Track Fitting with the new Event Model

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LHCb Joint OT/IT Software Meeting, NIKHEF, 5th September 2005

- ***Preliminary work: status of new Track Event Model***
  - ***tests / validation of classes and tools of the new TEM***
  - ***status of the new TEM***
- ***Track fitting status:***
  - ***set-up for the tests***
  - ***tests / validation of the Kalman track fitting code***
  - ***status of the new track fitting code***

Preliminary work:

Status of new TEM

Test/Validation of new TEM

In what follows:

- **All initial tracks produced with the ideal pattern recognition of the old TEM**
- **Tracks not fitted**
- **True states at each measurement (z-)position**
- **Tracks selection: loose quality cuts:**
  - ***Only long tracks***
  - ***Momentum > 1 GeV***
  - ***#of hits on track > 20***

OLD

nothing extra done

NEW

- TrFitTracks converted to Tracks

→ have LHCbIDs and measurements

Test/Validation of new TEM

Disclaimer:

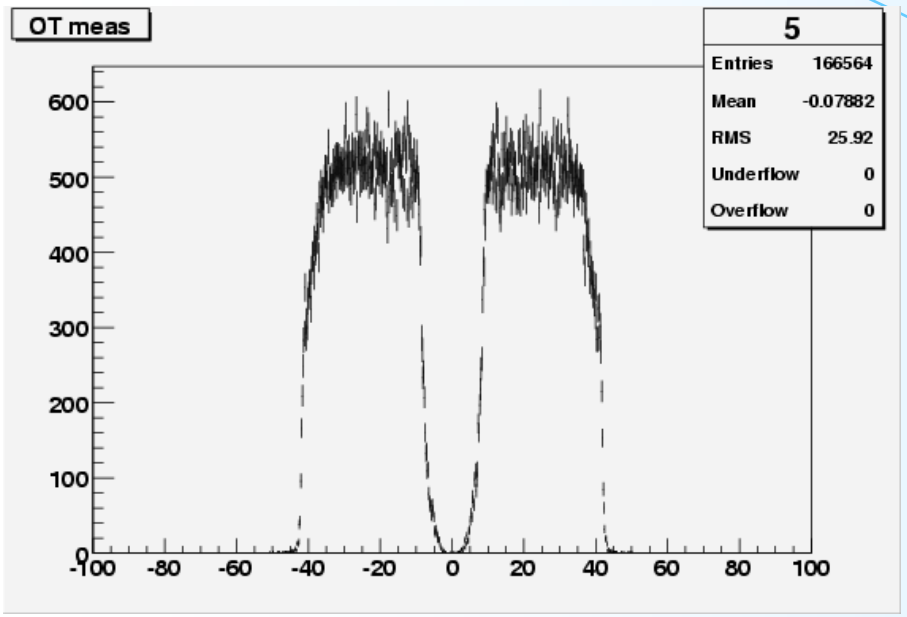
- **No attempt here to understand some features found already in the old TEM!**
  - ***Interesting in its own right but not purpose of these studies***
- **Our goal is to test and validate the new code with respect to the old one**

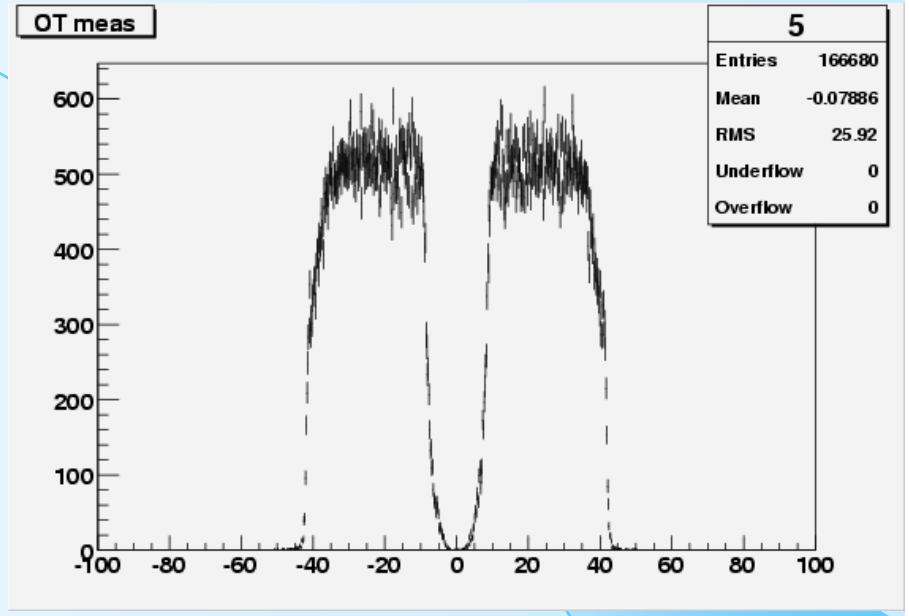
Plots:

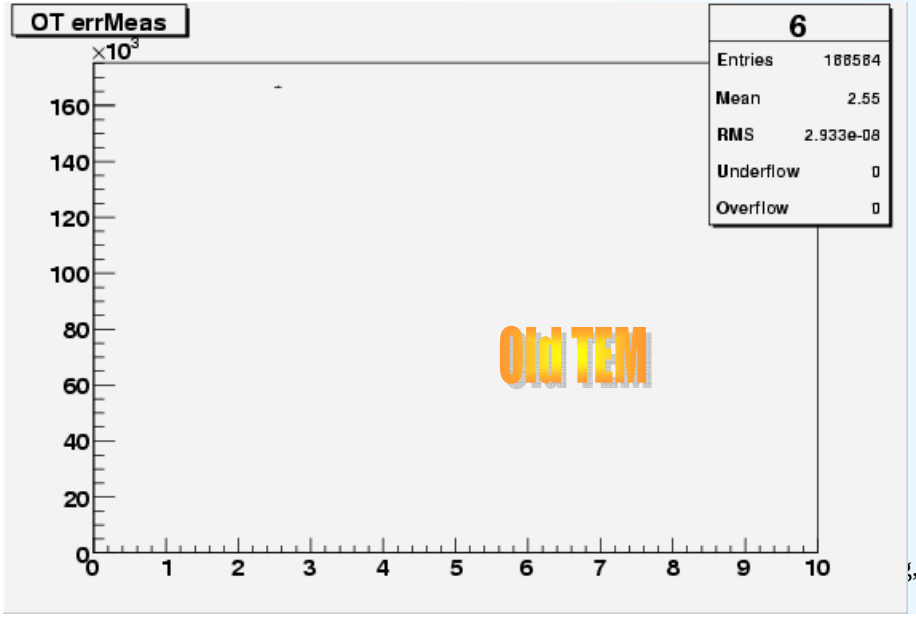
- **Separate for OT, IT, Velo-R and Velo-Φ measurements**

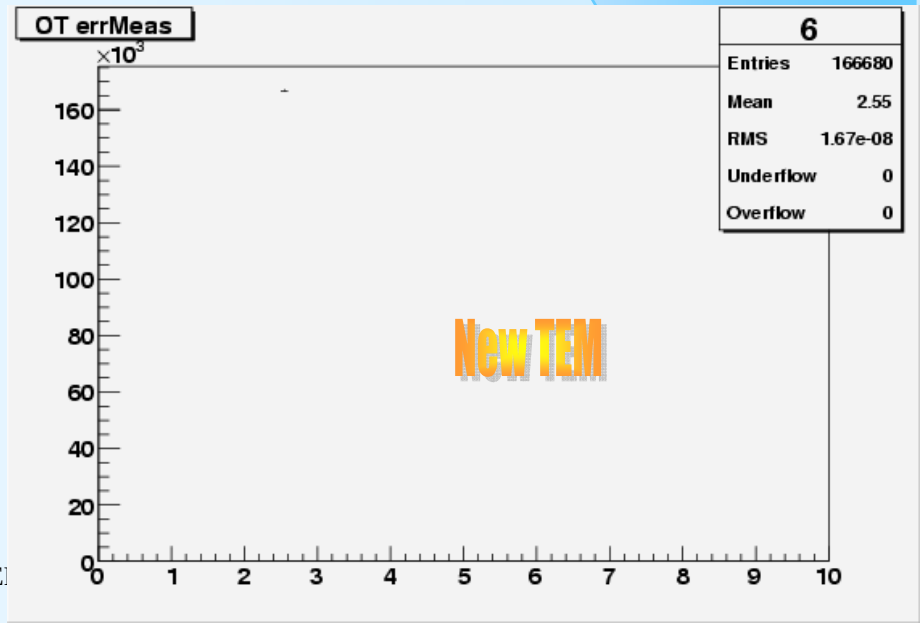
⇒ plots produced looping over all pairs of (state,measurement), all at same z-positions, by construction

OT measurements

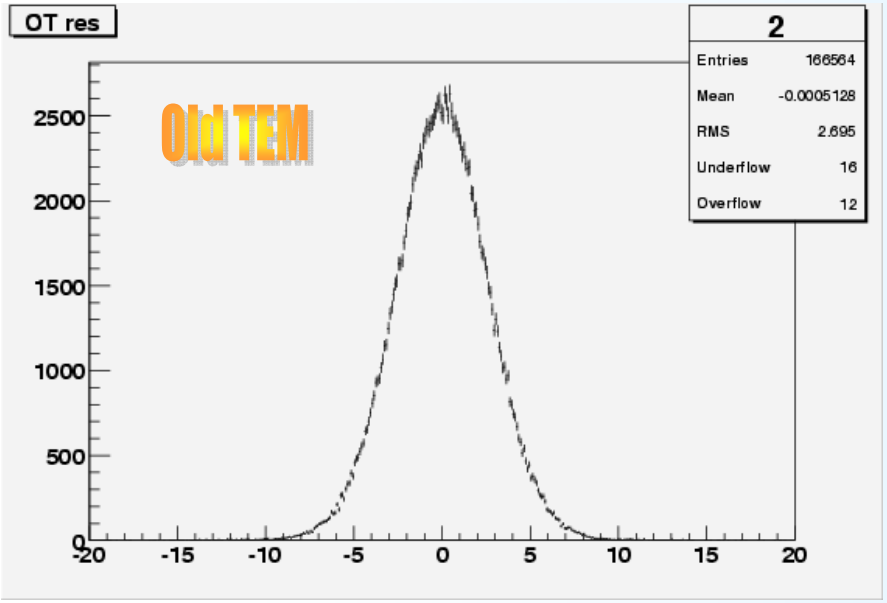


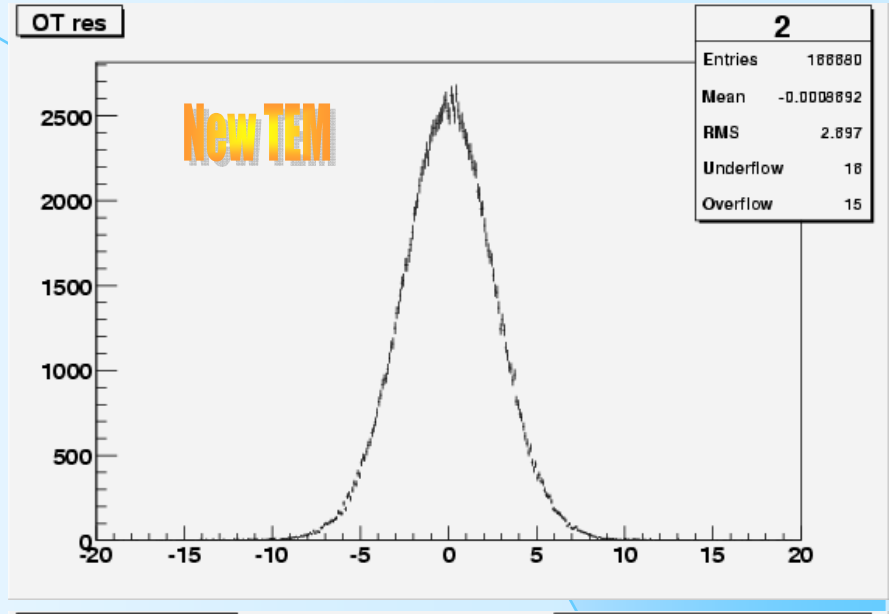


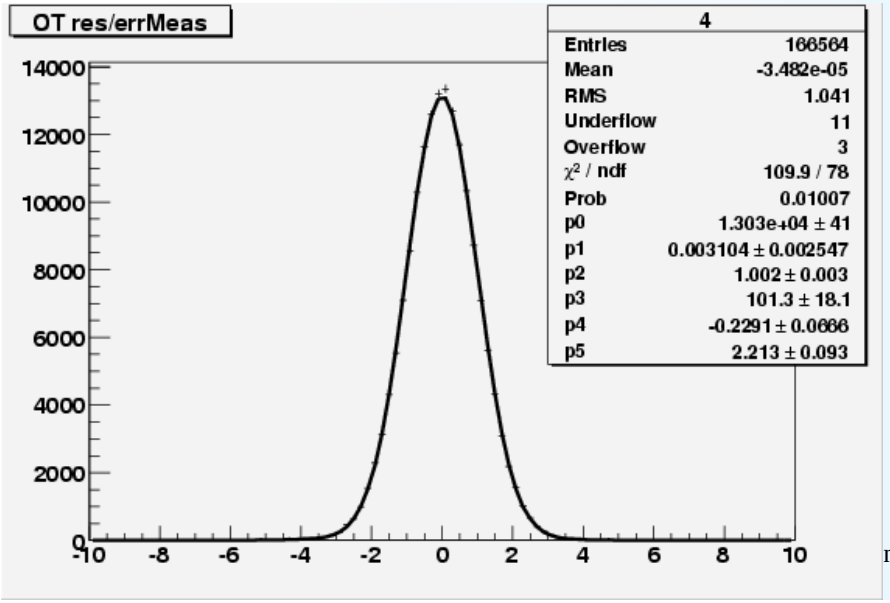


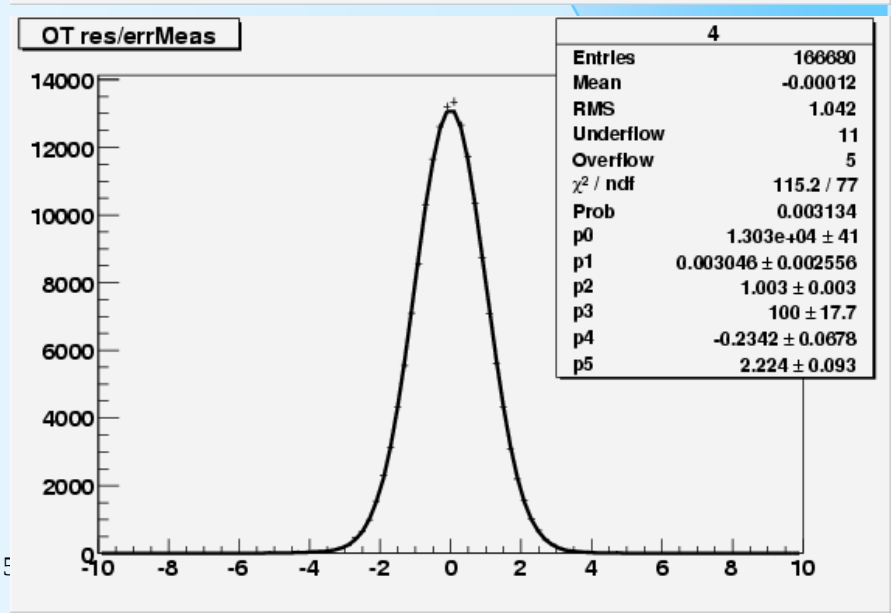


OT residuals and res/σ measurements

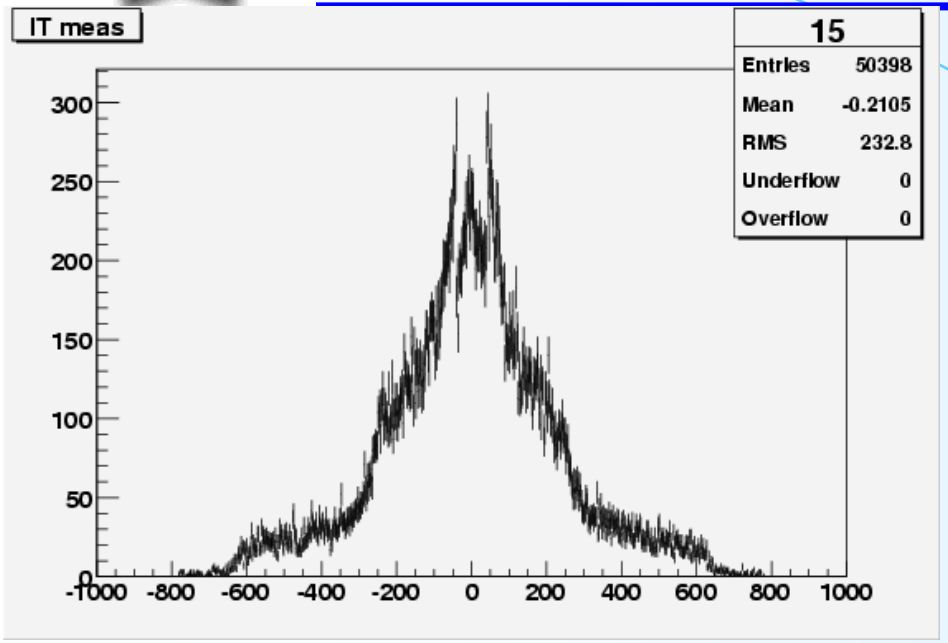


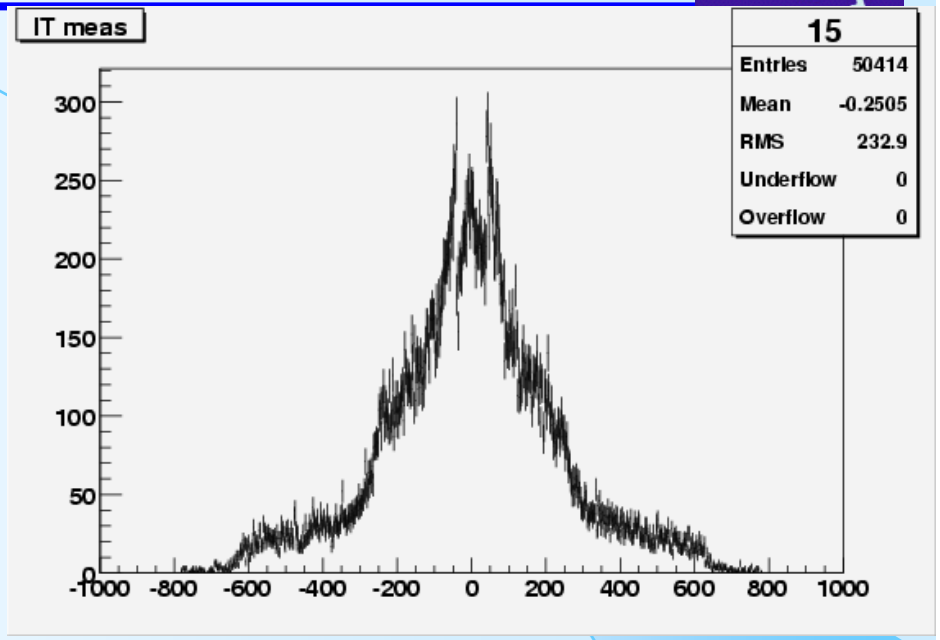


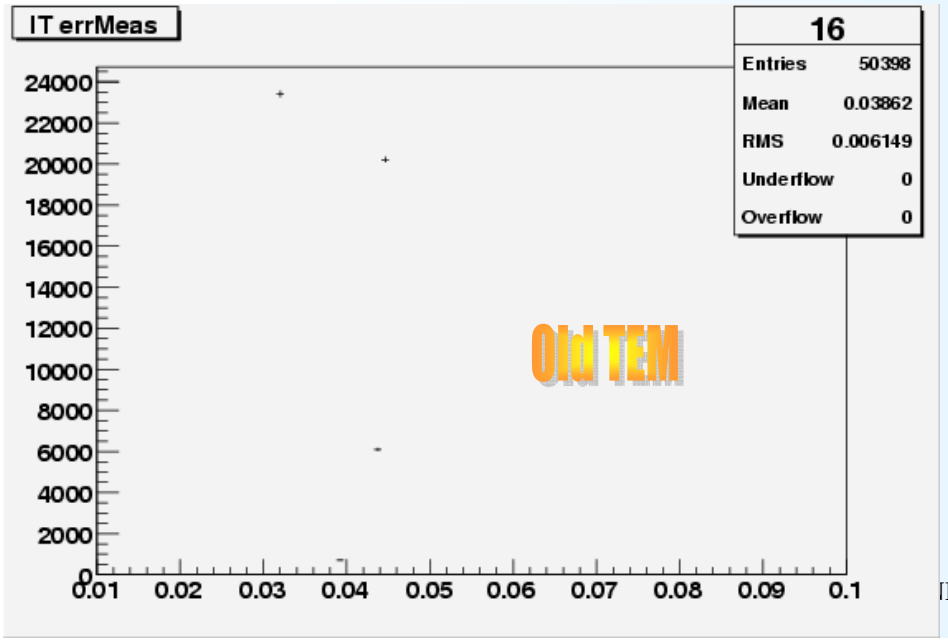


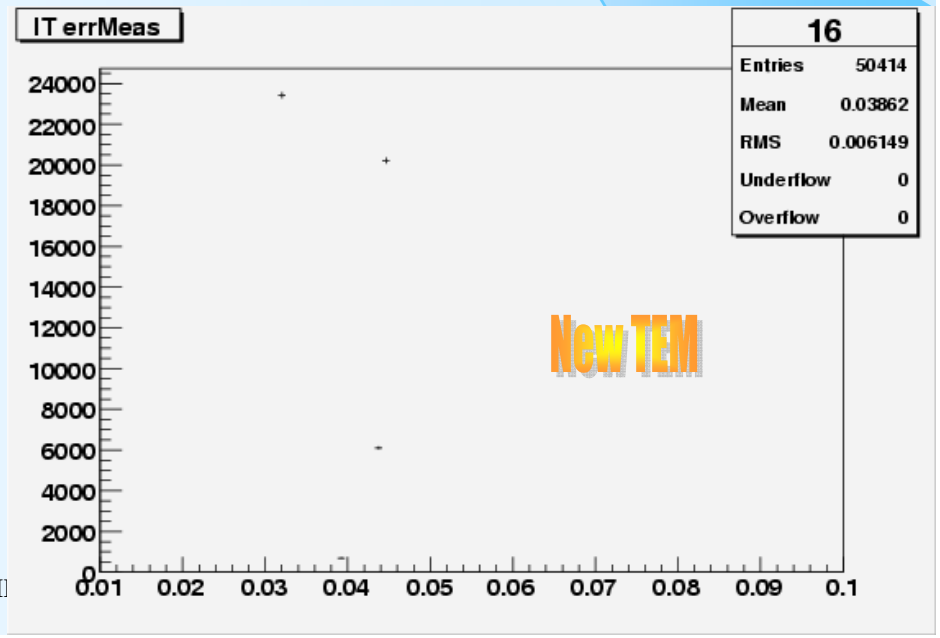


IT measurements

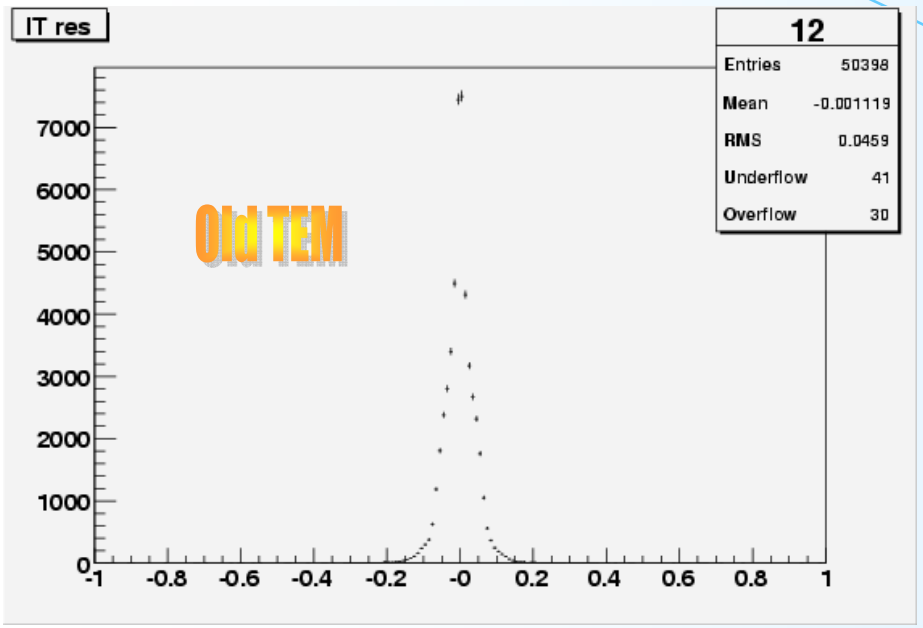


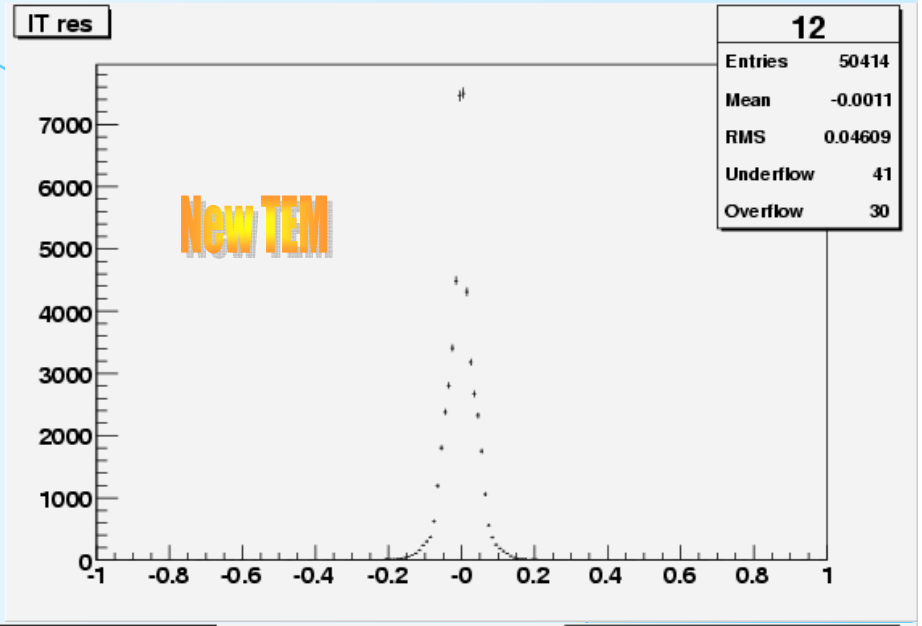


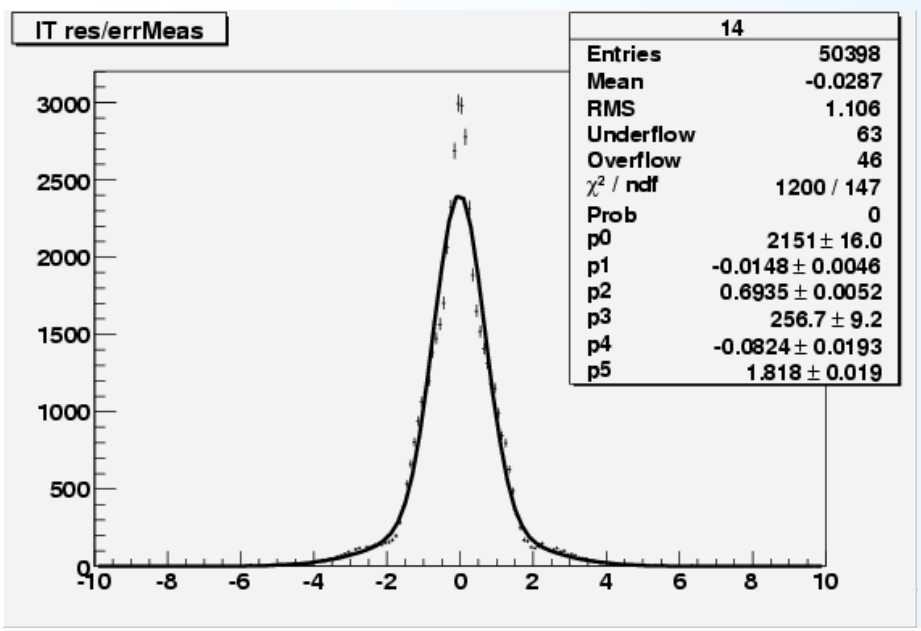


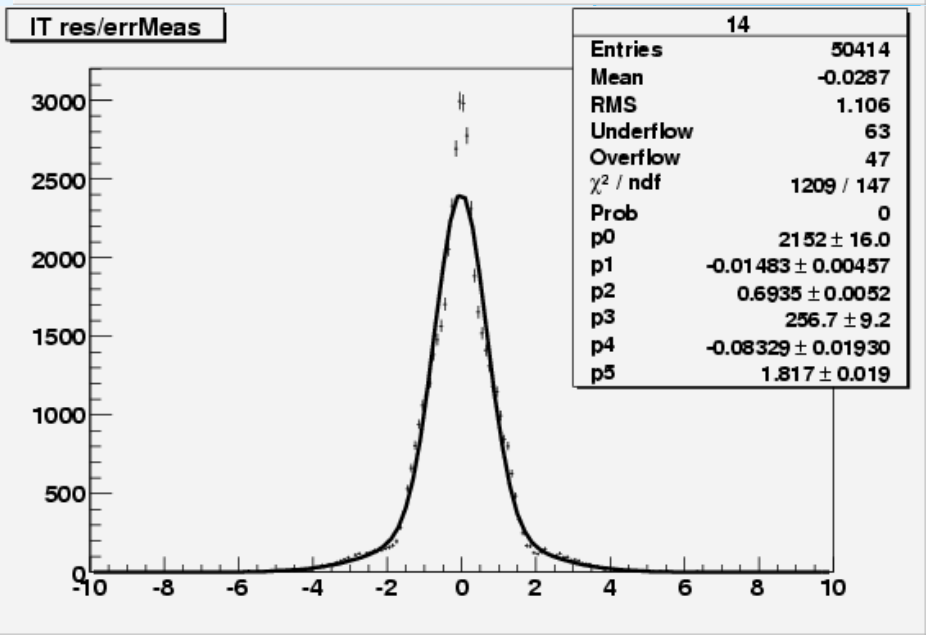


IT residuals and res/σ measurements

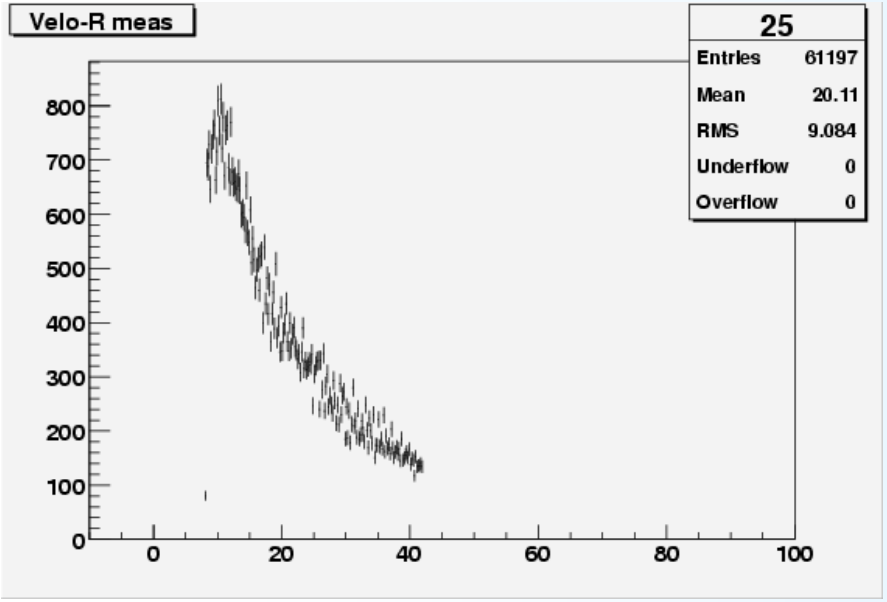


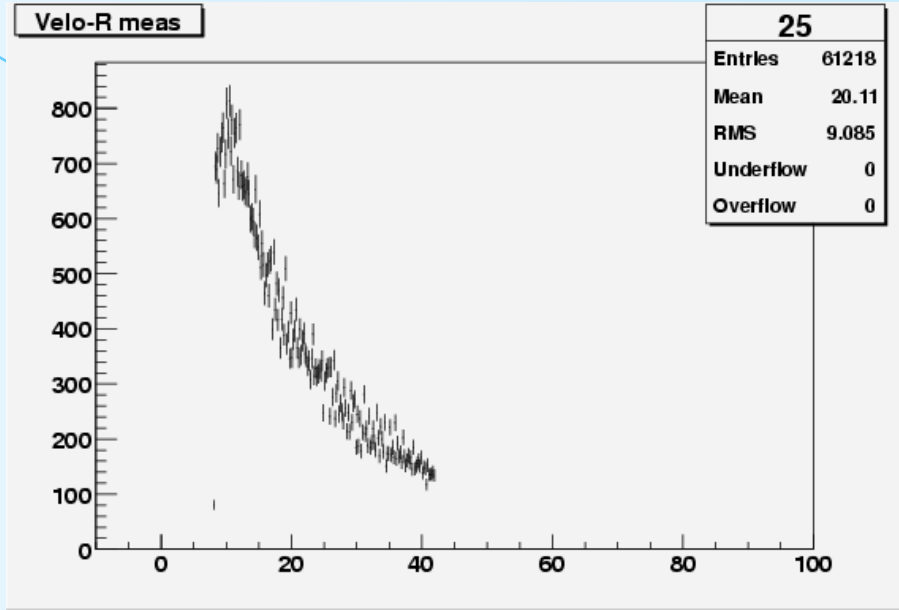


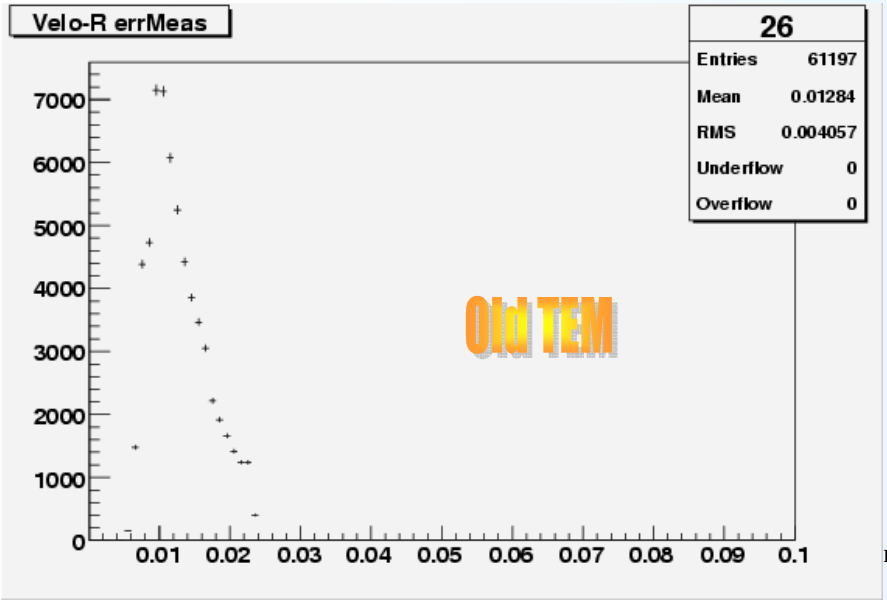


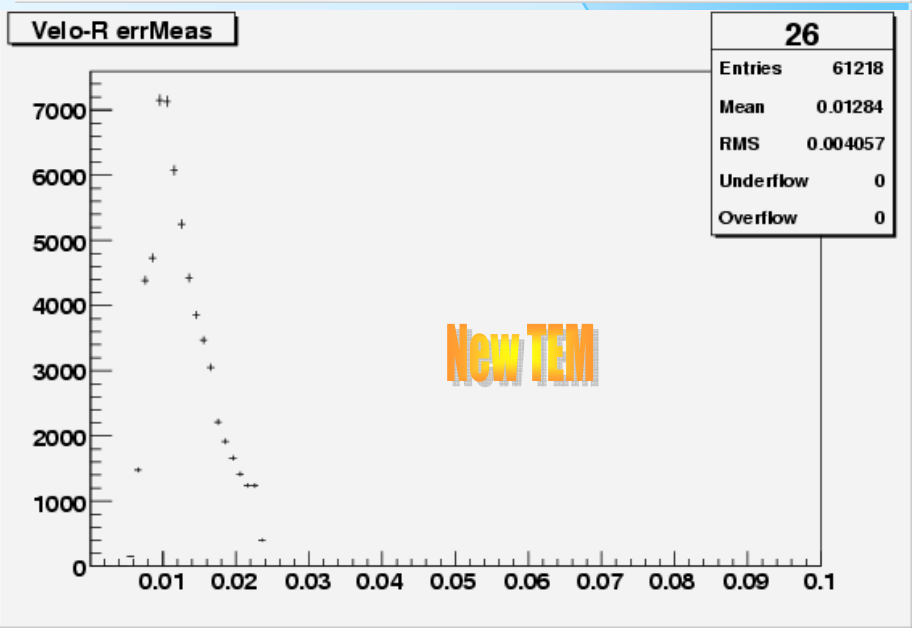


Velo-R measurements

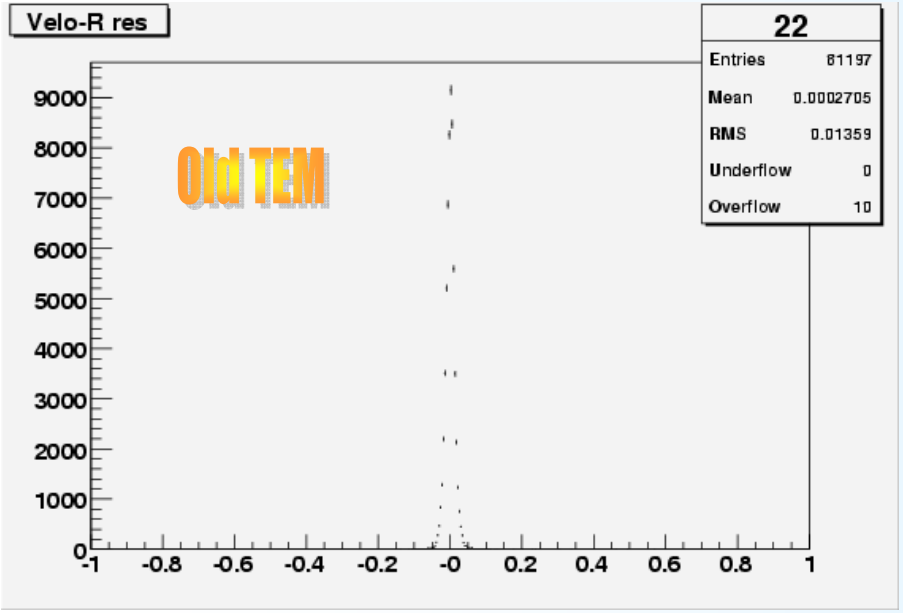


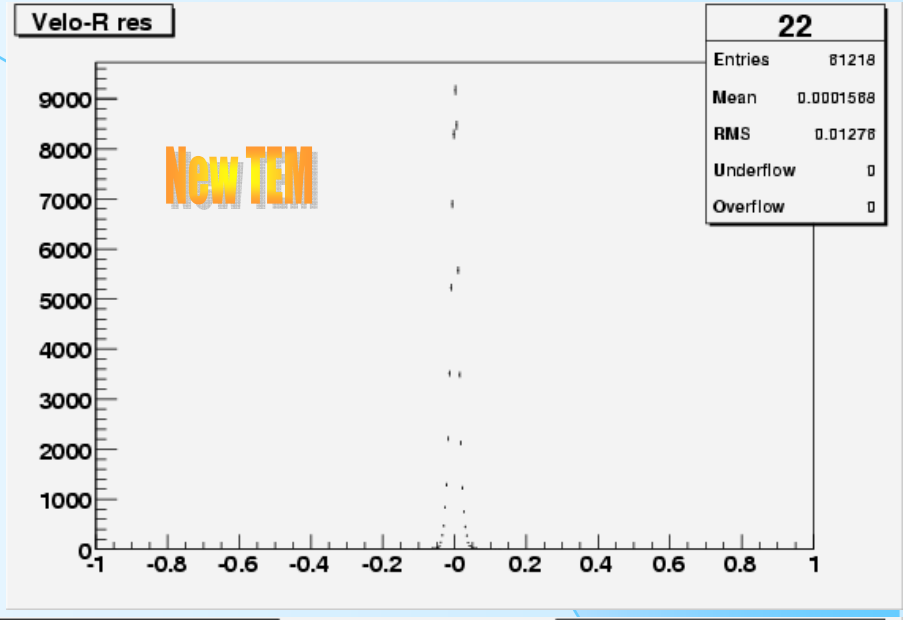


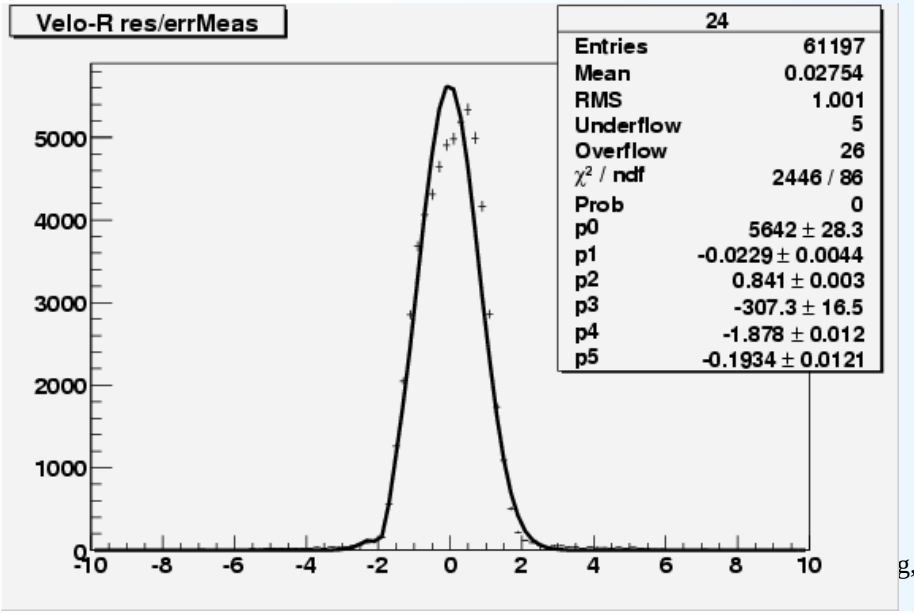


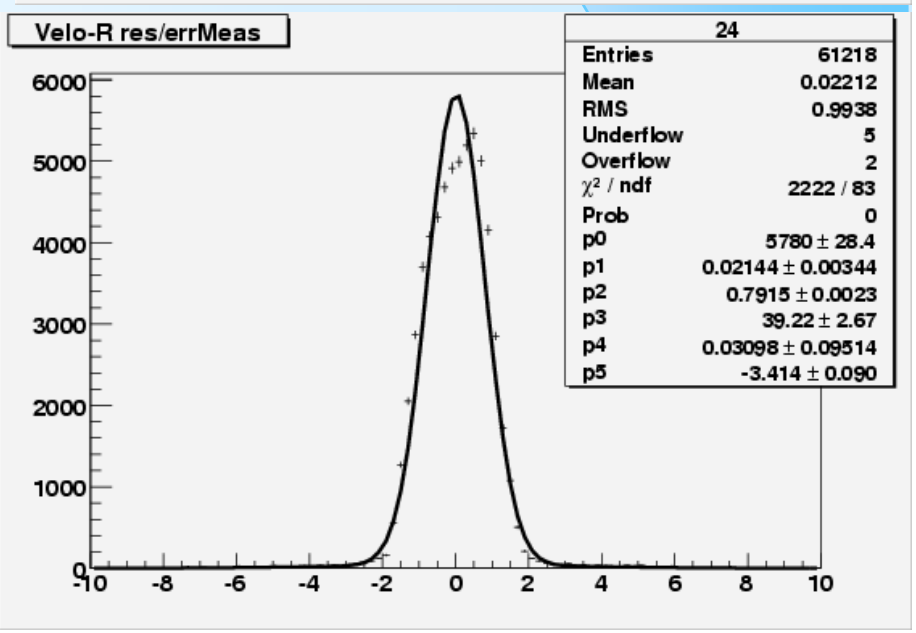


Velo-R residuals and res/σ measurements

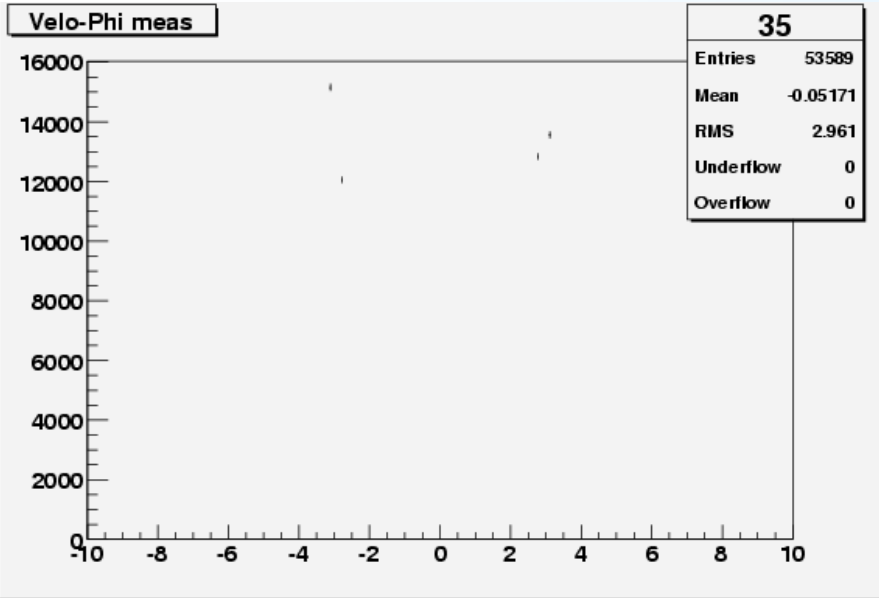


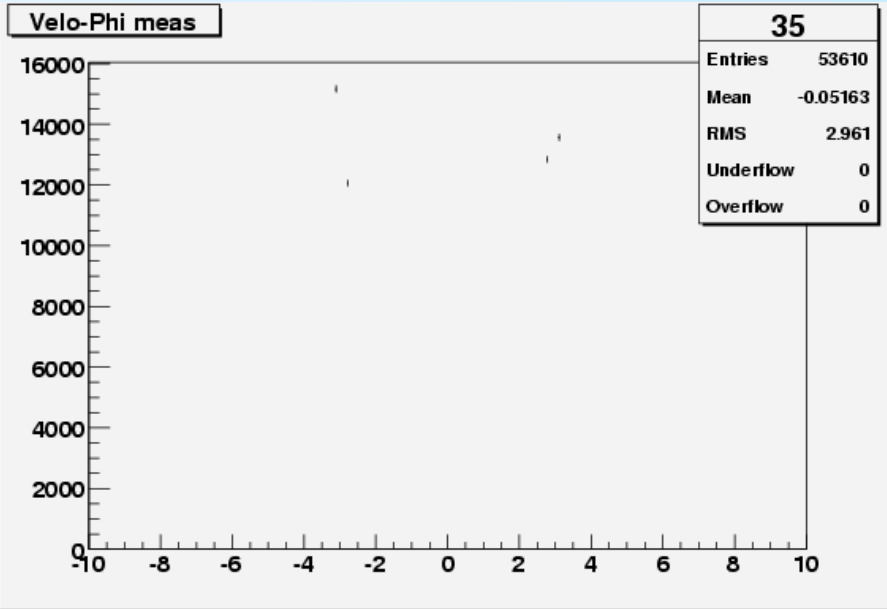


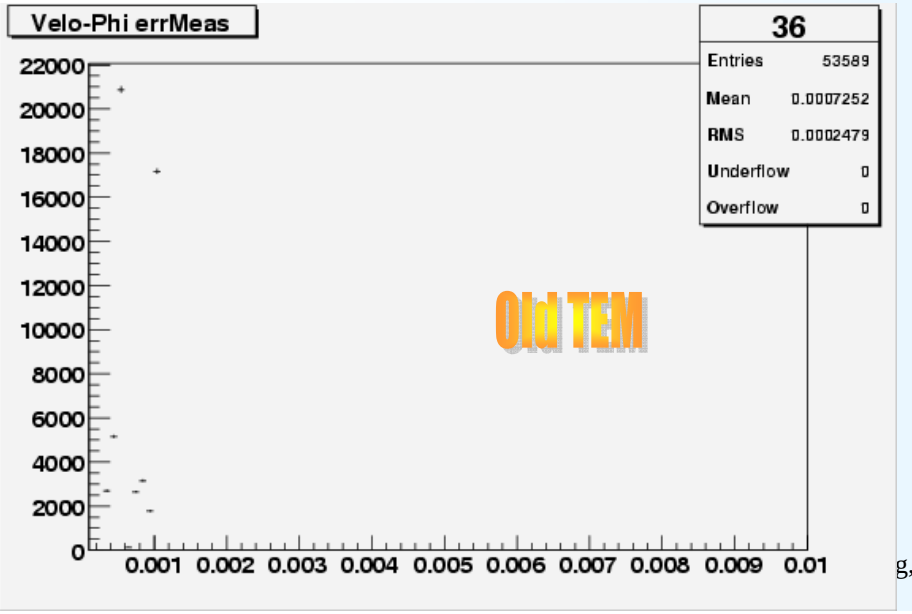


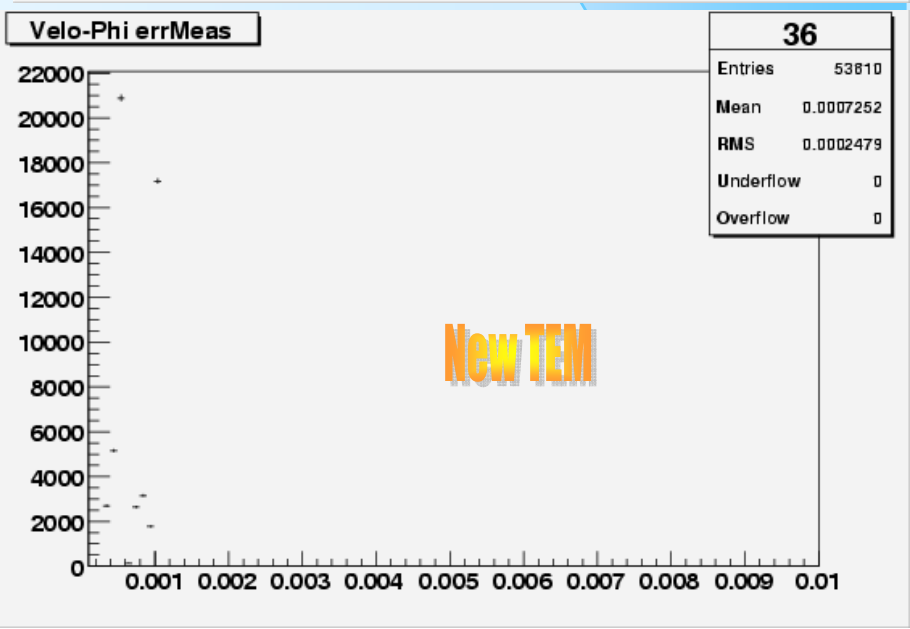


Velo-Φ measurements

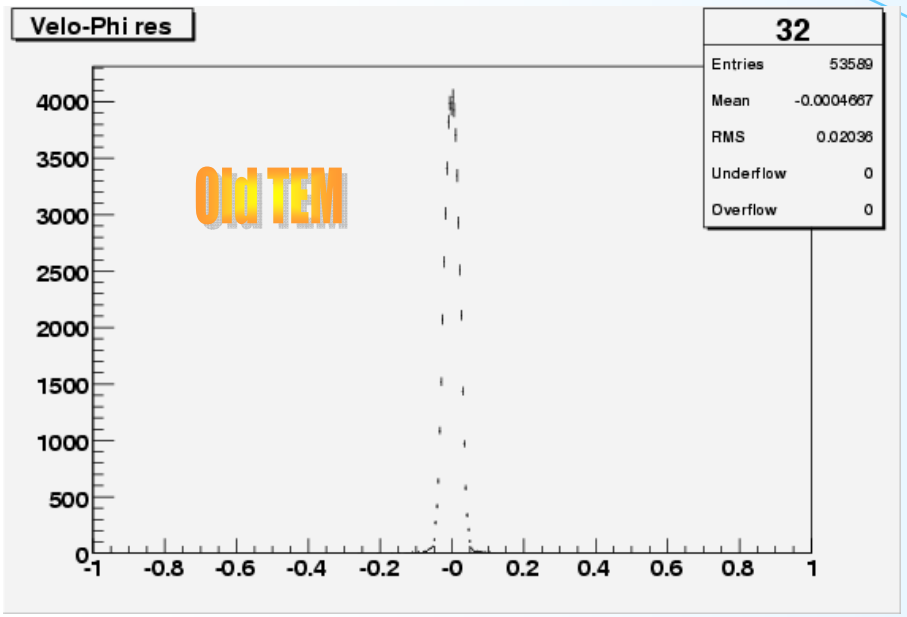


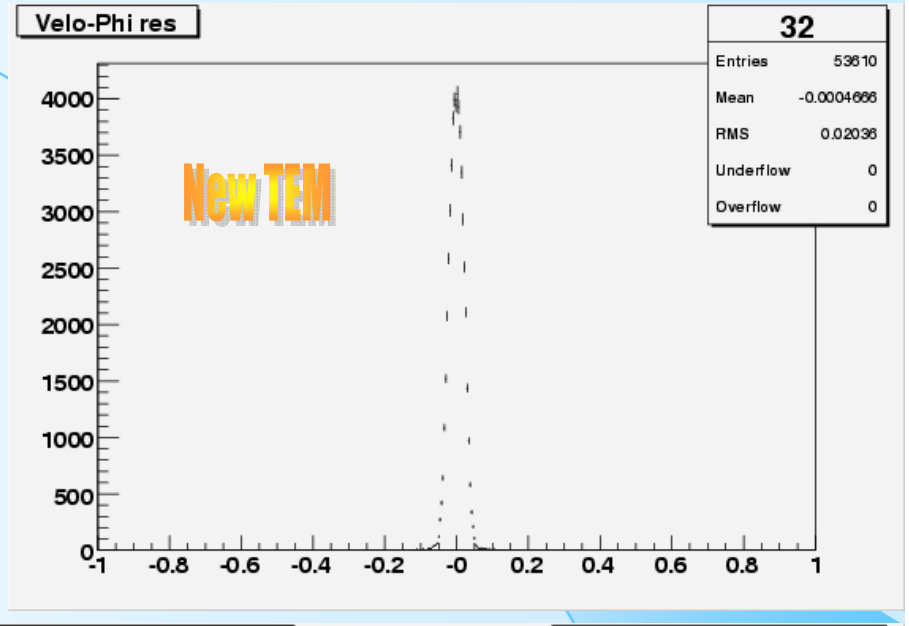


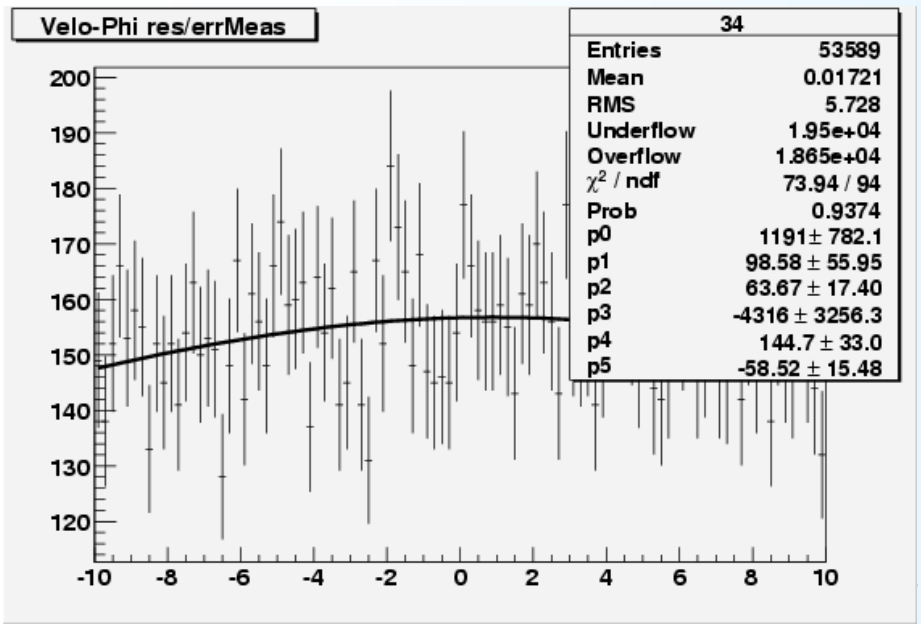


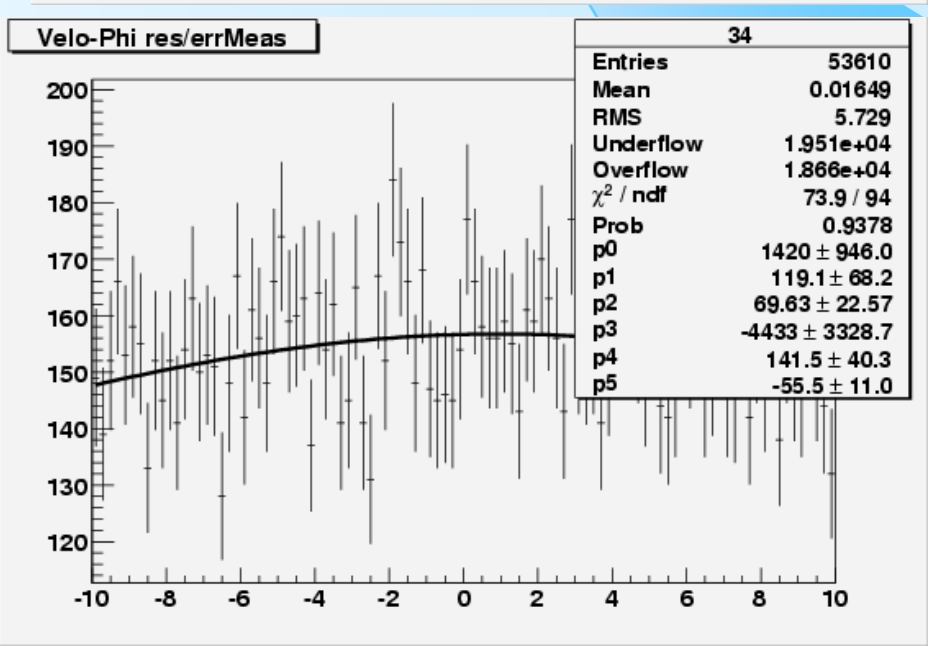


Velo-Φ residuals and res/σ measurements









Test/Validation of new TEM

Conclusions of these tests:

- **New TEM classes correctly store the information**
- **The converters are validated**
- **All projectors do the job well**

⇒ **Now we have everything we need to test (with confidence on the input) the new Kalman filter package Tr/TrackFitter !**

Track Fitting with new TEM: Status

Test/Validation of new Fitting Code

In what follows:

- All initial tracks produced with the ideal pattern recognition of the old TEM
- Tracks selection: loose quality cuts:
  - *Only long tracks*
  - *Momentum > 1 GeV*
  - *#of hits on track > 20*

OLD

- TrFitTracks fitted downstream with old KF code
- states predicted at each meas. position
- TrFitTracks converted to Tracks

NEW

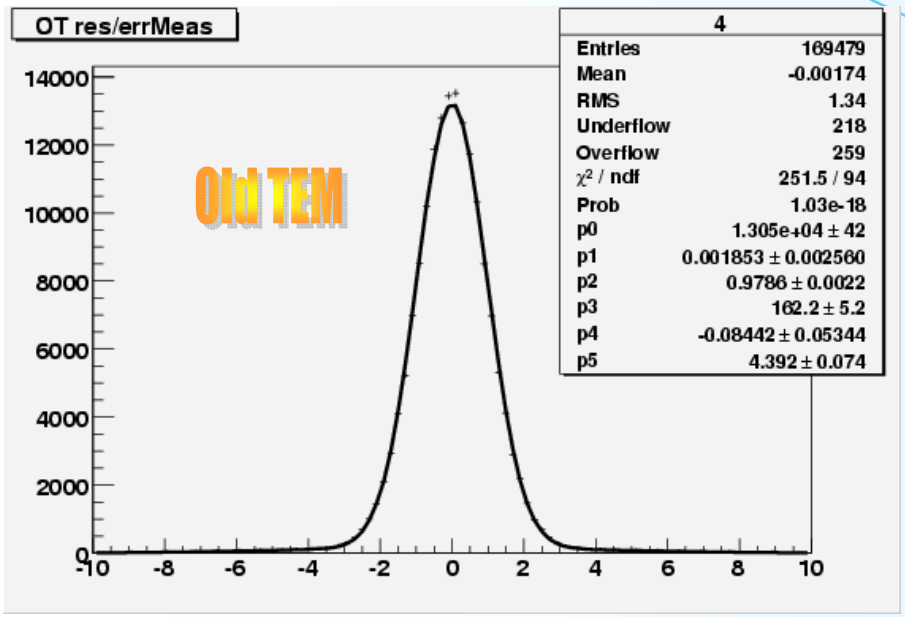
- non-fitted TrFitTracks converted to Tracks
- Tracks fitted downstream with new TEM KF package
- States predicted at each meas. position

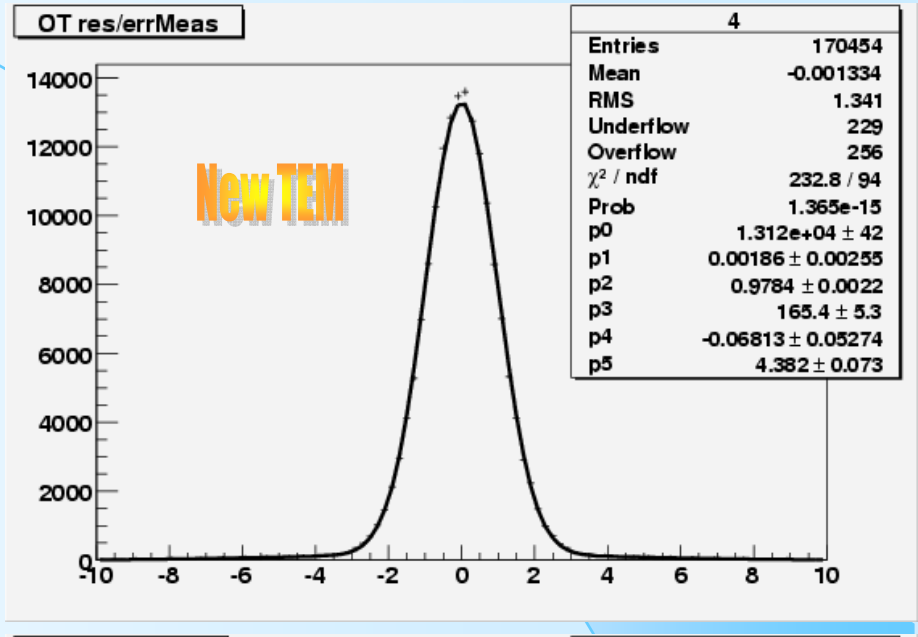
Plots:

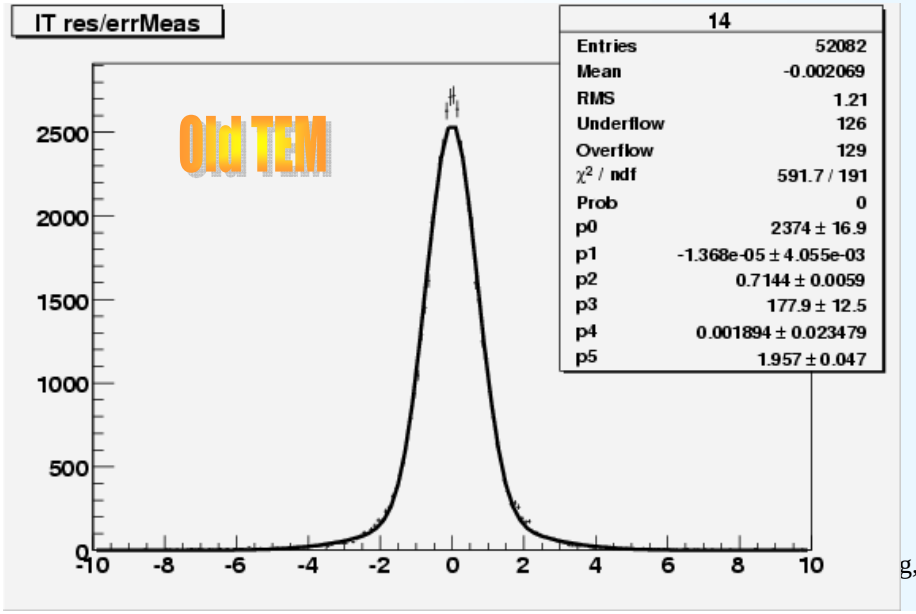
- Separate for OT, IT, Velo-R and Velo-Φ measurements

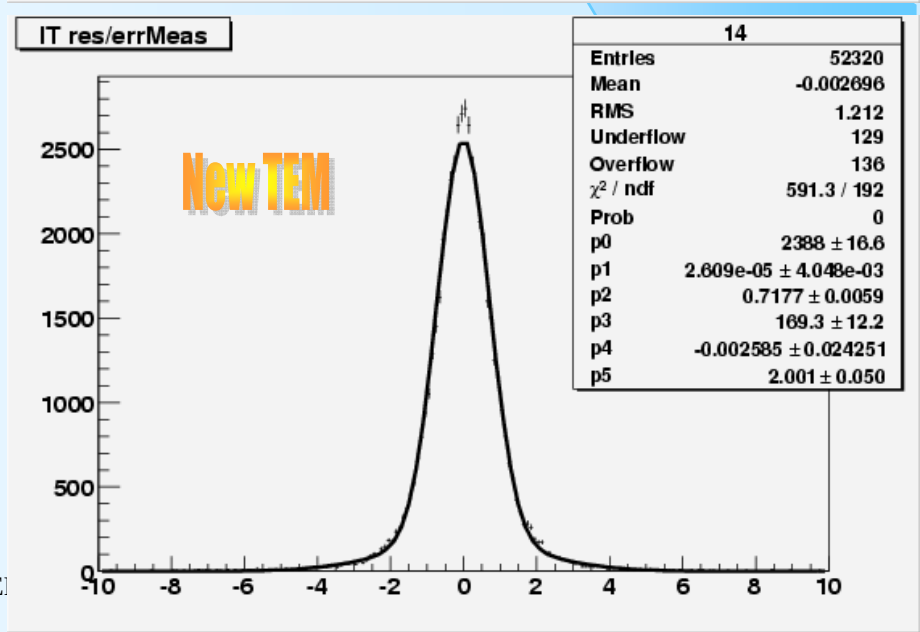
⇒ **plots produced looping over all pairs of (state,measurement), all at same z-positions, by construction**

OT & IT residuals/σ measurements

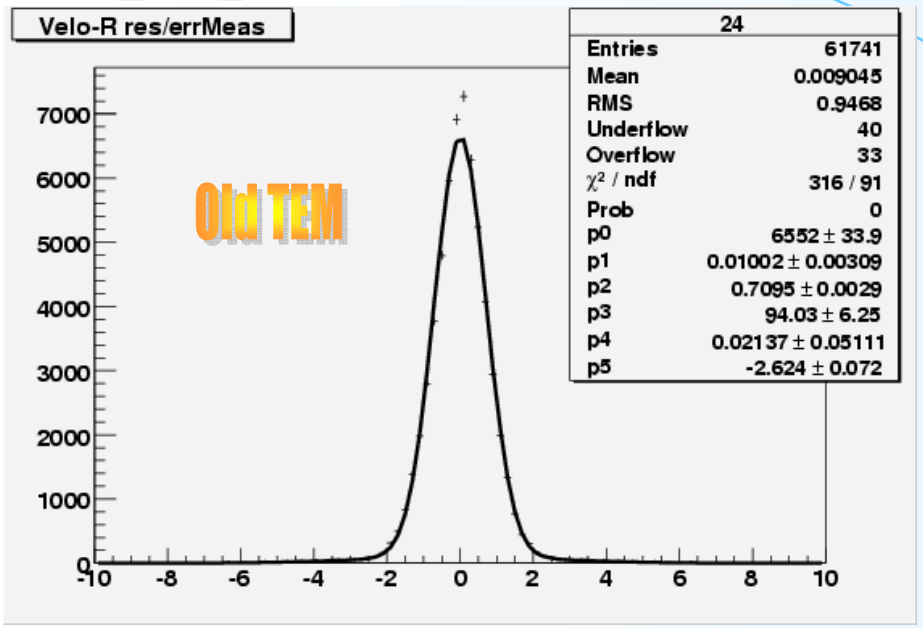


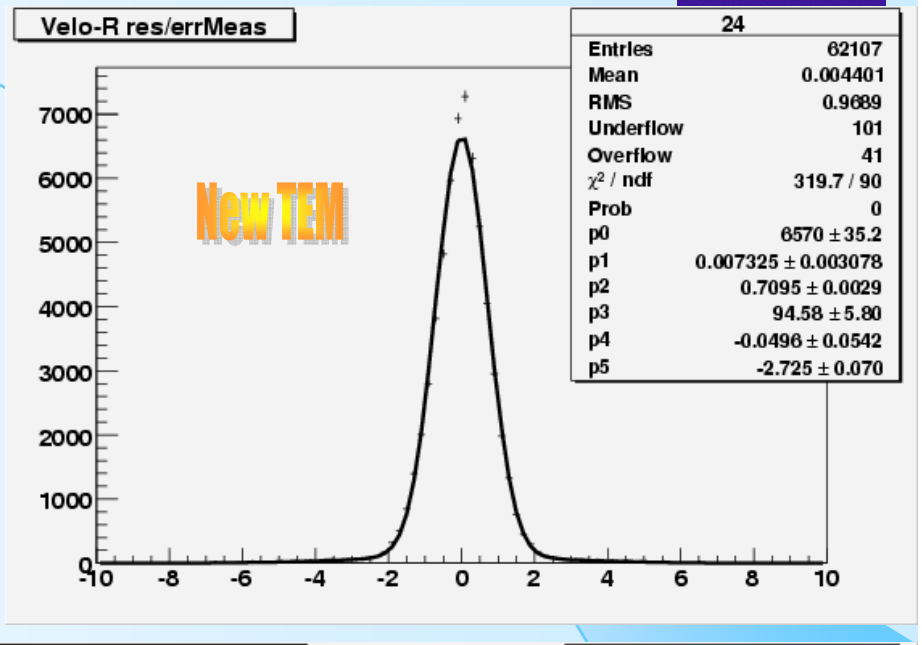


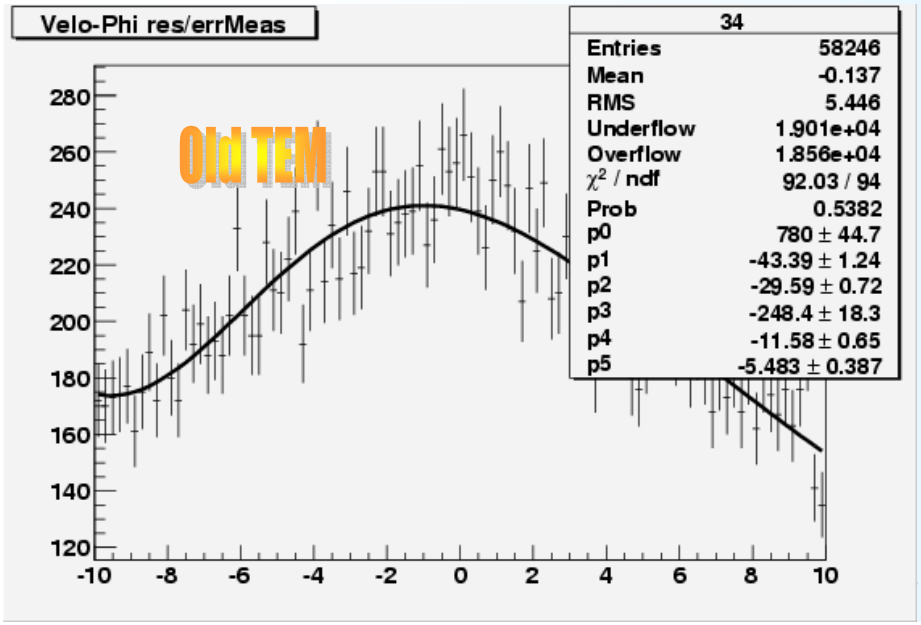


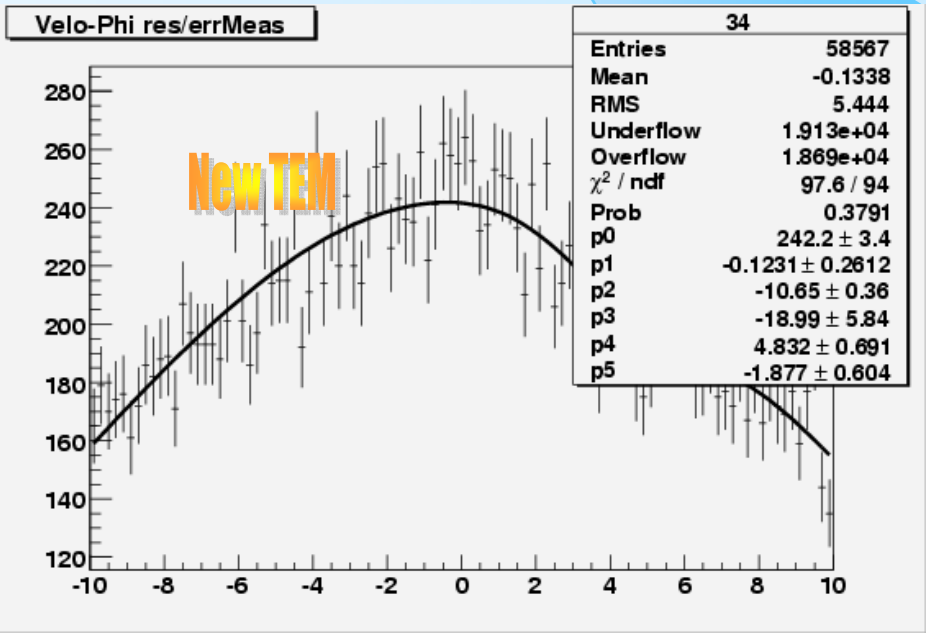


Velo-R & -Φ residuals/σ$_{measurements}$









Test/Validation of new Fitting Code

Conclusions of these tests:

- **The new TEM Kalman Filter package is now working!**

Remarks :

- **New KF package does not yet implement all the functionality of the old code**
  - ***Only downstream fitting implemented***
  - ***No outliers removal implemented***
  - ***Not yet possible to iterate filtering-smoothing sequence***

- **Timing not yet compared:**

  "first get a working version, then worry about timing"
- **Tests will continue until everything is understood …**

Final conclusion:

Back on Track !