

13th Monthly Report of the MI BPM Upgrade  
July, 2006  
wbs item 1.1.3.2 of the Run 2 Luminosity Upgrade Project  
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August 9, 2006

**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:**

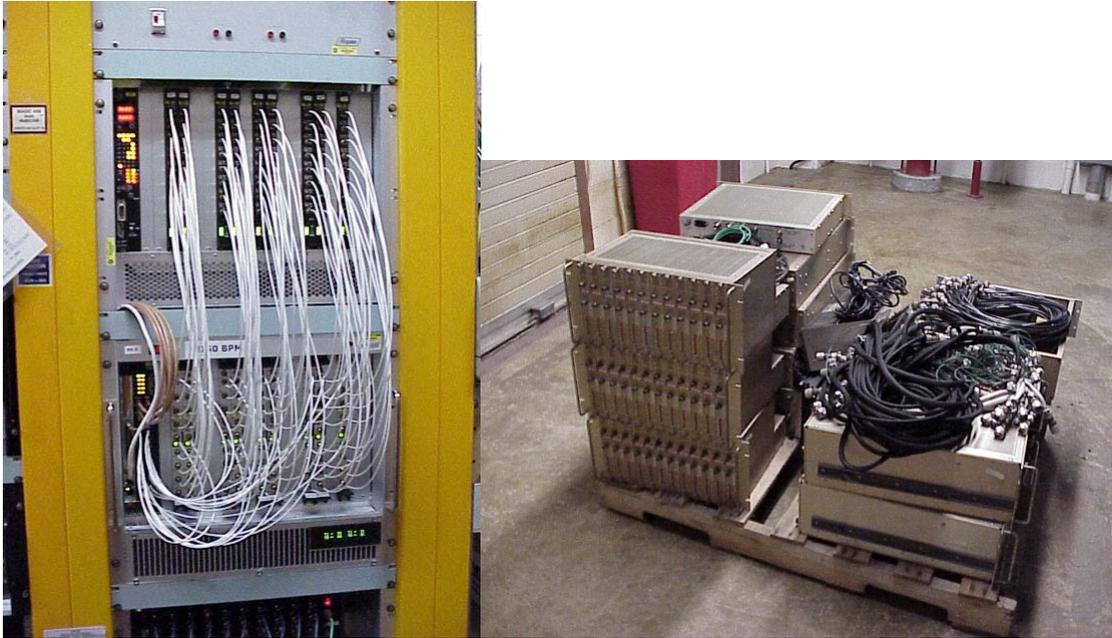
During July the project moved aggressively to install and commission the full MI BPM upgrade. By the month's end all but one service building (MI50) was fully upgraded to the new hardware. This was indeed a major accomplishment and now the end of the project is within sight.

The official installation order was established by the Main Injector Department. The actual dates of installation are given here.

<b>MI40</b>	<b>June 14, 2006</b>
<b>MI30</b>	<b>June 21, 2006</b>
<b>MI20</b>	<b>June 28, 2006</b>
<b>MI60S</b>	<b>July 12, 2006</b>
<b>MI60N</b>	<b>July 26, 2006</b>
<b>MI10</b>	<b>July 31, 2006</b>
<b>MI50</b>	<b>August 2, 2006</b>

A photo of a fully installed system (MI50) is shown on the next page on the left. The old BPM equipment that was removed is seen in the picture on the right. Photos of all of the installations and other project related pictures can be found at:

[http://www-cdserver.fnal.gov/cd\\_final/css/ess/MI-BPM%20Project/Photos/](http://www-cdserver.fnal.gov/cd_final/css/ess/MI-BPM%20Project/Photos/)



**New MI50 BPM electronics**

**Old MI50 BPM electronics removed**

The installation was halted and restarted during July because of VME crate problems, analog crate backplane/power supply problems, front-end analog transition board calibrations, and at least one operational issue related to reverse injection and orbit closing in the Main Injector.

A problem with DAWN VME crates was found early in July while testing systems for MI installation and by Peter Prieto and others who are using the same crates on other BPM upgrade projects. The fans used in the new DAWN crates draw more current than previous models and on occasion they turn off when a fuse opens, leading to a situation where the crate could overheat. A fix was recommended by DAWN (fuse replacement with a small wire) and this fix was installed in all DAWN crates before installation was allowed to continue. Safety issues and crate and temperature monitoring are all being addressed as part of this change.

Another problem found during system integration and testing was uncovered when a shortened backplane on the analog crate was installed during testing. An examination of the power connections indicated that a change was needed to ensure that a robust and safe configuration is achieved. This work was done and documented and all crates have been modified.

The transition boards were found to require a recalibration after the overall gain was changed on the 2.5 MHz signal path. The modification was made on all boards and old boards were replaced on all systems installed in the accelerator.

Reverse injection orbit closing was fixed by using data available from the new system and making some modifications to the application software.

Some of the cables that connect the analog transition boards to the digital signal processing Echotek boards had poor connector crimping. Marv Olson led the effort to recrimp all of the cables to ensure good connections.

Finally, work continued on understanding the data, finalizing the gains and timing, exploring the capabilities of the new system, and finishing or planning to finish the remaining required functionality.

**Resources Used in July 2006:**

The total time worked on the project in July 2006 from the Computing Division was 4.1 FTE-months and 15 people contributed. The time worked from the Accelerator Division was 3.6 FTE-months and 13 people contributed. The total time worked from both Divisions was 7.7 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
July, 2006	3.6	4.1	7.7
SUM (through July, 2006)	35.2	57.2	92.4

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

**Purchase requisitions/procard obligations through July, 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 as part of the project closeout.

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 July on the following dates:

Project Meetings: July 11,18,25: Minutes are available in beams-doc-1526.

### **Documents:**

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

[2012-v4 MI-BPM Upgrade Cable Specification Marv Olson](#) *et. al.* 25 Jul 2006

[2349-v1 Power Supply and Power Harness ECO for the Beam Position Monitor Transition Board System Bill Haynes](#) *et. al.* 17 Jul 2006

[2348-v1 Model of RF Leakage Effect on MI Beam Position Measurement Bob Webber](#)  
14 Jul 2006

[1951-v1 Monthly Report of the MI BPM Upgrade Project Bakul Banerjee](#) *et. al.* 13 Jul 2006