AD/RHIC-RD-7

Beam Transfer AGS/RHIC

Low F - High F

(Mini-Workshop on RHIC RF Systems)

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Transfer to 160 MHz Buckets

Assume bunch to be 270° wide then $N \cong .855$

$\alpha_N = .789$ so that for $A_b = .3$ ev sec/AMU $A_0 = .38$ ev sec

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

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

For Protons @ .3 ev sec $V_{160} = 44$ KV !!

@ .3 ev sec $V_{160} = 123$ KV

Compression - Rotation

Gold .3 ev sec 100 Kv 100 Gev $\hat{\phi} = \pm .67$ rad

Compression 865 Kv " $\hat{\phi}$ $\pm .39$ rad

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

Protons .3 ev sec 100 Kv 250 Gev $\hat{\phi} = \pm .43$ rad

Compression 144 Kv " $\hat{\phi} = \pm .39$ rad

.5 ev sec 100 Kv 250 Gev $\hat{\phi} = \pm .555$ rad

Rotation 200 Kv $= \pm .39$ rad

$\frac{Z}{n} < 1.5\,\Omega$ Protons at 250 Gev .3 ev sec

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

$$V_2 = \frac{320}{.0128} 5.58\times10^{-4} \frac{4.75}{6} = 11\,KV \quad (13.75 @ 400KV)$$

Gold at injection $\eta_1 = .0075$ $\eta_2 = 4.74\times10^{-3}$

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

Bunch Length: Protons for .3evsec 11.9 nsec

Protons @ .5evsec 15.36 nsec.

Gold for .3evsec/Amu 16.2 nsec

Bucket Area: At Injection Energy

Protons @ 11KV 1.56 evsec
@ 100KV and $\varphi_s = 30°$ 1.56 evsec

Gold @ 159KV .819 evsec/Amu
@ 300KV and $\varphi_s = 9°$ .8 evsec/AMU