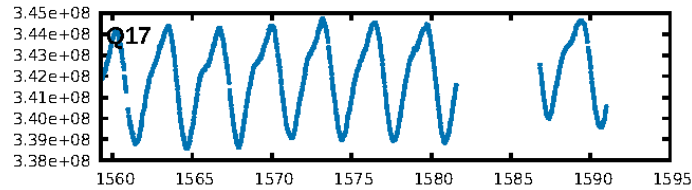
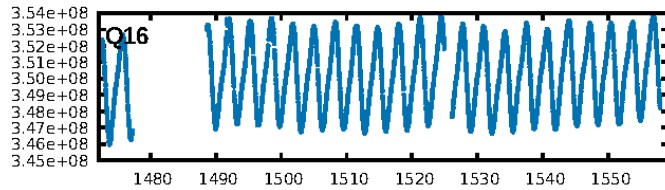
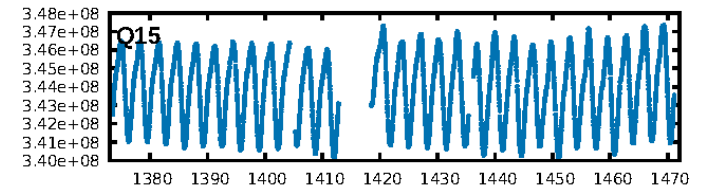
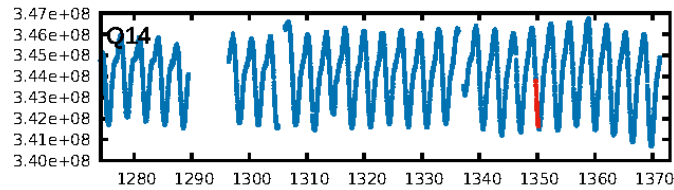
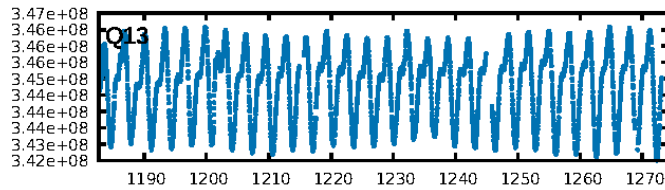
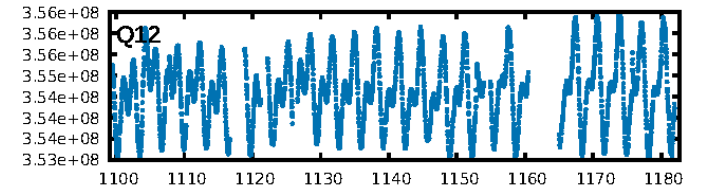
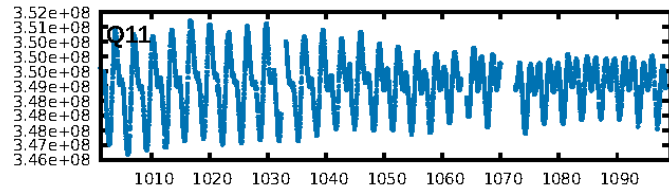
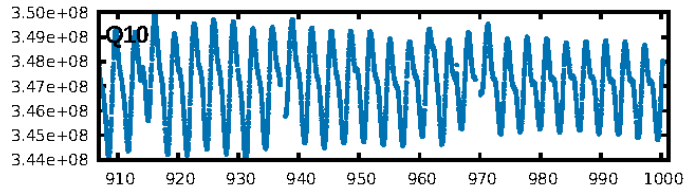
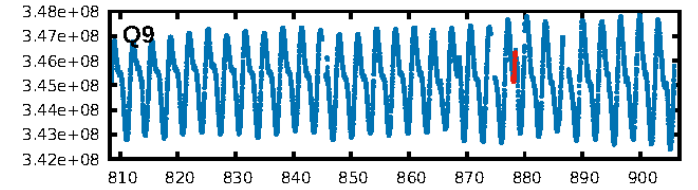
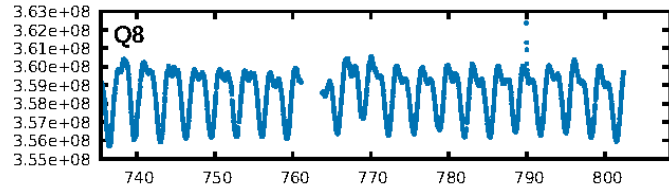
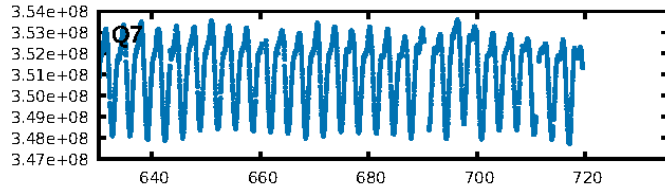
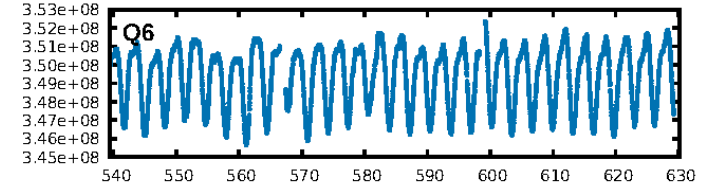
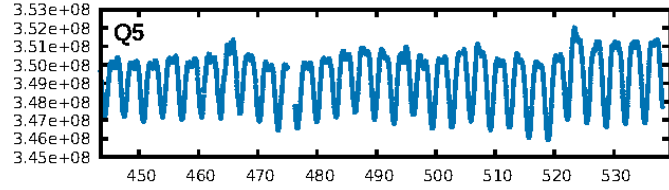
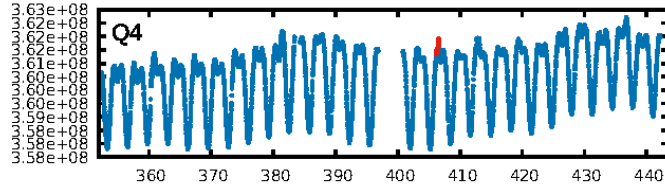
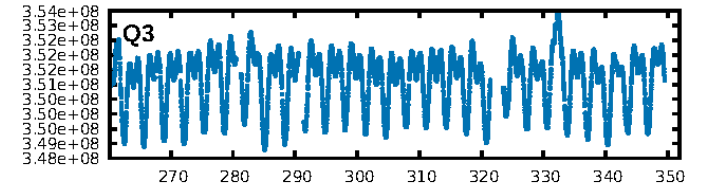
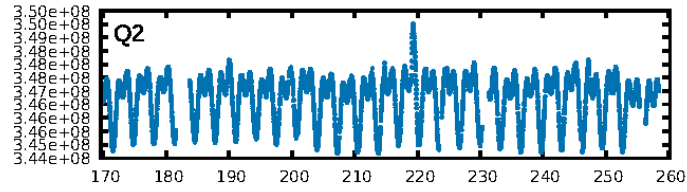
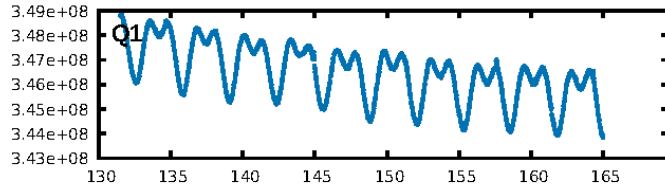
KIC: 9216367 Candidate: 4 of 5 Period: 471.786 d



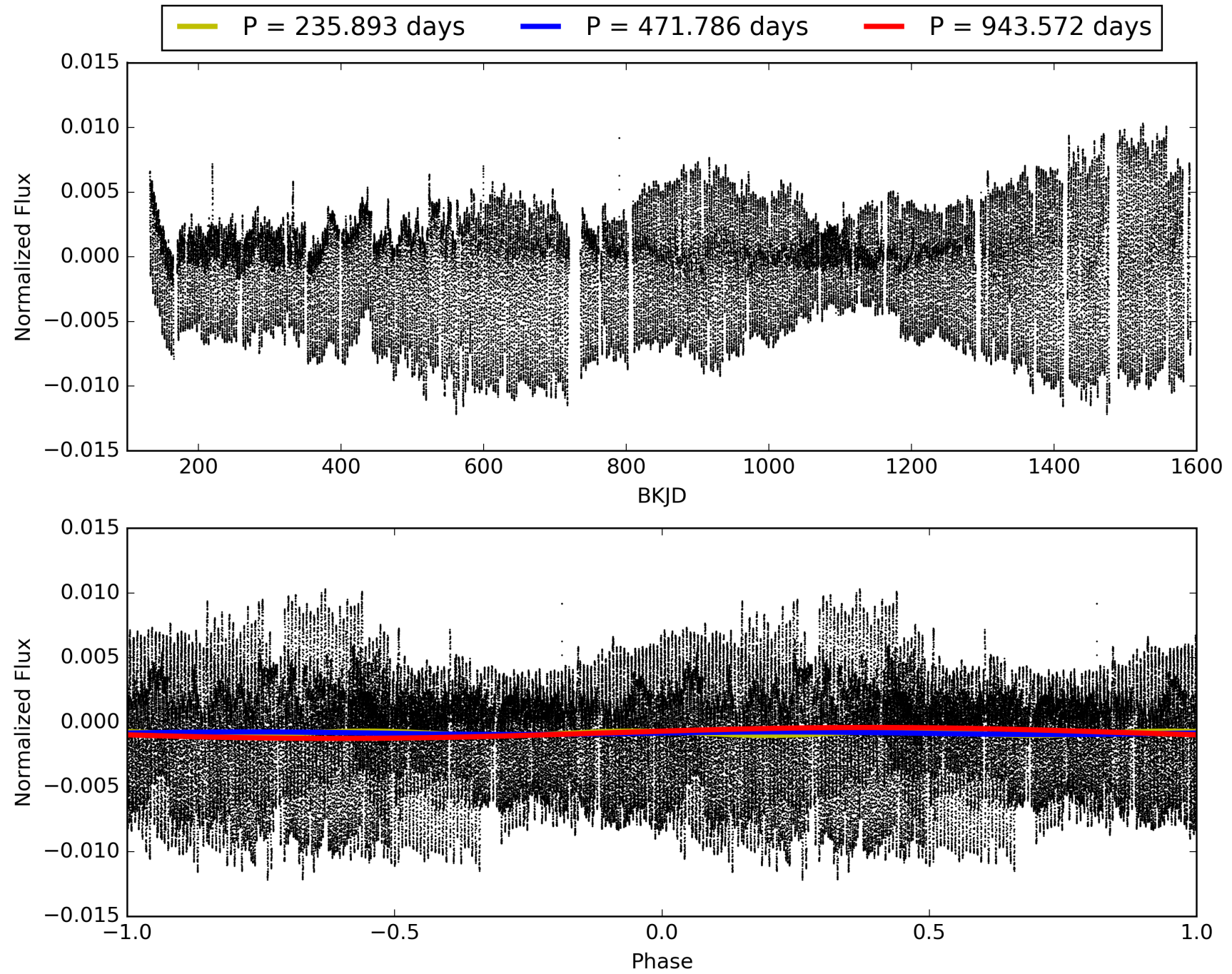
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:49:30 Z

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

# TCE 009216367-04, PDC Light Curves

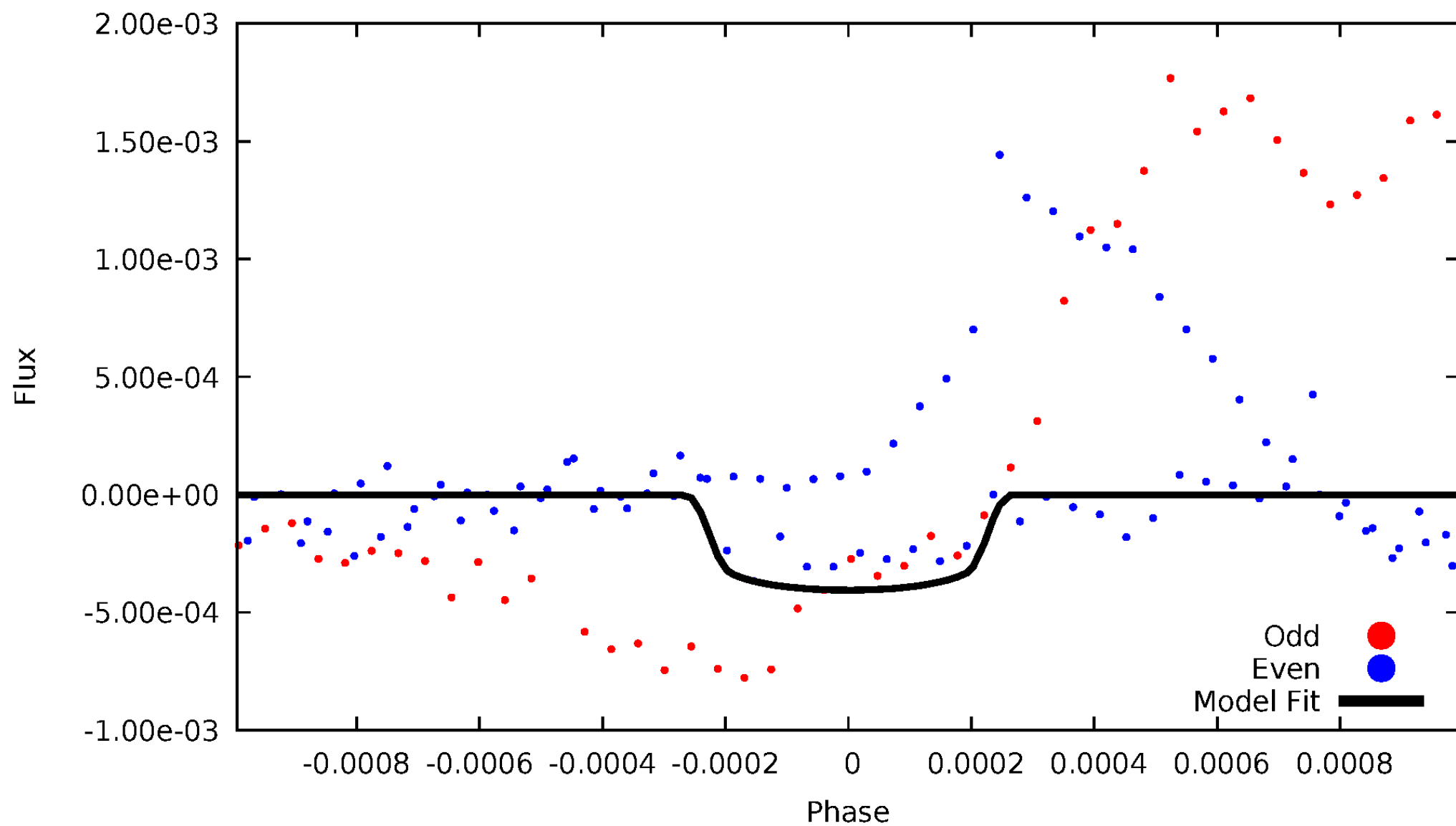


TCE 009216367-04



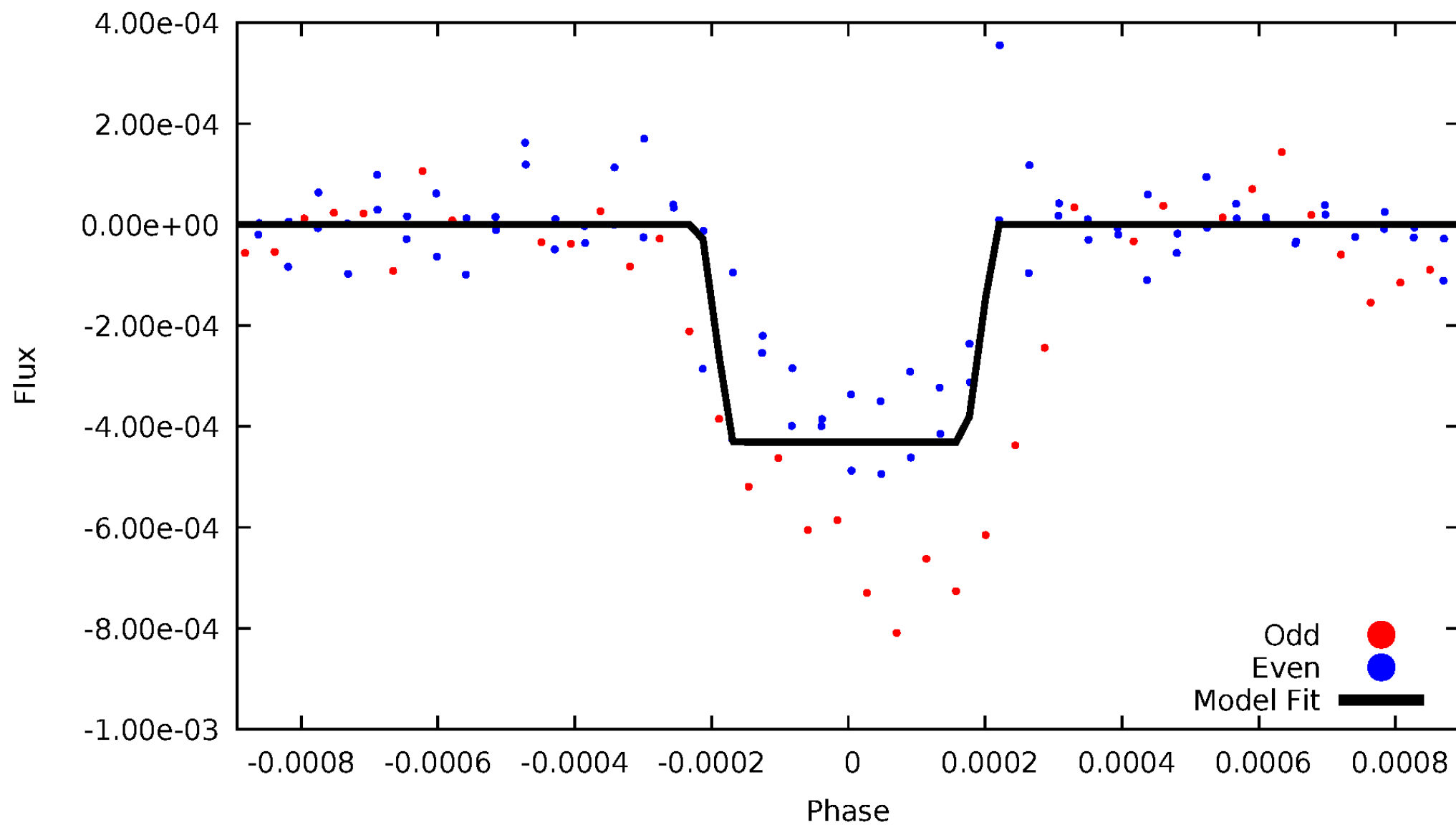
# DV Odd/Even

TCE 009216367-04



# ALT Odd/Even

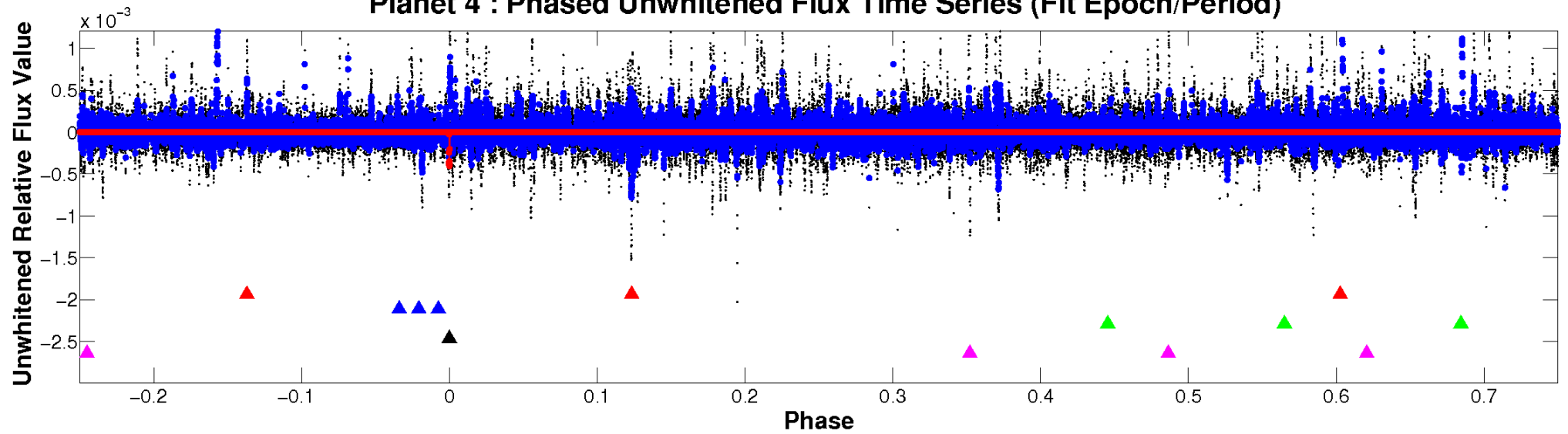
TCE 009216367-04



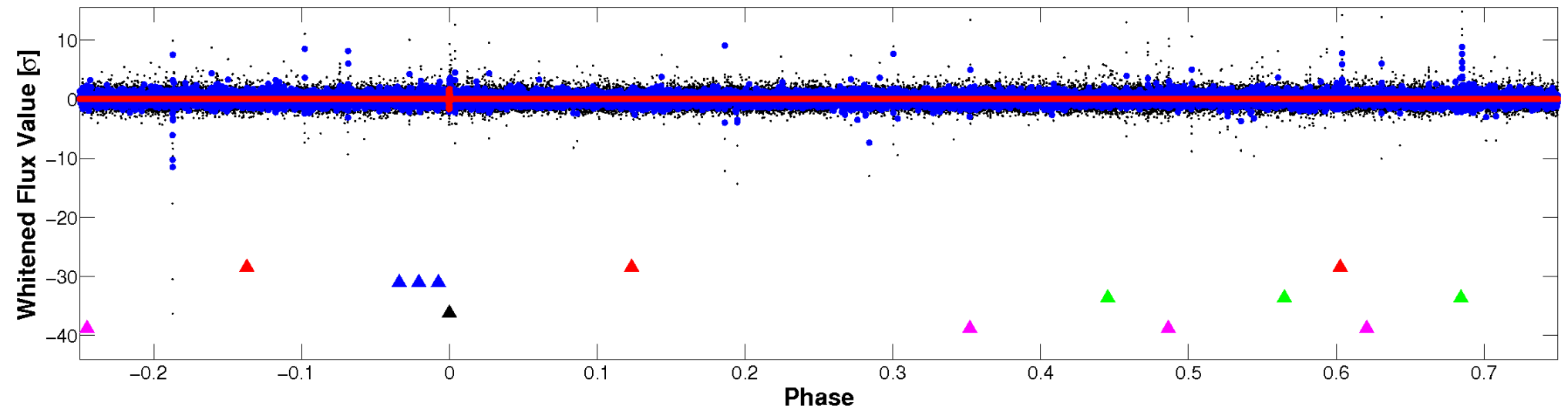


# Non-Whitened Vs. Whitened Light Curve

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



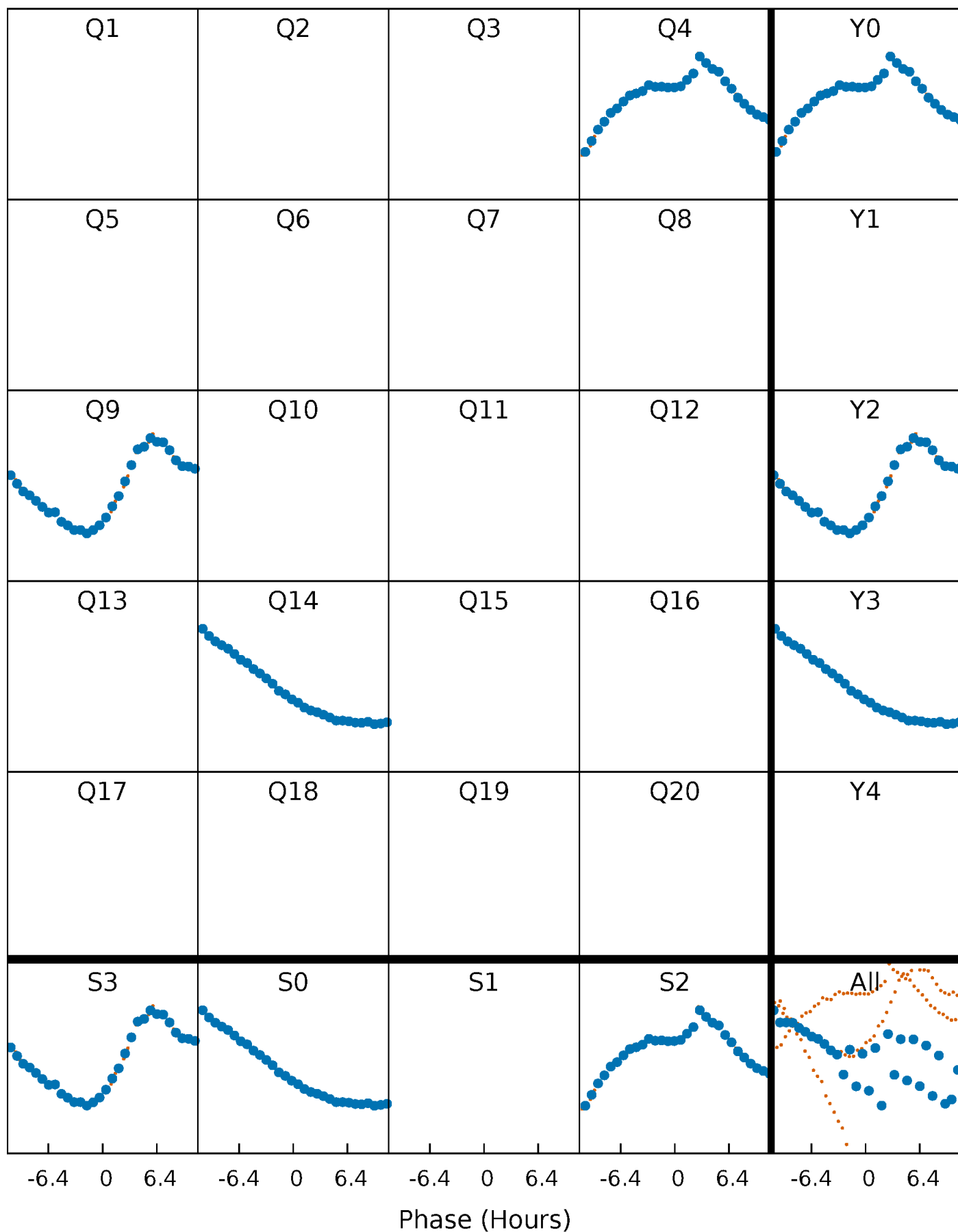
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





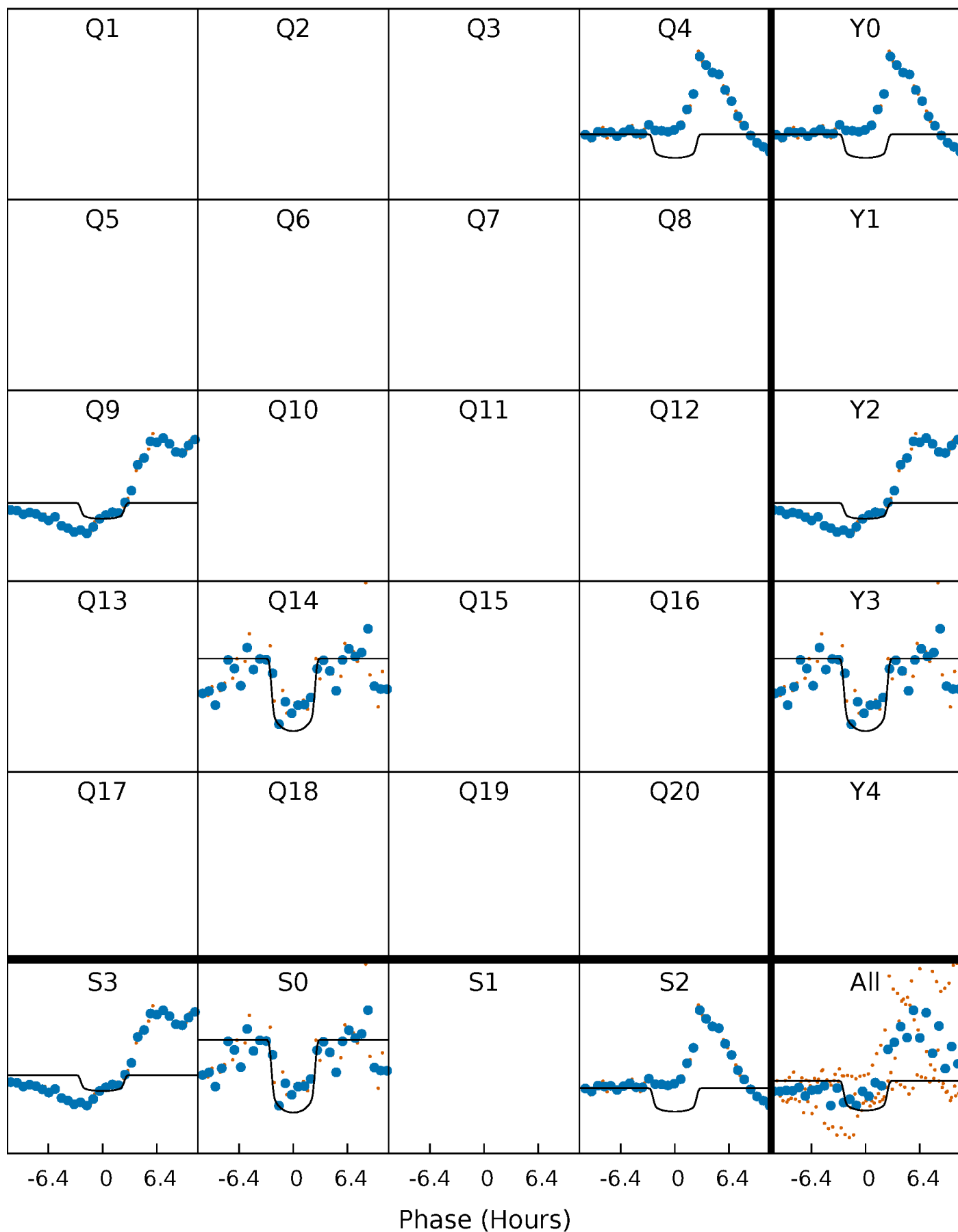
# PDC Quarter-Phased Transit Curves

TCE 009216367-04 P=471.785955 Days  $T_0=406.408997$  (BKJD)



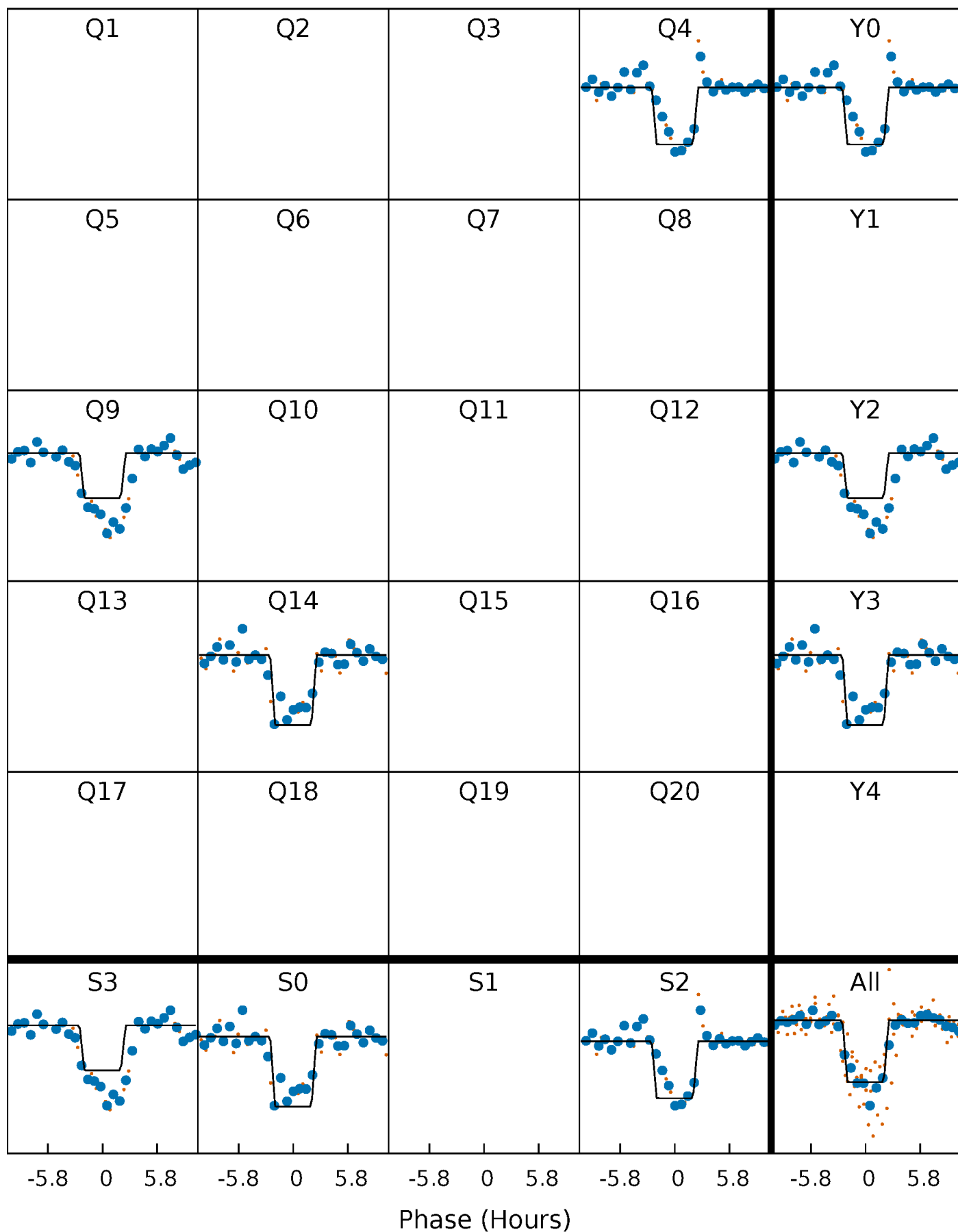
# DV Quarter-Phased Transit Curves

TCE 009216367-04     $P=471.785955$  Days     $T_0=406.408997$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

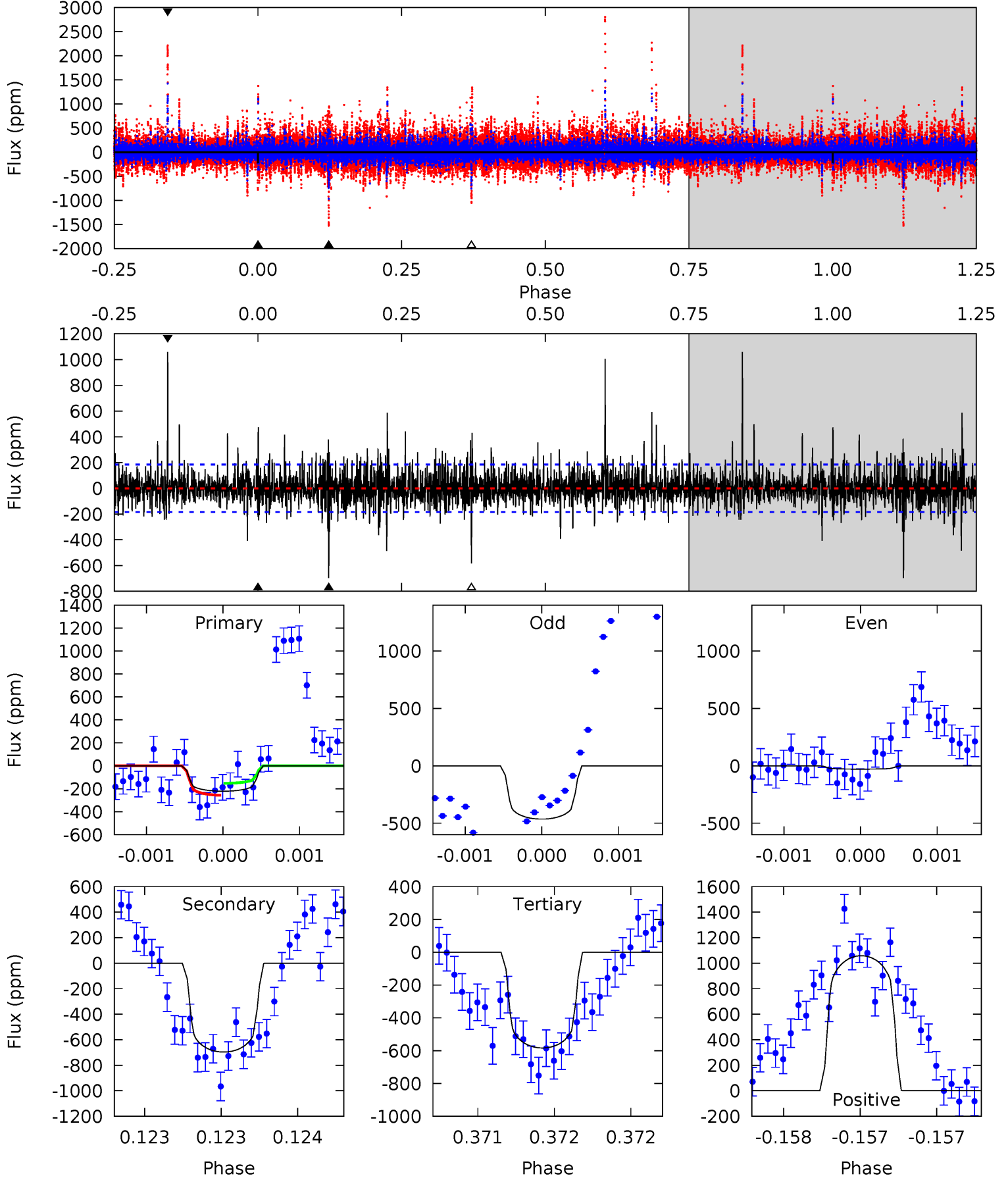
TCE 009216367-04 P=471.783656 Days  $T_0=406.420834$  (BKJD)



# DV Model-Shift Uniqueness Test

009216367-04, P = 471.785955 Days, E = 406.408997 Days

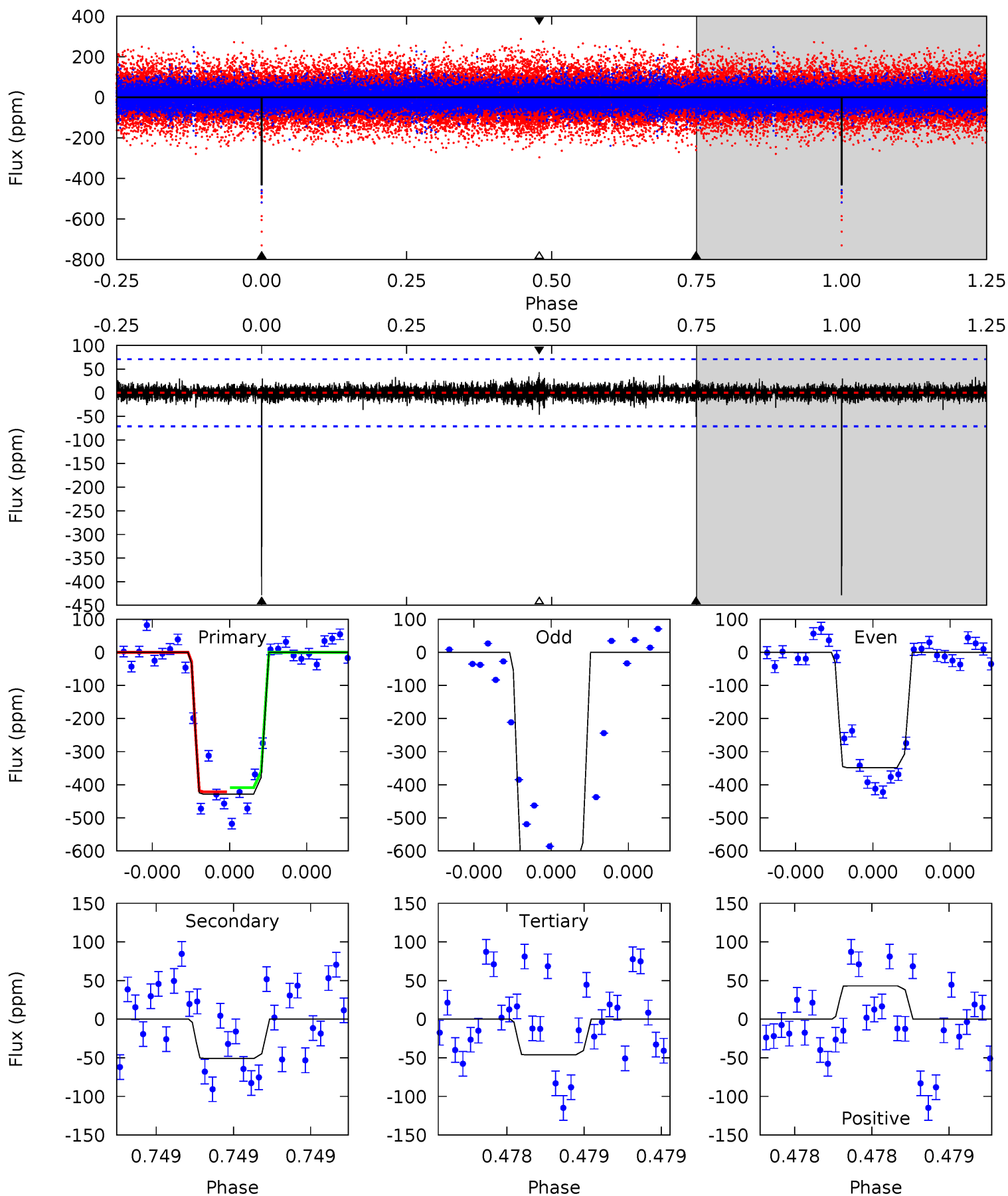
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.68	21.0	17.6	31.9	5.57	3.48	2.96	-10.9	-25.3	3.41	-10.9	5.41	0.60	0.60	1.55



# Alt Model-Shift Uniqueness Test

009216367-04, P = 471.783656 Days, E = 406.420834 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
33.8	3.99	3.64	3.40	5.60	3.52	0.61	30.2	30.4	0.36	0.59	12.1	1.27	0.09	0.50



### Stellar Parameters For KIC 009216367

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8061^{+223}_{-334}$	$3.668^{+0.501}_{-0.088}$	$-0.320^{+0.200}_{-0.300}$	$3.399^{+0.586}_{-1.759}$	$1.964^{+0.204}_{-0.510}$	$0.070^{+0.388}_{-0.019}$
	+3%/-4%	+14%/-2%	+62%/-94%	+17%/-52%	+10%/-26%	+551%/-27%
Source	KIC0	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 009216367-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-697 \pm 33$	$7.04^{+2.20}_{-2.15}$	$722^{+58}_{-96}$	$9150^{+1749}_{-1051}$	$16776^{+16300}_{-6736}$
Alt.	$-51 \pm 13$	$6.91^{+2.05}_{-2.02}$	$724^{+53}_{-89}$	$4727^{+525}_{-436}$	$1257^{+1286}_{-535}$

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

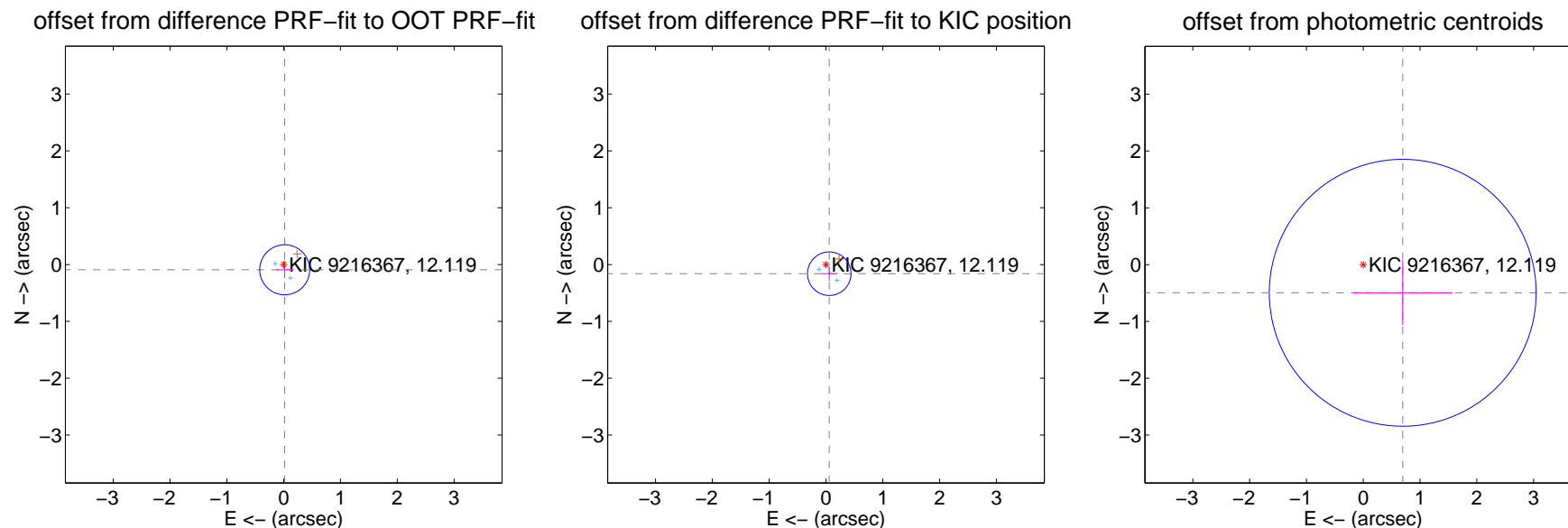
## DV Centroid Data

Supplemental centroid analysis for 009216367-04. Kepler magnitude: 12.12. Transit SNR 9.00

There are 2 quarters with good PRF difference image offsets

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

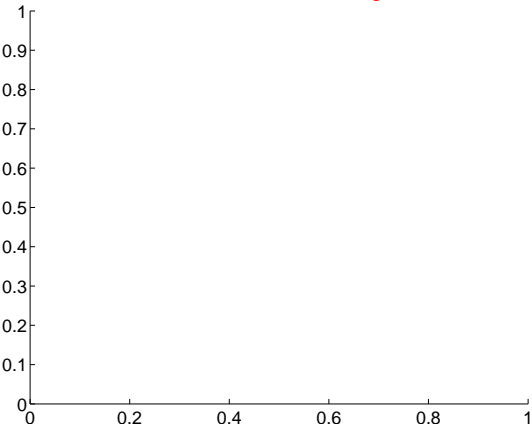
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.093 \pm 0.147$	0.64	$-0.018 \pm 0.150$	$-0.092 \pm 0.147$
PRF-fit source offset from KIC position	$0.171 \pm 0.128$	1.34	$-0.058 \pm 0.149$	$-0.161 \pm 0.125$
photometric centroid source offset	$0.85 \pm 0.78$	1.09	$-0.70 \pm 0.87$	$-0.50 \pm 0.57$



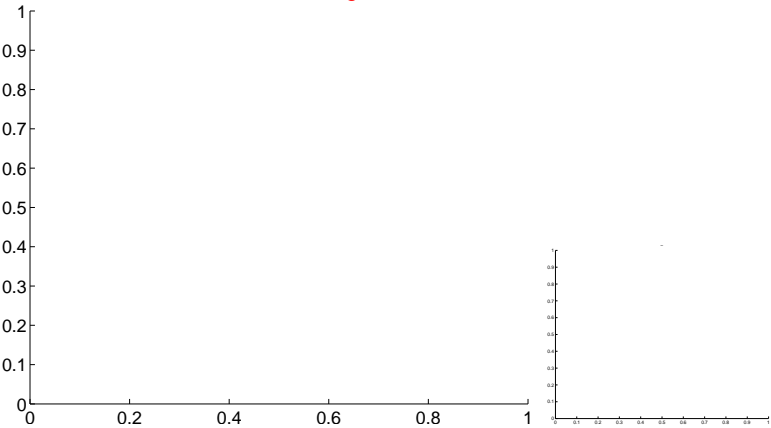
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

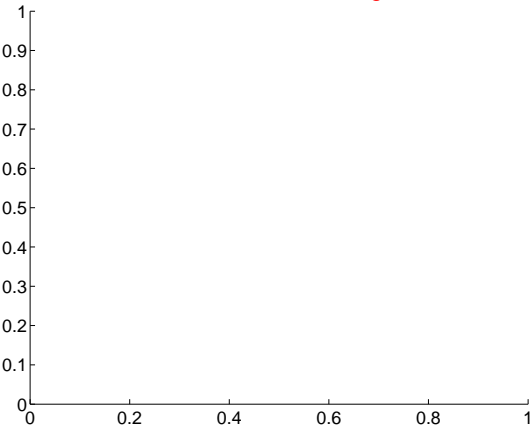
Q1 no difference image



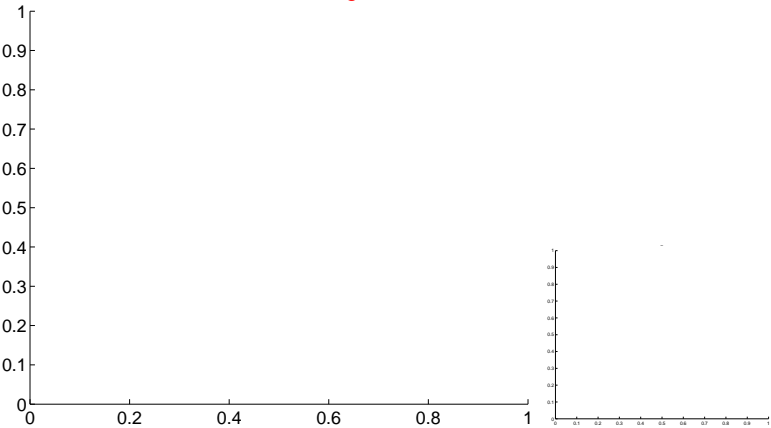
Q1 no OOT image



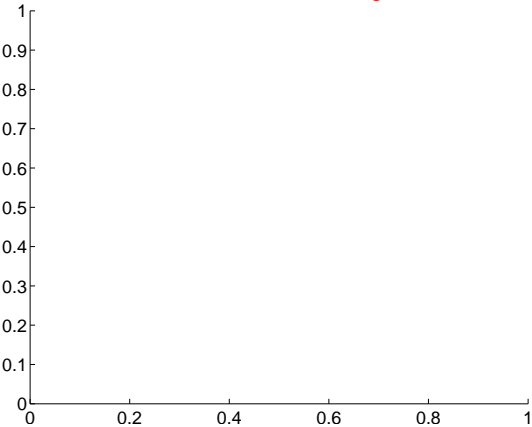
Q2 no difference image



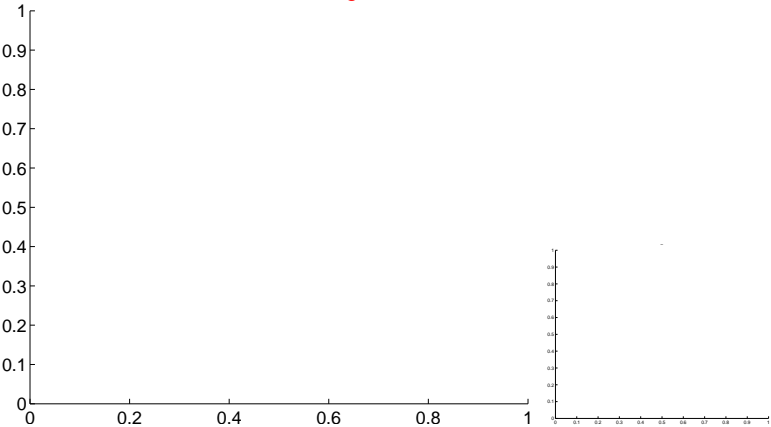
Q2 no OOT image



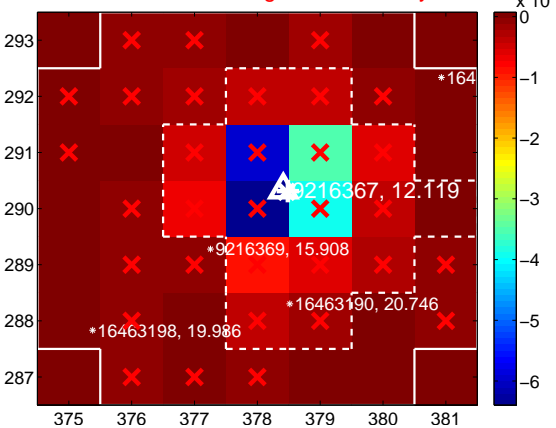
Q3 no difference image



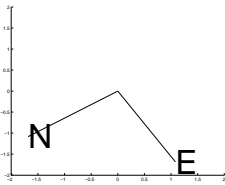
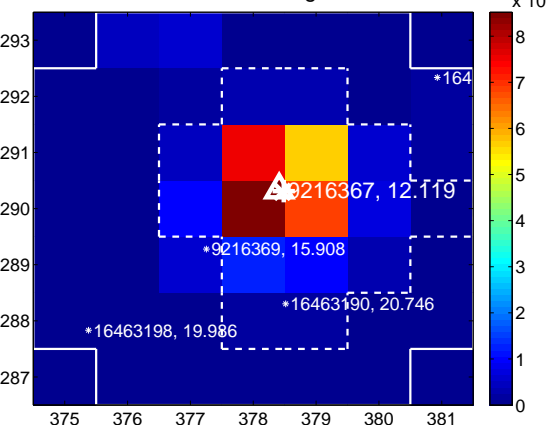
Q3 no OOT image



Q4 difference image. Poor Quality

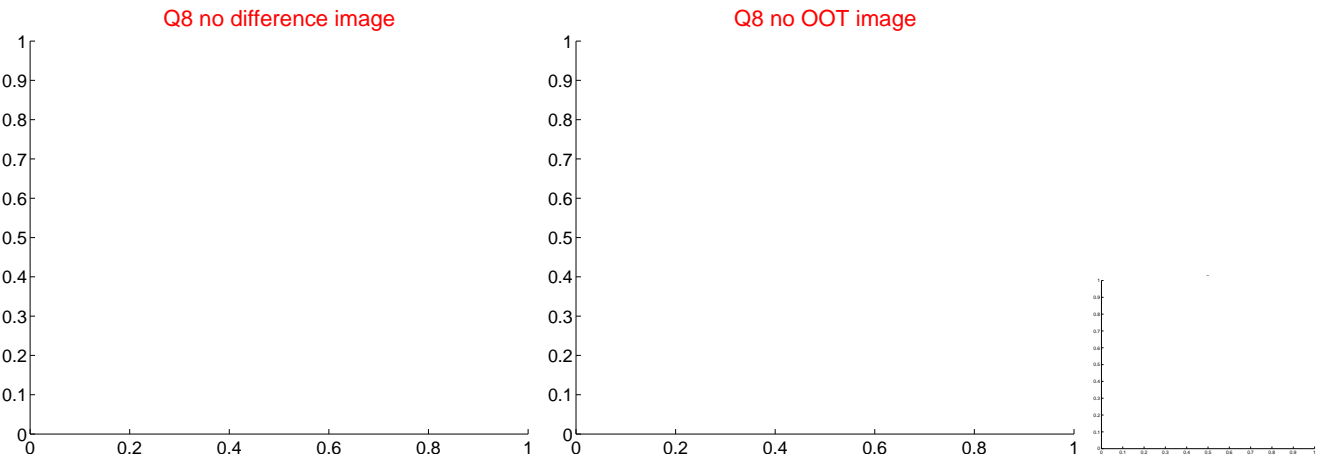
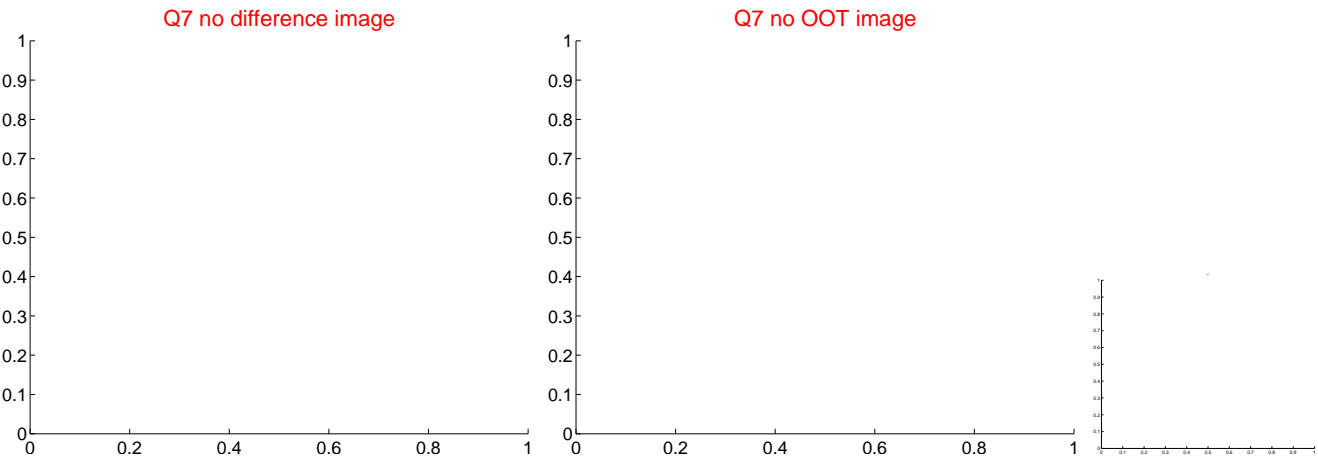
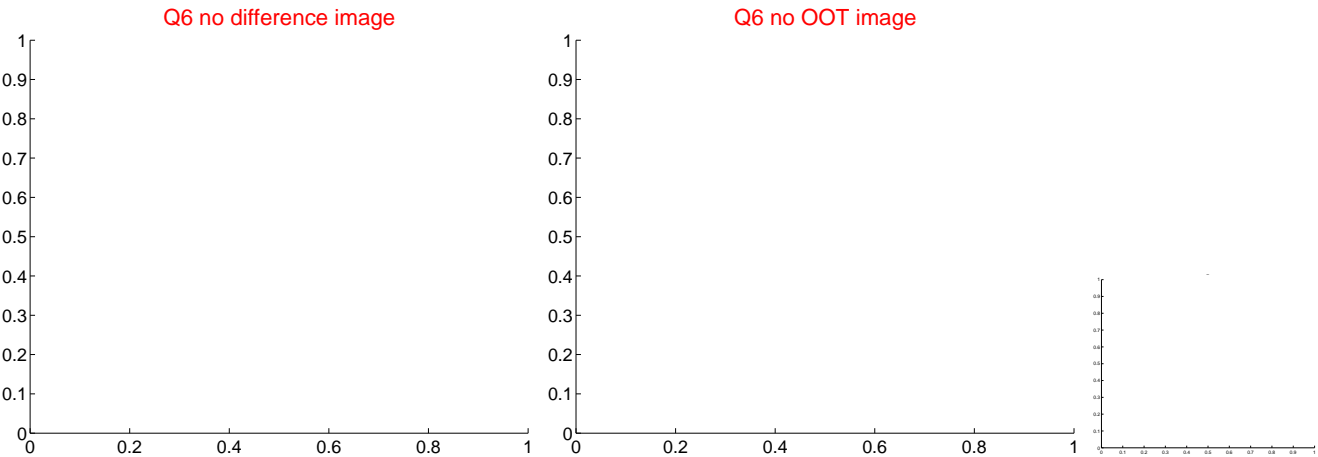
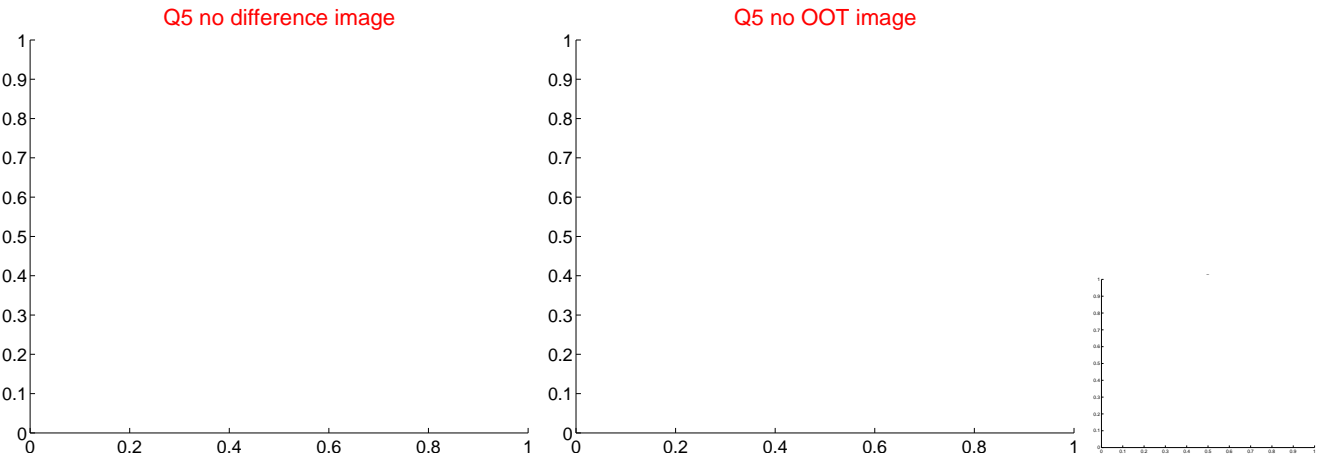


Q4 OOT image

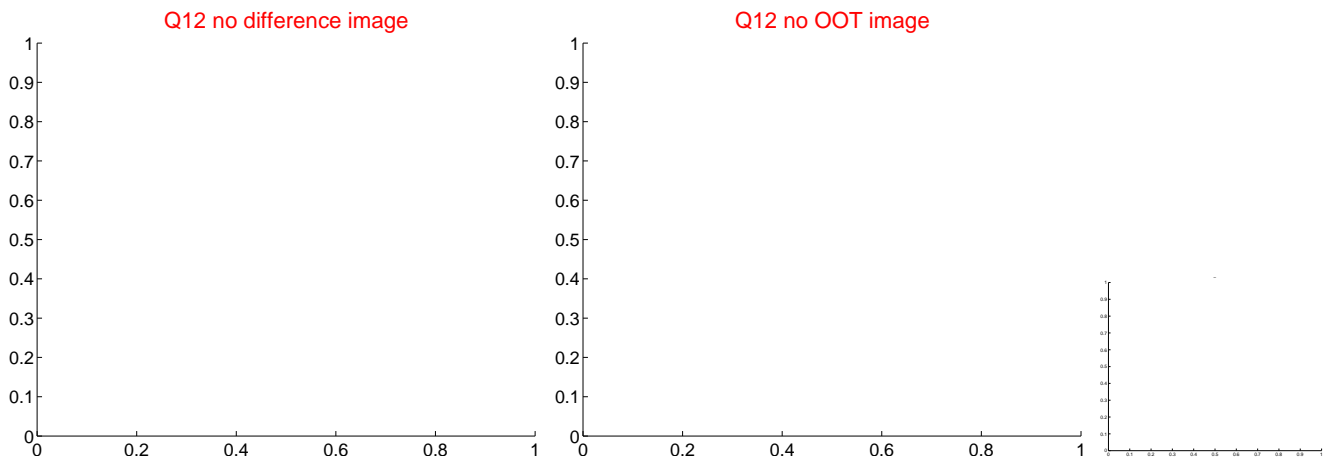
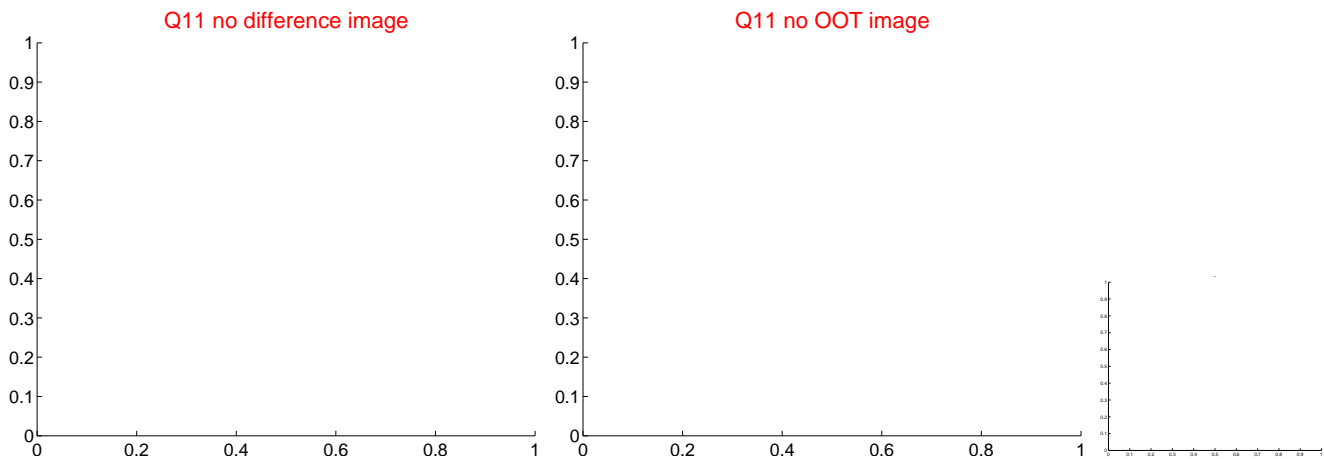
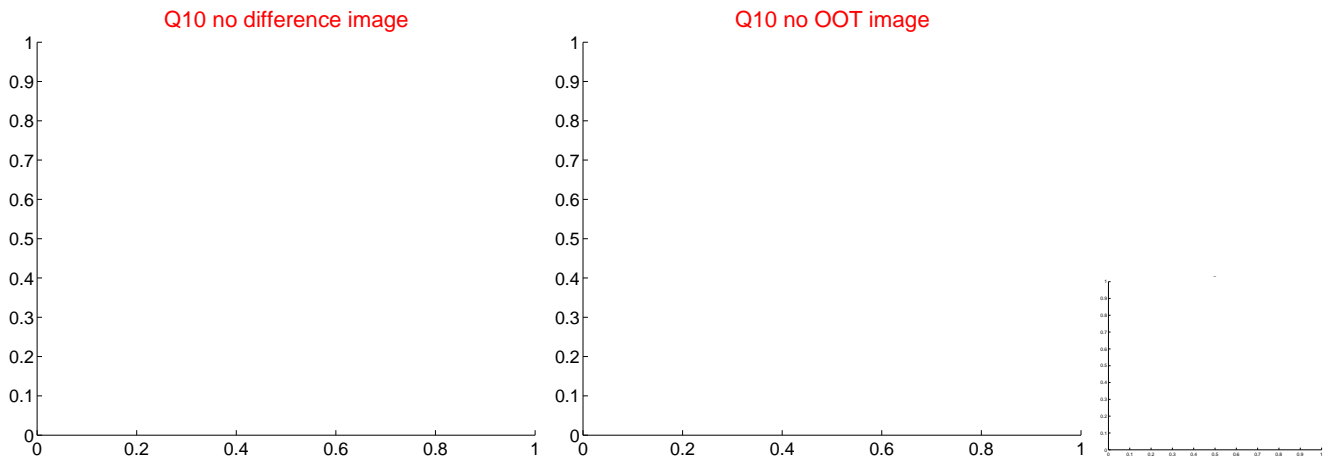
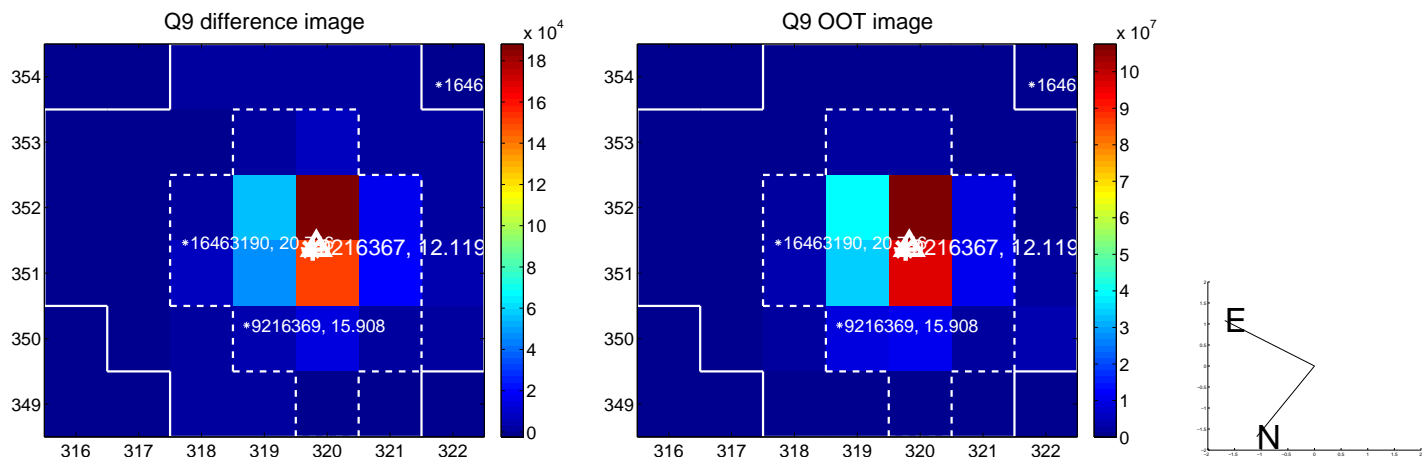




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

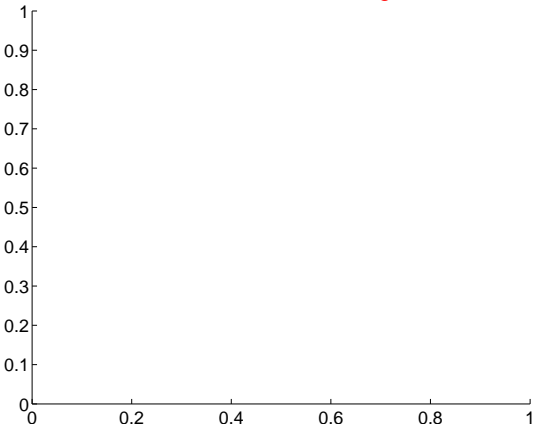


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

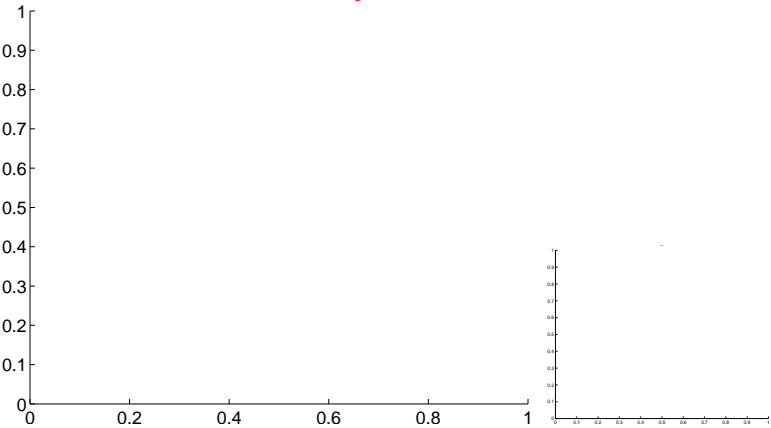


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

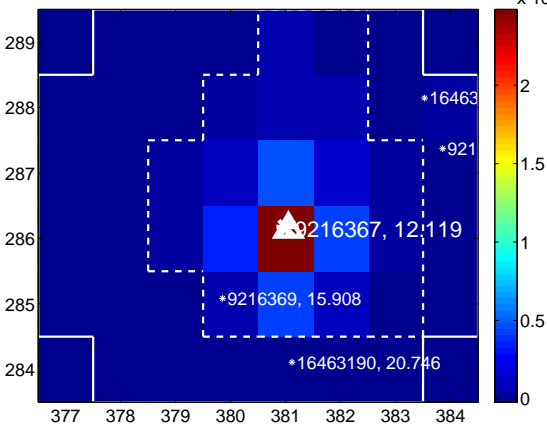
Q13 no difference image



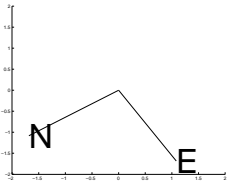
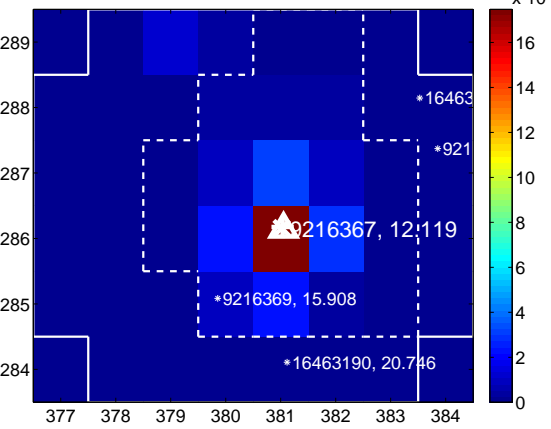
Q13 no OOT image



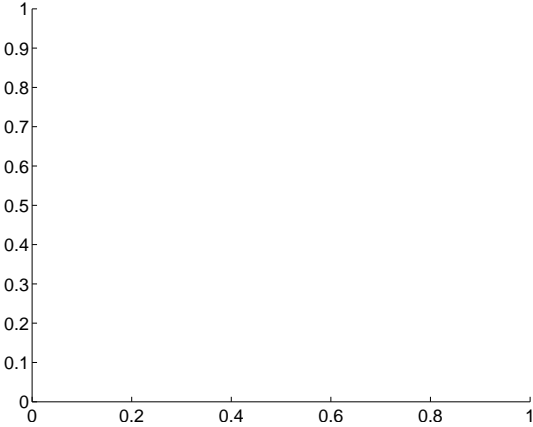
Q14 difference image



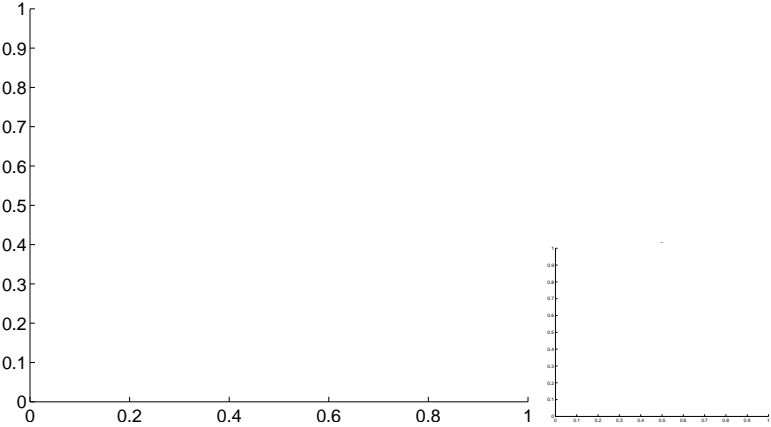
Q14 OOT image



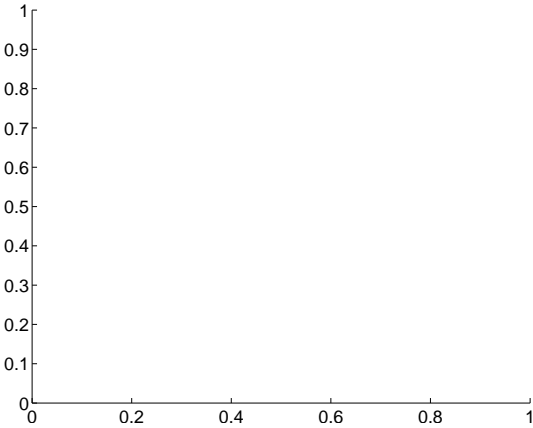
Q15 no difference image



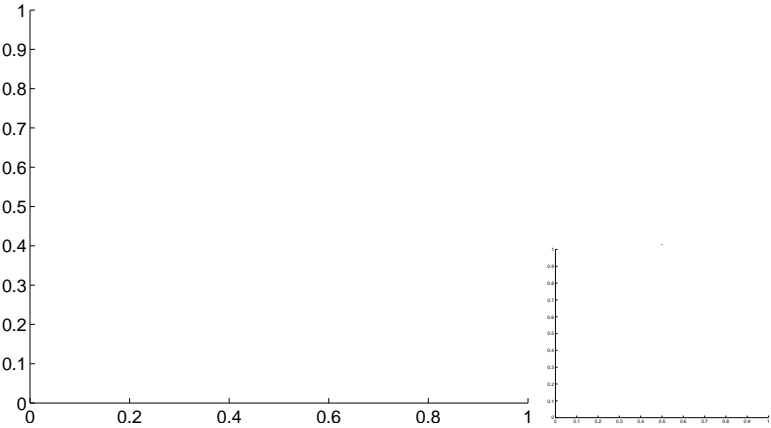
Q15 no OOT image



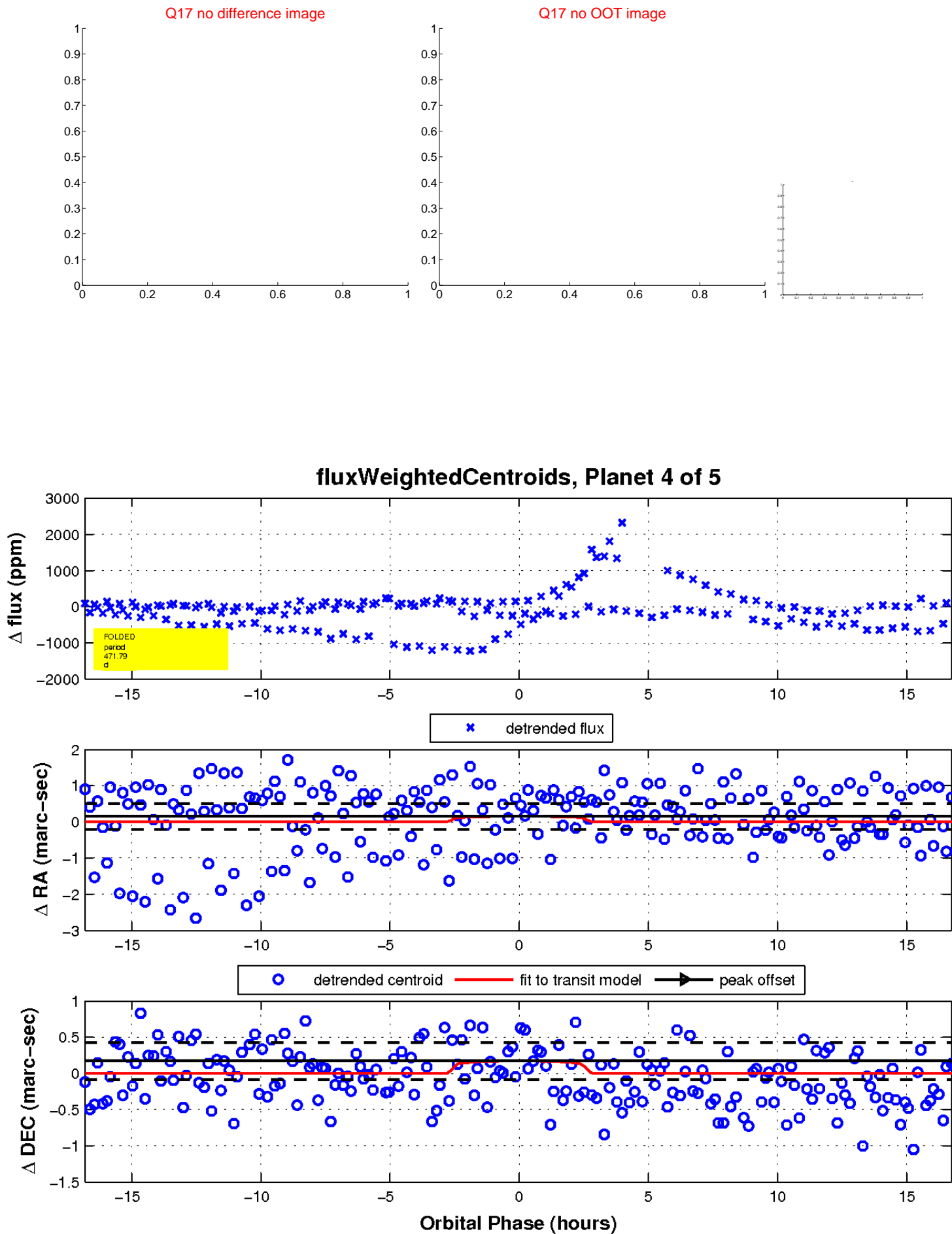
Q16 no difference image



Q16 no OOT image

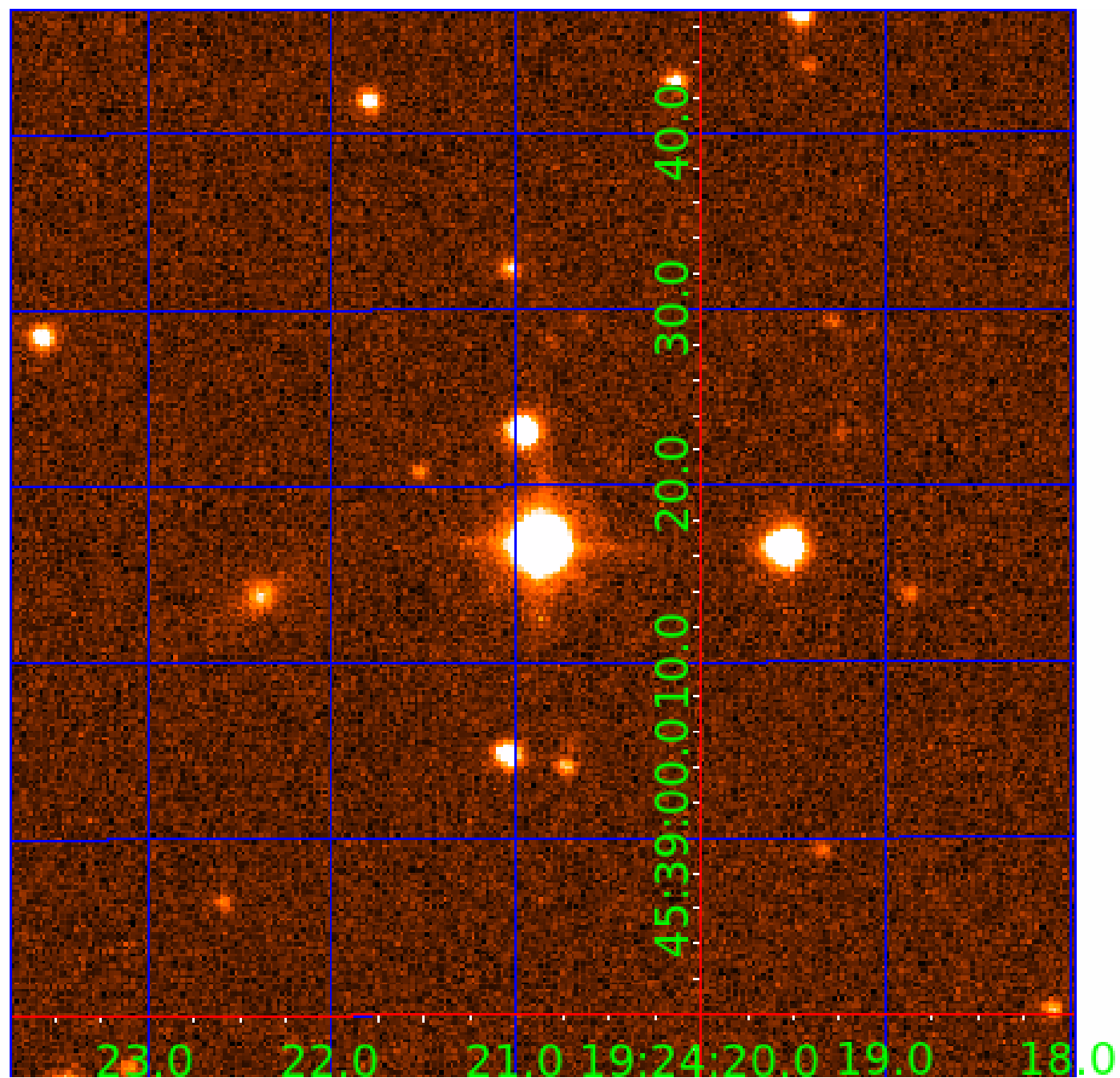


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009216367

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009216367-01	OBS	No	594.596093	218.977861	941.2	8.850	15.1	11.3	3.40	8061	18.09	14.56
009216367-02	OBS	No	478.046714	390.405015	577.3	9.670	14.1	9.2	3.40	8061	9.86	19.47
009216367-03	OBS	No	528.153153	144.791869	375.9	5.036	12.9	7.9	3.40	8061	7.35	17.05
009216367-04	OBS	No	471.785955	406.408997	405.6	5.628	12.4	9.0	3.40	8061	7.80	19.82
009216367-05	OBS	No	408.445669	290.784330	447.5	5.853	11.2	8.0	3.40	8061	8.04	24.02

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009216367-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009216367-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
009216367-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

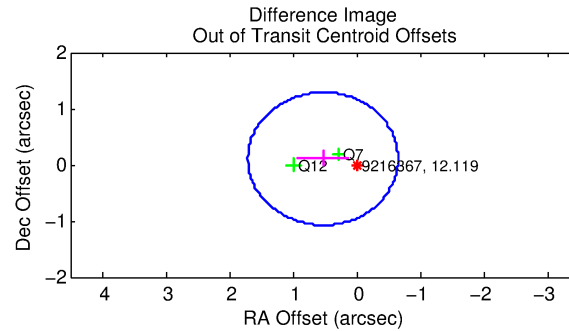
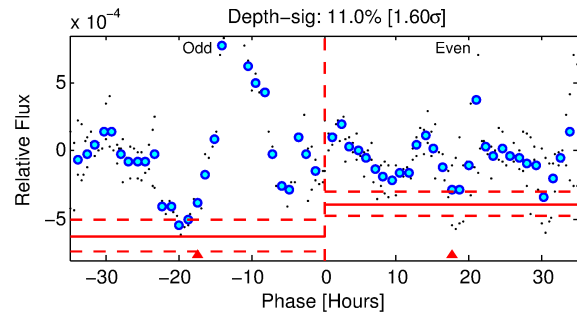
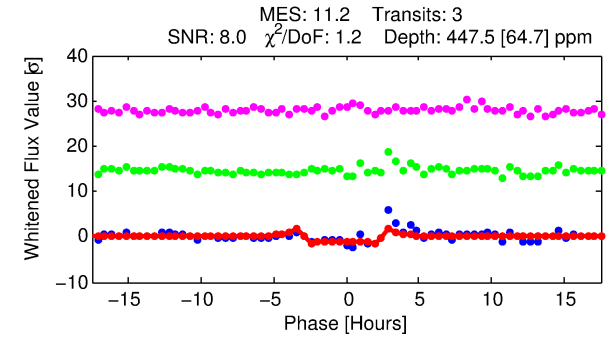
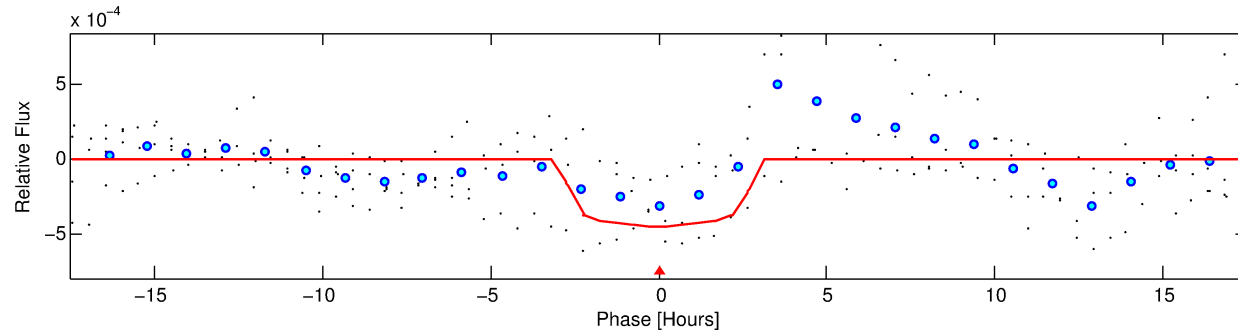
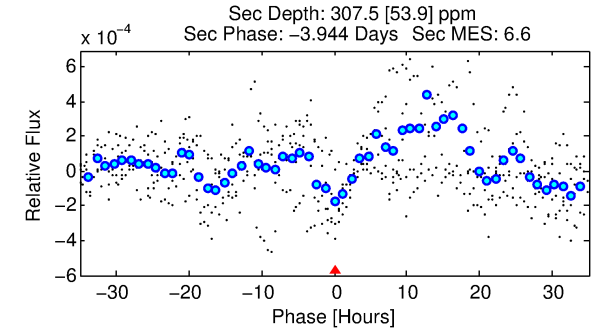
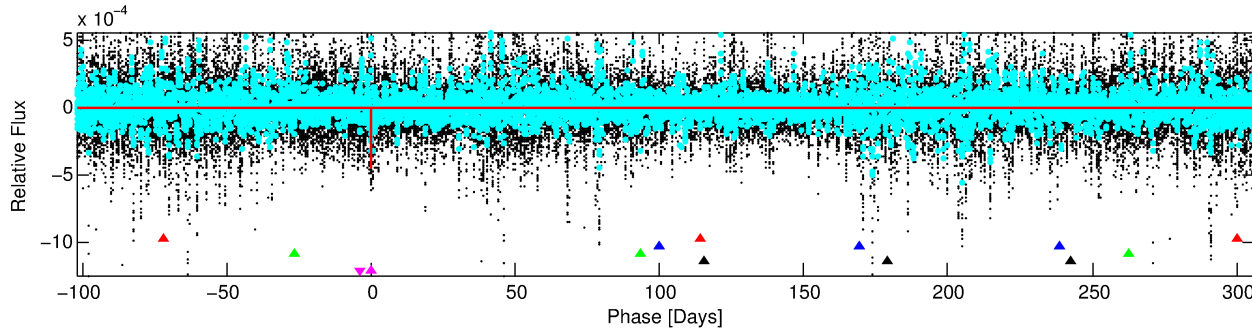
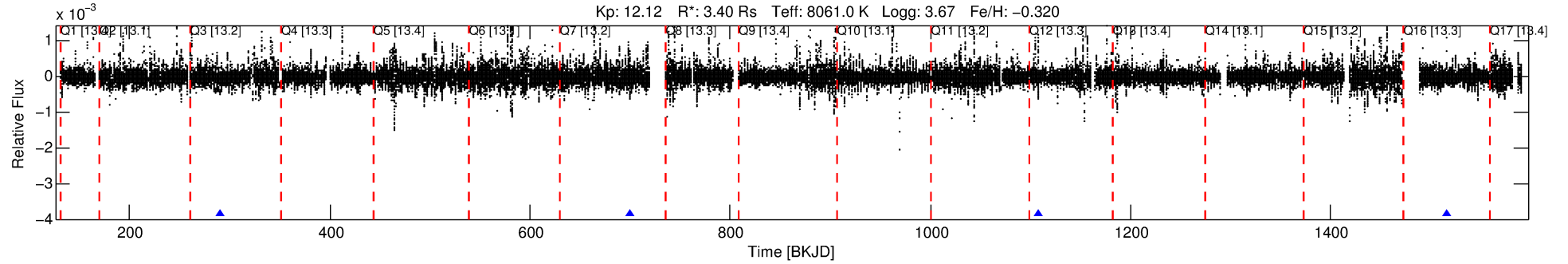
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009216367-05

No Significant Match Found

# DV One-Page Summary

KIC: 9216367 Candidate: 5 of 5 Period: 408.446 d



## DV Fit Results:

Period = 408.44567 [0.00315] d  
Epoch = 290.7843 [0.0085] BKJD  
Rp/R\* = 0.0217 [0.0126]  
a/R\* = 319.96 [1090.78]  
b = 0.83 [1.31]  
Seff = 24.02 [20.63]  
Teq = 564 [121] K  
Rp = 8.03 [6.25] Re  
a = 1.3490 [0.6969] AU  
Ag = 4768.56 [6899.76] [0.69 $\sigma$ ]  
Teffp = 7253 [2153] K [3.10 $\sigma$ ]

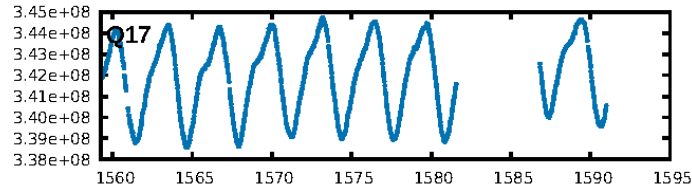
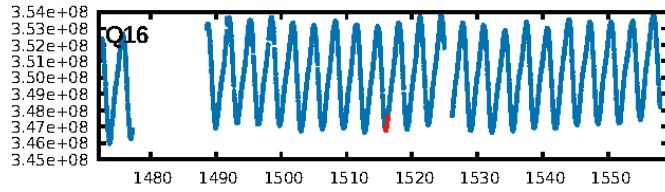
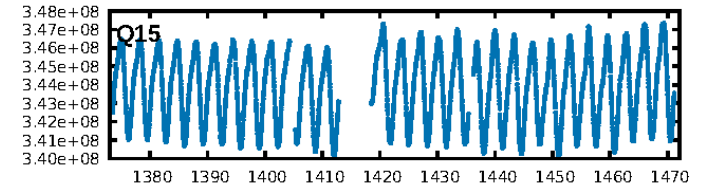
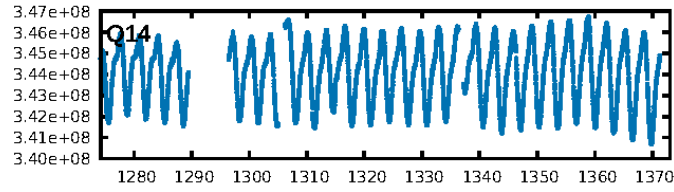
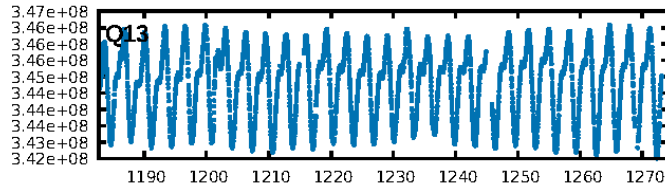
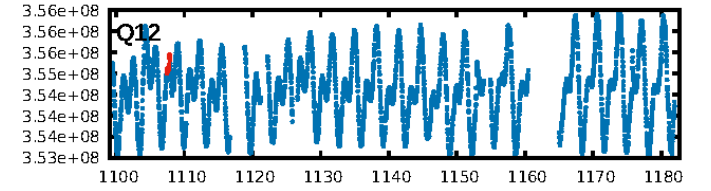
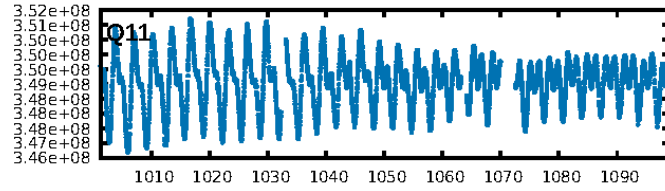
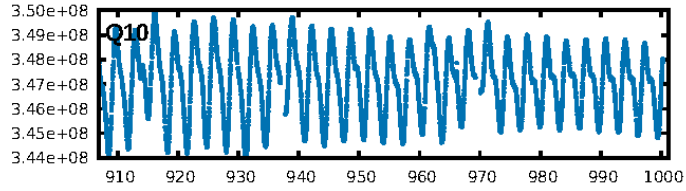
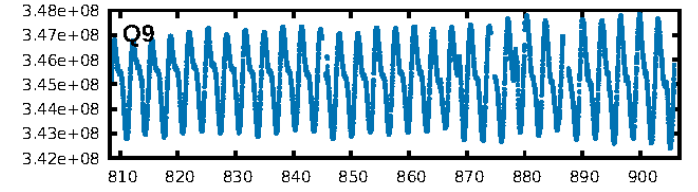
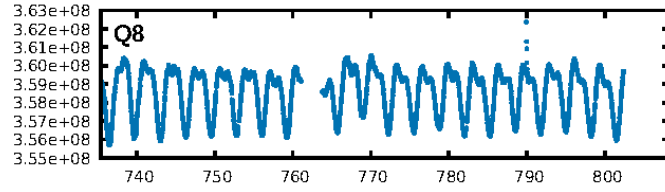
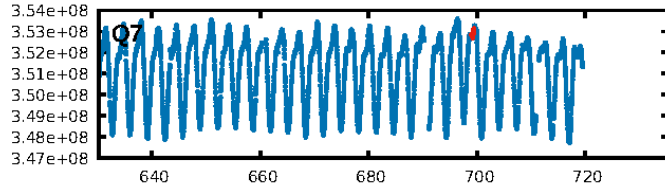
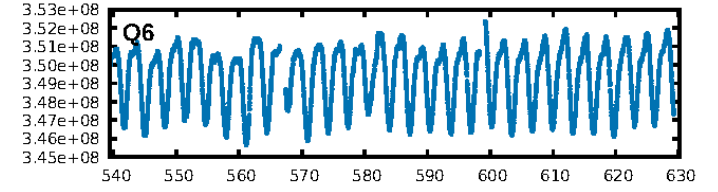
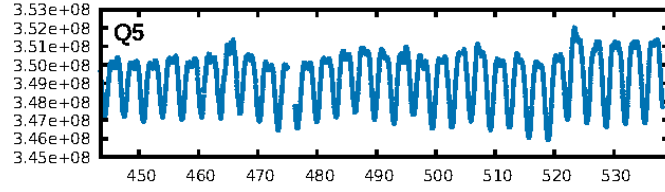
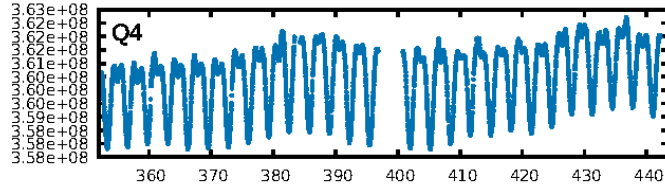
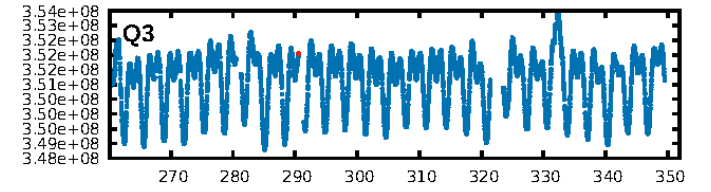
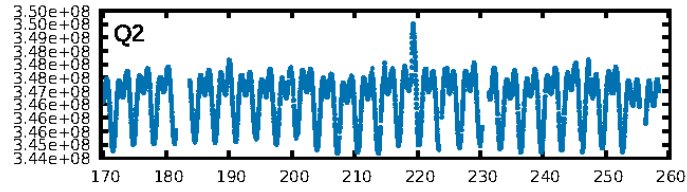
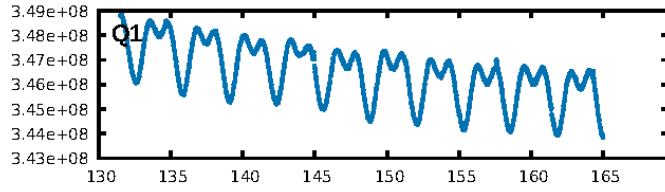
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [187.23 $\sigma$ ]  
ModelChiSquare2-sig: 23.7%  
ModelChiSquareGof-sig: 88.3%  
**Bootstrap-pfa: 1.16e-12**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.5566  
Centroid-sig: 93.5%  
Centroid-so: 0.523 arcsec [0.71 $\sigma$ ]  
OotOffset-rm: 0.535 arcsec [1.36 $\sigma$ ]  
OotOffset-st: 0/1/1/0 [2]  
KicOffset-rm: 0.509 arcsec [1.26 $\sigma$ ]  
KicOffset-st: 0/1/1/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [2/2]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:49:43 Z

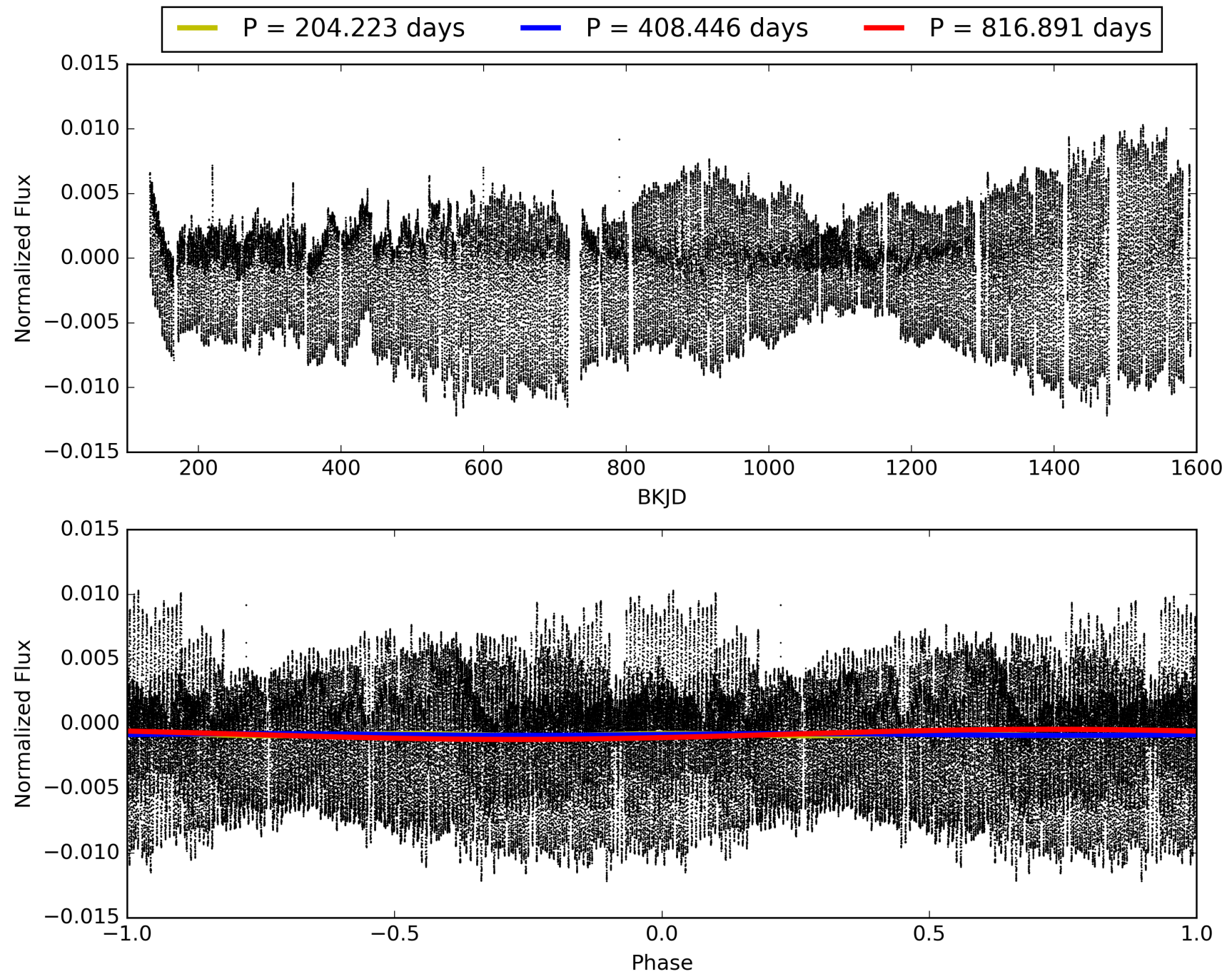
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009216367-05, PDC Light Curves



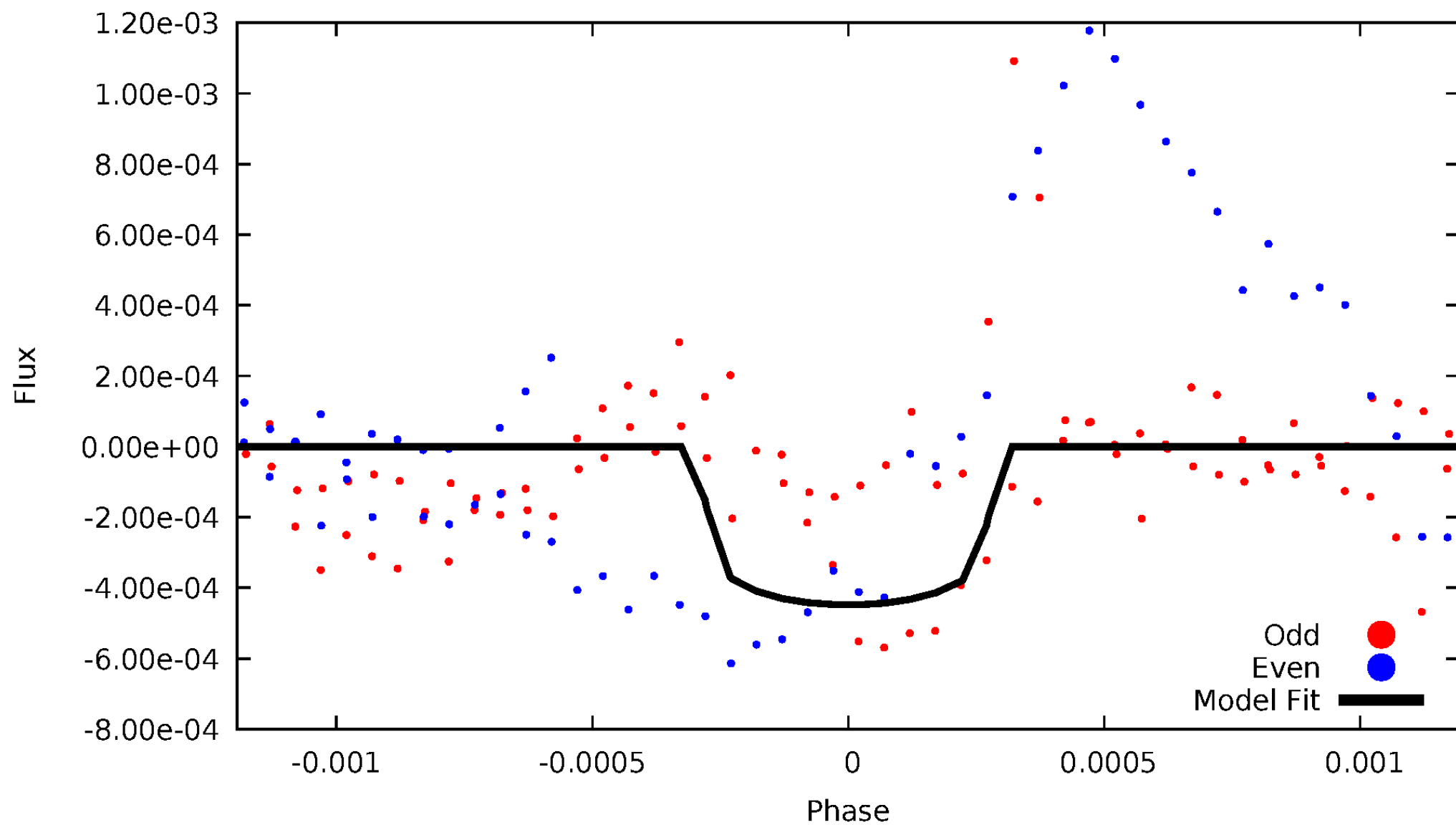


TCE 009216367-05



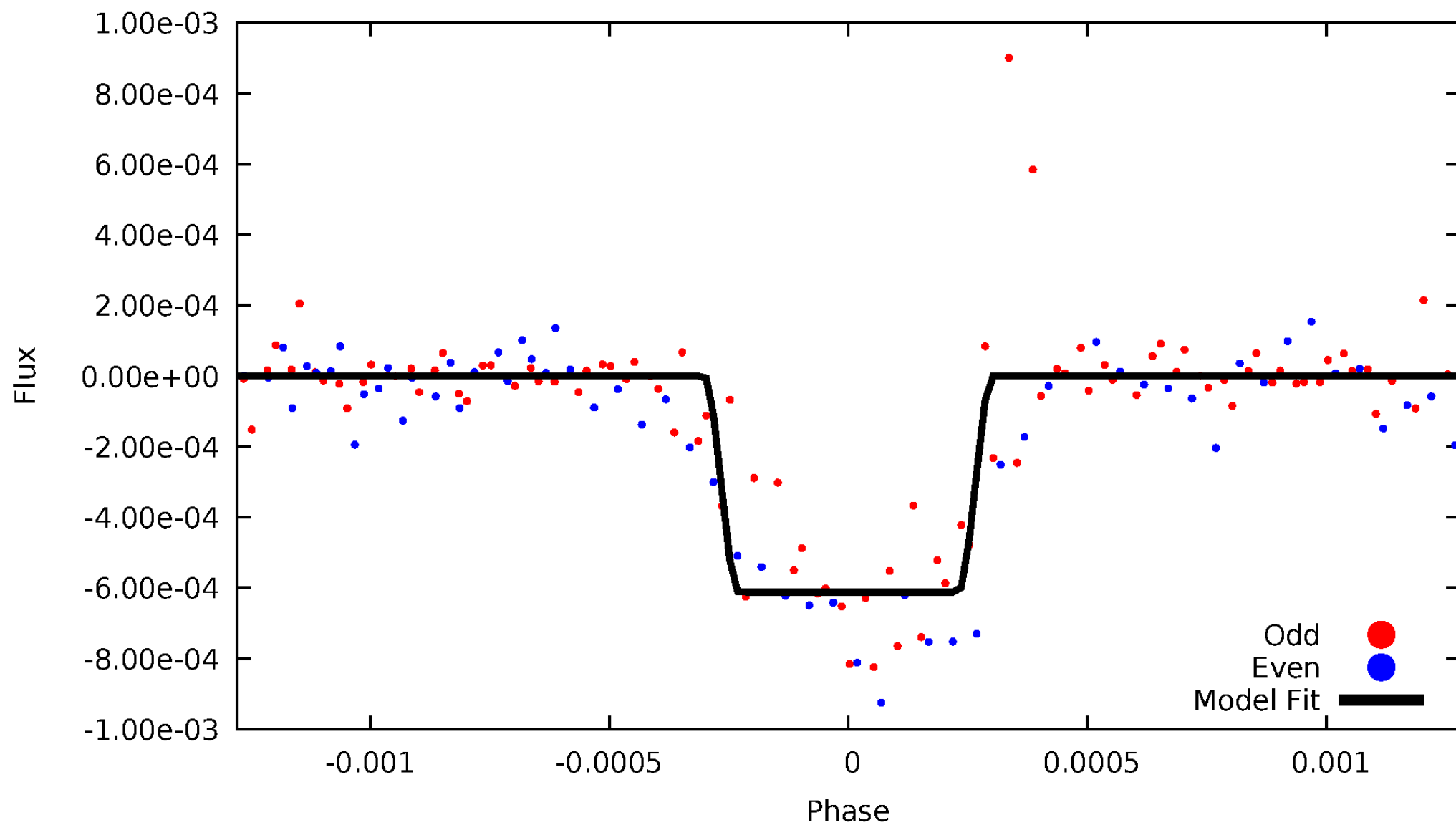
# DV Odd/Even

TCE 009216367-05



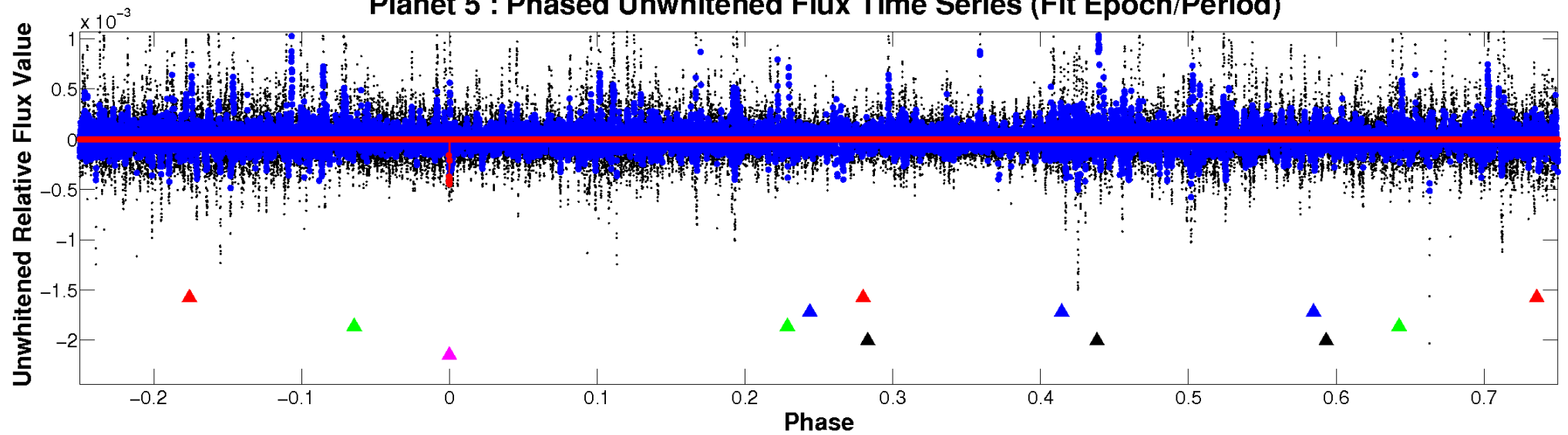
# ALT Odd/Even

TCE 009216367-05

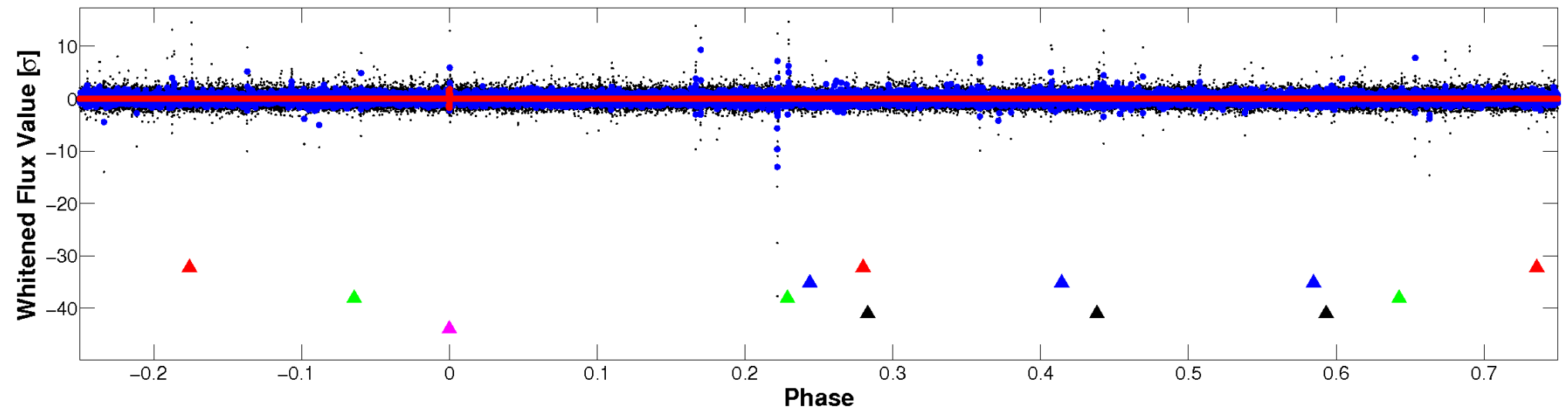


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

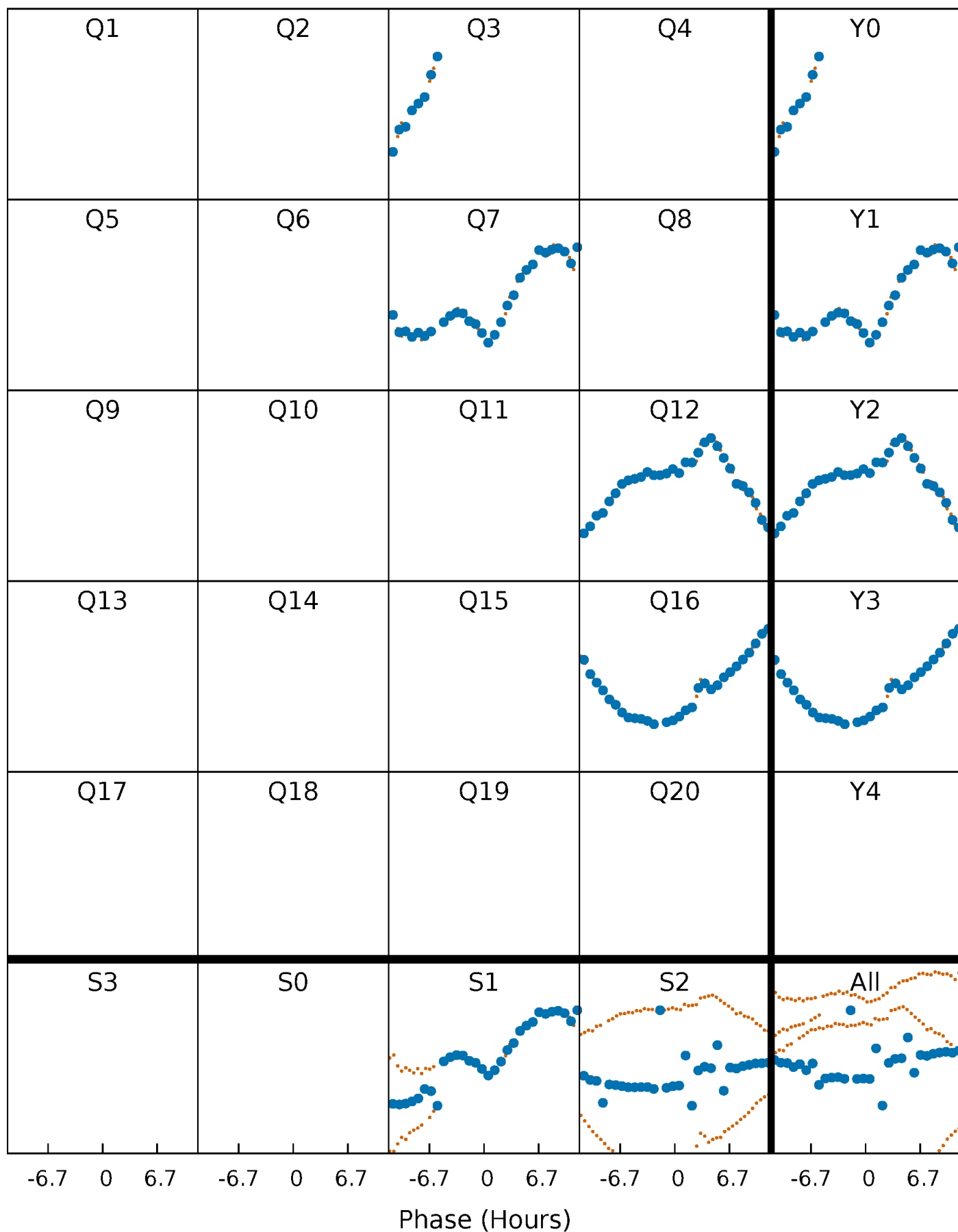


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



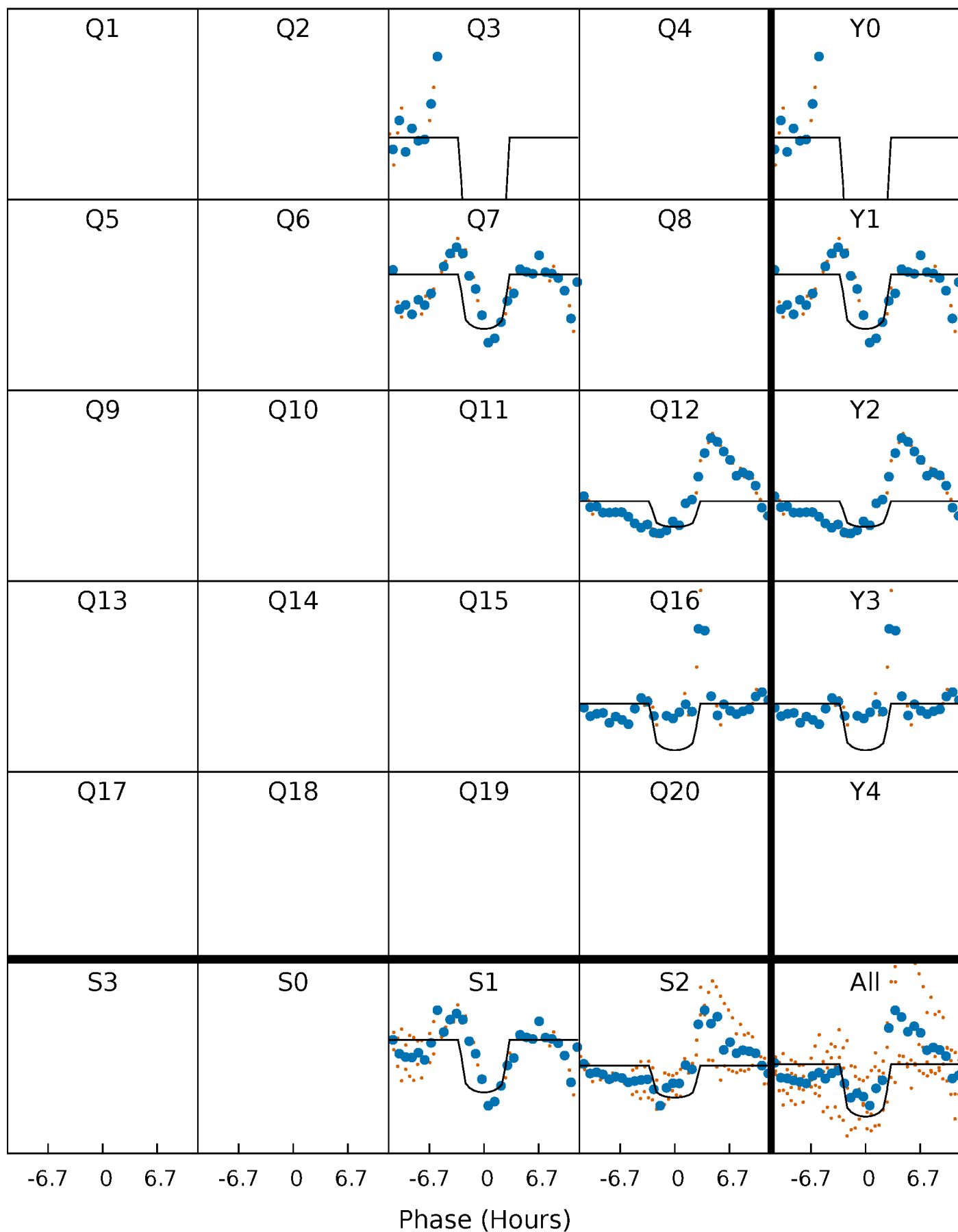
# PDC Quarter-Phased Transit Curves

TCE 009216367-05     $P=408.445669$  Days     $T_0=290.784330$  (BKJD)



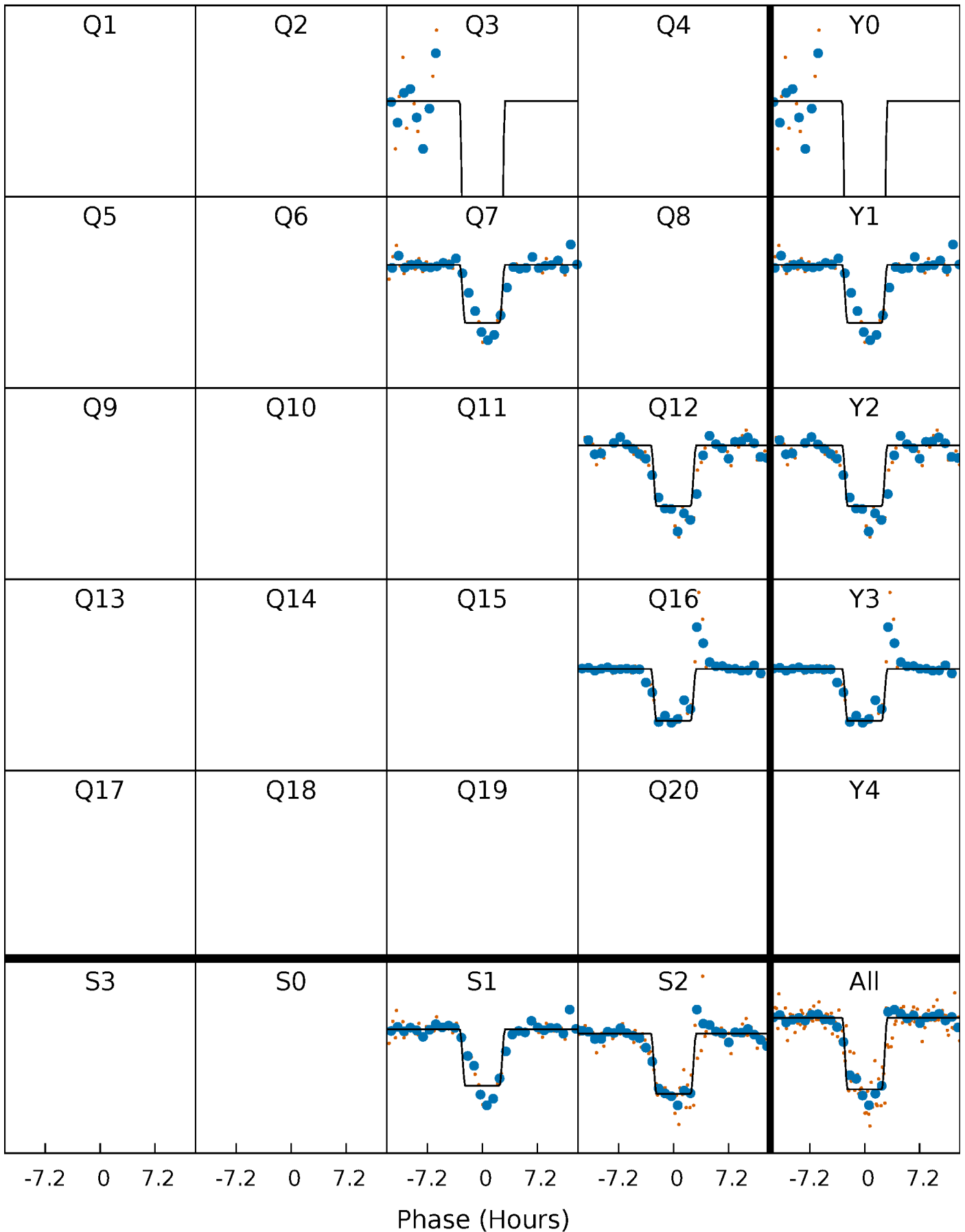
# DV Quarter-Phased Transit Curves

TCE 009216367-05     $P=408.445669$  Days     $T_0=290.784330$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

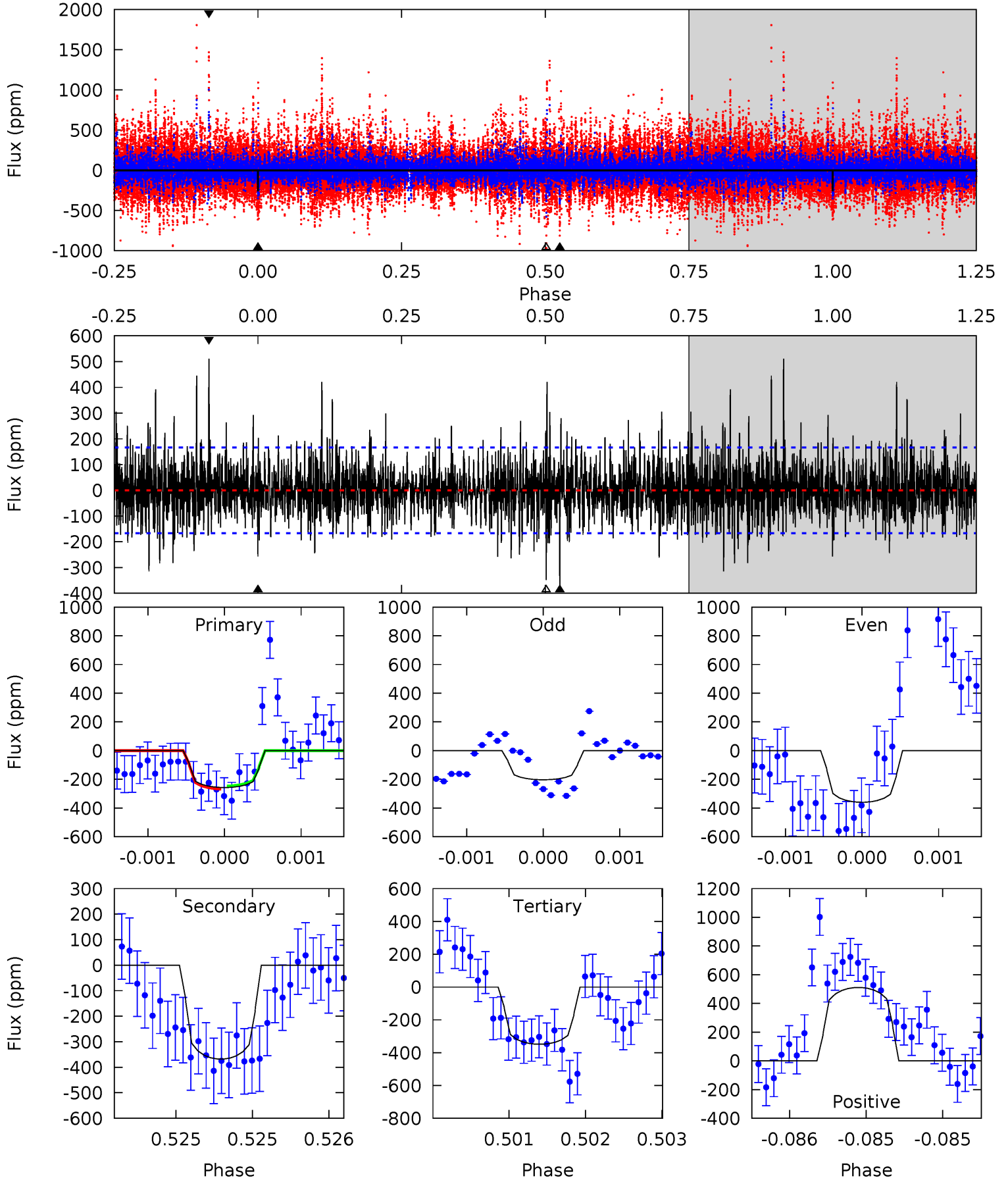
TCE 009216367-05     $P=408.439620$  Days     $T_0=290.797351$  (BKJD)



# DV Model-Shift Uniqueness Test

009216367-05, P = 408.445669 Days, E = 290.784330 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
8.55	12.2	11.6	17.0	5.54	3.43	2.68	-3.04	-8.44	0.64	-4.76	2.10	0.79	0.58	0.36

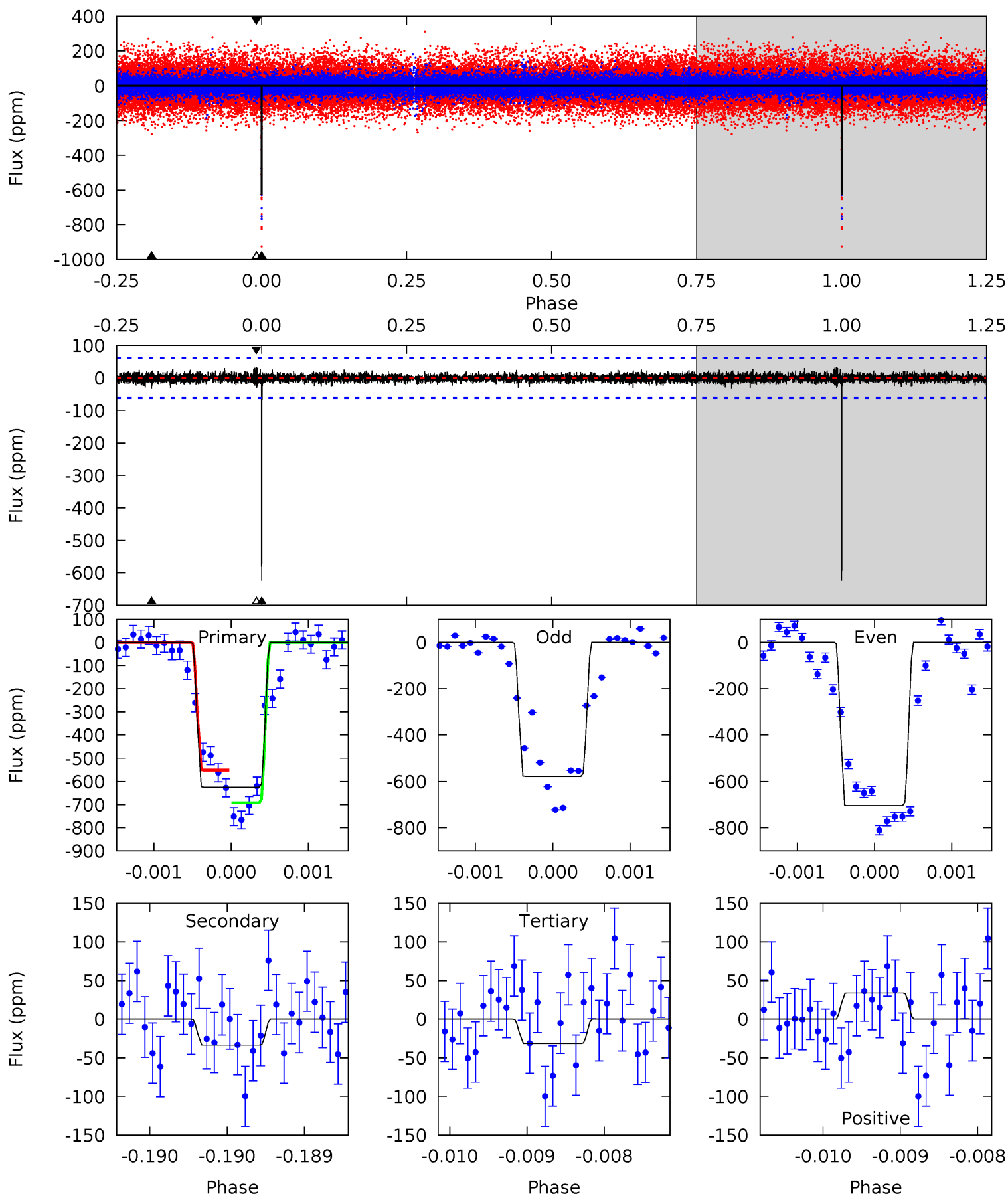




# Alt Model-Shift Uniqueness Test

009216367-05, P = 408.439620 Days, E = 290.797351 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
56.0	3.00	2.81	3.03	5.54	3.43	0.61	53.2	53.0	0.19	-0.03	5.60	1.07	0.05	6.34



### Stellar Parameters For KIC 009216367

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8061^{+223}_{-334}$	$3.668^{+0.501}_{-0.088}$	$-0.320^{+0.200}_{-0.300}$	$3.399^{+0.586}_{-1.759}$	$1.964^{+0.204}_{-0.510}$	$0.070^{+0.388}_{-0.019}$
	+3%/-4%	+14%/-2%	+62%/-94%	+17%/-52%	+10%/-26%	+551%/-27%
Source	KIC0	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 009216367-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-368 \pm 30$	$7.07^{+4.64}_{-3.83}$	$755^{+57}_{-96}$	$7379^{+4604}_{-1599}$	$7024^{+25930}_{-4455}$
Alt.	$-33 \pm 11$	$7.92^{+5.40}_{-3.87}$	$758^{+55}_{-100}$	$4018^{+1281}_{-571}$	$502^{+1595}_{-324}$

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

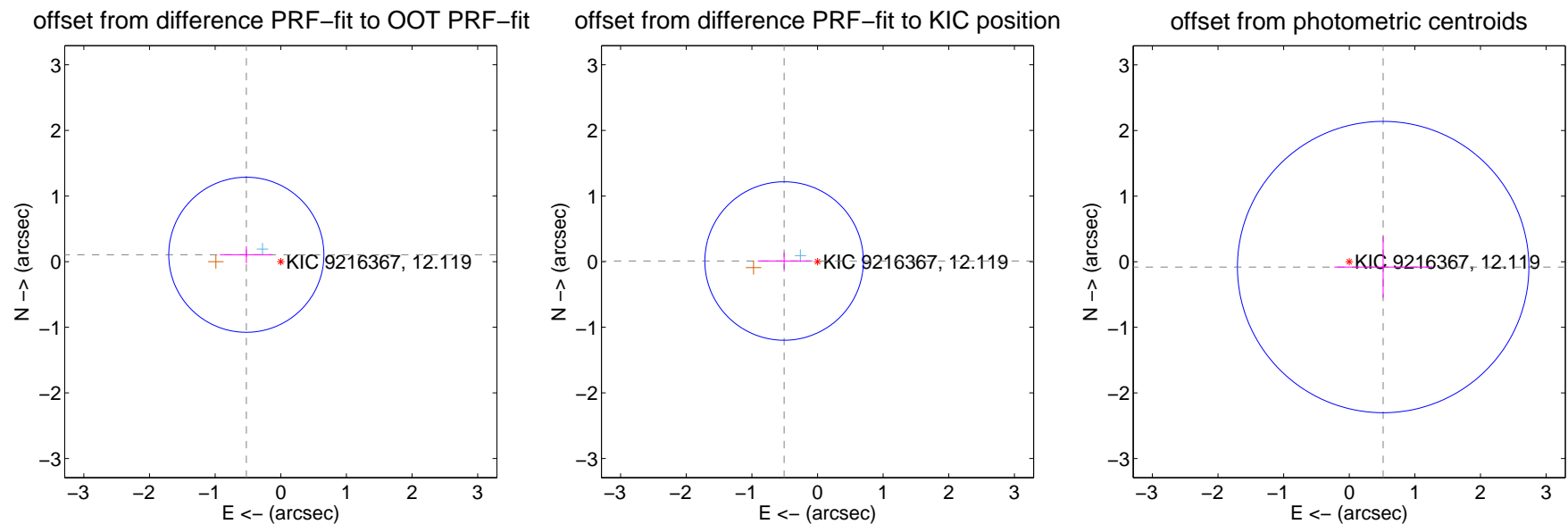
## DV Centroid Data

Supplemental centroid analysis for 009216367-05. Kepler magnitude: 12.12. Transit SNR 8.05

There are 1 quarters with good PRF difference image offsets

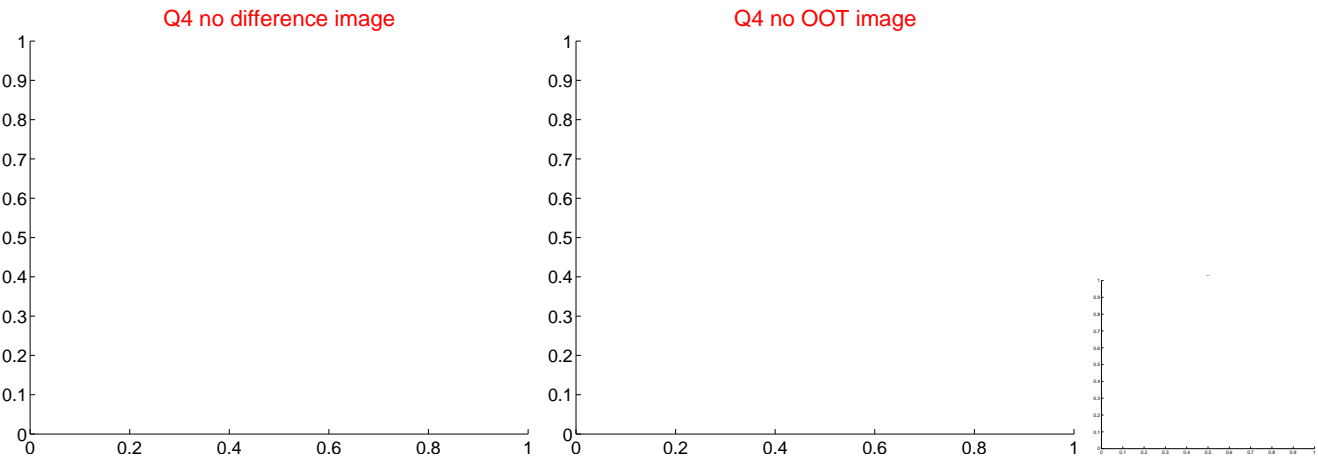
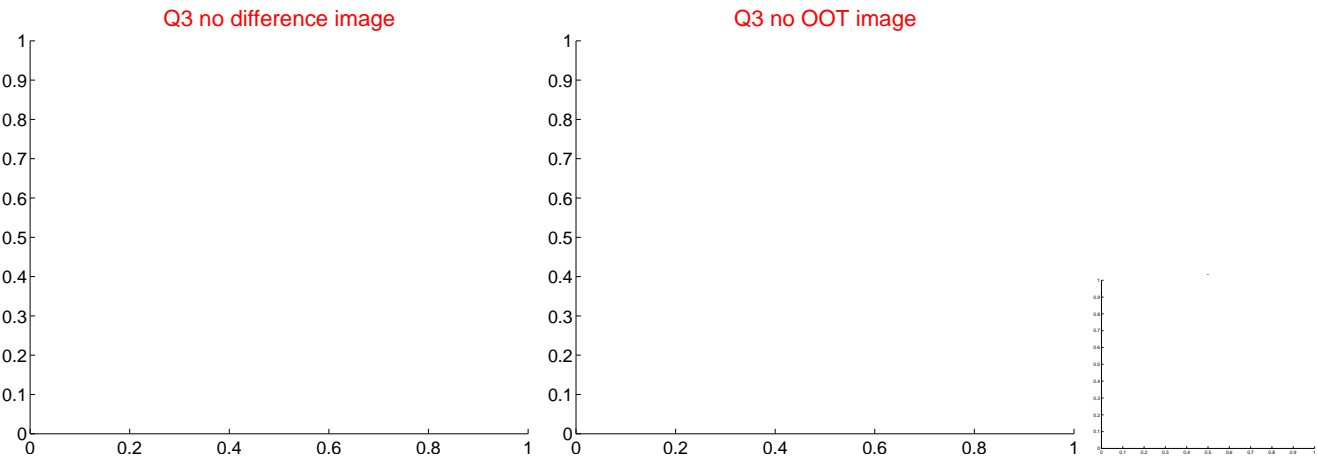
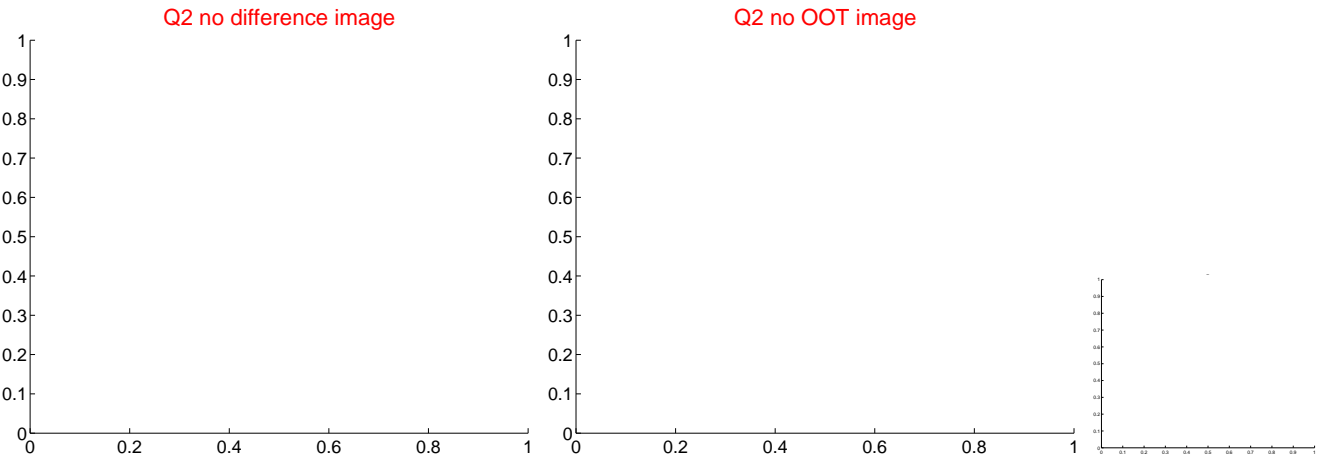
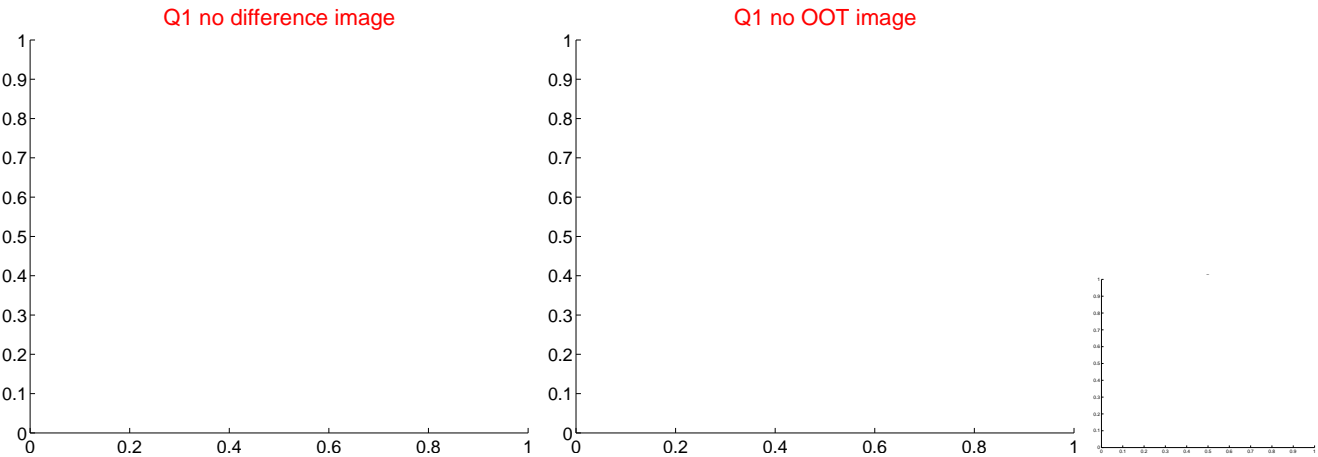
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.535 \pm 0.394$	1.36	$0.525 \pm 0.401$	$0.105 \pm 0.129$
PRF-fit source offset from KIC position	$0.509 \pm 0.403$	1.26	$0.509 \pm 0.403$	$0.009 \pm 0.125$
photometric centroid source offset	$0.52 \pm 0.74$	0.71	$-0.52 \pm 0.75$	$-0.08 \pm 0.47$

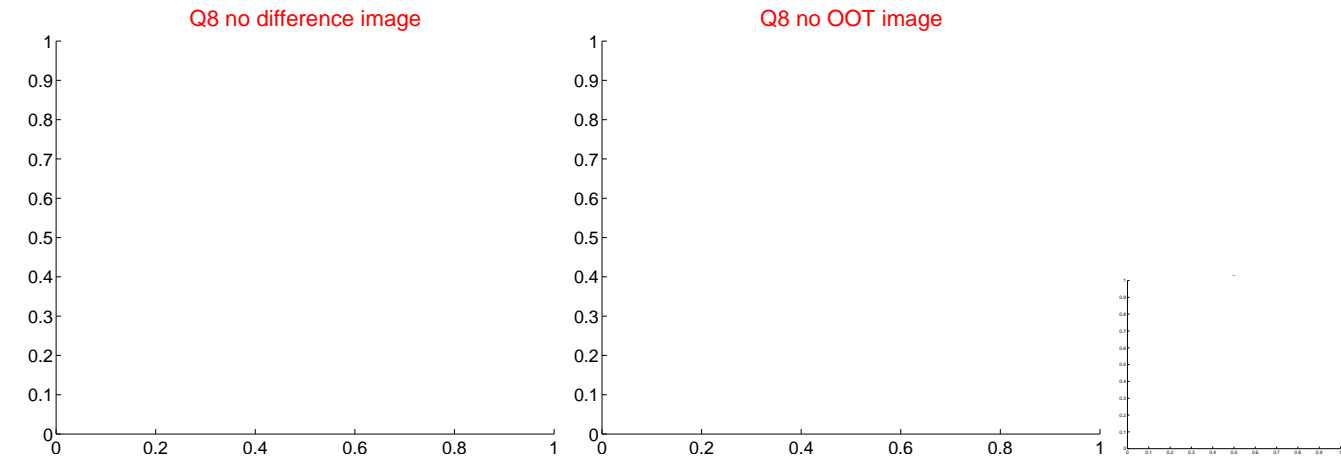
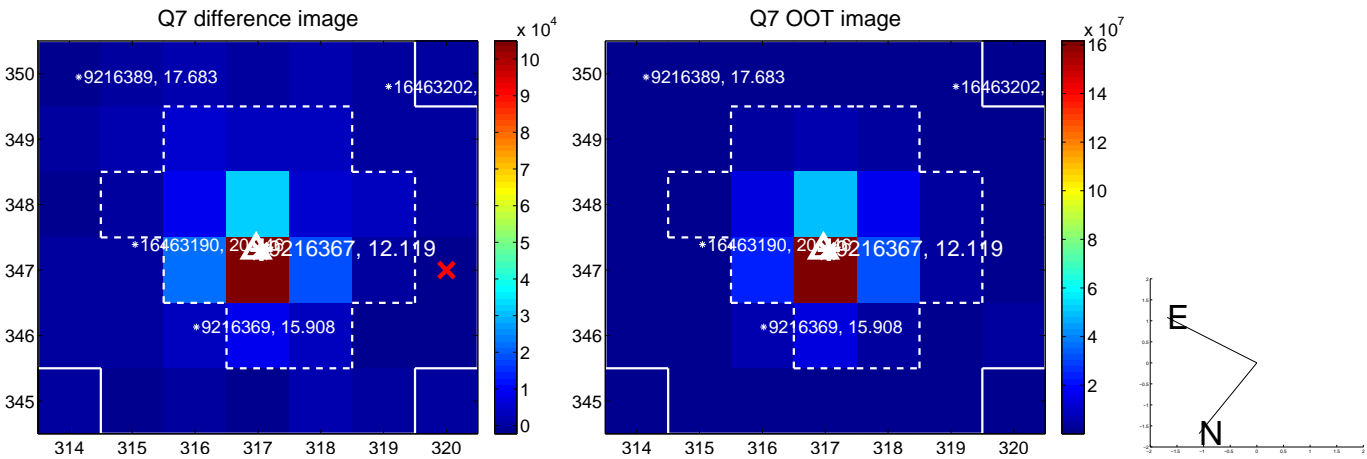
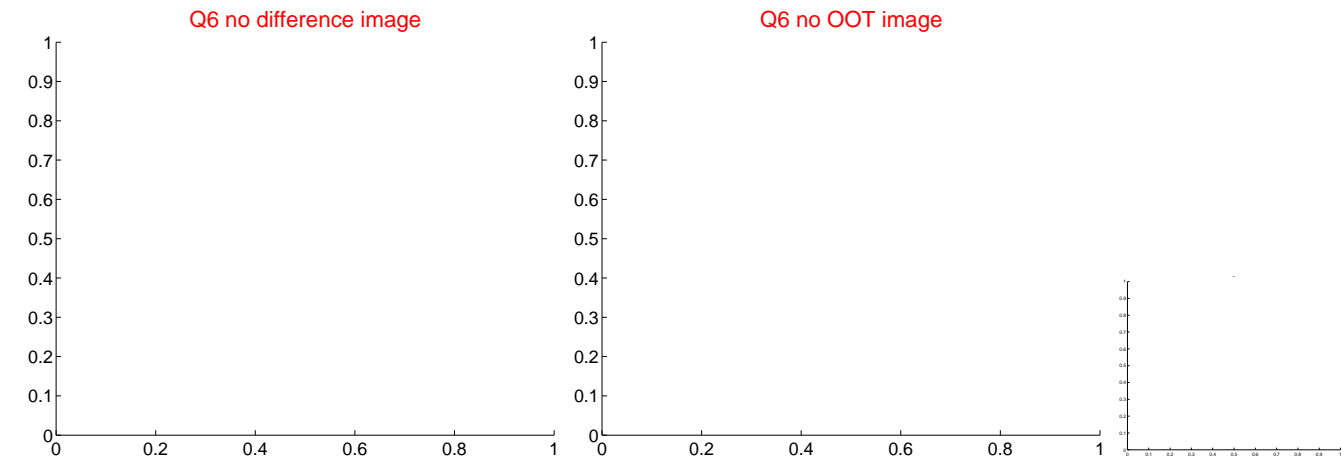
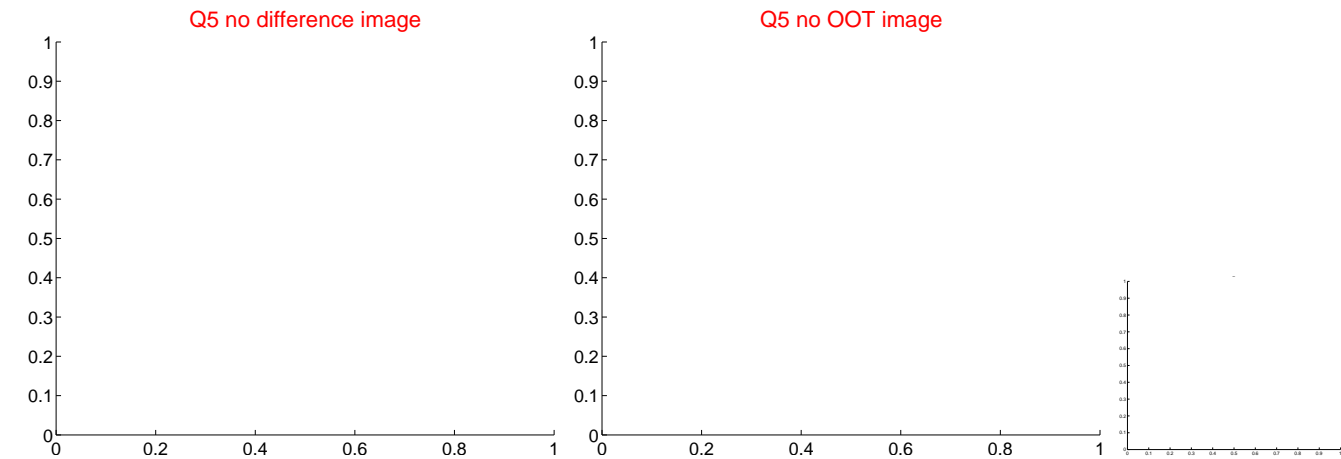


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

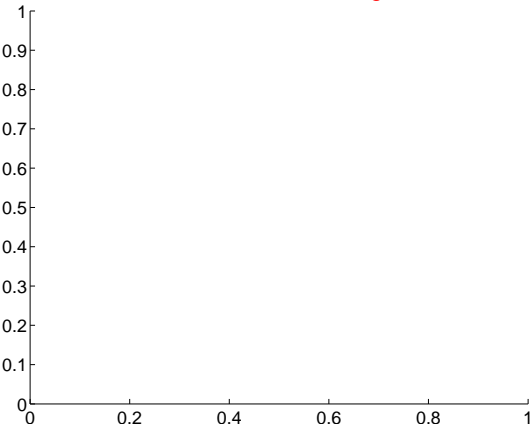


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

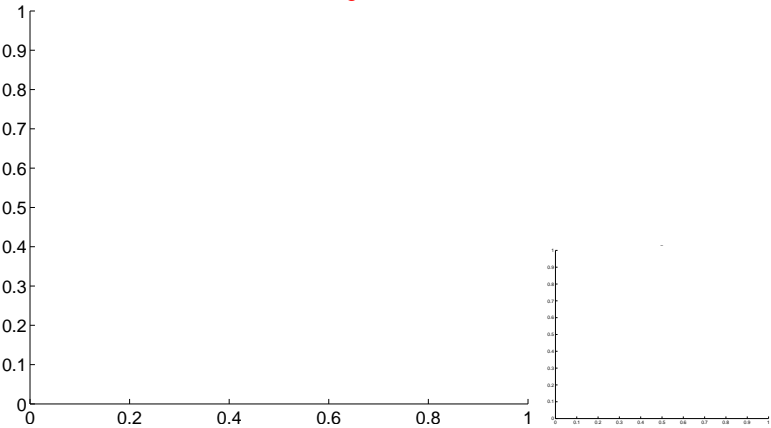


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

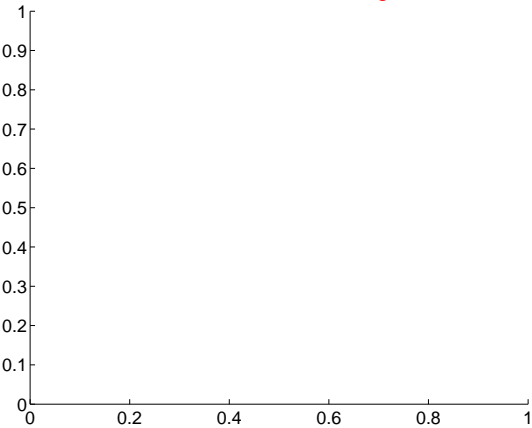
Q9 no difference image



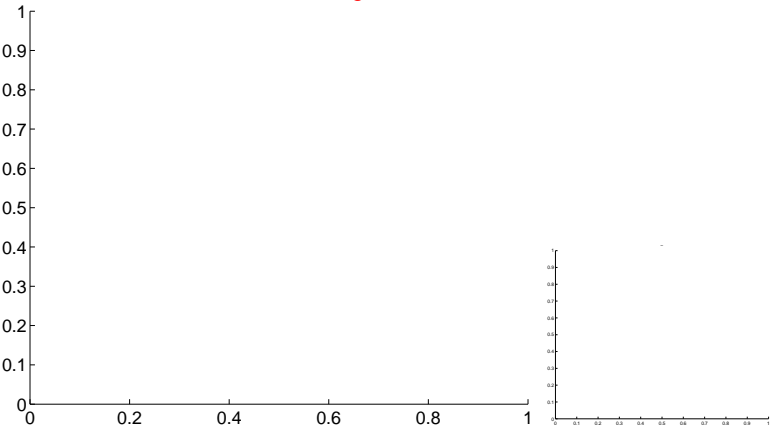
Q9 no OOT image



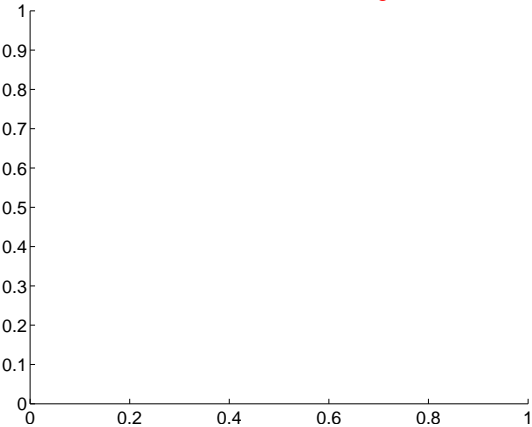
Q10 no difference image



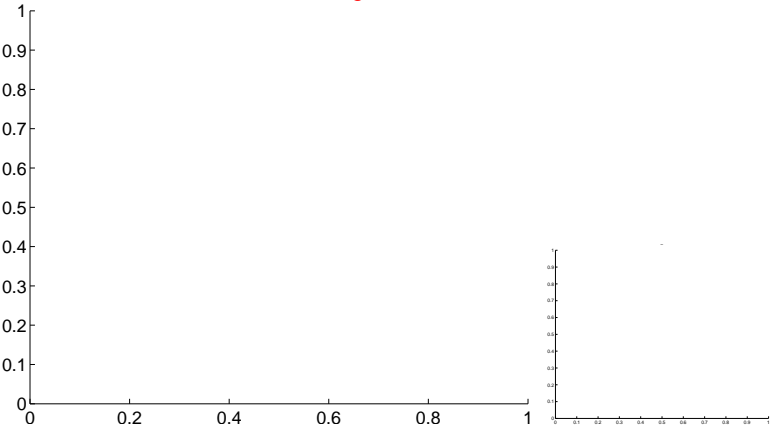
Q10 no OOT image



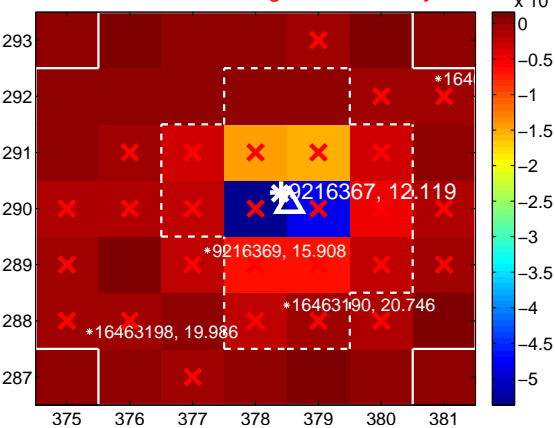
Q11 no difference image



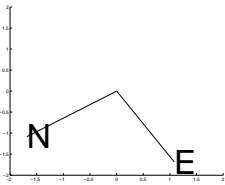
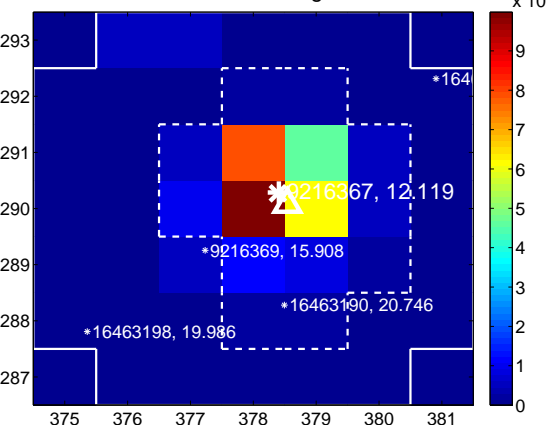
Q11 no OOT image



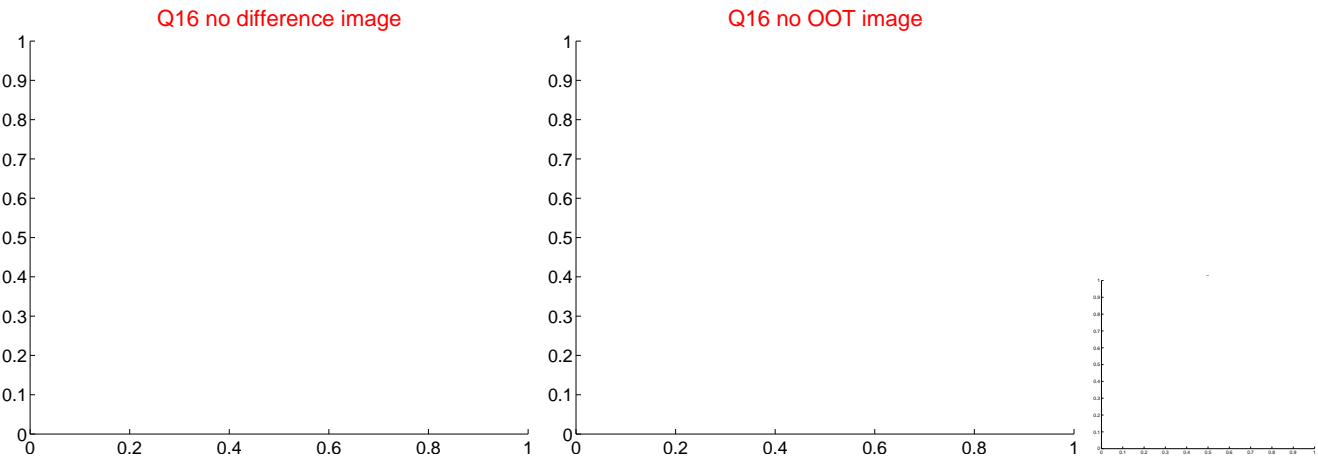
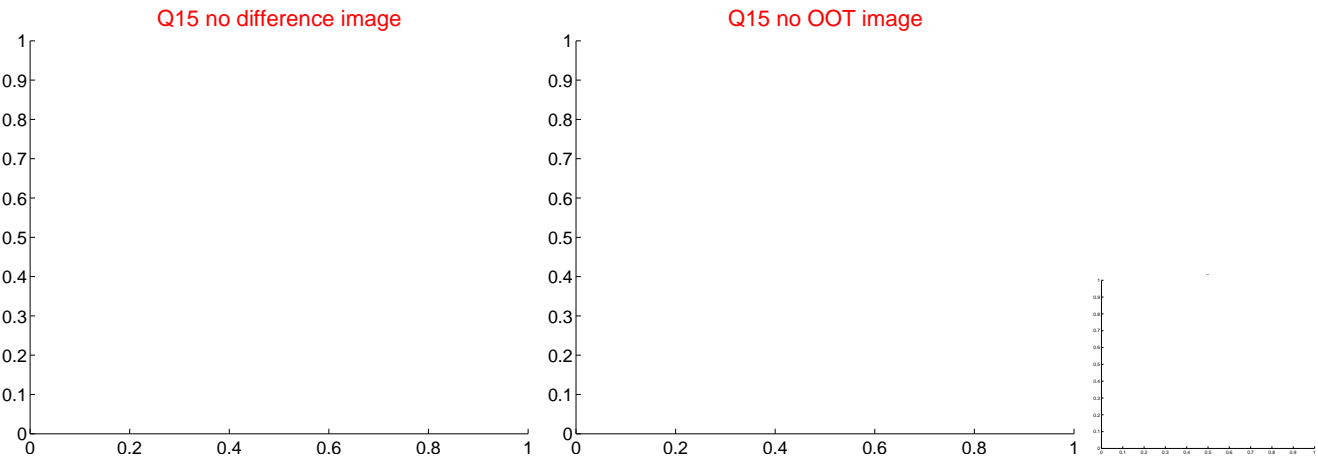
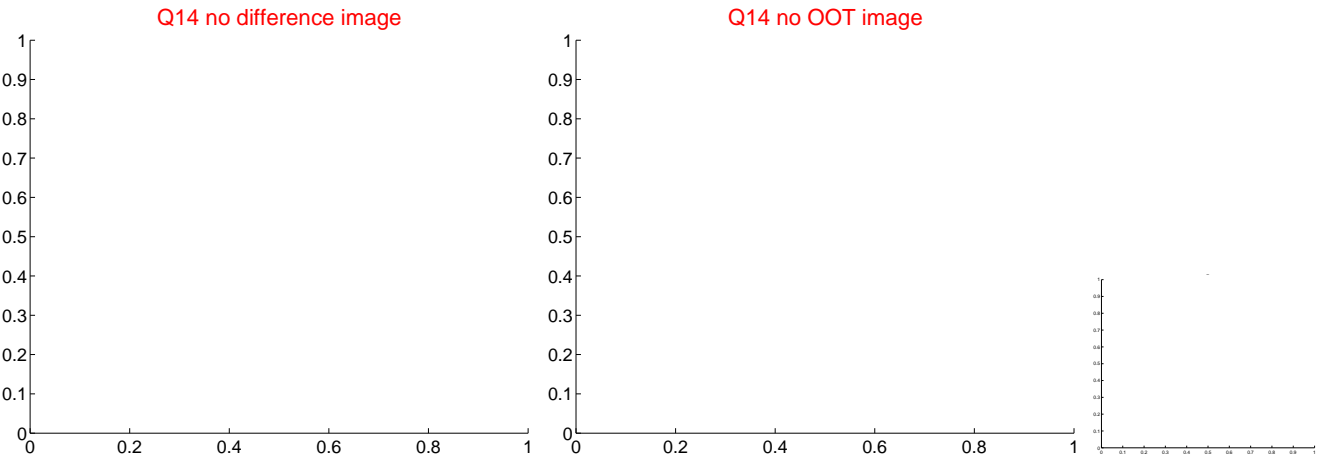
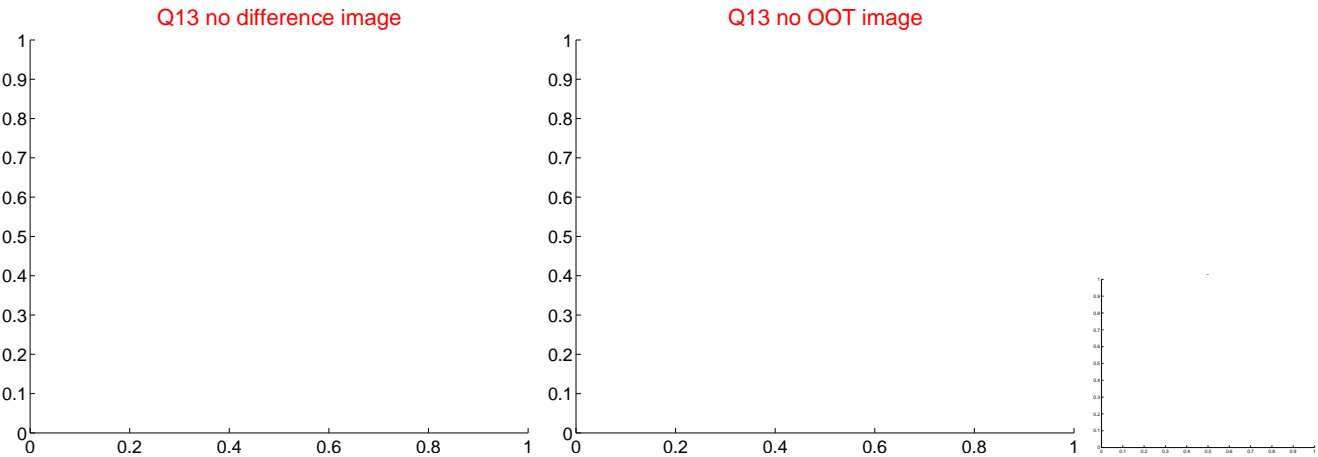
Q12 difference image. Poor Quality



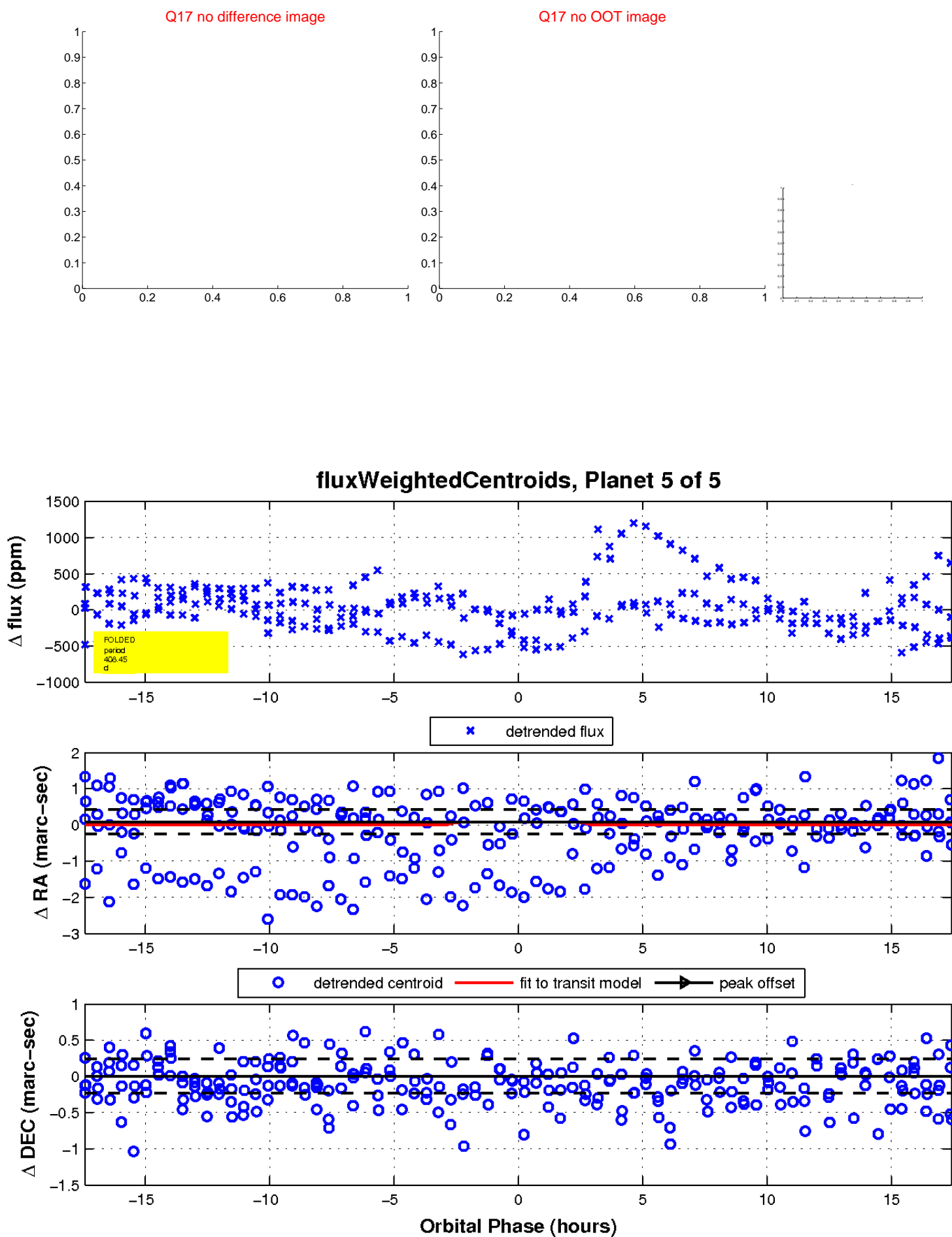
Q12 OOT image



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.





UKIRT Image

Declination

