III.H. CHARM AND HYBUC

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The γ factor of 50 to 100 at the Tevatron gives a decay length for the Λ_c^+ which is comparable with the Σ^+ from the PS at CERN. If one assumes a $c\tau_0$ of 4.5×10^{-3} cm for the Λ_c^+ and a γ of 50, then the mean laboratory path length is 2.2 mm. The mean Σ^+ track length in the HYBUC experiment[1] was 1.0 cm, with a mean error of 0.03 cm. HYBUC is the 11.5 T 10 Hz hydrogen bubble chamber used for the μ_{Σ^+} measurement at CERN.[2] It took a total of 2.5×10^6 pictures at fields in excess of 11 T and was constructed and is owned by MPI (Munich) and Vanderbilt University.

VU and MPI are presently considering an attempt to measure the magnetic moment of the Λ_c^+ which should give a measure of the magnetic moment of the charmed quark. The increased γ factor would make the experiment easier (or less impossible) at the Fermilab Tevatron than the CERN SPS. The high polarizations found at Fermilab energies for hyperons give hope that polarized Λ_c^+ are produced at some energies. The α for Λ_c^+ decay is not known, but the Λ^0 in the decay $\Lambda_c^+ \to \pi^+ + \Lambda^0$ should carry the spin information. In the case of $\Xi^- \to \pi^- + \Lambda^0$, the Λ^0 has as much spin information as the Ξ^- decay itself. Polarizations of the Λ_c^+ can by systematically studied using HYBUC, and the 11.5 T field will provide a magnetic moment measurement at the same time that a high Λ_c^+ polarization is observed.

At the present time S. Reucroft (VU) is helping to develop holographic illumination at CERN. The work of Dykes et al.[3] has produced 5 micron resolution in 10 cm depth of field. A picture showing 8 micron resolution in 7 cm depth of field is shown. This picture was taken in the Bern chamber and it represents an early stage of development. It is expected that the depth of field can be extended to 30 cm in the near future, and this would be adequate for HYBUC. The combination of holography and the 11.5 T field will facilitate the measurement of short lifetime particles.

HYBUC has sufficient field to contain and measure the backward cm angles at Tevatron energies. The transverse momenta are not large and they are perpendicular to and easily deflected by the 11.5 T field. The forward hemisphere tracks would need to be measured by a downstream system. The HYBUC window thickness is 2 gm/cm^2 along the beam axis, with the use of Lexon windows (tested to 40 atm).

The ISR results on Λ_c^+ suggest that $\sigma(\Lambda_c^+)$ is comparable with $\sigma(\Lambda_s^0)$ at large x. Careful attention will need to be paid to the Λ_c^+ trigger, but cross sections on the order of 100 nb are feasible with rapid cycling (200 expansions per machine pulse).

The Tevatron energy may give the x region and the high $\gamma\beta$ required for a $\mu_{\Lambda_c^+}$ moment and with the increased resolution from holography it will be useful for decays with more than 100 microns in space (10^{-14} to 10^{-12}s).

References (HYBUC)

1. J. Marraffino et al., Phys. Rev. **D21**, 2501 (1980) ($c\tau_{\Sigma^\pm}$).

2. R. Settles et al., Phys. Rev. **D20**, 2154 (1979) (μ_{Σ^+}).

3. D. Coffey et al., NIM **150**, 377 (1978) (Sup. Magnet).