

# LODU checking and DC'04 data

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## In short ...

### Software package:

- LOChecker

### Checks on DC'04 data:

- output rate on minimum bias
- comparisons with TDR efficiencies

### Proposal:

- new tuning of the thresholds

# LOChecker package (1/2)

## Purpose:

- check the performance and provide information for subsequent studies of LO

## Main checks:

- LO output rate
- rates after the global event cuts
- inclusive and exclusive sub-trigger rates
- $E_T$ /  $P_T$  distributions of the LO calorimeter and muon candidates
- Monte Carlo association to the LO calorimeter and muon candidates
- **NEW:** *check the performance of a given physics selection algorithm*

## Extra information:

- algorithm is configurable
  - ↳ histograms produced by default
  - ↳ an ntuple can also be produced if requested

## Configurable options

```

ApplicationMgr.DLLs      += { "L0Checker" };
ApplicationMgr.TopAlg    += { "L0Check" };

L0Check.OutputLevel     = 3;

// produce histograms?
//L0Check.HistogramFlag = false;      // default = true

// produce ntuple?
//L0Check.NtupleFlag    = true;        // default = false
//L0Check.NtupleName    = "1";        // default = ""

// check the L0 performance of a given physics selection algorithm?
//L0Check.CheckSelFlag  = true;        // default = false
//L0Check.PhysSelAlgoName = "";

// configurable options of the "VisPrimVertTool" tool (here set to their defaults)
// L0Check.VisPrimVertTool.TrackNum = 2;
// L0Check.VisPrimVertTool.VeloAndSeed = true;
// L0Check.VisPrimVertTool.OutputLevel = 3;

```

← Only 2 lines needed for "standard" run

# L0Checker output (1/2)

```

L0Check      INFO ===== L0Check Settings =====
L0Check      INFO   Produce histograms           : 0
L0Check      INFO   Produce ntuple              : 1
L0Check      INFO     - Ntuple name                    : 1
L0Check      INFO   Check physics selection result : 1
L0Check      INFO     - Selection algorithm name      : TDRselBs2MuMu
L0Check      INFO =====
L0Check      INFO
HbookNFileCnv INFO Opened NEW HBook RZ file:13112000_ntuples.hbook as FILE1
L0Check      INFO Ntuple booked in location "/NTUPLES/FILE1/L0/L0Check/1"
L0Check      INFO Global Event Cuts used by L0 "DecisionUnit":
L0Check      INFO   --> SumEt cut                       :    5.00 GeV
L0Check      INFO   --> PuVeto SumPeak2 cut:              3
L0Check      INFO   --> PuVeto Mult. cut                 :    112
L0Check      INFO   --> SPD Mult. cut                   :    280
  
```

# L0Checker output (2/2)

```

0Check          INFO ===== L0Check Summary =====
L0Check          INFO   Total # of events :      20500
L0Check          INFO   -----
L0Check          INFO   L0-pass      :   75.29 %   ( 15434)
L0Check          INFO   -----
L0Check          INFO   Hadron      :   12.86 %   ( 2636)   excl  2.62 %   (   538)
L0Check          INFO   Electron    :    2.07 %   (   424)   excl  0.14 %   (    28)
L0Check          INFO   Photon      :    1.66 %   (   340)   excl  0.12 %   (    25)
L0Check          INFO   Pi0 Local   :    2.11 %   (   433)   excl  0.04 %   (     9)
L0Check          INFO   Pi0 Global  :    2.68 %   (   550)   excl  0.09 %   (    19)
L0Check          INFO   Any Pi0     :    3.30 %   (   676)   excl  0.17 %   (    34)
L0Check          INFO   Muon        :   49.56 %   ( 10159)   excl  0.54 %   (   110)
L0Check          INFO   Sum Muon    :   70.79 %   ( 14512)   excl 21.87 %   (   4484)
L0Check          INFO   -----
L0Check          INFO   Veto from
L0Check          INFO   Global Event Cuts      :   31.97 %   ( 6553)
L0Check          INFO   * SumEt Cut            :    2.52 %   (   516)
L0Check          INFO   * Global Veto Cuts     :   29.52 %   ( 6051)
L0Check          INFO   - Pile-Up Veto (SumPeak2) :   26.62 %   ( 5458)
L0Check          INFO   - Pile-Up Multiplicity :    6.98 %   ( 1430)
L0Check          INFO   - Spd Multiplicity     :    7.26 %   ( 1489)
L0Check          INFO   -----
L0Check          INFO   L0 performance on
L0Check          INFO   "B_s0->mu+mu-"      ("TDRselBs2MuMu" algorithm)
L0Check          INFO   * efficiency = ( 98.1 +/- 0.3) %
L0Check          INFO   - selection-pass      :   1892
L0Check          INFO   - (L0 and selection)-pass :   1856
L0Check          INFO   =====

```

# Checks on DC'04 data (1/2)

**With the TDR settings:**

- L0 output rate on minimum bias events only 900 kHz

➤ re-tuning (roughly keeping same bandwidth division) to get rate back to nominal 1 MHz ...

**New proposed L0 settings:**

-----	
New L0 cuts (GeV)	
-----	
Hadron	= 3.50
Electron	= 2.60
Photon	= 2.30
Pi0 Local	= 4.30
Pi0 Global	= 3.70
Muon	= 1.30
Di-muon	= 1.50
Sum Et	= 5.00
VetoSumPeak2	= 3.00
VetoMult	=112.00
SpdMult	=280.00

# Checks on DC'04 data (2/2)

**With new tuning:**

Channels	L0 eff. (%) new settings	L0 eff. (%) TDR values
$B_d \rightarrow \pi\pi$	$53.1 \pm 0.9$	$53.6 \pm 0.4$
$B_d \rightarrow K\pi$	$54.3 \pm 0.8$	$54.1 \pm 0.8$
$B_s \rightarrow KK$	$53.3 \pm 0.8$	$51.8 \pm 0.3$
$B_d \rightarrow D^*\pi$	$51.0 \pm 1.0$	$49.0 \pm 1.1$
$B_d \rightarrow J/\Psi(\mu\mu) K_s$	$93.5 \pm 0.5$	$89.3 \pm 0.5$
$B_d \rightarrow K^*\mu\mu$	$95.5 \pm 0.6$	$93.6 \pm 0.7$
$B_s \rightarrow \phi\gamma$	$72.1 \pm 1.7$	$69.6 \pm 1.6$

Bandwidth on minimum bias events (kHz)	new settings	TDR values
HCAL	665	705
ECAL	275	282
MUONS	216	161