Proposal Number: PR12-11-107 **Hall: C**

Title: In Medium Nucleon Structure Functions, SRC, and the EMC effect

Contact person: Or Hen (Tel Aviv University)

Beam time request:

Days requested for approval:	40.0
Tune up included in beam line request:	no

Beam characteristics:

Energy:	11 GeV
Current:	1 μA
Polarization:	none

Targets:

Nuclei:	LD_2
Rastering:	not specified
Polarized:	no

Spectrometers:

HMS:	yes
SHMS:	yes
Other (SOS, BigCal, etc.):	LAD (+ GEM)

Special requirements/requests:

- New or modified scattering chamber required
- LAD from CLAS6

Technical Comments:

1. This experiment aims at demonstrating the link between the EMC effect and Short-range correlations. This is a semi-inclusive deep inelastic scattering measurement on deuterium using the HMS and SHMS for electron detection and the Large Acceptance Detector (LAD) from

decommissioned CLAS6 for back-scattered protons and neutrons. The spokespeople have extended expertise in this type of measurement and the experimental method seems solid.

2. No time was allocated on Al dummy. The target cell length and shape are not specified. From "the beam requirement list", it seems that the target cell length will be about 3 cm. The Al window/wall contamination won't be the same at low and high x' values so it is crucial to take data on Al dummy to perform the ratio high x' over low x'.

3. There is no discussion of electronics or readout scheme for the LAD, although the electronics needs would likely be similar to other Hall C large installation experiments. A frame/support for the LAD will be necessary.

4. The EMC region is defined with the x-Bjorken variable (x between 0.3 and 0.6, approximately). From the table of kinematics (page 21), the x-Bjorken values proposed in this measurement are 0.340 and 0.217, which is out of the EMC region.
The use of the variable x' to define the EMC region (or the regions with large and small in-medium modification) is confusing.

5. The experiment should take data on LH_2 at the same kinematics to establish the background from back-scattered nucleons not originating from a SRC.

6. The coincidence rates for accidentals are evaluated but the real/accidental ratios are not given.

Additional comments from the Independent TAC Review of PR12-11-107:

The experiment will measure DIS off the deuteron by tagging DIS scattering with high energy backward going protons or neutrons. In addition to the standard Hall-C spectrometers, experiment requires

- New scattering chamber
- Large acceptance Detector (LAD) composed of scintillator counters that will be decommissioned from CLAS in Hall-B

The following are issues found in the proposal (ones that are not addressed by TAC report):

1. Proton identification relies on ΔE vs TOF cut. This will work if π^+ background is low. At large angles number of pions will be orders of magnitude higher than protons. Out of time pions that undergo nuclear interaction in the scintillator counter can be misidentified as protons

2. Neutron identification is very much in question, there are no details or simulations on how beam related background will effect neutron identification. Accidental to real ratio in this case is very high.

   One can check CLAS "straight track runs" (with torus turned off) to estimate background rates on backward TOF counters and to check neutron identification.

3. The range of a 50 MeV proton is about 2.3 g/cm2. If there is to be no more than ~1 g/cm2 of Aluminum in the path, the thickness of windows and other structures cannot exceed 4 mm. The beam-left location of the scintillator array avoids the impediment by the existing target heat exchanger. All the cryogenic target cells used in Hall C to date have a re-entrant inlet tube which interferes somewhat with large angle charged particle acceptance. It looks like the existing 4cm tuna-can cells are a fair match to the proposed experiment, but the acceptance cuts off somewhere around 165 degrees. The collaboration should consult drawings