Plot approval for HCP

Muon combined performance

A. Salvucci

Radboud University Nijmegen and Nikhef
Fit procedure

Template-fit to reconstructed Z lineshape

- Allow for momentum smearing in the fit
- Combined fit of events with barrel-barrel, barrel-other_region and other_region-other_region configurations
- Fit separately Z lineshape obtained from MS and ID tracks, but using a combined based selection.

+Template-fit to \( q/pT_{ID} – q/pT_{MS} \):

- Same procedure as above
- Keep regions separated
- 8 bins between 15-95 GeV (each region)

Smearing of ID momenta

\[ pT = pT \cdot (1 + g\Delta b + g\Delta a_{ID} pT) \]

Smearing of MS momenta

\[ pT = pT \cdot (1 + g\Delta b + g\Delta a_{MS} pT) \]
Invariant mass plot

\( \int L = 2.54 \text{ fb}^{-1} \)

\( \sqrt{s} = 7 \text{ TeV} \)

**ATLAS Preliminary**

- **Data**
- **Simulation**

Barrel MS (\( |\eta| < 1.05 \))

- MS tracks

Barrel ID (\( |\eta| < 1.05 \))

- ID tracks

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11/3/2011
**Invariant mass plot**

**Left-side plot:** invariant mass for muon spectrometer muon tracks with $p_T>15$ GeV in the barrel region ($|\eta|<1.05$), before the fit procedure; in the plot is shown the invariant mass for data and Simulation ($Z \rightarrow \mu\mu +$ backgrounds). Muid algorithm and release 16.6 used.

**Right-side plot:** invariant mass for inner detector muon tracks with $p_T>15$ GeV in the barrel region ($|\eta|<1.05$), before the fit procedure; in the plot is shown the invariant mass for data and Simulation ($Z \rightarrow \mu\mu +$ backgrounds). Muid algorithm and release 16.6 used.
Invariant mass plot

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\( s = 7 \text{ TeV} \)

**ATLAS Preliminary**

Barrel MS (|\( \eta \)|<1.05)

- Data
- Simulation

Barrel ID (|\( \eta \)|<1.05)

- Data
- Simulation

MS tracks

ID tracks

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Invariant mass plot

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Muon momentum resolution plots
Muon momentum resolution plots

Left-side plot: muon momentum resolution for muon spectrometer barrel region ($|\eta| < 1.05$); in the plot is shown the muon momentum resolution from data (blue) and simulation (red).

Right-side plot: muon momentum resolution for muon spectrometer end-cap region ($1.7 < |\eta| < 2.0$); in the plot is shown the muon momentum resolution from data (blue) and simulation (red).

In both of plots, for data the solid line indicates the fit region, the dashed line the fit extrapolation and the light blue bar indicates the uncertainty, taking in account statistical and systematic errors and correlations of parameters. Muid algorithm and release 16.6 used.

The momentum resolution function is

$$\frac{\sigma(p)}{p} = \frac{p_0}{p_T} \oplus p_1 \oplus p_2 \cdot p_T$$
Muon momentum resolution plots

Barrel ID ( $|\eta|<1.05$ )

$\sqrt{s} = 7$ TeV

$\int L = 2.54 \text{ fb}^{-1}$

ATLAS Preliminary

$\sigma(1/p_T) \text{ [GeV}^{-1}]$

$p_T \text{ [GeV]}$

End-Cap ID ( $1.7<|\eta|<2.0$ )

$\sqrt{s} = 7$ TeV

$\int L = 2.54 \text{ fb}^{-1}$

ATLAS Preliminary

$\sigma(1/p_T) \text{ [GeV}^{-1}]$

$p_T \text{ [GeV]}$

Data

Extrapolation

Simulation
Muon momentum resolution plots

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$$\frac{\sigma(p)}{p} = p_1 \oplus p_2 \cdot p_T$$
Invariant mass plots

\( \sqrt{s} = 7 \text{ TeV} \)
\[ \int L = 2.54 \text{ fb}^{-1} \]

MS tracks

ATLAS Preliminary

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\([M_{\mu\mu} \text{ [GeV]}] \]

Entries/GeV

\begin{align*}
\text{Data} & \quad \text{Corrected Simulation} \\
\end{align*}
Invariant mass plots

**Left-side plot:** invariant mass for muon spectrometer muon tracks with $p_T > 15$ GeV, after the application of muon momentum corrections. Muid algorithm and release 16.6 used.

**Right-side plot:** invariant mass for inner detector muon spectrometer tracks with $p_T > 15$ GeV, after the application of muon momentum corrections. Muid algorithm and release 16.6 used.
Invariant mass plots

\( \sqrt{s} = 7 \) TeV
\[ \int L = 2.54 \text{ fb}^{-1} \]

Combined tracks

**ATLAS** Preliminary

Data

Corrected Simulation

Entries/GeV

\( M_{\mu\mu} \) [GeV]
Invariant mass plots

Invariant mass for combined muon tracks with $p_T > 15$ GeV, after the application of muon momentum corrections. Muid algorithm and release 16.6 used.