

# Comparison of old and new detector model

The CLIC\_ILD vs the CLIC\_o3\_v14 model

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    - Single selection cuts
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  - Missing energy
  - Leptons
  - Jets
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Sample	ID	Xsec [fb]
Old	3249	4309.7
New	9402	4309.7

**Table:** Samples used in the analysis

Both datasets are based on the same MC events and differ solely in the detector model used for the reconstruction.

The events in the datasets are scaled with the luminosity ( $1.5 \text{ ab}^{-1}$ ) and their cross-section. Additionally, they are divided by the total number of entries in the dataset.

The physics objects used in this analysis are:

- Leptons
  - Isolated leptons
- Jets
  - use Pandora PFOs without isolated leptons
  - reconstructed using the Valencia algorithm<sup>1</sup> with
    - jet size  $R = 0.8$
    - clustering order  $\beta = 1.0$
    - jet shrinking for forward jets  $\gamma = 0.7$
- Missing energy
  - Initial state minus sum of selected jets and lepton

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<sup>1</sup>algorithm string in marlin: 'ValenciaPlugin 0.8 1 0.7'

A basic event selection cuts has been applied to select the relevant physics objects:

- Exactly one charged lepton
- Lepton  $p_T > 10$  GeV

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Old cut	Single	Total	Entries	Events
Before cuts	100.0%	100.0%	209945	6464550.0
Lepton number	24.4%	24.4%	51212	1576901.3
Lepton pT	98.6%	24.1%	50503	1555070.0

**Table:** Selection efficiencies for the old sample

New cut	Single	Total	Entries	Events
Before cuts	100.0%	100.0%	2049119	6464550.0
Lepton number	17.0%	17.0%	348758	1100259.9
Lepton pT	97.5%	16.6%	340131	1073043.5

**Table:** Selection efficiencies for the new sample

The relative efficiency of every selection cut is listed ('Single') as well as the total efficiency ('Total'). The number of entries and the scaled number of events, using the cross-section and luminosity, are shown as well.

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# Beam energy

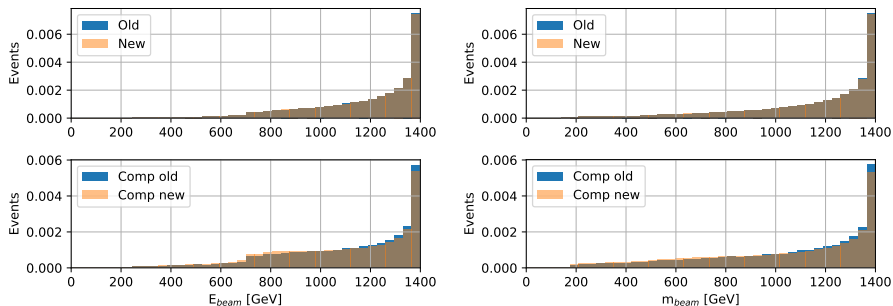


Figure:  $e^+ e^-$  beam energy and mass

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# All leptons

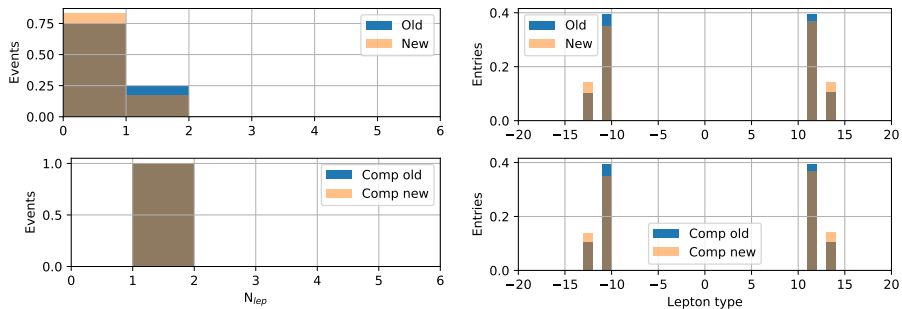


Figure: Total lepton number and type

# Total energy

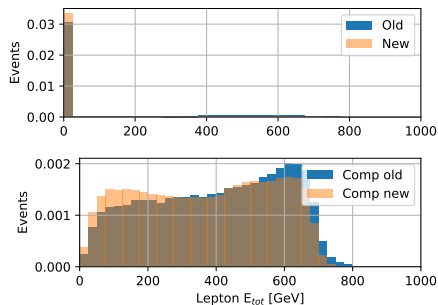


Figure: Total lepton energy

# Lepton kinematics

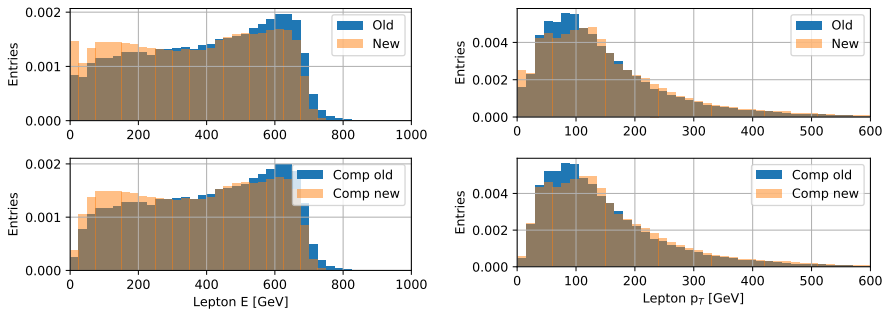


Figure: Lepton energy and  $p_T$

# Lepton kinematics

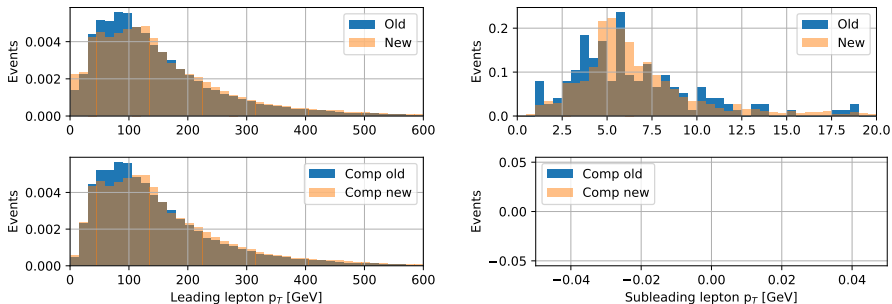


Figure: Leading and sub-leading lepton  $p_T$

# Lepton kinematics

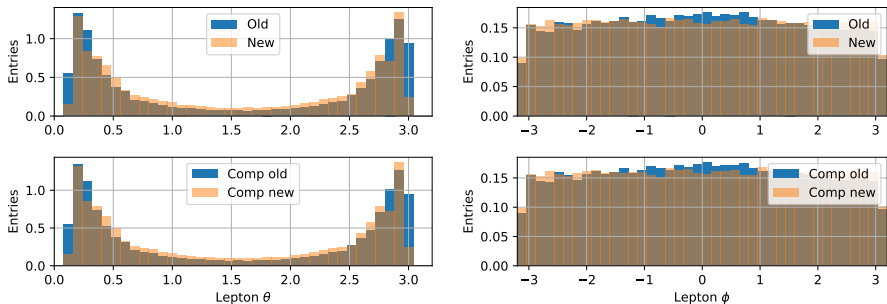


Figure: Lepton  $\phi$  and  $\theta$

# Electron kinematics

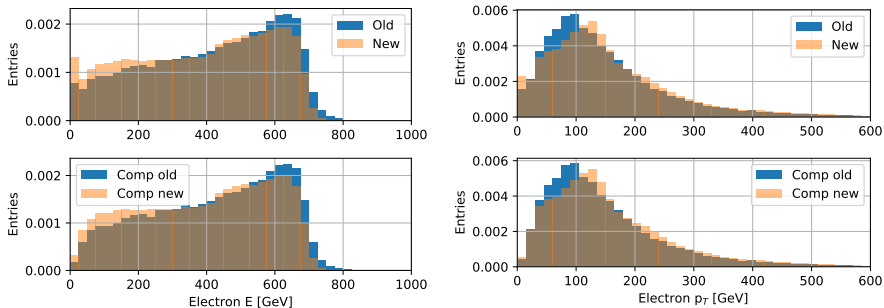


Figure: Electron energy and  $p_T$



# Electron kinematics

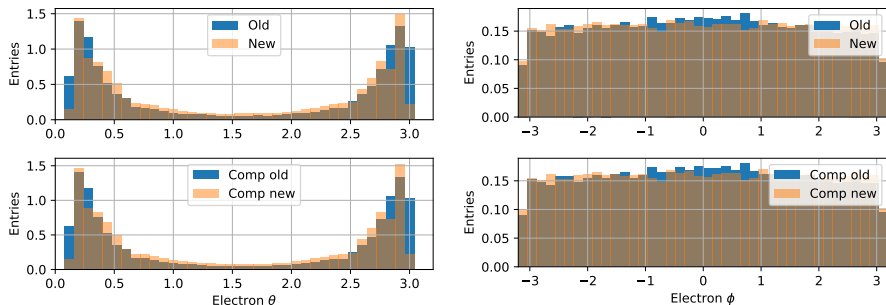


Figure: Electron  $\phi$  and  $\theta$

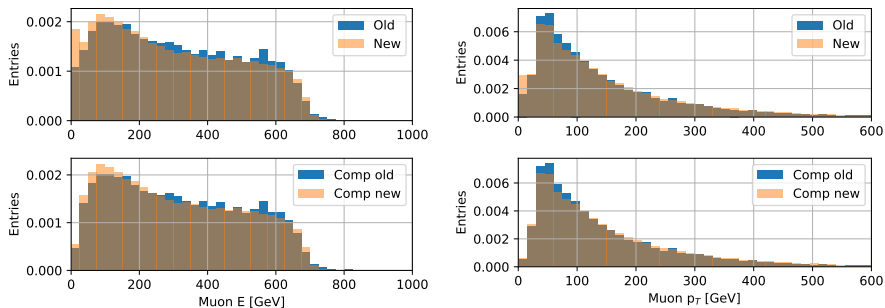


Figure: Muon energy and  $p_T$

# Muon kinematics

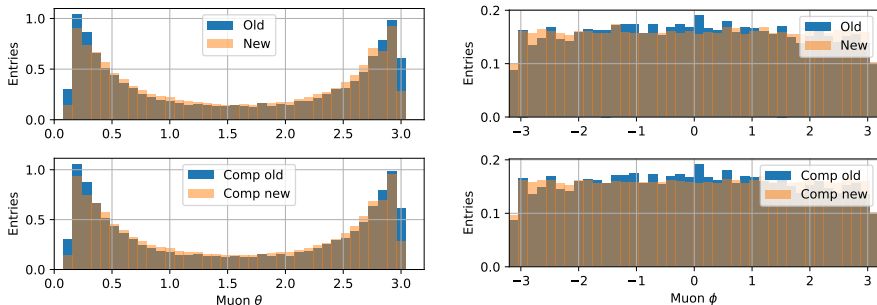


Figure: Muon  $\phi$  and  $\theta$

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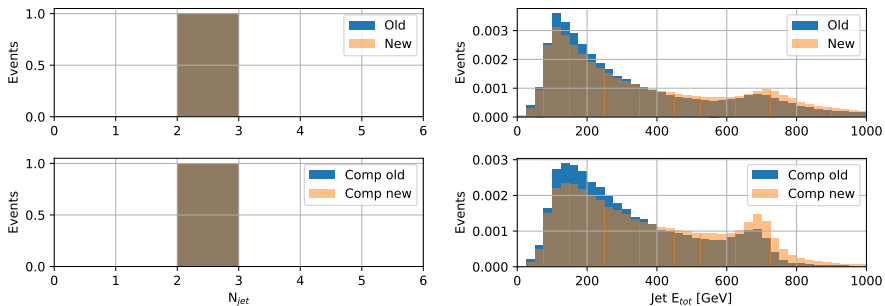


Figure: Total jet number and energy

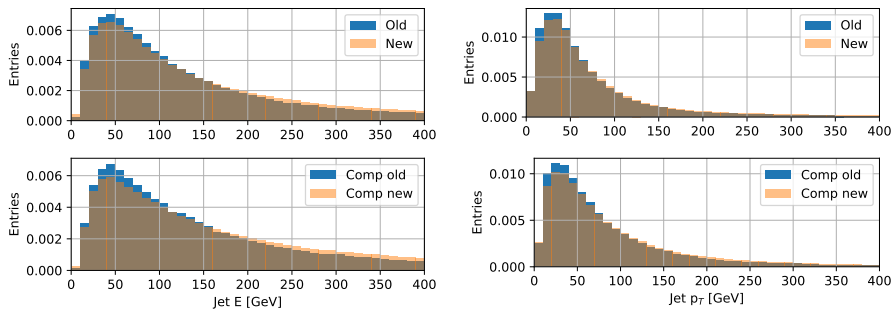


Figure: Jet energy and  $p_T$

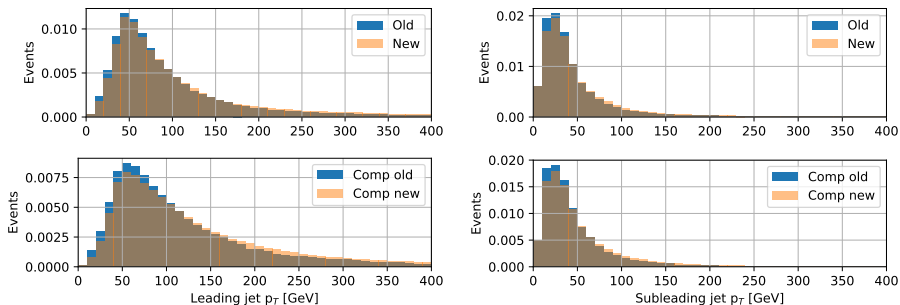


Figure: Leading and sub-leading jet  $p_T$

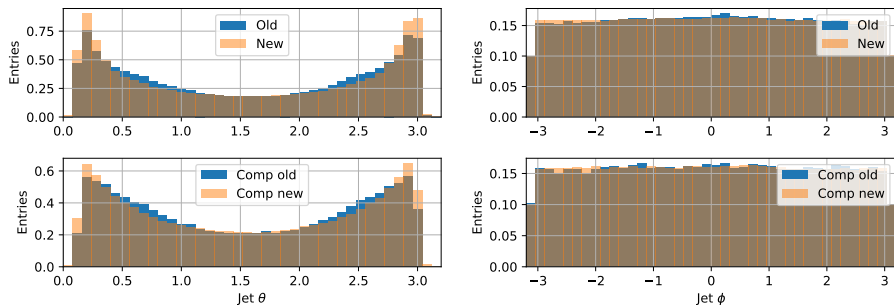


Figure: Jet  $\phi$  and  $\theta$



The two detector models show significant differences in

- beam energy: new is softer (should be the same, since MC events are identical)
- the lepton type: new has more muons and less electrons
- the lepton energy spectrum: new is softer
- the lepton  $\theta$ : new is less forward
- the jet energy spectrum: new is harder
- the jet  $\theta$ : new is more forward

Thank you for your attention. Feedback is very welcome!

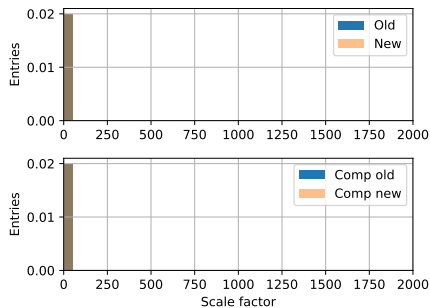


Figure: The applied scale factors