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BEC1 mask fabrication proposal
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1. OBJECTIVE

The goal of this fabrication is to make an array of beam blockers for CW-laser application. The beam blockers are silver (Ag) circular masks of radii ~ 100 μm that are deposited on a Thorlabs AR-coated glass window (N-BK7). The masks are distributed on the glass window according to the following pattern:

The BEC1 experiment creates an optical trap for ultracold atoms using 532 nm light in the form of a "coke can." The trap consists of one hollow beam and two end cap beams. The hollow beam is generated by using one of the masks in the pattern to block the central region of a Bessel beam. The diameter of the coke can be controlled by selecting a circular mask of a particular size from the pattern. The setup in BEC1 is similar, but not identical, to the following schematic:
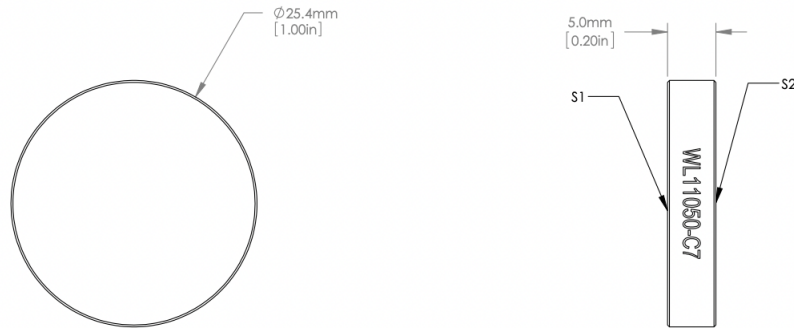
2. TENTATIVE PROCEDURE

(a) Acquire Thorlabs' WL11050-C7 glass window. Material N-BK7. Diameter: 1 inch. The glass window is AR-coated, suitable for 400-700 nm. The mask will be created on this glass window blank.

Other specifications:

- Surface flatness: $\leq \lambda/10$ at 633 nm
- Surface quality: 10-5 scratch-dig
- Thickness tolerance: ± 0.3 mm
- Parallelism: ≤ 5 arcsec

(b) Clean the N-BK7 window with acetone, followed by methanol, followed by IPA. Blow dry with N_2.

(c) Spin AZ3312 (positive) photoresist to approximately 400 nm thickness.

(d) Expose pattern with the MLA150 machine.

(e) Develop substrate. Time and temperature: to be determined.

(f) Deposit a layer of silver (Ag) with thickness of 150 nm by electron-beam evaporation using the E-beam-Aja machine.

(g) Silver liftoff: remove the photoresist and the silver that was deposited on the resist in the Microposit Remover 1165 overnight.

(h) Solvent clean using acetone, followed by methanol, followed by IPA. Blow dry with N_2.

(i) Deposit a 20 nm-thick layer of SiO_2 on the entire substrate using CVD.