

# Antichamber prototype

(Feb.25 11:15-11:35 K.Kanazawa)

# Antechamber and Electron Cloud

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KEKB Review

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1. Test chambers.
2. Electron cloud with and without an antechamber.
3. Electron cloud in a bending magnetic field.
4. Beam induced effect in an antechamber.

## 1. Test chambers

- B-chamber with antechamber.

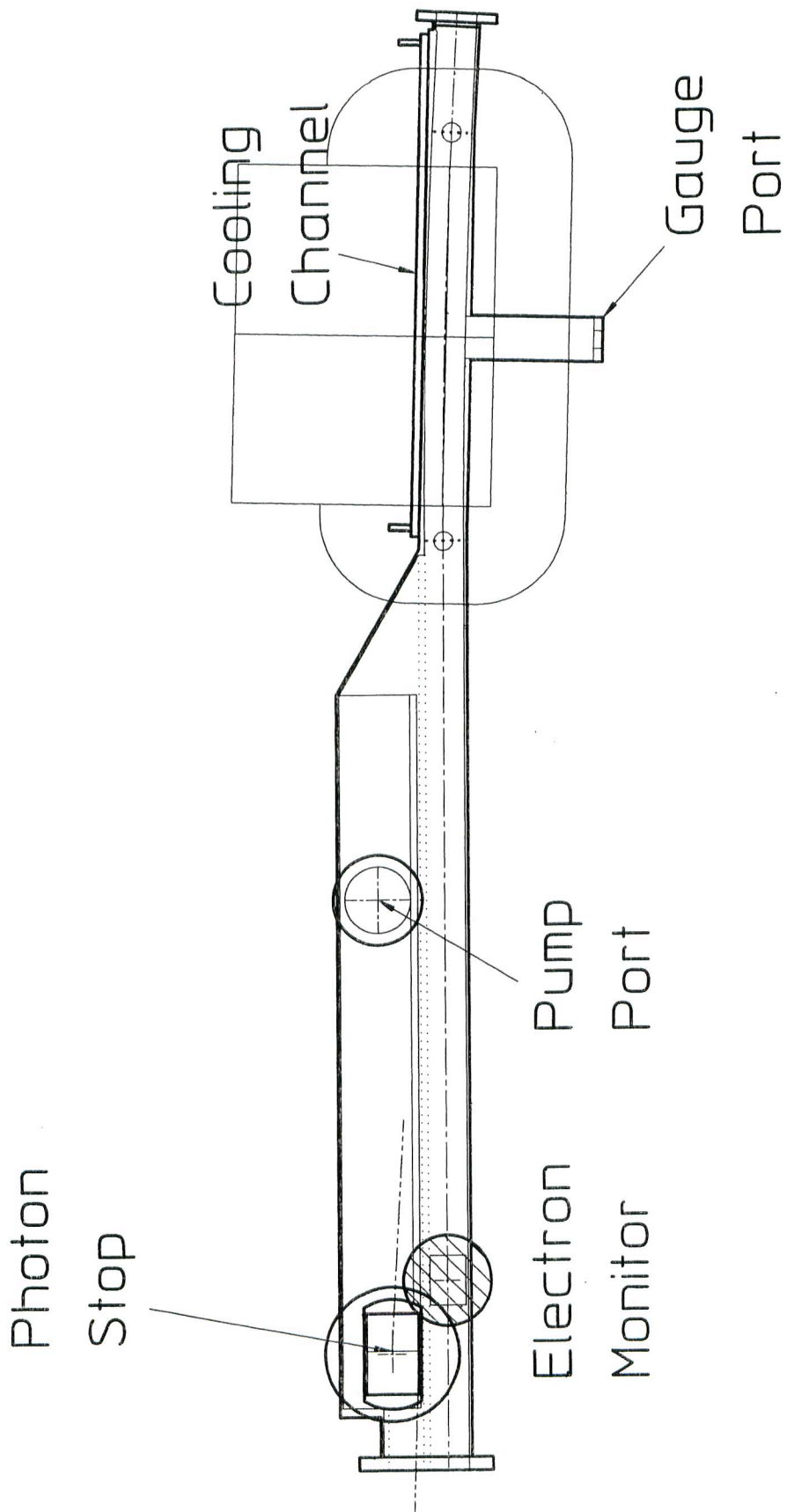
In a bending magnet, the chamber has a normal beam duct to see the behavior of electron cloud in a bending magnetic field with a vacuum gauge.

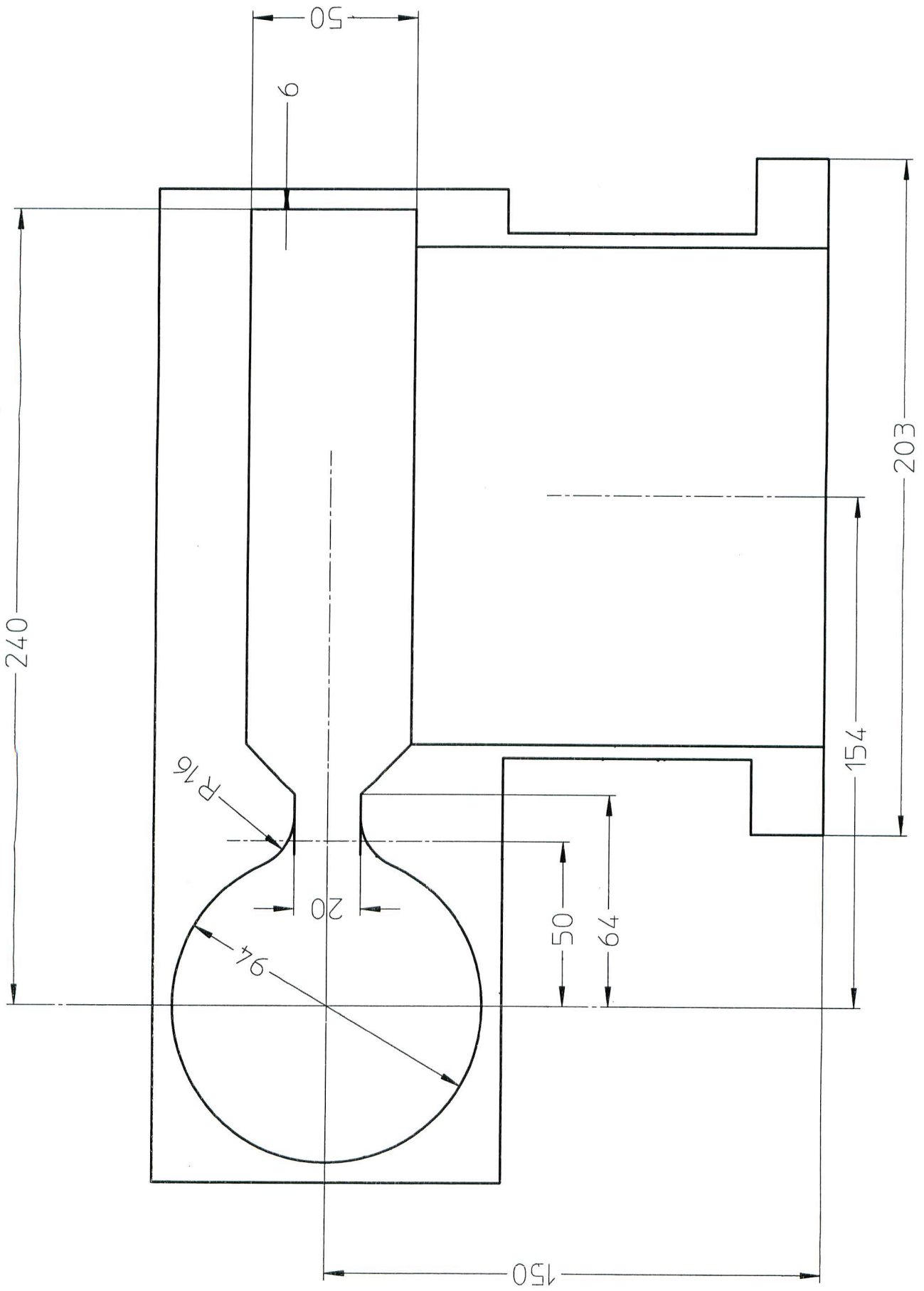
At the antechamber, a photon stop and pump ports are equipped.

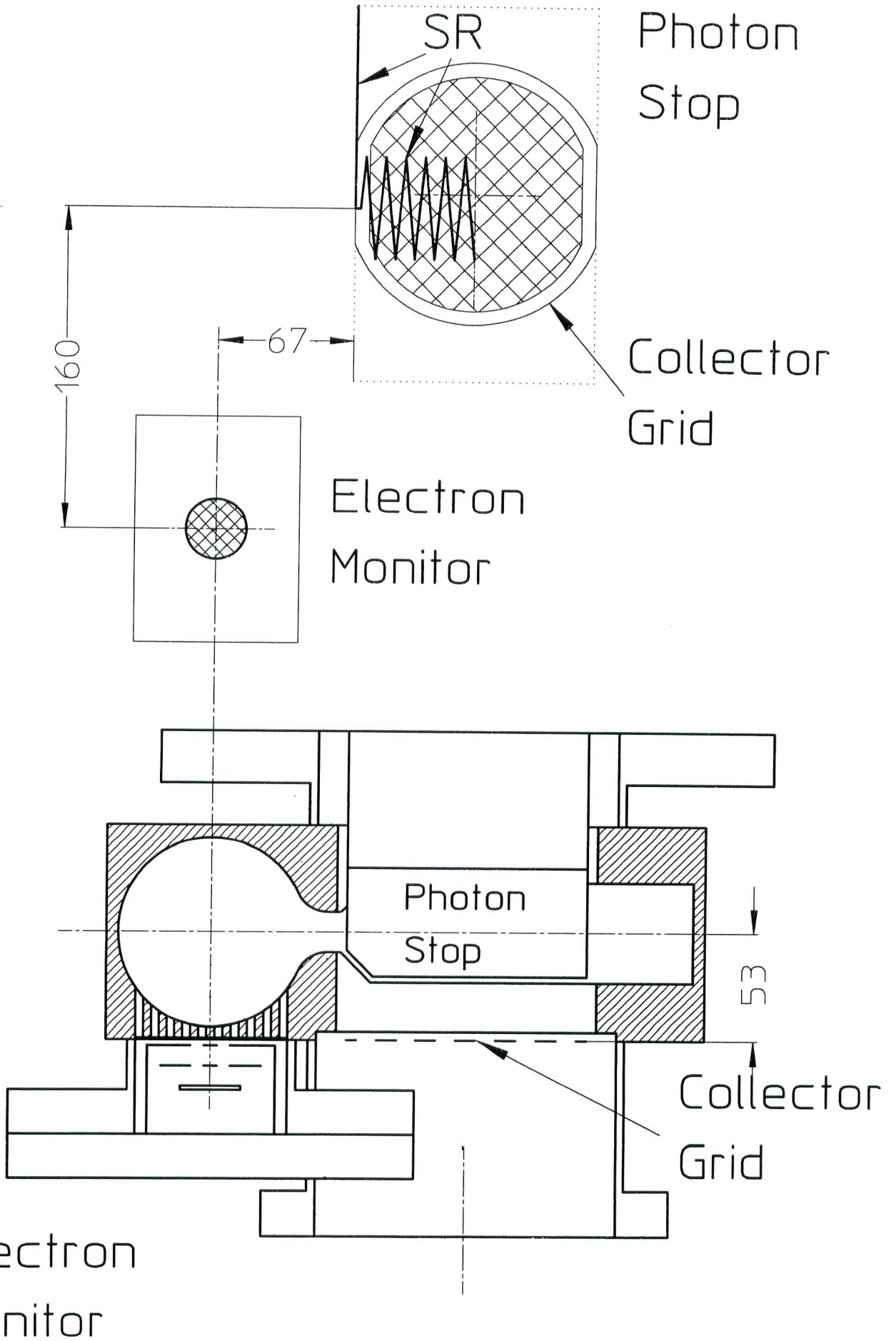
- Q-chamber with antechamber.

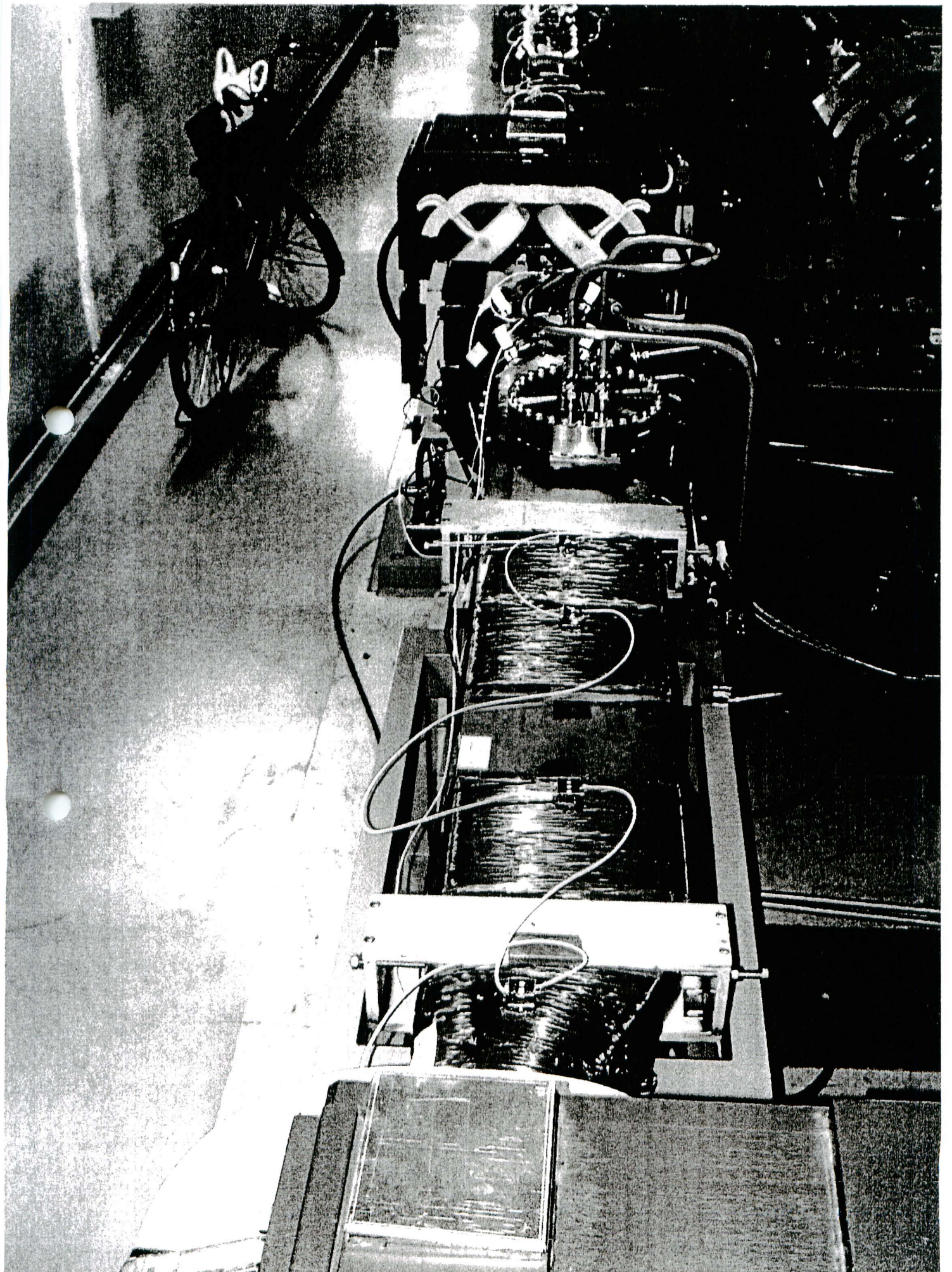
The chamber is completely in the shadow of the photon stop against synchrotron radiation.

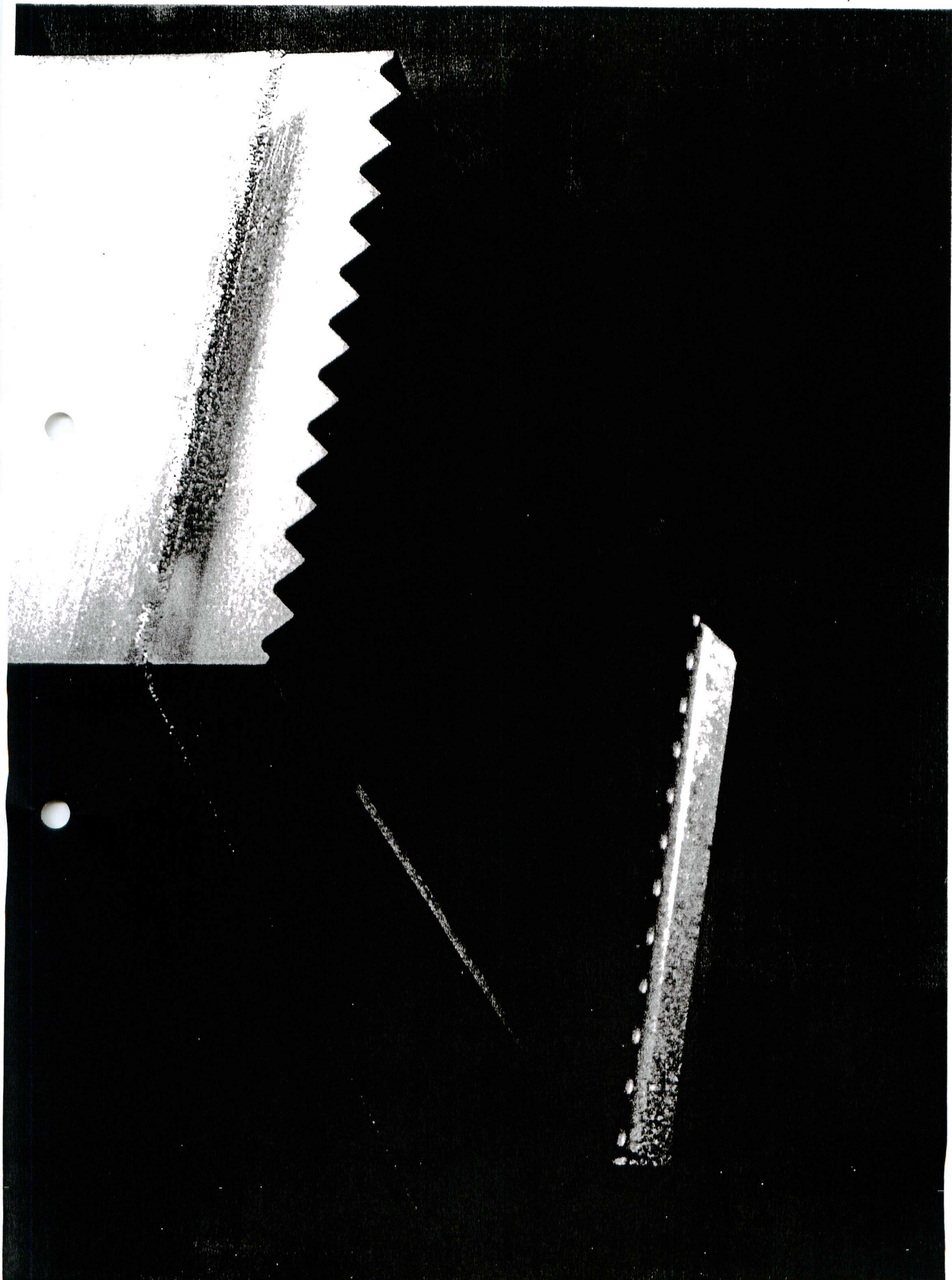
- S-chamber.



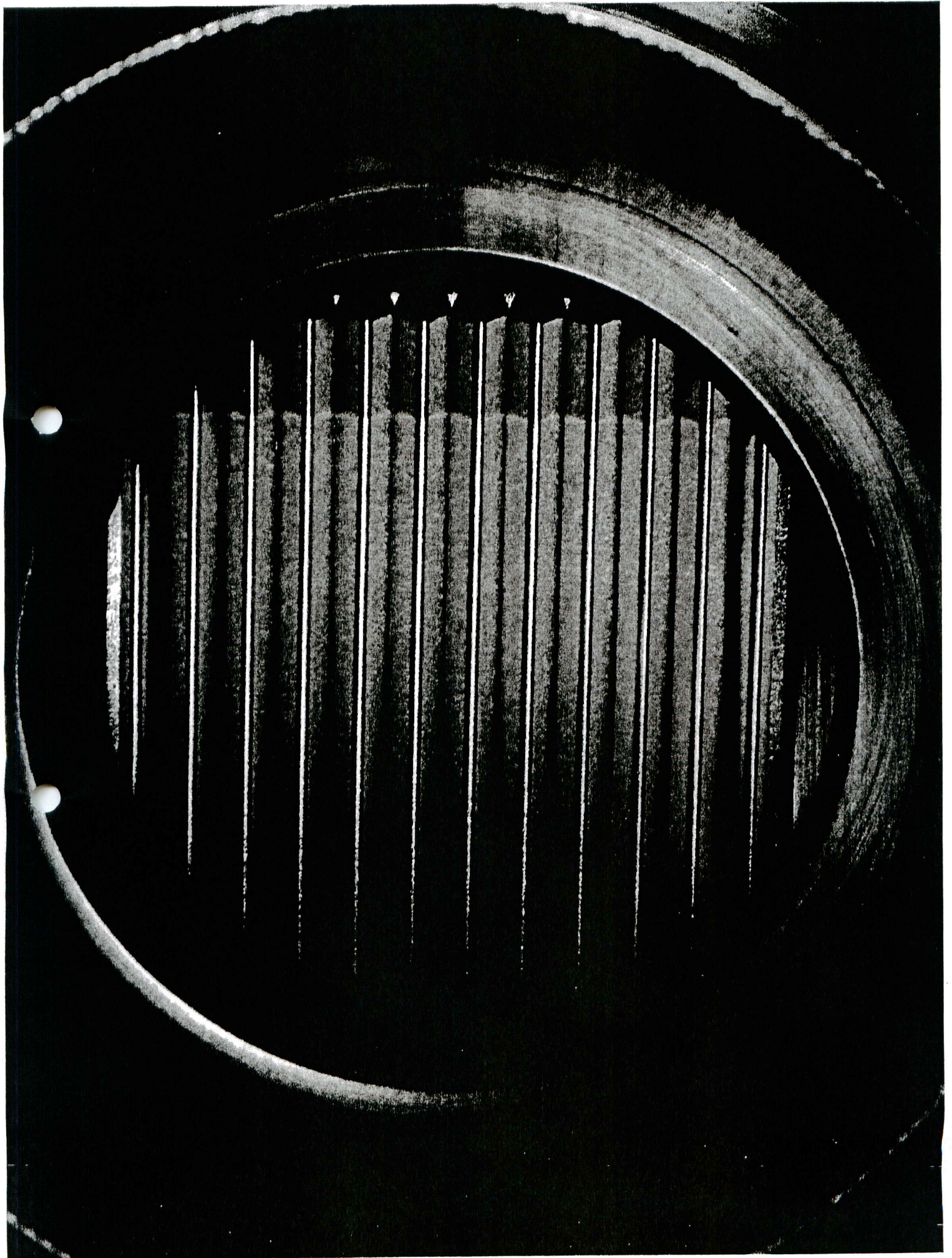


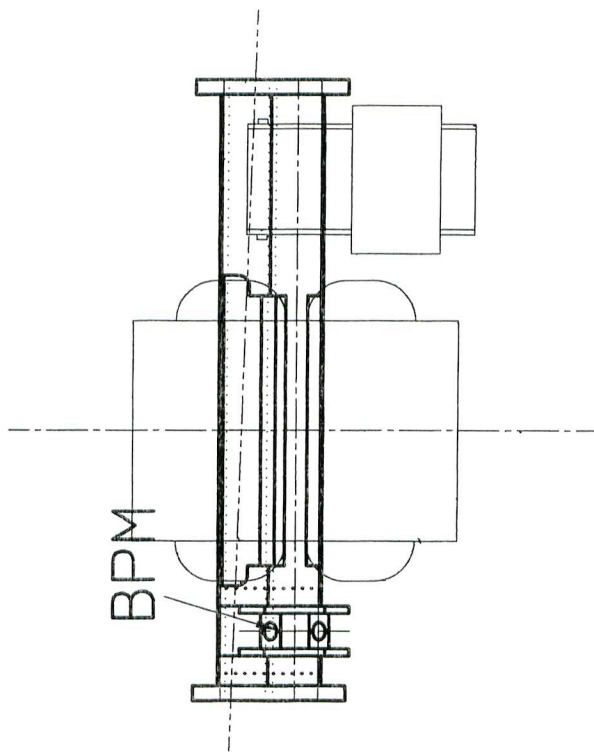


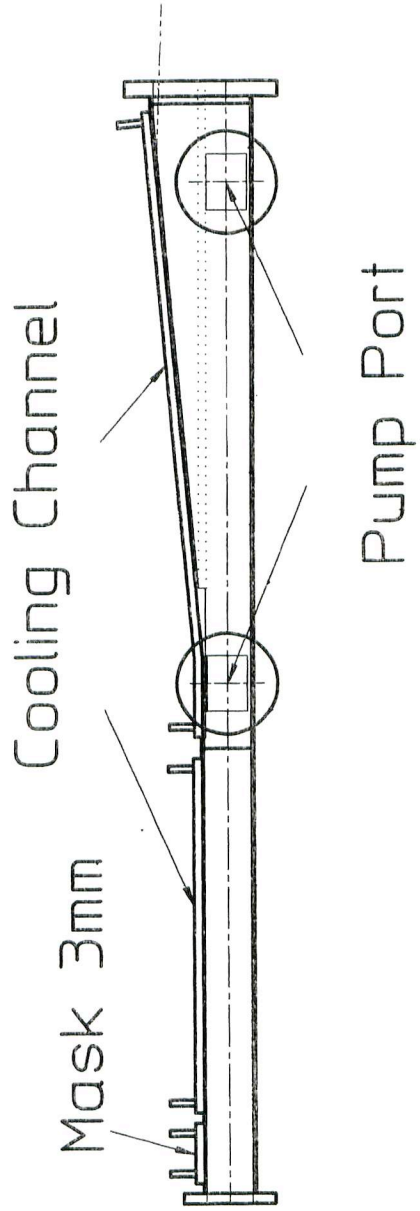












2. Electron cloud with and without an antechamber.

- DC electron current by the electron monitor.

Electron current under intense synchrotron radiation.

low

With an antechamber with a solenoid field

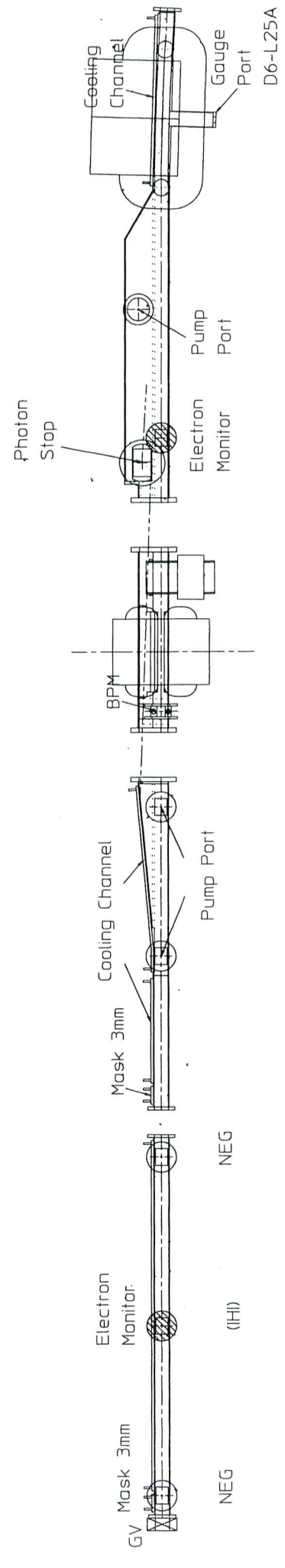
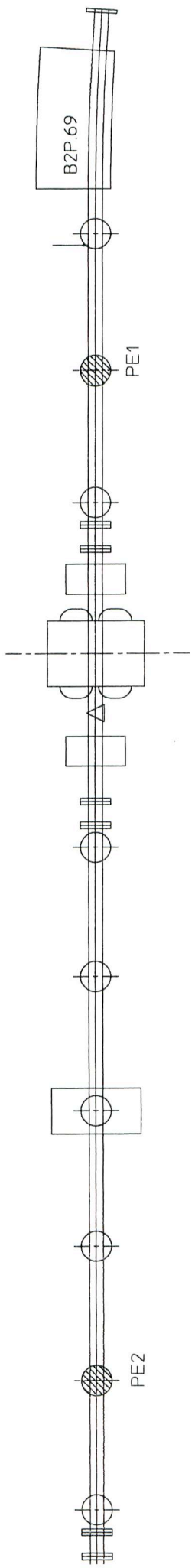
With antechamber without a solenoid field

Normal chamber with a solenoid field

Normal chamber without a solenoid field

high

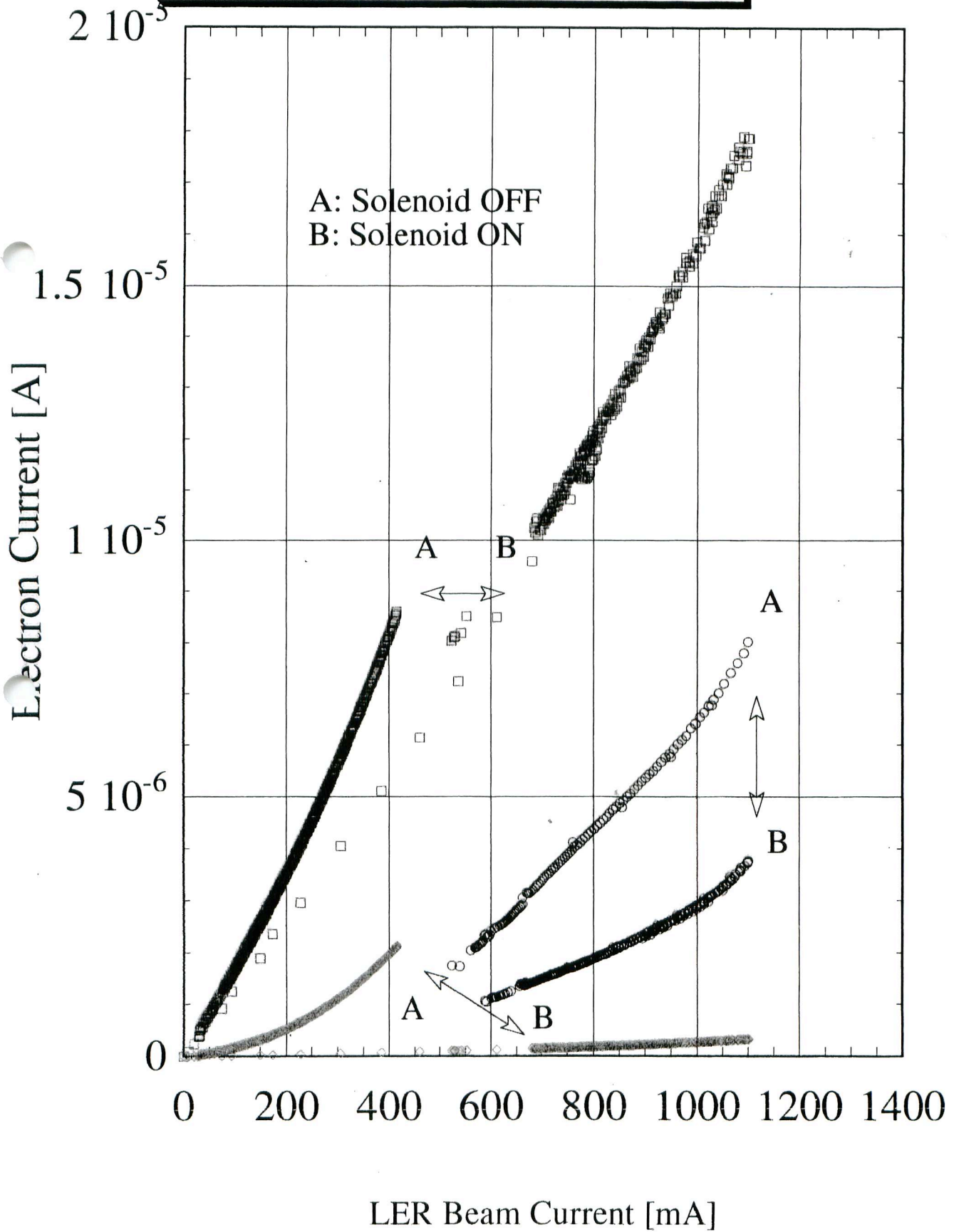
- Photoelectron yield of the photon stop is  $0.01 \sim 0.05$ .



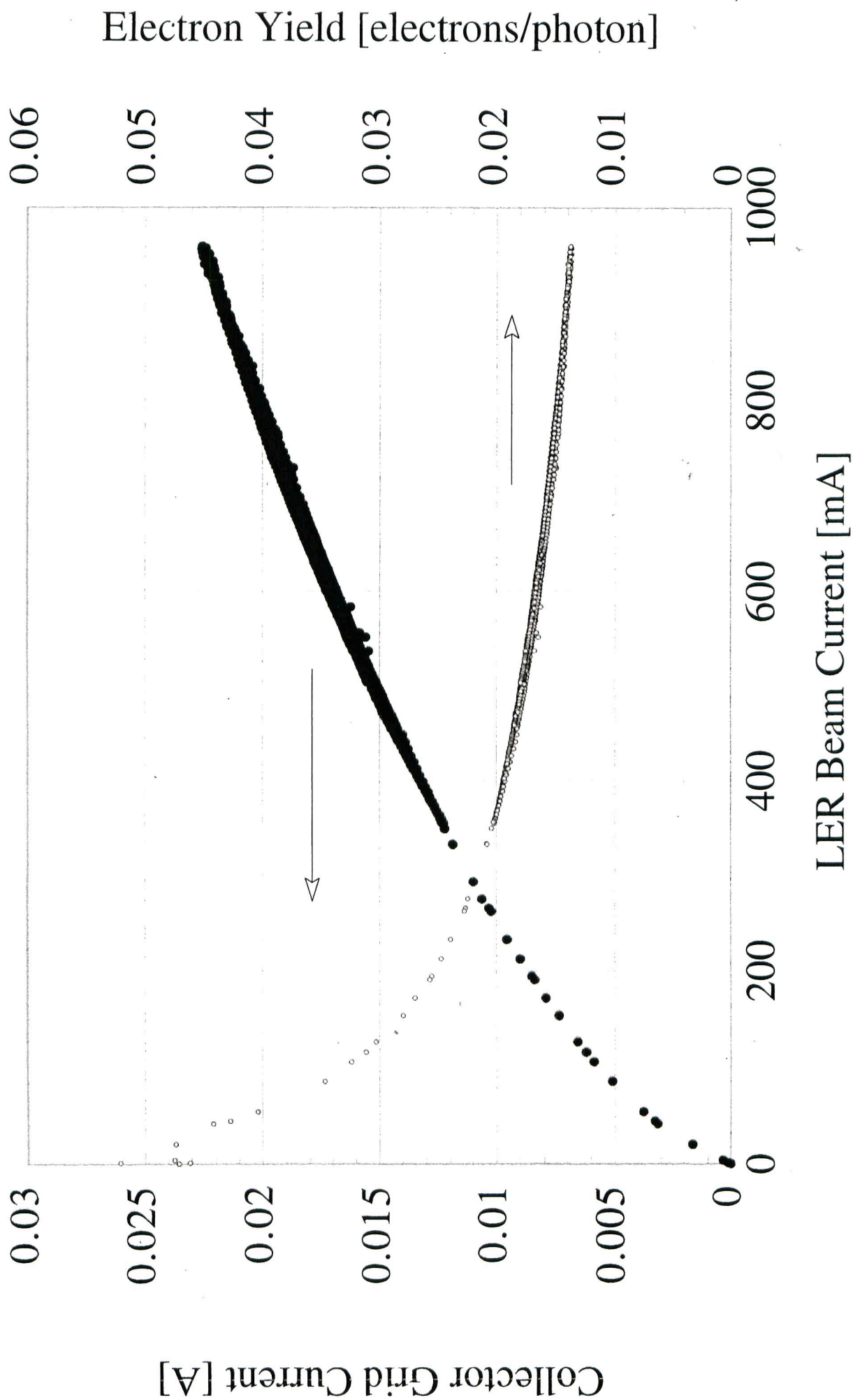
 Electron Monitor



- PE1(No Solenoid; Mar 2000)
- ◇ PE2(No Solenoid; Mar 2000)
- PE1(Solenoid ON; 30 Nov 2001)
- ◇ PE2(Solenoid ON; 30 Nov 2001)
- Antechamber(7 Nov 2001)



Collector Grid Current (8 Oct 2001)  
+300V





3. Electron cloud in a bending magnetic field.

- Measurement with a vacuum gauge (CCG).

Multipactoring is observed in a bending field.

Pressure rise due to multipactoring.

low



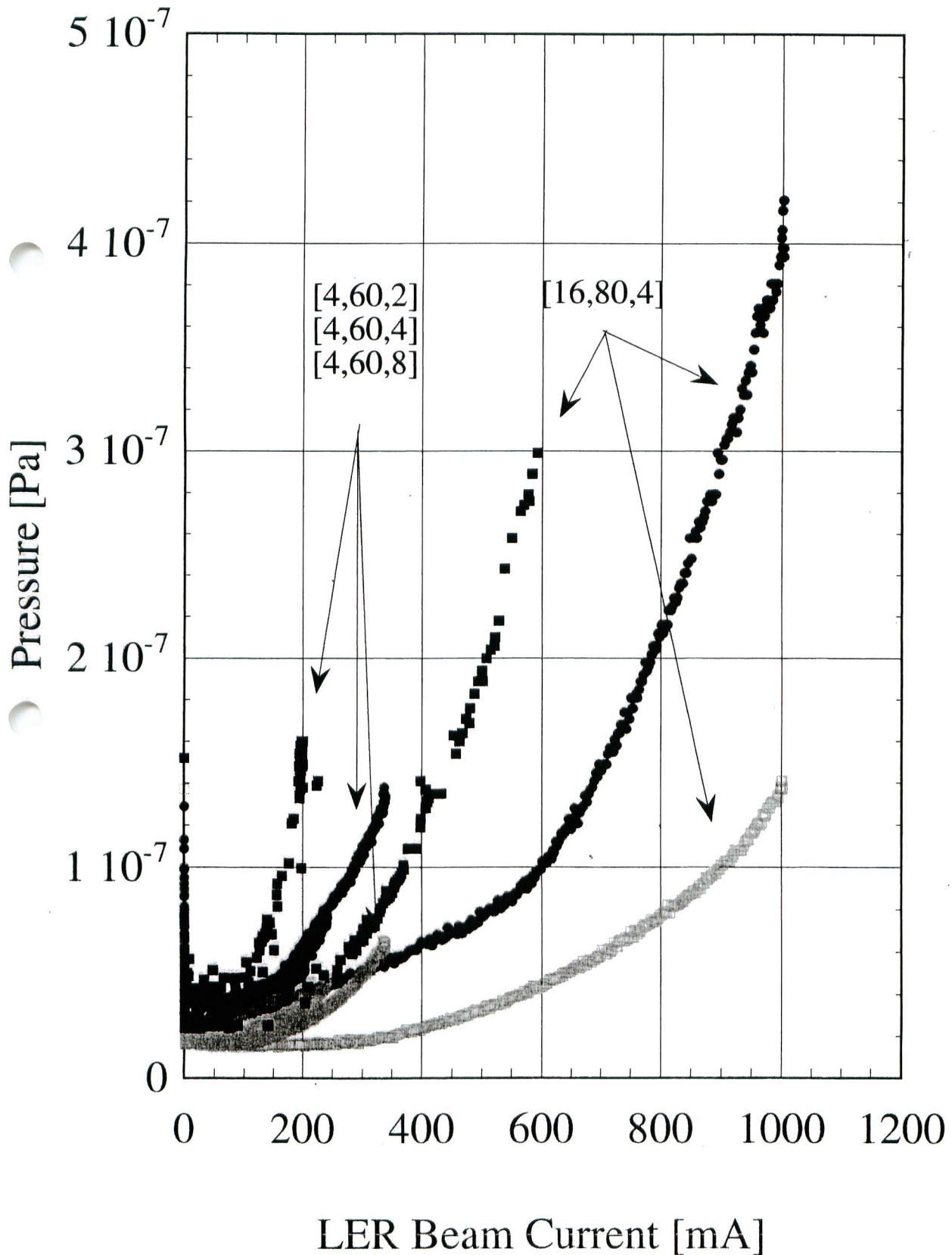
high

In a solenoid field

In a bending field

A field free region.

- D06-L25A (Bend)(25 Dec 2001)
- ◻ D07-L04(Straight, Solenoid ON)(25 Dec 2001)
- D07-L04(Straight, Solenoid OFF)(2 Dec 2000)



4. Beam induced effect in an antechamber.

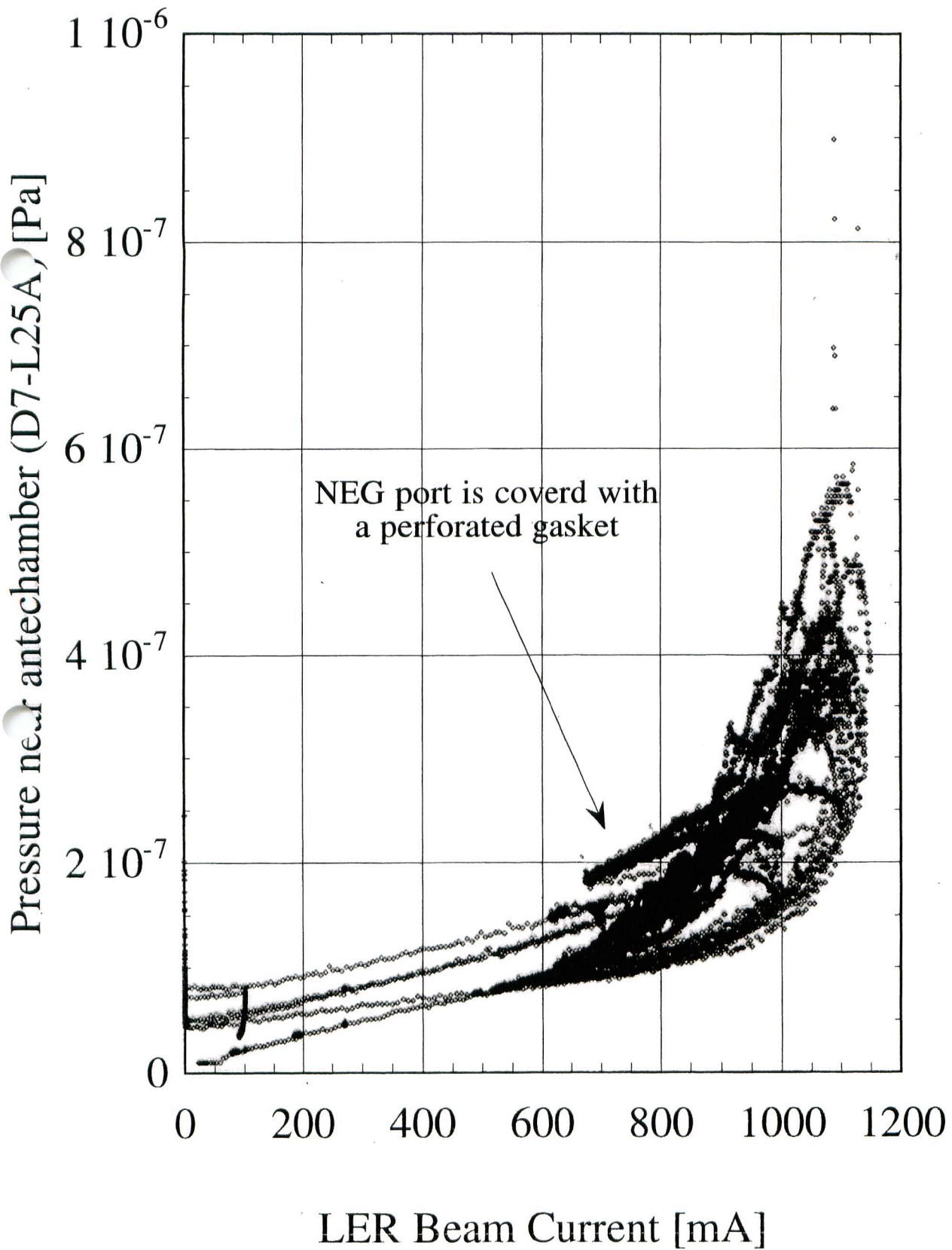
- NEG module in a port attached to the antechamber without an rf shield is heated up by the beam-induced field.

The temperature around photon stop port is also high.

The temperature of antechamber is warmer than other part.

- Photoelectron from the photon stop enters an ion pump. The electron current becomes an additional load to a power supply of IP.

- ◊ D06-L25A (14 Dec 01)
- ◊ D06-L25A(1 Feb 2002)



## Conclusion

1. Antechamber can reduce electron cloud considerably where synchrotron radiation is intense. It is more effective than a solenoid field. If solenoids are added to antechamber, the best effect will be attained.
2. In a bending field multipactoring occurs.
3. In an antechamber, beam induced field is not negligible. The design must be carefully done to reduce the effect of a beam-induced field.