PT @ COSY

Status report from PT-Bonn

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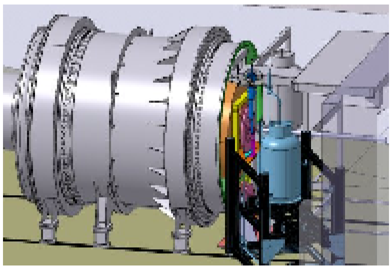
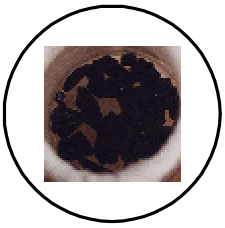


2nd Meeting "Polarized Nucleon Targets for Europe"
Miltenberg, 2-4 June 2005

The target



- "Uncertainty" in the thermal conductivity of doped Li compounds
  (effect of the F-centers on the phonon scattering properties)

- "Uncertainty" in the Kapitza resistance
  (which also depends on the velocity of sound in the material)

- "Difficulty" of experimental determination of the two points above
  (although there are volunteers interested in the issue)

?…

… build a model!

A FE model would give the possibility to study how a change in the parameters would affect the thermal behavior of the target

Nonlinearities:

$k=k(T)=\alpha T^{\beta}$

$$R_k = \frac{dT}{d\dot{Q}} = \frac{15\hbar\rho_s v_s^3}{2\pi^2 k_B^4 T^3 A\rho_h v_h} \Longrightarrow \frac{d\dot{Q}}{A} \propto T^3 dT$$

For systems which are steady with respect to time:

$$\frac{\partial}{\partial x}\left(k\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial y}\left(k\frac{\partial T}{\partial y}\right)+\frac{\partial}{\partial z}\left(k\frac{\partial T}{\partial z}\right)+q=\rho c\frac{\partial T}{\partial x}=0 \quad \textit{(Poisson eq.)}$$

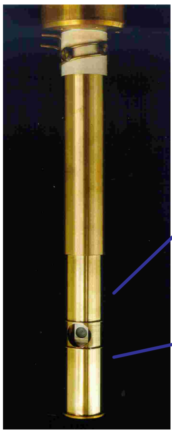
$$-k\nabla^2 T=-k\left(\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}+\frac{\partial^2 T}{\partial z^2}\right)=q$$

FE: $\int div(k\nabla T)\varphi=\int f\varphi$

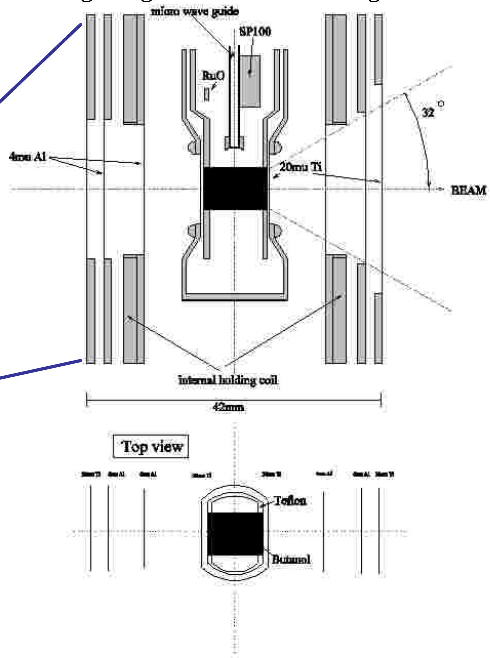
And integrating by parts: $-\int k\nabla T\cdot\nabla\varphi=\int f\varphi$

The non-linearity in the boundary condition is overcome by moving the dependence on a power of T into the recursive formula used for the iteration.

Vertical Target System for PS 185/3 @ LEAR



Target region with Butanol target

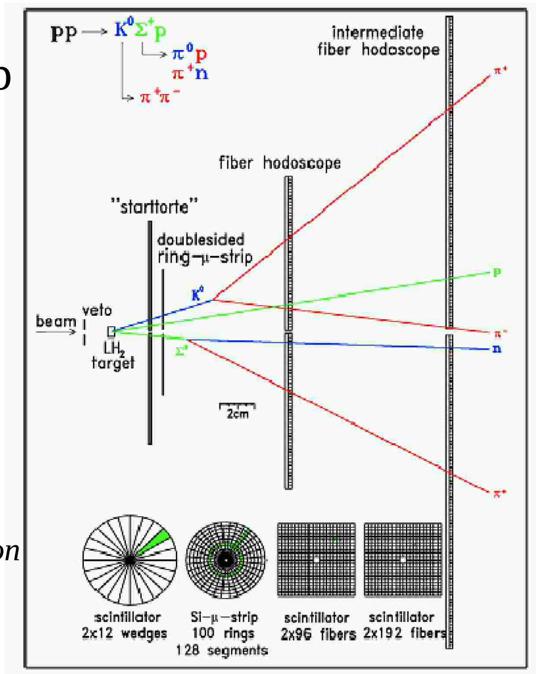


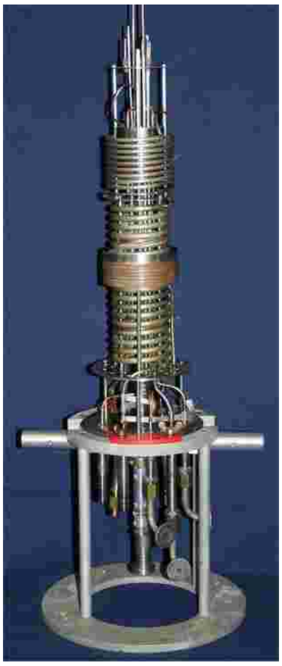
Acceptance:	± 32°
Target dimensions :	l = 9mm
	∅ = 6mm
P_{max} (butanol)	p ~ 80%

$pp \rightarrow \Sigma^+\Theta^+ \rightarrow \Sigma^+K^op$

Accurate determination of the interaction point:

- ☆ highly collimated beam
  (has consequences on the target)
- ☆ detection of Σ^+ ($c\tau \approx 2.4$cm)
  (sets strong requirements on the mechanical assembly)





The dilution cryostat is currently being renewed, reassembled and leak checked.

New:
• tubing
• needle valves
• thermometers (AB)
• radiation shields

- The parts are ready
- Delay due to the change of machine shop

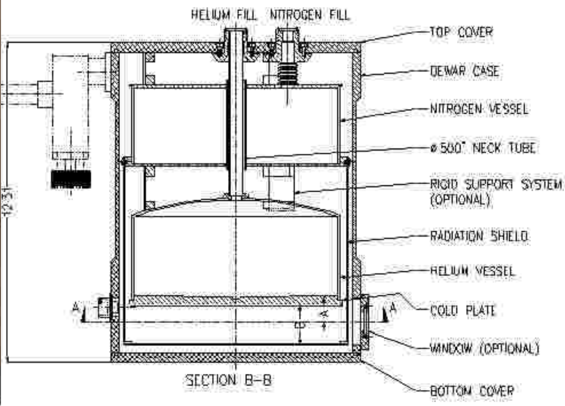
…in the meantime:

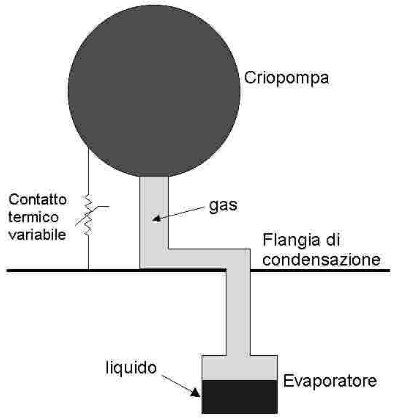
Thermometer calibration.

AB carbon resistors, ranging from 51 Ω to 510 Ω (including the standard 100 Ω)

Calibrated against:
- Lake Shore germanium thermometer (low T)
- Oxford CLTS linear thermometer (high T)

Self-contained ^{3}He refrigerator:
- Provide a condensation temperature below 3.2K
- Warm up cryopump to release ^{3}He gas so to condense liquid ^{3}He
- Cool cryopump to cryosorb ^{3}He gas so to reach T~300mK




Criopompa
Contatto
termico
variabile
gas
Flangia di
condensazione
liquido
Evaporatore