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Investigating the Impact of Synchrotron THz Radiation on the Corneal Hydration Using Synchrotron THz-Far Infrared Beamline

Terahertz (THz) communication systems are becoming desirable by the availability of extreme bandwidths. Currently, there is limited research on the biological impacts of THz. An adequate water balance (75%-80%) is the main constituent of a healthy cornea; even a minor 10% of water violations may result in pathological conditions. Water illustrates high absorption /reflection coefficient values in the 0.3-3 THz range Thus, any slight changes in the water content of samples can be detected by obtaining absorbance spectra in this range. THz/Far-IR Beamline of the Australian Synchrotron was used to expose porcine cornea and evaluate the corneal hydration. The absorbance/transmittance spectral scans between 2.5-8.5 THz were obtained by the Attenuated Total Reflection apparatus. The high-water sensitivity of the THz region was used for hydration evaluation to compare exposed and un-exposed corneal samples. The results were compared to water spectra. In the 2-3 THz range, the water showed high reflection coefficient. The spectrum revealed that the absorbance value of the cornea showed no significant differences when comparing the post-exposed sample with control in the range of 2.5-5.5 THz. We have found that the available Synchrotron generated THz intensities are too low to produce any discernible degradation in corneal structure. We are devising on methods to produce higher intensities at GHz frequencies and using the Synchrotron to examine the impacts on the THz spectra, to discern changes in absorption bands associated with protein structure. In conclusion, we evaluated the biological impacts of THz region on the cornea (evaluating hydration variation), following excessive THz exposure.

Level of Expertise

Student

Presenter Gender

Woman

Pronouns

She/Her

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In person - Melbourne

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Yes

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Yes

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Yes

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