BNL-101588-2014-TECH
RHIC/PG/45;BNL-101588-2013-IR

RHIC Performance And The Choice Of The RF Frequency

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April 1984

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~~RHIC~~

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The attached graphs indicate how the choice of the RF frequency, $h = 6 \times 57$ versus $h = 12 \times 57$ influences the intra-beam scattering and thus the RHIC performance.

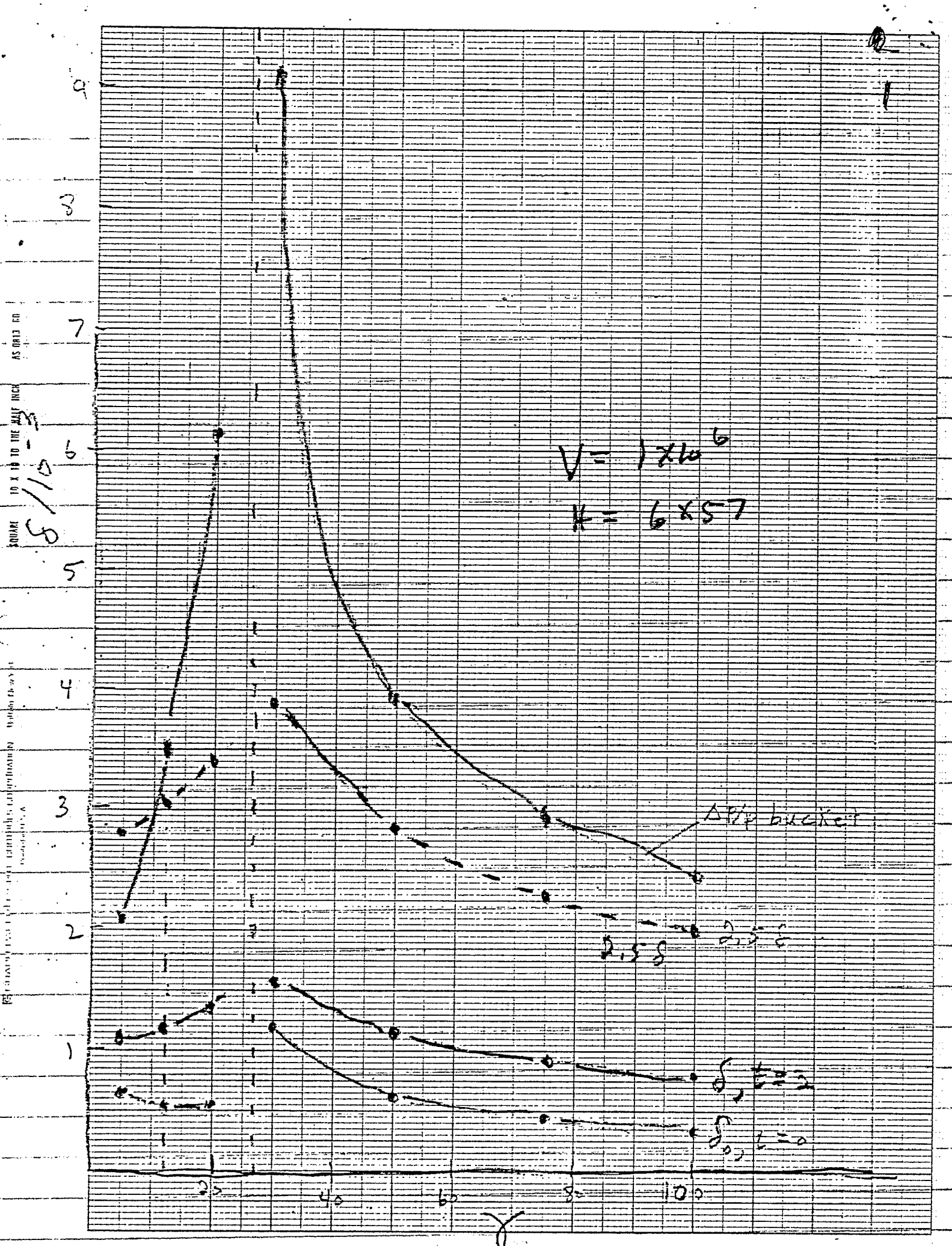
Figure 2 shows that $h = 12 \times 57$ RF requires the voltage of $V = 2 \times 10^6$ compared to $V = 1 \times 10^6$ for $h = 6 \times 57$.

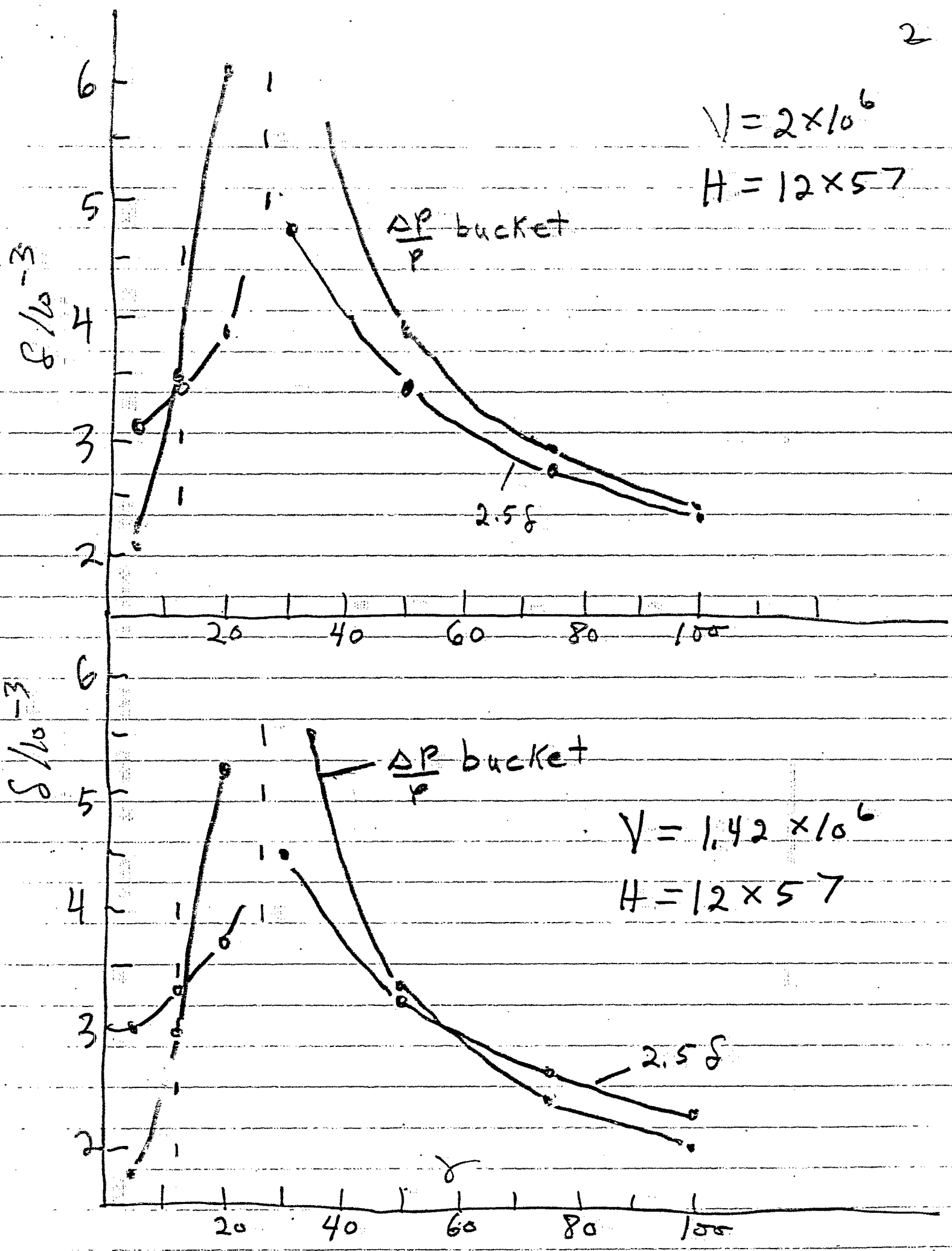
Figure 3 shows that the rms bunch length, σ_ℓ in cms, at $\gamma = 100$ is

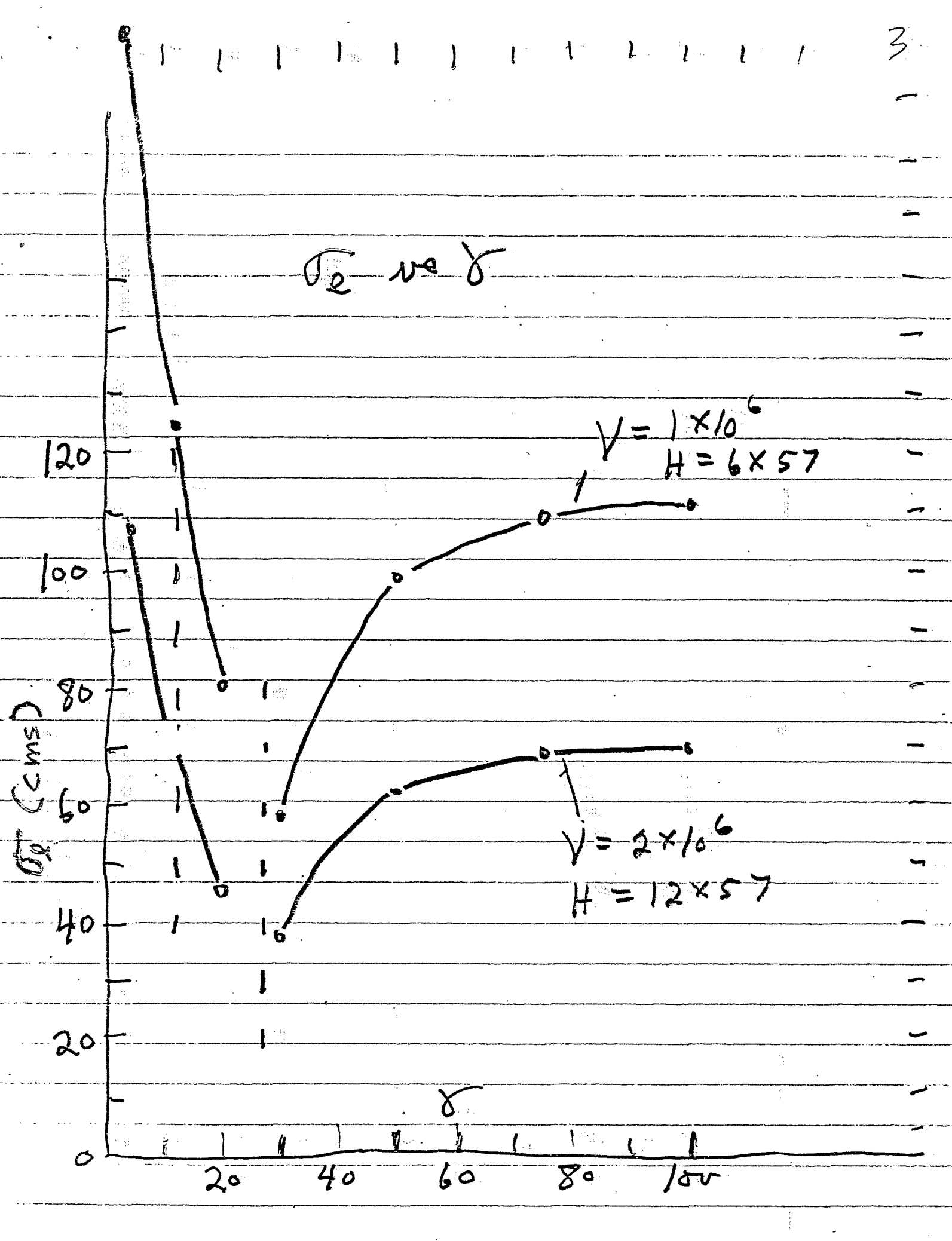
$h = 6 \times 57$ $\sigma_\ell = 110$ cms

$h = 12 \times 57$ $\sigma_\ell = 70$ cms

Figure 4 shows that $h = 12 \times 57$ RF leads to a somewhat large emittance growth, due to the shorter bunch length, and about 10% smaller aperture than that found for $h = 6 \times 57$ RF.


V = 1 x 10^6
K = 6 x 57
ΔP/P bucket
2.5 δ
δ, t = 2
δ, t = 0
20
40
60
80
100
Y


V = 2×10^6
H = 12×57
Δp/p bucket
2.5δ
δ/l0 -3
6
5
4
3
2
20
40
60
80
100
V = 1.42×10^6
H = 12×57
Δp/p bucket
2.5δ
γ


σ_e vs γ
$V = 1 \times 10^6$
$H = 6 \times 57$
$V = 2 \times 10^6$
$H = 12 \times 57$
σ_e (cms)
γ
0
20
40
60
80
100
120

ε vs γ