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Quantum interference and the magic angle in the observation of lithium D-lines R.C. BROWN, S. WU, J.V. PORTO, Joint Quantum Institute; University of Maryland and NIST, C.J. SANSONETTI, C.E. SIMIEN, J.D. GILLASPY, J.N. TAN, S.M. BREWER, National Institute of Standards and Technology, Gaithersburg — The spectroscopy of the hyperfine components in the D-lines in atomic lithium represents a realization of the double-(or triple-) slit experiment in the frequency domain. Since the spacing between hyperfine components is less than the natural line width it is impossible to determine which component scattered a given photon. We analyze data collected from a frequency comb based precision spectroscopic measurement of the ^{6,7}Li D-lines as a function of laser polarization [1]. Data fitted using a superposition of Voigt functions shows apparent frequency shifts which depend on the angle between the laser polarization and the direction of fluorescence collection. When restricted fluorescence collection direction and quantum interference terms are accounted for in the fitted line shape, spectra observed at all polarizations yield consistent results. At the so called "magic angle" of 54.7 degrees these additional quantum interference terms go to zero in analogy with the disappearance of quantum beats in the time domain. This may explain discrepancies between previous measurements.

[1] C.E.Simien et al. Can. J.Phys. **89**, 1, (2011)

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