

Third Monthly Report of the MI BPM Upgrade
September, 2005
wbs item 1.1.3.2 of the Run 2 Luminosity Upgrade Project
Bob Webber, Stephen Wolbers, Bakul Banerjee
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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:

The project is making progress on many fronts in parallel. The first combiner boards were delivered during September. 101 boards arrived and the remaining 124 were awaiting resolution of an issue of "missing parts" at the board manufacturer. By the end of the month the parts were either found or replaced and the company claims to have shipped the remaining 124 boards to Fermilab.

The first 23 combiner boards were mounted in the spare aluminum boxes, tested, and these were installed in the Main Injector tunnel during a short access on September 21. This went very well (though one BPM was not working after the installation). In future installs more care will be taken to check that everything is functioning.

The two-channel transition board prototype was assembled and tested on the bench and with beam signals in the MI30 service building test stand. The result of the testing shows that the design is sound but that some modifications were needed to handle saturation seen on the 53 MHz channels when the Main Injector is running at high intensity with protons. The changes were made and tested. Work is proceeding on the layout of the 8 channel boards including the control signals. A design review will be held in October before final production is approved.

The purchase order for the 11 VME subracks required for the project has been approved. The bid process has begun and the project is working with procurement to obtain VME subracks that are similar or identical either to the Tevatron/Transfer Line BPM subracks or the BLM subracks. This will facilitate monitoring and sparing for all of the projects.

Work continues on porting Tevatron BPM front end code and the associated and necessary libraries (accelerator controls and other) to the MVME 5500. Once it is

established that the code will run on the 5500 a purchase order will be submitted to acquire the necessary boards for the project.

Many people were involved working to provide MI BPM clock signals to the FCC3 test stand. This work was completed and the final connections were made. Greg Vogel was able to find an opportunity to establish the signals.

Work continued on the MI30 test stand. As part of that work it was shown that a Tevatron style timing board provides sufficient capability to be used for the MI BPM upgrade. The layout and production of those boards is now proceeding. Other tests were made on the prototype transition board, the Echotek board, among other things.

Work has begun to understand the final electronics position and cabling in the MI service buildings. A full survey of the buildings has been made and details of rack positions, cable trays, control and timing signal locations, etc. are being established and documented. First discussions of crate locations and installation order have begun.

Front-end and Online software work continues. Data structures have been designed and are being documented. Front-end software with some rudimentary MI BPM capability is being written with a hope of having early versions on the teststand and in MI30.

Resources Used in September 2005:

The total time worked on the project in calendar September 2005 from the Computing Division was 3.7 FTE-months with 14 people contributing. The time worked from the Accelerator Division was 2.8 FTE-months with 9 people contributing. The total time worked from both Divisions was 6.5 FTE-months. The following table gives the estimated or reported effort for both divisions (in FTE-months) since July, 2005.

<u>Month</u>	<u>AD Effort</u>	<u>CD Effort</u>	<u>Total Effort</u>
July, 2005	2.1	2.4	4.5
August, 2005	1.4	2.7	4.1
September, 2005	2.8	3.7	6.5
SUM (through Sep, 2005)	6.3	8.8	15.1

The effort listed here is time worked and does not include vacation, sick leave, holidays, etc. It should be noted here that the effort increased in September and this is encouraging given the large amount of work required to design, fabricate, install and commission this system.

Purchase requisitions/procard obligations through August, 2005:

No change since August. This will be updated in the October report.

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	1/10/2006
1.1.3.2.6	MI BPM system complete	8/15/2006

Meetings held, Reports Given:

Meetings were held in September on the following dates:

Project Meetings: September 6,13,20,27

Requirements discussions: September 23, 30

Documents:

The following documents were written and added to the Accelerator Division Document Database during September, 2005.

[1822-v2 MI Service Building Survey \(BPM electronics space\) Marv Olson](#) 29 Sep 2005

[1526-v2 MI BPM Meeting Notes and Minutes Steve Wolbers](#) 28 Sep 2005

[1970-v2 Assembly/Testing Status for Combiner Boxes Timothy J. Kasza](#) 28 Sep 2005

[1968-v1 Measurements on the MI BPM Transitionboard Manfred Wendt](#) 27 Sep 2005

[1958-v2 Antiproton Beam Position Measurements with Prototype Equipment at MI-30 Bob Webber et. al.](#) 19 Sep 2005

[1786-v6 Requirements for the Main Injector BPM upgrade Alberto Marchionni et. al.](#) 14 Sep 2005

[1956-v1 Qualification of the Haynes 10/7 Digitizer Clock Signal Bob Webber et. al.](#) 12 Sep 2005

[1955-v1 MIBPM Front-End Software Memory Requirements Review Luciano Piccoli](#) 09 Sep 2005

[1952-v1 Time and Data Distribution Systems at the Fermilab Accelerator David G. Beechy et. al. 07 Sep 2005](#)

[1951-v1 Monthly Report of the MI BPM Upgrade Project Bakul Banerjee 07 Sep 2005](#)

[1949-v1 Main Injector Beam Position Monitor Upgrade Software Specifications for Data Acquisition Luciano Piccoli et. al. 06 Sep 2005](#)

Subproject Leader Reports:

Vince Pavlicek: Timing Board

The Electronics group has extended the capabilities of the Timing Generator and Fanout (TGF) module to add the needs of the MI BPM system as it is currently understood. The TeV timing logic has been modified to 1) add another clock input and decoder and begin to reconfigure the three clock decoders for the MI system messages 2) add logic to increase the number of clock and sync outputs to 10 and 3) test these changes as possible. The logic to implement the complex state machine controller that will track the complex machine operations is being designed in parallel with the requirements. This logic will be the critical design task for this module.

The TGF board layouts, mother board, front panel and daughter card, has been modified to increase the I/O as needed and a new card, the TGF transition card, was designed and the layout completed. These designs are believed ready for production release and budgetary quotes have been acquired.

Rob Kutschke: Validation

I studied the MI BPM documents and meeting presentations to come up to speed after being away for a month. I worked with the Dave, Alberto, Margaret, Luciano and others to clarify many details in the requirements document. I started to prepare a plan for the data validation.

Margaret Votava: Front-End Software

Also in September we flushed out the last remaining details in the requirements document. They need to be updated in the doc, but at least we know what they are.