

OBJECTIVES GLASGOW LHCb GROUP 2001-02.

1. Introduction:

In the following document we will summarise the objectives of the Glasgow LHCb group for the next year 2001-02. The members of the group are:

- Paul Soler: Based at Glasgow from October-January each year and at Rutherford-Appleton Laboratory for the remainder of the year. Coordinator of the project. Tasks: RICH2 Mechanics, GEANT4 simulations, alignment and control.
- Andrew Pickford: RA to work on the software/physics and simulation of LHCb RICH (50%) and on the HPD testing stations (50%).
- Alan Flavell: Nominally 30% based on LHCb and in charge of networking, system management, security and farm management.
- Val O'Shea: Nominally 20% based on LHCb, in charge of laboratory infrastructure and interested in HPD characterization and applications.
- New CASE student? Hopefully will commence October 2001. Alignment of RICH detectors.
- New lecturer? Hopefully will commence October 2001. HPD testing stations, physics, software.

2. HPD Detector Testing:

One of the tasks allocated to the Glasgow group of LHCb is to build an HPD testing facility that will be able to characterize and certify as working units about 50% of the HPD detectors to be installed in the LHCb RICH detectors (approximately 250 HPDs). The lab where this activity will take place is Room 233. This lab will be furnished with appropriate bench space and storage space for the HPDs. We need to install a black metal box that will also act as a Faraday cage for the HPD tests. The global aim is to be able to have the HPD testing equipment ready and functional by mid-2002.

- Get room 233 conditioned as a laboratory. Contact Andy Sibbalt to have carpet replaced by linoleum, remove spare desks and install work benches. (Already contacted by me, but need to follow progress). Work to be finished by end April 2001.
- Move equipment from lab to lab 233 (finish move of equipment by May 2001). The aim of this equipment is to measure analog response of 61-pixel HPD, including charge sharing.
 - "Ben Nevis" PC with Windows 95 installed for use with stepping motors.
 - Black box to act as Faraday cage.
 - CAMAC crate with interface to PC.
 - NIM crate and triggering electronics.
 - 1 digital oscilloscope.

- Move multi-pixel (61 pixels) HPD and single pixel HPD.
- Microscope for focusing of LED light.
- Purchase the following equipment needed for test set-up (part of this might be ordered through CERN, in conjunction with Stephan Eisenhardt from Edinburgh). We would like to have the whole set-up in place to test working HPDs (or dummy chips) by October 2001.
 - 1 PC and printer for the lab.
 - 1 MXI interface
 - 1 VME crate (mini-crate?)
 - 2 pilot boards from CERN (~2 KSF each). This board sends the fast controls to the chip, encodes the data (including zero suppression) and runs the trigger, clock, data and the chip.
 - Alternatively, one might use Corelis JTAG controllers (\$3.5 K each) which are cards that can be put on the PC to drive JTAG signals.
 - PIXIE cards from Oxford.
 - VM013 8003 VME bus monitor from CES (desirable, not essential) to check activity on bus lines.
 - Labview software to run system.
- Start writing software for readout of HPD with pixel chip and have a working prototype by March 2002.
- Receive one prototype HPD with encapsulated pixel chip by October 2001.
- Perform study of analog response of HPD, measure cross-talk and measure ideal discriminator settings to eliminate noise and signals from neighbouring pixels by March 2002.

3. Software development:

The ScotGrid Beowulf cluster at Glasgow provides a unique opportunity for Glasgow to be at the forefront of Monte Carlo production for the LHCb experiment. We want to develop the software to make Glasgow into a Monte Carlo production and analysis centre for LHCb, totally integrated into the Grid infrastructure. To this aim, we need to install the LHCb software environment at Glasgow in preparation for the commissioning of the cluster.

- Install LHCb software at Glasgow by mirroring the environment produced at RAL (which is updated every night from CERN). Have installation by June 2001.
- Develop GEANT4 simulation of the RICH-1 and RICH-2 detectors, as well as the testbeam set-up to be run at Glasgow (March 2002 for first version).
- Explore possible contributions to the LHCb RICH reconstruction software within the Gaudi framework (object oriented C++ software). Identify possible contribution by June 2001.
- Be able to run LHCb Monte Carlo production on the Beowulf cluster by March 2002.

- Perform some benchmarking of LHCb jobs (simulation and reconstruction) between RAL and the Glasgow cluster using Globus or other Grid middleware (March 2002).
- Explore possible physics analysis channels to be studied. These could include B_s decays that involve the use of the RICH system (eg: $B_s \rightarrow J/\psi\phi$) or charm physics (eg. $D_0 - \bar{D}_0$ oscillations).