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Repent, the end is nigh or The uncertain future of the short pulse neutron sources

The ongoing refurbishment/optimization of the ISIS Target Station 1 (TS-1) target, reflector and moderators (TRaM) assembly is based on ISIS instrument scientists performance metric. The request coming from this metric is very simple: the degradation of TS-1 instruments time resolutions is completely unacceptable. This is understandable if we keep in mind that the short pulse (less than micro-second), accelerator-based, multi-instrument, spallation neutron sources (such as ISIS, JPARC and SNS) are basically the high–resolution machines. As a consequence of such a strong restriction, the source brightness gains are of secondary importance so it is not a surprise that expected ISIS TS-1 brightness (or efficiency) gain will be an insignificant few tens of percent [1].

Now, when planning for future ISIS-II neutron source is on the horizon, it is worth asking the question if the short-pulse facility is a viable option for a next generation of the accelerator-based, multi-instrument neutron sources. Or in other words, if the high-resolution is a blessing of short-pulse source, is it at the same time its curse in terms of the efficiency?

If we are looking for historical analogy, approximately half a century ago (around the time of the miscarriage of the Superconducting Super Collider project), the particle physics community has defined the future strategy in the field declaring three experimental frontiers: high energy frontier, high precision frontier and high sensitivity frontier. Over the years, this ultra-fine strategy has been silently moved aside (thanks to the success of the Large Hadron Collider) and replaced with the simple mantra: “Luminosity (raw power) is everything” . Long pulse neutron sources (like ESS) “adopted”this as a basic idea and developed it into a concept which will assure their bright future. In this work, the possibility to do the same for a short-pulse neutron sources will be discussed.

[1] G. Škoro et al., Physica B: Condensed Matter 551 (2018) 381–385, https://doi.org/10.1016/j.physb.2017.12.060.

Poster back-up

No

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