

MINOS Operations Notes Apr-May-Jun Quarter 2 2006

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Accelerator Shutdown end of Feb to late May

Horn 2 water leak (at a ceramic joint) was repaired during this time

There are also known problems with the target, but the spare won't be ready until August of this year

Upgrades were also made to the Target Hall cooling system, to collect more humidity, as humid air leaking from the Target Chase carries with it the tritium which has been detected in the Hall, the DK tunnel, and the MINOS sump.

The startup run plan for NuMI/MINOS was taking data at different beam energies, achieved by moving the target

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Accelerator Status

NuMI ran well all last week. MI went down Sunday morning due to a safety system PLC problem. Beam back about noon. Then things fell apart for NuMI Sunday afternoon. A bad timeline load caused beam to stray off-target and hit the baffle. This was the 2nd time in the past week. The wrong version of autotune was entered for the given timeline. The cause is human error, and an Operations issue, but at the Thursday NuMI (see below) meeting this degenerated into a lot of finger pointing between NuMI folks and Ops folks.

The target leak becomes worse every time beam hits the baffle and sprays the target. Increasing the He flow through the target solves any temperature-rise problem, but last weeks hit required a change to the He bottle regulator in order to increase the flow sufficiently.

Currently we have a ground fault in Horn 1. Trips off occasionally. Appears to be an intermittent short. Experts are looking ahead to extended downtime options, like floating the entire module, but have no short term fixes. The cause might be flakes on the stripline which are not burning off this time. Might be a real ground fault. Experts investigating and will keep us posted. --> Later in the day, another series of pulses is successful in burning off or shaking off the presumed flake of oxidation on the stripline - the ground faults cease, for now.

The Booster tune is getting better - they will be working on raising intensities. A small shot to the TeV during the weekend allowed for some studies and led to useful diagnostics in various locations. PBar production is low and they don't understand why yet. Shot transfers through the MI, between PBar and the TeV, shows problems - MI requested study time today to investigate this issue.

MINOS Operations

ROP problems developed at Far Det - ROP4 faults about once per week and does not reset easily - shifters are generally unsuccessful and have to call DAQ. Geoff thinks that during Tass's spares testing last winter, just before Shutdown, boards were not restored to their original position - it might be an iffy spare causing the trouble. Jeff Hartnell has the swap records - Geoff will contact him today. Geoff asks that next time this happens, shifters call YELL-DAQ before touching anything - DO NOT RESET.

We will use the current beam downtime to investigate things.

Otherwise at Far the detector looks good. Let it sit, taking data.

Geoff says the Far network performance is not as good as it used to be. Dave Saranen is aware of this and has been working with Andy Lego - but Dave now thinks they may not be looking at the right things. The Spill Server response time shows larger latency than before. Most responses are OK, but the tail of response times now

extends out to up to 2sec, and the timeout used to be 1sec. Geoff has increased his timeout to 2sec, but this means some data in TPs sits for a longer period than before. Bill thinks that the name-server problems have been resolved.

For the Near Det - as of 1-week ago Friday, most big holes were fixed in preparation for beam. Three CAPID errors accumulated last week and were swapped out last Friday. 2 more CAPID accumulated over the weekend. The MISCOUNT errors are at a low level in a specific board, and it's in the Master which was swapped out during beam startup debugging, and it might be an older board which missed some updates. We have no spare at present. Brian will email Gary about getting more Master spares.

As beam is down for this morning, the bad PIN boards will be removed and returned to Gary for repair and testing. Simona and Ting-yun are also investigating some missing LI channels.

NuMI Operations Meeting (same Monday)

The Target position moved to HE, 250, Sunday morning. A Target scan was done with different incoming beam angles, and beam position was shifted slightly to the apparent center. There is some dispute among the experts (Jim, Sam, Peter) about whether the scan was accurate enough to justify moving to a different beam position.

The Beam OTR was installed in the NuMI line; some initial cabling problems were found and solved, and they are able to check it out from the PS room (meaning beam-on access). The device uses 2 foils to determine beam position. The detector is currently out of the beam (has motor drive to move it in). They will request to move it in later today? This should be done with beam off, then have beam at low intensity at first and do a target scan (low intensity means 2 turns at present, about $3-4 \times 10^{12}$). Sam recommends keeping the Profile Monitor in during the first run of OTR, going down to 2-turns, and then raise intensity. Once at full intensity (which at present is 1.3×10^{13}), go off for 1-2 pulses and pull out Profile Monitor, and get OTR-only data. Then pull OTR out (Profile Monitor back in). Try this Tuesday afternoon? Peter will determine the exact time and let MINOS CR know.

Toroids - the calibrations have shifted a fraction of a percent compared to before the Shutdown. Doug Jensen is investigating.

Sasha requests that gas bottle changing be transferred from his (no longer present) local people to the Instrumentation Group. This includes ordering gas. Flows have recently been increased and bottle change time is now about every 2-3 weeks. (bottle changing was taken on by the Target Devices group, MI-8).

Weekly POT statistics - startup has been slow but steady. We are still far from normal intensities and rep rates, compared to last January. The Booster is limited to 5 turns at present, due to losses, but it is improving, and maintaining stability when intensity is increased.

The MI tune however needs work. Beam at NuMI target is frequently too wide. This means we are scrapping the baffle more frequently ALTHOUGH baffle temperatures do not indicate that this is a problem. Also it means a somewhat larger fraction of the beam is not hitting the target, while we still count the POTs. People on shift have called Peter Lucas when they see the beam being too big - which means a lot of calls to Peter which he cannot do anything about. Perhaps we should adjust the limits in Mary's file so the JAS display doesn't go red all the time. Or post a note on the display.

Sam requests that Mary add an overall Beam Permit button E:NuMIBP to her JAS display, so that when beam disappears due to Beam Permit we know that this is the case. Alberto was caught by this while on shift -beam went off and he could not determine why from the information presented in MINOS CR (so even an ACNET expert found it hard... no wonder Shifters can't figure it out).

Jim gave a brief presentation on the status of the target - mostly on the various upgrades to the target He back-pressure flow, to enable an increase in flow, up to x2 more than where it was in Feb.

The Target moved to pHE on Sunday morning as we had reached 1.5×10^{18} at pMHE. The Target scan showed target had moved horizontally about 0.4mm when pulled back to 250 relative to 150 Z position. Incoming beam was at a slightly different angle which makes conclusions from the scan data a bit harder. Jim's estimate was to move beam 0.2mm to get centered on target. Scan shows no water in target.

Peter Lucas discussed Autotune - there are two versions, one for NuMI-only cycles, and one for Mixed Mode cycles. Trying to develop one version which can auto-detect the cycle mode and adjust, but these have so far failed. However, the baffle hit which occurred over the weekend would not have been prevented by a better Autotune, as it was due to timeline issues in addition to running the wrong Autotune (some dispute on that point).

Report from a Controls expert, on a test of a single dual-Autotune program, says it looks like the process had the correct data from it's own logs and from acnet logs. So it is a mystery to the programmers as to why it didn't work. It does appear to be in phase with the operating MI mode, not lagging behind a few cycles. This expert needs to talk to a front-end device programmer to be certain that his code is not missing something somewhere. [this all-in-one Autotune was never made to work, and Operations made a better fail-safe for Operators to prevent the error which casued the weekend baffle-hit, so we remain with two versions of Autotune which gets swapped when the cycle mode swaps]

Sunday's baffle hit - not understood why this happened. There is an entry in the NuMI Beam log about this. A quad control card had been changed in response, but didn't seem to solve what they were trying to solve. Phil has looked at page and plot data in Log - sees some timing oddness? In mixed mode \$8E triggers correctors in MI

and it looks like the baffle hit occurred when timeline signals did not (did?) include this, and so made a mis-tune during NuMI extraction. Yes, Phil says if this IS the problem then having the dual-Autotune operating would not have done anything to prevent the hit. He will track this down via the data-logger to verify, and if so suggest a module change to prevent this from re-occurring.

The Horn-1 transient recorder was not functioning properly during trip Sunday AM, which made precise diagnosis of ground fault more difficult. Attempts to pulse to shake off a possible flake were not at first successful, but were successful by about noon Monday. And the transient recorder was fixed by then.

MINOS Operations, Jun 19, 2006

9am Accelerator Meeting

Accelerator Operations work is concentrating on pBar production and getting stores into the TeV. On Saturday there were problems with the Booster tune, eventually traced back to a Linac Klystron RF problem - the phase had drifted 15deg - they don't know why it didn't alarm, and also hardware installed in March was supposed to control such drifts. Intensities were dropped during re-tune efforts. The drift problem and other additional hardware problems will be investigated and worked on today/tomorrow.

Booster had a hard weekend. Ops tried to tune around the losses which were caused by the instabilities due to Linac issues. They will work on retunes once Linac is stable.

MI also would like to work on tuning issues, but will have to wait for Linac and Booster tuning to settle first.

Pbar stacking has resumed ~9am - it was off since 11pm last night. They are doing OK, with transfers to the Recycler at 75-85% efficiency. They lose particles in the debuncher transfer however.

Otherwise for NuMI generally smooth running, but still below $1.5E13$. They will work this week on getting that higher. There were many beam permit trips in the kicker gap on Saturday, which is indicative of problems in the upstream machines. No similar trips on Sunday. At 6:30am Wed, we turn off NuMI for cool-down, to prepare for an 8am access by the Berkeley Tritium testing crew.

The MiniBooNE horn has tripped off on a ground fault - problem is in the Power Supply. Being investigated.

There will be 2 shifts worth of collider downtime for a D-Zero ccess, and maybe also a TeV access, starting 6am Tuesday. At present this is the only scheduled machine down time. (NuMI beam down time on Wed is not considered a machine downtime).

There will be daily 9am meetings through the 1st week of August; maybe after that, they will try the M-W-F schedule. [in fact they never left off having daily meetings]

10am Minos Operations

Slim attendance at FNAL, due to a special tritium source meeting, which is being held just this once at exactly this time.

Gave above accelerator report. Make note of Wed morning downtime. Near Det has 5 CAPID and 2 Masters which need swapping. We decide to wait until the Wednesday downtime to swap. Far det also has electronics problems on 2 planes, and they will also hold off until Wed.

Discussion of Network latency problems, with Dave Saranen and Geoff on the line. Nathaniel sent around plots of spill server slow response spikes, which show a clear change at the end of May, worse than they used to be, and getting steadily worse. Geoff has already doubled his time-out on waiting for the spill server, to 2sec, and that is now again missing some spills. Signal goes from Near Timing PC to Far Timing PC. Liz and Art will ask Network guys to set up monitoring on this pathway.

No NuMI Operations meeting today. There will be one on Thursday.

MINOS Operations June 26, 2006

9am Accelerator Meeting

Fairly smooth running all during the week, only a few isolated glitches in machine operations, as far as beam to NuMI is concerned (shot setup to the Colliders is another story). A few downtimes, due to Linac issues; thunderstorms on Sunday evening caused a few trips of various devices.

On Friday Booster put their new collimators in. This changes their tune a bit, but also allows them to increase intensity - NuMI went from 5 to 7 turns. Collimators have a negative effect on overall efficiency, meaning how much beam stays in the Booster as it orbits around - this is to be expected as the collimators are there to insure a certain beam size and scrape it down if it gets big. However, Booster has been having problems with efficiency even without the collimators - the efficiency problems are the main reason why Booster intensity output remains low, and the experts continue to do studies to understand the efficiency.

The overall effect of these changes on Friday was that NuMI now gets 7 Booster turns, which is about $1.4E13$ protons per spill at the current average efficiency of about 88%.

Peter Lucas will try interleaved beam again today - exactly when will be worked out with MCR Ops. Interleaved was a complete failure when attempted a couple of weeks ago. We use different versions of Autotune to control our beam under NuMI-only and Mixed modes - when running interleaved, these two Autotunes must swap back and forth in coordination with the MI operation mode. The Autotune swapping happened, but not in coordination with MI. Phil Adamson found the problem last week - the state variable in the Timeline which Autotune used to trigger it's swap was changing earlier than advertised - but not always - sometimes the state variable worked correctly. Phil showed that the problems occur when the Timeline is "busy". So accelerator timing experts investigated - and today they will try their fix.

10am MINOS Operations

The Far Det wishes to know when a 2-hour or so window in beam-off will occur. They need to change a PVIC card and also do tests on one of the HV mainframes. They also have maintenance to do on the shield - searching for light leak, and a bad cable - this involves turning off HV on the shield, but this doesn't affect beam physics data so they will do this anytime they are ready.

Soudan had a brief - 20s - power glitch Friday. In general all the equipment behaved well, but every time such a glitch occurs, they find something, not on their checklist which doesn't come back properly, and so then it gets added to their checklist.

Network issues - are still there, and now we are closer on understanding them. Dave is now trying to catalog all changes made to the network, by us and by various ISPs,

during the Shutdown. Andy reported routing changes which were initiated by him - he will try to reverse this change and see if that has any effect; the change was made to create a more direct route between FNAL and Soudan and should have helped. However this is not the only change and may not be the culprit. Dave S. says their local ISP up north made wiring changes, which cannot be undone, and which occurred at about the time our current problems appeared. Again, this may or may not be the culprit.

Over the weekend there was a local network problem at Soudan, entered in the MINOS eLog - a surface switch went down - Dave S used his last GBit hardware to fix it, and now needs more such hardware from Computing Div; he has made the request to Andy and Liz. He also has some questions for Liz about the Help Ticket status for the network monitoring.

Near Detector - had a busy week for swaps. Last week there were 6 boards with CAPID, another "noisy" Minder, a Master with MISCOUNT errors on most channels, and another Master which would not calibrate. All these were swapped out on Wed during a beam-down time. Since Wed we have accumulated 6 more Minders with problems, 4 with CAPID and 2 others with different problems.

Simona and Tingyun found a swapped cable between a Minder and Master which had been there since the Minder PROM swap just before the end of the Shutdown. It showed up as missing LI channels, and so they had at first investigated the LI system for a problem, and did not move on to a mis-cabling until eliminating the LI. The database has been updated with the cable swap, so the offline will fix this in affected data.

The PIN boards, now fixed, tested and working, have been returned by Gary. These require turning off the HV to re-install, and so the Near Det also has tasks for a beam down-time.