|  |  |
| --- | --- |
| **Laboratory & Sample Preparation** |  |
| Laboratory name | Department of Earth Science, University of Tasmania – CODES |
| Sample type/mineral | Zircon |
| Sample preparation | Conventional mineral separation, 1 inch resin mount, 0.3um alumina polish. Cleaned in DI H2O degassed in vacuum. |
| **Laser ablation system** |  |
| Make, Model & type | ASI Resolution S155-HR and Resolution S155-SE |
| Ablation cell & volume | Two volume laser cell with an 8.8 cm3 small 2nd volume fixed cup. |
| Laser wavelength (nm) | 193nm for both systems |
| Pulse width (ns) | 20ns for the S155-HR and 5ns for the S155-SE |
| Fluence (J.cm-2) | 2.0 J/cm-2 unless otherwise stated. |
| Repetition rate (Hz) | 5Hz |
| Ablation duration (secs) | 30secs |
| Ablation pit depth / ablation rate | 8 to 10m pit depth, optical interferometry, equivalent to 50 to 60 nm/pulse |
| Spot size (um) | 29m for the 20ns laser and 30m for the 5ns laser. |
| Sampling mode / pattern | Static spot ablation |
| Carrier gas | 100% He in the cell set to 0.35 l/min, Ar carrier gas combined in 2nd volume of laser cell and was set to 1.05 l/min. |
| **ICP-MS Instrument** |  |
| Make, Model & type | Agilent 7900 ICP-MS for the 20ns laser system and Agilent 7700 for the 5ns laser system. |
| Sample introduction | Sample mixing done via ‘squid’ and Nylon tubing |
| RF power (W) | 1350W |
| Make-up gas flow (l/min) | 0.8 |
| Detection system | Electron multiplier with Pb and U in pulse counting mode |
| Masses measured | 49Ti, 56Fe, 91Zr, 178Hf, 202Hg, 204Pb, 206Pb, 207Pb, 208Pb, 232Th, 235U, & 238U |
| Integration time per peak/dwell times (ms); quadrupole settling time between mass jumps | 2ms dwell time for 56Fe, 91Zr, & 178Hf  10ms dwell for 49Ti, 202Hg, 208Pb, 232Th & 235U  15ms dwell for 204Pb & 238U  25ms dwell for 206Pb & 207Pb. |
| Total integration time per output | ~180ms |
| ‘Sensitivity’ as useful yield cps/ ppm | 2,200 cps / ppm on 238U in 91500 zircon assuming 80 ppm U |
| EM Dead time (ns) | 37 |
| **Data Processing** |  |
| Gas blank | 30 seconds |
| Calibration strategy | 91500 used as primary reference material for U-Pb and Th-Pb ratios. NIST610 used for Pb isotope ratios (207Pb/206Pb) and trace element concentrations. |
| Reference Material info | 91500 ([Horstwood et al., 2016](#_ENREF_13))  NIST610 ([Baker et al., 2004](#_ENREF_2); [Jochum et al., 2011](#_ENREF_18)) |
| Data processing package used / Correction for LIEF | In-house macro based Excel workbook “zirccalc” with code written by Sebastien Meffre. |
| Mass discrimination | Corrected using standard / sample bracketing |
| Common-Pb correction, composition and uncertainty | Common Pb correction applied to Monastery, Mudtank, Penglai, SP07-05, and Qing Hu zircons using Stacey-Kramer’s model Pb at age of zircon and 0.01 error (absolute) common Pb composition. |
| Uncertainty level & propagation | Ages are quoted at 2 sigma absolute, propagation is by quadratic addition of signal error of unknowns and standards, error in drift corrections, etc. as described by [Horstwood et al. (2016)](#_ENREF_13). |