STATEMENT

This thesis describes the results of an investigation into the fundamental principles of MgO-Type cold cathode emission.

A working model has resulted which provides a detailed explanation of the experimentally observed characteristics from such cold cathodes.

An analysis of the DC voltage distribution in an operating MgO diode indicates that the major portion of the applied DC voltage appears across the barrier layer, rather than across the MgO layer or the vacuum space. The IV-data, as well as the data obtained under constant current conditions of the effect of temperature on the barrier voltage, support the assumption that Frohlich-type avalanching occurs in the barrier layer.

Analysis of admittance characteristics from operating MgO cold cathodes has been very useful in understanding certain details of the principles of self-sustained mechanism. In particular, it has been shown that these data furnish the most direct information about charge transport in the MgO layer.

An analysis of the observed electron velocity distributions indicates that the source of primary electrons is an assemblage of electrons of high effective temperature T. Some of these electrons are "cooled" by inelastic collisions with the MgO layer before being observed. In addition, another group of electrons is observed which are the result of secondary multiplication at the MgO surface.

Spectral and luminosity measurements on operating MgO cold cathodes have been included to support the validity of the model.