

# Improving the invariant mass resolution in the search for Higgs to dimuon decays

*Friday, 8 November 2024 16:00 (20 minutes)*

The Higgs boson decay to two muons allows for the first measurement of the Yukawa coupling of the Higgs to second generation fermions. Despite the relative simplicity of the decay channel, the small mass of the muons and the large irreducible background from off-shell Z and  $\gamma$  decays make this very challenging. In this talk I will present a new method for improving the resolution of the  $H \rightarrow \mu\mu$  invariant mass distribution by refitting the shared vertex of the dimuon system. This method employs a modified least-squares fit to constrain the fitted vertex to the Primary Vertex of the event, which modifies the track parameters of the selected dimuon pair and updates their invariant mass. Initial studies using Run 2 Monte-Carlo simulation show that this method improves the mass resolution of the Higgs peak by up to 1%, the mass resolution of the Z peak is improved by 0.68%. Providing a small gain in sensitivity in an already highly optimized analysis.

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