

## The LANSCE Repair Project

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### ABSTRACT

The LANSCE liquid-hydrogen moderator safely vented on July 2, 1990. Subsequent investigations showed two leaks in the hydrogen loop. We substituted water for liquid hydrogen and continued to run LANSCE through October 1990. This substitution was an interim solution for providing neutrons to the two instruments using the hydrogen moderator as a neutron source. For a long-term solution we will remove the liquid-hydrogen loop and replace the canister and associated piping for the liquid-hydrogen moderator. During this LANSCE Repair Project, we will also replace the LANSCE target. The goal of the project is to have the new target and hydrogen-moderator loop installed by the beginning of the 1991 run cycle for the Clinton P. Anderson Meson Physics Facility (LAMPF).

### I. BACKGROUND

On July 2, 1990, the LANSCE liquid-hydrogen moderator<sup>1</sup> vented in a safe and controllable manner.<sup>2</sup> The LANSCE liquid-hydrogen moderator is depicted in Fig. 1. A vacuum gauge sensing the pressure in the hydrogen transfer-line jacket exceeded a preset trip point, signaling a valve to vent the hydrogen loop to the hydrogen vent stack. The overpressure resulted from one of the (three) helium compressors shutting down, which let the hydrogen system warm up, causing a "burp" (off-gassing from a cryopumped surface) and raising the pressure in the transfer line. The venting of the hydrogen loop is a normal shutdown procedure for such an occurrence.

Subsequent pressure tests with warm gas revealed two leaks:

- 1) *location:* in the hydrogen piping between the liquid-hydrogen and the transfer-line jacket  
*leak diameter:* 0.004 inches  
*cause:* failure in a transfer-line bellows
  
- 2) *location:* between the transfer-line jacket and the LANSCE cryo vacuum  
*leak diameter:* 0.065 inches  
*cause:* failure undetermined.

Since the LANSCE run cycle did not finish until the end of October 1990, an interim solution for providing neutrons to the instruments using the liquid-hydrogen moderator was to add a "stop leak" additive to the hydrogen loop and backfill the moderator canister

and piping with water. Figure 2 shows the calculated cold-source gain (neutron intensity from a liquid-hydrogen moderator to that of a water moderator). In Fig. 2, we also show the gain as measured by Hamilton and Smith<sup>3</sup>, which demonstrates a penalty (intensity reduction) for the water moderator at long wavelengths. Because of this penalty, we decided to replace the hydrogen-moderator canister and associated piping with new components before the beginning of the LAMPF 1991 run cycle. This moderator replacement together with the replacement of the LANSCE target is referred to as the LANSCE Repair Project.

## II. The LANSCE Repair Project

The objectives of the LANSCE Repair Project are to design, fabricate, test, and install the following by the beginning of the LAMPF 1991 run cycle:

- o a new canister, associated piping, and transfer lines for the liquid-hydrogen moderator;
- o new upper- and lower-tungsten targets, target canisters, and target-canister shrouds;
- o new upper-crypt shielding;
- o improved target (thermocouple) diagnostics; and
- o better proton-beam diagnostics.

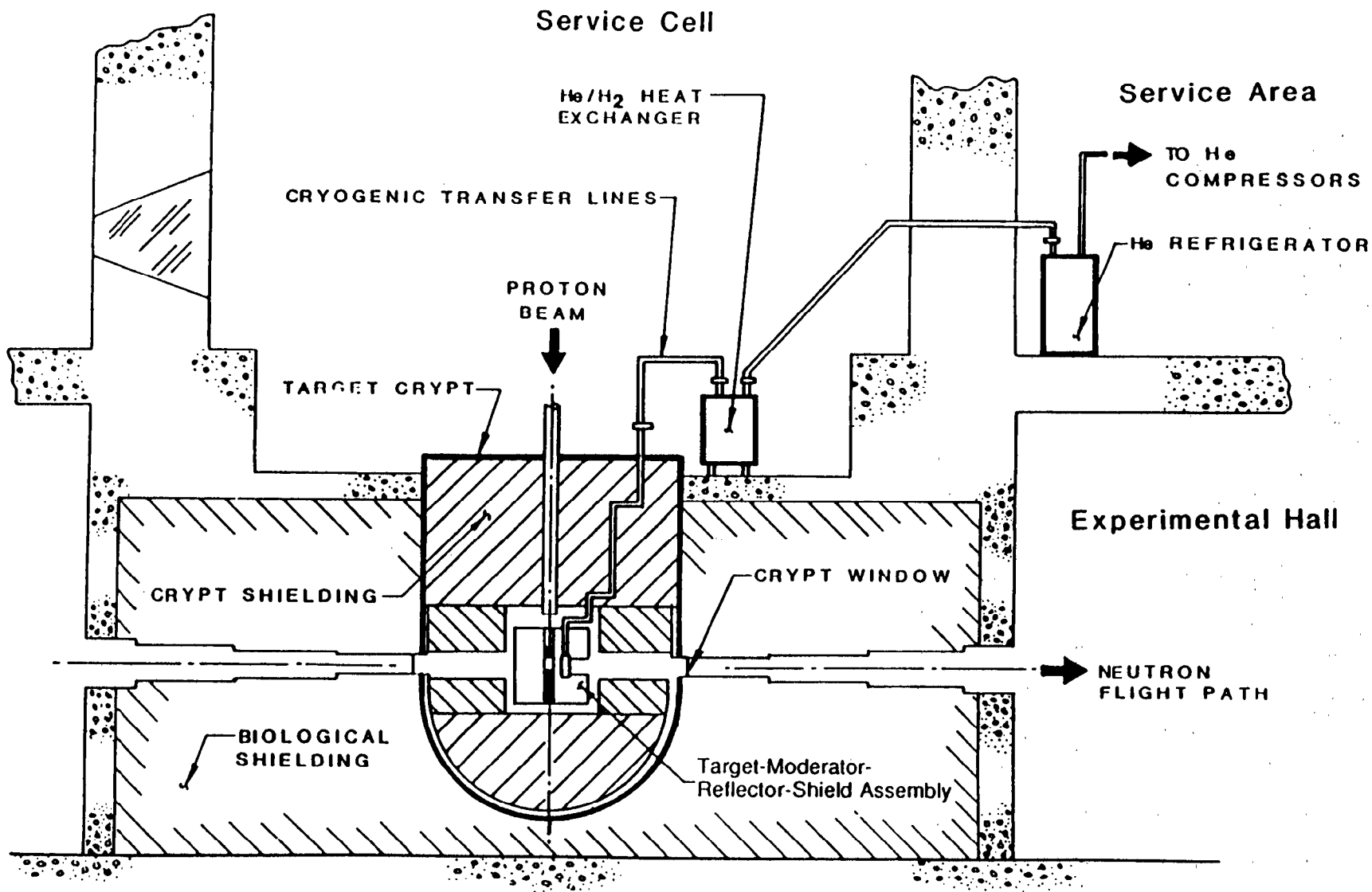
In addition, we will see if we can enhance moderator performance and increase the signal-to-noise ratio for all four LANSCE flux-trap moderators.<sup>4</sup>

## III. ACKNOWLEDGEMENTS

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## References

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2. J. H. Fretwell, et.al., "Review of the LANSCE Liquid-Hydrogen Moderator Problem," private communication.
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**Figure 1.** Section through the LANSCE target area, showing the location of the loop for the liquid-hydrogen moderator.

LANSCCE Liquid-Hydrogen Moderator  
Neutron-Leakage Gain  
Relative To Water

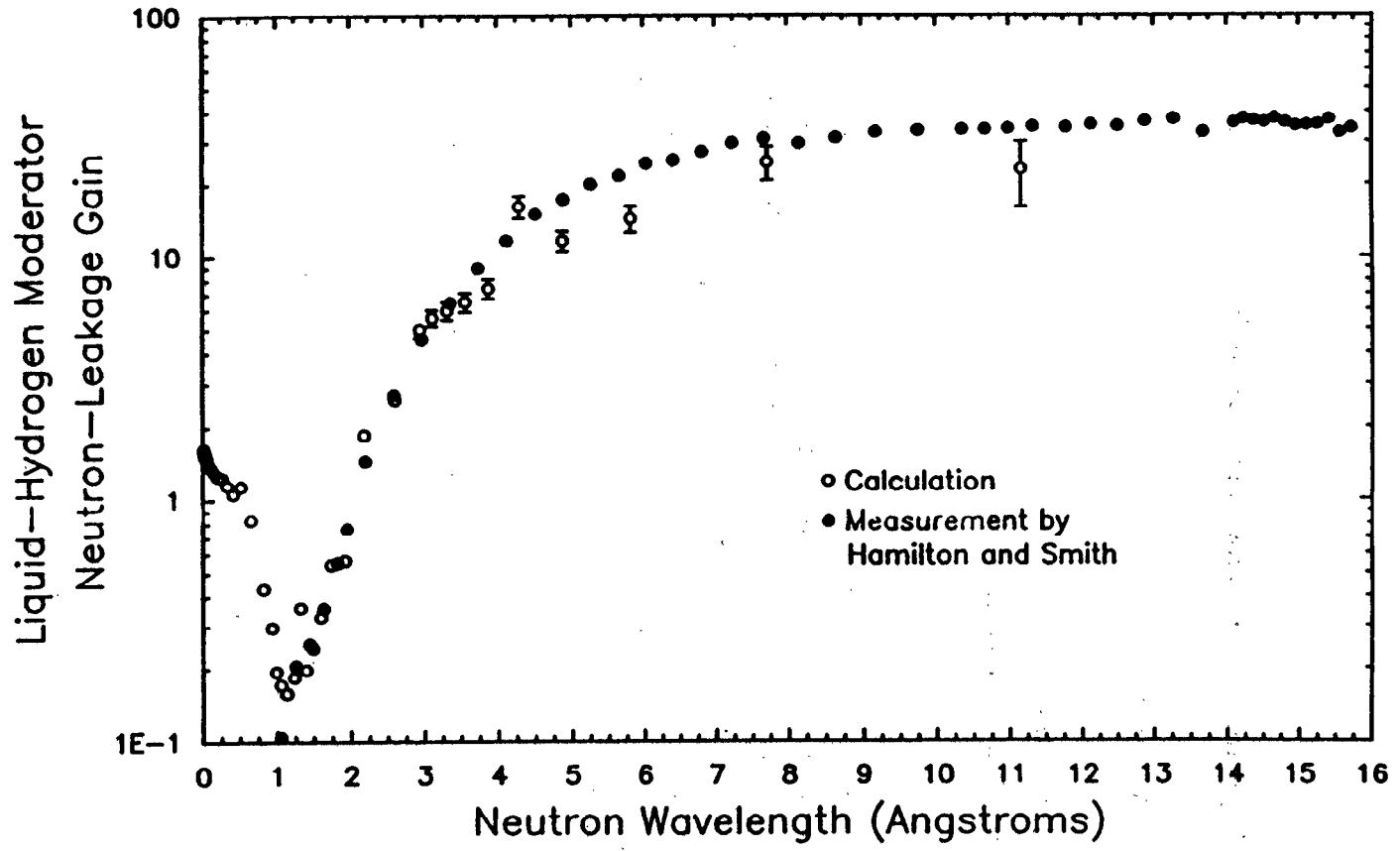


Figure 2. Comparison of calculated and measured neutron-leakage gain for the LANSCE liquid-hydrogen moderator.