BNL-101739-2014-TECH
RHIC/AP/84;BNL-101739-2013-IR

?-Spread Due to Random Field Multipoles

G. Parzen

July 1989

Collider Accelerator Department
Brookhaven National Laboratory

U.S. Department of Energy
USDOE Office of Science (SC)

DISCLAIMER

AD/RHIC-AP-84

ν-Spread Due To Random Field Multipoles

G. Parzen

BNL

July 12, 1989

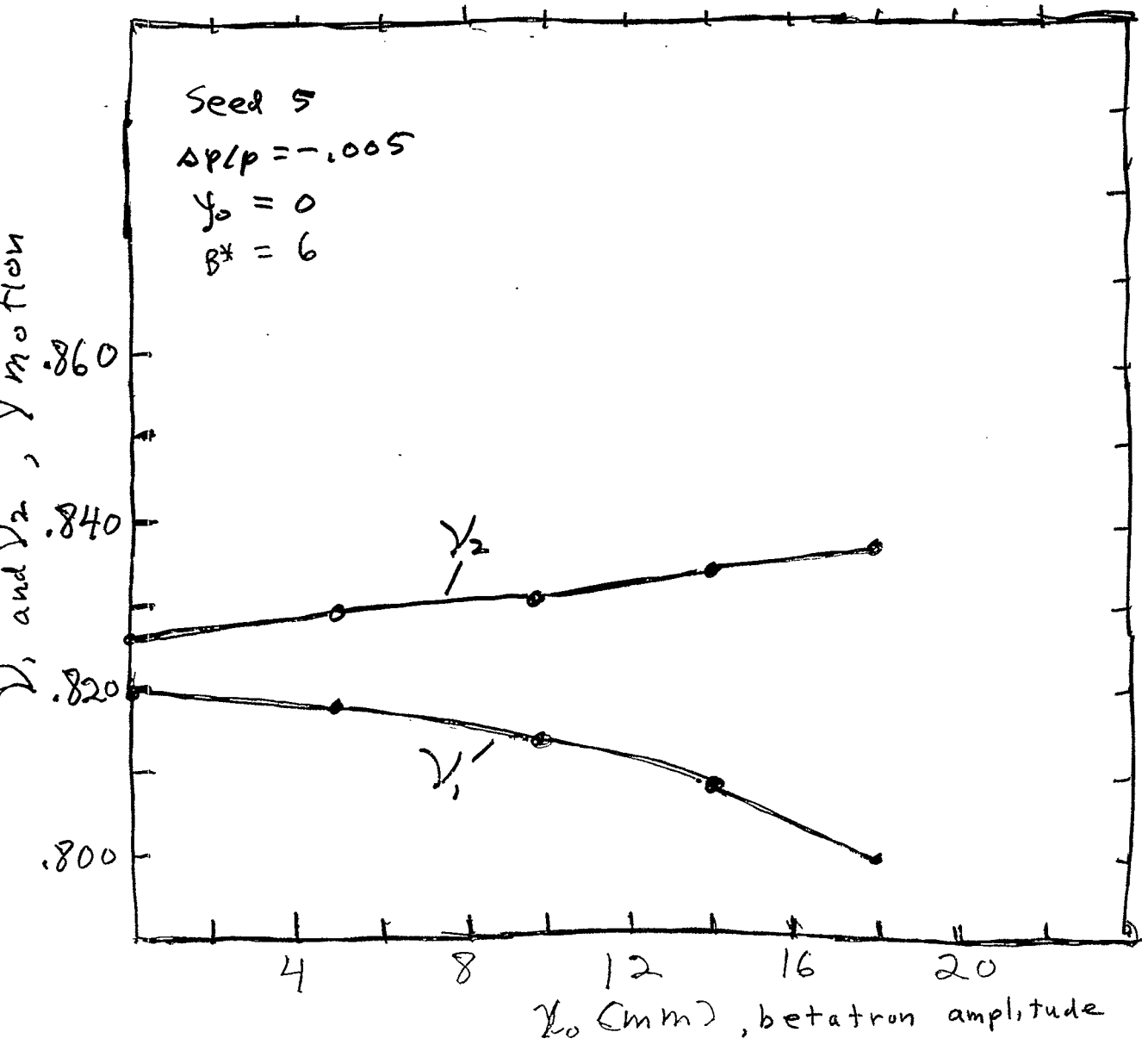
1. Introduction

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

x and y motion contains 2 ν-values, ν_1 and ν_2 similar to linear coupling. In this case, the shift in the ν-values depends on ε_x (assuming $\varepsilon_y = 0$).

The $|\nu_1 - \nu_2|$ found for the largest ε_x is a ν-spread, since smaller $|\nu_1 - \nu_2|$ will be found for smaller ε_x.

ν-shift due to Random Error Multipoles



2. $\Delta\nu$ spread due to random b_k, q_k

Random Error Distribution No.	Total $\Delta\nu/10^{-3}$ $\Delta\nu = \lvert\nu_1 - \nu_2\rvert$	$\Delta\nu/10^{-3}$ due to random b_k, q_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

$\beta^* = 6$, $x_0 = 9.8$ mm, $y_0 = 0$, $\varepsilon_t = 1.92$, $\gamma = 30$, $\frac{\Delta p}{p} = \pm .005$

When $b_k = q_k = 0$, $\nu_x = .826$ $\nu_y = .820$, at $\frac{\Delta p}{p} = -.005$

$\Delta\nu$ due to random b_k, q_k equals Total $\Delta\nu - 6 \times 10^{-3}$.

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

$a_K = b_K = 0$, $K \geq 5$, $\Delta V_T = 16$, $\Delta V_{ran} = 10$
$a_K = b_K = 0$, $K \leq 4$, $\Delta V_T = 6$, $\Delta V_{ran} = 0$

Sources of ΔV

a_2, b_2 only	$\Delta V_T = 9$,	$\Delta V_{ran} = 3$
a_3, b_3 only	$\Delta V_T = 12$,	$\Delta V_{ran} = 6$
a_4, b_4 only	$\Delta V_T = 8$,	$\Delta V_{ran} = 2$

Correctability of ΔV

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

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

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.