Status of 4Top analysis

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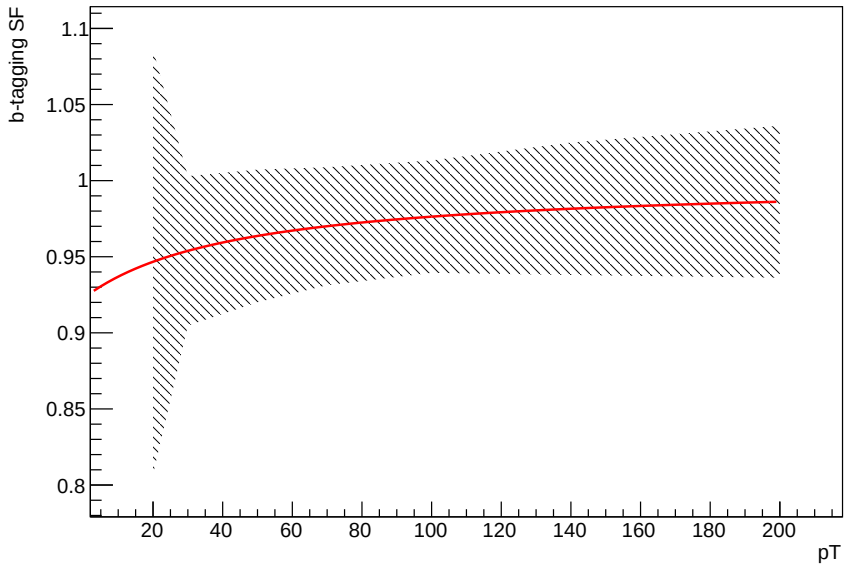
Before any $t\bar{t}$ correction

- I would like to implement all the *SFs* first.
- The SFs and uncertainty will have huge impact!



List of uncertainty

- Event level
  - Lumi, PU, trigger
- Object level
  - Electron : RECO, ID, ISO, energy scale/resolution
  - Muon : ID, ISO, energy scale/resolution
  - Tau : ID, energy scale/resolution
  - Jet : ID, PU ID?, energy scale/resolution
  - b-tagging
  - MET
- Maybe we can start with standalone implementation to avoid re-run BSMFramework.
- We already have JES/JER in BSMFramework.

Lumi

	2015	2016	2017	2018	2015-2018	2016-2018
Total delivered luminosity [1/fb]	4.31	41.58	49.81	67.86	163.56	159.25
Recommended luminosity [1/fb]	2.27*	36.33 (36.33)	41.48 (41.53)	59.83 (59.74)	139.92 (139.87)	137.65 (137.60)
Preliminary luminosity [1/fb]	2.26*	35.92 (35.92)	41.48 (41.53)	59.83 (59.74)	139.50 (139.45)	137.24 (137.19)
Change of recommended/preliminary	0.7%	1.1%	—	—	0.3 (0.3) %	0.3 (0.3) %
Recommended uncertainty [%]	1.6	1.2	2.3	2.5	1.6	1.6
Reference(s)	LUM-17-003	LUM-17-003	LUM-17-004	LUM-18-002	LUM-17-003–LUM-18-002	LUM-17-003–LUM-18-002

Pile up

- We should check the version of pile-up reweighting in BSMFramework.
- The uncertainty is 4.6%.

Trigger

- Fabio already derived it.
- Thanks to Fabio!

Electron

- RECO eff : Link
- ID : Link, not sure about the naming convention
- energy scale/resolution : Link, we need to read the variable from MINIAOD.

Muon

Link

There are RECO, ID, ISO, energy scale and resolution.

Tau

Link

- ID : correction on genuine tau, fake tau from genuine electrons and muons
- TES is available.
- TER is not mentioned.

Jet

Link

- Loose ID : perhaps the scale factor is not needed? since they are very loose selections.
- Pile up ID : we do not require this.
- JES/JER : It is available in BSMFramwork. We need to check the version.

b-tagging

Link

- The scale factor is provided by BTV POG.
- We need to calculate the b-tagging efficiency by ourselves.
- $weight = \prod_{btagged} SFs \prod_{nonbtagged} (1 - SF \times \epsilon)/(1 - \epsilon)$
- How should we obtain the ϵ sample by sample?
- The efficiency should also be related to the loose ID and overlap removal...

MET

Link

- Actually we do not do any cut on MET.