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SuperSUN –a new infrastructure for experiments with ultracold neutrons at ILL

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Conversion of cold to ultracold neutrons (UCNs) via single-phonon emission in superfluid helium has been proposed forty years ago by Golub and Pendlebury as a viable mechanism to achieve high densities of UCNs at the end of a neutron guide. Building on practical experience from two prototypes based on this mechanism, and able to provide UCNs to user experiments at room temperature, the new UCN source SuperSUN is currently being developed at the ILL. It will be located at an end position of a white, cold neutron beam and is designed as a single-user facility. The facility will primarily be suited for UCN storage experiments employing small-to-medium size storage cells but may also advance experiments that require continuous UCN extraction in a strongly restricted phase space element. Equipped with a magnetic multipole reflector around the helium converter, the UCN ensemble will be accumulated with high polarisation due to the Stern-Gerlach forces leading to spin-dependent UCN storage lifetimes. The projected spatial-mean saturation density is 1600 UCNs per ccm for energies up to 230 neV within 12 litres of ultrapure superfluid 4He held below 0.6 K. This talk will present the design concept and the status of the project.

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