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Estimate Of Intrabeam Scattering For The Lattice: ß= 40m, ?= 2.0m

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U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

ESTIMATE OF INTRABEAM SCATTERING FOR THE LATTICE: $\bar{\beta}$ = 40m, $\bar{\eta}$ = 2.0m

A. G. RUGGIERO

(BNL - December 6, 1983)

J. Claus lattice

Contribution from Regular Cell only

$\bar{\beta}$ = 39.18424 m $\Rightarrow$ 40. m

$\bar{\eta}$ = 2.023605 m $\Rightarrow$ 2. m

This corresponds to case # 82

The numbers in the following Tables correspond to

Gold : A = 197 , Z = 79

Bunched Beam

Peak Current = 1. Amp-electric

ε_N is normalized emittance
σ_E/E r.m.s. energy spread

τ^{-1} are growth rates in $\underline{\text{hour}^{-1}}$

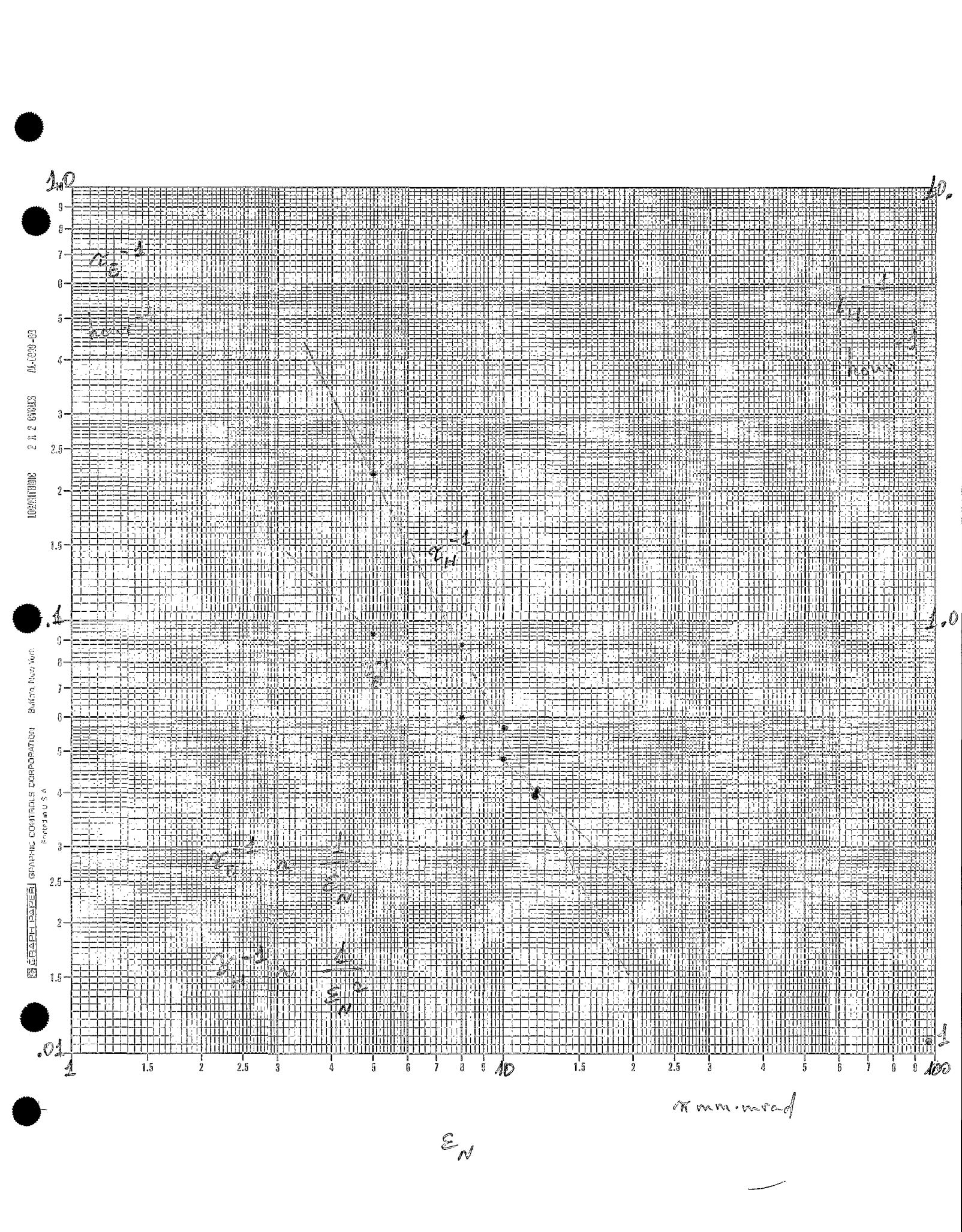
$\gamma = 100$ $\quad\quad$ $\varepsilon_N = 10\pi$ mm·mrad

σ_E/E	τ_E^{-1}	τ_H^{-1}	τ_V^{-1}
$.5 \times 10^{-3}$	.3471	1.0204	-.0208
.8	.0923	.6946	-.0142
1.0	.0483	.5681	-.0116
1.2	.0283	.4793	-.0098

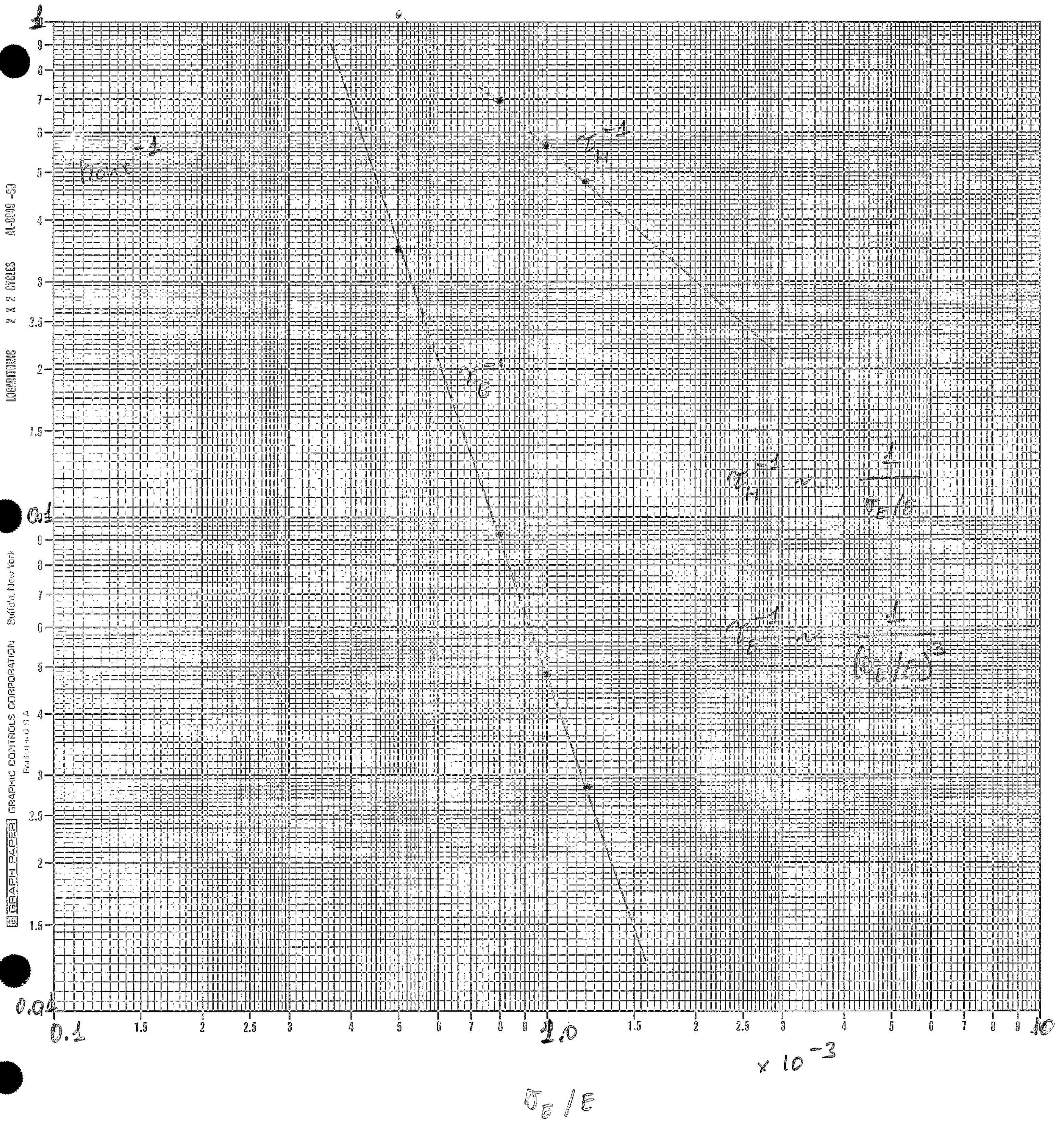
$\gamma = 100$ $\quad\quad$ $\sigma_E/E = 0.1\%$

ε_N	τ_E^{-1}	τ_H^{-1}	τ_V^{-1}
5. π mm·mrad	.0931	2.1901	-.0447
8.	.0598	.8788	-.0179
10.	.0483	.5681	-.0116
12.	.0405	.3971	-.0081

Variation of Diffusion Rates with emittance and energy spread.



ε_N


LOGARITHMIC 2 X 2 CYCLES AI-8209-50
GRAPH PAPER GRAPHIC CONTROLS CORPORATION Buffalo, New York
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Rate^-1
τ_H^{-1}
τ_E^{-1}
$\tau_H^{-1} \sim \frac{1}{\sigma_E/E}$
$\tau_E^{-1} \sim \frac{1}{(\sigma_E/E)^3}$
1
0.1
0.01
0.1
1.0
10
$\times 10^{-3}$
σ_E / E

$\varepsilon_N = 10\pi$ mm·mrad $\qquad \sigma_E/E = 10^{-3}$

γ	τ_E^{-1}	τ_H^{-1}	τ_v^{-1}
5	-2.9269	12.0445	13.7651
10	-.3359	.4011	.8022
12	-.0946	.0528	.1885
20	.1725	.2068	-.2068
40	.1480	.6214	-.0888
60	.0969	.6590	-.0388
80	.0667	.6198	-.0200
100	.0483	.5681	-.0116

Variation of Diffusion Rates with γ

Comparison with neighbouring lattices

$\gamma = 100$ $\quad \sigma_E/E = 10^{-3}$ $\quad \varepsilon_N = 10\pi$ mm · mrad

$\bar{\beta}$ \ $\bar{\eta}$	1.5 m	2.0 m	2.5 m	
35 m	.0589	.0515	.0451	E
	.4423	.6951	.9579	H
	-.0124	-.0108	-.0095	V
40 m	.0543	.0483	.0429	E
	.3537	.5681	.7936	H
	-.0130	-.0116	-.0103	V
45 m	.0502	.0454	.0407	E
	.2875	.4717	.6680	H
	-.0135	-.0123	-.0110	V

For a comparison with the lattice
$\bar{\beta} = 30$ m and $\bar{\eta} = 0.5$ m see RHIC-PG-10

Comparison between two lattices

$\bar{\beta}$ / $\bar{\eta}$	30. m / 0.5 m	40. m / 2. m
τ_E^{-1}	.0816 h^{-1}	.0483 h^{-1}
τ_H^{-1}	.0569	.5681
τ_V^{-1}	-.0147	-.0116

$\gamma = 100$

$\sigma_E/E = 1 \times 10^{-3}$

$\varepsilon_N = 10\pi$ mm·mrad

"Gold"