

# Relative U and Th Concentrations from LA-ICP-MS for Apatite Fission-Track Grain-Age Dating

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LA-ICP-MS provides higher precision determination of relative uranium concentrations compared to the conventional fission-track external detector method (EDM). For uranium standards, the relative error using LA-ICP-MS is ~1% vs. ~2% for EDM. For apatite grains (both standards and unknowns), the LA-ICP-MS relative error is typically ~4%; a comparable or better EDM precision requires  $\geq 600$  induced tracks to be counted, a feat rarely achieved. LA-ICP-MS also permits the measurement of relative thorium concentrations.

The following has been observed: 1. EDM/LA-ICP-MS apatite fission-track (AFT) age ratios tend to be  $>1$  for smaller grains. 2. EDM/LA-ICP-MS AFT age ratios show a sharp departure from near 1 for induced fission track counts ( $N_i$ )  $< 5$ , with EDM ages increasing rapidly as  $N_i \rightarrow 0$ . 3. Plots of LA-ICP-MS-derived AFT grain age vs. grain relative  $\alpha$ -Decay Energy Production ( $\alpha$ -DEP is a function of U and Th) for 7 of 12 Fennoscandia Shield samples studied show moderate to strong negative correlations (example shown below; most grains 500-1000 Ma). 4. Seven of 9 Canadian Shield samples studied show a slight negative correlation between AFT grain age and relative  $\alpha$ -DEP (most grains 300-600 Ma).

