Derivation of conductivity equation

Given: $R = \frac{\rho L}{A} = \frac{V}{I}$

$$\rho = \frac{Rwt}{L}$$

Where ρ is the resistivity, R is the resistance, w is the width of the inter-digitated design (which is the length of the curved path), t is the thickness of the film layer, and L is the length of the design (which is just the distance between the two probes). Solving for the conductivity $\sigma = \frac{1}{\rho}$ we have:

$$\sigma = \frac{1}{\rho} = \frac{L}{Rwt}$$

We know from the geometry that $L = 0.2$mm and we can assume that w is simply the perimeter of each digit times the number of digits plus half a digit and a little bit from the end of the pattern (This assumption is based on papers that can be found under the Interdigitated Conductivity Papers file which is in the conductivity file inside of the KoneznyLab folder in Box).

Given that there are 8 digits in the design, each with an effective perimeter of 13.6 mm, and there is an additional 0.2 mm tail end, we can find the value of w to be 115.8 mm. Plugging this in, we have:

$$\sigma = \frac{\alpha}{Rt}$$

Where $\alpha = \frac{L}{w} = \frac{0.2}{115.8} \approx 0.001727 \pm$ some uncertainty that is based on the measurements.