T-952

MEMORANDUM OF UNDERSTANDING
For The Test Exposure of OPERA Targets in The NuMI Beam

Petit-Exposure At NeUTrino beamline (PEANUT)

August 3, 2005

Contents

1 INTRODUCTION

The advantages of using nuclear emulsion as a particle detector are well known. The high resolution of emulsion has made it a medium of choice for a number of applications where the required spatial and angular resolution are paramount and its limitations due to the lack of timing information are less important. Emulsions are commonly used as cosmic ray detectors and have found applications in high energy experiments for detecting short lived particles such as charm, beauty and tau. The addition of electronic detectors to emulsion experiments solved the problem of the lack of timing information in the emulsion, but it was the development of automatic scanning machines that revolutionized the use of these hybrid detectors, making them capable of performing even in high rate environments. Most recently, The DONuT experiment (FNAL-E872), used a hybrid emulsion spectrometer to make the first direct observation of tau neutrino interactions [1].

The CNGS facility is being constructed to deliver a ν_μ beam from the CERN SPS to the Gran Sasso Laboratory. Since it is believed that $\nu_\mu \leftrightarrow \nu_\tau$ oscillations explain the observed atmospheric ν_μ deficit, the CNGS beam, coupled with a detector capable of observing τ appearance is an important experiment in the context of the world wide effort to determine the neutrino mass mixing matrix. The OPERA detector has been optimized to detect a significant sample of ν_τ interactions by the subsequent observation of τ production and decay [2].

The OPERA target is a massive emulsion detector made in a sandwich structure of lead plates and layers of nuclear emulsion. For historical reasons this arrangement has been called an Emulsion Cloud Chamber or ECC. The ECC concept, which has many advantages over the use of bulk emulsion, has been used in the DONuT experiment. The ECC detector is capable of measuring all of the tracks, not due to nuclear fragments, coming from the primary neutrino interaction vertex, with their three dimensional slopes and momenta. It is also capable of electron identification with good e/γ separation, due to its very fine segmentation. The OPERA ECC target modules are constructed as bricks of dimensions $12.5 \times 10.0 \times 7.5 cm^3$ in horizontal, vertical and along the beam axis. Each brick consists of series of 56 (1 mm thick) plates of passive material (lead or iron) alternated with emulsion films (43 μm emulsion layer on both sides of a transparent 200 μm thick plastic film). See Figure 1.

In preparation for OPERA we would like to expose the OPERA target modules to a beam of neutrinos. This will allow us to test many of our analysis procedures and techniques as well as to validate the simulation of neutrino interactions, both for the production of forward and backward particles. Although the HE (high energy) beam of NuMI would be a better match to the CNGS energy, data acquired with NuMI LE (low energy) beam would serve the same purpose, albeit more challenging. Given the high interaction rate from the NuMI beam, the test detector target mass can be kept low and additional detectors can easily be built around a small target. These measurements are not possible in the CNGS beam, since it has no short baseline hall.

For the requested exposure two independent target setups are proposed. They would be arranged side-by-side at the same z location. The first one uses multiple ECC bricks

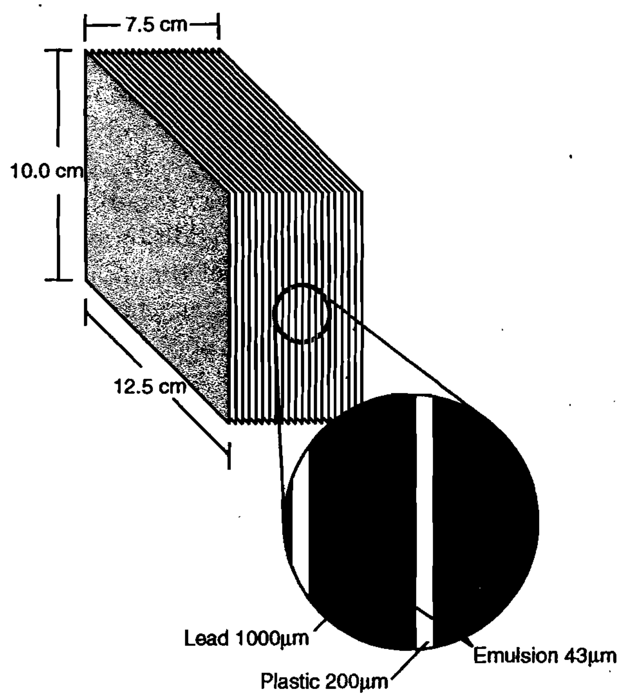

Figure 1: An OPERA ECC brick consists of 56 1 mm thick passive target material plates alternated with emulsion films ($43\mu m$ emulsion layer on both sides of a transparent $200\mu m$ thick plastic film). The passive target material can be changed from lead to iron.

and the DONuT scintillating fiber tracker (SFT). This configuration is optimized for the detection of a large number of events and will collect neutrino interactions mainly with the LE beam. The second set up uses a single ECC brick which will be able to measure a few events but in a very detailed way. This setup is more oriented to the study of the kinematics of the events at the CNGS energy and should run in correspondance to the short periods during which NuMI will be switched to the HE beam. The positioning of the setups with respect to the MINOS Near Detector is shown in Figures 2 and 3.

For both detectors muon identification will be performed by using electronic tracking detectors whose data is linked by time stamped events recorded in the MINOS near detector. We do not request direct access to the MINOS Near Detector data. We only need the muon and calorimetric information for a list of spills for which we will provide the time stamp.

For the ECC-DONuT Detector Setup (EDDS) we will use 48 bricks segmented into four walls of three (horizontal) by four (vertical) bricks. The downstream surface of each wall will be covered with a thin "changeable" emulsion sheet (CS) and 2 orthogonal (x-y) planes of scintillating fibers. The CS will be replaced periodically when the track density

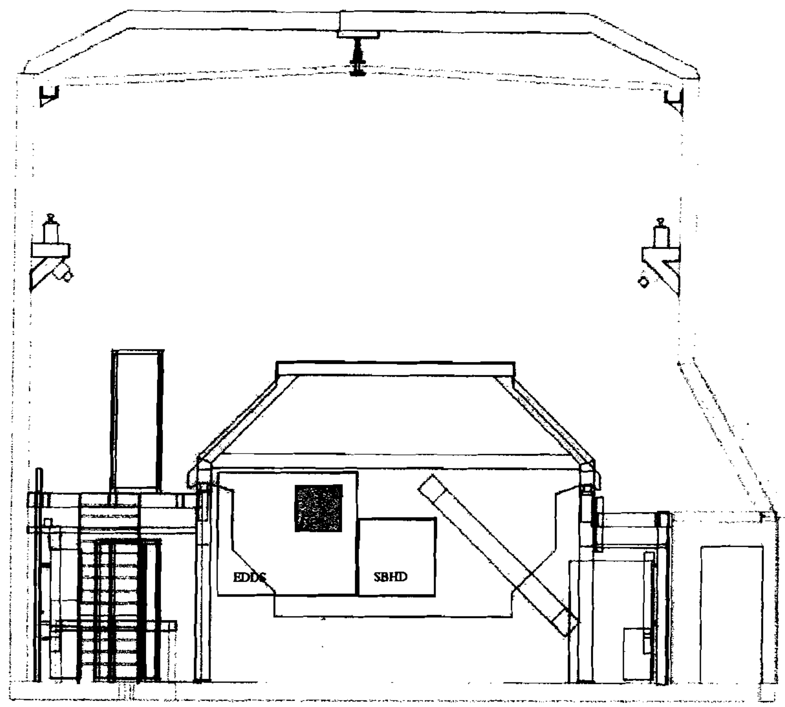

Figure 2: Location of detectors with respect to the MINOS Near Detector. The beam is into the page in this cross section view.

exceeds a predetermined level.

The fiber planes are the same ones used in the DONuT detector [3]. Each plane is $0.56m \times 0.56m$, and the fibers are $500\mu m$ diameter made from SCSF78 produced by Kuraray Co. Figure 4 shows a schematic of the brick wall and SFT arrangement.

The SFT planes are readout by image intensifiers and CCD cameras. A chain of high voltages ranging from 9 to 20 kV is applied to the image intensifiers continuously. The data from the CCD camera is read out at the end of beam spill by a local PC computer and stored on disk. A network connection to the PC will be used to control the PC and to transfer data off the disk.

For most of this exposure we plan to use lead as the passive material in the bricks, in order to achieve the best performance for the momentum measurement obtained through multiple-scattering and the electron ID. However, since the MINOS detector target material is iron, to check the number of shower tracks and emission angles for neutrino-iron interaction, we also plan to expose iron ECC bricks. With iron, the momentum measurement accuracy and electron ID efficiency will decrease due to the 3 times longer radiation length compared to lead.

This setup has already been constructed at Nagoya University in Japan. The brick

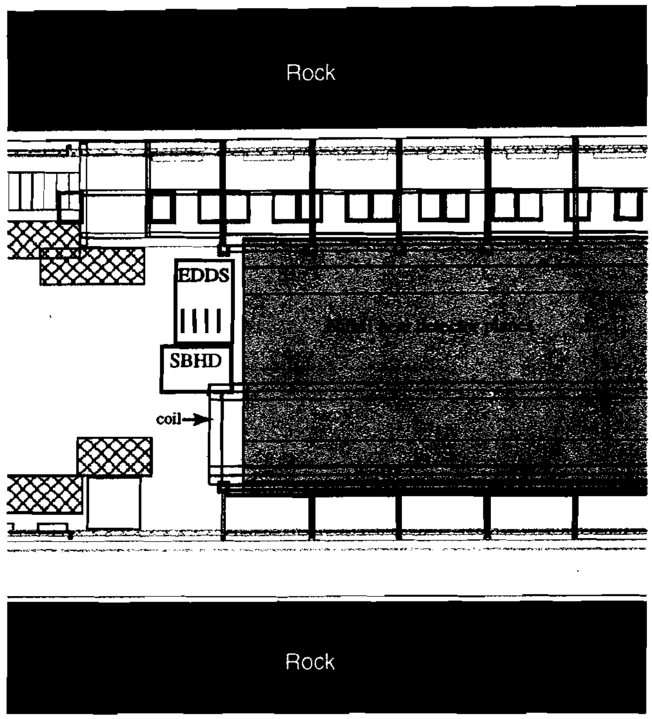

Figure 3: Location of test setups with respect to the MINOS Near Detector Plan view

arrangement is called a Mini-Wall structure, specifically designed to be similar to the installation in OPERA. Figure 5 is a photo of the setup in Nagoya. The setup as shown in the photo will be shipped from Nagoya. Both the SFT planes and Mini-Wall are supported by a frame of overall dimensions 1.8 m high, 1.8 m wide and 1.2 m long along to beam axis. The target mass of the 48 ECC bricks is 398.4 kg. The mass of the support frame is 200 kg. An additional structural support needed to elevate the setup to beam height will be designed and constructed at Fermilab.

In the Single Brick Hybrid Detector (SBHD) setup we will construct a small hybrid detector around a single ECC brick. This will allow us to study in fine detail a set of a few hundred neutrino interactions by combining the measurements performed in the ECC brick with the ones performed in tracking and calorimetric detectors surrounding the brick. The purpose of this exposure will be mainly for cross-checking the OPERA simulation and analysis procedures, but many of the results obtained could be of general interest in the neutrino community since they are affected by nuclear effects in neutrino interactions, particularly important in case of lead nuclei.

The hybrid setup (see Figure 6) includes one ECC brick, precise tracking in the forward and backward directions, backward detection of neutrons and photons, and measurement of forward electromagnetic energy. All of the detectors in this set up are made of recycled

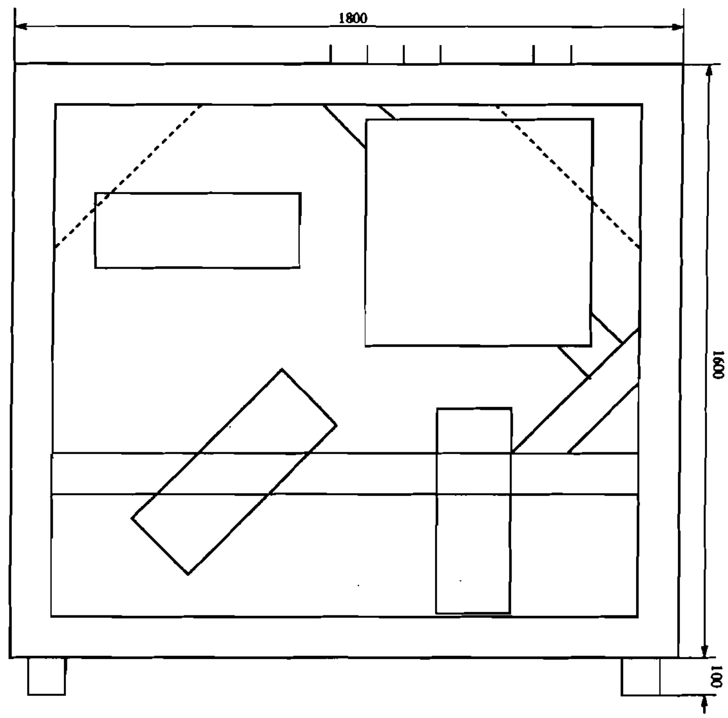

Figure 4: Dimensions of the EDDS Detector

equipment from the NOMAD, CMS and OPERA experiments. These will be shipped from Europe.

The dimensions of each component are quite small, given the fact that they have to match the acceptance of particles coming from just one ECC brick. The footprint of the entire setup will cover an area of 1.5 m along the beam axis and 1 m transverse to the beam. The detectors will be mounted in a light mechanical structure with an upper level which will support the detector centered at the beam height, while the electronics will be supported below the floor supporting the detector.

The central part of the SBHD is the single ECC brick placed in between two silicon trackers. Each tracker provides 3 views in x and 3 in y. The silicon trackers will measure precisely the directions of all the charged particles exiting the brick in the forward and backward directions. This telescope, with an active surface equivalent to the one of a brick, is built out of 12 single sided silicon sensors readout with strips with a pitch of $183\mu m$. The silicon detectors are readout through an optoelectronic chain down to a card hosted in a VME 9U bin. The VME bin is readout by a PC via a VME to PCI interface.

Downstream of the forward silicon tracker will be a few towers (each with a cross section of about $10 \times 10cm^2$ and a length of 50 cm) of a lead glass electromagnetic calorimeter. These towers will be readout with an ADC module inserted in the VME bin.

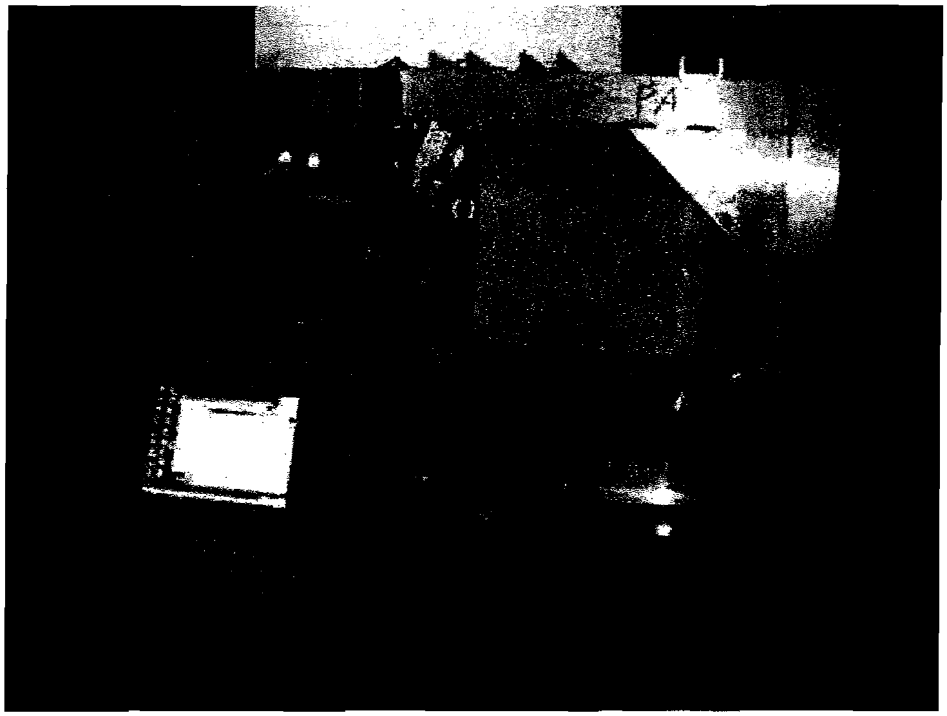

Figure 5: Picture of the EDDS taken at Nagoya University

Upstream of the backward silicon tracker will be a backward neutral detector (BND). The BND will be built with short pieces of the scintillator strips used for the construction of the OPERA target tracker. These strips have a thickness of 1 cm and a width of 2.6 cm. The cross section of the detector will be $20.8 \times 20.8 cm^2$ and the length about 20 cm. It will consist of 48 planes of 1 cm thickness, perpendicular to the beam direction. Each plane will be made out of 8 strips. The planes will have their strips alternatively aligned along the x or the y view. The strips will be read out with wave length shifting fibers, from one side only. The 384 fibers coming out of the detector will be read out by 6 Hamamatsu M64 photomultipliers coupled to the standard OPERA target tracker electronics. This is composed by a system distributing a time stamp to 6 front-end cards (one per photomultiplier). The front end cards output the data to a local ethernet network made by a switch connected to a PC. The event reconstruction is performed on the PC on the basis of the time stamp of the events.

Upstream of the first two planes of the BND we will put a thin layer of lead to be used as a preshower for the backward photons. The neutrons will be detected in the bulk of the scintillator planes after the lead foil. The BND detector will have an efficiency of about 60% for the detection of backward neutrons. Finally in the most upstream position will be a scintillator veto plane.

Longitudinal dimensions: **ECC + silicon trackers 20 cm**
Ecal (lead glass blocks) 50 cm
Neutron detector 50 cm
Veto 5 cm (scintillator planes)
Transverse dimensions: max 50 cm. Si trackers will just exceed the brick by a few cm per side

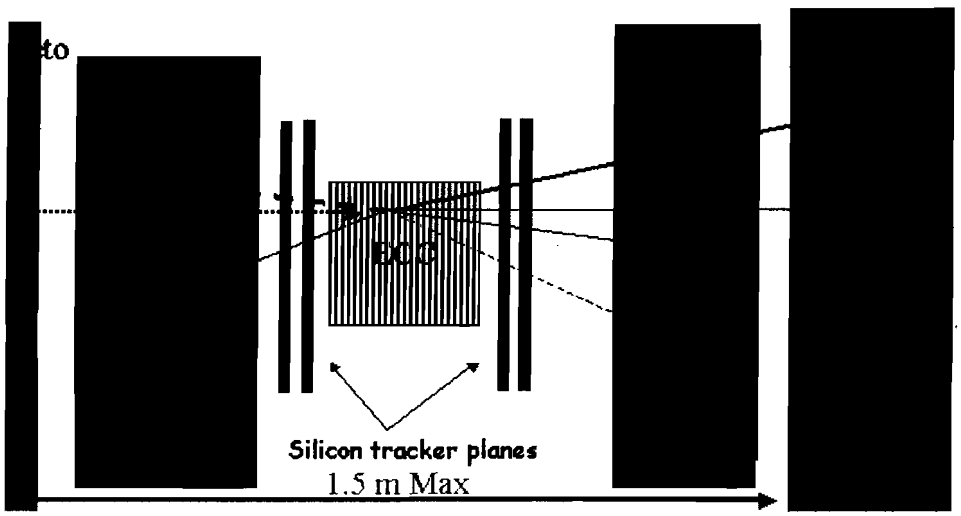

Figure 6: The Single Brick Hybrid Detector (SBHD). It includes one ECC brick, silicon tracking in the forward and backward directions, backward detection of neutrons and photons, forward electromagnetic calorimetry, forward hadronic calorimetry and muon identification from the MINOS near detector

The trigger logic will be based on the presence of a signal in the electromagnetic calorimeter in absence of signal in the veto. This trigger will be setup with NIM modules and distributed to the readout of the silicon telescope, the front end cards of the PMs for the BND readout and to the ADC for the ECAL readout. We plan to use two PCs, one for the readout of the BND and one for the readout of the silicon telescope and the ECAL trough the VME bus. The global event building will be performed with an ethernet based DAQ. The needed electronics will be included in one VME 9U bin and one NIM bin. The timing module will be hosted as well in the VME bin and it can accept as input standard PPS and IRIG-B signals from a GPS system. These signals will have to be provided by local GPS system used for the near detector of MINOS. The data will be stored locally on the disks of the PCs.

During the 1.87 s of the spill cycle the offline analysis will be able to determine, on the basis of the pattern on tracks recorded by the silicon trackers, if the trigger was really related to a neutrino interaction which occurred in the brick or an interaction in the ECAL, in the backward neutrals detector or in some mechanical supports. The connection with the part of the event measured in the MINOS near detector will be performed on the basis of the GPS time stamp.

The forward silicon tracker will perform the role that in OPERA is covered by the changeable sheet (a detachable emulsion sheet put downstream the brick in order to start the scanning procedure and validate the event location) it will allow us to reduce the scanning load by scanning the first emulsion sheet just in a small area around the prediction of the tracks reconstructed in the silicon tracker. The silicon tracker will also allow us to study the possible role of the changeable sheets in the confirmation of the event location in the brick.

The other interesting applications of the data taken with this setup will be related to the comparison between the kinematical reconstruction performed in the brick (thanks to the measurement of the momenta of charged particles trough their multiple scattering and the electron and photon reconstruction through the sampling of their showers) and the ones performed by the muon reconstruction and the calorimetric measurements outside the brick.

2 PERSONNEL AND INSTITUTIONS:

Physisist in charge of beam test: K. Niwa, Nagoya University, Japan
Fermilab liaison : R. Rameika

The group members at present and others interested in the test beam are:

Aichi University of Education, JAPAN : K. Kodama, Y. Nonoyama

University of Athens, GREECE : G. Tzanakos

Bari University and INFN, Italy : M.T. Muciaccia , S. Simone, M. DeSerio, M. Ieva, A. Pastore

Bologna University and INFN, Italy : G. Giacomelli, G. Mandrioli, M. Sioli, G. Sirri

Federico II University and INFN, Italy : S. Buontempo, G. De Lellis, G. De Rosa, F. Di Capua, P. Migliozzi, L. Scotto Lavina, V. Tioukov

FERMILAB : B. Baller, B. Lundberg, R. Rameika, N. Saoulidou

Laboratori Nazionali di Frascati/INFN ITALY : M. Spinetti, F. Terranova, L. Votano

Kobe University, JAPAN : S. Aoki

IPNL, IN2P3-CNRS and Université C. Bernard Lyon I, FRANCE : D. Autiero, L. Chaussard, Y Caffari, Y. Déclais, I. Laktineh, J. Marteau, P. Royole-Degieux

Nagoya University, JAPAN : A. Ariga, K. Hoshino, J. Kawada, N. Koike, M. Komatsu, M. Nakamura, N. Naganawa, T. Nakano, K. Narita, K. Niwa, N. Nonaka, S. Takahash, O. Sato, T. Toshito

Padova University and INFN, Italy : A. Longhini, E. Carrara

La Sapienza University and INFN, Italy : G. Rosa

Salerno University and INFN, Italy : G. Grella, C. Bozza, C. Sirignano

University of Pittsburgh : D. Naples, V. Paolone, B. Brown

3 EXPERIMENTAL AREA, BEAM AND SCHEDULE CONSIDERATIONS

3.1 LOCATION

3.1.1 The test is to take place in the MINOS Near Detector hall in the space in front of the MINOS Near Detector to the West side of the coil. A region of 3 m along along the beam axis as close as MINOS Near Detector as possible is requested. We believe that this request does not present a conflict for MINOS. The footprint of this space is shown on Figure 3.

3.1.2 An additional (temporary) work space of approximately 5 x 5 meters will be needed in the MINOS Service Building for pre-assembling for our detectors.

3.1.3 We request use of the dark rooms at the New Muon Laboratory (or equivalent space) for development of the emulsion films.

3.1.4 Additional, work space in the MINOS Near Detector hall for emulsion refreshing and brick (re)assembly is also requested. For the ECC brick assembling, we would like to avoid cosmic rays through emulsion films. The access area upstream from the MINOS Near Detector is well off the beam axis and would be ideal for the brick handling space. An area of on order 3m x 4m should be adequate for this purpose. We will not install this area for the initial start of the test, but will work on its design.

3.1.5 Our detectors require 110 V, 1.0 kW and 240 V 2.5 kW in total for the EDDS and the SBHD detectors respectively. For the brick refreshing space, we also need electricity in total 110 V, 2.15 kW maximum. Electrical requirements are summarized in Table 1, 2 and 3.

3.1.6 Access to DHCP network connections will be necessary.

3.1.7 Access to the beam timing signal will be necessary.

3.2 BEAM

3.2.1 We do not request any special beam operation. We will be totally synergistic with the MINOS Experiment's use of the NuMI beam. However, the SBHD setup will mainly run in correspondance to the high energy beam periods of NuMI, whenever they are scheduled.

Table 1: Electrical power requirements for the detectors

EDDS	110V
Readout II	0.10kW
NIM bin	0.30kW
DAQ host PC	0.20kW
misc.	0.15kW
Sub total for 110V	0.75kW
SBHD	240V
NIM bin	0.3kW
VME bin	1.0kW
PCs	0.6kW
Various	0.6kW
Sub total for 240V	2.5kW
Total	3.25kW

Table 2: Electrical power requirements for the brick refreshing space

Emulsion handling space	110V
Heater	0.50 kW
Dehumidifier	0.30 kW
Fans for circulator	0.15 kW
Vacuum pump for brick assembling	0.40 kW
Heat sealer for brick assembling	0.80 kW
Total for 110V	2.15 kW

3.2.2 Access to a copy of beam timing signal and a GPS time stamp will be necessary. We use the beam timing and GPS signals to initiate the detector readout and offline to match spills in our detector with corresponding muons and or showers in the MINOS Near Detector.

3.3 SCHEDULE

3.3.1 The EDDS detectors will be shipped to Fermilab in the Summer 2005; the SBHD equipment will be shipped in Autumn 2005

3.3.2 We request to expose our detectors in the NuMI beam at least until the 2005 shutdown. During this exposure we will exchange bricks on a routine daily schedule; each

Table 3: Required power for emulsion development space

Emulsion development space	110V
Safety light	0.50kW
Air conditioner	as there is
Total for 110V	0.50 kW

individual brick will remain in the beam for about one week. During any medium or high energy running, the SBHD brick may be exchanged up to several times per day.
3.3.3 We would like to continue to expose detectors in the NuMI beam provided that no operational conflicts arise or uncovered.

4 RESPONSIBILITIES - NON FERMILAB

	([] denotes replacement cost of existing hardware)	
1	EDDS Detector (All EDDS equipment will be supplied by Nagoya University)	
1.1	Scintillating Fiber Planes and Image Intensifier Tubes and CCDs for read out	[$400k]
1.2	DAQ Computer and associated interface	[$5k]
1.3	Miscellaneous Lab Instrumentation (NIM bins)	[$10k]
2	SBHD detector (All SBHD equipment will be supplied by Lyon University)	[$130K]
2.1	SSDs, Lead glass, etc	
2.2	DAQ Computer and associated interface	[$65K]
2.3	Miscellaneous Lab Instrumentation	[$5]
3	Emulsion refresh chamber (Nagoya)	[$5k]
4	Brick assembling tools (vacuum pump, heat sealer) (INFN)	[$3k]
5	Emulsion development (tanks, tools) (Nagoya)	[$1k]
	Total existing items	[$624]
6	Emulsion Bricks	
6.1	Emulsion films (23,000 films)	$43k
6.2	Pb and Fe (stainless steel) plates and brick packaging	$36.5k
6.3	Emulsion development solutions	$16k
	Total new items	$95.5K

5 RESPONSIBILITIES - FERMILAB

([] denotes replacement cast of existing hardware)

1 Fermilab Accelerator Division
1.1 Provide access to the beam timing signal via a 479 timing channel module or equivalent

2 Fermilab Particle Physics Division
2.1 Preparation of the New Muon Lab dark rooms : 2 Technicians for one week [$3.3K]

2.2 Installation of electrical circuits in the Near Detector Hall : $5K materials; $5K T&M electricians

2.3 Design, drawing and review of the detector support structure : 1 engineer for 4 weeks [$11.7K] ; 1 designer for 3.5 weeks [$6.8K]

2.4 Fabrication of the Detector Support Structure : 2 technicians and 1 welder for 4.5 weeks [$22.4K]; Materials : $8K

2.5 Installation of the Detector Support Structure : 3 technicians for 3.5 weeks [$17.5K]; 2 surveyors for 0.2 weeks [$0.7K]

2.6 Procurement and installation of a pre-fabricated structure in the Near Detector entrance tunnel to be used for emulsion refreshing and replacement brick assembly: 2 technicians for 1 week [$3.3 K]; Materials $2K

2.7 Assistance with safety review requirements : 1 person-week [$3.5K]

2.S Summary of Particle Division costs:

Type of Funds	Equipment	Operating	Personnel (person-weeks)
Total new items	$20.0K	$69.2K	28.0

6 SUMMARY OF COSTS

Source of Funds	Equipment	Operating	Personnel (person-weeks)
Particle Physics Division	$20.0K	$69.2K	28.0
Totals Fermilab	$20.0K	$69.2K	28.0
Totals Non-Fermilab	[$624K]+$95.5K		

7 SPECIAL CONSIDERATIONS

1. The responsibilities of the PEANUT Spokesperson and procedures to be followed by experiments are found in the Fermilab publication "Procedures for Experiments" (PFX). The Physicist in charge agrees to those responsibilities and to follow the described procedures.
2. To carry out the experiment a number of Environmental, Safety and Health (ES&H) reviews are necessary. This includes creating a Partial Operational Readiness Clearance document in conjunction with the standing Particle Physics Division committee. The PEANUT Spokesperson will follow those procedures in timely manner, as well as any other requirements put forth by division's safety officer.
2.1 All collaborators workiing on the experiment will require special training for working underground. Training will also be required for those collaborators who will develop the emulsions and handle the Pb plates.
3. All regulations concerning radioactive sources will be followed. No radioactive sources will be carried onto the site or moved without the approval of Fermilab ES&H section.
4. All items in the Fermilab Policy on Computing will be followed by experimenters.
5. The PEANUT Spokesperson will undertake to ensure that no PREP and computing equipment be transfered 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 consent of the Computing Division management.
6. 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 performs maintenance and repair should appear explicitly in this agreement.
7. If the experiment brings to Fermilab on-line data acquisition or data communications equipment to be integrated with Fermilab owned equipment, early consultation with the Computing Division is advised.
8. At the completion of the experiment:
8.1 The PEANUT Spokesperson is responsible for the return of all PREP equipment, Computing equipment and PREP data acquisition electronics. If the return is not completed after a period of one year after the end of running the PEANUT Spokesperson will be required to furnish, in writing, an explanation for any non-return.
8.2 The experimenters agree to remove their experimental equipment as the Laboratory requests them to. 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 done by the experimenters.
8.3 The experimenters will assist the Fermilab Divisions and Sections with the disposition of any articles left in the officers they occupied, including computer printout and magnetic tapes.
8.4 An experimenter will report on the test beam effort at a Fermilab All Experimenters Meeting.

8 SIGNATURES

The following persons have reviewed and concur with the terms of this MOU. Concurrence is documented by the attached e-mail replies to the request for final review of the document dated August 3, 2005

Kimio Niwa, Nagoya University, Japan, Spokesperson

Yves Declais, Université C. Bernard Lyon I, FRANCE

M.T. Muciaccia, Bari University, Italy

Masahiro Komatsu, Nagoya University, Physicist in charge - Japan

Dario Autiero, Université C. Bernard Lyon I, Physicist in charge - France

Saverio Simone, Bari University, Physicist in charge - Italy

Regina Rameika, Fermilab, Physicist in charge - US

Regina Rameika 8/11/05

Stan Wojicki, Stanford University, MINOS Co-spokesperson

8/11/05

Kieth Schuh, Fermilab - PPD ES&H and Building Management, Department Head

8/5/05

Mike Crisler, Fermilab - PPD Associate Division Head

M. Crisler 8/12/05

Jim Strait, Fermilab - Particle Physics Division, Head

8/8/05

Hugh Montgomery, Fermilab - Associate Director for Research

8/5/2005

From: Declais <declais@ipnl.in2p3.fr>
Subject: **Re: PEANUT MOU**
Date: August 15, 2005 2:57:47 AM CDT
To: Gina Rameika <rameika@fnal.gov>
Cc: Saverio.Simone@ba.infn.it, mariateresa.muciaccia@ba.infn.it, y.declais@ipnl.in2p3.fr, Masahiro KOMATSU <komatsu@flab.phys.nagoya-u.ac.jp>, niwa@flab.phys.nagoya-u.ac.jp, Dario.Autiero@cern.ch

Gina Rameika a écrit :

> Dear Colleagues,
> Enclosed you will find the final version of the PEANUT MOU. We are obtaining signatures for the Fermilab side this week. If each of you will please reply to this e-mail saying that you concur with the terms of the MOU that will be all that is needed. Of course, if you visit Fermilab in the near future you can also sign the document. I will distribute a copy of the document with the Fermilab signatures some time next week.
> Thanks very much,
> Gina Rameika

dear Gina,
I will sign the PEANUT MOU,
with my best regards,
Yves

From: Kimio Niwa <niwa@flab.phys.nagoya-u.ac.jp>
Subject: **Re: PEANUT MOU**
Date: August 10, 2005 5:59:57 AM CDT
To: Gina Rameika <rameika@fnal.gov>

Hi Gina-san,

Thank you for your fight to make PEANUT experiments...

DONUT.. Furukawa , Takahashi are working very hard..
They have no summer vacation.

regards,

K.Niwa

Gina Rameika wrote:

> Dear Colleagues,
> Enclosed you will find the final version of the PEANUT MOU. We are obtaining signatures for the Fermilab side this week. If each of you will please reply to this e-mail saying that you concur with the terms of the MOU that will be all that is needed. Of course, if you visit Fermilab in the near future you can also sign the document. I will distribute a copy of the document with the Fermilab signatures some time next week.
> Thanks very much,
> Gina Rameika

From: Masahiro KOMATSU <komatsu@flab.phys.nagoya-u.ac.jp>
Subject: **Re: PEANUT MOU**
Date: August 10, 2005 10:18:21 PM CDT
To: Gina Rameika <rameika@fnal.gov>

Dear Gina,

Formally I agree on MoU.

I talked with Niwa-san, and I ask Niwa-san to send reply to this mail.
Did you recieved mail from all?

And today is the expected date of deliverly to Fermilab.
When you recieve items which we sent to you. Please let us know.
And please open SFT and check inside. Originary few tens of fibers are broken. If number of broken fibers are not many, it is safe.
Please check this point. And onece you open box. You can use crane to move detector, but please use both left and right top frame for crane lift. If my explanation is unclear check out this photos.
http://flab.phys.nagoya-u.ac.jp/2005/index/img/050707l.jpg
http://flab.phys.nagoya-u.ac.jp/peanut/shipping/index.html

Best regards,
Komatsu

On Thu, 4 Aug 2005, Gina Rameika wrote:

> Dear Colleagues,
> Enclosed you will find the final version of the PEANUT MOU. We are obtaining signatures for the Fermilab side this week. If each of you will please reply to this e-mail saying that you concur with the terms of the MOU that will be all that is needed. Of course, if you visit Fermilab in the near future you can also sign the document. I will distribute a copy of the document with the Fermilab signatures some time next week.
> Thanks very much,
> Gina Rameika

F-Lab., Physics, Nagoya University, 464-8602, JAPAN
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Masahiro Komatsu

From: Maria Teresa Muciaccia <Mariateresa.Muciaccia@ba.infn.it>
Subject: **Re: PEANUT MOU**
Date: August 17, 2005 4:23:35 PM CDT
To: Gina Rameika <rameika@fnal.gov>
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Scrive Gina Rameika <rameika@fnal.gov>:

> Dear Colleagues,
> Enclosed you will find the final version of the PEANUT MOU. We are
>
> obtaining signatures for the Fermilab side this week. If each of you
> will please reply to this e-mail saying that you concur with the terms
>
> of the MOU that will be all that is needed. Of course, if you visit
> Fermilab in the near future you can also sign the document. I will
> distribute a copy of the document with the Fermilab signatures some
> time next week.
> Thanks very much,
> Gina Rameika

Dear Gina,
I will sign the PEANUT MOU.
Kind regards,
Maria Teresa Muciaccia

9 HAZARD IDENTIFICATION CHECKLIST

Cryogenics		**Electrical Equipment**		**Hazardous/Toxic Materials**	
	Beam line magnets		Cryo/Electrical devices		List hazardous/toxic materials
	Analysis magnets		capacitor bank		planned for use in a beam line or experimental enclosure:
	Target	X	high voltage		
	Bubble chamber		exposed equipment over 50V		
Pressure Vessels		**Flammable Gases or Liquids**			
	inside diameter	Type:			
	operating pressure	Flow rate:			
	window material	Capacity:			
	window thickness	**Radioactive Sources**			
Vacuum Vessels			permanent installation	**Target Materials**	
	inside diameter		temporary use		Beryllium (Be)
	operating pressure	Type:			Lithium (Li)
	window material	Strength:			Mercury (Hg)
	window thickness	**Hazardous Chemicals**		X	Lead (Pb)
Lasers			Cyanide plating materials		Tungsten (W)
	Permanent installation		Scintillation Oil		Uranium (U)
	Temporary installation		PCBs		Other :
	Calibration		Methene	**Mechanical Structures**	
	Alignment		TMAE		Lifting devices
type:			TEA		Motion controllers
Wattage:		X	photographic developers	X	scaffolding/elevated platforms
class:			Other:		Others

References

[1] K. Kodama *et al.*, Physics Letters B, 504, 218-224,2001

[2] M. Guler *et al.*(OPERA Collaboration, CERN-SPSC-2000-028,2000

[3] K. Kodama *et al.*, Nucl. Instrum. Meth. A493, 45-66, 2002