

## **Muon tomography applied to a dense uranium deposit at the McArthur River Mine**

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Muon radiography is a means of inferring density by measuring the attenuation of muon (a type of elementary particle naturally abundant from cosmic ray radiation) flux through matter. Muon tomography uses tomographic methods to derive 3D density maps from multiple muon flux measurements.

Measurements of the muon flux were first used by E. P. George (1955) to measure the overburden of a railway tunnel, and by Alvarez et al (1970) in searches for hidden chambers within pyramids. More recently, muon radiography has been used in volcanology, archaeology, and has also been considered for industrial and security applications. CRM Geotomography Technologies, Inc. (CRM), a spin-off from TRIUMF, is bringing muon tomography technology to bear in mineral exploration.

In this talk, I will report on the first application of muon tomography for imaging dense uranium deposits within the Athabasca Basin in Canada, performed by CRM at the McArthur River mine in Northern Saskatchewan with support from Areva Canada and Cameco. I will demonstrate the applicability of muon tomographic imaging using data acquired at a depth of about 600 m underground. I will show that the statistical significance of the known uranium deposit signature in the muon data is very high (larger than five standard deviations), and I will report on the very good compatibility of the corresponding 3D density inversion with drill assay data from the deposit. I will also briefly recap other recent progress by CRM in various applications of muon tomography.