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HEU Pancake Plates

A 21/15 HEU Pancake plate being cleaned.

Component History

The HEU Pancake plates, formerly known as the Jemima plates, were procured in two batches. The first, consisting of the 15” plates, was ordered and produced by LANL in 1958 [1]. A second set, consisting of the 21” rings was ordered by LANL but produced by ORNL sometime in the 1960s. The plates were used at LACEF in experiments such as Big Ten and the Zeus series of experiments. In the mid-2000s, they were shipped to NCERC where they reside today. Since being at NCERC, they have been used in Zeus and TEX style experiments.

Physical Characteristics

The HEU Pancake plates are all disks with varying inner and outer diameters, with the exception of the wedges, which have a 15” outer diameter and a 60° internal angle. The smaller 15” OD plates nest nicely inside of the larger rings.

Composition

The HEU Pancake plates are bare, high enriched uranium. Composition data provided here are averages over five plates, one 21/15 ring and four assorted 15” OD pieces. Uncertainty was propagated across the measurements at a 95% CI. These measurements were taken in 1974 using an AVCO mass spectrometer [2].

Isotope	Weight %
U-234	1.023 ± 0.0139
U-235	93.268 ± 0.0627
U-236	0.274 ± 0.102
U-238	5.472 ± 0.0613

*Uncertainty propagated via standard error of the mean

Dimensions

The HEU Pancake plates are typically referred to with a XX/YY convention, with XX denoting the outer diameter, and YY denoting the inner diameter, both dimensions in inches. For instance, a plate with a 15” outer diameter and a 6” inner diameter would be referred to as 15/6. Plates currently in inventory include 15/0 (5), 6/0 (1), 15/2.5 (7), 15/6 (7), 15/10 (8), 21/15 (31), and the 15” diameter wedges (6). All plates have a nominal thickness of 0.118”, which is very close to 3 mm.

Mass

The plates range in mass from ~1.1 kg to ~6.1 kg depending on the type of plate. Using measurements taken in 2023 [4], the average density of the plates is 18.57 g/cc (0.16 g/cc std. dev) [4].

Current Uses

The HEU pancake plates are currently used as fuel for multiple critical experiments performed on the Planet and Comet critical assemblies.

References

1. Internal memo. “*Request for Oy (93%) N-2-871.*” May 21, 1958. J. M. Taub et. al. LANL
2. Office Memorandum. “*Mass Spectrometer Analysis – GWK-2334-B P-5.*” J. H. Cappis. LANL
3. Internal memo. “*Available HEU Jemima Plates*.” LANL
4. “*HEU Pancake (Jemima) Plate Preliminary Characterization Report*” (LA-UR-24-20414) K. Amundson et. al. LANL