IBS in ATF DR

Comments on

- $\varepsilon_{y,real} < \varepsilon_{y,measured}$?

- $\Delta\varepsilon_y$ due to IBS. $\frac{\Delta\varepsilon_y}{\Delta\varepsilon_x}$ bigger than expected ?

from simulation results.

ATF measurement

(Stronger IBS than calculated ?

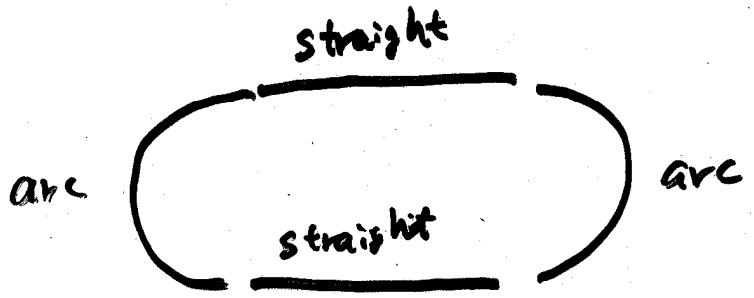
$\Delta\varepsilon_y/\varepsilon_y$ bigger than $\Delta\varepsilon_x/\varepsilon_x$?)

IBS

$\Delta\varepsilon_x \sim \langle \mathcal{H}_x \rangle$: arc dominant

$\because \langle \mathcal{H}_x \rangle_{arc} >> \langle \mathcal{H}_x \rangle_{straight}$

$\Delta\varepsilon_y \sim \langle \mathcal{H}_y \rangle$: arc ≈ straight.



No wiggler.

↓

$$\frac{\Delta\varepsilon_y}{\varepsilon_{yo}} > \frac{\Delta\varepsilon_x}{\varepsilon_{xo}}$$

⊙ BPM in straight sections are usually not as good as in arcs.

some of them are ignored,

some of them have poor resolution.

↓

may be $\langle \mathcal{H}_y \rangle_{straight} > \langle \mathcal{H}_y \rangle_{arc}$

⇓

$\frac{\Delta\varepsilon_y}{\varepsilon_{yo}}$ bigger

Simulation of DR tuning

Magnet misalignment

Measured

+ additional random misalignment, r.m.s.= 30 μm

BPM misalignment

Random offset: 0.3 mm w.r.t. nearest magnet

Random rotation: 0.02 rad.

BPM offset error affect COD correction

BPM rotation error affect Dispersion correction and Coupling correction.

Corrections

1. COD, 2. V-COD+Dispersion, 3. Coupling

⇒ IBS calculation using SAD

COD correction: using steering magnets, minimize

$$\sum_{BPM} x^2 \text{ and } \sum_{BPM} y^2$$

Vertical COD-dispersion correction: using steering magnets, minimize

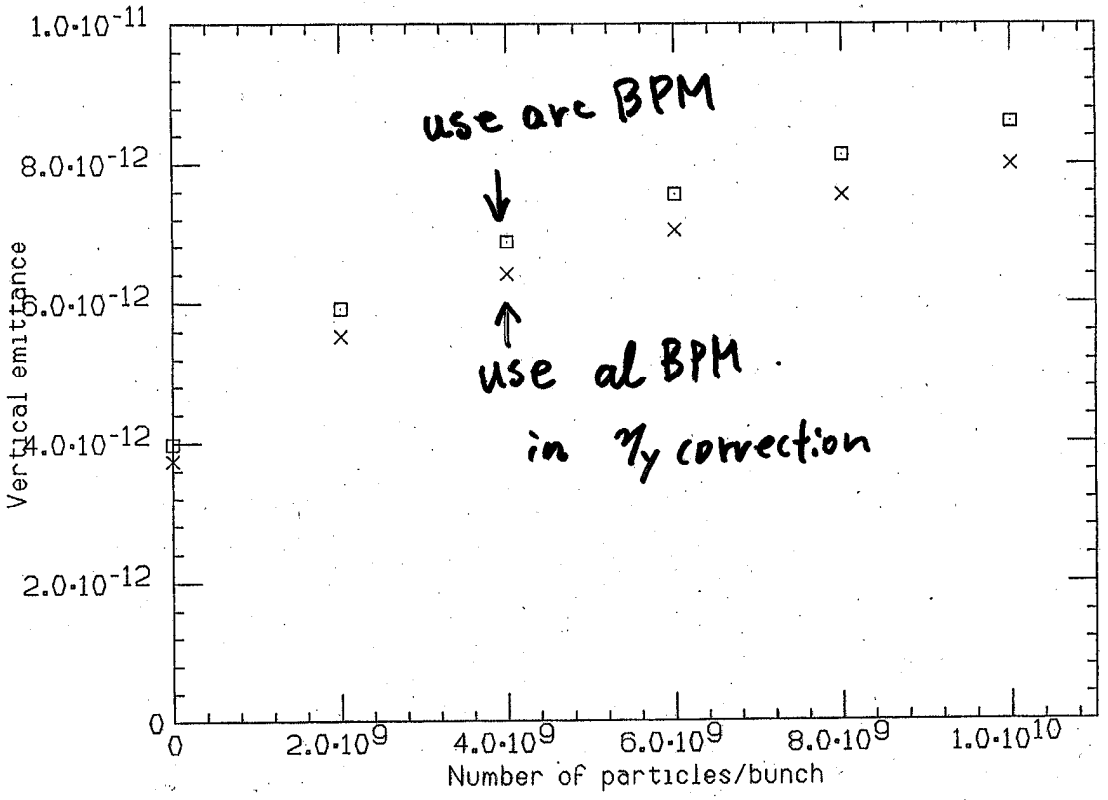
$$\sum_{BPM} y^2 + r^2 \sum_{BPM} \eta_y^2$$

compare { use all BPM
use only arc BPM

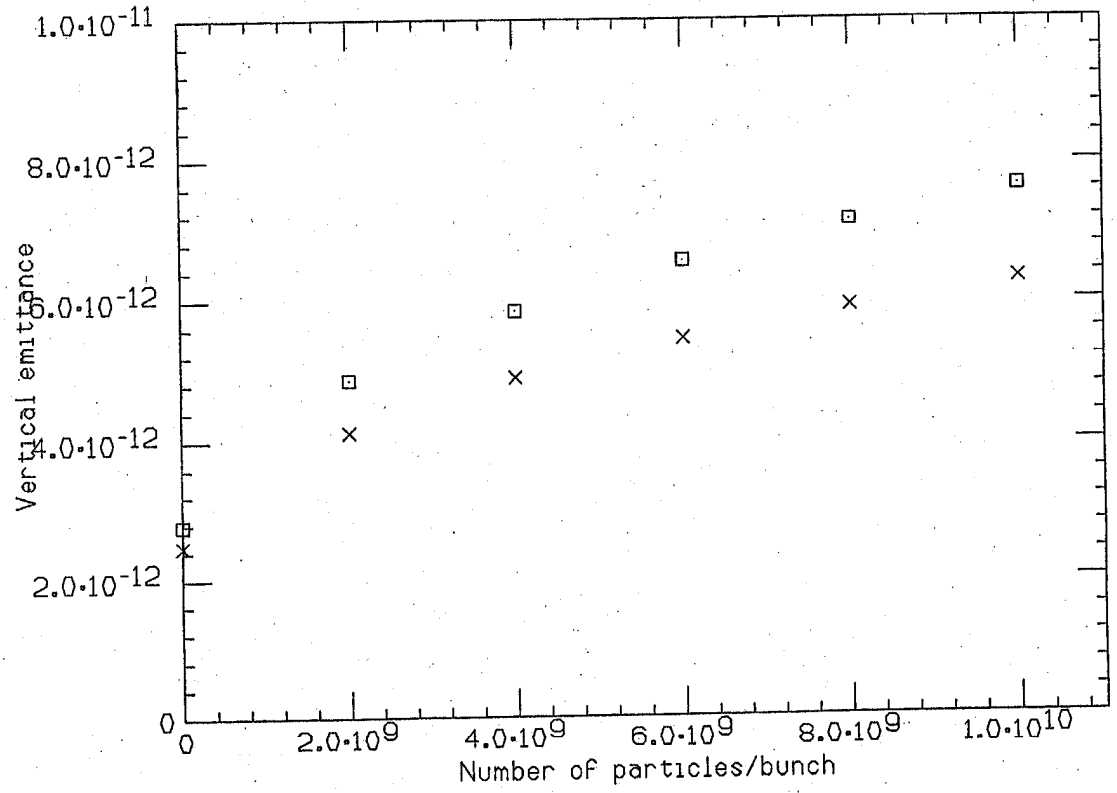
Coupling correction: using skew quads, minimize

$$C_{xy} \equiv \sqrt{\sum_{H-steers} \left(\sum_{BPM} \Delta y^2 \Big/ \sum_{BPM} \Delta x^2 \right)} \Big/ N_{steer}$$

ε_y vs. N

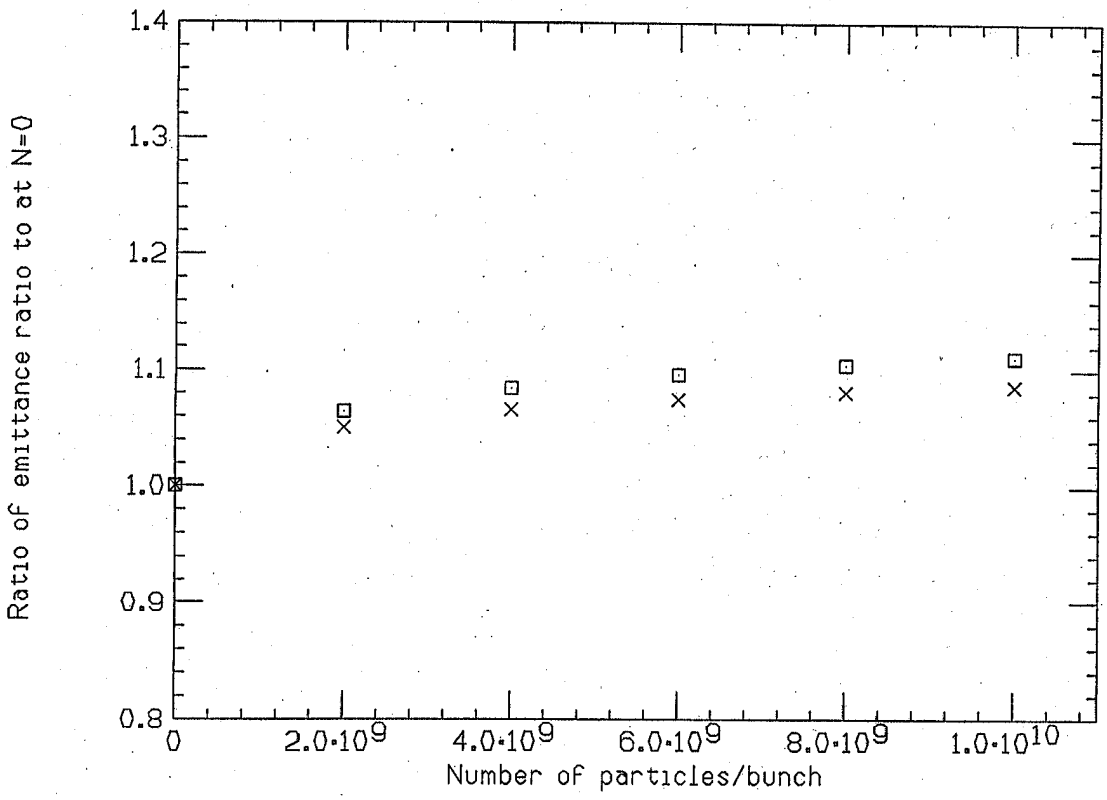


seed 1

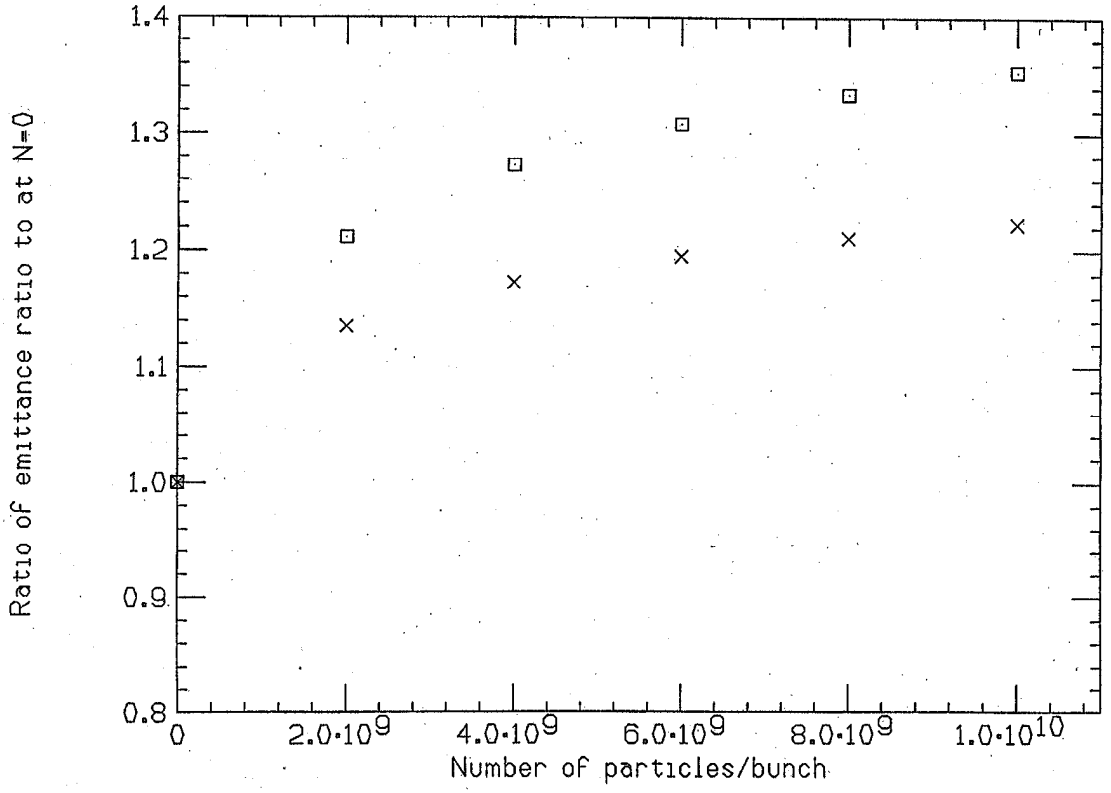


seed 2

$\frac{\varepsilon_y}{\varepsilon_x}(N=$ [redacted] $)/\frac{\varepsilon_y}{\varepsilon_x}(N=0)$ vs. N.



seed 1

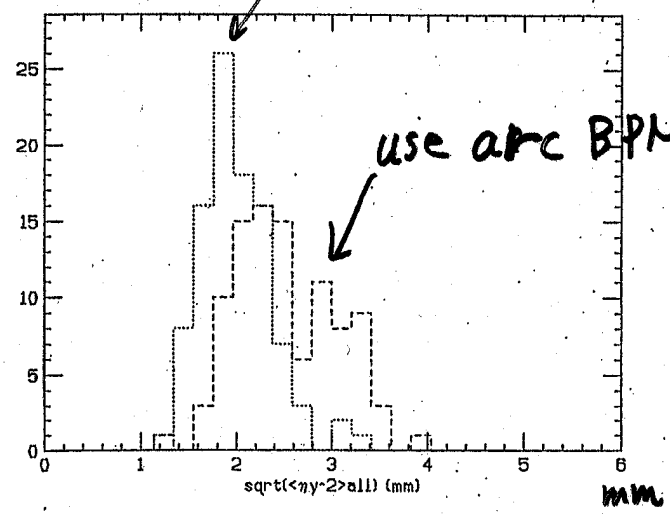


seed 2

use all BPM

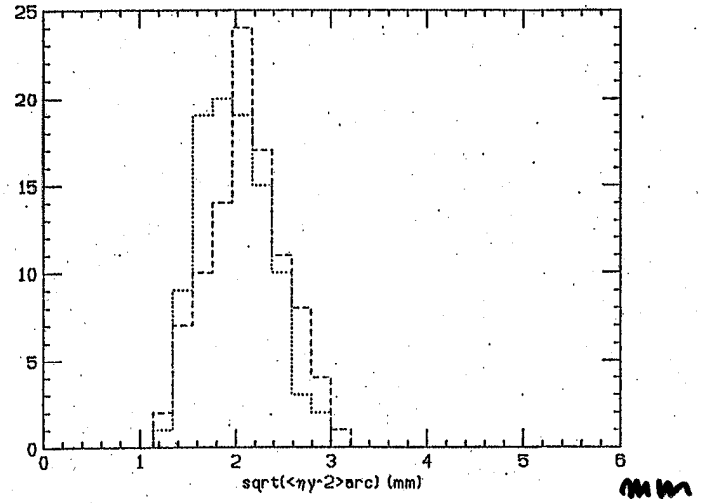
$\sqrt{<\eta_y^2>_{all}}$

use arc BPM



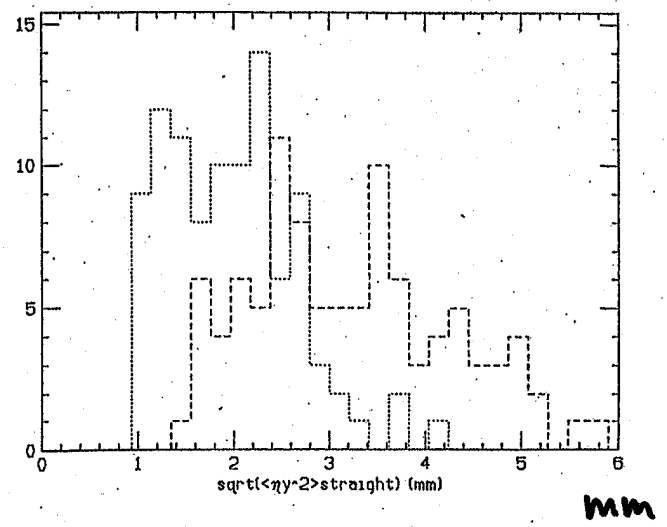
mm

$\sqrt{<\eta_y^2>_{arc}}$



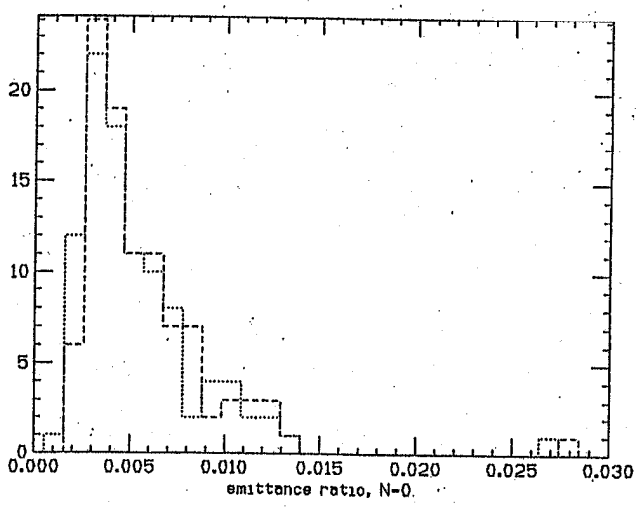
mm

$\sqrt{<\eta_y^2>_{straight}}$

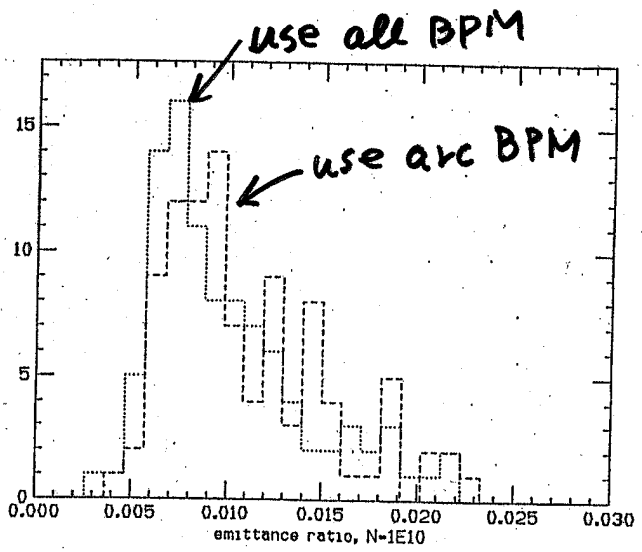


mm

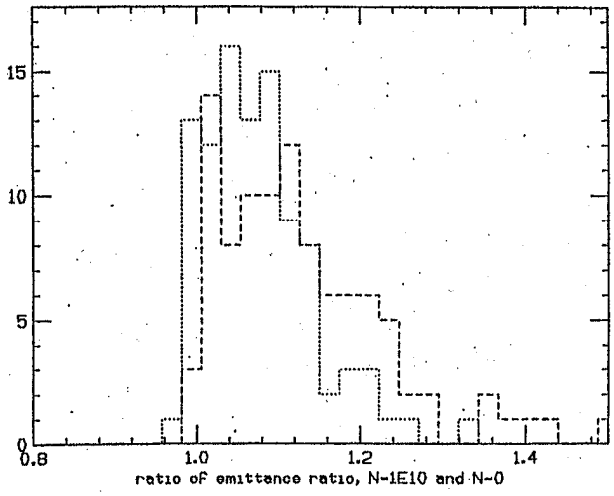
$\frac{\varepsilon_y(N=0)}{\varepsilon_x(N=0)}$

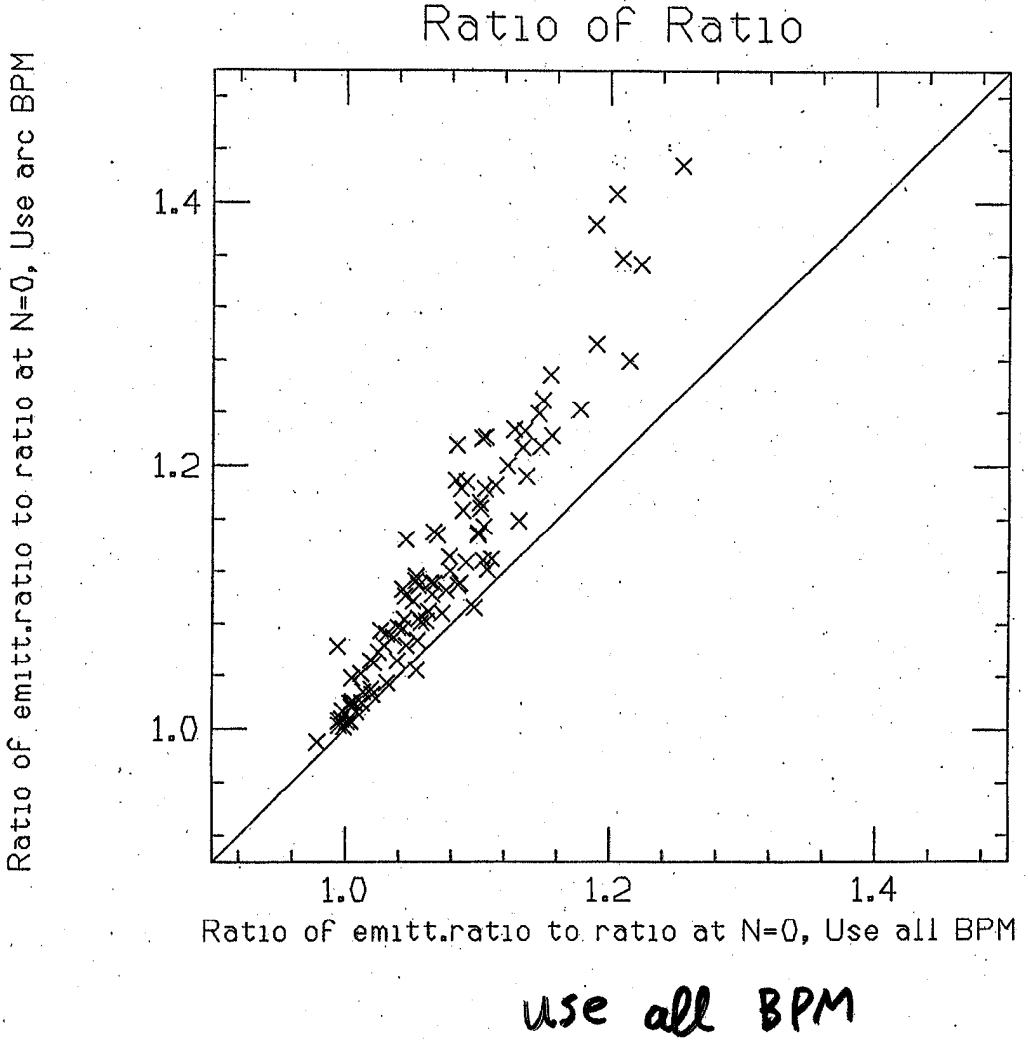


$\frac{\varepsilon_y(N=10^{10})}{\varepsilon_x(N=10^{10})}$



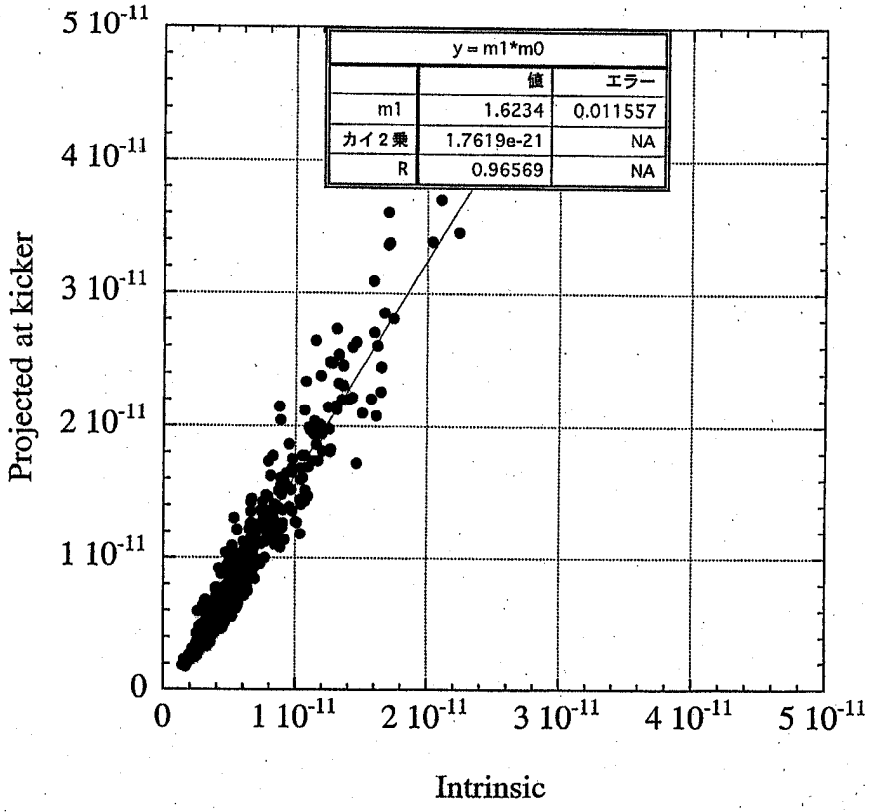
$\frac{\varepsilon_y}{\varepsilon_x}(N=10^{10}) \Big/ \frac{\varepsilon_y}{\varepsilon_x}(N=0)$

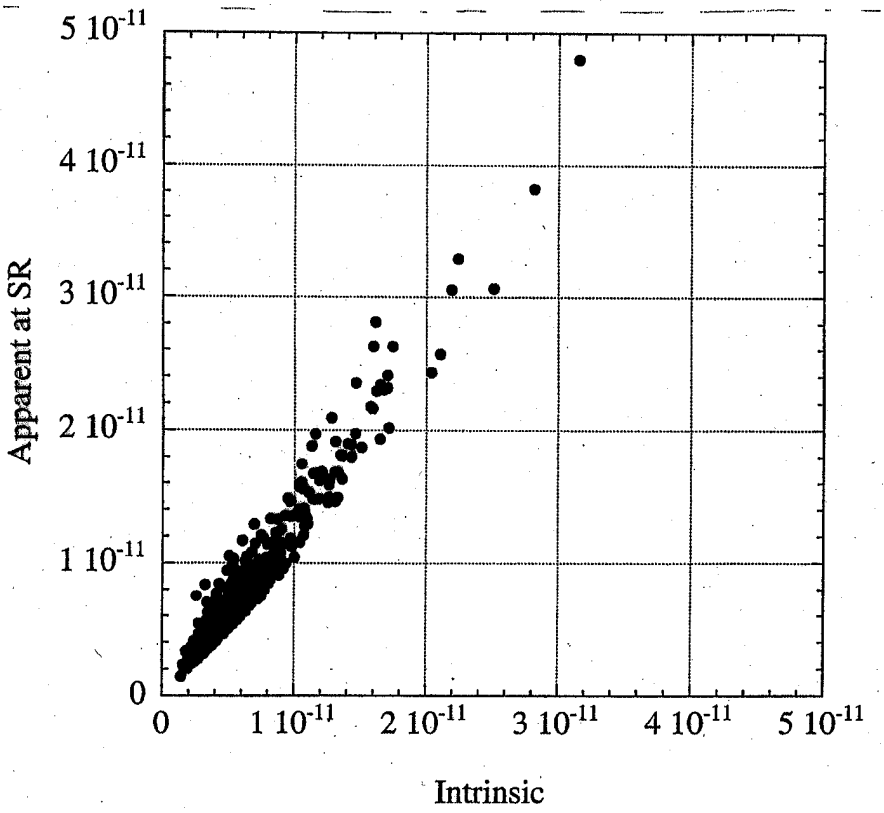




use arc BPM.

use all BPM





$\varepsilon_{y,\text{real}} \sim \frac{1}{1.5}\varepsilon_{y,\text{apparent}}$ due to residual x-y coupling (local)