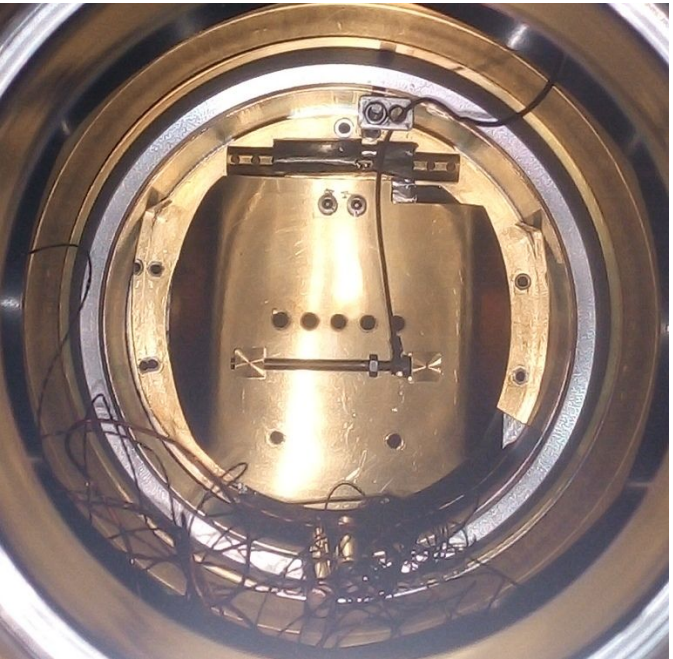
# ASACUSA@SMI 22/06/2021

Andi, Eric, Volkhard and Dan

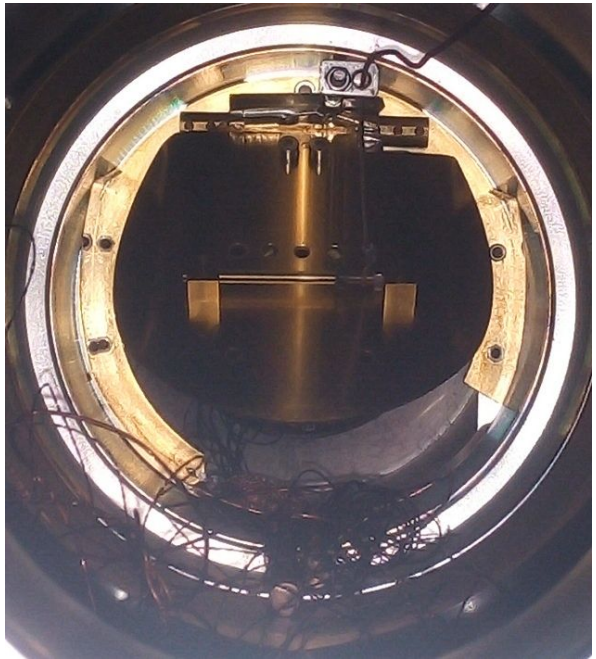
# Electrons (1/6)

Measure the temperature of the plasma with the Higaki shield in different positions

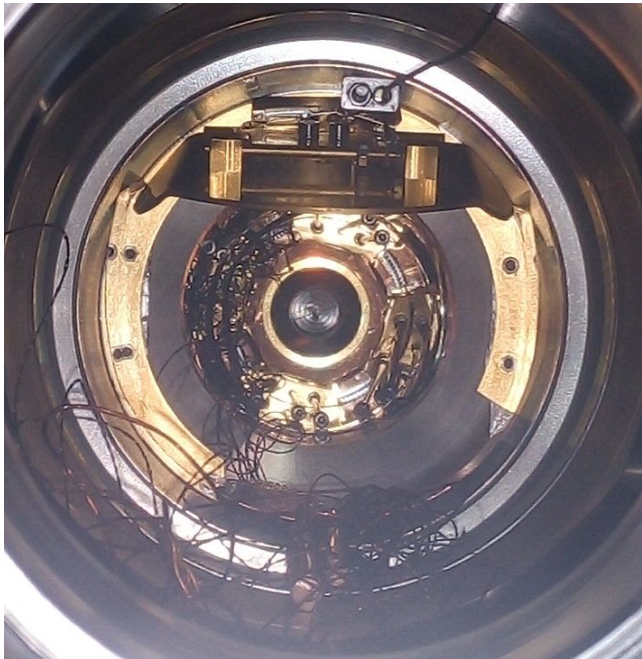
0 = closed



2 = partly open



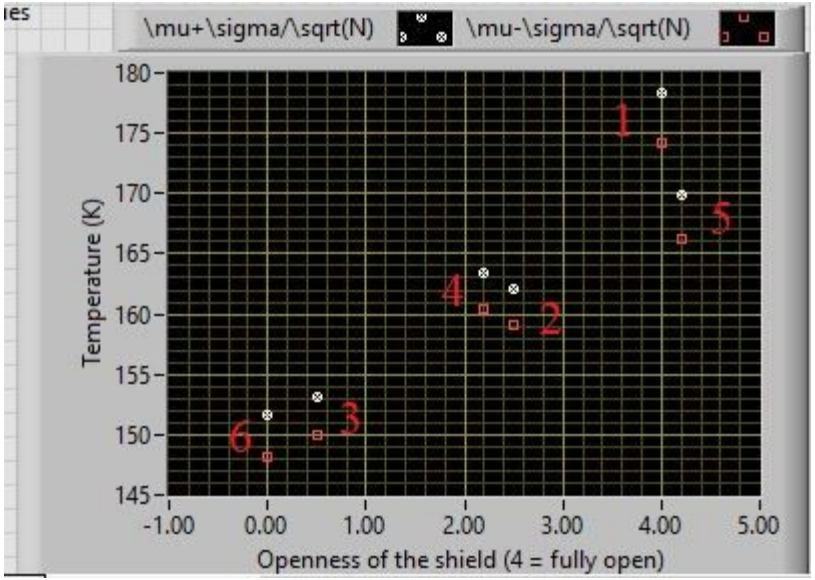
4 = fully open

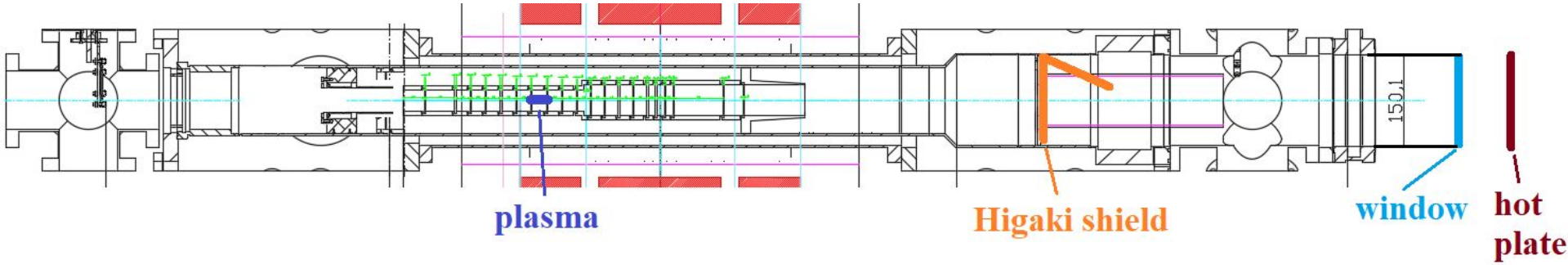


# Electrons (2/6)

Measure the temperature of the plasma with the Higaki shield in different opening states (0/4 closed, 2/4 half open, 4/4 fully open).

Red numbers show the order in which the measurements were taken. Each measurement consists of 17 points (about 20 minutes).

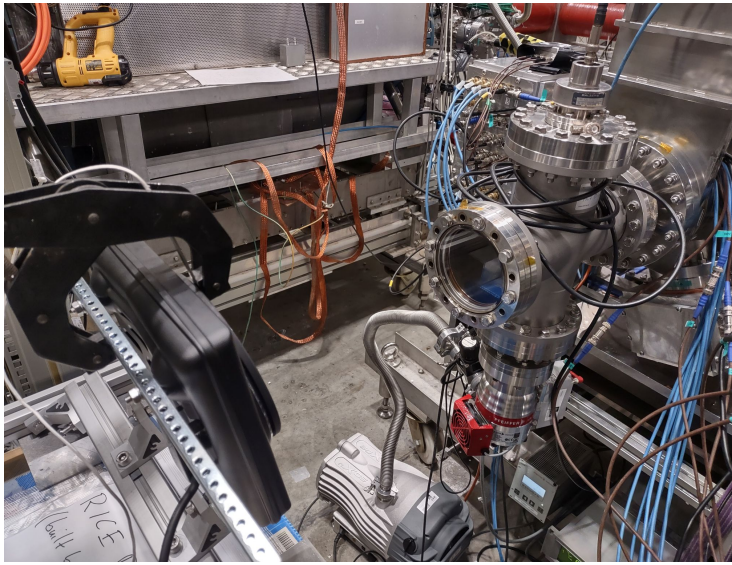


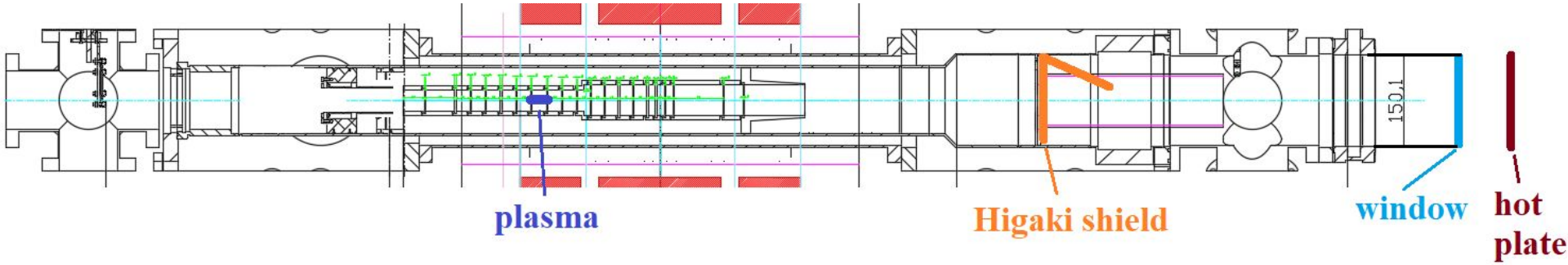



# Electrons (3/6)

Attempted to influence black body radiation environment using a hot plate. The plate covered the solid angle through the window and was heated to >450 K.

No additional plasma heating was observed.





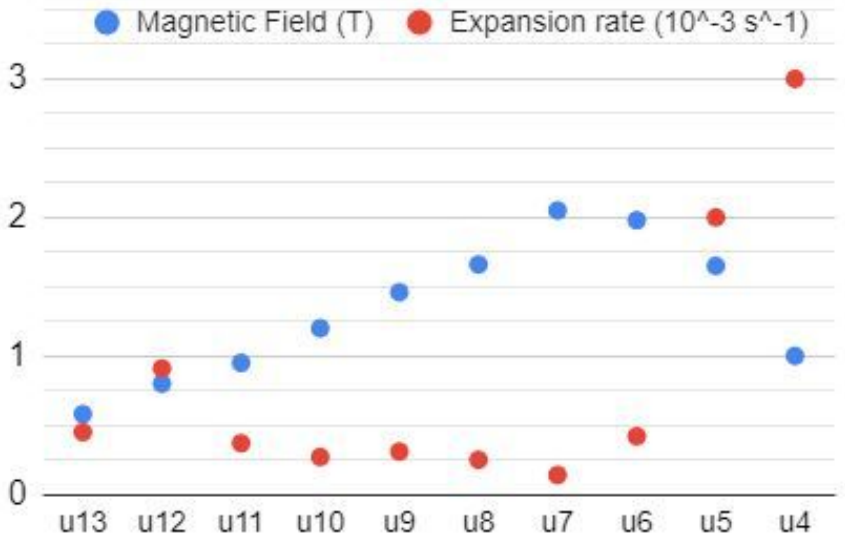
# Electrons (4/6)

Measured the expansion rate when the plasma sits under only one electrode. Varied which electrode.

Expansion rate is generally very low, corresponding to very little heating (H ~ 3 K/s).

This is far too little to explain the ~150 K equilibrium temperature of the plasma.

Oddly, the rate seems to increase faster than 1/B^2 for u5 and u4



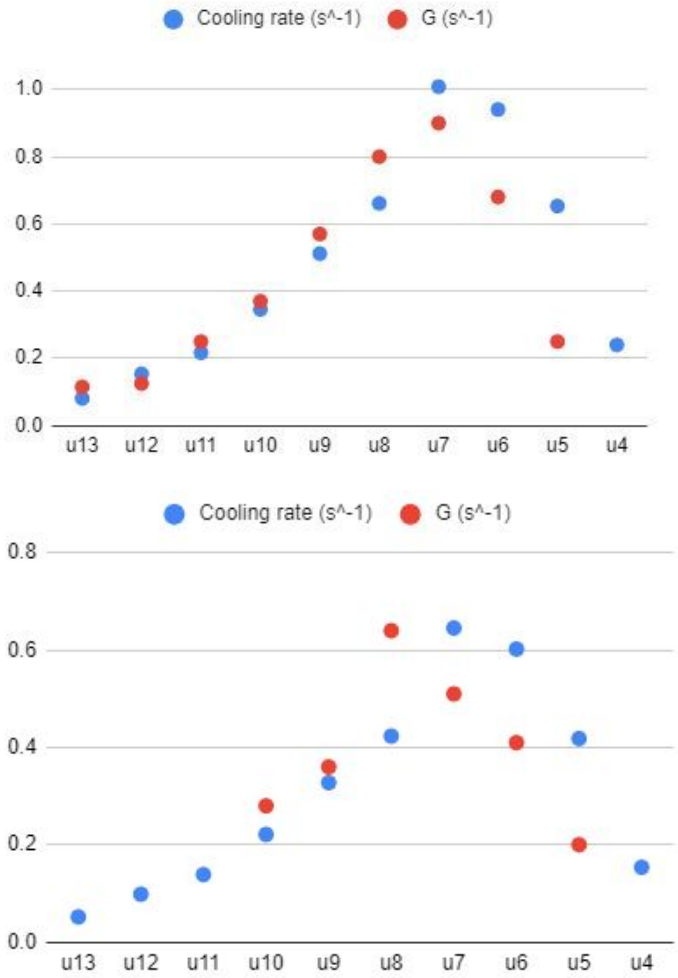
# Electrons (5/6)

The measured cooling rate (orange points) falls faster than expected in u6, u5, u4.

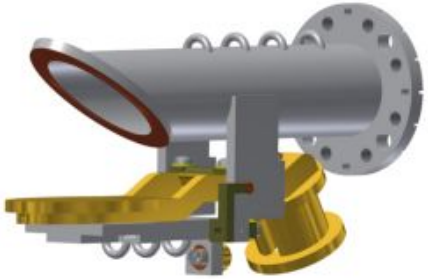
This is also true at 80% nominal field (bottom graph).

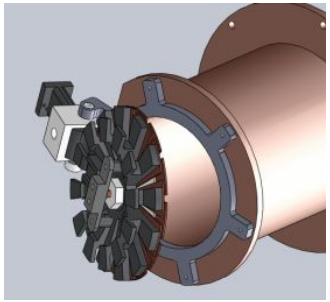
This corroborates the expansion rate anomaly: u5 and u4 are closer to the cusp (B=0) than expected. The trap has been installed too far downstream.

Good to know; hard to fix, and anyway doesn't address the central problem.



# Electrons (6/6)

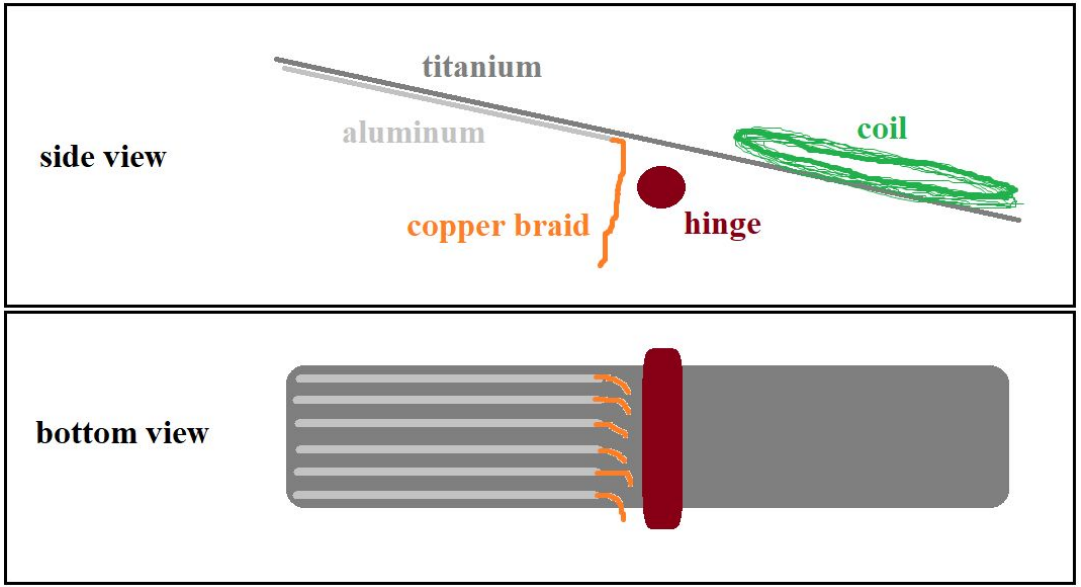




A cryogenic door would block both gas and microwaves

It has to open quickly, or else the plasma will rethermalize at a higher temperature before it is finished opening

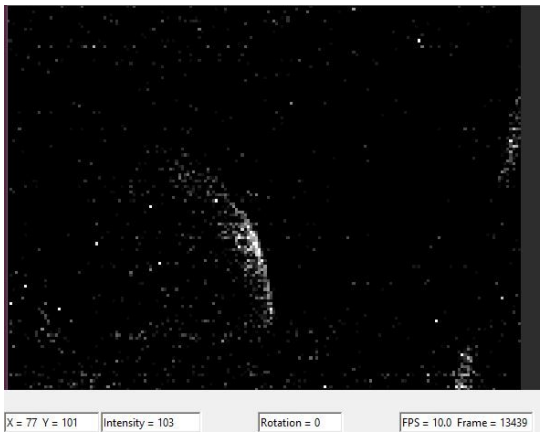
This door would have to be opened and closed ~2000 times per day, for 24 hour operation

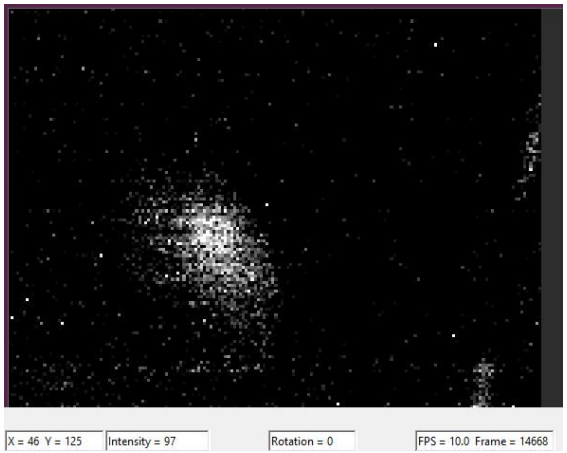


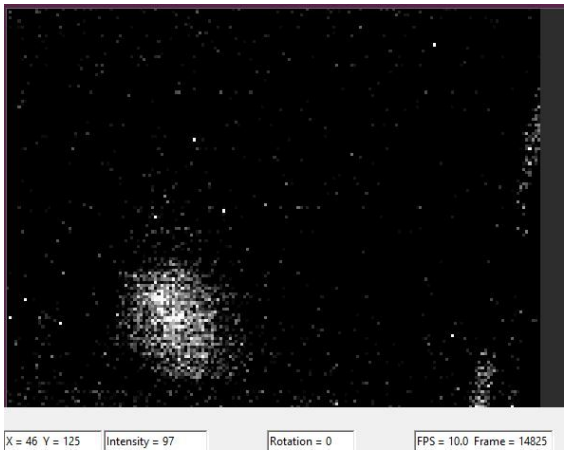
# Protons (1/2)

Turned around MCP to measure beam coming from the p-source.

Could move the beam using the electrodes in the p-source.



# Protons (2/2)

Caught protons in the cusp!

DC beam seems to dominate (not the RF cleaned population)
→ not only protons

There are too few particles in a bunch to measure the charge; based on the nominal gain of the MCP, we estimate roughly 5000 particles per bunch.