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Abstract for an Invited Paper  
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### **Non-perturbative Quantum Control via the Non-resonant Dynamic Stark Effect**

ALBERT STOLOW, National Research Council

We will discuss Quantum control using the non-resonant Dynamic Stark Effect as a new and powerful tool. Dynamic Stark Control (DSC) applies to both molecular rotation and vibration. We show how DSC, which uses the electric field of the laser pulse, can be used to control electronic branching ratios in non-adiabatic photodissociation without any absorption of light [1]. We illustrate the use of this tool in creating molecular frame alignment, via our technique of ‘switched’ wavepackets. We demonstrate full 3D, field-free, axis alignment of an asymmetric top rotor [2] – literally ‘fixing the molecule in space’ in order to make a measurement.

[1] Science 314, 278 (2006).

[2] Phys.Rev.Lett. 97, 173001 (2006).