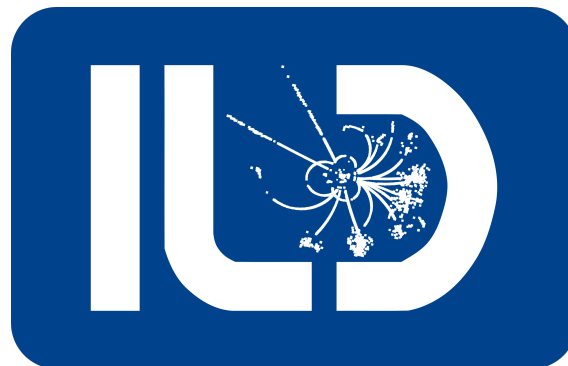


# ILD validation studies: backgrounds

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look at overlaid backgrounds in validation samples

simple final state:  $e^+e^- \rightarrow \mu^+ \mu^-$  @ 500 GeV

“physics event” is small and clean

→ more clearly see effect of the backgrounds

backgrounds added to event at reconstruction time

$\gamma\gamma \rightarrow$  hadrons

reconstructable tracks from pair backgrounds

← not included in DBD

$\gamma\gamma \rightarrow$  hadrons (“BgOverlay” processor):  
treatment has changed since the DBD

### DBD-era

(ILDConfig/v01-16-p05\_500/StandardConfig/current/bbudsc\_3evt\_stdreco.xml)

```
<parameter name="expBG" type="double">1.7 </parameter>
```

### validation samples

(ILDConfig/v01-19-05-p01/StandardConfig/production/Overlay/OverlayParameters500GeV.xml)

```
<constant name="ExpectedBgWW" value="0.211" />
```

```
<constant name="ExpectedBgWB" value="0.24605" />
```

```
<constant name="ExpectedBgBW" value="0.243873" />
```

```
<constant name="ExpectedBgBB" value="0.35063" />
```

[ n.b. these expected values not defined (= -1) at 250, 350, 1000 GeV  
so I guess no  $\gamma\gamma \rightarrow$  hadrons are overlayed for these energies? ]

in new 500 GeV samples, expect to see

less  $\gamma\gamma \rightarrow$  hadrons

more tracks from pair background “reconstructable tracks”

compare

recent validation samples v01-19-05-p01

with overlaid BG

```
/prod/ilc/mc-opt.dsk/ild/dst/500-TDR_ws/2f_Z_leptonic/ILD_I5_o1_v02/v01-19-05-p01/.../  
rv01-19-05-p01.sv01-19-05-p01.mILD_I5_o1_v02.E500-TDR_ws.I250106.P2f_z_l.eL.pR...  
rv01-19-05-p01.sv01-19-05-p01.mILD_I5_o1_v02.E500-TDR_ws.I250108.P2f_z_l.eR.pL...
```

without BG

```
/prod/ilc/mc-opt.dsk/ild/dst/500-TDR_ws/2f_Z_leptonic/ILD_I5_o1_v02_nobg/v01-19-05-p01/.../  
rv01-19-05-p01.sv01-19-05-p01.mILD_I5_o1_v02_nobg.E500-TDR_ws.I250106.P2f_z_l.eL.pR...
```

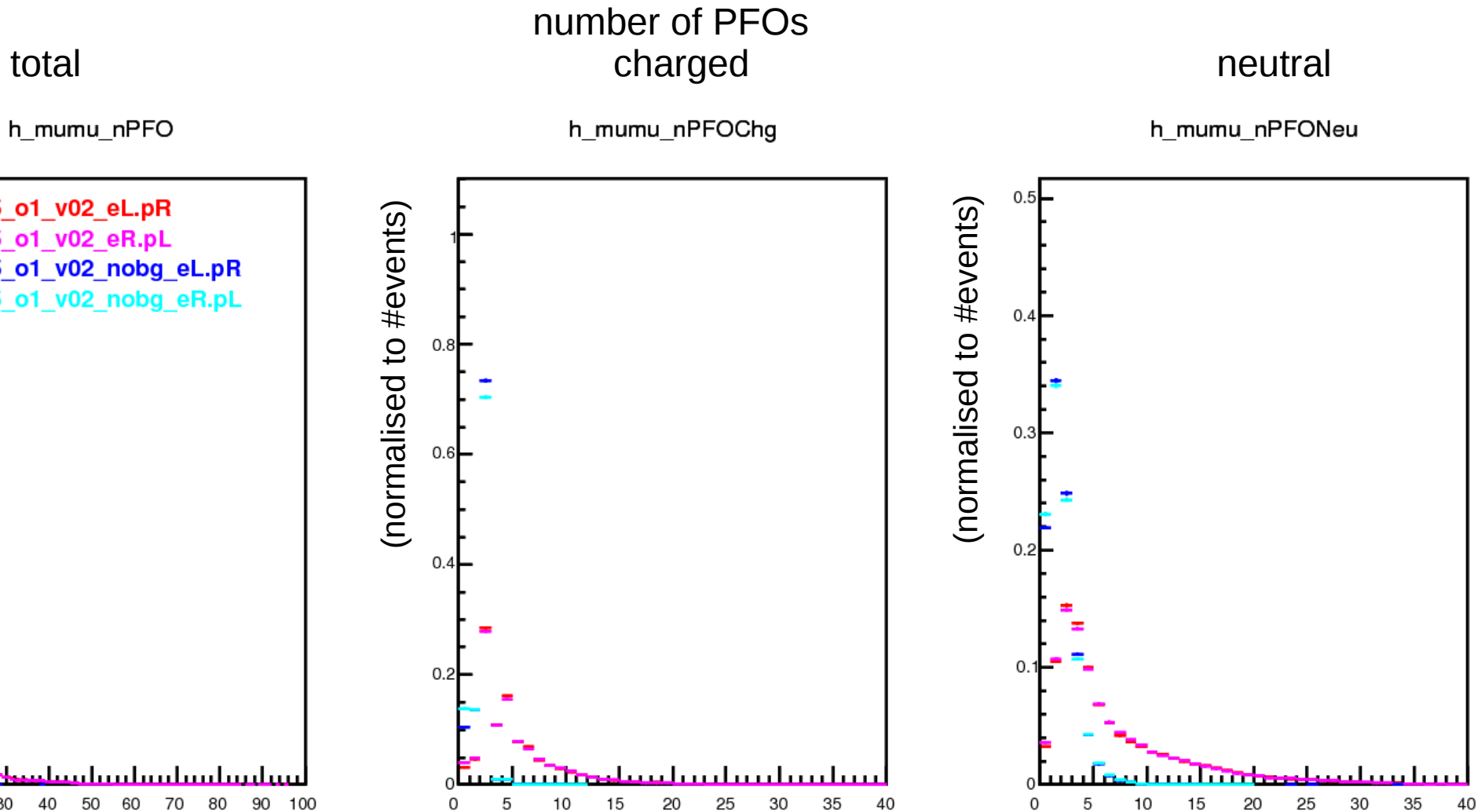
DBD samples v01-16-02

(with BG)

```
/prod/ilc/mc-dbd/ild/dst-merged/500-TDR_ws/2f_Z_leptonic/ILD_o1_v05/v01-16-p05_500/  
rv01-16-p05_500.sv01-14-01-p00.mILD_o1_v05.E500-TDR_ws.I250106.P2f_z_l.eL.pR...  
rv01-16-p05_500.sv01-14-01-p00.mILD_o1_v05.E500-TDR_ws.I250108.P2f_z_l.eR.pL...
```

[ select just mu+ mu- events ]

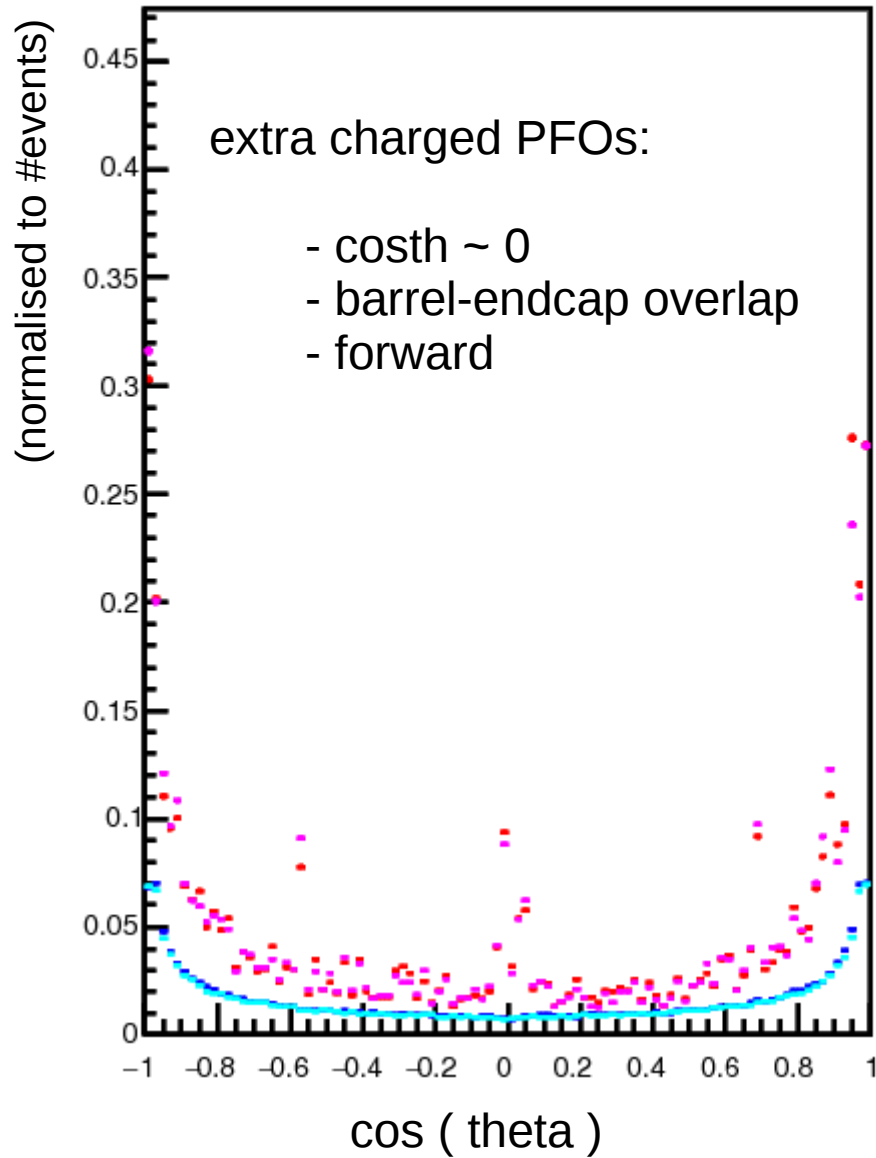
# compare validation samples: with and without overlaid backgrounds



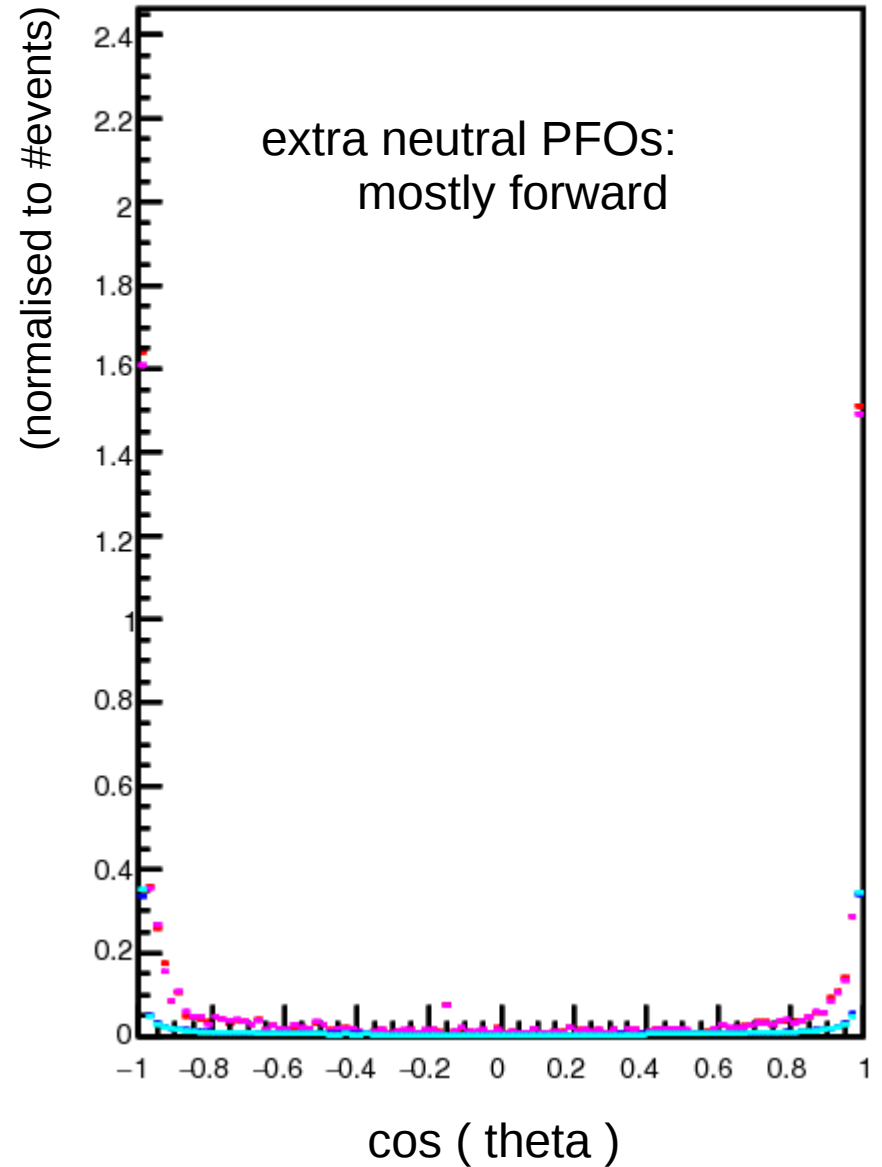
clear effect of BG: ~ a couple of both charged and neutral PFOs

# compare validation samples: with and without overlaid backgrounds

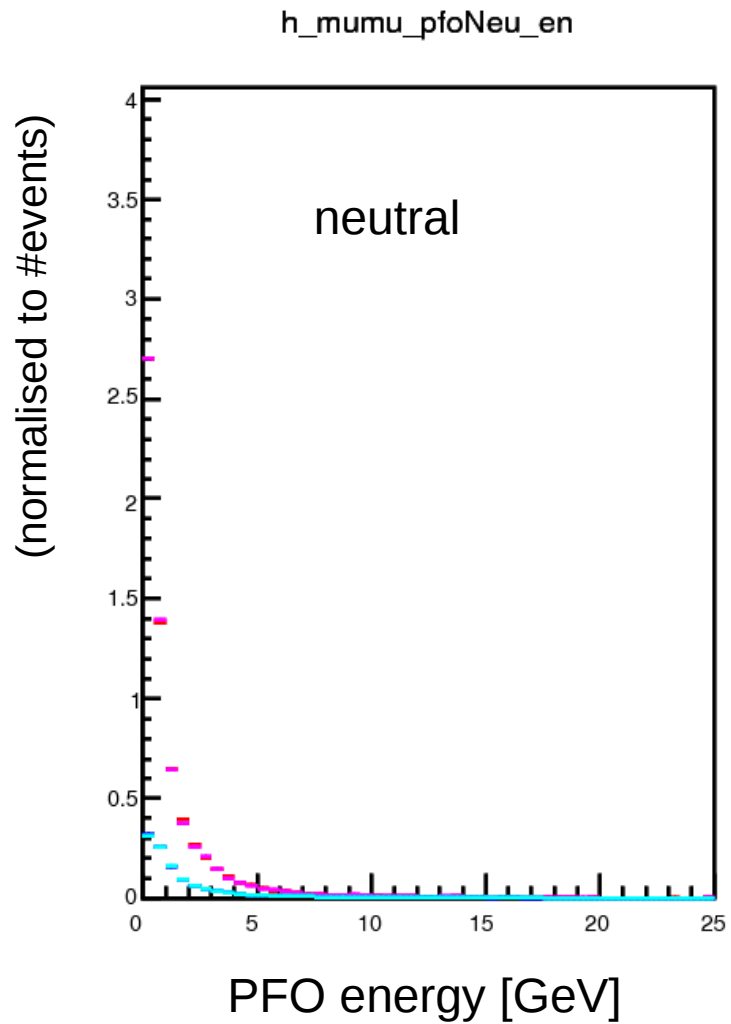
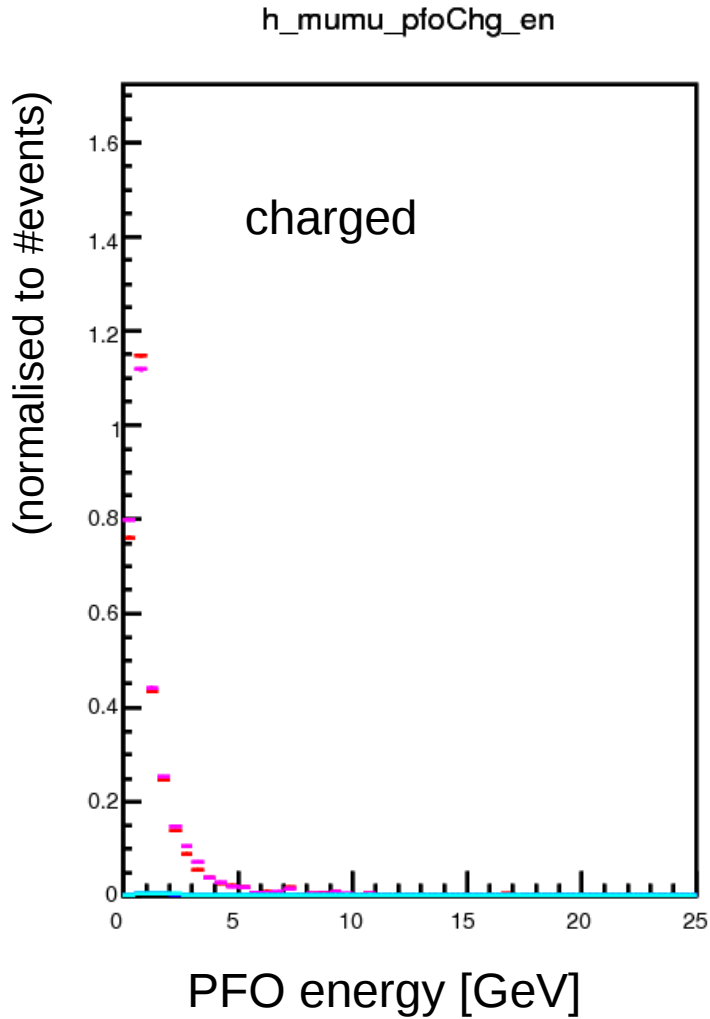
h\_mumu\_pfoChg\_costh



h\_mumu\_pfoNeu\_costh



compare validation samples:  
with and without overlaid backgrounds



additional PFOs most low energy

now compare

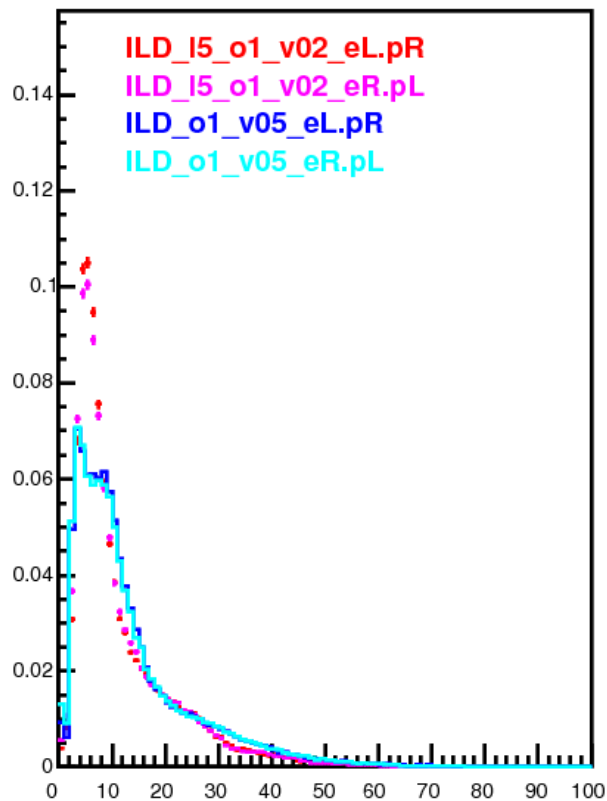
validation

DBD

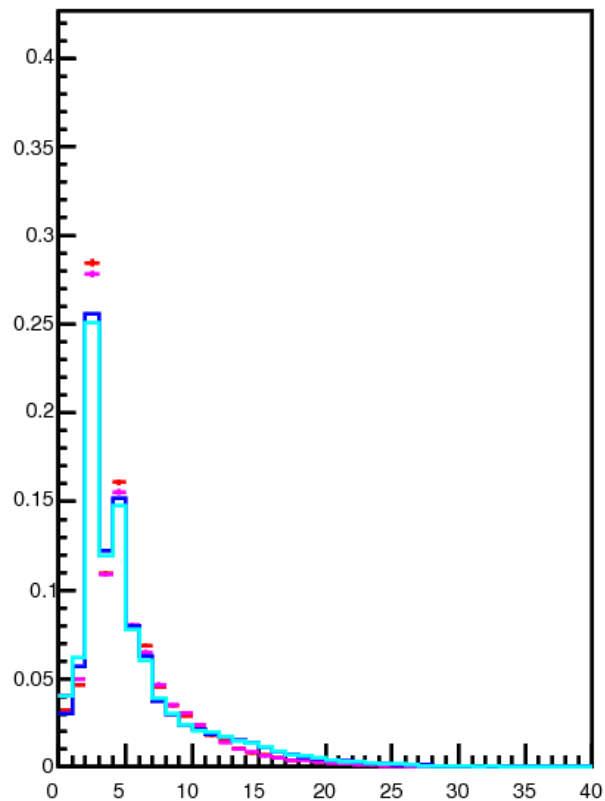
samples with BGs

samples with BGs

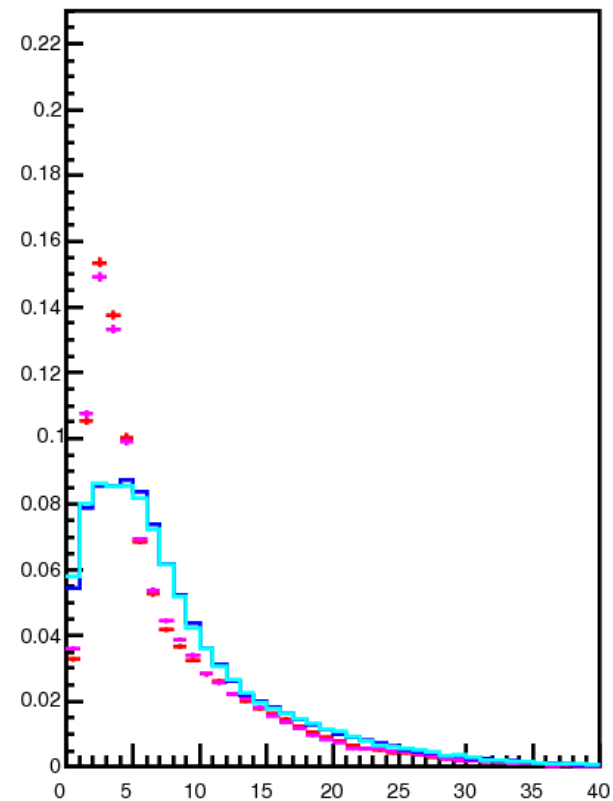
h\_mumu\_nPFO



h\_mumu\_nPFOChg



h\_mumu\_nPFONeu





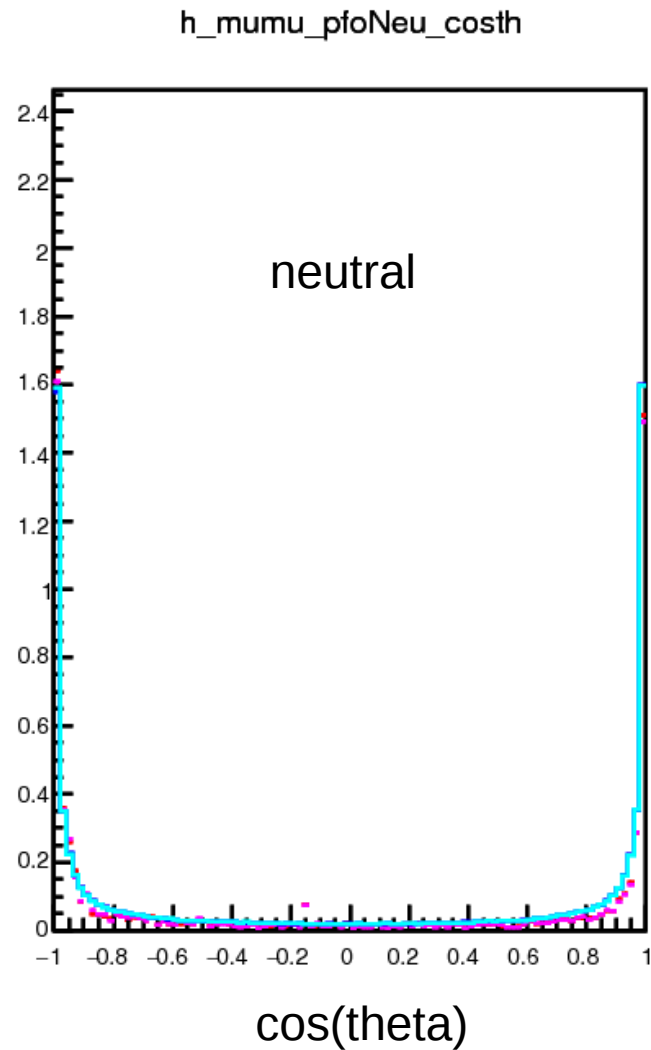
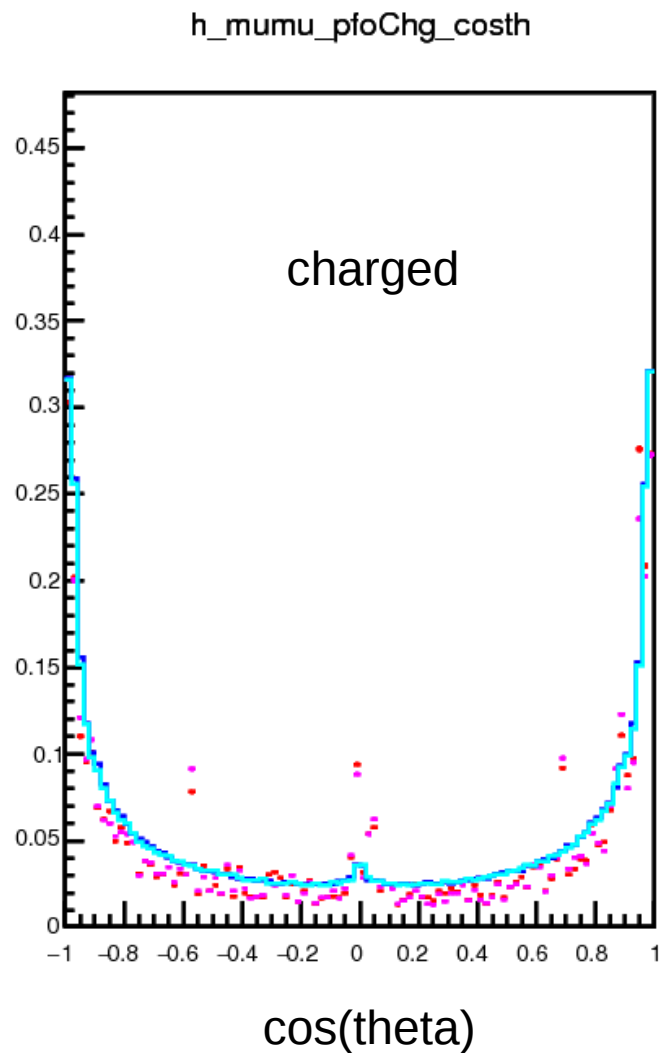
now compare

validation

DBD

samples with BGs

samples with BGs



quite different (especially charged : pair BGs / reco. algorithms / other ? )

now compare

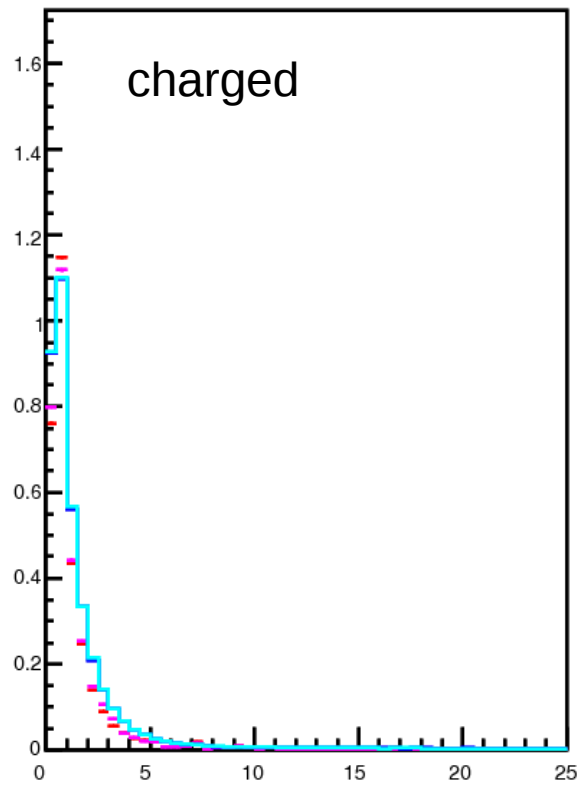
validation

DBD

samples with BGs

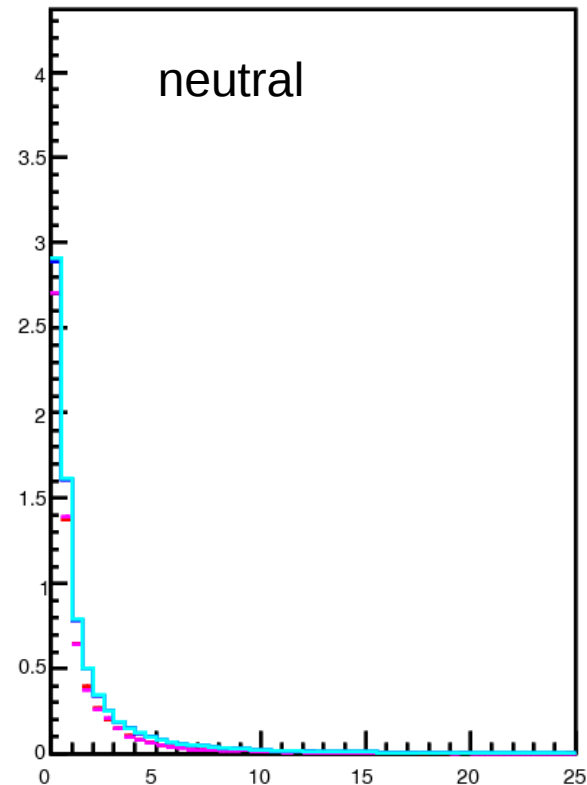
samples with BGs

h\_mumu\_pfoChg\_en



PFO energy [GeV]

h\_mumu\_pfoNeu\_en



PFO energy [GeV]

# summary

looked at effect of overlaid Bgs in  $\mu^+ \mu^-$  events at 250 GeV  
compared validation samples to DBD samples

some differences expected due to different treatment

several differences seen

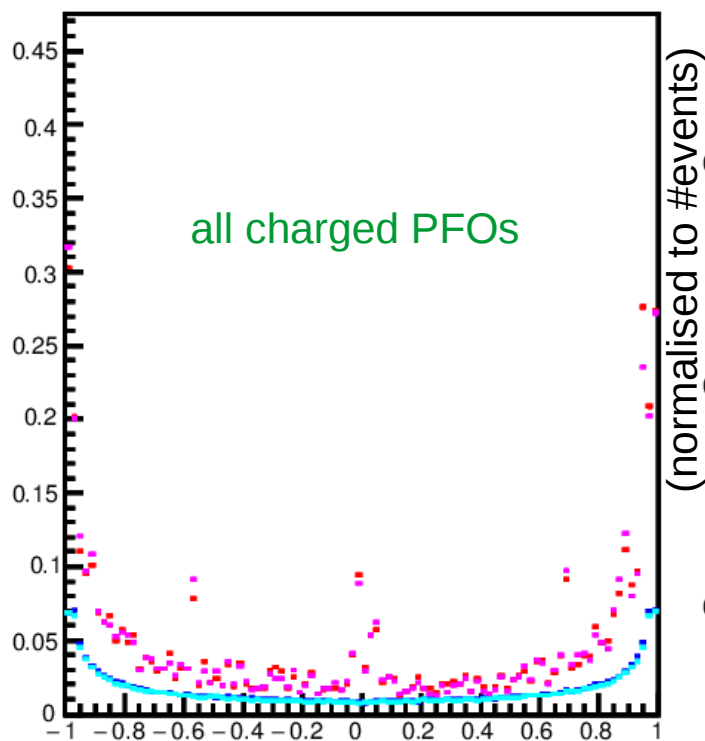
I don't understand all of them,  
especially  $\cos(\theta)$  distribution of charged PFOs

plots added after meeting to understand better:

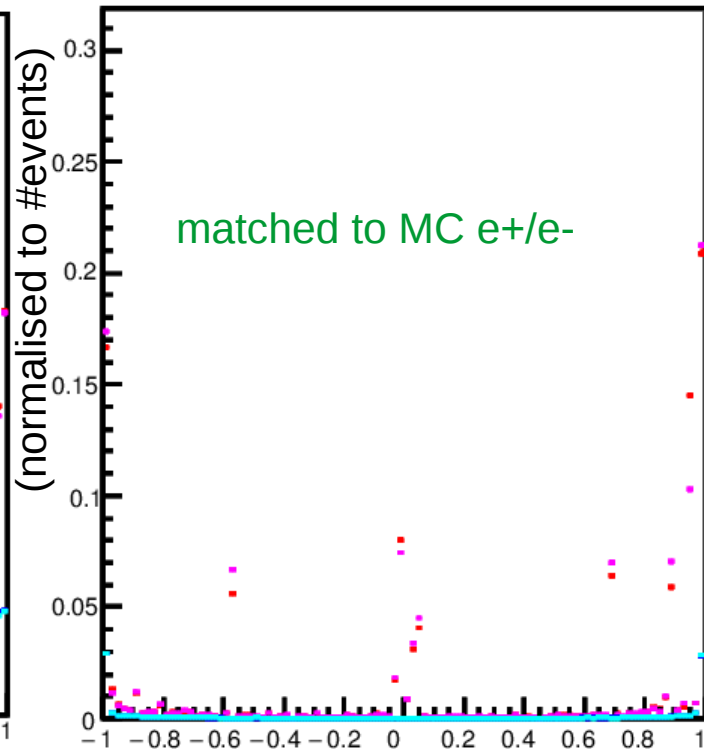
compare validation samples:

with and without overlaid backgrounds

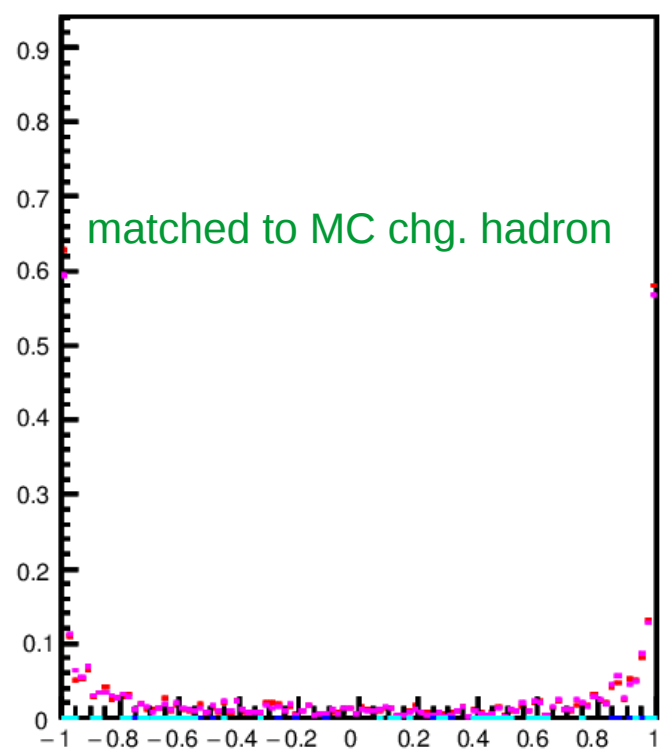
h\_mumu\_pfoChg\_costh



h\_mumu\_pfoMCEle\_costh



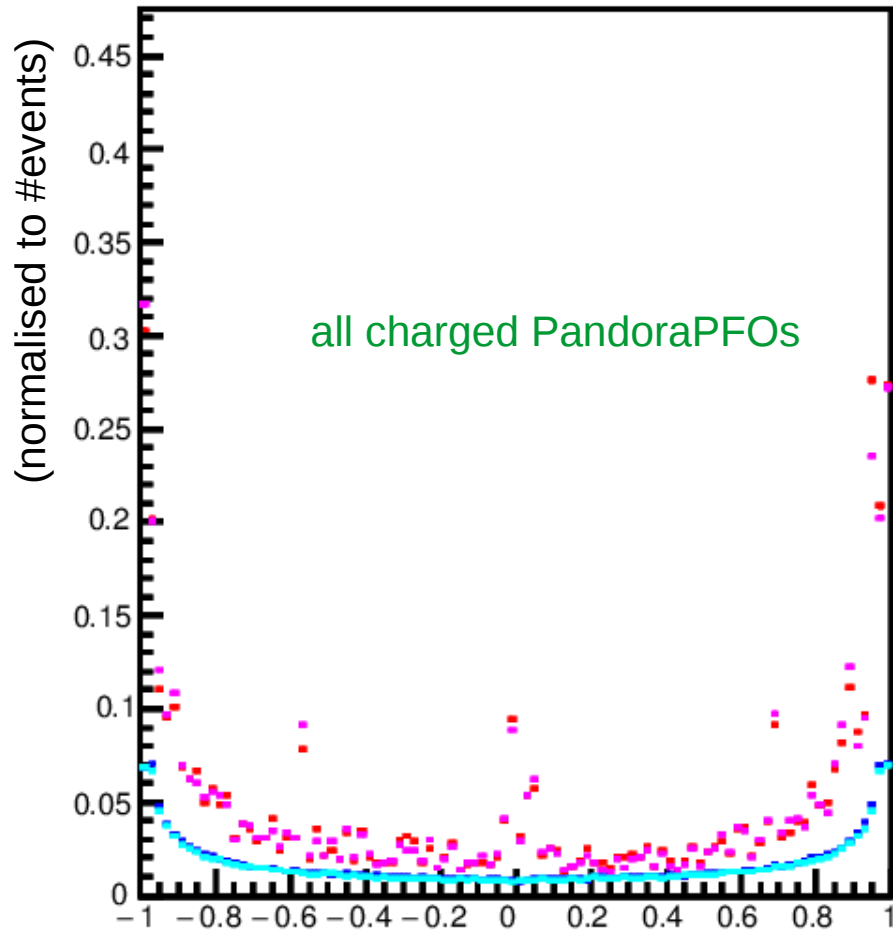
h\_mumu\_pfoMCchad\_costh



$\cos(\theta)$

compare validation samples:  
with and without overlaid backgrounds

h\_mumu\_pfoChg\_costh



h\_mumu\_trk\_costh

