



Data Validation (DV) Report

for TESS ID 25155310

Sectors 2 - 2

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

17-Sep-2020 07:21:37 Z

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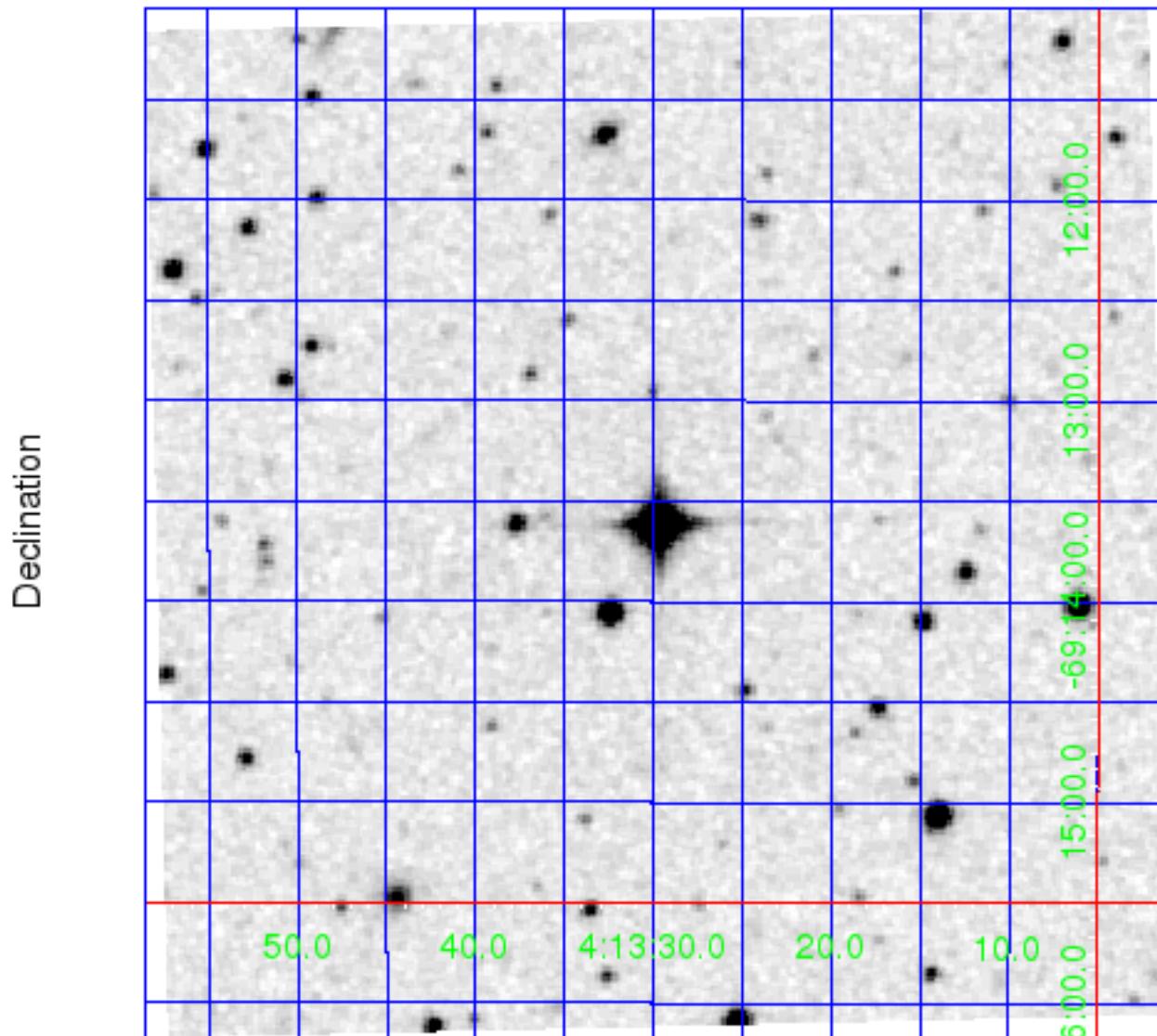
1 Summary

Target Properties	Value	Uncertainty	Units	Provenance
Catalog ID	25155310			
TOI ID	114			
TESS Name	-			
RA	63.37393962	0	degrees	TIC8.1
Dec	-69.22682270	0	degrees	TIC8.1
Magnitude	10.6103	0.006		TIC8.1
Radius	1.242	0.061	Solar radii	TIC8.1
Effective Temperature	5676	117	Kelvin	TIC8.1
log(g)	4.254	0.076818	cm/sec ²	TIC8.1
[M/H]	0.207	0.045809	Solar metallicity	TIC8.1
Stellar Density	0.528	0.097	Solar density	TIC8.1-Derived
Limb Darkening Coefficient 1	0.65828			
Limb Darkening Coefficient 2	-0.3173			
Limb Darkening Coefficient 3	0.68583			
Limb Darkening Coefficient 4	-0.33523			
Number of Planet Candidates	1			
TOI Model	csv-file-toi-catalog-09-16-20-edited.csv			
TESS Names Model	-			
External TCE Model	-			
Software Revision	spoc-5.0.11-20200915			
Date Report Generated	17-Sep-2020 07:21:37 Z			

Sector	Target Table	Camera/CCD	Crowding Metric	Flux Fraction
2	129	4:2	0.9724	0.8992

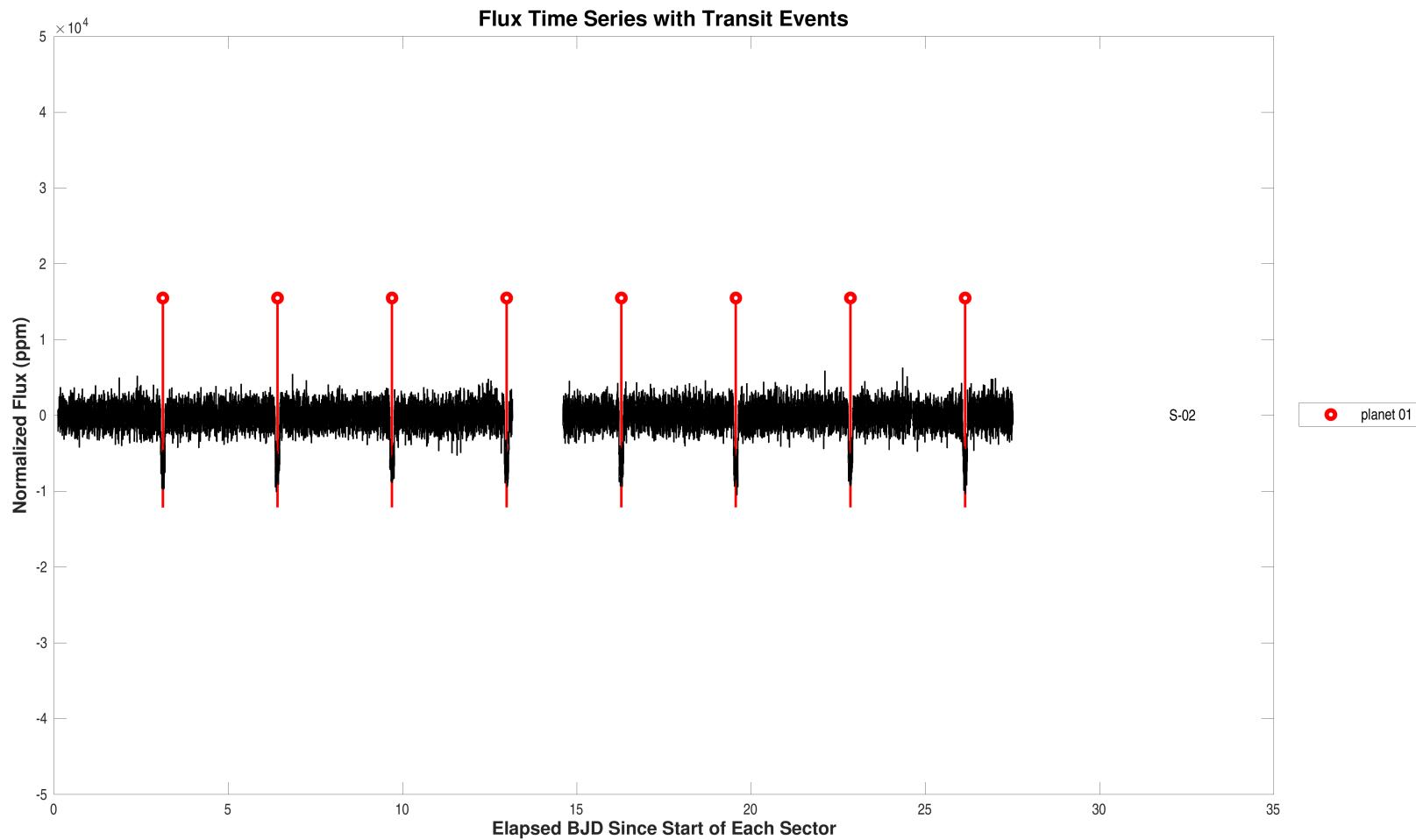
Planet Candidate	TOI ID	TESS Name	TOI Correlation	Period (days)	Period Ratio	Epoch (BTJD)	Semi-major Axis (AU)	Radius (Re)	Seff (K)	Teq (K)	False Alarm	Suspected EB
1	114.01	-	1.00	3.289	1.00	1357.120	0.04	10.5	759.4	1339	0.00e+00	false

2 Survey Image

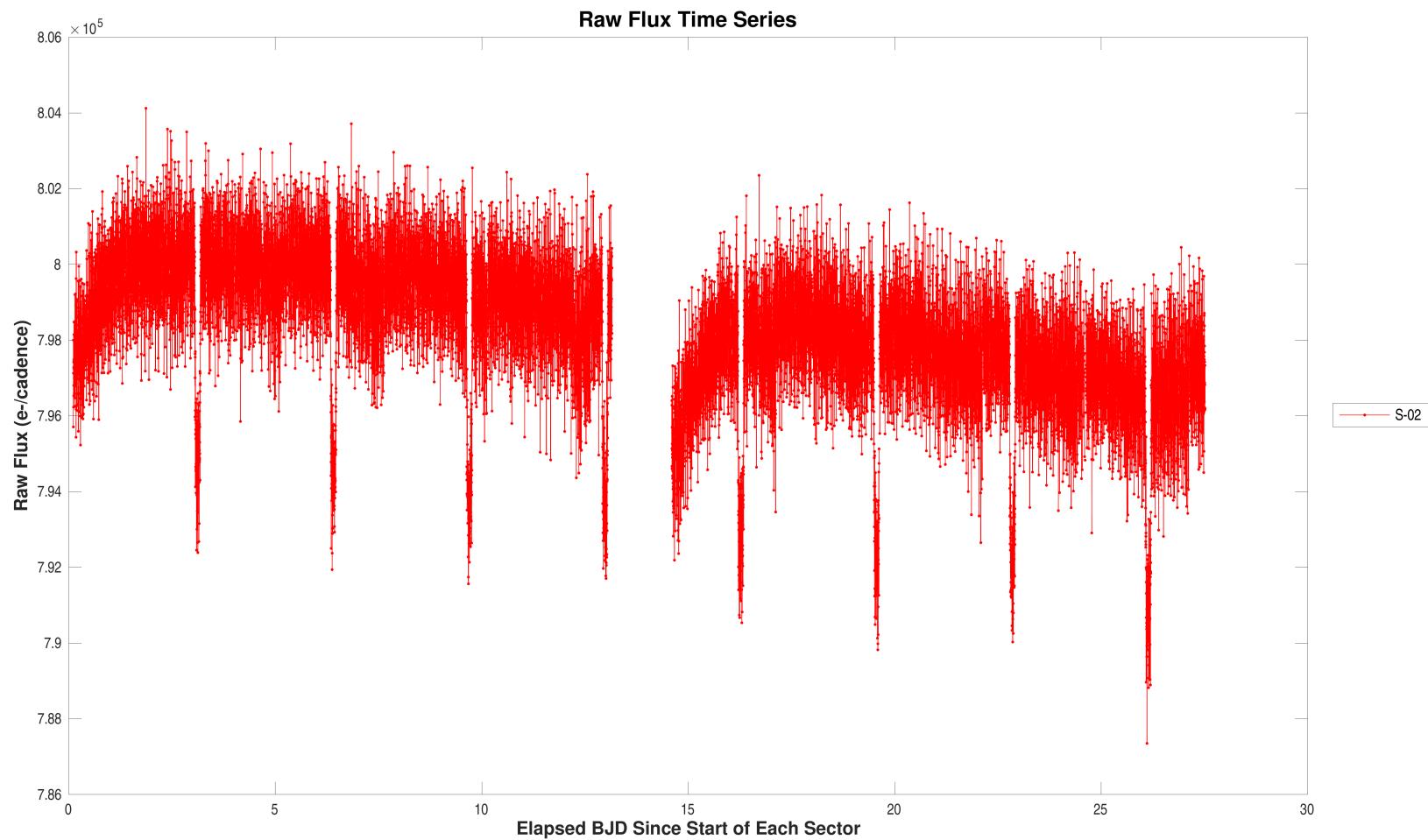


Digitized Sky Survey (DSS) red image. The 5' x 5' image is centered on the J2000 coordinates of target (25155310).

3 Flux Time Series



Summary plot of sector-stitched flux time series and transits for target 25155310, 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 2, target table 129, start BJD is 2458354.
Open [./summary-plots/0000000025155310-00-flux-dv-fit-02-129.fig](#)



Summary plot of raw flux time series. For the data of sector 2, target table 129, start BJD is 2458354.
Open [./summary-plots/000000025155310-00-raw-flux-02-129.fig](#)

4 Dashboards

Planet Candidate 1

Model Fitter	Stellar Radius 1.2 ± 0.1 Solar units Period = 3.3 ± 0.0 days Depth = 7082 ± 61 ppm Planet Radius = 10.5 ± 0.5 Earth radii Semi-major Axis = 0.0 ± 0.0 AU Effective Stellar Flux = 759.4 ± 111.9 Equilibrium Temperature = 1339 ± 49 Kelvin Chi-squared/DoF = 0.8 SNR = 120.8	Core Aperture Correlation Statistic Value = 73.64 Significance = 100.00% Halo Aperture Correlation Statistic Value = 11.68 Significance = 100.00% Core/Halo Ratio Ratio = 6.31		Ghost Diagnostic Test
Eclipsing Binary Discrimination Test	Odd-Even Depth Comparison Statistic Value = $6.67e-01$ Significance = 41.41%	Offsets Relative to Out of Transit Centroid Source RA Offset = $2.54e-01 \pm 2.50e+00$ arcsec (0.10 σ) Source Dec Offset = $7.72e-01 \pm 2.50e+00$ arcsec (0.31 σ) Source Offset Distance = $8.12e-01 \pm 2.50e+00$ arcsec (0.32 σ) Offsets Relative to TIC Position Source RA Offset = $9.00e-02 \pm 2.50e+00$ arcsec (0.04 σ) Source Dec Offset = $5.32e-01 \pm 2.50e+00$ arcsec (0.21 σ) Source Offset Distance = $5.39e-01 \pm 2.50e+00$ arcsec (0.22 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 = $0.00e+00$ Transit Count = 8 Max Multiple Event Statistic = 101.2	Bootstrap Test

Summary of model fitter results and validation test results for target 25155310, 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

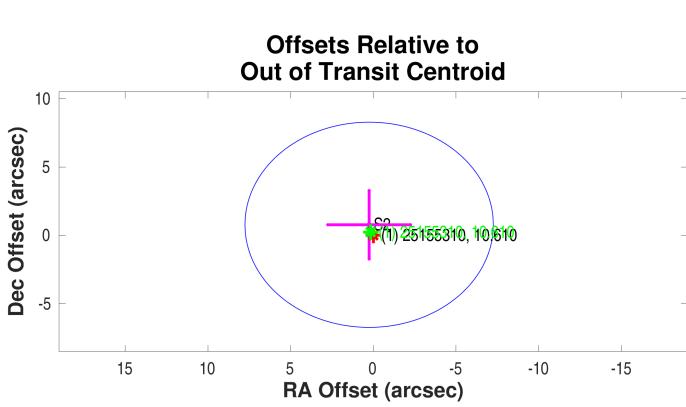
Multi-Sector Average PRF Fit of the Difference Images

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

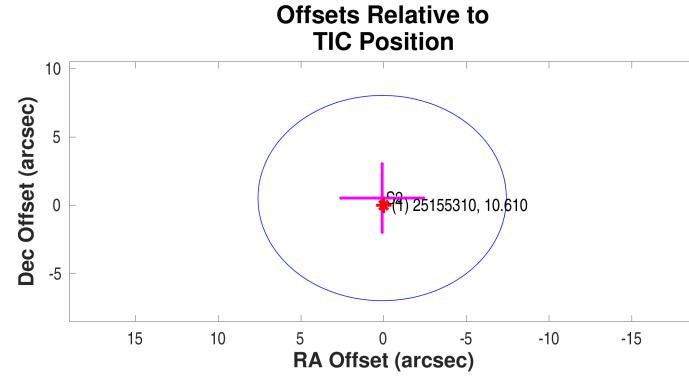
	RA	Dec	Units
Offset	$0.2540 \pm 2.50e + 00$	$0.7715 \pm 2.50e + 00$	arcseconds
Offset/ σ	0.10	0.31	
Offset Distance	$0.8123 \pm 2.50e + 00$		arcseconds
Offset Distance/ σ	0.32		
3σ Radius	7.5087		arcseconds

Mean offset from the TIC RA and Dec

	RA	Dec	Units
Offset	$0.0900 \pm 2.50e + 00$	$0.5318 \pm 2.50e + 00$	arcseconds
Offset/ σ	0.04	0.21	
Offset Distance	$0.5393 \pm 2.50e + 00$		arcseconds
Offset Distance/ σ	0.22		
3σ Radius	7.5092		arcseconds

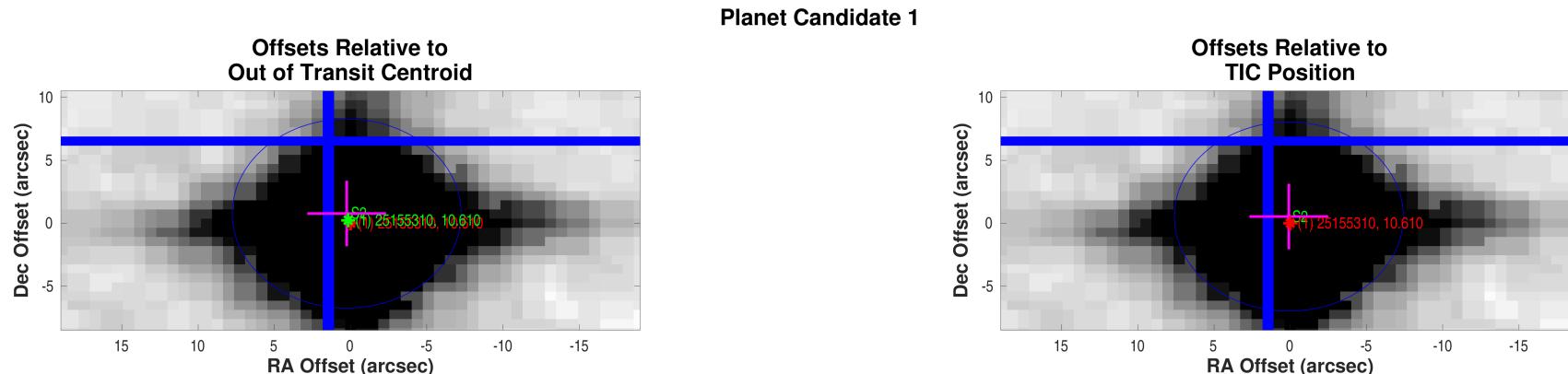


Planet Candidate 1



Difference image centroid offsets for target 25155310, 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/000000025155310-01-difference-image-centroid-offsets.fig](#)



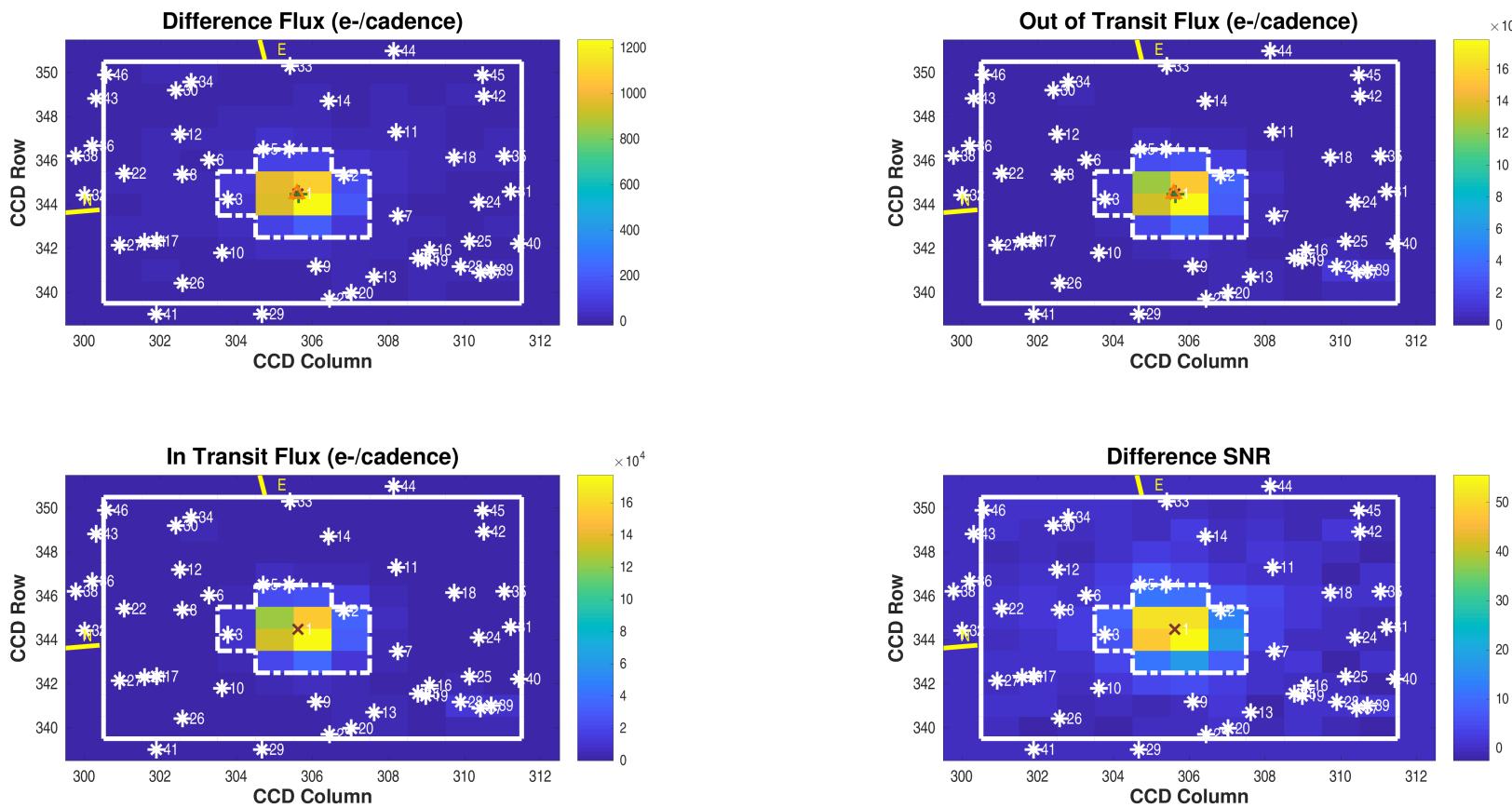
Difference image centroid offsets for target 25155310, planet candidate 1, displayed on survey image for given target. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in 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/000000025155310-01-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 2 / Target Pixel Table 129



Difference image for target 25155310, planet candidate 1, sector 2, target pixel table 129. 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 = 7; number of valid in-transit cadences = 566; number of in-transit cadence gaps = 21; number of valid out-of-transit cadences = 1464; number of out-of-transit cadence gaps = 27. Difference image quality metric = 1.00 (good).

Open [./planet-01/difference-image/000000025155310-01-difference-image-02-129.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	$344.47 \pm 2.75e - 05$	$305.63 \pm 2.29e - 05$	pixels	$63.37473489 \pm 8.42e - 07$	$-69.22661204 \pm 7.24e - 07$	degrees
Difference Image Centroid	$344.48 \pm 7.43e - 03$	$305.59 \pm 6.12e - 03$	pixels	$63.37493379 \pm 4.26e - 05$	$-69.22639773 \pm 3.49e - 05$	degrees
Offset	$0.0074 \pm 7.43e - 03$	$-0.0387 \pm 6.12e - 03$	pixels	$0.2540 \pm 5.44e - 02$	$0.7715 \pm 1.26e - 01$	arcseconds
Offset/ σ	0.99	-6.33		4.67		6.14
Offset Distance	$0.0394 \pm 6.14e - 03$		pixels	$0.8123 \pm 1.20e - 01$		arcseconds
Offset Distance/ σ	6.43			6.77		

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

	Row	Column	Units	RA	Dec	Units
TIC Reference Centroid	$344.48 \pm 1.44e - 04$	$305.61 \pm 1.25e - 04$	pixels	$63.37486328 \pm 0.00e + 00$	$-69.22654544 \pm 0.00e + 00$	degrees
Difference Image Centroid	$344.48 \pm 7.43e - 03$	$305.59 \pm 6.12e - 03$	pixels	$63.37493379 \pm 4.26e - 05$	$-69.22639773 \pm 3.49e - 05$	degrees
Offset	$0.0009 \pm 7.43e - 03$	$-0.0261 \pm 6.12e - 03$	pixels	$0.0900 \pm 5.44e - 02$	$0.5318 \pm 1.26e - 01$	arcseconds
Offset/ σ	0.12	-4.26		1.66		4.24
Offset Distance	$0.0261 \pm 6.12e - 03$		pixels	$0.5393 \pm 1.24e - 01$		arcseconds
Offset Distance/ σ	4.27			4.36		

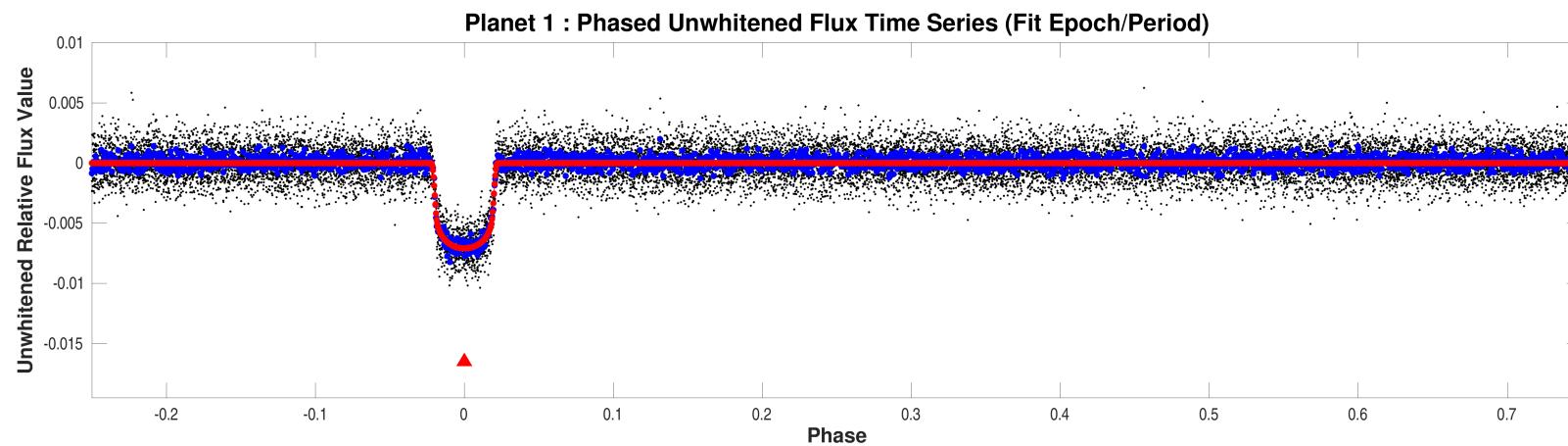
5.2 Difference Image TIC Key

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
1	25155310	10.610	63.37486328	-69.22654544	0.00
2	25155316	14.208	63.38521847	-69.23411233	30.28
3	684824398	18.726	63.37513610	-69.21585664	38.48
4	25155311	16.155	63.40698030	-69.22689514	41.03
5	684824394	19.401	63.40841844	-69.22299769	44.71
6	684824396	18.022	63.40389514	-69.21449281	57.07
7	684824391	17.829	63.35351612	-69.24064477	57.61
8	684824399	18.222	63.39513950	-69.20996041	65.08
9	684824538	19.486	63.32261466	-69.22654127	66.71
10	684824539	19.362	63.33763969	-69.21298992	68.12
11	684824377	18.868	63.41304627	-69.24352828	78.20
12	684824397	19.334	63.42371082	-69.21107671	83.61
13	25155317	15.398	63.31184500	-69.23486113	85.85
14	684824381	19.306	63.43872366	-69.23455920	86.49
15	25155318	16.705	63.32254532	-69.24208464	87.13
16	684824311	18.834	63.32770975	-69.24415489	87.43
17	684824546	19.534	63.34979085	-69.20366009	88.39
18	25155320	17.107	63.39178106	-69.25124819	91.52
19	684824312	19.268	63.32048491	-69.24320039	91.74
20	25155313	16.124	63.30187605	-69.23084555	94.47
21	684824548	18.247	63.34985323	-69.20182623	94.55
22	684824400	18.511	63.39933464	-69.20130216	96.10
23	684824537	18.371	63.29891408	-69.22735578	97.02
24	684824305	19.236	63.35871631	-69.25328619	98.45
25	684824309	19.142	63.33156306	-69.25044130	102.26
26	684824540	18.555	63.31854107	-69.20594732	103.30
27	684824545	18.668	63.34890848	-69.19797426	108.06
28	684824310	18.324	63.31416467	-69.24816703	109.84
29	684824542	18.528	63.29202162	-69.21668594	111.57
30	388128727	16.743	63.45503799	-69.21211018	114.80
31	684824304	19.319	63.36428205	-69.25842602	115.56
32	25155305	17.476	63.38625748	-69.19457757	116.00
33	684824383	18.632	63.46568927	-69.23005733	116.66
34	388128726	15.727	63.46004471	-69.21468079	116.85
35	25155322	16.880	63.38981018	-69.25880119	117.68
36	684824419	18.647	63.42057394	-69.19753166	119.65
37	25155319	13.815	63.30858063	-69.25090588	121.87
38	25155304	17.526	63.41439151	-69.19471251	125.22

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
39	684824308	19.341	63.30989329	-69.25262349	125.28
40	684824307	18.043	63.32701683	-69.25772798	127.80
41	684824543	18.619	63.29807850	-69.20088952	134.69
42	25155321	16.750	63.43332600	-69.25794200	135.45
43	388128733	17.193	63.45375872	-69.19983750	139.26
44	388128713	15.766	63.47055599	-69.24613988	141.08
45	684824372	18.293	63.44826513	-69.25856187	148.55
46	388128731	17.024	63.46993320	-69.20221960	149.68

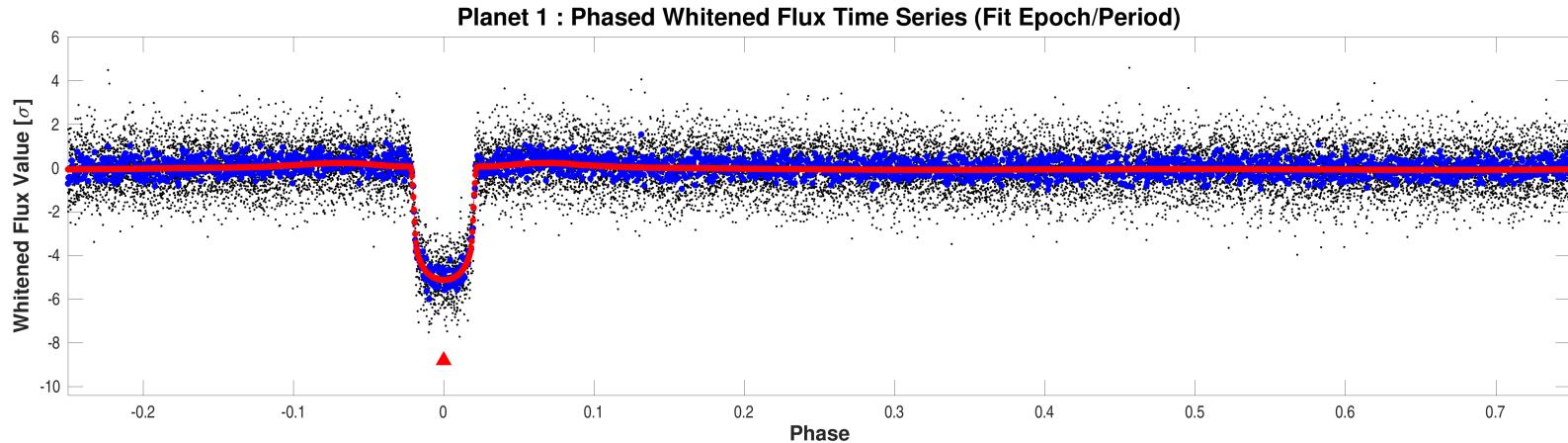
RA, Dec and Distances are corrected for proper motion. This table may not contain all of the objects shown.

6 Phased Light Curves



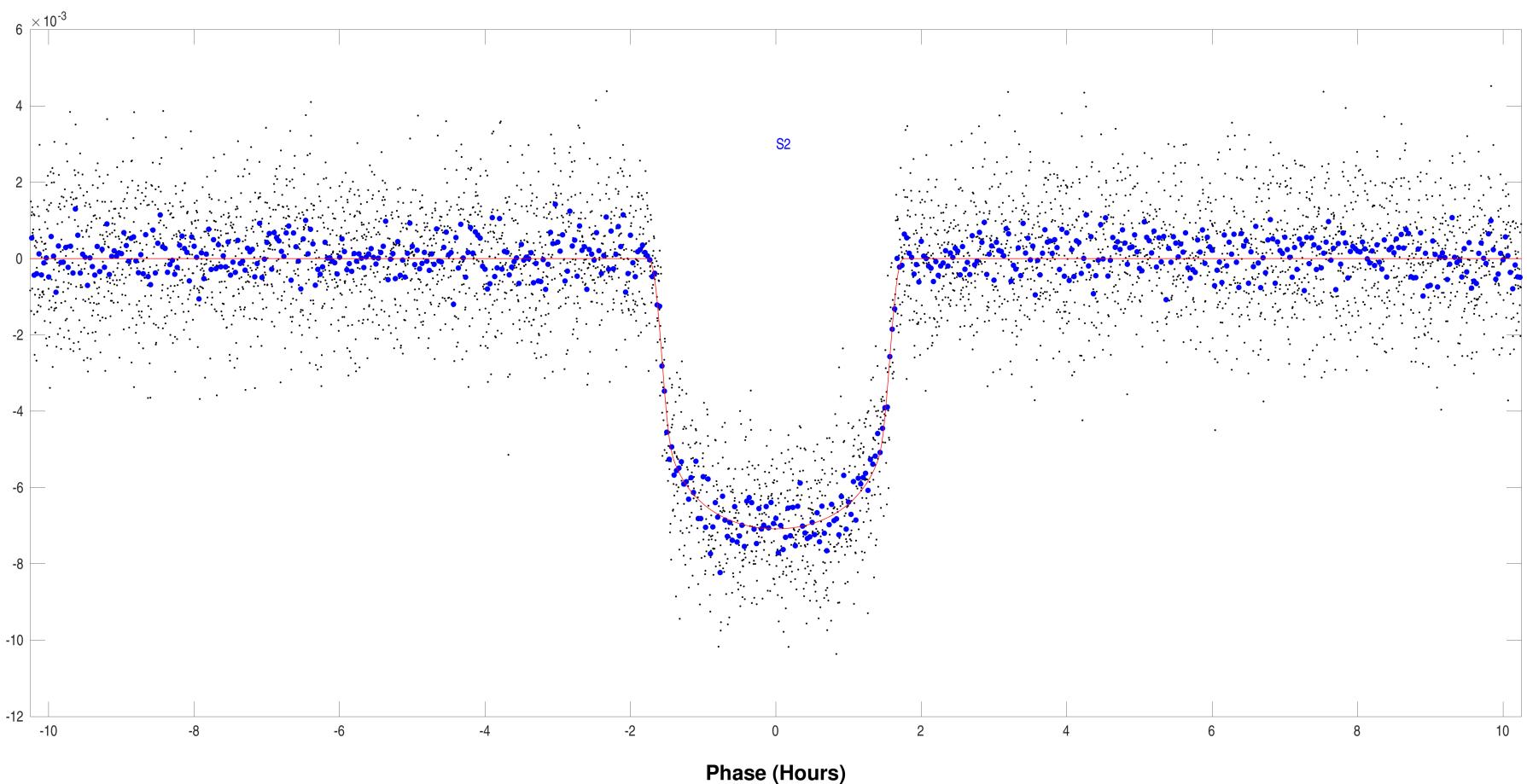
Phased unwhitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased unwhitened flux time series 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 planet candidate #1, red markers for transits of planet candidate #2, etc.

Open [./summary-plots/000000025155310-01-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 planet candidate #1, red markers for transits of planet candidate #2, etc.

Open [./summary-plots/0000000025155310-01-phased-whitened-flux-time-series.fig](#)

Planet: 1 Phased Unwhitened Flux Time Series by Sector

Phased unwhitened flux time series by sector for target 25155310, planet candidate 1. Period = 3.2887 days; transit epoch = 1357.1201 BTJD.
Open [./summary-plots/000000025155310-01-phased-unwhitened-flux-time-series-by-sector.fig](#)

7 Planet Candidate 1

7.1 Model Fitter: All Transits

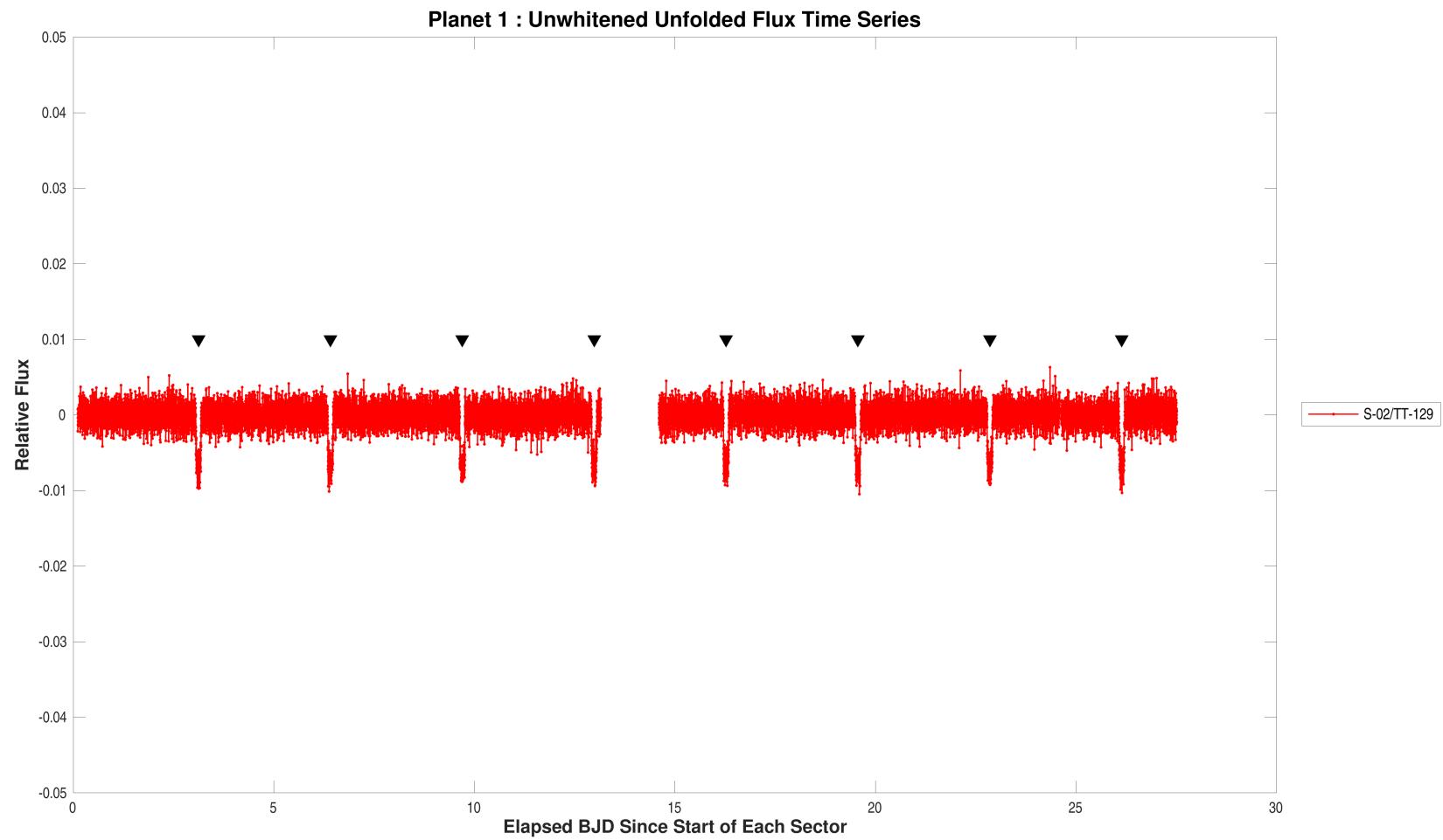
Model Characteristic	Name
Transit Model	mandel-agol_geometric_transit_model
Limb Darkening Model	claret_tess_nonlinear_limb_darkening_model

TCE Parameter	Value	Units
Trial Transit Pulse Duration	3.0	hours
Transit Epoch	1357.1130880	TJD
Orbital Period	3.2861099	days
Maximum SES	43.2	
Maximum MES	101.2	
Robust Statistic	99.4	
Chi Square Goodness of Fit Statistic (DoF)	1884.2 (697)	
Chi Square2 Statistic (DoF)	560.7 (835.1)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

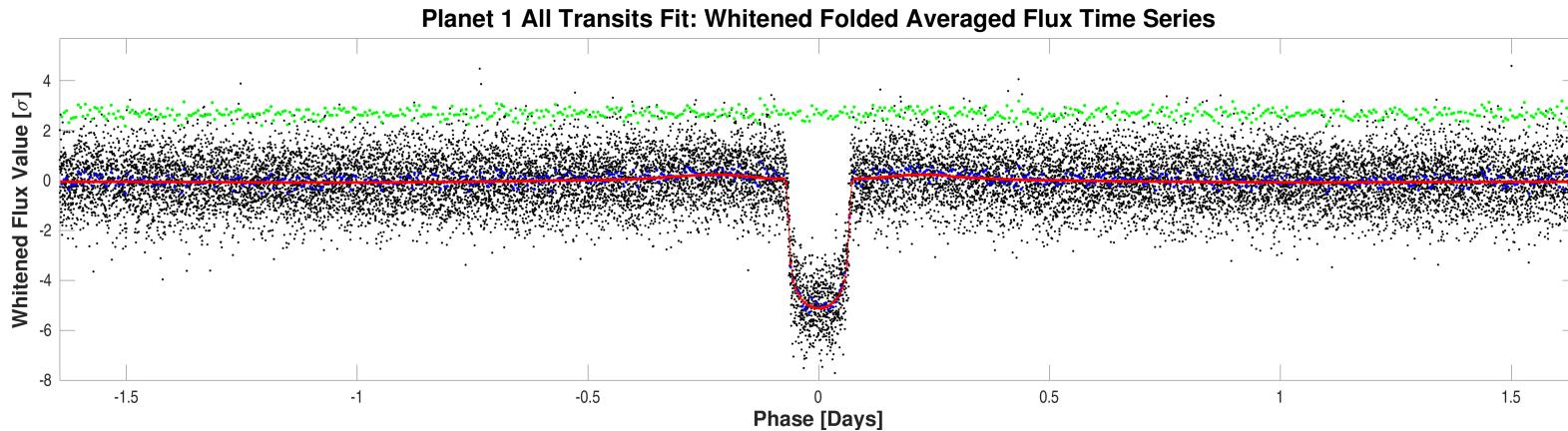
Parameter	Value	Uncertainty	Units
SNR	120.8		
Orbital Period	3.2886680	1.1992e-04	days
Transit Epoch	1357.1201382	4.8307e-04	BTJD
Impact Parameter	0.0202	4.1797e+00	
Planet Radius to Star Radius Ratio	0.0775144	1.3096e-03	
Semi-major Axis to Star Radius Ratio	7.9419	6.5456e-01	
Planet Radius	10.5080	5.4652e-01	Earth radii
Semi-major Axis	0.0434	2.9312e-03	AU
Effective Stellar Flux	759.3748	1.1195e+02	Goldilocks
Equilibrium Temperature	1339	4.9343e+01	Kelvin
Stellar Density	0.6223	1.5385e-01	Solar density
Transit Depth	7082	6.0762e+01	ppm
Transit Duration	3.4186	4.4240e-02	hours
Transit Ingress Duration	0.2472	4.5734e-02	hours
Eccentricity	0.0000	0.0000e+00	
Peri Longitude	0.0000	0.0000e+00	degrees
Model Chi Square Statistic (DoF)	3157.8 (3776.8)		
Model Chi Square Goodness of Fit Statistic (DoF)	486.6 (847)		
Model Chi Square2 Statistic (DoF)	5.0 (7)		

DoF: Degrees of Freedom



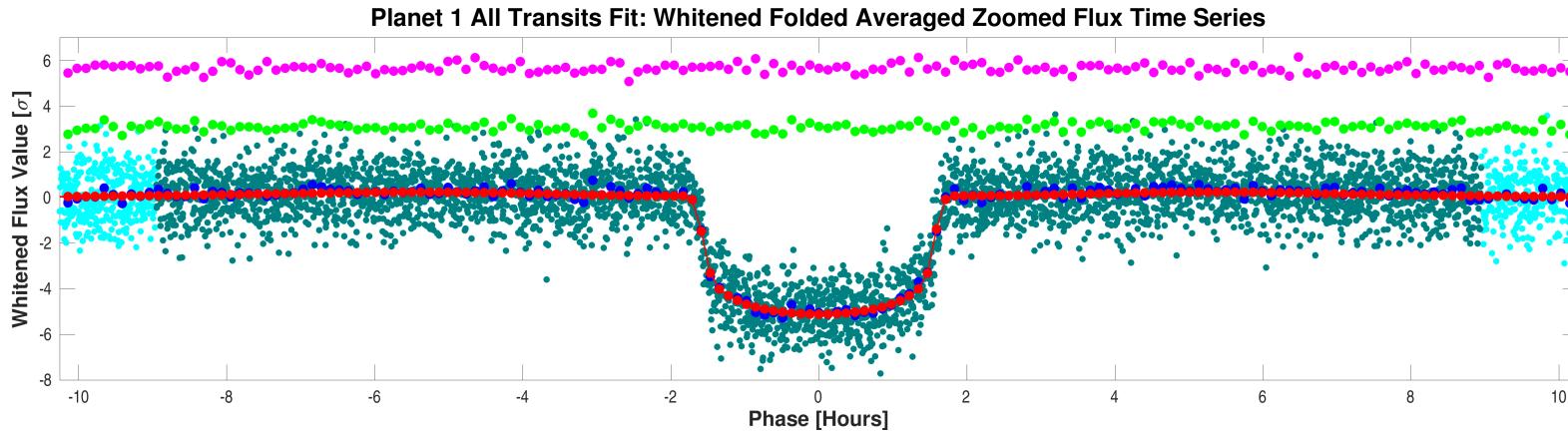
Flux time series for CatId 25155310, Planet candidate 1 in the unwhitened domain. For the data of Sector-02/TargetTableId-129, start BJD is 2458354. Transit event markers indicate the location of transits of the given planet candidate. All transits fit completed with full convergence.

Open [./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000025155310-01-all-unwhitened-02-129.fig](#)



Folded flux time series for CatId 25155310, 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/0000000025155310-01-all-whitened.fig](#)



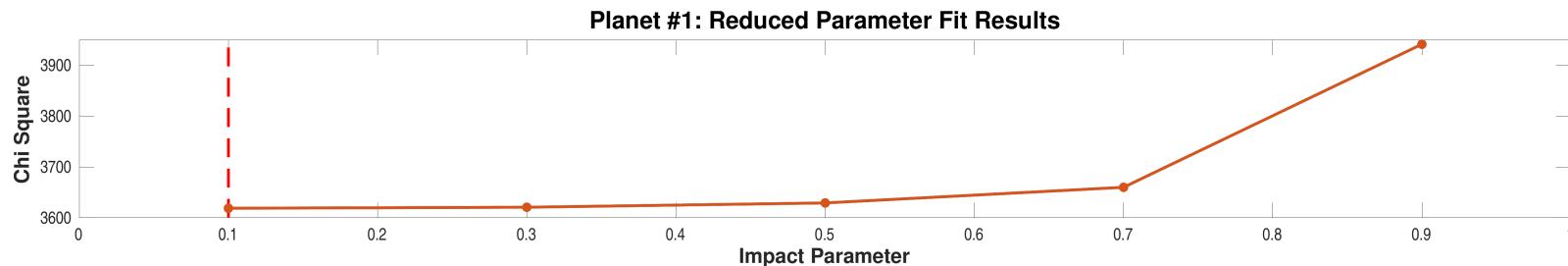
Folded flux time series for CatId 25155310, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged 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/0000000025155310-01-all-whitened-zoomed.fig](#)

7.2 Model Fitter: Reduced Parameter Fit Results

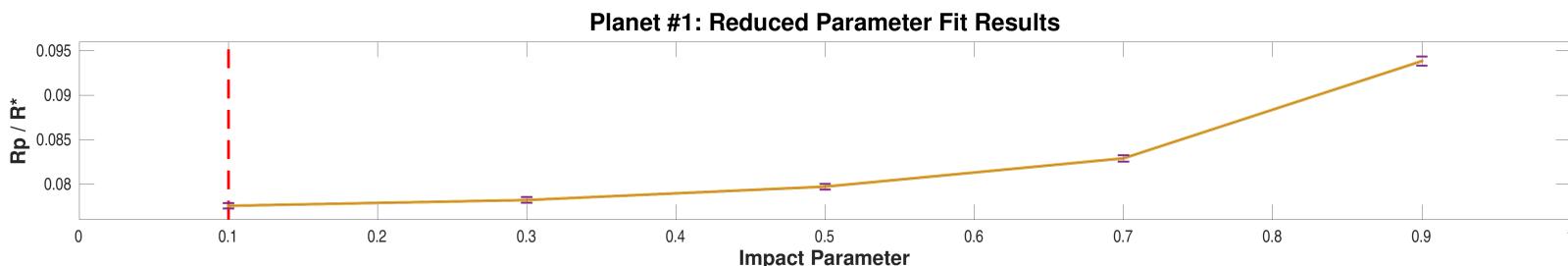
Impact Parameter	SNR	Model Chi Square	Planet Radius to Star Radius	Uncert	Semi-major Axis to Star Radius	Uncert	Transit Depth	Uncert	Transit Duration	Uncert
							(ppm)			
0.10	127.2	3618.8	0.0775658	3.1502e-04	7.9009	3.3738e-02	7079	5.7176e+01	3.4226	1.4479e-02
0.30	125.4	3620.8	0.0782176	3.2209e-04	7.5840	3.3145e-02	7085	5.8022e+01	3.4443	1.4922e-02
0.50	125.3	3629.2	0.0797209	3.3113e-04	6.9077	3.1986e-02	7095	5.8585e+01	3.5011	1.6078e-02
0.70	124.7	3660.0	0.0829055	3.5356e-04	5.7598	3.0454e-02	7126	6.0346e+01	3.6437	1.9146e-02
0.90	124.5	3941.6	0.0938440	4.9544e-04	3.8018	3.1846e-02	7526	7.7122e+01	4.2490	3.5354e-02

Highlighted row is the best reduced-parameter model fit.



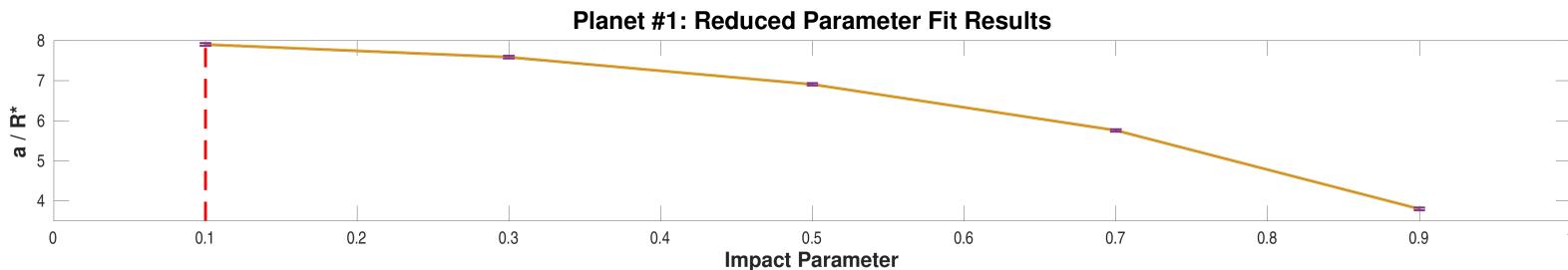
Model chi squares of reduced parameter fits vs. impact parameter for CatId 25155310, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.

Open [./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/0000000025155310-01-reduced-fits-chi-square.fig](#)



Ratios of planet radius to star radius of reduced parameter fits vs. impact parameter for CatId 25155310, 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/0000000025155310-01-reduced-fits-rp-over-rstar.fig](#)



Ratios of semimajor axis to star radius of reduced parameter fits vs. impact parameter for CatId 25155310, 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/0000000025155310-01-reduced-fits-a-over-rstar.fig](#)

7.3 Model Fitter: Trapezoidal Fit Results

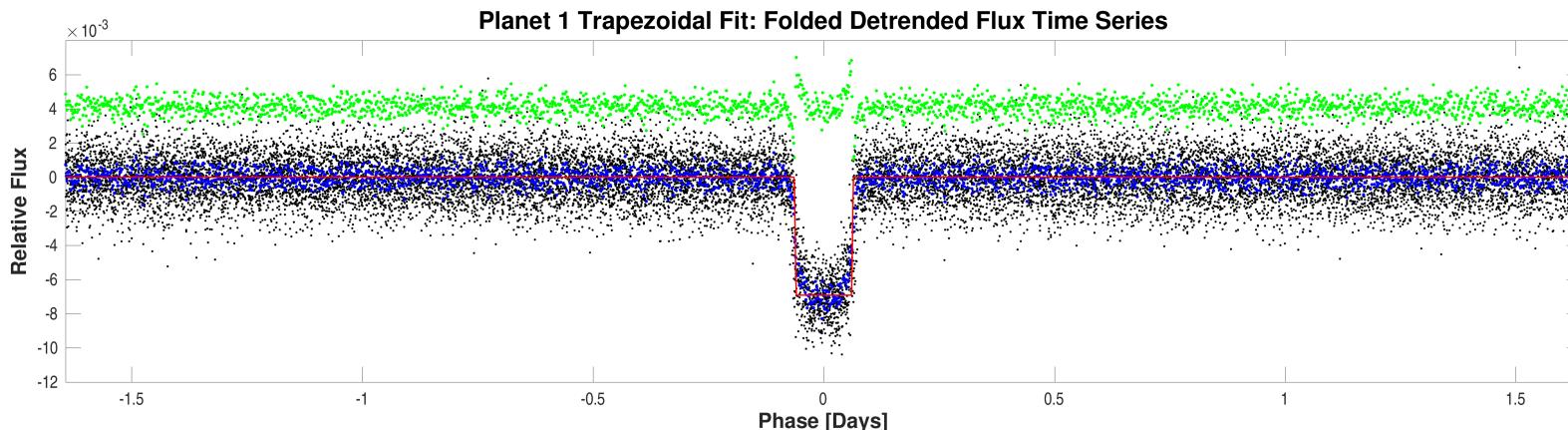
Model Characteristic	Name
Transit Model	trapezoidal_model
Limb Darkening Model	

TCE Parameter	Value	Units
Trial Transit Pulse Duration	3.0	hours
Transit Epoch	1357.1130880	TJD
Orbital Period	3.2861099	days
Maximum SES	43.2	
Maximum MES	101.2	
Robust Statistic	99.4	
Chi Square Goodness of Fit Statistic (DoF)	1884.2 (697)	
Chi Square2 Statistic (DoF)	560.7 (835.1)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

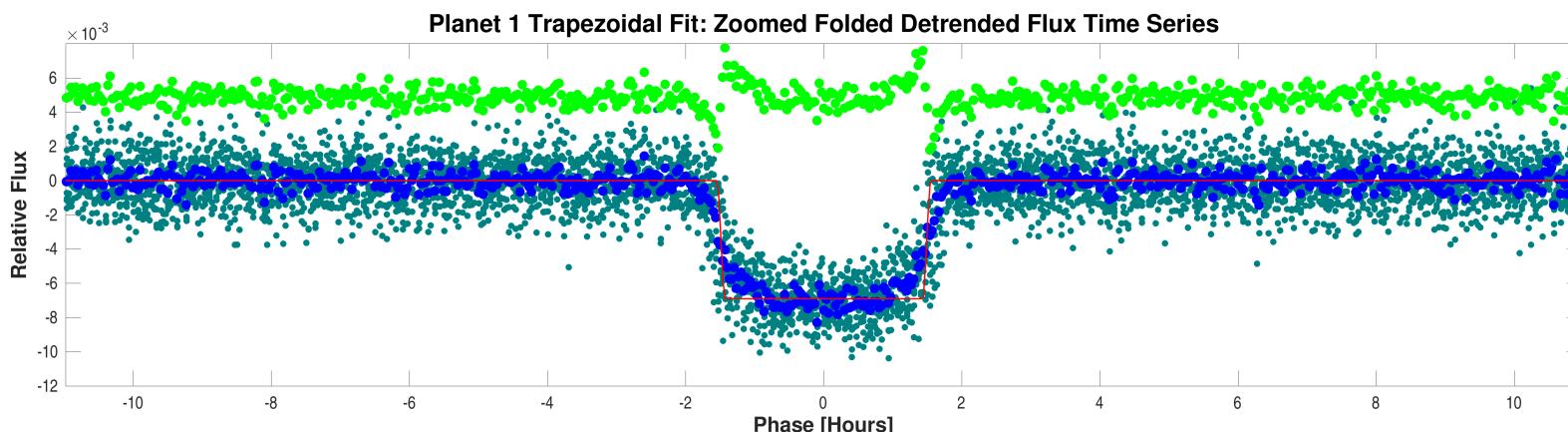
Parameter	Value	Uncertainty	Units
SNR	123.9		
Orbital Period	3.2861099		days
Transit Epoch	1357.1284300		BTJD
Transit Depth	6907		ppm
Transit Duration	3.6594		hours
Transit Ingress Duration	0.6799		hours
Model Chi Square Statistic (DoF)	18622.3 (5551)		

DoF: Degrees of Freedom



Folded detrended flux time series for CatId 25155310, Planet candidate 1 and folded trapezoidal model light curve.

Open [./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/000000025155310-01-all-trapezoidal.fig](#)



Zoomed folded detrended flux time series for CatId 25155310, Planet candidate 1 and folded trapezoidal model light curve.

Open [./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/000000025155310-01-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	3.2861		days		
Transit Duration	3		hours		
Maximum MES	101.2				
Secondary Phase	1.1903		days		
Secondary MES	1.6				
Minimum Phase	0.60833		days		
Minimum MES	-2.1				
Median MES	-0.1				
MAD MES	0.462				
Robust Statistic	1.3				
Secondary Depth	83.2	5.6065e+01	ppm		
Geometric Albedo	0.8	5.3658e-01		-0.4051	65.73
Planet Effective Temperature	1947	3.3079e+02	Kelvin	1.8183	3.45

7.4.2 Eclipsing Binary Discrimination Test

Result	Value	Value in Sigmas	Significance (%)
Odd Even Transit Depth Comparison Statistic	6.6691e-01	0.8166	41.41

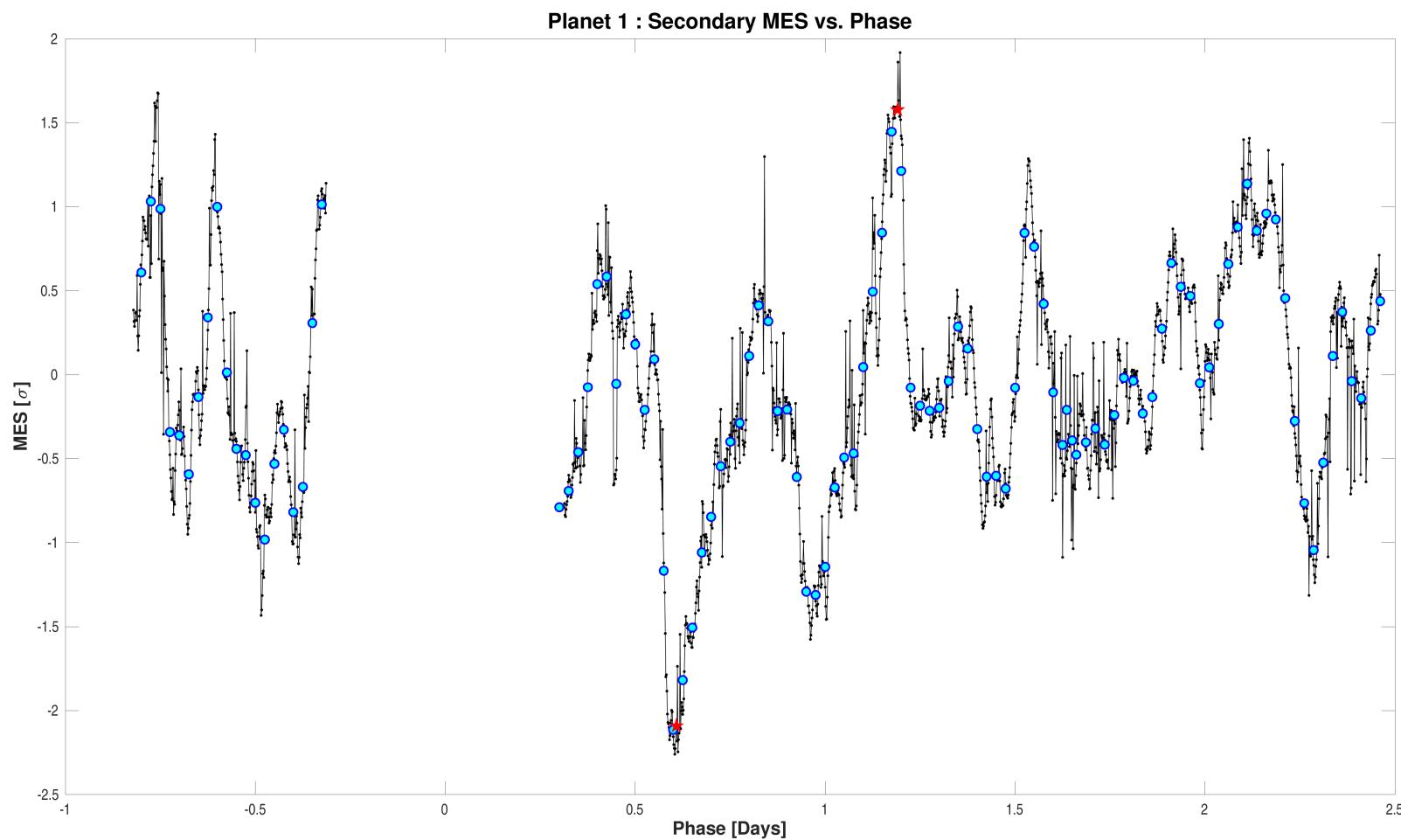
7.4.3 Bootstrap Test

Result	Value
False Alarm Probability	0.0000e+00
Bootstrap Threshold for Desired PFA	7.1
MES Mean	-0.20
MES Standard Deviation	1.03
Transit Count	8

7.4.4 Ghost Diagnostic Test

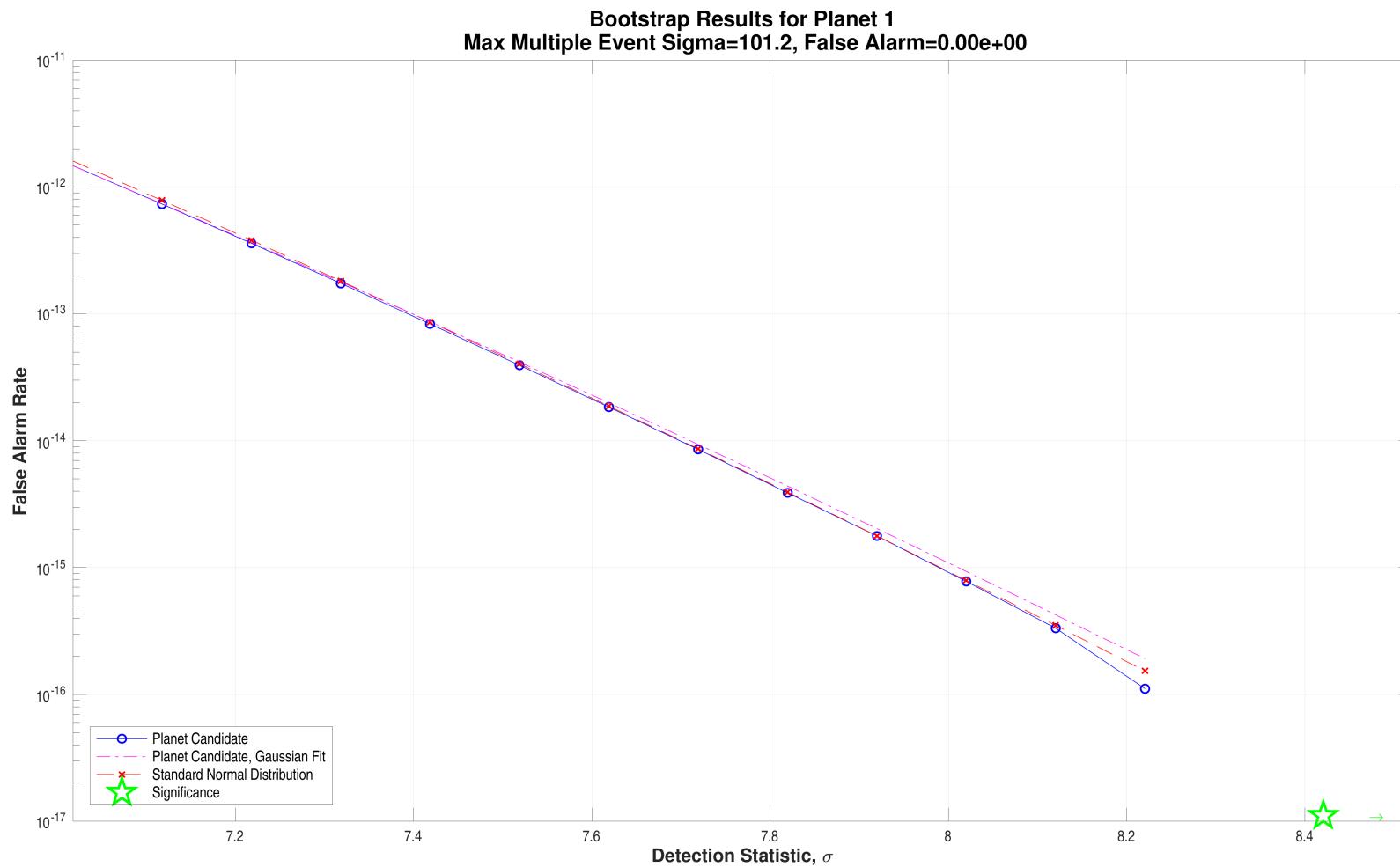
Result	Value	Significance (%)
Maximum MES	101.2	
SNR	120.8	
Core Aperture Statistic	7.3642e+01	100.00
Halo Aperture Statistic	1.1677e+01	100.00
Ratio of Core/Halo Aperture Statistics	6.3065e+00	

7.4.5 Validation Test Figures



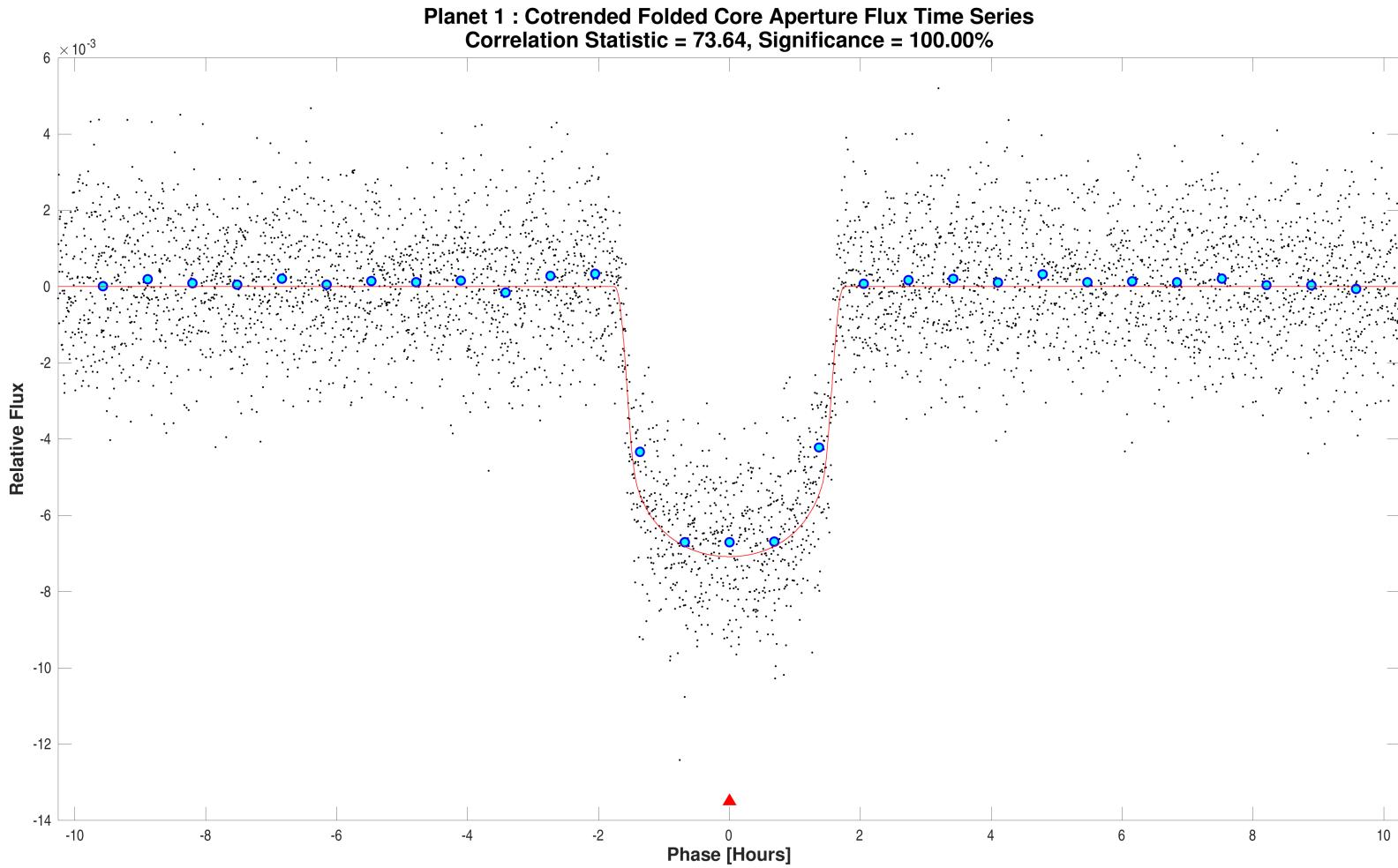
The primary event has been set to zero and both the max and min of the resulting MES vs. Phase are marked with a red star. The best matched pulse duration in hours is 3. The maximum secondary MES and corresponding phase are 1.5783 and 1.1903 days respectively. The minimum secondary MES and corresponding phase are -2.0911 and 0.60833 days respectively.

Open [./planet-01/report-summary/0000000025155310-01-weak-secondary-diagnostic.fig](#)



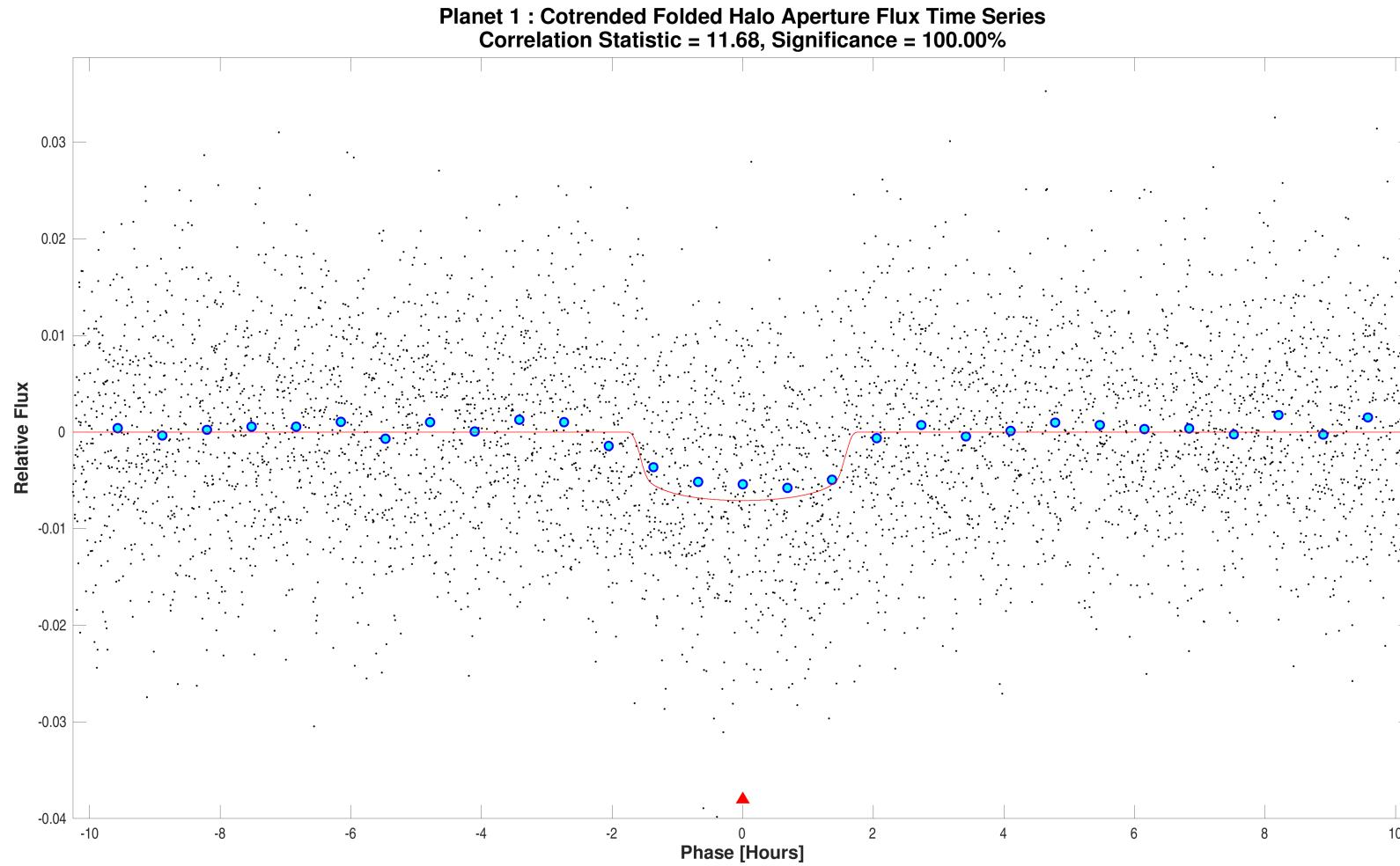
Bootstrap results for target 25155310, planet 1. Cumulative sum of the probabilities (derived from the histogram of counts) from upper tail to the search transit threshold; false alarm probability is indicated by the star. The Gaussian equivalent threshold for this false alarm probability is Inf. The threshold on this distribution that achieves the same false alarm rate as a 7.1 sigma threshold on a Gaussian distribution is 7.1476.

Open [./planet-01/bootstrap-results/000000025155310-01-bootstrap-false-alarm.fig](#)



Optical ghost diagnostic core aperture flux time series for target 25155310, 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/0000000025155310-01-core-unwhitened-cotrended-zoomed-model.fig](#)

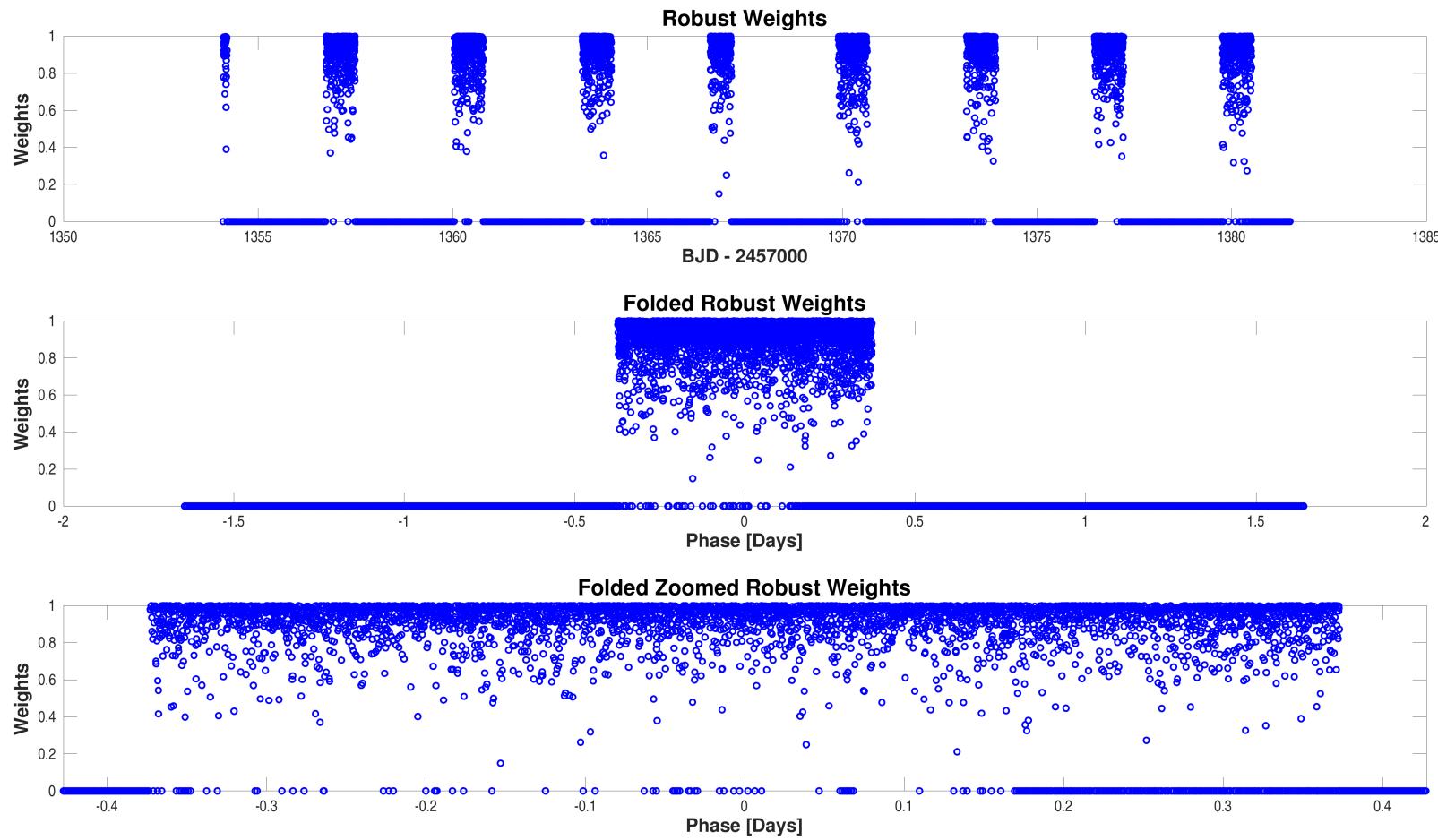


Optical ghost diagnostic halo aperture flux time series for target 25155310, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft 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/0000000025155310-01-halo-unwhitened-cotrended-zoomed-model.fig](#)

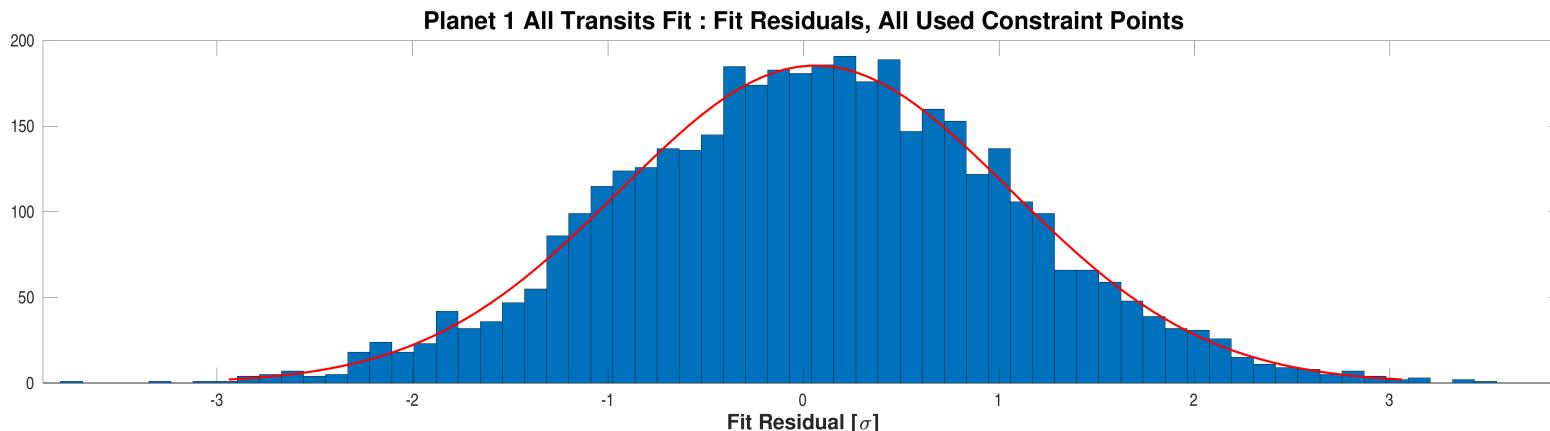
Appendix A Planet Candidate 1

A.1 Model Fitter: All Transits



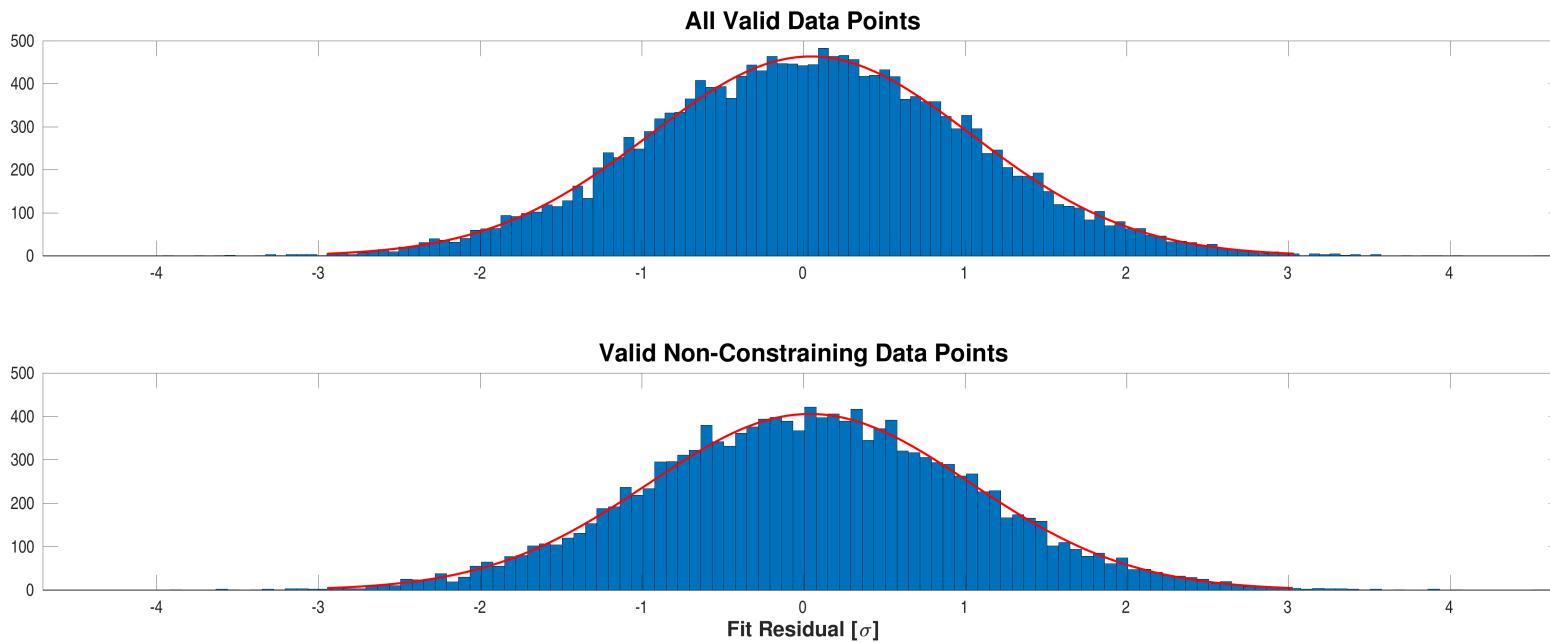
Robust weights distribution for CatId 25155310, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.

Open [./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000025155310-01-all-robust-weights.fig](#)



Fit residuals distribution for CatId 25155310, 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/0000000025155310-01-all-histo-used.fig](#)



Fit residuals distribution for CatId 25155310, 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.

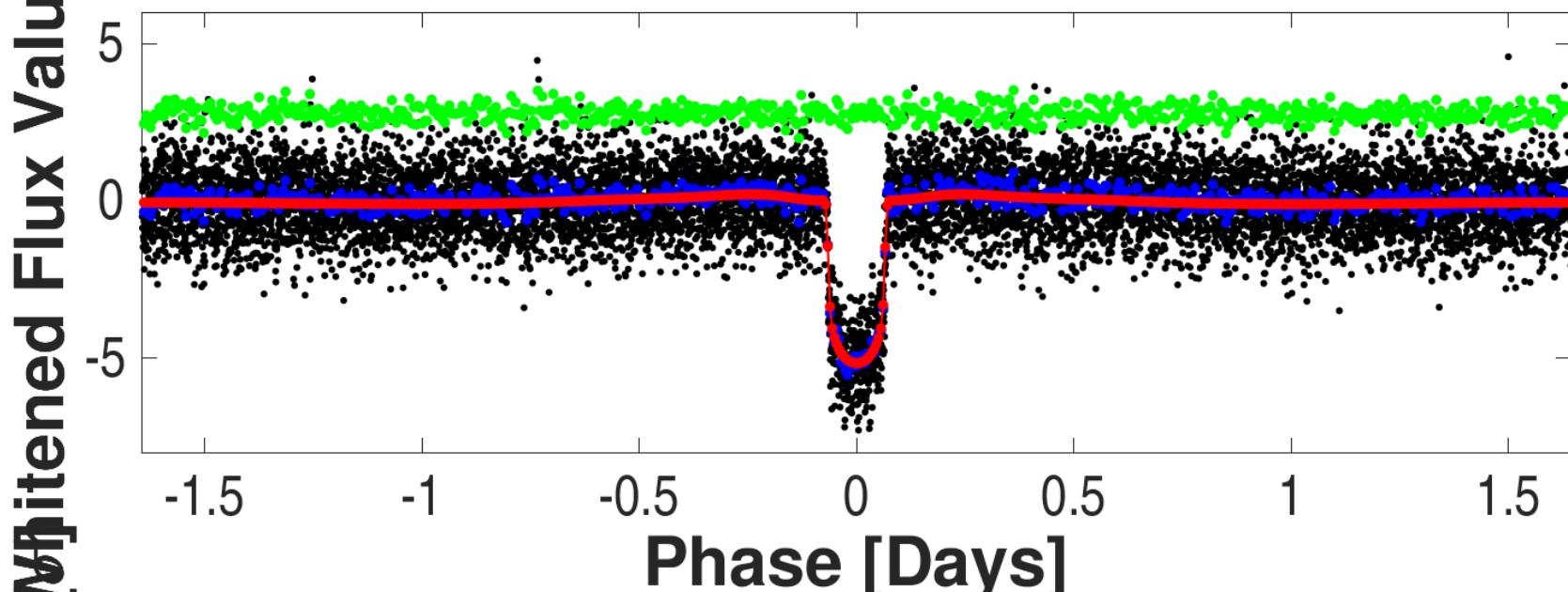
Open [./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000025155310-01-all-histo-all-and-unused.fig](#)

A.2 Model Fitter: Odd & Even Transits

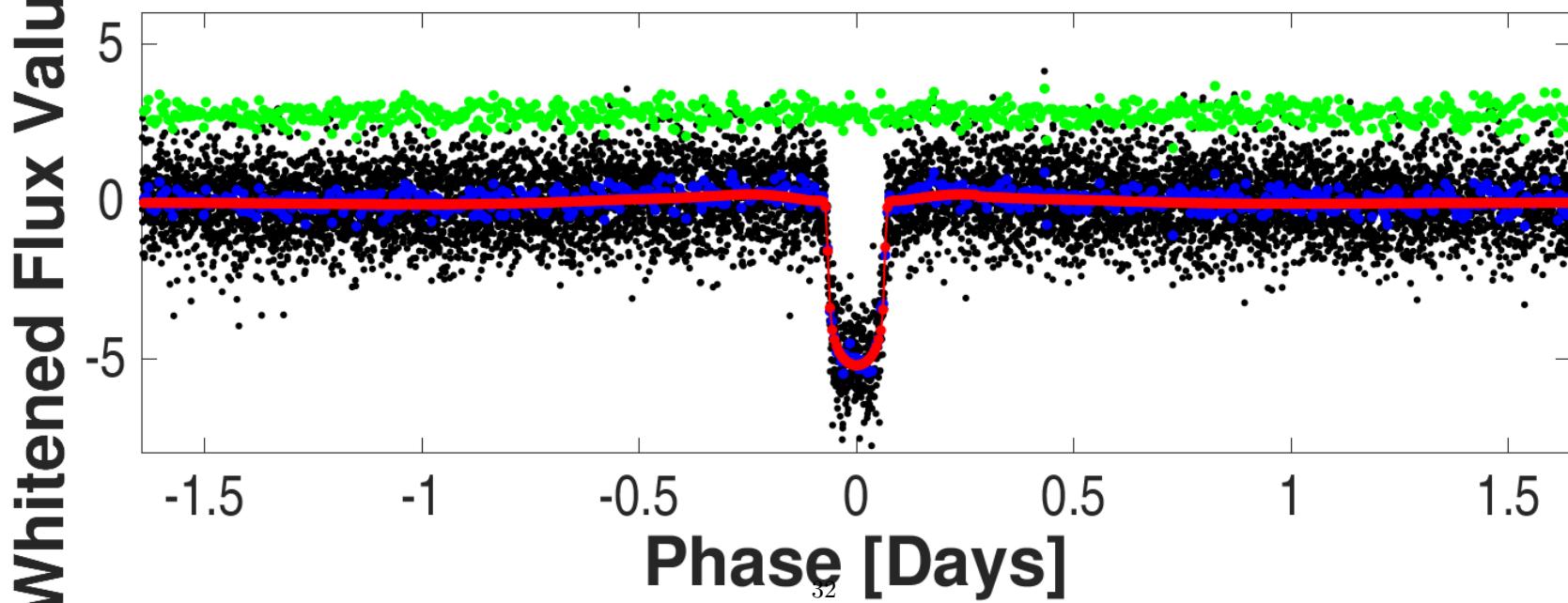
Parameter	Odd Transits Value	Odd Transits Uncertainty	Even Transits Value	Even Transits Uncertainty	Units	Difference $\ \text{Uncertainty}\ $
SNR	85.5		87.5			
Orbital Period	3.2886849	1.6613e-04	3.2886890	1.7837e-04	days	1.7193e-02
Transit Epoch	1357.1200774	6.2881e-04	1360.4087815	6.1989e-04	BTJD	4.0805e-02
Impact Parameter	0.0100	1.2005e+01	0.1192	9.7091e-01		9.0668e-03
Planet Radius to Star Radius Ratio	0.0772232	1.8565e-03	0.0778670	1.8322e-03		2.4683e-01
Semi-major Axis to Star Radius Ratio	7.9640	9.3468e-01	7.8687	8.9951e-01		7.3490e-02
Planet Radius	10.4685	5.7315e-01	10.5558	5.7558e-01	Earth radii	1.0745e-01
Semi-major Axis	0.0434	2.9312e-03	0.0434	2.9312e-03	AU	8.9038e-06
Effective Stellar Flux	759.3697	1.1195e+02	759.3684	1.1195e+02	Goldilocks	8.1495e-06
Equilibrium Temperature	1339	4.9343e+01	1339	4.9343e+01	Kelvin	8.1495e-06
Stellar Density	0.6275	2.2092e-01	0.6052	2.0754e-01	Solar density	7.3456e-02
Transit Depth	7029	8.5851e+01	7128	8.5122e+01	ppm	8.1665e-01
Transit Duration	3.4086	6.2683e-02	3.4314	6.2259e-02	hours	2.5884e-01
Transit Ingress Duration	0.2456	6.4647e-02	0.2525	6.4897e-02	hours	7.5276e-02
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)	3157.1 (3770.4)		3157.1 (3770.4)			

DoF: Degrees of Freedom

Odd Transits Fit: Whitened Folded Averaged Flux

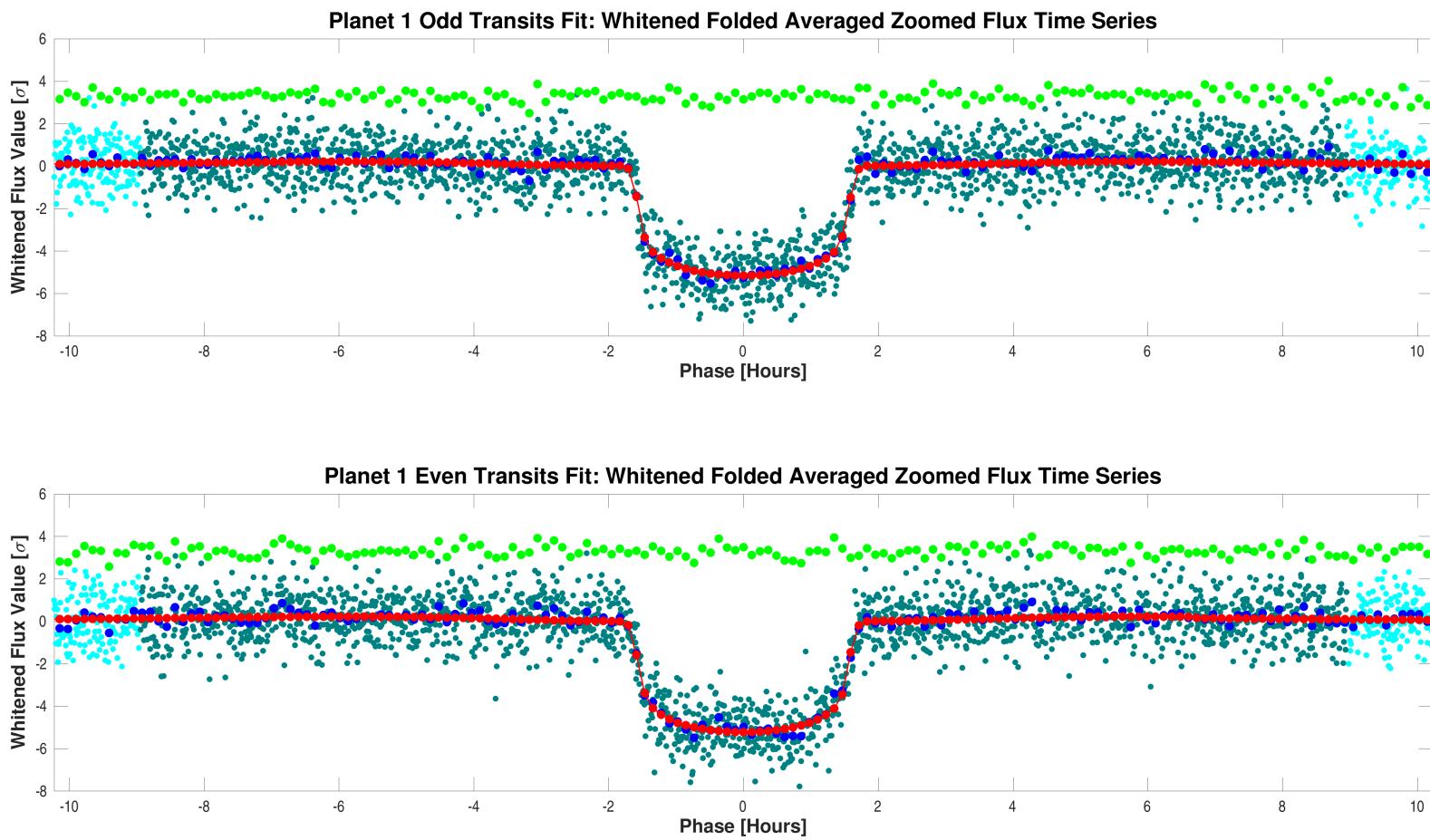


Even Transits Fit: Whitened Folded Averaged Flux



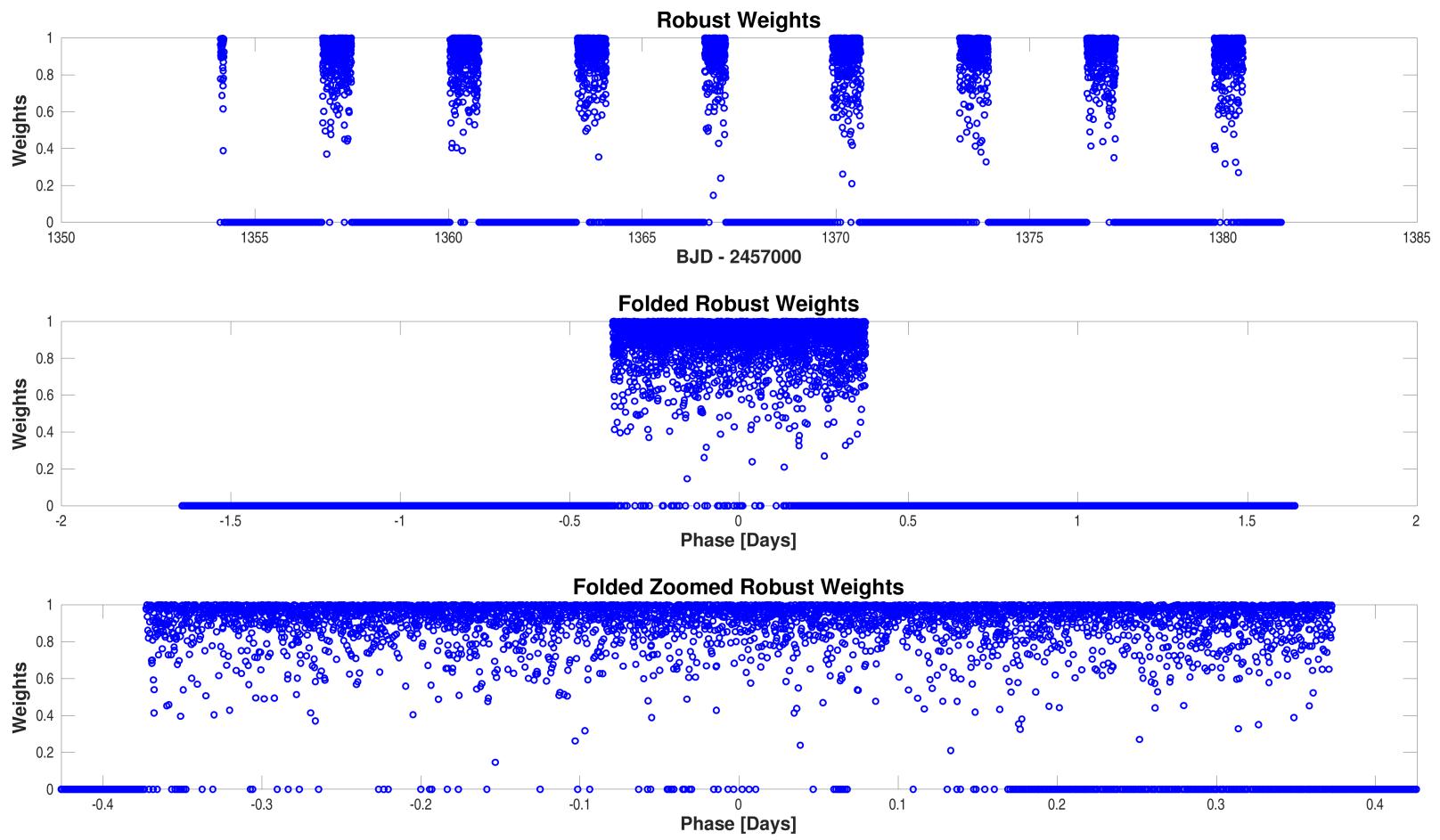
Folded flux time series for CatId 25155310, Planet candidate 1 in the whitened domain is plotted in black dots. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged values of the folded flux time series; the red dots represent the averaged values of the folded model light 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/0000000025155310-01-odd-even-whitened.fig`



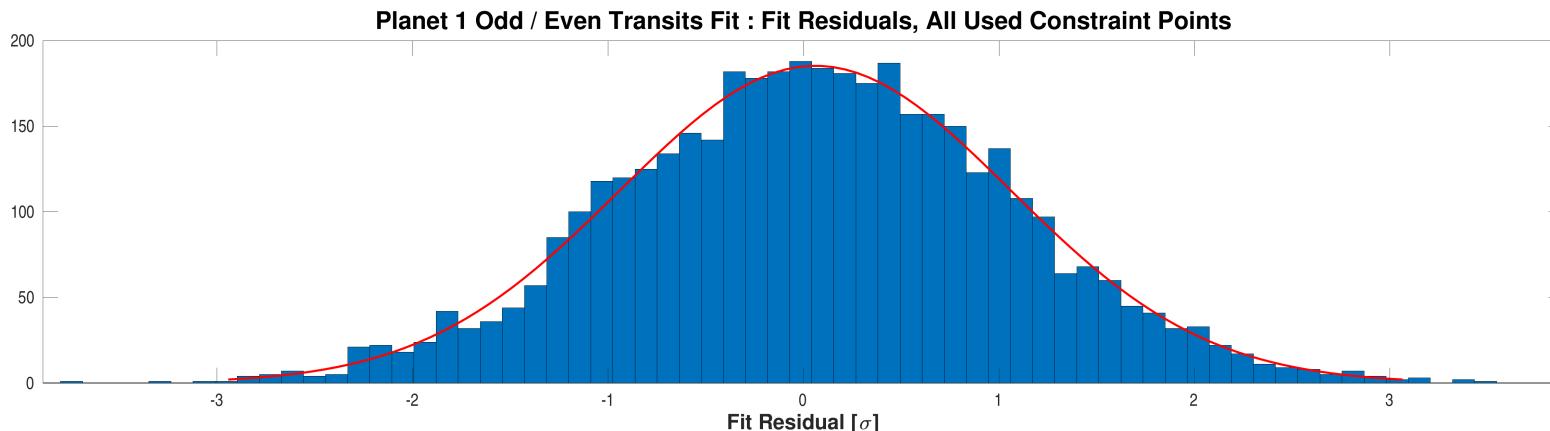
Folded flux time series for CatId 25155310, Planet candidate 1 in the whitened domain, zoomed on the transit. The flux data whose robust weights are larger/smaller than 0.1 are plotted in dark green/cyan dots, respectively. Values are averaged into 1 cadence wide bins. The blue dots represent the averaged 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/000000025155310-01-odd-even-whitened-zoomed.fig](#)



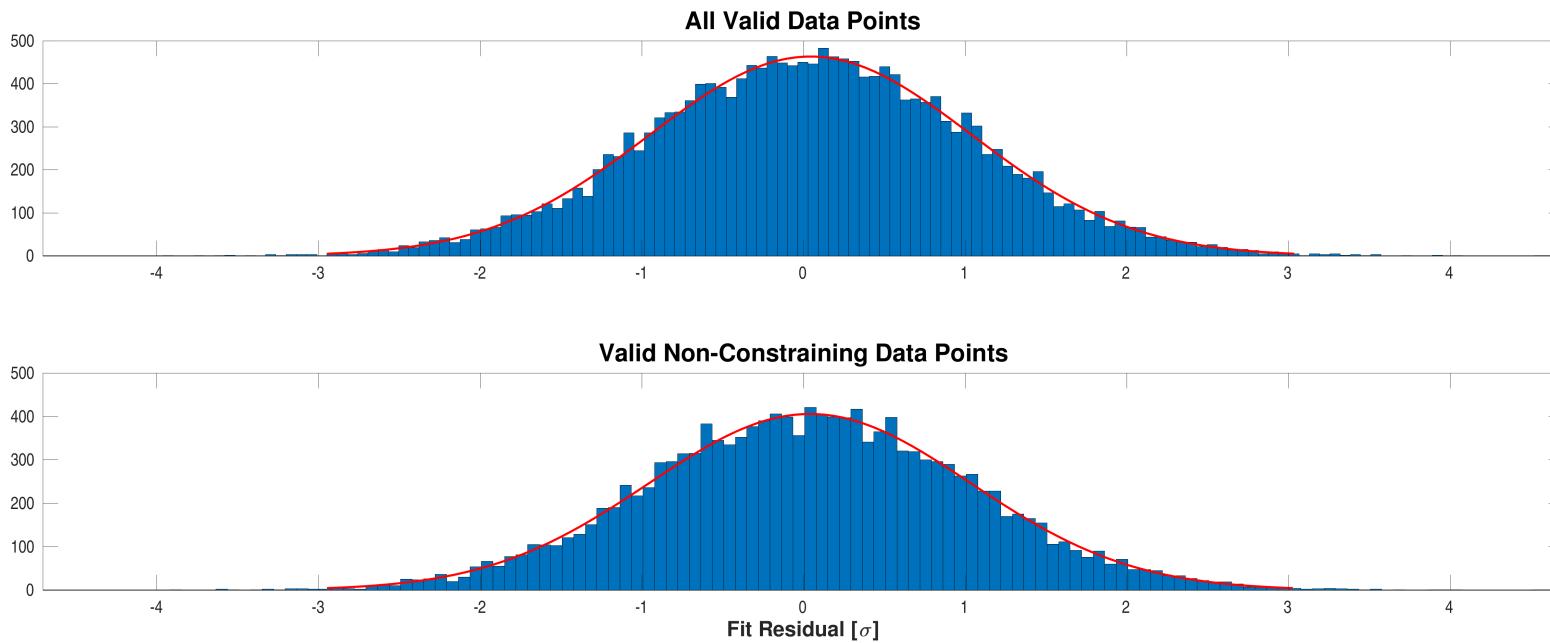
Robust weights distribution for CatId 25155310, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.

Open [./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000025155310-01-odd-even-robust-weights.fig](#)



Fit residuals distribution for CatId 25155310, 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.

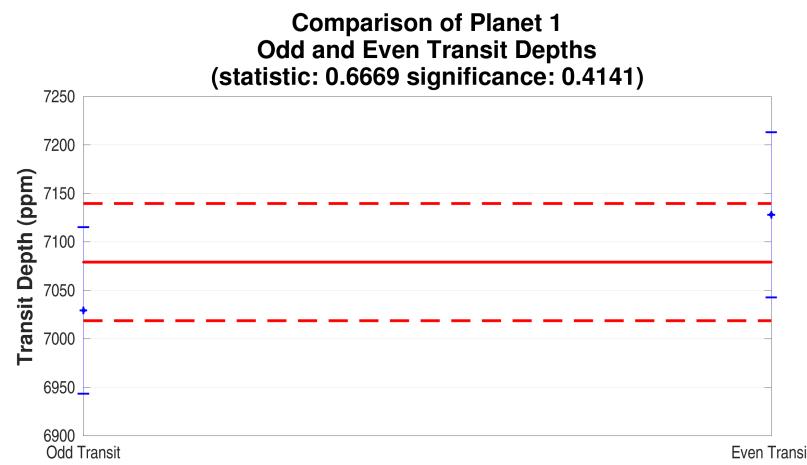
Open [./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000025155310-01-odd-even-histo-used.fig](#)



Fit residuals distribution for CatId 25155310, 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/0000000025155310-01-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 25155310, planet 1. A significance level close to 1/0 favors a transiting planet/an eclipsing binary.
Open [./planet-01/binary-discrimination-test-results/000000025155310-01-eclipsing-binary-discrimination-tests.fig](#)

Appendix B Alerts

This target did not trigger any alerts.