

# KIC 009453452

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009453452-01	OBS	No	1.696790	133.133016	4.2	9.573	8.1	6.9	2.81	8715	0.60	30228.38
009453452-02	OBS	No	369.413964	214.436917	67.6	39.252	9.5	7.1	2.81	8715	2.53	23.08
009453452-03	OBS	No	270.466316	161.358003	116.7	6.436	8.5	8.2	2.81	8715	3.44	34.98
009453452-04	OBS	No	0.607198	131.602629	7.3	4.525	9.5	7.6	2.81	8715	0.81	118981.41

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009453452-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
009453452-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED
009453452-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED—HALO_GHOST
009453452-04	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—CENT_SATURATED

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

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

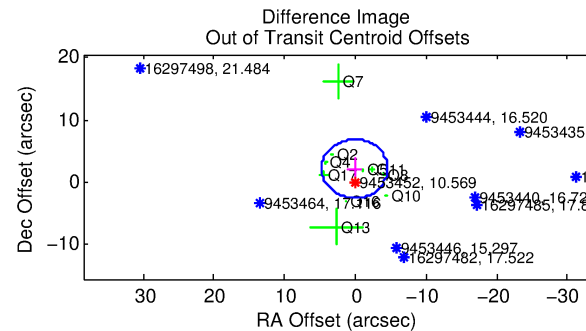
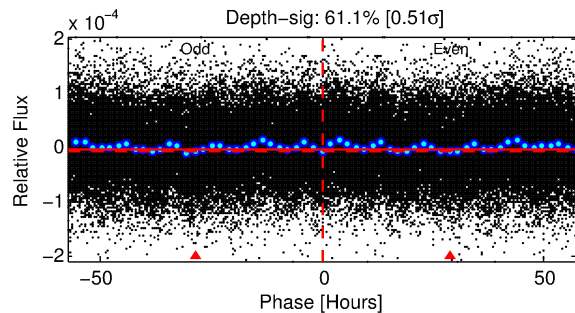
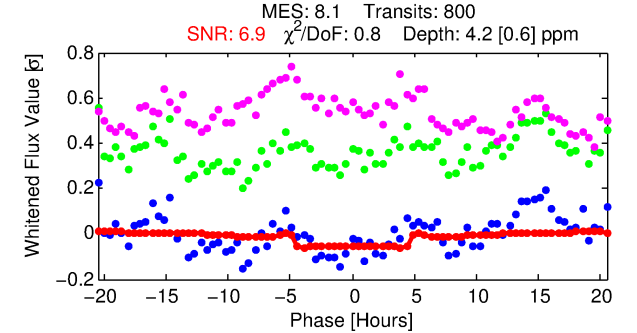
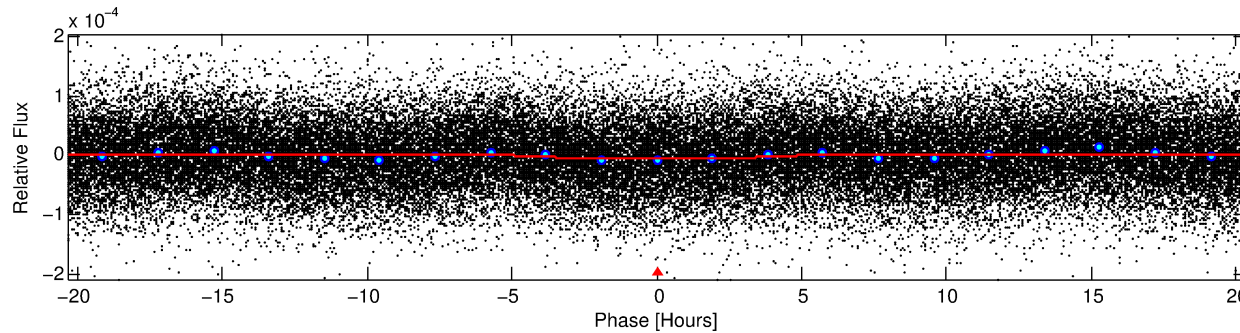
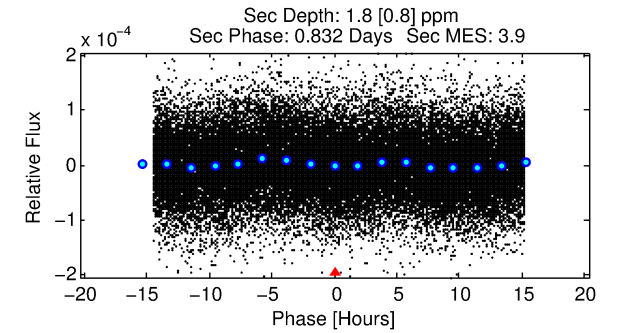
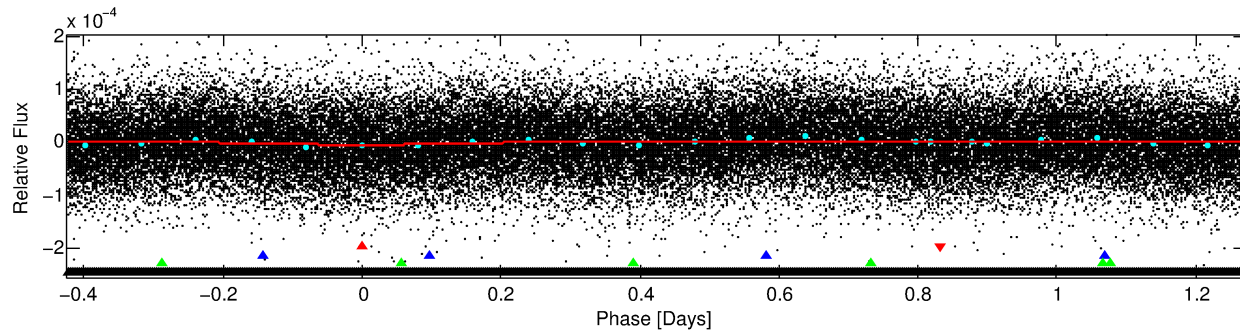
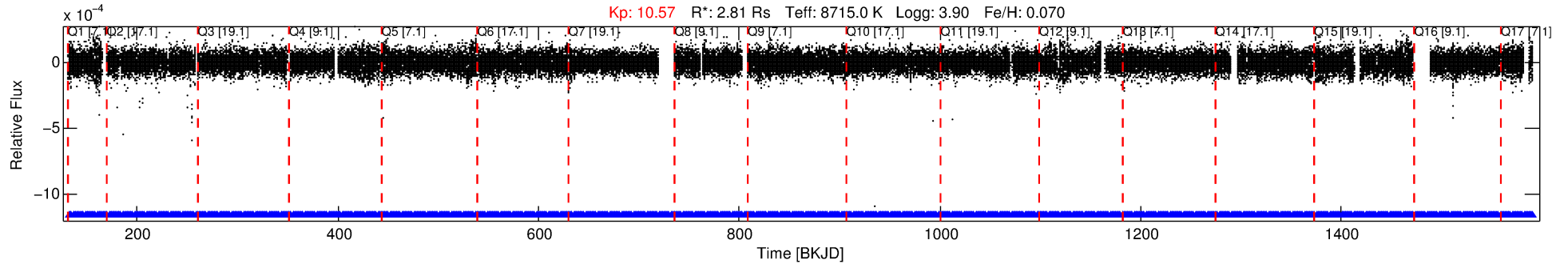
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009453452-01

No Significant Match Found

# DV One-Page Summary

KIC: 9453452 Candidate: 1 of 4 Period: 1.697 d



## DV Fit Results:

Period = 1.69679 [0.00003] d  
Epoch = 133.1330 [0.0080] BKJD  
Rp/R\* = 0.0020 [0.0004]  
a/R\* = 1.38 [0.75]  
b = 0.50 [1.72]  
Seff = 30228.38 [15292.53]  
Teq = 3362 [425] K  
Rp = 0.60 [0.24] Re  
a = 0.0367 [0.0113] AU  
Ag = 3.61 [2.78] [0.94σ]  
Teffp = 7164 [1137] K [3.13σ]

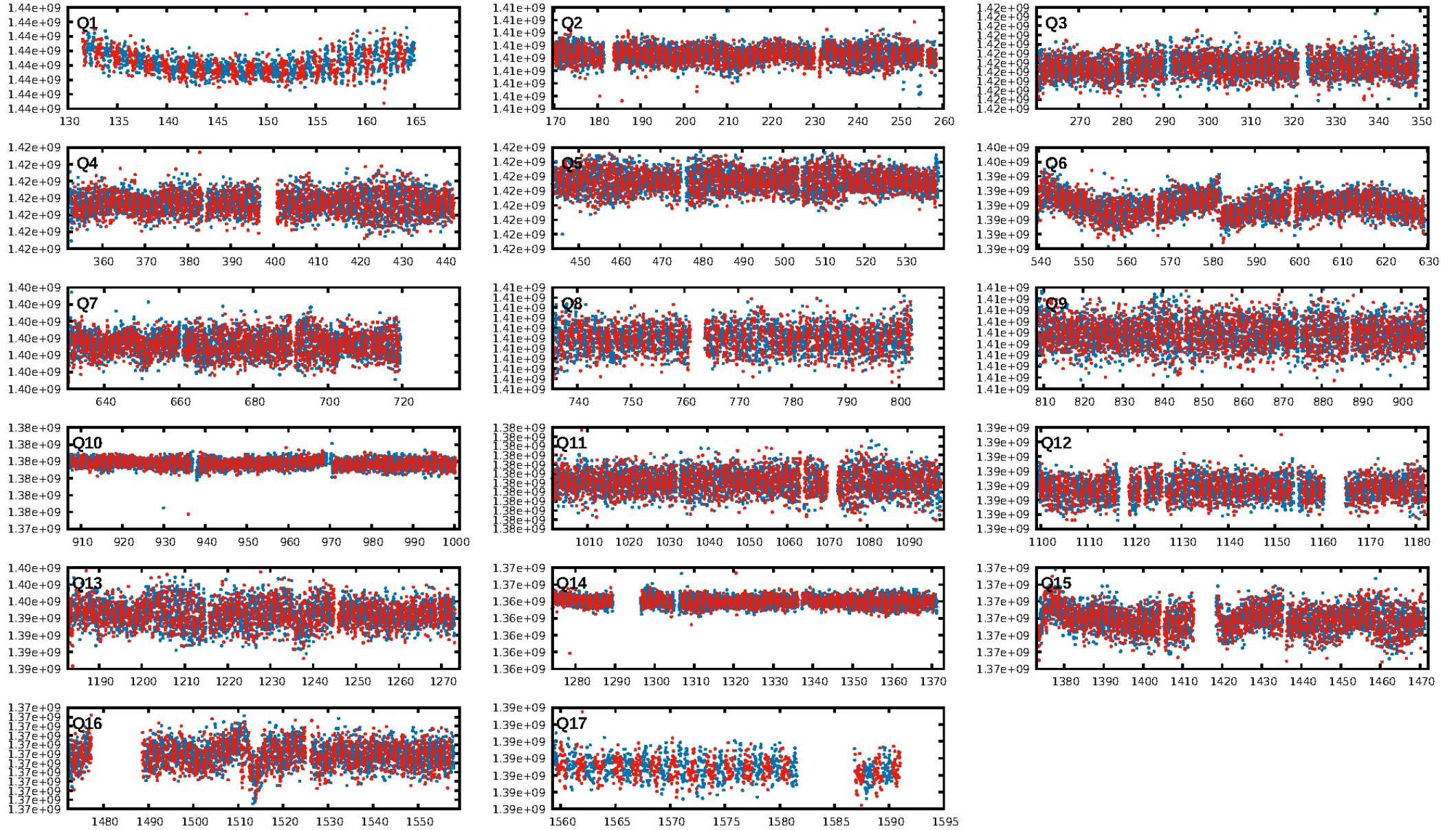
## DV Diagnostic Results:

ShortPeriod-sig: 98.6% [2.47σ]  
LongPeriod-sig: 100.0% [559.21σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [764/764]  
GhostDiagnostic-chr: N/A  
Centroid-sig: N/A  
Centroid-so: N/A  
OotOffset-rm: 2.149 arcsec [1.37σ]  
OotOffset-st: 2/2/3/3 [10]  
KicOffset-rm: 4.491 arcsec [3.46σ]  
KicOffset-st: 2/2/3/3 [10]  
DiffImageQuality-fgm: 0.40 [4/10]  
DiffImageOverlap-fno: 0.00 [0/17]

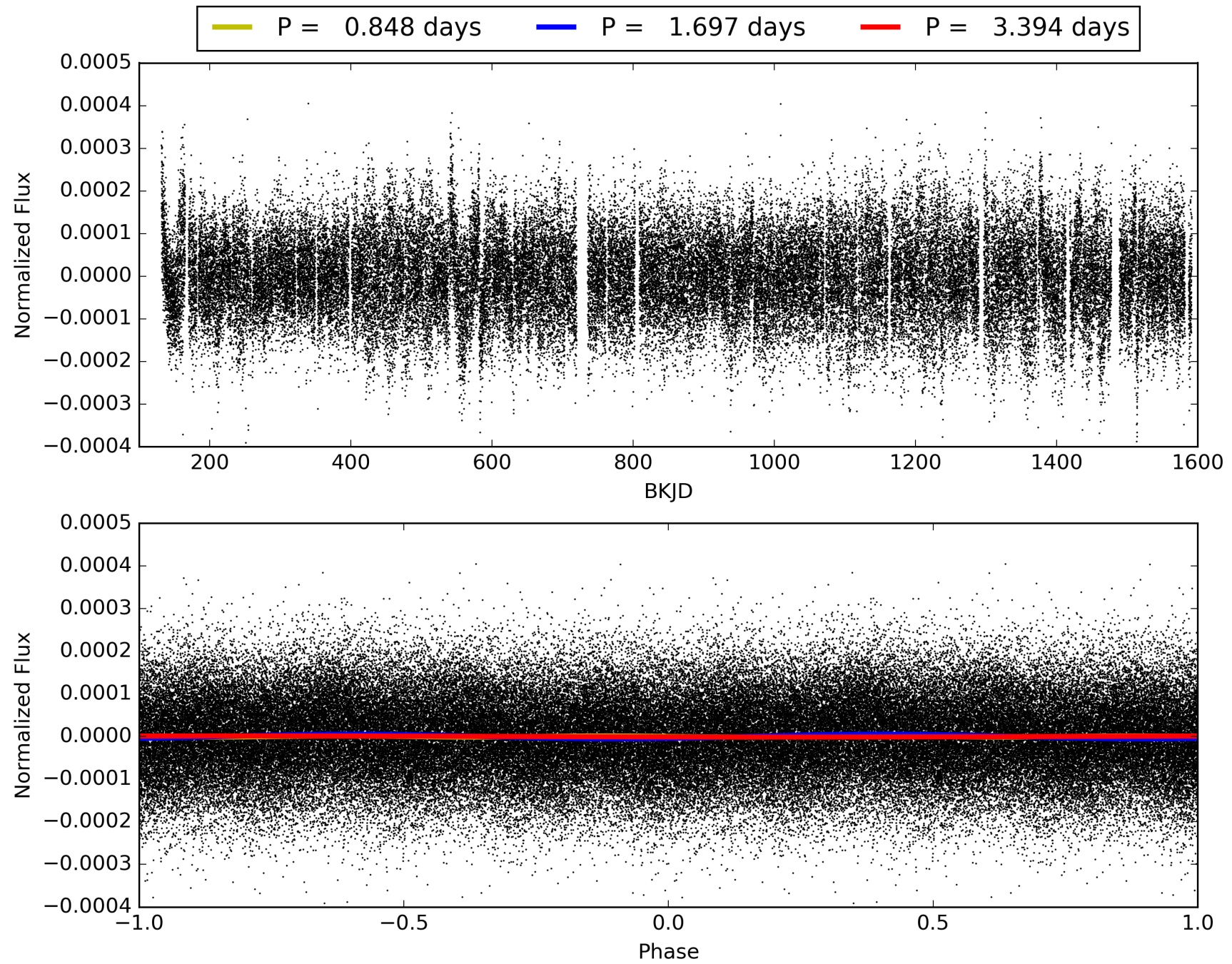
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:08:17 Z

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

# TCE 009453452-01, PDC Light Curves

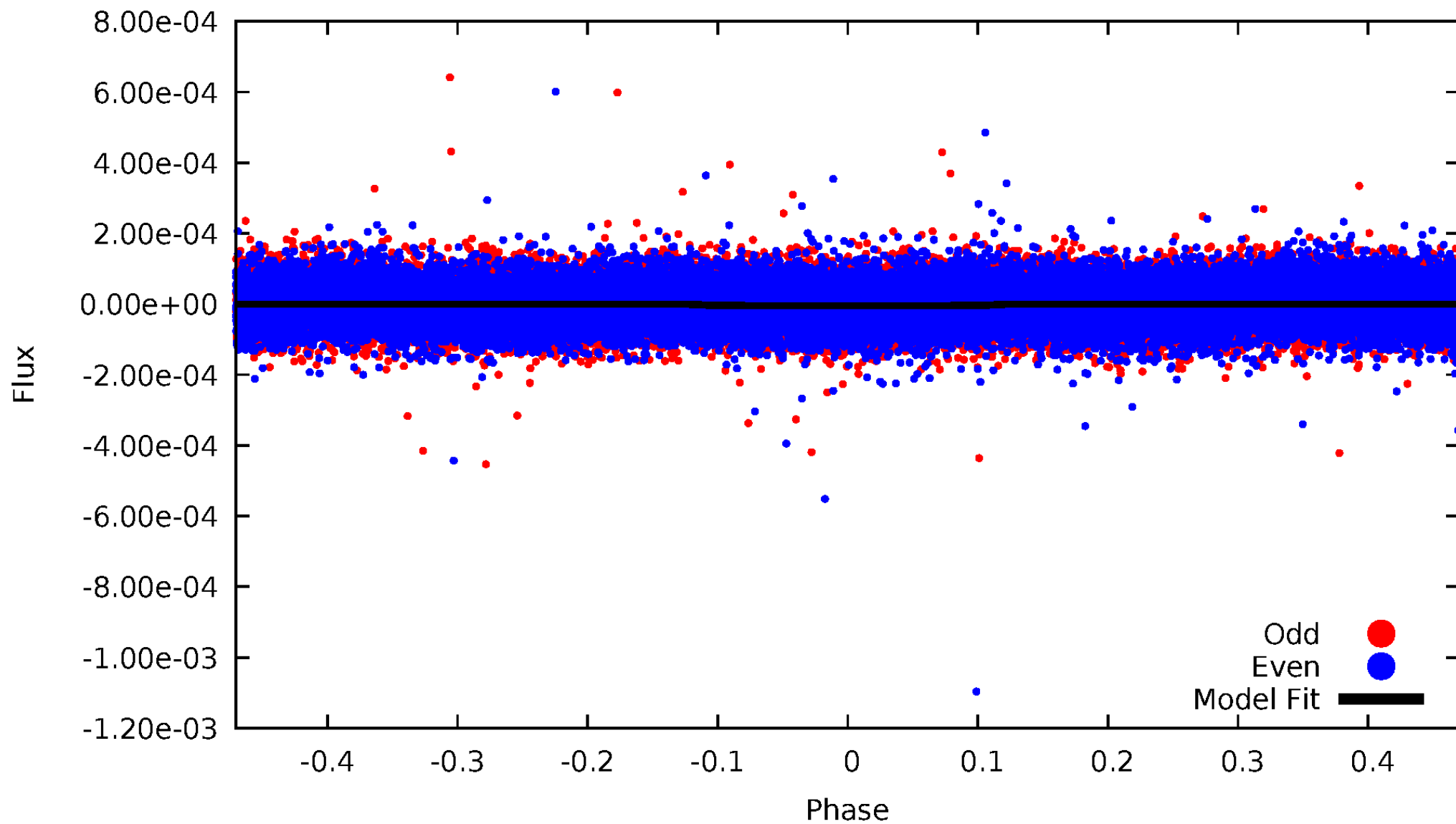


TCE 009453452-01



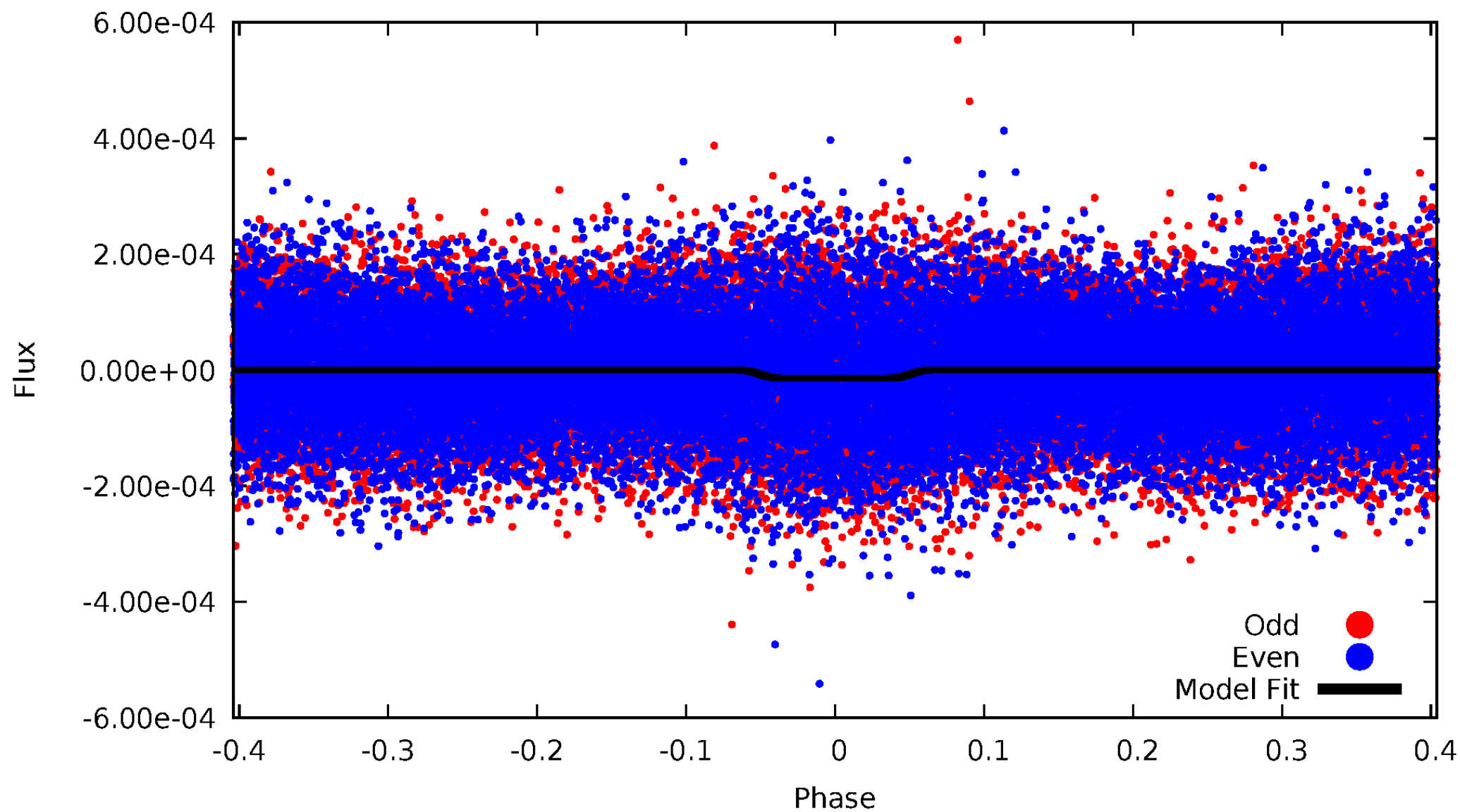
# DV Odd/Even

TCE 009453452-01

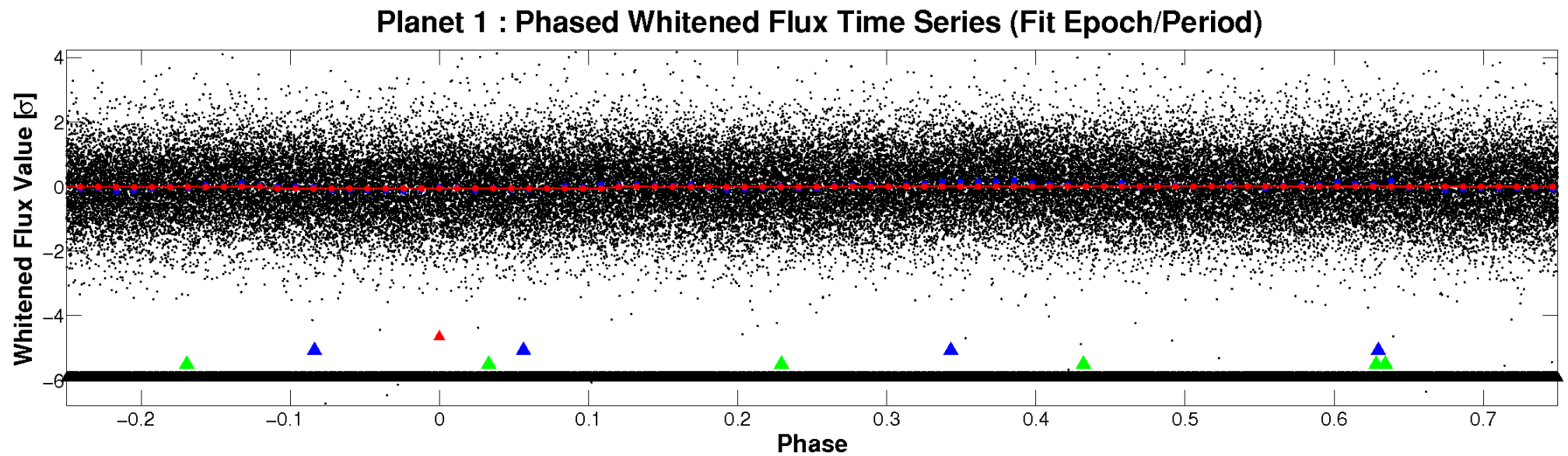
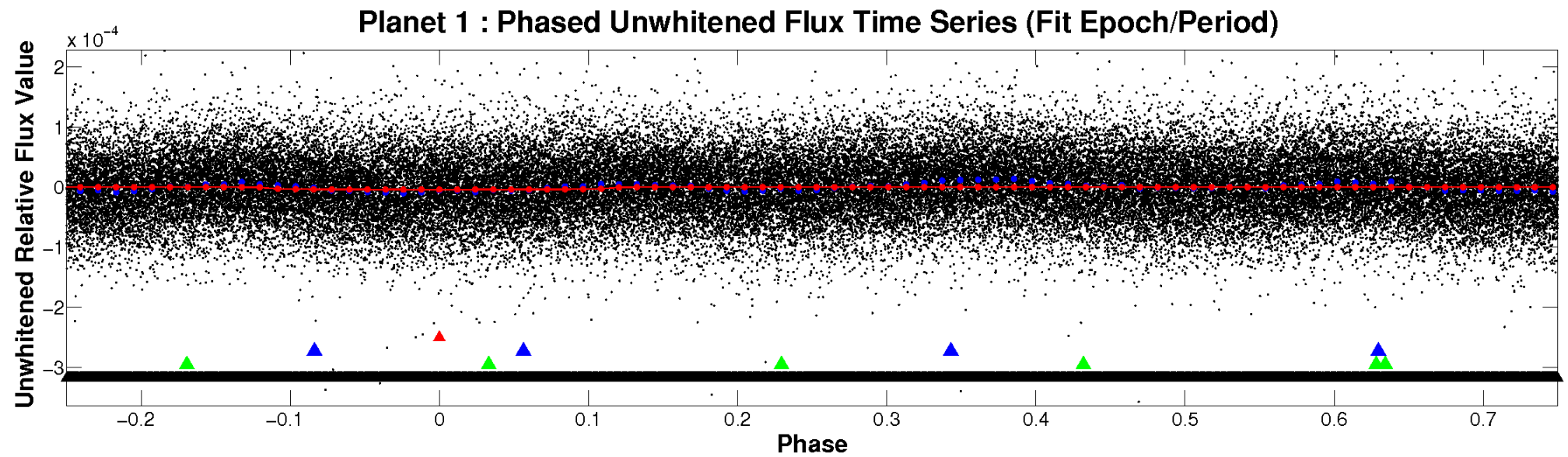


# ALT Odd/Even

TCE 009453452-01

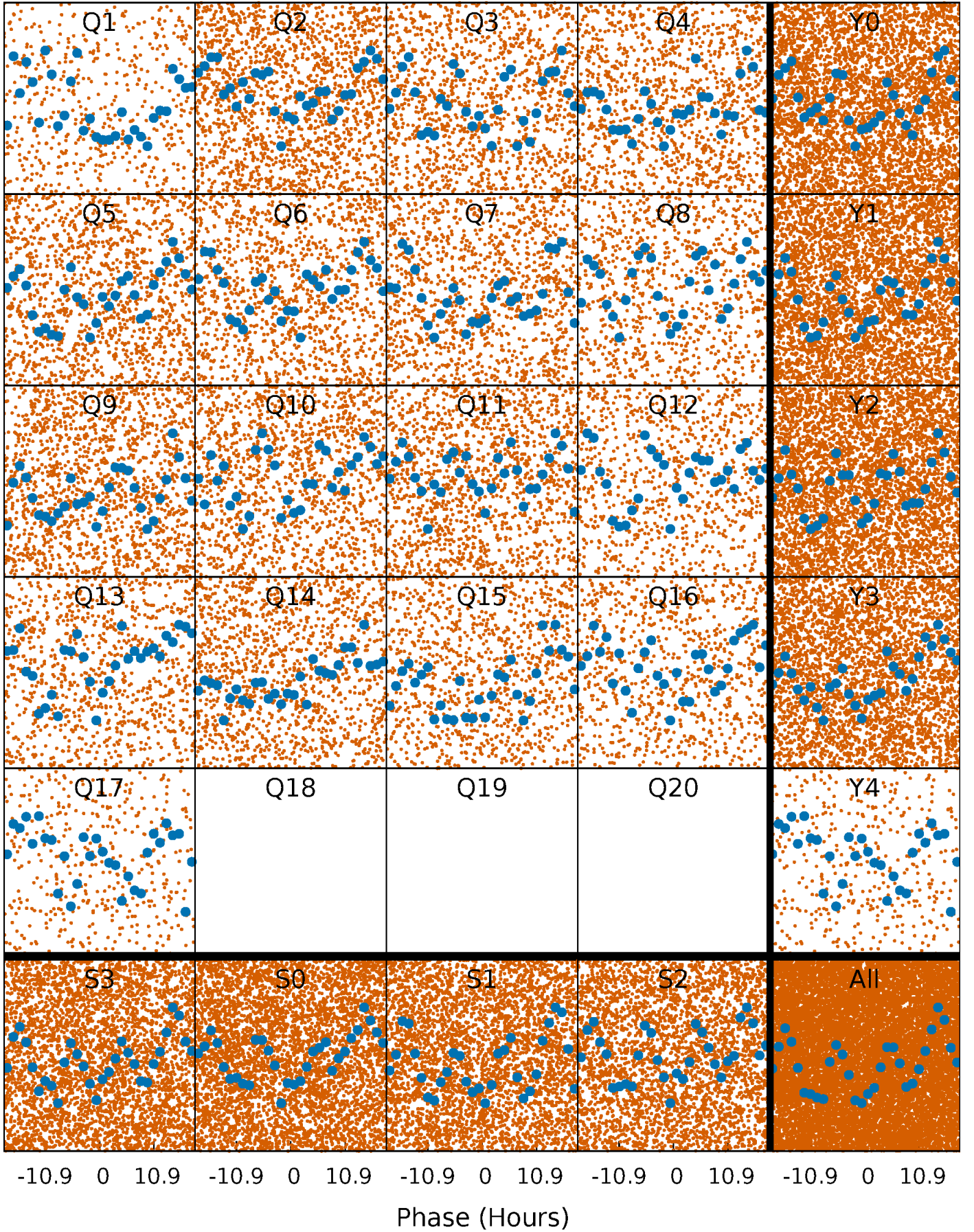


# Non-Whitened Vs. Whitened Light Curve



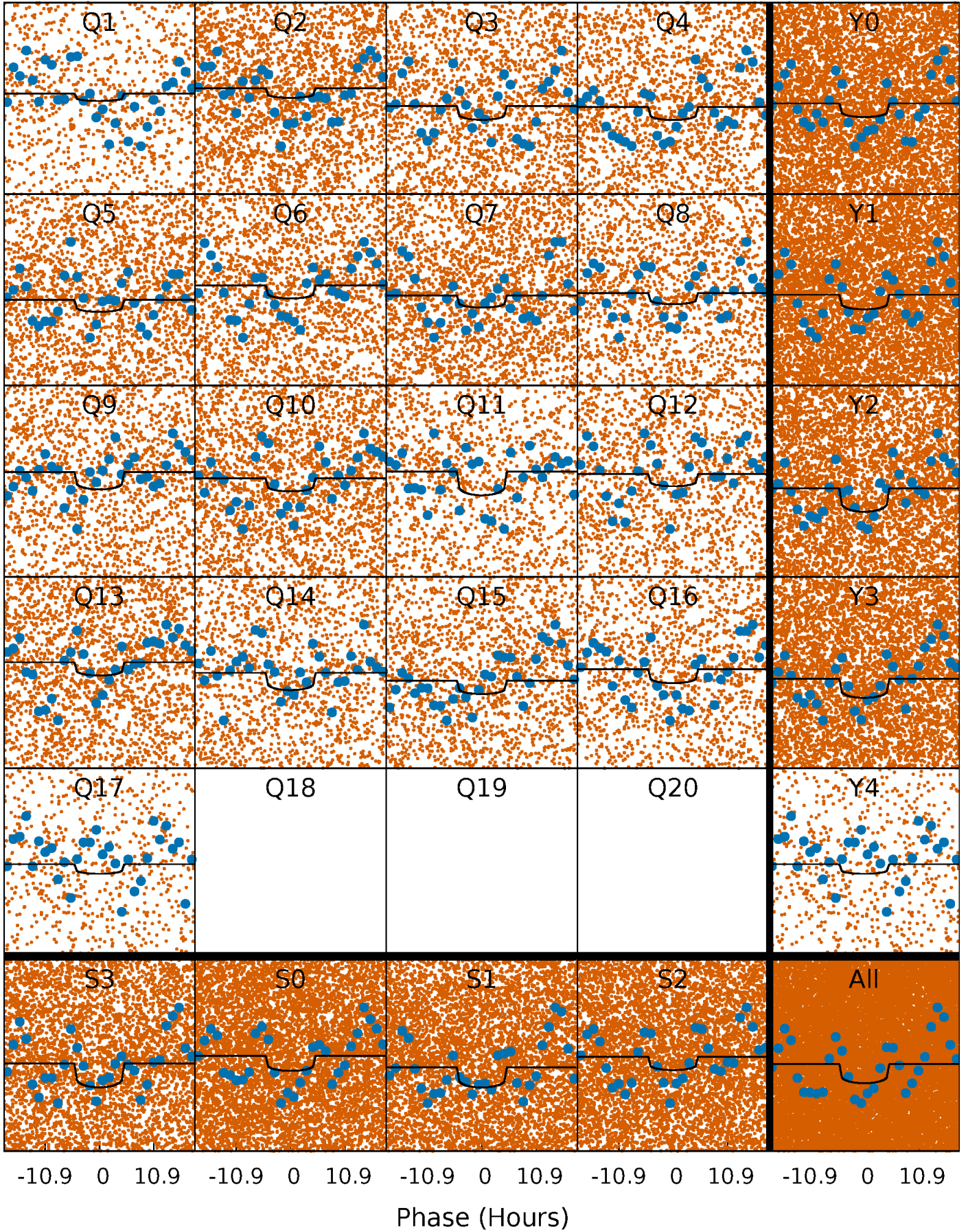
# PDC Quarter-Phased Transit Curves

TCE 009453452-01   P= 1.696790 Days    $T_0=133.133016$  (BKJD)



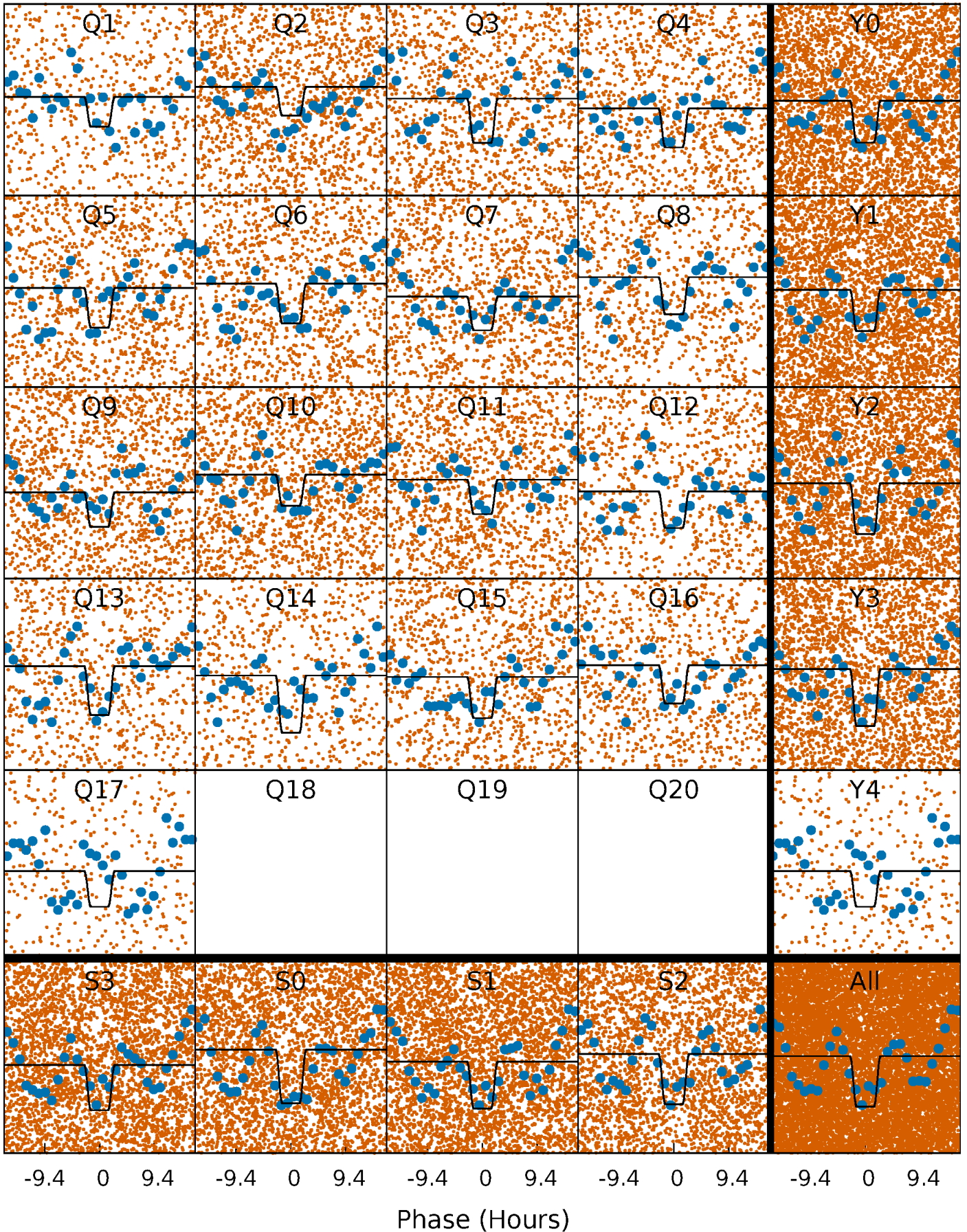
# DV Quarter-Phased Transit Curves

TCE 009453452-01 P= 1.696790 Days  $T_0=133.133016$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

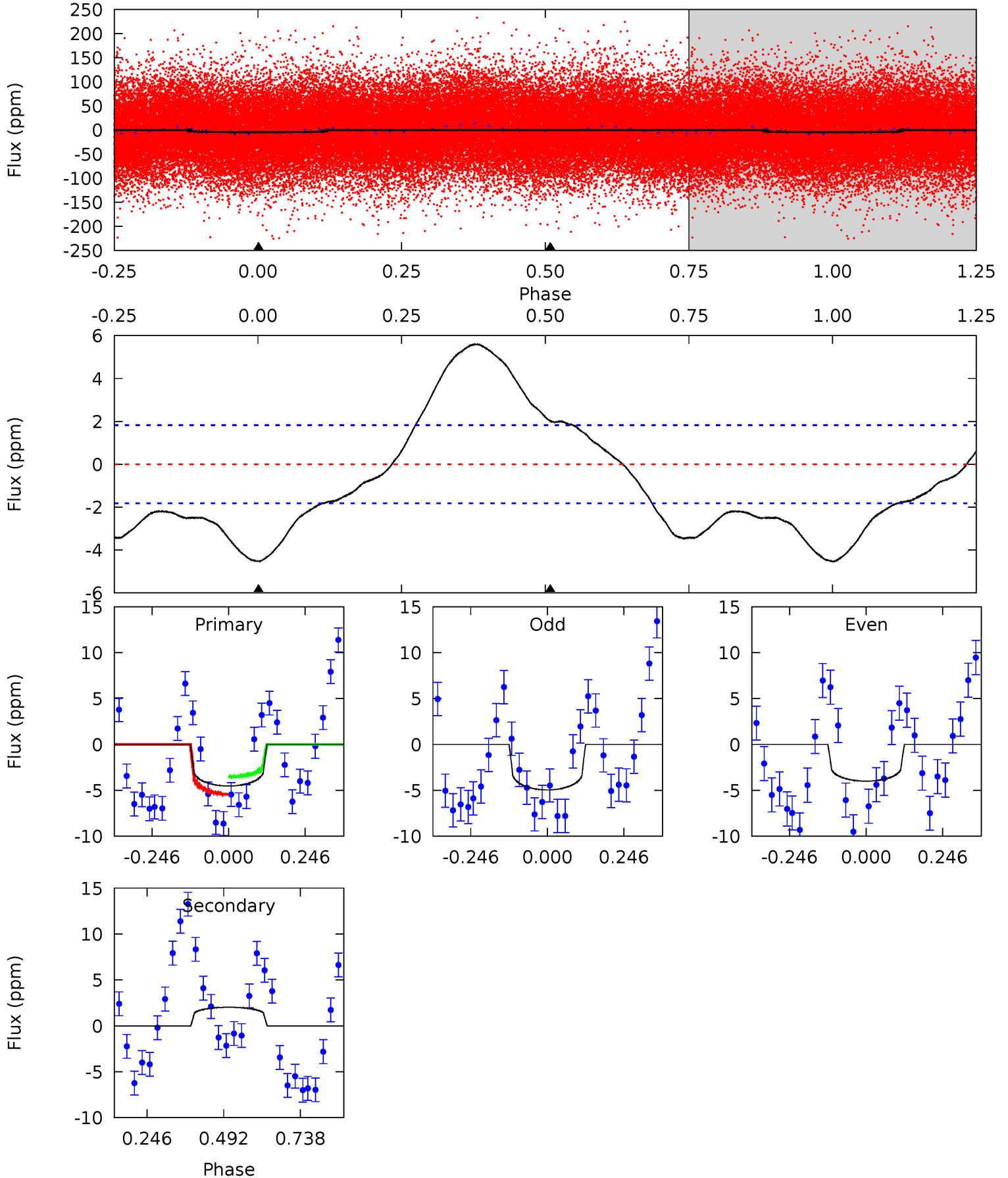
TCE 009453452-01 P= 1.696782 Days  $T_0=133.121300$  (BKJD)



# DV Model-Shift Uniqueness Test

009453452-01, P = 1.696790 Days, E = 131.436226 Days

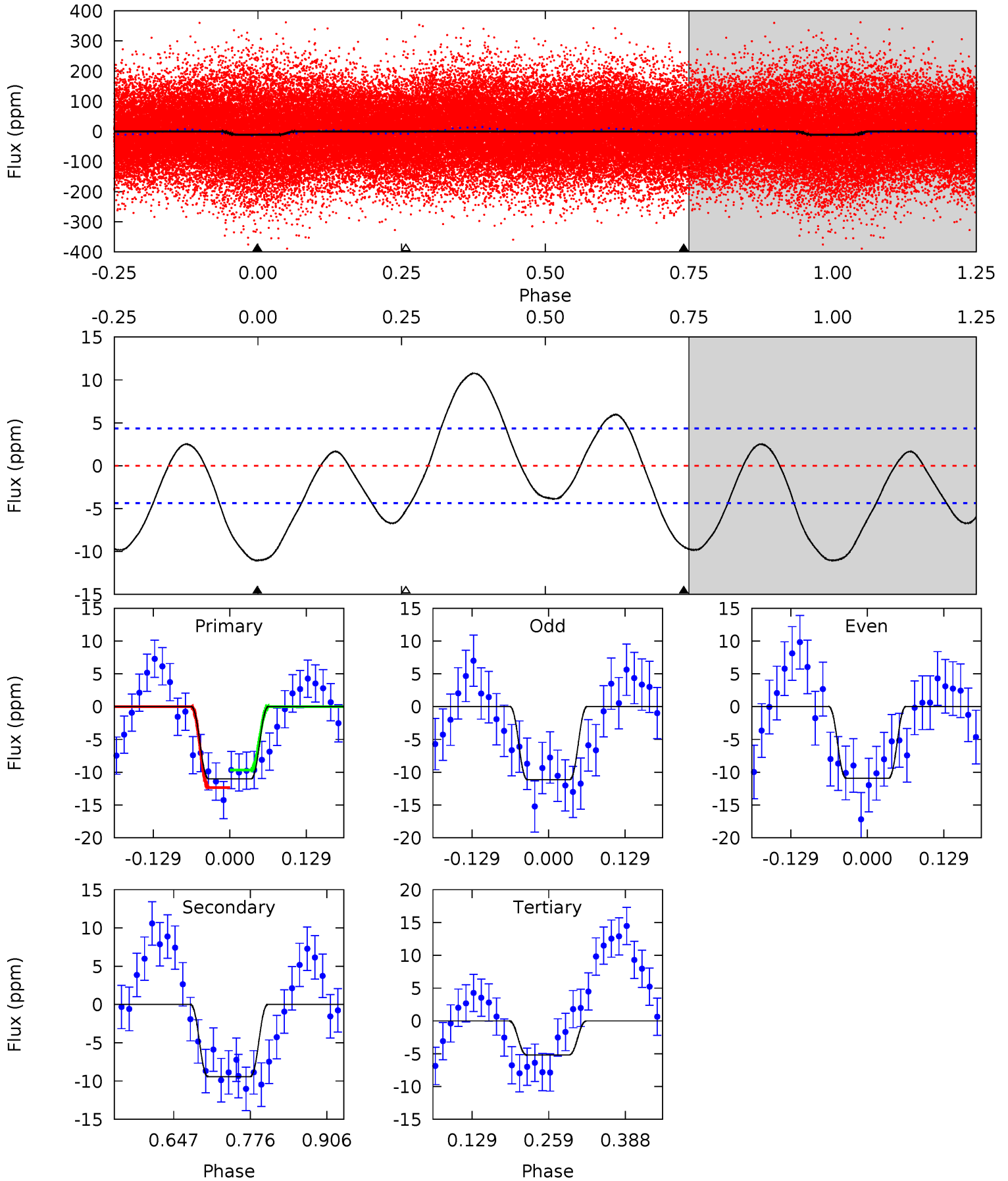
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.9	-4.84	0	0	4.37	1.16	5.32	10.9	10.9	-4.84	-4.84	1.15	1.02	0.55	2.28



# Alt Model-Shift Uniqueness Test

009453452-01, P = 1.696782 Days, E = 131.424518 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
11.4	9.76	5.38	0	4.51	1.52	5.34	6.05	11.4	4.38	9.76	0.11	1.09	0.49	1.42



### Stellar Parameters For KIC 009453452

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8715^{+246}_{-387}$	$3.901^{+0.270}_{-0.180}$	$0.070^{+0.250}_{-0.550}$	$2.805^{+0.965}_{-0.965}$	$2.283^{+0.337}_{-0.626}$	$0.146^{+0.283}_{-0.076}$
	+3%/-4%	+7%/-5%	+357%/-786%	+34%/-34%	+15%/-27%	+194%/-52%
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 009453452-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$2 \pm 0$	$0.57^{+0.17}_{-0.14}$	$4633^{+390}_{-443}$	$-7256^{+767}_{-1117}$	$-4.432^{+1.823}_{-3.757}$
Alt.	$-9 \pm 1$	$1.11^{+0.24}_{-0.22}$	$4634^{+384}_{-439}$	$7481^{+686}_{-535}$	$5.519^{+3.061}_{-1.754}$

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

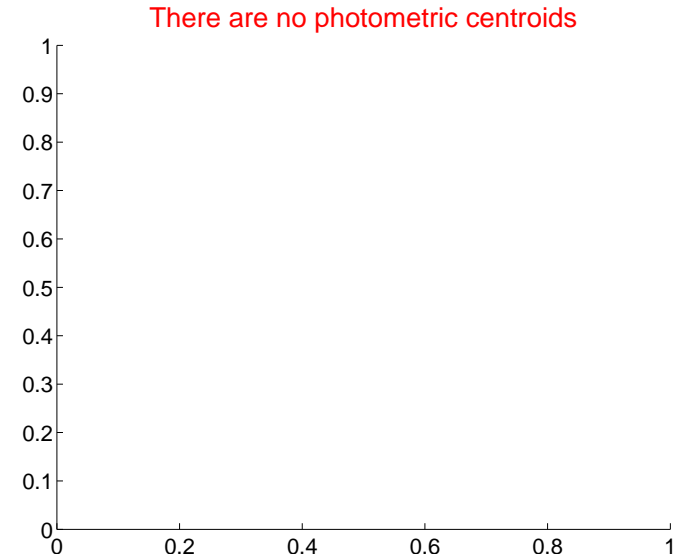
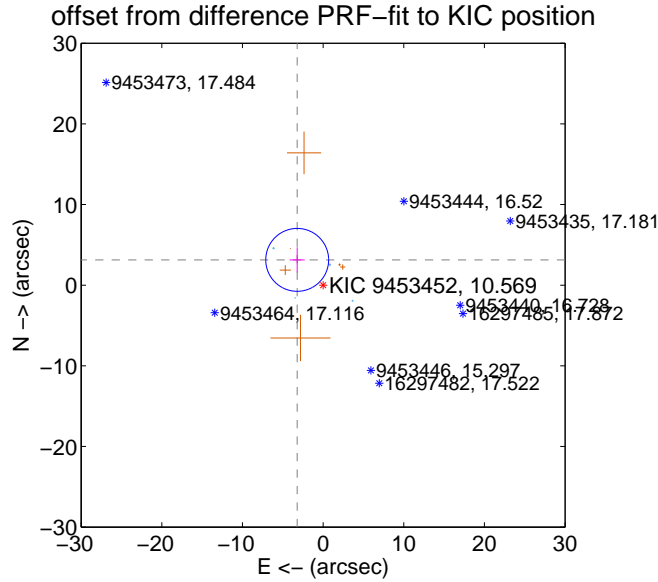
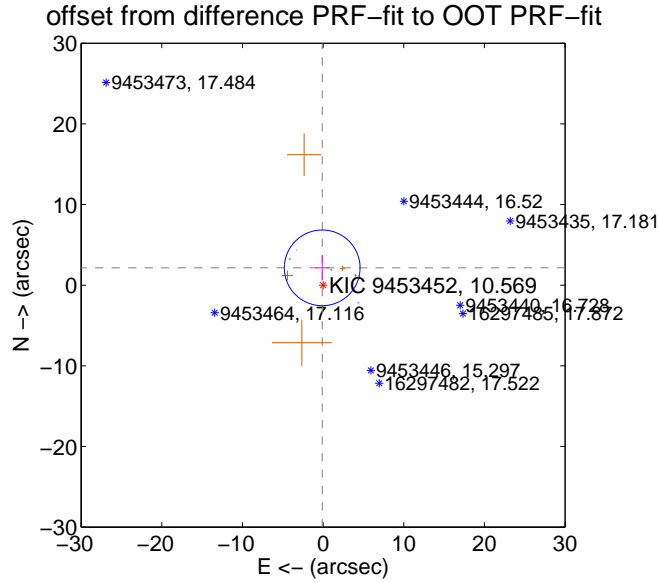
## DV Centroid Data

Supplemental centroid analysis for 009453452-01. **Kepler magnitude: 10.57.** Transit SNR 6.92

There are 4 quarters with good PRF difference image offsets

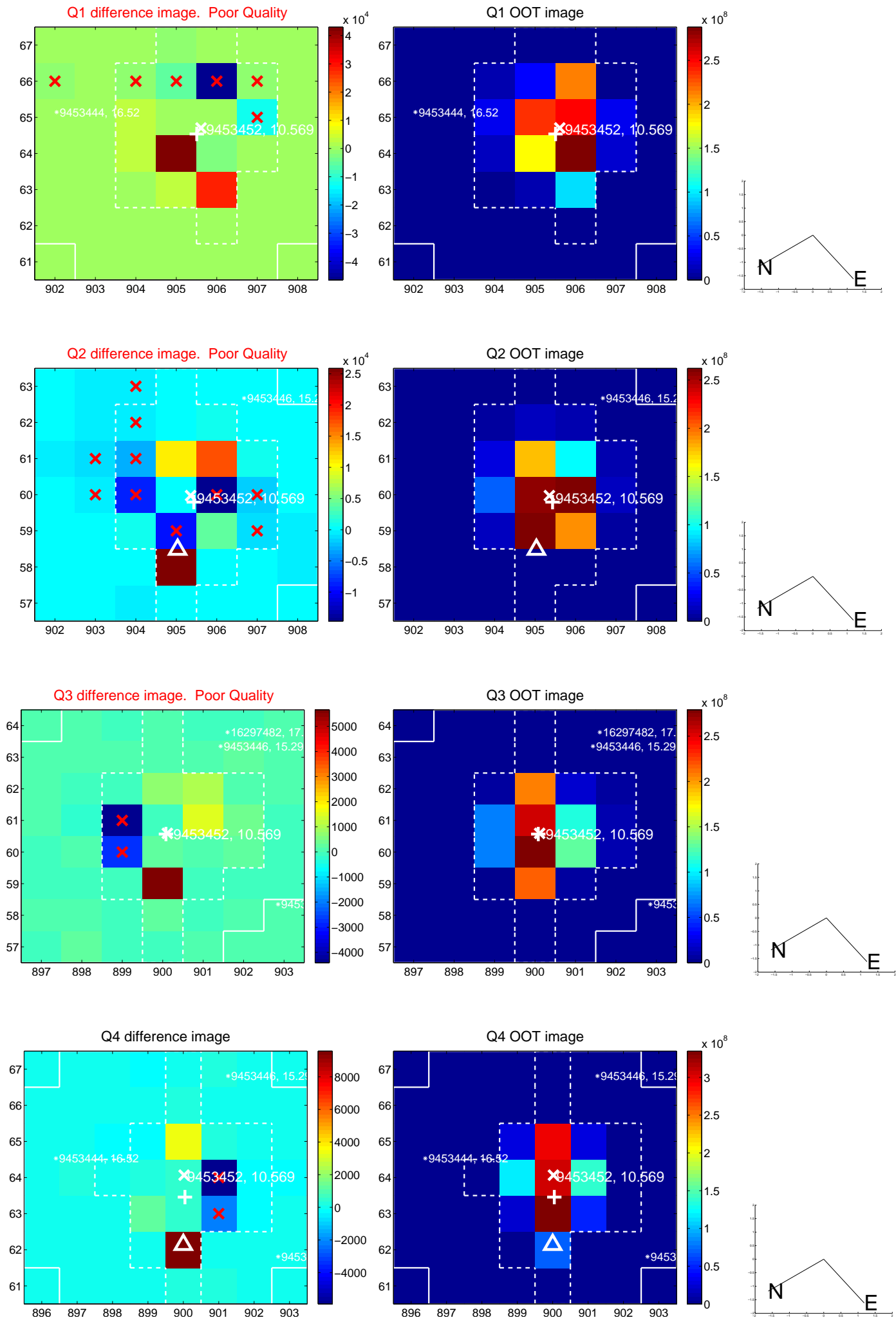
The direct PRF centroid is offset from the target star catalog position by about 0.72 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.149 \pm 1.565$	1.37	$0.110 \pm 0.889$	$2.147 \pm 1.560$
PRF-fit source offset from KIC position	<b><math>4.491 \pm 1.300</math></b>	<b>3.46</b>	$3.214 \pm 0.933$	$3.137 \pm 1.560$
photometric centroid source offset	—	—	—	—

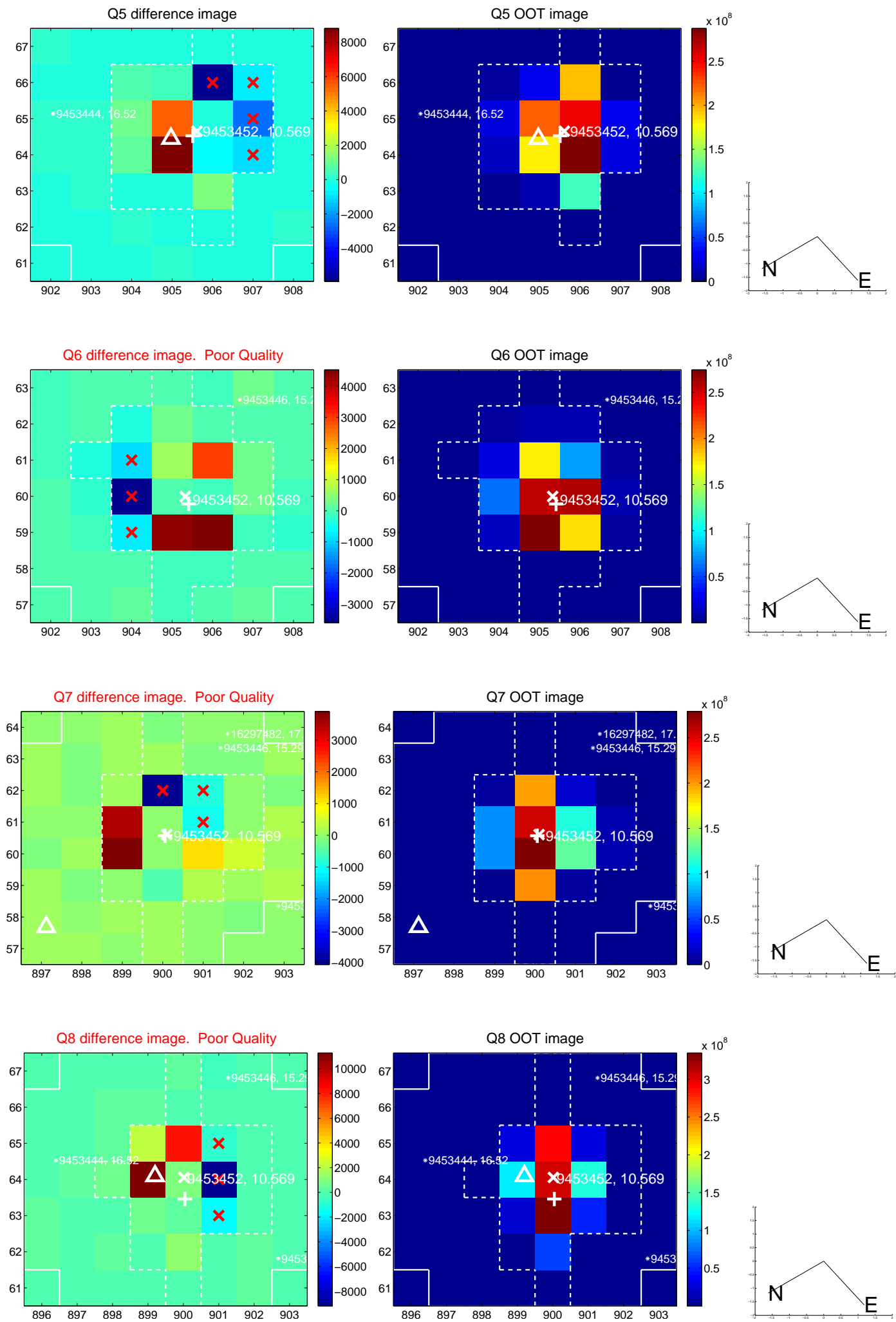


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

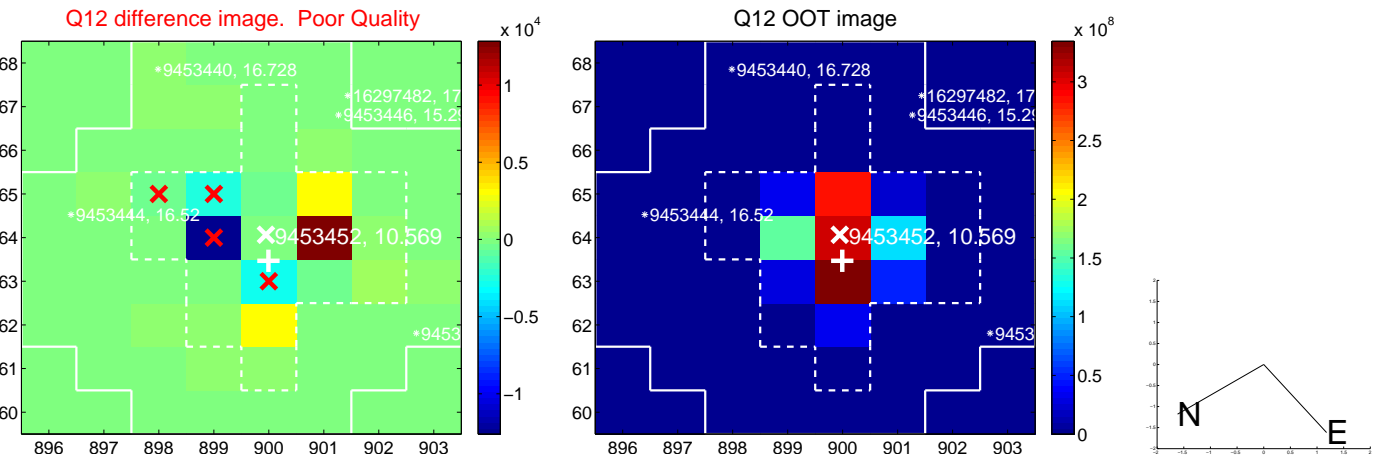
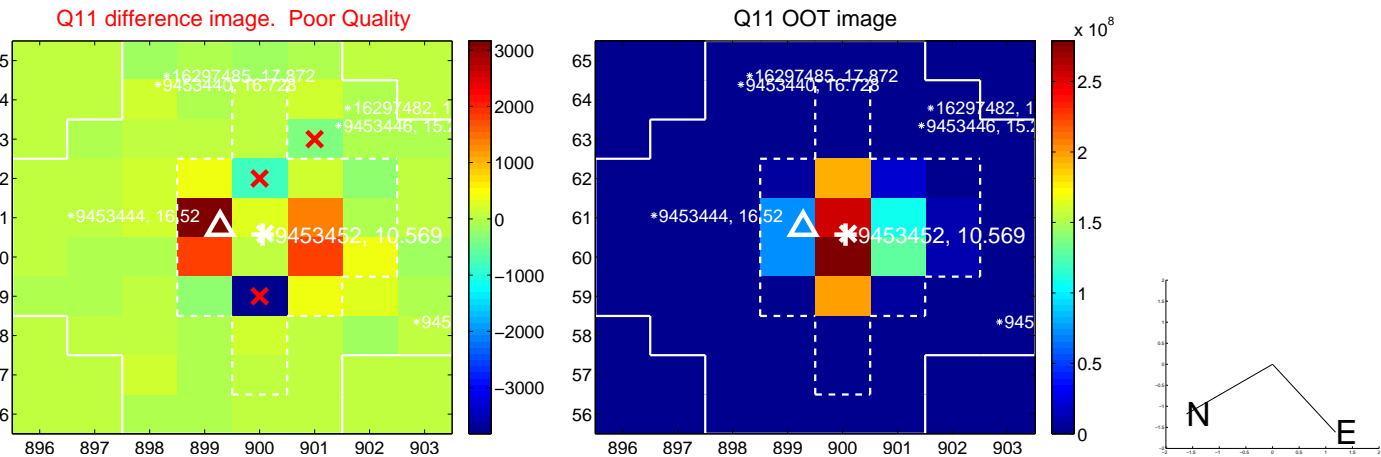
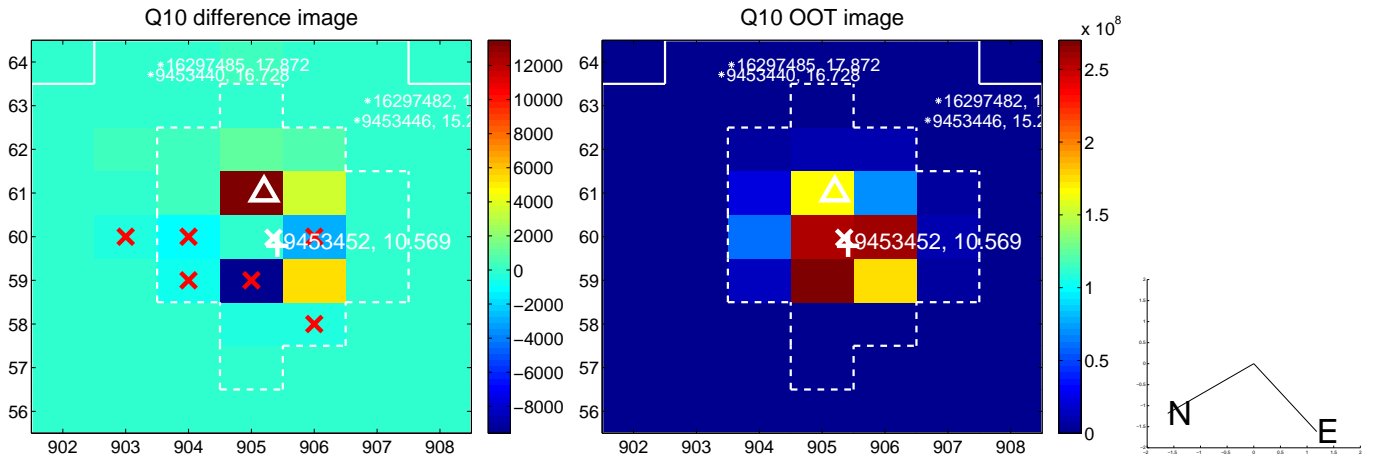
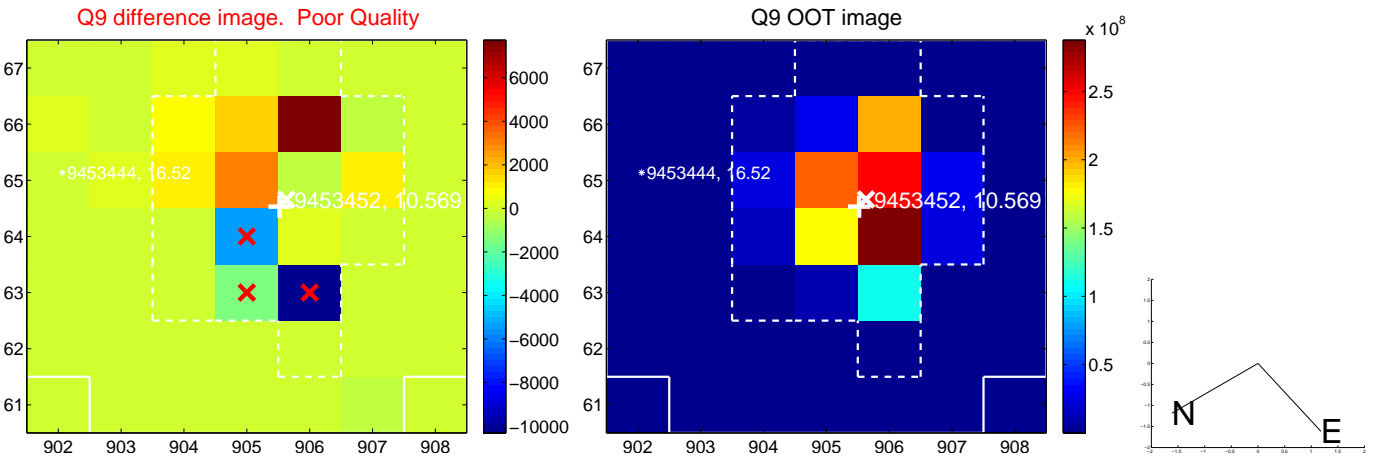
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



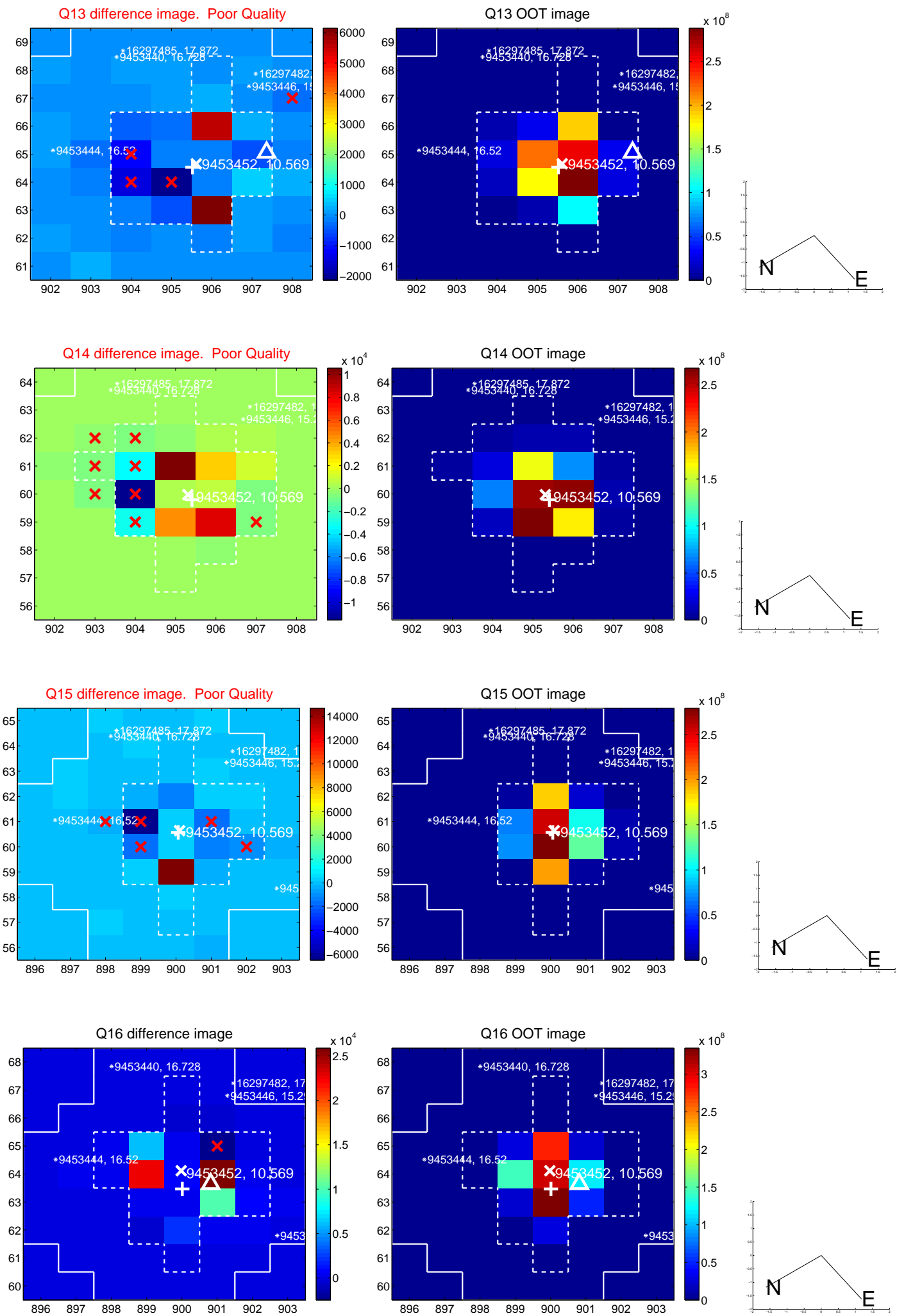
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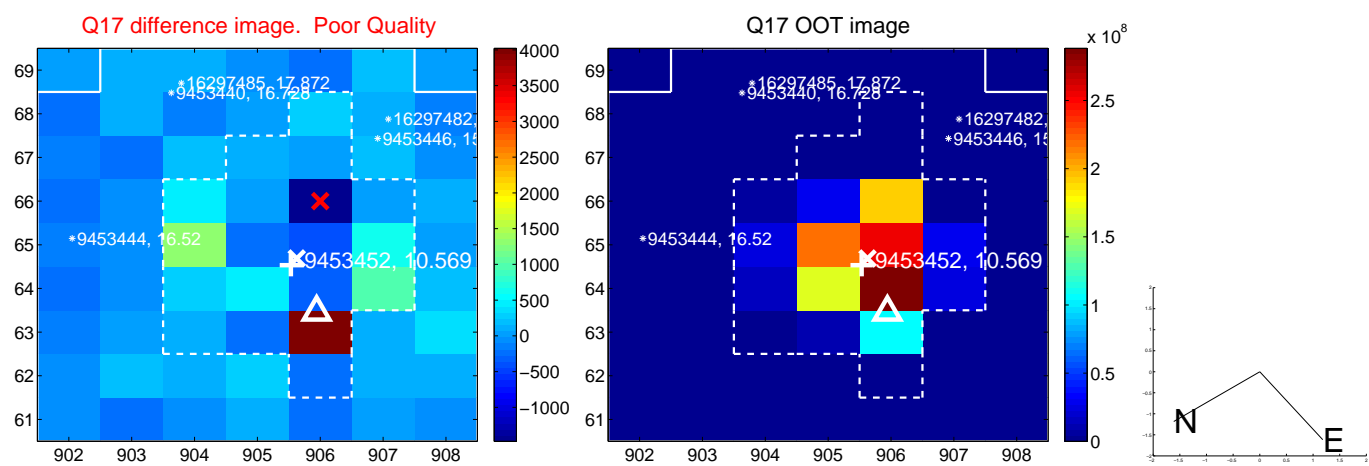
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



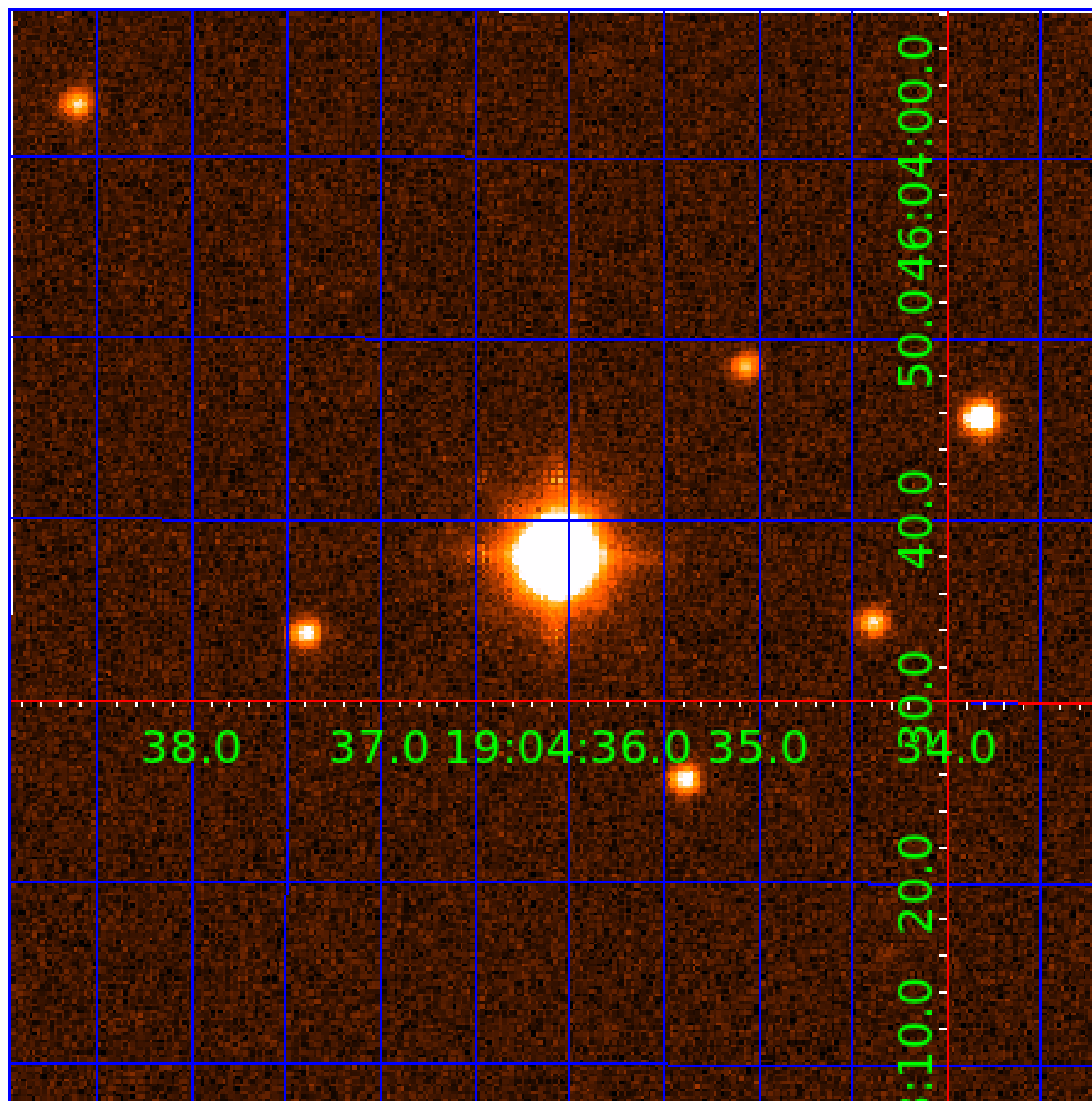
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



folded centroid time series figure for this object.

UKIRT Image

Declination



# KIC 009453452

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009453452-01	OBS	No	1.696790	133.133016	4.2	9.573	8.1	6.9	2.81	8715	0.60	30228.38
009453452-02	OBS	No	369.413964	214.436917	67.6	39.252	9.5	7.1	2.81	8715	2.53	23.08
009453452-03	OBS	No	270.466316	161.358003	116.7	6.436	8.5	8.2	2.81	8715	3.44	34.98
009453452-04	OBS	No	0.607198	131.602629	7.3	4.525	9.5	7.6	2.81	8715	0.81	118981.41

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009453452-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
009453452-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED
009453452-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED—HALO_GHOST
009453452-04	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—CENT_SATURATED

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

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

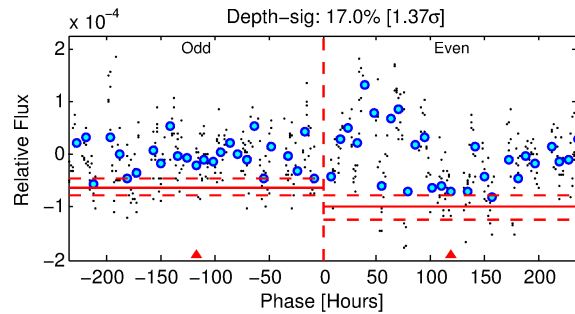
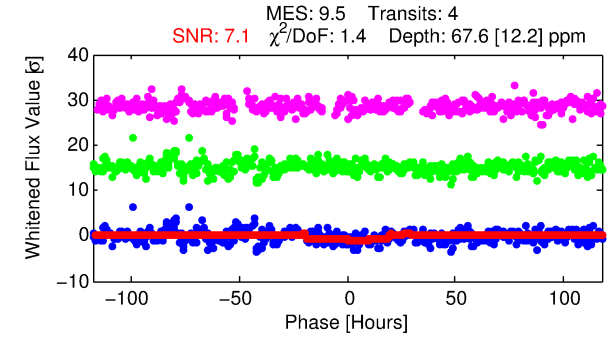
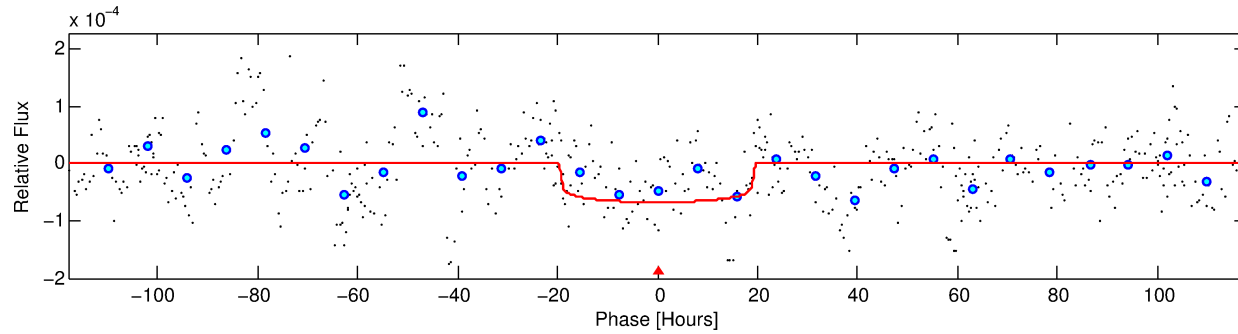
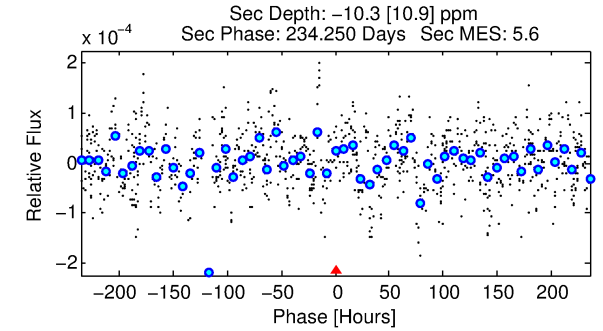
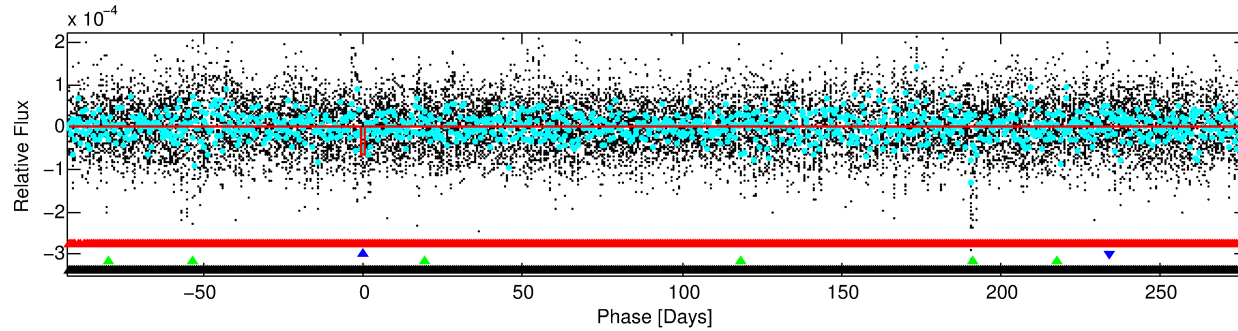
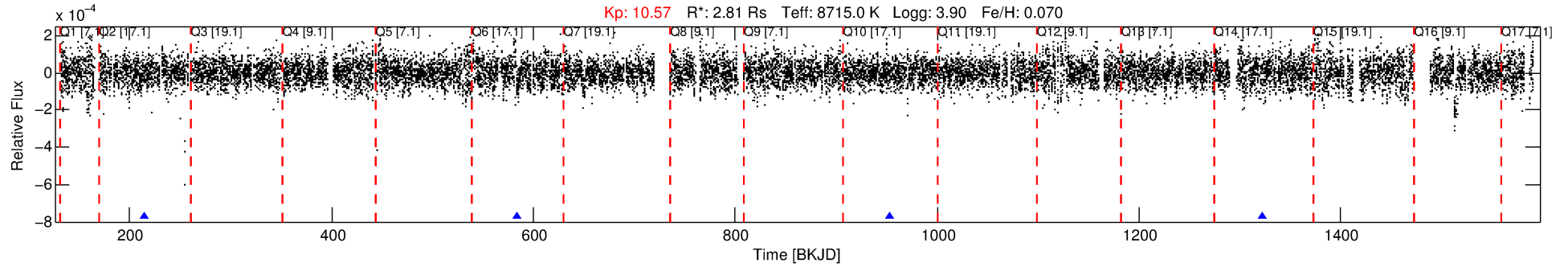
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## Ephemeris Match Information For 009453452-02

No Significant Match Found

# DV One-Page Summary

KIC: 9453452 Candidate: 2 of 4 Period: 369.414 d



## DV Fit Results:

Period = 369.41396 [0.01108] d  
Epoch = 214.4369 [0.0230] BKJD  
 $R_p/R^* = 0.0083$  [0.0010]  
 $a/R^* = 45.72$  [22.00]  
 $b = 0.78$  [0.24]  
 $S_{eff} = 23.08$  [11.68]  
 $T_{eq} = 559$  [71] K  
 $R_p = 2.53$  [0.92]  $R_e$   
 $a = 1.3274$  [0.4103] AU  
 $A_g = \text{N/A}$   
 $T_{effp} = \text{N/A}$

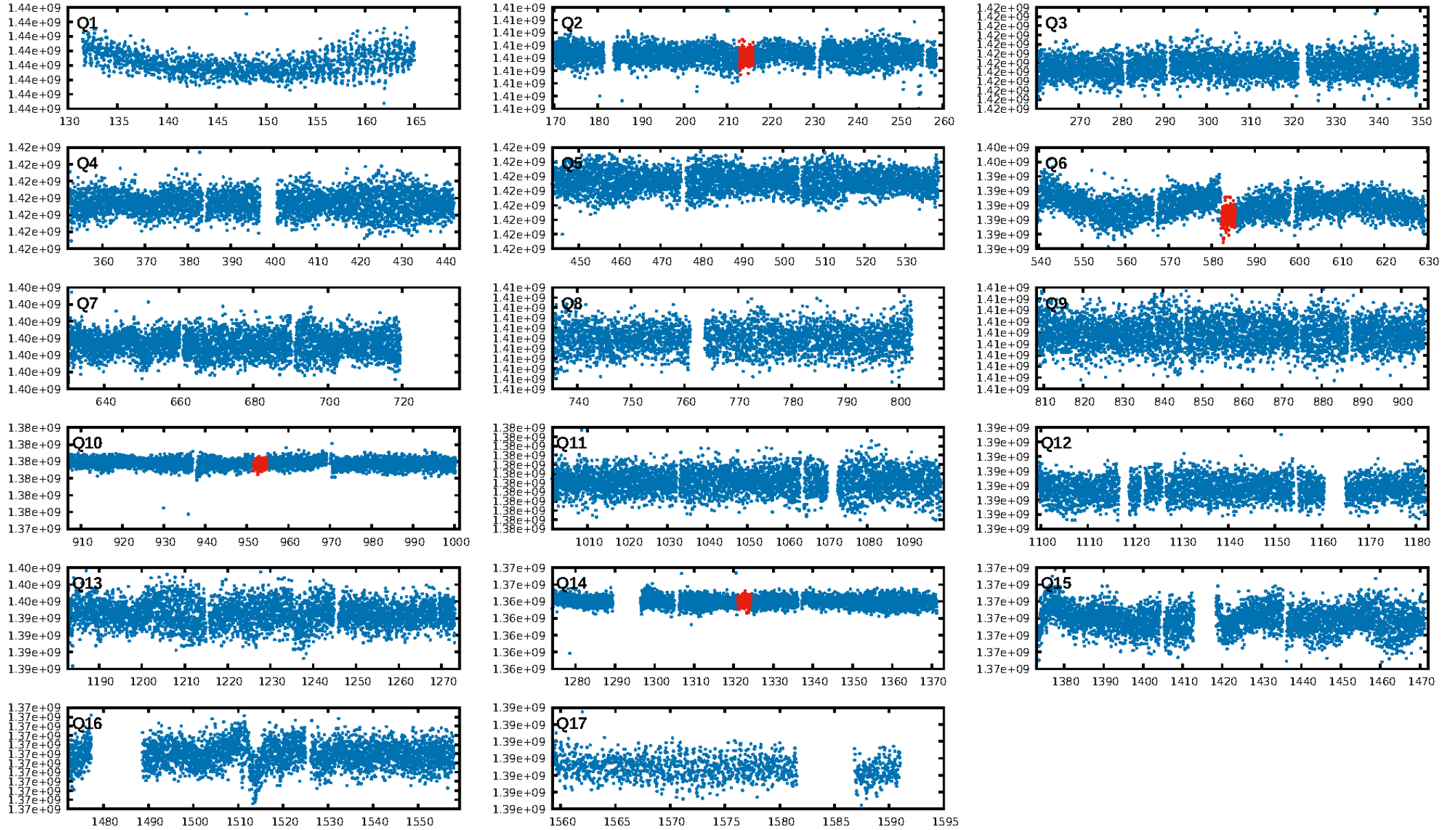
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [59.70σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 31.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 6.899  
Centroid-sig: 2.2%  
Centroid-so: 4.382 arcsec [1.57σ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0 [0]  
KicOffset-st: 0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 0.00 [0/4]

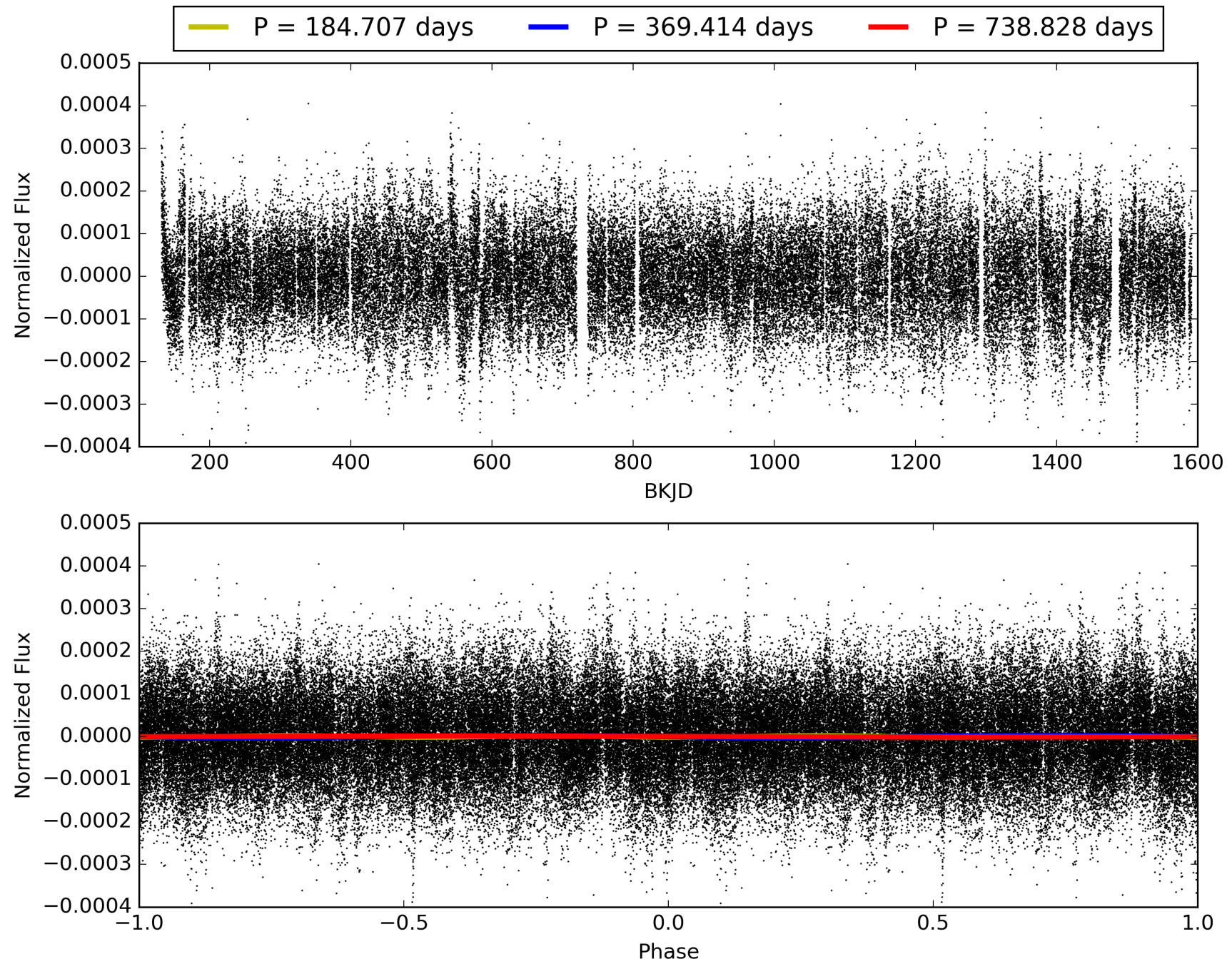
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:08:29 Z

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

# TCE 009453452-02, PDC Light Curves

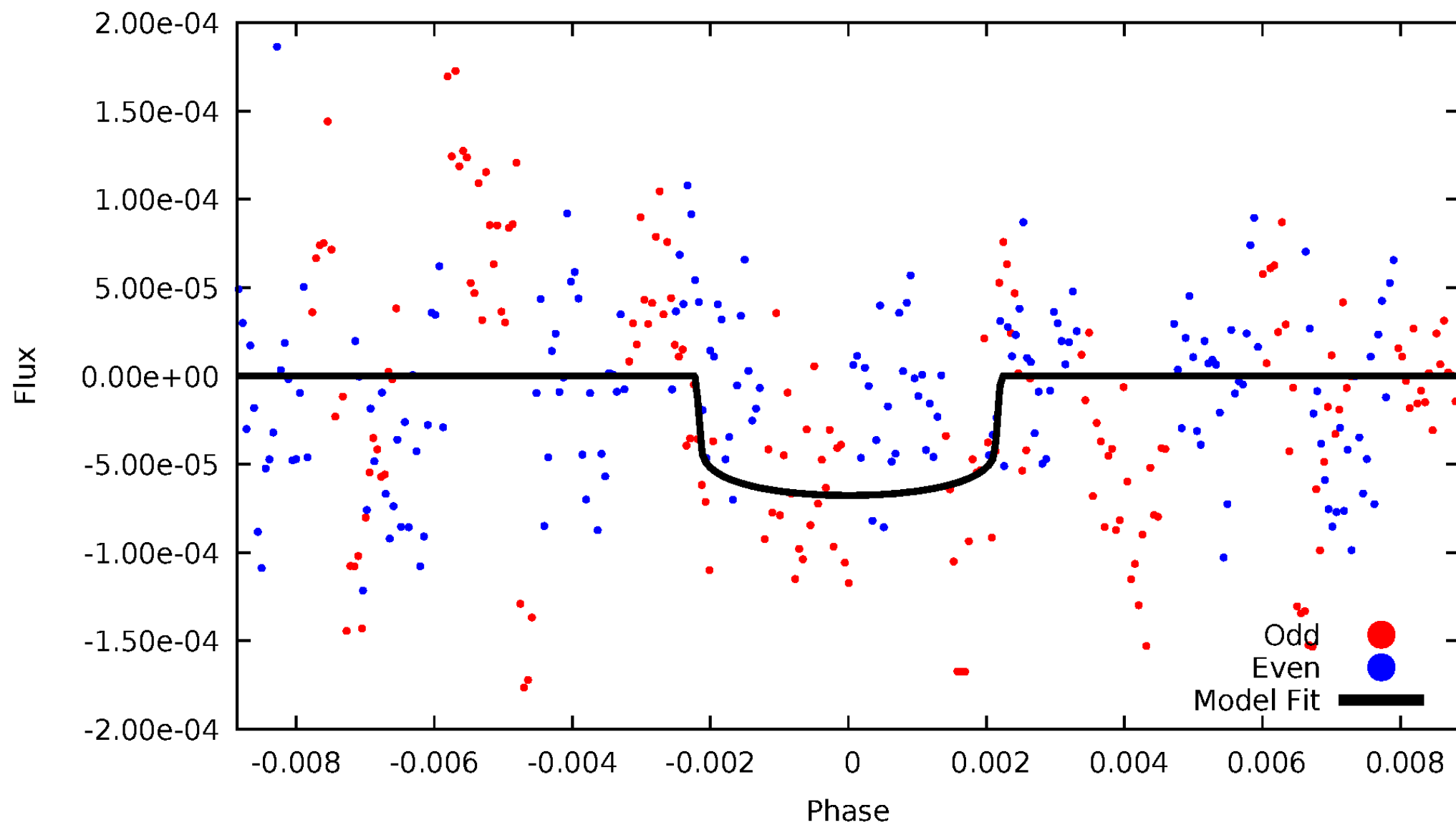


TCE 009453452-02



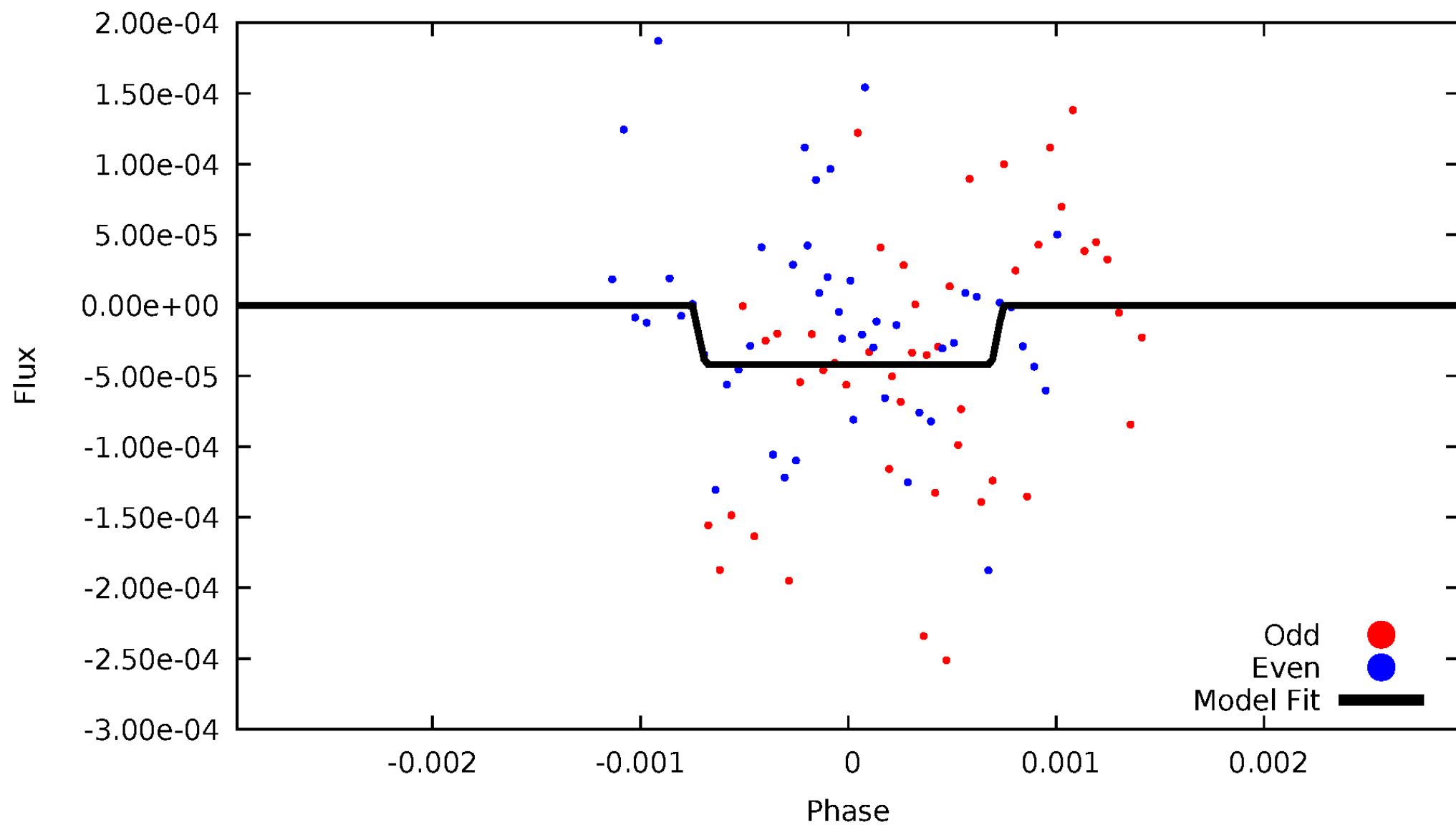
# DV Odd/Even

TCE 009453452-02



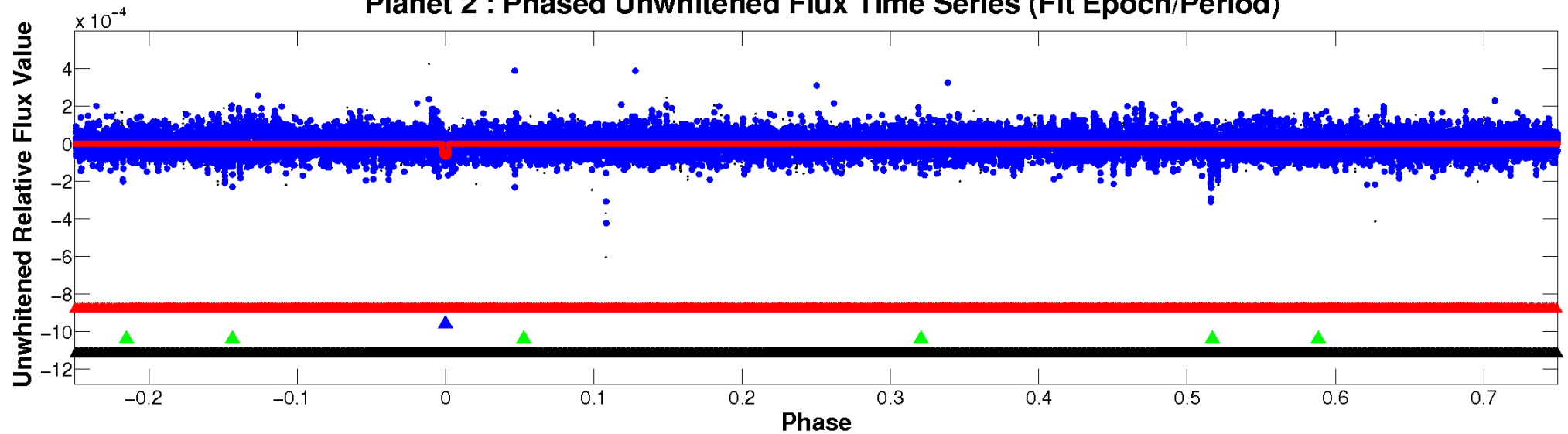
# ALT Odd/Even

TCE 009453452-02

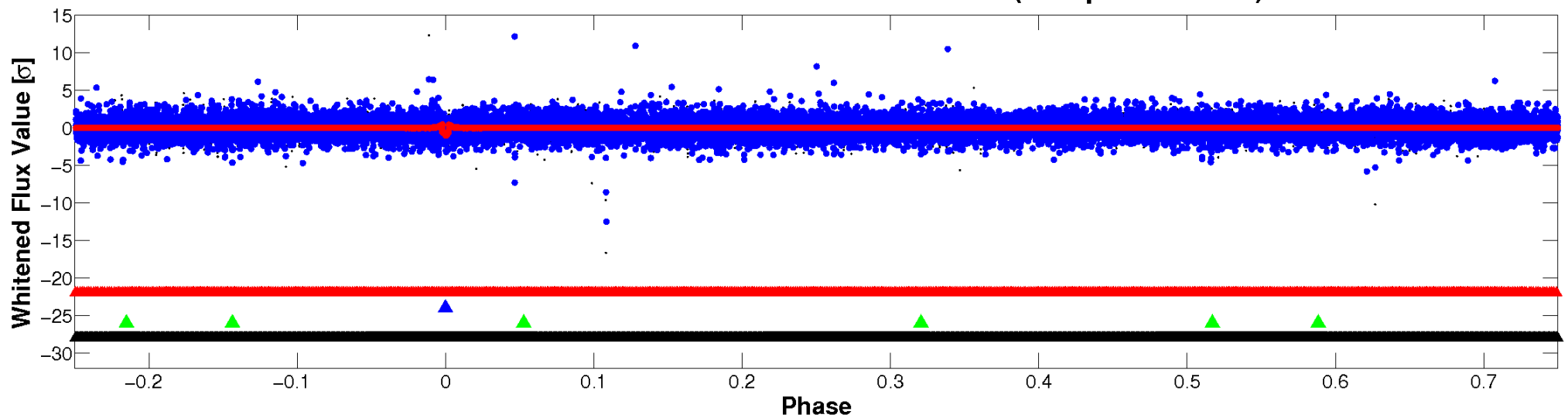


# Non-Whitened Vs. Whitened Light Curve

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



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



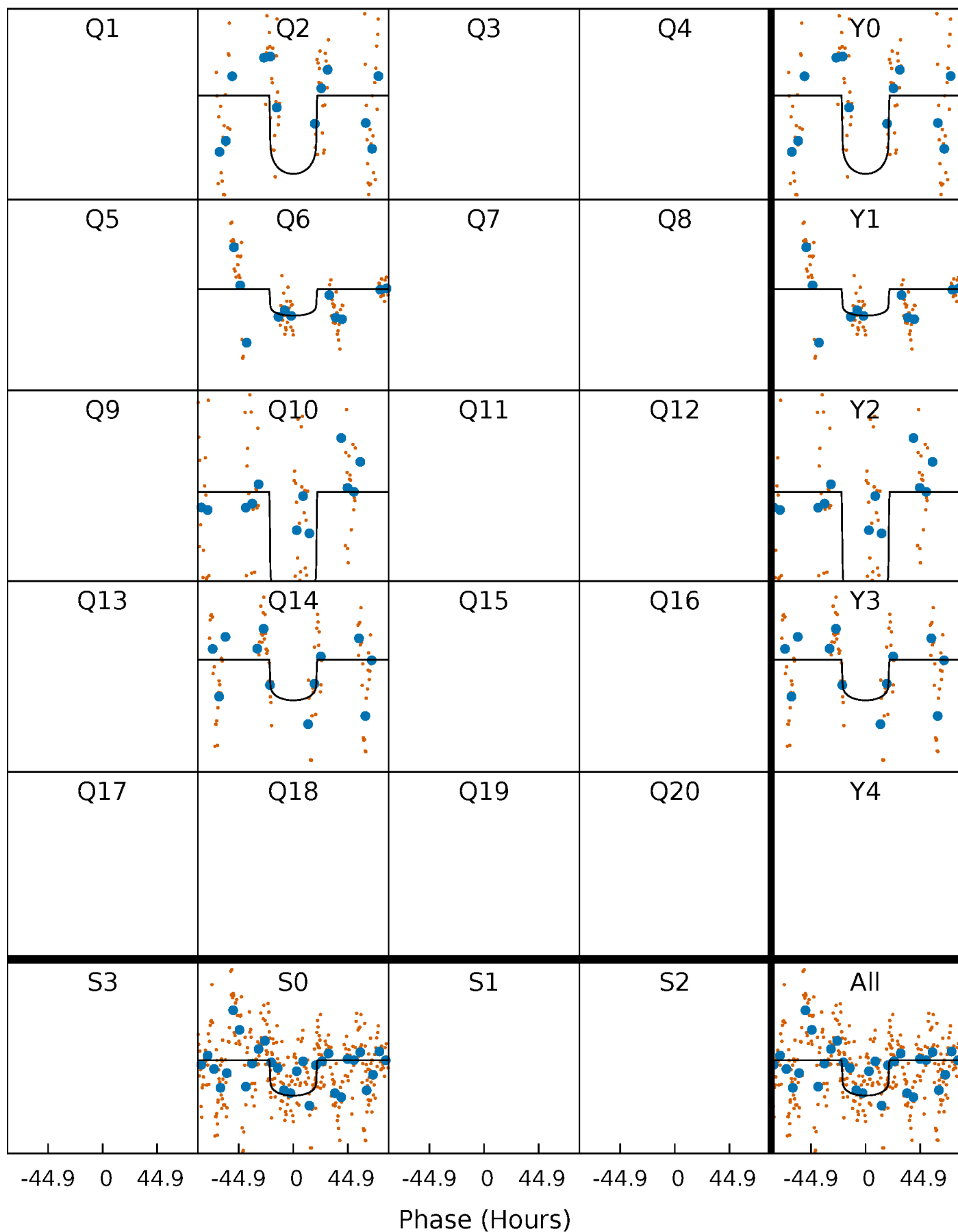
# PDC Quarter-Phased Transit Curves

TCE 009453452-02     $P=369.413964$  Days     $T_0=214.436917$  (BKJD)



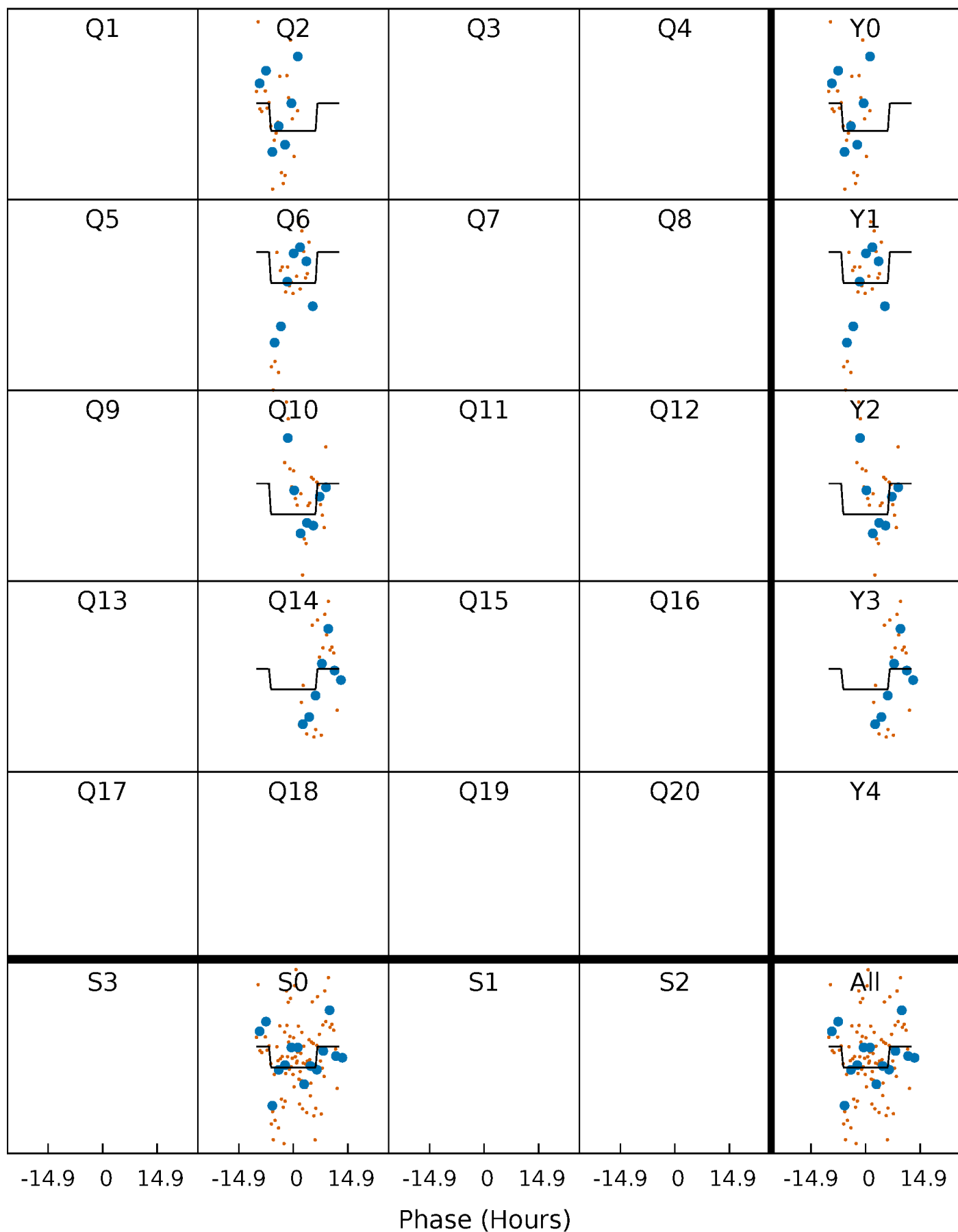
# DV Quarter-Phased Transit Curves

TCE 009453452-02 P=369.413964 Days  $T_0=214.436917$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

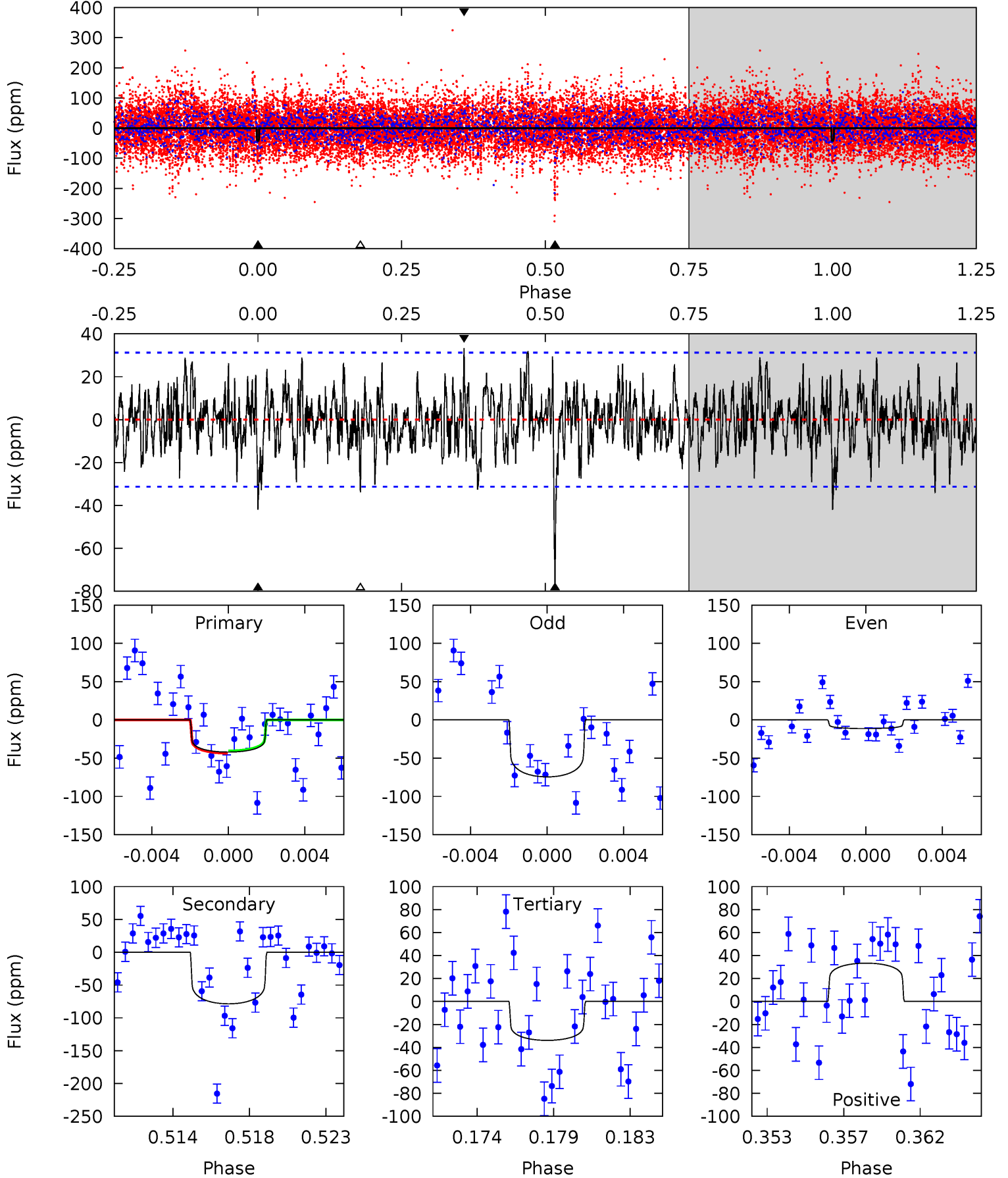
TCE 009453452-02 P=369.738457 Days  $T_0=213.913542$  (BKJD)



# DV Model-Shift Uniqueness Test

009453452-02, P = 369.413964 Days, E = 214.436917 Days

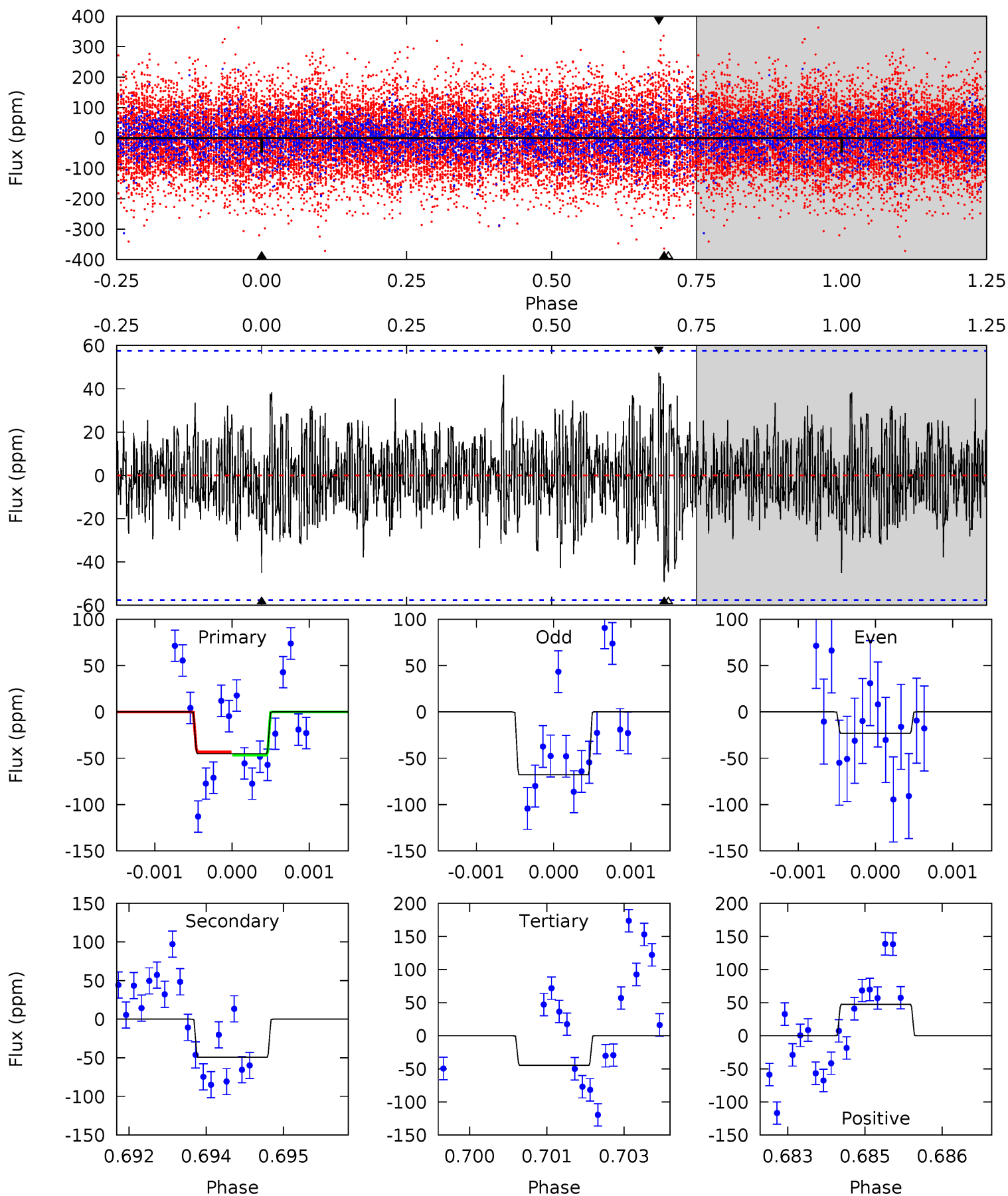
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.97	13.0	5.62	5.52	5.18	2.84	1.73	1.35	1.44	7.41	7.51	5.24	1.19	0.30	0.25



# Alt Model-Shift Uniqueness Test

009453452-02, P = 369.738457 Days, E = 213.913542 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
4.21	4.61	4.18	4.42	5.38	3.18	1.17	0.03	-0.21	0.43	0.19	2.08	1.39	0.49	0.16



### Stellar Parameters For KIC 009453452

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8715^{+246}_{-387}$	$3.901^{+0.270}_{-0.180}$	$0.070^{+0.250}_{-0.550}$	$2.805^{+0.965}_{-0.965}$	$2.283^{+0.337}_{-0.626}$	$0.146^{+0.283}_{-0.076}$
	+3%/-4%	+7%/-5%	+357%/-786%	+34%/-34%	+15%/-27%	+194%/-52%
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 009453452-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-79 \pm 6$	$2.44^{+0.62}_{-0.49}$	$769^{+69}_{-74}$	$9037^{+1029}_{-760}$	$12490^{+6951}_{-4265}$
Alt.	$-49 \pm 11$	$1.90^{+0.48}_{-0.42}$	$771^{+67}_{-78}$	$9149^{+1334}_{-1150}$	$12556^{+9048}_{-4894}$

$T_{\text{max}}$  = 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

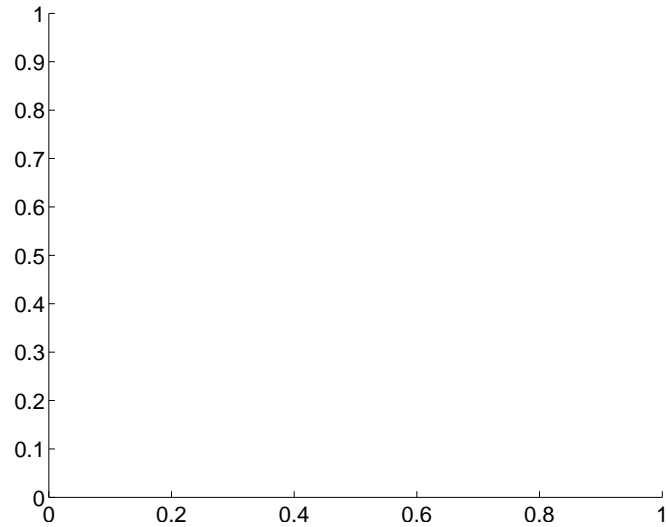
Supplemental centroid analysis for 009453452-02. **Kepler magnitude: 10.57.** Transit SNR 7.09

**There are 0 quarters with good PRF difference image offsets**

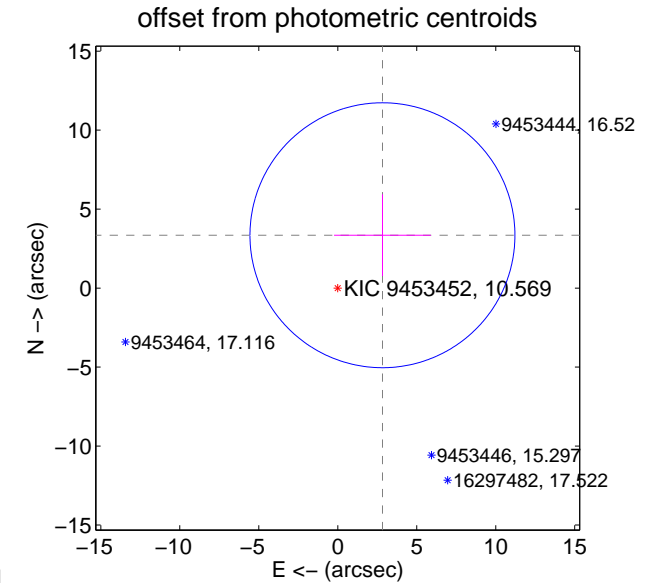
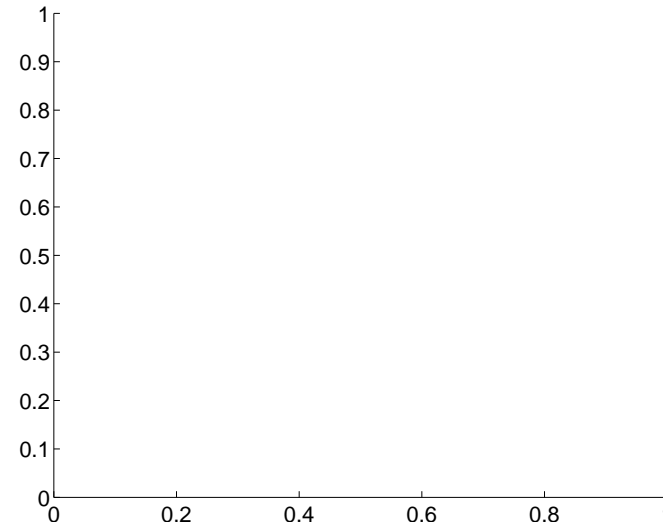
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	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	$4.38 \pm 2.80$	1.57	$-2.83 \pm 3.06$	$3.35 \pm 2.59$

There is no PRF-fit offset from OOT-fit

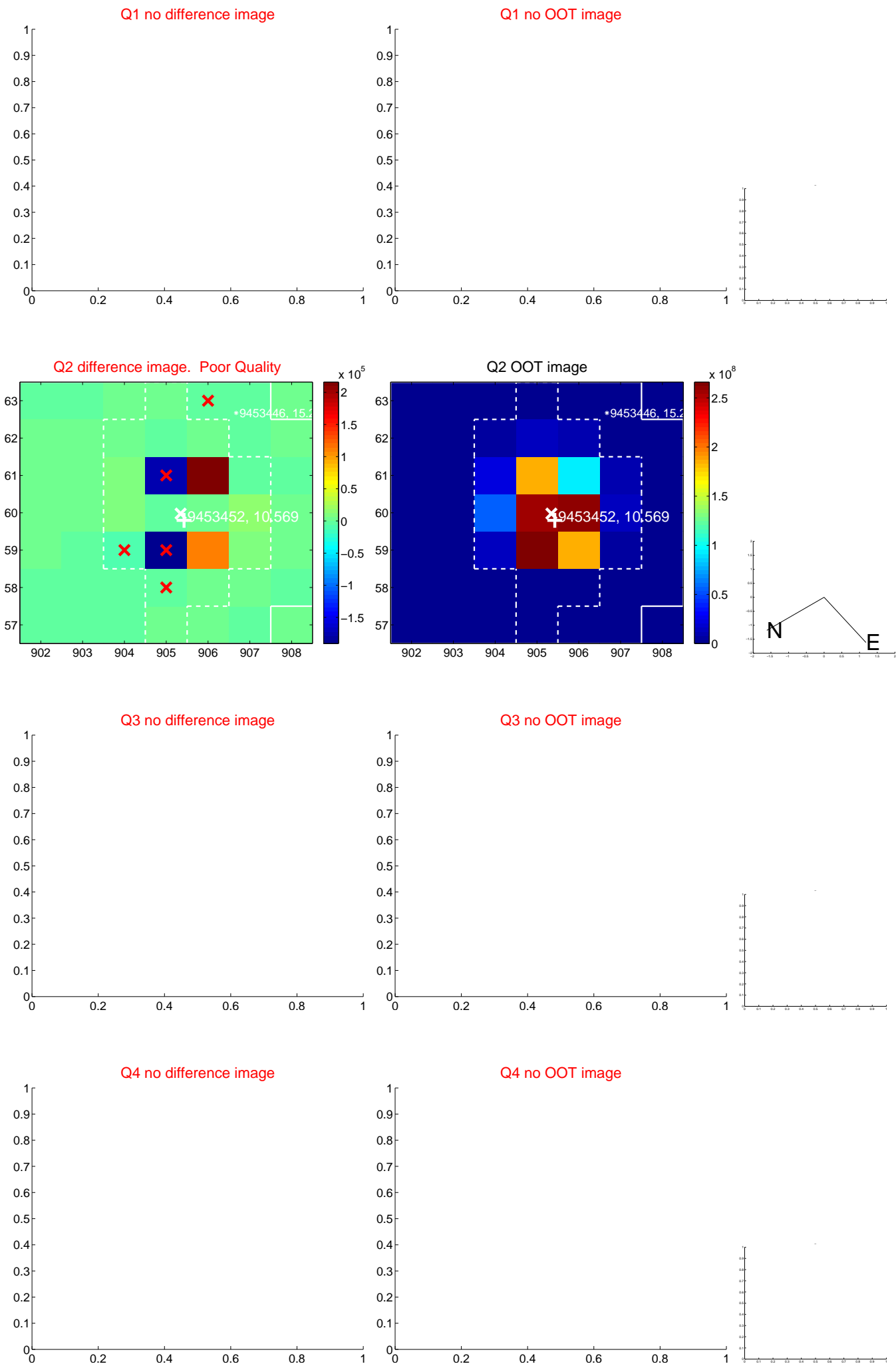


There is no PRF-fit offset from KIC

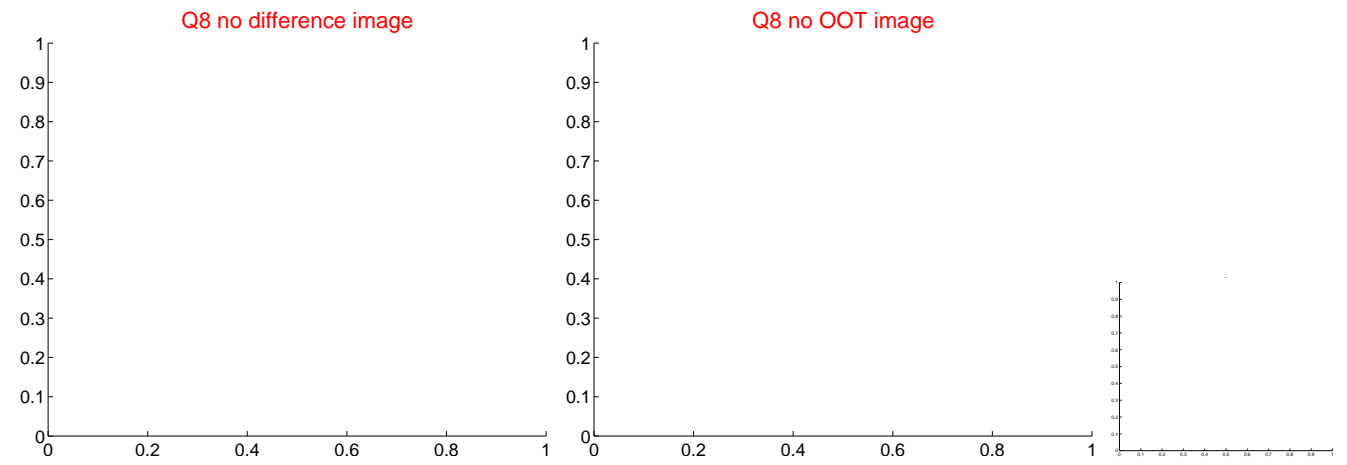
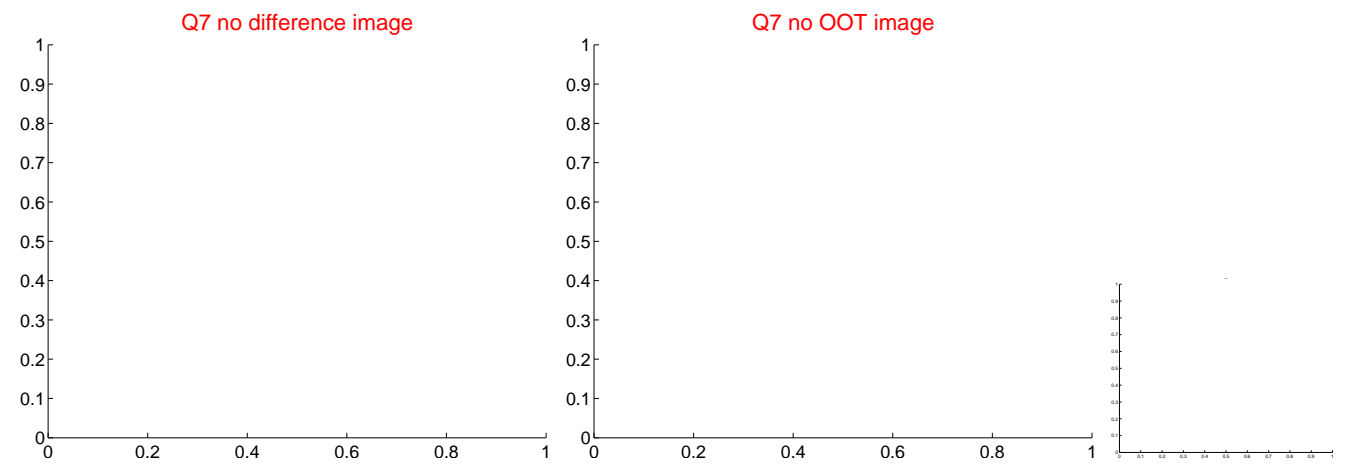
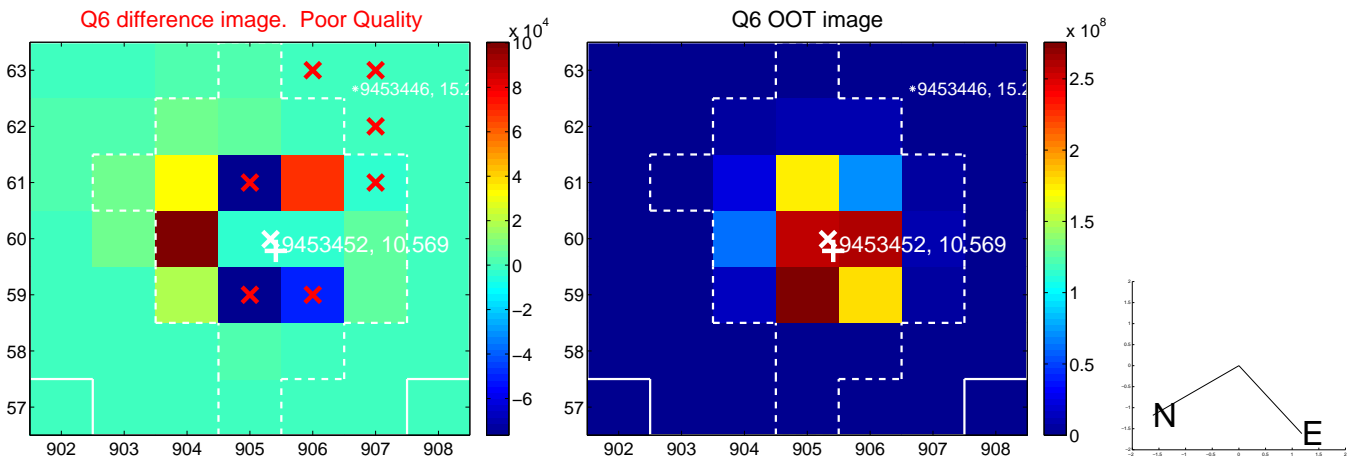
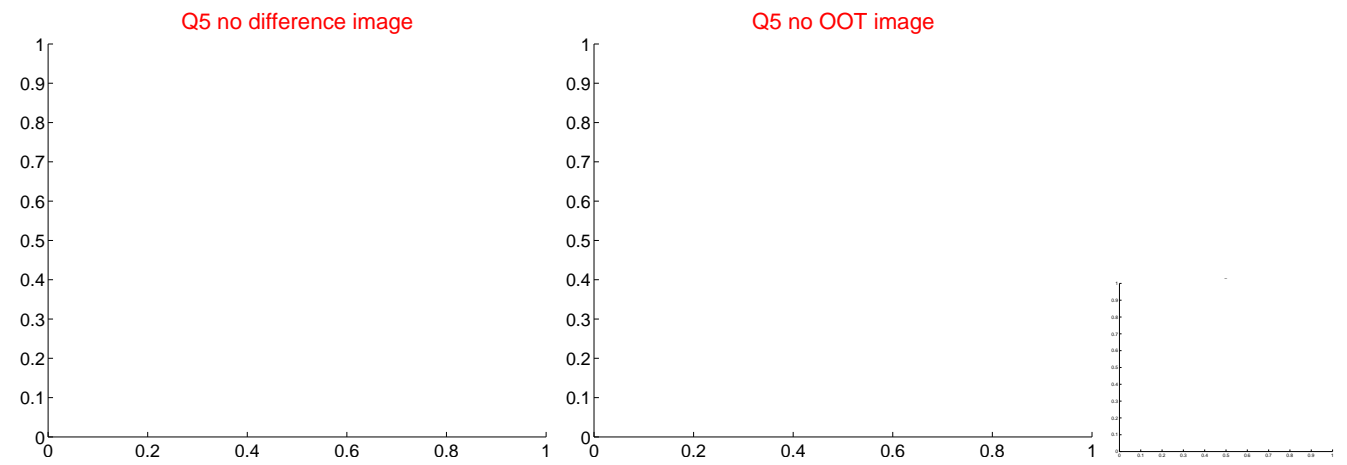


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

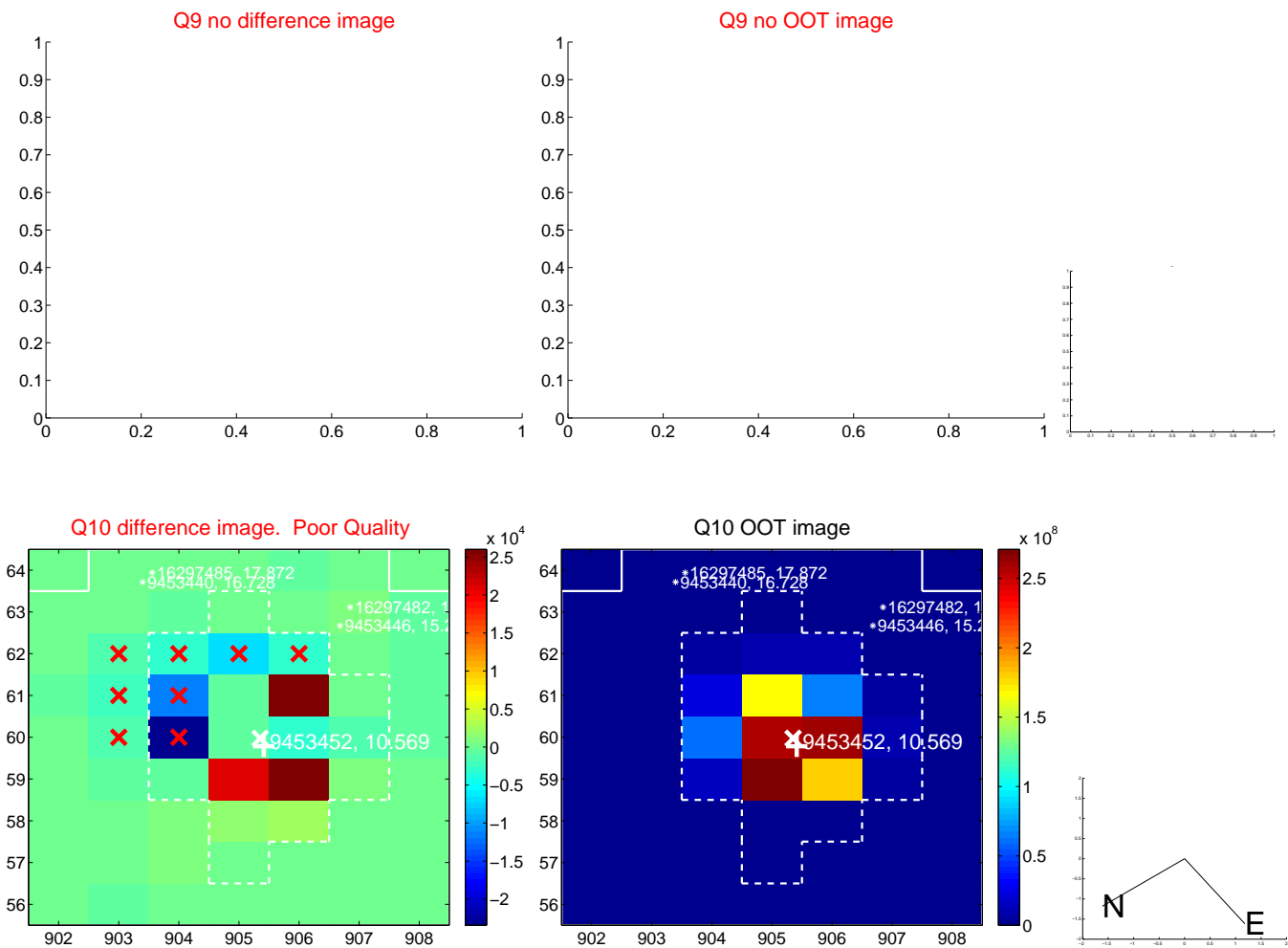
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



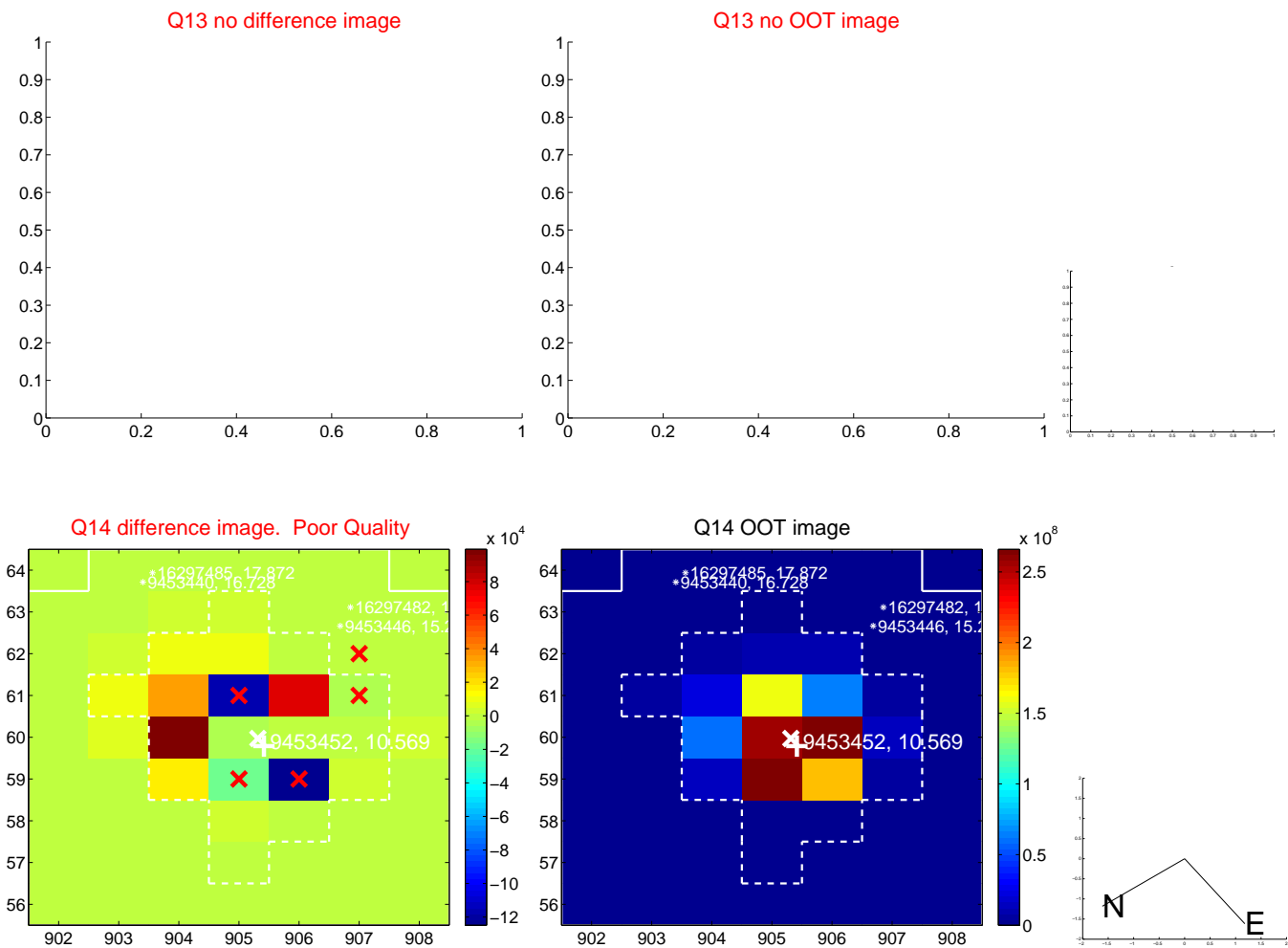
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



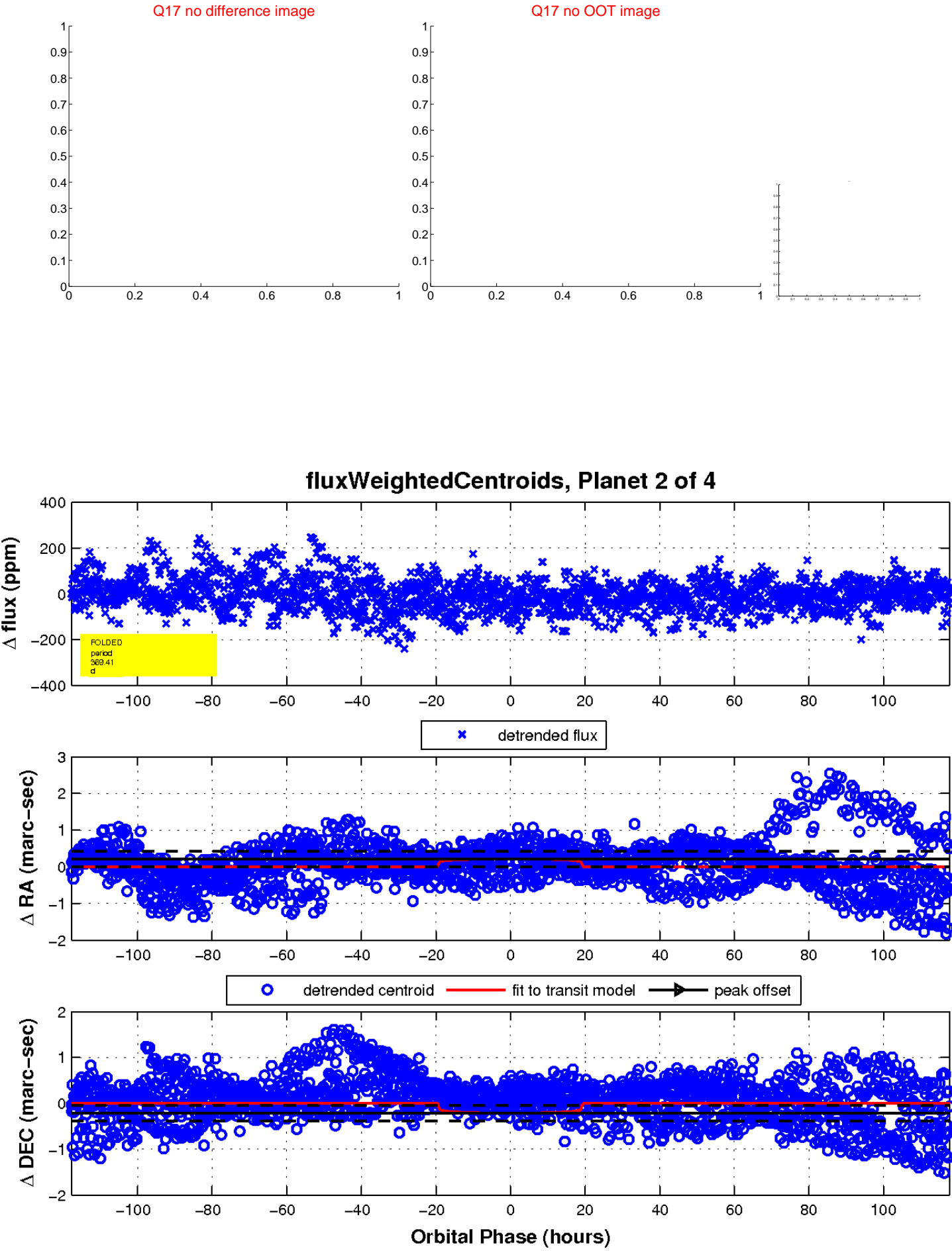
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

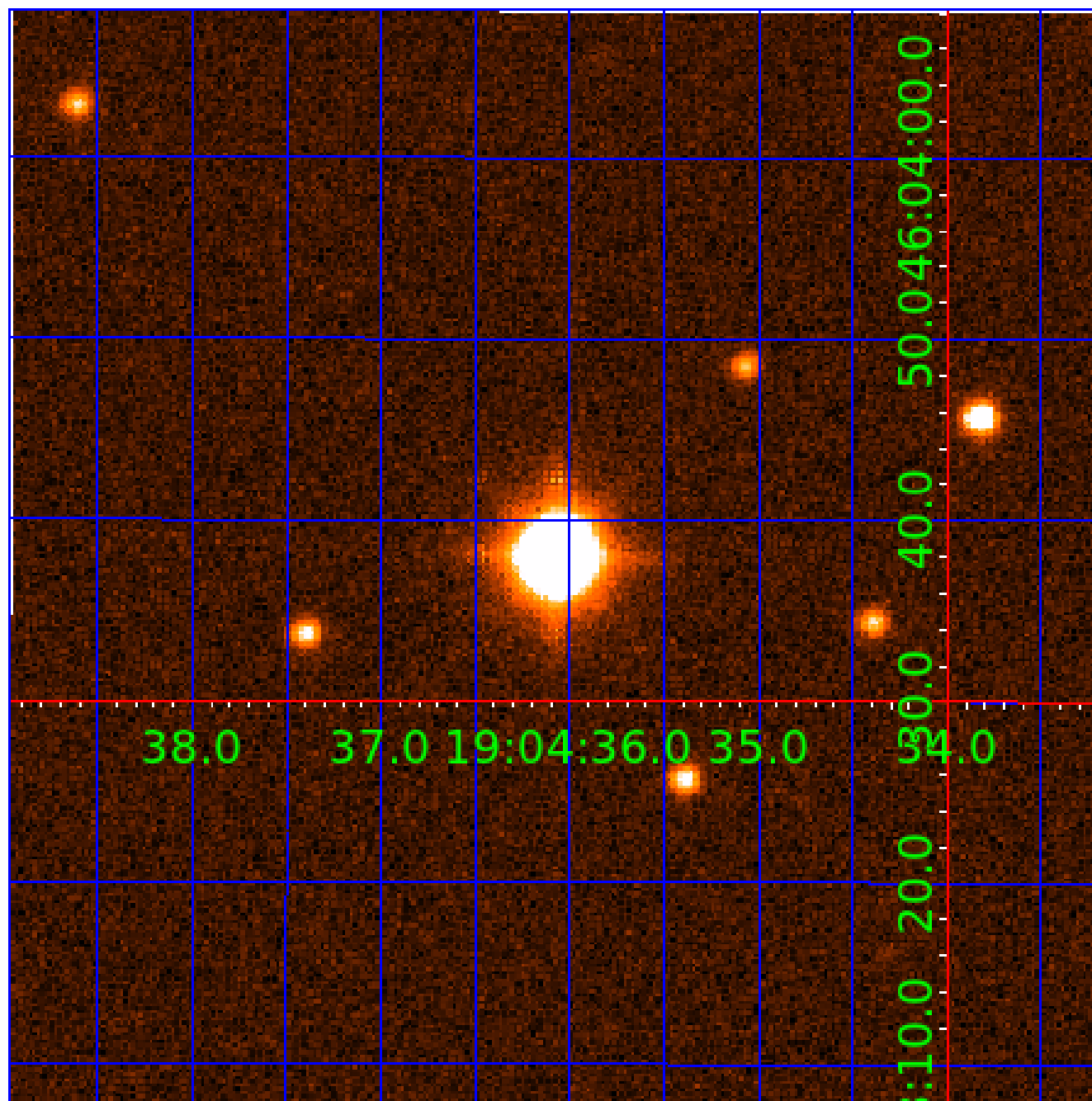


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009453452

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009453452-01	OBS	No	1.696790	133.133016	4.2	9.573	8.1	6.9	2.81	8715	0.60	30228.38
009453452-02	OBS	No	369.413964	214.436917	67.6	39.252	9.5	7.1	2.81	8715	2.53	23.08
009453452-03	OBS	No	270.466316	161.358003	116.7	6.436	8.5	8.2	2.81	8715	3.44	34.98
009453452-04	OBS	No	0.607198	131.602629	7.3	4.525	9.5	7.6	2.81	8715	0.81	118981.41

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009453452-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
009453452-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED
009453452-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED—HALO_GHOST
009453452-04	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—CENT_SATURATED

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

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

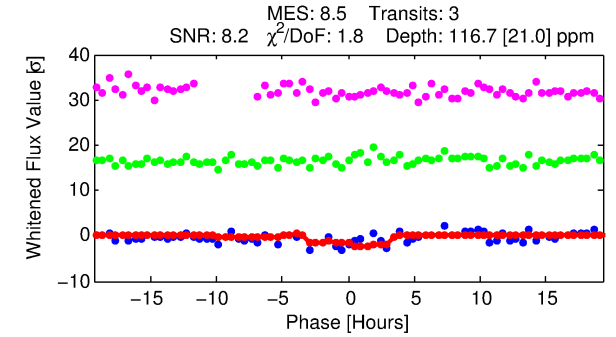
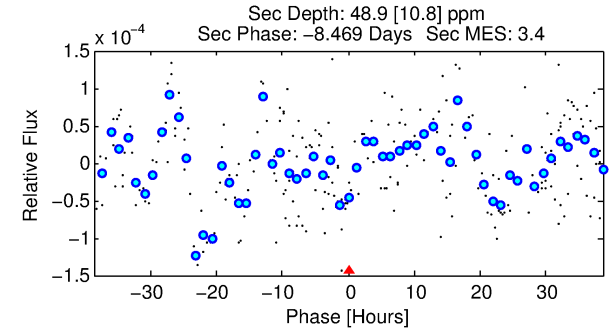
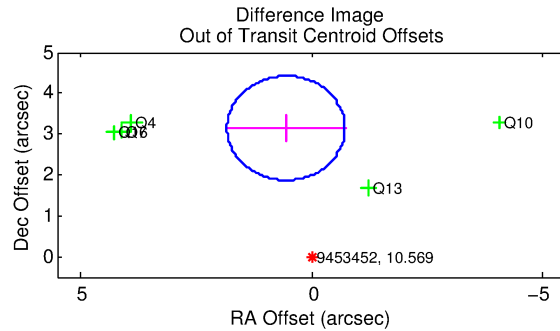
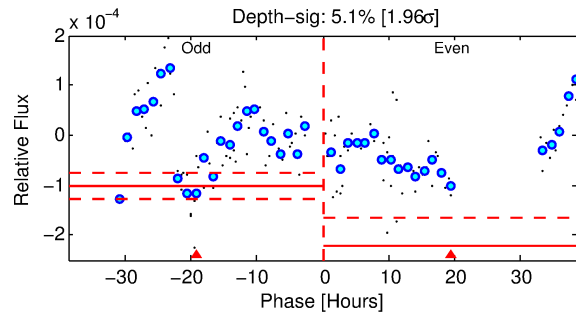
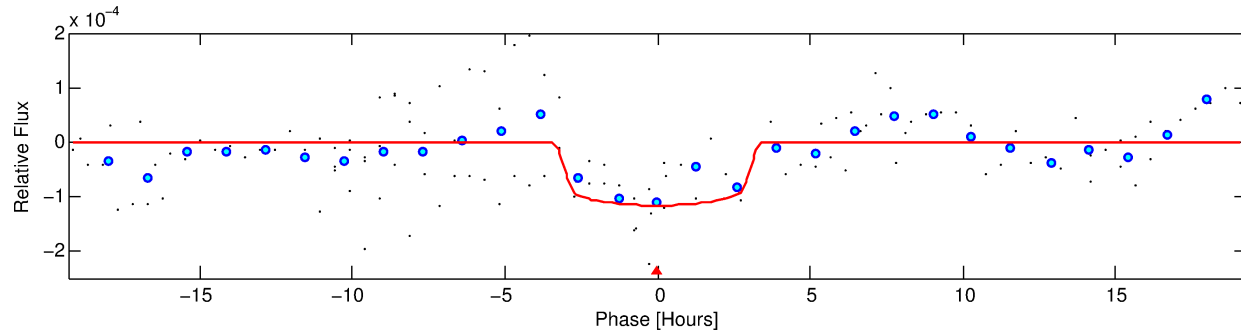
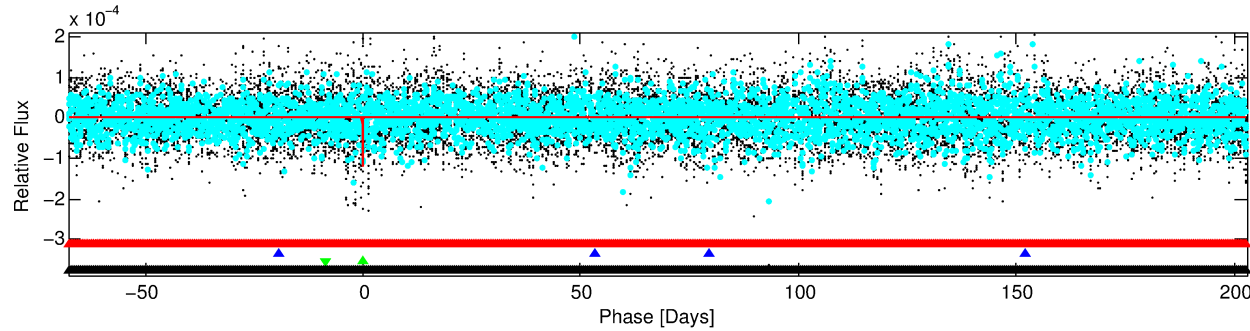
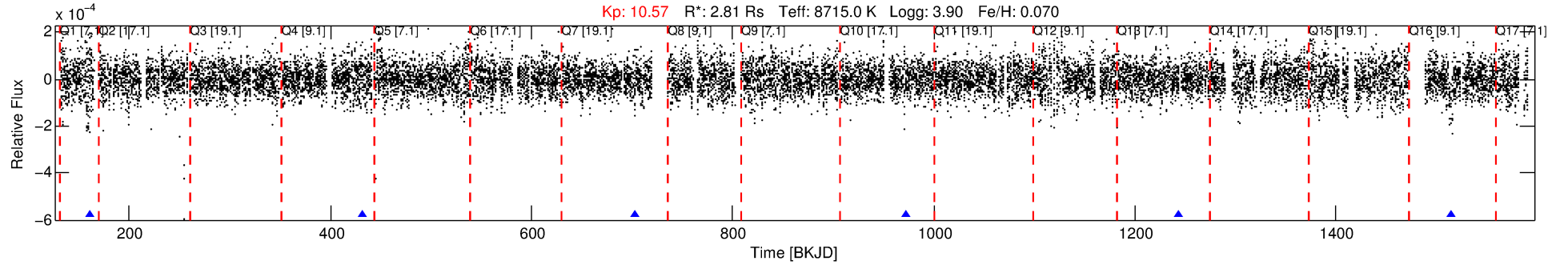
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009453452-03

No Significant Match Found

# DV One-Page Summary

KIC: 9453452 Candidate: 3 of 4 Period: 270.466 d



## DV Fit Results:

Period = 270.46632 [0.00513] d  
Epoch = 161.3580 [0.0178] BKJD  
Rp/R\* = 0.0112 [0.0111]  
a/R\* = 166.46 [1093.80]  
b = 0.87 [1.90]  
Seff = 34.98 [17.69]  
Teq = 620 [78] K  
Rp = 3.44 [3.58] Re  
a = 1.0783 [0.3333] AU  
Ag = 2649.52 [5395.50] [0.49 $\sigma$ ]  
Teffp = 6879 [3420] K [1.83 $\sigma$ ]

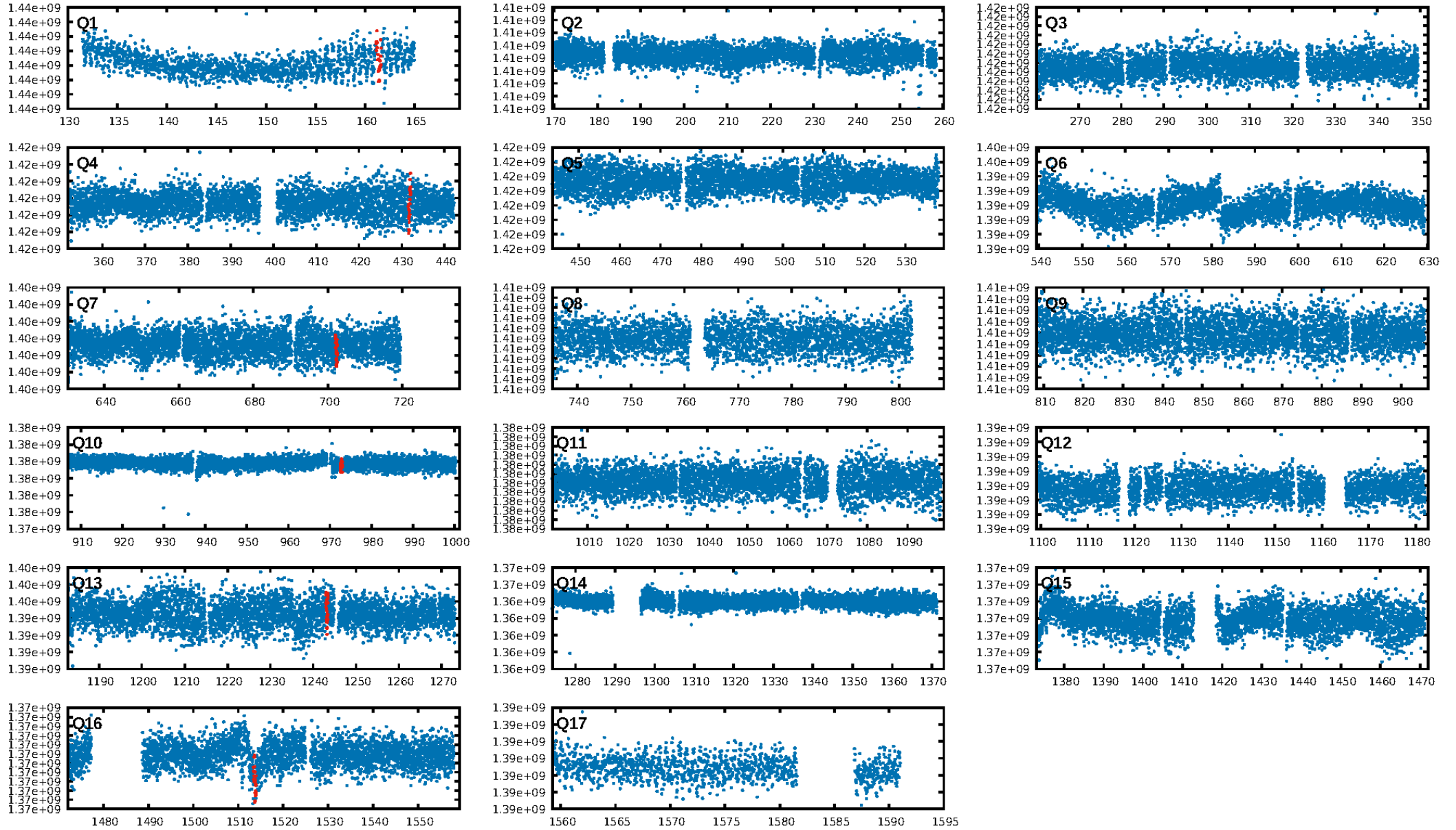
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [559.21 $\sigma$ ]  
LongPeriod-sig: 100.0% [59.70 $\sigma$ ]  
ModelChiSquare2-sig: 6.4%  
ModelChiSquareGof-sig: 96.1%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: -0.1585  
Centroid-sig: 1.7%  
Centroid-so: 1.754 arcsec [2.17 $\sigma$ ]  
OotOffset-rm: 3.192 arcsec [7.51 $\sigma$ ]  
KicOffset-rm: 3.957 arcsec [3.64 $\sigma$ ]  
OotOffset-st: 1/1/2/1 [5]  
KicOffset-st: 1/1/2/1 [5]  
DiffImageQuality-fgm: 0.80 [4/5]  
DiffImageOverlap-fno: 0.00 [0/6]

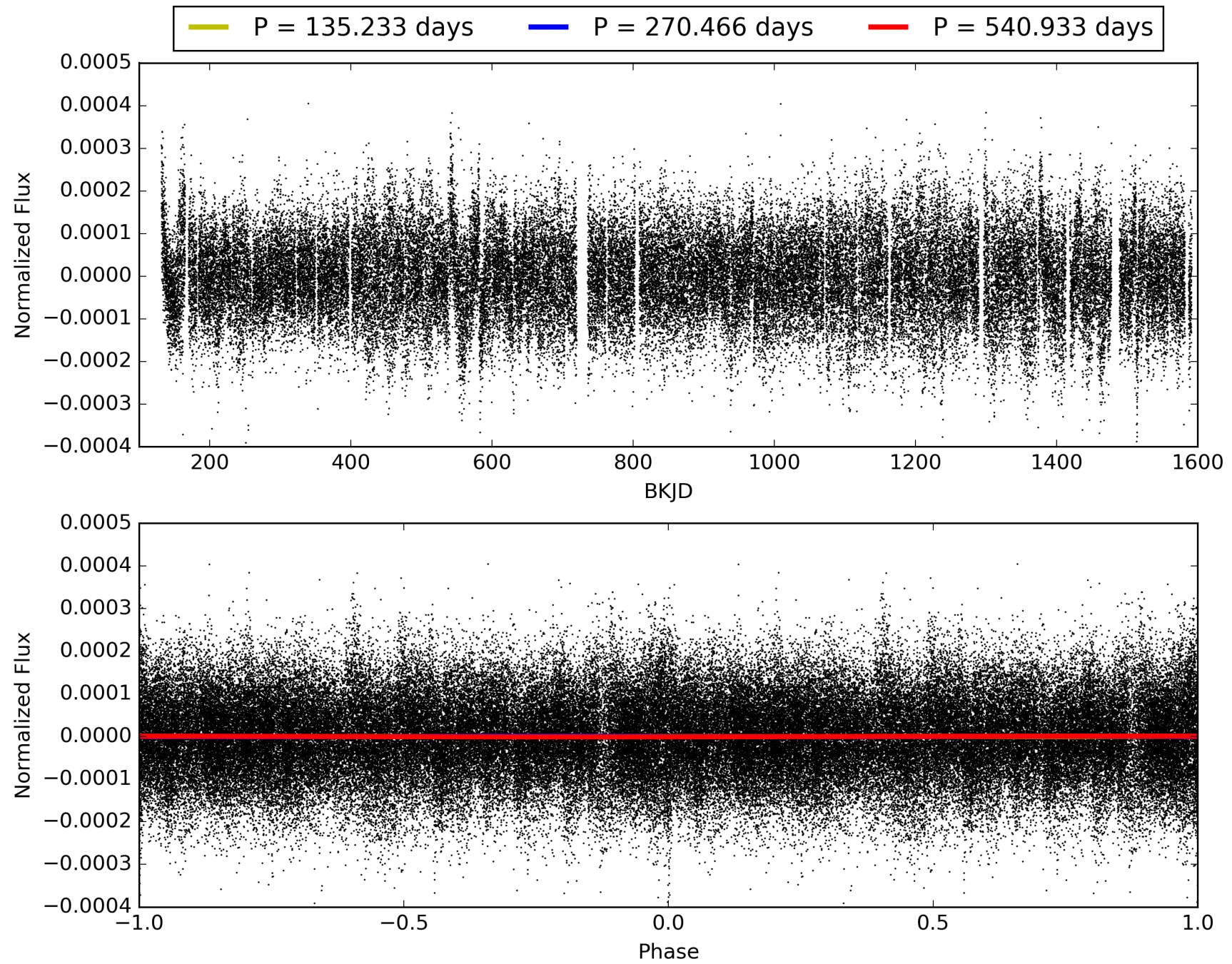
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:08:34 Z

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

# TCE 009453452-03, PDC Light Curves

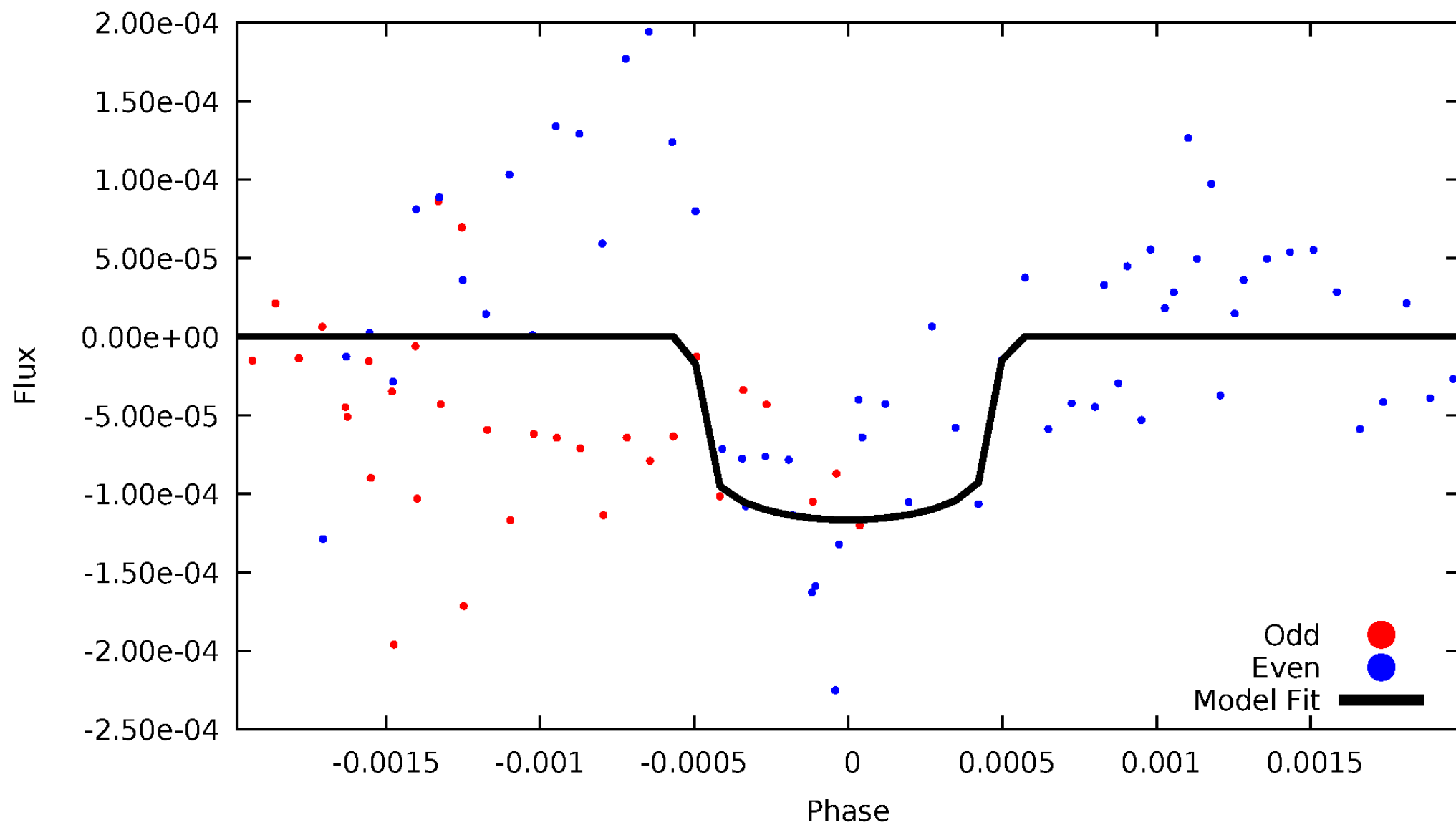


TCE 009453452-03



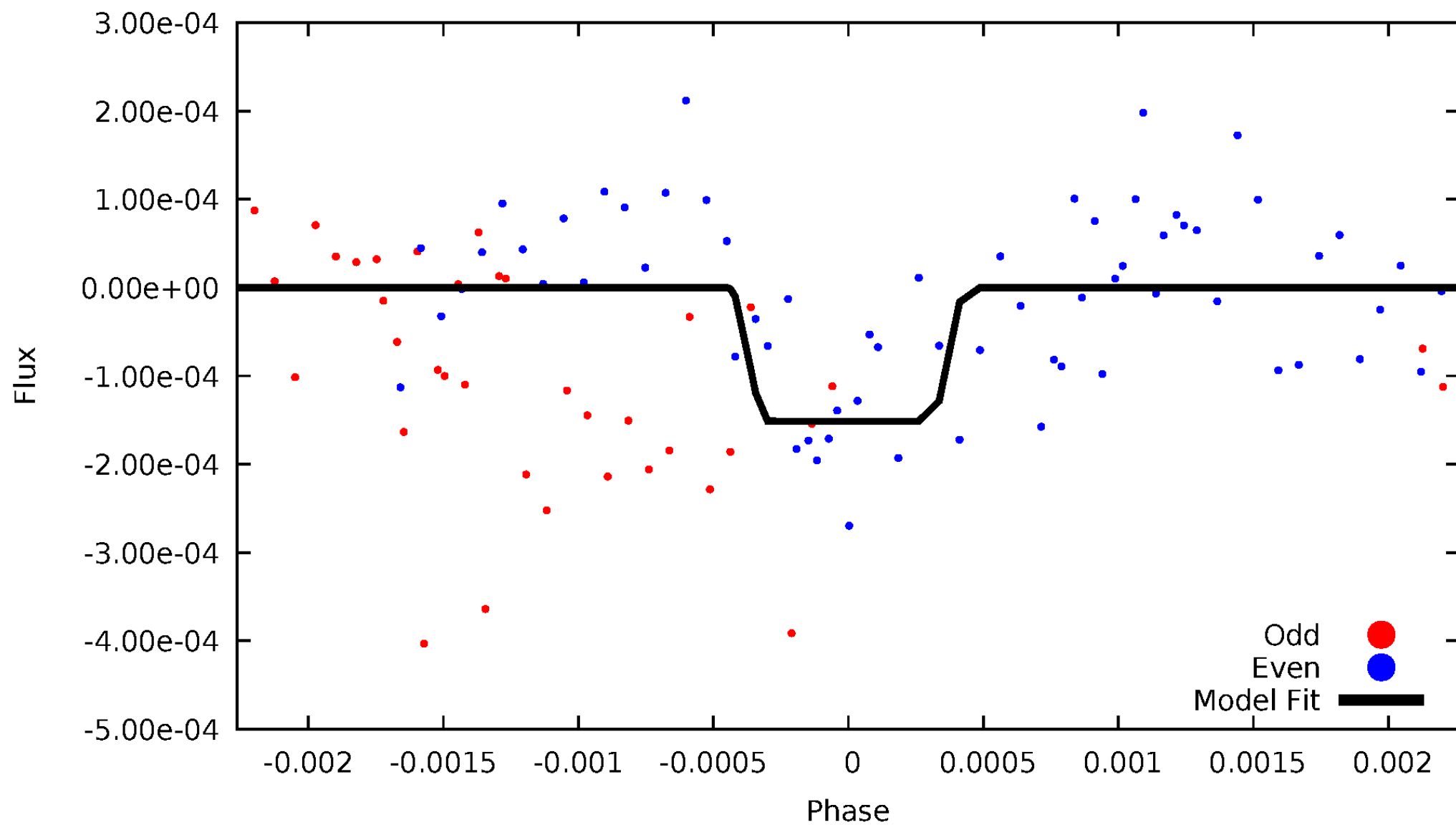
# DV Odd/Even

TCE 009453452-03



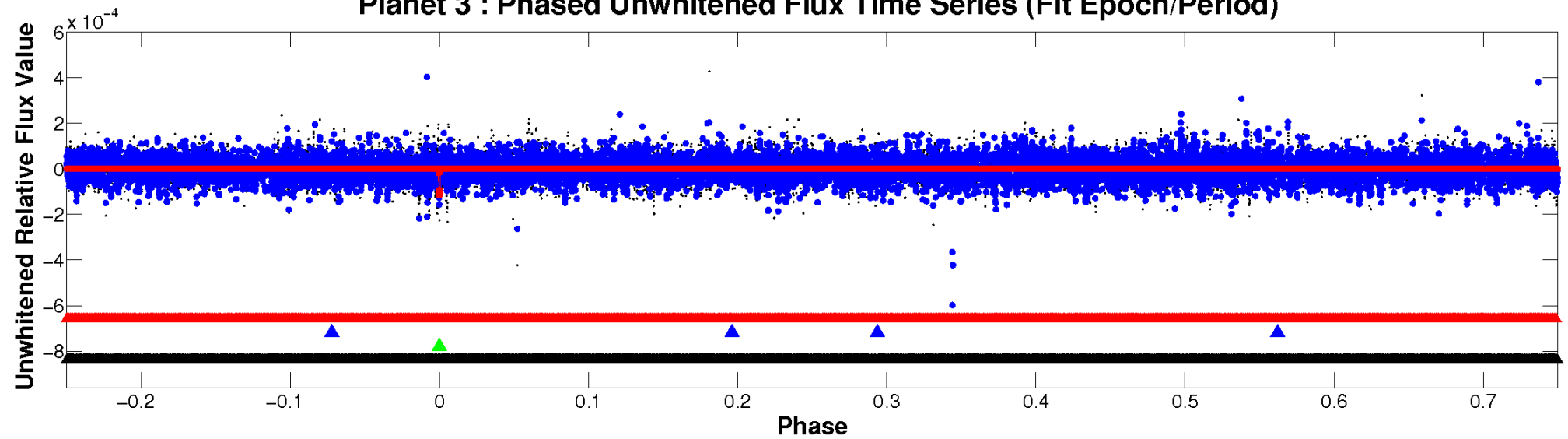
# ALT Odd/Even

TCE 009453452-03

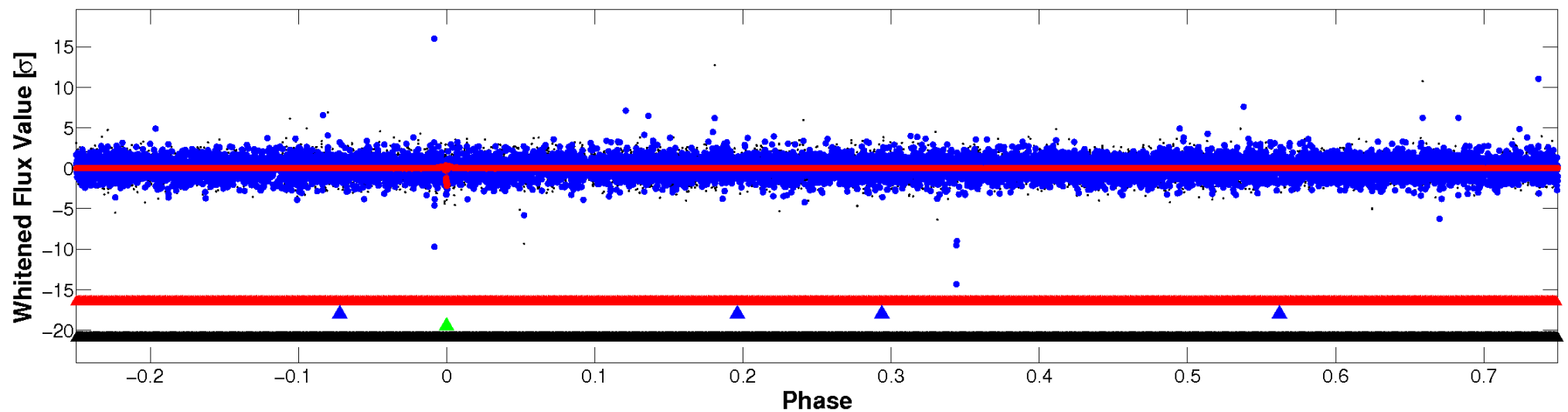


# Non-Whitened Vs. Whitened Light Curve

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

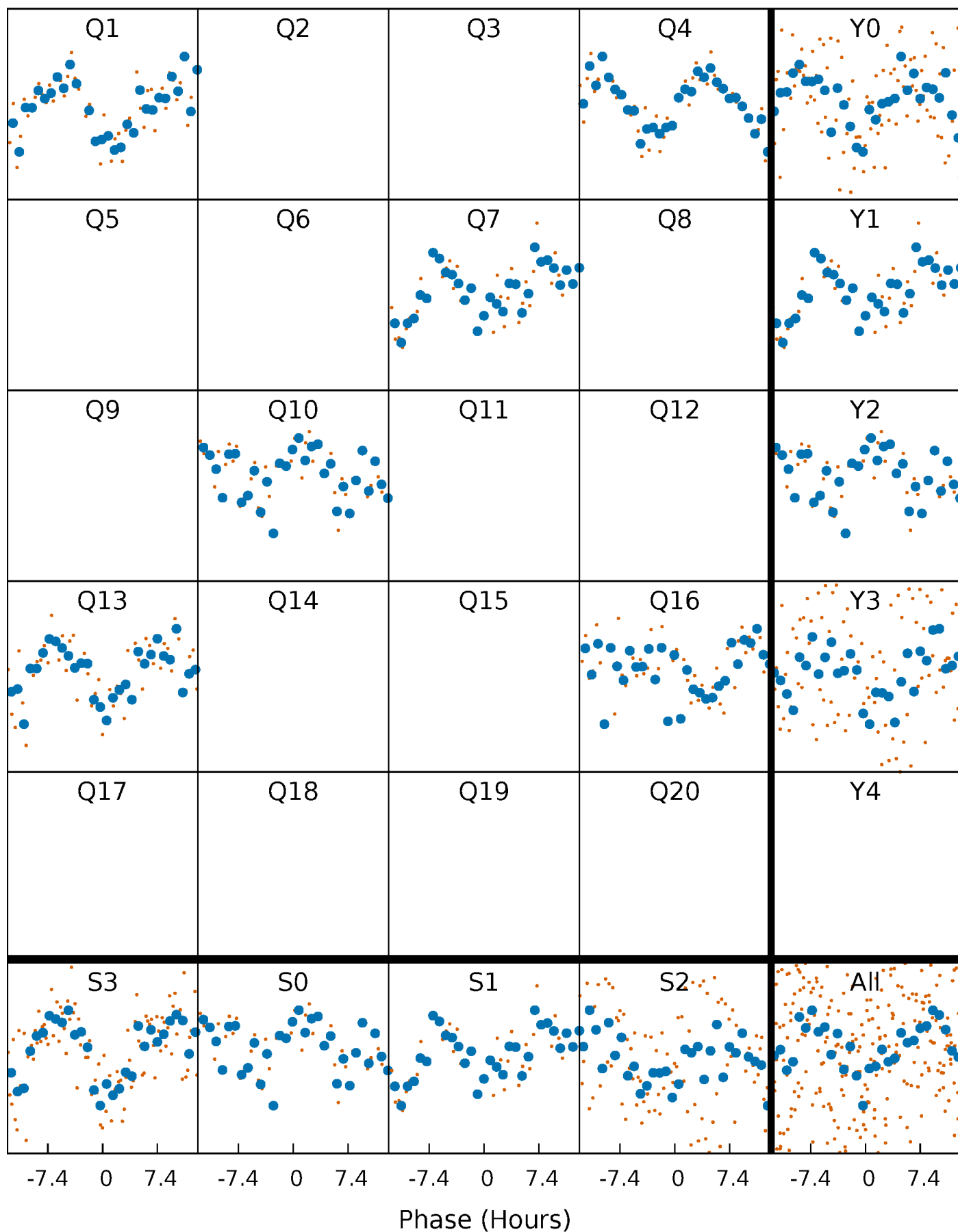


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



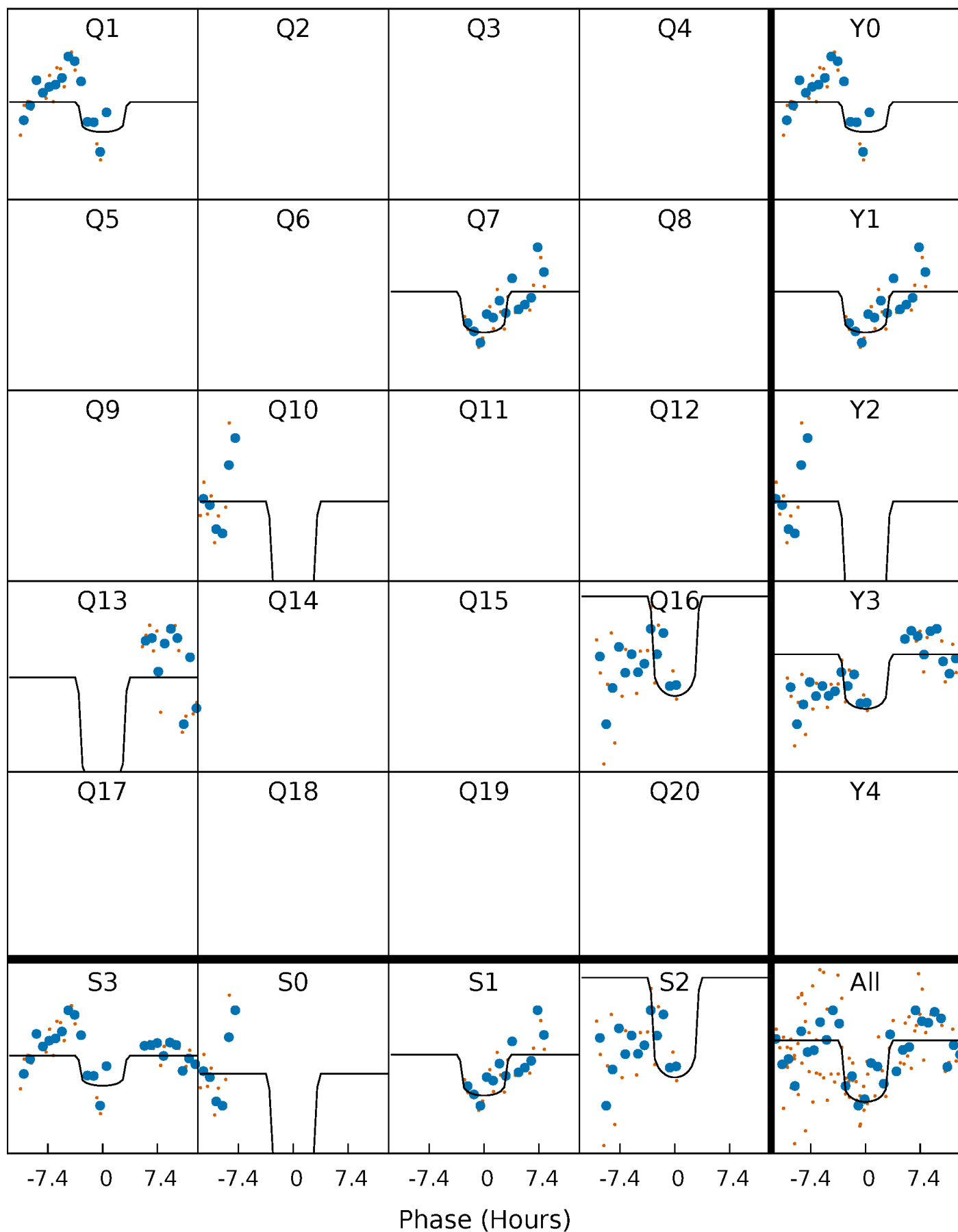
# PDC Quarter-Phased Transit Curves

TCE 009453452-03   P=270.466316 Days    $T_0=161.358003$  (BKJD)



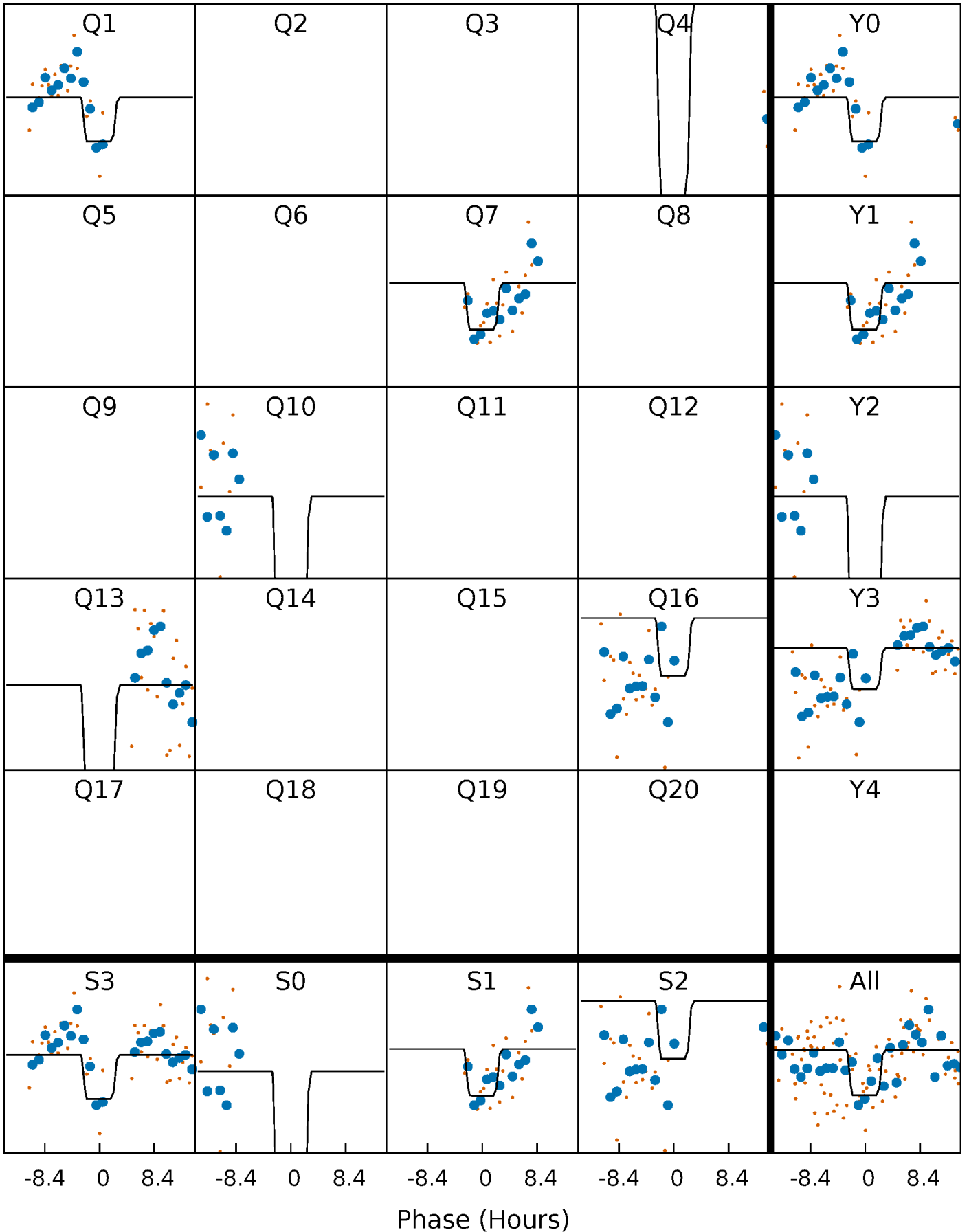
# DV Quarter-Phased Transit Curves

TCE 009453452-03     $P=270.466316$  Days     $T_0=161.358003$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

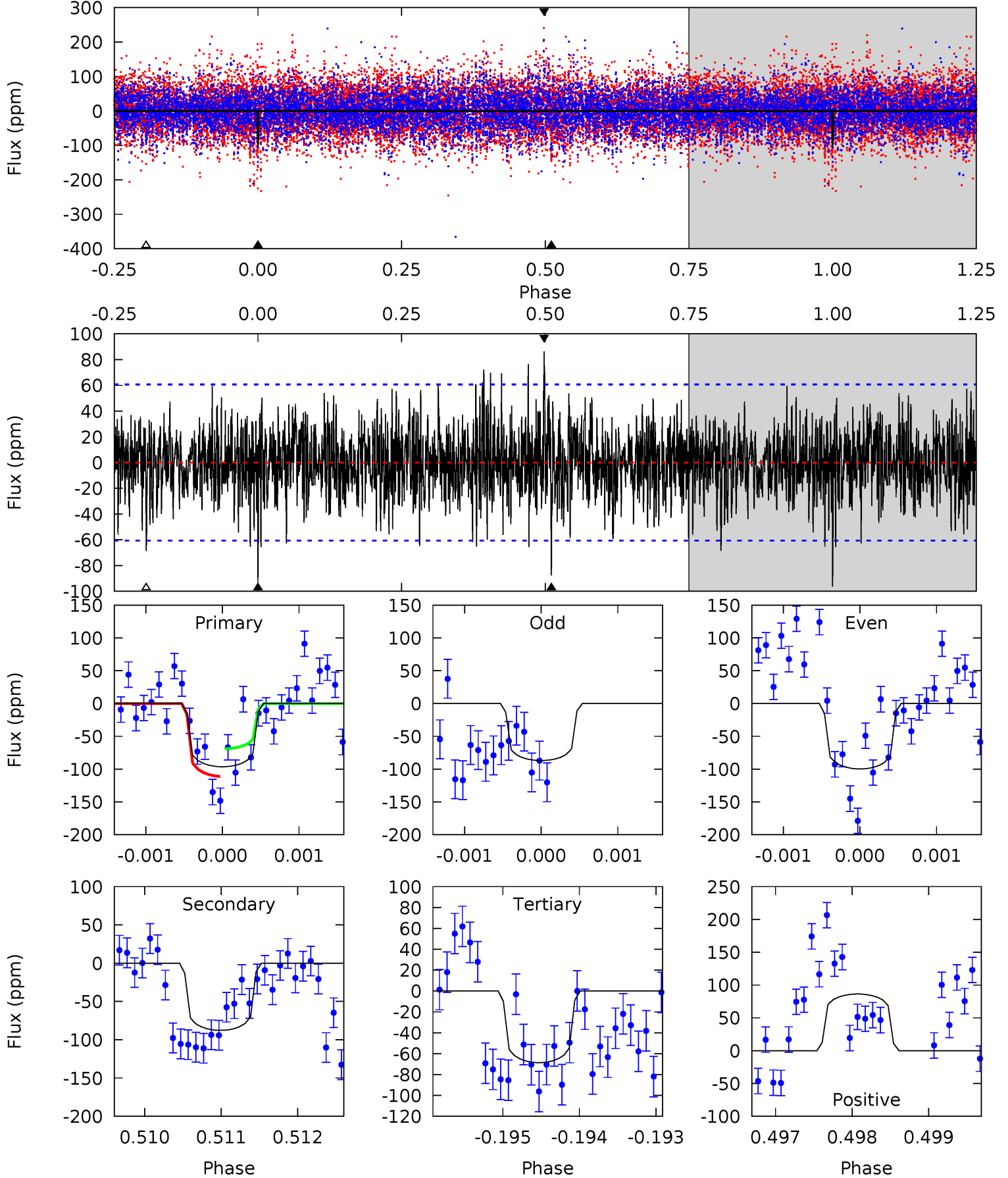
TCE 009453452-03     $P=270.473998$  Days     $T_0=161.345594$  (BKJD)



# DV Model-Shift Uniqueness Test

009453452-03, P = 270.466316 Days, E = 161.358003 Days

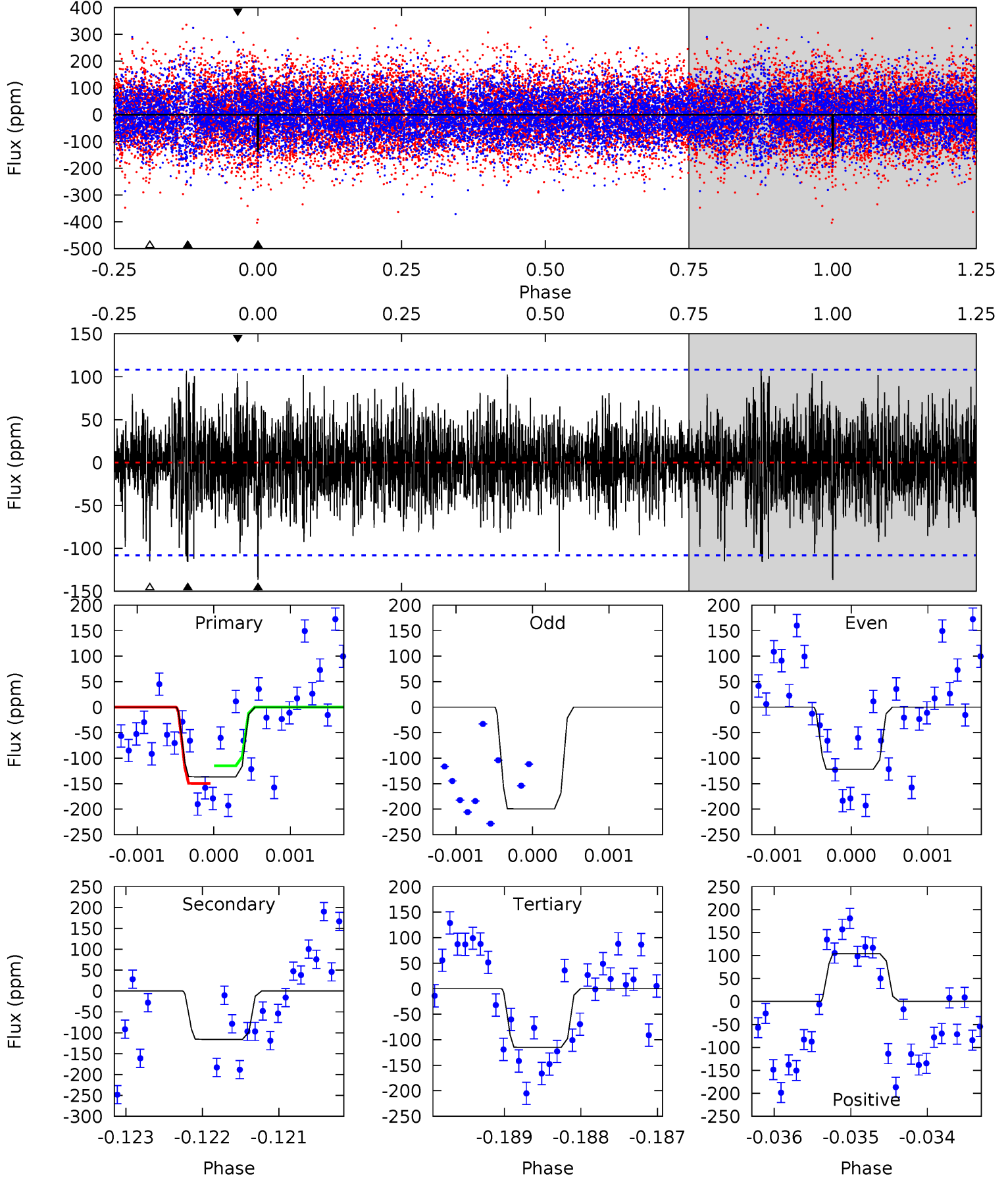
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.65	7.87	6.15	7.74	5.44	3.27	1.88	2.50	0.91	1.72	0.13	0.51	1.05	0.47	1.82



# Alt Model-Shift Uniqueness Test

009453452-03, P = 270.473998 Days, E = 161.345594 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
6.90	5.84	5.81	5.25	5.47	3.32	1.57	1.09	1.65	0.03	0.60	1.59	1.19	0.44	0.86



### Stellar Parameters For KIC 009453452

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8715^{+246}_{-387}$	$3.901^{+0.270}_{-0.180}$	$0.070^{+0.250}_{-0.550}$	$2.805^{+0.965}_{-0.965}$	$2.283^{+0.337}_{-0.626}$	$0.146^{+0.283}_{-0.076}$
	+3%/-4%	+7%/-5%	+357%/-786%	+34%/-34%	+15%/-27%	+194%/-52%
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 009453452-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-88 \pm 11$	$3.98^{+3.44}_{-2.54}$	$855^{+69}_{-81}$	$6859^{+6647}_{-1677}$	$3465^{+21213}_{-2468}$
Alt.	$-116 \pm 20$	$4.06^{+3.10}_{-2.57}$	$856^{+74}_{-83}$	$7407^{+7940}_{-1860}$	$4275^{+27290}_{-2892}$

$T_{\text{max}}$  = 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

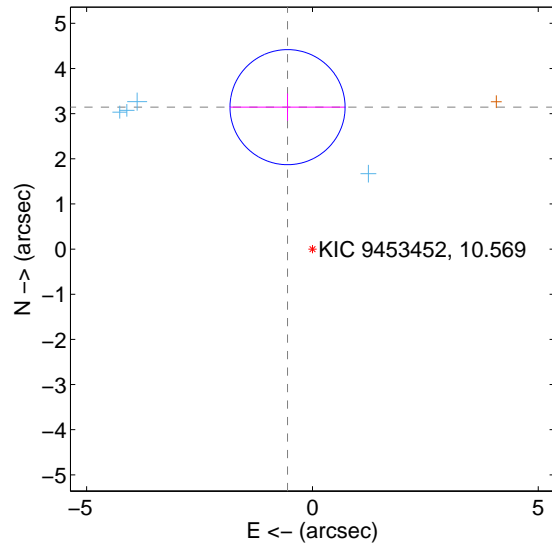
Supplemental centroid analysis for 009453452-03. **Kepler magnitude: 10.57.** Transit SNR 8.20

There are 4 quarters with good PRF difference image offsets

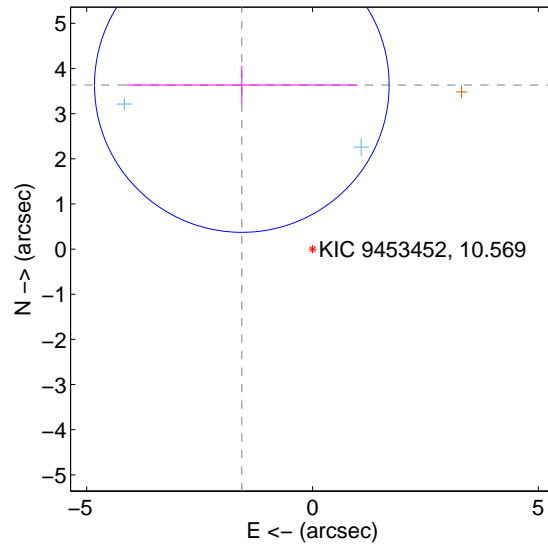
The OOT PRF centroid is offset from the target star catalog position by about 2.61 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>3.192 \pm 0.425</math></b>	<b>7.51</b>	$0.552 \pm 1.285$	$3.144 \pm 0.301$
PRF-fit source offset from KIC position	<b><math>3.957 \pm 1.087</math></b>	<b>3.64</b>	$1.566 \pm 2.562$	$3.633 \pm 0.428$
photometric centroid source offset	$1.75 \pm 0.81$	2.17	$1.51 \pm 0.84$	$0.89 \pm 0.70$

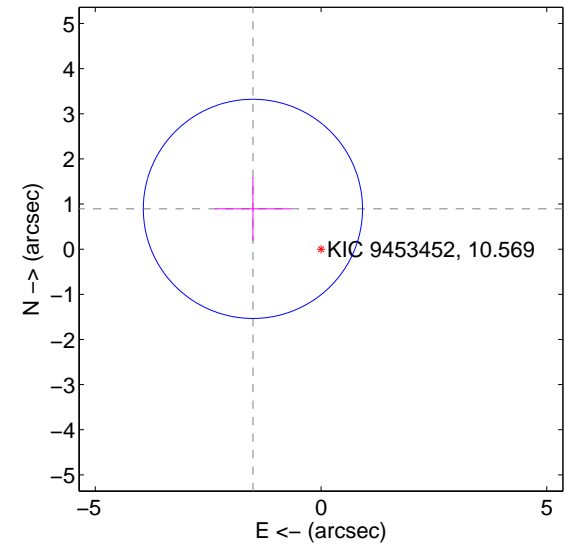
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

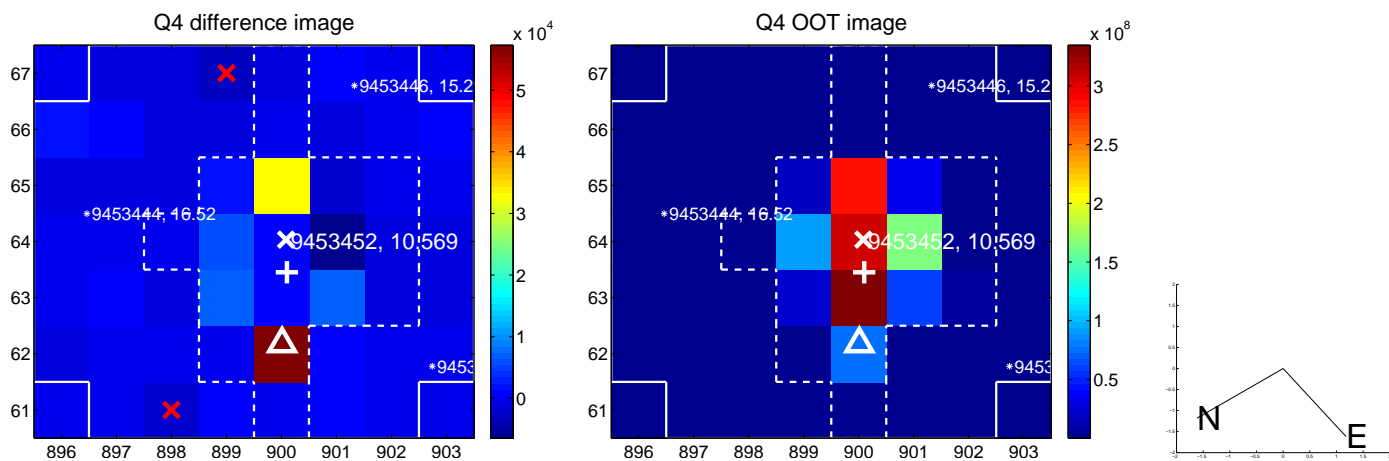
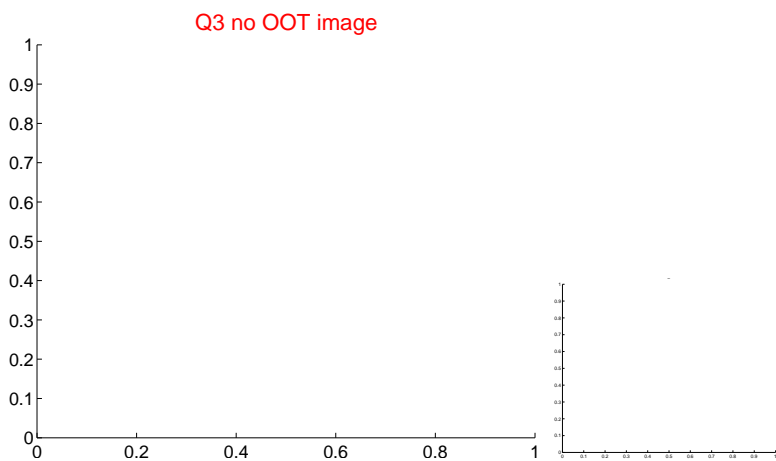
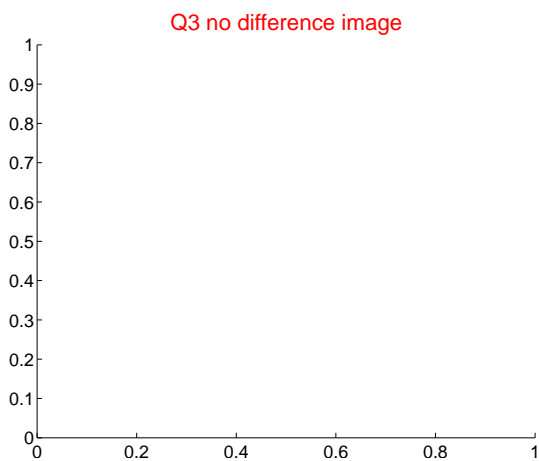
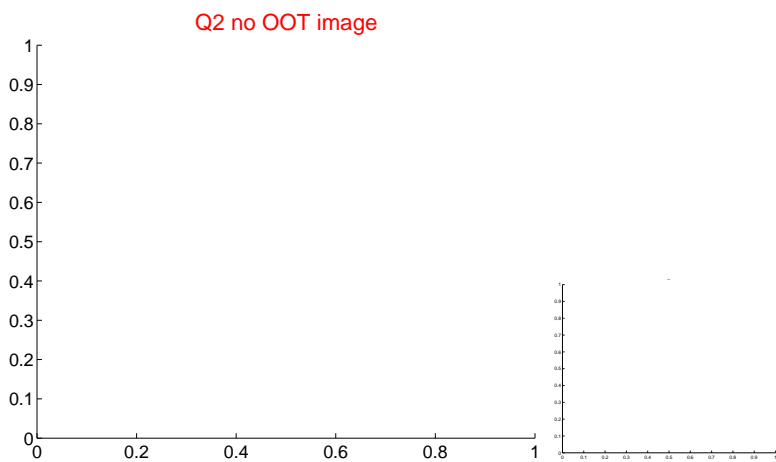
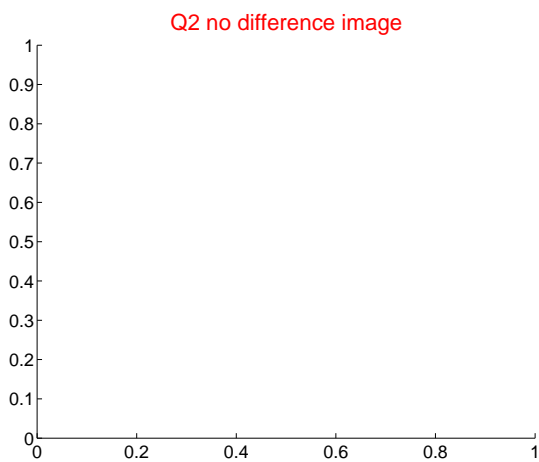
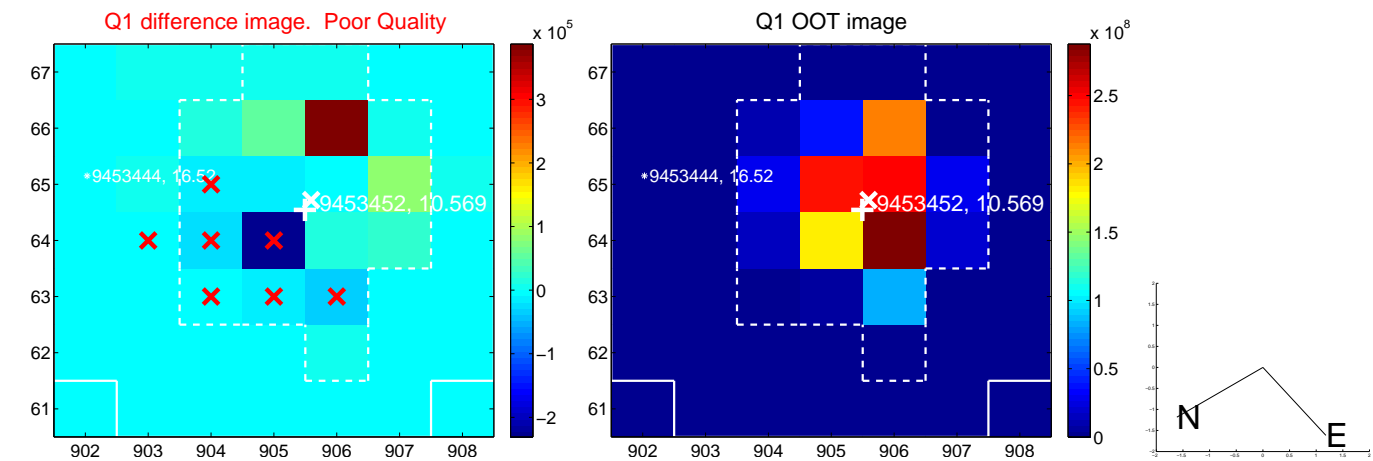


offset from photometric centroids



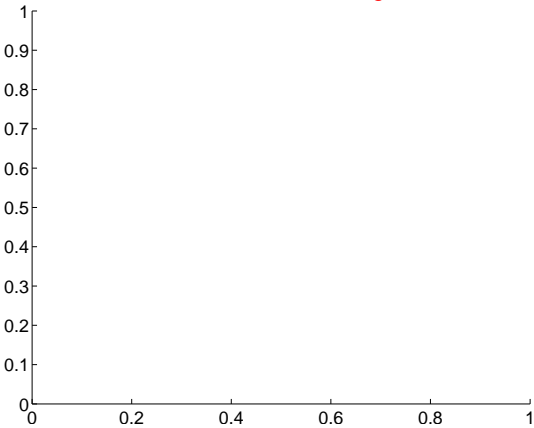
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

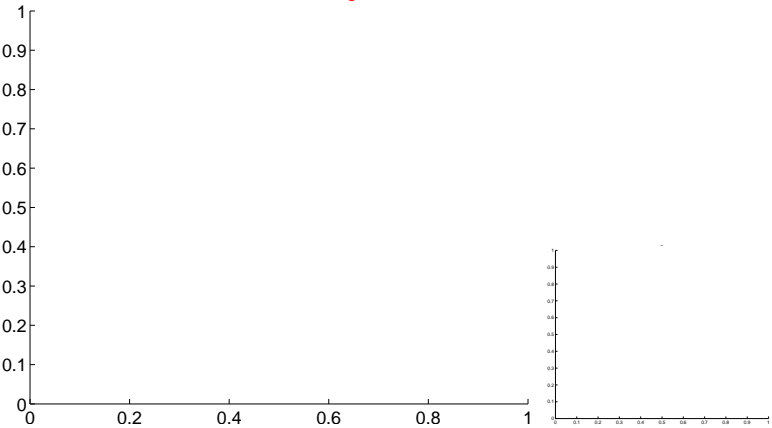


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

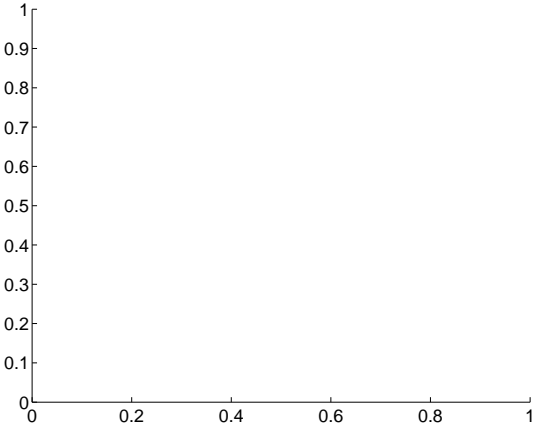
Q5 no difference image



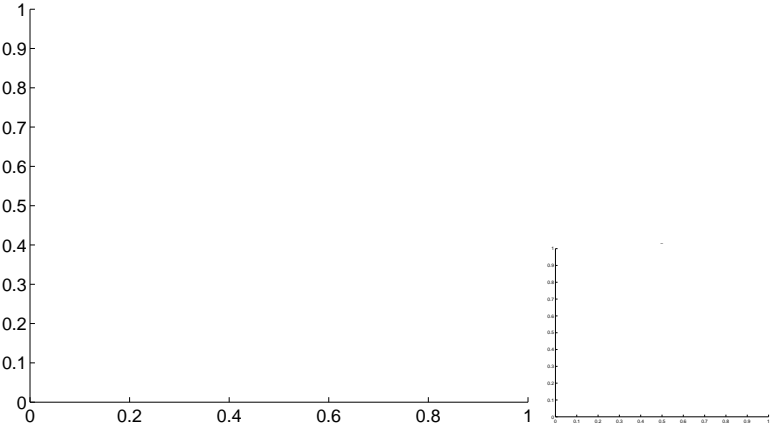
Q5 no OOT image



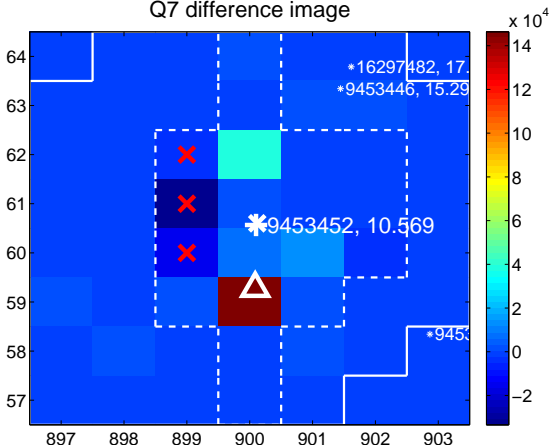
Q6 no difference image



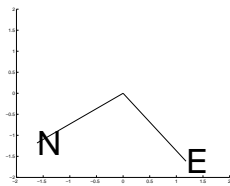
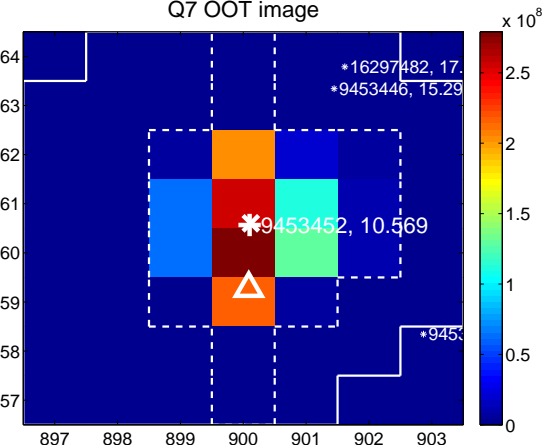
Q6 no OOT image



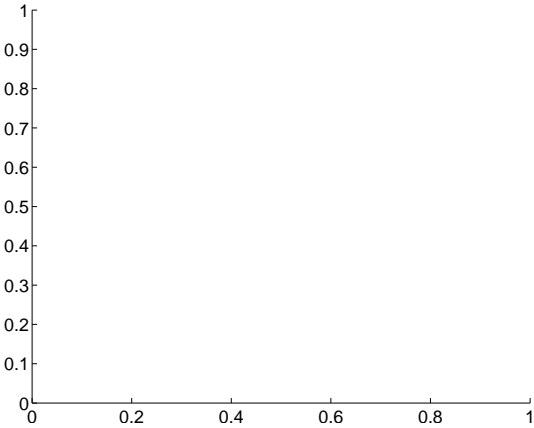
Q7 difference image



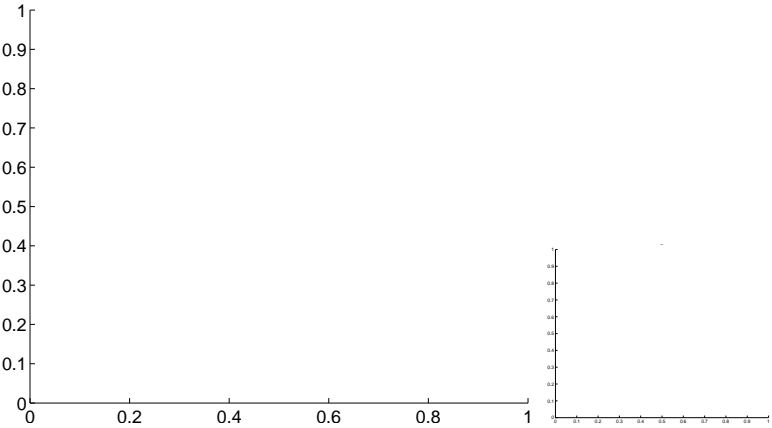
Q7 OOT image



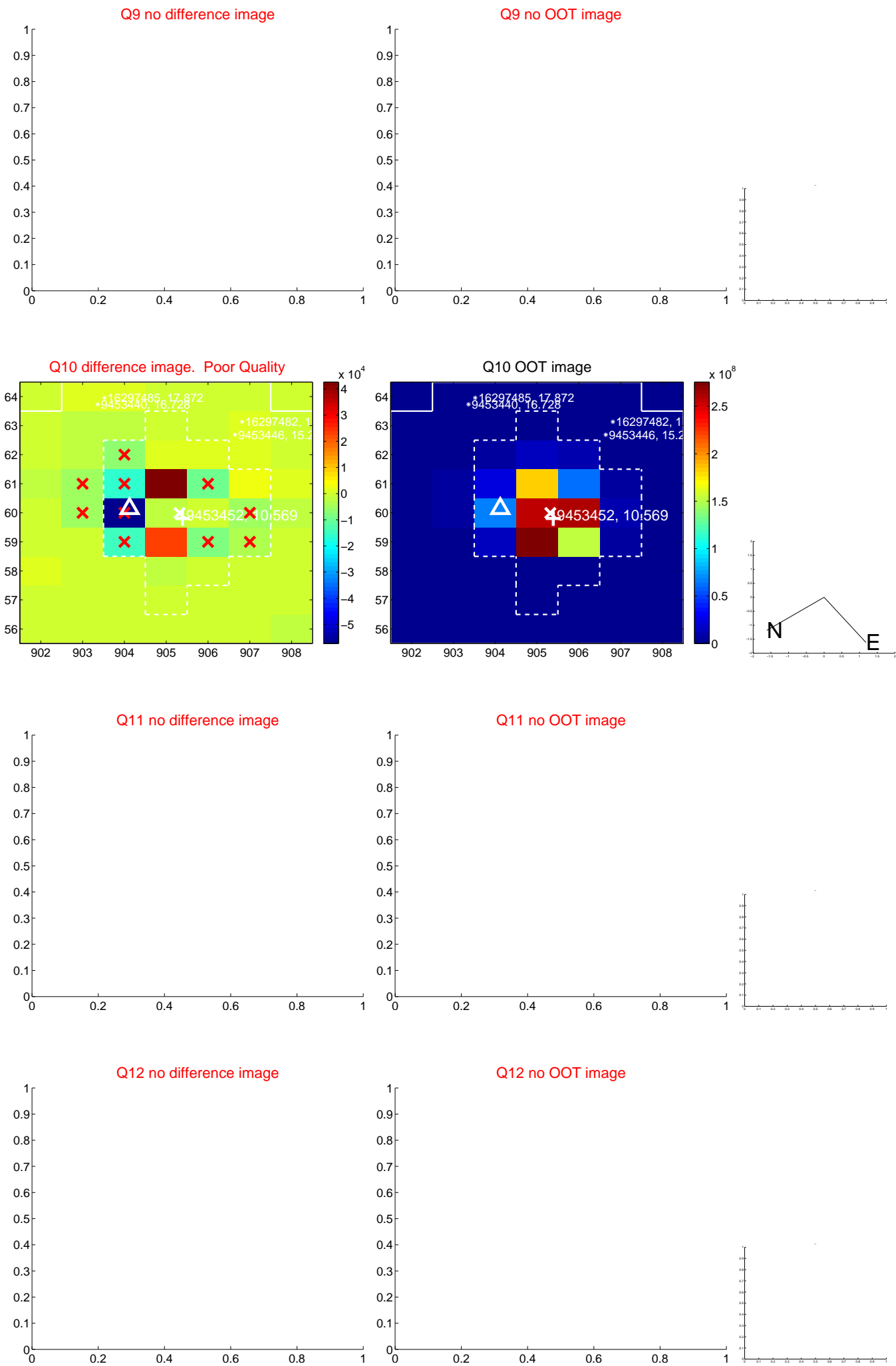
Q8 no difference image



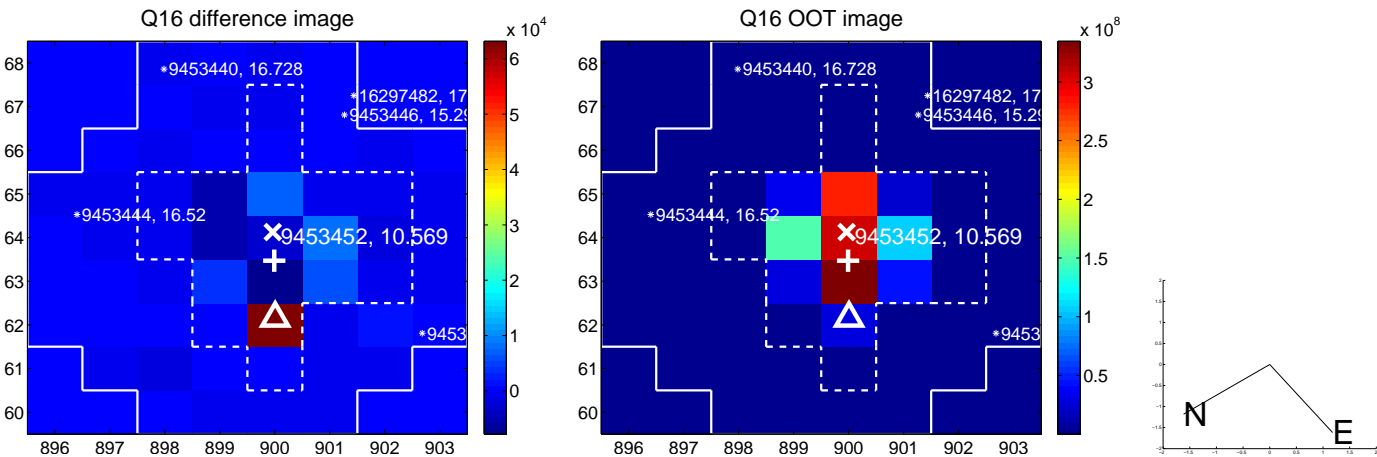
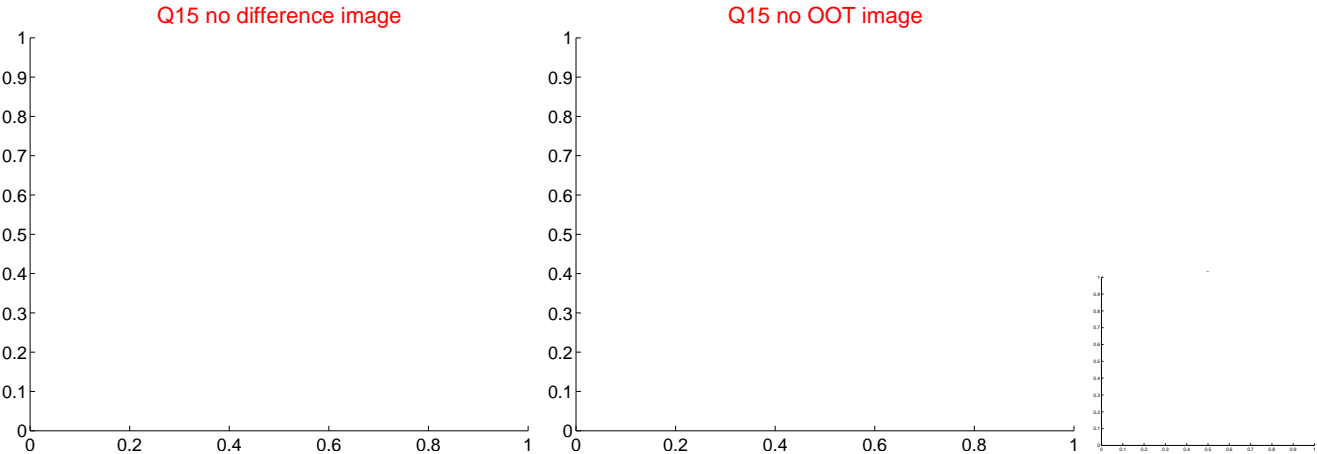
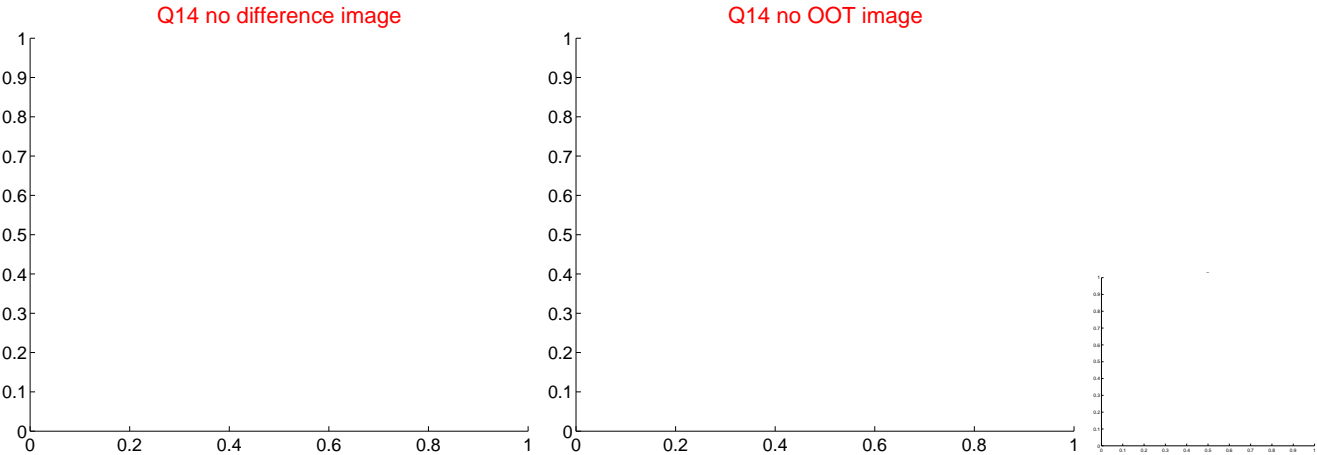
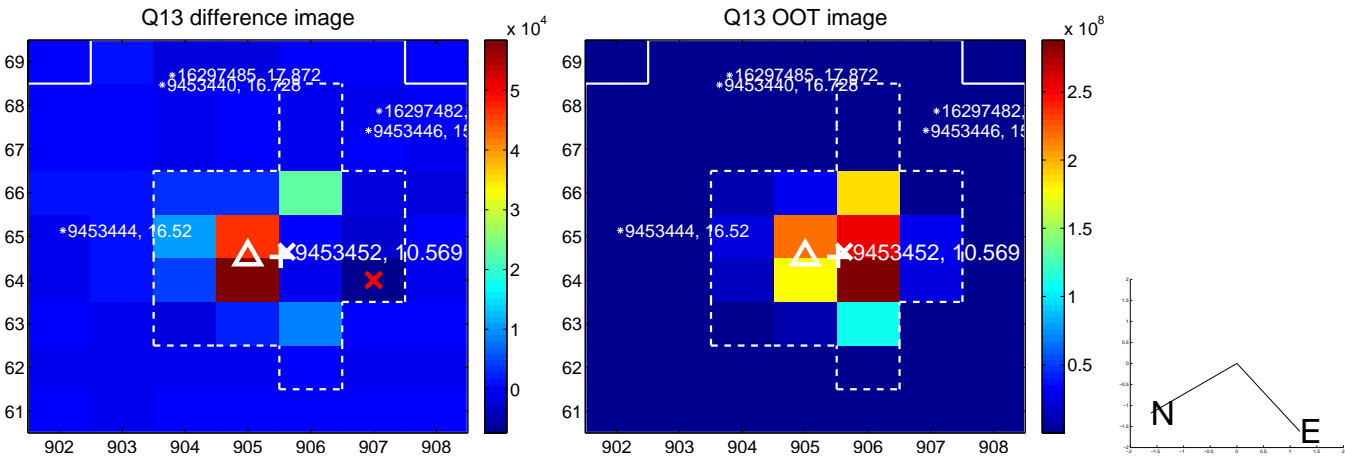
Q8 no OOT image



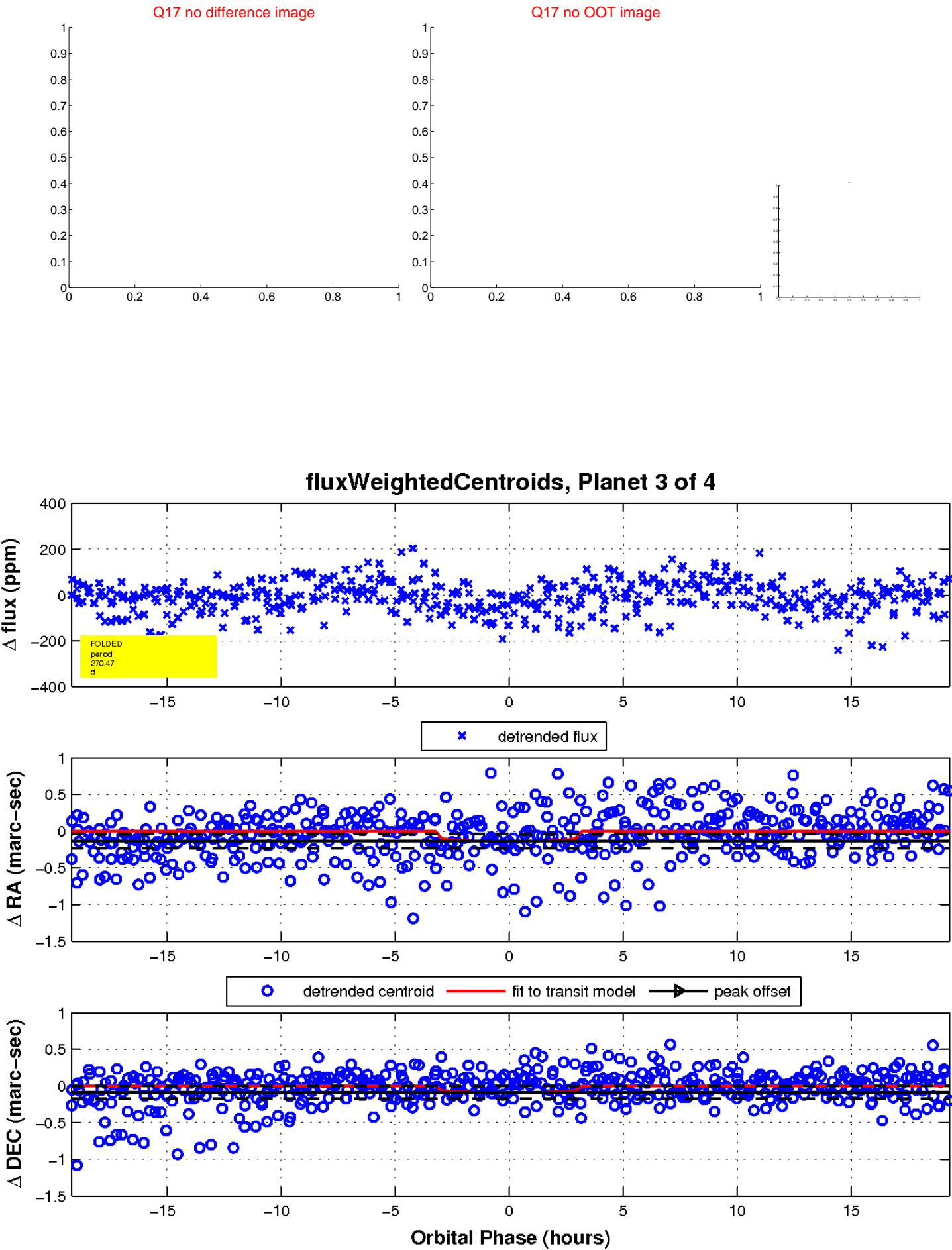
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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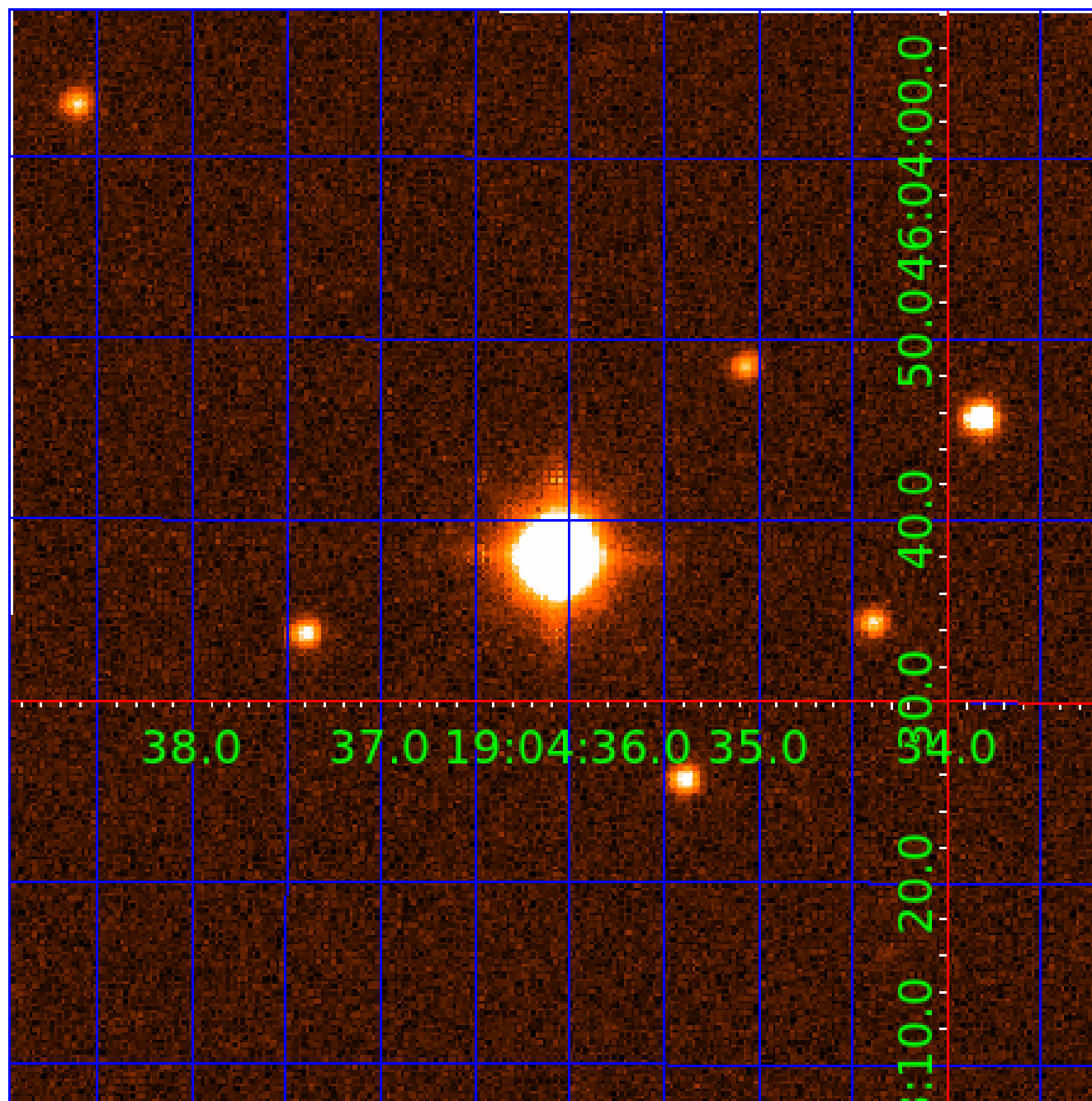


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009453452

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009453452-01	OBS	No	1.696790	133.133016	4.2	9.573	8.1	6.9	2.81	8715	0.60	30228.38
009453452-02	OBS	No	369.413964	214.436917	67.6	39.252	9.5	7.1	2.81	8715	2.53	23.08
009453452-03	OBS	No	270.466316	161.358003	116.7	6.436	8.5	8.2	2.81	8715	3.44	34.98
009453452-04	OBS	No	0.607198	131.602629	7.3	4.525	9.5	7.6	2.81	8715	0.81	118981.41

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009453452-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
009453452-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED
009453452-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED—HALO_GHOST
009453452-04	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—CENT_SATURATED

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

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

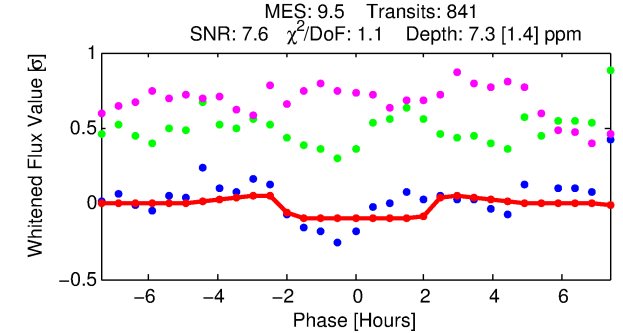
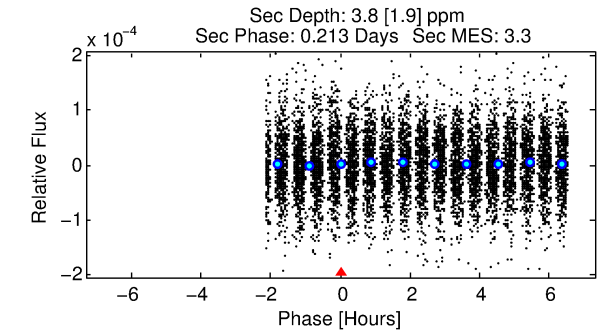
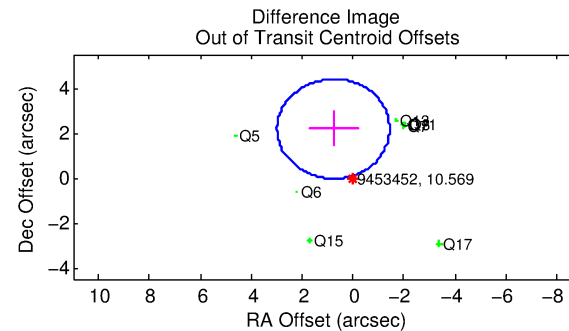
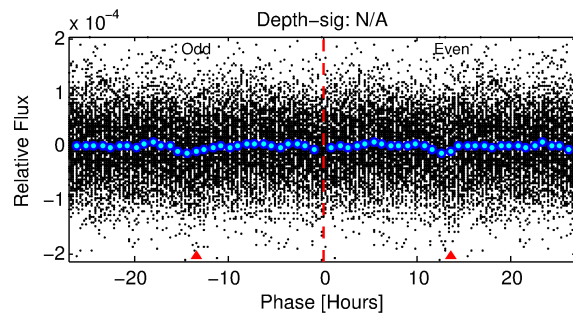
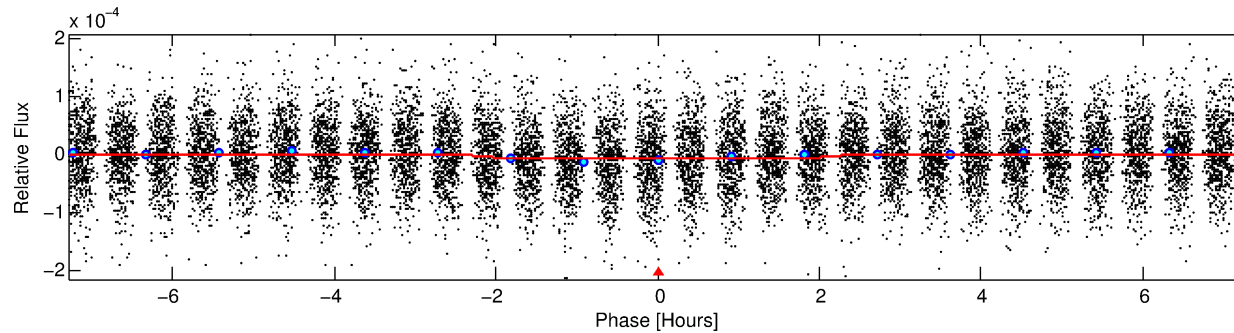
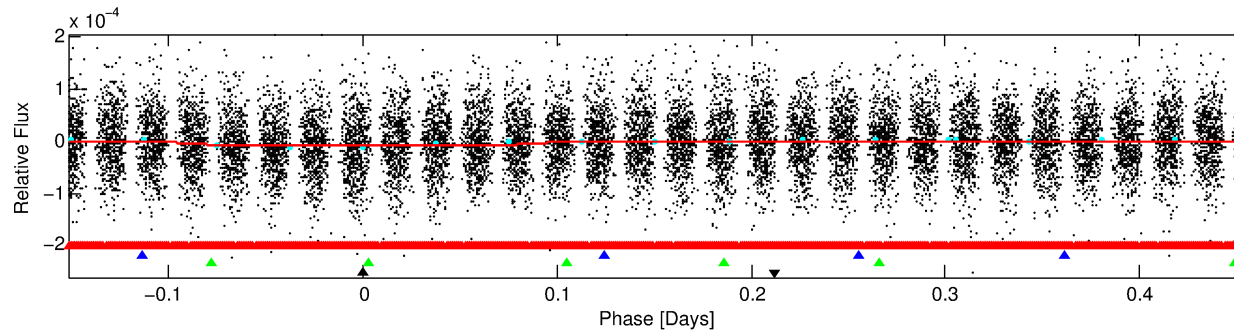
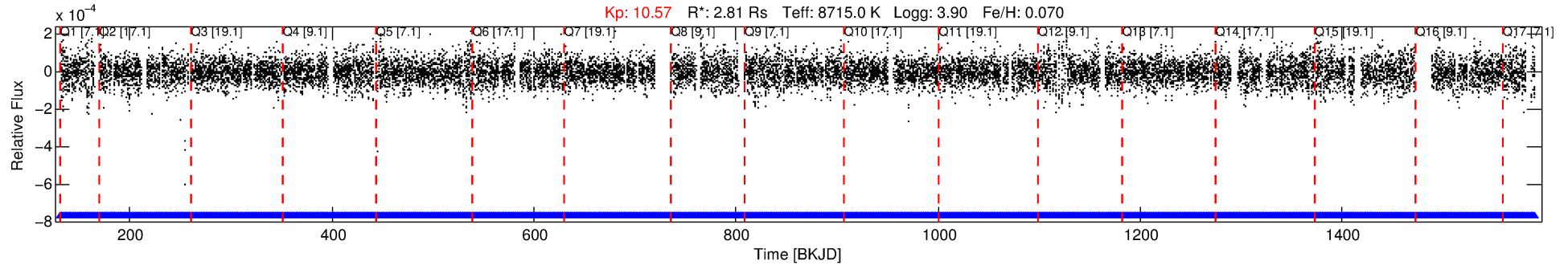
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009453452-04

No Significant Match Found

# DV One-Page Summary

KIC: 9453452 Candidate: 4 of 4 Period: 0.607 d



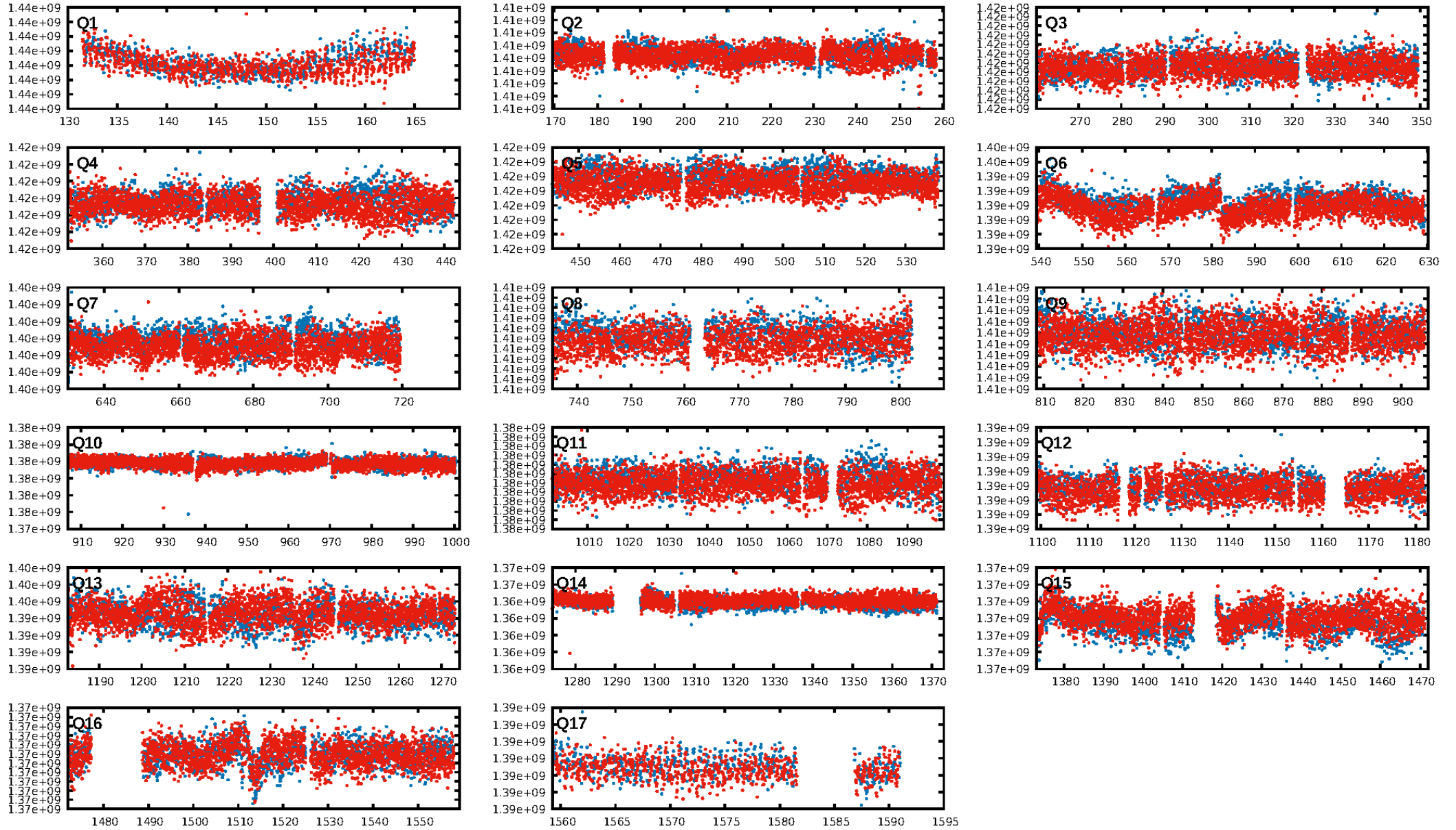
## DV Fit Results:

Period = 0.60720 [0.00002] d  
Epoch = 131.6026 [0.0046] BKJD  
Rp/R\* = 0.0026 [0.0010]  
a/R\* = 1.12 [0.52]  
b = 0.69 [1.81]  
Seff = 118981.41 [60192.67]  
Teq = 4736 [599] K  
Rp = 0.81 [0.41] Re  
a = 0.0185 [0.0057] AU  
Ag = 1.10 [1.10] [0.09 $\sigma$ ]  
Teffp = 7496 [1690] K [1.54 $\sigma$ ]

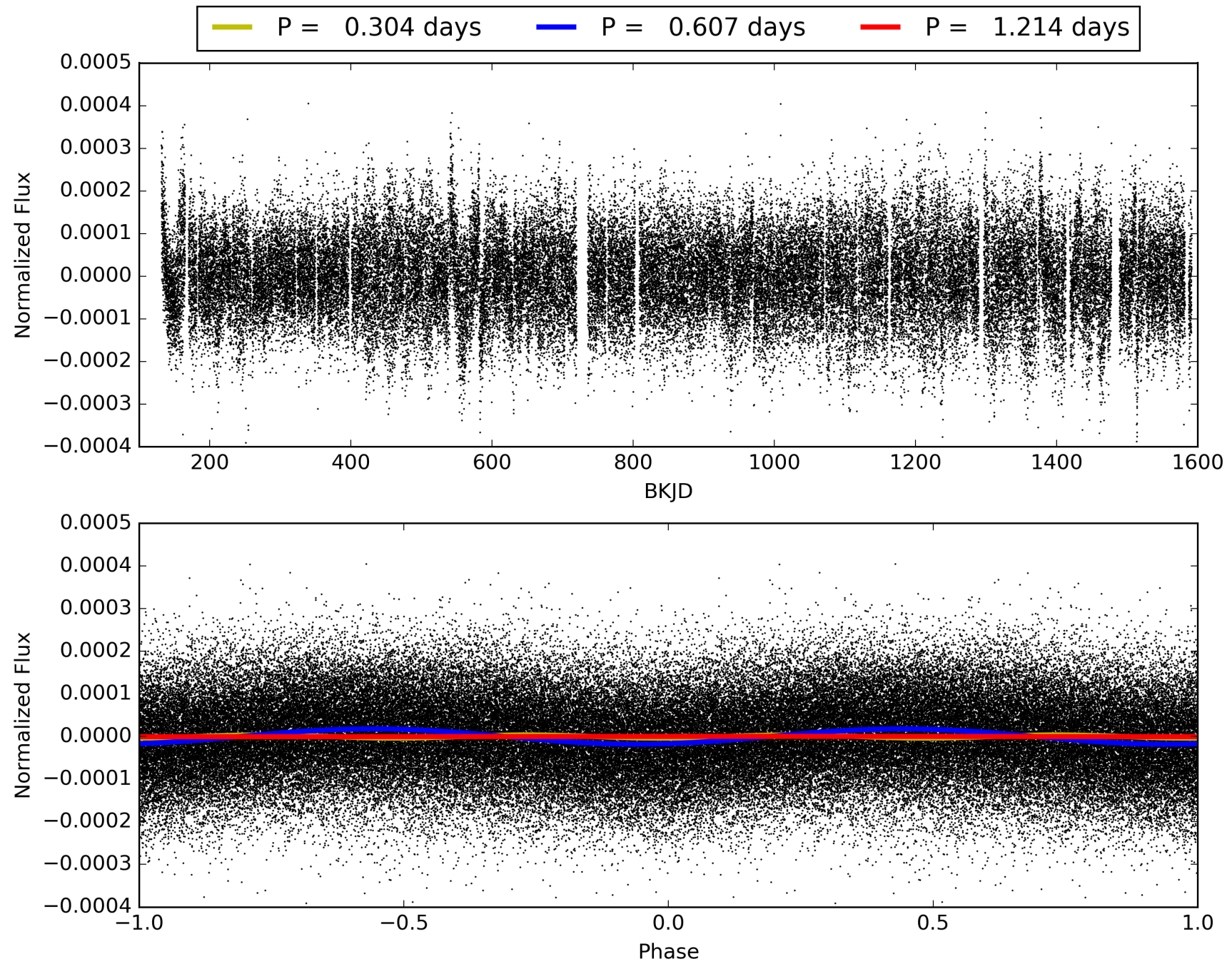
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 98.6% [2.47 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [805/805]  
GhostDiagnostic-chr: 2.997  
Centroid-sig: 0.1%  
Centroid-so: 1.514 arcsec [2.52 $\sigma$ ]  
OotOffset-rm: 2.311 arcsec [3.13 $\sigma$ ]  
KicOffset-rm: 2.833 arcsec [3.11 $\sigma$ ]  
OotOffset-st: 1/4/0/3 [8]  
KicOffset-st: 1/4/0/3 [8]  
DiffImageQuality-fgm: 0.62 [5/8]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009453452-04, PDC Light Curves

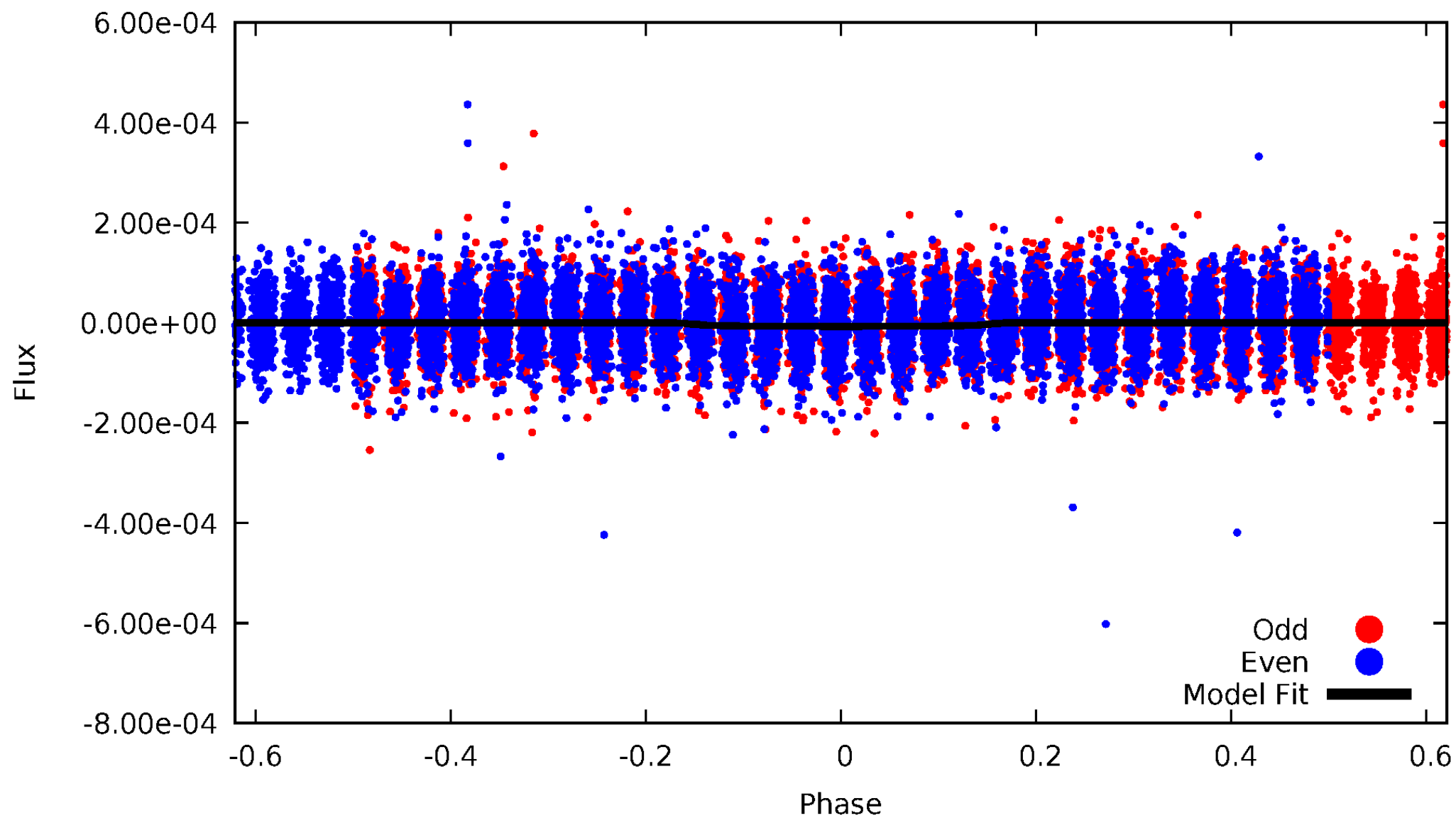


TCE 009453452-04



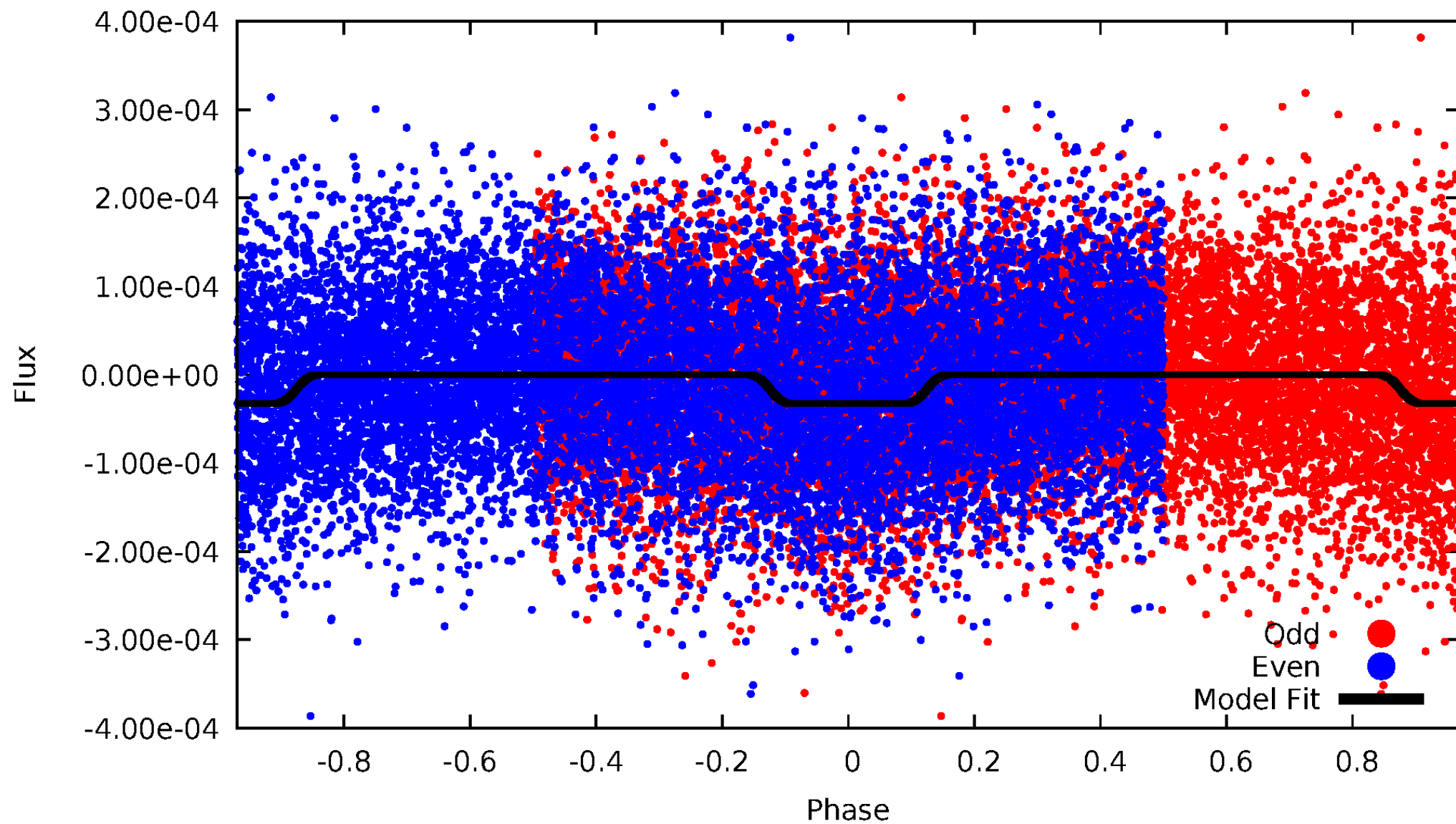
# DV Odd/Even

TCE 009453452-04



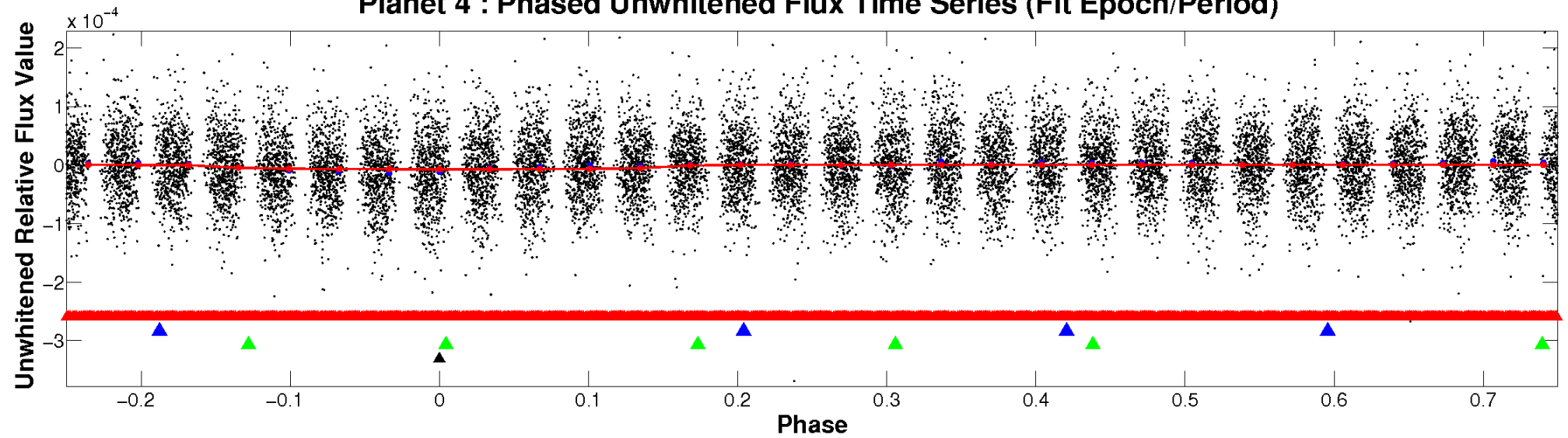
# ALT Odd/Even

TCE 009453452-04

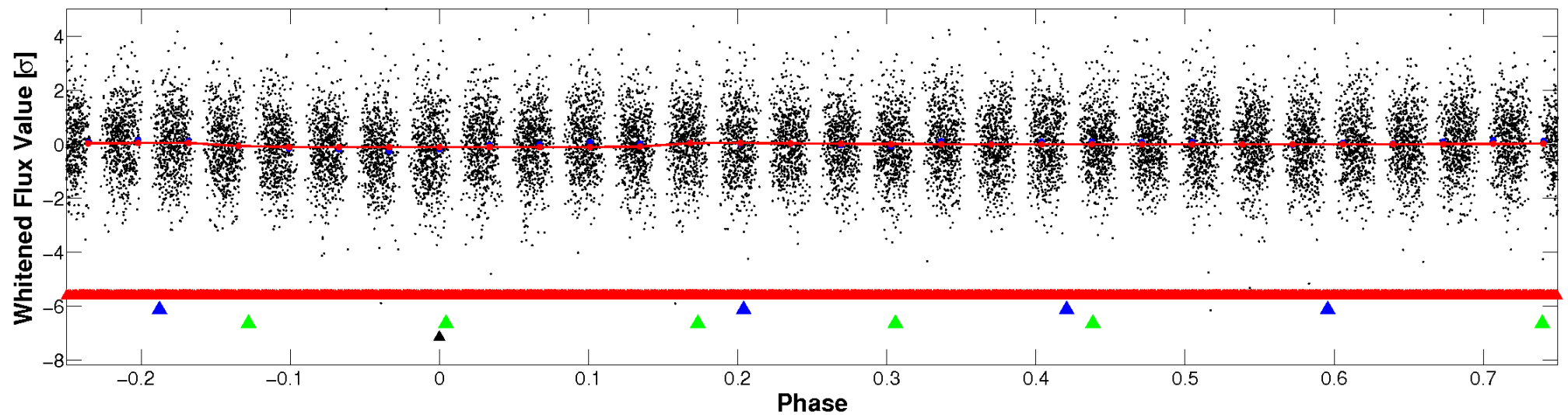


# Non-Whitened Vs. Whitened Light Curve

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

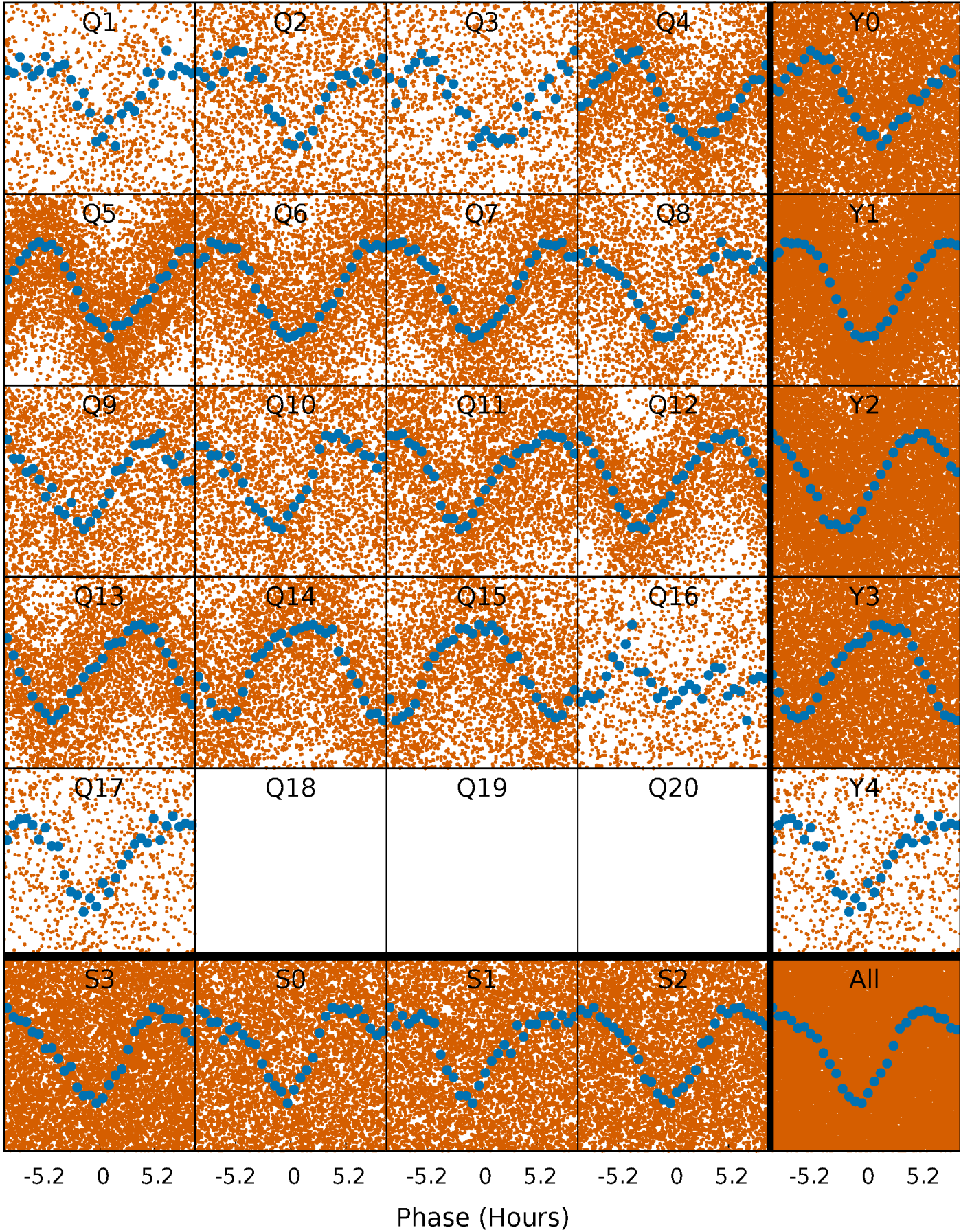


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



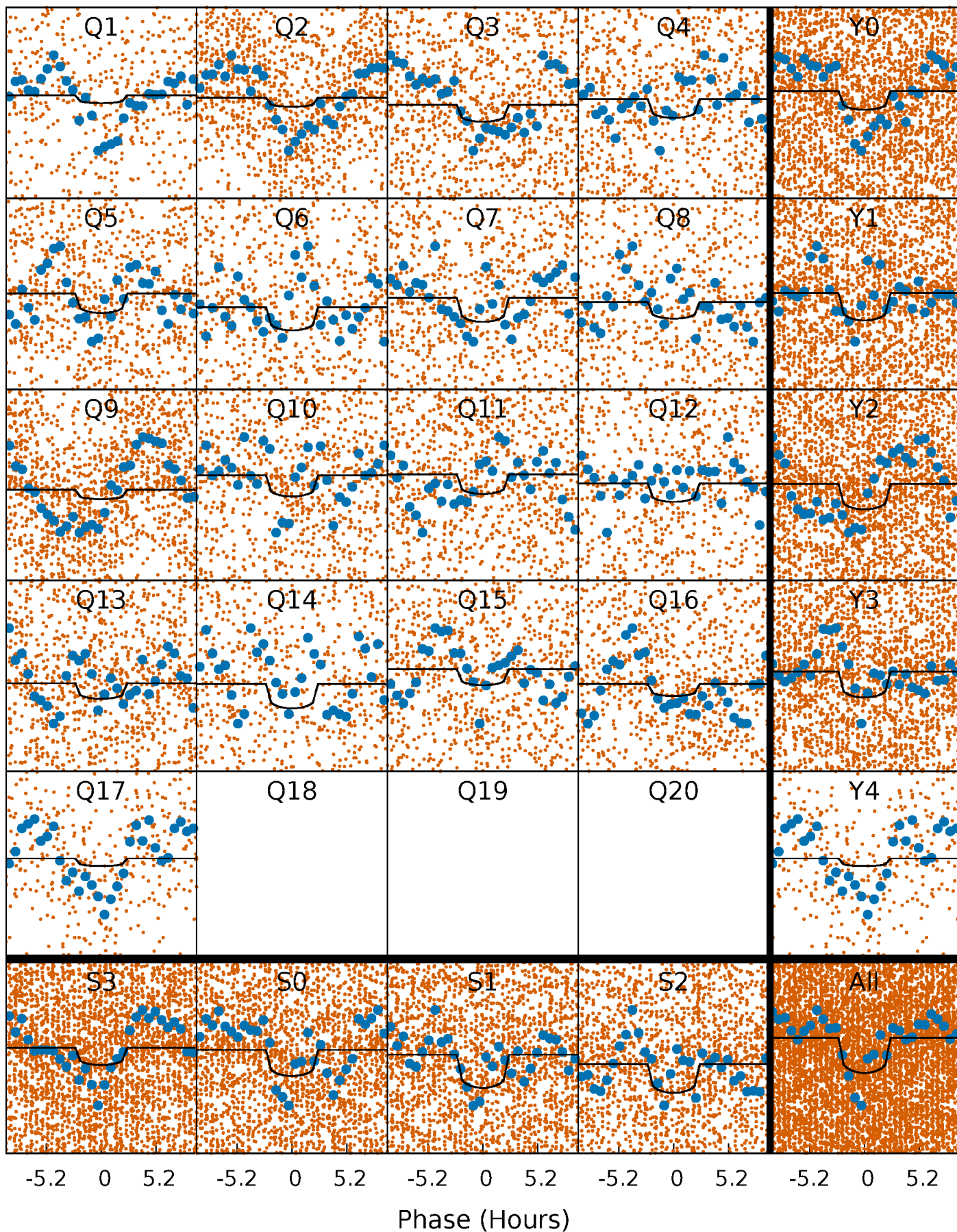
# PDC Quarter-Phased Transit Curves

TCE 009453452-04     $P = 0.607198$  Days     $T_0 = 131.602629$  (BKJD)



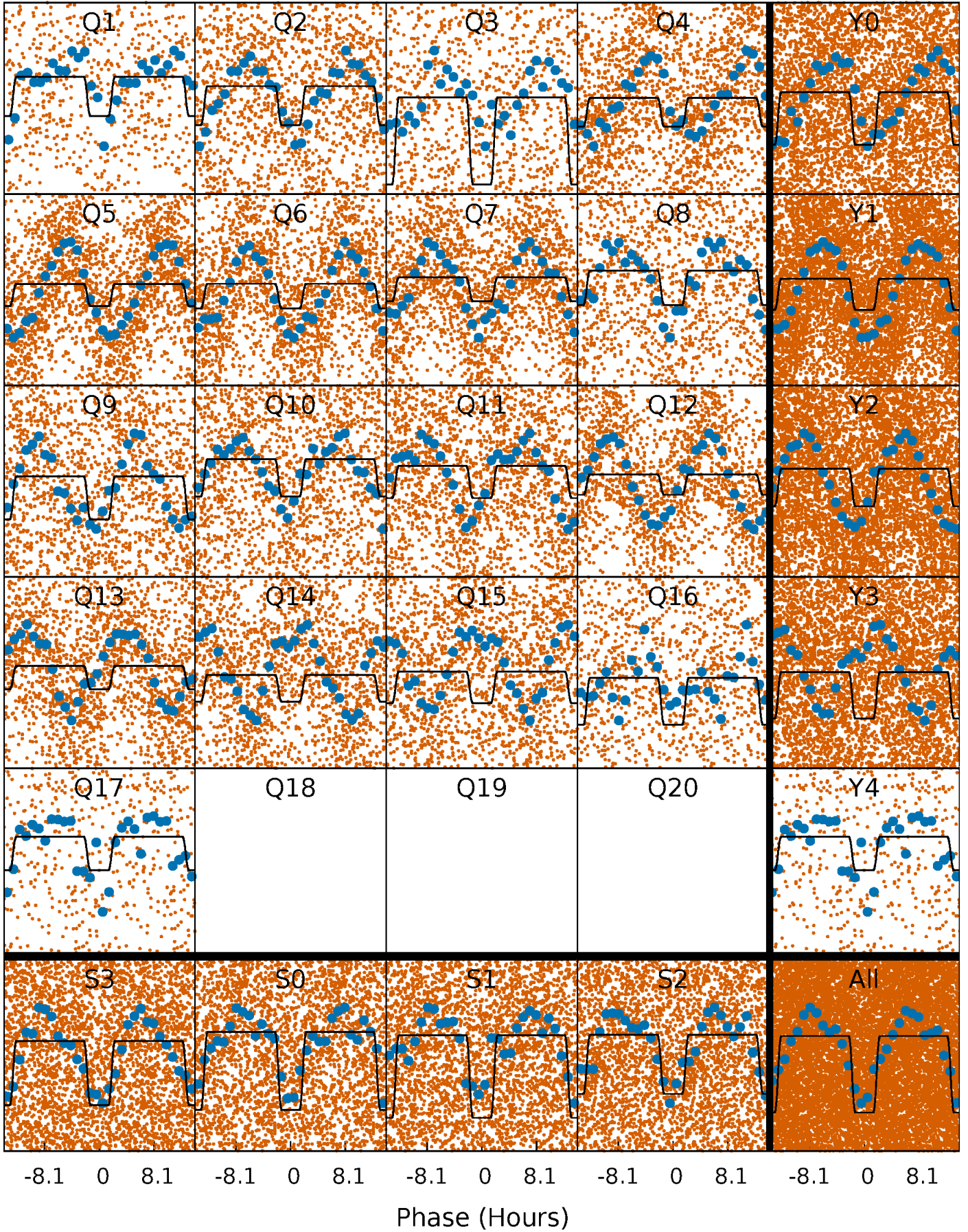
# DV Quarter-Phased Transit Curves

TCE 009453452-04 P= 0.607198 Days  $T_0=131.602629$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

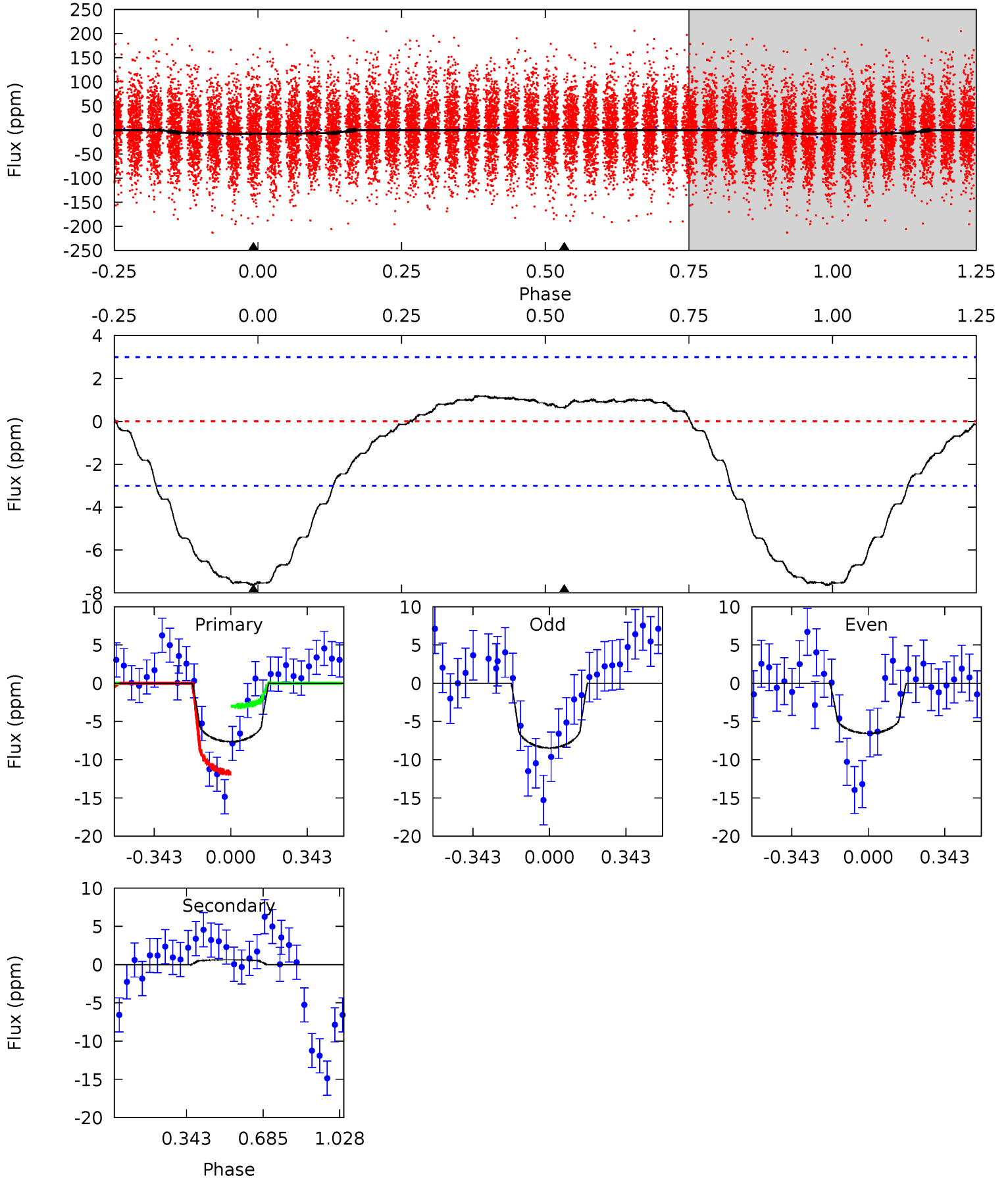
TCE 009453452-04   P= 0.607211 Days    $T_0=131.566174$  (BKJD)



# DV Model-Shift Uniqueness Test

009453452-04, P = 0.607198 Days, E = 131.602629 Days

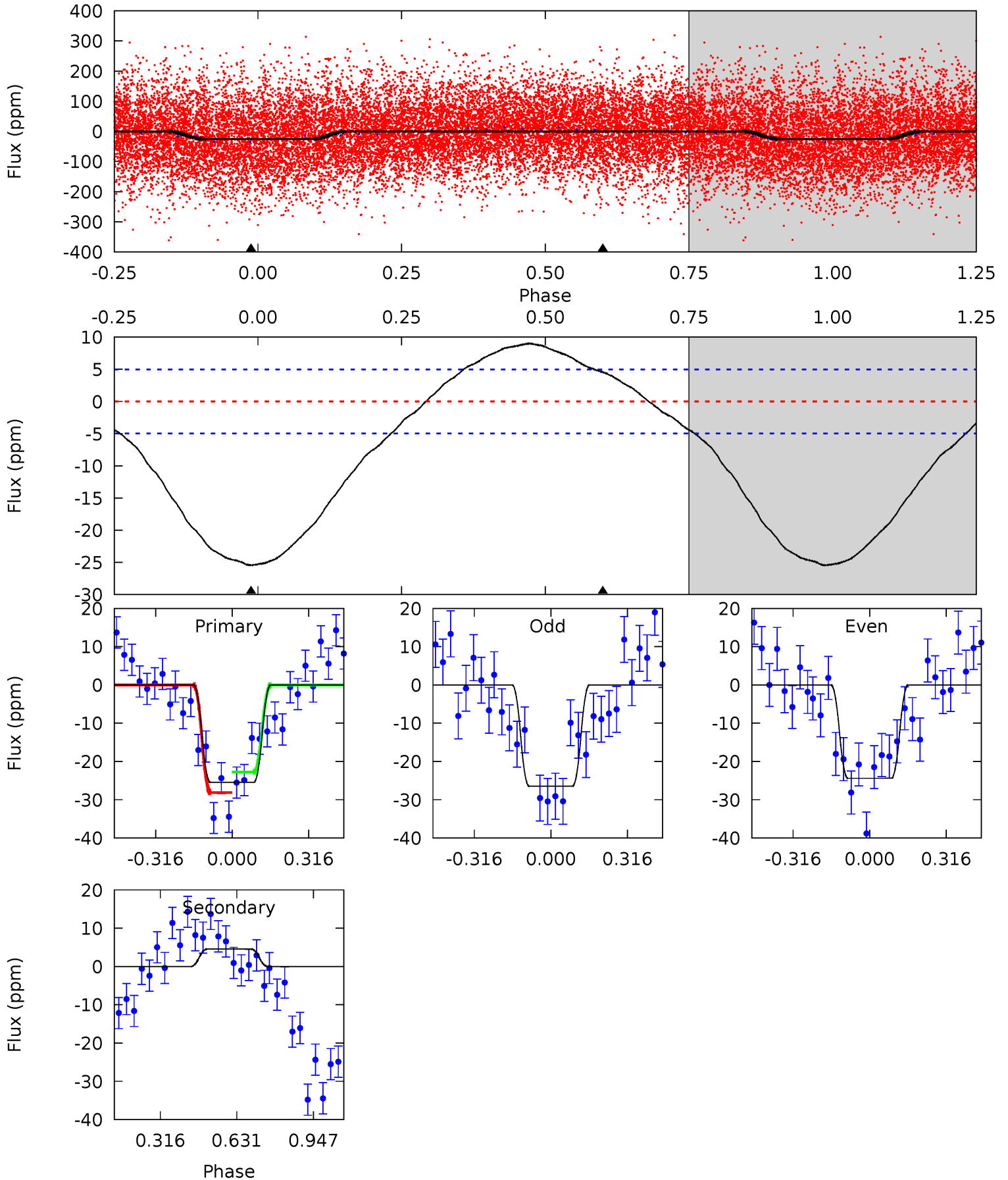
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.0	-0.91	0	0	4.30	0.95	0.53	11.0	11.0	-0.91	-0.91	1.39	1.05	0.13	6.20



# Alt Model-Shift Uniqueness Test

009453452-04, P = 0.607211 Days, E = 131.566174 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
22.1	-3.96	0	0	4.32	1.00	2.01	22.1	22.1	-3.96	-3.96	0.88	0.90	0.26	2.08



### Stellar Parameters For KIC 009453452

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8715^{+246}_{-387}$	$3.901^{+0.270}_{-0.180}$	$0.070^{+0.250}_{-0.550}$	$2.805^{+0.965}_{-0.965}$	$2.283^{+0.337}_{-0.626}$	$0.146^{+0.283}_{-0.076}$
	+3%/-4%	+7%/-5%	+357%/-786%	+34%/-34%	+15%/-27%	+194%/-52%
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 009453452-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$1 \pm 1$	$0.77^{+0.37}_{-0.30}$	$6533^{+595}_{-598}$	$-5740^{+723}_{-1042}$	$-0.155^{+0.180}_{-0.388}$
Alt.	$5 \pm 1$	$1.68^{+0.49}_{-0.43}$	$6510^{+612}_{-609}$	$-6101^{+424}_{-509}$	$-0.296^{+0.130}_{-0.239}$

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

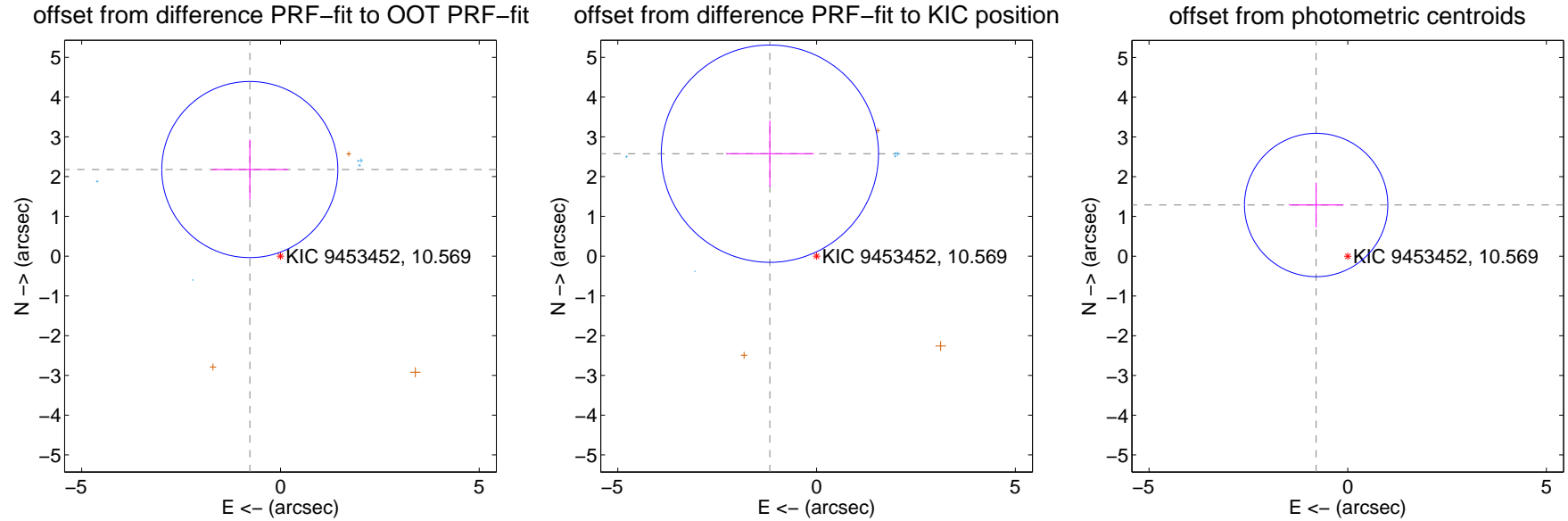
## DV Centroid Data

Supplemental centroid analysis for 009453452-04. **Kepler magnitude: 10.57.** Transit SNR 7.63

There are 5 quarters with good PRF difference image offsets

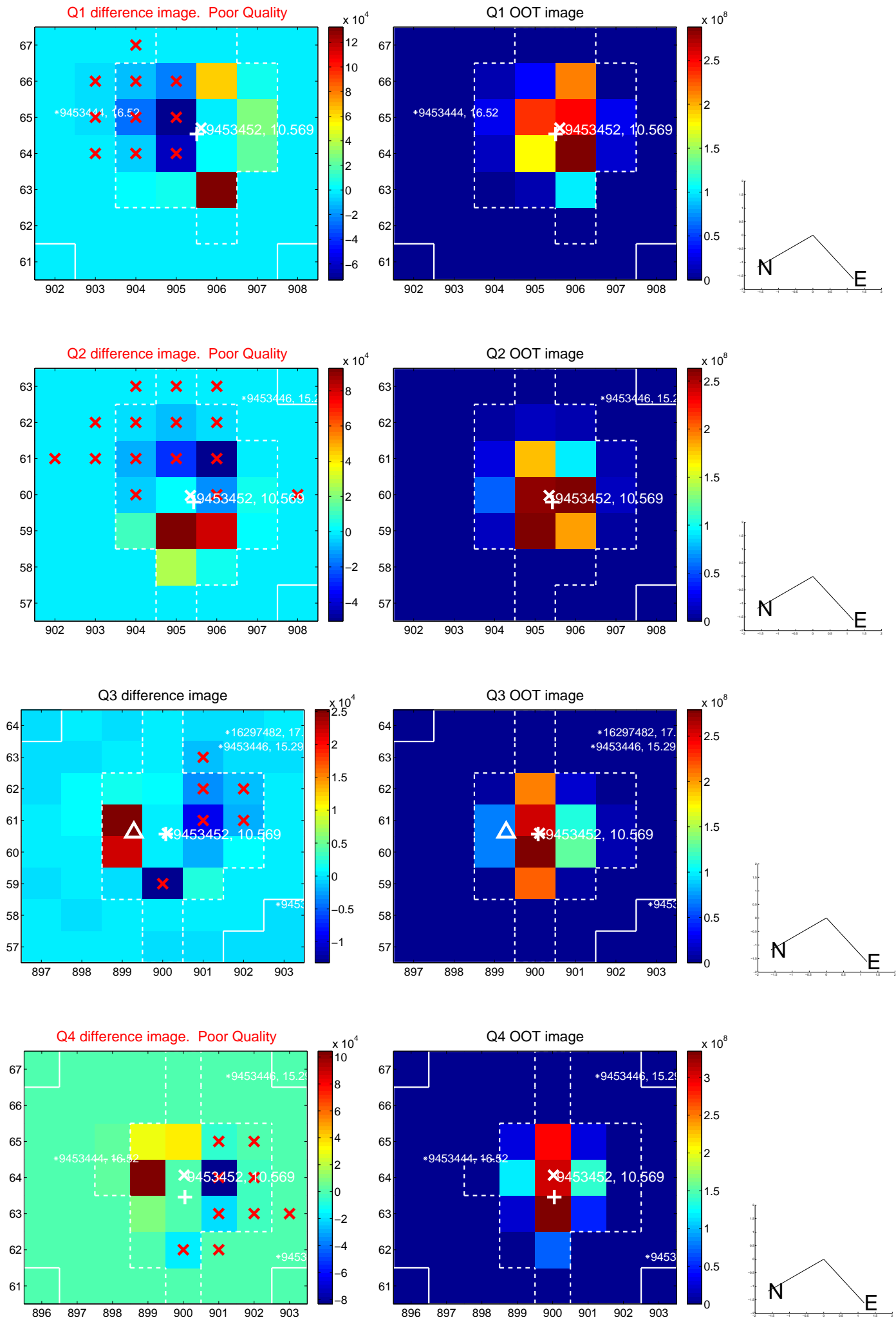
The direct PRF centroid is offset from the target star catalog position by about 0.72 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>2.311 <math>\pm</math> 0.739</b>	<b>3.13</b>	0.771 $\pm$ 0.958	2.178 $\pm$ 0.754
PRF-fit source offset from KIC position	<b>2.833 <math>\pm</math> 0.911</b>	<b>3.11</b>	1.175 $\pm$ 1.105	2.577 $\pm$ 0.828
photometric centroid source offset	1.51 $\pm$ 0.60	2.52	0.79 $\pm$ 0.69	1.29 $\pm$ 0.56

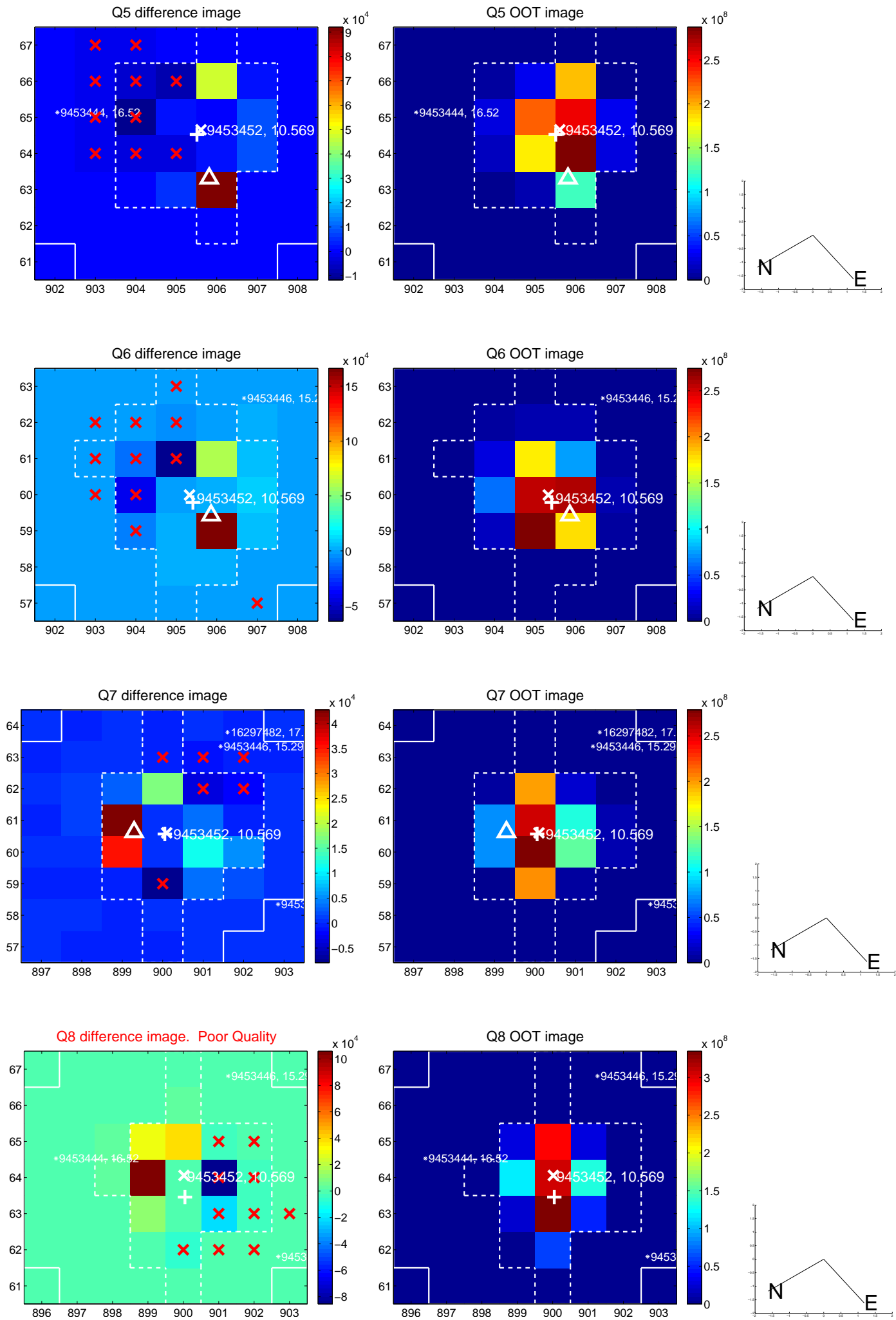


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

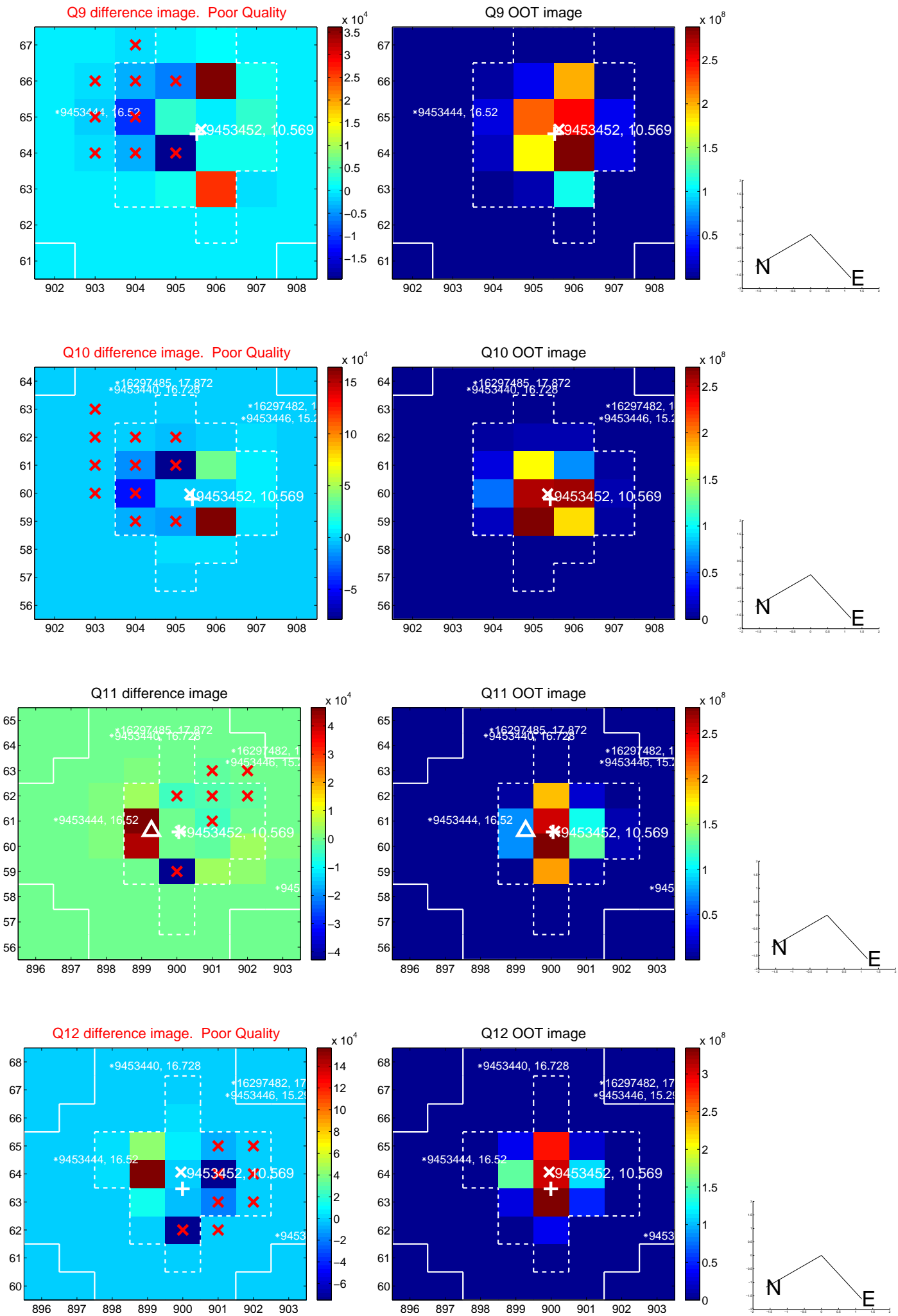
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



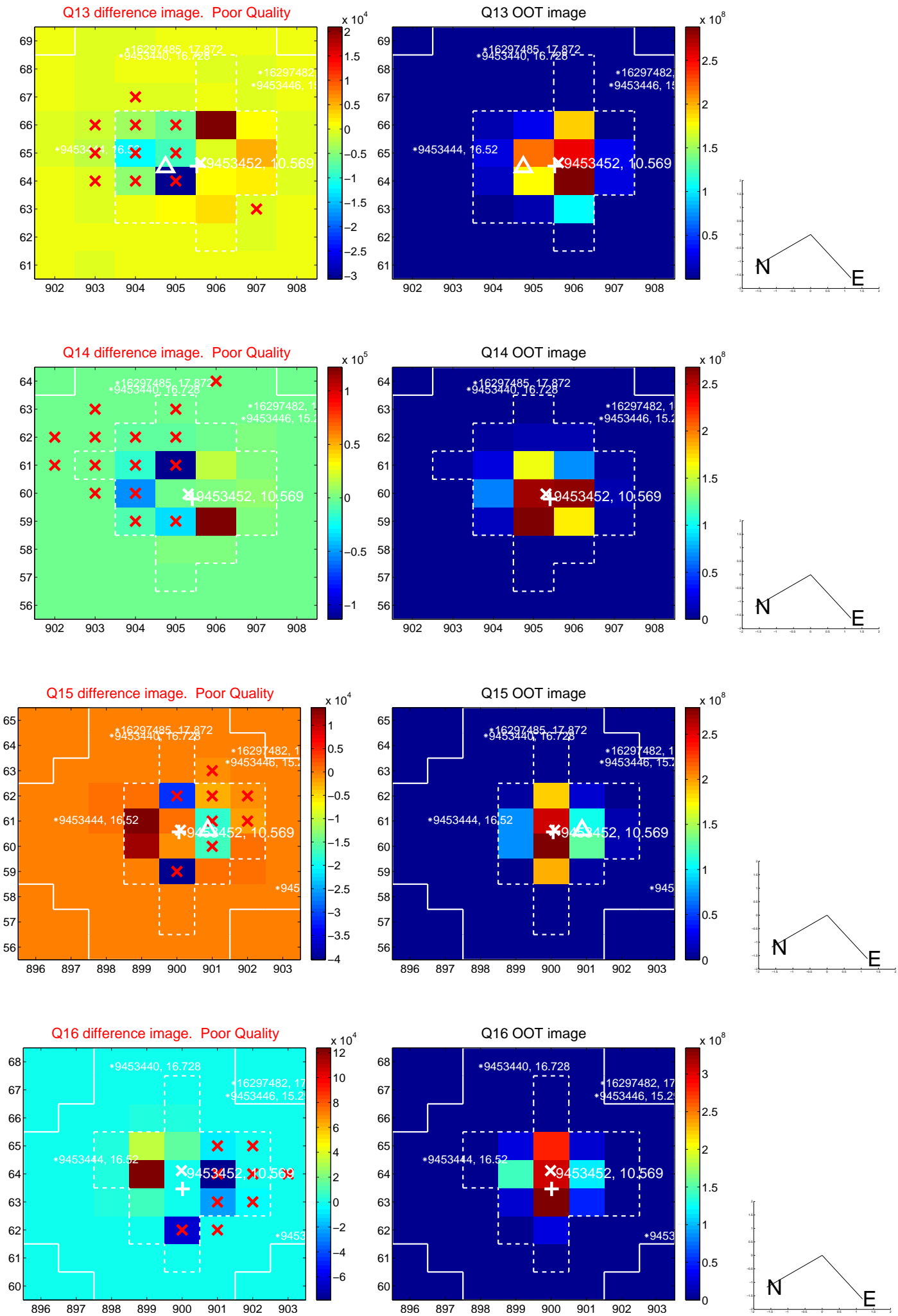
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



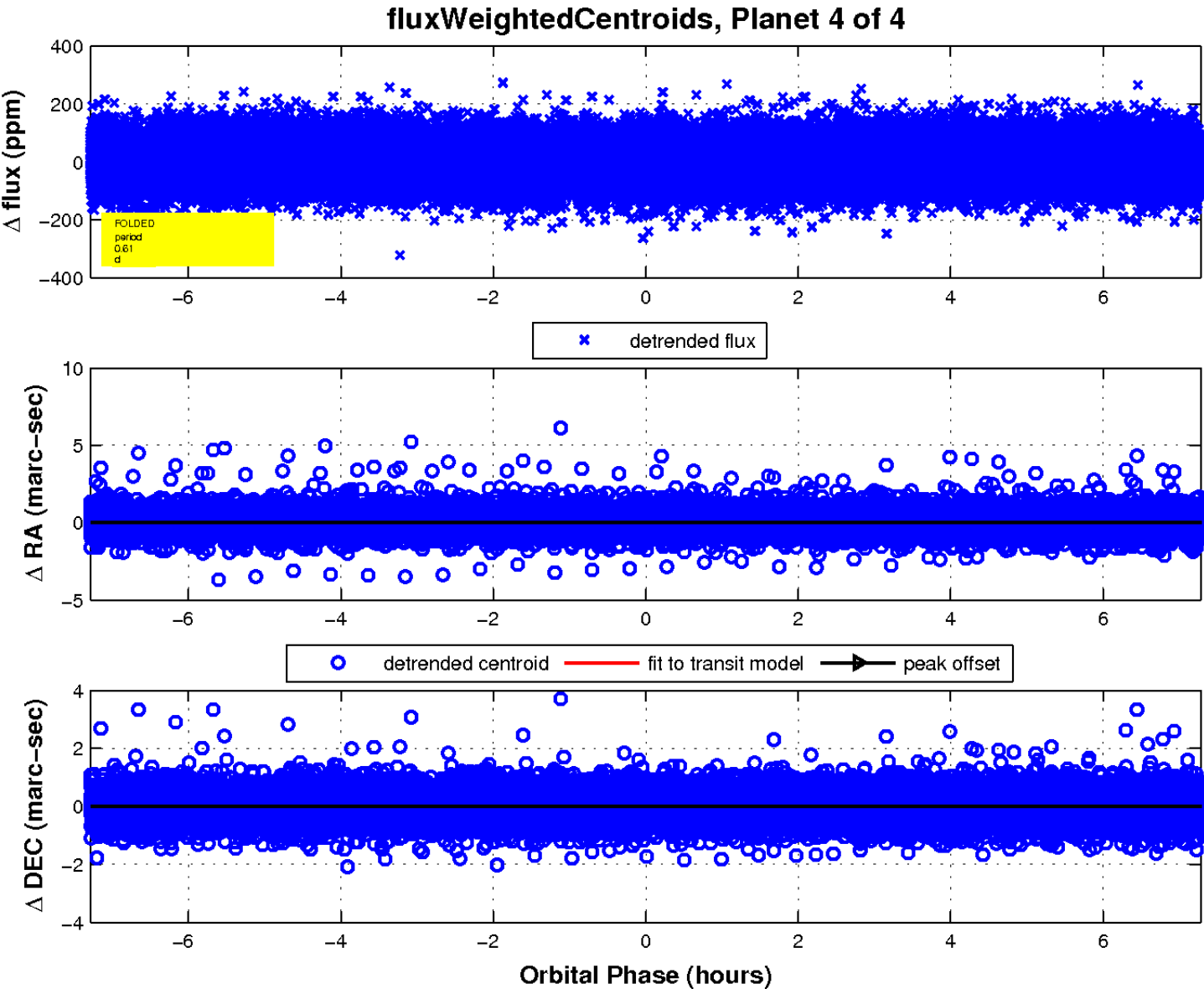
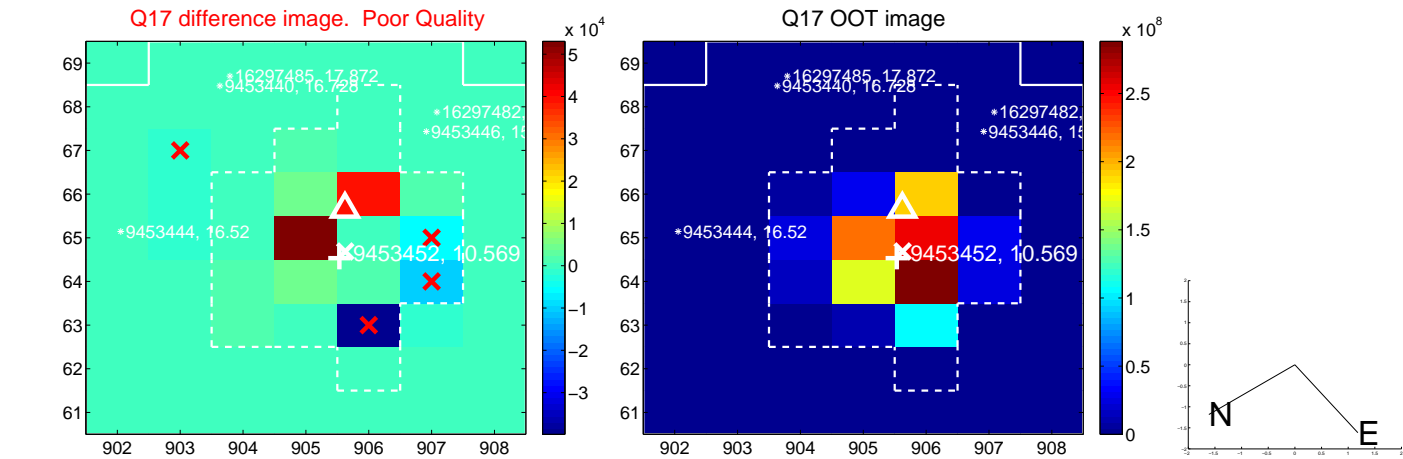
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

