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Design of the Birdcage Coil for a Gradient Spin-Flipper in a Strong Magnetic Field

The FLNP JINR is currently working on the development of an ultracold neutron (UCN) source with pulsed neutron accumulation in a trap. The concept is based decelerating very cold neutrons (VCNs) to the UCN energy using a gradient spin flipper, in which the neutron spin flip occurs under the action of a high-frequency magnetic field perpendicular to a stationary but coordinate-dependent strong magnetic field.

In this report, we present a preliminary design for an RF resonator, specifically 8-legged high-pass birdcage coil. This resonator design not only provides the desired magnitude and frequency of the alternating magnetic field with sufficient homogeneity, but also has cylindrical symmetry, which allows for the use of a most convenient, solenoidal geometry for the magnet forming stationary gradient magnetic field. In this configuration, neutrons traveling through the magnetic system would not meet any matter in their path.

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