

# Supplementary Information - An Analysis of Semicircular Channel Backscattering Interferometry Through Ray Tracing Simulations

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Unless otherwise explicitly stated, all variables within the Supporting Information are as defined within the main body of the text.

## General Channel Intersection Position Formula

The  $x$  position of the first intersection of the ray with the radius of the channel  $x_\theta$  in the general case of  $\psi \neq 0$  can be written

$$x_\theta = \cos^2(\epsilon) \left( -t \tan(\omega) - x \pm \tan(\epsilon) \sqrt{r^2 \tan^2(\epsilon) + r^2 - t^2 \tan^2(\omega) - 2tx \tan(\omega) - x^2} \right), \quad (\text{S1})$$

by rearranging Eq. 2, which was solved using the symbolic mathematics package `sympy` (version 1.1.1) in Python3. In this work, the negative root was used

## Oblique Fringe Pattern

Fig. S1 shows the observed fringe pattern at the detector plane for an incident angle of  $\psi = 3^\circ$ , with all other parameters as defined in the text. The fringes bear a high degree of similarity to those in Fig. 5, with a small reduction in the overall intensity of the  $p$ -polarised case. This is due to the fact that as the angle increases, the magnitude of the reflection coefficient decreases for  $p$ -polarised light, but increases for  $s$ -polarised light, causing small discrepancies in the fringe intensities.

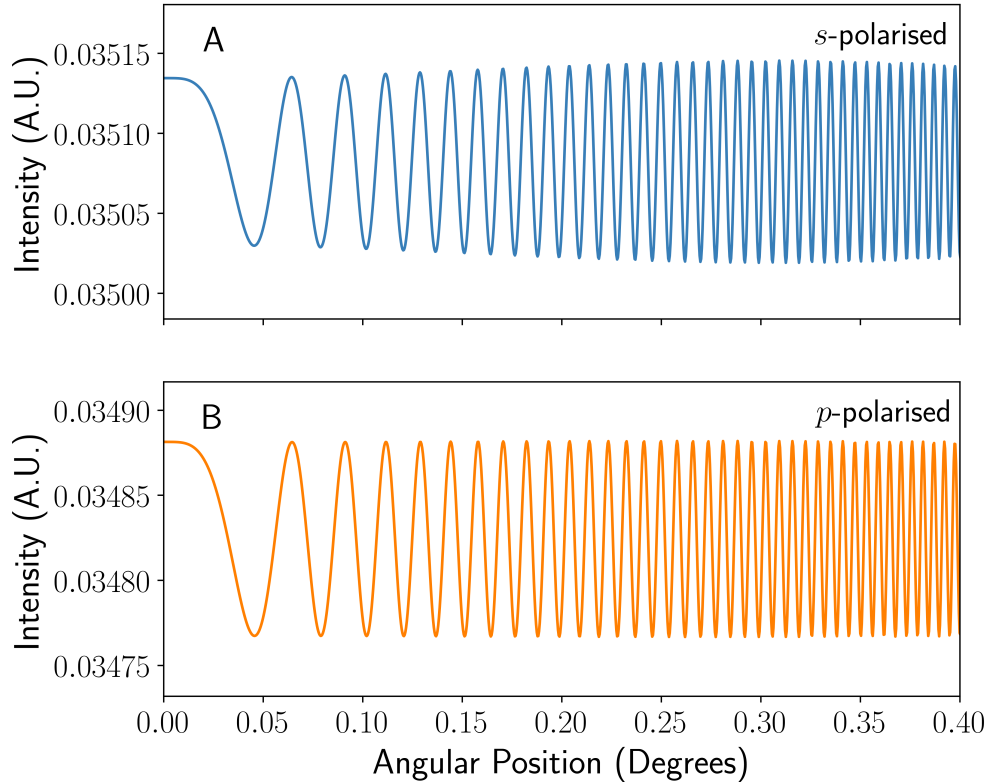


Figure S1: Graphs showing the interference patterns seen on a detector for an incident angle of  $\psi = 3^\circ$  using the parameters as set out in the main body of text at a distance of 1 m with the angle given from the line of  $x = 0$ . A shows the interference pattern for  $s$ -polarised incident light, whereas B shows the pattern imaged for  $p$ -polarised light.