束流辐照控温箱相关技术指标

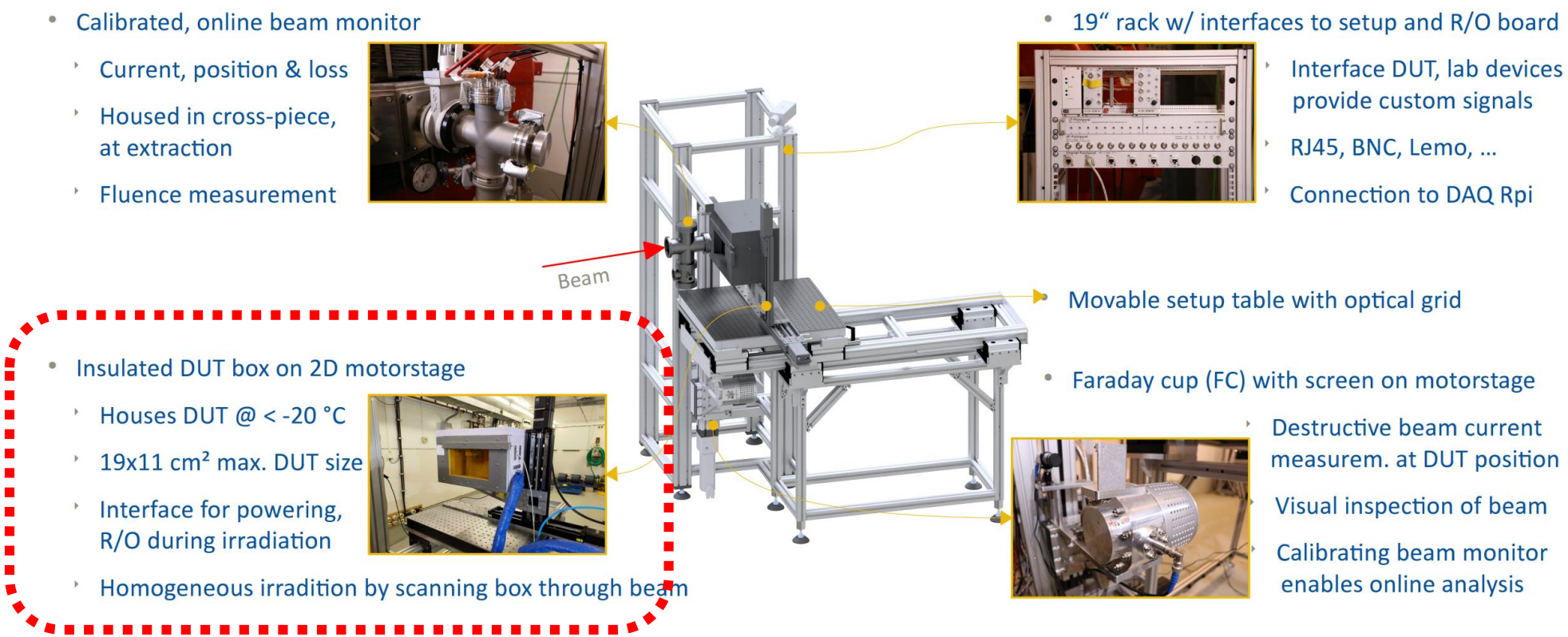
用途：

1、在进行束流辐照实验时，保证被辐射材料维持在低温状态。同时控制低温箱内湿度，以防出现大面积结霜：

- 温度要求：维持在-20℃以下，液氮循环制冷
- 湿度控制：干燥氮气循环

2、由于束流束斑大小有限且强度存在一定的不均匀，为确保分布在有限面积内的受照材料辐照均匀，要求束班中心能在辐照区域内扫描移动：

- XY移动平台精度（视束斑质量确定）

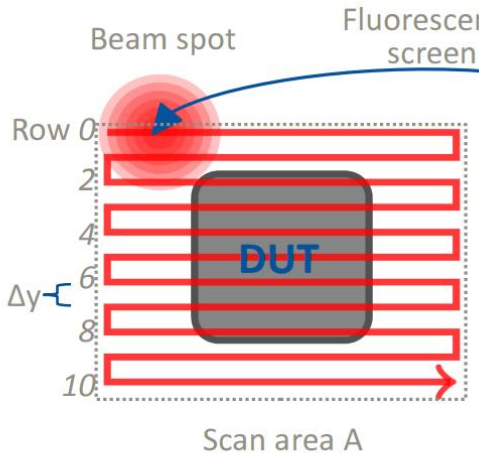


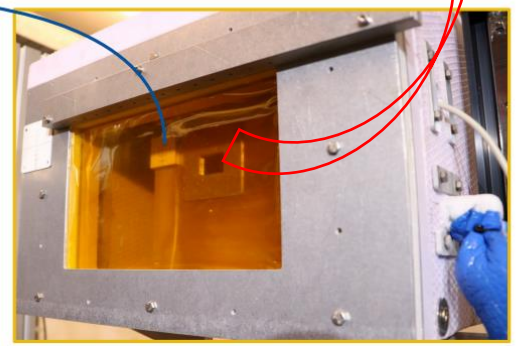
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IRRADIATION
--PROCEDURE--

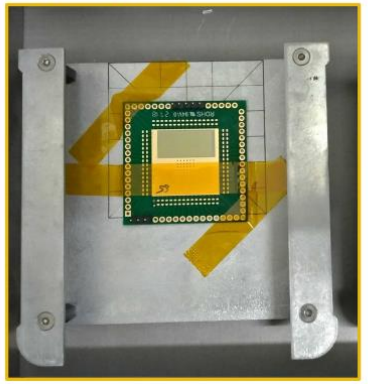
窗口材料的选择?

- DUTs mounted behind custom shielding @ < -20 °C, temp monitoring via NTCs in box
- Beam-based alignment using fluorescence screens, cameras and beam monitor
- Homogeneous irradiation by overscanning DUT area
- Row-wise scanning with row separation Δy and velocity v
- Proton fluence per completed scan (**v = const.** on DUT area) → $$\phi_p = \frac{I_{beam}}{q_e \cdot v \cdot \Delta y}$$
- Uncertainty dominated by I_{beam} → $$\frac{\Delta\phi_p}{\phi_p} = \frac{\Delta I_{beam}}{I_{beam}} = \sqrt{3}\%$$
- Method yields low rel. uncertainty vs. typically 20%
- Typcial values: I_{beam} = 1µA, v = 70 mm/s, Δy = 1 mm
  - ϕ_p ≈ 1e13 p/cm^2 per scan → 1e16 n_{eq}/cm² in ~ 2h

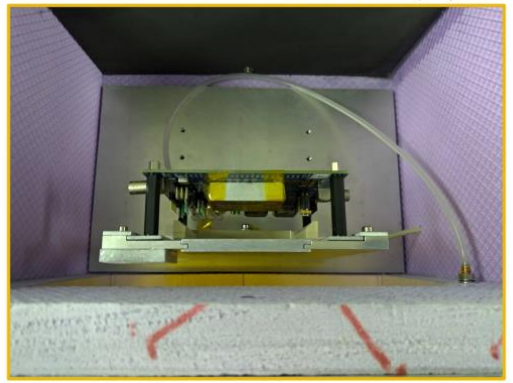




Surfboard + sensor on carrier



RD53A module on SCC behind shield (top view)



参考材料:
https://indico.cern.ch/event/1074989/contributions/4602004/attachments/2349442/4007091/development_status_proton_irradiation_Bonn.pdf