

12th Monthly Report of the MI BPM Upgrade
June, 2006
wbs item 1.1.3.2 of the Run 2 Luminosity Upgrade Project
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Project Definition:

The MI BPM Upgrade will replace the current BPM electronics and the data acquisition system used to transfer information between the BPMs and the Accelerator Controls Systems. As part of the project, the software used to read out, transfer, store, and analyze the BPM data will be upgraded. The goal of the project is to provide a BPM system based on modern hardware and software that gives the higher resolution and expanded functionality necessary to efficiently understand and operate the Main Injector now and for the foreseeable future including the needs for Run 2 and NUMI. Deliverables of the project include all relevant documentation, manuals, user's guides and any other written records necessary for maintaining the system.

Project Manager's Summary:

June was a very eventful month for the project. Early in the month the MI40 prototype system (instrumenting one house out of three) was re-established and made functional again. Many small errors and problems were found and resolved in the prototype before full installations were allowed to move forward. During June the first 3 building (out of 7) of upgraded MI BPM electronics were installed and partially commissioned. This was a huge accomplishment and went quite well. During the first installation at MI40 there were certainly problems encountered and surprises but the system was up and functioning rather quickly after installation and was usable by accelerator operations the same day. The three buildings installed so far are MI40, MI30 and MI20. They were installed on June 14, June 21 and June 28.

An official installation order was established by the Main Injector Department:

MI40
MI30
MI20
MI60S
MI60N
MI10
MI50

The first installation (MI40) was performed in conjunction with an installation of the BLM upgrade electronics in MI40. This is convenient from the hardware point of view because all of the old electronics is removed at once leaving a large amount of space for the new electronics. However, the BLM electronics and software required further debugging and the MI30 and MI20 upgrades included only the BPM electronics. This is

a more complicated installation because it requires extra cabling and equipment relocation to keep the old BLM system functional but this is not a major amount of extra work. The BLM electronics will be installed later once the problems and issues are resolved.

The ability to successfully perform the installations relied on good preparations as well as some hard work that was done to prepare the front-end transition boards. These boards had fabrication problems and a major effort was made in May and June to test and repair the boards quickly, to track the problems found, and to stress test the boards so that the probability of future failures could be reduced. Our conclusion is that the boards were not properly assembled. Discussions with the Fermilab Procurement Department and the board fabrication company were held. Some of the details of the board problems can be found in Bob Forster's presentation in beams-doc-2312-v1. Even with all of these problems the project was able to test and repair sufficient boards to provide the full number required for the project (56) plus spares. At the end of June 6 transition boards were still in the phase of being tested and/or repaired.

In addition to the transition board work a large effort went into properly testing fully integrated systems (transition boards + controller + Echotek + timing board) with test input signals in the test stand in the Feynman Computing Center. Each building's electronics were integrated and tested before they were declared ready for installation. The results of the testing will be placed in docDB.

In the process of installation and commissioning much has been learned about the system and the capabilities that are required. A "safe flash" mode is being implemented to measure orbits when the beam is injected from the Tevatron to the Main Injector. Settings of the 2.5 MHz channel gains were proposed by Bob Webber for pbars based on measurements and these have been implemented. Work continues on the transition controller card to implement functionality including transition board gain adjustments that will be used to correct for differential attenuations, mainly coming from cable length differences.

Towards the end of the month some problems were found with the DAWN VME crates. A high priority was given to coming up with a diagnosis and a fix to the crates and work will continue on this in July.

Resources Used in June 2006:

The total time worked on the project in June 2006 from the Computing Division was 5.1 FTE-months with 16 people contributing. The time worked from the Accelerator Division was 3.8 FTE-months with 13 people contributing. The total time worked from both Divisions was 8.9 FTE-months. The following table gives the estimated or reported effort for both divisions (in FTE-months) since July, 2005.

Month	AD Effort	CD Effort	Total Effort
July, 2005	2.1	2.4	4.5
August, 2005	1.4	2.7	4.1
September, 2005	2.8	3.7	6.5
October, 2005	3.5	4.7	8.2
November, 2005	2.1	5.1	7.2
December, 2005	1.4	5.7	7.1
January, 2006	3.1	4.1	7.2
February, 2006	4.2	5.7	9.9
March, 2006	3.0	4.2	7.2
April, 2006	2.1	4.2	6.3
May, 2006	2.1	5.5	7.6
June, 2006	3.8	5.1	8.9
SUM (through June, 2006)	31.6	53.1	84.7

The effort listed here is time worked and does not include vacation, sick leave, holidays, etc.

Purchase requisitions/procard obligations through June, 2006:

A final purchase list for the MI BPM project has been generated. The total M&S costs for the MI BPM upgrade is \$822,778.70.

A breakdown of the largest purchases by subsystem is given in the table below. The final assignment of costs to each subsystem, including all small purchases, will be completed in the near future.

Echotek boards	\$504,000
Timing boards	\$ 11,250
MVME (+plug-in cards)	\$ 43,417
VME crates	\$ 77,055
Transition boards	\$ 34,292
Cables	\$ 34,414

Milestones:

1.1.3.2.1.2	MI BPM: Review (Milestone)	7/25/2005
1.1.3.2.4.2	All Combiner boxes available	10/25/2005
1.1.3.2.3.1.3.5	Transition module PO issued	3/03/2006
1.1.3.2.6	MI BPM system complete	9/25/2006

Meetings held, Reports Given:

Meetings were held in June on the following dates:

Project Meetings: June 6, 13, 20, 27: Minutes are available in beams-doc-1526.

Documents:

The following documents were written and added to the Accelerator Division Document Database during June, 2006.

[1526-v6 MI BPM Meeting Notes and Minutes Steve Wolbers](#) 28 Jun 2006

[2312-v1 MI BPM Transition Board Assembly Problems Bob Forster et. al.](#) 28 Jun 2006

[2301-v2 Proposed MI BPM 2.5MHz Transition Board Gains Bob Webber](#) 27 Jun 2006

[2129-v2 Raw Mode Measurements in the Upgraded MI BPM System Steve Foulkes](#) 20 Jun 2006

[2292-v1 MI PBM Commissioning Checklist Robert Dysert](#) 14 Jun 2006

[2007-v2 Extra Wide Aperture BPM Test Stand Measurement Results James A. Fitzgerald](#) 14 Jun 2006

[1951-v1 Monthly Report of the MI BPM Upgrade Project Bakul Banerjee et. al.](#) 09 Jun 2006

[2285-v2 Rapid Transfer BPM List as of 6-9-06 \(after upgrades\) John Van Bogaert](#) 09 Jun 2006

[2280-v1 MI Extra Wide Aperture BPM Scaling in Difference-Over-Sum BPM System Bob Webber](#) 05 Jun 2006

[2288-v1 MIBPM Cable Measurements Bob Webber](#) 05 Jun 2006