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One-Bunch Mode Operation Of The Booster

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

DISCLAIMER

RHIC-PG-15

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(BNL, December 8, 1983)

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One-bunch Mode Operation of the Booster

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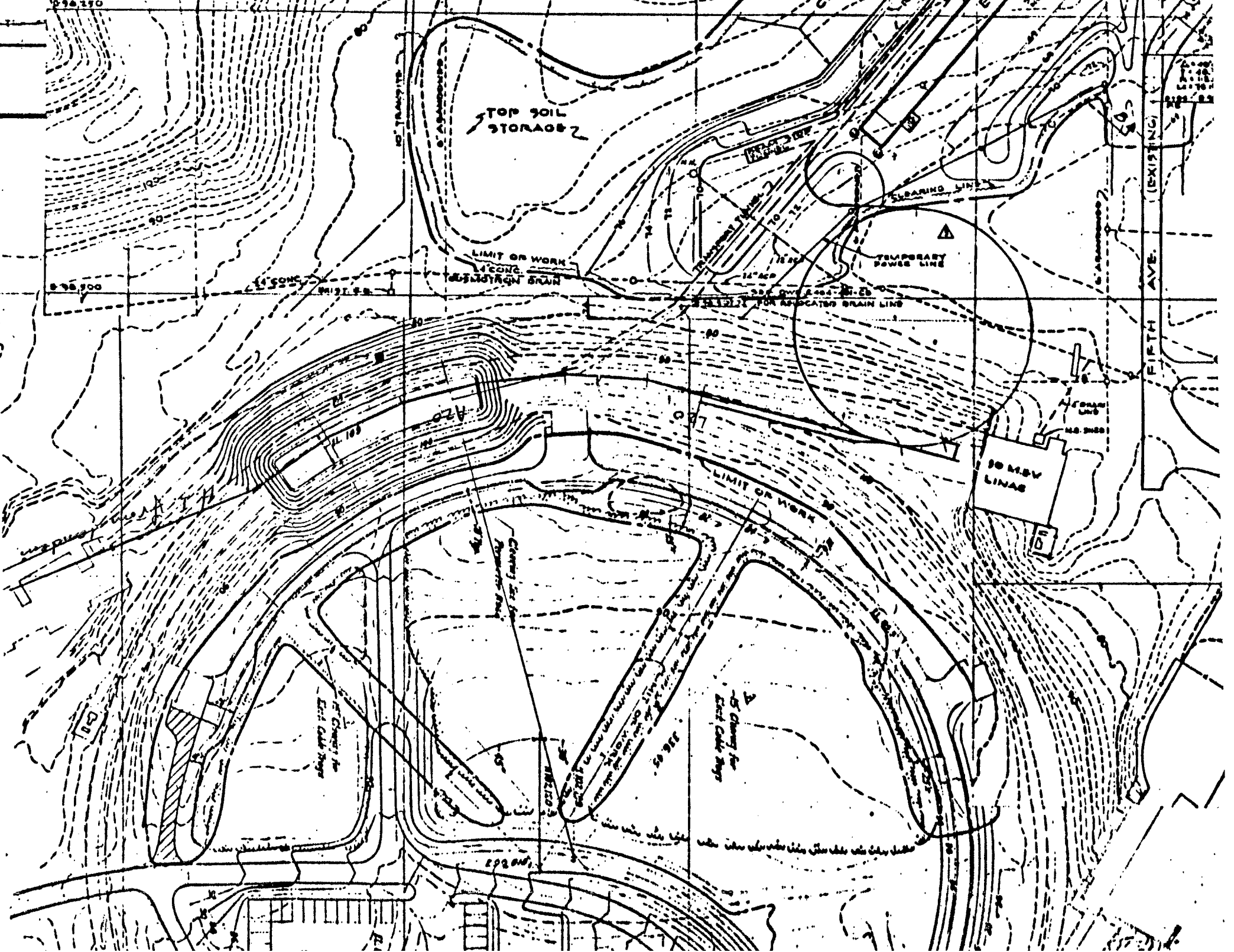
BNL, Dec. 9, 1983


TOP SOIL STORAGE
LIMIT OF WORK
TEMPORARY POWER LINE
FIFTH AVE. (EXISTING)
50 M.S.V. LINES
LIMIT OF WORK
15' Clearing for East Cable Trays
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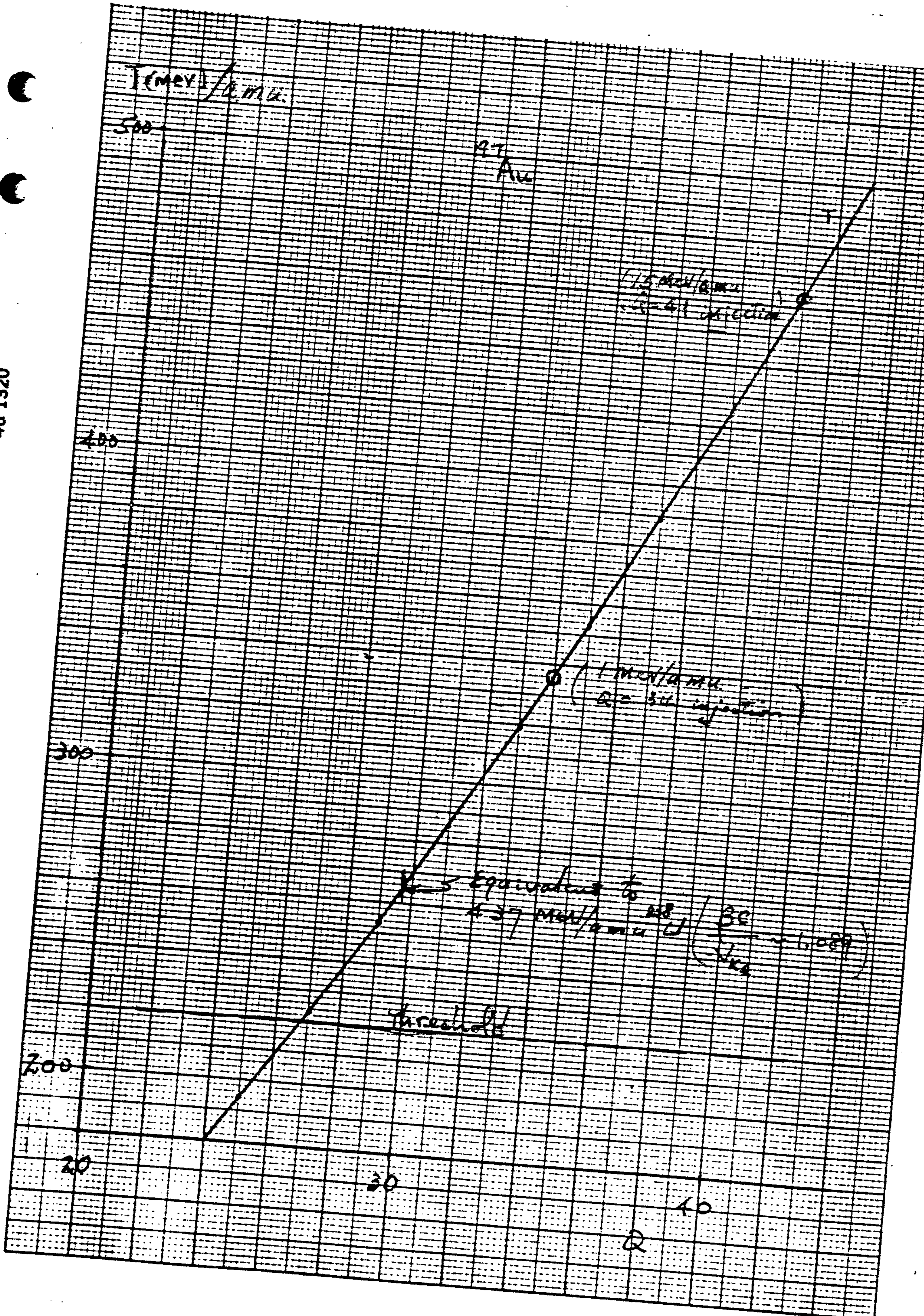
ACCUMULATOR/BOOSTER PARAMETERS

INJECTION ENERGY FOR PROTONS	T = 200 MeV
EJECTION ENERGY FOR PROTONS	T = 2.5 GeV
CIRCUMFERENCE	201.75 M
# FOCUSING CELLS	24
CELL LENGTH	8.4 M
PERIODICITY	12
STRAIGHT SECTIONS #/LENGTH	12/3.7
PHASE ADVANCE/CELL	100.5°
$\nu_X \sim \nu_Y$	6.7
β_{MAX}/β_{MIN}	16/2 M
η_{MAX}	1.7 M
DIPOLES	
#	36
LENGTH	2.4 M
FIELD INJ/EJEC (PROTONS)	1.56/8 KG
(" HEAVY ION)	~~0.682~~ 0.0682 A/Z/12 KG 395 gauss for Au^{+34} / 336 MeV/amu
QUADRUPOLES	
#	48
LENGTH	0.5
APERTURE	8"



If Ignore intra beam scattering and

I we can take large space charge tune shift

$1 \sim 3 \times 10^9$ /bunch

If the othered hand one only can have say

6×10^8/bunch in the collider

The we can work backward

→ 1.2×10^9/bunch in the Booster.

Let's compare several schemes

6×10^8/Bunch in collider

option	# required	# turn inj	(ε_N) required (10^{-6})			# Bunch in Collider
			$\Delta\nu = .1$	$\Delta\nu = .2$	$\Delta\nu = .4$	
Booster	3.6×10^9	10	$4\pi\ 10^{-6}$	2π	1π	57
Booster w. Linac	3.6×10^9	22	$1.8\ \pi\ (3.4\pi)$	$.9\ (3.4\pi)$	$.45\pi\ (3.4\pi)$	57
Booster*	1.2×10^9	3	1.3π	$.7$	$.3\pi$	$57 \times n$ $n = 1, 2 \cdots$

Assume; 4 μA beam with $\varepsilon = 1.5\pi \times 10^{-6}$ from Tandem or linac

* Bunch and accelerate to 200 MeV/amu in $h = 1$
Transfer to $h = 3$

In $A = 197$

$Q = 34$

$T = 1$ MeV/AMu.

If Keep $\frac{\Delta p}{p} < .01$

	$h = 1$	$h = 3$
Bunching V	1.8 KV	5.3 KV
τ_s	3×10^{-3}	1×10^{-3}
A	.017 eV-sec/AMu	.006 eV-sec/AMu/bunch

At 200 MeV/amu.

$V = 30$ KV

$\varphi_s = 30°$

$h = 3$.

$A_{30} = .075$ eV-sec/amu/bunch.

at AGS

336 MeV/amu

280 KV

$h = 12$

$A_{30°} = .244$ eV-sec/amu/bunch