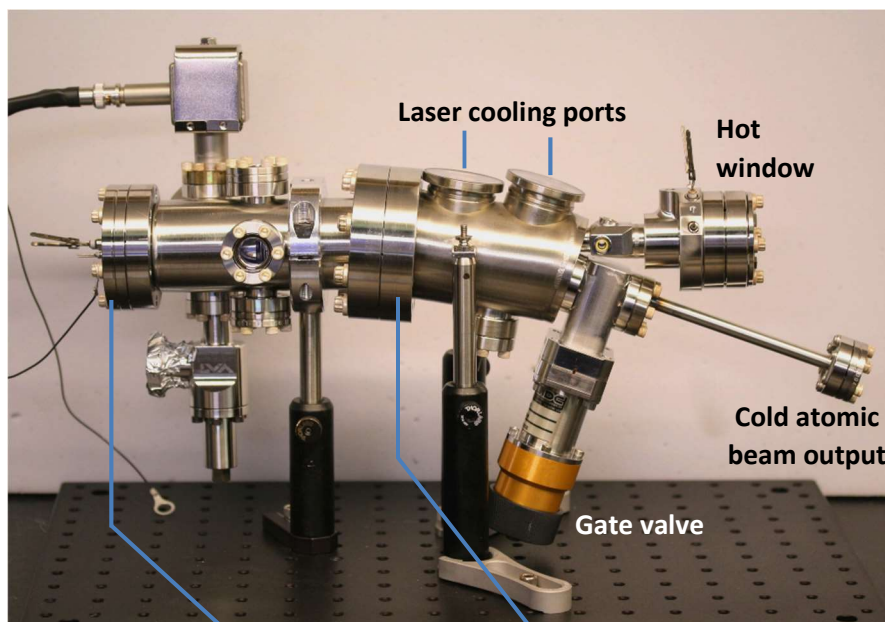


Beam-RevC-XX

Cold atomic beam system

- Cold atom flux $> 10^{11}$ atoms/s at $T_{\perp} < 3$ mK, axial speed ~ 40 m/s.
- Miniature chambers (1-2 L) and in-vacuum optics achieve baseline pressures $< 10^{-10}$ Torr.
- Proprietary oven and Zeeman slower, hot window, and integrated transverse cooling/trapping.
- Hot beam flux is entirely blocked from entering the cold beam output port.
- Species available: strontium, calcium, or ytterbium.



High flux atomic beam oven

- Low power consumption and no water cooling.
- Exceptionally low outgassing at elevated temperatures (6×10^{-8} Torr-L/s at 400 °C).
- Flux $> 10^{13}$ atoms/s using only 4 W.
- Holds many grams of material.



Zeeman slower

- Permanent magnet design (US Patent 8,710,428 B1)
- Requires no electrical power or cooling water.

Cold Atomic beam system	Performance
Cold atom flux	10^{11} atoms/s
Temperature transverse	$T_{\perp} < 3$ mK
Axial speed	~ 40 m/s
Atomic beam oven	Performance
Strontium flux, 17 mrad half-angle	$> 3 \times 10^{13}$ atoms/s
Calcium flux, 11 mrad half-angle	$> 1 \times 10^{14}$ atoms/s
Power consumption	5 W at 520 °C
Outgassing	6×10^{-8} Torr-L/s at 400 °C
Water cooling	none
Maximum temperature (tested)	650 °C
Zeeman slower	Performance
Type	Sigma-minus standard
B-field generation	Permanent magnets
Magnetic shield	Integrated
Thermal shield	Integrated
Mounting	In-vacuum
Hot window for slower	Performance
Maximum temperature (tested)	480 °C
Outgassing	3×10^{-9} Torr-L/s at 480 °C
Mounting	In-vacuum
Window material	Z-cut sapphire, AR coating
Clear aperture	8.5 mm diameter
Atomic beam chambers	Performance
Windows	Welded, AR coated
Seals	ConFlat
Volume	2 L, complete system
Ion pump	3 L/s, integrated
Getter pumps	50 L/s and 5 L/s
Beam chamber baseline vacuum level (before pressure drop across the differentially-pumped output tube):	
<ul style="list-style-type: none"> Oven and hot window off 480 °C oven, 350 °C window – typical operation 	$< 1 \times 10^{-10}$ Torr $< 2 \times 10^{-8}$ Torr
Connection to customer systems	UHV gate valve standard (not shown)

Sub-assemblies can be provided in off-the-shelf vacuum enclosures by request.