

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

14 May 2004

Draft Version 1

## 1 Introduction

This Memorandum of Understanding (MOU) outlines the activities and responsibilities of the Florida State University (FSU) Hadronic Nuclear Physics Group 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 FSU 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 Florida State University group is currently working on the design, construction, and testing of photon veto prototypes to be used to veto soft photons emerging upstream of the GlueX detector target region. The object of this phase of R&D is to construct veto prototypes instrumented to test the building technique, and to do cosmic and possible in beam tests. These efforts, expected to be completed early 2005, will provide a feasibility measurement of the energy resolution for a iron-scintillator sampling calorimeter with respect to a traditional lead-scintillator sampling calorimeter. Based on both this work and continued Monte Carlo studies of both the detector and physics, the group will develop final design for the GlueX upstream photon veto device.

### **2.2 Hardware Deliverables for GlueX**

Upon completion of the final design for the GlueX upstream photon veto, the Florida State University group takes on the responsibility of building the upstream photon veto for the GlueX experiment. This responsibility includes the detector itself. The electronics that mount directly on the detector and cables to take the signals to the Data Acquisition Electronics.

The start date for this construction project is contingent on funding for the GlueX experiment. The tasks outlined represent approximately three years of work by the FSU group. With a flexible purchasing procedure, it may be possible to preorder much of the material, and shorten the project by up to one year.

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

Members of the FSU group have contributed to the development for the GlueX Fast Monte Carlo, (HDFast). The group will continue to provide maintenance, support, and continued development of the Fast Monte Carlo system.

The FSU group will work to develop and test tools for Partial Wave Analysis that will be generally applicable to understanding and GlueX data. Of particular interest to the FSU group is a systematically correct way of removing or handling baryon resonances in the GlueX data. A large portion of this work will be working with unpolarized photoproduction data from the JLab CLAS experiment. These efforts will involve the study of both the Baryon and the Meson systems with primary goal of developing better tools and techniques to analyze the two systems together.

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

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

## **2.6 Theoretical Support to GlueX**

## **2.7 Collaboration Responsibilities**

Paul Eugenio currently serves on the GlueX collaboration board . The FSU group fully supports this effort and any other efforts deemed necessary by the collaboration.

# **3 Funding and Infrastructure**

## **3.1 Florida State University**

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

The Florida State University group will request funding from the Department of Energy and from Jefferson Lab to carry out work beyond the scope covered by this MOU.

The Florida State University group shares a fully equipped shop and several full time technicians. These will be available to carry out the fabrication work covered by this MOU. The Florida State University group also has free access to departmental shared machine shops which contains several computerized milling and machining systems including a wire EDM system. These resources will also be available for the fabrication of GlueX equipment components.

The Florida State University group controls lab space which is presently being used for GlueX detector research, development, and testing. Additional lab space necessary to build large hardware equipment is under control of the nuclear physics group and can be made available for GlueX equipment construction.

In addition, the FSU group has or will obtain sufficient electronics, test equipment and infrastructure to carry out all needed tests on both prototypes and final calorimeter veto.

The Florida State University 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 upstream photon veto 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 FSU provided and installed equipment while located on JLab property.
- JLab will provide reasonable assistance to the FSU group to assure smooth flow of information regarding DOE procedures and protocols as they affect the funding of the work agreed between JLab and Florida State University.
- JLab will provide physical space to FSU personnel and for their equipment to facilitate their work on GlueX. The FSU group will convey such requirements to JLab with reasonable advance notice in the spirit of good relations and sound planning.
- Official contact between the FSU 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 Florida State University group is Paul Eugenio.
2. The following personnel are included in the FSU GlueX group:

<b>Person</b>	<b>Positions</b>	<b>Percent of Research Effort</b>
Philip Coltharp	Graduate Student	75%
Volker Credè	Assistant Professor*	50%
Paul Eugenio	Assistant Professor	50%
Alex Kiss	Undergraduate Student	100%
Alexander Ostrovidov	Research Associate	50%
Greg Riccardi	Professor of Computer Science	30%
Blake Sharin	Undergraduate Student	100%
Burnham Stokes	Graduate Student	20%

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. \*Dr. Volker Credè, who is presently at Cornell University, will join Florida State University faculty starting late in 2004. 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 Florida State University 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 Florida State University 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**

\_\_\_\_\_  
Prof. Paul Eugenio  
Contact Person  
Florida State University

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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