

Action Spectrum and Correlation between Irradiation and Temperature Rise in the Retina

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Abstract- This study investigates the action spectrum and correlation between irradiation and temperature rise in the retina due to infrared and visible electromagnetic radiation. The research highlights how variations in transmittance (from 0.794 to 0.702) and incident power on the cornea influence retinal irradiance and temperature distribution. The findings reveal that irradiance increases with wavelength and exposure time, with a sharp rise observed at 1064 nm in the near-infrared spectrum. Retinal temperature exhibits a complex relationship with exposure time, initially increasing but decreasing for prolonged durations, suggesting photochemical and photothermal interactions. The study also incorporates the Stiles-Crawford effect (SCE I) to model temperature distribution, demonstrating its impact on retinal thermal response. Data from rhesus monkey retinas further validate the observed trends, showing consistent irradiance patterns under varying transmittance conditions. The results underscore the importance of wavelength, exposure duration, and beam characteristics in assessing retinal damage risks from optical radiation.