High Efficiency Spin Flipper for the n3He Experiment

CHRISTOPHER HAYES, Univ of Tennessee, Knoxville, N3HE COLLABORATION — The n^3He experiment, constructed on the Fundamental Neutron Physics Beamline (FnPB) at the Spallation Neutron Source, is designed to measure the parity violating (PV) proton asymmetry $A_p$ in the capture reaction

$$n + ^3\text{He} \rightarrow ^3\text{H} + p + 765\text{keV}$$  \hspace{1cm} (1)

The asymmetry has an estimated value $A_p \sim -1 \times 10^{-7}$ and is directly related to the weak isospin conserved couplings $h_\rho^0$ and $\omega_\rho^0$ which are of fundamental interest in the verification of the meson exchange model of low energy NN interactions. Data production for the n^3He experiment began in February 2015 and is scheduled to continue thru December 2015 – reaching a statistical sensitivity $\delta A_p \sim 10^{-8}$ or better. I will discuss the spin flipper which is designed using the theory of double cosine-theta coils, and capable of flipping neutron spins with an efficiency approaching its maximum value $\epsilon_{sf} = 1$. I will also discuss the theory of Spin Magnetic Resonance (SMR) and how it is employed by the spin flipper to flip 60 Hz pulses of cold neutrons over a range of wavelengths.

Christopher Hayes
Univ of Tennessee, Knoxville

Date submitted: 27 Jun 2015

Electronic form version 1.4