

**Memorandum of Understanding  
between the GlueX Collaboration,  
Jefferson Lab  
and the University of Connecticut**

May 3 , 2005

Draft Version 1

## 1 Introduction

This Memorandum of Understanding (MOU) outlines the activities and responsibilities of the University of Connecticut (UConn) Nuclear Physics within the Jefferson Lab (JLab) GlueX collaboration. It describes the commitments of all three parties to the successful completion of the GlueX experiment and is subject to regular review and updating by all three parties. The manpower commitment and deliverables described in this document are contingent on continued funding of the UConn group.

The goal of the GlueX experiment is a mapping of the spectrum of gluonic excitations with the ultimate objective being a quantitative understanding of the nature of confinement in QCD. To achieve this goal a hermetic detector, the GlueX spectrometer, optimized for amplitude analysis, will be constructed in a new experimental hall (HALL D). A tagger facility will produce  $9\text{GeV}$  linearly polarized photons via coherent bremsstrahlung radiation of  $12\text{GeV}$  electrons through a diamond wafer. To achieve  $12\text{GeV}$  photons CEBAF will be upgraded to  $12\text{GeV}$  with additional cryomodules, modified arcs and an additional arc. Critical Decision 0 (CD-0) for the upgrade and GlueX was awarded by the Department of Energy (DOE) in April, 2004. The GlueX collaboration was formed in 1998. The fourth and most recent version of the GlueX Design Report was issued in 2002. The project has been reviewed externally and by the JLab PAC. The GlueX management has been in place since 2000 with a Spokesman, Deputy-spokesman, HALL D group leader and an elected Collaboration Board.

This MOU does not constitute a contractual obligation on the part of any collaborating GlueX institution or JLab. No contractual obligations shall arise except pursuant to appropriate written authorizations by each party. All foregoing work is subject to the appropriate written contractual agreement of the parties.

## 2 Institutional Commitments to GlueX

### 2.1 Commitments to GlueX R&D

The UConn group commitments to GlueX are in the area of photon beam instrumentation and Monte Carlo simulations. Responsibilities for photon beam instrumentation include the design and prototyping of the high-resolution tagger focal plane array, design and prototyping of an active photon beam collimator, and the design of the shielding in the collimator area. This also includes interfacing with the Jefferson Lab Accelerator Division personnel who have responsibility for the electron beam controls and instrumentation. These activities will be carried out within the context of the Photon Beam Working Group of the GlueX collaboration.

Within the context of the GlueX Software Working Group, the UConn group has assumed responsibility for the physics Monte Carlo program HDGEANT and its associated libraries for geometry and event *i/o*. This responsibility includes regular maintenance of the current production version of the program, together with the introduction of a new version that interfaces to the GEANT4 library. The UConn group will also serve as a point of integration for the ongoing development and optimization of the simulation components that is carried out by the various groups in charge of particular detector subsystems. Included in this will be the addition of a detailed model of the tagging spectrometer, which is presently absent from the simulation.

### 2.2 Hardware Deliverables for GlueX

The following hardware components are to be delivered by the UConn group to Jefferson Lab for use in the GlueX experiment.

1. high-resolution tagger focal plane detector array (microscope)
2. electronics for readout of the tagger microscope
3. primary and secondary collimators for the photon beam line
4. position-sensitive active segment for front face of primary collimator
5. electronics for readout of the active collimator

For the following items related to the collimator area instrumentation and shielding, the UConn group will contribute time and labour, but will rely on Jefferson Lab staff for major materials, engineering and installation support.

1. three-point collimator mounts for primary and secondary collimators
2. collimator mount controls that facilitate efficient beam line alignment

3. tables for holding the collimators
4. shielding materials for the collimator area (steel, concrete, lead)
5. two dipole magnets to serve as sweeps following the two collimators
6. lead for insertions inside gaps the sweep magnets
7. vacuum beam pipe from second sweep magnet to experimental target
8. vacuum pumps for beam pipe

For the following items related to the tagger focal plane instrumentation, the UConn group will contribute time and labour, but will rely on Jefferson Lab staff for engineering and installation support.

1. alignment system for positioning the tagger focal plane detectors in spectrometer coordinates
2. means for registering the position of the tagger microscope relative to the fixed focal plane detector array.

### **2.3 Software Deliverables and Support for GlueX**

In support of the GlueX collaboration during the R&D phase, the UConn group will provide a web-based simulation service that enables users to run simulations on the UConn cluster and browse Monte Carlo results without having to learn how to build and run the simulation software. The site will also offer the possibility for users who want to run customized versions of the event generators or `HDGEANT` to upload their own code and run simulations on the cluster. A common database of simulations will be maintained there, and an interface provided for browsing and interactive analysis of simulation results. In addition, the following software developments will be delivered to the GlueX collaboration and supported by the UConn group, in the context of the Software Working Group.

1. addition of the tagging spectrometer to the geometry description and simulation code
2. support for groups refining and optimizing simulation geometries and hits information specific to detector subsystems
3. release of a development version of `HDGEANT` that interfaces to `GEANT4` libraries
4. ongoing development and debugging of the production `GEANT3`-based `HDGEANT` simulation program until the `GEANT4` release is sufficiently mature for production, after which development of the `GEANT3` version will be discontinued

## **2.4 Support for Running The GlueX Experiment**

The UConn group assumes shared responsibility within the context of the GlueX Photon Beam Working Group for the installation and commissioning of all aspects of the HALL D photon beam. Particular responsibility is assumed for installation of the collimators and associated shielding and instrumentation in the collimator area, and for the tagger focal plane instrumentation, with coordination and assistance to be provided by Jefferson Lab staff.

## **2.5 Support for Analysis of GlueX Data**

Students and staff of the UConn Nuclear Physics group will take part in the analysis of data collected by the GlueX experiment.

## **2.6 Theoretical Support to GlueX**

## **2.7 Collaboration Responsibilities**

Members of the UConn Nuclear Physics group will continue to serve within the management structure of the GlueX collaboration, subject to the will of the collaboration and the principles of the GlueX Collaboration Management Plan.

# **3 Funding and Infrastructure**

## **3.1 University of Connecticut**

The University of Connecticut group will provide funds associated with support of personnel and travel to carry out the tasks outlined in this MOU.

The research efforts of the University of Connecticut group are supported by the University of Connecticut Physics Department machine shop. The shop will be available to carry out aspects of the fabrication work covered by this MOU. University of Connecticut will also provide many of the smaller components needed for fabrication as part of the normal group operating budget.

The University of Connecticut group controls lab space necessary to both build hardware and perform tests of the resulting equipment. This space exists and is assigned to the UConn group involved in GlueX. In addition, the UConn group has some general-purpose electronics, test equipment and infrastructure to carry out needed tests on both prototype and final detectors.

The University of Connecticut group will provide written time lines for the completion of various phases of the project and written reports on the outcome of each of these various phases.

## 3.2 The GlueX Collaboration

The construction of the final detector components described in this MOU will be contingent on securing additional funds from outside sources specifically for this project. The GlueX collaboration will develop a global plan for the timely funding and construction of all elements of the GlueX detector. The collaboration as a whole will seek funds to build all parts of the detector in a coordinated fashion.

## 3.3 Jefferson Lab

- JLab will retain ownership of all deliverables as specified under individual contracts and MOUs.
- JLab is responsible for all engineering aspects of GlueX and all aspects of the detector integration that require legal and certified engineer approval.
- JLab assumes all legal liabilities related to UConn provided and installed equipment while located on JLab property.
- JLab will provide reasonable assistance to the UConn group to assure smooth flow of information regarding DOE procedures and protocols as they affect the funding of the work agreed between JLab and University of Connecticut.
- JLab will provide physical space to UConn personnel and for their equipment to facilitate their work on GlueX. The UConn group will convey such requirements to JLab with reasonable advance notice in the spirit of good relations and sound planning.
- Official contact between the UConn group and JLab will be through the HALL D project management office and its JLab appointed staff.

## 4 Personal

1. The contact person for the University of Connecticut group is Richard Jones.
2. The following personnel are included in the UConn GlueX group:

<b>Person</b>	<b>Positions</b>	<b>Percent of Research Effort</b>
Wesley Gohn	Graduate Student	100%
Richard Jones	Professor	50%

The percentages refer to the approximate percentage of research time to be spent by the person on all GlueX activities during FY2004–FY2006 time period. These commitments will be updated as the project matures.

## 5 Special Considerations

- 1 The GlueX collaboration will have final responsibility for the acceptance of all deliverables and retains the right, to terminate or renegotiate this MOU if the technical requirements, performance, physical specifications, time schedules and costs cannot be met by the University of Connecticut group.
- 2 The GlueX collaboration retains the right to assign additional manpower and/or additional groups to this project if it is deemed that this is necessary for timely and within budget completion of the project.
- 3 The continuation of this agreement is dependent on the approval for continuing funding for all parties in the MOU.
- 4 This agreement may be amended as necessary.
- 5 The University of Connecticut group, the GlueX Collaboration management and the JLab management of GlueX agree to commit themselves on a collegial, open and effective working relationship for the benefit of the project.

**SIGNATURE PAGE**

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Prof. Richard T. Jones  
Contact Person  
University of Connecticut

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Date

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Prof. Alex Dzierba  
Spokesperson  
GlueX Collaboration

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Date

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Dr. Elton Smith  
JLab HALL D Group Leader  
Jefferson Lab

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Date