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## BATS –a highly flexible option for inverted TOF spectroscopy on the neutron backscattering spectrometer IN16B

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Present day reactor based neutron backscattering spectrometers routinely achieve sub- $\mu\text{eV}$  energy resolution with Si 111 monochromator and analyser, but are limited in energy transfer range to a window of typically  $\pm 30 \mu\text{eV}$ . Current scientific applications of this technique from various fields of e.g. energy materials, biology, or glass formers, are dealing with complex systems that demand a broad dynamic range to study processes stretched over multiple time scales. In response to this demand, the recently commissioned BATS option for inverted TOF spectroscopy extends the energy transfer window of IN16B at ILL by a factor of 6. A novel chopper system consisting of two counter rotating disc chopper pairs with multiple slits provide high flexibility of varying the instrumental resolution in seven steps between 1.4 and 9.8  $\mu\text{eV}$  for energy windows of 340  $\mu\text{eV}$  and momentum transfers up to  $1.9 \text{ \AA}^{-1}$ , with the additional possibility for inelastic offsets. High repetition rate modes with a pulse frequency of 237 Hz are available to trade intensity for energy transfer range, and future use of the available Si 311 analyser allows to reach momentum transfers up to  $3.7 \text{ \AA}^{-1}$  with an expected variable resolution between 6.8 and 59  $\mu\text{eV}$ . To improve on a necessary compromise of reducing the chopper slit size below the width of the existing neutron guide, we finally propose a variable focusing and defocusing guide system yielding an expected flux gain of 6 for the smallest slit size.

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