# VXD Hit Recovery for Belle 2

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# Update

- Conical code commited to genfit2 svn and basf2 updated (thanks to Tobias)
- Code commited to repo (with an example script)
  - In tracking/modules/cdcToVXDExtrapolator
- Extrapolation to layers stored in map, now module adds negligible time to do module extrapolation and search module width for hits
  - Was previously re-extrapolating for each hit on a module
- Found bug in my scripts causing PXD hits to not be included, fixed and added option to extrapolate to pixel layers

# Timing

```
===================================================================================
Name                    |  Calls | Memory(MB) |  Time(s) |    Time(ms)/Call
===================================================================================
RootInput               |   1001 |         -1 |    89.17 |    89.08 +- 122.73
Progress                |   1000 |          0 |     0.02 |     0.02 +-   0.01
Gearbox                 |   1000 |          0 |     0.01 |     0.01 +-   0.00
Geometry                |   1000 |          0 |     0.01 |     0.01 +-   0.00
SetupGenfitExtrapolation|   1000 |          0 |     0.01 |     0.01 +-   0.00
Trasan                  |   1000 |         12 |   997.56 |   997.56 +- 752.51
VXDTF                   |   1000 |        232 |   144.18 |   144.18 +- 485.10
MCTrackCandCombiner      |   1000 |          0 |    22.58 |    22.58 +-   4.28
GenFitter               |   1000 |         68 |   596.40 |   596.40 +- 286.40
CDCToVXDExtrapolator     |   1000 |         44 |    97.25 |    97.25 +- 107.02
TrackBuilder            |   1000 |        105 |    10.38 |    10.38 +-   4.91
V0Finder                |   1000 |          2 |    32.23 |    32.23 +-  18.53
...
===================================================================================
Total                   |   1001 |        462 |  1997.64 | 1995.65 +-1050.44
===================================================================================
```

- Timing for a setup where I, for each layer:
  - Extrapolate to the layer cylinder
  - Look for hits, re-extrapolate to sensor for compatible hits (within n $\sigma$)
  - SVD+PXD+all layers search (PXD search requires at least one hit to be found in SVD)
- With the new setup, can add reextrapolation to sensors and stay on avg. under 100ms/events
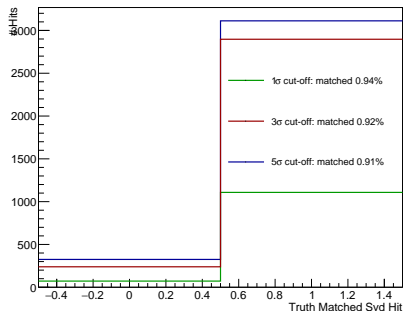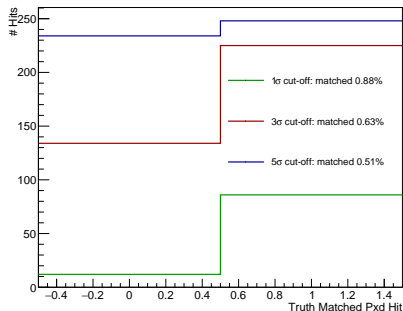
- Sample is $B^{\pm} \to DK^{\pm}$, $D^0 \to K_S \pi^+ \pi^-$ w/background included by:
  bkgFiles = glob('/sw/belle2/bkg/*root')
- 1000 events, 2247 cdc-only tracks, 1387 with recoverable hits
- Same hit $\sigma$ requirements on PXD & SVD but we search all SVD layers, only look for PXD if a SVD hit found
- Qn: what is an appropriate measure to tune cuts for/validate on?
  - Recovery efficiency? Purity? Physics object improvments?