

# KIC 010748621

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010748621-01	OBS	3532.01	286.178819	403.846076	275291.8	12.000	2970.0	-1.0	0.95	5904	40.97	1.38
010748621-02	OBS	No	286.172008	314.108692	336824.7	9.000	2456.1	-1.0	0.95	5904	42.65	1.38
010748621-03	OBS	No	412.527237	312.955679	1616.2	19.119	43.1	13.1	0.95	5904	6.20	0.85
010748621-04	OBS	No	375.775145	226.810165	1747.2	54.868	45.1	24.4	0.95	5904	7.50	0.96
010748621-05	OBS	No	369.557817	435.610411	1250.7	48.010	15.4	10.6	0.95	5904	6.42	0.98
010748621-06	OBS	No	427.123172	406.002780	2454.7	30.547	15.5	13.1	0.95	5904	6.95	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010748621-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010748621-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS
010748621-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-06	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

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

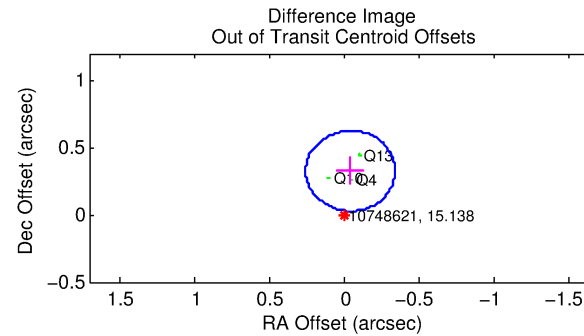
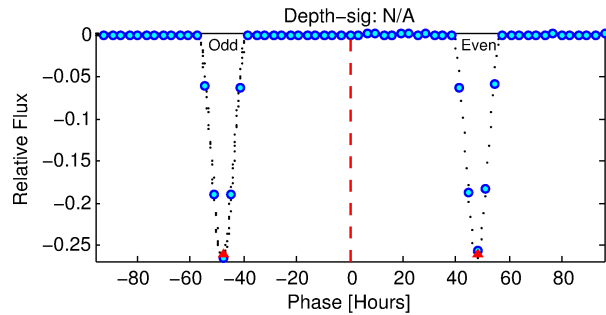
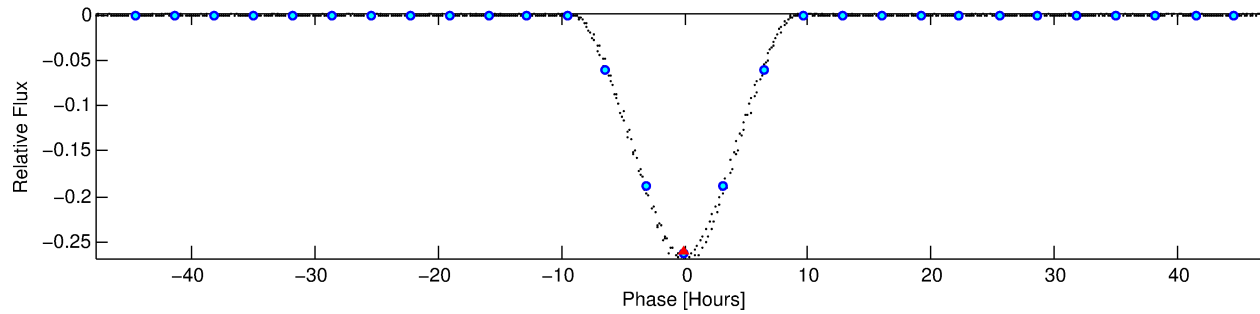
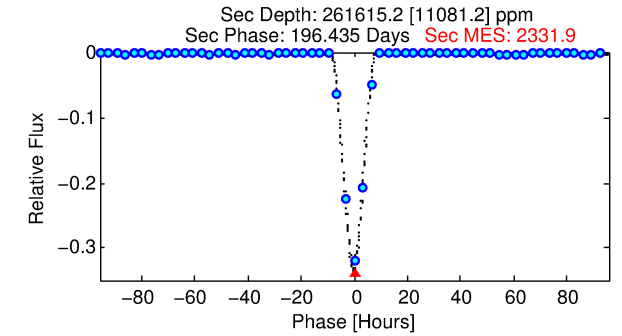
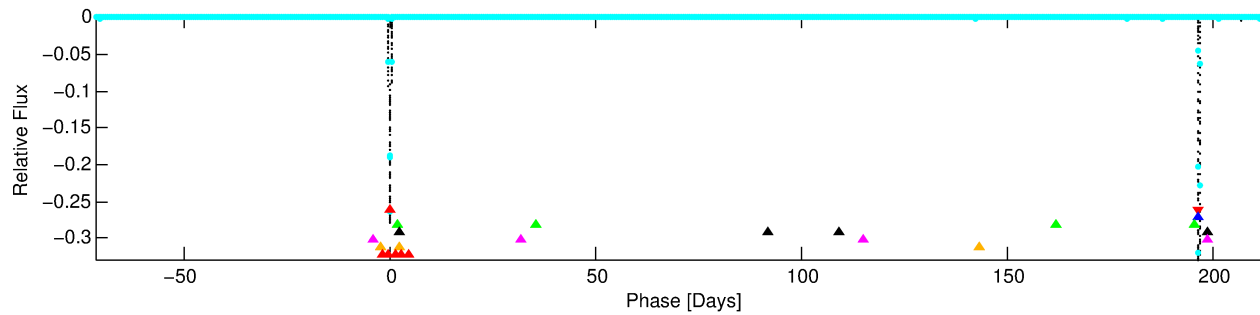
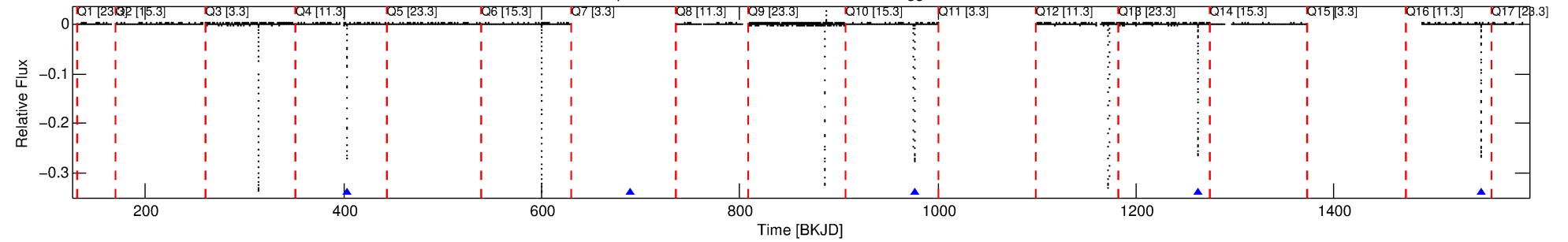
## Ephemeris Match Information For 010748621-01

No Significant Match Found

# DV One-Page Summary

KIC: 10748621 Candidate: 1 of 7 Period: 286.179 d  
KOI: K03532 Corr: No Ephemeris Match

Kp: 15.14 R\*: 0.95 Rs Teff: 5904.0 K Logg: 4.47 Fe/H: -0.160



## TPS TCE Results:

Period = 286.17882 d  
Epoch = 403.8461 BKJD

DV fit results are unavailable

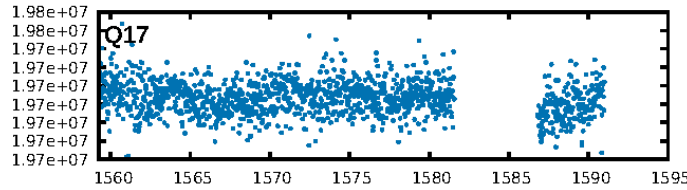
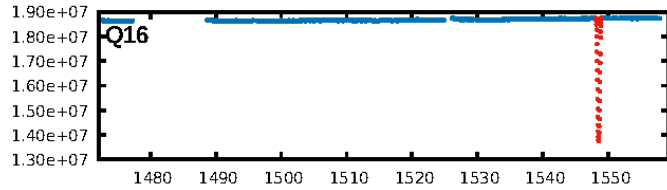
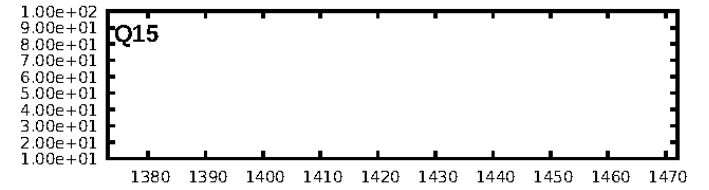
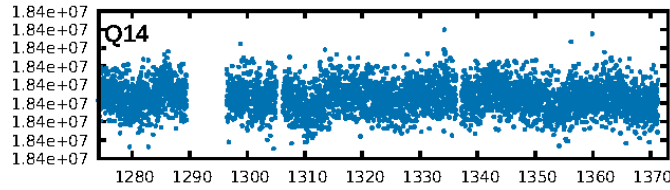
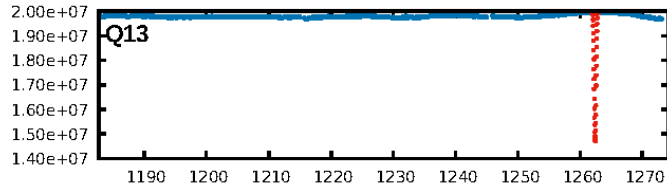
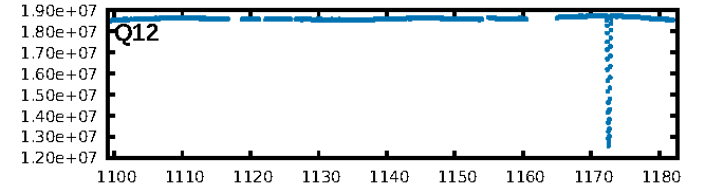
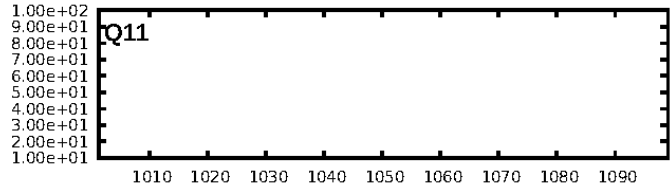
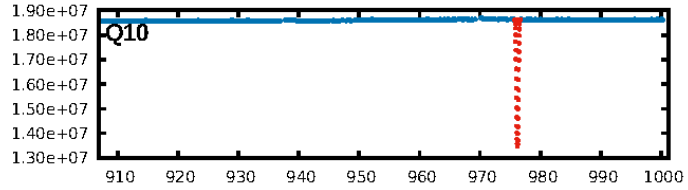
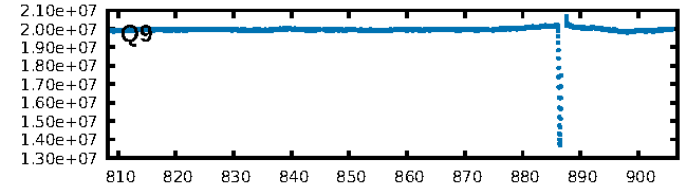
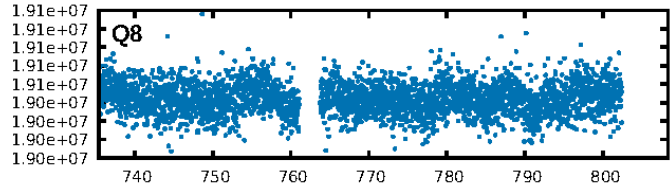
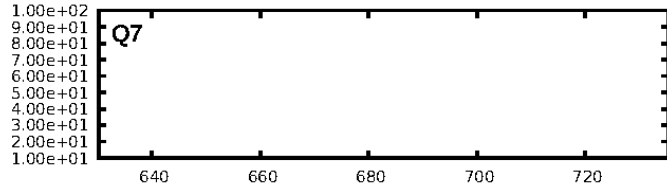
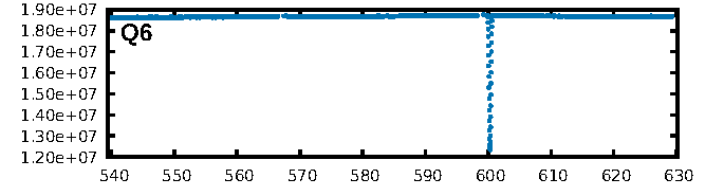
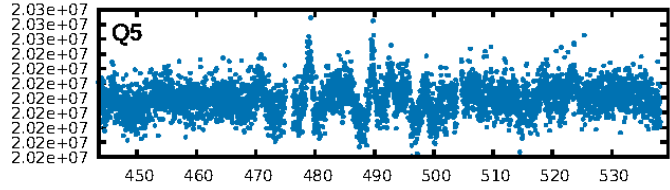
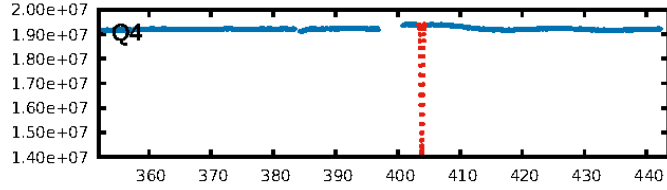
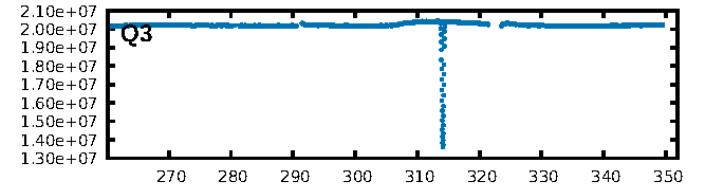
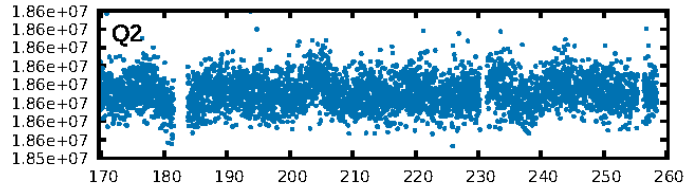
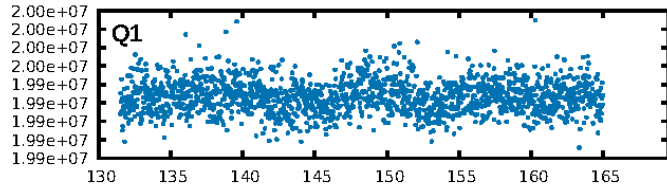
## DV Diagnostic Results:

ShortPeriod-sig: 0.9% [0.01 $\sigma$ ]  
LongPeriod-sig: 98.3% [2.38 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 3.837  
Centroid-sig: 0.0%  
Centroid-so: 0.119 arcsec [44.01 $\sigma$ ]  
OotOffset-rm: 0.330 arcsec [3.31 $\sigma$ ]  
KicOffset-rm: 0.044 arcsec [0.41 $\sigma$ ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 0.67 [2/3]

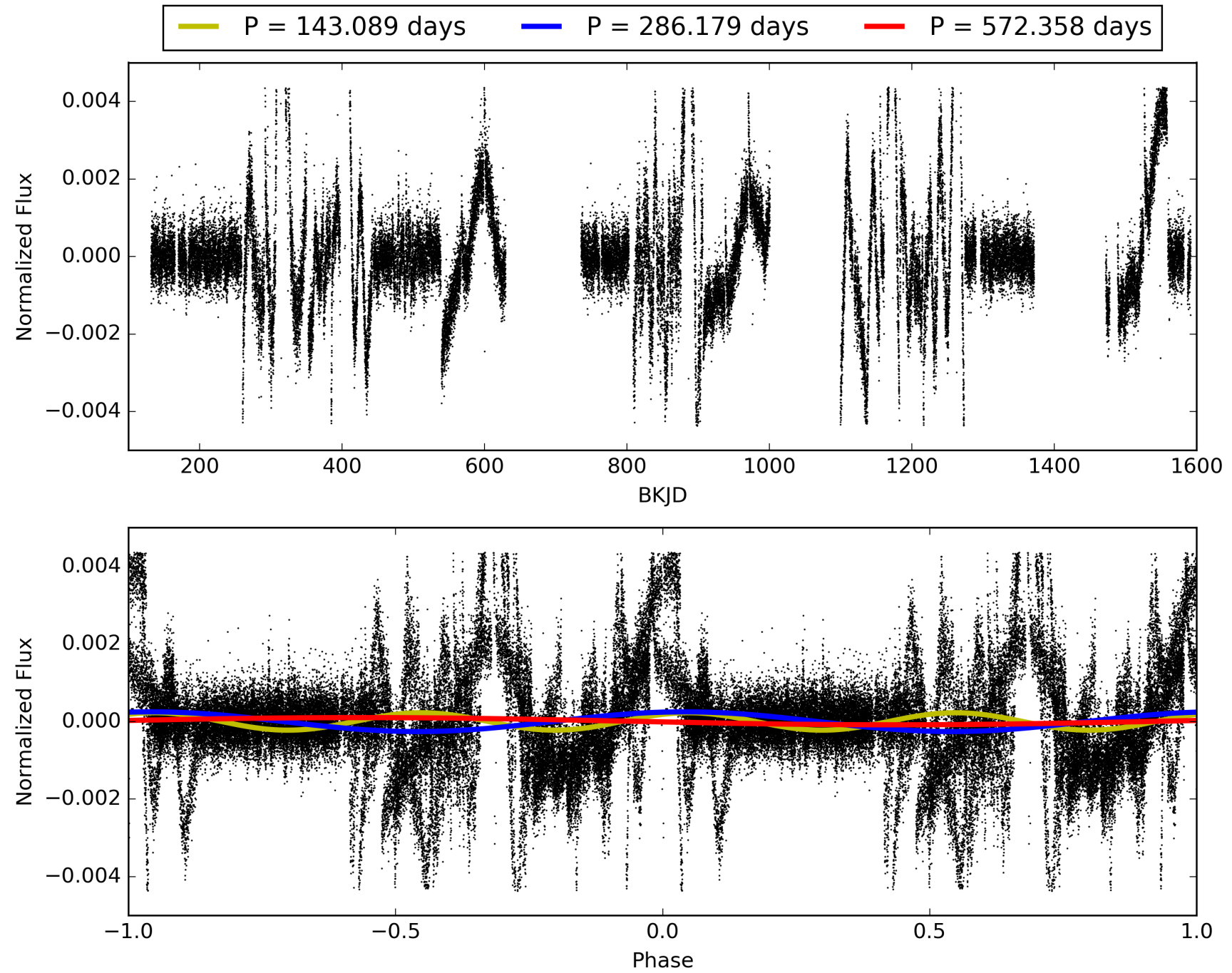
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:47:42 Z

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

## TCE 010748621-01, PDC Light Curves



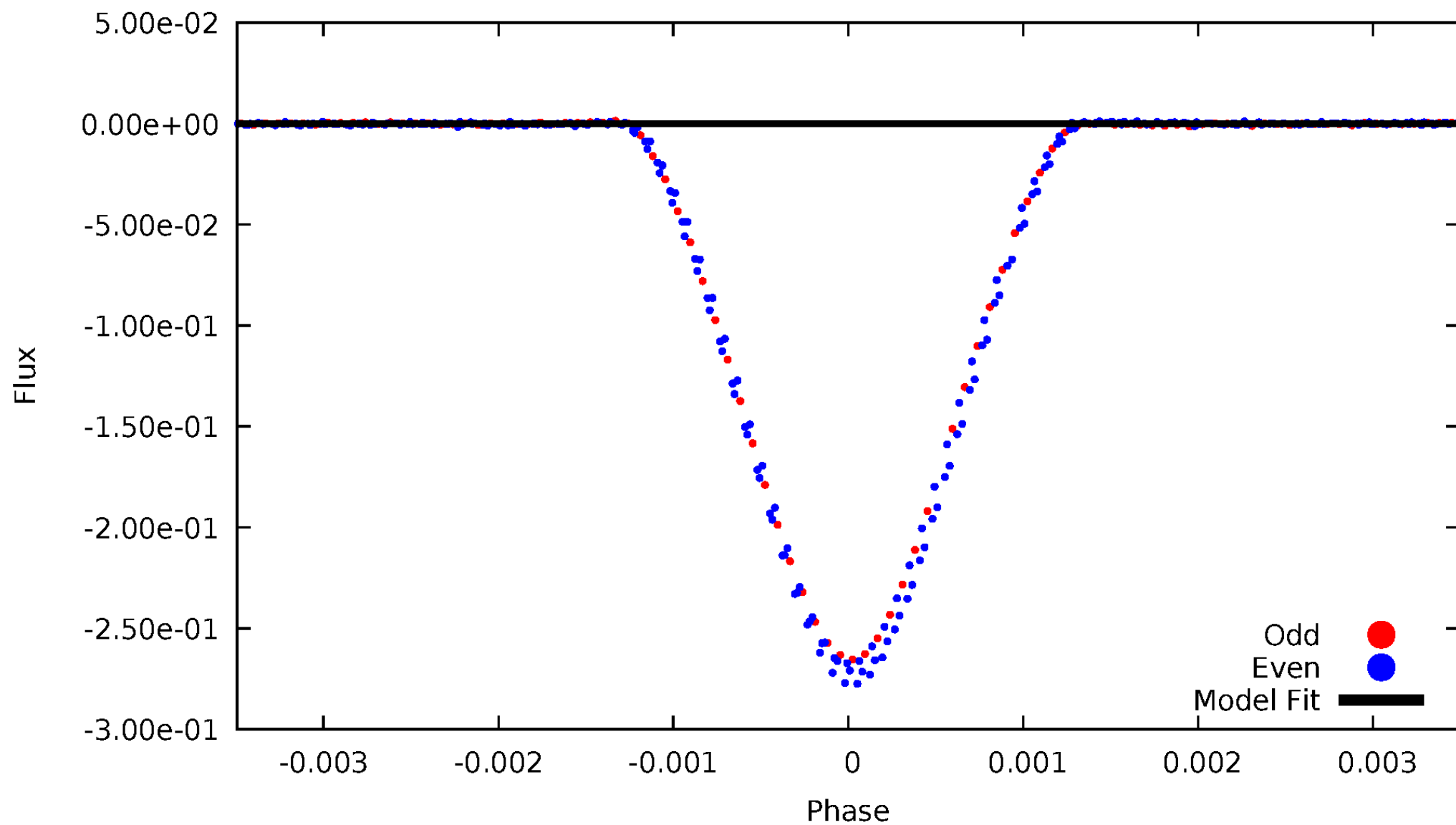
TCE 010748621-01





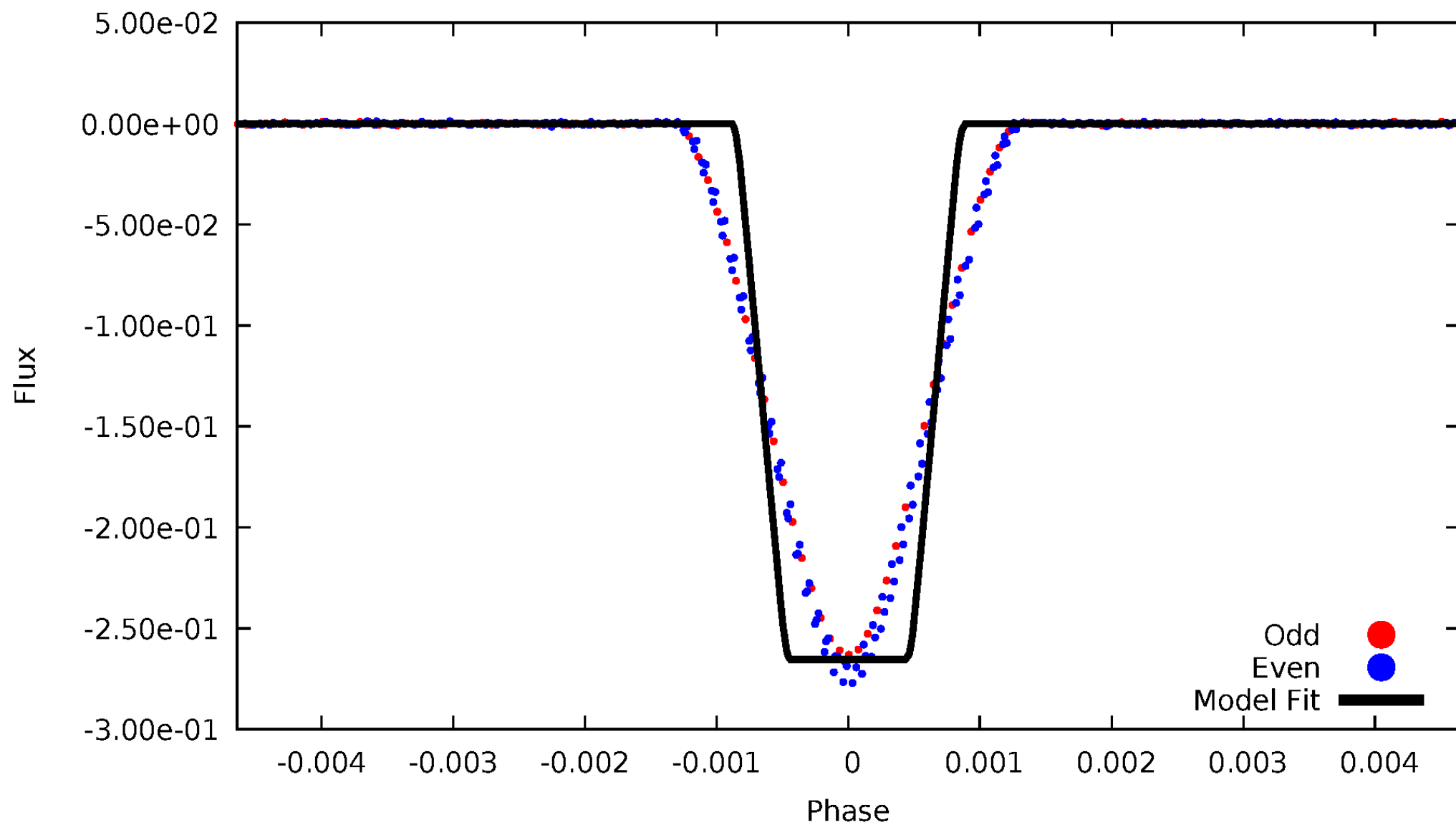
# DV Odd/Even

TCE 010748621-01



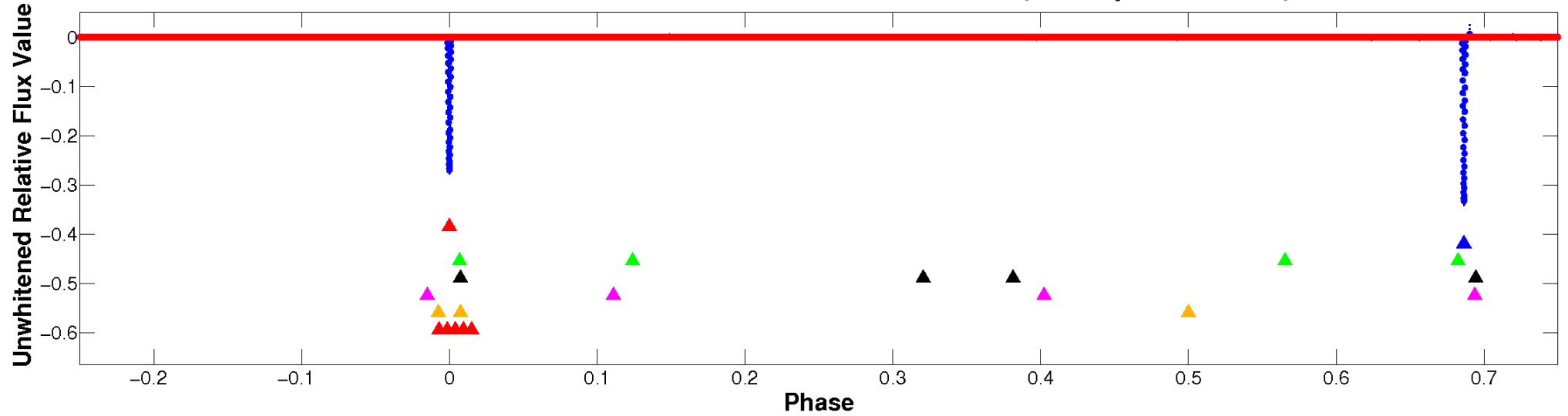
# ALT Odd/Even

TCE 010748621-01

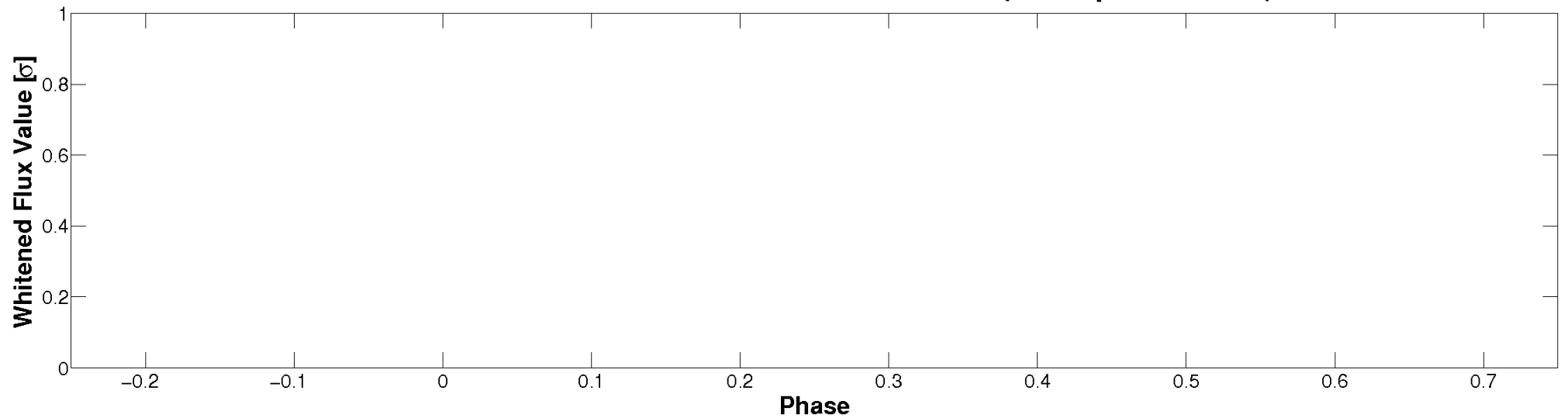


# Non-Whitened Vs. Whitened Light Curve

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

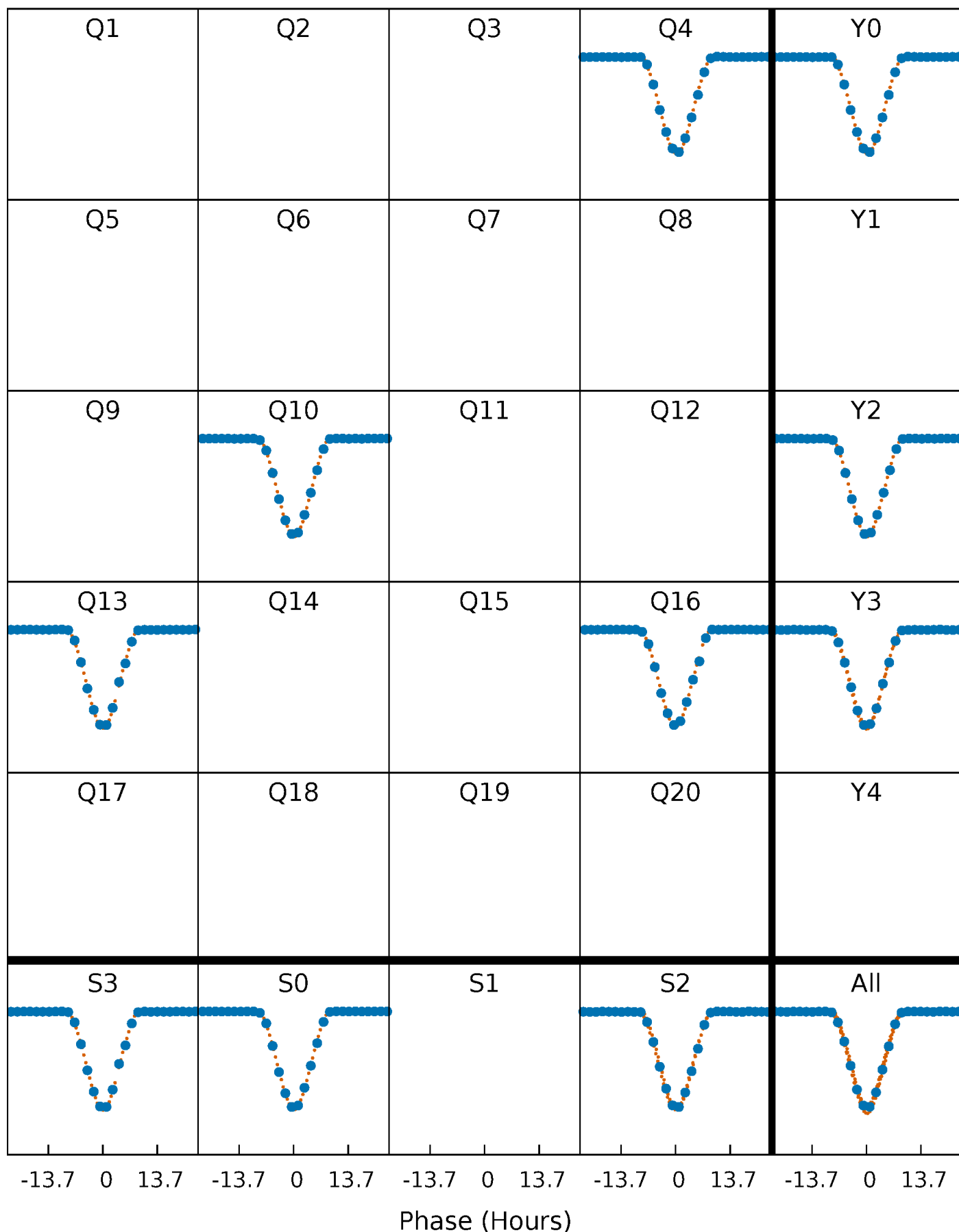


Planet 1 : Phased Whitened Flux Time Series (TPS Epoch/Period)



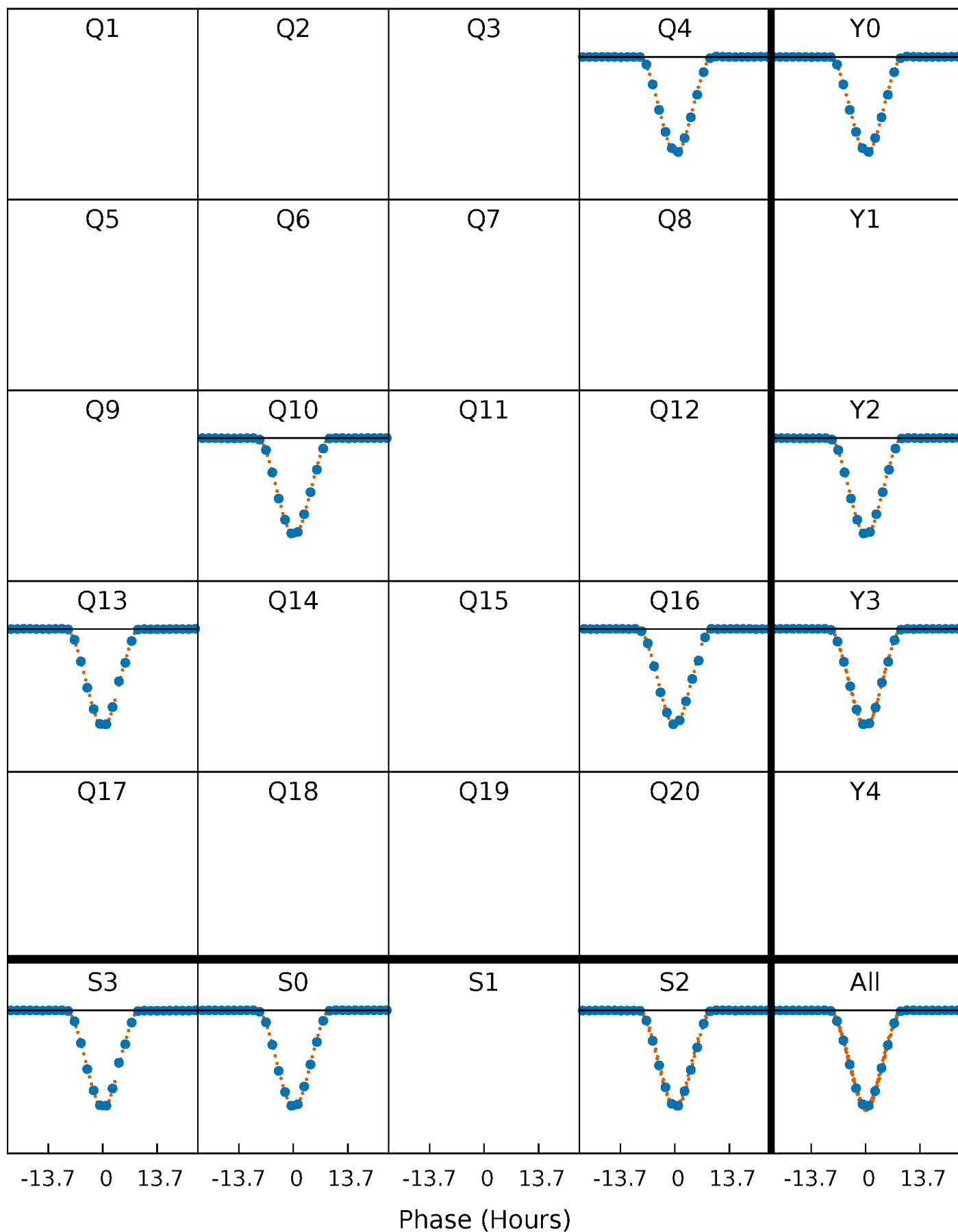
# PDC Quarter-Phased Transit Curves

TCE 010748621-01 P=286.178819 Days  $T_0=403.846076$  (BKJD)



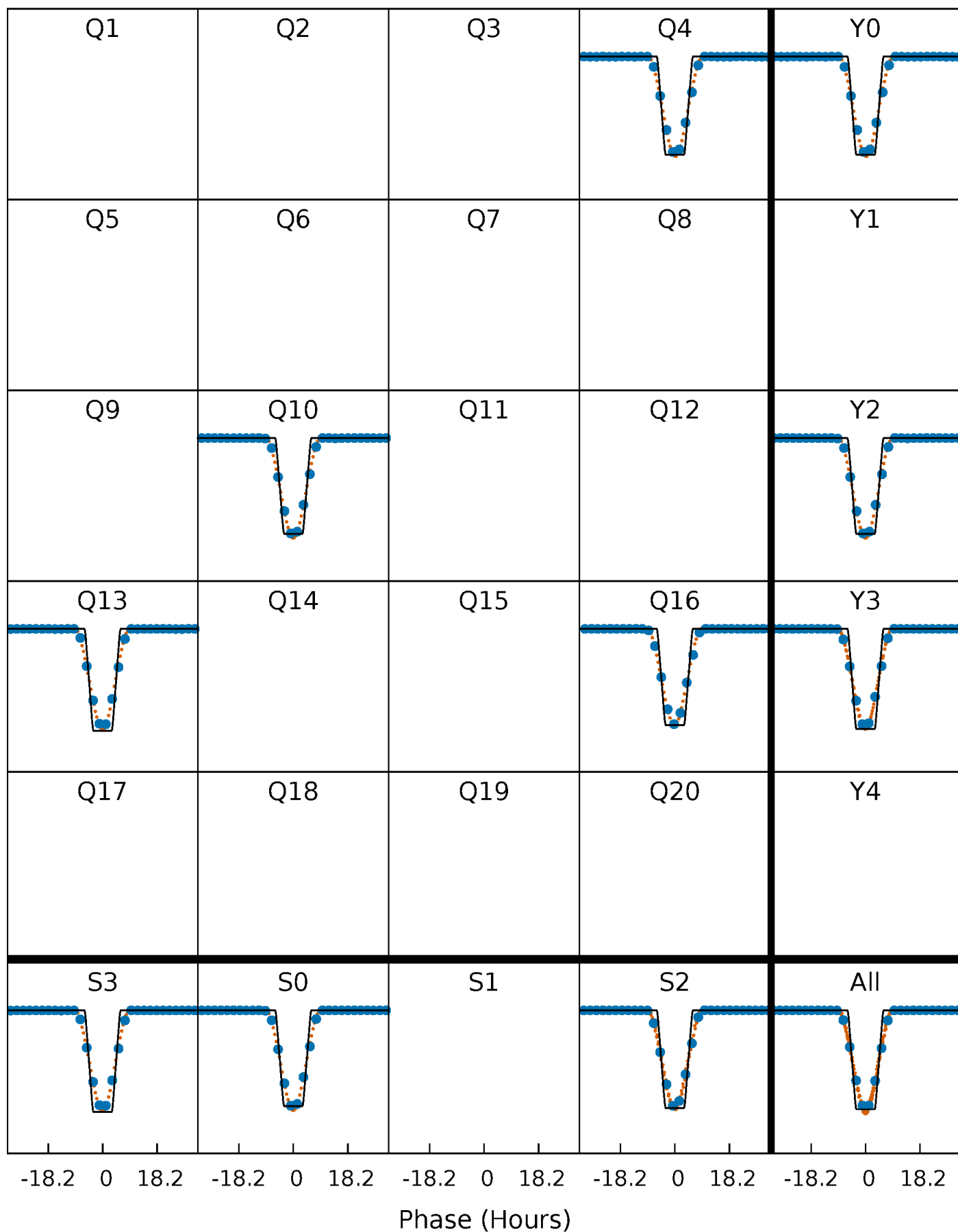
# DV Quarter-Phased Transit Curves

TCE 010748621-01 P=286.178819 Days  $T_0=403.846076$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010748621-01 P=286.178819 Days  $T_0=403.851647$  (BKJD)

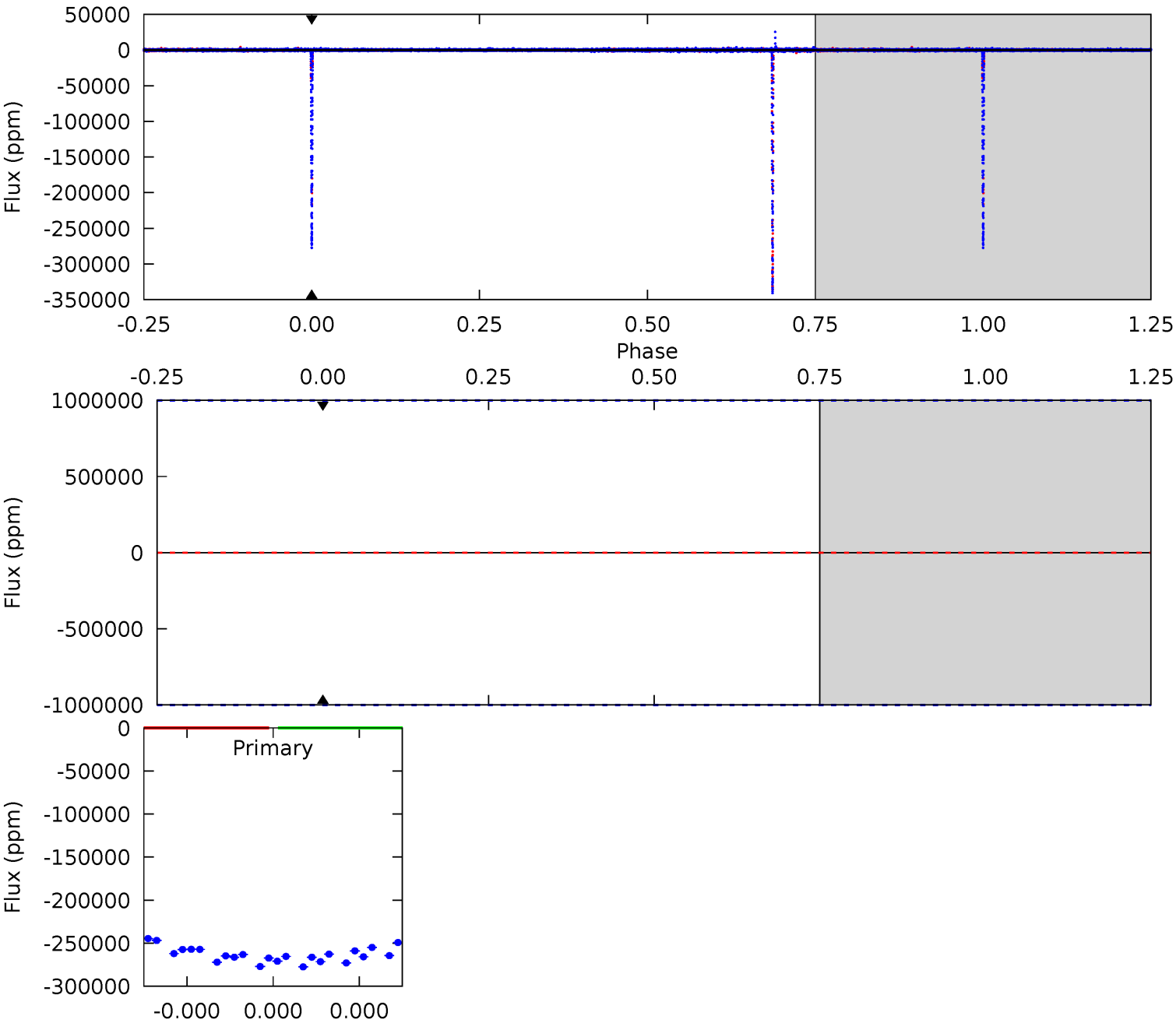




# DV Model-Shift Uniqueness Test

010748621-01, P = 286.178819 Days, E = 117.667257 Days

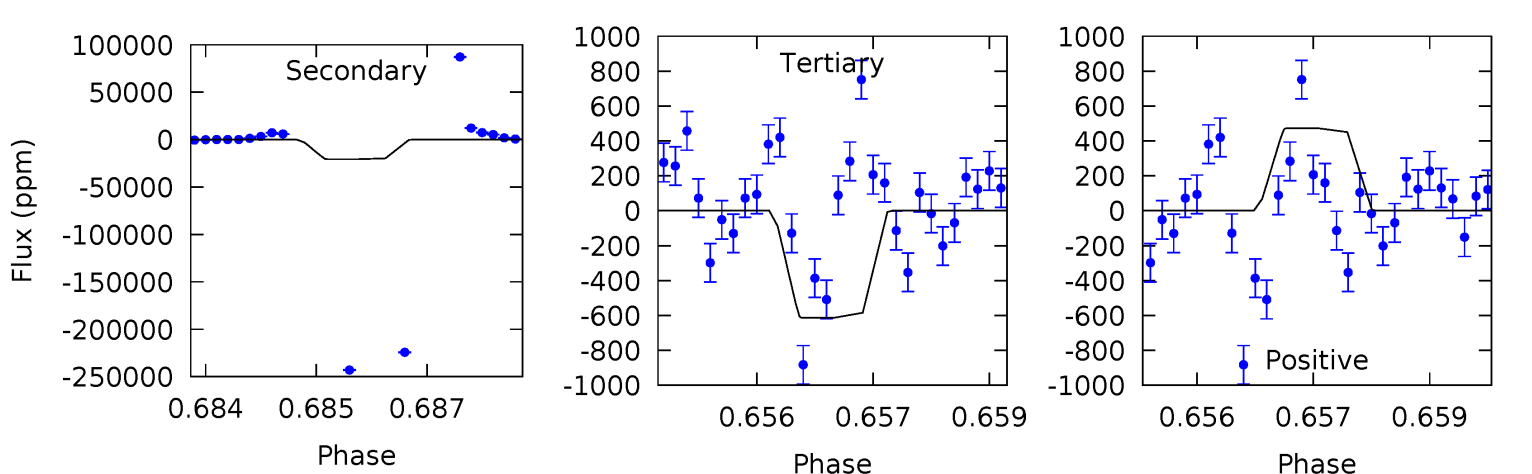
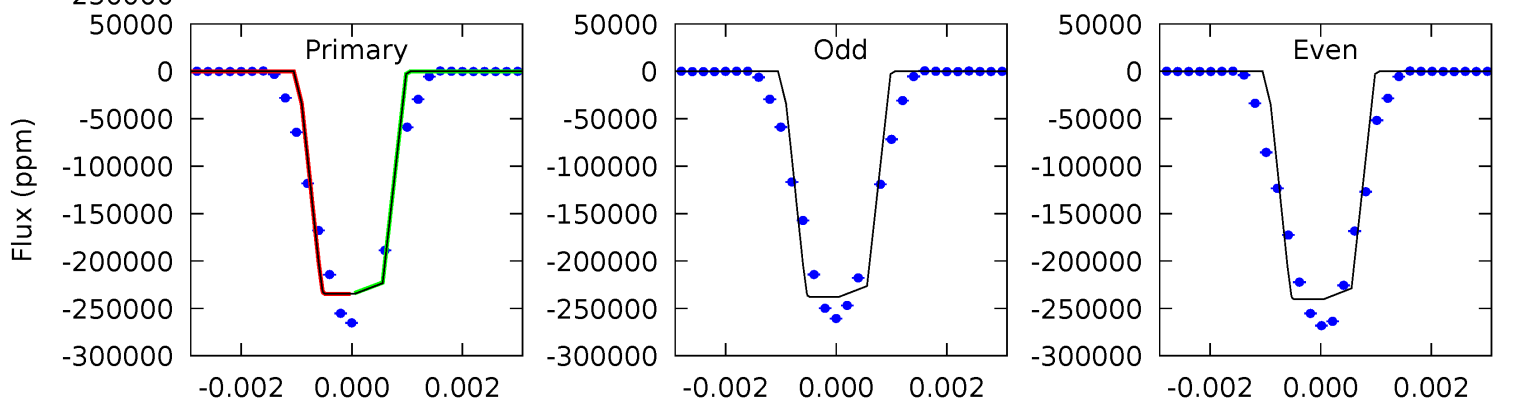
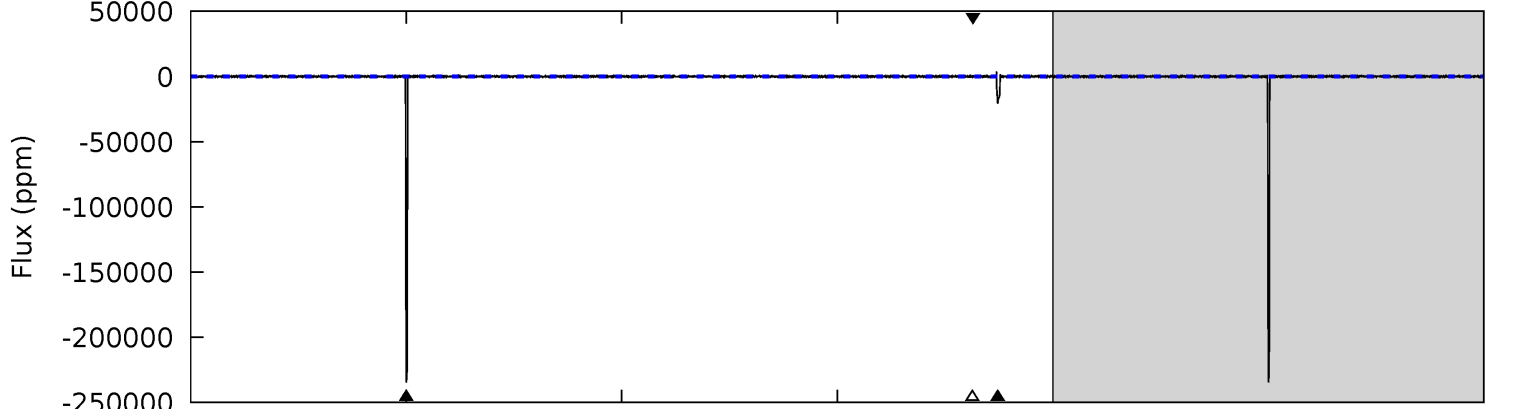
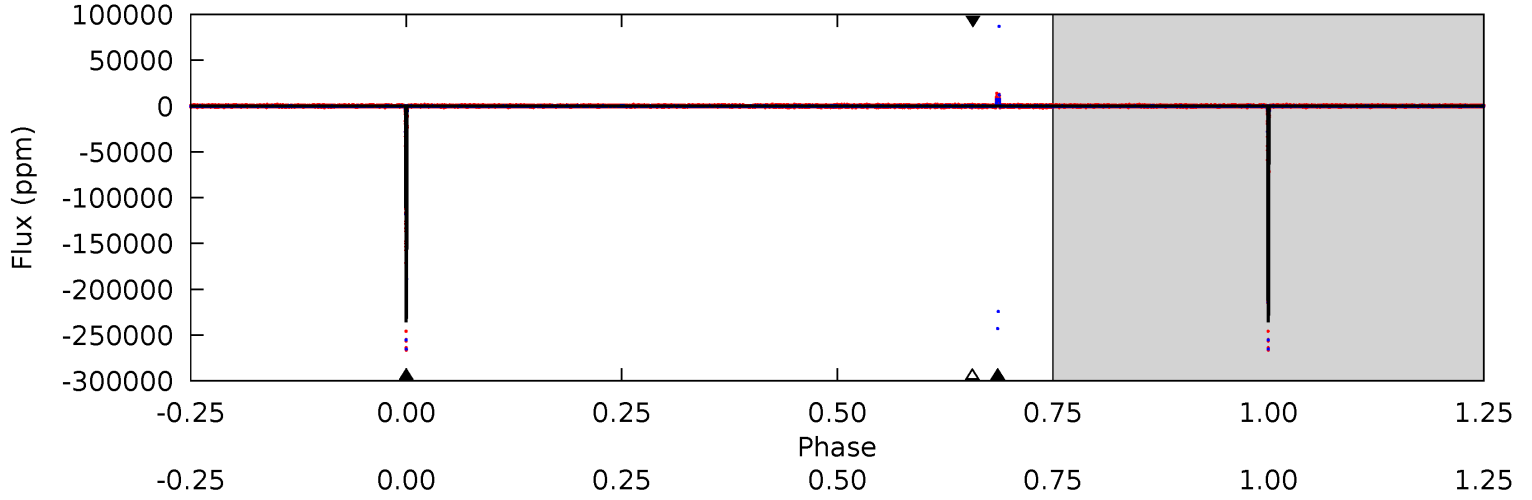
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

010748621-01, P = 286.178819 Days, E = 117.672828 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
2793	246.5	7.31	5.63	5.35	3.13	3.24	2786	2788	239.2	240.9	7.98	1.01	0.01	0



### Stellar Parameters For KIC 010748621

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5904^{+159}_{-195}$	$4.471^{+0.067}_{-0.202}$	$-0.160^{+0.300}_{-0.300}$	$0.946^{+0.287}_{-0.115}$	$0.966^{+0.120}_{-0.120}$	$1.606^{+0.550}_{-0.795}$
	+3%/-3%	+1%/-5%	+188%/-188%	+30%/-12%	+12%/-12%	+34%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 010748621-01 / KOI 3532.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$42.51^{+12.62}_{-11.65}$	$393^{+29}_{-20}$	$3162^{+2442}_{-8431}$	$1388^{+24027}_{-21634}$
Alt.	$-20703 \pm 84$	$54.51^{+12.46}_{-10.77}$	$393^{+28}_{-20}$	$3606^{+276}_{-219}$	$2706^{+1535}_{-877}$

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

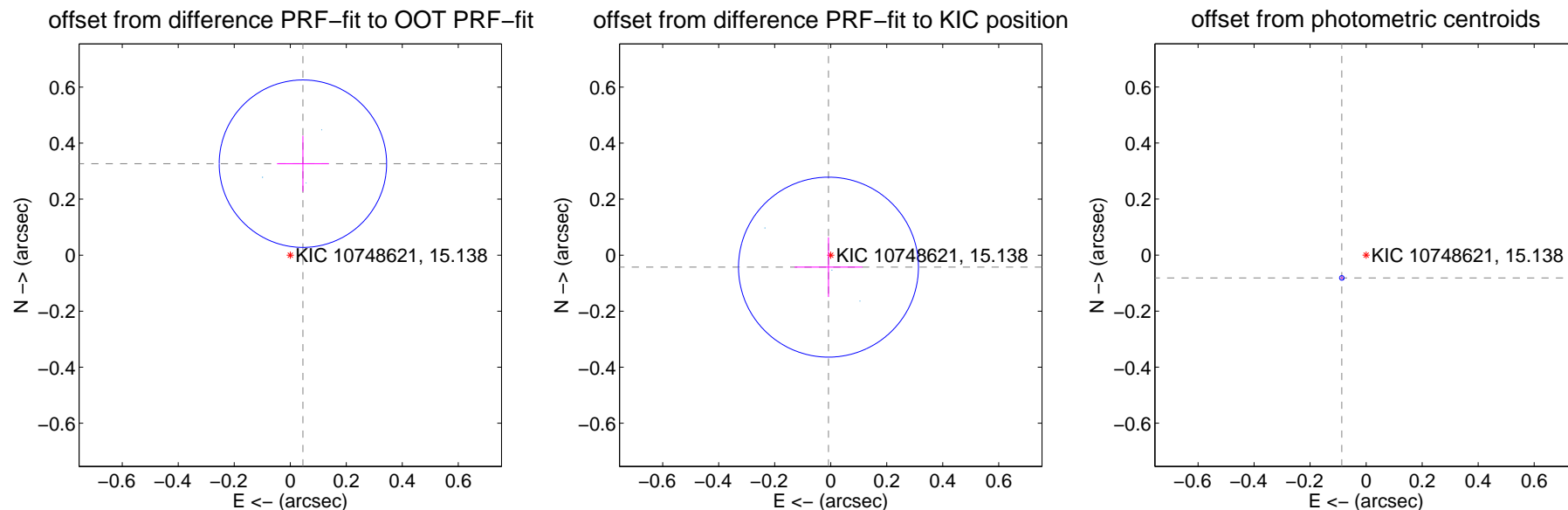
## DV Centroid Data

Supplemental centroid analysis for 010748621-01. Kepler magnitude: 15.14. Transit SNR -1.00

There are 3 quarters with good PRF difference image offsets

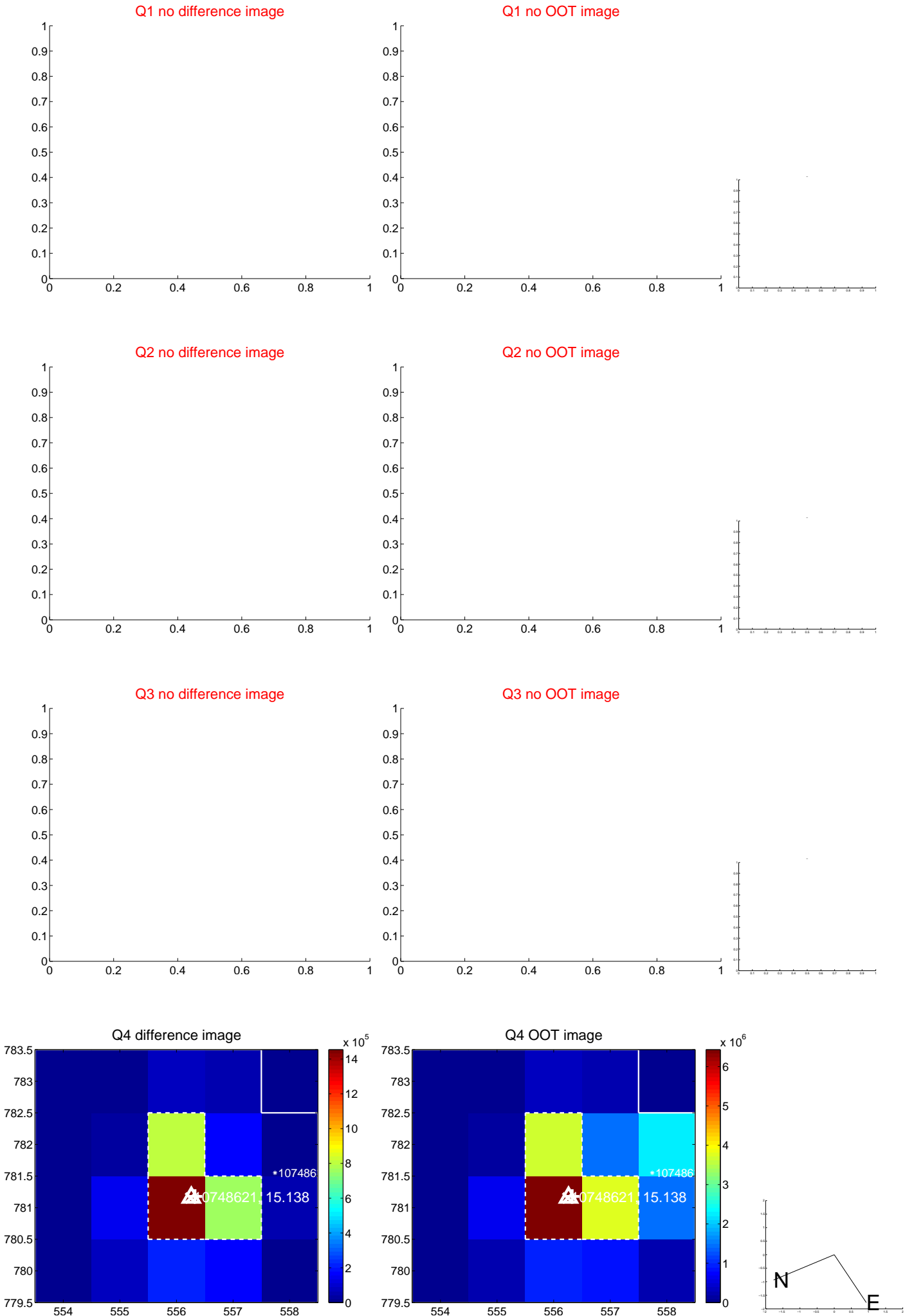
The direct PRF centroid is offset from the target star catalog position by about 0.61 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.330 \pm 0.100$	3.31	$-0.045 \pm 0.092$	$0.327 \pm 0.100$
PRF-fit source offset from KIC position	$0.044 \pm 0.107$	0.41	$0.008 \pm 0.121$	$-0.043 \pm 0.107$
photometric centroid source offset	$0.12 \pm 0.00$	44.01	$0.09 \pm 0.00$	$-0.08 \pm 0.00$



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

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



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



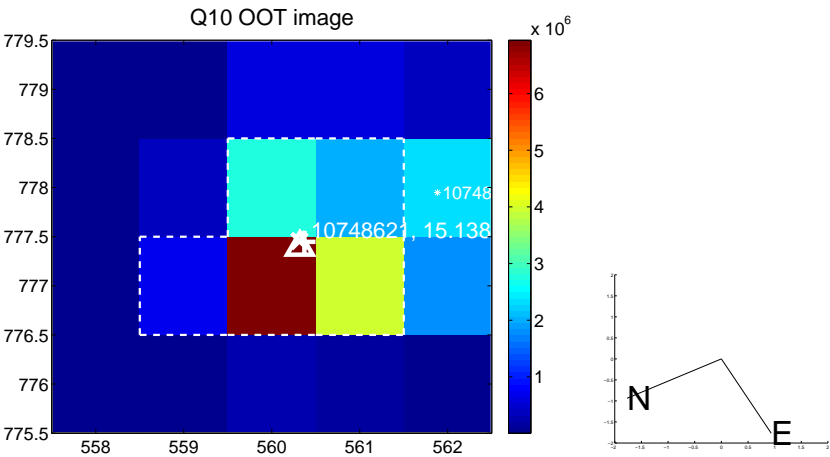
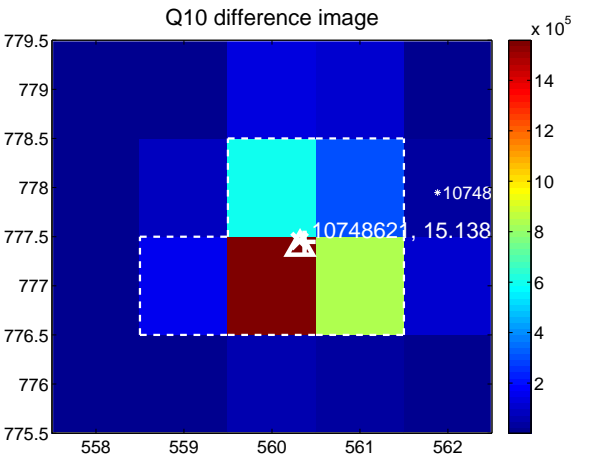


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

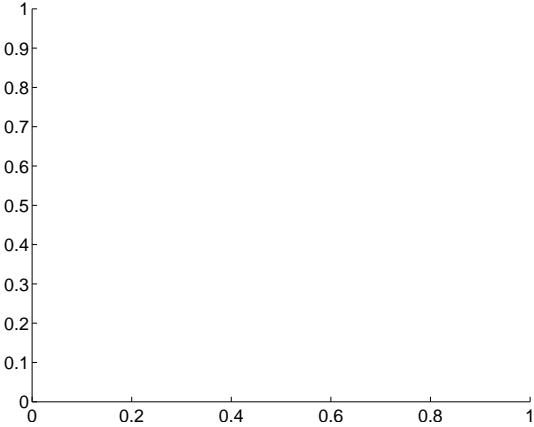
Q9 no difference image



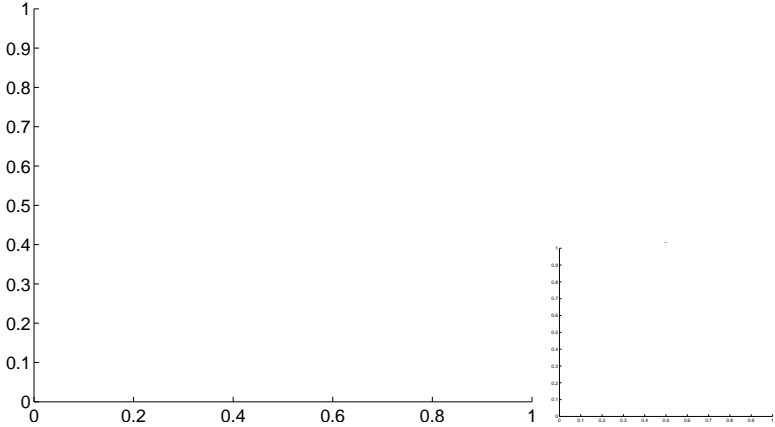
Q9 no OOT image



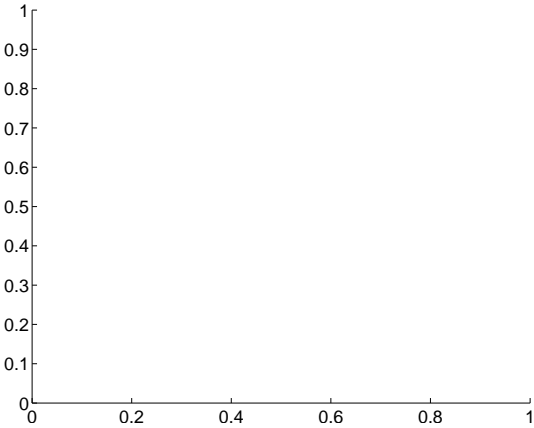
Q11 no difference image



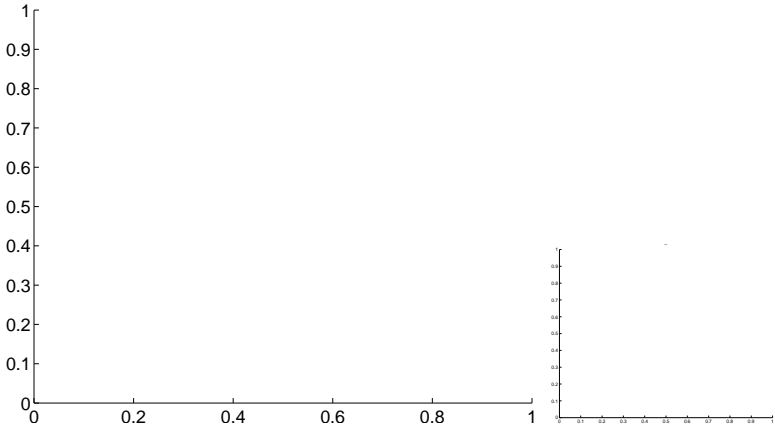
Q11 no OOT image



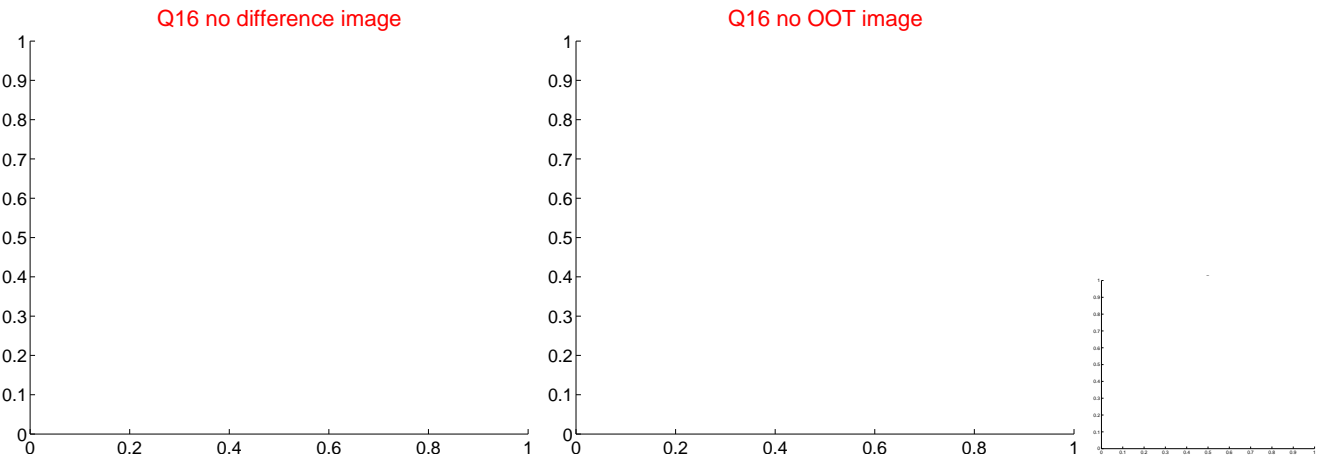
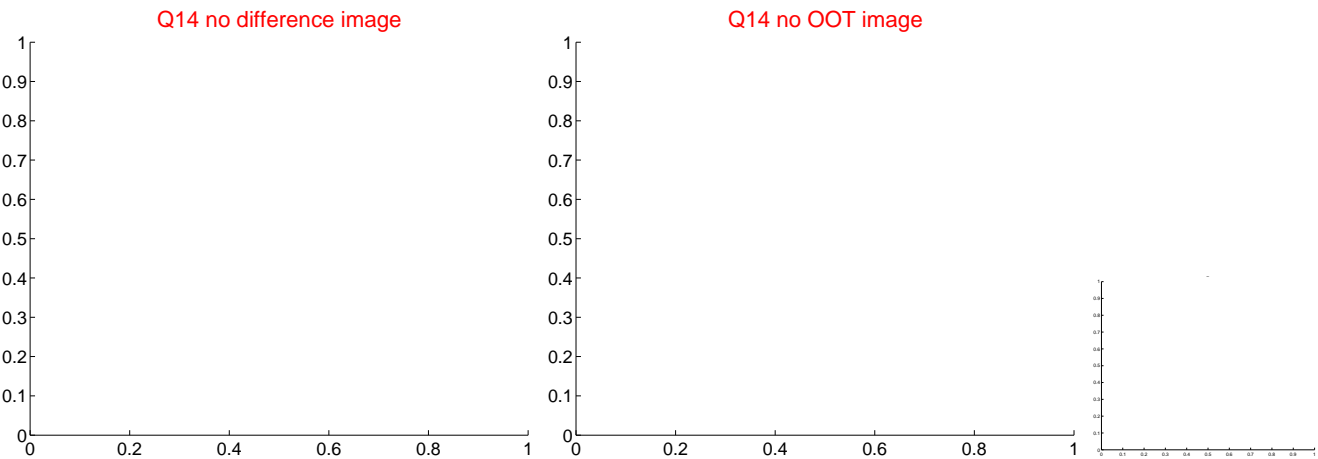
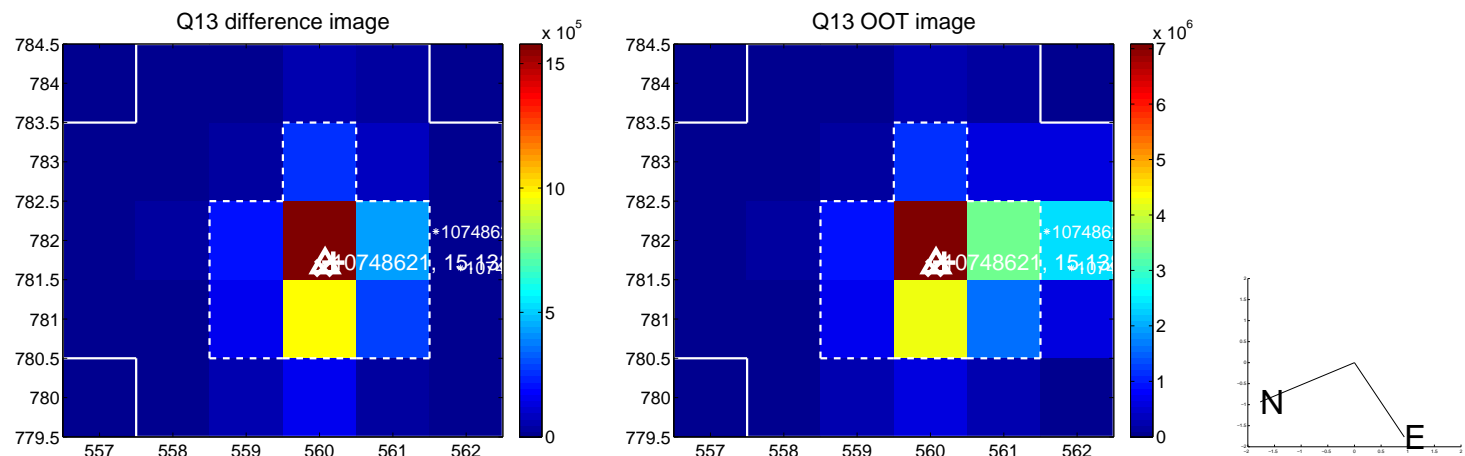
Q12 no difference image



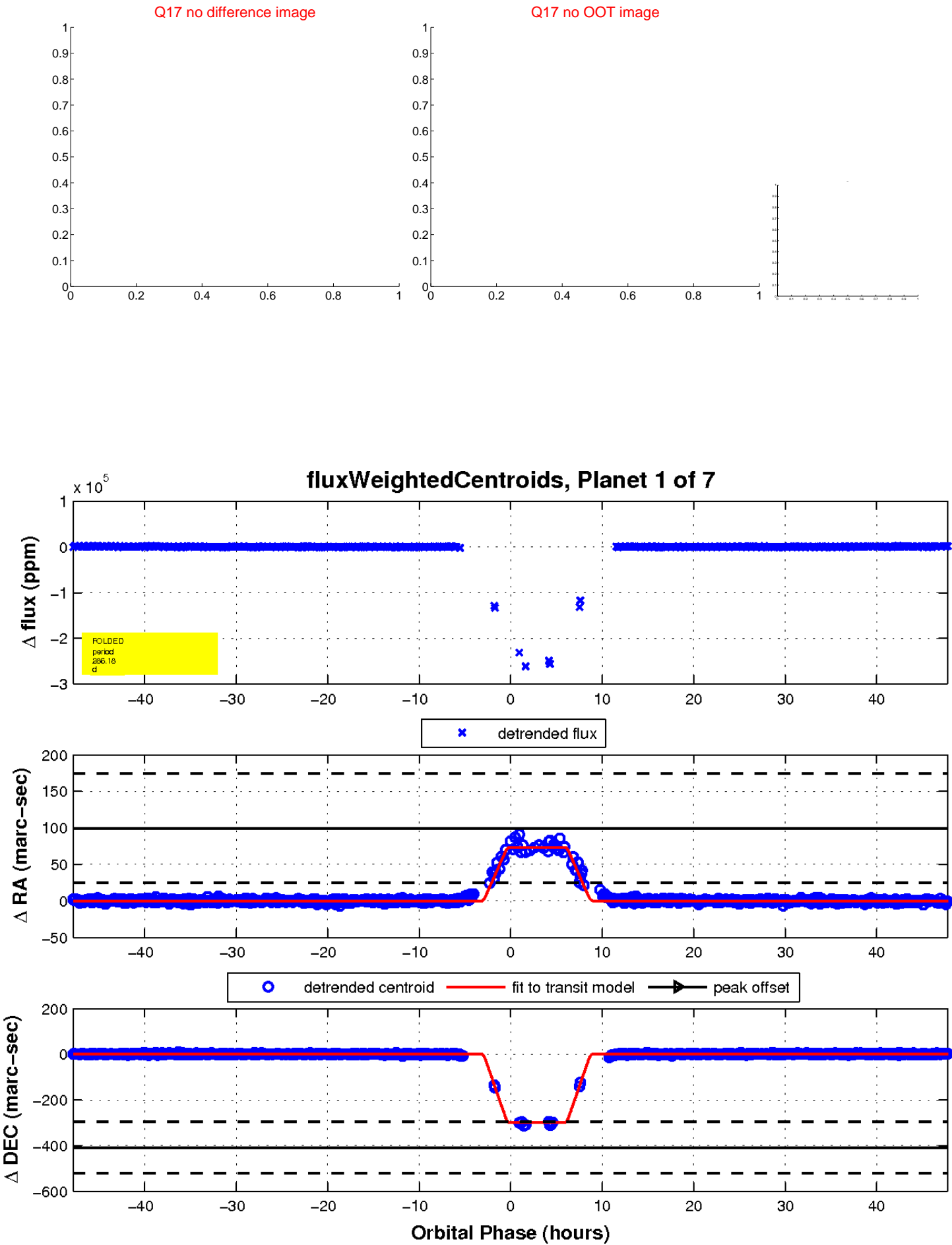
Q12 no OOT image



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

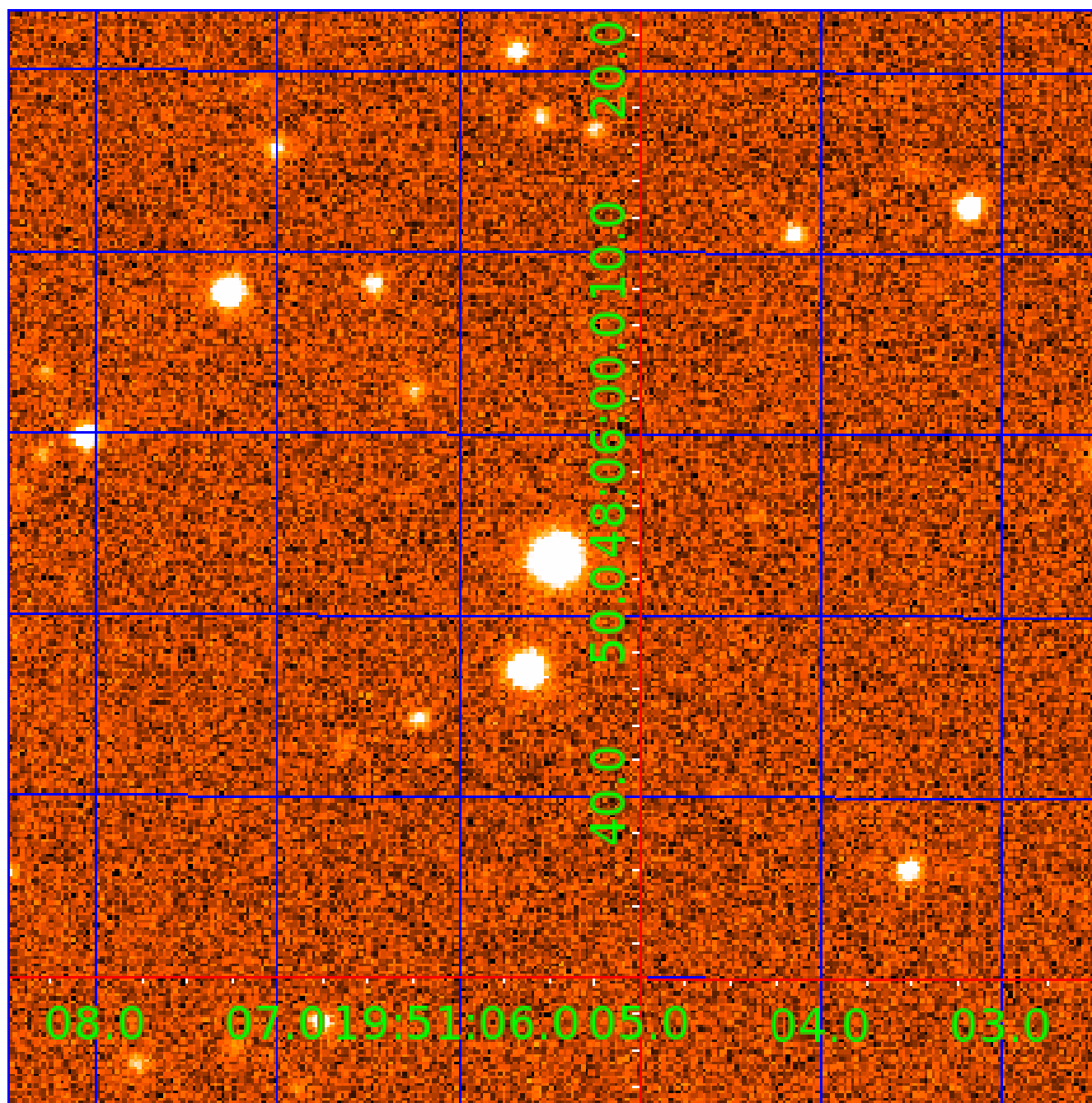


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010748621

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010748621-01	OBS	3532.01	286.178819	403.846076	275291.8	12.000	2970.0	-1.0	0.95	5904	40.97	1.38
010748621-02	OBS	No	286.172008	314.108692	336824.7	9.000	2456.1	-1.0	0.95	5904	42.65	1.38
010748621-03	OBS	No	412.527237	312.955679	1616.2	19.119	43.1	13.1	0.95	5904	6.20	0.85
010748621-04	OBS	No	375.775145	226.810165	1747.2	54.868	45.1	24.4	0.95	5904	7.50	0.96
010748621-05	OBS	No	369.557817	435.610411	1250.7	48.010	15.4	10.6	0.95	5904	6.42	0.98
010748621-06	OBS	No	427.123172	406.002780	2454.7	30.547	15.5	13.1	0.95	5904	6.95	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010748621-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010748621-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS
010748621-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-06	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

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

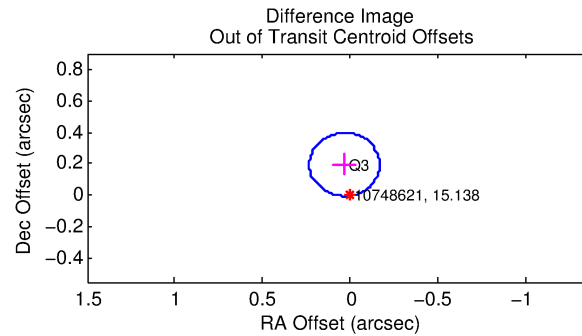
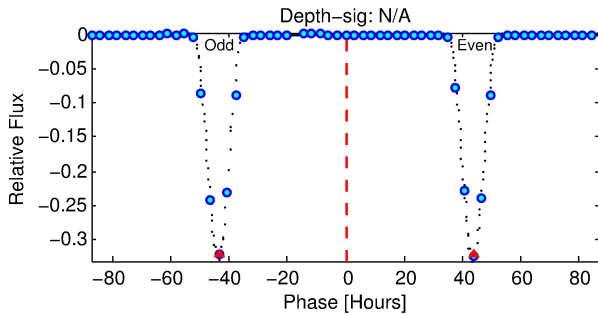
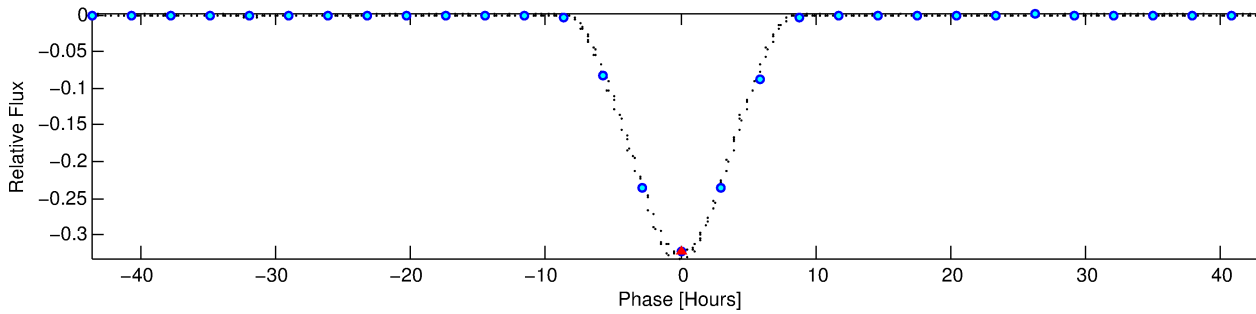
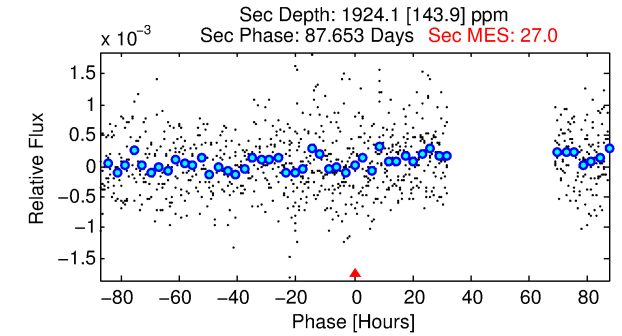
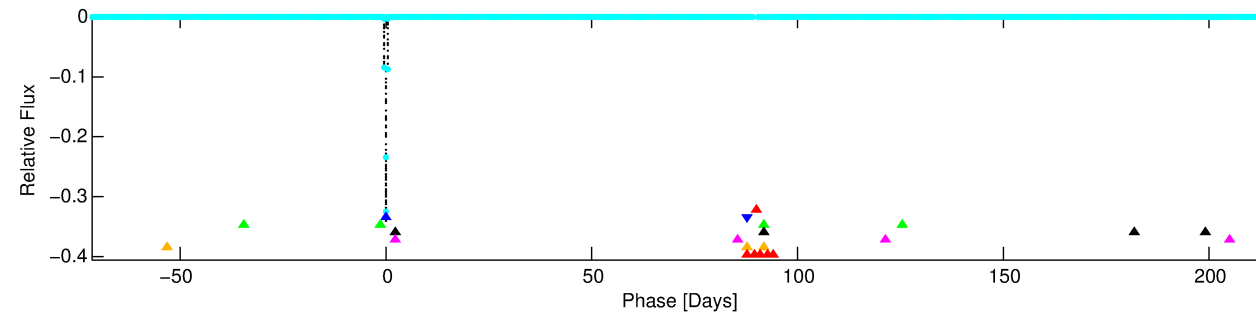
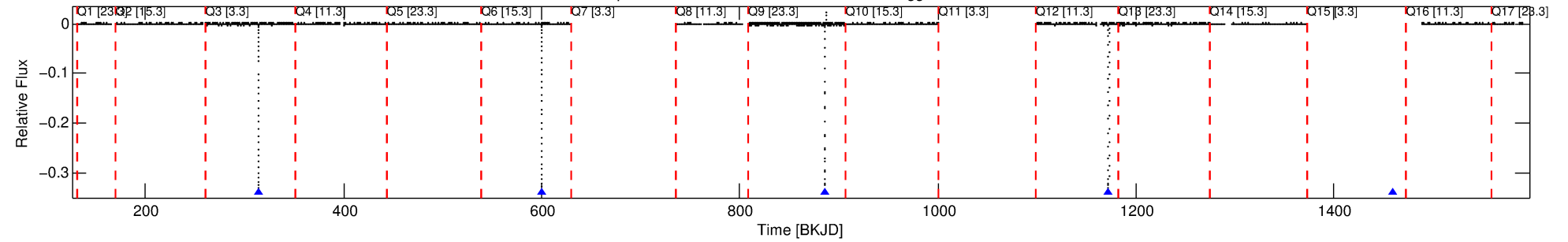
## Ephemeris Match Information For 010748621-02

No Significant Match Found

# DV One-Page Summary

KIC: 10748621 Candidate: 2 of 7 Period: 286.172 d  
KOI: K03532 Corr: No Ephemeris Match

Kp: 15.14 R\*: 0.95 Rs Teff: 5904.0 K Logg: 4.47 Fe/H: -0.160



## TPS TCE Results:

Period = 286.17201 d  
Epoch = 314.1087 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.9% [0.01σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 2.227

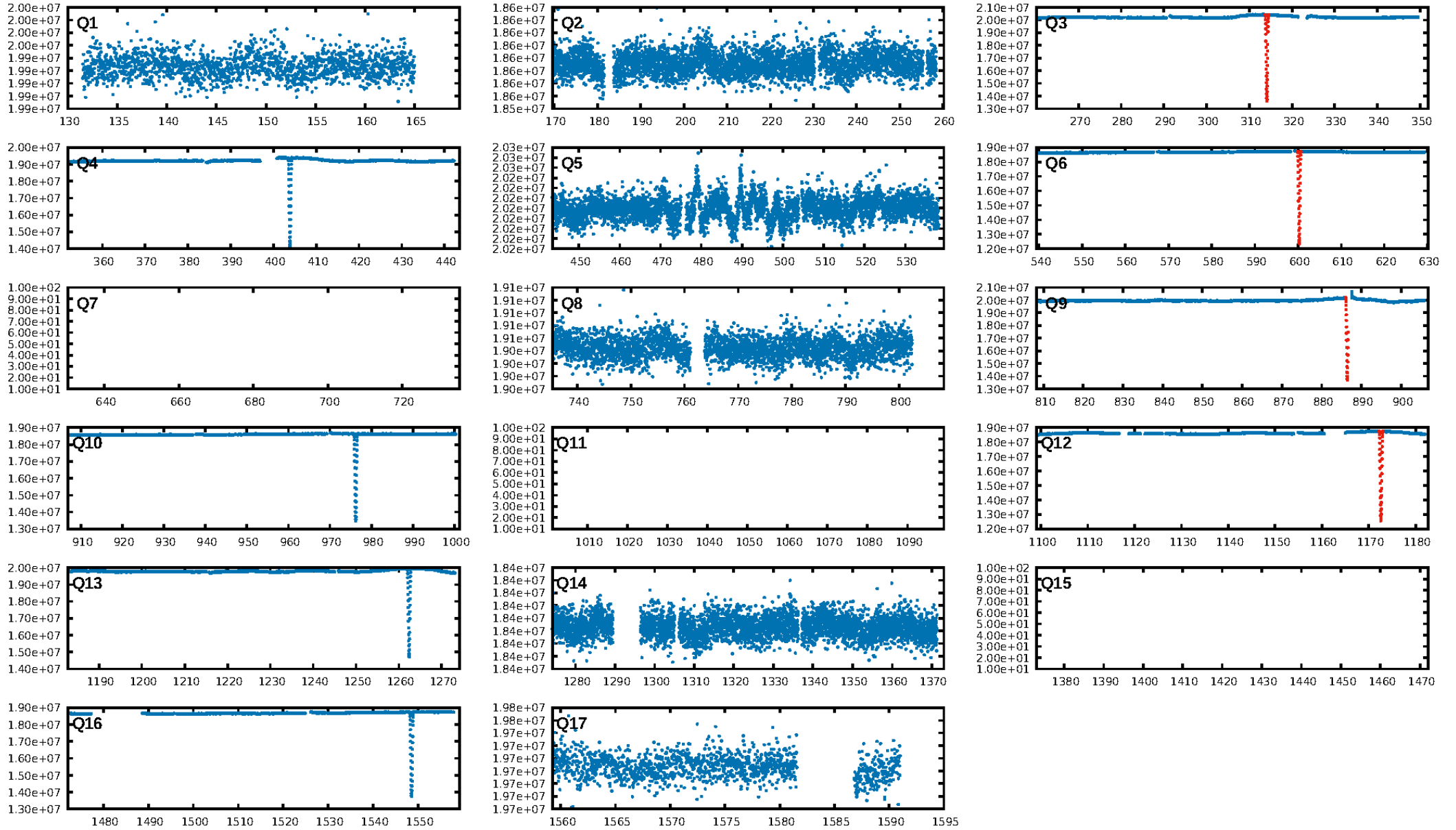
Centroid-sig: 0.0%  
Centroid-so: 0.206 arcsec [78.32σ]  
OotOffset-rm: 0.198 arcsec [2.97σ]  
KicOffset-rm: 0.175 arcsec [2.62σ]  
OotOffset-st: 0/1/0/0 [1]  
KicOffset-st: 0/1/0/0 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 0.00 [0/1]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:47:47 Z

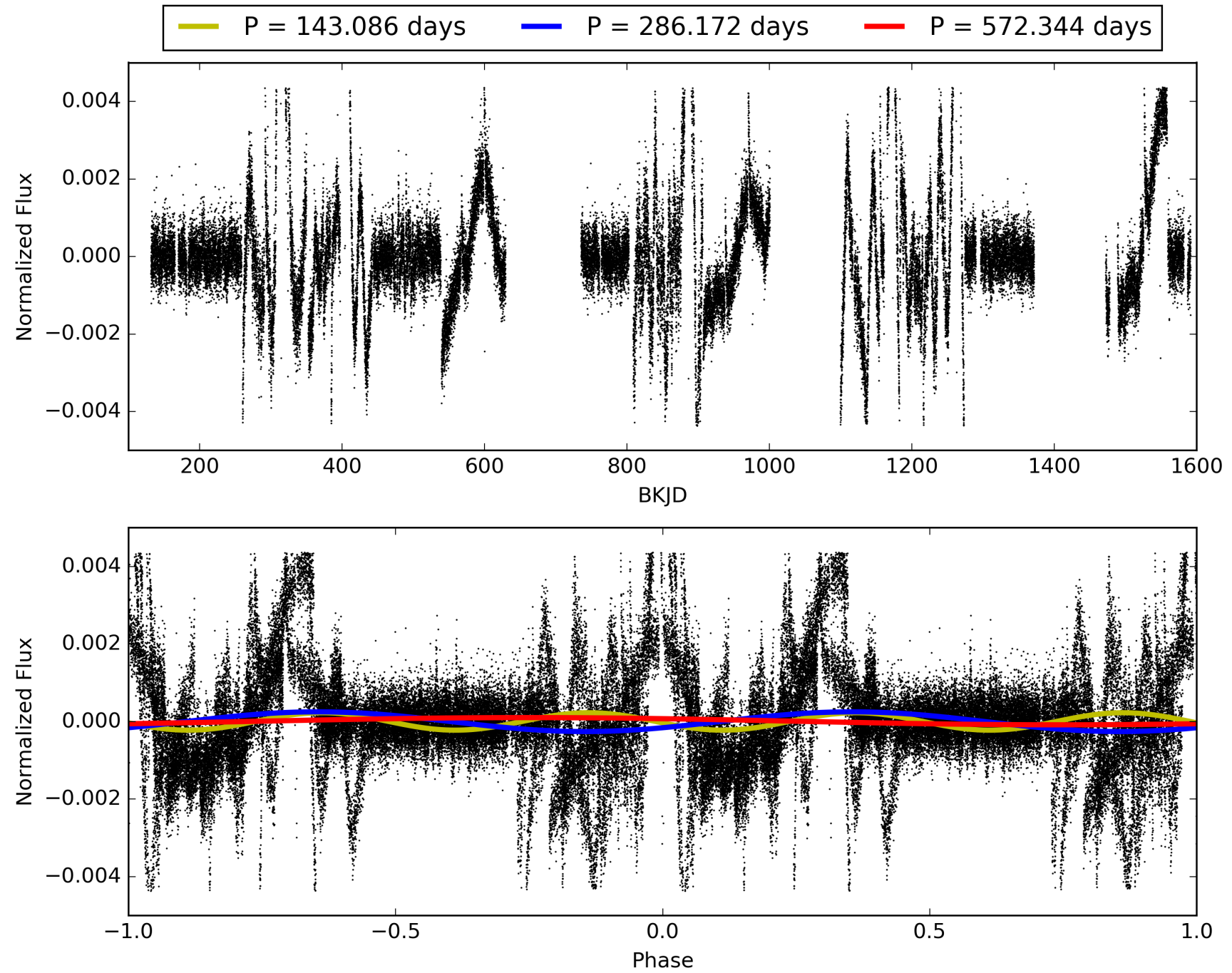
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 010748621-02, PDC Light Curves

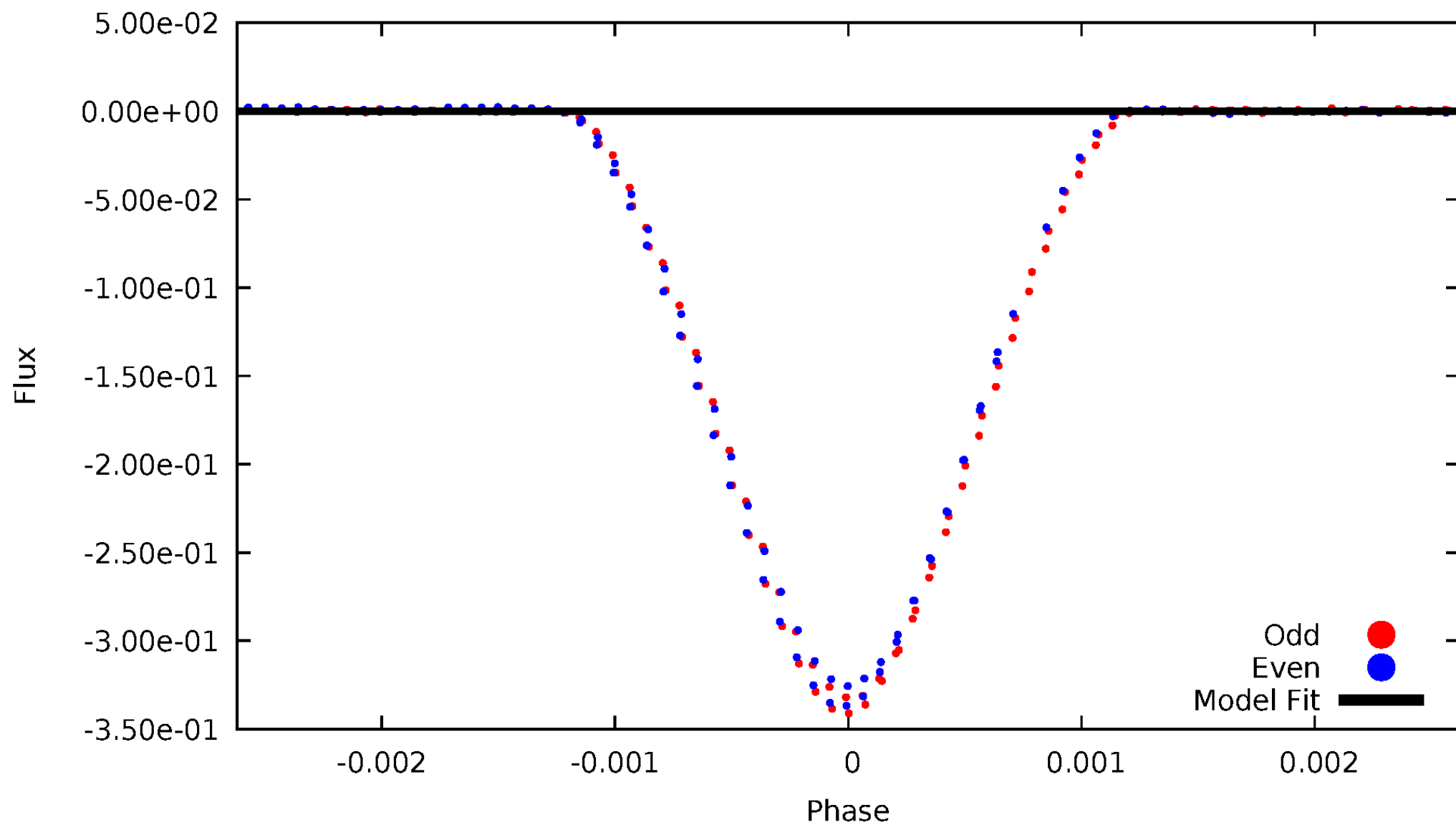


TCE 010748621-02



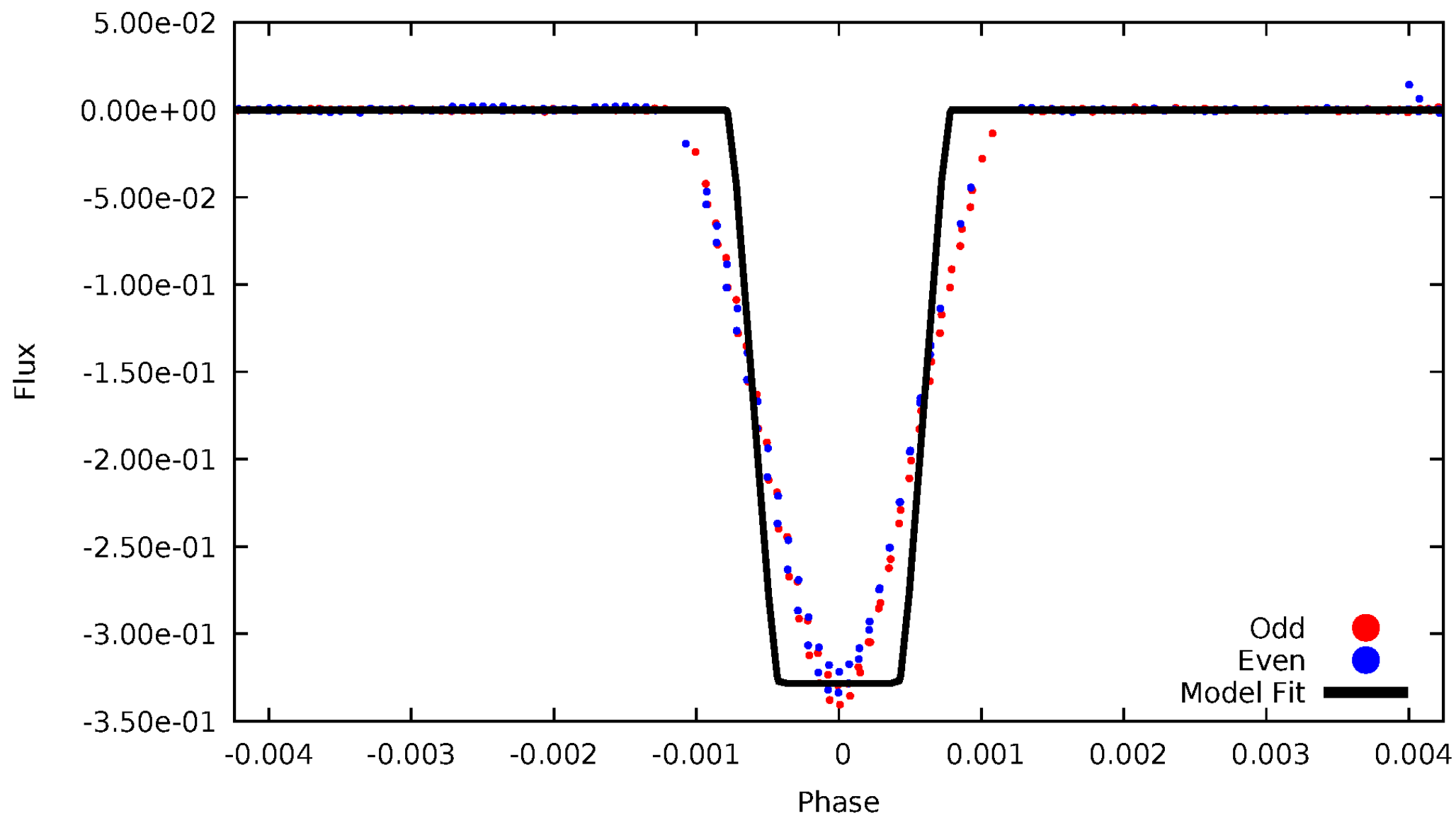
# DV Odd/Even

TCE 010748621-02



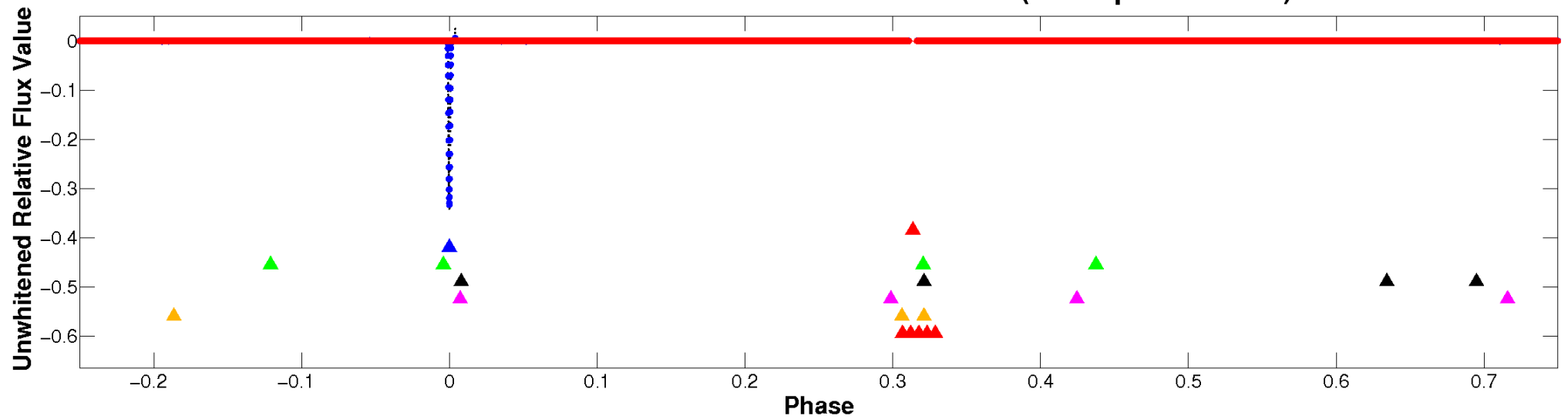
# ALT Odd/Even

TCE 010748621-02

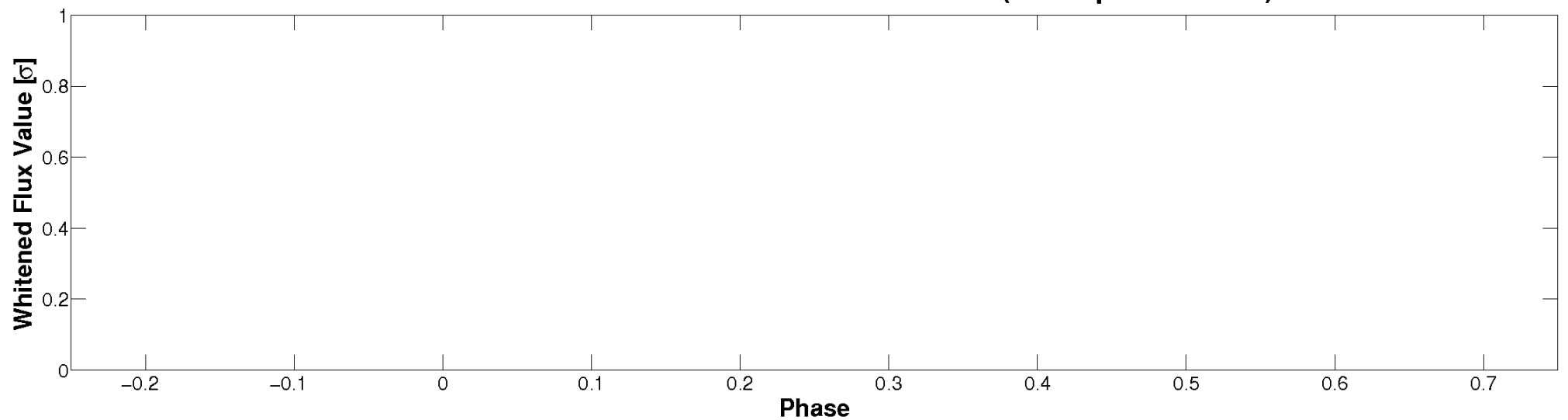


# Non-Whitened Vs. Whitened Light Curve

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

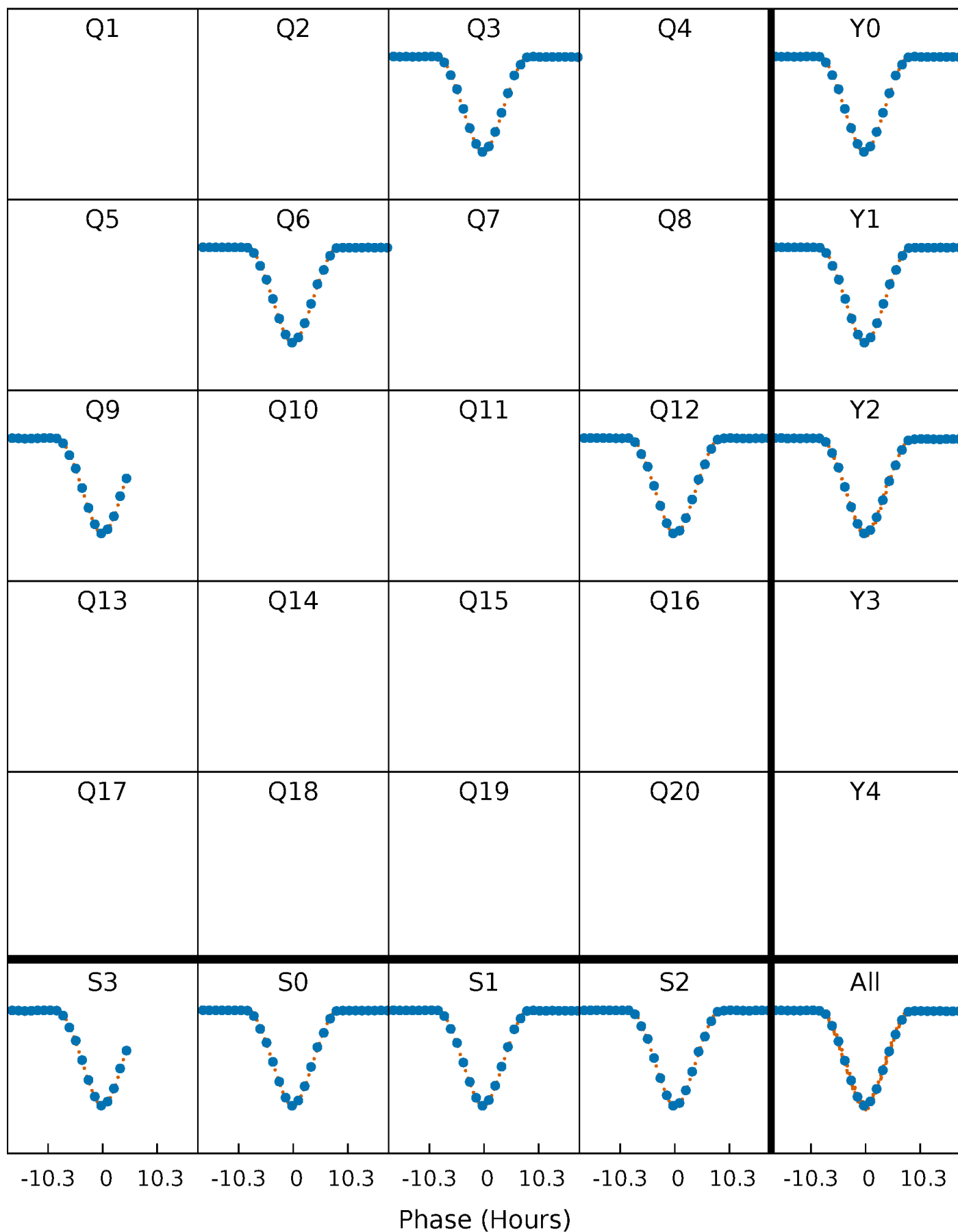


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

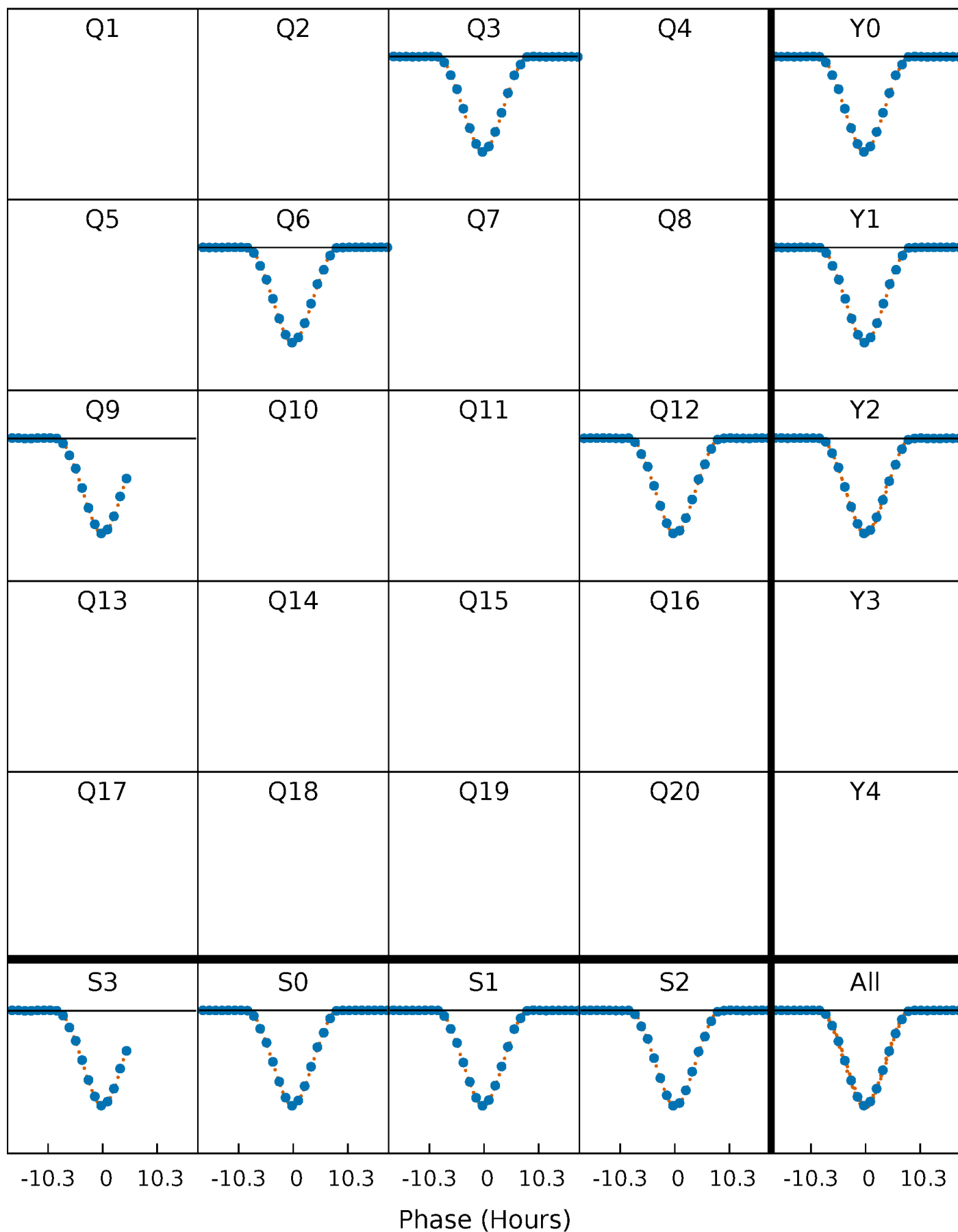
TCE 010748621-02 P=286.172008 Days  $T_0=314.108692$  (BKJD)





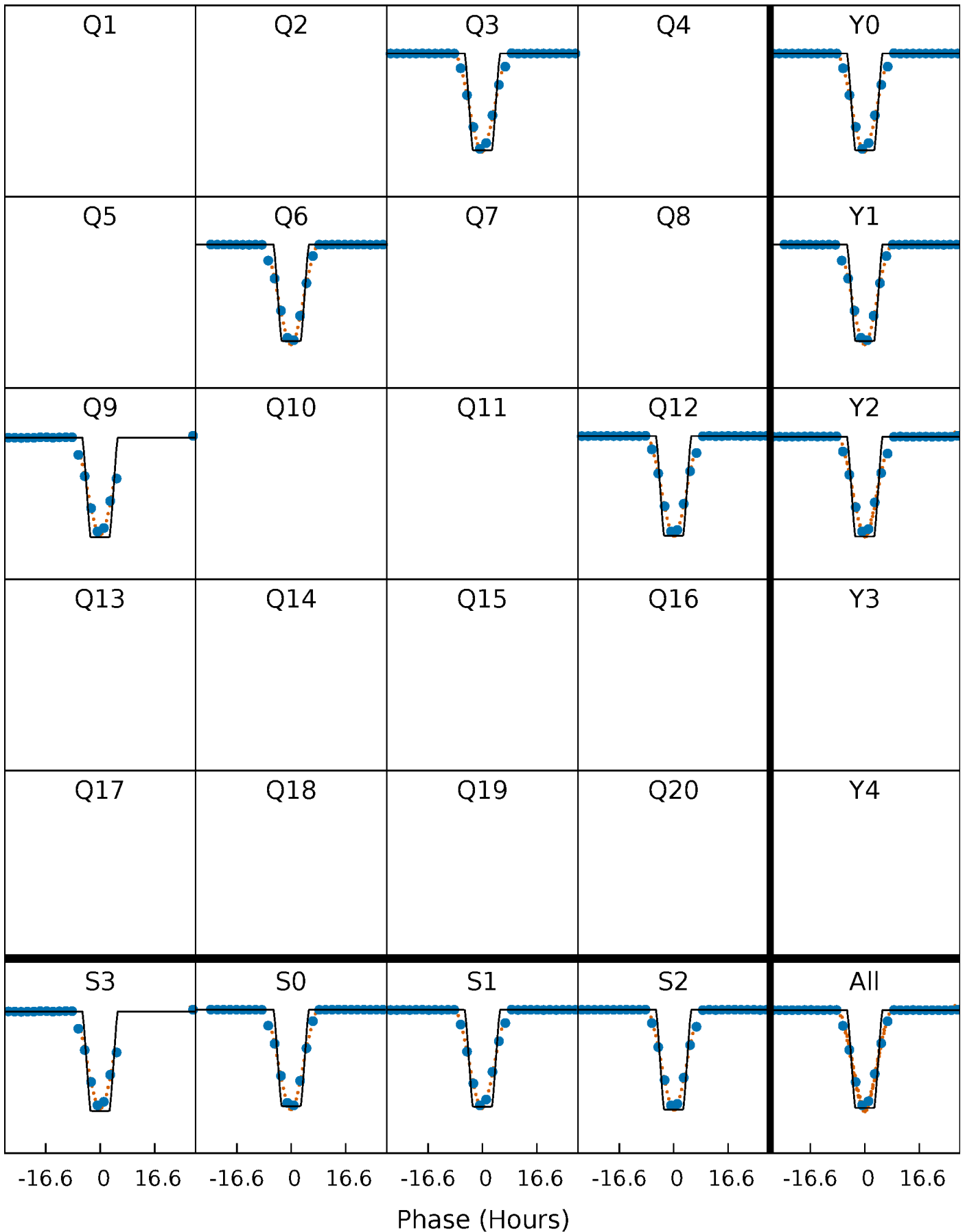
# DV Quarter-Phased Transit Curves

TCE 010748621-02     $P=286.172008$  Days     $T_0=314.108692$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

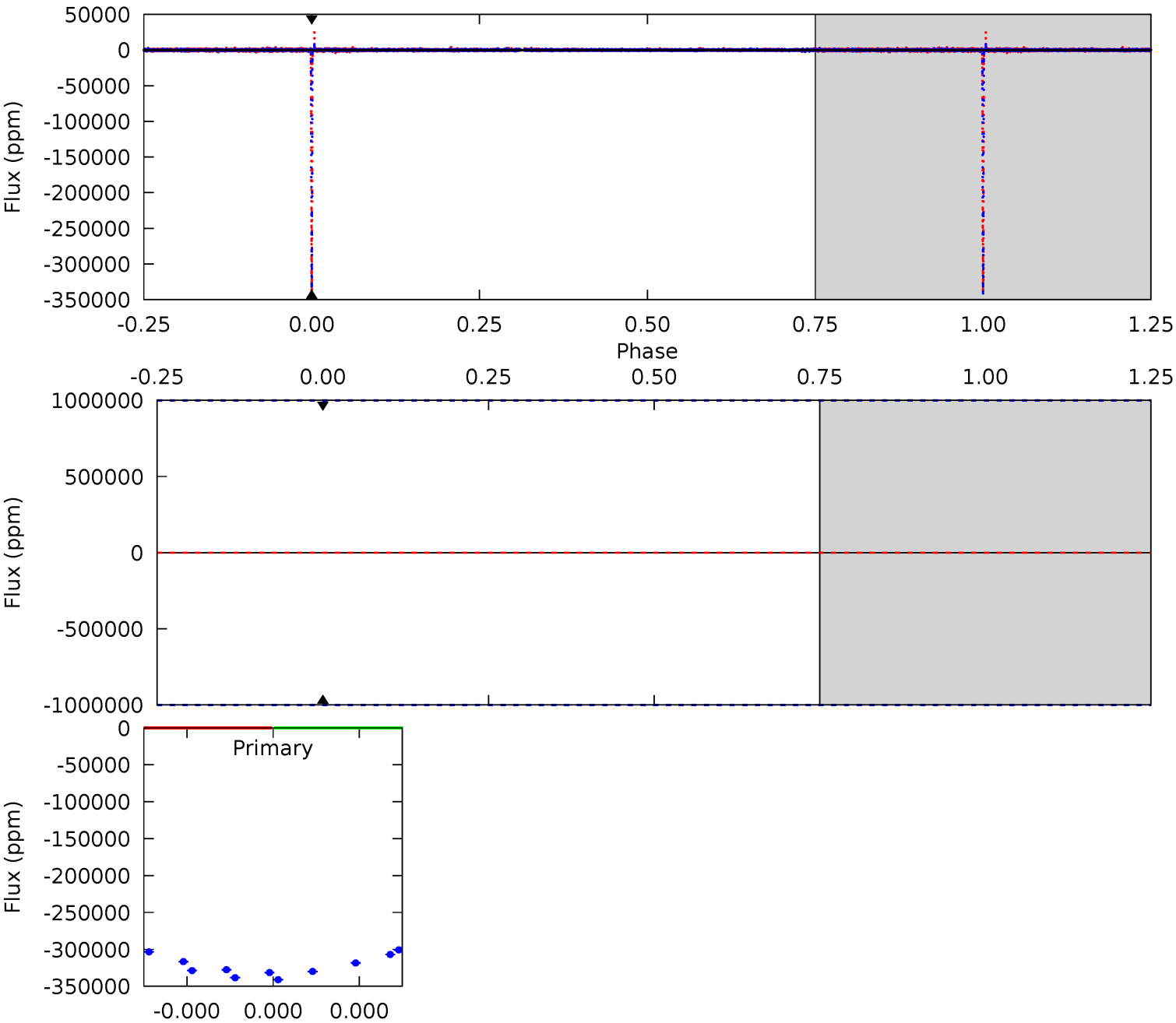
TCE 010748621-02 P=286.172008 Days  $T_0=314.107300$  (BKJD)



# DV Model-Shift Uniqueness Test

010748621-02, P = 286.172008 Days, E = 27.936684 Days

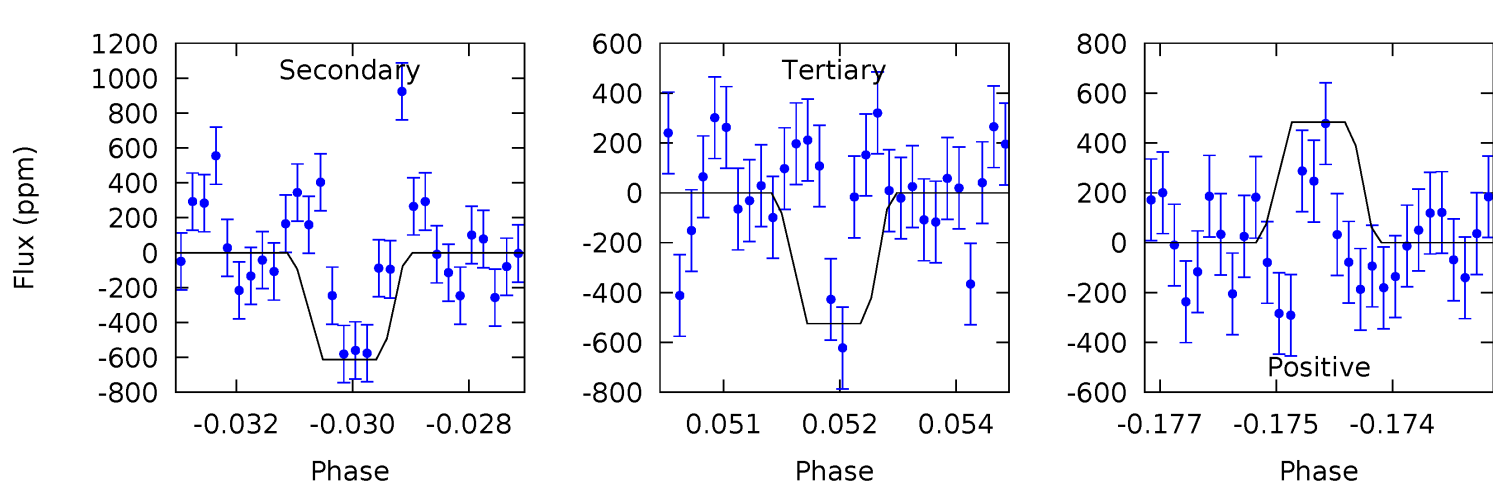
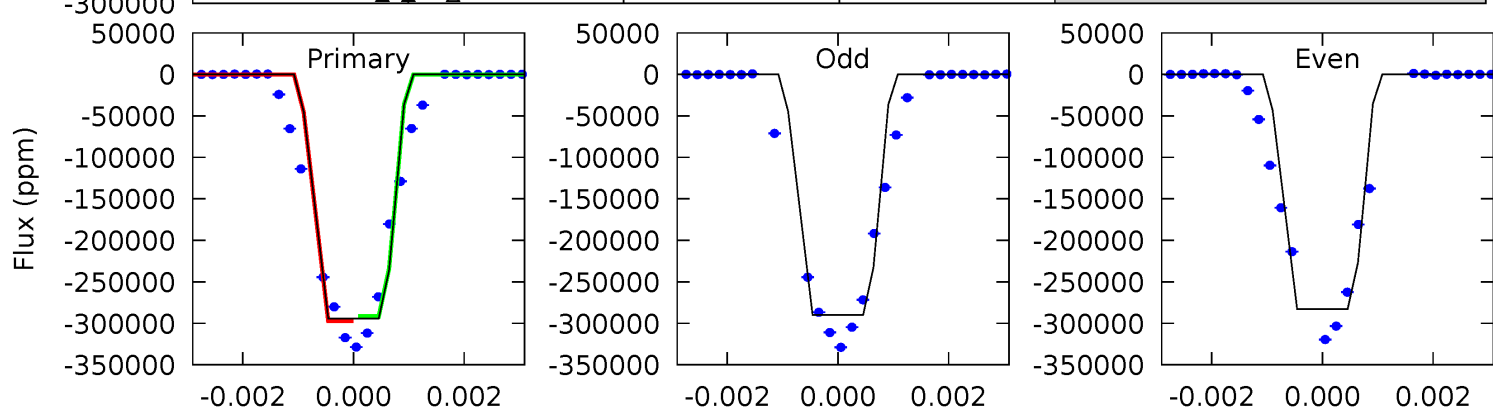
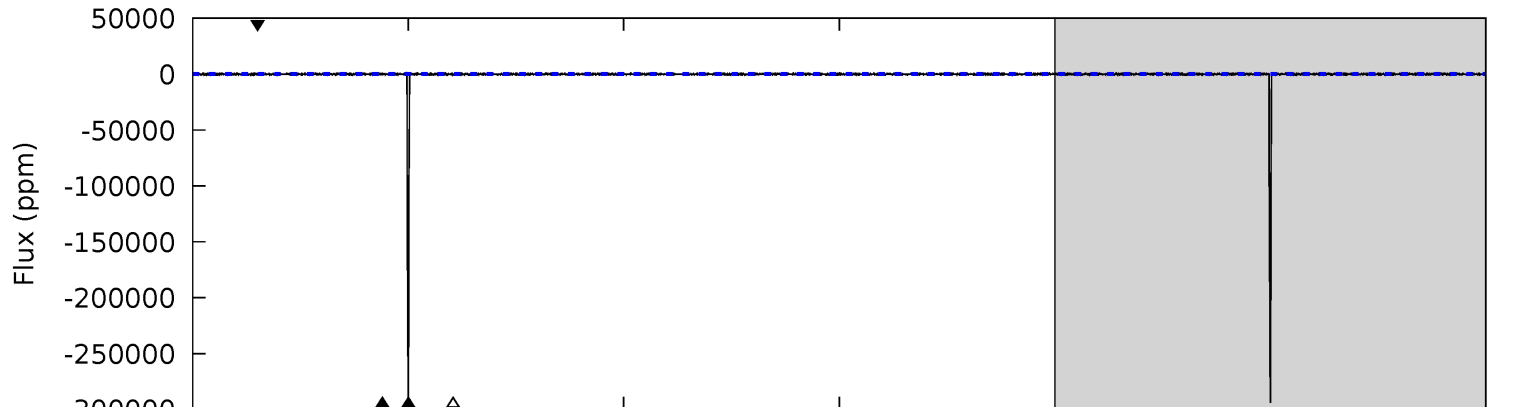
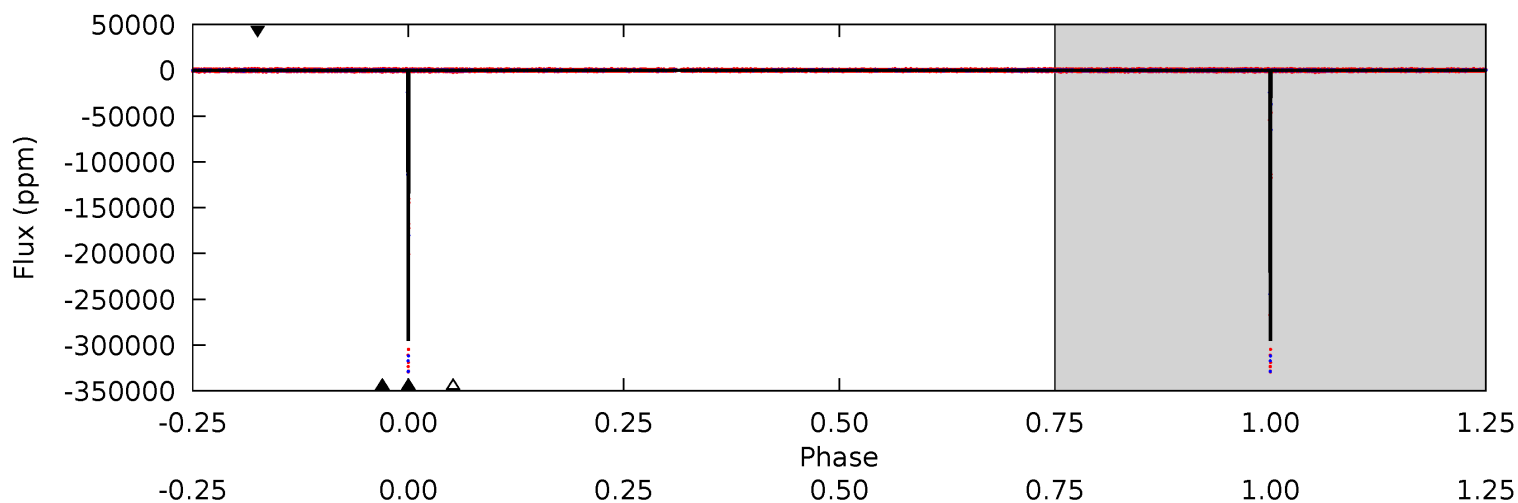
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

010748621-02, P = 286.172008 Days, E = 27.935292 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
3169	6.61	5.66	5.21	5.37	3.16	1.25	3163	3164	0.96	1.41	56.7	1.00	0.00	28.8



### Stellar Parameters For KIC 010748621

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5904^{+159}_{-195}$	$4.471^{+0.067}_{-0.202}$	$-0.160^{+0.300}_{-0.300}$	$0.946^{+0.287}_{-0.115}$	$0.966^{+0.120}_{-0.120}$	$1.606^{+0.550}_{-0.795}$
	+3%/-3%	+1%/-5%	+188%/-188%	+30%/-12%	+12%/-12%	+34%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 010748621-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$45.14^{+11.16}_{-12.12}$	$392^{+29}_{-20}$	$-2706^{+8068}_{-2549}$	$-370.485^{+21458.788}_{-20370.816}$
Alt.	$-614 \pm 93$	$62.34^{+13.37}_{-12.45}$	$392^{+27}_{-20}$	$2172^{+114}_{-84}$	$60^{+35}_{-19}$

$T_{\text{max}}$  = 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

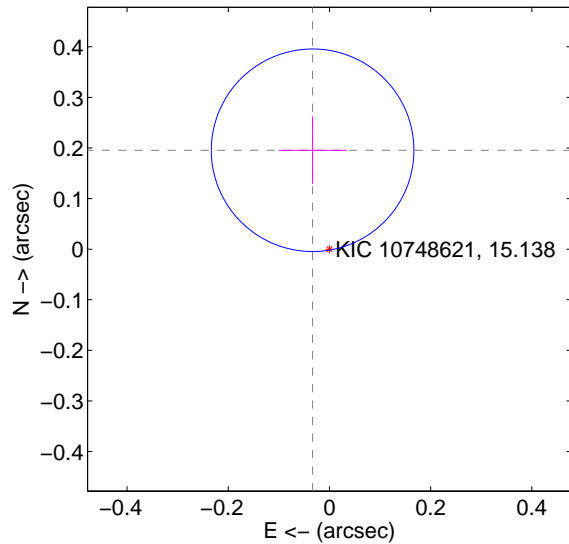
Supplemental centroid analysis for 010748621-02. Kepler magnitude: 15.14. Transit SNR -1.00

There are 1 quarters with good PRF difference image offsets

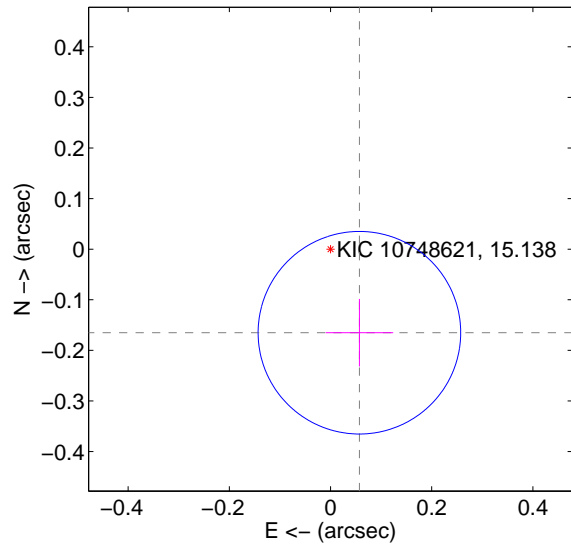
The direct PRF centroid is offset from the target star catalog position by about 0.37 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.198 \pm 0.067$	2.97	$0.033 \pm 0.067$	$0.195 \pm 0.067$
PRF-fit source offset from KIC position	$0.175 \pm 0.067$	2.62	$-0.057 \pm 0.067$	$-0.165 \pm 0.067$
photometric centroid source offset	$0.21 \pm 0.00$	78.32	$0.08 \pm 0.00$	$-0.19 \pm 0.00$

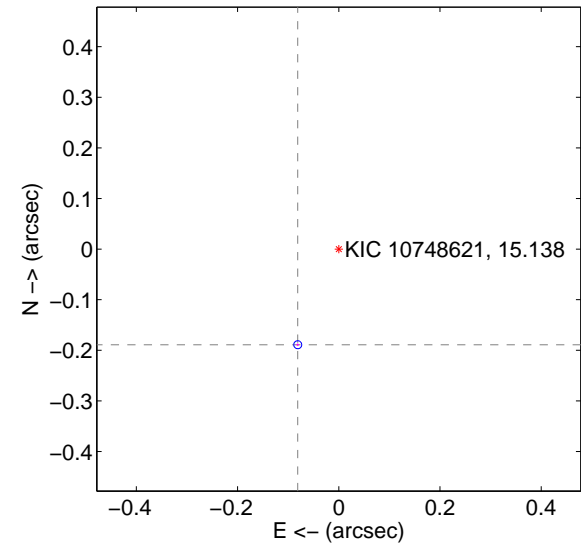
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

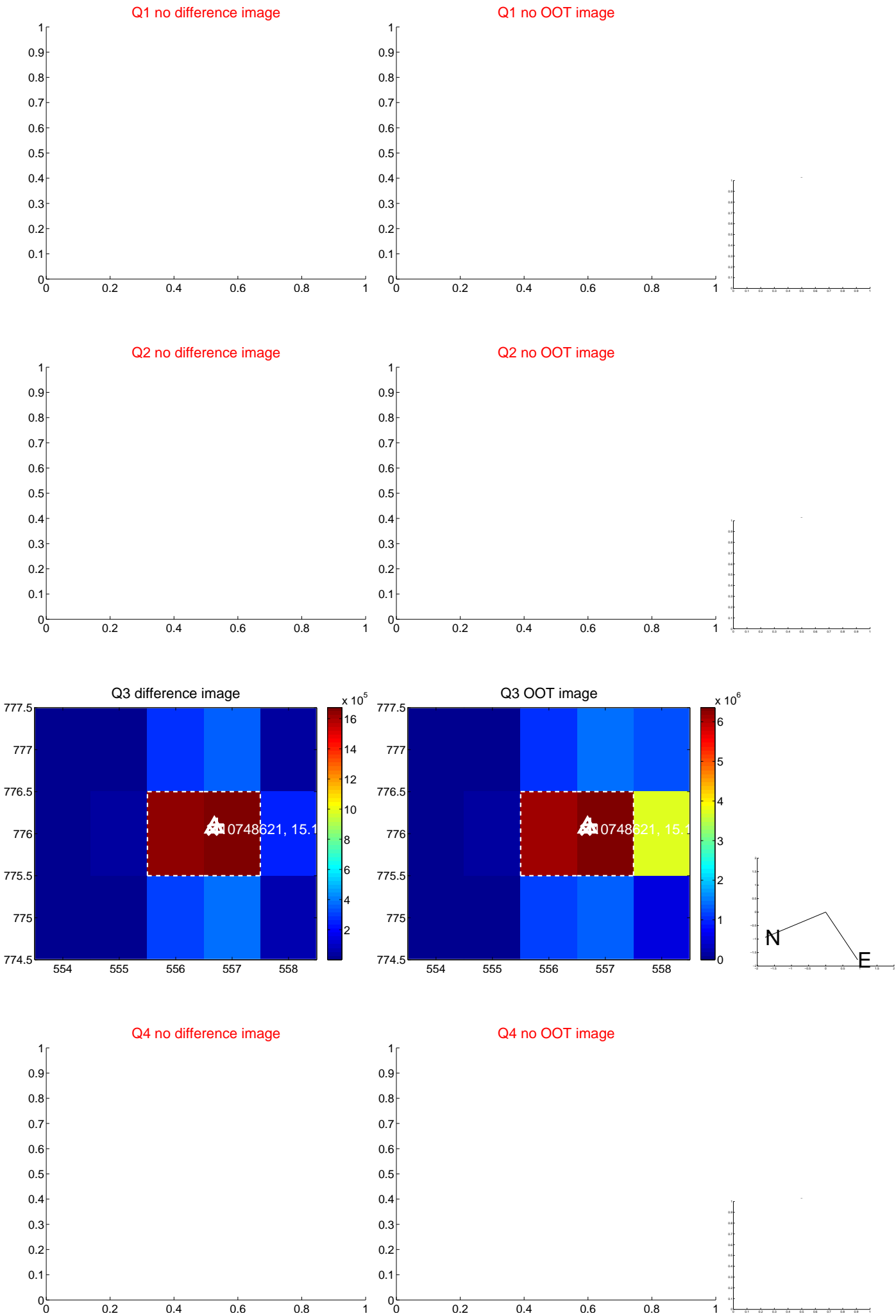


offset from photometric centroids



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.





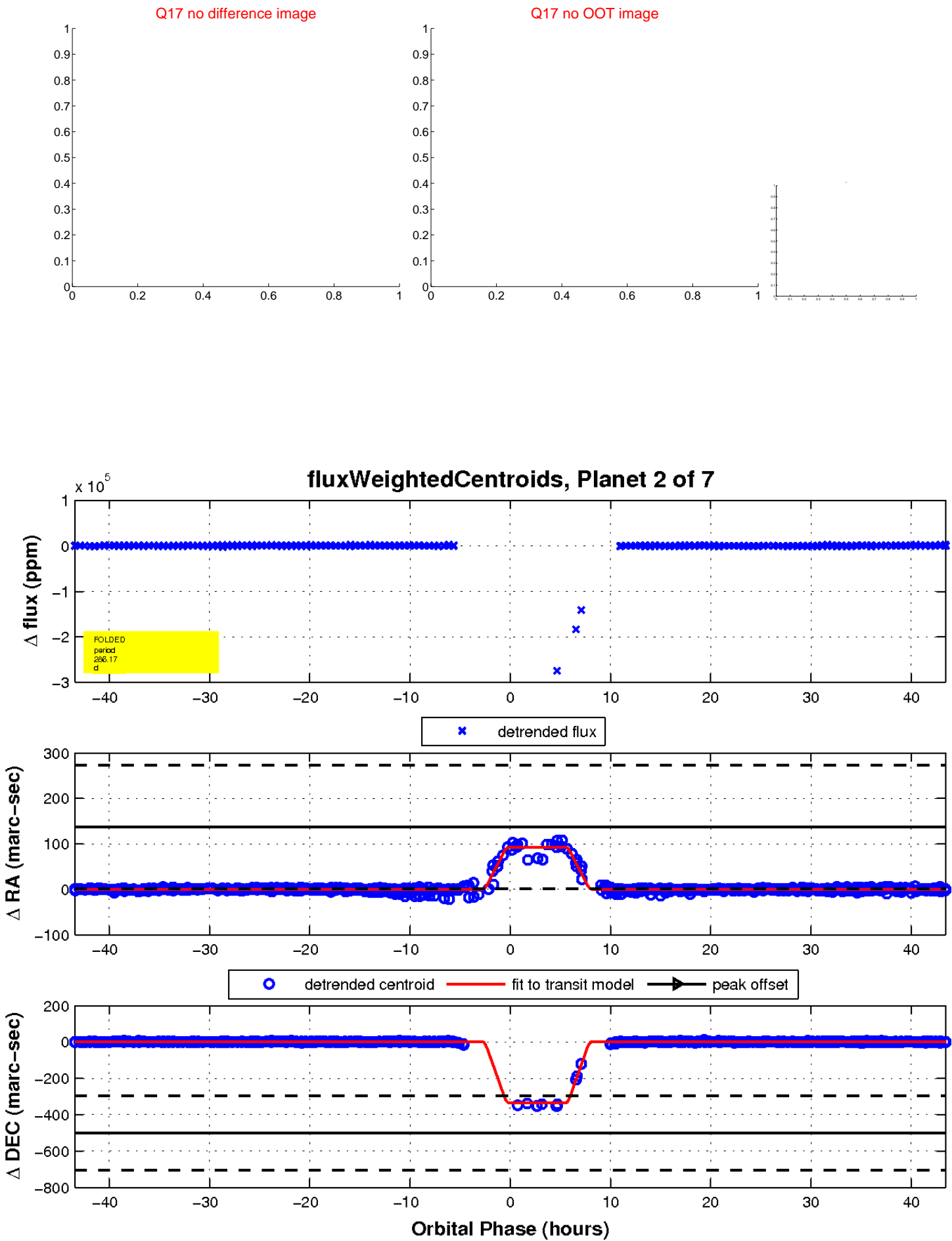
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

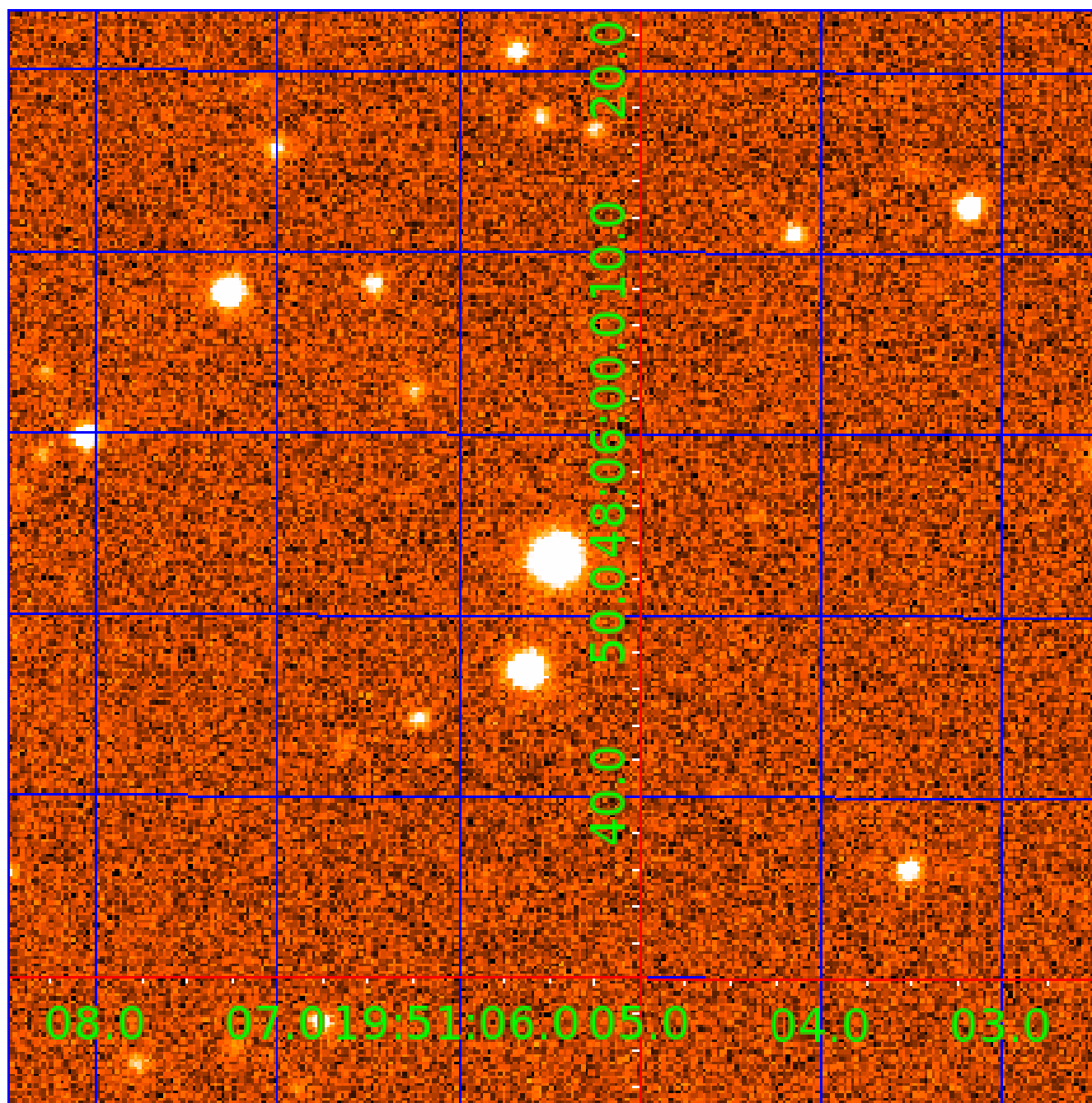


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010748621

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010748621-01	OBS	3532.01	286.178819	403.846076	275291.8	12.000	2970.0	-1.0	0.95	5904	40.97	1.38
010748621-02	OBS	No	286.172008	314.108692	336824.7	9.000	2456.1	-1.0	0.95	5904	42.65	1.38
010748621-03	OBS	No	412.527237	312.955679	1616.2	19.119	43.1	13.1	0.95	5904	6.20	0.85
010748621-04	OBS	No	375.775145	226.810165	1747.2	54.868	45.1	24.4	0.95	5904	7.50	0.96
010748621-05	OBS	No	369.557817	435.610411	1250.7	48.010	15.4	10.6	0.95	5904	6.42	0.98
010748621-06	OBS	No	427.123172	406.002780	2454.7	30.547	15.5	13.1	0.95	5904	6.95	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010748621-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010748621-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS
010748621-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-06	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

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

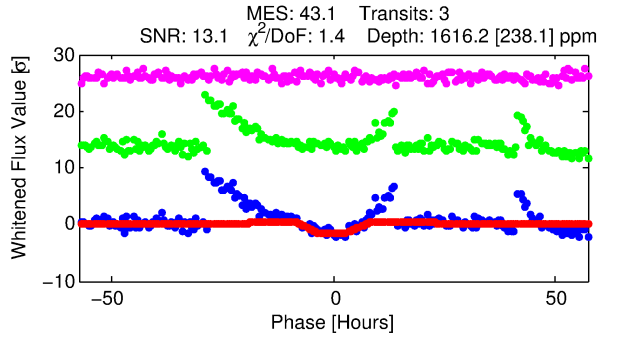
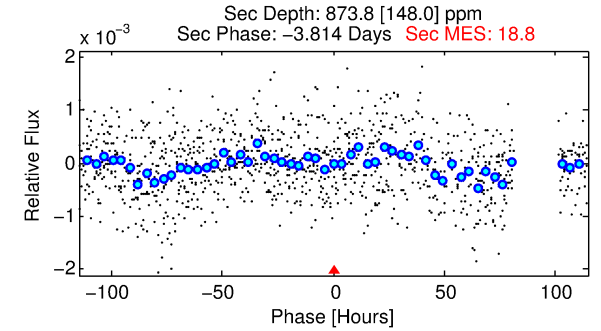
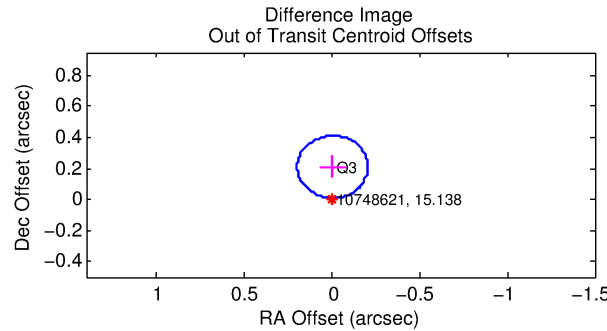
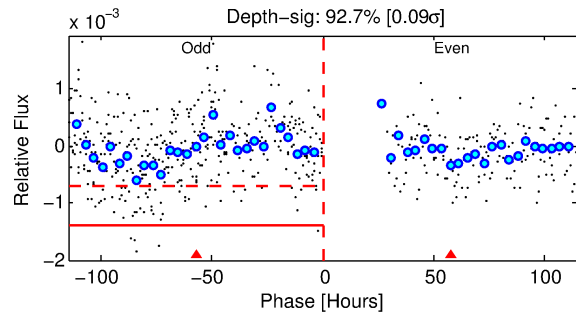
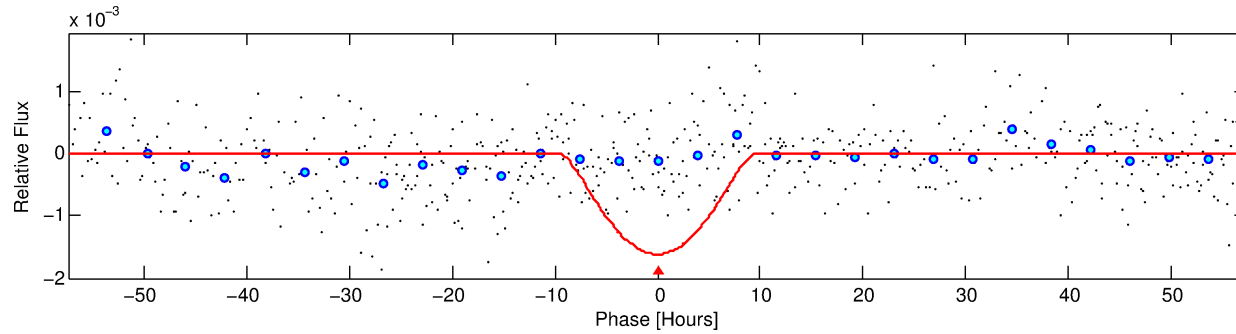
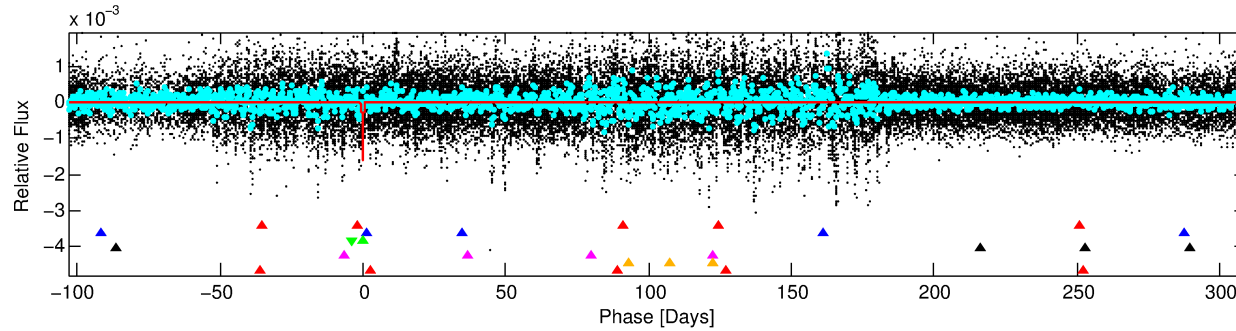
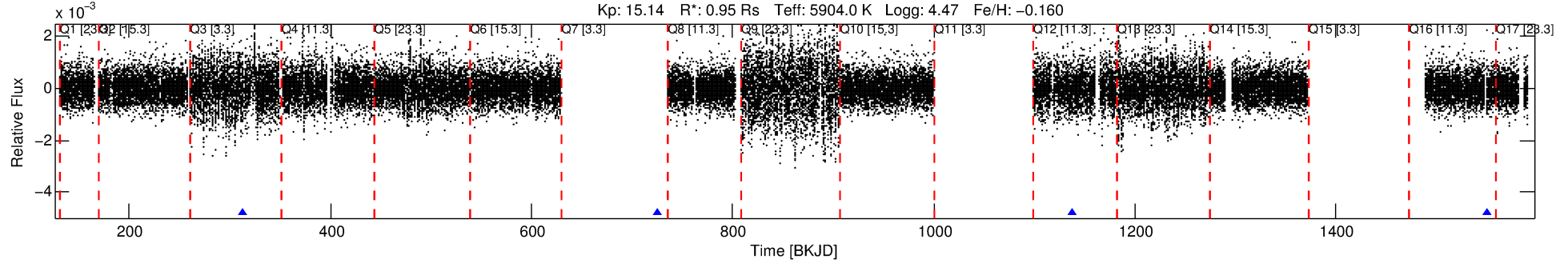
## Ephemeris Match Information For 010748621-03

No Significant Match Found

# DV One-Page Summary

KIC: 10748621 Candidate: 3 of 7 Period: 412.527 d  
KOI: K03532 Corr: No Ephemeris Match

Kp: 15.14 R\*: 0.95 Rs Teff: 5904.0 K Logg: 4.47 Fe/H: -0.160



## DV Fit Results:

Period = 412.52724 [0.02324] d  
Epoch = 312.9557 [0.0597] BKJD  
Rp/R\* = 0.0600 [0.1227]  
a/R\* = 64.89 [39.42]  
b = 0.98 [0.21]  
Seff = 0.85 [0.33]  
Teq = 245 [24] K  
Rp = 6.20 [12.81] Re  
a = 1.0722 [0.2732] AU  
Ag = 14386.76 [59102.72] [0.24σ]  
Teffp = 4143 [4240] K [0.92σ]

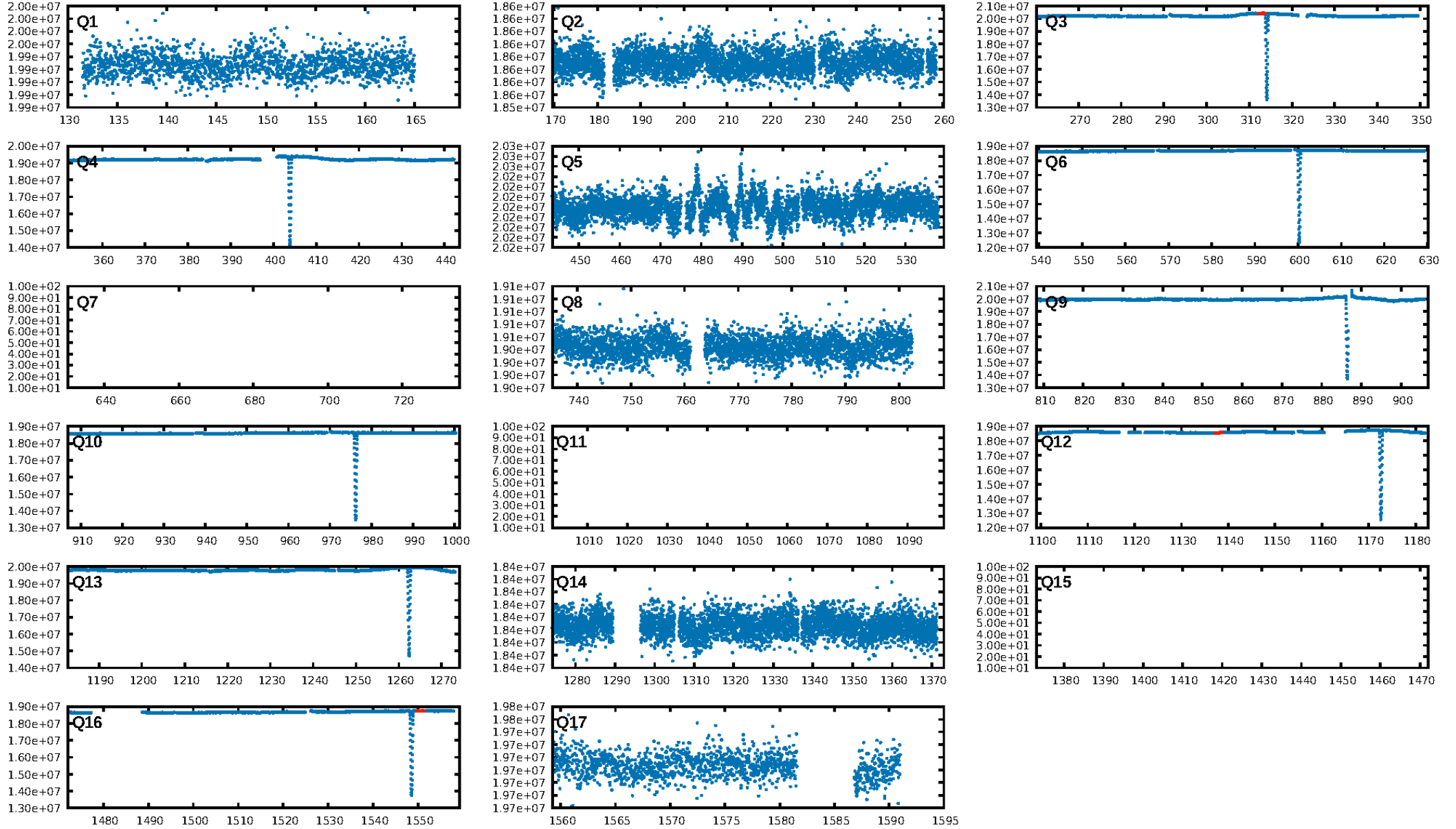
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [15.18σ]  
LongPeriod-sig: 100.0% [9.72σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 9.5%  
Bootstrap-pfa: 4.79e-125  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 5.376  
Centroid-sig: 16.7%  
Centroid-so: 0.682 arcsec [1.36σ]  
OotOffset-rm: 0.210 arcsec [3.14σ]  
OotOffset-st: 0/1/0/0 [1]  
KicOffset-rm: 0.188 arcsec [2.81σ]  
KicOffset-st: 0/1/0/0 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 0.50 [1/2]

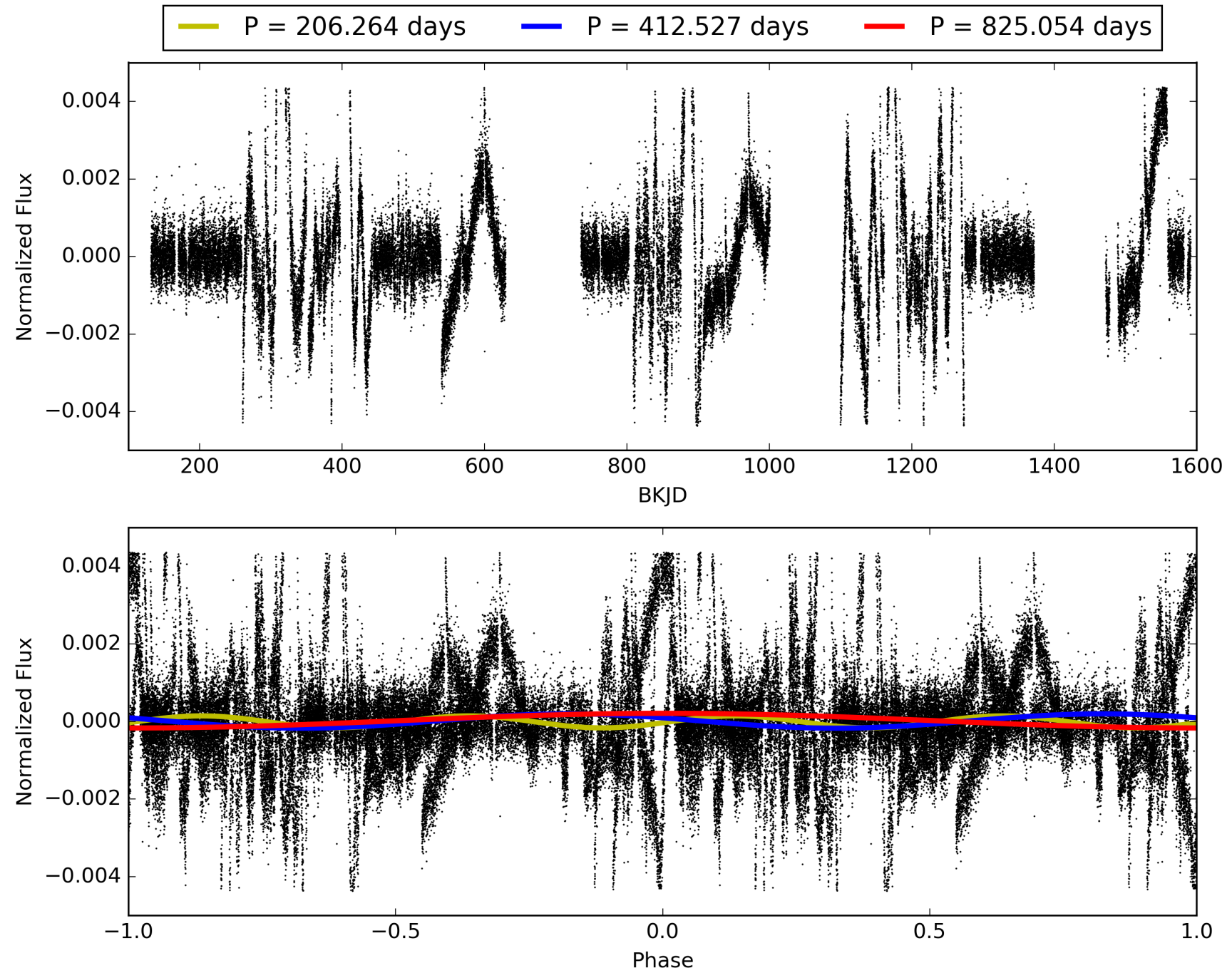
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:47:52 Z

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

# TCE 010748621-03, PDC Light Curves



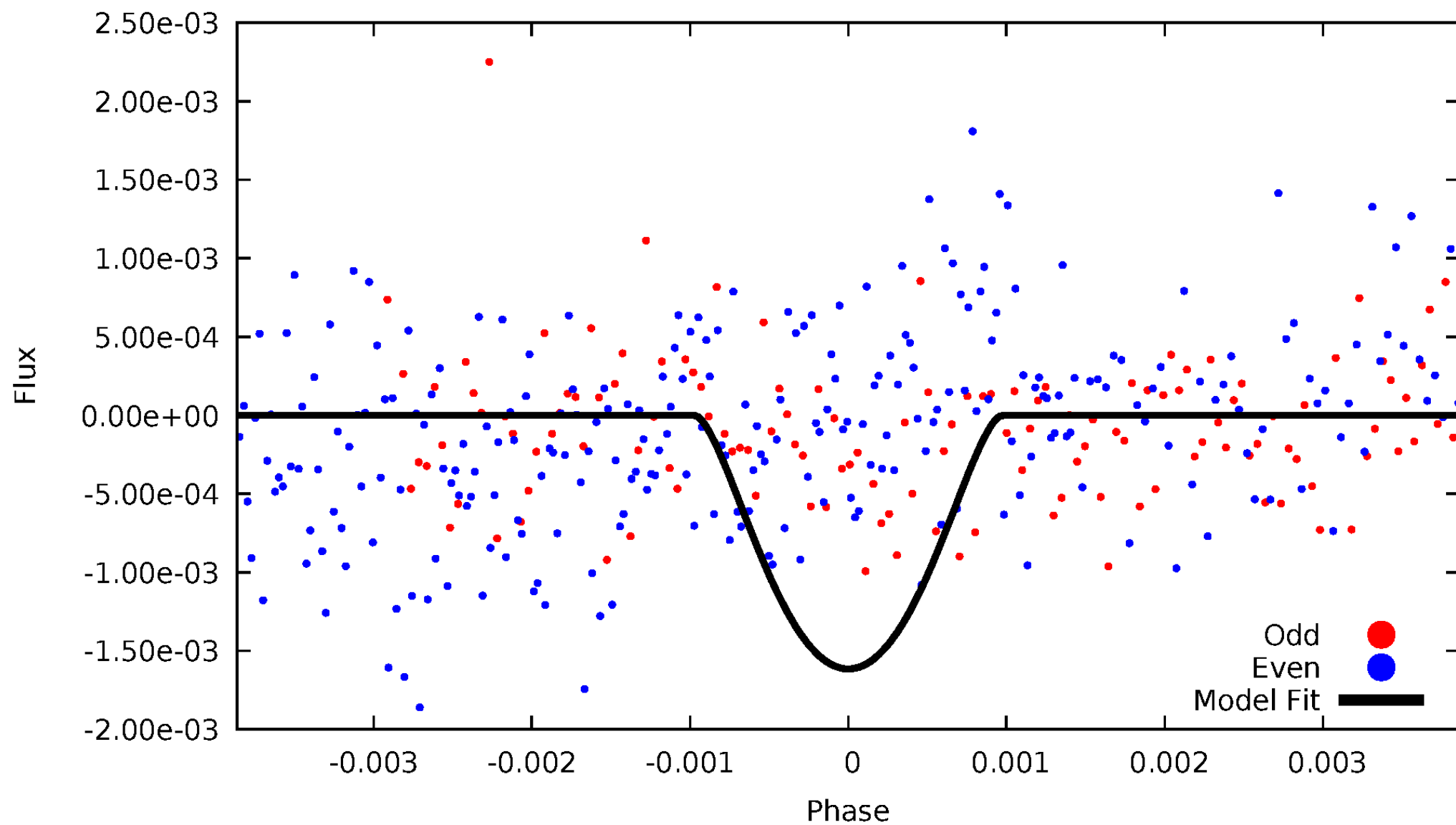
TCE 010748621-03





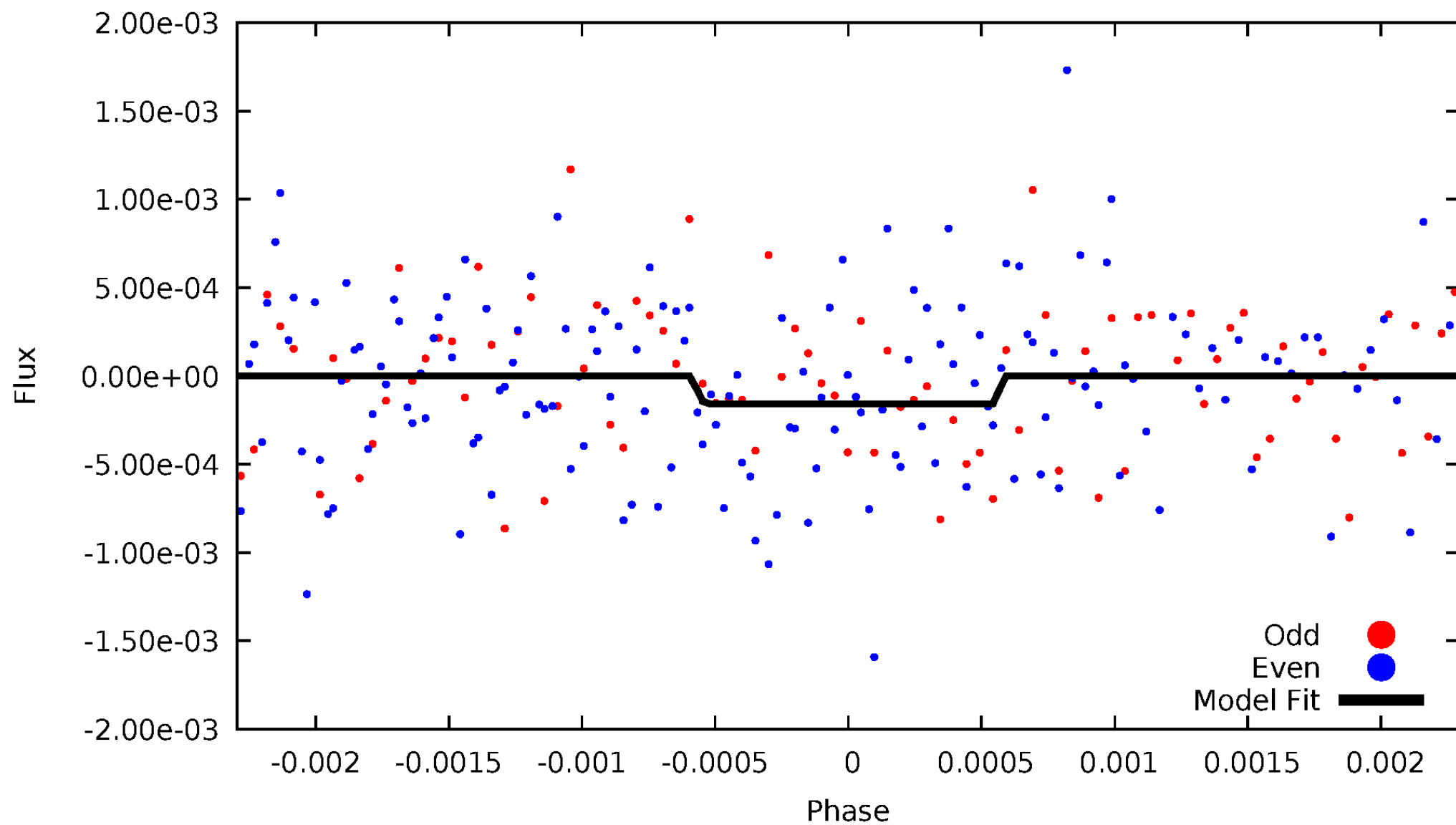
# DV Odd/Even

TCE 010748621-03



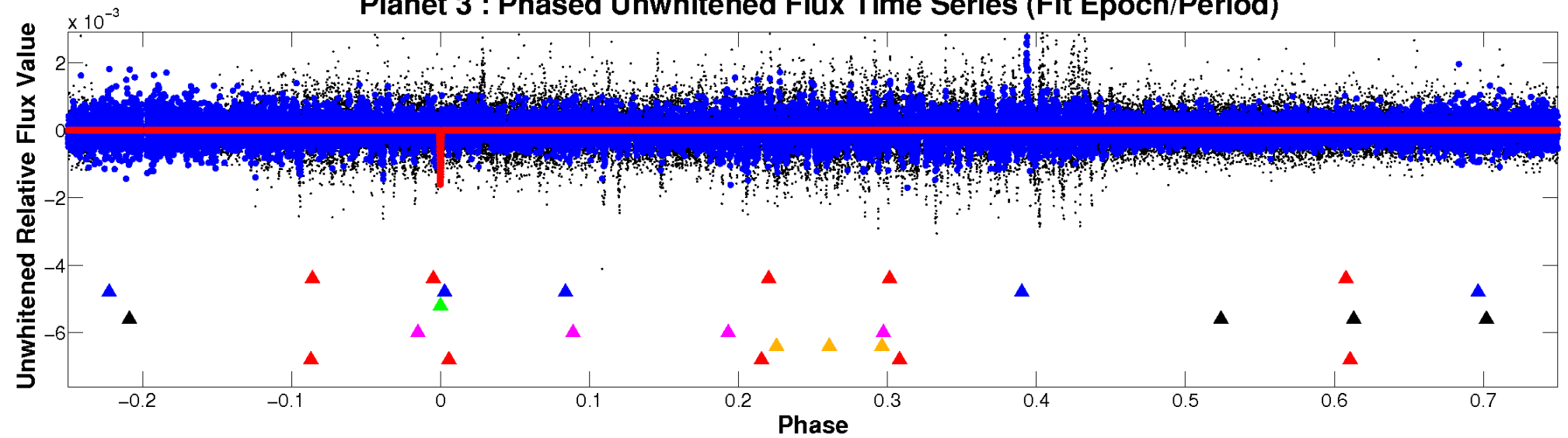
# ALT Odd/Even

TCE 010748621-03

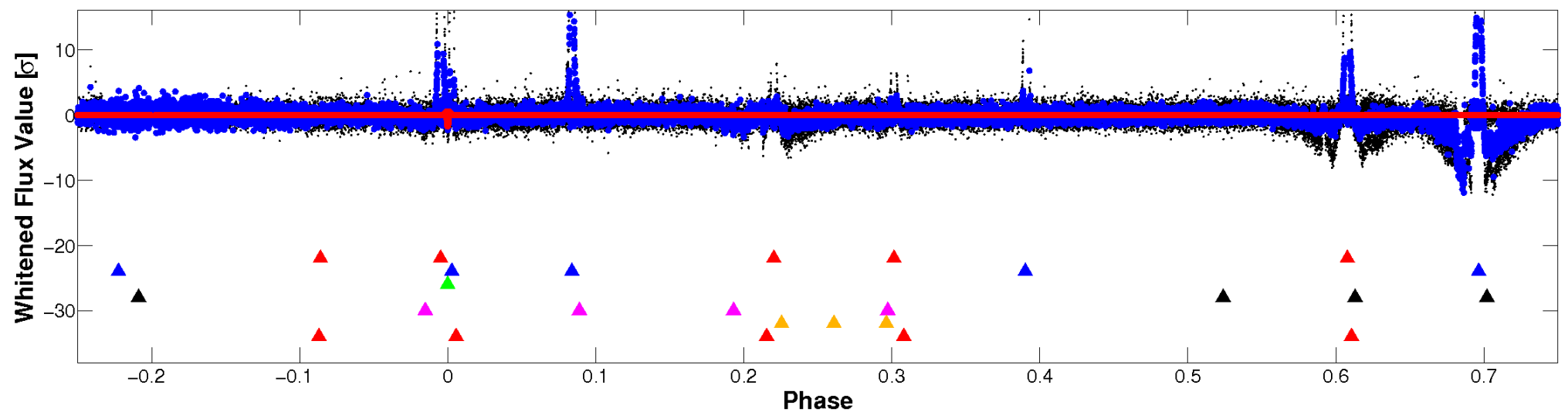


# Non-Whitened Vs. Whitened Light Curve

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

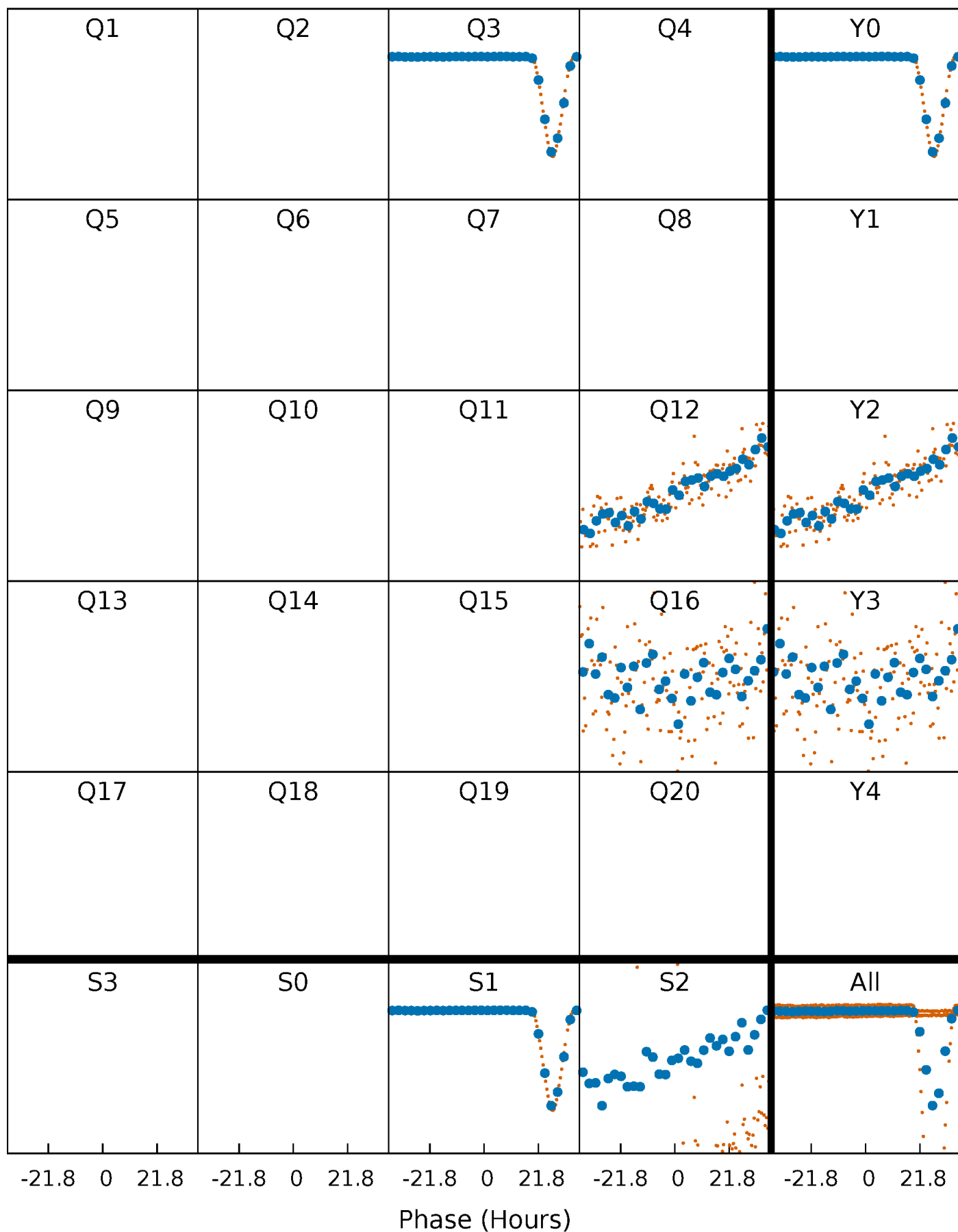


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



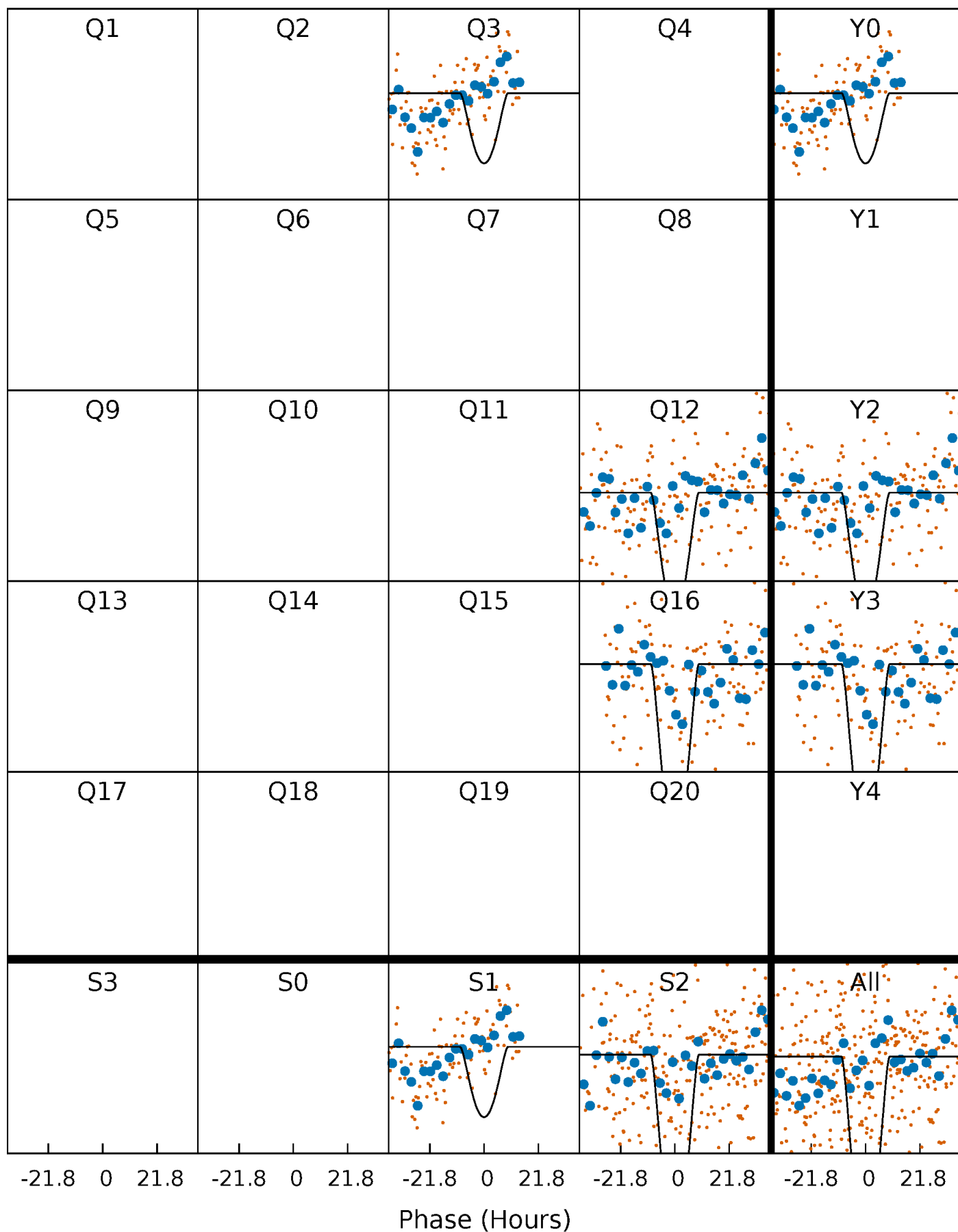
# PDC Quarter-Phased Transit Curves

TCE 010748621-03 P=412.527237 Days  $T_0=312.955679$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 010748621-03 P=412.527237 Days  $T_0=312.955679$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

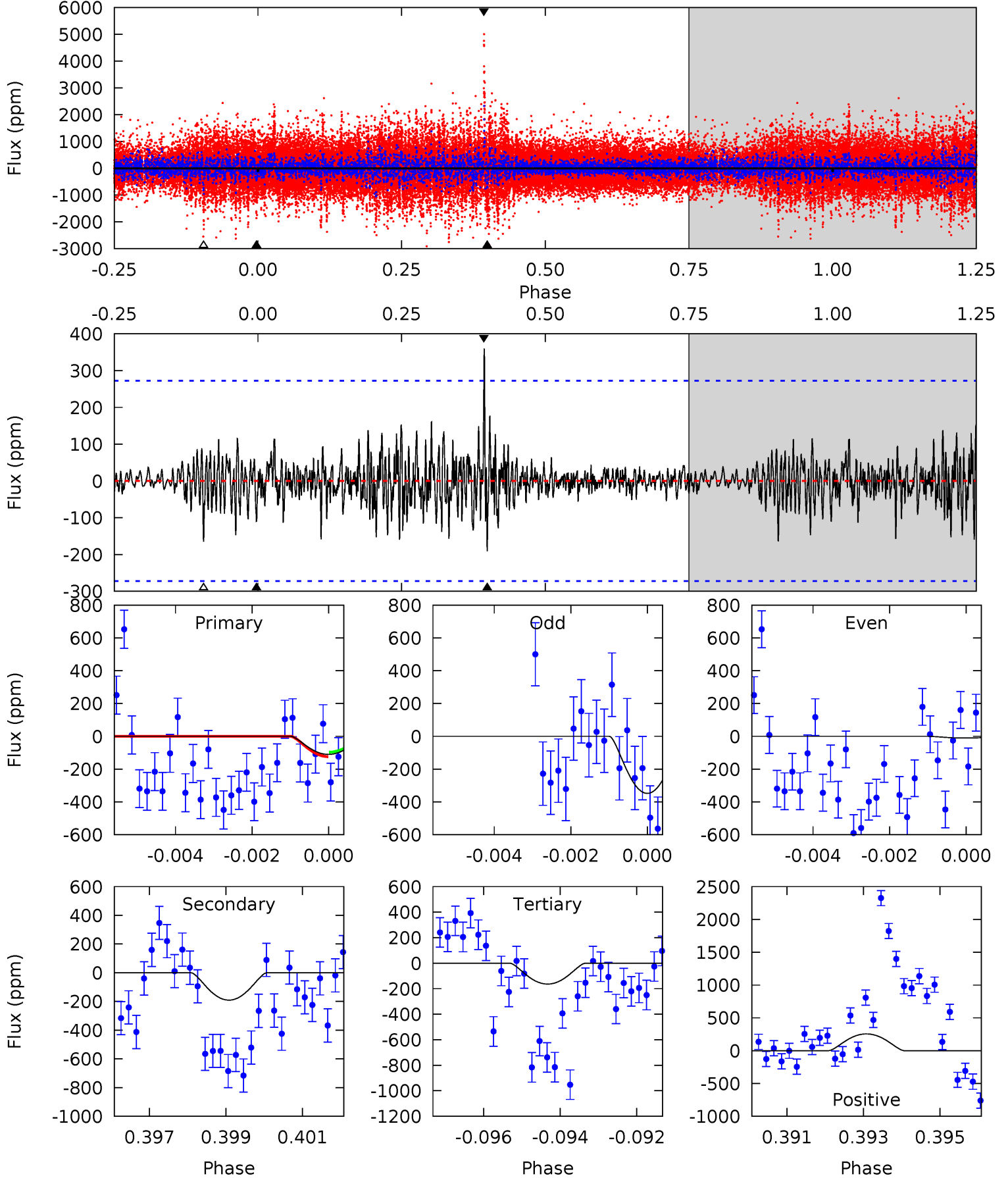
TCE 010748621-03 P=412.444597 Days  $T_0=313.106264$  (BKJD)



# DV Model-Shift Uniqueness Test

010748621-03, P = 412.527237 Days, E = 312.955679 Days

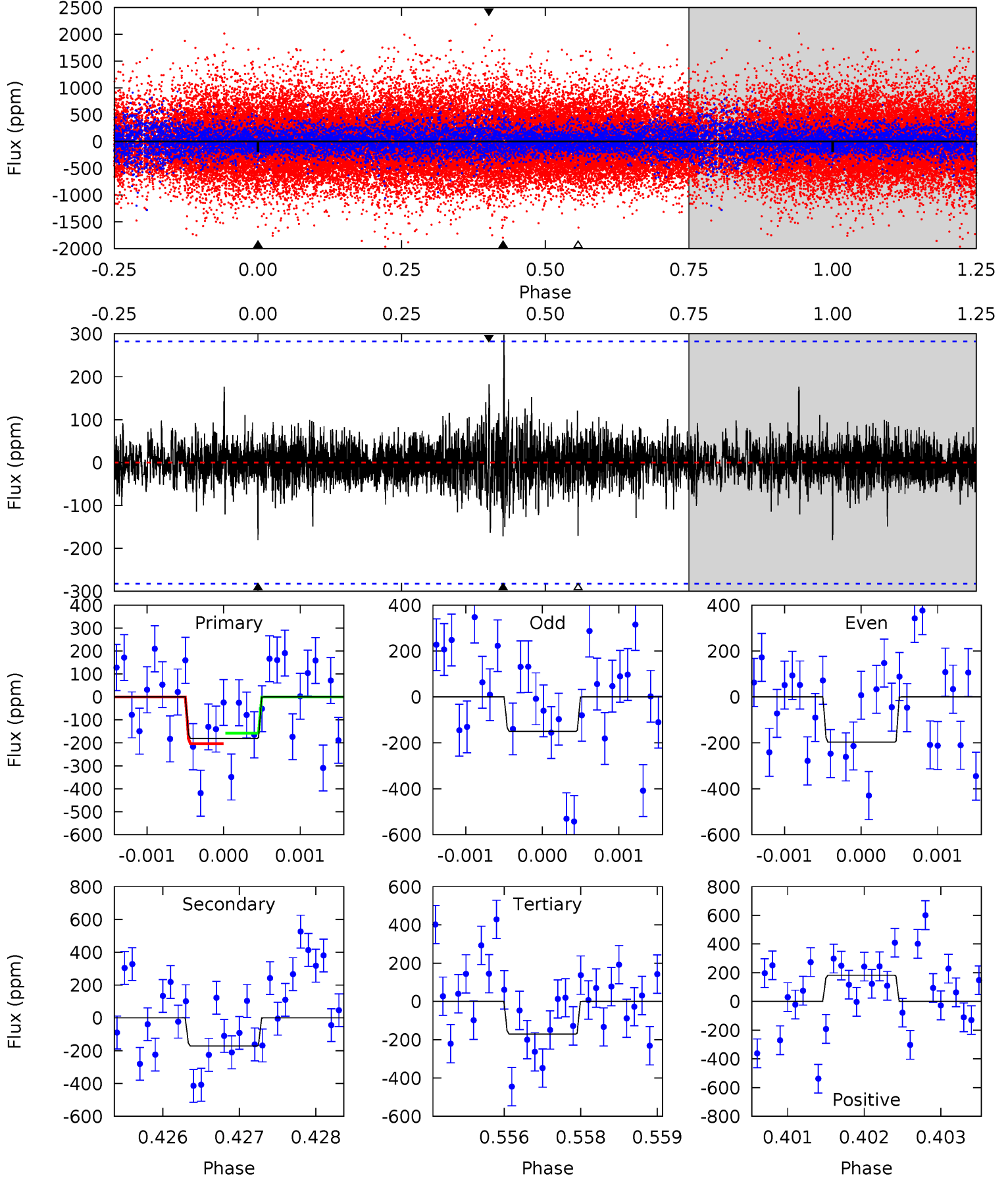
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.16	3.73	3.20	5.00	5.33	3.10	0.90	-1.04	-2.84	0.53	-1.27	2.98	0.67	0.65	0.27



# Alt Model-Shift Uniqueness Test

010748621-03, P = 412.444597 Days, E = 313.106264 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
3.47	3.31	3.27	3.50	5.42	3.24	0.72	0.21	-0.02	0.04	-0.19	0.43	1.20	0.62	0.44





### Stellar Parameters For KIC 010748621

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5904^{+159}_{-195}$	$4.471^{+0.067}_{-0.202}$	$-0.160^{+0.300}_{-0.300}$	$0.946^{+0.287}_{-0.115}$	$0.966^{+0.120}_{-0.120}$	$1.606^{+0.550}_{-0.795}$
	+3%/-3%	+1%/-5%	+188%/-188%	+30%/-12%	+12%/-12%	+34%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 010748621-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-191 \pm 51$	$10.80^{+11.23}_{-7.15}$	$347^{+24}_{-18}$	$2875^{+1161}_{-464}$	$992^{+7936}_{-762}$
Alt.	$-172 \pm 52$	$9.14^{+9.81}_{-6.61}$	$347^{+24}_{-18}$	$2999^{+1467}_{-528}$	$1304^{+14421}_{-1023}$

$T_{max}$  = 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

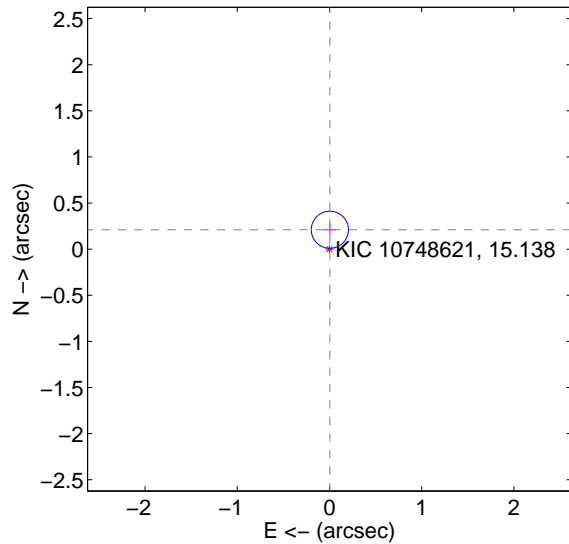
Supplemental centroid analysis for 010748621-03. Kepler magnitude: 15.14. Transit SNR 13.10

There are 0 quarters with good PRF difference image offsets

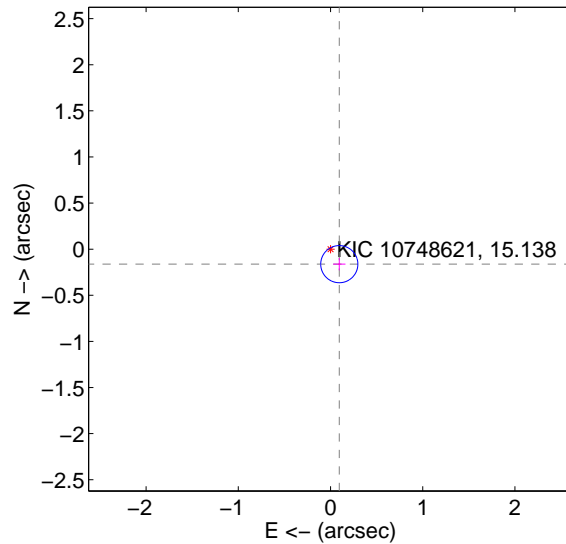
The direct PRF centroid is offset from the target star catalog position by about 0.38 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.210 \pm 0.067$	3.14	$-0.004 \pm 0.067$	$0.210 \pm 0.067$
PRF-fit source offset from KIC position	$0.188 \pm 0.067$	2.81	$-0.095 \pm 0.067$	$-0.162 \pm 0.067$
photometric centroid source offset	$0.68 \pm 0.50$	1.36	$0.28 \pm 0.49$	$-0.62 \pm 0.50$

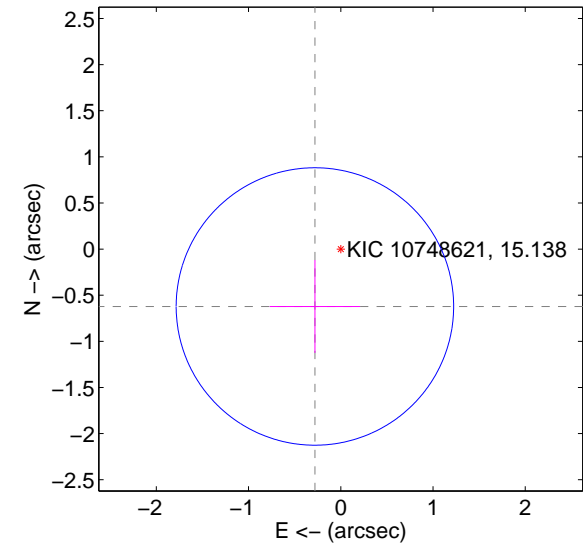
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

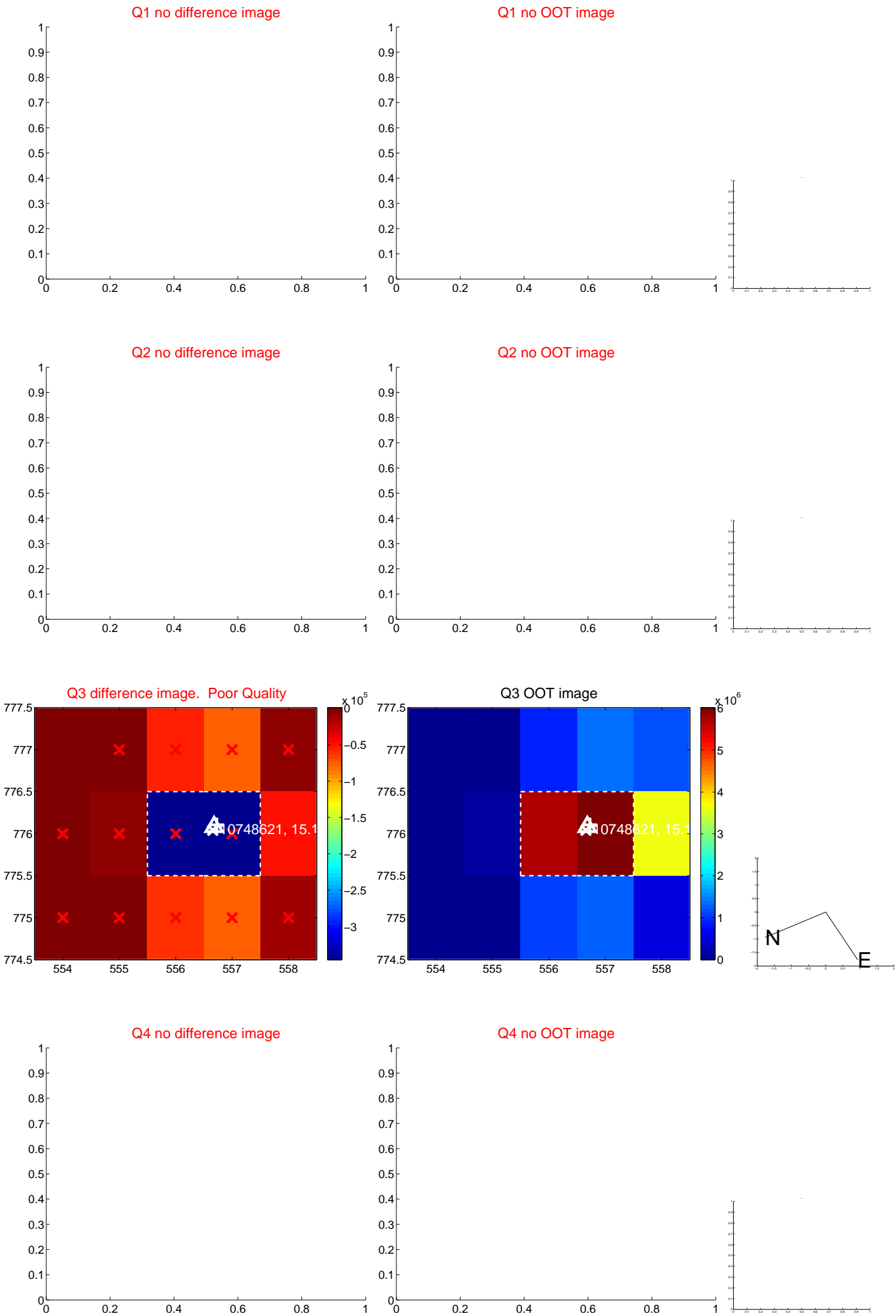


offset from photometric centroids



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.

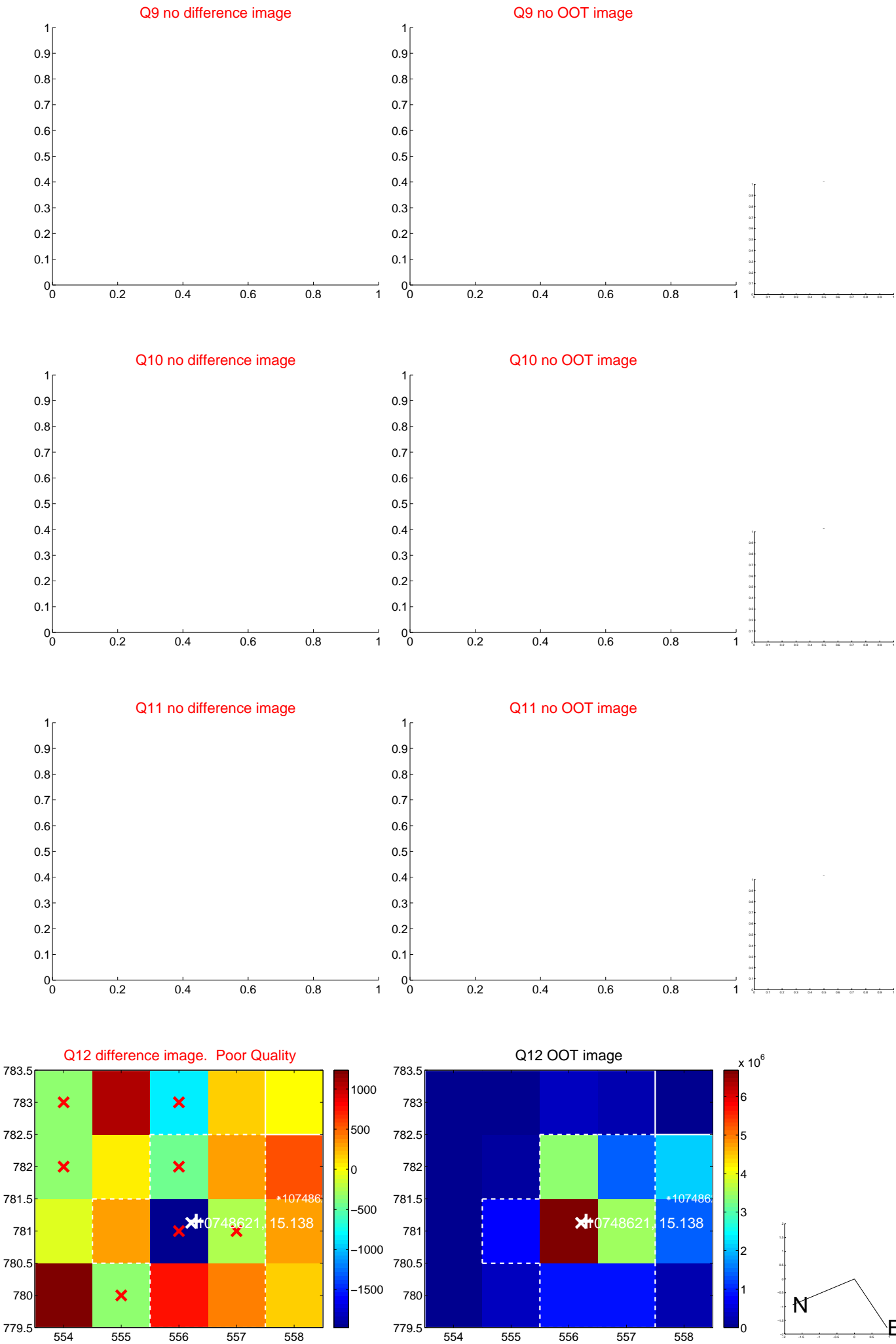
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



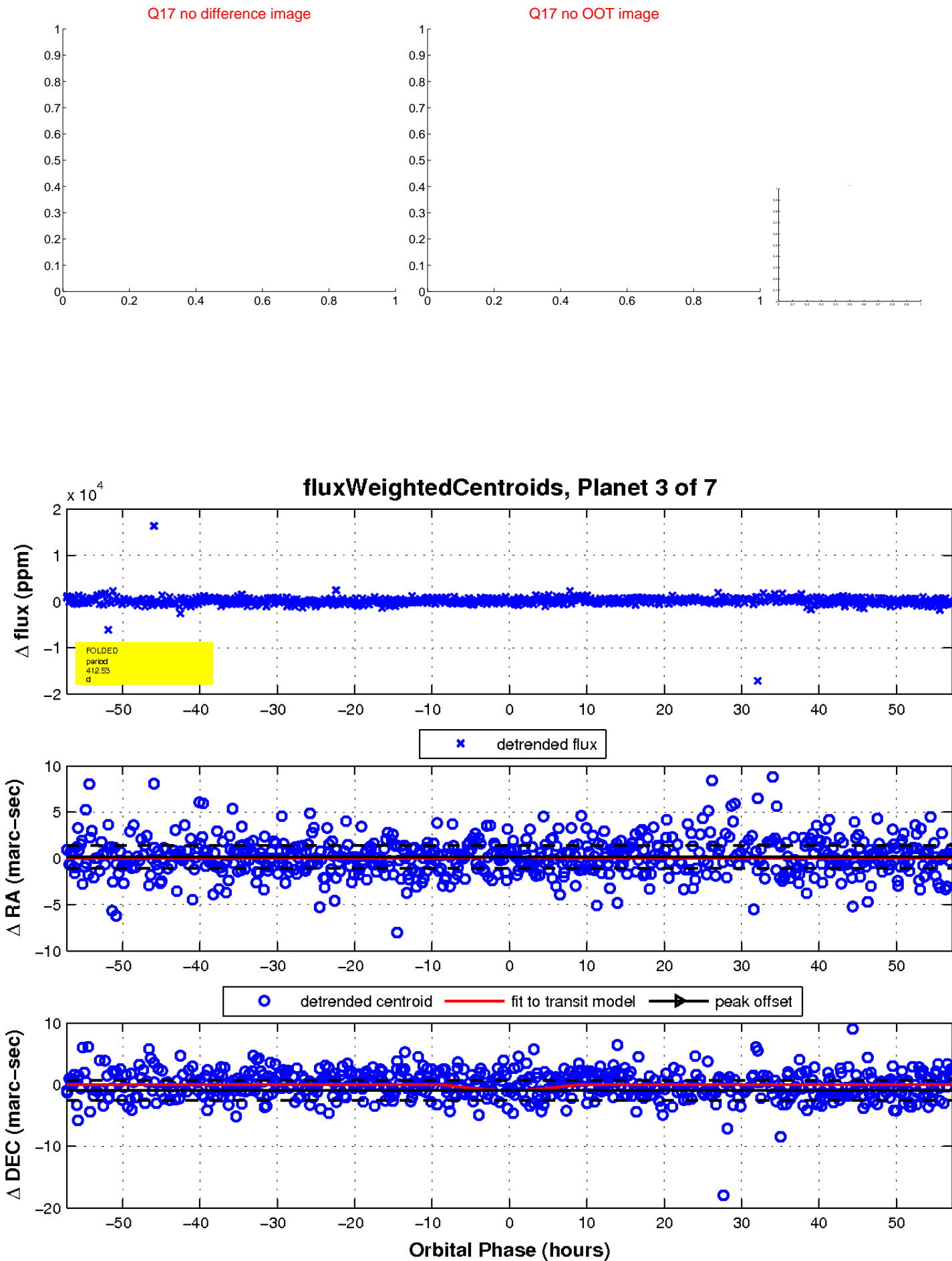
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

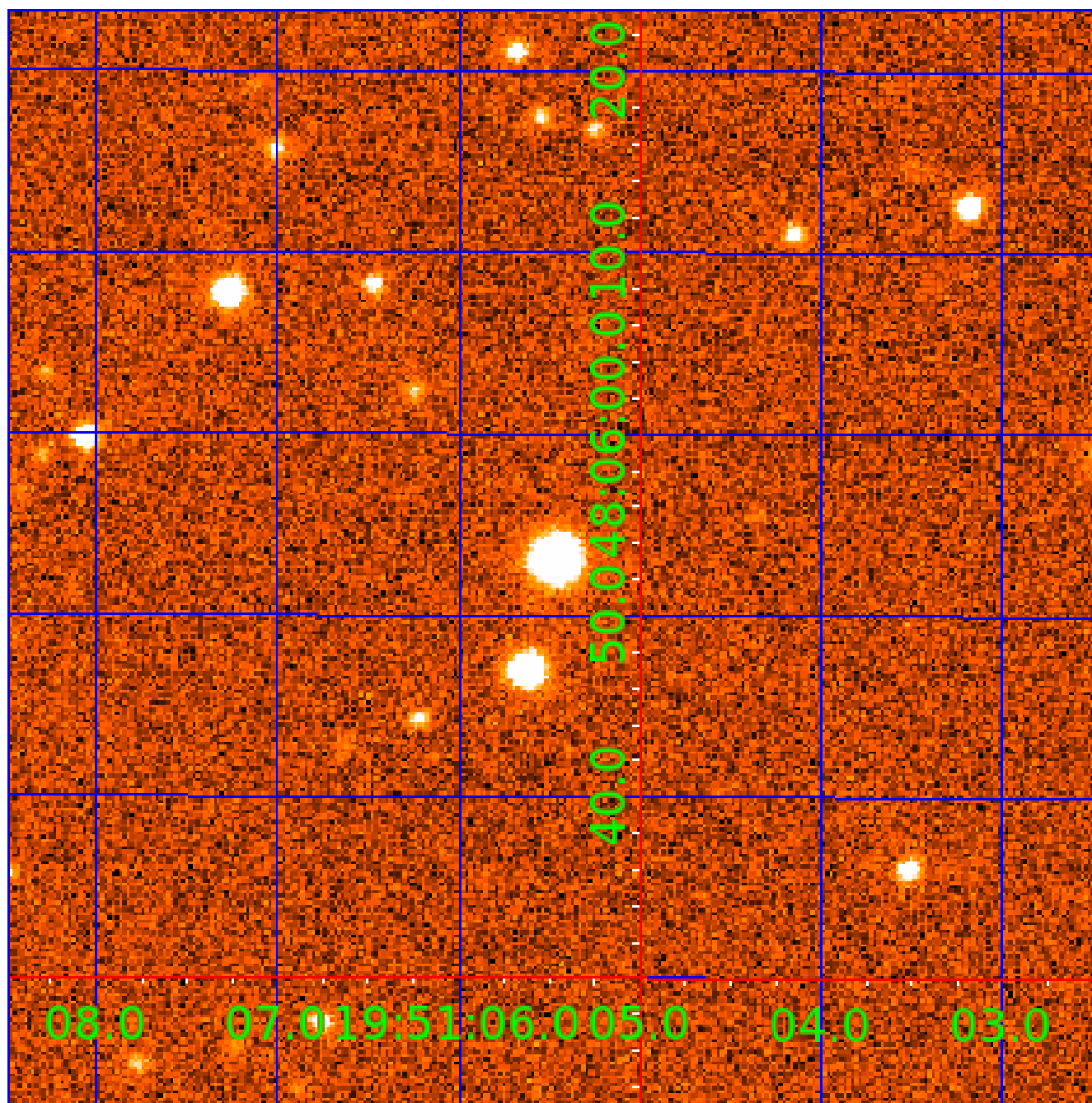


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 010748621

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010748621-01	OBS	3532.01	286.178819	403.846076	275291.8	12.000	2970.0	-1.0	0.95	5904	40.97	1.38
010748621-02	OBS	No	286.172008	314.108692	336824.7	9.000	2456.1	-1.0	0.95	5904	42.65	1.38
010748621-03	OBS	No	412.527237	312.955679	1616.2	19.119	43.1	13.1	0.95	5904	6.20	0.85
010748621-04	OBS	No	375.775145	226.810165	1747.2	54.868	45.1	24.4	0.95	5904	7.50	0.96
010748621-05	OBS	No	369.557817	435.610411	1250.7	48.010	15.4	10.6	0.95	5904	6.42	0.98
010748621-06	OBS	No	427.123172	406.002780	2454.7	30.547	15.5	13.1	0.95	5904	6.95	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010748621-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010748621-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS
010748621-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-06	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

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

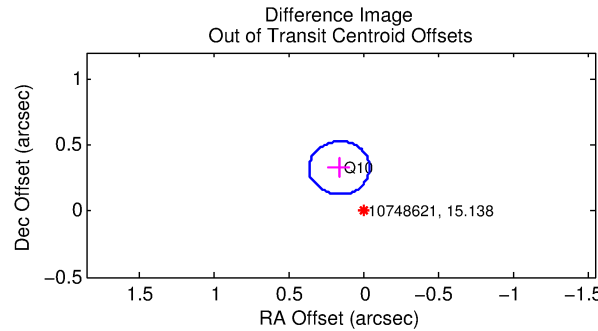
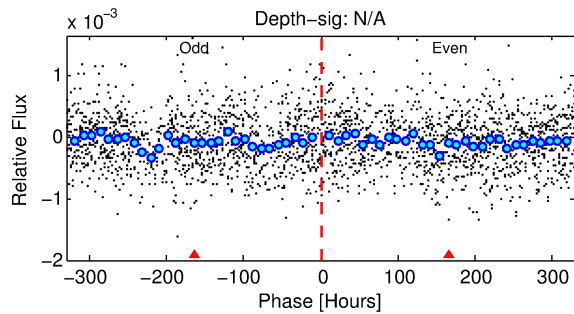
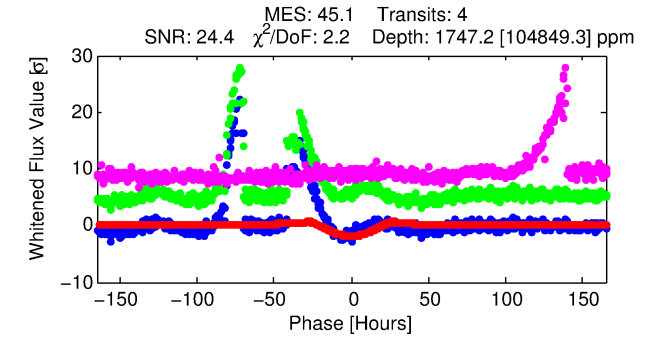
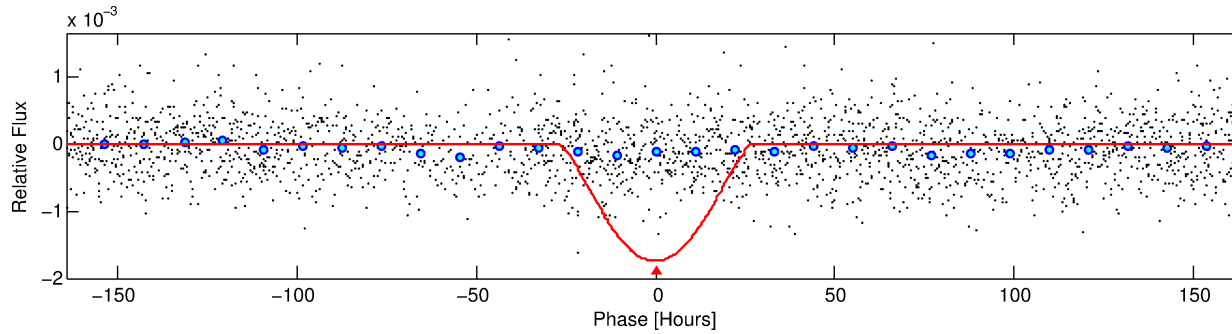
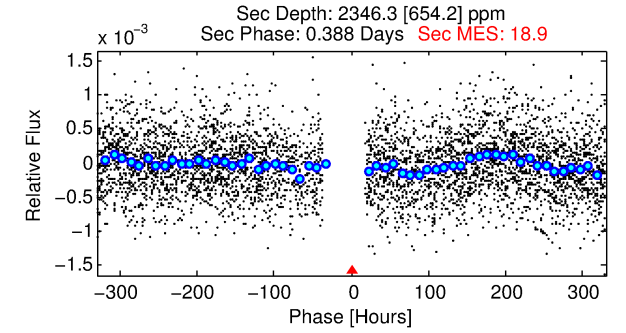
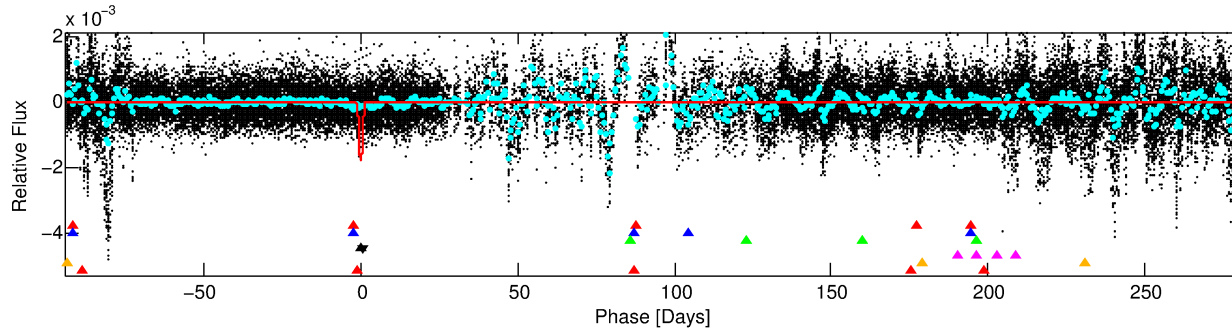
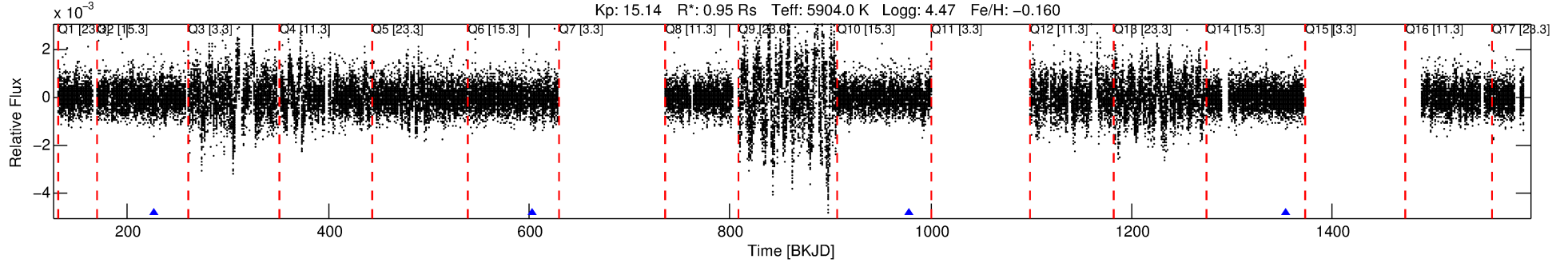
## Ephemeris Match Information For 010748621-04

No Significant Match Found

# DV One-Page Summary

KIC: 10748621 Candidate: 4 of 7 Period: 375.775 d  
KOI: K03532 Corr: No Ephemeris Match

Kp: 15.14 R\*: 0.95 Rs Teff: 5904.0 K Logg: 4.47 Fe/H: -0.160



## DV Fit Results:

Period = 375.77514 [0.03451] d  
Epoch = 226.8102 [0.0673] BKJD  
Rp/R\* = 0.0727 [0.1394]  
a/R\* = 20.33 [8.55]  
b = 1.00 [2.73]  
Seff = 0.96 [0.38]  
Teq = 252 [25] K  
Rp = 7.50 [14.57] Re  
a = 1.0075 [0.2568] AU  
Ag = 23290.49 [90019.51] [0.26σ]  
Teffp = 4821 [4639] K [0.98σ]

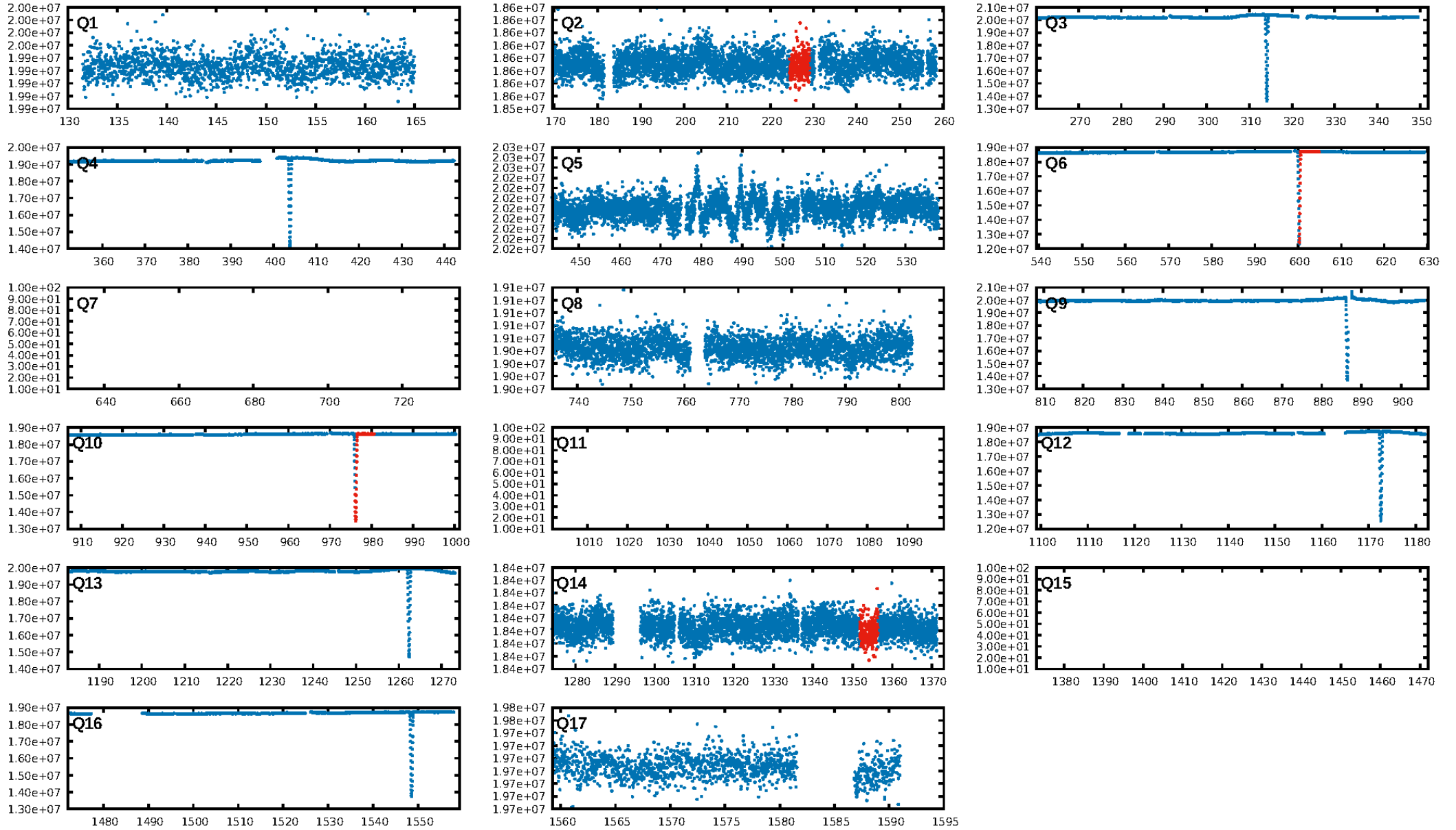
## DV Diagnostic Results:

ShortPeriod-sig: 95.9% [2.05σ]  
LongPeriod-sig: 100.0% [15.18σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 3.66e-207  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.246  
Centroid-sig: 16.7%  
Centroid-so: 0.984 arcsec [3.41σ]  
OotOffset-rm: 0.362 arcsec [5.40σ]  
KicOffset-rm: 0.325 arcsec [4.83σ]  
OotOffset-st: 1/0/0/0 [1]  
KicOffset-st: 1/0/0/0 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 0.50 [1/2]

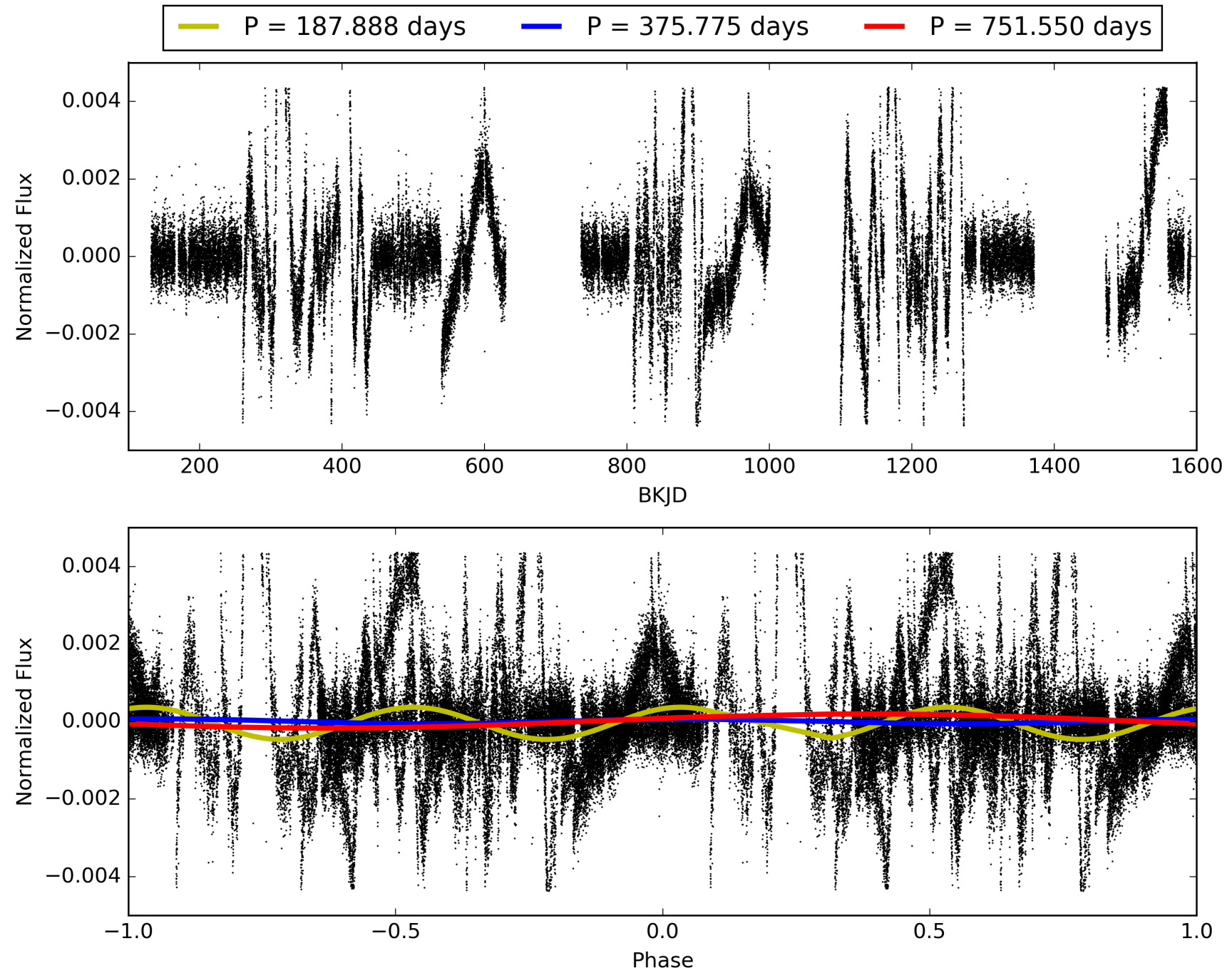
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:48:00 Z

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

# TCE 010748621-04, PDC Light Curves

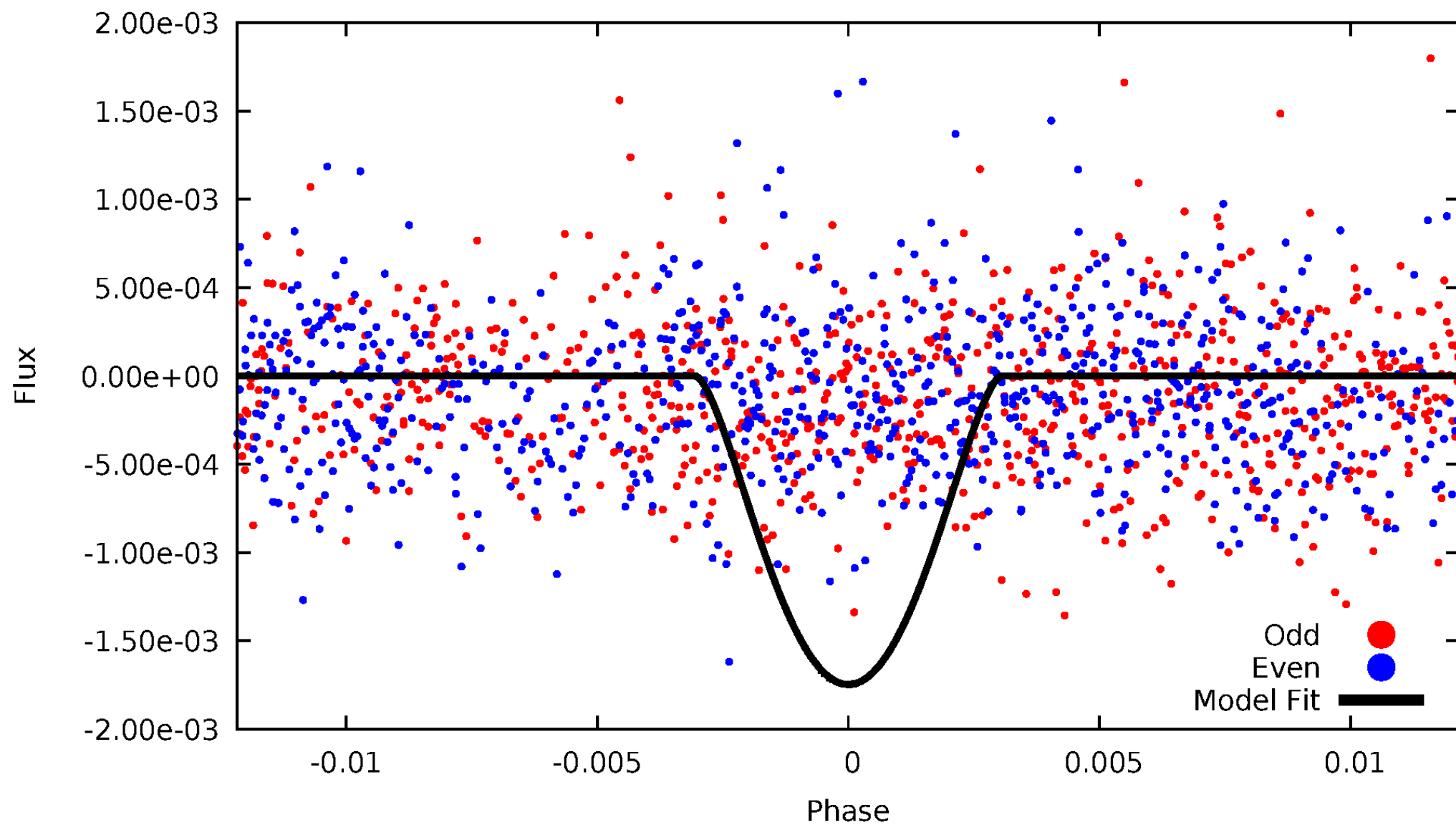


TCE 010748621-04



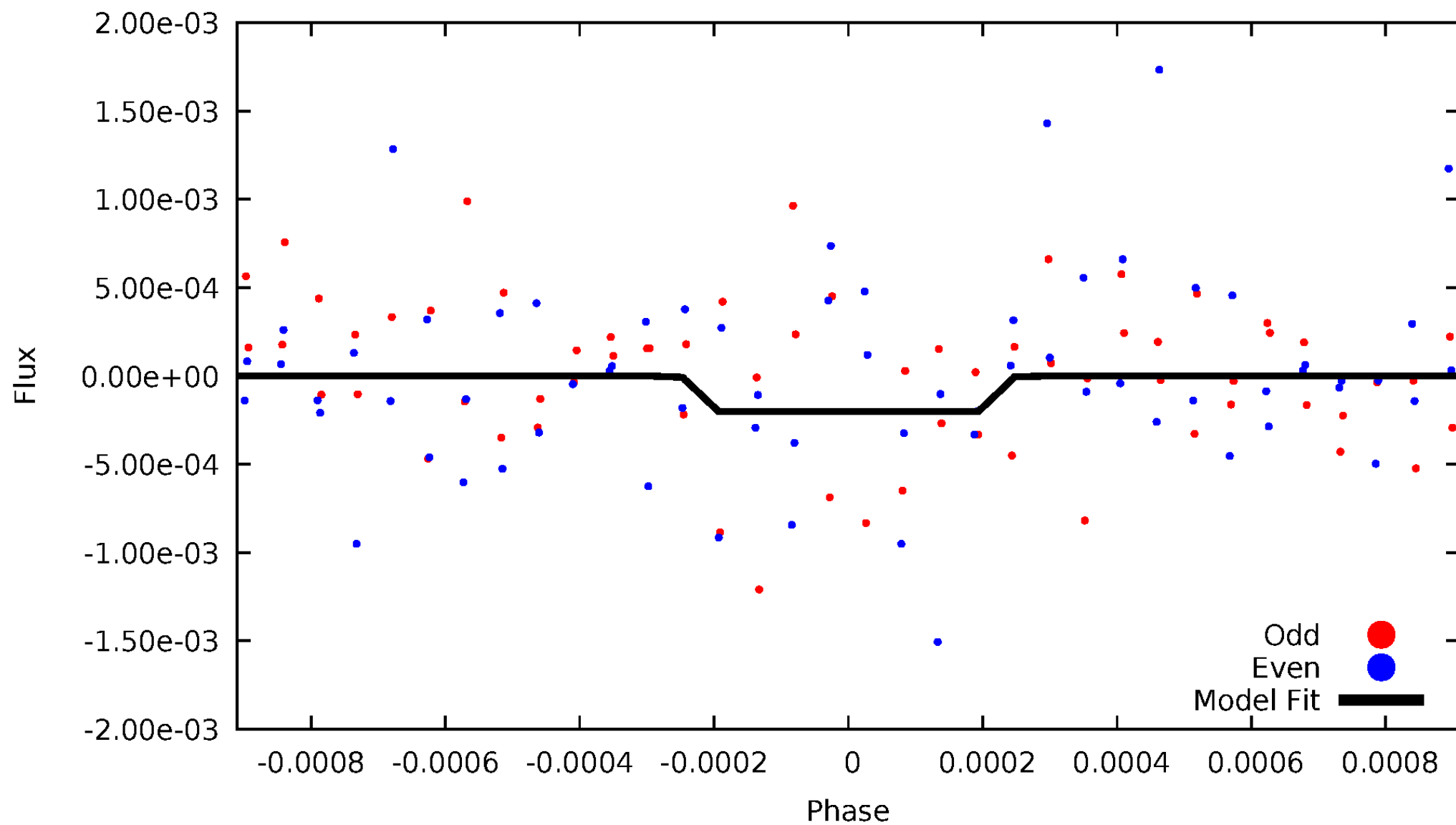
# DV Odd/Even

TCE 010748621-04



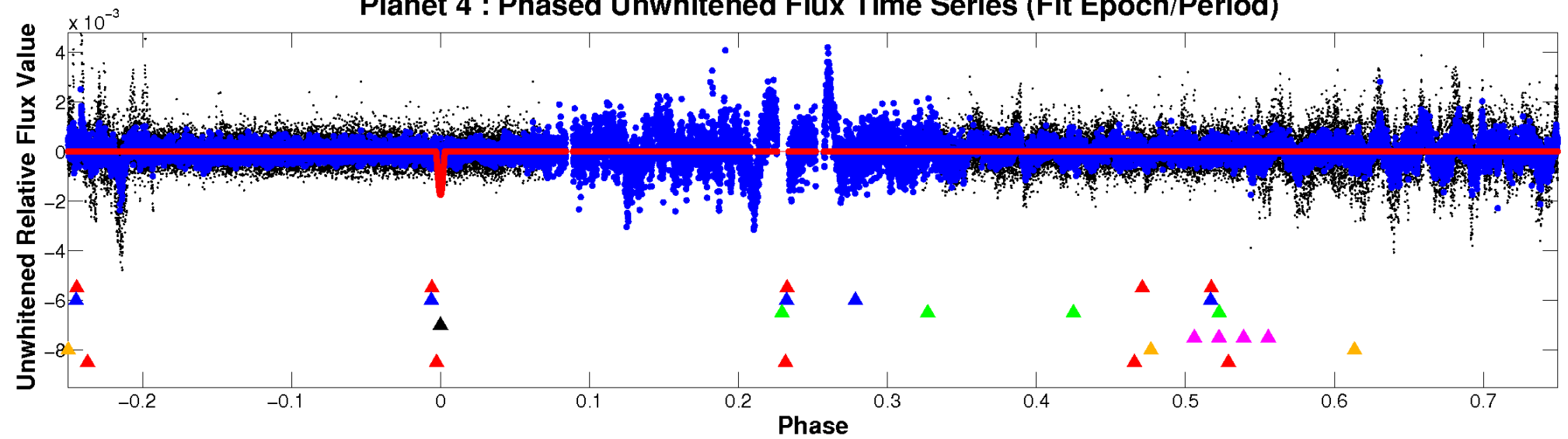
# ALT Odd/Even

TCE 010748621-04

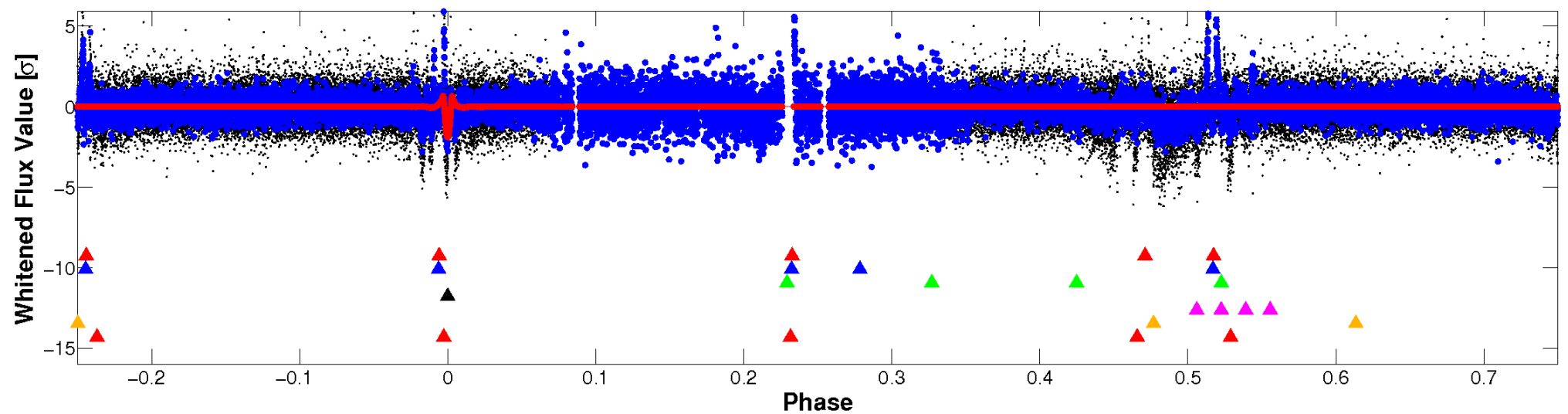


# Non-Whitened Vs. Whitened Light Curve

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

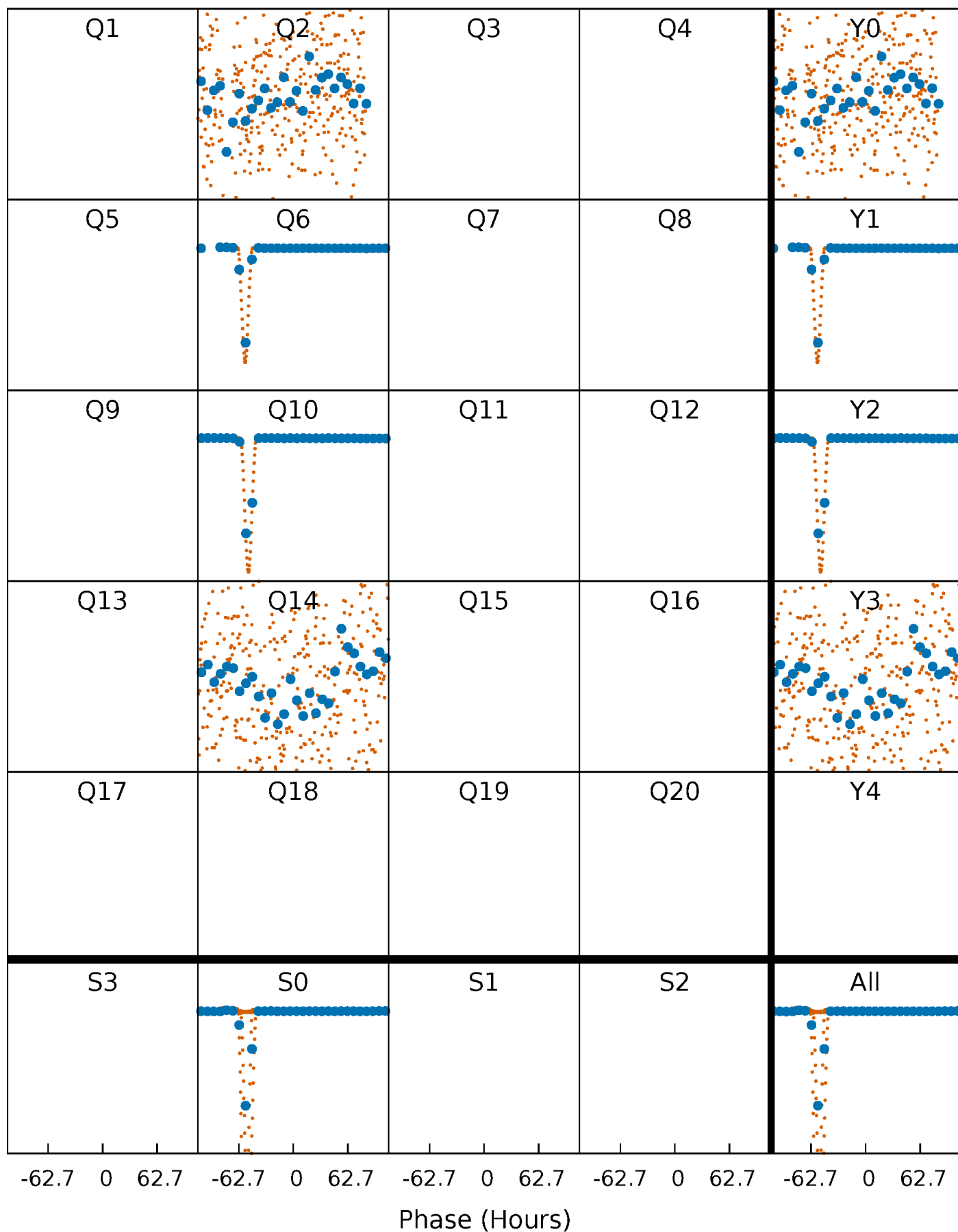


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

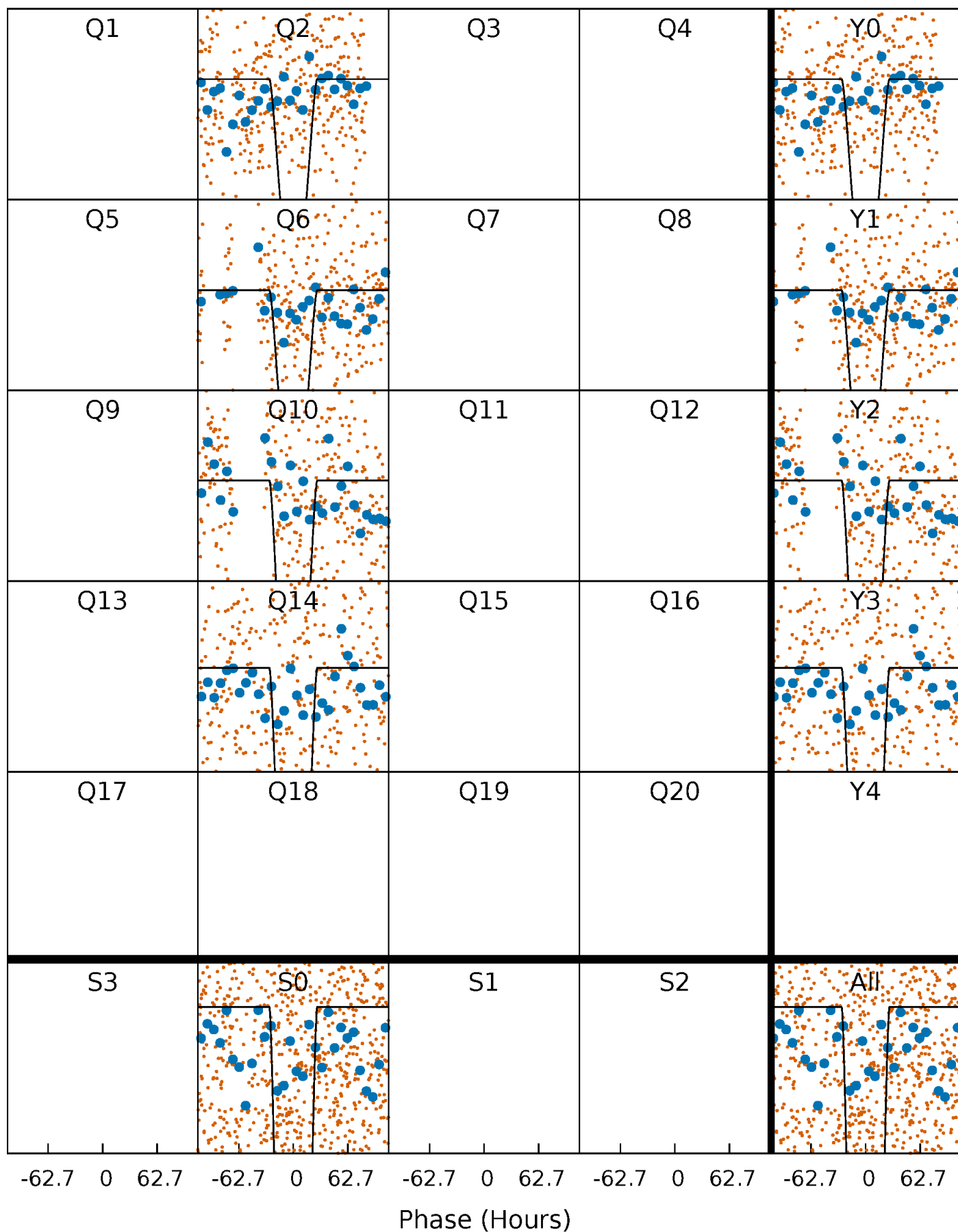
TCE 010748621-04 P=375.775145 Days  $T_0=226.810165$  (BKJD)





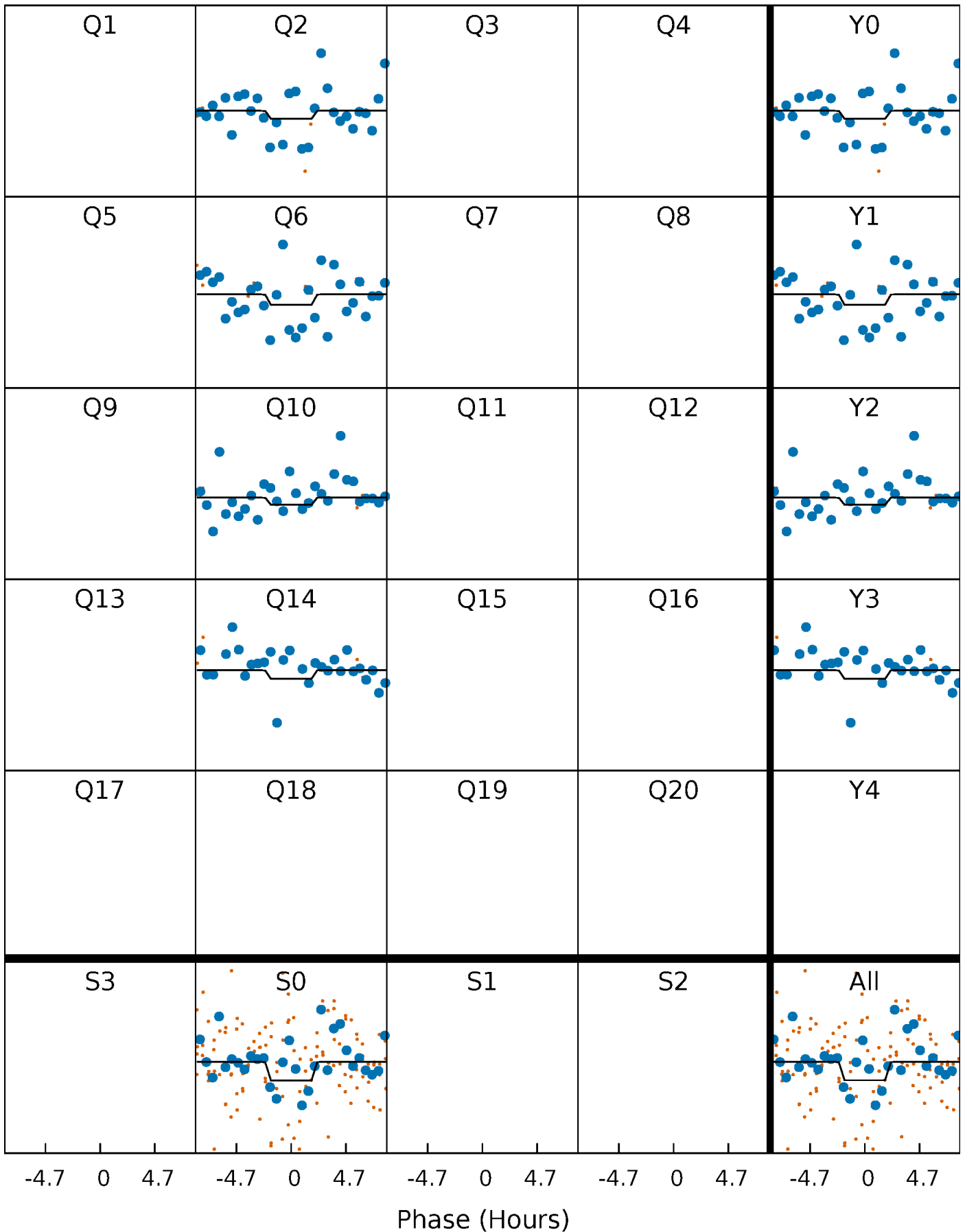
# DV Quarter-Phased Transit Curves

TCE 010748621-04 P=375.775145 Days  $T_0=226.810165$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

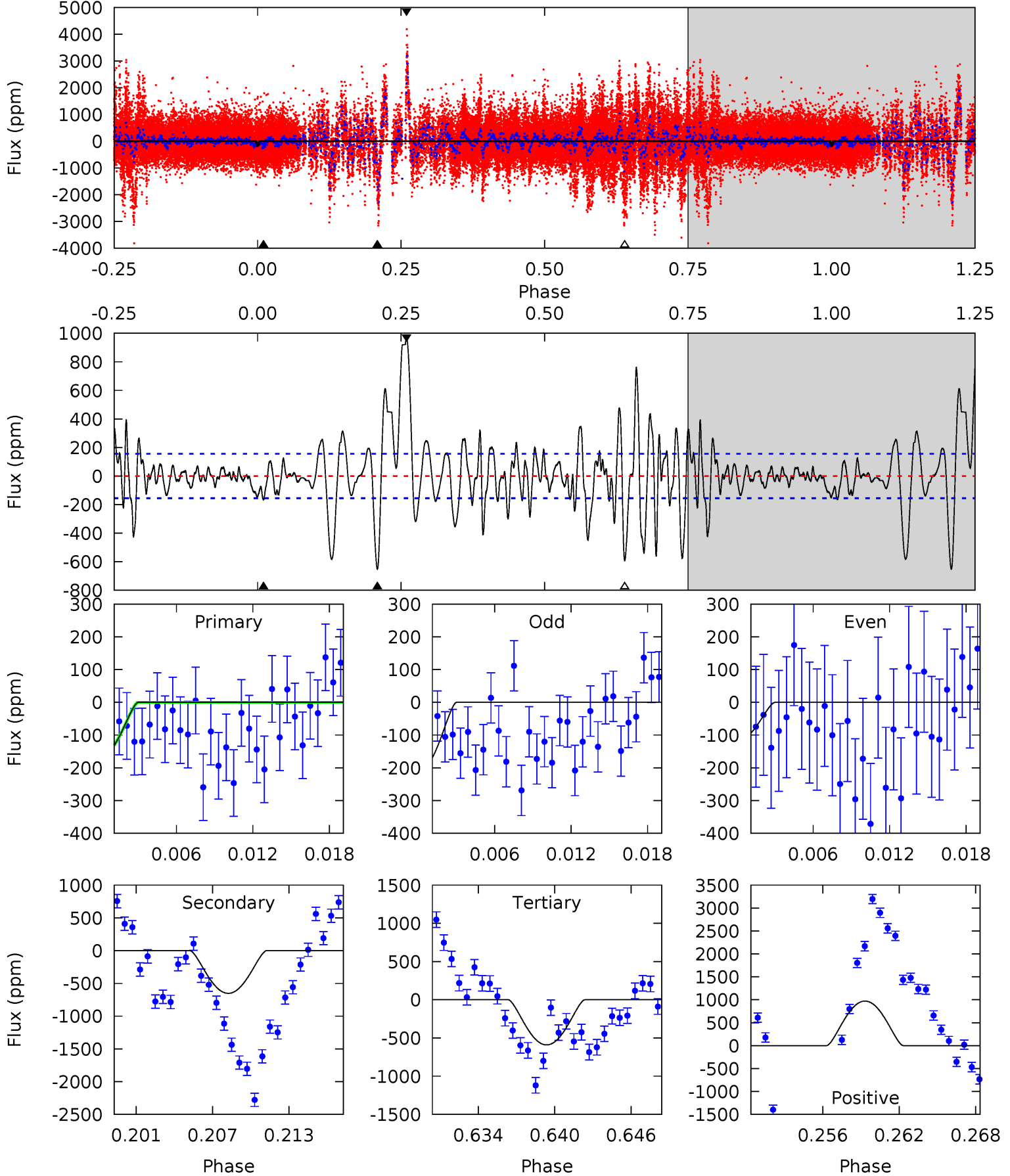
TCE 010748621-04     $P=376.120539$  Days     $T_0=225.867205$  (BKJD)



# DV Model-Shift Uniqueness Test

010748621-04, P = 375.775145 Days, E = 226.810165 Days

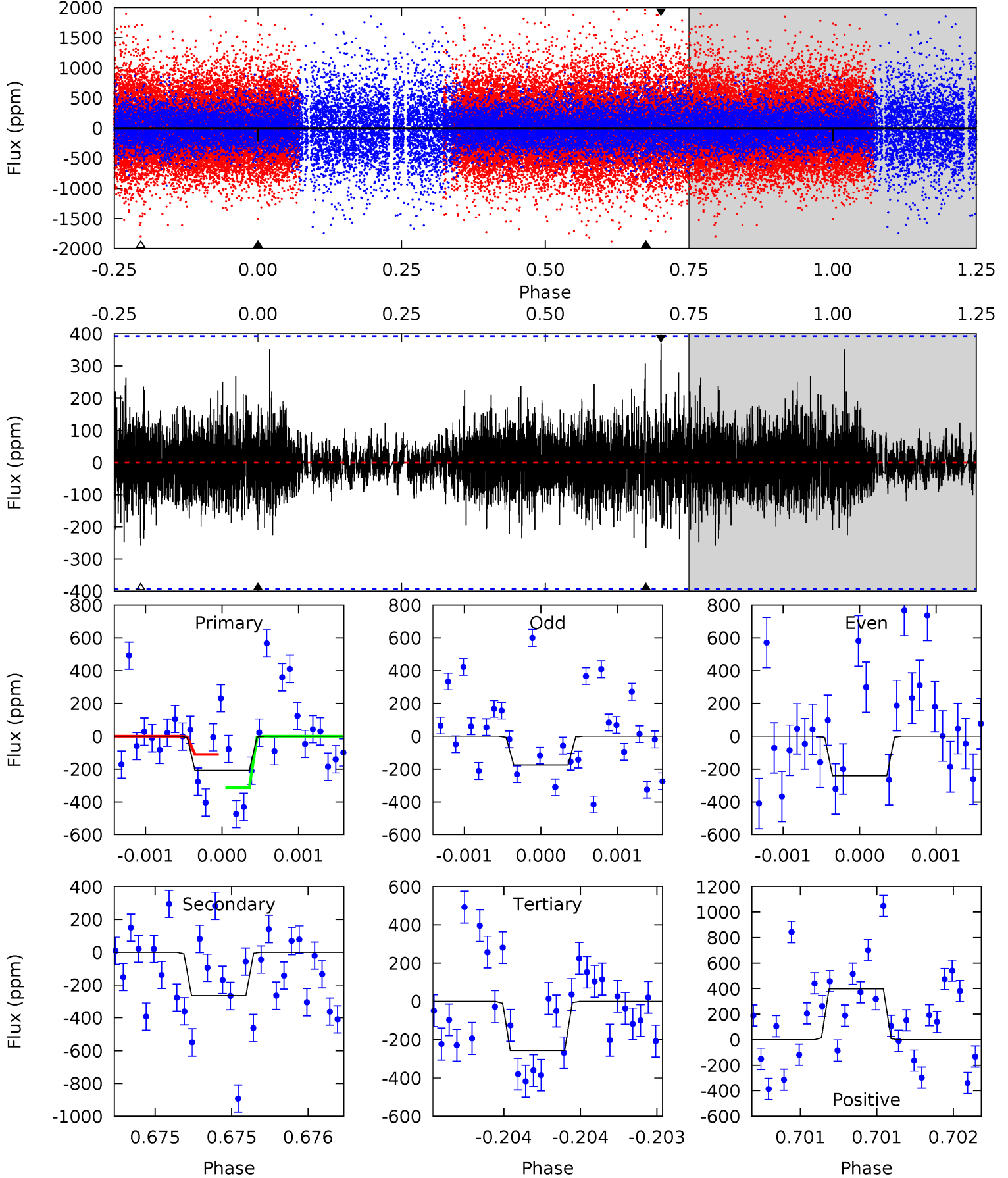
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.45	21.5	19.5	32.0	5.12	2.74	6.23	-14.0	-26.6	2.01	-10.5	1.51	1.15	0.60	0.03



# Alt Model-Shift Uniqueness Test

010748621-04, P = 376.120539 Days, E = 225.867205 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.95	3.75	3.62	5.64	5.56	3.46	0.93	-0.68	-2.69	0.13	-1.88	0.48	1.21	0.60	1.44



### Stellar Parameters For KIC 010748621

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5904^{+159}_{-195}$	$4.471^{+0.067}_{-0.202}$	$-0.160^{+0.300}_{-0.300}$	$0.946^{+0.287}_{-0.115}$	$0.966^{+0.120}_{-0.120}$	$1.606^{+0.550}_{-0.795}$
	+3%/-3%	+1%/-5%	+188%/-188%	+30%/-12%	+12%/-12%	+34%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 010748621-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-652 \pm 30$	$13.91^{+12.46}_{-9.31}$	$357^{+25}_{-18}$	$3219^{+1443}_{-532}$	$1820^{+16092}_{-1295}$
Alt.	$-265 \pm 71$	$10.44^{+11.34}_{-7.36}$	$358^{+28}_{-17}$	$3051^{+1560}_{-559}$	$1368^{+12818}_{-1084}$

$T_{max}$  = 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

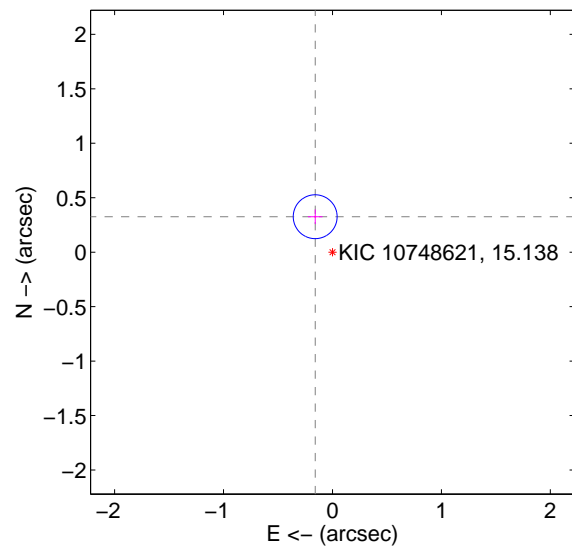
Supplemental centroid analysis for 010748621-04. Kepler magnitude: 15.14. Transit SNR 24.38

There are 0 quarters with good PRF difference image offsets

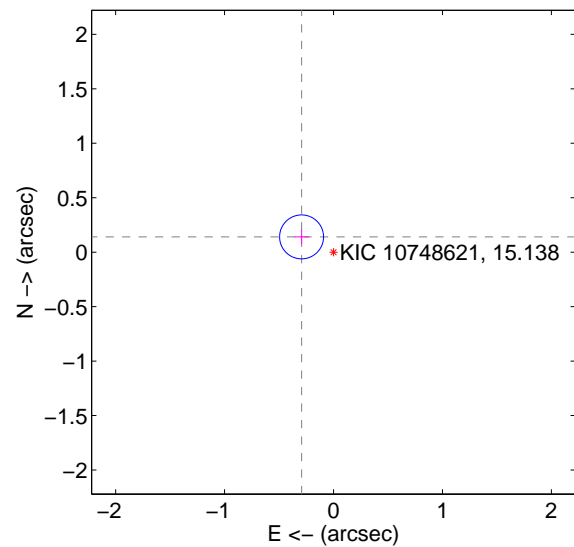
The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.362 \pm 0.067$	5.40	$0.159 \pm 0.067$	$0.326 \pm 0.067$
PRF-fit source offset from KIC position	$0.325 \pm 0.067$	4.83	$0.293 \pm 0.067$	$0.140 \pm 0.067$
photometric centroid source offset	$0.98 \pm 0.29$	3.41	$0.41 \pm 0.29$	$-0.90 \pm 0.29$

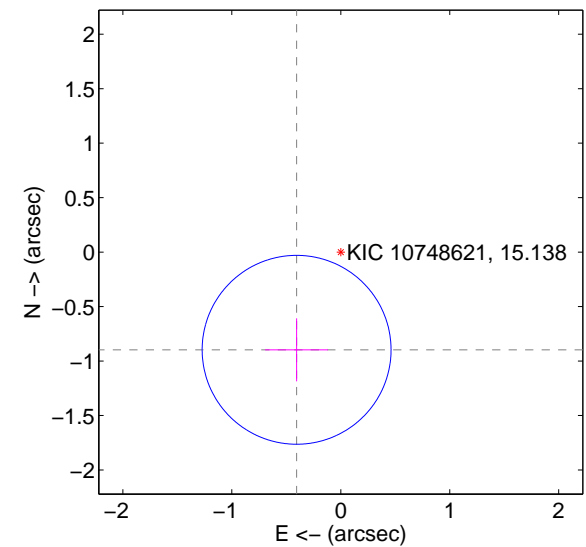
offset from difference PRF-fit to OOT PRF-fit



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

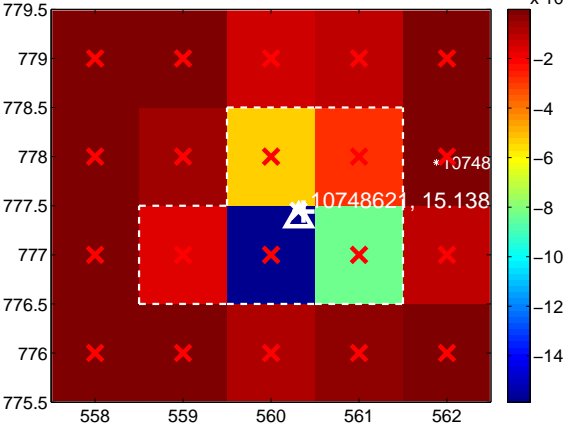
Q9 no difference image



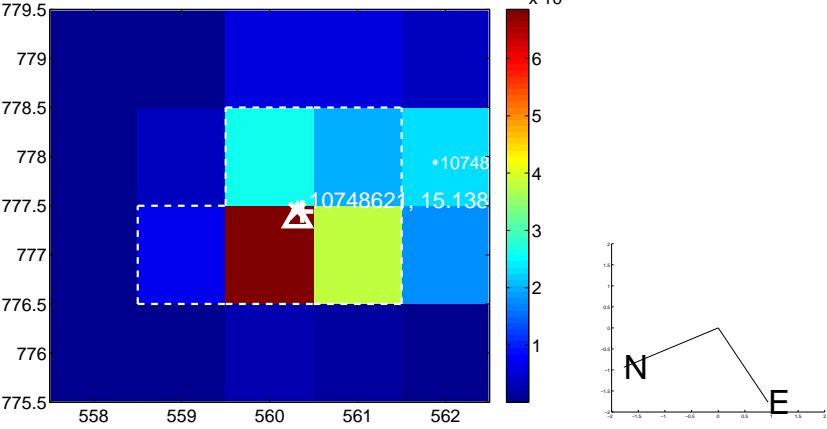
Q9 no OOT image



Q10 difference image. Poor Quality



Q10 OOT image



Q11 no difference image



Q11 no OOT image



Q12 no difference image



Q12 no OOT image



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

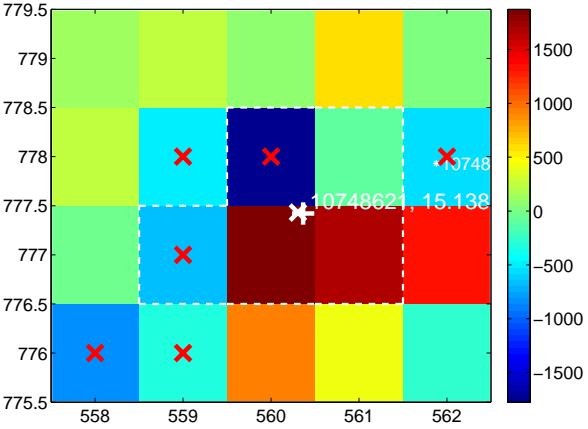
Q13 no difference image



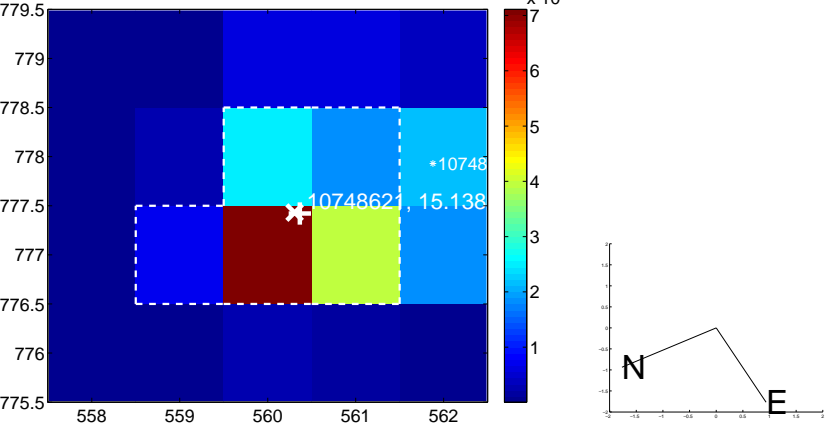
Q13 no OOT image



Q14 difference image. Poor Quality



Q14 OOT image



Q15 no difference image



Q15 no OOT image



Q16 no difference image

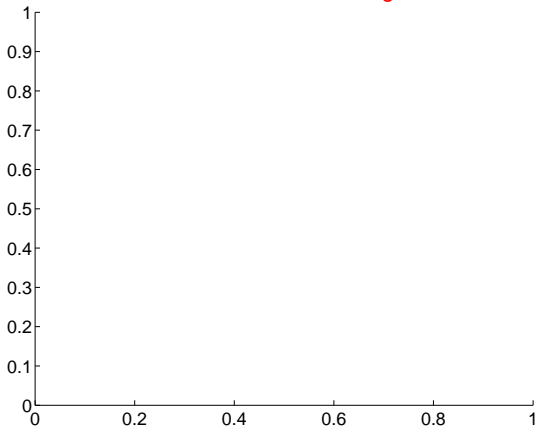


Q16 no OOT image

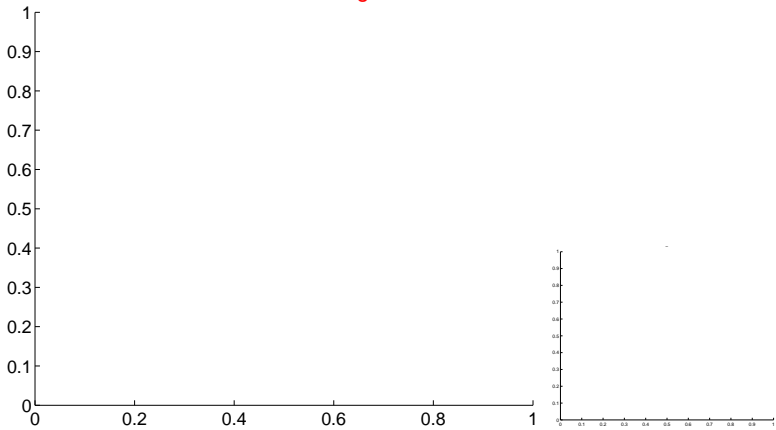


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

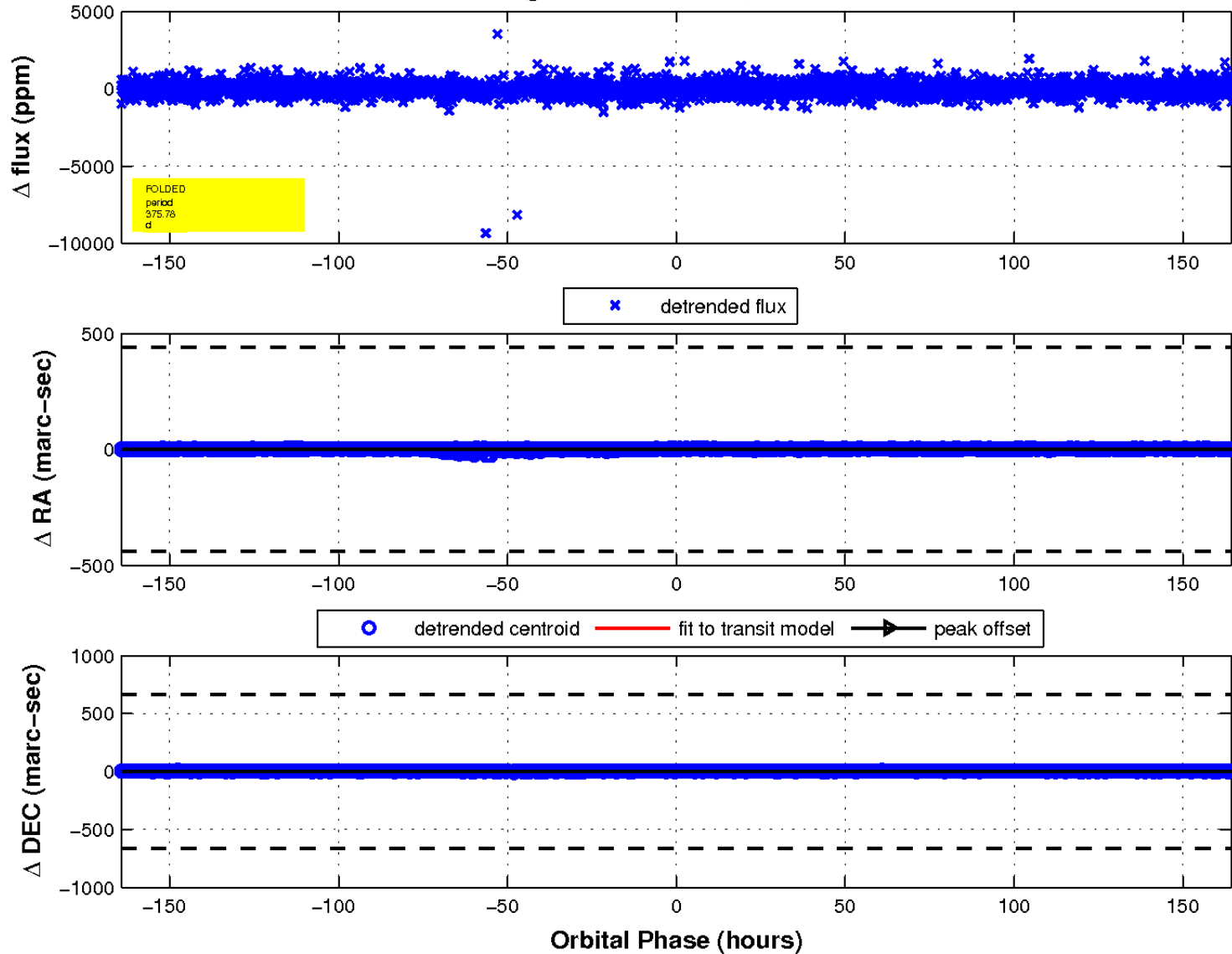
Q17 no difference image



Q17 no OOT image

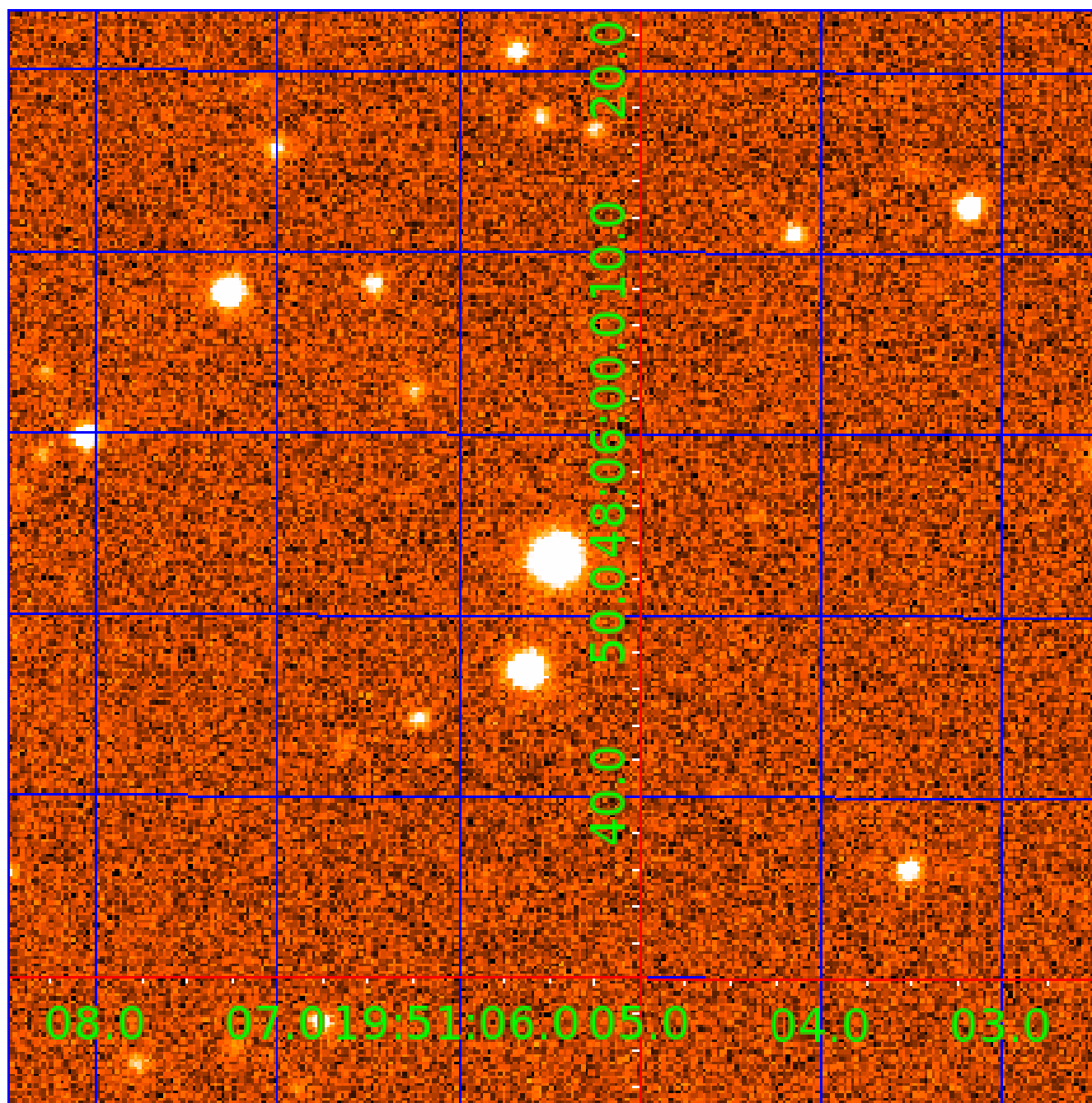


fluxWeightedCentroids, Planet 4 of 7



UKIRT Image

Declination



# KIC 010748621

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010748621-01	OBS	3532.01	286.178819	403.846076	275291.8	12.000	2970.0	-1.0	0.95	5904	40.97	1.38
010748621-02	OBS	No	286.172008	314.108692	336824.7	9.000	2456.1	-1.0	0.95	5904	42.65	1.38
010748621-03	OBS	No	412.527237	312.955679	1616.2	19.119	43.1	13.1	0.95	5904	6.20	0.85
010748621-04	OBS	No	375.775145	226.810165	1747.2	54.868	45.1	24.4	0.95	5904	7.50	0.96
010748621-05	OBS	No	369.557817	435.610411	1250.7	48.010	15.4	10.6	0.95	5904	6.42	0.98
010748621-06	OBS	No	427.123172	406.002780	2454.7	30.547	15.5	13.1	0.95	5904	6.95	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010748621-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010748621-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS
010748621-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-06	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

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

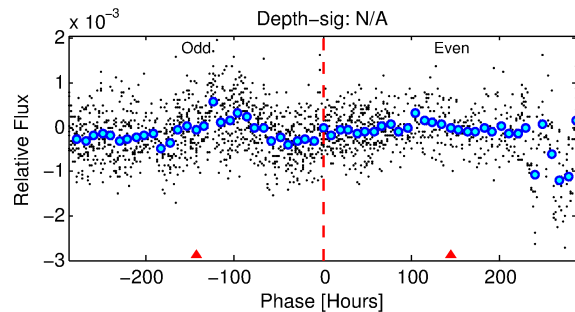
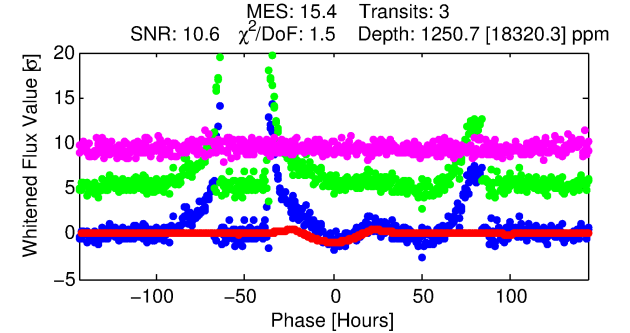
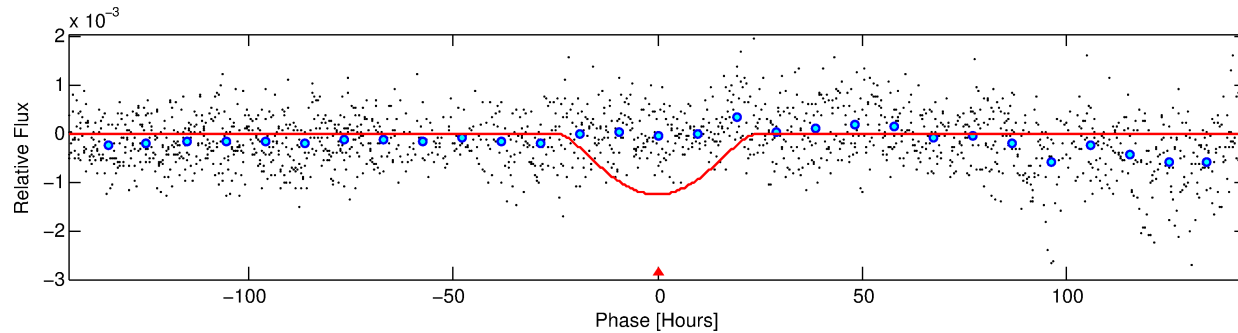
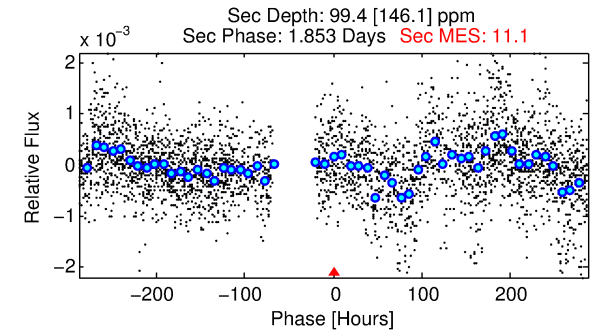
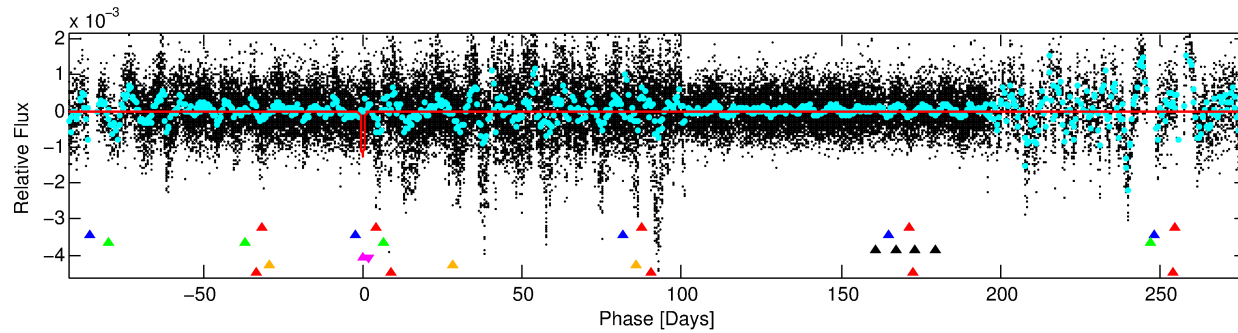
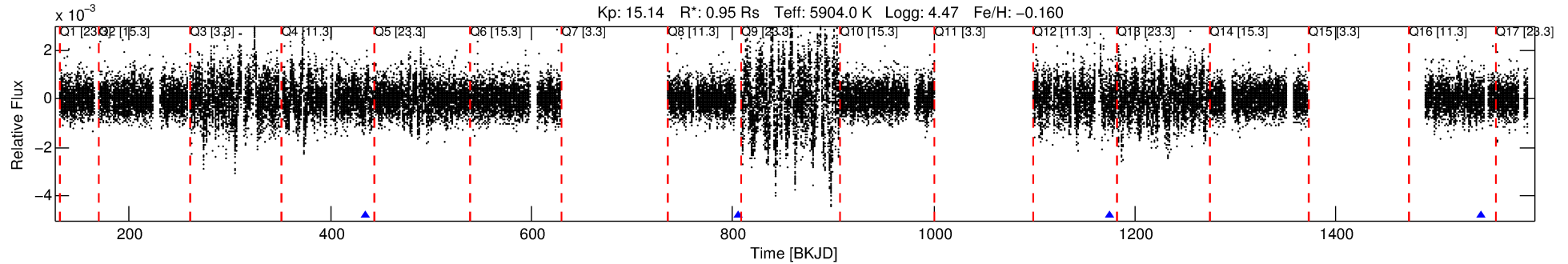
## Ephemeris Match Information For 010748621-05

No Significant Match Found

# DV One-Page Summary

KIC: 10748621 Candidate: 5 of 7 Period: 369.558 d  
KOI: K03532 Corr: No Ephemeris Match

Kp: 15.14 R\*: 0.95 Rs Teff: 5904.0 K Logg: 4.47 Fe/H: -0.160



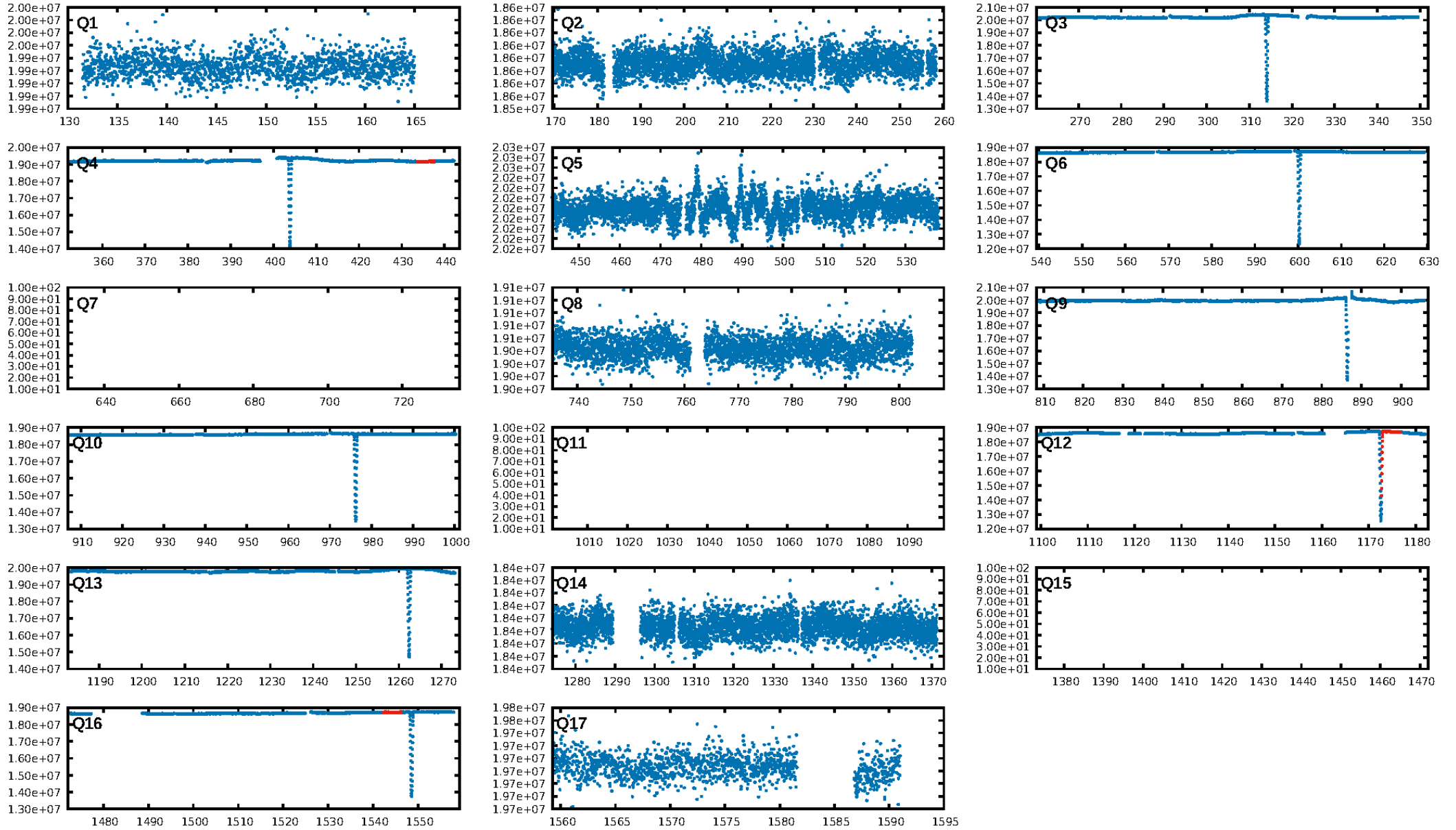
## DV Fit Results:

Period = 369.55782 [0.05080] d  
Epoch = 435.6104 [0.1264] BKJD  
Rp/R\* = 0.0621 [0.1794]  
a/R\* = 21.08 [14.03]  
b = 1.00 [0.36]  
Seff = 0.98 [0.39]  
Teq = 254 [25] K  
Rp = 6.42 [18.62] Re  
a = 0.9964 [0.2539] AU  
Ag = 1318.93 [7871.75] [0.17σ]  
Teffp = 2365 [3522] K [0.60σ]

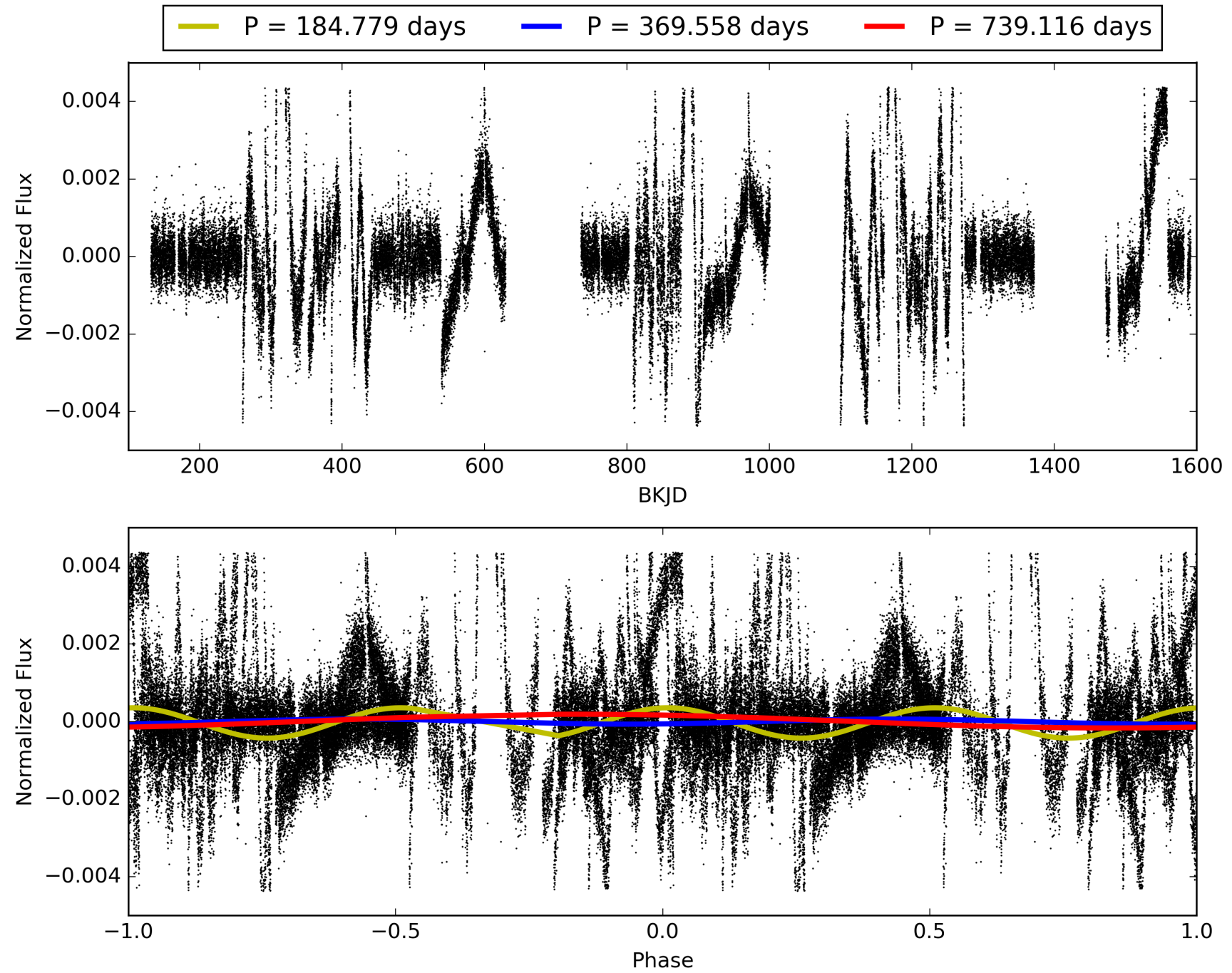
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [39.95σ]  
LongPeriod-sig: 95.9% [2.05σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGoF-sig: 76.3%  
Bootstrap-pfa: 1.82e-20  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.2548  
Centroid-sig: 9.4%  
Centroid-so: 1.273 arcsec [2.84σ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0/0 [0]  
KicOffset-st: 0/0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: N/A

# TCE 010748621-05, PDC Light Curves



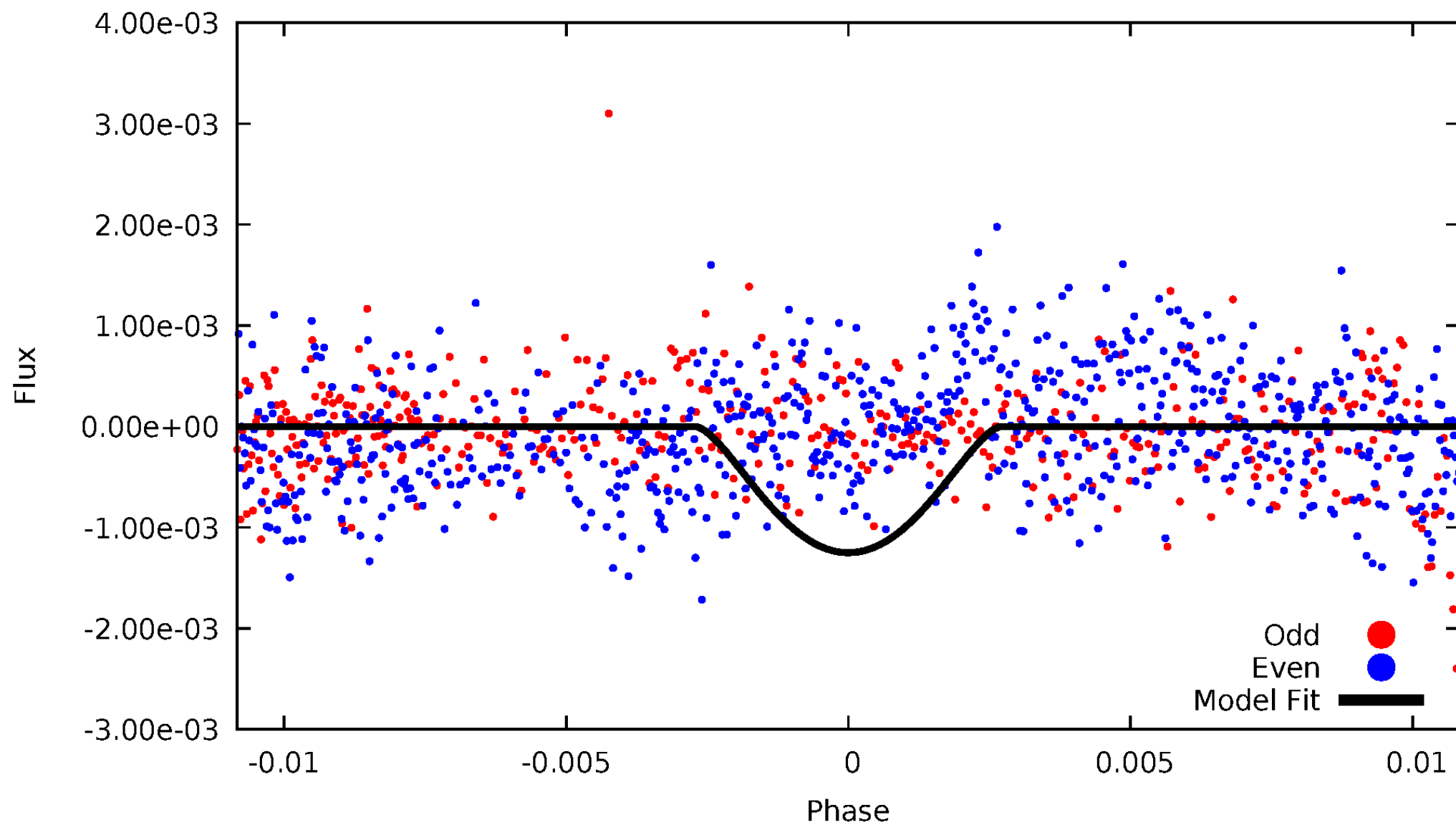
TCE 010748621-05





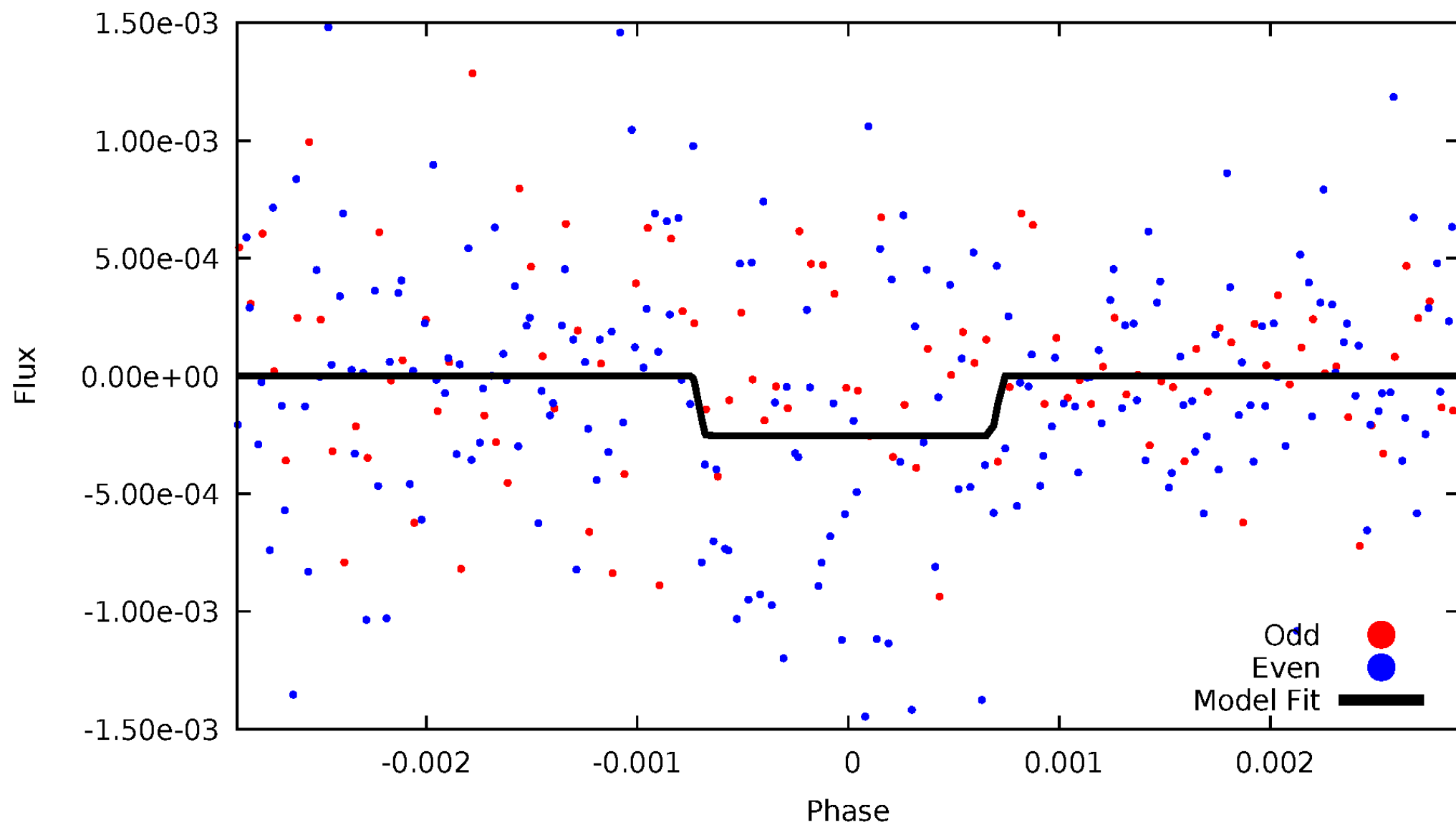
# DV Odd/Even

TCE 010748621-05



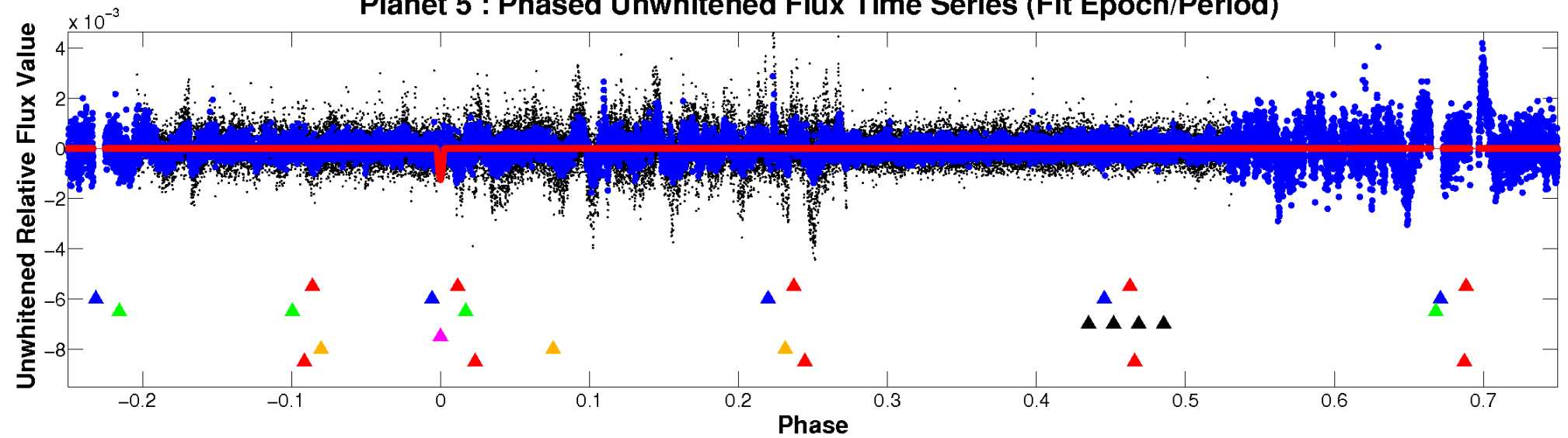
# ALT Odd/Even

TCE 010748621-05

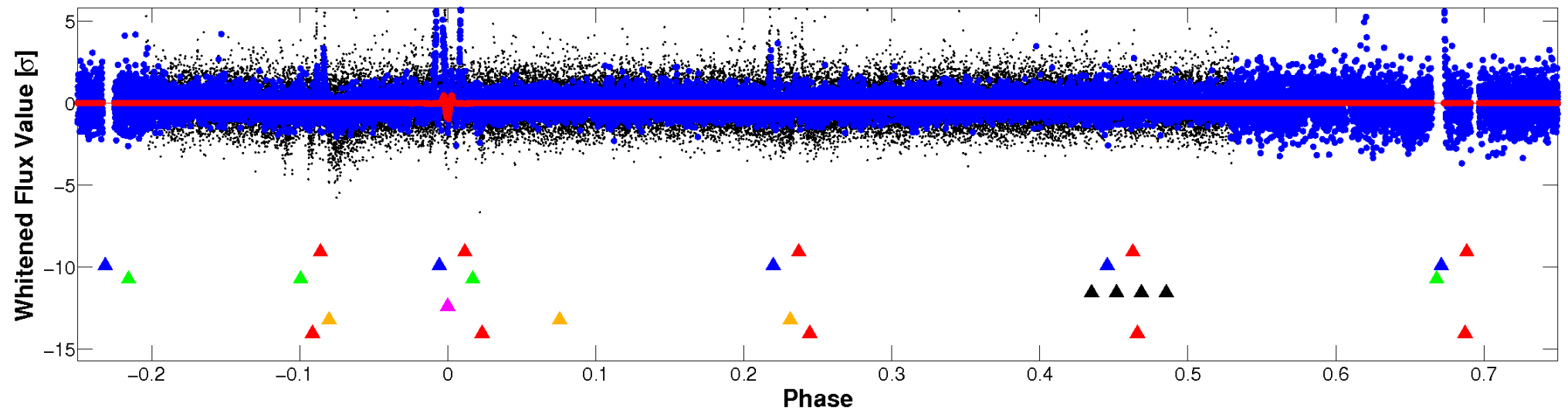


# Non-Whitened Vs. Whitened Light Curve

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

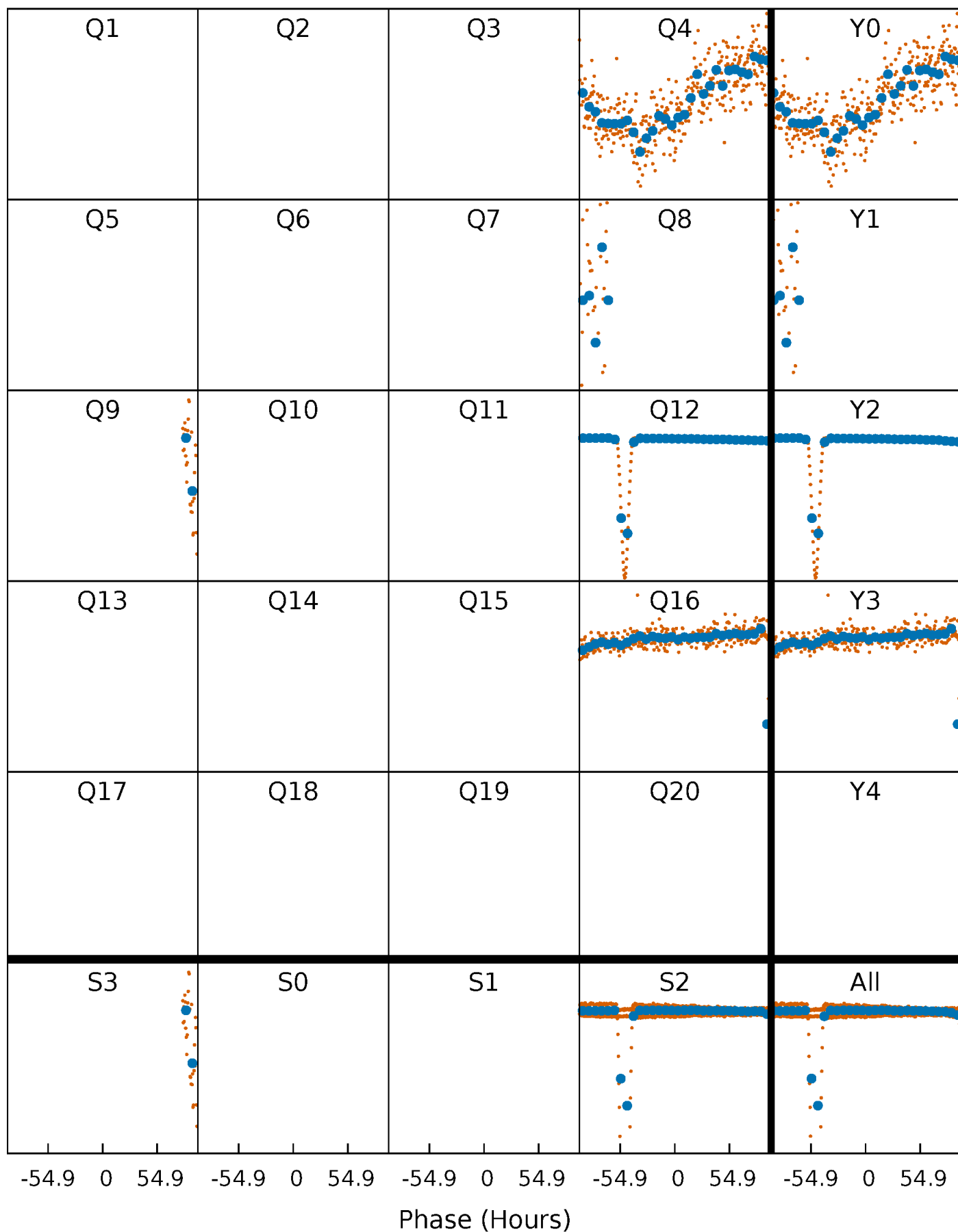


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



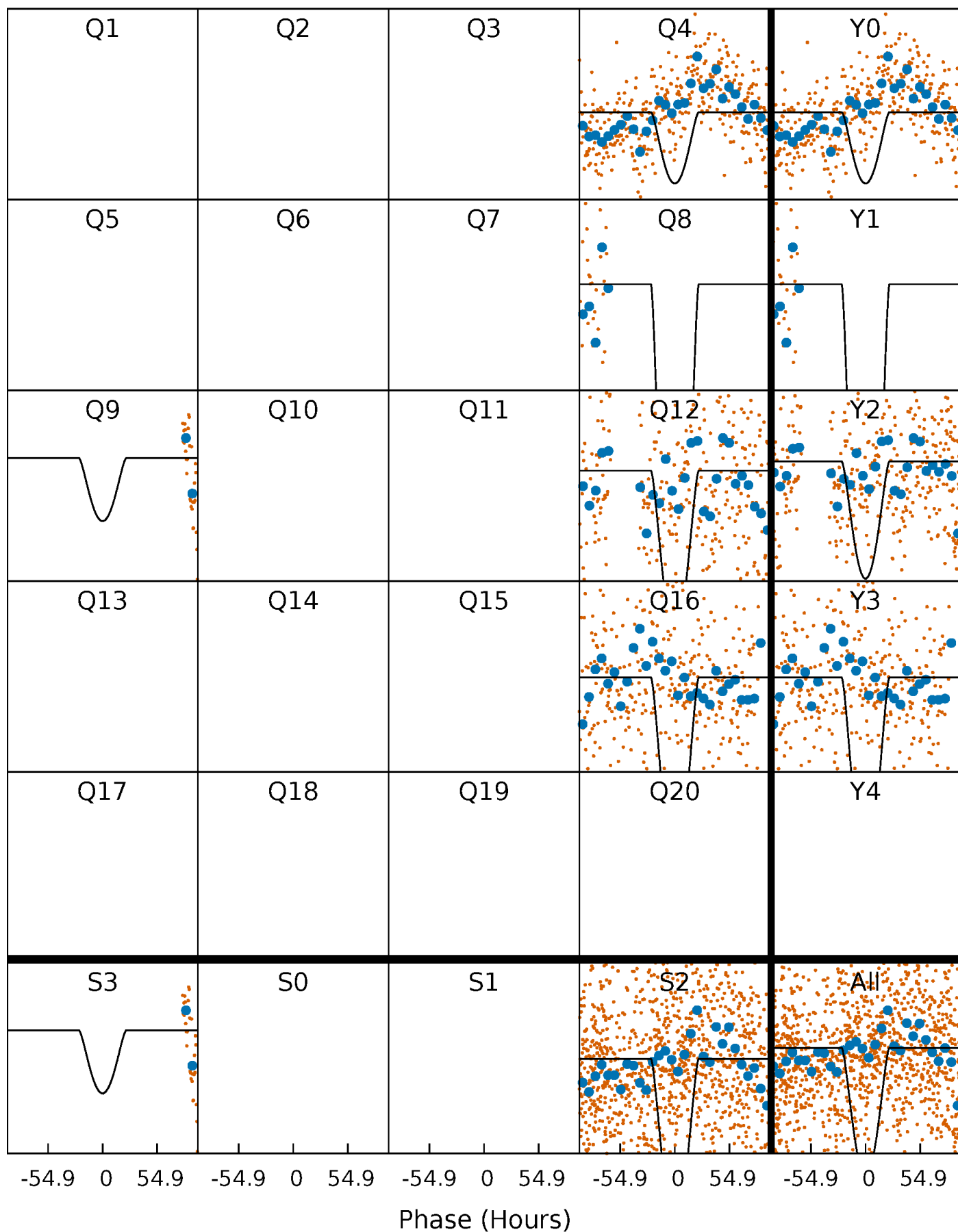
# PDC Quarter-Phased Transit Curves

TCE 010748621-05     $P=369.557817$  Days     $T_0=435.610411$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 010748621-05     $P=369.557817$  Days     $T_0=435.610411$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

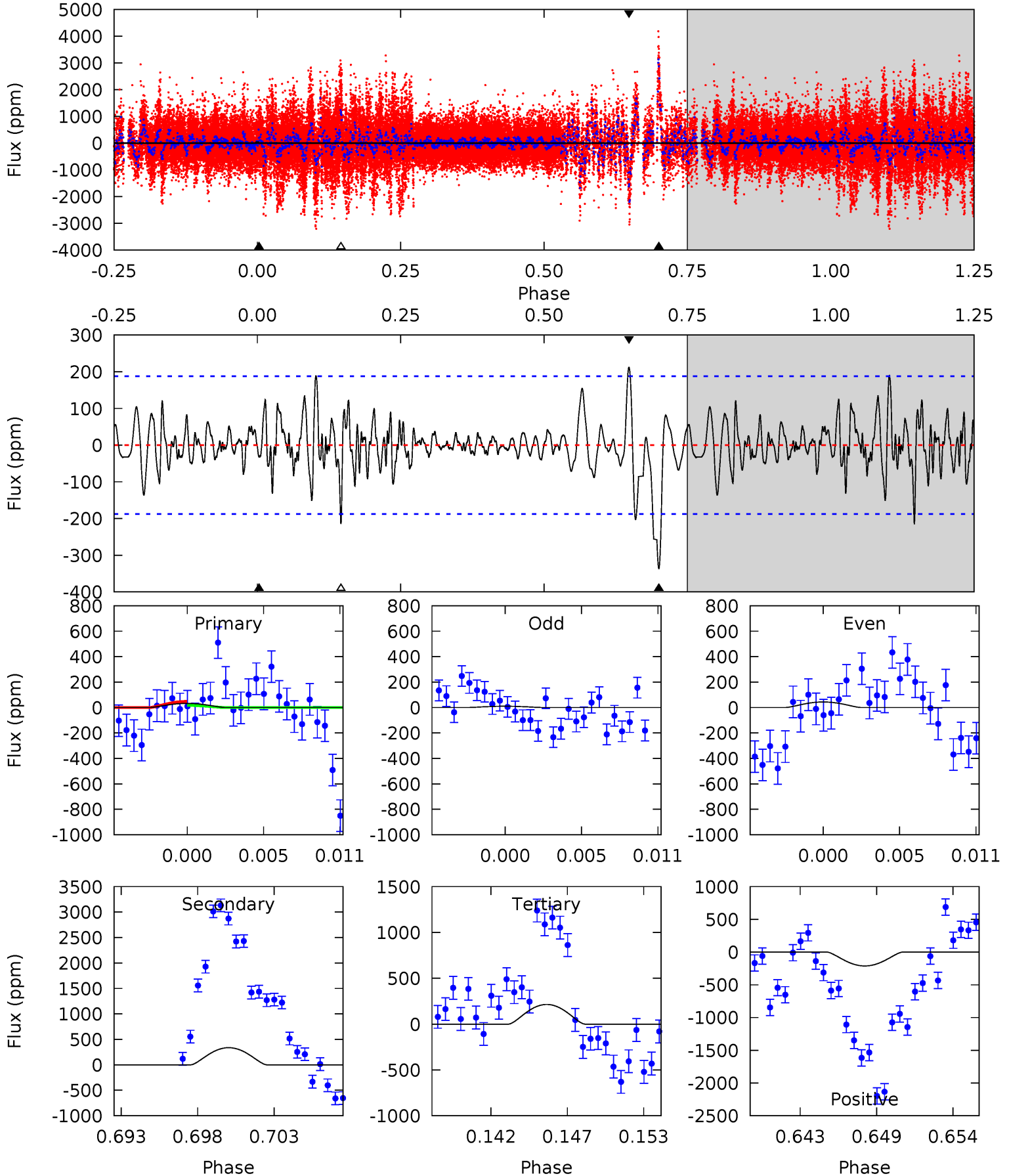
TCE 010748621-05     $P=369.554555$  Days     $T_0=435.628753$  (BKJD)



# DV Model-Shift Uniqueness Test

010748621-05, P = 369.557817 Days, E = 66.052594 Days

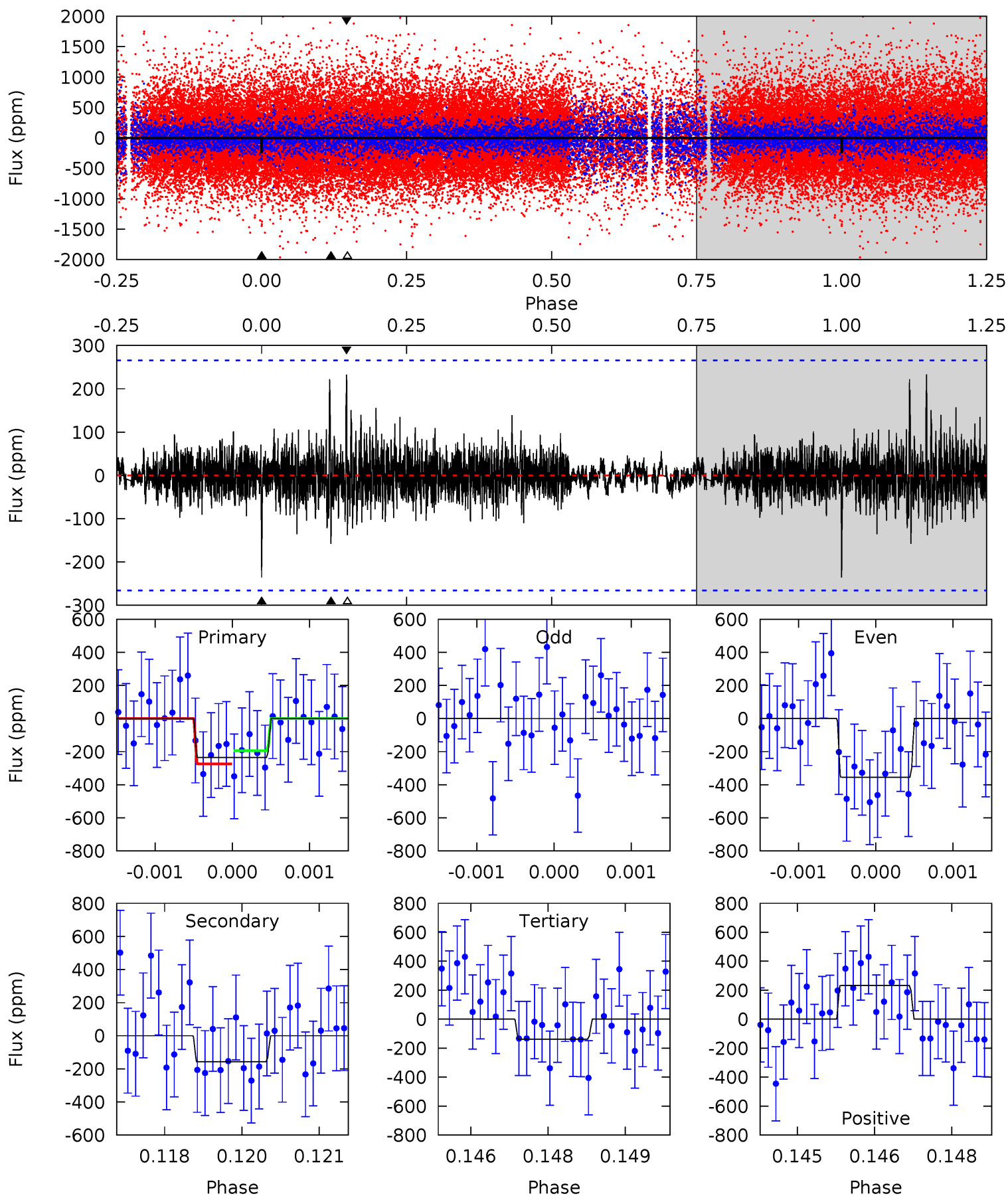
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.88	9.23	5.87	5.82	5.14	2.78	1.35	-4.98	-4.93	3.36	3.41	0.41	3.23	0.39	0.45



# Alt Model-Shift Uniqueness Test

010748621-05, P = 369.554555 Days, E = 66.074198 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
4.76	3.19	2.79	4.72	5.38	3.18	0.72	1.98	0.05	0.41	-1.53	3.41	-796.5	0.50	0.82





### Stellar Parameters For KIC 010748621

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5904^{+159}_{-195}$	$4.471^{+0.067}_{-0.202}$	$-0.160^{+0.300}_{-0.300}$	$0.946^{+0.287}_{-0.115}$	$0.966^{+0.120}_{-0.120}$	$1.606^{+0.550}_{-0.795}$
	+3%/-3%	+1%/-5%	+188%/-188%	+30%/-12%	+12%/-12%	+34%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 010748621-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-337 \pm 36$	$16.04^{+16.29}_{-11.30}$	$361^{+26}_{-19}$	$2812^{+1402}_{-456}$	$718^{+7739}_{-535}$
Alt.	$-158 \pm 49$	$14.24^{+15.48}_{-9.69}$	$362^{+26}_{-19}$	$2619^{+1056}_{-432}$	$412^{+3793}_{-319}$

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

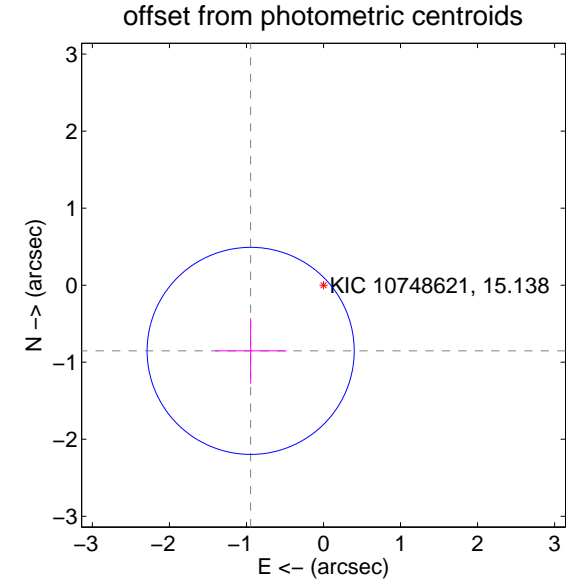
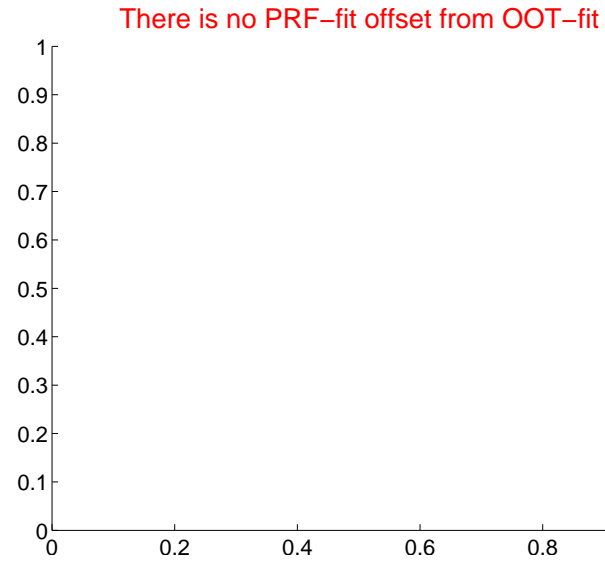
## DV Centroid Data

Supplemental centroid analysis for 010748621-05. Kepler magnitude: 15.14. Transit SNR 10.56

There are 0 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$1.27 \pm 0.45$	2.84	$0.95 \pm 0.47$	$-0.85 \pm 0.42$



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.



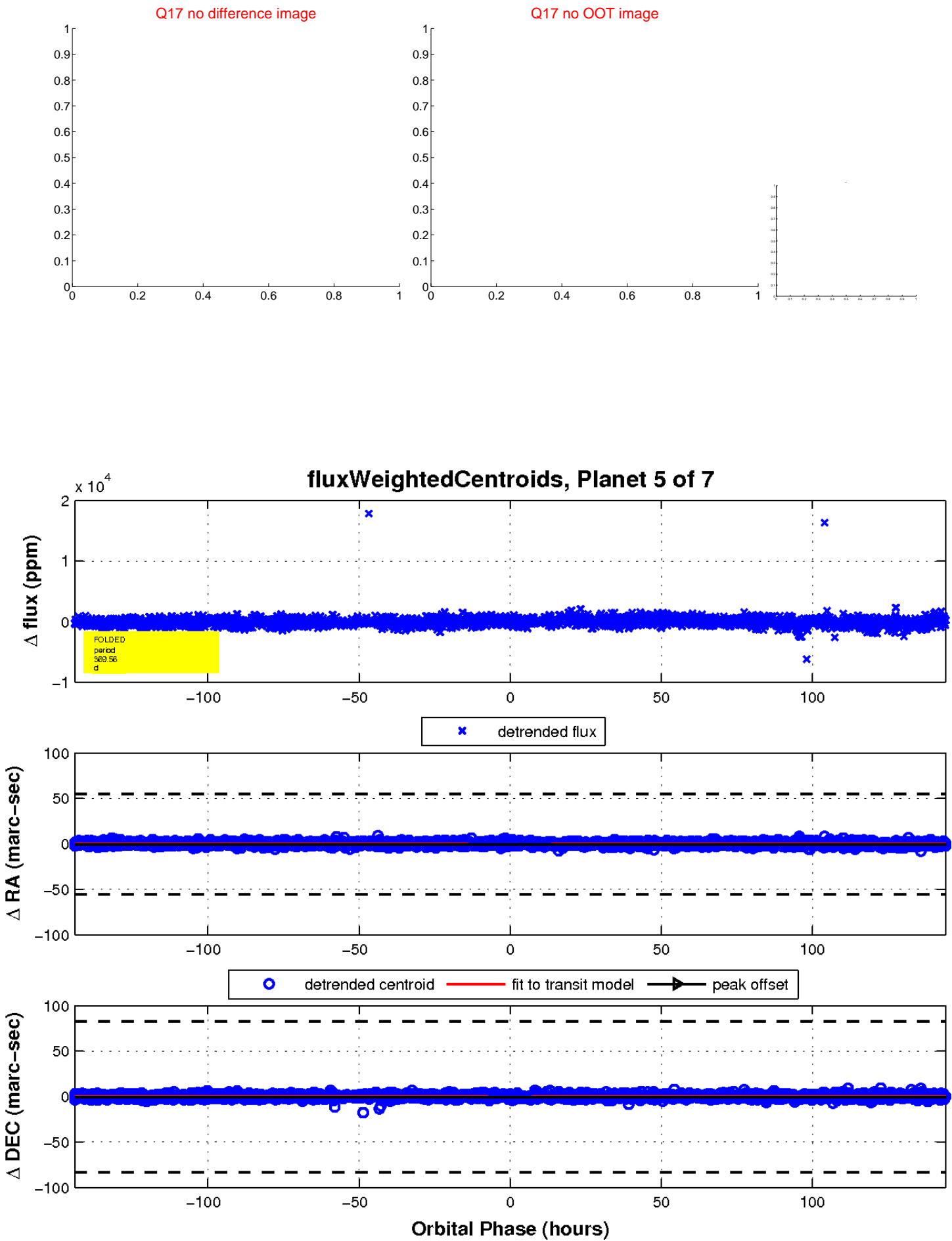
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

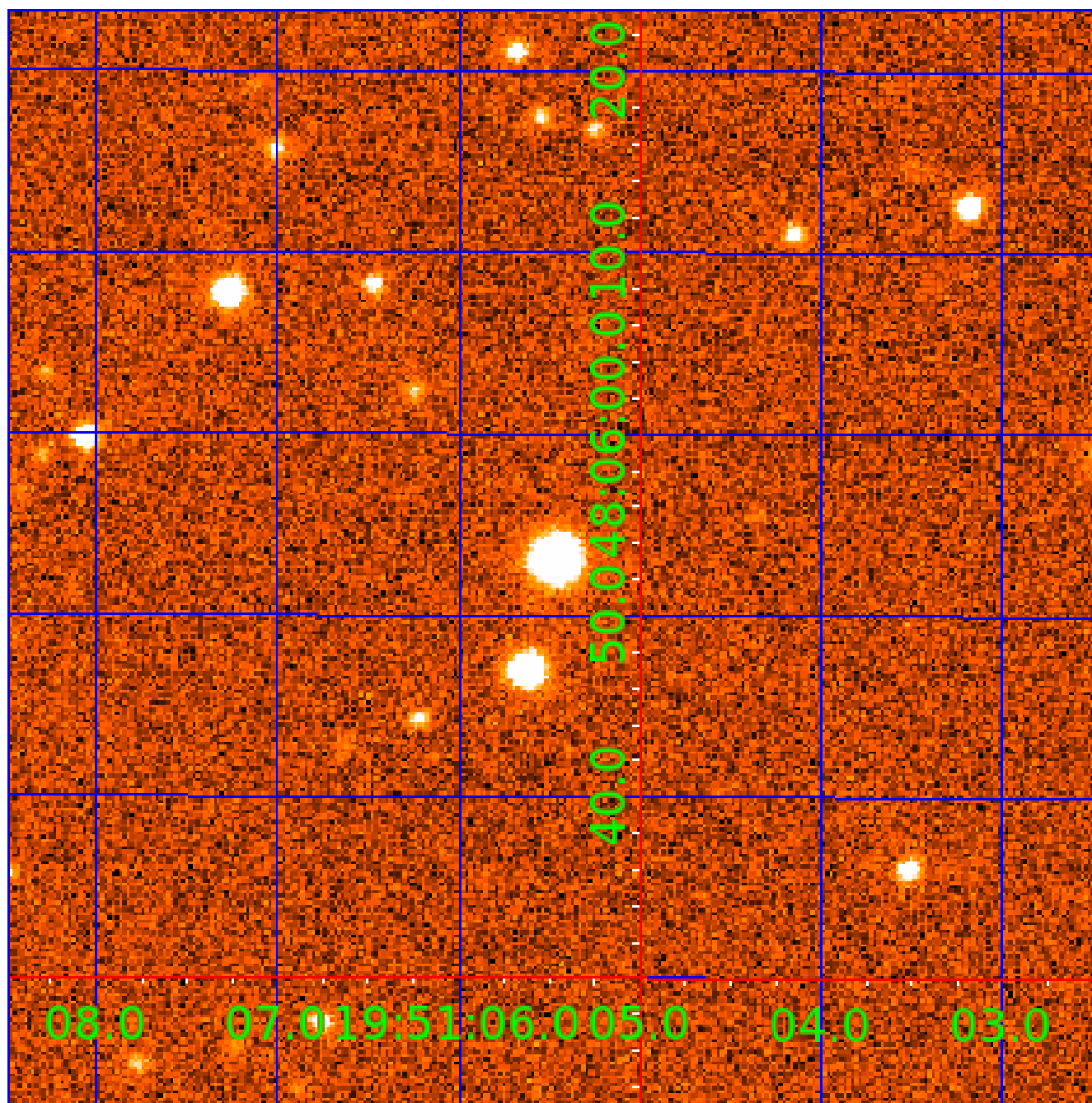


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 010748621

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010748621-01	OBS	3532.01	286.178819	403.846076	275291.8	12.000	2970.0	-1.0	0.95	5904	40.97	1.38
010748621-02	OBS	No	286.172008	314.108692	336824.7	9.000	2456.1	-1.0	0.95	5904	42.65	1.38
010748621-03	OBS	No	412.527237	312.955679	1616.2	19.119	43.1	13.1	0.95	5904	6.20	0.85
010748621-04	OBS	No	375.775145	226.810165	1747.2	54.868	45.1	24.4	0.95	5904	7.50	0.96
010748621-05	OBS	No	369.557817	435.610411	1250.7	48.010	15.4	10.6	0.95	5904	6.42	0.98
010748621-06	OBS	No	427.123172	406.002780	2454.7	30.547	15.5	13.1	0.95	5904	6.95	0.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010748621-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_ALT—HAS_SEC_TCE—CENT_NOFITS
010748621-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS
010748621-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010748621-06	OBS	FP	0.00	1	0	0	0	LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

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

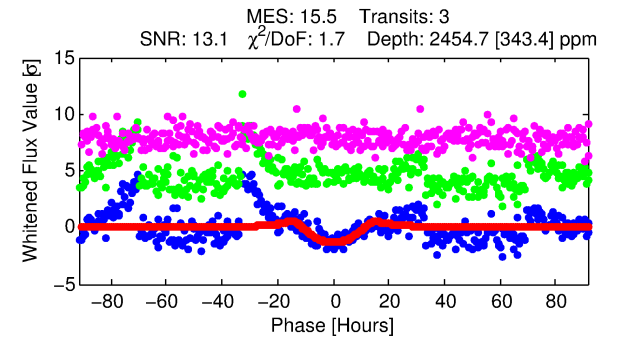
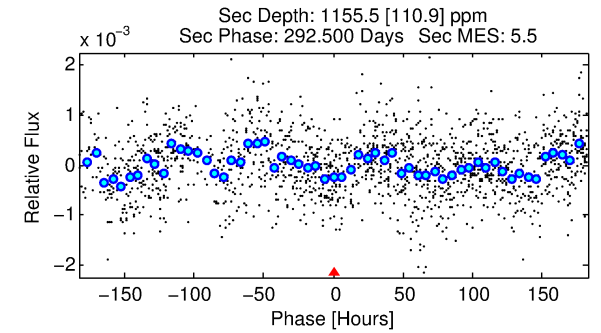
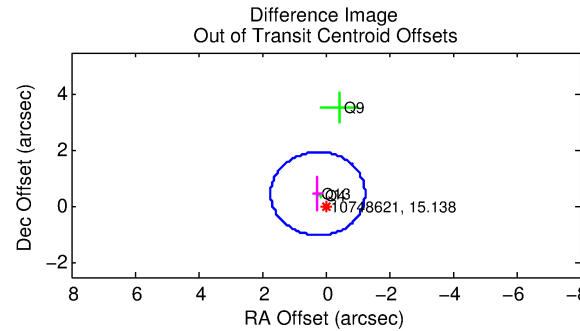
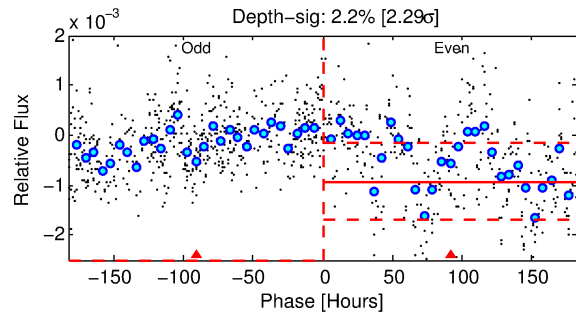
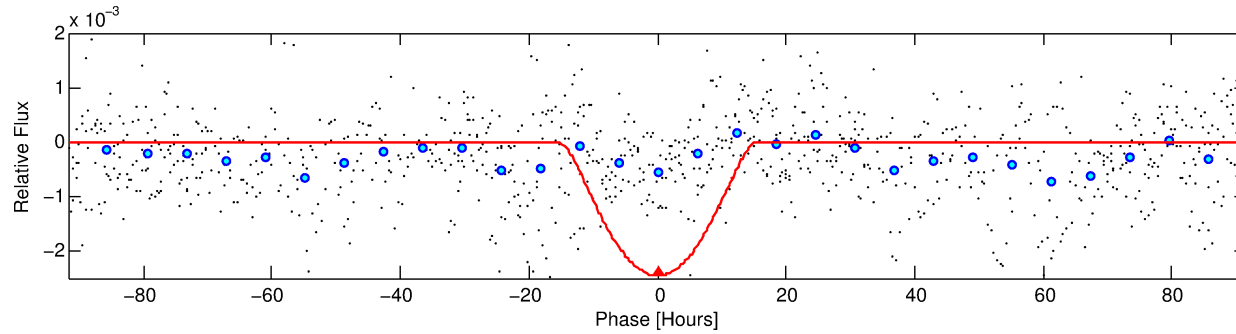
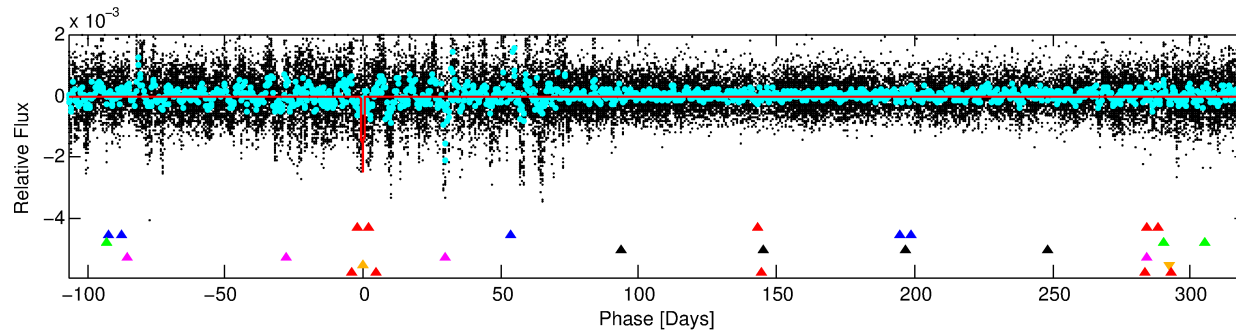
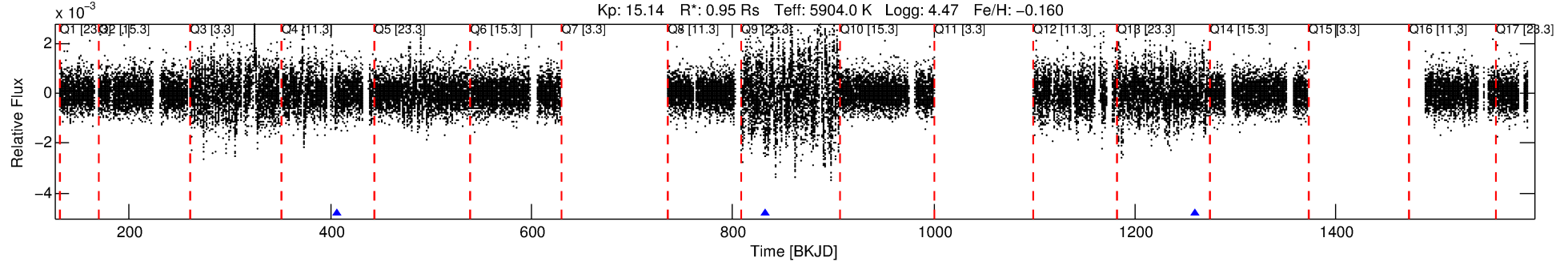
## Ephemeris Match Information For 010748621-06

No Significant Match Found

# DV One-Page Summary

KIC: 10748621 Candidate: 6 of 7 Period: 427.123 d  
KOI: K03532 Corr: No Ephemeris Match

Kp: 15.14 R\*: 0.95 Rs Teff: 5904.0 K Logg: 4.47 Fe/H: -0.160



## DV Fit Results:

Period = 427.12317 [0.03638] d  
Epoch = 406.0028 [0.0360] BKJD  
Rp/R\* = 0.0673 [0.0613]  
a/R\* = 47.40 [15.13]  
b = 0.97 [0.11]  
Seff = 0.81 [0.32]  
Teq = 242 [24] K  
Rp = 6.95 [6.67] Re  
a = 1.0973 [0.2796] AU  
Ag = 15836.84 [29472.60] [0.54σ]  
Teff = 4195 [1918] K [2.06σ]

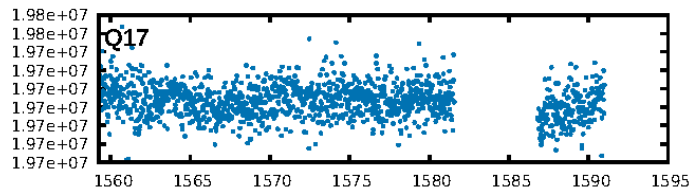
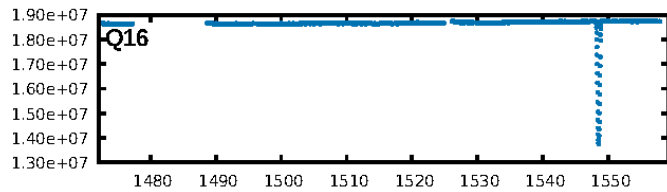
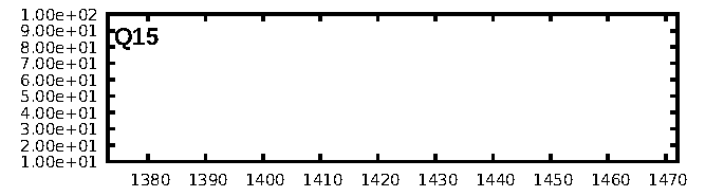
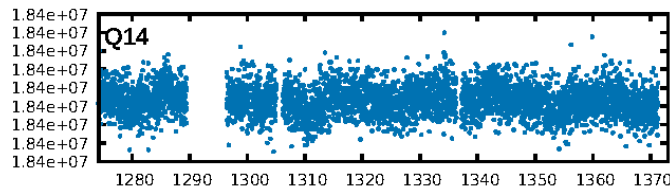
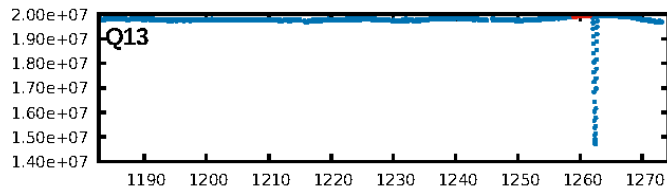
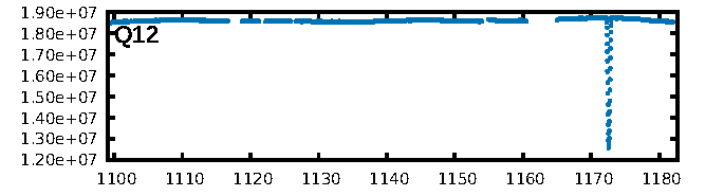
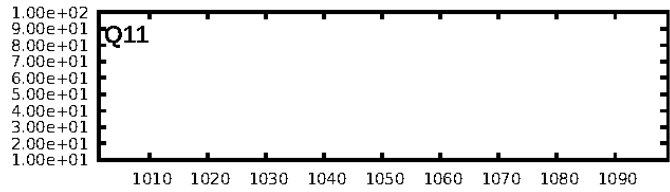
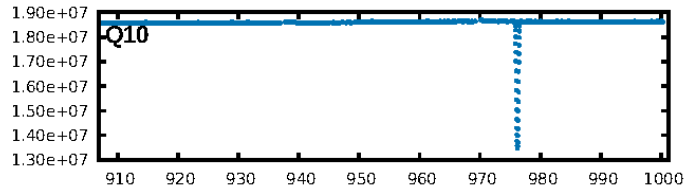
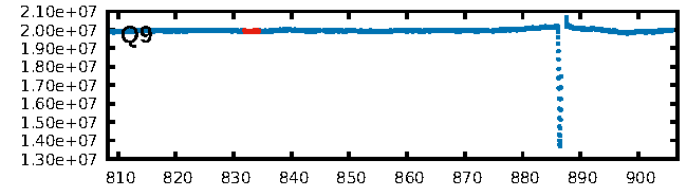
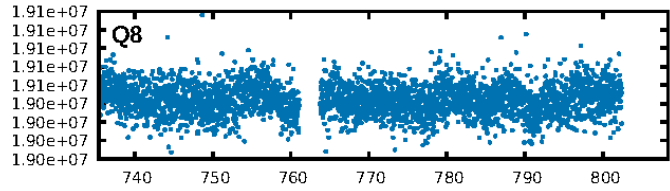
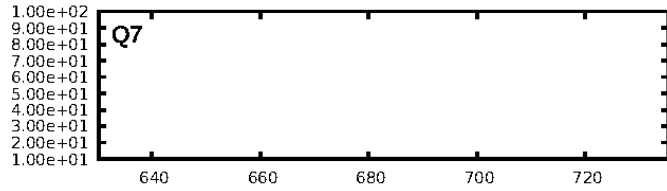
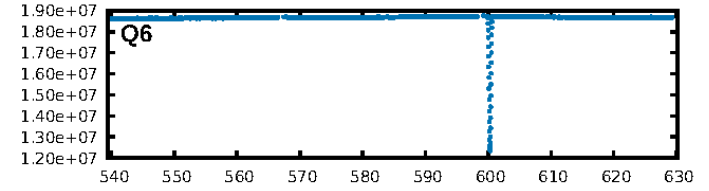
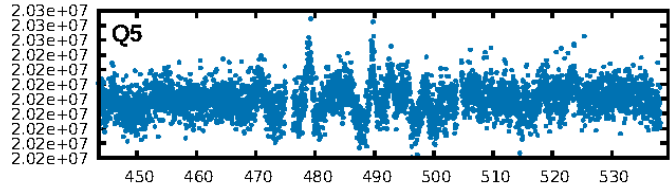
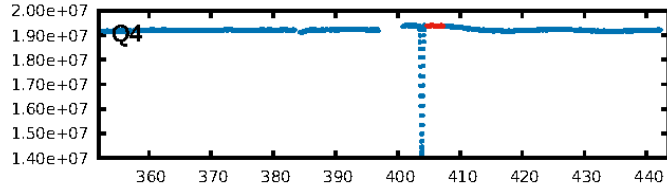
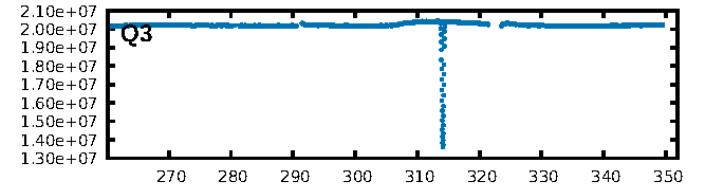
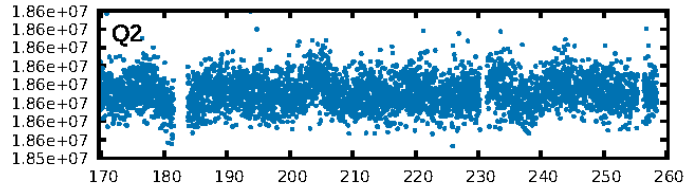
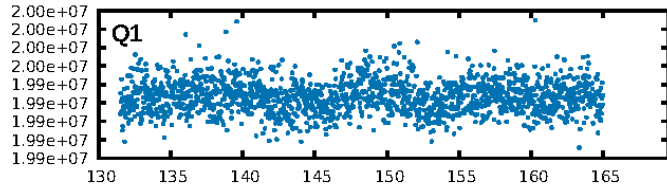
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [9.72σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGof-sig: 92.1%  
Bootstrap-pfa: 1.44e-23  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 2.193  
Centroid-sig: 97.5%  
Centroid-so: 1.226 arcsec [3.95σ]  
OotOffset-rm: 0.523 arcsec [1.06σ]  
KicOffset-rm: 0.262 arcsec [0.99σ]  
OotOffset-st: 0/0/1/2 [3]  
KicOffset-st: 0/0/1/2 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 0.33 [1/3]

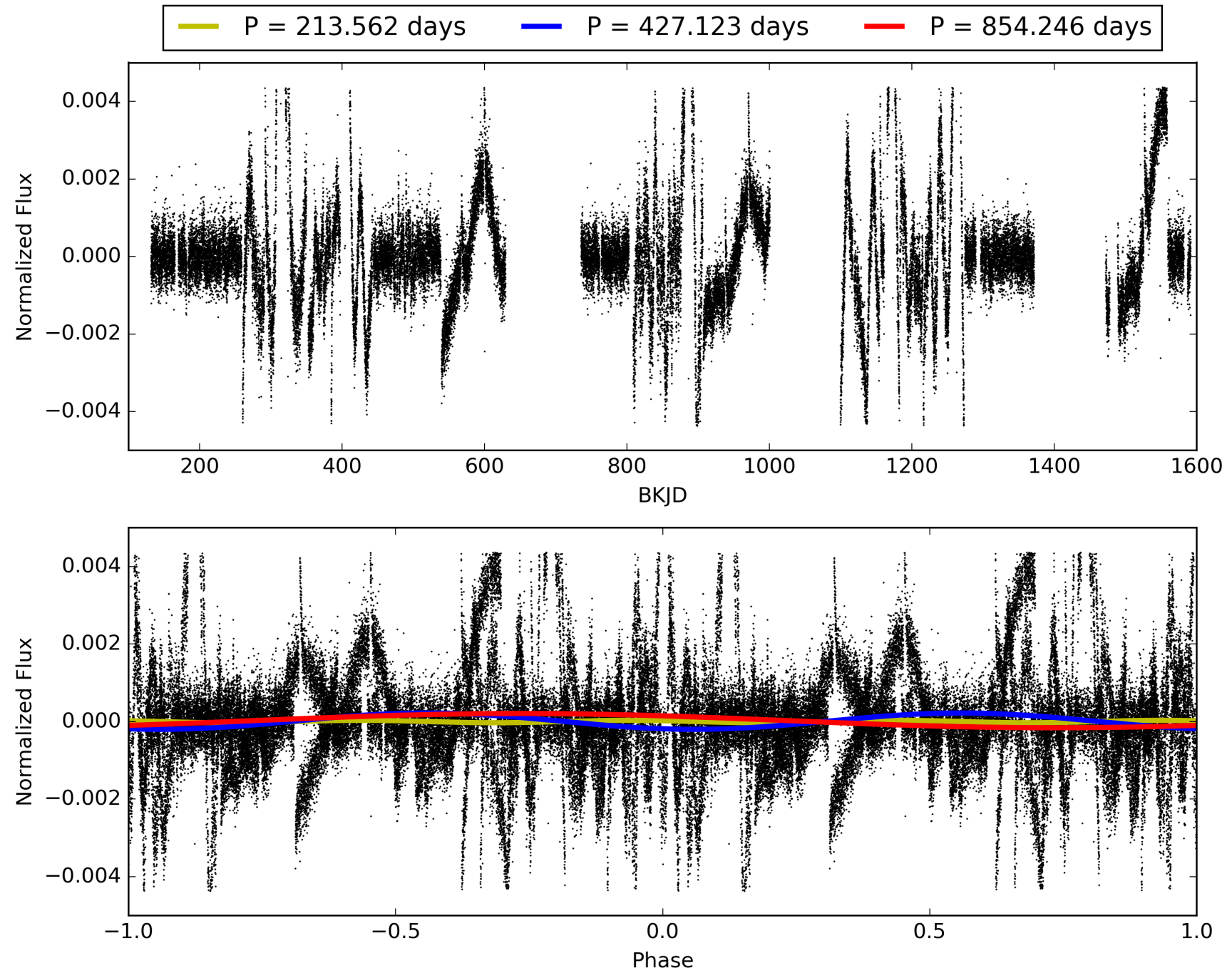
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 05:48:15 Z

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

## TCE 010748621-06, PDC Light Curves

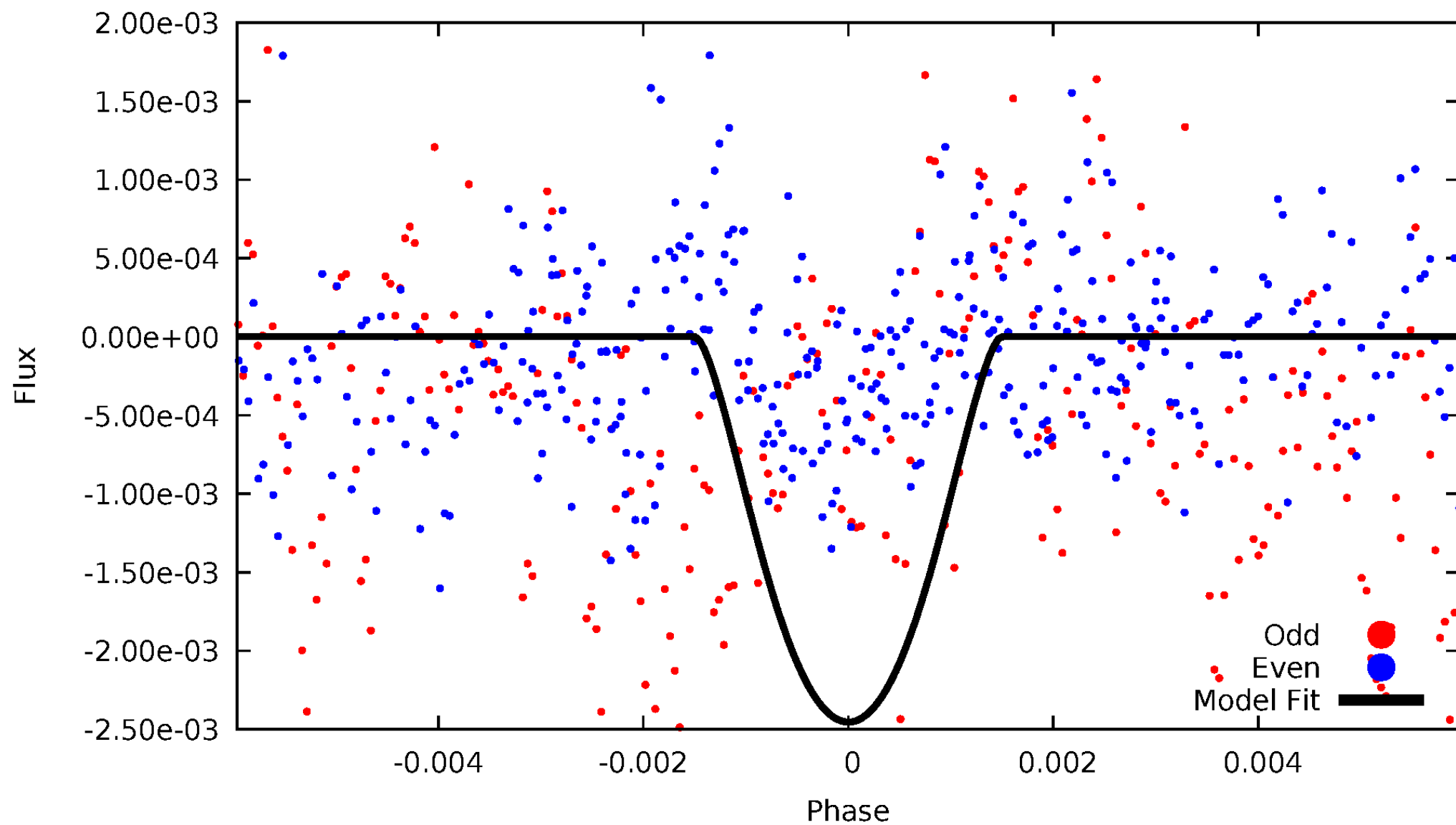


TCE 010748621-06



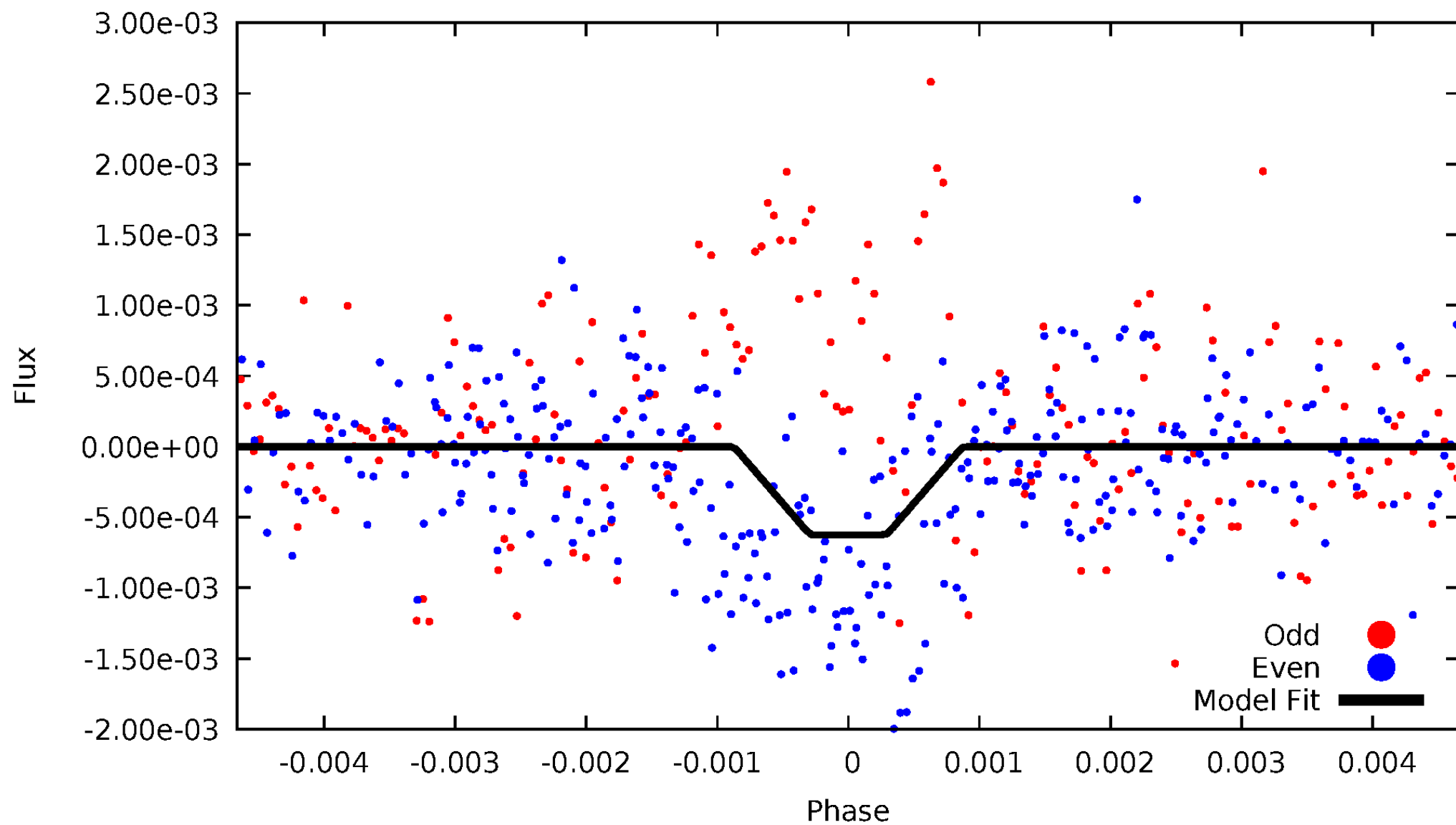
# DV Odd/Even

TCE 010748621-06



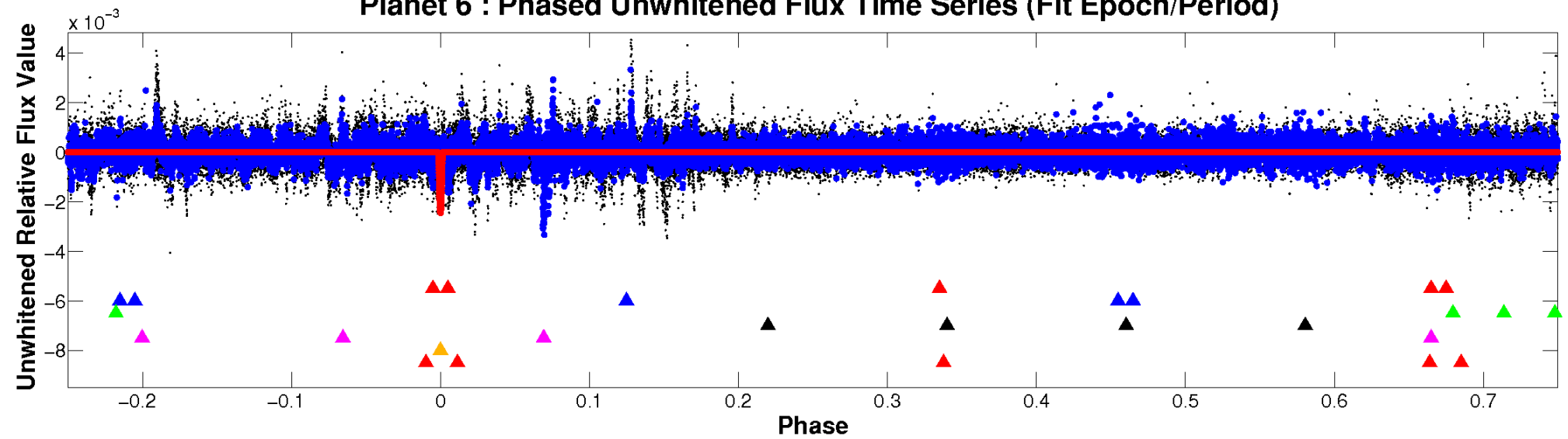
# ALT Odd/Even

TCE 010748621-06

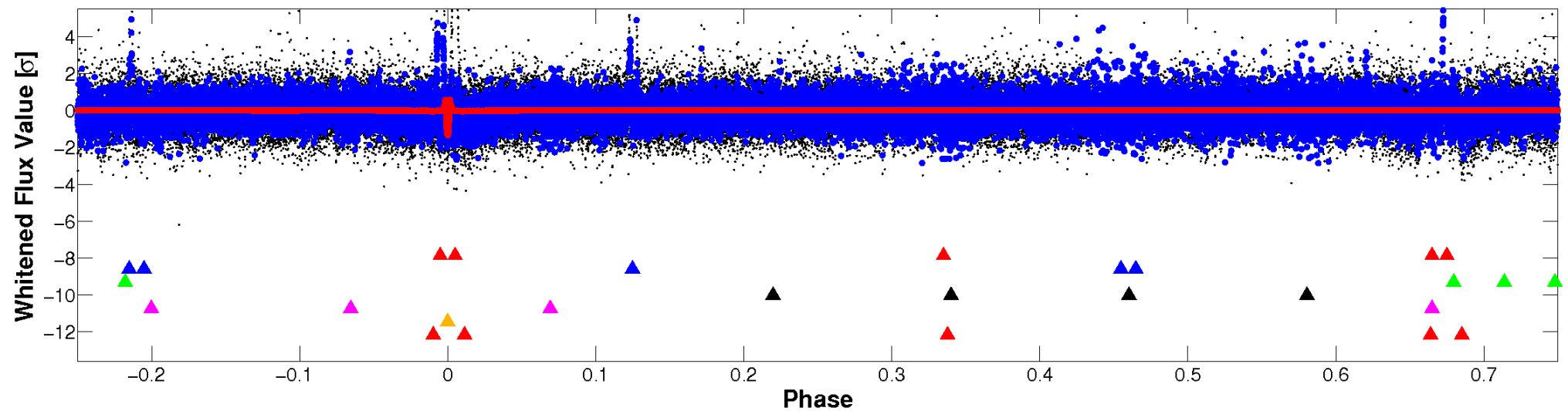


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

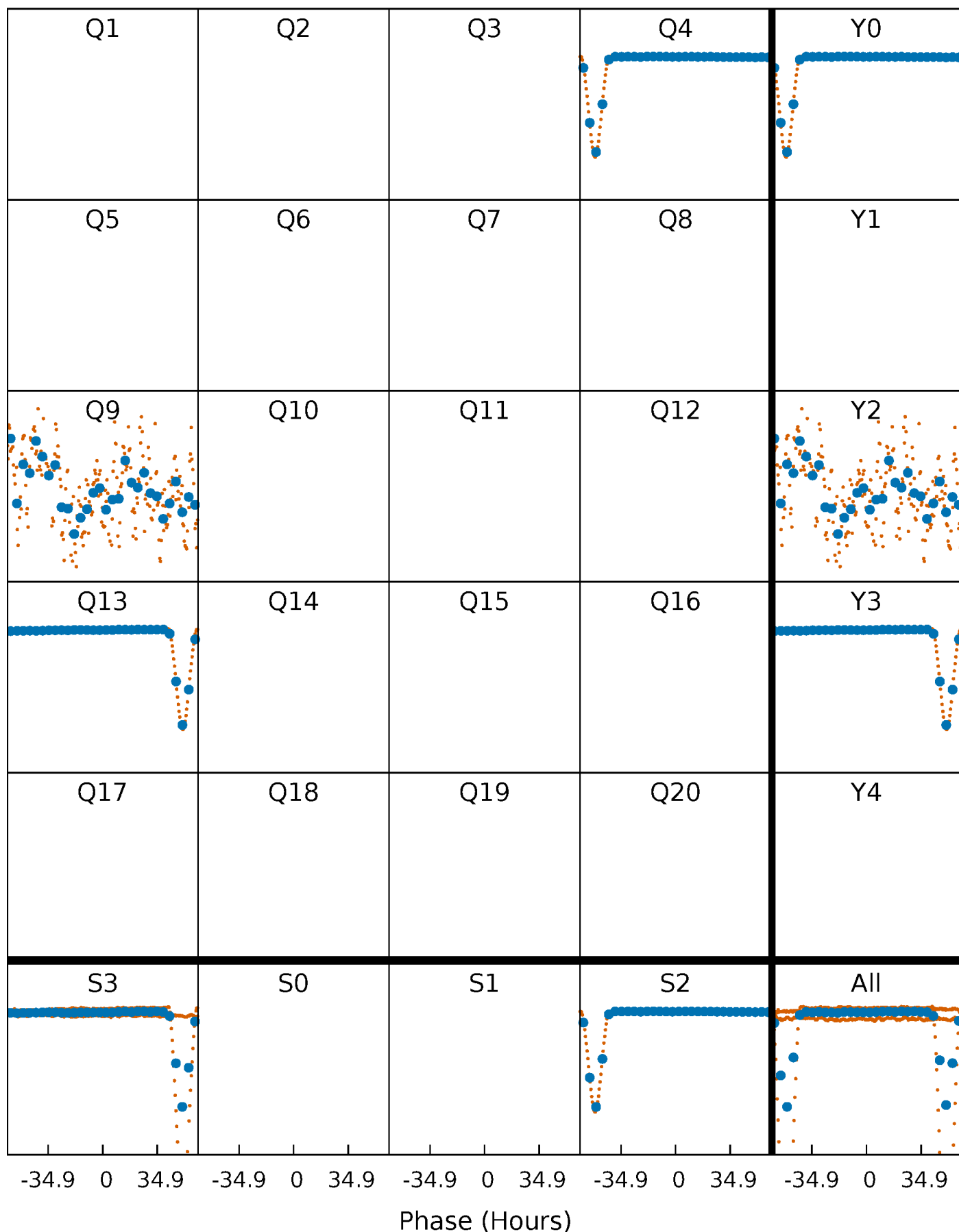


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

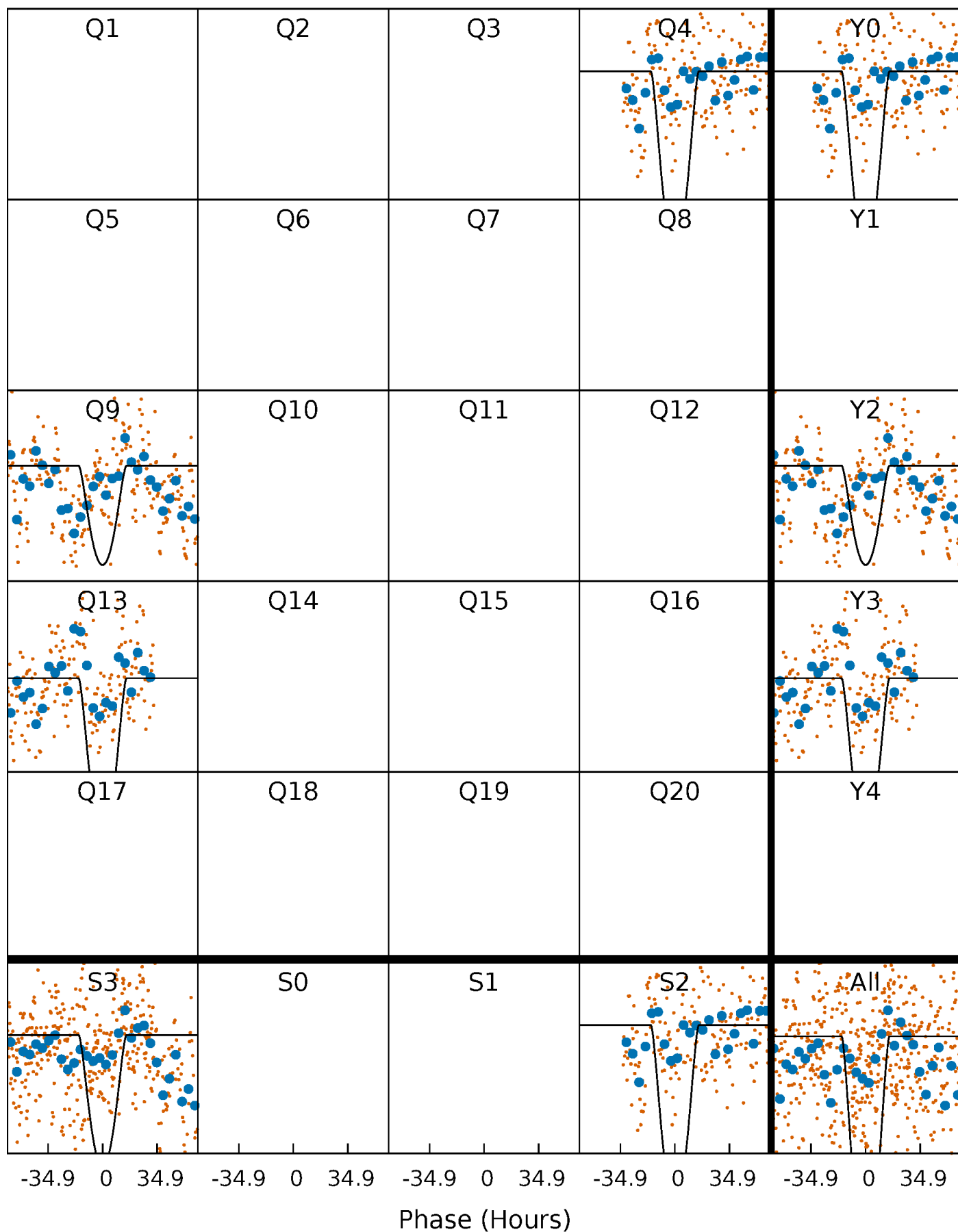
TCE 010748621-06     $P=427.123172$  Days     $T_0=406.002780$  (BKJD)





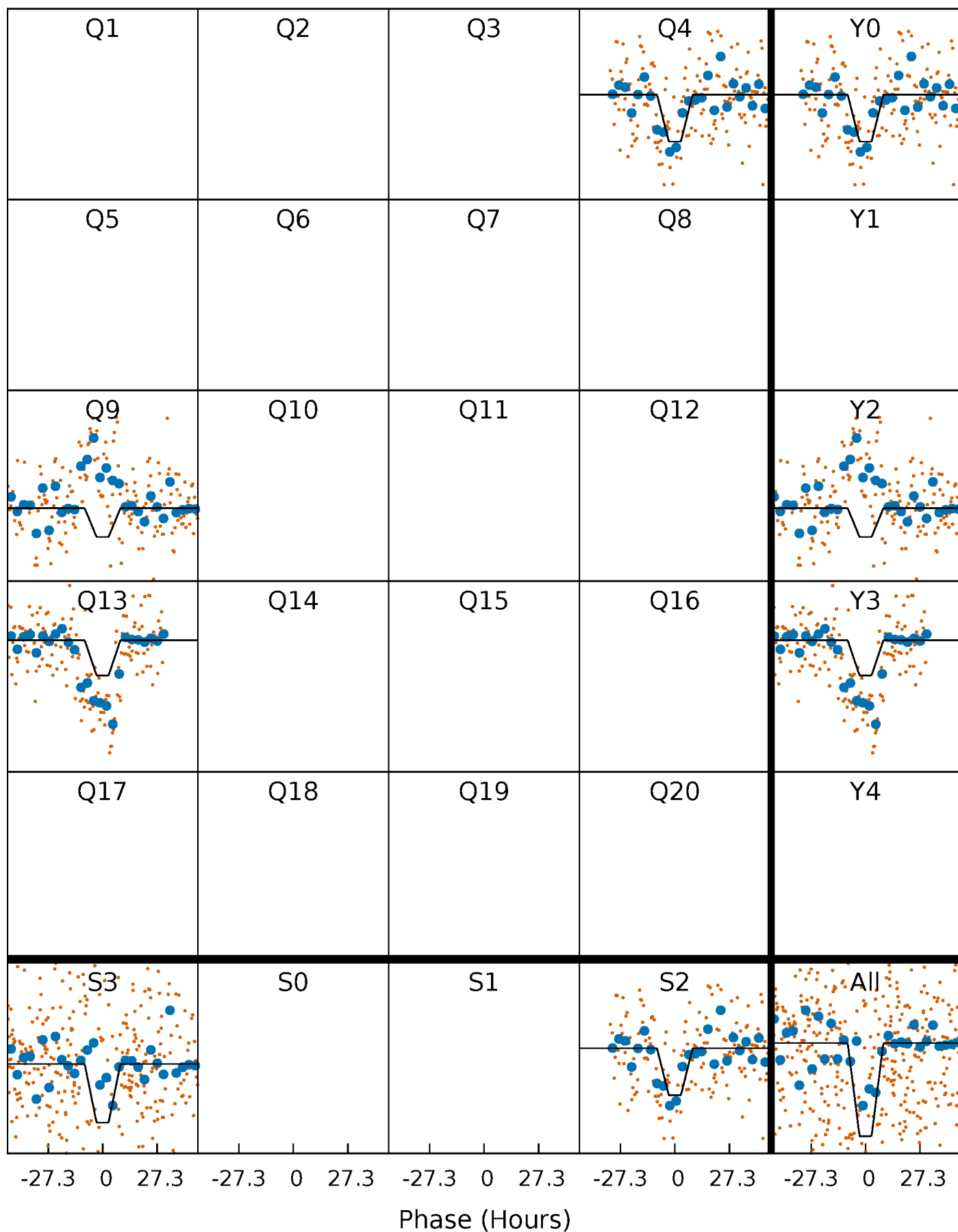
# DV Quarter-Phased Transit Curves

TCE 010748621-06     $P=427.123172$  Days     $T_0=406.002780$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

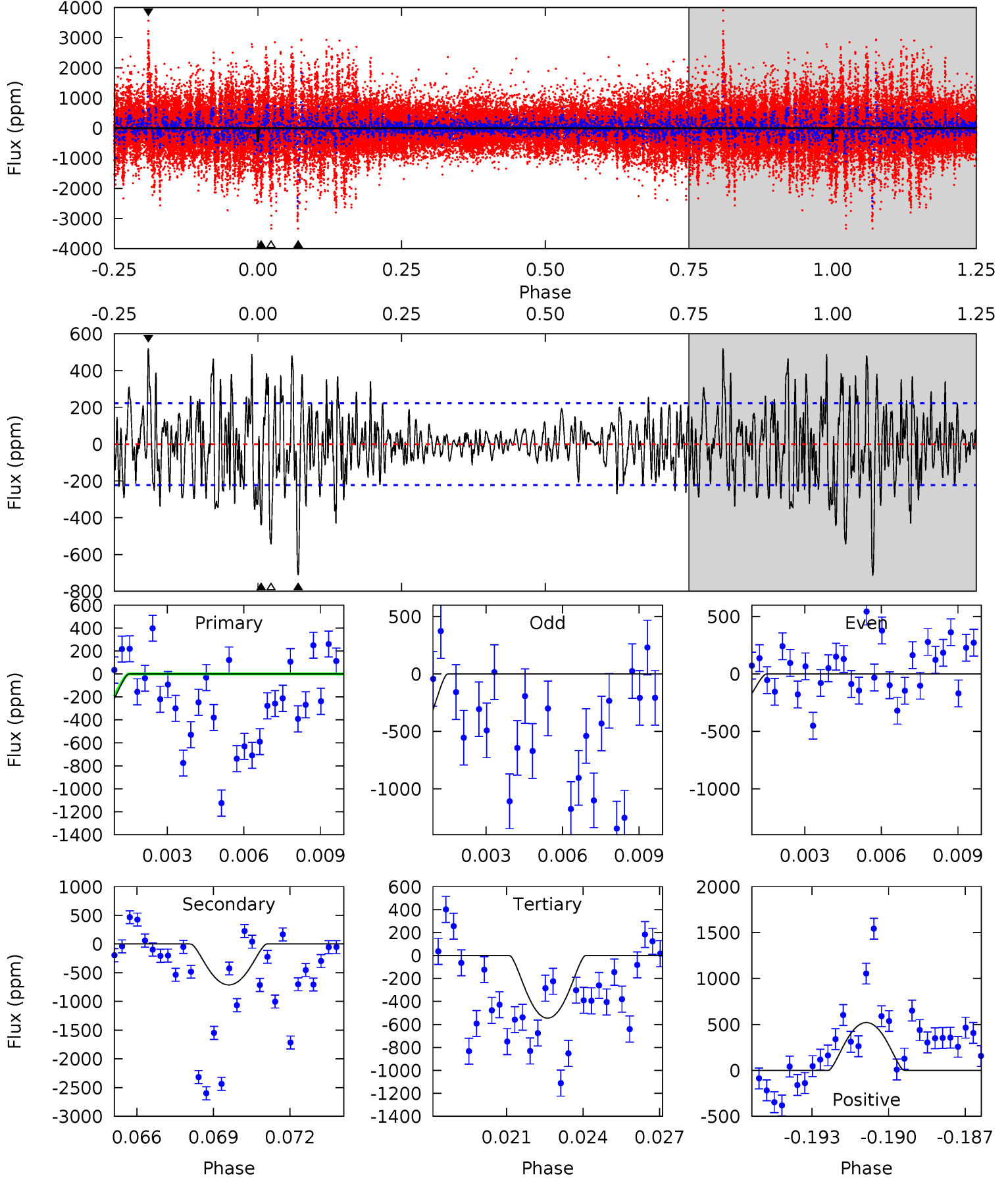
TCE 010748621-06 P=427.184005 Days  $T_0=405.992746$  (BKJD)



# DV Model-Shift Uniqueness Test

010748621-06, P = 427.123172 Days, E = 406.002780 Days

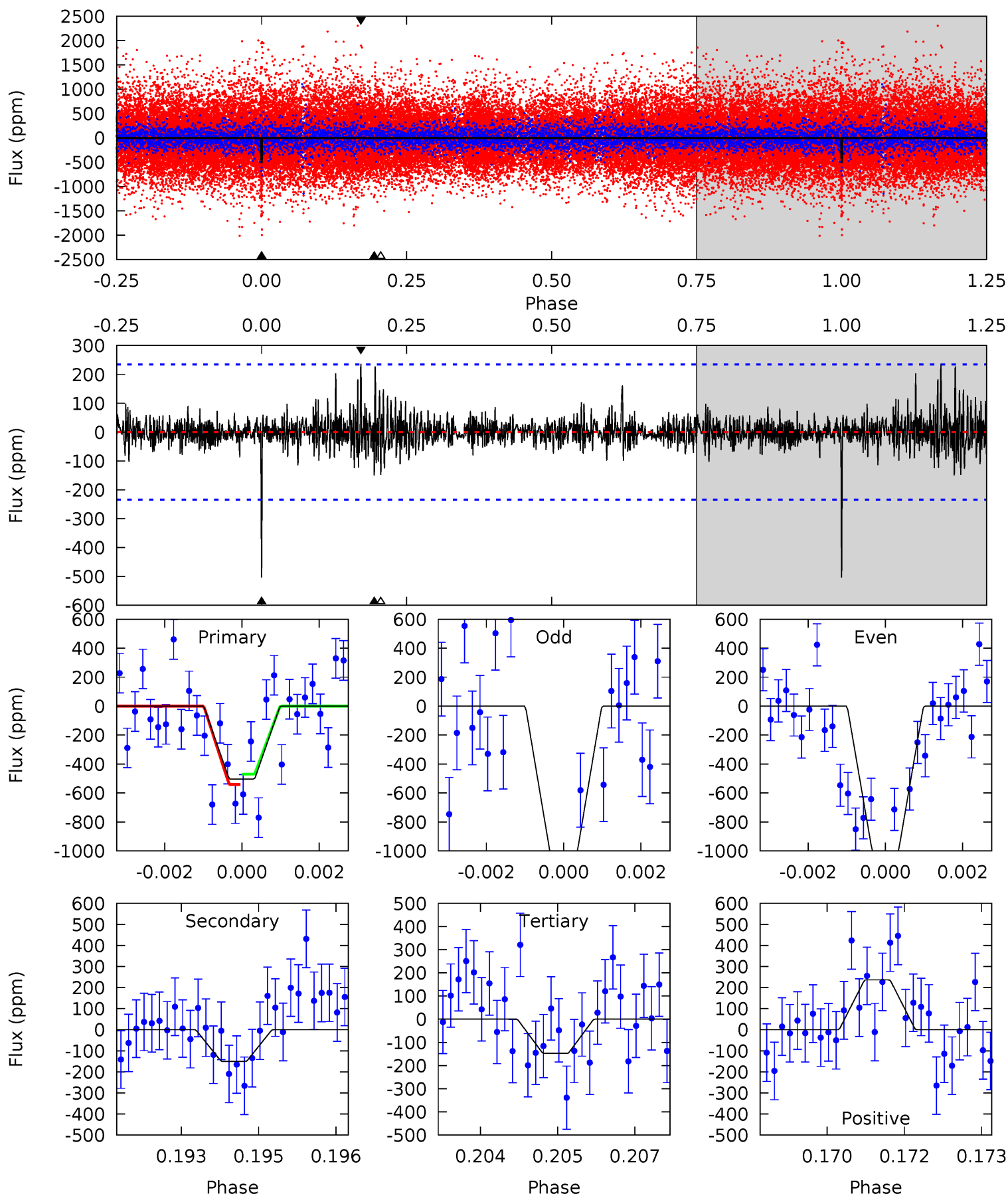
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.4	16.8	12.9	12.3	5.25	2.97	3.50	-2.48	-1.90	3.93	4.51	3.03	1.16	0.42	1.18



# Alt Model-Shift Uniqueness Test

010748621-06, P = 427.184005 Days, E = 405.992746 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.5	3.42	3.37	5.40	5.35	3.13	0.83	8.13	6.10	0.05	-1.98	0.30	0.53	0.32	0.81



### Stellar Parameters For KIC 010748621

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5904^{+159}_{-195}$	$4.471^{+0.067}_{-0.202}$	$-0.160^{+0.300}_{-0.300}$	$0.946^{+0.287}_{-0.115}$	$0.966^{+0.120}_{-0.120}$	$1.606^{+0.550}_{-0.795}$
	+3%/-3%	+1%/-5%	+188%/-188%	+30%/-12%	+12%/-12%	+34%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 010748621-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-712 \pm 42$	$8.43^{+6.54}_{-5.16}$	$344^{+26}_{-17}$	$3794^{+1764}_{-600}$	$6451^{+38197}_{-4360}$
Alt.	$-150 \pm 44$	$5.83^{+5.27}_{-3.94}$	$344^{+25}_{-18}$	$3335^{+1804}_{-567}$	$2817^{+25261}_{-2051}$

$T_{max}$  = 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

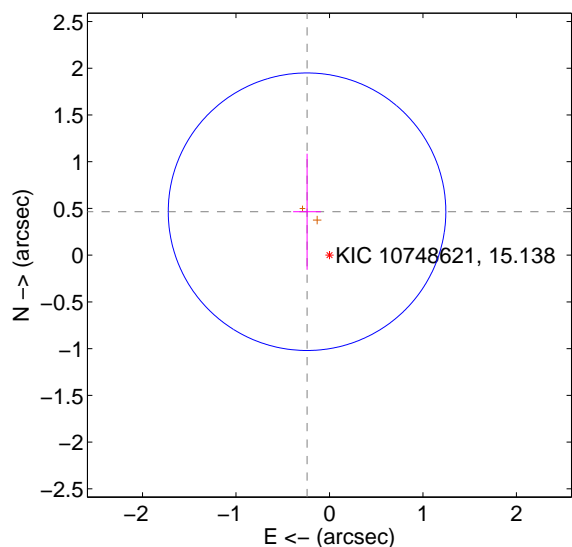
Supplemental centroid analysis for 010748621-06. Kepler magnitude: 15.14. Transit SNR 13.11

There are 0 quarters with good PRF difference image offsets

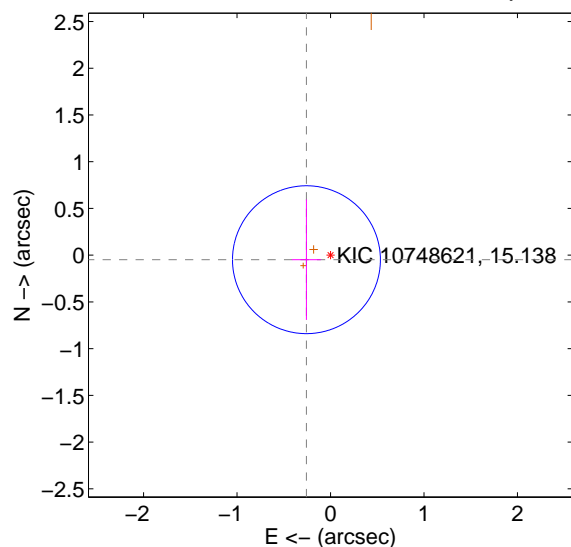
The direct PRF centroid is offset from the target star catalog position by about 0.61 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.523 \pm 0.495$	1.06	$0.240 \pm 0.149$	$0.465 \pm 0.621$
PRF-fit source offset from KIC position	$0.262 \pm 0.264$	0.99	$0.257 \pm 0.155$	$-0.048 \pm 0.645$
photometric centroid source offset	$1.23 \pm 0.31$	3.95	$0.35 \pm 0.36$	$-1.17 \pm 0.31$

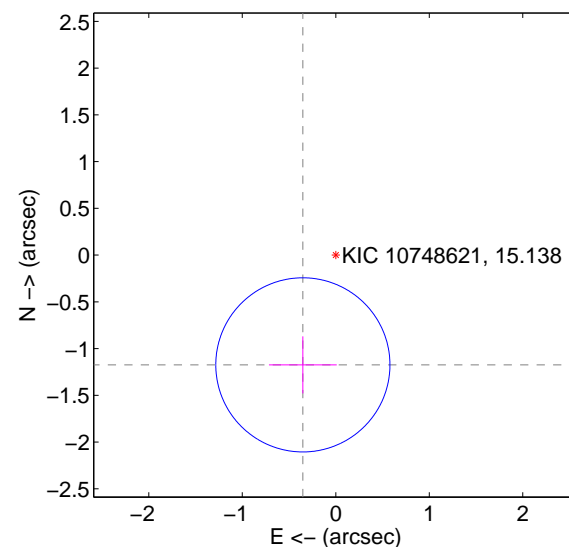
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

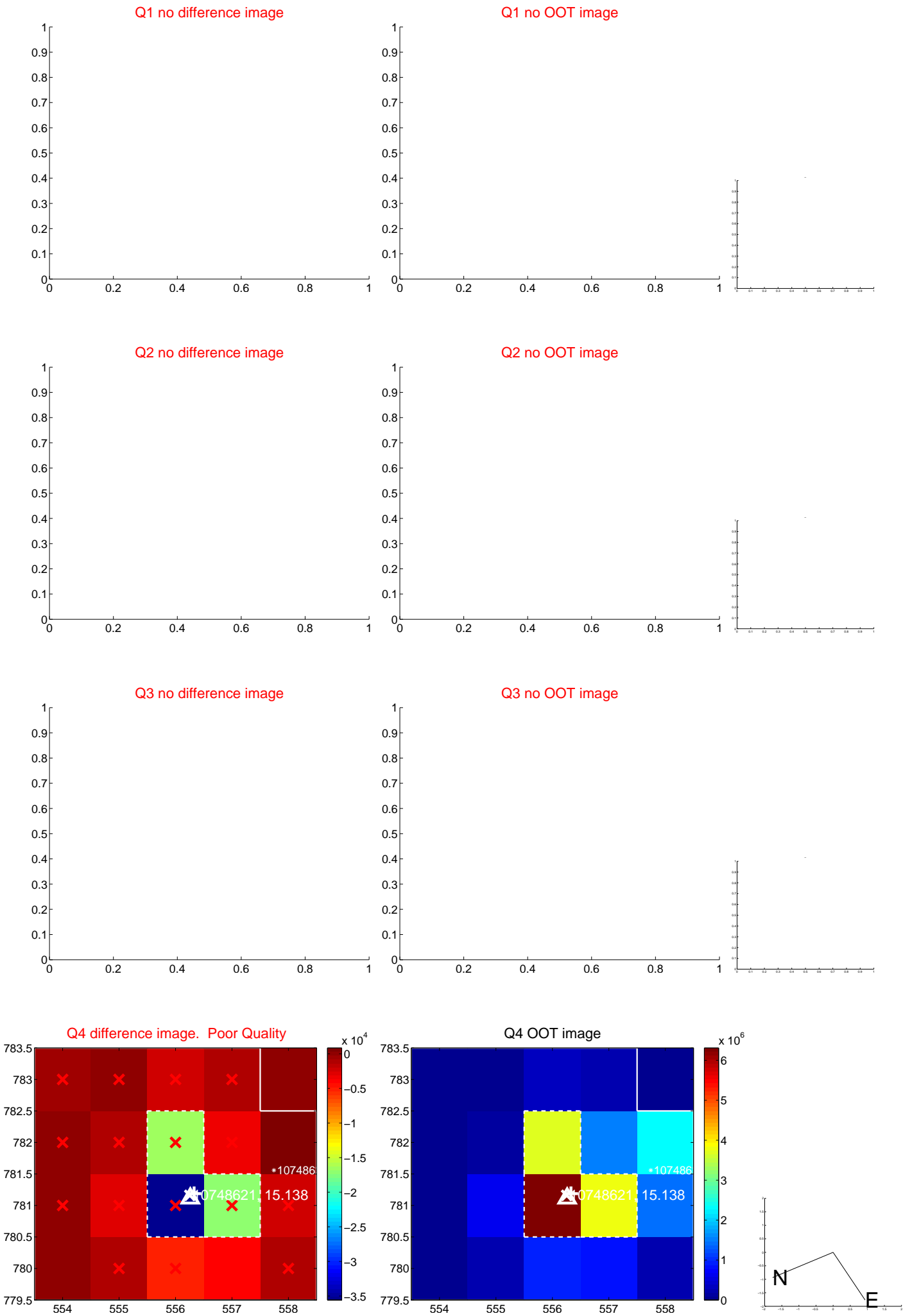


offset from photometric centroids



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.

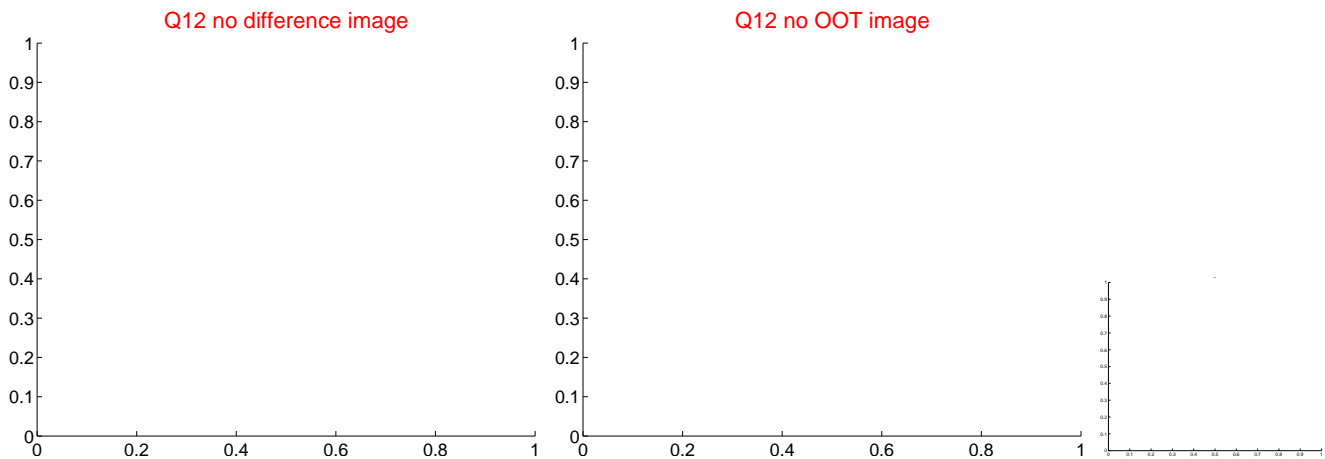
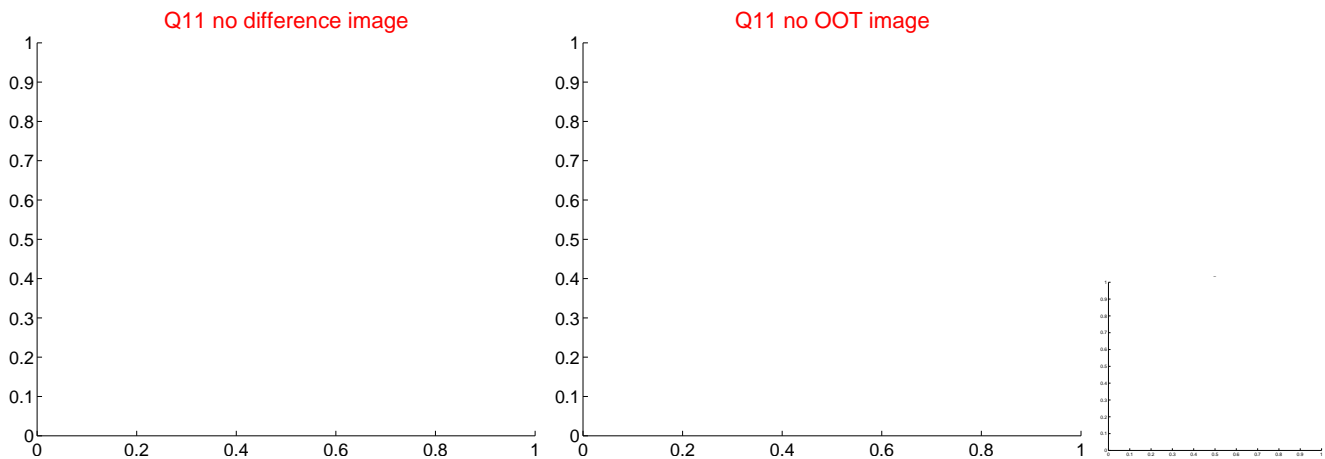
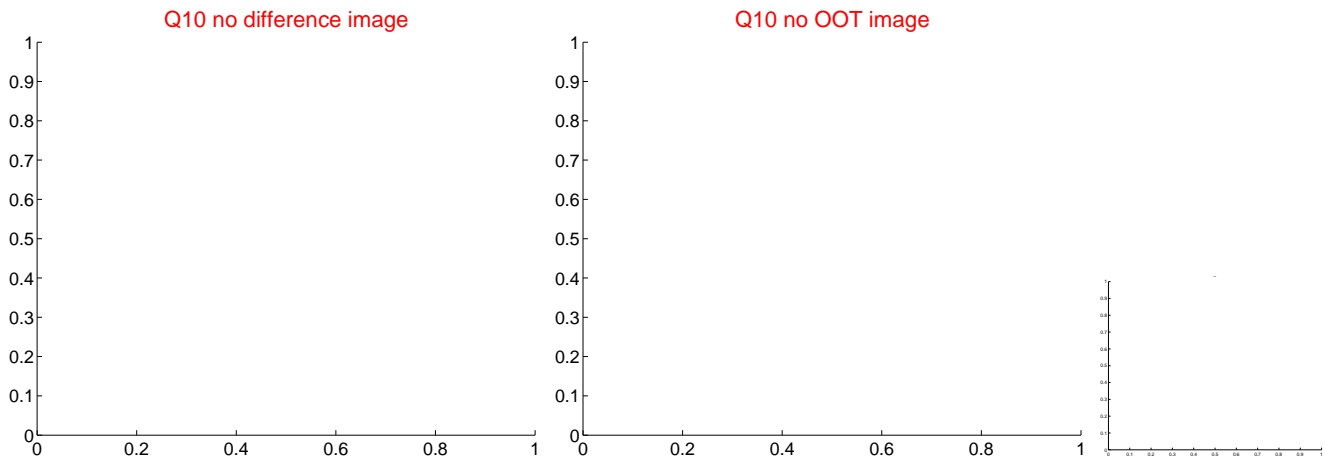
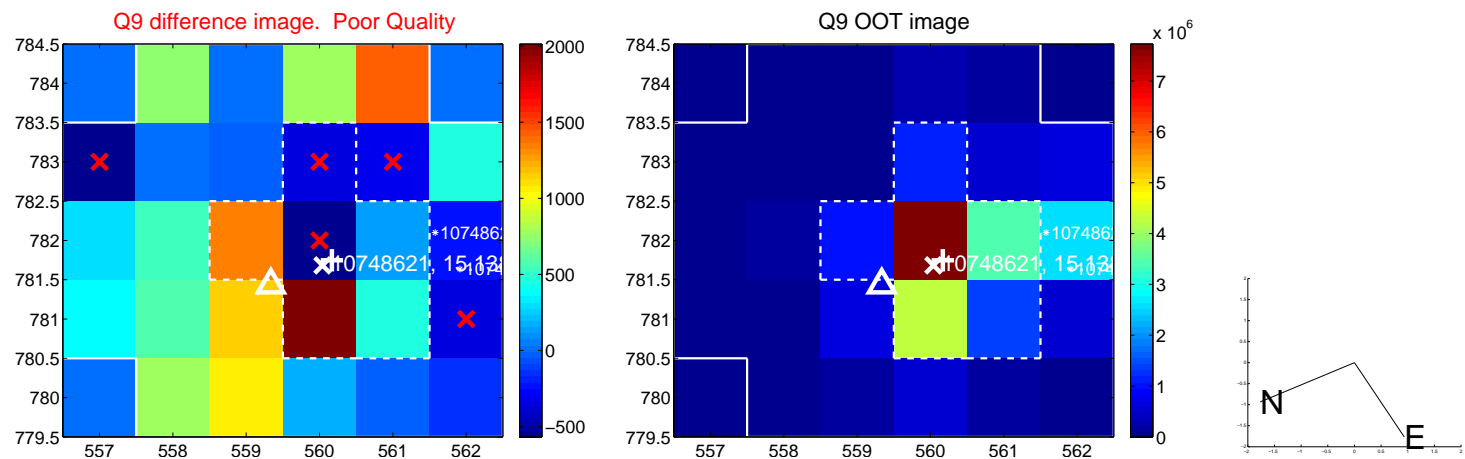


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

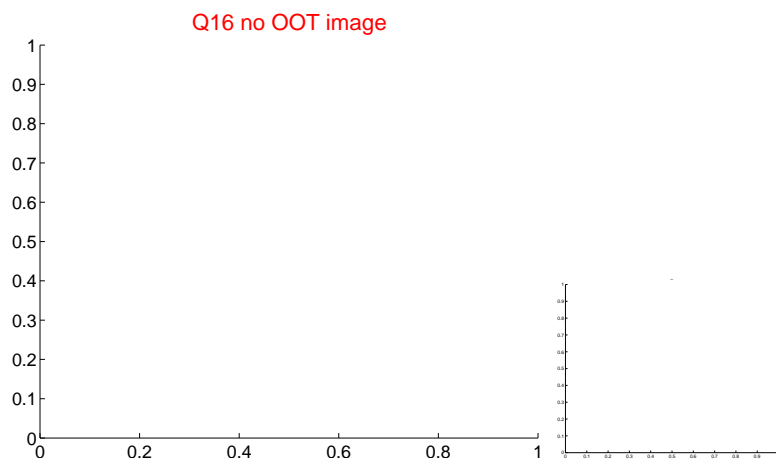
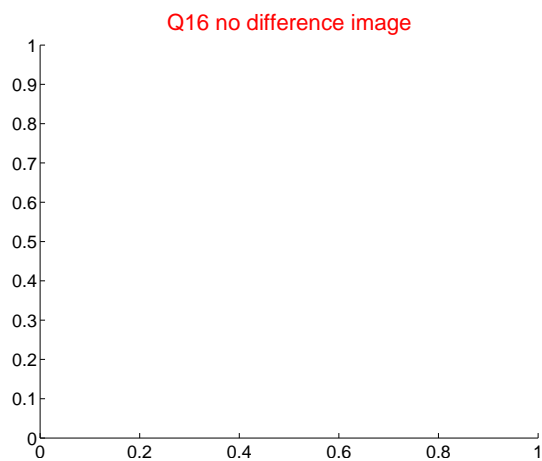
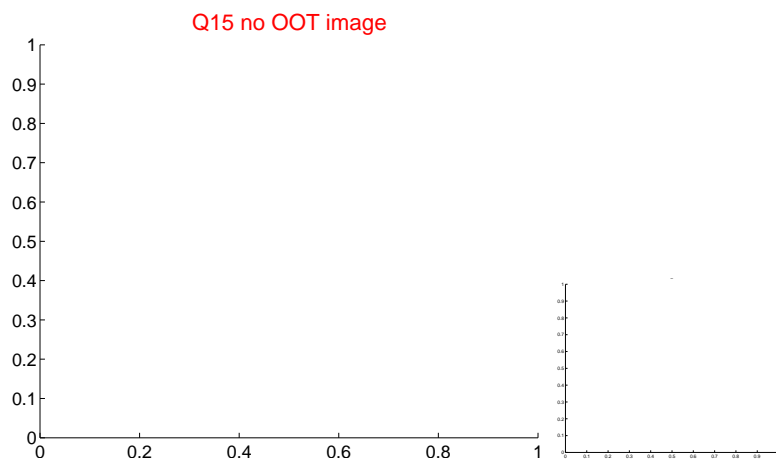
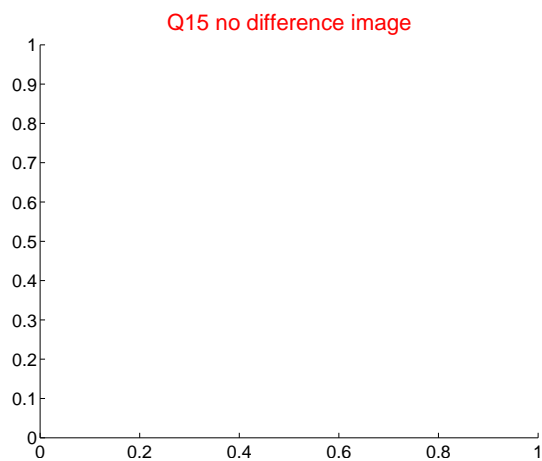
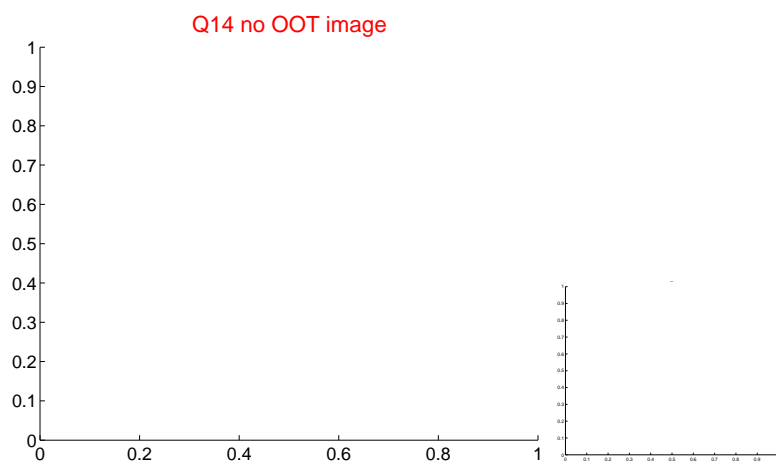
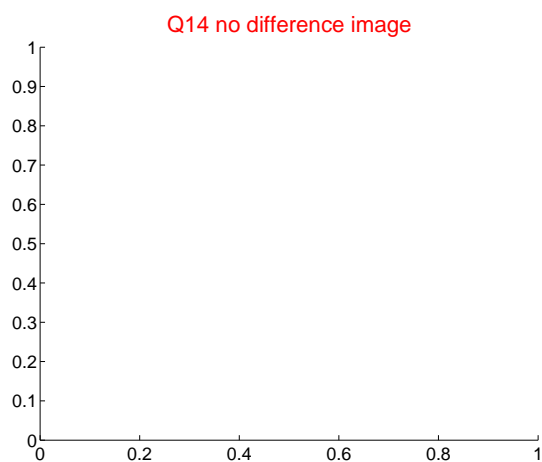
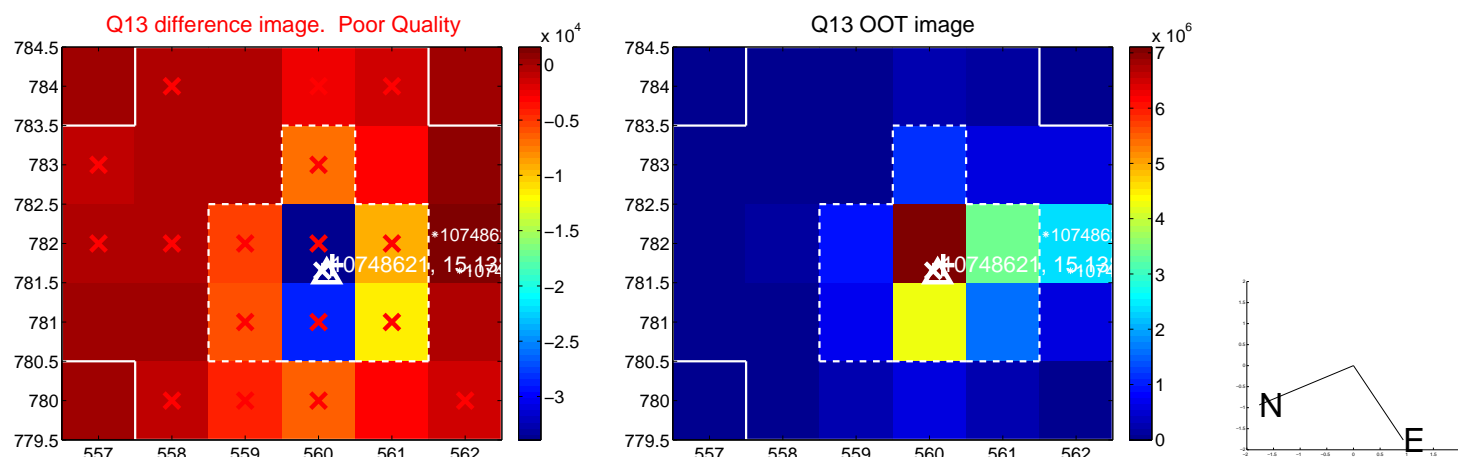




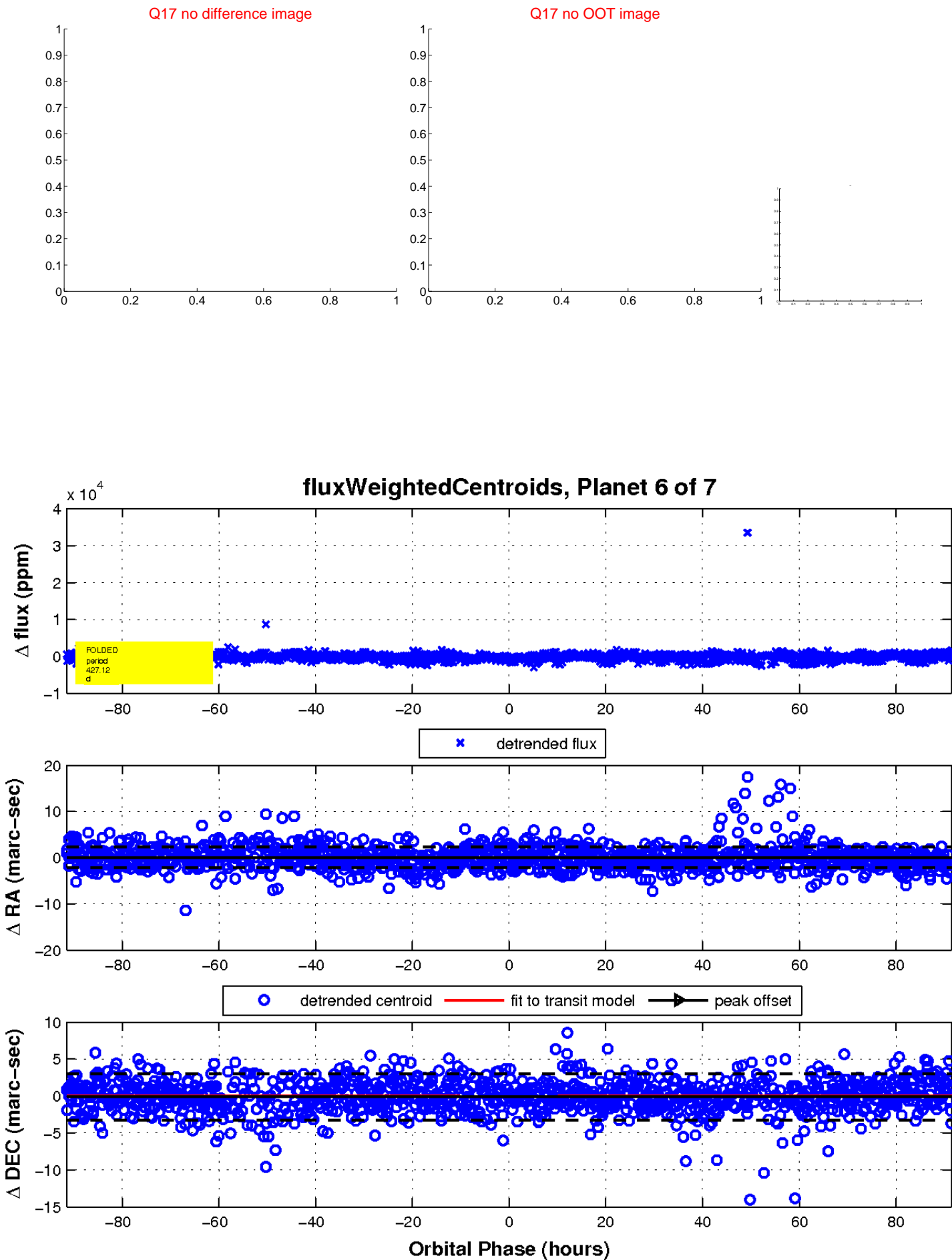
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

