16456 - REVELATION: Reconnaissance of Extreme Velocity Exoplanets for Lyman-Alpha Transit Investigations of Outflowing Neutrals

Cycle: 28, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. R. O. Parke Loyd (PI) (Contact)	**Eureka Scientific Inc.**	**parke.loyd@gmail.com**
Dr. Evgenya L. Shkolnik (CoI)	Arizona State University	shkolnik@asu.edu
Dr. Adam Schneider (CoI)	United States Naval Observatory Flagstaff Station	aschneid10@gmail.com
Dr. Ruth A. Murray-Clay (CoI)	University of California - Santa Cruz	rmc@ucsc.edu
Dr. James Edward Owen (CoI) (ESA Member)	Institute For Advanced Study	james.owen@imperial.ac.uk
John McCann (CoI)	University of California - Santa Barbara	mccann@ucsb.edu
Dr. Courtney Dressing (CoI)	University of California - Berkeley	dressing@berkeley.edu
Steven Giacalone (CoI)	University of California - Berkeley	steven_giacalone@berkeley.edu
Dr. David R. Ardila (CoI)	Jet Propulsion Laboratory	david.r.ardila@jpl.nasa.gov
Dr. Travis Stuart Barman (CoI)	University of Arizona	barman@lpl.arizona.edu
Dr. Sarah Peacock (CoI)	NASA Goddard Space Flight Center	sarah.peacock3@gmail.com

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) TYC-243-1528-1 WAVE	STIS/CCD STIS/FUV-MAMA	1	01-Mar-2021 17:00:16.0	yes
02	(1) TYC-243-1528-1 WAVE	STIS/CCD STIS/FUV-MAMA	1	01-Mar-2021 17:00:17.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(2) LP-961-53 WAVE	STIS/CCD STIS/FUV-MAMA	1	01-Mar-2021 17:00:18.0	yes
04	(2) LP-961-53 WAVE	STIS/CCD STIS/FUV-MAMA	1	01-Mar-2021 17:00:18.0	yes

4 Total Orbits Used

ABSTRACT

Exoplanets provide the only means of observing hydrodynamic atmospheric escape in action. However, absorption by the interstellar medium (ISM) has so far prevented the observation of transits in the Lyman-alpha core. Near the Lyman-alpha core, photons are plentiful and transits are deep. Capitalizing on the recent discoveries of TESS, it is now possible to push past this limitation. We have identified 2 planets confirmed since the last regular HST cycle in systems with radial velocities that shift the host star's Lyman-alpha line away from ISM absorption. These systems provide the potential to characterize the Lyman-alpha transits of planets smaller than Neptune and observe material escaping at velocities below 30 km/s for the first time. Doing so would enable previously infeasible tests of outflow models. It would also provide insight into the role of hydrodynamic escape in shaping the sub-Neptune planet population. Lyman-alpha reconnaissance of these 2 systems is the prudent first step toward these goals. Reconnaissance will eliminate key unknowns regarding the host star's intrinsic Lyman-alpha flux and the column depth of the intervening ISM. At the same time, this program will check for signs of deep Lyman-alpha transits. Doing so will enable informed planning of follow up observations to characterize the Lyman-alpha transits of the highest priority targets during the next regular HST cycle.

OBSERVING DESCRIPTION

We will allocate two HST orbits per target for a total of 4. For each target, one exposure will be made roughly 15 h prior to transit, with another following near mid-transit.

We will observe these systems using STIS with the G140M grating and 1222 CENWAVE setting, a configuration used for previous successful Lya transit observations (e.g., Kulow et al. 2014).

Visit

Proposal 16456, TOI-561 c Out of Transit (01), implementation Mon Mar 01 22:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 100%; Period 10.779 D AND ZERO-PHASE HJD2458527.06

Fixed Targets

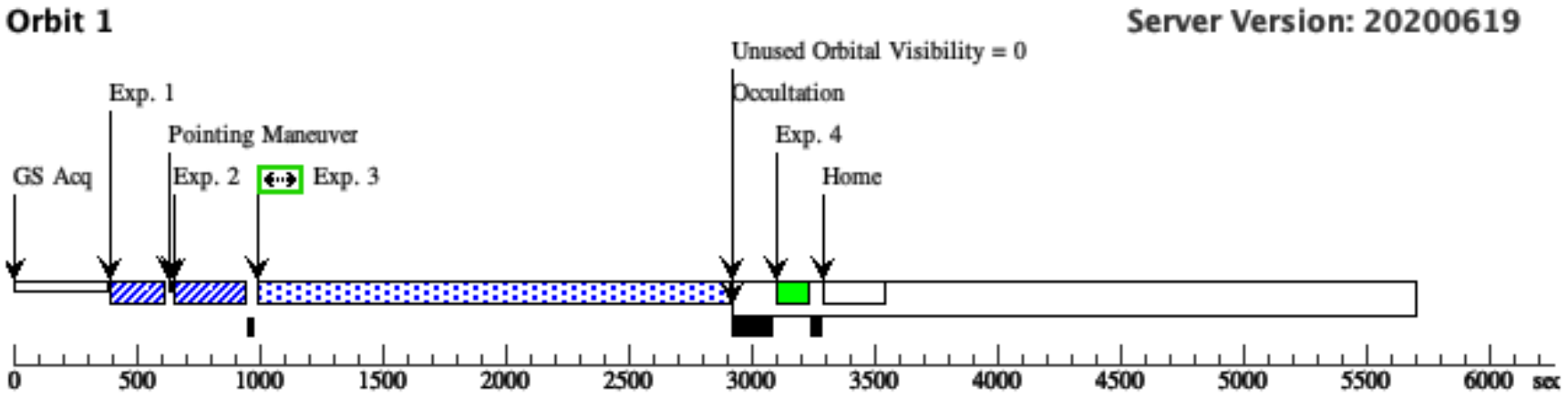
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	TYC-243-1528-1	RA: 09 52 44.4364 (148.1851517d) Dec: +06 12 57.97 (6.21610d) Equinox: J2000	Proper Motion RA: -0.007221793339456465 sec of time/yr Proper Motion Dec: -0.06171900008666853 arcsec/yr Parallax: 0.0116268" Epoch of Position: 2015.5 Radial Velocity: 79.54 km/sec	V=10.25	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. User updated coordinates to those listed as ICRS in SIMBAD.
Category=STAR
Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, G V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1471824)	(1) TYC-243-1528-1	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT	PHASE 0.18554596 901382317 TO 0.9072270154930884	Sequence 1-4 Non-Int in TOI-561 c Out of Transit (01)	0.1 Secs (0.1 Secs) *[==>]*	*[1]*
2	(STIS.ta.1472360)	(1) TYC-243-1528-1	STIS/CCD, ACQ/PEAK, 52X0.05	MIRROR			Sequence 1-4 Non-Int in TOI-561 c Out of Transit (01)	0.1 Secs (0.1 Secs) *[==>]*	*[1]*
3	(STIS.sp.1472361)	(1) TYC-243-1528-1	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=6853; WAVECAL=NO		Sequence 1-4 Non-Int in TOI-561 c Out of Transit (01)	2000 Secs (1780 Secs) *[==>1780.0 Secs]*	*[1]*
4		WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in TOI-561 c Out of Transit (01)	*[==>]*	*[1]*

Orbit Structure



Visit

Proposal 16456, TOI-561 c In Transit (02), implementation Mon Mar 01 22:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 100%; AFTER 01 BY 15 H TO 2.5 D; BETWEEN 05-APR-2021:00:00:00 AND 05-JUL-2021:00:00:00; Period 10.779 D AND ZERO-PHASE HJD2458527.06

Fixed Targets

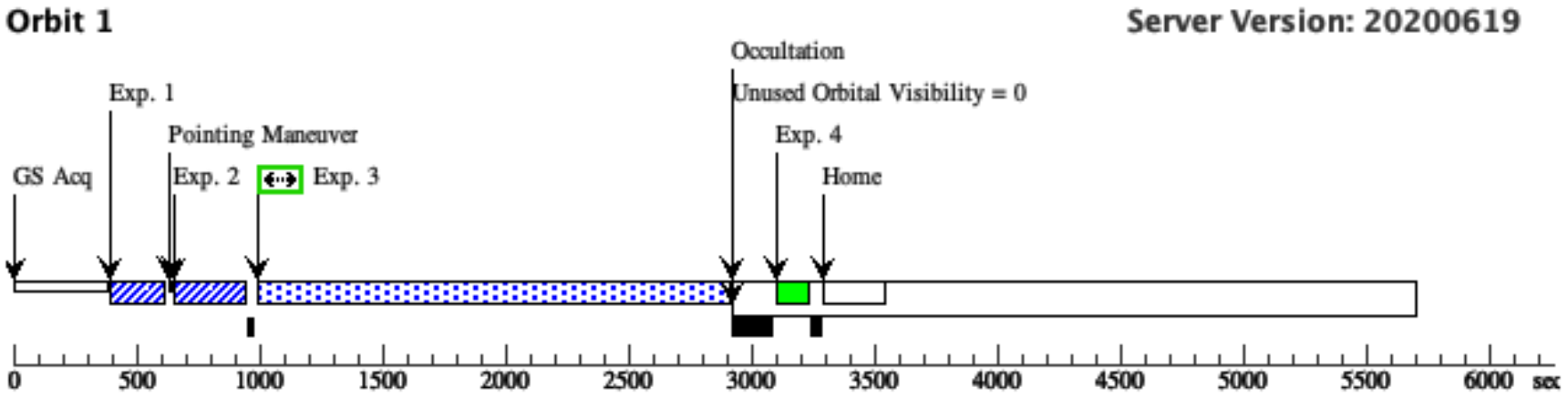
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	TYC-243-1528-1	RA: 09 52 44.4364 (148.1851517d) Dec: +06 12 57.97 (6.21610d) Equinox: J2000	Proper Motion RA: -0.007221793339456465 sec of time/yr Proper Motion Dec: -0.06171900008666853 arcsec/yr Parallax: 0.0116268" Epoch of Position: 2015.5 Radial Velocity: 79.54 km/sec	V=10.25	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. User updated coordinates to those listed as ICRS in SIMBAD.
Category=STAR
Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, G V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1471824)	(1) TYC-243-1528-1	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT	PHASE 0.99822918 03344984 TO 0.0043 87389058972693	Sequence 1-4 Non-Int in TOI-561 c In Transit (02)	0.1 Secs (0.1 Secs) *[==>]*	 ***[1]***
2	(STIS.ta.1472360)	(1) TYC-243-1528-1	STIS/CCD, ACQ/PEAK, 52X0.05	MIRROR			Sequence 1-4 Non-Int in TOI-561 c In Transit (02)	0.1 Secs (0.1 Secs) *[==>]*	 ***[1]***
3	(STIS.sp.1472361)	(1) TYC-243-1528-1	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=6853; WAVECAL=NO		Sequence 1-4 Non-Int in TOI-561 c In Transit (02)	2000 Secs (1780 Secs) *[==>1780.0 Secs]*	 ***[1]***
4		WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in TOI-561 c In Transit (02)	*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 16456, TOI-776 b Out of Transit (03), implementation Mon Mar 01 22:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 100%; Period 8.24664 D AND ZERO-PHASE HJD2458571.4167

Fixed Targets

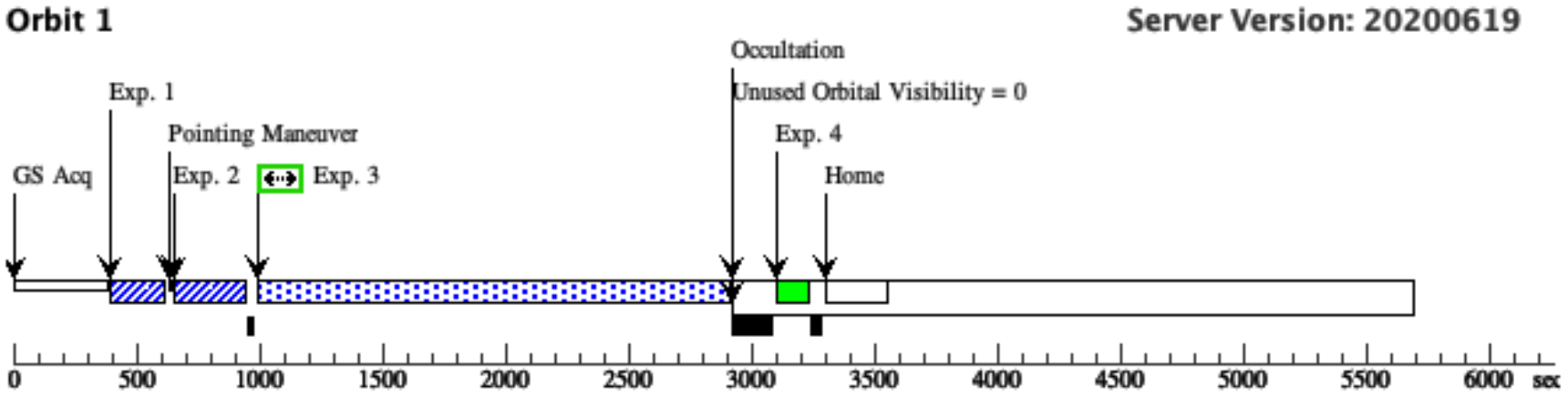
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	LP-961-53	RA: 11 54 18.7193 (178.5779971d) Dec: -37 33 12.08 (-37.55336d) Equinox: J2000	Proper Motion RA: 0.021116415003683546 sec of time/yr Proper Motion Dec: -0.1450590001013552 arcsec/yr Parallax: 0.0367762" Epoch of Position: 2015.5 Radial Velocity: 49.34 km/sec	V=11.536	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. User updated coordinates to those listed as ICRS in SIMBAD.
Category=STAR
Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, M V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1472375)	(2) LP-961-53	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT	PHASE 0.24252301 54341647 TO 0.8787384922829177	Sequence 1-4 Non-Int in TOI-776 b Out of Transit (03)	0.1 Secs (0.1 Secs) *[==>]*	*[1]*
2	(STIS.ta.1472375)	(2) LP-961-53	STIS/CCD, ACQ/PEAK, 52X0.05	MIRROR			Sequence 1-4 Non-Int in TOI-776 b Out of Transit (03)	0.1 Secs (0.1 Secs) *[==>]*	*[1]*
3	(STIS.sp.1472362)	(2) LP-961-53	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=6821; WAVECAL=NO		Sequence 1-4 Non-Int in TOI-776 b Out of Transit (03)	2000 Secs (1785 Secs) *[==>1785.0 Secs]*	*[1]*
Comments: Target is an M1, inactive. Checked for count rate violation risk due to flares per ISR STIS 2017-02 and found no violation, see ETC STIS.sp.1472374.									
4		WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in TOI-776 b Out of Transit (03)	*[==>]*	*[1]*

Orbit Structure



Visit

Proposal 16456, TOI-776 b In Transit (04), implementation Mon Mar 01 22:00:19 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 100%; AFTER 03 BY 15 H TO 3.5 D; BETWEEN 05-MAY-2021:00:00:00 AND 05-AUG-2021:00:00:00; Period 8.24664 D AND ZERO-PHASE HJD2458571.4167

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	LP-961-53	RA: 11 54 18.7193 (178.5779971d) Dec: -37 33 12.08 (-37.55336d) Equinox: J2000	Proper Motion RA: 0.021116415003683546 sec of time/yr Proper Motion Dec: -0.1450590001013552 arcsec/yr Parallax: 0.0367762" Epoch of Position: 2015.5 Radial Velocity: 49.34 km/sec	V=11.536	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. User updated coordinates to those listed as ICRS in SIMBAD.
Category=STAR
Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, M V-IV]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.1472375)	(2) LP-961-53	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT	PHASE 0.99713570 41826681 TO 0.0023 49441712018471	Sequence 1-4 Non-Int in TOI-776 b In Transit (04)	0.1 Secs (0.1 Secs) *[==>]*	*[1]*
2	(STIS.ta.1472375)	(2) LP-961-53	STIS/CCD, ACQ/PEAK, 52X0.05	MIRROR			Sequence 1-4 Non-Int in TOI-776 b In Transit (04)	0.1 Secs (0.1 Secs) *[==>]*	*[1]*
3	(STIS.sp.1472362)	(2) LP-961-53	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=6821; WAVECAL=NO		Sequence 1-4 Non-Int in TOI-776 b In Transit (04)	2000 Secs (1785 Secs) *[==>1785.0 Secs]*	*[1]*
Comments: Target is an M1, inactive. Checked for count rate violation risk due to flares per ISR STIS 2017-02 and found no violation, see ETC STIS.sp.1472374.									
4		WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in TOI-776 b In Transit (04)	*[==>]*	*[1]*

Orbit Structure