Appendix C

Rate Estimates

In order to estimate the time needed to obtain a complete data set for one combination of colliding beams at one energy the following requirements were defined to obtain high quality spectra of pions, kaons, protons, and antiprotons. The goal, as established earlier, is to measure to p_t of at least 1.5 GeV/c where possible. We require to have in each 40 MeV/c bin of p_t 400 kaons per angle setting. This is roughly equivalent to observing 5000 pions in each bin following the model predictions. Also, since emphasis is put on the most central collisions, a 5% trigger is employed. For the Forward Angle Spectrometer the momentum bites are such that the entire range can be covered in about 7 settings for each angle . For the high momentum bite, which is most crucial for the rate estimates, the spectrometer accepts about 1° in polar angle.

In Table C.1 the estimated times for central Au+Au at $\sqrt{s}$ = 200 GeV per nucleon pair based on the FRITIOF predictions for pions are shown. The VENUS prediction would give similar times at the most forward angles and somewhat shorter times at the larger angles. Summed over angle and both magnetic field polarities it is estimated that a complete distribution can be obtained in ≈3200 hours. This is very much dependent on the highest p_t to be measured. If the p_t range at the angles from 5° and backward was limited to p_t(max) = 1.5 GeV/c the time is reduced by 50%. It is envisioned that less central and peripheral collision spectra can be measured concurrently with the centrally triggered events; the time required for minimum bias running is estimated to be approximately 5 times that for central triggers. An average luminosity of 4 fm^{-2}s^{-1} was used for the rate estimate.

With regard to the midrapidity spectrometer the polar range of 30°-90° can be covered in 8 angle settings each with two different field settings and two polarities. A measurement of spectra up to p_t ≈1.4 GeV/c requires 270,000 events (including a correction for K^+ decay), which will take ≈2 hours per angle and polarity setting. The

Angle (deg.)	$(p_t)_{max}$ GeV/c	p_{max} GeV/c	Events/sec/40 MeV per collision at p_{max}	Time (hrs) at p_{max}	Total time (hrs) This angle
3 (1)	1.30	25	0.0135	10	16
5 (1)	2.00	23	0.005	60	100
10 (1)	2.00	11.5	0.0004	90	140
15 (2)	2.00	7.32	0.00001	200	300

Table C.1: Counting rates in the Forward Angle Spectrometer. The numbers in parentheses are the angular openings, in degrees, assumed.

inclusive measurement can then be done in ≈64 hours. To cover up to p_t ≈2.0 GeV/c, 2.1 million events are needed corresponding to ≈ 15 hours for the high field settings. The total survey for one beam-beam combination can be done in ≃360 hours. The time at 90° to acquire 100,000 K^+ pairs for a correlation measurement is ≃200 hours, while at 30° 10 hours suffice. These estimates assume that the p_t spectra are binned in 20 MeV/c bins below 1.4 GeV/c and 50 MeV/c bins up to 2 GeV/c. The bins in rapidity are 0.2 units wide.