

A note on systematics

There are 102 nuisance parameters associated with systematic uncertainties. Of these, 29 are “kappa” parameters, which measure the closure of the ABCD method used to determine the background. They are independent of the signal model. The remainder arise from the simulation of the signal. Two of these (luminosity and jet ID) take values that are also independent of the signal model.

The remaining 71 parameters depend, at least nominally, on the signal model. Of these, 54 are simply the statistical uncertainties of the signal yield predictions in the SRs and CRs. The number of these nuisances in some of the datacards is less than 54 because these parameters are omitted if the MC signal yield is zero, as may happen in a CR or SR at the edge of the acceptance. These uncertainties could be inserted into the datacards, given a simulation of an alternate signal model, one nonzero value for each nuisance parameter in the corresponding bin for the signal process.

That leaves 17 systematics parameters, representing uncertainties on flavor-tagging efficiencies, jet mass resolution, and the like, as propagated to the analysis channels. These vary to some extent with the signal model parameters.

We have performed some checks of the sensitivity of the results, specifically the asymptotic cross section limits, to the choice of datacard into which a signal is embedded. In these tests, the embedding consists of simply replacing the rate line in each of the datacards for a given channel with the one from the datacard representing a chosen signal mass point. Figure 1 presents example limit graphs, styled as in Figs. 11 and 14 in the paper, each showing the observed cross section limit for a chosen mass point, as a function of the mass point of the host datacard. The chosen point is shown as a filled purple circle, through which a horizontal purple line is drawn as a ruler by which to measure the dependence on the datacard mass point. As indicated in the legend, the black line is the observed limit found in the fits to these altered datacards. We see that the deviation, the separation between black and purple lines, is invisibly small on the scale of the uncertainty band, except for the smallest $m(\text{NLSP})$ values.

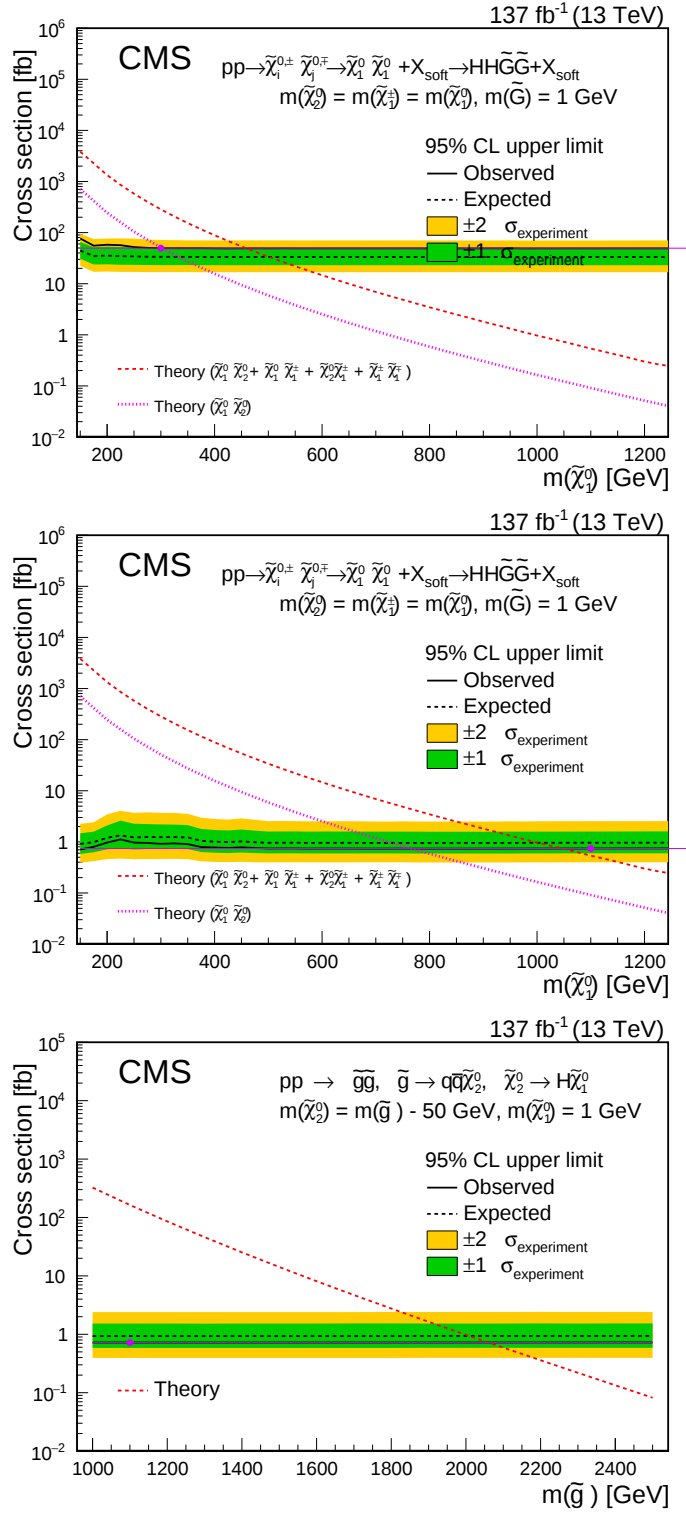


Figure 1: Cross section upper limits for the TChiHH-G model with $m(\text{NLSP})$ fixed at (upper) 300 GeV and (middle and lower) 1100 GeV. The signal yields for these models are embedded in the datacards corresponding to the (upper and middle) TChiHH-G and (lower) T5HH models with $m(\text{NLSP})$ values shown on the abscissa. The signal model point is represented by the purple filled circle, with its cross section value extended by the purple line.