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Optical control of DNA radio-sensitivity RAMIN ABOLFATH, University of Texas, Southwestern Medical Center, Dallas — We explore the manipulation of the radio-sensitivity of the DNA molecules driven by the spin blockade mechanism of diffusive free radicals. We propose a mechanism which uses the simultaneous application of circularly polarized light and an external magnetic field to control the polarization of the free radicals and create an $S = 1$ electron-hole spin excitation (exciton) on DNA molecules. It allows us to manipulate and partially suppress the damage induced by ionizing radiation. We deploy an *ab-initio* molecular dynamics model to calculate the characteristic parameters of the light needed for optical transitions and investigate the effect of spin-injection on the formation of a free energy barrier in diffusion controlled chemical reaction pathways that controls radiation-induced DNA damage. As a specific example, we present the numerical results calculated for a nucleotide-base, e.g., Guanine, in the presence of an OH free radical.

Ramin Abolfath
University of Texas, Southwestern Medical Center, Dallas

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