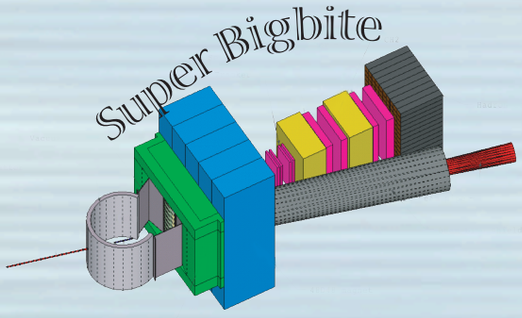
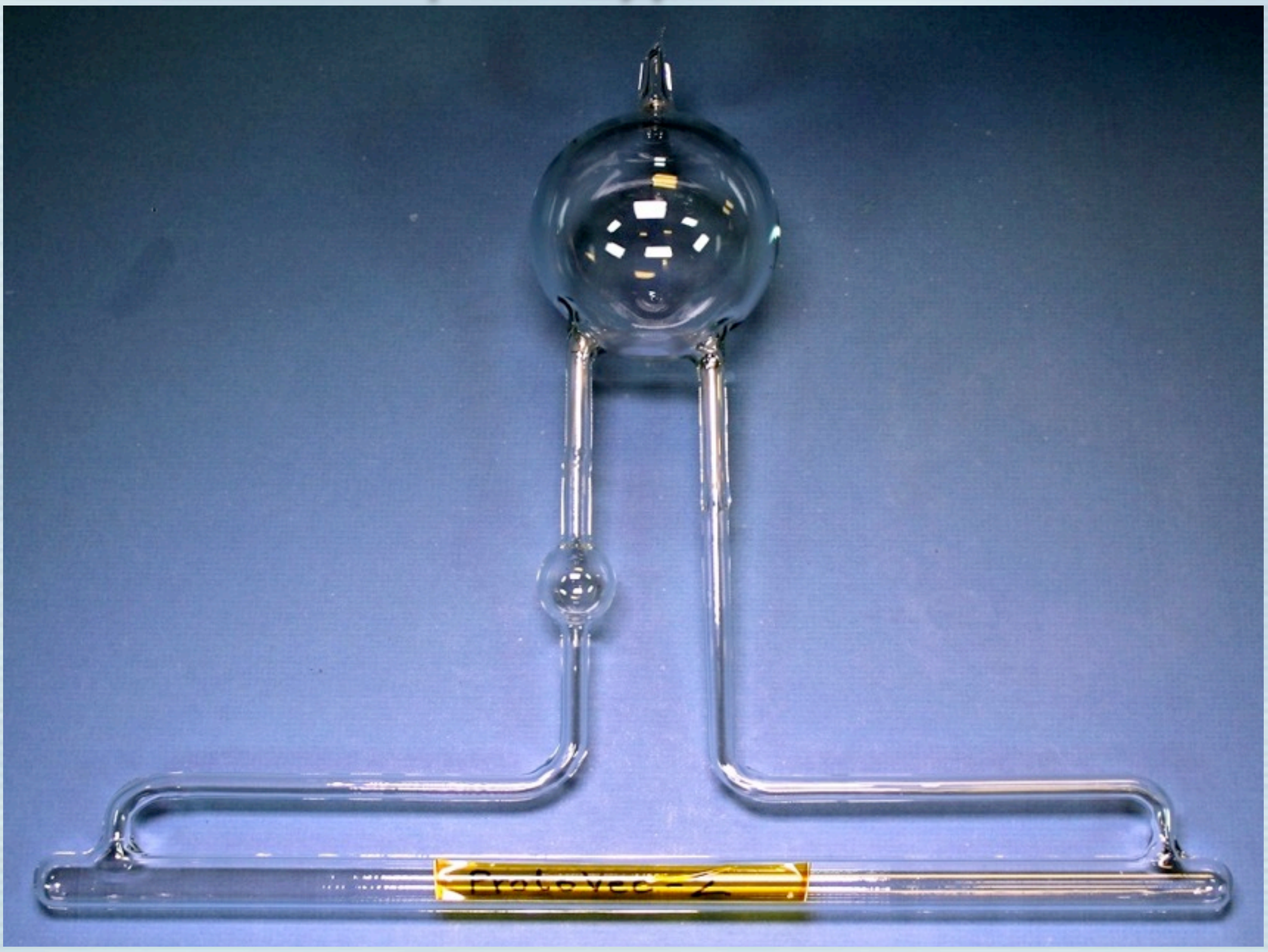
Update on work to develop metal windows for the polarized ^{3}He SBS target



G. Cates, UVa

Dec. 4, 2013

Half-scale SBS prototype
full-scale prototype for Hall A A_1^n



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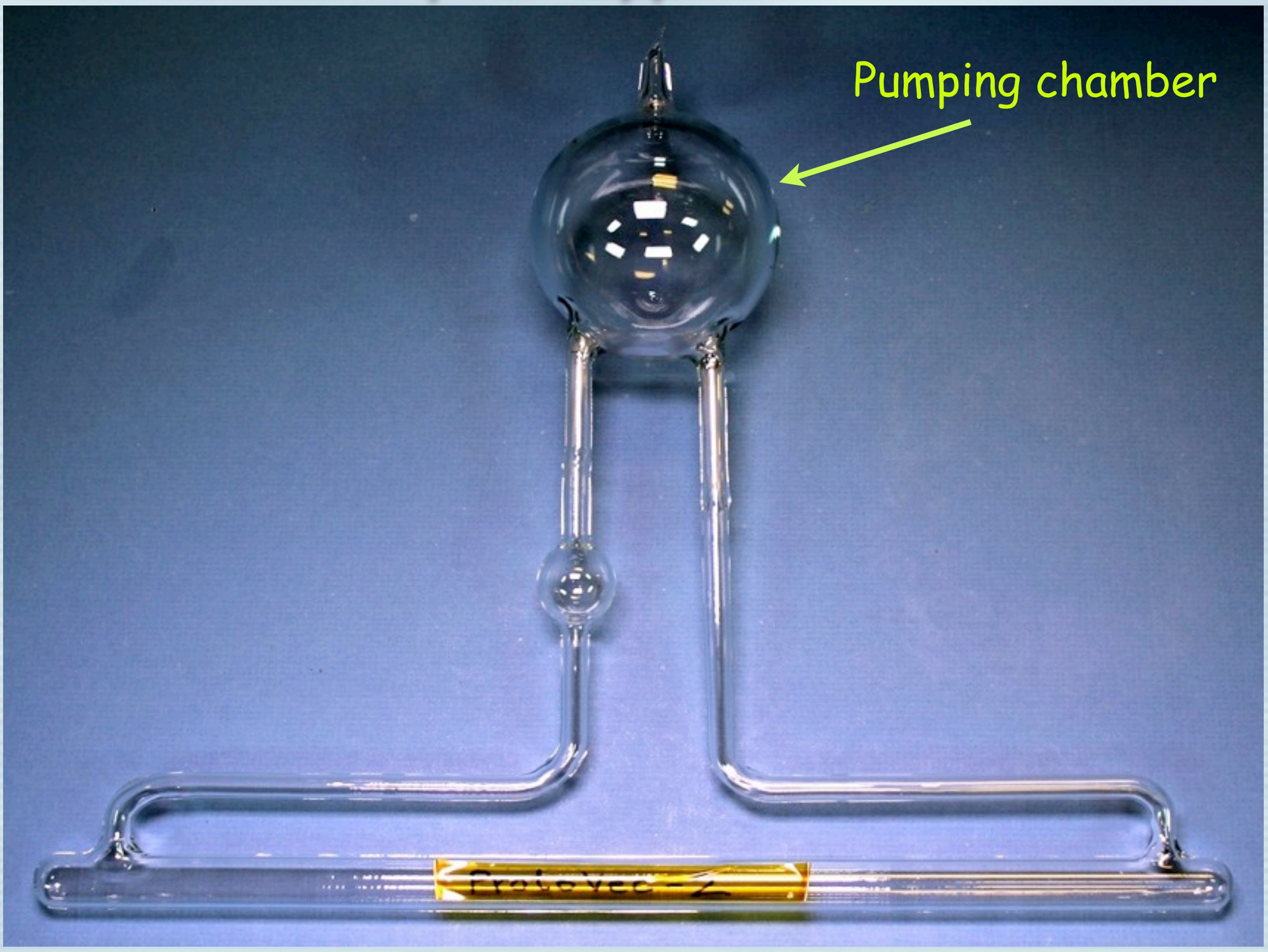
full-scale prototype for Hall A A_1^n



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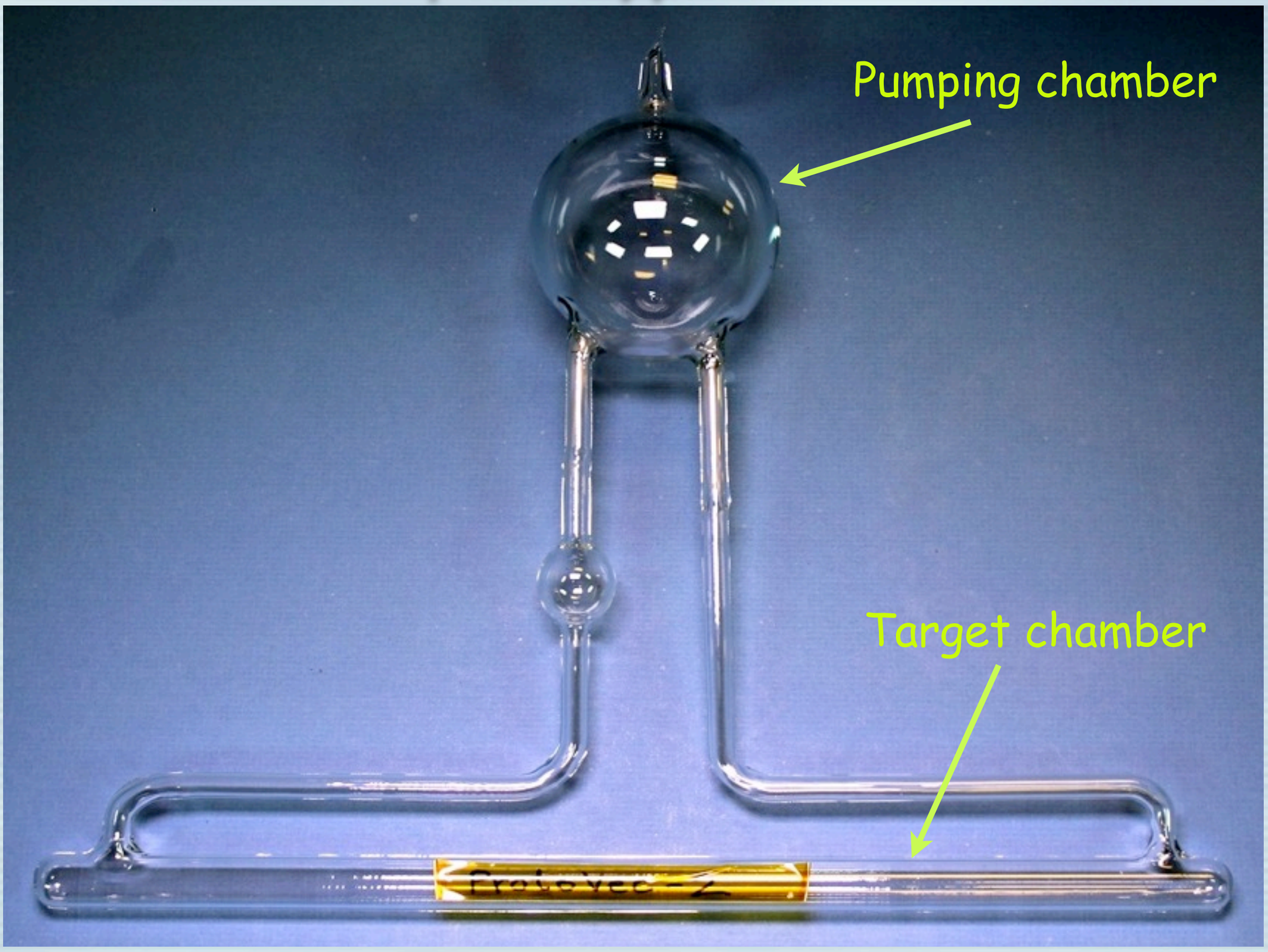
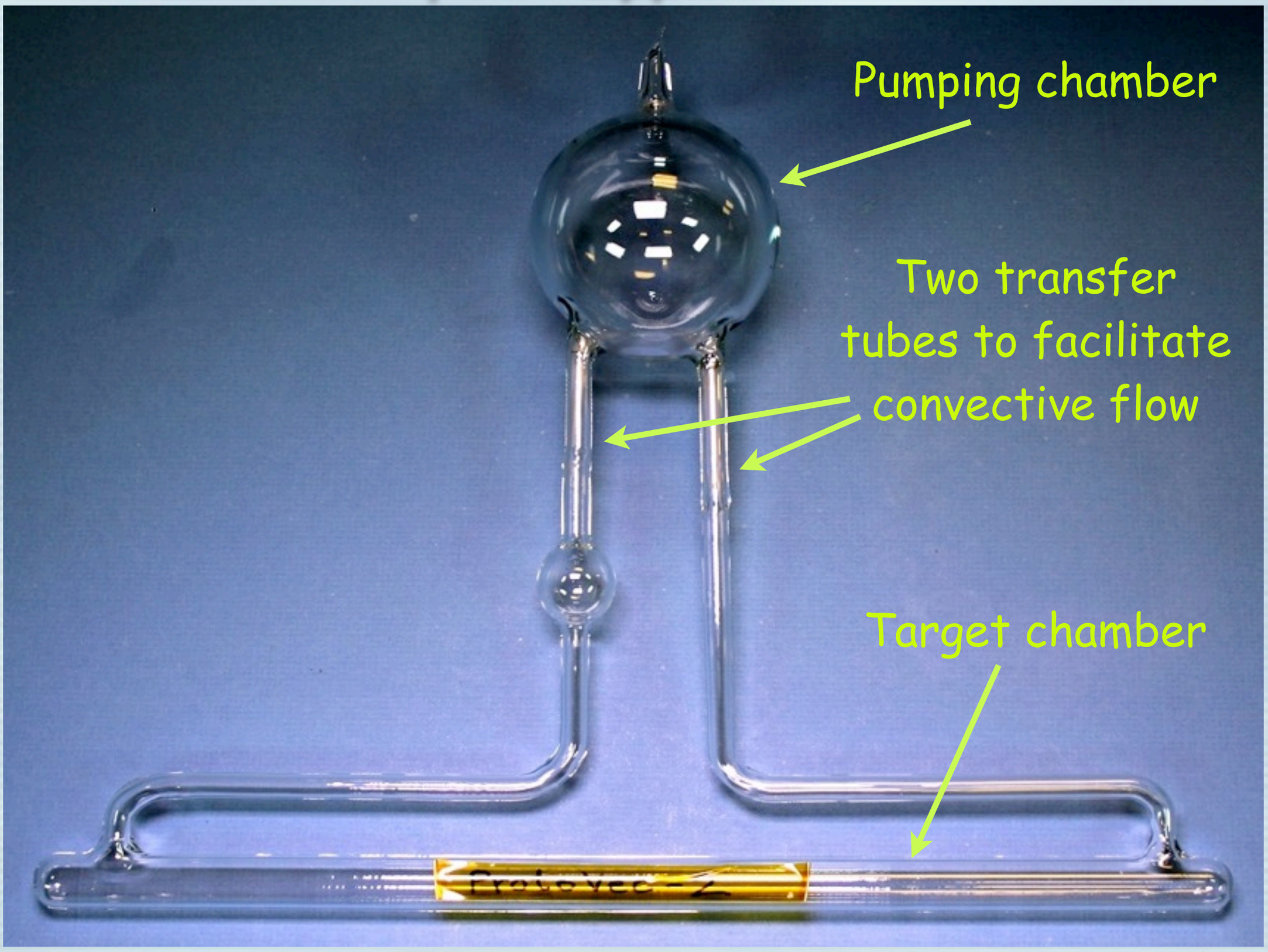
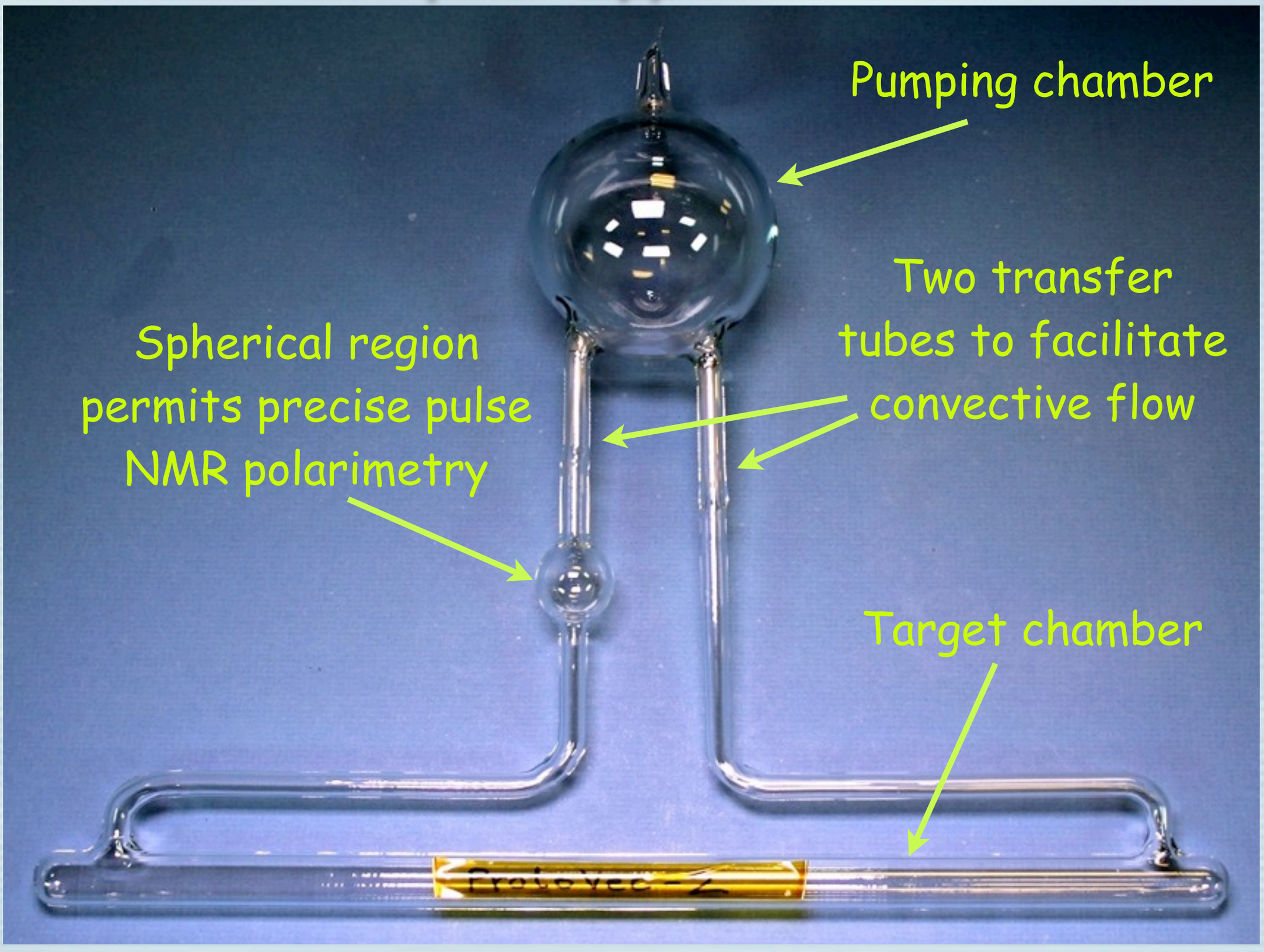


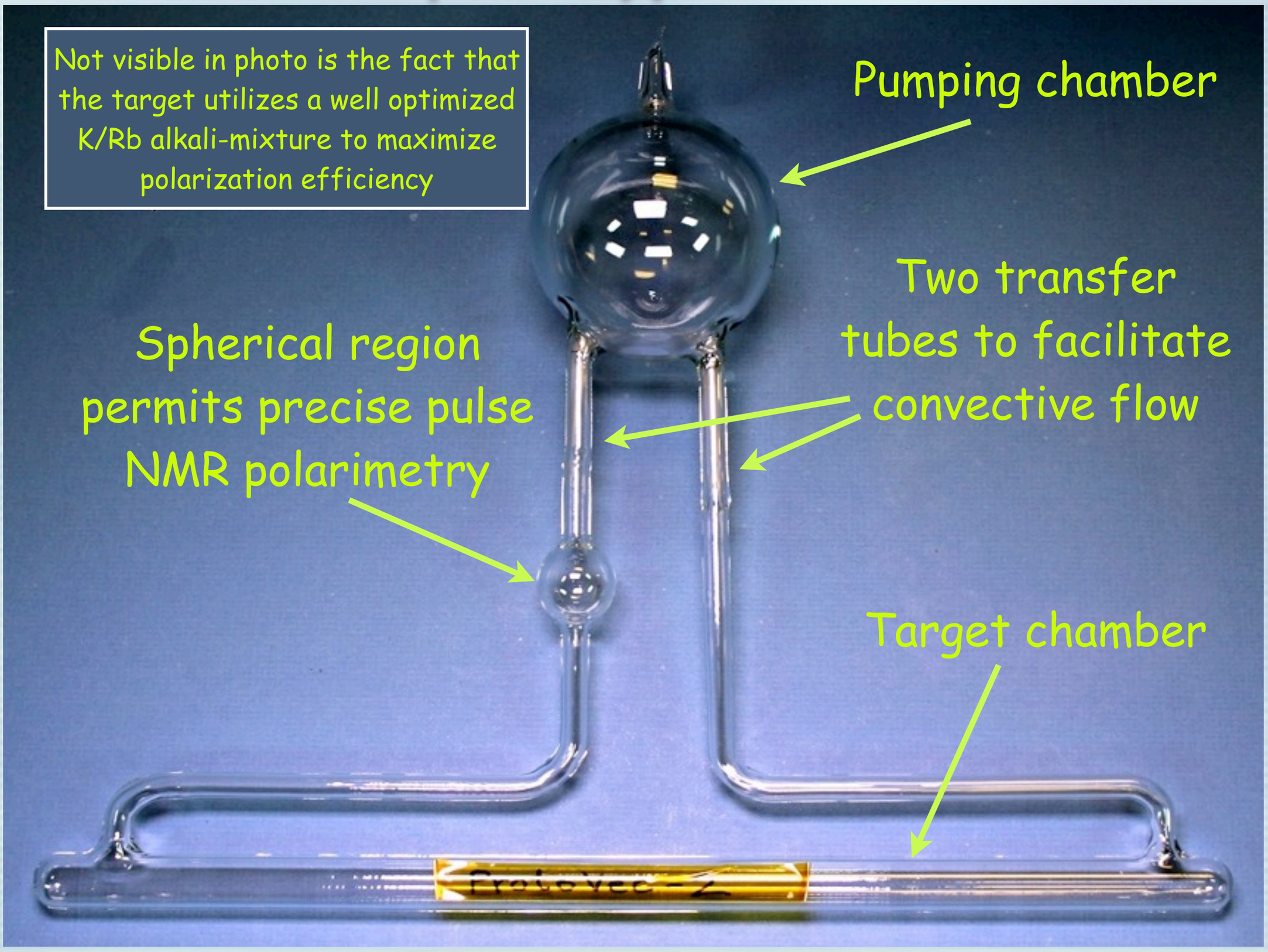
Half-scale SBS prototype
full-scale prototype for Hall A A_1^n



Half-scale SBS prototype
full-scale prototype for Hall A A_1^n

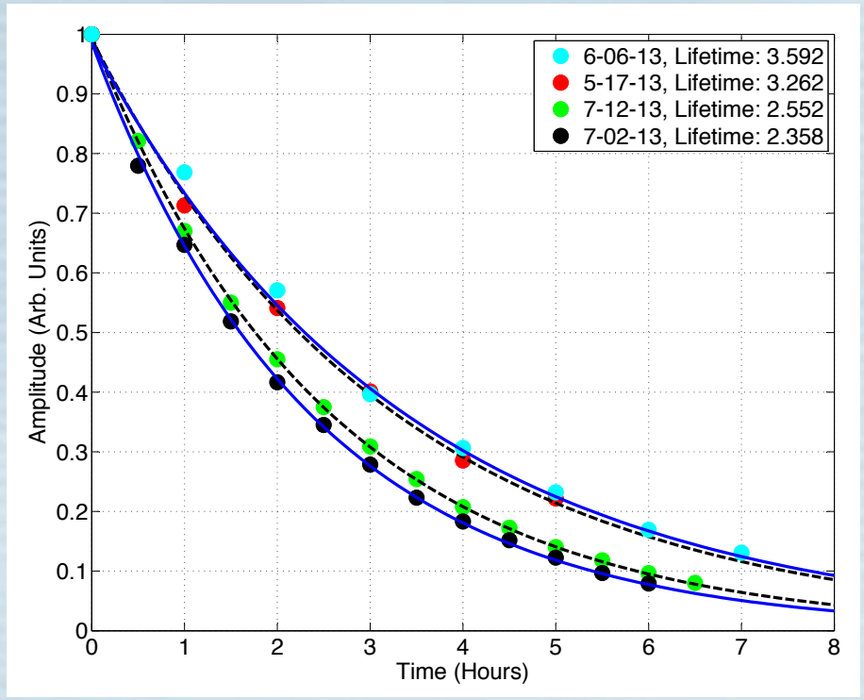


Half-scale SBS prototype
full-scale prototype for Hall A A_1^n

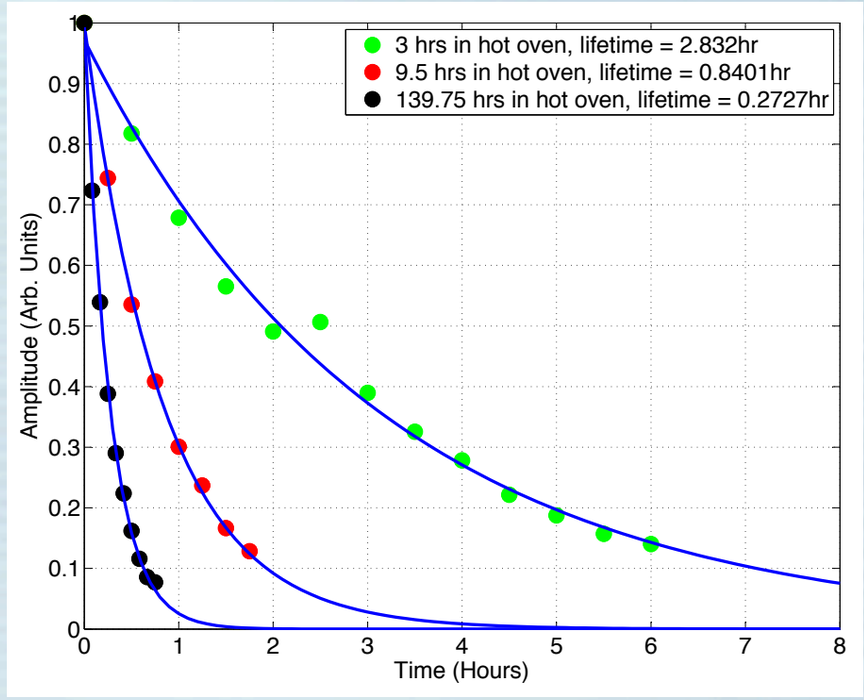


Previous end-cap development

Photo is actually of Goldfinger

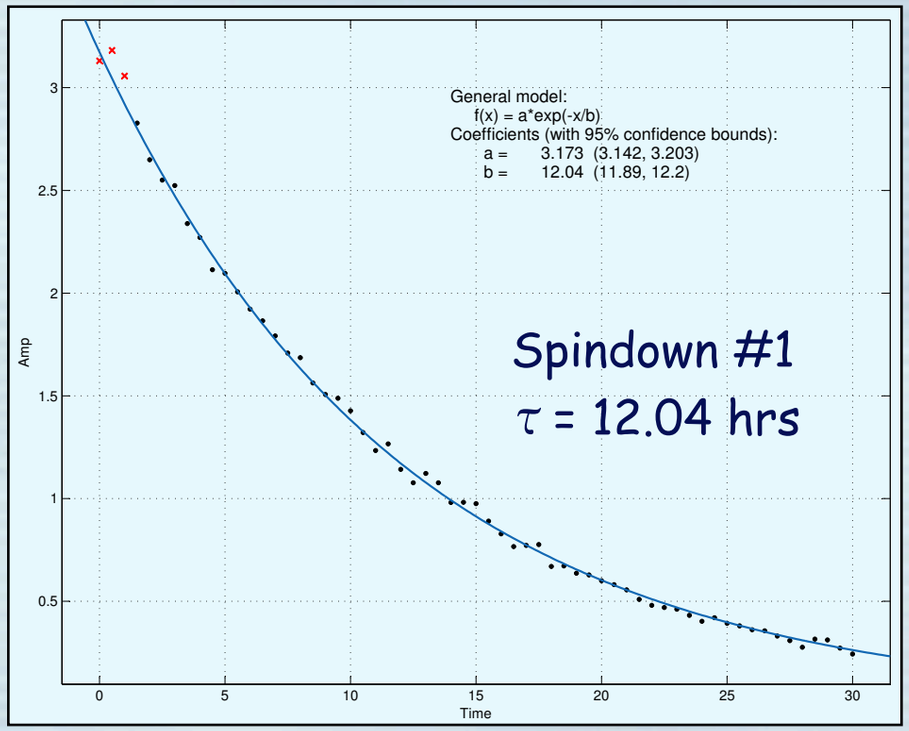


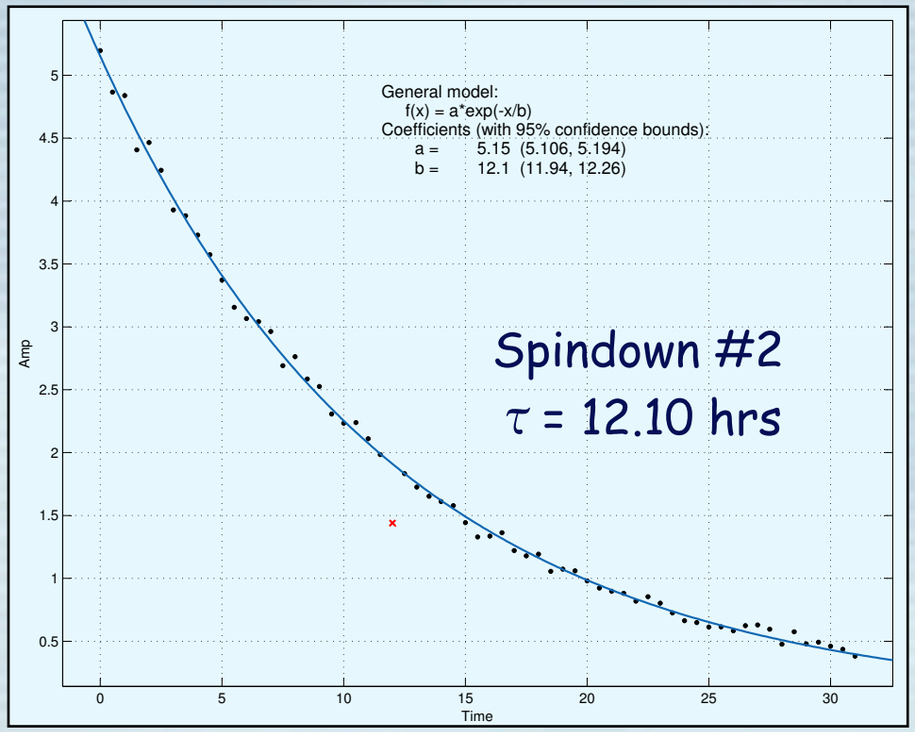
Goldfinger, gold-coated copper, showed lifetimes degrade from 3.6 hrs to 2.4 hours, but we suspected that it started out much longer

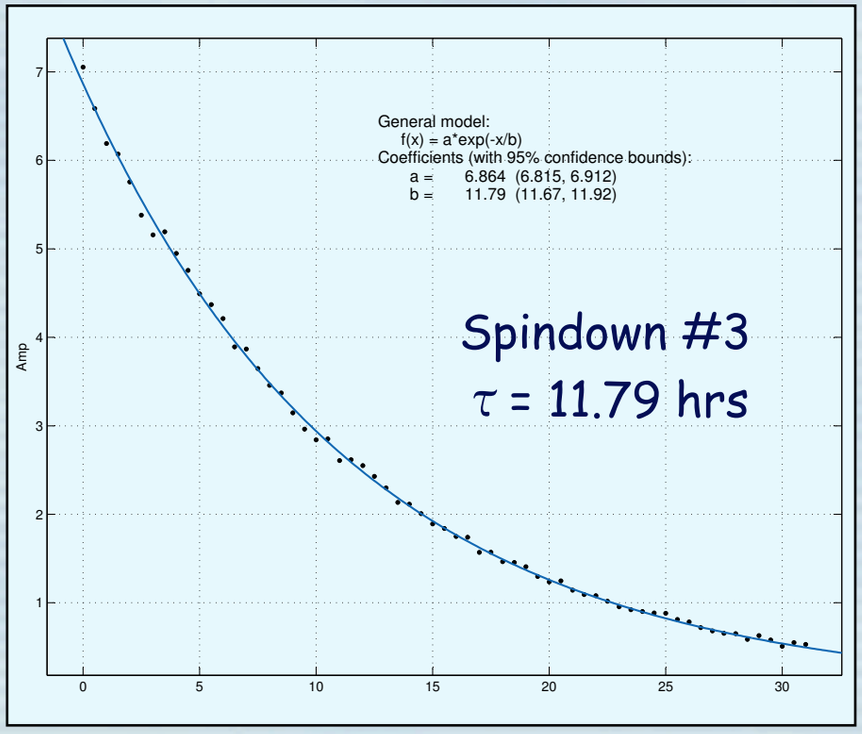


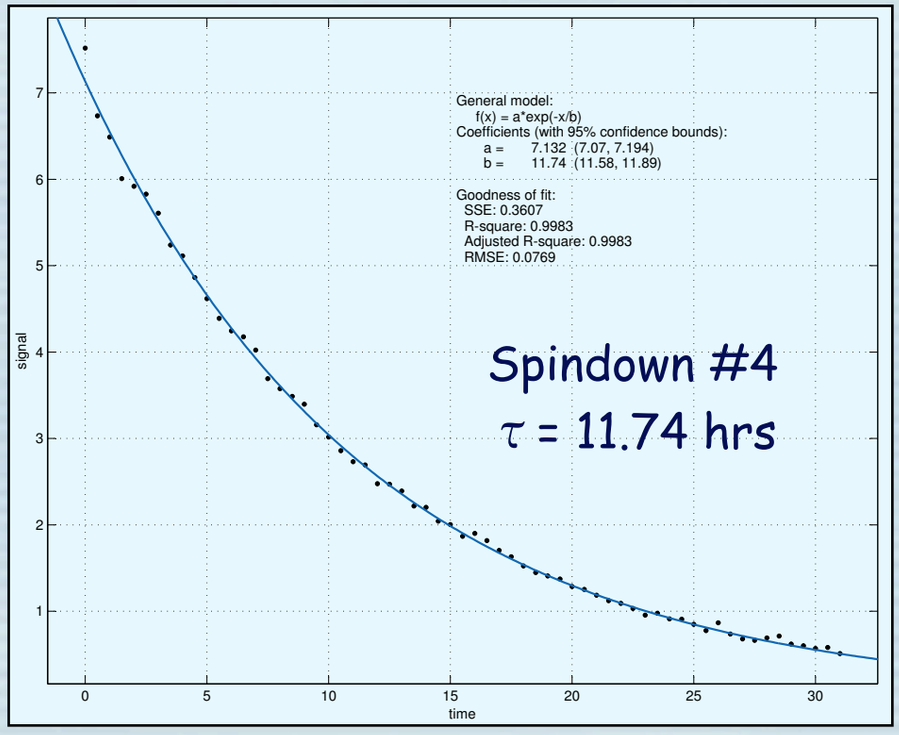
Cupid, copper-only, showed lifetimes degrade from 2.8 hrs to 0.3 hours. This test reinforced our belief that Rb exposure was seriously degrading our surfaces.

Tests of "GoldRush"



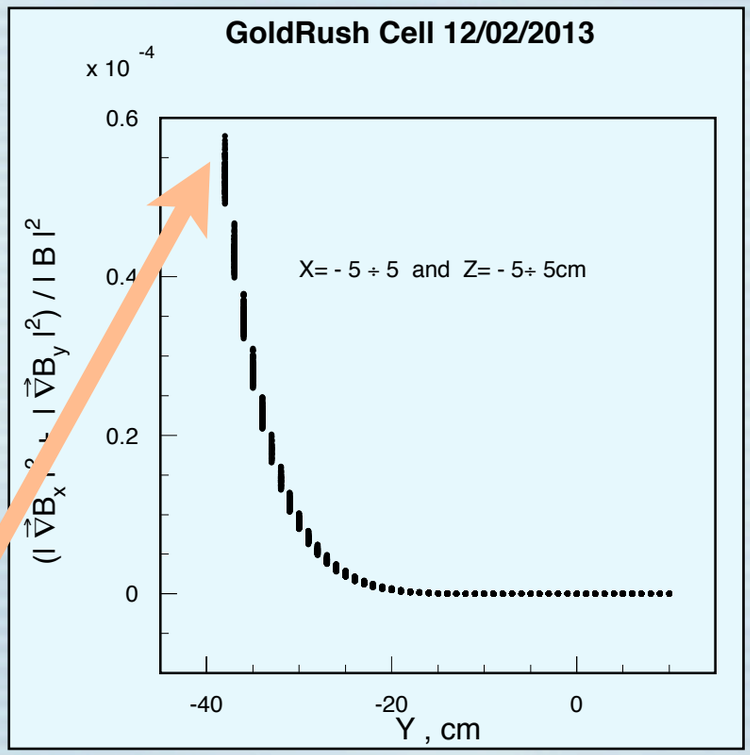






No serious degradation of lifetime was observed over four spin downs

Tests of "GoldRush" were at least partially limited by magnetic field inhomogeneities



- Repostioned cell upwards by ~7 cm
- Spin-down is now ongoing
- Preliminary lifetime: τ = 16.9 hrs
- When adjusted for polarimetry losses, τ = 20.1 hrs !
- What does this imply?
  - Assume ALL relaxation is due to metal surface.
  - Assume endcaps would have cumulative area half that of existing metal surface.
  - Protovec I would experiencr a contribution to wall relaxation of Γ = 1/55 hrs
  - G_E^n-style cell (double chambered) would experience a contribution to wall relaxation of Γ = 1/110 hrs.
  - This is consistent with required performance!
  - Certain alloys of copper are strong enough that we use a 50 μ thick hemi-spherical end cap.

Could we tolerate a 50 μ copper window ?