

KIC 009092504

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009092504-01 | OBS | 2716.01 | 0.962857 | 132.129300 | 248.7 | 1.790 | 25.5 | 26.3 | 0.80 | 5704 | 1.51 | 1824.04 |
| 009092504-02 | OBS | 2716.02 | 6.459978 | 135.977054 | 368.4 | 2.091 | 12.2 | 14.1 | 0.80 | 5704 | 1.80 | 144.15 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------|
| 009092504-01 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009092504-02 | OBS | PC | 0.96 | 0 | 0 | 0 | 0 | NO_COMMENT |

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 for comment definitions.

Ephemeris Match Information For 009092504-01

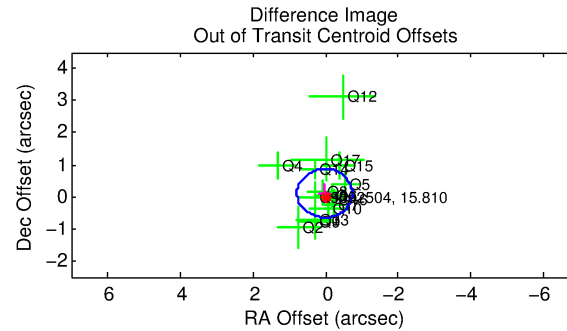
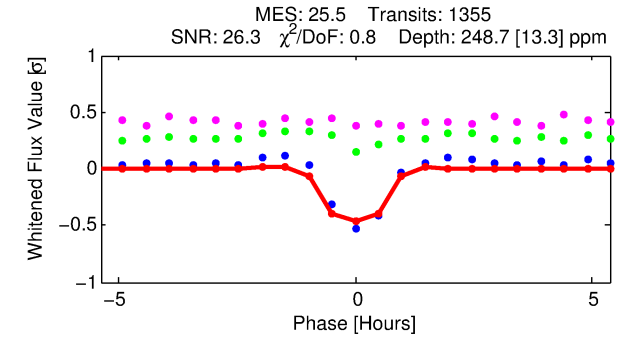
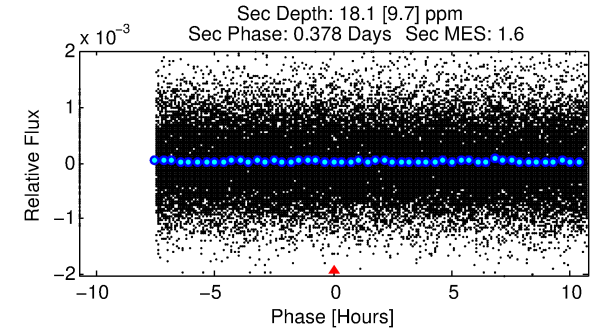
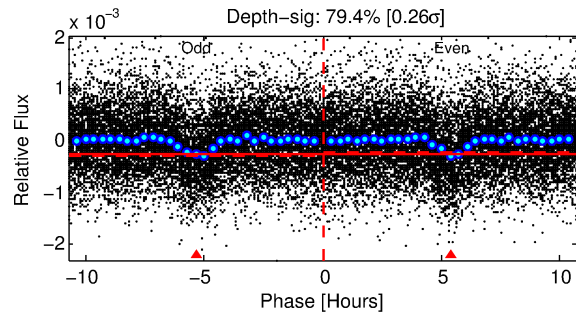
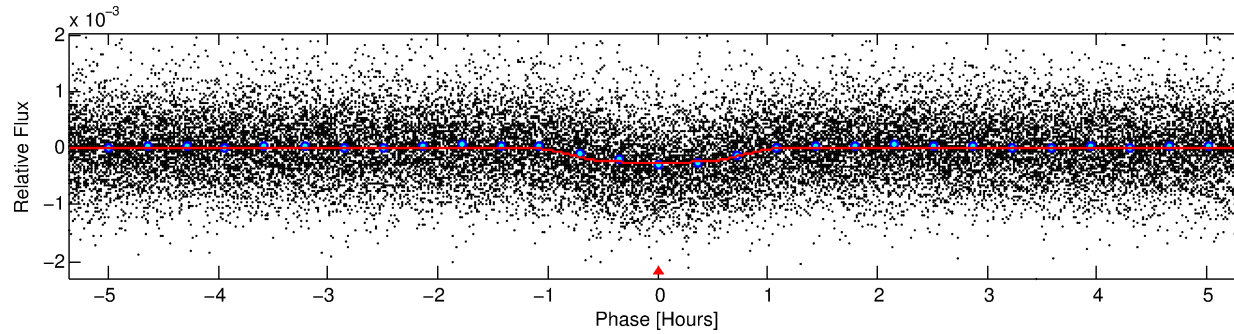
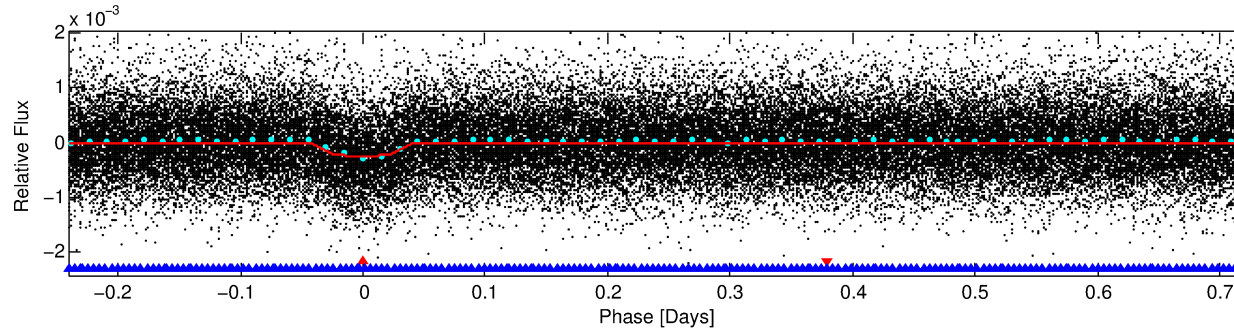
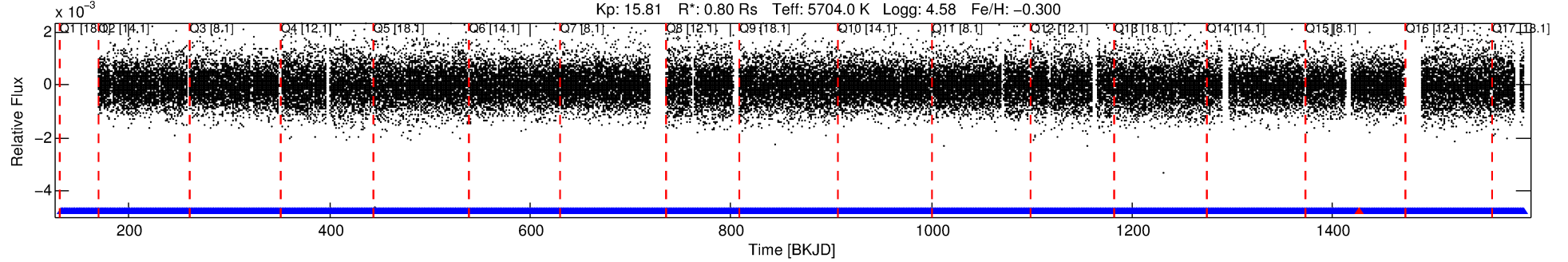
No Significant Match Found

DV One-Page Summary

KIC: 9092504 Candidate: 1 of 2 Period: 0.963 d

KOI: K02716.01 Corr: 0.927

Kp: 15.81 R*: 0.80 Rs Teff: 5704.0 K Logg: 4.58 Fe/H: -0.300



DV Fit Results:

Period = 0.96286 [0.00000] d
Epoch = 132.1293 [0.0010] BKJD
Rp/R* = 0.0172 [0.0049]
a/R* = 2.16 [2.35]
b = 0.90 [0.30]
Seff = 1824.04 [586.01]
Teff = 1666 [134] K
Rp = 1.51 [0.57] Re
a = 0.0183 [0.0037] AU
Ag = 1.47 [1.24] [0.38σ]
Teffp = 2839 [566] K [2.02σ]

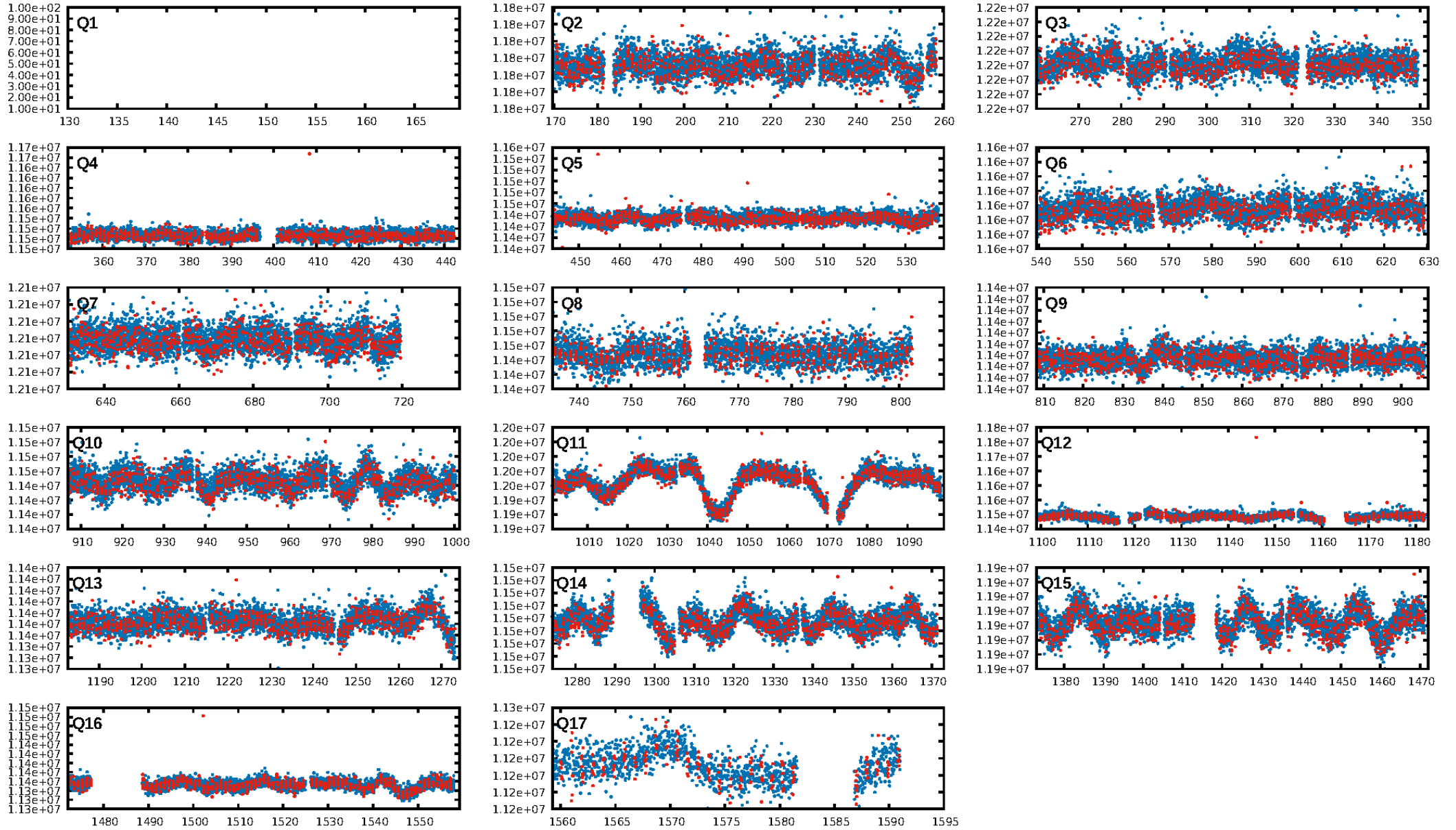
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [47.93σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 2.89e-140
RollingBand-fgt: 1.00 [1326/1327]
GhostDiagnostic-chr: 4.43
Centroid-sig: 16.7%
Centroid-so: 0.849 arcsec [1.70σ]
OotOffset-rm: 0.113 arcsec [0.45σ]
KicOffset-rm: 0.167 arcsec [0.61σ]
OotOffset-st: 4/4/4/4 [16]
KicOffset-st: 4/4/4/4 [16]
DiffImageQuality-fgm: 0.94 [15/16]
DiffImageOverlap-fno: 1.00 [16/16]

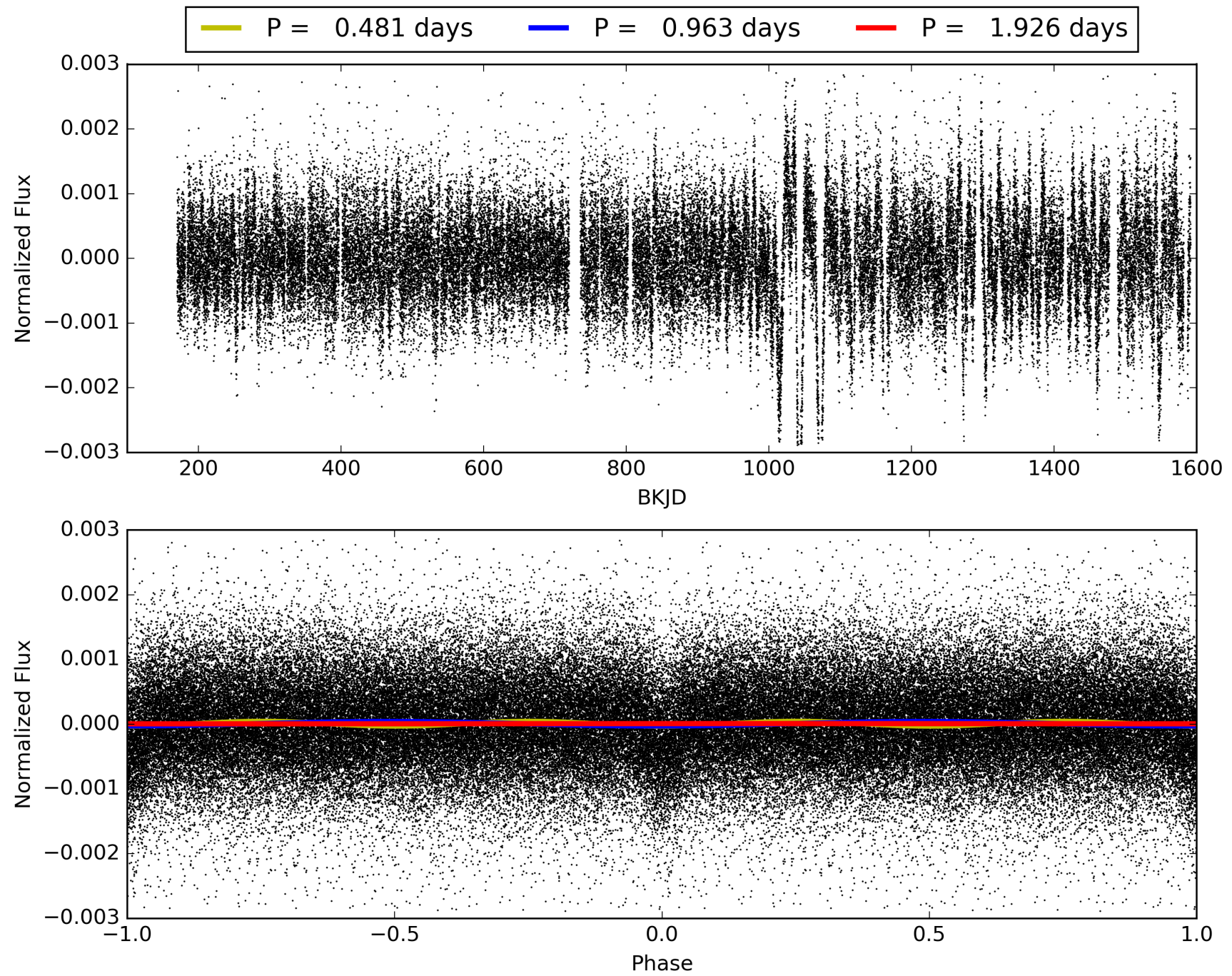
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 00:08:15 Z

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

TCE 009092504-01, PDC Light Curves

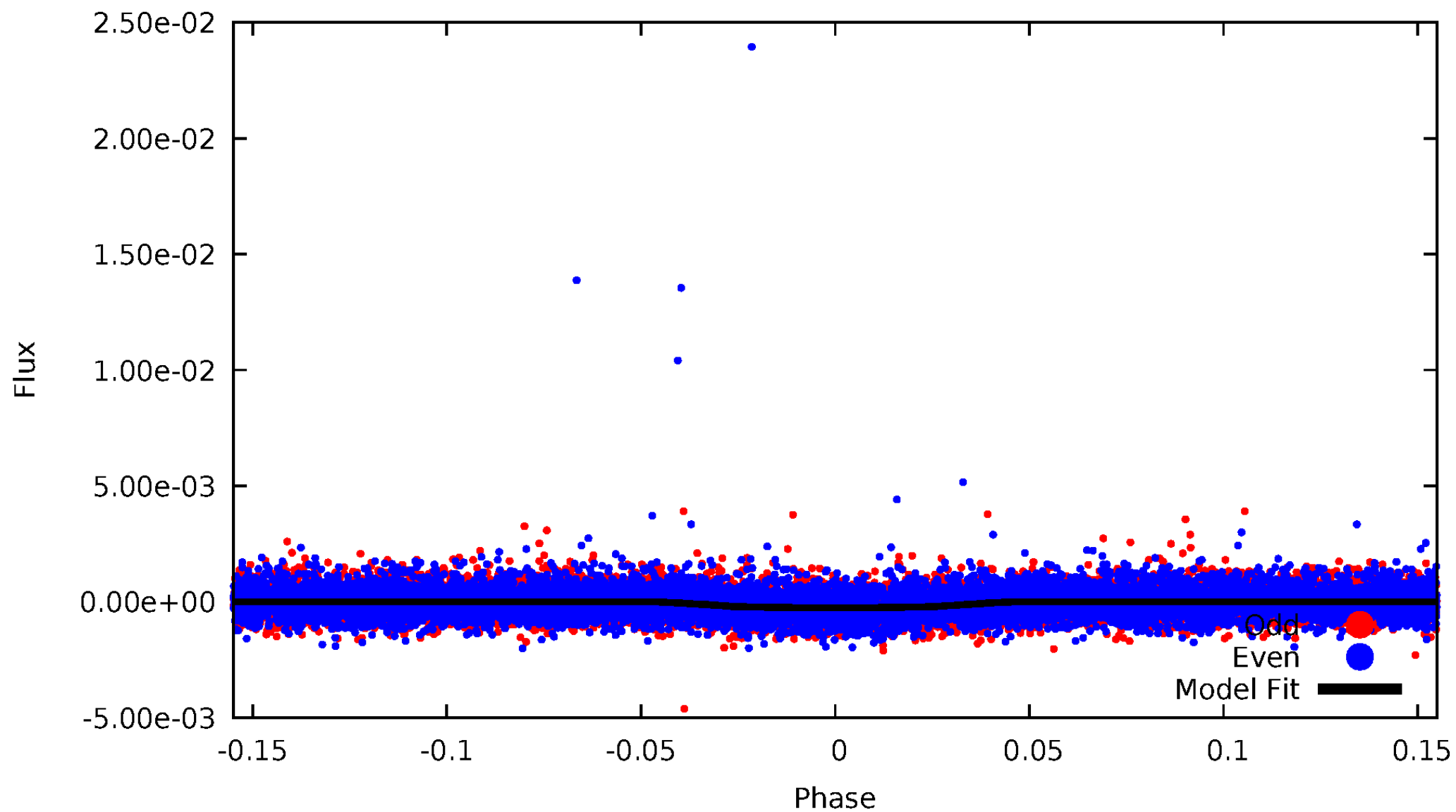


TCE 009092504-01



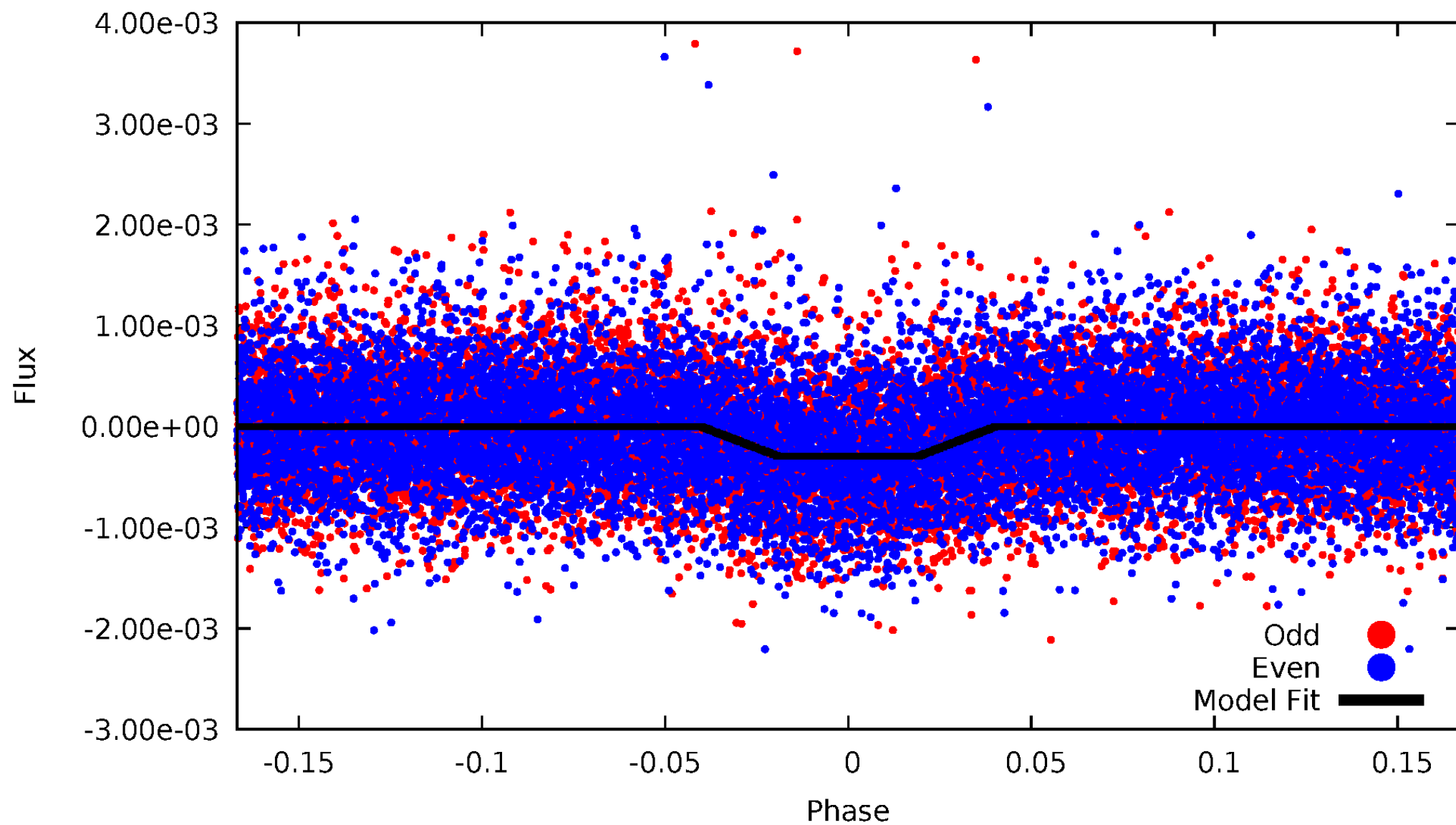
DV Odd/Even

TCE 009092504-01



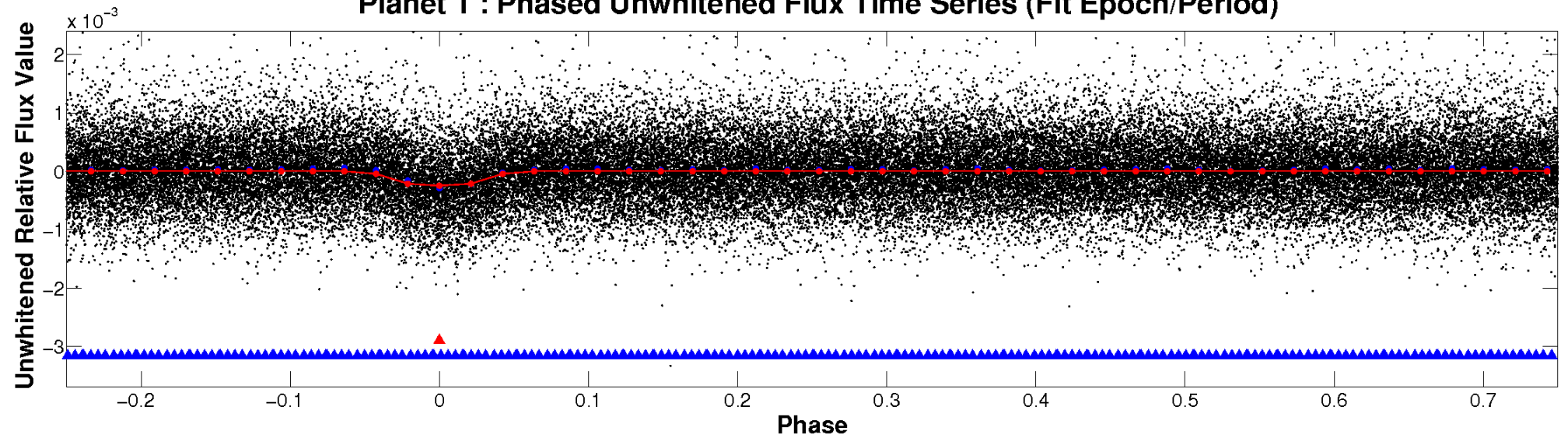
ALT Odd/Even

TCE 009092504-01

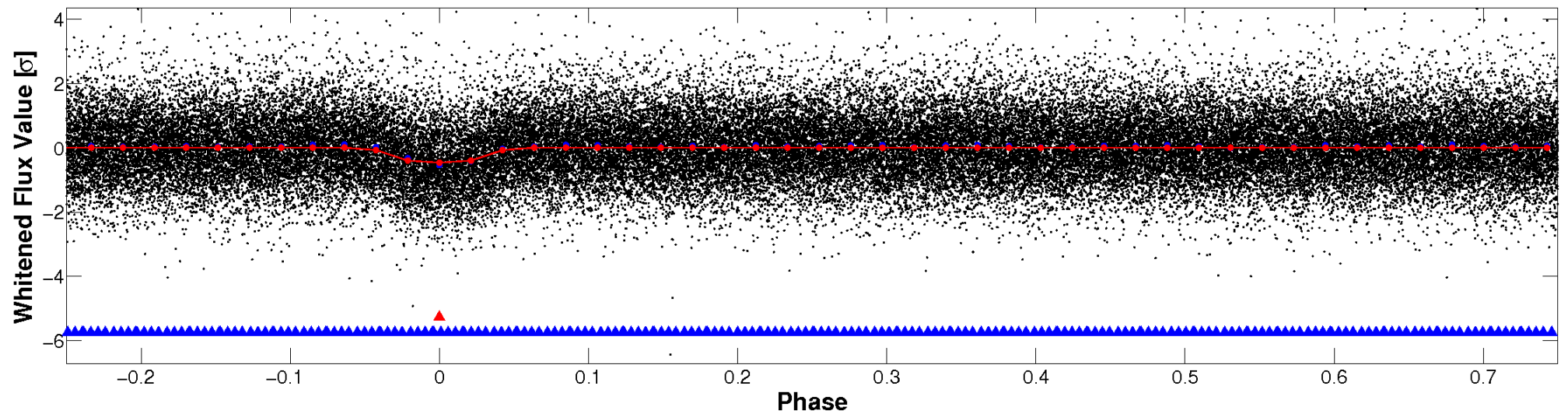


Non-Whitened Vs. Whitened Light Curve

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

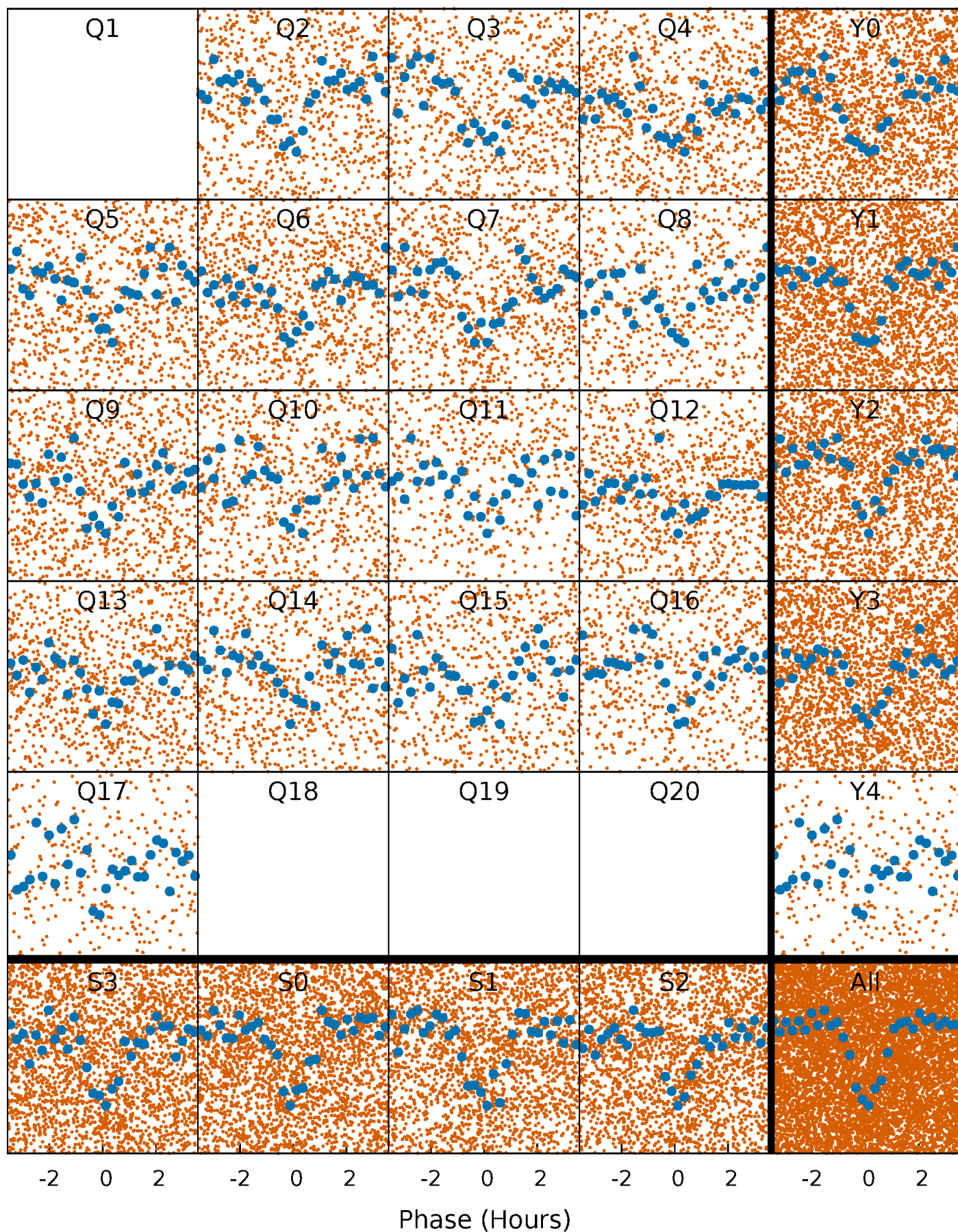


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



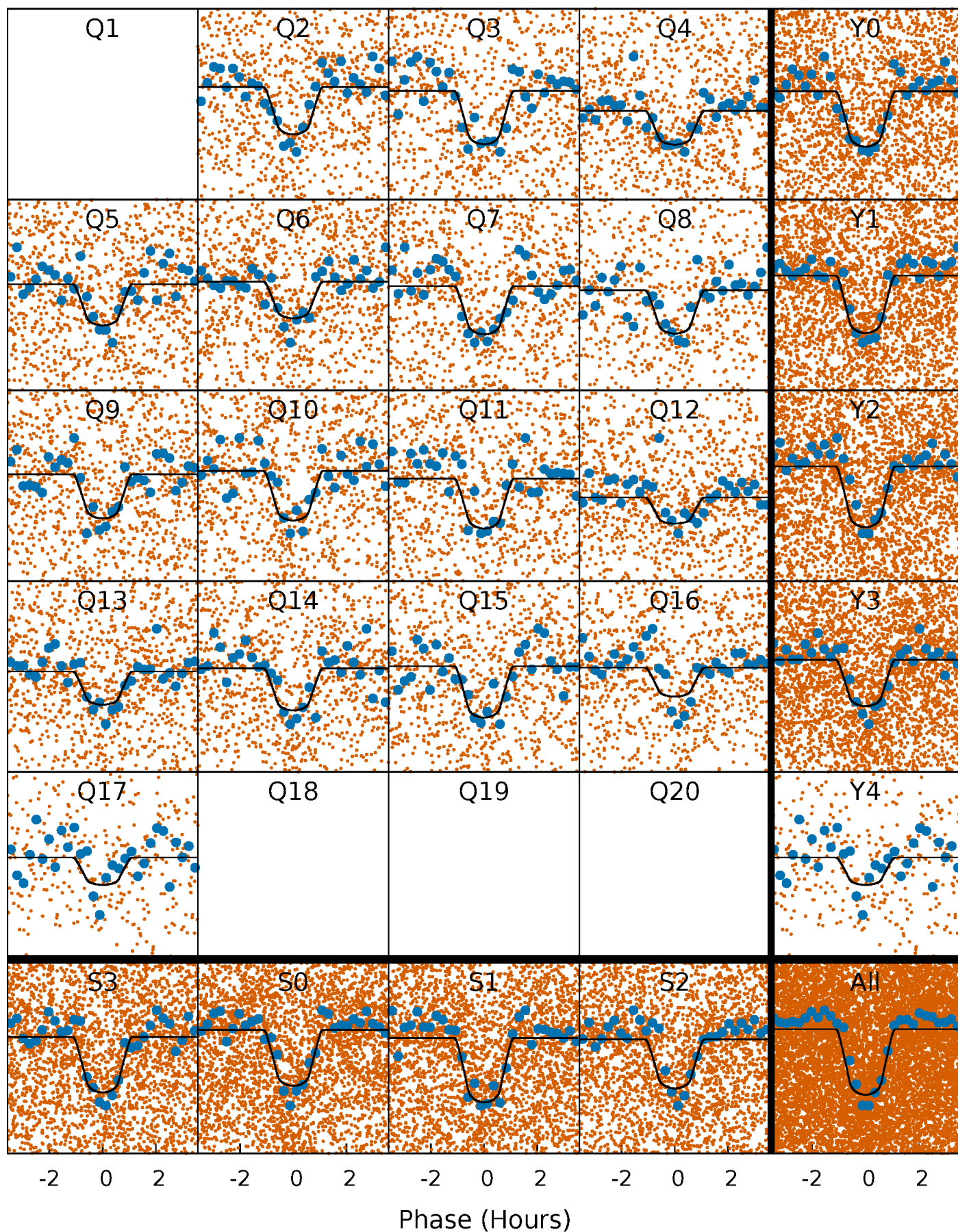
PDC Quarter-Phased Transit Curves

TCE 009092504-01 P= 0.962857 Days $T_0=132.129300$ (BKJD)



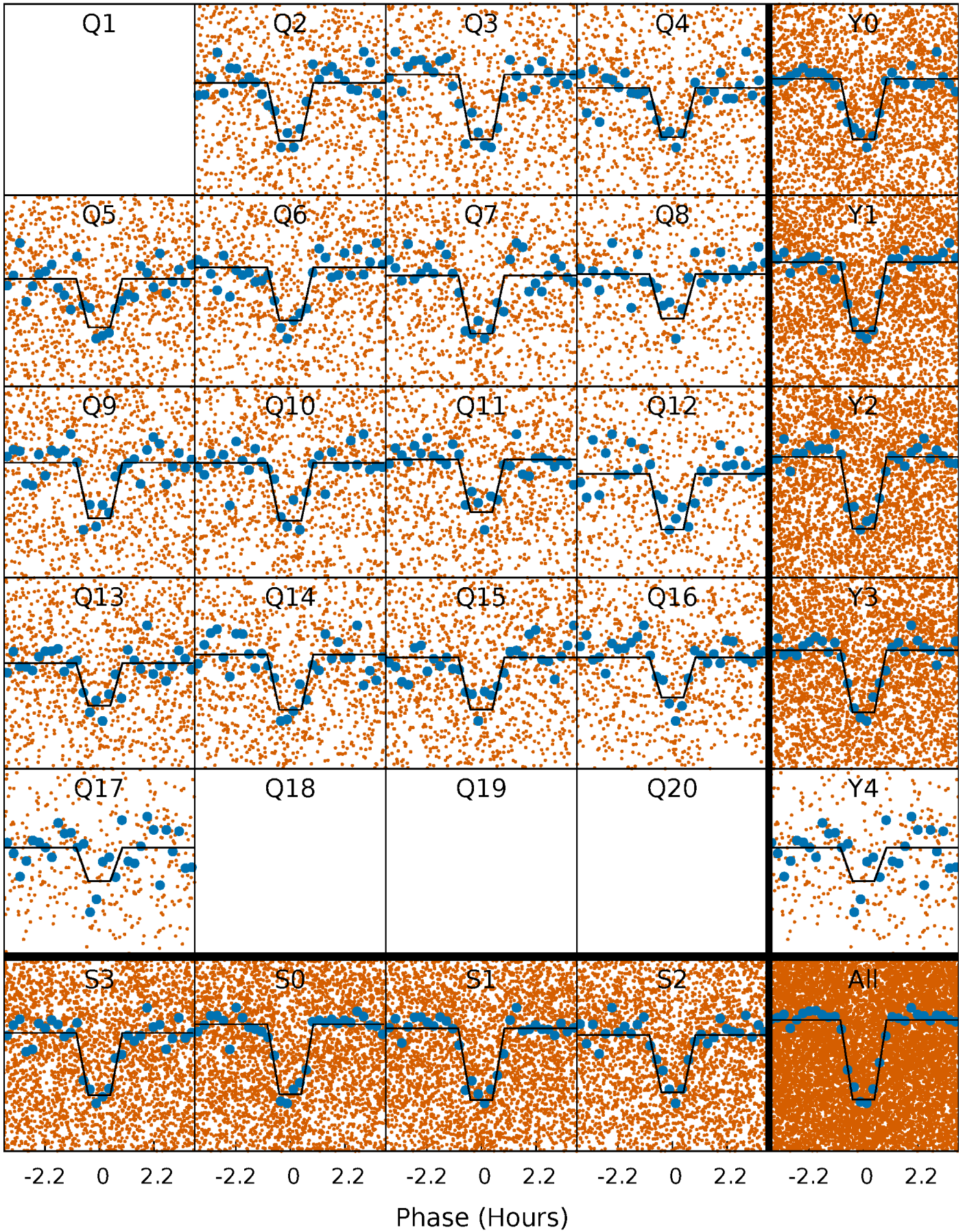
DV Quarter-Phased Transit Curves

TCE 009092504-01 P= 0.962857 Days $T_0=132.129300$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

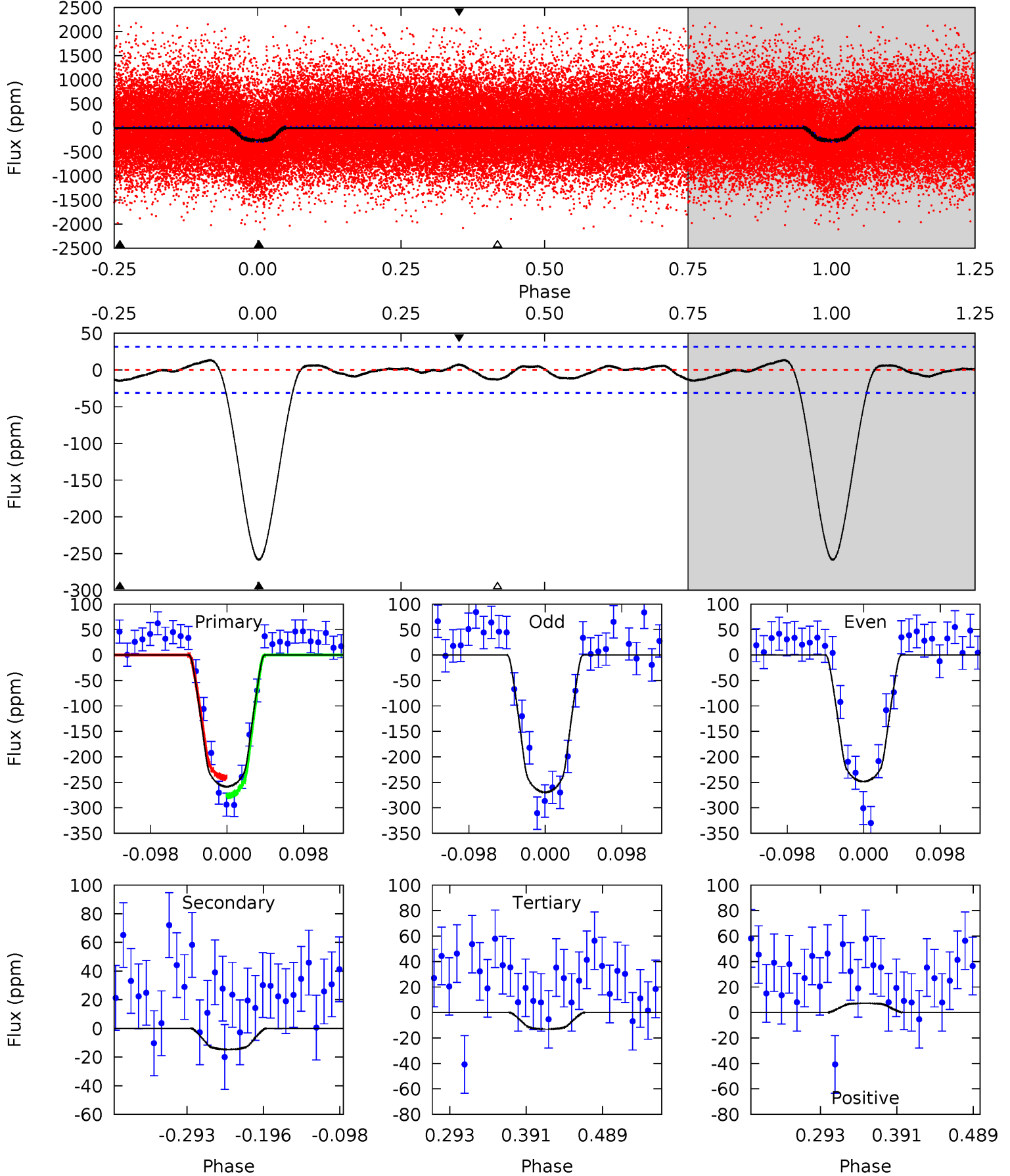
TCE 009092504-01 P= 0.962860 Days $T_0=132.129098$ (BKJD)



DV Model-Shift Uniqueness Test

009092504-01, P = 0.962857 Days, E = 132.129300 Days

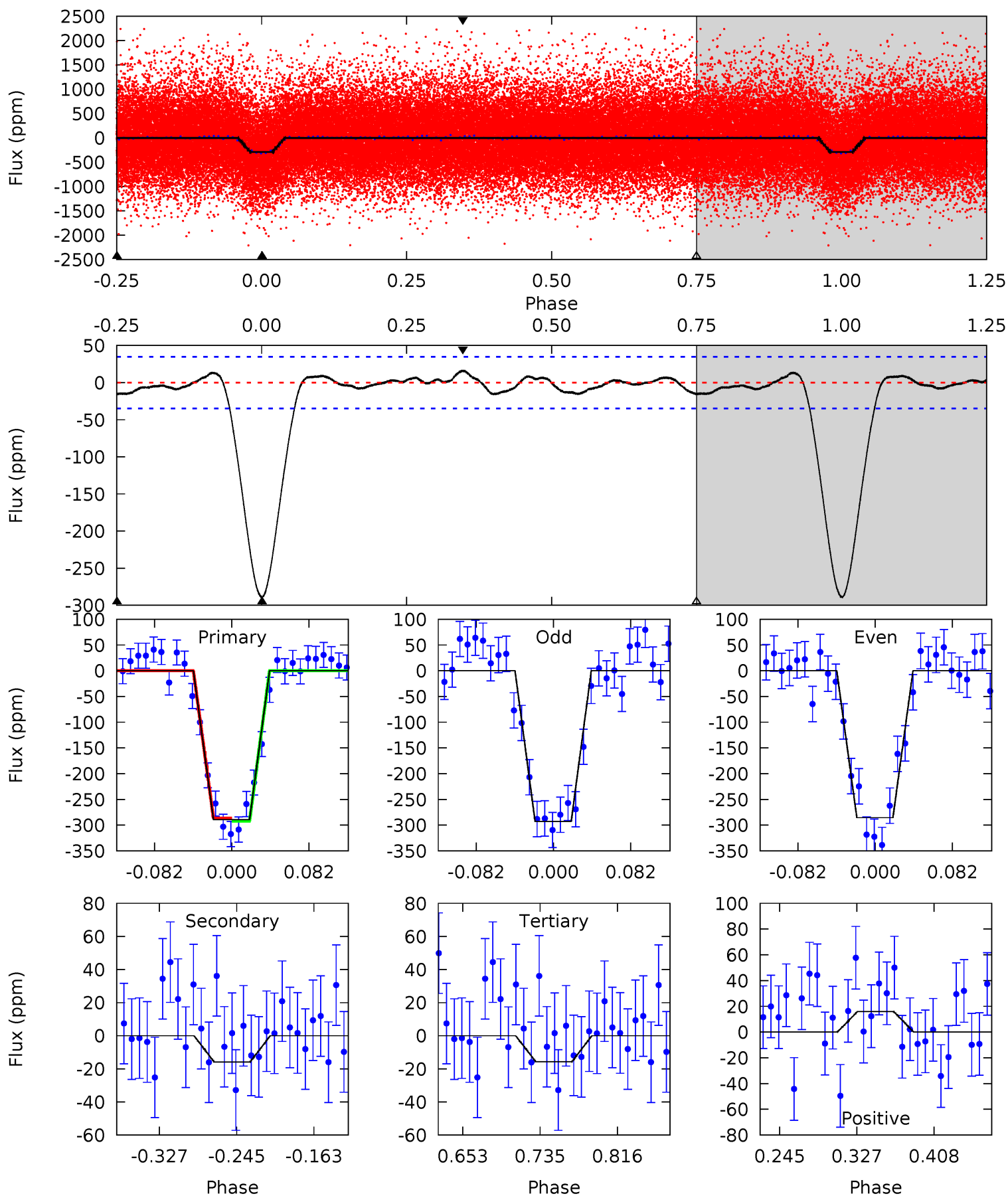
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 37.5 | 2.13 | 1.90 | 1.05 | 4.57 | 1.66 | 0.82 | 35.6 | 36.4 | 0.23 | 1.08 | 1.54 | 0.94 | 0.05 | 2.56 |



Alt Model-Shift Uniqueness Test

009092504-01, P = 0.962860 Days, E = 132.129098 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 38.2 | 2.09 | 2.08 | 2.11 | 4.61 | 1.74 | 0.95 | 36.1 | 36.1 | 0.01 | -0.02 | 0.49 | 0.98 | 0.05 | 0.40 |



Stellar Parameters For KIC 009092504

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5704^{+169}_{-186} | $4.575^{+0.040}_{-0.160}$ | $-0.300^{+0.300}_{-0.300}$ | $0.804^{+0.194}_{-0.077}$ | $0.897^{+0.088}_{-0.107}$ | $2.429^{+0.521}_{-1.071}$ |
| | +3%/-3% | +1%/-3% | +100%/-100% | +24%/-10% | +10%/-12% | +21%/-44% |
| 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 009092504-01 / KOI 2716.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -15 ± 7 | $1.57^{+0.52}_{-0.44}$ | 2380^{+129}_{-112} | 3085^{+505}_{-627} | $1.037^{+1.190}_{-0.620}$ |
| Alt. | -16 ± 8 | $1.57^{+0.48}_{-0.43}$ | 2374^{+141}_{-108} | 3136^{+478}_{-548} | $1.122^{+1.280}_{-0.625}$ |

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

DV Centroid Data

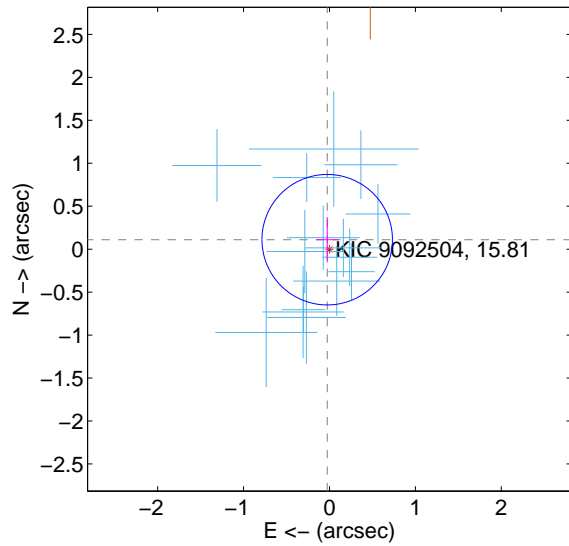
Supplemental centroid analysis for 009092504-01. Kepler magnitude: 15.81. Transit SNR 26.30

There are 15 quarters with good PRF difference image offsets

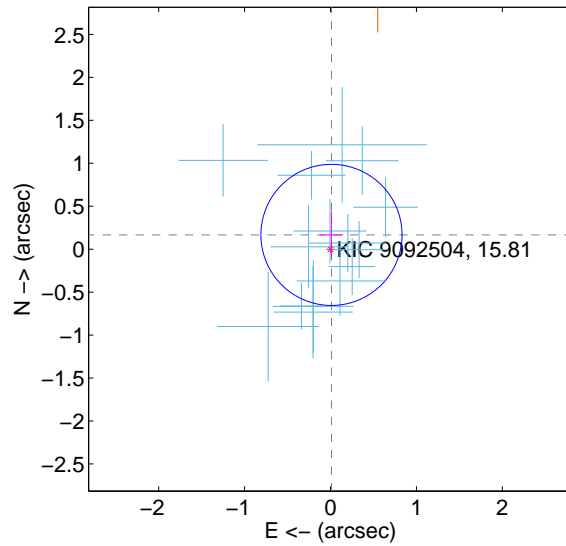
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.113 ± 0.253 | 0.45 | 0.026 ± 0.130 | 0.110 ± 0.264 |
| PRF-fit source offset from KIC position | 0.167 ± 0.274 | 0.61 | -0.011 ± 0.136 | 0.166 ± 0.272 |
| photometric centroid source offset | 0.85 ± 0.50 | 1.70 | -0.41 ± 0.48 | -0.74 ± 0.50 |

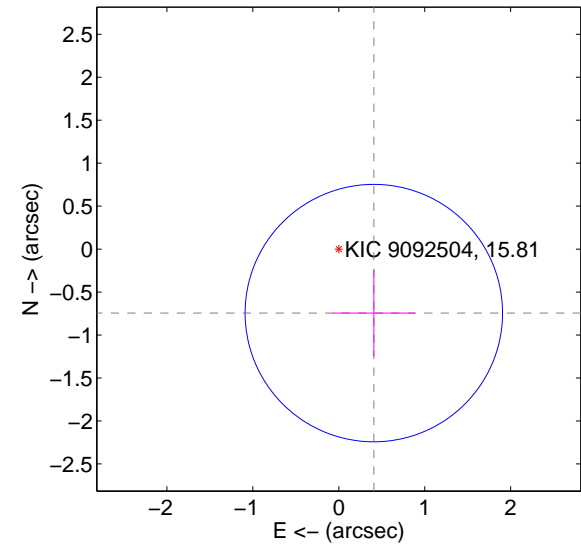
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

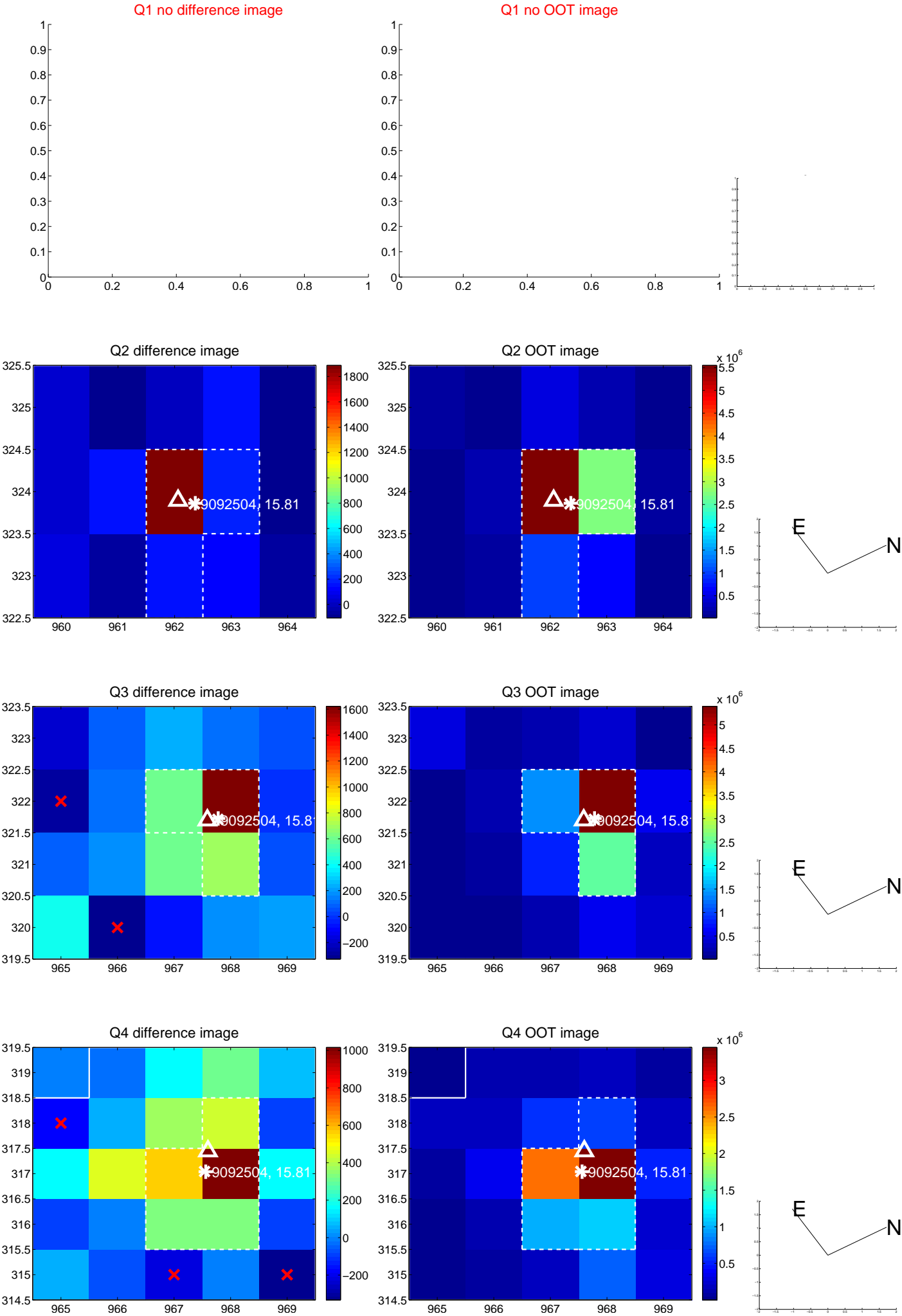


offset from photometric centroids

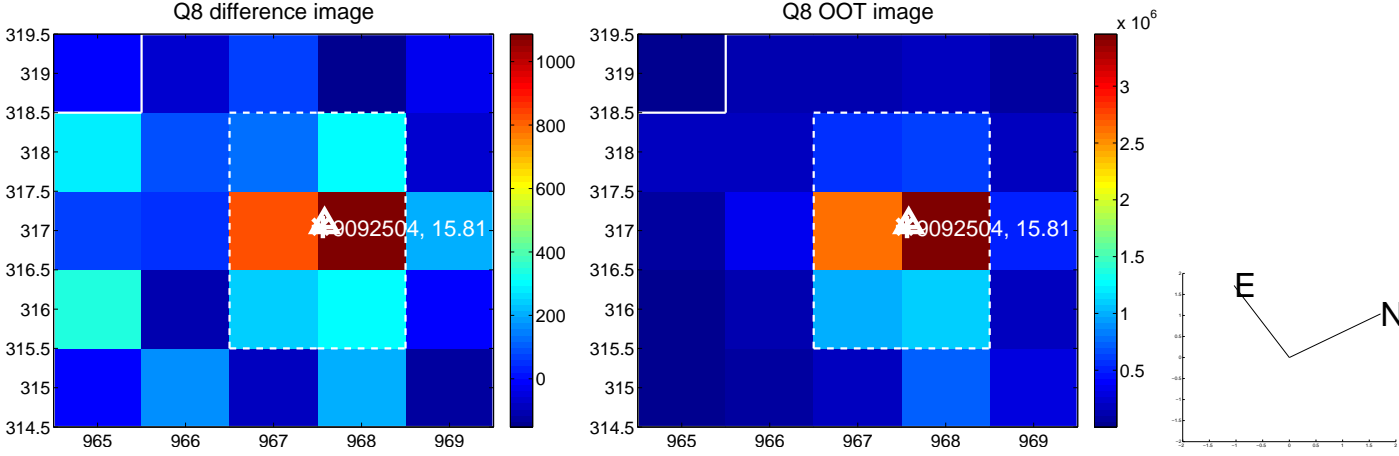
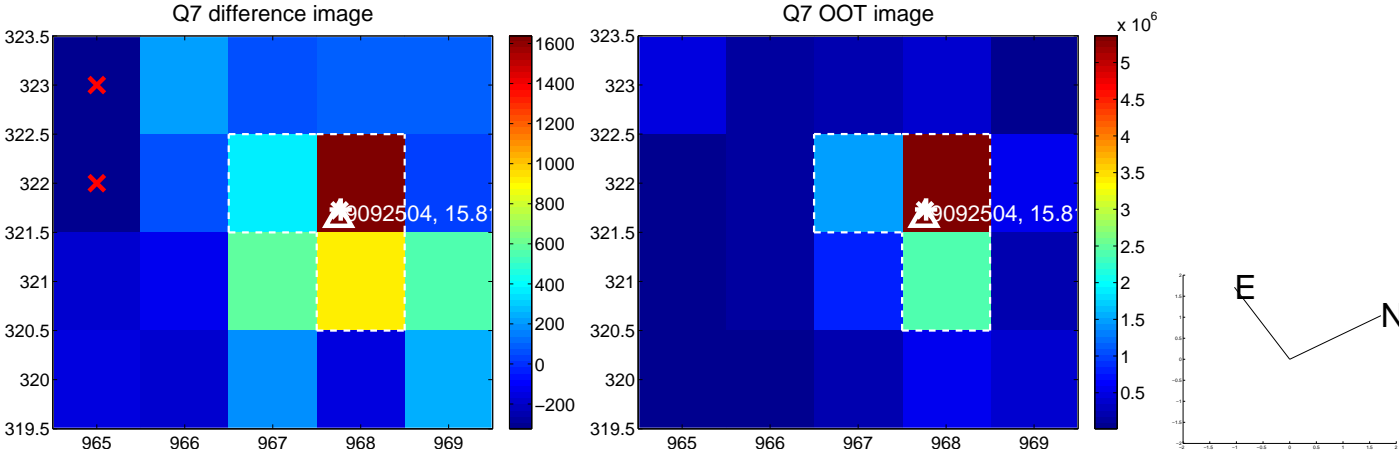
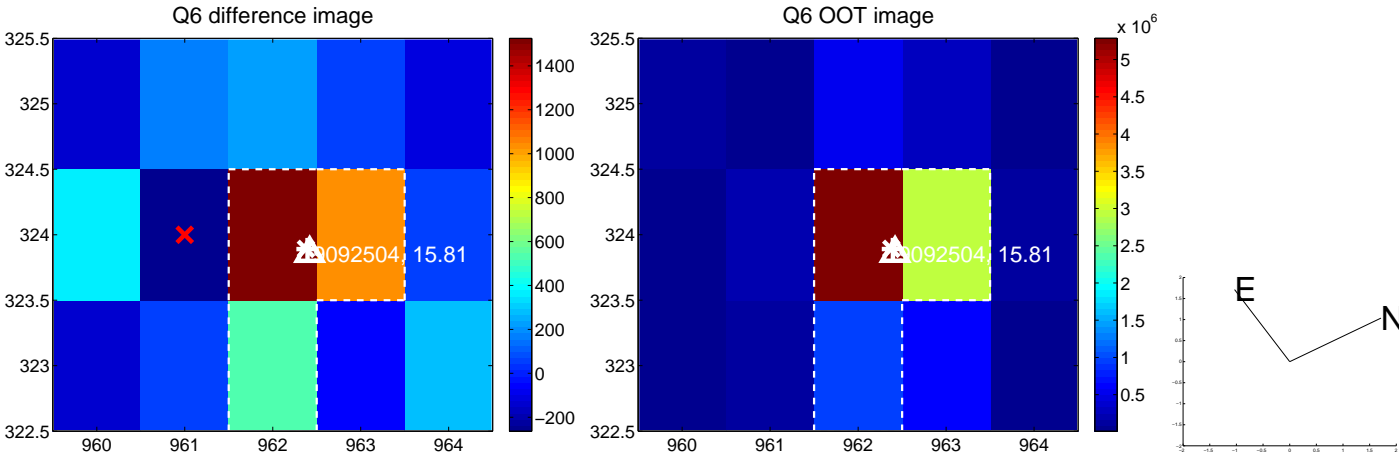
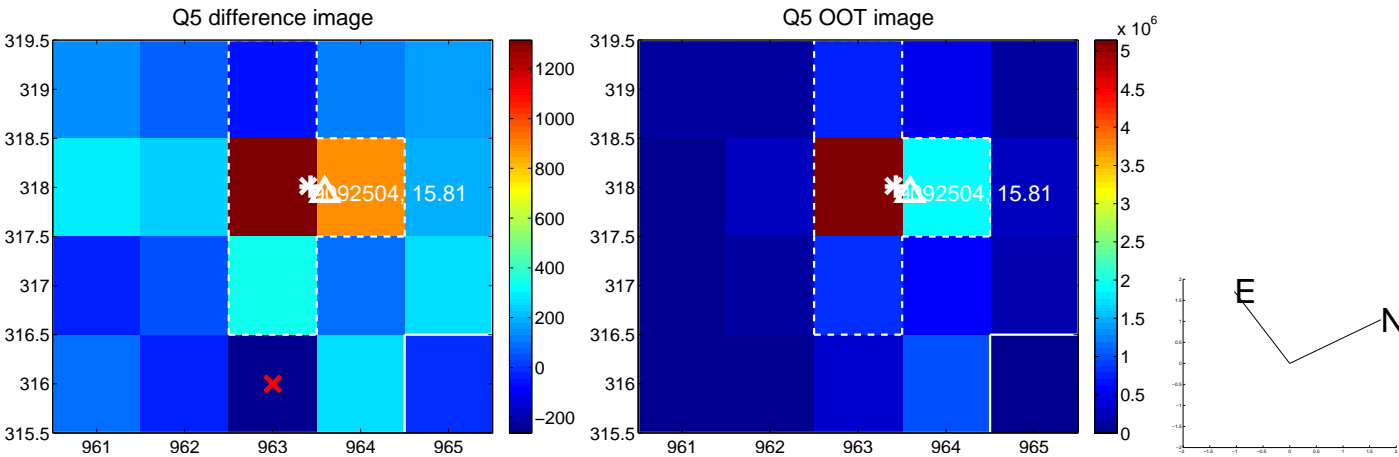


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

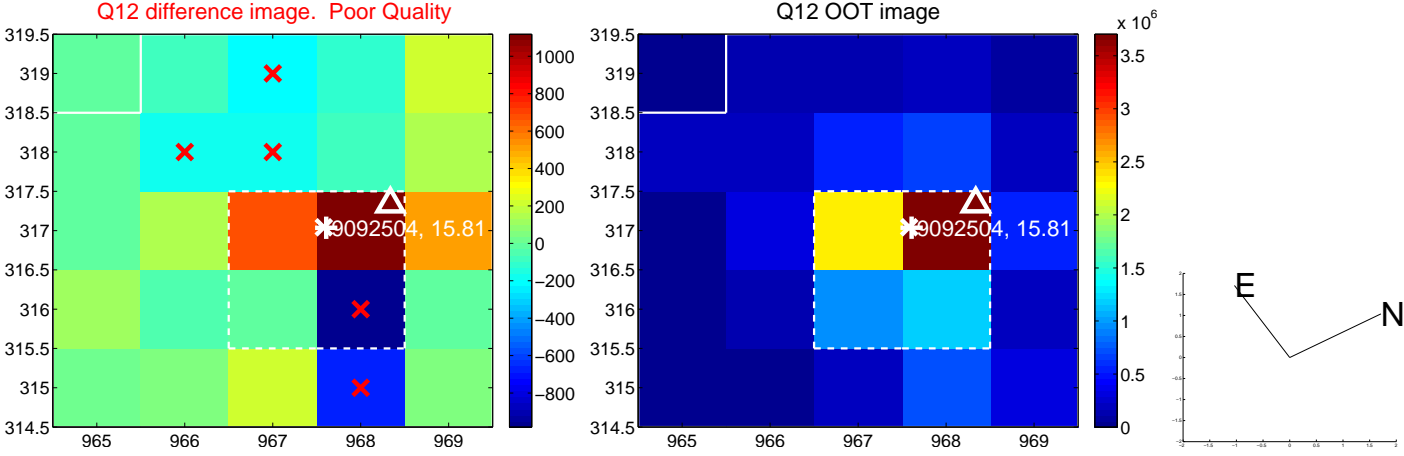
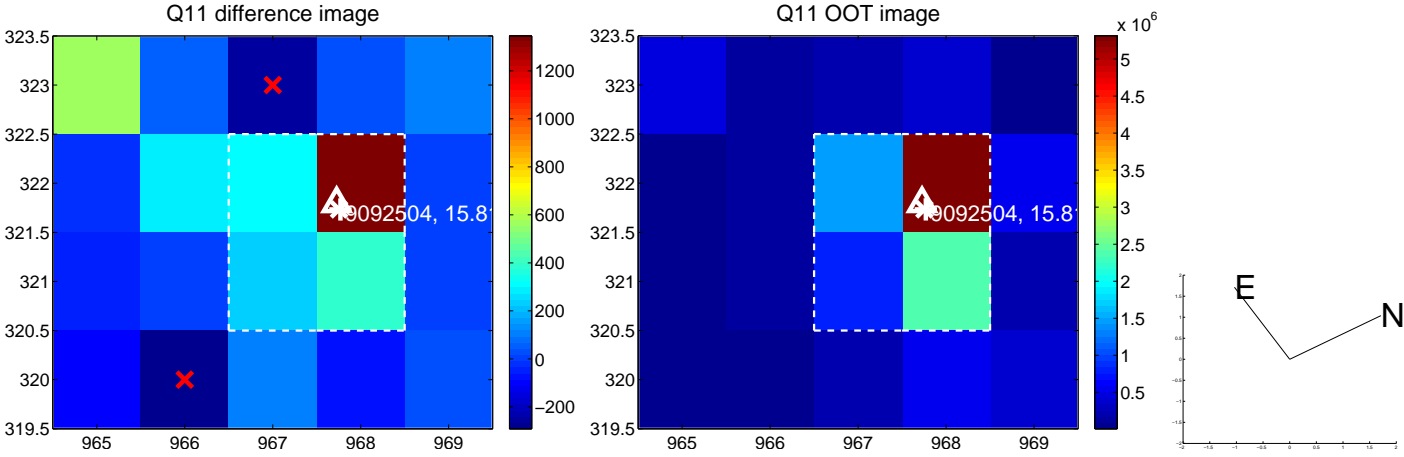
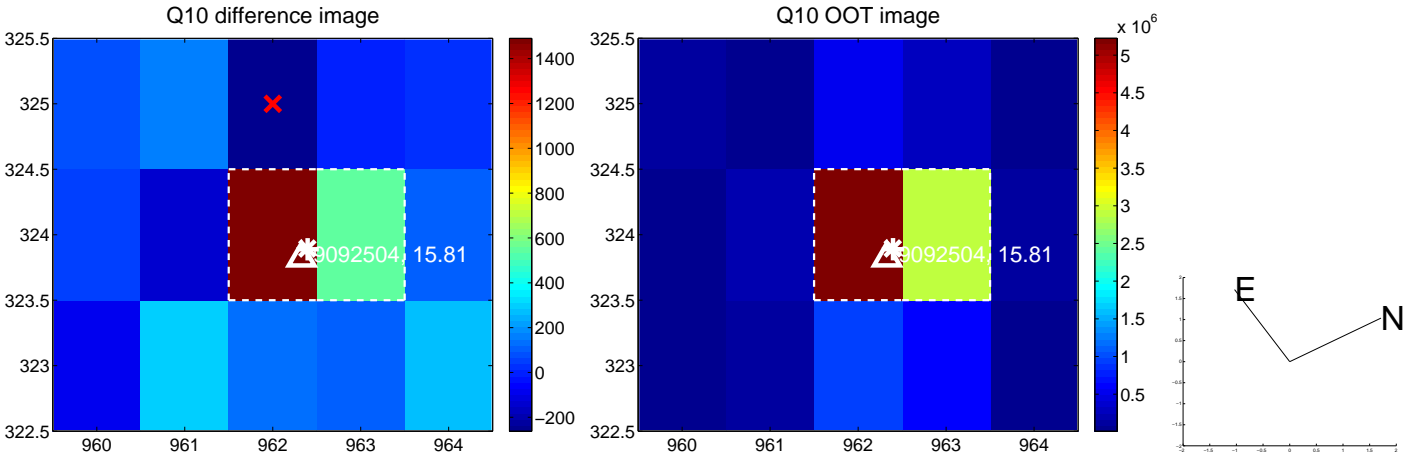
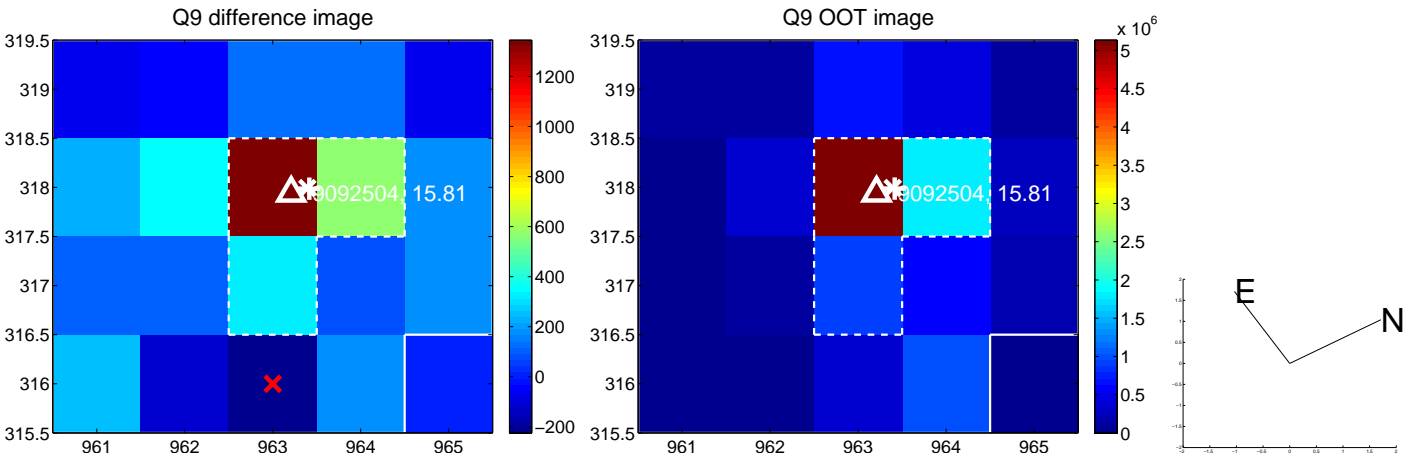
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



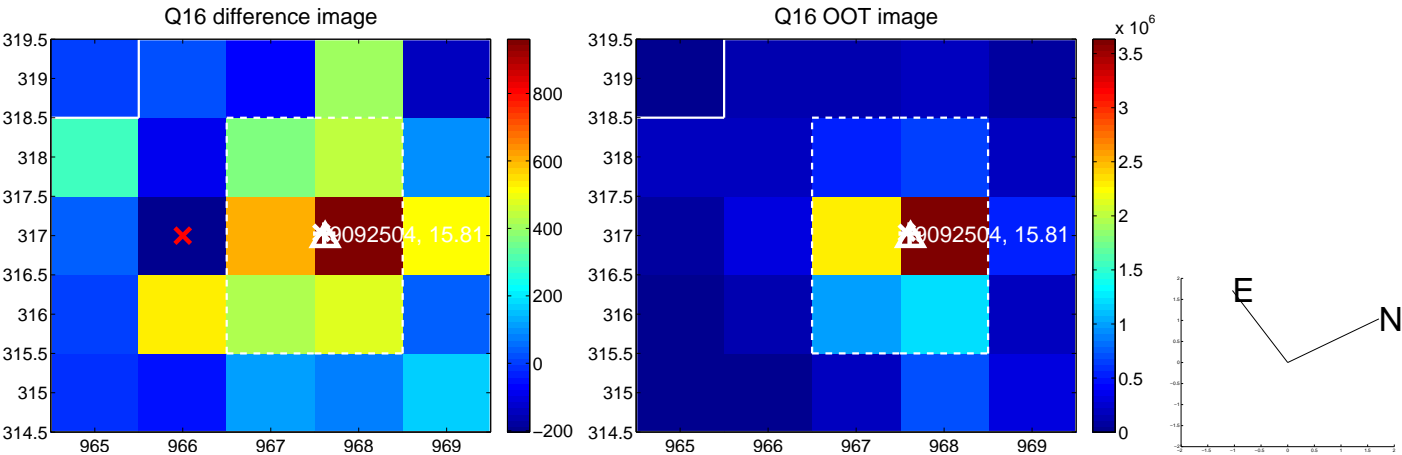
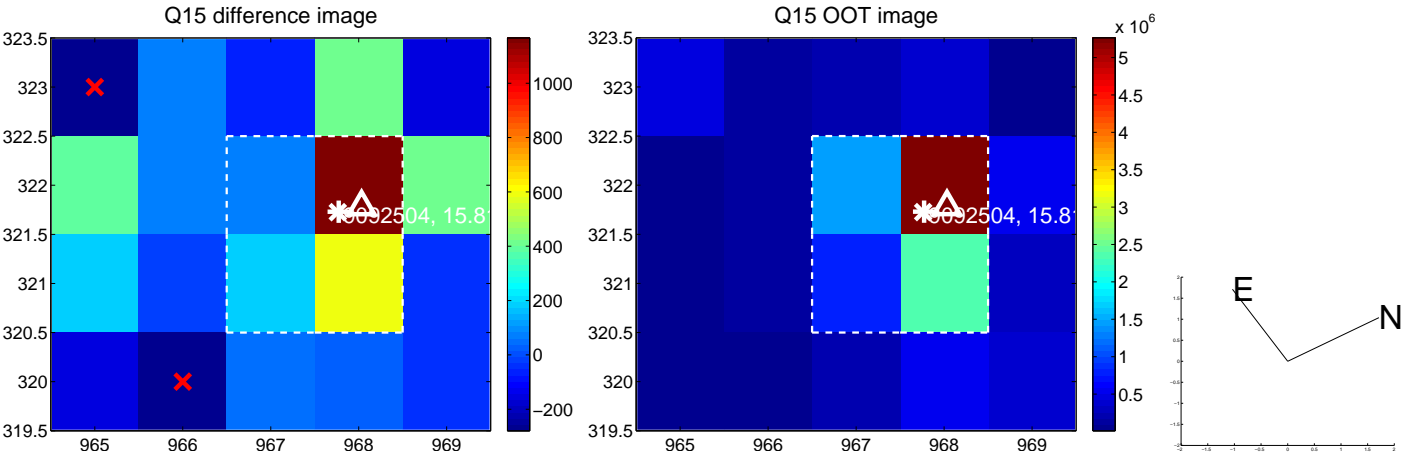
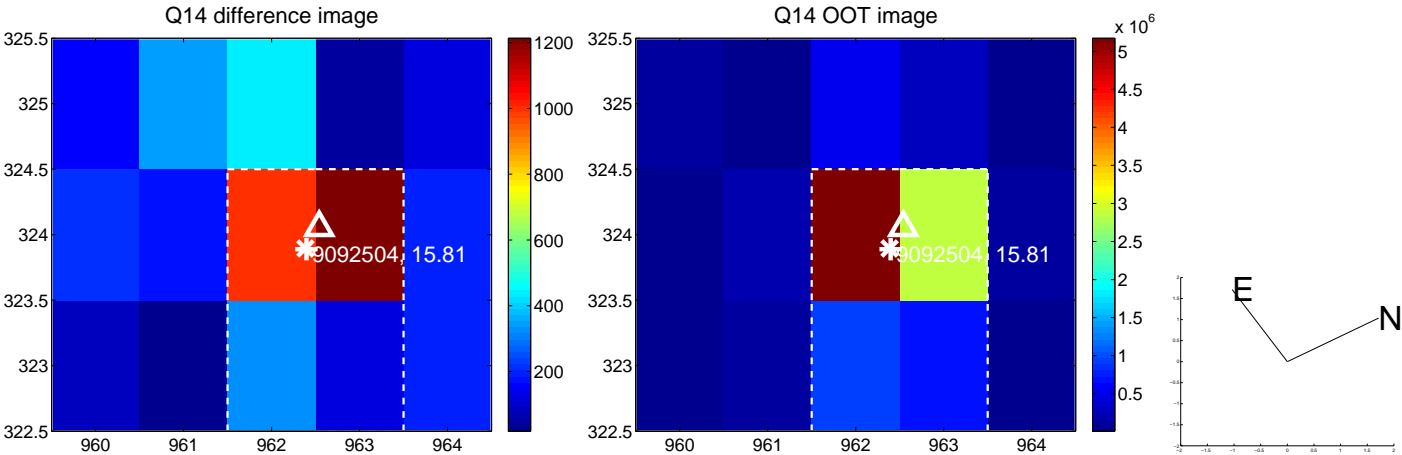
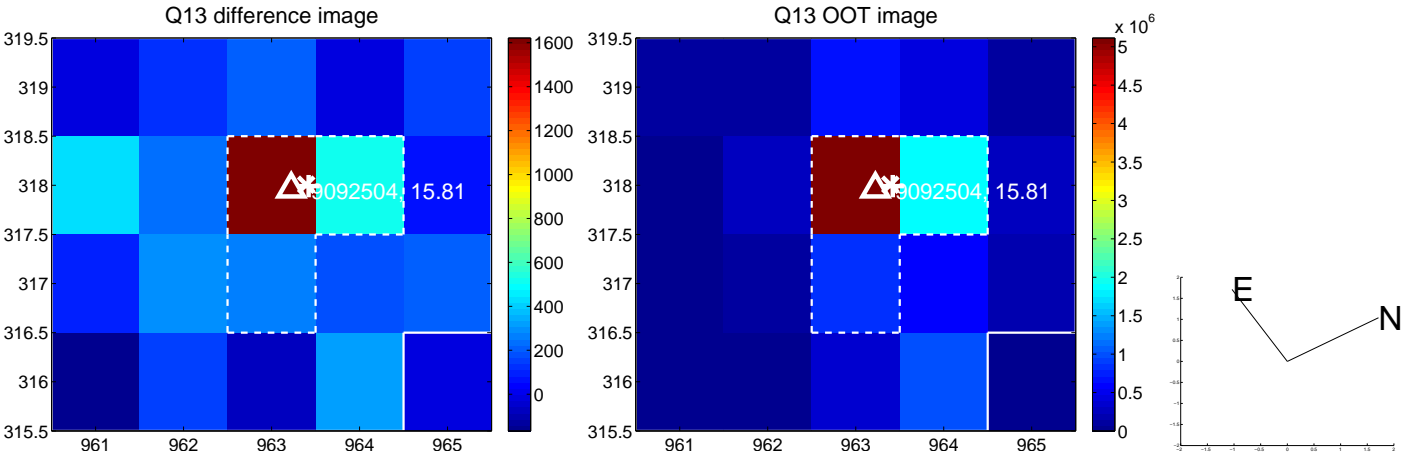
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



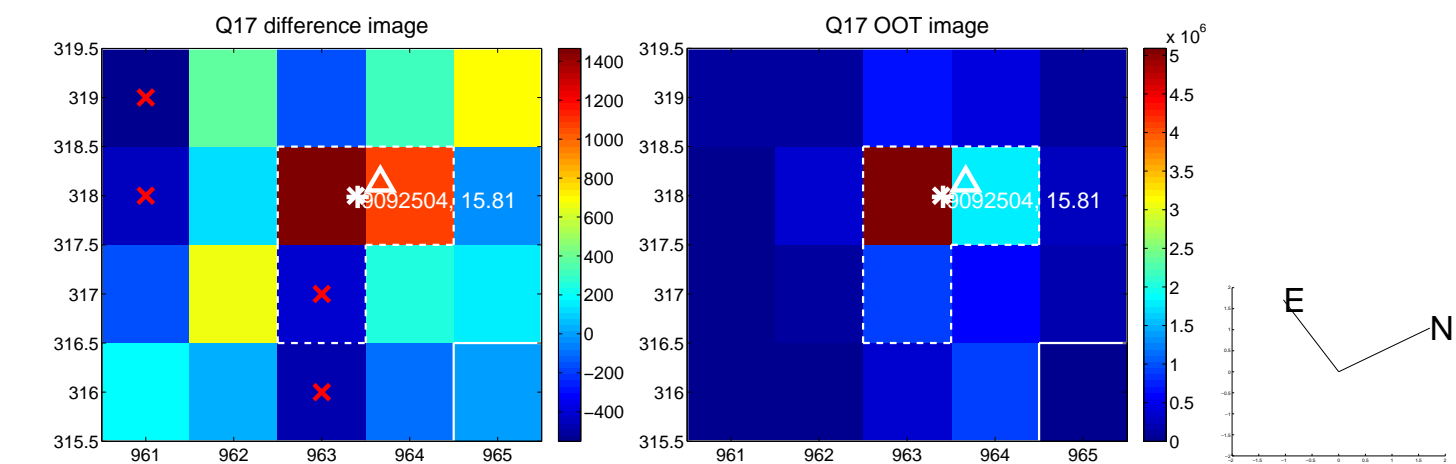
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



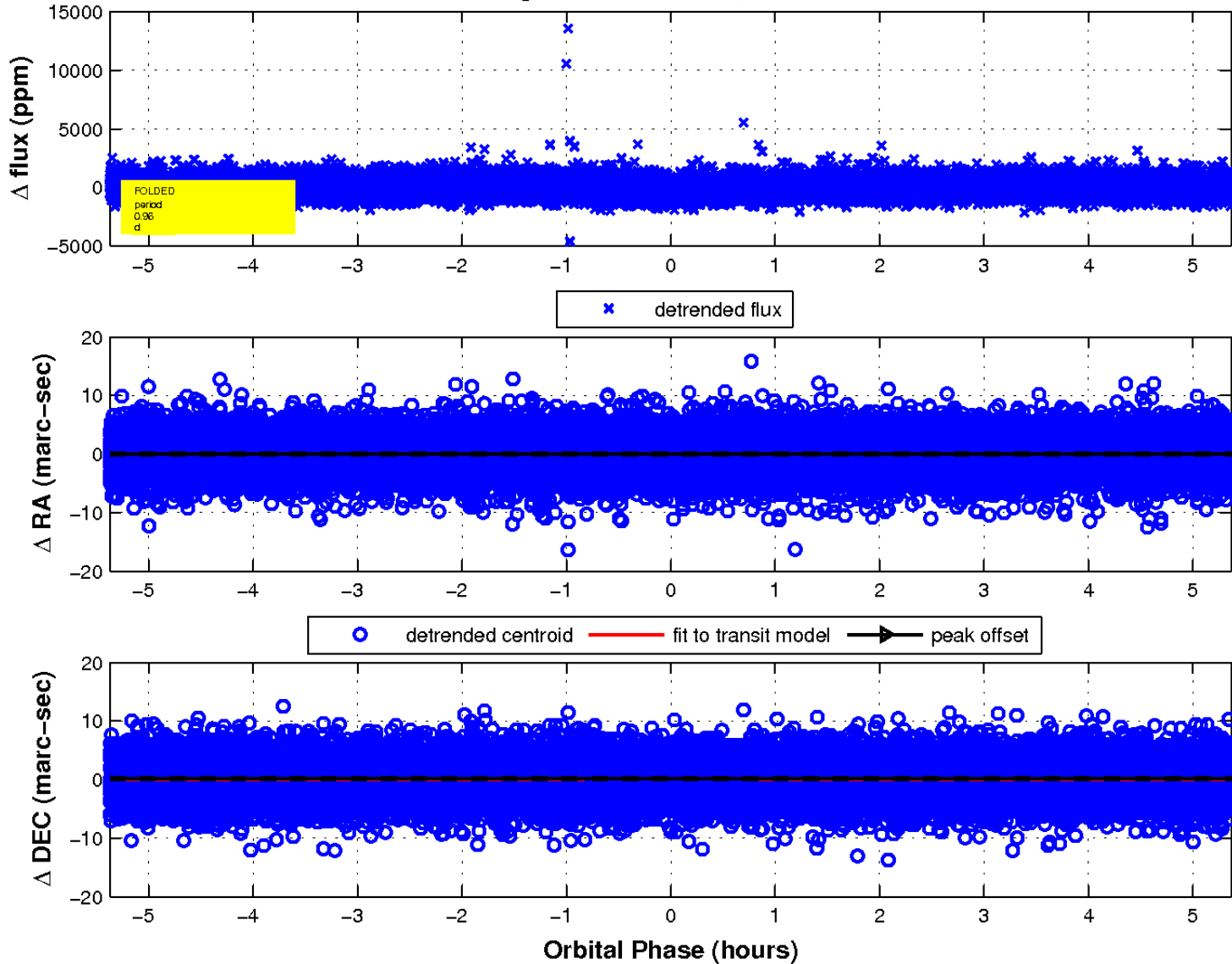
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

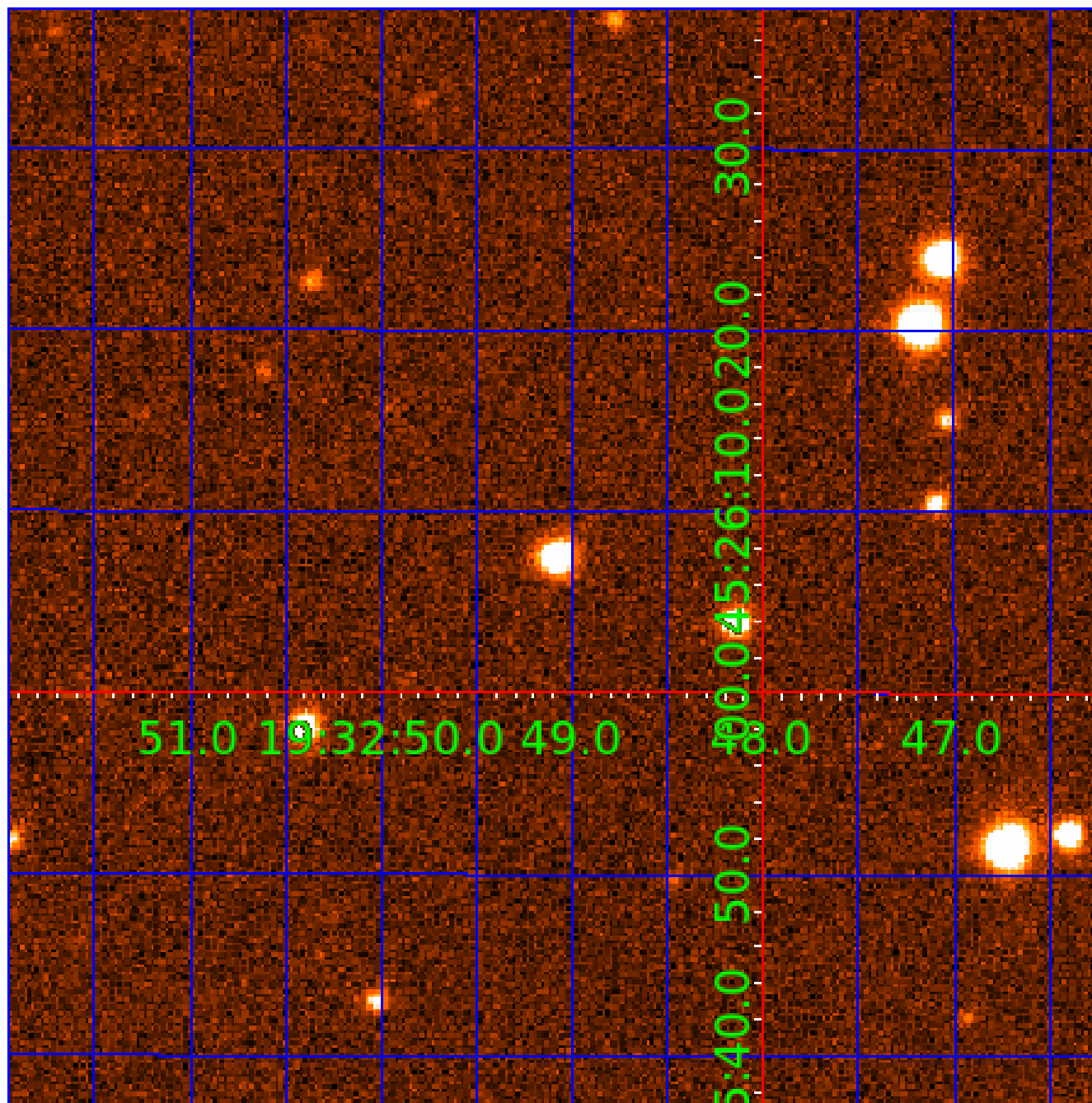


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 009092504

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009092504-01 | OBS | 2716.01 | 0.962857 | 132.129300 | 248.7 | 1.790 | 25.5 | 26.3 | 0.80 | 5704 | 1.51 | 1824.04 |
| 009092504-02 | OBS | 2716.02 | 6.459978 | 135.977054 | 368.4 | 2.091 | 12.2 | 14.1 | 0.80 | 5704 | 1.80 | 144.15 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------|
| 009092504-01 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009092504-02 | OBS | PC | 0.96 | 0 | 0 | 0 | 0 | NO_COMMENT |

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

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

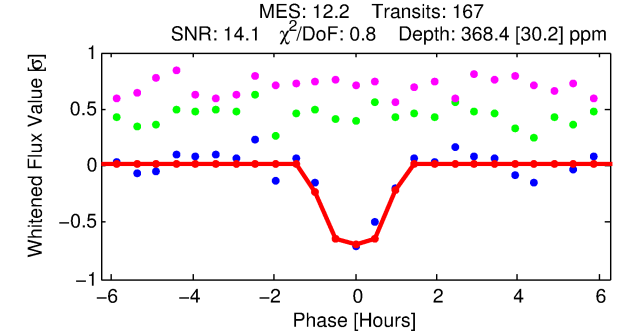
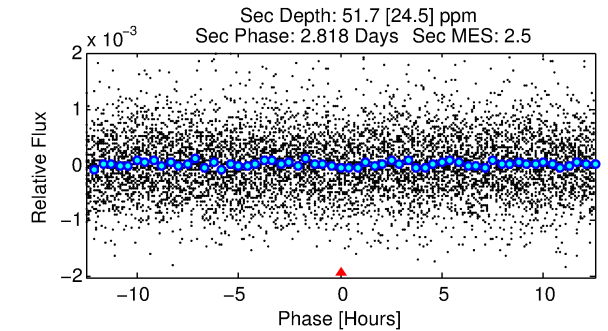
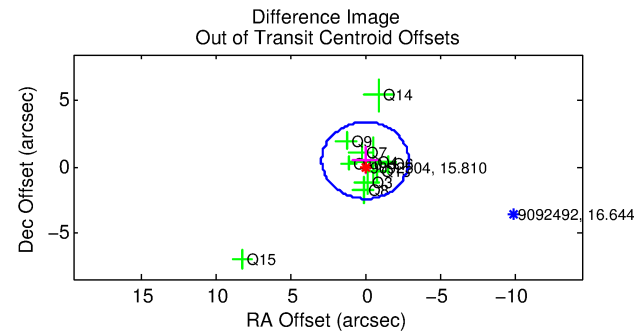
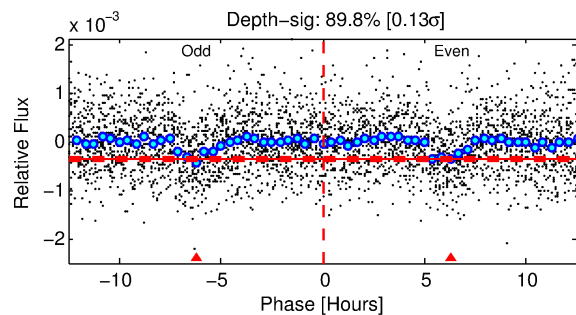
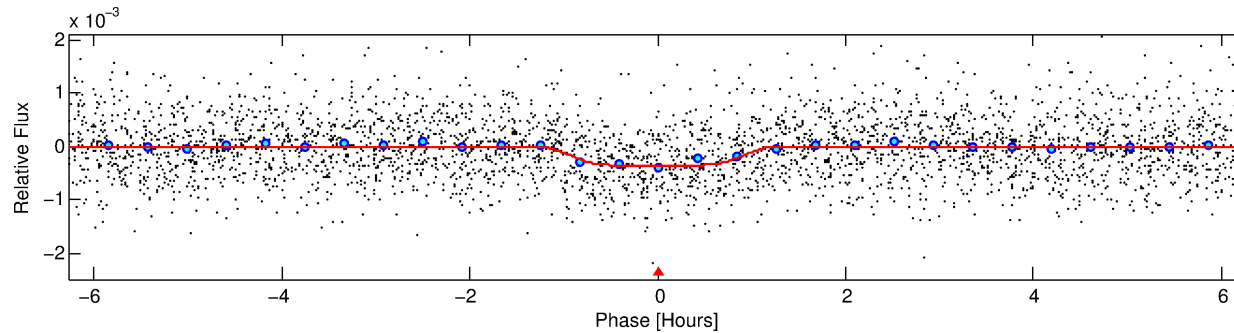
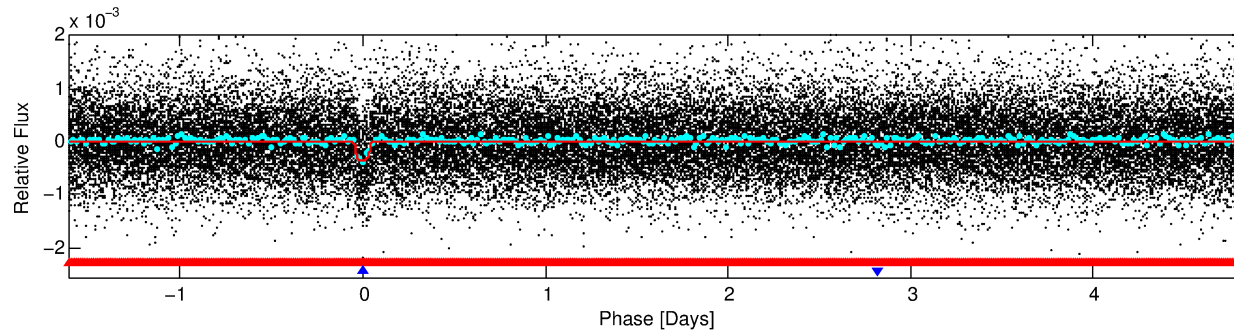
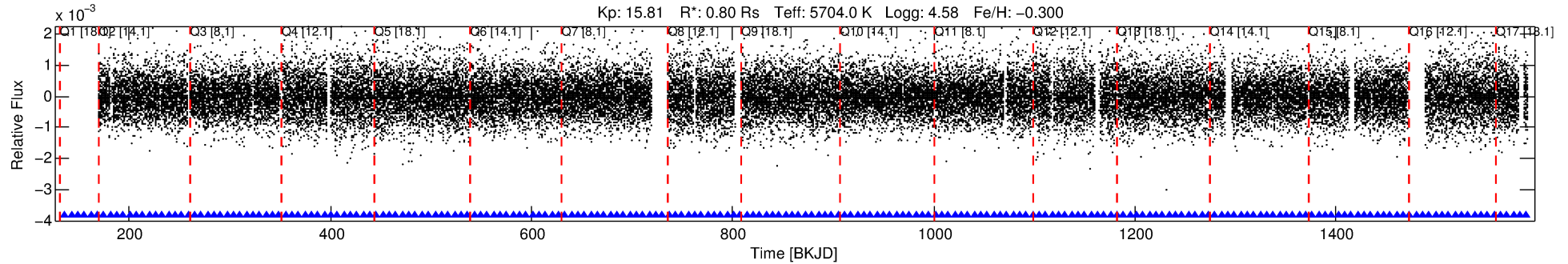
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009092504-02

No Significant Match Found

DV One-Page Summary

KIC: 9092504 Candidate: 2 of 2 Period: 6.460 d
KOI: K02716.02 Corr: 0.909



DV Fit Results:

Period = 6.45998 [0.00003] d
Epoch = 135.9771 [0.0033] BKJD
Rp/R* = 0.0205 [0.0113]
a/R* = 12.22 [31.54]
b = 0.88 [0.68]
Seff = 144.15 [46.31]
Teq = 884 [71] K
Rp = 1.80 [1.08] Re
a = 0.0652 [0.0132] AU
Ag = 37.25 [45.95] [0.79 σ]
Teffp = 3375 [1017] K [2.44 σ]

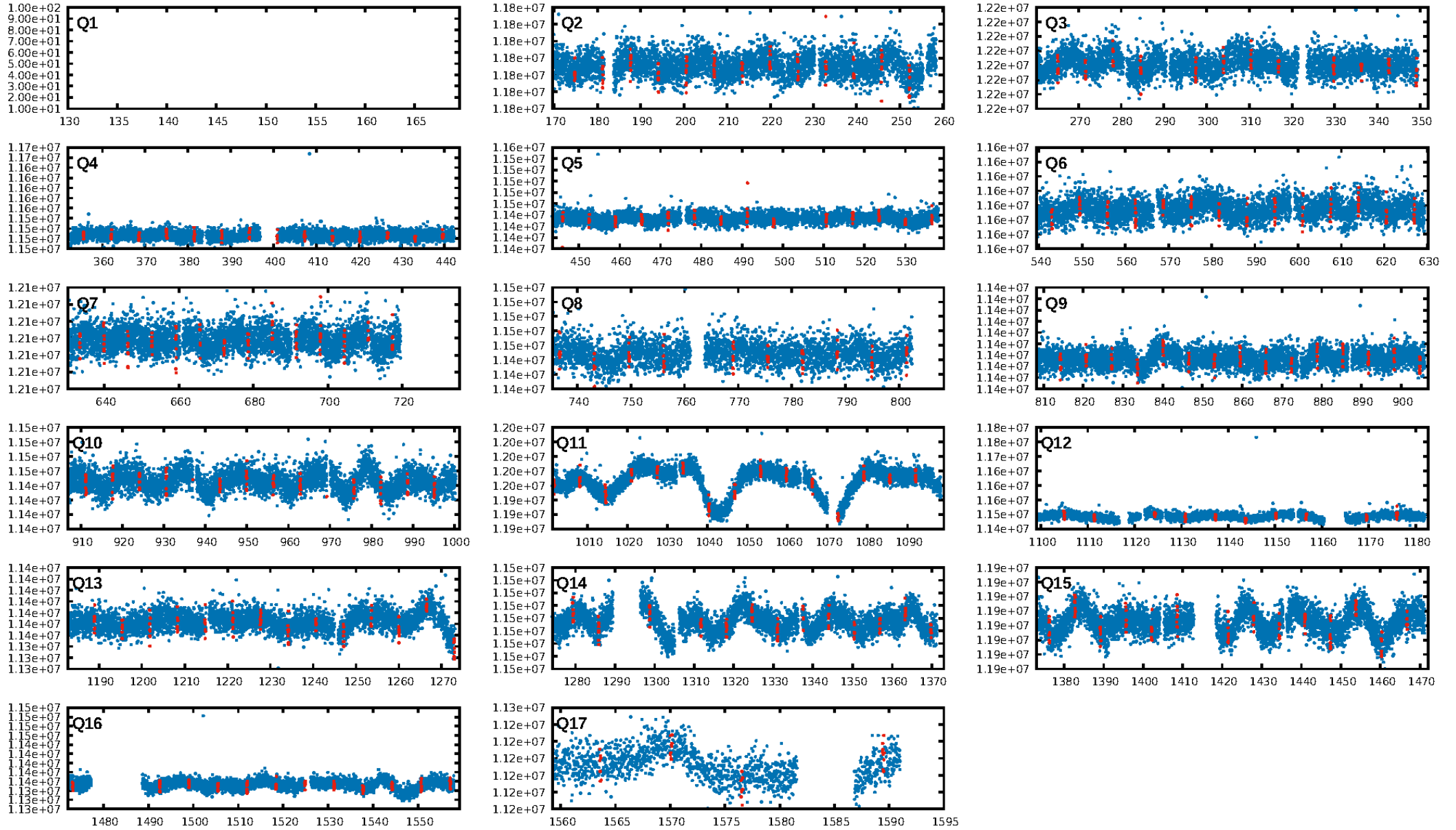
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [47.93 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 99.8%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 7.57e-34
RollingBand-fgt: 1.00 [163/163]
GhostDiagnostic-chr: -7.201
Centroid-sig: 4.6%
Centroid-so: 0.755 arcsec [0.93 σ]
OotOffset-rm: 0.473 arcsec [0.49 σ]
KicOffset-rm: 0.517 arcsec [0.44 σ]
OotOffset-st: 3/3/2/2 [10]
KicOffset-st: 3/3/2/2 [10]
DiffImageQuality-fgm: 0.40 [4/10]
DiffImageOverlap-fno: 1.00 [16/16]

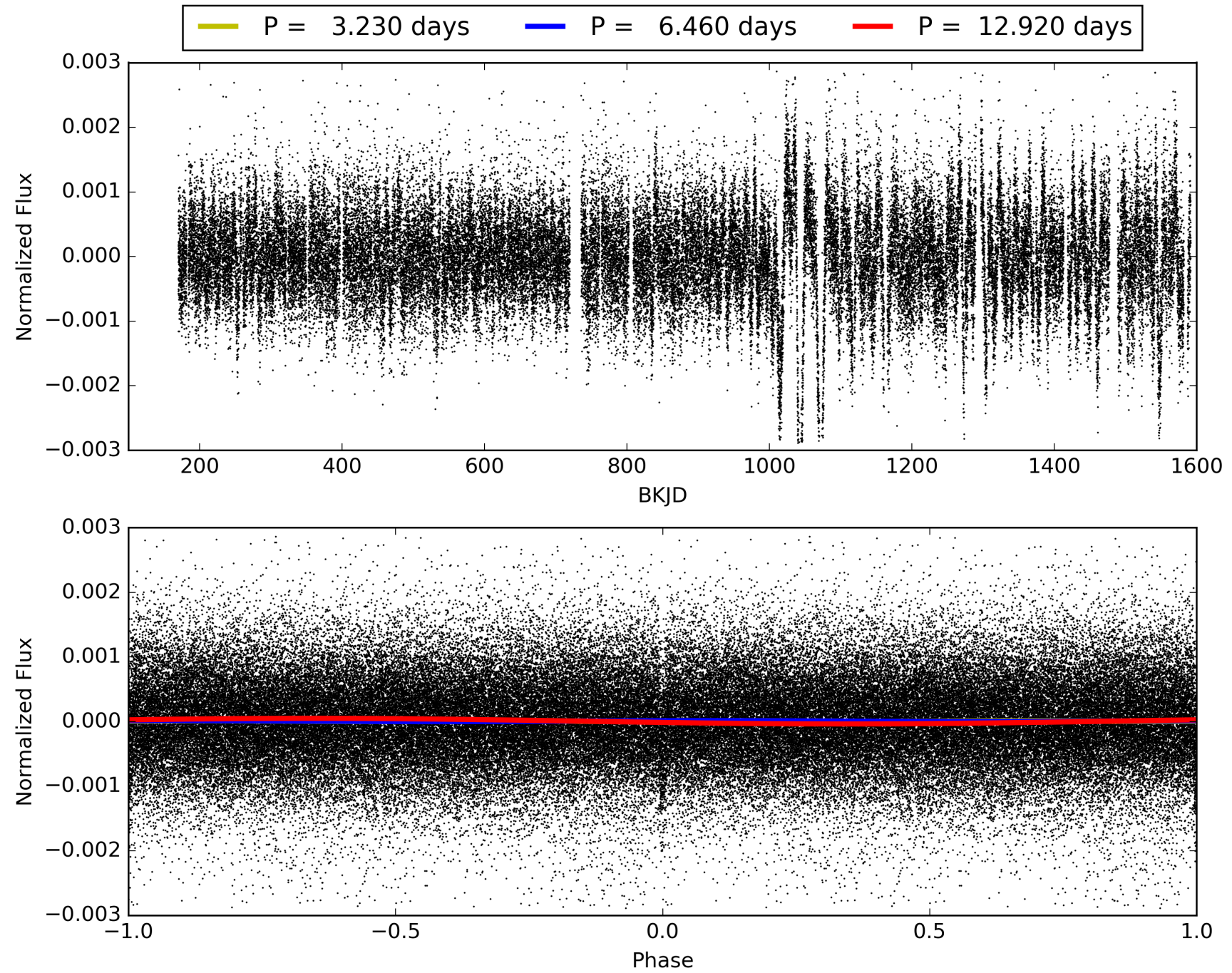
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 00:08:24 Z

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

TCE 009092504-02, PDC Light Curves

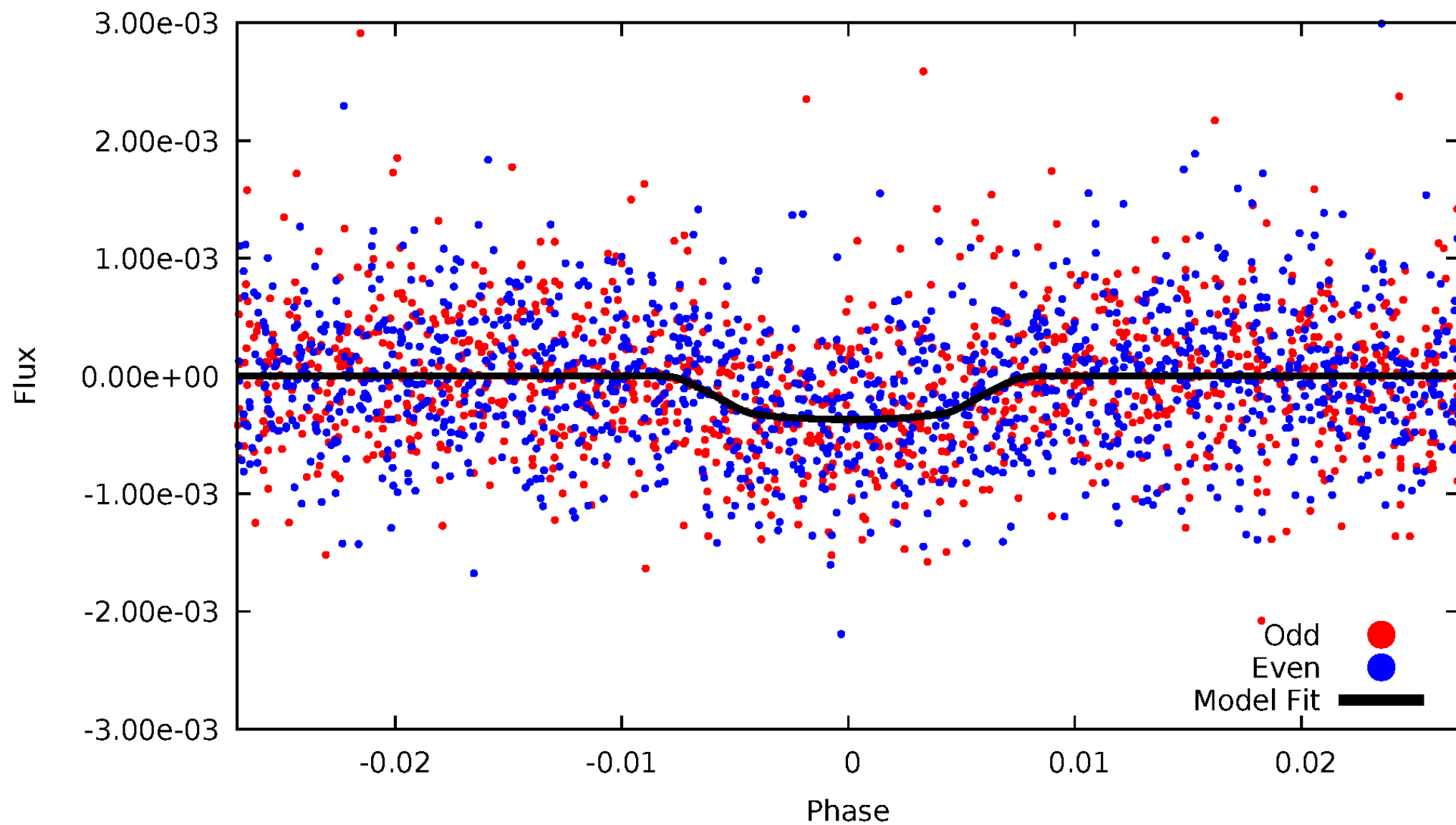


TCE 009092504-02



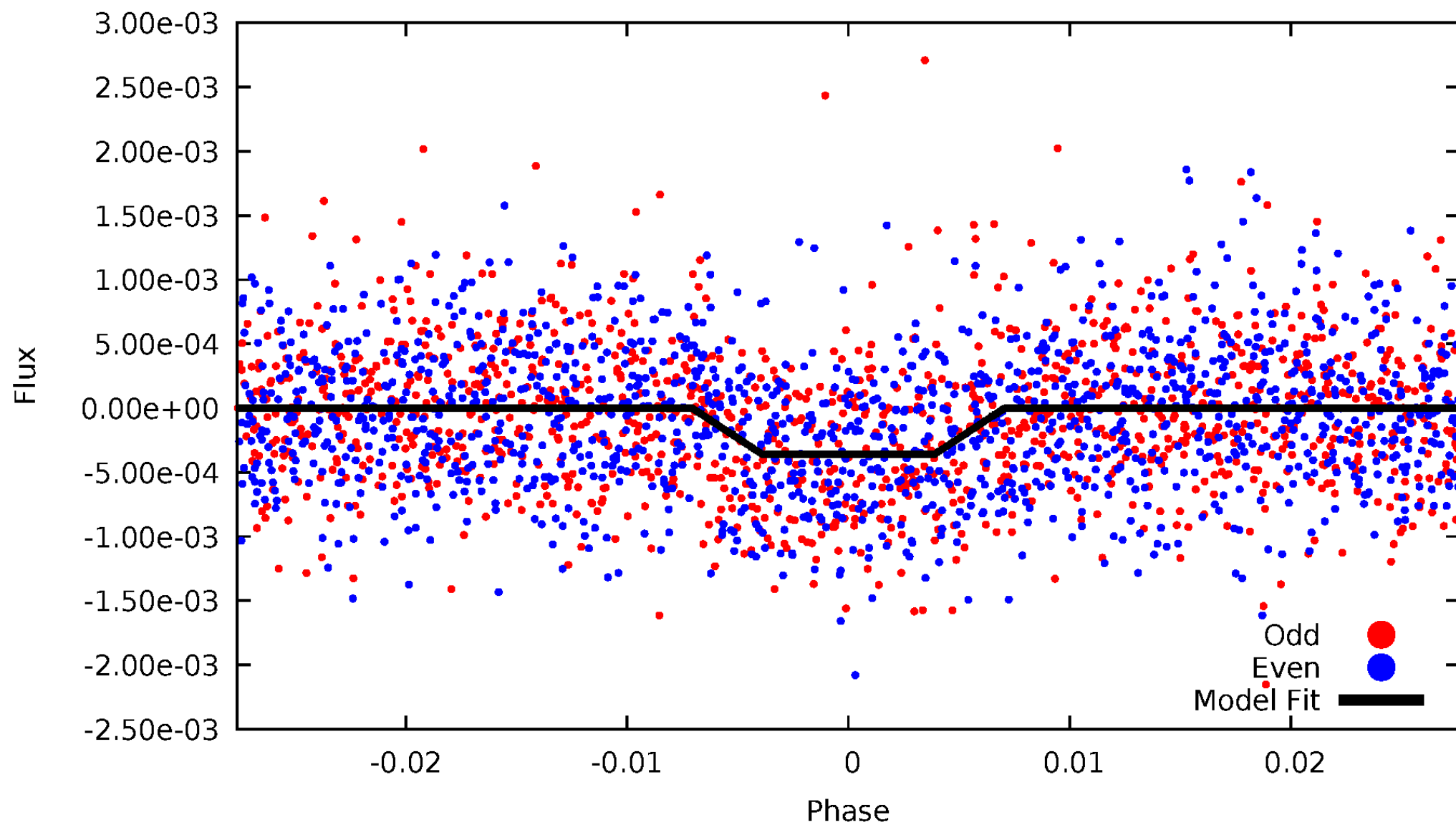
DV Odd/Even

TCE 009092504-02



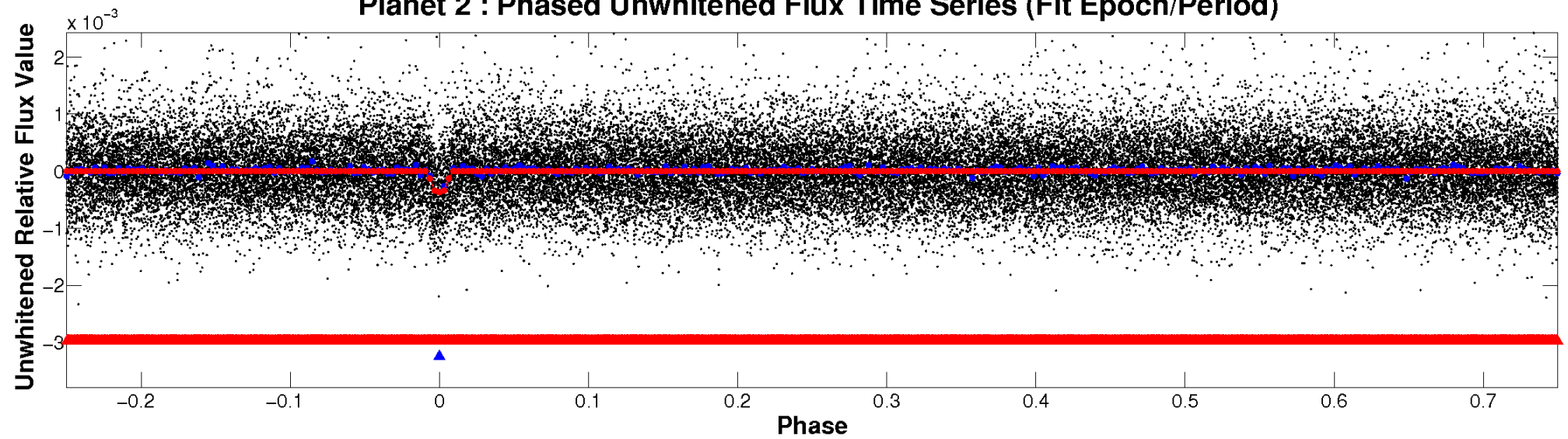
ALT Odd/Even

TCE 009092504-02

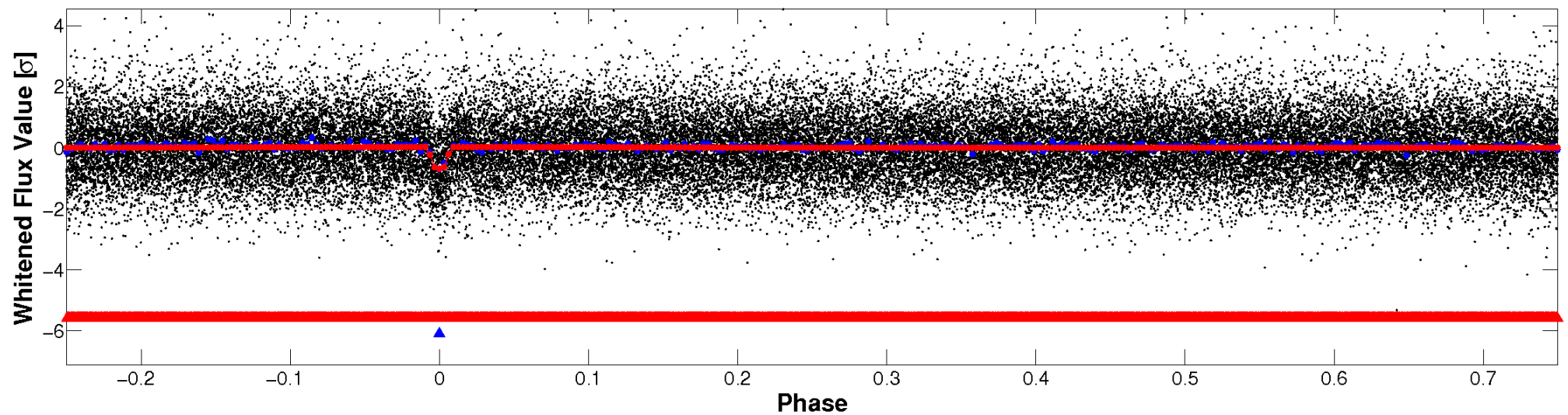


Non-Whitened Vs. Whitened Light Curve

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

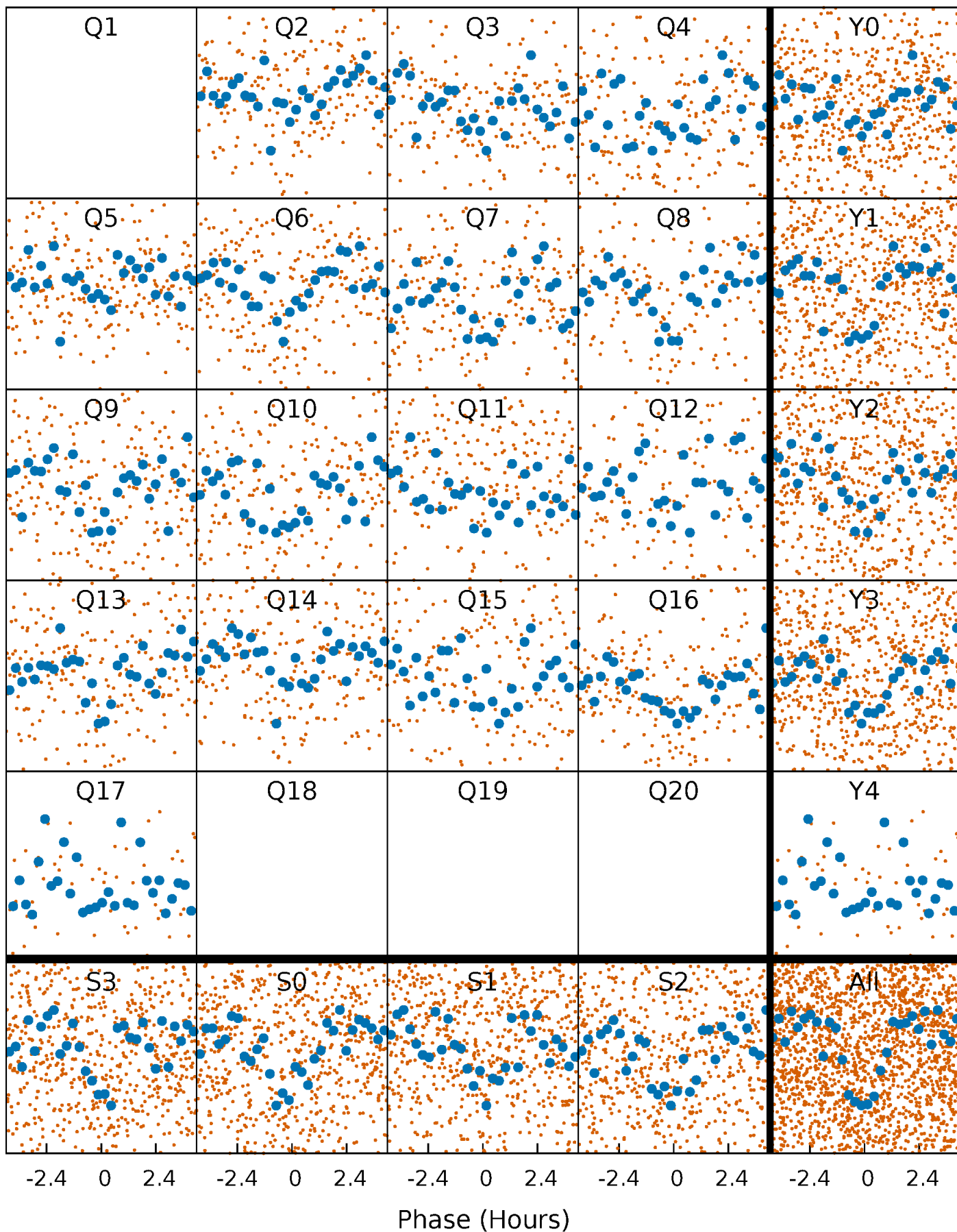


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



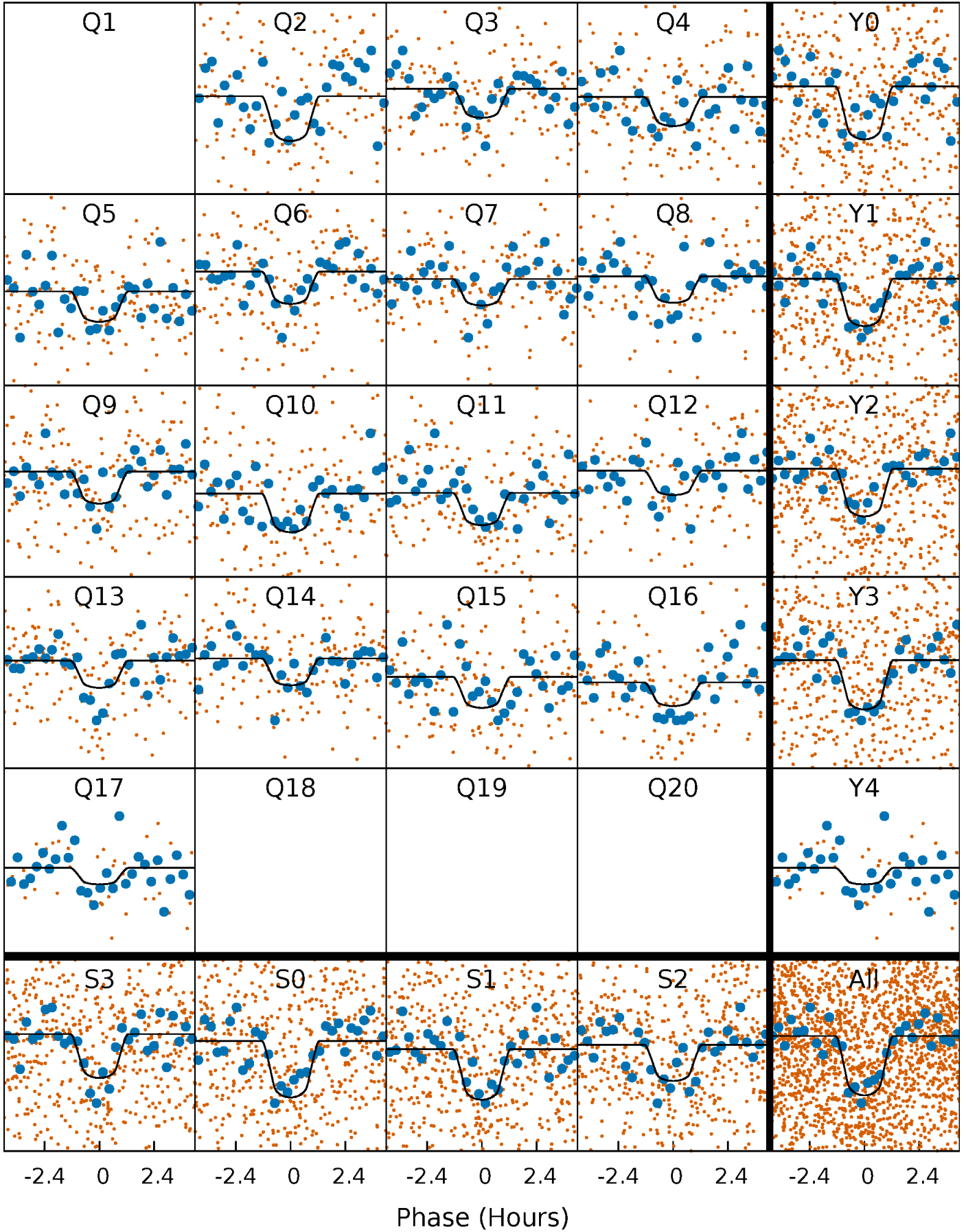
PDC Quarter-Phased Transit Curves

TCE 009092504-02 P= 6.459978 Days $T_0=135.977054$ (BKJD)



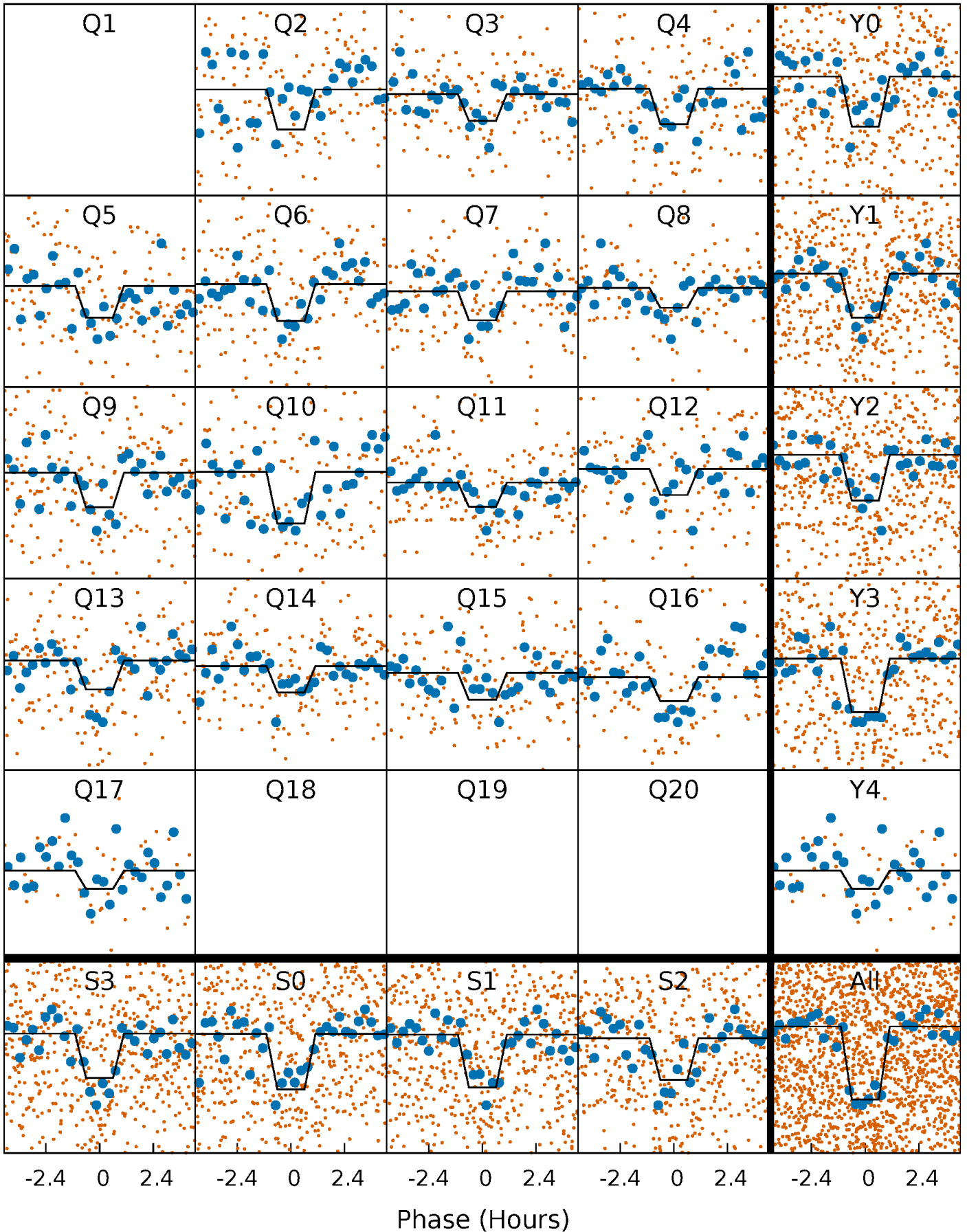
DV Quarter-Phased Transit Curves

TCE 009092504-02 P= 6.459978 Days $T_0=135.977054$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

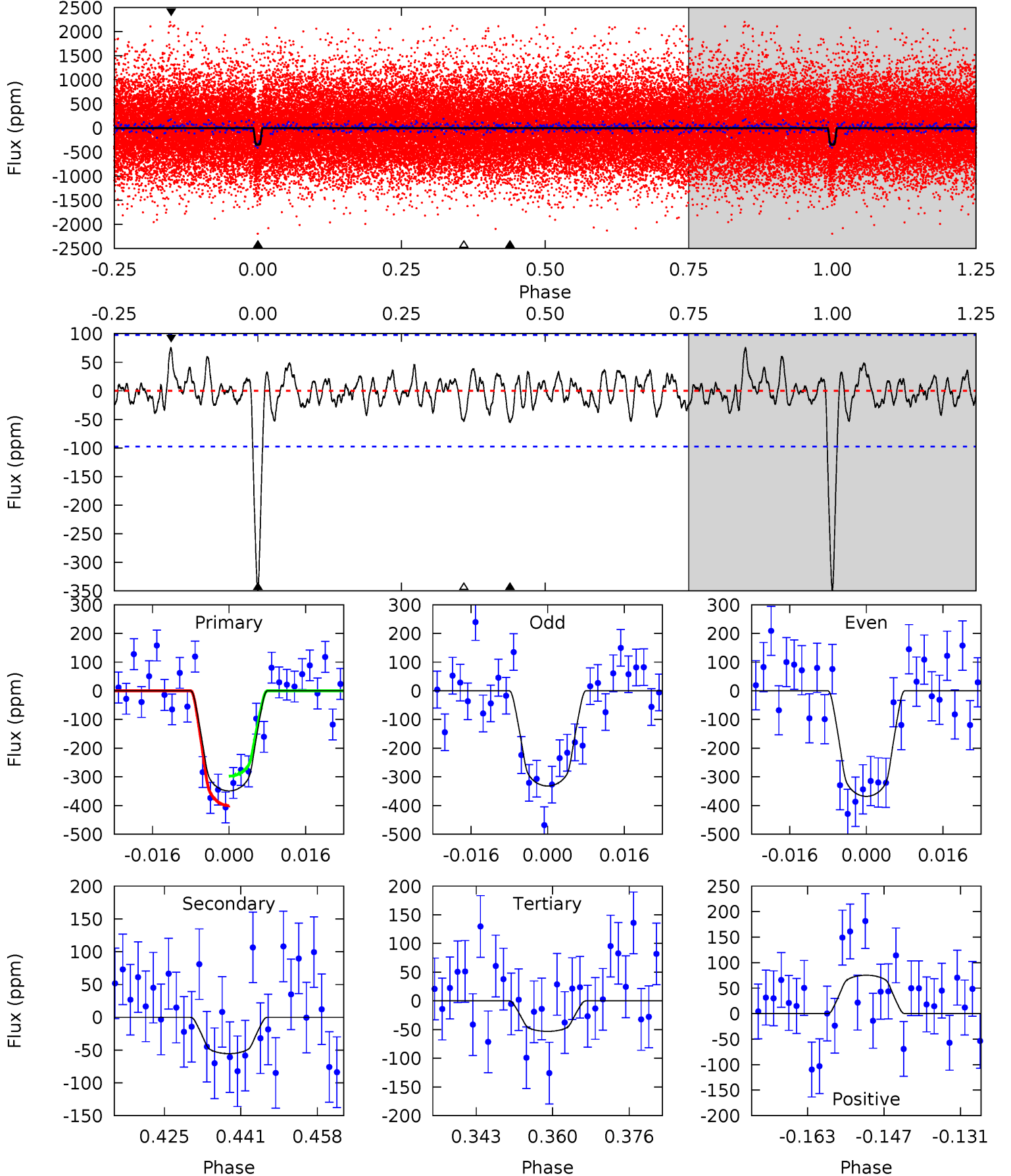
TCE 009092504-02 P= 6.460006 Days $T_0=135.971455$ (BKJD)



DV Model-Shift Uniqueness Test

009092504-02, P = 6.459978 Days, E = 135.977054 Days

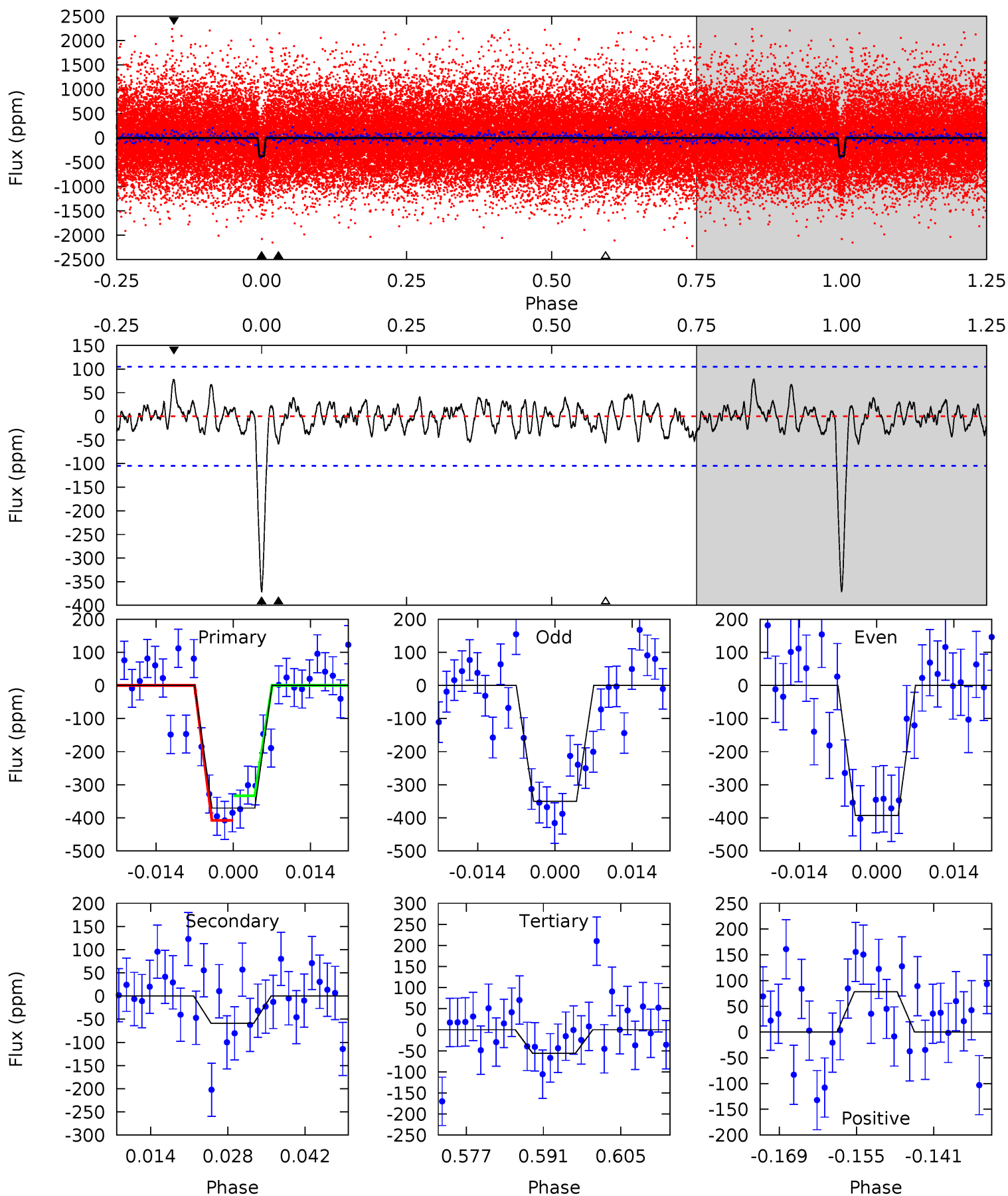
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.7 | 2.80 | 2.69 | 3.81 | 4.93 | 2.40 | 1.08 | 15.0 | 13.8 | 0.12 | -1.00 | 0.92 | 1.09 | 0.18 | 2.61 |



Alt Model-Shift Uniqueness Test

009092504-02, P = 6.460006 Days, E = 135.971455 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.5 | 2.77 | 2.64 | 3.70 | 4.96 | 2.46 | 1.09 | 14.9 | 13.8 | 0.13 | -0.93 | 0.99 | 1.03 | 0.17 | 1.77 |



Stellar Parameters For KIC 009092504

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5704^{+169}_{-186} | $4.575^{+0.040}_{-0.160}$ | $-0.300^{+0.300}_{-0.300}$ | $0.804^{+0.194}_{-0.077}$ | $0.897^{+0.088}_{-0.107}$ | $2.429^{+0.521}_{-1.071}$ |
| | +3%/-3% | +1%/-3% | +100%/-100% | +24%/-10% | +10%/-12% | +21%/-44% |
| 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 009092504-02 / KOI 2716.02

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|--------------|------------------------|----------------------|-----------------------|-------------------|
| DV | -55 ± 20 | $1.90^{+1.09}_{-0.94}$ | 1259^{+71}_{-60} | 3722^{+1218}_{-511} | 33^{+117}_{-20} |
| Alt. | -59 ± 21 | $1.74^{+1.02}_{-0.89}$ | 1258^{+72}_{-60} | 3914^{+1290}_{-594} | 43^{+144}_{-27} |

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

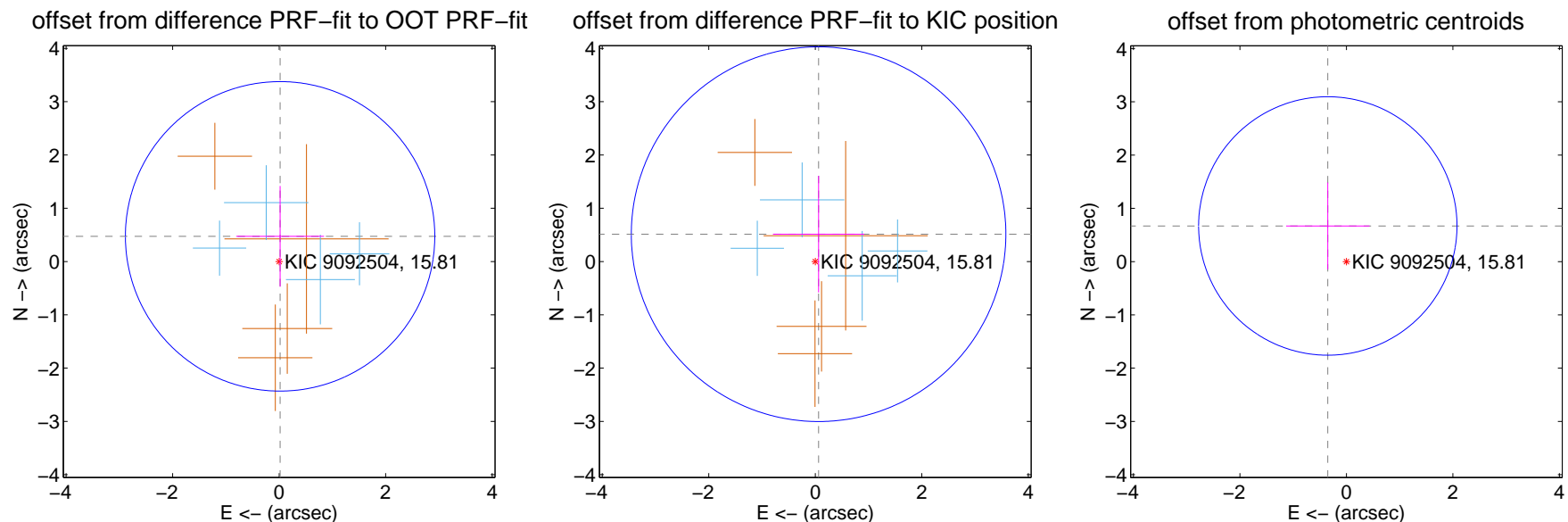
DV Centroid Data

Supplemental centroid analysis for 009092504-02. Kepler magnitude: 15.81. Transit SNR 14.11

There are 4 quarters with good PRF difference image offsets

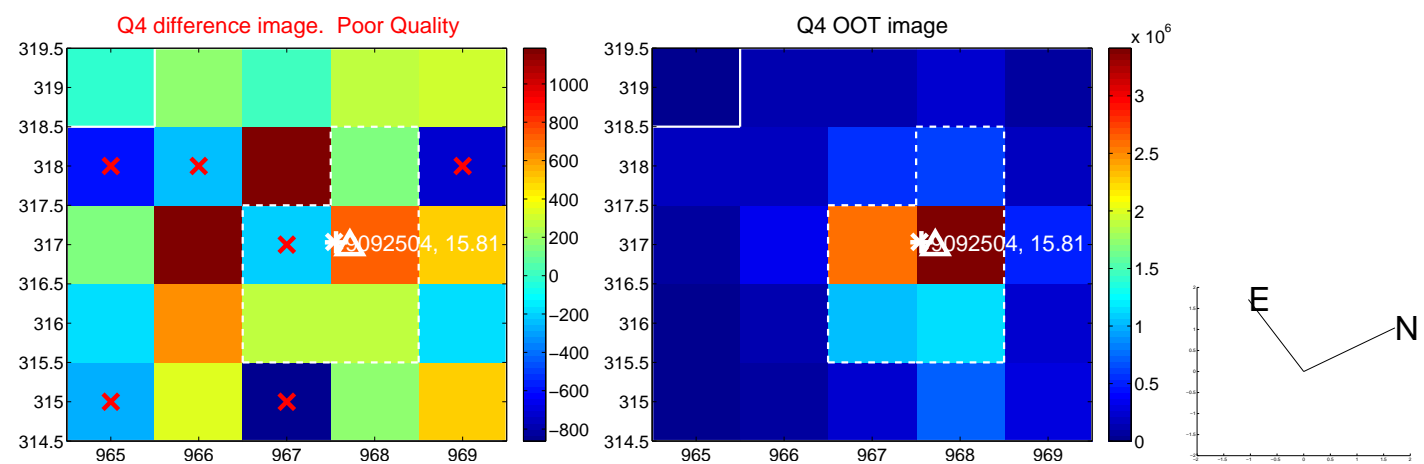
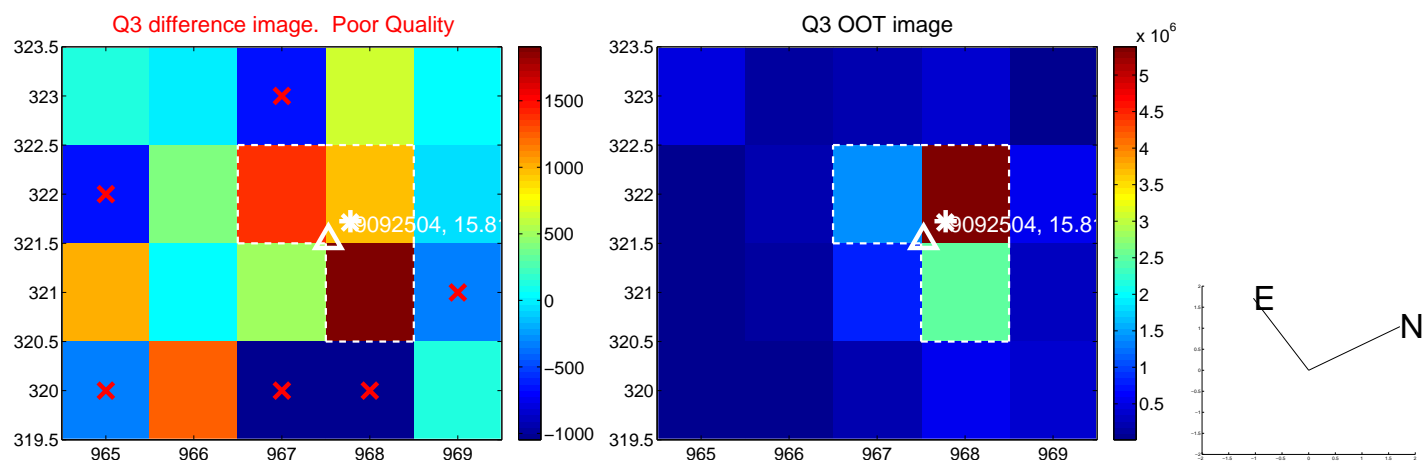
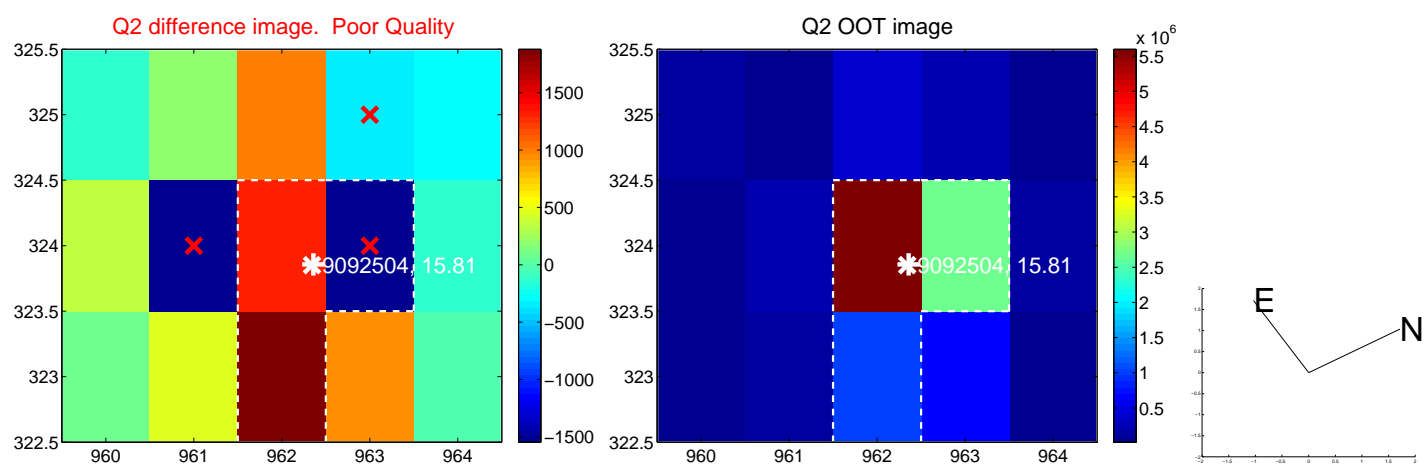
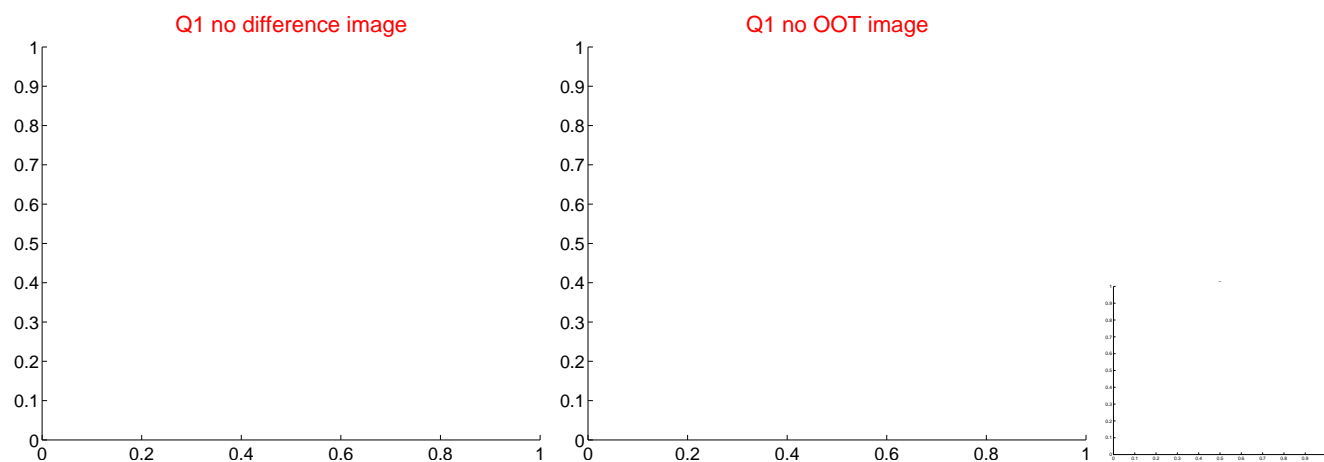
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.473 ± 0.968 | 0.49 | -0.018 ± 0.825 | 0.473 ± 0.946 |
| PRF-fit source offset from KIC position | 0.517 ± 1.172 | 0.44 | -0.062 ± 0.858 | 0.513 ± 1.094 |
| photometric centroid source offset | 0.76 ± 0.81 | 0.93 | 0.35 ± 0.78 | 0.67 ± 0.82 |

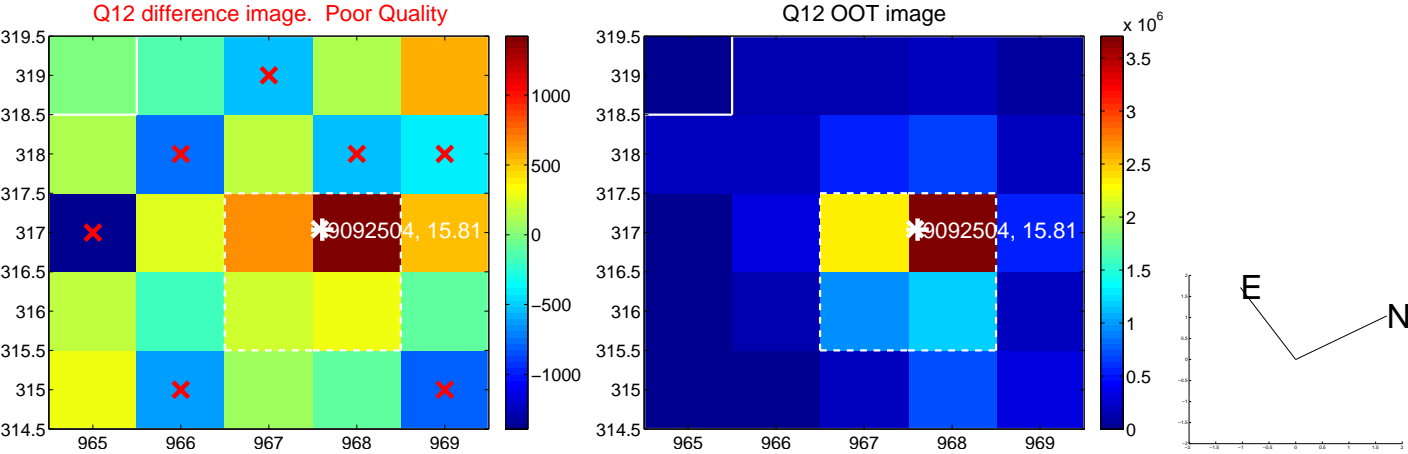
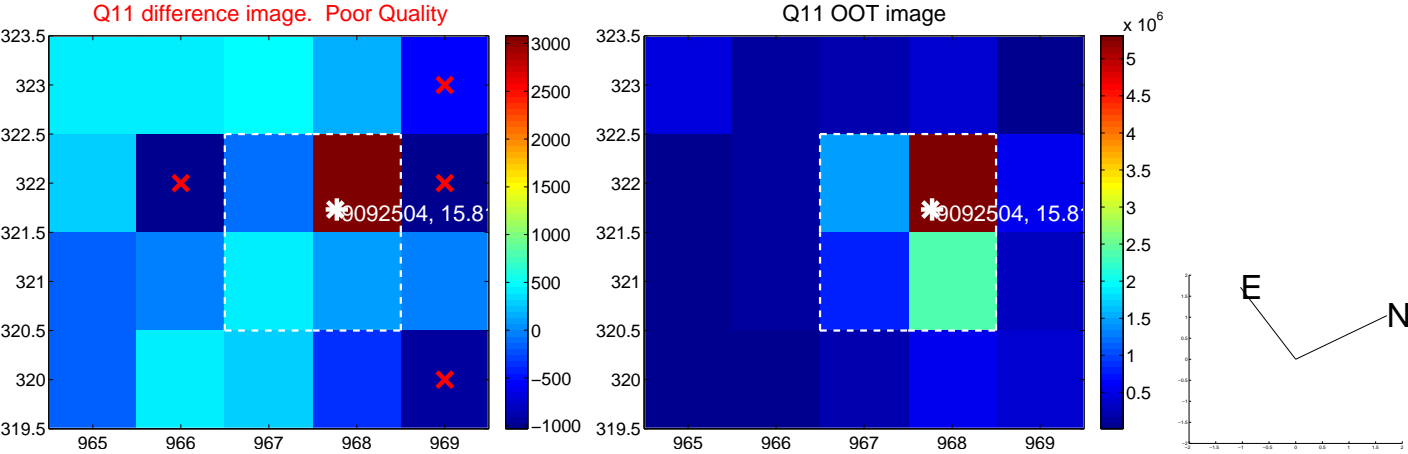
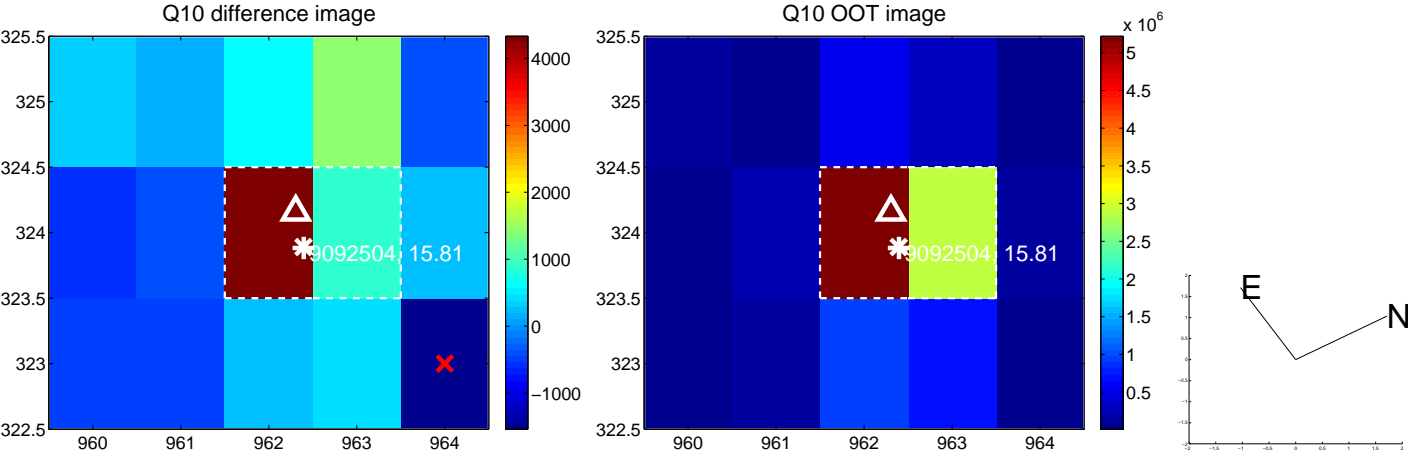
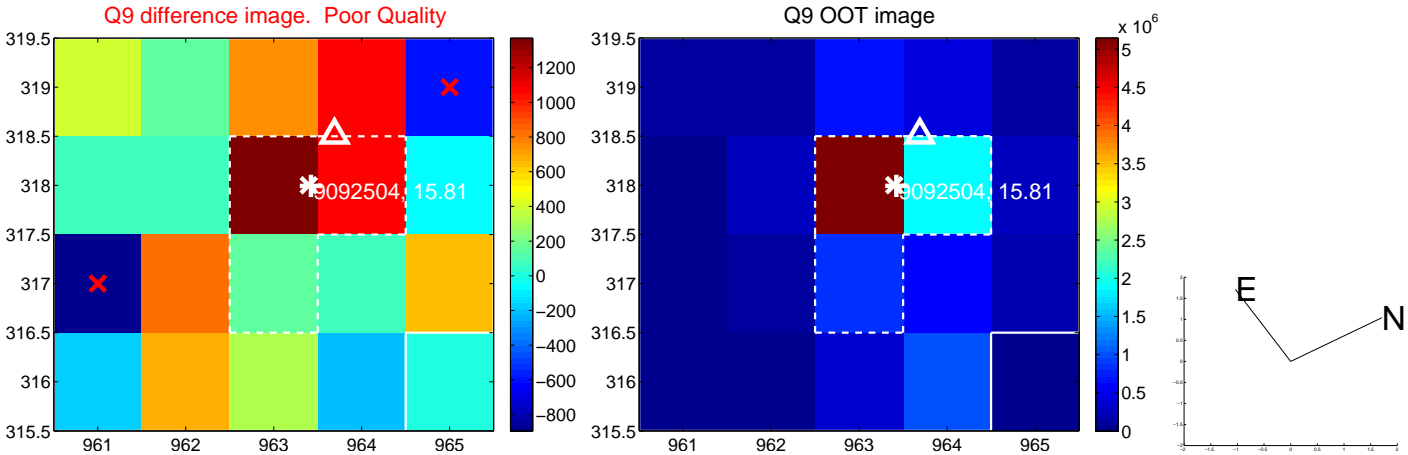


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

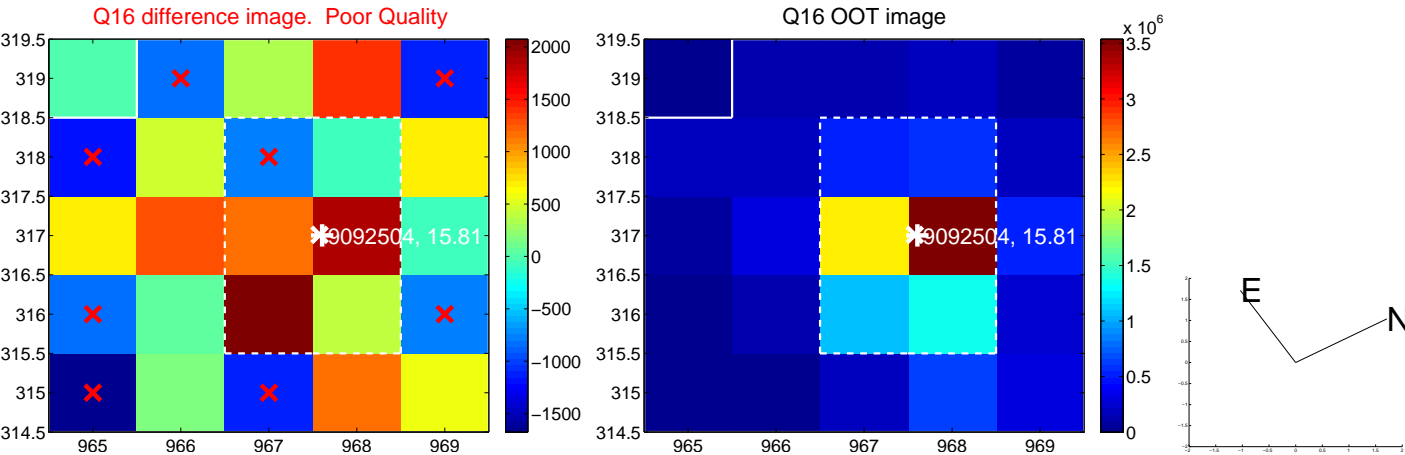
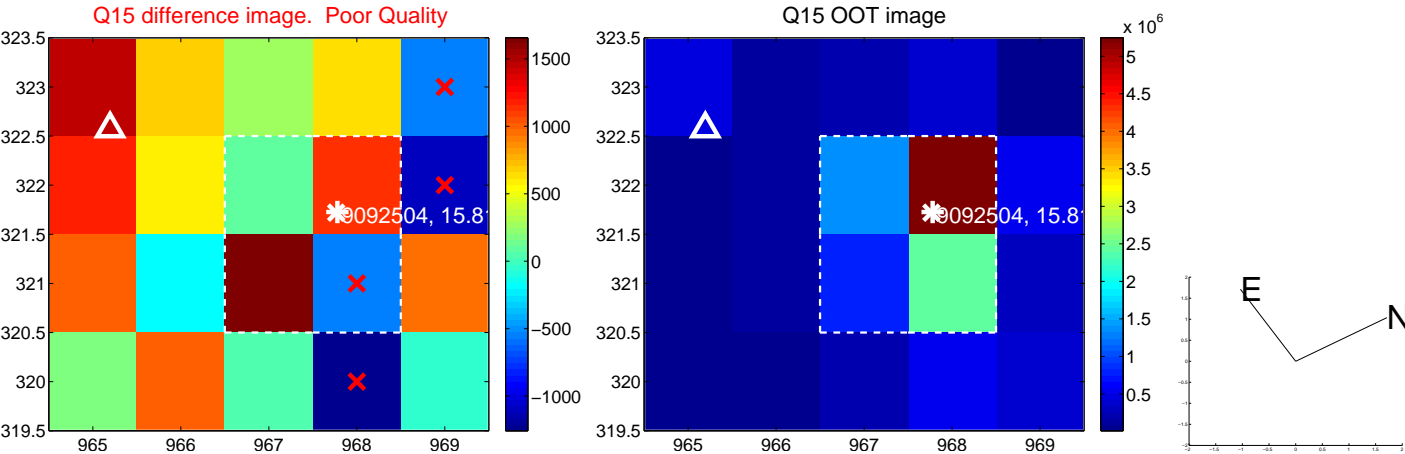
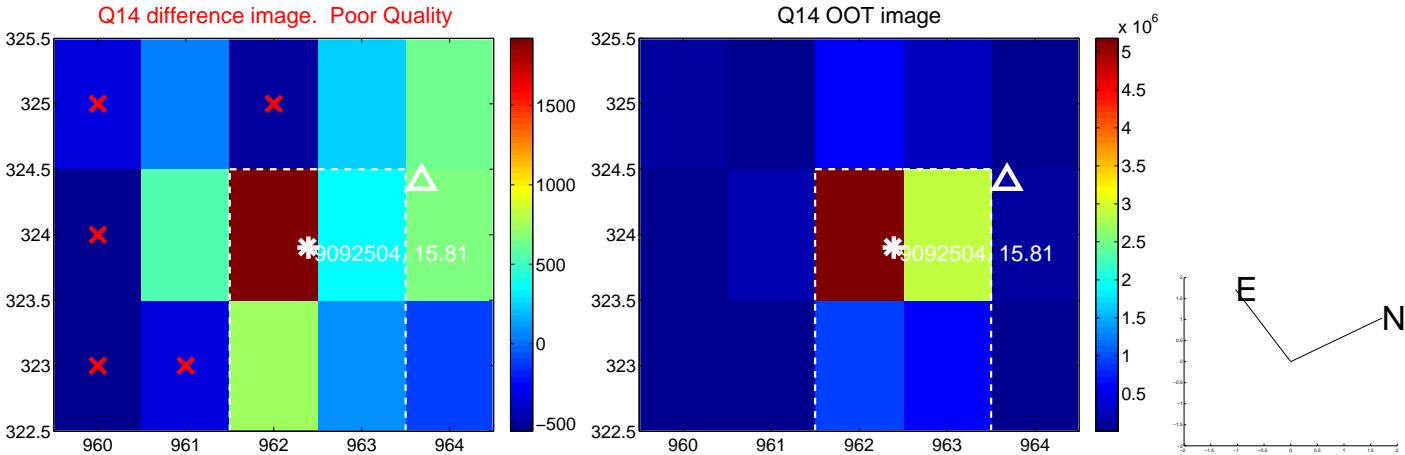
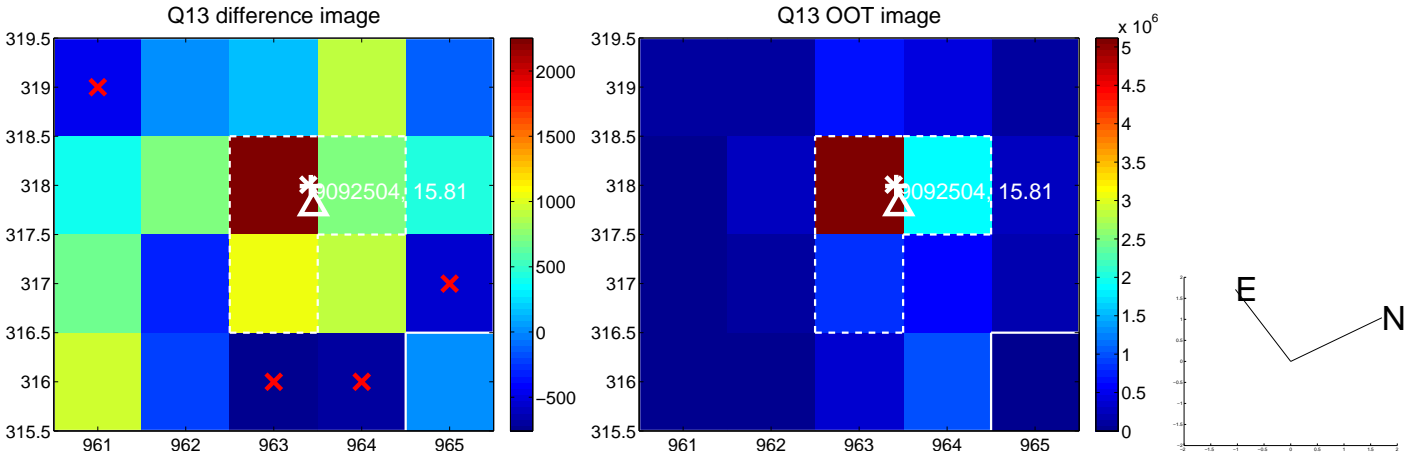
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



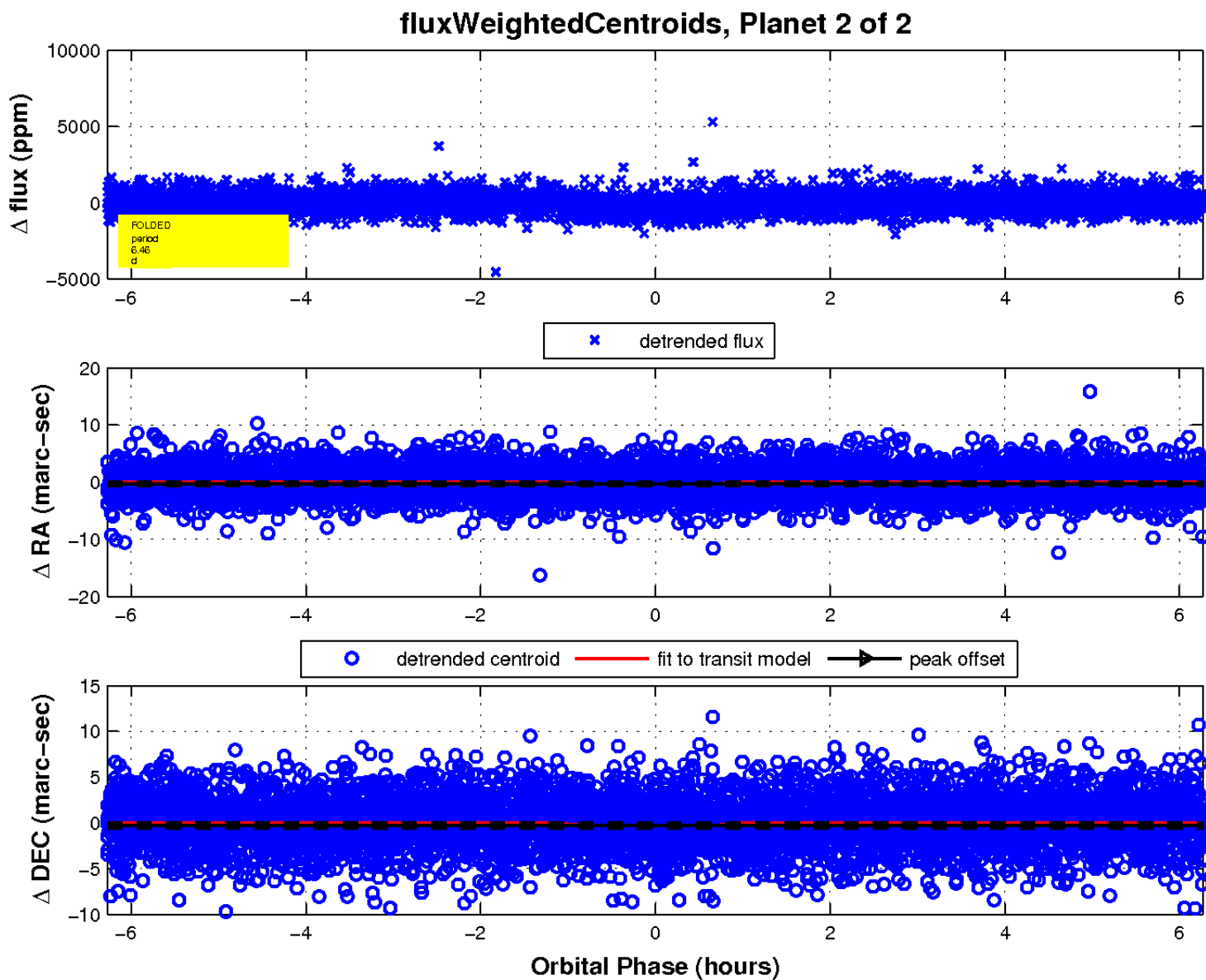
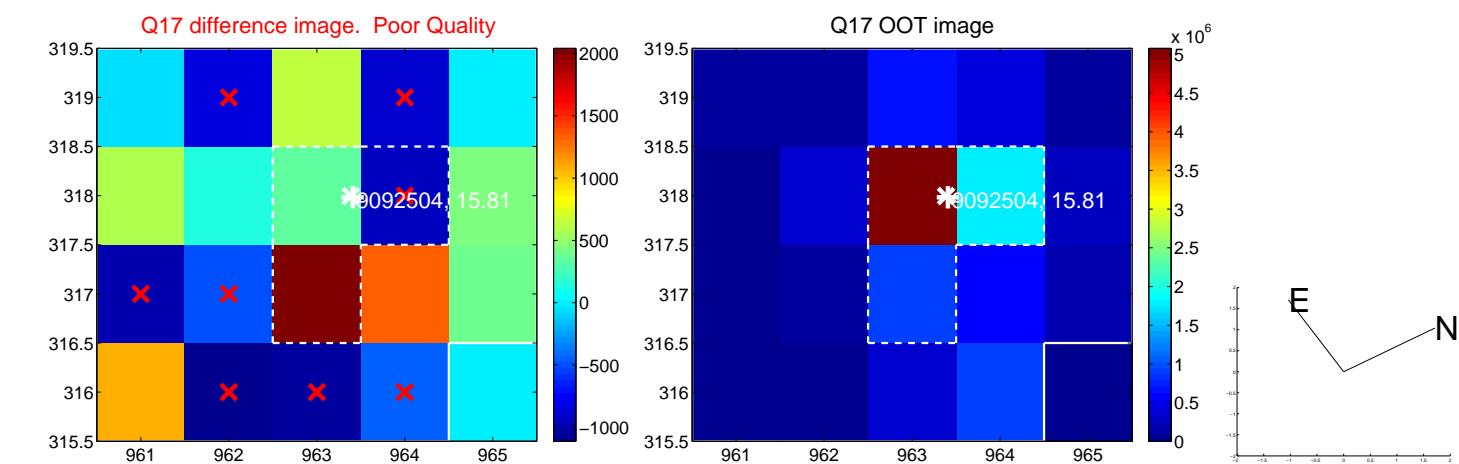
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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.



UKIRT Image

Declination

