

Extreme Precision in Radial Velocity IV



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The *Veloce* Doppler Spectrograph at the AAT

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Veloce is a new precision Doppler spectrograph for the 3.9m Anglo-Australian Telescope sited on Siding Spring Observatory in Australia. Cost considerations for an instrument with a total budget of A\$5.4m mean that *Veloce*'s design philosophy is one of "just enough" stabilisation (i.e. stabilising the spectrograph in pressure and temperature so that changes over time will be small and linear) combined with simultaneous calibration in every exposure. It uses a fibre-optic integral-field unit to reformat a 2.5" aperture into a 19 fibre x 0.5" slit at the spectrograph entrance, plus 5 sky fibres and two fibres for simultaneous calibration using either a ThXe arc lamp, or a Menlo Systemsastro comb (delivered directly into the spectrograph by an endlessly single-mode fibre). The main fibre run comprises octagonal fibres passing through two fibre agitators, which are then fused to circular fibres before injection into the spectrograph. The spectrograph's first *Rosso* camera covers 600-930nm, with two additional cameras (*Verde* and *Azzurro*) funded for installation in 2019 to provide complete coverage from 380-930nm in a single exposure. The optical performance of the *Rosso* camera (which started operation in September) is excellent, with the average FWHM of images from the single-mode astrocomb being less than 1 pixel over the whole echellogram. While processing the IFU data has provided challenges, early results are very promising, and by EPRV IV I hope to be able to highlight recent TESS mass measurement results from *Veloce*.

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