RHIC Retreat 2009
Beam Position Monitor System
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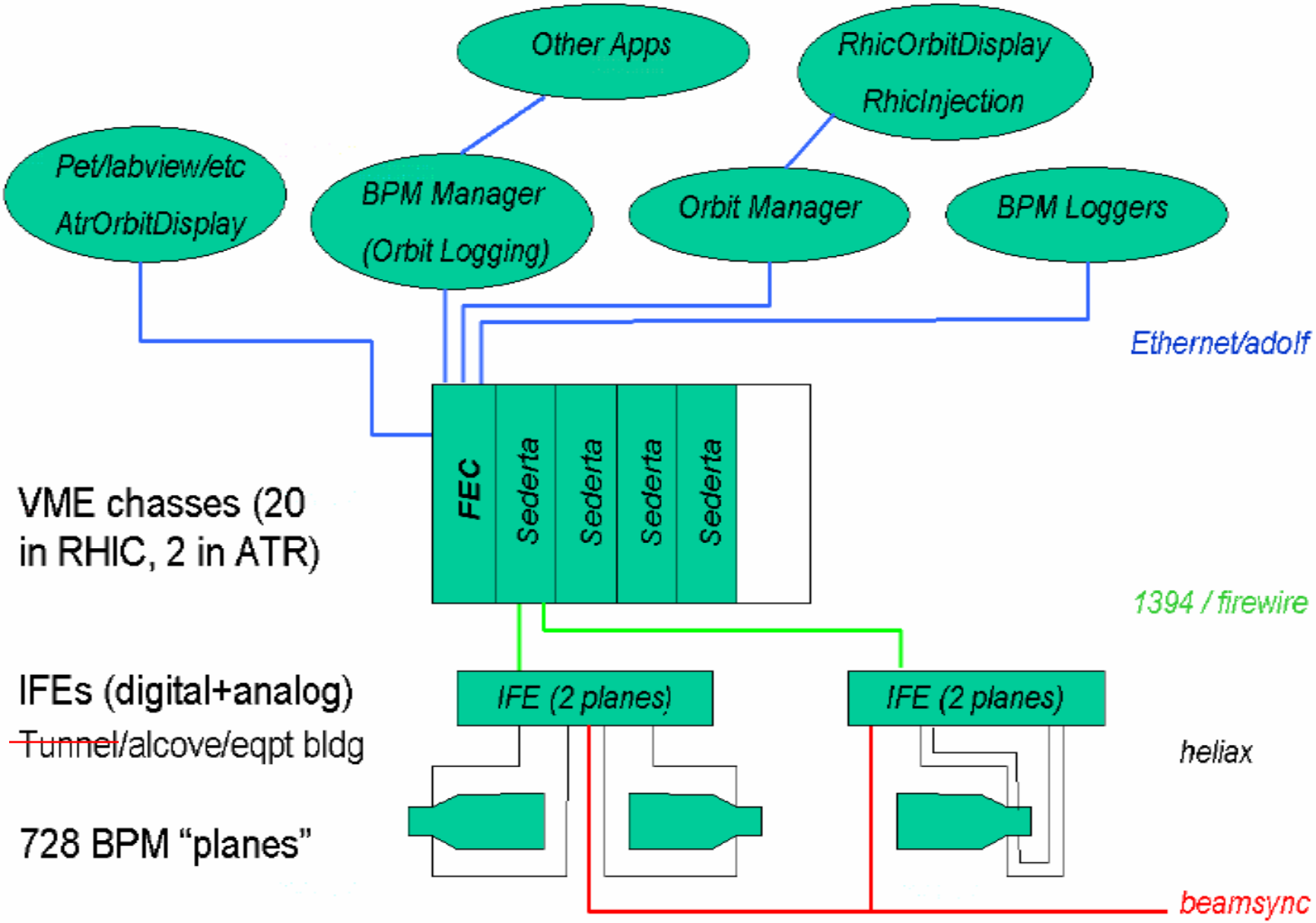
Topics

- Statistics
- The best year ever
- Measurement accuracy
- Fixed-trigger timing
- Very fine delay timing
- Other Issues
- Global orbit feedback signal
- To Do

BPM System Overview

(T. Satogata)



Statistics

(provided by P. Cerniglia)

- Sederta Issues
  - 2 reset storms
  - 1 failed board
  - 16 hangs
- IFE Issues
  - 6 blown fuses
  - 13 planes hung
  - 8 modules replaced
- 8 Open Feed-throughs (last year: 43)

Note: Failures due to power dips are excluded

The Best Year Ever

- Improved data reliability due to data quality checks
  - Bad data are flagged and not used
  - Enhancements in DSP code, ADO, Manager, Applications
- Improved uptime due to 1394 firewire protocol rewrite
  - Error checking, retry on failure, staggered data delivery (R. Hulsart)
- Improved data quality due to new continuous average orbit calculation
  - Variations of measurements decreased from ~100 to ~10 microns
- Fewer holes in data sets due to:
  - correction of timestamp problems (slow and fast)
  - auto-gain implementation

Other System Enhancements

- DSP race conditions discovered and corrected
- Found and resolved several DSP memory corruption issues
- New DSP compiler now operational (R. Hulsart)
  - Eliminates the need for old Windows 3.1 machine
- Opto-isolator modification completed
- Lots of other small stuff
- The more we look, the more we find

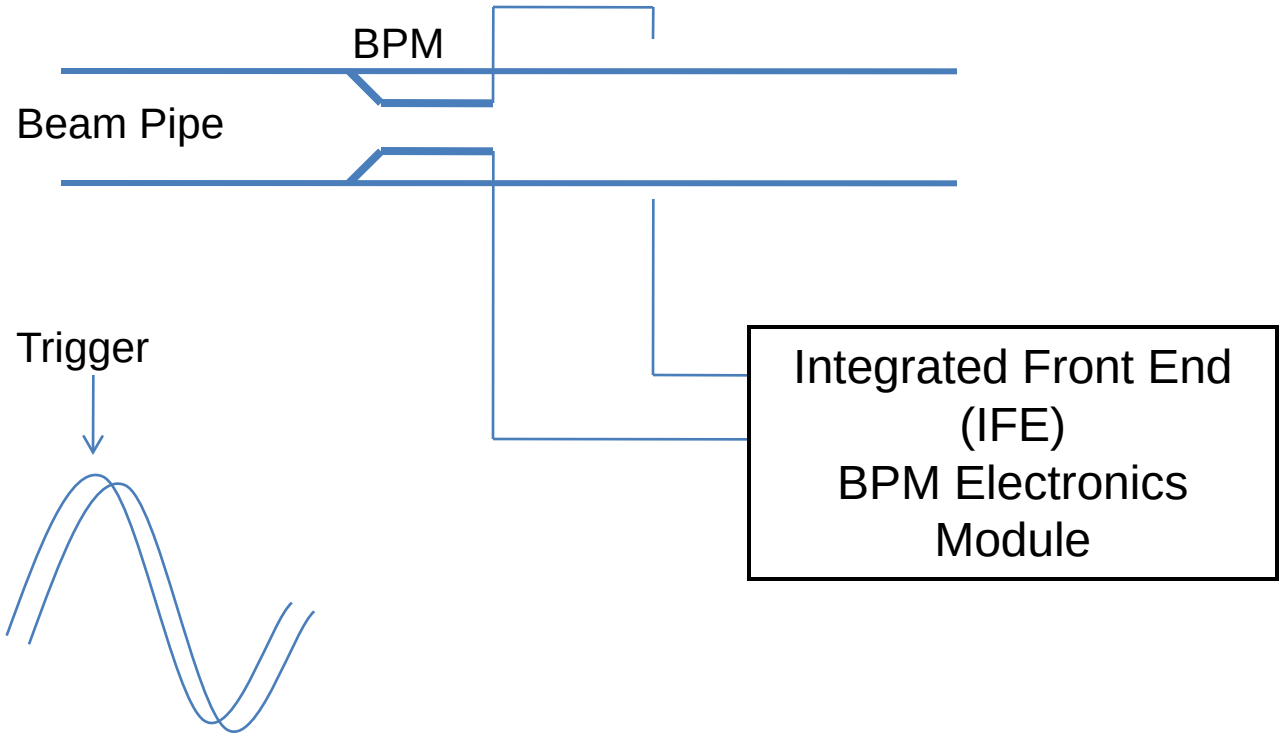
Measurement Accuracy

- We may have reached the limitation of our hardware
  - ~200 micron absolute, ~10-15 micron relative accuracy
- Absolute position still not well understood
  - Beam based alignment in IRs did not produce straight line in vertical from Q3 to Q3.

Fixed-Trigger Timing

- DXs configured to fixed-trigger at the beginning of Run 09; All BPM planes were configured to fixed-trigger mode for the last month of Run 09.
- Some automation tools were developed (by Todd), but configuration was still somewhat painful.
  - Configuration took about 3 days
  - Timing adjustment factor to track from injection to store was not perfect
- Additional software tools are needed to automate timing at injection and store
  - Note: Trigger timing shifts from injection to store are greater for ions than for protons because of larger RF frequency change.

Very Fine Delay Timing



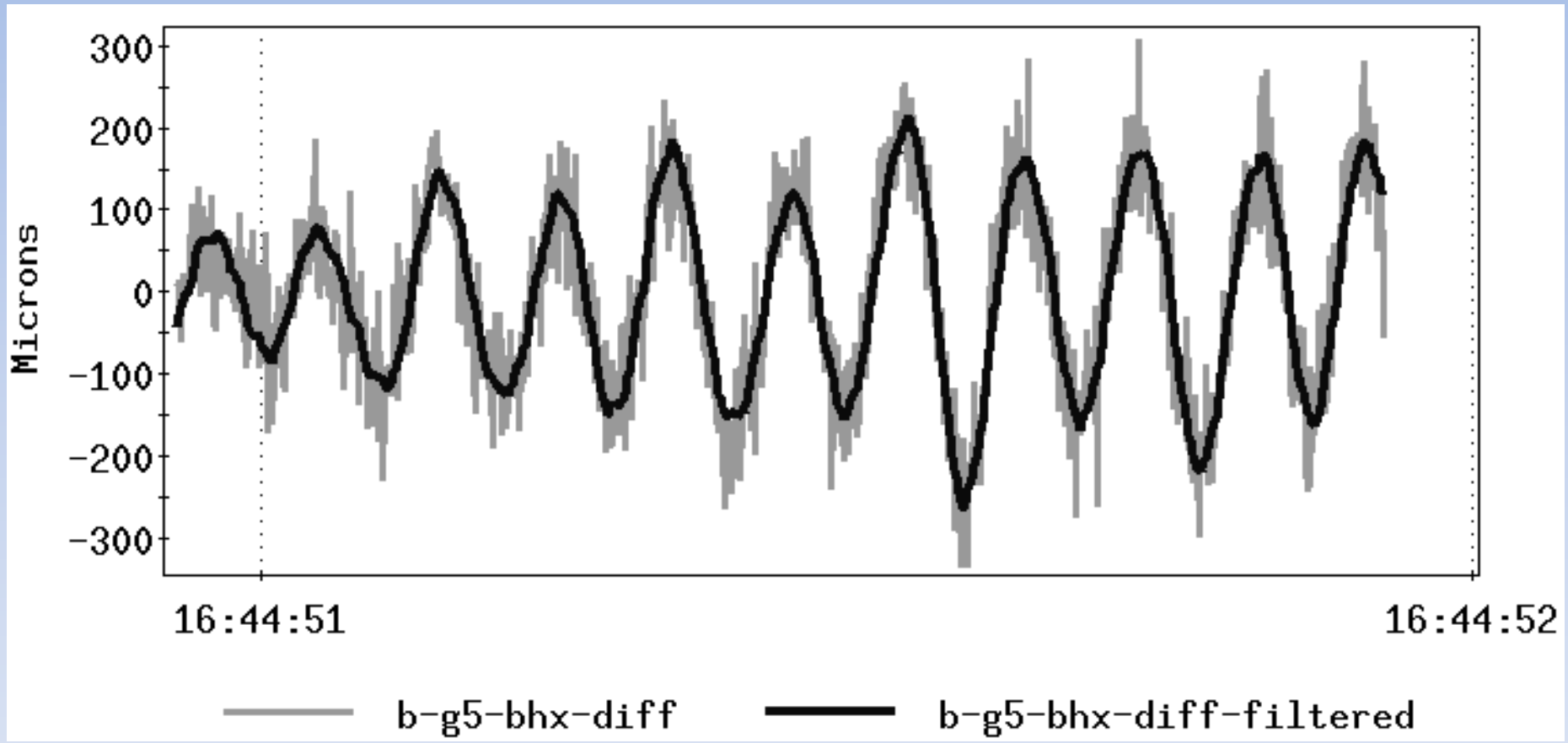
Signals from stripline

When these signals are not perfectly aligned, position measurements vary as trigger position changes. The hardware provides 20 ps per count adjustment.

Other Issues

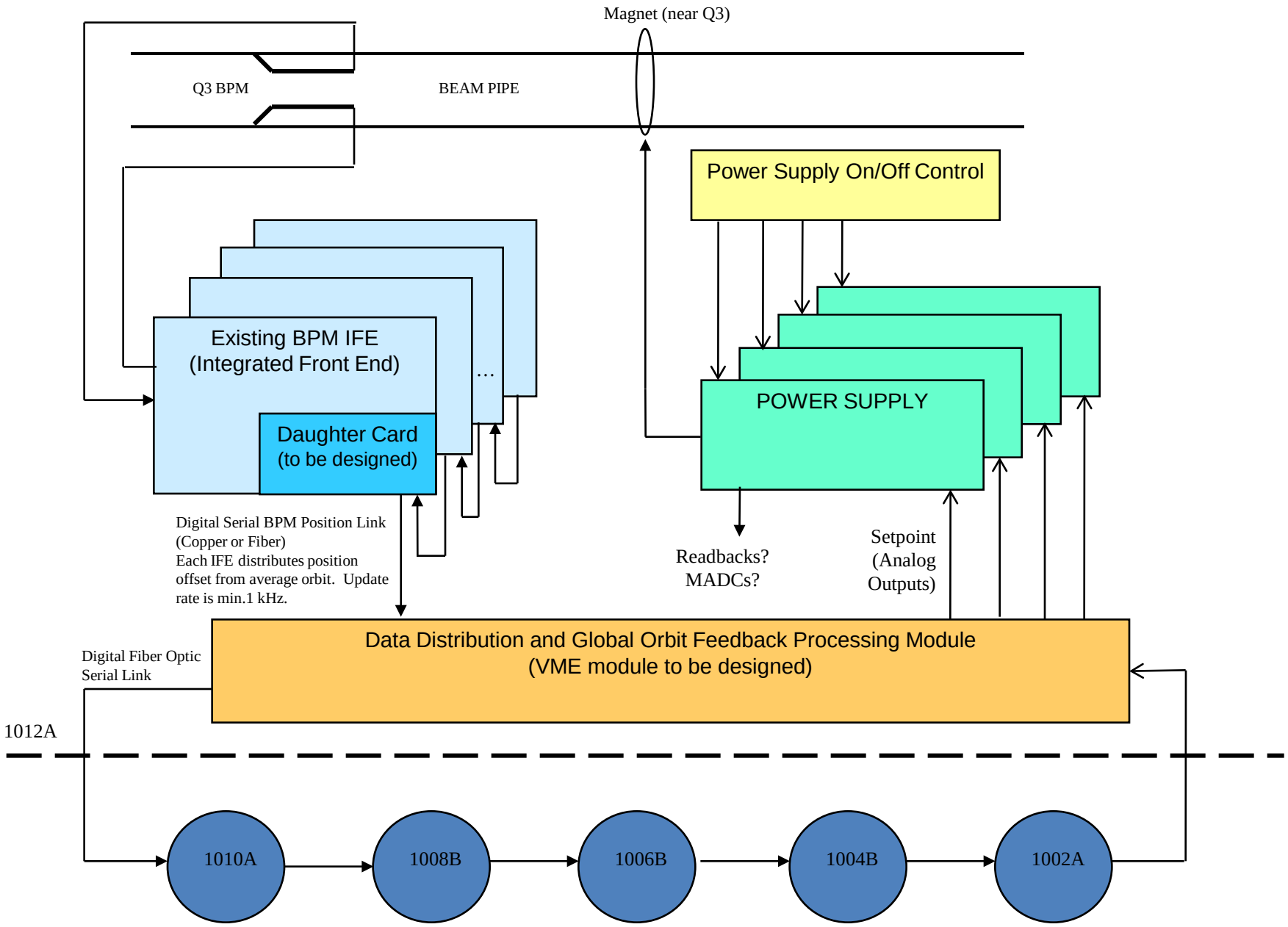
- Very fine delay timing was found to be critical in order to limit position changes as fixed-trigger timing varies.
  - Although C. Degen has developed a Labview VI to help determine optimal very fine delay settings, significant work is still required to robustly automate this operation.
- Calibration with external signal may be required.
  - The very fine delay timing may not have been properly configured when the external calibration was last performed.
  - This will require a substantial effort – many weeks.

Global Orbit Feedback
BPM Signal (new output tested this run)



The digital filtered difference signal will be used for the orbit correction calculations.

Proposed RHIC Global Orbit Feedback System Block Diagram



To Do

- Fixed-trigger automation
- Very fine delay timing
- Upgrade IFE fuses from 2 amp to 4 amp
- Replace more feed-throughs
  - About 140 available, replace minimum 60
- Calibration with external signal?
- Begin considering design options for next generation BPM

What do you think?