Overview
Compact Linear Collider (CLIC) is one of the proposed next generation high energy colliders. Breakdown rate in such a collider is one of the major limiting factors for operation at high gradients. The Large Electrode System (LES) is a pulsed DC system used for breakdown analysis at CERN. The LES allows for different parameters to be changed and record the impact on breakdowns. This system is capable of reaching 10kV and the gap between electrodes can be between 20µm and 100µm. Typically a pulsed voltage from a MARX generator is used within the system allowing for different parameters to be varied.

Pulsed DC Large Electrode System
Figure 1 displays an image of the cross section of the LES. The cameras used for capturing images of the breakdowns can be seen perpendicular to each other. The cameras are placed next to the windows that are lined up with the gap between the electrodes.

One interest in using a spectrometer within the system is to relate the amount of light released. The amount of current increases with voltage, in theory this can be between 20µm and 100µm. Typically a pulsed voltage from a MARX generator is used within the system allowing for different parameters to be varied.

Setup
To integrate the spectrometer one of the cameras was removed a collimator put in its place. One camera remains attached to the system to indicate if there is any light or whether a breakdown has occurred. Figure 4 shows a schematic of the current setup for integrating the spectrometer with the LES. Figure 5 is an image of the physical setup for the spectrometer with the LES in the lab.

Measurements
During Breakdown
During a breakdown there is a high intensity light produced. Figure 6 shows the waveform captured with the current setup of this light. Due to its high intensity compared to other possible light sources with the system only this light can be seen during a long exposure. The waveform shows that this is a broadband light that ranges over the visible spectrum.

During Field Emission
Figure 7 shows the results whilst using a constant voltage applied between the two electrodes. There was a light found that peaks around the 600nm which is in red wavelength range. Voltages given for these results are the voltage from the power supply and not the voltage across the gap. The source of this light is currently unknown but possibilities include: photoemission, Optical Transition Radiation and surface plasmon resonances.

Future Work
Electrons emitted from the cathode as a result of field emission are accelerated towards the anode before impacting on the surface. There are different types are light emission that can occur when electrons hit the surface of a metal. These include photoemission, optical transition radiation (OTR), and the presence of surface plasmon resonances. The aim is to determine the cause by differentiating between the different possible sources.