MEMORANDUM OF UNDERSTANDING

between

JEFFERSON SCIENCE ASSOCIATES, LLC.,

and

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN – II. PHYSIKALISCHES INSTITUT

FOR COOPERATION IN THE HALL B SCIENCE PROGRAM AND SCIENCE PROJECTS OF MUTUAL INTEREST IN HALLS A AND C

Jefferson Science Associates, LLC, the management and operating contractor of the Thomas Jefferson National Accelerator Facility (JSA/Jefferson Lab), for the United States Department of Energy, under U.S. DOE Contract No. DE-AC05-060R23 1 77 located at 12000 Jefferson Avenue, Newport News, Virginia 23606 and Justus-Liebig-Universität Giessen – II. Physikalisches Institut (Giessen – II-PI group) located at Heinrich-Buff-Ring 16, 35392 Giessen, Germany, collectively herein the "Participants",

SHARING an interest in collaborating to advance basic science research in nuclear and particle physics using data obtained with the 6 GeV (billion electron volts) facility at Jefferson Lab and its 12 GeV upgrade,

HAVE REACHED THE FOLLOWING UNDERSTANDING:

I. OBJECTIVE

1. The Participants intend to work together in analyzing data obtained with the CEBAF Large Acceptance Spectrometer (CLAS) during its 6 GeV run as well as to collaborate in support of the Jefferson Lab 12 GeV science program.

2. The entities expected to collaborate in the activities under this Memorandum of Understanding (MOU) include:

   2.1 JSA is a Southeastern Universities Research Association/Pacific Architects and Engineers, Inc. (PAE), limited liability company created specifically to manage and operate Jefferson Lab. The DOE Office of Nuclear Physics within the Office of Science operates the Continuous Electron Beam Accelerator Facility (CEBAF) as a national user facility at Jefferson Lab. CEBAF is a world-leading facility in the experimental study of hadronic matter. The 12 GeV CEBAF Upgrade directly addresses a major scientific opportunity identified in both the 2002 and the 2007 Long Range Plans in which the Nuclear Science Advisory Committee of DOE and the U.S. National Science Foundation recommended the 12 GeV CEBAF Upgrade as one of the highest priorities for the program of the DOE Office of Science's Office of Nuclear Physics. The scope of the 12 GeV CEBAF Upgrade project includes upgrading the electron energy of the main accelerator from 6 GeV to 12 GeV, constructing a new experimental area (Hall D), and enhancing the capabilities in the existing experimental halls. Construction started in 2009 and completion is scheduled for 2017.

   2.2 The Giessen – II-PI group plans to participate in all aspects of the analysis of data obtained in previous runs using the CLAS 6 experiment as well as render support in calibration, commissioning, operation and documentation of the CLAS12 detector systems, using beam interactions, and maintain operation of detector systems as agreed upon by both parties. The Giessen – II-PI group also plans to collaborate with Jefferson Lab on research and instrumentation projects of mutual interest, taking advantage of the expertise of the Giessen – II-PI group in calorimetry and silicon detectors.

II. PLANNED AREAS OF COOPERATION

Proposed collaboration may include, but is not limited to, the following:

1. Giessen – II-PI group:

a) Participate as a member of the CLAS 6 and CLAS12 Collaboration in all aspects of the CLAS12 operation, shift taking, detector calibration and commissioning, raw data processing and related software development

b) Provide support with respect to service work to maintain proper calibration and operation of the CLAS12 detector systems and other ancillary systems and provide corresponding documentation,

c) Provide scientific leadership in one or several analysis projects, e.g. in the area of cascading baryon resonance decays in Hall B and other topics in Halls A, B or C,

d) Provide regular updates on progress and schedule to the Hall B Manager and other key personnel,

e) Participate in calorimetry and silicon detector projects such as the development of the Neutral Particle Spectrometer (NPS) in Hall C.

2. JSA/Jefferson Lab:

a) Provide an appropriate on-site work environment including space, computer access, necessary training, and other items for all user scientists,

b) Keep key Giessen-II-PI group informed of overall project status and requirements for the joint research effort,

c) Provide travel support for Giessen-II-PI group while working at Jefferson Lab. Any such support is to be implemented under an appropriate written contract,

d) Provide emergency medical coverage for members of the Giessen-II-PI group stationed at Jefferson Lab. Such medical coverage should be provided for stays of any length but is not to be extended to any accompanying family members. Any such support is to be implemented under an appropriate written contract, and

e) Other collaborative activities may be added by the Participants' mutual consent in writing.

III. FORMS OF COOPERATION

Cooperation may include, but is not limited to:

1. Exchange of information, publications, reports, and technical data;

2. Exchange of scientists, engineers, students, and other specialists for participation in project activities. Each Participant is to abide by the health, safety, and environmental requirements of the host Participant when on an exchange assignment at the host Participant's facility;

3. Temporary loan of equipment for continued development purposes, to be implemented under a loan agreement.

IV. MECHANISMS OF COOPERATION

Key persons to act as the liaison and primary points of contact for this collaboration:

JLab: Dr. Volker Burkert, Hall B Group Leader
Dr. Cynthia Keppel, Halls A/C Group Leader

Giessen – II-PI: Prof. Dr. Kai-Thomas Brinkmann, Group Leader

V. GENERAL CONSIDERATIONS

1. This MOU does not create any legally binding obligations. If commitment, obligation, or transfer of funds is required, a specific contractual agreement, or other reimbursable arrangement is to be developed between JSA/Jefferson Lab and the participating organization.

2. The conduct of cooperative activities contemplated by this MOU is subject to the availability of funding, personnel, and other resources.

3. Each Participant should conduct the cooperation contemplated by this MOU in accordance with applicable laws and regulations to which it is subject, including export control laws and regulations, and international agreements to which its Government is party.

4. Each Participant is to be responsible for the costs it incurs in participating in cooperative activities under this MOU, except as contemplated in Section II.

5. The Participants intend to acknowledge in publications all institutions that contribute to results achieved from activities conducted under this MOU and in the manner customary for scholarly publication. Each Participant intends to utilize its institutions' review procedures for all publications (to include presentations) developed under this MOU.

VI. INTELLECTUAL PROPERTY

If the Participants decide to engage in future collaborative research and development, they intend to conclude, in good faith, a written contract to provide for the adequate protection and allocation of any intellectual property created or furnished in connection therewith.

VII. COMMENCEMENT, MODIFICATION AND DISCONTINUATION

1. Cooperative activities under this MOU may commence upon signature by the Participants and continue for a 5-year period unless discontinued in accordance with paragraph 2 of this Section VII.

2. The Participants may discontinue this MOU at any time in writing. A Participant that wishes to discontinue its participation in this MOU should endeavor to provide at least ninety (90) days written notice to the other Participant.

3. This MOU may be modified in writing by the mutual consent of the Participants. and may be extended for additional periods.

Signed in duplicate.

Jefferson Science Associates, LLC

3/3/2017

Hugh Montgomery
Director

Date

2/17/17

Robert McKeown
Deputy Director of Science

Date

03/17/17

Rolf Ent
Associate Director of Physics

Date

2/15/17

Cynthia Keppel
Hall A Group Leader

Date

2/15/17

Volker Burkert
Hall B Group Leader

Date

Justus-Liebig-Universität Gießen

06. FEB. 2017

Dr. Joybrato Mukherjee
President of Administration

Date

13. Feb. 2017

Kai-Thomas Brinkmann
Group Leader

Date