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Internally self-consistent temperature diagnostic of hydrogen plasma from H-alpha and H-beta line spectra

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Plasma temperature is a critical parameter in the physics of discharge capillary plasma sources. It determines their ability to form guiding channels in LWFA, can influence the gas refill time and therefore the maximum repetition rate and confound density measurements taken via optical emission spectroscopy; to name but a few effects. Accurately determining the temperature of these plasmas is therefore essential to properly characterise, understand and improve these plasma sources. This is difficult to achieve in practise, especially with pure hydrogen plasma, due to limited number of spectral lines, single ionisation state and lack of other elements.

Here we present the results of a successfully implemented analysis method based on an internally self-consistent comparison between H-alpha and H-beta line densities of a discharge-generated pure hydrogen plasma.

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