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$\Delta\phi$ distributions between final state particles as a criterion of the pile-up background mismodeling and its impact on $Z(\nu\nu)\gamma$ process

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In the case of the pile-up background (background from the neighboring interactions inside the bunch crossing) for $Z(\nu\nu)\gamma$ process, its accurate calculation is very challenging. If the impact of the pile-up background is negligible, as it is expected in the case of $Z(\nu\nu)\gamma$ process selection, some global uncertainty from this source can be used. This report studies the pile-up background and shows that it is expected to have totally different shape for $\Delta\phi$ distributions between final state particles in comparison to the signal and other background processes. Thus, the absence of $\Delta\phi$ -mismodeling in the analysis proves that the pile-up background is indeed negligible.

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