- Data for 50 pb<sup>-1</sup>: efficiency of Muon Spectrometer wrt to Inner Detector
  - $\star$  fake probes<sup>1</sup> give major impact here, other efficiency terms are done wrt this

Sample	probe/pb <sup>-1</sup>	€probe	ємс	tot fake %	proc fake %
Data	773	94.6	-	0.9	-
$Z  ightarrow \mu \mu$	754.2	95.4	95.9	0.09	0.1
$W  ightarrow \mu  u$	4.2	6.6	-	0.52	94.8
Z  o  au  au	2.1	79.0	-	0.05	19.0
W  ightarrow  au  u	0.1	14.3	-	0.02	85.7
tŦ	2.4	83.6	-	0.03	9.8
ΒΒμμ	2.9	34.0	-	0.23	60.4
DYμμ	7.0	95.4	-	0.00	0.0

<sup>1</sup>fake means not associated with a truth muon within a 0.05 dR cone

#### $\bigstar$ tracks localized at low $p_T$ and in critical $\eta$ regions



- Data for 50 pb<sup>-1</sup>: efficiency of Muon Spectrometer wrt to Inner Detector
  - $\star$  fake probes<sup>1</sup> give major impact here, other efficiency terms are done wrt this

Sample	probe/pb <sup>-1</sup>	€probe	ємс	tot fake %	proc fake %
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<sup>1</sup>fake means not associated with a truth muon within a 0.05 dR cone

- ★ Tag-probe invariant mass cut still to be tuned
  - now takes up to 15  $\Gamma_Z$
- ★ Tightening cut to 10  $\Gamma_Z$  can help to excluded first 4-5 fake bins



- $\bullet~$  Testing effect of backgrounds on cut-flow efficiency estimation on  $Z \to \mu \mu$ 
  - ★ weighting MC kinematics with efficiency maps built from signal only and from "data"



#### $\star$ low efficiency at low p<sub>T</sub> as expected

Method	<i>ϵ</i> ( <i>sel</i> ) (%)	$\delta\epsilon/\epsilon(sel)$ (%)	
Cut Flow	$38.64 \pm 0.21$		
Truth efficiency weighted	$38.85 \pm 0.21$	$0.53\pm0.76$	
Tag&Probe (signal) efficiency weighted	$38.84 \pm 0.21$	$0.52 \pm 0.76$	
Tag&Probe ("data") efficiency weighted	$38.04 \pm 0.21$	$-1.56 \pm 0.75$	
Tag&Probe background effect	data-signal/signal = -2.08 $\pm$ 0.75		

- $\bullet~$  Testing effect of backgrounds on cut-flow efficiency estimation on  $W \to \mu \nu$ 
  - ★ weighting MC kinematics with efficiency maps built from signal only and from "data"



- $\star$  low efficiency at low p<sub>T</sub> as expected and high p<sub>T</sub> due to empty/low stat map bins
  - empty/low stat bins to be corrected taking macro-bins (or apply a upper bound on  $p_T$ )

Method	$\epsilon(sel)$ (%)	$\delta\epsilon/\epsilon(sel)$ (%)	
Cut Flow	$44.97 \pm 0.07$		
Truth efficiency weighted	$44.68 \pm 0.07$	$-0.64 \pm 0.22$	
Tag&Probe (signal) efficiency weighted	$44.56 \pm 0.07$	$-0.91 \pm 0.22$	
Tag&Probe ("data") efficiency weighted	$43.69 \pm 0.07$	$-2.85 \pm 0.21$	
Tag&Probe background effect	data-signal/signal = -1.96 $\pm$ 0.22		

## Effect of Z+jets events on isolation efficiency

• mappa di isolamento a sinistra pt,eta a destra pt, angolo\_mu\_Z (piano trasverso)

