Data Validation (DV) Report
for TESS ID 28230919
Sectors 14 - 14

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

13-Sep-2019 13:13:33 Z

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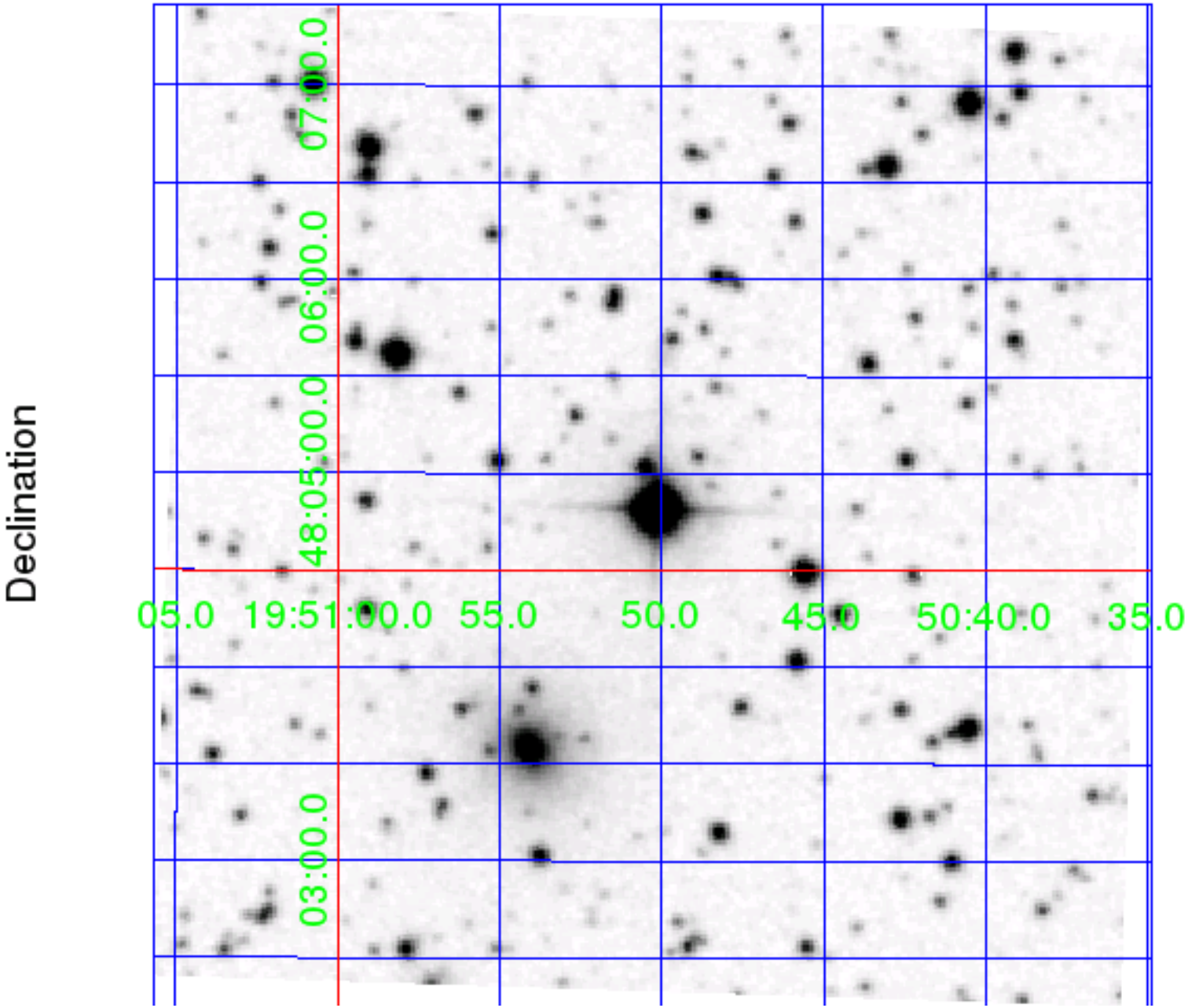
1 Summary

Target Properties	Value	Uncertainty	Units	Provenance
Catalog ID	28230919			
TOI ID	-			
TESS Name	-			
RA	297.70936440	0	degrees	TIC8
Dec	48.08086038	0	degrees	TIC8
Magnitude	8.5077	0.006		TIC8
Radius	0.760	0.048	Solar radii	TIC8
Effective Temperature	4778	113	Kelvin	TIC8
log(g)	4.563	0.086511	cm/sec^2	TIC8
[M/H]	0.300	0.05268	Solar metallicity	TIC8
Stellar Density	1.755	0.367	Solar density	TIC8-Derived
Limb Darkening Coefficient 1	0.74654			
Limb Darkening Coefficient 2	-0.70802			
Limb Darkening Coefficient 3	1.2035			
Limb Darkening Coefficient 4	-0.48308			
Number of Planet Candidates	1			
TOI Model	toi-plus-2019-08-29.csv			
TESS Names Model	-			
External TCE Model	-			
Software Revision	spoc-4.0.8-20190912			
Date Report Generated	13-Sep-2019 13:13:33 Z			

Sector	Target Table	Camera/ CCD	Crowding Metric	Flux Fraction
14	167	2:4	0.9844	0.8848

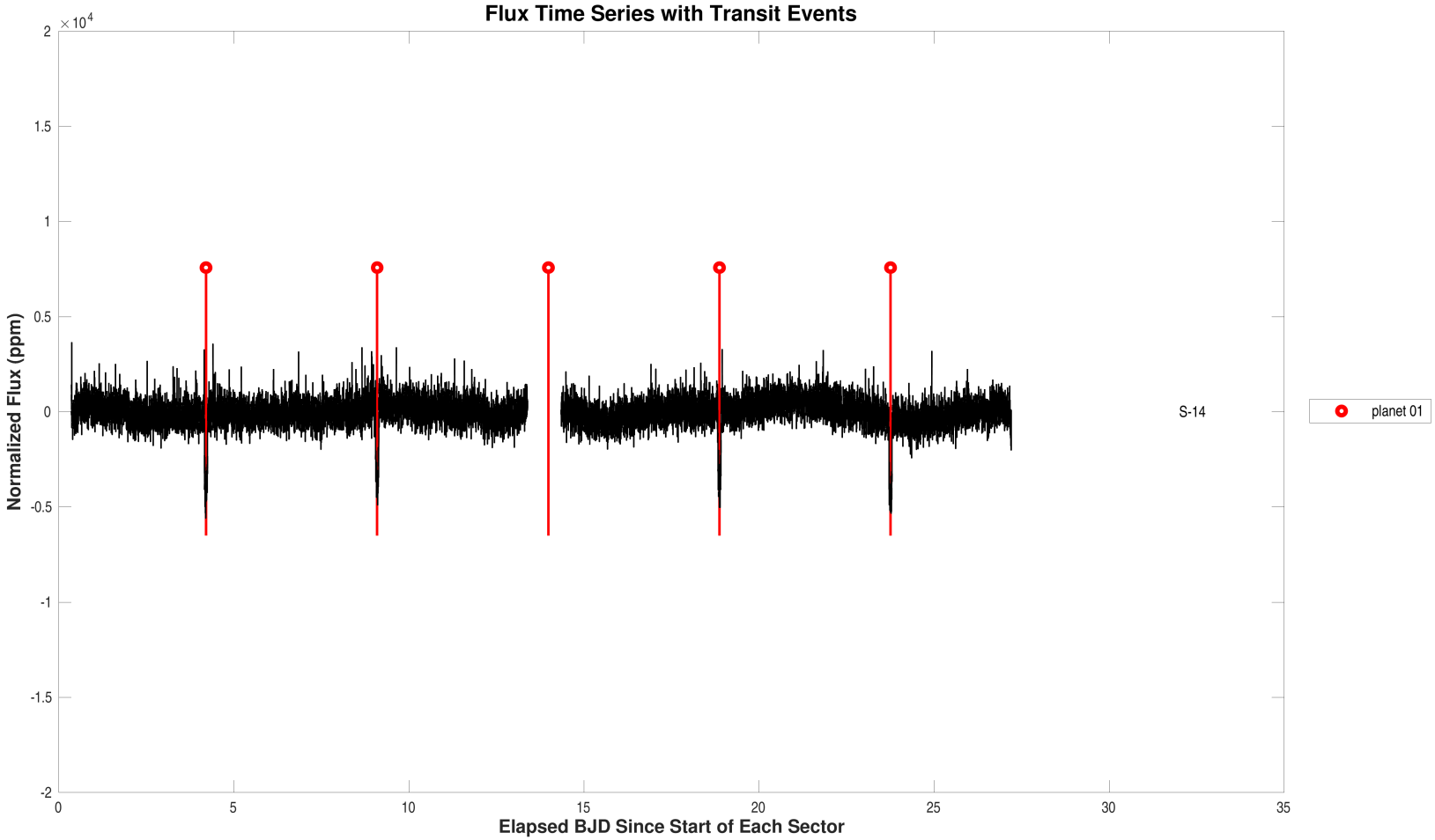
Planet Candidate	TOI ID	TESS Name	TOI Correlation	Period (days)	Period Ratio	Epoch (BTJD)	Semi-major Axis (AU)	Radius (Re)	Seff	Teq (K)	False Alarm	Suspected EB
1	-	-	-	4.888	1.00	1687.206	0.05	4.9	100.9	808	0.00e+00	false

2 Survey Image

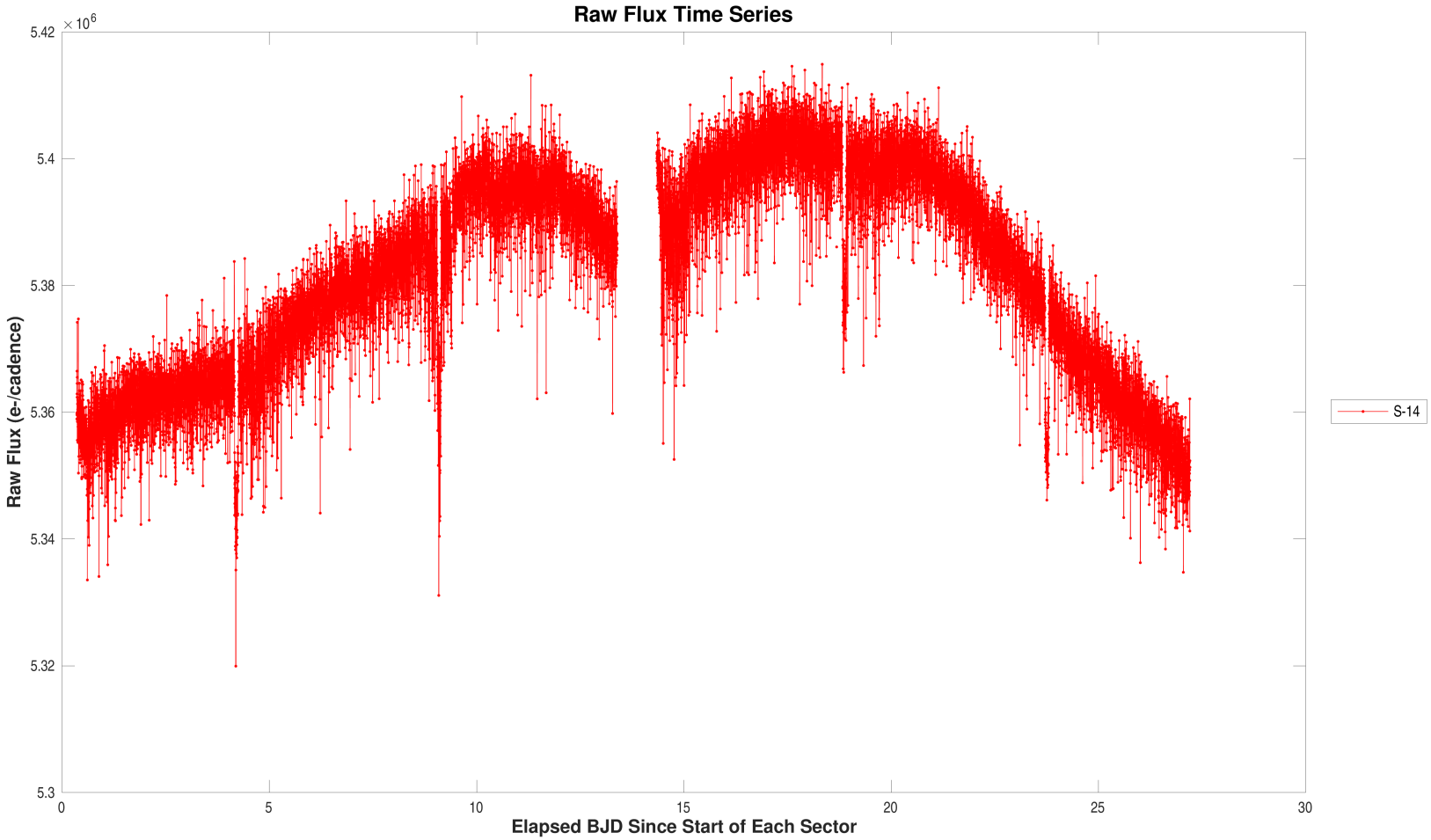


Digitized Sky Survey (DSS) red image. The 5' x 5' image is centered on the J2000 coordinates of target (28230919).

3 Flux Time Series



Summary plot of sector-stitched flux time series and transits for target 28230919, 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 14, target table 167, start BJD is 2458683.
Open `./summary-plots/0000000028230919-00-flux-dv-fit-14-167.fig`



Summary plot of raw flux time series. For the data of sector 14, target table 167, start BJD is 2458683.
Open `./summary-plots/0000000028230919-00-raw-flux-14-167.fig`

4 Dashboards

Planet Candidate 1

<table>
<tr><td rowspan="2">Model Fitter</td><td colspan="2">Stellar Radius
0.8 ± 0.0 Solar units</td><td rowspan="2">Core Aperture Correlation Statistic
Value = 32.18
Significance = 100.00%
Halo Aperture Correlation Statistic
Value = 13.33
Significance = 100.00%
Core/Halo Ratio
Ratio = 2.41</td><td rowspan="2">Ghost Diagnostic Test</td></tr>
<tr><td colspan="2">Period = 4.9 ± 0.0 days
Depth = 4225 ± 53 ppm
Planet Radius = 4.9 ± 0.4 Earth radii
Semi-major Axis = 0.1 ± 0.0 AU
Effective Stellar Flux = 100.9 ± 17.0
Equilibrium Temperature = 808 ± 34 Kelvin
Chi-squared/DoF = 0.8
SNR = 80.0</td></tr>
<tr><td rowspan="2">Eclipsing Binary Discrimination Test</td><td colspan="2">Odd-Even Depth Comparison Statistic
Value = 1.41e-01
Significance = 70.75%</td><td>Offsets Relative to Out of Transit Centroid
Source RA Offset = -4.79e-01 ± 2.50e+00 arcsec (-0.19 σ)
Source Dec Offset = -5.47e-02 ± 2.51e+00 arcsec (-0.02 σ)
Source Offset Distance = 4.82e-01 ± 2.50e+00 arcsec (0.19 σ)
Offsets Relative to TIC Position
Source RA Offset = -1.31e+00 ± 2.50e+00 arcsec (-0.52 σ)
Source Dec Offset = 2.20e-01 ± 2.51e+00 arcsec (0.09 σ)
Source Offset Distance = 1.33e+00 ± 2.50e+00 arcsec (0.53 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 = 5
Max Multiple Event Statistic = 81.2</td><td>Bootstrap Test</td></tr>
</table>

Summary of model fitter results and validation test results for target 28230919, 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

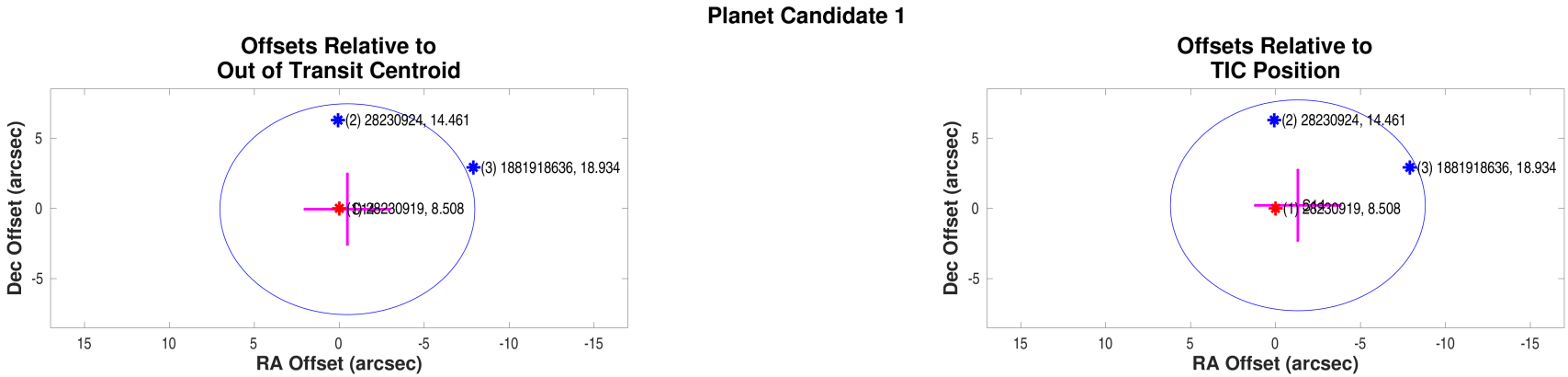
Multi-Sector Average PRF Fit of the Difference Images

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

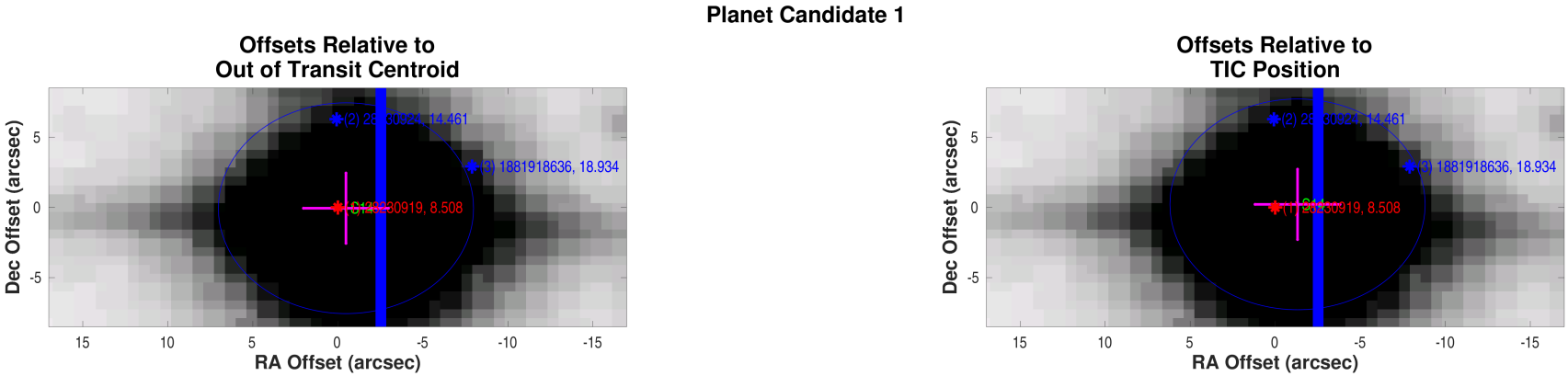
	RA	Dec	Units
Offset	$-0.4787 \pm 2.50e+00$	$-0.0547 \pm 2.51e+00$	arcseconds
Offset/σ	-0.19	-0.02	
Offset Distance	$0.4818 \pm 2.50e+00$		arcseconds
Offset Distance/σ	0.19		
3σ Radius	7.5060		arcseconds

Mean offset from the TIC RA and Dec

	RA	Dec	Units
Offset	$-1.3121 \pm 2.50e+00$	$0.2199 \pm 2.51e+00$	arcseconds
Offset/σ	-0.52	0.09	
Offset Distance	$1.3304 \pm 2.50e+00$		arcseconds
Offset Distance/σ	0.53		
3σ Radius	7.5061		arcseconds



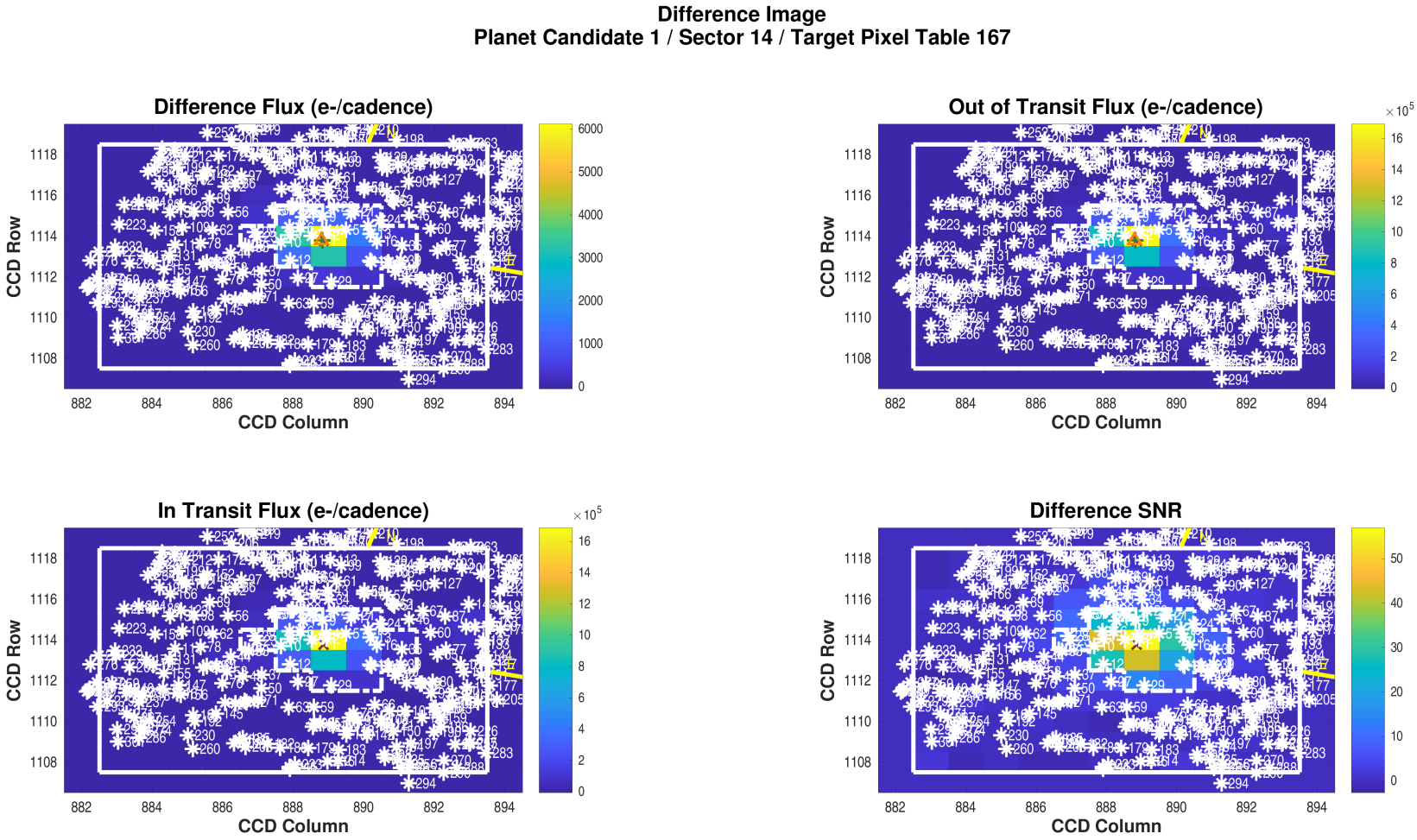
Difference image centroid offsets for target 28230919, planet candidate 1. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in RA and Dec with respect to the TC coordinates 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; 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/0000000028230919-01-difference-image-centroid-offsets.fig`



Difference image centroid offsets for target 28230919, 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; 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/0000000028230919-01-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 28230919, planet candidate 1, sector 14, target pixel table 167. 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 = 4; number of valid in-transit cadences = 220; number of in-transit cadence gaps = 2; number of valid out-of-transit cadences = 593; number of out-of-transit cadence gaps = 2. Difference image quality metric = 1.00 (good).
Open `./planet-01/difference-image/0000000028230919-01-difference-image-14-167.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	$1113.79 \pm 1.51e-05$	$888.82 \pm 1.48e-05$	pixels	$297.71004354 \pm 5.35e-07$	$48.08220389 \pm 5.35e-07$	degrees
Difference Image Centroid	$1113.79 \pm 7.67e-03$	$888.80 \pm 7.42e-03$	pixels	$297.70984450 \pm 4.10e-05$	$48.08218870 \pm 4.53e-05$	degrees
Offset	$0.0037 \pm 7.67e-03$	$-0.0230 \pm 7.42e-03$	pixels	$-0.4787 \pm 9.86e-02$	$-0.0547 \pm 1.63e-01$	arcseconds
Offset/σ	0.49	−3.10		−4.85	−0.34	
Offset Distance	$0.0233 \pm 7.27e-03$		pixels	$0.4818 \pm 1.02e-01$		arcseconds
Offset Distance/σ	3.21			4.73		

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

	Row	Column	Units	RA	Dec	Units
TIC Reference Centroid	$1113.77 \pm 9.17e-05$	$888.86 \pm 9.30e-05$	pixels	$297.71039007 \pm 0.00e+00$	$48.08212761 \pm 0.00e+00$	degrees
Difference Image Centroid	$1113.79 \pm 7.67e-03$	$888.80 \pm 7.42e-03$	pixels	$297.70984450 \pm 4.10e-05$	$48.08218870 \pm 4.53e-05$	degrees
Offset	$0.0274 \pm 7.67e-03$	$-0.0586 \pm 7.42e-03$	pixels	$-1.3121 \pm 9.86e-02$	$0.2199 \pm 1.63e-01$	arcseconds
Offset/σ	3.57	−7.89		−13.30	1.35	
Offset Distance	$0.0647 \pm 7.09e-03$		pixels	$1.3304 \pm 9.78e-02$		arcseconds
Offset Distance/σ	9.13			13.60		

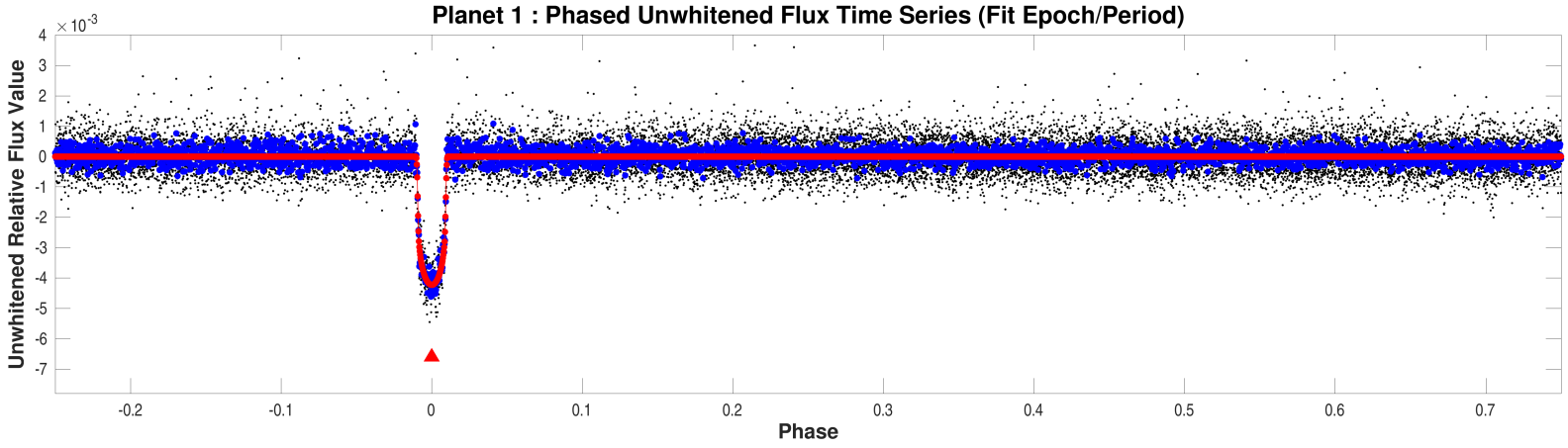
5.2 Difference Image TIC Key

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
1	28230919	8.508	297.71039007	48.08212761	0.00
2	28230924	14.461	297.71042281	48.08387400	6.29
3	1881918636	18.934	297.70710505	48.08293824	8.42
4	1881918637	18.545	297.70982950	48.08524120	11.29
5	1881918613	18.319	297.71445544	48.08617826	17.56
6	28230930	16.382	297.70349722	48.08473115	19.04
7	1881918530	18.221	297.70191090	48.08221951	20.40
8	1881918537	19.837	297.70091364	48.08431351	24.11
9	1881918631	20.122	297.70754715	48.08866045	24.49
10	1881918534	19.543	297.70049503	48.07987362	25.14
11	1881918635	20.302	297.70301723	48.08775037	26.91
12	1881918535	20.121	297.70464534	48.07532257	28.13
13	1881918612	18.643	297.72070972	48.08615453	28.74
14	1881918624	18.960	297.70478564	48.08969837	30.41
15	28230935	16.028	297.71927056	48.08821991	30.61
16	28230929	17.322	297.72297224	48.08441558	31.36
17	1881918633	19.487	297.71401848	48.09059726	31.71
18	1881918609	19.178	297.72354556	48.07872193	33.93
19	1881918614	19.399	297.72394090	48.07848551	35.13
20	1881918632	20.114	297.70920929	48.09186570	35.17
21	1881918625	17.620	297.71453924	48.09154706	35.35
22	28230942	16.953	297.70121875	48.09063145	37.73
23	1881918533	20.277	297.69426830	48.08031513	39.32
24	1881918616	19.083	297.72156575	48.09030308	39.86
25	1881918630	19.862	297.69914185	48.09028026	39.92
26	1881918629	19.997	297.69939821	48.09045149	39.96
27	1881918516	20.124	297.70830321	48.07087212	40.83
28	1881918531	18.104	297.69330355	48.08150331	41.16
29	1881918512	19.584	297.71657241	48.07134953	41.55
30	1881918536	19.882	297.69567996	48.08846513	42.10
31	28230934	18.019	297.69511955	48.08815856	42.66
32	1881918611	19.563	297.72792267	48.07918485	43.48
33	1881918529	17.966	297.69344060	48.07710327	44.60
34	28230950	15.888	297.70683673	48.09472431	46.15
35	28230926	14.519	297.72929426	48.08432623	46.15
36	1881918532	20.339	297.69250876	48.07726893	46.43
37	1881918538	19.903	297.69906424	48.07118195	47.90
38	1881918626	18.141	297.70006497	48.09359190	48.17

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
39	1881918610	18.882	297.73069934	48.08013569	49.37
40	1881918615	20.043	297.73084982	48.07805092	51.35
41	28230951	16.911	297.70276080	48.09558696	51.81
42	1881918608	17.387	297.73051701	48.07688122	51.96
43	1881918628	17.774	297.70557829	48.09706916	55.02
44	28230906	12.164	297.68980333	48.07472084	56.24
45	1881918634	20.603	297.69797034	48.09558593	56.92
46	1881918617	18.873	297.72780997	48.09285746	56.99
47	1881918644	15.465	297.71450206	48.09778998	57.25
48	1881918627	19.739	297.69496470	48.09438393	57.65
49	1881918526	20.059	297.69480356	48.06991234	57.78
50	1881918520	18.826	297.70040089	48.06748456	57.93
51	1881918618	18.168	297.72285315	48.09595043	58.09
52	1881918621	20.022	297.72228275	48.09624204	58.31
53	28230962	14.250	297.71430000	48.09853700	59.82
54	1881918645	15.282	297.71420748	48.09863445	60.13
55	1881918562	19.749	297.73400087	48.07534526	61.81
56	1881921489	19.804	297.68486143	48.08577889	62.79
57	28230961	17.516	297.71996463	48.09842349	63.02
58	1881918521	18.433	297.69055261	48.07050083	63.47
59	1881918517	20.733	297.71472848	48.06466929	63.71
60	28230941	16.147	297.73424519	48.09019131	64.30
61	1881918641	19.759	297.70670423	48.10002539	65.04
62	28230917	17.251	297.68313815	48.08017027	65.92
63	1881918513	20.122	297.70887035	48.06354066	67.01
64	1881918525	19.681	297.68750179	48.07148414	67.07
65	1881918571	18.646	297.73822998	48.08450644	67.50
66	1881918559	19.062	297.72885507	48.06798102	67.57
67	1881918619	17.685	297.73014188	48.09574189	68.25
68	1881918638	16.888	297.69833560	48.09929213	68.26
69	28230969	14.972	297.70111417	48.10010350	68.45
70	28230909	18.493	297.73727922	48.07568821	68.70
71	1881918510	19.693	297.70086132	48.06410726	68.80
72	500798428	20.349	297.73760861	48.07583220	69.27
73	28230968	16.550	297.69903300	48.10002500	69.98
74	1881918623	16.782	297.69909178	48.10006870	70.07
75	28230891	16.289	297.72471439	48.06477372	71.34
76	28230896	14.128	297.69074480	48.06714547	71.70

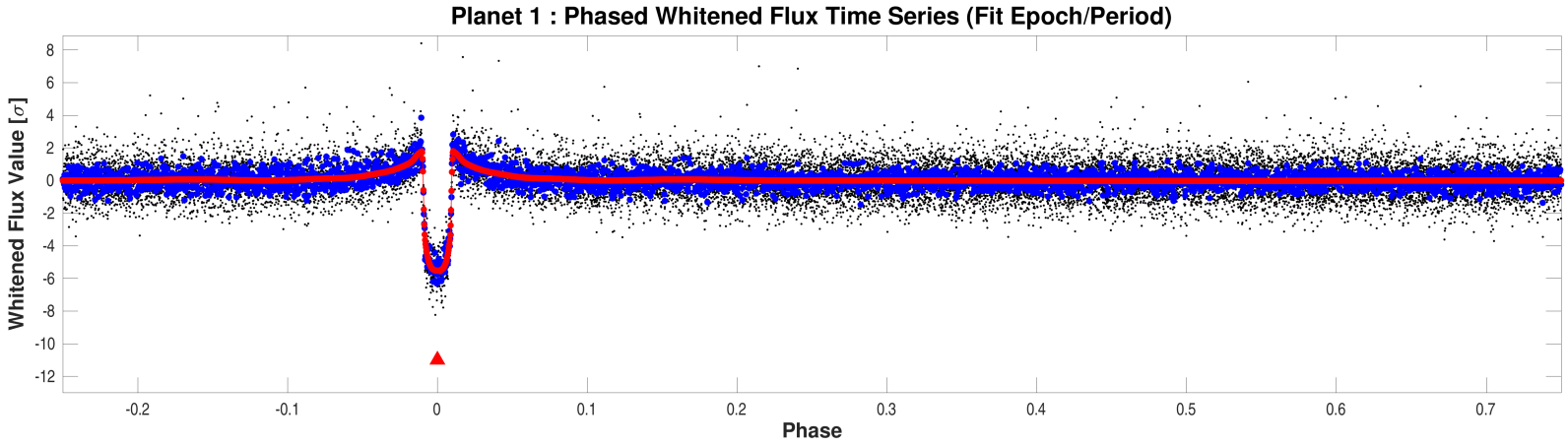
RA, Dec and Distances are corrected for proper motion. This table may not contain all of the objects shown.

6 Phased Light Curves

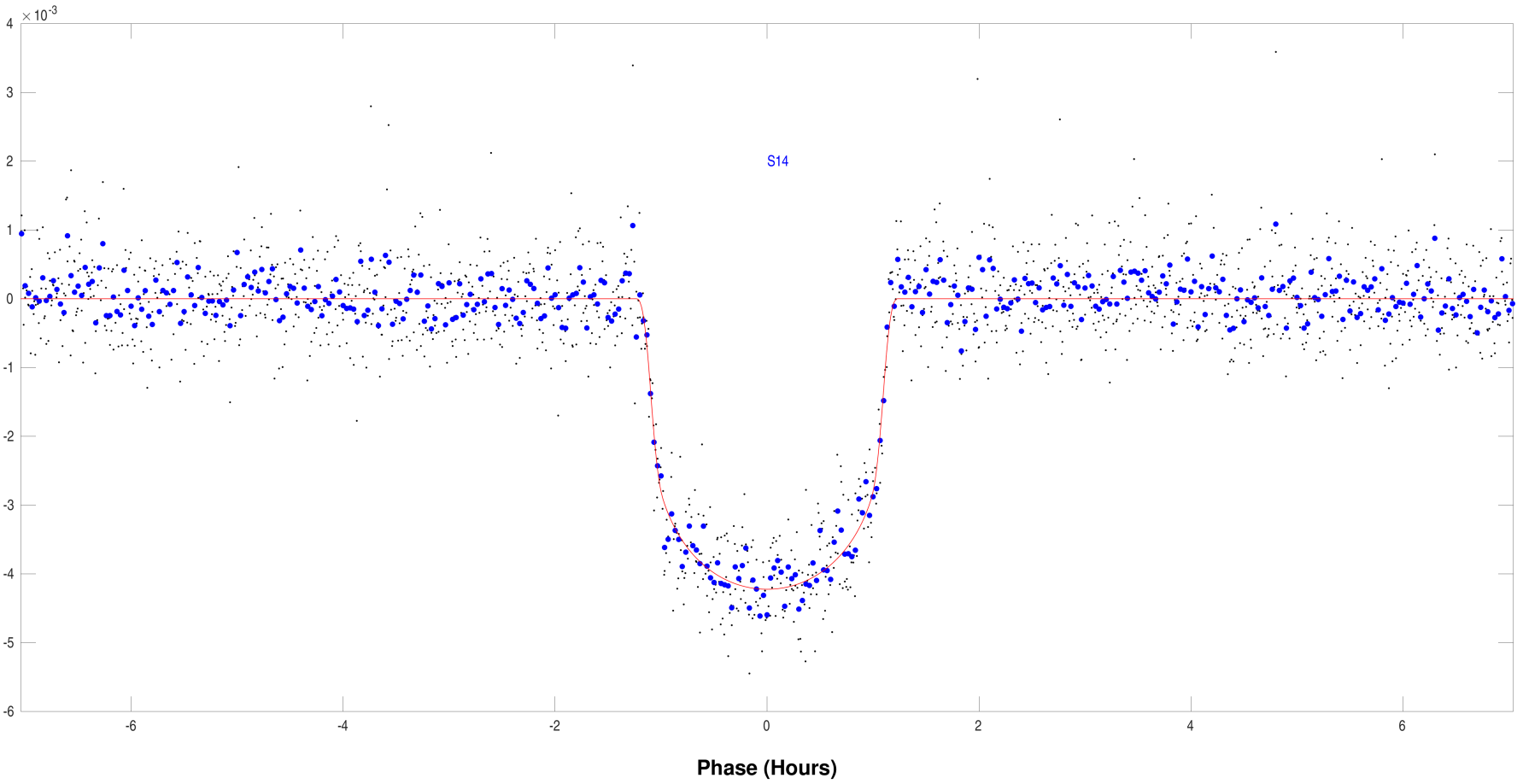


Phased unwhitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased unwhitened flux time series 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/0000000028230919-01-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/0000000028230919-01-phased-whitened-flux-time-series.fig`



Phased unwhitened flux time series by sector for target 28230919, planet candidate 1. Period = 4.8877 days; transit epoch = 1687.2061 BTJD.
Open `./summary-plots/0000000028230919-01-phased-unwhitened-flux-time-series-by-sector.fig`

7 Planet Candidate 1

7.1 Model Fitter: All Transits

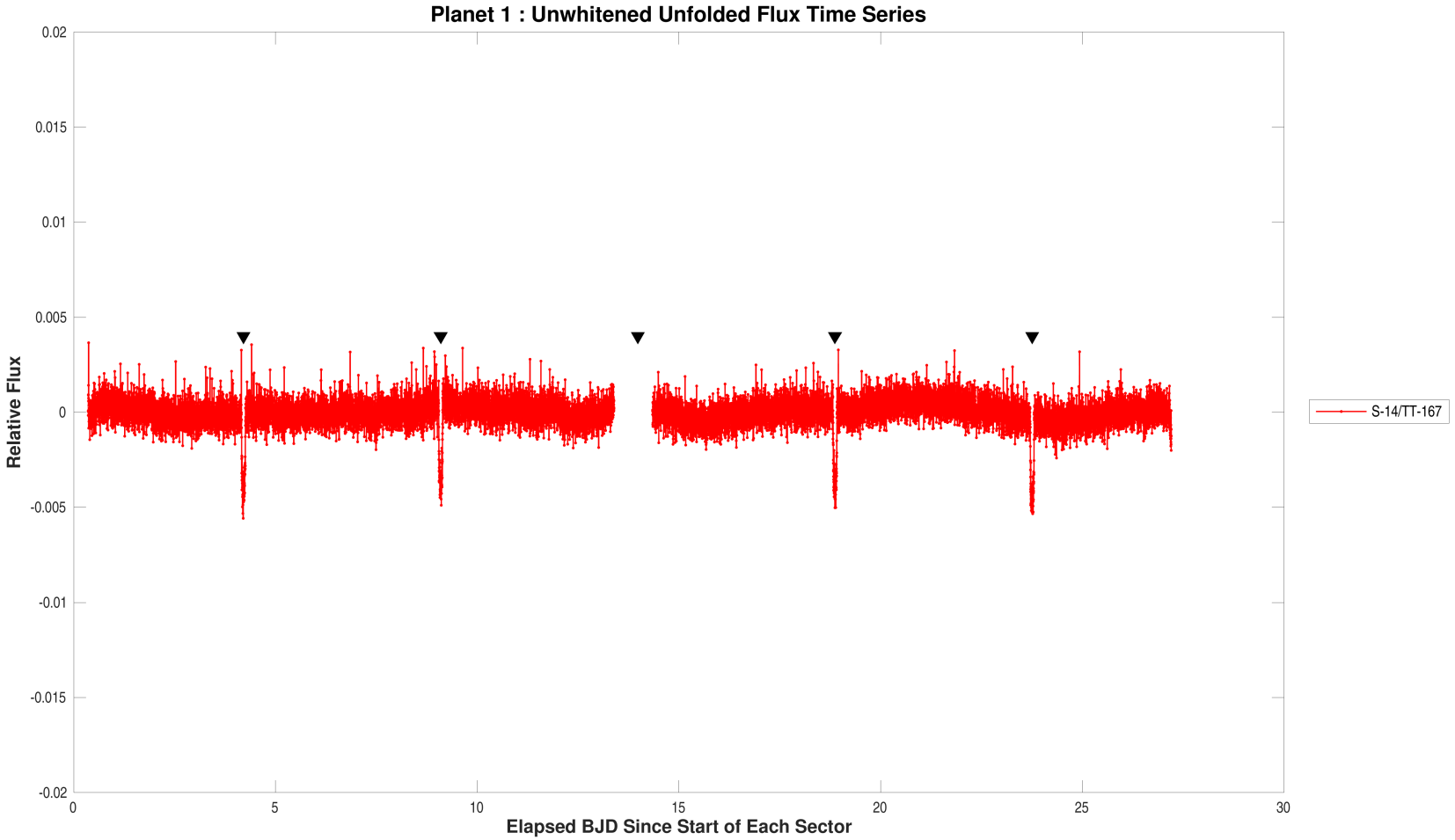
Model Characteristic	Name
Transit Model	mandel-agol_geometric_transit_model
Limb Darkening Model	claret_tess_nonlinear_limb_darkening_model

TCE Parameter	Value	Units
Trial Transit Pulse Duration	2.5	hours
Transit Epoch	1687.2039234	TJD
Orbital Period	4.8874979	days
Maximum SES	43.0	
Maximum MES	81.2	
Robust Statistic	75.7	
Chi Square Goodness of Fit Statistic (DoF)	868.0 (297)	
Chi Square2 Statistic (DoF)	7.9 (496.9)	
Threshold for Desired PFA		

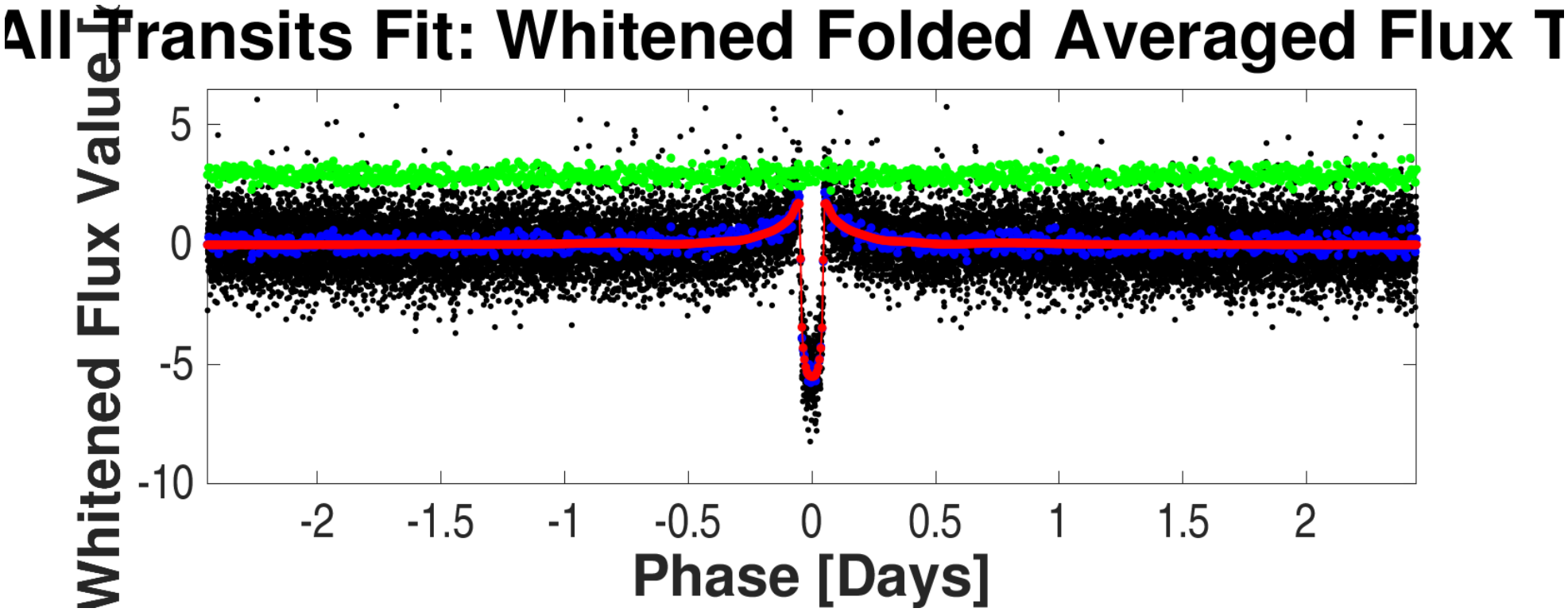
DoF: Degrees of Freedom

Parameter	Value	Uncertainty	Units
SNR	80.0		
Orbital Period	4.8877430	1.3872e-04	days
Transit Epoch	1687.2060561	3.5709e-04	BTJD
Impact Parameter	0.0100	2.1917e+01	
Planet Radius to Star Radius Ratio	0.0586085	3.2793e-03	
Semi-major Axis to Star Radius Ratio	16.8520	3.6319e+00	
Planet Radius	4.8618	4.1166e-01	Earth radii
Semi-major Axis	0.0517	4.0715e-03	AU
Effective Stellar Flux	100.8661	1.6986e+01	Goldilocks
Equilibrium Temperature	808	3.4029e+01	Kelvin
Stellar Density	2.6914	1.7401e+00	Solar density
Transit Depth	4225	5.2530e+01	ppm
Transit Duration	2.3470	5.6988e-02	hours
Transit Ingress Duration	0.1301	6.3987e-02	hours
Eccentricity	0.0000	0.0000e+00	
Peri Longitude	0.0000	0.0000e+00	degrees
Model Chi Square Statistic (DoF)	1109.2 (1343.6)		
Model Chi Square Goodness of Fit Statistic (DoF)	174.4 (293)		
Model Chi Square2 Statistic (DoF)	7.4 (3)		

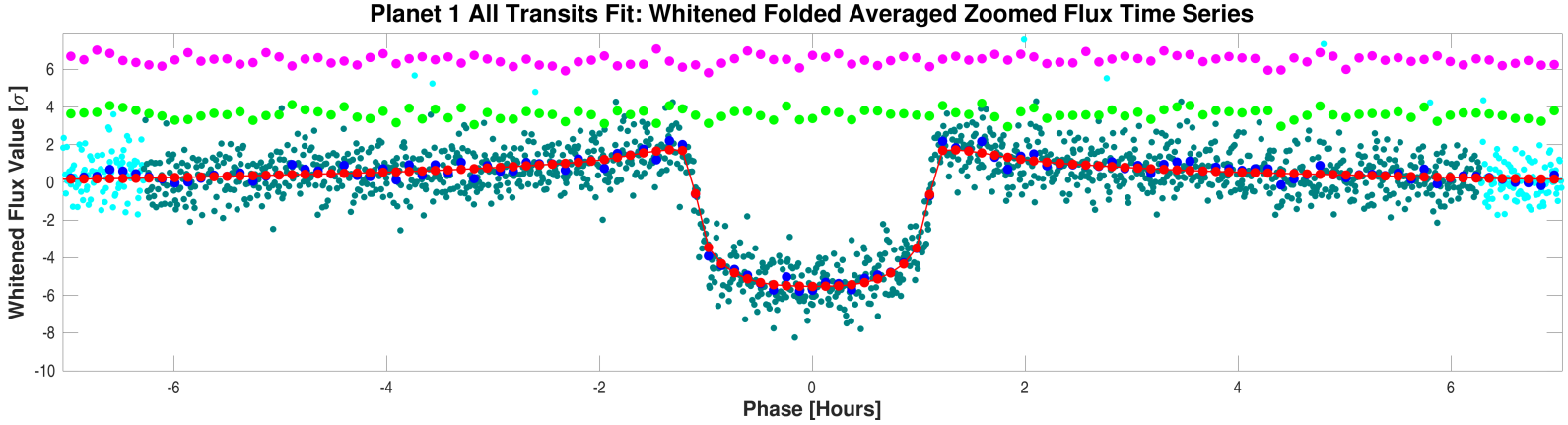
DoF: Degrees of Freedom



Flux time series for CatId 28230919, Planet candidate 1 in the unwhitened domain. For the data of Sector-14/TargetTableId-167, start BJD is 2458683. 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/0000000028230919-01-all-unwhitened-14-167.fig`



Folded flux time series for CatId 28230919, 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/0000000028230919-01-all-whitened.fig`



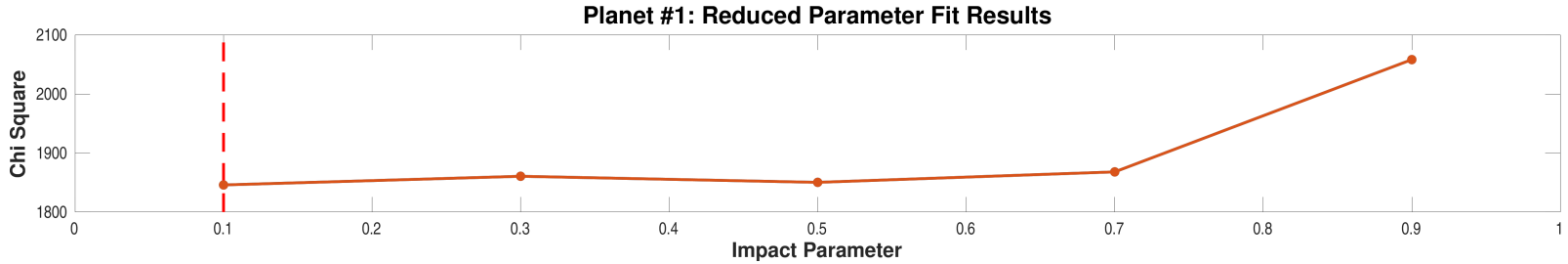
Folded flux time series for CatId 28230919, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged 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/0000000028230919-01-all-whitened-zoomed.fig`

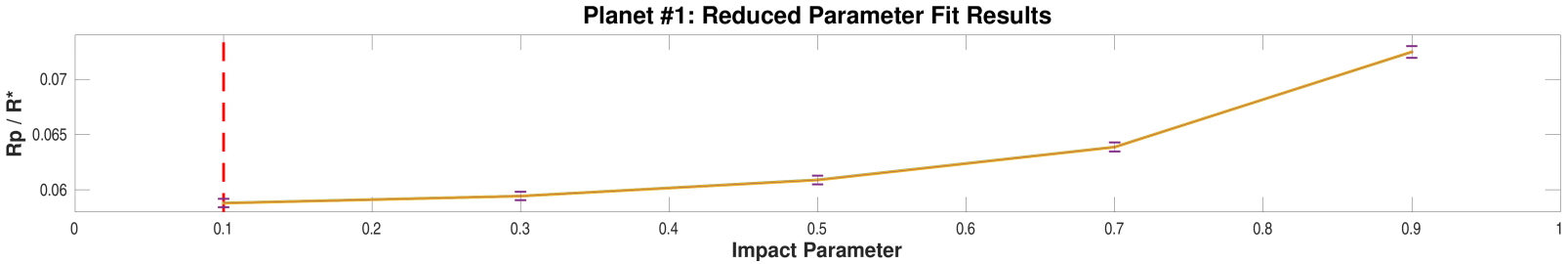
7.2 Model Fitter: Reduced Parameter Fit Results

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	84.6	1845.9	0.0588146	3.7717e-04	16.7288	8.8132e-02	4244	5.4135e+01	2.3544	1.2377e-02
0.30	84.7	1860.6	0.0594443	3.8275e-04	16.0528	8.6170e-02	4244	5.4349e+01	2.3655	1.2673e-02
0.50	84.3	1850.3	0.0609070	3.9365e-04	14.6030	8.1047e-02	4243	5.4534e+01	2.3956	1.3281e-02
0.70	84.7	1868.0	0.0638724	4.1529e-04	12.1092	7.4745e-02	4242	5.4798e+01	2.4763	1.5297e-02
0.90	82.5	2058.2	0.0724623	5.3743e-04	7.7632	7.5852e-02	4346	6.3402e+01	2.8270	2.7743e-02

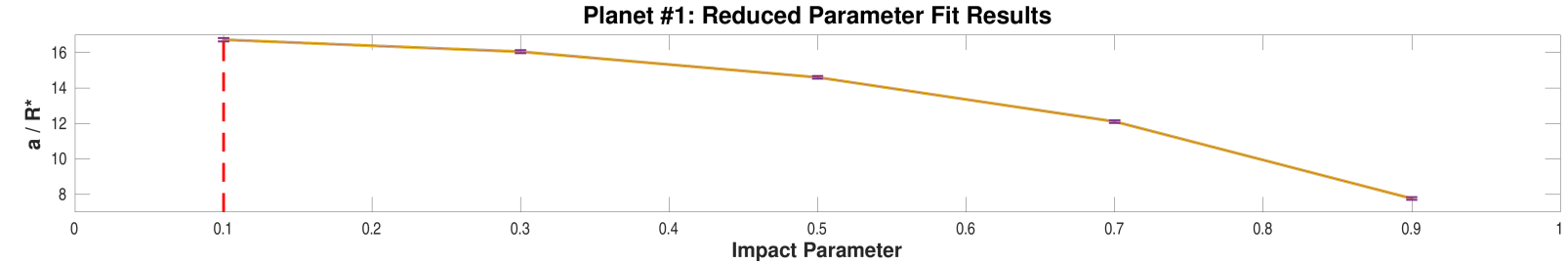
Highlighted row is the best reduced-parameter model fit.



Model chi squares of reduced parameter fits vs. impact parameter for CatId 28230919, 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/0000000028230919-01-reduced-fits-chi-square.fig`



Ratios of planet radius to star radius of reduced parameter fits vs. impact parameter for CatId 28230919, 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/0000000028230919-01-reduced-fits-rp-over-rstar.fig`



Ratios of semimajor axis to star radius of reduced parameter fits vs. impact parameter for CatId 28230919, 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/0000000028230919-01-reduced-fits-a-over-rstar.fig`

7.3 Model Fitter: Trapezoidal Fit Results

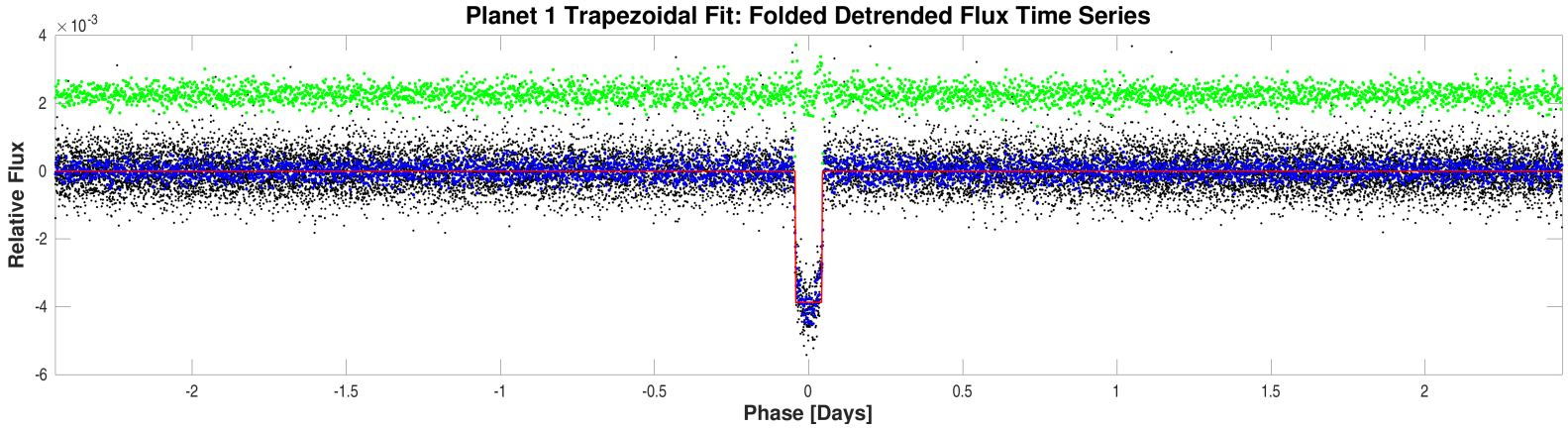
Model Characteristic	Name
Transit Model	trapezoidal_model
Limb Darkening Model	

TCE Parameter	Value	Units
Trial Transit Pulse Duration	2.5	hours
Transit Epoch	1687.2039234	TJD
Orbital Period	4.8874979	days
Maximum SES	43.0	
Maximum MES	81.2	
Robust Statistic	75.7	
Chi Square Goodness of Fit Statistic (DoF)	868.0 (297)	
Chi Square2 Statistic (DoF)	7.9 (496.9)	
Threshold for Desired PFA		

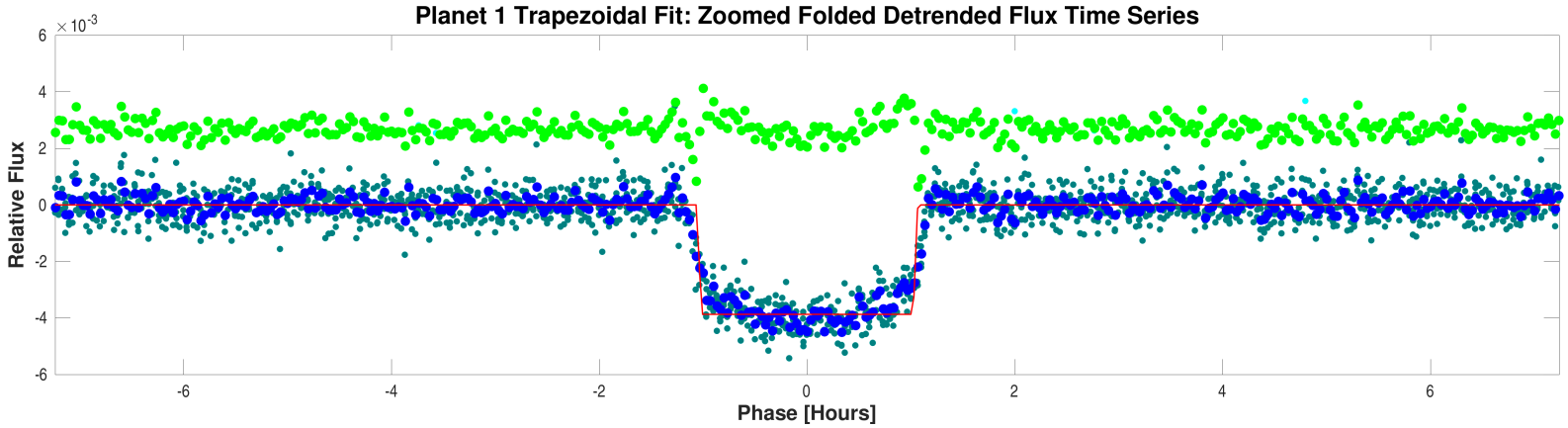
DoF: Degrees of Freedom

Parameter	Value	Uncertainty	Units
SNR	110.6		
Orbital Period	4.8874979		days
Transit Epoch	1687.2063606		BTJD
Transit Depth	3871		ppm
Transit Duration	2.4121		hours
Transit Ingress Duration	0.3319		hours
Model Chi Square Statistic (DoF)	19779.7 (2393)		

DoF: Degrees of Freedom



Folded detrended flux time series for CatId 28230919, Planet candidate 1 and folded trapezoidal model light curve.
Open `./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000028230919-01-all-trapezoidal.fig`



Zoomed folded detrended flux time series for CatId 28230919, Planet candidate 1 and folded trapezoidal model light curve.
Open `./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000028230919-01-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	4.8875		days		
Transit Duration	2.5		hours		
Maximum MES	81.2				
Secondary Phase	2.3639		days		
Secondary MES	3.0				
Minimum Phase	2.9236		days		
Minimum MES	-2.5				
Median MES	0.1				
MAD MES	0.75411				
Robust Statistic	2.7				
Secondary Depth	129.4	4.3750e+01	ppm		
Geometric Albedo	8.0	3.0776e+00		2.2896	1.10
Planet Effective Temperature	2105	1.9389e+02	Kelvin	6.5858	0.00

7.4.2 Eclipsing Binary Discrimination Test

Result	Value	Value in Sigmas	Significance (%)
Odd Even Transit Depth Comparison Statistic	1.4075e-01	0.3752	70.75

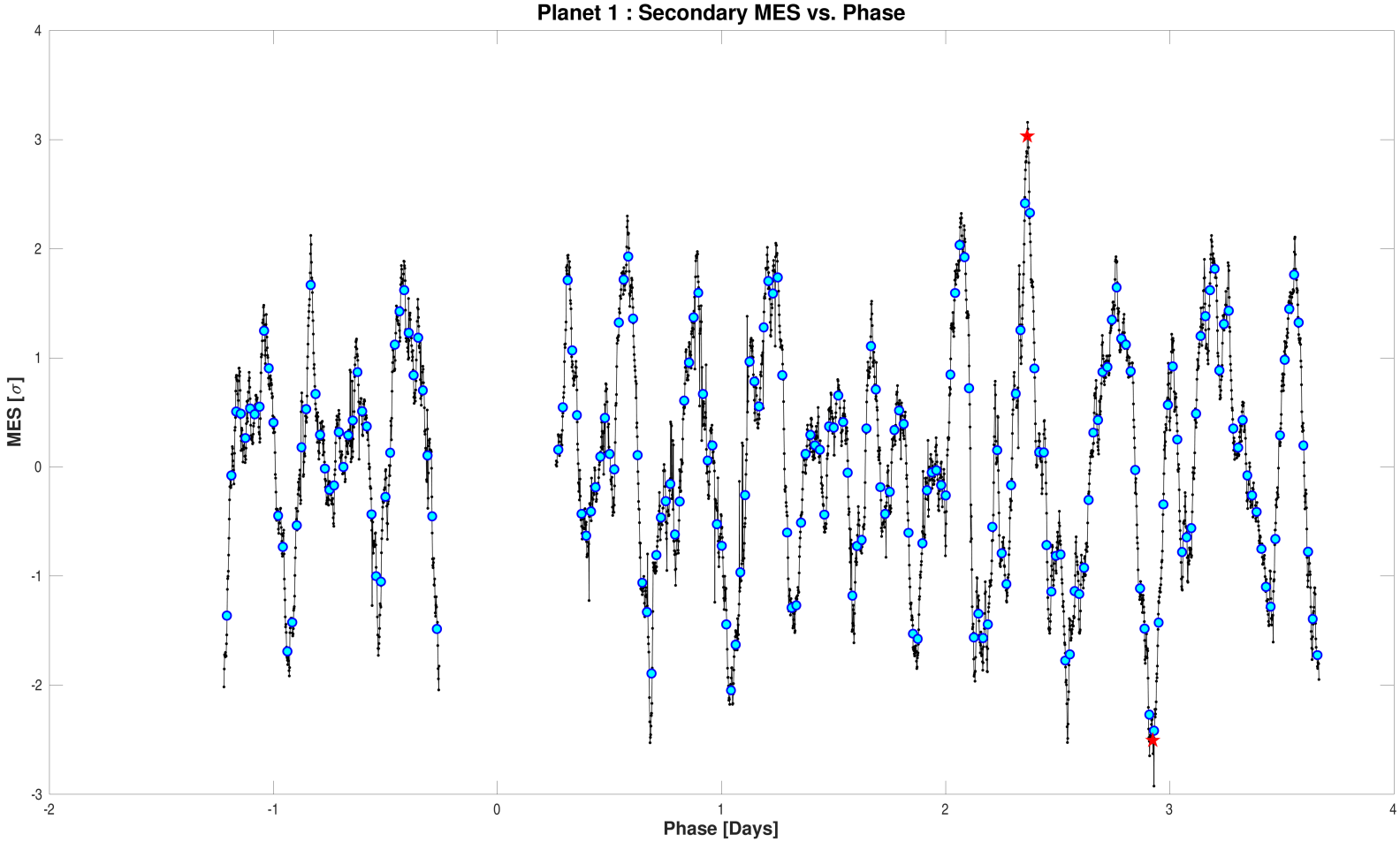
7.4.3 Bootstrap Test

Result	Value
False Alarm Probability	0.0000e+00
Bootstrap Threshold for Desired PFA	7.5
MES Mean	0.33
MES Standard Deviation	1.02
Transit Count	5

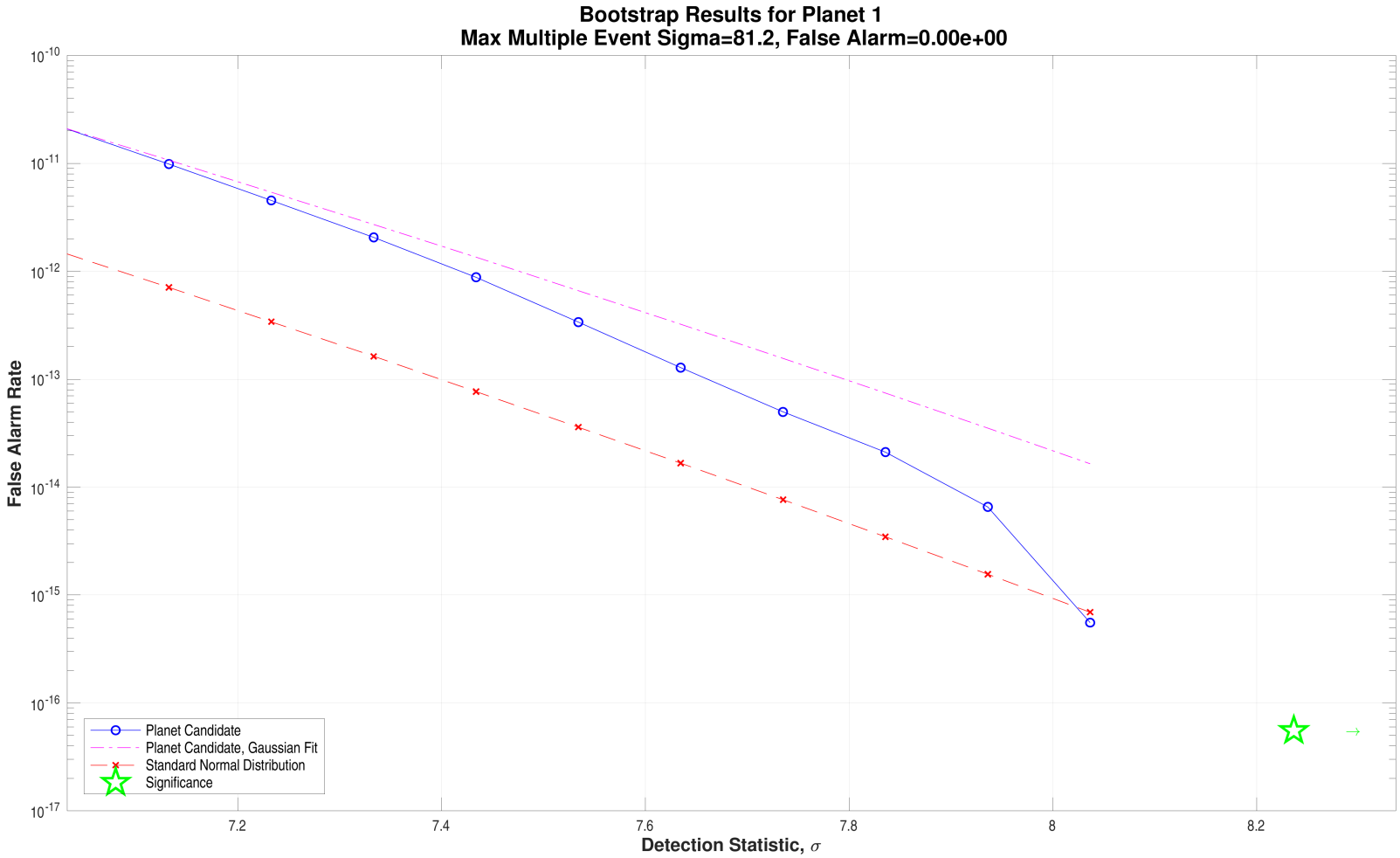
7.4.4 Ghost Diagnostic Test

Result	Value	Significance (%)
Maximum MES	81.2	
SNR	80.0	
Core Aperture Statistic	3.2178e+01	100.00
Halo Aperture Statistic	1.3333e+01	100.00
Ratio of Core/Halo Aperture Statistics	2.4134e+00	

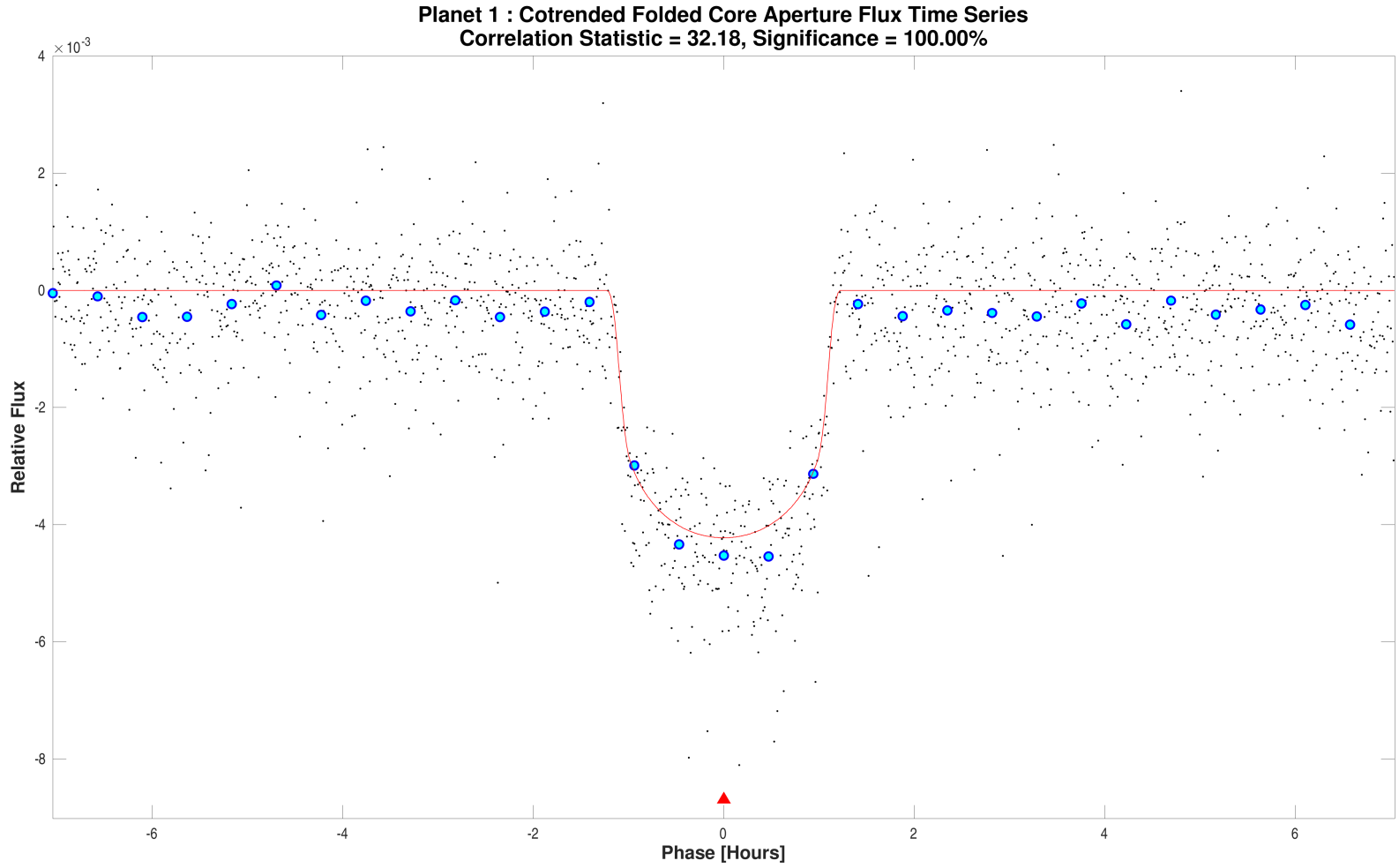
7.4.5 Validation Test Figures



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 2.5. The maximum secondary MES and corresponding phase are 3.0309 and 2.3639 days respectively. The minimum secondary MES and corresponding phase are -2.5048 and 2.9236 days respectively.
Open `./planet-01/report-summary/0000000028230919-01-weak-secondary-diagnostic.fig`

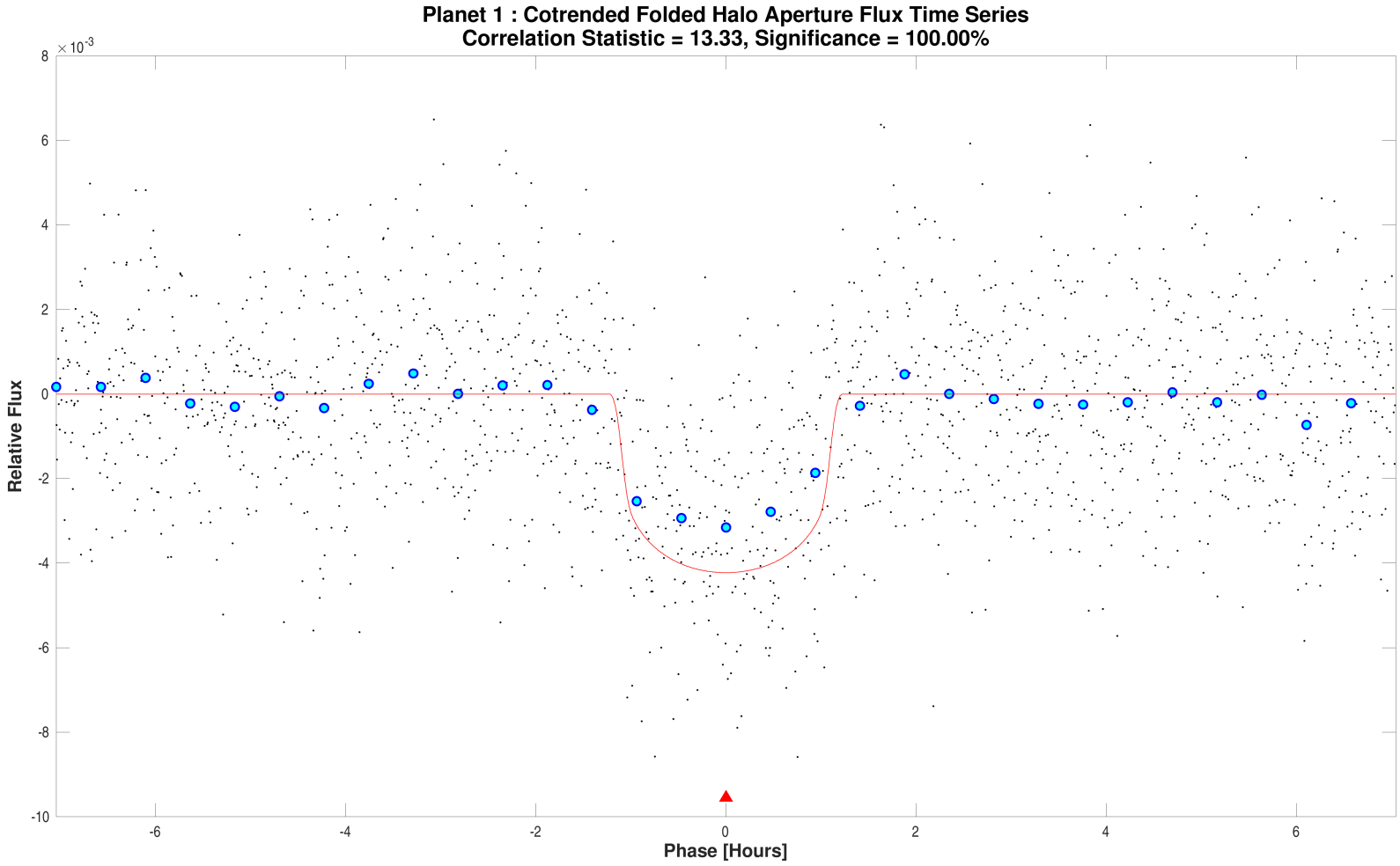


Bootstrap results for target 28230919, planet 1. Cumulative sum of the probabilities (derived from the histogram of counts) from upper tail to the search transit threshold; false alarm probability is indicated by the star. The Gaussian equivalent threshold for this false alarm probability is Inf. The threshold on this distribution that achieves the same false alarm rate as a 7.1 sigma threshold on a Gaussian distribution is 7.4813.
Open `./planet-01/bootstrap-results/0000000028230919-01-bootstrap-false-alarm.fig`



Optical ghost diagnostic core aperture flux time series for target 28230919, 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/0000000028230919-01-core-unwhitened-cotrended-zoomed-model.fig`

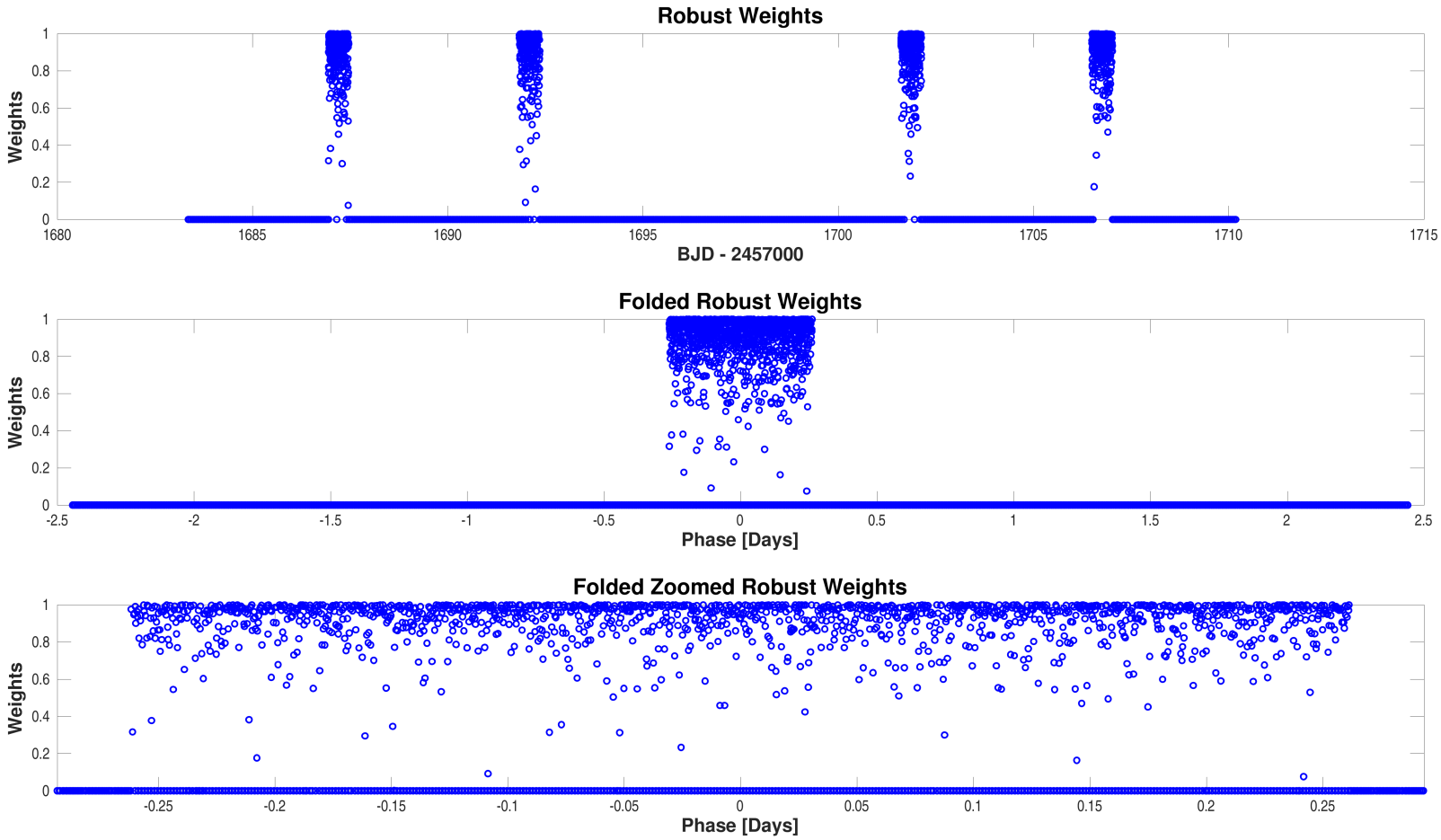


Optical ghost diagnostic halo aperture flux time series for target 28230919, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft 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.

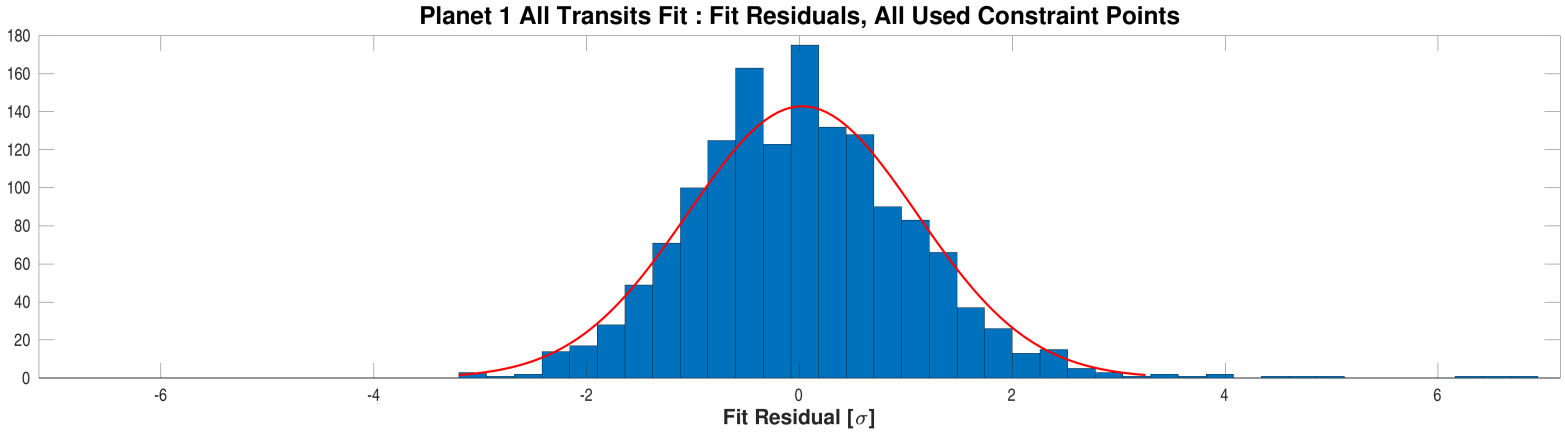
Open `./planet-01/ghost-diagnostic-results/0000000028230919-01-halo-unwhitened-cotrended-zoomed-model.fig`

Appendix A Planet Candidate 1

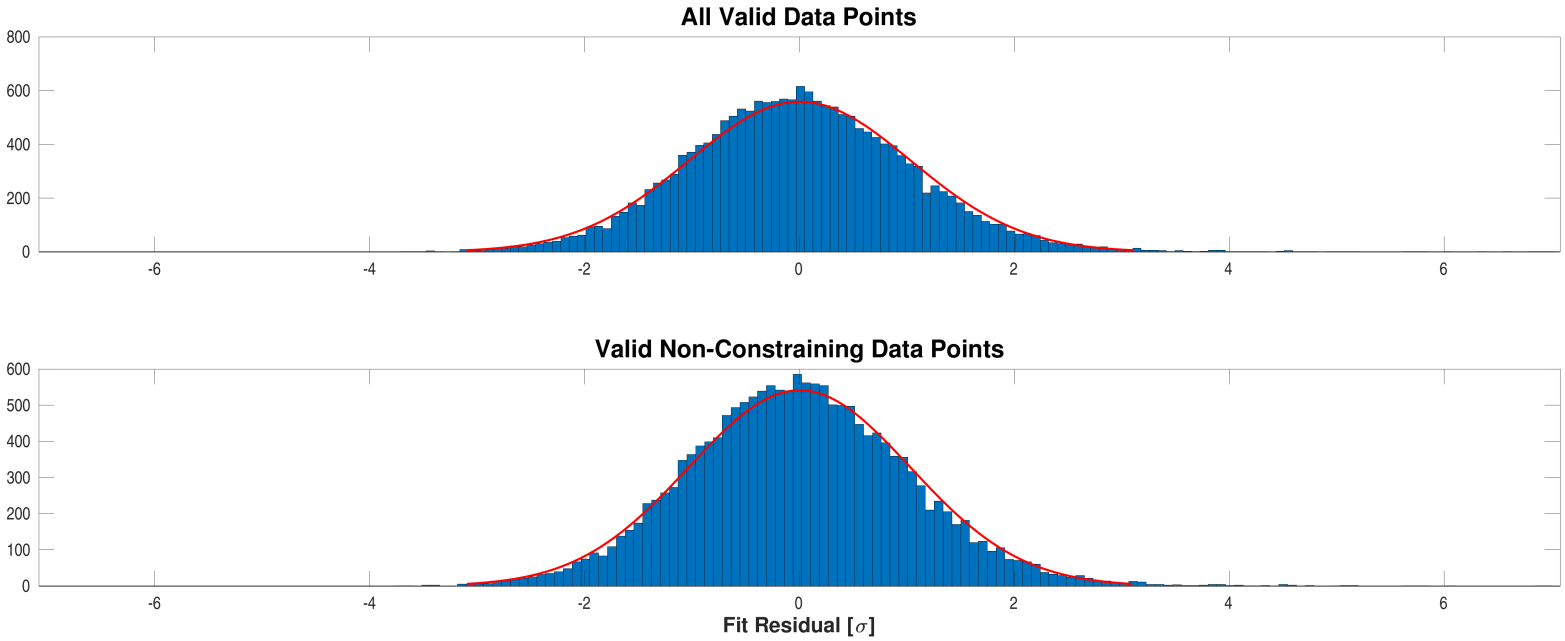
A.1 Model Fitter: All Transits



Robust weights distribution for CatId 28230919, 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/0000000028230919-01-all-robust-weights.fig`



Fit residuals distribution for CatId 28230919, 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/0000000028230919-01-all-histo-used.fig`

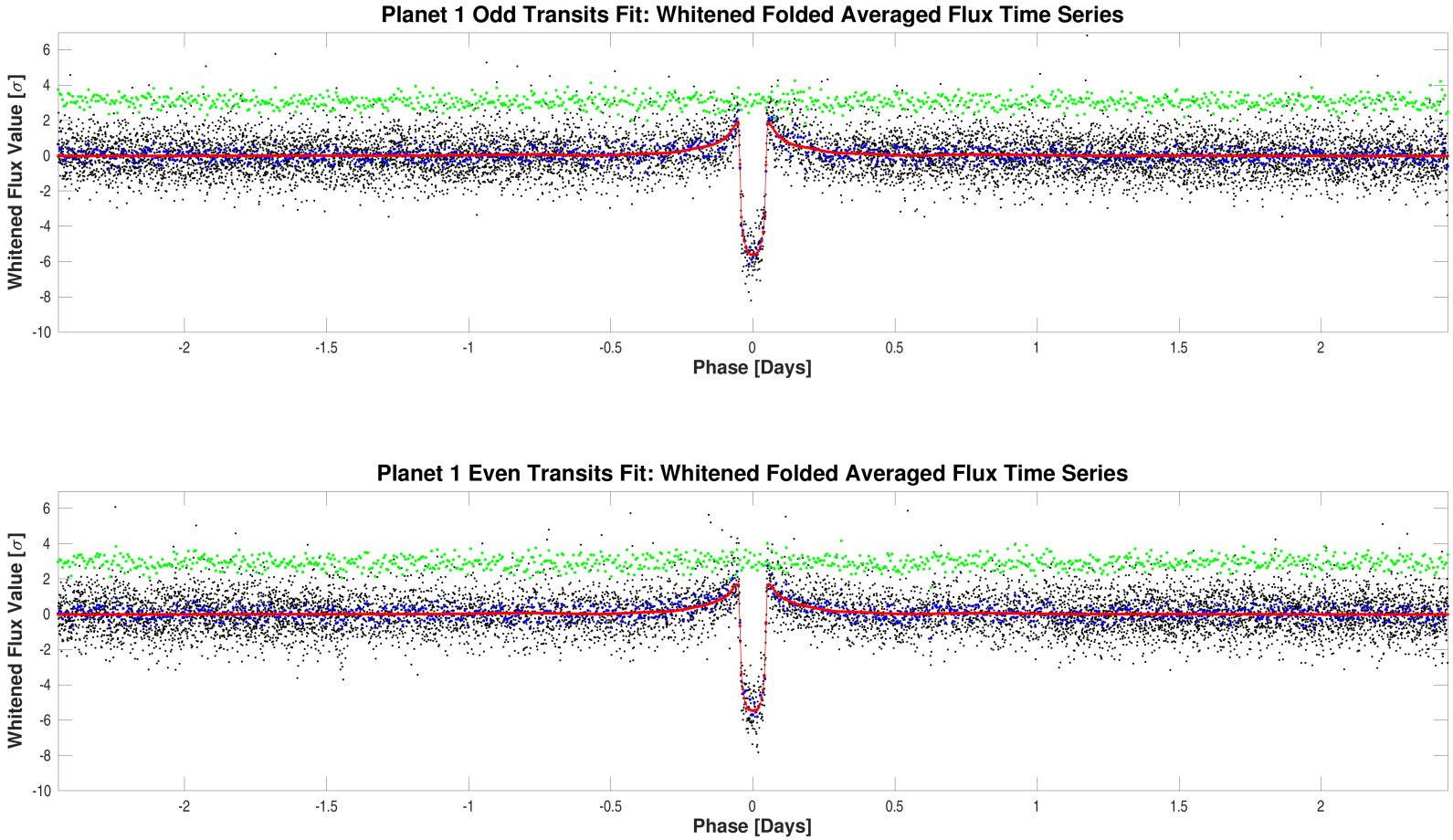


Fit residuals distribution for CatId 28230919, Planet candidate 1. Top plot: all valid data. Bottom plot: valid data not used to constrain fit (due to distance from a transit). Gaussian fits to the histograms are shown in red.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000028230919-01-all-histo-all-and-unused.fig`

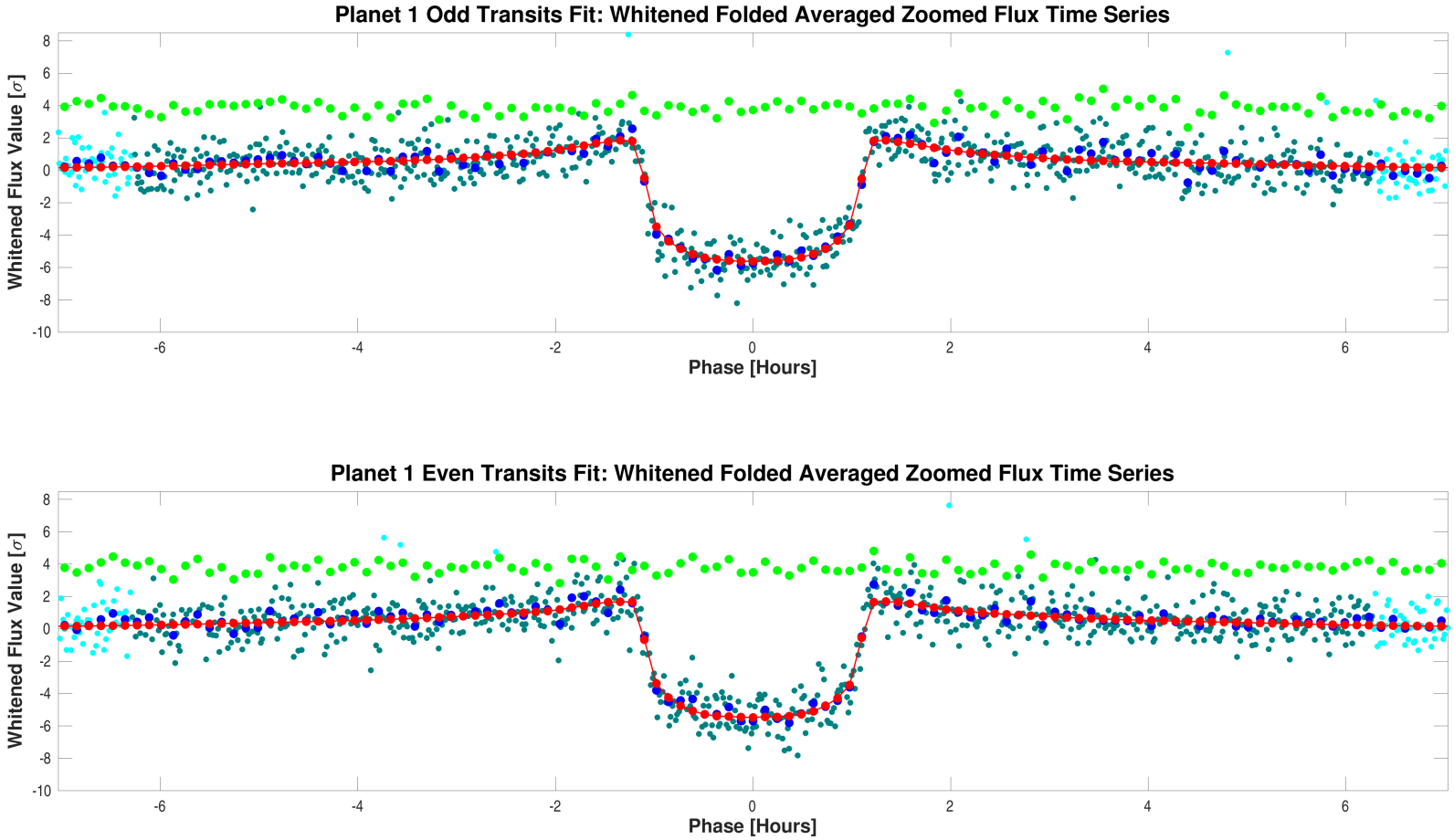
A.2 Model Fitter: Odd & Even Transits

Parameter	Odd Transits Value	Odd Transits Uncertainty	Even Transits Value	Even Transits Uncertainty	Units	Difference / ‖Uncertainty‖
SNR	57.9		55.4			
Orbital Period	4.8878121	1.5370e-04	4.8875328	3.1739e-04	days	7.9224e-01
Transit Epoch	1687.2058820	4.3728e-04	1692.0939453	4.5064e-04	BTJD	5.1017e-01
Impact Parameter	0.0100	3.0643e+01	0.0791	3.9119e+00		2.2357e-03
Planet Radius to Star Radius Ratio	0.0588112	4.6036e-03	0.0585817	4.6561e-03		3.5055e-02
Semi-major Axis to Star Radius Ratio	16.8798	5.0857e+00	16.8048	5.1426e+00		1.0371e-02
Planet Radius	4.8786	4.9190e-01	4.8595	4.9453e-01	Earth radii	2.7297e-02
Semi-major Axis	0.0517	4.0715e-03	0.0517	4.0714e-03	AU	3.4210e-04
Effective Stellar Flux	100.8642	1.6986e+01	100.8719	1.6987e+01	Goldilocks	3.2001e-04
Equilibrium Temperature	808	3.4029e+01	808	3.4030e+01	Kelvin	3.2001e-04
Stellar Density	2.7046	2.4446e+00	2.6691	2.4503e+00	Solar density	1.0282e-02
Transit Depth	4254	7.3901e+01	4214	7.5770e+01	ppm	3.7517e-01
Transit Duration	2.3437	7.9742e-02	2.3470	8.1393e-02	hours	2.9636e-02
Transit Ingress Duration	0.1303	8.9627e-02	0.1308	9.1356e-02	hours	3.6706e-03
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)	1109.5 (1338.8)		1109.5 (1338.8)			

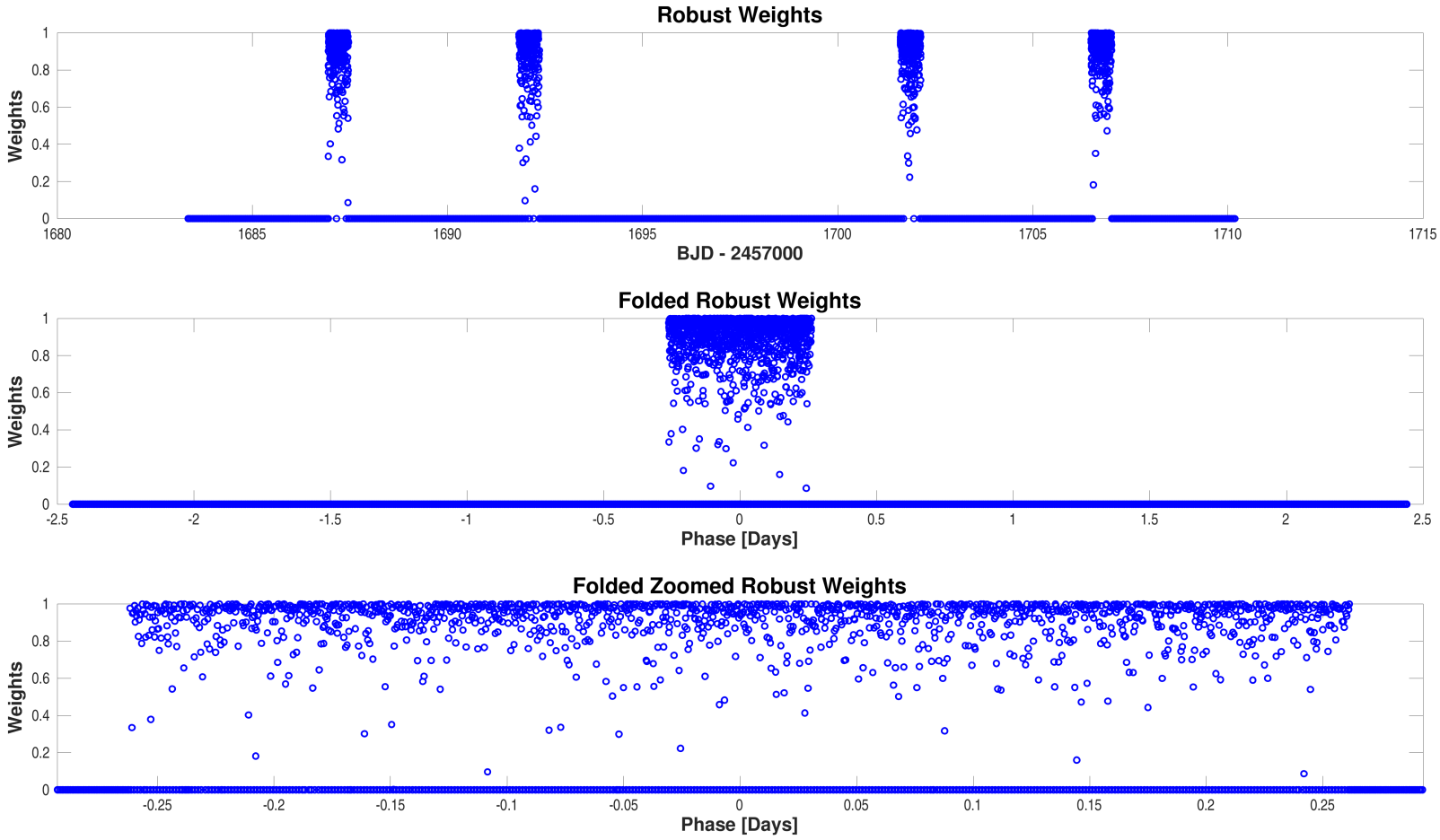
DoF: Degrees of Freedom



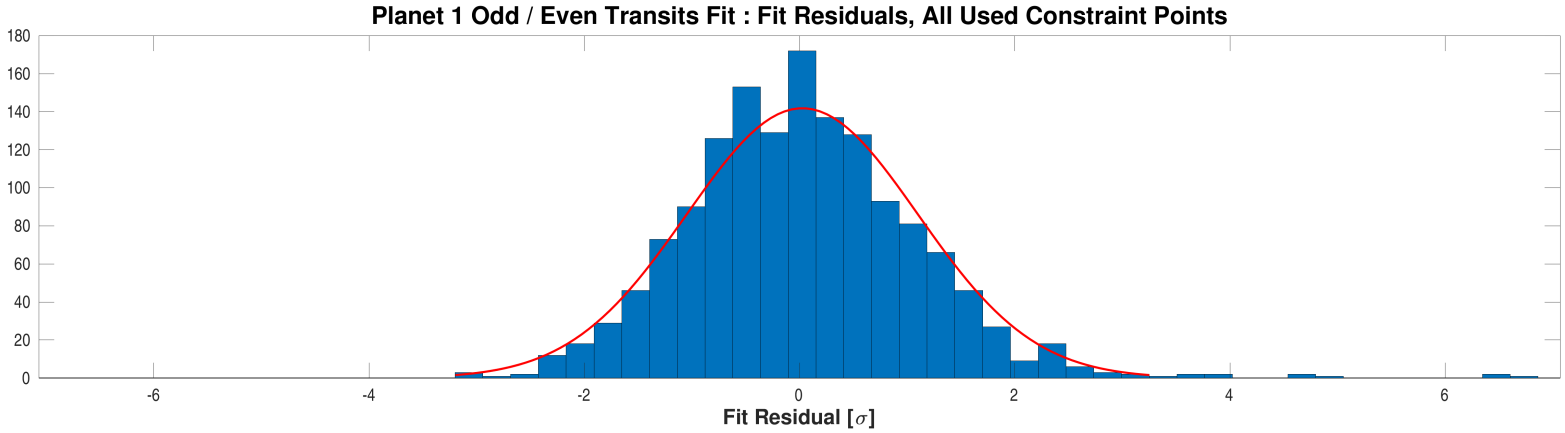
Folded flux time series for CatId 28230919, Planet candidate 1 in the whitened domain is plotted in black dots. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the folded model light 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/0000000028230919-01-odd-even-whitened.fig`



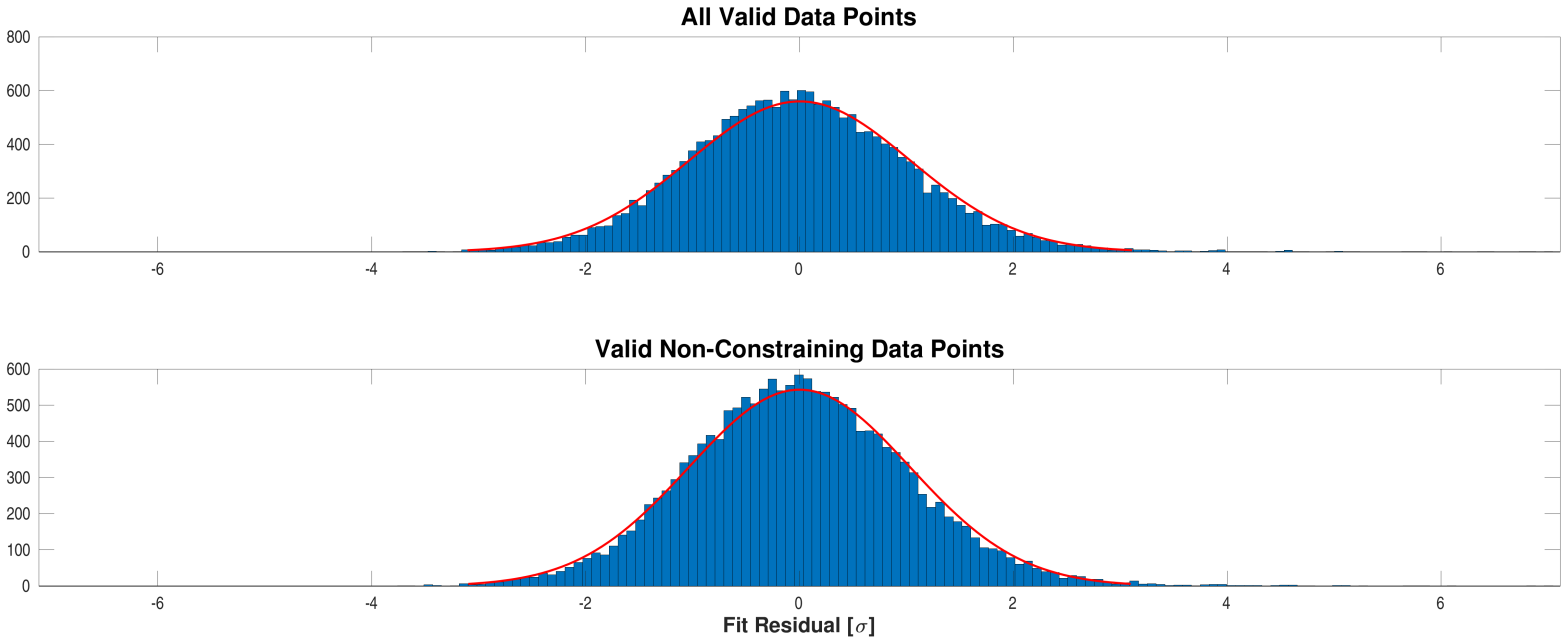
Folded flux time series for CatId 28230919, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged 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/0000000028230919-01-odd-even-whitened-zoomed.fig`



Robust weights distribution for CatId 28230919, 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/0000000028230919-01-odd-even-robust-weights.fig`

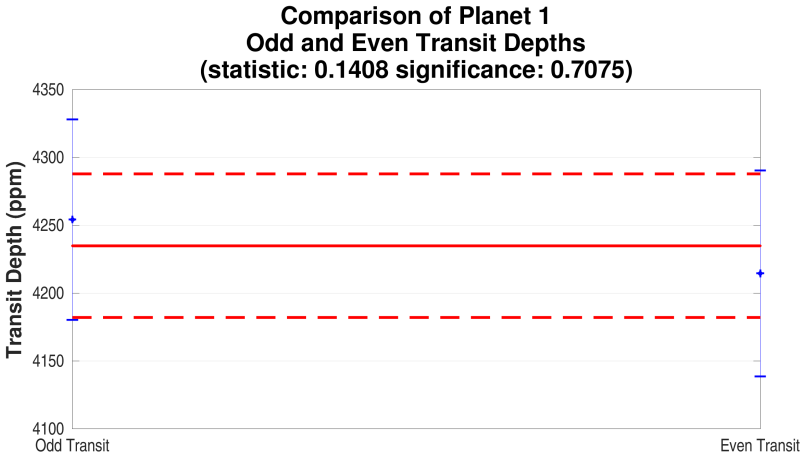


Fit residuals distribution for CatId 28230919, Planet candidate 1. Only the valid data points used to constrain the fit are shown here. A Gaussian fit to the histogram is shown in red.
Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000028230919-01-odd-even-histo-used.fig`



Fit residuals distribution for CatId 28230919, 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/0000000028230919-01-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 28230919, planet 1. A significance level close to 1/0 favors a transiting planet/an eclipsing binary. Open `./planet-01/binary-discrimination-test-results/0000000028230919-01-eclipsing-binary-discrimination-tests.fig`

Appendix B Alerts

This target did not trigger any alerts.