# Update on work to develop metal windows for the polarized <sup>3</sup>He SBS target



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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<sub>1</sub><sup>n</sup>



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

Pumping chamber

Two transfer tubes to facilitate convective flow

Target chamber

#### Half-scale SBS prototype full-scale prototype for Hall A A1<sup>n</sup>

Pumping chamber

Spherical region permits precise pulse NMR polarimetry Two transfer tubes to facilitate convective flow

Target chamber

#### Half-scale SBS prototype full-scale prototype for Hall A A1<sup>n</sup>

Not visible in photo is the fact that the target utilizes a well optimized K/Rb alkali-mixture to maximize polarization efficiency

Spherical region permits precise pulse NMR polarimetry Pumping chamber

Two transfer tubes to facilitate convective flow

Target chamber

### Previous end-cap development





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.

Photo is actually of Goldfinger

### 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:  $\tau$  = 16.9 hrs
- When adjusted for polarimetry losses,  $\tau = 20.1 \text{ hrs }!$
- 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 experience a contribution to wall relaxation of  $\Gamma$  = 1/55 hrs
- $G_E^n$ -style cell (double chambered) would experience a contribution to wall relaxation of  $\Gamma = 1/110$  hrs.
- This is consistent with required performance!
- Certain alloys of copper are strong enough that we use a 50  $\mu$  thick hemi-spherical end cap.

#### Could we tolerate a 50 $\mu$ copper window ?