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## Beam Transfer AGS/RHIC, Low F - High F

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**U.S. Department of Energy**

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AD/RHIC-RD-7

Beam Transfer AGS/RHIC

Low F - High F

*(Mini-Workshop on RHIC RF Systems)*

*July 11-15, 1988  
Collider Center*

E. C. Raka  
BNL

## Transfer to 160 MHz Buckets

Assume bunch to be  $270^\circ$  wide then  $N \approx .855$   
 $\alpha_N = .789$  so that for  $A_b = .3 \text{ evsec/AMU}$   $A_0 = .38 \text{ evsec}$

$$\left(\frac{\Delta p}{p}\right)_{\text{Bunch}} = \sqrt{N} \left(\frac{\Delta p}{p}\right)_{\text{Bucket}} = .924 \left(\frac{\Delta p}{p}\right)_{\text{Bucket}}$$

For Gold  $V_{160} = 283 \text{ Kv}$   $\left(\frac{\Delta p}{p}\right)_{\text{Bucket}} = .496 \times 10^{-3}$

For Protons @ .3 evsec  $V_{160} = 44 \text{ Kv} !!$

@ .3 evsec  $V_{160} = 123 \text{ Kv}$

## Compression - Rotation

Gold .3 evsec 100 Kv 100 GeV  $\hat{\phi} = \pm .67 \text{ rad}$   
Compression 865 Kv "  $\hat{\phi} = \pm .39 \text{ rad}$

Rotation  $V = \sqrt{865 \times 100} = 293 \text{ Kv}$

Protons .3 evsec 100 Kv 250 GeV  $\hat{\phi} = \pm .43 \text{ rad}$   
Compression 144 Kv "  $\hat{\phi} = \pm .39 \text{ rad}$

.5 evsec 100 Kv 250 GeV  $\hat{\phi} = \pm .555 \text{ rad}$   
Rotation 200 Kv  $= \pm .39 \text{ rad}$

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$\frac{E}{h} < 1.5 \text{ eV}$  Protons at 250 GeV .3 evsec

# Matching

## Small Amplitude Case

$$V_2 = V_1 \frac{\eta_2}{\eta_1} \frac{\omega_{rf1}}{\omega_{rf2}} \frac{R_2}{R_1}$$

Protons at injection  $\eta_1 = .0128$   $\eta_2 = 5.58 \times 10^{-4}$

$$V_2 = \frac{320}{.0128} \frac{5.58 \times 10^{-4}}{6} \frac{4.75}{6} = 11 \text{KV} \quad (13.75 \text{ @ } 400 \text{KV})$$

Gold at injection  $\eta_1 = .0075$   $\eta_2 = 4.74 \times 10^{-3}$

$$V_2 = 320 \frac{4.7}{7.5} \frac{4.75}{6} = 159 \text{KV}$$

Bunch Length: Protons for .3evsec 11.9 nsec

Protons @ .5evsec 15.36 nsec. Gold for .3evsec/Amu 16.2 nsec

Bucket Area: Protons @ 11KV 1.56 evsec  
@ 100KV and  $Q_s = 30^\circ$  1.56 evsec

At Injection  
Energy

Gold @ 159KV .819 evsec/Amu  
@ 300KV and  $Q_s = 9^\circ$  .8 evsec/Amu