

Analysis with nanoDSTs

The background of the slide is a photograph of a large, multi-story adobe building, likely a government or institutional structure. The building is made of light-colored earth and has several windows and balconies. In the foreground, there is a flagpole with two flags: the United States flag and a yellow flag. The sky is clear and blue.

- **Making nanoDSTs**
 - Scheme
 - Last improvements
- **Analyzing nanoDSTs**
 - Current procedure
 - Analysis Framework : MWGana
 - A new macro for background estimation

Analysis with nanoDSTs

- **NanoDST scheme**

- **2 Trees :**

- **T1 → run information : 1 entry per selected run**
 - **T → event information : 1 entry per selected event**
 - **TrigLvl1 node**
 - **PHGlobal node : Zvertex, BBC, ZDC, run number, ...**
 - **PHMuoTracks node : Muon (and dimuon) tracks information**

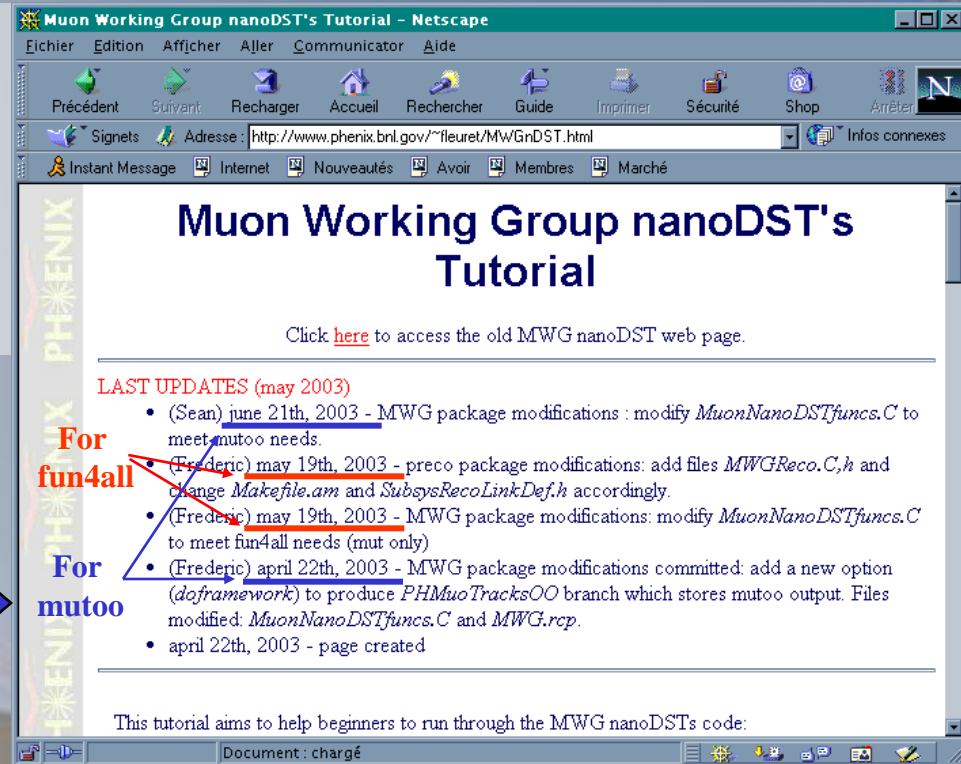
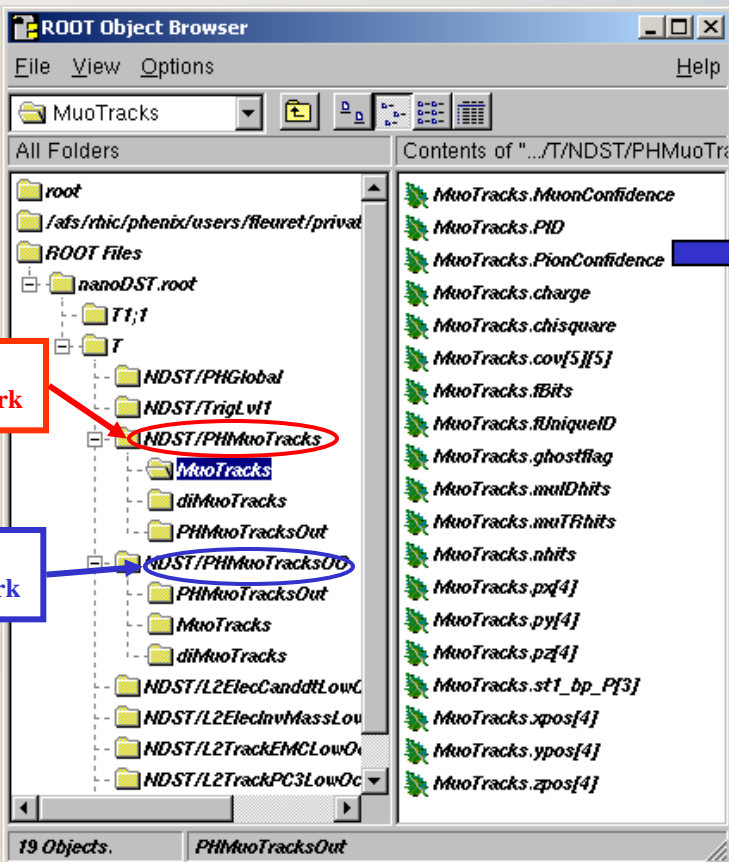
- **Guideline : Keep It Small & Simple**

- **Add variables and information within one of the existing nodes**
 - **Don't add node unless it's necessary**

Analysis with nanoDSTs

• Last improvements

- Add a branch for mutoo (Chun & Sean)
- Changes for fun4all (Vi-Nham & Fred)
- Add Fcal (MVD?) info (Jane)
- Add dMuiPseudoTrigger info (Hiroki)
- Memory leak investigation (Jason)



Fun4all troubles :

- lost cuts on tracks
- no output track's cut information

Analysis with nanoDSTs

- **Current analysis procedure**
 1. **Produce nanoDSTs : DSTs → nanoDSTs**
(nanoDSTs size / DSTs size < 0.2 %)
 2. **Produce ntuple with analyze.C :**
 - A compiled macro.
 - Few minutes to go thru all nanoDSTs.
 - Output = a root ntuple.
 3. **Produce plots with plots.C :**
 - A root macro.
 - Less than a minute to go thru data.
 - No specific library to be loaded.

MWGana

- Analysis framework proposal
 - « CVSify » the analysis code

The screenshot shows a Microsoft Internet Explorer browser window displaying the MWGana analysis framework interface. The browser address bar shows `http://www.phenix.bnl.gov/viewcvs/offline/analysis/`. The page title is `offline/analysis` and it is powered by Apache ViewCVS and CVS Help. The current directory is `[Development] / offline / analysis`. The file list includes `MWGana/`, `DSTMuonSkim/`, `DimuPRDF/`, `GammaGamma/`, `HWGana/`, `HadronPid/`, `JetCorrelation/`, `MuiEff/`, `PHIAnalysis/`, `PHI_KK/`, `POW/`, and `POW1/`. The interface is overlaid with a 3D-style diagram showing the following components and their functions:

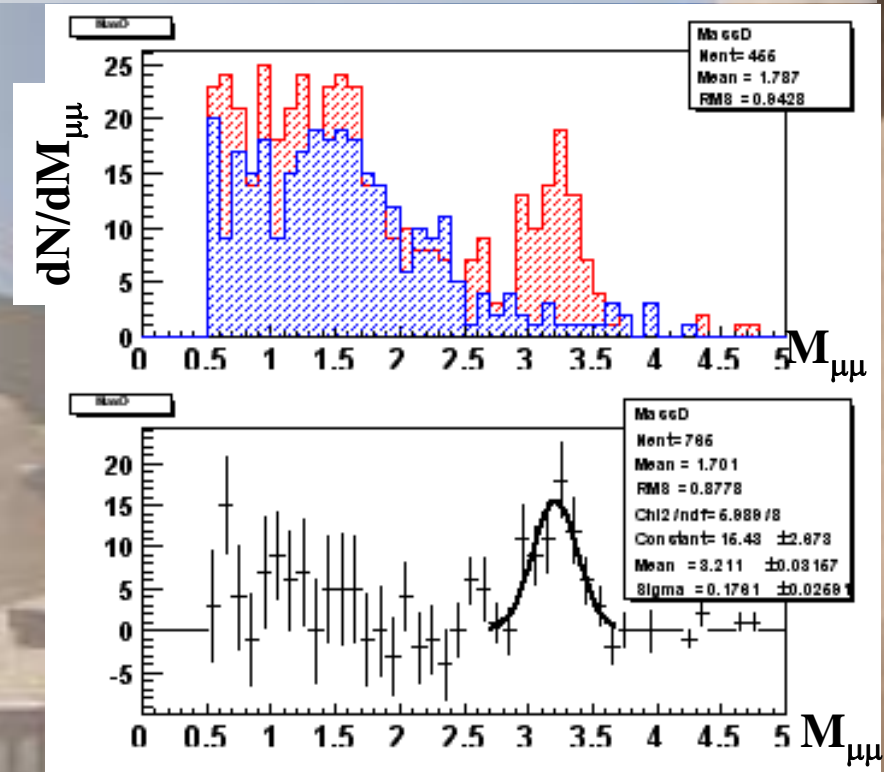
- Analyze/**
 - `analyze.C`:
 - Access the nanoDSTs
 - Create output ntuples
 - Provide various information
 - `makefile`
- Dimuons/**
 - `dimuons.h`:
 - Apply event selection
 - Apply particle selection
 - Fill dimuons ntuple
 - `background.h`
- Singlemuons/**
- Plots/**
 - `plots.C`:
 - Build background spectra
 - Fill background ntuple

Arrows indicate the flow of data from the `MWGana/` directory to the `Analyze/` and `Plots/` components.

Background estimation

- Study of the Background coming from π 's (main source) and K's decays.
 - So far : $N_{\text{signal}} = N^{+-} - (N^{++} + N^{--})$

Goal : Use *single* μ events to estimate the background



A new background estimation

- **Material : Real data**

- *Sample : pp 2002*

- **Event Selection :**

- **2 μ trigger (1 *deep* + 1 *shallow*)**

- **$|Z_{\text{BBC}}| < 38 \text{ cm}$**

- ***Statistics :***

- **Events w/ at least 2 tracks : 455 $\mu^+\mu^-$ / 202 $\mu^+\mu^+$ / 108 $\mu^-\mu^-$**

- **Events w/ 1 track only : 25658 *single* μ^+ / 17782 *single* μ^-**

- ***Create fake dimuons samples :***

- **Pick randomly 10000 single μ events from the 43440 single μ events sample**

- **Create combinatorial dimuons from these 10000 single μ events, with $|Z_{\text{BBC1}} - Z_{\text{BBC2}}| < 5 \text{ cm}$**

→ ~ 6 M 2μ

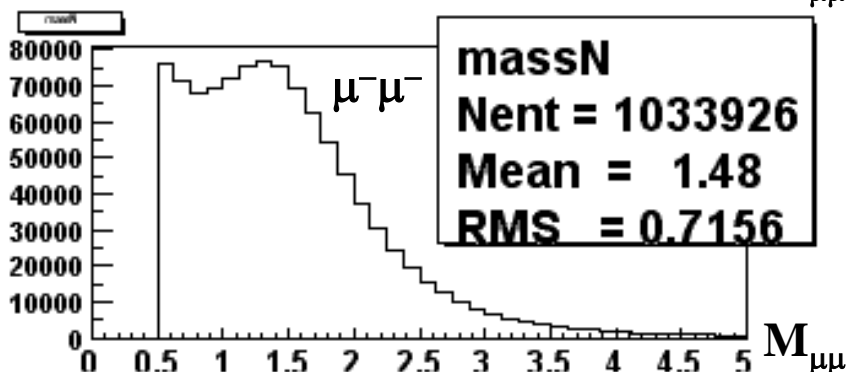
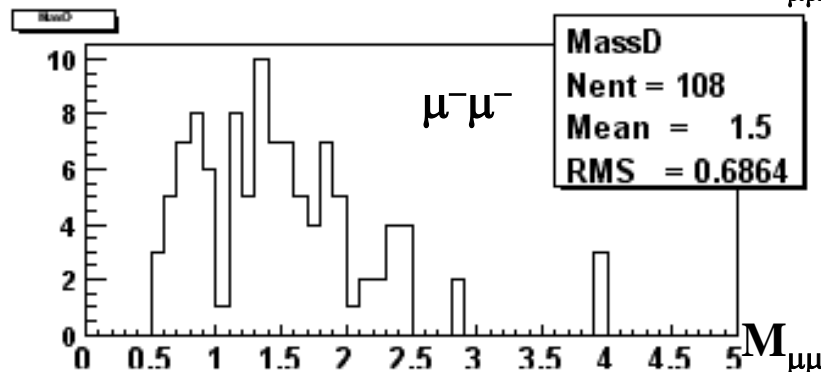
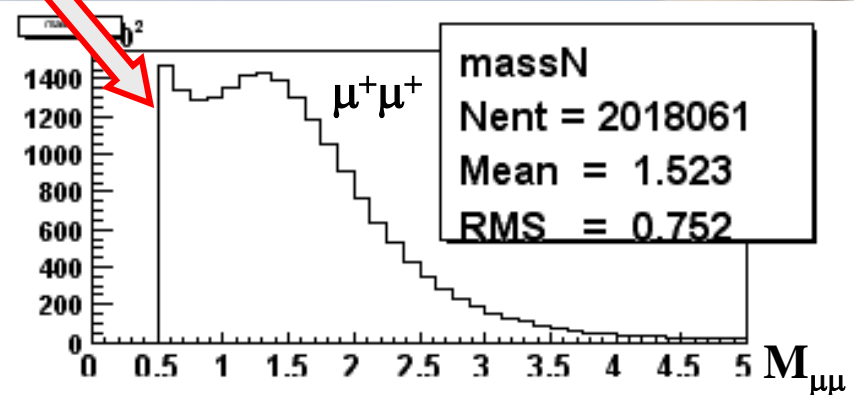
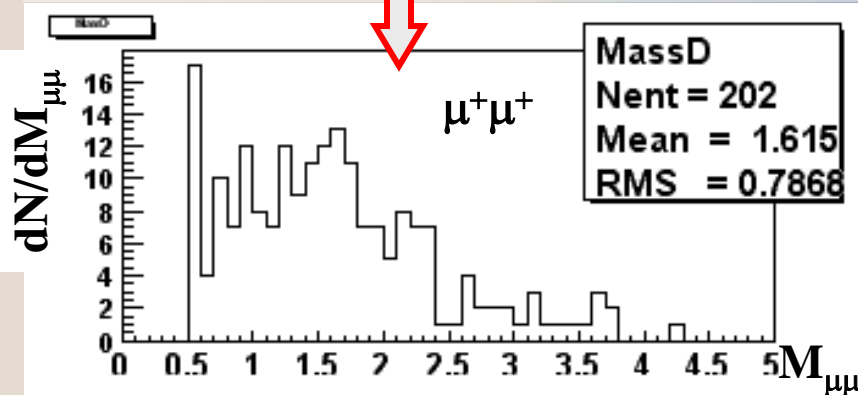
A new background estimation

- Likesign dimuons

- Mass spectra

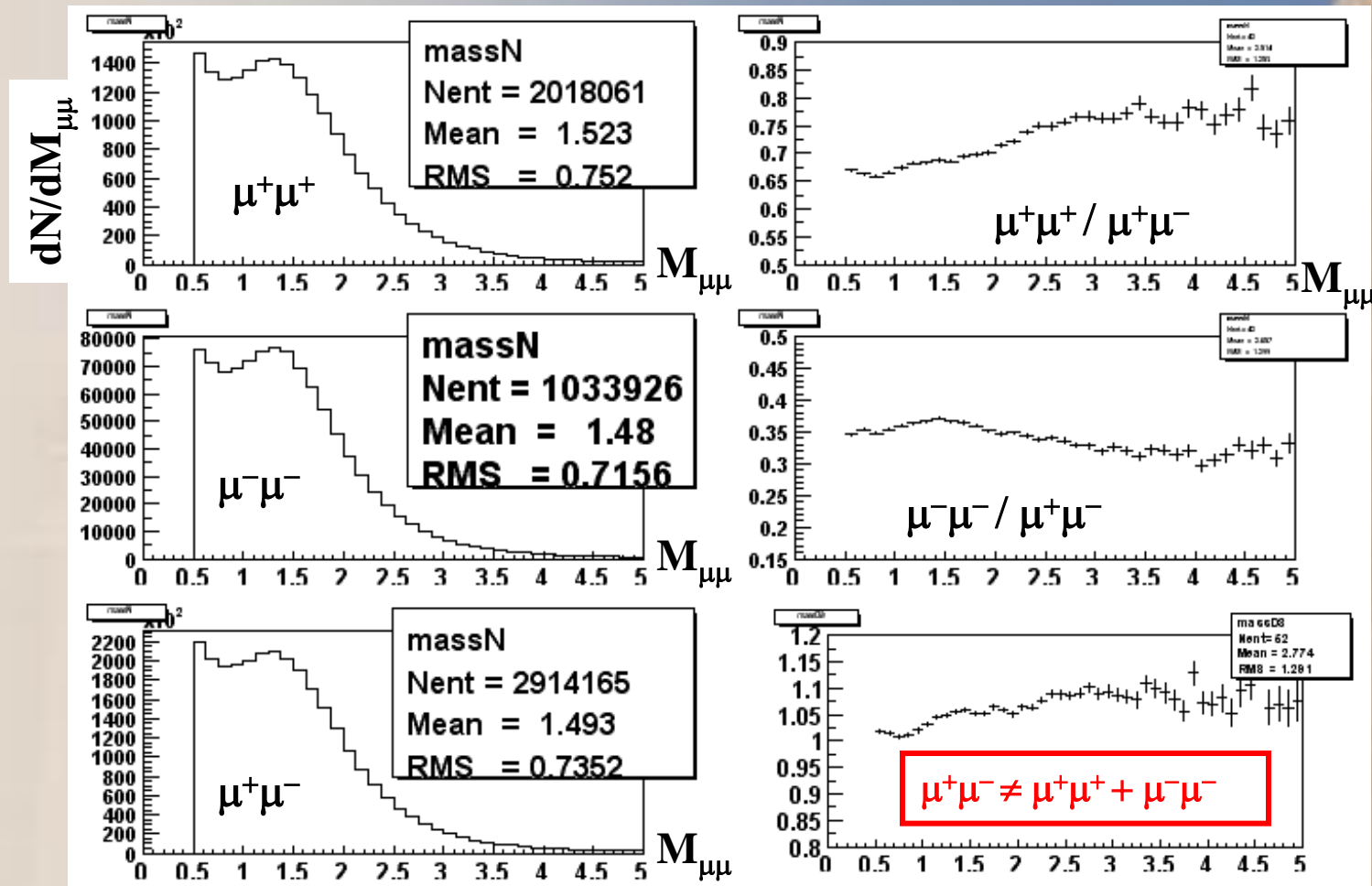
- true dimuons : $N^{++}/N^{--} = 1.87 \quad 0.31$

- fake dimuons : $N^{++}/N^{--} = 1.952 \quad 0.003$



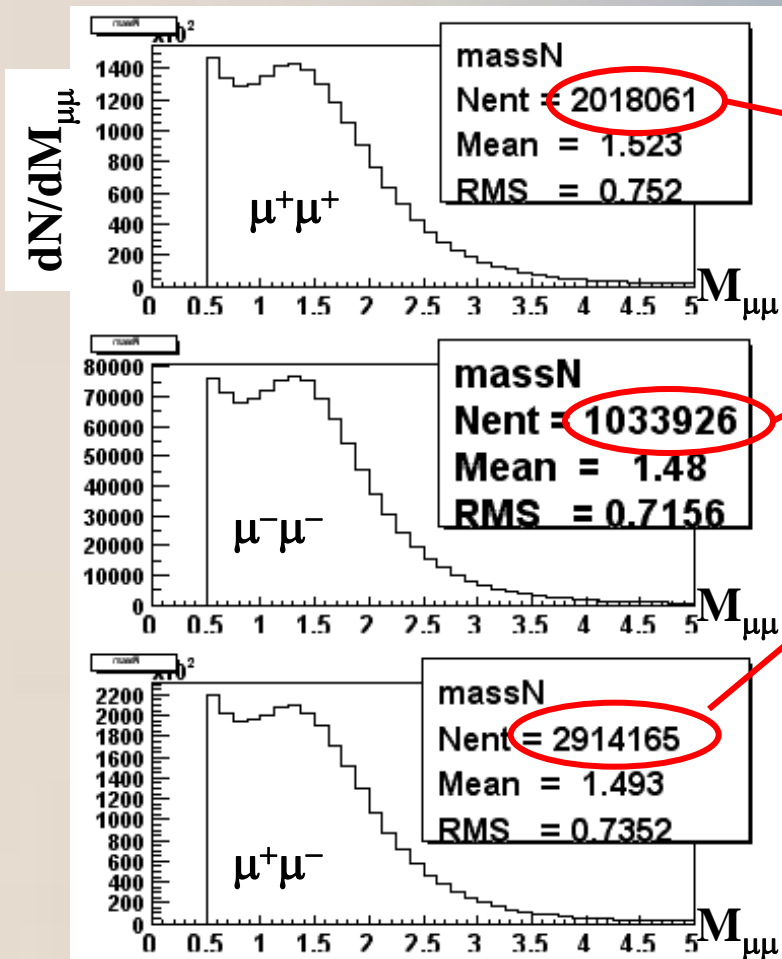
A new background estimation

- Fake dimuons
 - Spectra's shapes



A new background estimation

- Fake dimuons
 - Opposite signs .vs. Like signs



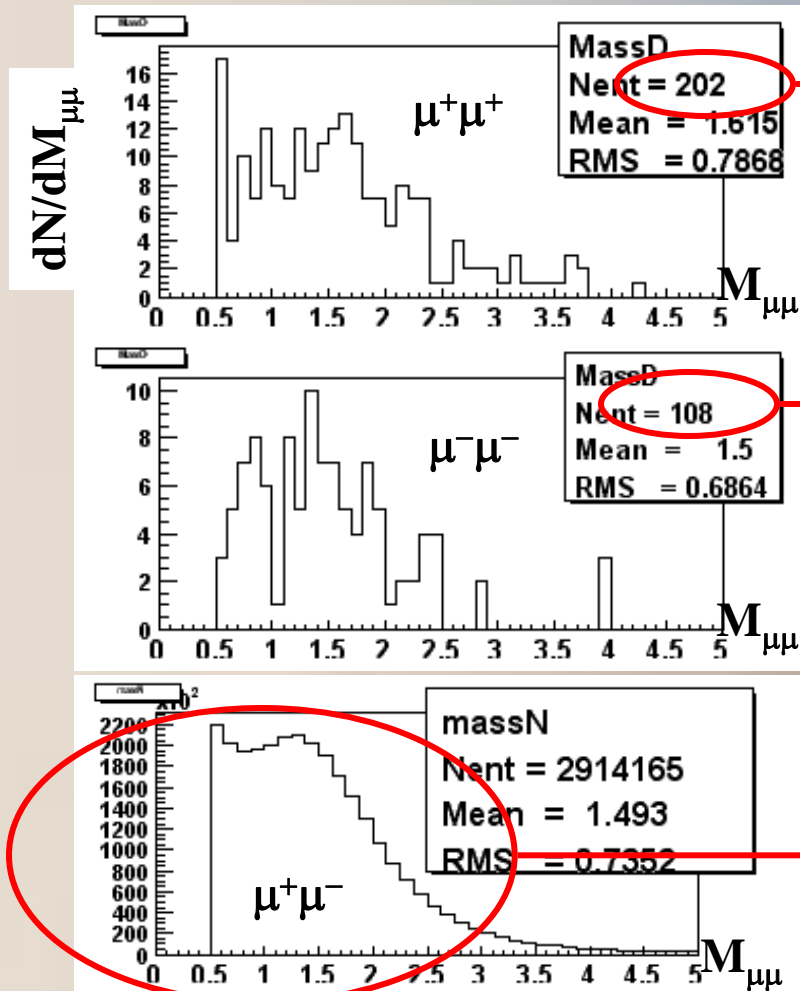
Fake dimuons :

N^{++}, N^{--}, N^{+-} known

$$N^{+-} = 0.955 \times (N^{++} + N^{--})$$

A new background estimation

- Normalisation with true dimuons



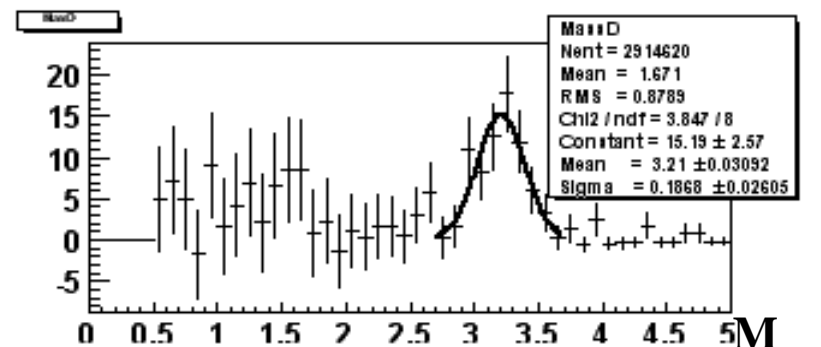
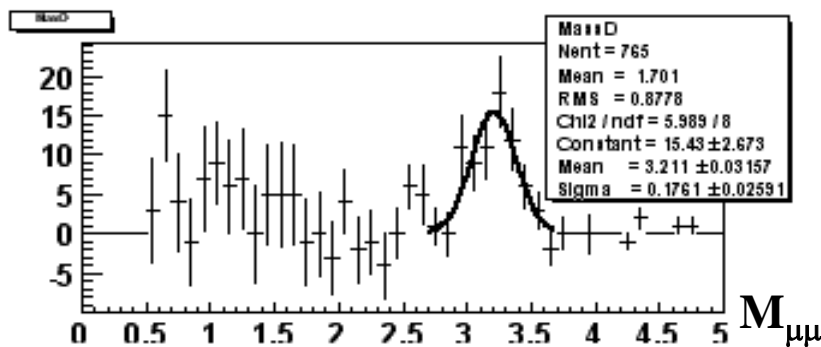
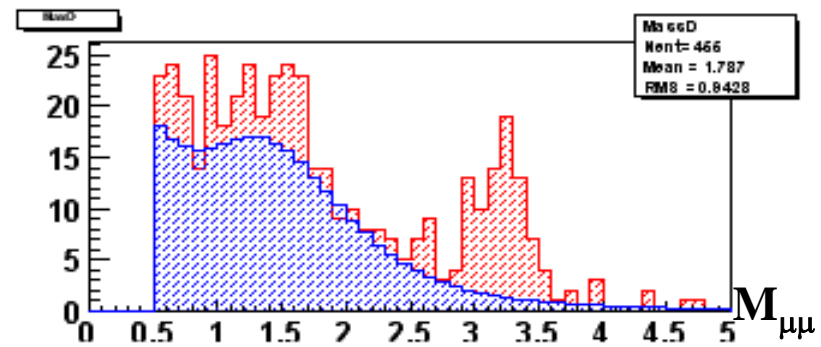
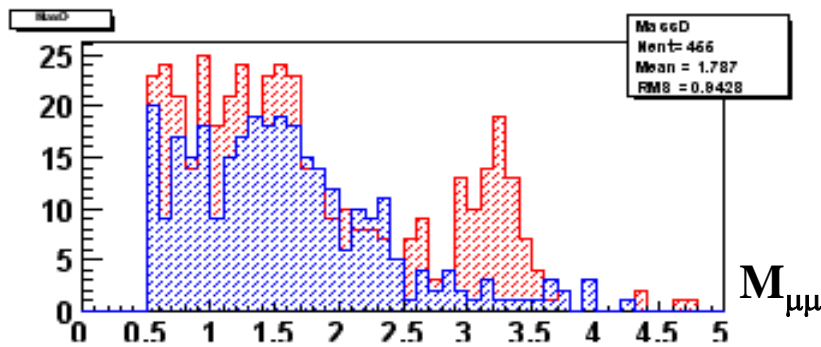
$$N^{+-} = 0.955 \times (N^{++} + N^{--})$$
$$= 0.955 \times (202 + 108) = 296.05$$

Use numbers of **true** $\mu^+\mu^+$ and **true** $\mu^-\mu^-$ to normalize the **fake** $\mu^+\mu^-$ spectrum

A new background estimation

- Bkg's shape : $\mu^+\mu^- \neq \mu^+\mu^+ + \mu^-\mu^-$
- Bkg's integral : $N^{+-} = 0.955 \times (N^{++} + N^{--})$
- Use of fake dimuons spectrum
- Normalisation with true likesign dimuons

$dN/dM_{\mu\mu}$



Analysis with nanoDSTs : summary

- **Making nanoDSTs**

- *in progress...*

- **Analyzing nanoDSTs**

- **CVSify the code : comments, suggestions ?**

- **A new macro for background estimation :**

- to be included in MWGana...*

Background estimation

- *single* μ
 - Momentum's spectra

