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Simulating the effect of Ultra-high Dose Rate on DNA Strand Break[1] DANIEL MULROW, NATALIA GUITIERREZ, JOHN-STEPHEN TAYLOR, LEE SOBOTKA, Washington University in St. Louis — Ultra-high dose rate radiation therapy, which is orders of magnitude faster than conventional therapy, has recently regained interest in the field of Radiation Oncology. Irradiating tissue at these ultra-high rates has shown a normal tissue sparing effect, termed FLASH, when compared to conventional dose rates in pre-clinical trials. Not all studies involving ultra-high dose rates have produced a normal tissue sparing effect which has resulted in the debate of the FLASH phenomenon. Other works have compared the mean dose rate, the total dose, and the oxygen-dependency required to observe the FLASH effect. This work looks to compare the literature based on the dose delivered in a single pulse, i.e. instantaneous dose rate, and the biological endpoint of interest. Further analysis was performed by simulating DNA strand breaking to better understand certain biological endpoints with respect to instantaneous dose rate. Through this lens we aim to provide a chemical description to bridge the physical and the biological limitations of these studies. In doing so we hope to find trends among the existing literature to assess the feasibility of FLASH radiation therapy and to better guide future studies.

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