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Background Modelling in the ttH(H→γγ) Channel

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The discovery of the Higgs boson in 2012 by the ALTAS and CMS experiments at CERN was only the beginning, the properties of this particle still need to be measured and compared with theoretical predictions. The ttH production channel allows a direct measurement of the Higgs coupling to top quarks, the heaviest particle in the Standard Model, while the H→γγ decay channel gives a narrow peak in the mγγ spectrum that is easily distinguished from background.
The shape of this background model needs to be as accurate as possible in order to minimise uncertainty on measurements. With the models being created from analytical functions fitted to simulated Monte Carlo background samples, a method for estimating how much the resulting model differs from the true distribution is required. For H→γγ analyses this is carried out using the spurious signal method which quantifies how much background could falsely be interpreted as signal and assigns it as the systematic error on the model.
However, the spurious signal method is highly dependent on the statistical fluctuations of the Monte Carlo sample, making it difficult for the production of simulated events to keep up with the rising luminosity of datasets. This has resulted in the background systematics becoming dominant in several measurement channels. A study to quantify the effects of Monte Carlo sample statistics on the systematic error on the background model has been undertaken to provide estimates to help decide which channels are not feasible for producing enough Monte Carlo events for the spurious signal test or for which channels need an increase in production. This talk will address the spurious signal problem and present the results of this study.

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