

Absorption of ultraviolet radiation by the human eye

Omar Rodríguez López¹, Alfo José Batista Leyva¹

¹ Higher Institute of Technology and Applied Sciences (InSTEC), University of Havana, Havana, Cuba.

omar.rodriguez@instec.cu

The eye is one of the human sensory organs and it is responsible for providing visual perception. Of all the senses, sight is often considered the most important. It has been estimated that 80% of the information we perceive reaches the brain through the eyes.

In recent years, medicine has been inclined for processes that model the behavior of human organs, since they would be very useful for carrying out a possible medical intervention. In this area, research on the eyeball and lens modeling play a great role due to the two conditions that most affect: cataract and presbyopia.

In this sense, the development of new techniques and the proposal of advanced tissue behavior models allow the development of simulation models that take into account both biomechanical and optical aspects, helping surgeons to plan the different treatments.

One of the main causes of optical conditions in the lens is the incidence of ultraviolet radiation. It is necessary to know the effect of radiation on the lens because together with the cornea and the aqueous and vitreous humors, they make up the path of ocular transparency, necessary for vision.

This work tries to study the behavior of non-ionizing radiations when they hit the crystalline. For that, the computational simulations through the Montecarlo method of the physical [1], chemical [2] and physicochemical processes involved here, will be of great help for the corresponding development of the same. The software with which this method will be implemented is Geant4 [3].

Energy deposited by the photons of UV radiation was obtained by means of the simulations. It is also possible to obtain the absorbed dose, a magnitude of great importance in future dosimetric studies.

Index Terms: crystalline, ultraviolet radiation, computational simulations

- [1] Tendeiro, D., Lopez, G., Vieira, P., and Santos, J. P. (2014). Monte Carlo simulation of laser beams interaction with the human eye using Geant4. *BioMedical Engineering ONLine*.
- [2] Piersimoni, P., Rimoldi, A., Riccardi, C., Pirola, M., Molinelli, S., and Ciocca, M. (2015). Optimization of a general-purpose, actively scanned proton beamline for ocular treatments: Geant4 simulations. *Journal of applied clinical medical physics*, 16(2), 261-278.

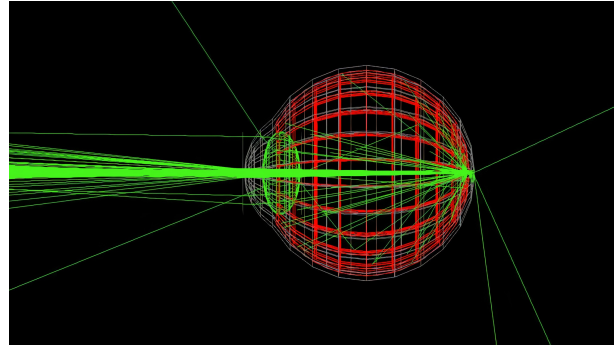


Figure 1: *Three-dimensional representation of the human eye in Geant4 (OpenGL Graphics).*

- [3] J. Allison et al., "Geant4 developments and applications," in *IEEE Transactions on Nuclear Science*, vol. 53, no. 1, pp. 270-278, Feb. 2006, doi: 10.1109/TNS.2006.869826.