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Parameterized Muons in the CMSSW Fast Simulation

Complete: 

Introduction

Parameterized muons in the FastSimulation aim at providing the muon objects needed in the event selection and analysis (**Level 1** muon trigger, **Level 3** muon trigger, offline **Global Muon**) with efficiencies and pT resolutions parameterized on the same quantities of the full simulation. At the moment, the parameterizations are the same as the old FAMOS.

All three muon objects are produced via a single **producer**, located in the package *FastSimulation/ParamL3MuonProducer*. They can be enabled separately via control cards in the configuration file. For the L3 and Global muon the reconstructed track must also be produced in advance.

The Parameterized Muon module is defined in *FastSimulation/ParamL3MuonProducer/data/ParamL3Muon.cfi* and can be accessed through the sequence **famosWithMuons** available in *FastSimulation/Configuration/data/FamosSequences.cff*

The L1 muons

Parameterized L1 muons in the FastSimulation are stored as a collection of *L1MuGMT Cand* (L1 Global Muon Trigger candidates).

Parameterization has been done for the pT, eta, phi, charge. Quality is assigned by default as 7 (matched DT-RPC or CSC-RPC, the highest) to all GMT selected cand's.

The L3 and Global muons

Parameterized L3 and Global muons in the FastSimulation are stored as a collection of *reco::Muon* (which is a *reco::RecoCandidate*).

The *reco::Muon* is filled by the following quantities, as a result of the parameterization of the reconstruction efficiency and pT resolution:

- one *LorentzVector* (the smeared four-vector in parameterized muons);
- the charge (the same charge as the corresponding tracker track);
- one vertex (the same vertex as the corresponding tracker track);

Also, a *TrackRef* to the tracker track is set (accessible by method *track()*).

All other (non mandatory) ingredients of a *reco::Muon* are not filled at the moment.

Overall configuration cards (with their default values)

```
include "FastSimulation/Configuration/data/FamosSequences.cff"

// Debug level
replace paramMuons.MUONS.Debug = false

// What is to be produced=
```

```

replace paramMuons.MUONS.ProduceL1Muons = true
replace paramMuons.MUONS.ProduceL3Muons = true
replace paramMuons.MUONS.ProduceGlobalMuons = true

// Simulate only simtracks in this eta range
replace paramMuons.MUONS.MinEta = -2.4
replace paramMuons.MUONS.MaxEta = 2.4

// The muon simtrack's must be taken from there
replace paramMuons.MUONS.simModuleLabel = "famosSimHits"
replace paramMuons.MUONS.simModuleProcess = "MuonSimTracks"

```

Configuration cards for L3 and Global muons (with their default values)

In addition to what above:

```

// The reconstructed tracks must be taken from there
replace paramMuons.MUONS.trackModuleLabel = "gsWithMaterialTracks"

// Set to true if the full pattern recognition was used to reconstruct tracks in the tracker
replace paramMuons.TRACKS.FullPatternRecognition = false

```

Example

An example on how to run the producer can be found in *FastSimulation/ParamL3MuonProducer/test/FamosTrackProducer_withMuons.cfg*.

Parameterized muons in the event can be read with the usual classes (analyzers, etc.) that reads the corresponding data formats in the full simulation: be aware of the missing quantities in the *reco::Muon*, however!

Review status

| Reviewer/Editor and Date (copy from screen) | Comments |
|---|-----------------------|
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Responsible: AndreaPerrotta
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This topic: CMSPublic > SWGuideFastSimMuonParametrization
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