Brian Carmignani, Physics and Mathematics

University: Truman State University
Year in School: Sophomore
Hometown: Columbia, Missouri
Faculty Mentor: Dr. Ping Yu, Physics & Astronomy
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Medical imaging lasers: Fluorescence molecular tomography

Brian Carmignani, Sunder Balasubramanian, and Ping Yu

Quite possibly the most deciding factor in deciding treatment methods and subsequent patient outcomes in regards to cancer is the ability to have early and sensitive detection. Fluorescence molecular tomography (FMT) is such a method of detection. In FMT, a near infrared light laser is modulated at a radio frequency to generate a diffused photon density wave that provides a measure of how much phase difference there is between the incident laser light and the detected laser light due to the structure of a tissue sample. As it is more accurate to measure this phase difference at a lower frequency, we use a low frequency sinusoidal signal carried by a radio frequency to modulate the laser source. Phase measurement is then accomplished by measuring how much each peak has shifted due to the tissue compared to the incident sinusoidal signal. 3D images of tumors and other tissue abnormalities can then be constructed from this data, and FMT can be integrated with other more conventional imaging techniques such as magnetic resonance imaging (MRI). The advantages of this technique include improved precision, cost effectiveness and no patient risk. Construction of a single light source FMT system has been completed. Initial study shows a constant drift associated with the system which must be calibrated each day. The effect of a change in intensity of the laser on system drift is currently under study.