AD/RHIC-AP-75

Dynamic aperture for lattices with some $\beta^* = 2$ insertions

G. Parzen

BNL

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The introduction of some $\beta^* = 2$ insertions appears to produce a sudden drop in the dynamic aperture.

This is in contrast to a previous result (G. Parzen, AD/RHIC-24) for a previous lattice with some $\beta^* = 3$ insertions, where the dynamic aperture decreased almost linearly with the number of $\beta^* = 3$ insertions

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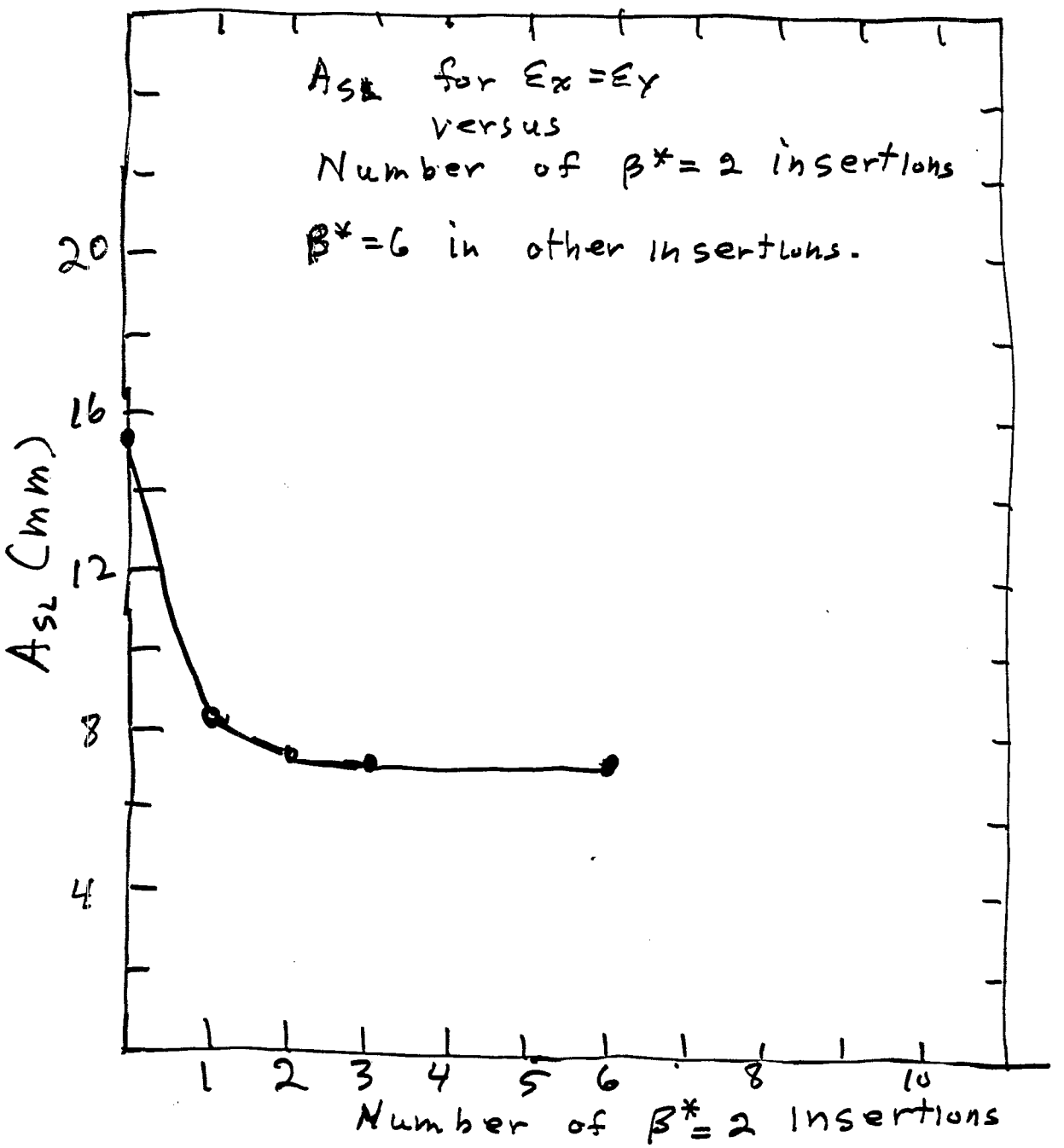
With one $\beta^* = 2$ insertion, A_{SL} for $\varepsilon_x = \varepsilon_y$ drops from $A_{SL} = 15.5$ mm for 6 $\beta^* = 6$ insertions to $A_{SL} = 8.5$ mm with 1 $\beta^* = 2$ insertion, and to $A_{SL} = 7.5$ mm for 6 $\beta^* = 2$ insertions

Note that the 6σ rule requires $A_{SL} = 10$ mm for 10 hr operation at $\gamma = 100$ for Au when $\varepsilon_{x,0} = 60$. Thus even one $\beta^* = 2$ insertion violates the 6σ rule here.

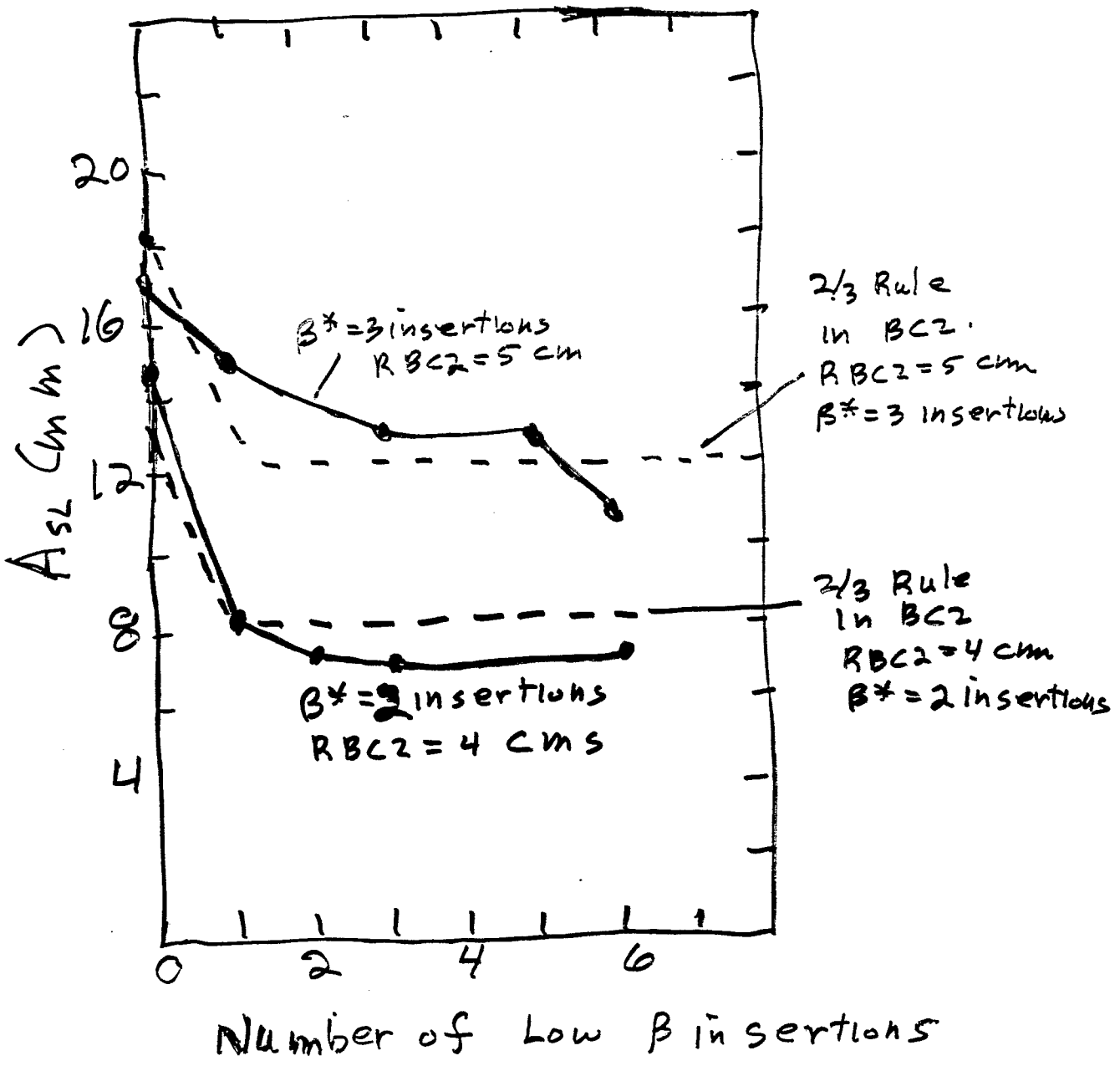
For $\varepsilon_{x,0} = 10$, $A_{SL} = 7.1$ mm is required for 10 hr operation at $\gamma = 100$ for Au.

The Lattices with some $\beta^* = 2$ insertions were provided by S.Y. Lee.


A_{s2} for $\varepsilon_x = \varepsilon_y$
versus
Number of $\beta^* = 2$ insertions
$\beta^* = 6$ in other insertions.
A_{s2} (mm)
20
16
12
8
4
1
2
3
4
5
6
8
10
Number of $\beta^* = 2$ insertions

Possible Interpertation (2/3 rule in BC2)

Assume A_{SL} is determined by BC2 and is given by particle in BC2 reaching 2/3 of RBC2 in any BC2. This gives $A_{SL} = 8.4$ mm for RBC2 = 4 cm and $B^* = 2$.

For RBC2 = 5 cm and $B^* = 3$, this 2/3 rule gives $A_{SL} = 12.5$ mm.

2/3 Rule in BC2 Interpertation