

HEFT reweighting uncertainties

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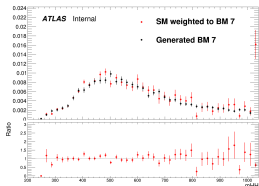
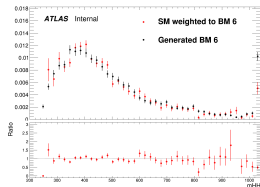
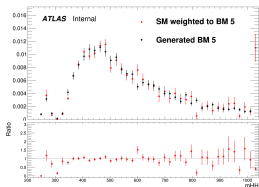
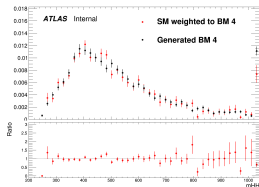
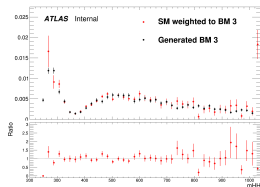
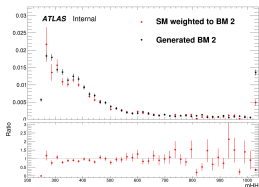
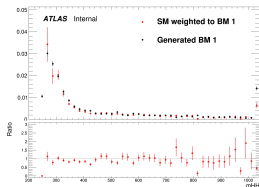
Outline

- SM: Parton level truth sample with 100k events produced by Stefano
- HEFT samples: 100k events with $c_{gghh} = 1, \pm 0.5$ and $c_{tthh} = 1, \pm 0.5$
- Added the Pythia8 shower and produced TRUTH3 derivations
- HEFT weights apply on the SM using klambdareweightool with option B) (Consistent with Laura)

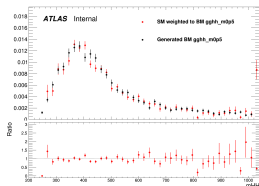
Outline

- Try to implement some preselection: (GeV)
 - ▶ Common in SLT and LTT:
 - ★ $m_{bb} < 150$
 - ★ $m_{\tau\tau} > 60$
 - ★ Tau $|\eta| < 2.3$
 - ★ 2 truth b quarks, leading b $p_T > 45$, subleading > 20 (and require parents of both to be Higgs)
 - ★ One electron/muon, electron $|\eta| < 2.47$ and not $1.37 < |\eta| < 1.52$, mu $|\eta| < 2.7$
 - ★ Minimum lepton cut: e/mu $p_T > 7$ GeV in order to be considered in the selection
 - ▶ SLT: e/mu $p_T > 27$, $\tau p_T > 20$, veto additional lepton with $p_T < 27$
 - ▶ LTT: e/mu $p_T > 18/15$, and $p_T < \text{SLT cut}$, $\tau p_T > 30$, veto additional lepton with $p_T < 18/15$

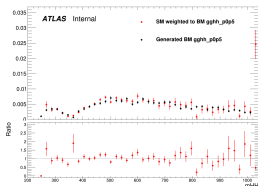
SLT BMs $\Delta R_{\tau\tau}$ shape: weighted SM vs generated BM



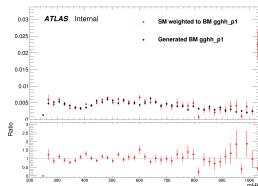
SLT c_{ggHH} scan $\Delta R_{\tau\tau}$ shape: weighted SM vs generated BM



$$c_{ggHH} = -0.5$$

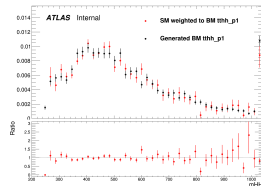
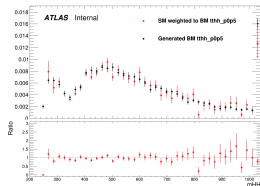
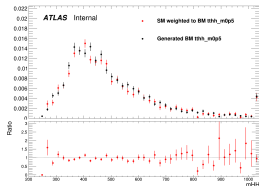


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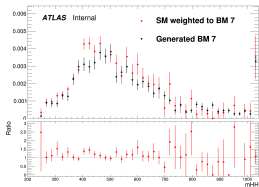
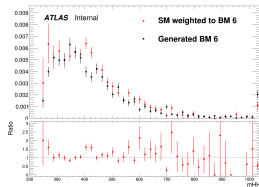
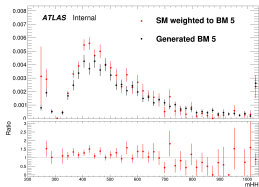
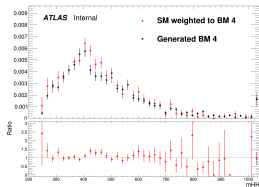
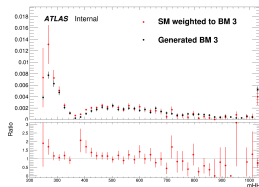
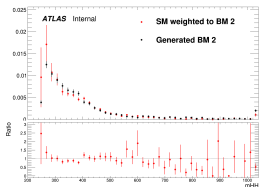
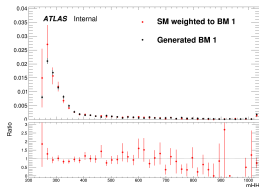


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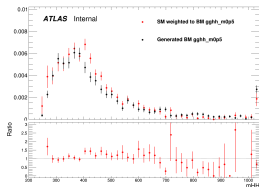
SLT c_{ttHH} scan $\Delta R_{\tau\tau}$ shape: weighted SM vs generated BM



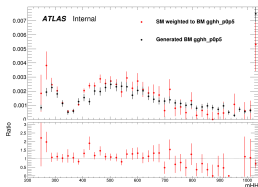
LTT BMs $\Delta R_{\tau\tau}$ shape: weighted SM vs generated BM



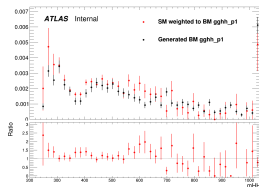
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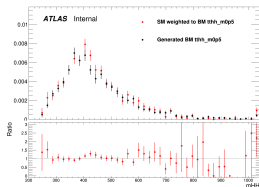


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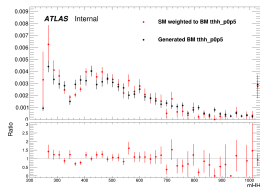


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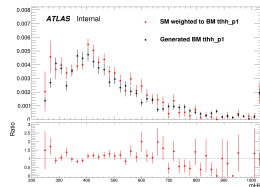
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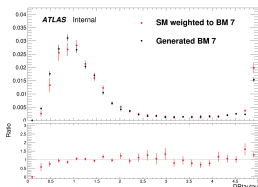
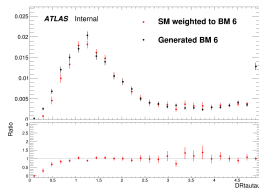
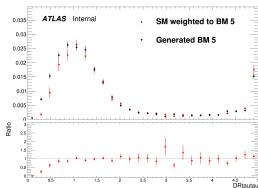
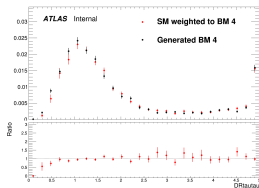
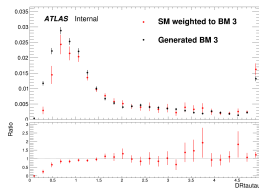
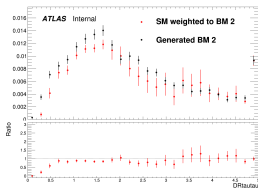
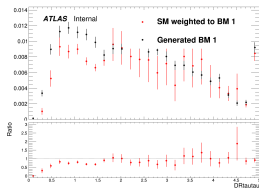
BM points (parameter values)	SLT	LTT
gghh:-0.5	0.92 ± 0.03	1.11 ± 0.04
gghh:1.0	0.9 ± 0.04	1.09 ± 0.06
gghh:0.5	0.9 ± 0.04	1.04 ± 0.06
tthh:0.5	0.96 ± 0.03	1.06 ± 0.06
tthh:-0.5	0.96 ± 0.02	1.07 ± 0.04
tthh:1.0	0.98 ± 0.03	1.1 ± 0.05
BM1	0.85 ± 0.06	1.08 ± 0.13
BM2	0.87 ± 0.04	1.06 ± 0.09
BM3	0.9 ± 0.04	1.14 ± 0.09
BM4	0.98 ± 0.03	1.08 ± 0.04
BM5	0.92 ± 0.03	1.17 ± 0.05
BM6	0.97 ± 0.03	1.14 ± 0.05
BM7	0.99 ± 0.03	1.12 ± 0.05

Table: yield ratios: weighted SM divided by generated BMs

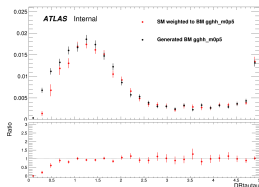
Conclusion

- No significant shape dependence
- assigning the difference from 1 of the yields ratios as the uncertainty

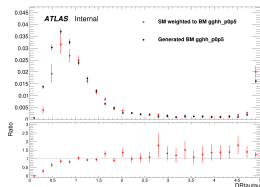
Bkp: SLT BMs $\Delta R_{\tau\tau}$ shape: weighted SM vs generated BM



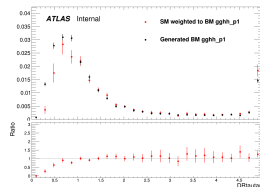
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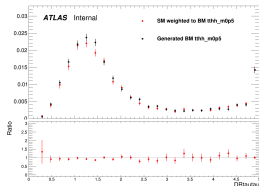


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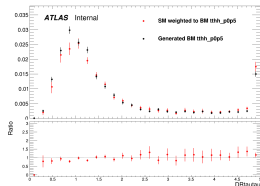


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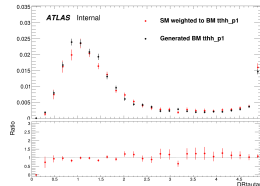
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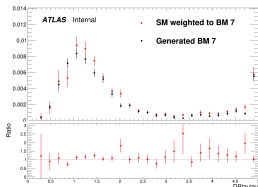
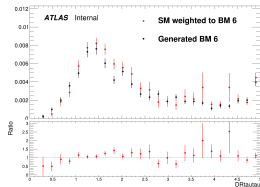
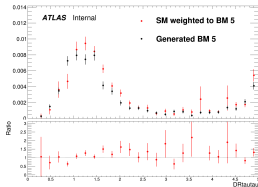
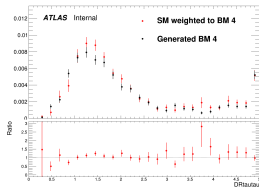
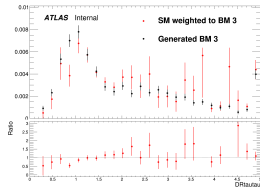
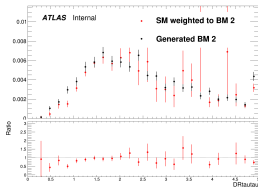
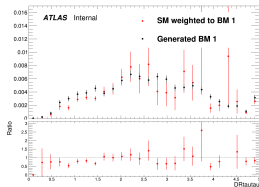


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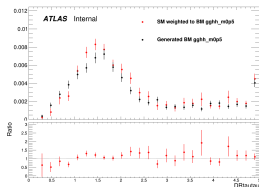


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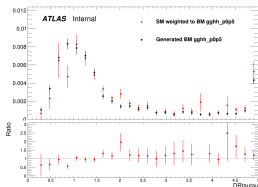
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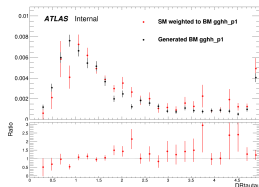
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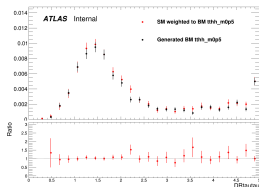


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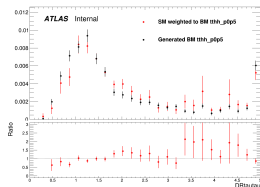


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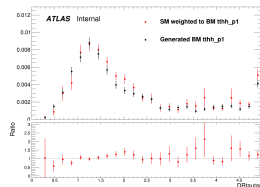
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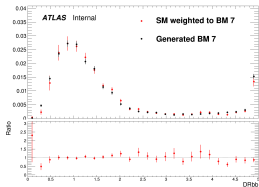
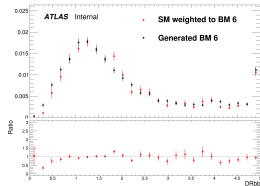
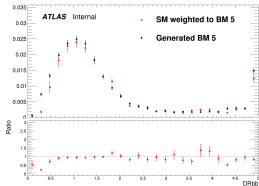
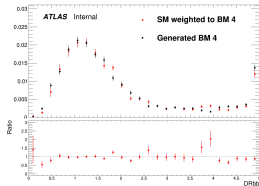
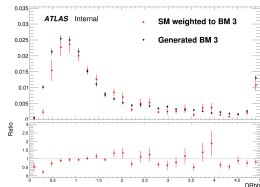
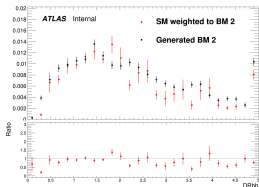
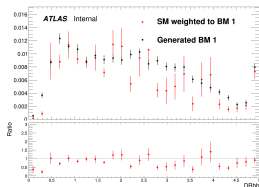


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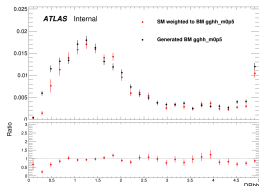


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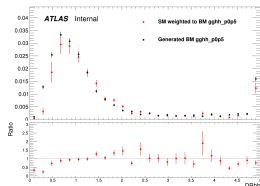
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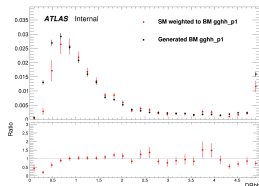
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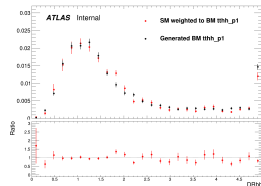
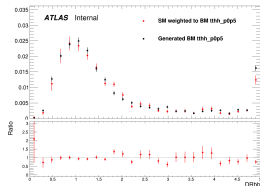
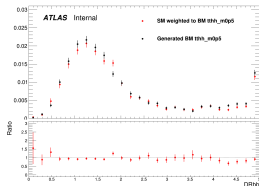


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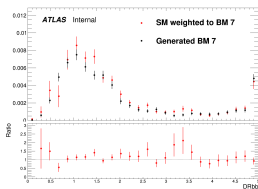
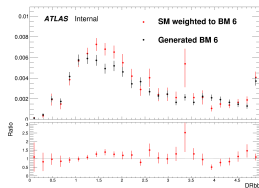
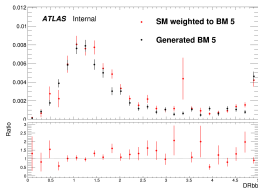
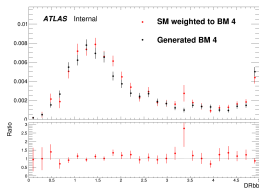
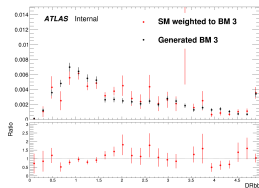
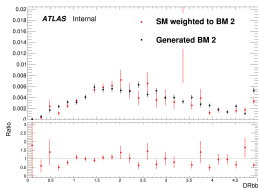
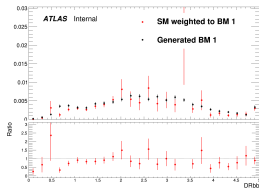


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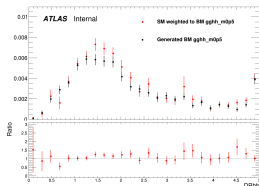
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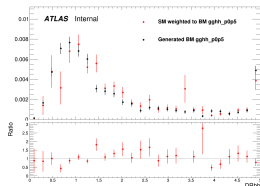
Bkp: LTT BMs ΔR_{bb} shape: weighted SM vs generated BM



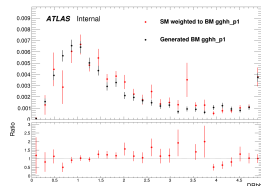
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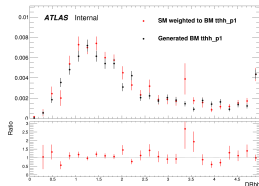
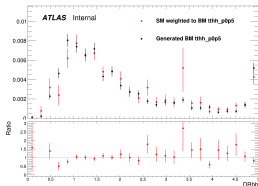
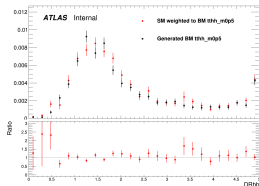


$$c_{ggHH} = 0.5$$

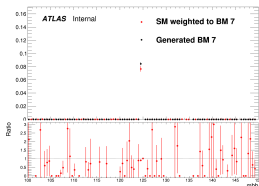
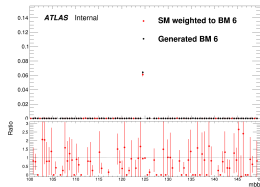
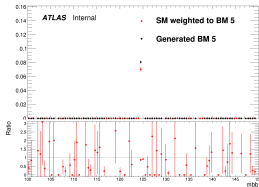
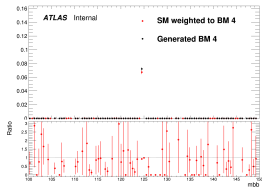
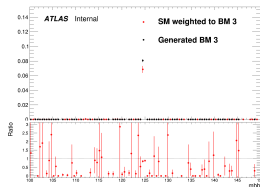
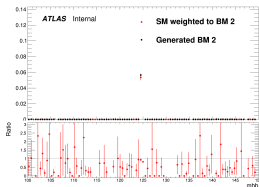
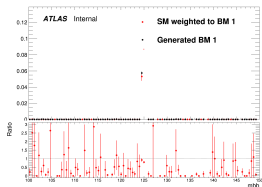


$$c_{ggHH} = 1.0$$

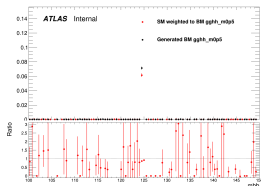
Bkp: LTT c_{ttHH} scan ΔR_{bb} shape: weighted SM vs generated BM



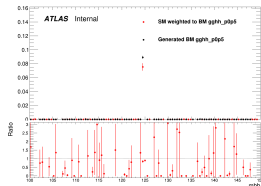
Bkp: SLT BMs m_{bb} shape: weighted SM vs generated BM



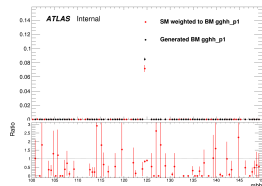
Bkp: SLT c_{ggHH} scan m_{bb} shape: weighted SM vs generated BM



$$c_{ggHH} = -0.5$$

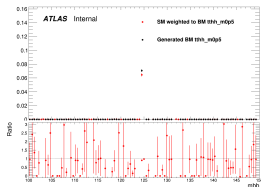


$$c_{ggHH} = 0.5$$

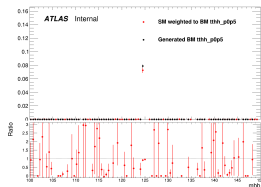


$$c_{ggHH} = 1.0$$

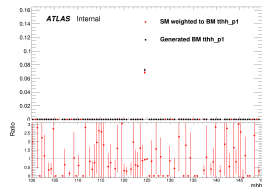
Bkp: SLT c_{ttHH} scan m_{bb} shape: weighted SM vs generated BM



$$c_{ttHH} = -0.5$$

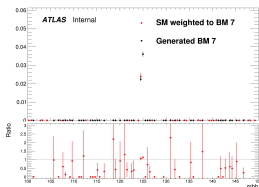
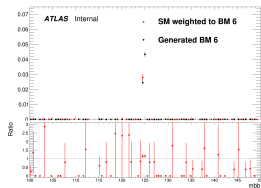
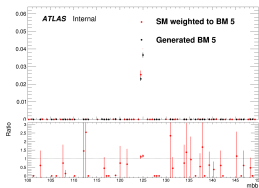
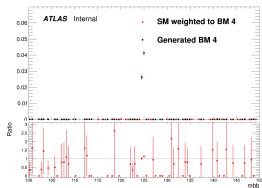
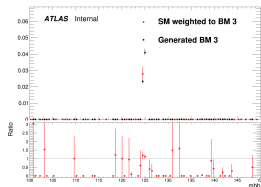
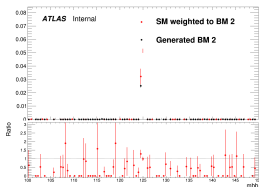
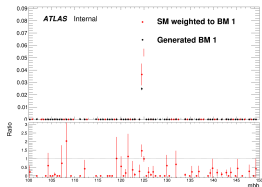


$$c_{ttHH} = 0.5$$

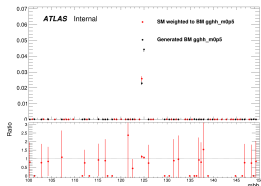


$$c_{ttHH} = 1.0$$

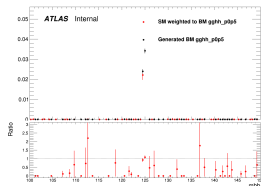
Bkp: LTT BMs m_{bb} shape: weighted SM vs generated BM



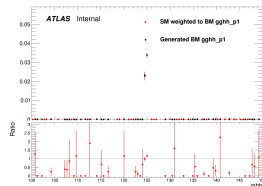
Bkp: LTT c_{ggHH} scan m_{bb} shape: weighted SM vs generated BM



$$c_{ggHH} = -0.5$$

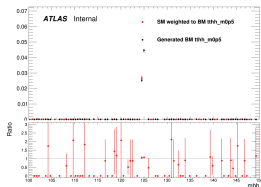


$$c_{ggHH} = 0.5$$

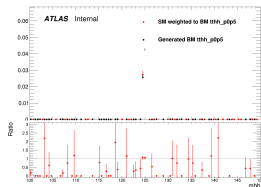


$$c_{ggHH} = 1.0$$

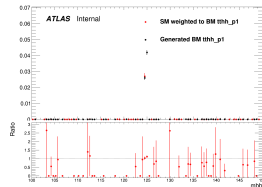
Bkp: LTT c_{ttHH} scan m_{bb} shape: weighted SM vs generated BM



$$c_{ttHH} = -0.5$$



$$c_{ttHH} = 0.5$$



$$c_{ttHH} = 1.0$$