Review #3

Proposal Number:	1229424
NSF Program:	Major Research Instrumentation
Principal Investigator:	Horn, Tanja
Proposal Title:	MRI Consortium: Development of a Neutral Pion Detection System for Hall C at 12 GeV JLab
Rating:	Excellent

REVIEW:

What is the intellectual merit of the proposed activity?
Strengths

Dr. Horn and collaborators propose to build an electromagnetic calorimeter that will detect photons, permitting the reconstruction of neutral pions in electron-proton scattering experiments in Hall C at JLAB. The calorimeter, when used in combination with the high momentum spectrometers, will allow for the extension of several physics programs to include neutral psueduoscalers. Specifically the PI is interested in studying the contribution of the t-channel term, which is highly surpressed in neutral pion channels, to the onset of factorization in both neutral and charged pion electroproduction. While measuing the scale of the onset of factorization is interesting in and of itself, it is also relevant to other experiments, for example those aiming to access information about the Generalized Parton Distribution functions.

Weaknesses

The experiment this calorimeter is designed for (E1211102) is conditionally approved by the JLAB PAC. The reason for the conditional status is not discussed and it is not clear if this is due to a physics or experimental concern on the part of the PAC. The reviewer also notes that Dr. Horn is not listed as spokesperson on the JLAB website (http://www.jlab.org/exp_prog/12GEV_EXP/E1211102.html).

It is not clear to the reviewer if tests of factorization may also be done in parallel by the experiments aiming to measure other observables (GPD's for example).

What are the broader impacts of the proposed activity?
Strengths

The tasks associated with the design, construction and testing of this detector are diverse enough to allow for a broad range of students to participate in the project. Dr. Horn plans to include engineering students in the design work, a smart use of local resources. Dr. Horn indicates that both undergraduate and graduate students, from all member institutions, will particpate in this

project. It is noted that FIU serves an under-represented Hispanic community. Dr. Horn's ongoing work on the kaon aerogel detector indicates she is able to successfully incorporate highschool, undergraduate and graduate students into the project, mentoring them and providing opportunities for them to present their work at conferences. The construction of a detector is an extremely valuable experience for all types of physics students and can serve as an access point to recruiting the best students to our field. The opportunity for students to visit and work at JLAB is invaluable and necessary to preserve support in the future for all of our national laboratories.

Weaknesses

FIU and ODU's track record for incorporating and mentoring a broad range of students into their portion of the project is not discussed.

Program Specific Criteria

For instrument and development proposals: 1) the adequacy of the management plan; 2) the availability of appropriate technical expertise to design and construct the instrument; 3) the appropriateness of the cost of the new technology; 4) the need for development of a new instrument.

Comments on both strengths and weaknesses

Strengths:

The reuse of the PRIMEX PbWO4 crystals significantly reduces the cost of this proposal. The pricing and schedule for the design and contruction of the remaining pieces (temp controlled stand, magnet, voltage dividers) seems reasonable. While Dr. Horn has no previous expertise in building calorimeters, she has secured experts from Yerevan and JLAB to assist in critical pieces of detector design and testing. FIU and ODU have previous experience in building preamps and calorimeters respectively.

WEAKNESSES:

The reviewer is concerned about the completeness of the simulations used to estimate the pion signal to background ratio. It isn't clear if the full beamline was implemented into the simulation and how/if the electromagnetic backgrounds produced by this simulation were confronted with actual experimental backgrounds in Hall C.

While the completion of the kaon aerogel detector indicates Dr. Horn is capable of managing the construction of a project the size of the electromagnetic calorimeter, it also means that her group will be involved in supporting two detector packages. The reviewer assumes both of these detectors will be need to be installed, calibrated and manned for their experiments and it is not clear how these responsibilities overlap or interfere with each other if at all.

Summary Rationale for the Rating

This proposal appears to be well motivated, planned and managed. The reviewer's primary concern is that Dr. Horn's group will be able to support and manage both the kaon aerogel and the electromagnetic calorimeter detectors in the future.