

Operation of prototype detector at LNGS



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26 June 2006

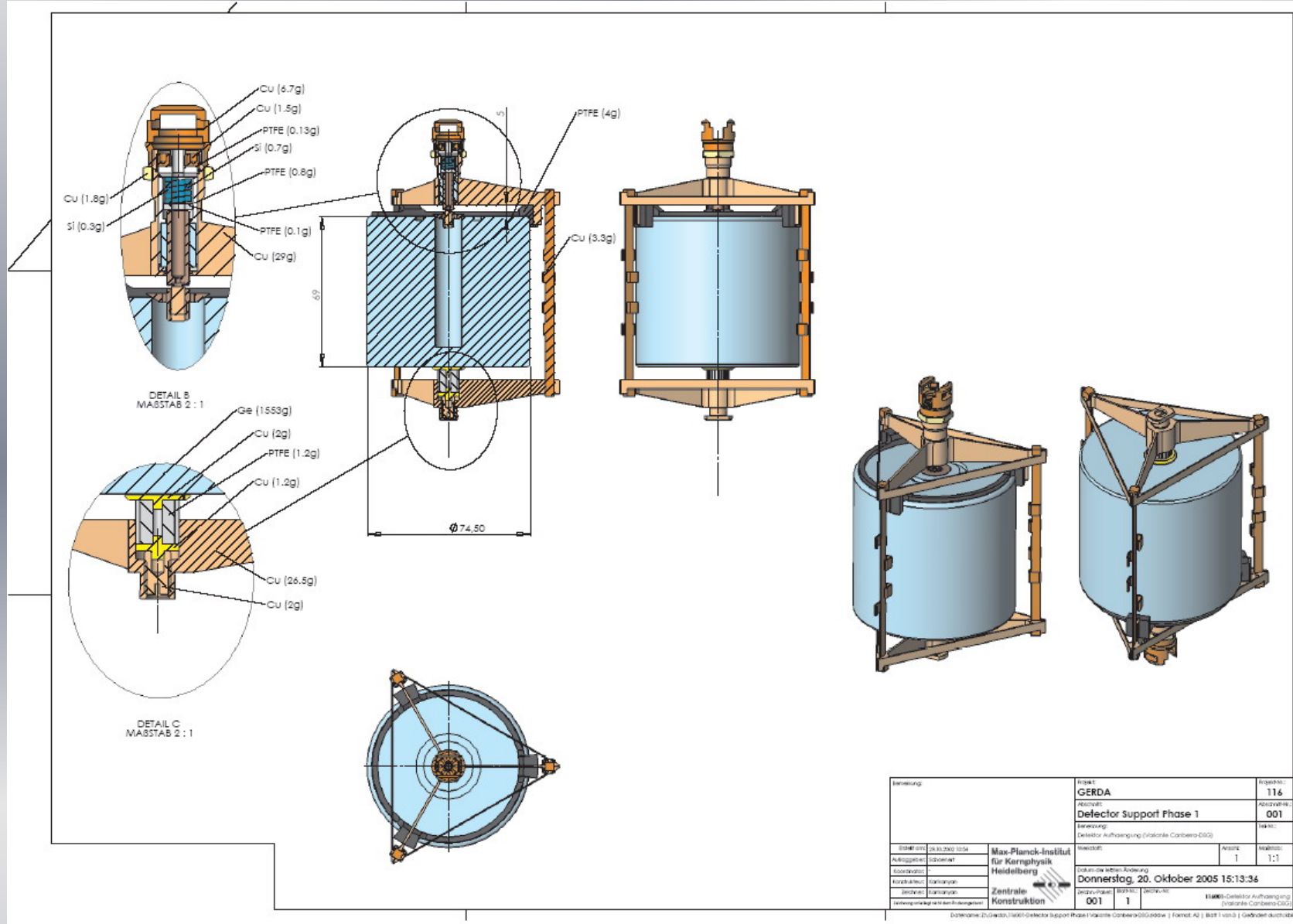
GERDA meeting, LNGS, Italy

Initial parameters of detector

- Dimensions:
 - 75 mm - diameter
 - 69 mm - height
 - 12 mm - diameter of well
 - 60 mm - deep of well
- Weight:
 - 1,6 kg
- Resolution (at 4000 V):
 - In typical cryostat:
 - FWHM = 2,2 keV
 - In liquid nitrogen (at Canberra):
 - FWHM = 2,6 keV ($T_{\text{FET}} = 77 \text{ K}$)
 - FWHM = 2,2 keV ($T_{\text{FET}} = 300 \text{ K}$)



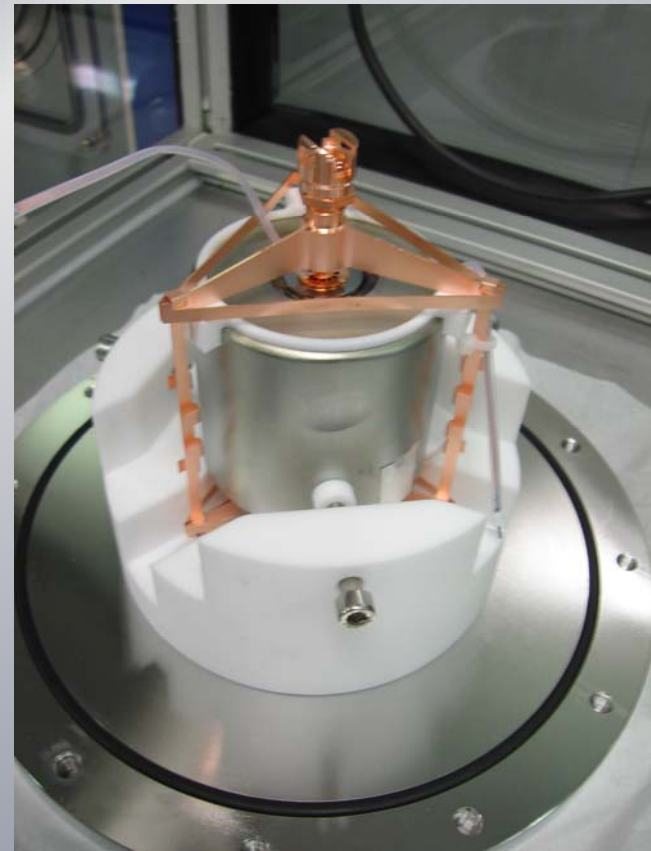
Support construction

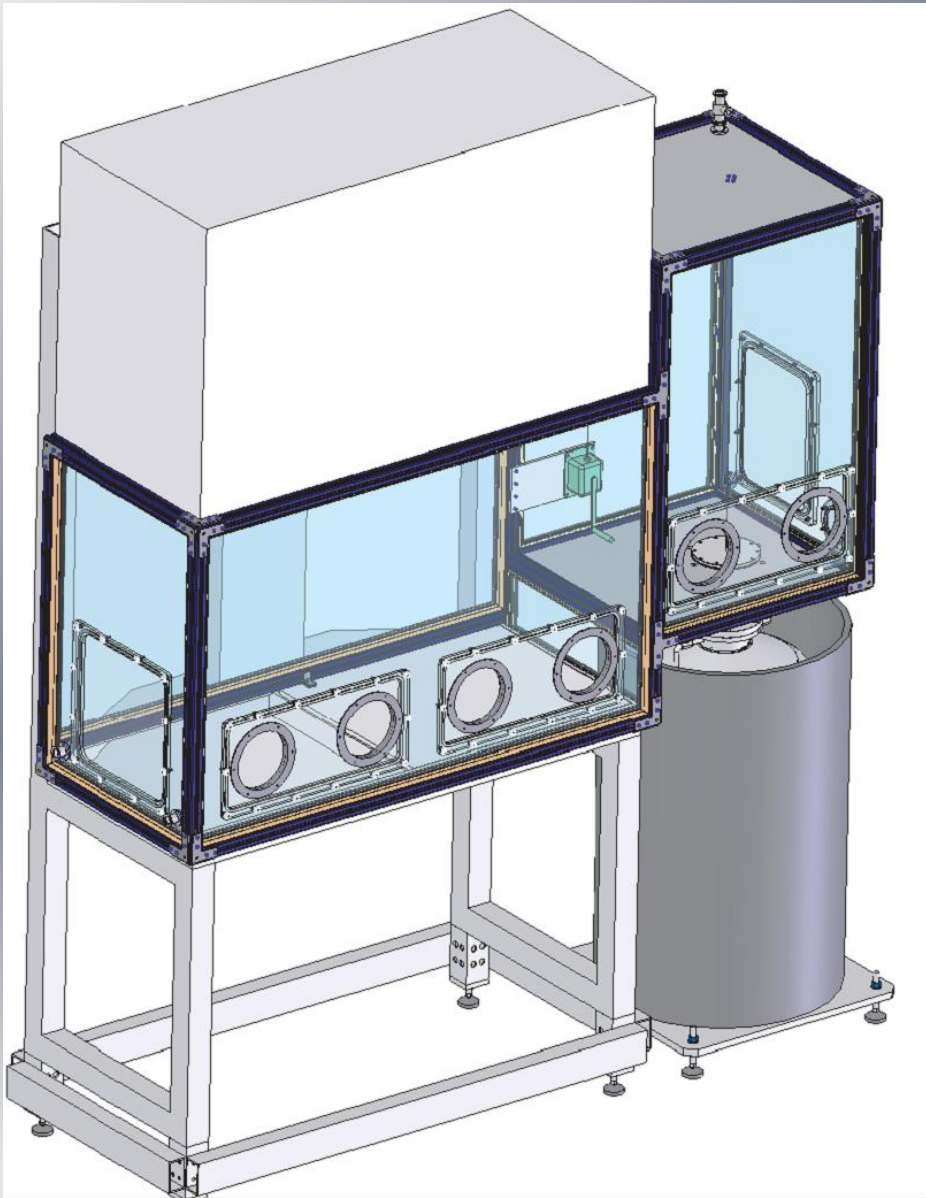


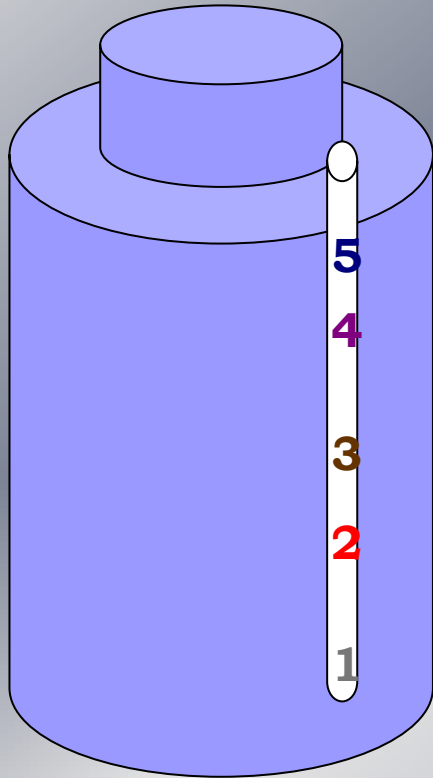
Bemerkung:		Projekt: GERDA		Projekt-Nr.: 116	
		Arbeits-Nr.: Defector Support Phase 1		Arbeits-Nr.: 001	
		Bemerkung: Defector Aufbauzeichnung (Viktorie Carbera-DSG)		Datum:	
		Zeichner:		Anzahl: 1	
		Gezeichnet:		Maßstab: 1:1	
		Geprüft:		Datum der letzten Änderung: Donnerstag, 20. Oktober 2005 15:13:34	
		Freigegeben:		Arbeits-Nr.: 116001-Defector Aufbauzeichnung (Viktorie Carbera-DSG)	
		001 1		116001-Defector Aufbauzeichnung (Viktorie Carbera-DSG)	

Aims of our work

- test prototype inside nitrogen at LNGS (try to repeat Canberra results)
- perform all operations (warming, cooling, remounting, etc.) ourselves
- reach as best as possible FWHM
- compare of HV-contact quality with and without In foil
- try to use another design of diode support (HV-contact on top)







48 cm

44.3 cm

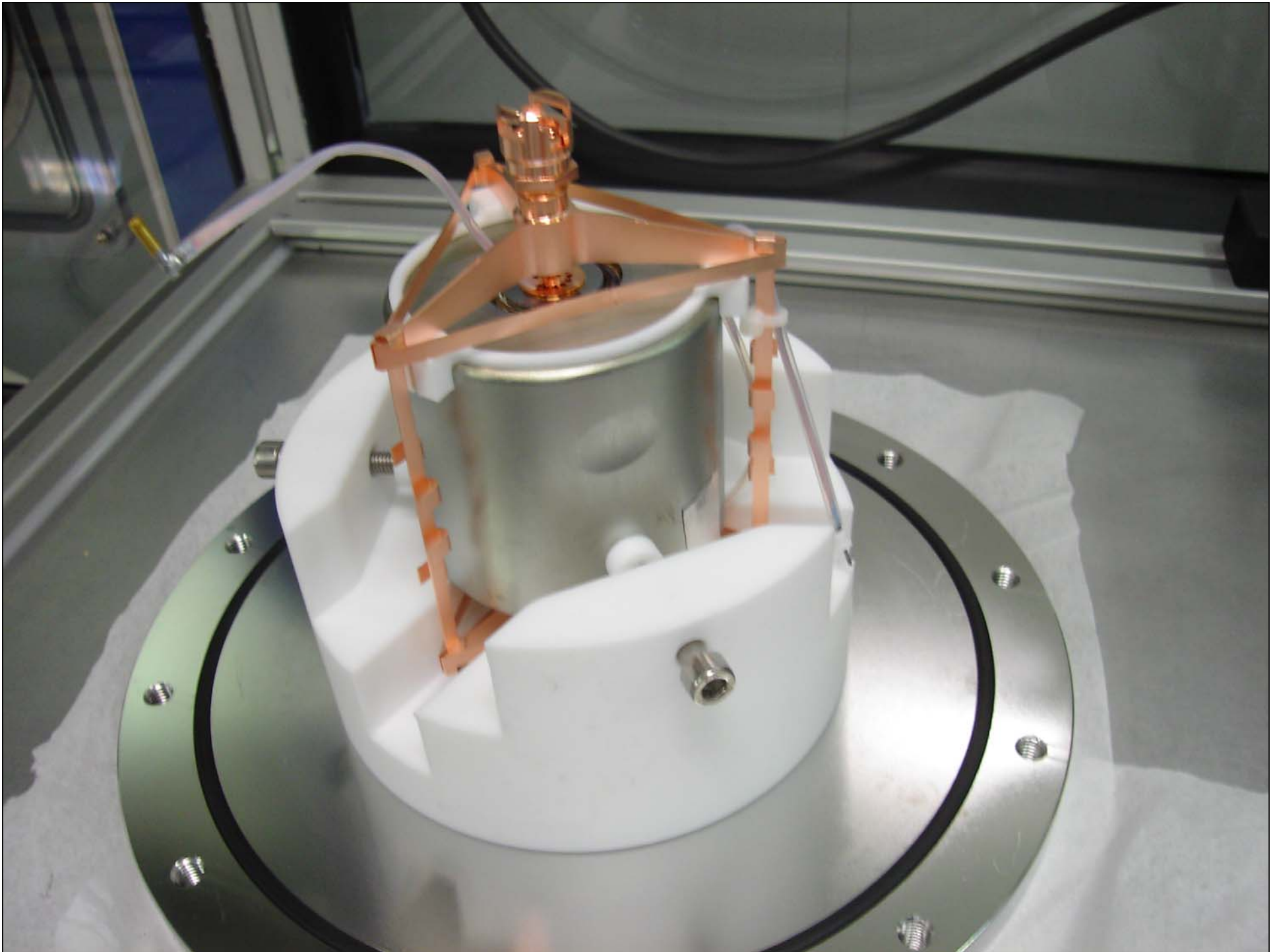
31 cm

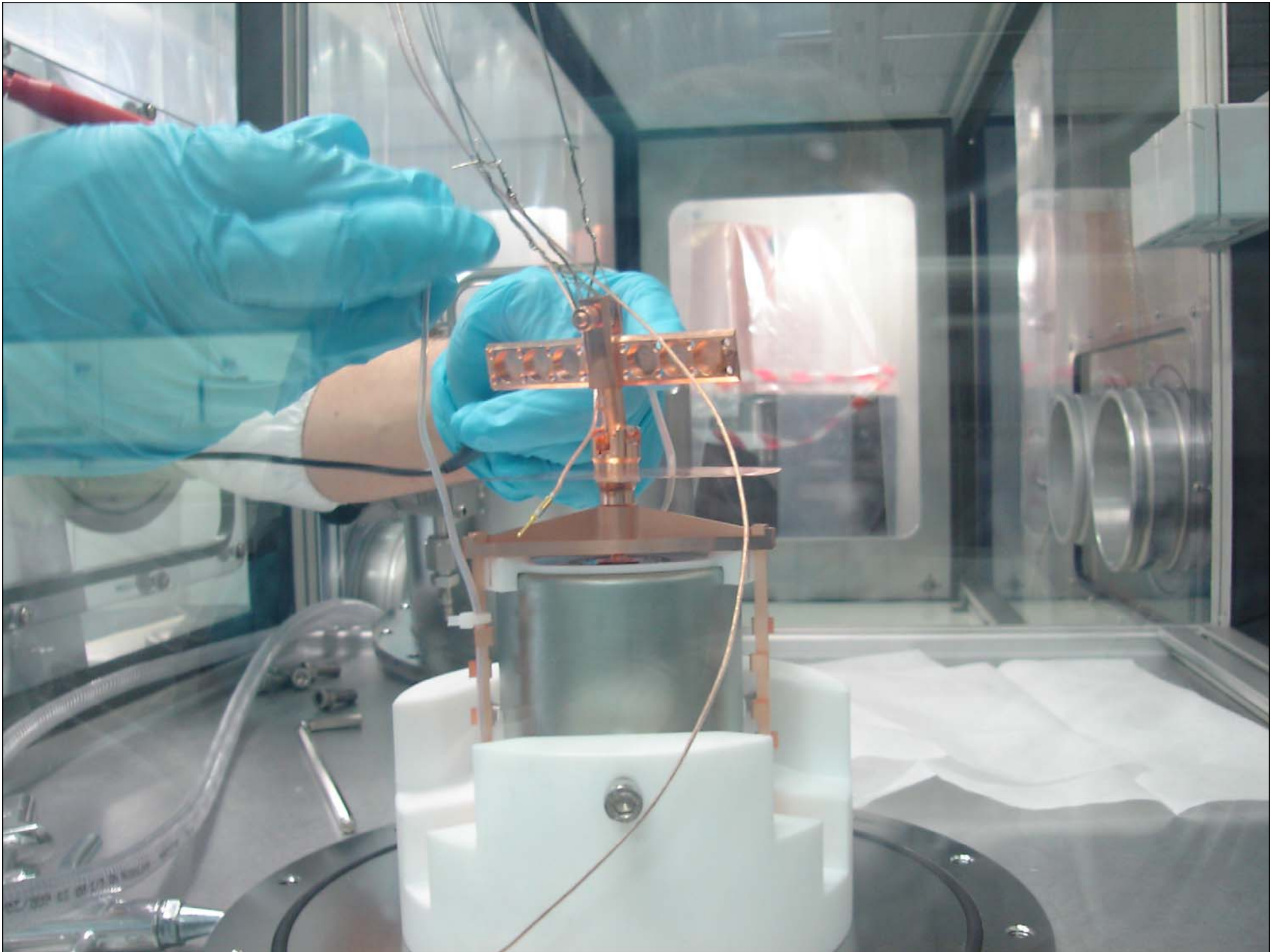
25 cm

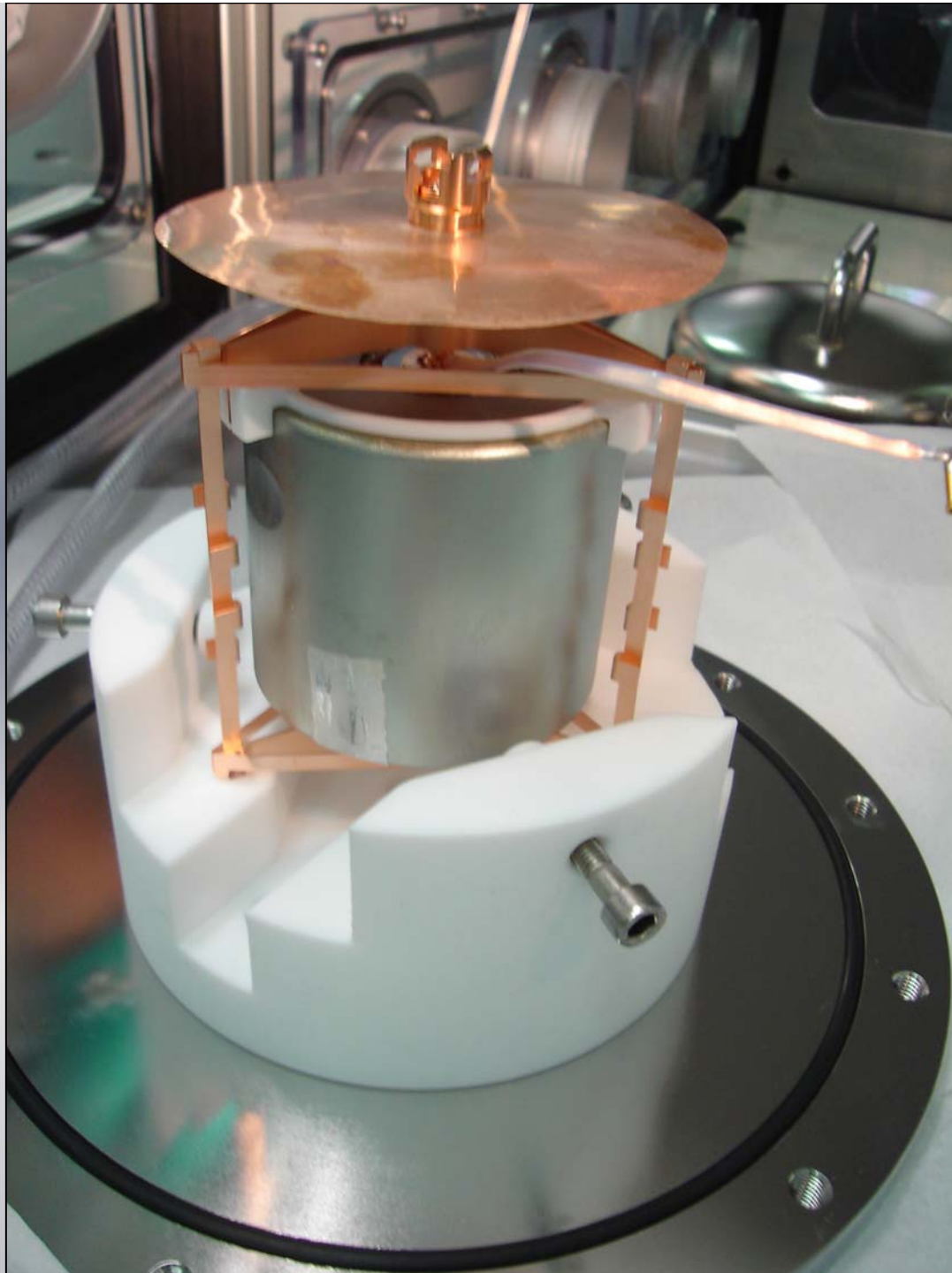
10,5 cm

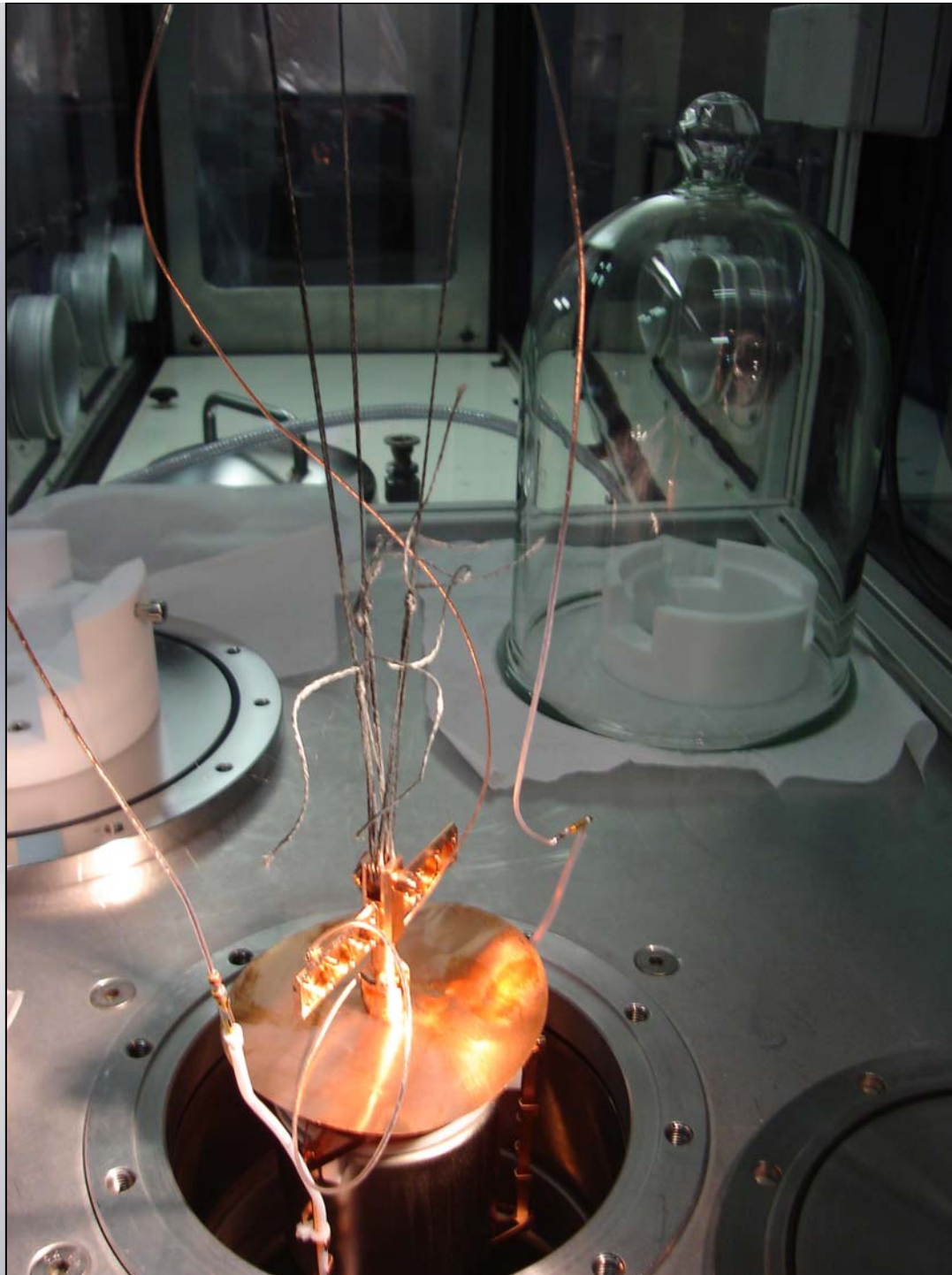


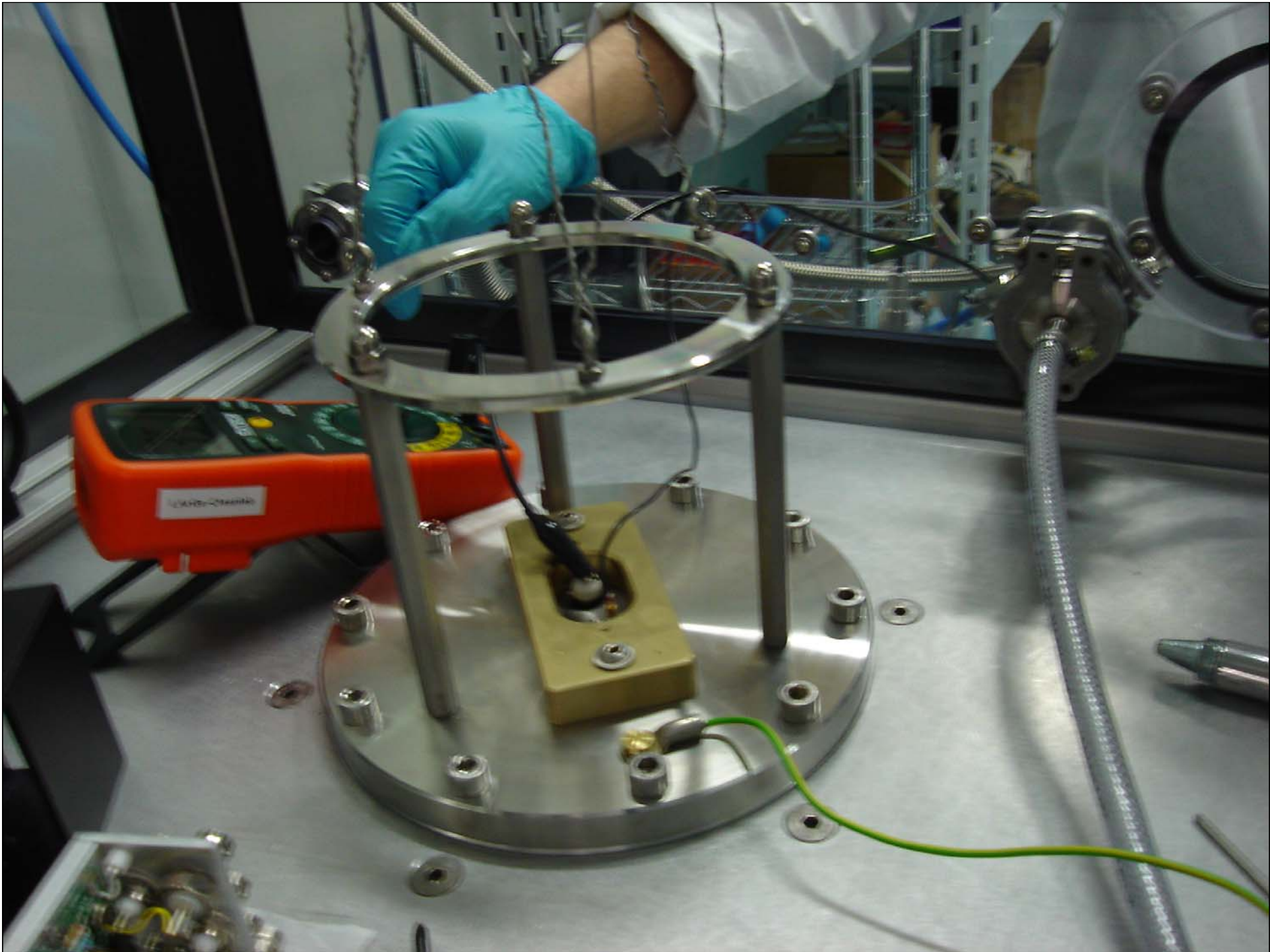


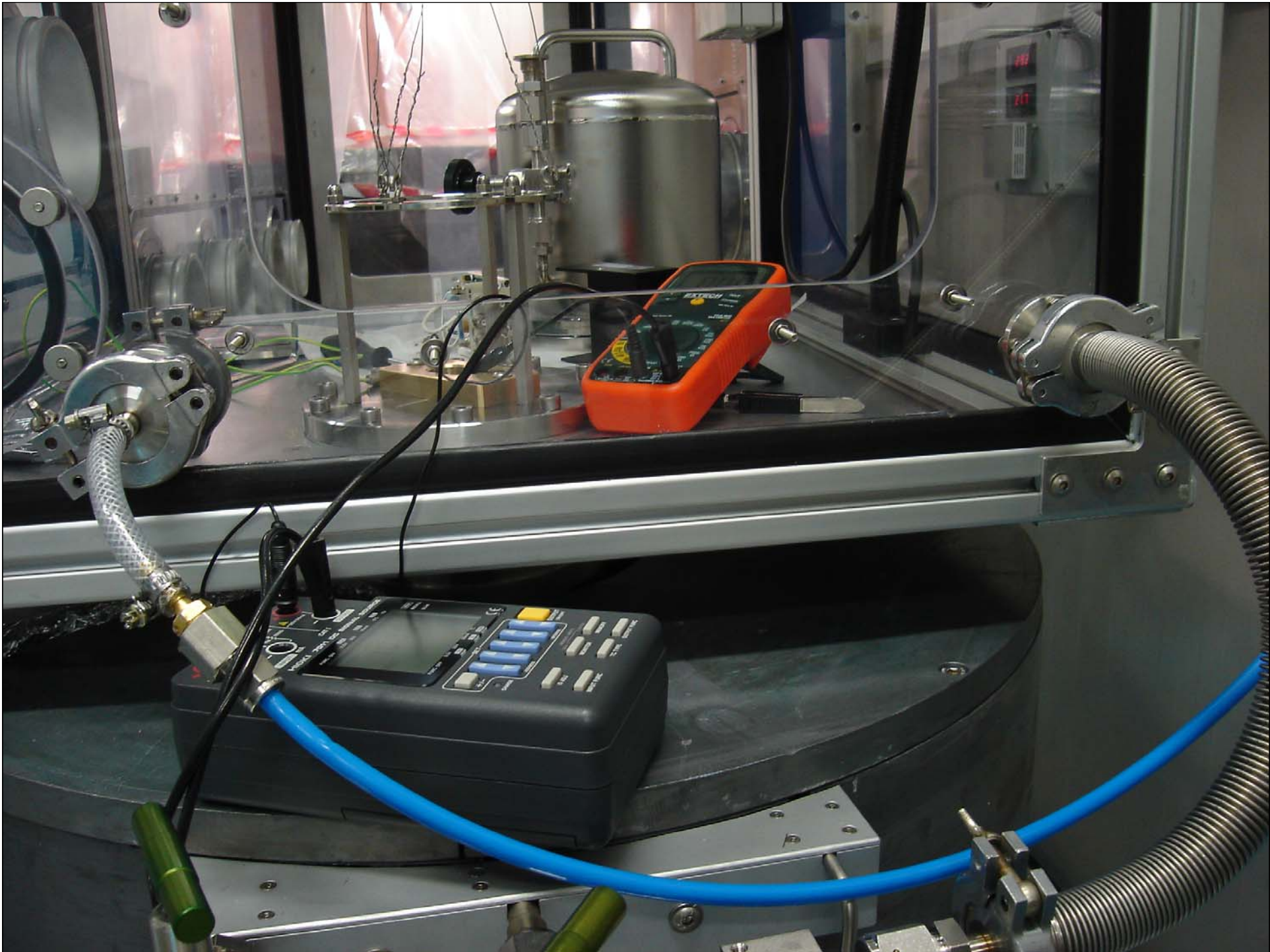






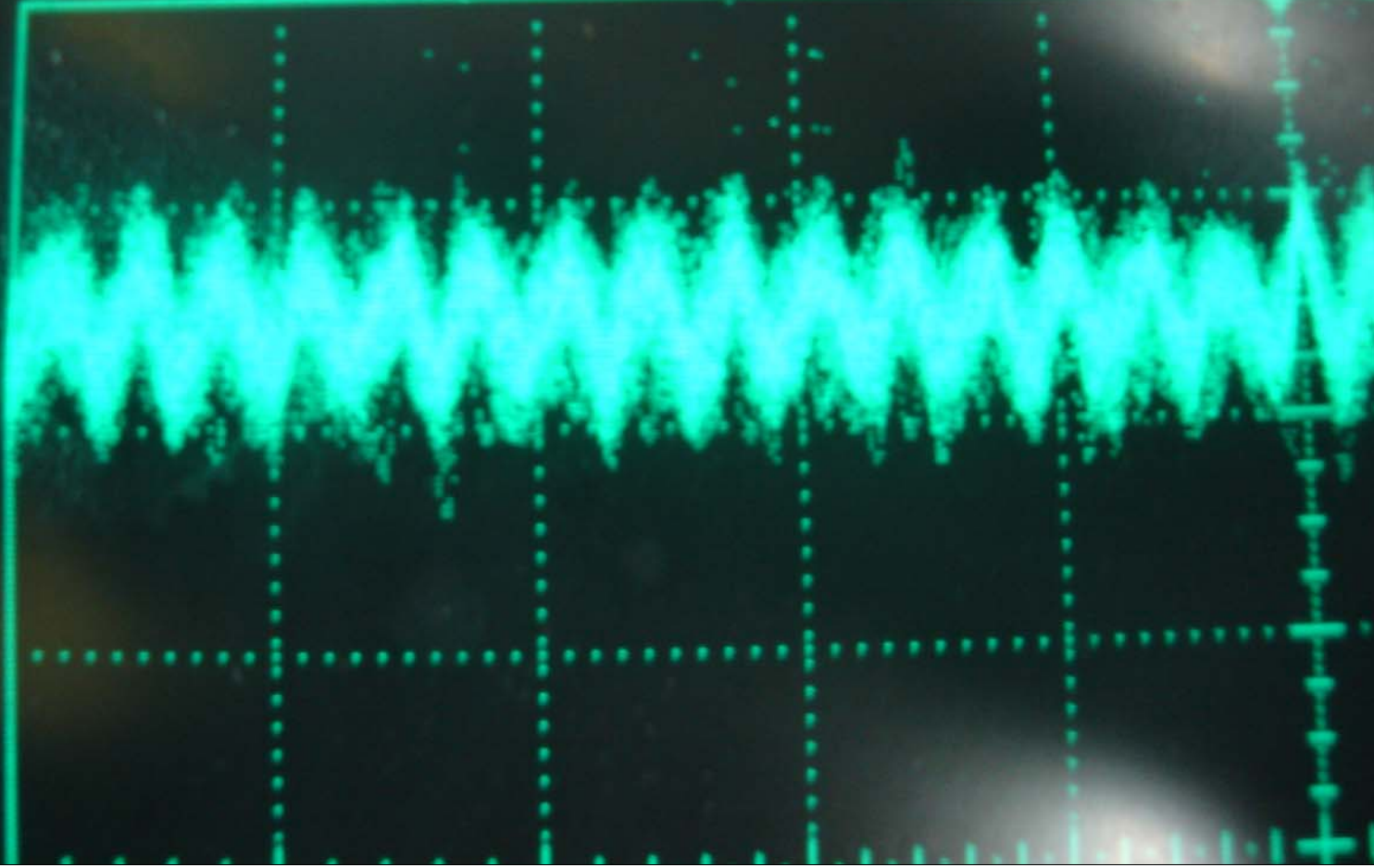


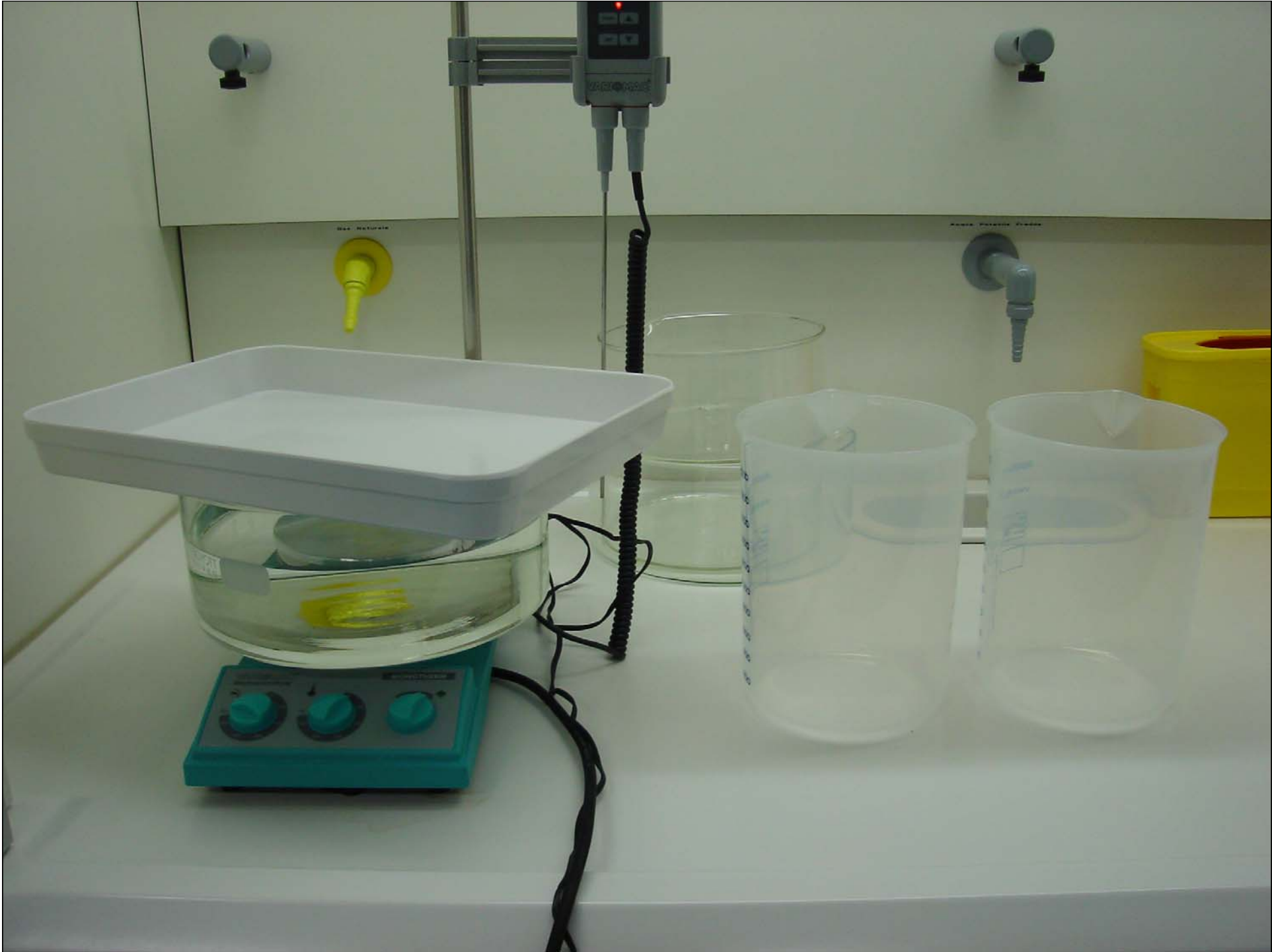


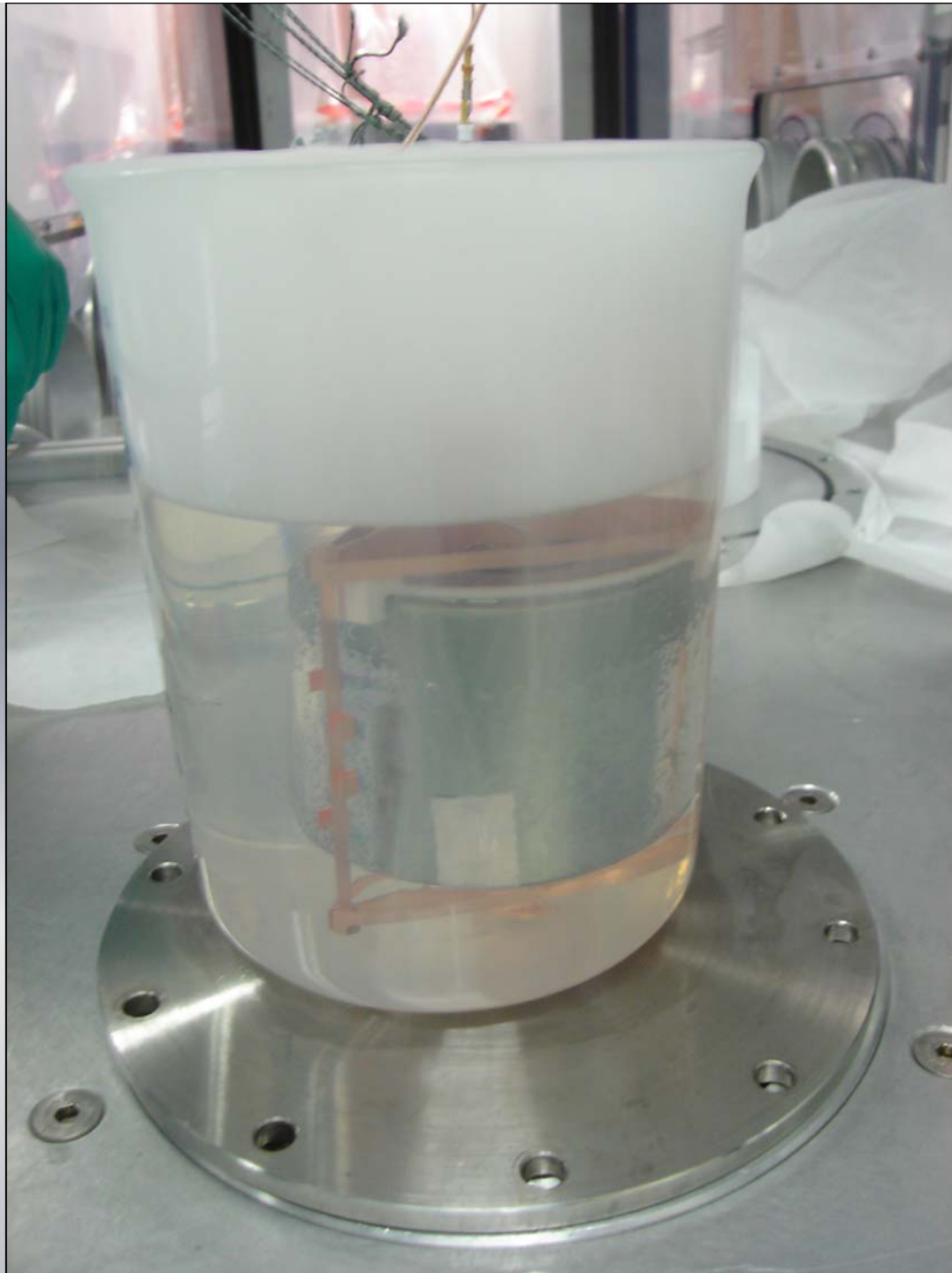


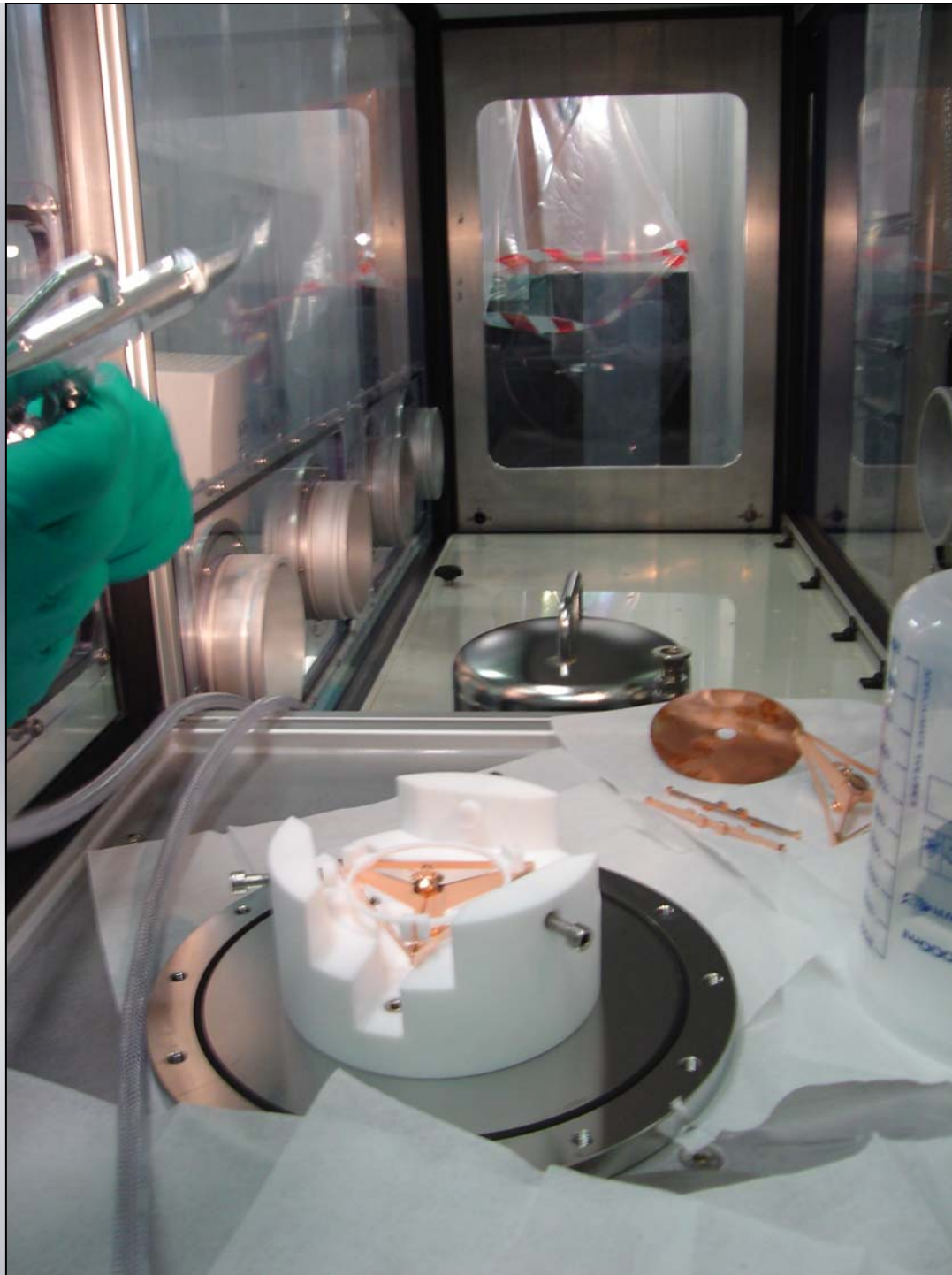
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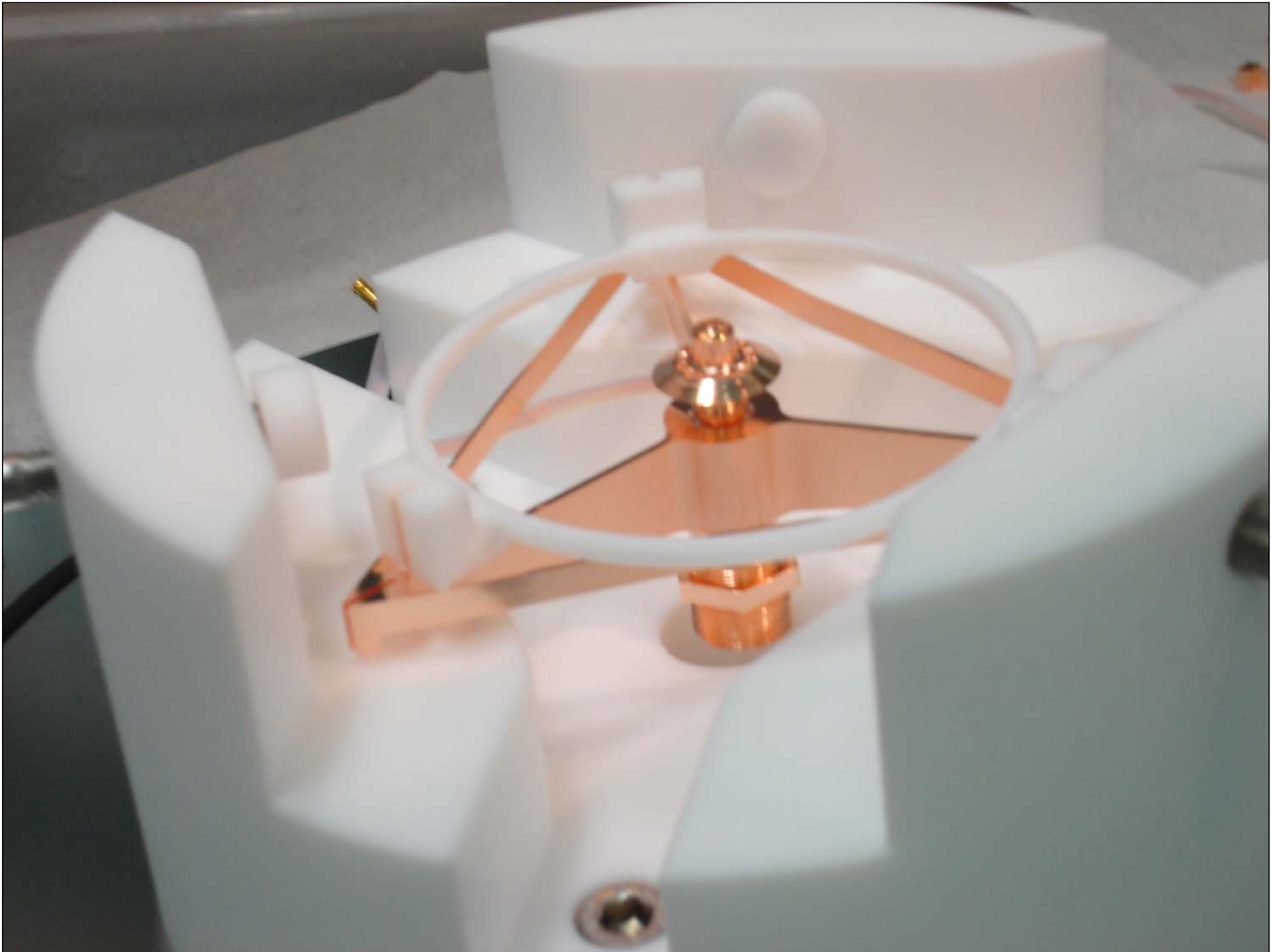
70

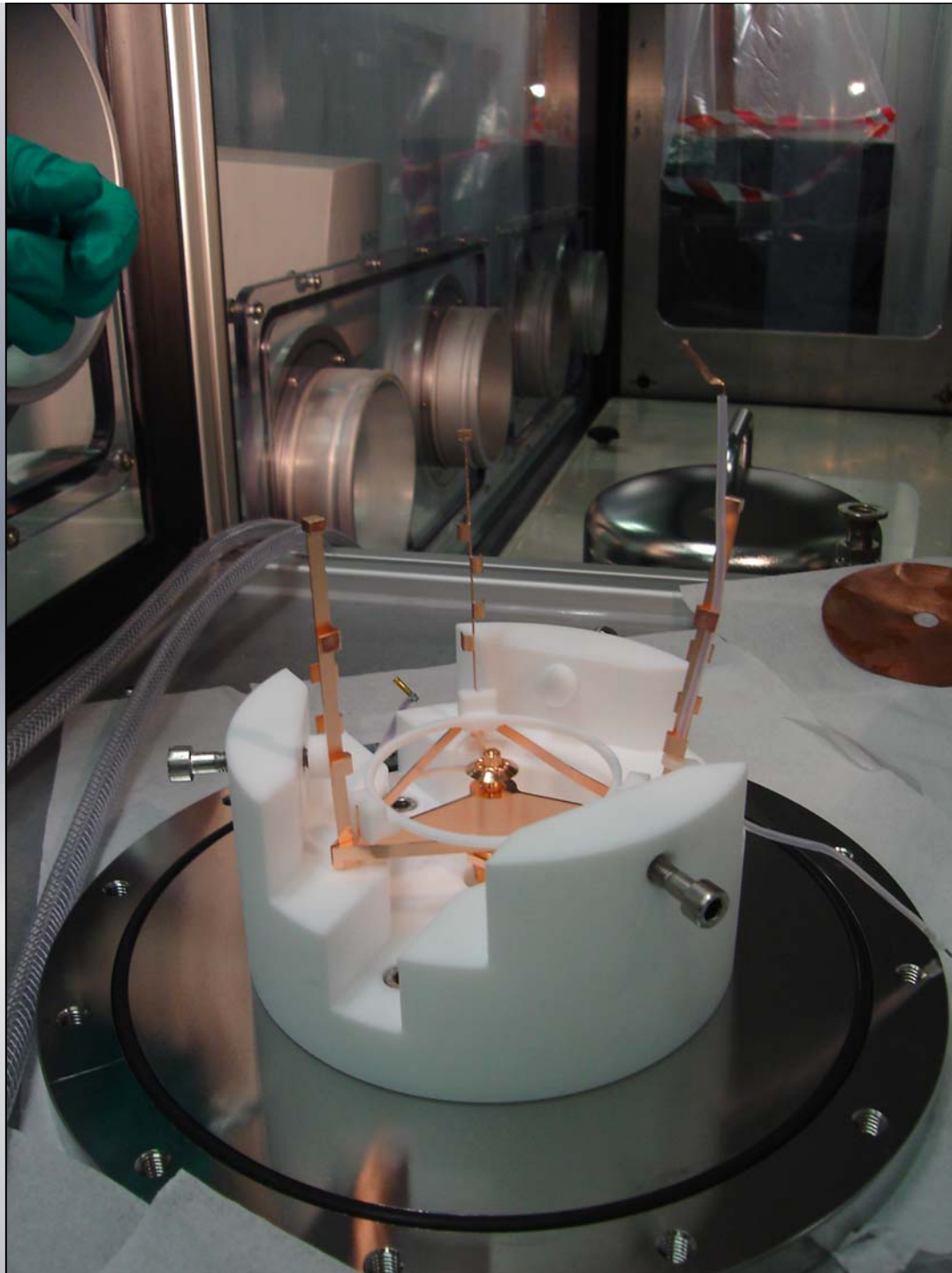






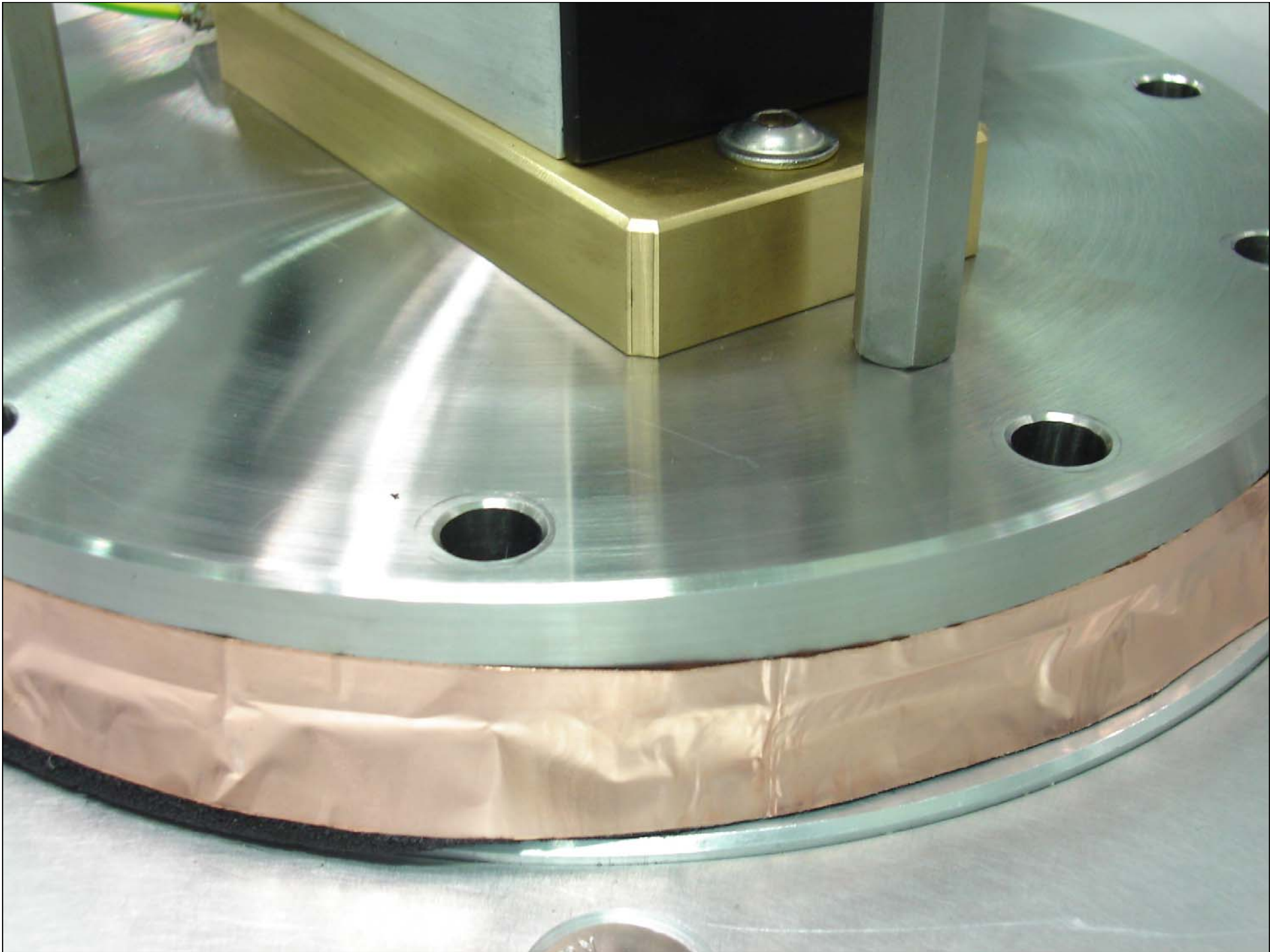








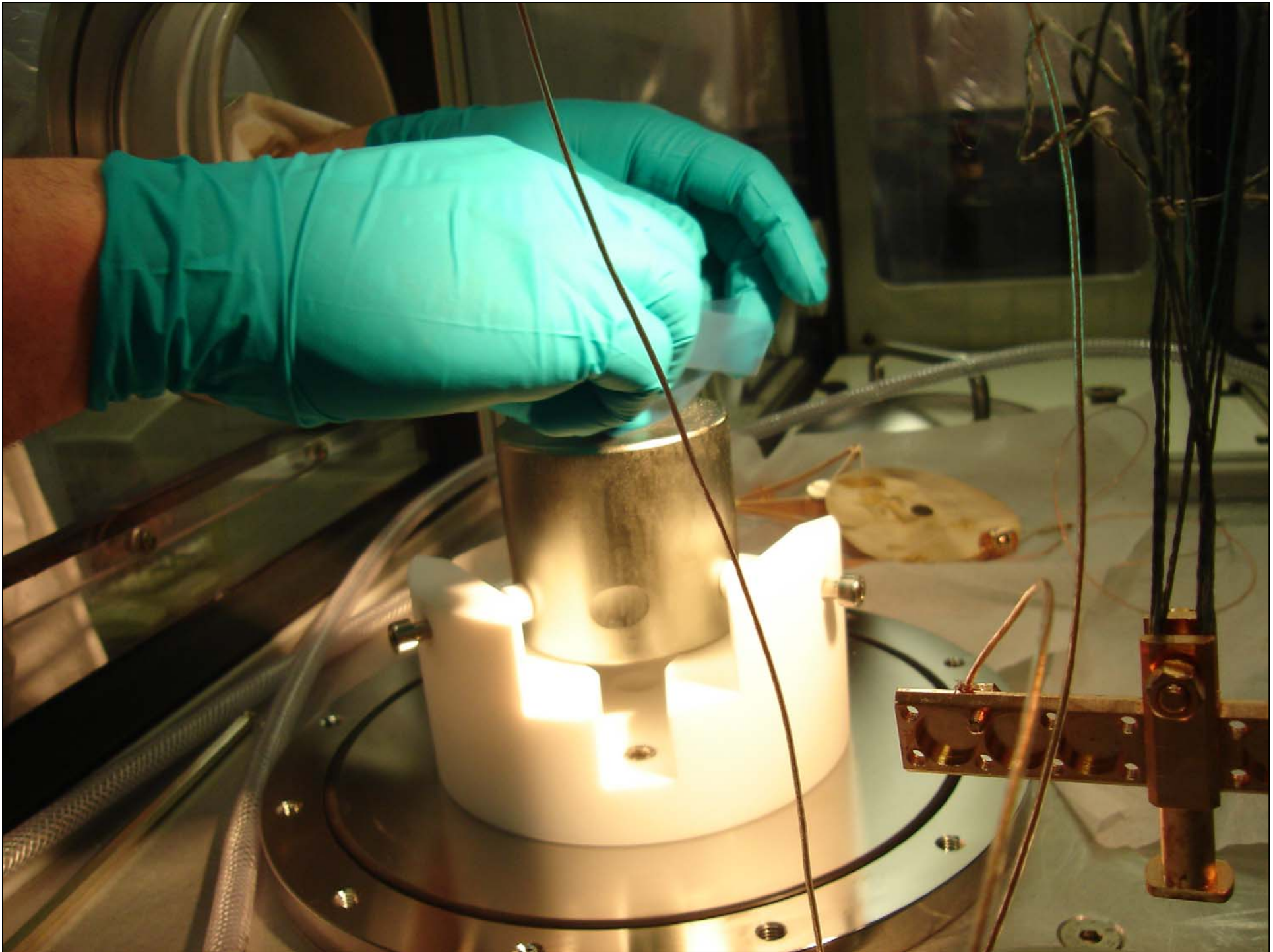






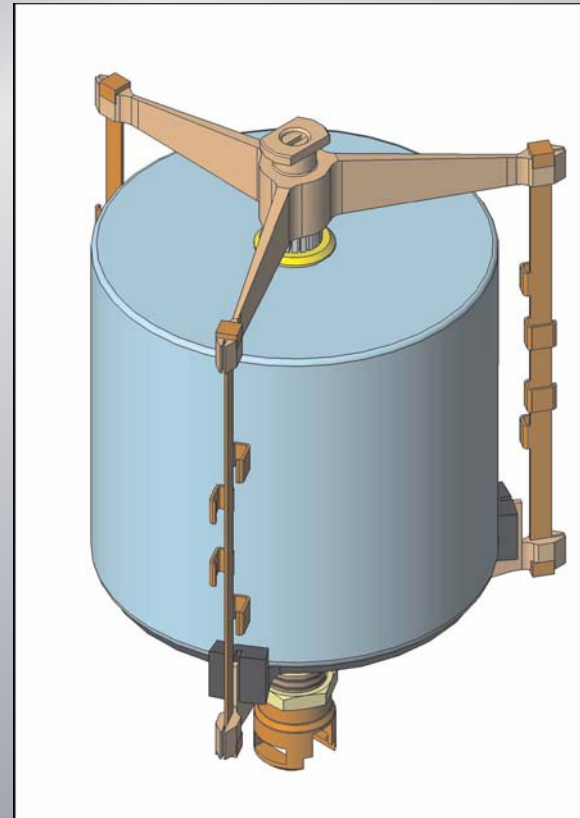




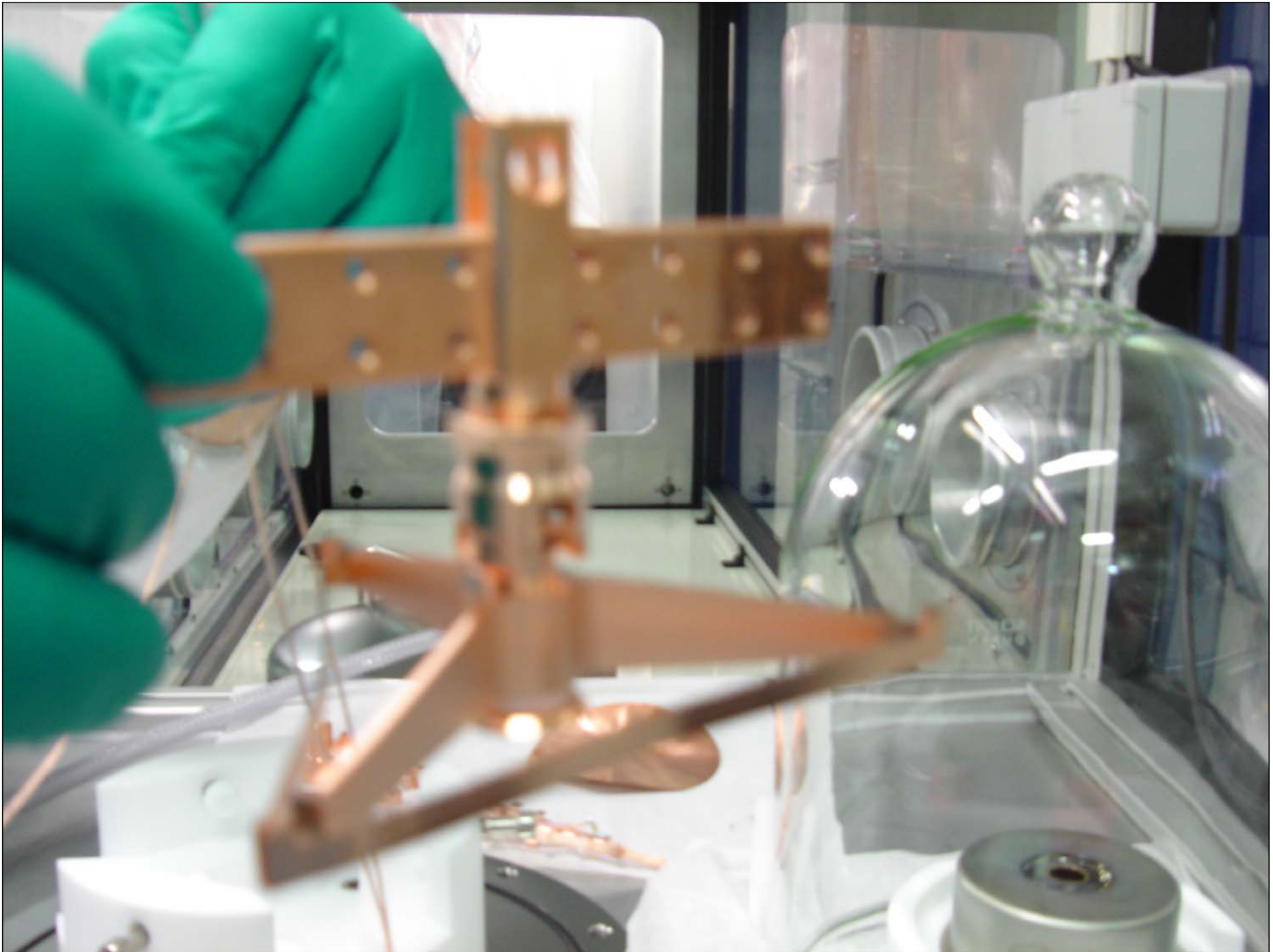


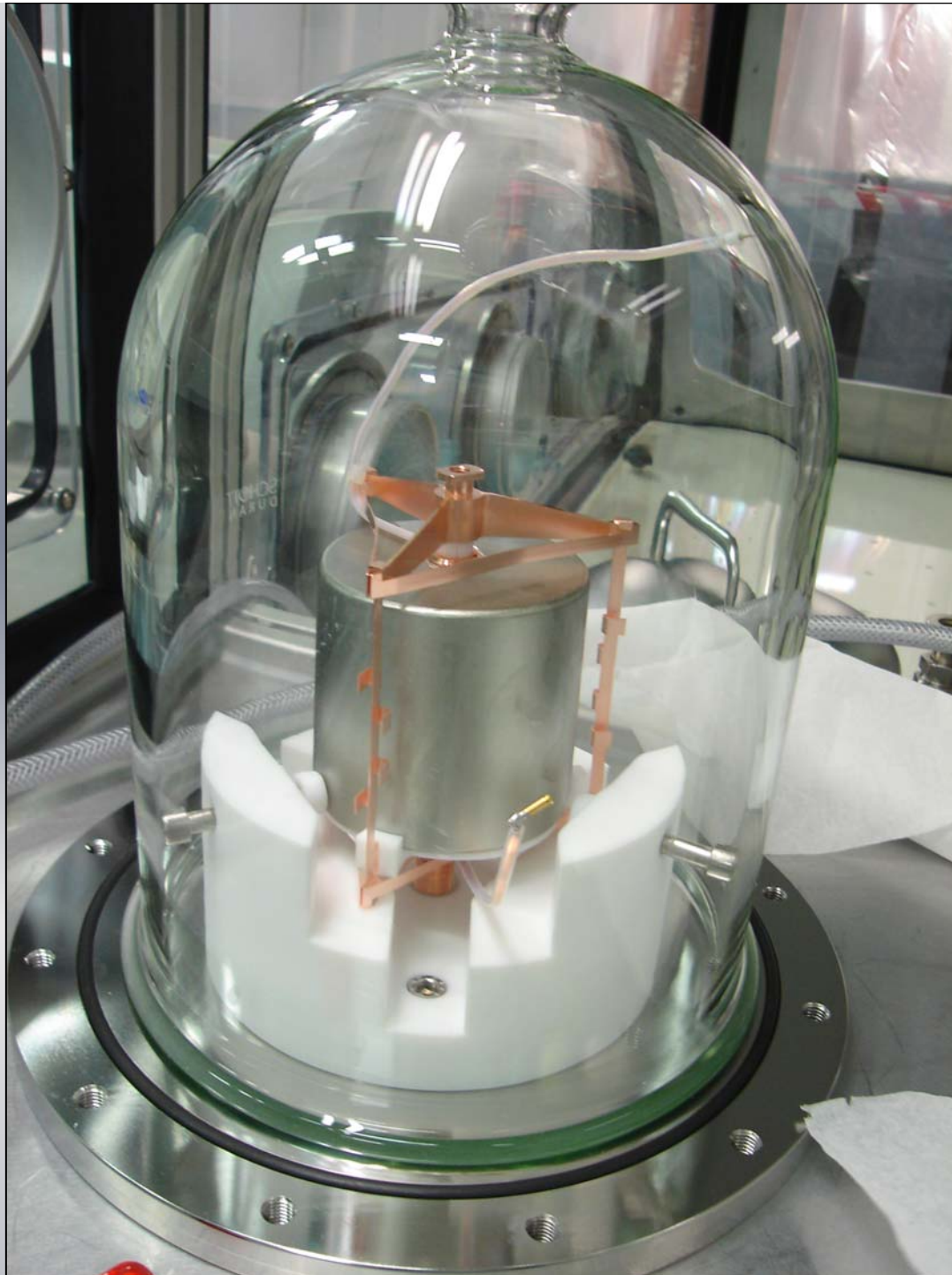
New design avoid:

- mounting manipulation above the inner hole
- nitrogen trapping when detector is warmed up









Results (warm FET)

■ Tests with In

- $R = 38 \Omega$ (at 300 K)
- $R = 1,2 \text{ k}\Omega$ (at 77 K)
- $\text{FWHM} = 2,6 \text{ keV}$ (4000 v, 6 μs)

■ Tests without In (after polishing of diode surface):

- Usual orientation:
 - $R = 48 \Omega$ (at 300 K)
 - $R = 1,7 \text{ k}\Omega$ (at 77 K)
 - $\text{FWHM} = 2,8 \text{ keV}$ (4000 V, 6 μs)
- Upside down:
 - $R = 52 \Omega$ (at 300 K)
 - $R = 3,9 \text{ k}\Omega$ (at 77 K)
 - $\text{FWHM} = 3,2 \text{ keV}$ (4000 V, 6 μs)

Conclusions

- the radon-free clean bench attached to the dewar is a source of mechanical noise
- the temperature sensors are sources of noise
- because the barrack is not grounded, all cables and metallic tubings should not be in contact with it
- LCD monitor is required
- the warm FET showed a lower noise level (and better energy resolution) than the FET in liquid nitrogen (maybe choose best one?)
- the signal to HV at room temperature and the forward resistivity at liquid nitrogen temperature measurements give similar results for both design, indicating that the design with the HV contact on top can be used (additional tests needed)
- we did not see big difference in HV-contact parameters with and without In foil (additional tests needed)
- transportation and the measurement dewars are contaminated with dust