**Abstract**

**Method**: Superconducting screens provide a sharp transition between two magnetic field regions. This can be used to create a non-adiabatic transition and hence provide efficient spin reversal ($\pi$ flip).[1]

**Motivation**: High temperature superconducting screens (YBCO) eliminate the need for cryogens. This allows the creation of a turn key device [2]. Our aim is to create a low maintenance and cost effective compact spin flipper for use in a variety of applications including large beams.

---

**Preliminary measurements using permanent magnets**

350 nm thick YBCO film capped with 100 nm of gold on a 78 x 100 x 0.5 mm sapphire substrate (Theva, Germany) mounted in an oxygen free copper high conductivity frame.

Test measurement on SESAME beamline at LENS- simple guide field using permanent magnets – orientation swapped for flipping/non flipping.

Magnetic field at YBCO film ~12 G
Temperature ~8.5 K (measured on copper frame)
Flipping ratios ~16 at 5.5 angstroms
Beam diameter 40 mm
Corresponds to ~95% efficiency
– works despite crude guide field (and with large beam)

**Cold finger and heat shield detail**

Low cross section (57 mm) allows for close placement of electromagnets
Sapphire windows for high transmission
All aluminium construction of vacuum vessel to limit magnetic contamination.

---

**Guide field electromagnet design**

Finite element simulation of air cooled guide field electromagnet and super conducting film was produced using *Radia* [3].

Vector plot of field profile to the superconductor - shows uniformity over large region – for efficient spin transport (high flipping efficiency)

Vertical magnetic field (Z on diagram above, $Y=0$, $X=5$ mm) component showing guide field across ~40 mm

Bz>12 G

---

**Exploded view of design**

-Aluminium vacuum vessel
-Mu-metal box
-Oxygen free copper high conductivity frame

*Mu-metal box is placed around film during cooling to prevent flux trapping
**Guide field can be mounted either vertically or horizontally

---

**Summary**

Preliminary measurements show suitability of chosen film
Small device footprint along beamline ~20 cm
Will be tested on SEAME beamline at LENS

---

**References**

1. J.B. Forsyth, At Energy Rev. 17 (1979) 345

We would like to thank E. LeBlanc – Berna (ILL) for useful discussions on the heat shield and window design. We also acknowledge J. Doakow (LENS) for design input.