Experiment X-1
Introduction to X-Rays

I **Reference Reading**

Acquaint yourself with x-ray concepts and equipment: tubes high-voltage supplies, controls, component ratings, spectra, methods for measuring intensities, etc. Also, safety measures to avoid damaging the equipment, electrical shock, and unsafe exposure dosages.

II Schematic Diagrams

Trace the wires and identify all the component elements of the x-ray generator circuit you will use. Draw its schematic diagram noting all the switches and adjustment controls, component ratings, the upper limit on safe tube voltage, tube current, and anode power. Curiously look over two or three other x-ray set-ups in the laboratory and identify their visual components.

III. Pin-Hole Pictures

Take two such x-ray pictures of.the Mo-Cu anode operating at 60 kVp and 1.5 mA. One picture should be taken with 2x magnification to show the focal-spot details and the other with 1x magnification to show generally, the central region of the tube {with the focal spot obviously over-exposed). Qualitatively explain all the features of both pictures, including the type of x-ray and its origin. Make a semi-quantitative measurement of the ratio of the intensities across the Mo-Cu interface, and another of all the intensities from the focal spot to the rays from the remaining anode. From these ratios, deduce {1) the ratio of the atomic number of the target button to that of the anode stem and (2) the fraction of the cathode electrons that back-scatter from the target button. (If you can improve the measurements of (l) and (2) after completion of Part IV, then state your results later in your notebook and cross-reference the earlier data. Remember to date all entries).

IV.

Using a standard free-air ionization chamber, study the following:

a) *saturation curve:* Plot this curve for a 60 kVp, 1.5 mA beam and decide with arguments, where on this curve you should operate for reliable measurements of intensities. Is this chamber-voltage also a good choice for a beam of a different voltage?