

# HOM Data Analysis

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## 1 HOM visibility extraction Procedure

The raw HOM visibility is calculated using the formula:

$$\mathcal{V}_{HOM} = 1 - \frac{A_{\parallel}}{A_{\perp}} \quad (1)$$

where  $A_{\parallel}$  and  $A_{\perp}$  are the normalized areas underneath the central peak for the co- and cross-polarized measurements. The areas are normalized by the average area of the side peaks, excluding the first peaks at  $\pm 12.5$  ns.

To calculate the true two single-photon HOM visibility, the raw HOM visibility is corrected to account for the imperfections in the measurement setup. These imperfections come from the classical visibility of the Mach-Zehnder interferometer and the imbalance in the 50:50 fiber beam splitter. The expression for the corrected HOM visibility is given by:

$$\mathcal{V}_{True} = \frac{1}{(V_{class})^2} (1 - 2g^{(2)}(0)) \left( \frac{R^2 + T^2}{2RT} \right) \mathcal{V}_{Raw} \quad (2)$$

Where:

- $V_{class}$  is the classical visibility of the Mach-Zehnder interferometer.
- $g^{(2)}(0)$  is the second-order correlation function at zero delay.
- $R$  and  $T$  are the reflectance and transmittance coefficients of the beam splitter.
- $\mathcal{V}_{Raw}$  is the raw HOM visibility calculated above.