

Chasing instrumental systematics: Lessons learned from the HARPS-N spectrograph

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Measuring RV to sub-meter-per-second precision is an art that required an in-depth understanding of the instrument, how to extract relevant information at the calibration level and last but not least how to measure at best, from an extracted spectrum, the RV signal.

In this talk, we will get our hands dirty and discuss about what is most of the time swept under the rug by instrument teams that only highlight their nicest results. Along its 10 years lifetime, HARPS-N experienced many interventions that induced significant changes at the raw frame level: change of instrument focus, warm-up of the cryostat every 6 months due to a leak contaminating raw frames, primary thorium calibration lamp going out of specification and its replacement. In addition, we will also discuss the effect of charge transfer inefficiency and aging of thorium lamps. We will describe how those effects can be handled by the new version of the HARPS-N data reduction software (for which the products will soon be available to the community), and show on stellar and solar observations, that those instrumental systematics can be corrected to the sub-meter-per-second level over the 10 years of HARPS-N.

The detection of another Earth will require a community effort, and in that regard, every extremely precise RV (EPRV) team should be aware of the problems and solutions adopted by their peers. This talk is therefore going in this direction, to provide extremely useful information to other team exploiting or building new EPRV instruments.