

ON FEASIBILITY OF THE DIRECT NEUTRON-NEUTRON SCATTERING MEASUREMENT AT SNS

I. PHYSICS: CHARGE-SYMMETRY OF NUCLEAR FORCE, IS $A_{NN} = A_{PP}$?

II. THE ESS IDEA (*D. DUBBERS, PPPNB - 2000*): FAST NEUTRONS FROM A BURST COLLIDE WITH SLOW NEUTRONS FROM THE PREVIOUS BURST

III. AN OPTION FOR SNS EXPERIMENTAL SET UP (CONCEPTUALLY):

- Accumulator Ring with an optimized phasing of burst pairs
- Cold Neutron Source
- A Neutron Guide with the front end at $\simeq 1$ m from the cold source
- Evacuated Collision Chamber at a flight path of ~ 15 m
- Cylindrical array of detectors with TOF and coincidence electronics

IV. AN ESTIMATE OF THE COLLISION RATE, N /PER BURST-PAIR, AT SNS:

$$N = \langle \phi_1(t)/v_1 \rangle \cdot \langle \phi_2(t)/v_2 \rangle \cdot \langle v_{rel}(t) \rangle \cdot \sigma \cdot T \cdot V \simeq 2 \times 10^{-7}$$

$\langle \phi_1(t)/v_1 \rangle$ and $\langle \phi_2(t)/v_2 \rangle$, neutron densities in the cm^{-3} units as calculated from the 10x12 cm Bender + Straight Guide spectrum

$\langle v_{rel}(t) \rangle \simeq 0.5 \times 10^5$ cm/s, the relative velocity

$\sigma \simeq 10.7 \times 10^{-24}$ cm^2 , the nn-scattering cross section

$T \simeq 6$ ms, the effective length of the neutron density TOF-spectrum

$V \simeq 0.6 \times 10^5$ cm^3 , the volume of the scattering chamber

V. NOT FEASIBLE, CLEARLY: DATA TAKING OF $\simeq 2$ EVENTS /PER 100 HRS