

## Detection of Iron and Titanium in the atmosphere of Kelt-9 b

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Kelt-9 b was discovered in 2017 to orbit a bright, hot early-type (A0) star in a 3.4 day orbit, and is the hottest hot-Jupiter known to date, with an expected equilibrium temperature of over 4000 K. This extreme temperature implies an atmospheric chemistry that is distinct from cooler, more commonly detected hot Jupiters with temperatures around 3000 K or less. We have predicted that at the limb, the atmosphere is in chemical equilibrium over a large range in pressure; meaning that the chemistry is fully constrained by the temperature and the metallicity.<sup>2</sup> Another consequence is the expected absence of clouds, making the transmission spectrum less prone to degeneracies that plague retrieval analyses for planets with lower temperatures, that are often cloudy.

Assuming a non-inverted atmosphere, we predicted to be able to detect absorption by neutral Iron (Fe) in the transmission spectrum of the planet, using a high-resolution cross-correlation-based analysis.

We subsequently were able to perform this analysis on a single transit observation by the HARPS-N instrument, and detected the absorption signal of Fe, and unexpectedly, much stronger absorption by Fe<sup>+</sup> and Ti<sup>+</sup> - implying high temperatures - above the equilibrium temperature of the planet. This work is currently under review at Nature; and in this talk I will present the analysis and our interpretation of these exciting detections.

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<sup>2</sup>Kitzmann et al. 2018, under review