

# Muon exclusive PLIV WPs calibration

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## 1. Introduction

A new algorithm Prompt Lepton Improved Veto (**PLIV**) gives a substantial improvement for rejecting non-prompt leptons while maintaining high efficiency to select prompt leptons, compared to previously available methods within ATLAS.

The calibration of pseudocontinuous (PC) PLIV WPs and derivation of scale factors (SFs) were needed for muons. The 'Tight-Not-Very-Tight' which is exclusive WP, was implemented in ttW/ttH multi-lepton analysis.

### ➤ New improved algorithm:

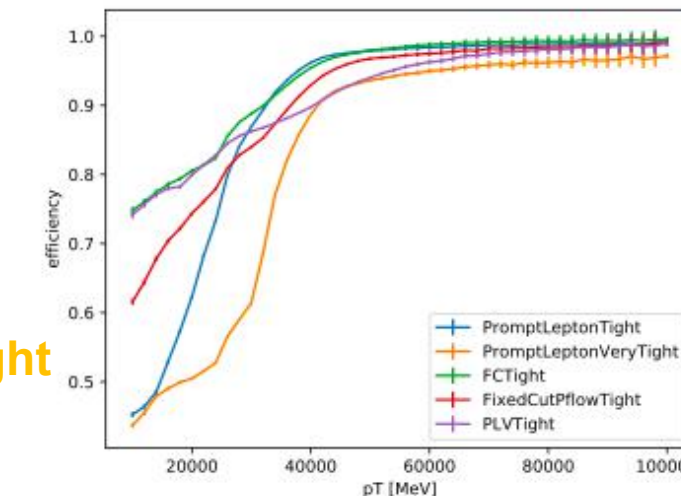
- New more powerful isolation variables
- New dedicated secondary vertex reconstruction algorithm using ID tracks with  $p_T > 500$  MeV
- Updated BDT training procedures that improve performance at high  $p_T$
- Dedicated recursive neural network using ID tracks

### ➤ PLIV muon WPs: **PromptLeptonTight** and **PromptLeptonVeryTight**

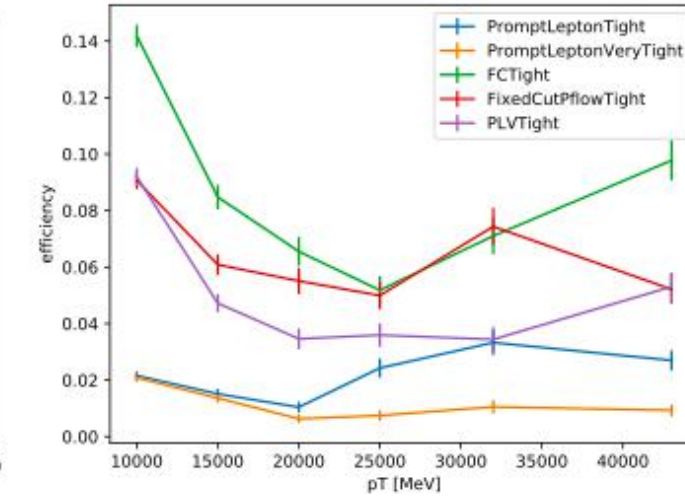
### ➤ New working points have a strong non-prompt rejection.

## 2. Inclusive PLIV WPs

prompt eff.



non-prompt eff.

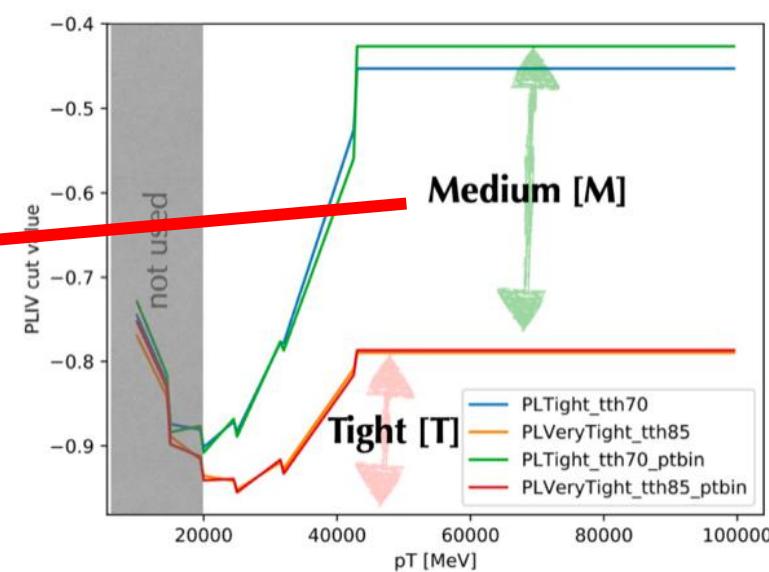


## 3. Exclusive PLIV WPs

### ➤ Motivation:

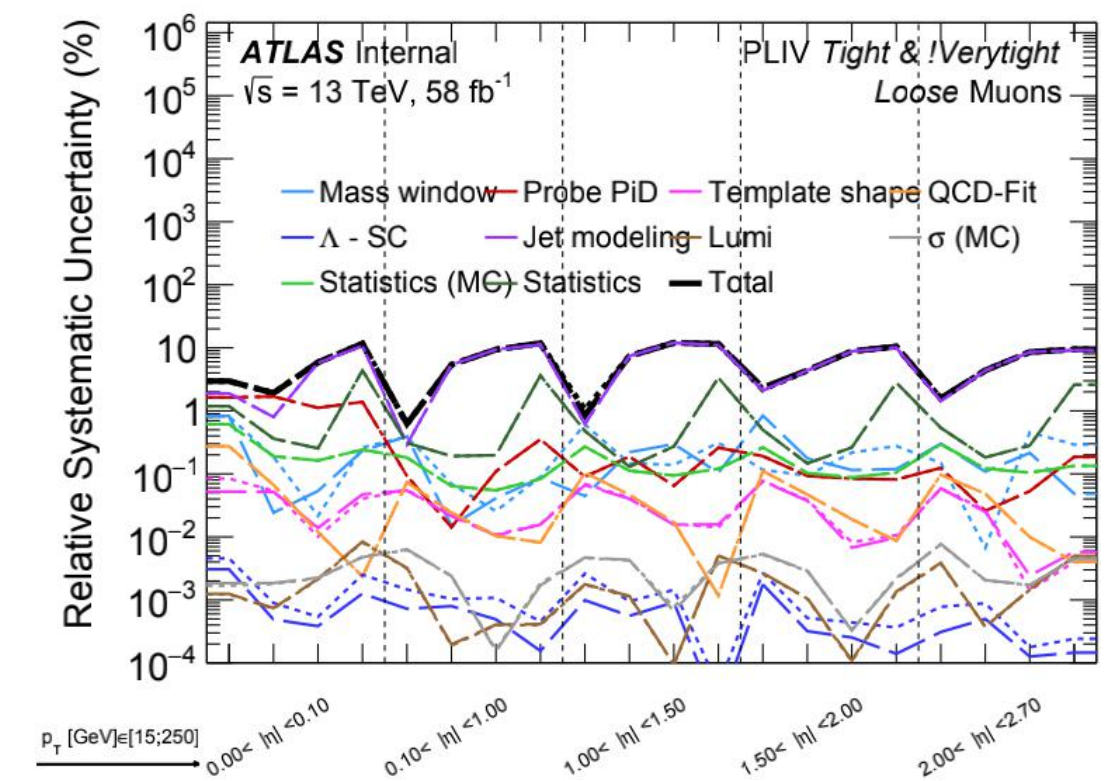
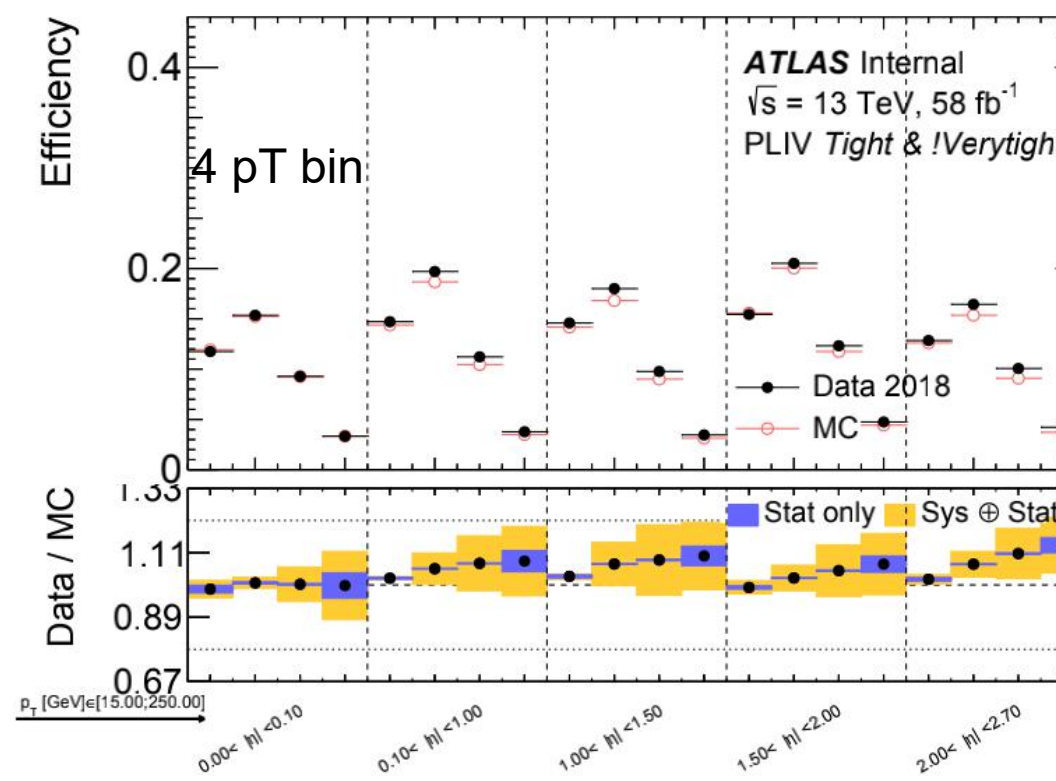
- Build fakes-enriched control-regions (CRs)
- Allows for more flexibility in analyses

### ➤ Define exclusive WPs on PLIV discriminant



PLIV Tight-Not-VeryTight

## 5. Efficiency & Uncertainty



## 4. T&P Method

### ➤ Sig: $Z \rightarrow \mu\mu$

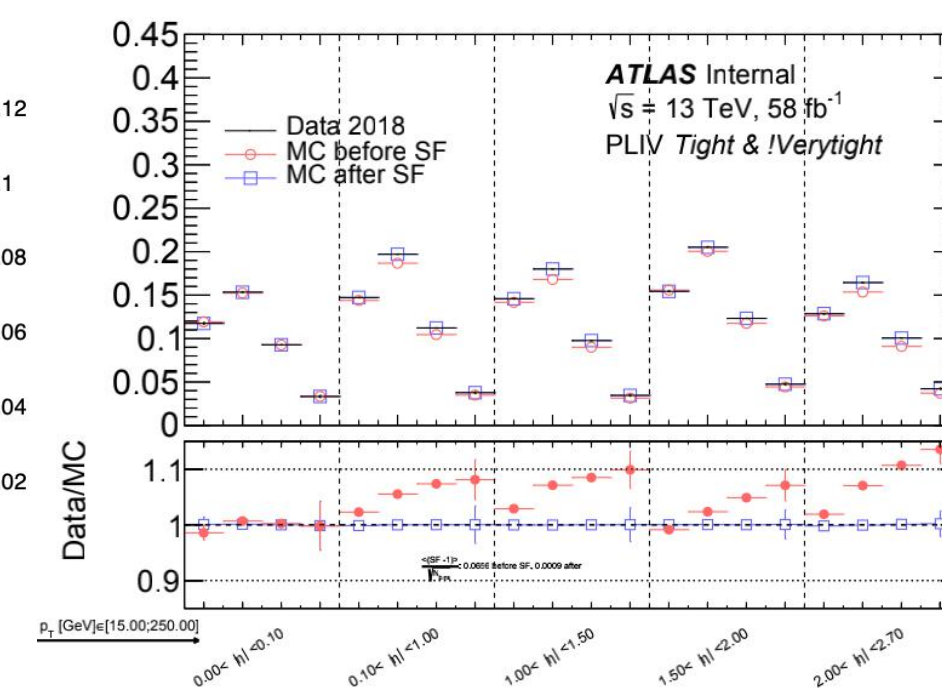
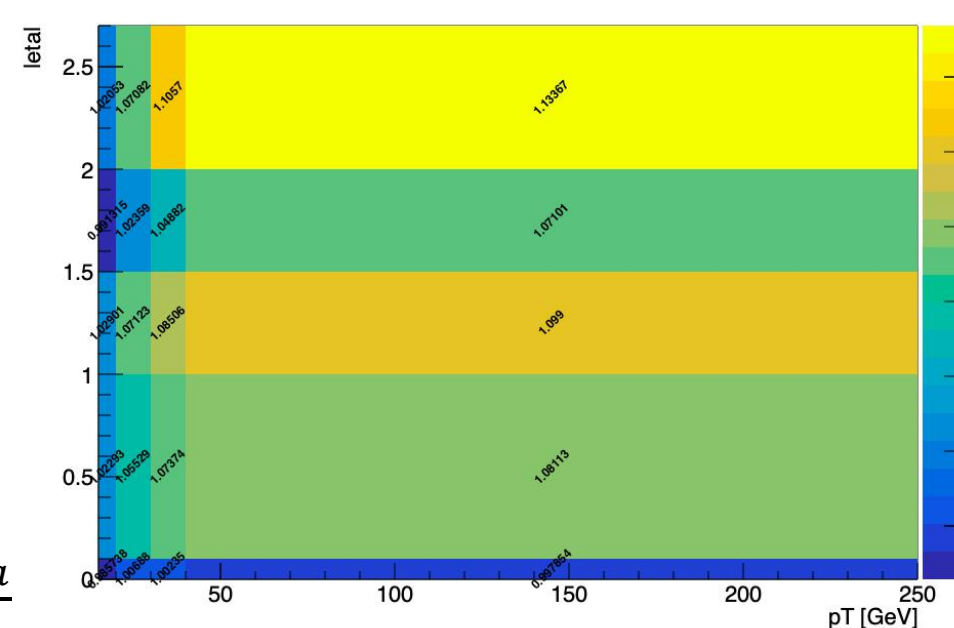
### ➤ Bkg: $Z \rightarrow \tau\tau$ , Drell-Yan, $t\bar{t}$ , WW, Wjets, VZ

### ➤ Selection of tag and probe muons:

Object	$p_T$ [GeV]	PID	$ \eta $	$ d_0/\sigma(d_0) $	$ z_0 \sin(\theta) $ [mm]	Iso
tag muon	-	Tight	-	< 3	< 0.5	-
probe muon	- or > 10 GeV	Loose	-	< 3	< 0.5	-

➤ Efficiency:  $\varepsilon = \frac{N_{pass PLIV}}{N_{pass Loose}}$  ➤ Scale Factor:  $SF(pT, \eta) = \frac{\varepsilon_{Data}}{\varepsilon_{MC}}$

## 6. SFs & Closure Plot



➤ Good agreement between data and MC after applying SFs.

➤ Further studies of the impact on the SFs by pflow jets and the dominant systematics are still ongoing...