

# Status Report on Detector Performance Note

CLICdp Collaboration Meeting 2018

Emilia Leogrande, André Sailer, Matthias Weber  
(CERN)

Latest version on gitlab: all suggestions by the advisory committee implemented and committed into

[https://gitlab.cern.ch/CLICdp/Publications/DraftDocuments/Note\\_DetectorPerformance](https://gitlab.cern.ch/CLICdp/Publications/DraftDocuments/Note_DetectorPerformance)

## Physics Performance

- 4.1 Simulation and Reconstruction . . . . .
  - 4.1.1 Event Generation . . . . .
  - 4.1.2 Detector Simulation . . . . .
  - 4.1.3 Event Reconstruction . . . . .
  - 4.1.4 Treatment of  $\gamma\gamma \rightarrow$  hadrons Background . . . . .
- 4.2 Performance for Lower Level Physics Observables
  - 4.2.1 Single Particle Performances . . . . .
  - 4.2.2 Performances for Complex Events . . . . .
  - 4.2.3 Jet Energy Resolution . . . . .
  - 4.2.4 Flavour Tagging . . . . .
  - 4.2.5 Performance of Very Forward Calorimetry . . . . .
  - 4.2.6 Forthcoming Studies and Improvements . . . . .

## Study many objects:

**Tracking:** impact parameter &  $p_T$  resolutions, efficiencies (with and without background)

## Flavour tagging

## Single particle performance:

Lepton identification with and without background

## Electron Reconstruction in Lumi & BeamCal

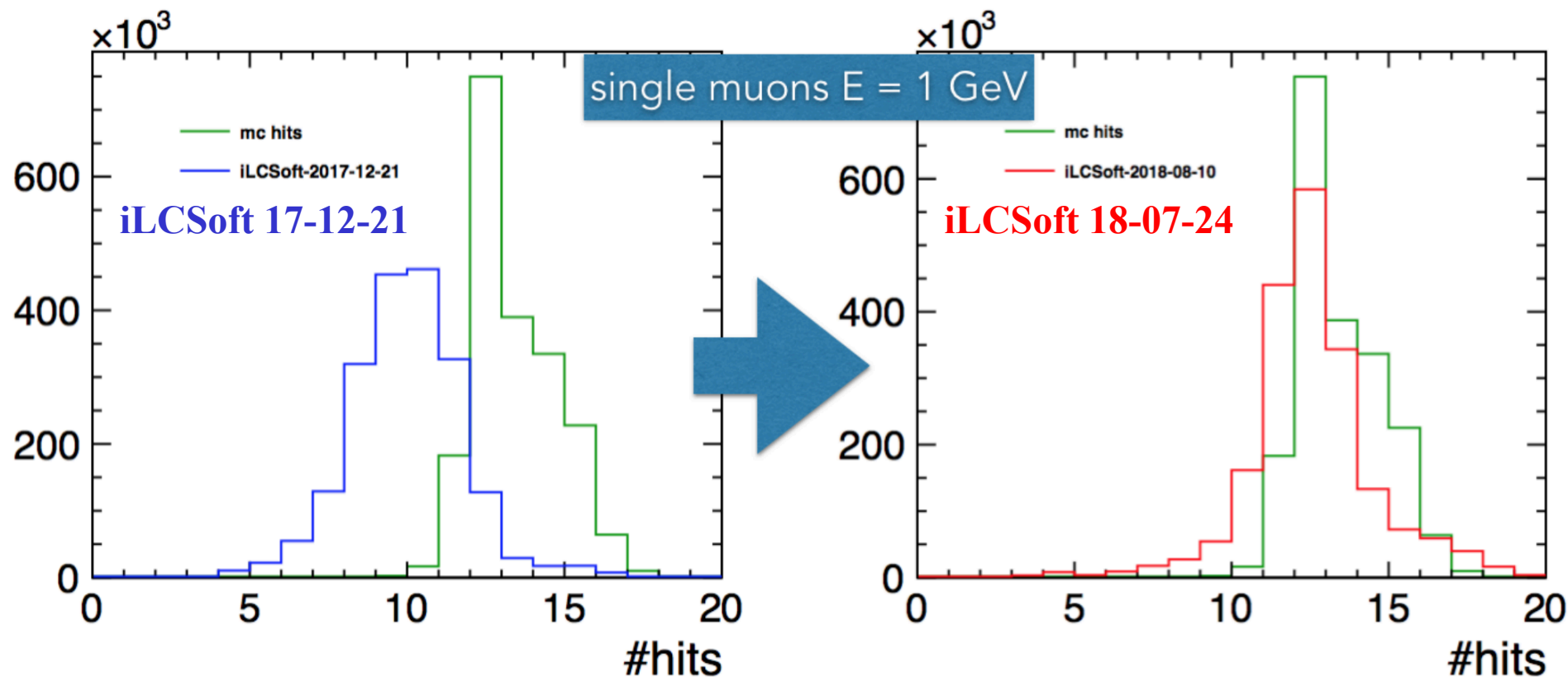
## Jet Energy Resolution (without BG)

## MET Resolution with and without BG

# Lots of additional work: Prompt Tracks



All issues for prompt tracks (treatment of split and clone tracks) are resolved  
→ see Emilia's talk this morning in Software session

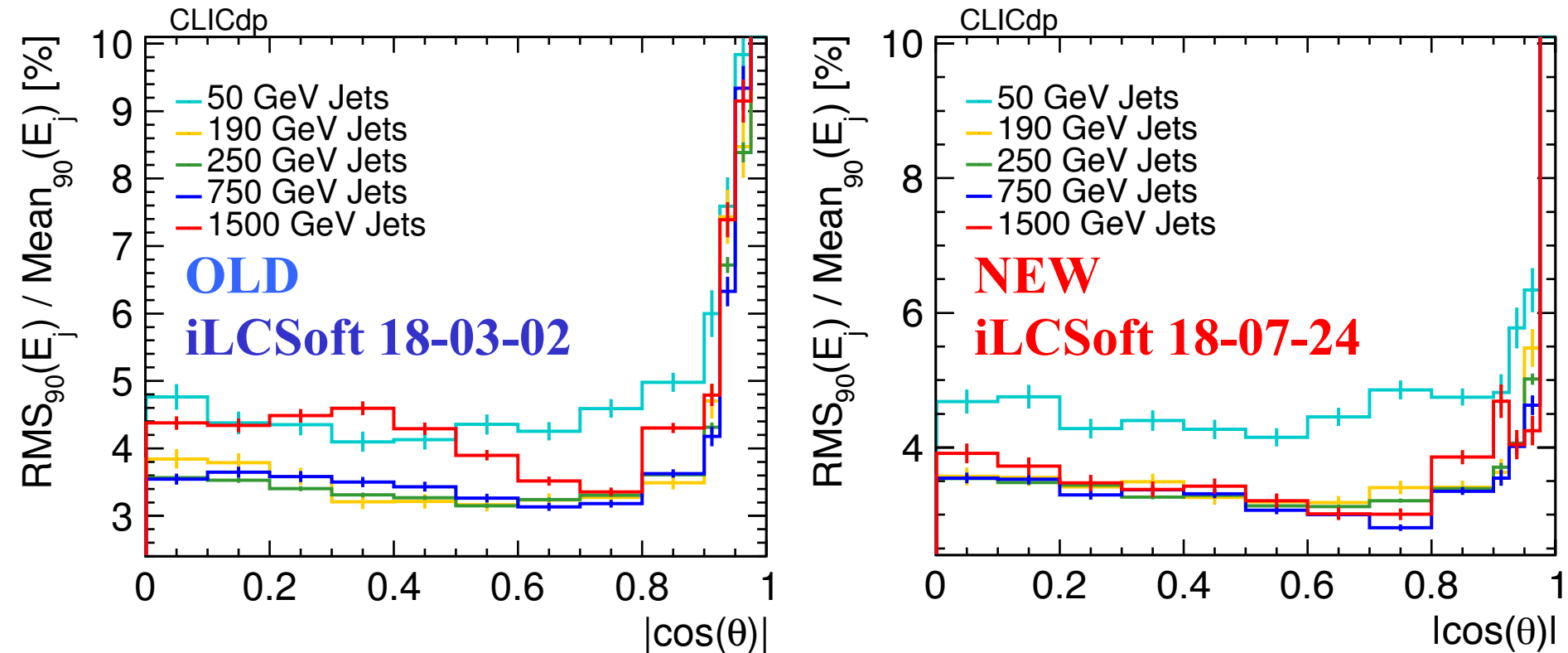


Excess tracks reduced for single muons from 5% down to 0.3 %, for  $b\bar{b}$  events from 25 % to 6 %

# Impact of Prompt Tracks on Jet Reconstruction



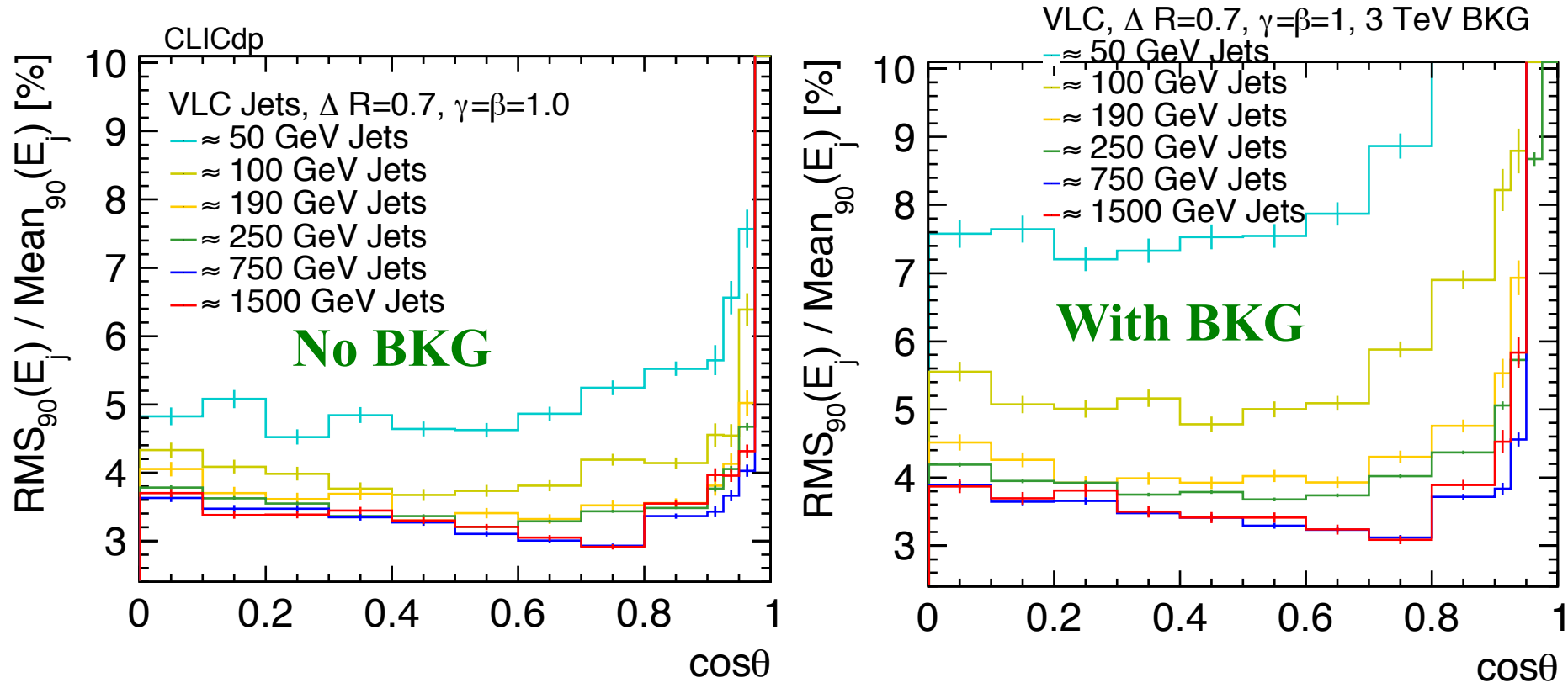
Big impact of tracking modifications on jet energy resolution



Clear improvement of jet energy resolution for high jet energies 4.5 %  $\rightarrow$  3.5-4 % due to track modifications

Significant improvement in jet energy resolution for forward jets (better tracking for boosted jets)

# NEW: jets with background



**NEW: impact of  $\gamma\gamma \rightarrow \text{hadrons}$  on jet energy resolution (3TeV conditions)**

→ for 100 GeV increase from 4 % from 5-5.5% in barrel, 7 % in endcap)

At high energy mild increase, besides for very forward jets

Work in progress: conformal tracking for displaced tracks → b-tagging  
→ see Emilia's talk this morning in Software session

Add W/Z mass separation plots

Add and discuss plots for first energy stage, including plots for beam background levels for 380 GeV machine

- Track efficiency plots for 380 GeV dijet events with and without BG
  - Jet Energy resolution plots for various jet energies with 380 GeV BG levels
- So far discussed impact of 3 TeV background levels only

Timeline for note:

Ready for **review by begin of November**

Plan to have **note out by 1<sup>st</sup> of December**

Should you feel something crucial is missing, please let us know in the coming days

# BACKUP

Latest version on github: all suggestions by the advisory committee implemented and committed into

[https://gitlab.cern.ch/CLICdp/Publications/DraftDocuments/Note\\_DetectorPerformance](https://gitlab.cern.ch/CLICdp/Publications/DraftDocuments/Note_DetectorPerformance)

## 1 Introduction

## 2 CLICdet layout and main parameters

- 2.1 Overview . . . . .
- 2.2 Vertex and Tracker . . . . .
- 2.3 Calorimetry . . . . .
- 2.4 Muon Detector System . . . . .
- 2.5 Very Forward Calorimeters LumiCal and BeamCal . . . . .

## 3 Brief Summary of CLIC Experimental Conditions and Detector Requirements

- 3.1 The CLIC Beam . . . . .
- 3.2 Beam-Induced Backgrounds . . . . .
- 3.3 Overview of Requirements for Physics Reconstruction . . . . .
- 3.4 Impact of Backgrounds on the Detector Requirements . . . . .
  - 3.4.1 Impact on Vertex and Tracking Detectors . . . . .
  - 3.4.2 Backgrounds in ECAL and HCAL . . . . .
  - 3.4.3 Backgrounds in LumiCal and BeamCal . . . . .
- 3.5 Overview of Detector Timing Requirements at CLIC . . . . .
- 3.6 A detector at CLIC for 380 GeV, 1.5 TeV and 3 TeV . . . . .