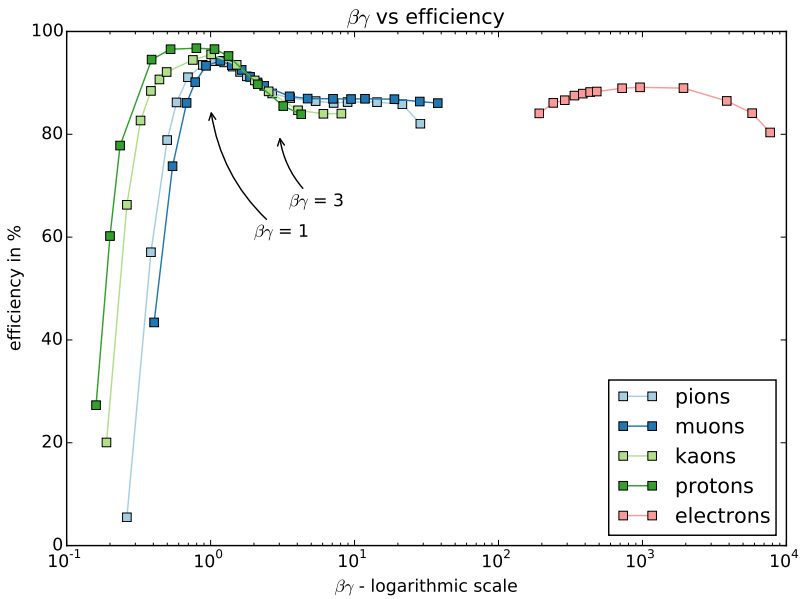
VXDTF Efficiency study - current status

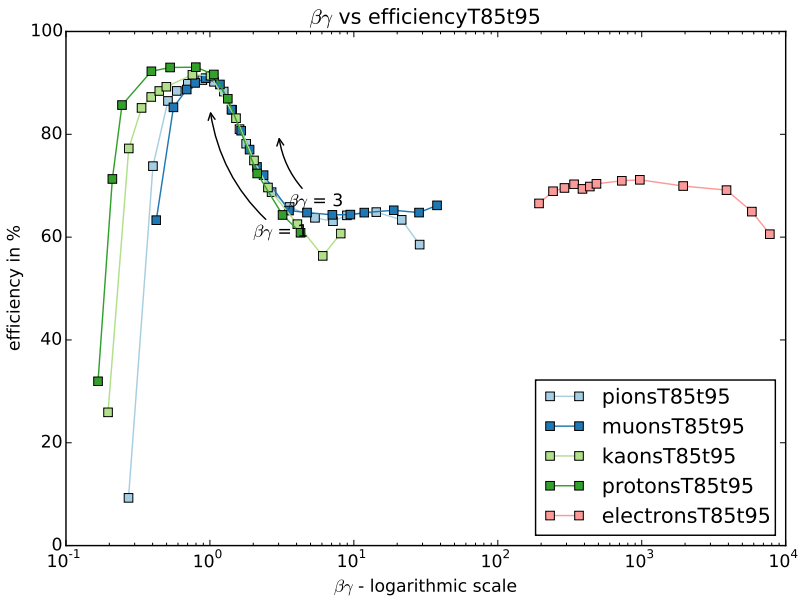
R. Frühwirth, J. Lettenbichler, T. Madlener

Institute of High Energy Physics
Austrian Academy of Sciences

March 27, 2015

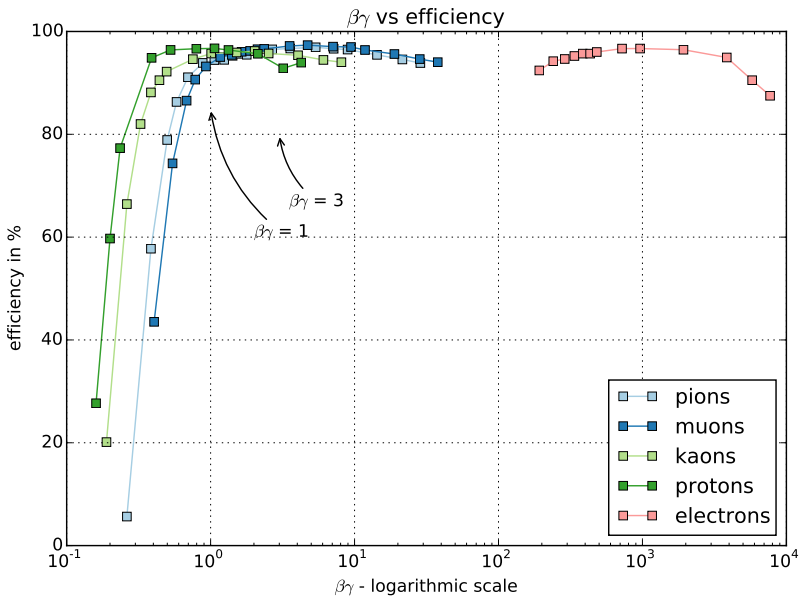
$\beta\gamma$ vs efficiency

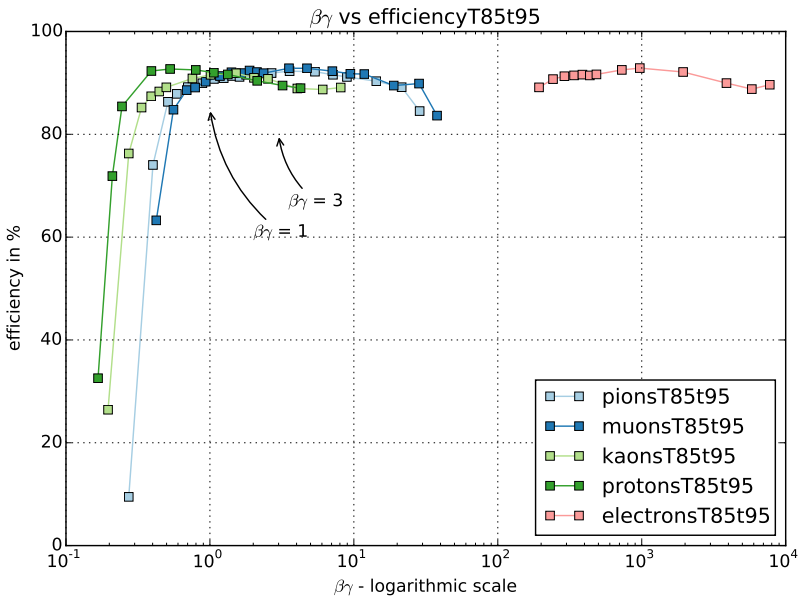




$\beta\gamma$ vs efficiency. Left full $\theta 12 - 152°$, right $\theta 85 - 95°$

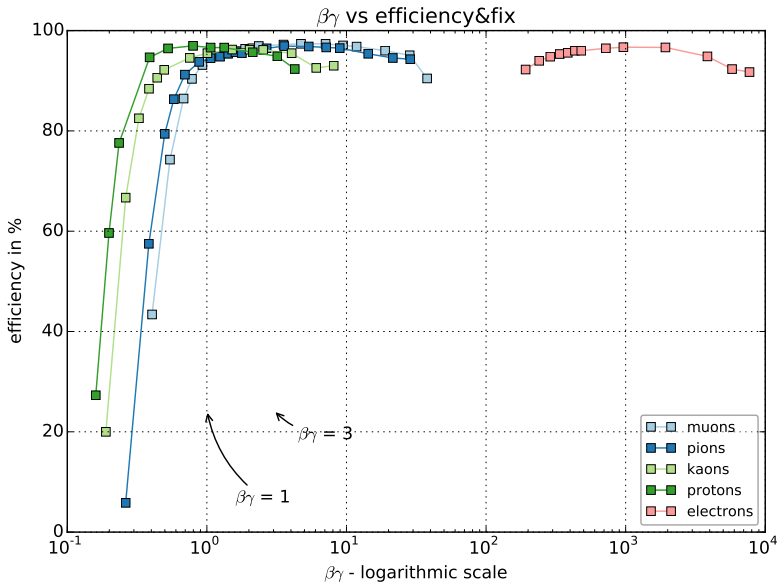
$\beta\gamma$ vs efficiency - workaround

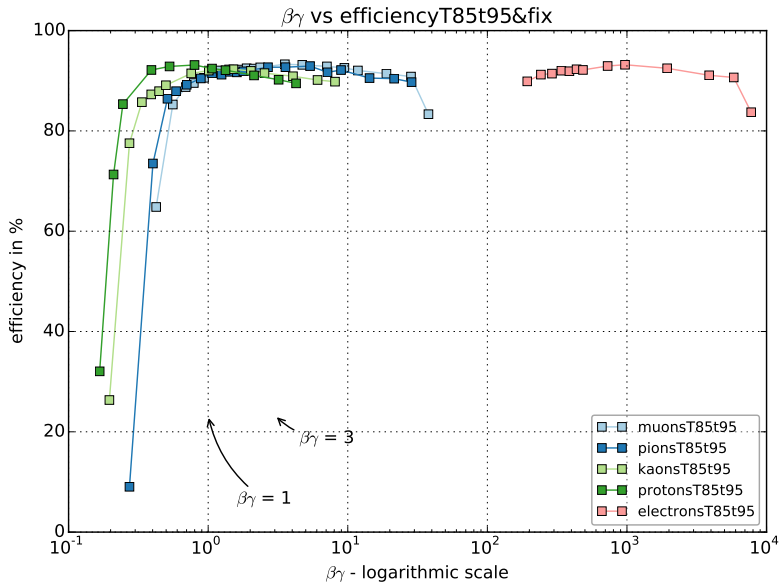




$\beta\gamma$ vs efficiency. Left full $\theta 12 - 152°$, right $\theta 85 - 95°$ using workaround

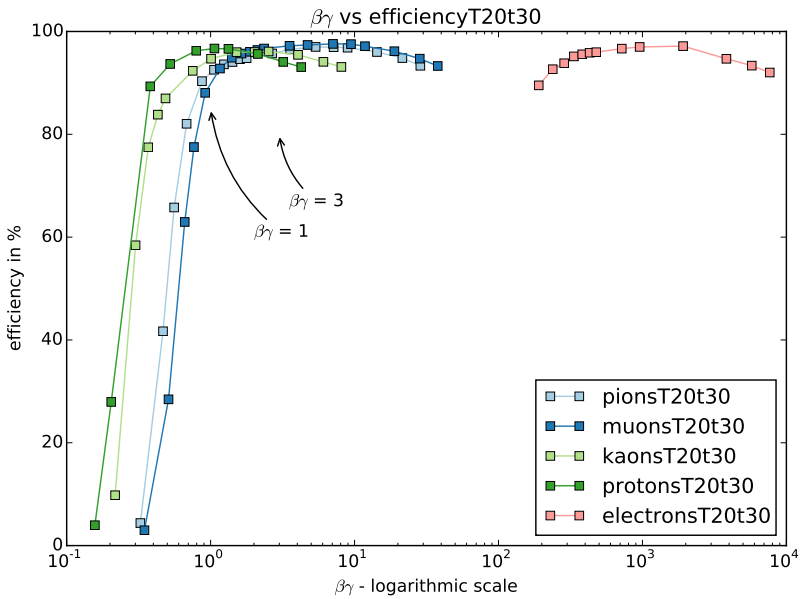
$\beta\gamma$ vs efficiency - fix

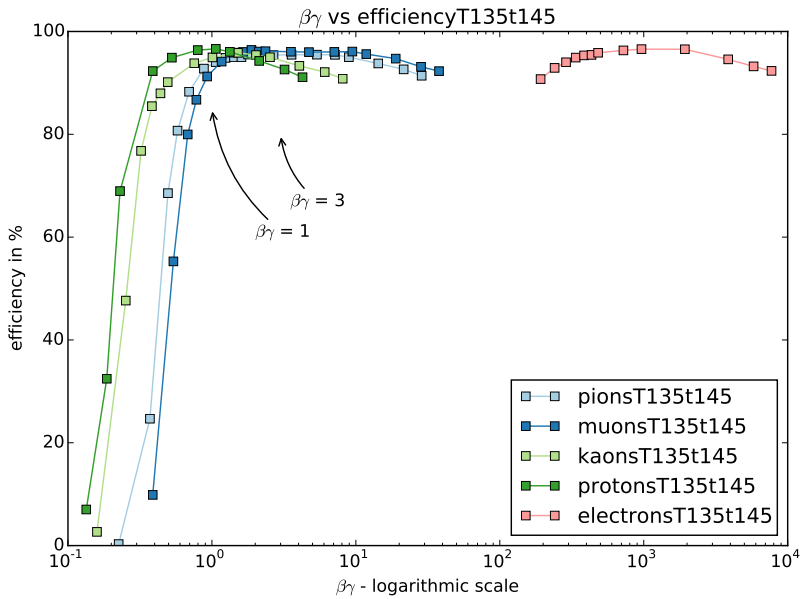




$\beta\gamma$ vs efficiency. Left full $\theta 12 - 152°$, right $\theta 85 - 95°$ using Peters fix

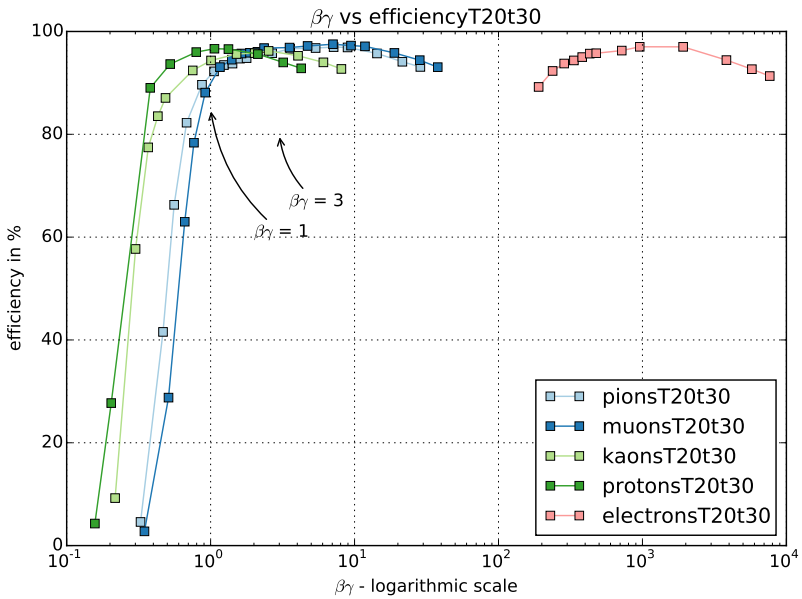
$\beta\gamma$ vs efficiency II

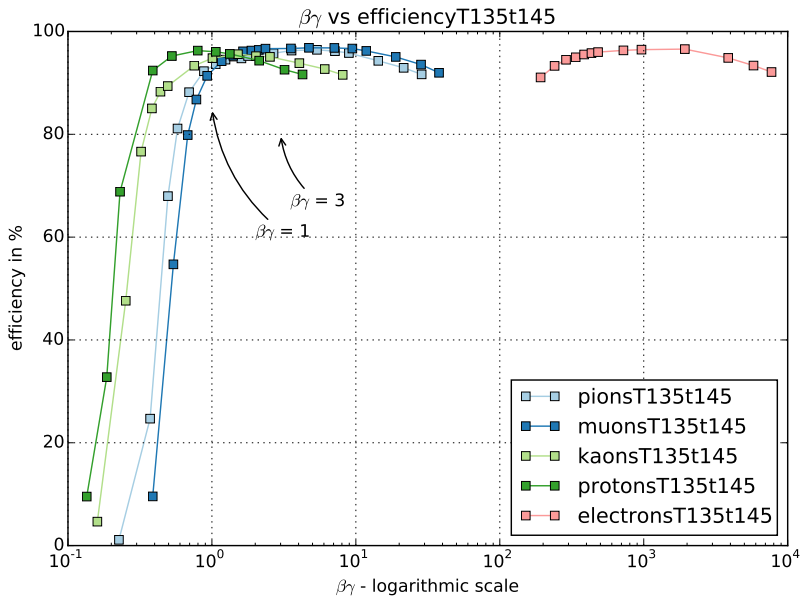




$\beta\gamma$ vs efficiency. Left $\theta 20 - 30°$, right $\theta 135 - 145°$

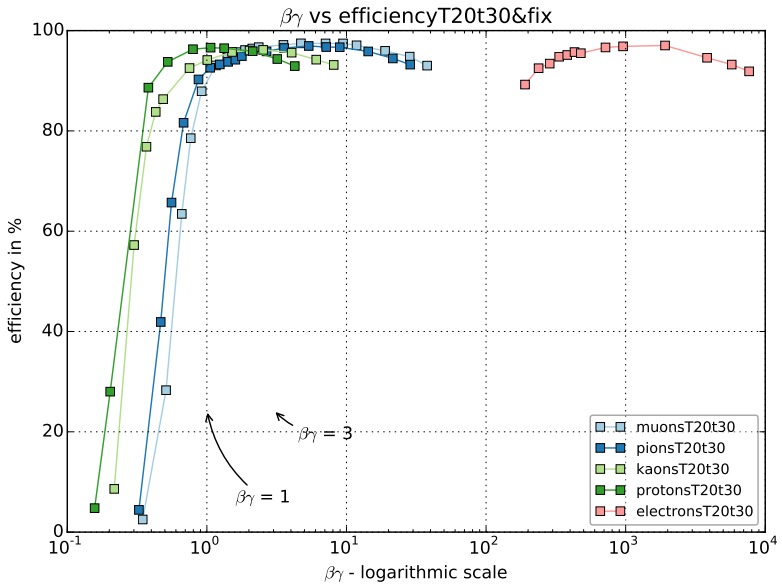
$\beta\gamma$ vs efficiency II - workaround

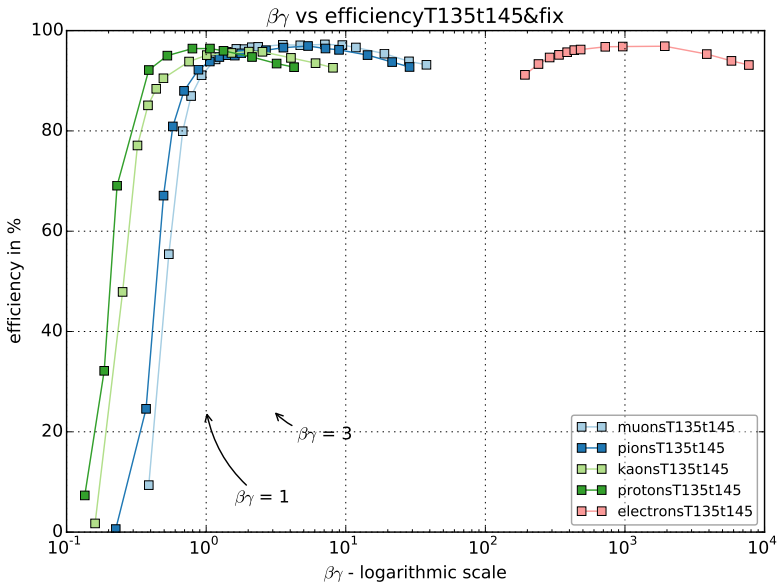




$\beta\gamma$ vs efficiency. Left $\theta 20 - 30°$, right $\theta 135 - 145°$ using workaround

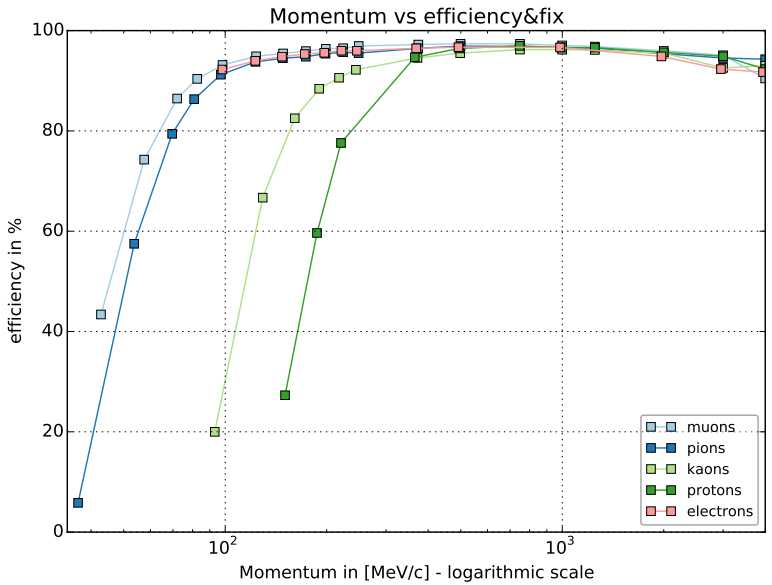
$\beta\gamma$ vs efficiency II - fix

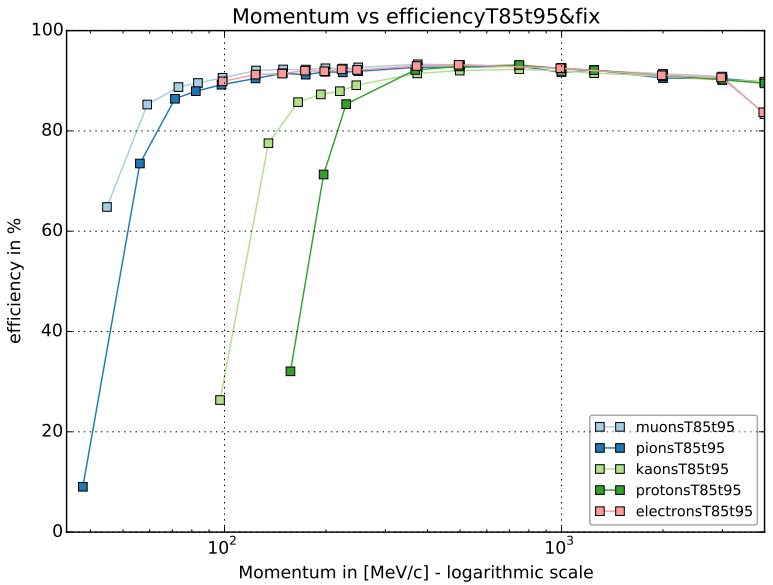




$\beta\gamma$ vs efficiency. Left $\theta 20 - 30°$, right $\theta 135 - 145°$ using Peters fix

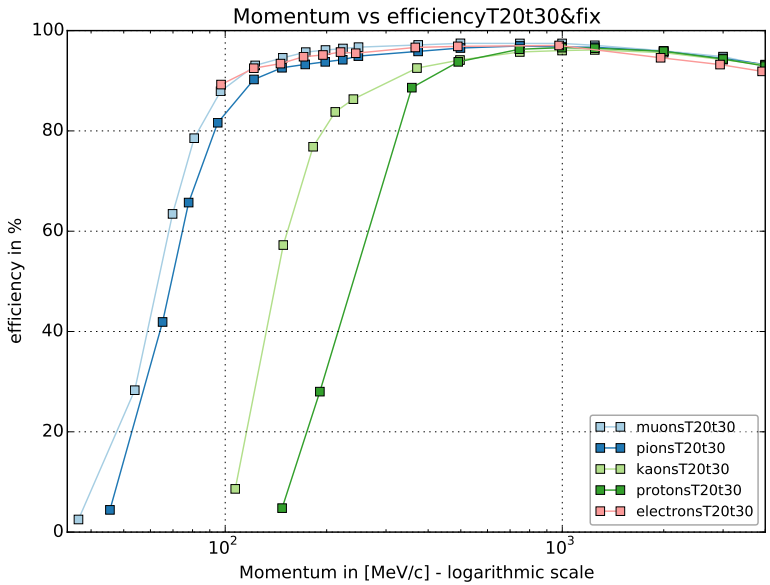
momentum vs efficiency - fix

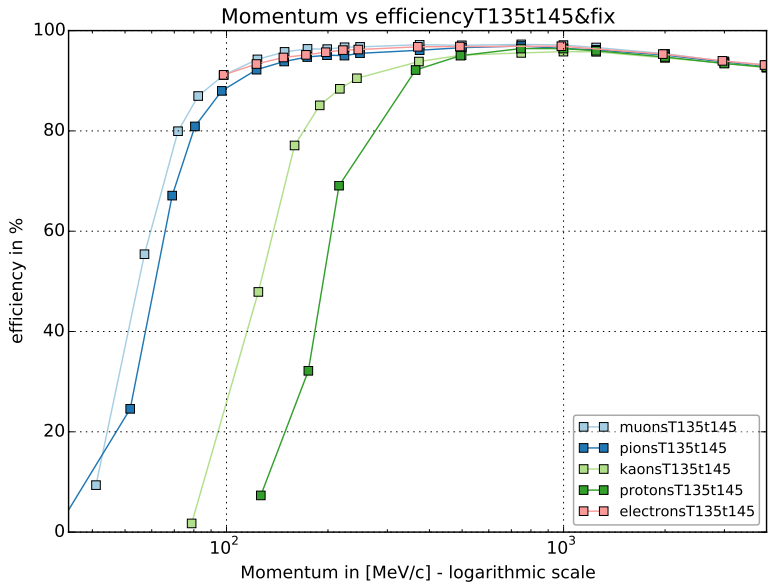




momentum vs efficiency. Left full $\theta 12 - 152^\circ$, right $\theta 85 - 95^\circ$ using Peters fix

momentum vs efficiency II - fix



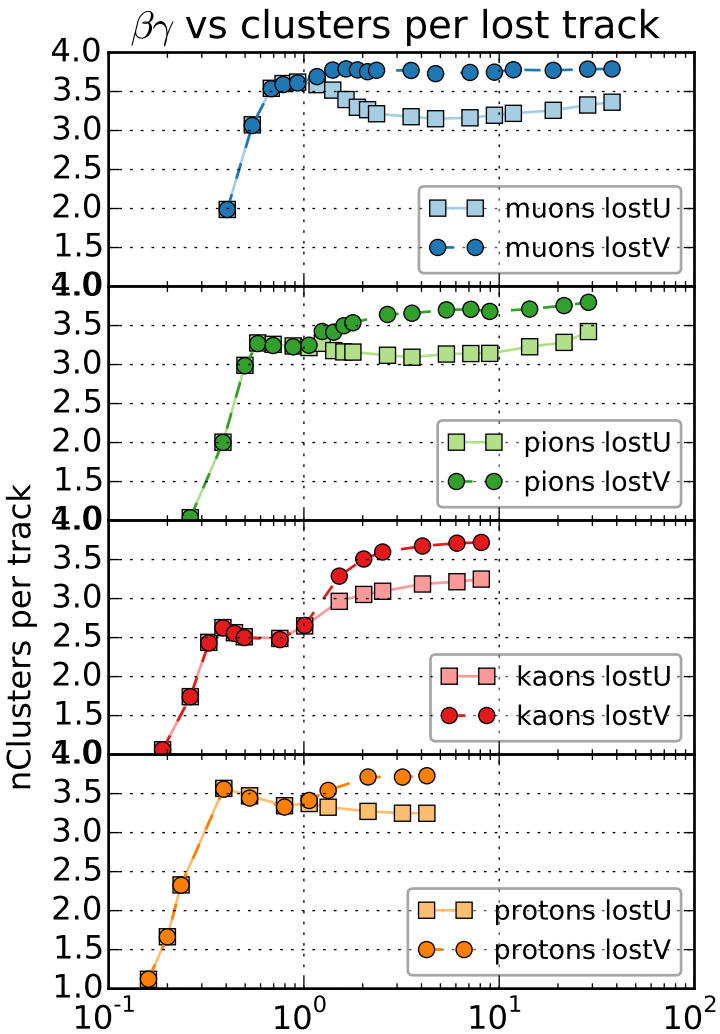


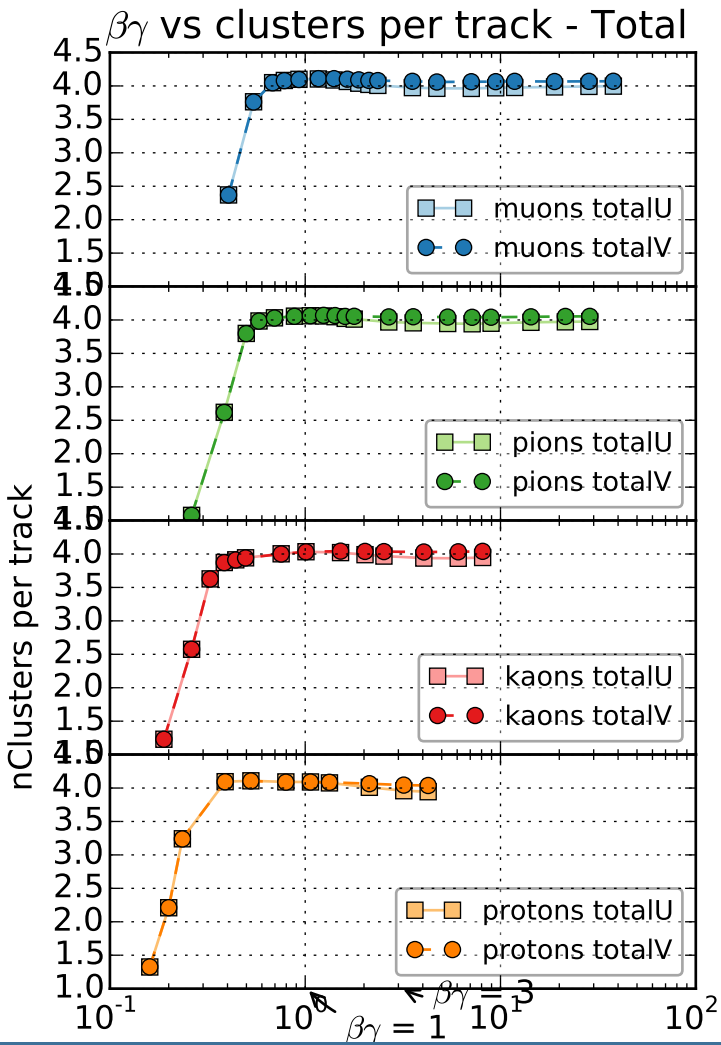
momentum vs efficiency. Left $\theta 20 - 30°$, right $\theta 135 - 145°$ using Peters fix

$\beta\gamma$ vs clusters (lost) tracks

$\beta\gamma$ vs clusters in lost tracks (left), full $\theta 12 - 152^\circ$

$\beta\gamma$ vs clusters in all tracks (right), full $\theta 12 - 152^\circ$

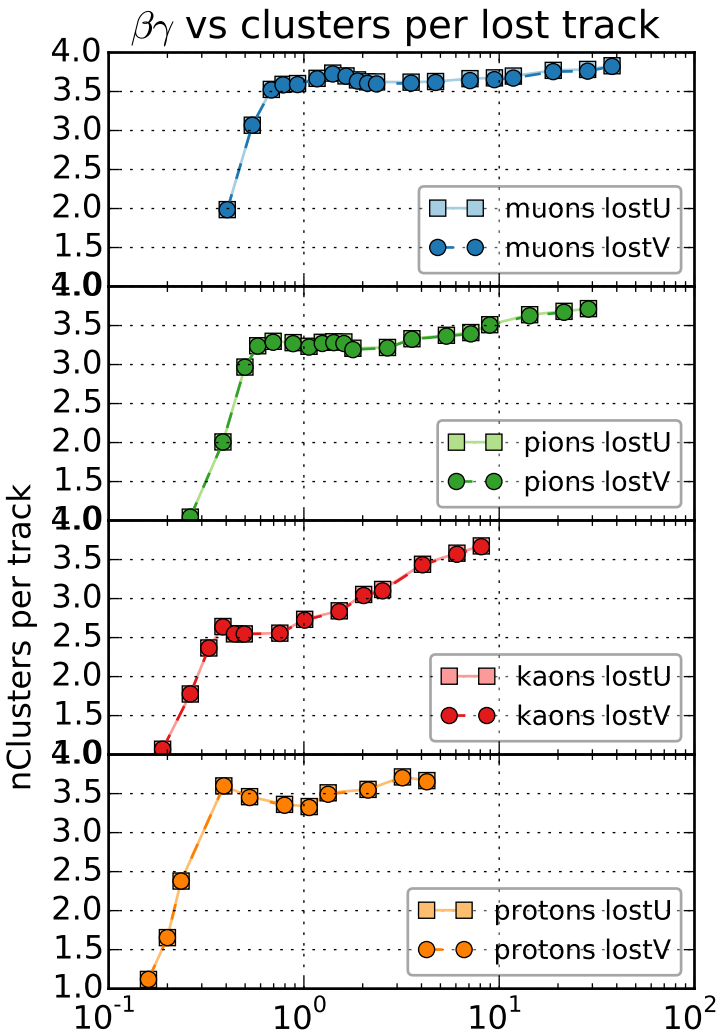


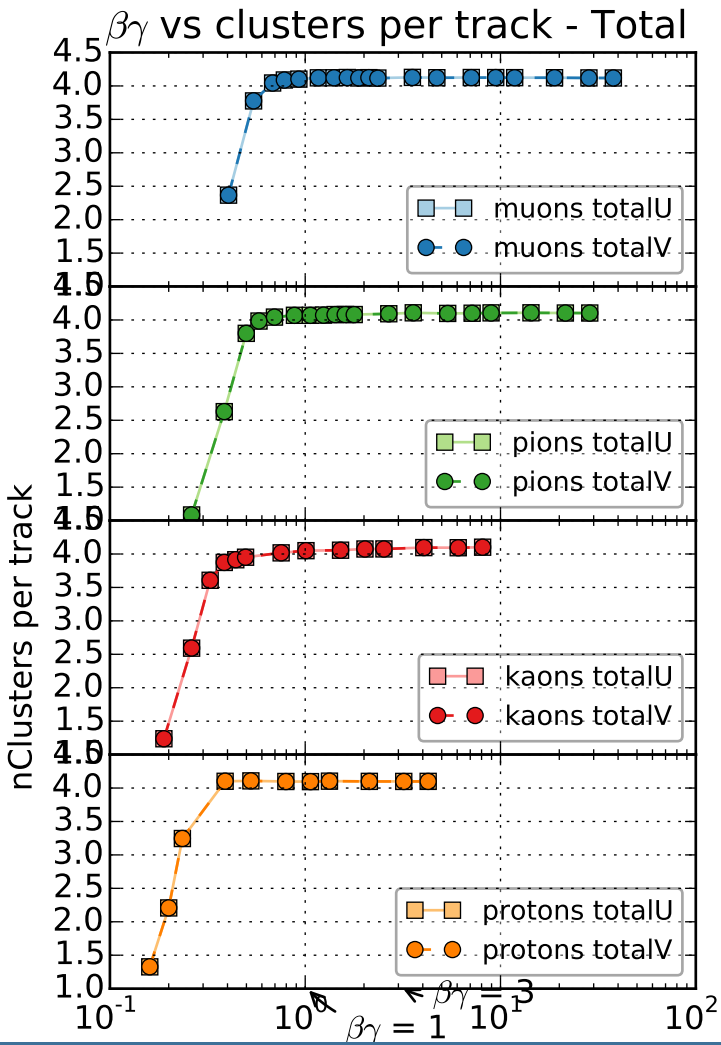


$\beta\gamma$ vs clusters (lost) tracks - workaround

$\beta\gamma$ vs clusters in lost tracks (left), full $\theta 12 - 152°$

$\beta\gamma$ vs clusters in all tracks (right), full $\theta 12 - 152°$

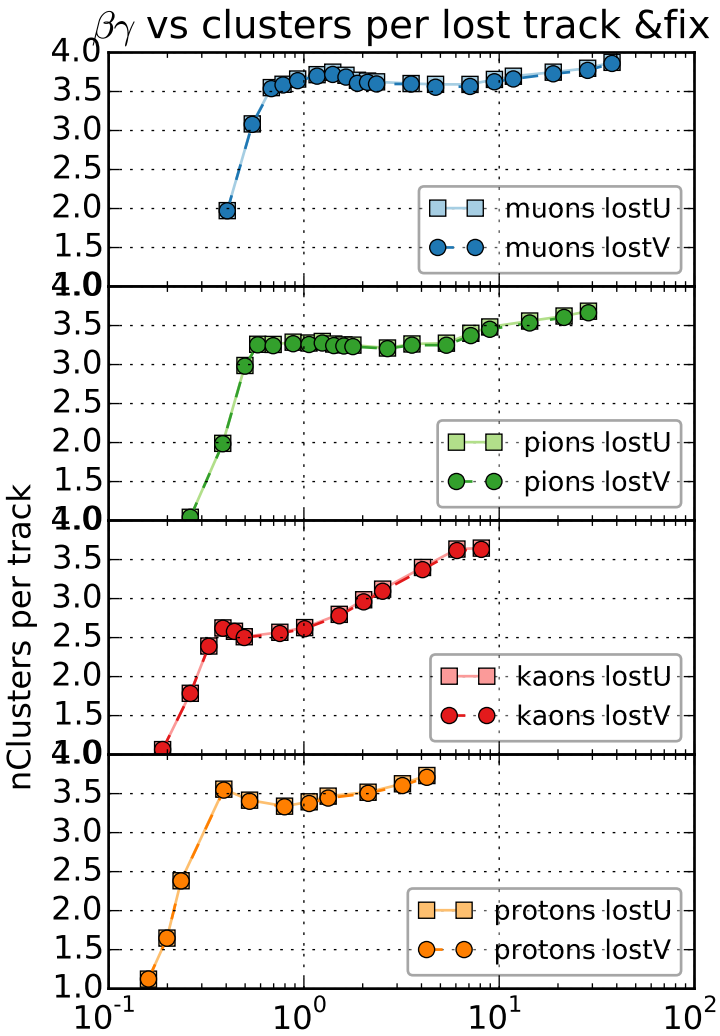


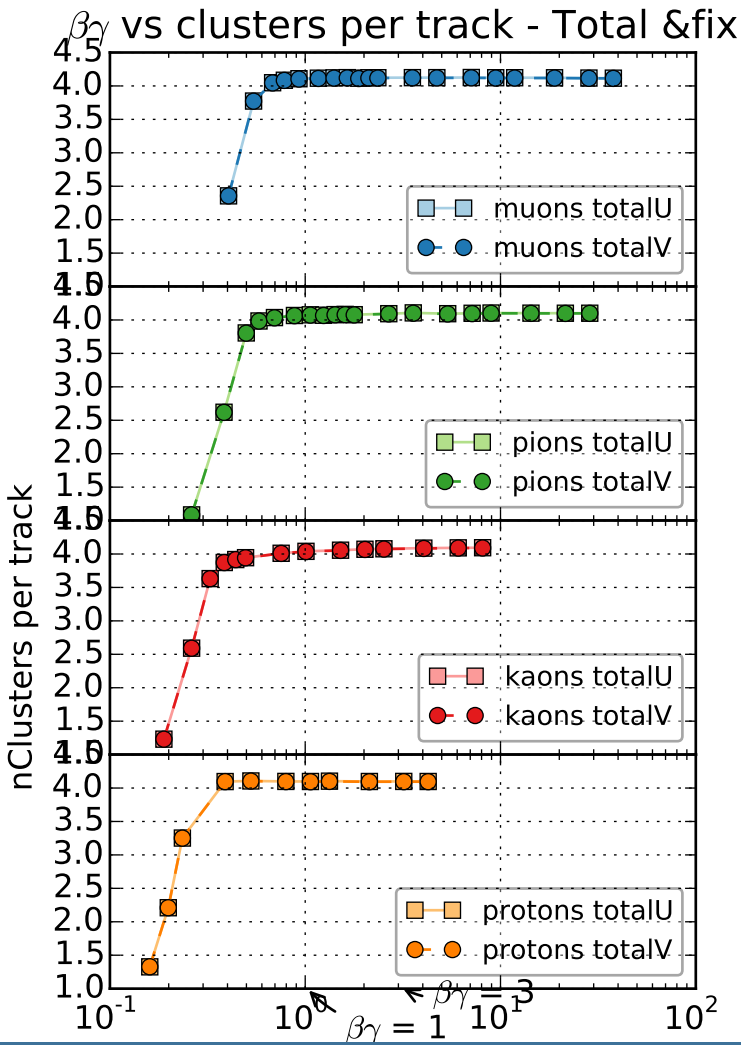


$\beta\gamma$ vs clusters (lost) tracks - fix

$\beta\gamma$ vs clusters in lost tracks (left), full $\theta 12 - 152^\circ$

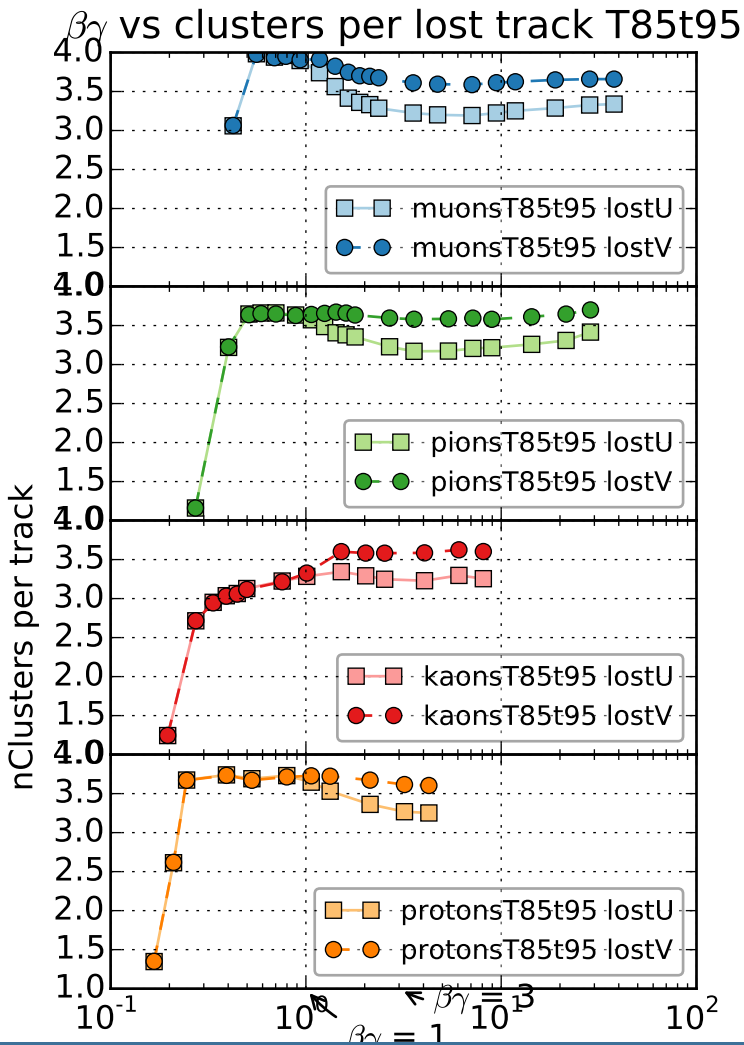
$\beta\gamma$ vs clusters in all tracks (right), full $\theta 12 - 152^\circ$

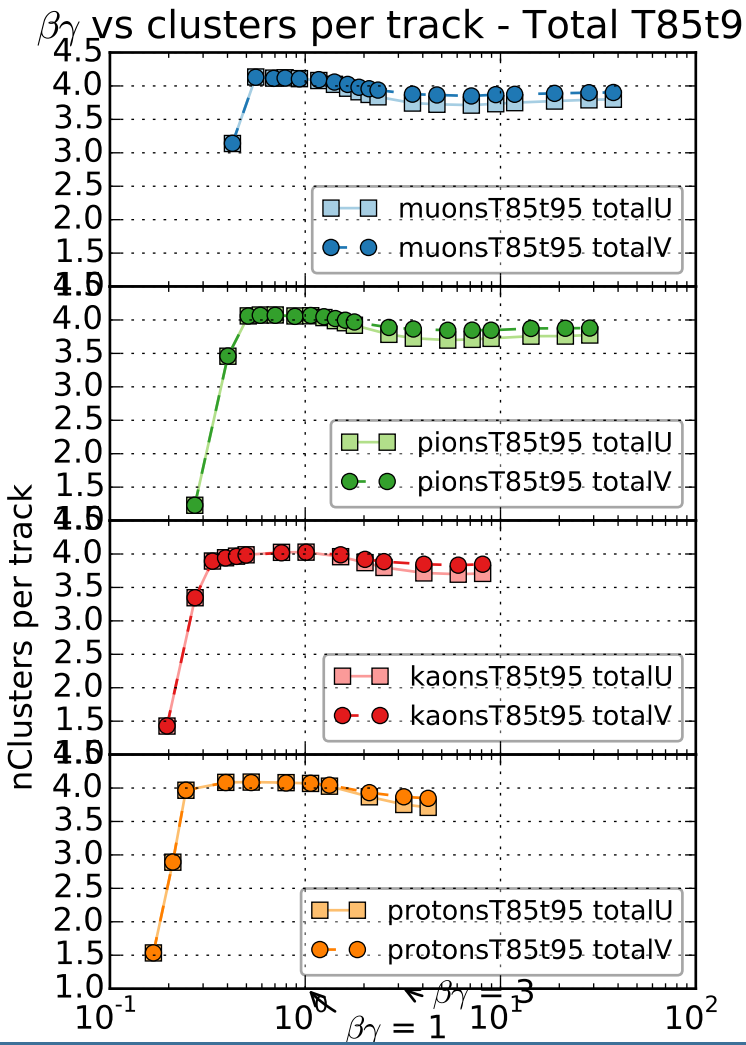




$\beta\gamma$ vs clusters (lost) tracks II

$\beta\gamma$ vs clusters in lost tracks (left), $\theta 85 - 95°$ $\beta\gamma$ vs clusters in all tracks (right), $\theta 85 - 95°$

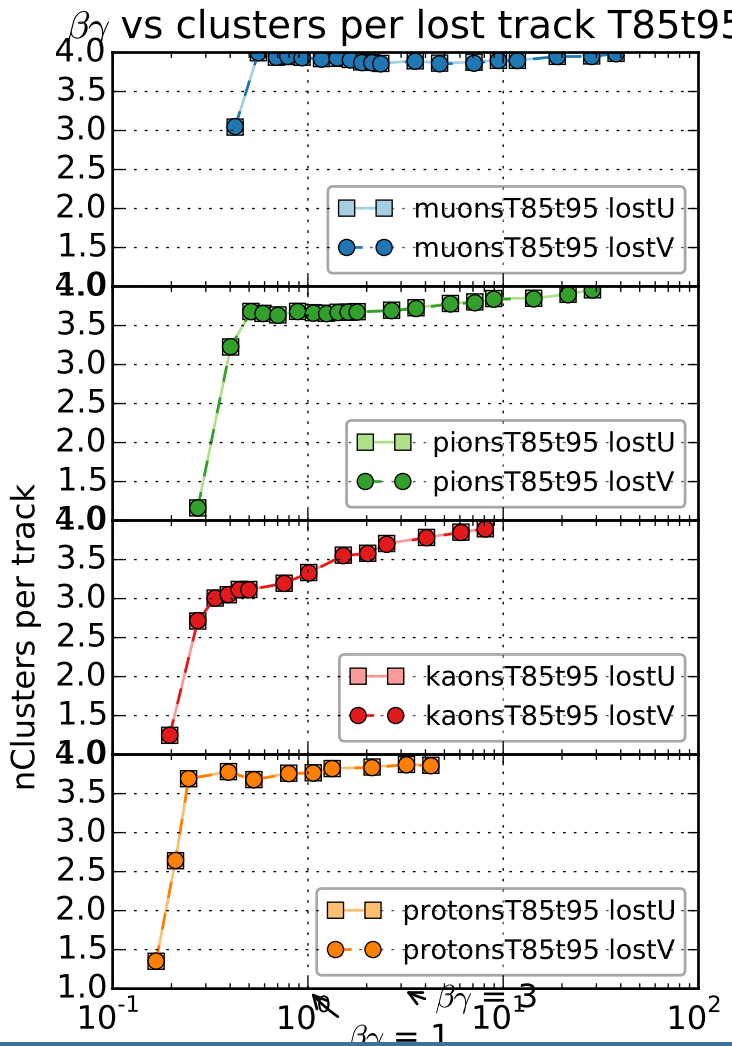


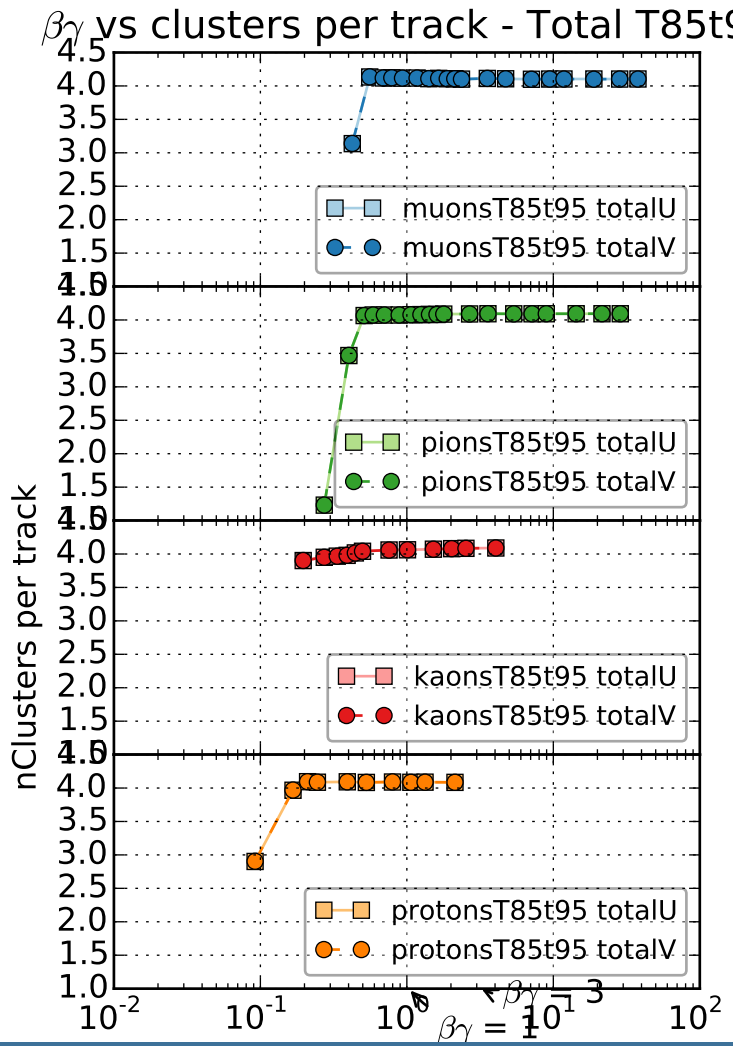


$\beta\gamma$ vs clusters (lost) tracks II - workaround

$\beta\gamma$ vs clusters in lost tracks (left), $\theta 85 - 95°$

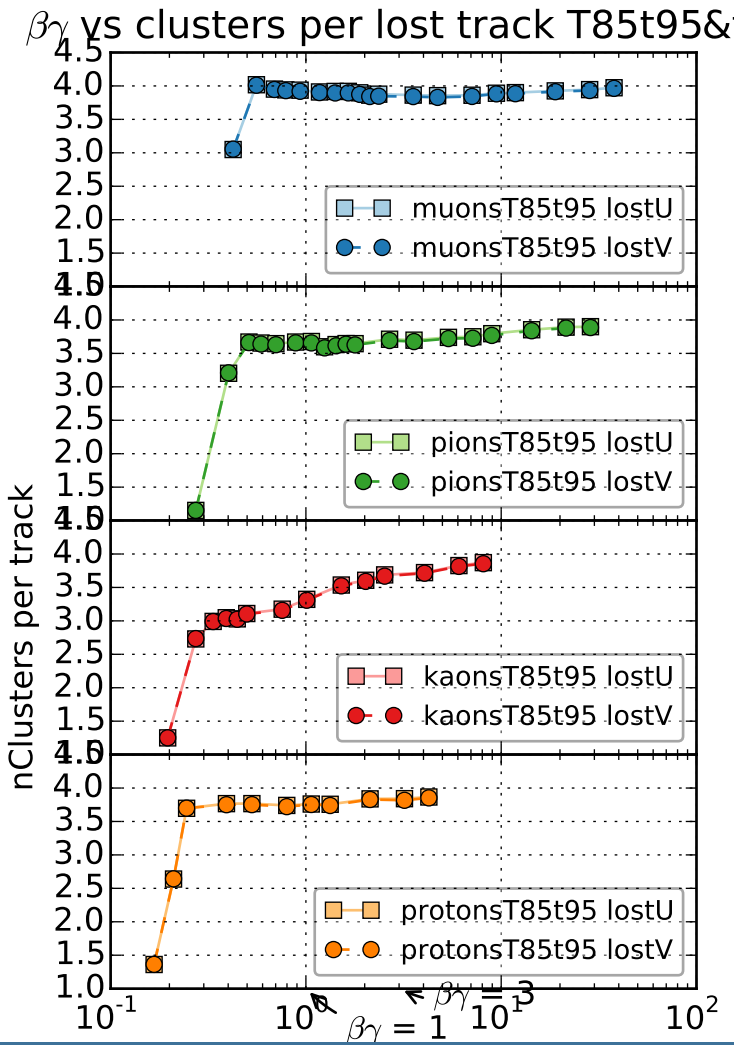
$\beta\gamma$ vs clusters in all tracks (right), $\theta 85 - 95°$

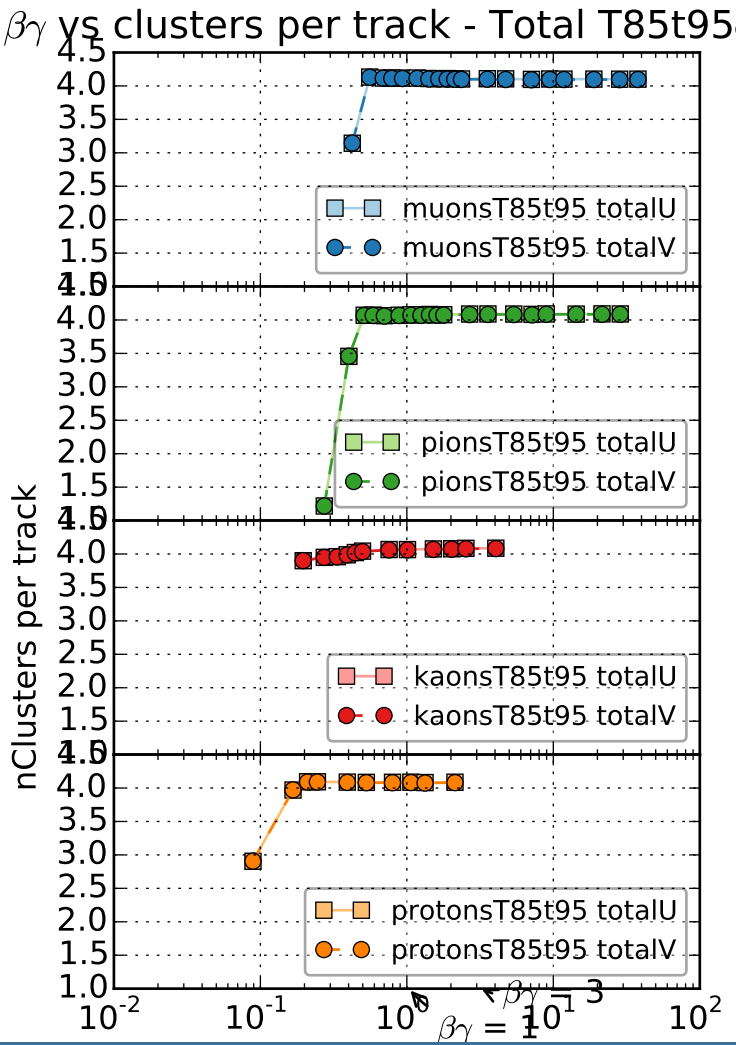




$\beta\gamma$ vs clusters (lost) tracks II - fix

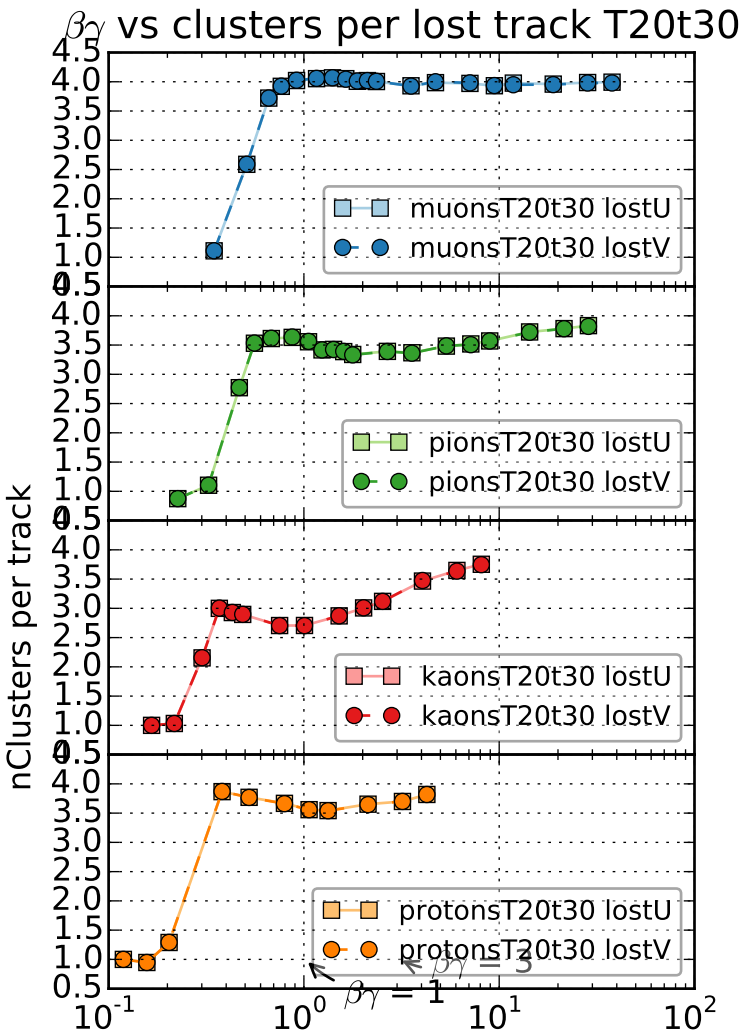
$\beta\gamma$ vs clusters in lost tracks (left), $\theta 85 - 95°$ $\beta\gamma$ vs clusters in all tracks (right), $\theta 85 - 95°$

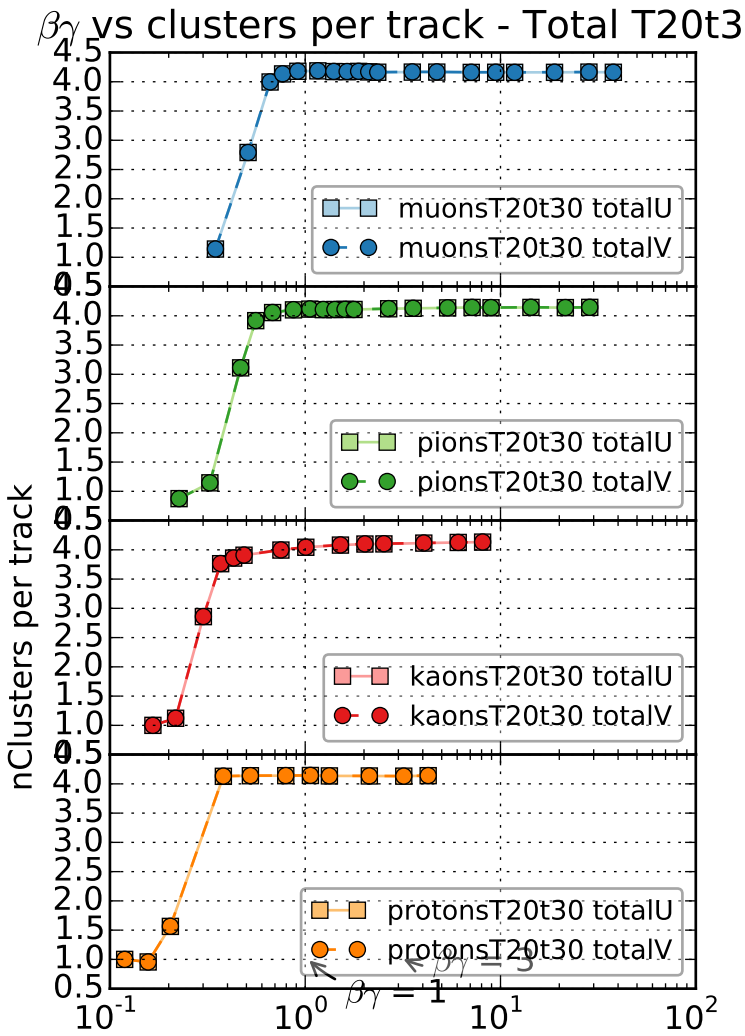




$\beta\gamma$ vs clusters (lost) tracks III

$\beta\gamma$ vs clusters in lost tracks (left), $\theta 20 - 30°$ $\beta\gamma$ vs clusters in all tracks (right), $\theta 20 - 30°$

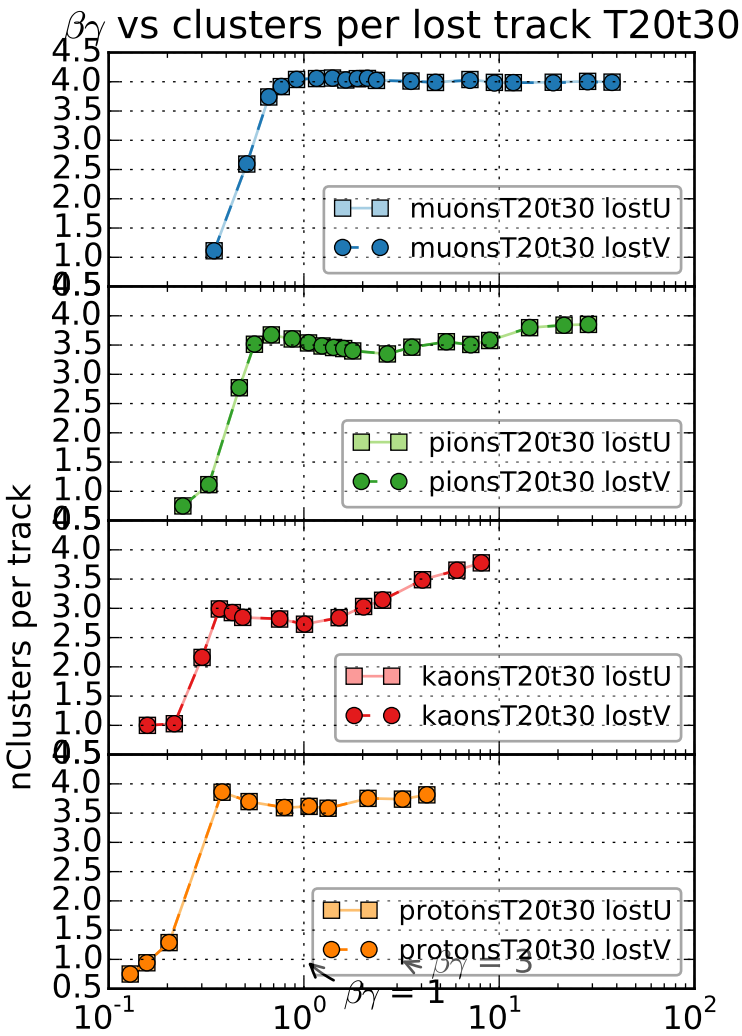


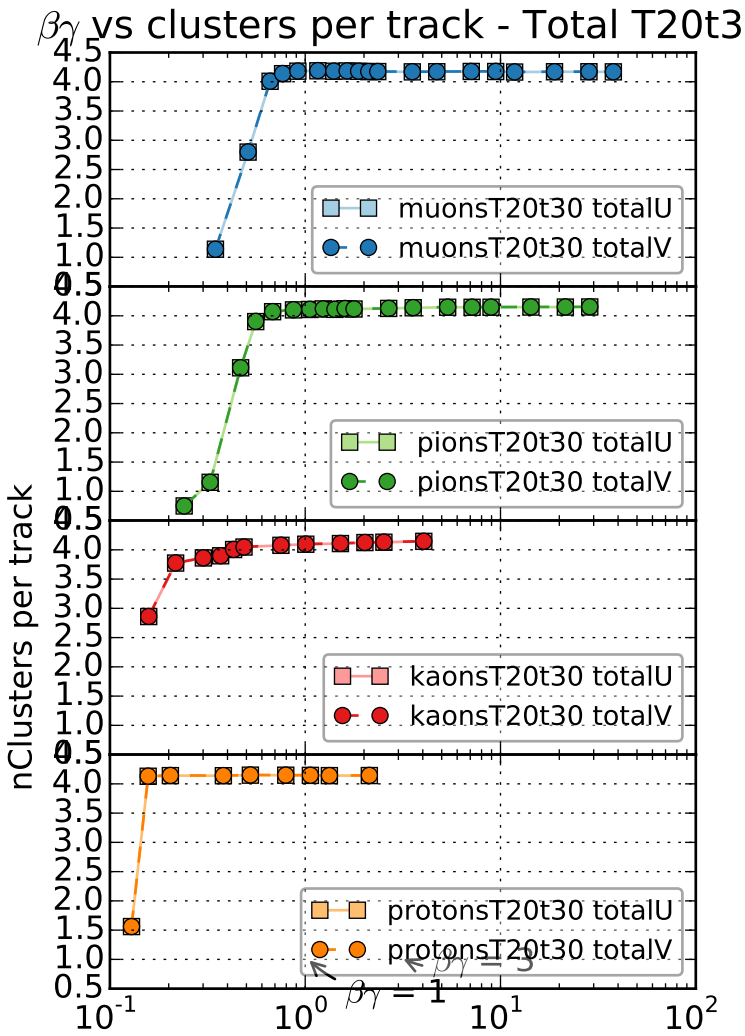


$\beta\gamma$ vs clusters (lost) tracks III - workaround

$\beta\gamma$ vs clusters in lost tracks (left), $\theta 20 - 30°$

$\beta\gamma$ vs clusters in all tracks (right), $\theta 20 - 30°$

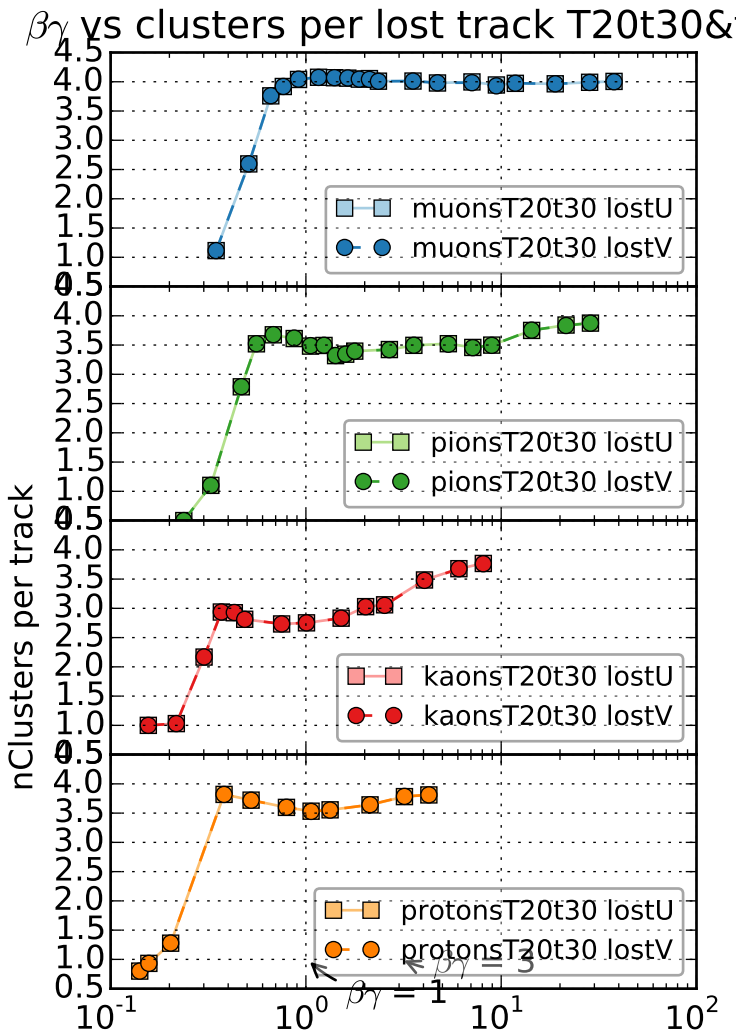


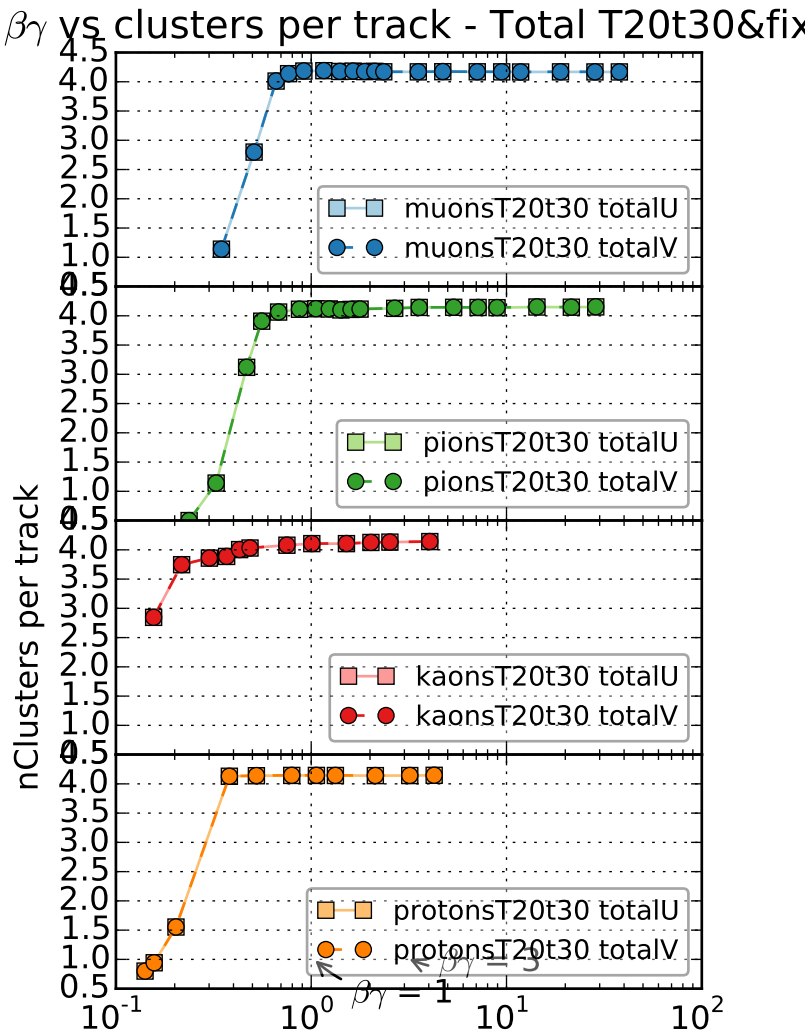


$\beta\gamma$ vs clusters (lost) tracks III - fix

$\beta\gamma$ vs clusters in lost tracks (left), $\theta 20 - 30°$

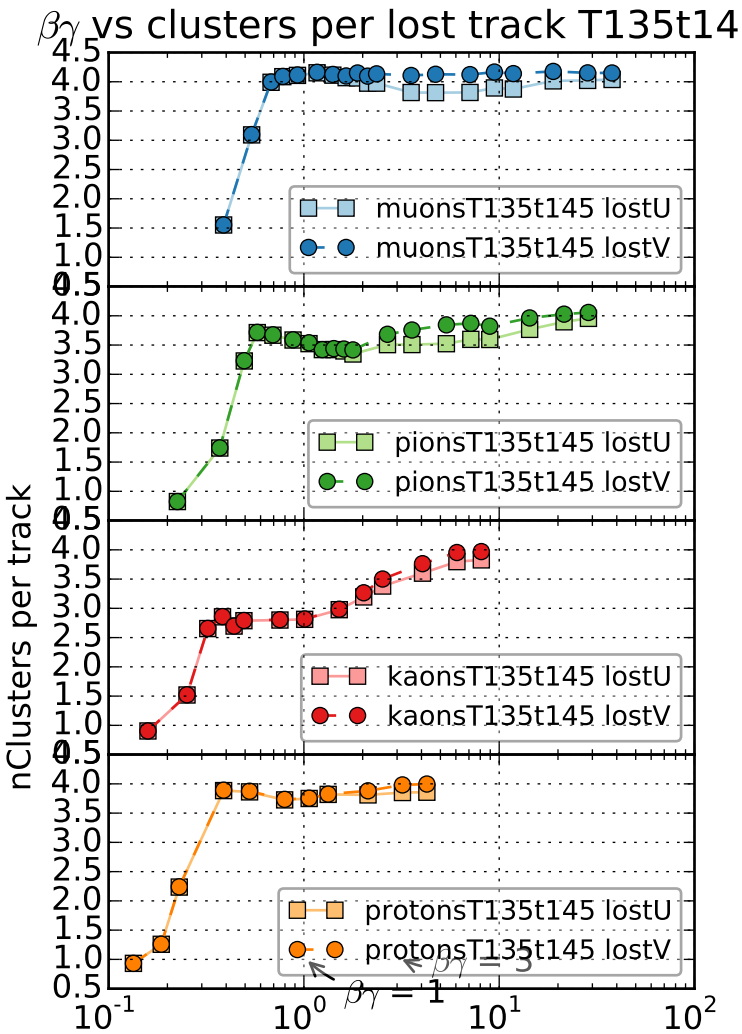
$\beta\gamma$ vs clusters in all tracks (right), $\theta 20 - 30°$

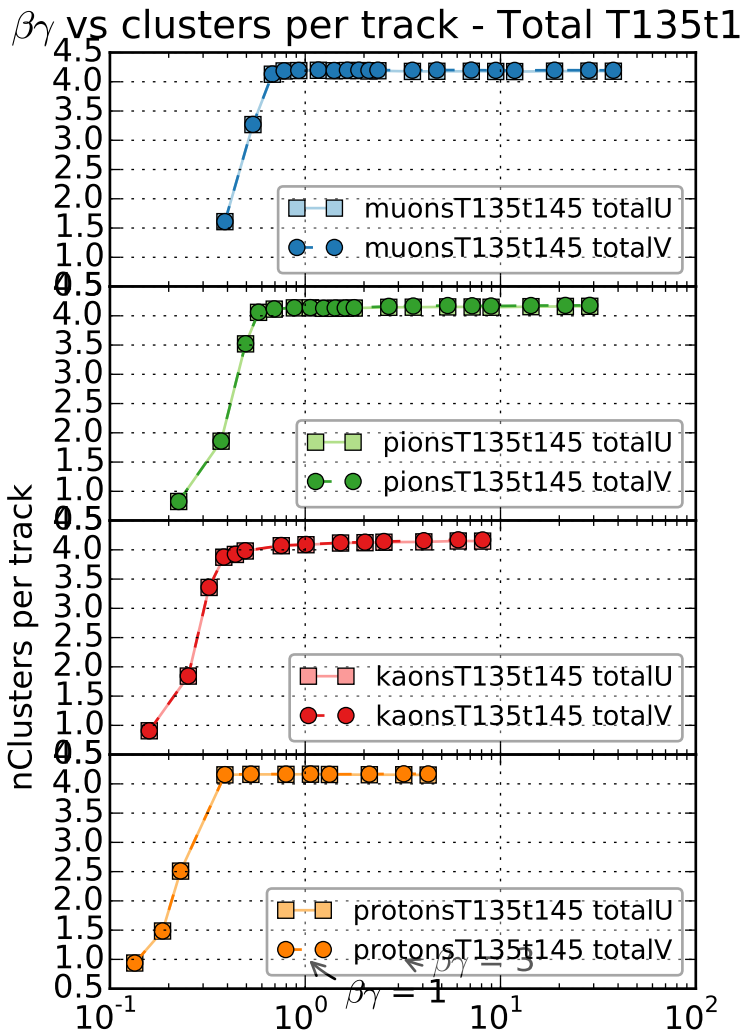




$\beta\gamma$ vs clusters (lost) tracks IV

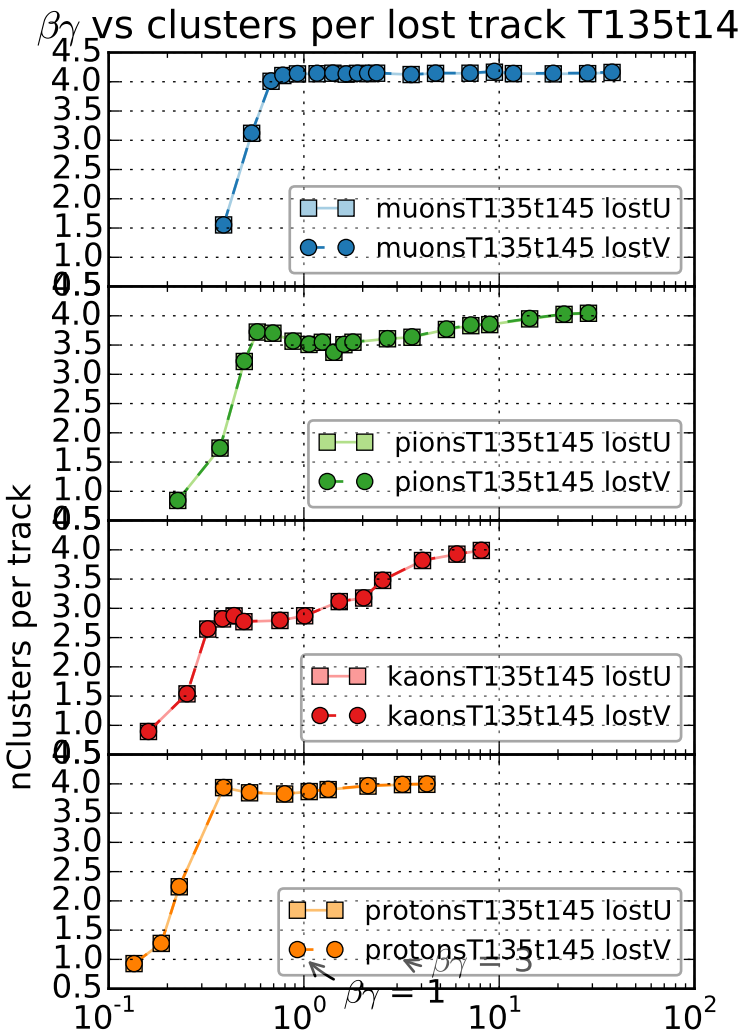
$\beta\gamma$ vs clusters in lost tracks (left), $\theta 135 - 145°$ $\beta\gamma$ vs clusters in all tracks (right), $\theta 135 - 145°$

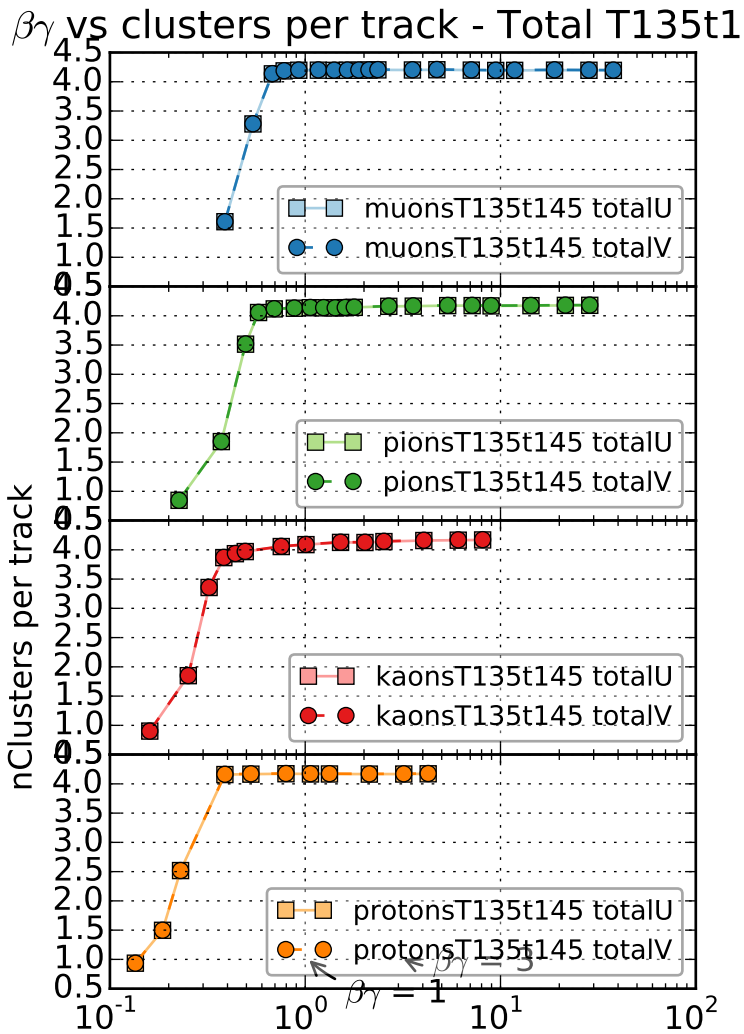




$\beta\gamma$ vs clusters (lost) tracks IV - workaround

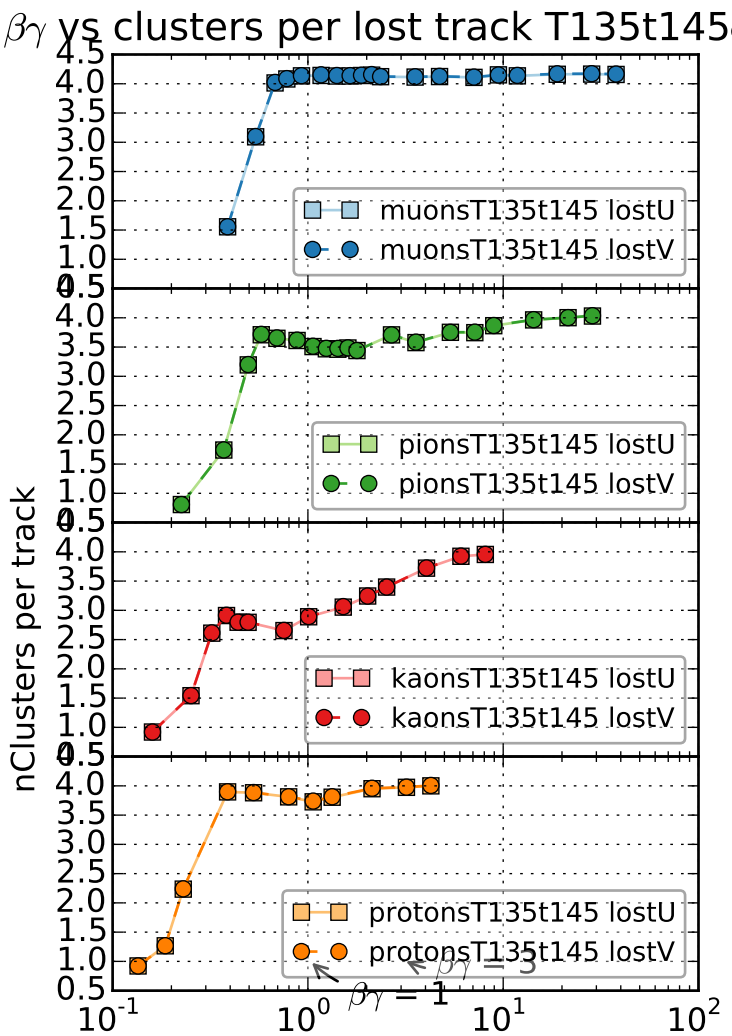
$\beta\gamma$ vs clusters in lost tracks (left), $\theta 135 - 145°$ $\beta\gamma$ vs clusters in all tracks (right), $\theta 135 - 145°$

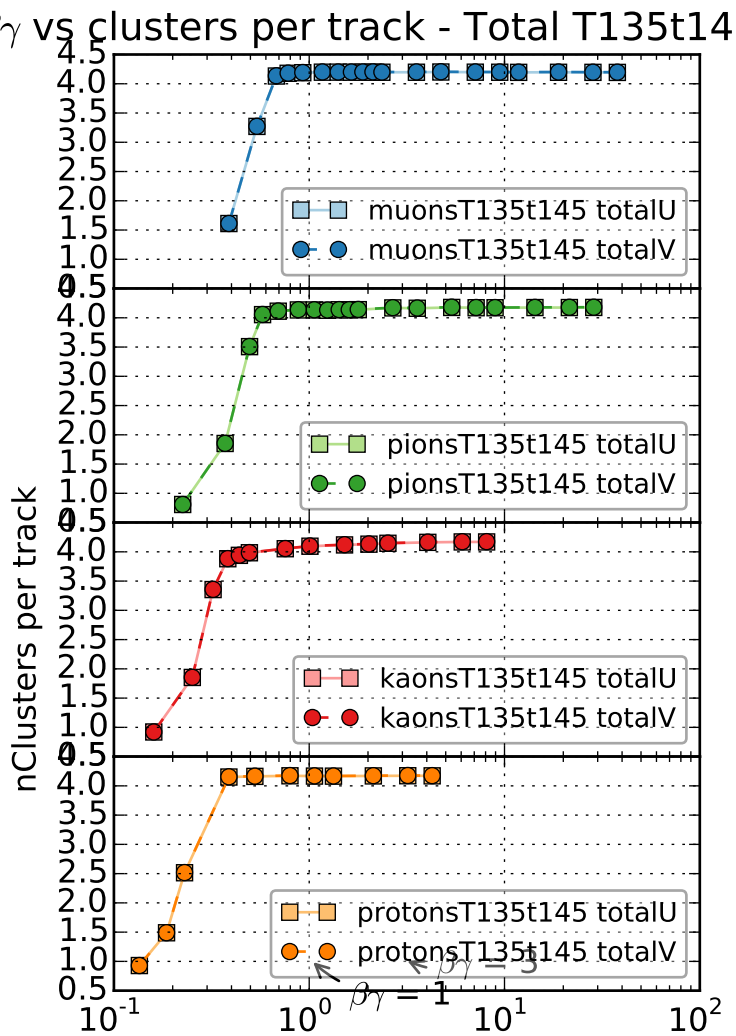




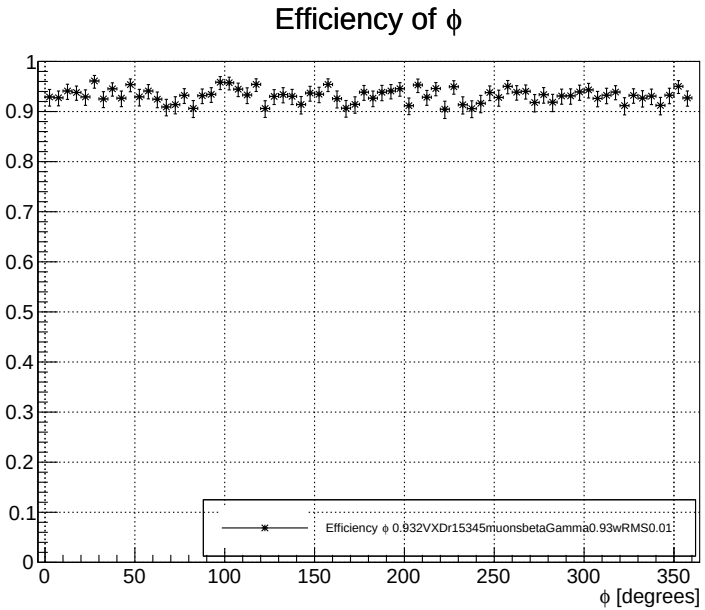
$\beta\gamma$ vs clusters (lost) tracks IV - fix

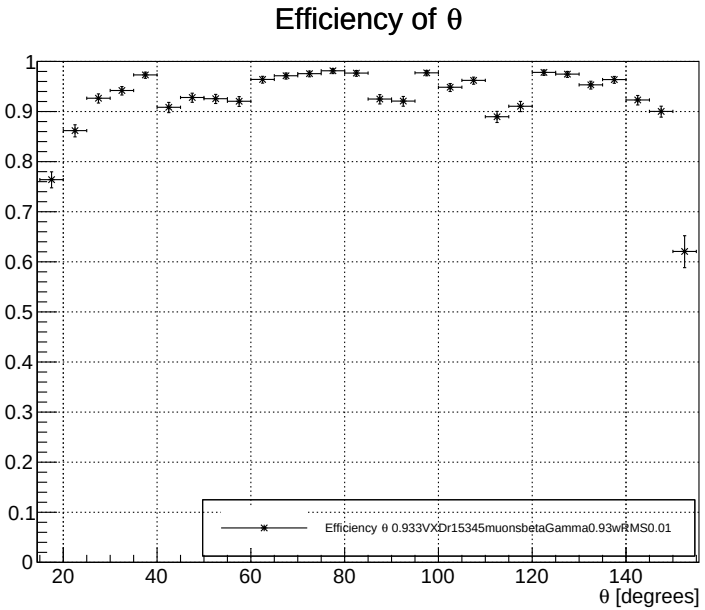
$\beta\gamma$ vs clusters in lost tracks (left), $\theta 135 - 145°$ $\beta\gamma$ vs clusters in all tracks (right), $\theta 135 - 145°$





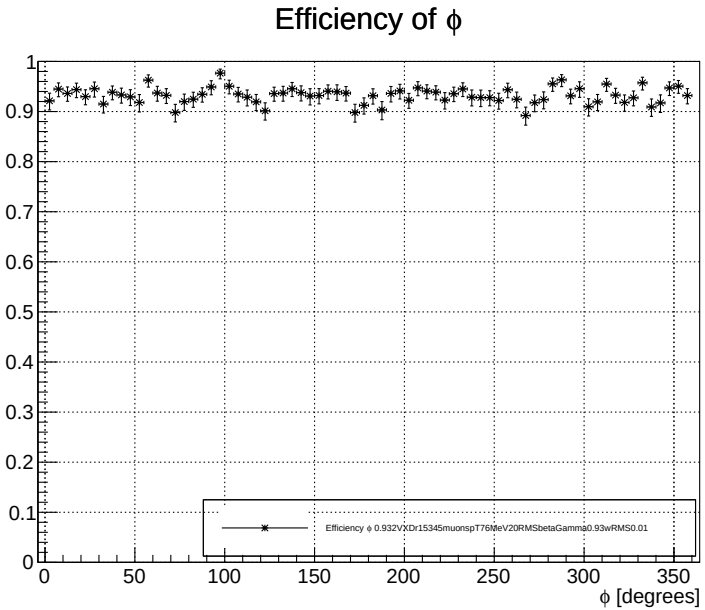
muons with p=100MeV ($\sim \beta\gamma 1$) full Clusterizer

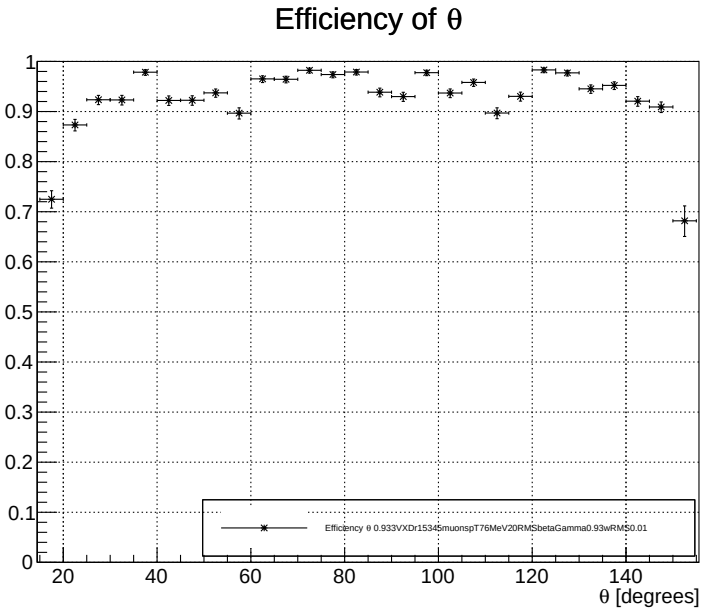




5 muons with p=100MeV full Clusterizer

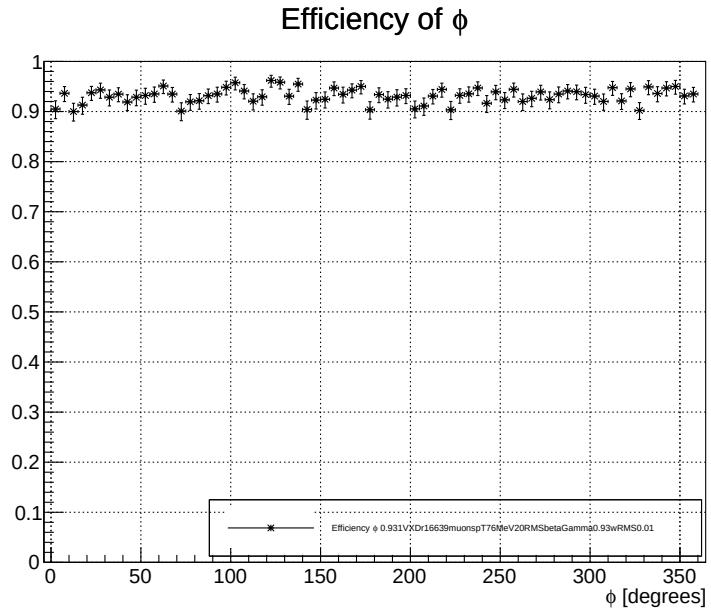
muons with p=100MeV ($\sim \beta\gamma 1$) full Clusterizer new

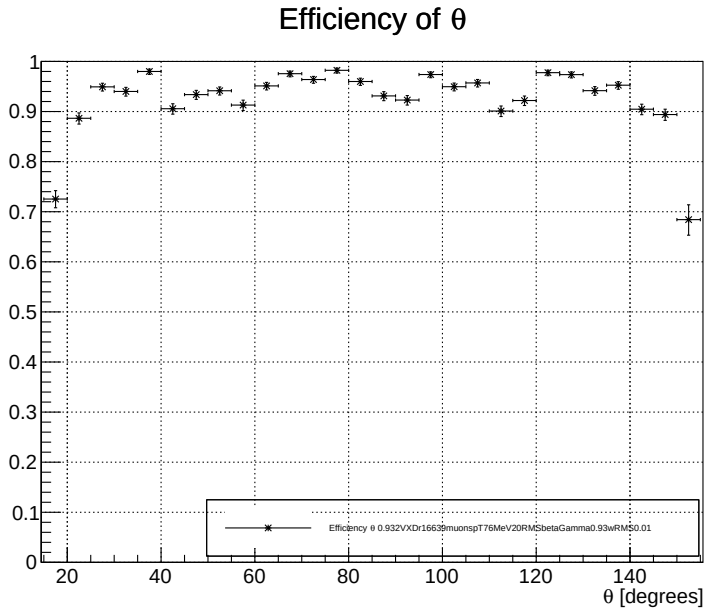




5 muons with p=100MeV full Clusterizer using workaround

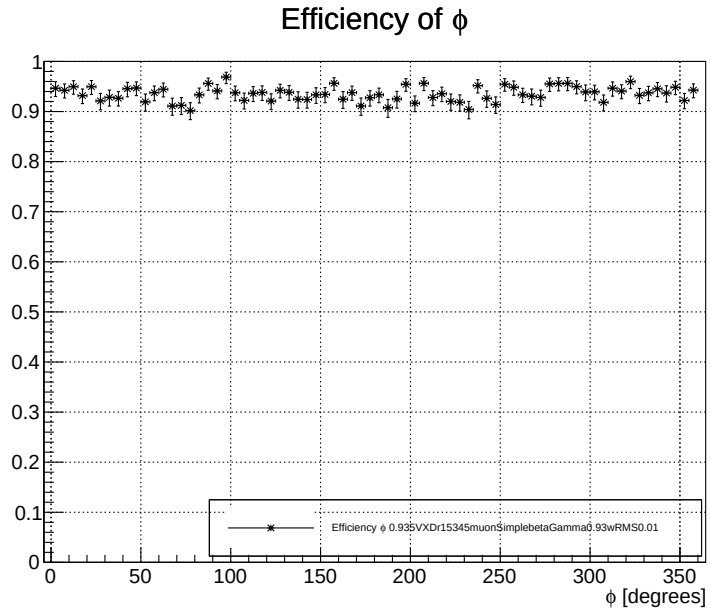
muons with p=100MeV ($\sim \beta\gamma 1$) full Clusterizer fix

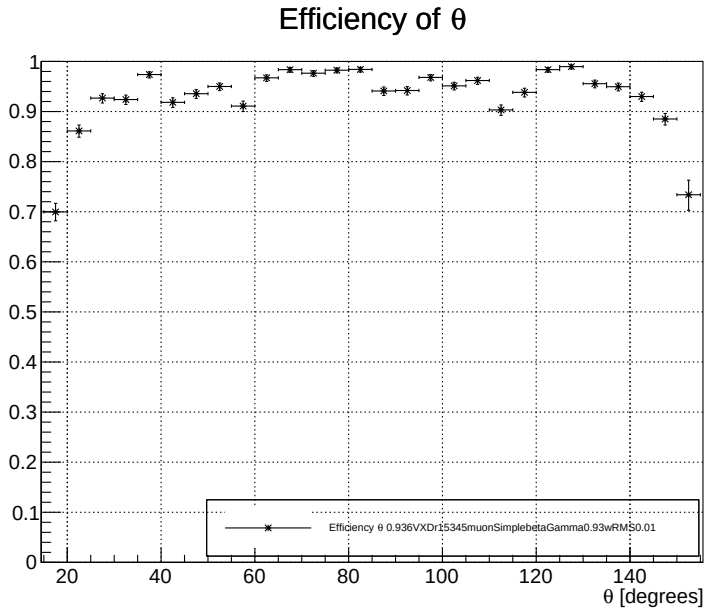




5 muons with p=100MeV full Clusterizer using Peters fix

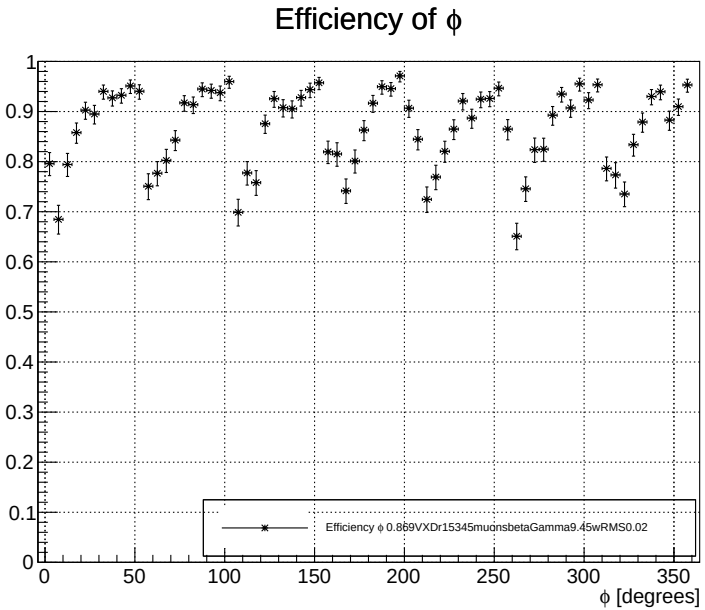
muons with p=100MeV ($\sim \beta\gamma 1$) simple Clusterizer

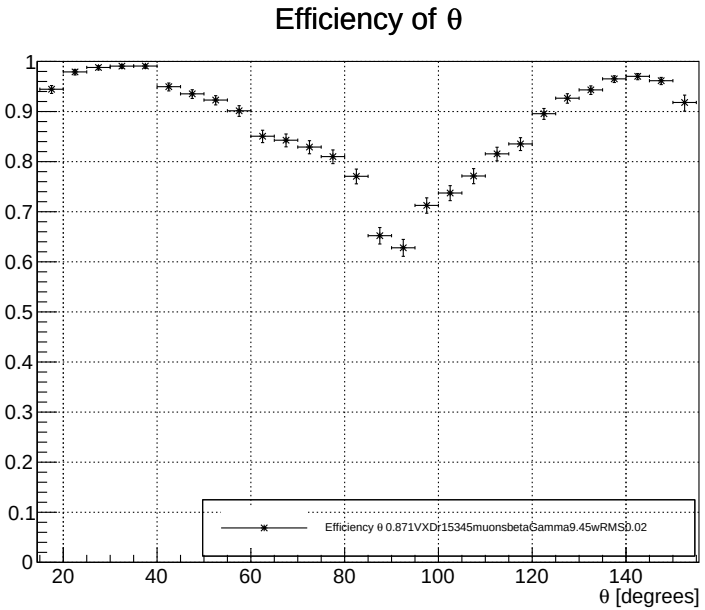




5 muons with p=100MeV simple Clusterizer

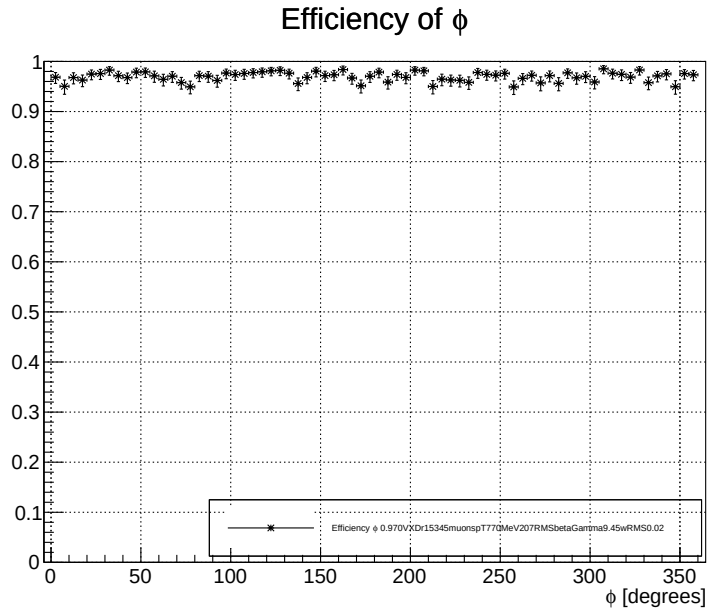
muons with p=1000MeV ($\sim \beta\gamma 10$) full Clusterizer

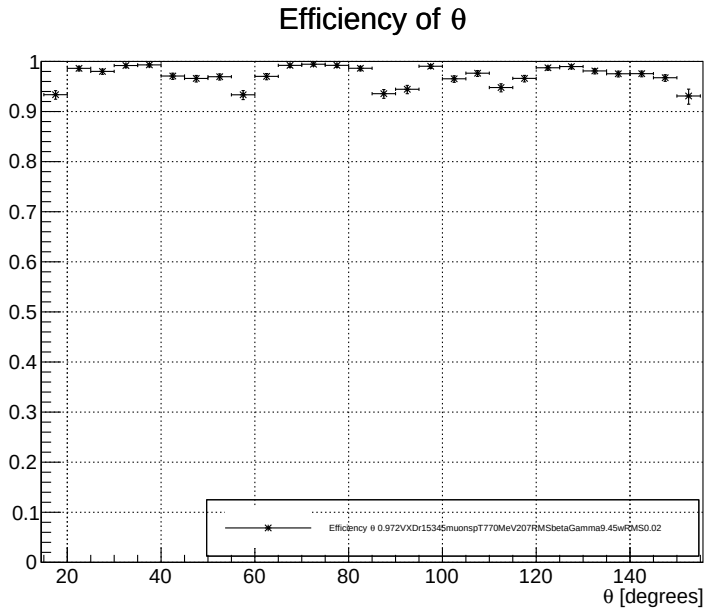




5 muons with p=1000MeV full Clusterizer

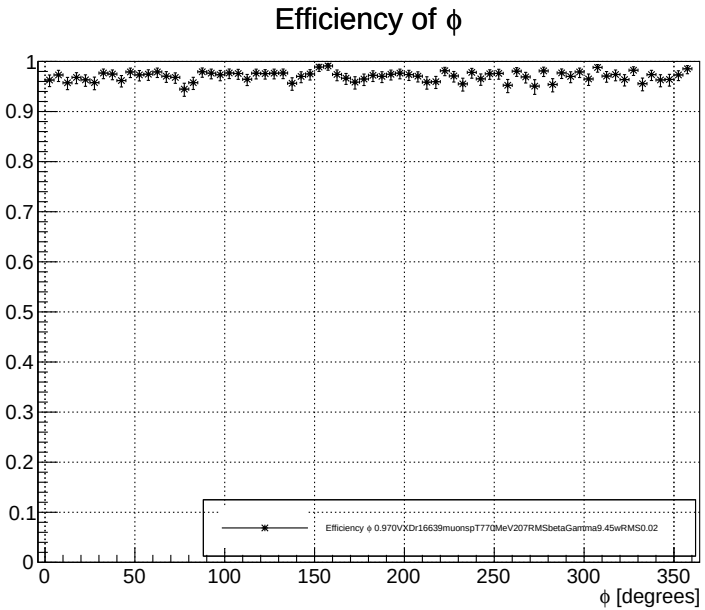
muons with p=1000MeV ($\sim \beta\gamma 10$) full Clusterizer new

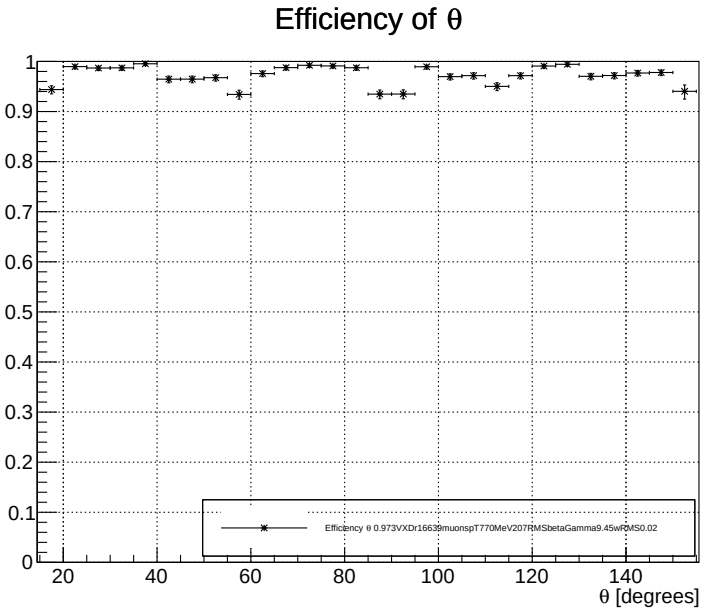




5 muons with p=1000MeV full Clusterizer using workaround

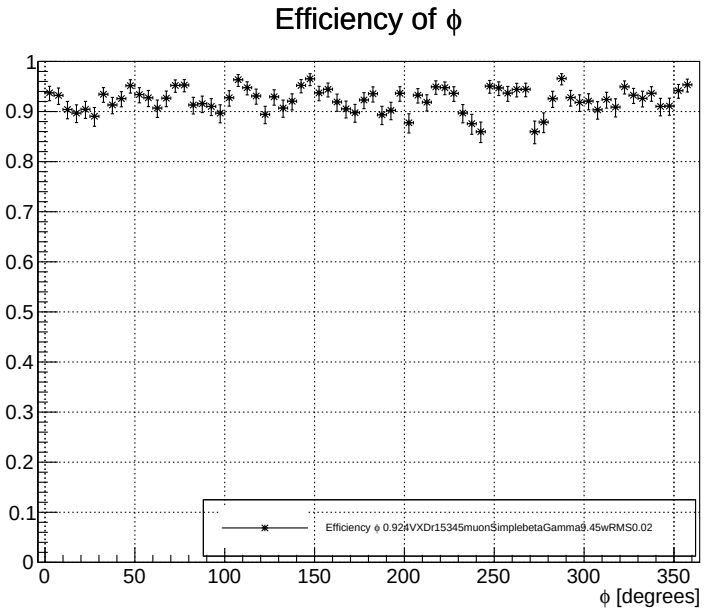
muons with p=1000MeV ($\sim \beta\gamma 10$) full Clusterizer fix

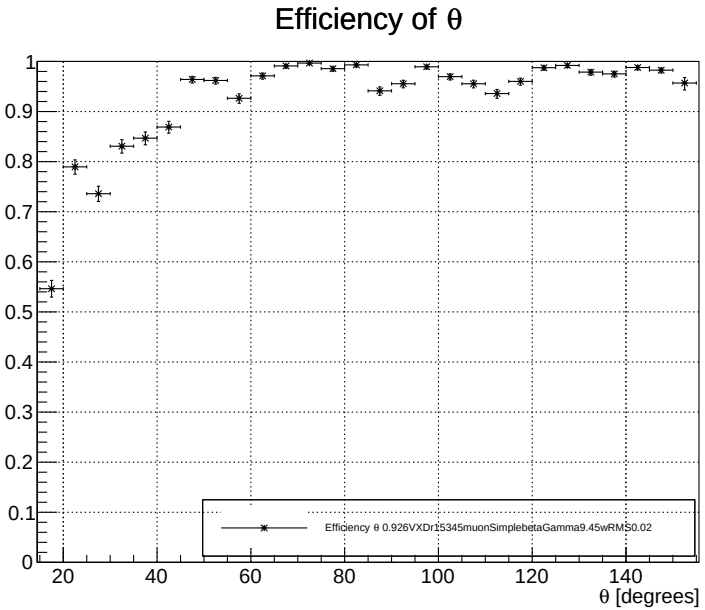




5 muons with p=1000MeV full Clusterizer using Peters fix

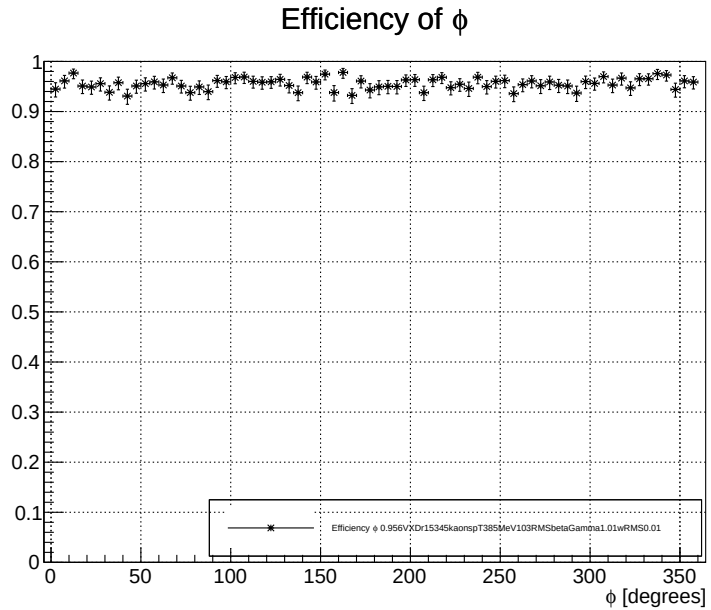
muons with p=1000MeV ($\sim \beta\gamma 10$) simple Clusterizer

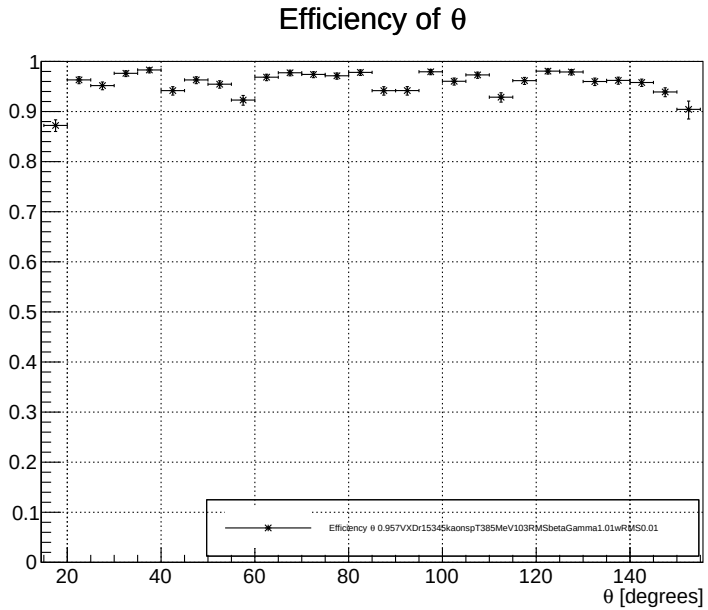




5 muons with p=1000MeV simple Clusterizer

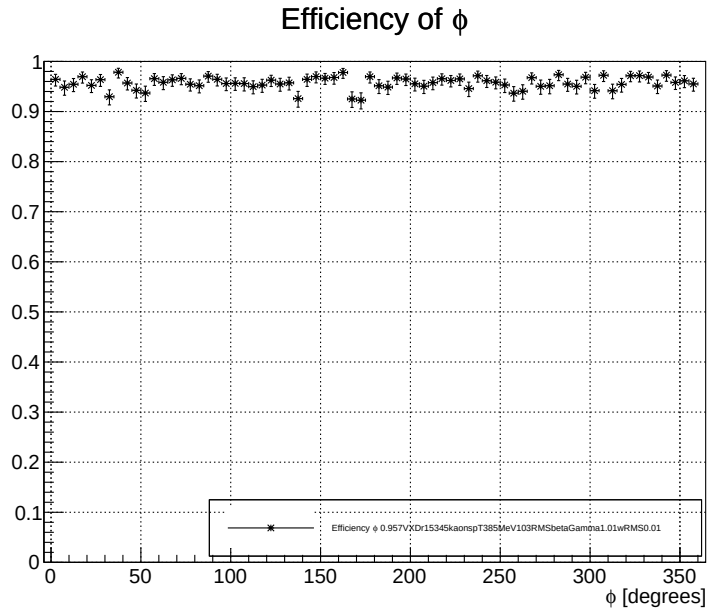
kaons with p=500MeV ($\sim \beta\gamma 1$) full Clusterizer

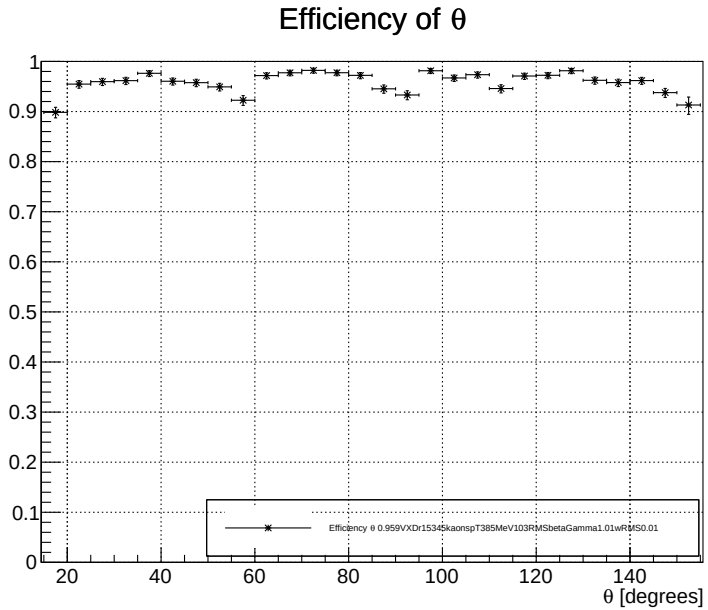




5 kaons with p=500MeV full Clusterizer

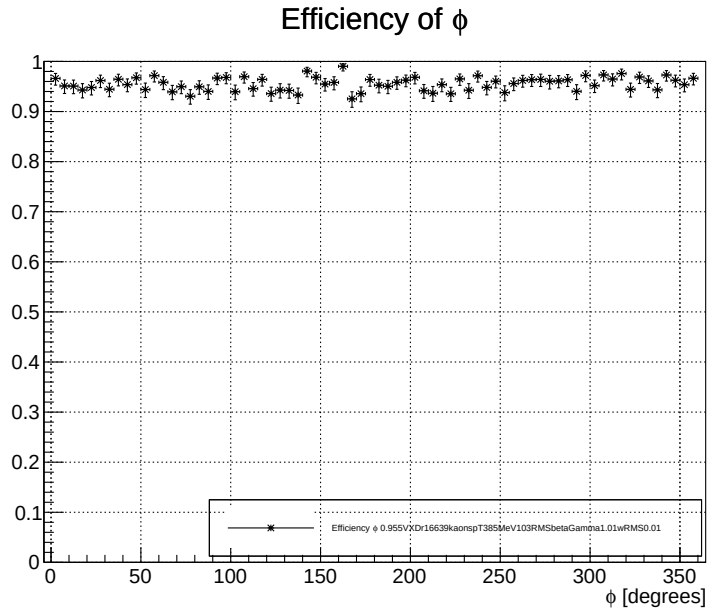
kaons with p=500MeV ($\sim \beta\gamma 1$) full Clusterizer new

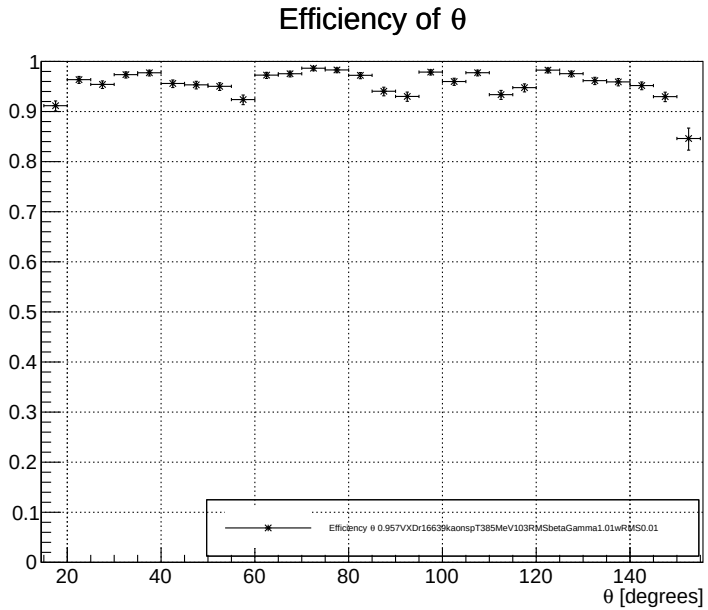




5 kaons with p=500MeV full Clusterizer using workaround

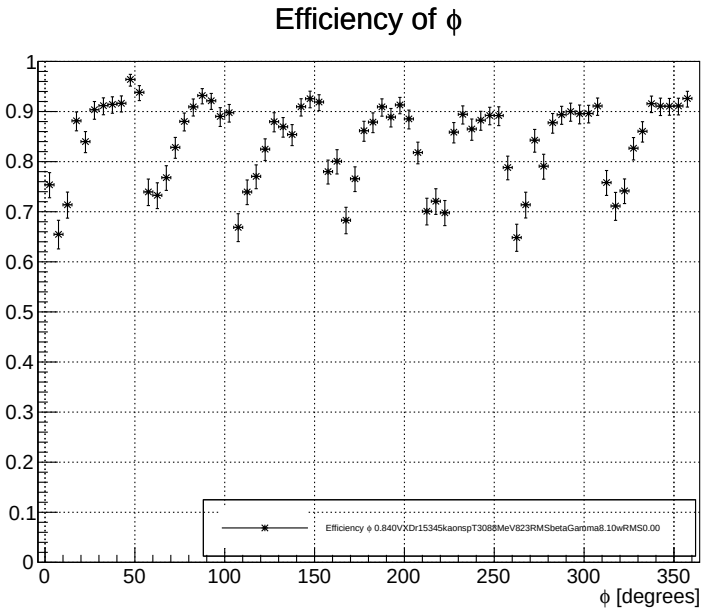
kaons with p=500MeV ($\sim \beta\gamma 1$) full Clusterizer fix

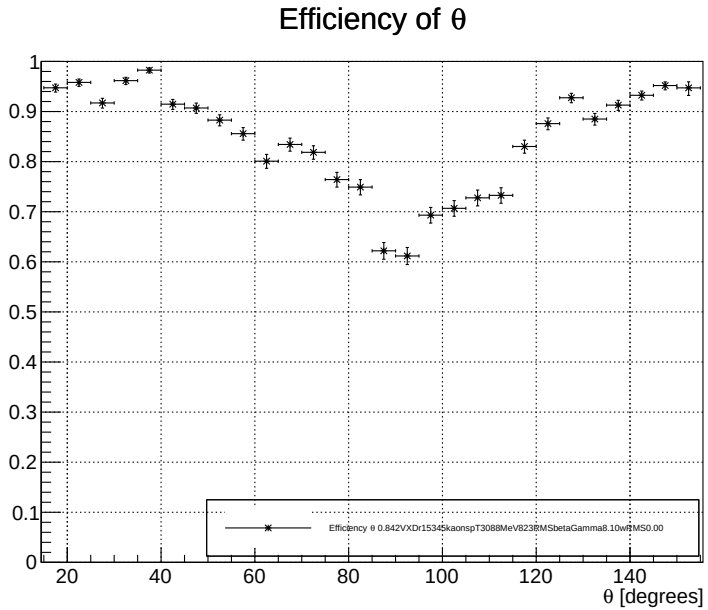




5 kaons with p=500MeV full Clusterizer using Peters fix

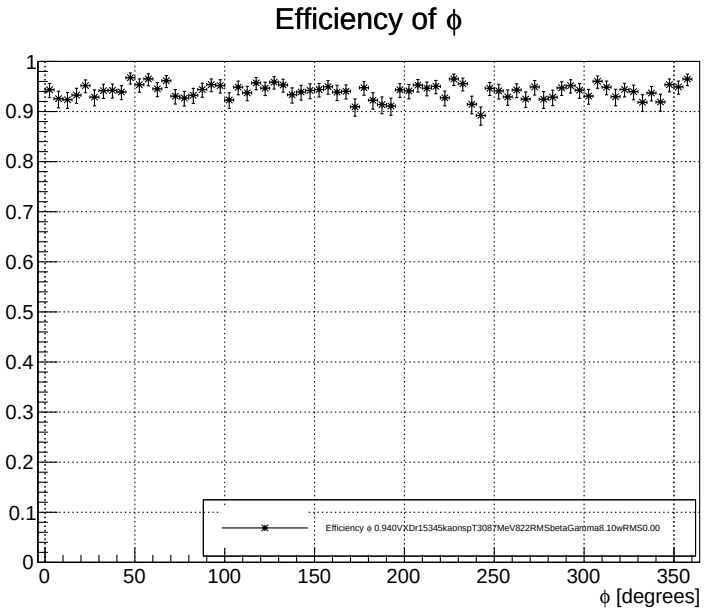
kaons with p=4000MeV ($\sim \beta\gamma 8$) full Clusterizer

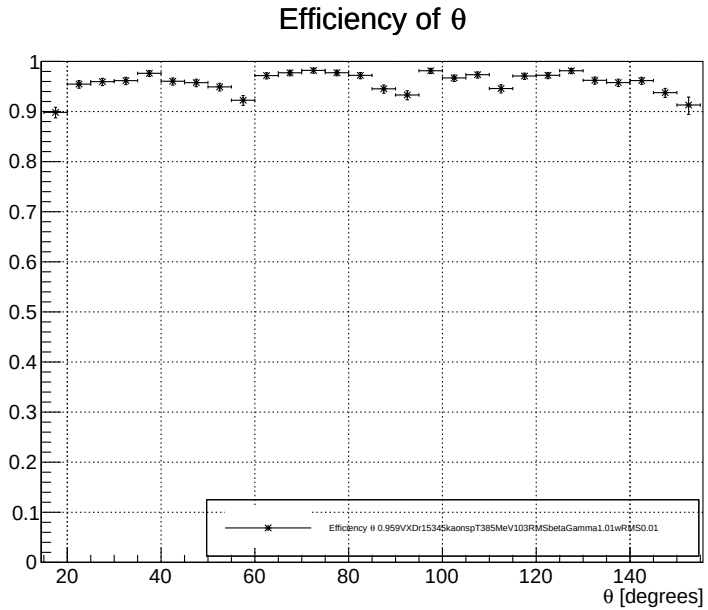




5 kaons with p=4000MeV full Clusterizer

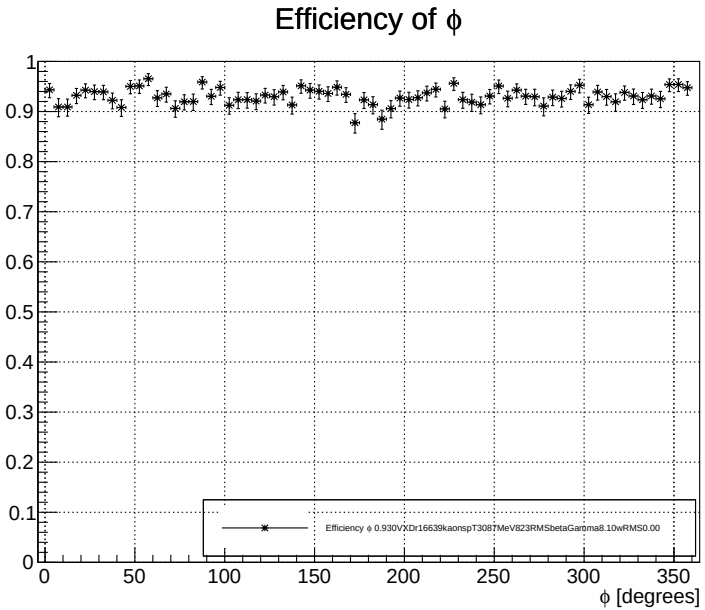
kaons with p=4000MeV ($\sim \beta\gamma 8$) full Clusterizer new

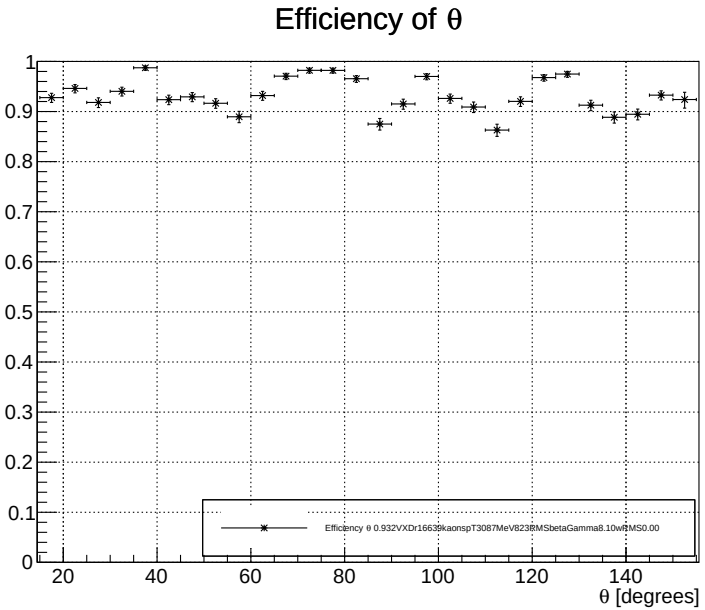




5 kaons with p=4000MeV full Clusterizer using workaround

kaons with p=4000MeV ($\sim \beta\gamma 8$) full Clusterizer fix





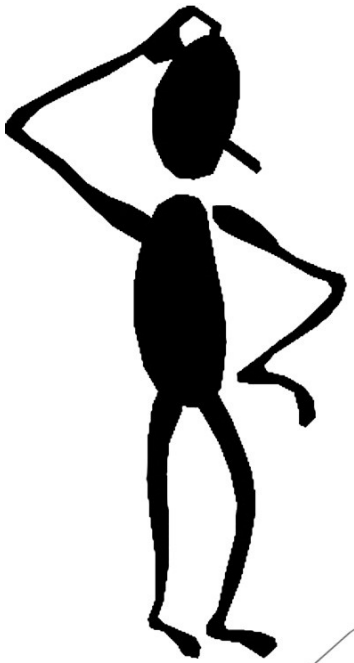
5 kaons with p=4000MeV full Clusterizer using Peters fix

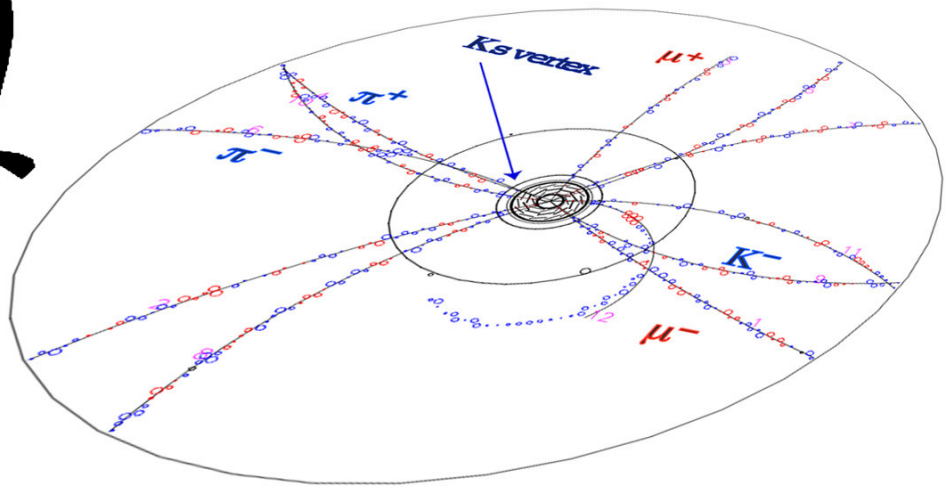
Conclusions and ToDo

Conclusions

- With workaround effect disappears completely
- Still minor sag in efficiency for higher beta gamma values (probabl pt-related, bad tuning)
- Redesign
- Unclear whether gradually falling efficiency is connected to simple clusterizer

that's all, folks!

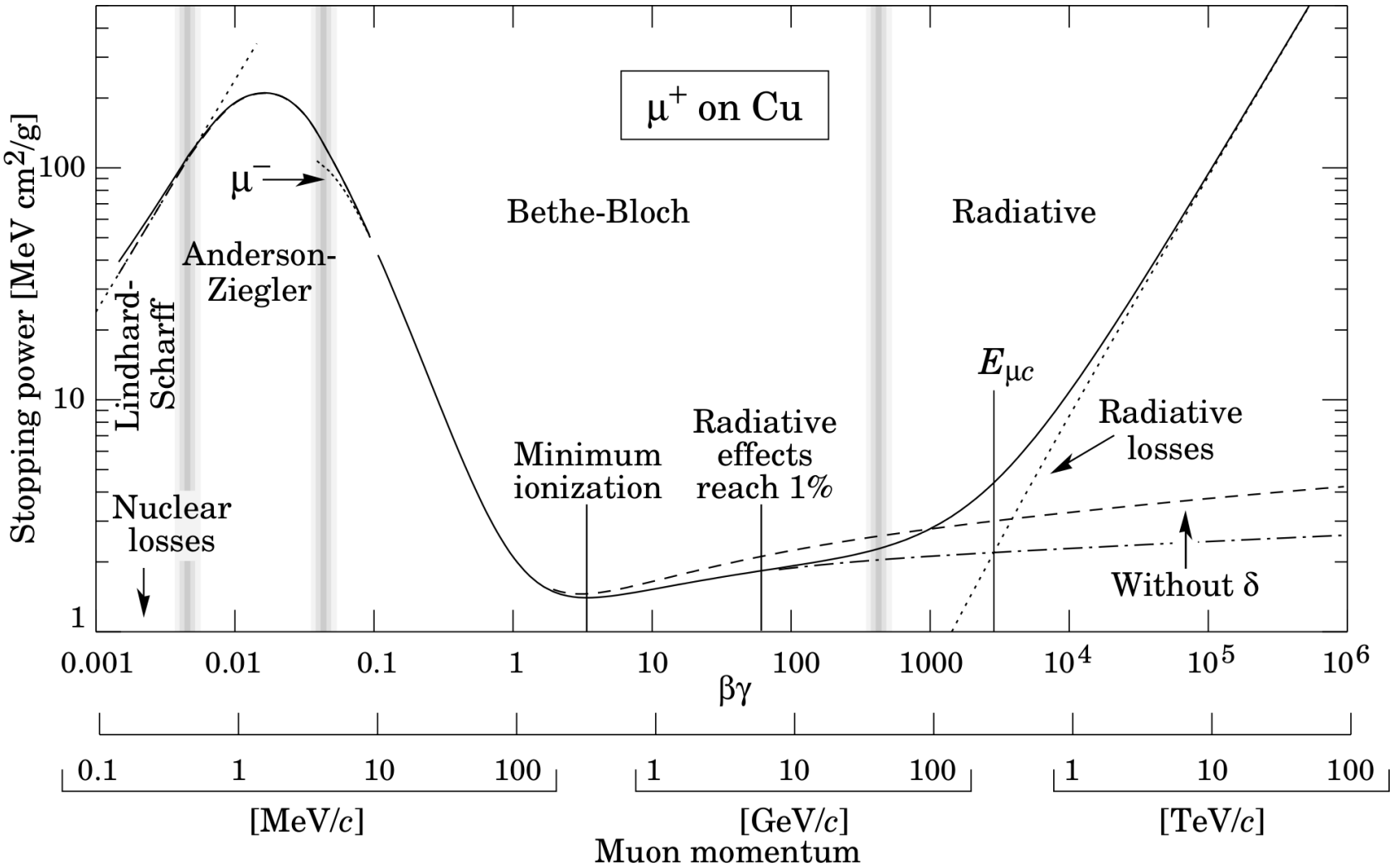




Any suggestions, ideas or requests?

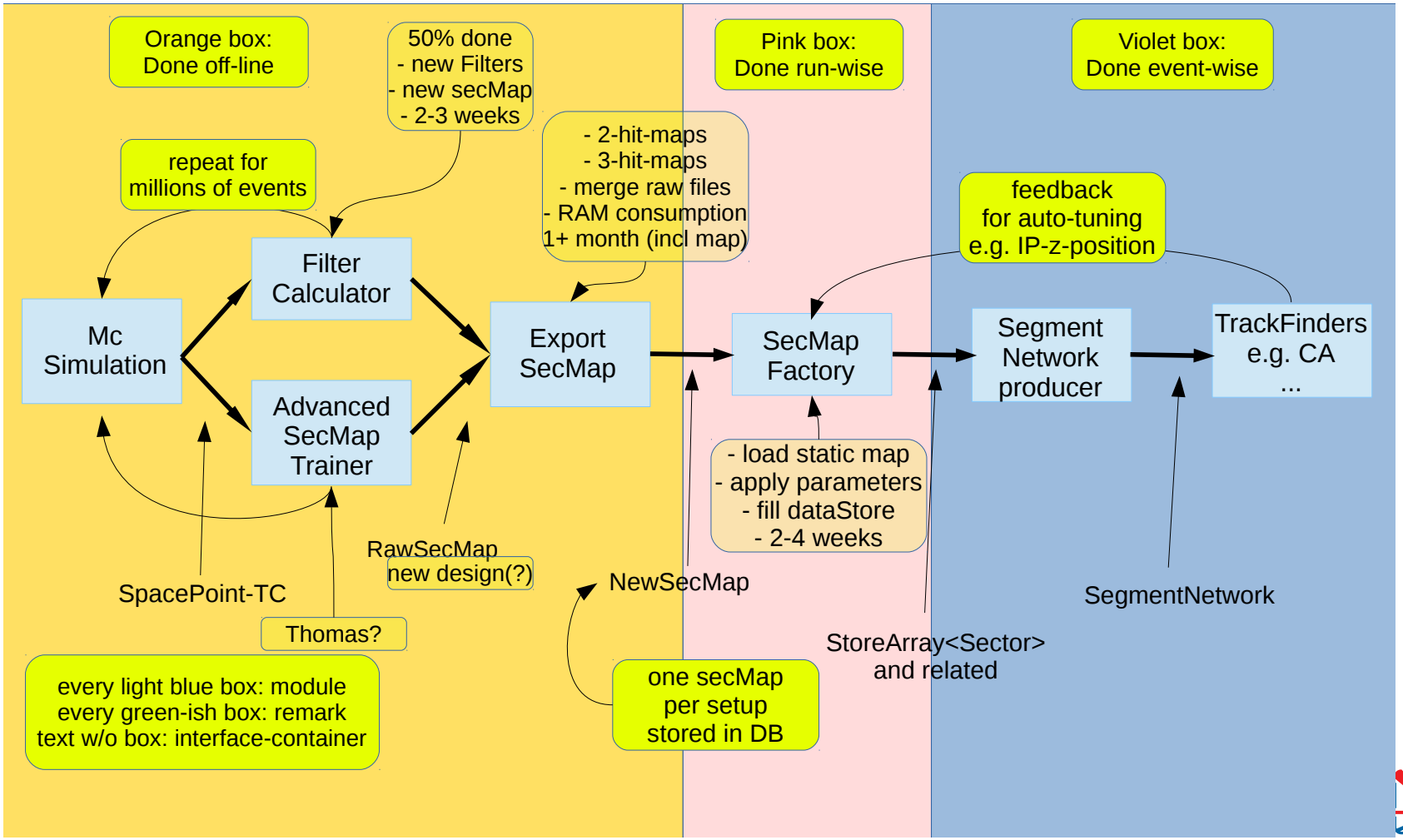
Jakob.Lettenbichler@oeaw.ac.at

betheBloch


μ+ on Cu
Stopping power [MeV cm²/g]
100
10
1
μ⁻
Anderson-
Ziegler
Lindhard-
Scharff
Nuclear
losses
Bethe-Bloch
Minimum
ionization
Radiative
effects
reach 1%
Radiative
Eμc
Radiative
losses
Without δ
0.001
0.01
0.1
1
10
100
1000
10⁴
10⁵
10⁶
βγ
0.1
1
10
100
[MeV/c]
1
10
100
[GeV/c]
1
10
100
[TeV/c]
Muon momentum

secMap

The way of the sectorMap – estimate ToDo: 2+ months



event-part

Future state of the trackFinderVXD-approach (event-part)
Estimate ToDo: 8 months