Data Validation (DV) Report
for TESS ID 149603524
Sectors 27 - 27

This Data Validation Report was produced in the
TESS Science Processing Operations Center (SPOC) Pipeline
at NASA Ames Research Center

29-Aug-2020 00:50:36 Z

Contents

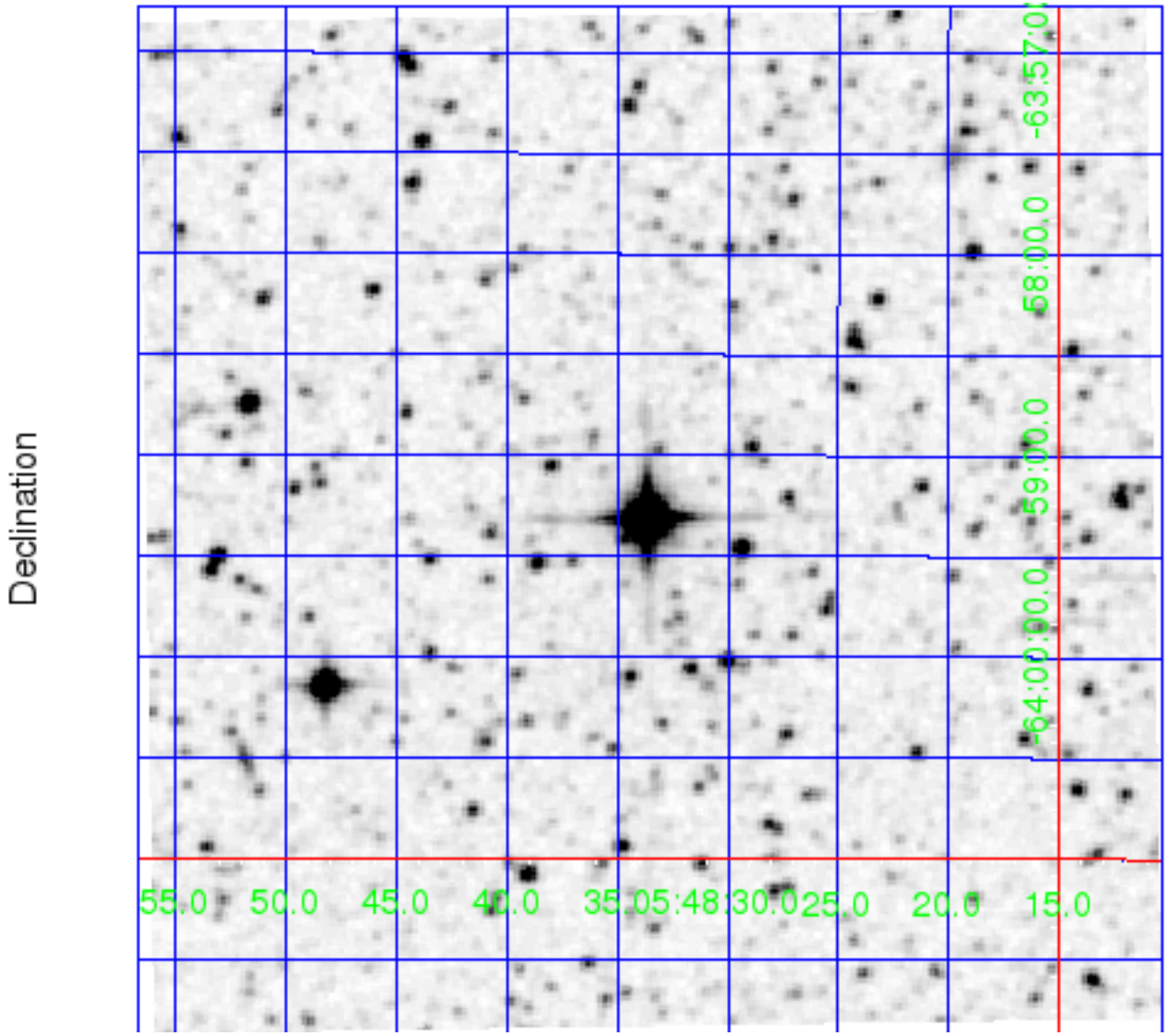
1 Summary

Target Properties	Value	Uncertainty	Units	Provenance
Catalog ID	149603524			
TOI ID	102			
TESS Name	-			
RA	87.13997409	0	degrees	TIC8.1
Dec	-63.98844079	0	degrees	TIC8.1
Magnitude	9.7109	0.006		TIC8.1
Radius	1.214	0.054	Solar radii	TIC8.1
Effective Temperature	6391	116	Kelvin	TIC8.1
log(g)	4.377	0.079722	cm/sec^2	TIC8.1
[M/H]	0.240	0.05	Solar metallicity	TIC8.1
Stellar Density	0.715	0.135	Solar density	TIC8.1-Derived
Limb Darkening Coefficient 1	0.52997			
Limb Darkening Coefficient 2	0.22961			
Limb Darkening Coefficient 3	-0.11543			
Limb Darkening Coefficient 4	-0.0070603			
Number of Planet Candidates	1			
TOI Model	csv-file-toi-catalog-08-28-20-edited.csv			
TESS Names Model	-			
External TCE Model	-			
Software Revision	spoc-5.0.9-20200827			
Date Report Generated	29-Aug-2020 00:50:36 Z			

Sector	Target Table	Camera/ CCD	Crowding Metric	Flux Fraction
27	258	4:4	0.9857	0.9277

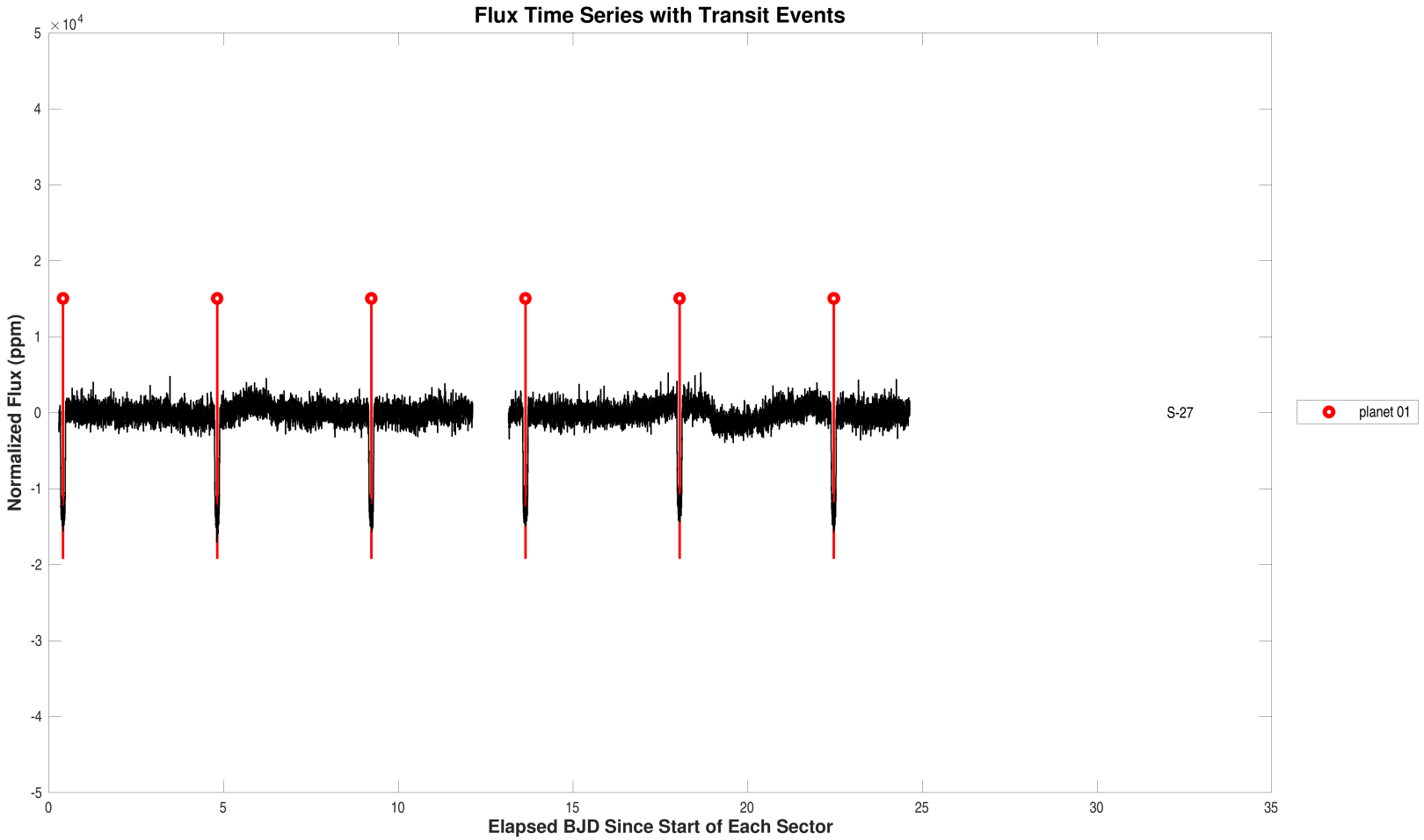
Planet Candidate	TOI ID	TESS Name	TOI Correlation	Period (days)	Period Ratio	Epoch (BTJD)	Semi-major Axis (AU)	Radius (Re)	Seff	Teq (K)	False Alarm	Suspected EB
1	102.01	-	1.00	4.412	1.00	2036.401	0.06	14.6	673.8	1299	0.00e+00	false

2 Survey Image

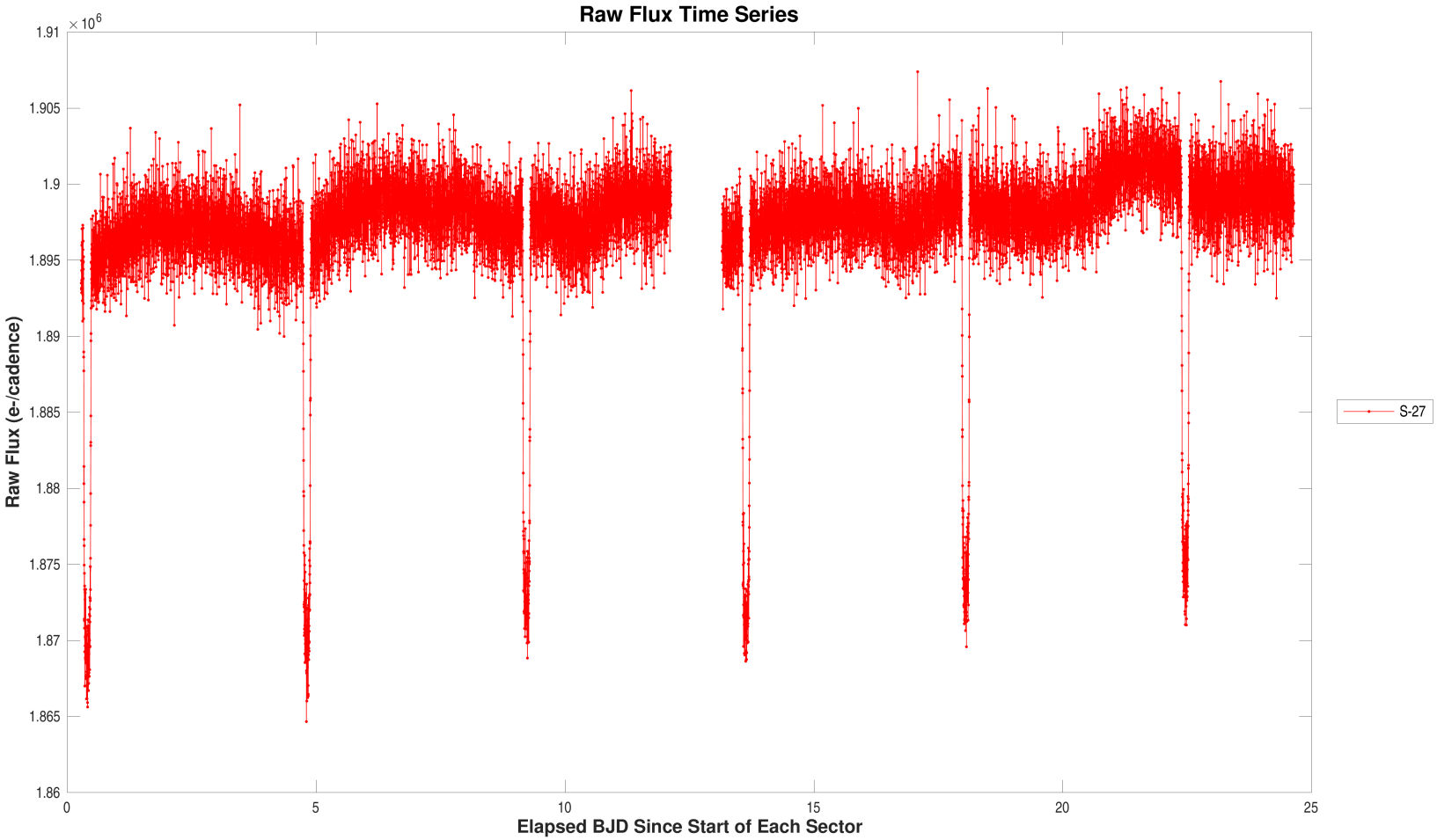


Digitized Sky Survey (DSS) red image. The 5' x 5' image is centered on the J2000 coordinates of target (149603524).

3 Flux Time Series



Summary plot of sector-stitched flux time series and transits for target 149603524, marked with DV fitted epoch/period (or TPS epoch/period if fit was not successful). Transits of identified planets are labeled with epoch BTJD and orbital period. For the data of sector 27, target table 258, start BJD is 2459036.
Open `./summary-plots/0000000149603524-00-flux-dv-fit-27-258.fig`



Summary plot of raw flux time series. For the data of sector 27, target table 258, start BJD is 2459036.
Open `./summary-plots/0000000149603524-00-raw-flux-27-258.fig`

4 Dashboards

Planet Candidate 1

<table>
<tr><td rowspan="2">Model Fitter</td><td colspan="2">Stellar Radius
1.2 ± 0.1 Solar units</td><td rowspan="2">Core Aperture Correlation Statistic
Value = 163.44
Significance = 100.00%
Halo Aperture Correlation Statistic
Value = 14.47
Significance = 100.00%
Core/Halo Ratio
Ratio = 11.29</td><td rowspan="2">Ghost Diagnostic Test</td></tr>
<tr><td colspan="2">Period = 4.4 ± 0.0 days
Depth = 13904 ± 72 ppm
Planet Radius = 14.6 ± 0.7 Earth radii
Semi-major Axis = 0.1 ± 0.0 AU
Effective Stellar Flux = 673.8 ± 97.9
Equilibrium Temperature = 1299 ± 47 Kelvin
Chi-squared/DoF = 0.8
SNR = 193.1</td></tr>
<tr><td rowspan="2">Eclipsing Binary Discrimination Test</td><td colspan="2">Odd-Even Depth Comparison Statistic
Value = 4.36e-01
Significance = 50.90%</td><td>Offsets Relative to Out of Transit Centroid
Source RA Offset = -8.77e-02 ± 2.50e+00 arcsec (-0.04 σ)
Source Dec Offset = 7.42e-02 ± 2.50e+00 arcsec (0.03 σ)
Source Offset Distance = 1.15e-01 ± 2.50e+00 arcsec (0.05 σ)
Offsets Relative to TIC Position
Source RA Offset = 6.04e-02 ± 2.50e+00 arcsec (0.02 σ)
Source Dec Offset = -8.80e-01 ± 2.50e+00 arcsec (-0.35 σ)
Source Offset Distance = 8.82e-01 ± 2.50e+00 arcsec (0.35 σ)</td><td>Difference Image Centroid Offsets</td></tr>
<tr><td>Shorter Period Comparison Statistic
Value = N/A
Significance = N/A</td><td>Longer Period Comparison Statistic
Value = N/A
Significance = N/A</td><td>False Alarm = 0.00e+00
Transit Count = 6
Max Multiple Event Statistic = 167.8</td><td>Bootstrap Test</td></tr>
</table>

Summary of model fitter results and validation test results for target 149603524, planet candidate 1. In general, green denotes that the candidate is likely a planet, while red denotes that the candidate is unlikely to be a planet. Cyan denotes that no data is available. The color of the Model Fitter block is: green, when the SNR of the fit is greater than or equal to 10; yellow, if the SNR is greater than or equal to 7.1 but less than 10; red, if the SNR is less than 7.1 or if the fitter failed. The color of the Ghost Diagnostic Test and Eclipsing Binary Discrimination Test blocks are: green, when the significance is within 2-sigma; yellow, when the significance is between 2- and 3-sigma; red when the significance is greater than 3-sigma. The color of the Difference Image Centroid Offsets block is: green, when the max offset distance sigma is less than or equal to 2; yellow, when the max sigma is between 2 and 3; red when the max sigma is greater than 3. The color of the Bootstrap Test block is green whenever the false alarm probability is less than 10^{-12}, low enough to limit the total number of false alarms from a four year mission to less than one. If the false alarm probability is greater than 10^{-12}, the color of the Bootstrap Test block is: green, when the false alarm probability is less than or equal to the CCDF of a Gaussian distribution at the observed maximum multiple event statistic; yellow when the false alarm probability is between 1 and 2 times that of a Gaussian distribution at the max multiple event statistic; and red when the false alarm probability is more than 2 times that of a Gaussian distribution at the max multiple event statistic.

5 Pixel Level Diagnostics

To reduce clutter, the catalog IDs in the difference images have been replaced by indices representing distance from the target star. The mapping between the indices and the catalog IDs is found in a table at the end of this section.

5.1 Planet Candidate 1

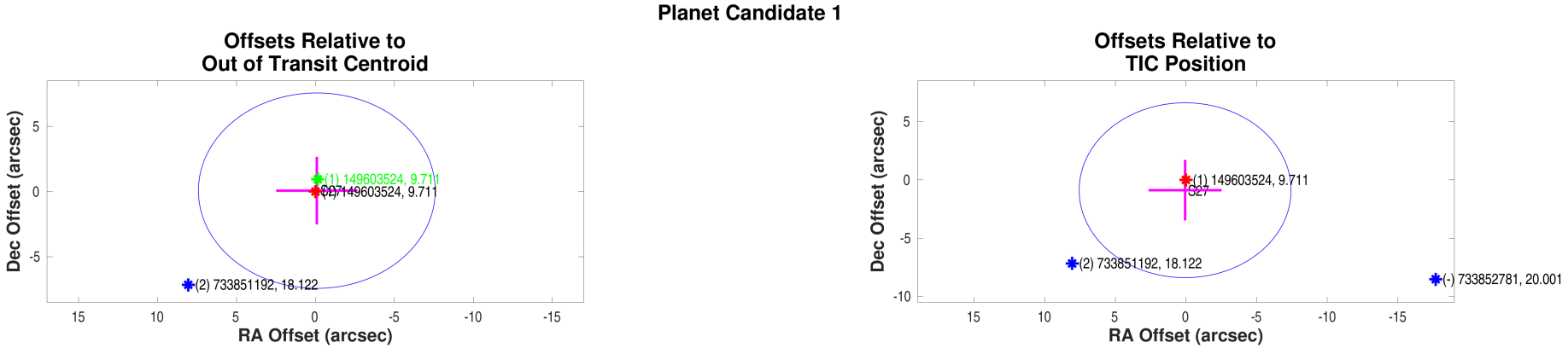
Multi-Sector Average PRF Fit of the Difference Images

Mean offset from the PRF fit to the out of transit image

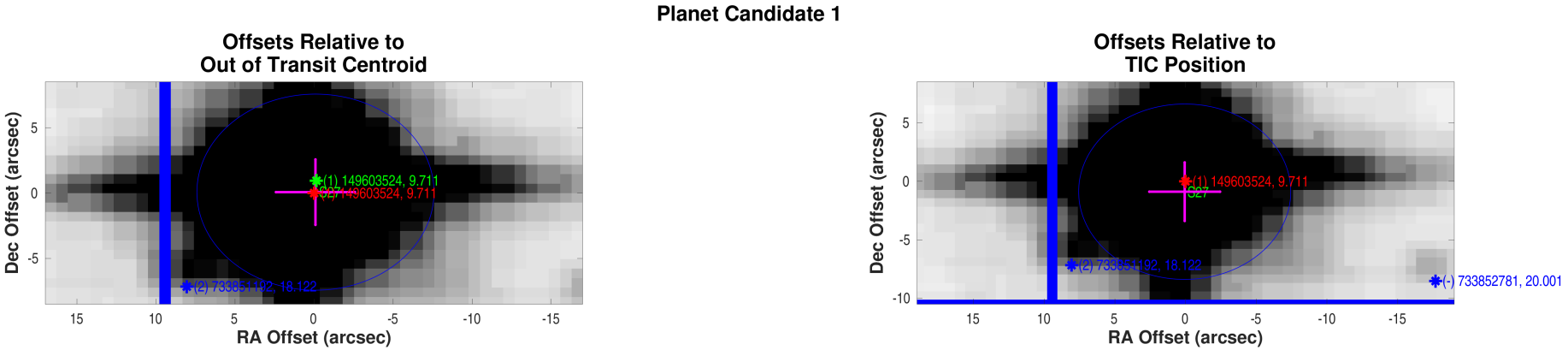
	RA	Dec	Units
Offset	$-0.0877 \pm 2.50e+00$	$0.0742 \pm 2.50e+00$	arcseconds
Offset/σ	-0.04	0.03	
Offset Distance	$0.1149 \pm 2.50e+00$		arcseconds
Offset Distance/σ	0.05		
3σ Radius	7.5007		arcseconds

Mean offset from the TIC RA and Dec

	RA	Dec	Units
Offset	$0.0604 \pm 2.50e+00$	$-0.8796 \pm 2.50e+00$	arcseconds
Offset/σ	0.02	-0.35	
Offset Distance	$0.8817 \pm 2.50e+00$		arcseconds
Offset Distance/σ	0.35		
3σ Radius	7.5011		arcseconds



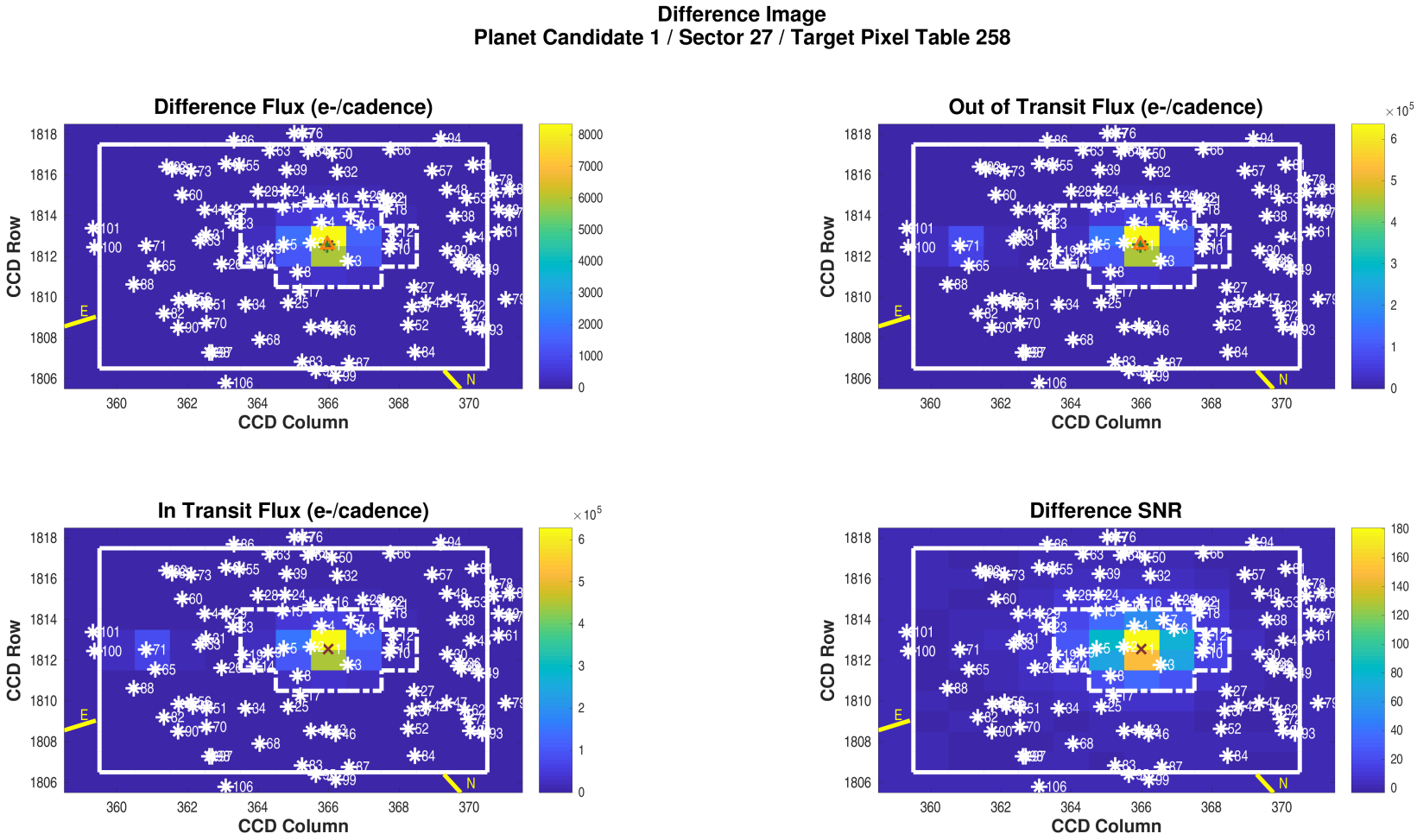
Difference image centroid offsets for target 149603524, planet candidate 1. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in RA and Dec with respect to the TC coordinates of the given target. Symbol key: green cross: per sector centroid offsets with 1-sigma error bars in RA and Dec; magenta cross: robust weighted mean offset over all sectors with 1-sigma error bars in RA and Dec; blue circle: 3-sigma radius of confusion for weighted mean offset; red asterisk: location of target star (out-of-transit centroid in left panel and TIC position in right panel); green asterisk: TIC location of target star with respect to out-of-transit centroid; blue asterisk: location of other TIC objects in the neighborhood. TIC ID and magnitude are noted in the text associated with each marked object. A constant error term of 2.5000 arcseconds has been added in quadrature to the computed uncertainty in the RA and Dec components of the robust mean offset.
Open `./planet-01/difference-image/0000000149603524-01-difference-image-centroid-offsets.fig`



Difference image centroid offsets for target 149603524, planet candidate 1, diplayed on survey image for given target. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in RA and Dec with respect to the TIC coordinates of the given target. Symbol key: green cross: per sector centroid offsets with 1-sigma error bars in RA and Dec; magenta cross: robust weighted mean offset over all sectors with 1-sigma error bars in RA and Dec; blue circle: 3-sigma radius of confusion for weighted mean offset; red asterisk: location of target star (out-of-transit centroid in left panel and TIC position in right panel); green asterisk: TIC location of target star with respect to out-of-transit centroid; blue asterisk: location of other TIC objects in the neighborhood. TIC ID and magnitude are noted in the text associated with each marked object. A constant error term of 2.5000 arcseconds has been added in quadrature to the computed uncertainty in the RA and Dec components of the robust mean offset.
Open `./planet-01/difference-image/0000000149603524-01-difference-image-centroid-offsets-survey.fig`

Difference Image Summary Metrics

Number of Difference Images	Number of Metrics	Number of Good Metrics	Fraction of Good Metrics	Quality Threshold
1	1	1	1.0000	0.70



Difference image for target 149603524, planet candidate 1, sector 27, target pixel table 258. Upper left: difference between mean flux out-of-transit and in-transit; upper right: mean out-of-transit flux; lower left: mean in-transit flux; lower right: difference between mean flux out-of-transit and in-transit after normalizing by the uncertainty in the difference for each pixel. The optimal aperture is outlined with a white dash-dotted line in each panel and the target mask is outlined with a solid white line. Symbol key: x: target position from TIC RA and Dec converted to CCD coordinates via motion polynomials; *: position of nearby TIC objects converted to CCD coordinates via motion polynomials; +: PRF-fit location of target from out-of-transit image; triangle: PRF-fit location of transit source from the difference image. Number of transits = 5; number of valid in-transit cadences = 455; number of in-transit cadence gaps = 0; number of valid out-of-transit cadences = 1171; number of out-of-transit cadence gaps = 0. Difference image quality metric = 1.00 (good).
Open `./planet-01/difference-image/0000000149603524-01-difference-image-27-258.fig`

PRF Fit of the Difference Image

Offset from the PRF fit to the out of transit image

	Row	Column	Units	RA	Dec	Units
Out of Transit Image Centroid	$1812.58 \pm 1.40e-05$	$365.96 \pm 1.94e-05$	pixels	$87.13986436 \pm 8.18e-07$	$-63.98855711 \pm 8.05e-07$	degrees
Difference Image Centroid	$1812.58 \pm 2.01e-03$	$365.96 \pm 2.77e-03$	pixels	$87.13980883 \pm 1.55e-05$	$-63.98853650 \pm 1.20e-05$	degrees
Offset	$-0.0012 \pm 2.01e-03$	$0.0053 \pm 2.77e-03$	pixels	$-0.0877 \pm 2.45e-02$	$0.0742 \pm 4.33e-02$	arcseconds
Offset/σ	-0.57	1.92		-3.57	1.71	
Offset Distance	$0.0054 \pm 2.70e-03$		pixels	$0.1149 \pm 3.69e-02$		arcseconds
Offset Distance/σ	2.02			3.11		

Offset from the TIC RA and Dec converted to pixels via motion polynomials

	Row	Column	Units	RA	Dec	Units
TIC Reference Centroid	$1812.54 \pm 1.42e-04$	$365.99 \pm 1.40e-04$	pixels	$87.13977057 \pm 0.00e+00$	$-63.98829215 \pm 0.00e+00$	degrees
Difference Image Centroid	$1812.58 \pm 2.01e-03$	$365.96 \pm 2.77e-03$	pixels	$87.13980883 \pm 1.55e-05$	$-63.98853650 \pm 1.20e-05$	degrees
Offset	$0.0354 \pm 2.02e-03$	$-0.0222 \pm 2.77e-03$	pixels	$0.0604 \pm 2.45e-02$	$-0.8796 \pm 4.32e-02$	arcseconds
Offset/σ	17.58	-7.99		2.47	-20.36	
Offset Distance	$0.0418 \pm 2.14e-03$		pixels	$0.8817 \pm 4.35e-02$		arcseconds
Offset Distance/σ	19.49			20.27		

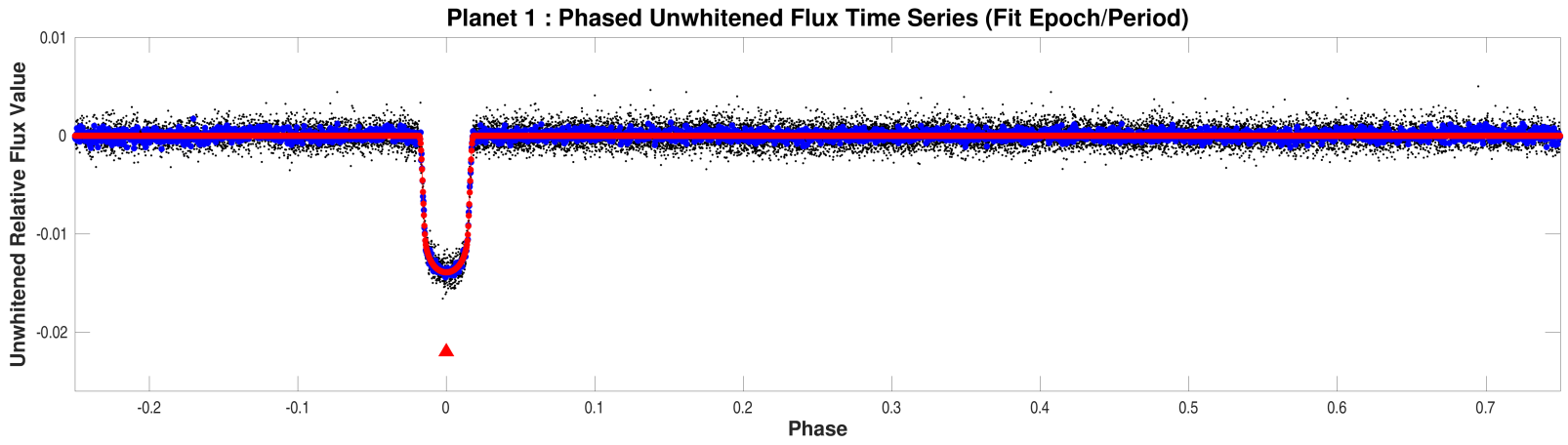
5.2 Difference Image TIC Key

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
1	149603524	9.711	87.13977057	-63.98829215	0.00
2	733851192	18.122	87.14487089	-63.99027989	10.77
3	733851191	18.163	87.13800309	-63.98278510	20.02
4	733851143	18.527	87.13486048	-63.99471476	24.39
5	733851193	18.283	87.15449189	-63.99198301	26.77
6	149603525	15.042	87.12243091	-63.99089364	28.93
7	733852774	18.405	87.12319365	-63.99390959	33.07
8	149603518	15.962	87.15830692	-63.98392609	33.22
9	149603528	15.996	87.16094894	-63.99213906	36.19
10	149603517	16.657	87.12037576	-63.98255965	36.93
11	733852828	18.458	87.11824462	-63.98378544	37.66
12	149603521	17.034	87.11372020	-63.98670750	41.52
13	149603533	16.712	87.13209683	-64.00085771	46.83
14	733851190	17.920	87.16987675	-63.98971636	47.81
15	149603534	16.930	87.14329841	-64.00150526	47.89
16	149603531	15.498	87.12519309	-64.00024808	48.81
17	733851201	18.243	87.16349209	-63.97867598	51.00
18	733852775	18.286	87.10904083	-63.99287163	51.24
19	733851158	18.237	87.17027278	-63.99351212	51.69
20	733852756	18.114	87.11292451	-63.99808304	55.13
21	733852760	18.315	87.10584809	-63.99496181	58.69
22	149603530	17.065	87.10644420	-63.99602230	59.52
23	733851154	18.228	87.16485599	-64.00131724	61.38
24	733851125	18.288	87.13736456	-64.00541870	61.77
25	733851202	18.514	87.17100310	-63.97681110	64.34
26	149603527	17.127	87.18128608	-63.99184083	66.78
27	149603509	17.587	87.12409799	-63.97089183	67.35
28	733851124	17.810	87.14664808	-64.00748394	69.94
29	733851141	18.229	87.16290860	-64.00526838	71.20
30	733852827	17.568	87.10155922	-63.97767626	71.41
31	149603532	17.996	87.17752040	-64.00054072	74.14
32	733852771	17.346	87.11397247	-64.00623564	76.37
33	733851157	17.364	87.18124829	-63.99947073	76.86
34	149603515	17.253	87.18581529	-63.97972205	78.97
35	149603510	16.510	87.10148400	-63.97385410	79.72
36	733852830	18.067	87.09989805	-63.97440770	80.38
37	733852855	18.668	87.13081525	-63.96607609	81.22
38	149603519	16.997	87.08850362	-63.98584660	81.42

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
39	733851131	18.046	87.13033644	-64.01069859	82.03
40	733852829	18.126	87.10131634	-63.97282336	82.38
41	733851110	18.170	87.17019473	-64.00693385	82.53
42	733852847	17.641	87.12470585	-63.96615600	83.16
43	733851413	18.270	87.16540388	-63.96795875	83.64
44	733851412	17.938	87.17081571	-63.96886183	85.41
45	733852812	18.478	87.08942077	-63.97929347	85.84
46	733851414	18.662	87.16352936	-63.96617064	88.03
47	733852848	17.564	87.11669108	-63.96542711	90.02
48	733852798	18.117	87.08282259	-63.99309937	91.56
49	149603507	16.429	87.09681015	-63.97041937	93.49
50	733851928	18.105	87.11005551	-64.01127578	95.12
51	733851390	18.552	87.19879159	-63.98278586	95.27
52	733851415	18.402	87.13764088	-63.96179592	95.45
53	733852805	18.272	87.07876297	-63.98946381	96.41
54	733851913	17.515	87.11747346	-64.01371021	98.04
55	149603543	16.176	87.14489554	-64.01552568	98.37
56	733851187	17.906	87.20206464	-63.98558773	98.83
57	733851942	18.296	87.08182749	-63.99911381	99.43
58	733851387	18.496	87.20290011	-63.98424362	100.73
59	733851917	18.326	87.11527394	-64.01412852	100.73
60	733851123	17.175	87.17315088	-64.01247760	101.77
61	733852813	18.330	87.07847659	-63.97846587	103.03
62	733852849	17.528	87.11279651	-63.96219306	103.16
63	149603546	17.206	87.12999502	-64.01695025	104.32
64	733851132	18.208	87.14878931	-64.01700642	104.35
65	733851170	18.111	87.20402855	-63.99661770	105.79
66	149603539	16.970	87.08928898	-64.00776573	106.15
67	149603520	17.061	87.20683874	-63.98602239	106.20
68	149603504	16.659	87.19192929	-63.96964198	106.25
69	733852795	18.180	87.07157478	-63.98402116	108.76
70	733851386	18.280	87.20462831	-63.97803868	108.85
71	149603535	11.861	87.20093504	-64.00237376	109.06
72	733852851	18.598	87.11449732	-63.95956395	110.85
73	149603547	15.816	87.16282920	-64.01782853	112.39
74	733852809	18.090	87.06791258	-63.98874242	113.46
75	149603516	17.533	87.06895675	-63.98237540	113.81
76	733851919	18.285	87.11367804	-64.01880657	117.32

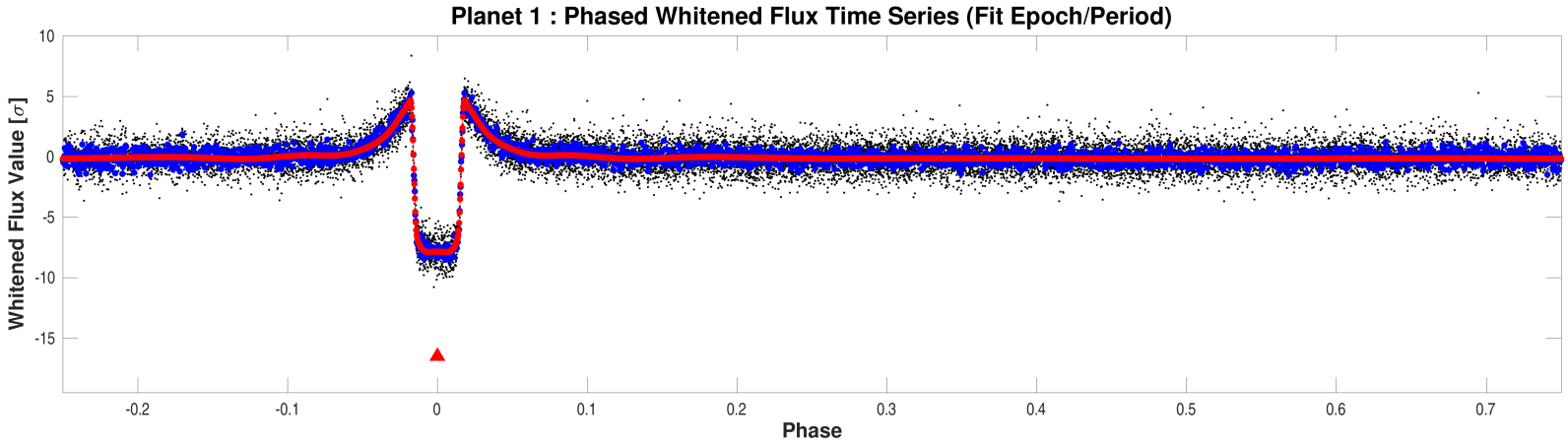
RA, Dec and Distances are corrected for proper motion. This table may not contain all of the objects shown.

6 Phased Light Curves

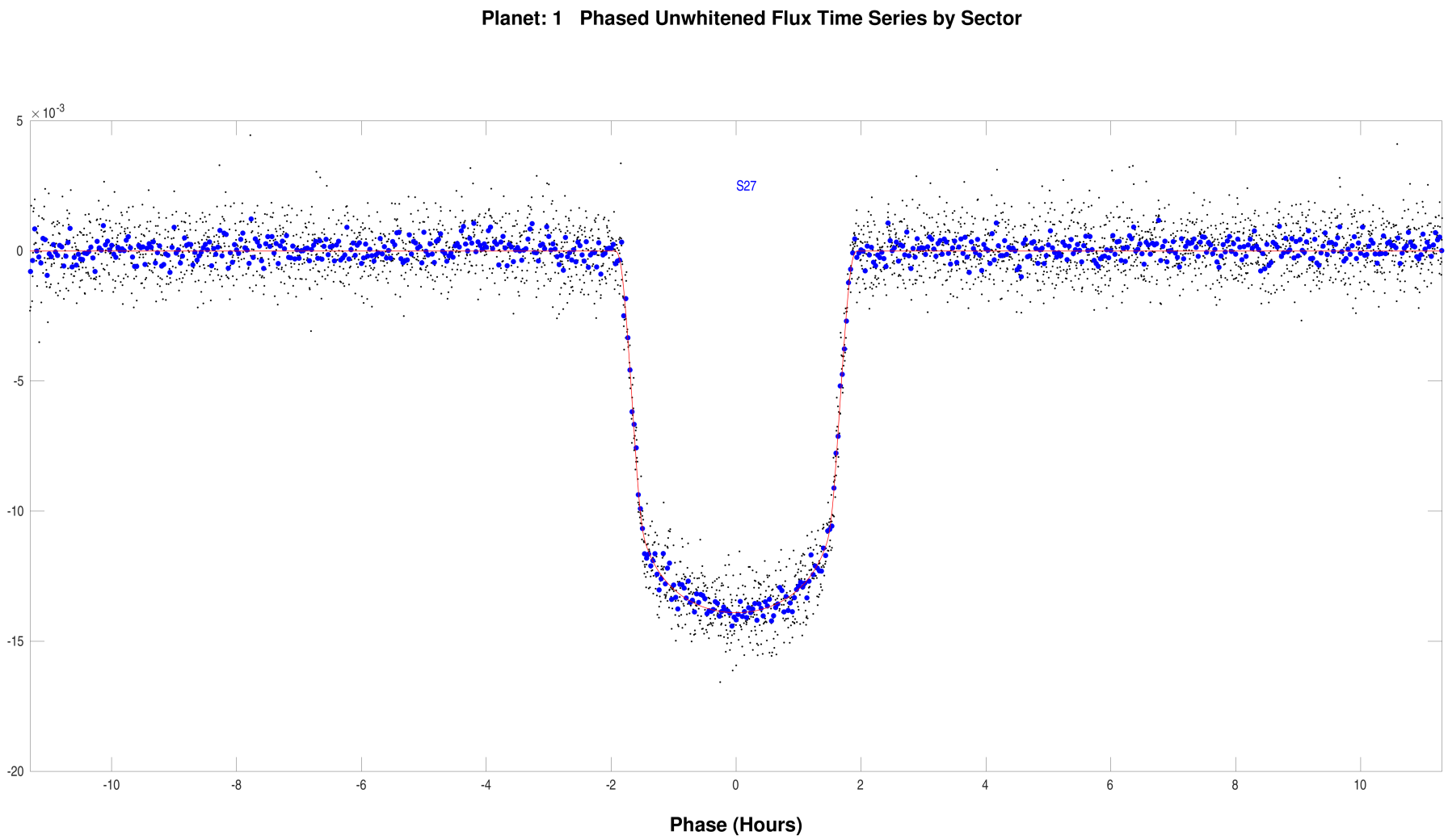


Phased unwhitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased unwhitened flux time series averaged in one cadence wide bins are plotted in bigger blue dots. When all transits fit completes with full or secondary convergence, the averaged values of the phased unwhitened fitted model light curve are plotted in red dots. Transit event markers in different colors indicate the locations of the transits of all planet candidates. The transits of the same planet candidate are labeled with the markers of the same color, for example, blue markers for transits of plane candidate #1, red markers for transits of planet candidate #2, etc.

Open `./summary-plots/0000000149603524-01-phased-unwhitened-flux-time-series.fig`



Phased whitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased whitened flux time series averaged in one cadence wide bins are plotted in bigger blue dots. When all transits fit completes with full or secondary convergence, the averaged values of the phased whitened fitted model light curve are plotted in red dots. Transit event markers in different colors indicate the locations of the transits of all planet candidates. The transits of the same planet candidate are labeled with the markers of the same color, for example, blue markers for transits of plane candidate #1, red markers for transits of planet candidate #2, etc.
Open `./summary-plots/0000000149603524-01-phased-whitened-flux-time-series.fig`



Phased unwhitened flux time series by sector for target 149603524, planet candidate 1. Period = 4.4119 days; transit epoch = 2036.4009 BTJD.
Open `./summary-plots/0000000149603524-01-phased-unwhitened-flux-time-series-by-sector.fig`

7 Planet Candidate 1

7.1 Model Fitter: All Transits

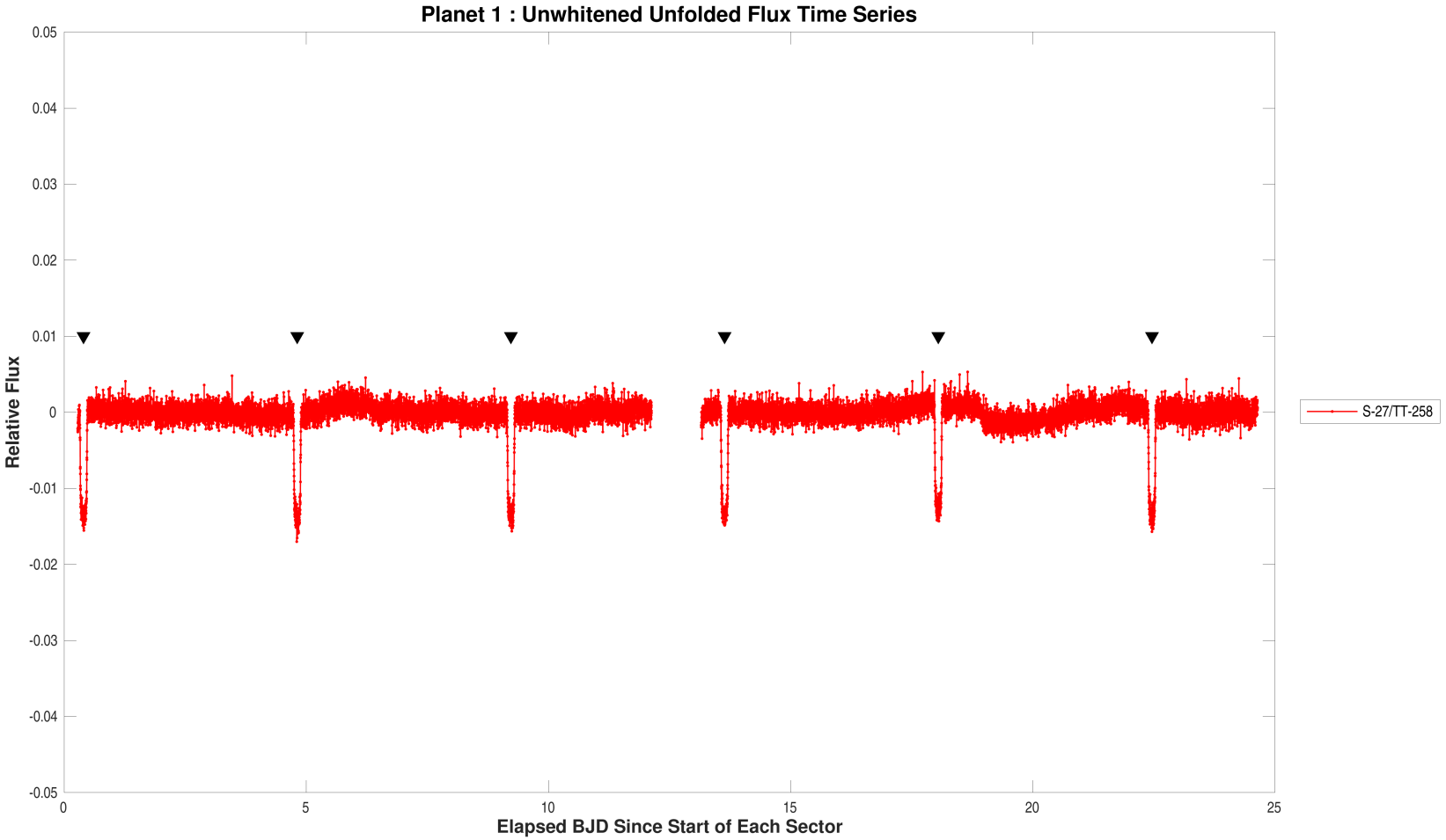
Model Characteristic	Name
Transit Model	mandel-agol_geometric_transit_model
Limb Darkening Model	claret_tess_nonlinear_limb_darkening_model

TCE Parameter	Value	Units
Trial Transit Pulse Duration	3.5	hours
Transit Epoch	2036.4037708	TJD
Orbital Period	4.4111090	days
Maximum SES	83.7	
Maximum MES	167.8	
Robust Statistic	148.3	
Chi Square Goodness of Fit Statistic (DoF)	2850.1 (629)	
Chi Square2 Statistic (DoF)	2050.6 (1901.7)	
Threshold for Desired PFA		

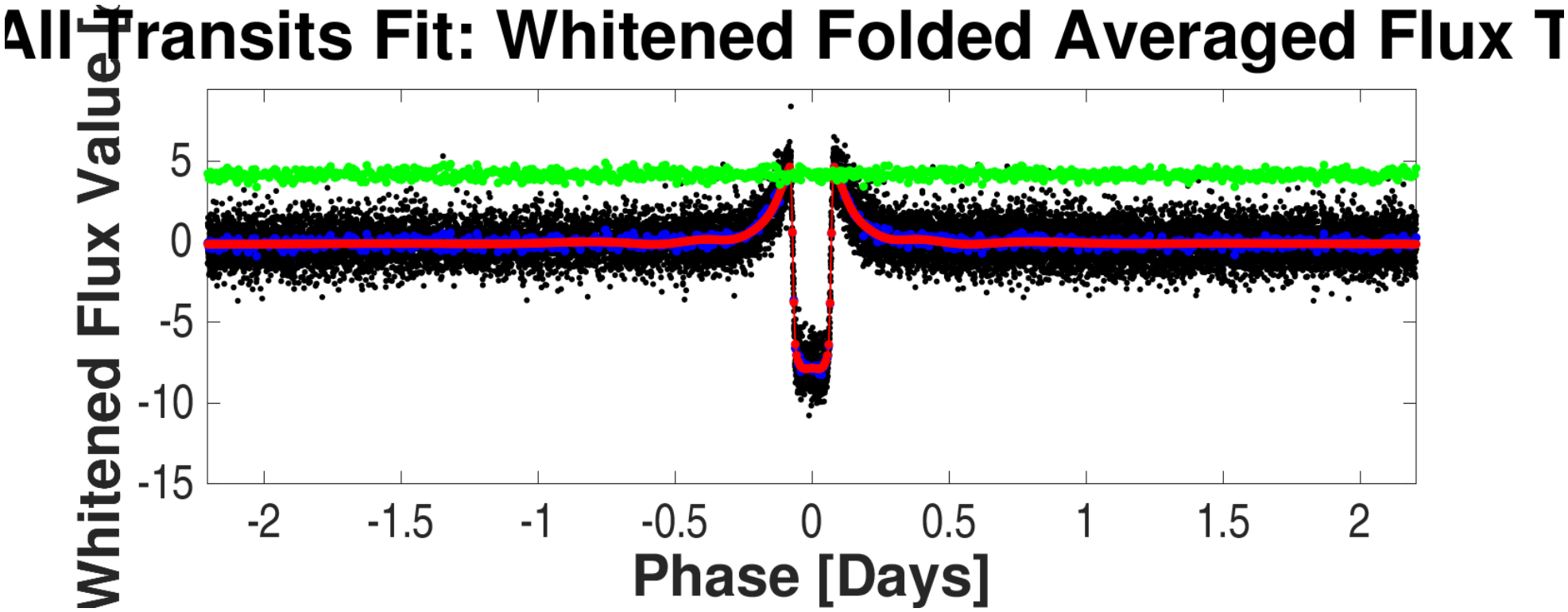
DoF: Degrees of Freedom

Parameter	Value	Uncertainty	Units
SNR	193.1		
Orbital Period	4.4119292	6.9840e-05	days
Transit Epoch	2036.4008902	2.1099e-04	BTJD
Impact Parameter	0.0100	2.0163e+00	
Planet Radius to Star Radius Ratio	0.1100678	4.8367e-04	
Semi-major Axis to Star Radius Ratio	9.9481	1.9872e-01	
Planet Radius	14.5908	6.5467e-01	Earth radii
Semi-major Axis	0.0572	3.8917e-03	AU
Effective Stellar Flux	673.7917	9.7926e+01	Goldilocks
Equilibrium Temperature	1299	4.7213e+01	Kelvin
Stellar Density	0.6795	4.0722e-02	Solar density
Transit Depth	13904	7.1701e+01	ppm
Transit Duration	3.7687	1.6882e-02	hours
Transit Ingress Duration	0.3748	1.6570e-02	hours
Eccentricity	0.0000	0.0000e+00	
Peri Longitude	0.0000	0.0000e+00	degrees
Model Chi Square Statistic (DoF)	2452.3 (3038.2)		
Model Chi Square Goodness of Fit Statistic (DoF)	453.5 (698)		
Model Chi Square2 Statistic (DoF)	19.0 (5)		

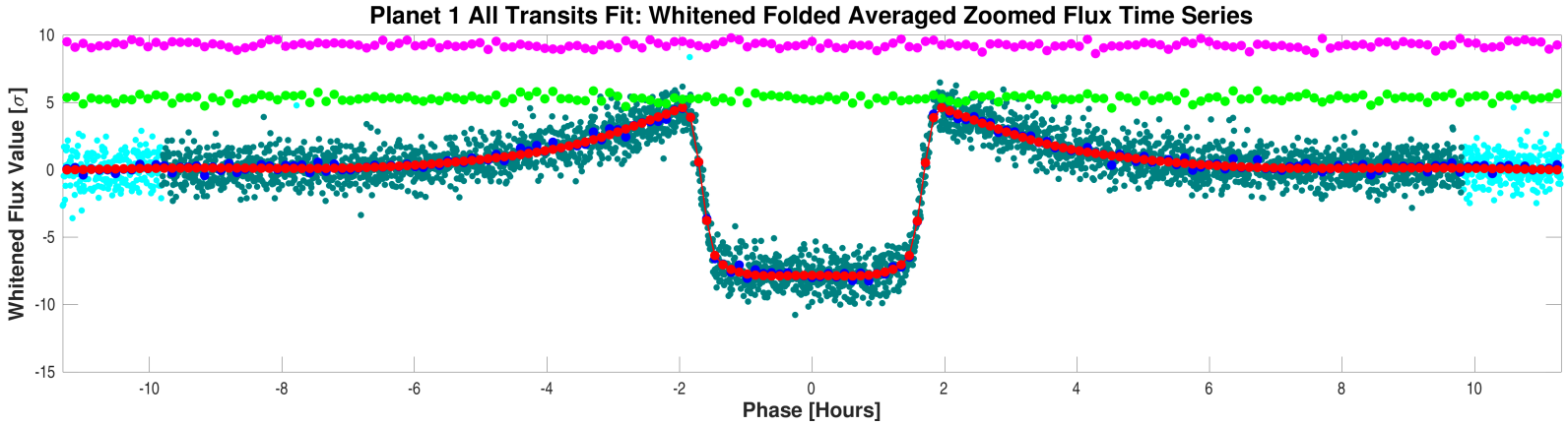
DoF: Degrees of Freedom



Flux time series for CatId 149603524, Planet candidate 1 in the unwhitened domain. For the data of Sector-27/TargetTableId-258, start BJD is 2459036. Transit event markers indicate the location of transits of the given planet candidate. All transits fit completed with full convergence.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000149603524-01-all-unwhitened-27-258.fig`



Folded flux time series for CatId 149603524, Planet candidate 1 in the whitened domain is plotted in black dots. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the folded model light curve of the all transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. All transits fit completed with full convergence.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000149603524-01-all-whitened.fig`



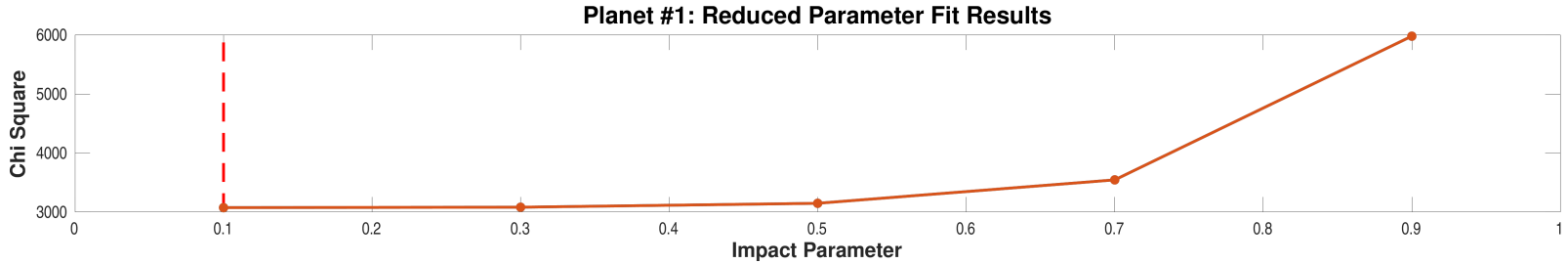
Folded flux time series for CatId 149603524, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux

time series; the red dots represent the averaged values of the fitted model light curve of the all transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. Magenta dots are the averaged values of the folded flux time series, with a phase shift of 0.5 relative to the blue dots, vertically offset for clarity. All transits fit completed with full convergence.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000149603524-01-all-whitened-zoomed.fig`

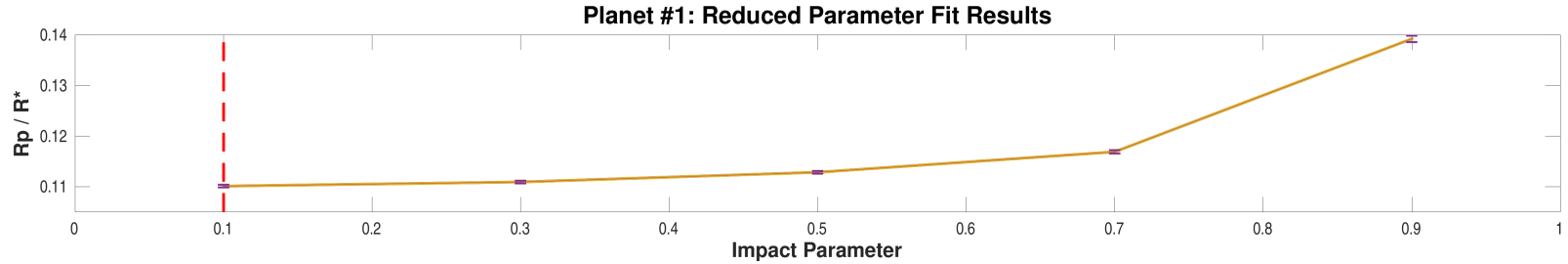
7.2 Model Fitter: Reduced Parameter Fit Results

Impact Parameter	SNR	Model Chi Square	Planet Radius to Star Radius	Uncert	Semi-major Axis to Star Radius	Uncert	Transit Depth (ppm)	Uncert	Transit Duration (hours)	Uncert
0.10	200.9	3075.1	0.1101239	2.7630e-04	9.9051	1.7123e-02	13896	6.9318e+01	3.7702	6.6138e-03
0.30	201.0	3082.2	0.1109431	2.7900e-04	9.5025	1.7067e-02	13919	6.9581e+01	3.8040	6.9475e-03
0.50	200.7	3148.3	0.1128630	2.8856e-04	8.6412	1.7061e-02	13974	7.0978e+01	3.8930	7.8562e-03
0.70	196.8	3544.9	0.1168976	3.2785e-04	7.1712	1.8503e-02	14098	7.8382e+01	4.1204	1.0981e-02
0.90	185.9	5978.4	0.1392256	6.4067e-04	5.0010	2.6617e-02	15494	1.1926e+02	4.8014	2.6289e-02

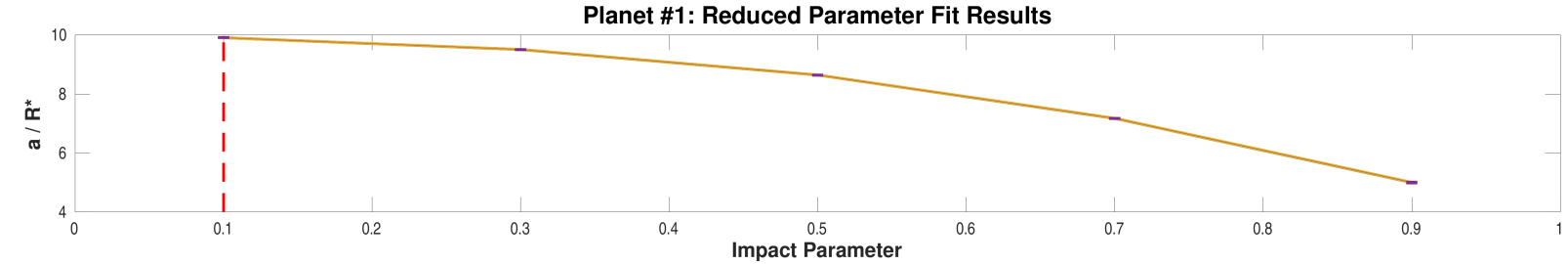
Highlighted row is the best reduced-parameter model fit.



Model chi squares of reduced parameter fits vs. impact parameter for CatId 149603524, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.
Open `./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/0000000149603524-01-reduced-fits-chi-square.fig`



Ratios of planet radius to star radius of reduced parameter fits vs. impact parameter for CatId 149603524, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.
Open `./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/0000000149603524-01-reduced-fits-rp-over-rstar.fig`



Ratios of semimajor axis to star radius of reduced parameter fits vs. impact parameter for CatId 149603524, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.
Open `./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/0000000149603524-01-reduced-fits-a-over-rstar.fig`

7.3 Model Fitter: Trapezoidal Fit Results

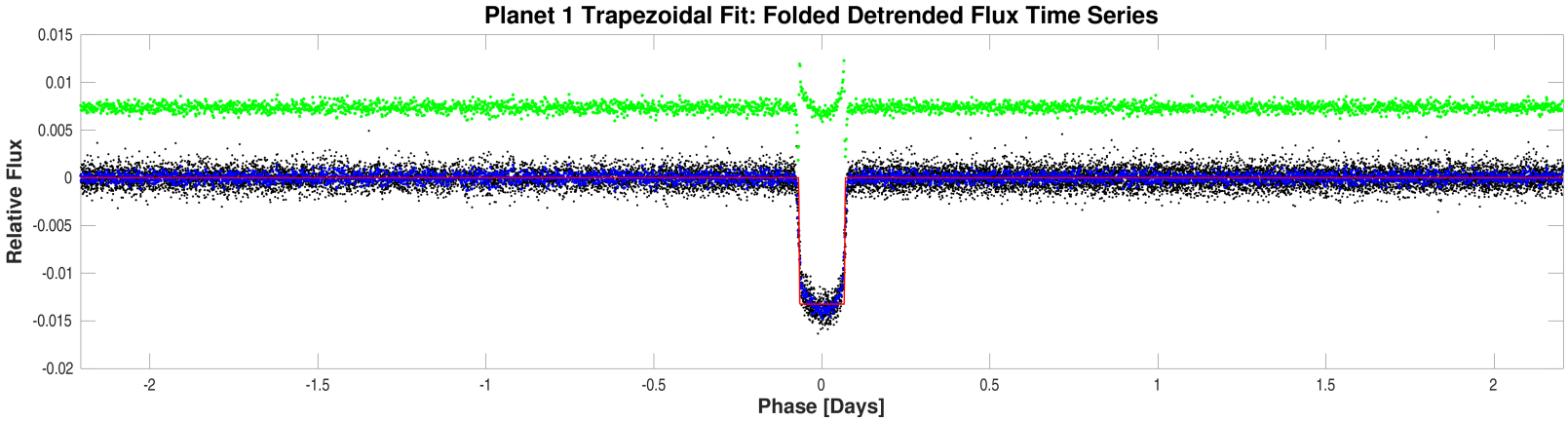
Model Characteristic	Name
Transit Model	trapezoidal_model
Limb Darkening Model	

TCE Parameter	Value	Units
Trial Transit Pulse Duration	3.5	hours
Transit Epoch	2036.4037708	TJD
Orbital Period	4.4111090	days
Maximum SES	83.7	
Maximum MES	167.8	
Robust Statistic	148.3	
Chi Square Goodness of Fit Statistic (DoF)	2850.1 (629)	
Chi Square2 Statistic (DoF)	2050.6 (1901.7)	
Threshold for Desired PFA		

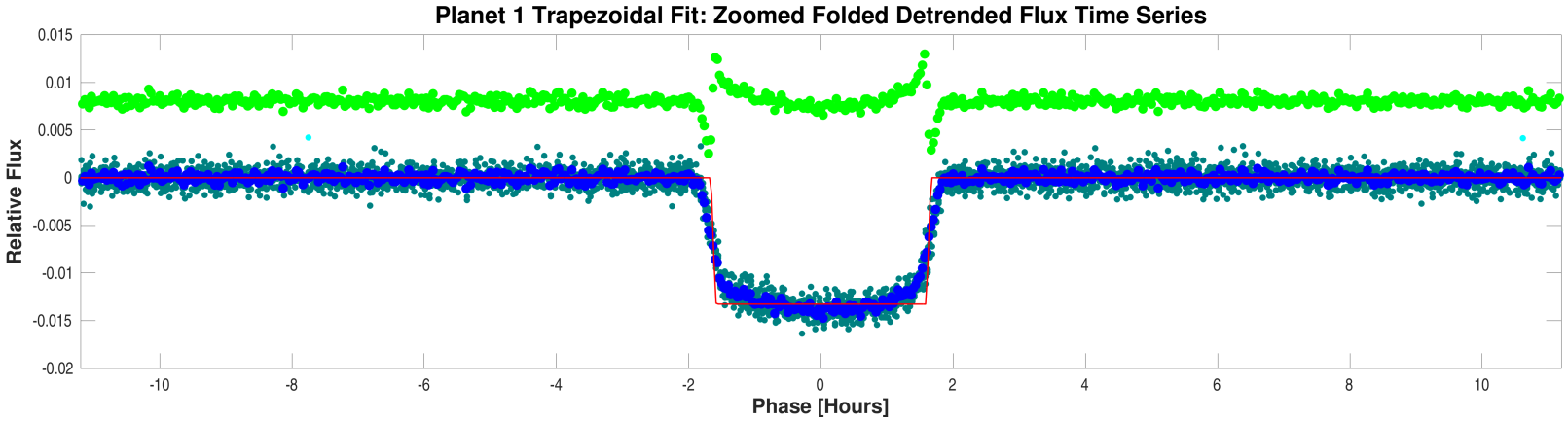
DoF: Degrees of Freedom

Parameter	Value	Uncertainty	Units
SNR	339.4		
Orbital Period	4.4111090		days
Transit Epoch	2036.4030137		BTJD
Transit Depth	13258		ppm
Transit Duration	3.7321		hours
Transit Ingress Duration	0.4758		hours
Model Chi Square Statistic (DoF)	17900.0 (4632)		

DoF: Degrees of Freedom



Folded detrended flux time series for CatId 149603524, Planet candidate 1 and folded trapezoidal model light curve.
Open `./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000149603524-01-all-trapezoidal.fig`



Zoomed folded detrended flux time series for CatId 149603524, Planet candidate 1 and folded trapezoidal model light curve.
Open `./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000149603524-01-all-trapezoidal-zoomed.fig`

7.4 Validation Tests

The Centroid Test and Eclipsing Binary Discrimination Test are chi-squared hypothesis tests. For these tests, a significance of 100% favors a planet, while 0% indicates an unlikely planet.

7.4.1 Weak Secondary Test

Result	Value	Uncertainty	Units	Statistic in Sigmas	Significance (%)
Orbital Period	4.4111		days		
Transit Duration	3.5		hours		
Maximum MES	167.8				
Secondary Phase	0.58333		days		
Secondary MES	3.8				
Minimum Phase	0.44028		days		
Minimum MES	-3.2				
Median MES	-0.0				
MAD MES	0.58351				
Robust Statistic	4.2				
Secondary Depth	634.9	1.4988e+02	ppm		
Geometric Albedo	5.4	1.4366e+00		3.0393	0.12
Planet Effective Temperature	3058	1.8891e+02	Kelvin	9.0303	0.00

7.4.2 Eclipsing Binary Discrimination Test

Result	Value	Value in Sigmas	Significance (%)
Odd Even Transit Depth Comparison Statistic	4.3614e-01	0.6604	50.90

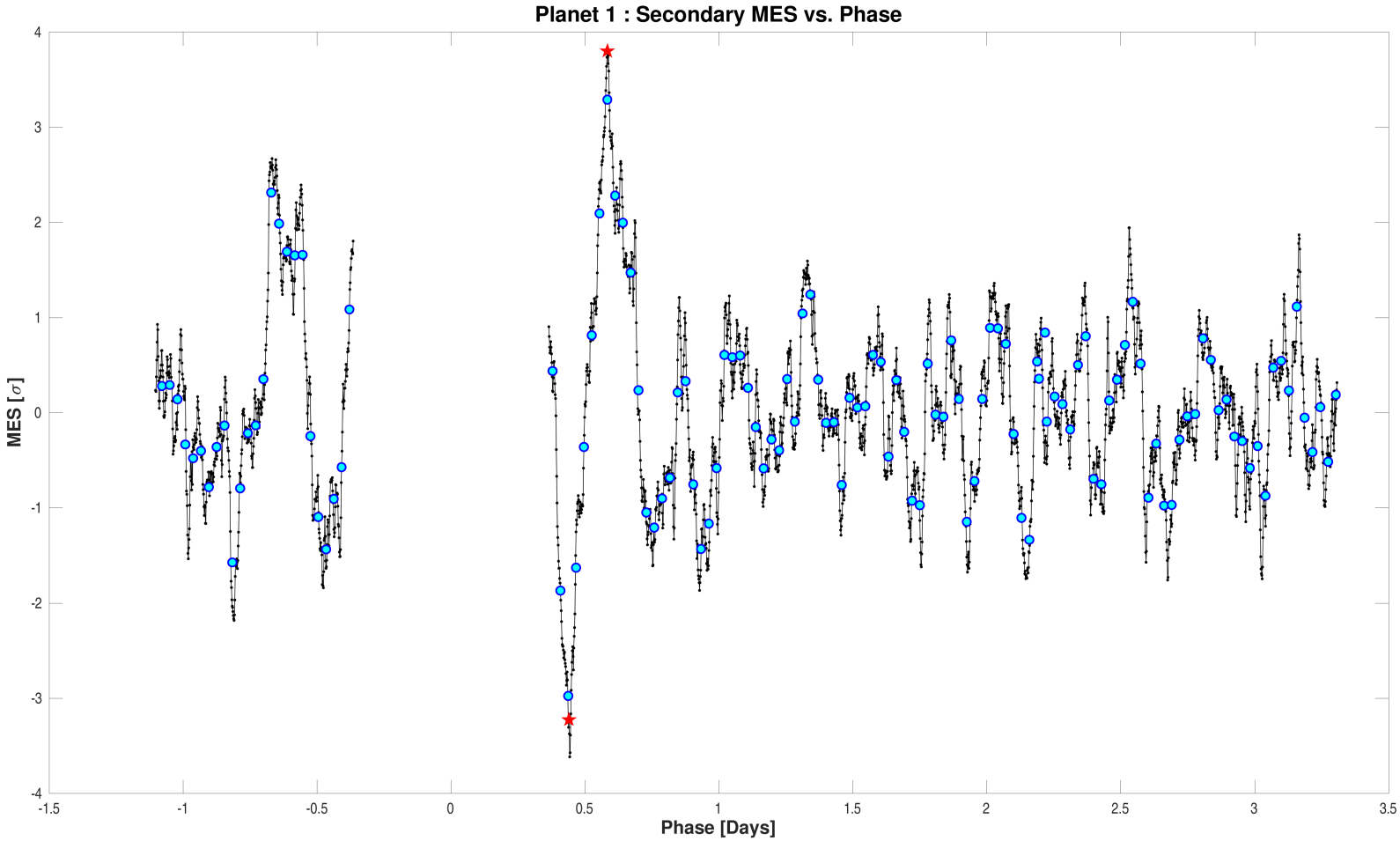
7.4.3 Bootstrap Test

Result	Value
False Alarm Probability	0.0000e+00
Bootstrap Threshold for Desired PFA	7.4
MES Mean	-0.36
MES Standard Deviation	1.10
Transit Count	6

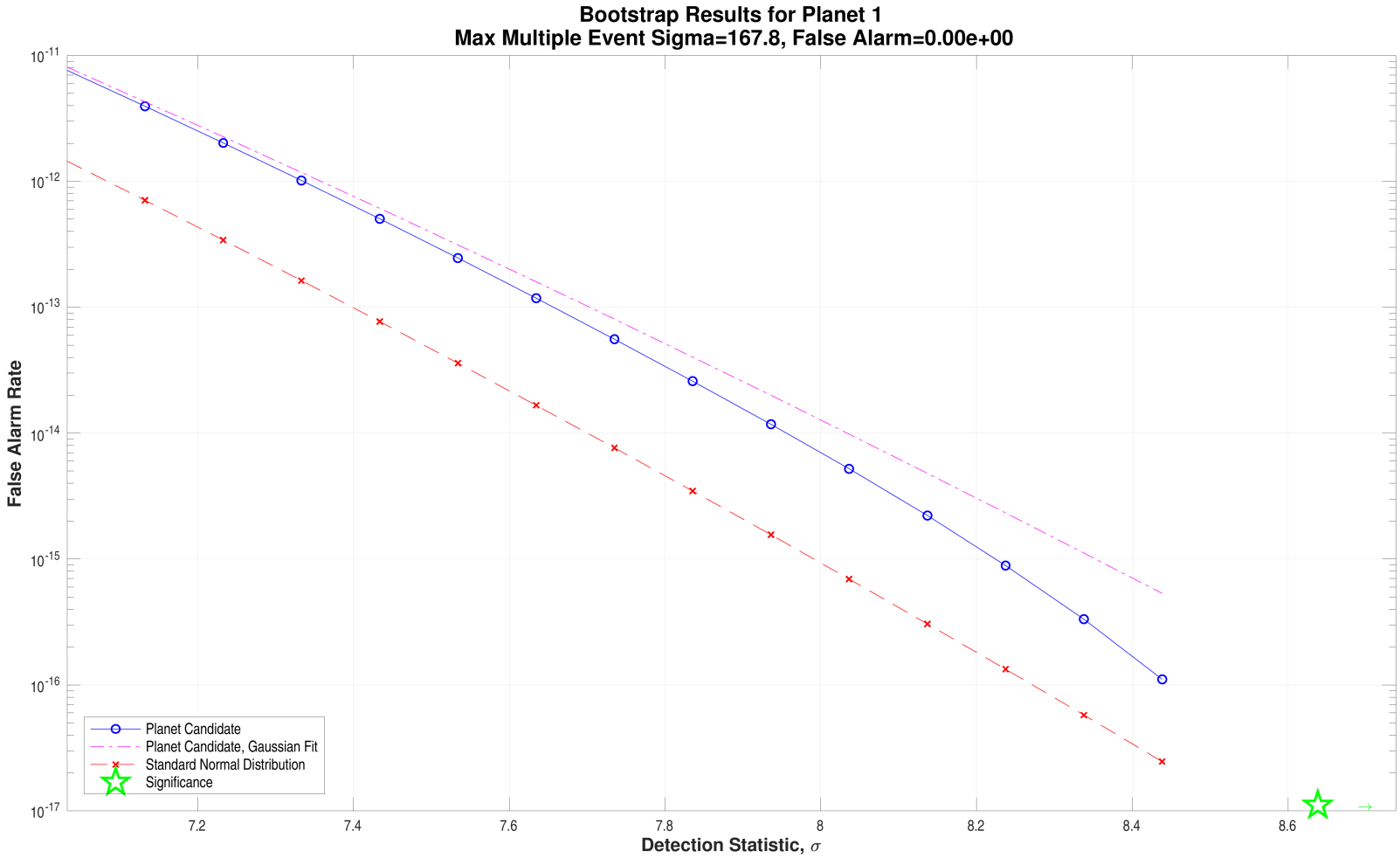
7.4.4 Ghost Diagnostic Test

Result	Value	Significance (%)
Maximum MES	167.8	
SNR	193.1	
Core Aperture Statistic	1.6344e+02	100.00
Halo Aperture Statistic	1.4472e+01	100.00
Ratio of Core/Halo Aperture Statistics	1.1293e+01	

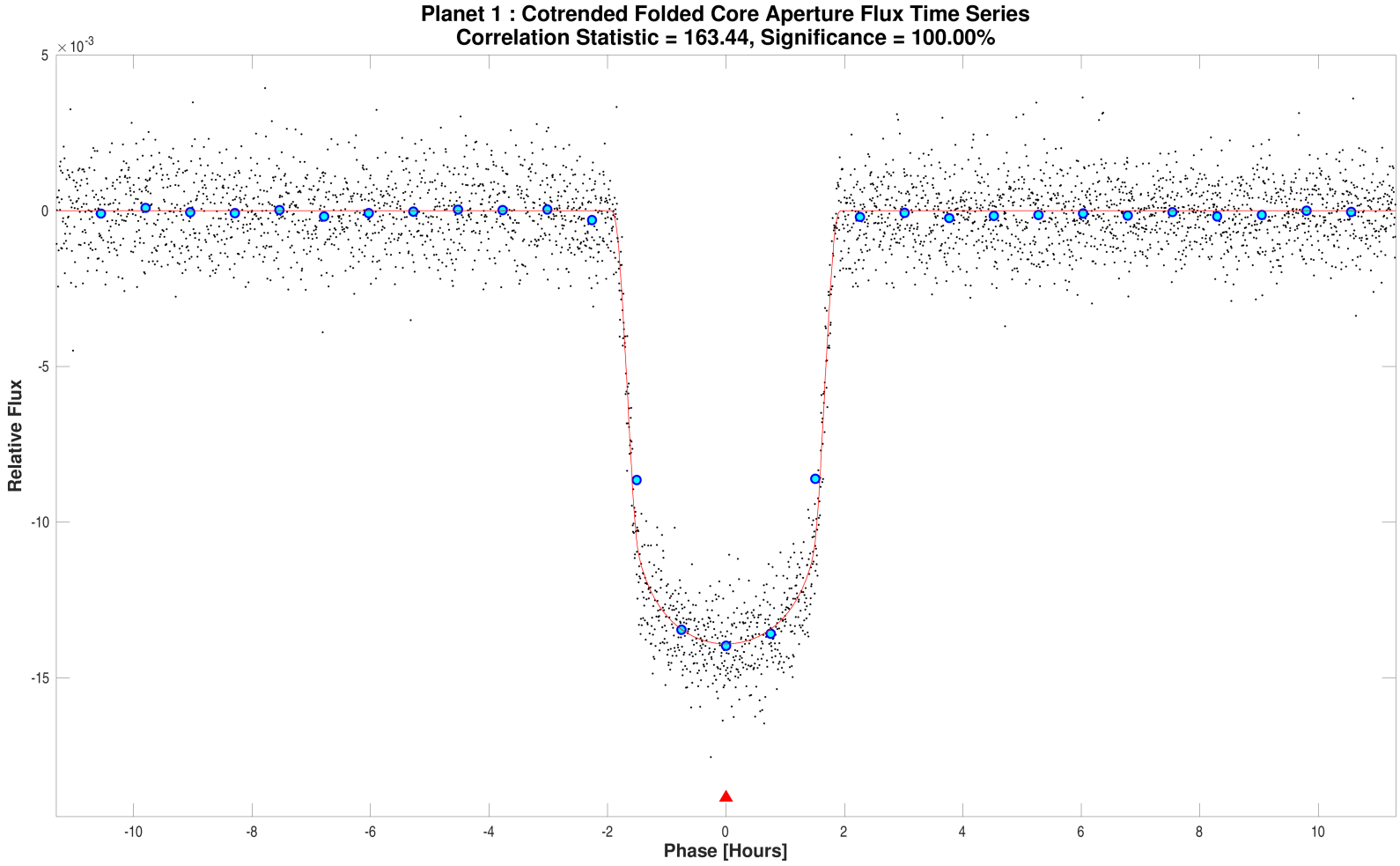
7.4.5 Validation Test Figures



The primary event has been set to zero and both the max and min of the resulting MES vs. Phase are marked with a red star. The best matched pulse duration in hours is 3.5. The maximum secondary MES and corresponding phase are 3.8019 and 0.58333 days respectively. The minimum secondary MES and corresponding phase are -3.2256 and 0.44028 days respectively.
Open `./planet-01/report-summary/0000000149603524-01-weak-secondary-diagnostic.fig`

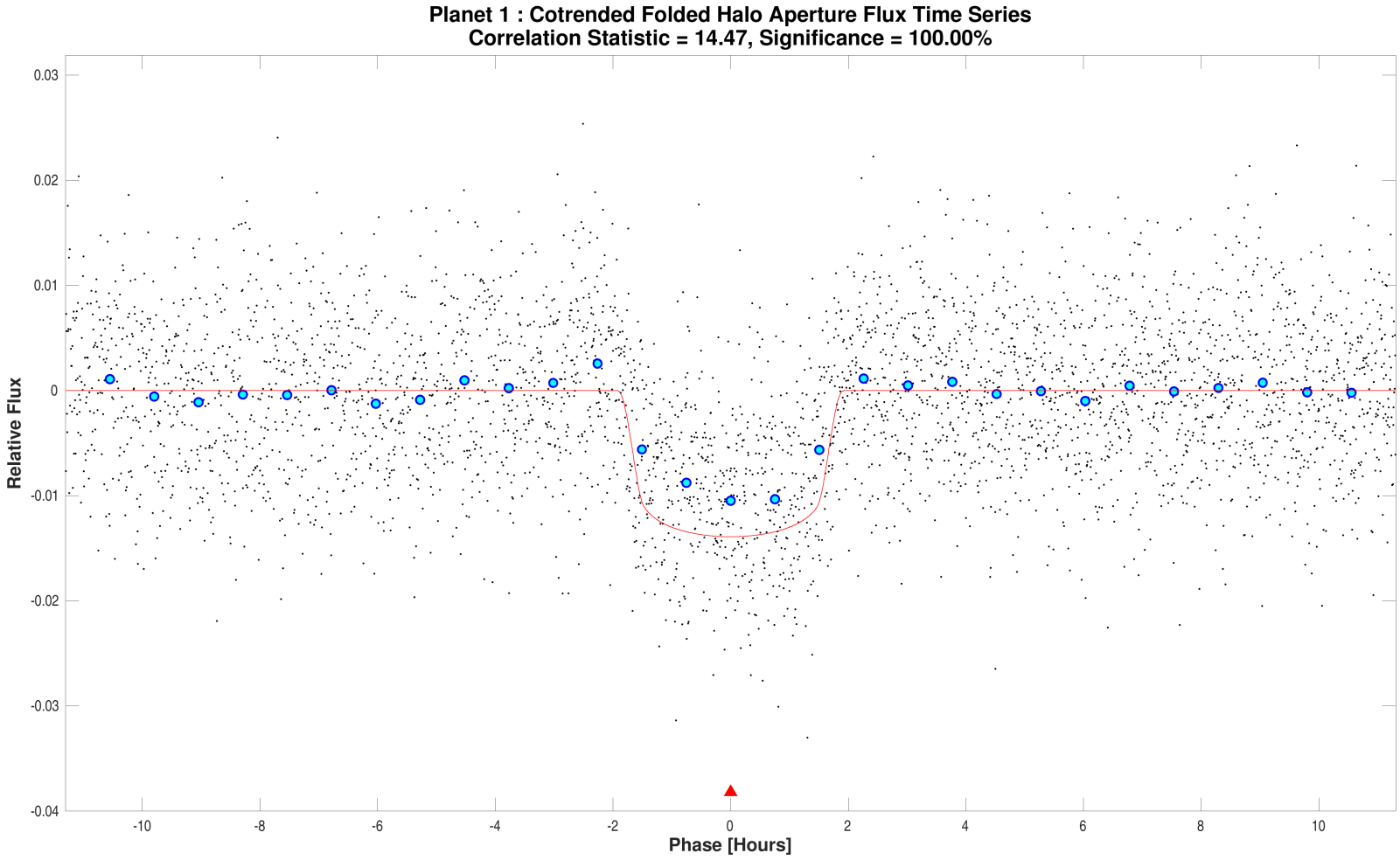


Bootstrap results for target 149603524, planet 1. Cumulative sum of the probabilities (derived from the histogram of counts) from upper tail to the search transit threshold; false alarm probability is indicated by the star. The Gaussian equivalent threshold for this false alarm probability is Inf. The threshold on this distribution that achieves the same false alarm rate as a 7.1 sigma threshold on a Gaussian distribution is 7.4104.
Open `./planet-01/bootstrap-results/0000000149603524-01-bootstrap-false-alarm.fig`



Optical ghost diagnostic core aperture flux time series for target 149603524, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft engineering data, motion proxies, and/or cotrending basis vectors (CBVs) to remove systematic effects. Flux time series data represent the mean per pixel flux in the core or haloaperture; phase folded data points are shown in the figure with black dots. Binned and averaged phase folded flux values are marked with filled blue circles. The unwhitened transit model light curve is displayed in the figure with a red line. The value and significance of the core aperture correlation statistic are displayed in the figure title if the statistic was successfully computed.

Open `./planet-01/ghost-diagnostic-results/0000000149603524-01-core-unwhitened-cotrended-zoomed-model.fig`

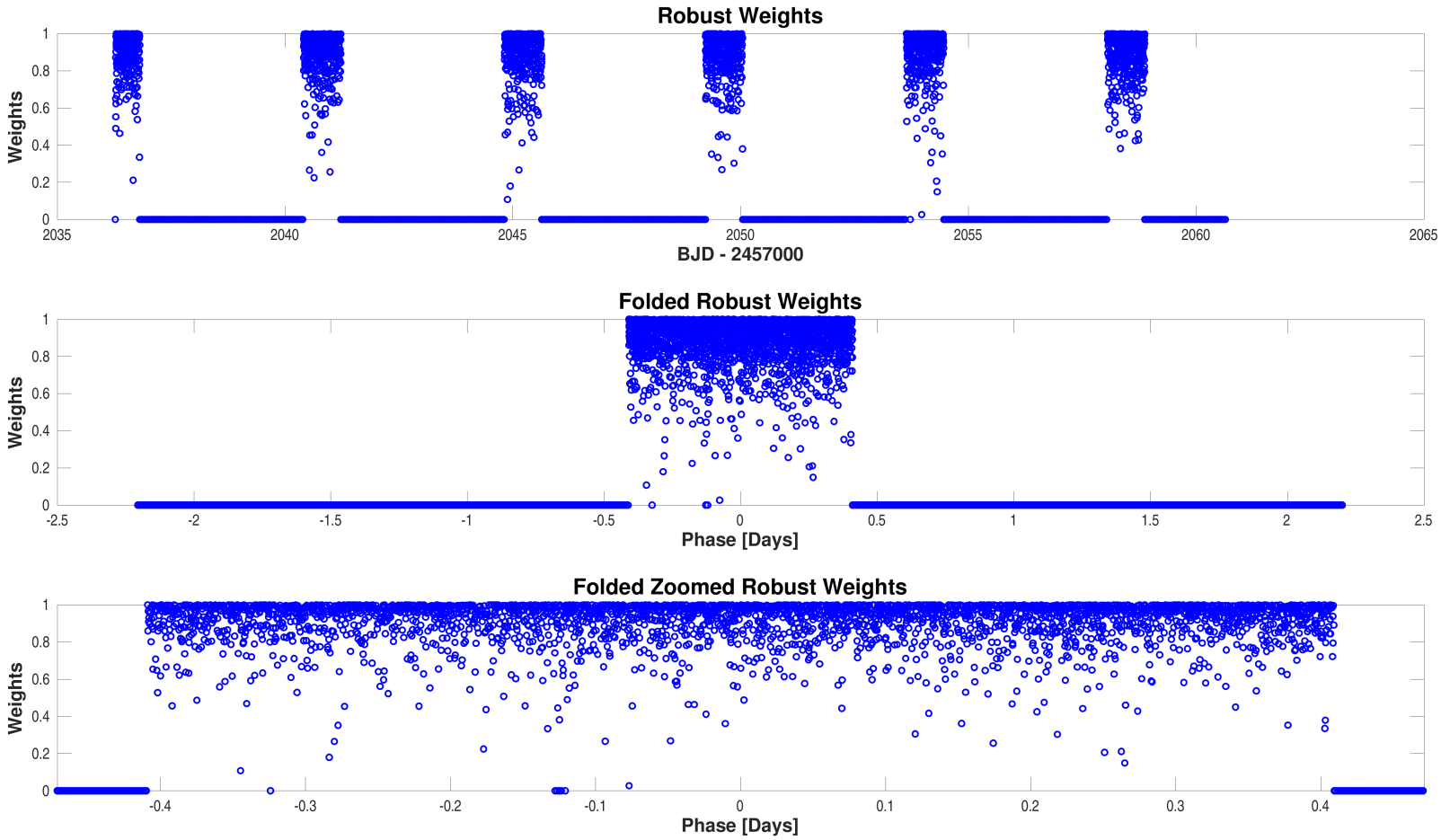


Optical ghost diagnostic halo aperture flux time series for target 149603524, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft engineering data, motion proxies, and/or cotrending basis vectors (CBVs) to remove systematic effects. Flux time series data represent the mean per pixel flux in the core or haloaperture; phase folded data points are shown in the figure with black dots. Binned and averaged phase folded flux values are marked with filled blue circles. The unwhitened transit model light curve is displayed in the figure with a red line. The value and significance of the halo aperture correlation statistic are displayed in the figure title if the statistic was successfully computed.

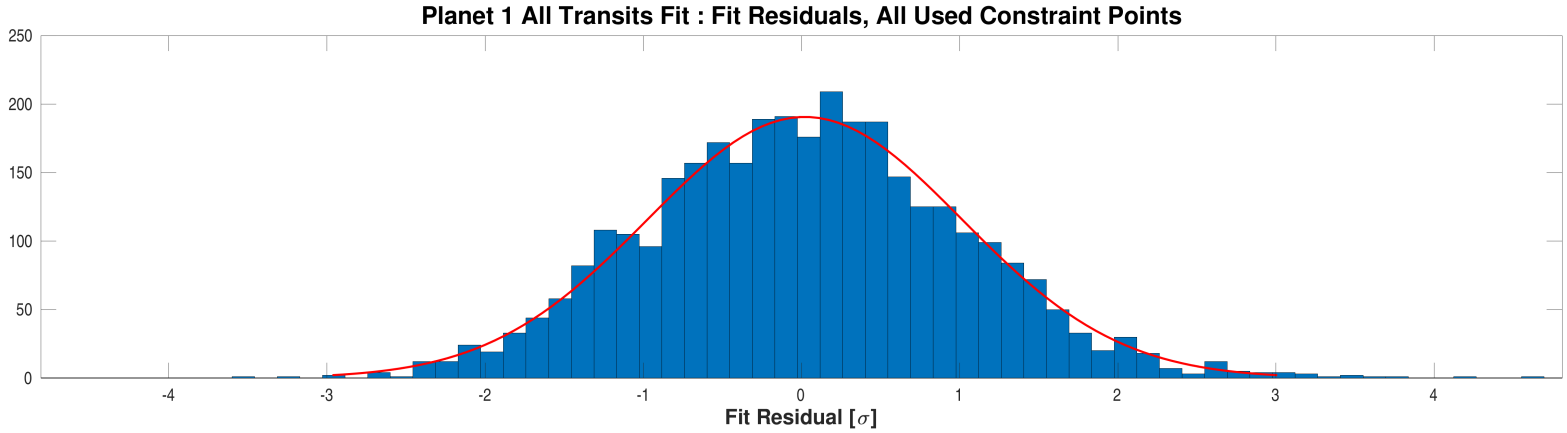
Open `./planet-01/ghost-diagnostic-results/0000000149603524-01-halo-unwhitened-cotrended-zoomed-model.fig`

Appendix A Planet Candidate 1

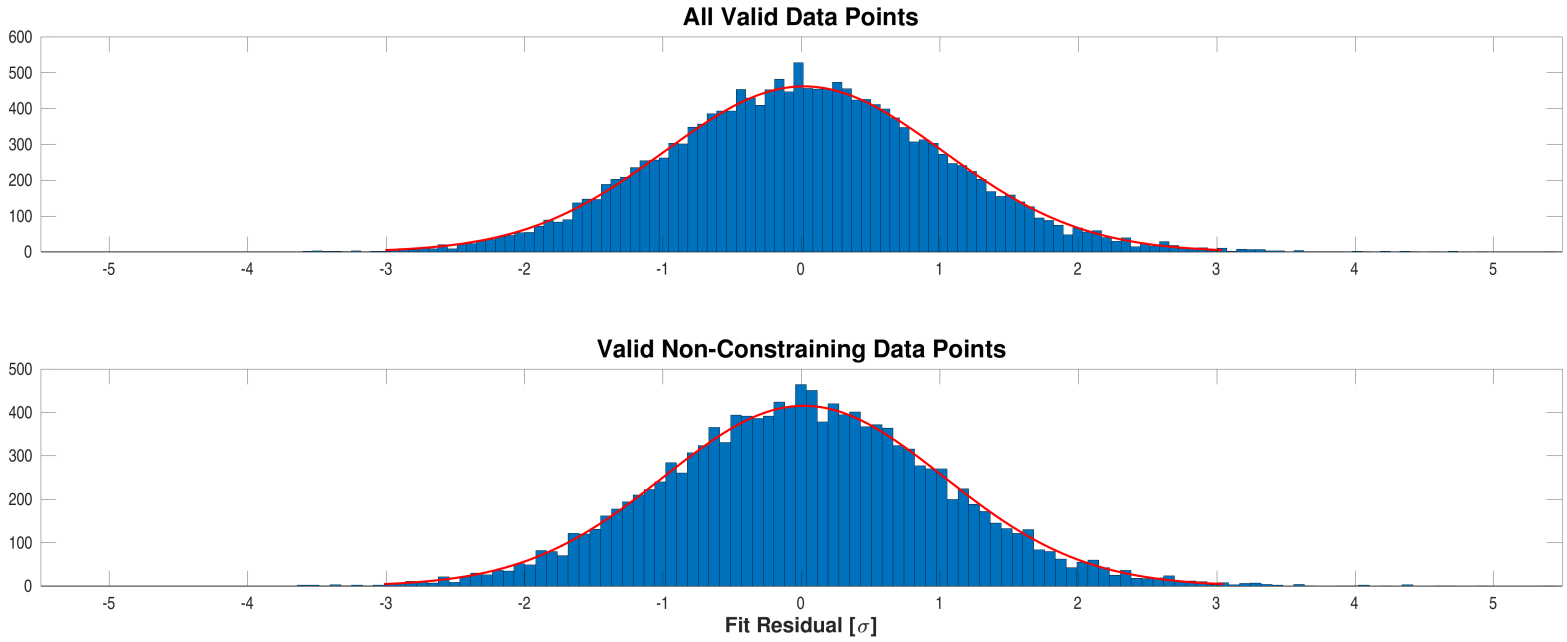
A.1 Model Fitter: All Transits



Robust weights distribution for CatId 149603524, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000149603524-01-all-robust-weights.fig`



Fit residuals distribution for CatId 149603524, Planet candidate 1. Only the valid data points used to constrain the fit are shown here. A Gaussian fit to the histogram is shown in red.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000149603524-01-all-histo-used.fig`

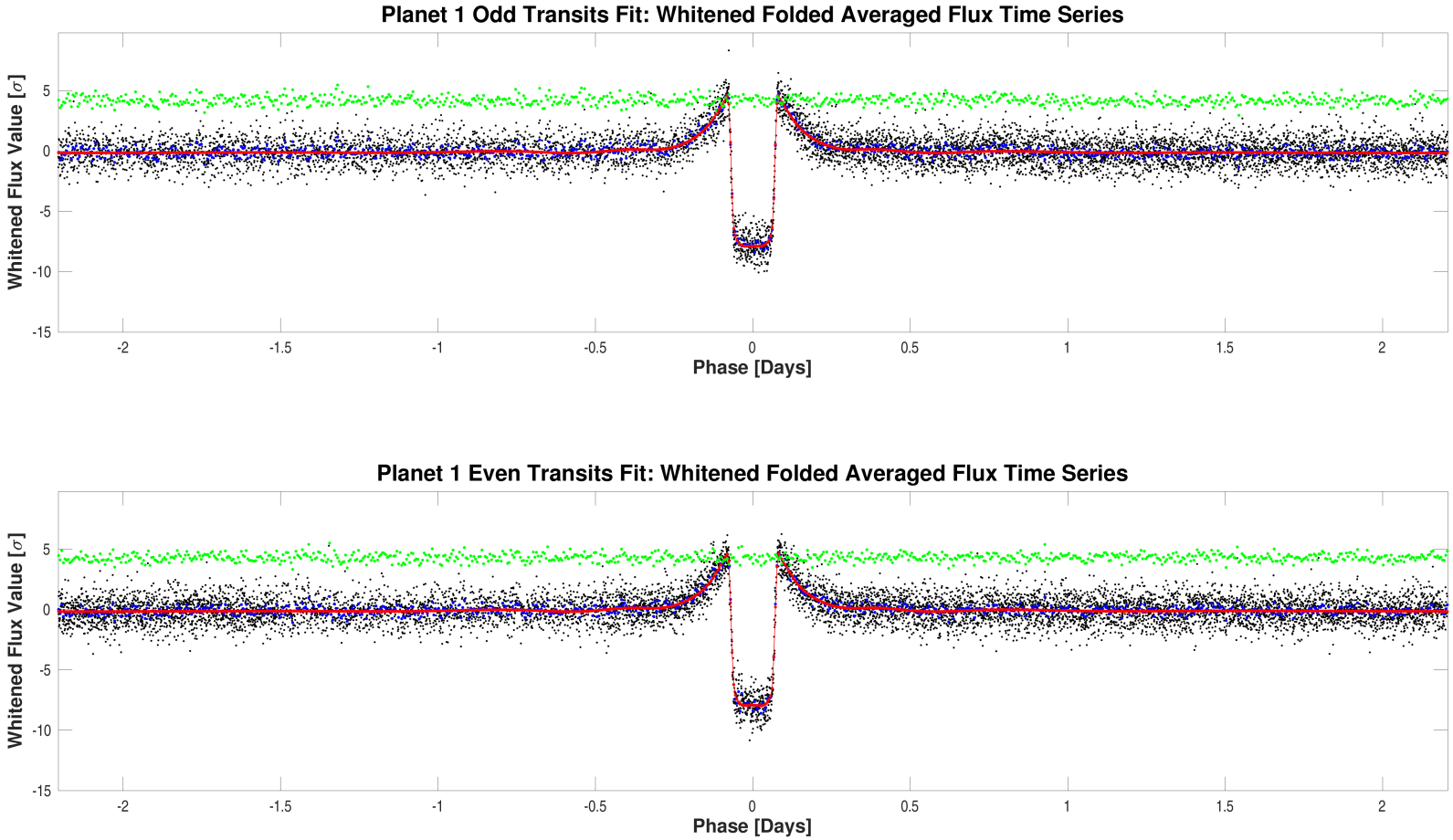


Fit residuals distribution for CatId 149603524, Planet candidate 1. Top plot: all valid data. Bottom plot: valid data not used to constrain fit (due to distance from a transit). Gaussian fits to the histograms are shown in red.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000149603524-01-all-histo-all-and-unused.fig`

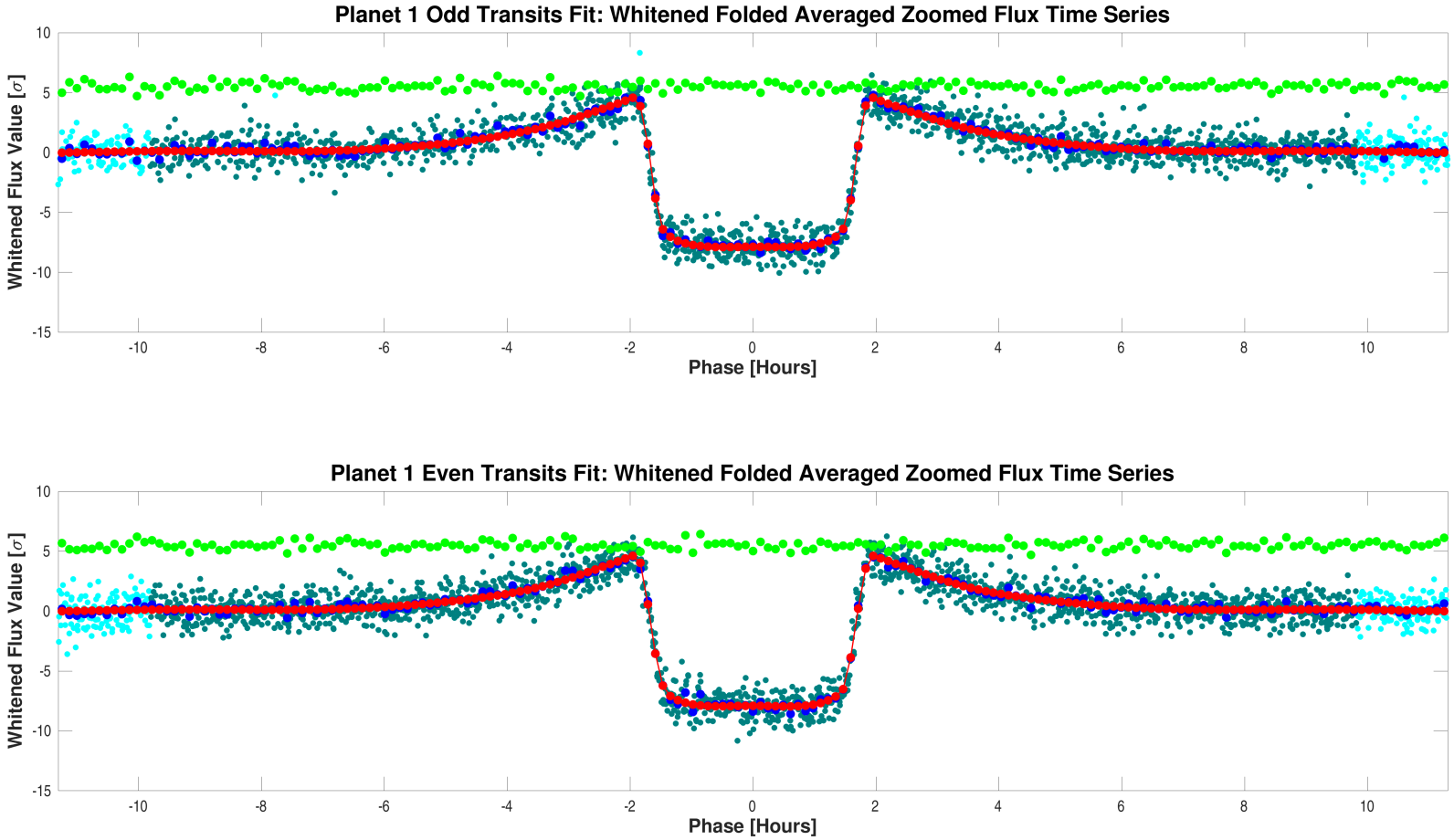
A.2 Model Fitter: Odd & Even Transits

Parameter	Odd Transits Value	Odd Transits Uncertainty	Even Transits Value	Even Transits Uncertainty	Units	Difference / ‖Uncertainty‖
SNR	136.2		137.9			
Orbital Period	4.4118996	1.0400e-04	4.4118992	1.0365e-04	days	2.6607e-03
Transit Epoch	2036.4008228	2.6593e-04	2040.8130250	2.6858e-04	BTJD	7.2225e-01
Impact Parameter	0.0100	2.8281e+00	0.1118	2.5111e-01		3.5855e-02
Planet Radius to Star Radius Ratio	0.1098910	6.8001e-04	0.1103723	6.8306e-04		4.9940e-01
Semi-major Axis to Star Radius Ratio	9.9492	2.7880e-01	9.8812	2.7827e-01		1.7263e-01
Planet Radius	14.5673	6.5669e-01	14.6311	6.5957e-01	Earth radii	6.8555e-02
Semi-major Axis	0.0572	3.8917e-03	0.0572	3.8917e-03	AU	6.1345e-07
Effective Stellar Flux	673.7977	9.7927e+01	673.7978	9.7927e+01	Goldilocks	5.7443e-07
Equilibrium Temperature	1299	4.7213e+01	1299	4.7213e+01	Kelvin	5.7443e-07
Stellar Density	0.6797	5.7144e-02	0.6659	5.6258e-02	Solar density	1.7262e-01
Transit Depth	13859	1.0143e+02	13953	1.0084e+02	ppm	6.6041e-01
Transit Duration	3.7676	2.3688e-02	3.7763	2.4134e-02	hours	2.5771e-01
Transit Ingress Duration	0.3742	2.3203e-02	0.3808	2.3745e-02	hours	2.0032e-01
Eccentricity	0.0000	0.0000e+00	0.0000	0.0000e+00		
Peri Longitude	0.0000	0.0000e+00	0.0000	0.0000e+00	degrees	
Model Chi Square Statistic (DoF)	2449.6 (3034.1)		2449.6 (3034.1)			

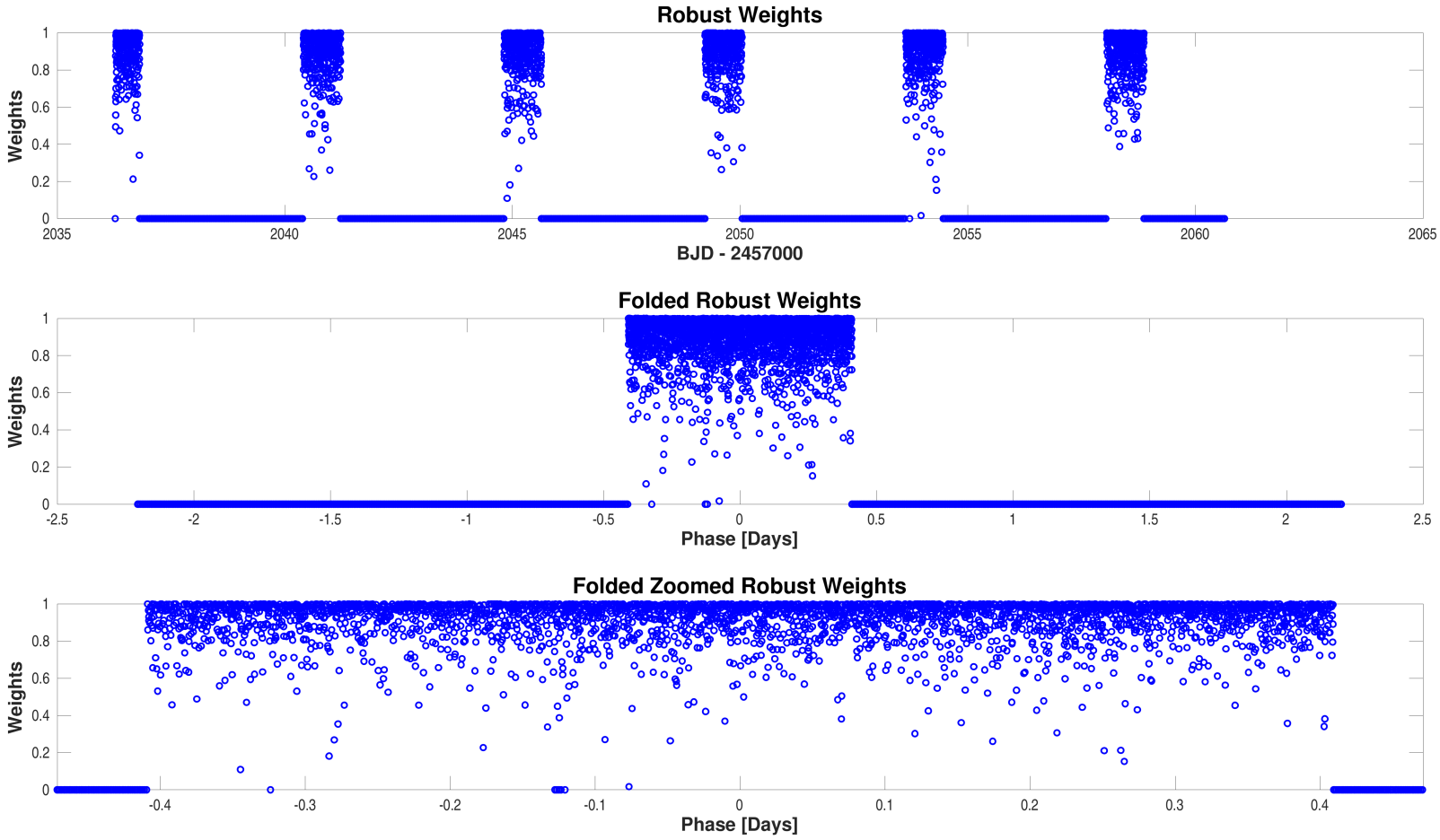
DoF: Degrees of Freedom



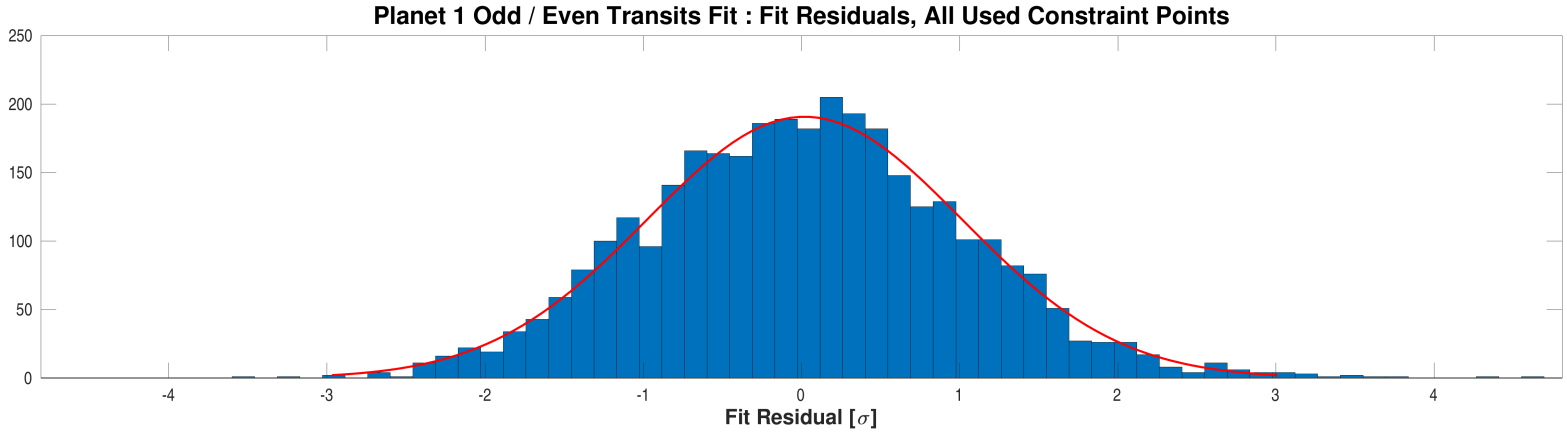
Folded flux time series for CatId 149603524, Planet candidate 1 in the whitened domain is plotted in black dots. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the folded model light curve of the odd/even transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. Odd-even transits fit completed with full convergence.
Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000149603524-01-odd-even-whitened.fig`



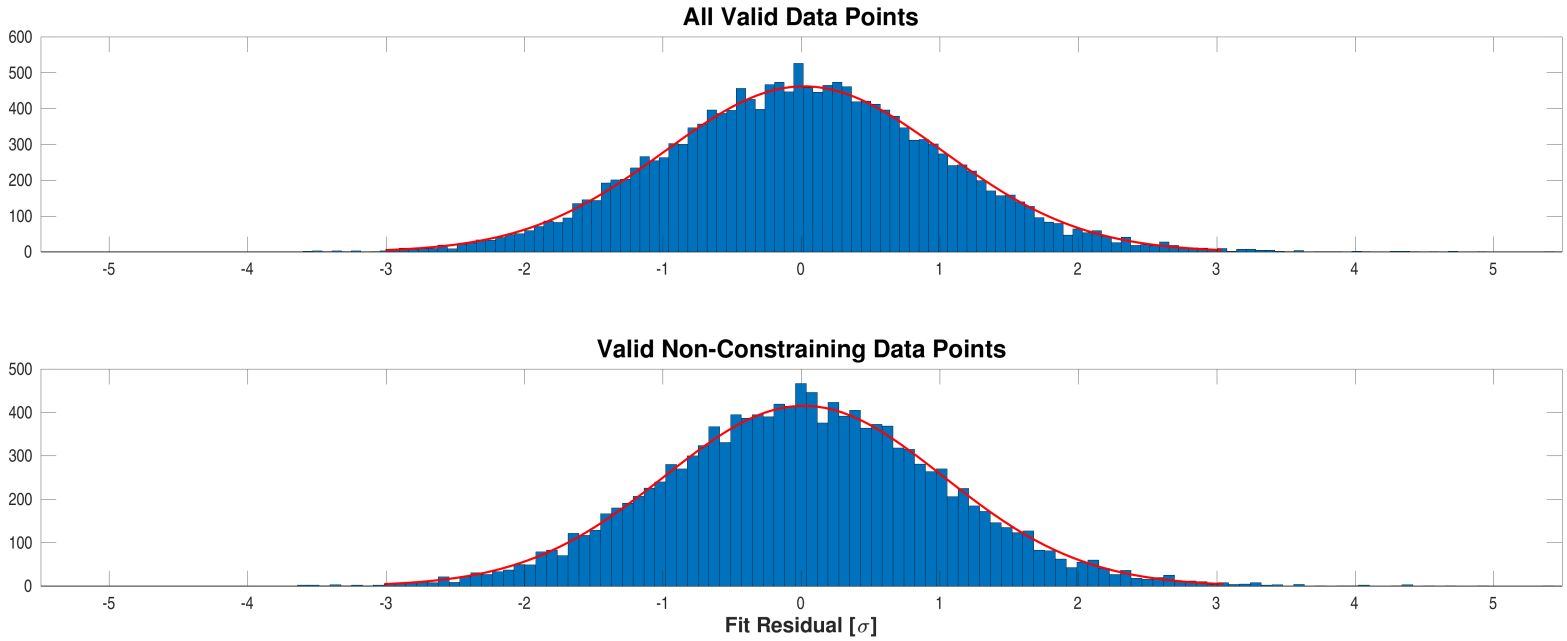
Folded flux time series for CatId 149603524, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the fitted model light curve of the odd/even transits fit; the green dots are the averaged folded fit residuals, vertically offset for clarity. Magenta dots are the averaged values of the folded flux time series, with a phase shift of 0.5 relative to the blue dots, vertically offset for clarity. Odd-even transits fit completed with full convergence.
Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000149603524-01-odd-even-whitened-zoomed.fig`



Robust weights distribution for CatId 149603524, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.
Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000149603524-01-odd-even-robust-weights.fig`

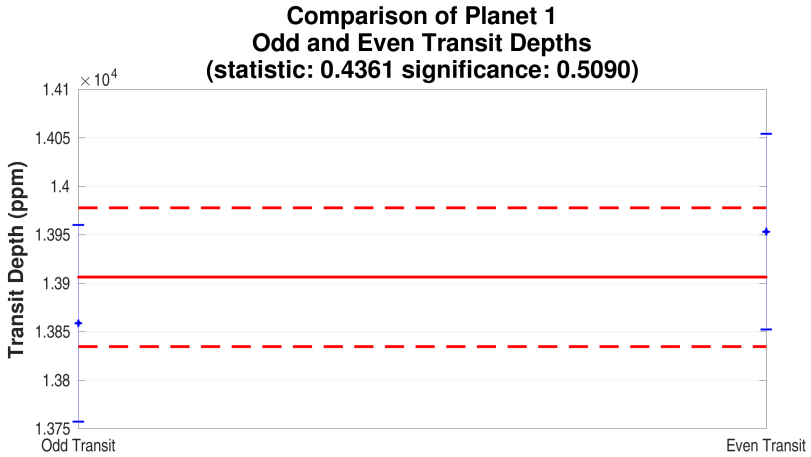


Fit residuals distribution for CatId 149603524, Planet candidate 1. Only the valid data points used to constrain the fit are shown here. A Gaussian fit to the histogram is shown in red.
Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000149603524-01-odd-even-histo-used.fig`



Fit residuals distribution for CatId 149603524, Planet candidate 1. Top plot: all valid data. Bottom plot: valid data not used to constrain fit (due to distance from a transit). Gaussian fits to the histograms are shown in red.
Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000149603524-01-odd-even-histo-all-and-unused.fig`

A.3 Eclipsing Binary Discrimination Test



Top-left: Diagnostic plot of Odd/Even Transit Depth Test for catId 149603524, planet 1. A significance level close to 1/0 favors a transiting planet/an eclipsing binary. Open `./planet-01/binary-discrimination-test-results/0000000149603524-01-eclipsing-binary-discrimination-tests.fig`

Appendix B Alerts

This target did not trigger any alerts.