BELLE2-NOTE-PL-XXXX
DRAFT Version 1.0
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Search for Dark Higgsstrahlung in $e^+e^- \to \mu^+\mu^-$ and missing energy final states with the Belle II experiment

The Belle II Collaboration

Abstract

This note contains the approved plots associated with the Dark Higgstrahlung analysis work presented in BELLE2-NOTE-PH-2020-048.

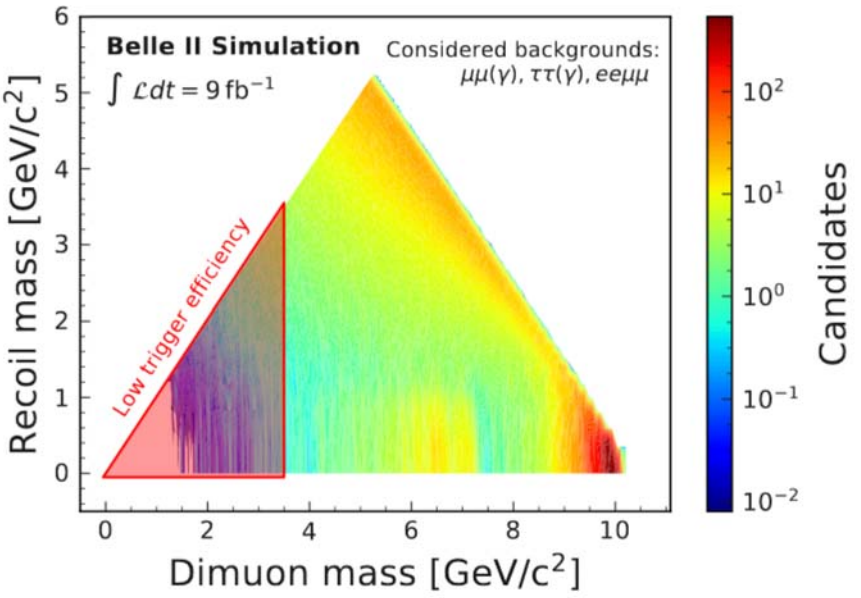

FIG. 1: Total background distribution inside mass windows after the preselections, normalized to an integrated luminosity of 9 fb^{-1}. Smoothed version.

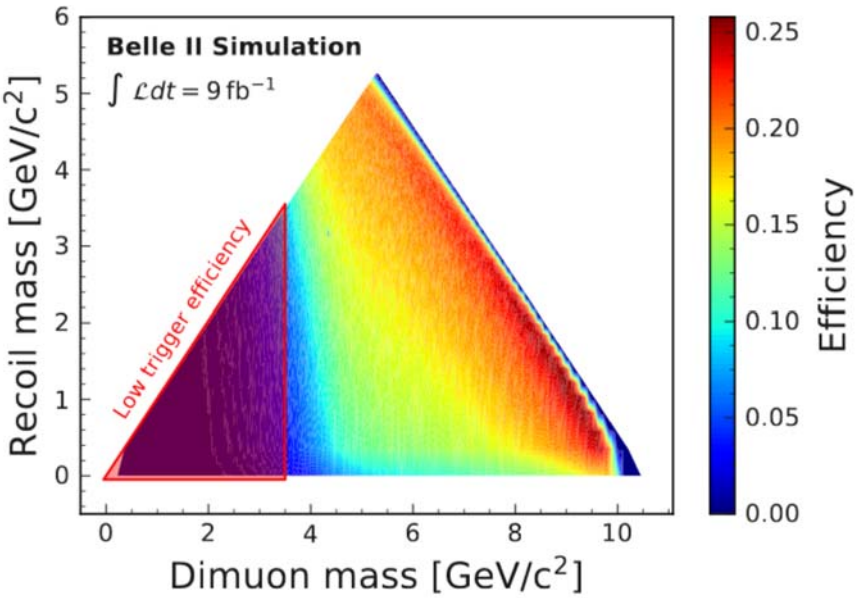

FIG. 2: Signal efficiency distribution inside mass windows after the preselections. Smoothed version.

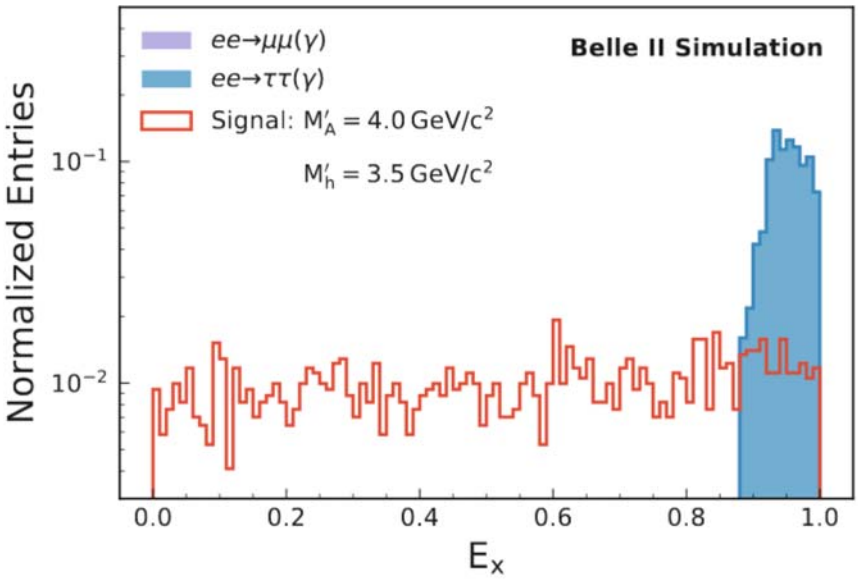

FIG. 3: Distribution of the final background suppression variable E_x. E_x is the absolute value of the asymmetry computed along the line described by the distribution $E_{\mu 1}^{CMS}$ vs $E_{\mu 0}^{CMS}$ in a mass window. Here $M_{A'} = 3.5\,GeV/c^2$, $M_{h'} = 4.0\,GeV/c^2$. The background here is dominated by the $\tau\tau(\gamma)$ contribution.

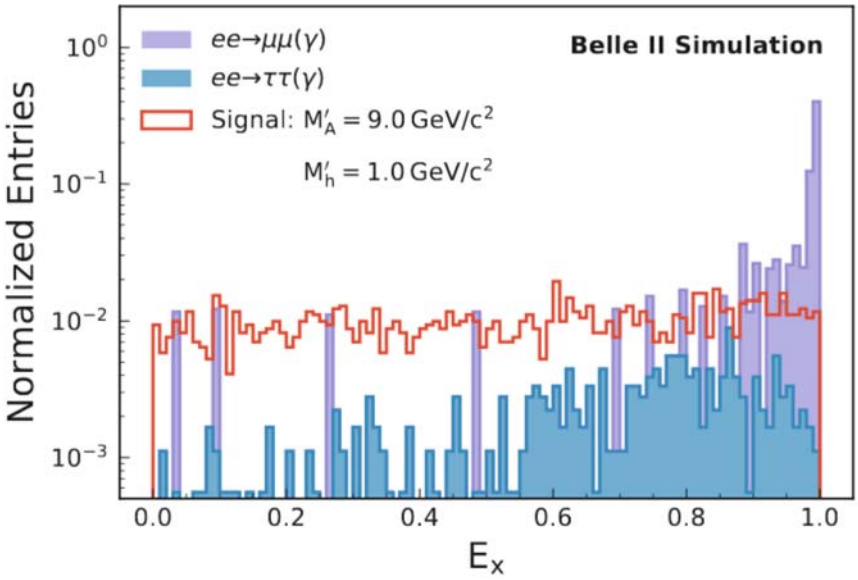

FIG. 4: Distribution of the final background suppression variable E_x. E_x is the absolute value of the asymmetry computed along the line described by the distribution $E_{\mu 1}^{CMS}$ vs $E_{\mu 0}^{CMS}$ in a mass window. Here $M_{A'} = 9.0\,GeV/c^2$, $M_{h'} = 1.0\,GeV/c^2$.

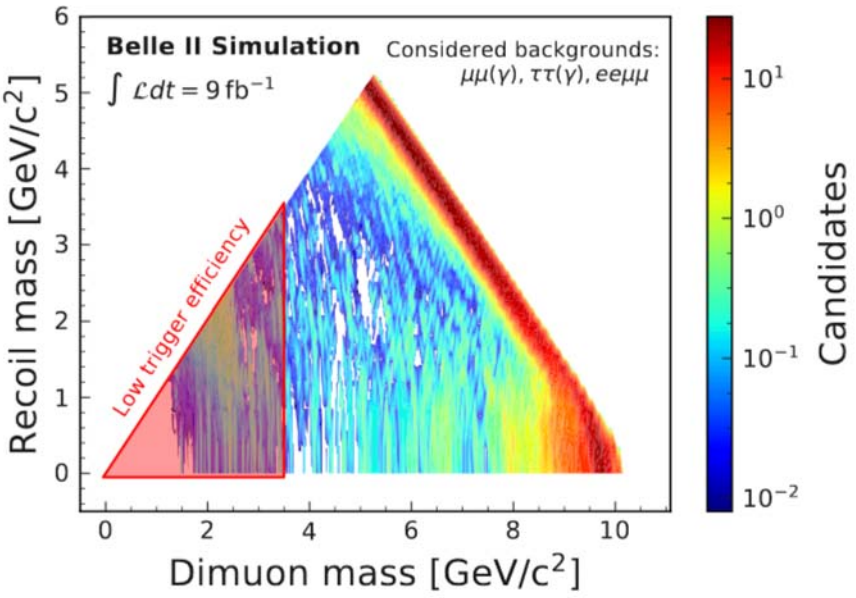

FIG. 5: Total background distribution inside mass windows after the final background suppression (E_x selection), normalized to an integrated luminosity of 9 fb^{-1}. Smoothed version.

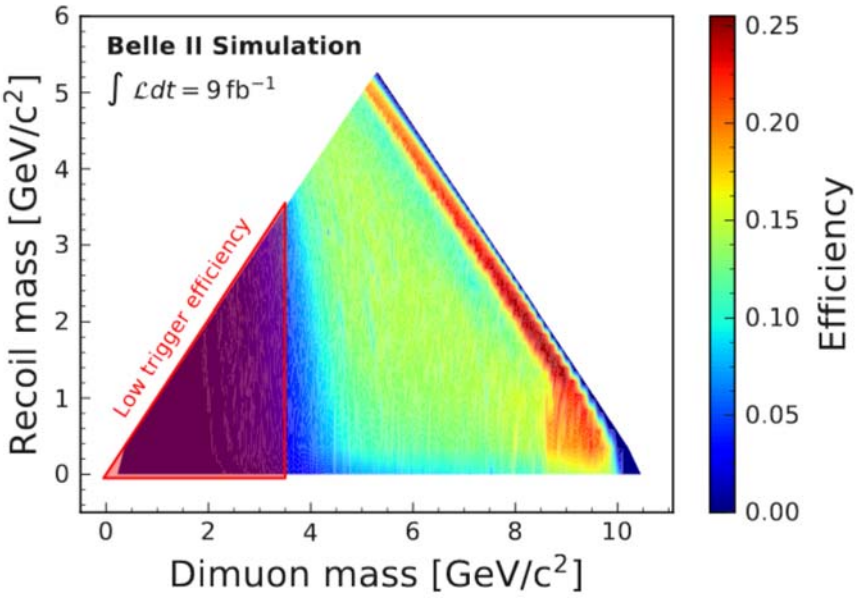

FIG. 6: Signal efficiency distribution inside mass windows after the final background suppression (E_x selection). Selection optimized for an integrated luminosity of 9 fb^{-1}. Smoothed version.

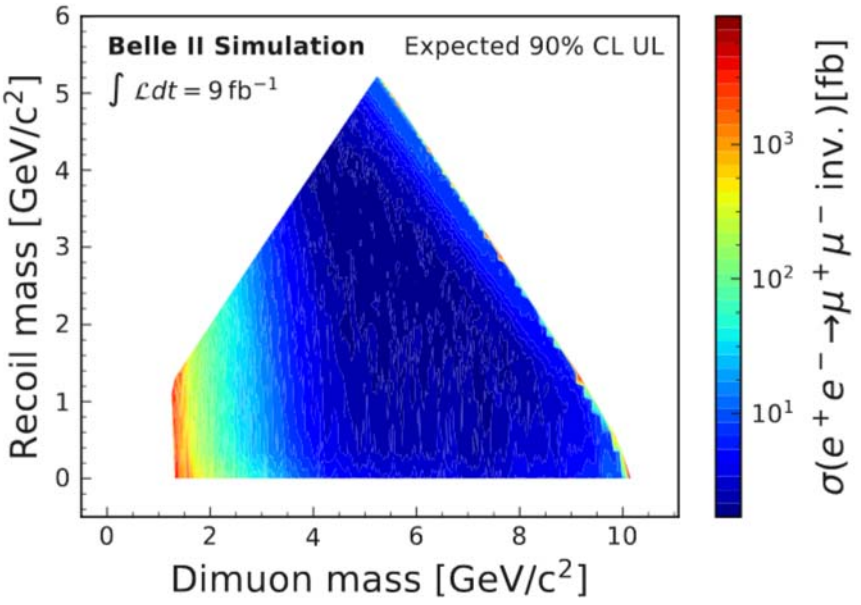

FIG. 7: Smoothed expected sensitivities on cross-section after the final background suppression (E_x selection) estimated with a Bayesian counting technique. Preliminary conservative systematics considered.

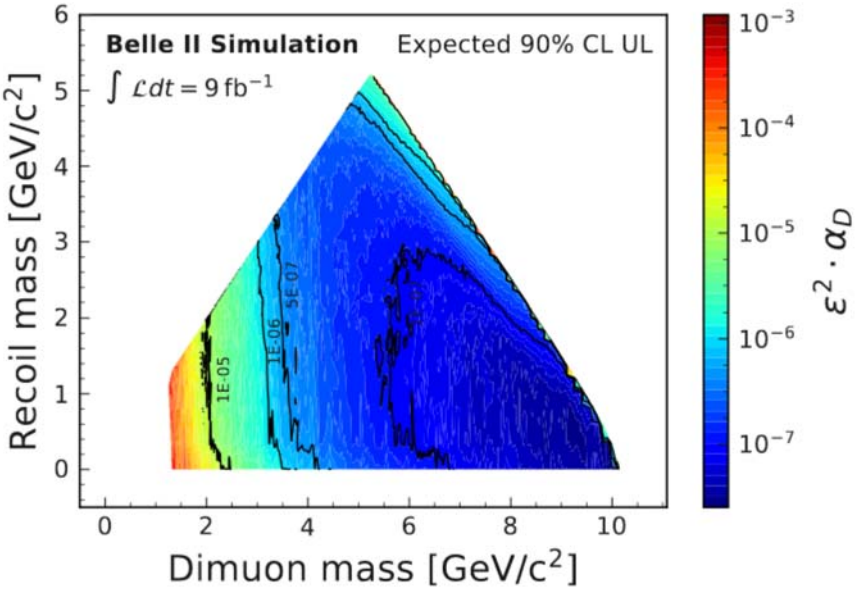

FIG. 8: Smoothed expected sensitivities in $\epsilon^2\alpha_D$ after the final background suppression (E_x selection) estimated with a Bayesian counting technique. Preliminary conservative systematics considered. Contour lines corresponding to $\epsilon^2\alpha_D$ values of 10^{-7}, 5×10^{-7}, 10^{-6} and 10^{-5} are shown.

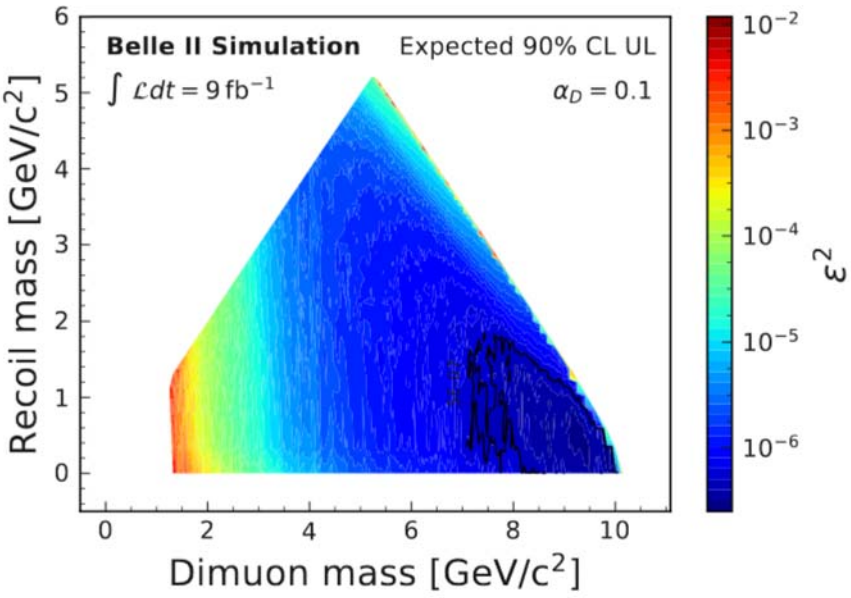

FIG. 9: Smoothed expected sensitivities in ϵ^2 for the arbitrary choice $\alpha_D = 0.1$ after the final background suppression (E_x selection) estimated with a Bayesian approach. Preliminary conservative systematics considered.