



TECHNISCHE
UNIVERSITÄT
WIEN

DISSERTATION

Cool Science

ausgeführt am Atominstitut



der Technische Universität Wien
Fakultät für Physik

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“The Setesh guard’s nose drips.”
TEAL’C

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1 Vacuum test chamber

ignore from here

Vacuum chamber -> Frank

Kurz: Wie sieht die Kammer aus, ev. Wie ist die CRT drinnen gemountet

CRT Mount ??

2020-08-30 leak rate 2020-09-27 set voltages 2020-09-30 first successful external run
2020-10-07 spot vs pressure 2020-10-22 current measurement aluminum foil 2020-11-05
forgot to turn off filament heating 2020-11-14 assemble chamber with copper rings
to here

In order to be able to fit the CRT screen, CF160 flanges were chosen for the test chamber. At one point during testing, major changes were made which will be explained in section 1.2.

1.1 First iteration

A 3D render of the chamber is shown in (fig. 1.1).

1.1.1 Parts

The center piece consists of a 6-way cross with view ports at the front and bottom. A valve was installed at the back in order to flood the chamber with nitrogen when installing a new CRT to avoid oxygen poisoning. On the right side, a HiCube 300 Eco turbo pump was installed and on the left side a wobble stick was attached with a wire. A nipple fitting was installed at the top with a 5 port cluster flange, each being of type CF63.

pure nitrogen
name?

length

In the middle port, a VSH vacuum transducer was installed to measure pressure. This needs a 24 V dc power supply. On the left, a 19 pin connector was installed to supply the necessary voltages to the CRT. Two flanges were equipped with four BNC feedthroughs each. One of them was used to connect do the x-, and y-plates, while the

how many pins
model name?

other connected to the wobble stick and aluminum foil at the CRT screen. Further explanation will be given in . The last port was capped off by a blank flange.

For the inside wires, stranded copper cables were used. The chamber was sealed by rubber gaskets.

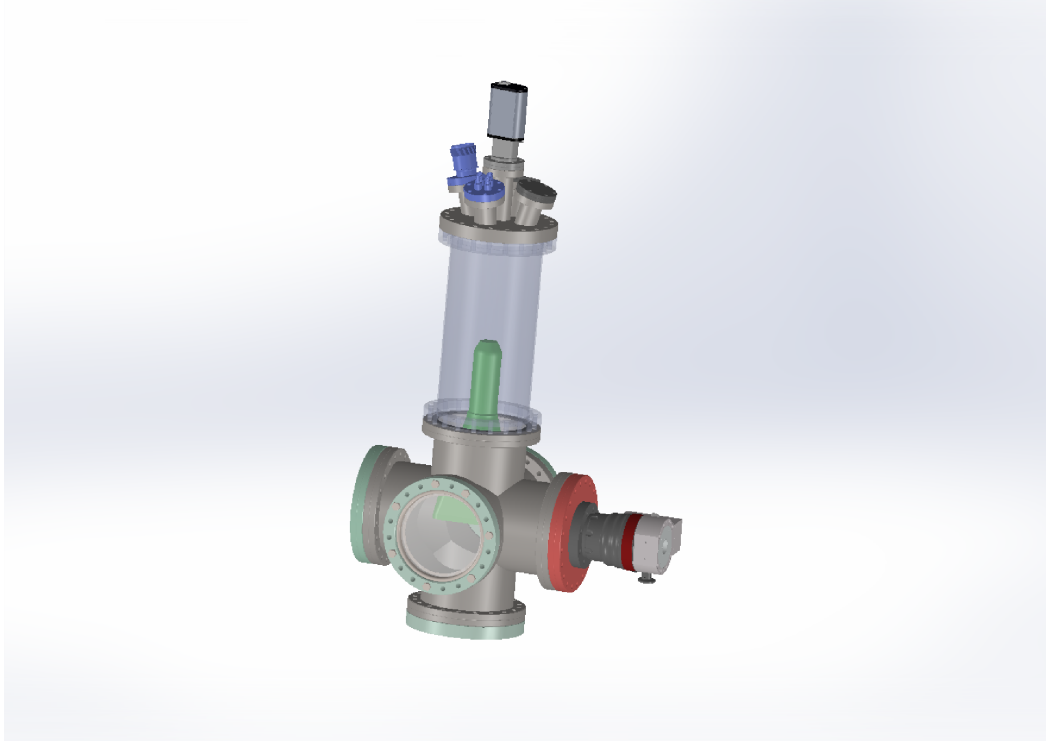


Figure 1.1: 3D rendering of test chamber.

1.1.2 CRT mounting mechanism

Two M8 rods of length were drilled into the cluster flange. On each, a L-piece was installed between two nuts and they were connected by a hose clamp. Two of these were used to secure the CRT inside the nipple facing the cross (fig. 1.2).

1.1.3 Leak test

Before inserting a CRT, a leak test was performed. First, the chamber was set to a pressure of 10^{-5} mbar after which the pump was turned off. The pressure was measured once a minute for a duration 3 h. This is shown in fig. 1.3.

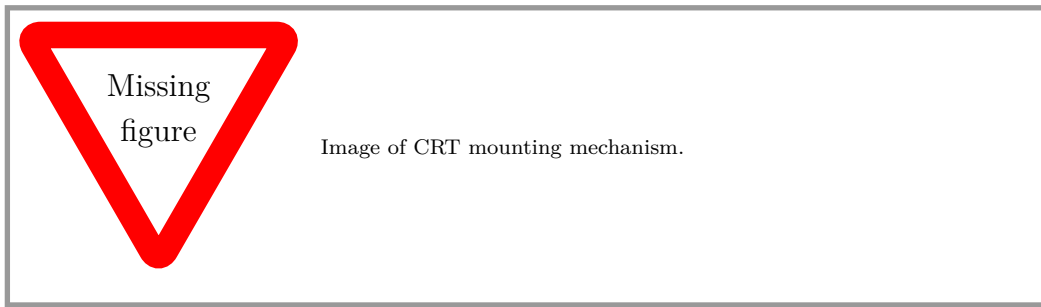


Figure 1.2: Image of CRT mounting mechanism.

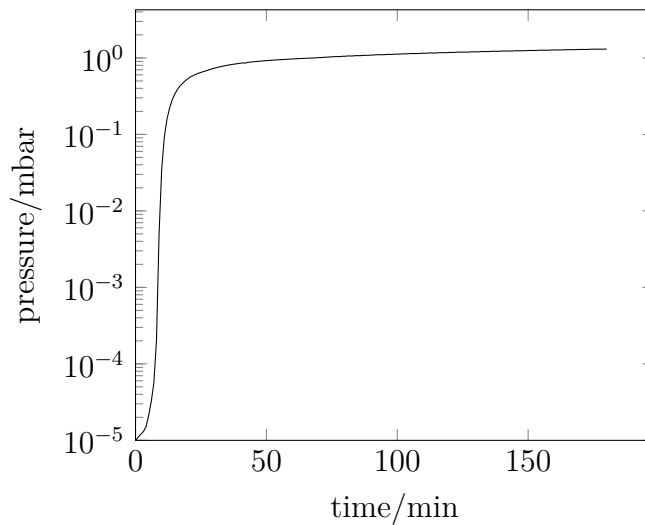


Figure 1.3: Leak rate of test chamber after turning off pump.

1.2 Second iteration

At one point during experimentation, major changes were made to the chamber.

1.2.1 Changes

First, every rubber gasket was changed to a copper one for a better seal, except at the cluster flange, since that spot will be opened and closed the most often. Each copper stranded cable inside was switched to a coaxial one and the mantle was connected to the chamber wall, which was set to ground. A Faraday cup was installed below the wobble stick, to accurately measure the beam current (further details in). The aluminum foil was extended to cover all four sides of the screen.

ref ch:Beam characterization

1.2.2 Fastening

When attaching flanges, it is important to start with a low torque and to fasten opposite screws to prevent too much force on one side of the gasket. For M6 screws, the torque was incrementally set to 6 N m, 10 N m, 15 N m and 20 N m and for M8 screws 8 N m, 16 N m and 25 N m. After finishing every opposite screw pair at a set torque, the procedure was repeated twice before going to a higher torque. This was done in order guarantee a tight and even seal.

1 **Todo list**

2	■ pure nitrogen name?	1
3	■ length	1
4	■ how many pins and model name?	1
5	■ ref ch:Beam characterization, include picture there	2
6	■ rod length?	2
7	Figure: Image of CRT mounting mechanism.	3
8	■ ref ch:Beam characterization	3