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ATLAS EXPERIMENT

Status of the $4\ell + E_{\mathrm{T}}^{\mathrm{miss}}$ analysis

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General update

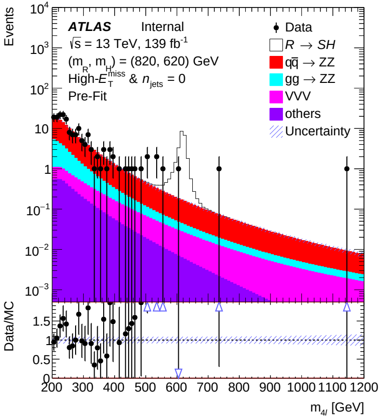
- The note with unblinded results was circulated on last week for the HDBS approval.
- The approval meeting is scheduled next week on Monday, May 22nd at 13:00 (CERN).
- Now I'm working on fixing and new studies to answer some of the questions on the CDS.
- Status of the paper writing: now we have the first paper draft.
- I already shared this draft with the HBSM conveners and the editorial board.

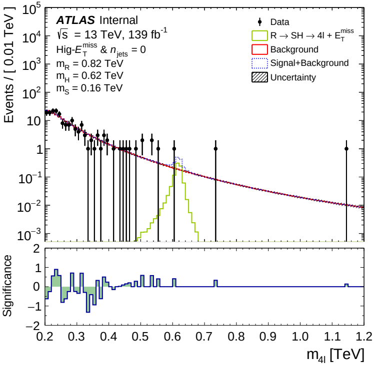
Questions received and need more studies

- ☐ Since you are scanning over mH and mR for the R→SH channel, does you result (e.g. Figure 68 the 2D limits) holds true only for the mS you chose (160GeV) or any possible combination of mS and gap that fits in a certain mH, mR point? For example with mH = 500GeV and mR = 1000 GeV, is the limit valid for both (mS=160GeV, mGap=340GeV) and (mS=200GeV, mGap=300GeV)?
- ☐ You claimed that the choice of mS would not affect the kinematics like MET or pT4l too much, and compared that in Figure 73, 74. But what you showed is that when mGap is fixed, the change of mS doesn't change the shape too much. This means for a given mH, the mR needs to be changed according to mS to keep the shape not affected as mGap is fixed. For example if mH = 500GeV, mGap = 340 GeV, then mR=1000GeV should have similar kinematics as mR = 1040 GeV as the choice of mS between 160GeV and 200GeV should have little effect. Am I understanding these plots correctly?
- ☐ Then does it mean the limit corresponding to e.g. (mH = 500GeV, mR = 1000 GeV, mS=160GeV) should be equal (or similar) to (mH = 500GeV, mR = 1040 GeV, mS=200GeV)? Because you fit on m4l that's irrelevant to the mR and cut on MET and pT4l that has similar acceptance (because the shapes between these 2 cases are similar as you showed in Figure 73, 74)
- ☐ This makes the limit of (mH = 500GeV, mR = 1000GeV) in your analysis not generalized to all (mH = 500GeV, mR = 1000GeV) cases with different mS, but generalized to all cases with (mH=500GeV, mGap = 340GeV). This is a bit of a strange conclusion. Let me know if I'm clear about my point.
- ☐ **To answer these questions, I'm doing a truth study. The plan is to generate similar mass points as mentioned on the questions and see how the S mass choice will impact the efficiency.**
- ☐ **To avoid confusion, we need to add the choice of the S mass to the RSH plots and the captions.**

Comments from the HBSM convenors

- ☐ Showing the significance in the ratio plots instead of the Data/MC.





$$Z = \begin{cases} +\sqrt{2\left(n\ln\left[\frac{n(b+\sigma^2)}{b^2+n\sigma^2}\right] - \frac{b^2}{\sigma^2}\ln\left[1+\frac{\sigma^2(n-b)}{b(b+\sigma^2)}\right]\right)} & \text{if } n \geqslant b \\ -\sqrt{2\left(n\ln\left[\frac{n(b+\sigma^2)}{b^2+n\sigma^2}\right] - \frac{b^2}{\sigma^2}\ln\left[1+\frac{\sigma^2(n-b)}{b(b+\sigma^2)}\right]\right)} & \text{if } n < b. \end{cases}$$

Symmetrisation for some NP

- I've been asked to understand the behaviour of NPs
- And these impact also have to be added to the paper.