Fermilab

Directorate

MEMORANDUM OF UNDERSTANDING
FOR THE 2013-2014 FERMILAB TEST BEAM FACILITY PROGRAM

T-1031

ATLAS Tile Calorimeter Upgrade Electronics Test

October 12, 2012

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INTRODUCTION

This is a memorandum of understanding between the Fermi National Accelerator Laboratory (Fermilab) and the experimenters of the University of Chicago who have committed to participate in beam tests to be carried out during the 2013-2014 Fermilab Test Beam Facility program.

The memorandum is intended solely for the purpose of recording expectations for budget estimates and work allocations 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 modify this memorandum to reflect such required adjustments. Actual contractual obligations will be set forth in separate documents.

Description of Detector and Tests:

The on-detector electronics of the ATLAS hadronic calorimeter (Tilecal) at the CERN LHC consist of frontend boards (FEB) that receive and shape PMT signals and send them to a Main Board (MB) that digitizes the signals, controls clocks and parameter setups, serializes and sends data via fiberoptic transceivers. In the LHC and HL-LHC cavern environments the experimenters expect the electronics to experience periodic Single Event Upsets (SEU) and other forms of radiation damage, both recoverable and permanent. Indeed, in the 2011 and 2012 LHC running Tilcal has experienced on the order of one SEU per inverse picobarn of collisions. The experimenters are in the process of designing replacement electronics and complete upgrade systems for the higher energy and intensities of the 2015 running of the LHC. It is therefore essential to monitor the new electronics in an HL-LHC cavern environment to gauge the feasibility of the design.

FNAL accelerator physicists have shown that the M03 alcove near a pinhole collimator has a radiation environment remarkably similar to the HL-LHC caverns under normal running conditions. This alcove proves ideal for the testing of small instrumentation packages. The shielded space next to the alcove is a good location for a rack of monitoring electronics. The experiment therefore proposes to install an instrumentation package (on the order of 30 cm on a side) near the beam pipe in the alcove; this package will include the FEB, MB and LV power supply, and several ion gauges supplied by the University of Chicago. Additionally, signal and power cables will be run from the test package to a half-height relay rack in the shielded area about 3 meters away. This DAQ rack contains the CPU, VME system and ion gauge controller. The system would be monitored in a parasitic mode with the beamline operation, with data transmitted for analysis via Ethernet.

I. PERSONNEL AND INSTITUTIONS:

Spokesperson: Mark Oreglia

Fermilab liaison: Aria Soha

The group members at present are:

	Institution	Collaborator
1.1	University of Chicago	Mark Oreglia Kelby Anderson
1.2	Fermilab	Erik Ramberg
1.3	Argonne National Lab	Gary Drake

II. EXPERIMENTAL AREA, BEAMS AND SCHEDULE CONSIDERATIONS:

2.1 LOCATION

2.1.1 The beam test(s) will take place in ~~section MT3~~the M03 Alcove, near the MTest beamline.

2.2 BEAM

2.2.1 BEAM TYPES AND INTENSITIES

Energy of beam: 120 GeV protons on the MT3 collimator ("proton mode").

2.2.2 BEAM SHARING

The experiment will run in parasitic mode.

2.2.3 RUNNING TIME

~~We propose to monitor the test package for one month. Additional months of running could be necessary with future versions of the electronics.~~The electronics test package will be left in place for approximately 1 month while monitored for SEU. Access may be necessary to repair failed electronics, but such access can await normal beamline access periods.

2.3 EXPERIMENTAL CONDITIONS

2.3.1 AREA INFRASTRUCTURE

The experimenters will be using the MT3 alcove for the instrument package under test, and approximately 9 square feet of floor space in the shielded are for the DAQ rack.

2.3.2 ELECTRONICS NEEDS

The experiment will need AC power (110v, 15A), for their electronics in the enclosure, and a network (Ethernet) connection from the DAQ rack in the enclosure, such that the DAQ CPU can be monitored from off site. (Remote Access)

No items from PREP are being requested at this time.

The Front End Boards, and Main Board are custom electronics, everything else is commercial. This system was run for several months in the APS ring at Argonne.

2.3.3 DESCRIPTION OF TESTS

The experiment does not intend to install any material in the beam line itself. Experimenters will install an instrumentation package (on the order of 30 cm on a side) near the beam pipe in the alcove; this package will include the FEB, MB and LV power supply, and several ion gauges

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The system would be monitored from off-site in a parasitic mode with the beamline operation, with data transmitted for analysis via Ethernet. An experiment contact will be available 24/7 and two contact numbers will be registered with MCR operators, and with the Fermilab Liason.

The experiment proposes to monitor the test package for one month. Additional months of running could be necessary with future versions of the electronics.

2.4 SCHEDULE

The experimenters would like access to the area for approximately one year, with the understanding that the experiment will be parasitic and coexist with other tests conducted in the M03 alcove, or in the MT6 enclosures.

III. RESPONSIBILITIES BY INSTITUTION – NON FERMILAB

3.1

UNIVERSITY OF CHICAGO:

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The University of Chicago will provide all necessary instrumentation.

- Front End Boards
- Main Board
- Low Voltage power supply
- Several ion gauges
- CPU for DAQ
- VME system
- Ion gauge controller

[$10k]

IV. RESPONSIBILITIES BY INSTITUTION – FERMILAB

4.1 FERMILAB ACCELERATOR DIVISION:

4.1.1 Use of MTest beam as outlined in Section II.
4.1.2 Maintenance of all existing standard beam line elements (SWICs, loss monitors, etc) instrumentation, controls, clock distribution, and power supplies.
4.1.3 Reasonable access to the equipment in the MTest beamline, specifically the M03 enclosure.
4.1.4 The test beam energy and beam line elements will be under the control of the AD Operations Department Main Control Room (MCR). [0.5 person-weeks]
4.1.5 Position and focus of the beam on the experimental devices under test will be under control of MCR.
4.1.6 The integrated effect of running this and other SY120 beams will not reduce the neutrino flux by more than an amount set by the office of Program Planning, with the details of scheduling to be worked out between the experimenters and the Office of Program Planning.

4.2 FERMILAB PARTICLE PHYSICS DIVISION:

4.2.1 The test-beam efforts in this MOU will make use of the Fermilab Test Beam Facility. Requirements for the beam and user facilities are given in Section II. The Fermilab Particle Physics Division will be responsible for coordinating overall activities in the MTest beam-line, including use of the user beam-line controls, readout of the beam-line detectors, and MTest computers. [1.0 person weeks]
4.2.2 Conduct a NEPA review of the experiment.
4.2.3 Provide day-to-day ES&H support/oversight/review of work and documents as necessary.
4.2.4 Provide safety training as necessary, with assistance from the ES&H Section.
4.2.5 Update/create ITNA's for users on the experiment.
4.2.6 Initiate the ES&H Operational Readiness Clearance Review and any other required safety reviews.

4.3 FERMILAB SCIENTIFIC COMPUTING DIVISION

4.3.1 The experiment requests a network (Ethernet) connection from the DAQ rack in the enclosure, such that the DAQ CPU can be monitored from off site. (Remote Access)

4.4 FERMILAB ES&H SECTION

4.4.1 Assistance with safety reviews.
4.4.2 Provide safety training, with assistance from PPD, as necessary for experimenters. [0.5 person weeks]

V. SUMMARY OF COSTS

Source of Funds [$K]	Materials & Services	Labor (person-weeks)
Particle Physics Division	$0K	1.0
Accelerator Division	0	0.5
Scientific Computing Division	0	0
ES&H Section	0	0.5
Totals Fermilab	$0K	2
Totals Non-Fermilab	$10K	4

VI. SPECIAL CONSIDERATIONS

6.1 The responsibilities of the Spokesperson and the procedures to be followed by experimenters are found in the Fermilab publication "Procedures for Researchers": (http://www.fnal.gov/directorate/PFX/PFX.pdf). The Spokesperson agrees to those responsibilities and to follow the described procedures.

6.2 To carry out the experiment a number of Environmental, Safety and Health (ES&H) reviews are necessary. This includes creating an Operational Readiness Clearance document in conjunction with the standing Particle Physics Division committee. The Spokesperson will follow those procedures in a timely manner, as well as any other requirements put forth by the Division's Safety Officer.

6.3 The system would be monitored from off-site in a parasitic mode with the beamline operation, with data transmitted for analysis via Ethernet. An experiment contact will be available 24/7 and two contact numbers will be registered with MCR operators, and with the Fermilab Liason.

6.4 All regulations concerning radioactive sources will be followed. No radioactive sources will be carried onto the site or moved without the approval of the Fermilab ES&H section.

6.5 All items in the Fermilab Policy on Computing will be followed by the experimenters. (http://computing.fnal.gov/cd/policy/cpolicy.pdf).

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

6.7 The experimenters will be responsible for maintaining both the electronics and the computing hardware supplied by them for the experiment. Fermilab will be responsible for repair and maintenance of the Fermilab-supplied electronics. Any items for which the experiment requests that Fermilab performs maintenance and repair should appear explicitly in this agreement.

At the completion of the experiment:

6.8 The Spokesperson is responsible for the return of all PREP equipment, computing 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.

6.9 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 borne by the experimenters unless removal requires facilities and personnel not able to be supplied by them, such a rigging, crane operation, etc.

6.10 The experimenters will assist Fermilab with the disposition of any articles left in the offices they occupied.

SIGNATURES:

Mark Oreglia , Experiment Spokesperson — 10 / 12 / 2012

Michael Lindgren, Particle Physics Division, Fermilab — 10/15/2012

Roger Dixon, Accelerator Division, Fermilab — 10/17/2012

Robert Roser, Scientific Computing Division, Fermilab — 10/18/2012

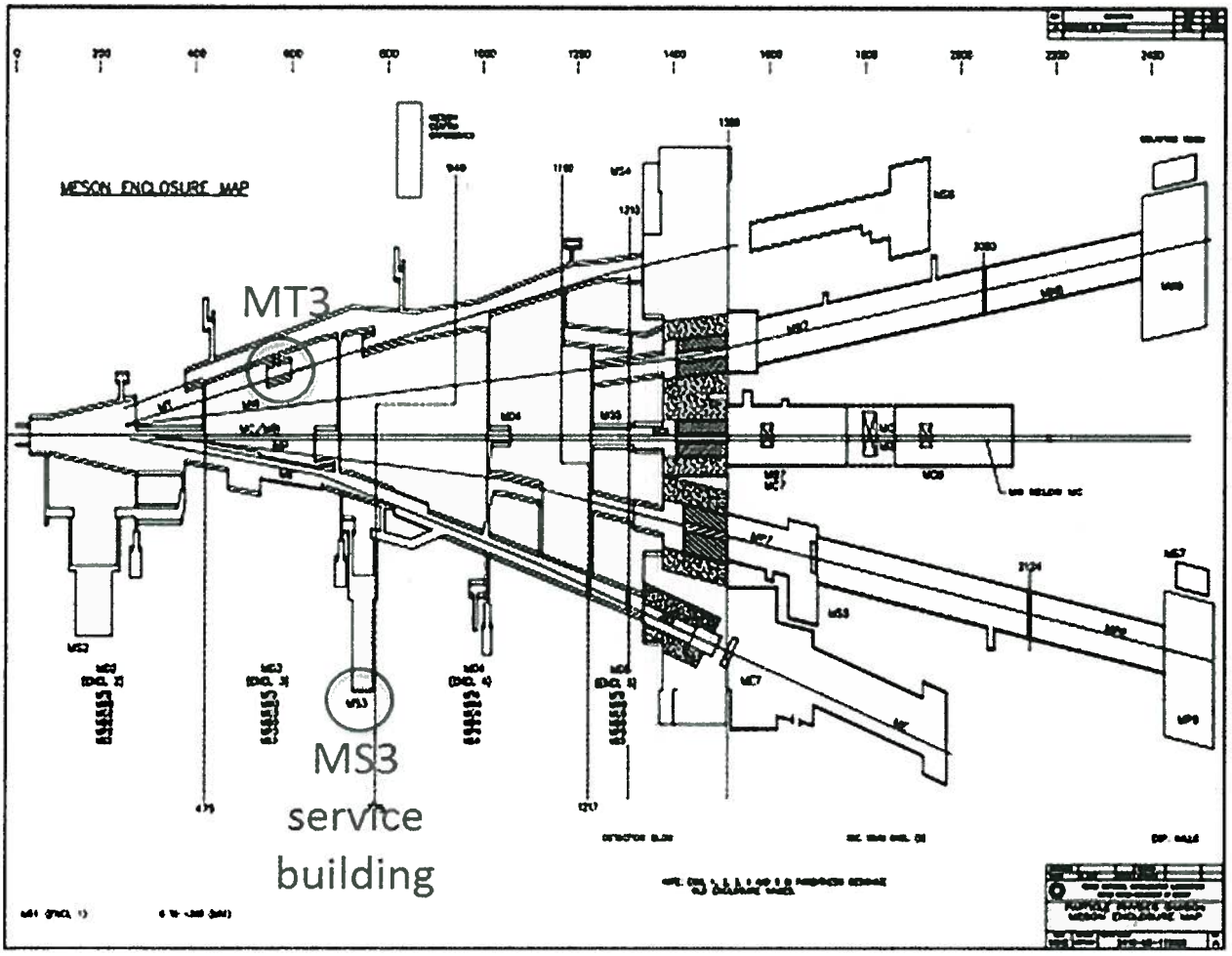
Nancy Grossman, ES&H Section, Fermilab — 10/16/2012

Greg Bock, Associate Director for Research, Fermilab — 10/24/2012

Stuart Henderson, Associate Director for Accelerators, Fermilab — 10/22/2012

APPENDIX I: MT6 AREA LAYOUT

MTEST AREAS



APPENDIX II: - HAZARD IDENTIFICATION CHECKLIST

Items for which there is anticipated need have been checked. See next page for detailed descriptions of categories.

Flammable Gases or Liquids		Other Gas Emissions		Hazardous Chemicals		Other Hazardous /Toxic Materials
Type:		Type:				List hazardous/toxic materials planned for use in a beam line or an experimental enclosure:
Flow rate:		Flow rate:				
Capacity:		Capacity:				
Radioactive Sources		**Target Materials**				
	Permanent Installation		Beryllium (Be)			
	Temporary Use		Lithium (Li)			
Type:			Mercury (Hg)			
Strength:			Lead (Pb)			
Lasers			Tungsten (W)			
	Permanent installation		Uranium (U)			
	Temporary installation		Other:	**Nuclear Materials**		
	Calibration	**Electrical Equipment**		Name:		
	Alignment		Cryo/Electrical devices	Weight:		
Type:			Capacitor Banks	**Mechanical Structures**		
Wattage:			High Voltage (50V)		Lifting Devices	
Class:			Exposed Equipment over 50 V		Motion Controllers	
		X	Non-commercial/Non-PREP		Scaffolding/ Elevated Platforms	
			Modified Commercial/PREP		Other:	
Vacuum Vessels		**Pressure Vessels**		**Cryogenics**		
Inside Diameter:		Inside Diameter:			Beam line magnets	
Operating Pressure:		Operating Pressure:			Analysis magnets	
Window Material:		Window Material:			Target	
Window Thickness:		Window Thickness:			Bubble chamber	