# ID-TIMS U-Pb geochronology at the 0.1 ‰ level using the Triton XT with $10^{13}$ Ω resistors

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Uranium-lead geochronology provides valuable insights into the timing and rates of various geological processes throughout Earth's history. Isotope dilution thermal ionization mass spectrometry is the most precise and accurate technique for U-Pb geochronology. This technique is most commonly applied to single zircon crystals or crystal fragments resulting in small amounts of radiogenic Pb (typically <100 pg) and U (~1 ng) available for analysis. Precise and accurate analysis of such small samples requires sensitive ion detection systems. Here, we document recent advances in U-Pb geochronology using a Thermo Scientific™ Triton Plus™ TIMS equipped with $10^{13}$ Ω Amplifier Technology™. We use the synthetic EARTHTIME 100 Ma solution to document the long-term performance and reproducibility of this technique and report data on natural zircons ranging in age from the Archean to Cenozoic. We compare the precision of static Pb measurements (using $10^{13}$ ohm amplifiers) to the traditional dynamic single SEM peak-hopping Pb measurements. $UO_2$ measurements were always performed with $10^{13}$ Ω amplifiers. We demonstrate that for the homogenous ET100 solution, a long-term (>4 years) external reproducibility of the $^{206}Pb/^{238}U$ dates of better than 0.03% (2 s.d.; n=12) can be achieved for static Pb measurements, a factor 2 better than for dynamic single SEM peak-hopping Pb measurements. The superior precision of static Pb measurements is most significant for highly radiogenic zircons for which the internal precision of the measurement is the dominat source of uncertainty. For the Archean zircon standard OG-1, $^{207}Pb/^{206}Pb$ dates with uncertainties better than 100 ka are achievable allowing to resolve excess scatter in magmatic zircon populations. The significant improvement in analytical precision opens up new avenues for studying Archean magmatism at a resolution similar to much younger igneous system.