

Memorandum of Understanding Between

<Institution>

and the

**D0 Run IIb Project
at
Fermilab**

<date signed>

1. Introduction

This memorandum covers activities of the research group at <Institution> in their collaboration with Fermi National Accelerator Laboratory (Fermilab) and other institutions in the design, construction, and commissioning of the upgraded components for the DØ Run IIb Upgrade (E925) of the DØ Detector at the Fermilab Tevatron. The DØØ Detector is designed to probe proton-antiproton collisions at 2.0 TeV, and is described in the November 1984 Design Report. Subsequent additions and upgrades are described in relevant Technical Design Reports and supporting technical documents. The technical description of the DØ Run IIb Upgrade is presented in the DØ Run IIb Silicon Detector Upgrade Technical Design Report (Version 4.0, March 29, 2002) and the DØ Run IIb Trigger Technical Design Report (Version 4.3, April 8, 2002). Fermilab has overall responsibility for the DØ Run IIb Project.

The scope of the Run IIb Upgrade Project is that set out in the Work Breakdown Structure (WBS) for the project and, upon having received approval, the baseline set of deliverables as determined by the Department of Energy. The project management infrastructure (D0 Run IIb Project Office) resides at Fermilab, and the responsibility for D0 Run IIb project management resides in the D0 Run IIb Project Manager (PM). The PM reports to the Fermilab Associate Director for Research, in part through regular meetings of the Project Management Group (PMG). The D0 Run IIb PM has appointed WBS Level 2 (L2) subproject managers who are responsible to him for specific subsystems of the D0 Run IIb Upgrade Project.

This Memorandum of Understanding describes the long-term contributions of <Institution> to the design, construction, and commissioning of the D0 Run IIb Upgrade. It is understood that these contributions of <Institution> may later be modified or that additional responsibilities may be added. Fabrication of the silicon detector is currently scheduled for completion near

the end of FY2005, with all installation and technical commissioning complete – the upgraded experiment ready for colliding beam - near the end of CY2005.

An annual Statement of Work (SOW) will detail the contributions of <Institution> as the detector construction proceeds and will contain the specific activities, deliverables and funding required on a year-by-year basis. The normal period of performance will be the US fiscal year (October 1 - September 30). A separate SOW will be written yearly for each D0 institution; the MOU will be a single document for each D0 Institution participating in the D0 Run IIb Upgrade that outlines the scope and conditions of its participation in the project.

This Memorandum of Understanding is made between <Institution> and the D0 Run IIb Upgrade Project. Fermilab is a signatory as part of its role in management oversight. It does not constitute a legal, contractual obligation on the part of any of the parties. It reflects an arrangement that is currently satisfactory to the parties involved. The parties agree to negotiate amendments to this memorandum as required.

2. Personnel

2.1. List of Scientific Personnel

Participating scientists committed to the D0 Run IIb Project at <Institution> over the full project period are listed below. No support for these individuals comes from project funds. The D0 Run IIb Fraction refers to the fraction of research time committed to the D0 Run IIb Project.

| Name | D0 Run IIb Fraction | Other Research Commitments/Comments |
|------|---------------------|-------------------------------------|
| | | |
| | | |

2.2. Institutional Board Representative

<Name> is the present representative of <Institution> to the D0 Institutional Board.

2.3. List of Technical Personnel

Participating technical personnel with the anticipated fraction of their time (time fractions are estimates and are not cost shares) committed to the D0 Run IIb Project during this period of performance and their source(s) of support are indicated below. The possible sources are DDO = DOE, D0 Run IIb Project; DBG = DOE base grant; NDO = NSF, D0-specific MRI or other NSF non-base grant; NBG = NSF base grant; UID = university infrastructure, DOE-supported group; and UIN = university infrastructure, NSF-supported group. The summary of the level of work assumed for the D0 Run IIb Project (1 FTE = 182 days) by physicists, engineers and technicians at <Institution> throughout the life of the project is given in Appendices A, B and C, respectively.

Engineers

| Name | D0 Run IIb Fraction | Cost on D0 Run IIb Project | Source of Support |
|------|---------------------|----------------------------|-------------------|
| | | | |
| | | | |

Designers

| Name | D0 Run IIb Fraction | Cost on D0 Run IIb Project | Source of Support |
|------|---------------------|----------------------------|-------------------|
| | | | |
| | | | |

Technical Specialists

| Name | D0 Run IIb Fraction | Cost on D0 Run IIb Project | Source of Support |
|------|---------------------|----------------------------|-------------------|
| | | | |
| | | | |

Programmers

| Name | D0 Run IIb Fraction | Cost on D0 Run IIb Project | Source of Support |
|------|---------------------|----------------------------|-------------------|
| | | | |
| | | | |

Scientists

| Name | D0 Run IIb Fraction | Cost on D0 Run IIb Project | Source of Support |
|------|---------------------|----------------------------|-------------------|
| | | | |
| | | | |

Others

| Name | D0 Run IIb Fraction | Cost on D0 Run IIb Project | Source of Support |
|------|---------------------|----------------------------|-------------------|
| | | | |
| | | | |

2.4. Other Key Personnel

The Environment, Safety and Health officer for <Institution> currently responsible for compliance with applicable ES&H policies associated with D0 Run IIb participation by this institution is <ES&H Name> of <Institution>. The Quality Assurance officer for the D0 group at <Institution> currently responsible for QA compliance of tasks performed by this institution is currently <name> of <Institution>.

3. Design, Fabrication and Installation Responsibilities

3.1. Design and Fabrication Responsibilities - Construction Period

3.1.1 *WBS Items at L2, Estimated Cost and Deliverable:*

The D0 Run IIb Work Breakdown Structure (WBS) contains a detailed cost estimate of the items needed to complete the D0 Run IIb Project. By this MOU <Institution> agrees to make a best effort to provide the following items at a cost not to exceed the WBS base cost estimate. This includes engineering and design time. Procedures to be followed in the event of a necessary variation of cost from the base cost are described in section 3.3 below. The table below lists the WBS summary items at L2 of the estimated cost. Contingency is not included.

Appendix D gives the full WBS breakdown of the items that <Institution> is responsible for delivering to the lowest WBS level.

| WBS (L2) | Task - Deliverable | WBS Base Cost (k\$) | Cost at this institution |
|----------|------------------------|---------------------|--------------------------|
| 1.1. | Silicon Detector (SMT) | 15,539 | |
| 1.2. | Trigger Systems (TRG) | 3,621 | |
| 1.3. | DAQ/Online (DON) | 657 | |
| 1.4. | Installation (INS) | 2,000 | |
| 1.5. | Administration (ADM) | 1,500 | |
| TOTAL | | 24,317 | |

3.1.2 *Transportation*

Unless specifically indicated otherwise here, items produced by <Institution> for use in the D0 detector or subsystems shall be transported by the providing institution to the agreed upon point of delivery. <Institution> shall be responsible for safe transport of all items to these delivery points. The method of transport and packaging are to be authorized by the D0 Run IIb Project Office in consultation with the appropriate L2 Manager and/or L2 lead engineer.

3.1.3 *Installation and Commissioning*

<Institution> will participate in the installation and commissioning of their contributed items at Fermilab as listed. The agreement between the D0 Experiment and <Institution> regarding the post-beam maintenance and operation (M&O) of these items will be delineated in a separate Maintenance and Operations MoU.

3.2. Coordination and Reporting

The D0 Run IIb L2 Managers are signatories to this MOU. The institution contact person for D0 Run IIb activities at <Institution> is <name>. The task managers for D0 Run IIb activities carried out at <Institution> are as follows:

| Task | Task Manager |
|------------------|--------------|
| Silicon Detector | |
| Trigger System | |
| DAQ/Online | |
| Installation | |
| Administration | |

The progress of the design, fabrication, and testing of these components will be reported by the above-named task managers on a monthly basis, by WBS element to L3 in detail, to the D0 Run IIb L2 Manager, who in turn will report subsystem progress to the D0 Run IIb Project Manager. The D0 Run IIb PM will, in turn, report to the Fermilab Associate Director of Research. The L2 Manager will report on financial as well as technical progress to the D0 Run 2b Project Management.

3.3. Procurement Authorization

The authorized financial officer at <Institution> is <name>. The D0 Run IIb PM delegates obligation authority regarding the designated WBS items in the SOW to the authorized financial officer subject to the requirements that follow. The base cost of the WBS items is given in section 3.1.1 and Appendix D without contingency. The officer agrees that these cost ceilings cannot be exceeded without the authorization of the D0 Run IIb PM and the relevant L2 Manager. In addition, the officer agrees that purchases of any individual items exceeding a specified limit (currently 10 k\$) must be authorized by the D0 Run IIb L2 Manager.

Major procurements (currently, those above 50 k\$) must in addition have the written authorization of the D0 Run IIb PM. Items purchased for the Project Office (WBS category 1.5) must be authorized by the D0 Run IIb PM.

3.4. Reporting to D0 Run IIb Project Management

<Institution> will report all D0 Run IIb-related expenditures and labor charges together with associated technical progress in each item of work by Work Breakdown Structure (WBS) category on a monthly basis through the appropriate L2 Manager(s) to the D0 Run IIb Project Manager. Cost reporting will apply to D0 Run IIb Project funds related to detector fabrication. Other, non-DOE and non-NSF costs will be reported in a manner that is agreed to by the L2 Manager(s), the D0 Run IIb PM and <Institution>. Any request for variance from the base cost must be immediately reported to the appropriate L2 Manager.

Technical progress will be reported by WBS element to the L2 Manager and the D0 Run IIb PM on a monthly basis and will describe all items covered in the relevant Statement of Work regardless of the specific nature of the funding support.

<Institution> agrees to furnish complete documentation of the quality control and performance checks that are carried out for the D0 Run IIb Project. Further, the institution agrees to furnish full documentation of all equipment and services that it provides for the D0 Run IIb Project. This will include engineering drawings of equipment, full schematics of electronics, and documentation of all software. Where relevant, an acceptable level of spares (as specified in the base cost estimate) will be provided and maintained by <Institution>.

Each D0 group at <Institution> agrees, with this document, to set up and maintain a ledger, of a form specified by D0 Run IIb Project Management. This ledger will contain information on cost items of the D0 Run IIb WBS. Each Institution agrees to provide and maintain this ledger so as to provide timely information to the L2 Manager and the D0 Run IIb Project Office.

3.5. Collaboration with Other Groups and Institutions

Design, construction, installation and commissioning related to the D0 Run IIb Project will be carried out in close communication and collaboration with other groups working on this and related subsystems. The groups working with <Institution> are identified at WBS L4 in the table below.

| WBS / Task (L4) | Collaborating Group | Responsibility with <Institution> |
|-----------------|---------------------|-----------------------------------|
| | | |
| | | |

4. Contribution of Effort, Services and Equipment

4.1. Effort

Subject to funding by DOE or NSF, <Institution> will provide support for the scientific and technical personnel as indicated in section 2. This contribution refers only to support provided outside the D0 Run IIb Project.

4.2. Services

The services of the <Institution> Purchasing, Expediting, and Receiving Departments and the Administrative Staff will be available to the D0 Run IIb Project to the degree required to carry out the fabrication responsibilities of <Institution>. By this MOU, <Institution> agrees to provide the services of the responsible financial officer. Standard <Institution> cost accounting practices will be applied to the D0 Run IIb Project activities at <Institution>.

4.3. Facilities and Equipment

The following <Institution> facilities and equipment will be made available to the D0 Run IIb Upgrade Project to the degree necessary to carry out the design and fabrication responsibilities of the group:

Facilities and Equipment:

4.4. Operating Costs

<Institution>, subject to the availability of funds from DOE or NSF, will support the normal research operating expenses (such as physicists' salaries, travel expenses, miscellaneous supplies, administrative support, etc.) of the <Institution> group working on the D0 Run IIb Project. These normal operating expenses are not considered as part of the D0 Run IIb cost estimate nor will they be borne by the D0 Run IIb Project.

5. **Fermilab Effort, Services and Facilities**

Tracking of Fermilab D0 Run IIb support, whether provided by Fermilab or paid by the D0 Run IIb Project, will be done using appropriate effort reporting codes. Subject to agreement by the D0 Run IIb PM, <Institution> expects the following Fermilab resources to be available in support of the design, fabrication, and installation responsibilities of <Institution>.

5.1. Administrative and Technical Personnel

Participating Fermilab staff members foreseen to be available to the project are:

Administrative Staff

| Name | D0 Run IIb Fraction | Source of Support |
|------|---------------------|-------------------|
| | | |

Engineers

| Name | D0 Run IIb Fraction | Source of Support |
|------|---------------------|-------------------|
| | | |

Designers

| Name | D0 Run IIb Fraction | Source of Support |
|------|---------------------|-------------------|
| | | |

Technical Specialists

| Name | D0 Run IIb Fraction | Source of Support |
|------|---------------------|-------------------|
| | | |

Programmers

| Name | D0 Run IIb Fraction | Source of Support |
|------|---------------------|-------------------|
| | | |

| | | |
|--|--|--|
| | | |
|--|--|--|

Others

| Name | D0 Run IIb Fraction | Source of Support |
|------|---------------------|-------------------|
| | | |

Administrative and technical staff salary support may be paid by the D0 Run IIb Project, or may be provided by Fermilab as project host laboratory. The salary support of Fermilab staff contributing to the responsibilities of <Institution> must be negotiated annually with the D0 Run IIb Project Manager and, if necessary, the Laboratory as part of the SOW. Support provided by Fermilab will be tracked and reported to the Fermilab Associate Director for Research and the PMG.

5.2. Services

The services of the Fermilab Purchasing, Expediting, and Receiving Departments are expected to be available to <Institution> for procurement.

5.3. Facilities and Equipment

<Institution> expects that the following Fermilab facilities, equipment, and laboratory space will be available during the course of the project:

6. **Costs and Funding**

6.1. Expected Sources of Funding

The cost of the detector elements covered under the D0 Run IIb Project WBS are taken in detail from the current D0 Run IIb Cost Estimate (April 16, 2002). Anticipated sources of funding - DOE, NSF, institutional contributions, etc. - were also delineated in April 2002. Final funding from DOE for the D0 Run IIb Project is partially contingent on successfully passing a DOE Baseline Review, which is scheduled for the week of September 23, 2002. <Institute> agrees to not exceed the costs as described in the WBS, estimated cost less contingency, subject to the procedures given in section 3.3.

6.2. Management Reserve

Each year, a SOW will be written with each D0 Run IIb Institution for each relevant WBS L2 subsystem. The allocation of funds for the fiscal year will be in two parts. The first will cover work for the first six months. The remaining funds needed to complete the tasks described in the SOW will be provided subject to availability of funding and performance during the first half-year. Management control requires the review and concurrence of the L2 Manager and the Project Office, as needed, for major expenditures, as defined above. The release of funds above the given thresholds by the responsible financial officer at <Institution> as named above will be contingent upon this concurrence.

7. **Method of Funding Transfers**

The expenditures by <Institution> are to be covered by project funds upon the allocation decision of the D0 Run IIb PM.

All equipment items bought or fabricated using DOE or NSF funds will be properly marked as the property of DOE or NSF. The equipment will remain part of the D0 detector until it is dismantled or the detector element in question is replaced.

8. General Considerations

8.1. Safety and Engineering Practices

The experimenters from <Institution> agree to familiarize themselves with DOE and NSF safety policies and to adhere to them. All detector components must be designed, fabricated, installed and operated in conformity with DOE, NSF and Fermilab safety policies and practices as well as DOE, NSF and Fermilab engineering standards. All engineering, design, quality assurance, safety, and other activities shall be in compliance with ISO standards. All major components will undergo appropriate design, safety, and engineering reviews.

8.2. Operations

<Institution> agrees to maintain, to the best of their ability, equipment provided for the D0 detector as long as <Institution> is a member of the D0 collaboration. However, this agreement does not constitute a commitment to maintenance and operations for Run II – these functions are covered in a separate MoU between D0 and <Institution>.

8.3 Lasers

Any laser to be used at Fermilab will be shipped to Fermilab and used at Fermilab in accordance with all appropriate Fermilab ES&H policies.

8.4 Radioactive Sources

Any radioactive material to be used at Fermilab will be shipped to Fermilab and used at Fermilab in accordance with all appropriate Fermilab ES&H policies.

8.5 Ownership of Upgrade Equipment

All items purchased or fabricated with funds supplied by Fermilab will remain the property of Fermilab, and will be properly identified with a Fermilab property tag. Any <Institution> owned apparatus installed as a part of the DØ Detector shall have a <Institution> property tag affixed and is to remain a part of the detector until the detector is decommissioned or the detector element is replaced.

9. Schedules and Milestones

<Institution> will make every effort to carry out their institutional responsibilities consistent with the D0 Run IIb Upgrade Project schedule. These schedules may have to be changed as the project progresses. Changes that affect <Institution> will be noted in the annual SOW. The program milestones over the life of the project relevant to <institution> will appear in the annual SOW.

10. Scientific Participation in Run IIb

The main function of the memorandum concluded between Fermilab and the institutions participating in the DØ Project is to specify the responsibilities of the Collaborators in building and commissioning the experiment. It is understood that all members of the DØ Collaboration who participate in the construction of the detector may be involved in the physics analysis of the data obtained with it.

It is helpful to specify some guiding principles to govern how the DØ Collaboration will conduct its scientific affairs in order to ensure a successful outcome. Obviously, this represents an extremely complicated and sensitive set of issues that cannot be spelled out completely. The success of this endeavor will require the goodwill and good sense of all members of the Collaboration in addition to any written agreements. Some of the principles that guide the participants in the DØ Collaboration are:

- A. Data from all parts of the DØ experiment shall be available to all members of the DØ Collaboration for analysis. Any member of the Collaboration is free to analyze any part of the data as s/he sees fit.
- B. The results of any and all analyses of the data shall be reported first to the DØ Collaboration in a manner that indicates the analysis methods, data runs used, and any other information necessary for interested members of the Collaboration to perform an independent check of the results before an announcement is made outside of the Collaboration. After discussion and review, the DØ Collaboration may decide that a particular physics result can be announced outside the Collaboration even though the final analysis to prepare for publication has not yet been completed. At that time, the preliminary yet public result can be discussed by members of the DØ Collaboration at seminars and other informal talks.
- C. All significant results from the DØ experiment shall be submitted to refereed journals in a timely fashion after review, criticism, and agreement by the Collaboration.
- D. Scientific results will be submitted under the full DØ Author List (except when the work meets specific criteria laid out in the Authorship Rules that make it appropriate for a restricted author list.)
- E. No press releases or other release of information to the media shall take place without consultation with the representatives of all the member institutions of the DØ Collaboration.
- F. The selection of speakers for conferences and meetings outside the Collaboration will be made by the DØ Speakers Bureau. It is understood that all such talks or presentations shall include proper acknowledgment of the contributions made by all members of the Collaboration. The Speakers Bureau will keep a record of all talks, seminars, and colloquia given by members of the Collaboration on DØ results or technical subjects. All members of the Collaboration are expected to inform the Speakers Bureau of such talks and to make available copies or electronic files of the transparencies if requested.

The detailed rules of conduct, and the roles and responsibilities of the collaboration, its spokespersons and boards, are laid down in the DØ Governance Document posted on the DØ web pages.

V1.4
12-09-02

Appendix A – Physicist Manpower at <Institution> Assumed for D0 Run IIb Project

| Name | D0 Run IIb Fraction | | | | | |
|-------|---------------------|------|------|------|------|--------------|
| | FY02 | FY03 | FY04 | FY05 | FY06 | TOTAL (FTEs) |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| TOTAL | | | | | | |

Appendix B – Engineering Manpower at <Institution> Assumed for D0 Run IIb Project

| Name | D0 Run IIb Fraction | | | | | |
|-------|---------------------|------|------|------|------|--------------|
| | FY02 | FY03 | FY04 | FY05 | FY06 | TOTAL (FTEs) |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| TOTAL | | | | | | |

Appendix C – Technician Manpower at <Institution> Assumed for D0 Run IIb Project

| Name | D0 Run IIb Fraction | | | | | |
|-------|---------------------|------|------|------|------|--------------|
| | FY02 | FY03 | FY04 | FY05 | FY06 | TOTAL (FTEs) |
| | | | | | | |
| | | | | | | |
| TOTAL | | | | | | |

Appendix D - WBS Items Delivered by <Institution> at Lowest Level