DISSERTATION

Cool Science

ausgeführt am Atominstitut

der Technische Universität Wien
Fakultät für Physik

unter der Anleitung von
Univ.Prof. Dipl.-Ing. Dr.techn. Gorge Hammond
und
Projektass. Dr.rer.nat Rodney MacKay MSc.
Projektass. Dr.techn. Dr.techn. Dr.techn. Dipl.-Ing.
Samantha Carter

durch

Daniel Jackson

Matrikelnummer: 9-18-27-15-21-36

Stadionallee 2
1020 Wien

Wien, am 06.05.2020

Contents

1 Beam Characterization

Chapter about beam characterization.

ignore from here
2019-09-27 set voltages
2019-09-30 first successful external run
2019-10-07 spot vs pressure
2019-10-22 wobble stick measurement
2019-11-05 forgot to turn off filament heating
2019-11-14 assemble chamber with copper rings
2019-11-18 Faraday cup measurement, and next day variation
to here

possible sections
current and voltage on filament
pressure (oxygen exposure) vs beam current
aluminum foil
What happens with the wobblestick ->
Faraday cup -> Frank
Beam current measurement -> Frank
Measurement Ablenkungsgeschwindigkeit (frequency) -> Alex

1.1 Aluminum foil

In fig. 1.1 the inside of the 6-way cross of the first iteration is shown. On one side of the phosphor screen, aluminum foil was attached to simulate the aquadag coating inside a CRT. The beam was deflected on the aluminum foil and the BNC output was connected to ground through an ammeter to measure the beam current. As shown in fig. 1.2 there is close to no difference in the filament voltage (and therefore heating power) between an opened and unopened CRT while the beam current on the aluminum foil varies widely. One possible reason could be that electrons scatter around and not all choose the wire path to ground. Therefore a Faraday cup (see) was used in the second

explain in basic what aquadag

ref Faraday cup tion

iteration.

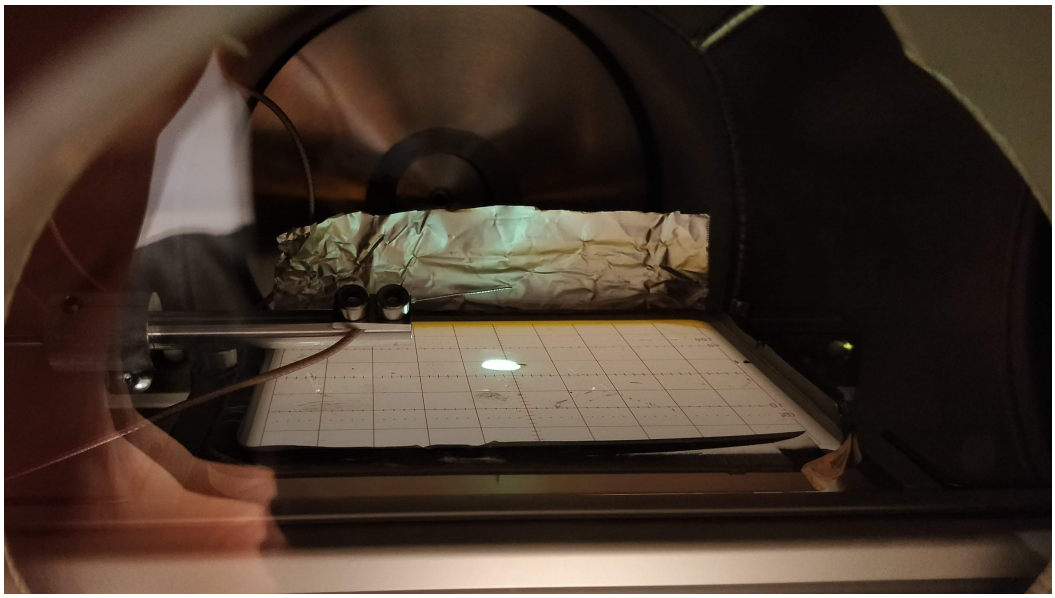

Figure 1.1: Front view of vacuum chamber (first iteration).

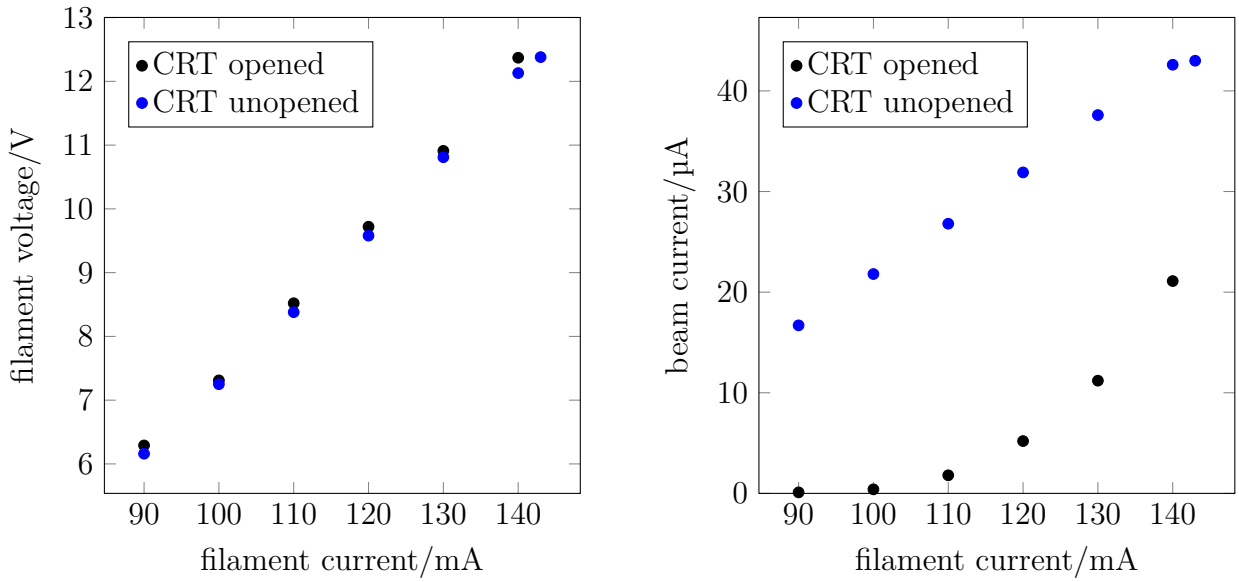

Figure 1.2: Difference in filament voltage and beam current between an opened and unopened CRT.

figure size, overfull hbox

1.2 Faraday cup

,

Package tikz E
Sorry, the syste
call 'pdflatex -i
on-error -intera

In order to accurately measure the beam current, a Faraday cup was built. A schematic is shown in fig. 1.3. A copper tube was cut at an 45° angle on one side and a Cu-sheet was soldered at the top and bottom. A small hole was drilled at the top and a coaxial cable was attached on the mantle which connects to a BNC feedthrough at the top of the chamber. The small opening and bent floor were made in order to reduce backscattering as shown by the blue arrows. At the top surface a phosphor coating was applied in order to make the beam visible which made it easier to guide it into the opening hole.

diameter?

With this improve setup, the beam current was measured again. A summary is shown in fig. 1.4. It can be seen that a current of over 300 µA was achieved, which is more than the necessary amount for the experiment. A problem is the fact, that the current is not stable. A measurement on the next day under the same settings resulted in a current between 50 µA to 120 µA.

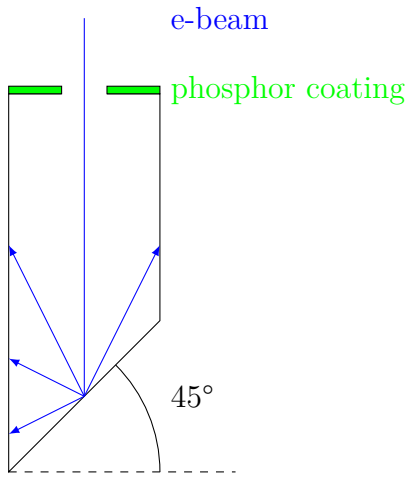

Figure 1.3: Schematics of Faraday cup.

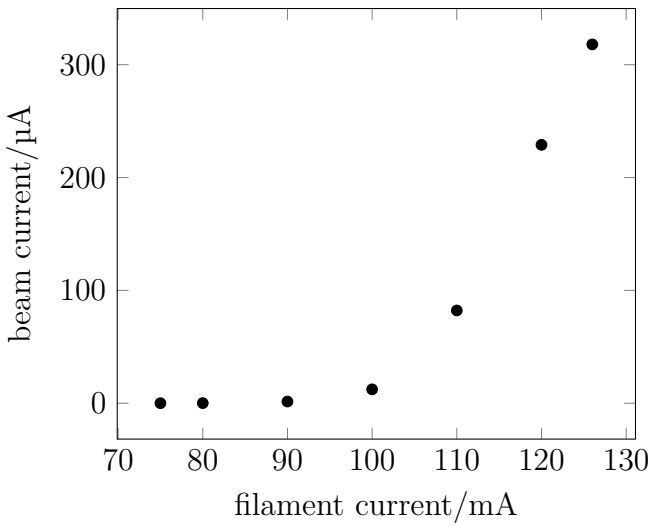

Figure 1.4: Beam current dependence on heater current.

Todo list