Draft version August 11, 2022
Typeset using LaTeX **twocolumn** style in AASTeX631

Planetary Radius Valley Investigation

ASTR 581 APO Proposal

Tom Wagg [1]

[1] *Department of Astronomy, University of Washington, Seattle, WA, 98195*

(Received August 11, 2022)

1. SCIENCE JUSTIFICATION

(Christiansen et al. 2018), (Lopez et al. 2019) (Hardegree-Ullman et al. 2021), (Acuña et al. 2022) Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

2. PROPOSED OBSERVATIONS

We propose to observe two transits of K2-138 on 2022-09-18 and 2022-09-19 by K2-138c and K2-138b respectively using ARCTIC in order to better characterise the lightcurve. In particular, we aim to focus on the ingress and egress of the transit. The transit durations are 1.95 and 2.34 hours respectively and we need to observe the flux for 30 minutes prior to and after the transit. We therefore request two half-nights that include the transits (see Table 2).

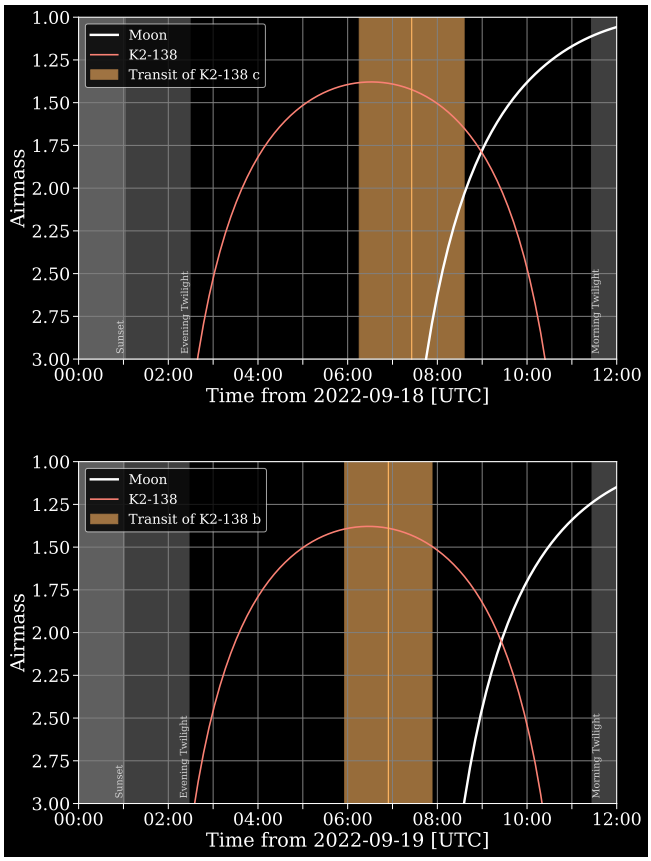

Figure 1. Proposed transit observation for K2-138. Airmass over time for two separate observing nights. Grey shaded regions indicate sunset and twilight times. Orange shaded region indicates transit period and orange line represents the time of mid-transit.

Corresponding author: Tom Wagg
tomwagg@uw.edu

We intend to use to narrow-band H-α filter in order to prevent saturation that can occur when using broadband filters with a star of this magnitude[1]. We will observe with a cadence of 2 minutes and an exposure time of 3-5 seconds, using the default medium readout time of 25 seconds[2]. Since one of the main purposes of these observations is to better characterise the lightcurve and transit timing variations, we will increase the cadence to 30 seconds for 20 minutes around the ingress and egress of the transits, using the fast readout time of 11 seconds (see Table 3).

Property	Value
Right Ascension	23h15m47.77s
Declination	$-10^\circ\ 50'\ 59.06''$
V-band Magnitude	12.25
Stellar Type	K1V

Table 1. Properties of the proposed target star KS-138

Planet	Transit Date	Ingress	Mid-Transit	Egress
KS-138c	2022-09-18	05:56	06:54	07:53
KS-138b	2022-09-19	06:27	07:26	08:24

Table 2. Transit information for planets around KS-138 in UTC

Setting	Value	
	Regular	Ingress/Egress
Exposure Time	3-5 seconds	3-5 seconds
Filter	H-α	H-α
Readout time	25 seconds	11 seconds
Cadence	2 minutes	30 seconds

Table 3. ARCTIC Settings for observations. We increase use the ARCTIC fast readout time and increase the cadence for 20 minutes around transit ingress and egress in order to better characterise transit timing variations.

REFERENCES

Acuña, L., Lopez, T. A., Morel, T., et al. 2022, A&A, 660, A102, doi: 10.1051/0004-6361/202142374

Christiansen, J. L., Crossfield, I. J. M., Barentsen, G., et al. 2018, AJ, 155, 57, doi: 10.3847/1538-3881/aa9be0

Hardegree-Ullman, K. K., Christiansen, J. L., Ciardi, D. R., et al. 2021, AJ, 161, 219, doi: 10.3847/1538-3881/abeab0

Lopez, T. A., Barros, S. C. C., Santerne, A., et al. 2019, A&A, 631, A90, doi: 10.1051/0004-6361/201936267

[1] https://www.apo.nmsu.edu/arc35m/Instruments/ARCTIC/#3p6

[2] https://www.apo.nmsu.edu/arc35m/Instruments/ARCTIC/#3p1