

## One-Bunch Mode Operation Of The Booster

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USDOE Office of Science (SC)

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(BNL, December 8, 1983)

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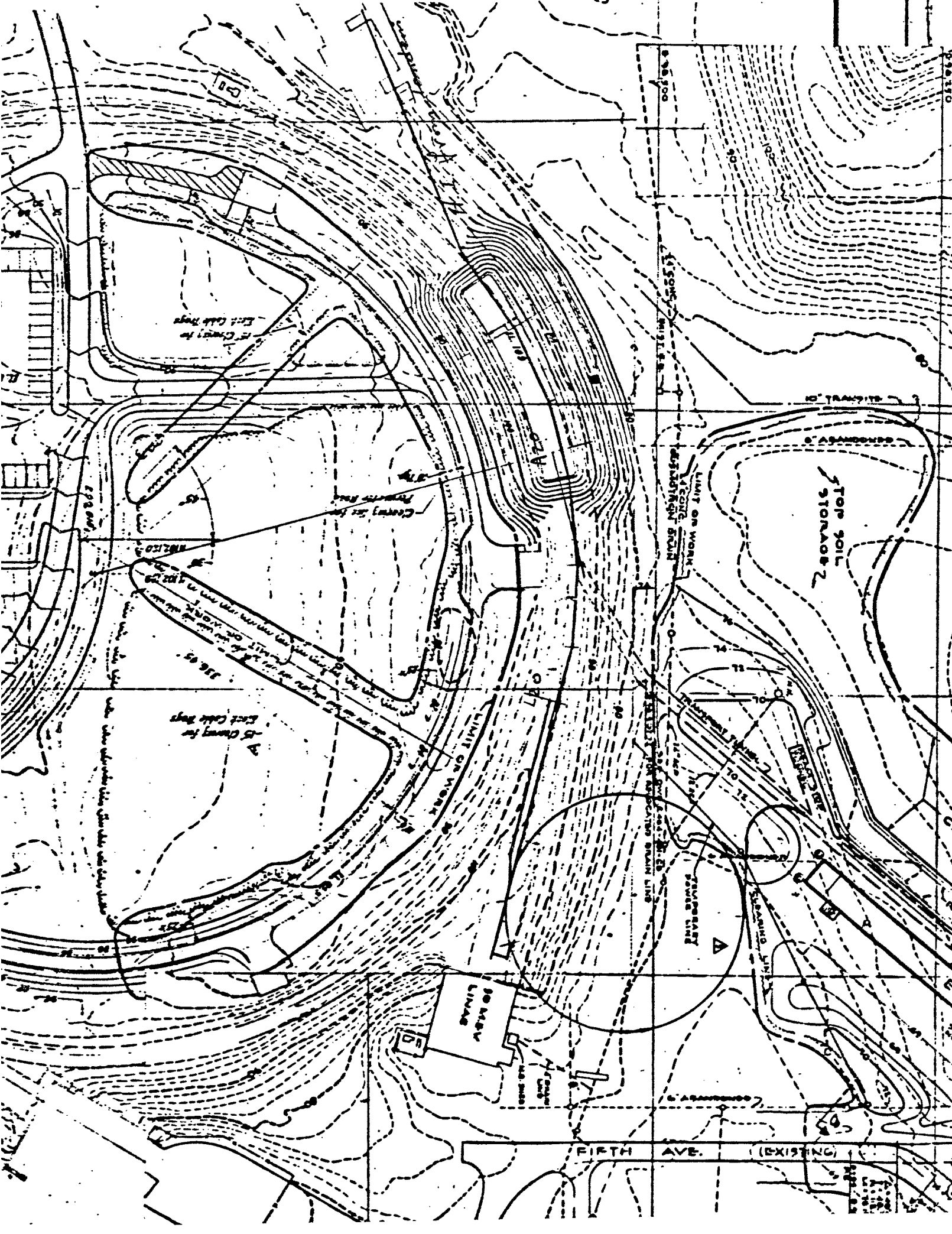
(BNL, December 9, 1983)

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One-bunch Mode Operation  
of the Booster

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BNL, Dec. 9, 1983



East Side Dept

Clearing for  
Provisional Road

Clearing for  
East Side Dept

SOILS

TOP SOIL  
STORAGE 2

LIMIT ON WORK  
REINFORCED BRAIN

LIMIT ON WORK  
REINFORCED BRAIN LINE

SEWER  
POWER LINE

FIFTH AVE. (EXISTING)

10' TRANSIT

ABANDONED

ABANDONED

ABANDONED

PROB.

# 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°
$v_x \sim v_y$	6.7
$B_{MAX} / B_{MIN}$	16/2 M
$\eta_{MAX}$	1.7 M
DIPOLES	
#	36
LENGTH	2.4 M
FIELD INJ/EJEC (PROTONS)	1.56/8 KG
( " HEAVY ION)	<del>0.682</del> 0.0682 A/Z/12 KG
QUADRUPOLES	
#	48
LENGTH	0.5
APERTURE	8"

*395 gauss for Au<sup>+34</sup>  
/ 336 Mex/amu*

Time / a.m.u.

500

27  
Au

(15 MeV/a.m.u.  
20 MeV injected)

400

(1 MeV/a.m.u.  
20 MeV injected)

300

5 equivalents to  
4.37 MeV/a.m.u.  $\left( \frac{30}{7} \right)$

threshold

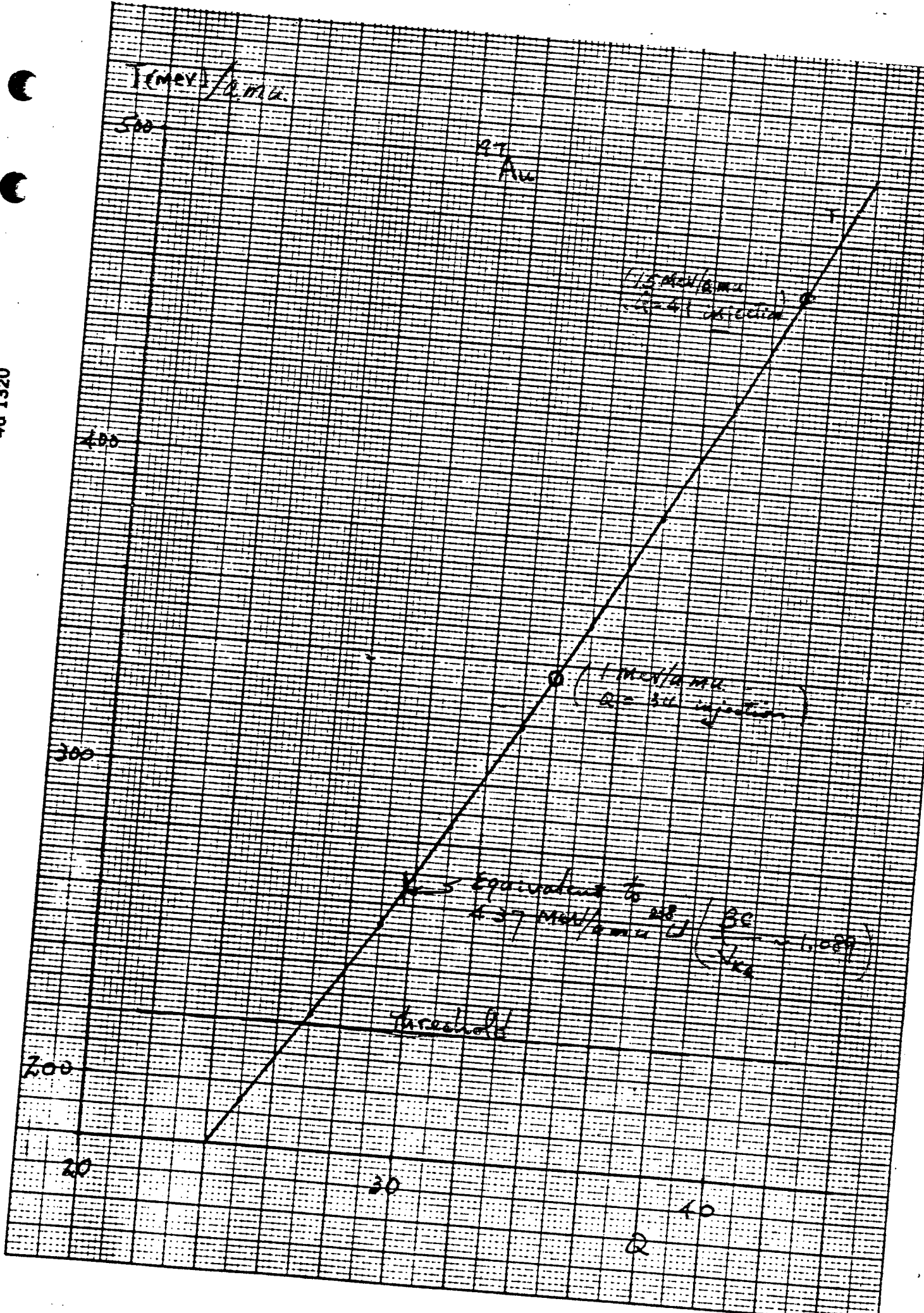
200

20

30

10

2





If I ignore intra beam scattering and

I we can take large space charge tune shift

$$1 \sim 3 \times 10^9 \text{ / bunch}$$

If the other hand one only can have say

$$6 \times 10^8 \text{ / bunch in the collider}$$

the we can work backward

$$\rightarrow 1.2 \times 10^9 \text{ / bunch in the Booster}$$

Let's compare several schemes

$6 \times 10^8$  / Bunch in collider

option	# required	# turn inj	$(E_N)$ required ( $10^{-6}$ )			# Bunch in Collider
			$\Delta V = .1$	$\Delta V = .2$	$\Delta V = .4$	
Booster	$3.6 \times 10^9$	10	$4\pi \cdot 10^{-6}$	$2\pi$	$1\pi$	57
Booster w. Linac	$3.6 \times 10^9$	22	$1.8\pi (3.4\pi)$	$.9 (3.4\pi)$	$.5\pi (3.4\pi)$	57
Booster*	$1.2 \times 10^9$	3	$1.3\pi$	$.7$	$.3\pi$	$57 \times n$ $n=1, 2, \dots$

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

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

$J_{rr} \quad A = 197$   
 $Q = 34$   
 $T = 1 \text{ MeV/AMU.}$

If keep  $\frac{\Delta P}{P} < .01$

	$h = 1$	$h = 3$
Bunching V	1.8 KV	5.3 KV
$T_s$	$3 \times 10^{-3}$	$1 \times 10^{-3}$
A	.017 eV-sec/AMU	.006 eV-sec/AMU/bunch

At. 200 MeV/amu.

$V = 30 \text{ KV}$

$\phi_s = 30^\circ$

$h = 3.$

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

at AGS

336 MeV/amu

280 KV

$h = 12$

$A_{30^\circ} = .244 \text{ eV-sec/amu/bunch}$