

## An Infrared Absorbance Sensor for the Detection of Melanoma in Skin Biopsies

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**Abstract:** An infrared (IR) absorbance sensor has been designed, realized and tested with the aim of detecting malignant melanomas in human skin biopsies. The sensor has been designed to obtain fast measurements (80 s) of a biopsy using a small light spot (0.5 mm in diameter, typically five to 10 times smaller than the biopsy size) to investigate different biopsy areas. The sensor has been equipped with a monochromator to record the whole IR spectrum in the 3330–3570 nm wavelength range (where methylene and methyl stretching vibrations occur) for a qualitative spectral investigation. From the collected spectra, the CH<sub>2</sub> stretch ratio values (ratio of the absorption intensities of the symmetric to asymmetric CH<sub>2</sub> stretching peaks) are determined and studied as a cancer indicator. Melanoma areas exhibit different spectral shapes and significantly higher CH<sub>2</sub> stretch ratios when compared to healthy skin. The results of the infrared investigation are compared with standard histology. This study shows that the IR sensor is a promising supportive tool to improve the diagnosis of melanoma during histopathological analysis, decreasing the risk of misdiagnosis.

**Keywords:** infrared sensor; absorbance spectroscopy; skin biopsy; melanoma

“.....The light transmitted by the sample is detected by an InAs photodiode from IoffeLED (St. Petersburg, Russia) operating at room temperature. Among the photodiodes available in the market, this photodiode provides a good compromise between cost and performance in the spectral range of interest. With a peak wavelength detection at 3305 nm and a cutoff wavelength at 3700 nm, it has a good sensitivity (>1 A/W) in the range 3330 nm–3570 nm...”