

COT-dE/dx Status&Plans

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- Current Calibrations and UC
- Works in progress:
 - Short-term: new UC, 2nd iteration of corrections, improved model for $\sigma(dE/dx)$
 - Longer-term: improved hit-level calibrations

Current Calibrations

- **Hit-level:** Eiko/Dave/Nigel/Joel/Peter CDF6361
 - Pre 4.3 based (runs up to ≈ 145000)
- **Track-based:** Diego/Pierluigi et Al. CDF6932
 - 4.8 based (full statistic up to Sept.03 shutdown)
 - D^0 (D^* tagged), XFT/SVT biased
 - OK for $K/\pi/p$: XFT/SVT triggered, $|\eta| < 1$, $N_{\text{hits}}(dE/dx) > 42$
 - Some problems for low-Pt / non-XFT biased tracks
- **UC:**
 - Diego version: OK only for K/π XFT/SVT triggered $\rightarrow \beta\gamma \in [\sim 6, \sim 80]$
 - Pierluigi improved: OK also for p XFT/SVT triggered $\rightarrow \beta\gamma \in [\sim 2, \sim 10]$
 - $1/\beta^2$ and saturation regions not well described
- **Corrections available for general use in:**
 - TrackingCT/CT_DedxAnalysis
 - 5.3.1int1 \rightarrow Diego UC
 - dev \rightarrow Pierluigi improved (this friday)

Work in progress for summer analyses

- Overall strategy:
 - Stick as much as possible with the available calibrations
 - Test performances with 5.X data
 - 2nd iteration of track-based corrections if needed
 - Improved UC
 - For XFT-biased tracks → from exclusive modes
 - For non-XFT tracks (and low- p_T tracks) → combined fit COT-dedx, TOF and SI-dedx (powerful@low- p_T)
 - quantify COT-dedx performances and systematic uncertainties using multiple exclusive decays

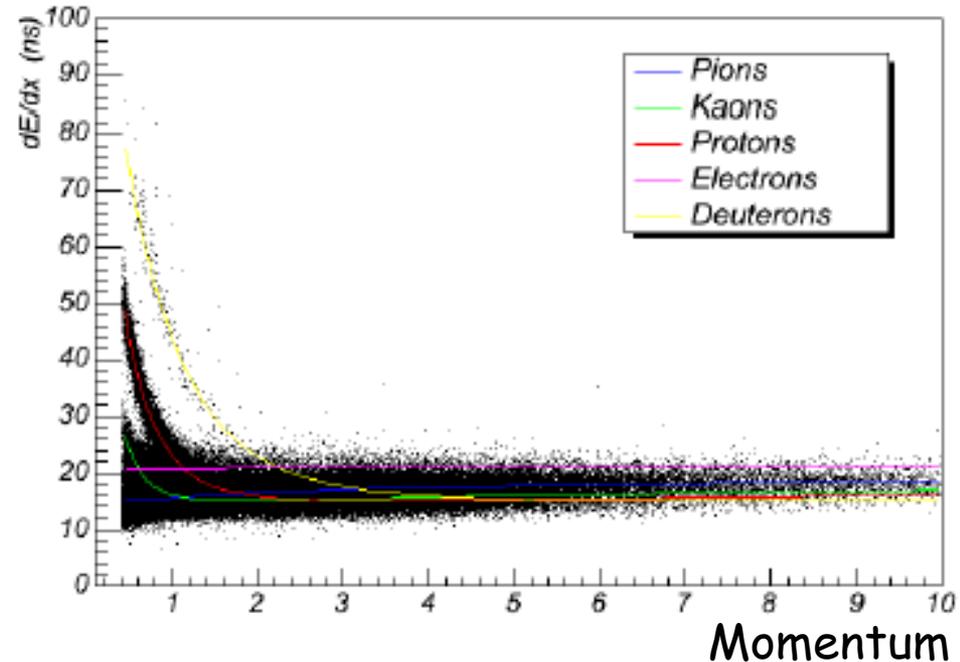
Using TOF-PID to fit UC for low- p_T tracks

Strategy:

- Use TOF to identify particles in $\sim 1/\beta^2$ region
- Assume UC is universal
- Simultaneous likelihood fit TOF&COT-dE/dx
- Use latest COT-dedx corrections

Advantages:

- Large statistic
- Optimal use of all the PID infos
- Useful in the TOF t_0 calculation
- Minimize biases due to BG subtraction in exclusive channels

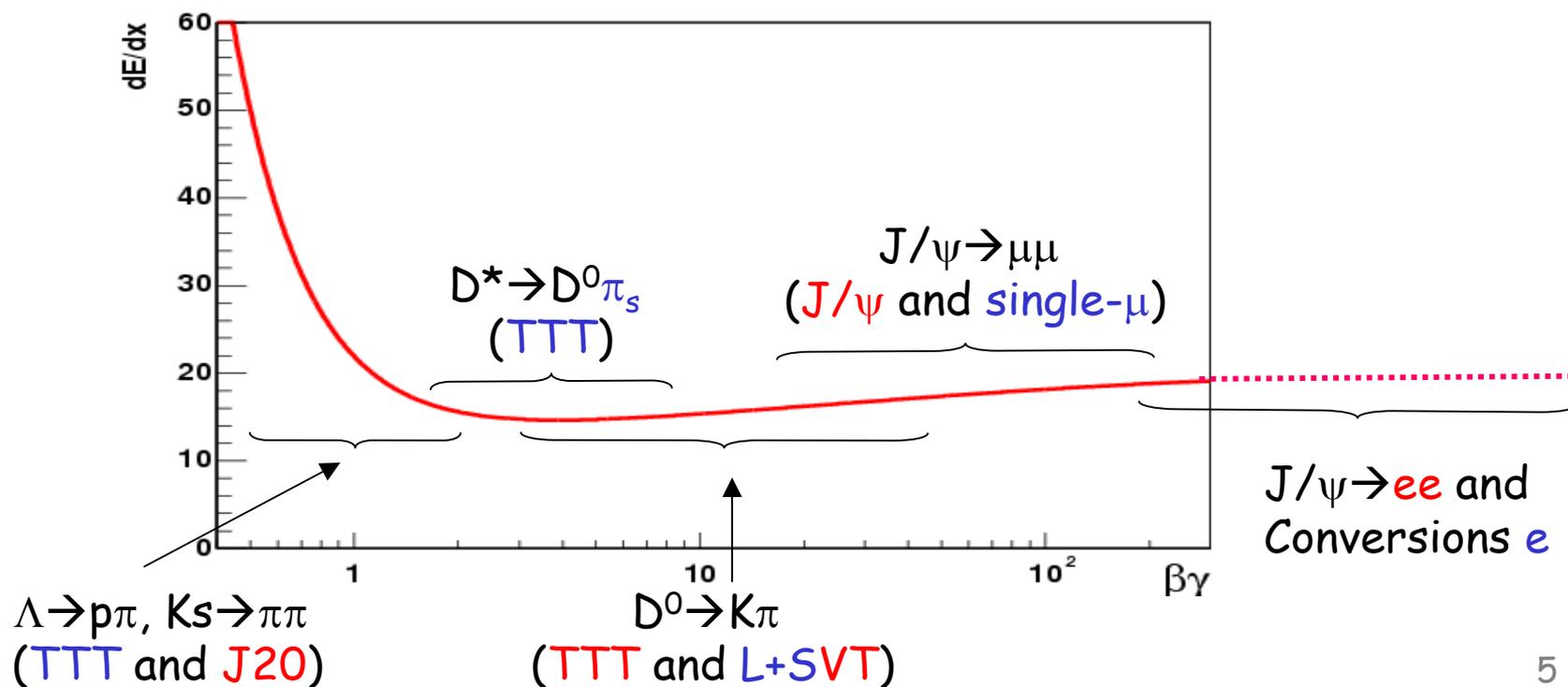


In progress:

- Improved model for $\sigma_{dE/dx}$
- Constraint TOF resolution using π_s from $D^* \rightarrow D^0 \pi_s$ decays and electron from conversions
- Separate fits for positive and negative tracks
- Extend momentum range
- Include SI-dE/dx

Using Exclusive Modes to fit UC for XFT-biased tracks & to measure performances of the low- p_T UC

- High S/B fully reconstructed modes selected by different triggers \rightarrow XFT-biased and non-XFT biased tracks
 - All particle species and full $\beta\gamma$ range
 - Measure residuals/pulls respect to the UC



Hit-level corr.: CT_DedxCalculator

Hit Merging

We need to check of everything works using hits from tracks instead of restoring

Elec. Pedestal

Current code fits a single offset for all channels (12ns)
10÷15% fluctuations in channel to channel width
→ Change to individual offsets

HV corr.

SL by SL, HV taken from DB
→ More automatic procedure, check if we can use CTMD

Hit Z pos. corr.

SL by SL

Correlated: path length attenuation effects

→ Still residual effects visible
→ might introduce sample dep.
→ Can be improved

$1/\sin\theta$ corr.

Only one global correction

$(\sin\alpha, d)$ corr.

SL by SL using 10x20 look-up table in $\sin\alpha \times d$
Includes also wire dependence corrections
→ bias in $\sin\alpha$ may induce charge dependence
→ should be revised (not clear how yet)

Pressure corr.

From CTMD, not needed anymore for run > 160458

How can be further improved?

- What is missing in current implementation:
 - Time dependent variations
 - Homogeneity in dE/dx response still unsatisfactory
- Two ideas at the moment seems the most viable solutions:
 1. [Dave]: use online width calibrations (currently not used) to intercalibrate electronic response
 - can be implemented in stage0
 2. [Jonathan]: use sample of tracks (ex. conversion- e , $K_S \rightarrow \pi\pi$) to check the width response (after all standard hit-level corrections applied) with a fine cell-granularity, and intercalibrate and balance dE/dx response in the full COT volume
 - granularity in time will depend on the available track statistics and the chosen cell size
- Advantages:
 - Logic and structure of `CT_DedxCalculator` unchanged
 - Much smaller track-based corrections needed
- Time scale: this summer