

## Intrabeam Scattering Results

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INTRABEAM SCATTERING RESULTS

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# RHIC Intra-beam Scattering Results

This note summarizes ~~the~~ some results of a study of the effects of Intra-Beam Scattering on the beam for the RHIC-2 lattice ( $\beta_x^* = 17$ ,  $\beta_y^* = 3$ ). An output file for this lattice was provided by Jan Clauss.

The effects of intra beam scattering were studied as a function of  $\delta$ . At each  $\delta$ , the beam was allowed to grow for 2 hours.

The RHIC2 lattice has the following parameters. In the cell,  $X_{p,max} = 1.39$  m,  $\beta_{x,max} = 51.4$  m.  $\gamma_t = 26.4$

The table on the following page lists the starting parameters  $S_0$ ,  $\sigma_{z0}$ ,  $E_0$  and the various beam parameters after  $t = 2$  hours. Below transition,  $\gamma_t = 26.4$ , the initial bunch area is  $A = .2$  ev-sec, and above  $\gamma_t$ , the initial bunch area is  $A = 1$  ev-sec. All results are for  $A_4$  with  $N = 1.2 \times 10^9$  ions/bunch. The RF parameters are  $V = 1 \times 10^6$  volts,  $h = 6 \times 57$ .

# RHIC Performance

$X_p = 1.39$ ,  $V = 1 \times 10^6$ ,  $N = 1.2 \times 10^9$  / bunch  
 $\beta_x = 51.4$ ,  $H = 5 \times 67$ ,  $\epsilon_0 = 10 \times 10^{-6}$ ,  $\delta_z = 26.4$   
 $\beta_x^* = 17$ ,  $\beta_y^* = 3$

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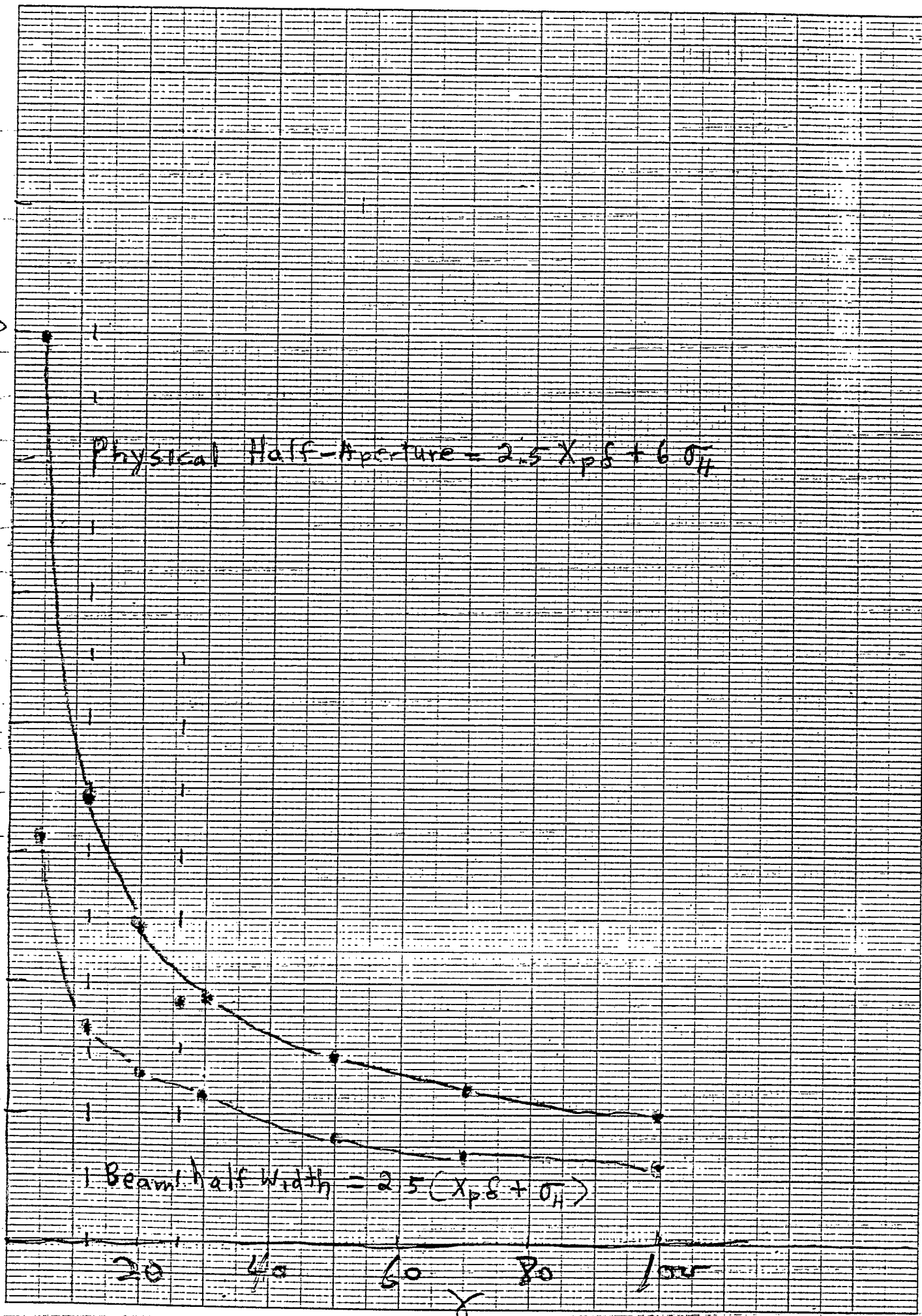
A = 1.2 ev-sec

A = 1 ev-sec

$\gamma$	5	12	20	30	50	75	100	26.4 $\delta_z$
$\delta_0 / 10^{-3}$ , $t=0$	.638	.529	.543	1.205	.614	.432	.343	
$\sigma_{z0}$ (cm), $t=0$	110.	54.1	31.6	47.3	55.7	52.9	49.9	
$\epsilon / 10^{-6}$ , $t=2$	70.1	34.5	24.8	18.9	17.7	18.3	18.4	10
$\delta / 10^{-3}$ , $t=2$	1.11	1.22	1.37	1.57	1.14	.921	.789	4.12
$\sigma_z$ (cm), $t=2$	191	125	80.	58	99	109	111	
$A_v, Lum / L_0$	.212	.413	.554	.680	.690	.672	.669	
RF								
2.5 $\delta / 10^{-3}$	2.78	3.05	3.42	3.92	2.85	2.30	1.97	
$\Delta p / p$ bucket $10^{-3}$	2.08	3.49	6.13	9.08	3.93	2.91	2.45	
Aperture								
$X_p \delta$ (mm)	1.55	1.70	1.91	2.19	1.59	1.28	1.10	5.7
$\sigma_H = \sigma_v$ (mm)	11.0	4.96	3.26	2.32	1.74	1.44	1.26	1.8
2.5 $X_p \delta$	3.88	4.25	4.78	5.48	3.98	3.20	2.75	
2.5 $\sigma_H$	27.5	12.4	8.15	5.80	4.35	3.60	3.15	
Beam Half Width								
2.5 ( $\sigma_H + X_p \delta$ )	31.4	16.6	12.9	11.3	8.33	6.80	5.90	18.7
2.5 $\sigma_v$	27.5	12.4	8.15	5.80	4.35	3.60	3.15	4.5
Physical Half-Aperture								
2.5 $X_p \delta + 6 \sigma_H$	69.9	34.01	24.34	19.4	14.4	11.8	10.3	—
6 $\sigma_v$	66.0	29.76	19.56	13.92	10.44	8.64	7.56	—
Luminosity / $10^{26}$	.011	.106	.331	.802	1.45	2.06	2.67	

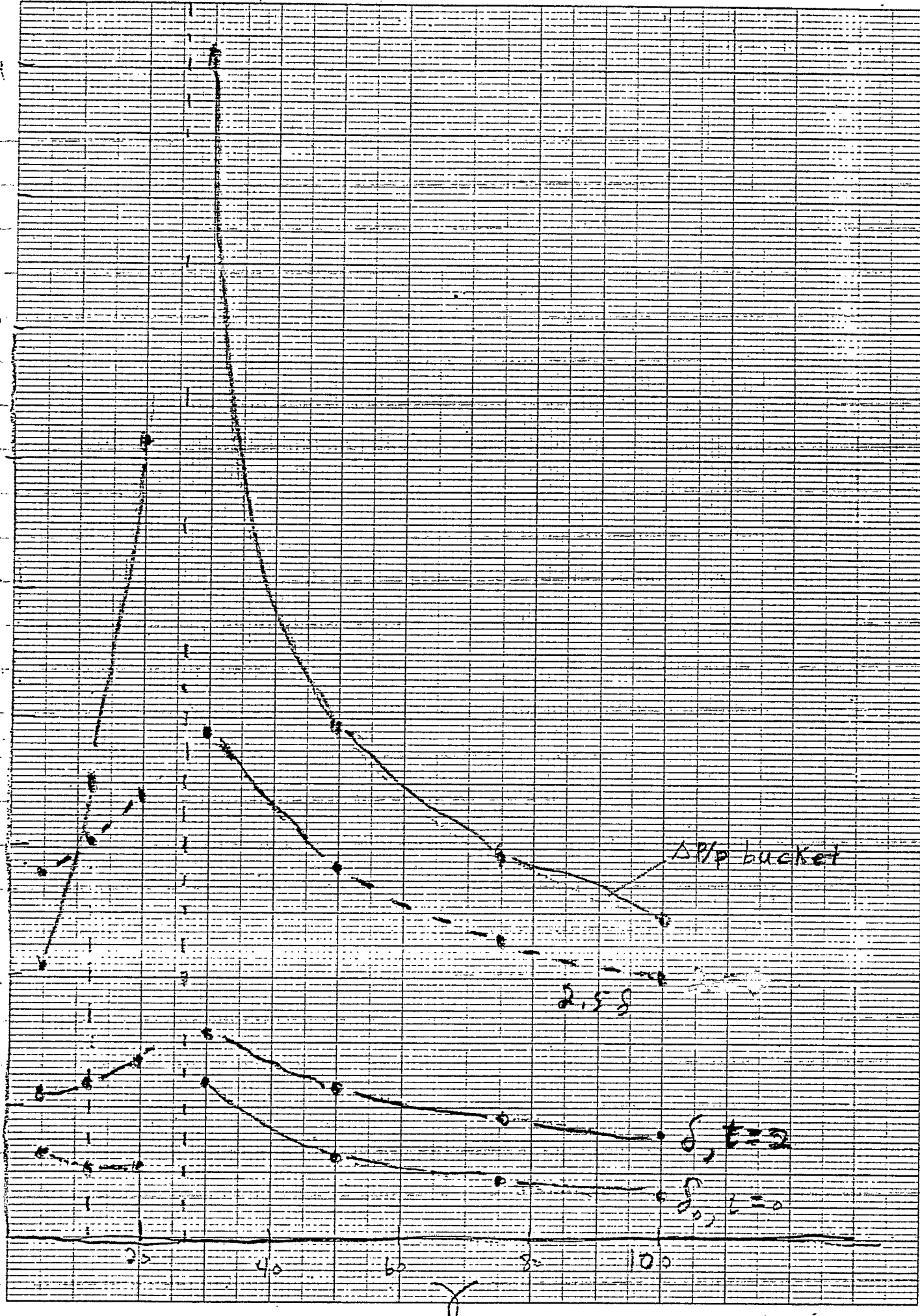
$$Luminosity / 10^{26} = 4 * A_v, Lum / L_0 * (\sigma_{H, 100} / \sigma_H)^2$$

(mm)



SQUARE  
 10 X 10 TO THE HALF INCH  
 AS 0013 60

10 X 10 TO THE HALF INCH  
 AS 0013 60



**SQUARE TO X TO THE HALF DEGREE AS ONLY ONE**

