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Development of an automated electroplating process for the manufacturing of thin-walled hohlraum.

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In order to optimize the implosion symmetry for indirect drive experiments carried out on the LMJ facility, the CEA has implemented a new diagnostic approach through the development of thin-walled hohlraum platform. With a gold wall thickness of only 6 µm, the thickness is thick enough to maintain the soft X-ray albedo equal to a standard thickness hohlraum, but is thin enough to ensure good X-ray transmission to quantify the laser power of internal and external laser beam cones.

The main challenge in manufacturing these thin-walled Hohlraum targets is to achieve a wall thickness of 6 µm ± 2 µm. A technical solution could be to electroplate a thick layer of gold onto the surface of a copper mandrel and then machine it to reach the required final thickness. However, due to the softness of gold, machining the gold layer to achieve a thickness less than 10 µm with the required precision can be very challenging or even impossible depending on the geometry of the parts.

For these reasons, we opted to achieve the requested gold hohlraum thickness directly by electrolytic deposition. The CEA has developed an automated electroplating process to optimize the uniformity of current density distribution on the surface of the mandrel during electrolytic deposition. Thickness measurements obtained using the X-ray fluorescence technique indicate that the gold deposited is uniform, with a standard deviation of less than 0.5 µm, regardless of whether the hohlraum is cylindrical or a rugby-shaped.