

KIC 008416152

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 008416152-01 | OBS | No | 0.990458 | 132.010365 | 40.3 | 4.749 | 9.1 | 8.1 | 0.58 | 5184 | 0.39 | 774.26 |
| 008416152-02 | OBS | No | 371.329484 | 213.964176 | 844.2 | 12.152 | 13.1 | 8.9 | 0.58 | 5184 | 1.76 | 0.29 |
| 008416152-03 | OBS | No | 288.379325 | 337.482279 | 646.7 | 14.796 | 8.9 | 6.7 | 0.58 | 5184 | 1.80 | 0.40 |
| 008416152-04 | OBS | No | 635.901480 | 226.613152 | 682.5 | 7.126 | 7.7 | 7.3 | 0.58 | 5184 | 1.59 | 0.14 |
| 008416152-05 | OBS | No | 210.555156 | 167.547527 | 637.7 | 7.840 | 7.4 | 6.2 | 0.58 | 5184 | 1.56 | 0.61 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 008416152-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | LPP_DV |
| 008416152-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—CENT_FEW_DIFFS |
| 008416152-05 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

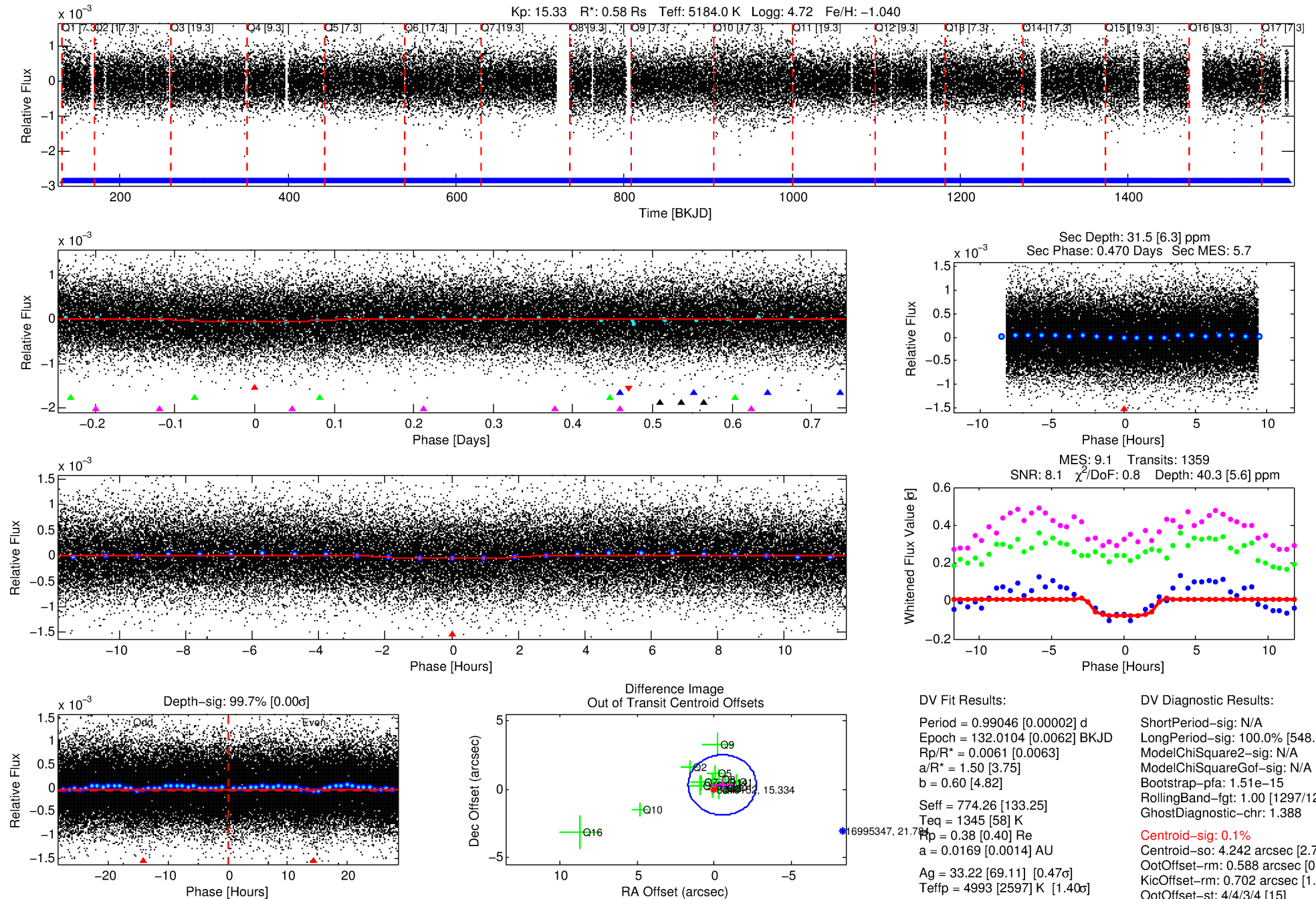
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008416152-01

No Significant Match Found

DV One-Page Summary

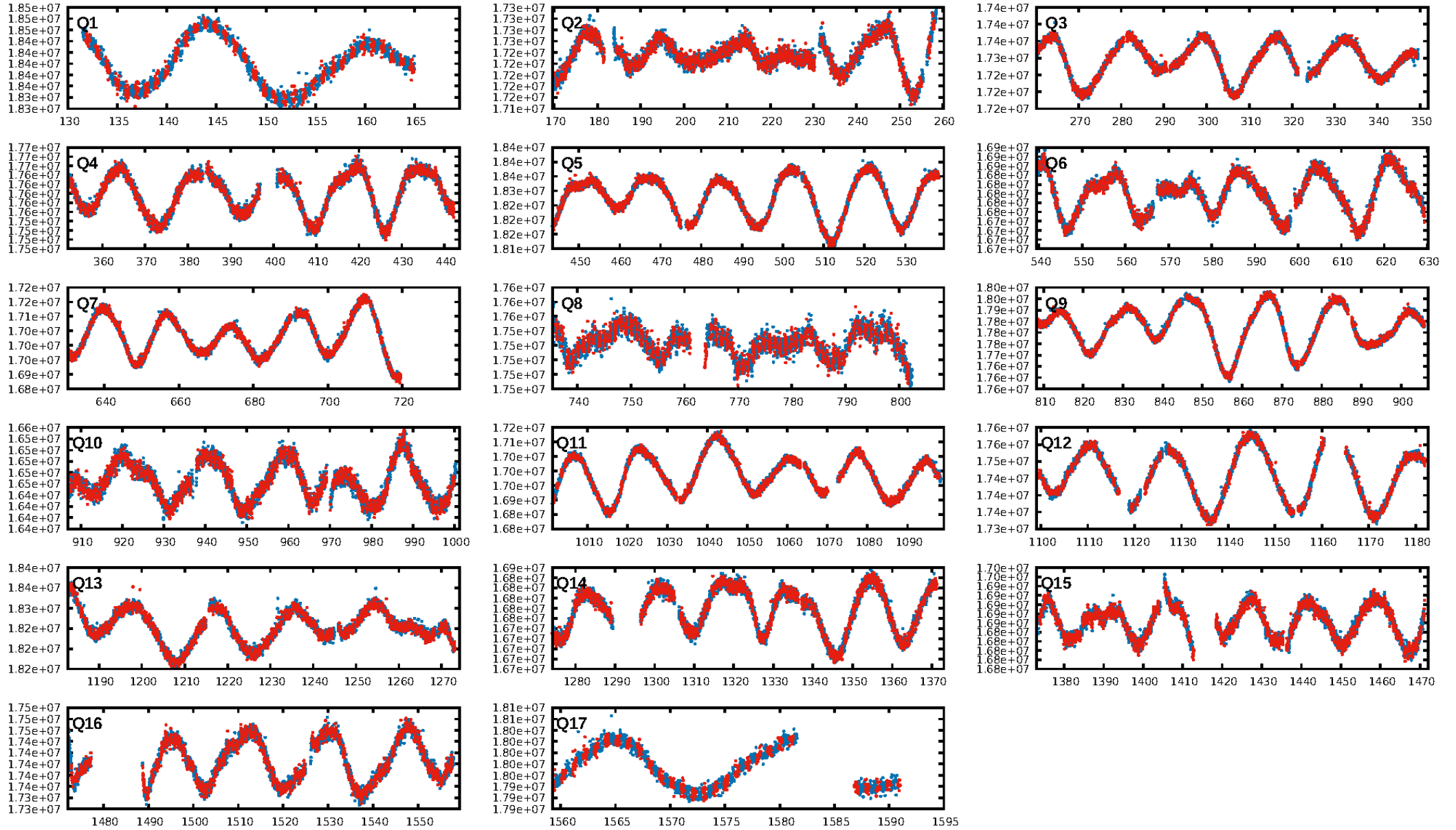
KIC: 8416152 Candidate: 1 of 5 Period: 0.990 d



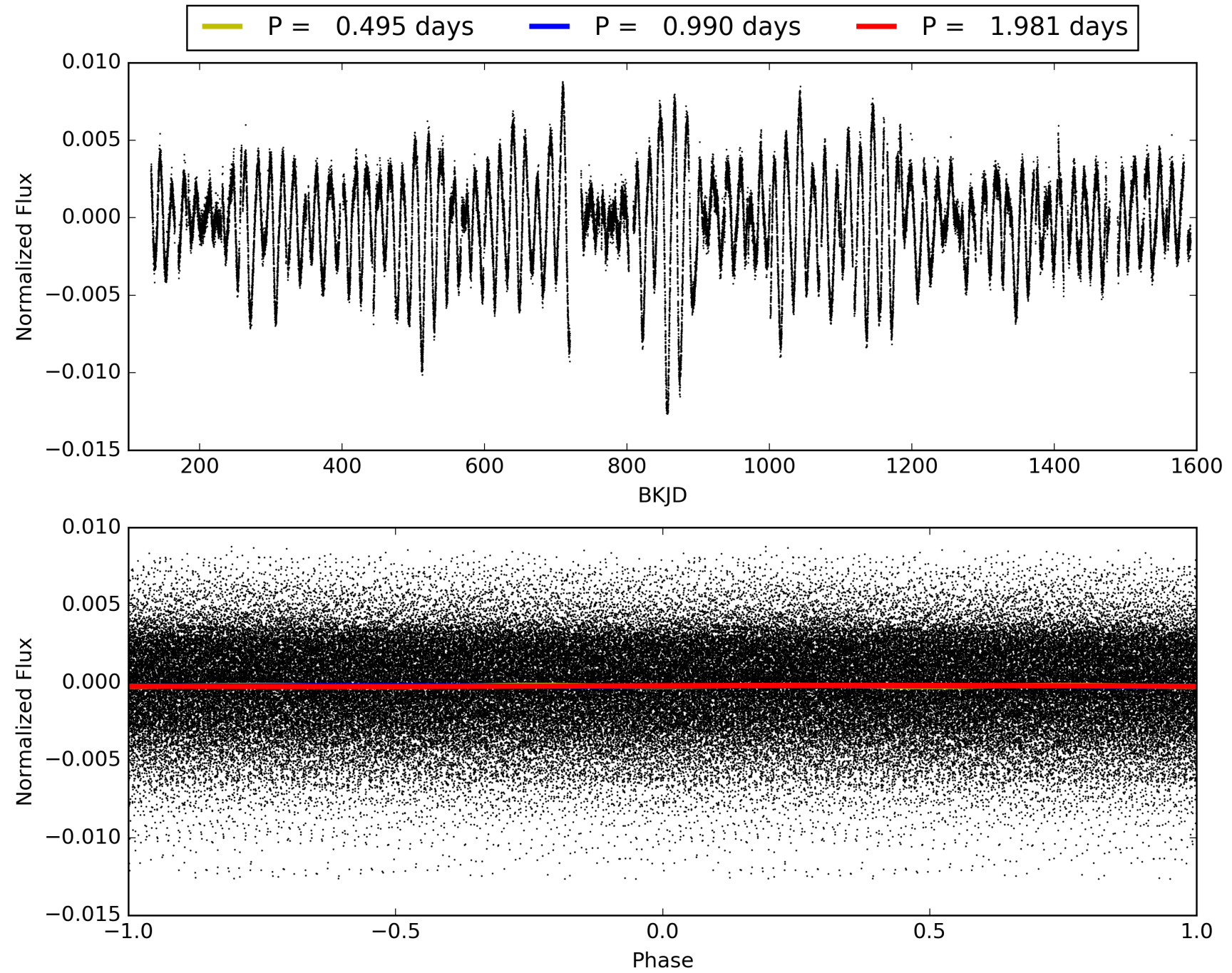
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:06:40 Z

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

TCE 008416152-01, PDC Light Curves

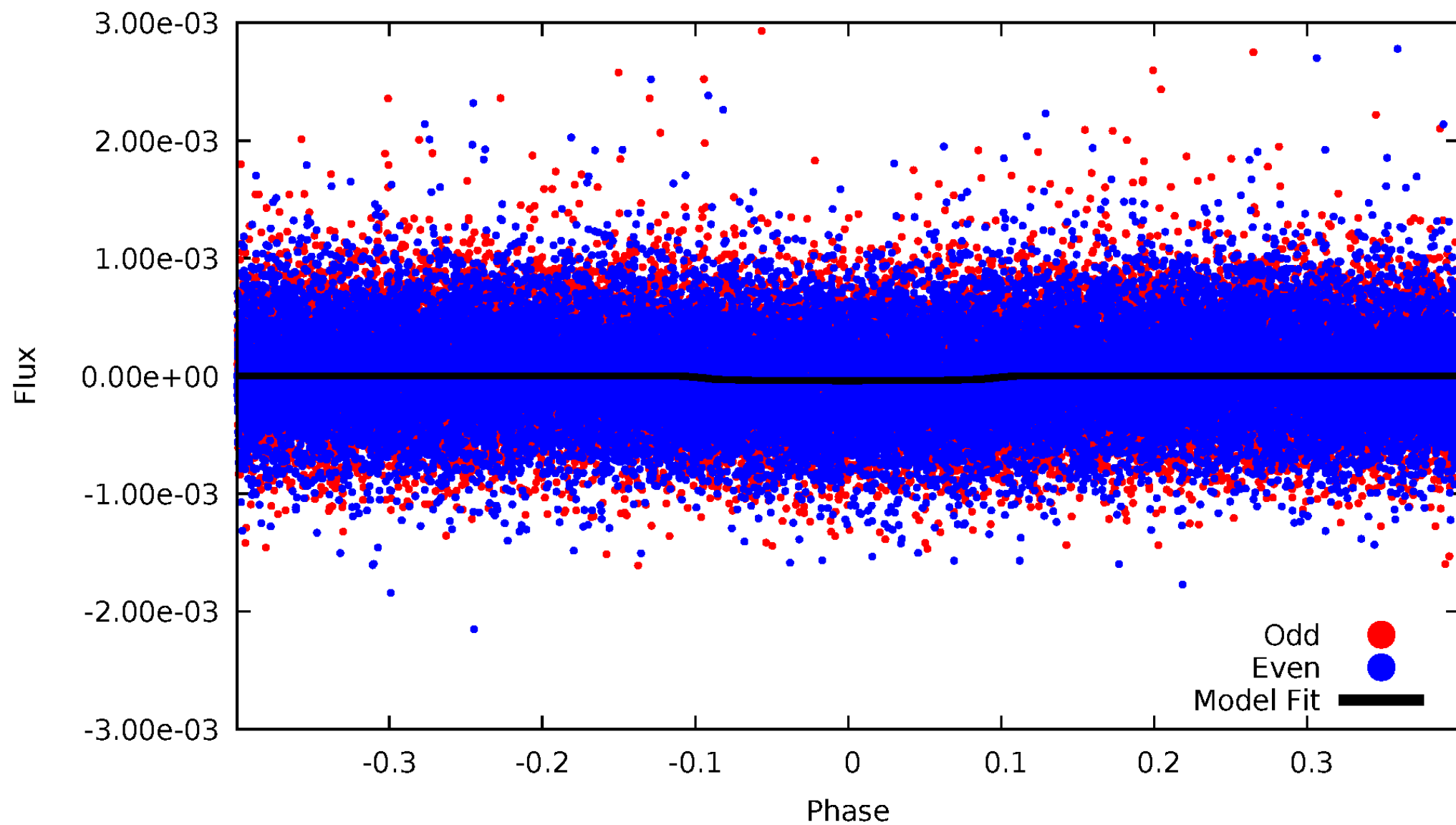


TCE 008416152-01



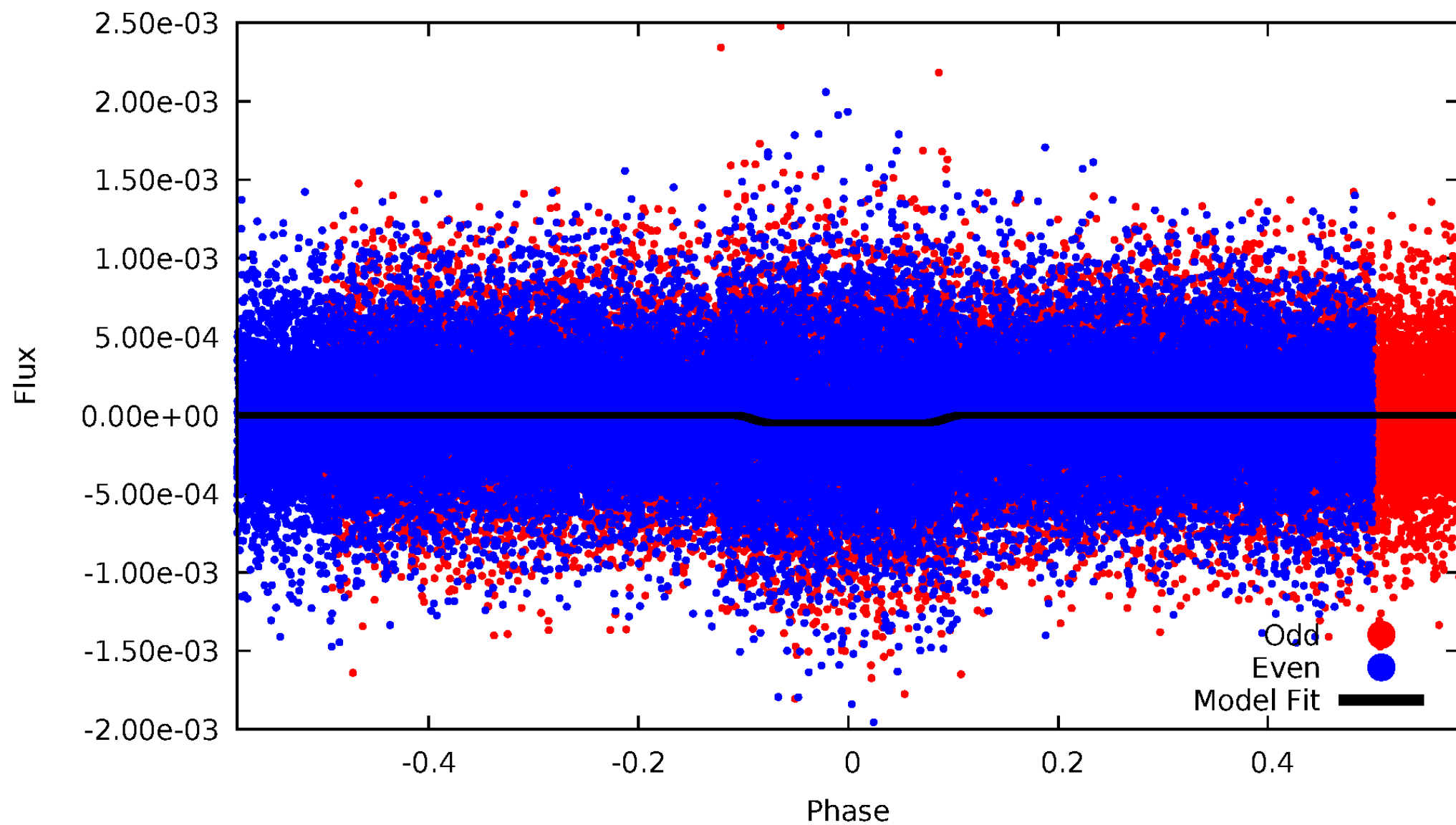
DV Odd/Even

TCE 008416152-01

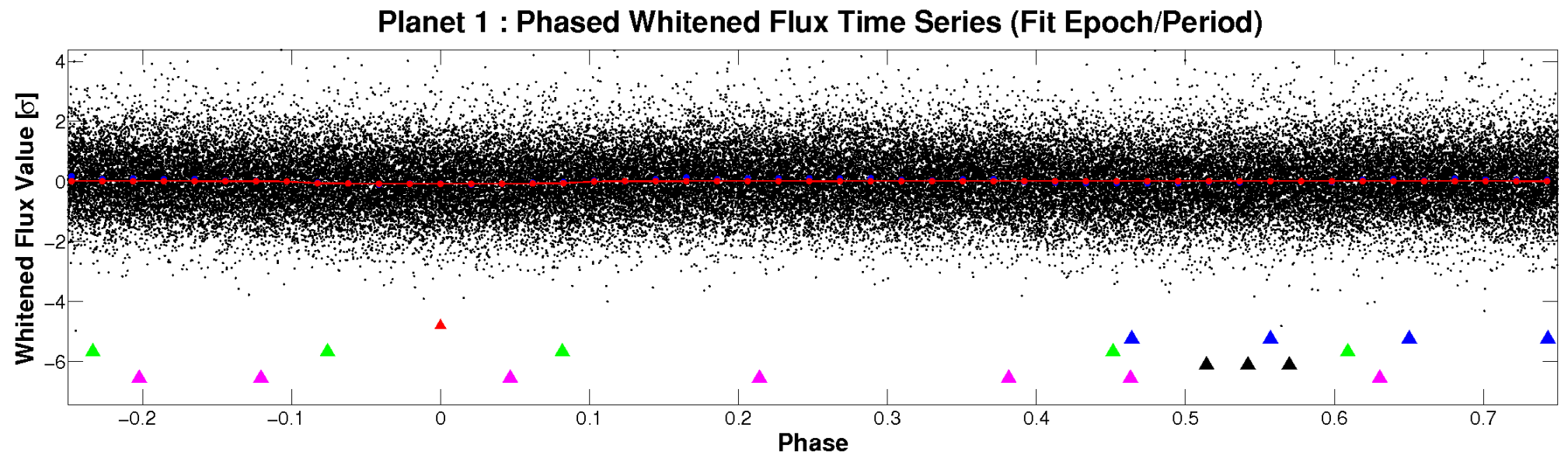
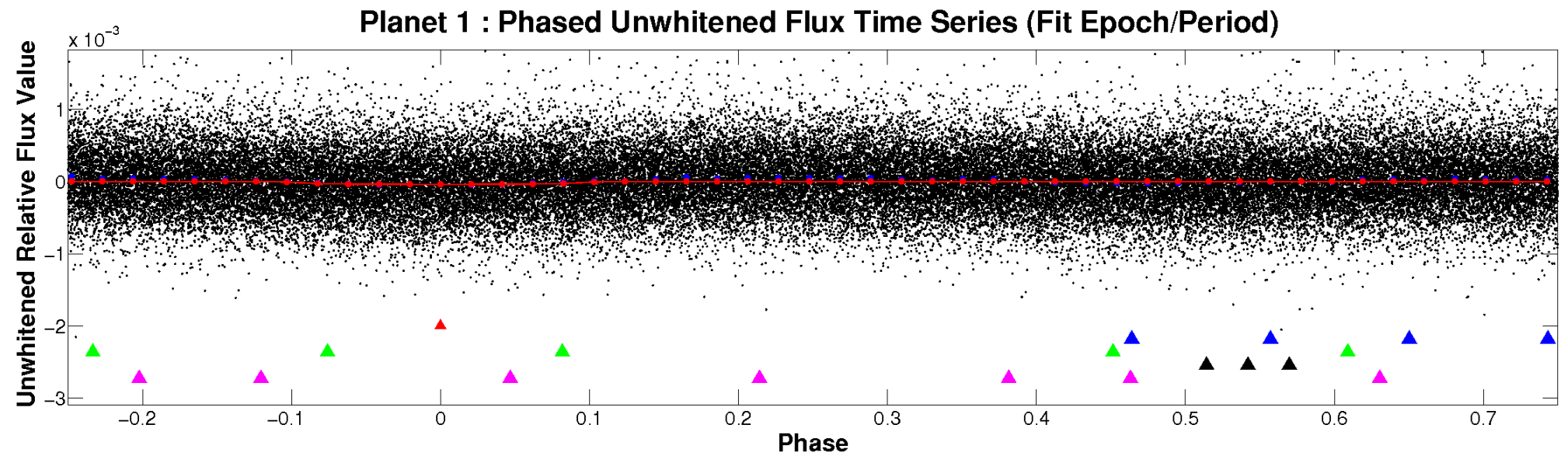


ALT Odd/Even

TCE 008416152-01

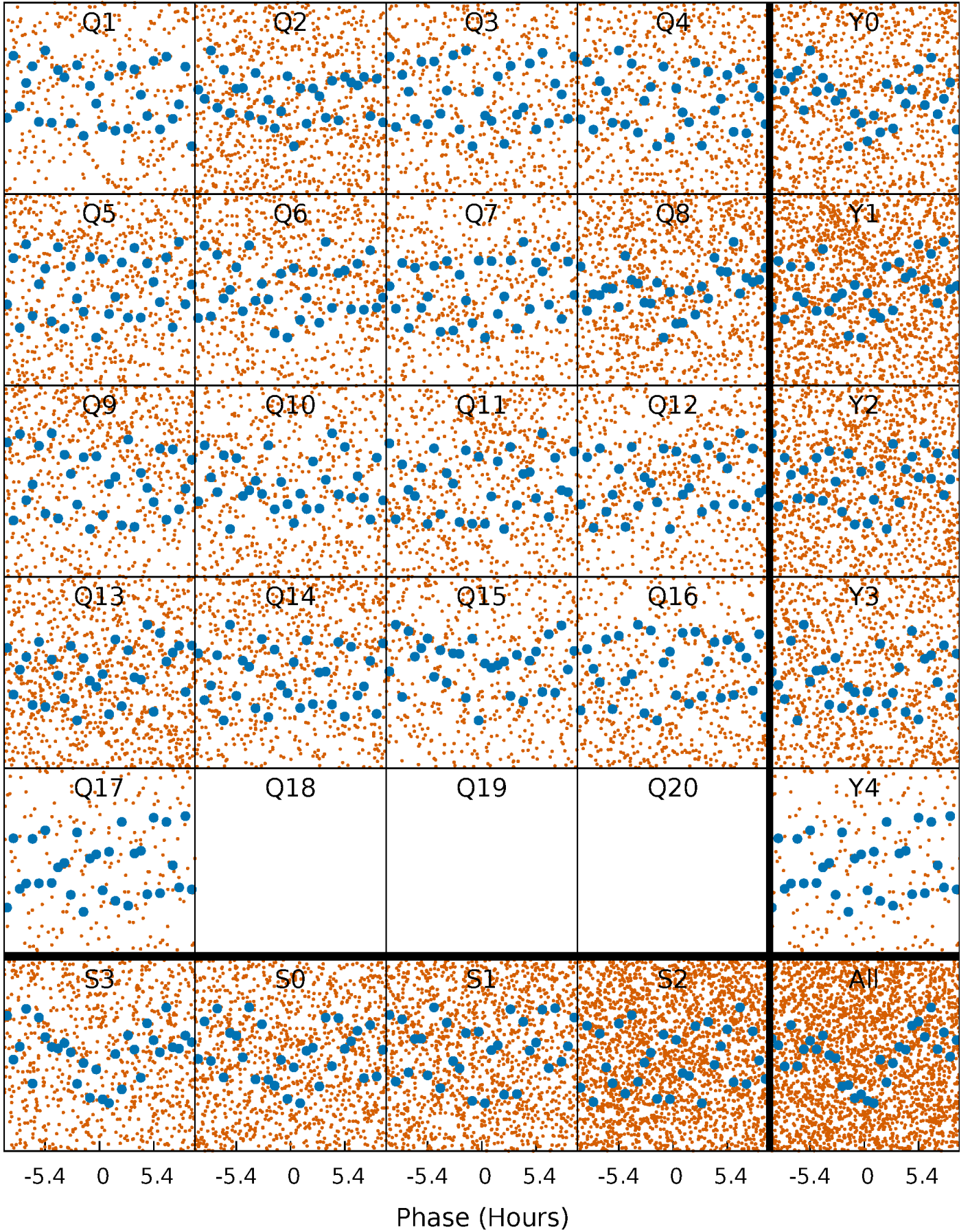


Non-Whitened Vs. Whitened Light Curve



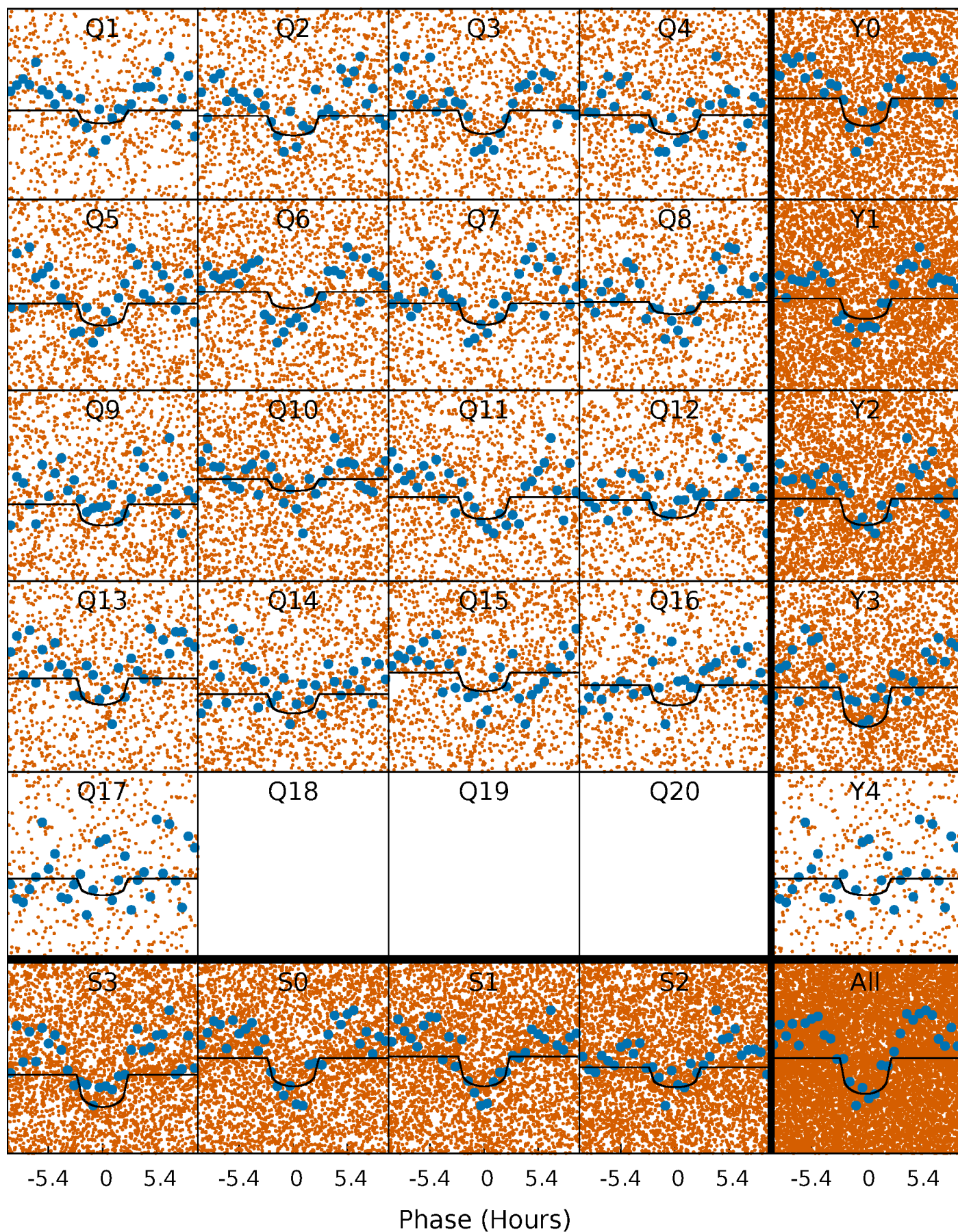
PDC Quarter-Phased Transit Curves

TCE 008416152-01 P= 0.990458 Days $T_0=132.010365$ (BKJD)



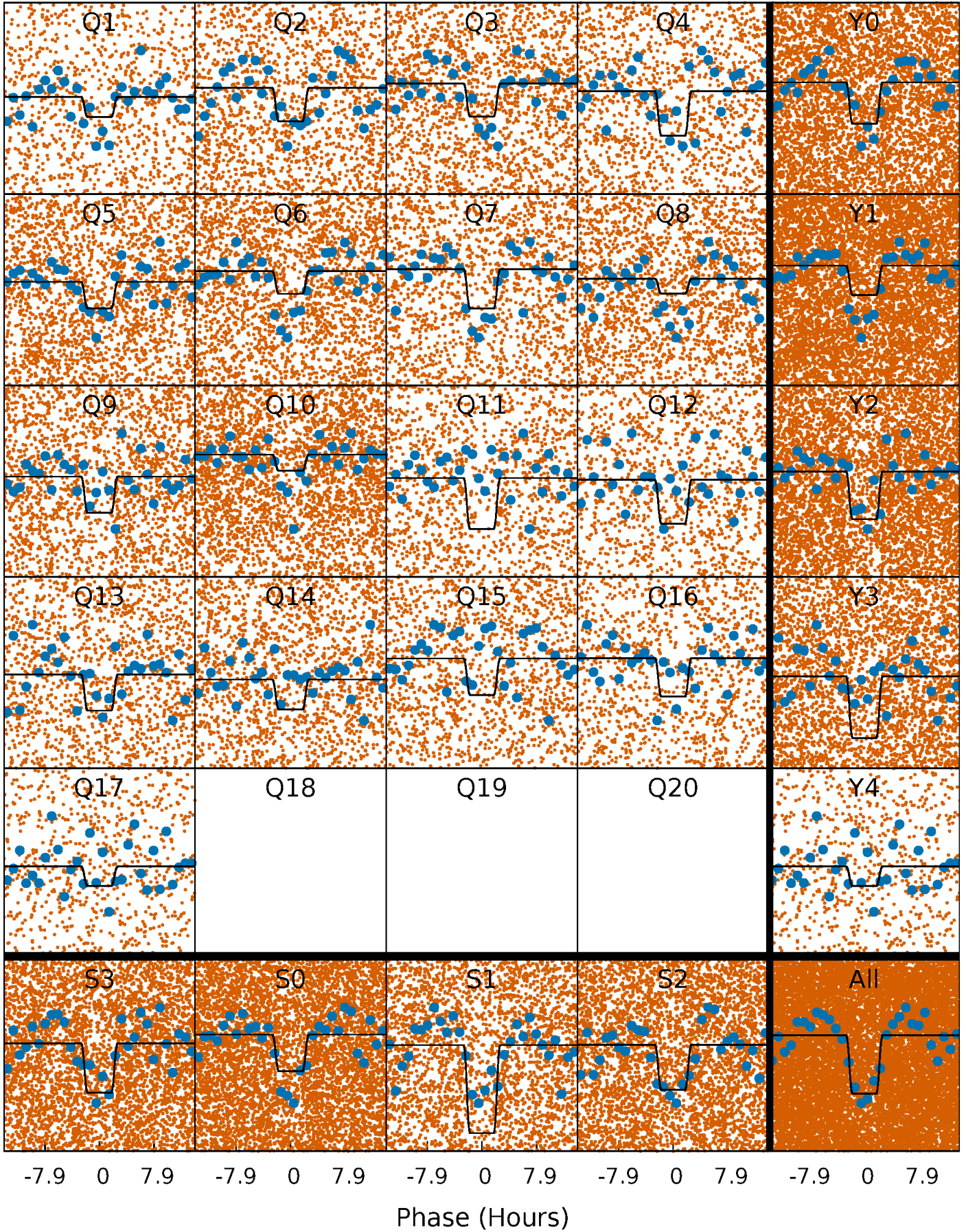
DV Quarter-Phased Transit Curves

TCE 008416152-01 P= 0.990458 Days $T_0=132.010365$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

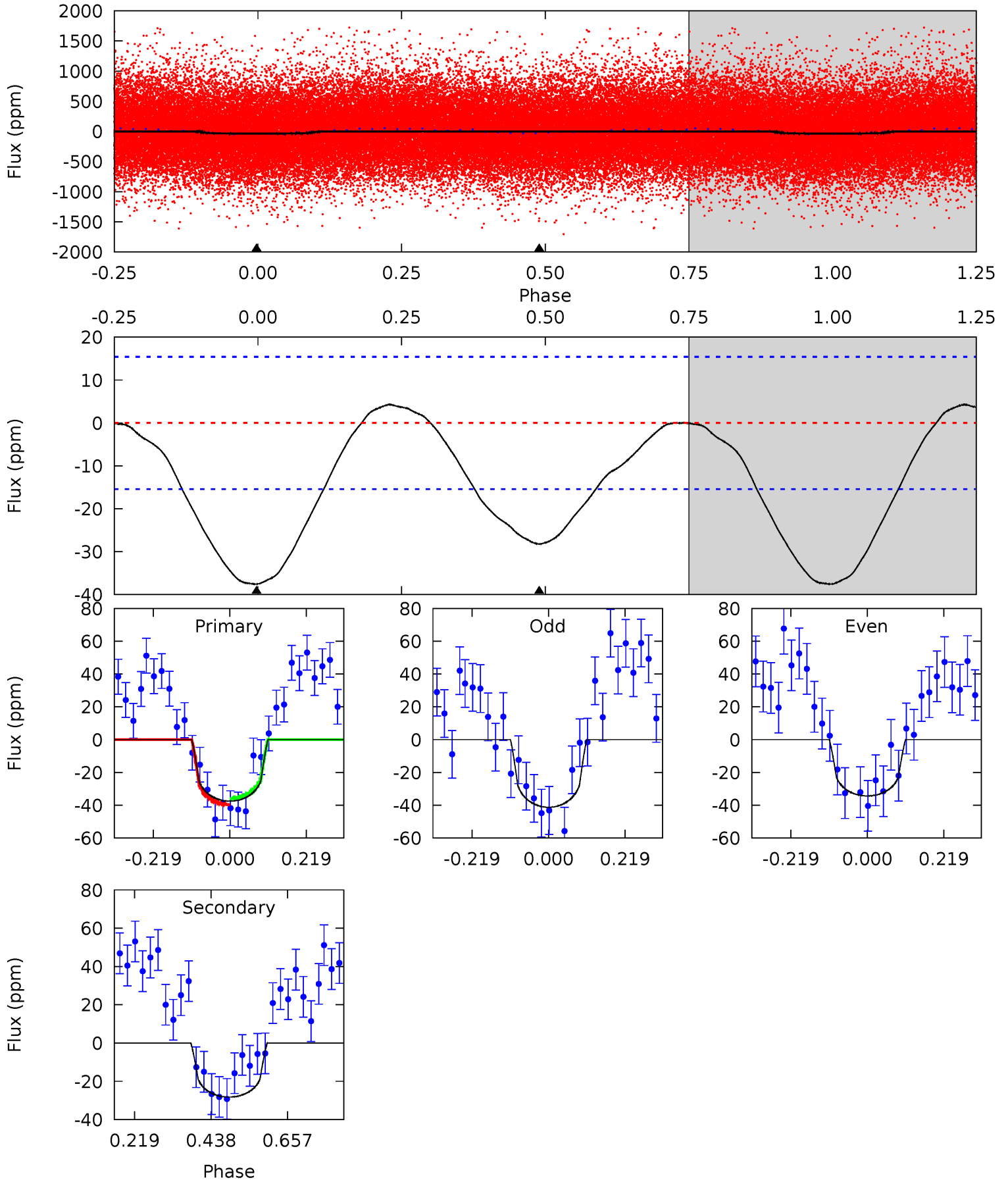
TCE 008416152-01 P= 0.990521 Days $T_0=131.973456$ (BKJD)



DV Model-Shift Uniqueness Test

008416152-01, P = 0.990458 Days, E = 131.019907 Days

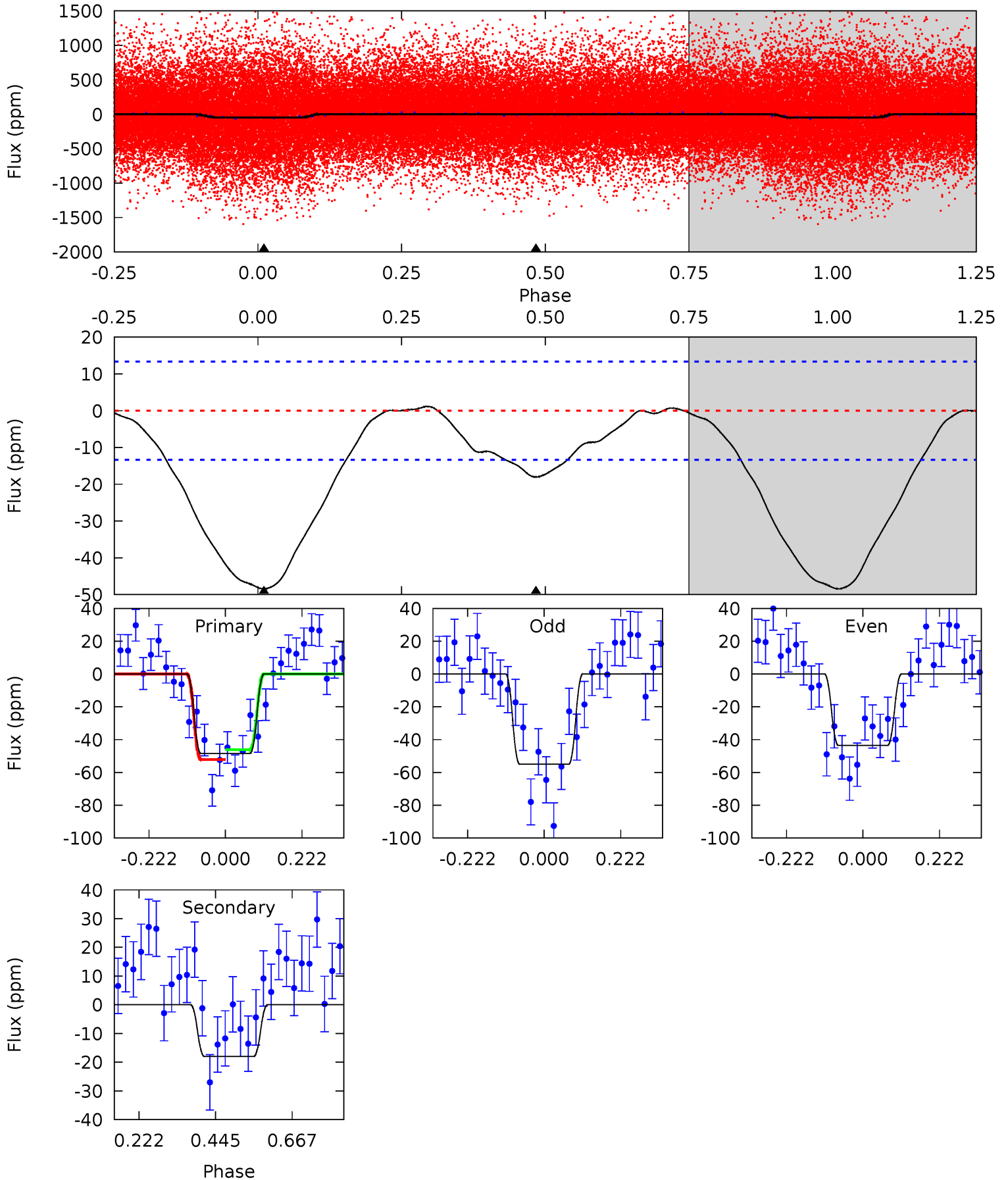
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.7 | 8.05 | 0 | 0 | 4.40 | 1.23 | 0.57 | 10.7 | 10.7 | 8.05 | 8.05 | 1.00 | 0.91 | 0.10 | 0.53 |



Alt Model-Shift Uniqueness Test

008416152-01, P = 0.990521 Days, E = 130.982935 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 15.9 | 5.93 | 0 | 0 | 4.39 | 1.22 | 0.35 | 15.9 | 15.9 | 5.93 | 5.93 | 1.87 | 0.90 | 0.02 | 0.99 |



Stellar Parameters For KIC 008416152

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5184^{+156}_{-156} | $4.720^{+0.018}_{-0.067}$ | $-1.040^{+0.300}_{-0.300}$ | $0.583^{+0.059}_{-0.025}$ | $0.652^{+0.042}_{-0.042}$ | $4.628^{+0.418}_{-0.995}$ |
| | +3%/-3% | +0%/-1% | +29%/-29% | +10%/-4% | +6%/-6% | +9%/-21% |
| 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 008416152-01 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|------------------------|----------------------|-----------------------|-------------------|
| DV | -28 ± 4 | $0.48^{+0.36}_{-0.31}$ | 1897^{+69}_{-65} | 4453^{+2982}_{-789} | 19^{+139}_{-12} |
| Alt. | -18 ± 3 | $0.51^{+0.37}_{-0.32}$ | 1894^{+68}_{-65} | 4021^{+2167}_{-694} | 11^{+65}_{-7} |

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 $A_{\text{obs}} \gg 1.0$

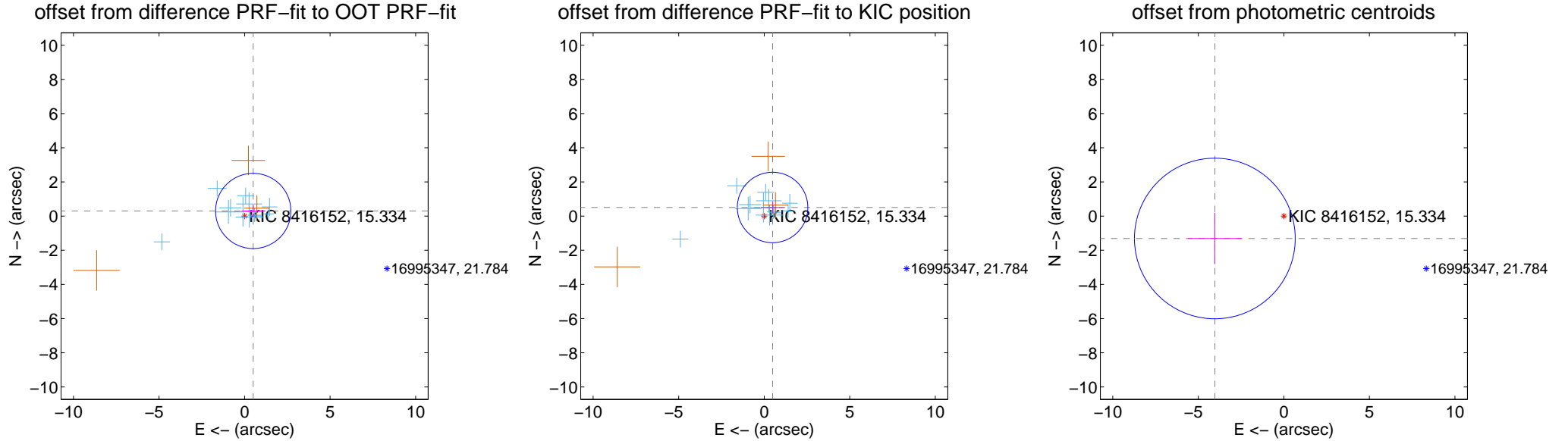
DV Centroid Data

Supplemental centroid analysis for 008416152-01. Kepler magnitude: 15.33. Transit SNR 8.09

There are 12 quarters with good PRF difference image offsets

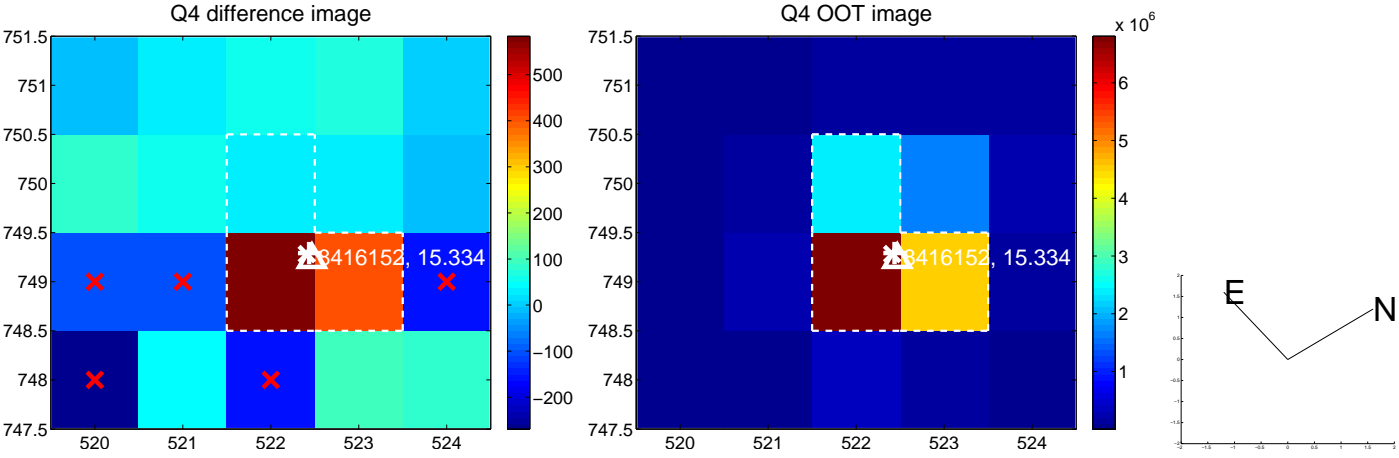
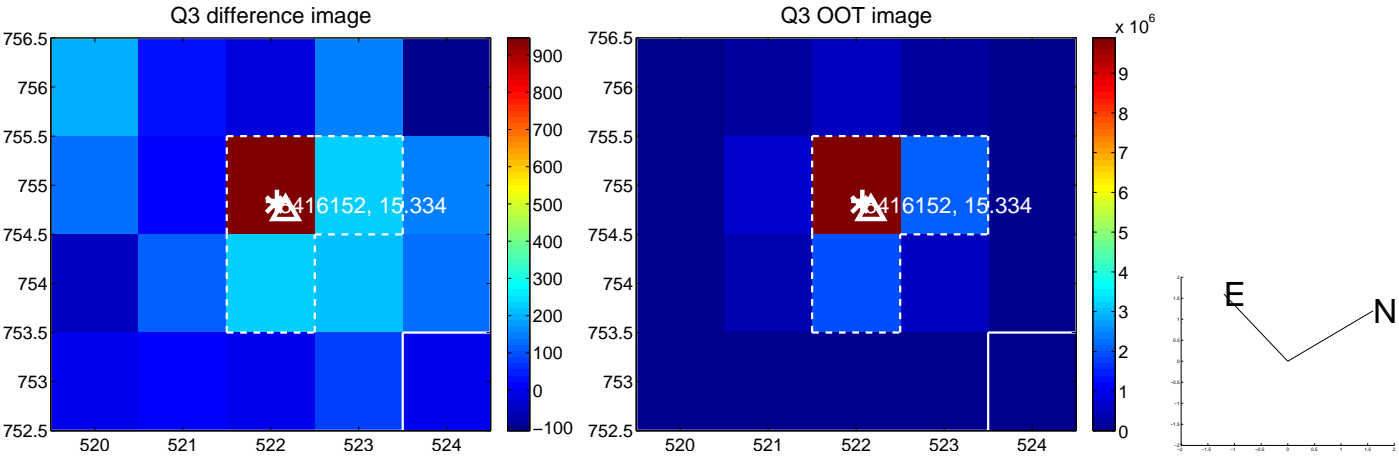
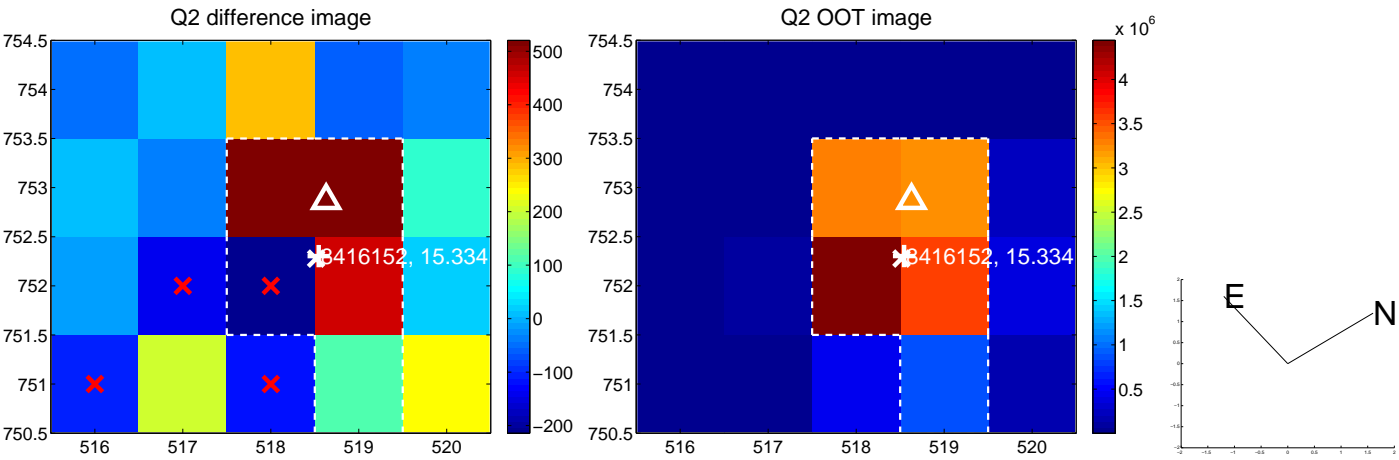
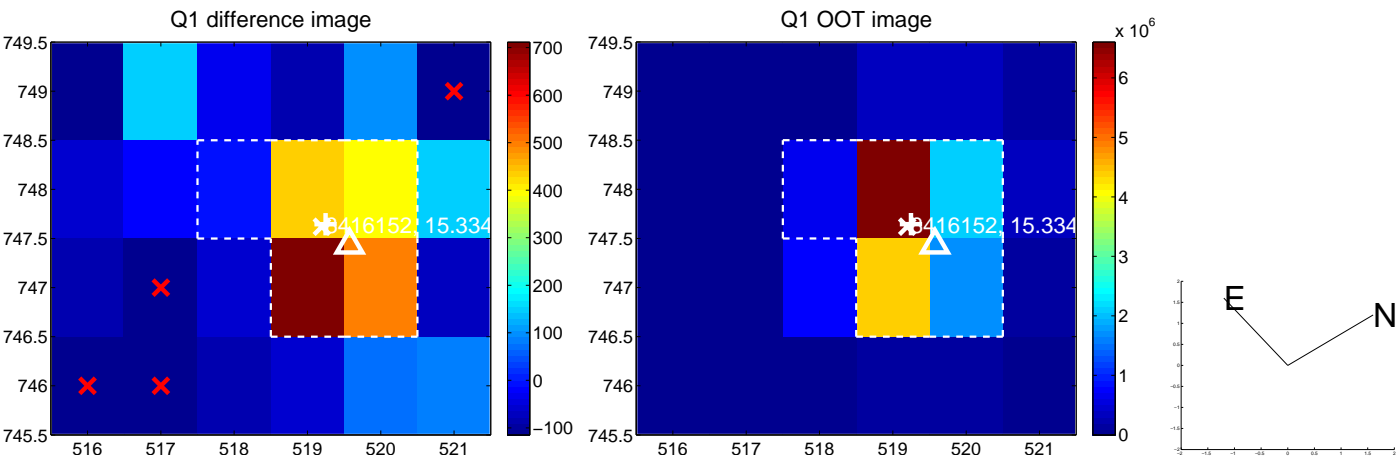
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.588 ± 0.734 | 0.80 | -0.505 ± 0.683 | 0.300 ± 0.372 |
| PRF-fit source offset from KIC position | 0.702 ± 0.687 | 1.02 | -0.488 ± 0.689 | 0.504 ± 0.364 |
| photometric centroid source offset | 4.24 ± 1.57 | 2.71 | 4.03 ± 1.57 | -1.31 ± 1.50 |

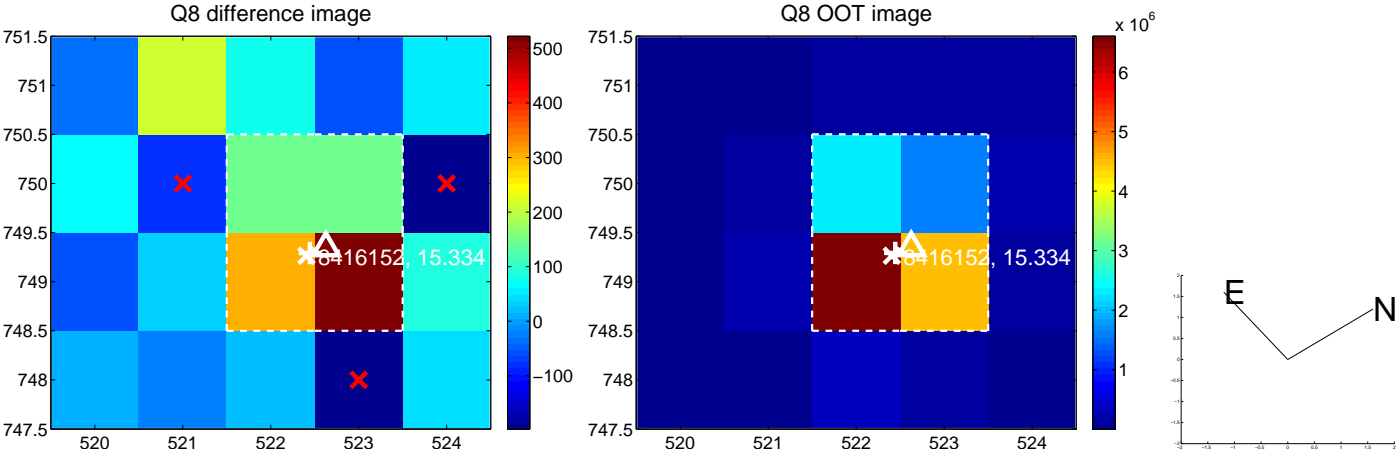
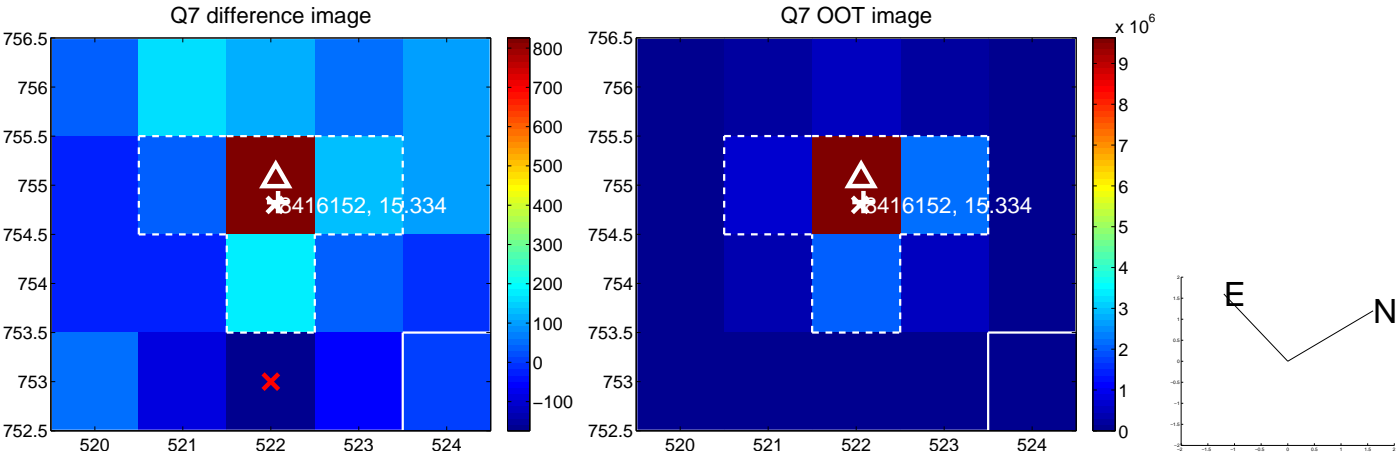
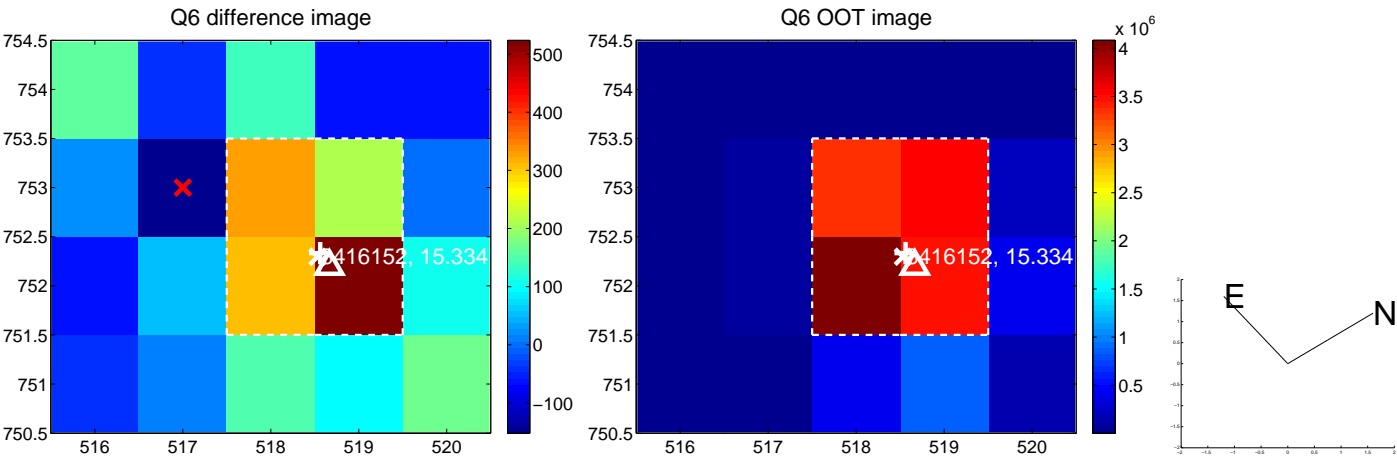
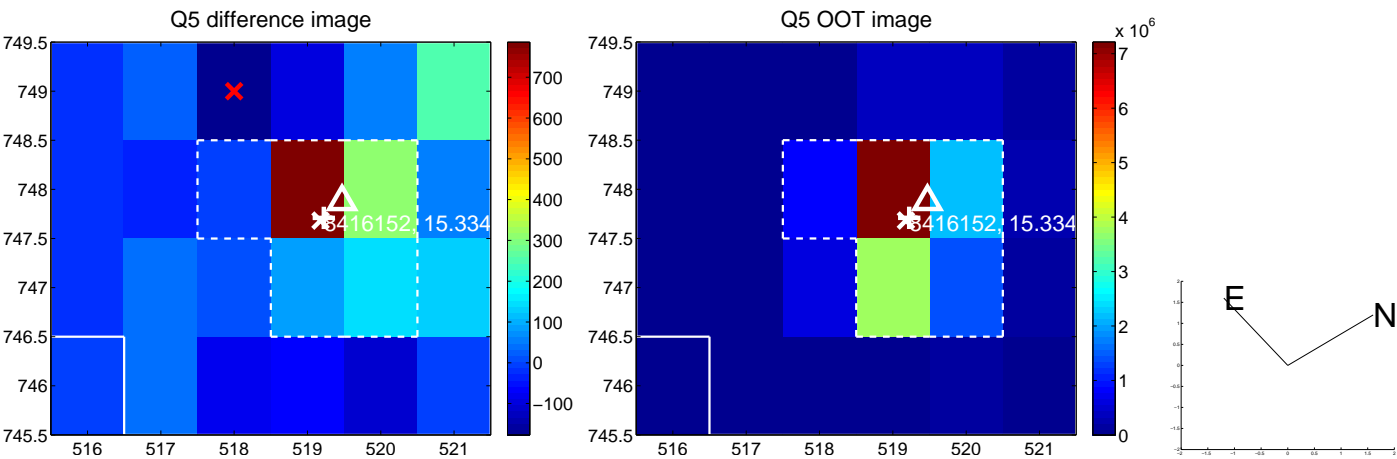


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

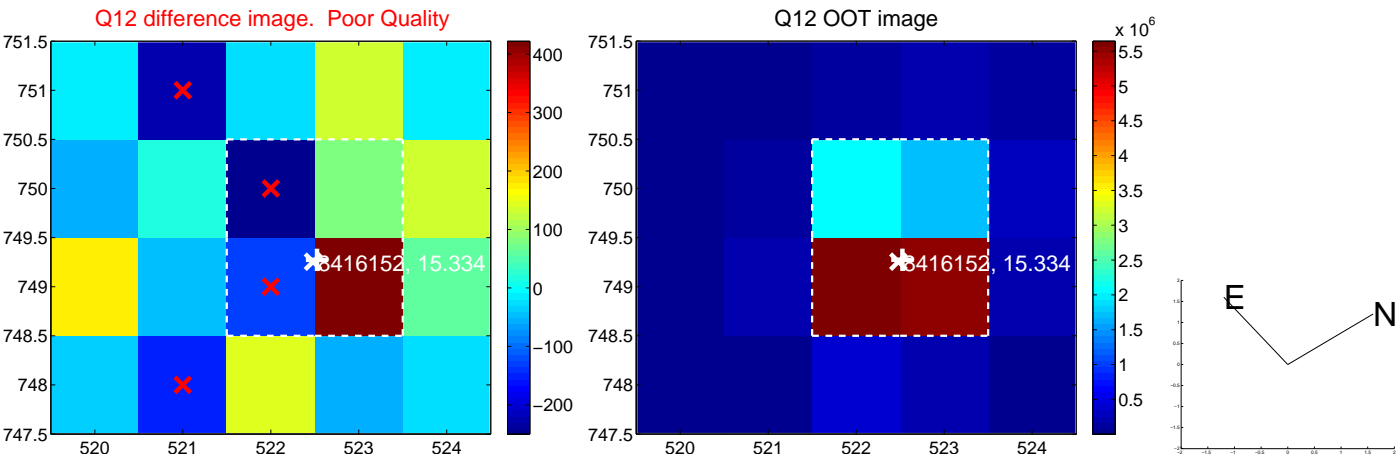
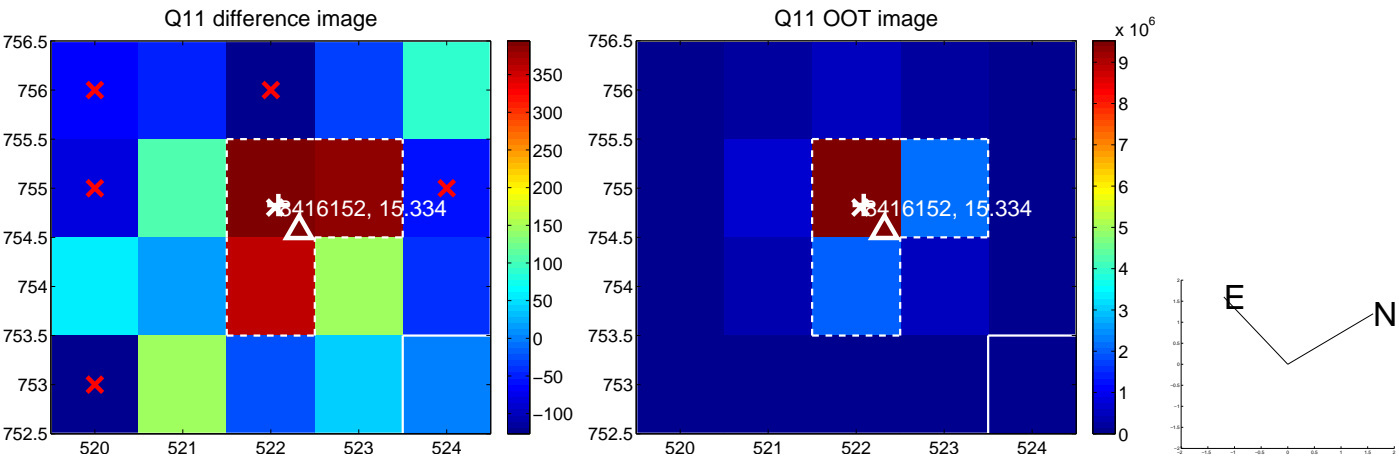
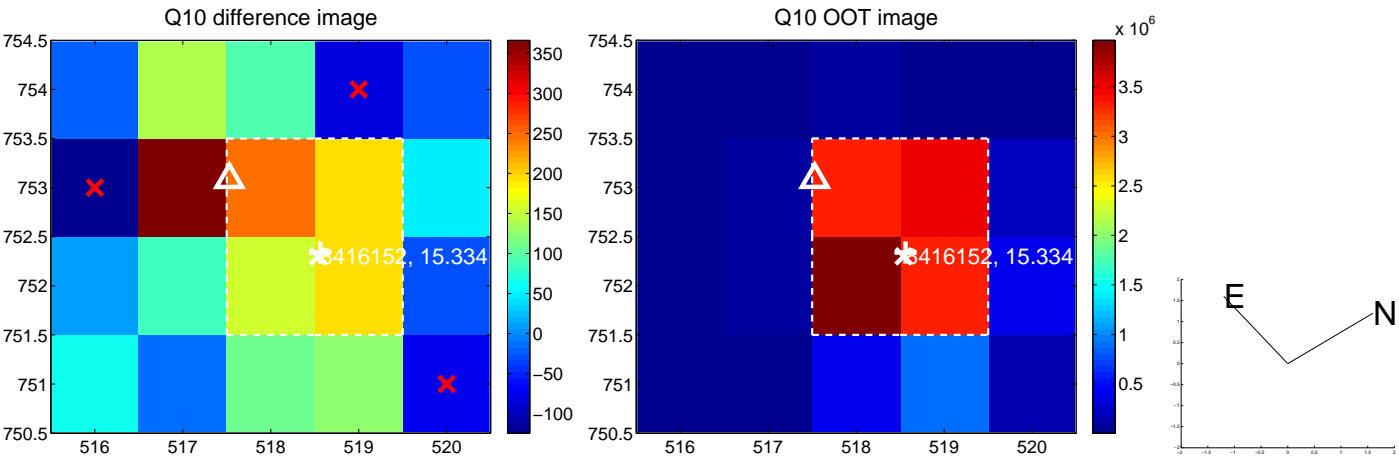
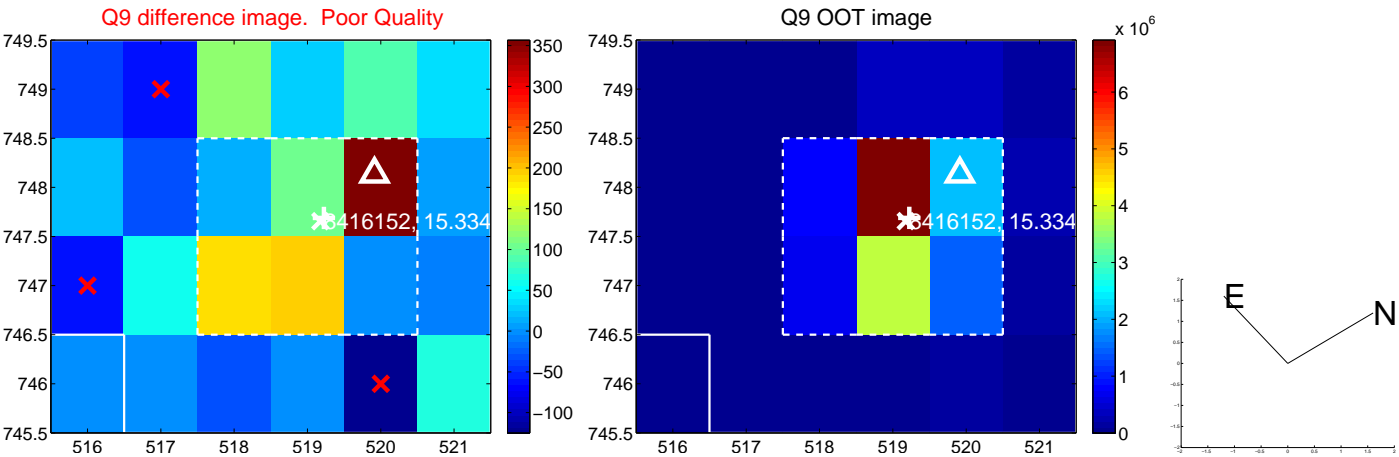
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



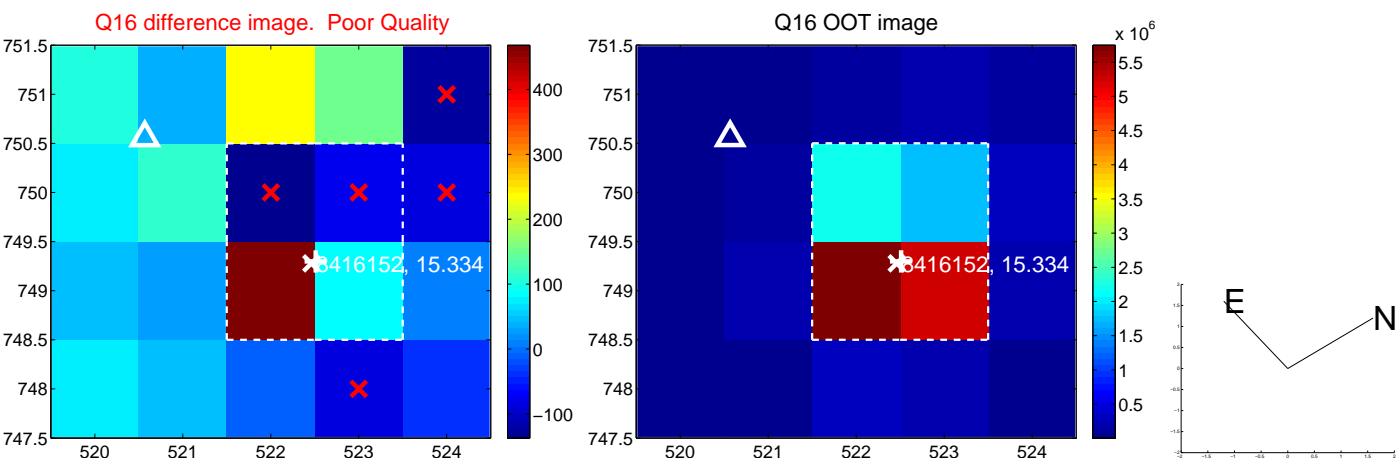
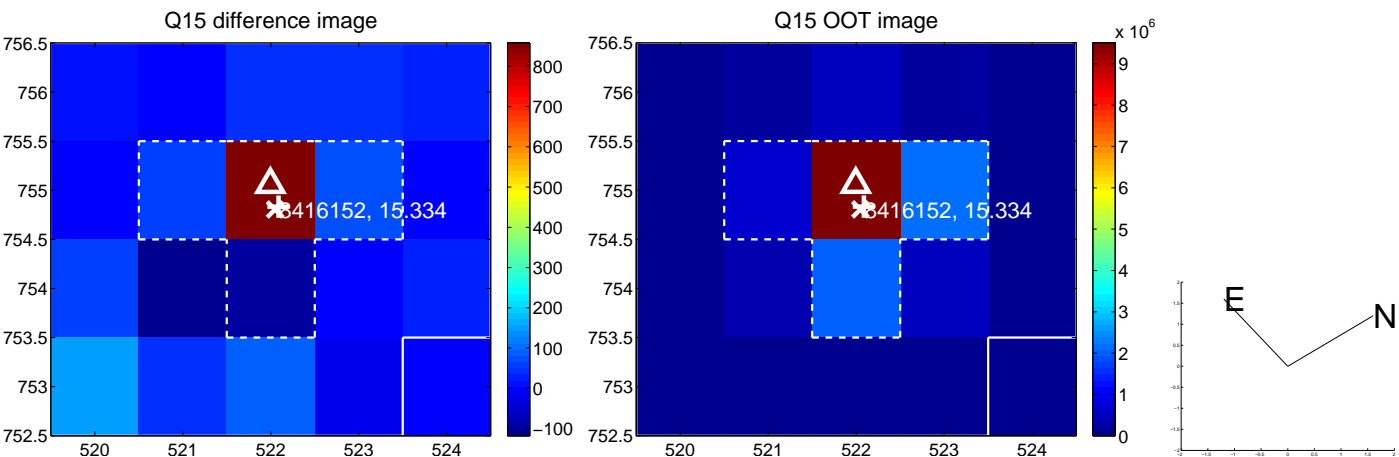
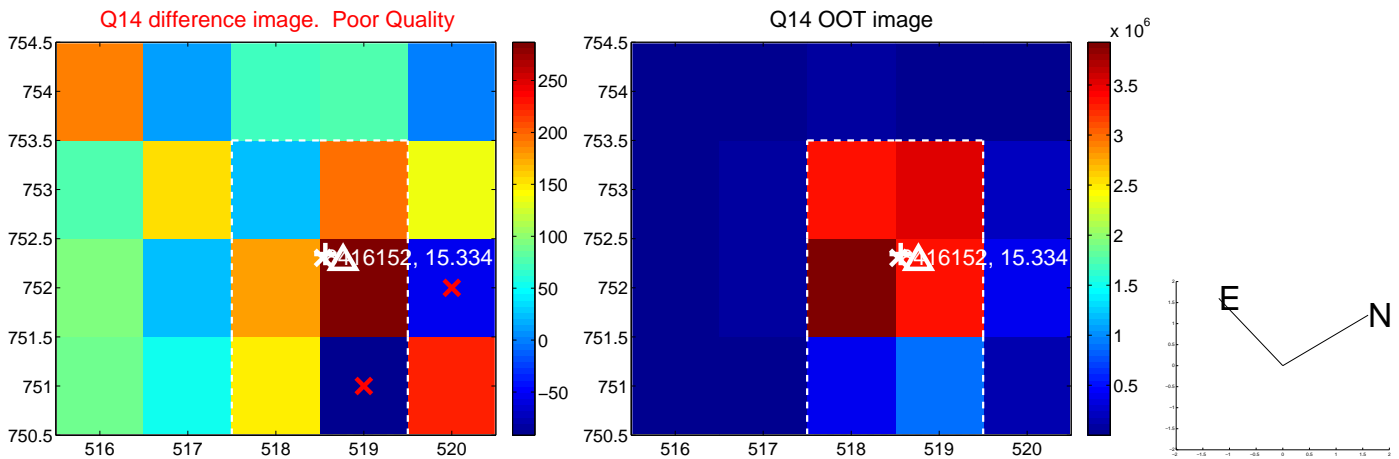
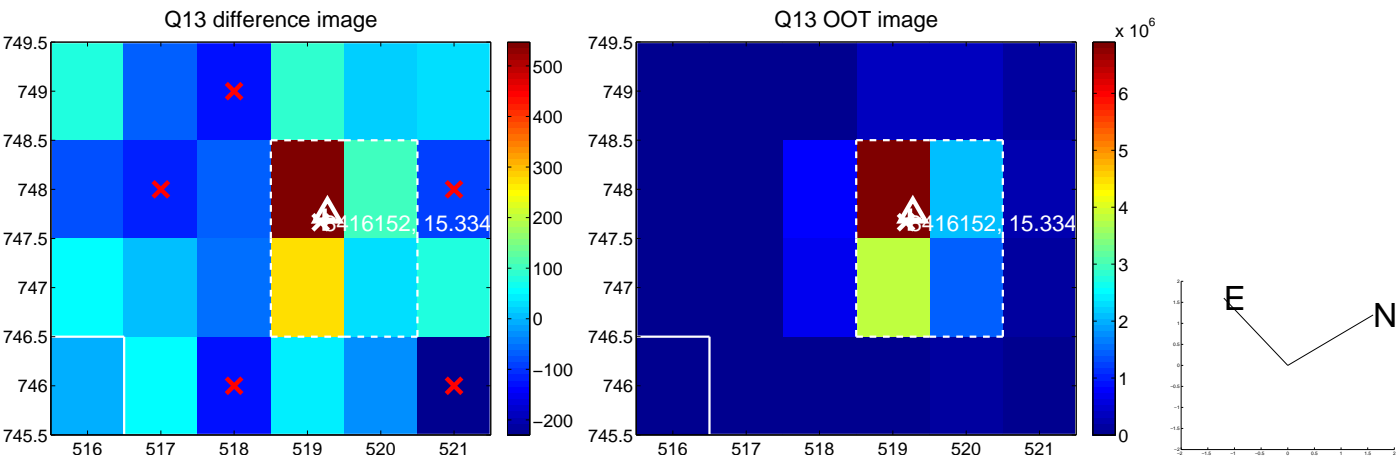
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



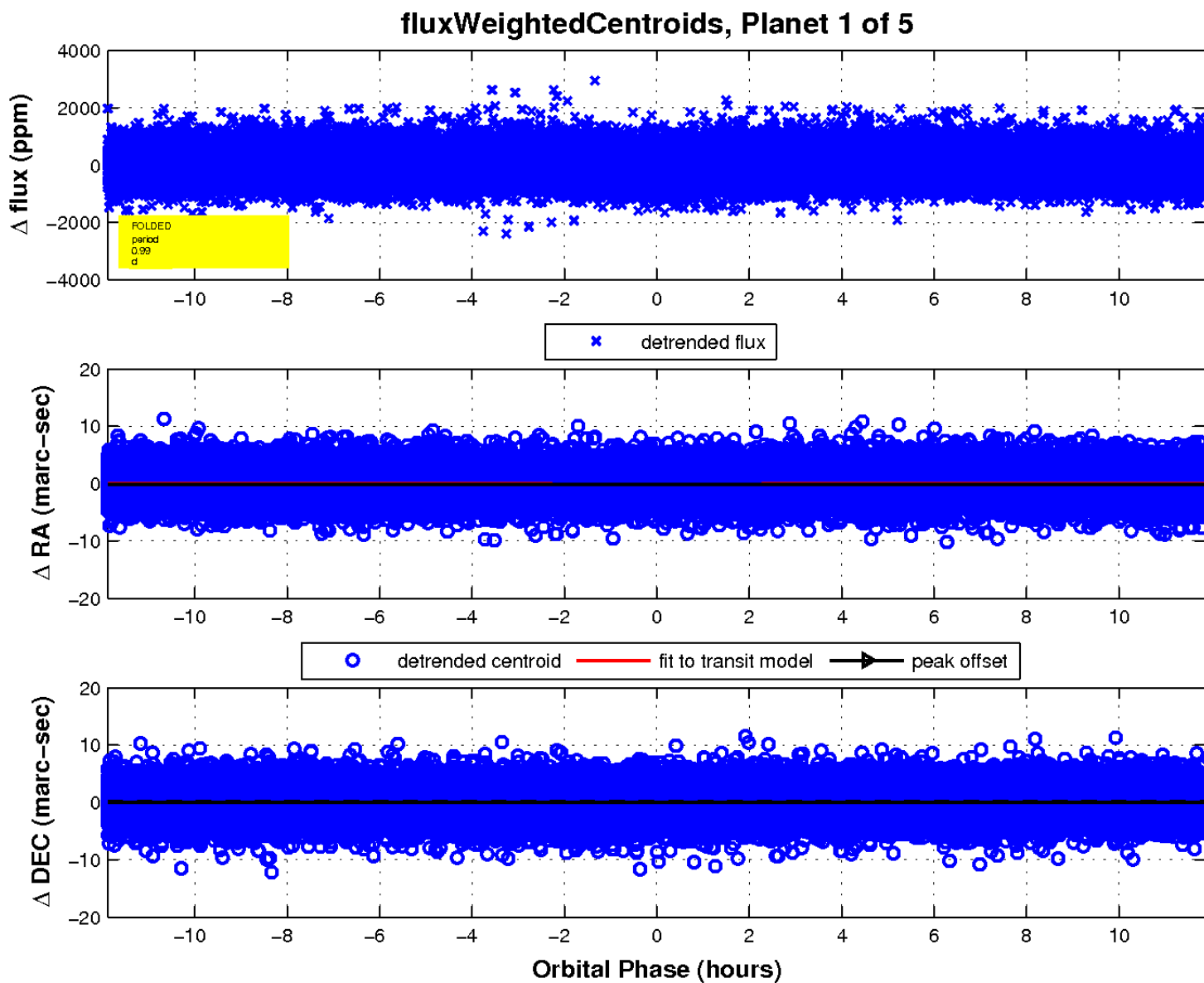
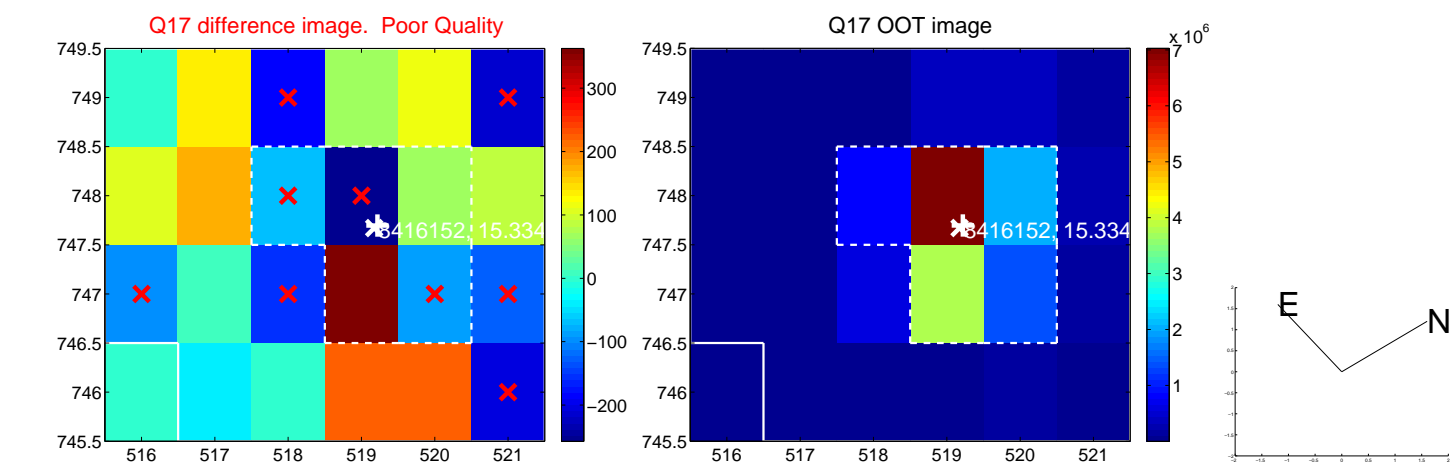
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

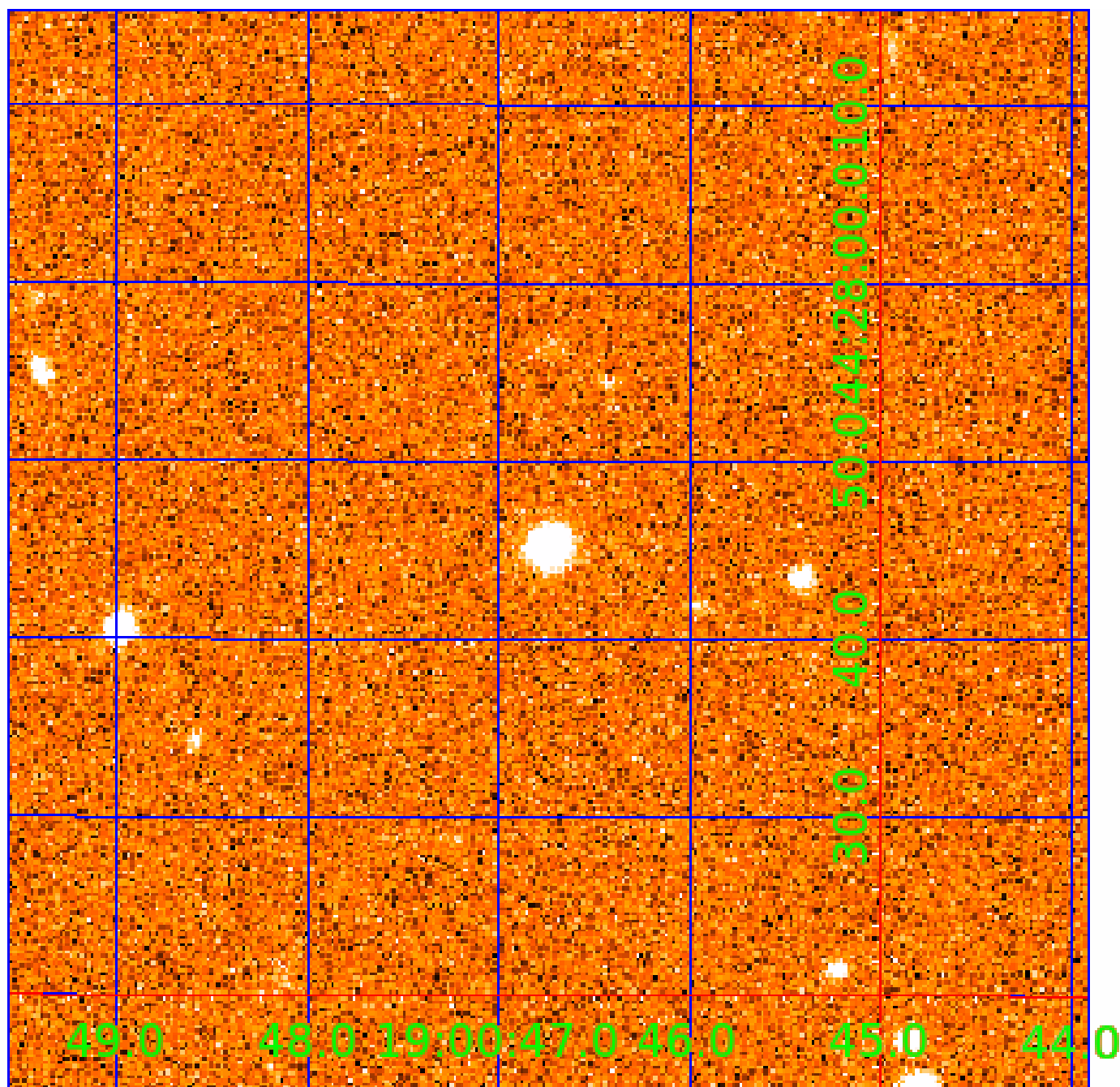


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008416152

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 008416152-01 | OBS | No | 0.990458 | 132.010365 | 40.3 | 4.749 | 9.1 | 8.1 | 0.58 | 5184 | 0.39 | 774.26 |
| 008416152-02 | OBS | No | 371.329484 | 213.964176 | 844.2 | 12.152 | 13.1 | 8.9 | 0.58 | 5184 | 1.76 | 0.29 |
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| 008416152-04 | OBS | No | 635.901480 | 226.613152 | 682.5 | 7.126 | 7.7 | 7.3 | 0.58 | 5184 | 1.59 | 0.14 |
| 008416152-05 | OBS | No | 210.555156 | 167.547527 | 637.7 | 7.840 | 7.4 | 6.2 | 0.58 | 5184 | 1.56 | 0.61 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 008416152-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | LPP_DV |
| 008416152-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—CENT_FEW_DIFFS |
| 008416152-05 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

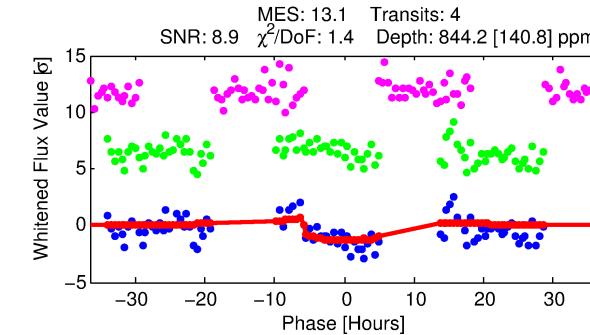
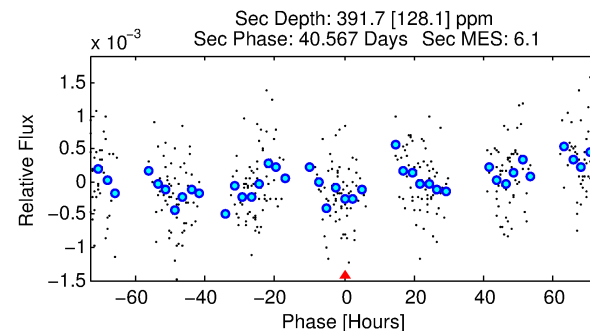
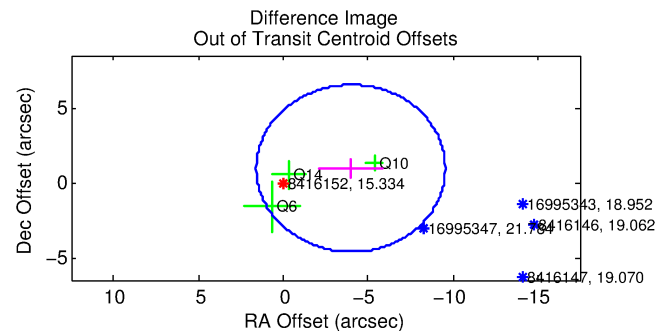
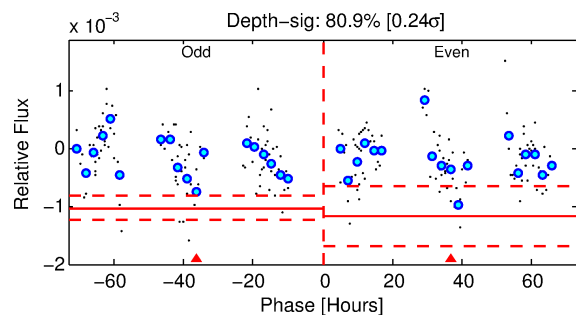
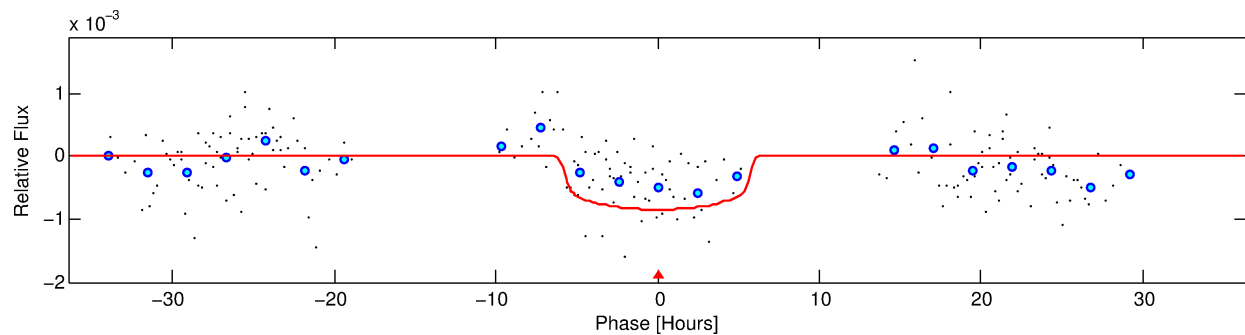
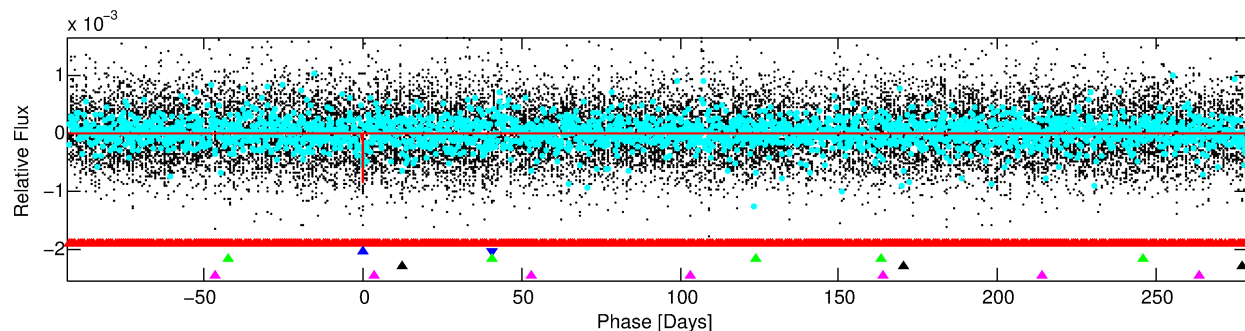
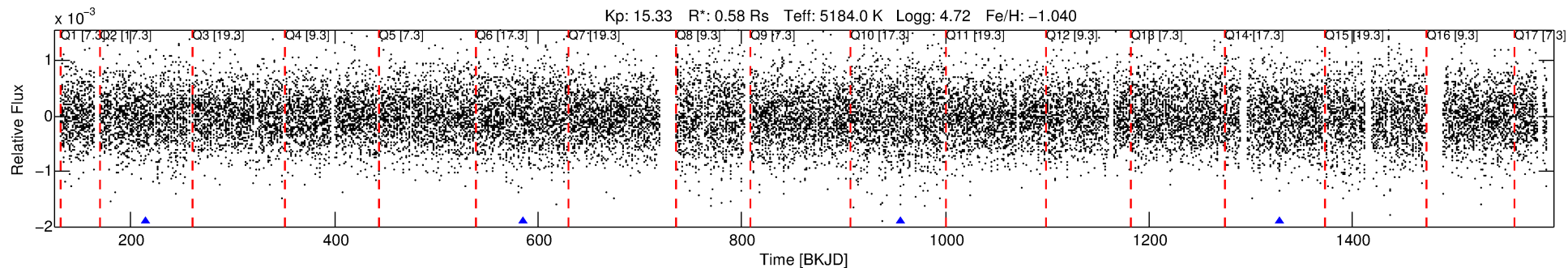
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008416152-02

No Significant Match Found

DV One-Page Summary

KIC: 8416152 Candidate: 2 of 5 Period: 371.329 d



DV Fit Results:

Period = 371.32948 [0.02940] d
Epoch = 213.9642 [0.0693] BKJD
Rp/R* = 0.0277 [0.0195]
a/R* = 193.05 [575.37]
b = 0.61 [3.19]
Seff = 0.29 [0.05]
Teq = 187 [8] K
Rp = 1.76 [1.25] Re
a = 0.8763 [0.0743] AU
Ag = 53152.85 [76949.67] [0.69σ]
Teffp = 4379 [1585] K [2.65σ]

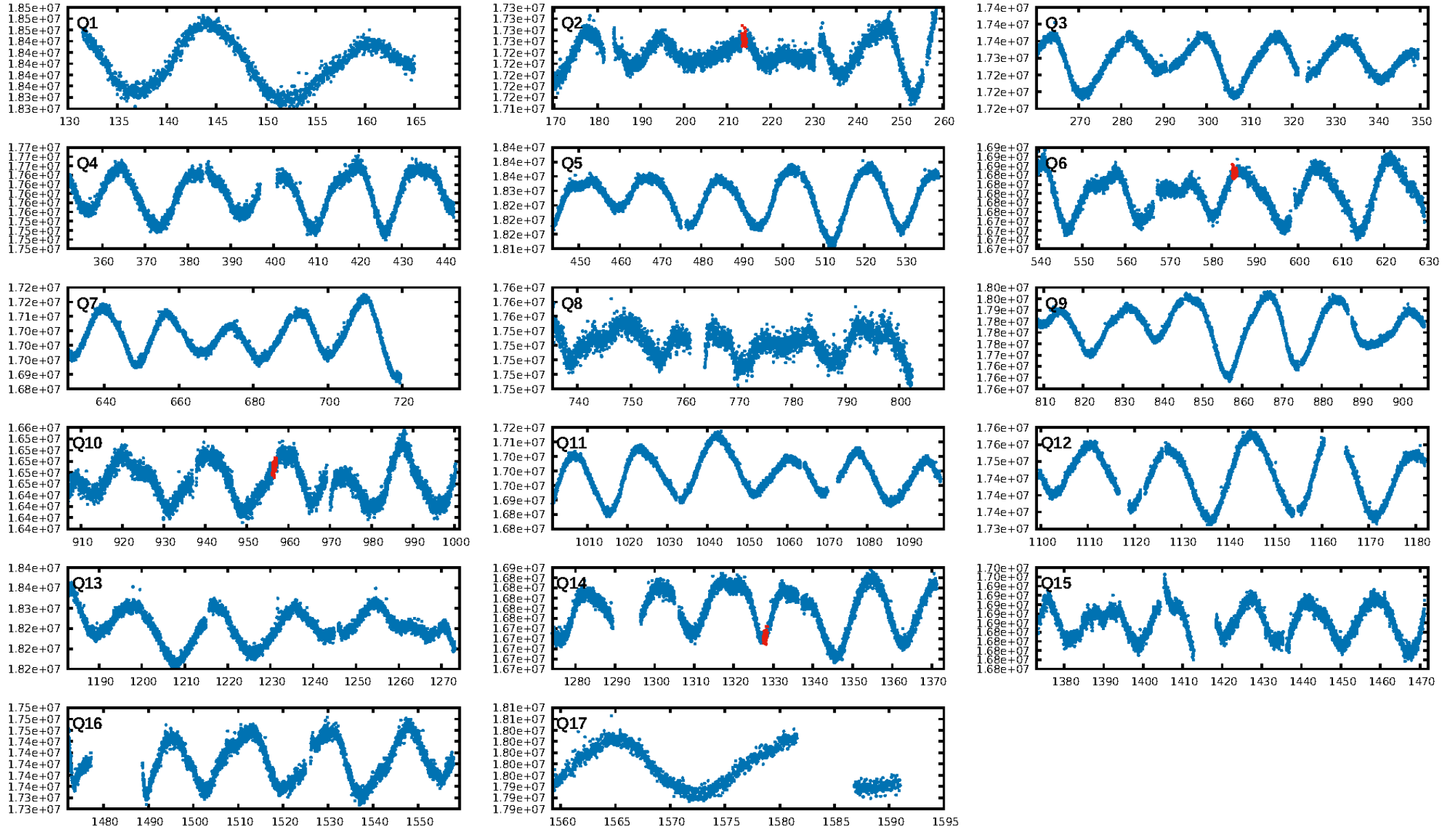
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [103.97σ]
LongPeriod-sig: 100.0% [450.73σ]
ModelChiSquare2-sig: 0.0%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.04e-18
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: -0.3262
Centroid-sig: 9.3%
Centroid-so: 0.776 arcsec [0.97σ]
OotOffset-rm: 4.104 arcsec [2.21σ]
OotOffset-st: 3/0/0/0 [3]
KicOffset-rm: 4.074 arcsec [2.22σ]
KicOffset-st: 3/0/0/0 [3]
DiffImageQuality-fgm: 0.00 [0/3]
DiffImageOverlap-fno: 0.00 [0/4]

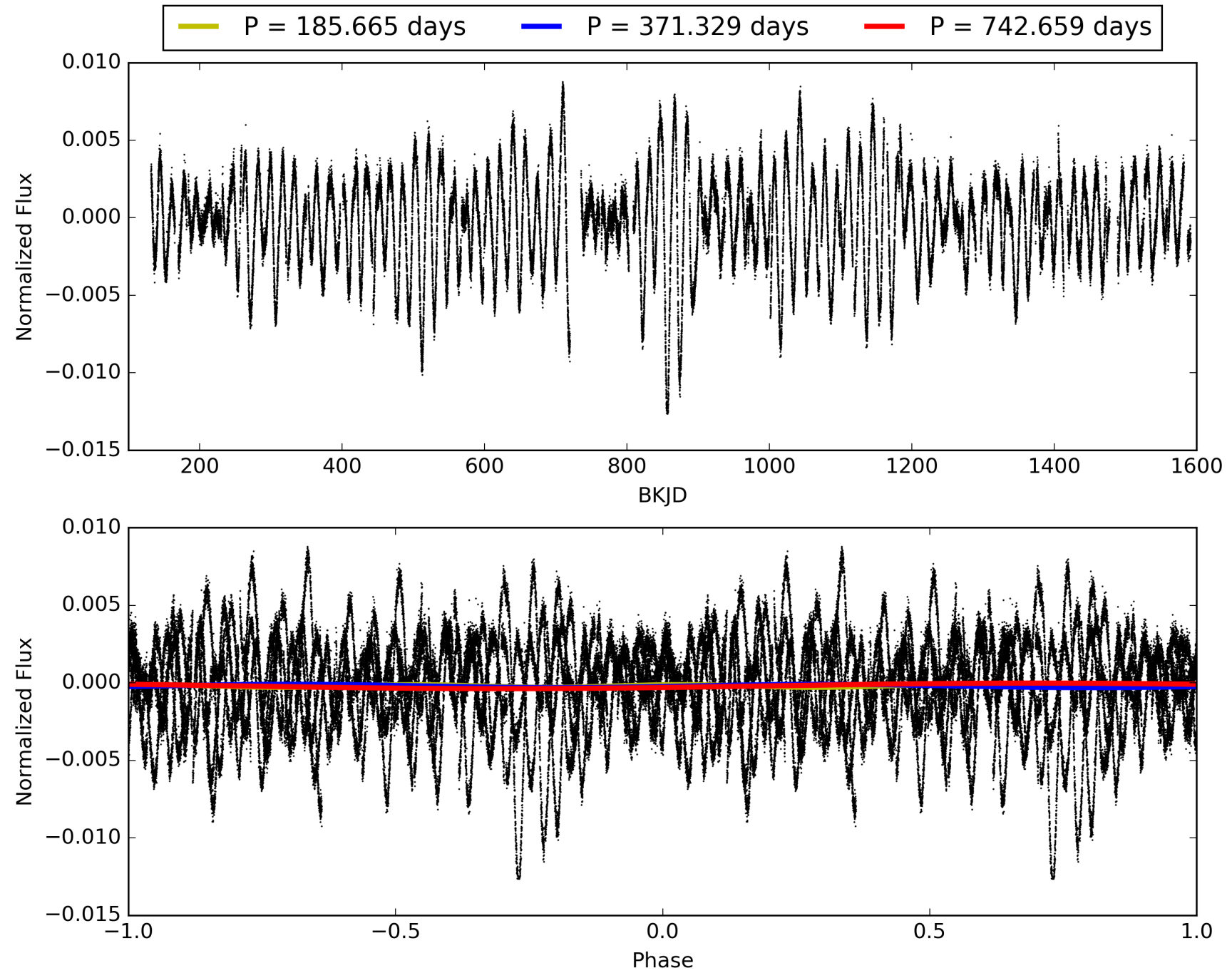
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:06:52 Z

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

TCE 008416152-02, PDC Light Curves

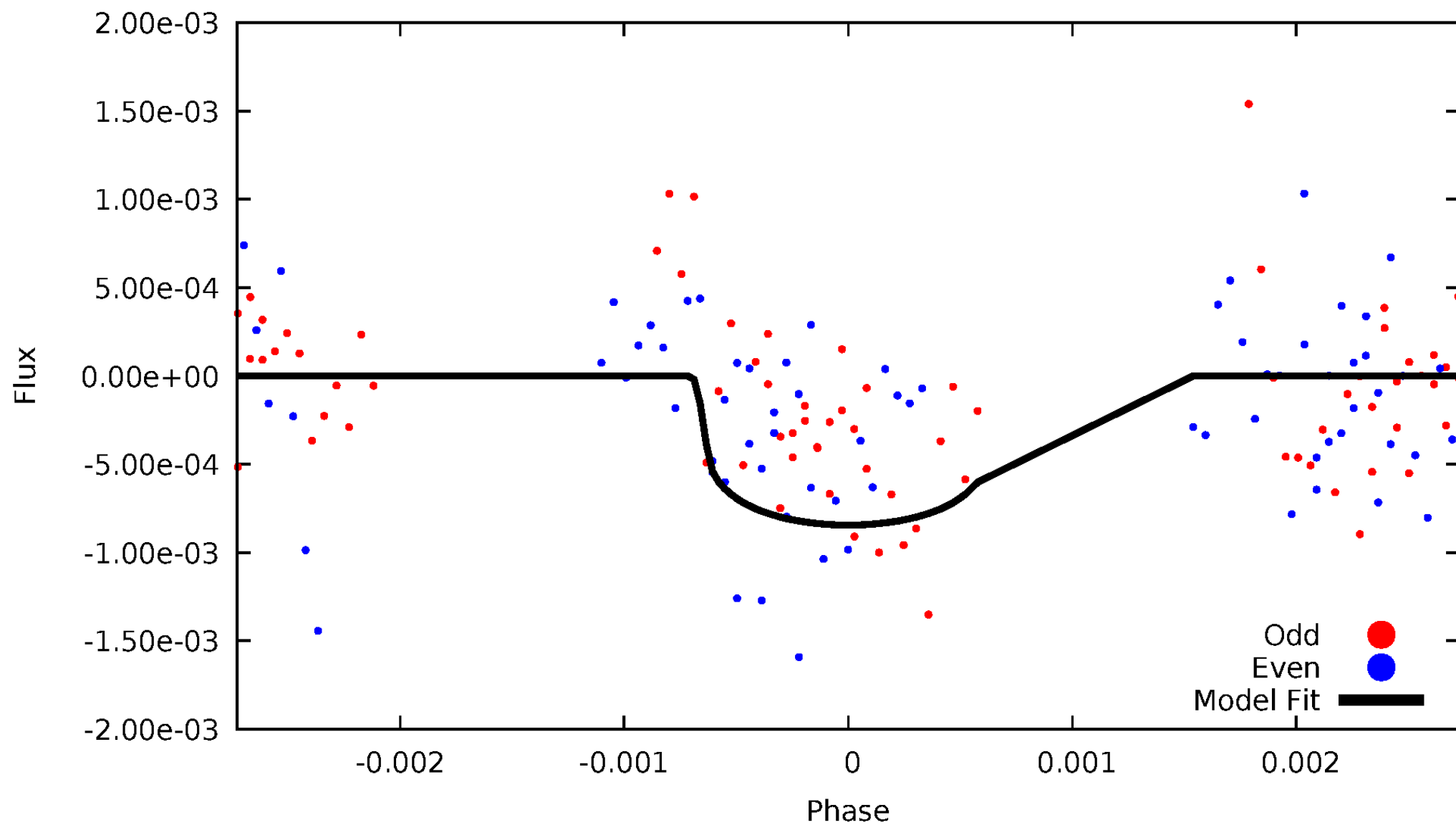


TCE 008416152-02



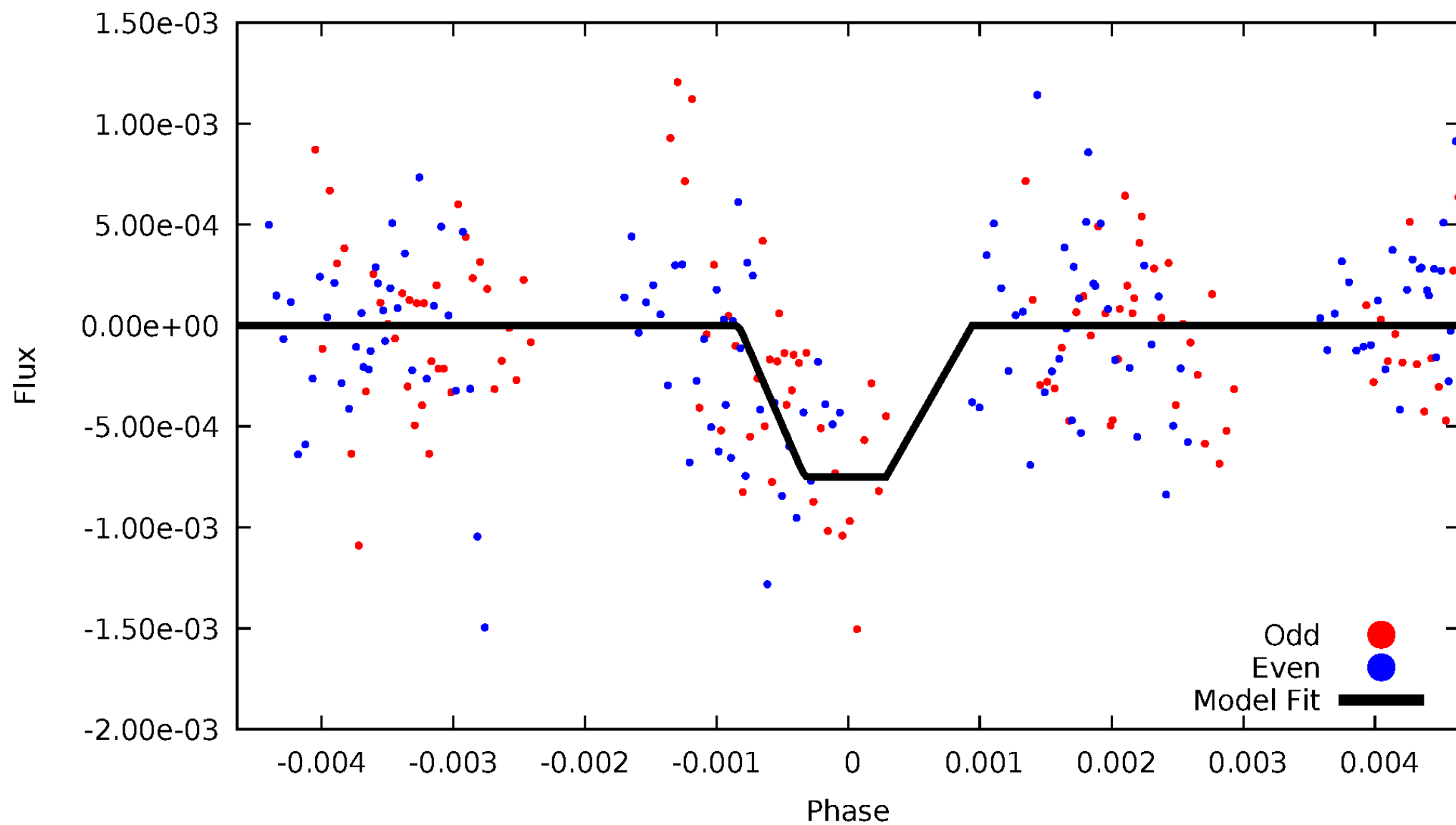
DV Odd/Even

TCE 008416152-02



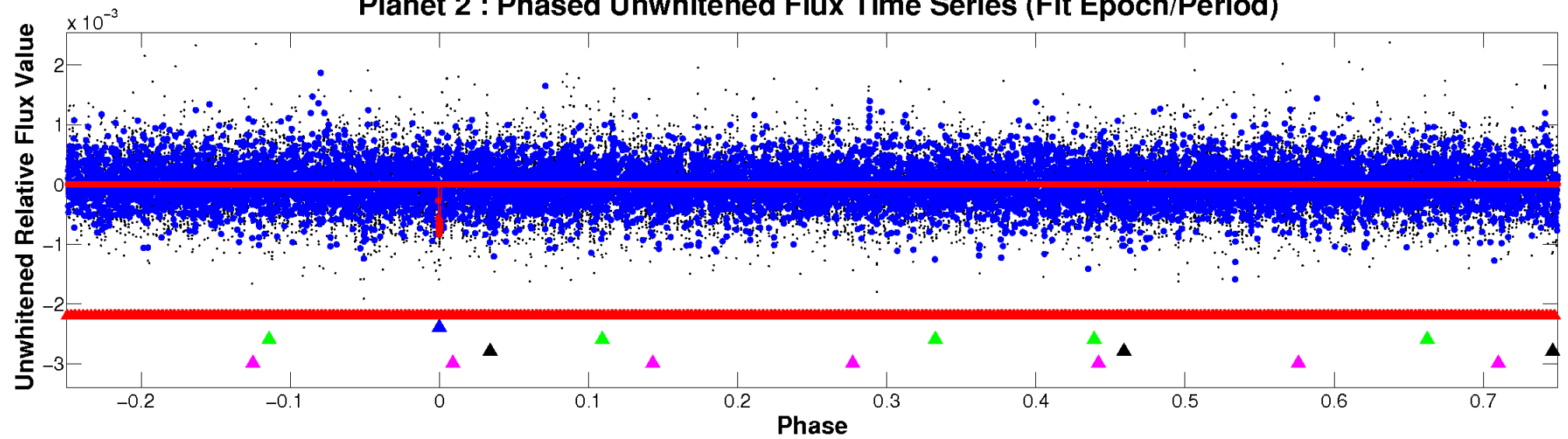
ALT Odd/Even

TCE 008416152-02

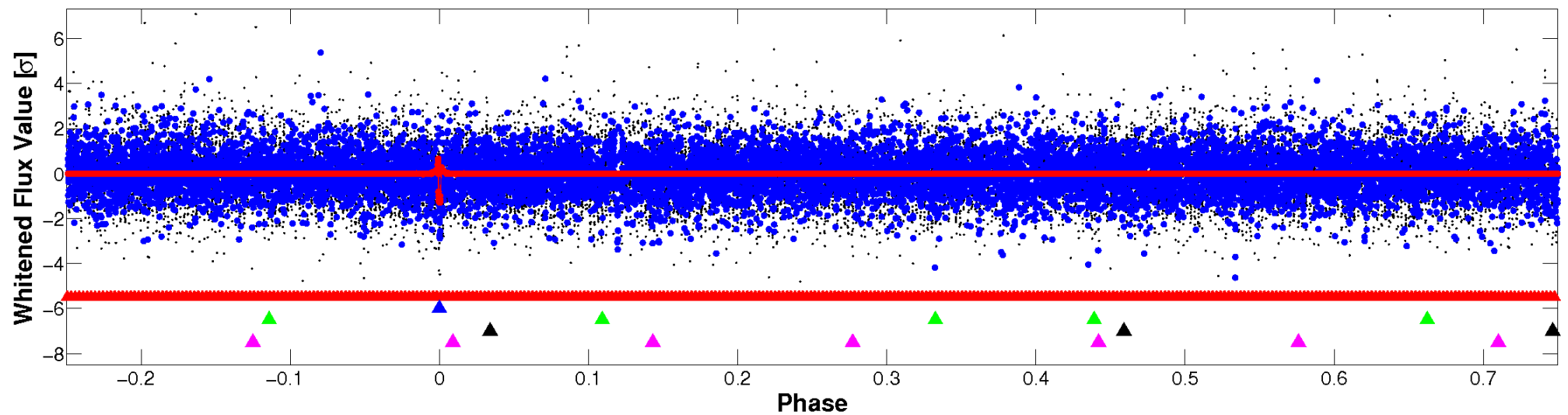


Non-Whitened Vs. Whitened Light Curve

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

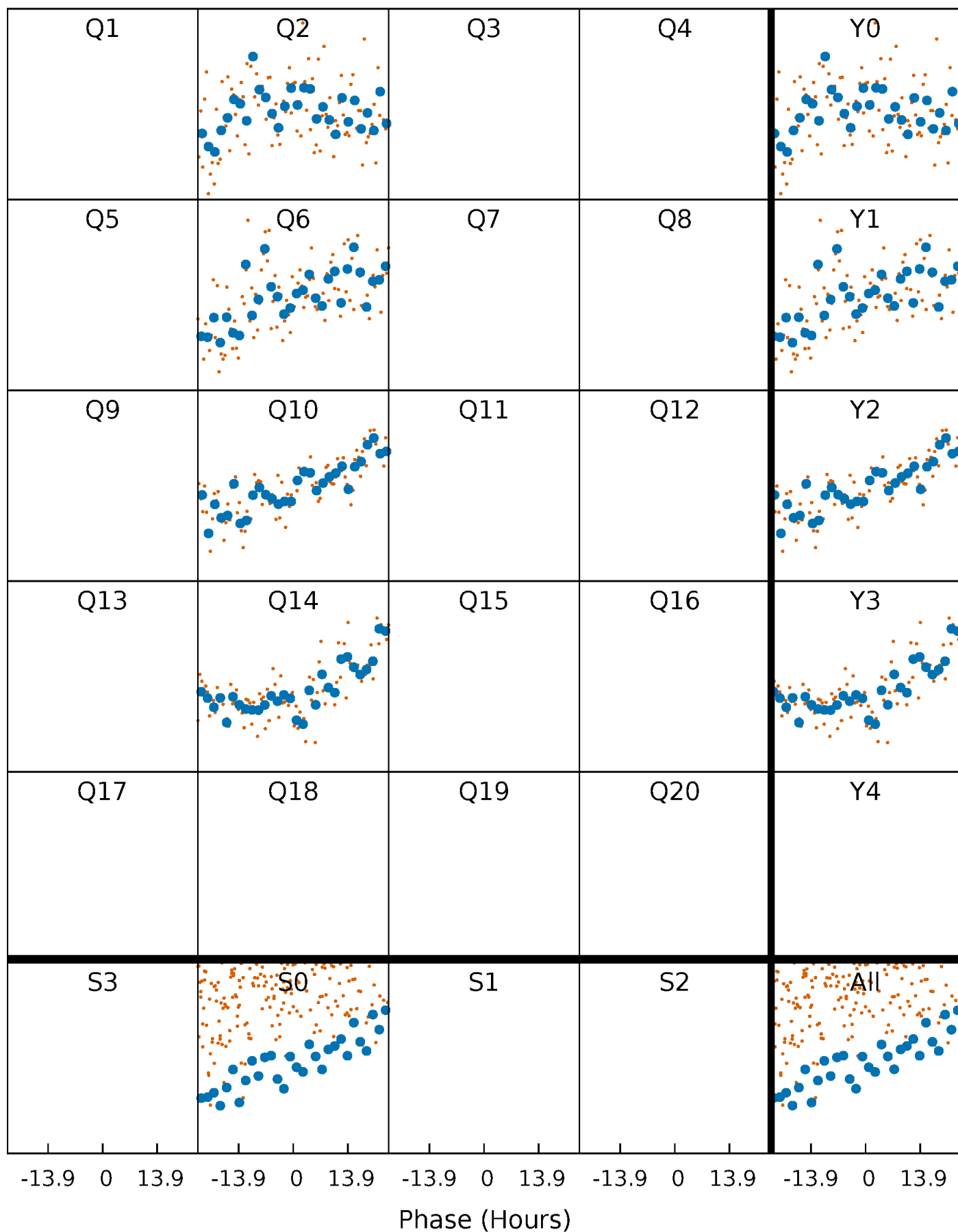


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



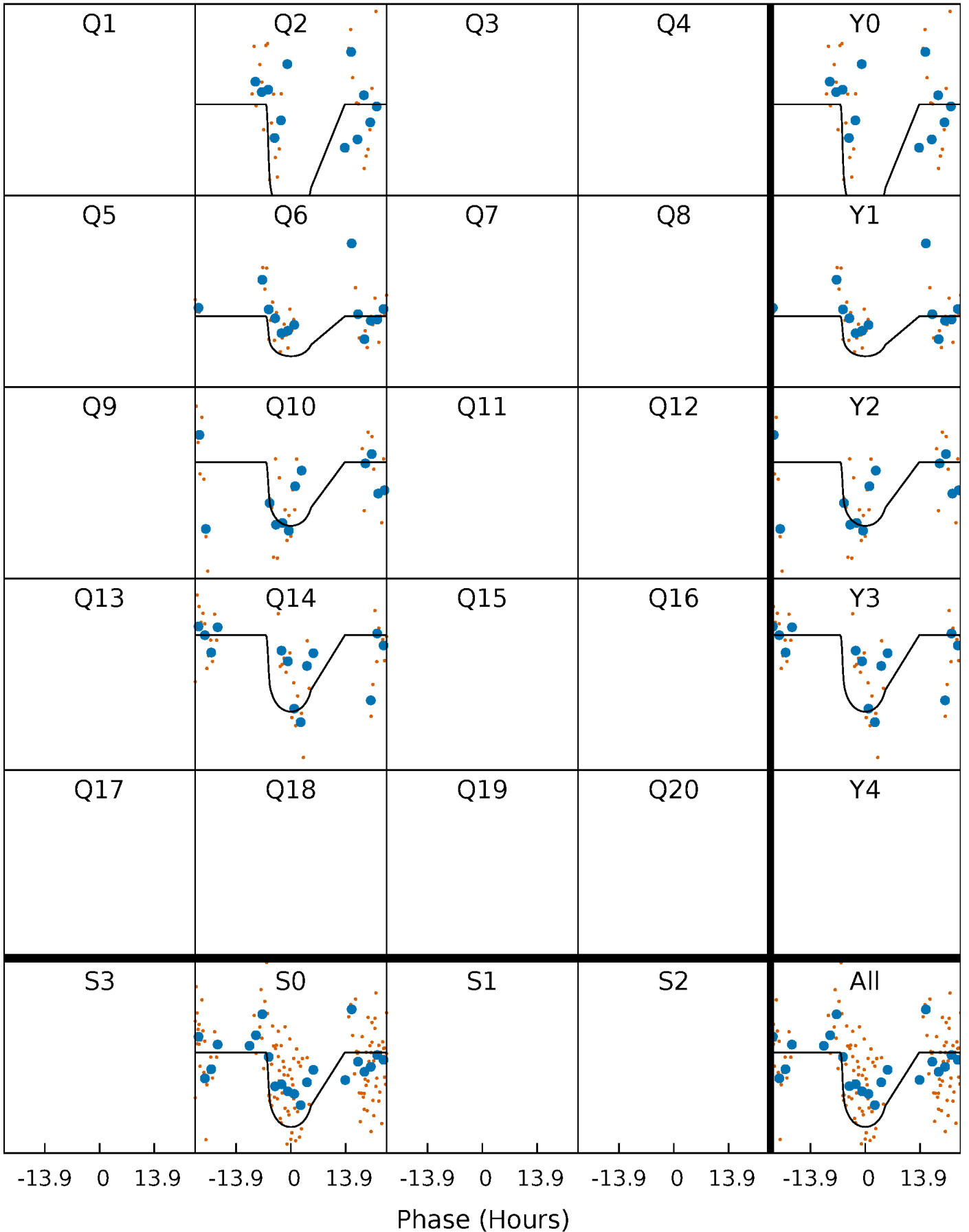
PDC Quarter-Phased Transit Curves

TCE 008416152-02 P=371.329484 Days $T_0=213.964176$ (BKJD)



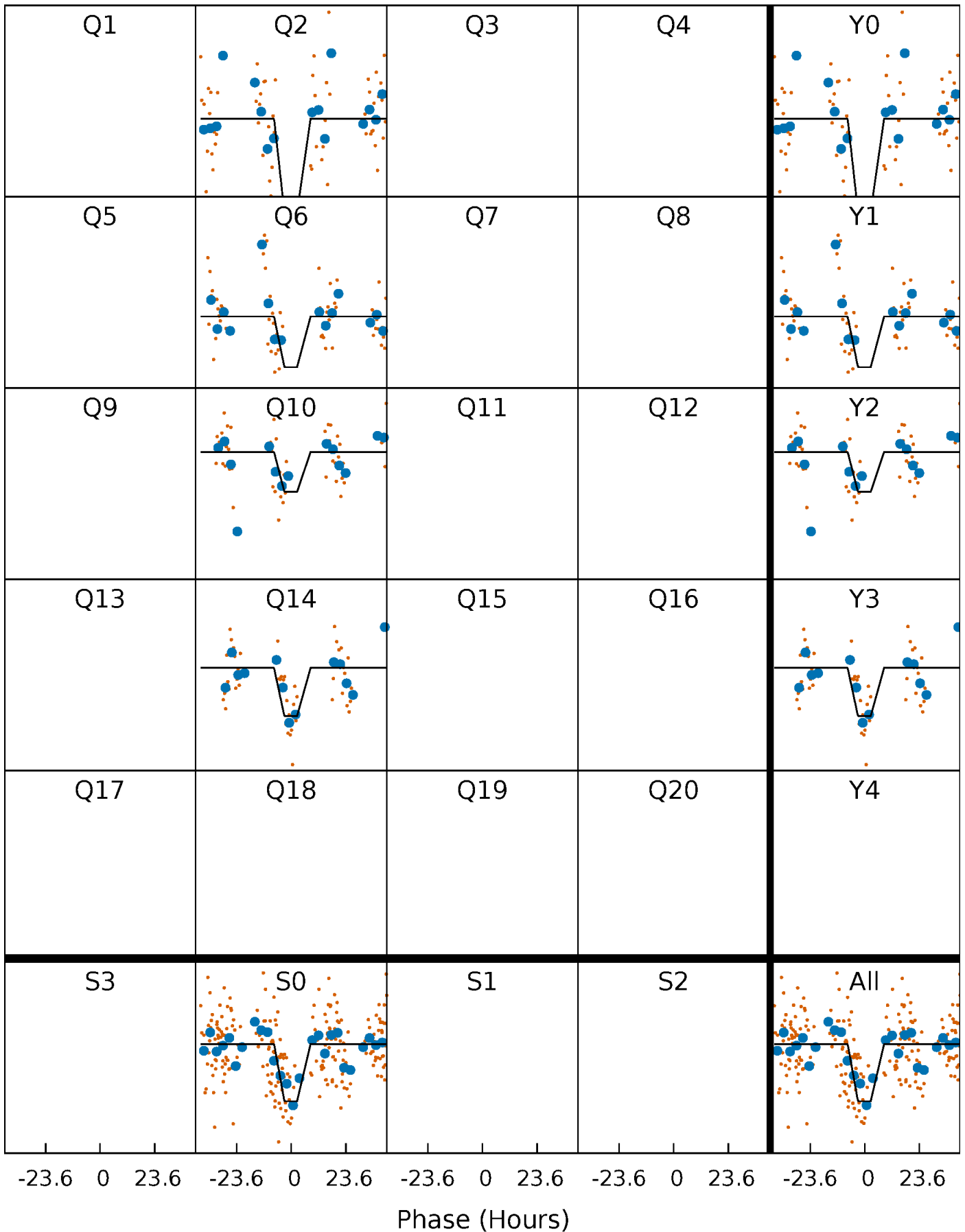
DV Quarter-Phased Transit Curves

TCE 008416152-02 P=371.329484 Days $T_0=213.964176$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

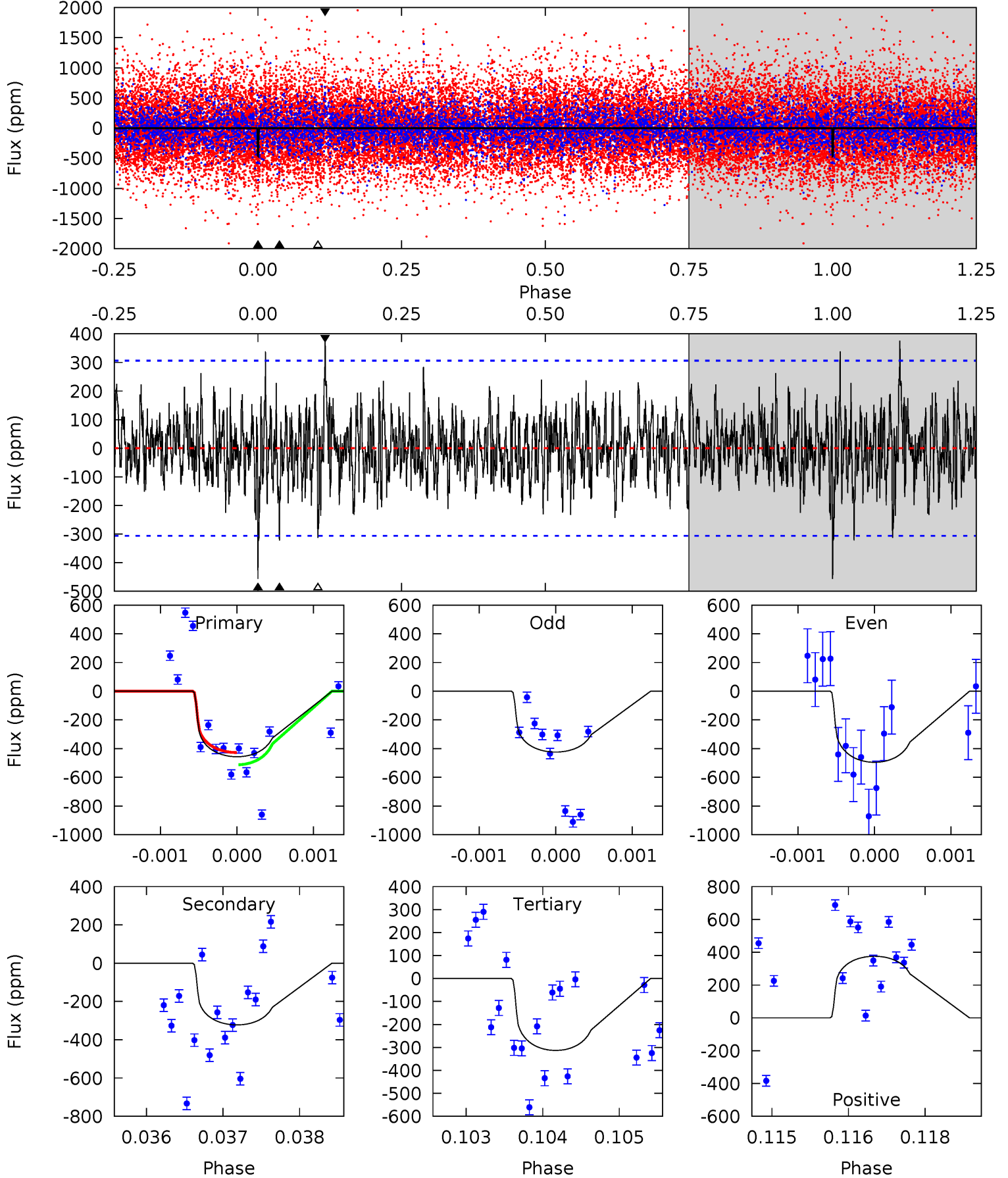
TCE 008416152-02 P=371.291408 Days $T_0=214.186627$ (BKJD)



DV Model-Shift Uniqueness Test

008416152-02, P = 371.329484 Days, E = 213.964176 Days

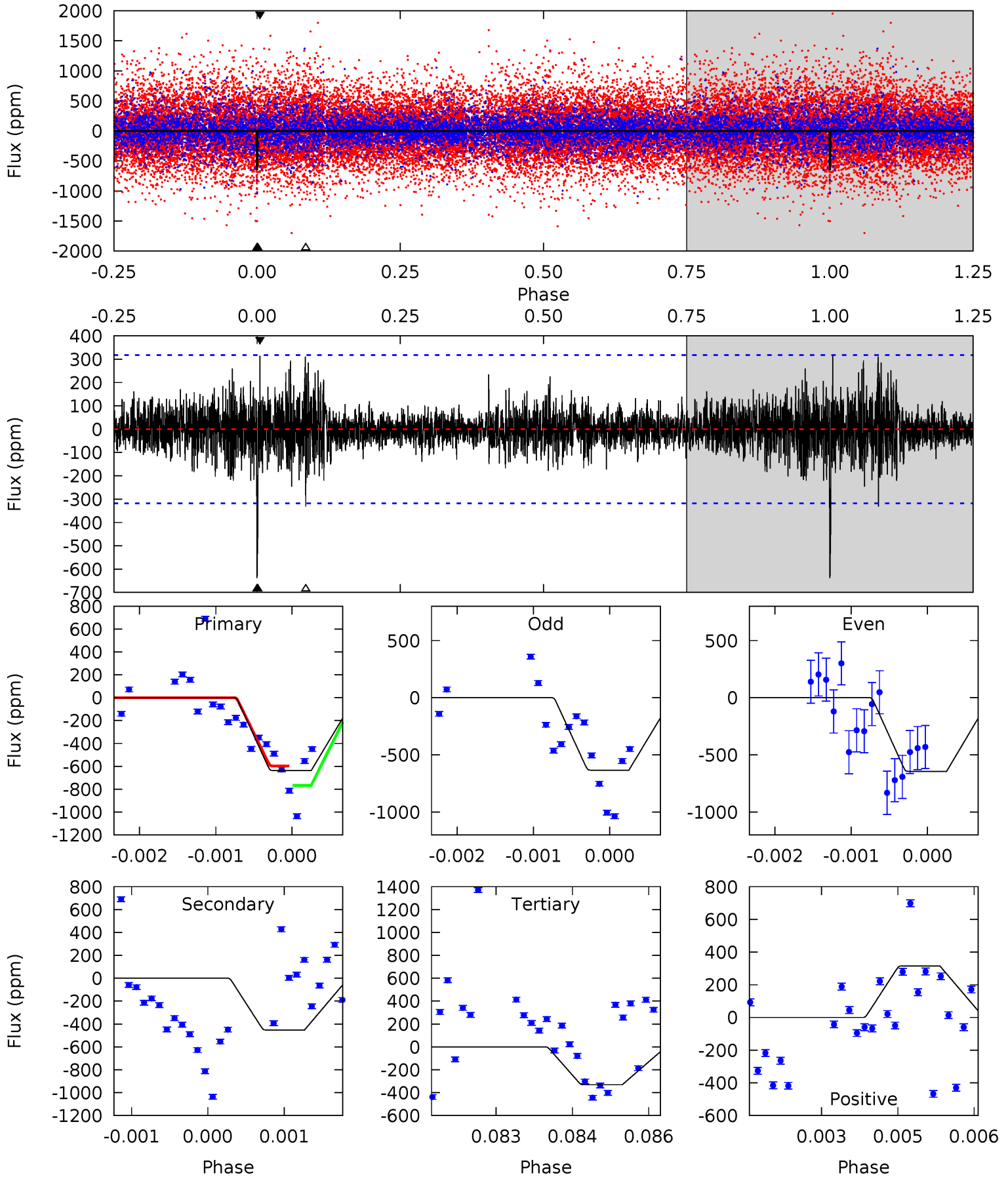
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.07 | 5.70 | 5.54 | 6.63 | 5.41 | 3.23 | 1.61 | 2.53 | 1.43 | 0.16 | -0.94 | 0.63 | 1.00 | 0.45 | 0.70 |



Alt Model-Shift Uniqueness Test

008416152-02, P = 371.291408 Days, E = 214.186627 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|------|
| 10.9 | 7.73 | 5.66 | 5.38 | 5.43 | 3.25 | 1.04 | 5.22 | 5.51 | 2.07 | 2.36 | 0.08 | -0.11 | 0.33 | 0.95 |



Stellar Parameters For KIC 008416152

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5184^{+156}_{-156} | $4.720^{+0.018}_{-0.067}$ | $-1.040^{+0.300}_{-0.300}$ | $0.583^{+0.059}_{-0.025}$ | $0.652^{+0.042}_{-0.042}$ | $4.628^{+0.418}_{-0.995}$ |
| | +3%/-3% | +0%/-1% | +29%/-29% | +10%/-4% | +6%/-6% | +9%/-21% |
| 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 008416152-02 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|---------------|------------------------|-----------------|-----------------------|----------------------------|
| DV | -322 ± 57 | $1.99^{+1.23}_{-1.16}$ | 263^{+9}_{-9} | 4173^{+1921}_{-645} | $34556^{+167691}_{-22204}$ |
| Alt. | -453 ± 59 | $1.85^{+1.23}_{-0.95}$ | 263^{+9}_{-8} | 4565^{+1784}_{-782} | $56029^{+175141}_{-36243}$ |

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 $A_{obs} \gg 1.0$

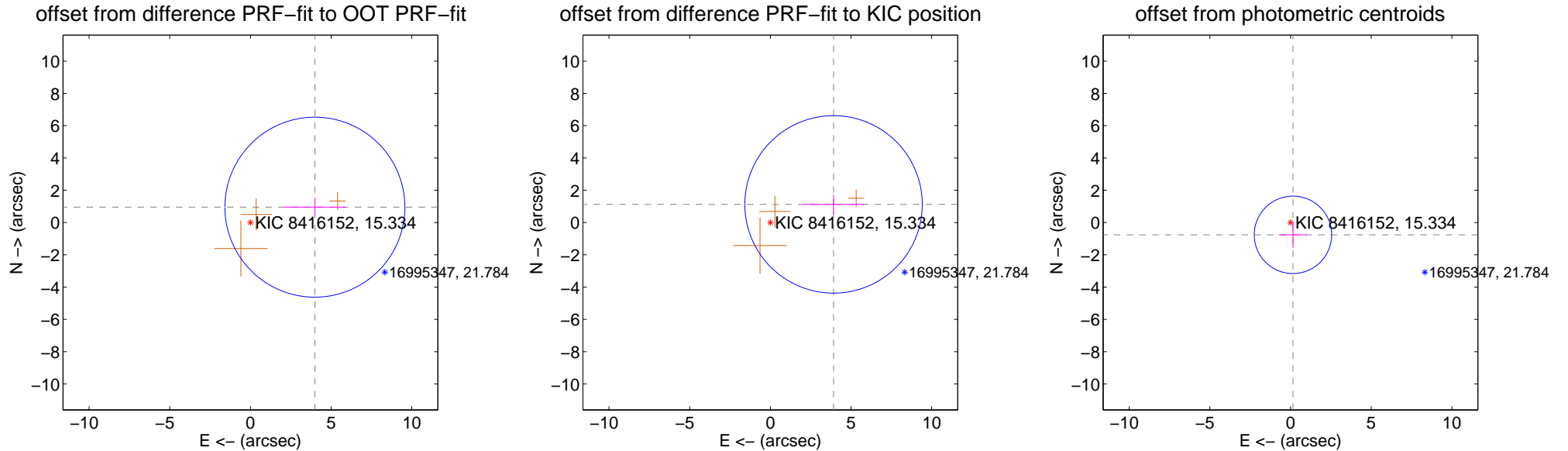
DV Centroid Data

Supplemental centroid analysis for 008416152-02. Kepler magnitude: 15.33. Transit SNR 8.85

There are 0 quarters with good PRF difference image offsets

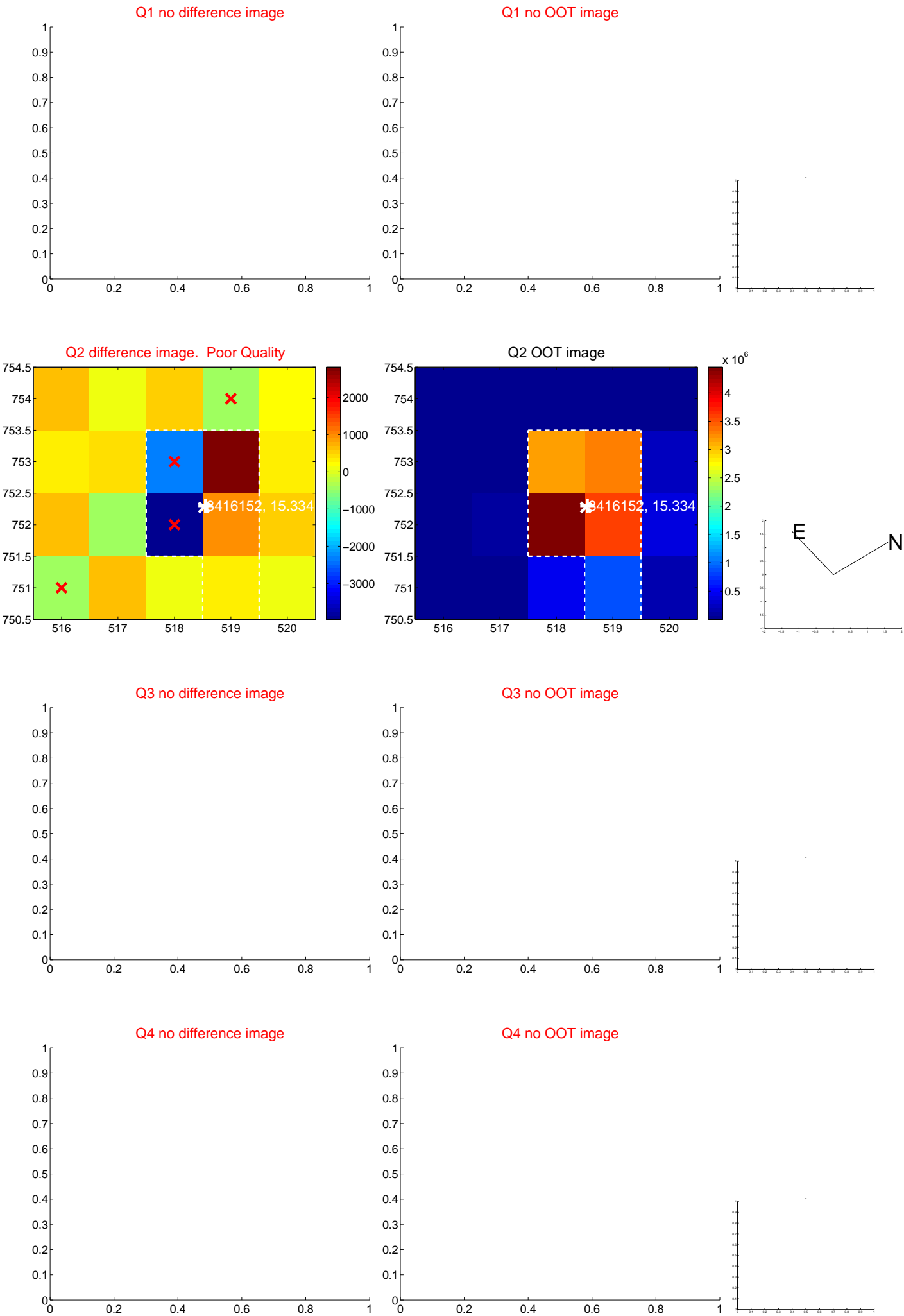
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 4.104 ± 1.859 | 2.21 | -3.992 ± 1.905 | 0.951 ± 0.605 |
| PRF-fit source offset from KIC position | 4.074 ± 1.832 | 2.22 | -3.916 ± 1.898 | 1.123 ± 0.601 |
| photometric centroid source offset | 0.78 ± 0.80 | 0.97 | -0.15 ± 0.88 | -0.76 ± 0.80 |

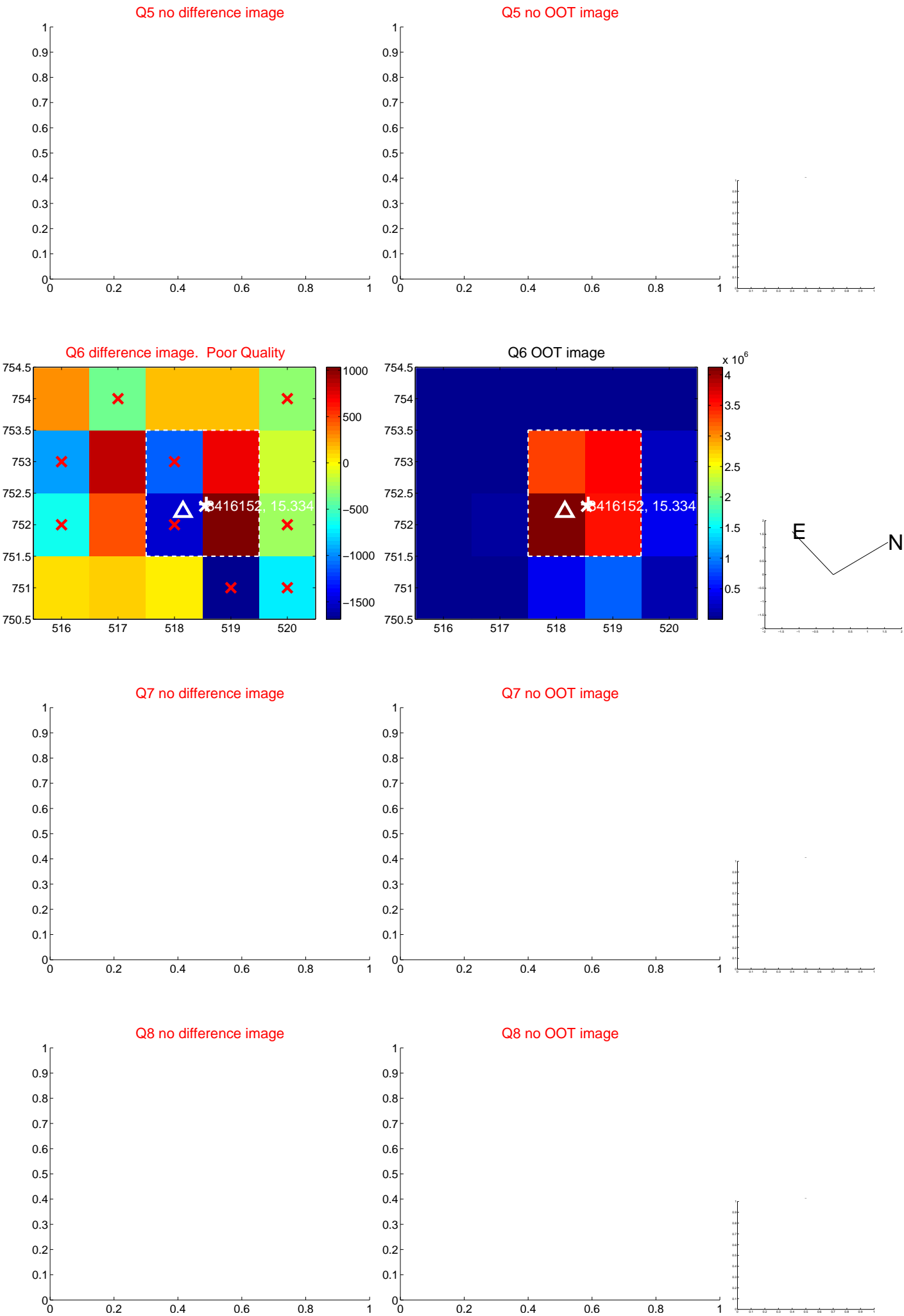


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

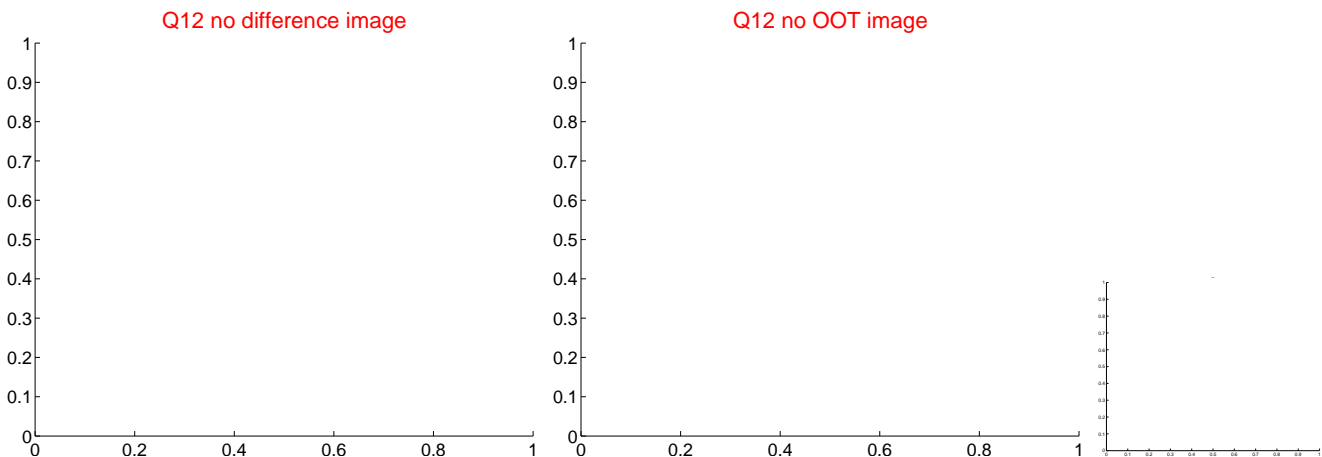
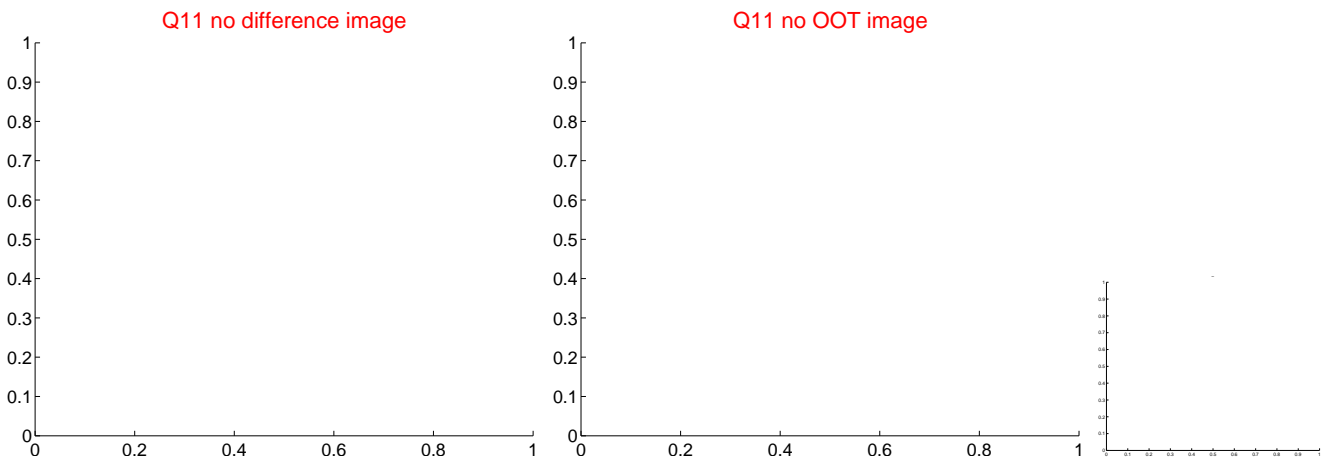
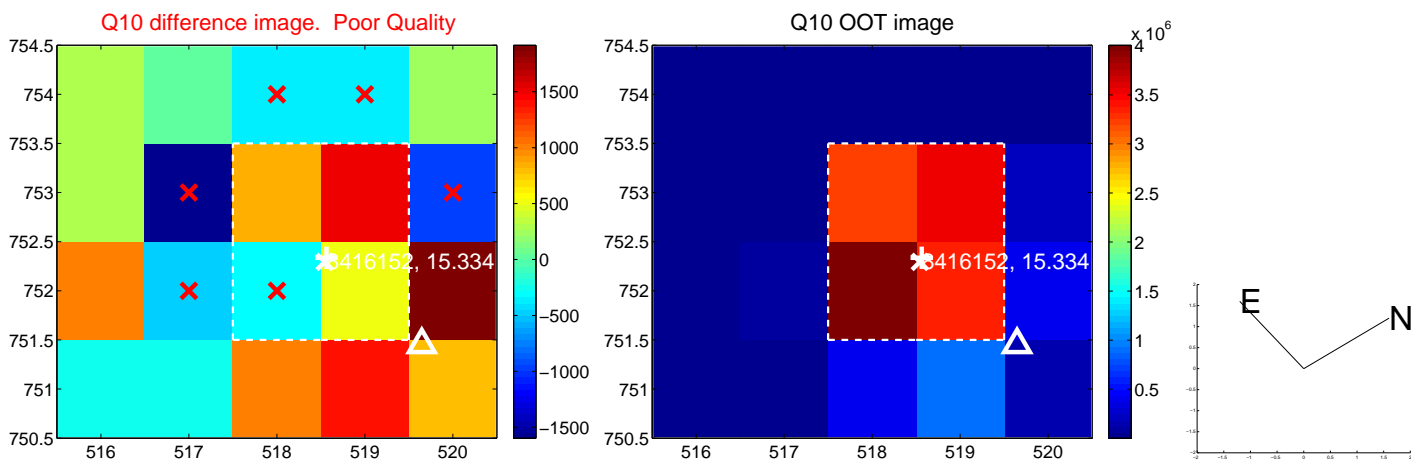
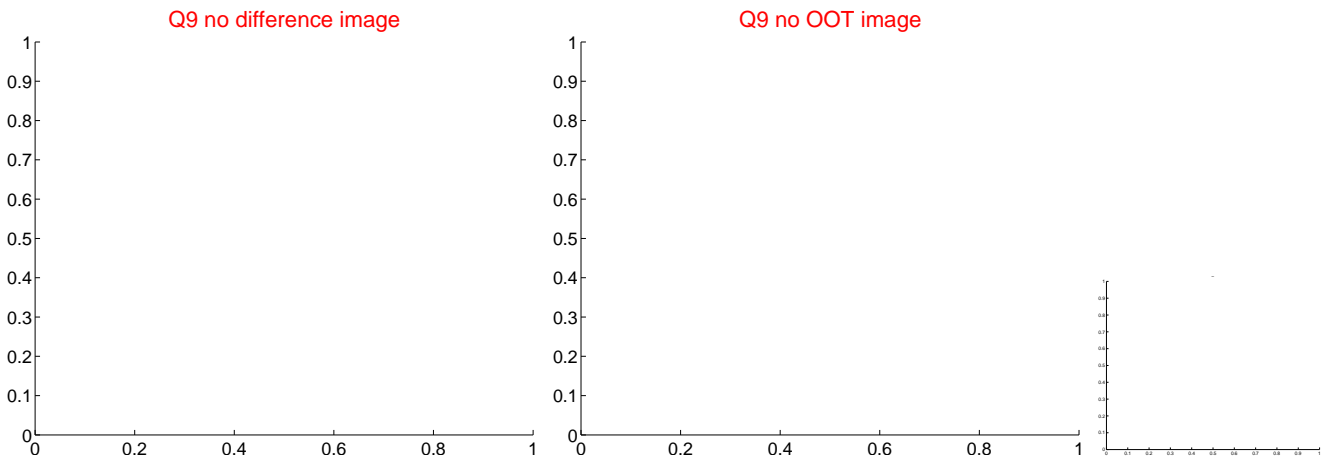
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



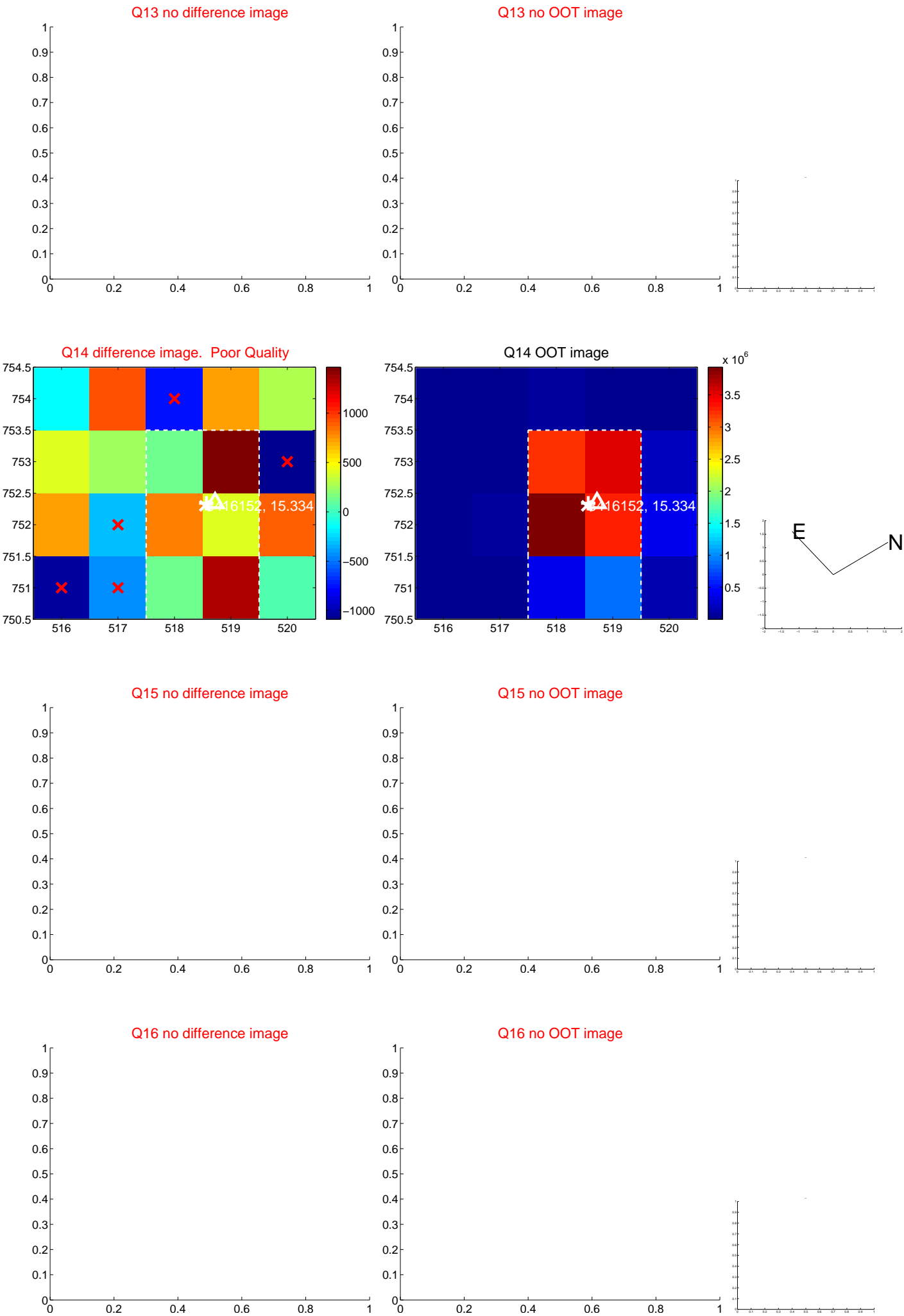
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



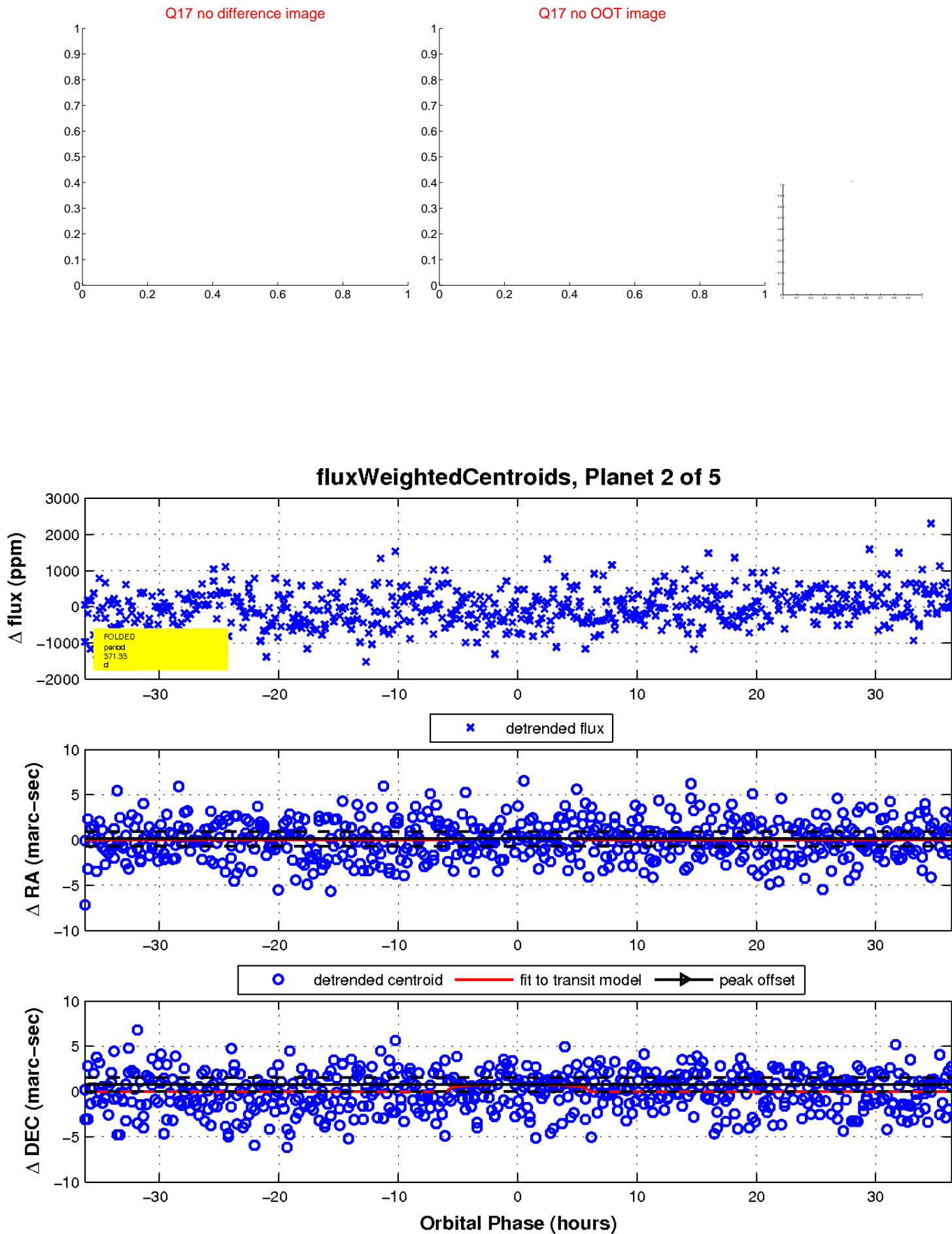
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

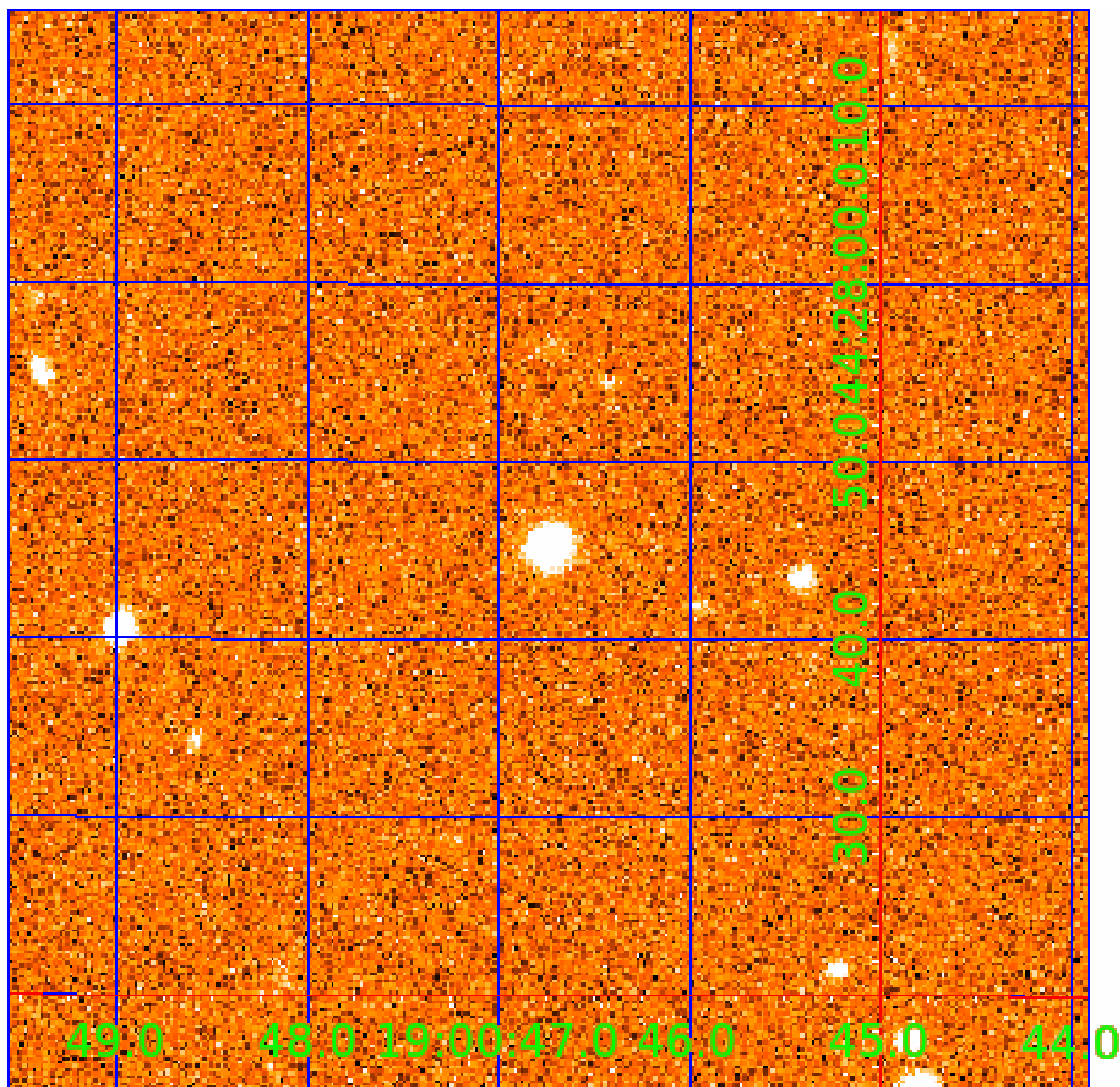


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008416152

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 008416152-01 | OBS | No | 0.990458 | 132.010365 | 40.3 | 4.749 | 9.1 | 8.1 | 0.58 | 5184 | 0.39 | 774.26 |
| 008416152-02 | OBS | No | 371.329484 | 213.964176 | 844.2 | 12.152 | 13.1 | 8.9 | 0.58 | 5184 | 1.76 | 0.29 |
| 008416152-03 | OBS | No | 288.379325 | 337.482279 | 646.7 | 14.796 | 8.9 | 6.7 | 0.58 | 5184 | 1.80 | 0.40 |
| 008416152-04 | OBS | No | 635.901480 | 226.613152 | 682.5 | 7.126 | 7.7 | 7.3 | 0.58 | 5184 | 1.59 | 0.14 |
| 008416152-05 | OBS | No | 210.555156 | 167.547527 | 637.7 | 7.840 | 7.4 | 6.2 | 0.58 | 5184 | 1.56 | 0.61 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 008416152-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | LPP_DV |
| 008416152-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—CENT_FEW_DIFFS |
| 008416152-05 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

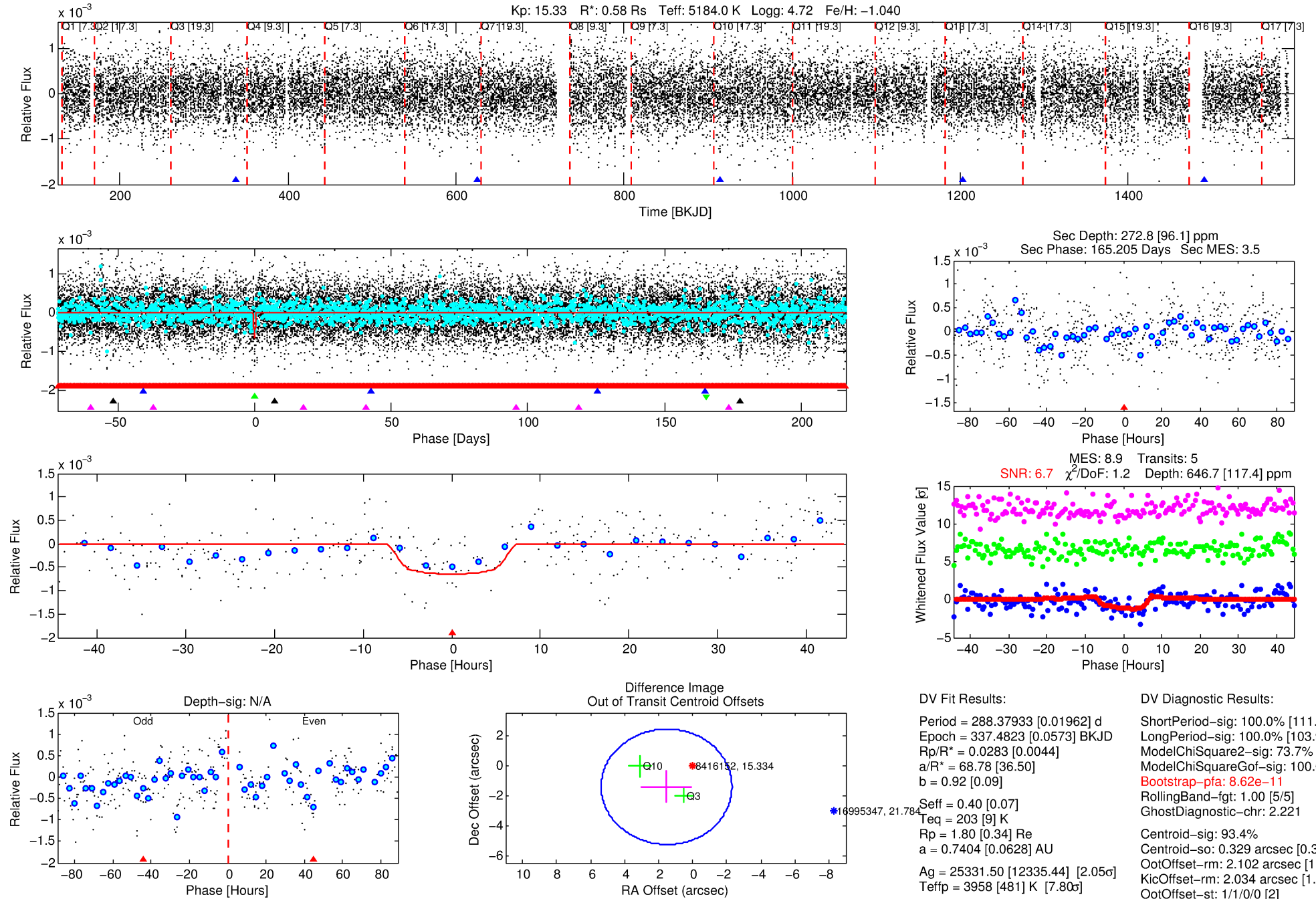
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008416152-03

No Significant Match Found

DV One-Page Summary

KIC: 8416152 Candidate: 3 of 5 Period: 288.379 d



DV Fit Results:

Period = 288.37933 [0.01962] d
Epoch = 337.4823 [0.0573] BKJD
Rp/R* = 0.0283 [0.0044]
a/R* = 68.78 [36.50]
b = 0.92 [0.09]
Seff = 0.40 [0.07]
Teq = 203 [9] K
Rp = 1.80 [0.34] Re
a = 0.7404 [0.0628] AU
Ag = 25331.50 [12335.44] [2.05] σ
Teffp = 3958 [481] K [7.80] σ

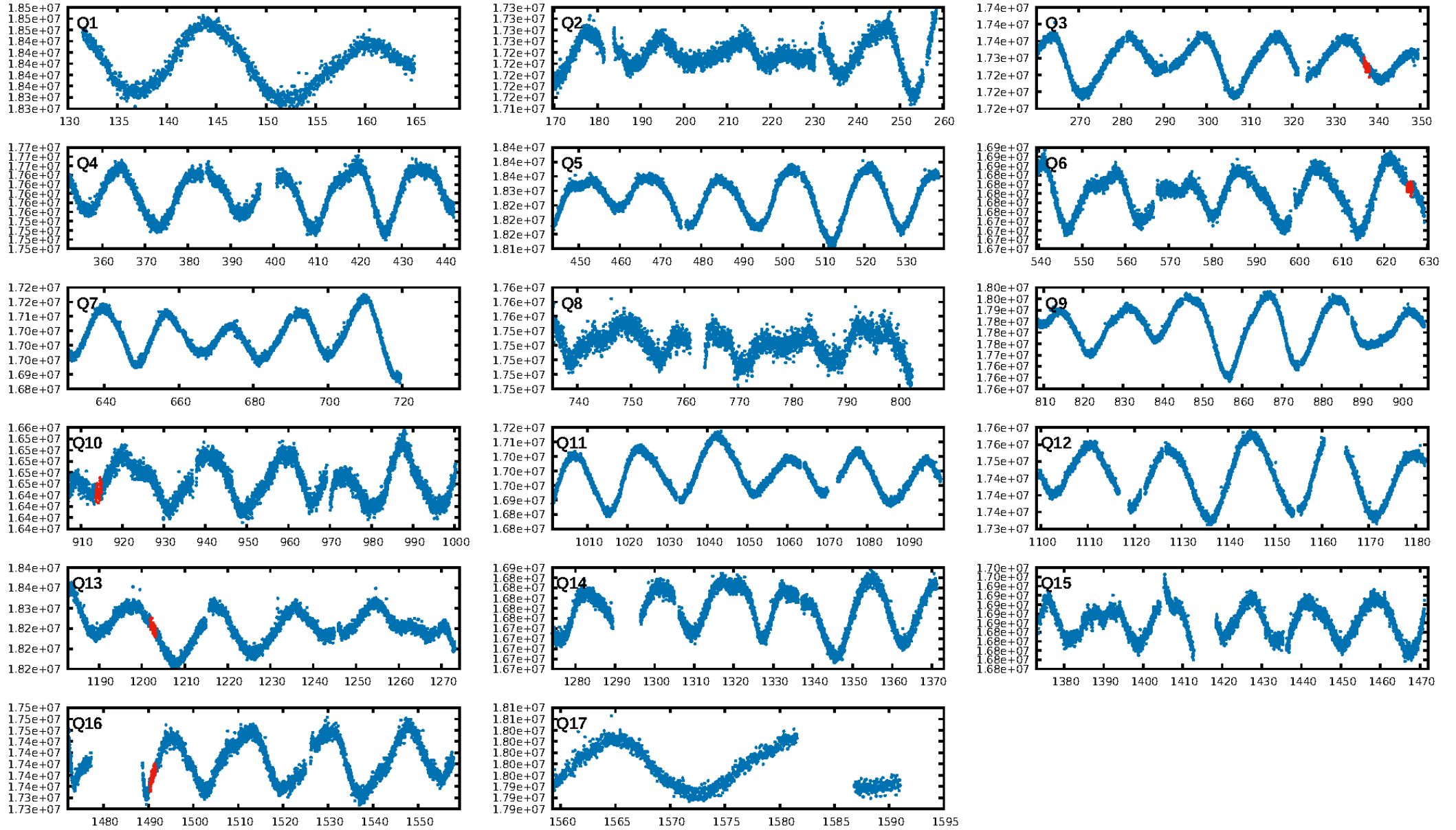
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [111.54] σ
LongPeriod-sig: 100.0% [103.97] σ
ModelChiSquare2-sig: 73.7%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 8.62e-11
RollingBand-fgt: 1.00 [5/5]
GhostDiagnostic-chr: 2.221
Centroid-sig: 93.4%
Centroid-so: 0.329 arcsec [0.37] σ
OotOffset-rm: 2.102 arcsec [1.64] σ
KicOffset-rm: 2.034 arcsec [1.57] σ
OotOffset-st: 1/1/0/0 [2]
KicOffset-st: 1/1/0/0 [2]
DiffImageQuality-fgm: 1.00 [2/2]
DiffImageOverlap-fno: 0.00 [0/5]

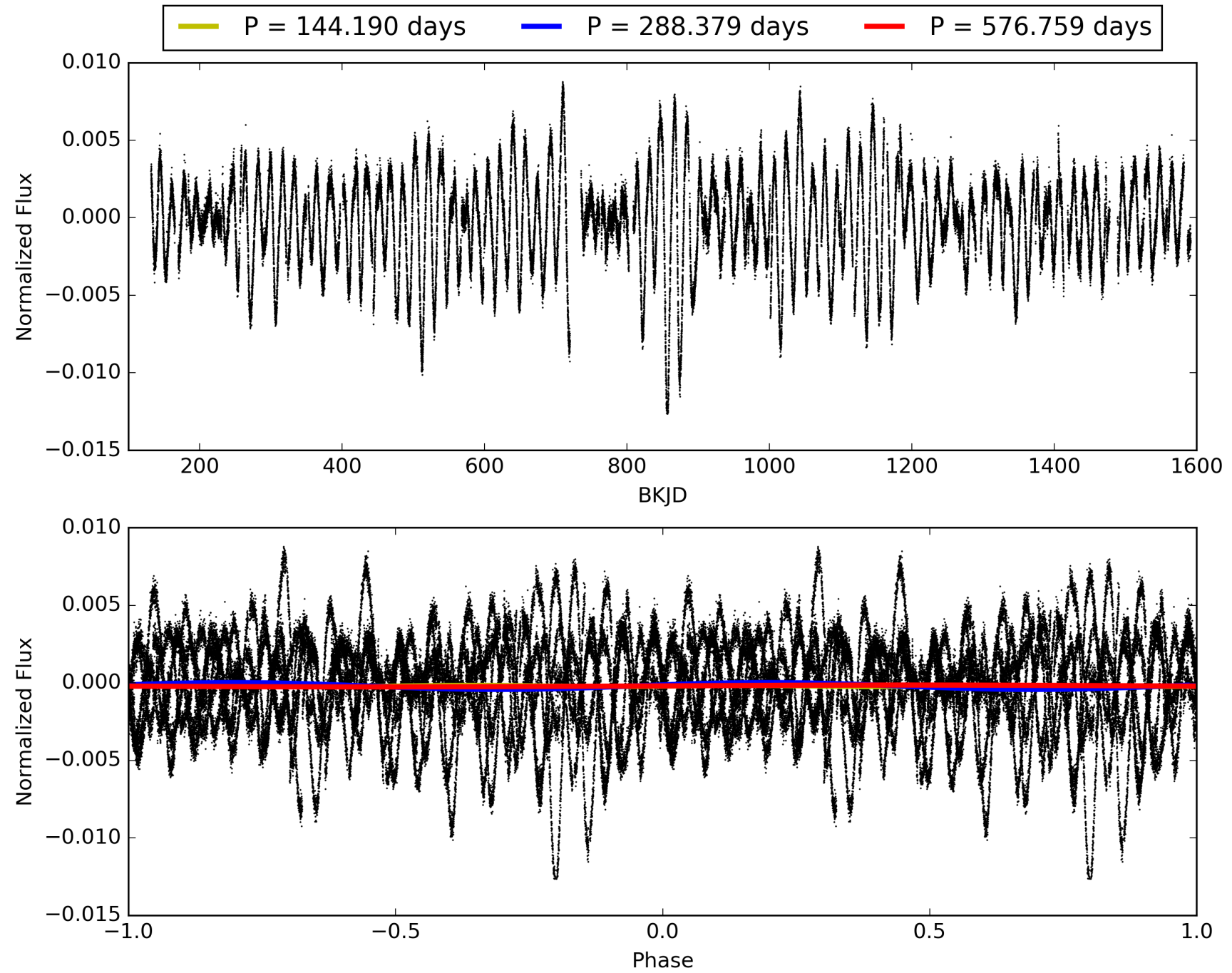
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:06:57 Z

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

TCE 008416152-03, PDC Light Curves

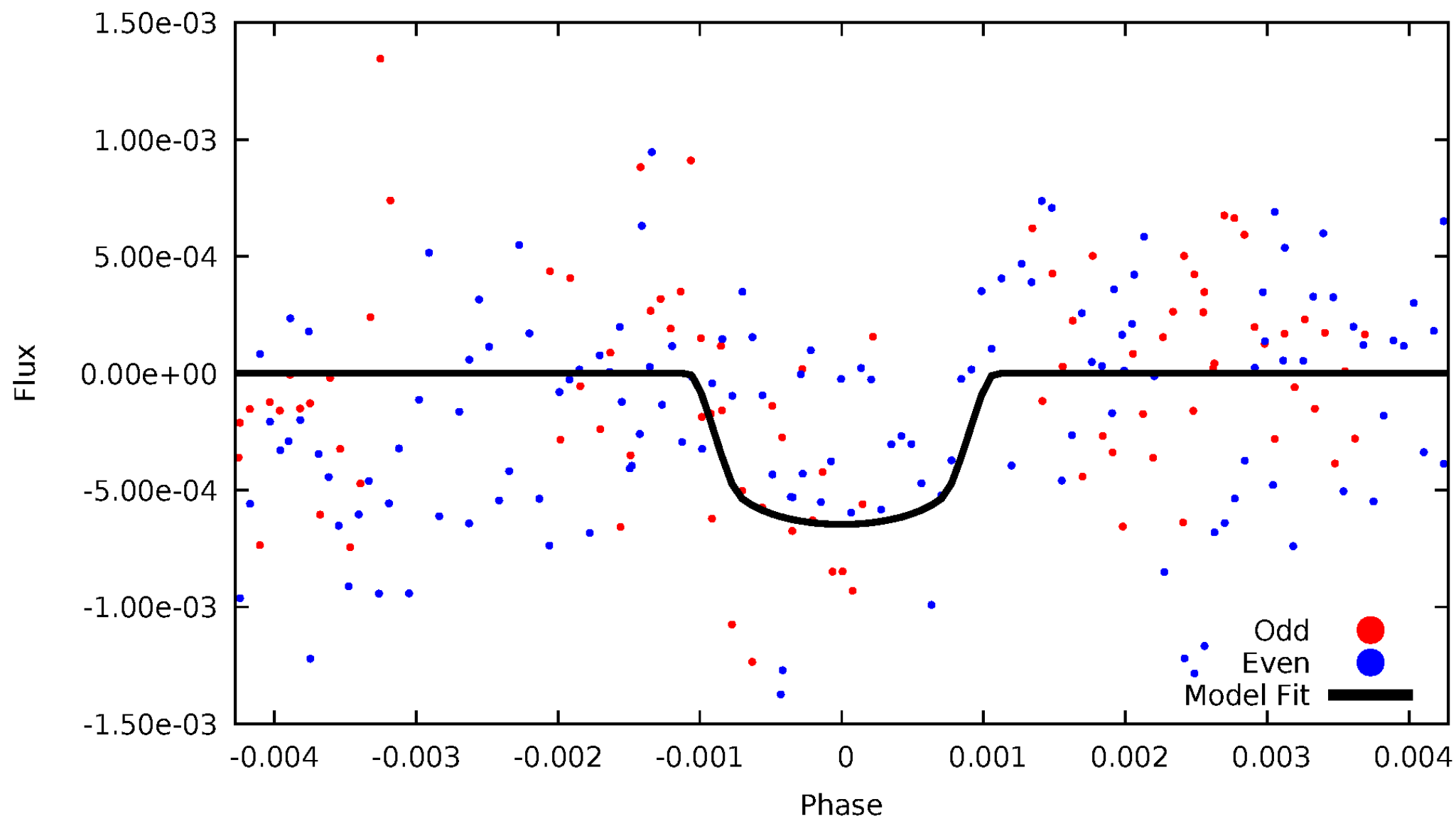


TCE 008416152-03



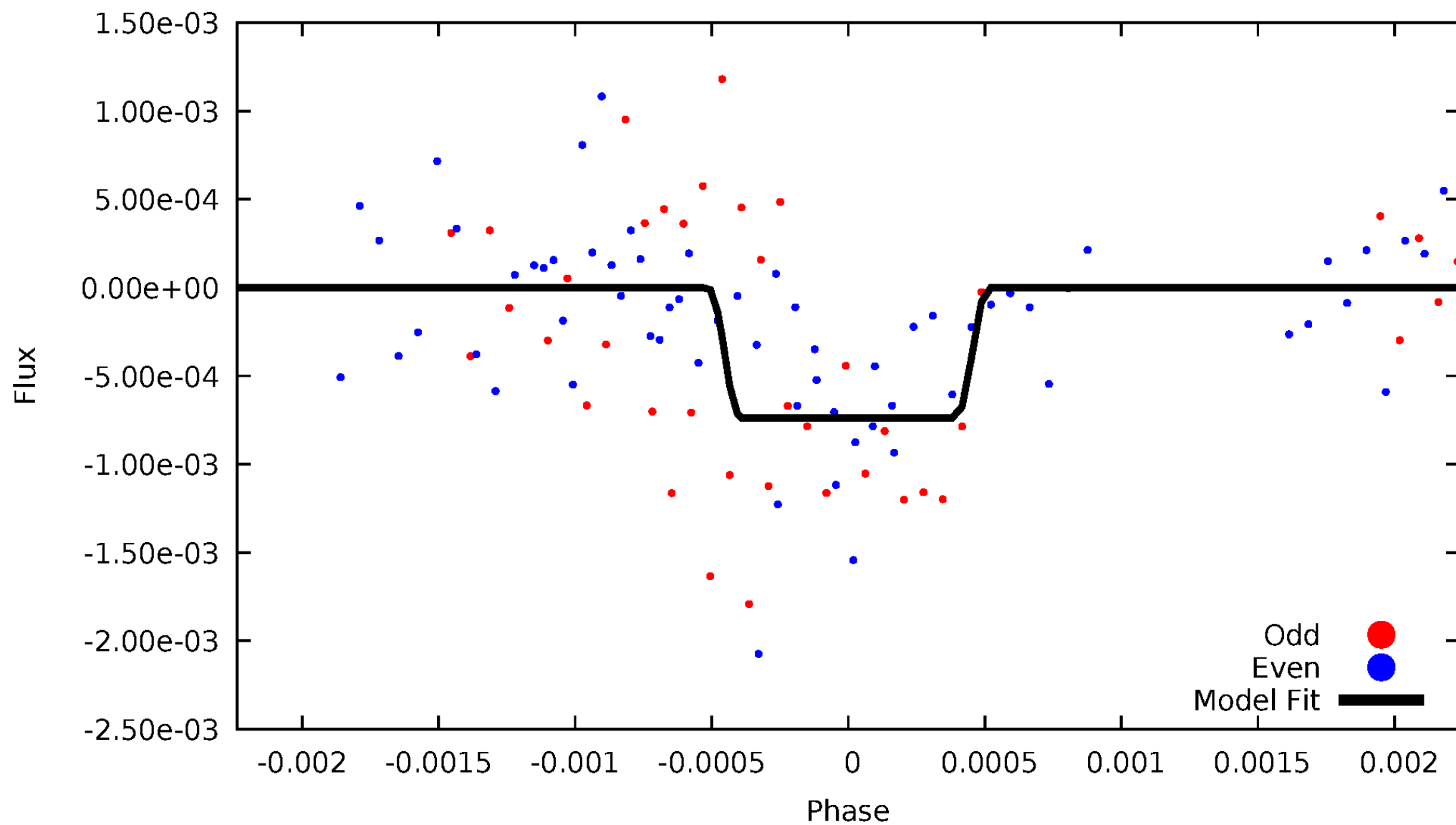
DV Odd/Even

TCE 008416152-03

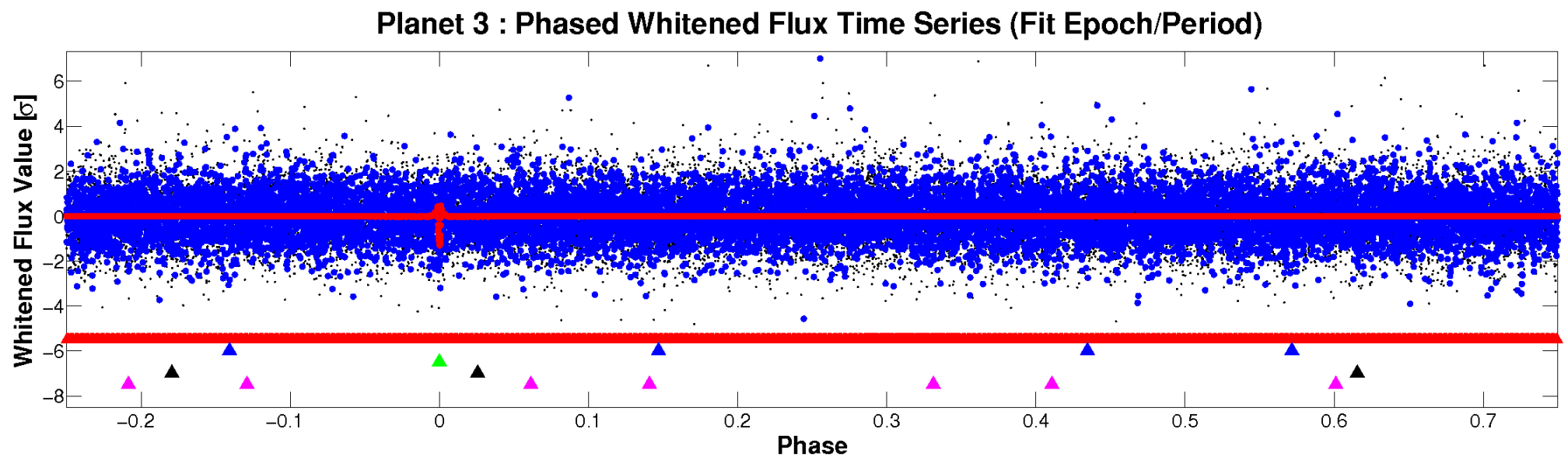
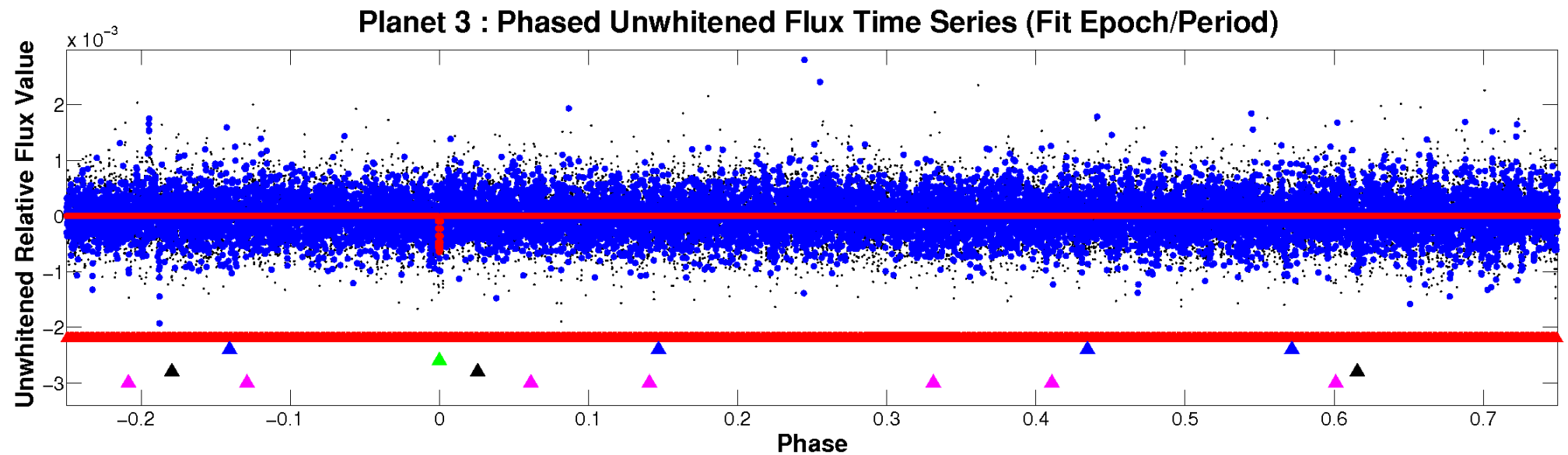


ALT Odd/Even

TCE 008416152-03

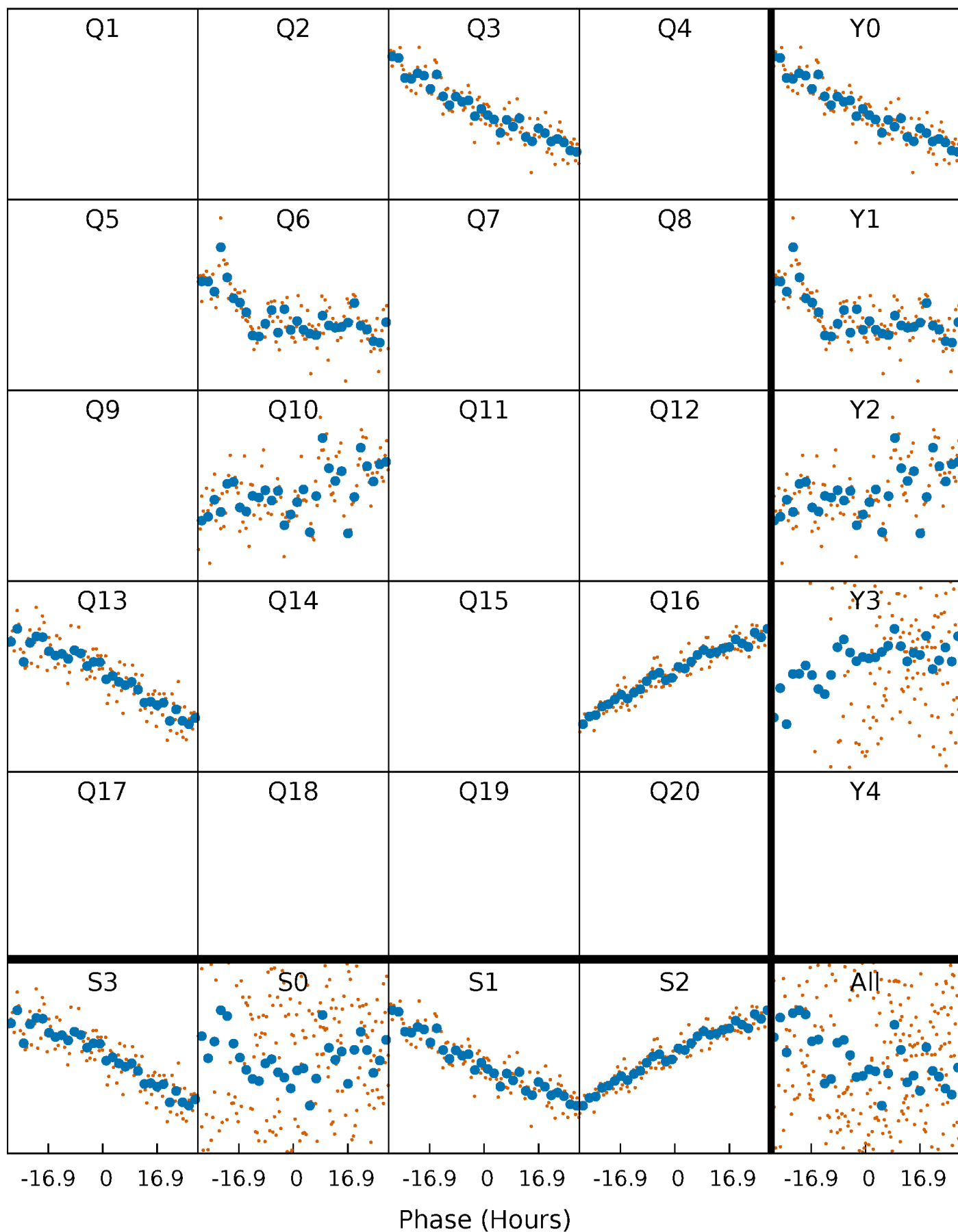


Non-Whitened Vs. Whitened Light Curve



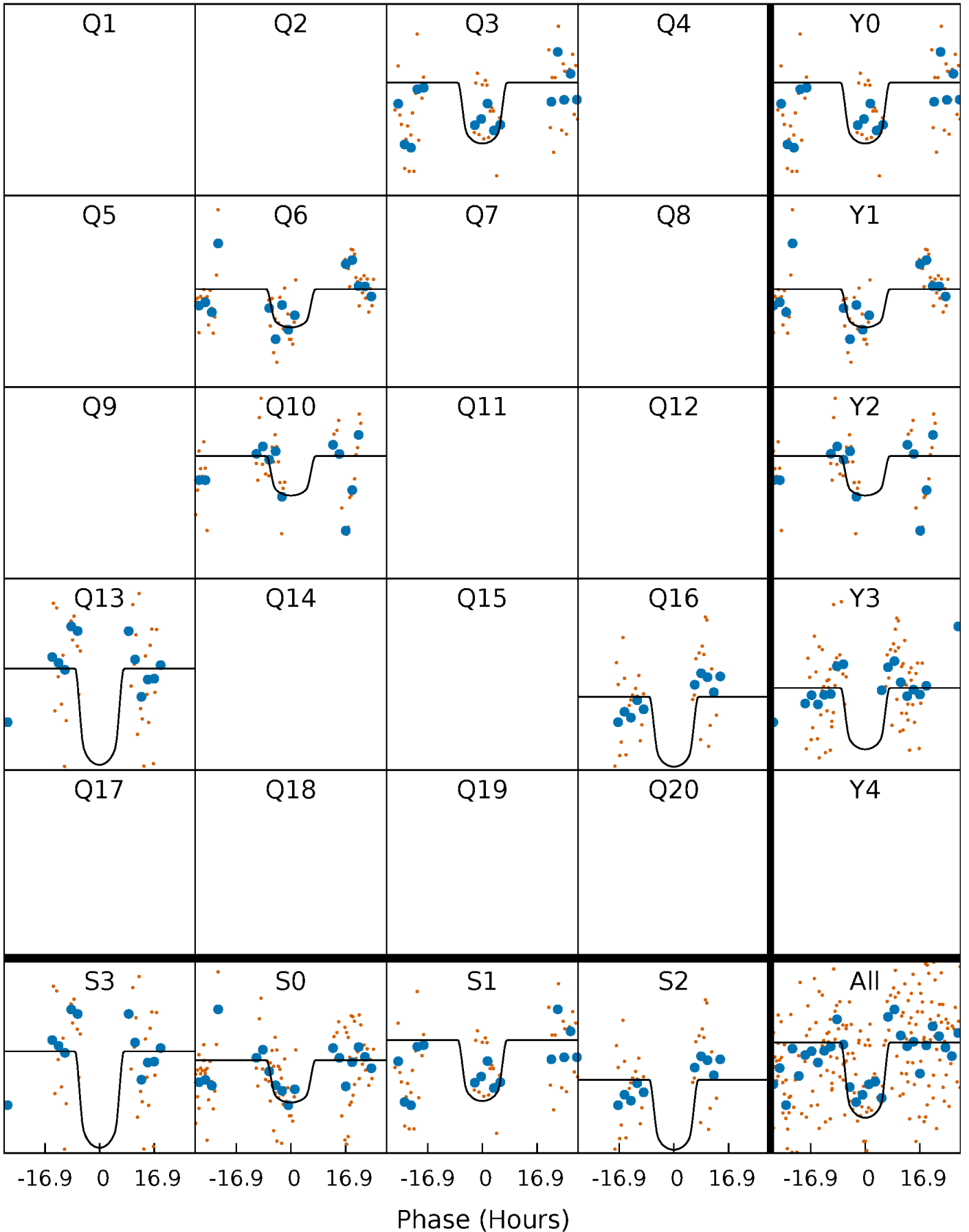
PDC Quarter-Phased Transit Curves

TCE 008416152-03 P=288.379325 Days $T_0=337.482279$ (BKJD)



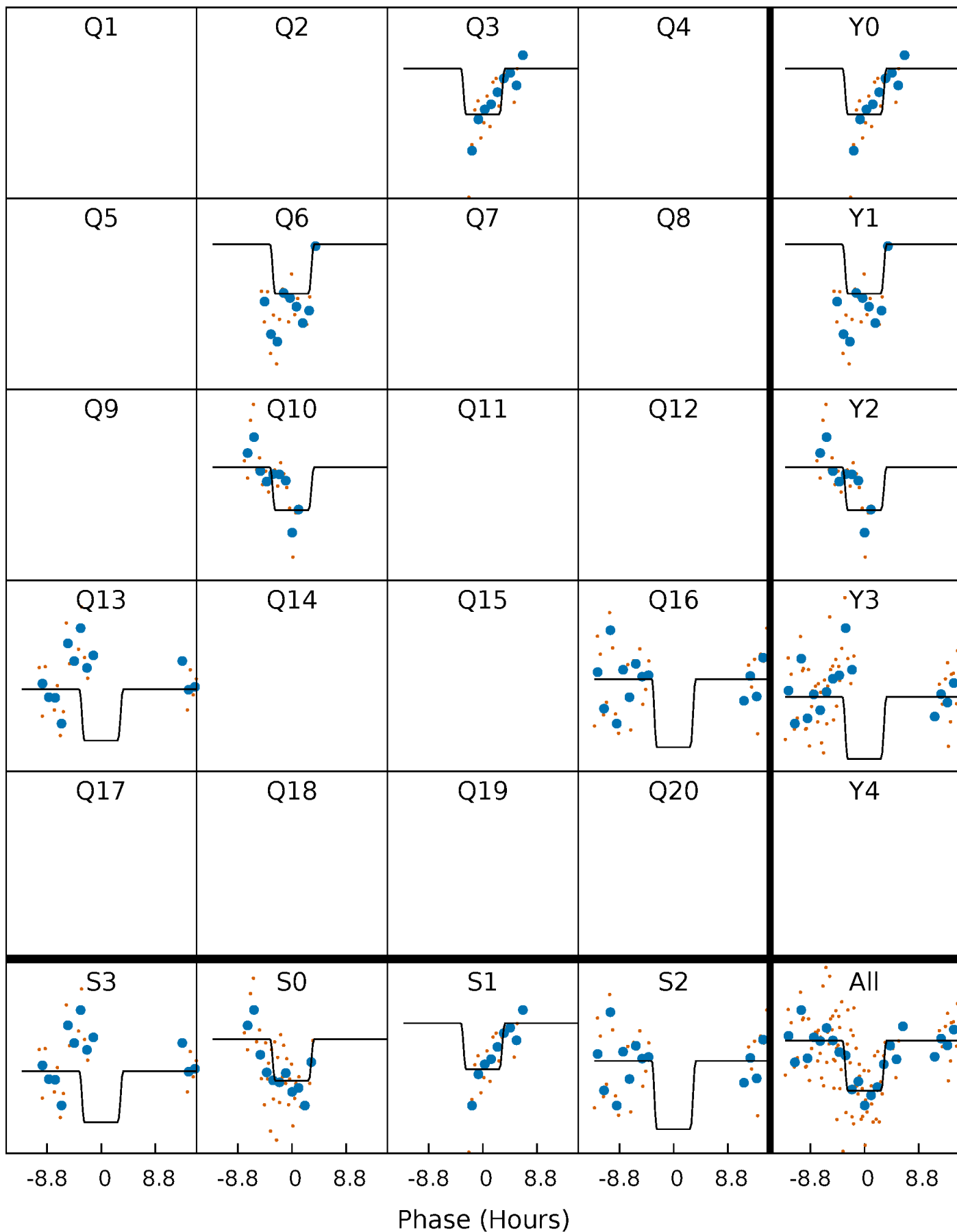
DV Quarter-Phased Transit Curves

TCE 008416152-03 P=288.379325 Days $T_0=337.482279$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

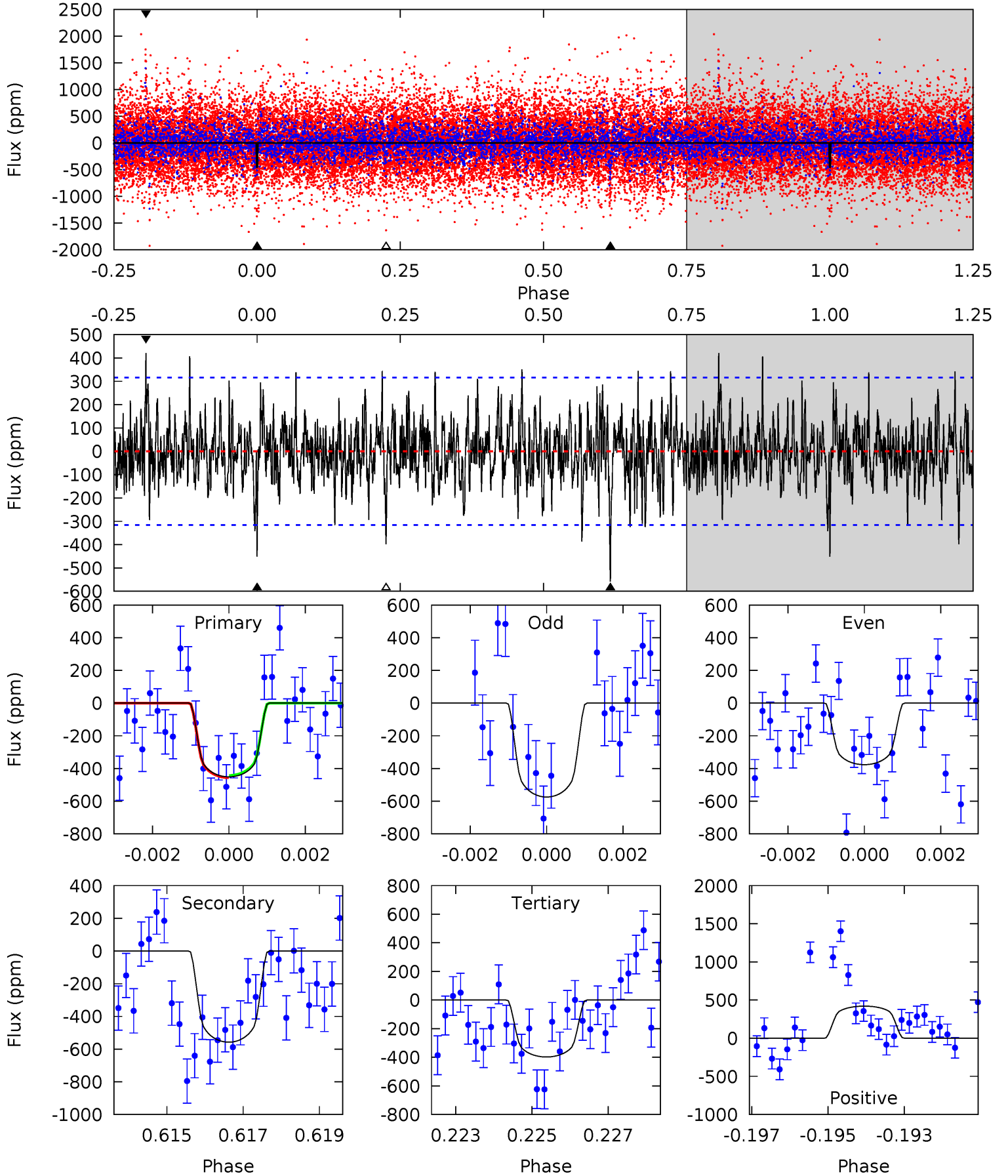
TCE 008416152-03 P=288.331154 Days $T_0=337.453049$ (BKJD)



DV Model-Shift Uniqueness Test

008416152-03, $P = 288.379325$ Days, $E = 49.102954$ Days

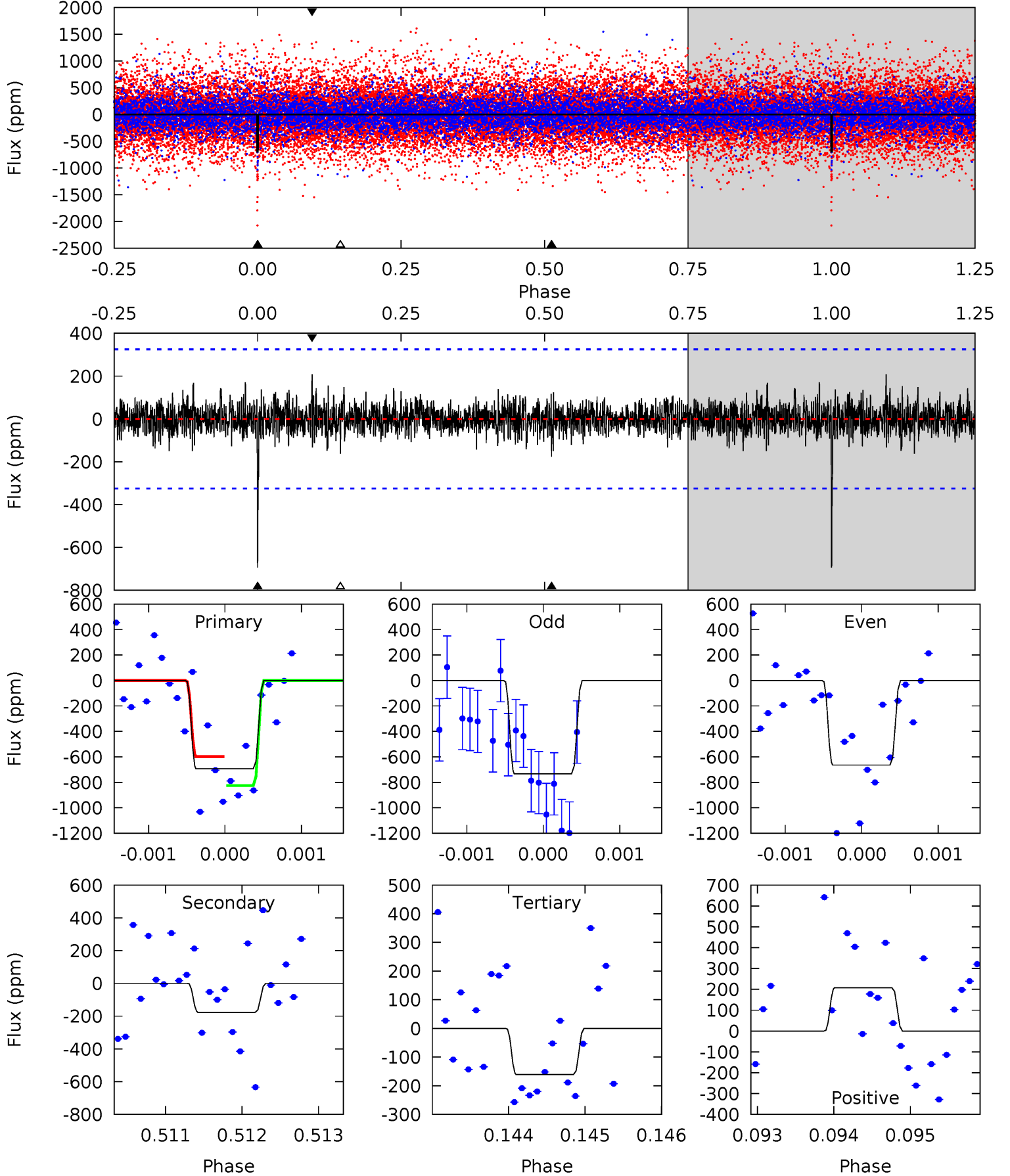
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.59 | 9.38 | 6.70 | 7.08 | 5.32 | 3.07 | 1.87 | 0.90 | 0.52 | 2.69 | 2.31 | 1.65 | 0.70 | 0.43 | 0.11 |



Alt Model-Shift Uniqueness Test

008416152-03, P = 288.331154 Days, E = 49.121895 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 11.6 | 2.96 | 2.70 | 3.48 | 5.45 | 3.28 | 0.74 | 8.93 | 8.15 | 0.26 | -0.52 | 0.58 | 0.71 | 0.23 | 1.89 |



Stellar Parameters For KIC 008416152

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | $M(M_{\odot})$ | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5184^{+156}_{-156} | $4.720^{+0.018}_{-0.067}$ | $-1.040^{+0.300}_{-0.300}$ | $0.583^{+0.059}_{-0.025}$ | $0.652^{+0.042}_{-0.042}$ | $4.628^{+0.418}_{-0.995}$ |
| | +3%/-3% | +0%/-1% | +29%/-29% | +10%/-4% | +6%/-6% | +9%/-21% |
| 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 008416152-03 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|---------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -558 ± 59 | $1.83^{+0.30}_{-0.28}$ | 286^{+10}_{-9} | 4801^{+389}_{-317} | 49495^{+20621}_{-13221} |
| Alt. | -177 ± 60 | $1.76^{+0.28}_{-0.30}$ | 286^{+10}_{-9} | 3942^{+367}_{-351} | 17190^{+10235}_{-6802} |

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

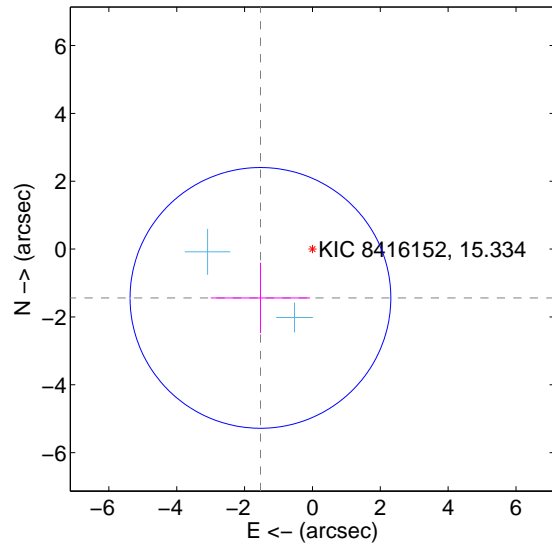
Supplemental centroid analysis for 008416152-03. Kepler magnitude: 15.33. Transit SNR 6.69

There are 2 quarters with good PRF difference image offsets

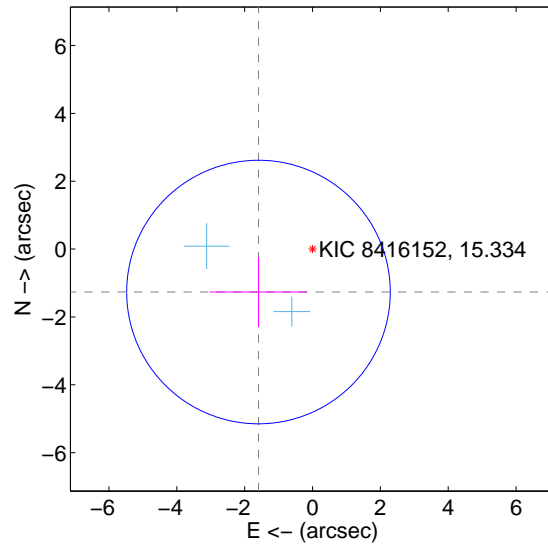
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 2.102 ± 1.281 | 1.64 | 1.533 ± 1.462 | -1.438 ± 1.037 |
| PRF-fit source offset from KIC position | 2.034 ± 1.295 | 1.57 | 1.593 ± 1.436 | -1.266 ± 1.033 |
| photometric centroid source offset | 0.33 ± 0.88 | 0.37 | -0.13 ± 0.92 | 0.30 ± 0.87 |

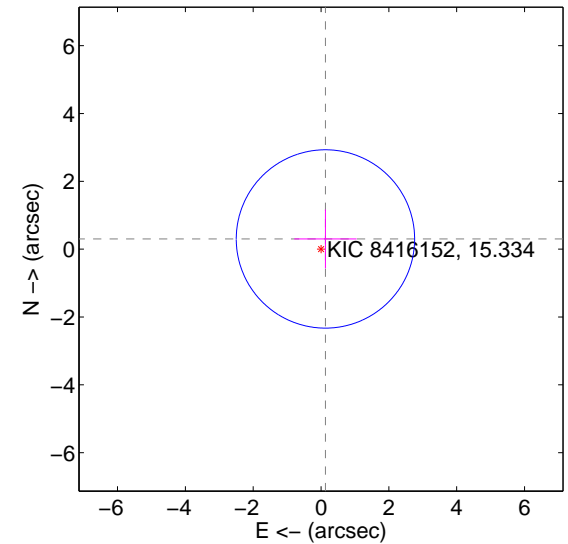
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

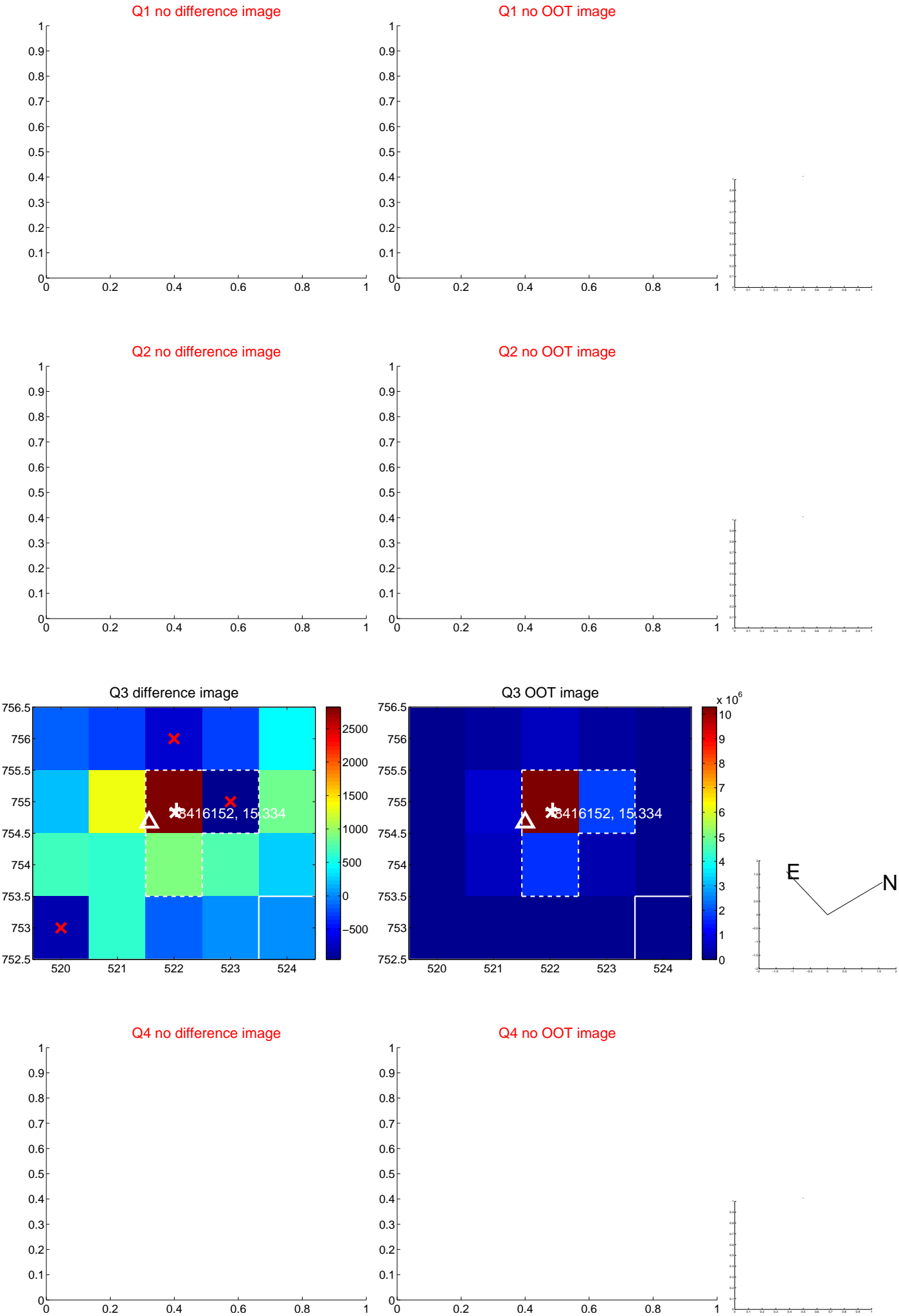


offset from photometric centroids

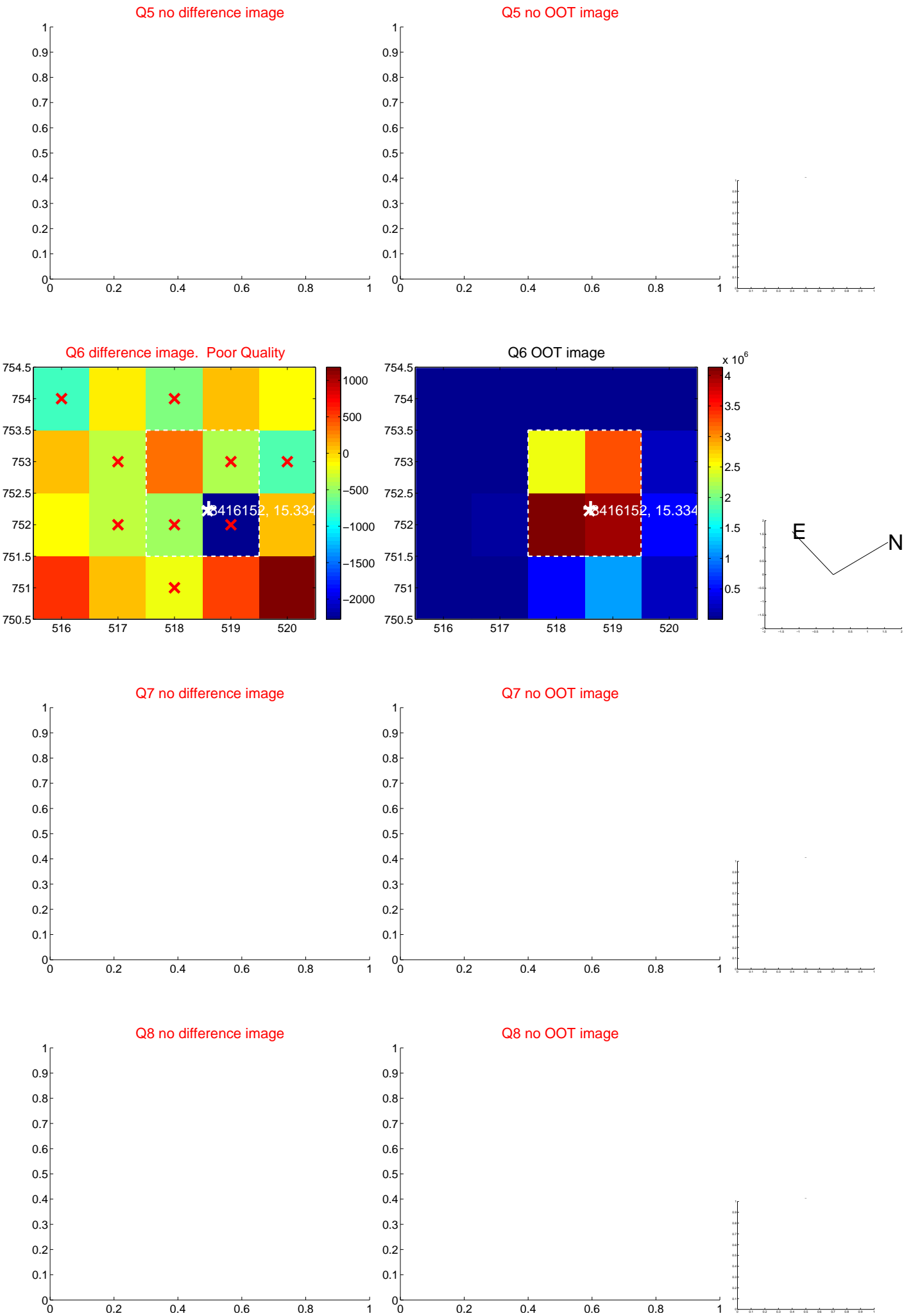


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

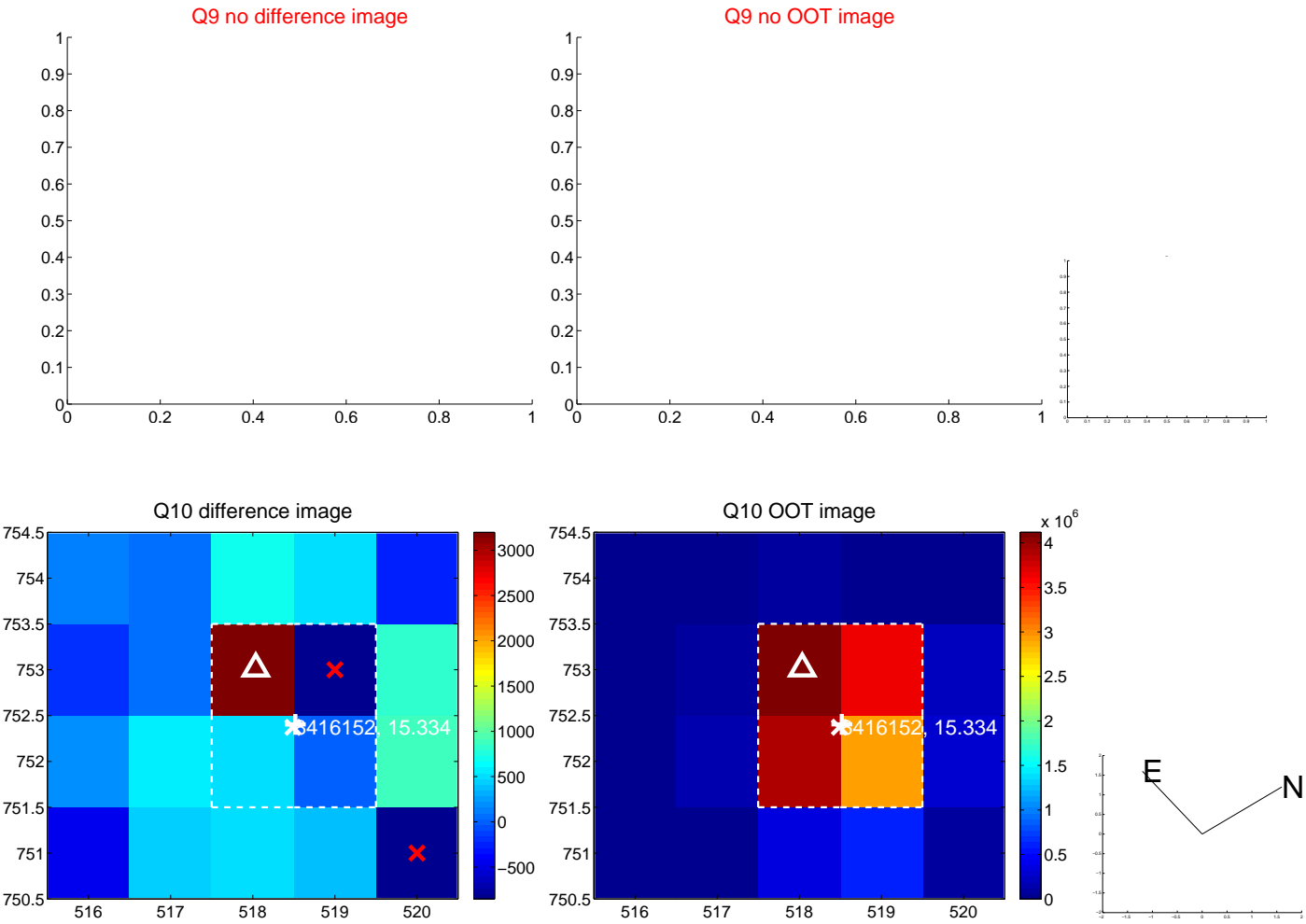
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



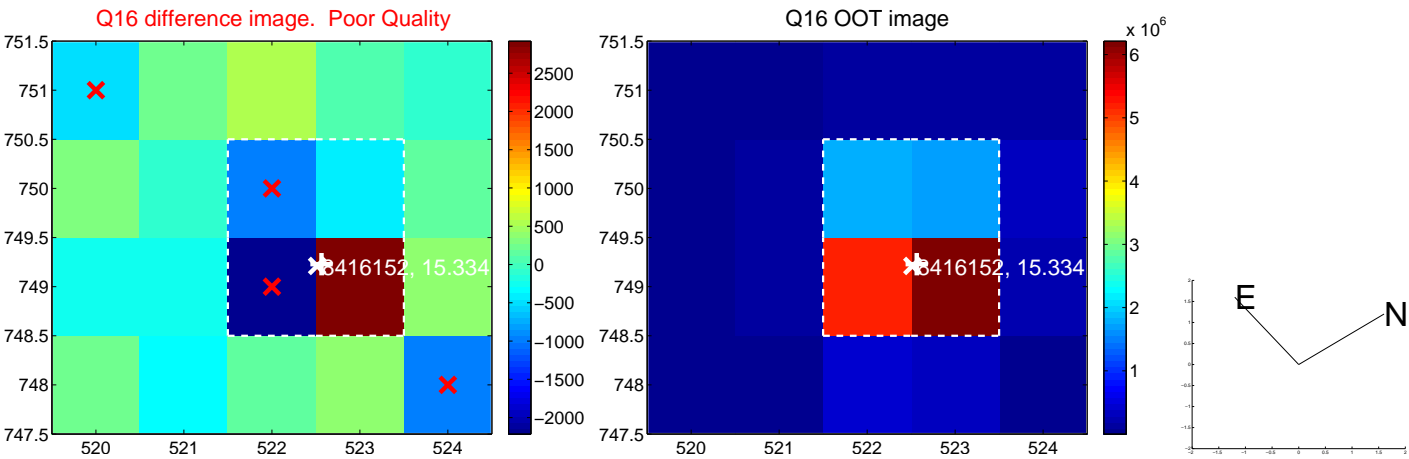
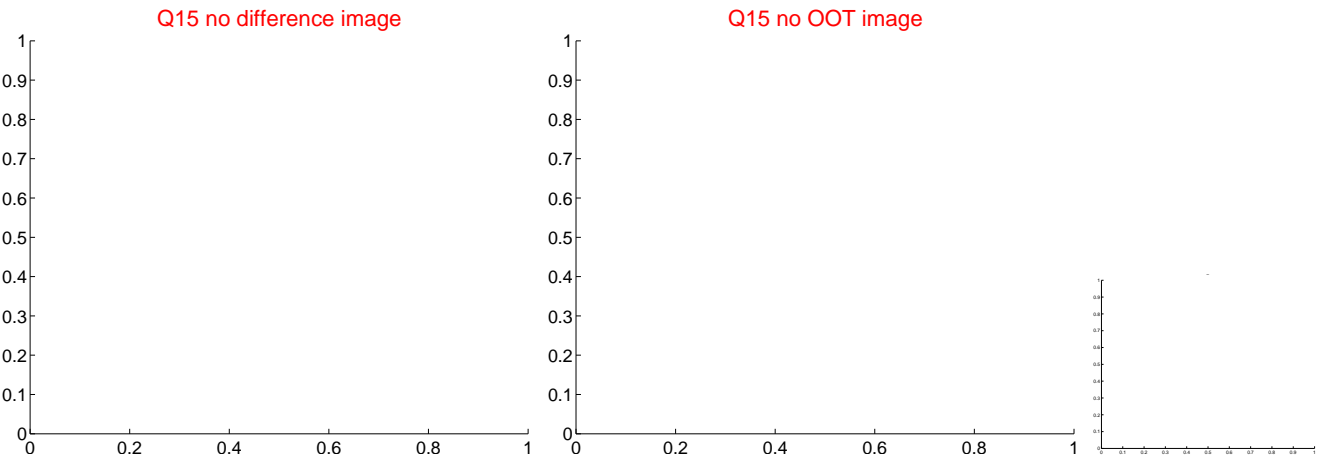
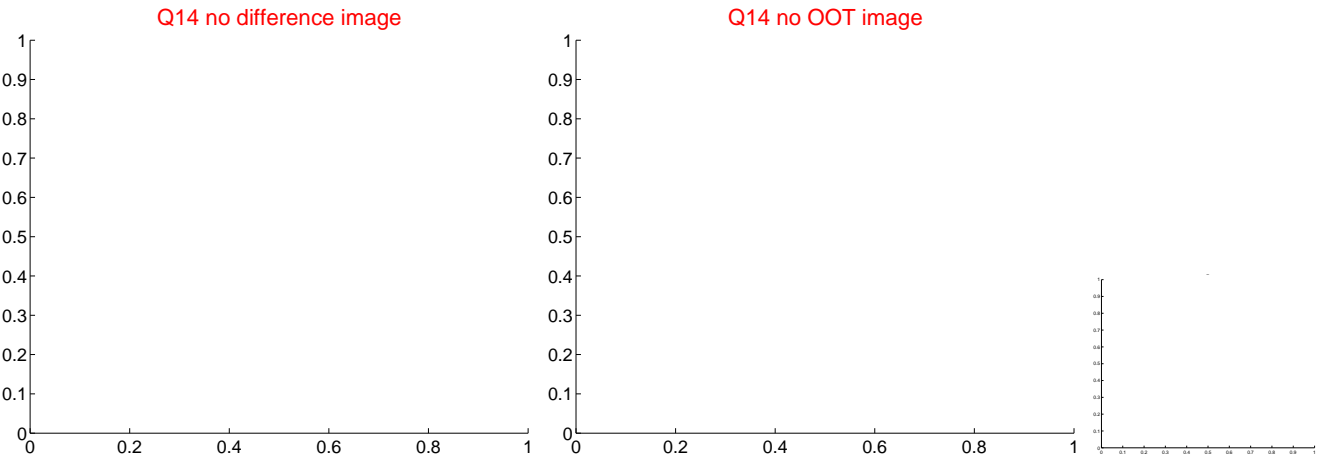
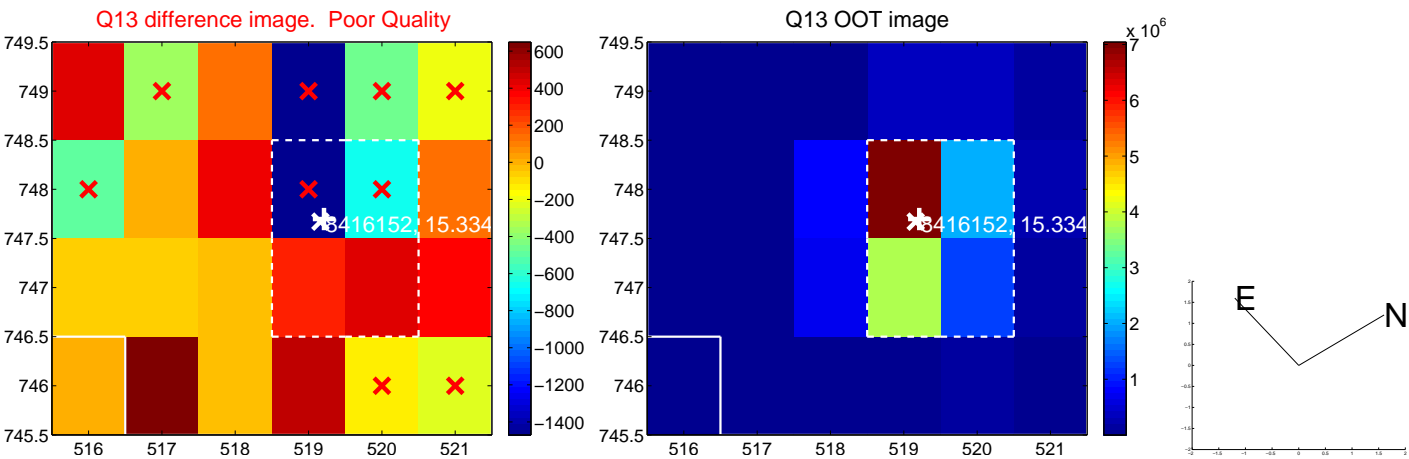
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



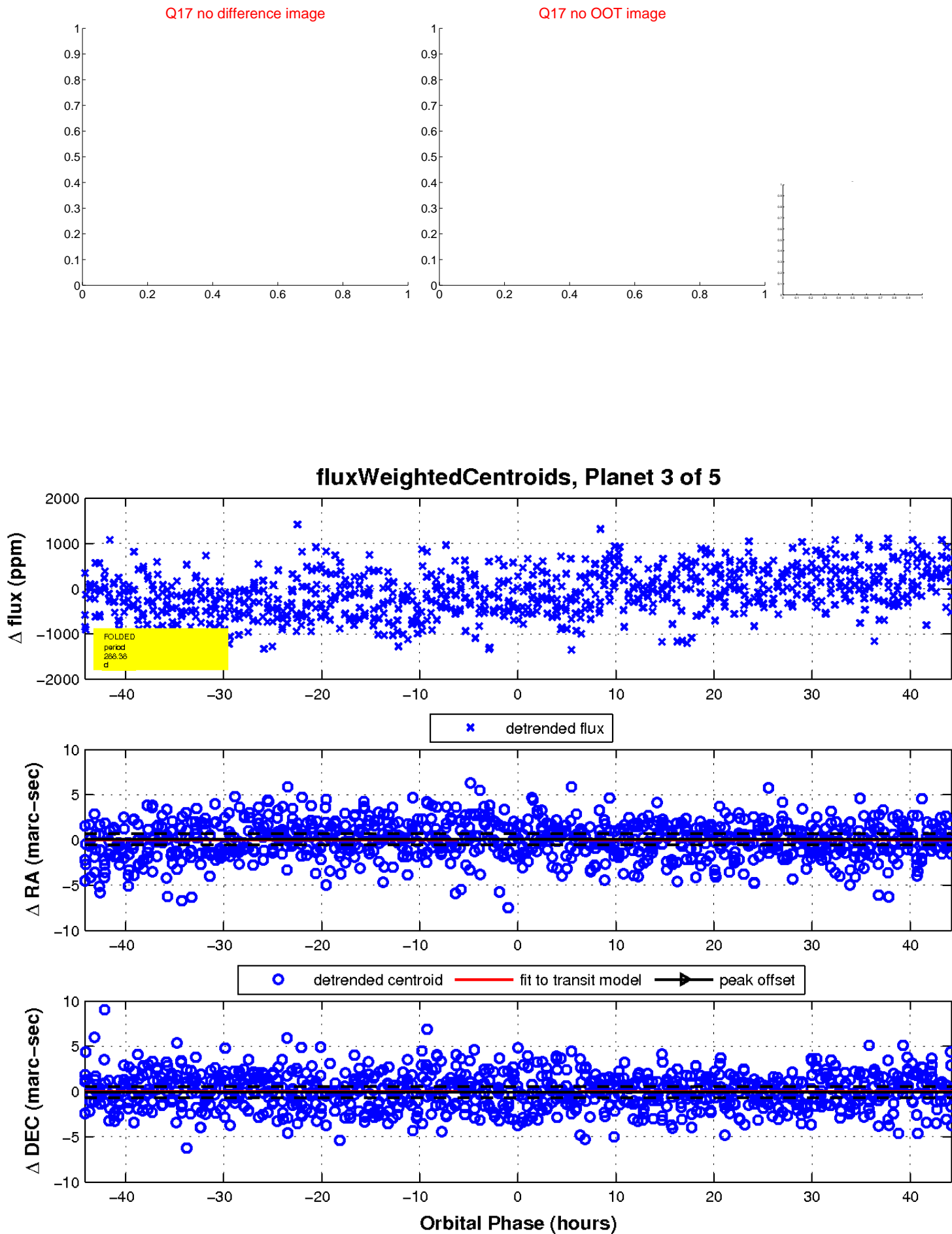
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

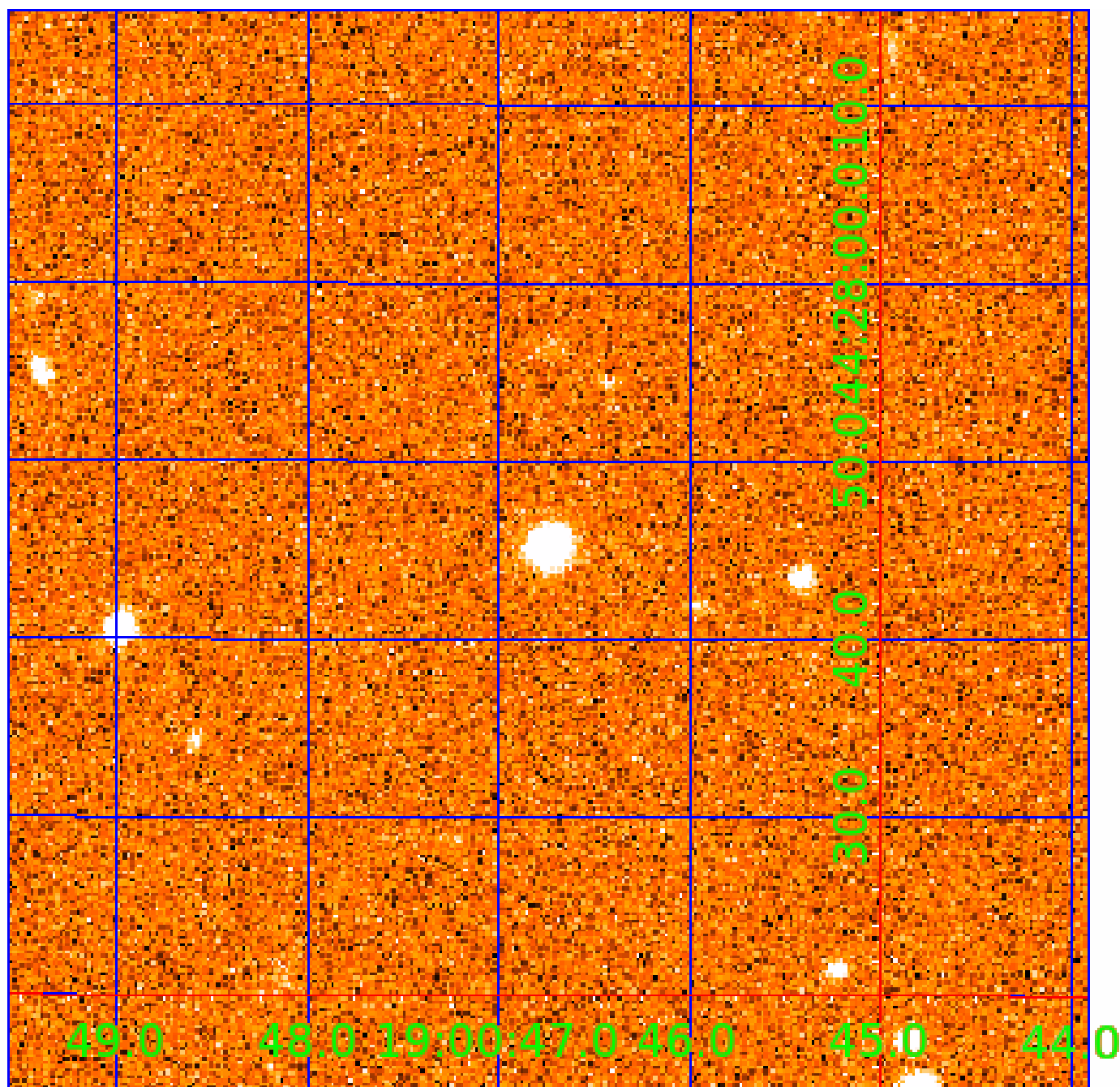


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008416152

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 008416152-01 | OBS | No | 0.990458 | 132.010365 | 40.3 | 4.749 | 9.1 | 8.1 | 0.58 | 5184 | 0.39 | 774.26 |
| 008416152-02 | OBS | No | 371.329484 | 213.964176 | 844.2 | 12.152 | 13.1 | 8.9 | 0.58 | 5184 | 1.76 | 0.29 |
| 008416152-03 | OBS | No | 288.379325 | 337.482279 | 646.7 | 14.796 | 8.9 | 6.7 | 0.58 | 5184 | 1.80 | 0.40 |
| 008416152-04 | OBS | No | 635.901480 | 226.613152 | 682.5 | 7.126 | 7.7 | 7.3 | 0.58 | 5184 | 1.59 | 0.14 |
| 008416152-05 | OBS | No | 210.555156 | 167.547527 | 637.7 | 7.840 | 7.4 | 6.2 | 0.58 | 5184 | 1.56 | 0.61 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 008416152-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | LPP_DV |
| 008416152-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—CENT_FEW_DIFFS |
| 008416152-05 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

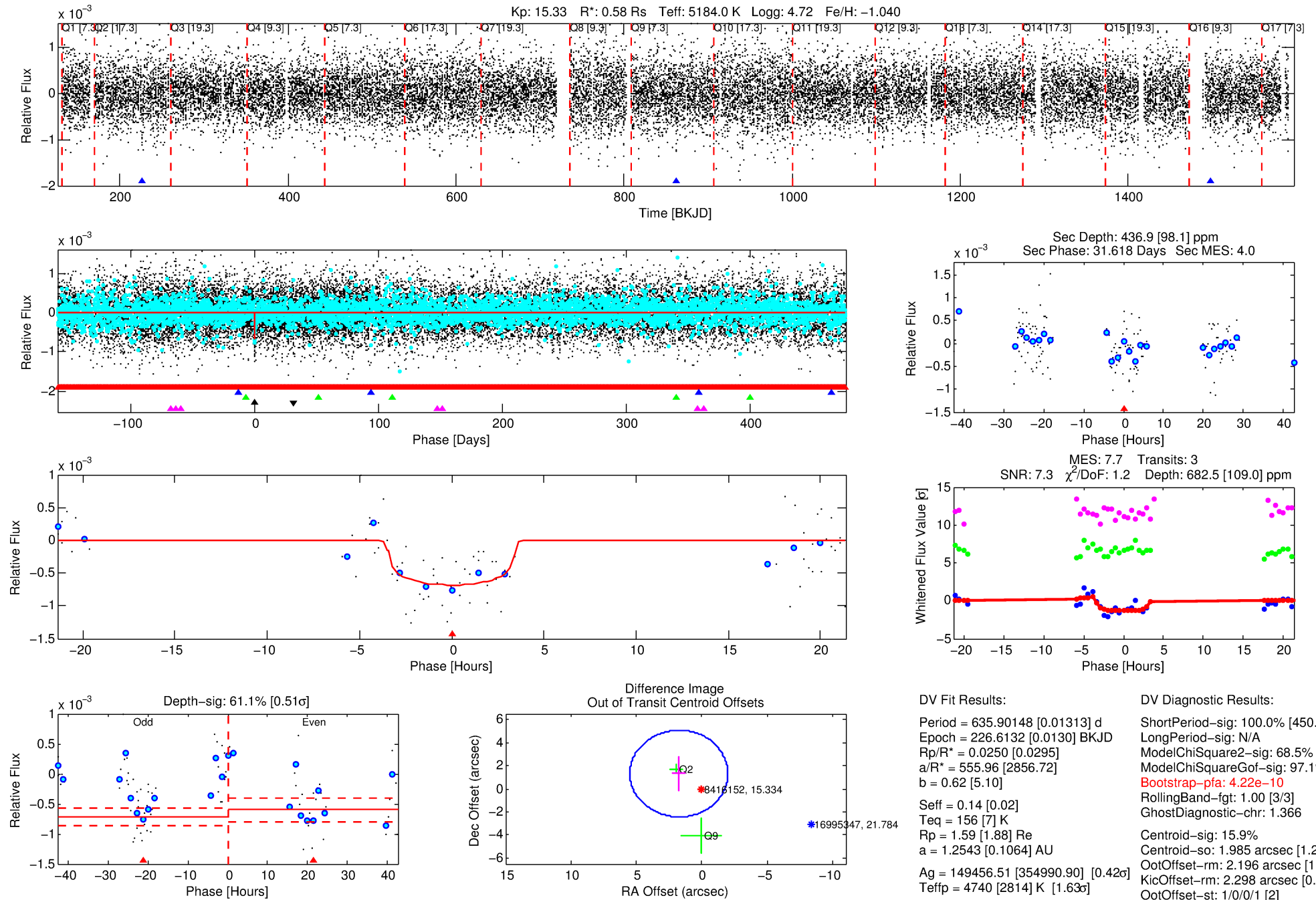
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008416152-04

No Significant Match Found

DV One-Page Summary

KIC: 8416152 Candidate: 4 of 5 Period: 635.901 d



DV Fit Results:

Period = 635.90148 [0.01313] d
Epoch = 226.6132 [0.0130] BKJD
Rp/R* = 0.0250 [0.0295]
a/R* = 555.96 [2856.72]
b = 0.62 [5.10]
Seff = 0.14 [0.02]
Teq = 156 [7] K
Rp = 1.59 [1.88] Re
a = 1.2543 [0.1064] AU
Ag = 149456.51 [354990.90] [0.42 σ]
Teff = 4740 [2814] K [1.63 σ]

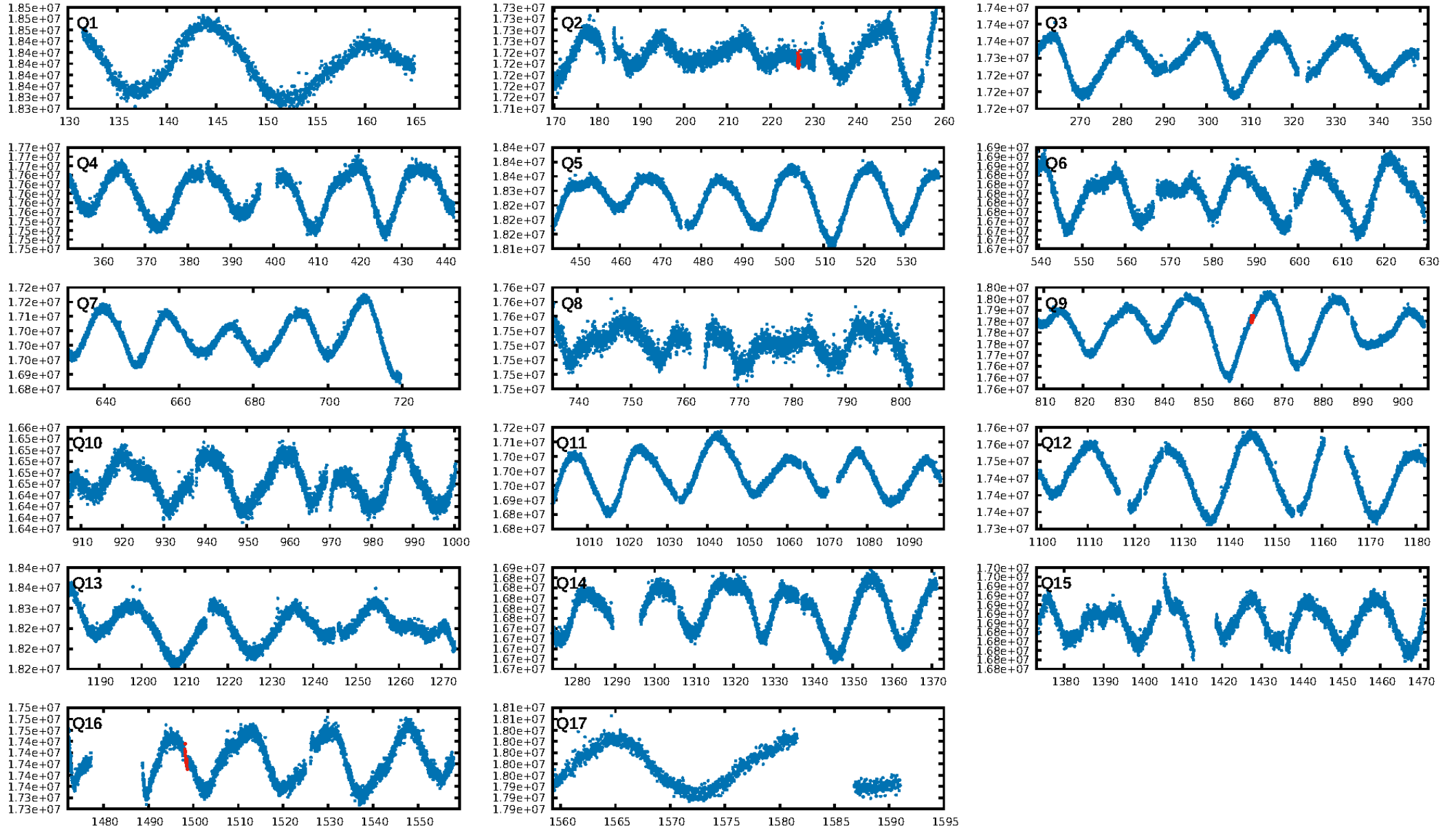
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [450.73 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 68.5%
ModelChiSquareGof-sig: 97.1%
Bootstrap-pfa: 4.22e-10
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 1.366
Centroid-sig: 15.9%
Centroid-so: 1.985 arcsec [1.23 σ]
OotOffset-rm: 2.196 arcsec [1.76 σ]
KicOffset-rm: 2.298 arcsec [0.90 σ]
OotOffset-st: 1/0/0/1 [2]
KicOffset-st: 1/0/0/1 [2]
DiffImageQuality-fgm: 0.50 [1/2]
DiffImageOverlap-fno: 0.00 [0/2]

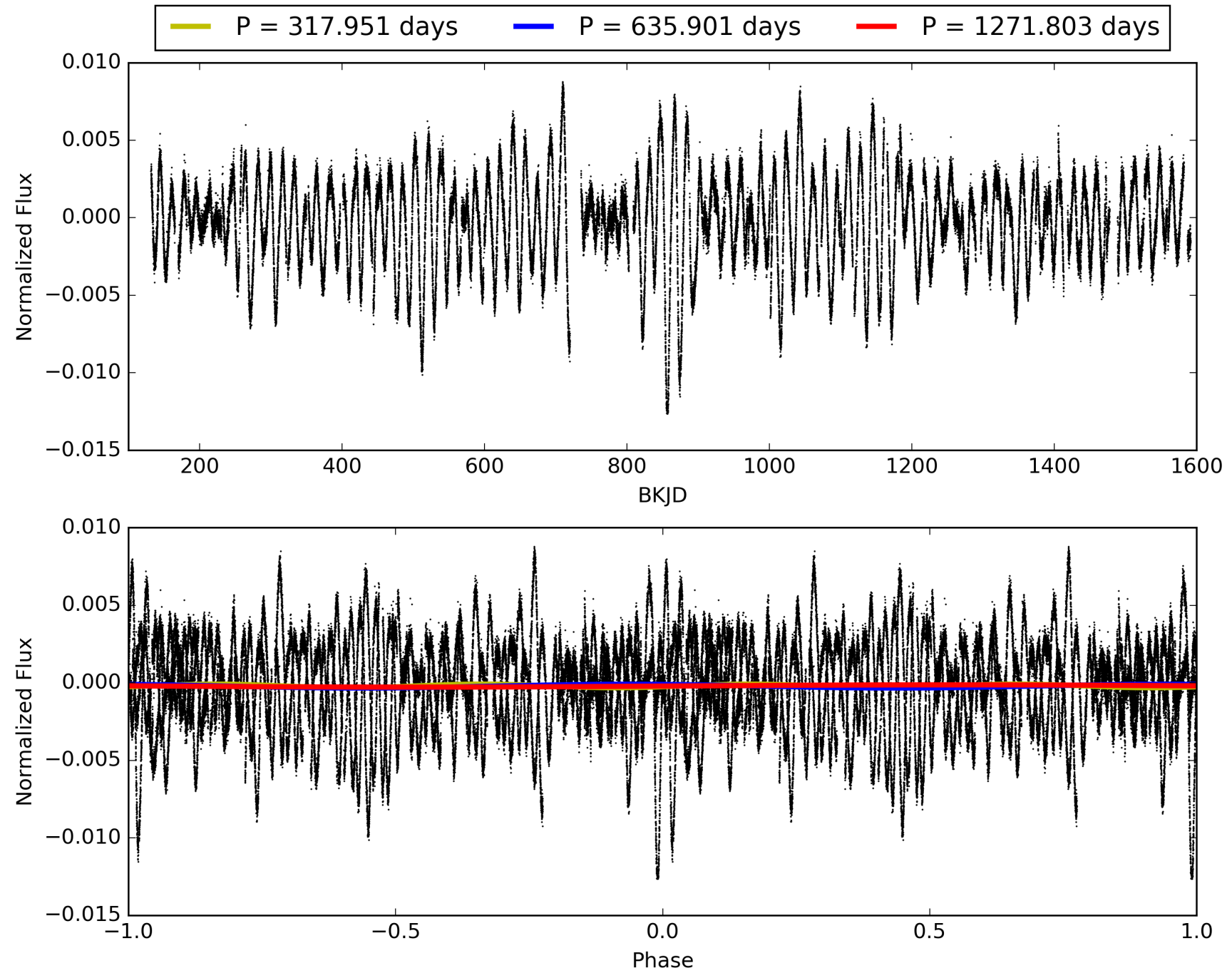
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:07:05 Z

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

TCE 008416152-04, PDC Light Curves

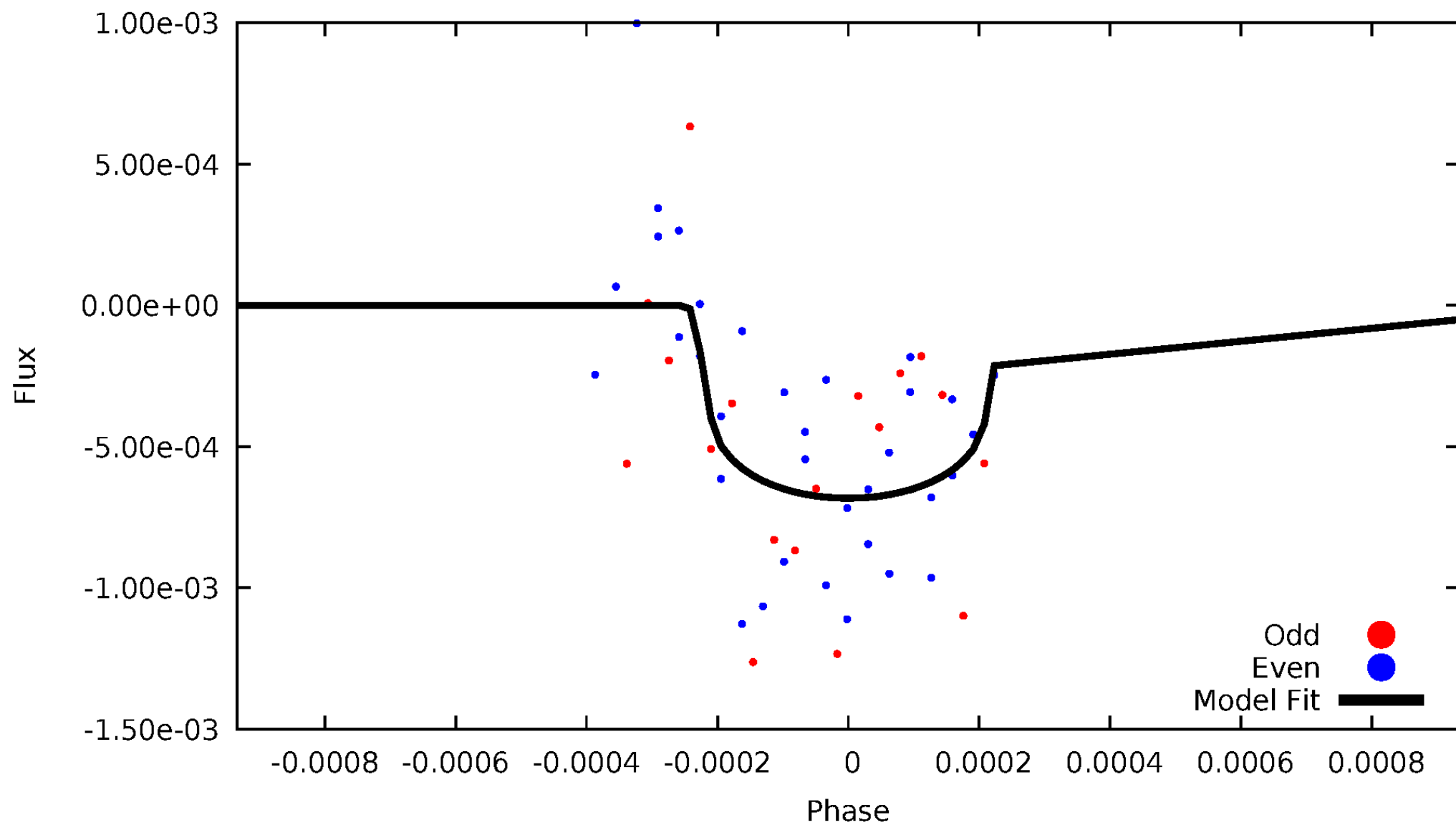


TCE 008416152-04



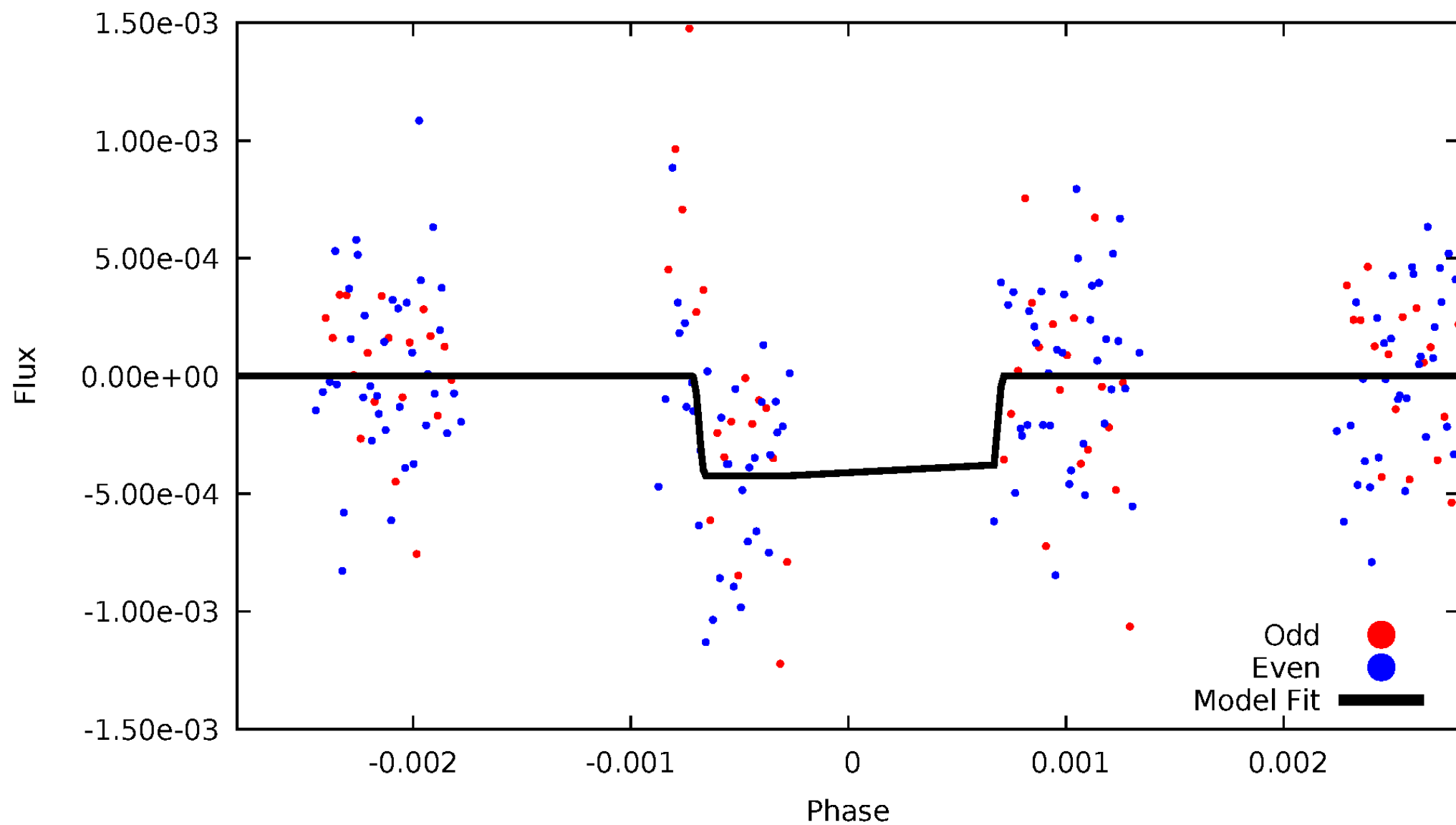
DV Odd/Even

TCE 008416152-04



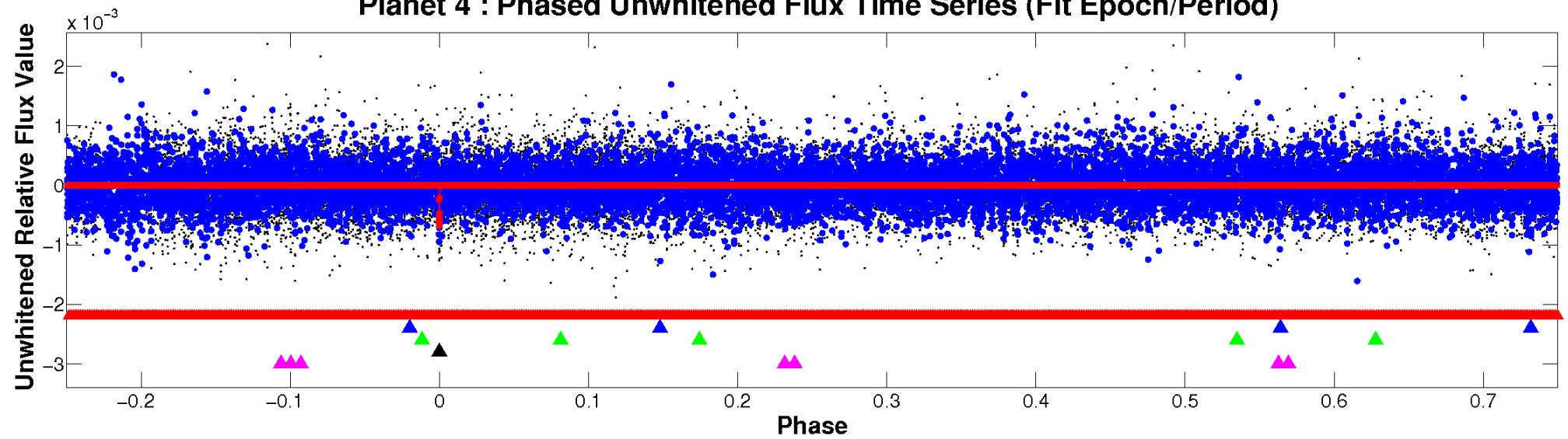
ALT Odd/Even

TCE 008416152-04

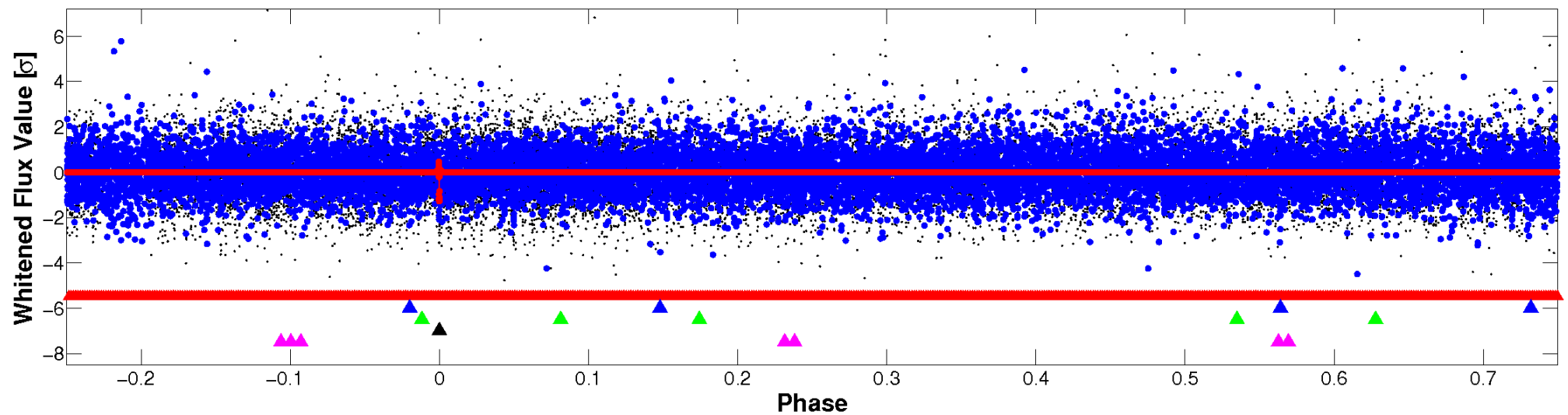


Non-Whitened Vs. Whitened Light Curve

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

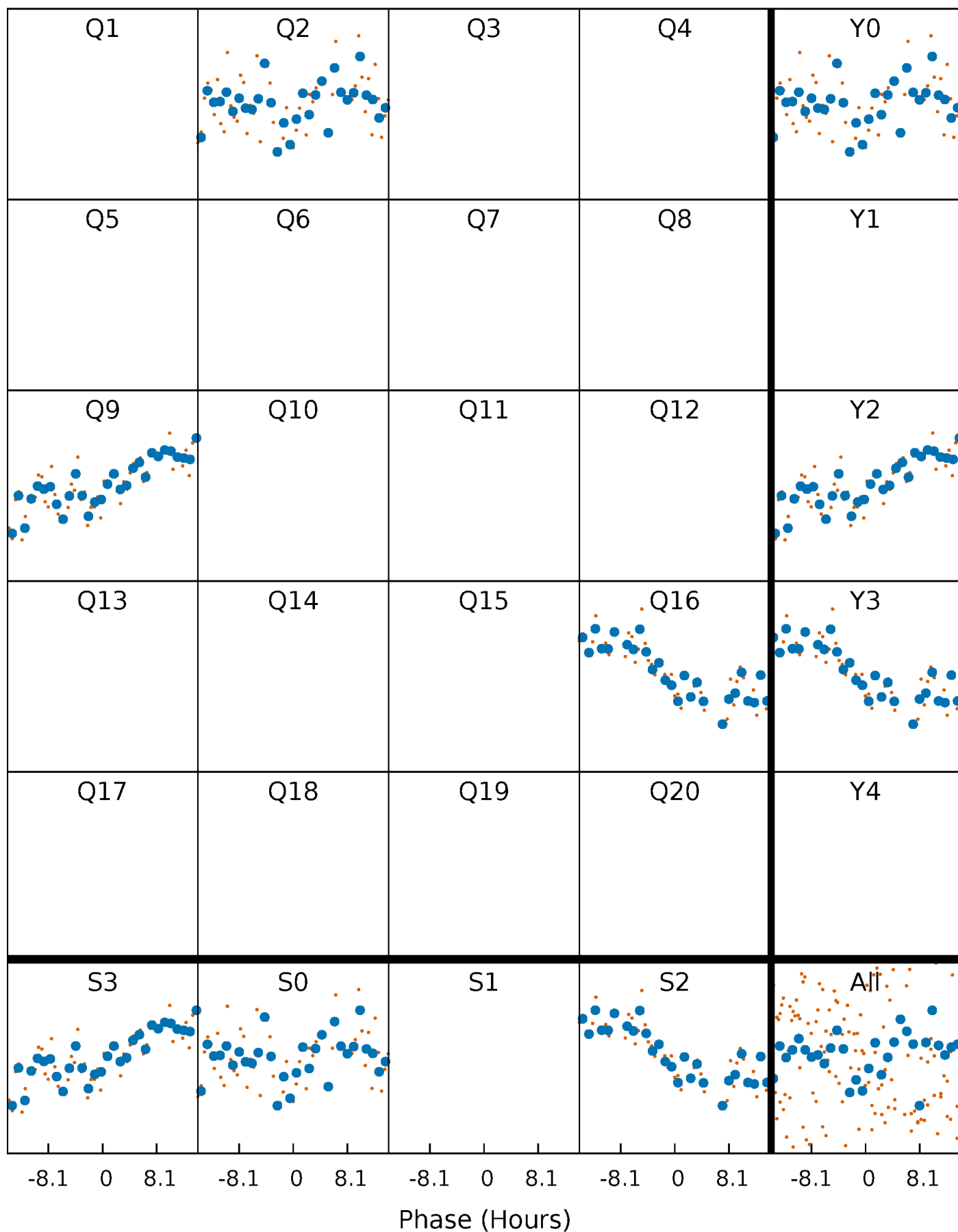


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



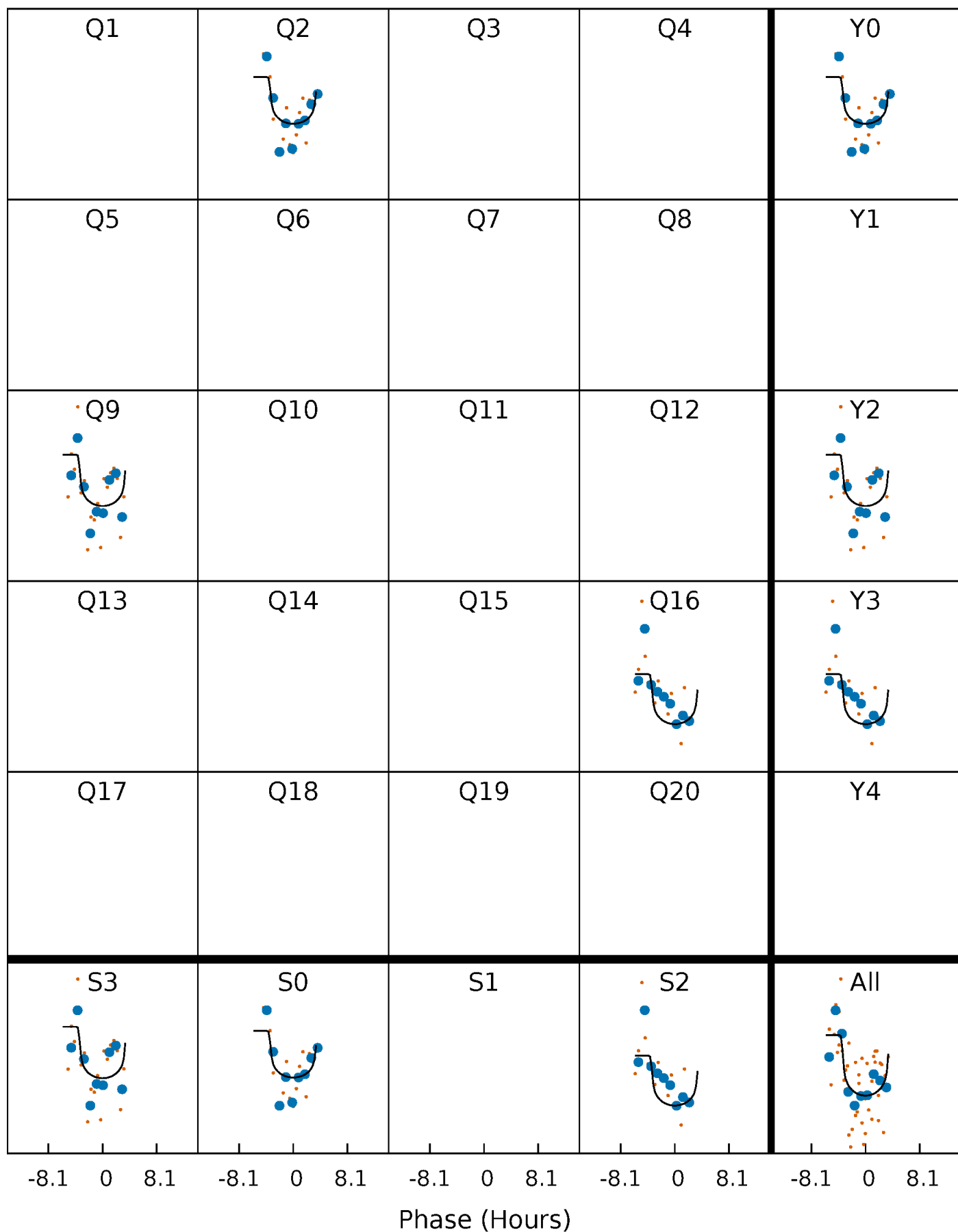
PDC Quarter-Phased Transit Curves

TCE 008416152-04 P=635.901480 Days $T_0=226.613152$ (BKJD)



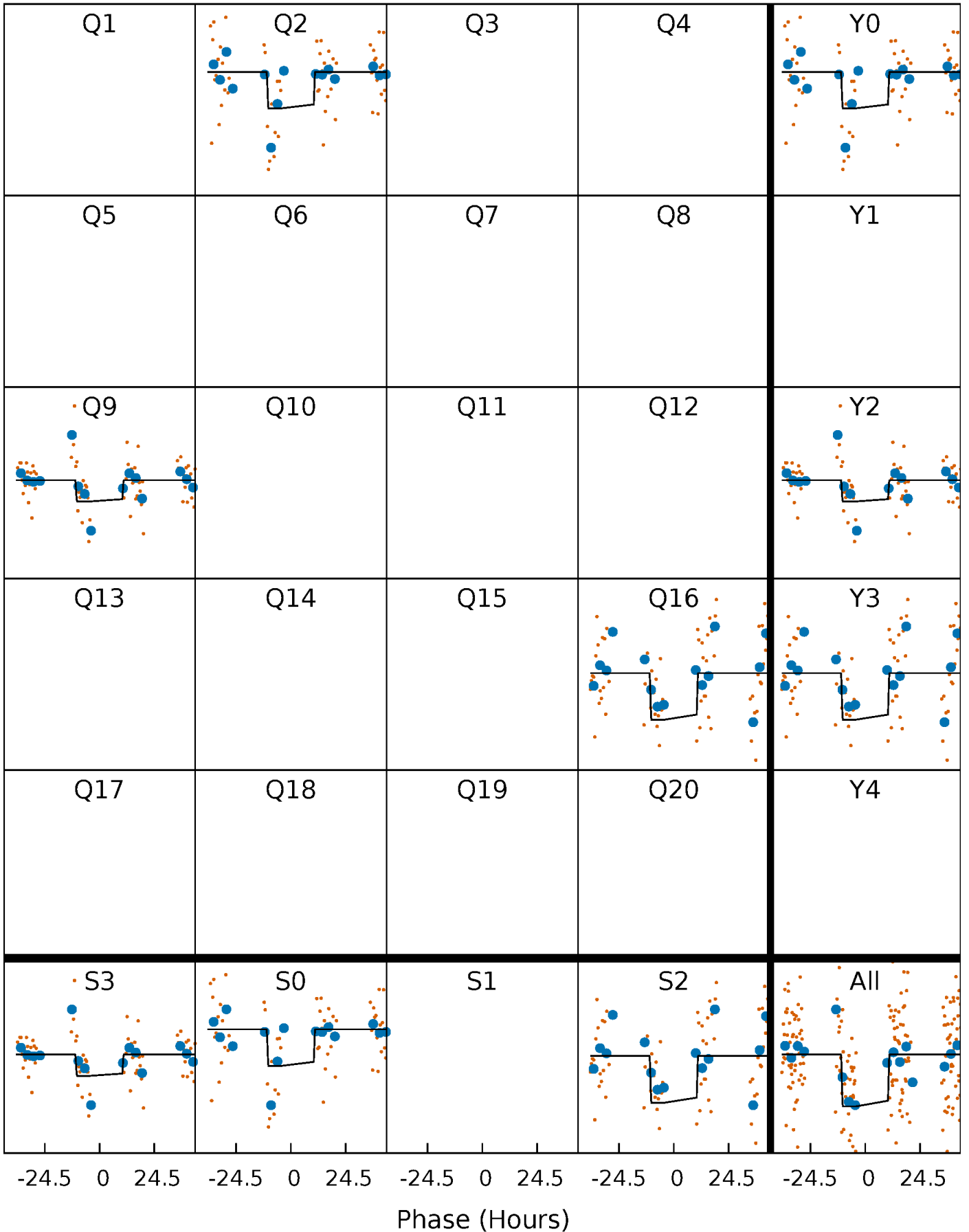
DV Quarter-Phased Transit Curves

TCE 008416152-04 P=635.901480 Days $T_0=226.613152$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

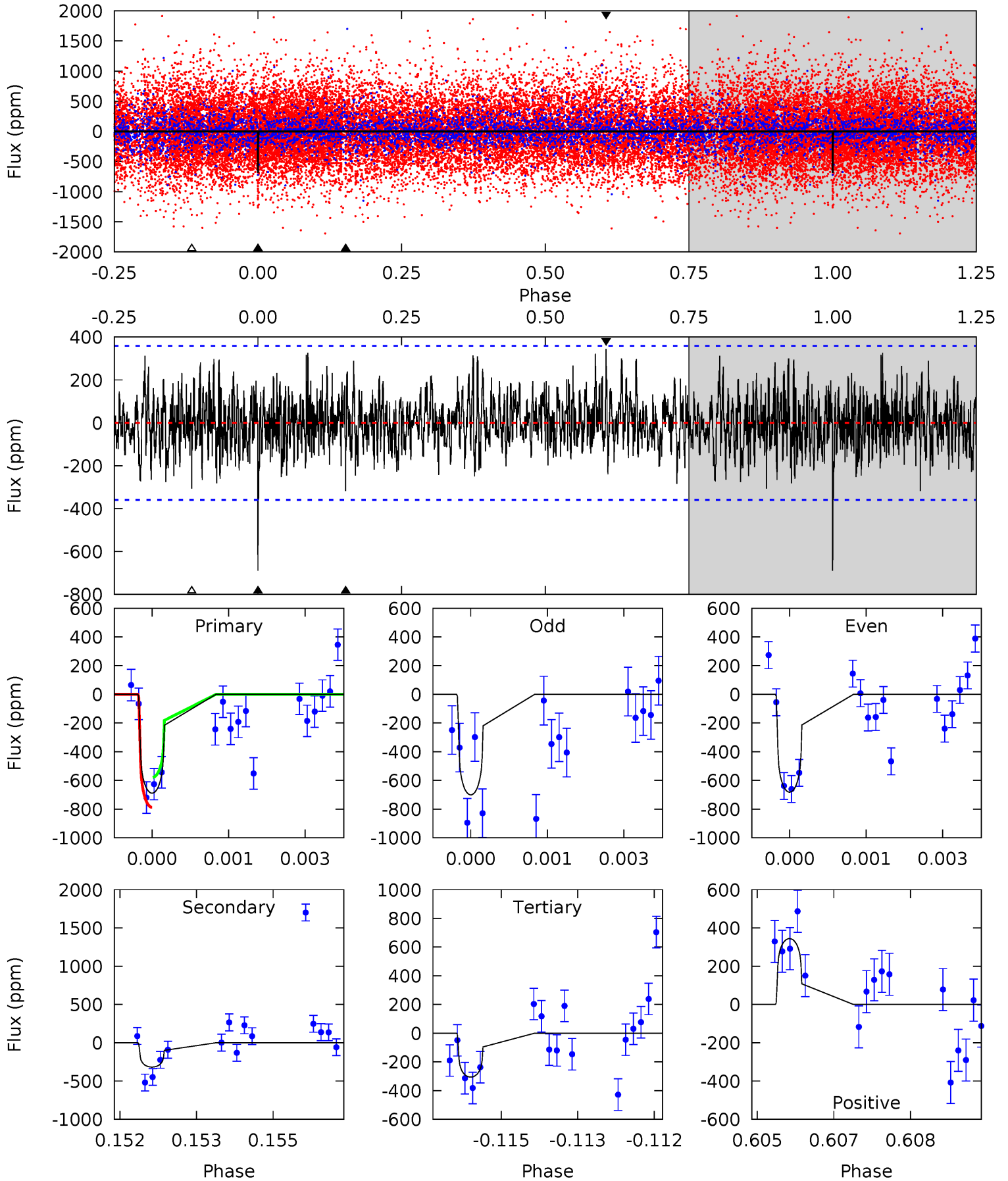
TCE 008416152-04 P=635.899198 Days $T_0=226.926229$ (BKJD)



DV Model-Shift Uniqueness Test

008416152-04, P = 635.901480 Days, E = 226.613152 Days

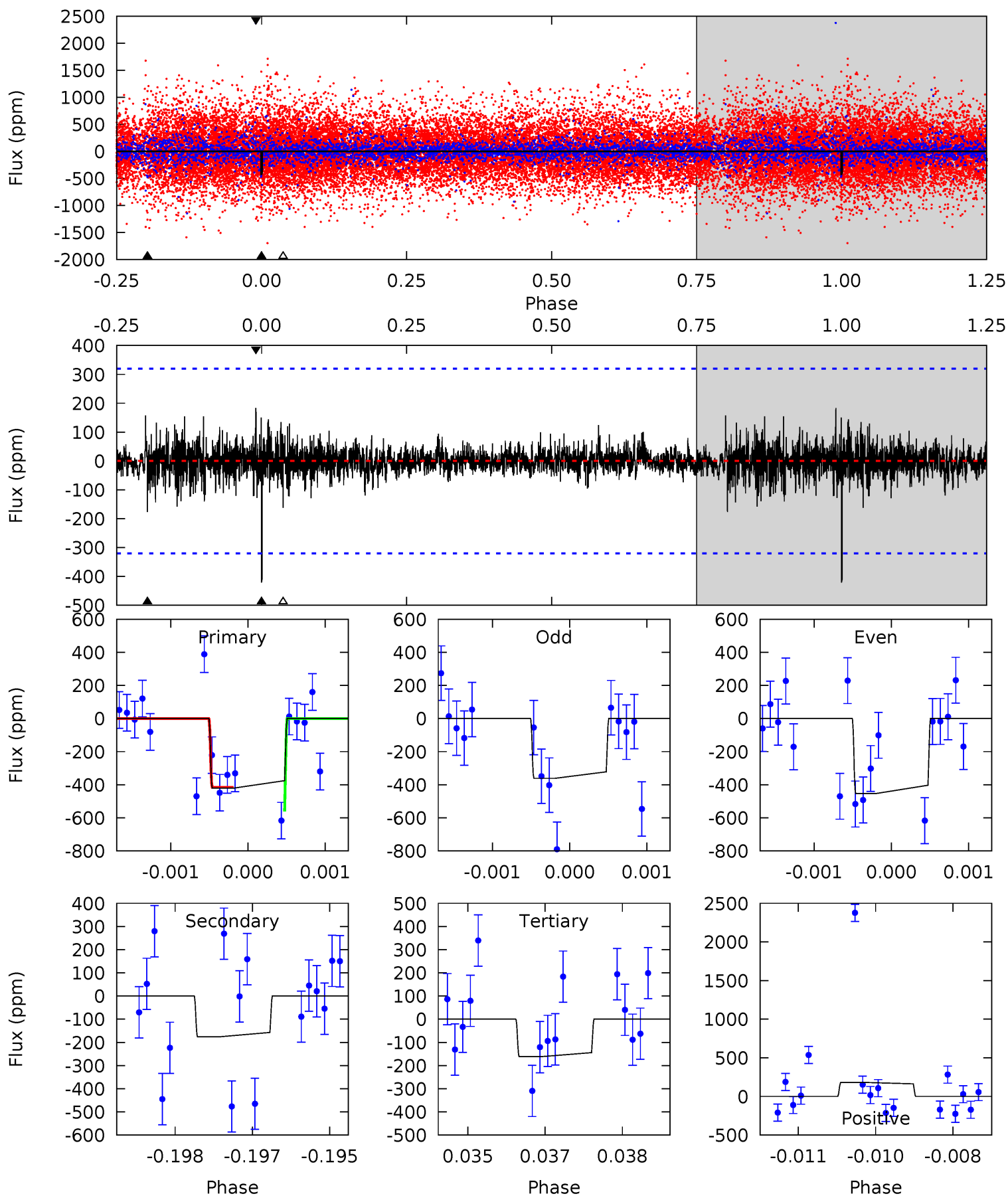
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.4 | 4.78 | 4.60 | 5.18 | 5.39 | 3.20 | 1.49 | 5.76 | 5.18 | 0.18 | -0.40 | 0.13 | 0.97 | 0.33 | 1.56 |



Alt Model-Shift Uniqueness Test

008416152-04, $P = 635.899198$ Days, $E = 226.926229$ Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.09 | 2.97 | 2.73 | 3.08 | 5.39 | 3.19 | 0.59 | 4.36 | 4.01 | 0.24 | -0.11 | 0.73 | 1.15 | 0.30 | 0.39 |



Stellar Parameters For KIC 008416152

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5184^{+156}_{-156} | $4.720^{+0.018}_{-0.067}$ | $-1.040^{+0.300}_{-0.300}$ | $0.583^{+0.059}_{-0.025}$ | $0.652^{+0.042}_{-0.042}$ | $4.628^{+0.418}_{-0.995}$ |
| | +3%/-3% | +0%/-1% | +29%/-29% | +10%/-4% | +6%/-6% | +9%/-21% |
| 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 008416152-04 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|---------------|------------------------|-----------------|-----------------------|----------------------------|
| DV | -318 ± 67 | $2.16^{+1.65}_{-1.39}$ | 220^{+8}_{-7} | 4032^{+2160}_{-706} | $57233^{+390647}_{-39661}$ |
| Alt. | -176 ± 59 | $1.92^{+1.66}_{-1.31}$ | 219^{+8}_{-7} | 3746^{+2219}_{-678} | $39159^{+335315}_{-29066}$ |

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 $A_{obs} \gg 1.0$

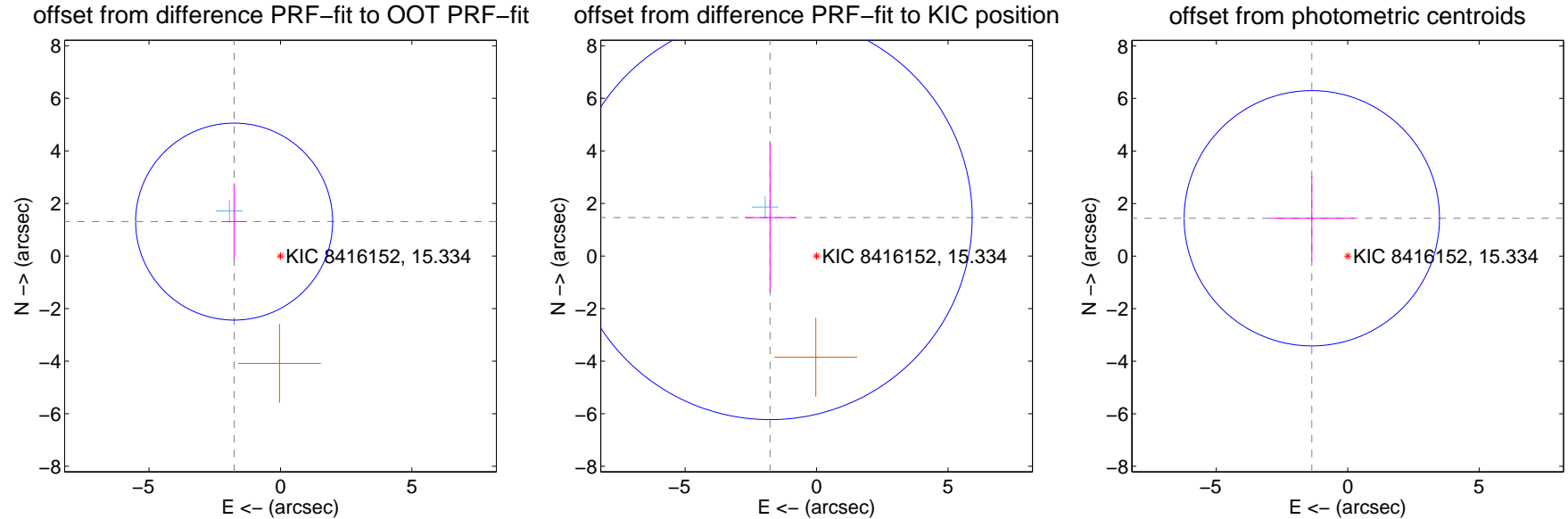
DV Centroid Data

Supplemental centroid analysis for 008416152-04. Kepler magnitude: 15.33. Transit SNR 7.31

There are 1 quarters with good PRF difference image offsets

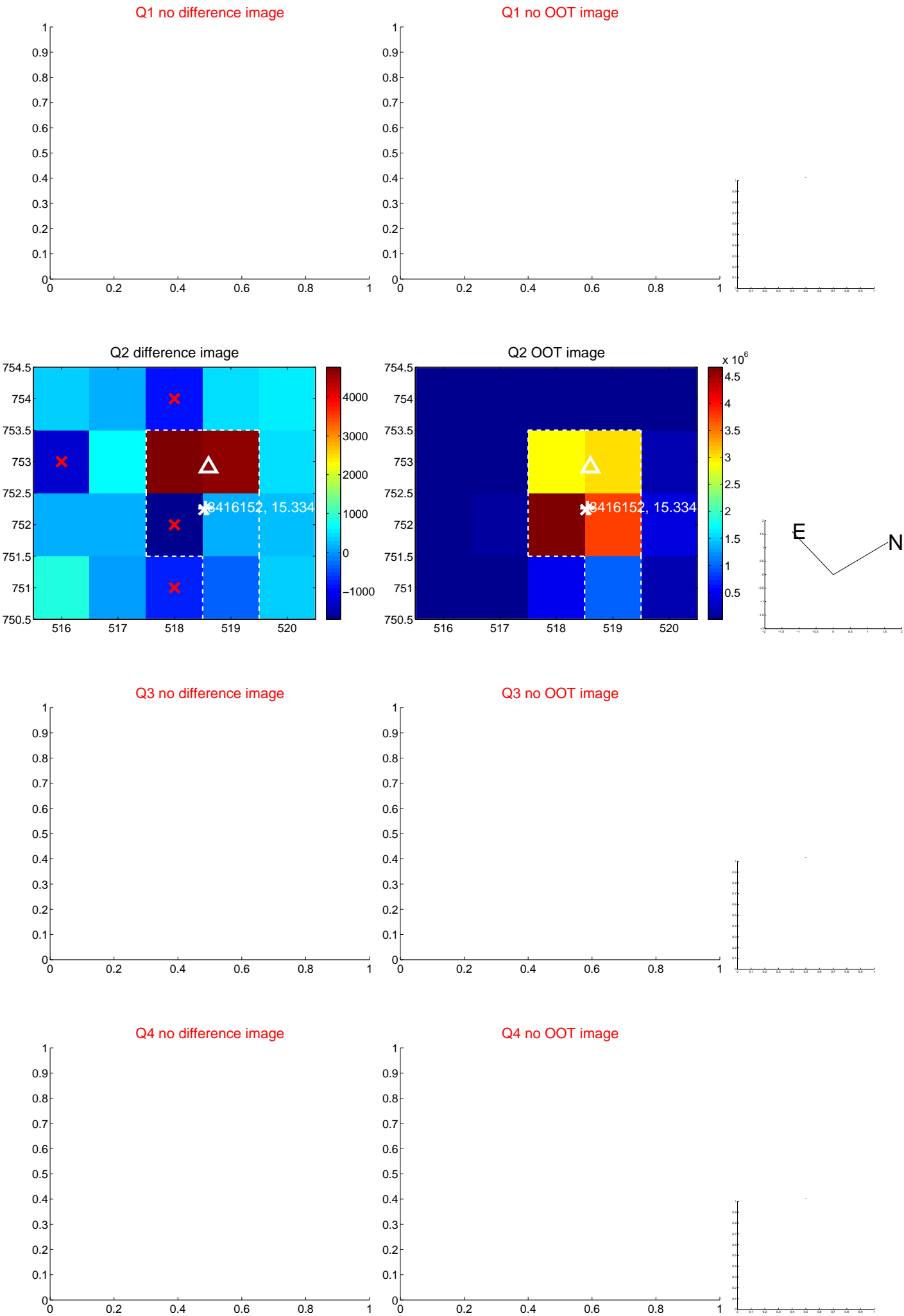
The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT | 2.196 ± 1.249 | 1.76 | 1.763 ± 0.481 | 1.310 ± 1.452 |
| PRF-fit source offset from KIC position | 2.298 ± 2.563 | 0.90 | 1.771 ± 0.964 | 1.464 ± 2.859 |
| photometric centroid source offset | 1.99 ± 1.62 | 1.23 | 1.37 ± 1.61 | 1.44 ± 1.62 |

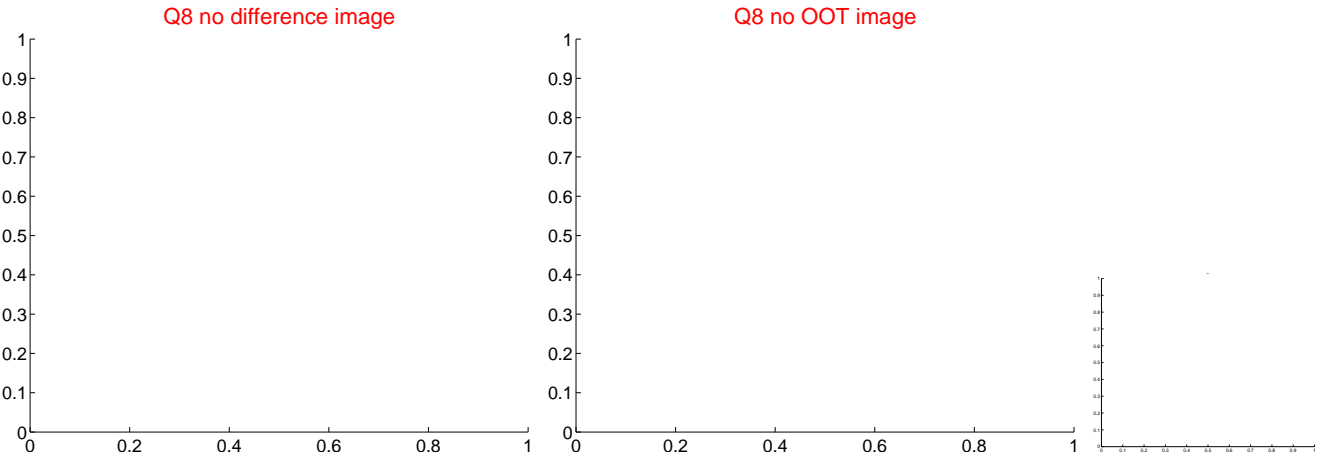
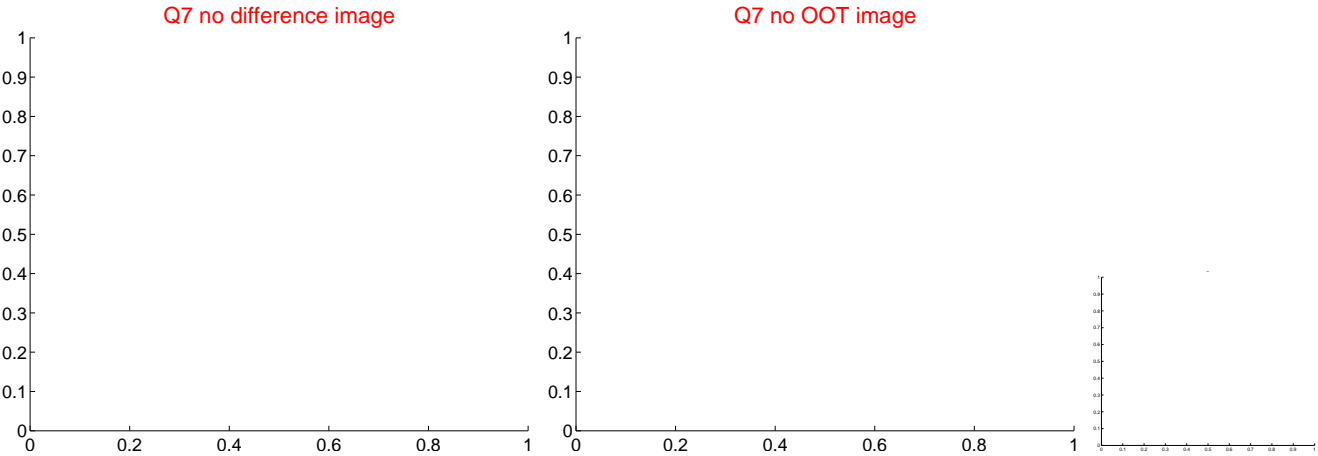
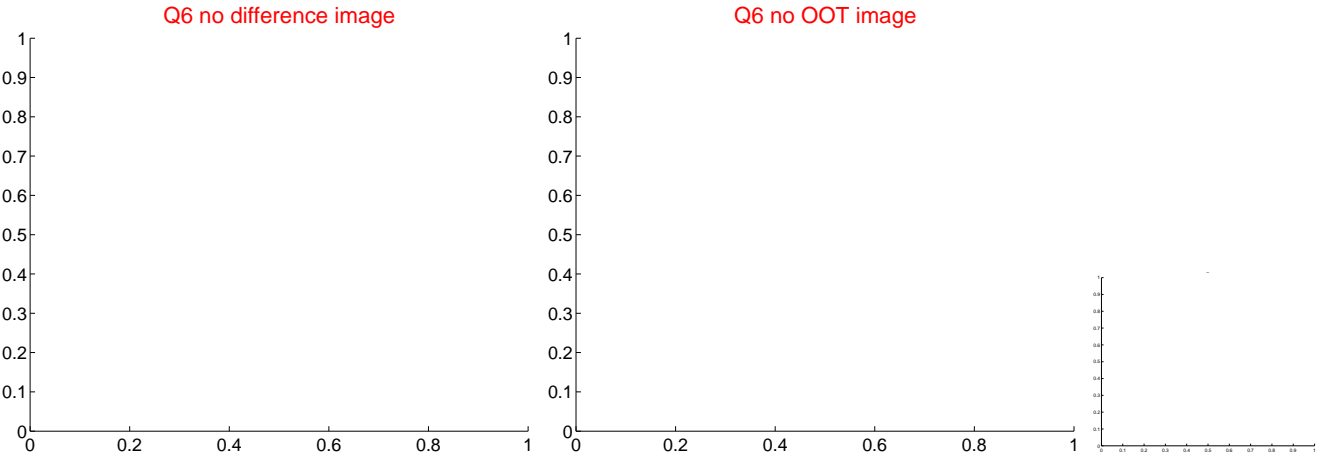
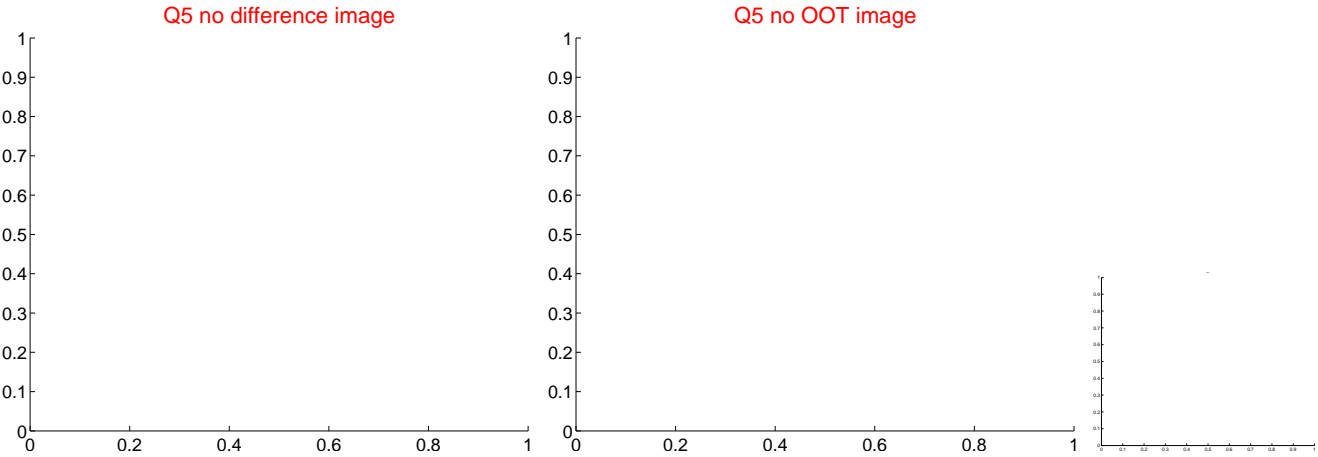


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

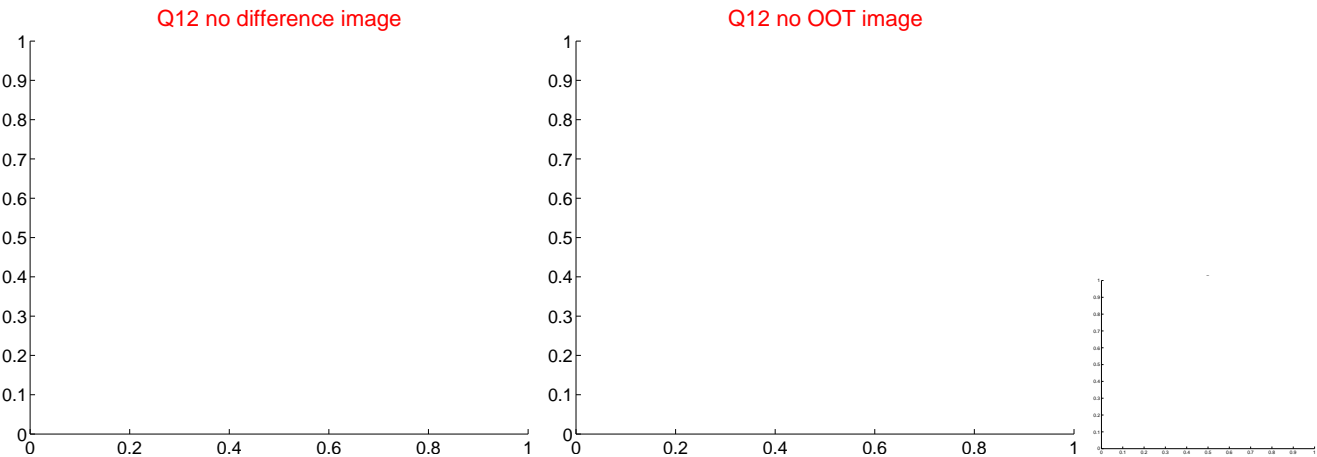
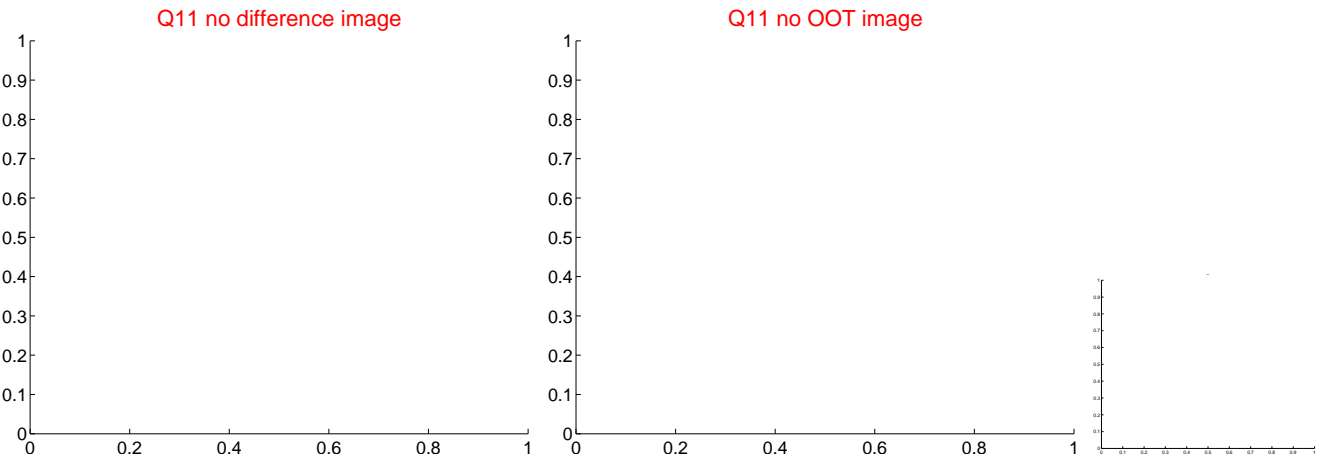
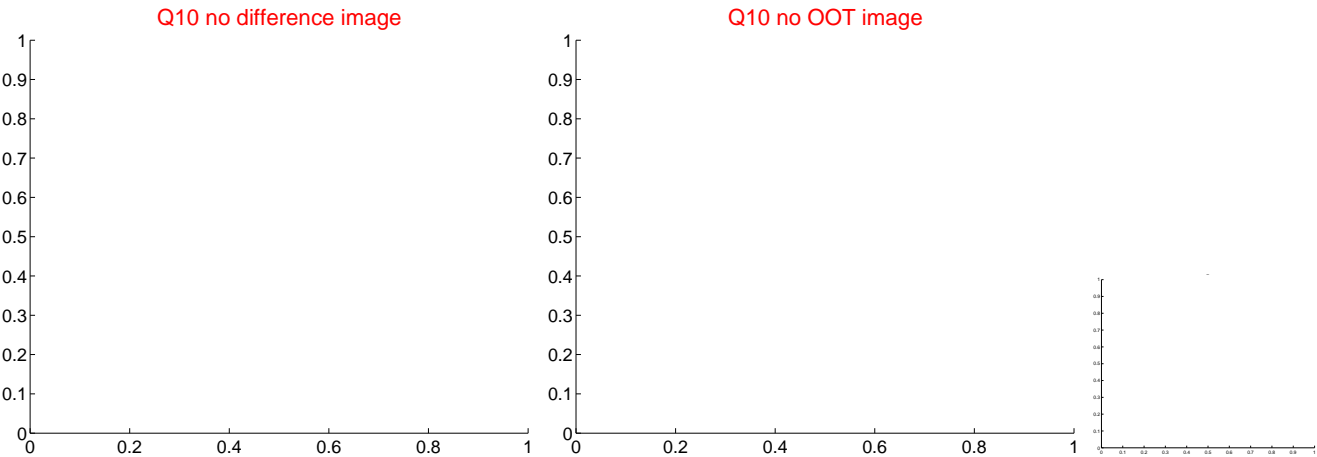
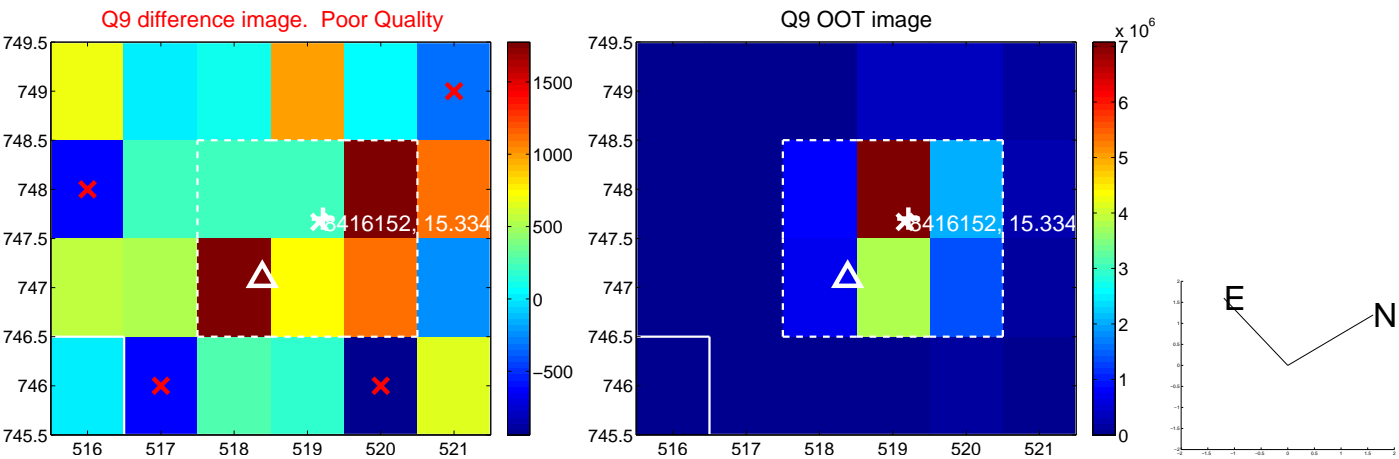
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



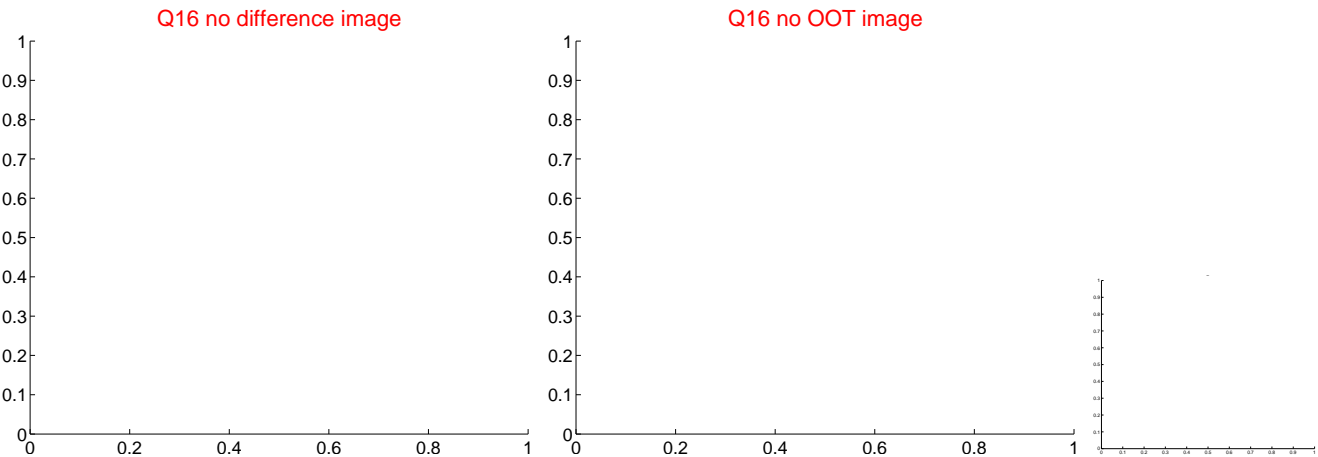
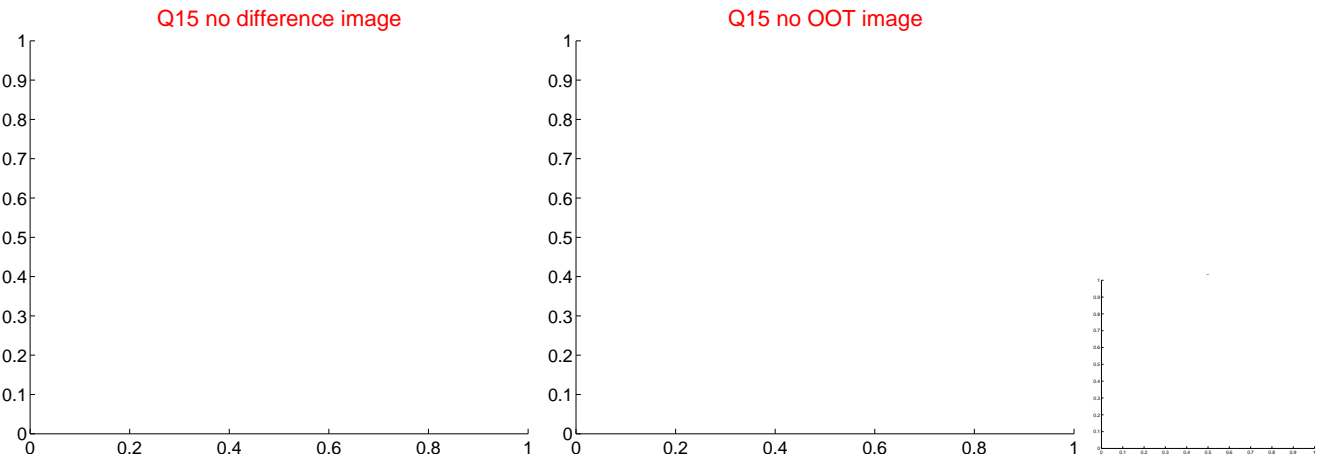
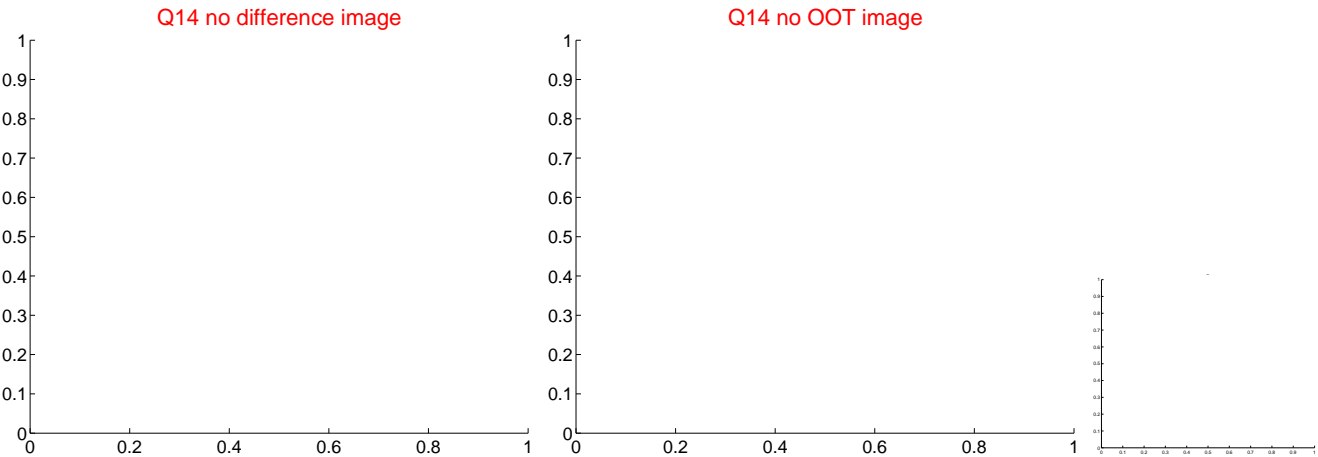
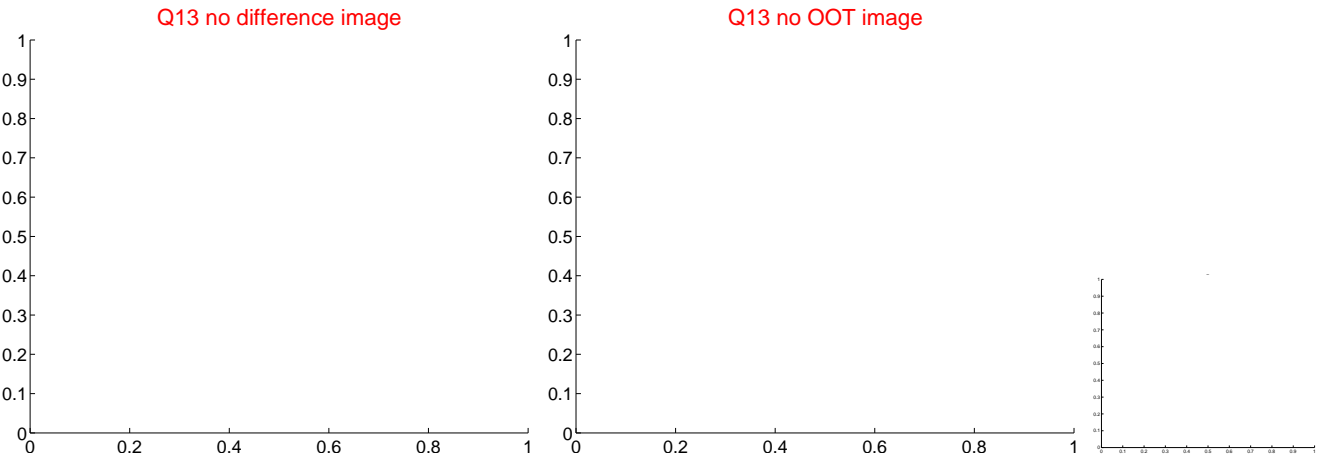
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



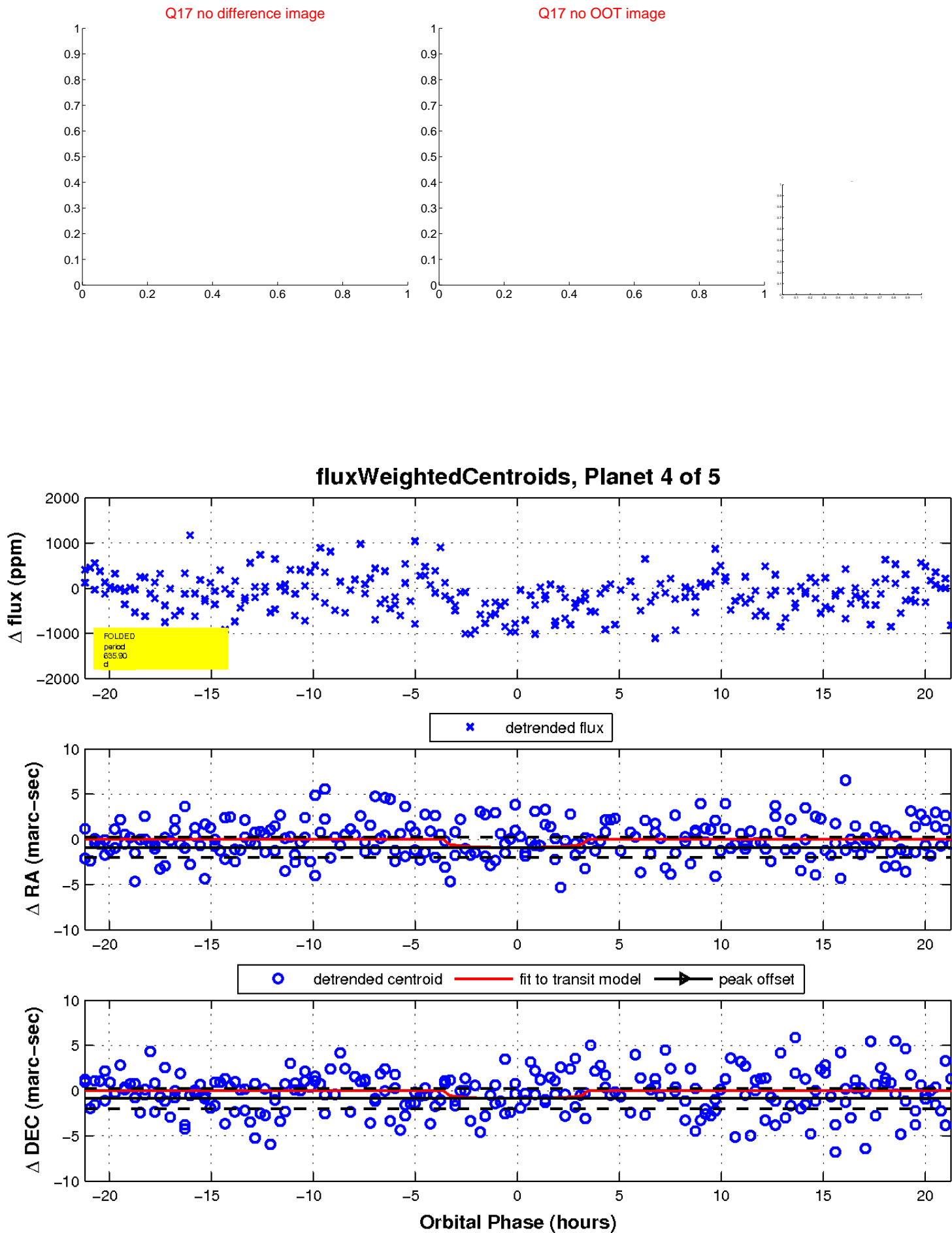
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

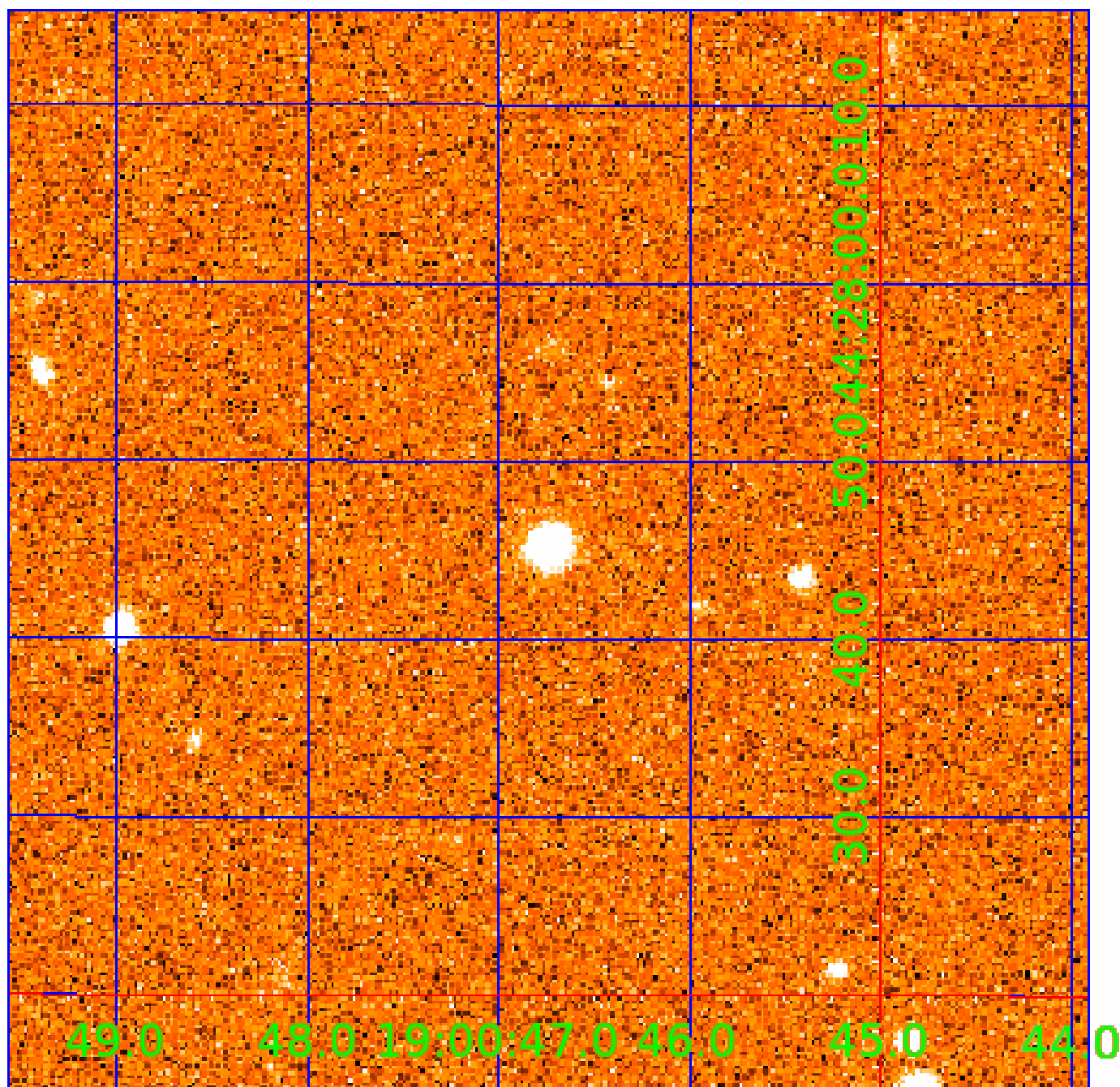


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008416152

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 008416152-01 | OBS | No | 0.990458 | 132.010365 | 40.3 | 4.749 | 9.1 | 8.1 | 0.58 | 5184 | 0.39 | 774.26 |
| 008416152-02 | OBS | No | 371.329484 | 213.964176 | 844.2 | 12.152 | 13.1 | 8.9 | 0.58 | 5184 | 1.76 | 0.29 |
| 008416152-03 | OBS | No | 288.379325 | 337.482279 | 646.7 | 14.796 | 8.9 | 6.7 | 0.58 | 5184 | 1.80 | 0.40 |
| 008416152-04 | OBS | No | 635.901480 | 226.613152 | 682.5 | 7.126 | 7.7 | 7.3 | 0.58 | 5184 | 1.59 | 0.14 |
| 008416152-05 | OBS | No | 210.555156 | 167.547527 | 637.7 | 7.840 | 7.4 | 6.2 | 0.58 | 5184 | 1.56 | 0.61 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 008416152-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | LPP_DV |
| 008416152-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 008416152-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_ALT—ALL_TRANS_CHASES—CENT_FEW_DIFFS |
| 008416152-05 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

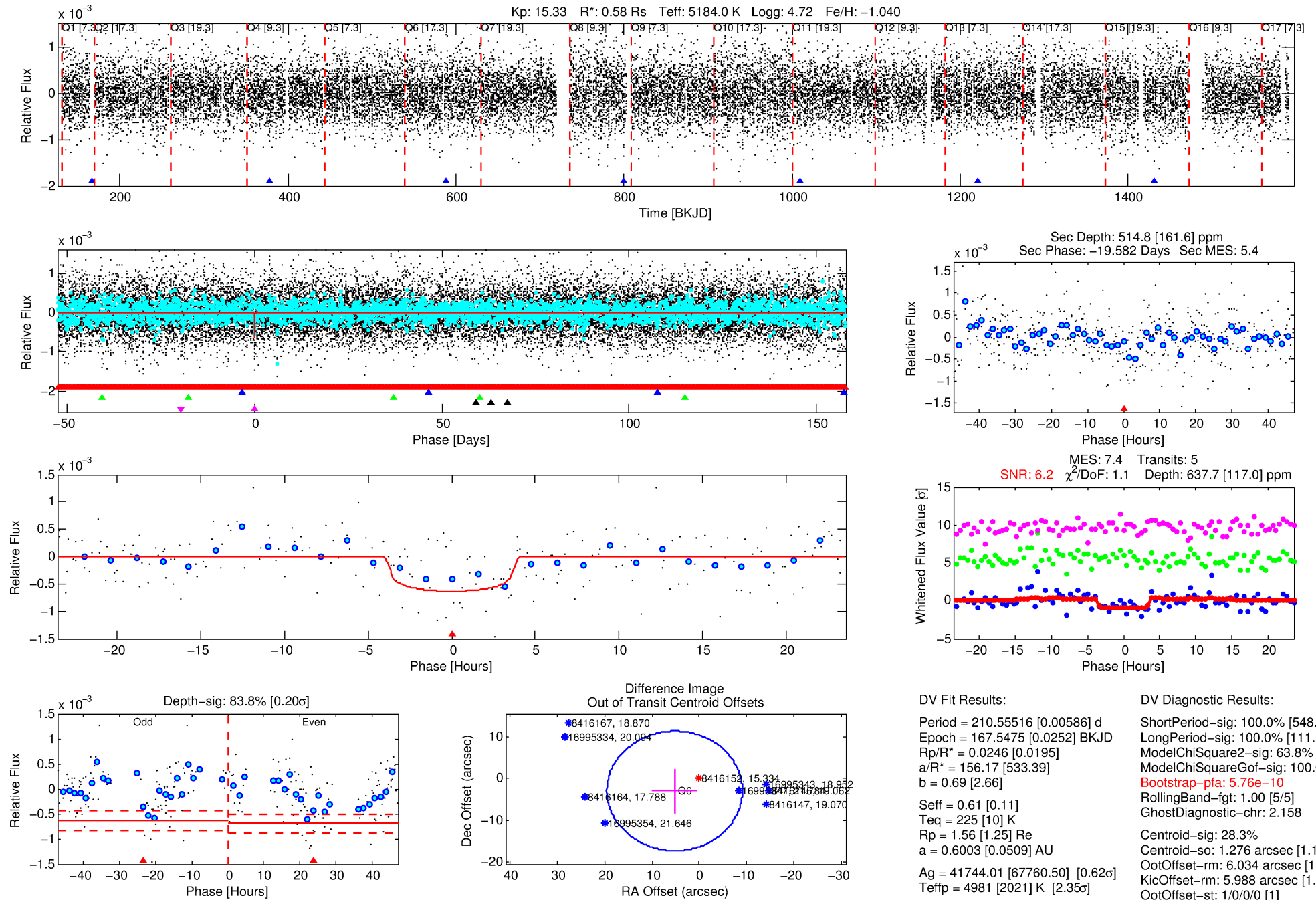
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008416152-05

No Significant Match Found

DV One-Page Summary

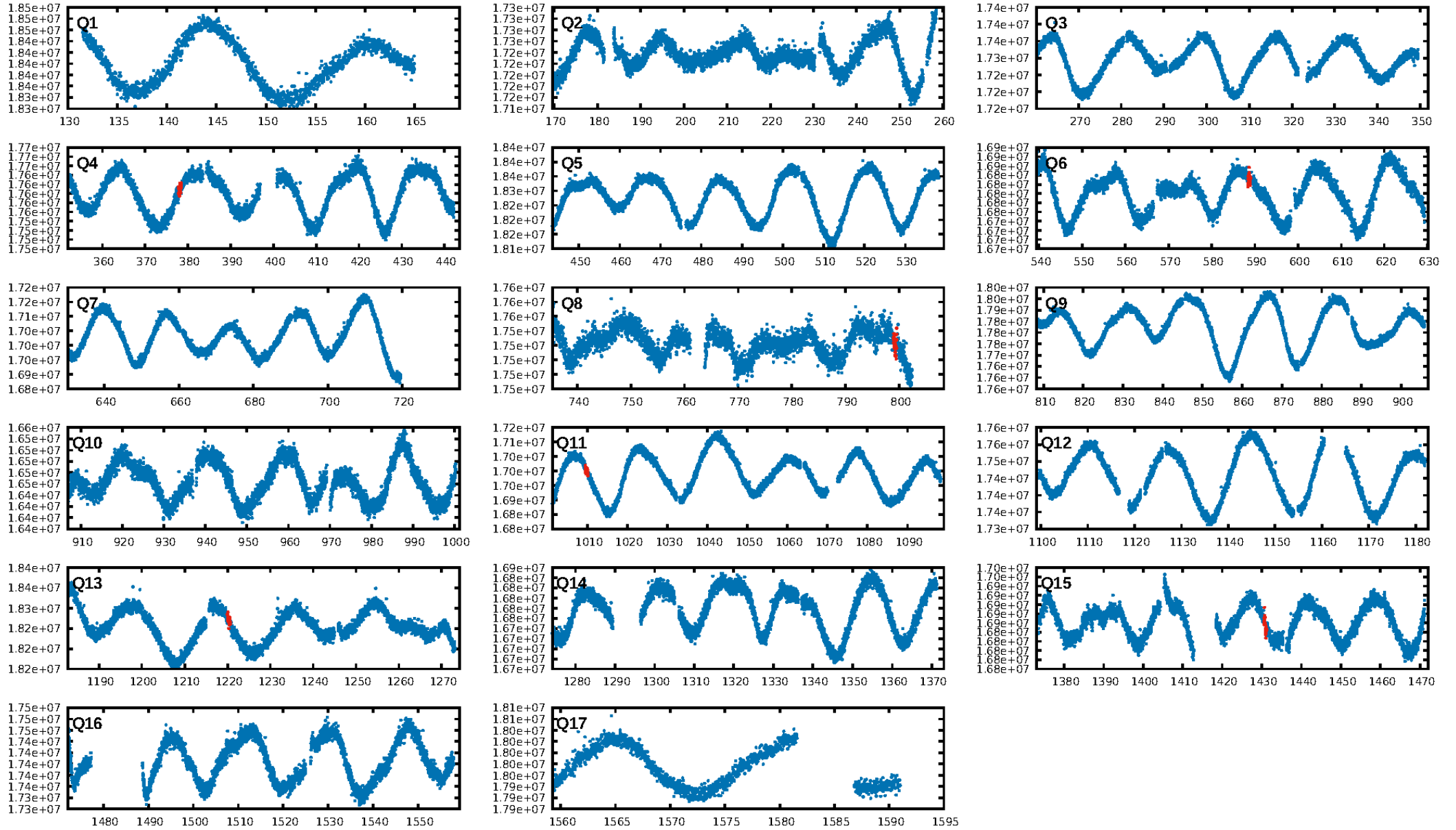
KIC: 8416152 Candidate: 5 of 5 Period: 210.555 d



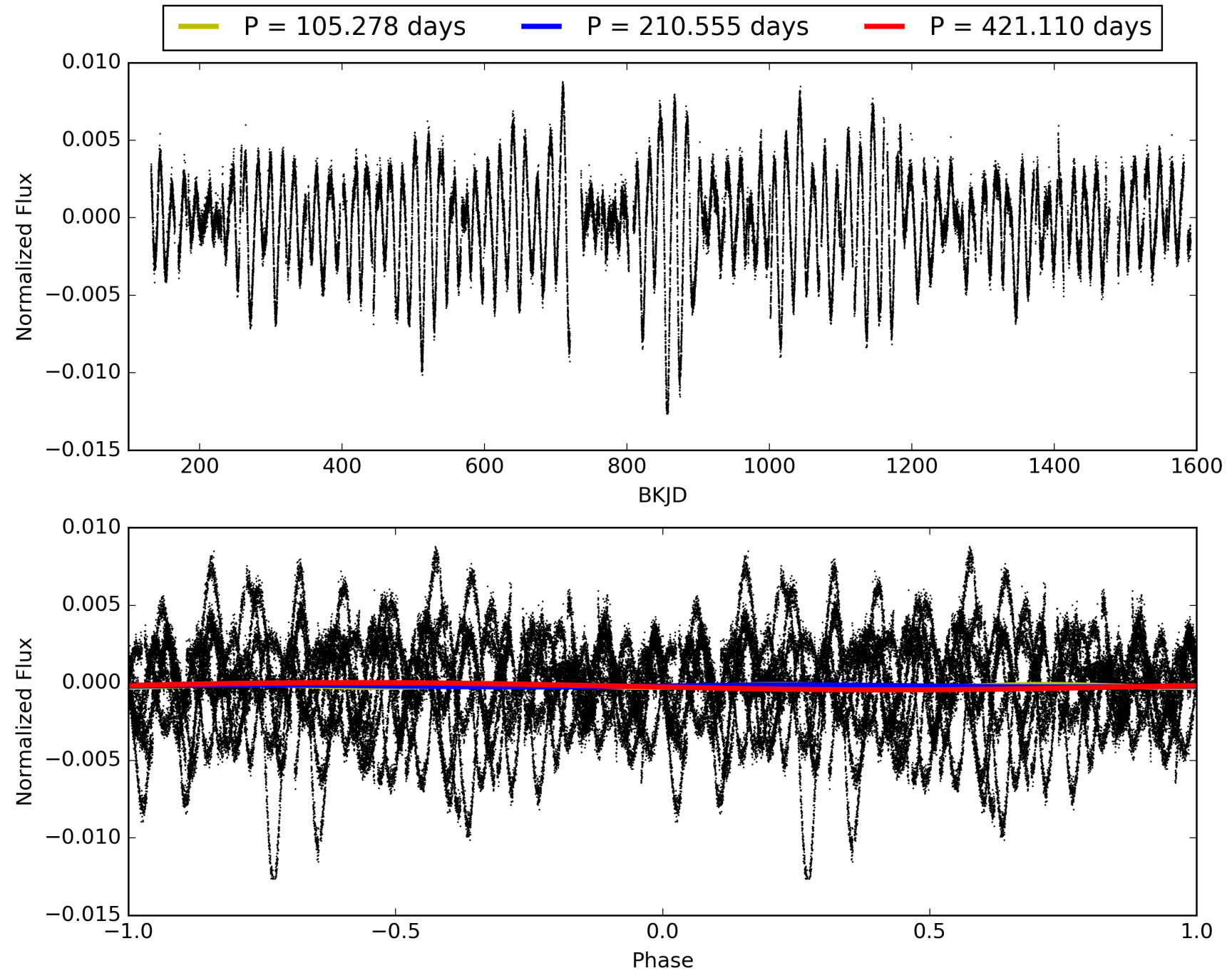
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:07:10 Z

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

TCE 008416152-05, PDC Light Curves

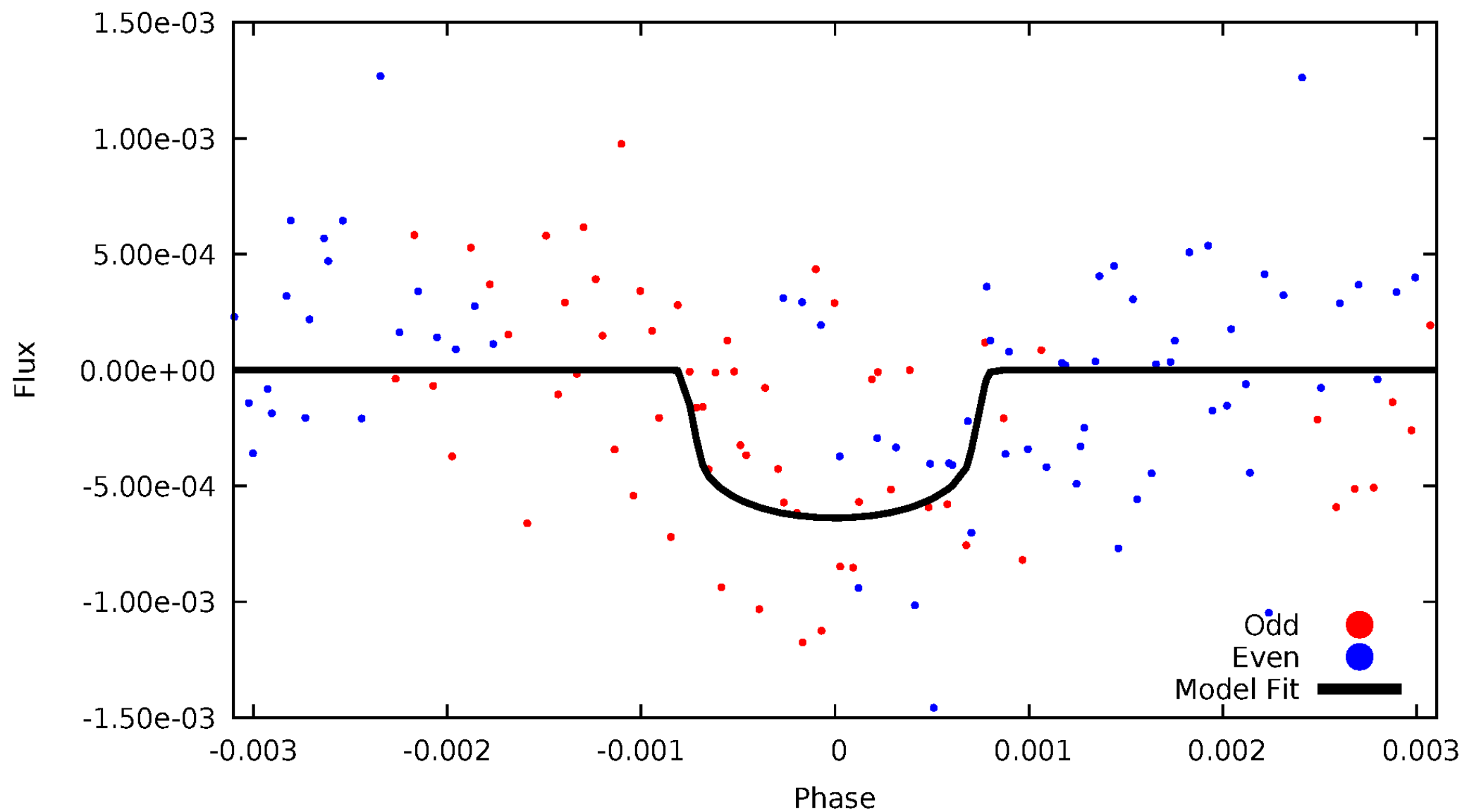


TCE 008416152-05



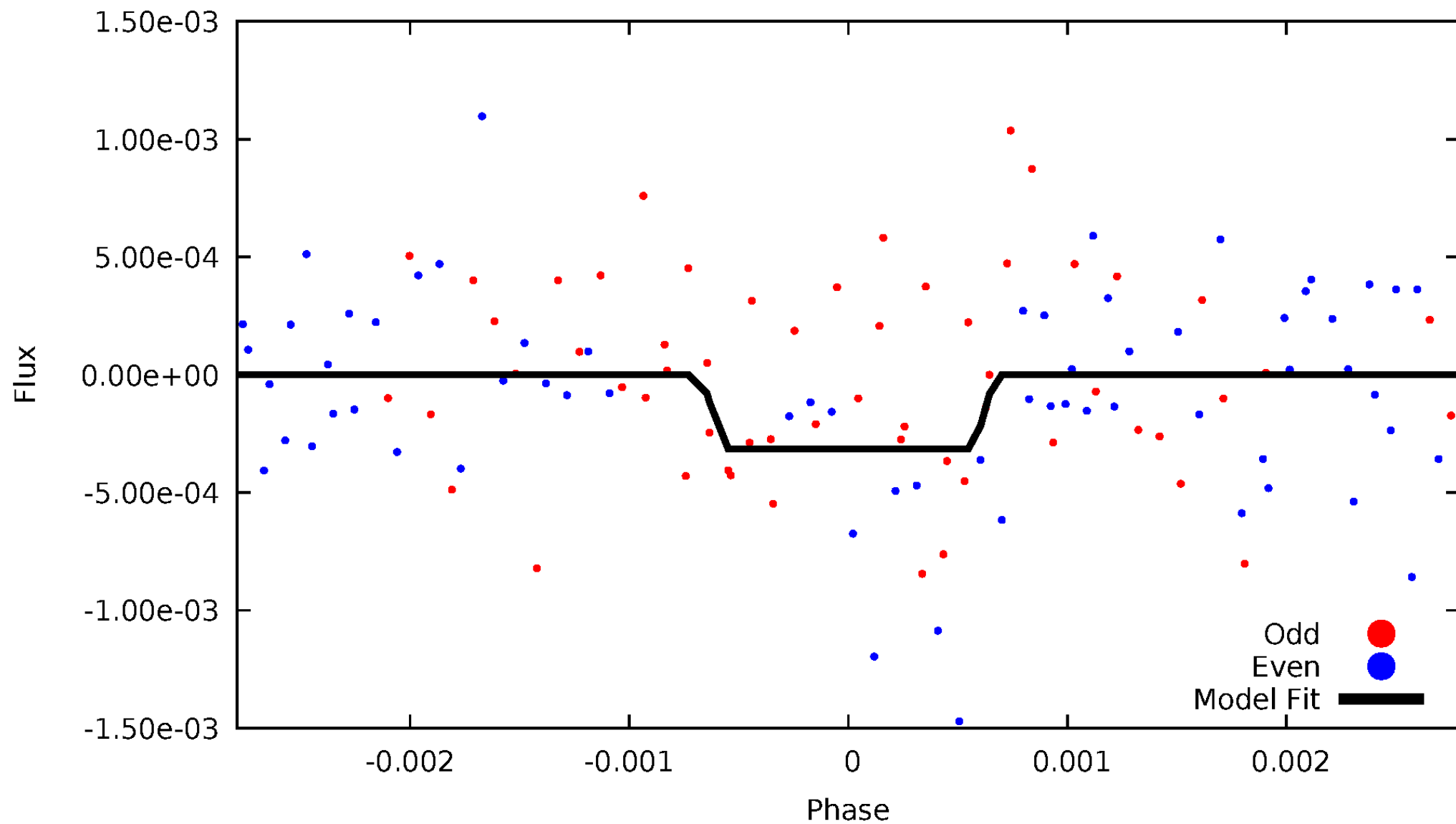
DV Odd/Even

TCE 008416152-05



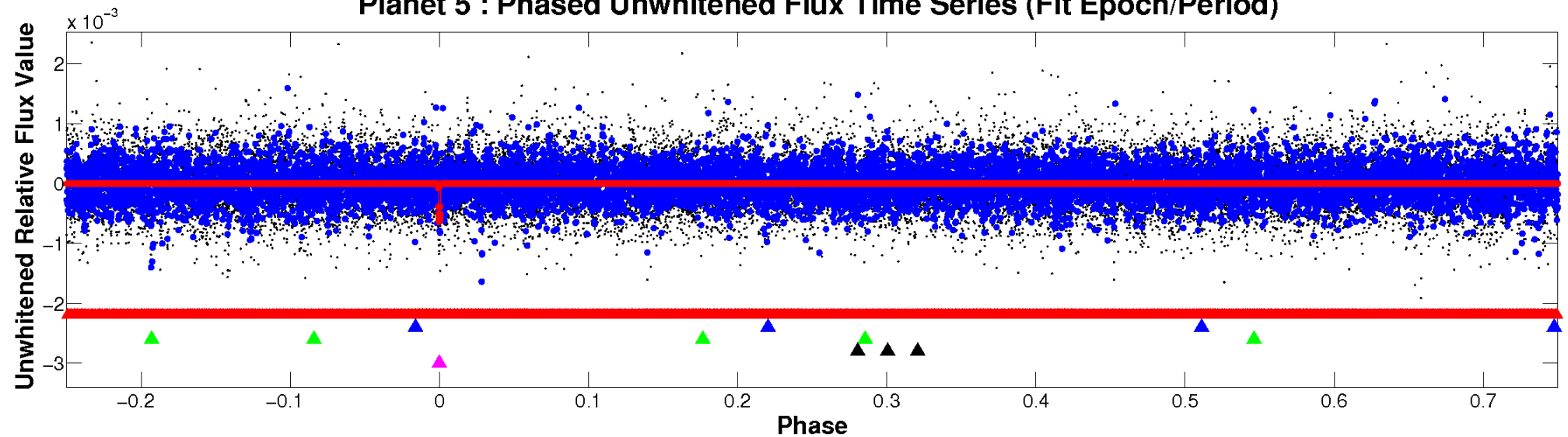
ALT Odd/Even

TCE 008416152-05

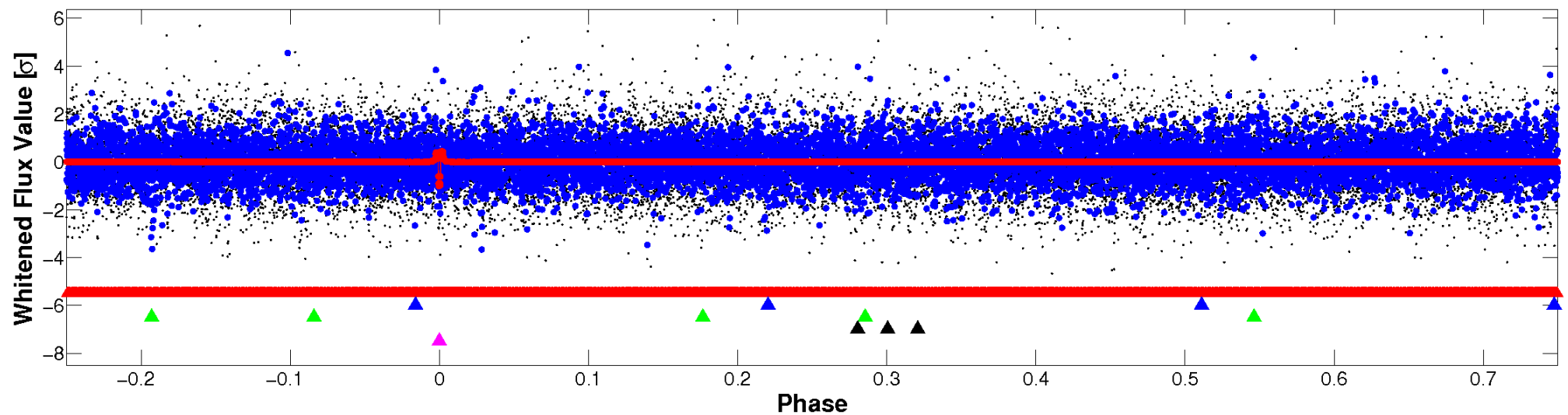


Non-Whitened Vs. Whitened Light Curve

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

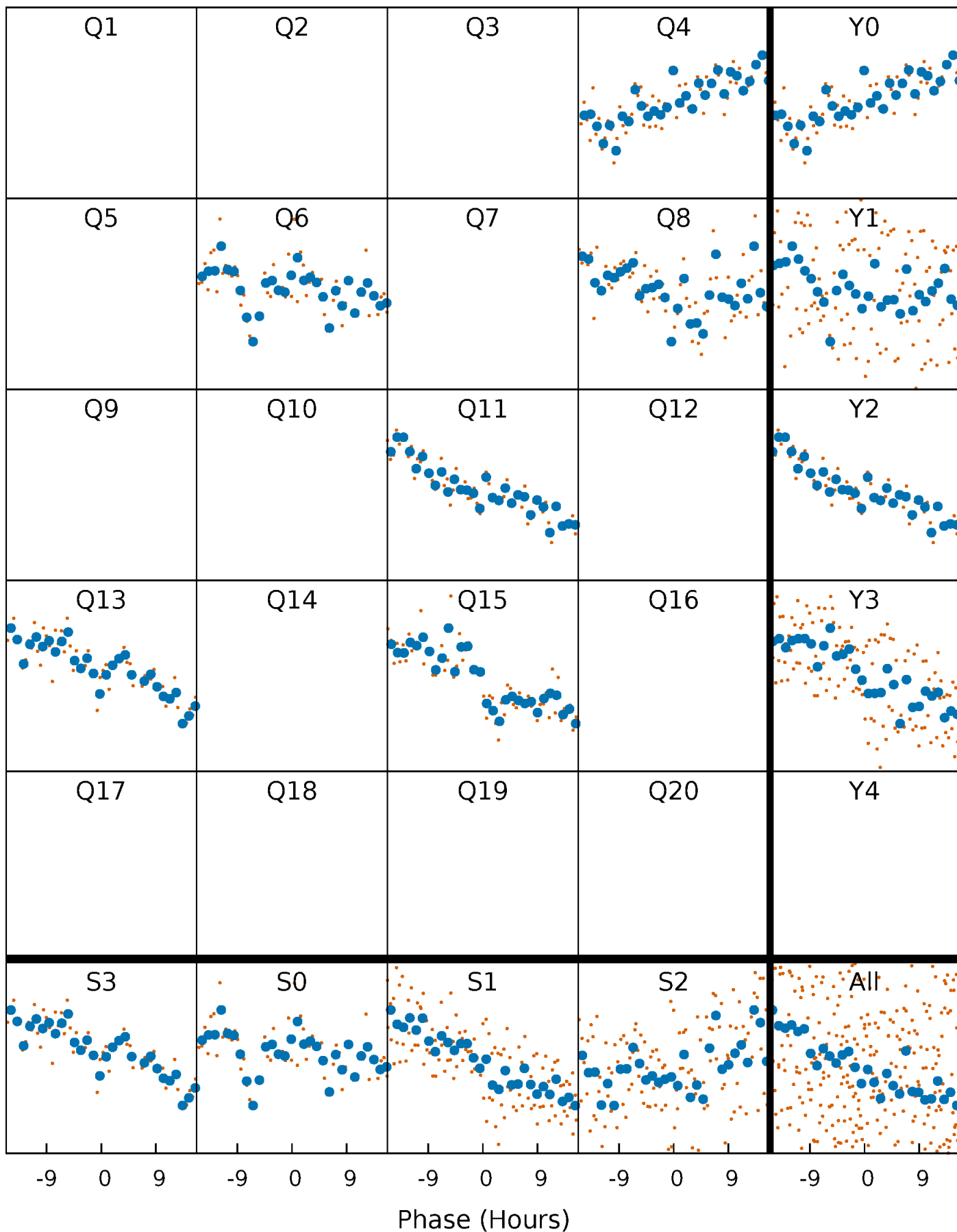


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



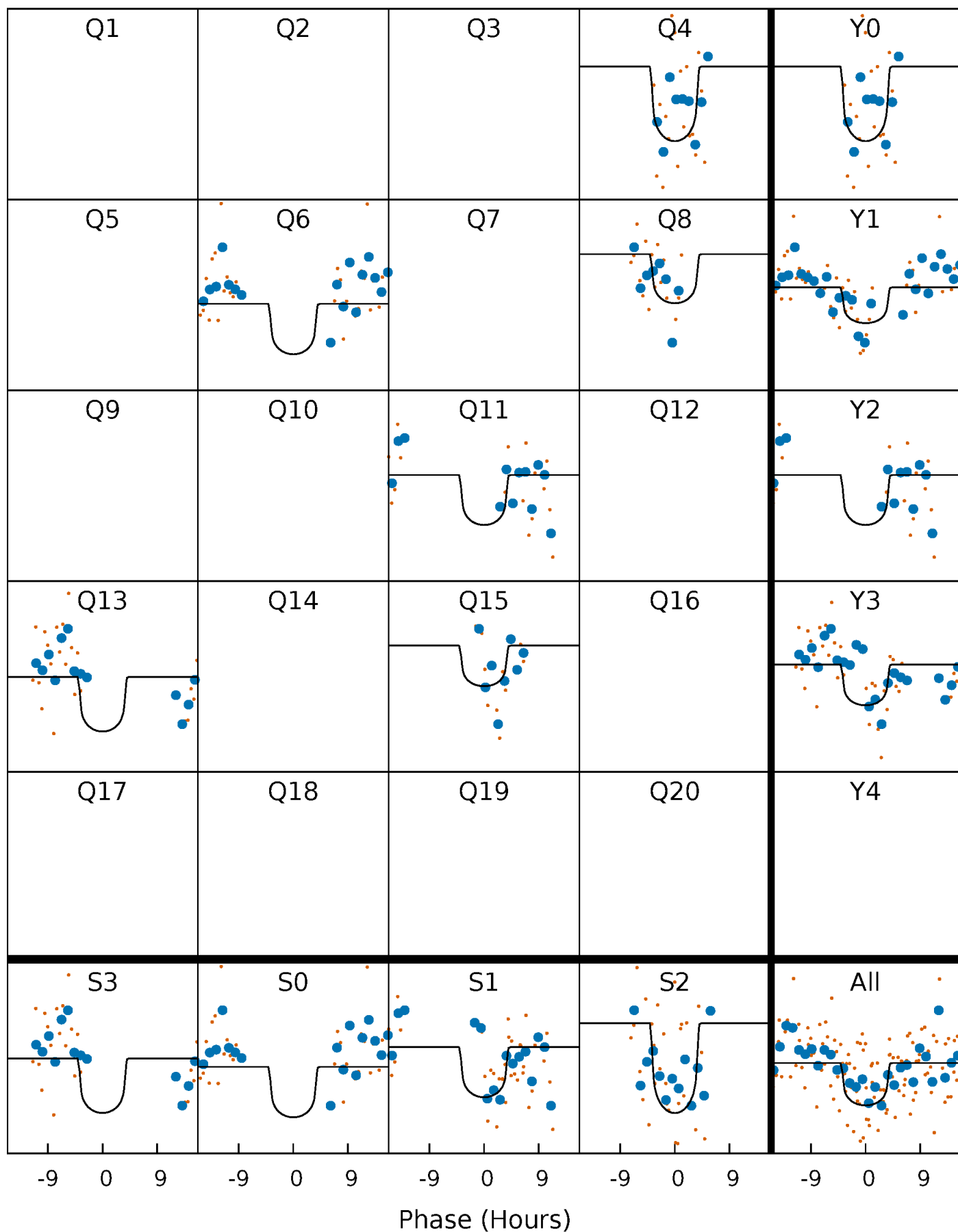
PDC Quarter-Phased Transit Curves

TCE 008416152-05 $P=210.555156$ Days $T_0=167.547527$ (BKJD)



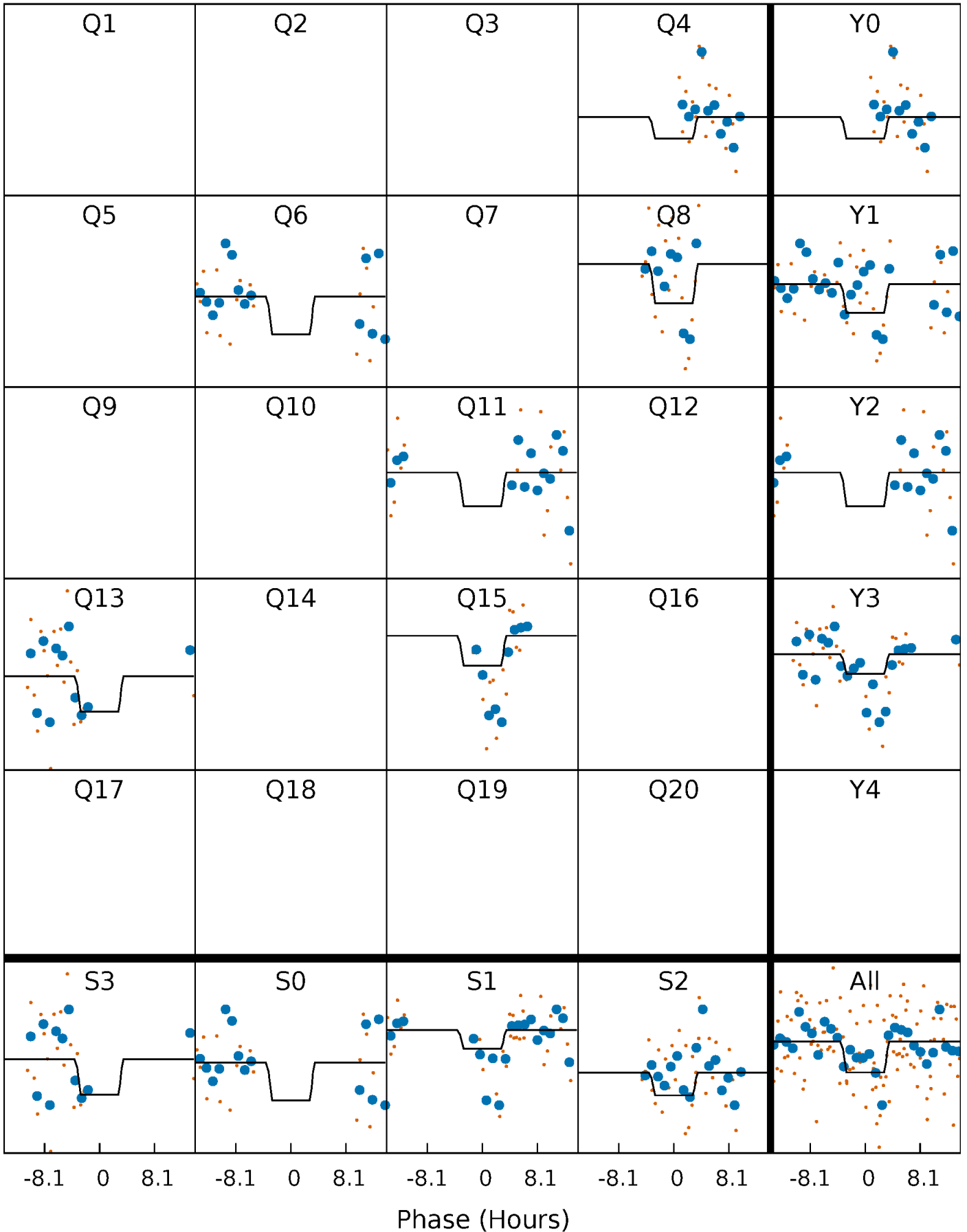
DV Quarter-Phased Transit Curves

TCE 008416152-05 $P=210.555156$ Days $T_0=167.547527$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

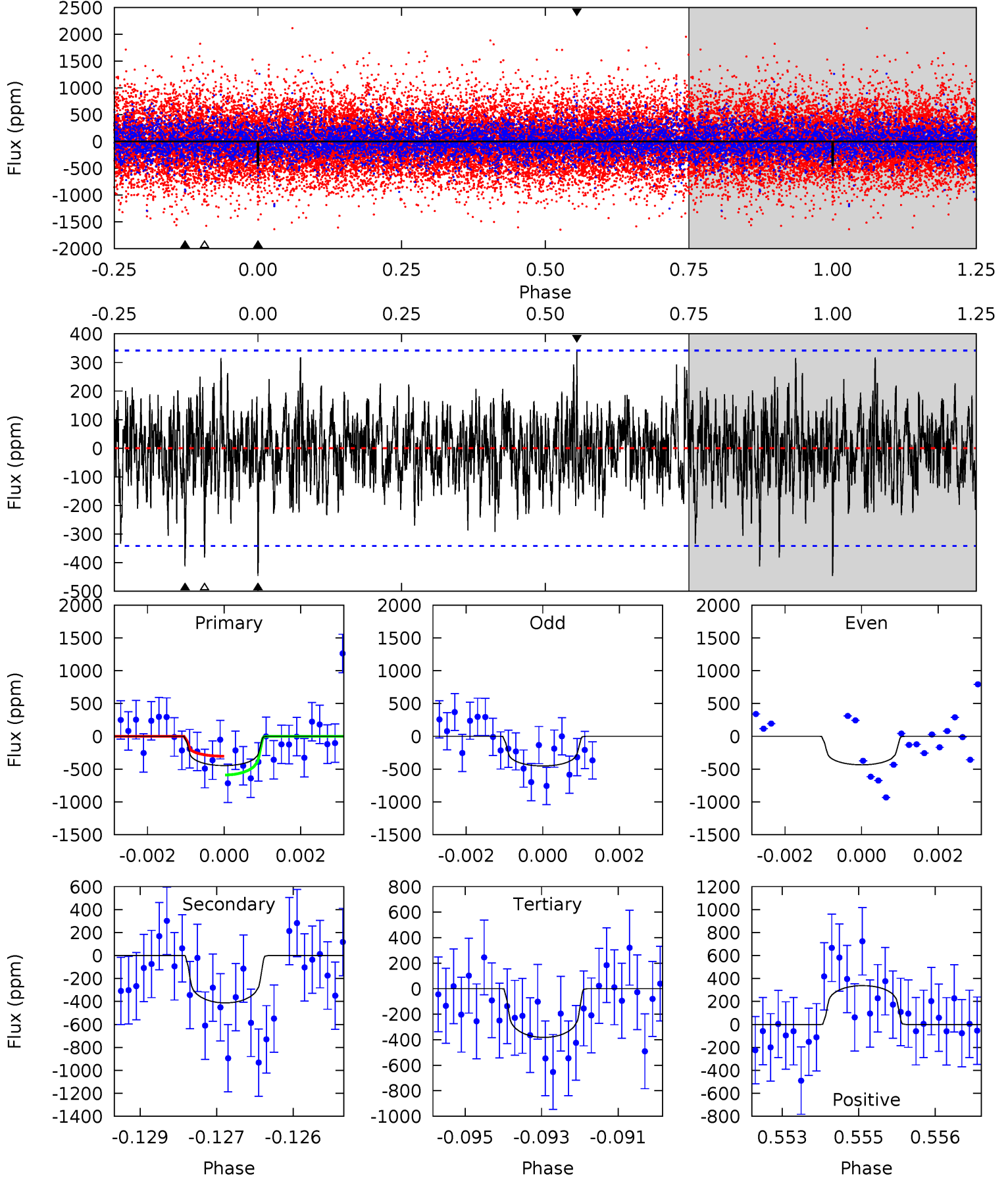
TCE 008416152-05 $P=210.590710$ Days $T_0=167.334841$ (BKJD)



DV Model-Shift Uniqueness Test

008416152-05, P = 210.555156 Days, E = 167.547527 Days

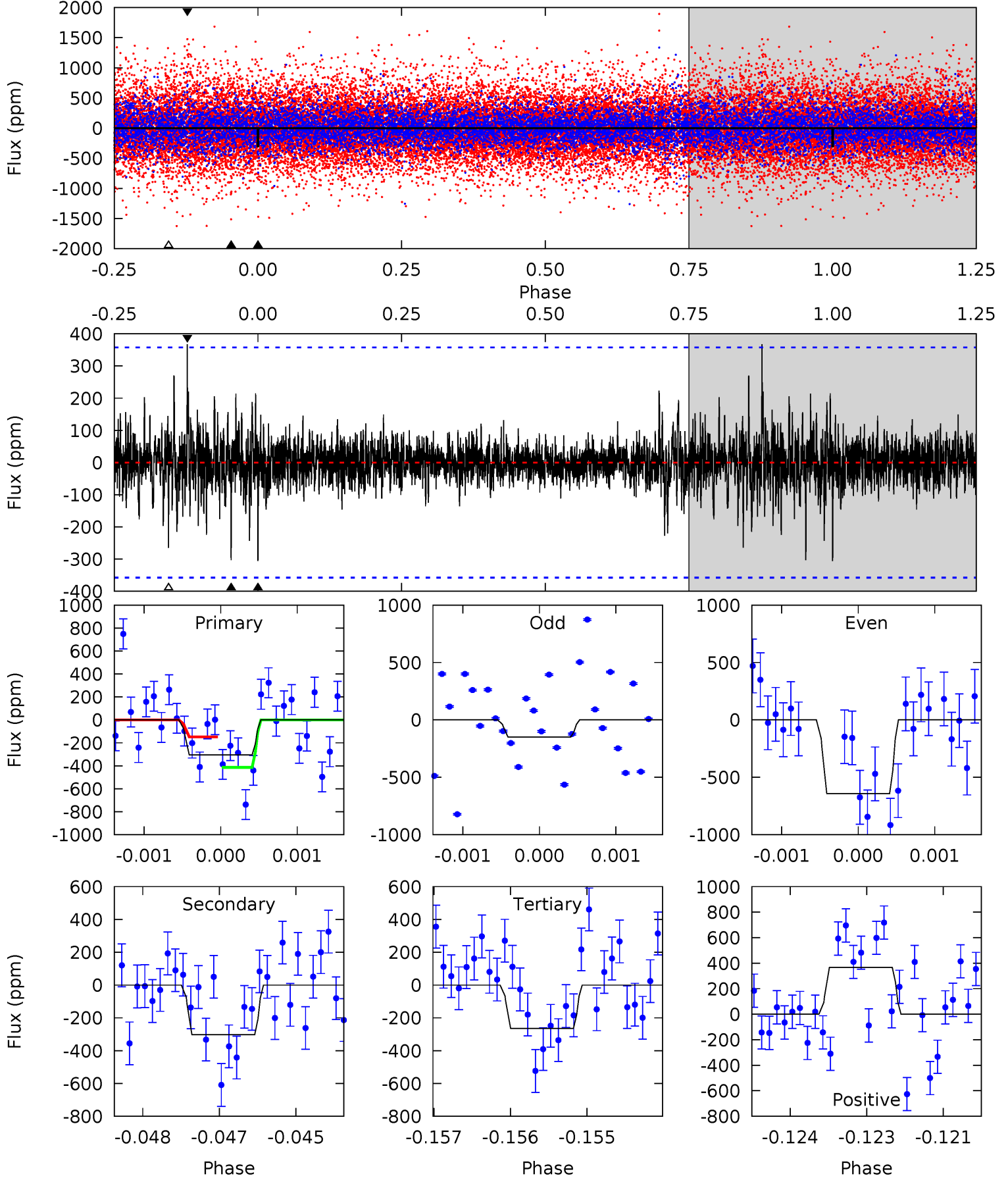
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.03 | 6.49 | 6.01 | 5.32 | 5.37 | 3.17 | 1.52 | 1.02 | 1.71 | 0.48 | 1.18 | 0.13 | 0.88 | 0.43 | 2.25 |



Alt Model-Shift Uniqueness Test

008416152-05, P = 210.590710 Days, E = 167.334841 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4.61 | 4.57 | 3.99 | 5.55 | 5.40 | 3.21 | 0.79 | 0.62 | -0.94 | 0.58 | -0.98 | 3.58 | 1.00 | 0.55 | 1.93 |



Stellar Parameters For KIC 008416152

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5184^{+156}_{-156} | $4.720^{+0.018}_{-0.067}$ | $-1.040^{+0.300}_{-0.300}$ | $0.583^{+0.059}_{-0.025}$ | $0.652^{+0.042}_{-0.042}$ | $4.628^{+0.418}_{-0.995}$ |
| | +3%/-3% | +0%/-1% | +29%/-29% | +10%/-4% | +6%/-6% | +9%/-21% |
| 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 008416152-05 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|---------------|------------------------|-------------------|-----------------------|----------------------------|
| DV | -413 ± 64 | $1.80^{+1.15}_{-1.00}$ | 318^{+11}_{-11} | 4565^{+1980}_{-799} | $24754^{+105217}_{-15557}$ |
| Alt. | -303 ± 66 | $1.47^{+1.17}_{-0.90}$ | 319^{+11}_{-11} | 4591^{+2737}_{-850} | $25269^{+162851}_{-16688}$ |

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 $A_{obs} \gg 1.0$

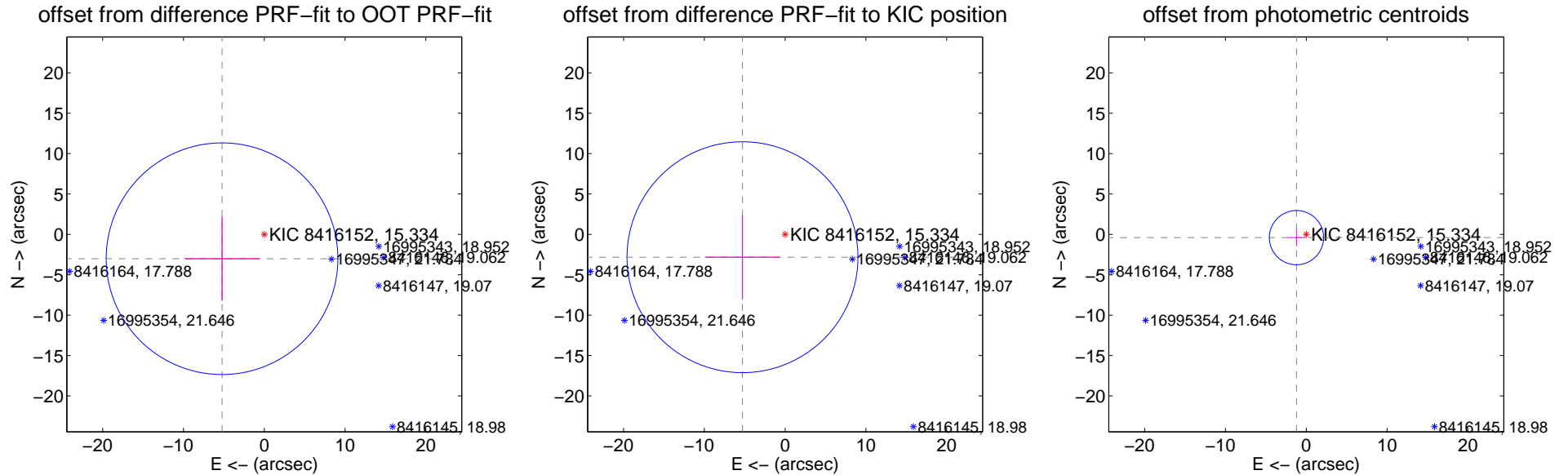
DV Centroid Data

Supplemental centroid analysis for 008416152-05. Kepler magnitude: 15.33. Transit SNR 6.18

There are 0 quarters with good PRF difference image offsets

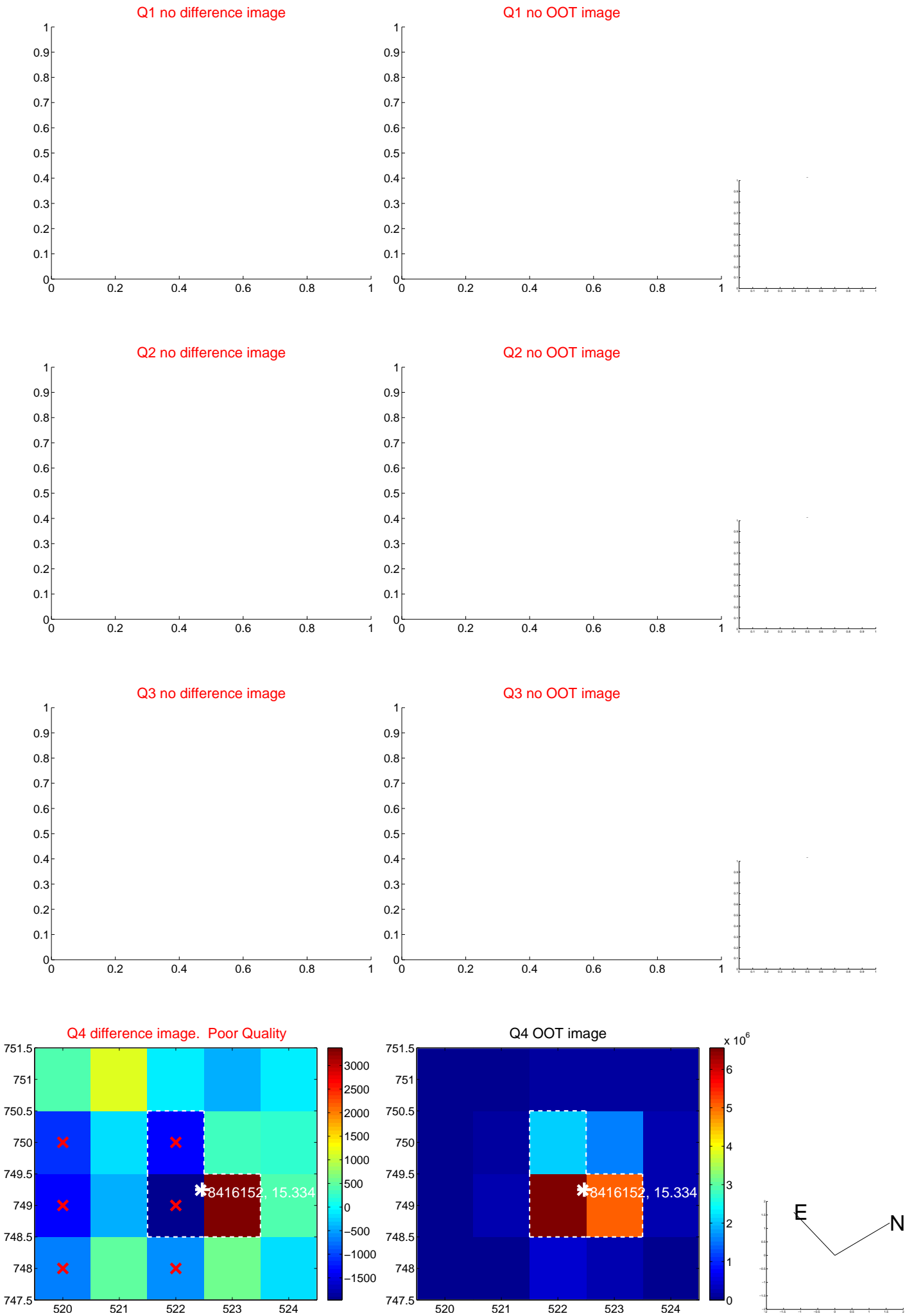
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 6.034 ± 4.780 | 1.26 | 5.228 ± 4.629 | -3.012 ± 5.208 |
| PRF-fit source offset from KIC position | 5.988 ± 4.764 | 1.26 | 5.278 ± 4.629 | -2.827 ± 5.208 |
| photometric centroid source offset | 1.28 ± 1.12 | 1.14 | 1.21 ± 1.12 | -0.40 ± 1.07 |

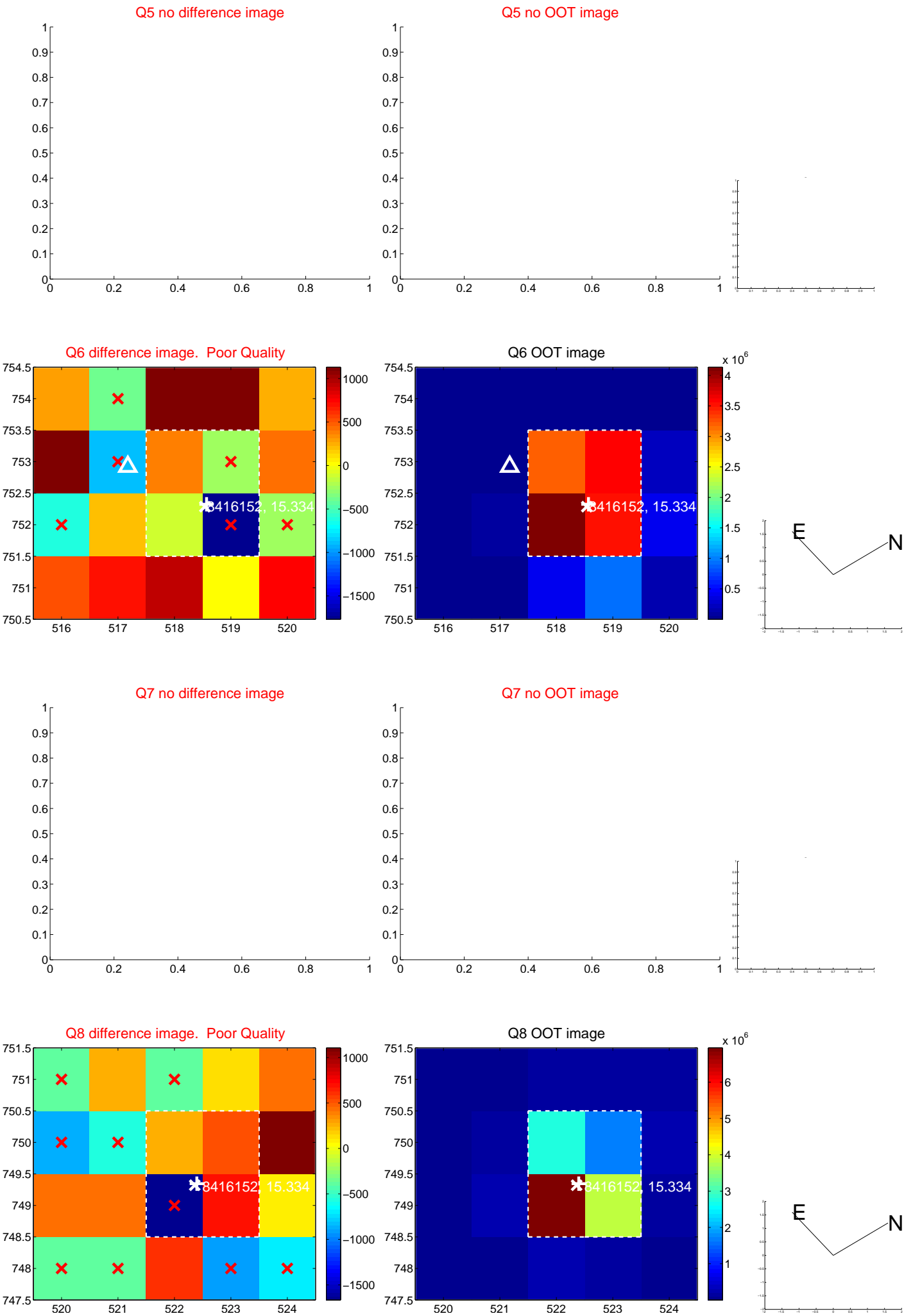


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

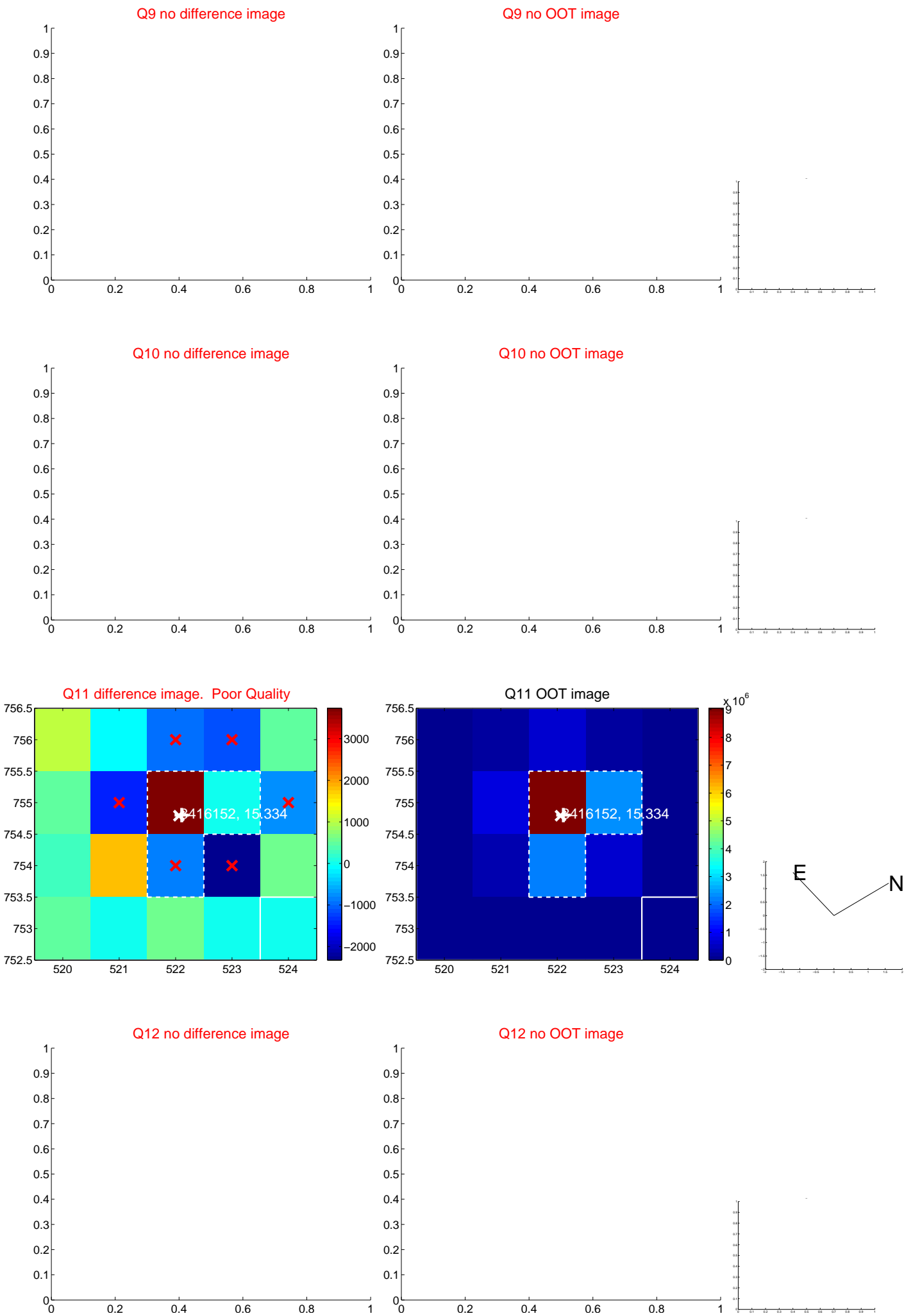
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



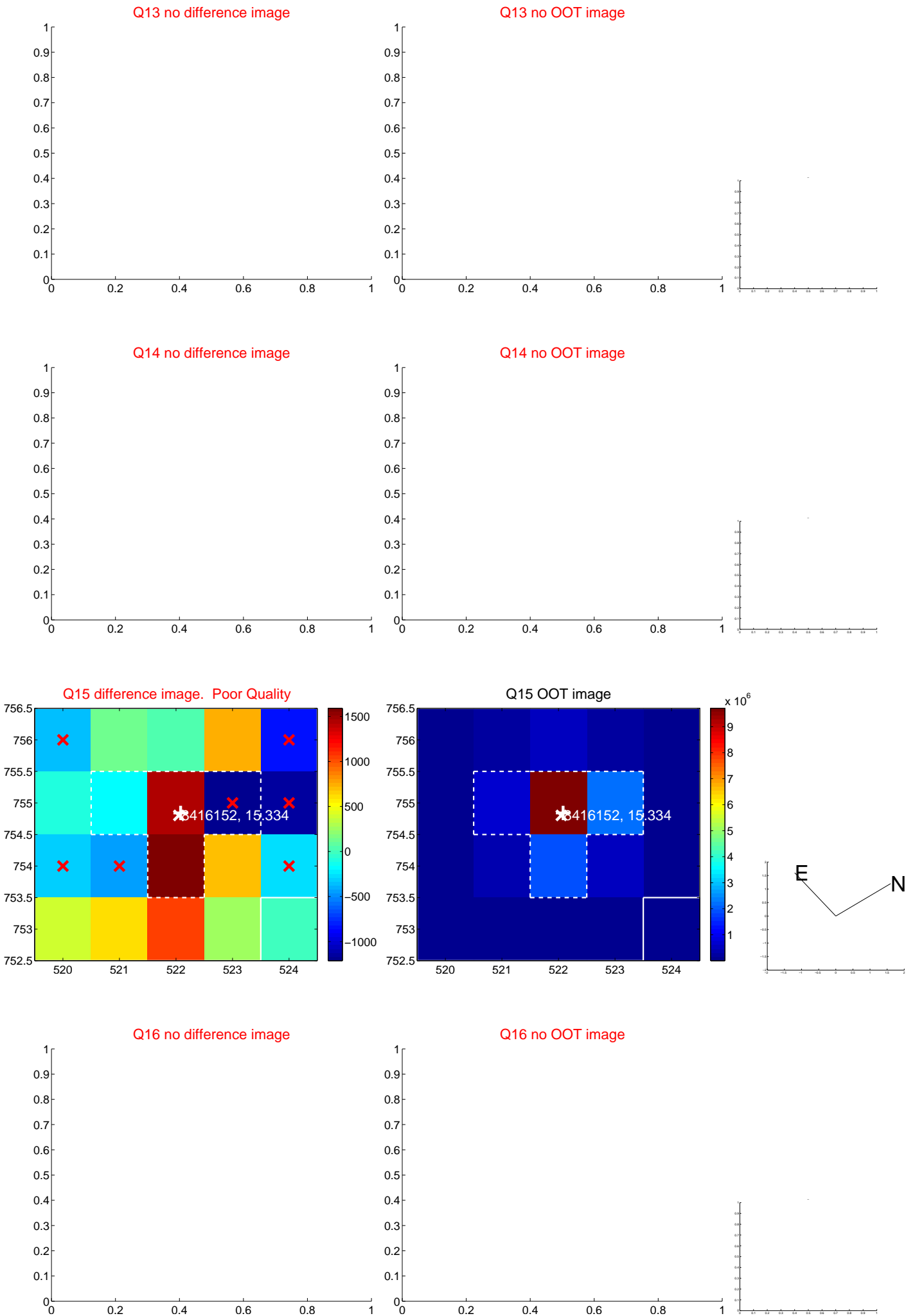
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



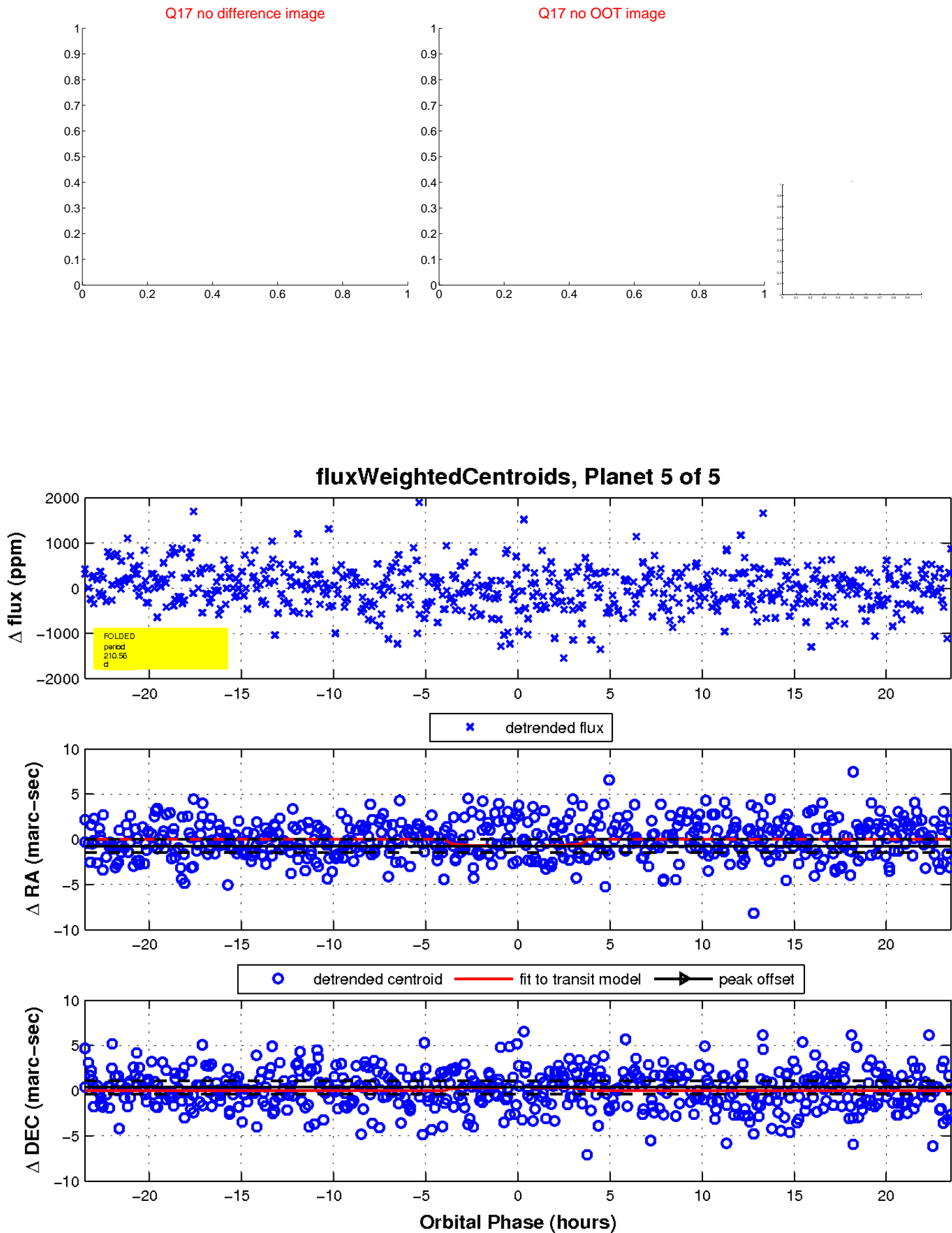
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

