ATF Status

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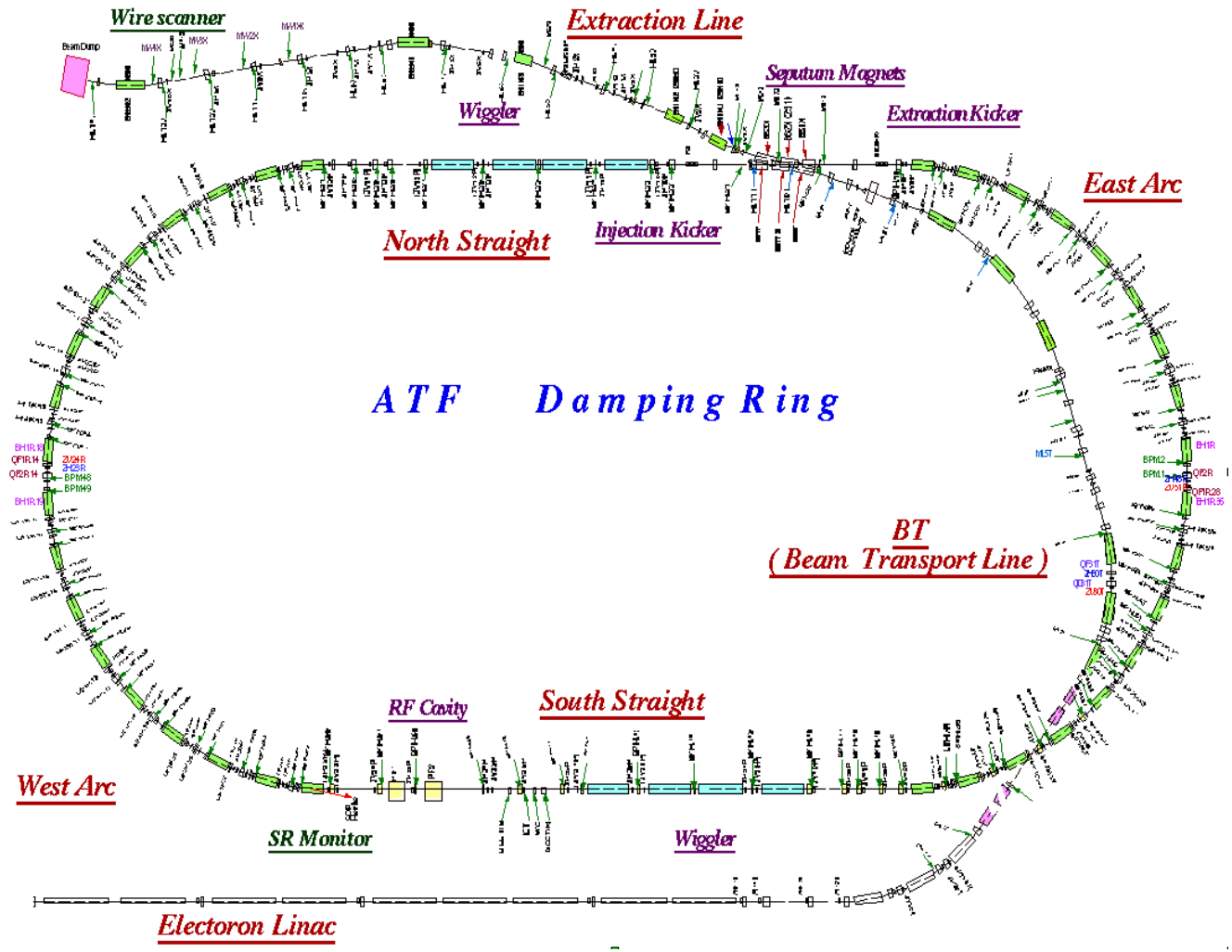
for Naito Takashi and ATF collaboration

Contents

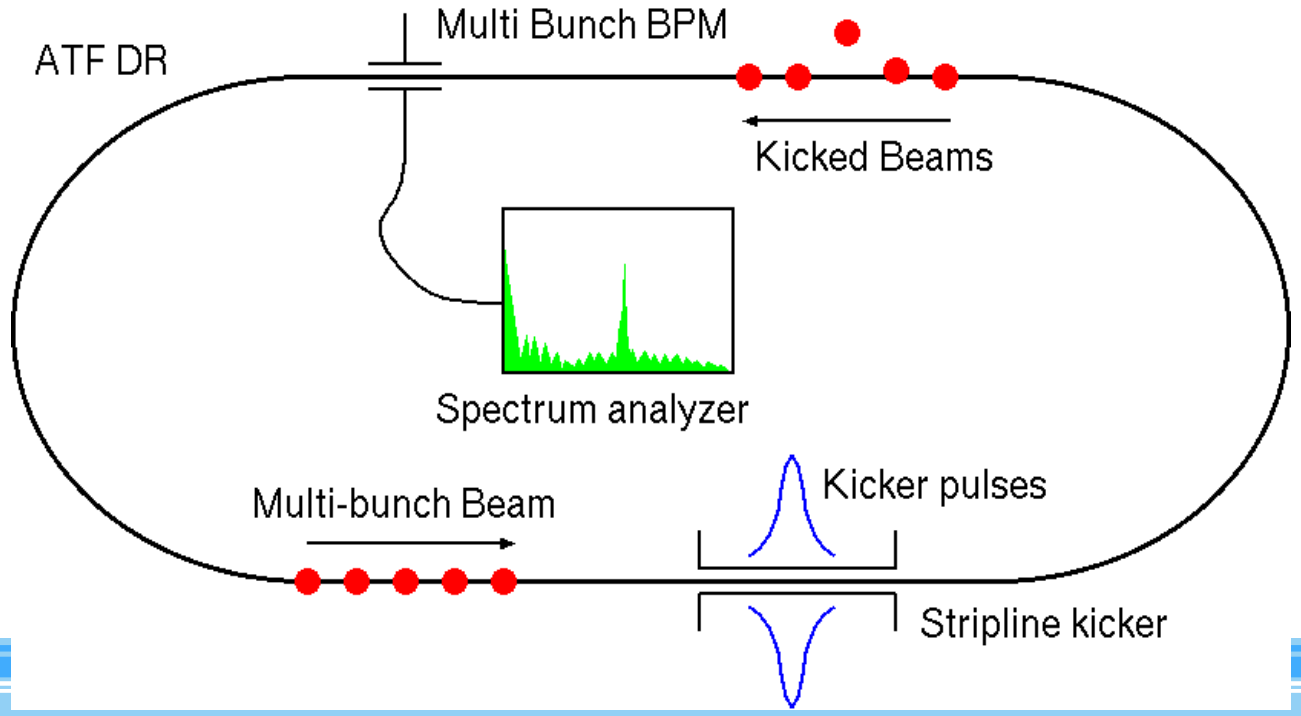
ATF Overview

- E = 1.28GeV
- N = 2x10^{10} e/bunch
- 1 ~ 20 bunches
- $\varepsilon_{x/y}$ - 1.5nm/4pm
- 20 weeks/year
- 2 weeks/month



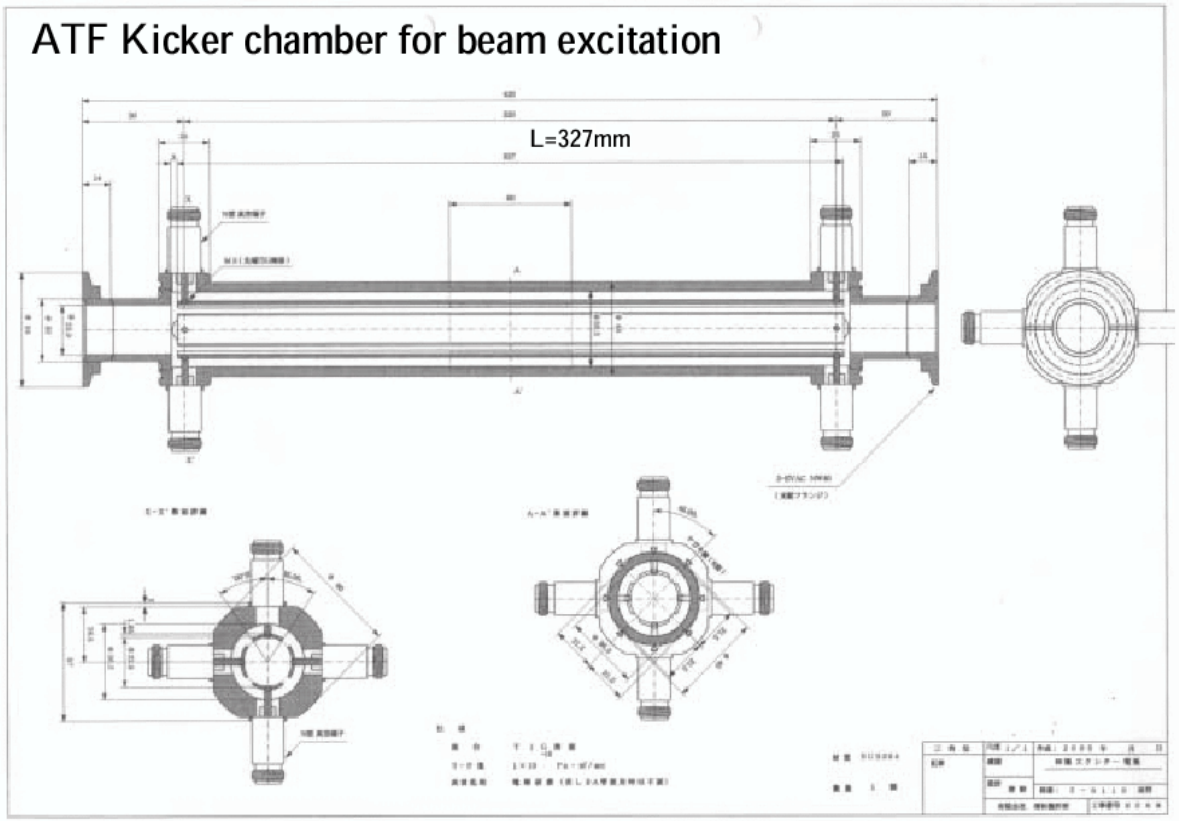
Demonstration for the Fast Kicker

- It is a key component to determine DR design.
- A strip line kicker deflects Multi-bunch beam to qualify the shortest bunch spacing for the individual beam handling.
- The kick is observed by a multi-bunch BPM as a betatron motion .



ATF Strip-line kicker

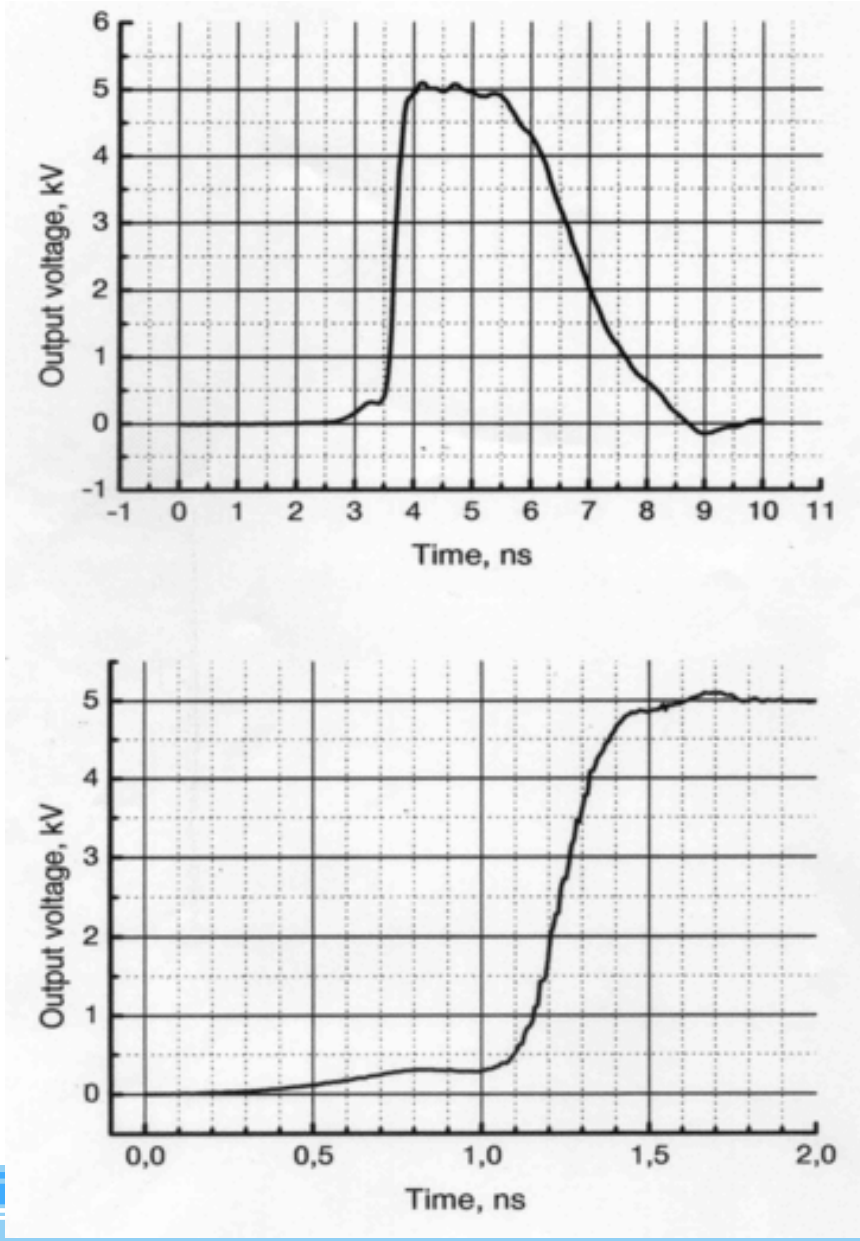
- 2.2ns rise/fall time determined by the propagation.
- 327mm length.
- 10 kV (+-5kV).
- Kick angle ~ 60 urad



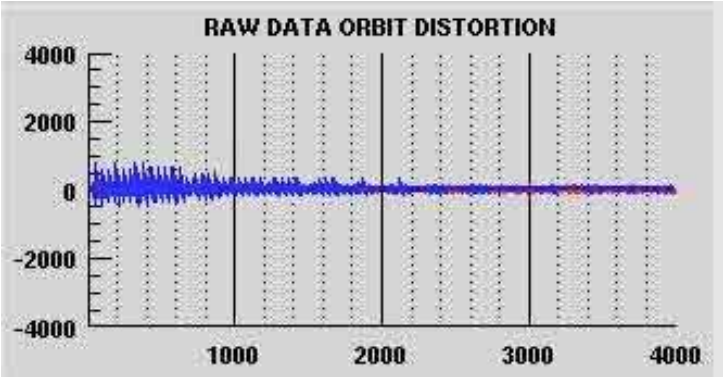
Pulse Power Supply

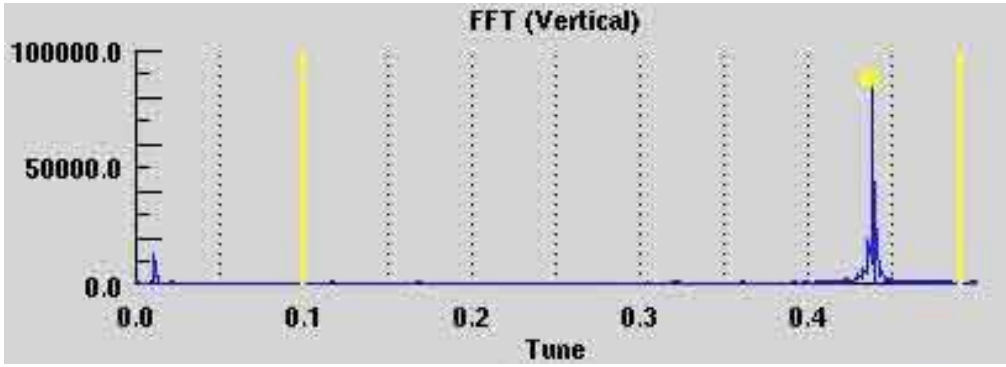
FPG 5-1PM(FID Technology)

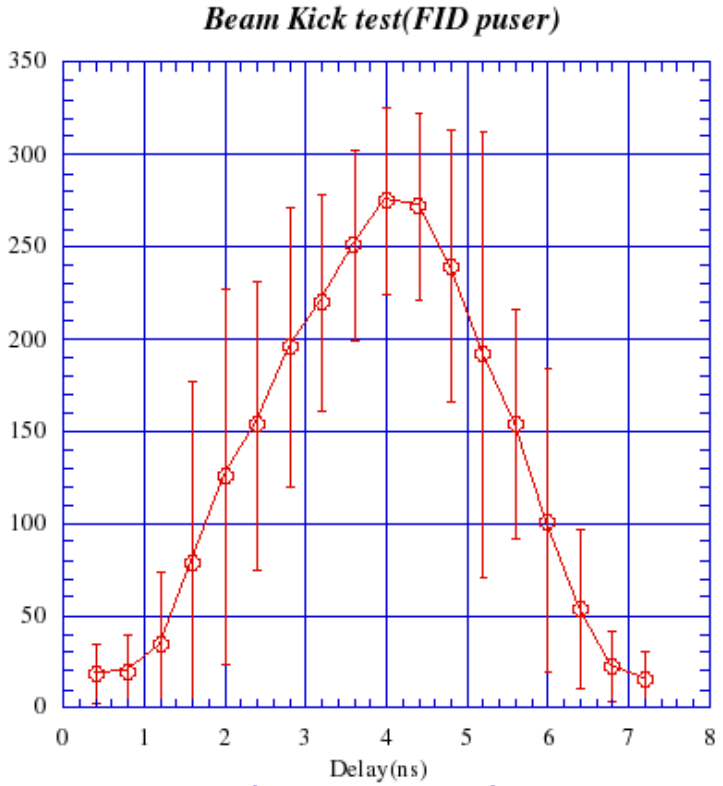
Max voltage : 5kV
Pulse width : ~3ns
Rise time : ~300ps
Rep. Rate : < 1kHz



Measurement Result (Preliminary)







Amplitude of the betatron frequency as a function of the kicker timing.

The clear betatron peak was observed by the turn-by-turn BPM. The kicker pulse envelope was measured by scanning the pulse timing.

Wiggler Operation

- Large COD had been observed by turning on the four wiggler magnets due to the imperfection of the half end poles.
- Auxiliary power supplies were installed to correct the half pole in Summer of 2004.
- The study with the wigglers has been started since last October.

Wiggler Magnets

- Length : 2.1 m
- Period : 0.4 m
- Gap : 20 mm
- B_{peak} : 1.6 T
- Current : 1000 A/ pole
- Number of poles :
  9x2(full) + 2x2(half)
- 4 magnets in DR.

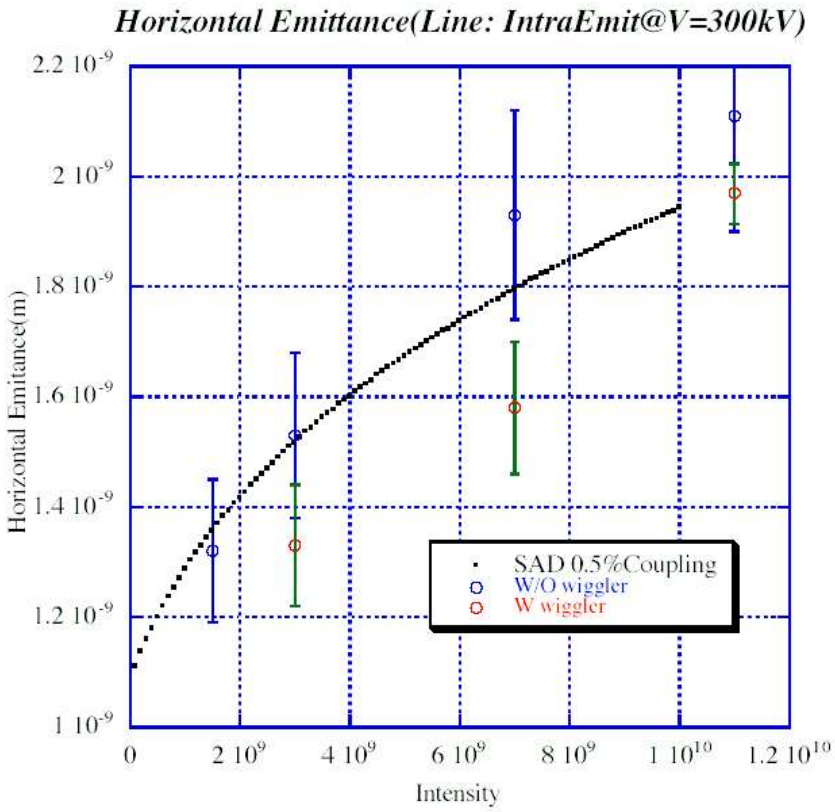
Damping Time

Item	Wiggler 0A SAD/DATA (ms)	Wiggler 600A SAD/DATA (ms)
x	17.5 / 19.3±0.63	15.0 / 15.7±0.38
y	28.5 / 28.8±1.5	23.0 / 25.4±0.67
z	20.5 / 21.4±3.9	15.5 / 14.2±2.4

- The measured damping times were not fully consistent to the SAD calculations.
- IBS might play a role.
- Need more careful study.

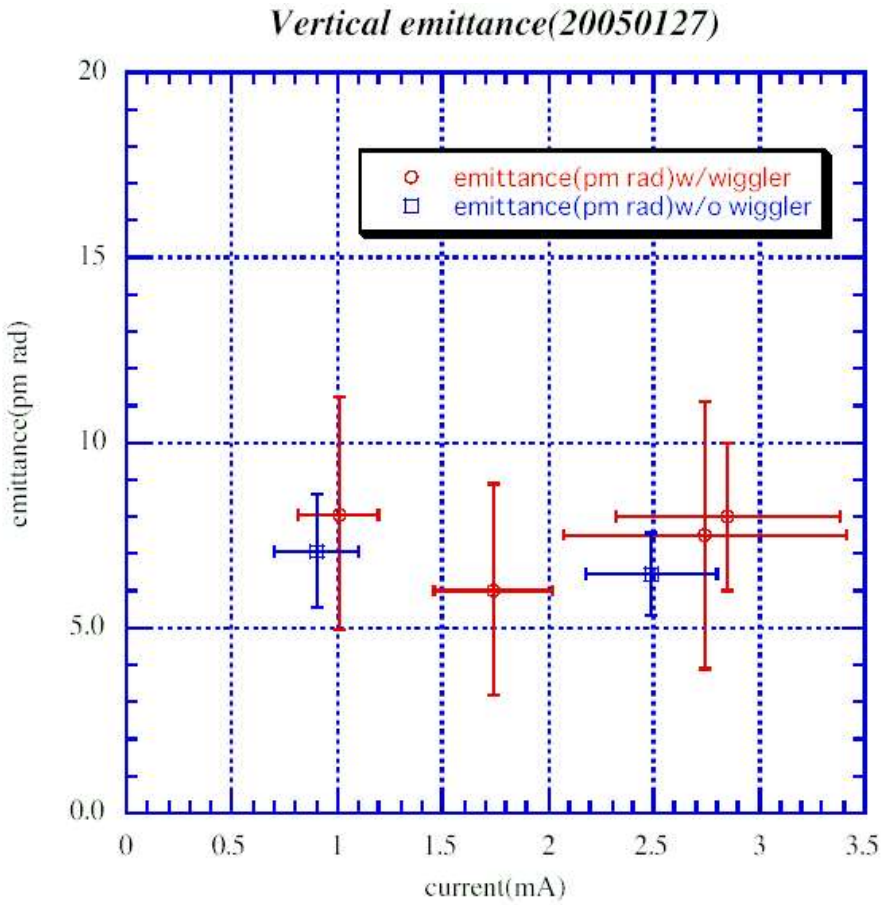
Horizontal Emittance

- The horizontal emittance was measured by the wire scanner in the extraction line.
- SAD calculation (0.5% of xy-coupling and 300kV Vc) predicted ~15% reduction of the emittance.
- The results were consistent to the SAD prediction.



Vertical Emittance

- The vertical emittance was measured by the laser wire in the DR.
- Emittances with / without wiggler are consistent within the errors.



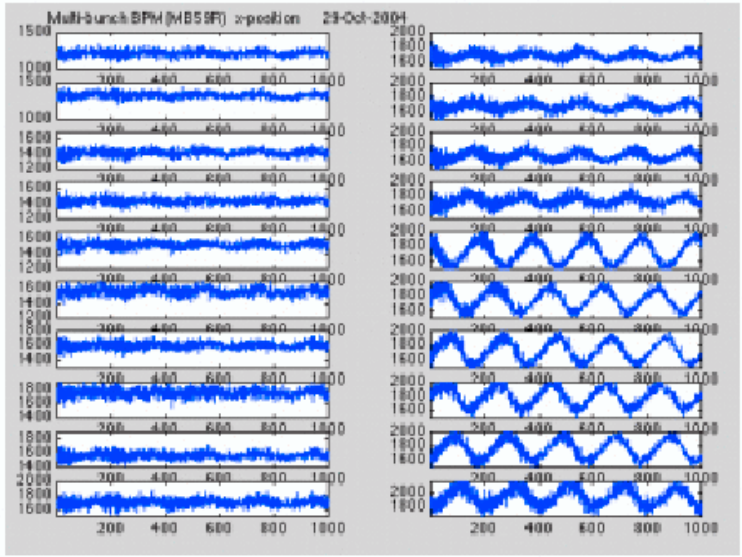
Summary

- A fast kicker demonstration was just started.
- ~3ns rise/fall time on the beam motion by the kicker was observed (Preliminary).
- Operation with wiggler magnets was started.
- The beam is stored successfully with the wiggler excitation (600A).
- Further studies will continue for both items.

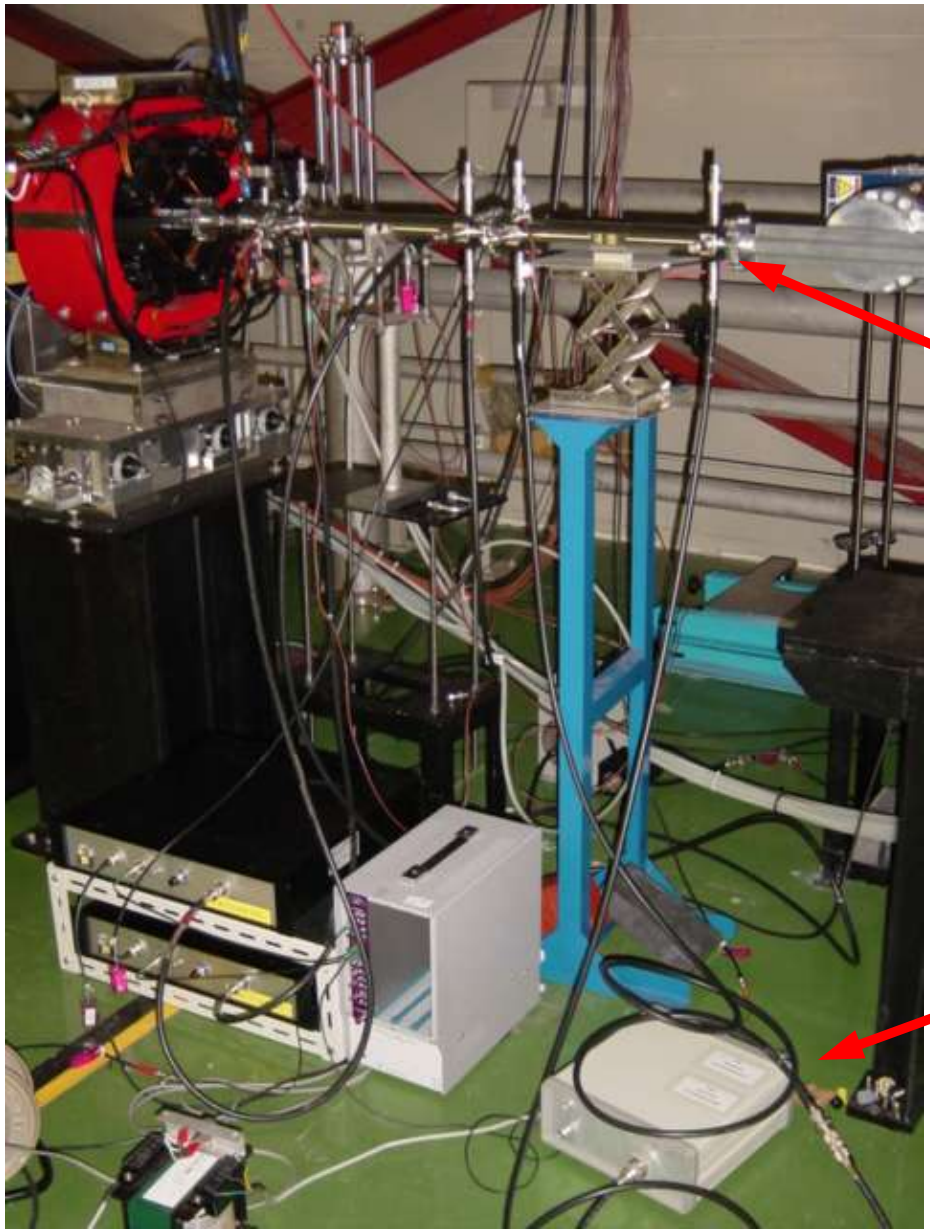
Multi-bunch BPM

- A button type BPM with FADC turn by turn processing.
- Individual turn by turn position measurement for each bunch.
- By analyzing the data, the betatron oscillation amplitude is obtained with a high accuracy (~several tens um) which is enough to observe the enhancement.

An example of MB oscillation measurement



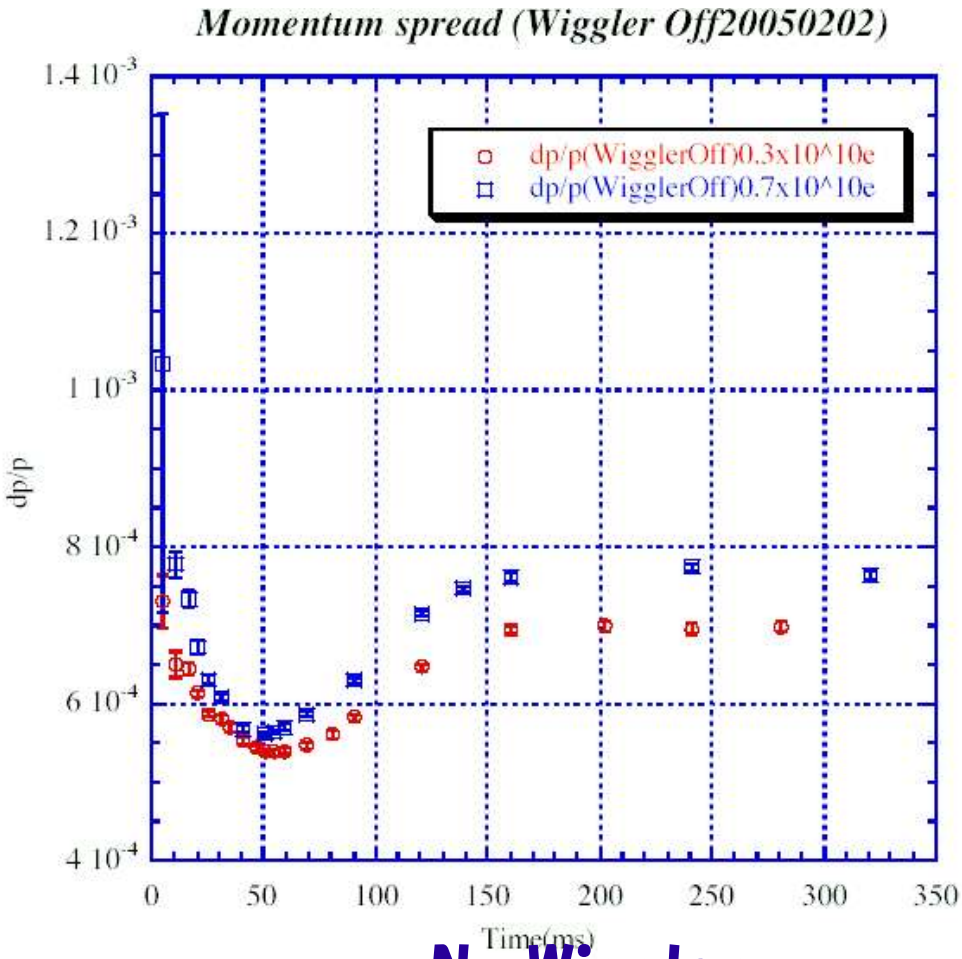
Setup



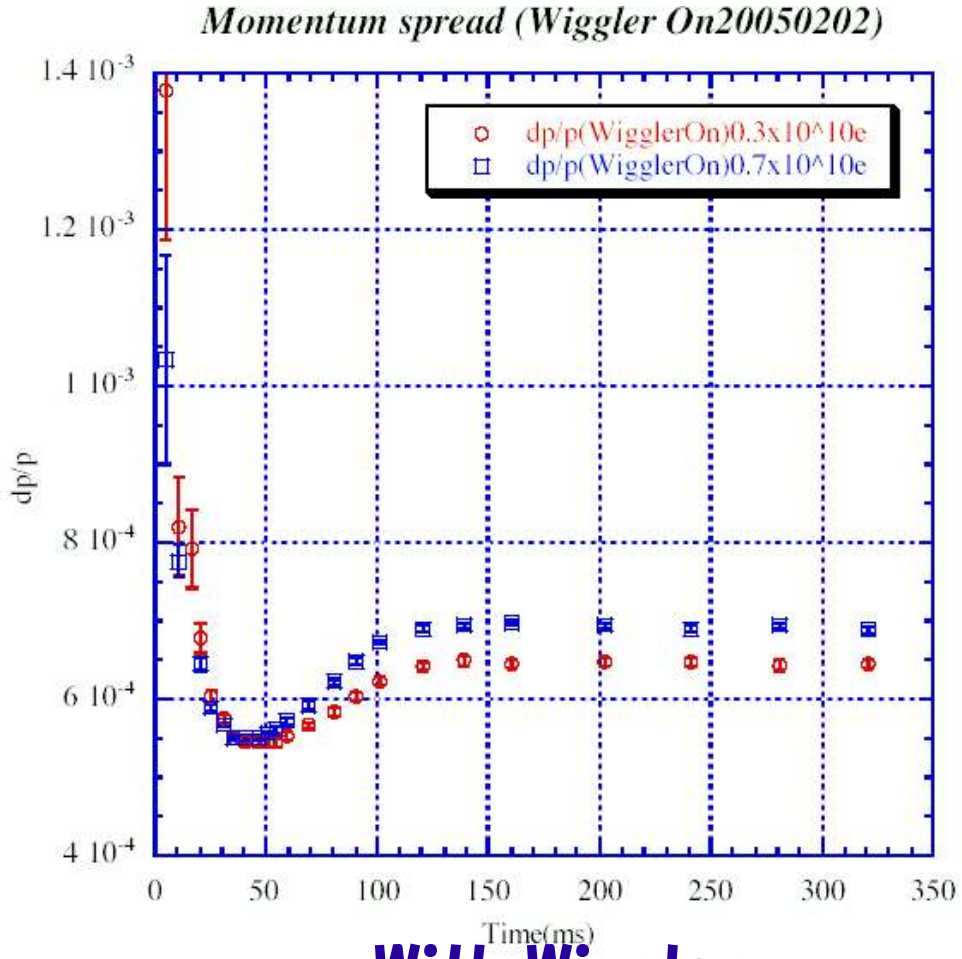
Kicker Projects

- Fast kicker development to extract the beam in ILC format from ATF.
  - Several fast pulser R&Ds are in progress as collaborations with SLAC, DESY.
  - Low impedance strip-line chamber design by LLNL.
- Epoxy magnet kicker making a very long pulse to extract in semi-ILC format (154ns spacing, 3 bunches) for the fast feedback experiment.

Momentum Spread

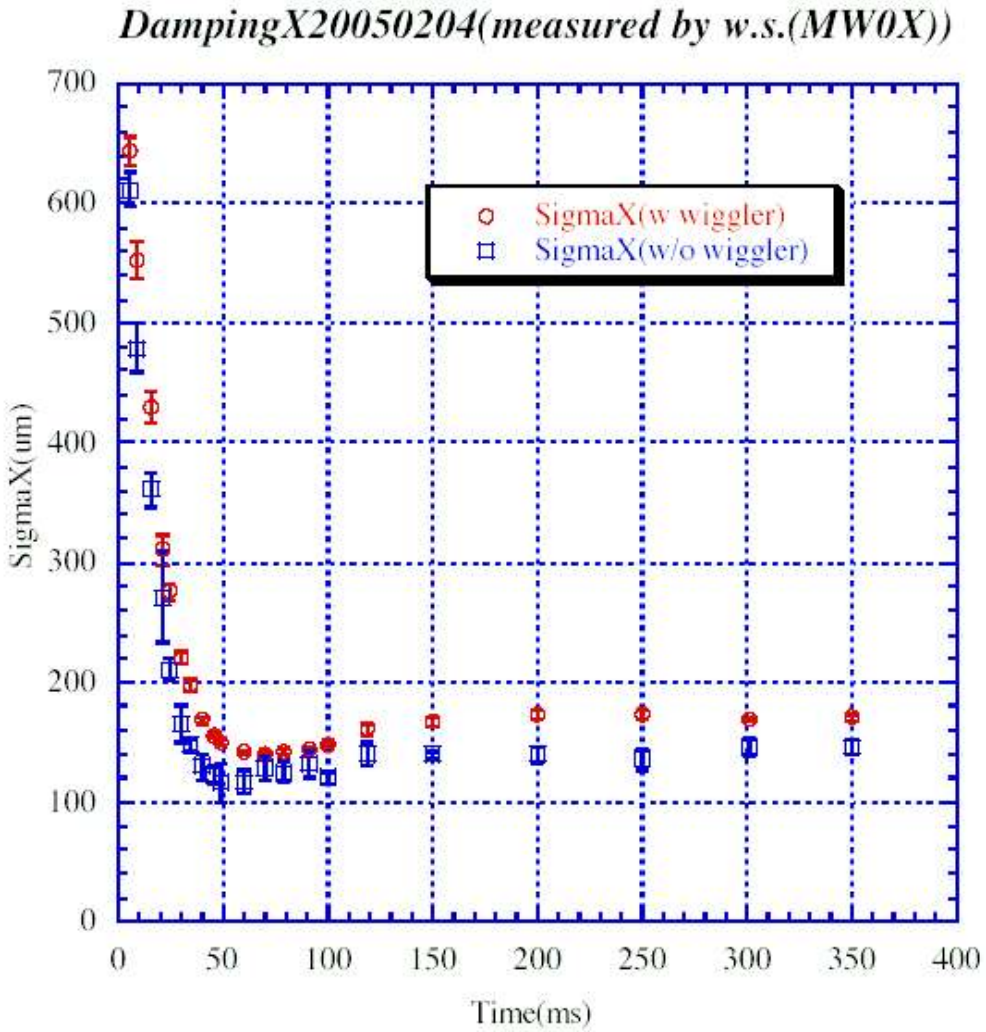


No Wiggler

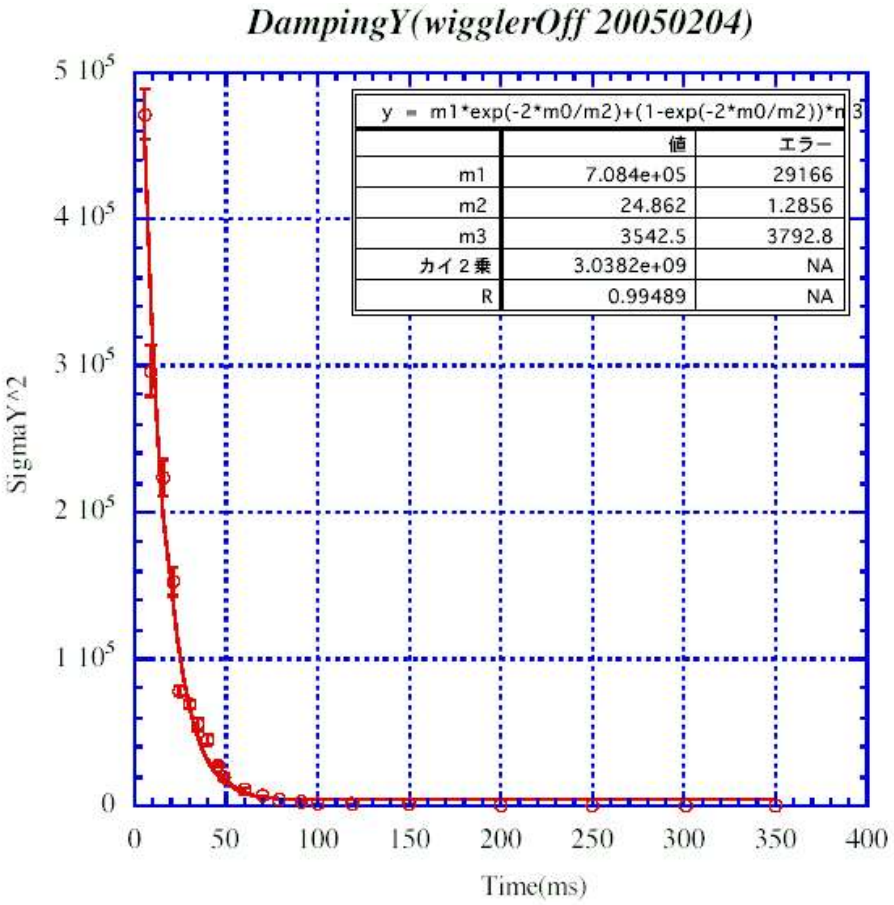


With Wiggler

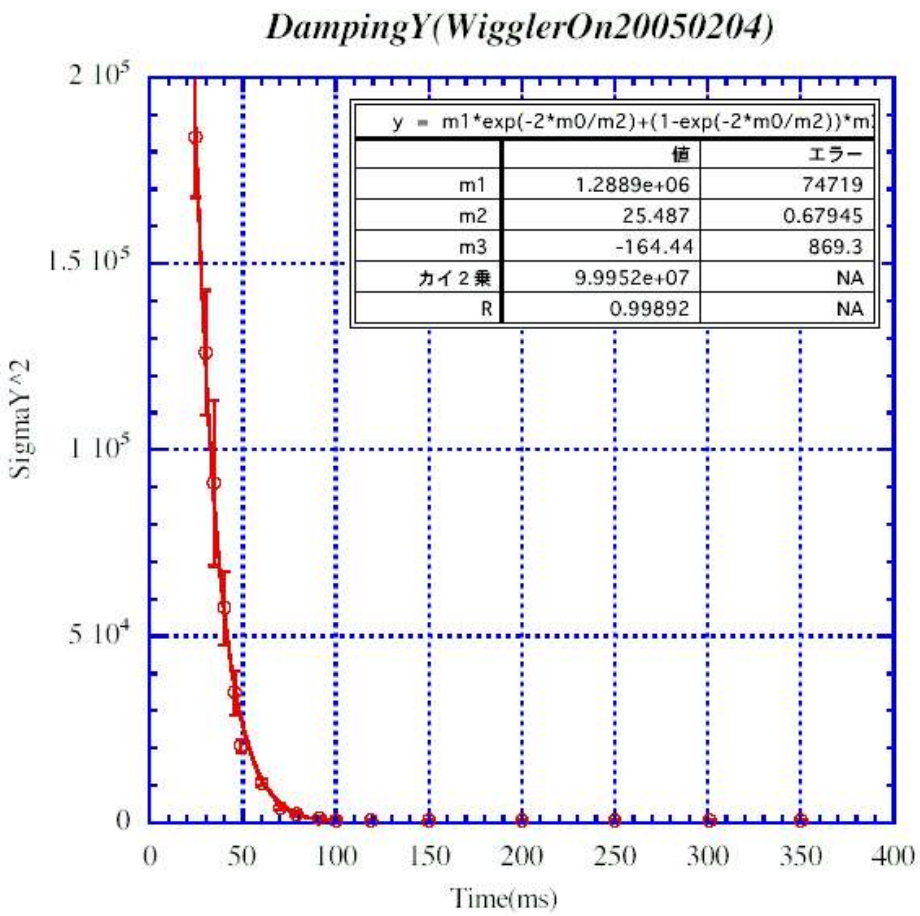
Horizontal Beam Size



Vertical Beam Size



No Wiggler



With Wiggler