

Corneal Hydration Sensing with Thz Illumination

Tech ID: 22577 / UC Case 2012-100-0

SUMMARY

UCLA researchers in the Department of Bioengineering have created a novel imaging system that measures corneal hydration levels by utilizing terahertz (THz) frequency (100 GHz - 1 THz) sources and detectors.

BACKGROUND

Proper corneal hydration levels are critical to maintaining optical vision. Currently, corneal hydration is measured using ultrasound optical pachymetry, which involves measuring the central corneal thickness and extrapolating the average water content from these measurements. However, mapping from thickness to hydration is very inaccurate and is limited by inherent constraints. Another method uses confocal Raman spectroscopy to remotely measure corneal hydration. However, the excitation illumination influence necessary to achieve accurate measurements exceeds the ANSI regulations for use in humans by orders of magnitude.

INNOVATION

Researchers at UCLA have developed an imaging system to detect corneal hydration levels by illuminating the cornea with low power, low energy, THz frequency light and measuring the magnitude of the reflected THz signal. The system is capable of resolving 0.18% changes in the water concentration of the cornea in vivo and results suggest a ~3x increase in dynamic range over ultrasound based pachymetry.

APPLICATIONS

- ▶ Detecting inflammation, immune response, edema or disease in the cornea
- ▶ Building real-time hydration tracking modules for LASIK in order to correct for hydration changes

ADVANTAGES

- ▶ Low-power
- ▶ Non-invasive
- ▶ No direct contact with the corneal tissue
- ▶ Robust to user error
- ▶ Measures hydration directly

STATE OF DEVELOPMENT

DEVELOPMENT-TO-DATE: Researchers have created a working prototype and have successfully completed a preliminary *in-vivo* animal trials.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,690,331	04/08/2014	2012-100

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OTHER INFORMATION

KEYWORDS

Corneal hydration, optical pachymetry, LASIK

CATEGORIZED AS

- ▶ **Imaging**
 - ▶ Remote Sensing
- ▶ **Medical**
 - ▶ Devices
- ▶ **Sensors & Instrumentation**
 - ▶ Biosensors

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