Data Validation (DV) Report
for TESS ID 66818296
Sectors 12 - 12

Contents

1   Summary

Target Properties	Value	Uncertainty	Units	Provenance
Catalog ID	66818296			
TOI ID	-			
TESS Name	-			
RA	239.96230300	0	degrees	TIC7
Dec	-28.06173700	0	degrees	TIC7
Magnitude	11	0.019		TIC7
Radius	1.570	0.000	Solar radii	TIC7
Effective Temperature	6650	0	Kelvin	TIC7
log(g)	4.164	0	cm/sec^2	TIC7
[M/H]	-0.070	0.1	Solar metallicity	TIC7
Stellar Density	0.339	0.000	Solar density	TIC7-Derived
Limb Darkening Coefficient 1	0.3949			
Limb Darkening Coefficient 2	0.62153			
Limb Darkening Coefficient 3	-0.63029			
Limb Darkening Coefficient 4	0.20854			
Number of Planet Candidates	1			
TOI Model	toi-plus-2019-06-26.csv			
TESS Names Model	-			
External TCE Model	-			
Software Revision	spoc-3.3.73-20190626			
Date Report Generated	01-Jul-2019 20:58:47 Z			

Sector	Target Table	Camera/ CCD	Crowding Metric	Flux Fraction
12	161	1:4	0.9852	0.8803

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	-	-	-	3.735	1.00	1627.126	0.05	21.3	1622.4	1619	0.00e+00	false

2 Survey Image
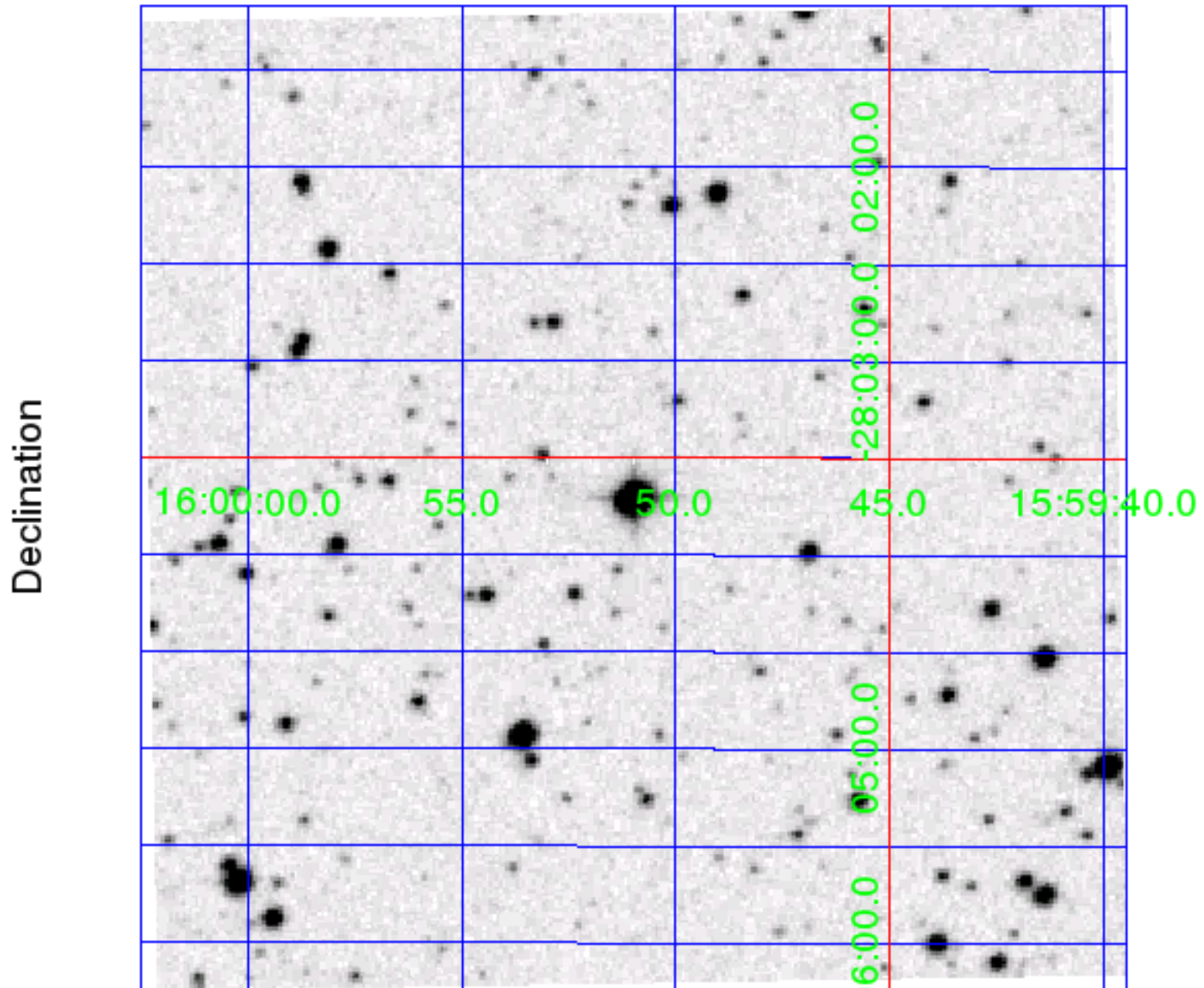
Digitized Sky Survey (DSS) red image. The 5' x 5' image is centered on the J2000 coordinates of target (66818296).

3   Flux Time Series
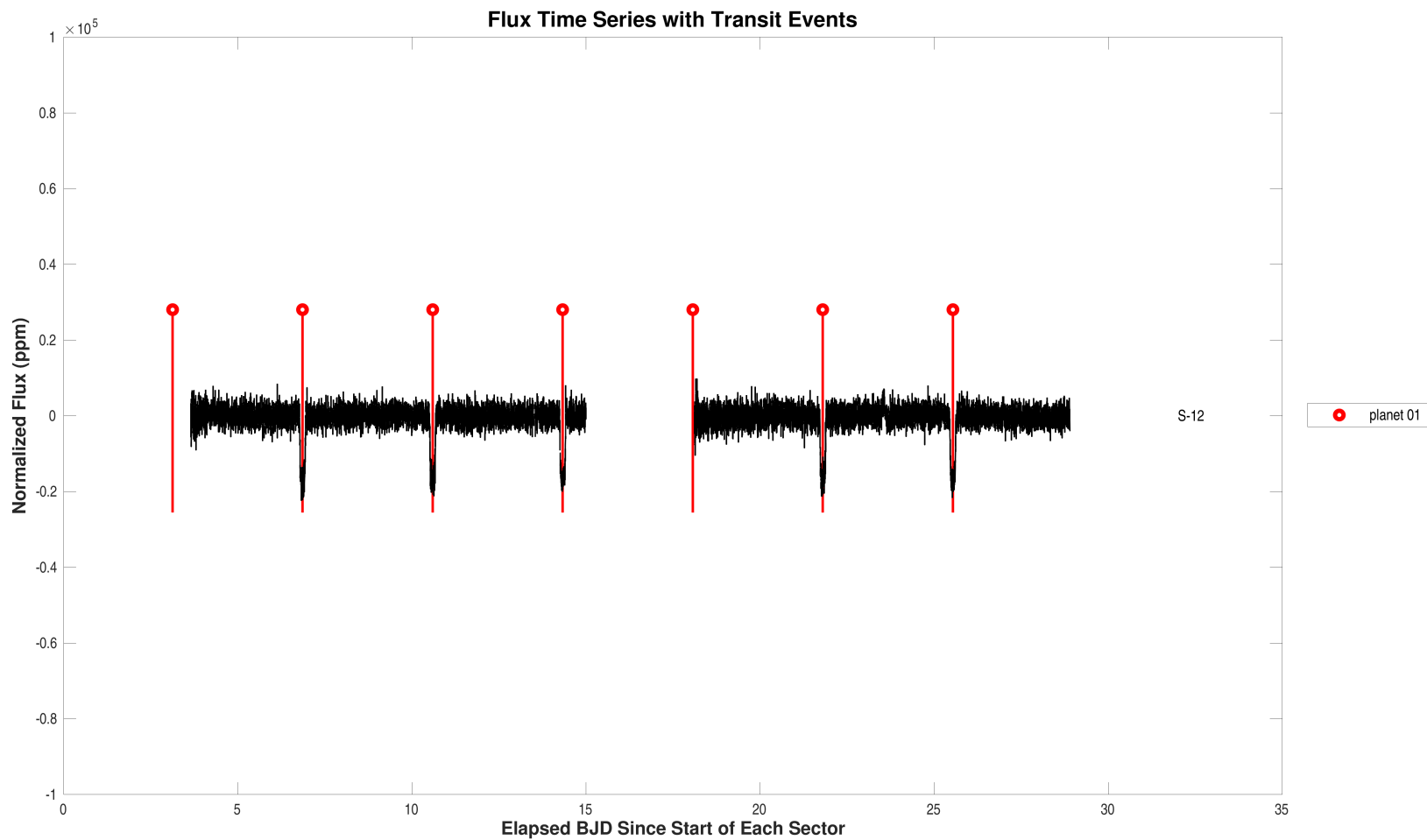
Summary plot of sector-stitched flux time series and transits for target 66818296, marked with DV fitted epoch/period (or TPS epoch/period if fit was not successful). Transits of identified planets are labeled with epoch BTJD and orbital period. For the data of sector 12, target table 161, start BJD is 2458624.
Open `./summary-plots/0000000066818296-00-flux-dv-fit-12-161.fig`

Raw Flux Time Series
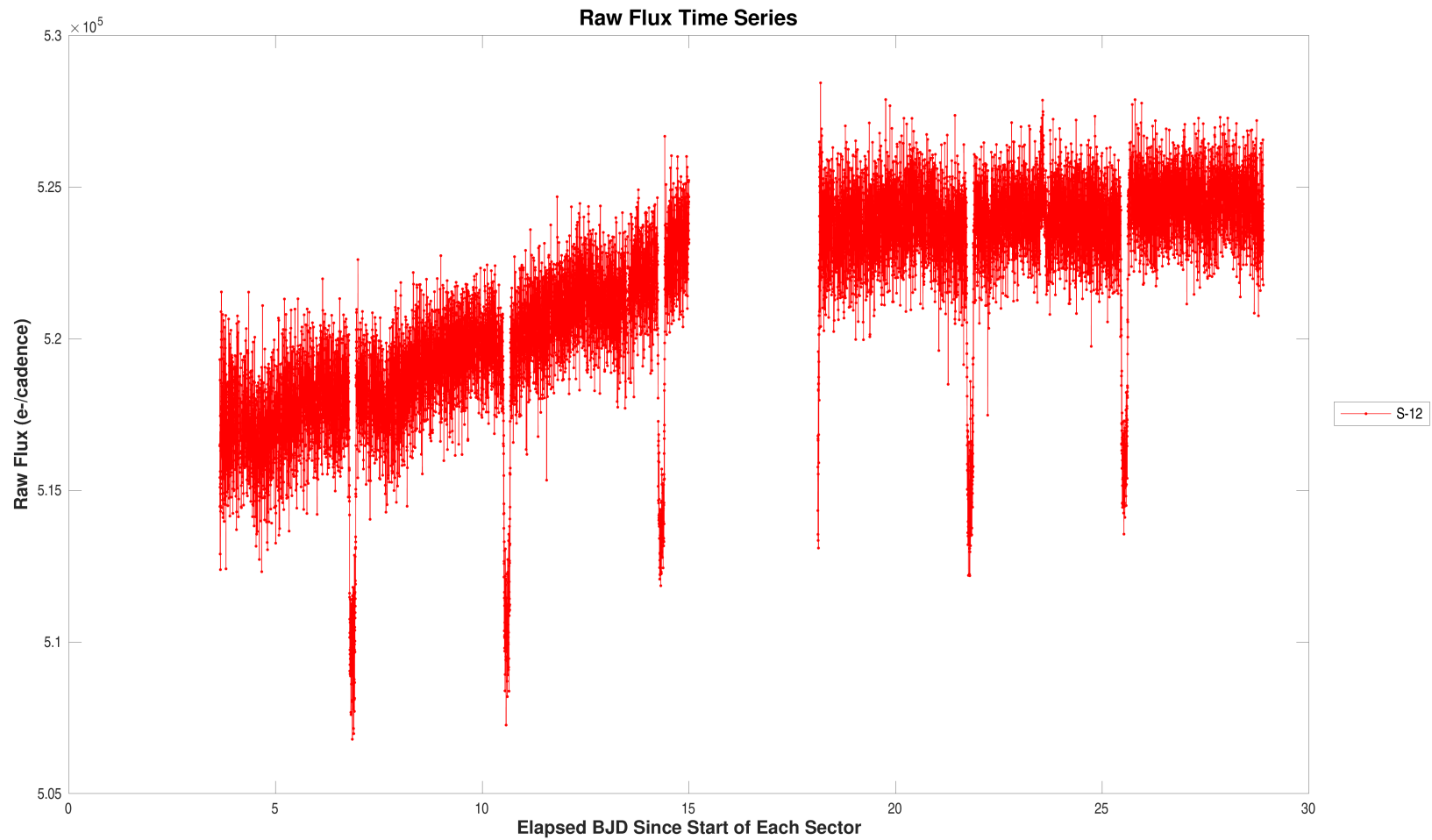
Summary plot of raw flux time series. For the data of sector 12, target table 161, start BJD is 2458624.
Open `./summary-plots/0000000066818296-00-raw-flux-12-161.fig`

4   Dashboards

Planet Candidate 1

Model Fitter	**Stellar Radius** 1.6 ± 0.0 Solar units	**Core Aperture Correlation Statistic** Value = 68.85 Significance = 100.00%	Ghost Diagnostic Test
	Period = 3.7 ± 0.0 days Depth = 17208 ± 134 ppm Planet Radius = 21.3 ± 0.1 Earth radii Semi-major Axis = 0.1 ± 0.0 AU Effective Stellar Flux = 1622.4 ± 0.1 Equilibrium Temperature = 1619 ± 0 Kelvin Chi-squared/DoF = 0.9 SNR = 135.7	**Halo Aperture Correlation Statistic** Value = 7.06 Significance = 100.00% **Core/Halo Ratio** Ratio = 9.76	

Eclipsing Binary Discrimination Test	**Odd-Even Depth Comparison Statistic** Value = 7.48e-02 Significance = 78.45%		**Offsets Relative to Out of Transit Centroid** Source RA Offset = 3.63e-03 ± 2.50e+00 arcsec (0.00 σ) Source Dec Offset = 7.12e-01 ± 2.50e+00 arcsec (0.28 σ) Source Offset Distance = 7.12e-01 ± 2.50e+00 arcsec (0.28 σ) **Offsets Relative to TIC Position** Source RA Offset = 8.63e-01 ± 2.50e+00 arcsec (0.35 σ) Source Dec Offset = -7.80e-01 ± 2.50e+00 arcsec (-0.31 σ) Source Offset Distance = 1.16e+00 ± 2.50e+00 arcsec (0.47 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 = 7 Max Multiple Event Statistic = 134.8	Bootstrap Test

Summary of model fitter results and validation test results for target 66818296, 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	$0.0036 \pm 2.50e + 00$	$0.7116 \pm 2.50e + 00$	arcseconds
Offset/σ	0.00	0.28	
Offset Distance	$0.7116 \pm 2.50e + 00$		arcseconds
Offset Distance/σ	0.28		
3σ Radius	7.5079		arcseconds

Mean offset from the TIC RA and Dec

|	RA	Dec	Units
Offset	$0.8633 \pm 2.50e + 00$	$-0.7802 \pm 2.50e + 00$	arcseconds
Offset/σ	0.35	-0.31	
Offset Distance	$1.1636 \pm 2.50e + 00$		arcseconds
Offset Distance/σ	0.47		
3σ Radius	7.5069		arcseconds

Planet Candidate 1
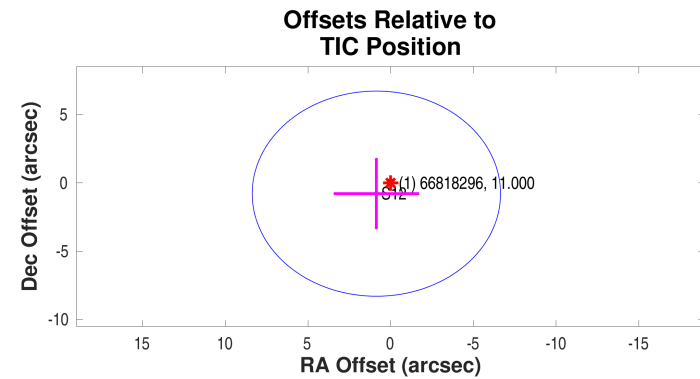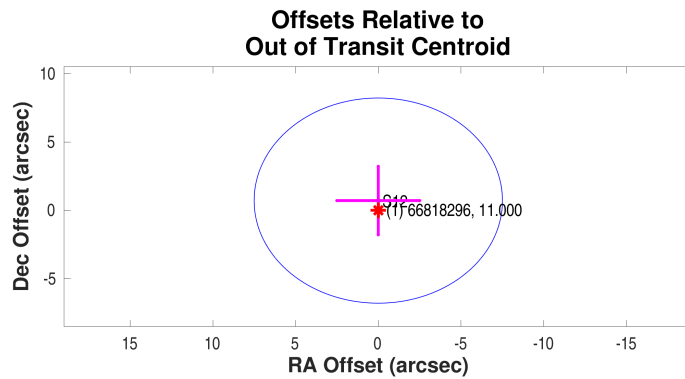
Difference image centroid offsets for target 66818296, planet candidate 1. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in RA and Dec with respect to the TC coordinates 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/0000000066818296-01-difference-image-centroid-offsets.fig`
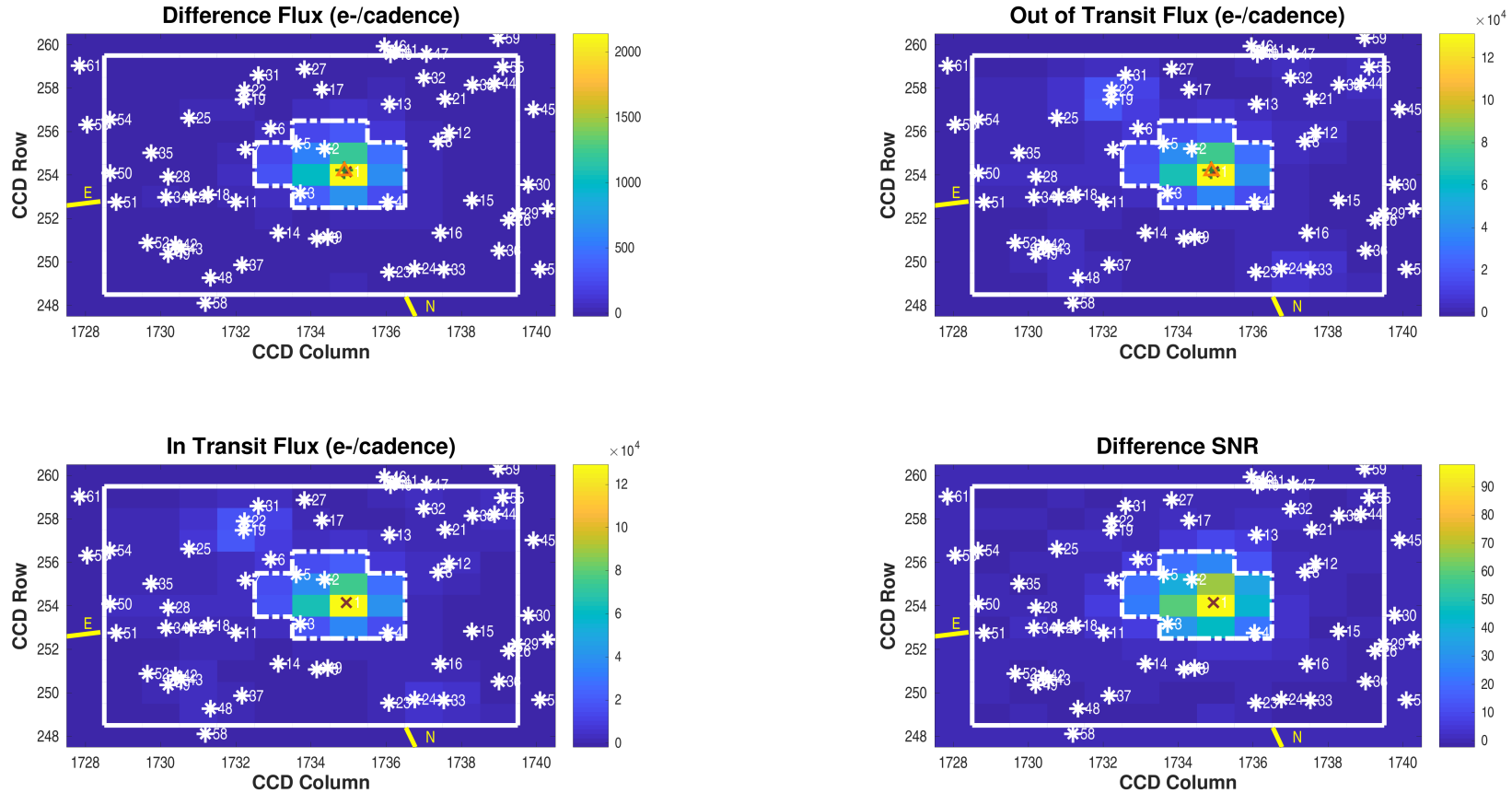
Planet Candidate 1
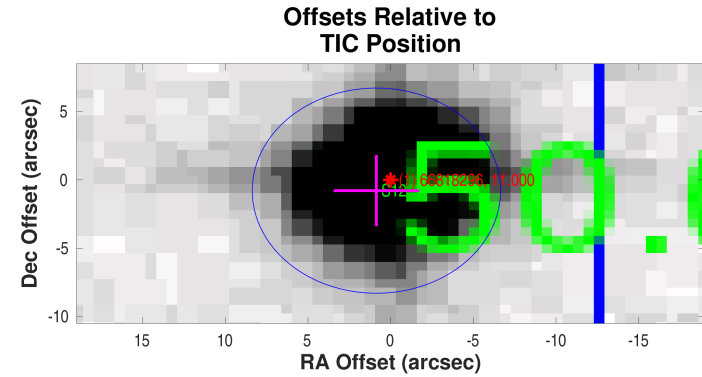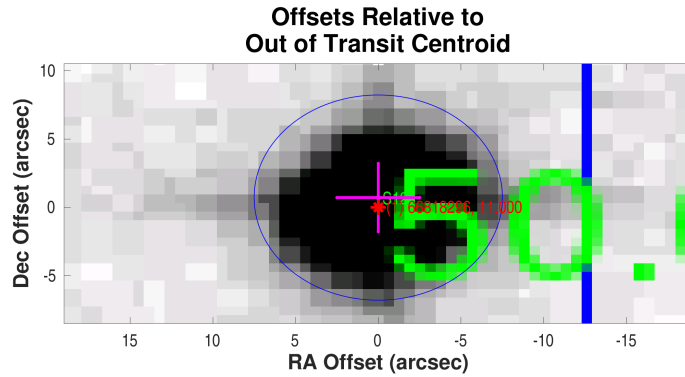
Difference image centroid offsets for target 66818296, planet candidate 1, diplayed on survey image for given target. Left: difference image PRF centroid offsets in RA and Dec with respect to the per sector out-of-transit centroids for the given target. Right: difference image PRF centroid offsets in 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/0000000066818296-01-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 12 / Target Pixel Table 161

Difference image for target 66818296, planet candidate 1, sector 12, target pixel table 161. Upper left: difference between mean flux out-of-transit and in-transit; upper right: mean out-of-transit flux; lower left: mean in-transit flux; lower right: difference between mean flux out-of-transit and in-transit after normalizing by the uncertainty in the difference for each pixel. The optimal aperture is outlined with a white dash-dotted line in each panel and the target mask is outlined with a solid white line. Symbol key: x: target position from TIC RA and Dec converted to CCD coordinates via motion polynomials; *: position of nearby TIC objects converted to CCD coordinates via motion polynomials; +: PRF-fit location of target from out-of-transit image; triangle: PRF-fit location of transit source from the difference image. Number of transits = 5; number of valid in-transit cadences = 498; number of in-transit cadence gaps = 3; number of valid out-of-transit cadences = 1311; number of out-of-transit cadence gaps = 19. Difference image quality metric = 1.00 (good).
Open ./planet-01/difference-image/0000000066818296-01-difference-image-12-161.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	$254.22 \pm 4.64e-05$	$1734.88 \pm 4.75e-05$	pixels	$239.96253325 \pm 9.45e-07$	$-28.06219718 \pm 9.54e-07$	degrees
Difference Image Centroid	$254.18 \pm 5.54e-03$	$1734.89 \pm 5.61e-03$	pixels	$239.96253439 \pm 3.18e-05$	$-28.06199951 \pm 3.18e-05$	degrees
Offset	$-0.0360 \pm 5.54e-03$	$0.0097 \pm 5.61e-03$	pixels	$0.0036 \pm 1.01e-01$	$0.7116 \pm 1.15e-01$	arcseconds
Offset$/\sigma$	-6.50	1.74		0.04	6.20	
Offset Distance	$0.0373 \pm 5.62e-03$		pixels	$0.7116 \pm 1.15e-01$		arcseconds
Offset Distance$/\sigma$	6.64			6.20		

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

	Row	Column	Units	RA	Dec	Units
TIC Reference Centroid	$254.15 \pm 1.61e-04$	$1734.94 \pm 1.57e-04$	pixels	$239.96226265 \pm 0.00e+00$	$-28.06178278 \pm 0.00e+00$	degrees
Difference Image Centroid	$254.18 \pm 5.54e-03$	$1734.89 \pm 5.61e-03$	pixels	$239.96253439 \pm 3.18e-05$	$-28.06199951 \pm 3.18e-05$	degrees
Offset	$0.0305 \pm 5.54e-03$	$-0.0535 \pm 5.61e-03$	pixels	$0.8633 \pm 1.01e-01$	$-0.7802 \pm 1.15e-01$	arcseconds
Offset$/\sigma$	5.50	-9.55		8.54	-6.80	
Offset Distance	$0.0616 \pm 5.72e-03$		pixels	$1.1636 \pm 1.09e-01$		arcseconds
Offset Distance$/\sigma$	10.77			10.66		

5.2 Difference Image TIC Key

Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
1	66818296	11.000	239.96226265	-28.06178278	0.00
2	66818287	17.291	239.96397588	-28.06791832	22.75
3	66818306	16.427	239.97128121	-28.05800582	31.71
4	66753205	17.170	239.95793988	-28.05335826	33.29
5	66818282	16.250	239.96815555	-28.06995450	34.87
6	66818271	16.568	239.97110836	-28.07430248	53.11
7	66818279	15.481	239.97672800	-28.07002300	54.70
8	66753225	14.417	239.94527466	-28.06635032	56.42
9	66818329	15.769	239.97024222	-28.04670218	59.92
10	66818330	17.055	239.97213200	-28.04663100	62.92
11	66818308	18.183	239.98225094	-28.05774959	65.14
12	66753227	18.167	239.94285484	-28.06811799	65.74
13	66753241	17.259	239.95019827	-28.07671216	66.01
14	66818323	18.106	239.97784814	-28.04911510	67.31
15	66753203	17.496	239.94435525	-28.05126619	68.33
16	66753191	15.969	239.95188934	-28.04441973	70.66
17	66753250	17.446	239.95990929	-28.08215369	73.72
18	66818299	16.264	239.98615313	-28.06029436	76.08
19	66818259	12.885	239.97319231	-28.08205931	80.83
20	66818300	17.160	239.98906013	-28.06026778	85.30
21	66753240	17.631	239.94088600	-28.07635500	85.81
22	66818256	15.934	239.97237500	-28.08424400	87.01
23	66818340	17.429	239.96313260	-28.03652699	90.96
24	66753179	14.956	239.95873027	-28.03661100	91.31
25	66818265	16.073	239.98334830	-28.07920939	91.78
26	66753194	16.269	239.93998337	-28.04547766	91.95
27	66818254	16.610	239.96112500	-28.08757600	92.93
28	66818291	14.835	239.99118000	-28.06573100	92.96
29	66753197	17.729	239.93814739	-28.04690373	93.48
30	66753204	16.054	239.93412188	-28.05343615	94.31
31	66818255	17.654	239.96900065	-28.08746403	94.90
32	66753249	17.277	239.94270801	-28.08197611	95.62
33	66753178	13.967	239.95415157	-28.03555691	97.87
34	66818298	17.724	239.99307605	-28.06092012	97.94
35	66818276	16.583	239.99209166	-28.07193633	101.57
36	66753183	17.574	239.94384137	-28.03847458	102.30
37	66818336	16.258	239.98612324	-28.04249489	102.80
38	66753243	17.281	239.93545213	-28.07890415	105.13

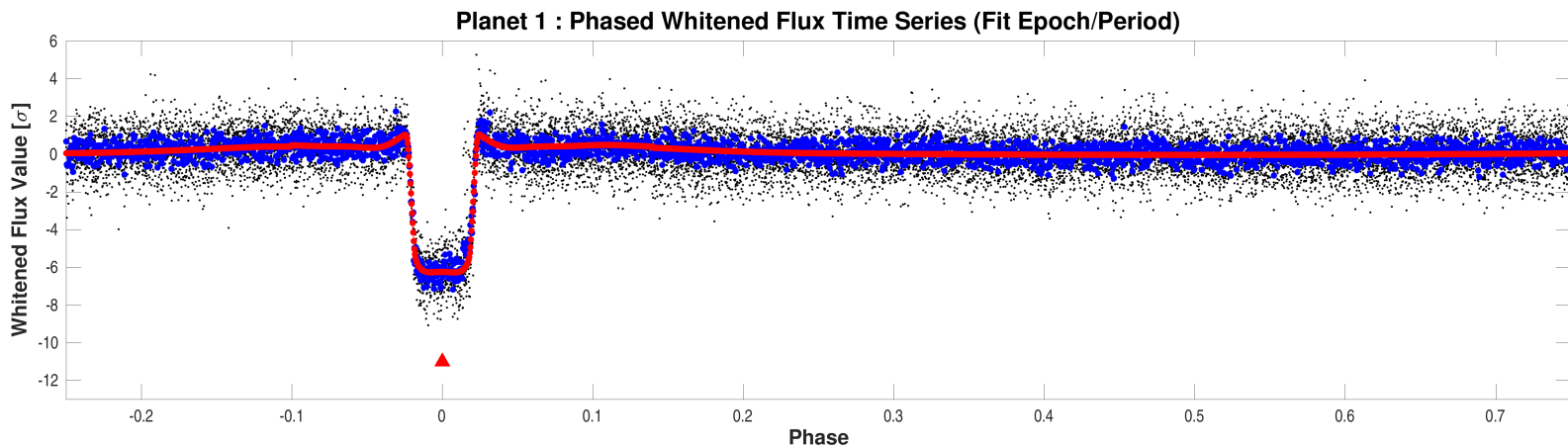| Index	Catalog ID	Mag	RA (degrees)	Dec (degrees)	Distance (arcsec)
39	66753198	17.966	239.93288715	-28.04712680	107.20
40	66753261	17.346	239.94624585	-28.08860940	109.16
41	66753265	17.497	239.94498900	-28.08940300	113.57
42	66818322	15.484	239.99520215	-28.04928675	113.90
43	66818325	15.641	239.99464900	-28.04808400	114.09
44	66753242	15.385	239.93180692	-28.07863276	114.19
45	66753231	15.215	239.92756267	-28.07128243	115.42
46	66753268	17.002	239.94654600	-28.09074662	115.61
47	66753260	14.898	239.94043934	-28.08767123	116.16
48	66818338	14.752	239.99212154	-28.04037180	122.22
49	66818328	17.730	239.99708738	-28.04724305	122.39
50	66818286	15.824	240.00018595	-28.06829059	122.73
51	66818297	16.836	240.00144800	-28.06117100	124.50
52	66818321	16.947	239.99954119	-28.05053609	125.16
53	66753174	17.296	239.93870985	-28.03286717	128.20
54	66818261	15.707	239.99614750	-28.08112586	128.20
55	66753251	17.602	239.92924351	-28.08229496	128.28
56	66818262	16.904	240.00017175	-28.08057325	138.13
57	66753175	16.235	239.93166600	-28.03448900	138.21
58	66818344	15.027	239.99485608	-28.03446352	142.81
59	66753263	17.292	239.92774101	-28.08935934	147.93
60	66753272	16.630	239.93229005	-28.09412840	150.42
61	66818240	16.754	239.99693935	-28.09490741	162.34
62	66818351	17.480	239.99555880	-28.02738571	162.86
63	66753273	15.311	239.92439330	-28.09455191	168.49
64	66818241	12.900	240.00057565	-28.09483220	170.20

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

6   Phased Light Curves
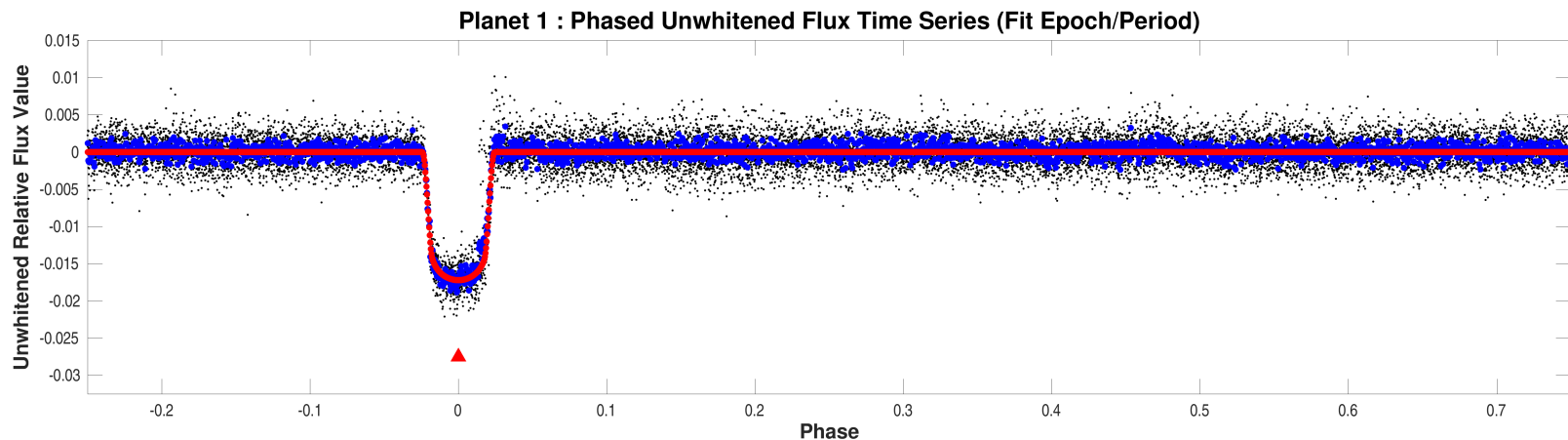
Phased unwhitened flux time series is plotted in black dots. When all transits fit completed with full or secondary convergence, the phase is determined with the fitted epoch and period; otherwise, the phase is determined with the TPS epoch and period. The values of the phased unwhitened flux time series 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/0000000066818296-01-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/0000000066818296-01-phased-whitened-flux-time-series.fig`

Planet: 1   Phased Unwhitened Flux Time Series by Sector
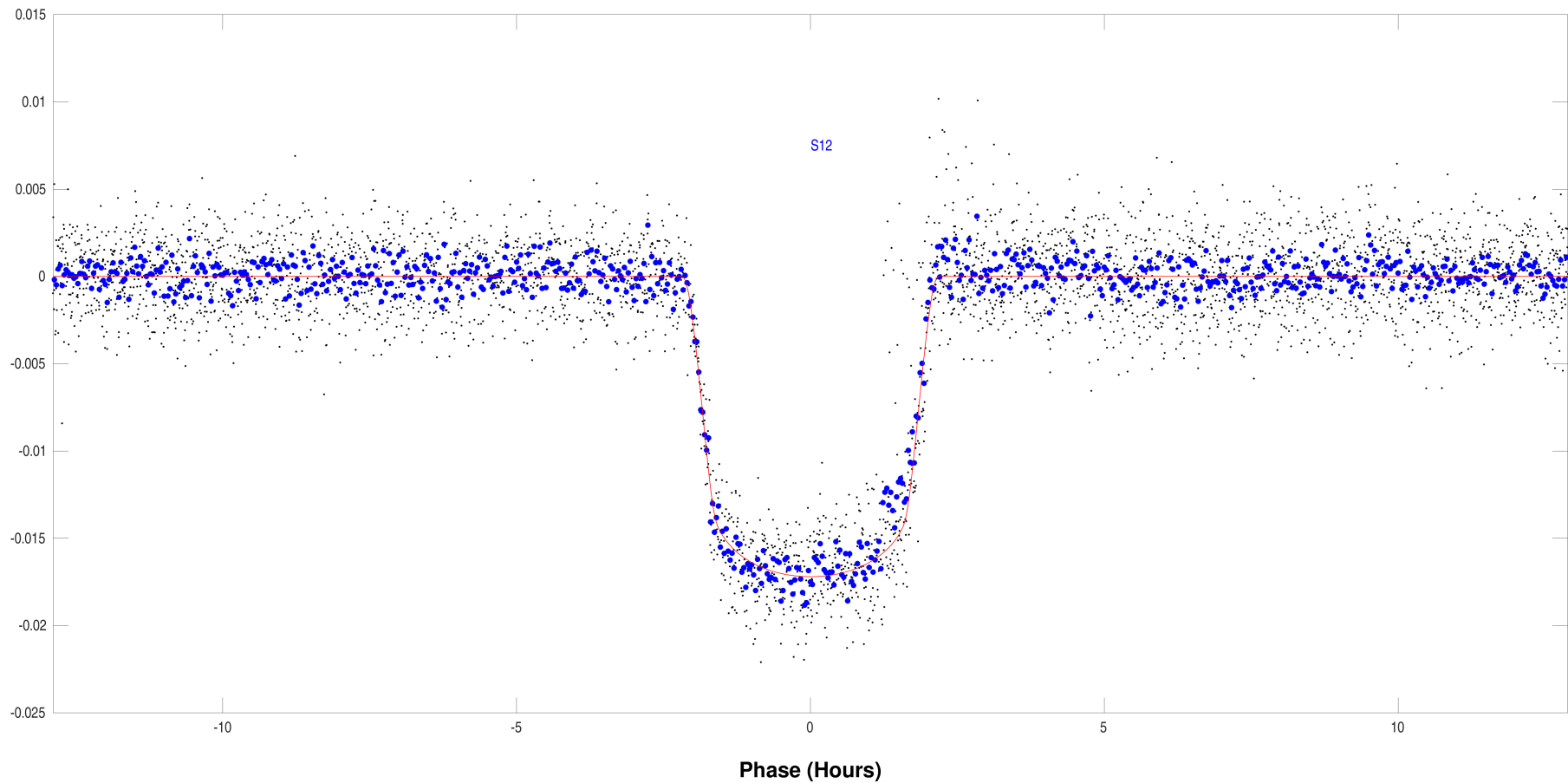
Phased unwhitened flux time series by sector for target 66818296, planet candidate 1. Period = 3.7353 days; transit epoch = 1627.1262 BTJD.
Open `./summary-plots/0000000066818296-01-phased-unwhitened-flux-time-series-by-sector.fig`
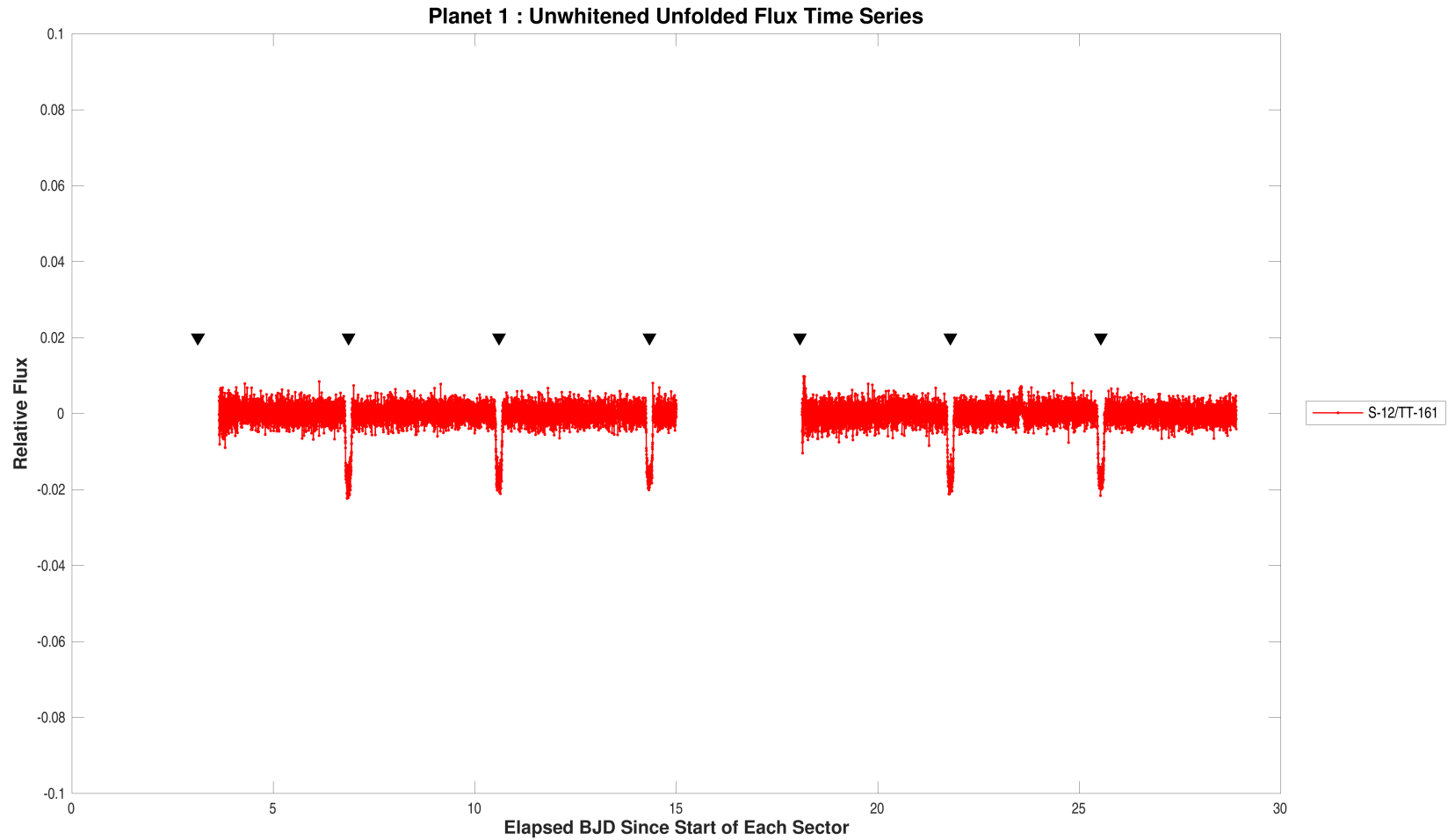
7   Planet Candidate 1

7.1   Model Fitter: All Transits

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

TCE Parameter	Value	Units
Trial Transit Pulse Duration	3.5	hours
Transit Epoch	1627.1178380	TJD
Orbital Period	3.7361095	days
Maximum SES	62.0	
Maximum MES	134.8	
Robust Statistic	124.1	
Chi Square Goodness of Fit Statistic (DoF)	821.1 (520)	
Chi Square2 Statistic (DoF)	25.7 (1426.9)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

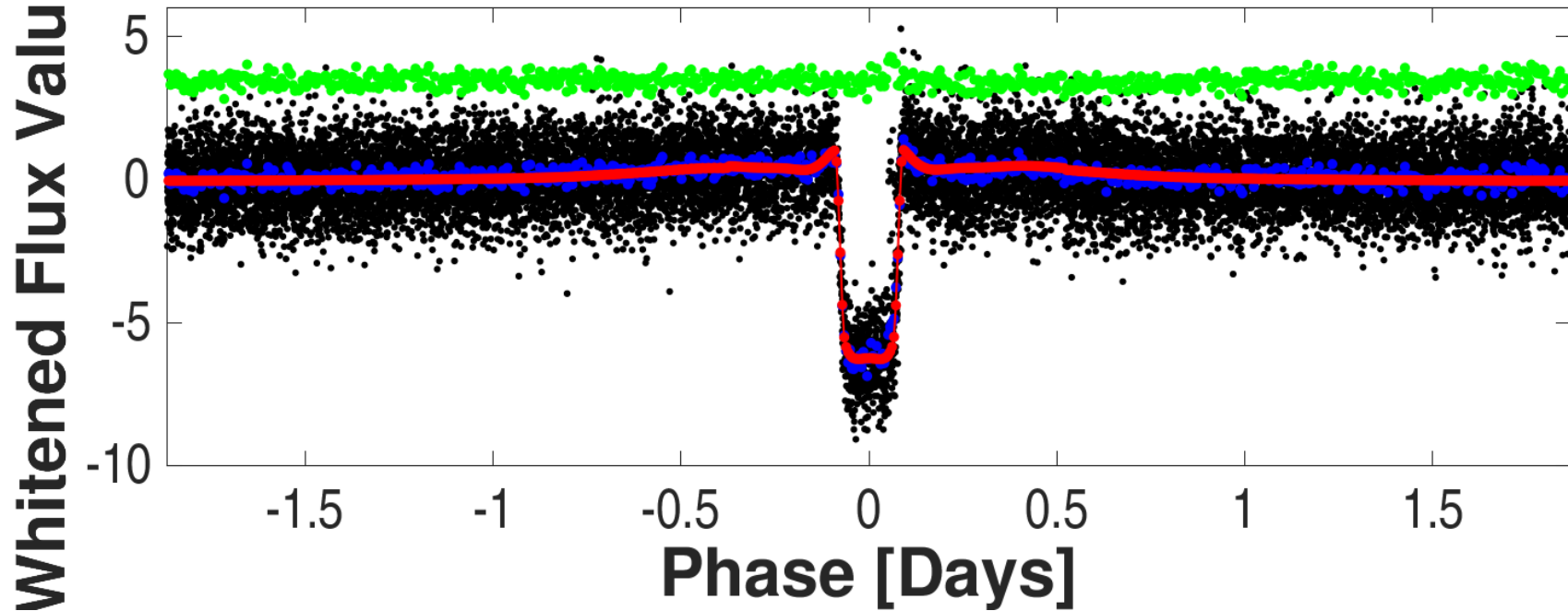| Parameter	Value	Uncertainty	Units
SNR	135.7		
Orbital Period	3.7352852	1.4822e-04	days
Transit Epoch	1627.1262207	5.8389e-04	BTJD
Impact Parameter	0.3251	8.4419e-02	
Planet Radius to Star Radius Ratio	0.1241202	7.8821e-04	
Semi-major Axis to Star Radius Ratio	7.1824	2.1654e-01	
Planet Radius	21.2738	1.3510e-01	Earth radii
Semi-major Axis	0.0516	1.3649e-06	AU
Effective Stellar Flux	1622.4309	8.5843e-02	Goldilocks
Equilibrium Temperature	1619	2.1411e-02	Kelvin
Stellar Density	0.3568	3.2268e-02	Solar density
Transit Depth	17208	1.3355e+02	ppm
Transit Duration	4.2959	3.5565e-02	hours
Transit Ingress Duration	0.5272	3.5379e-02	hours
Eccentricity	0.0000	0.0000e+00	
Peri Longitude	0.0000	0.0000e+00	degrees
Model Chi Square Statistic (DoF)	3026.7 (3314.9)		
Model Chi Square Goodness of Fit Statistic (DoF)	433.0 (792)		
Model Chi Square2 Statistic (DoF)	17.6 (5)		

DoF: Degrees of Freedom

Flux time series for CatId 66818296, Planet candidate 1 in the unwhitened domain. For the data of Sector-12/TargetTableId-161, start BJD is 2458624. Transit event markers indicate the location of transits of the given planet candidate. All transits fit completed with full convergence.
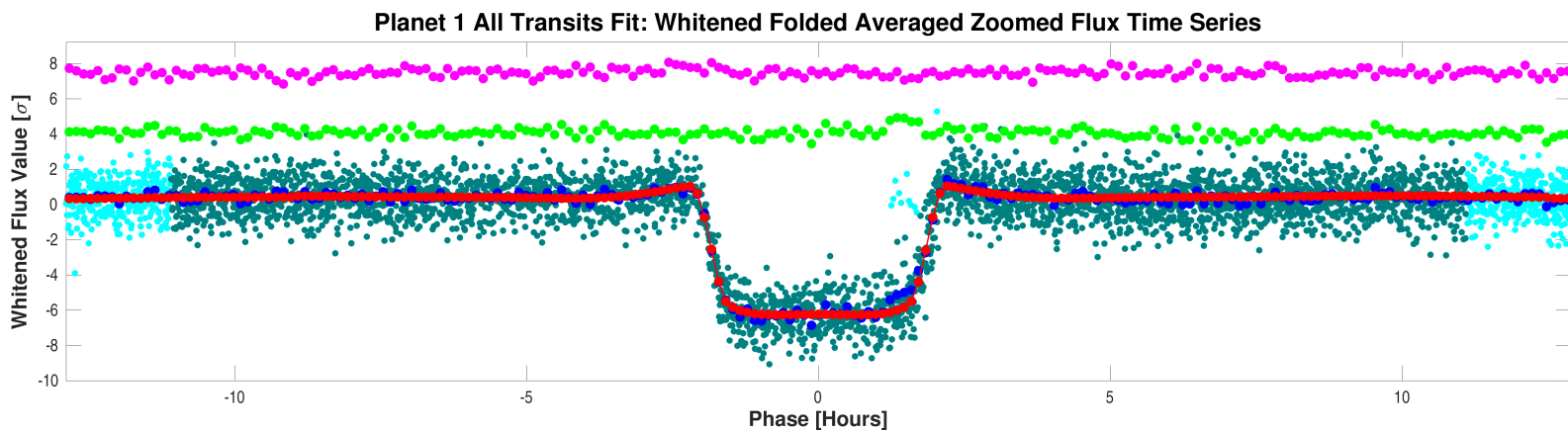
Open ./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000066818296-01-all-unwhitened-12-161.fig

All Transits Fit: Whitened Folded Averaged Flux T

Folded flux time series for CatId 66818296, 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/0000000066818296-01-all-whitened.fig

Planet 1 All Transits Fit: Whitened Folded Averaged Zoomed Flux Time Series

Folded flux time series for CatId 66818296, 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/0000000066818296-01-all-whitened-zoomed.fig`

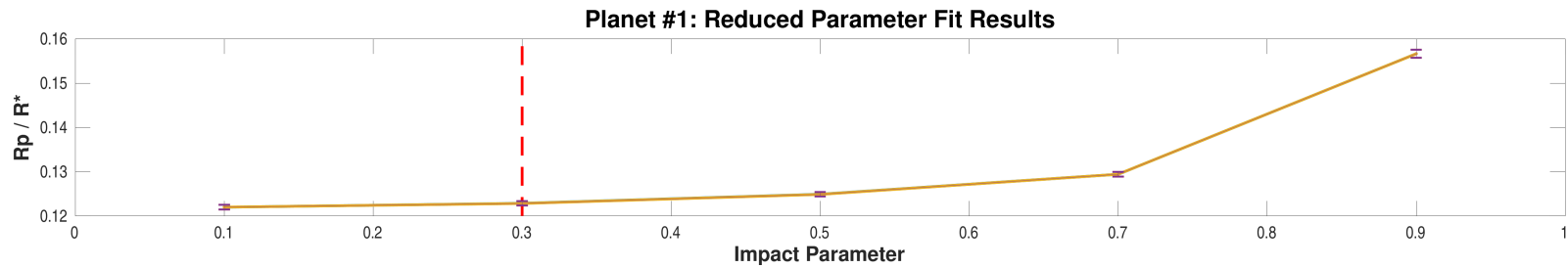## 7.2   Model Fitter: Reduced Parameter Fit Results

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	137.9	3615.2	0.1220017	5.0090e-04	7.5563	2.6714e-02	16876	1.3773e+02	4.2362	1.4889e-02
0.30	137.1	3607.5	0.1228699	5.0814e-04	7.2532	2.6572e-02	16906	1.3895e+02	4.2767	1.5590e-02
0.50	139.8	3660.9	0.1249213	5.1452e-04	6.6103	2.6558e-02	16988	1.3897e+02	4.3797	1.7538e-02
0.70	136.9	3677.0	0.1294331	5.5905e-04	5.5192	2.7042e-02	17235	1.4749e+02	4.6404	2.2775e-02
0.90	134.5	4384.8	0.1566286	9.2469e-04	4.0202	3.3021e-02	19057	1.8764e+02	5.3214	4.2454e-02

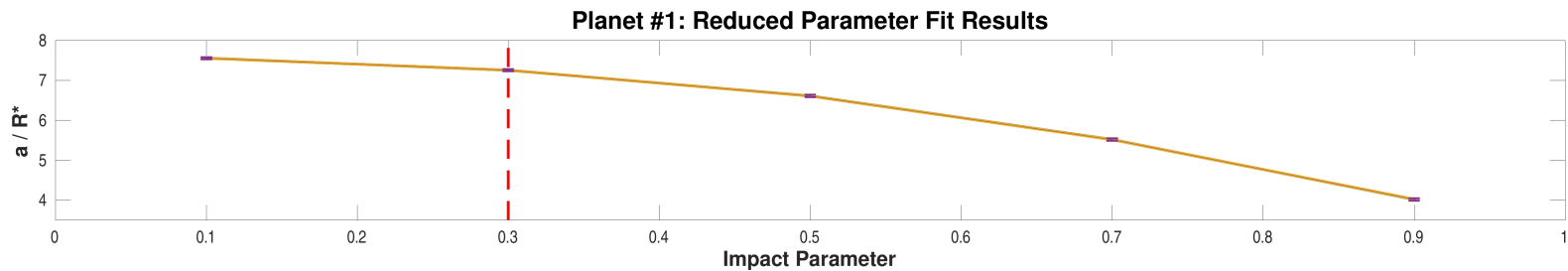Highlighted row is the best reduced-parameter model fit.
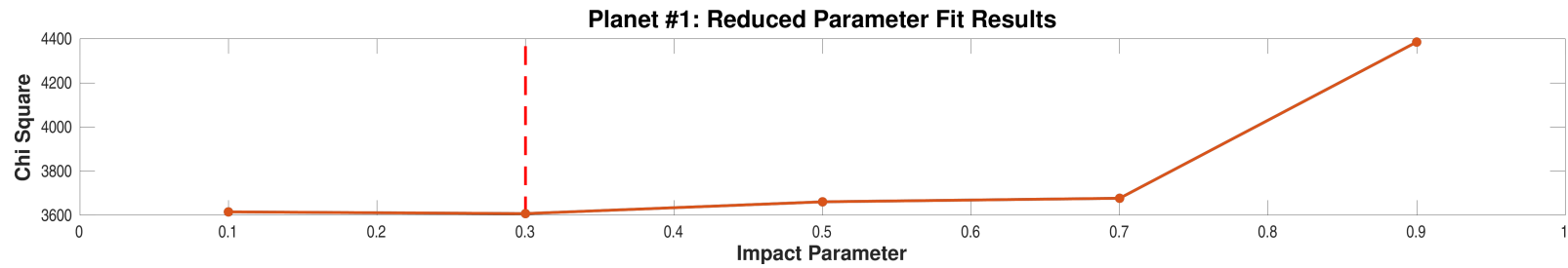
Model chi squares of reduced parameter fits vs. impact parameter for CatId 66818296, Planet candidate 1. The fit result with the minimum chi square is marked with a dashed line in the plot.
Open `./planet-01/planet-search-and-model-fitting-results/reduced-parameter-fits/0000000066818296-01-reduced-fits-chi-square.fig`

Ratios of planet radius to star radius of reduced parameter fits vs. impact parameter for CatId 66818296, 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/0000000066818296-01-reduced-fits-rp-over-rstar.fig`

Ratios of semimajor axis to star radius of reduced parameter fits vs. impact parameter for CatId 66818296, 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/0000000066818296-01-reduced-fits-a-over-rstar.fig`
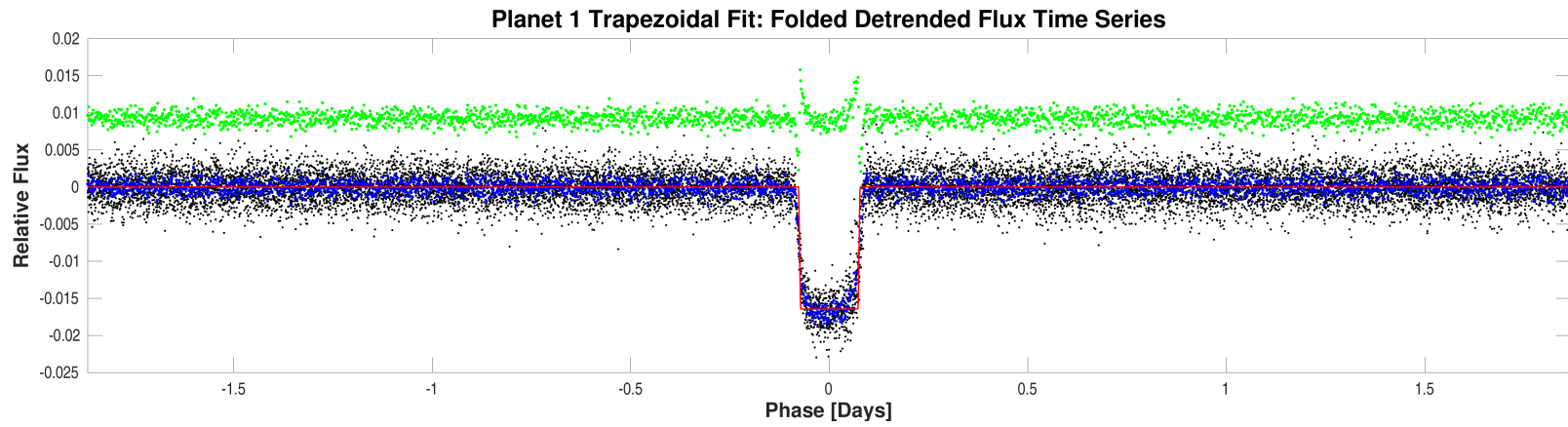
7.3   Model Fitter: Trapezoidal Fit Results

Model Characteristic	Name
Transit Model	trapezoidal_model
Limb Darkening Model	

| TCE Parameter	Value	Units
Trial Transit Pulse Duration	3.5	hours
Transit Epoch	1627.1178380	TJD
Orbital Period	3.7361095	days
Maximum SES	62.0	
Maximum MES	134.8	
Robust Statistic	124.1	
Chi Square Goodness of Fit Statistic (DoF)	821.1 (520)	
Chi Square2 Statistic (DoF)	25.7 (1426.9)	
Threshold for Desired PFA		

DoF: Degrees of Freedom

Parameter	Value	Uncertainty	Units
SNR	180.6		
Orbital Period	3.7361095		days
Transit Epoch	1627.1229355		BTJD
Transit Depth	16449		ppm
Transit Duration	4.2847		hours
Transit Ingress Duration	0.6908		hours
Model Chi Square Statistic (DoF)	16683.6 (4685)		

DoF: Degrees of Freedom

Folded detrended flux time series for CatId 66818296, Planet candidate 1 and folded trapezoidal model light curve.
Open ./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000066818296-01-all-trapezoidal.fig
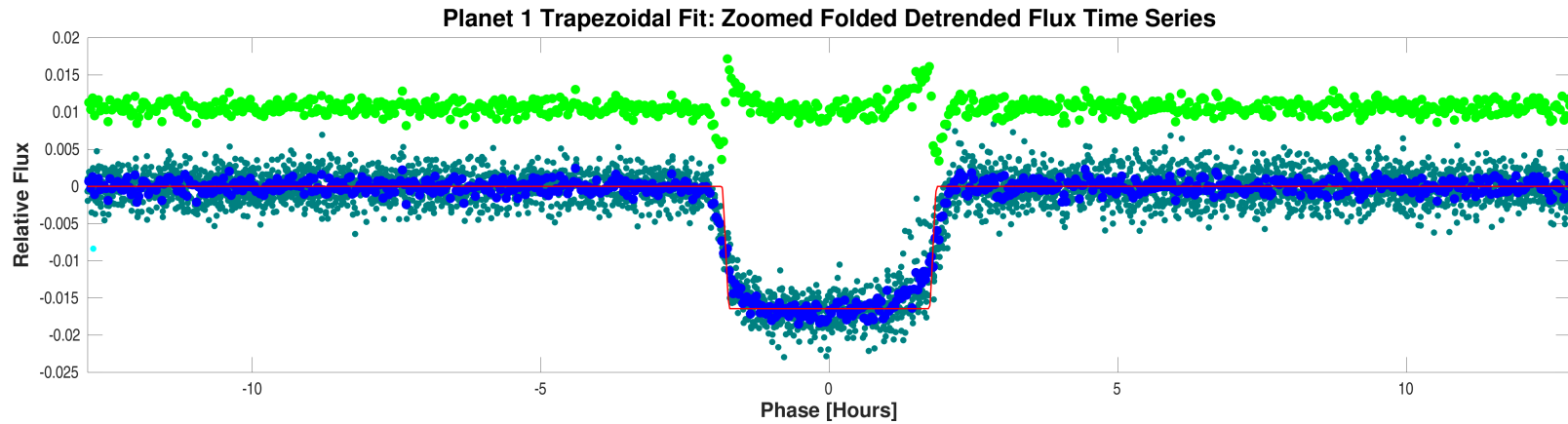
Zoomed folded detrended flux time series for CatId 66818296, Planet candidate 1 and folded trapezoidal model light curve.
Open ./planet-01/planet-search-and-model-fitting-results/trapezoidal-model-fit/0000000066818296-01-all-trapezoidal-zoomed.fig

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	3.7361		days		
Transit Duration	3.5		hours		
Maximum MES	134.8				
Secondary Phase	-0.63611		days		
Secondary MES	2.9				
Minimum Phase	1.7431		days		
Minimum MES	-2.8				
Median MES	0.1				
MAD MES	0.69359				
Robust Statistic	2.1				
Secondary Depth	600.3	2.5055e+02	ppm		
Geometric Albedo	1.9	8.1112e-01		1.1621	12.26
Planet Effective Temperature	2955	3.0842e+02	Kelvin	4.3315	0.00

7.4.2 Eclipsing Binary Discrimination Test

Result	Value	Value in Sigmas	Significance (%)
Odd Even Transit Depth Comparison Statistic	7.4783e-02	0.2735	78.45

7.4.3   Bootstrap Test

Result	Value
False Alarm Probability	0.0000e+00
Bootstrap Threshold for Desired PFA	10.2
MES Mean	-1.77
MES Standard Deviation	1.69
Transit Count	7

7.4.4   Ghost Diagnostic Test

Result	Value	Significance (%)
Maximum MES	134.8	
SNR	135.7	
Core Aperture Statistic	6.8854e+01	100.00
Halo Aperture Statistic	7.0579e+00	100.00
Ratio of Core/Halo Aperture Statistics	9.7557e+00	

7.4.5   Validation Test Figures

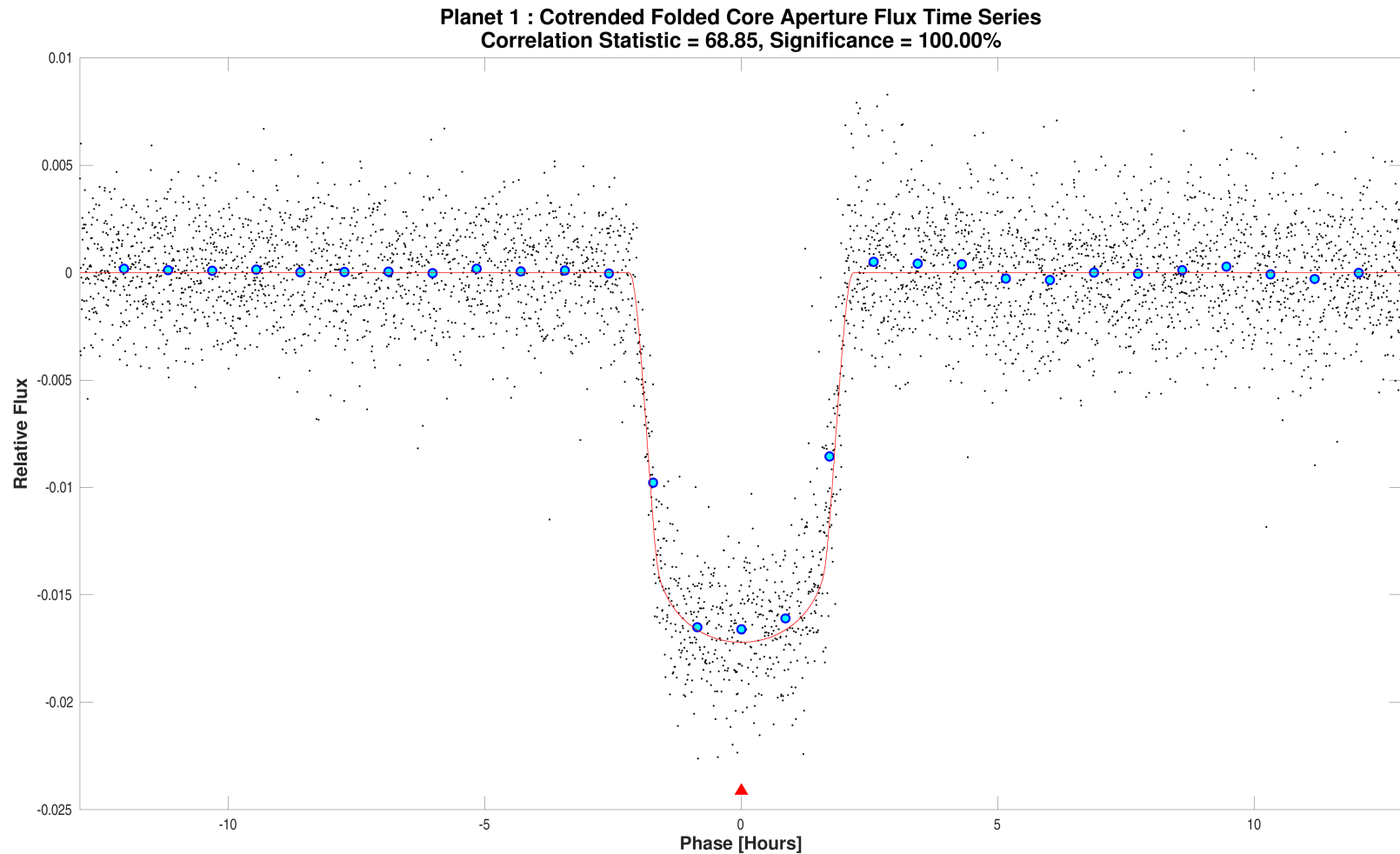**Planet 1 : Secondary MES vs. Phase**
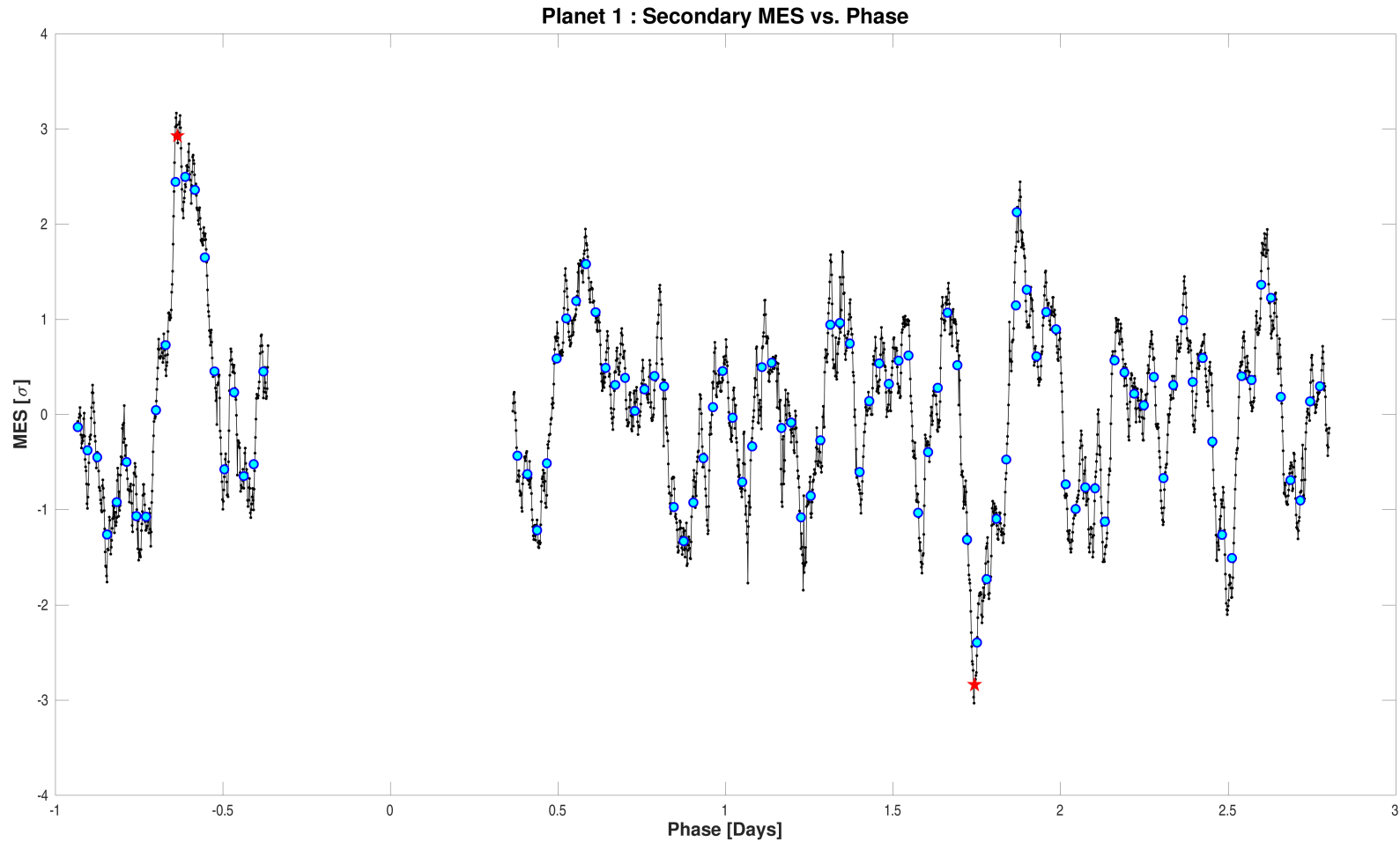
The primary event has been set to zero and both the max and min of the resulting MES vs. Phase are marked with a red star. The best matched pulse duration in hours is 3.5. The maximum secondary MES and corresponding phase are 2.9275 and -0.63611 days respectively. The minimum secondary MES and corresponding phase are -2.8376 and 1.7431 days respectively.

Open `./planet-01/report-summary/0000000066818296-01-weak-secondary-diagnostic.fig`

Bootstrap Results for Planet 1
**Max Multiple Event Sigma=134.8, False Alarm=0.00e+00**
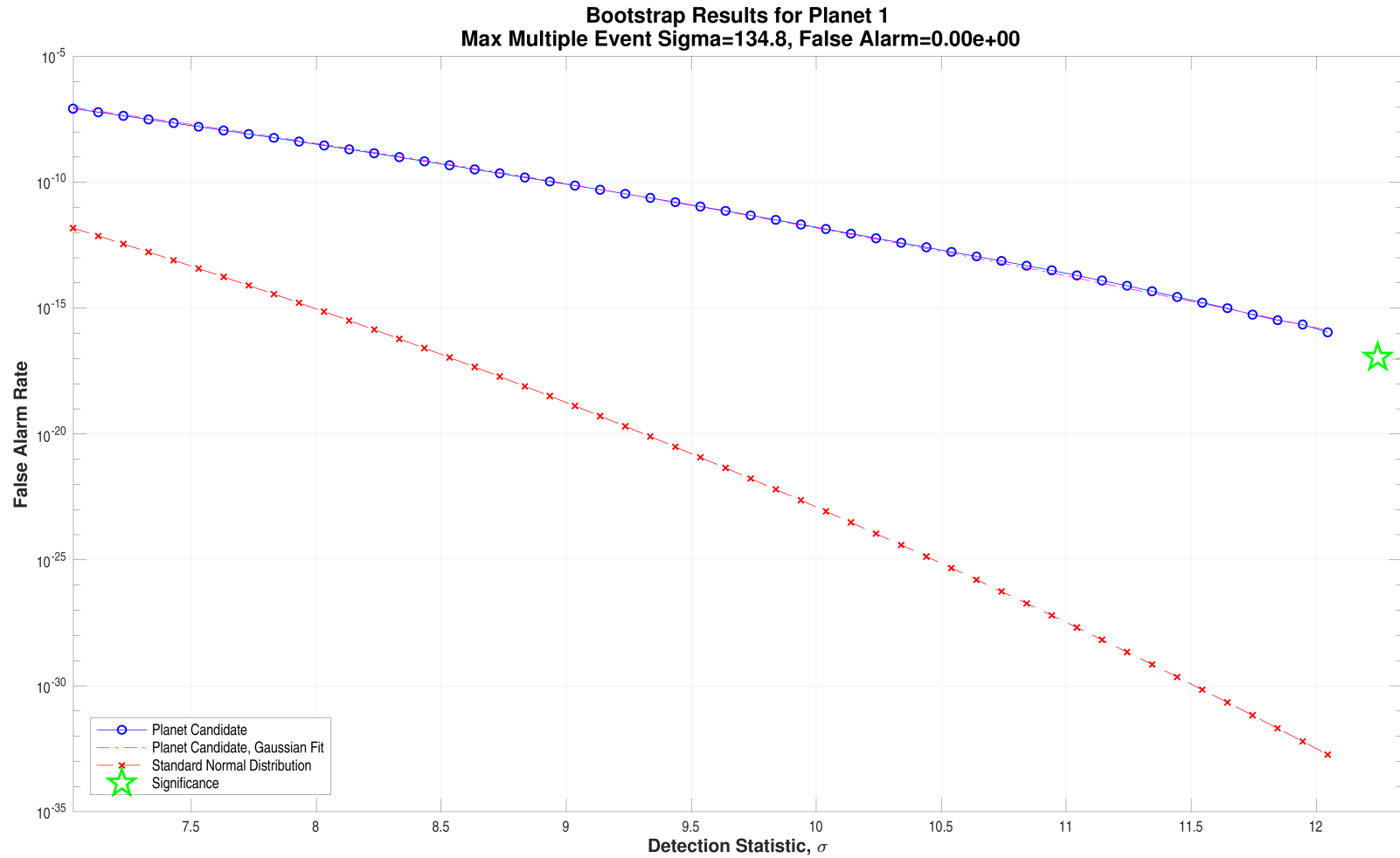
Bootstrap results for target 66818296, planet 1. Cumulative sum of the probabilities (derived from the histogram of counts) from upper tail to the search transit threshold; false alarm probability is indicated by the star. The Gaussian equivalent threshold for this false alarm probability is Inf. The threshold on this distribution that achieves the same false alarm rate as a 7.1 sigma threshold on a Gaussian distribution is 10.2311.
Open ./planet-01/bootstrap-results/0000000066818296-01-bootstrap-false-alarm.fig

Planet 1 : Cotrended Folded Core Aperture Flux Time Series
Correlation Statistic = 68.85, Significance = 100.00%

Optical ghost diagnostic core aperture flux time series for target 66818296, 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/0000000066818296-01-core-unwhitened-cotrended-zoomed-model.fig`

Planet 1 : Cotrended Folded Halo Aperture Flux Time Series
**Correlation Statistic = 7.06, Significance = 100.00%**
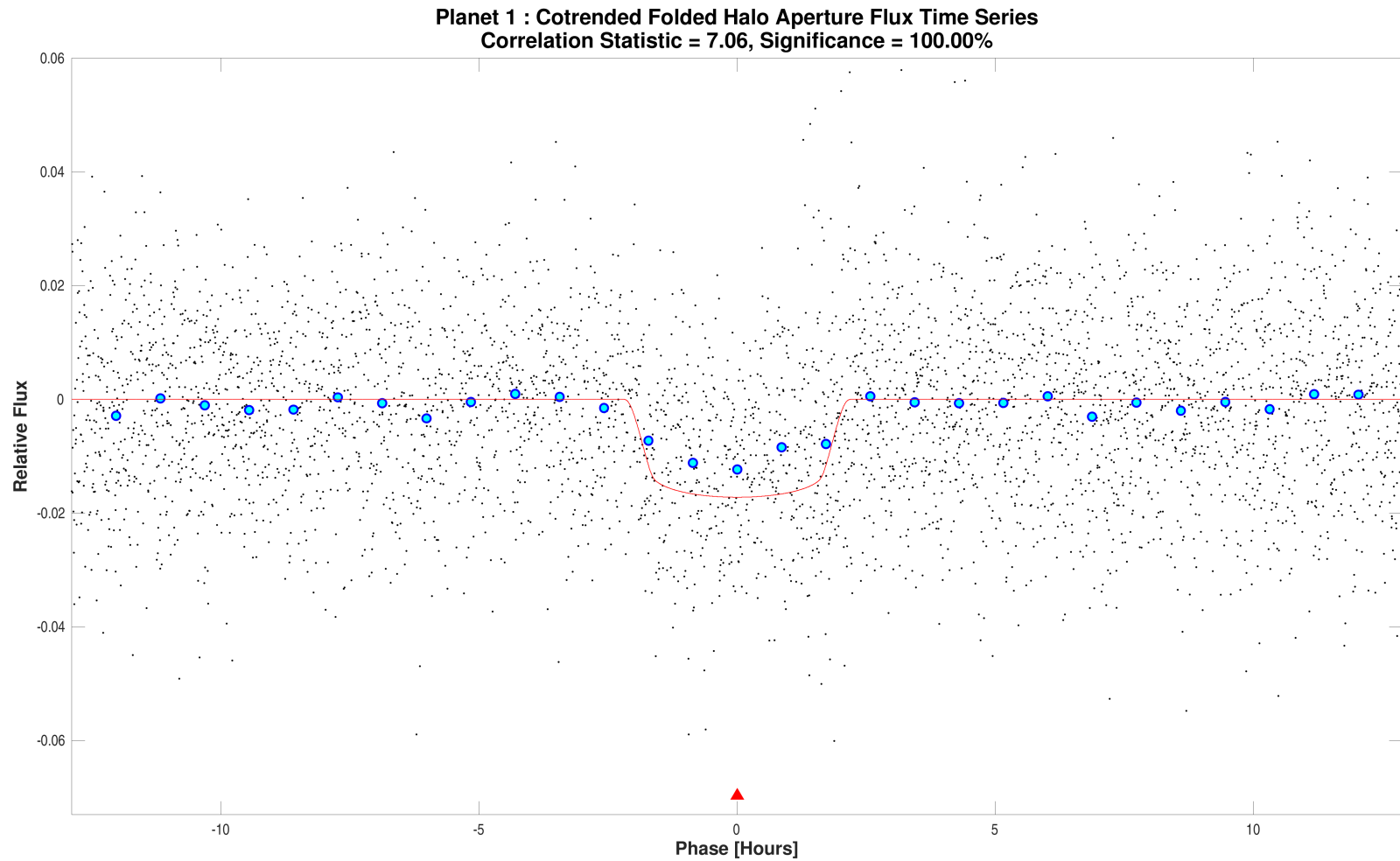
Optical ghost diagnostic halo aperture flux time series for target 66818296, planet candidate 1. The unwhitened time series is phase folded at the orbital period associated with the planet candidate and centered on the epoch of the first transit. The time series was first cotrended against spacecraft 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/0000000066818296-01-halo-unwhitened-cotrended-zoomed-model.fig`

Appendix A Planet Candidate 1

A.1 Model Fitter: All Transits
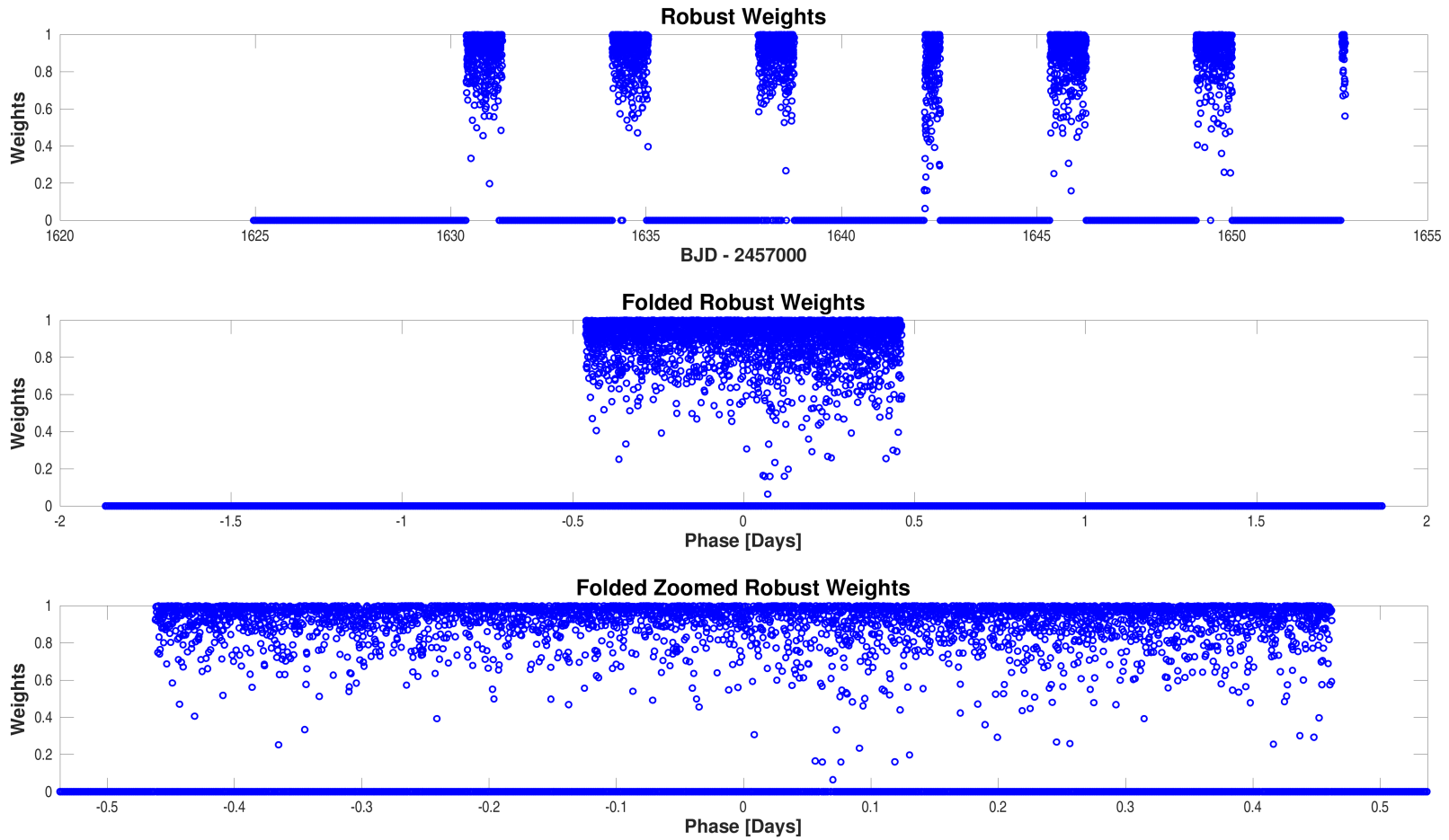
Robust weights distribution for CatId 66818296, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.
Open `./planet-01/planet-search-and-model-fitting-results/all-transits-fit/0000000066818296-01-all-robust-weights.fig`
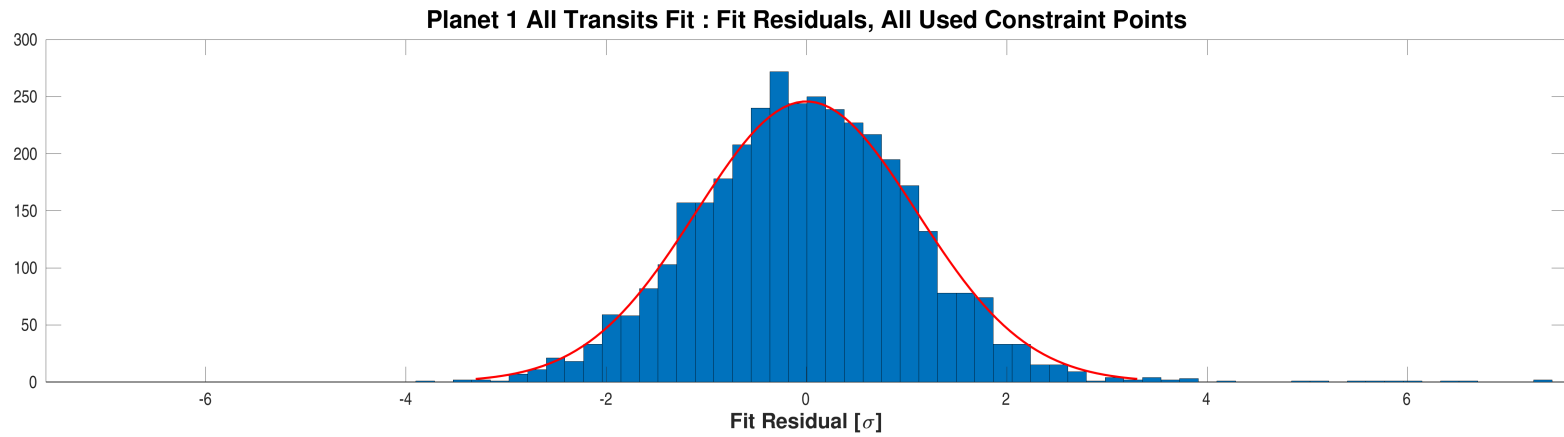
Planet 1 All Transits Fit : Fit Residuals, All Used Constraint Points

Fit residuals distribution for CatId 66818296, 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/0000000066818296-01-all-histo-used.fig
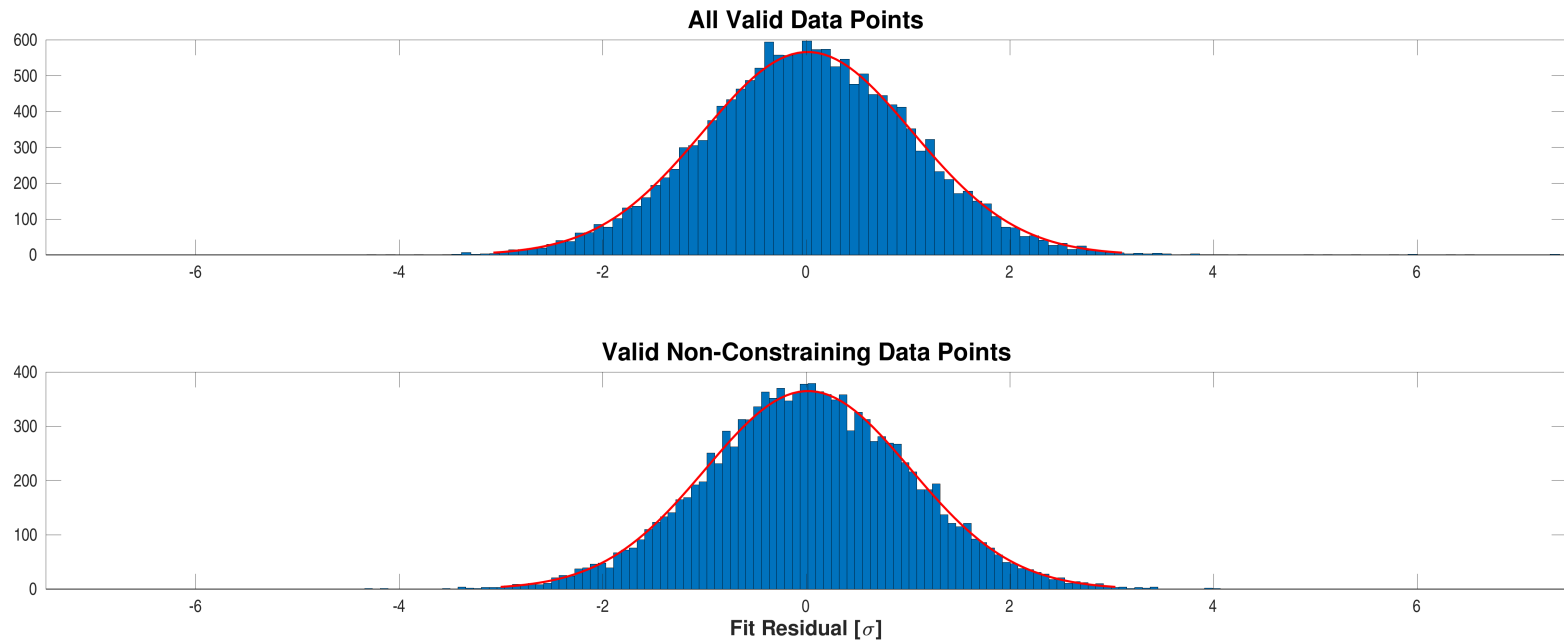
All Valid Data Points

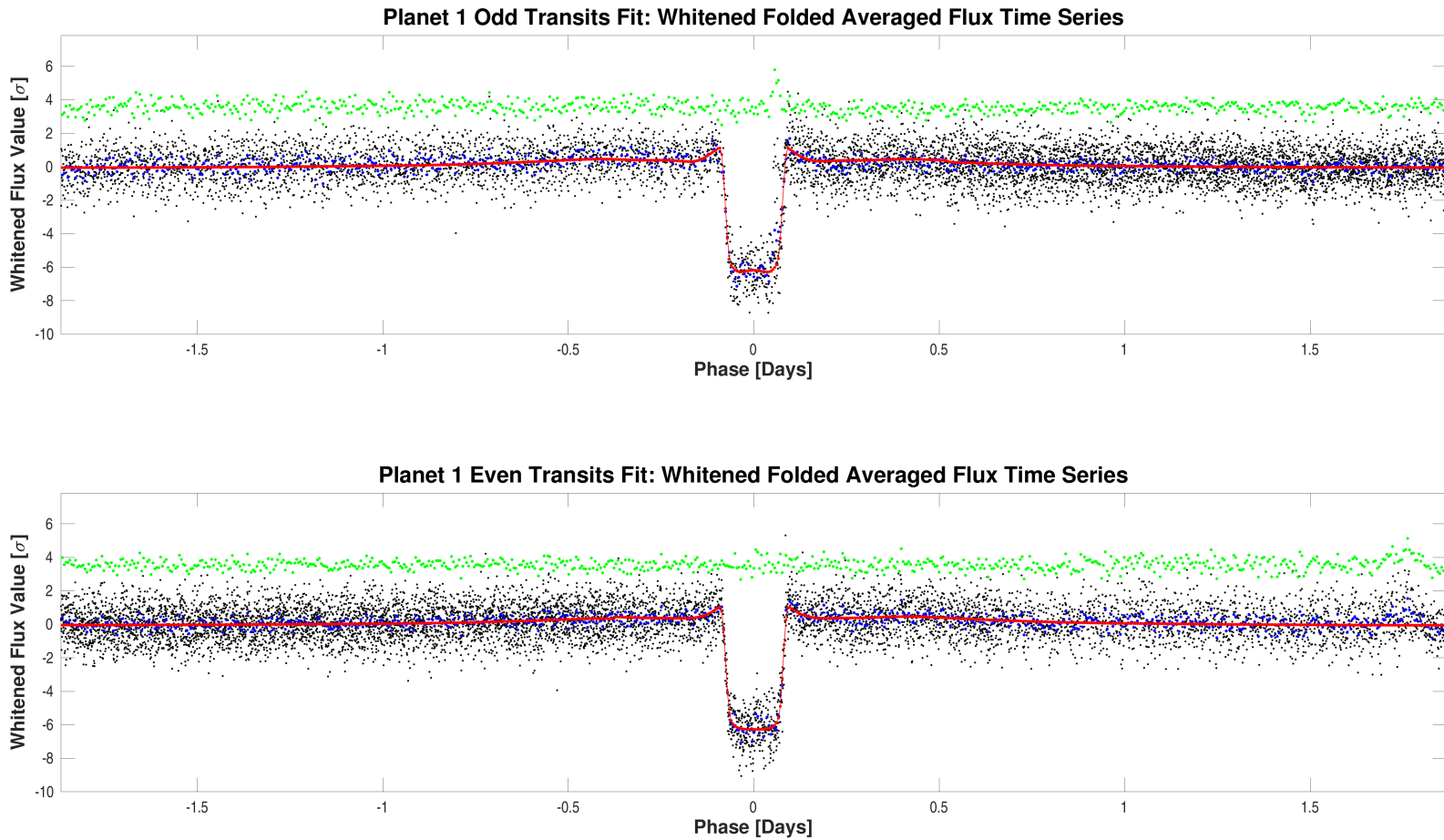**Valid Non-Constraining Data Points**

Fit residuals distribution for CatId 66818296, 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/0000000066818296-01-all-histo-all-and-unused.fig

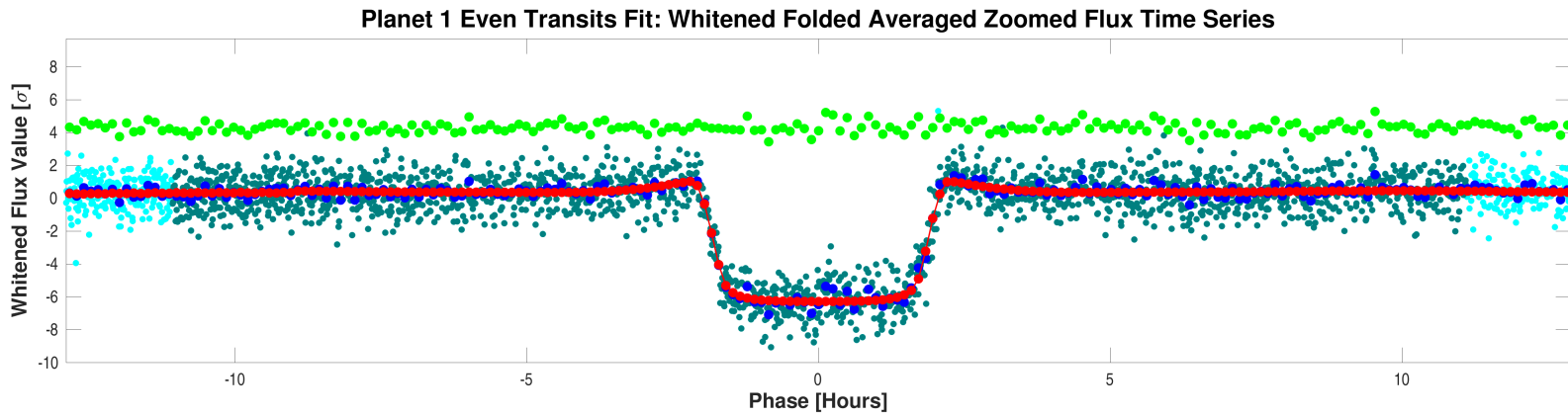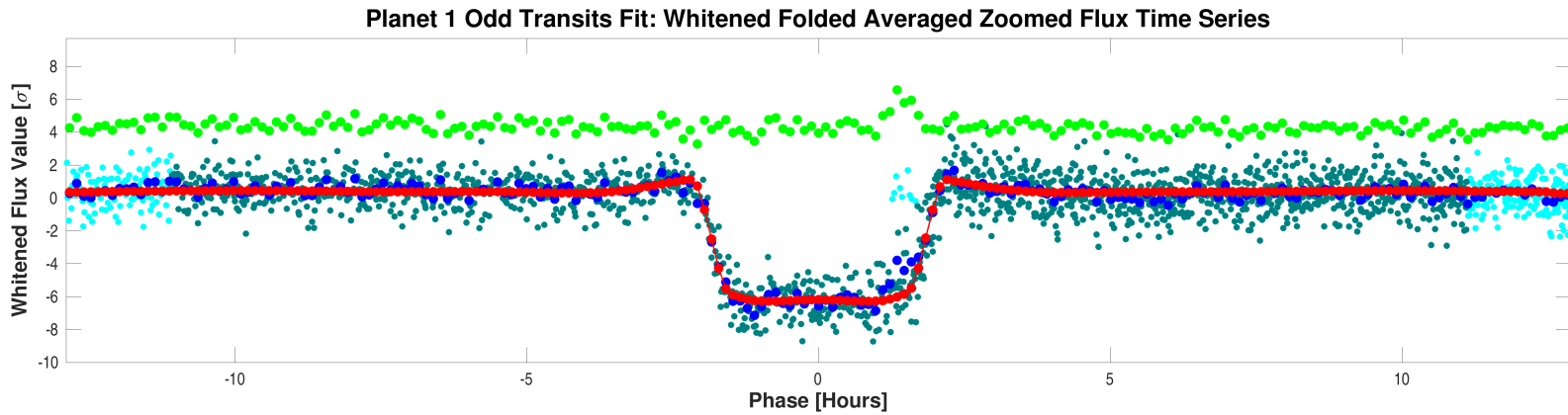## A.2   Model Fitter: Odd & Even Transits

Parameter	Odd Transits Value	Odd Transits Uncertainty	Even Transits Value	Even Transits Uncertainty	Units	Difference ‖Uncertainty‖
SNR	86.3		104.5			
Orbital Period	3.7354572	2.1696e-04	3.7353355	2.1924e-04	days	3.9442e-01
Transit Epoch	1627.1248781	9.5803e-04	1630.8619064	5.7761e-04	BTJD	1.5582e+00
Impact Parameter	0.3634	1.0618e-01	0.2997	1.2743e-01		3.8352e-01
Planet Radius to Star Radius Ratio	0.1242335	1.1884e-03	0.1240705	1.0547e-03		1.0259e-01
Semi-major Axis to Star Radius Ratio	7.1009	3.1158e-01	7.2160	2.9651e-01		2.6769e-01
Planet Radius	21.2932	2.0369e-01	21.2653	1.8077e-01	Earth radii	1.0259e-01
Semi-major Axis	0.0516	1.9979e-06	0.0516	2.0188e-06	AU	3.9442e-01
Effective Stellar Flux	1622.3313	1.2564e-01	1622.4018	1.2696e-01	Goldilocks	3.9442e-01
Equilibrium Temperature	1619	3.1338e-02	1619	3.1668e-02	Kelvin	3.9442e-01
Stellar Density	0.3447	4.5377e-02	0.3618	4.4599e-02	Solar density	2.6823e-01
Transit Depth	17164	2.0790e+02	17238	1.7515e+02	ppm	2.7346e-01
Transit Duration	4.2974	5.3796e-02	4.3042	4.7471e-02	hours	9.5126e-02
Transit Ingress Duration	0.5421	5.2949e-02	0.5198	4.7568e-02	hours	3.1327e-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)	3019.8 (3310.6)		3019.8 (3310.6)			

DoF: Degrees of Freedom

Planet 1 Odd Transits Fit: Whitened Folded Averaged Flux Time Series

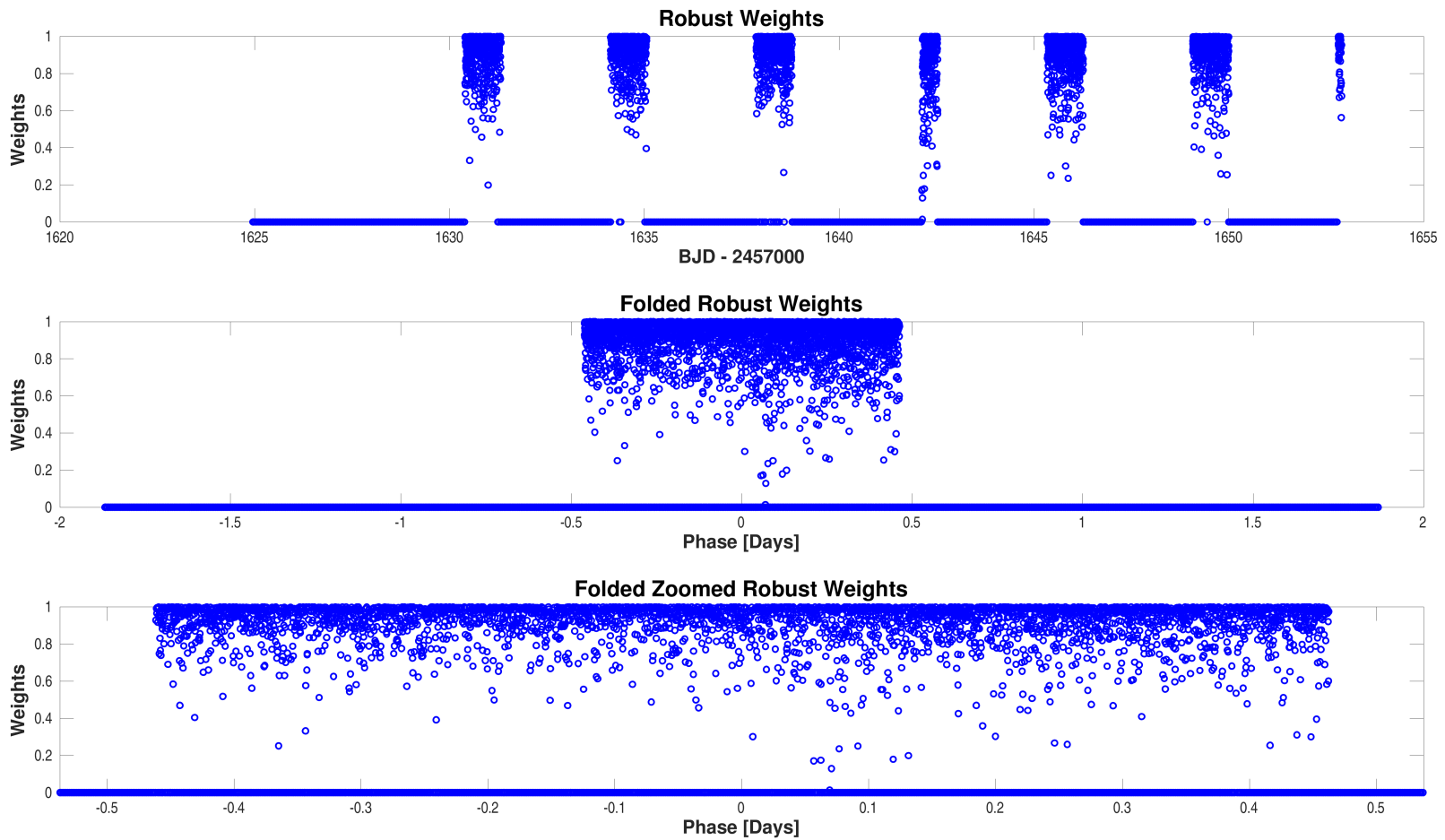**Planet 1 Even Transits Fit: Whitened Folded Averaged Flux Time Series**

Folded flux time series for CatId 66818296, 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/0000000066818296-01-odd-even-whitened.fig`

Planet 1 Odd Transits Fit: Whitened Folded Averaged Zoomed Flux Time Series

Planet 1 Even Transits Fit: Whitened Folded Averaged Zoomed Flux Time Series

Folded flux time series for CatId 66818296, 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/0000000066818296-01-odd-even-whitened-zoomed.fig
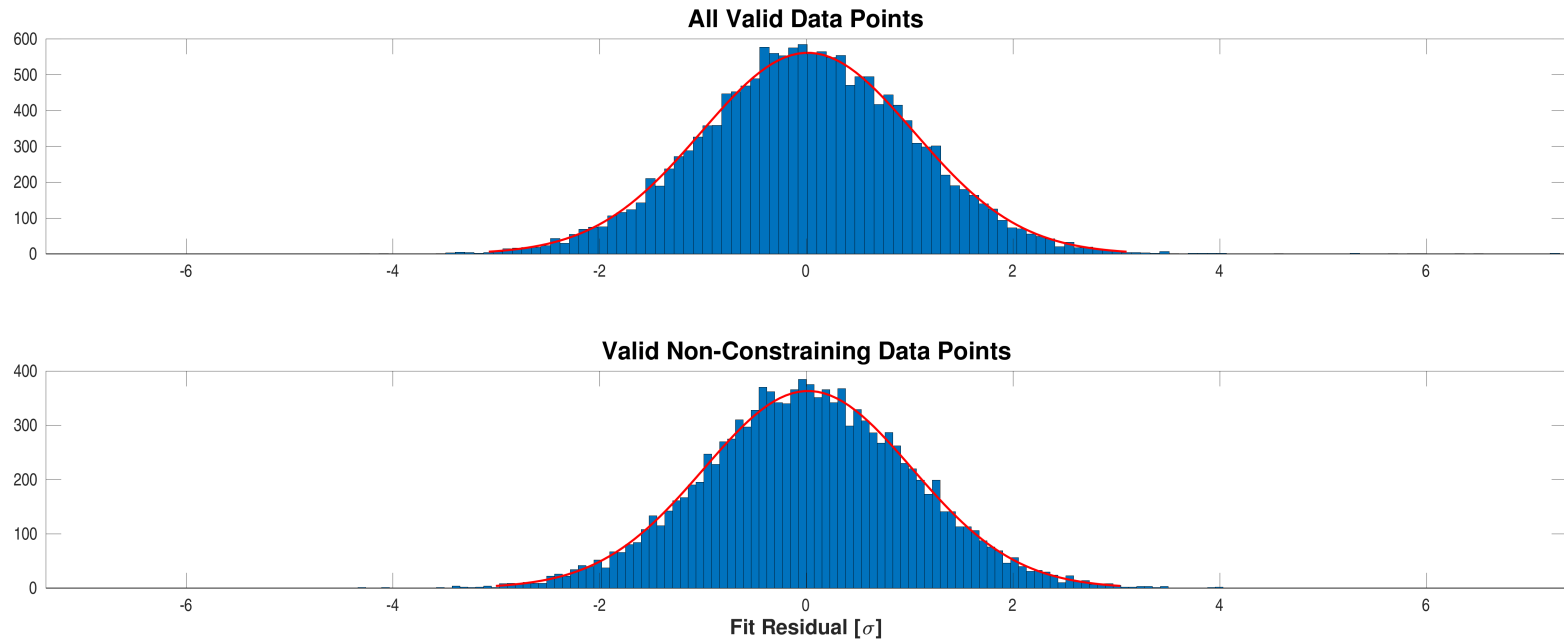
Robust weights distribution for CatId 66818296, Planet candidate 1. Top plot: all data points. Middle plot: all data points, folded per the fitted period and epoch. Bottom plot: all data points, folded and zoomed.

Open `./planet-01/planet-search-and-model-fitting-results/odd-even-transits-fit/0000000066818296-01-odd-even-robust-weights.fig`
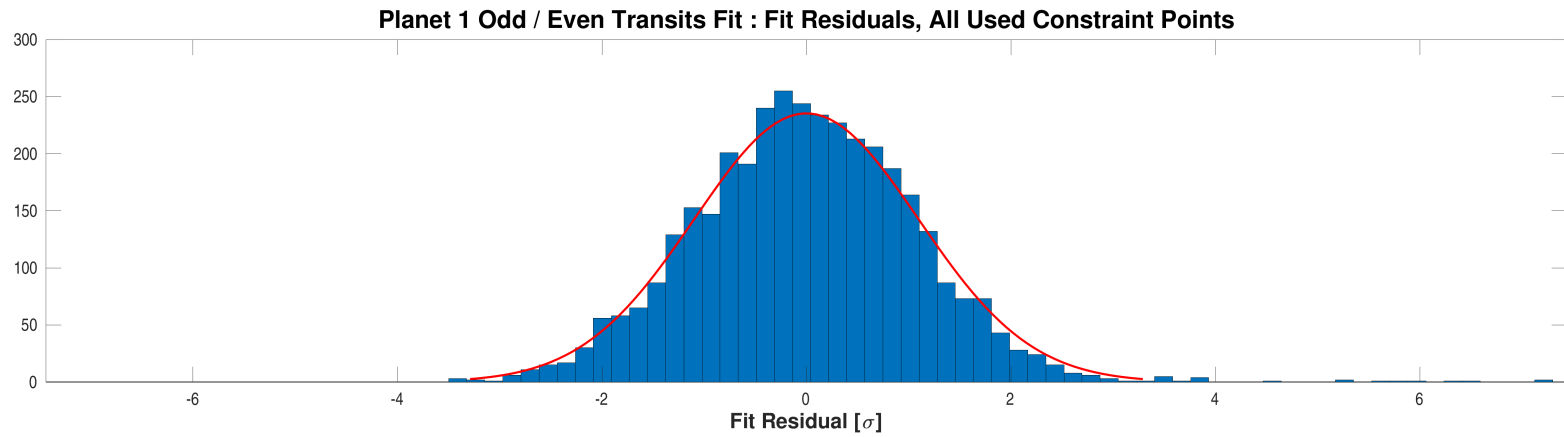
Planet 1 Odd / Even Transits Fit : Fit Residuals, All Used Constraint Points

Fit residuals distribution for CatId 66818296, 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/0000000066818296-01-odd-even-histo-used.fig

All Valid Data Points

Valid Non-Constraining Data Points

Fit residuals distribution for CatId 66818296, 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/0000000066818296-01-odd-even-histo-all-and-unused.fig

A.3　Eclipsing Binary Discrimination Test
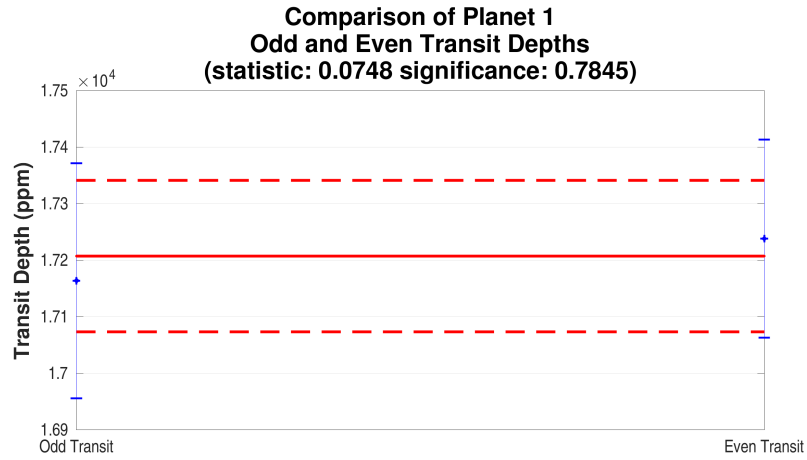
Top-left: Diagnostic plot of Odd/Even Transit Depth Test for catId 66818296, planet 1. A significance level close to 1/0 favors a transiting planet/an eclipsing binary.
Open `./planet-01/binary-discrimination-test-results/0000000066818296-01-eclipsing-binary-discrimination-tests.fig`

Appendix B   Alerts

This target did not trigger any alerts.