E954 MOU
12/8/06
DRAFT

Fermilab

MEMORANDUM OF UNDERSTANDING

E954 (SciBooNE)
And
Fermilab

Version 0.9

An experiment to measure
muon-neutrino and muon-antineutrino cross sections on carbon
with the Fermilab Booster Neutrino Beam

December 8, 2006

I. INTRODUCTION

This is a Memorandum of Understanding (MOU) between the Fermi National Accelerator Laboratory (Fermilab) and the E954 experimenters to perform E954 in the Fermilab Booster Neutrino Beam line.

The experiment uses the SciBar detector from the K2K neutrino experiment at KEK, including the "electron catcher" EM calorimeter, and a muon range detector (MRD) made from existing iron plates, plastic scintillator and photomultipliers from previous experiments at Fermilab. The experiment utilizes the existing Booster Neutrino Beam at Fermilab. The BNB consists of a target within a focusing system followed by a 50 m long pion decay volume.

The memorandum is intended for the purpose of providing a work allocation for Fermilab, the funding agencies and the participating institutions. It reflects an arrangement that currently is satisfactory to the parties; however, it is recognized and anticipated that changing circumstances of the evolving research program will necessitate revisions. The parties agree to negotiate amendments to this memorandum which will reflect such required adjustments.

II. PERSONNEL AND INSTITUTIONS

Co-spokespersons: Tsuyoshi Nakaya and Morgan Wascko

Project Head: Richard Tesarek

Analysis Coordinator: to be decided

Beam Coordinator: Tom Kobilarcik

Detector Coordinators: Hidekazu Tanaka, Lucio Ludovici, and Robert Napora

Accelerator Division (AD) Liaison: Tom Kobilarcik

Computing Division (CD) Liaison: Robert Bernstein

Particle Physics Division (PPD) Liaison: Steve Brice

List of collaborating institutions:

A. University of Barcelona, IFAE, Barcelona, Spain

B. Chonnam National University, Gwangju, Korea

C. University of Cincinnati, Cincinnati, OH 45221

D. University of Colorado, Boulder, CO 80309

E. Columbia University, Nevis Labs, Irvington, NY 10533

F. Dongshin University, Naju, Korea

G. Fermi National Accelerator Laboratory, Batavia, IL 60510

H. High Energy Accelerator Research Organization (KEK), Tsukuba, Japan

I. Imperial College London, London, UK

J. Indiana University, Bloomington, IN

K. Institute for Cosmic Ray Research (ICRR), Tokyo, Japan

L. Kyoto University, Kyoto, Japan

M. Los Alamos National Laboratory, Los Alamos, NM 87545

N. Louisiana State University, Baton Rouge, LA 70803

O. Purdue University Calumet, Hammond, IN, 46323

P. University of Rome "La Sapienza", INFN, Rome, Italy

Q. Seoul National University, Seoul, Korea

R. Saint Mary's University of Minnesota, Winona, MN, 55987

S. Tokyo Institute of Technology; Tokyo, Japan

T. University of Valencia, IFIC, Valencia, Spain

III. EXPERIMENTAL AREA, BEAMS

Location

The experiment will take place in the 8 GeV beamline, the BNB, and the SciBooNE detector area, which is to be constructed. For details of the civil construction of the detector hall, see the SciBooNE Conceptual Design Report and SciBooNE Project Execution Plan.

Beam and Intensity

The experiment uses the existing BNB, which uses the 8 GeV ~~incident~~ proton beam from the Booster. The experiment expects beam performance similar to what MiniBooNE has seen since the advent of NuMI: approximately 4.5 x 10^{12} POT per beam spill, at approximately 2 Hz, but less than 5 Hz.

The total number of protons on target will be up to 2×10^{20}. The initial operation plan of the experiment is for one partial year (0.5×10^{20} POT) with a neutrino beam and the rest of the year (1.5×10^{20} POT) with an antineutrino beam. Specific details of the run configuration will be negotiated with the Office of Program Planning.

The 8 GeV beam and BNB are described in MiniBooNE Technical Design Reports. The experiment will utilize the Fermilab-supplied beam-monitoring devices through the duration of the experiment.

Overall monitoring of the primary proton intensity for the neutrino beam to <5% is required.

No test beam is required.

IV. FEMILAB HOST FACILITY CONTRIBUTIONS

Fermilab's contributions are listed below by division.

1. Fermilab Accelerator Division (AD)

Personnel:

Liaison Physicist: Tom Kobilarcik

Requirements:

The experiment requires use of the 8 GeV BNB. AD will operate and provide necessary maintenance for the optimal neutrino production.

AD will provide beam-timing signals for use in the experiment triggering and DAQ (ACNET DAQ). AD will provide for and support the necessary hardware to receive and process the beam information in the SciBooNE detector hall.

2. Fermilab Computing Division (CD)

See Appendix I for an overview of the overall SciBooNE computing model and use of Fermilab CD resources, and Appendix II for the Physics Research Equipment Pool (PREP) request list.

Personnel:

FNAL CD Liaison: Bob Bernstein

SciBooNE CD Liaison and General Computer Security Coordinator (GCSC):

Ray Stefanski (+1-630-303-1637)

SciBooNE Analysis Software Liaison: Michel Sorel

SciBooNE DAQ Coordinator: Masashi Yokoyama

Infrastructure Requirements:

CD will ensure that a high bandwidth network connection between the experimental hall (detector site), the experiment control room (Wilson Hall), and the Feynman Center (tape storage facility) is established using optical fiber and other hardware (routers, bridges, switches). CD will assist the experiment in maintaining, and if needed optimizing, the network infrastructure, and will also provide assistance and support in order to maintain a secure network configuration. The cost to CD for this is estimated to be $2400.

CD will provide use of PREP electronics (NIM and CAMAC crates and modules, and LeCroy 1440 HV power supplies) for the MRD readout system, including sufficient spare availability. The specific request is listed in Appendix II. It is understood that CD does not currently have personnel to support CAMAC software.

CD will allow use of the Enstore system to store raw and processed data and Monte Carlo generated events, and provide up to 10 TB worth of tape cartridges compatible with the Enstore system. Use of the stored SciBooNE data requires a disk cache system. CD will provide one 5 TB dedicated disk server for this purpose, along with 8×5 maintenance and administration of this and other nodes of the disk cache system. The cost to CD for the terabyte servers is estimated to be $19,000, and $3800 for the ENSTORE tapes.

Support Requirements:

The experiment will implement DAQ control, nearline data monitoring, and data flow control to tape media by several PCs running Fermi Linux, and will support those custom software packages. CD will provide 24×7 repair/replacement arrangements for the computer hardware and 24×7 system administration for DAQ and other system-critical machines, excluding custom electronics and CAMAC units.

CD will provide 24×7 support for the Enstore system for DAQ taping processes, and provide 24×7 assistance and support to maintain uninterrupted operation of the system during the data-taking phase of the experiment.

CD will provide access to the PC farms for Monte Carlo production and data analysis, with 8×5 support. The size of the system should be on the order of 50 nodes or more.

SciBooNE currently uses 120 GB AFS disk space, maintained by CD administrators, as dedicated project area. CD will provide 8×5 support and maintenance of this disk space (or equivalent system) during the data taking and analysis phases of the experiment.

CD will provide for approximately 0.5 FTE averaged over the years 2006-2008 for offline analysis software development consultation (ROOT, C++ software design).

CD will provide for use of and 8×5 support of the CVS server for code distribution and CD web server for managing SciBooNE's web pages.

CD will provide 8×5 support and maintenance for a secure database server for the experiment's data and Monte Carlo simulated data. The specific requirements for this system will be negotiated in a future version of this memorandum.

Summary of Costs:

Switch	$1,000.00
Fiber	$777.00
MMOs	$100.00
Installation	$500.00
Subtotal	$2,377.00
Tapes	50 at $76
Subtotal	$3,800.00
Terabyte Server	$6,000.00
Power crates	$13,500.00
Subtotal	$19,500.00
TOTAL	**$25,677.00**

Procedures:

All support requests will be submitted either by phone (Helpdesk X2345) or through use of the url: http://helpdesk.fnal.gov/ .

Critical problems that require 24×7 support, that is support of around-the-clock people who are on-call after normal working hours, will be submitted through the helpdesk, either by e-mail through http://helpdesk.fnal.gov/, or by calling x2345. All machines supported directly by the CD are critical to SciBooNE data taking. Contact will be made with the SciBooNE liaison whenever a request for support is submitted through the helpdesk.

Non-critical problems, requiring support only during normal work hours, will be reported through the http://www-ppd.fnal.gov/DSGOffice/. The user will provide as much detail about the problem as they can, including error messages, exact commands used, full paths to pertinent files, etc. All work tickets that enter into the system are given the same priority and support experts are to process work tickets in the order in which they have been received.

3. Fermilab Particle Physics Division (PPD)

Personnel:

Liaison Physicist: Steve Brice

Chairman of Fermilab Safety Committee: Winslow Baker

Project Head: Rick Tesarek

Support Liaison, General Computer Security Coordinator (GCSC), and MACS:

Ray Stefanski, x3872, (+1-630-303-1637) stefanski@fnal.gov

Backup: Morgan Wascko (Imperial College), wascko@fnal.gov

Data Support Group (DSG) contact: Jason Ormes, ormes@fnal.gov

Infrastructure Requirements:

PPD will provide funds for the civil construction contract to build the detector hall, as described in the SciBooNE Conceptual Design Report and Project Execution Plan.

PPD will provide the iron plates and plastic scintillators from E-605 for use in the MRD, as well as the PMTs, which come from several sources. PPD will also provide SHV and signal cables for the MRD, and SHV cables for the EC, from old cables stored in the SELEX detector hall.

PPD will provide office space for 38 people, as shown below:

Group	# people full-time	# people part-time
Barcelona	2 students	1 prof
Chonnam		2 profs
Cincinnati	N/A (desk at MiniBooNE)	N/A (desk at MiniBooNE)
Colorado	N/A (desk at MiniBooNE)	N/A (desk at MiniBooNE)
Columbia	N/A (desk at MiniBooNE)	N/A (desk at MiniBooNE)
Dongshin		1 prof
FNAL	1 postdoc	
Imperial	1 prof, 1 student	2 profs
Indiana	N/A (desk at MiniBooNE)	N/A (desk at MiniBooNE)
ICRR		1 prof
Kyoto	1 prof, 1 postdoc, 3 students	1 prof, 2 students
KEK		1 scientist
LANL	N/A (desk at MiniBooNE)	N/A (desk at MiniBooNE)
LSU	N/A (desk at MiniBooNE)	N/A (desk at MiniBooNE)
Purdue Calumet	1 prof	
Rome	1 student	1 prof, 1 postdoc
Seoul		2 profs, 2 postdocs
St. Mary's	N/A (desk at MiniBooNE)	1 student
Tokyo Tech	1 student	2 profs
Valencia	2 student	1 postdoc, 1 prof, 1 student
TOTALS	**15 people**	**23 people**

Total office space request: 25 desks in 10 offices.

Not to scale of other expts?

PPD will provide space in Lab 6 for the MRD PMT testing and scintillation counter assembly and testing, as well as occasional technician support for the MRD efforts.

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PPD will provide whatever environmental monitoring is necessary, such as, for example, sump discharges.

PPD will provide storage space at the New Muon Lab or equivalent, and an electronics-testing area. The storage area needs some temperature control, for spare detector parts (fibers, PMTs, and electronics) as well as space for larger components. PPD will also provide lab space for an electronics repair stand.

Why not list what's there now?

4-5 offices w/20 - spots

Support Requirements:

PPD will contribute the usual overhead charges for the US/Japan Research Funds. ← check that this is normal

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PPD will provide mechanical engineering support for the designs of the structural frames for all sub-detectors. PPD will also provide technical support during the assembly and installation of the detector.

PPD will work with the collaboration to ensure good project management. The Project manager will be a PPD physicist, and PPD will provide funds for management and administrative software as needed.

PPD will provide occasional technician support for the MRD assembly efforts, as needed. PPD will also provide technicians as needed and when available to support work at the detector.

PPD will support the Fermilab Scientists in the collaboration for travel and specifically negotiated M&S. This budget will be arranged with PPD at the beginning of each fiscal year.

The total funding needed is detailed in the SciBooNE Project Cost Estimate.

Data Support Requirements:

PPD's Support Service Department Data Support Group (DSG) will support SciBooNE desktop computers running Linux and Windows operating systems. The list of SciBooNE desktop computers will be maintained by PPD in MISCOMP. It is understood that this list will change over time as old machines are retired, and new machines are brought on line. The system support will be based on the following criteria:

- The Linux operating system will always be a Fermi LTS version and the configuration file will be maintained as part of the SciBooNE workgroup file.
- Windows systems that are Fermi owned will be supported according to the prevailing DSG practices as specified in the section entitled DSG Support Practices.
- Support for Non-Fermi owned Linux and Windows systems will be limited to the following:
    - Operating system support is limited to installing available critical patches, Kerberized daemons (Linux), and AntiVirus (Windows) that are required for network access onto Fermi LAN.
    - Reinstallation of operating system is not covered, owners are to seek support from their home institution or manufacturer desktop support.
    - Software products that require a license code must be installed by the end-user.
    - System Support will assist the end-user with the basic network and printer configuration for the Fermilab environment.

DSG Support Practices

The Data Support Group (DSG) provides general support for Fermilab owned desktop computers and printers within the Particle Physics Division. Operating system support covers Fermi Linux (LTS) and Microsoft Windows (Win2k, WinXP) with

administrative duties in the Windows domain called FERMI. Support policies for software and required applications can be found on the DSG web site. Procedures for submitting a desktop support work request are under section - Problem Reporting Procedure.

Accounts -Workgroup

The computer liaison person will approve new account requests. All work performed on the SciBooNE cluster must have an account on FNALU and the SciBooNE cluster.

Organizations and Duties

PPD-DSG

- Operating system Support
  - DSG will provide 8x5[1] operating system support for the SciBooNE cluster.
  - DSG will Install and maintain the current running Linux operating system supported by the SciBooNE cluster.
  - Security and driver updates that are not automatically handled by yum (e.g. kernel updates) will be installed by DSG, when SciBooNE submits a Work Request ticket. The party that first becomes aware of such an upgrade will alert the other parties.
  - DSG will respond to system alerts only after SciBooNE submits a Work Request ticket, as defined under the Problem Reporting Procedures.

- Hardware Support
  - All computer problems are referred to the DSG by following the Problem Reporting Procedures. If the problem is diagnosed as hardware related, the DSG may choose, at their discretion, to have the problem referred to Decision One. The SciBooNE liaison must concur and authorize work to be performed by Decision One.
  - DSG will perform preliminary diagnostics prior to calling Decision One.
  - Upon return of a system from Decision One, DSG will evaluate and bring the system back into a working state.

SciBooNE

SciBooNE will maintain, operate, and monitor all custom software packages used by the experiment for operations and analysis.

Problem Reporting Procedures

[1] See Problem Reporting Procedures section for definition of 8x5

Problems will be reported through the url http://www-ppd.fnal.gov/DSGOffice/ The user should provide as much detail about the problem as they can, including error messages, exact commands used, full paths to pertinent files, etc. All work tickets that enter into the system are given the same priority and support experts are to process work tickets in the order in which they have been received.

8x5 Support Definition

8x5 support is defined as that covered during a normal work week: 8:30 AM to 5:00 PM, Monday through Friday on normal business weeks of 5 work days. Holidays that fall within the normal work week are not covered. Saturday and Sunday support will fall over to the first work day of the new week.

V. SciBooNE Contributions

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V. SPECIAL CONSIDERATIONS AND NOTES

The responsibilities of the Scientific Spokespersons and procedures to be followed by experimenters are found in the Fermilab publication "Procedures for Experimenters" (PFX: http://www.fnal.gov/directorate/documents/pfx.pdf). The Scientific Spokespersons agree to those responsibilities and to follow the described procedures.

To carry out the experiment a number of Environmental, Safety and Health (ES&H) reviews are necessary. The procedures to carry out these various reviews are found in the Fermilab Particle Physics Division Operating Manual Note PPD_ESH_006: "ES&H Review of Experiments" (http://www-ppd.fnal.gov/DivOffice/Operating_Manual/PPD_ESH_006%20Rev%20of%20Exp.pdf). The spokespersons undertake to follow those procedures in a timely manner.

The experiment spokespersons will undertake to ensure that no PREP or Fermilab-supplied computing equipment be transferred from the experiment to another use except with the approval of and through the mechanism provided by the Computing Division management. They also undertake to ensure that no modifications of PREP equipment take place without the knowledge and written consent of the Computing Division management.

Each institution will be responsible for maintaining and repairing both the electronics and the computing hardware supplied by them for the experiment. Any items for which the experiment requests that Fermilab perform maintenance and repair should appear explicitly in this agreement.

At the completion of the experiment:

The spokespersons are responsible for the return of all PREP equipment, Computing Division equipment and non-PREP data acquisition electronics. If the return is not completed after a period of one year after the end of running the spokesperson will be required to furnish, in writing, an explanation for any non-return.

The experimenters agree to remove their experimental equipment as the Laboratory requests. They agree to remove it expeditiously and in compliance with all ES&H requirements, including those related to transportation. All the expenses and personnel for the removal will be borne by the experimenters.

The experimenters will assist the Fermilab Divisions and Sections with the disposition of any articles left in the offices they occupied, including computer printout and magnetic tapes. Disposition of magnetic tapes will be in compliance with Fermilab's tape retirement policies. Costs for shipment of printouts and/or tapes will be borne by the receiving university.

SciBooNE will keep the Fermilab Office of Program Planning apprised of its progress (operation, and later, data analysis) on a regular basis and as requested.

SIGNATURES

_____ / / 2006
Tsuyoshi Nakaya, SciBooNE co-Spokesperson

_____ / / 2006
Morgan Wascko, SciBooNE co-Spokesperon

_____ / / 2006
Pier Oddone, FNAL Director

_____ / / 2006
Hugh Montgomery, FNAL Assoc. Dir. for Research

_____ / / 2006
Steve Holmes, FNAL Assoc. Dir. For Accelerators

_____ / / 2006
William Griffing, ES&H Director

_____ / / 2006
Roger Dixon, FNAL AD Head

_____ / / 2006
Victoria White, FNAL CD Head

_____ / / 2006
James Strait, FNAL PPD Head

APPENDIX I. SYNOPSIS OF SciBooNE COMPUTING MODEL

SciBooNE will use a distributed computing model for its data analysis. Raw and processed data will be stored using the FNAL Enstore system. Our total data storage requirements are on the order of 10 TB, for the full data run, and up to 20 TB more for simulated data. The tapes, using the parallel network files system (pnfs), are available to the on-site analysis computers, which include standalone workstations (Fermi Linux) and central systems like fnalu as well as the Open Science Grid. A small SciBooNE analysis "cluster" will be formed with standalone workstations that will be university- or PPD-owned, and system administration of these machines will be handled by PPD. Each university may also maintain its own analysis cluster at the home institution. To maintain storage tape integrity, a cache system is also needed (dcache). The analysis machines share the same products and libraries using the FNAL kits database and the ups/upd utilities. The experiment's analysis code and other auxiliary data (ROOT trees, n-tuples) are stored on AFS project area disk, managed by FNAL. The experiment will use a central database server located at Fermilab. SciBooNE uses CVS to maintain and distribute code, and relies on the CD CVS server for its CVS implementation. The reconstruction of the raw data will take place on the analysis workstations and central systems including the FNAL CD PC farms and the Open Science Grid. Monte Carlo generation, both for the detector and the beam, requires use of the FNAL CD PC farms and the Open Science Grid.

APPENDIX II. REQUEST FOR PREP ELECTRONICS

The following list may be updated as needed:

1) Crates:
   a) Mechtronics 156 NIM Bins, 3 units
   b) CAMAC crates, 8 units
2) CAMAC crate controllers: Jorway 73A, 6 units
3) Power Supplies:
   a) LeCroy 1440 system with CAMAC interface, 4 crates, 64 cards
   b) Mechtronics 201, 6 units
   c) Mechtronics 156, 3 units
   d) PowerDesign 1570, 2 units
   e) CAMAC power supply: BiRa 6700P, 8 units
4) Discriminators:
   a) CAMAC Model 3412, 33 modules
   b) NIM: LeCroy 623, 2 units
5) ADC:
   a) CAMAC LeCroy 4300B, 32 modules
   b) CAMAC LeCroy 2249 A/W, 4 modules
6) TDC: CAMAC Model 3377, 16 modules
7) Input Registers: Jorway 65, 2 modules
8) Output Registers: Jorway 41, 2 modules
9) Amplifiers: LeCroy 612, 20 units
10) Gate Generators:
   a) LeCroy 222, 10 units
   b) Phillips 794, 4 units
11) Pulse Generators:
   a) Berkeley 8010, 3 units
   b) Genradio 1340, 1 unit
12) Scalers:
   a) Jorway 1880, 2 units
   b) Joerger, 3 units
   c) LeCroy 2551, 2 modules
13) Digital oscilloscopes:
   a) Scopes: Tektronix 2465, 2 units
   b) Probes: Tektronix P136, 2 units
   c) Probes: Tektronix P137, 2 units
14) Logic Units
   a) LeCroy 364, 5 units
   b) Le Croy 623, 3 units
   c) LeCroy 429, 6 units

APPENDIX III. E954 HAZARD IDENTIFICATION CHECKLIST

Items for which there is anticipated need have been checked

Cryogenics			Electrical Equipment			Hazardous/Toxic Materials	
	Beam line magnets			Cryo/Electrical devices			List hazardous/toxic materials
	Analysis magnets			Capacitor banks			planned for use in a beam line or detector enclosure:
	Target			High voltage (> 5 kV)			
	Bubble chamber			Exposed equipment over 50 V			
Pressure Vessels			**Flammable Gases/Liquids**				
	Inside diameter		Type:				
	Operating pressure		Flow rate:				
	Window material		Capacity:				
	Window thickness		**Radioactive Sources**			X	^{90}Sr
Vacuum Vessels				Permanent installation		**Target Materials**	
	Inside diameter			Temporary use			Beryllium (Be)
	Operating pressure		Type:				
	Window material		Strength:				
	Window thickness		**Hazardous Chemicals**				
Lasers				Cyanide plating materials			
	Permanent installation			Scintillation Oil			
	Temporary installation			PCBs			
	Calibration			Methane		**Mechanical Structures**	
	Alignment			TMAE		X	Lifting devices
Type:		Nitrogen		TEA			Motion controllers
Wattage:				Photographic developers		X	Scaffolding/elevated platforms
Class:		III		Other			Others