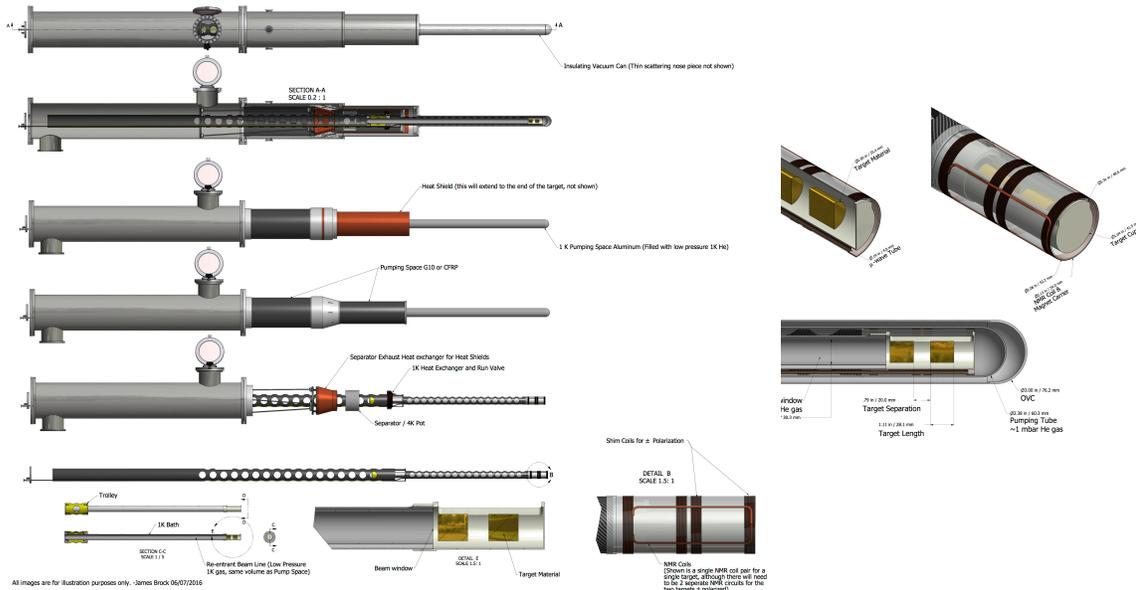


CLAS12 – Longitudinally Polarized Target



A longitudinally polarized target is under construction for CLAS12. The target sample, comprising beads of irradiated ammonia (NH_3 or ND_3), will be dynamically polarized using the 5 T magnetic field of the CLAS12 solenoid. To optimize high luminosity performance, the sample will be cooled to approximately 1 K using a horizontal, high-power ^4He evaporation refrigerator. Dynamic polarization of nuclei in the sample will be driven by a 140 GHz microwave source, and measured by a Q-meter based NMR system. The target is designed to operate with electron beam currents up to 30 nA.

Longitudinally Polarized Target - Technical Parameters

PARAMETER	DESIGN VALUE
Target material	Protons / deuterons (NH_3/ND_3 , LiH, LiD)
Sample dimensions	2.5 cm diameter x 4 cm long, 60% filling factor
Polarization method	Dynamic Nuclear Polarization (DNP)
Magnetic field	5.0 Tesla
Temperature	1 Kelvin
Expected Performance	DESIGN VALUE
Proton polarization	>90%
Deuteron polarization	>40%
Proton & Neutron Luminosity	$1.4 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ per nA beam current
Maximum Beam Current	30 nA

- **Construction Strategy and Project Leadership:**

The project is a collaborative effort between

- Old Dominion University (S. Bueltmann, S. Kuhn)
- University of Virginia (D. Crabb)
- Christopher Newport University (R. Fersch)
- Jefferson Lab (C. Keith)

- Microwave and pumping systems procured by the ODU & CNU collaborators.
- Target cryostat and refrigerator will be designed and constructed by JLab and UVa.

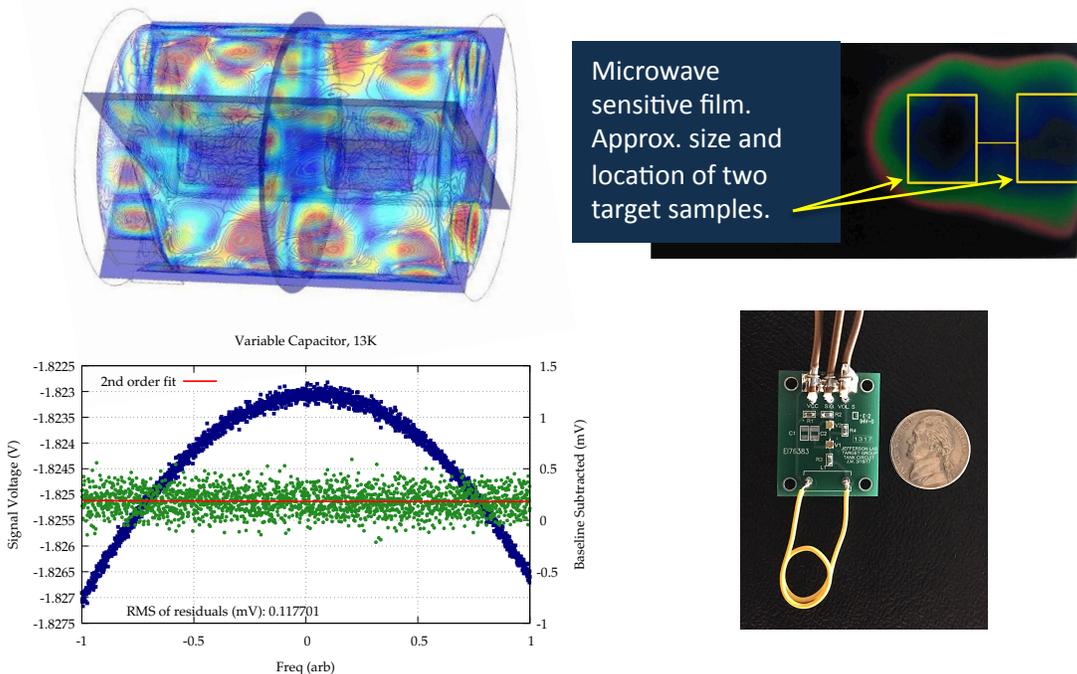
- **Project Status:**

Procurement of the NMR, microwave, and pumping systems is complete.

Design of a novel sample delivery system is now underway at JLab.

Optimization of the microwave cavity and waveguide for both single and double target sample configurations being pursued at CNU, UVa, and JLab.

Development of a new, remotely tunable CW-NMR system is underway at JLab.



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Jefferson Lab



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