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P13 - Current measurement for low current microprobe techniques including MeV SIMS

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Reliable measurement of ion beam currents can be a challenging task in experiments utilizing low microbeam currents (for example lower than 1 pA). This is in particular the case for heavy ions that produce a high number of secondary electrons. Normally the current is measured directly from the sample itself or by using a Faraday cup behind the sample. Unfortunately these methods are not reliable under the earlier mentioned circumstances especially if the sample holder for the MeV SIMS setup is on a high kV potential (5 kV at the RBI setup).

In order to enable reliable measurement of beam currents down to a fA range that was needed to investigate the dependence of MeV SIMS yields on different ion microbeam parameters (ion mass, energy, current, etc.), we have considered different approaches. One alternative is indirect determination using RBS. This is only effective for beam currents that are relatively high for MeV SIMS. Therefore a more reliable and reproducible method was proposed by measuring the current directly using a PIN-diode that occasionally intercepts the ion beam.

In order to make this possible a new system has been constructed at the RBI microprobe beamline using a stepper motor driven PIN diode holder. In this work we present the constructed system and direct beam intensity measurements that have been compared to indirect measurements using RBS to show the different capabilities of the two methods. Furthermore first yield measurements are shown as well, preparing the way for a better understanding of the processes occurring during MeV SIMS.

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