

The TITAN-EBIT

a status report

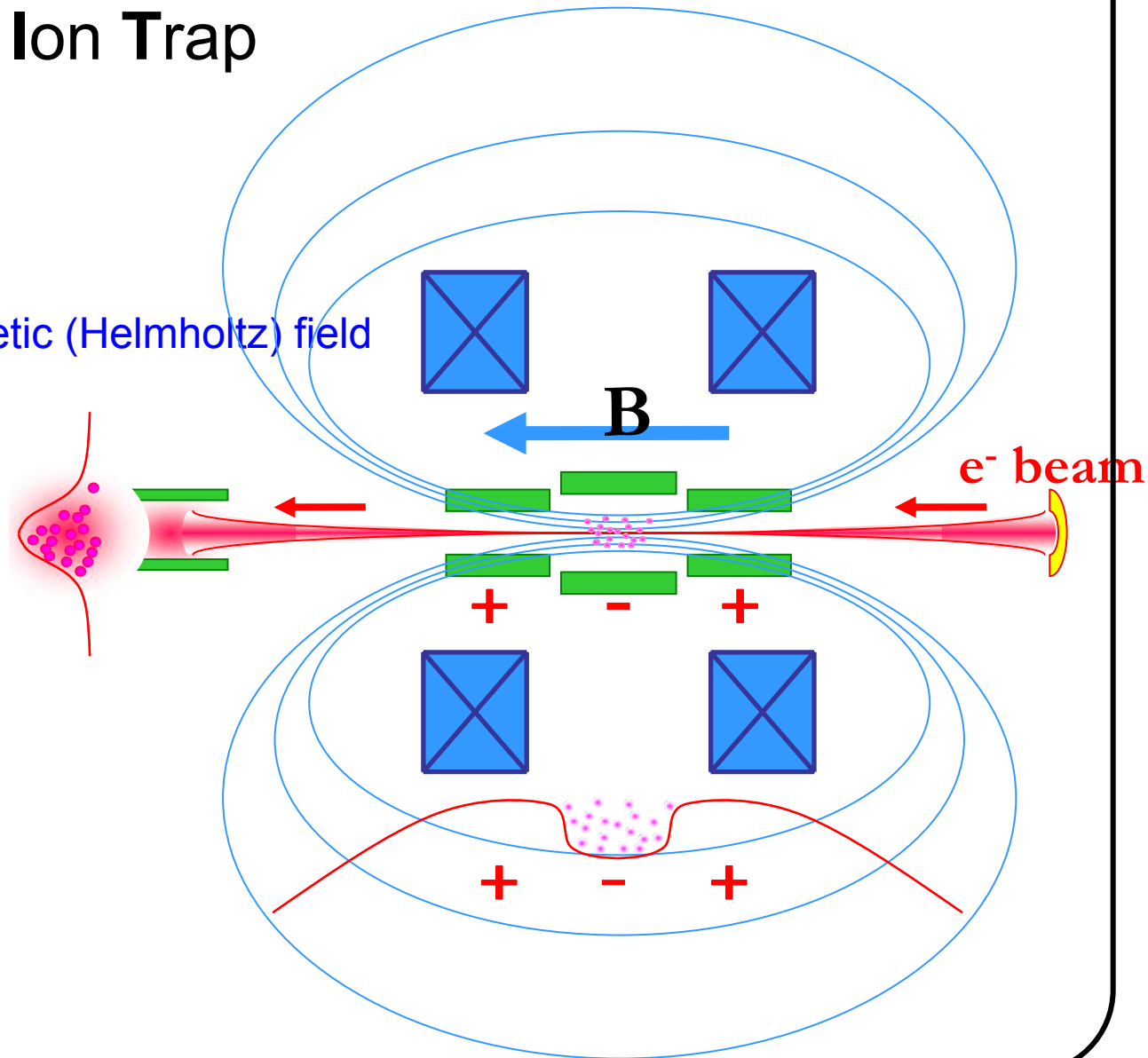
- Introduction (see “TITAN” by V. Ryjkov)
- Principle of an Electron Beam Ion Trap
- Motivation (EBIT meets rare isotope facility)
- Present status (reaching the end of the valley of tears)
- Outlook (future prospects)

Introduction

- **TRIUMF** (**TRI**-**U**niversity **M**eson **F**acility) is Canada's National Laboratory for Particle and Nuclear Physics.
- **ISAC** (**I**sotope **S**eparator and **AC**celerator) is TRIUMF's radioactive beam facility.
- **TITAN** (**TRIUMF**'s **I**on **T**rap for **A**tomic and **N**uclear science) is initially aiming for high precision mass measurements on radionuclides.
- The **TITAN-EBIT** (**E**lectron **B**eam **I**on **T**rap)

The principle of an Electron Beam Ion Trap

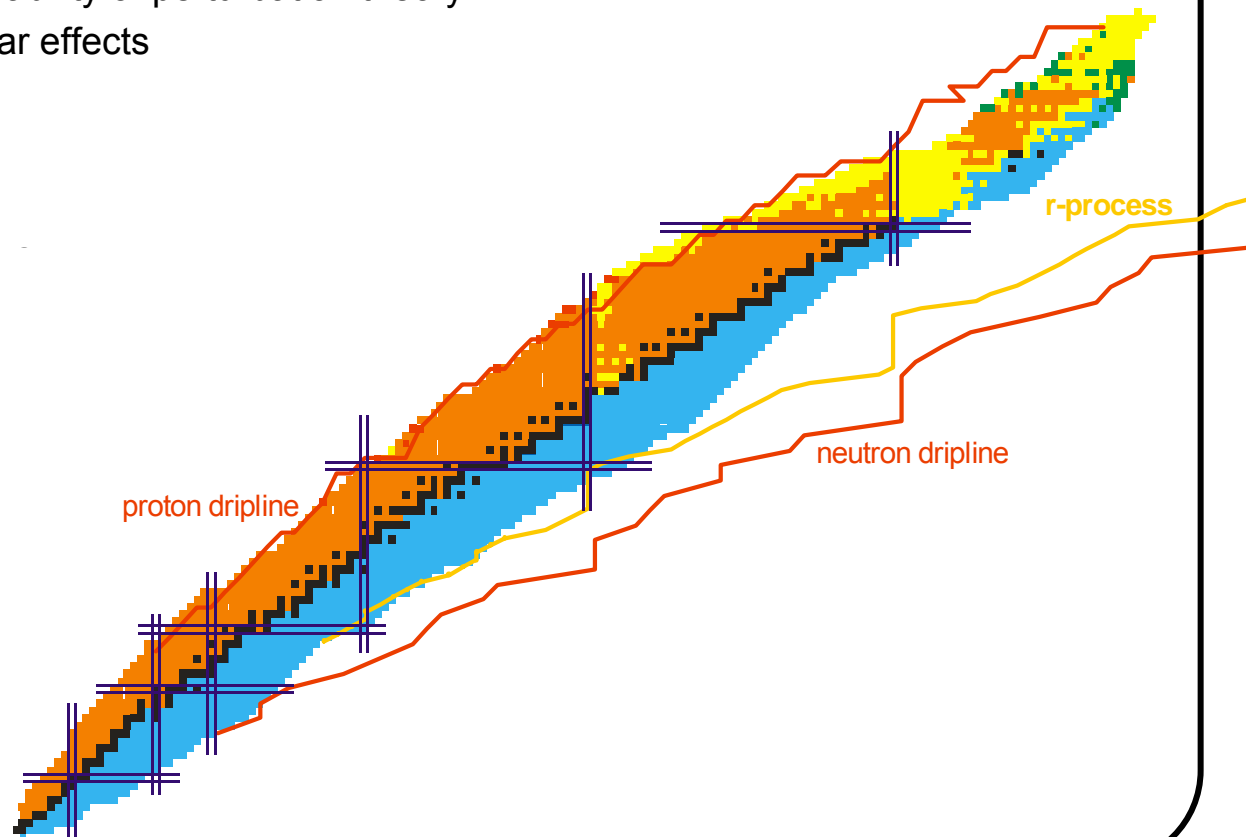
The electron beam is compressed by a magnetic (Helmholtz) field



$$\begin{aligned}\phi_{sc} &\approx 0.1 - 1 \text{ keV} \\ T_{ion} &\approx 100 - 500 \text{ eV} \\ t_{ionize} &\approx 1 \text{ ms} - 10 \text{ s}\end{aligned}$$

EBIT meets rare isotope facility

- “EBIT physics”: Spectroscopy on HCl → Test QED
 - Calculations for heavier systems limited by
 - » applicability of perturbation theory
 - » nuclear effects

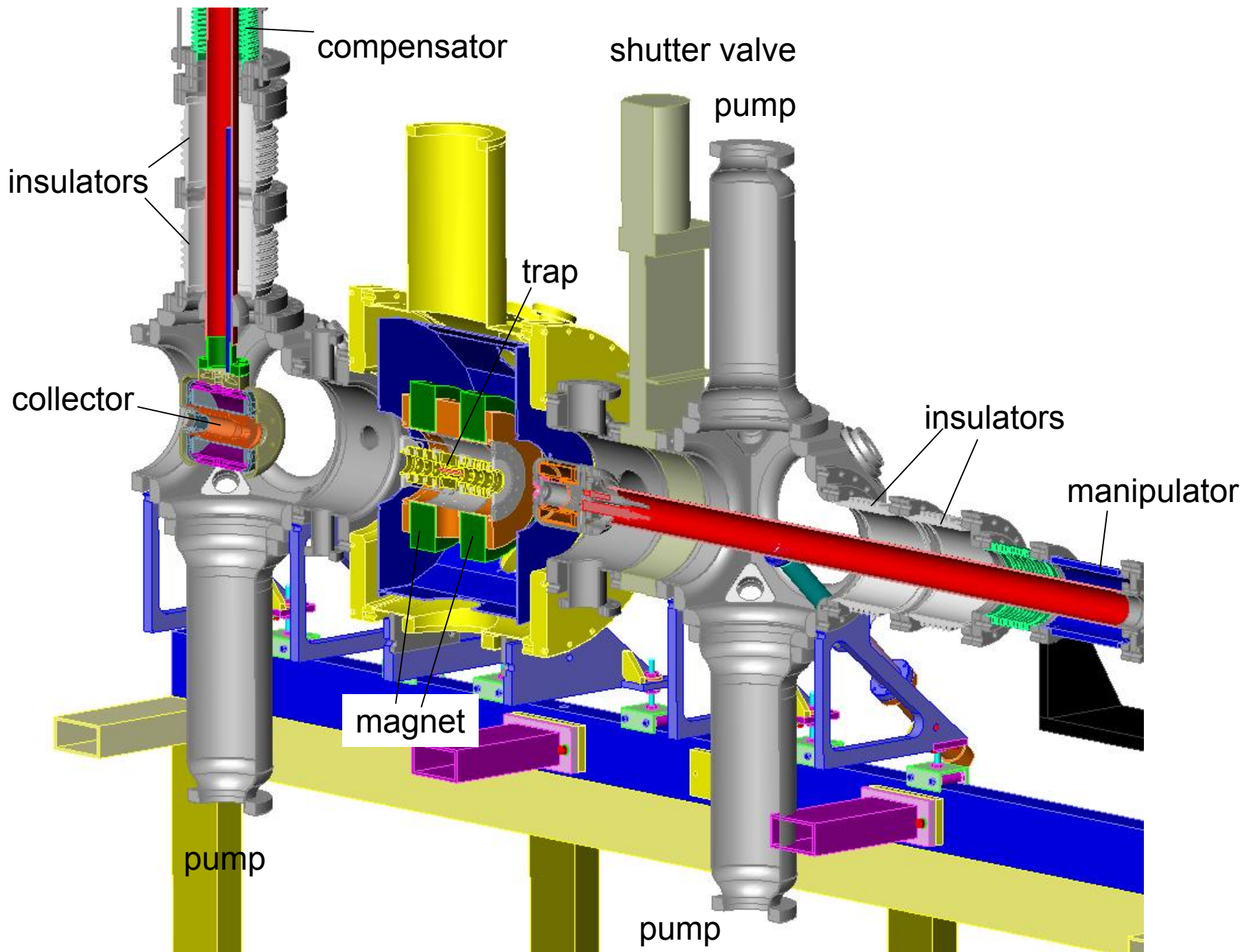


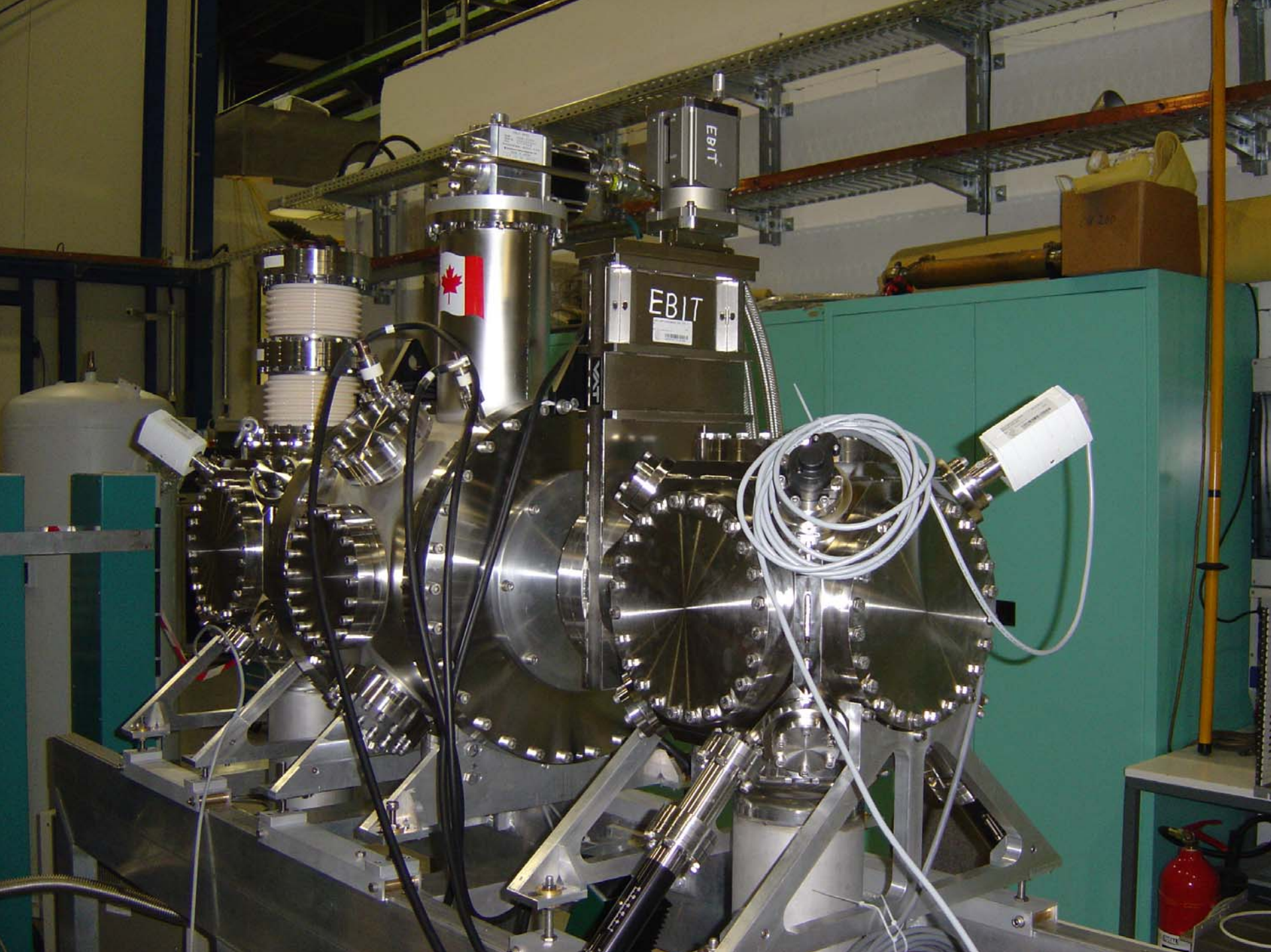
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- The **TITAN-EBIT** (**E**lectron **B**eam **I**on **T**rap)
 - » will allow for **charge breeding** of radionuclides
 - » and the expansion of **atomic spectroscopy** to rare isotopes.

Special requirements

- Rapid charge breeding (2 – 20 ms)

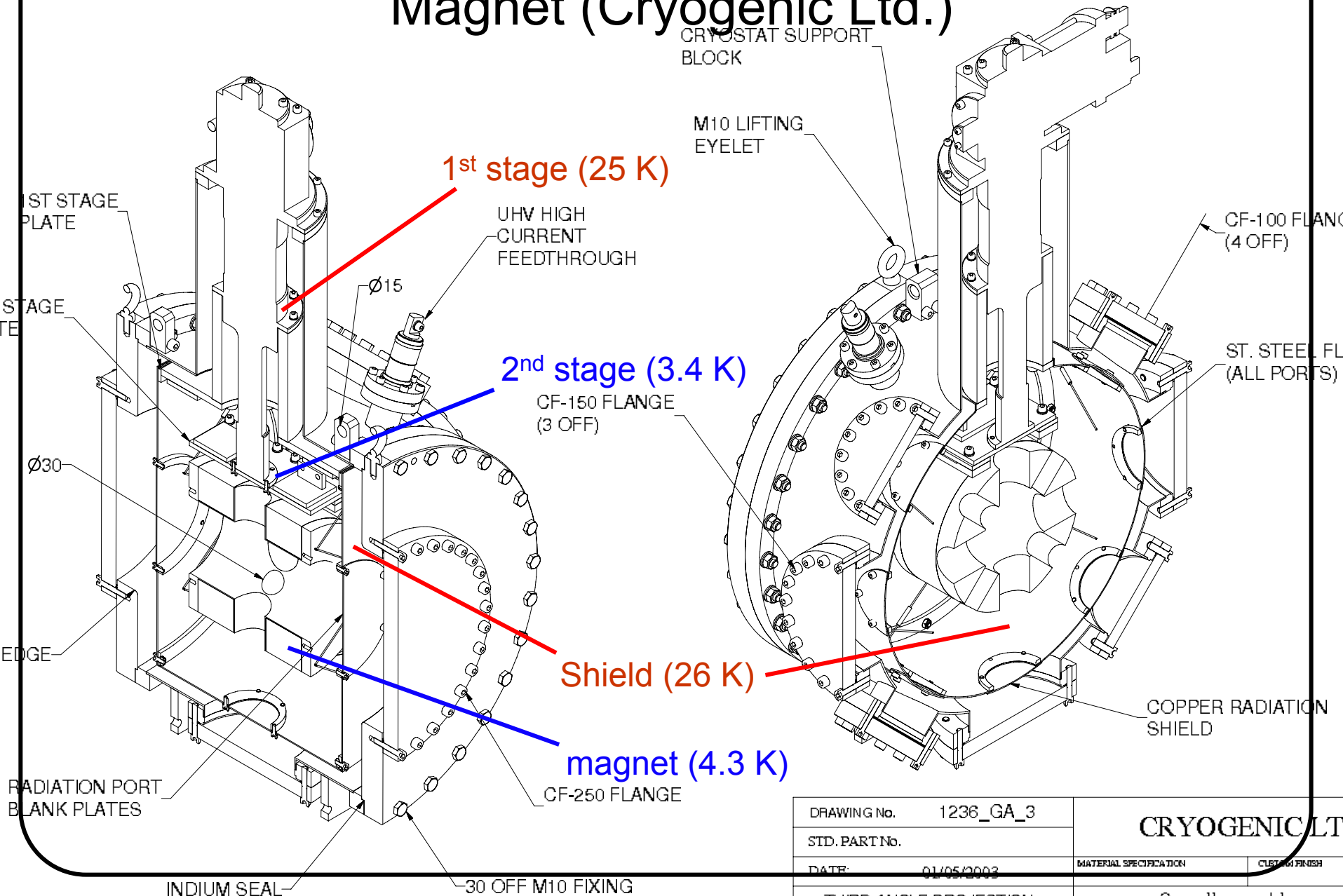




Superconducting Magnet

- **6 Tesla superconducting coils**
- **Dry (closed LHe / compressor)**
- **Very simple operation**
- **Stable over long periods**

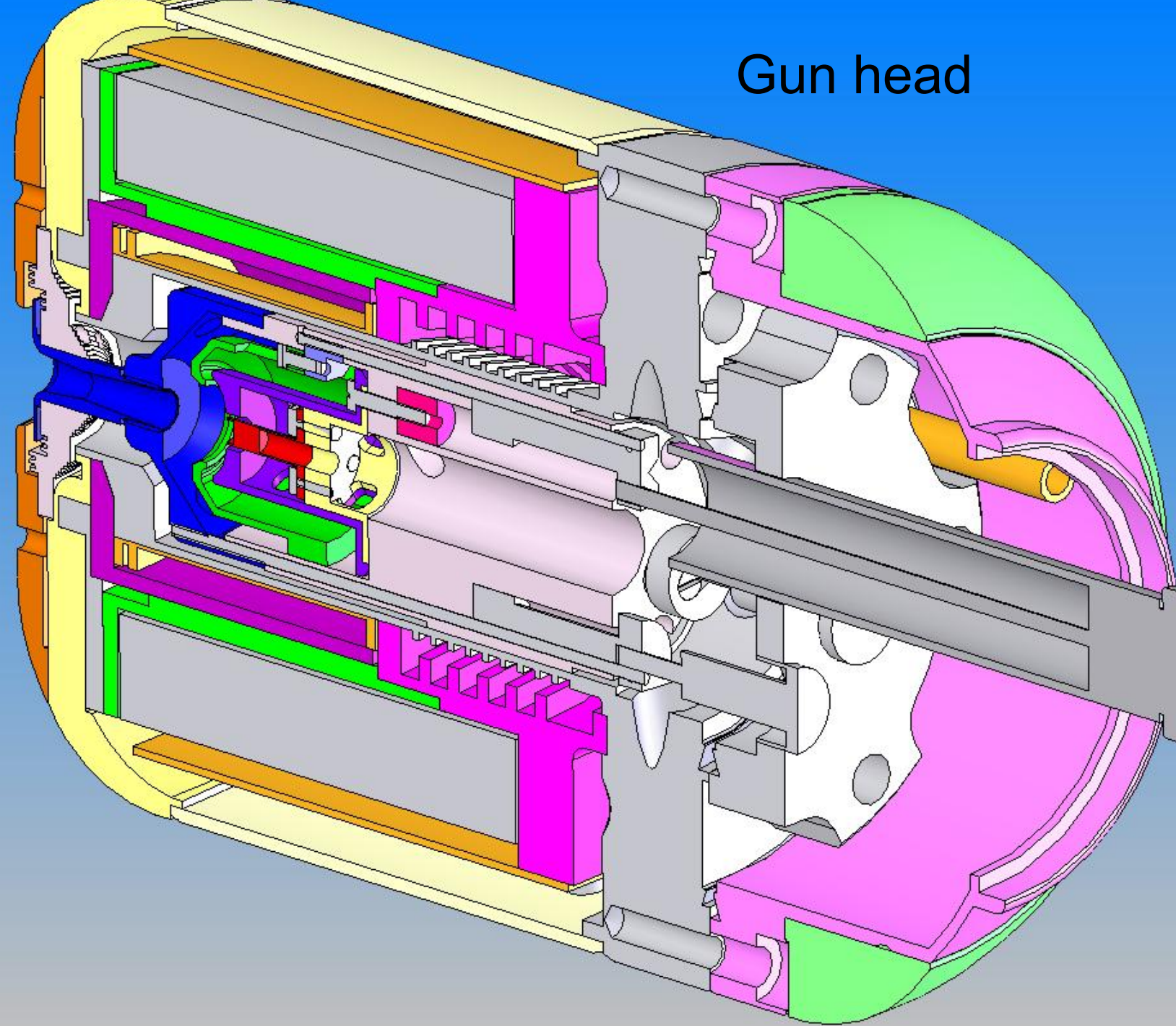
Magnet (Cryogenic Ltd.)



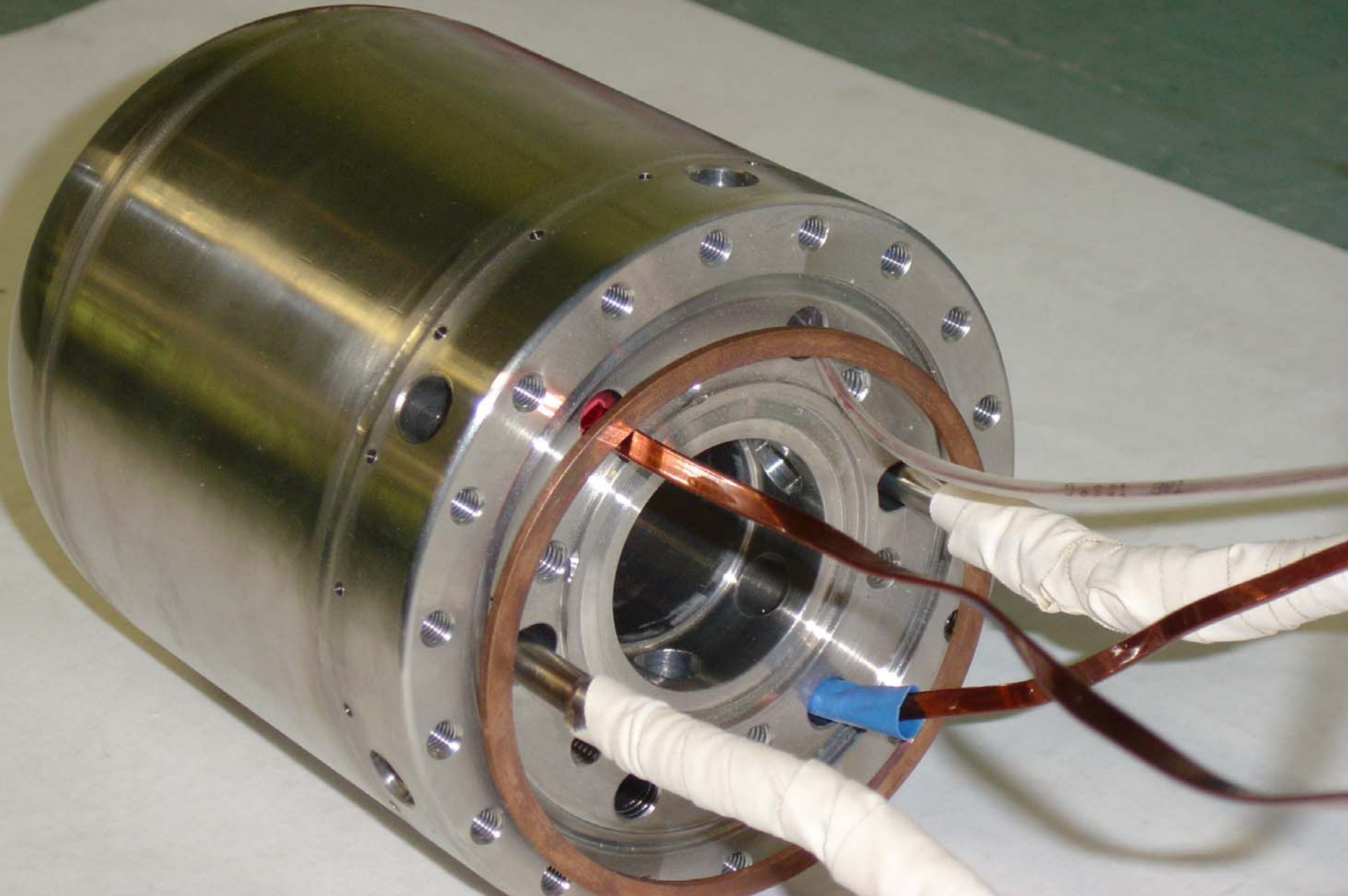
DRAWING No.	1236_GA_3	CRYOGENIC LTD.	
STD. PART No.			
DATE:	01/05/2003	MATERIAL SPECIFICATION	CLEAN FINISH
THIRD ANGLE PROJECTION		Overall assembly	

Electron Gun

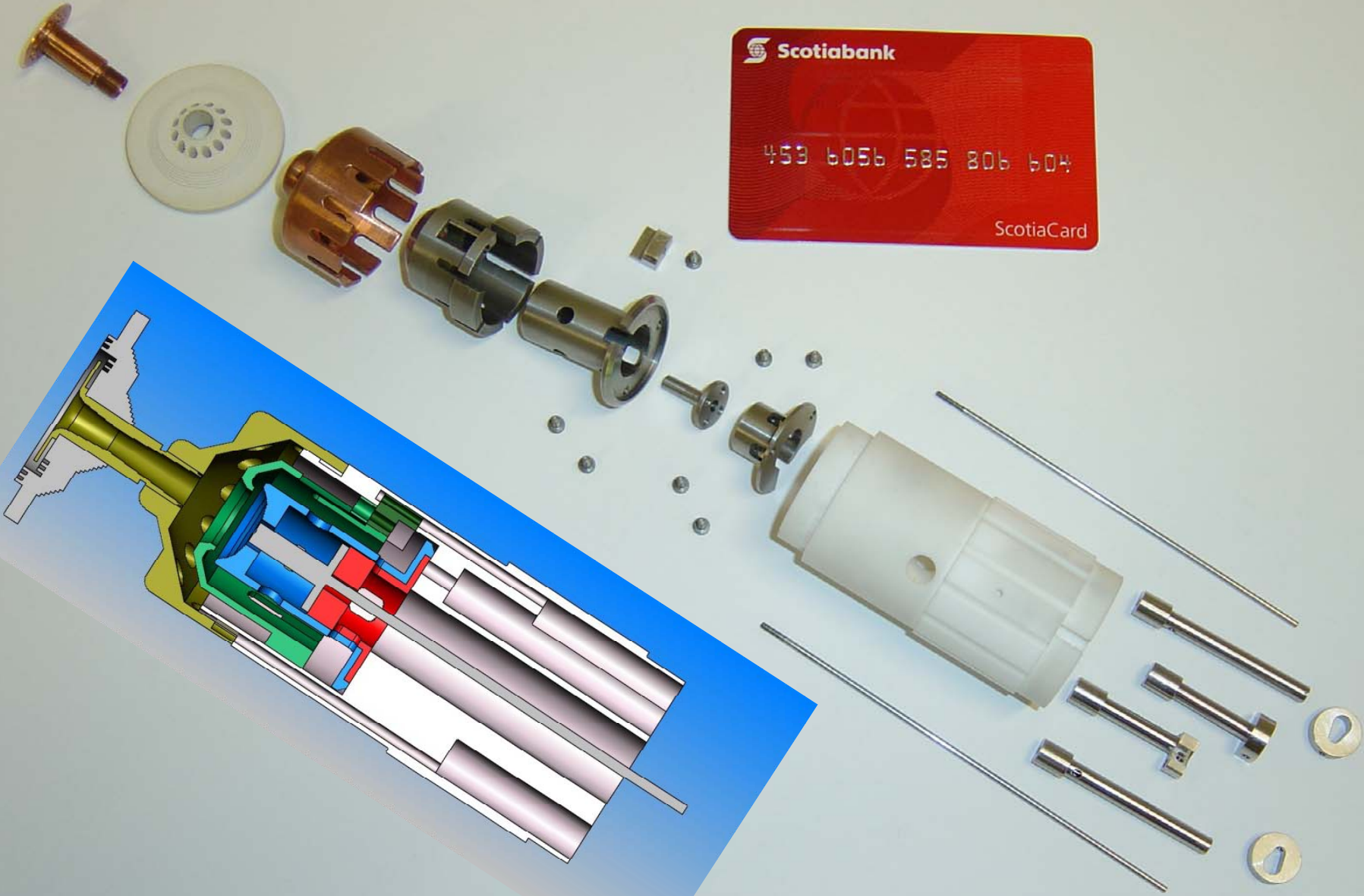
Gun head



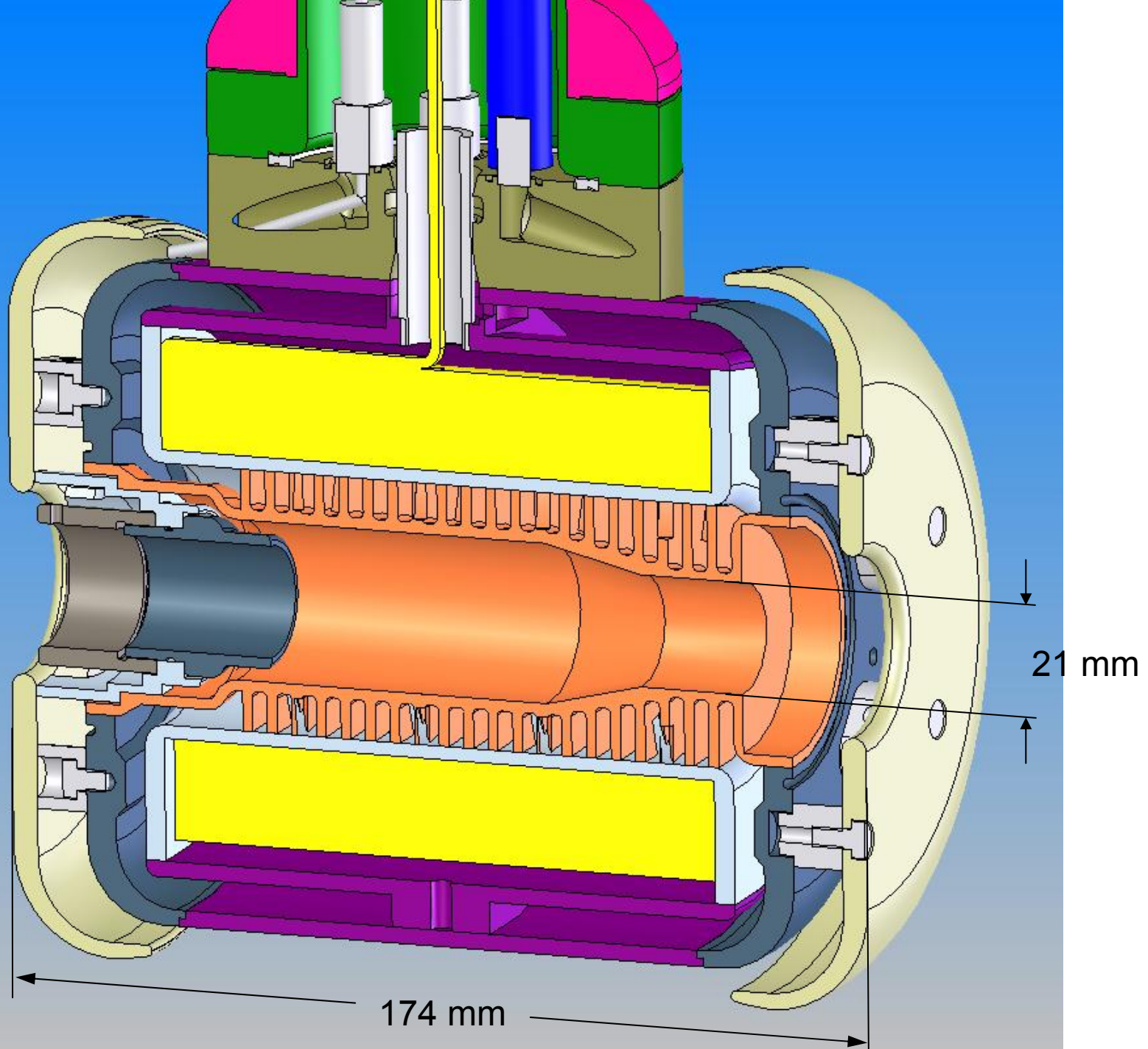
Gun head

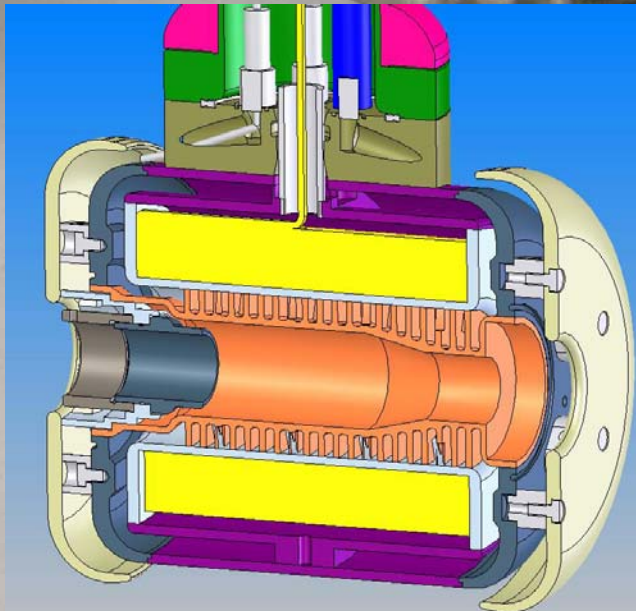
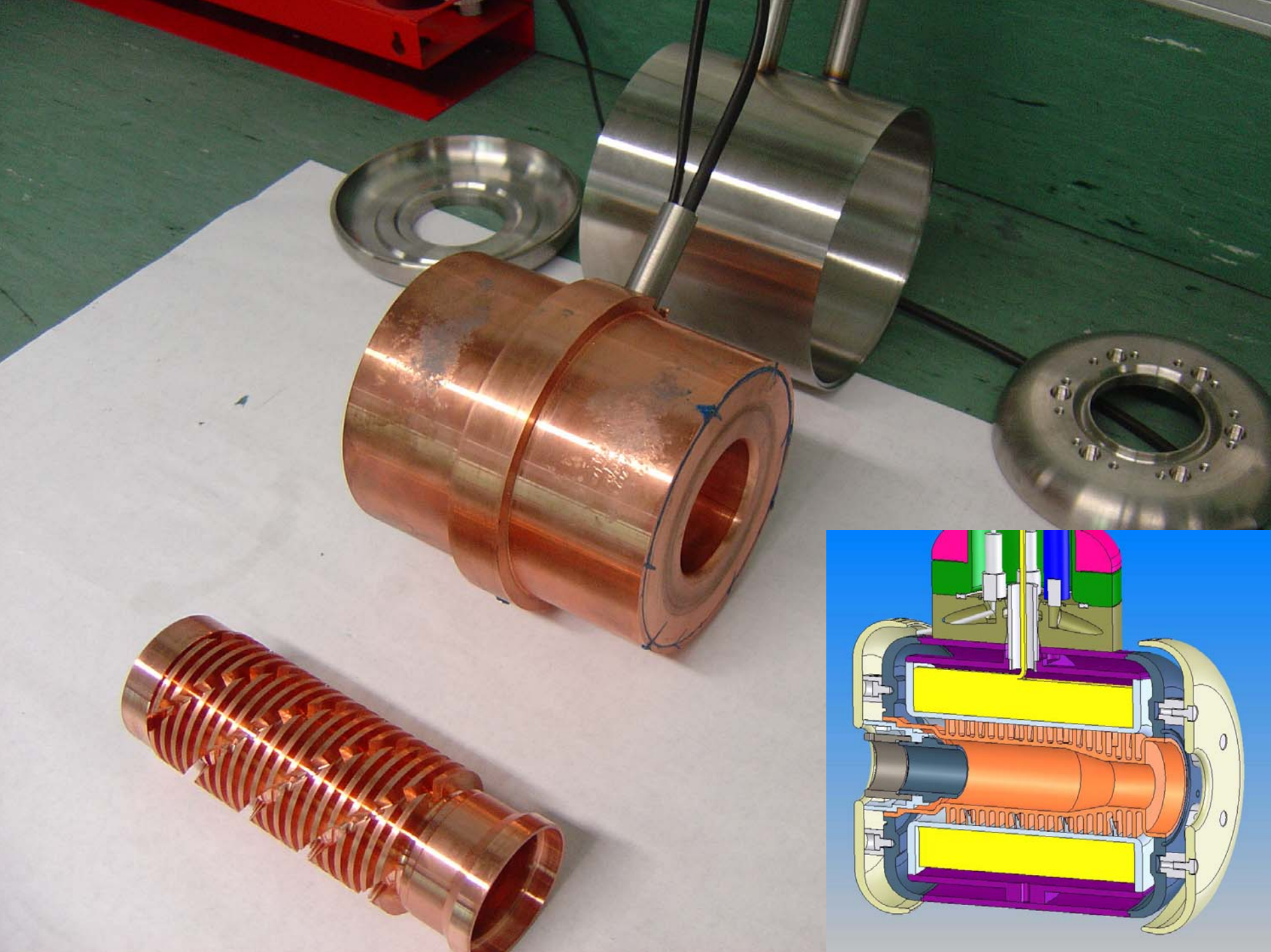


Cathode assembly



Collector







Outlook

(near) future perspectives

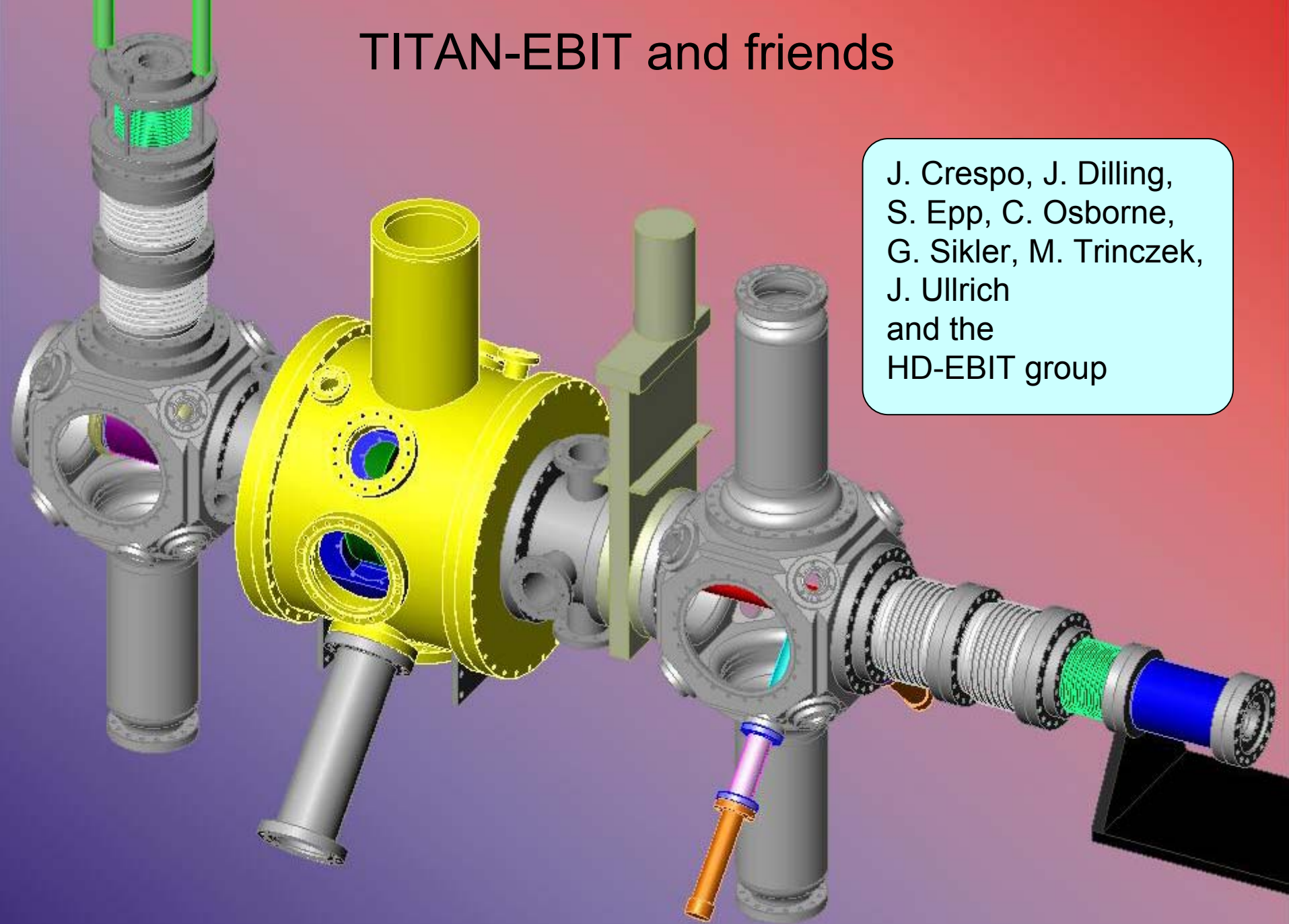
- Setup of complete vacuum system including electron gun, magnet and collector + alignment
-





TITAN-EBIT and friends

J. Crespo, J. Dilling,
S. Epp, C. Osborne,
G. Sikler, M. Trinczek,
J. Ullrich
and the
HD-EBIT group



Bonus track: (eventually some physics)

- test ion source, new emittance meter, Wien filter
 - test injection and extraction
 - determine efficiency, temperature and emittance
- Extraction schemes
 - extraction without electron-beam
 - pulsed extraction (minimize pulse length)
 - energy dependent extraction
 - charge state dependent extraction
- Cooling schemes (?)