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Making the best of mixed-field orientation of polar molecules: A recipe for achieving adiabatic dynamics in an electrostatic field combined with laser pulses

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We have experimentally and theoretically investigated the mixed-field orientation of rotational-state-selected OCS molecules and we achieve strong degrees of alignment and orientation. The applied moderately intense nanosecond laser pulses are long enough to adiabatically align molecules. However, in combination with a weak dc electric field, the same laser pulses result in nonadiabatic dynamics in the mixed-field orientation. These observations are fully explained by calculations employing, both, adiabatic and non-adiabatic time-dependent models.

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