

# Report on the LEGEND Vessels Shipment

Firas Abouzahr, Marek Proga, Karol Lang, Will Matava, Shawn Park  
The University of Texas at Austin  
October 12, 2021

## OVERVIEW

The LEGEND vessels are stainless steel chambers used to store and transport Germanium-76. The vessels are fabricated, cleaned, and partially assembled at The University of Texas at Austin by the UTKL research group. Each vessel consists of a flange, a hat, internal components for holding Germanium-76, and a Swagelok valve. This is the third instance of vessel fabrication, a total of 70 vessels (UT81 through UT151) were processed and shipped during this effort.

## FABRICATION

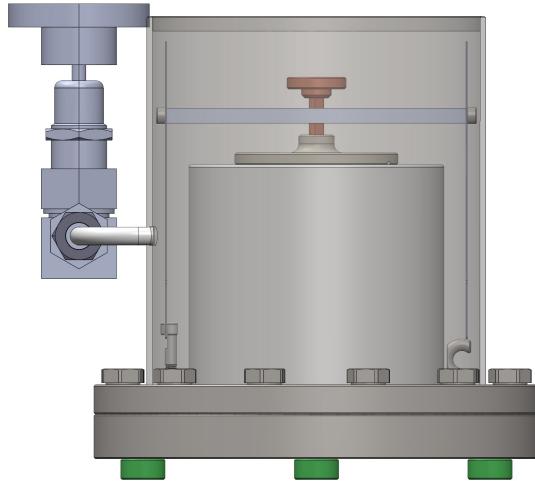
The LEGEND vessels were fabricated at the University of Texas Physics Machine Shop. All hats were leak tested to ensure proper sealing before being transported to the UTKL Laboratory for cleaning procedures. After fabrication, components were washed in a dishwater to remove any residual grease and then transferred to the clean room. The dimensions of the fabricated flanges and hats are listed in Table 1 below.

Vessel Component	Dimensions (mm)
Flanges	Diameter: 150 mm; Height: 15 mm
Short Hats	Outer Diameter: 150 mm; Inner Diameter: 115 mm; Height: 135 mm
Tall Hats	Outer Diameter: 150 mm; Inner Diameter: 115 mm; Height: 160 mm

**Table 1:** Dimensions of the flanges and both hat sizes.



**Figure 1:** The hats and flanges before being processed in the machine shop.



**Figure 2:** A rendering of a completed short LEGEND vessel courtesy of Marek Proga.

## CLEAN ROOM PROCEDURE

Every fabricated component is thoroughly cleaned in the UTKL clean room. The procedure in the clean room for Teflon and stainless steel parts (including hats and flanges) is as follows:

1. Components are cleaned in a 3% Micro-90 solution (deionized water) for 20 minutes at 65 °C in an ultrasonic cleaner.

2. Components are moved to a second ultrasonic cleaner filled only with deionized water for another 20 minutes.
3. Parts are allowed to sufficiently dry under heat lamps overnight.

Elements composed of aluminum and copper were cleaned in an ultrasonic cleaner with methanol to prevent discoloration from Micro-90. Certain components were purchased already clean and required no further attention in the clean room (e.g. valves, M6 flange screws and washers, aluminum base M3 screws and washers). O-ring gaskets were gently wiped with methanol.

#### ASSEMBLY AND SHIPMENT

In order to reduce the quantity of individual components in the shipments, the vessels were partially assembled after being cleaned. Flanges were equipped with aluminum adjustable bases, M4 modified screws, Teflon stands, and O-ring gaskets. 13 of the flanges were assembled without the aluminum bases as some of the bases were shipped with the first vessels. The hats were installed with the Swagelok valves and then closed with their corresponding flanges. Once a vessel was assembled, it was placed in two large, labeled zip lock bags to maintain sanitation and removed from the clean room. A total of three packages were sent out from the UTKL group for this phase of LEGEND vessel fabrication. The shipment dates are detailed in Table 2.

Date Shipped	Contents
September 27, 2021	36 Vessels; Loose Teflon, copper, aluminum, and steel parts
October 11, 2021	33 Vessels; Spare parts from Assembly
TBD	Vessel UT151 <sup>1</sup>

**Table 2:** The dates of shipment and contents for vessel packages.



**Figure 3:** Hats drying under infrared lights after ultrasonic baths.



**Figure 4:** Vessels packaged in their shipping container from the September 27th shipment.

---

<sup>1</sup>Due to issues in the machine shop, UT151 was fabricated at a later date than all other vessels and had to be shipped separately.