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Breaking spin-orbit measurement degeneracies with precise photometric and spectroscopic transit observations

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Spin-orbit angle measurments (e.g., with the Rossiter-McLaughlin effect) are often degenerates. This is due to fundamental symetries in the problem, to complex correlations between parameters, and to the difficulty to measure some parameters (e.g., the stellar inclination). Recently, independent teams reported spin-orbit angle measurments of the same systems (e.g., KELT-9) using different instruments and methods. In particular, exoplanetary systems around rapidly rotating and pulsating early-type stars present different possibilities to measure their spin-orbit angles. For these systems, one can access the stellar inclination thanks to the independent detections and studies of stellar differential rotations, of stellar gravity darkening, and of stellar pulsations. In this presentation, we will show that these measurments don't necessary have the same symetries. Thus, it may be possible to break degenaracies in the spin-orbit angle measurment by combining precise photometric transit (that allow us to measure, e.g., gravity darkening) and precise spectroscopic transit measurments (that allow us to measure, e.g., differential rotation and pulsations). A tentative coherent explanation of recent data on the KELT-9 system will be presented as an example and as a motivation to develop new synergies in this domain.