Plan for Antechamber

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To shut out photoelectrons which are thought to cause beam blow up in LER from beam duct, the use of an antechamber is considered. Here we show a plan to let 90% of photons of synchrotron radiation enter an antechamber.

Considerations and features

• Neglect photons whose energy is lower than 5.8 eV (for example), because they produce no photoelectrons.

• An vertical aperture which allow all photons with an energy higher than 5.8 eV pass through is now called 100% aperture.

• An vertical aperture which allow 90% of photons with an energy higher than 5.8 eV pass through is called 90% aperture.

• Vacuum chambers which lie within a 90% fan of SR from a bending magnet will be changed.

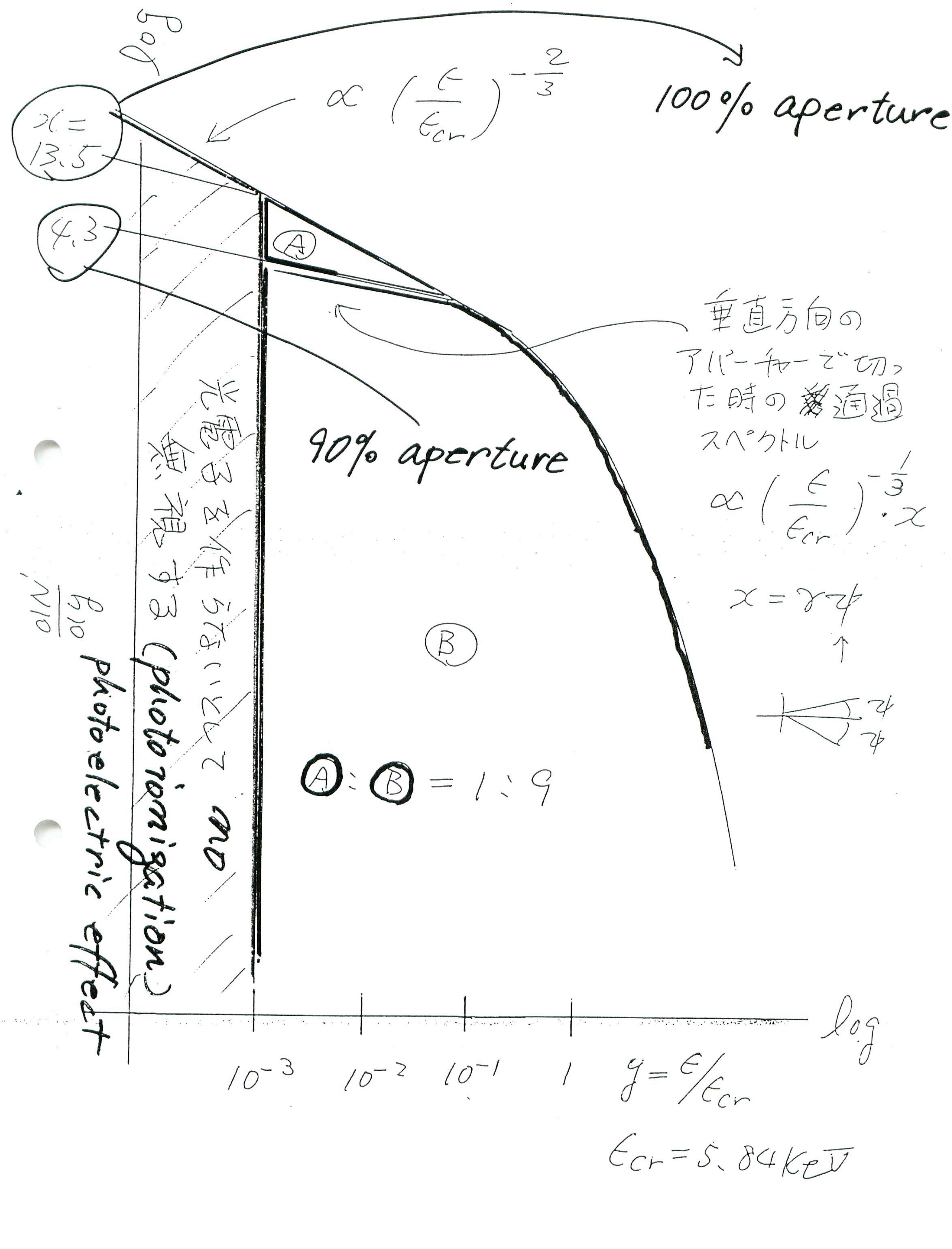
• The height of the slot gap is 20 mm (full)

• This gives 100% aperture for 83% of SR fan. For the rest 7% of the fan an aperture wider than 90% aperture is given. Therefore at least $1\times0.83+0.9\times0.07\approx0.9$ of (effective) photons from a bending magnet enter an antechamber.

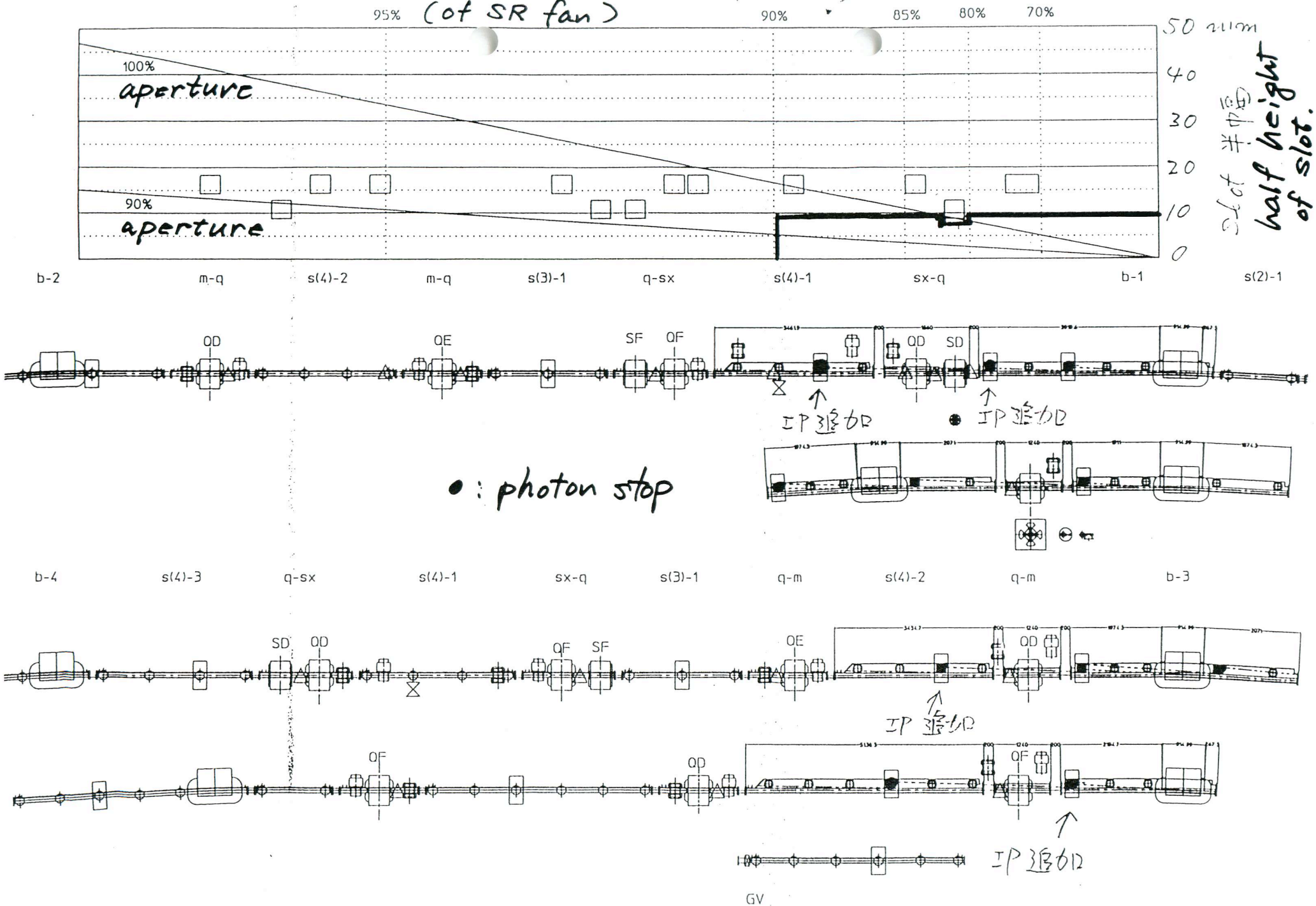
- Antechamber between sextuple magnet poles has narrower aperture. But it is only a small part.
- A Photon stop is tilted to 20:1 to reduce a heat concentration.
- Under the photon stop, a biased grid is supplied to attract photoelectrons.
- High capacity NEG and a sputter ion pump are placed at the photon stop.
- All pump port will be attached to an antechamber.
- Special bellows is required.

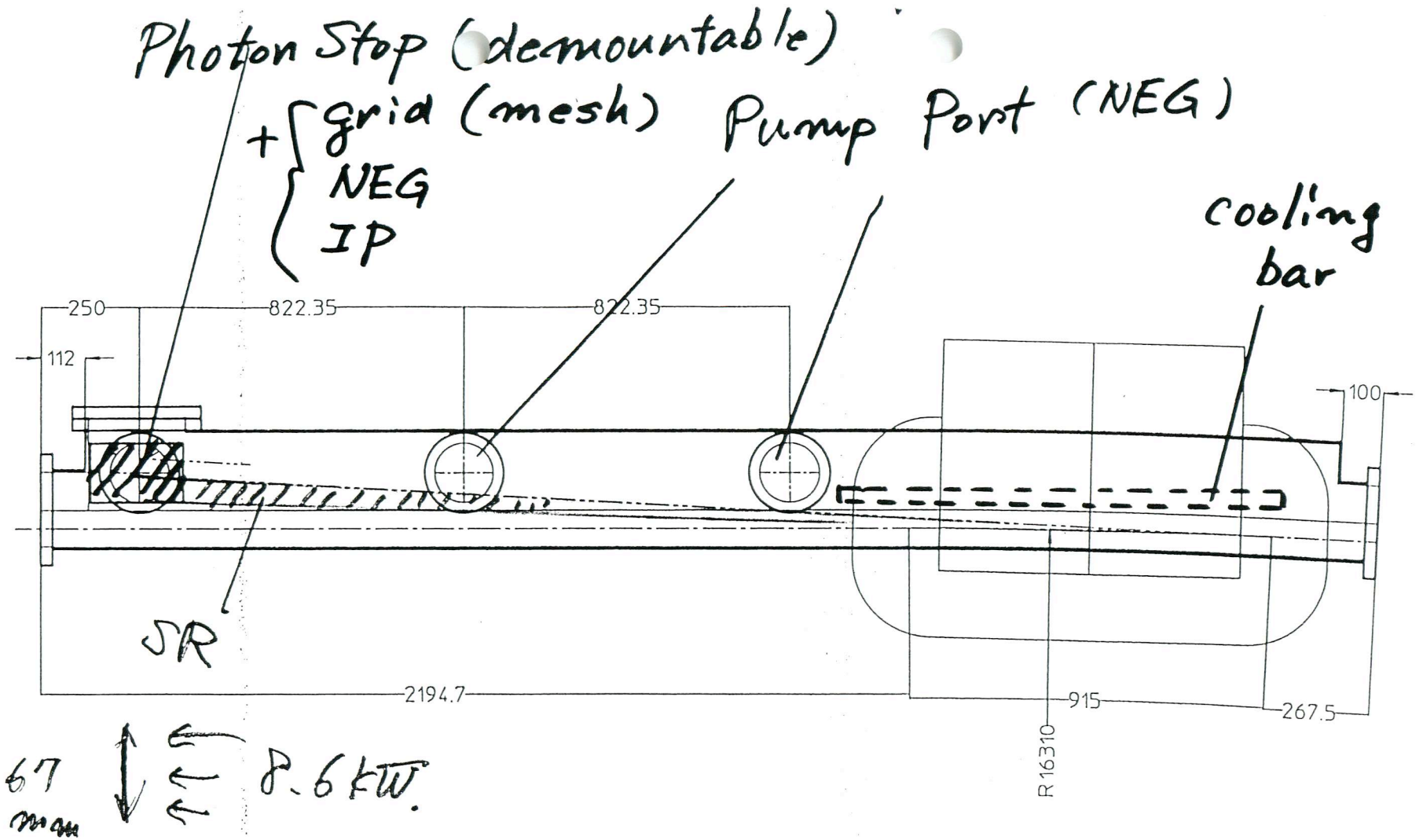
Acknowledgement

Sincere thanks are due to John Seeman for sending us detailed drawings of SLAC PEPII LER vacuum chamber.

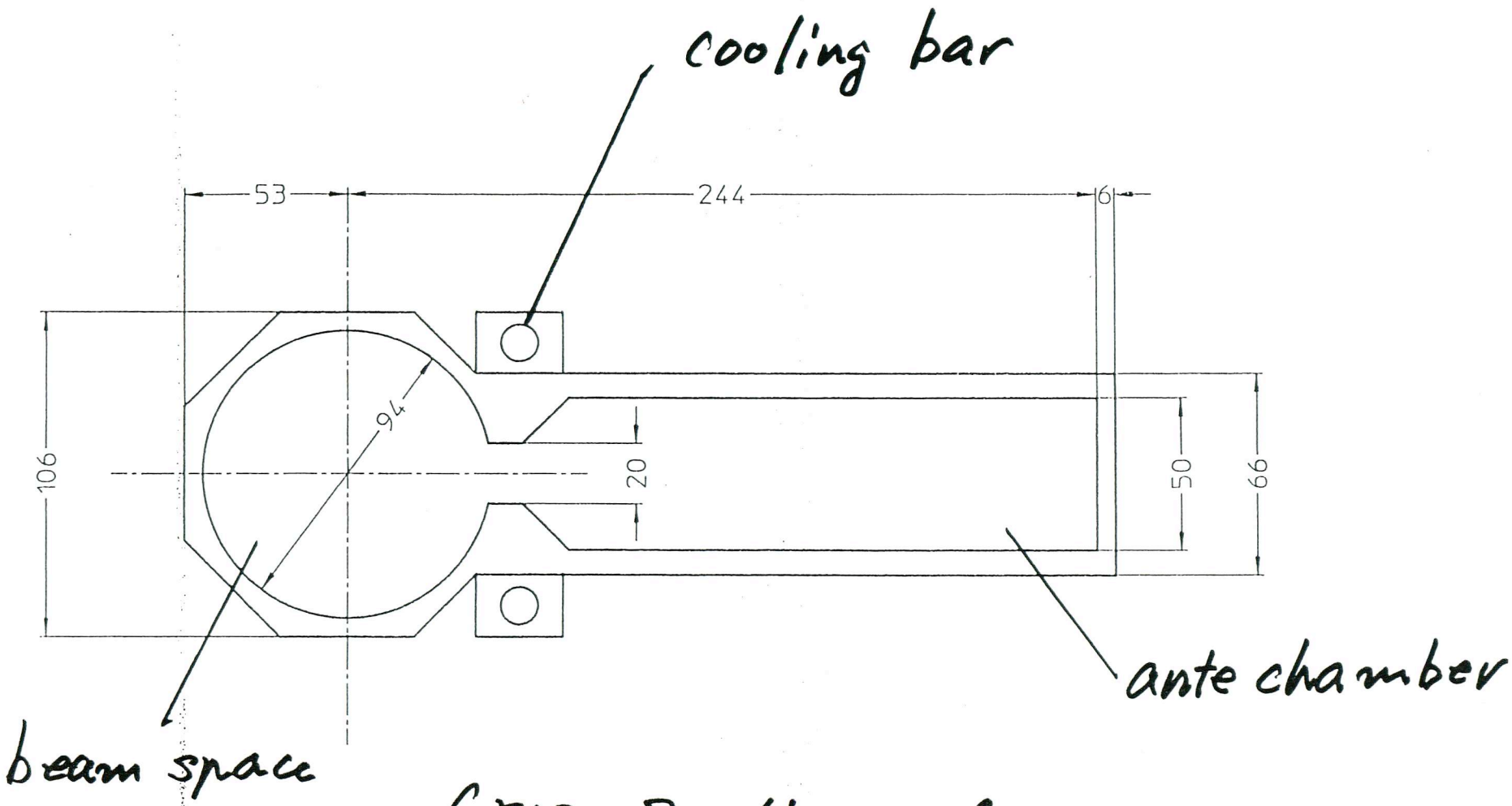


log
100% aperture
∝ (ε/εcr)^(-2/3)
x = 13.5
4.3
A
B
90% aperture
垂直方向のアパーチャーで切った時の透過スペクトル
∝ (ε/εcr)^(-1/3)·x
x = γψ
ψ
ψ
光電子を伴わないとして無視する (photoionization)
no photoelectric effect
9/10
1/10
A : B = 1 : 9
10^-3
10^-2
10^-1
1
log
y = ε/εcr
εcr = 5.84 keV

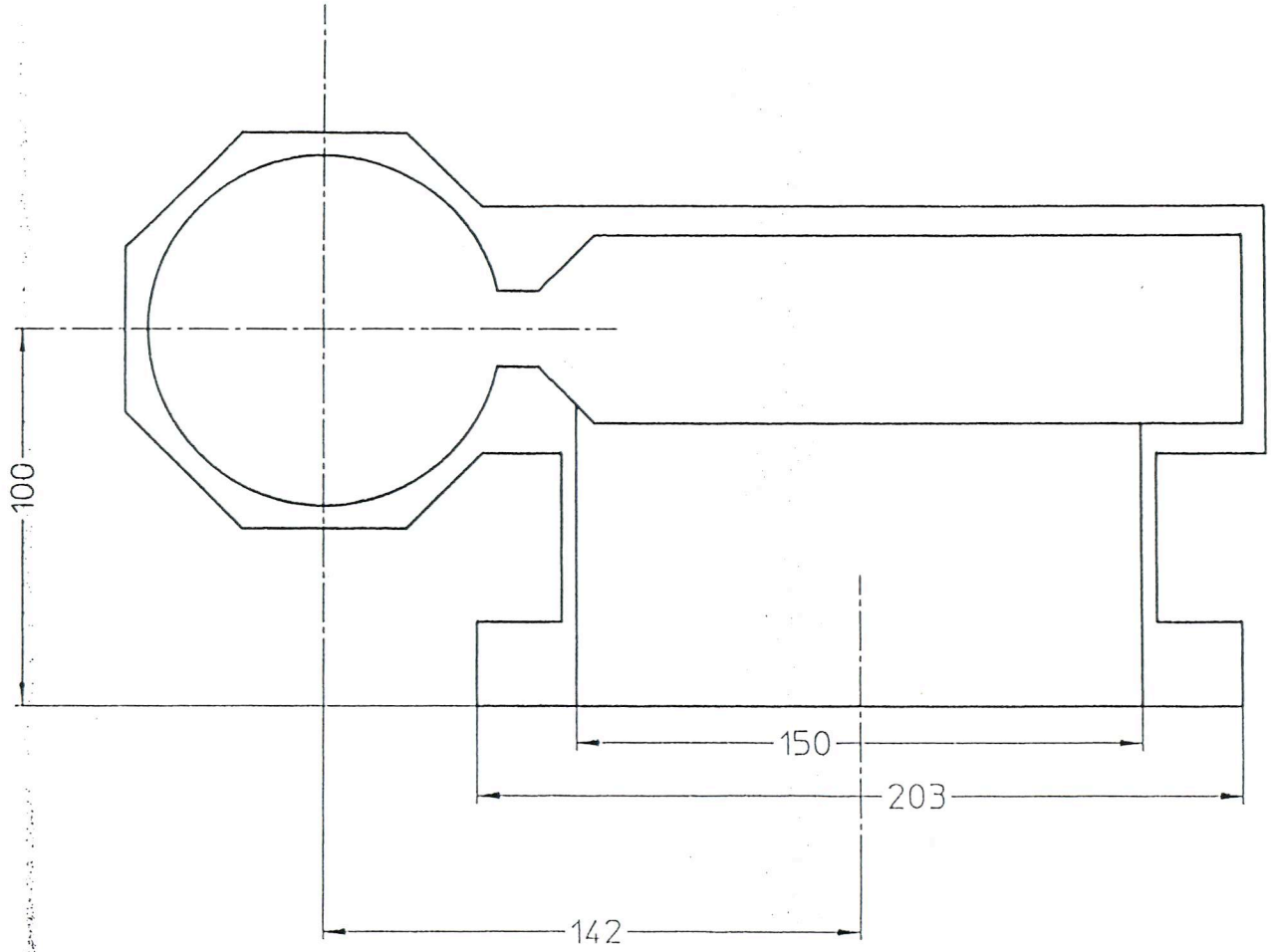

95% (of SR fan)
90%
85%
80%
70%
100%
aperture
90%
aperture
50 mm
40
30
20
10
0
half height of slot.
b-2
m-q
s(4)-2
m-q
s(3)-1
q-sx
s(4)-1
sx-q
b-1
s(2)-1
QD
QE
SF
QF
QD
SD
IP 進加
IP 進加
● : photon stop
b-4
s(4)-3
q-sx
s(4)-1
sx-q
s(3)-1
q-m
s(4)-2
q-m
b-3
SD
QD
QF
SF
QE
QD
IP 進加
QF
QD
QF
IP 進加
GV


Photon Stop (demountable)
+ grid (mesh)
NEG
IP
Pump Port (NEG)
cooling bar
250
822.35
822.35
112
100
SR
2194.7
915
267.5
R16310
67 max
8.6 kW.

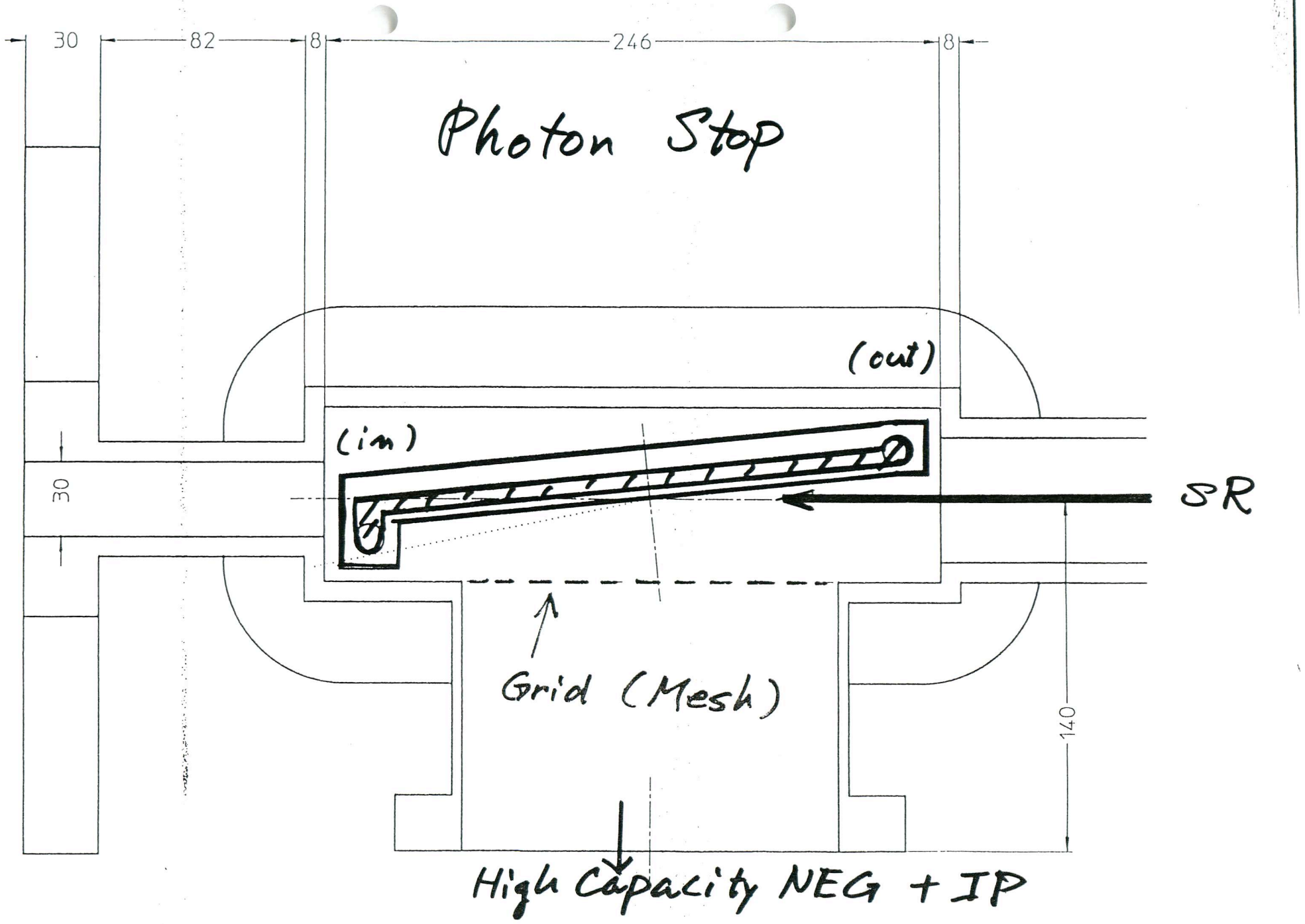
B chamber

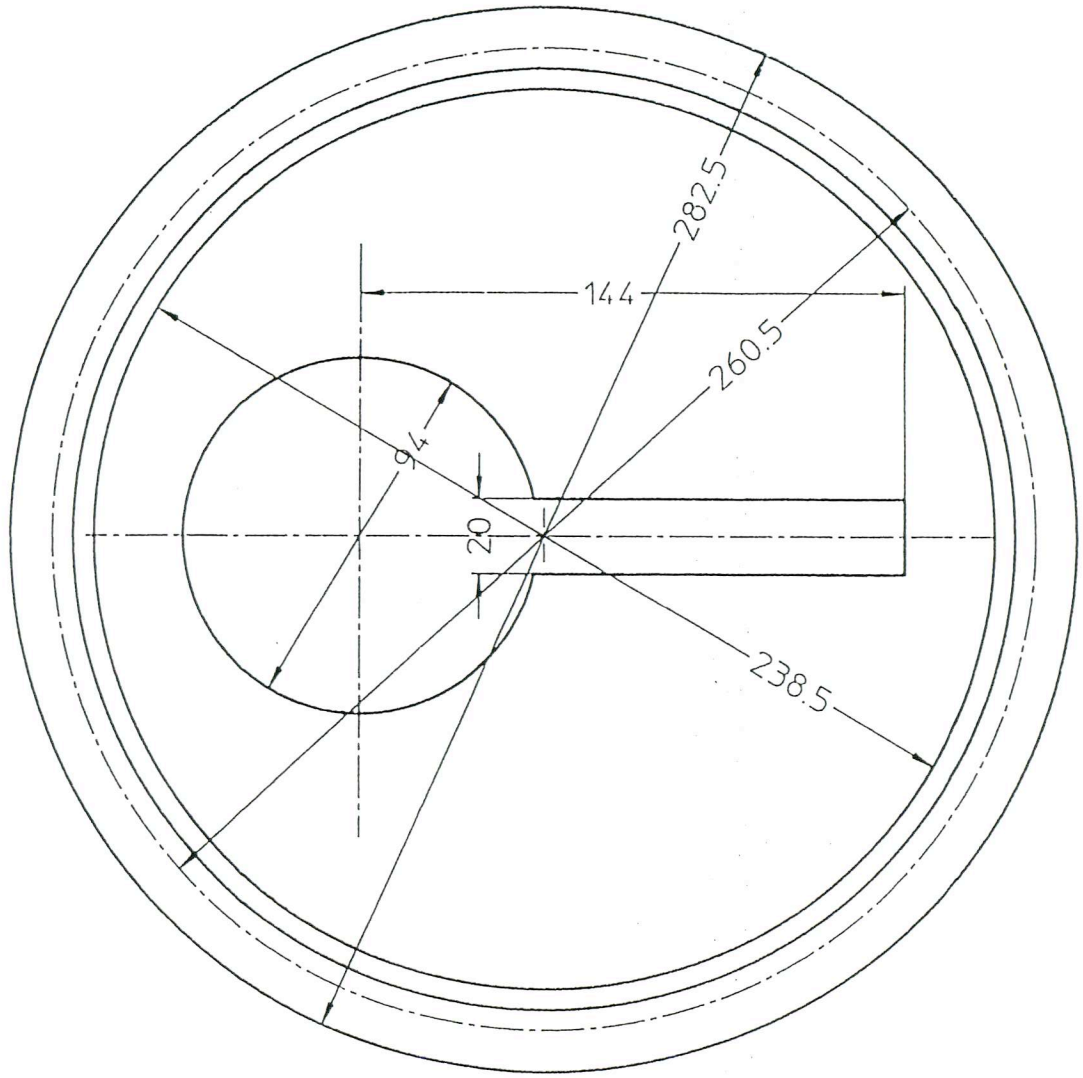


Cross Section of
B chamber

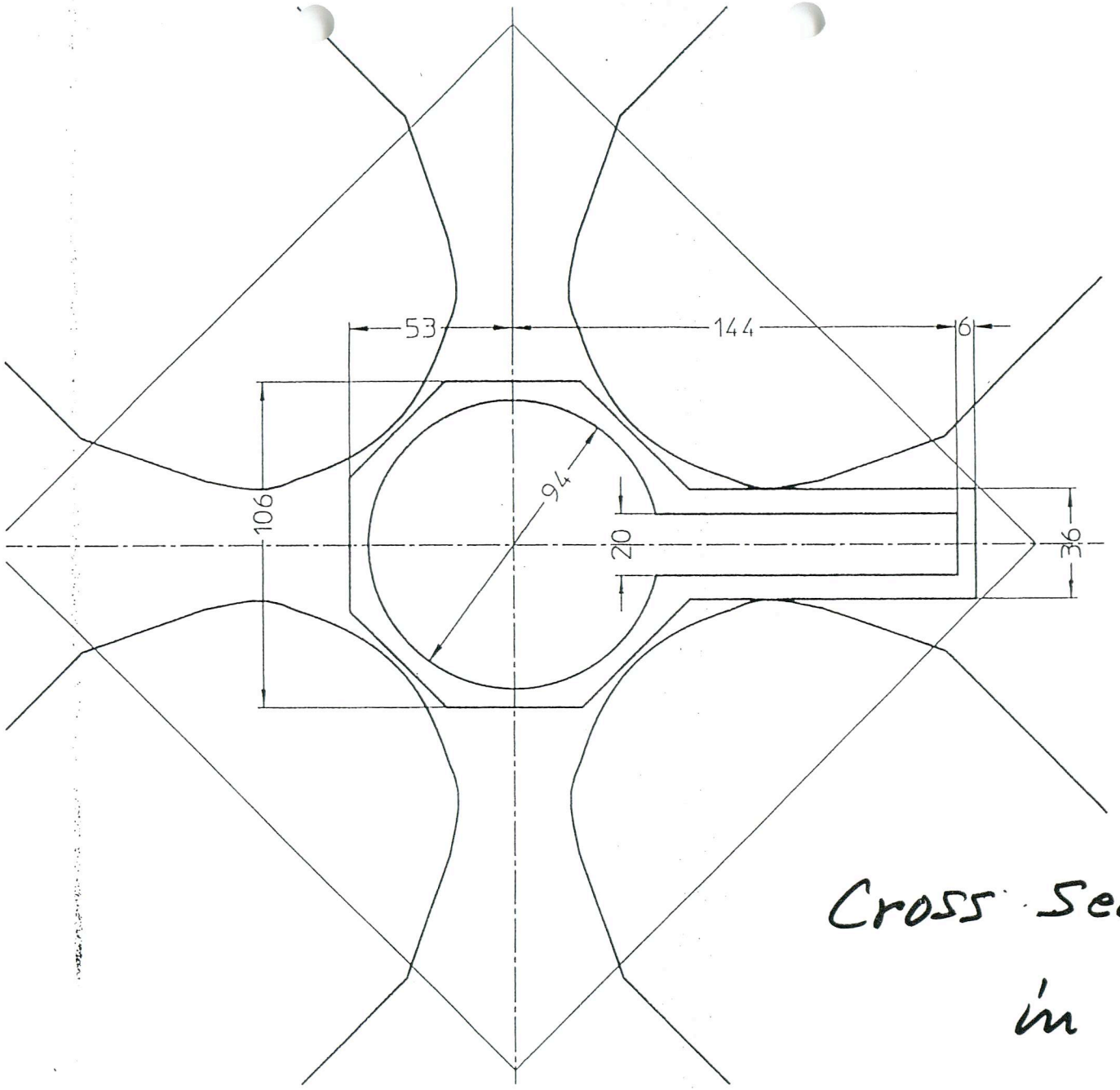


Pump Port

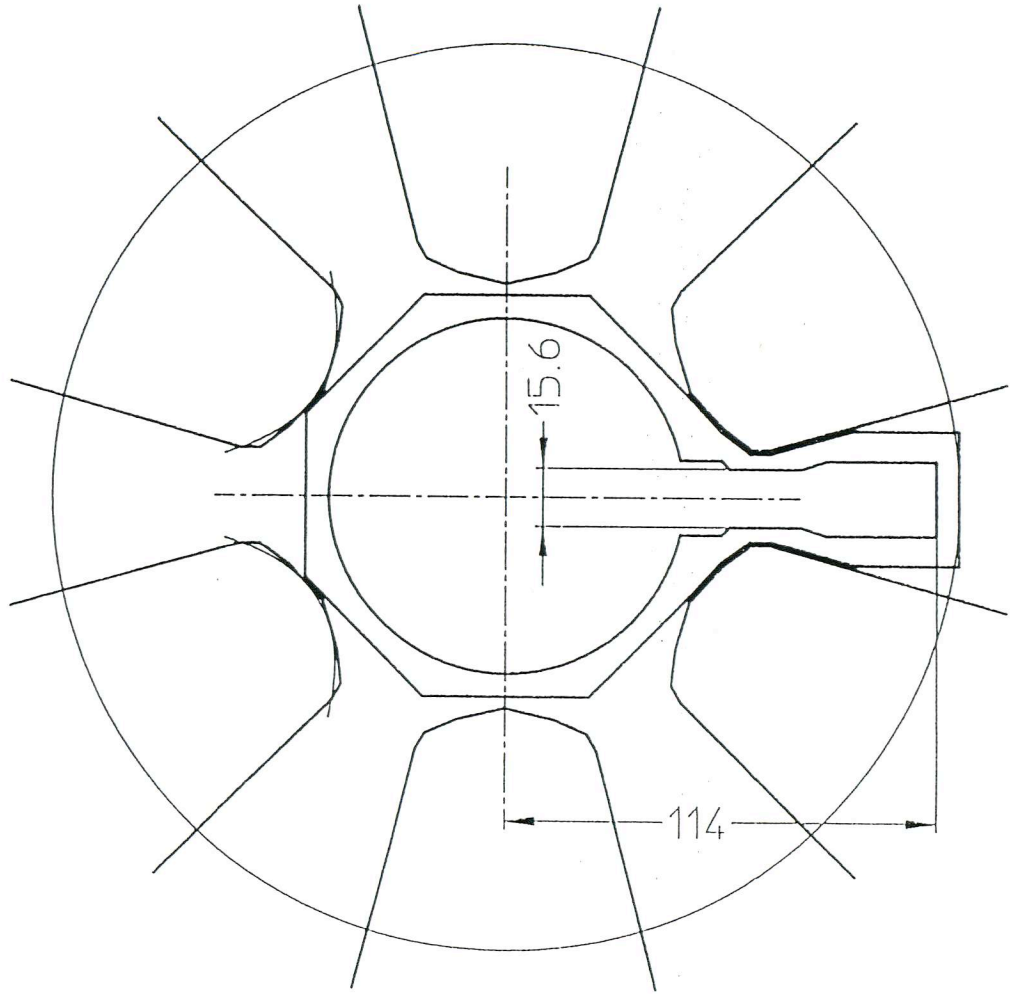

30
82
8
246
8
Photon Stop
(out)
(in)
30
SR
Grid (Mesh)
140
High Capacity NEG + IP



Flange



Cross Section in Q



Cross Section
in SX