Decay search

| Head (exactly): ▾ | Decay head | ⌄ | Contains (all of): ▾ | Particles in decay... | ⌄ | Show only selected: ☐ |

| Event Type | ⌄ | Production Method | ⌄ | Production Cuts | ⌄ |

$\pi^0 \to \gamma\gamma$

Event Type: 56200001 | ?

$\pi^0 \to (H_3^0 \to e^+e^-)\gamma$

12 DecFiles

$K^- \to e^+e^-\pi^-$

Event Type: 37123000 | ? | Event Type: 37123001 | ?

$K^- \to e^-e^-\pi^+$

Event Type: 37123010 | ? | Event Type: 37123011 | ?

$K^+ \to e^+e^+\pi^-$

LHCb Simulation Wizard

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Agenda

This Barbie is making simulations accessible.

Open Data & Accessibility

LHCb Simulation Wizard

Workflow

Metadata

Decay Search

Wizard Outcomes

LHCb vs Open Data
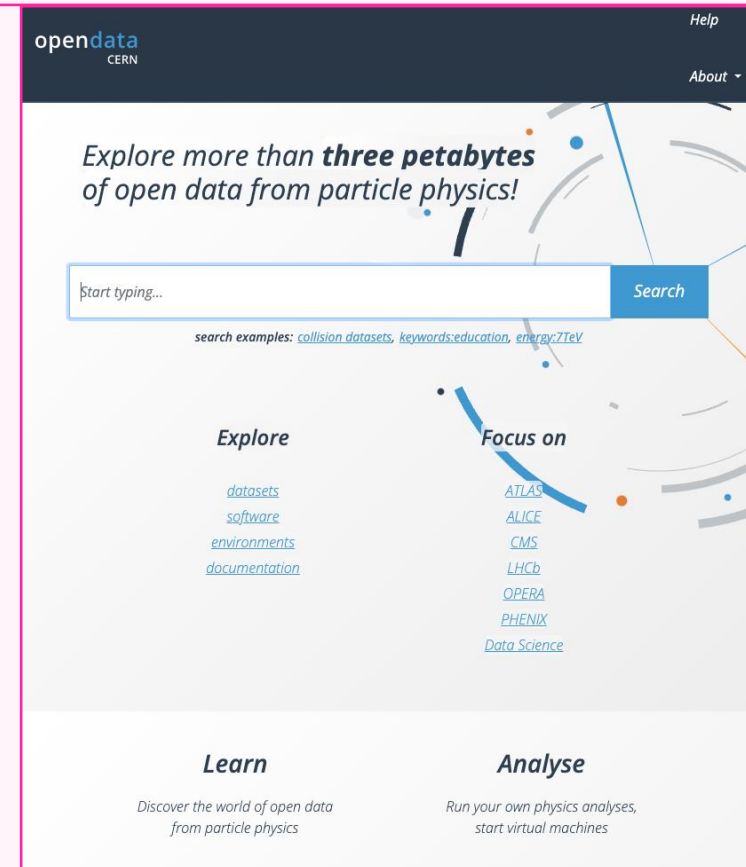
Annotated Decfiles

LHCb Simulation Wizard

A web tool designed to make it easier for people to access existing simulation samples and request/produce new ones.

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Open Data & Accessibility

All CERN research should be fully accessible, inclusive, democratic and transparent.

"able to technically get to the file" != accessible

Accessibility is about removing barriers to access – reducing the learning curve.

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NTuple Wizard vs Simulation Wizard

The same core structure – SW has the NW as a dependency.

NW configures a production of derived data-sets suitable for physics analysis ("ntuples").

5

Metadata

simulation_decay.json: keys are decays, and contains decay descriptors and event types.

decfiles.json: keys are event type, and contains Decfile-specific information.

Metadata came from parsing all 7800 Decfiles using the underline decaylanguage package from scikit-hep.

```
"13506001": {
  "text": "# EventType: 13506001\n#\n# Descr
  "signal_particles": [
    "B_s0",
    "B_s~0"
  ],
  "full_decays": [
    "B_s0 -> (tau+ -> nu_tau~ pi+ pi+ pi-) (
    "B_s~0 -> (tau+ -> nu_tau~ pi+ pi+ pi-)
  ],
  "production": "Pythia8",
  "cuts": [
    "DaughtersInLHCb"
  ]
},
"13506002": {
  "text": "# EventType: 13506002\n#\n# Descr
  "signal_particles": [
    "B_s0",
    "B_s~0"
```
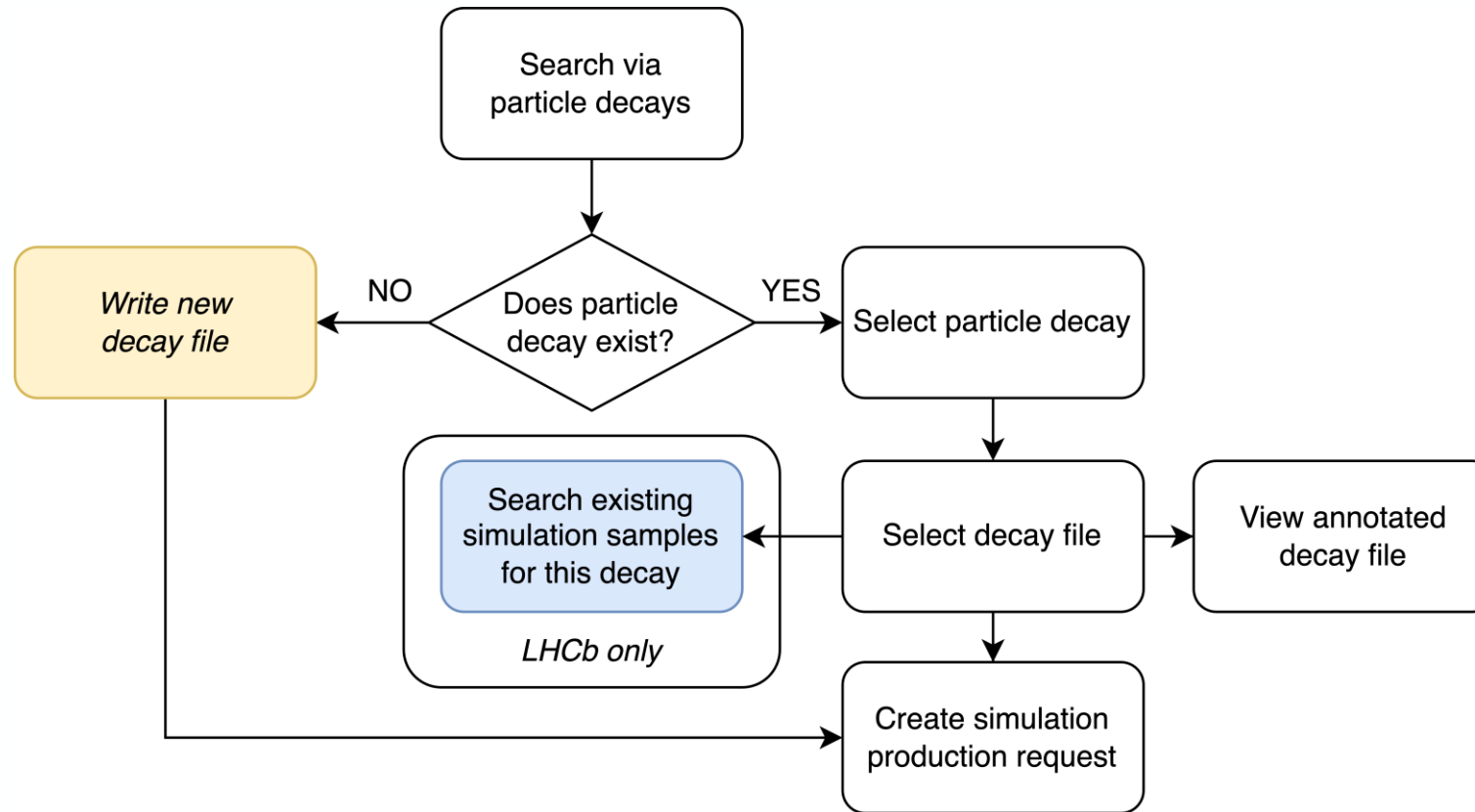
Workflow

Decay search

Filters:

- Decay head

- Particles in decay

- Event Type

- Production Method

- Production Cuts

Selection is via **Event Type**, not decay.

Annotated Decfile

Annotated Decfile   ✕

```
# EventType: 37113020
#
# Descriptor: {[K+ => pi+ e- mu+]cc, [K+ => pi+ mu- e+]cc}
#
# NickName: K+_pi+e-mu+=DecProdCut
#                 ┌─────────────────────────┐
# Cuts:  D        │ Specifies which one of a │
#                 │ predetermined set of cut │
# Documentation:  │      tools are used.     │ e- mu+ (LFV)
# EndDocumentation└─────────────────────────┘
#
# PhysicsWG: RD
# Tested: Yes
# Responsible: Lukas Calefice
# Email: lukas.calefice@cern.ch
# Date:    20210117
# CPUTime: 2 min
#
Decay        K+sig
  0.500      pi+ e- mu+      Phsp;
  0.500      pi+ e+ mu-      Phsp;
Enddecay
CDecay K-sig
#
End



# EventType: 37113020
#
# Descriptor: {[K+ => pi+ e- mu+]cc, [K+ => pi+ mu- e+]cc}
#
# NickName: K+_pi+e-mu+=DecProdCut
#
# Cuts: DaughtersInLHCb
#
# Documentation: Forces a K+ to pi+ e- mu+ (LFV)
# EndDocumentation
#
# PhysicsWG: RD
# Tested: Yes
# Responsible: Lukas Calefice
# Email: lukas.calefice@cern.ch
# Date:    20210117
# CPUTime: 2 min
#
Decay        K+sig
  0.500      pi+ e- mu+      Phsp┌────────────────────┐
  0.500      pi+ e+ mu-      Phsp│ Class to handle generic│
Enddecay                         │ phase space decays not │
CDecay K-sig                     │   done in other decay  │
#                                │        models..        │
End                              └────────────────────┘
```
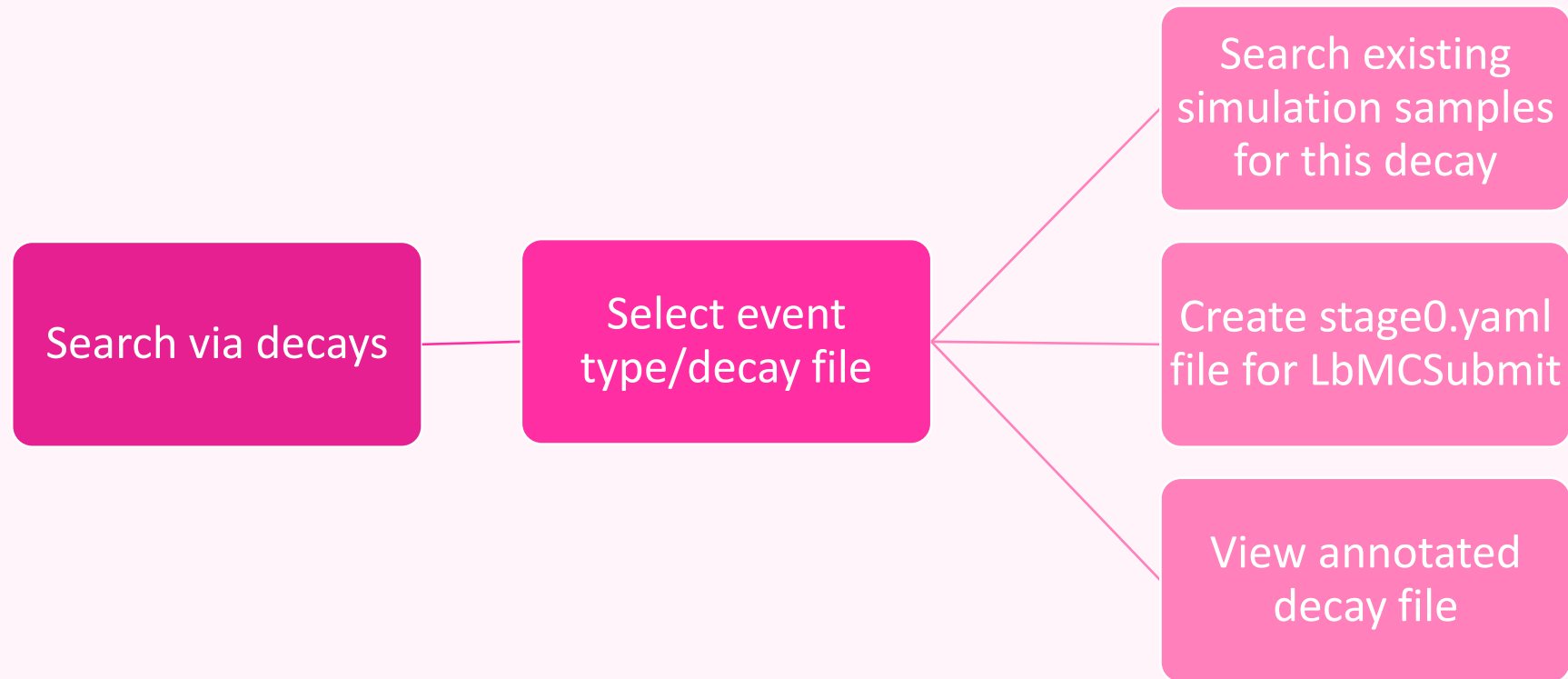
Close

Whole raw text of decay file viewable in a pop-up modal.

Keywords all have hover-activated pop-ups that give definitions.

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Wizard Outcomes

Search via decays → Select event type/decay file →

- Search existing simulation samples for this decay
- Create stage0.yaml file for LbMCSubmit
- View annotated decay file

LHCb vs Open Data

LHCb Users

- Can get a list of bookkeeping paths

- Can use the YAML file to make a production request directly using <u>the MC Request repository</u>.

Open Data Users

- Have to find a way to produce samples themselves (but all necessary information is contained in the output of LbMCSubmit) – we are **not** taking production requests!

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References

Software repositories:

- Simulation Wizard
- NTuple Wizard
- DecFiles

Papers & Posters:

- NTuple Wizard Paper
- Simulation Wizard Poster

LHCb Simulation Wizard

Thank you

Special thanks to my supervisors, Adam Morris and Chris Burr, and the summer student team.

Any questions?

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This Barbie is making simulations accessible.

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