BNL-101789-2014-TECH
AD/RHIC/RD/7;BNL-101789-2013-IR

Beam Transfer AGS/RHIC, Low F - High F

E. Raka

July 1988

Collider Accelerator Department
Brookhaven National Laboratory

U.S. Department of Energy
USDOE Office of Science (SC)

DISCLAIMER

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° wide then $N \doteq .855$

$\alpha_N = .789$ so that for $A_b = .3 \text{ eV sec/AMU}$ $A_0 = .38 \text{ eV sec}$

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

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

For Protons @ .3 eV sec $V_{160} = 44 \text{ KV}$!!

@ .3 eV sec $V_{160} = 123 \text{ KV}$

Compression - Rotation

Gold .3 eV sec 100 KV 100 GeV $\hat{\phi} = \pm .67$ rad

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

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

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

$\frac{z}{h} < 1.5 \Omega$ 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 1.56evsec
@ 100Kv and $\phi_s = 30°$ 1.56evsec

Gold @ 159Kv .819evsec/Amu
@ 300Kv and $\phi_s = 9°$ .8evsec/Amu