

# Interaction Region

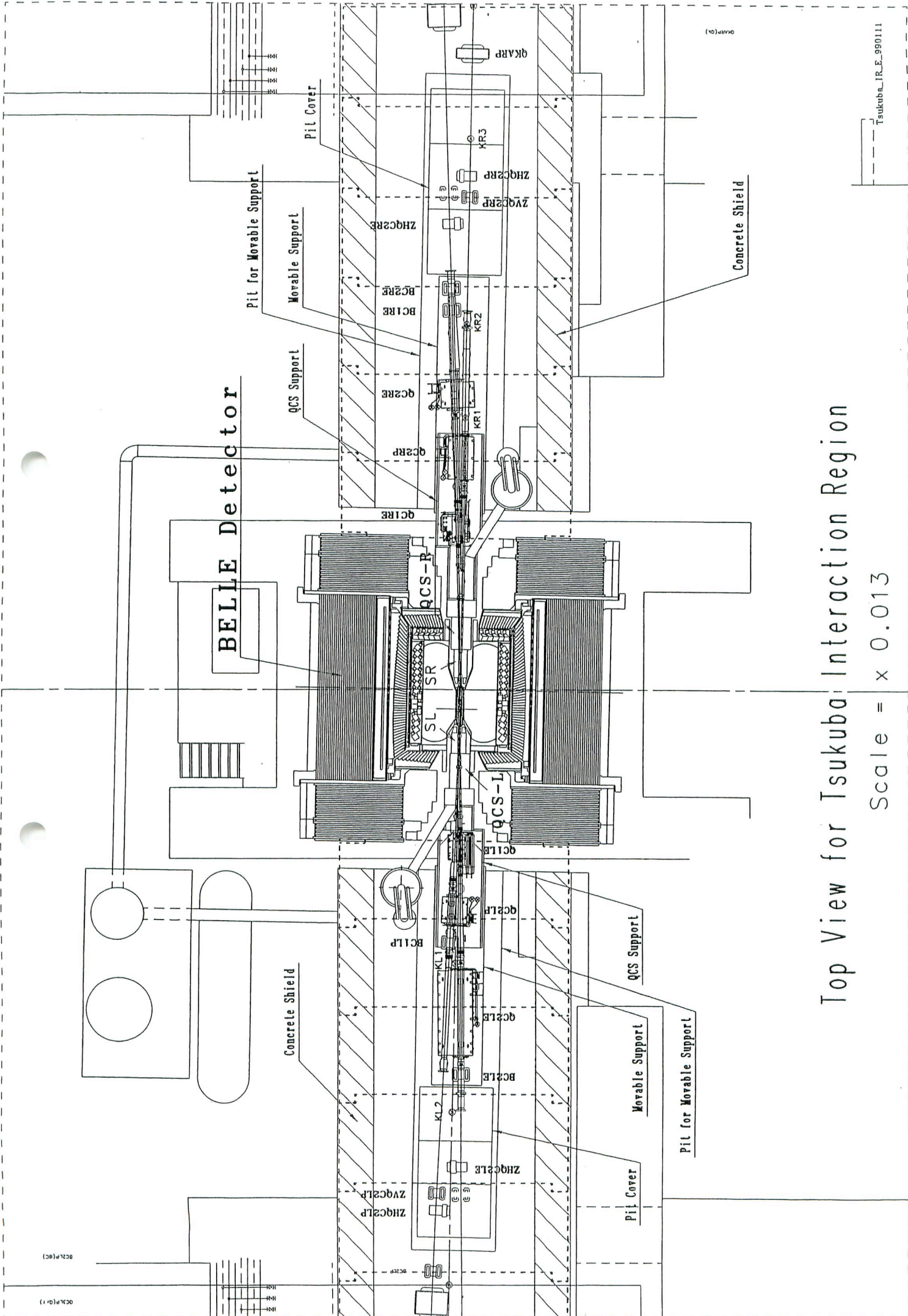
K. Tsuchiya

- 1) IR Overview
- 2) Operational History
- 3) Progress in 2000
- 4) Summary

# IR Design

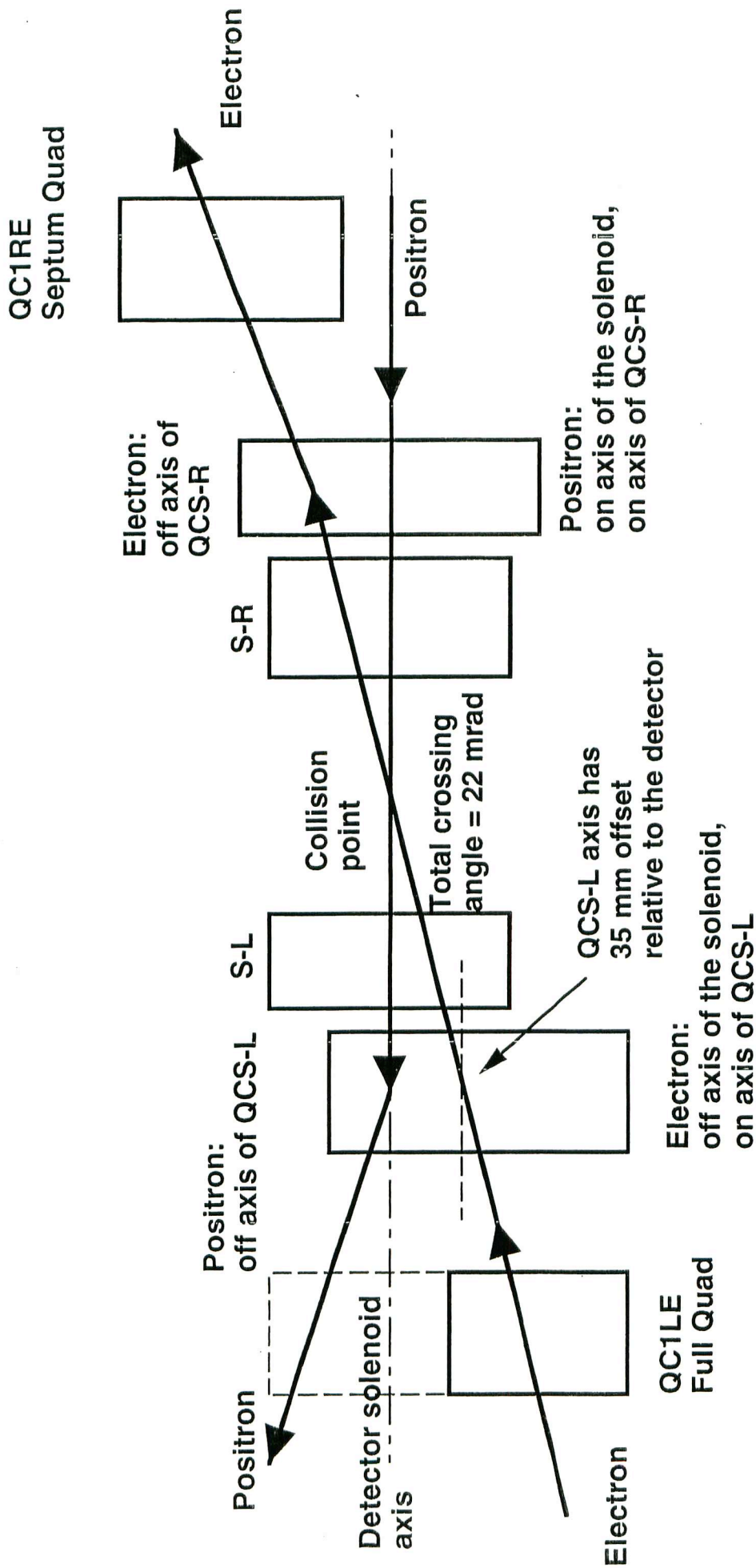
	<b>LER</b>	<b>HER</b>
Energy (GeV)	3.5	8.0
Current (A)	2.6	1.1
Crossing Angle (mrad)	2 x 11	
Luminosity (cm <sup>-2</sup> s <sup>-1</sup> )	1 x 10 <sup>34</sup>	
Bunch length (mm)	4	
Bunch spacing (m)	0.59	
$\beta_x^*$ (m)	0.33	
$\beta_y^*$ (m)	0.01	

- The beams collide with finite angle (2 x 11 mrad) at the interaction point (IP).
- Closest vertically focusing quad (QCS) has both beams.
- Compensation solenoid and QCS are superconducting magnets.



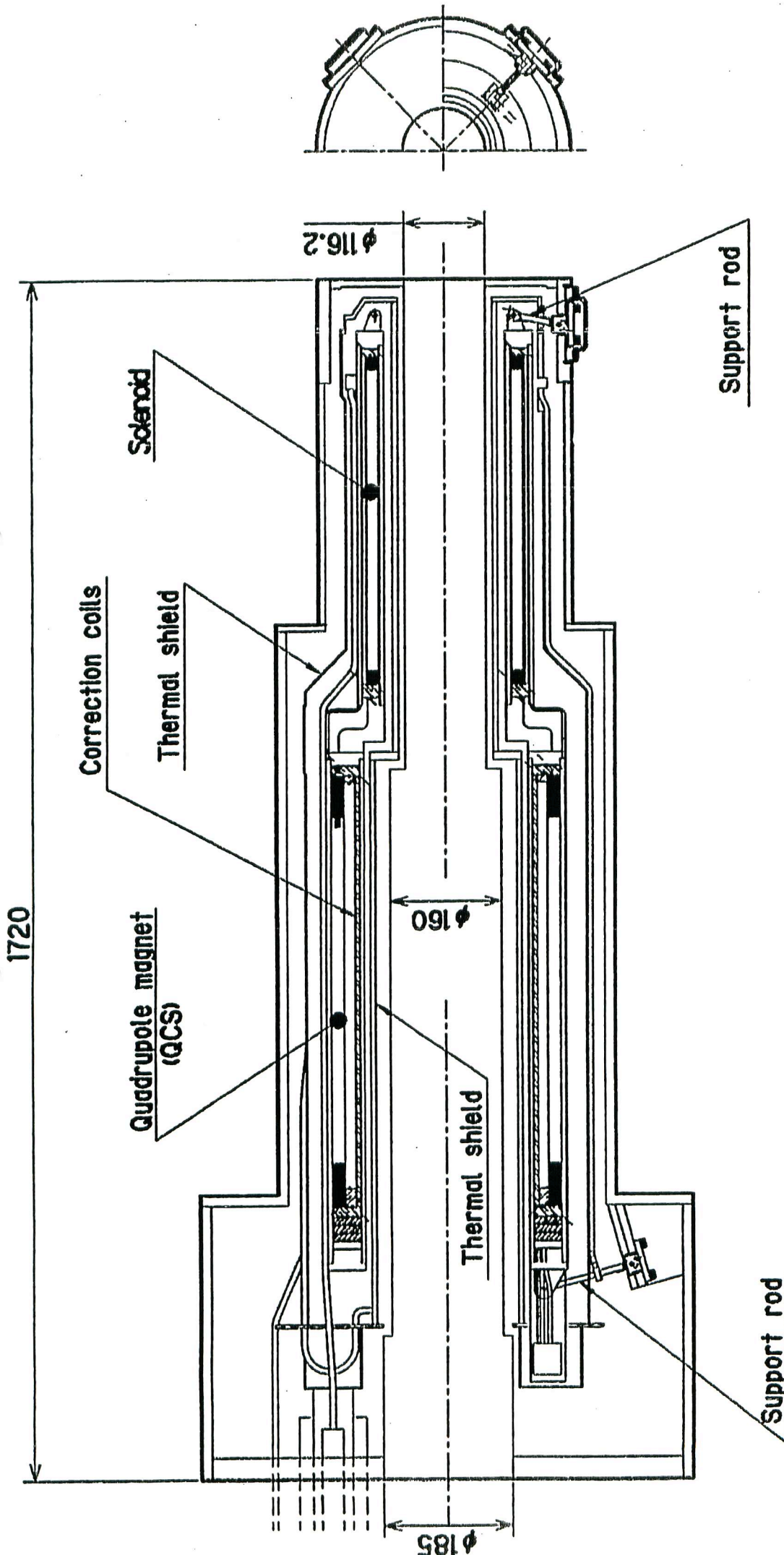
Top View for Tsukuba Interaction Region

Scale = x 0.013



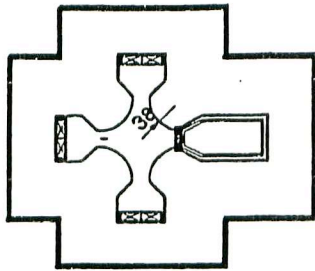
Schematic layout of the magnets and the beam line near IP



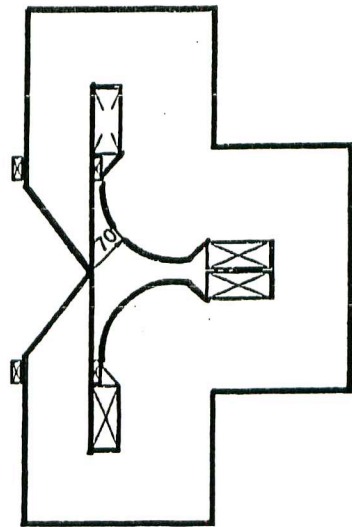


SC Magnets and L-side Cryostat

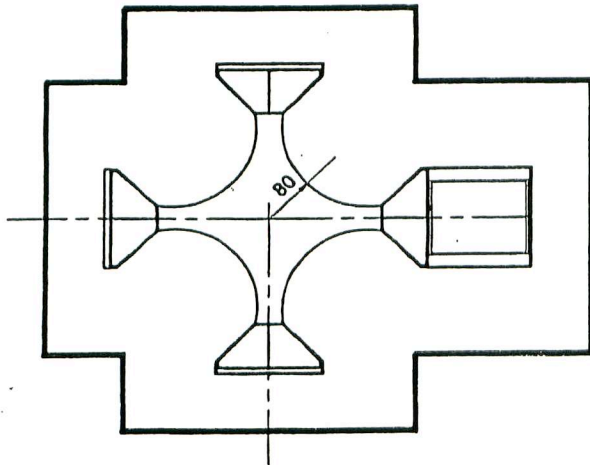
*Example Cross Section of IR Special Quadrupole Magnets*



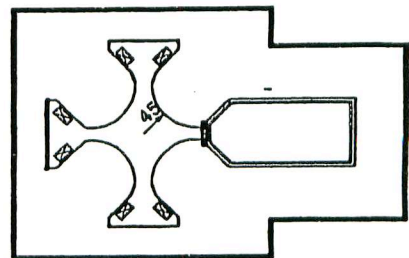
QC1LE



QC1RE



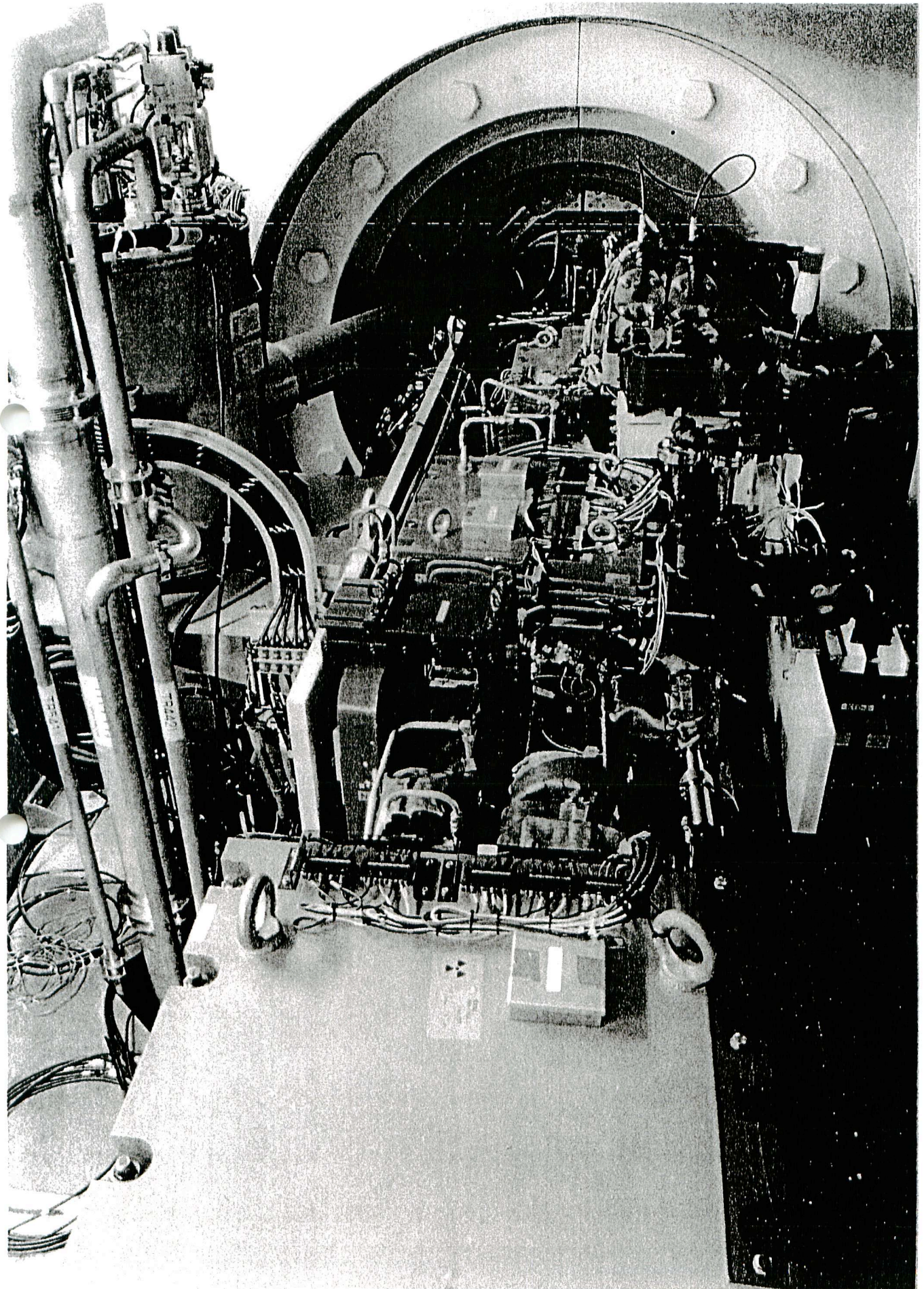
QC2LE



QC2RP

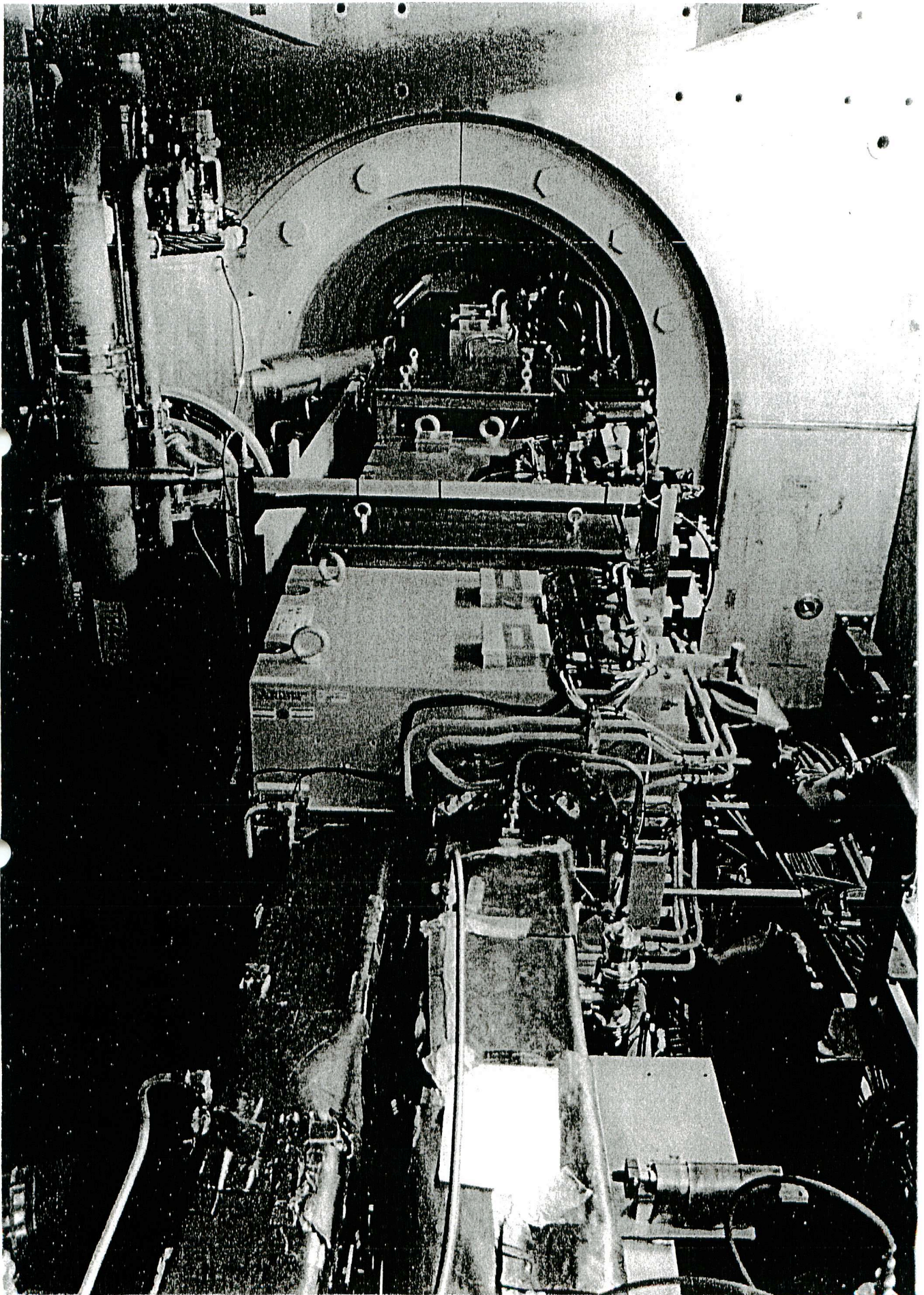






L-side beam line





R- side beam line



# History of IR Operation

'98

Nov.

completed the construction of IR

Dec.

start KEKB commissioning  
w/o Belle solenoid

'99

Feb. 28

QC2RE vacuum chamber trouble happened.  
synchrotron light deformed the chamber and  
caused vacuum leak.

Apr. 19 - May 24 (5 weeks)

Belle detector rolled into the beam line

Jun. 12

IP vacuum trouble happened.  
an iron plate was pulled into the R-side  
cryostat bore and break the beam monitor  
feed-through.

Aug. 4 - Oct. 6

summer shut down  
system maintenance and SVD replacement

Dec. 15

QC1LE trouble happened; coil burnt

2000

Jan. 11 - July 25

SCM protection circuit triggered eleven times;  
earthquake  
electric power line troubles etc.

Oct. 1 - Dec. 28

SCM protection circuit triggered four times;  
electric power line trouble  
power supply trouble

2001

Jan. 4 - Feb.

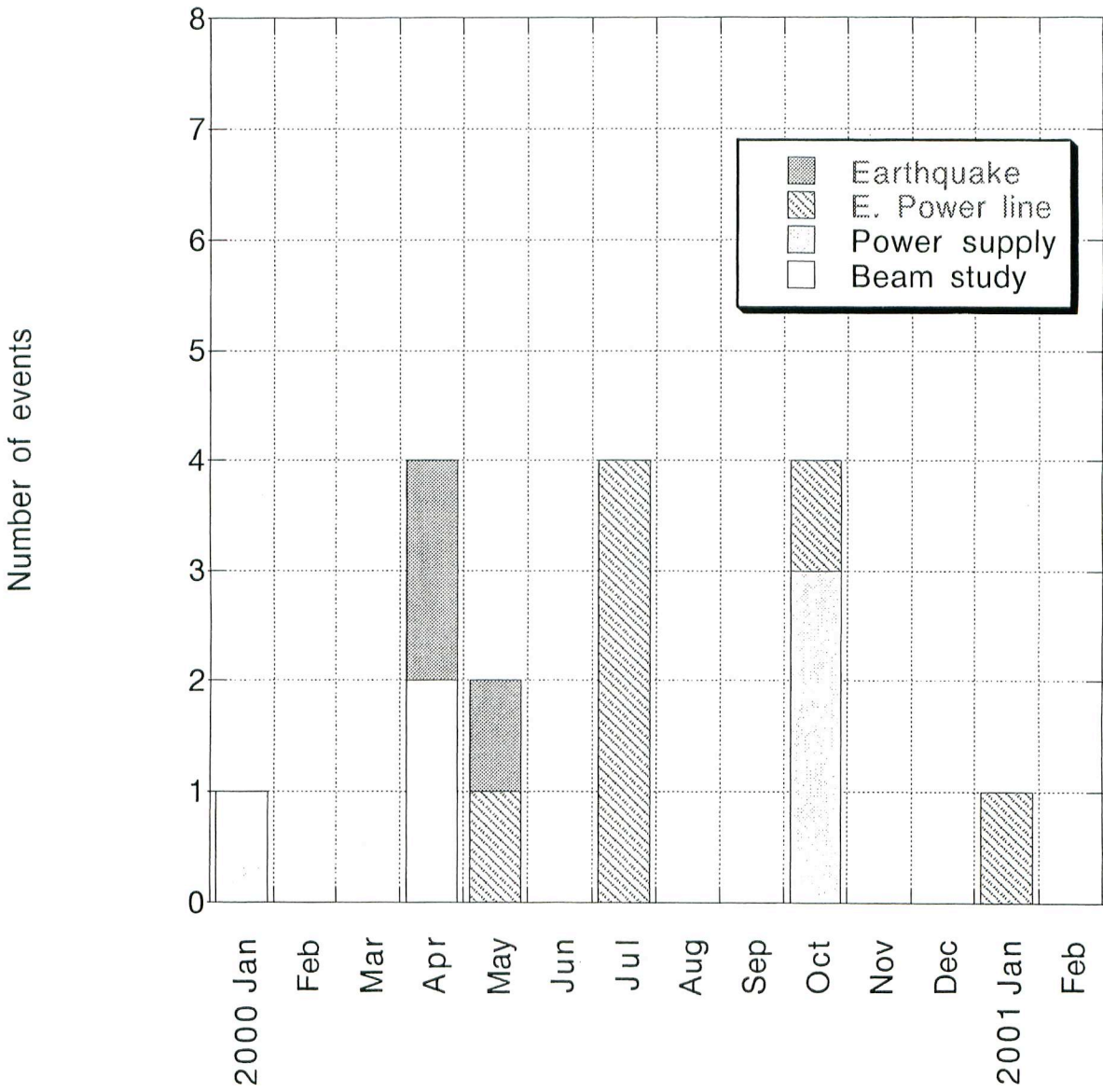
SCM protection circuit triggered one time;  
electric power line trouble

## Progress in 2000

- 1) Earthquake sensor was introduced into beam abort interlock system.  
This reduced the beam induced quenching of SC magnets and the unnecessary radiation dose on SVD.
- 2) SCM power supplies were improved to be less sensitive to the AC line voltage change.
- 3) The burnout protection of the QC1LE coil was improved.  
In addition to the temperature sensor, coil voltage monitor (interlock) was added.



### Summary of SCM discharge action



## Summary

- 1) The superconducting magnet system has been operating without serious trouble, although numbers of protection actions were enforced by power line trouble etc.
- 2) The IR hardware (magnets) has been working quite stably.

Recently, small movement ( $\sim 20 \mu\text{m}$ ) of QC1RE was found. It seems that this movement is related to the temperature rise of the beam duct heated by synchrotron light. The detailed study will be performed in the near future.