**Flowchart for analyzing data – Part II of Thermionic Emission experiment**

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Take intercept of each line at V = 0, for each T. **This is ln(I0(T)).** Calculate all I0/T2 values (as in 3rd and 4th lines of Table 3.1)

Taking ln of both sides, modified eq. 2.3b is:

ln I = ln I0 + kV1/2/T

Plot ln I vs. V1/2 for each T (semi-log plots) and fit to st. lines. (See last sentence of paragraph at top of p. 70.)

I. Child’s Law – examine data in the space charge region of your plot of emission current I vs. V, and fit to power law. Compare with Melissinos handout’s Eqns. 2.4 b or 2.4c. Also find value for e/m from either of these equations, using the filament data from section 2.3, p. 72.

II. Saturation region analysis – examine the data, then start from 3rd paragraph at top of p. 71, which is a condensed outline of the procedure described in this flowchart. See eq. 2.3b, and substitute V1/2 for E1/2, with an unknown constant k in the exponential function (since E is proportional to V). Also, to put 2.3b into usable form for fitting our experimental I-V curves, multiply both sides by the cathode (tungsten filament) area to obtain the total current Is = I0exp(kV1/2/T). (Is is also the measured anode current!) I0 is the effective emission current at temperature T and 0 anode voltage, and its temperature dependence is described by Richardson’s equation.

Plot ln(I0/T2) vs. 1000/T and fit to st. line, like Fig. 3.16.

This is the fit to Richardson’s equation 2.2. The slope will give your measured work function φ value, in eV.