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Reducing the RF Voltage Swing by Blowing up the Initial Energy Spread

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Reducing the RF voltage swing by blowing up the initial energy spread

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Introduction

The high frequency rf system can have a large range in voltage requirements; e.g. from $V = .12$ to $V = 11$ MV. This large range can be reduced by blowing up the initial energy spread, σ_{p_0}. However, this increase in σ_{p_0} is limited by the following effects due to intrabeam scattering

1) increase in the final emittance
2) increase in the final energy spread
3) increase in the final voltage required.

The following IBS results show that by blowing up σ_{p_0} one can get by with a RF voltage swing of

$$V = 1.5 \text{ to } V = 12 \text{ MV}.$$

Blow up of σ_{p_0} by raising voltage V.

1) Prepare beam in low frequency Rf as if transfering to high frequency bucket such that

$A_0 = .3$ ev-sec

$\sigma_{\ell_0} = 31$ cm

σ_{p_0} determined by σ_{ℓ_0}, A_0

V gives $\Delta_B = 2\sigma_p$

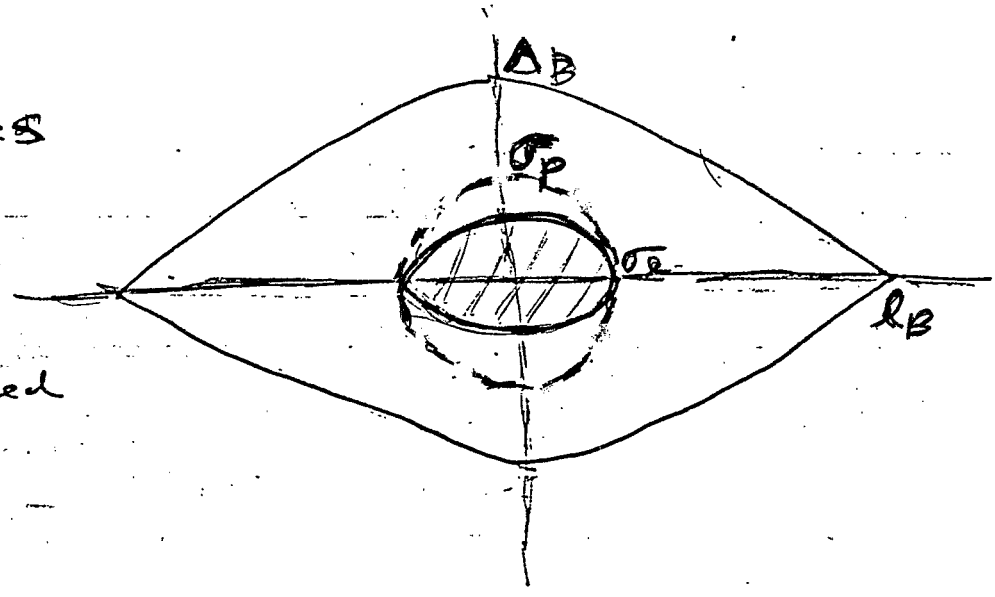
(2) Raise V

Δ_B increases

σ_p increases

$\sigma_p = \Delta_B \sin\frac{\phi}{2}$

σ_ℓ unchanged



What happens to final V after 10 hours, final σ_p, final ε_x ?

IBS Results for blow up of σ_{p_0}.

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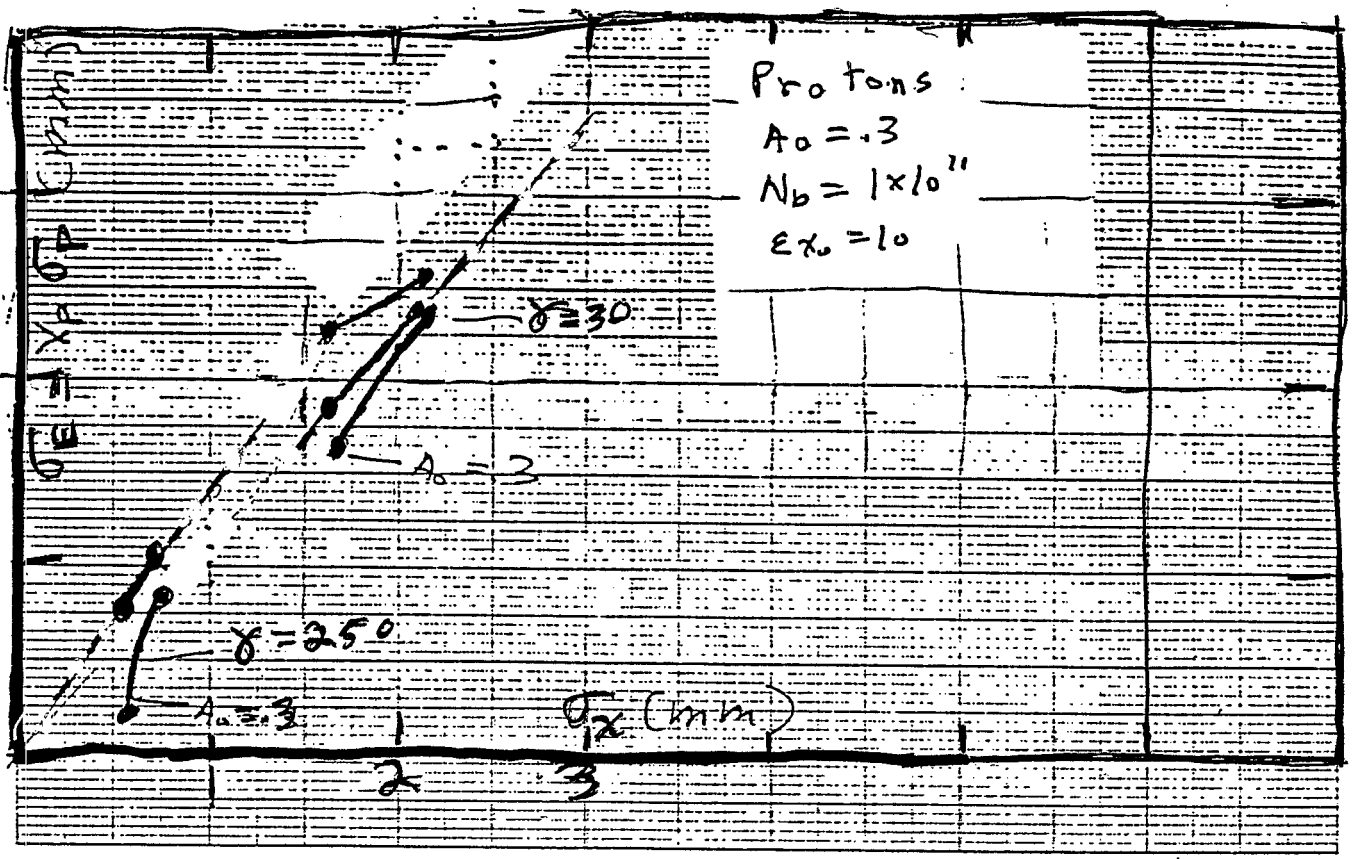
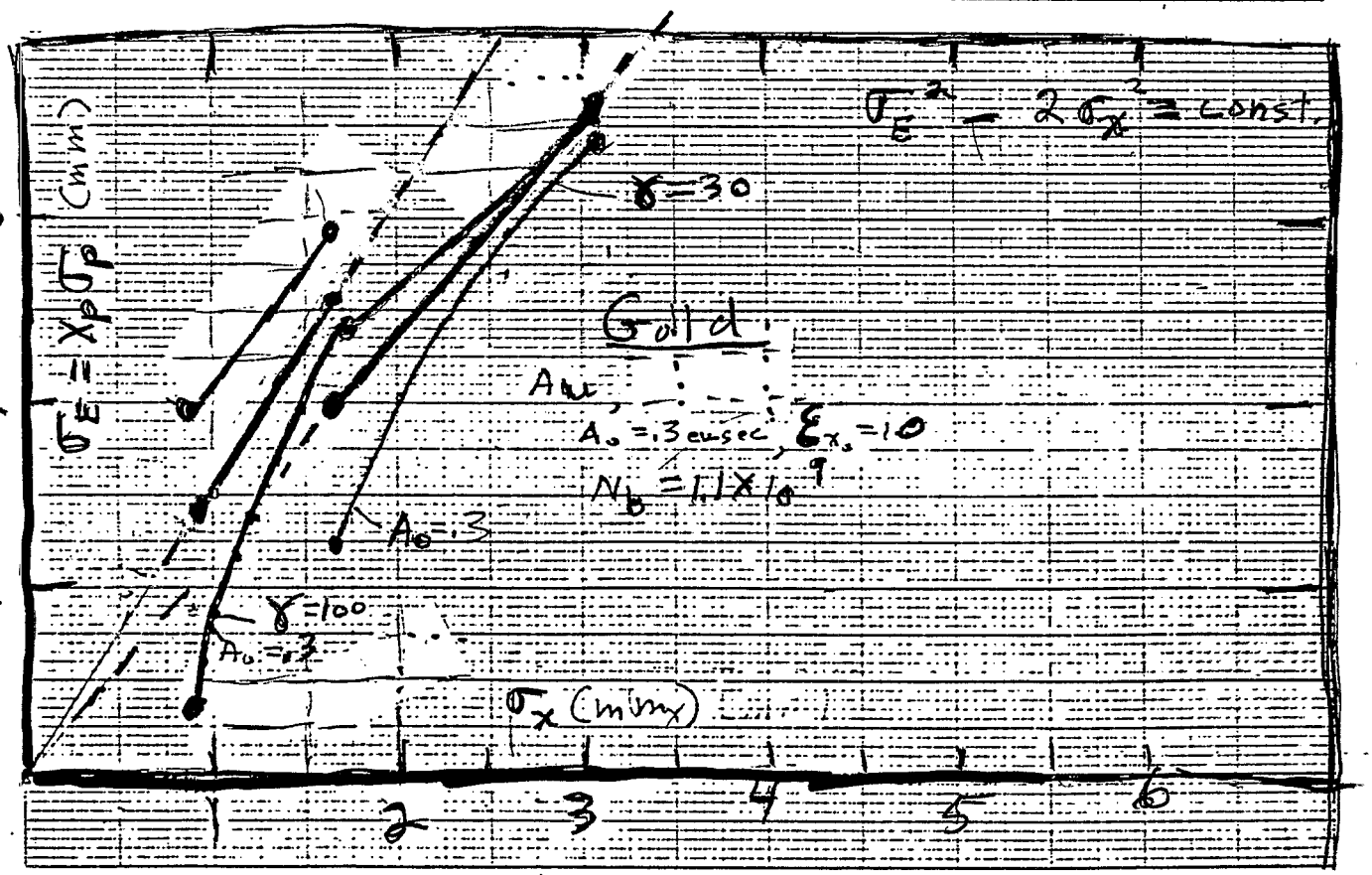
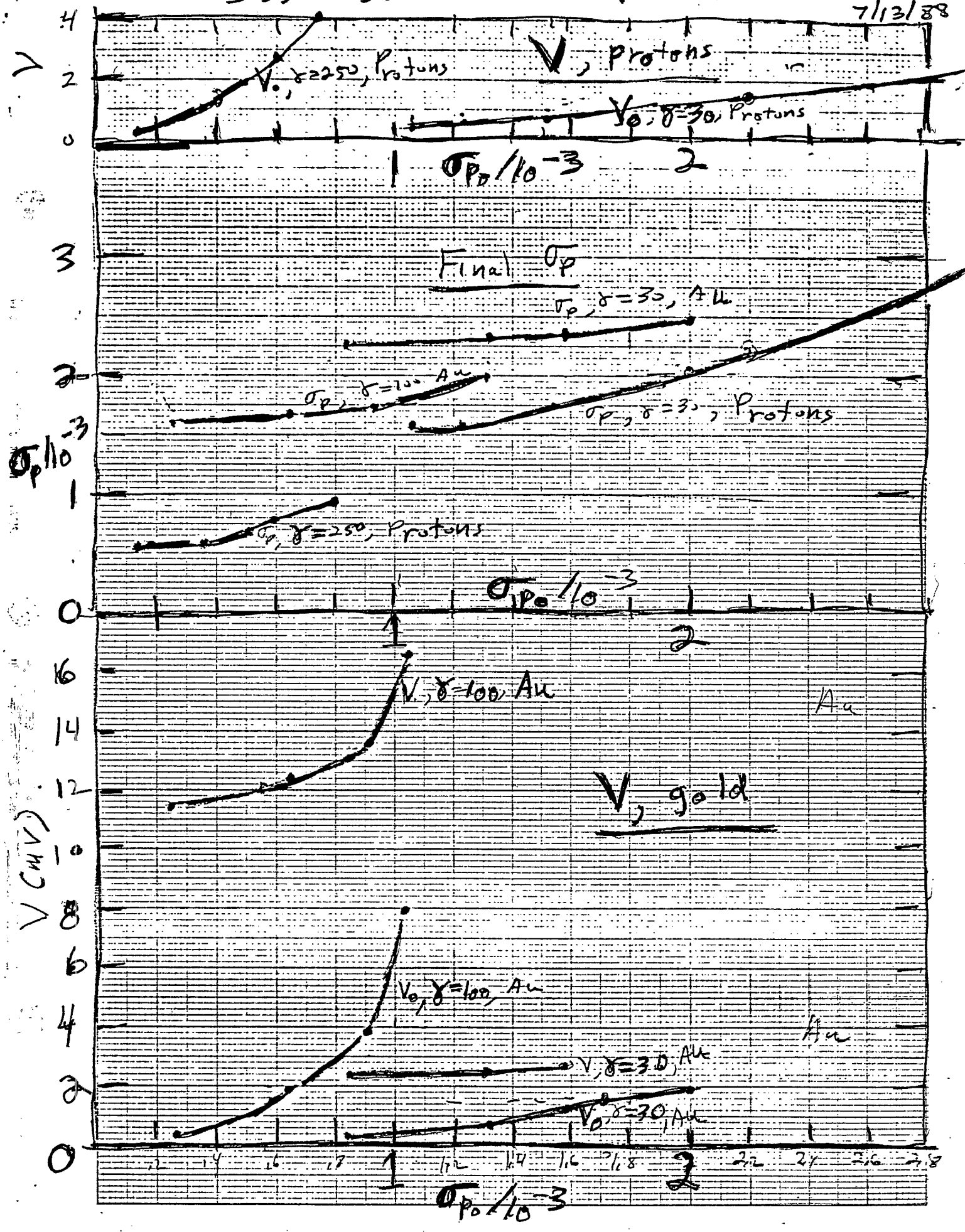




IBS Results for blow up of σ_{p_0}

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