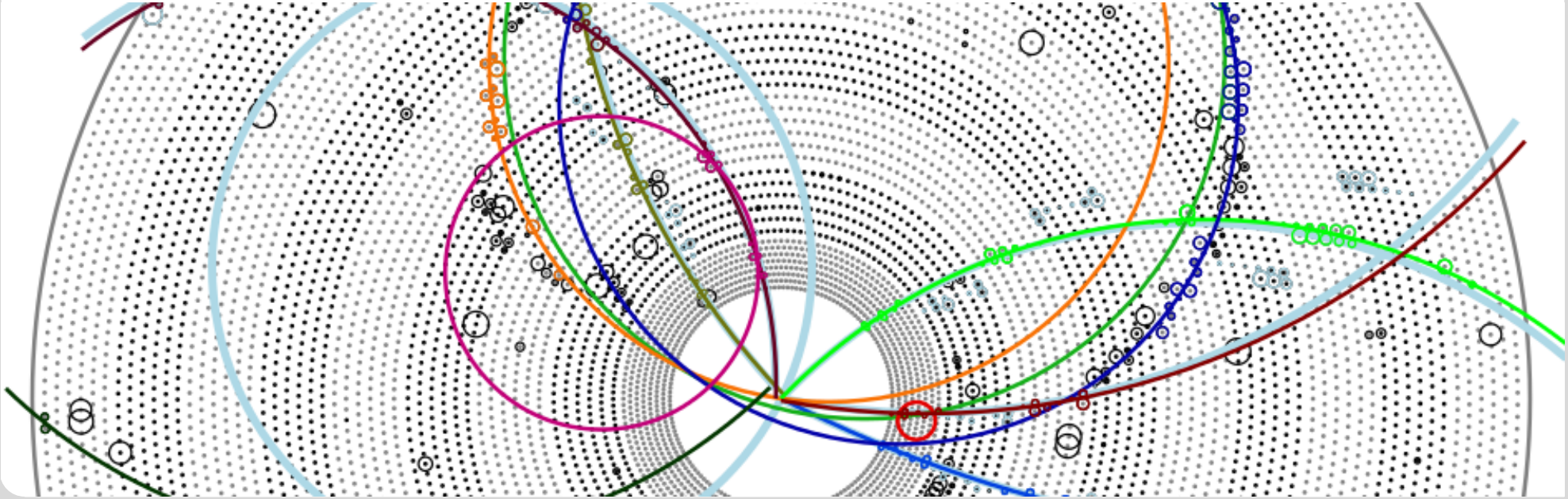
Karlsruher Institut für Technologie

# MC-Matching based on $\chi^2$ (cont).

Weekly Tracking Meeting.

Nils Braun | 20.01.2017

IEKP - KIT



# Recap: New MC-Matcher

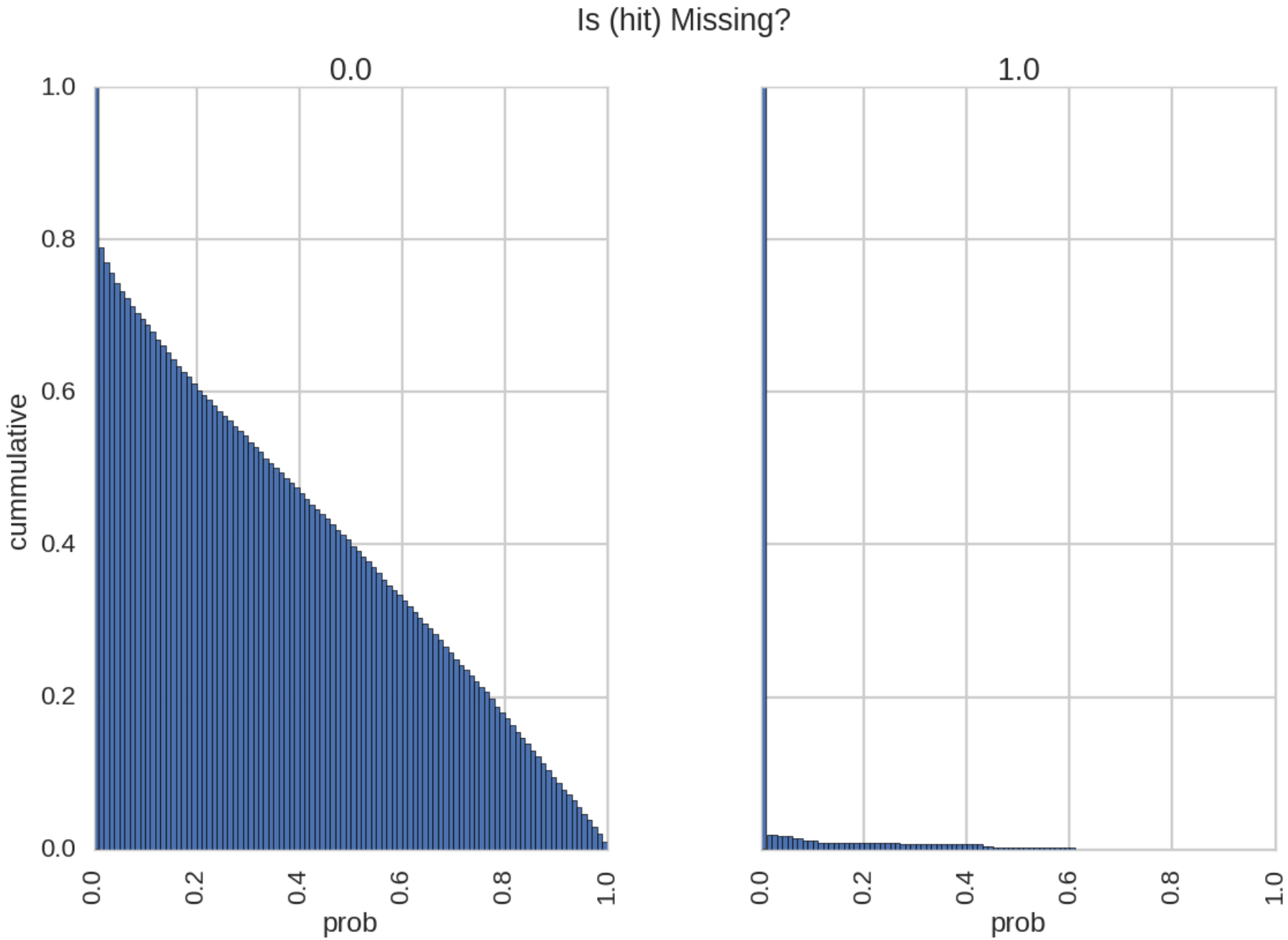
- Current matcher is based on hit-information - which is perfectly well for tracking studies, but may not be the information we want to "deliver" in the end.
- An additional matching based on the extracted tracking parameters may (?!) be better suited for the analysis people
- New matcher uses the fitted tracks (`Belle2::Track`), which is our final result.

# Recap: How does it work?

- I extracted a base class for the matcher, on which the hit-based and the parameter-based matcher are built on.
- Basic functionality taken from hit-based matcher (+ some generalization): extract a “confusion matrix” relating all MC and PR tracks (entries depend on implementation) and use it to classify as “fakes”, “clones”, etc.
- implementation for the parameter-based matcher:
  - Get the `TrackFitResult` for each PR track and extract a 5d-state (if fit failed, classify as “background”).
  - Extract the 5d-state also from the MC Reco Tracks.
  - Calculate the entry in the matrix with

$$\chi^2 = (s_{\mathrm{MC}} - s_{\mathrm{PR}})^T C^{-1} (s_{\mathrm{MC}} - s_{\mathrm{PR}})$$

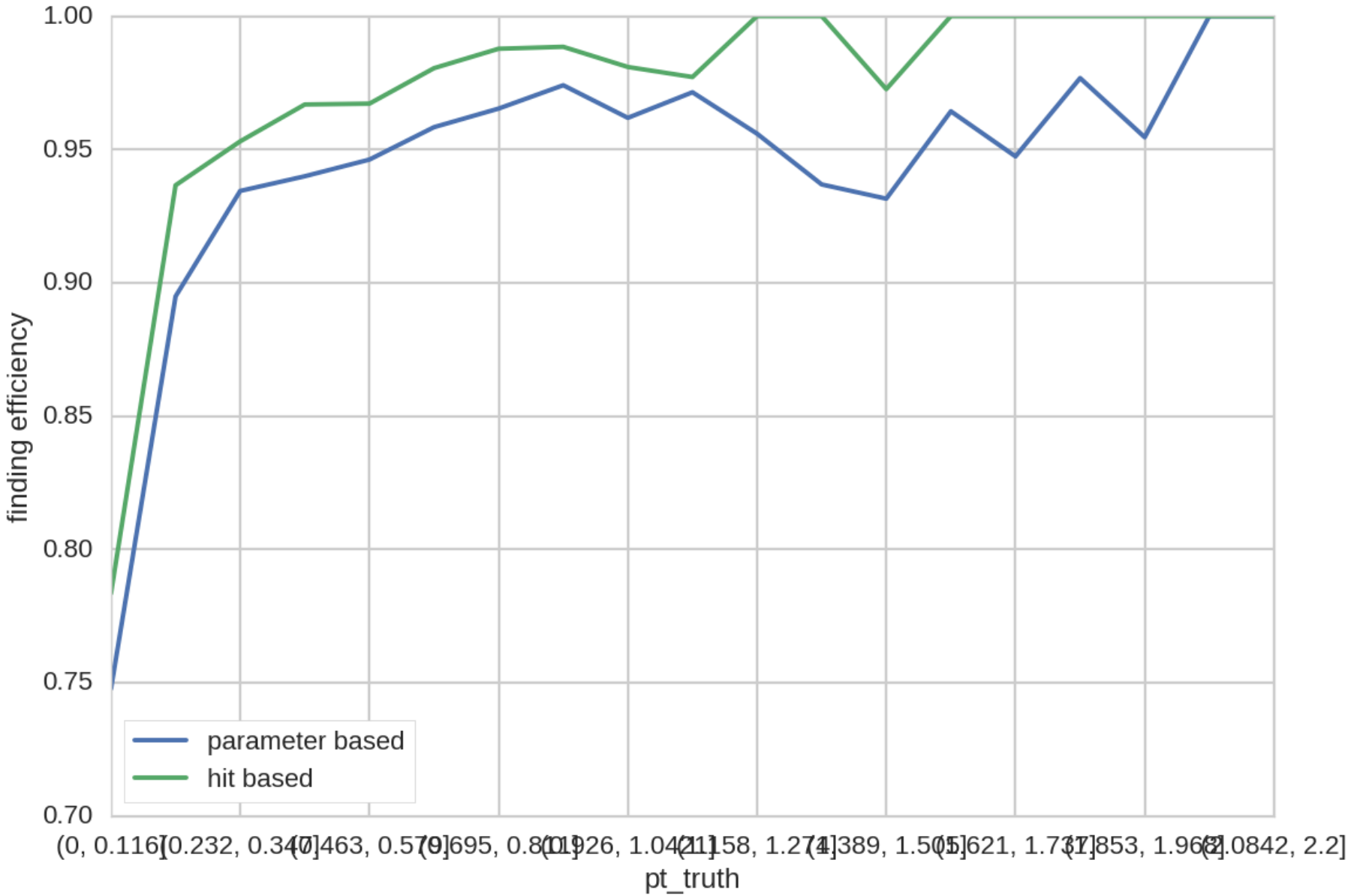
    (precisely use the **probability**)
- After that, the same rules apply as for the hit-based matcher (best match is called “found”, rest is clone. If probability is **below** $10^{-6}$, do not make the relation ...).




(1000 BB events, only primaries, full state)

# Numbers

| | clone rate | finding e. | fake rate |
|---|---|---|---|
| MC, mu, parameter | 0.000000 | 0.997998 | 0.002002 |
| MC, bb, parameter | 0.016185 | 0.969248 | 0.014806 |
| mu, hit | 0.025366 | 1.000000 | 0.000975 |
| mu, parameter | 0.026316 | 1.000000 | 0.000000 |
| bb, hit | 0.106921 | 0.943612 | 0.176417 |
| bb, parameter | 0.273871 | 0.915756 | 0.016963 |

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