November 28 2004

Projects in the Accelerator Division suited for University participation

The projects below were submitted by:
B. Ashmanskas, B. Chase, C. Gattusso, E. Harms, A. Jannson, I. Kourbanis, V. Lebedev, M. Martens, R. Mau, E. Mccrory, S. Mishra, D. Moehs, N. Mokhov, C. Moore, S. Nagaitsev, V. Papadimitriou, R. Pasquinelli, J. Patrick, P. Piot, S. Pordes, E. Prebys, J. Reid, J. Slaughter, J. Spalding, V. Shiltsev, M. Syphers, A. Tollestrup, J. Volk, R. Webber.

The list was compiled by:
V. Papadimitriou on the basis of discussions with the proponents between 10/06/2004 and 11/24/2004.

LINAC-ION SOURCE:

Discussion with Elliott Mccrory (10/29/2004) and Doug Moehs (11/1/2004)

1)
project: Measuring the Linac aperture. Writing software for the measurement and participating in the measurement. (fixing possible aperture restrictions could improve the associated beam halo)

qualifications: programming skills. Knowledge of JAVA would be very useful.

duration: 5-6 months for one student/postdoc, ~50% of the time.

work with: E. Mccrory, L. Allen.

latest time to start: Any time by summer 2005.

2)
project: Improve the brightness of the ion source by introducing a small quantity of Nitrogen gas to the Hydrogen gas. Perform setup and measurements at the ion source test bed.

qualifications: Willing and able to use their hands. Willing to learn the basics of low energy beam diagnostics and about plasma physics.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: D. Moehs

latest time to start: Any time by January 2005.

BOOSTER:

Discussion with Eric Prebys on 10/22/2004

1)
project: Transition jump system at Booster

qualifications: knowledge of linear algebra, learn the basics of the control system

duration: 1 year for one student/postdoc ~50% of the time

work with: existing Booster postdocs

latest time to start: summer 2005

2)
project: Ramp monitor program

qualifications: knowledge of programming in Java

duration: 1 year for one student/postdoc, ~50% of the time

work with: mostly independently

latest time to start: as soon as possible; this project will not be completed unless we have a volunteer

Discussion with B. Ashmanskas on 11/09/2004 and E. Prebys on 11/24/2004

3)
project: Program a general purpose FPGA-based circuit board to serve as a new digital frequency source and phase control for the Booster. If this goes quickly, extend it to replace other blocks of the Booster low-level RF system.

qualifications: Basic knowledge of digital electronics (e.g. familiar with flip-flops). Eager to learn to program modern Field Programmable Gate Arrays.

duration: 6 months for one student, ~50% of the time.

work with: Bill Ashmanskas, Craig Drennan, Sten Hansen

start: some time early 2005

CONTROLS

Discussion with Jim Patrick on 10/28/2004

1)
project: Converting C applications from VMS to Linux as well as participating in the validation of the software after the conversion.

qualifications: above average computer skills, knowledge of C.

duration: 1 year for one student/postdoc, ~50% of the time would be very valuable in completing a few of these applications.

work with: colleagues in the Controls Department as well as representatives from the Systems Departments during the validation period.

latest time to start: any time between now and summer 2005 would be OK.
The earlier a person starts, the more skilled they would need to be.

2)
project: Putting into the Sybase database the control files of the Sequencer

qualifications: some knowledge of database design.

duration: 6 months for one student/postdoc/computer professional, ~50% of the time would be probably sufficient.

work with: Brian Hendricks in the Controls Department.

latest time to start: as soon as possible in the next few months.

INSTRUMENTATION

Discussion with Bob Webber on 10/25/2004

1)
project: Diagnostic software for BPMs
It involves writing a program that exercises the diagnostics, storing the data and plotting it. This software (with appropriate adjustments) could be used for the BPMs of all rings.

qualifications: programming, learning the basics of the control system

duration: 1 year for one student/postdoc, ~50% of the time

work with: one representative of each ring and a representative from instrumentation

latest time to start: as soon as possible. This project will not start unless a new person joins.

2)
project: Automating the calibrations for the Beam current monitors (DCCTs, transfer toroids)
hardware: build electronics to send current for monitoring
(this is a bit more involved with the transfer toroids where we have pulsed signals and proper timing is important)
software: writing a program that exercises the hardware, storing the data and ploting it. This software (with appropriate adjustments) could be used for all beam current monitors.

qualifications:
hardware: competence on building electronics
software: programming, learn the basics of the control system, interacting with the hardware team.

duration:
hardware: 1 year for one student/postdoc and a technician/engineer, ~50% of the time
software: 1 year for one student/postdoc ~50% of the time

work with: one representative of each ring and a representative from instrumentation

latest time to start: as soon as possible. This will not start unless a new person joins.

Discussion with Stephen Pordes on 10/26/2004

3)
project: Understand the temperature dependance of the electronics circuit of the Fast Integrator and attempt to reduce it. (The current temperature dependance is at the level of 0.25% per degree. We want it to be ~5 times smaller)

qualifications: need an electrical engineer at a University Lab.

duration: 3 months for one engineer, ~50% of the time.

work with: S. Pordes

latest time to start: Should start as soon as possible by March 2005.

4)
project: Organize and make easily accessible the data of the Optical Transition Radiation devices (OTR) which are being currently installed at the transfer lines and the Tevatron.

qualifications: Willing to participate in measurements. Programming skills. Will mainly work with Labview. Knowledge of JAVA or C, C++ will be very useful.

duration: 6 months for a student/postdoc, ~50% of the time.

work with: V. Scarpine, S. Pordes

latest time to start: Should start as soon as possible by January or February 2005.

5)
project: Image analysis of the Optical Transition Radiation devices (OTR).
Correlate Tevatron IPM and Tevatron OTR when both devices are operating.

qualifications: Willing to participate in measurements. Programming skills. Will mainly work with Labview. Knowledge of JAVA or C, C++ will be very useful.

duration: 6 months for a student/postdoc, ~50% of the time.

work with: V. Scarpine, S. Pordes

latest time to start: Should start as soon as possible by March 2005.

6)
project: Modify the physical setup of the OTR in order to record individual pbar bunches.

qualifications: Willing to participate in measurements. Some instrumentation skills.

duration: 3 months for a student/postdoc, ~50% of the time.

work with: V. Scarpine, S. Pordes

latest time to start: Should start on February or March 2005.

7)
project: Commissioning and data validation of the TeV IPMs.

qualifications: willing to participate in measurements. Programming skills. Knowledge of JAVA or C++ would be very useful.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: A. Jansson

latest time to start: Should start as soon as possible between January-March 2005.

8)
project: Abort gap signal processing. The goal is to reduce/remove the noise in the gap.

qualifications: programming skills. Knowledge of JAVA or C++ would be very useful. Need to develop an OAC for this.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: R. Keup and Tevatron people

latest time to start: Should start as soon as possible, by February 2005.

SDA

Discussion with Jean Slaughter on 10/27/2004

1)
project: Study the Tevatron orbit data taken with the new BPMs.
Start with the old BPM data and try to look for possible correlations with other quantities, like lifetimes, etc. Write some sofware that makes the relevant information easily accessible.

qualifications: programming skills. Knowledge of JAVA or C++ will be very useful.

duration: 6 months for one student/postdoc, ~50% of the time would be probably sufficient.

work with: SDA group and in consultation with the Tevatron Department.

latest time to start: as soon as possible within the next 4-5 months.

Discussion with Vaia Papadimitriou on 11/16/2004

2)
project: optics measurements at the CDF and D0 IPs using the CDF and D0 detectors and consistency with the luminosity measurements by CDF and D0. Studying possible correlations with beam parameters. Developping software that makes these checks automatically.

qualifications: programming and analysis skills. Knowledge of JAVA or C++ will be very useful.

duration: 6 months to a year for two student/postdocs, ~50% of the time would be probably sufficient. We need here participation from both the CDF and D0 experiments

work with: SDA group and in consultation with the Tevatron Department and the CDF and D0 collaborations.

latest time to start: as soon as possible within the next 2-3 months.

BEAM STUDIES

Discussion with Valeri Lebedev on 10/28/2004

1)
project: Study of luminosity and beam parameter evolution.

qualifications: programming skills. Will work mainly with Mathcad but programming skills on C and C++ would be very helpful. Willingness to learn beam physics and interpret the findings of the study.

duration: 6 months to 2 years (depending on the scope) for one student/postdoc, ~50% of the time.

work with: Valeri Lebedev and Sasha Valishev

latest time to start: should start sometime in the next few months, by March 2005.

Discussion with Mike Syphers on 11/04/2004

2)
project: Lattice analysis using the new Tevatron BPMs. This includes as well automatic collection of the BPM data.

qualifications: Programming skills. Knowledge of C and C++ would be very useful. Willingness to learn beam physics and interpret the findings of the study.

duration: 6 months for one student/postdoc ~50% of the time.

work with: Valeri Lebedev and Mike Syphers

latest time to start: should start sometime between January and March 2005.

TEVATRON

Discussion with Vladimir Shiltsev on 10/28/2004 and follow up discussions with M. Martens, A. Jannson, J. Volk, N. Mokhov, J. Spalding as indicated below.

BPMs

Discussion with Mike Martens on 10/29/2004

1)
project: Organizing the data for the new Tevatron BPMs.
E.g. writing software to collect automatically the orbit data and the dipole corrector data in one place.

qualifications: programming skills. Knowledge of JAVA or C++ would be useful.

duration: 4-5 months for one student/postdoc, ~50% of the time.

work with: M. Martens

latest time to start: Should start February or March 2005.

2)
project: Use the new Tevatron BPM data to understand orbit deviations from the ideal orbit and what might be moving at the Tevatron.

qualifications: programming skills. Knowledge of matrix arithmetic, willing to study and understand smoothing algorithms.

duration: 6 months to a year for one student/postdoc, ~50% of the time.

work with: M. Martens

latest time to start: Starting March or April 2005 would be very helpful.

Schottky

Discussion with Andreas Jannson on 10/28/2004

1)
project: Analysis of the 1.7 GHz Schottky data

qualifications: willing to learn some beam physics. Programming skills. Knowledge of JAVA or C++ would be very useful.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: A. Jansson, R. Pasquinelli, P. Lebrun.

latest time to start: Should start as soon as possible, by February 2005.

HLS:

Discussion with Jim Volk on 10/29/2004
Discussion with Jeff Spalding on 10/28/2004

project: Hydrostatic water level monitoring of the Tevatron

There are four different HLS systems installed in the Tevatron

1) BINP single pipe system in B sector
2) Fermi lab 2 pipe system in B sector
3) Fermi lab 2 pipe system in E sector
4) BINP 2 pipe systems at D0 and B0 on low beta quads

The jobs are:

1) getting data out of each of these systems in a usable format
2) Understand systematic errors in each system such as effects of temperature, pressure and ramping of magnets.
3) Compare results from the two systems in B sector evaluate these systems and see if they are useful
4) Correlate the vertex positions for both CDF and D0 with water level data
5) Use the data to develop a feed forward system to keep vertex position stable at the store to store level or faster.
6) Determine the effects of ground motion on low beta quad position and luminosity.

qualifications: Willing to participate in measurements. Programming and analysis skills needed. Some instrumentation skills or electronics experience would be useful for sub-project number 5.

duration: Each one of the projects above requires ~2 months for one student/postdoc, ~50% of the time. Two students working together would be very efficient here.

work with: J. Volk

latest time to start: It would be very useful for somebody to start in December or January 2005.

Crystal Collimator

Discussion with N. Mokhov on 11/03/2004

1)
project: Commisioning and data validation of the TEV crystal collimator.

qualifications: Willing to participate in the comissioning and measurements, some experience with Tev DAQ, knowledge of Fortran and JAVA.

duration: 4 months, one student/postdoc ~50% of the time.

work with: Nikolai Mokhov and PHD student Ludovic Nicolas.

latest time to start: December 2004.

2)
project: Improving the TeV Collimation efficiency using crystal collimation and other novel techniques.

qualifications: Instrumentation skills. Willing to participate in measurements, experience with Tev DAQ, knowledge of Fortran and JAVA.

duration: ~ 3 year ~50% of the time for a PHD, ~1 year 50% of the time to accomplish intermediate milestones.

work with: Nikolai Mokhov

latest time to start: Spring 2005

Collimation counters

Discussion with A. Tollestrup on 11/10/2004

1)
project: Tuning the Tevatron collimators by using the scintillator counters looking at them.

qualifications: Willing to participate in measurements. Programming and analysis skills.

duration: 6 months for a student/postdoc, ~50% of the time.

work with: Nikolai Mokhov

latest time to start: As soon as possible, by February 2005.

MAIN INJECTOR

Discussion with Ioannis Kourbanis on 11/01/2004

1)
project: Study the MI IPM data and measure beam size and other beam parameters. Compare with MI FW data when both available. (The IPM has the advantage of providing turn by turn data). Direct comparison in beam size measurements between the two horizontal detectors; one with the permanent magnet and one without.

qualifications: Willing to participate in measurements. Data will be collected with Labview. Programming skills needed. Knowledge of JAVA or C++ would be useful.

duration: 4-6 months for one student/postdoc, ~50% of the time.

work with: A. Marchionni and J. Zagel

latest time to start: Should start by March 2005.

PBAR

Discussion with B. Ashmanskas on 11/09/2004

1)

project: Commission new (first board arrived in November 2004) circuit boards to read out beam position monitors in AP2 and D-to-A transfer lines. Integrate boards with controls system software. If time allows, adapt this board or a similar design to other diagnostic measurements in the antiproton source.

duration: 6 months for one student, ~50% of the time.

qualifications: Comfortable writing C code, moving bits around. Interested in learning some electronics and data acquisition.

work with: Bill Ashmanskas, Dave Peterson, Sten Hansen

start: soon, between now and end of January

RECYCLER

Discussion with Sergei Nagaitsev 11/08/2004
Discussion with Cons Gattuso 11/01/2004

1)
project: Writing software for the Recycler dampers. The software does not exist yet. The project has the following milestones:
a) writing a digital filter program.
b) uploading the filter in a DAQ board
c) testing with beam.

qualifications: Programming skills. Knowledge of C would be very useful.
Willing to participate on measurements.

duration: 5 months for one student/postdoc, ~50% of the time.

work with: J. Crisp

latest time to start: Should start by January or February 2005.

2)
project: Writing software to display the information from the Recycler Ionization Current Monitors (ICMs). Establishing the ICM calibration program in an automatic way.

qualifications: Programming skills. Knowledge of C++ or JAVA would be very useful. Willing to participate in measurements. The person involved will have the opportunity to get exposed to the atomic physics involved in calibrating ionization gages.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: Dan Broemmelsiek

latest time to start: As soon as possible, before January 2005.

3)
project: Cross-calibrating the Recycler FW and Shottky monitors for emittance measurements.

qualifications: Programming and analysis skills. Willing to participate in measurements.

duration: 4 months for a student/postdoc 50% of the time

work with : M. Hu, J. Crisp

latest time to start: January or February 2005.

SY120

Discussion with Craig Moore on 11/05/2004

1)
project: BPMs in SY
hardware: commisioning resonant BPMs in SY
software: incorporating them into an automatic tuning program called Autotune

qualifications: Some instrumentation skills. Willing to participate in measurements. Programming skills. Knowledge of Fortran and JAVA will be very helpful.

duration: 6 months for a student/postdoc 50% of the time.

work with: Peter Lucas and a contact person from Instrumentation Department

latest time to start: As soon as possible but before January or February 2005.

2)
project: making an automatic septa alignment program work (mainly software)

qualifications: Willing to participate in measurements. Programming skills. Knowledge of Fortran and JAVA will be very helpful.

duration: 4 months for a student/postdoc 50% of the time.

work with: Peter Lucas

latest time to start: As soon as possible but before January or February 2005.

OPERATIONS

Discussion with Bob Mau on 11/12/2004

1)
project: Develop a display of the NUMI intensity as a function of the position along the beam line.

qualifications: Programming skills. Knowledge of C and JAVA will be very helpful.

duration: 3 months for a student/postdoc 50% of the time.

work with: M. Allcorn

latest time to start: Should start on February 2005.

2)
project: Keep track of the statistics of the beam delivered to Meson Center, NUMI, etc. in an automatic way. (How many pulses we deliver and what is their intensity?)

qualifications: Programming skills and some instrumentation skills. Willing to participate in measurements.

duration: 2 months for a student/postdoc 50% of the time.

work with: W. Kissel

latest time to start: Should start between January and February 2005

R&D

Discussion with Shekhar Mishra on 10/06/2004

1)
project: Linear Collider R&D

a) cryomodule fabrication and testing
b) accelerator physics simulations, main Linac simulation
c) simulations of detector/machine interface (MARS code, N. Mokhov)
d) RF kicker design and testing

qualifications: Some instrumentation skills; willing to participate in measurements, programming and analysis skills

duration: 6 months to one year for 3-4 students/postdocs, ~50% of the time would be very instrumental here to achieve indermediate goals.

work with: S. Mishra, R. Pasquinelli, N. Mokhov and other collaborators.

latest time to start: Should start between January-March 2005.

Discussion with Andreas Jannson on 10/28/2004 and Mike Syphers on 11/04/2004

2)
project: Evaluate the feasibility of using an AC dipole to oscillate the beam without increasing its emittance. (RHIC plans to use something similar, LHC is investigating the option. Would be interesting to use the Tevatron as a test bed)

qualifications: Instrumentation skills. Willing to do literature search, learn about the accelerator complex and help in this evaluation.

duration: One year for one student/postdoc, ~50% of the time.

work with: A. Jansson and M. Syphers

latest time to start: Should start between February-May 2005.

Discussion with Andreas Jannson on 10/28/2004

3)
project: Neutrino beam generation using radioactive ions.
Can we use the Tevatron to accelerate the ions and produce the needed intensities? Some simulation work is already being performed by N. Mokhov.

qualifications: Programming skills for simulation performance.
Willing to do literature search and learn about the accelerator complex.

duration: One year for one student/postdoc, ~50% of the time.

work with: A. Jansson, N. Mokhov

latest time to start: Should start anytime before Fall 2005.

Discussion with Philippe Piot on 11/01/2004

4)
project: RF characterization/cold tests of the "CKM" 3.9 GHz deflecting mode cavity (dipole mode). Such a cavity could be used in the LC main injector and can be effectively used to provide beam diagnostics and in the "crab crossing technique" where bunches are tilted with the goal to increase the luminosity.

qualifications: Instrumentation skills. Willing to participate in measurements.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: L. Bellantoni

latest time to start: Should start by March 2005.

5)
project: Developing an rf source for the 3.9 GHz cavities and a feedback system.

qualifications: Instrumentation skills. Programming skills (electronic chip level), signal processing skills

duration: 6 months for one student/postdoc, ~50% of the time.

work with: L. Bellantoni + J. Reid + DESY colleagues

latest time to start: Should start as soon as possible, by January 2005.

6)
project: Commission with electron beam of the 3.9 GHz deflecting mode cavity in the beam line and perform measurements of bunch length resolution, longitudinal phase space, etc.

qualifications: Willing to take measurements and perform data analysis. Programming skills.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: P. Piot, L. Bellantoni

latest time to start: Should start by spring 2006.

7)
project: Upgrade the low level rf system of the TESLA 1.3 GHz accelerating mode cavity. Plan to reach 40-50 MeV with this cavity (compare with 16 MeV now).

qualifications: Programming skills (chip level), willing to become familiar with the hi level controls system (such as EPICS). Skills in signal processing, and knowledge of C would be very useful.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: P. Piot + DESY colleagues

latest time to start: Should start by Spring 2005.

8)
project: Beam emittance measurements at 50 MeV with the upgraded TESLA 1.3 GHz cavity.

qualifications: Programming and analysis skills. Willing to perform measurements.

duration: 6 months for one student/postdoc, ~50% of the time.

work with: P. Piot

latest time to start: Should start by January 2006.

Discussion with Ralph Pasquinelli on 10/28/2004 and on 11/24/2004
Discussion with B. Chase, R. Pasquinelli and J. Reid on 11/17 2004

9)
Project: ILC/ Proton Driver - simulations of RF control system with microphonics

Qualifications: Programing skills, knowledge of feedback, willing to learn RF basics.

Duration: 6 months for one student/postdoc, ~50% of the time.

Work with: Brian Chase

latest time to start: anytime

10)
Project: Develop new control system based on Lab G Klystron controls and adapt it for the 200Kwatt Klystron modulator and system interlocking for A0 photo injector

Qualifications: Programming skills, basic understanding of digital logic and analog electronics

Duration: 6 months for one student/postdoc, ~50% of the time.

work with: John Reid

latest time to start: anytime

11)
Project: Support of SMTF

Qualifications: to be specified more accurately when SMTF becomes a real project . (Some instrumentation skills, willing to participate in measurements, programming skills)

duration: 6 months or more for one student postdoc 50% of the time would be very useful

work with: a wide variety of people

latest time to start: to be determined