

## **Optical enhancement of DNA-base radio-resistivity**

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**Purpose:** Manipulation of the radio-sensitivity of the DNA molecules driven by the spin blockade mechanism of diffusive free radicals against ionizing radiation.

**Materials and methods:** 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  $S=1$  electron-hole spin excitations (excitons) on DNA molecules. We deploy an *ab-initio* molecular dynamics model to calculate the characteristic parameters of the light needed for optical transitions.

**Results:** 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. To increase the radio-resistivity of this system, an infra-red and a blue light source for the optical pumping of free radicals and induction of excitons on guanine can be used.

**Conclusions:** The effect of spin-injection on the formation of a free energy barrier in diffusion controlled chemical reaction pathways leads to the control of radiation-induced DNA damage. The proposed method allows us to manipulate and partially suppress the damage induced by ionizing radiation.