

# Accurately counting ions from laboratory radiation exposure

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Thermoluminescence is used extensively in archaeology and the earth sciences to date artifacts and rocks. When exposed to radiation, quartz emits light proportional to the energy it absorbs. Replicating the very low dose of background radiation from natural sources present in quartz is a key precondition for precise and accurate dating results. Italian scientists have now developed a method to control the accuracy of the dose calibrations delivered to the samples during laboratory irradiation with heavy particles, replicating natural radiation exposure.

These findings have just been published by Lara Palla from the National Institute of Nuclear Physics (INFN), Italy, and colleagues in a paper in *EPJ Plus*. Using oxygen and lithium ions from the Tandem accelerator at INFN LABEC in Florence, they found that their measurements were accurate to within 1%, despite large fluctuations in the irradiation beam.

In this study, the authors greatly improve on previous calibration measurement techniques. To do so, they employ a pulsed ion beam that produces ion bunches, and rely on a system combining an aluminium foil and an electron detector, dubbed the MicroChannelPlate (MCP). When the ion bunches pass through the aluminium foil some electrons are emitted and detected by the MCP.

The MCP's energy resolution is not sufficient to count the number of ions constituting the bunch. However, Palla and colleagues have found they can perform the calibration by comparing the response of the MCP with that of a silicon detector, which offers extremely good energy

resolution. They show that it is thus possible to precisely evaluate the number of ions within each bunch crossing the foil and reaching the target to be irradiated.

**More information:** Accurate on line measurements of low fluences of charged particles, *European Physical Journal Plus* 130: 39, [DOI: 10.1140/epjp/i2015-15039-y](https://doi.org/10.1140/epjp/i2015-15039-y)

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