# Methods for Determining High Finesse in Open Cavity Systems

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Open microcavities enhance the interaction of light and quantum emitters, which is used to obtain bright sources of indistinguishable on-demand single photons [1] and is expected to enable advanced measurements of emmiters' coherent and noncoherent dynamics [2]. Microcavities with low internal optical losses, characterized by several thousand and higher finesse factors, are of particular interest. Measuring such high finesse values is an experimental challenge that can be approached in several ways.

Traditionally, finesse is defined as $F = FSR/\delta\nu$ [3], where FSR (Free Spectral Range) is the frequency spacing to the next longitudinal mode, and $\delta\nu$ is the resonance linewidth. However, this definition is hard to use for high-finesse microcavities based on distributed Bragg reflectors (DBRs) as the FSR can be comparable to, or even larger, than the stopband of the DBR structure. Additionally, measuring the resonance linewidth requires very high mechanical stability of the cavity.

To overcome the challenges mentioned above, a dynamic setup[4] can be used in which the length of the cavity changes periodically in time, minimizing the influence of acoustic noise. In addition, this allows finesse measurements to be performed using single or multiple light wavelengths, and resonances are observed as the length of the cavity changes.

In this work, we applied several methods for determining high finesse values in a planar-concave open cavity system. We discuss the advantages and limitations of each method and compare the results.

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