

# GOALI: Constricted Current CPP Magnetic Sensor Via Electroplating

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## Advantages of Constricted Current (CPP) Read Heads:

- Good choice for high density recording media
- High magnetoresistive ratio  $\Delta R/R$
- Good heat dissipation
- Sufficiently small R for small RC time constants

## Motivation:

- In order to acquire adequate magnetoresistance  $\Delta R/R$  in CPP geometries, A needs to be substantially reduced because  $R = \rho L/A$ , ( $\rho$  = resistivity, L = length of the current path, and A = cross-sectional area),
- Electroplating is a good way to grow Co/Cu nanowires with sharp edges.
- Templates being researched for nanowire growth include self-assembled anodic alumina and e-beam defined holes in polymethylmethacrylate (PMMA).

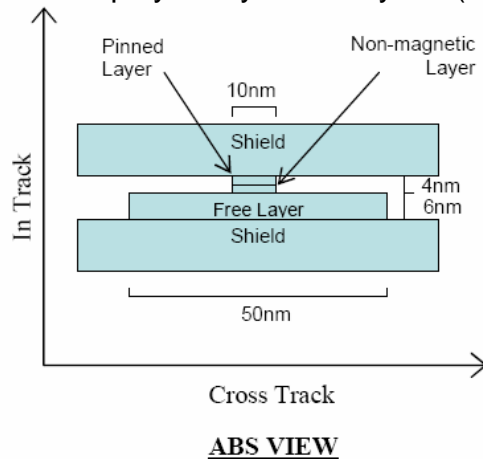


Figure 1. Ideal geometry of constricted current CPP read head

## Observation:

- In order to get the smallest hole in PMMA, the trend between diameter and dose is being investigated (Fig 2).
- The spacing between the hole affects the diameter of holes.
- The smallest hole (Fig 3) - for 300nm spacing,  $d_{min} = 68\text{nm}$   
- for 400nm spacing,  $d_{min} = 75\text{nm}$
- AAO pores can be smaller ( $\sim 10\text{nm}$ , but will not be ordered yet)

PMMA(A4) on Cu 20kv/10 $\mu\text{m}$

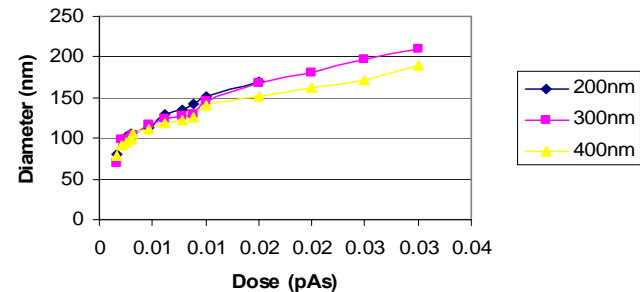


Figure 2. Trend between diameter and dose

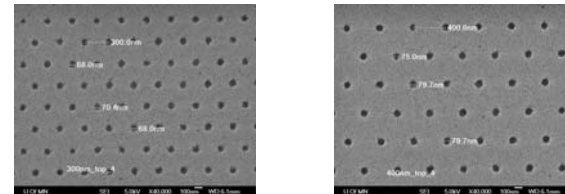


Figure 3. SEM images of PMMA, 300nm space (left); 400nm space (right)

## Future work:

- Continue to decrease PPMA hole diameters
- Continue to increase the range of order in 10nm AAO.
- Grow nanowires and measure the magnetoresistance.