# Beam Diagnostics for the Commissioning of SPring-8 Synchrotron

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## 1. Introduction

The commissioning of SPring-8 synchrotron was started on December 10, 1996. We achieved the first turn on the same day, the RF capture on December 11 and the acceleration at 8 GeV on December 16. This report describes about the beam diagnostics during the first stage of the commissioning. In this stage, we used short pulse beam (10 mA, 40 ns) from linac to suppress the radiation dose around the synchrotron.

## 2. Beam Profile Monitor

The beam profile and the position were observed by the fluorescent screens. We call the monitor "Beam Profile Monitor". Two screens are installed at the upstream side of two septum magnets for injection. The screens are fixed on the magnets to across the injection orbit. They have a square hole not to distract the beam. The injection orbit was adjusted that the beam passed through the center of the hole.

Movable eight screens are installed at the upstream side of the focusing quadrupole magnets where the horizontal dispersions are about 1 m. The size of the screens are 30 mm x 30 mm. The first turn of the beam was observed by the screen which was located at the most downstream side of the synchrotron. Figure 1 shows the beam profile on the screen at the first turn. The injection energy is adjusted to 1 GeV by observing the beam position on the screens.

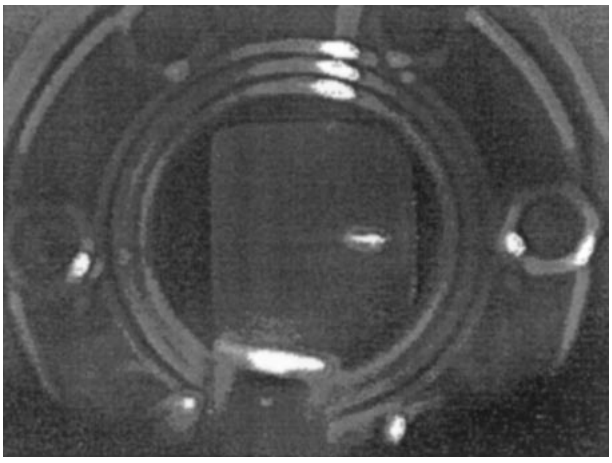

Figure 1. The beam profile at the first turn.

## 3.First Current Transformer

After the first turn, The excitation current of the dipole and quadrupole magnets was adjusted to increase the lifetime by observing the first current transformer (FCT). The sensitivity of the FCT is 2.5 V/A and the rise time is 500 ps. Figure 2 shows the waveform observed by the FCT at the first turns.

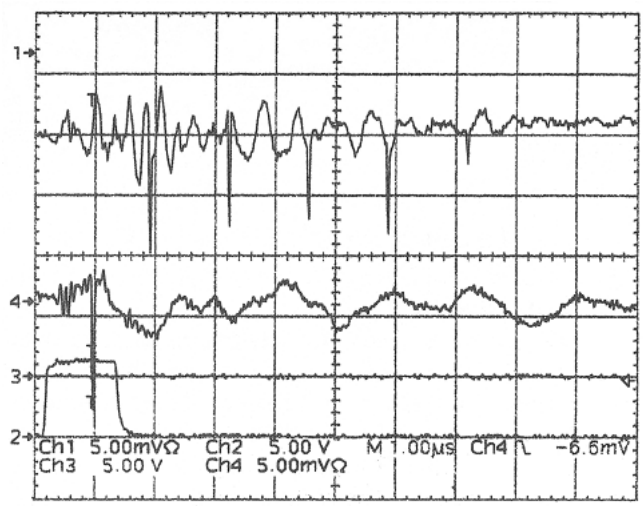


Figure 2. The first turns observed by the FCT (Ch1). Ch2 shows the waveform of injection kicker magnet and Ch4 shows the beam waveform at the transport line from linac.

## 4. Beam Position Monitor

After the beam lifetime was increased, the RF capture was performed. After the lifetime became 1 sec, COD was measured by the beam position monitors (BPMs). [1] Figure 3 shows the COD in DC operation at 1 GeV. In this measurement, the sextupole magnets and the correction magnets were not powered yet.

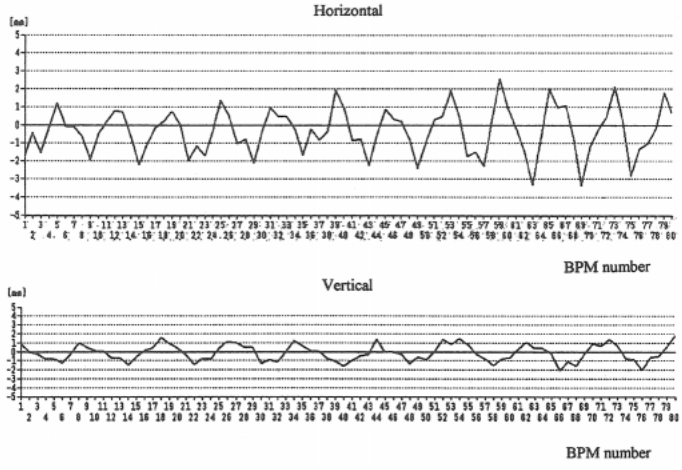


Figure 3. The COD measured at 1 GeV.

There was no differences between the COD's after 50 ms and 500 ms from the beam injection. After the COD measurement at 1 GeV, the beam was accelerated to 8 GeV. Figure 4 shows the result of COD measurement at 8 GeV.

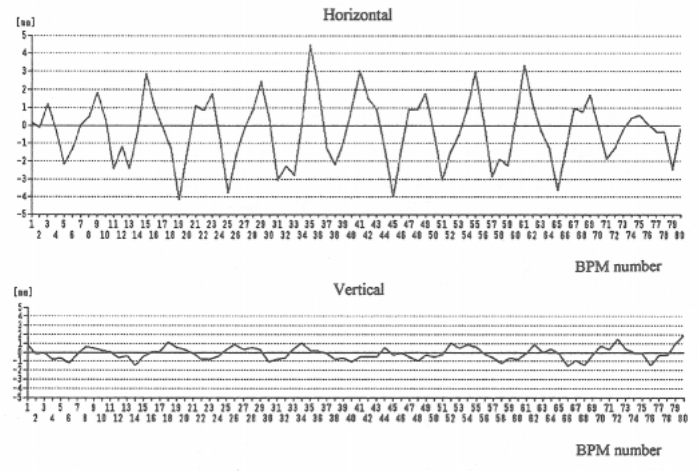


Figure 4. The COD measured at 8 GeV.

## 5. Conclusion

We achieved 8 GeV acceleration on the first stage of commissioning. Because of the short pulse beam from linac, the average beam current of the synchrotron couldn't be measured by the DCCT. On the next stage, we will correct the COD and measure the tune using 1 ms long pulse beam. The beam extraction to the storage ring is scheduled in next March.

## References

[1] T. Aoki et al, Proc. Syn. Rad. Instr. 1995.