

?-Spread Due to Random Field Multipoles

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ν -Spread Due To Random Field Multipoles

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BNL

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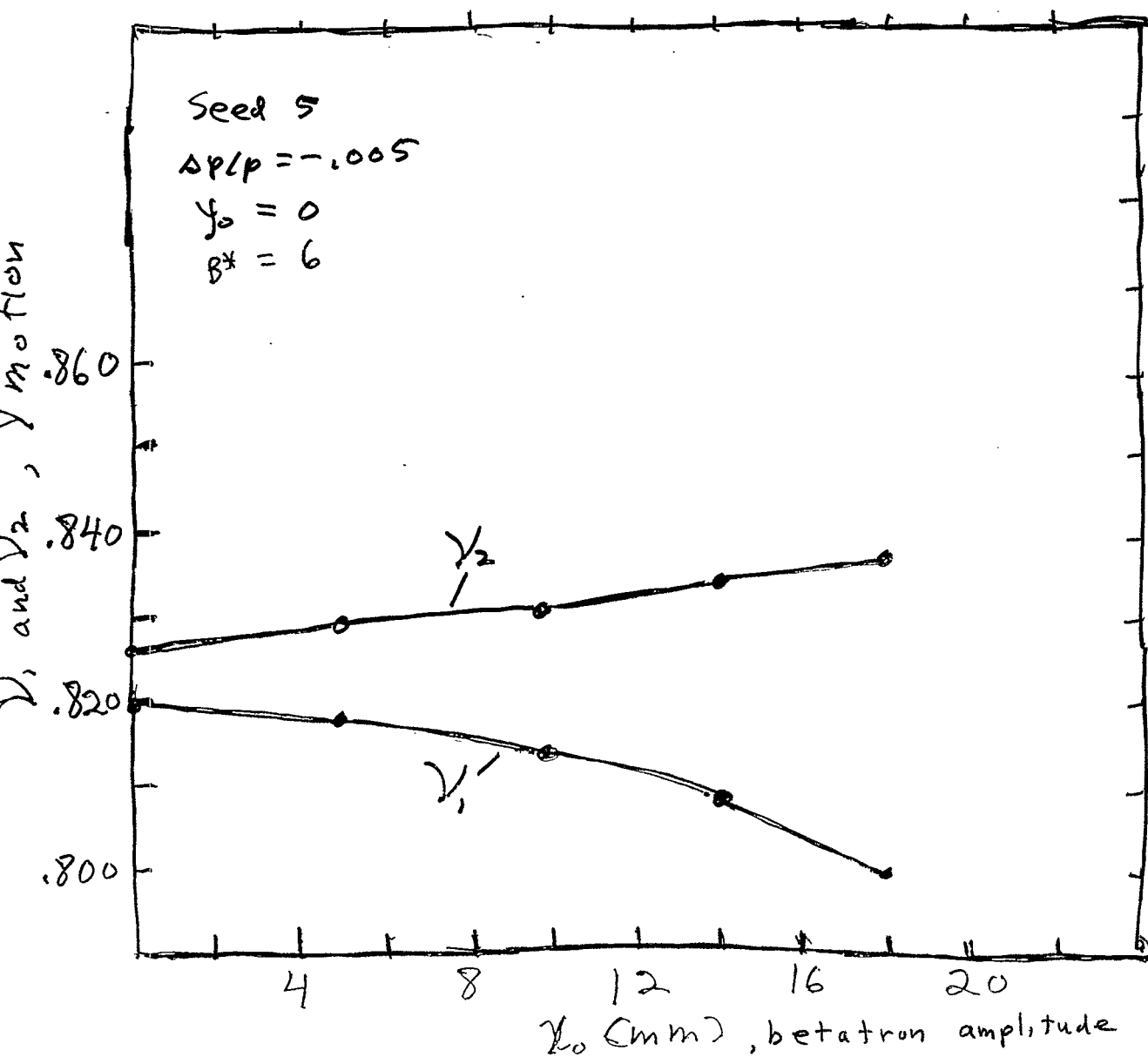
1. Introduction

Random a_k, b_k can produce an appreciable ΔV spread (AD/RHIC-AP-52, 1987)
Largest ΔV occurs when $E_y = 0$

X and Y motion contains 2 V -values, V_1 and V_2 similar to linear coupling. In this case, the shift in the V -values depends on E_x (assuming $E_y = 0$).

The $|V_1 - V_2|$ found for the largest E_x is a V -spread, since smaller $|V_1 - V_2|$ will be found for smaller E_x .

ν -shift due to Random Error Multipoles



2. ΔV spread due to random b_k, a_k

Random Error Distribution No.	Total $\Delta V / 10^{-3}$ $\Delta V = V_1 - V_2 $	$\Delta V / 10^{-3}$ due to random b_k, a_k
1	10	4
2	11	5
3	7	1
4	6	0
5	17	11
6	8	2
7	10	4
8	11	5
9	8	2
10	8	2

$$\beta^* = 6, \quad \chi_0 = 9.8 \text{ mm}, \quad \gamma_0 = 0, \quad \varepsilon_t = 1.92, \quad \gamma = 30, \quad \frac{\Delta p}{p} = \pm 0.005$$

When $b_k = a_k = 0$, $V_x = 1.826$, $V_y = 1.820$, at $\frac{\Delta p}{p} = \pm 0.005$,
 ΔV due to random b_k, a_k equals total $\Delta V = 6 \times 10^{-3}$.

ΔV , break down

ΔV spread appears due to

a_2, b_2 , a_3, b_3 and a_4, b_4 .

Some correction of ΔV appears possible

$$\begin{aligned} a_K = b_K = 0, \quad K \geq 5 & , \quad \Delta V_T = 16 & , \quad \Delta V_{\text{ran}} = 10 \\ a_K = b_K = 0, \quad K \leq 4 & , \quad \Delta V_T = 6 & , \quad \Delta V_{\text{ran}} = 0 \end{aligned}$$

Sources of ΔV

a_2, b_2 only

$$\Delta V_T = 9, \quad \Delta V_{\text{ran}} = 3$$

a_3, b_3 only

$$\Delta V_T = 12, \quad \Delta V_{\text{ran}} = 6$$

a_4, b_4 only

$$\Delta V_T = 8, \quad \Delta V_{\text{ran}} = 2$$

Correctability of ΔV

$$a_3 = b_3 = 0, \text{ all other } b_K, a_K \text{ present}, \quad \Delta V_T = 11, \quad \Delta V_{\text{ran}} = 5$$

$$b_2 = b_3 = b_4 = 0, \quad " \quad " \quad , \quad \Delta V_T = 9, \quad \Delta V_{\text{ran}} = 3$$

The reduction in ΔV of about 8 in this case seems surprisingly large. It might be safer to assume a possible reduction of about 5.