**Jack,**

**I’m confused on how, given contrast and differential phase, we can calculate the 6 ellipse parameters [A,B,C,D,E,F] that satisfy**

**Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0 and B^2 – 4AC < 0.**

A picture containing text

Description automatically generated**Text

Description automatically generatedI follow the work presented in [1] that starts with this background:**

Graphical user interface, text, application

Description automatically generated**I’m not exactly sure what these four wave functions refer to, but I assume in the expression for x and y (2.28) that: b\_x = b\_y = ½. Next, [1] normalizes x and y to form x’ and y’ below:** Text

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**Here I don’t know what c\_x or c\_y refer to, and I’m unsure what values I should use for b\_x and b\_y (2.31). If I construct the model used in the multiplexed clock paper, I believe phi\_d = phi/2, where**

x = (1 - C cos(theta))/2

y = (1 - C cos(theta + phi))/2

**Lastly, there seems to be some issue when phi\_d = pi/4 => a\_2 = 0 => phi\_d is complex. Also, phi\_d real => a\_1\*a\_2 > 0 but a\_1\*a\_2 > 0 is not true in general for ellipses.**

[1] B. V. Estey, “Precision Measurement in Atom Interferometry Using Bragg Diﬀraction,” p. 203.