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## Portable Diffuse Reflectance Spectroscopy for Non-invasive and Quantitative Assessment of the Parathyroid Glands Viability During Surgery

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Romine, Mark; Luong, Linh; Moazzen, Alex; Cho, Katie; and Lee, Paul, "Portable Diffuse Reflectance Spectroscopy for Non-invasive and Quantitative Assessment of the Parathyroid Glands Viability During Surgery" (2023). *Symposium of Student Scholars*. 162.

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## **Portable Diffuse Reflectance Spectroscopy for Non-invasive and Quantitative Assessment of the Parathyroid Glands Viability during Surgery**

**Mark Romine, Linh Luong, Alex Moazzen, Katie Cho and Paul Lee**

The parathyroid glands (PTGs) are responsible for the regulation of calcium levels in the blood by secreting a parathyroid hormone. This parathyroid hormone then regulates the body's absorption, storage, and secretion of calcium, which can directly affect the way muscles and nerves operate. PTGs are often at risk of damage, or accidental removal during thyroid surgeries, because it is challenging to identify PTGs and to determine their viability. Current methods of visual inspections are often subjective and blood panels have long processing times. Diffuse Reflectance Spectroscopy (DRS) may provide a solution for the noninvasive, rapid, and quantitative assessment of the viability of PTGs.

DRS is a non-invasive technique that uses the reflectance properties of tissue to quantify the hemoglobin (Hb) and concentrations and tissue oxygenation. DRS consists of a white LED (wavelength 400nm – 700nm) for a light source, a compact spectrometer that records tissue reflectance and a fiber optic probe. In this project, we have built a portable DRS system and verified the performance of the prototyped DRS system. We have characterized a signal-to-noise ratio (SNR) on tissue simulating optical phantom and the computed SNR is around 40 dB as expected. Also, we have demonstrated that DRS can measure the change in oxygenation values in our blood phantom testing. These bench-top tests show that our prototype is ready for human study during a thyroid surgery.