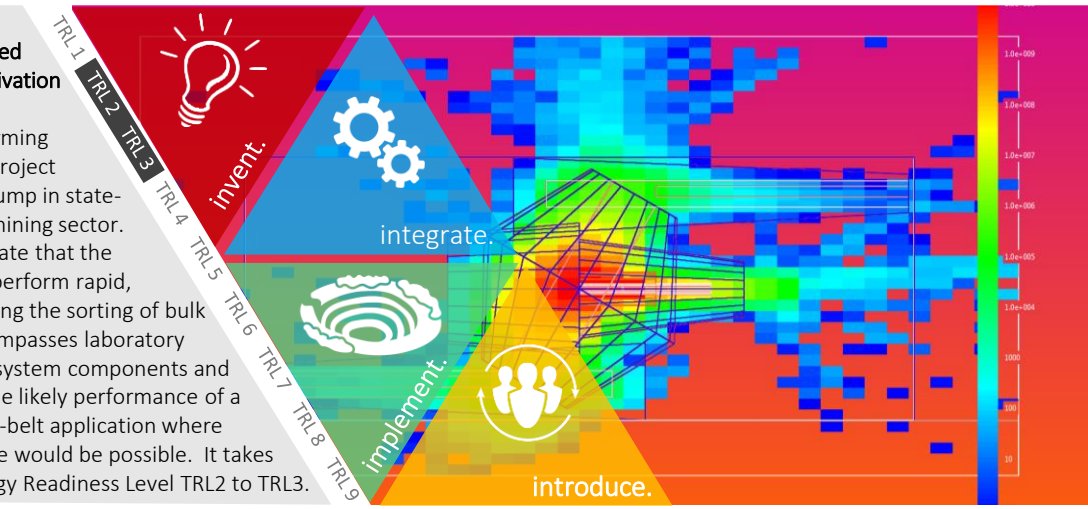
PROGRAM 1:
DEFINE

Gamma Activation Analysis for geo-sensing Phase 1

PROJECT P1-001

To develop a conveyor belt based grade sensor using Gamma Activation Analysis (GAA).

No group in the world is performing on-belt GAA and a successful project would represent a significant jump in state-of-the-art technology for the mining sector. A key challenge is to demonstrate that the approach can be scaled up to perform rapid, on-belt measurement supporting the sorting of bulk ore streams. This project encompasses laboratory demonstrations of the critical system components and a model based evaluation of the likely performance of a final system in a real-world, on-belt application where diversion of ore based on grade would be possible. It takes the technology from Technology Readiness Level TRL2 to TRL3.



Research collaboration

CSIRO has extensive experience developing novel nuclear- based instrumentation for mining and mineral processing applications, from concept through to commercialisation. CSIRO has extensive expertise in the use of computer modelling to design and optimise nuclear-based analysers and the development and construction of radiation detection systems and associated electronics and software.

CRC ORE and CSIRO are keen to further engage gold producers, especially from Western Australia, in the earliest stages of the project. At first this would involve sourcing of samples, understanding the deposit-based geological variability, and input into the system design. This will be used to develop commercial value propositions based on Grade Engineering® techniques.

Program Coordinator:	Paul Revell, CRC ORE
Project Leader:	Peter Coghill, CSIRO
Timing:	April 2016 – March 2017
Participants:	CSIRO. Potentially an offshore manufacturer of high-power x-ray sources for trial work and a gold mining collaboration to provide geological data and samples.

Image: Illustration of an initial shielding model of irradiation of ore, supplied by CSIRO

Background & aims

Gamma activation analysis involves bombarding samples with high-energy X-rays to induce nuclear reactions in elements. This results in isotope decay reactions generating a gamma ray fingerprint unique to different elements and isotopes. GAA involves quantifying the decay reactions to resolve the grade of the sample. To date, CSIRO have demonstrated GAA as a gold fire assay replacement technology.

This project aims to advance the application of GAA from fixed, laboratory-based samples to conveyor belt applications where the samples are moving and the material presented to the sensor is constantly changing. The main challenges revolve around understanding the precision and speed required for an effective GAA conveyor belt sensor and developing the radiation source, detector and shielding systems required. Such a system could then be used to divert pods or batches of barren rock or identify high grade ore.

Focus on outcomes

- Identification of the most suitable detector technology to measure activated gold, and a laboratory demonstration of the selected detector components.
- Detailed X-ray irradiator design, most likely built around a transfer point between two conveyors. Computer modelling would be used to establish both gold analysis and safety performance. The design would also include input from industry materials handling experts.
- Detailed analysis of the GAA-based Grade Engineering response of one gold deposit, based on geological information.

crcore@crcore.org.au
www.crcore.org.au

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