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Associated Universities, Inc.
Upton, New York

BNL 18176
CRISP 73-12
ISABELLE Project

ACCELERATOR DEPARTMENT
Informal Report

INTERSECTING STORAGE ACCELERATOR NOTES

STANDARD PARAMETERS FOR ISABELLE DESIGN CALCULATIONS

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August 1, 1973

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To facilitate comparison between different calculations of ISA layout, lattice, radiofrequency, luminosity and other calculations it is desirable to base all of these on a standard set of assumptions concerning AGS parameters, transfer energy, and final energy. Otherwise confusion may arise, for example, if one calculation is based on transfer energy of 30 GeV and another on $\gamma = 30$. We propose the following for adoption in all ISA calculations.

1. Universal Constants and Formulas

Velocity of light	$c = 2.997925 \times 10^8$ m/sec
Proton mass	$M = 0.9382592$ GeV/c ²
Electronic charge	$e = 1.602192 \times 10^{-19}$ Coulomb

Magnetic rigidity and momentum

$$p \text{ (GeV/c)} = 0.02997925 B\rho \text{ (kG-m)}$$

$$I \text{ (amp)} = 4.80325 \times 10^{-11} BN/C$$

(N = number of protons of velocity β_c in ring of circumference C).

2. Transfer and Final Energies

	<u>Transfer</u>	<u>Final</u>
T = kinetic energy	28.5	200 GeV
E = total energy	29.43826	200.93826 GeV
p = momentum	29.42330	200.9361 GeV/c
γ	31.3754	214.1607
β	0.999492	0.999989
$\beta\gamma$	31.35946	214.1584
$B\rho$ = magnetic rigidity	981.4555	6702.5059 kG-m

3. AGS Orbit and Beam Parameters

Circumference $C = 807.125 \text{ m}$ ($R = 128.4579 \text{ m}$)

Transition energy: $\gamma_t = 8.5$, energy = 7.0369 (kinetic), 7.9752 (total)

Frequency coefficient at transfer: $\zeta = \frac{1}{\gamma_t^2} - \frac{1}{\gamma^2} = 0.0128$

Radiofrequency (12th harmonic): 4.45493 MHz

Rf amplitude: 384 kV

Synchrotron frequency (flat top, 384 kV):

$$\nu_s = 5.650 \times 10^{-4}$$

$$\frac{\Omega_s}{2\pi} = 209.75 \text{ Hz}$$

Current in AGS for N_0 protons circulating: $5.948 \times 10^{-14} N_0$ amperes.

Phase space areas:

	<u>Longitudinal</u>	<u>Horizontal</u>	<u>Vertical</u>
Area A	0.35	9.25×10^{-4}	$1.233 \times 10^{-4} \text{ eV-sec}$
Normalized emittance ϵ_0 = A/Mc	0.0356π	$9.408\pi \times 10^{-5}$	$1.2544\pi \times 10^{-5} \text{ rad-m}$
Emittance ϵ at transfer = $\epsilon_0/\beta\gamma$	$1.135\pi \times 10^{-3}$	$3.0\pi \times 10^{-6}$	$0.4\pi \times 10^{-6} \text{ rad-m}$

[Transverse amplitude = $(c\beta/\pi)^{1/2}$ where β is amplitude function.]