

Gold Analysis using PhotonAssay: Deployment and Operating Experience

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ABSTRACT

The Chrysos PhotonAssay technology provides fast, accurate, non-destructive and fully automated measurements of gold and other metals in ore samples. The method uses high-energy X-rays to activate metal atoms inside the sample; the activated atoms subsequently emit characteristic gamma-ray signatures that are detected and counted to determine the metal grade. The high-energy X-rays and gamma-rays can penetrate substantial volumes of solid rock, enabling true bulk assays of 400-600 g samples.

Following deployment of an initial PhotonAssay unit in Perth in 2018, two additional systems were deployed in Kalgoorlie in the first half of 2019, providing combined gold assay capabilities in excess of 0.5M (Perth) and 1M (Kalgoorlie) samples per annum. Collectively, the three systems have processed several hundred thousand samples since their initial deployment.

In this paper, we summarise the performance of the new technology, including:

- Validation of assay precision, measurement uncertainty and calibration procedures, leading to NATA accreditation.
- Performance results on certified reference materials.
- Extensive exploration of sampling issues and sample preparation requirements. The larger volume of material used in PhotonAssay compared to conventional fire-assay allows significantly simpler sample preparation protocols to be used in most cases.
- Performance validation on a wide range of deposit types.
- Operating experiences: throughput, turn-around samples and system availability.
- Extension of the PhotonAssay method to elements other than gold.

The operating characteristics of the technology make it ideally suited for on-site deployment, where it can provide near real-time analysis of samples for mine planning and process control applications. We discuss the development of a 'mine-site' unit optimised for high-reliability operations in remote locations and prospects for deployments in Australia and around the world.