

Memorandum of Understanding
between the GlueX Collaboration,
Jefferson Lab and The University of Alberta
Sept 13, 2004

Draft version 1

1. Introduction

This Memorandum of Understanding (MOU) outlines the activities and responsibilities of the University of Alberta (UofA) Group within the Jefferson Lab (JLab) and the 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 UofA 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 9 GeV 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 for GlueX was awarded by the Department of Energy (DOE) in April of 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. The UofA Commitments to GlueX

2.1 Commitments to GlueX R&D

The UofA group has assumed the commitment and responsibility to complete the R&D phases of hardware tasks to such a state that firm decisions can be made toward funding decisions and subsequent construction and physics phases of the GlueX project.

By October of 2005, the UofA group will complete the design, fabrication and testing of 20 prototype Constant Fraction Discriminator (CFD) boards for GLUEX Time of Flight (TOF), barrel calorimeter (BCAL) and start counter. This design will be based on an existing design by F. J. Barbosa. In addition, in the same period, the UofA group will complete the design, fabrication and testing of 20 (160 channels) prototype pre-amp boards for the GLUEX drift chamber systems. The pre-amp design will be based on an existing pre-amp ASIC either from the VTX pre-amp design or the ASD ASIC (from CERN). The prototypes will be tested to

establish the ability of the electronics to reach the design goals established by the GLUEX collaboration for these components.

2.1.1 Hardware Deliverables for GlueX R&D

The deliverables for the hardware R&D are: the prototype boards, the complete design documentation, and detailed test reports derived from the project to construct the CFD and drift chamber pre-amp boards.

2.2 Hardware Deliverables for GlueX Construction

Upon completion of the final design of the GLUEX electronics, the UofA group will undertake the responsibility of building and testing all of the CFD and drift chamber pre-amp boards for GLUEX, to the specifications and performance requirements dictated by the experimental demands on the physics analysis. The group will also take the responsibility for the method of connection of these boards to the GLUEX detector. However, the design of this connection hardware is not part of this MOU.

2.2.1 Prototype Design, Fabrication and Testing Timeline

The design, construction and testing of all prototypes as well as the preparation of all necessary documentation will be completed within one year. The timeline scenario is given in the production plan below:

Timetable is based from start of project	
+ 0 to 5 months	<ul style="list-style-type: none"> • <i>Design CFD board based on existing design by F.J. Barbosa</i> • <i>Get 20 boards fabricated</i> • <i>Acquire components for 20 prototypes boards</i> • <i>Construct the 20 prototype boards</i> • <i>Construct testbed</i> • <i>Test prototypes</i> • <i>Deliver prototypes for testing at Jlab.</i>
+ 5 to 11 months	<ul style="list-style-type: none"> • <i>Design pre-amp board based on existing ASIC (the VTX pre-amp ASIC or the ASD ASIC)</i> • <i>Get 20 boards fabricated</i> • <i>Acquire components for 20 prototypes boards</i> • <i>Fabricate 20 prototype boards</i> • <i>Construct or arrange testbed facilities</i> • <i>Test prototypes</i> • <i>Deliver prototypes for testing at Jlab.</i>

+ 11 to 12 months	<ul style="list-style-type: none"> • <i>Write documentation detailing development and testing of CFD prototype</i> • <i>Write documentation detailing development and testing of pre-amp prototype</i> • <i>Deliver documentation to GLUEx collaboration</i>
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2.3 Support for Running The GlueX Experiment

The UofA group will provide manpower support as a member of GlueX, in general, as well as software support for the elements for which the group has assumed responsibility. The overall support will reflect efforts by faculty members, research scientists, post-doctoral fellows and graduate students.

2.4 Support for Analysis of GlueX Data

The UofA group has considerable computing resources and these resources will be made available to the Collaboration for PWA, non-PWA and simulations. The group will, in consultation with the Collaboration, assume certain reaction channels to perform PWA, non-PWA and simulation within the overall GlueX effort.

2.5 Collaboration Responsibilities

The UofA group will participate in all aspects of Collaboration management. Such activity will continue and group members will attend Collaboration meetings, Working Group meetings and will host such meetings at the UofA, if required. The participation in all such GlueX and Collaboration activities will be active and continuous. The group members will let their names stand for election to positions as defined in the Collaboration Management Plan.

3. Funding and Infrastructure

3.1 The UofA

The UofA group will provide funds associated with support of personnel and travel to carry out the tasks outlined in this MOU. The source of such funding is NSERC, UofA institutional funding and GLUEx project funding.

The University of Alberta is currently funded mainly by NSERC with support for infrastructure and technicians from the Physics Department. GLUEx has been endorsed as an Institute for Particle Physics (IPP) project by IPP in Canada. The UofA group is also a longstanding IPP Institutional Member. If the progress on GlueX is satisfactory and the project continues to be supported by DOE, the level of funding by NSERC is expected to cover the group's travel and any future post-doctoral and student obligations. Although opportunities for major equipment grants in support of GlueX exist, no such commitments can be made a priori and funding for the fabrication and testing of the CFDs and drift chamber pre-amps is a DOE responsibility.

Machine and electronics shops facilities at the UofA can easily support the work plan provided in the document and can support primarily design and prototype construction. (As a point of information, there is adequate infrastructure and technical expertise at the CSR to host the construction of the BCAL in collaboration with the University of Regina, the lead group on the BCAL construction.)

The UofA 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 as defined in task-specific MOU's and contracts.

3.2 The GlueX Collaboration

The design and fabrication of the CFD and drift chamber pre-amp boards is necessary for the successful readout of the detector systems concerned and will be contingent on adequate funding from sources, other than NSERC and UofA which are considered internal sources for the purpose of this MOU. The Hall-D Collaboration, as the body managing the GlueX project, will develop a global plan for the timely and adequate funding for the construction of all elements of the GlueX project such that the experiment can be declared as completed and ready to take data.

3.3 Jefferson Lab

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

4. Personnel

1. The contact person for the UofA group is James L. Pinfeld
2. The following personnel is included in the UofA GlueX group:

Person	Position (UofA/CSR)	Fraction of Research Effort
Bill Burris	Electronic technician	10%
Lars Holm	Senior electronic technician	40%
James Pinfeld	Professor	20%
Patrick Price	Electronics technician	50%
Jan Schaapman	Electronic technician	40%
Jan Soukup	Engineer	40%
Gilbert Lachat	Machinist	10%
Paul Zimmerman	Machinist	10%

The percentages refer to the approximate percentage of research time to be spent by the person on all GlueX activities listed in this MOU during the FY2004–FY2005 time period. These commitments will be updated as the project matures.

5. Special Considerations

1. The Hall-D 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 and physical specifications, time schedules and costs cannot be met by the UofA group.
2. The Hall-D Collaboration retains the right to assign additional manpower and/or additional groups to this project if it is deemed that such action is necessary for the 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 to this MOU.
4. This agreement may be amended as necessary.
5. The UofA group, the Hall-D Collaboration management and the JLab management of GlueX agree and commit themselves on a collegial, open and effective working relationship for the benefit of the project.

6. Signatures

Dr John Beamish
Chair of Physics

Dr Doug Gingrich
Director of the Centre for Subatomic Research

Dr. James Pinfold
Professor and Coordinator of the Subatomic Physics Focus Area