THEORY OF MICROWAVE 5-WAVE MIXING OF CHIRAL MOLECULES

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Microwave three-wave mixing spectroscopy produces a Free Induction Decay Field that is proportional to the enantiomeric excess (*ee*) of a sample of chiral molecules. However, since there is an unavoidable loss of measured signal strength due to dephasing of the molecular emission, it is not possible to quantitate this *ee* unless one has an enantiomeric pure sample of the same molecule with which to compare the amplitude of the signal of a sample of unknown *ee*.

In this talk, I will demonstrate that it is in principle possible to use a 5 wave mixing experiment, based upon AC Stark shifts produced by nearly resonant fields, to produce a differential splitting of a transition such that one has frequency resolved peaks for the two enantiomers. The peaks corresponding to the two enantiomers can be switched by phase cycling of the fields. This method is promising to allow the quantitative measurement of molecular *ee*'s by microwave spectroscopy. There are experimental issues that make such an experiment difficult. It will likely be required to use of skimmed molecular beam (which will substantially reduce the number of molecular emitters and thus signal level) in order to reduce the field amplitude and phase inhomogeneity of the excited molecules.