LEAR Crystal Barrel Experiment, PS197
Run Coordinator's Summary of the December 1990 Run

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Abstract

The December 1990 run of the Crsytal Barrel Experiment began on 12 December, 1990 and ended on 21 December 1990. The run was devoted to studies of *inflight* annhilations at both 600 MeV/c and 1700 MeV/c. Trigger studies and optimization were performed for these *inflight* data. Approximately 1.5 million minimum bias events at 600 MeV/c and 55,000 minimum bias events at 1700 MeV/c were collected over the run period.

Status of the Apparatus

Beam

The beam first arrived at about 23:00 on the 14'th , and continued to 06:00 on the 21'st. The late arrival (8 hours) on the 14'th was due mainly to the ongoing strike at CERN. In general the beam was quite good. The spot size was smaller than what we have had at 200 MeV/c, but the exact size was not determined. The first beam was at 600MeV/c, while about 24 hours of 1800MeV/c beam was also taken. Two major improvements over previous runs were made by the LEAR staff. First of all, we finally obtained a slit control in the experimental hut, and second, the operators were able to start the spills with a trickle of beam, and slowly build up to our desired rate, rather than overwhelming the apparatus with an enourmous pulse, and then settling down to the desired rate.

Silicon Counters

Much work was done to get a combination of silicon counters on which we could trigger. A major problem was a strong 70kHz noise signal which was about the same size as the minimum ionizing signal from the anti-protons. In the end we wound up using only the central and lower left counter. The others either produced no signal, or the signal was down in the noise.

Target

The target performed as it has always performed. However, due to the broad stop distribution from the in flight data, the effects of the target bubbling were not noticible.

PWC

The PWC functioned perfectly throughout the run. There were a couple of voltage trips, but the chamber was quickly brought back to operational voltage.

JDC

The JDC functioned well during the entire run period. The High Voltages and the preamplifier voltages were not changed during the run period. The only troublesome area will be the gas mixture, which fluctuated between 9.8% Isobutane and 10.1% Isobutane. As the HDC was not functioning, there was no inline measurement of the actual gas mixture, only a measurement of what was going into the chamber, which probably has an eight hour time constant. The pressure also varied quite a bit during the run, however during most of the data collection period it was confined between 730 and 735 torr.

Crystals

The problem with the Pedestal subtraction encountered in previous runs was solved before this run started, which greatly reduced the amount of Crystal data written to tape. Also, during the period of high momentum running, (runs 5570 to 5579), the 2282 system was not working. This in general means that only FERA data are available during this period. However, in general there were no problems with the crystals or the crystal readout during the run.

Magnet

No magnet problems were encountered during this run. However, due to the LEAR shutdown procedure which occured on the 21'st, we have managed to test the temperature interlock on the

magnet. This worked quite well, and did prevent the magnet from melting when its cooling water was turned off.

Monitor Drift Chamber

The monitor drift chamber was not functioning during this run.

Slow Control

Slow control was working, and was written to tape at a frequency of about 100 slow control event per data cartridge. Everything except the monitor chamber were written out. It should be noted that without the monitor chamber, the gas mixture is basically unknown, or at least it lags the mixture data by several hours.

Data Aquisition

The data aquisition ran well during the entire run period. The only *serious* problem was that TABLE events were not written on the data tapes until after run number 5521.

Trigger

Because we had never collected inflight data before, the trigger was one of the areas which needed a lot of work. The signal seen in the Si counters was often too small to be used as a trigger, and the final combination of scintillator and silicon counters used was only ten to fifteen percent efficient. This precluded any meaningful all neutral data because the event rate was far too small. During this run, all of the data were taken with a combination of the following trigers:

- $\bar{p}$–stop as defined by a combination of silicon counters and the plastic scintillator.
- Silicon–veto as defined by a very large signal in a silicon counter, indicative of annhilation in the silicon counter.
- Pile–up veto from the downstream Π–counter.
- Software Total energy sum, requiring at least 200 MeV of energy in the barrel.

Data

The data taken during the run were of continuously improving quality. I will try to group runs into sections and describe the basic quality of each block.

Runs 5422 to 5447

These data were the very first *physics* data taken. Approximately thirty percent of the events are empty, (no data), and of the remainder, about half are coming from the silicon counters. These 240,000 events would probably make a nice source of $\overline{p}Si$ data, but it is not clear they are worth producing.

Runs 5448 to 5455

These data were taken during optimisation of the trigger, and are of widely varying quality. They should not be produced for physics purposes.

Runs 5456 to 5494

These 280,000 events were taken with our first good trigger. We have about fifty percent of the events coming from downstream of the target. Probably from the light pipe on the veto counter. However, these data are good, and should be produced.

Runs 5495 to 5569

These 300,000 events were taken with the voltage on the veto counter raised by 200 volts. Otherwise they are the same as the previous period. The data should be produced.

Runs 5570 to 5582

These data are our sample of 1.77GeV/c events. There are about 55,000 events in this set, however, most of them probably have no 2282 data.

Runs 5583 to 5653

For these data taken at 600MeV/c, the trigger was again improved. The width of the veto gate was changed from 50ns to 600ns. This removed almost all events coming from outside the target region. In this period, are 632,000 events, and they are our best sample of data from this run.

Conclusions and Recomendations

Of major importance during this run was the ability to change trigger conditions, and get a fairly quick response from the offline software as to what happened. The analysis of several tapes per day with the offline software also provided a major handle on what was going on during the experiment. Without this fast turnaround, I feel that it is quite questionable if we would have been able to acheive such an optimum trigger at the end of the run. I would strongly reccomend that during future runs, there is always someone who is able to analyze events with the offline program in a timely fashion.