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A New Plutonium Metal Certified Reference Material at CETAMA: Release of the MP4 Standard

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The production and use of high-purity plutonium (Pu) metal standards are the cornerstone of Pu fissile material accountancy, as they are needed to calibrate the analytical tools used to characterize Pu-containing materials. But the task is a relatively complex one, because facilities capable of purifying and producing high-purity Pu in metal form are very rare, and also because it requires a large workforce to characterize the material and determine reference values.

More than ten years ago, CEA Valduc and CETAMA joined forces to launch the MP4 program in order to complete the range of Pu metal certified reference materials (CRMs) in CETAMA's catalog. The aim was to offer the CRM in the form of a metal piece with reduced mass compared with the current MP2 CRM (See fig. 1).

Manufacturing and packaging took place over the 2017-2019 period, and material characterization was carried out through the organization of an interlaboratory comparison (ILC) involving expert laboratories of CETAMA's network from 2021 to 2023.

In this paper, we will detail the data processing, which enabled us to determine reference values for various quantities such as the Pu isotopy and the Pu mass fraction. We will also try to convince you that the MP4 stands for a remarkable and unique Pu metal standard with a reduced mass and a comprehensive set of certified values.



Figure 1: MP4 Pu metal pieces in their sealed glass ampoule.