Memorandum of Understanding between the GlueX Collaboration, Jefferson Lab and Institute for High Energy Phyisics (IHEP), Protvino, Russia

30 July, 2004
Draft Version 3

1 Introduction

This Memorandum of Understanding (MOU) outlines the activities and responsibilities of IHEP 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 IHEP 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 9GeV linearly polarized photons via coherent bremsstrahlung radiation of 12GeV electrons through a diamond wafer. To achieve 12GeV photons CEBAF will be upgraded to 12GeV 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 IHEP group is carrying out R&D associated with the time-of-flight (TOF), the lead glass electromagnetic detector (LGD), magnetic shielding and electronics (TDC) together with physicists from IU.

R&D for the TOF has been completed following tests with cosmic rays and beam tests at IHEP accelerator. Results have been presented at conferences and in 3 publications.

Magnetic shielding tests have been carried out using a Helmholtz coil arrangement with spacing of 50 cm and a central field of 200 G. A paper summarizing results has been submitted for publication. Several TDC prototype boards have been produced and are now being tested at IHEP.

2.2 Hardware Deliverables for GlueX

An approximate timeline for the construction of the LGD, TOF and electronics is shown in Figure 1. The schedule is contingent on funding.

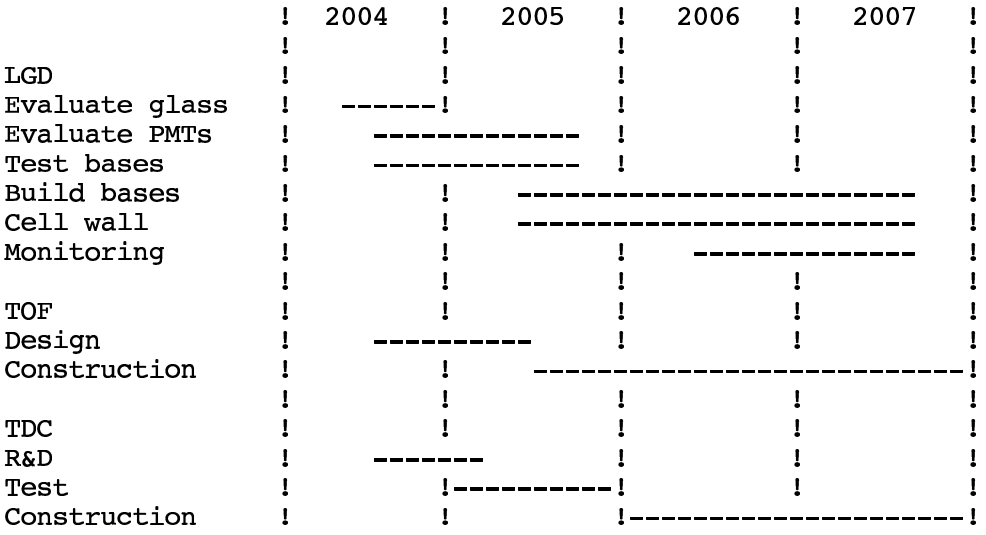

Figure 1: Approximate timeline for construction of the LGD, TOF and electronics.

2.3 Software Deliverables and Support for GlueX

The IHEP group has been involved in Monte Carlo studies of TOF counters needed to optimize the detector design. The IHEP group continues to work on optimization of the TDC design. We will also provide the necessary software for calibration of the TOF counters and particle identification.

2.4 Support for Running The GlueX Experiment

During the running of the experiment the IHEP group will participate in commissioning the detector, provide manpower needed for data taking, provide available expertise to diagnose and repair problems with the subsystems that fall under the responsibility of the IHEP group and also provide manpower to evaluate data in real time.

2.5 Support for Analysis of GlueX Data

2-3 PWA experts from IHEP group will participate in data analysis.

2.6 Theoretical Support to GlueX

2.7 Collaboration Responsibilities

3 Funding and Infrastructure

3.1 The IHEP group

The IHEP group will provide funds associated with support of personnel and travel in Russia to carry out the tasks outlined in this MoU.
The IHEP group will request funding from the Russian Ministry for Science and Education, from Jefferson Lab and from the Collaboration to carry out work on detector design and construction and for travel abroad. The IHEP group will also work with the IU group to secure additional joint funds from the Civilian Research and Development Fund (CRDF) and the International Science and Technology Center (ISTC) in particular for the tagger design and construction.
The IHEP group has a fully equipped shop and 4 technicians. These will be used to fabricate a part of small components needed for both prototypes and final detectors.
The IHEP group controls lab space necessary to both build hardware and perform tests of the resulting equipment. This space exists and is assigned to the IHEP group involved in GlueX. In addition, the IHEP group has or will obtain sufficient electronics, test equipment and infrastructure to carry out all needed tests on the TOF and TDC prototypes and LGD.
The IHEP 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 TOF, LGD, and TDC's 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 IHEP provided and installed equipment while located on JLab property.
• JLab will provide reasonable assistance to the IHEP group to assure smooth flow of information regarding DOE procedures and protocols as they affect the funding of the work agreed between JLab and IHEP.

• JLab will provide physical space to IHEP personnel and for their equipment to facilitate their work on GlueX. The IHEP group will convey such requirements to JLab with reasonable advance notice in the spirit of good relations and sound planning.
• Official contact between the IHEP 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 IHEP group is Sergey Denisov.
2. The following personnel are included in the IU GlueX group:

Person	Positions	Percent of Research Effort
Sergey Denisov	Professor	50%
Vladimir Samoylenko	Associate Professor	50%
Alexei Popov	Senior Scientist	30%
Alexander Klimenko	Post Doc	100%
Mikhail Soldatov	Electronics Engineer	50%
Sergey Zviagintsev	Technician	100%
Igor Shvabovitch	Technician	50%

In addition the IHEP group will involve 1-2 undergraduates a year devoted to GlueX-related research.
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 IHEP 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 IHEP 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. Sergey Denisov Contact Person IHEP	Date
Prof. Alex Dzierba Spokesperson GlueX Collaboration	Date
Dr. Elton Smith JLab Hall D Group Leader Jefferson Lab	Date