



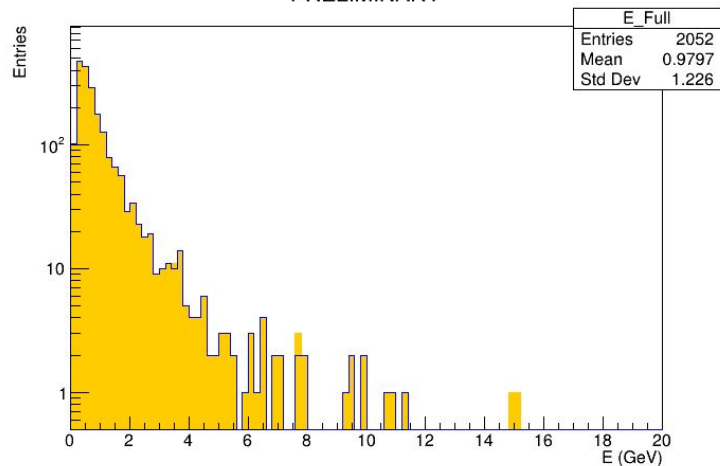
Updates

Héctor García Cabrera (CIEMAT)

BB

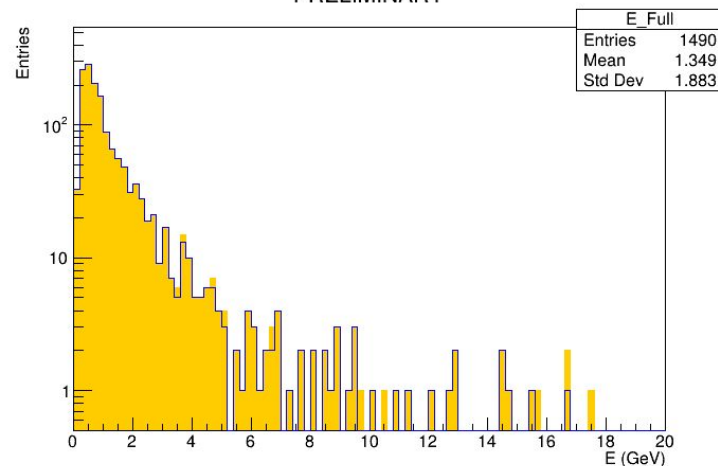
YCut = 0.001

PRELIMINARY



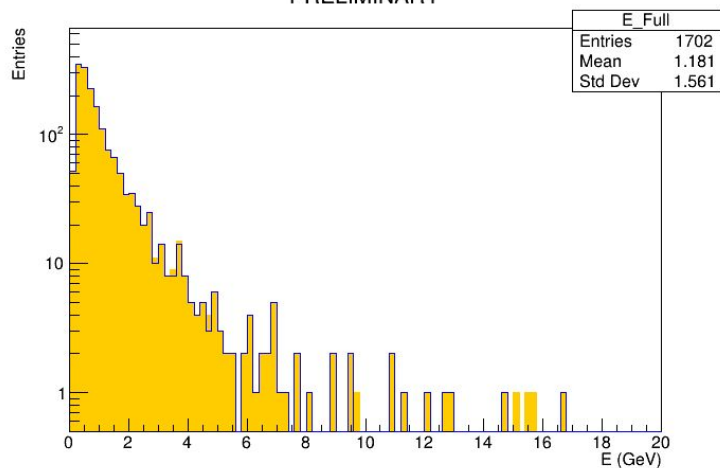
YCut = 0.01

PRELIMINARY



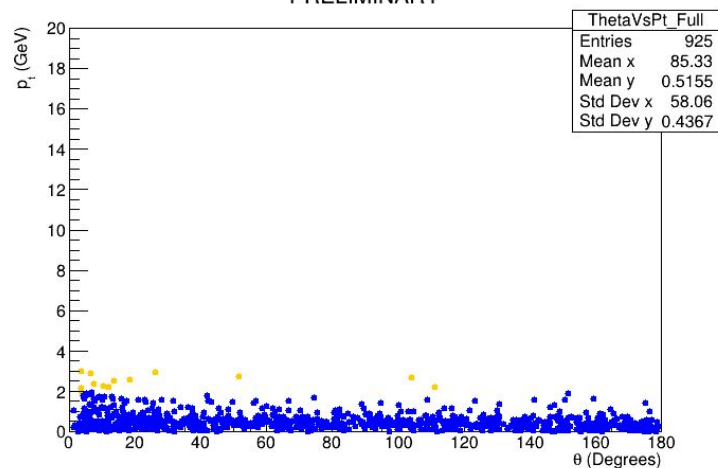
YCut = 0.004

PRELIMINARY



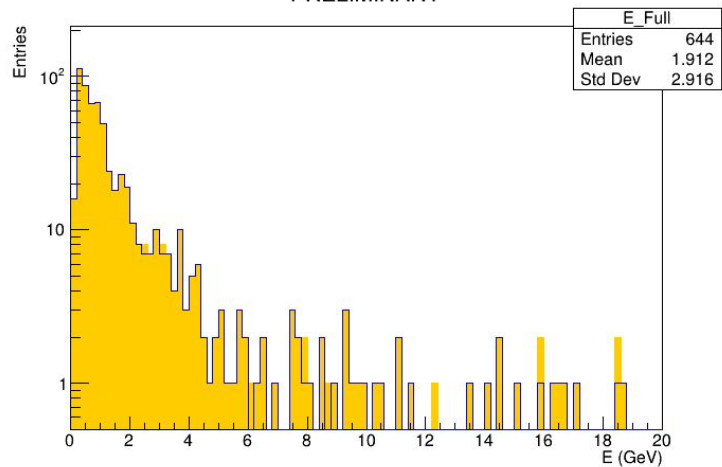
YCut = 0.001

PRELIMINARY



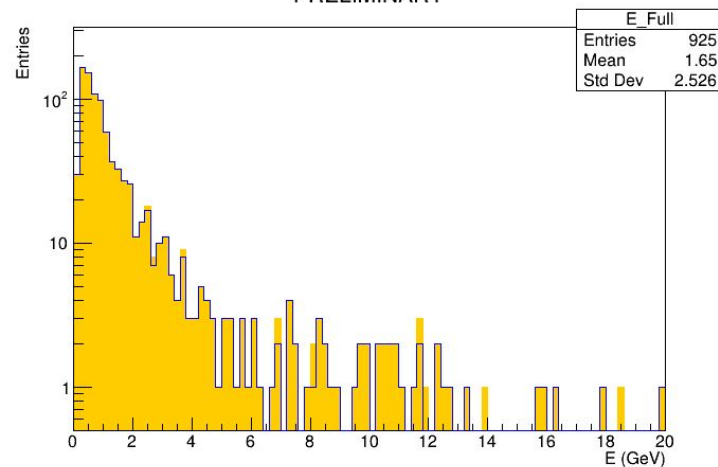
YCut = 0.001

PRELIMINARY



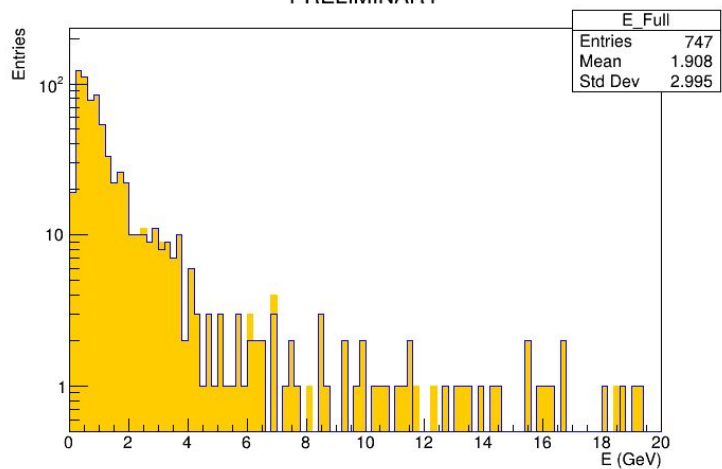
YCut = 0.01

PRELIMINARY



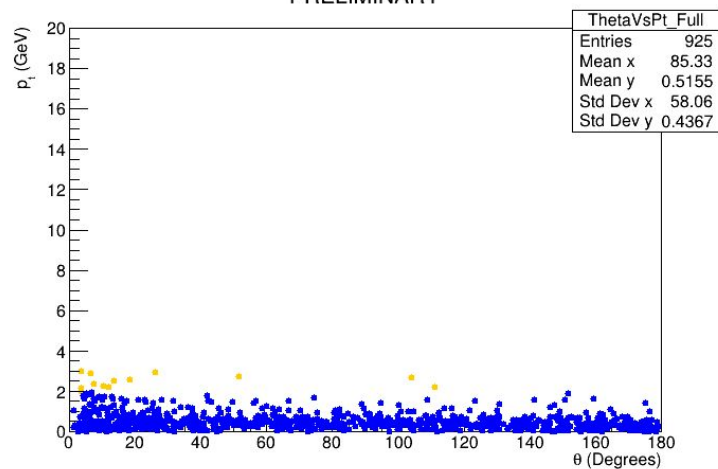
YCut = 0.004

PRELIMINARY



YCut = 0.001

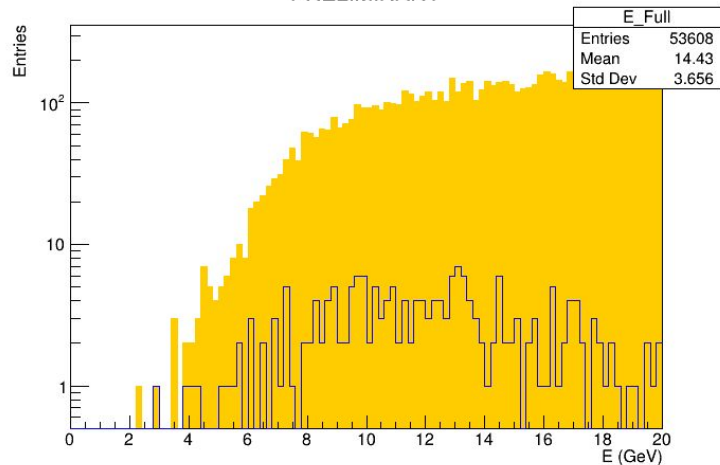
PRELIMINARY



Higgs

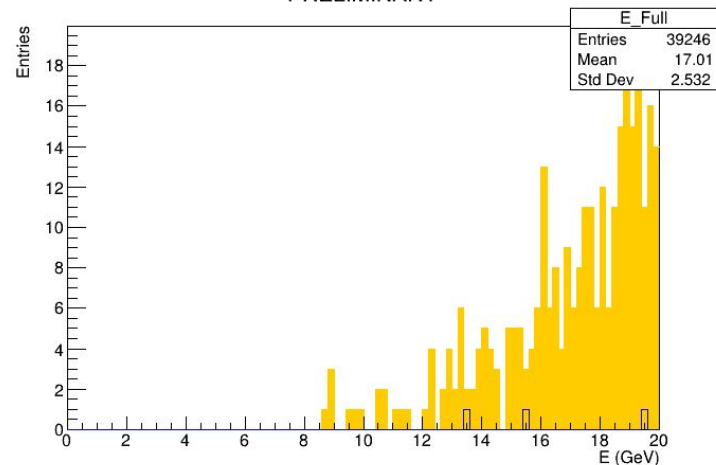
YCut = 0.001

PRELIMINARY



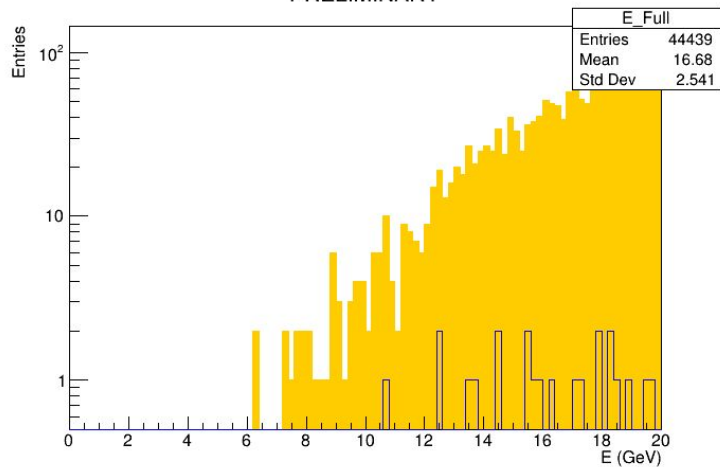
YCut = 0.01

PRELIMINARY

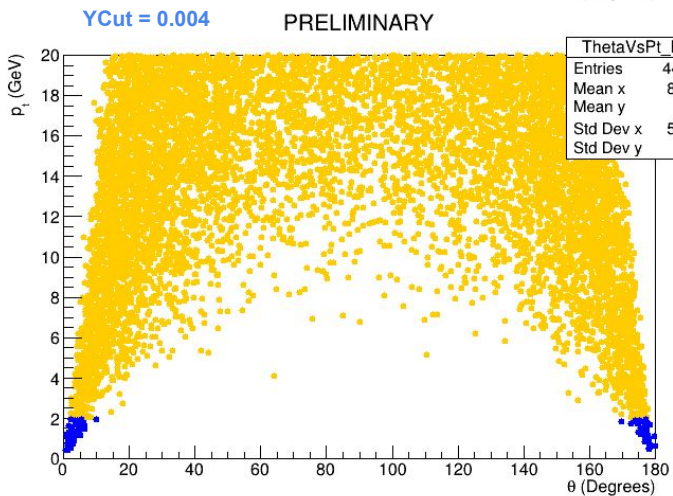
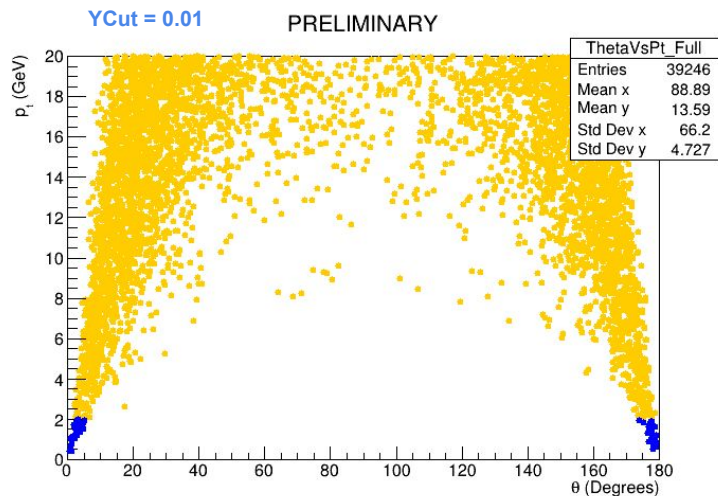
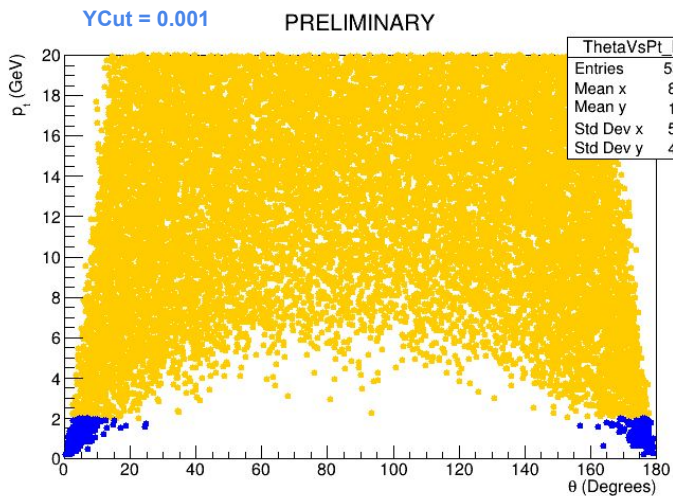


YCut = 0.004

PRELIMINARY



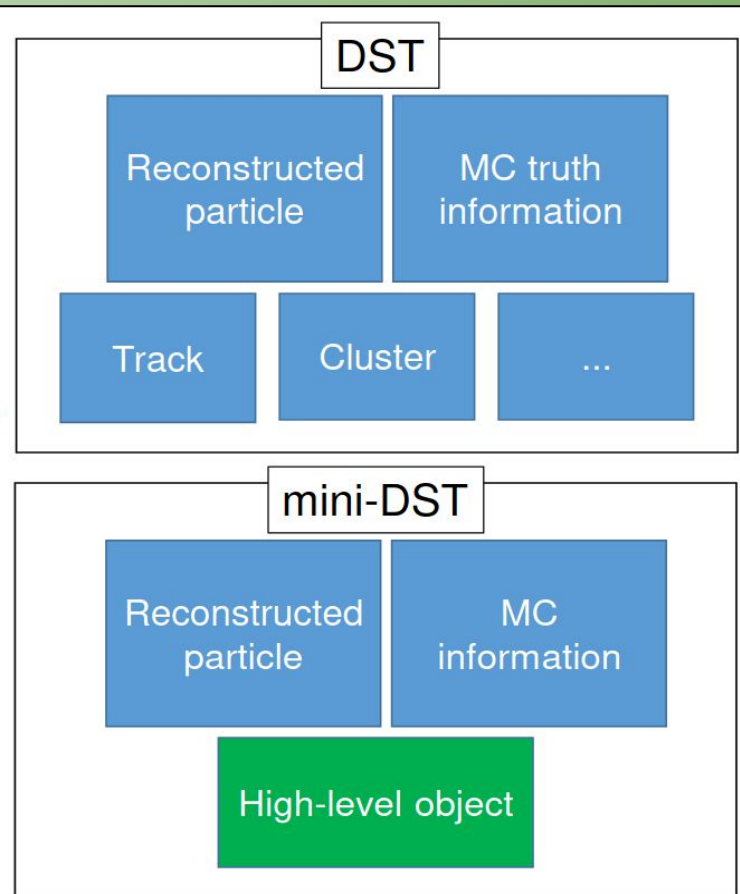
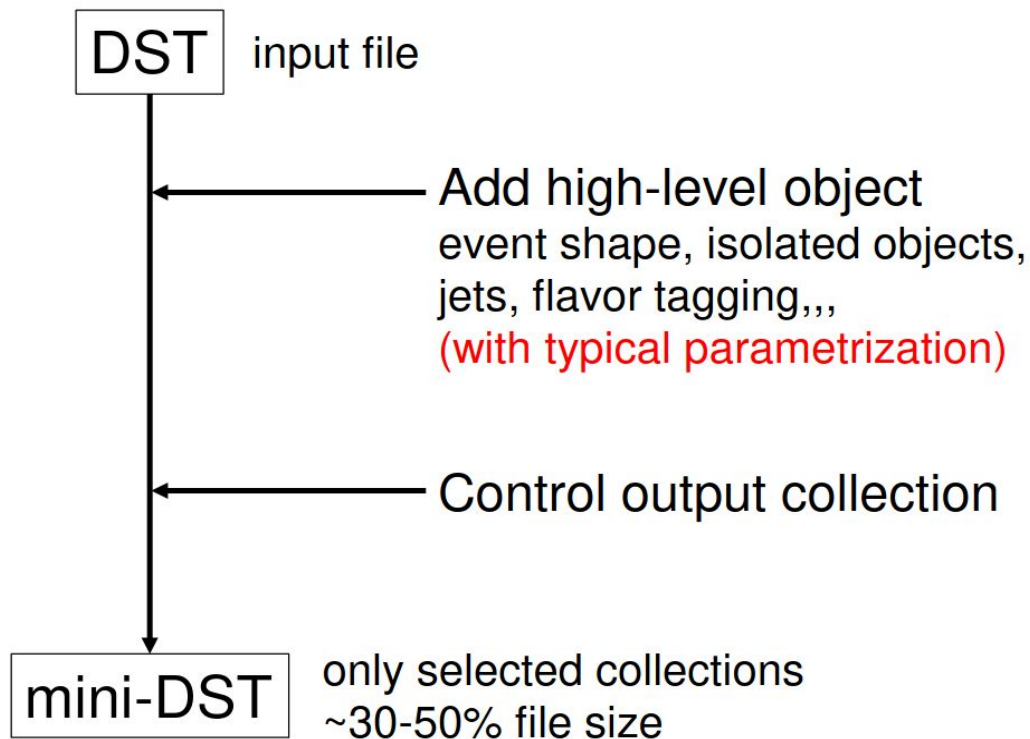
Higgs



Backup

Mini-DST

mini-DST in a nutshell



Details of mini-DST

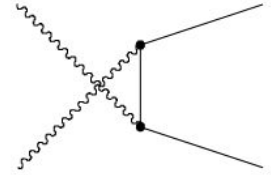
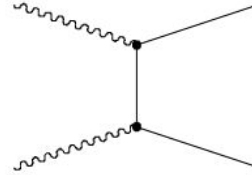
- Particle flow object (reconstructed particle)
 - including event shape variables, proton/kaon/pion ID, particles reconstructed with forward detectors
- MC truth information, links between reconstructed particle and MC truth
- High-level object
 - Isolated electrons/muons/taus/photons
 - Jets ($N = 2, 3, 4, \dots$ up to 10)
 - Durham algorithm applied to remained particle flow objects
 - Flavor tagging
 - Sophisticated MVA approach, giving three output classifications (b-, c-, other tag)

Overlays:

BB - Two real Beamstrahlung
gammas

BB

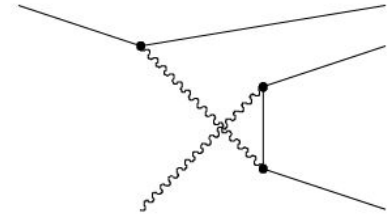
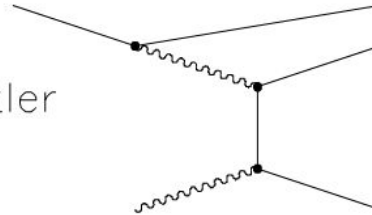
Breit–Wheeler
process



BW/WB - One real and one virtual
gamma

BW/WB

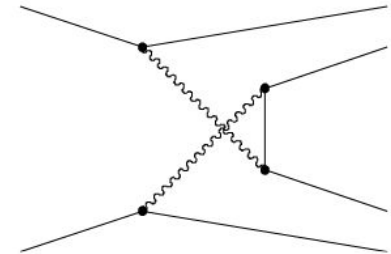
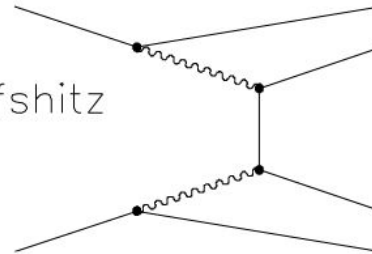
Bethe–Heitler
process



WW - Two virtual gammas

WW

Landau–Lifshitz
process



SeeablePairs - Pair production

Overlay - MC

WW

```
----- print out of MCTParticle collection -----
```

```
flag: 0x0
```

simulator status bits: [sbvtcls] s: created in simulation b: backscatter v: vertex is not endpoint of parent t: decayed in tracker c: decayed in calorimeter l: has left detector s: stopped o: overlay

[illegible]

Overlay CLIC and ILC

LCD-Note-2011-006



Huge beam-induced background at CLIC

- $\gamma\gamma \rightarrow \text{had.}$
important for detector performance

- Timing cuts on PFOs to reduce this bckg.

Virtual W $\rightarrow$ low **p**, **E** of decay products
 $\rightarrow$ big influence of $\gamma\gamma \rightarrow \text{had.}$ background!

Timing cuts not implemented in Delphes model for CLIC

We apply effective cuts on the generator level

Overlay CLIC and ILC

After timing cuts on **hits** in full sim.: 10 ns after physical event left



Additional timing cuts on PFOs to reduce $\gamma\gamma \rightarrow \text{had. backg.}$

Example: Accept **tracks** with $p_T \leq 1 \text{ GeV}$ with $t < 2 \text{ ns}$

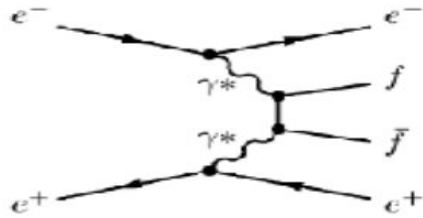


1. Take gen-level gamma-gamma events in batches of 20
2. Accept specific particles from first N events
 - based on cuts from CLIC CDR
3. Overlay on physical sample

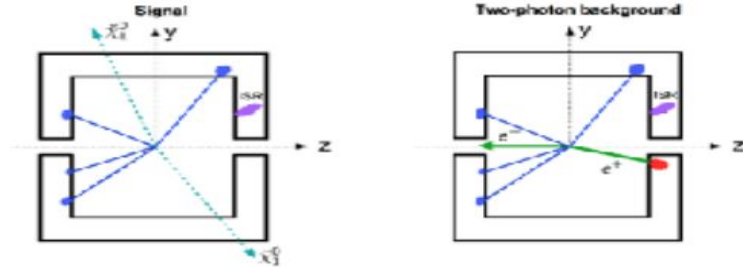
Overlay for SUSY

The Standard Model and the Signal

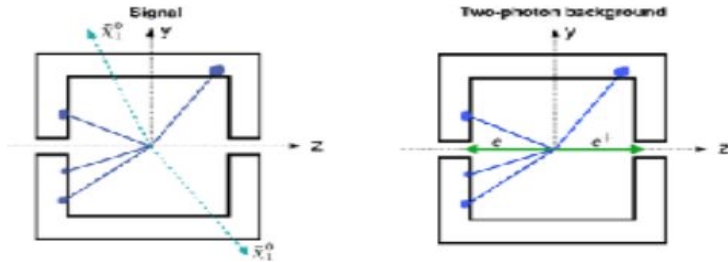
- The $\gamma\gamma \rightarrow 2f$ background has same signature as the signal



- A hard ISR photon is required to suppress this type background



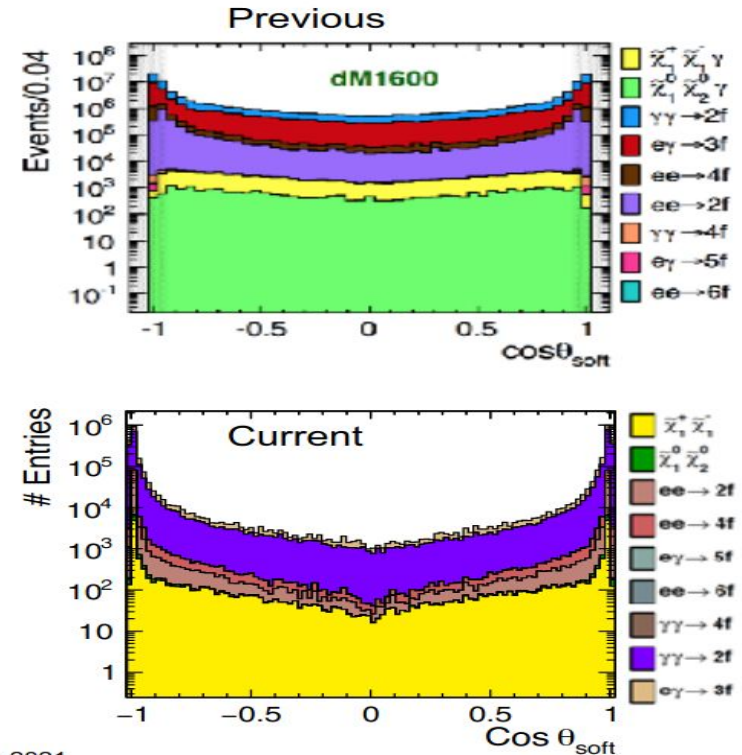
- In the final state: $e^+e^- \rightarrow \tilde{\chi}_1^+ \tilde{\chi}_1^- \gamma$
- A few soft visible particles
- A large missing energy ($2\tilde{\chi}_1^0$)



Overlay for SUSY

The impact of $\gamma\gamma$ overlay

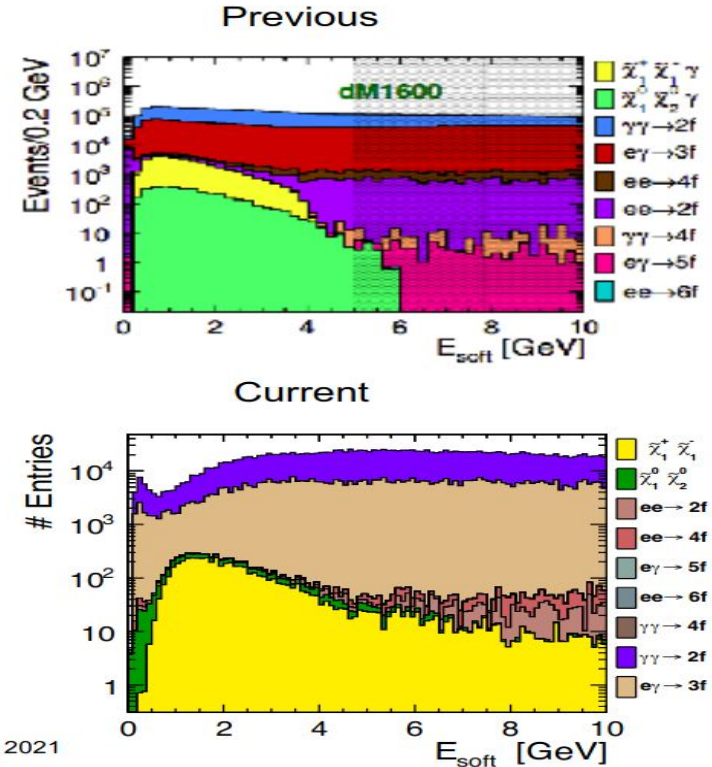
- The presence of $\gamma\gamma \rightarrow$ low p_T hadron overlay changes the topology of events
- All particles should have $|\cos\theta| < 0.9397 \Rightarrow 20^\circ$ away from the beam
- $\gamma\gamma \rightarrow$ low p_T hadron particles found in forward part of the detector



Overlay for SUSY

The impact of $\gamma\gamma$ overlay

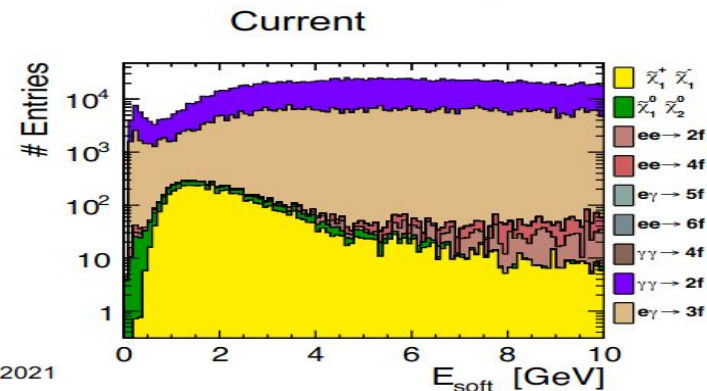
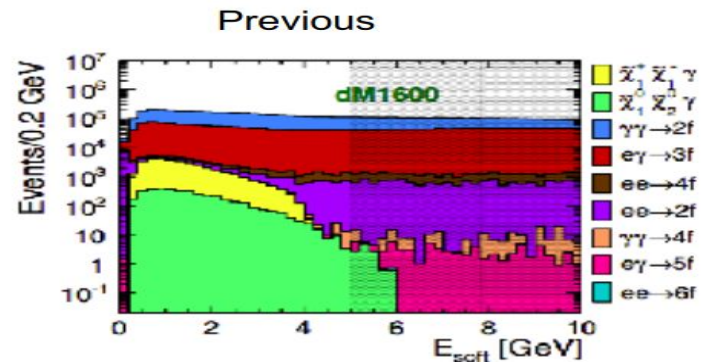
- The presence of $\gamma\gamma \rightarrow$ low p_T hadron overlay changes the topology of events
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- $\gamma\gamma \rightarrow$ low p_T hadron particles found in forward part of the detector
- Every particle should have $E < 5$ GeV



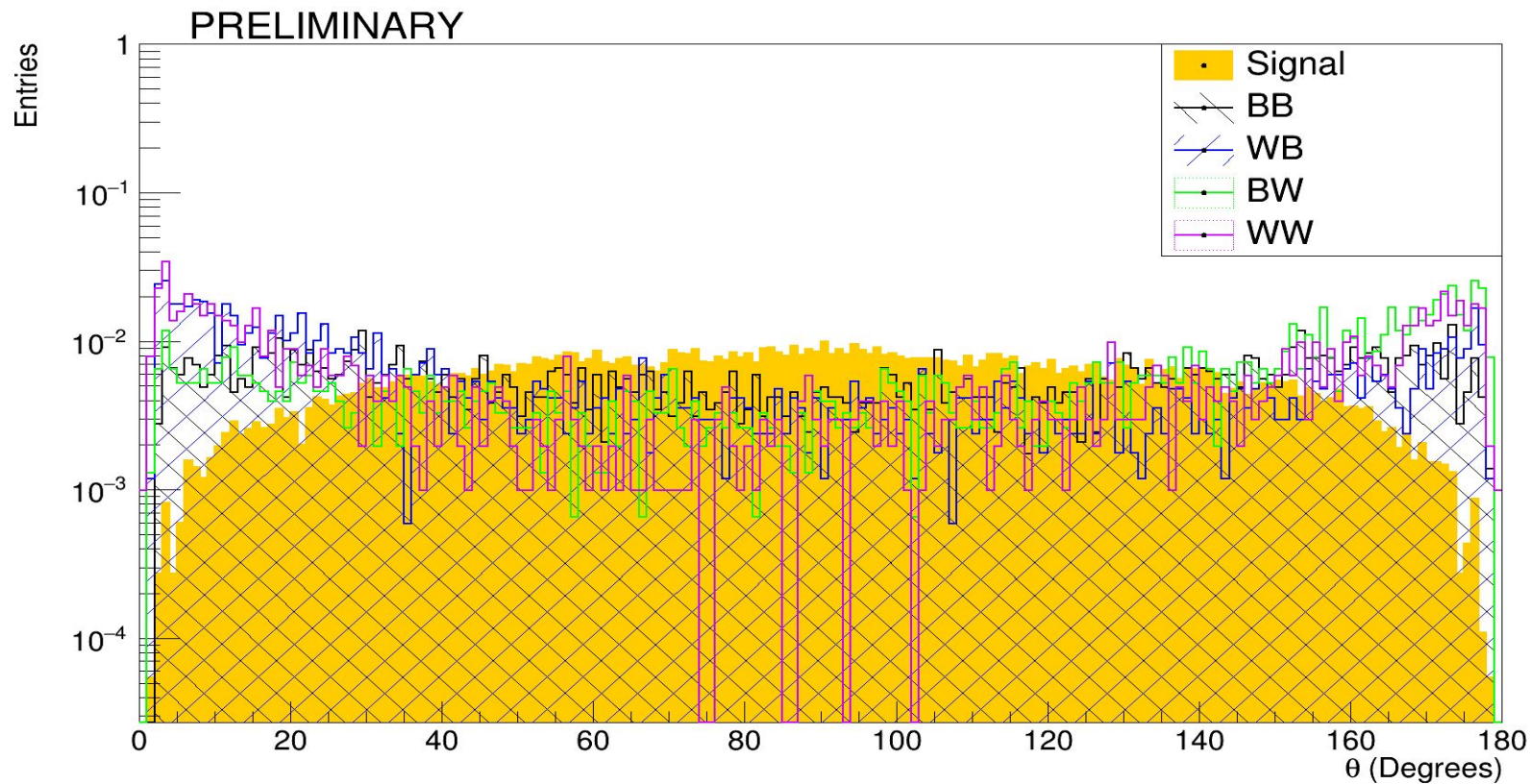
Overlay for SUSY

The impact of $\gamma\gamma$ overlay

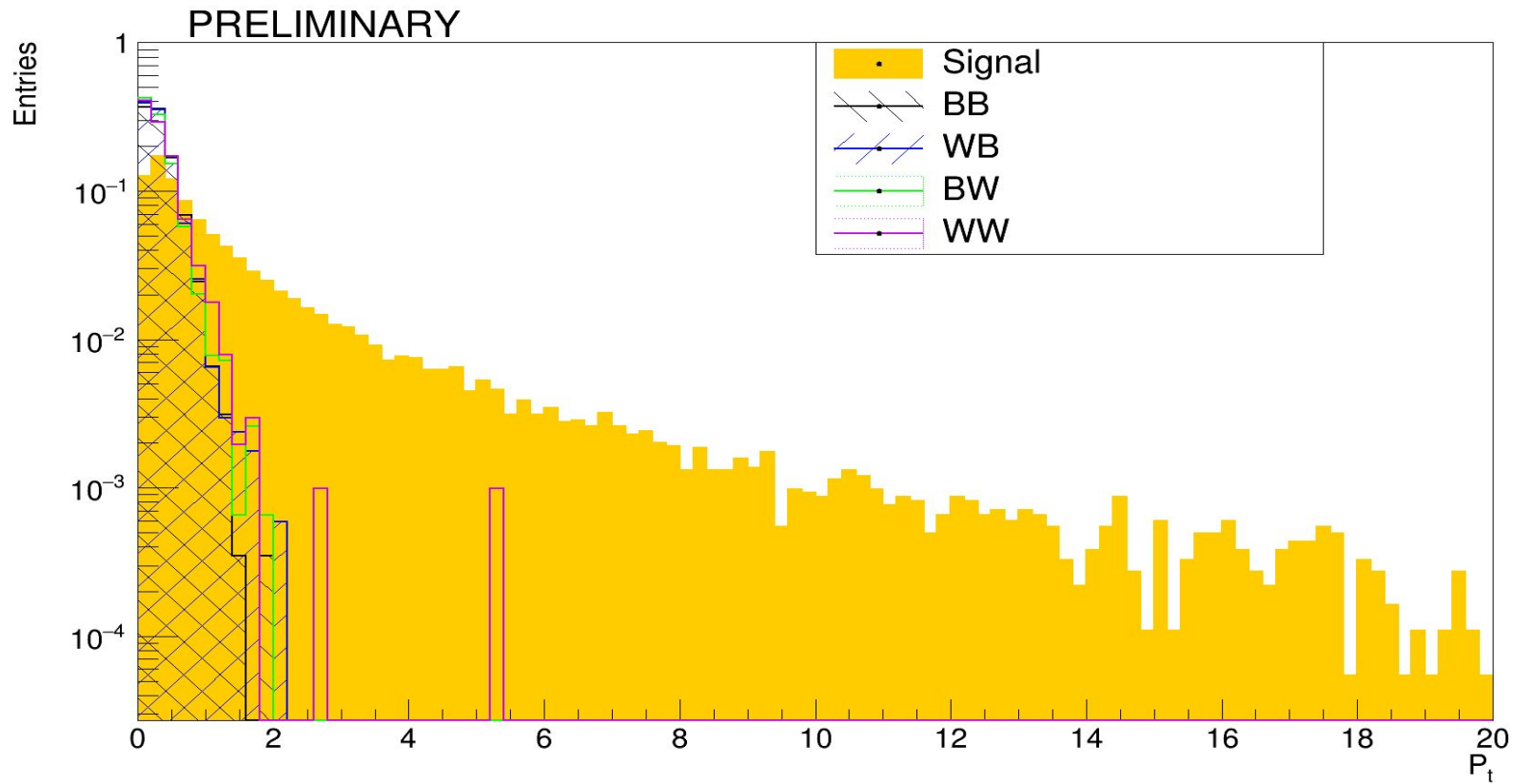
- The presence of $\gamma\gamma \rightarrow$ low p_T hadron overlay changes the topology of events
- All particles should have $|\cos\theta| < 0.9397 \Rightarrow 20^\circ$ away from the beam
- $\gamma\gamma \rightarrow$ low p_T hadron particles found in forward part of the detector
- Every particle should have $E < 5$ GeV
- Previous analysis only had particles from the higgsino decays
- To reduce impact of $\gamma\gamma \rightarrow$ low p_T overlay $\Rightarrow$ separation of signal and overlay required



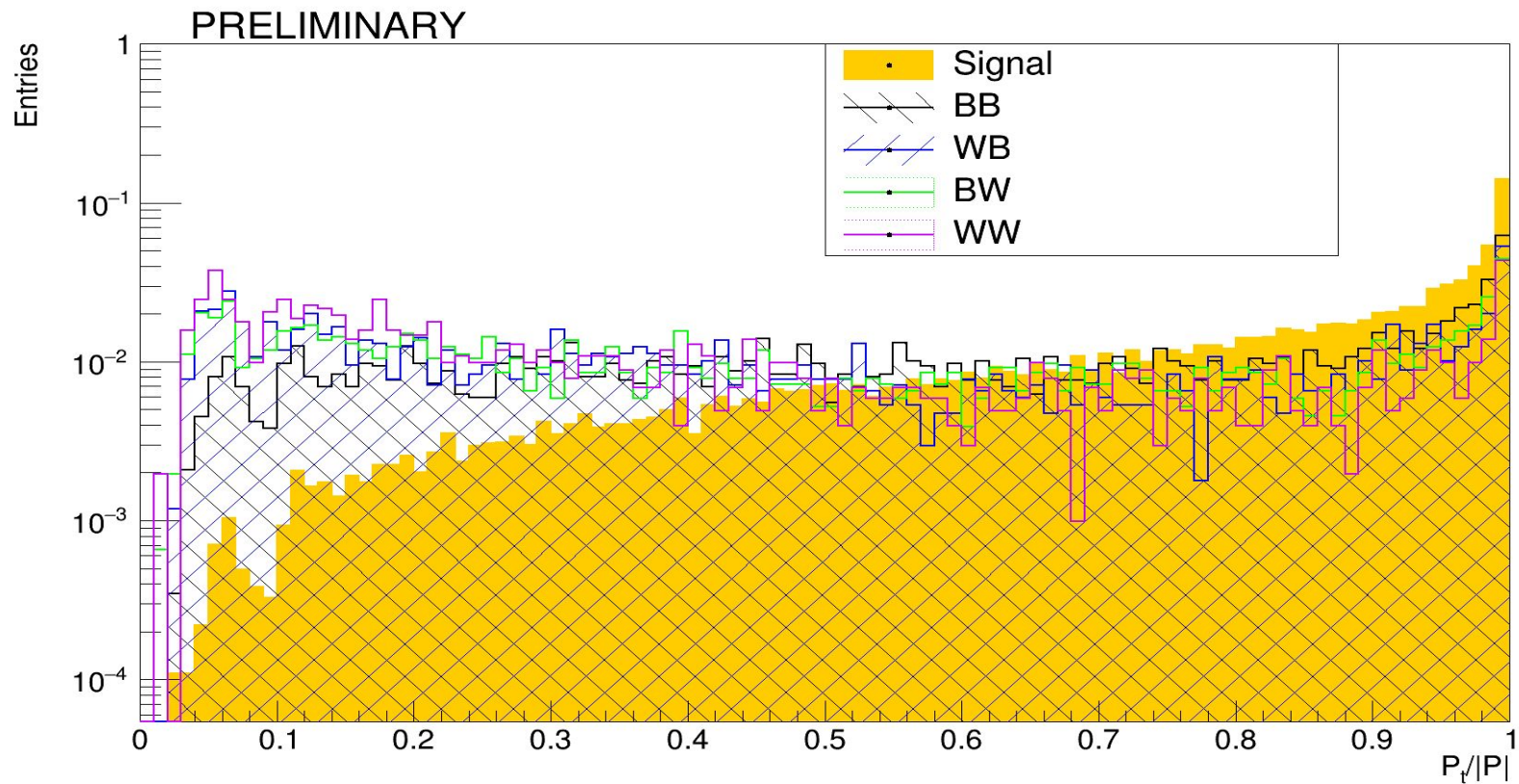
PFO - Angle



$PFO - P_t$



$PFO - Pt/|P|$



Theta vs Pt

