



Data Validation (DV) Report

for TESS ID 184733148
Sectors 58 - 58
Cadence: TARGET (2.0-min)

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

29-Nov-2022 23:51:12 Z

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1 Summary

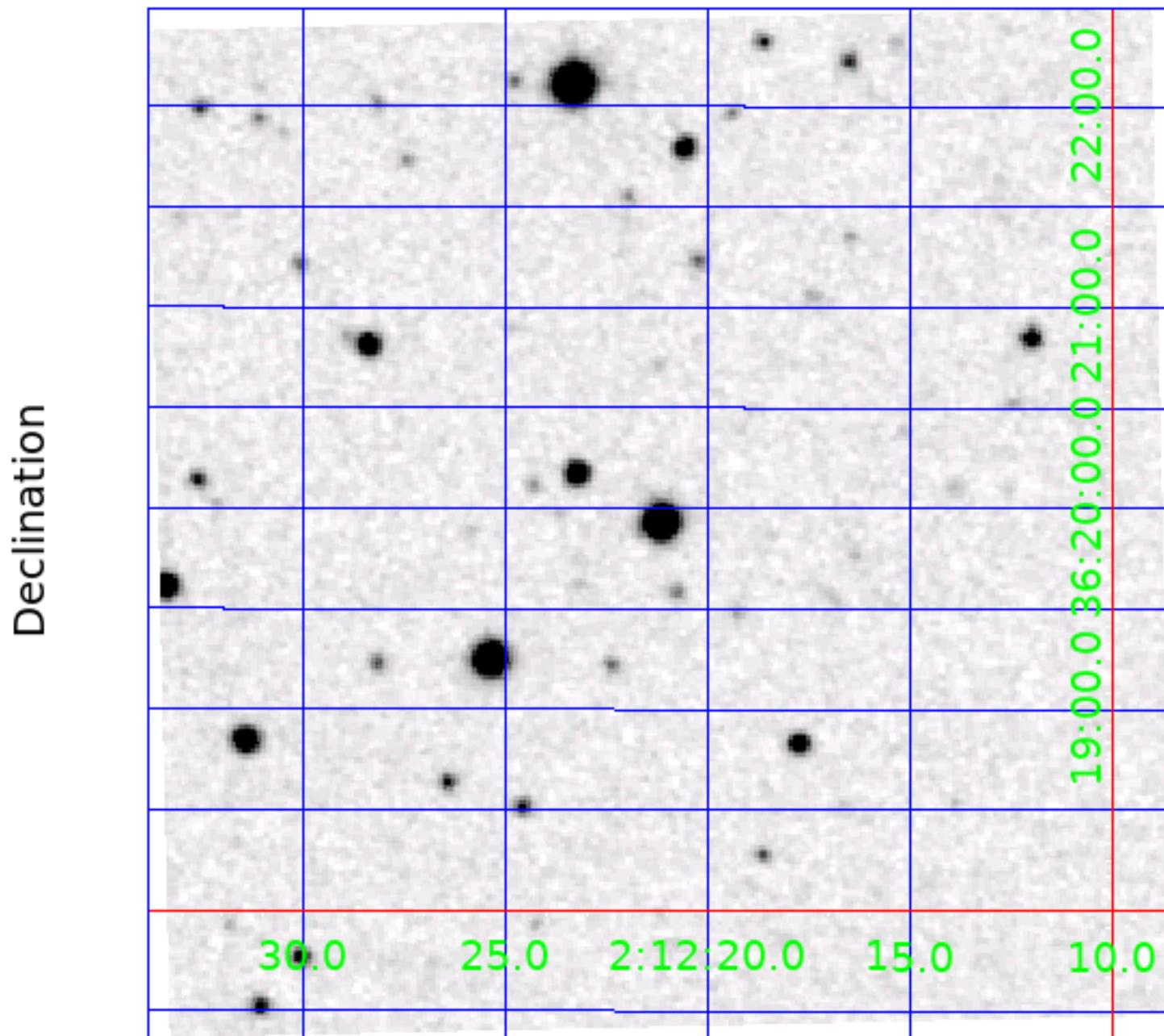
Target Properties	Value	Uncertainty	Units	Provenance
Catalog ID	184733148			
TOI ID	3645			
TESS Name	-			
RA	33.08816812	0	degrees	TIC8.2
Dec	36.33228274	0	degrees	TIC8.2
Magnitude	12.851	0.0073		TIC8.2
Radius	1.125	0.059	Solar radii	TIC8.2
Effective Temperature	5585	122	Kelvin	TIC8.2
log(g)	4.331	0.082344	cm/sec ²	TIC8.2
[M/H]	0.000	0	Solar metallicity	Solar
Stellar Density	0.695	0.137	Solar density	TIC8.2-Derived
Limb Darkening Coefficient 1	0.61			
Limb Darkening Coefficient 2	-0.23132			
Limb Darkening Coefficient 3	0.6183			
Limb Darkening Coefficient 4	-0.31528			
Number of Planet Candidates	1			
TOI Model	csv-file-toi-catalog-11-28-22.csv			
TESS Names Model	-			
External TCE Model	-			
Software Revision	spoc-5.0.77-20221025			
Date Report Generated	29-Nov-2022 23:51:12 Z			

Sector	Target Table	Camera/CCD	Crowding Metric	Flux Fraction
58	378	1:2	0.9047	0.7618

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	-	-	-	2.959	1.00	2883.795	0.04	12.5	682.3	1303	6.62e-152	false

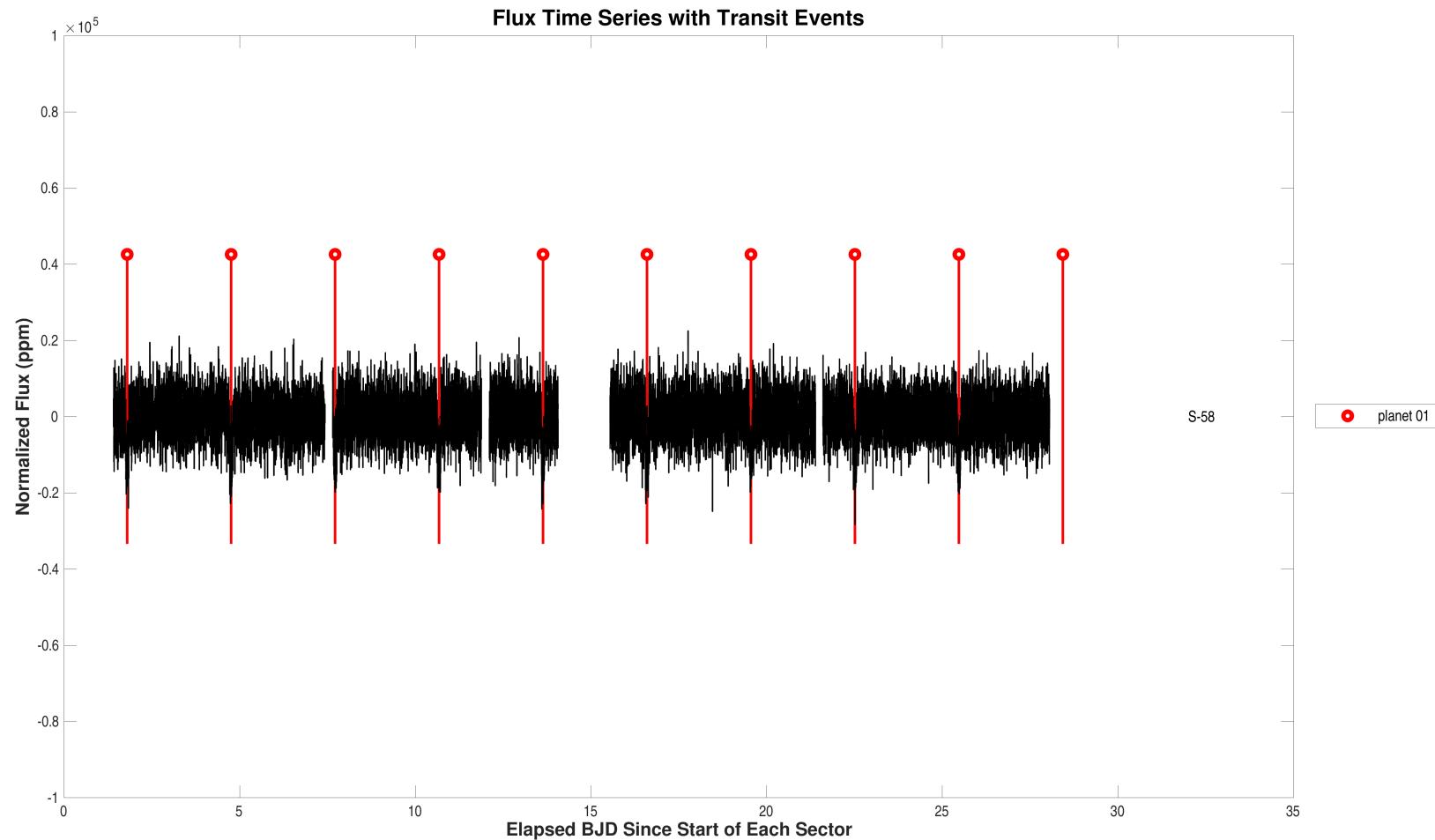
DV did not produce matching results for the following TOI IDs: 3645.01

2 Survey Image

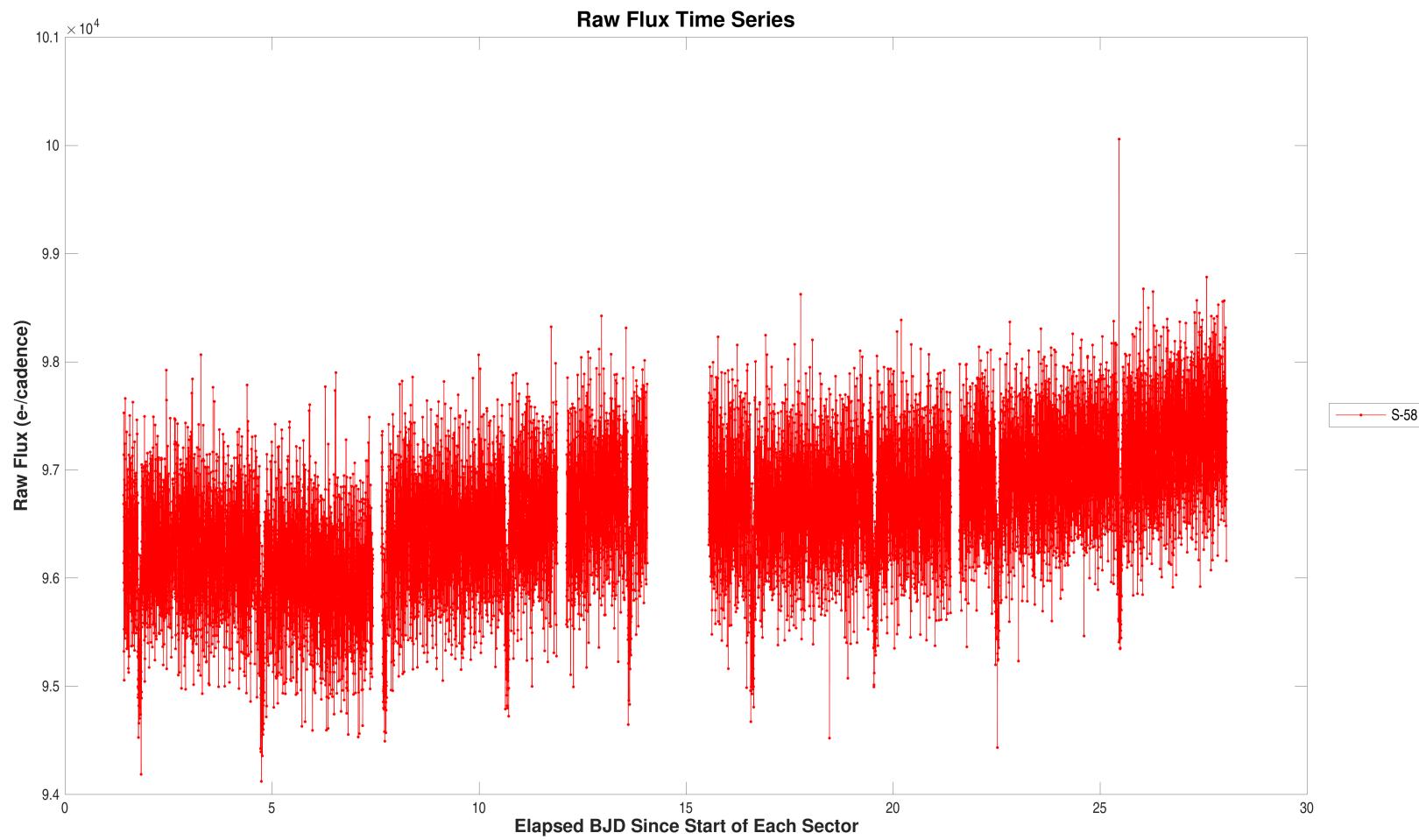


Digitized Sky Survey (DSS) red image. The 5' x 5' image is centered on the J2000 coordinates of target (184733148).

3 Flux Time Series



Summary plot of sector-stitched flux time series and transits for target 184733148, 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 58, target table 378, start BJD is 2459882.
Open [./summary-plots/0000000184733148-00-flux-dv-fit-58-378.fig](#)



Summary plot of raw flux time series. For the data of sector 58, target table 378, start BJD is 2459882.
Open [./summary-plots/0000000184733148-00-raw-flux-58-378.fig](#)

4 Dashboards

Planet Candidate 1

Model Fitter	Stellar Radius 1.1 ± 0.1 Solar units	Core Aperture Correlation Statistic Value = 25.14 Significance = 100.00%	Ghost Diagnostic Test
	Period = 3.0 ± 0.0 days Depth = 11441 ± 292 ppm Planet Radius = 12.5 ± 0.8 Earth radii Semi-major Axis = 0.0 ± 0.0 AU Effective Stellar Flux = 682.3 ± 107.6 Equilibrium Temperature = 1303 ± 51 Kelvin Chi-squared/DoF = 0.9 SNR = 41.6	Halo Aperture Correlation Statistic Value = 5.06 Significance = 100.00% Core/Halo Ratio Ratio = 4.97	
Eclipsing Binary Discrimination Test	Odd-Even Depth Comparison Statistic Value = $9.15e-01$ Significance = 33.88%	Offsets Relative to Out of Transit Centroid Source RA Offset = $-2.74e+00 \pm 2.52e+00$ arcsec (-1.09 σ) Source Dec Offset = $-7.93e-02 \pm 2.54e+00$ arcsec (-0.03 σ) Source Offset Distance = $2.74e+00 \pm 2.52e+00$ arcsec (1.09 σ) Offsets Relative to TIC Position Source RA Offset = $-3.24e-02 \pm 2.52e+00$ arcsec (-0.01 σ) Source Dec Offset = $-3.41e-03 \pm 2.54e+00$ arcsec (-0.00 σ) Source Offset Distance = $3.26e-02 \pm 2.52e+00$ arcsec (0.01 σ)	Difference Image Centroid Offsets
	Shorter Period Comparison Statistic Value = N/A Significance = N/A	Longer Period Comparison Statistic Value = N/A Significance = N/A False Alarm = $6.62e-152$ Transit Count = 9 Max Multiple Event Statistic = 23.8	Bootstrap Test

Summary of model fitter results and validation test results for target 184733148, 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

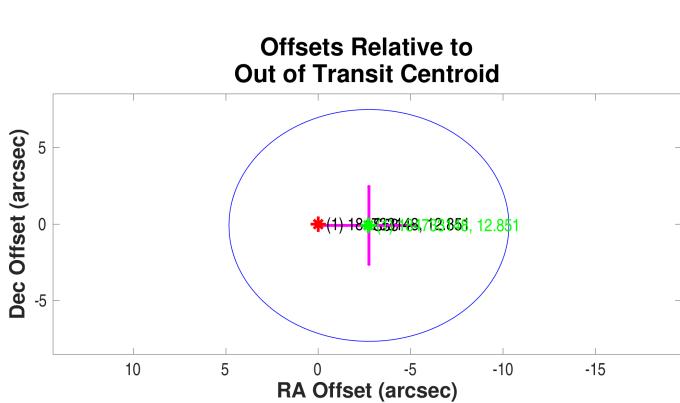
Multi-Sector Average PRF Fit of the Difference Images

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

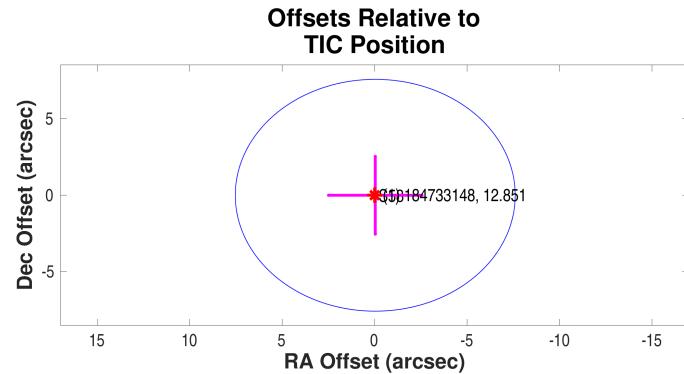
	RA	Dec	Units
Offset	$-2.7422 \pm 2.52e + 00$	$-0.0793 \pm 2.54e + 00$	arcseconds
Offset/ σ	-1.09	-0.03	
Offset Distance	$2.7434 \pm 2.52e + 00$		arcseconds
Offset Distance/ σ	1.09		
3σ Radius	7.5719		arcseconds

Mean offset from the TIC RA and Dec

	RA	Dec	Units
Offset	$-0.0324 \pm 2.52e + 00$	$-0.0034 \pm 2.54e + 00$	arcseconds
Offset/ σ	-0.01	-0.00	
Offset Distance	$0.0326 \pm 2.52e + 00$		arcseconds
Offset Distance/ σ	0.01		
3σ Radius	7.5723		arcseconds

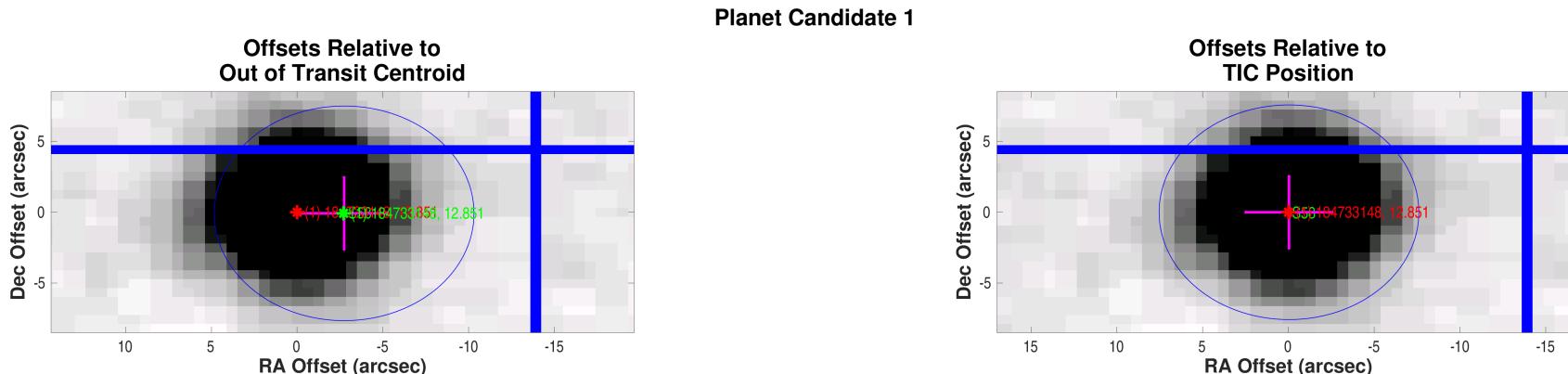


Planet Candidate 1



Difference image centroid offsets for target 184733148, 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/0000000184733148-01-difference-image-centroid-offsets.fig`



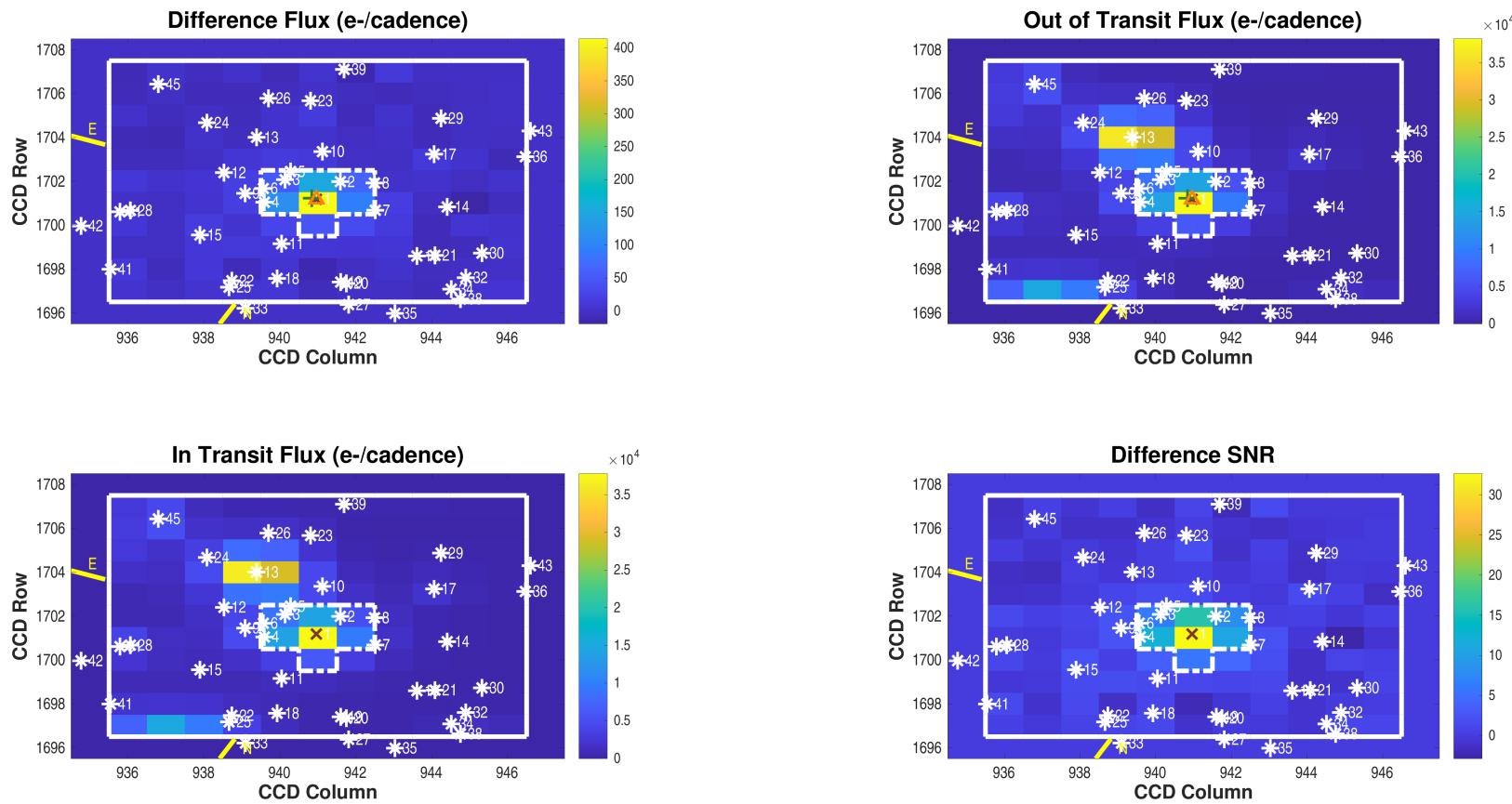
Difference image centroid offsets for target 184733148, planet candidate 1, displayed on survey image for given target. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets 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/0000000184733148-01-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
Planet Candidate 1 / Sector 58 / Target Pixel Table 378



Difference image for target 184733148, planet candidate 1, sector 58, target pixel table 378. 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 = 8; number of valid in-transit cadences = 485; number of in-transit cadence gaps = 0; number of valid out-of-transit cadences = 1362; number of out-of-transit cadence gaps = 0. Difference image quality metric = 0.99 (good).

Open [./planet-01/difference-image/000000184733148-01-difference-image-58-378.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	$1701.23 \pm 8.77e - 05$	$940.84 \pm 1.18e - 04$	pixels	$33.08913257 \pm 9.17e - 07$	$36.33228742 \pm 8.99e - 07$	degrees
Difference Image Centroid	$1701.18 \pm 1.85e - 02$	$940.96 \pm 2.28e - 02$	pixels	$33.08818702 \pm 1.20e - 04$	$36.33226540 \pm 1.18e - 04$	degrees
Offset	$-0.0505 \pm 1.85e - 02$	$0.1219 \pm 2.28e - 02$	pixels	$-2.7422 \pm 3.47e - 01$	$-0.0793 \pm 4.24e - 01$	arcseconds
Offset/ σ	-2.72	5.34		-7.90		-0.19
Offset Distance	$0.1320 \pm 2.15e - 02$		pixels	$2.7434 \pm 3.50e - 01$		arcseconds
Offset Distance/ σ	6.15			7.84		

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

	Row	Column	Units	RA	Dec	Units
TIC Reference Centroid	$1701.18 \pm 1.16e - 04$	$940.96 \pm 1.25e - 04$	pixels	$33.08819821 \pm 0.00e + 00$	$36.33226635 \pm 0.00e + 00$	degrees
Difference Image Centroid	$1701.18 \pm 1.85e - 02$	$940.96 \pm 2.28e - 02$	pixels	$33.08818702 \pm 1.20e - 04$	$36.33226540 \pm 1.18e - 04$	degrees
Offset	$-0.0005 \pm 1.85e - 02$	$0.0015 \pm 2.28e - 02$	pixels	$-0.0324 \pm 3.47e - 01$	$-0.0034 \pm 4.24e - 01$	arcseconds
Offset/ σ	-0.03	0.07		-0.09		-0.01
Offset Distance	$0.0016 \pm 2.18e - 02$		pixels	$0.0326 \pm 3.59e - 01$		arcseconds
Offset Distance/ σ	0.07			0.09		

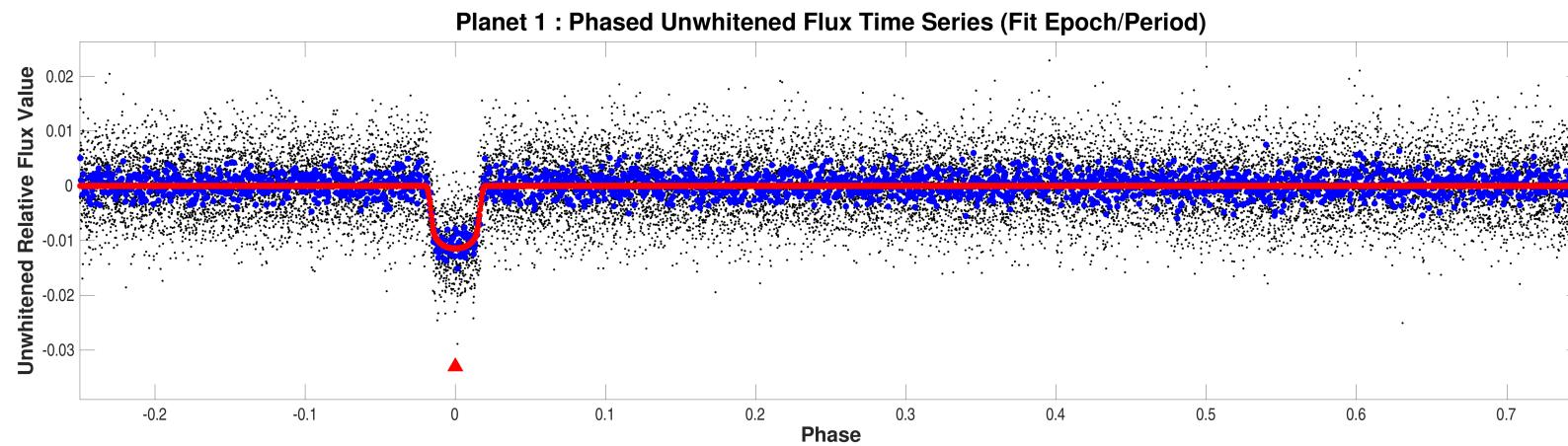
5.2 Difference Image TIC Key

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
1	184733148	12.851	33.08819821	36.33226635	0.00
2	621066128	18.256	33.08642930	36.32646001	21.52
3	621066122	19.510	33.09622124	36.32945928	25.37
4	184733147	15.269	33.09676227	36.33625450	28.69
5	621066124	19.382	33.09635975	36.32712900	30.04
6	621066120	19.227	33.09877682	36.33298900	30.79
7	621066127	19.416	33.07658287	36.33122034	33.90
8	621066126	19.054	33.08036741	36.32464551	35.62
9	621066123	18.630	33.10126385	36.33530045	39.44
10	184733152	16.888	33.09352759	36.32029390	45.79
11	621066133	19.254	33.08823877	36.34524623	46.73
12	621066121	19.827	33.10767884	36.33160377	56.55
13	184733151	12.733	33.10678265	36.32096707	67.52
14	621066125	19.411	33.06464540	36.32588684	72.06
15	621066134	19.666	33.10347642	36.34826451	72.67
16	621066131	19.111	33.06328313	36.33971679	77.07
17	184733155	16.003	33.07395400	36.31390067	77.96
18	184733141	17.667	33.08436400	36.35397700	78.95
19	621066135	18.934	33.07292880	36.35085016	80.23
20	621066132	20.118	33.07176058	36.35082373	82.07
21	621066130	19.949	33.06025633	36.33843628	84.02
22	621066137	20.212	33.09185684	36.35737488	91.01
23	184733158	17.355	33.10237817	36.30868514	94.33
24	621066119	18.018	33.11728625	36.32053855	94.33
25	184733139	18.196	33.09147992	36.35911844	97.13
26	184733157	17.251	33.10994779	36.31075027	99.89
27	621066157	18.899	33.06853717	36.35582464	102.20
28	184733144	15.368	33.11875669	36.34666908	102.68
29	621066118	18.056	33.07756117	36.30475213	103.74
30	621066129	19.104	33.05246765	36.33492486	104.06
31	621106871	18.693	33.12035644	36.34765557	108.48
32	621066150	18.815	33.05196490	36.34192277	110.68
33	184733137	15.981	33.08581136	36.36321413	111.63
34	621066151	20.239	33.05293959	36.34561064	112.98
35	621066152	20.509	33.05938860	36.35503984	117.06
36	621066114	19.676	33.05791103	36.30877223	121.94
37	621066136	18.557	33.08084077	36.36604208	123.45
38	184733143	16.330	33.05002291	36.34744848	123.47
39	621066117	19.309	33.10079995	36.29896763	125.32
40	621066156	19.546	33.06929183	36.36548865	131.57
41	621106878	18.579	33.11429624	36.36221319	131.72

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
42	621106872	18.307	33.12517034	36.35354246	131.77
43	621066113	19.495	33.06047627	36.30218393	134.88
44	621066154	19.318	33.05253596	36.35707389	136.65
45	184733492	14.819	33.13083028	36.31421547	139.68
46	621066153	19.822	33.05335179	36.36062876	143.66
47	184733521	17.639	33.12951373	36.36551201	169.36

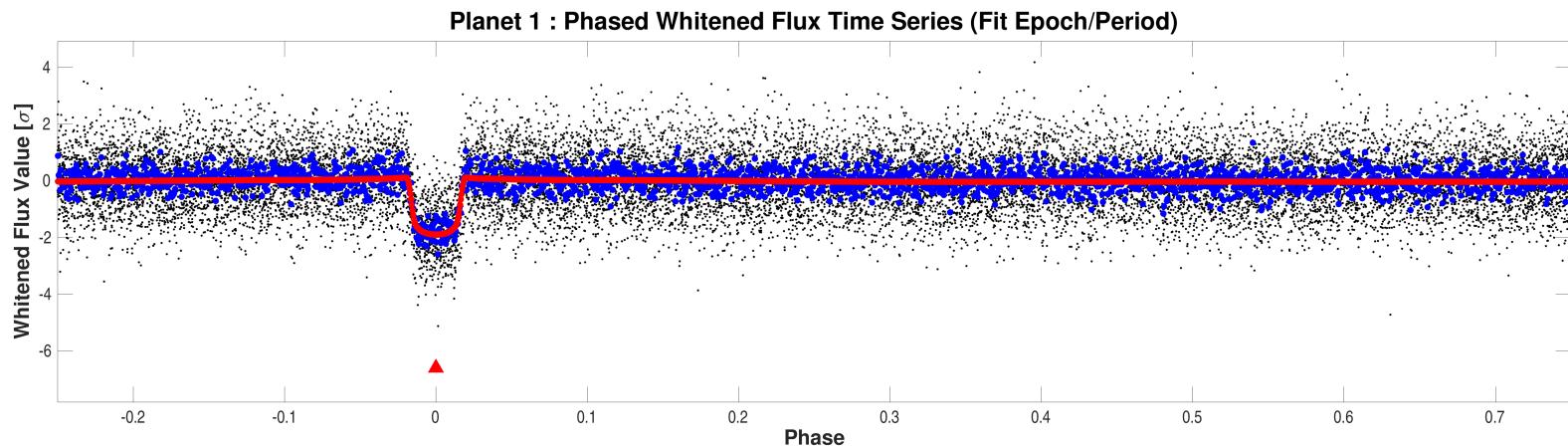
RA, Dec and Distances are corrected for proper motion. This table may not contain all of the objects shown.

6 Phased Light Curves



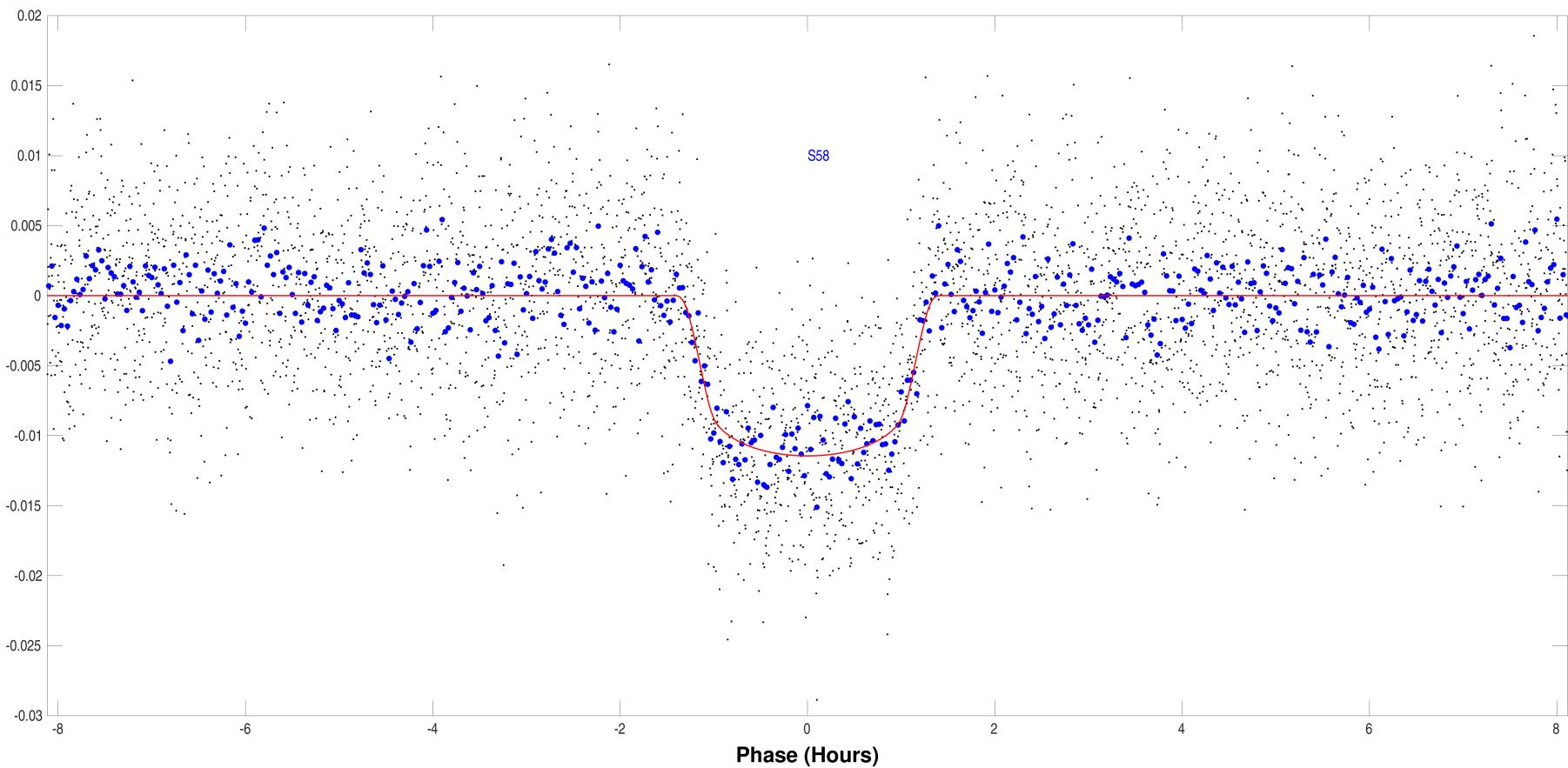
Phased unwhitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased unwhitened flux time series 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/0000000184733148-01-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/0000000184733148-01-phased-whitened-flux-time-series.fig](#)

Planet: 1 Phased Unwhitened Flux Time Series by Sector

Phased unwhitened flux time series by sector in year 5 for target 184733148, planet candidate 1. Period = 2.9594 days; transit epoch = 2883.7953 BTJD.
Open [./summary-plots/000000184733148-01-phased-unwhitened-flux-time-series-by-sector-05.fig](#)

7 Planet Candidate 1

7.1 Model Fitter: All Transits

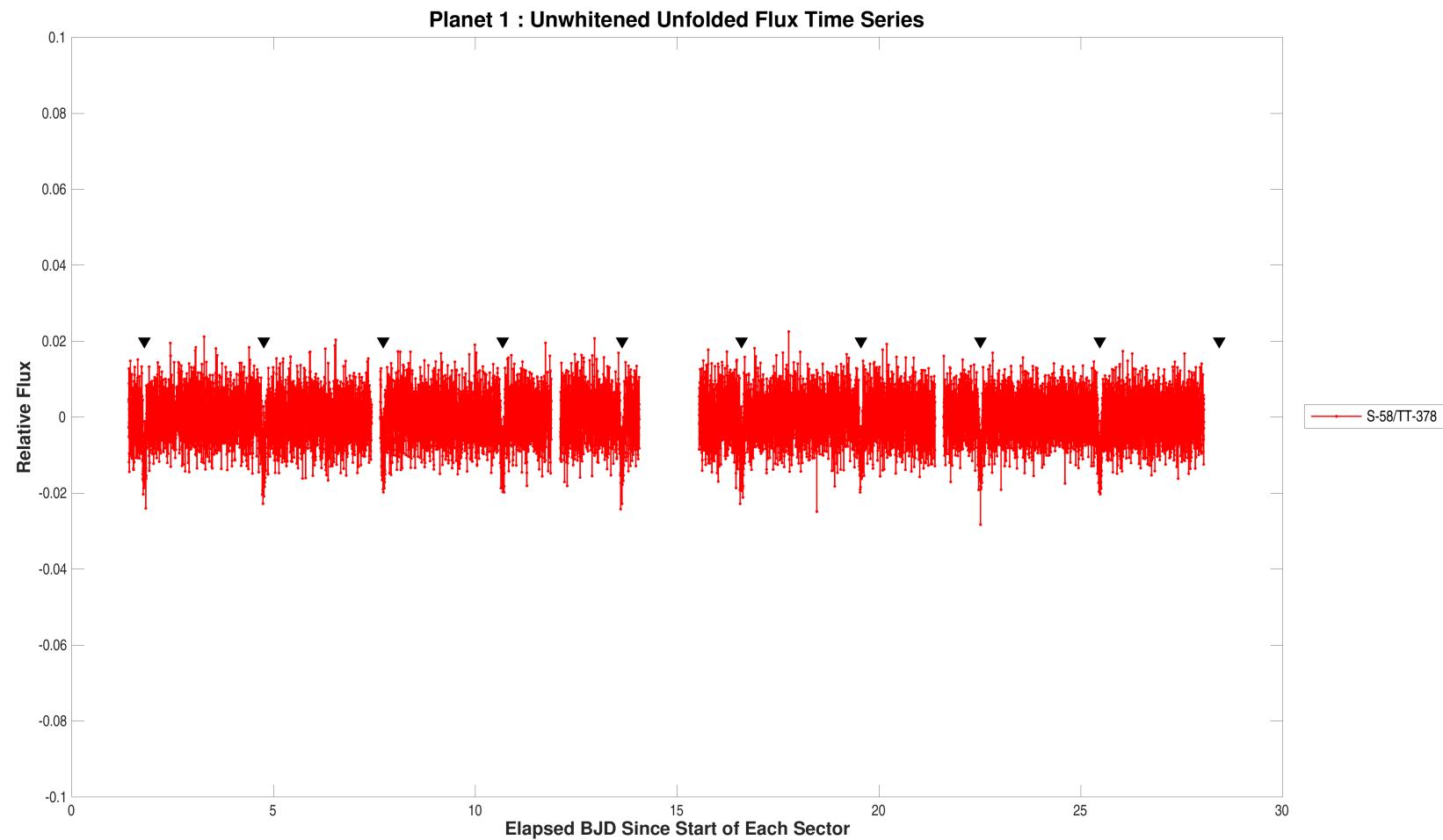
Model Characteristic	Name
Transit Model	mandel-agol_geometric_transit_model
Limb Darkening Model	claret_tess_nonlinear_limb_darkening_model

TCE Parameter	Value	Units
Trial Transit Pulse Duration	2.5	hours
Transit Epoch	2883.7867230	TJD
Orbital Period	2.9597208	days
Maximum SES	12.7	
Maximum MES	23.8	
Robust Statistic	34.6	
Chi Square Goodness of Fit Statistic (DoF)	606.1 (666)	
Chi Square2 Statistic (DoF)	118.2 (112.2)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

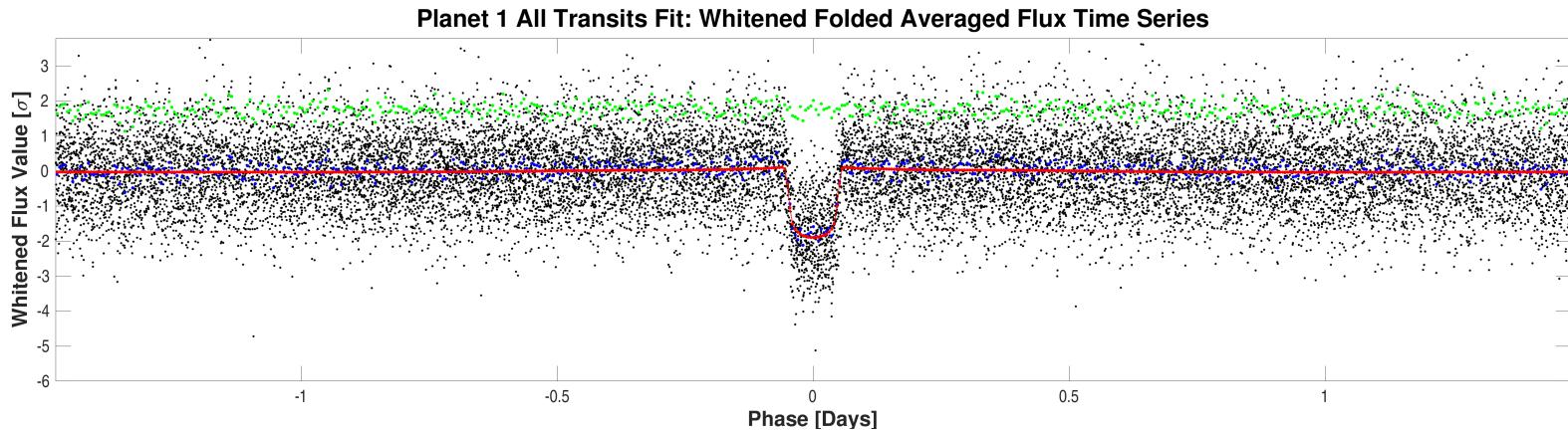
Parameter	Value	Uncertainty	Units
SNR	41.6		
Orbital Period	2.9594164	2.5701e-04	days
Transit Epoch	2883.7953401	1.2595e-03	BTJD
Impact Parameter	0.5517	1.6347e-01	
Planet Radius to Star Radius Ratio	0.1020055	3.0369e-03	
Semi-major Axis to Star Radius Ratio	8.0101	1.0113e+00	
Planet Radius	12.5327	7.5699e-01	Earth radii
Semi-major Axis	0.0402	2.9070e-03	AU
Effective Stellar Flux	682.2786	1.0761e+02	Goldilocks
Equilibrium Temperature	1303	5.1398e+01	Kelvin
Stellar Density	0.7884	2.9861e-01	Solar density
Transit Depth	11441	2.9166e+02	ppm
Transit Duration	2.7053	9.4309e-02	hours
Transit Ingress Duration	0.3491	1.0070e-01	hours
Eccentricity	0.0000	0.00000e+00	
Peri Longitude	0.0000	0.00000e+00	degrees
Model Chi Square Statistic (DoF)	2787.3 (3263.5)		
Model Chi Square Goodness of Fit Statistic (DoF)	444.9 (760)		
Model Chi Square2 Statistic (DoF)	2.7 (8)		

DoF: Degrees of Freedom



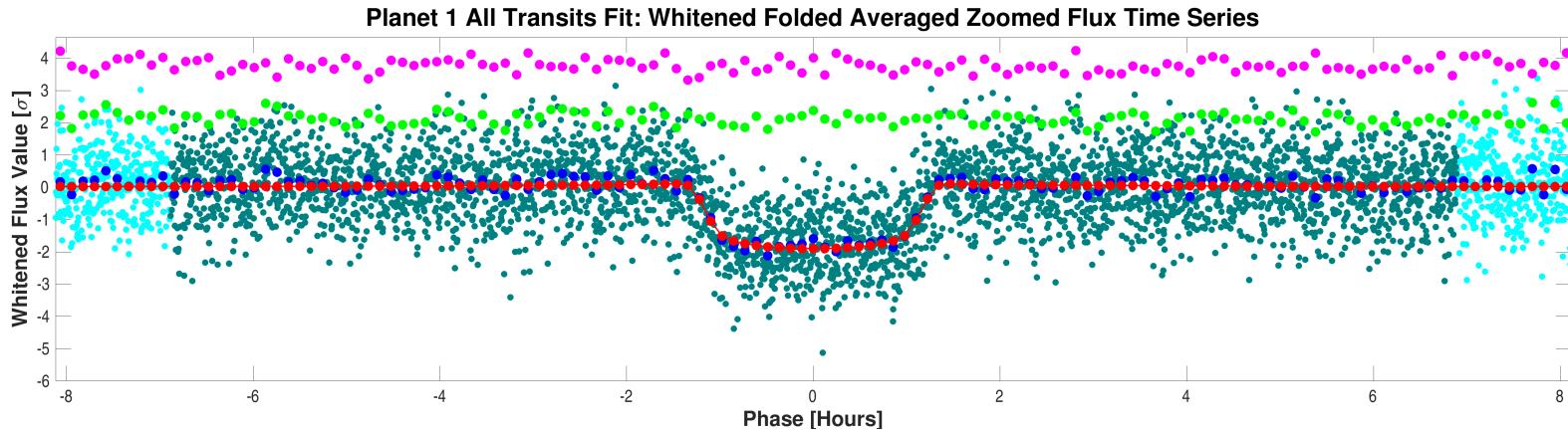
Flux time series for CatId 184733148, Planet candidate 1 in the unwhitened domain. For the data of Sector-58/TargetTableId-378, start BJD is 2459882. Transit event markers indicate the location of transits of the given planet candidate. All transits fit completed with full convergence.

Open [./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000184733148-01-all-unwhitened-58-378.fig](#)



Folded flux time series for CatId 184733148, 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/0000000184733148-01-all-whitened.fig](#)



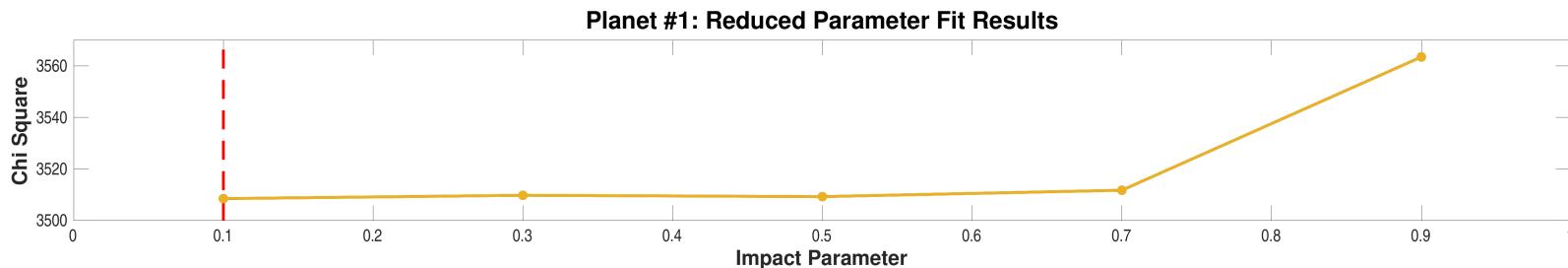
Folded flux time series for CatId 184733148, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged 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/0000000184733148-01-all-whitened-zoomed.fig](#)

7.2 Model Fitter: Reduced Parameter Fit Results

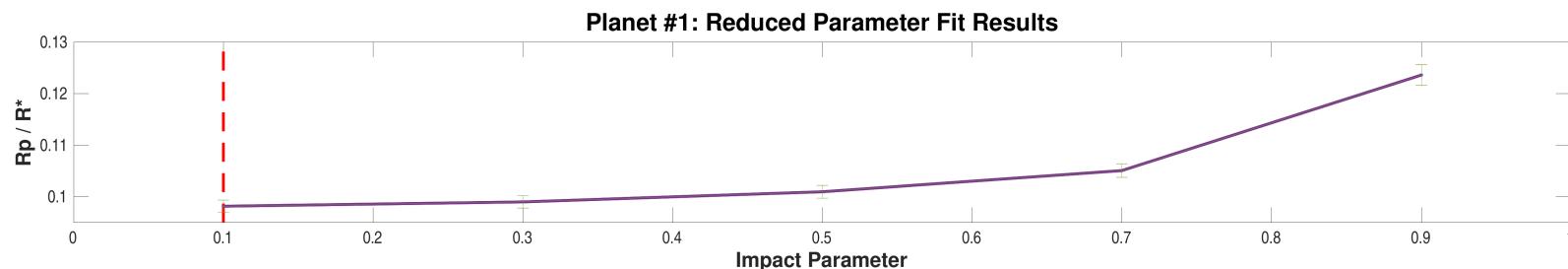
Impact Parameter	SNR	Model Chi Square	Planet Radius to Star Radius	Uncert	Semi-major Axis to Star Radius	Uncert	Transit Depth (ppm)	Uncert	Transit Duration (hours)	Uncert
0.10	43.1	3508.5	0.0981585	1.1903e-03	9.5368	1.1953e-01	11332	2.7321e+02	2.5983	3.2168e-02
0.30	43.0	3509.8	0.0989930	1.2045e-03	9.1482	1.1750e-01	11344	2.7436e+02	2.6201	3.3237e-02
0.50	43.0	3509.3	0.1009629	1.2358e-03	8.3244	1.1399e-01	11372	2.7652e+02	2.6750	3.6161e-02
0.70	42.9	3511.7	0.1050715	1.3172e-03	6.9232	1.1034e-01	11429	2.8408e+02	2.8141	4.4214e-02
0.90	42.0	3563.5	0.1236015	2.0057e-03	4.7405	1.1936e-01	12352	3.3973e+02	3.2795	7.8926e-02

Highlighted row is the best reduced-parameter model fit.



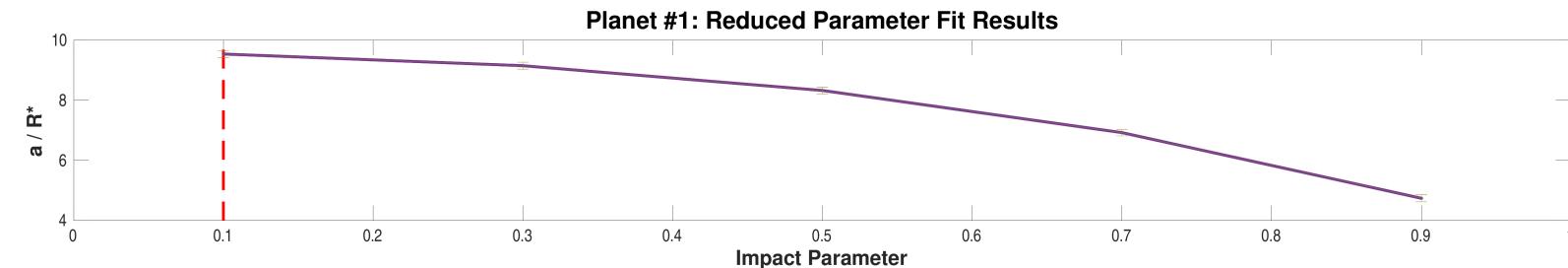
Model chi squares of reduced parameter fits vs. impact parameter for CatId 184733148, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.

Open [./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/0000000184733148-01-reduced-fits-chi-square.fig](#)



Ratios of planet radius to star radius of reduced parameter fits vs. impact parameter for CatId 184733148, 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/0000000184733148-01-reduced-fits-rp-over-rstar.fig](#)



Ratios of semimajor axis to star radius of reduced parameter fits vs. impact parameter for CatId 184733148, 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/0000000184733148-01-reduced-fits-a-over-rstar.fig](#)

7.3 Model Fitter: Trapezoidal Fit Results

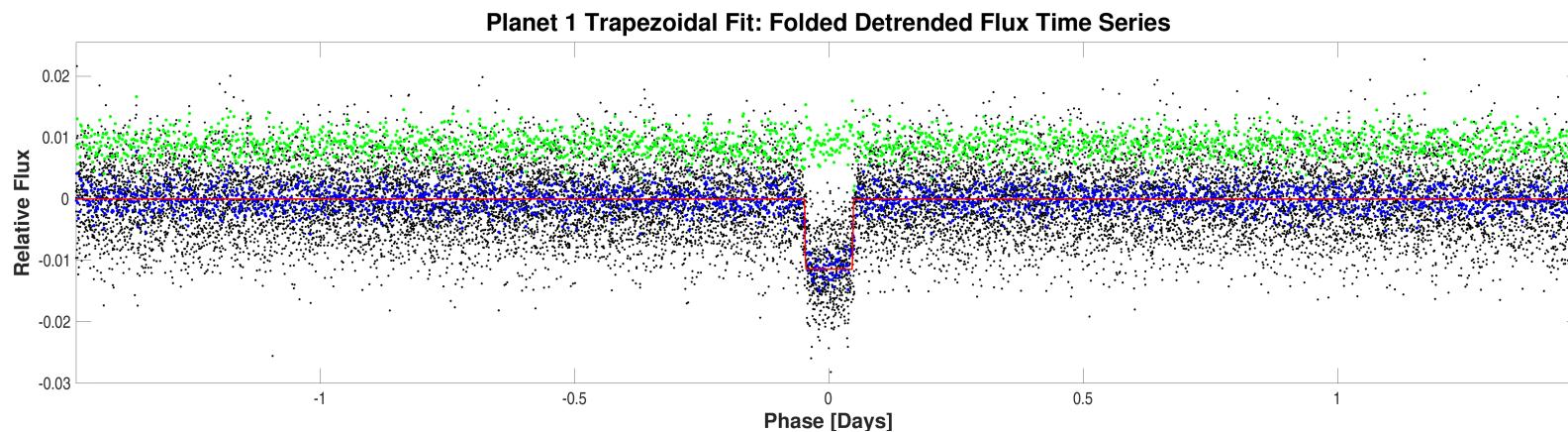
Model Characteristic	Name
Transit Model	trapezoidal_model
Limb Darkening Model	

TCE Parameter	Value	Units
Trial Transit Pulse Duration	2.5	hours
Transit Epoch	2883.7867230	TJD
Orbital Period	2.9597208	days
Maximum SES	12.7	
Maximum MES	23.8	
Robust Statistic	34.6	
Chi Square Goodness of Fit Statistic (DoF)	606.1 (666)	
Chi Square2 Statistic (DoF)	118.2 (112.2)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

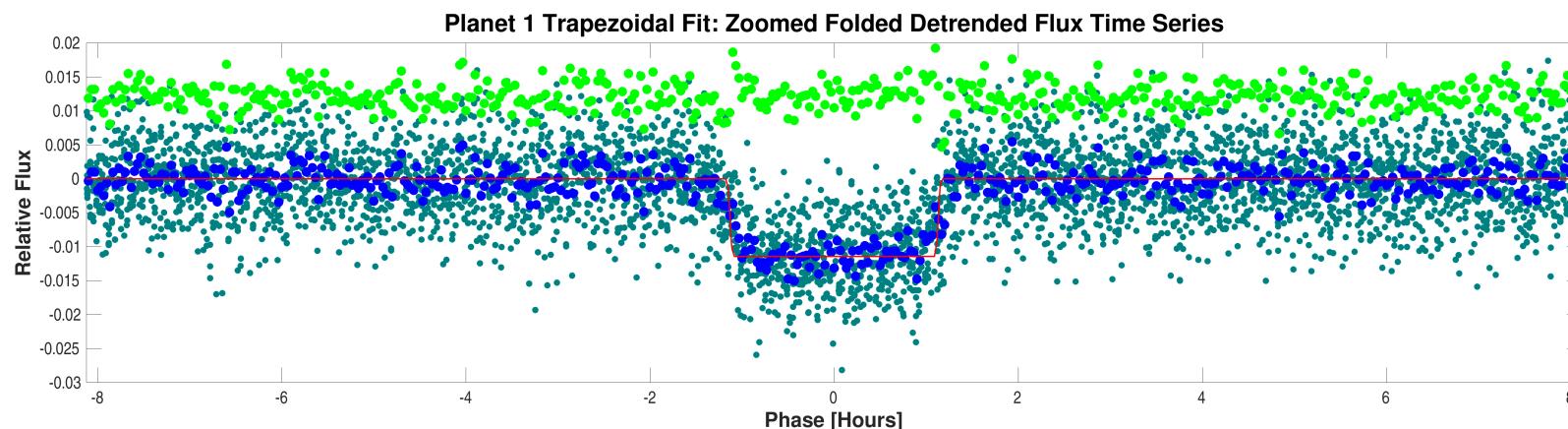
Parameter	Value	Uncertainty	Units
SNR	48.0		
Orbital Period	2.9597208		days
Transit Epoch	2883.7938434		BTJD
Transit Depth	11419		ppm
Transit Duration	2.7074		hours
Transit Ingress Duration	0.4456		hours
Model Chi Square Statistic (DoF)	17638.8 (5249)		

DoF: Degrees of Freedom



Folded detrended flux time series for CatId 184733148, Planet candidate 1 and folded trapezoidal model light curve.

Open [./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000184733148-01-all-trapezoidal.fig](#)



Zoomed folded detrended flux time series for CatId 184733148, Planet candidate 1 and folded trapezoidal model light curve.

Open [./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000184733148-01-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	2.9597		days		
Transit Duration	2.5		hours		
Maximum MES	23.8				
Secondary Phase	1.6028		days		
Secondary MES	2.5				
Minimum Phase	-0.31389		days		
Minimum MES	-2.9				
Median MES	-0.3				
MAD MES	0.57953				
Robust Statistic	2.6				
Secondary Depth	823.6	2.8868e+02	ppm		
Geometric Albedo	4.7	1.7691e+00		2.0735	1.91
Planet Effective Temperature	2962	2.7118e+02	Kelvin	6.0100	0.00

7.4.2 Eclipsing Binary Discrimination Test

Result	Value	Value in Sigmas	Significance (%)
Odd Even Transit Depth Comparison Statistic	9.1480e-01	0.9565	33.88

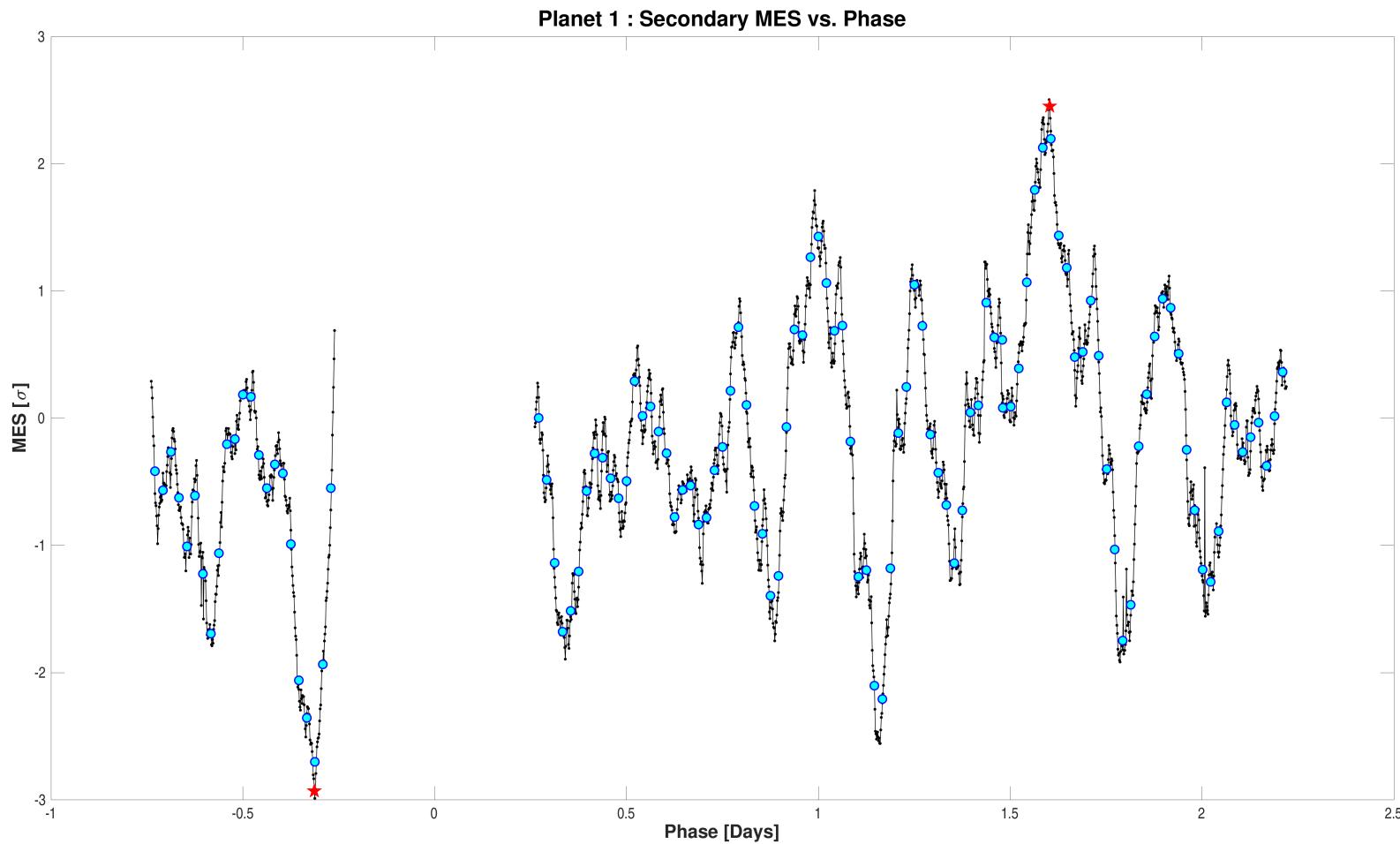
7.4.3 Bootstrap Test

Result	Value
False Alarm Probability	6.6191e-152
Bootstrap Threshold for Desired PFA	6.3
MES Mean	-0.20
MES Standard Deviation	0.92
Transit Count	9

7.4.4 Ghost Diagnostic Test

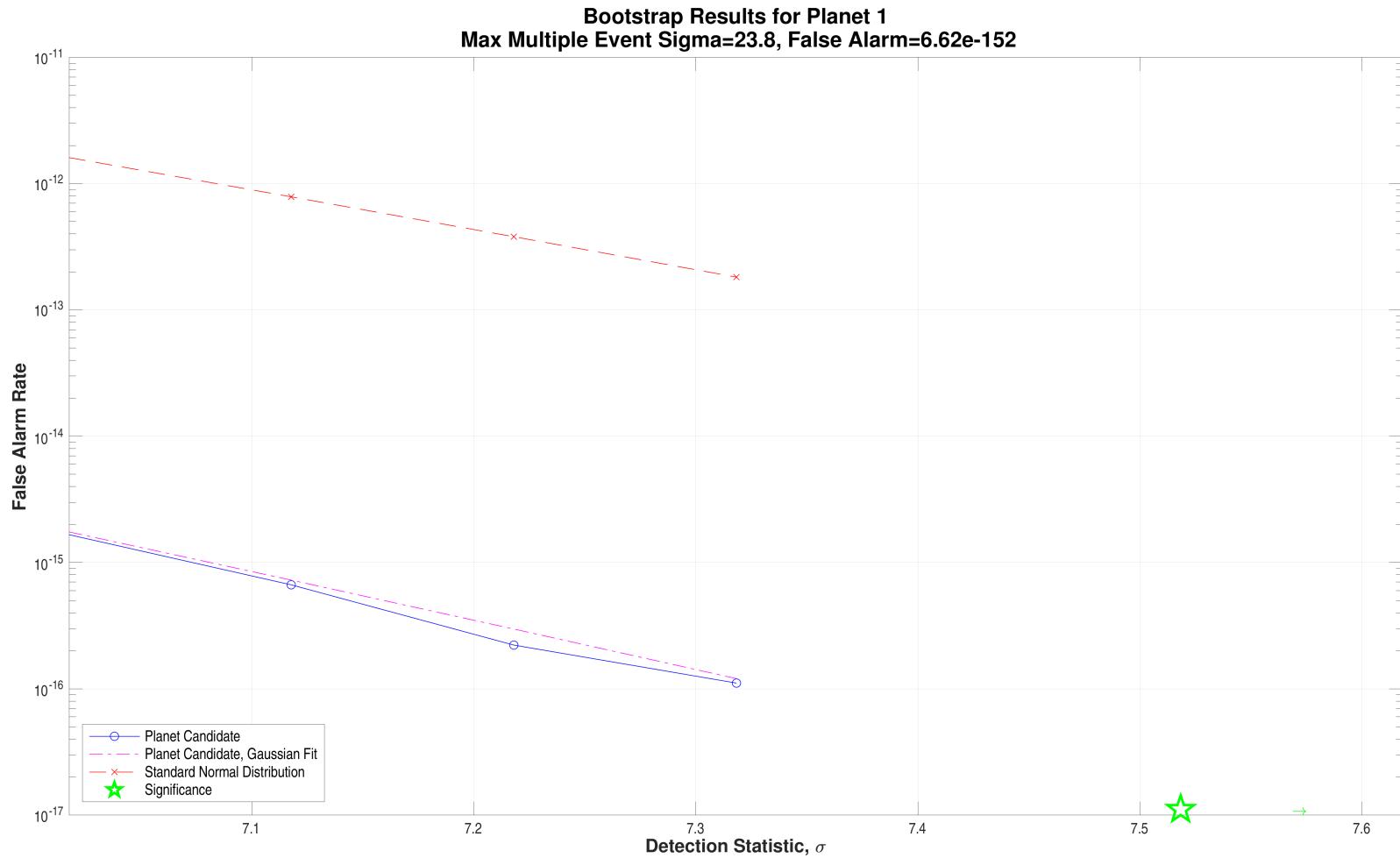
Result	Value	Significance (%)
Maximum MES	23.8	
SNR	41.6	
Core Aperture Statistic	2.5141e+01	100.00
Halo Aperture Statistic	5.0554e+00	100.00
Ratio of Core/Halo Aperture Statistics	4.9731e+00	

7.4.5 Validation Test Figures



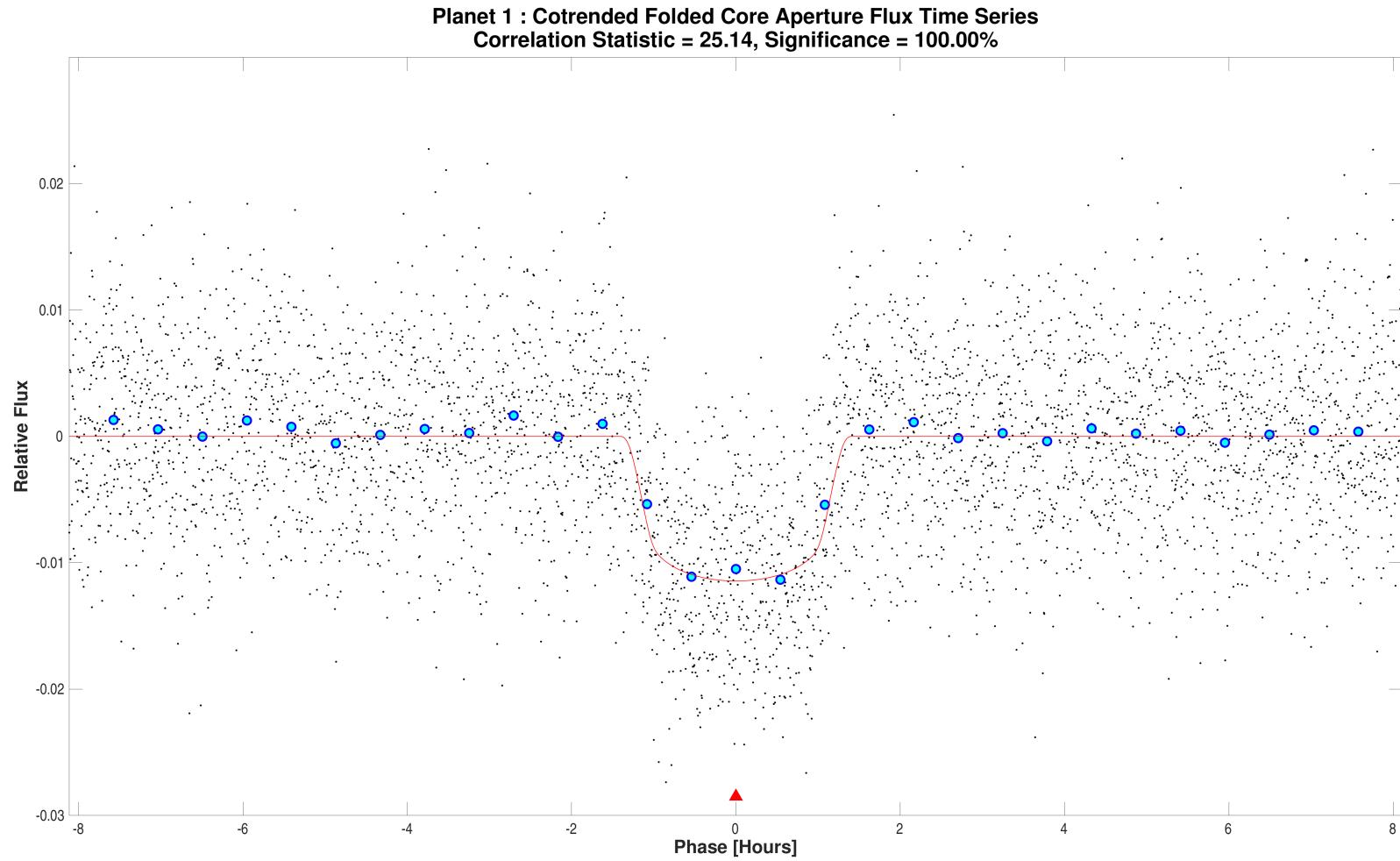
The primary event has been set to zero and both the max and min of the resulting MES vs. Phase are marked with a red star. The best matched pulse duration in hours is 2.5. The maximum secondary MES and corresponding phase are 2.4527 and 1.6028 days respectively. The minimum secondary MES and corresponding phase are -2.9303 and -0.31389 days respectively.

Open [./planet-01/report-summary/0000000184733148-01-weak-secondary-diagnostic.fig](#)



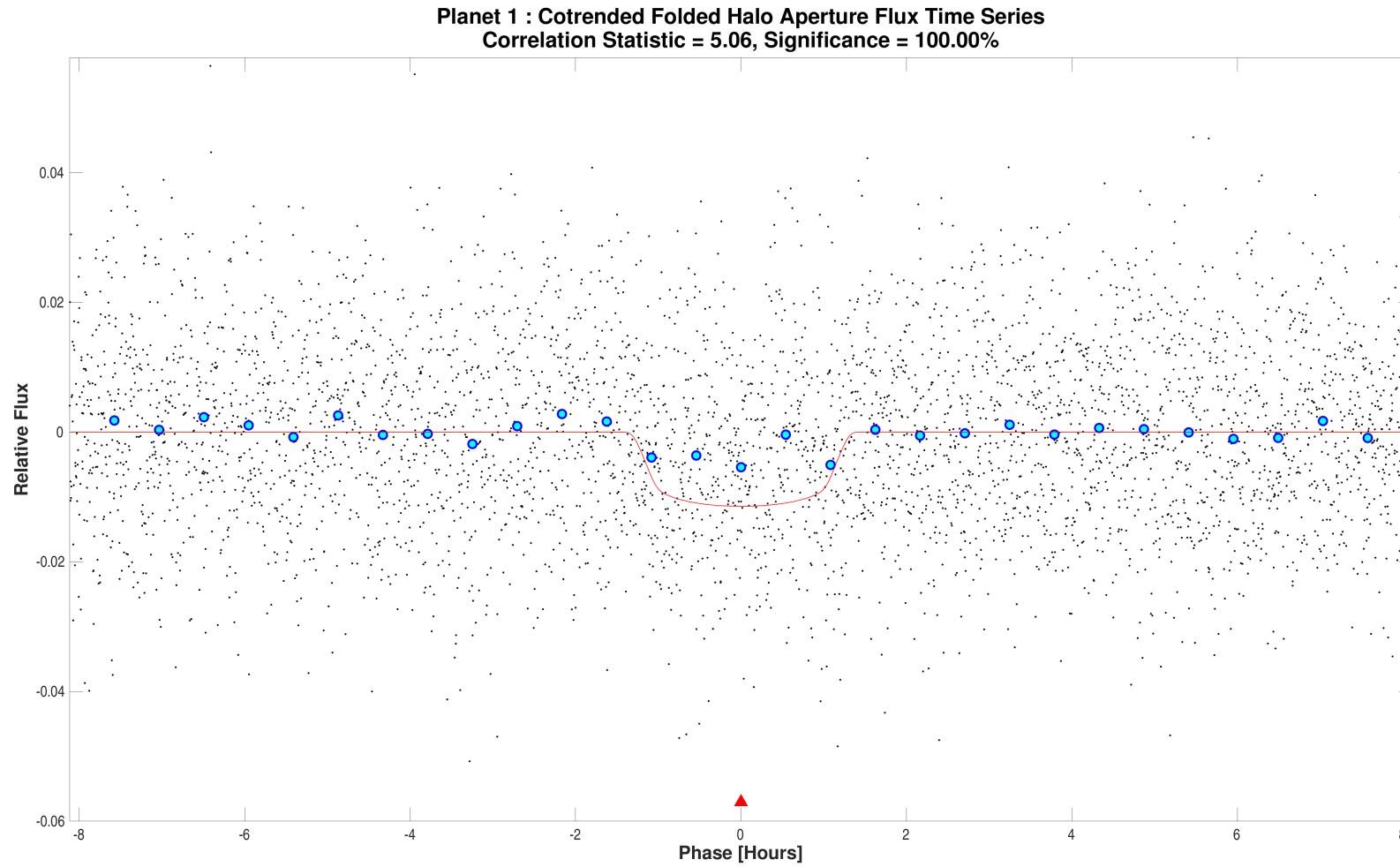
Bootstrap results for target 184733148, planet 1. Cumulative sum of the probabilities (derived from the histogram of counts) from upper tail to the search transit threshold; false alarm probability is indicated by the star. The Gaussian equivalent threshold for this false alarm probability is 26.2265. The threshold on this distribution that achieves the same false alarm rate as a 7.1 sigma threshold on a Gaussian distribution is 6.3127.

Open [./planet-01/bootstrap-results/000000184733148-01-bootstrap-false-alarm.fig](#)



Optical ghost diagnostic core aperture flux time series for target 184733148, 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/0000000184733148-01-core-unwhitened-cotrended-zoomed-model.fig](#)

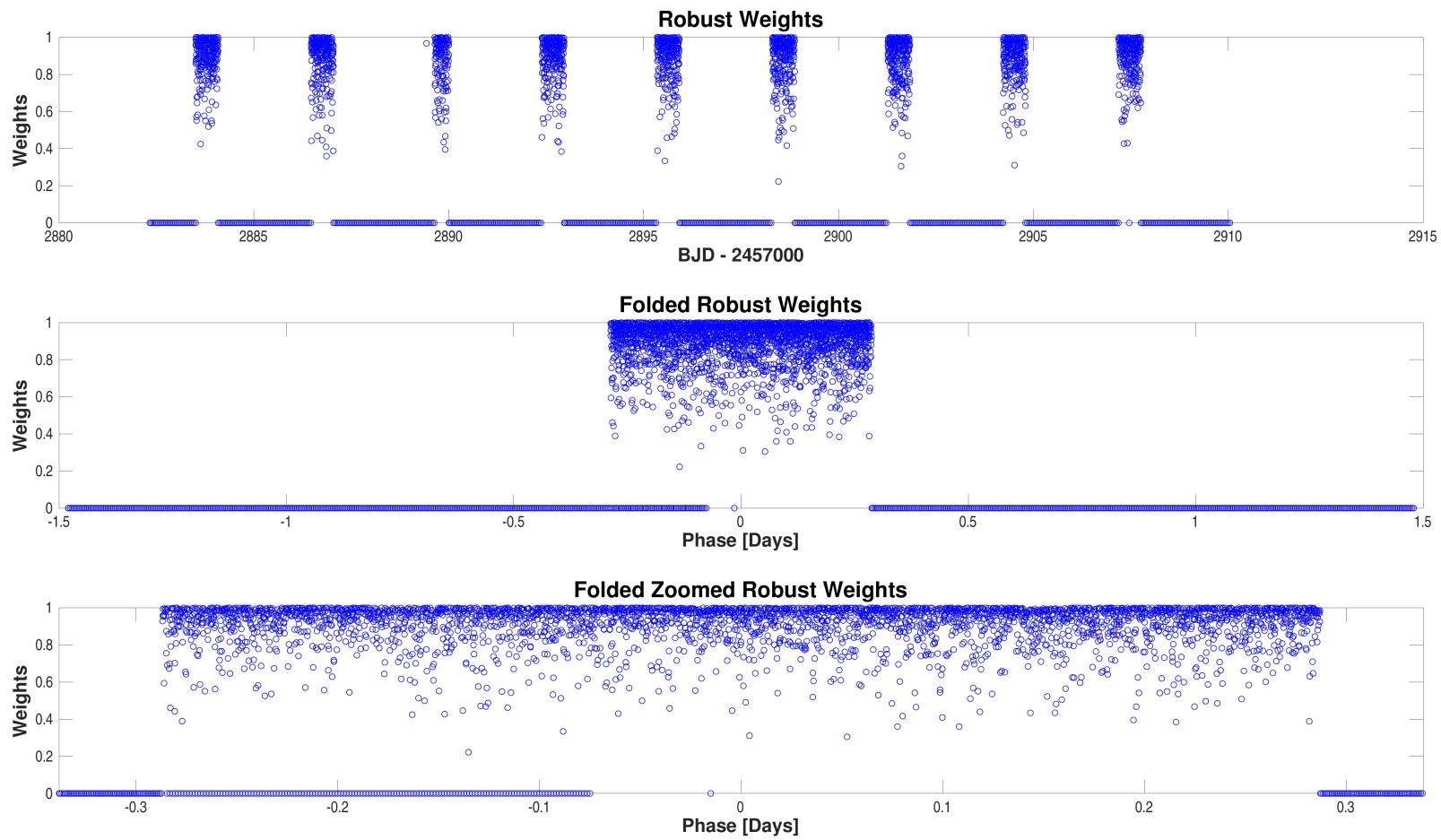


Optical ghost diagnostic halo aperture flux time series for target 184733148, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft 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/0000000184733148-01-halo-unwhitened-cotrended-zoomed-model.fig](#)

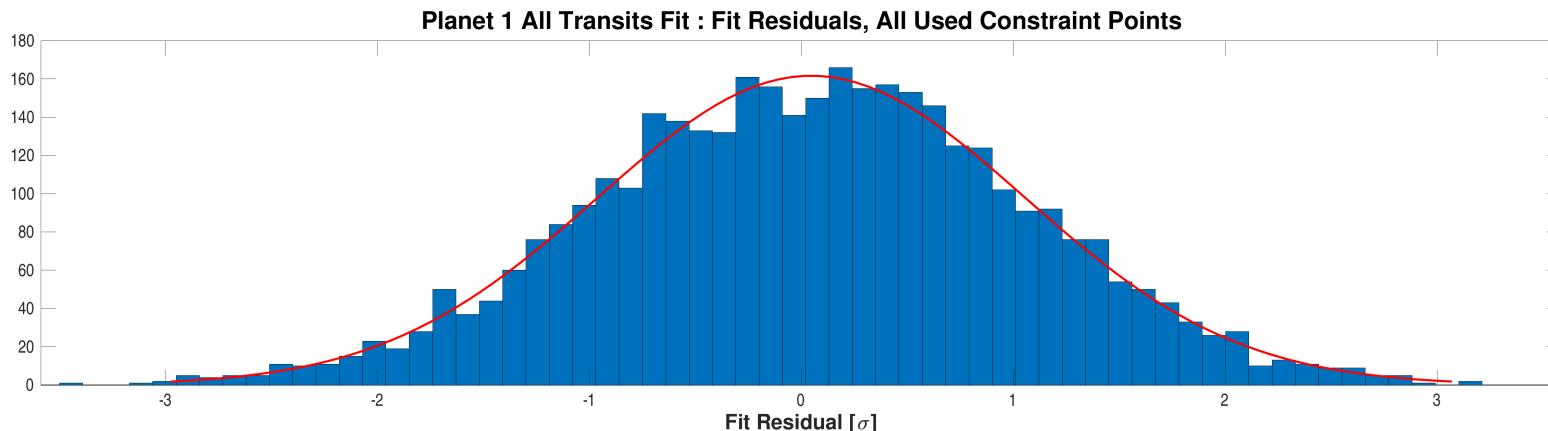
Appendix A Planet Candidate 1

A.1 Model Fitter: All Transits



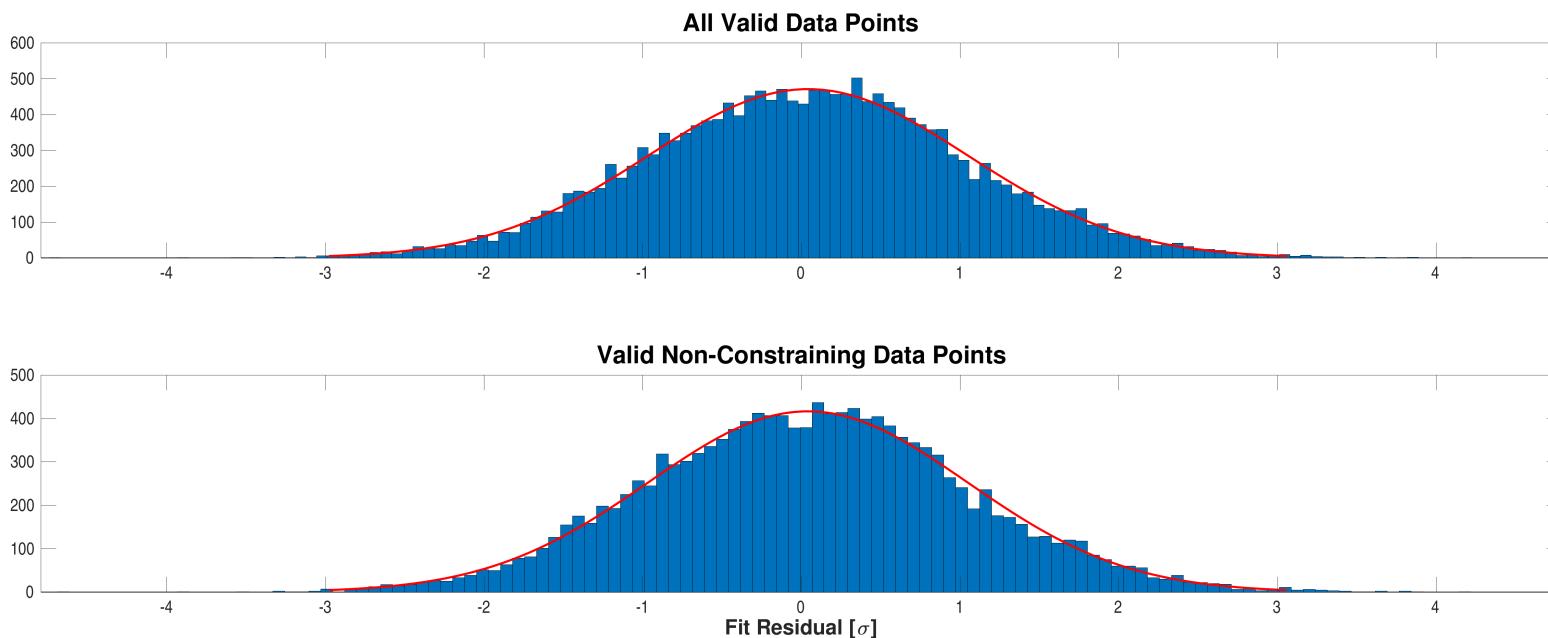
Robust weights distribution for CatId 184733148, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.

Open [./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000184733148-01-all-robust-weights.fig](#)



Fit residuals distribution for CatId 184733148, 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/0000000184733148-01-all-histo-used.fig](#)



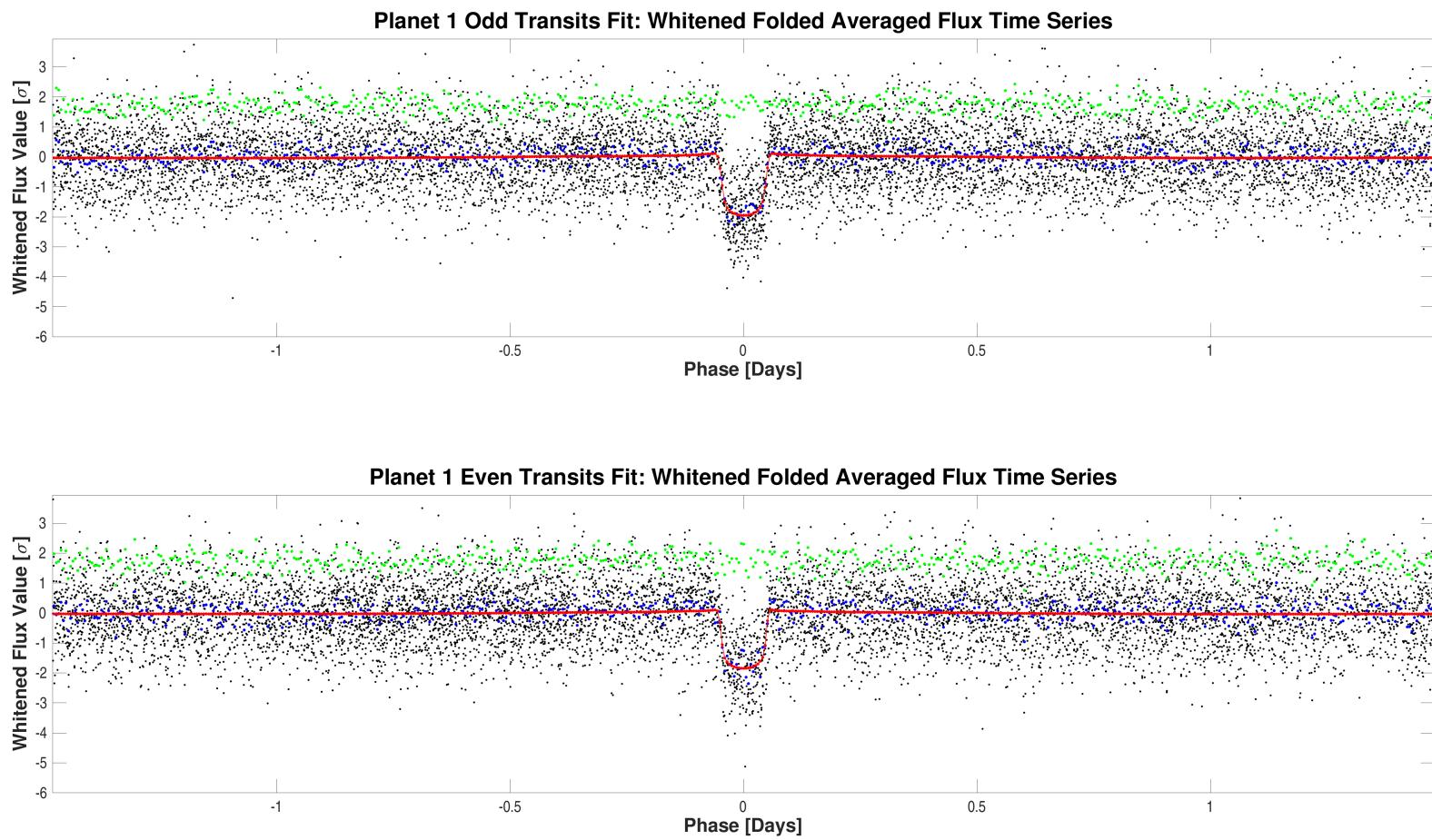
Fit residuals distribution for CatId 184733148, Planet candidate 1. Top plot: all valid data. Bottom plot: valid data not used to constrain fit (due to distance from a transit). Gaussian fits to the histograms are shown in red.

Open [./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000184733148-01-all-histo-all-and-unused.fig](#)

A.2 Model Fitter: Odd & Even Transits

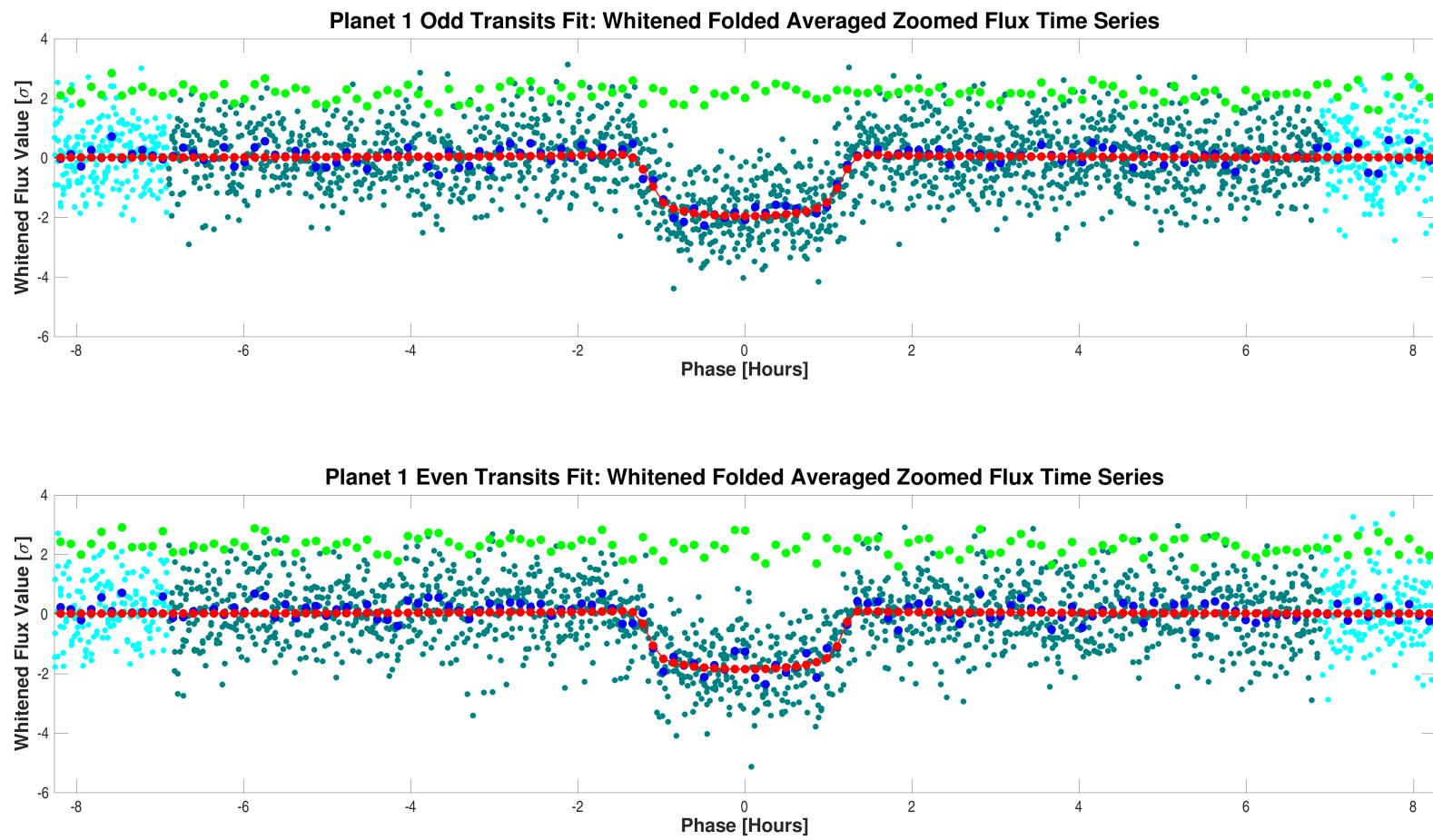
Parameter	Odd Transits Value	Odd Transits Uncertainty	Even Transits Value	Even Transits Uncertainty	Units	Difference Uncertainty
SNR	31.7		27.1			
Orbital Period	2.9597177	3.2685e-04	2.9591142	4.0899e-04	days	1.1526e+00
Transit Epoch	2883.7942676	1.6547e-03	2886.7556600	1.5680e-03	BTJD	8.6681e-01
Impact Parameter	0.6381	1.3521e-01	0.2427	1.1003e+00		3.5672e-01
Planet Radius to Star Radius Ratio	0.1047554	3.7010e-03	0.0977737	5.8397e-03		1.0098e+00
Semi-major Axis to Star Radius Ratio	7.4477	1.0490e+00	9.2777	2.5844e+00		6.5611e-01
Planet Radius	12.8706	8.1503e-01	12.0128	9.5569e-01	Earth radii	6.8294e-01
Semi-major Axis	0.0402	2.9072e-03	0.0402	2.9068e-03	AU	1.3302e-03
Effective Stellar Flux	682.1860	1.0760e+02	682.3715	1.0763e+02	Goldilocks	1.2189e-03
Equilibrium Temperature	1303	5.1397e+01	1304	5.1400e+01	Kelvin	1.2189e-03
Stellar Density	0.6336	2.6772e-01	1.2253	1.0239e+00	Solar density	5.5908e-01
Transit Depth	11697	3.9601e+02	11137	4.3147e+02	ppm	9.5645e-01
Transit Duration	2.7547	1.2448e-01	2.6154	1.4962e-01	hours	7.1611e-01
Transit Ingress Duration	0.4196	1.3706e-01	0.2471	1.5449e-01	hours	8.3524e-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)	2781.0 (3257.5)		2781.0 (3257.5)			

DoF: Degrees of Freedom



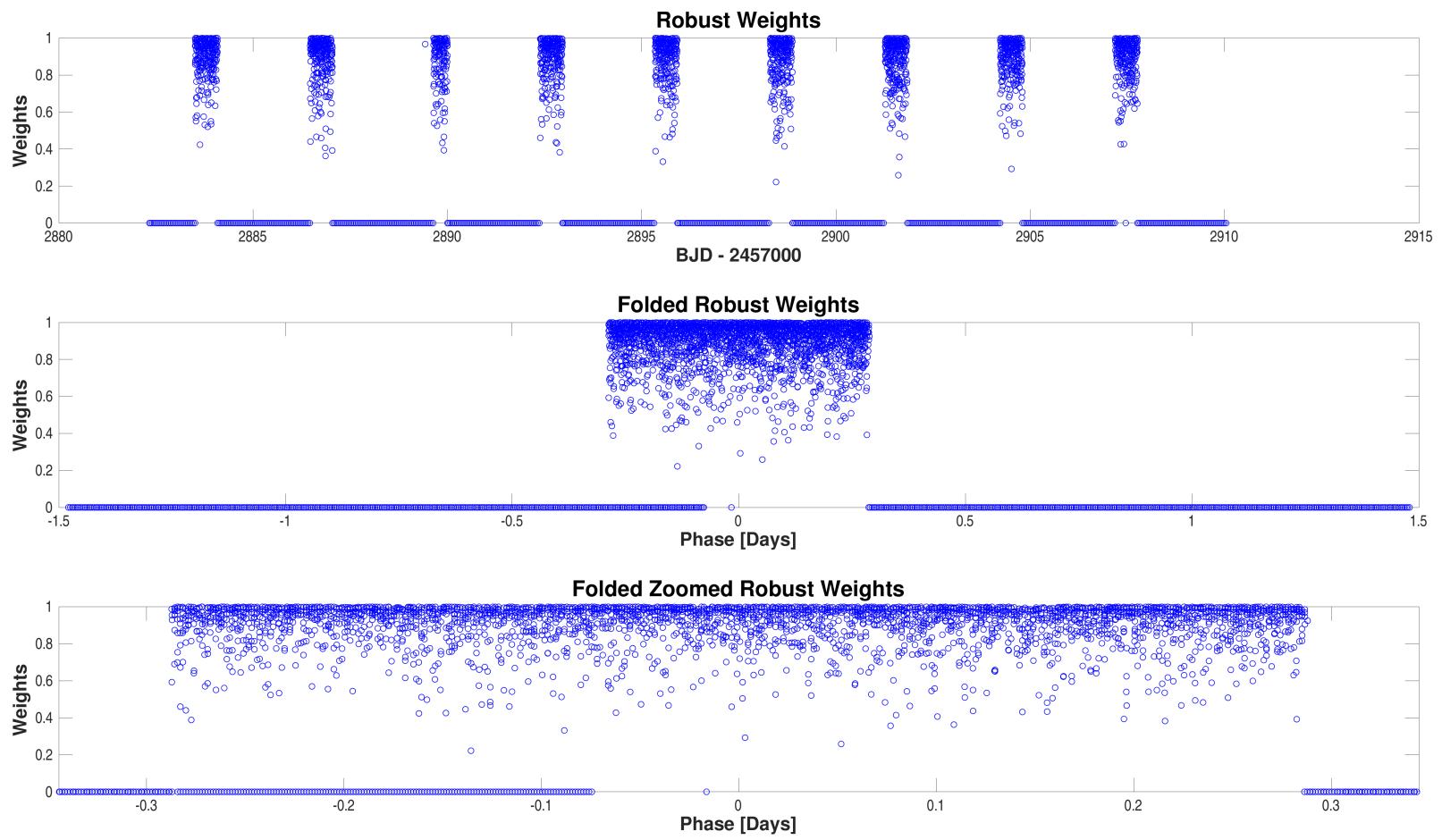
Folded flux time series for CatId 184733148, Planet candidate 1 in the whitened domain is plotted in black dots. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the folded model light 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/0000000184733148-01-odd-even-whitened.fig](#)



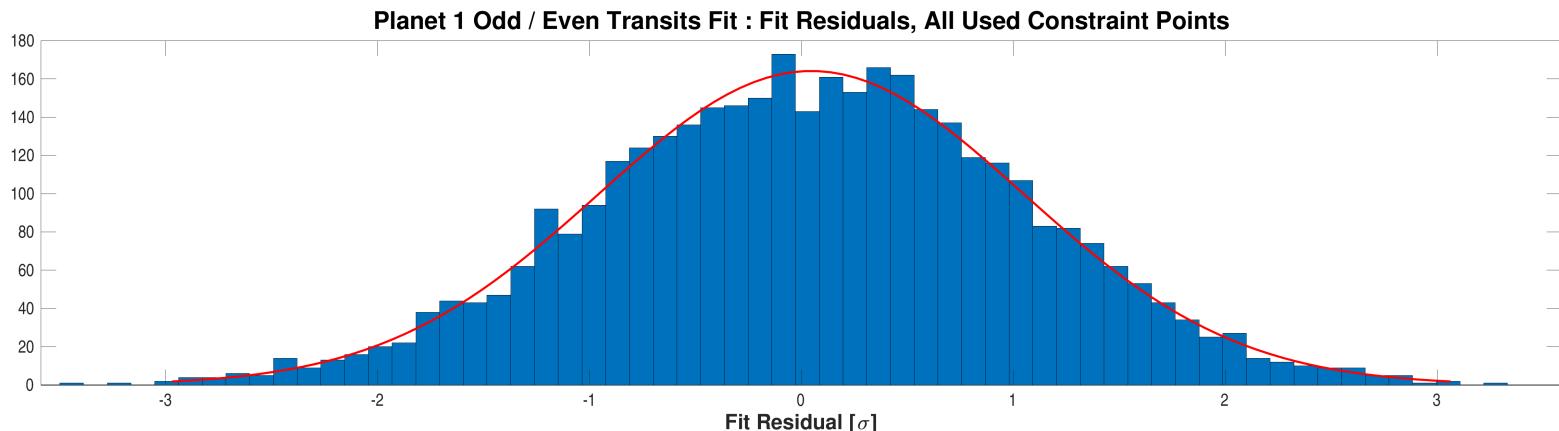
Folded flux time series for CatId 184733148, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged 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/0000000184733148-01-odd-even-whitened-zoomed.fig](#)



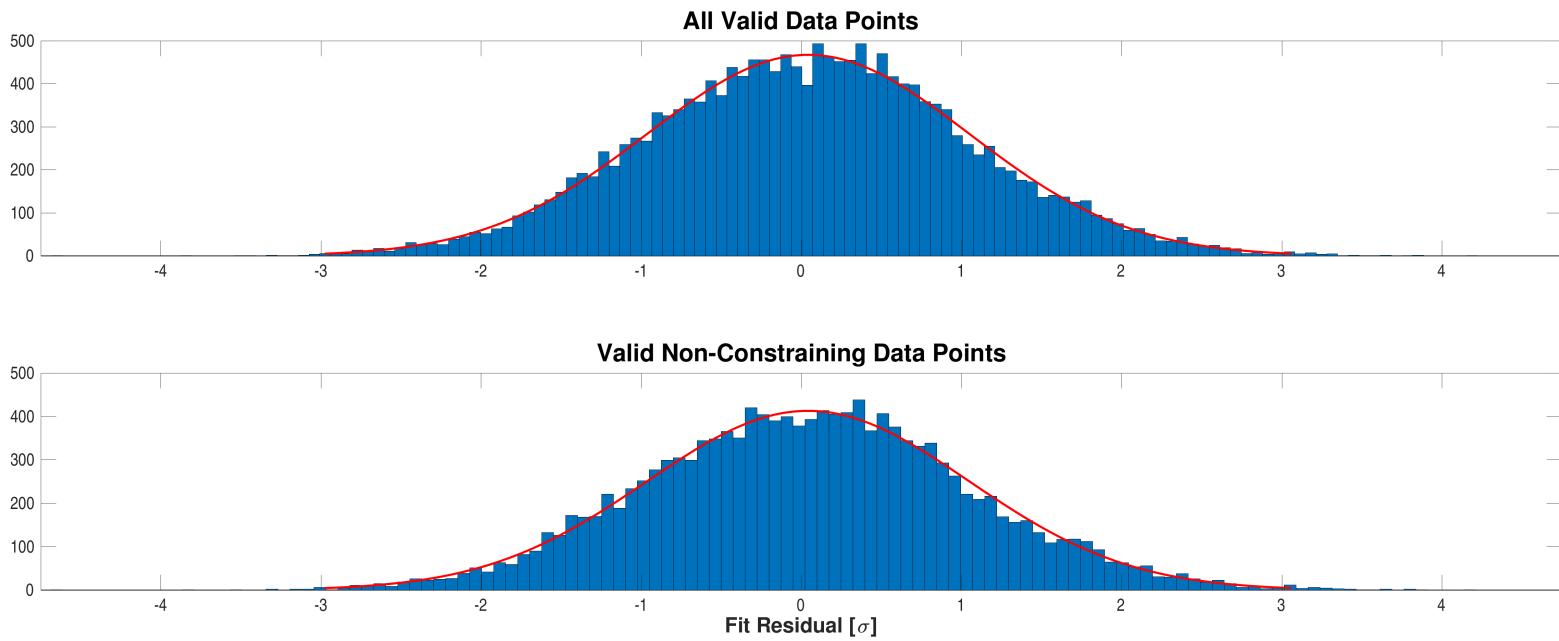
Robust weights distribution for CatId 184733148, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.

Open [./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000184733148-01-odd-even-robust-weights.fig](#)



Fit residuals distribution for CatId 184733148, 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.

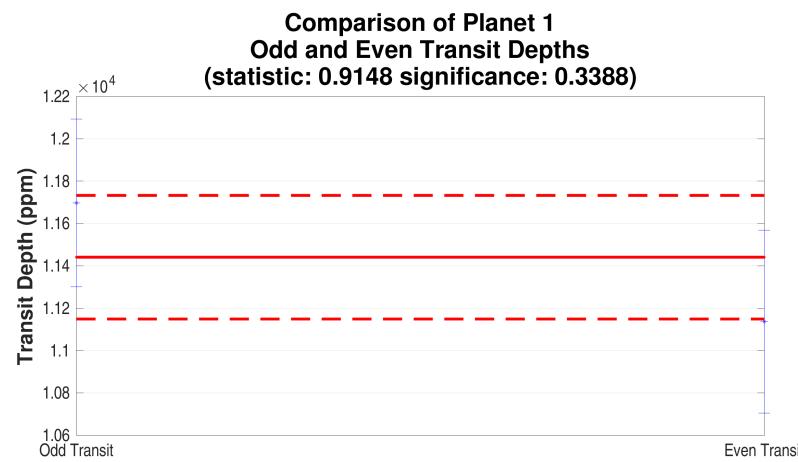
Open [./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000184733148-01-odd-even-histo-used.fig](#)



Fit residuals distribution for CatId 184733148, 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/0000000184733148-01-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 184733148, planet 1. A significance level close to 1/0 favors a transiting planet/an eclipsing binary.
Open [./planet-01/binary-discrimination-test-results/0000000184733148-01-eclipsing-binary-discrimination-tests.fig](#)

Appendix B Alerts

This target did not trigger any alerts.