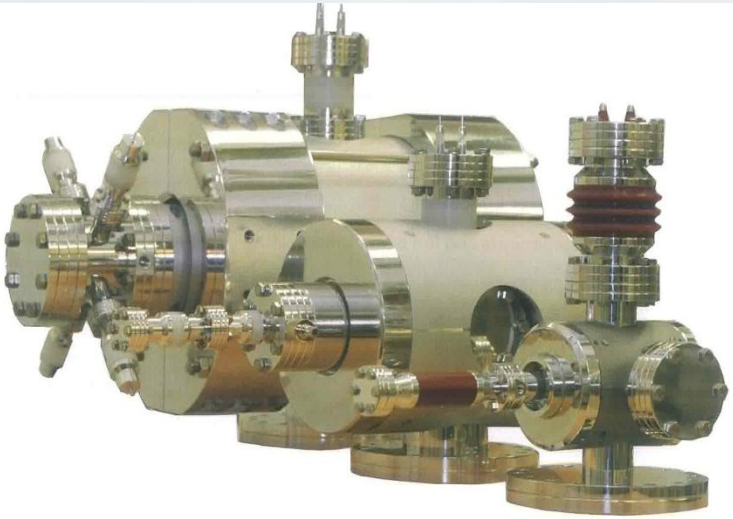
# Cryogenics and vacuum in Dreebit EBITs

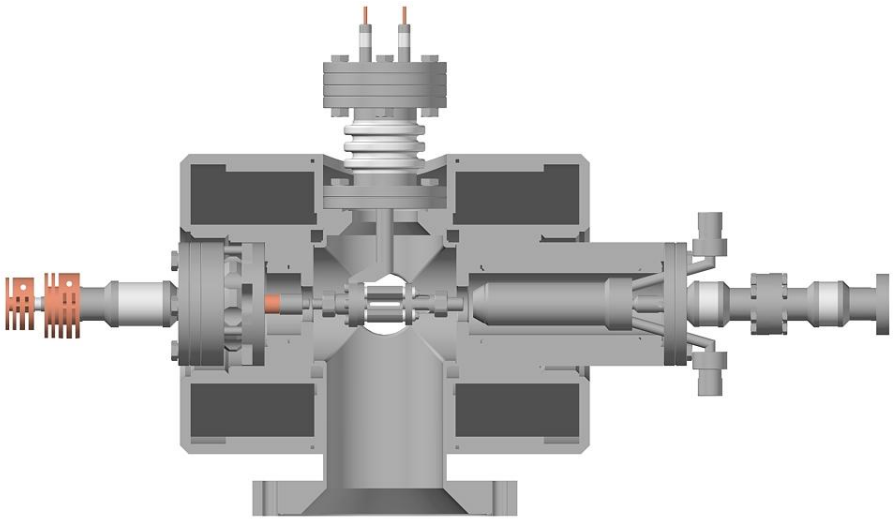
**The vacuum problem in EBIST is the problem of ensuring high vacuum into a long drift tube.**
**It can be done using one of the following methods:**

- **By standard methods and pumps in the case of the short drift tube with slots. It was realised in the Dresden "Warm" EBIT series of devices.**
- **By crypumping in the case, when the inner surface of the drift tube is the pumping surface in the same time. This method was realised at first in "Kryion-X" devices in Dubna. In the "Kryion-2" the drift tube with inner diameter of 3 mm and the length of 1 m had the temperature of 4.2 K. The vacuum in the ion trap was about of$10^{-11}$- $10^{-12}$ Torr, which was estimated by the measuring of the compensation degree.**
- **By the crypumping or sorption surface in the case, when wall of the drift tube is relatively transparent for the pumping and the pumping tools are located near the drift tube. This design was applied in Cornell EBIS and in BNL EBIS now.**

# Vacuum in Dreebit EBITs



**Familie of the Dresden EBITs**



**Pamping Flange**

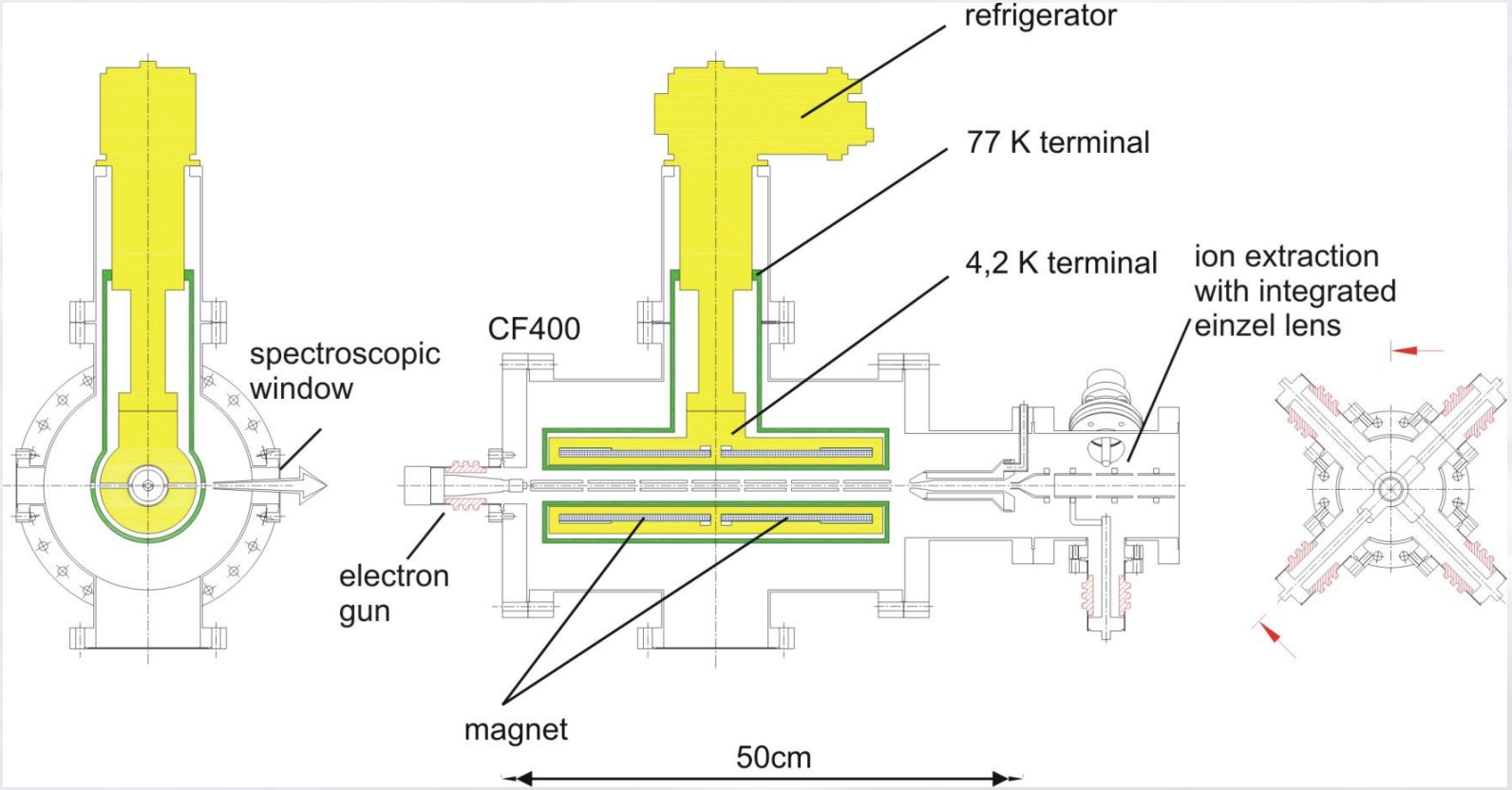
# Dresden EBIS - SC

| Parameters | Project | Really |
|---|---|---|
| Magnetic field (T) | 6 | 6.5 - max |
| Electron Current (A) | 1 | 0.9 |
| Electron energy (keV) | 30 | 18 |
| Electron density(A/cm$^2$) | 1000 | >800 |

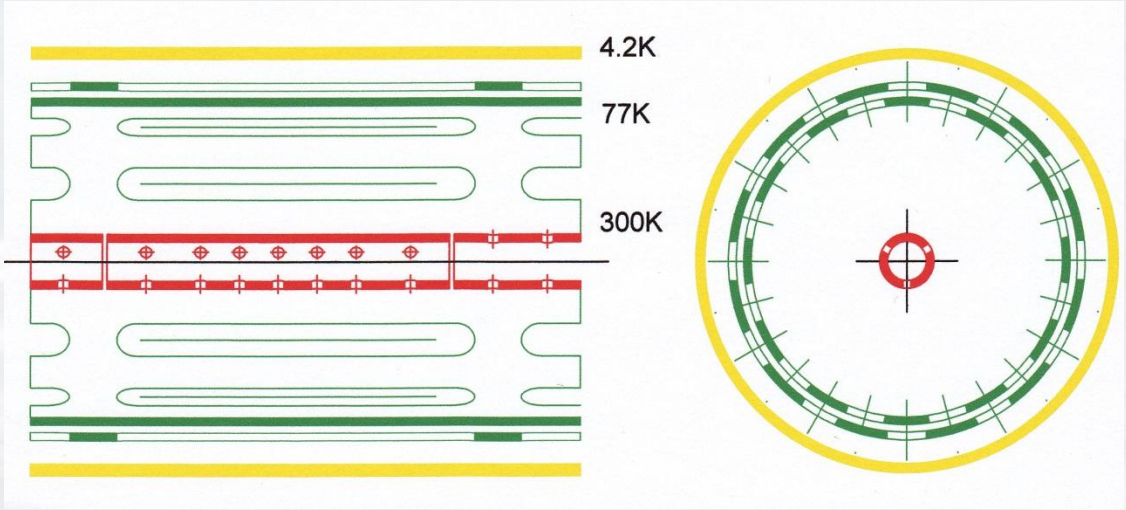
For the electron beam 1A and electron density 1000A/cm$^2$ diameter of the beam is 0.178 mm, only. Therefore, the accuracy for all parts of an electron optic system and the accuracy of mounting them on a common axis of the ion source must be less than 0.1 mm.

In this case, the possibility of crypumping of the drift tubes whit the temperature 4.2K was ignored to provide the necessary accuracy of the electron optic system.

# The Conceptual Design of Dresden EBIS-SC



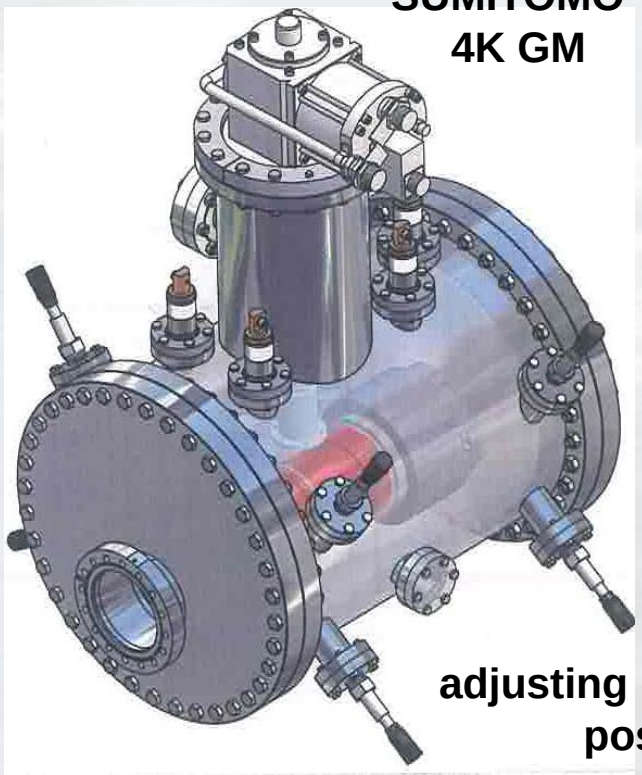
# The Pumping of the Drift Tube




**The pumping is carried out by sorption on the cryogenic surface through a two layers LN screen.**

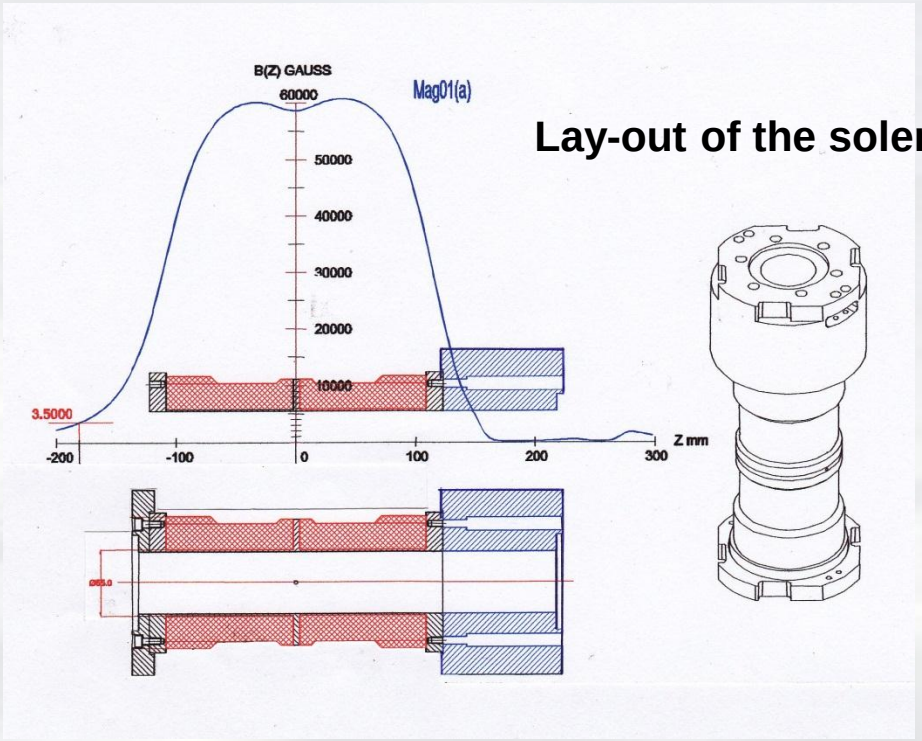
# The conceptual design of Cryogenics and Superconducting Solenoid

**SUMITOMO 4K GM**



**adjusting of the magnet positions**

**Lay-out of the solenoid**

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# EBIS-SC - overview