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Increasing Extraction Efficiency of Au77+ Beam Using H20

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Study Period: December 10, 1995

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Machine/Beam : AGS, 11.8 GeV/c/n Au 77+

Tools : C10 Ion chamber, Extraction loss monitors

Aim : Increase the Extraction Efficiency for Au79+

1 Introduction

In the FY95 HIP run the attempt was made to insert H20 and see how much we could increase the extraction efficiency for the 11.8 GeV/c/n Au77+ beam in the AGS. These attempts failed to provide any significant increase in the extraction efficiency. In May 1995 it was found that some of the sextupoles in the AGS had shorted windings. It is now believed that the poor extraction efficiencies for the HIP run were due to the bad sextupoles. In order to gain some confidence that this was a reasonable hypothesis we again inserted H20 to see how good we could make the extraction efficiency for the Au77+. The test is important because there was uncertainty about how efficient we could be. The uncertainty arises from not knowing how much beam loss to expect from the stripping of the last two electrons from scraping against various apertures in the extraction process. Also it was not known how much beam loss to expect from the stripping with H20 inserted. In general it was expected that losses from these mechanisms should be very small, but they are very difficult to quantify. During the shutdown prior to the FY96 HIP run the bad sextupoles were fixed. We found in general that we could achieve higher extraction efficiency than we could in the past (able to get over 70 % while in past runs we had difficulty getting over 50 %).

2 Study Description

In this study we simply inserted the H20 septum and collected loss monitor and ion chamber data at the same time. We had available the F5, F10, and the sum of the four long loss monitors in the AGS as scalars in the computer (collected with GPM), but the H20 loss monitor signal was not working in the computer. We did have the analog signals which were monitored.

3 Results

Figures 1 and 2 show the effect of inserting the H20 septum. The extraction efficiency was increased from 70 to over 90 %. The F5 losses decreased from 250 counts/10^6 ions accelerated to about 10 counts/10^6 ions accelerated (raw F5 counts normalized on internal circulating beam current).

4 Conclusions

By using H20 for heavy ion operation we can achieve over 90 % extraction efficiency. In future heavy ions runs it will become part of the overall setup to include H20. Since it was possible to get high extraction efficiency with H20 inserted it seems reasonable to say that losses due to stripping are insignificant.

Figure 1: Extraction Eff. vs H20US position

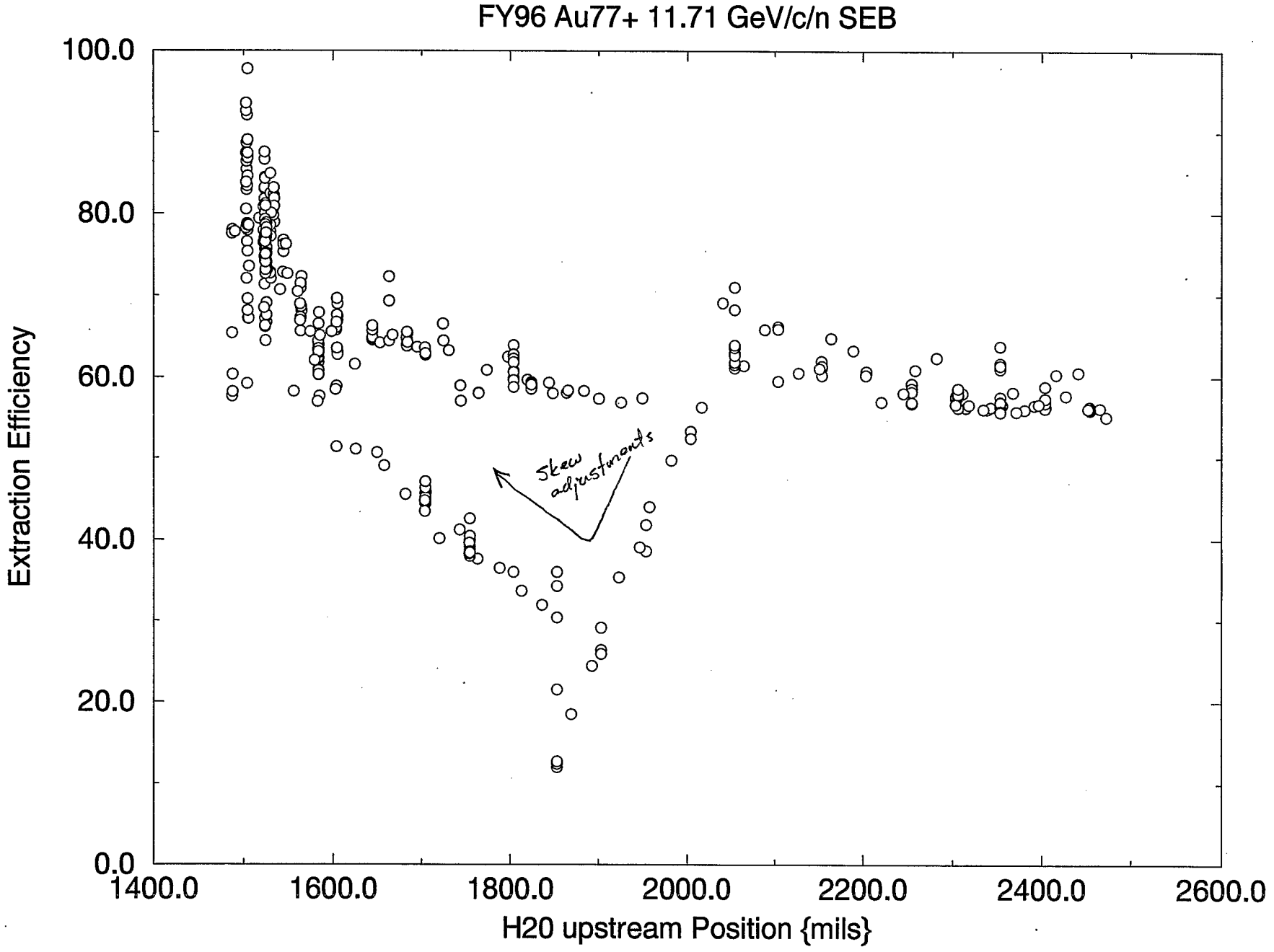

Figure 2: F5 Losses vs H20US position