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Ultracold neutron sources and their applications at the research reactor TRIGA Mainz

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The inherently safe research reactor TRIGA Mainz is able to produce neutron pulses with an energy of 10 MWs for a duration of 30 ms. This makes it a perfect tool for the investigation of the free neutron's lifetime and for fundamental neutron research in general. Within the Cluster of Excellence PRISMA, a superthermal source for ultracold neutrons (UCN) was built and is used in pulsed operation at the TRIGA Mainz. A UCN density of up to 8.5 UCN per cm^3 per neutron pulse in a volume of 32 liters was established [1]. In close collaboration with TU Munich, a second superthermal UCN source is operational and can be used in the continuous operation mode with 100 kW thermal reactor power, e.g., to test and improve experimental components. After a short introduction of the TRIGA Mainz reactor, the talk will concentrate on the production mechanism of UCN, the UCN sources and examples of the research activities with UCN in Mainz.
[1] J. Kahlenberg et al., Eur. Phys. J. A (2017) 53: 226

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