Molecular interferometry with $^2\Sigma$ molecules in large magnetic fields

Sergey Alyabyshev, Roman Krems, University of British Columbia, UNIVERSITY OF BRITISH COLUMBIA TEAM — $^2\Sigma$ molecules in superimposed magnetic and electric (static or laser) fields exhibit avoided crossings between Zeeman levels of different rotational states as functions of external field parameters [1]. We explore the possibility of using these avoided crossings for molecular interferometry experiments. Our calculations demonstrate that the population of a particular spin state is extremely sensitive to both electric and magnetic fields near avoided crossings between Zeeman levels corresponding to the rotationally ground N=0 and rotationally excited N=1 states. The position and strength of these avoided crossings can be tuned by varying the external fields [1,2]. We propose that an interferometry experiment using $^2\Sigma$ molecules in the presence of a microwave laser field can be used to probe small fluctuations of the magnitude ($\sim$1 Gauss on the background of 4 Tesla) and direction of large magnetic fields (2 - 6 Tesla) on the molecular length scale.