# NEUTRON PULSE TAILORING BY MEANS OF A SPATIAL MAGNETIC SPIN RESONATOR

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Spatial magnetic spin resonance (SSR), first proposed by Drabkin et al., allows for velocity-selective spin flipping of a polarised neutron beam. It has found a series of applications, for instance as a neutron monochromator with variable output wavelength at fixed take-off angle, as an electronically tunable energy analyser in inverted geometry neutron time-of-flight spectrometers, or as neutron time-of-flight focusing device. This technique exploits the fact that upon passage of polarised neutrons through a spatially alternating transverse static magnetic field each neutron in its rest frame experiences its own frequency according to its velocity and the spatial period of the alternating field. If this frequency equals the Larmor frequency - determined by the strength of an orthogonally oriented static field - a resonant spin flip will take place. This effect can be used to single out a specific wavelength from an initially polychromatic polarised neutron beam. We have developed a novel design of such a resonator, consisting of a sequence of separate modules which fulfils the specifications required for fast chopping of the beam intensity. On the basis of this design concept we have realised a first prototype resonator which we have installed at a polarised neutron beamline at the 250 kW TRIGA reactor of the Vienna University of Technology. First test experiments showed up a very promising performance of this prototype, but we still see a series of possibilities for further improvements [1]. Very likely our novel pulsed spin resonator could be quite useful for polarised neutron beamlines at the ESS, because it would allow for fast chopping of the (planned) 2 ms ESS source pulses into shorter wavelength-selected sub-pulses. It will be of clear advantage that the time structure of these sub-pulses will be almost arbitrarily adjustable in the microsecond regime by purely electronic means.

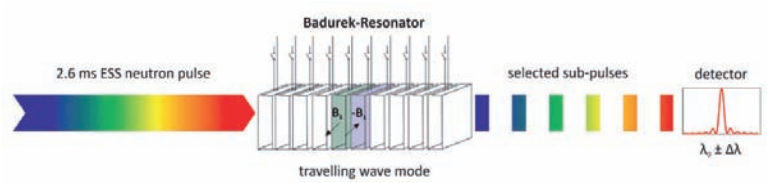


Figure 1: Illustration of the basic concept of the presented neutron spin resonator, driven in 'travelling wave mode'. Wavelength-selected sub-pulses created by this type of resonator reach pulse-widths down to the order of 10 µs.

**References**

[1] C. Gösselsberger *et al.*, J. Phys.: Conf. Ser. 340 (2011), 012028.

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