IMPROMAT

RmsBeGa
Beta-Gamma Measurement System

The **R**adioactivity **M**easurement **S**ystem **Be**ta-**Ga**mma (RmsBeGa) is a system that is particularly developed to check both *slag samples* and *cast samples* for radioactive contaminants emitting:

- B-radiation with an energy between 50 keV and 3 MeV
- γ-radiation with an energy between 50 keV and 2 MeV

Hardware description

- a robust floor standing aluminum structure with adjustable working height and all moving parts shielded with polycarbonate plates
- a *Gamma measurement station* with integrated multichannel analyzer to measure both slag and steel samples
- a *Beta measurement station* with integrated multichannel analyzer to measure slag samples
- a robot input station – developed according to customer's robot gripper
- a manual input station to offer slag/steel samples and reference samples manually to the system
- a robot-arm = an electrically driven axis with pneumatic gripper to move the samples between the different stations
- 3 different return position: for steel samples, for slag samples and for manual offered samples
- an electrical console containing the DC power supply and all internal cabling
- a compressed air line preparation equipment and manifold
- a PC containing:
    - a digital I/O board for input/output interpretation
    - a RS485 serial card for motor communication
    - the software with user interface, setup and result database

IMPROMAT V1.0
Park Diamant 3, B-2590 Berlaar, BELGIUM
Tel: +32 (0)3 482 41 44, Fax: +32 (0)3 482 14 24, E-mail: info@impromat.be

Operating principle

Gamma measurement station

The Gamma Measurement station is equipped with a NaI(Tl) scintillation crystal that is connected to a photomultiplier tube that converts the scintillation pulses into electrical pulses of which the amplitude is proportional to the energy the photon deposited into the detector.

These pulses are amplified and send to a Multi Channel Analyzer (MCA) converting them into a spectrum of counts versus energy. As gamma radiation is mono-energetic and each isotope disintegrates in its own specific manner, the spectrum gives information on the isotope being measured.

However, the resolution of a scintillation detector is limited, and therefore it is not possible to perform a real isotope analysis, merely isotope recognition.

So the measurement is performed on the entire energy range (so that all radiation photons within the range of 50 to 2000 keV will be detected) but the operator can setup different regions of interest for the isotopes he expects to find.

Beta measurement station

The Beta Measurement station is equipped with a plastic crystal type 35BM0.5 / 2-ZnS-P-X. The ZnS-coating ensures for improved detection of α-particles.

During startup the setup parameters are read from the database, the slides are moved out and the system counts its initial background value. Although the detectors are shielded by a lead castle, some ambient radiation still reaches the detector and causes a constant background signal that needs to be subtracted from the measurement value. As the level of this background radiation is not constant (dependant on weather conditions), it needs to be updated continuously.
So after startup, while waiting for a sample to be measured, the system measures continuously the background level and updates its value.

Whenever a sample reaches the slide, the sample is put underneath the detector and the sample is being measured.
After the measurement, the background value is subtracted from the measurement value and the result is evaluated against the alarm threshold. After that the result is put into the results database.