



14915 - First Atmosphere Characterization of the Benchmark Exo-Neptune WASP-107b

Cycle: 24, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) TYC-5530-1795-1	WFC3/IR	5	01-May-2017 21:02:29.0	yes

5 Total Orbits Used

ABSTRACT

WASP-107b is a newly announced transiting planet that is the highest signal-to-noise target for transmission spectroscopy discovered in the last decade, thanks to its low surface gravity and small, bright host star. The planet is in the intriguing transition region between ice and gas giants, with a mass comparable to Neptune and a radius similar to Jupiter. Relative to other benchmark systems, WASP-107b has a cool equilibrium temperature (780 K), where methane and water are both expected to be abundant. The planet therefore provides a unique opportunity for spectroscopic characterization of carbon and oxygen chemistry. With its large expected signal, WASP-107b also provides an excellent laboratory to study aerosol formation. The features are so large that even if thick clouds/haze are present at very high altitudes (0.1 mbar), it will still be possible to detect absorption features peeking out above them. Here we propose a reconnaissance observation of a single transit of WASP-107b. This measurement

will vet the planet's atmosphere composition and test for the presence of aerosols so that the community can decide on the best follow-up strategy for this exciting system.

OBSERVING DESCRIPTION

We will obtain time series spectroscopy of the WASP-107b planetary system with the WFC3 instrument during one transit of the planet. We will use the G141 grism and the 256x256 subarray. The observation will consist of five sequential HST orbits to obtain quasi-continuous coverage of the planet's transit. Following common practice, we will use the first orbit in the visit as a burn-in to decrease instrument systematics. The remaining four orbits are required to observe the transit and measure the out-of-transit baseline flux level.

We will obtain a direct image of the target star with the F130N filter at the beginning of each orbit for wavelength calibration. The remainder of each orbit will consist of 112 s exposures with the NSAMP = 6, SPARS25 readout pattern. To keep the fluence near 30,000 photoelectrons, we will use spatial scan mode with a 0.134 arcsec/sec scan rate (yielding a total scan height of 124 pixels). To maximize the duty cycle of the observations, we will alternate between forward and reverse scanning along the detector. We calculated the optimal scan parameters using the open-source PandExo_HST python package, which is based the observational design from past HST programs that yielded photon-limited light curves.

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Visit	Proposal 14915, Visit 01, implementation Tue May 02 01:02:33 GMT 2017				
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: BEFORE 31-OCT-2017:00:00:00; Period 5.7214742 D AND ZERO-PHASE HJD2457584.329897				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(1)	TYC-5530-1795-1	RA: 12 33 32.8480 (188.3868667d) Dec: -10 08 46.14 (-10.14615d) Equinox: J2000	Proper Motion RA: -96.1 mas/yr Proper Motion Dec: -9.6 mas/yr Epoch of Position: 2000.	V=11.47 Reference Frame: SIMBAD
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.					

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Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	F130N	NSAMP=3; SAMP-SEQ=RAPID	POS TARG null,-9; PHASE 0.9667 TO 0.9692	Sequence 1-2 Non-Int in Visit 01	0.833445 Secs (0.833 Secs) [==>]	[1]
	2		(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPARS25	POS TARG null,-9; SPATIAL SCAN 0.134,90.0 Degrees,Round trip	Sequence 1-2 Non-Int in Visit 01	112.00801 Secs X 9 (2016.144 Secs) [==>(Copy 1, Forward)] [==>(Copy 1, Reverse)] [==>(Copy 2, Forward)] [==>(Copy 2, Reverse)] [==>(Copy 3, Forward)] [==>(Copy 3, Reverse)] [==>(Copy 4, Forward)] [==>(Copy 4, Reverse)] [==>(Copy 5, Forward)] [==>(Copy 5, Reverse)] [==>(Copy 6, Forward)] [==>(Copy 6, Reverse)] [==>(Copy 7, Forward)] [==>(Copy 7, Reverse)] [==>(Copy 8, Forward)] [==>(Copy 8, Reverse)] [==>(Copy 9, Forward)] [==>(Copy 9, Reverse)]	[1]
	3		(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	F130N	NSAMP=3; SAMP-SEQ=RAPID	POS TARG null,-9	Sequence 3-5 Non-Int in Visit 01	0.833445 Secs (0.833 Secs) [==>]	[2]
	4		(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPARS25	POS TARG null,-9; SPATIAL SCAN 0.134,90.0 Degrees,Round trip	Sequence 3-5 Non-Int in Visit 01	112.00801 Secs X 9 (2016.144 Secs) [==>(Copy 1, Forward)] [==>(Copy 1, Reverse)] [==>(Copy 2, Forward)] [==>(Copy 2, Reverse)] [==>(Copy 3, Forward)] [==>(Copy 3, Reverse)] [==>(Copy 4, Forward)] [==>(Copy 4, Reverse)] [==>(Copy 5, Forward)] [==>(Copy 5, Reverse)] [==>(Copy 6, Forward)] [==>(Copy 6, Reverse)] [==>(Copy 7, Forward)] [==>(Copy 7, Reverse)] [==>(Copy 8, Forward)] [==>(Copy 8, Reverse)] [==>(Copy 9, Forward)] [==>(Copy 9, Reverse)]	[2]

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5	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPAR S25	POS TARG null,-9; SPATIAL SCAN 0.1 34,90.0 Degrees,Forward	Sequence 3-5 Non-Int in Visit 01	112.00801 Secs (112.008 Secs)	
							[==>]	[2]
6	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	F130N	NSAMP=3; SAMP-SEQ=RAPID	POS TARG null,-9	Sequence 6-8 Non-Int in Visit 01	0.833445 Secs (0.833 Secs)	
							[==>]	[3]
7	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPAR S25	POS TARG null,-9; SPATIAL SCAN 0.1 34,90.0 Degrees,Round trip	Sequence 6-8 Non-Int in Visit 01	112.00801 Secs X 9 (2016.144 Secs)	
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							[==>(Copy 9, Reverse)]	
8	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPAR S25	POS TARG null,-9; SPATIAL SCAN 0.1 34,90.0 Degrees,Forward	Sequence 6-8 Non-Int in Visit 01	112.00801 Secs (112.008 Secs)	
							[==>]	[3]
9	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	F130N	NSAMP=3; SAMP-SEQ=RAPID	POS TARG null,-9	Sequence 9-11 Non-Int in Visit 01	0.833445 Secs (0.833 Secs)	
							[==>]	[4]

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10	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPAR S25	POS TARG null,-9; SPATIAL SCAN 0.1 34,90.0 Degrees,Round trip	Sequence 9-11 Non-Int in Visit 01	112.00801 Secs X 9 (2016.144 Secs)	[4]
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11	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPAR S25	POS TARG null,-9; SPATIAL SCAN 0.1 34,90.0 Degrees,Forward	Sequence 9-11 Non-Int in Visit 01	112.00801 Secs (112.008 Secs)	[4]
							[==>]	
12	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	F130N	NSAMP=3; SAMP-SEQ=RAPID	POS TARG null,-9	Sequence 12-14 Non-Int in Visit 01	0.833445 Secs (0.833 Secs)	[5]
							[==>]	
13	(1) TYC-5530-1795-1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPAR S25	POS TARG null,-9; SPATIAL SCAN 0.1 34,90.0 Degrees,Round trip	Sequence 12-14 Non-Int in Visit 01	112.00801 Secs X 9 (2016.144 Secs)	[5]
							[==>(Copy 1, Forward)] [==>(Copy 1, Reverse)] [==>(Copy 2, Forward)] [==>(Copy 2, Reverse)] [==>(Copy 3, Forward)] [==>(Copy 3, Reverse)] [==>(Copy 4, Forward)] [==>(Copy 4, Reverse)] [==>(Copy 5, Forward)] [==>(Copy 5, Reverse)] [==>(Copy 6, Forward)] [==>(Copy 6, Reverse)] [==>(Copy 7, Forward)] [==>(Copy 7, Reverse)] [==>(Copy 8, Forward)] [==>(Copy 8, Reverse)] [==>(Copy 9, Forward)] [==>(Copy 9, Reverse)]	

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	14	(1) TYC-5530-1795- 1	WFC3/IR, MULTIACCUM, GRISM256	G141	NSAMP=6; SAMP-SEQ=SPAR S25	POS TARG null,-9; SPATIAL SCAN 0.1 34,90.0 Degrees,For ward	Sequence 12-14 Non -Int in Visit 01	112.00801 Secs (112.008 Secs) [==>]		[5]
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