Alexis Papandreou
Supervisor: Prof. Makoto Fujiwara

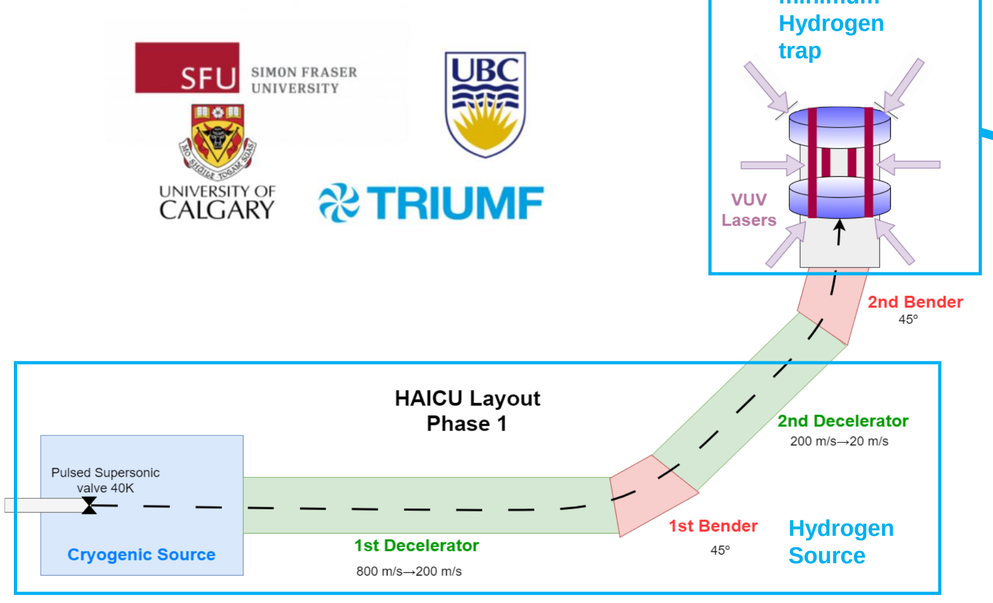
Developing atomic manipulation techniques for (anti)hydrogen measurements in ALPHA and HAICU

Ambitions of the field:

1) Apparatus capable of performing measurements on both hydrogen and antihydrogen.
2) Measurement volume free of magnetic fields.

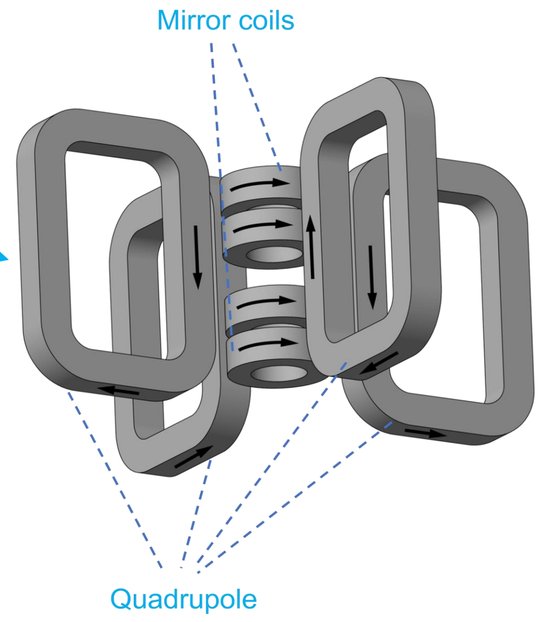
These present numerous technical challenges. HAICU, based at TRIUMF, serves as a platform to develop the necessary atomic manipulation techniques on hydrogen, that will eventually be applied to antihydrogen.

Hydrogen-Antihydrogen Infrastructure of Canadian Universities (HAICU)



The current layout of HAICU. Split into hydrogen source and decelerator, and magnetic hydrogen trap.

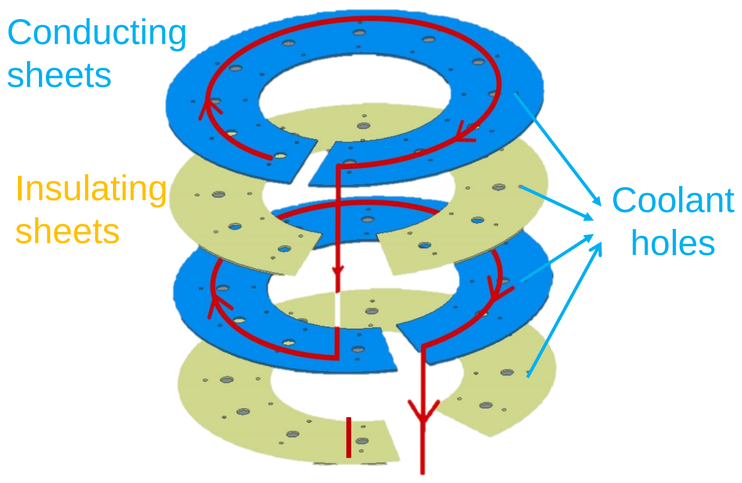
Ioffe trap layout



Simplified model of the planned hydrogen trap courtesy of Dr. Chukman So.

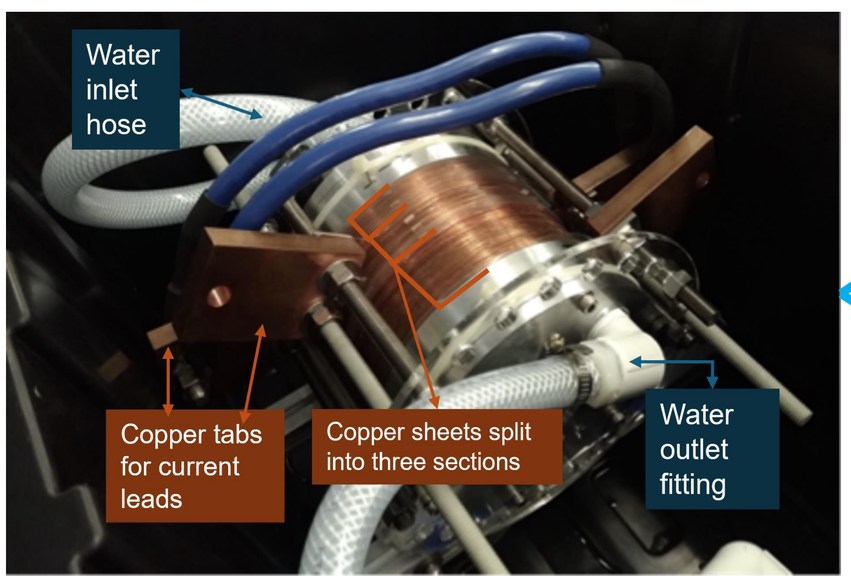
Technology of choice:

Bitter-style coils:



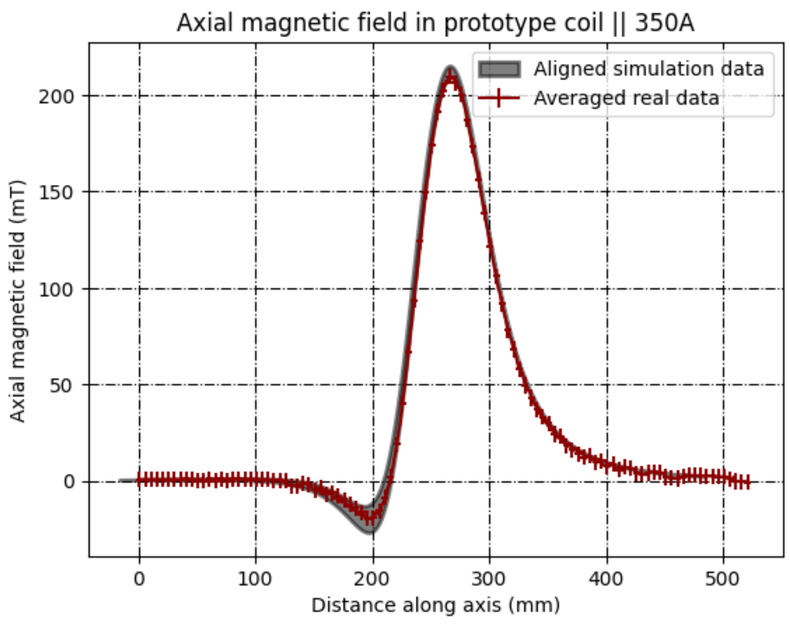
Exploded view of a Bitter-style magnet with the current path in red.

Prototype coil



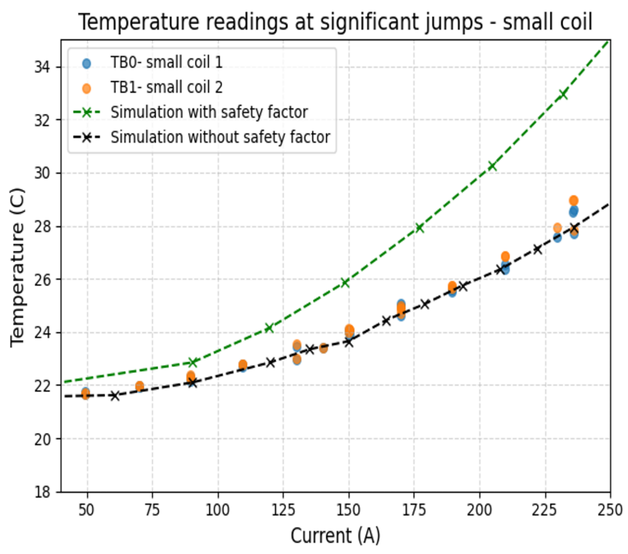
Prototype coil built for proof of principle experiment.
Fundamentals of the control and safety system have been developed.

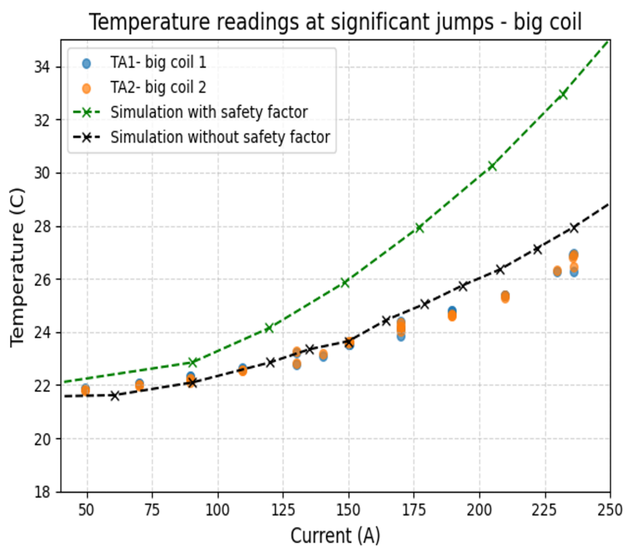
Magnetic field shape



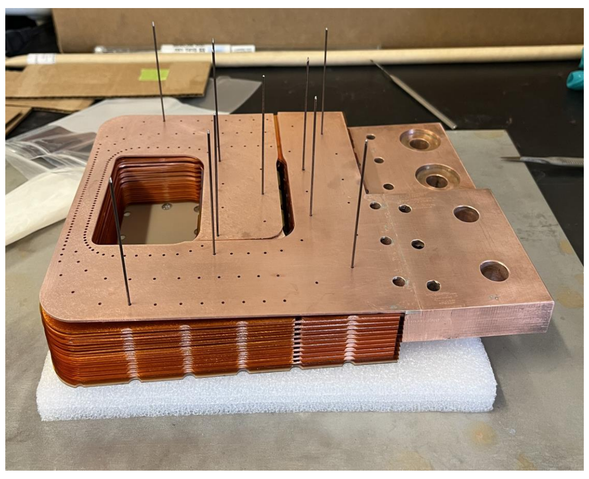
Magnetic field data taken by pushing a Hall probe through the bore of the prototype coil.

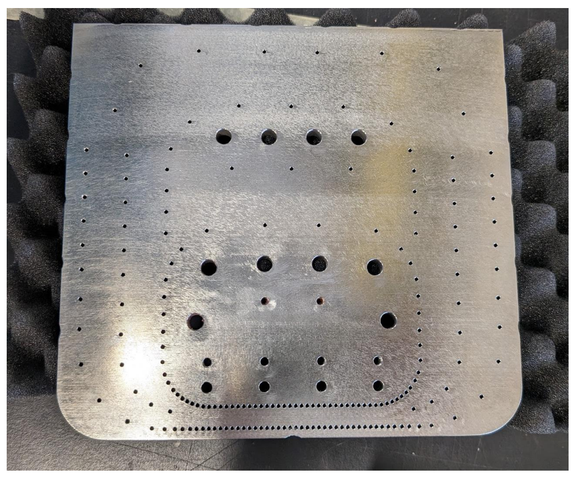
Thermal response of coil





Temperature probes used to compare performance of coolant holes to simulations.





The first of the quadrupoles is almost fully assembled and ready for testing.

HAICU aims to trap and detect decelerated atomic hydrogen by the end of 2024.

Discovery, accelerated