

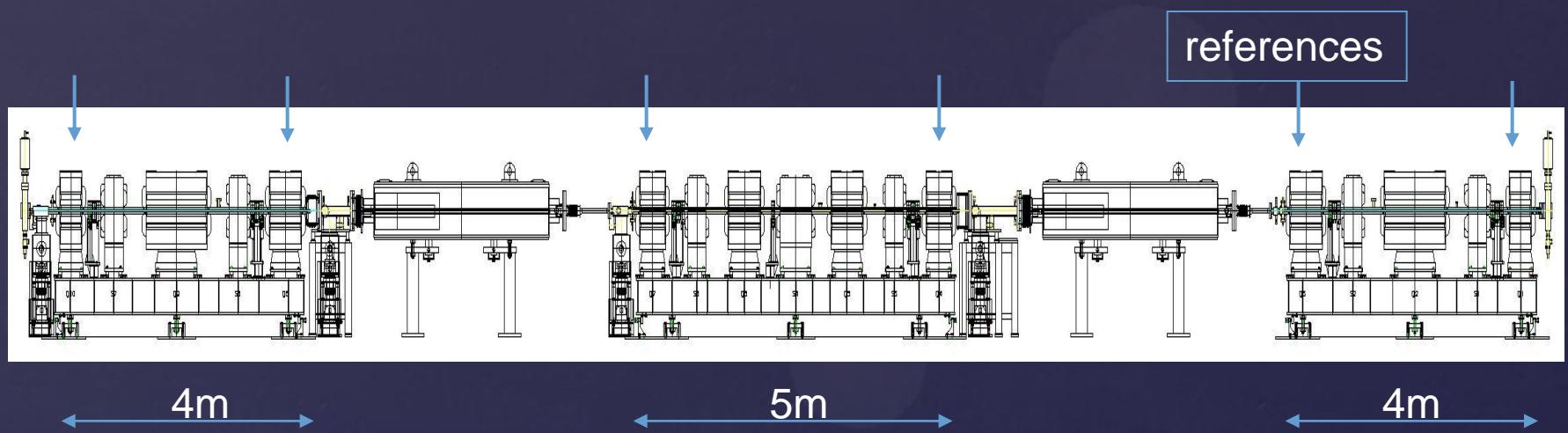


# Developing an iris diaphragm laser alignment system for SPring-8 storage ring magnets

C. Zhang

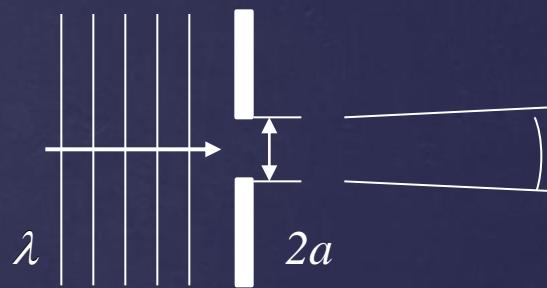
JASRI / SPring-8

# SPring-8 storage ring magnets

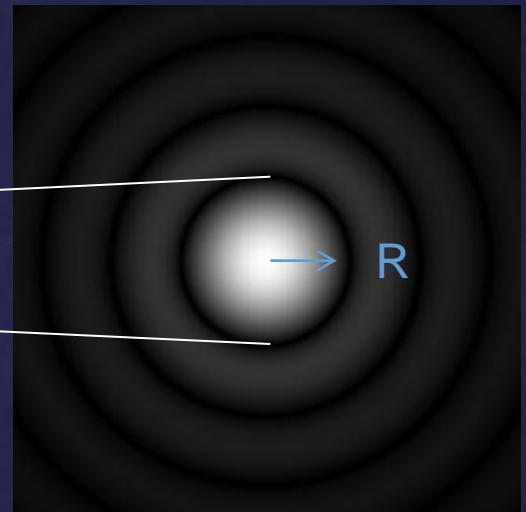


# Airy pattern of an iris

Plane wave      Iris



Airy pattern



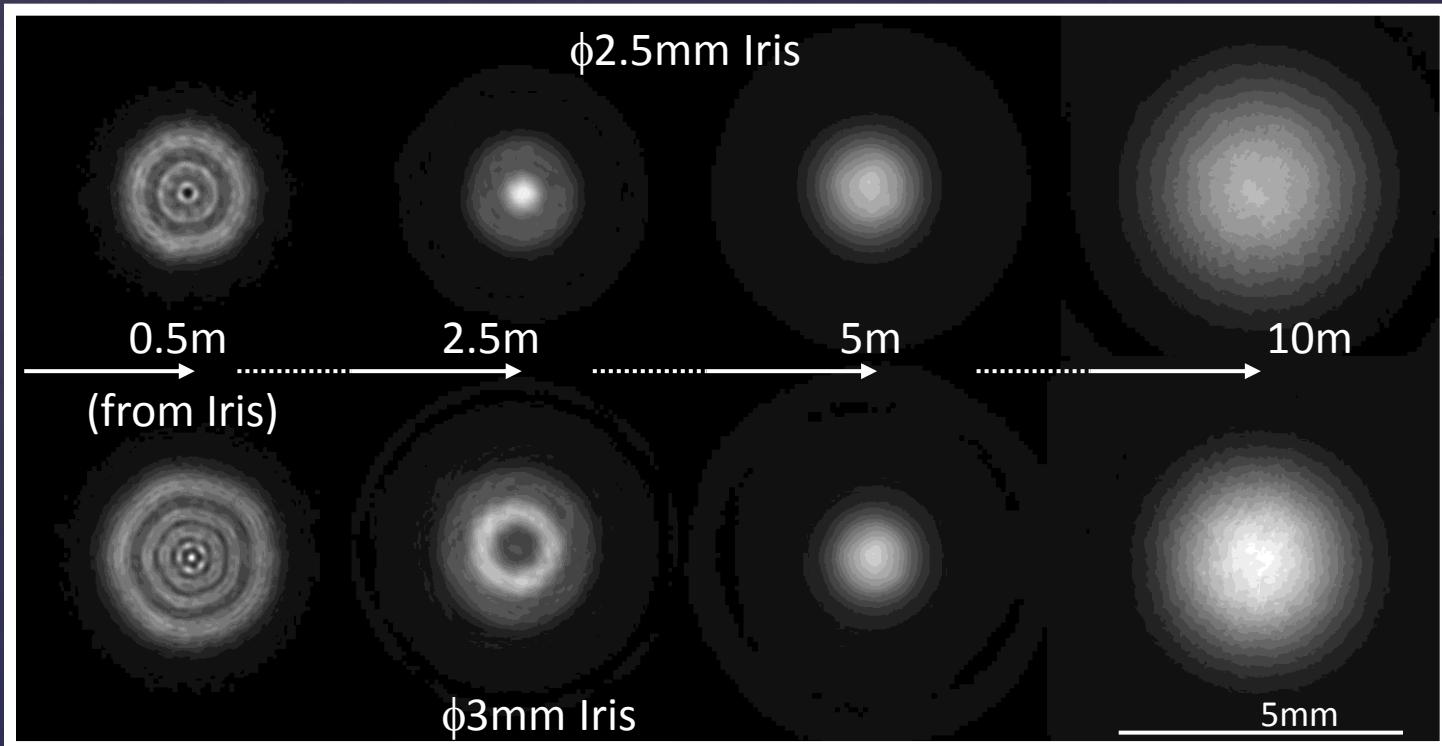
From Wikipedia

$$\longleftrightarrow$$

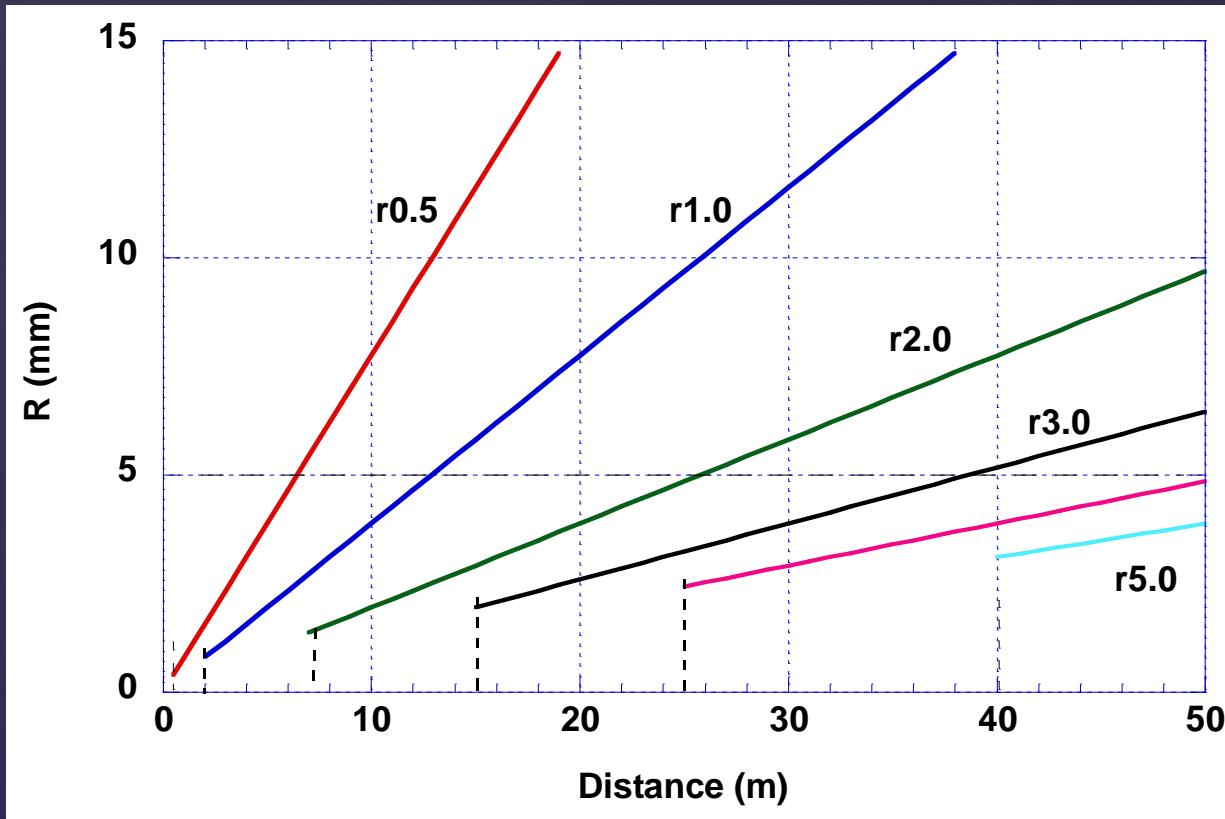
$$z \gg a^2 / \lambda$$

$$R = 0.61 \lambda z / a$$

# Diffraction patterns of an iris

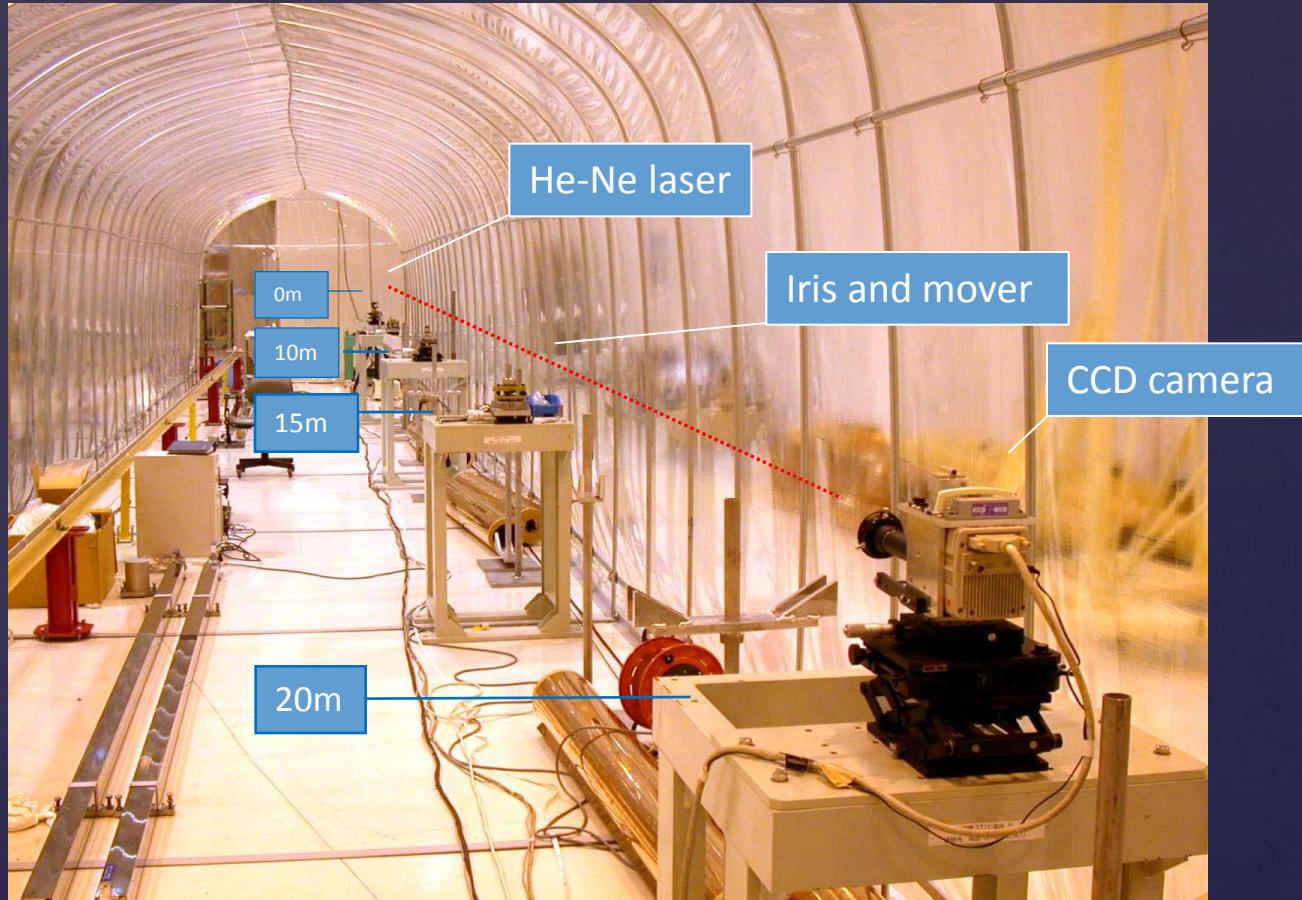


# Distance range of the iris system

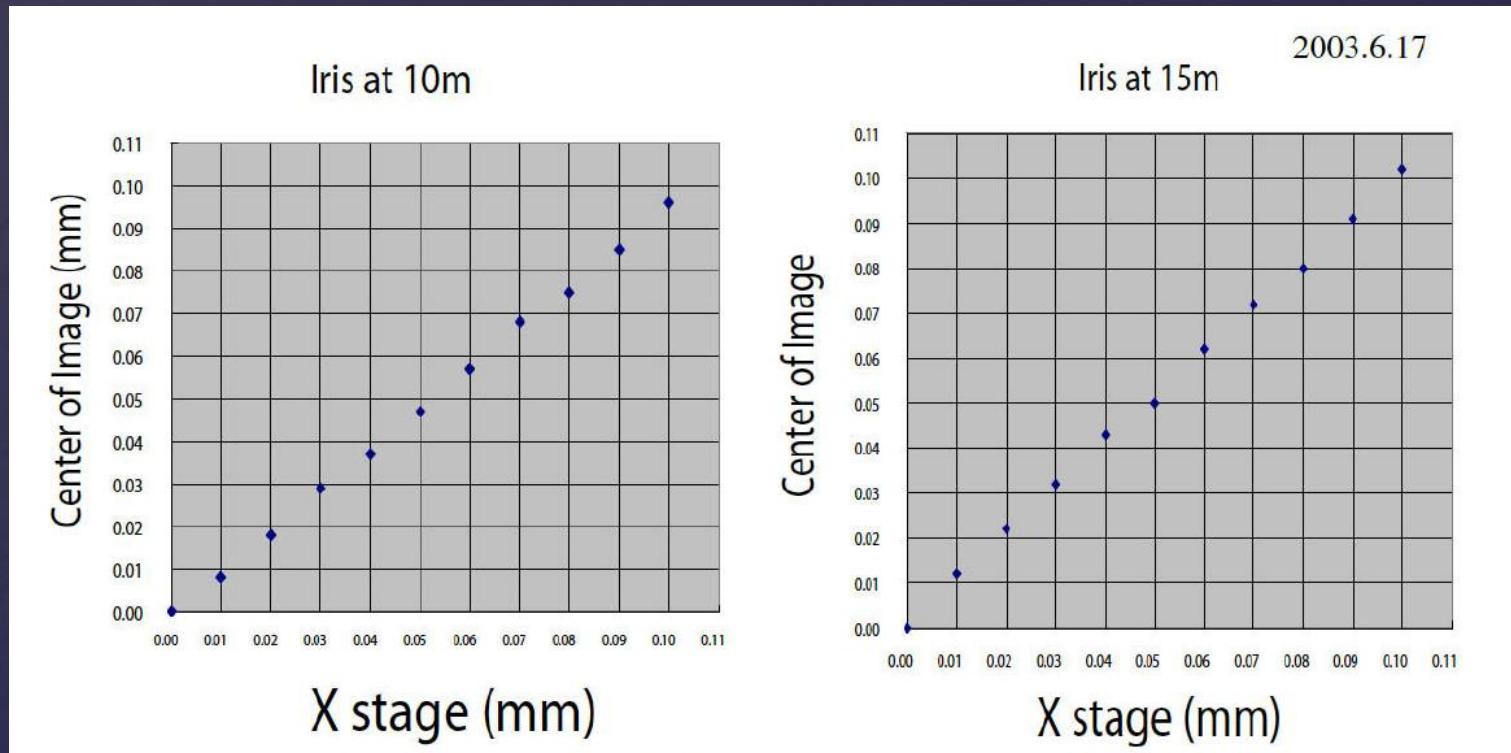


# Verification of the iris alignment system

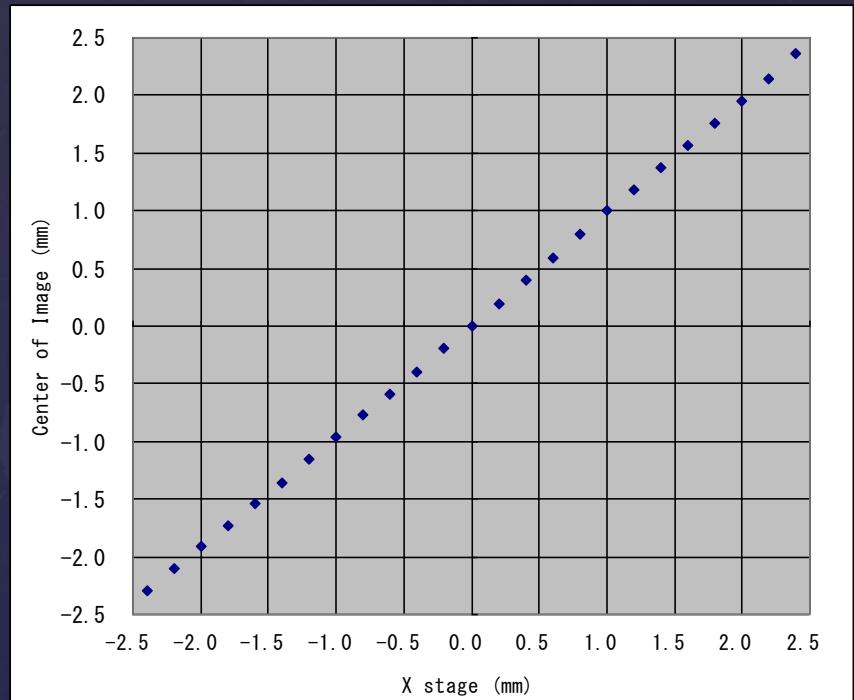
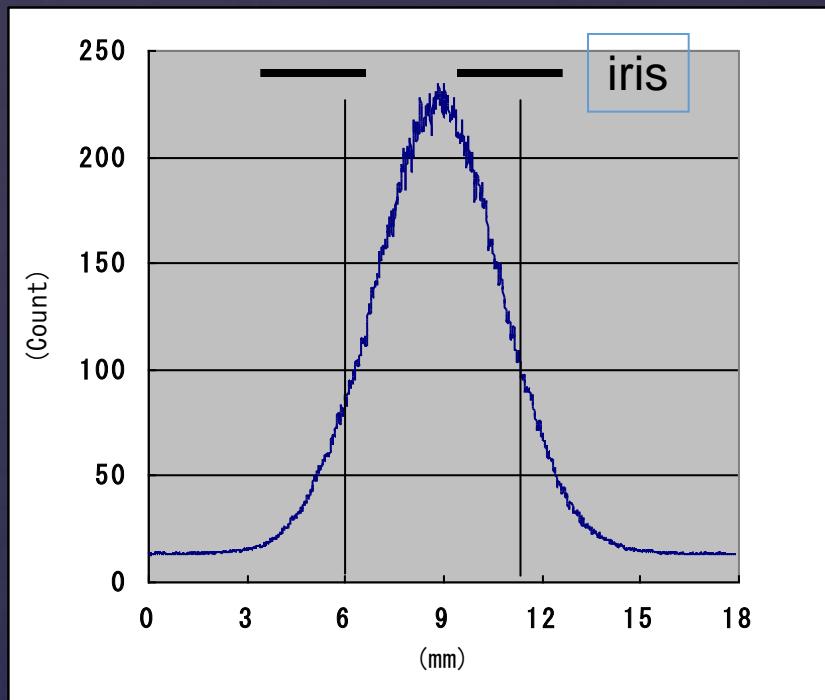
2003.6.17



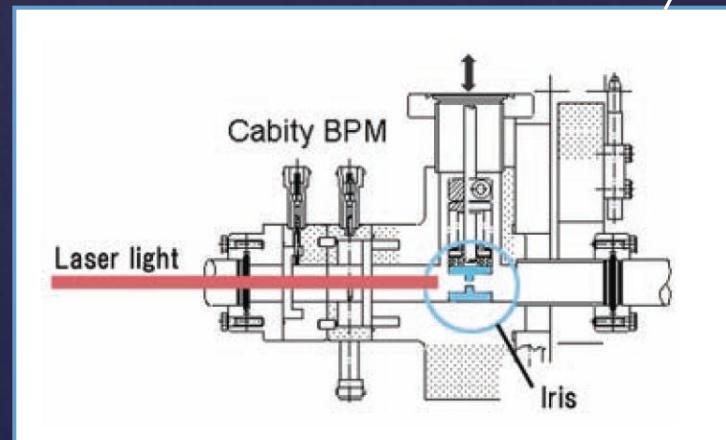
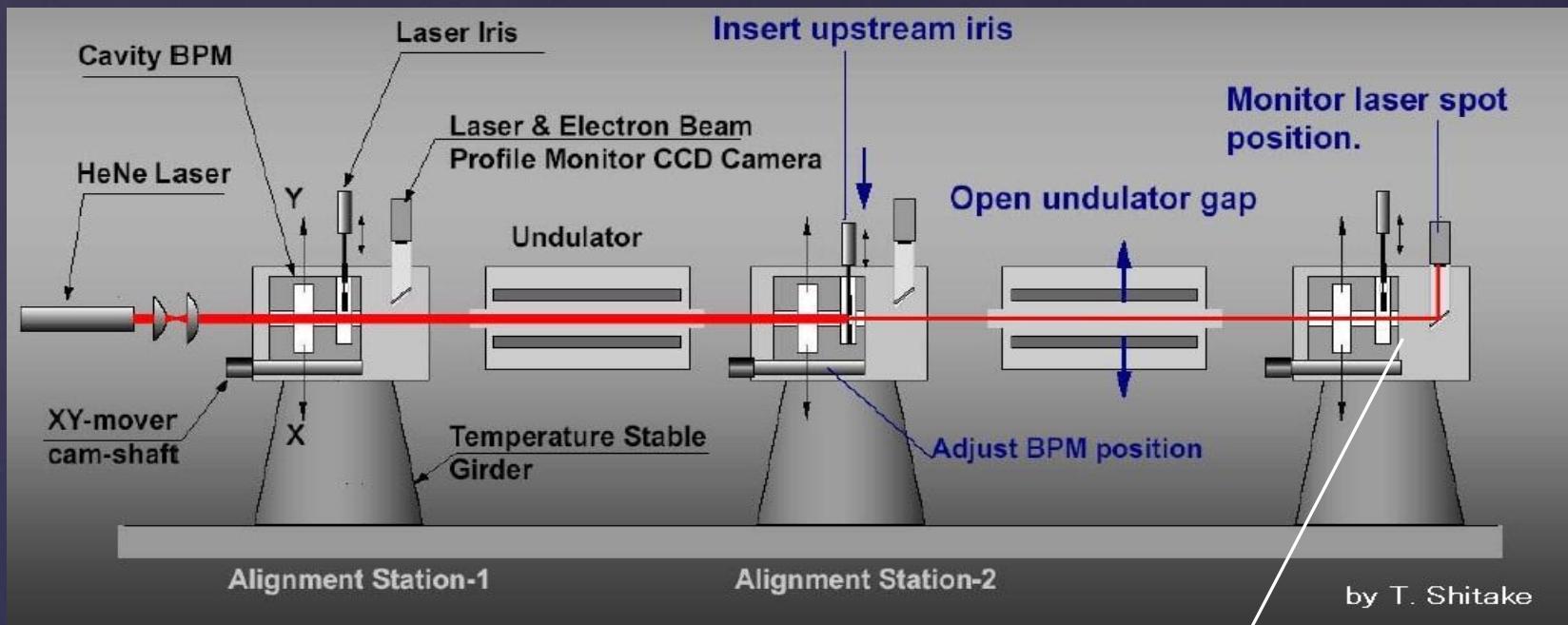
# Sensitivity test of laser - iris



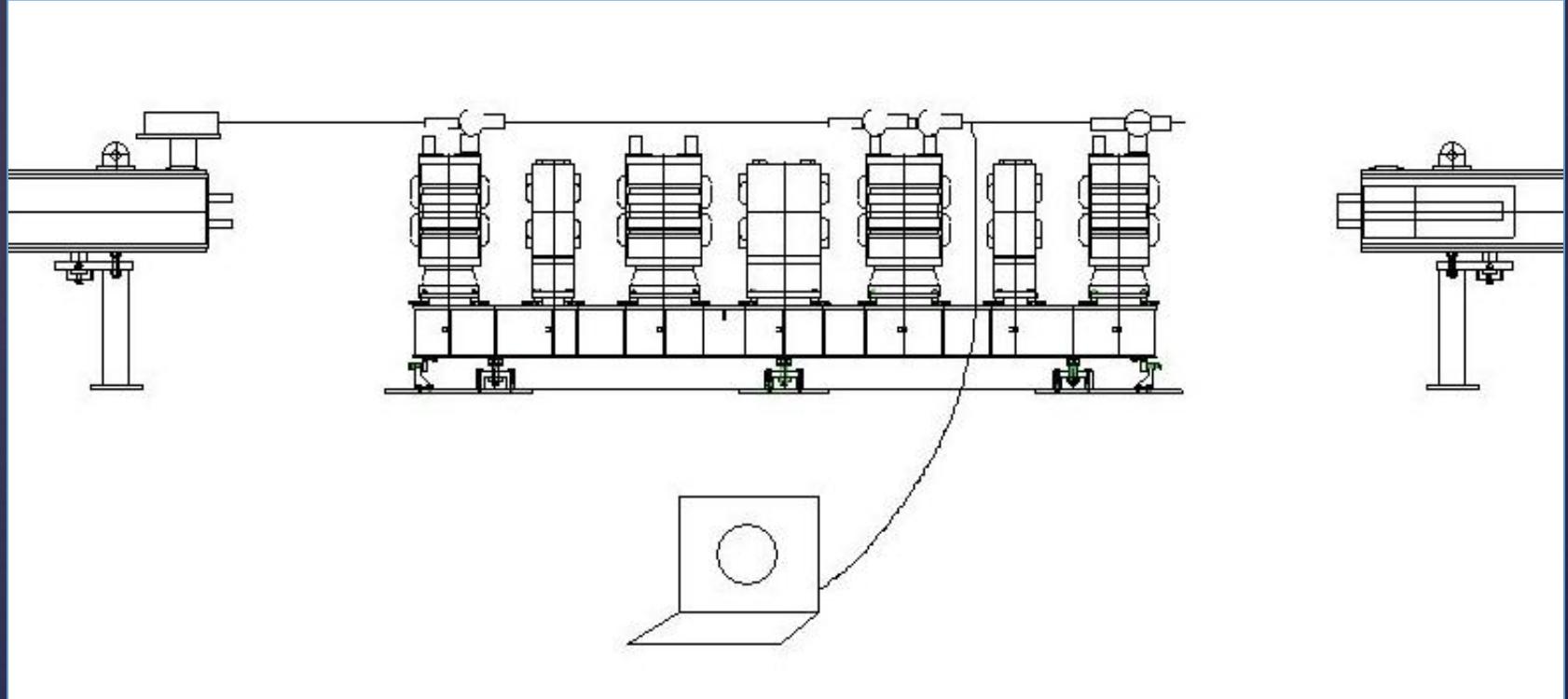
# Linearity test of laser - iris



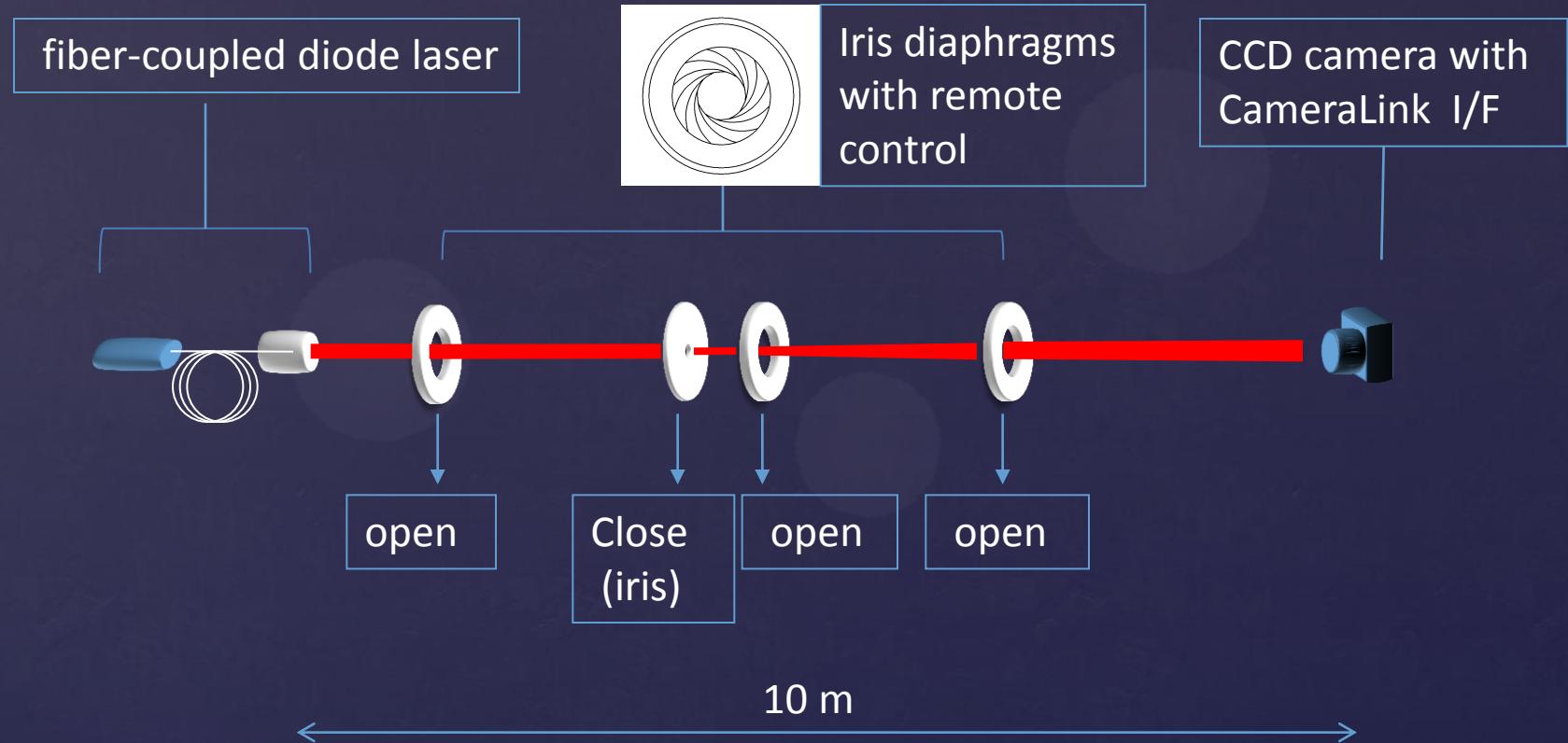
# Alignment concept of the SCSS



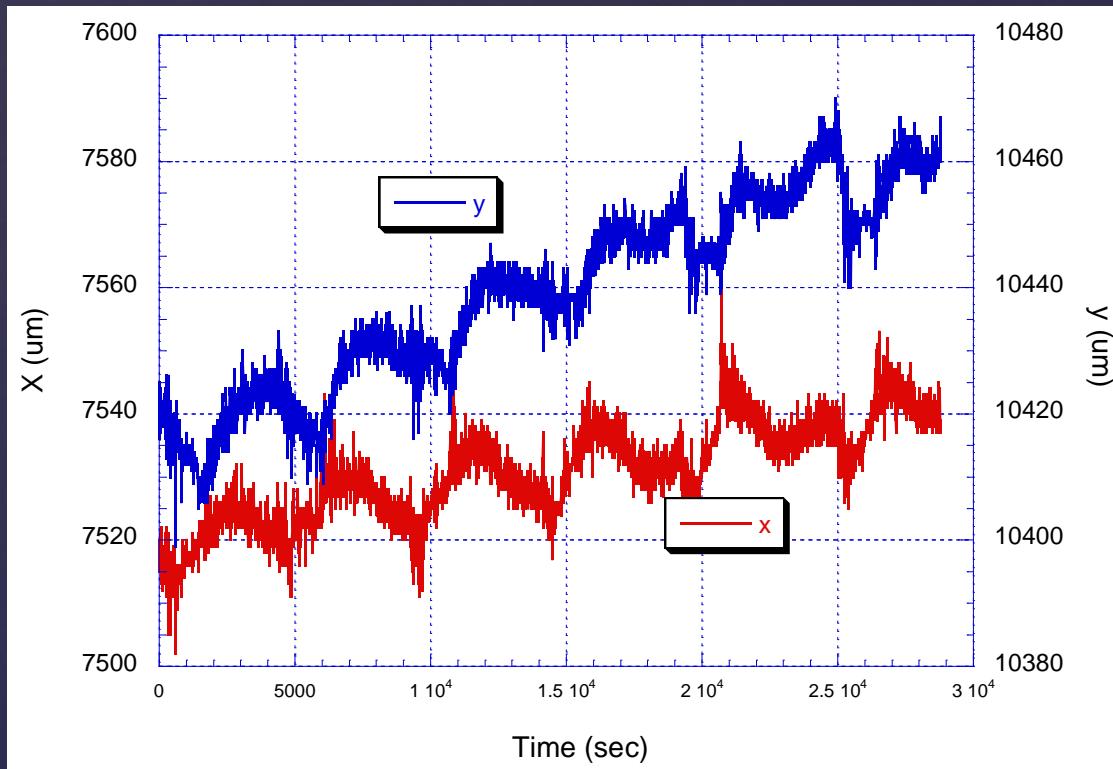
# Former method of laser alignment system



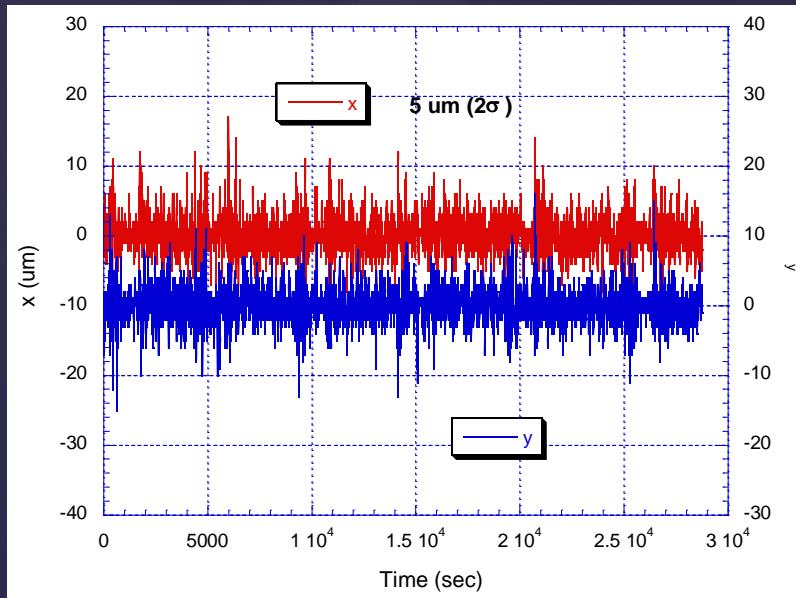
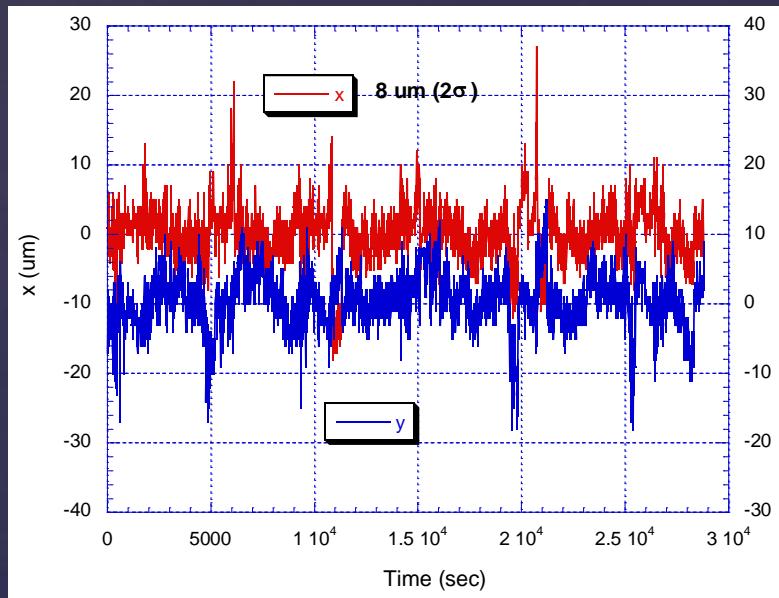
# Iris diaphragm laser alignment system



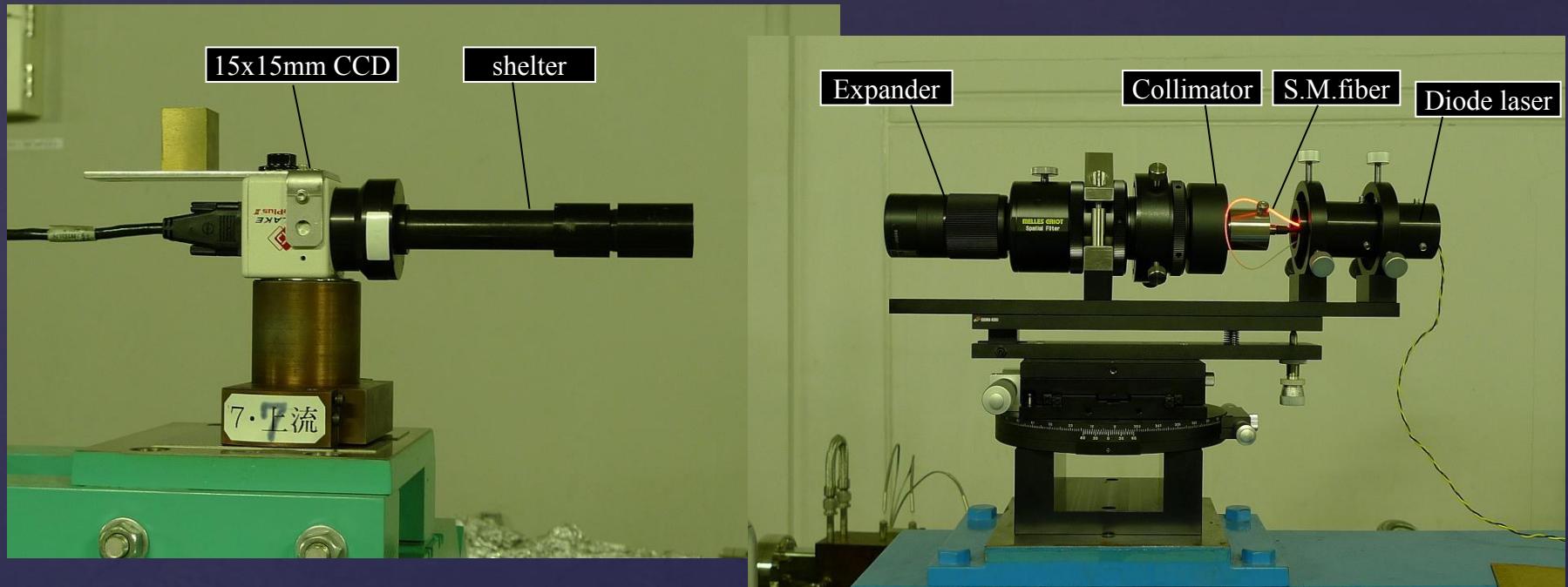
# A sample of laser pointing stability



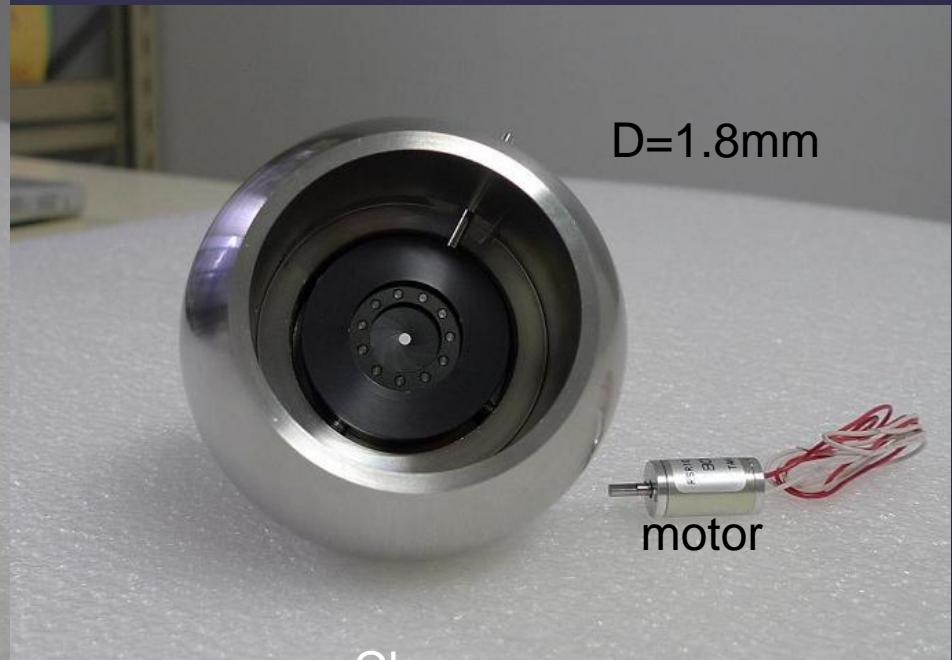
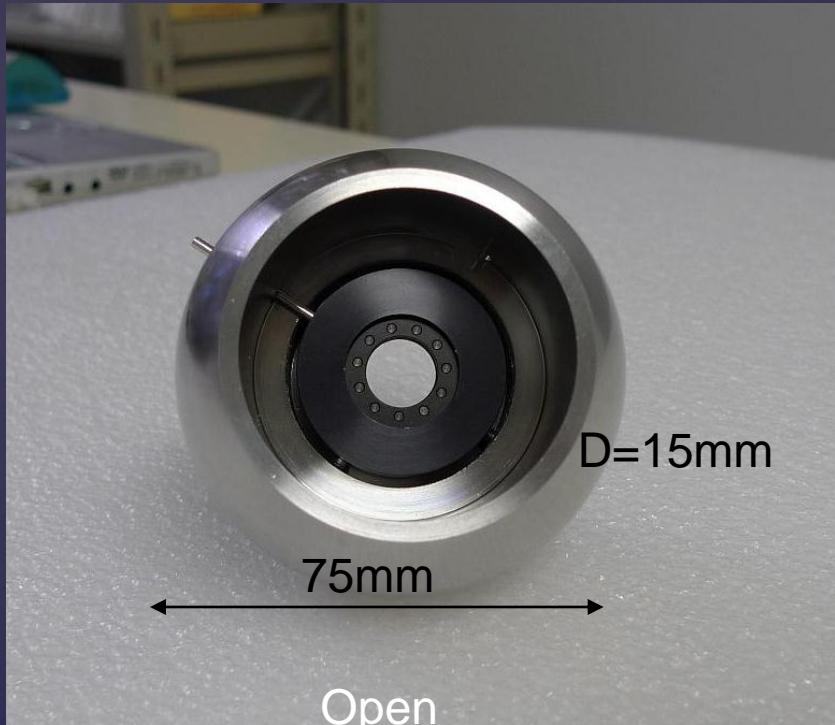
# Simulations of the two methods



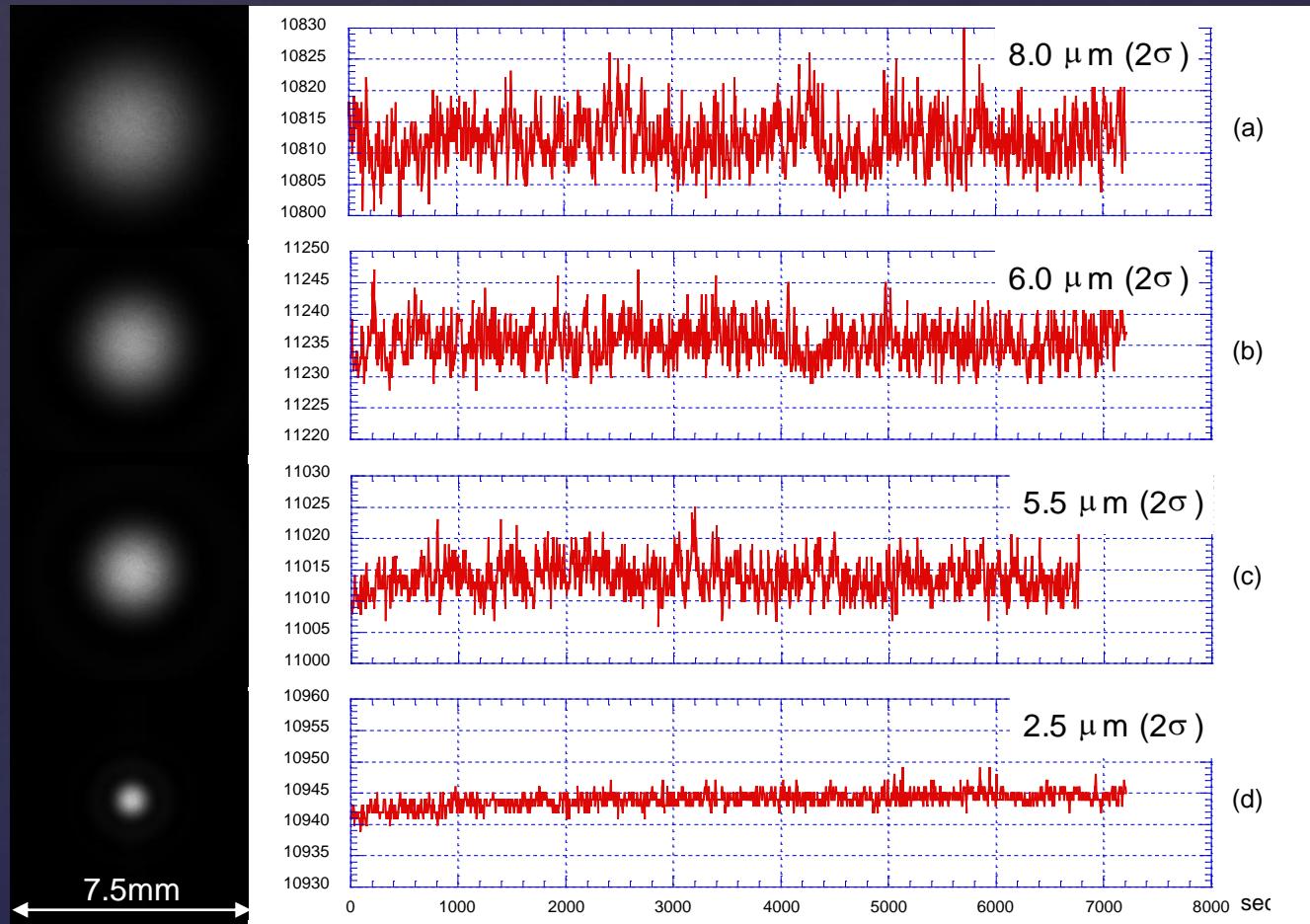
# Laser head and CCD camera



# Iris diaphragm target



# Measurement uncertainty of system



# CONCLUSION

Alignment using laser-iris was tested in 2003 and we verified it is a feasible method for alignment of short range and used this system in the alignment of the SCSS.

When renew the laser alignment system for the storage ring magnets of the SPring-8, we propose an iris diaphragm laser alignment system. It is under developing.

The new system of iris diaphragm is consists of a fiber-coupled diode laser source, four iris diaphragms and a CCD camera. With remote control of the diaphragms this system will much shorten measurement time. It is expected to have capability of  $10\text{-}\mu\text{m}$  ( $2\sigma$ ) accuracy for the alignment of the storage ring magnets on common girders.