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L0Muon lookup-table gotchas

This page tries to collate some of the wisdom about the L0Muon FOI lookup table and how to correctly emulate L0Muon.

There is a lookup table, which is stored in ParamFiles:

https://svnweb.cern.ch/trac/lhcb/browser/Param/trunk/ParamFiles/data

The version number can be set explicitly with the lines:

```python
from Configurables import L0Conf
L0Conf().L0MuonForceLUTVersion = "V4"
```

The default value is set by the DataType:

https://svnweb.cern.ch/trac/lhcb/browser/LHCb/trunk/L0/L0DU/python/L0DU/Configuration.py?rev=194870#L450

and is (currently) v1 for 2009-11, v3 for 2012 and v8 for 2015. The 2015 default was introduced in L0/L0DU v10r34, which was included in LHCb v39r1. In older versions there is no explicit default for the 2015 datatype and the default picked up is v3, which is unlikely to be desirable (https://svnweb.cern.ch/trac/lhcb/browser/LHCb/trunk/L0/L0Muon/src/component/L0MuonAlg.cpp?rev=194870#L86).

- v7 corresponds to 2015 data in fills starting with 3981
- v8 is the MC version of v7, which is different because of the new 50 MeV step size

Note that this means the default in the above code (v8) is not what you want for emulating L0Muon on 2015 [nobias] data (v7).

All of this relates to the emulation of L0Muon by L0App. This is obviously neccessary in order to process MC with L0, but is often done on real data as well (where it is not normally neccessary, because L0 information from the pit is already present). A modified version of L0App () (by Julien Cogan) is available here:

https://gitlab.cern.ch/olupton/HLT-test-scripts/blob/master/NoBias/L0-L0App-python-L0App-Configuration.py

This adds the L0App ().ReplayL0DUOnly option, which allows one to calculate the L0 decisions (i.e. apply cuts to existing ADC counts) without emulating the ADCs themselves. This can be used to avoid emulating L0Muon on real data and, therefore, sidestep issues with the LUT version.

Extra information from email exchanges

Some extra information copied from email threads:

- v8 is the MC version - it was simply introduced to get the correct step sizes. More details below:

To get the 50 MeV bins (the new steps size), you need to use LUT V4 (not using any alignment constant) or V5 (using the same alignment constant as...
V3, i.e. 2012 geometry).

The Muon geometry used in the simulation is not the one used to make any of the existing LUT. One part of the muon alignment is not taken into account by the simulation but is of course used to make the LUT used in the data taking.

I think the best is to make yet another LUT specific for the 2015 simulation. I'll try to do it today. (ed: this is referring to what became v8?)

One would then need to use the corresponding LUT version to configure the L0Muon emulator.