

APPENDIX 4

“Nothing is too good to be true if it be consistent with the laws of nature, and in such things as these, experiment is the best test of such consistency”.

Michael Faraday (1791 - 1867)

A PROPOSED EXPERIMENT TO TEST RADIATIONAL ELECTRODYNAMICS

A schematic diagram of an experiment, proposed to test *radiational electrodynamics*, is shown below (Figure A4.1). It consists of a long evacuated glass tube with a cathode at each end and an anode at the centre. The hot cathode, on the left, is kept at a high negative voltage $-V_{HC}$, the anode at zero (0) volt and the cold cathode at 0 or $-V_{HC}$ volts. The hot cathode, heated by a heater H , emits electrons which pass through a grid to move toward the anode. An accelerating electrostatic field is maintained, within a separation L , between the hot cathode and the anode. A decelerating field is provided, also within a separation L , between the anode and the cold cathode.

The grid is maintained at a positive or negative voltage relative to the hot cathode. If the grid is negative, electrons are repelled by it and no charges reach the anode. If the grid is positive, electrons are accelerated through it to the anode. Some of the accelerated electrons pass through a small hole in the anode and may proceed to reach the cold cathode.

In the first place, the cold cathode is maintained at the same zero (0) volt as the anode. The accelerated electrons pass through the anode and may drift on, with constant speed, to hit the cold cathode. Electrons striking the cold cathode have a heating effect on it.

A narrow pulse of electrons, from the hot cathode, produces a signal as it passes through the anode and another signal as it strikes the cold cathode. The speed of the electrons is determined from the length L and the time interval between the two signals. This time interval and speed, measured with a fast oscilloscope, may be varied.

The next step is to maintain the cold cathode at $-V_{HC}$, the same high voltage as the hot cathode, so that a decelerating field exists between the anode and the cold cathode. Thus, relative to the anode, the high accelerating potential is equal to the decelerating potential. As a result of

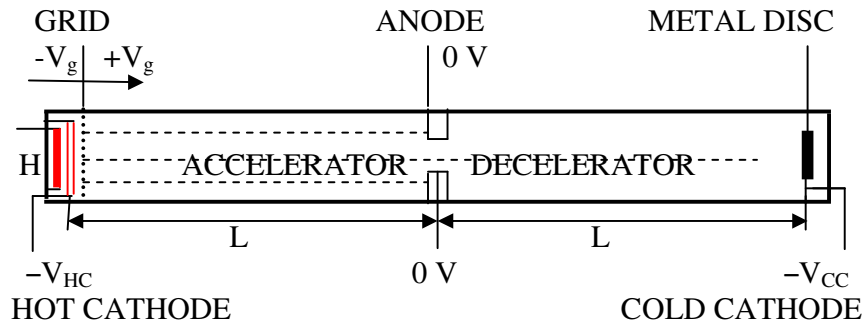


Figure A4.1 Apparatus for testing *radiational electrodynamics*

energy radiation, electrons passing the anode will be stopped and turned back, before reaching the cold cathode.

In classical, relativistic and *radiational electrodynamics*, moving electrons decelerated by an electric field, radiate energy at the expense of their kinetic energy. Therefore, the potential energy gained is less than the kinetic energy lost, the difference being the energy radiated. Narrow positive and negative-going voltages, on the grid, should give a train of pulses of electrons, from the hot cathode to the anode, with a repeat rate of T seconds. The electrons would oscillate, with decreasing amplitude about the anode. They should emit light/heat and electromagnetic radiations, dissipating energy at the anode, before another pulse arrives within T seconds.

In classical and relativistic electrodynamics, heat is dissipated on the cold cathode when moving electrons lose kinetic energy by striking it. Where electrons do not reach the cold cathode, there should be no heating as might be indicated by a rise in temperature.

In *radiational electrodynamics*, there is light/heat radiation in the direction of motion of the accelerated or decelerated electrons. Radiation is transmitted, at the speed of light, ahead of the moving electrons, to impinge on the cold cathode. As such, there should be heat dissipation even where the electrons do not reach and hit the cold cathode. The incidence of radiation and rise in temperature of the cold cathode, verifies *radiational electrodynamics*.