Recent result in ATF Damping Ring

Kiyoshi KUBO (KEK), 2001.7.6. Snowmass

Tuning for Low emittance

COD correction: using steering magnets, minimize

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

Vertical COD-dispersion correction: using steering magnets, minimize

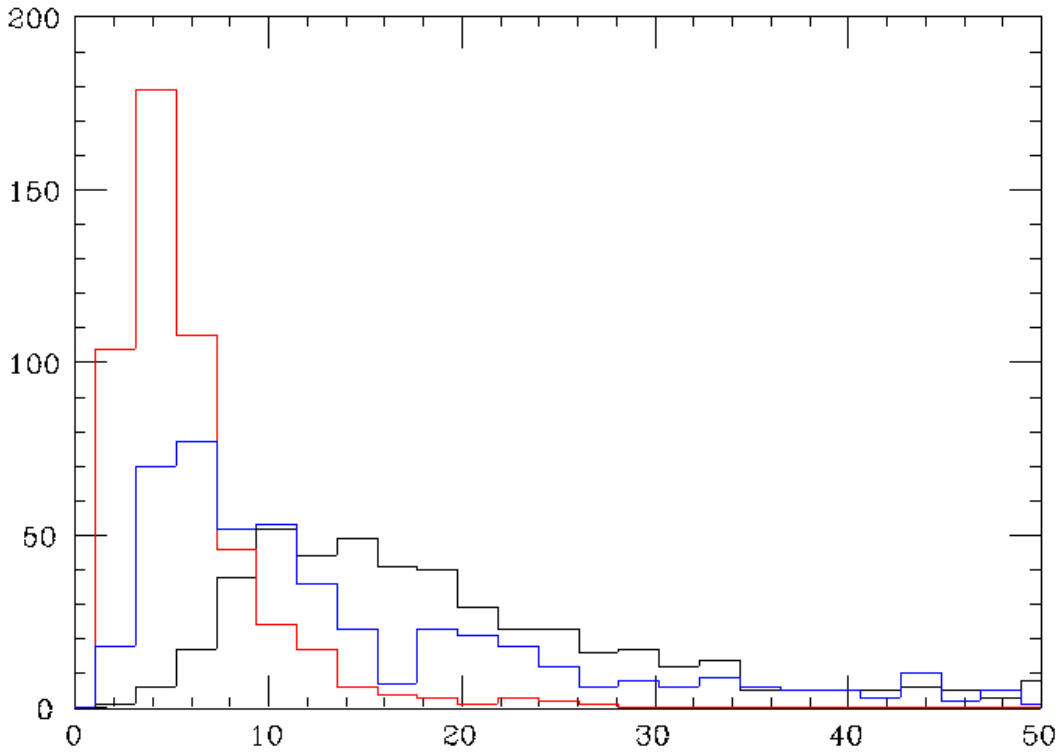
$$\sum_{BPM} y^2 + r^2 \sum_{BPM} \eta_y^2$$

Coupling correction: using skew quads, minimize

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

Simulated vertical emittance after each correction

	Average	<1.1E-11 rad-m
COD	2.28 (E-11 rad-m)	20 %
V COD-dispersin	1.67	51 %
Coupling	0.58	91 %



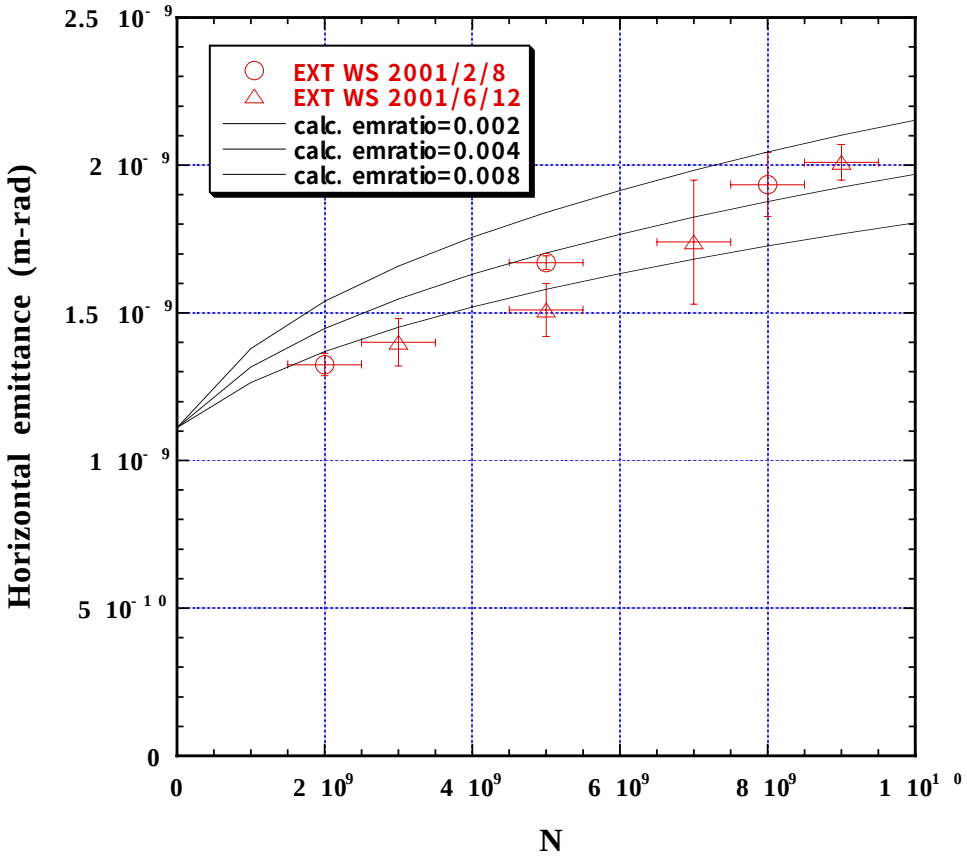
Misalignment : as measured

+ random 30 micron offset

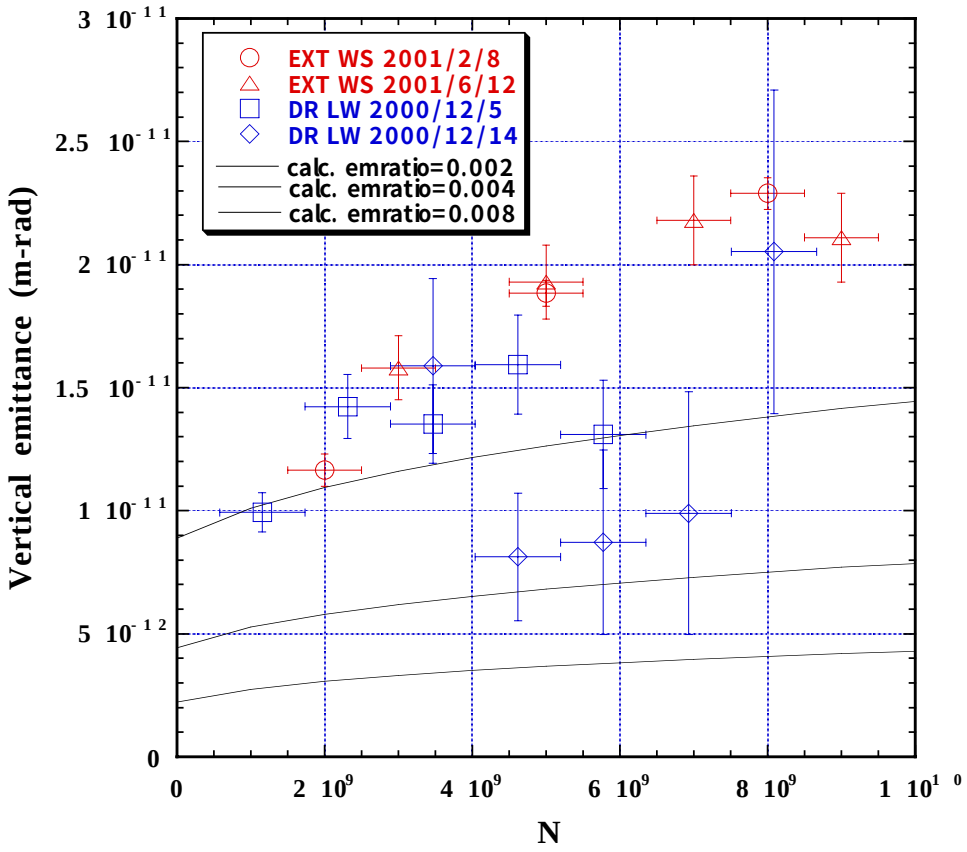
+ random 0.3 mrad. rotation

BPM error : offset 300 micron, rotation 0.02 rad.

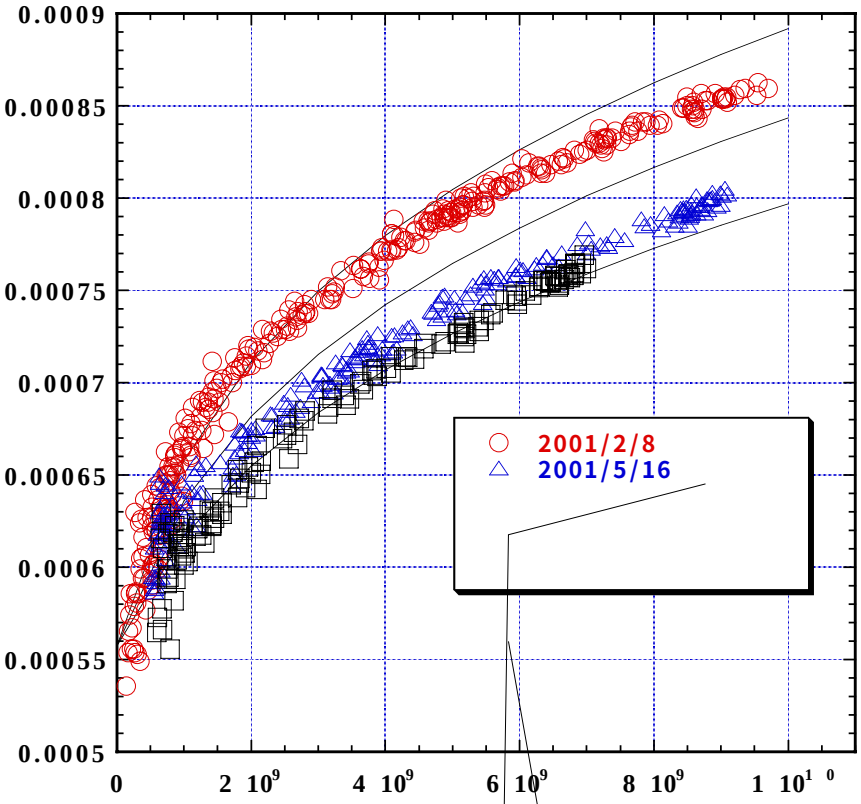
Horizontal emittance vs. Intensity



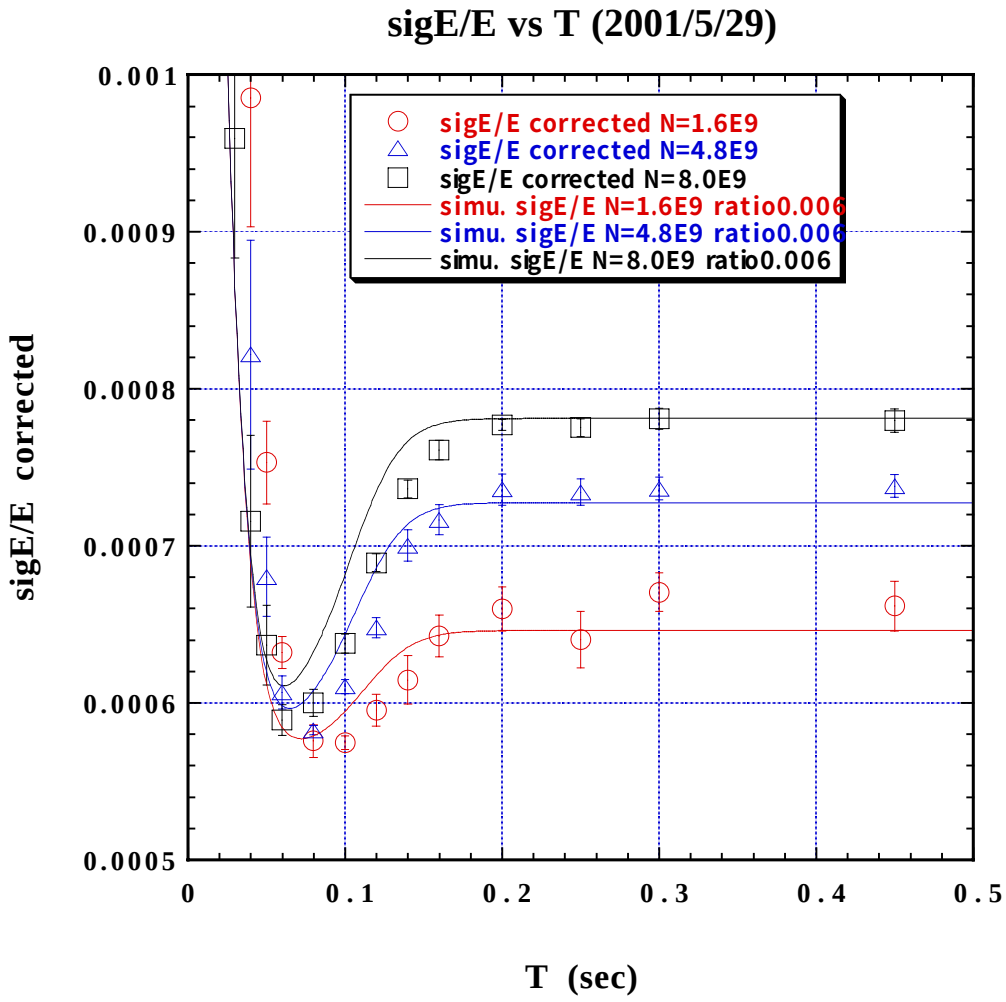
Vertical emittance vs. Intensity



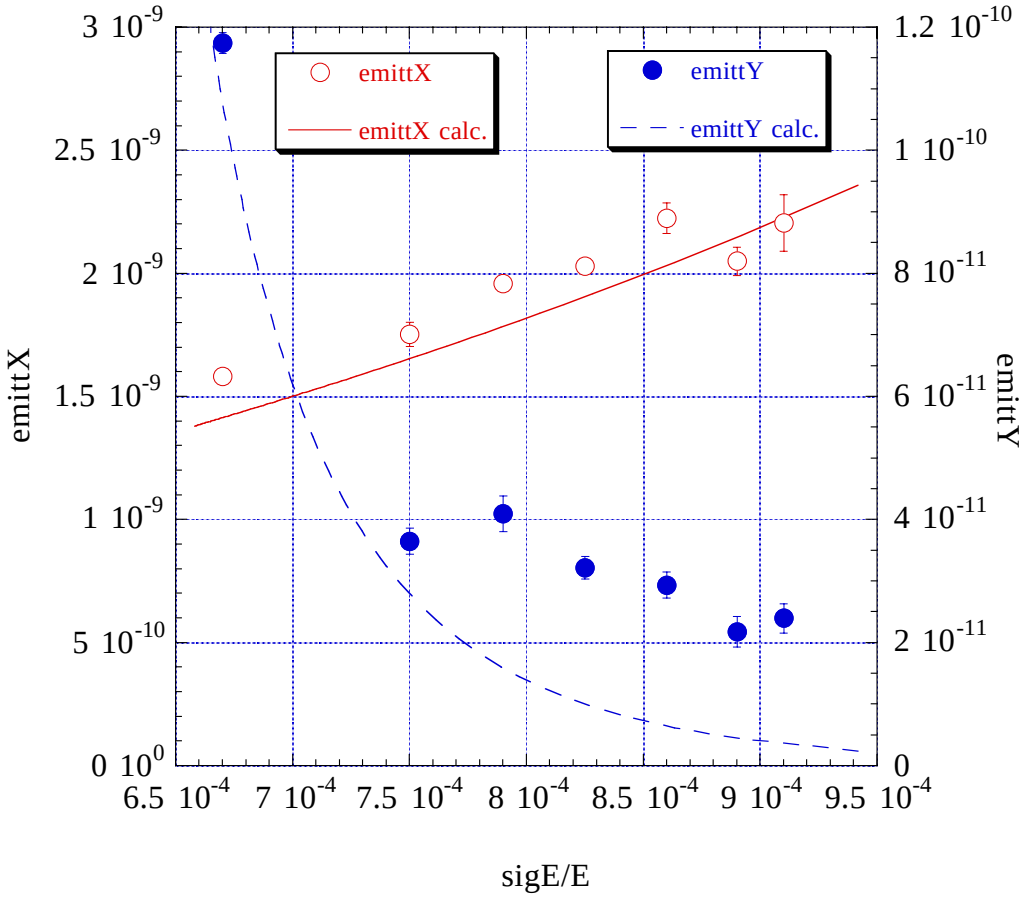
Energy spread vs. Intensity



Energy Spread vs. Store time



Emittance vs. Energy Spread



Summary of single bunch emittance

Damping ring tuning

Small v-dispersion and small x-y coupling: achieved

Energy spread and horizontal emittance

Agree well with calculation at low intensity

Dependence on intensity

Explained by intra-beam scattering

Suggesting low vertical emittance

Vertical emittance

$\varepsilon_y / \varepsilon_x$ ~ 0.01 achieved.

Strongly depend on intensity, may be explained by IBS.

Still some problems in beam size measurement

Multibunch operation

Started in Nov. 2000

Gun out: 1.2×10^{11}, 0.78 Hz, 18 bunch

Energy compensation in Linac: successful

Ring and Extraction line:

5×10^{10}, 18 bunch ($\sim3\times10^{9}$/bunch)

Emittance, X: 1.6E-9, Y: 3.0E-11 m-rad

Intensity uniformity and injection efficiency should be improved

Photo cathode RF-gun study started

Instrumentation for multibunch

Multibunch wire scanner measurement:

commissioned

Multibunch BPM : under development

Multibunch laser wire measurement: started

Other activities in ATF

OTR (optical transition radiation) monitor

ODR (optical diffraction radiation) monitor

Polarized positron production

- gamma-ray generated from laser-electron scattering

Double kicker system for stable extraction study