SpacePoint Quality Indexing

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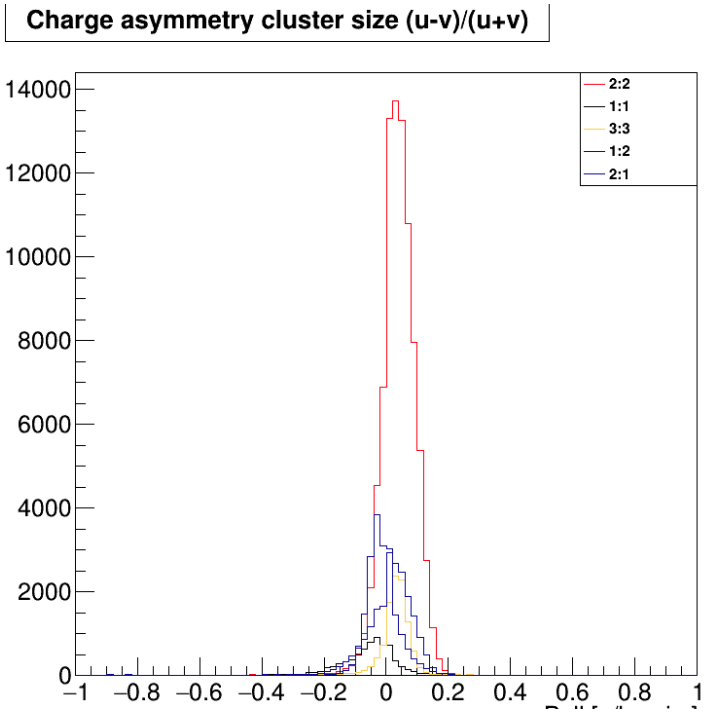
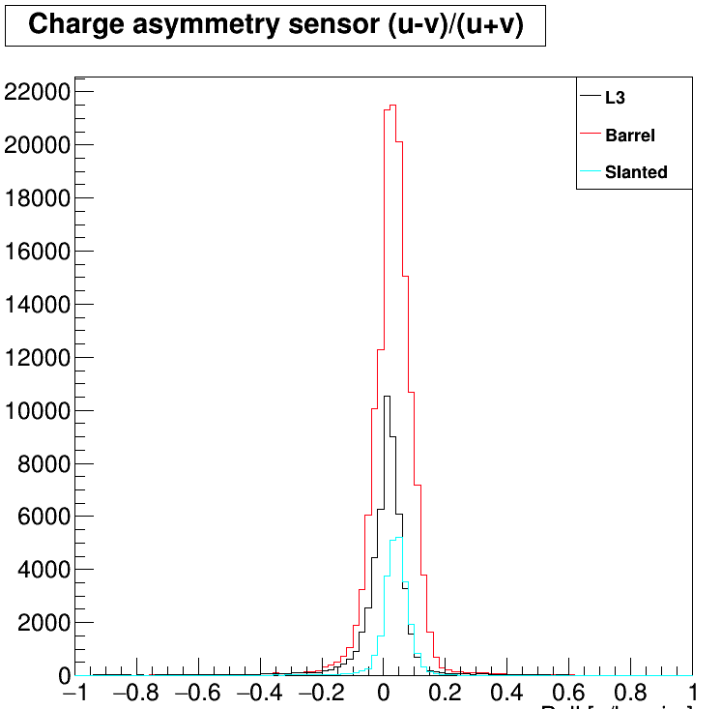
UPDATE

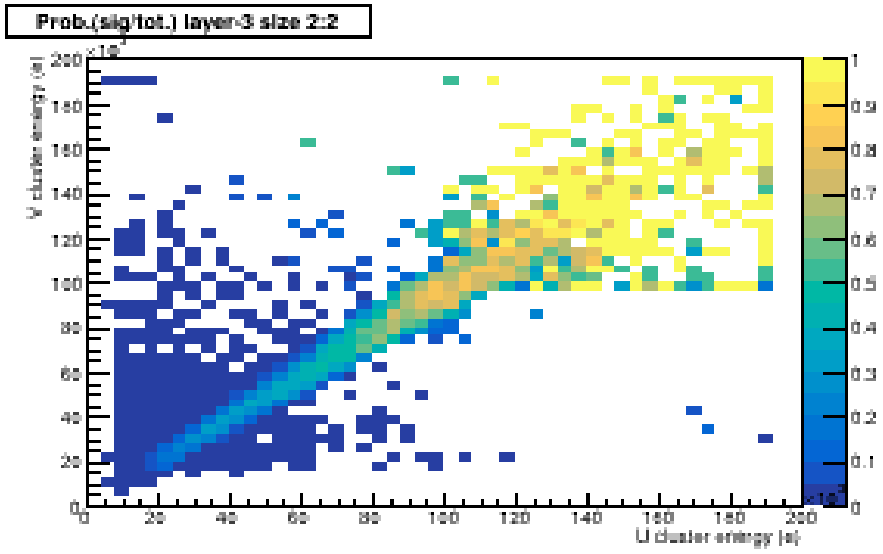
- Idea to make use of the different cluster hit times and energy characteristics to discern between signal and ghost clusters.
- In assigning a quality estimation the probability of a cluster being result of a signal hit is determined from 2d pdfs with each bin P=$\frac{sig}{sig+bkg}$
- All results obtained using CoG clusterizer with default settings (no trig. jitters) and standard simulation using January build.
- In each pdf sample 250k $\Upsilon(4S)$ generic decays have been used.
- Binning error now determined using Bayes' theorem, can now mask bins that have zero hits.

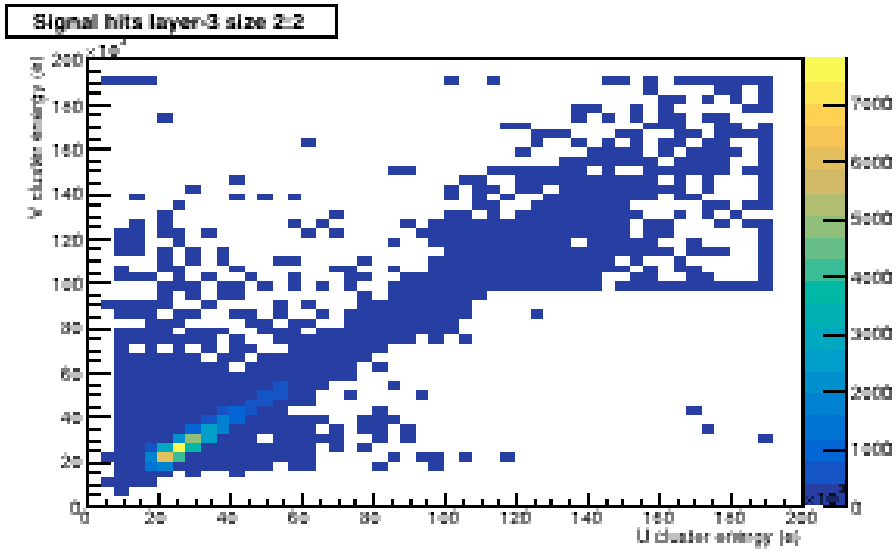
Charge Asymmetry

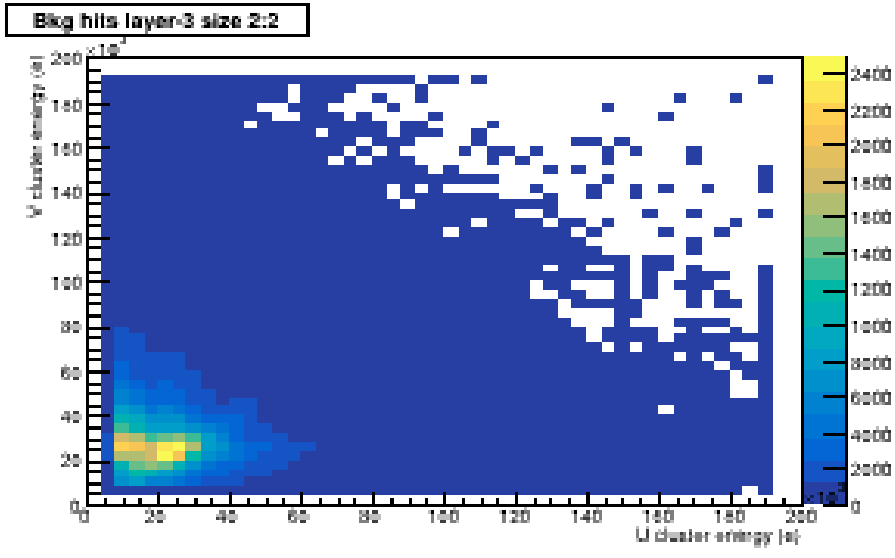


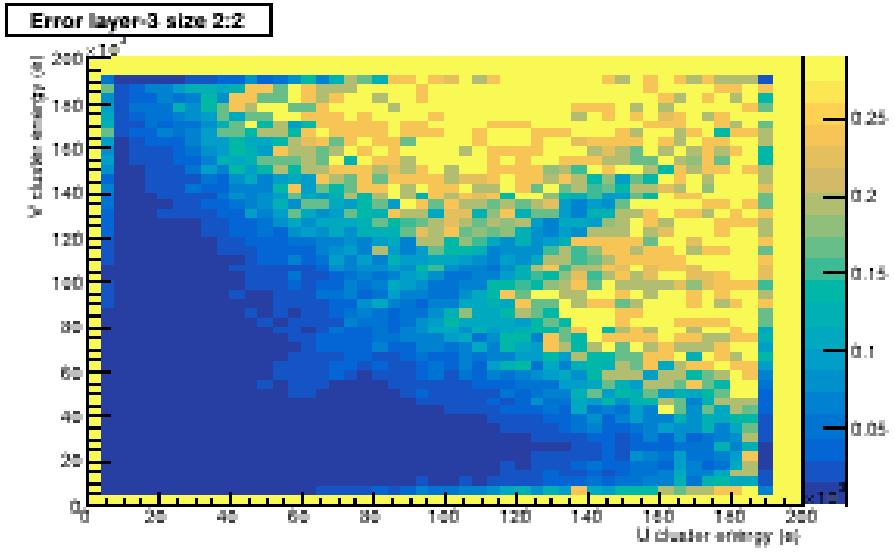


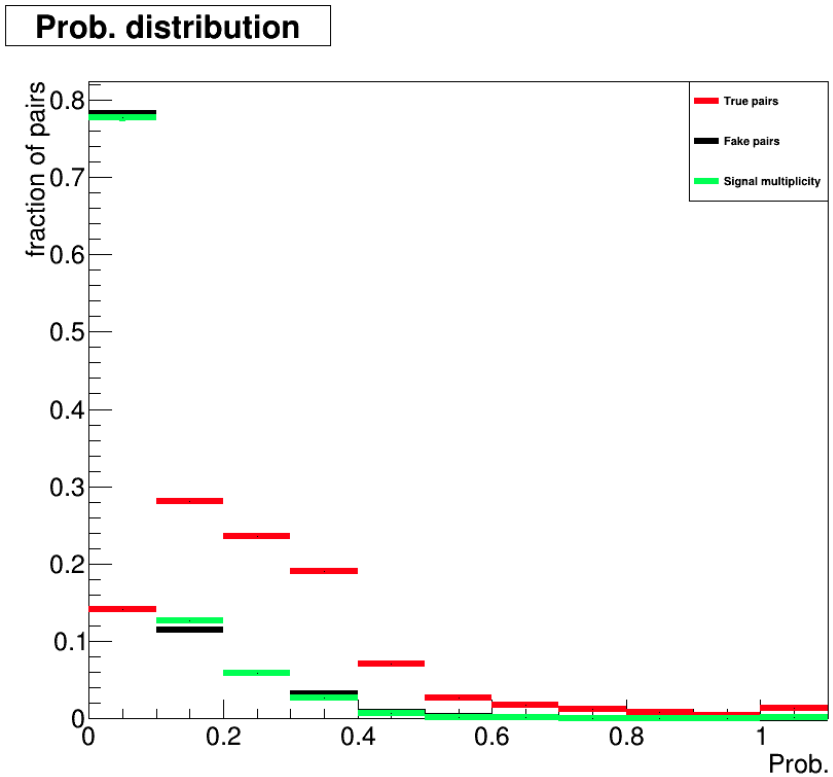
- Sensor topology and size of cluster play part in charge asymmetry.
- Pull = $\frac{u-v}{u+v}$
- Separate pdfs defined for each sensor type and u/v cluster size up to 5-strips.


Prob.(sig/tot.) layer-3 size 2:2
V cluster energy (e)
U cluster energy (e)


Signal hits layer-3 size 2:2
V cluster energy (e)
U cluster energy (e)

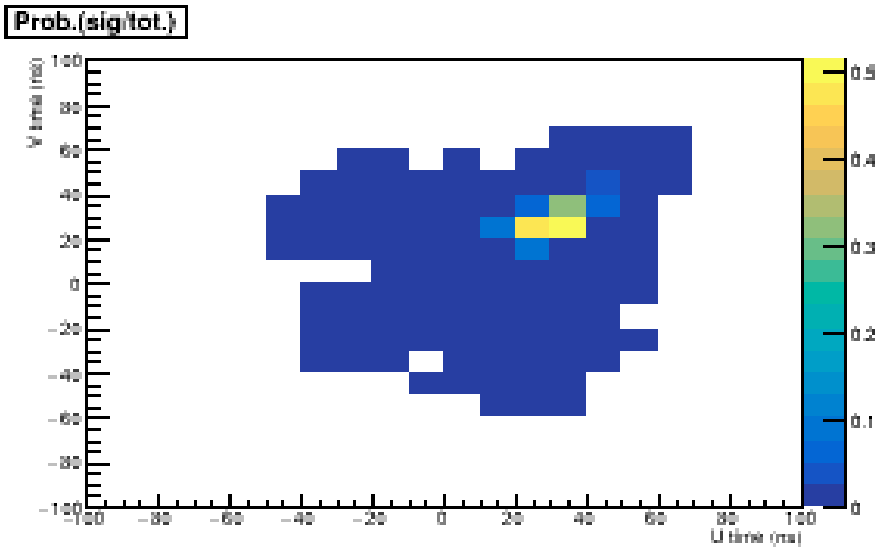

Bkg hits layer-3 size 2:2
V cluster energy (e)
U cluster energy (e)

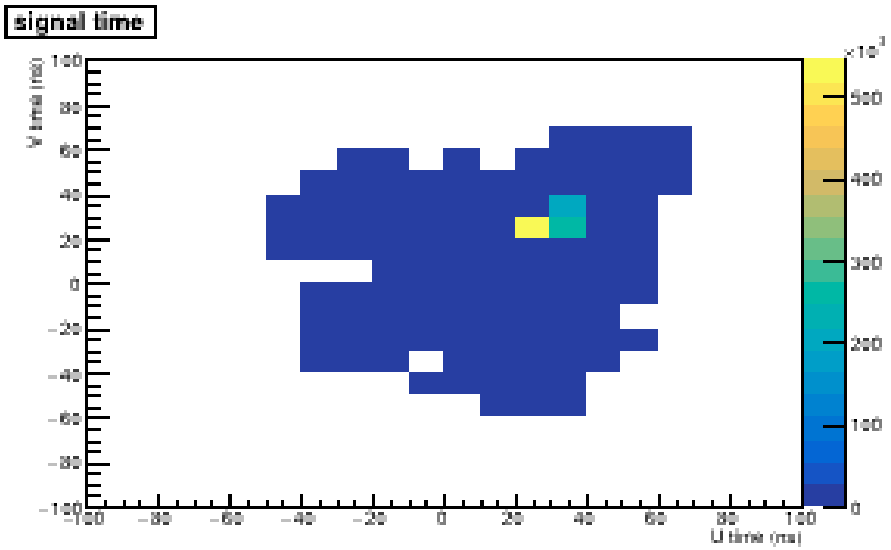

Error layer-3 size 2:2
V cluster energy (e)
U cluster energy (e)

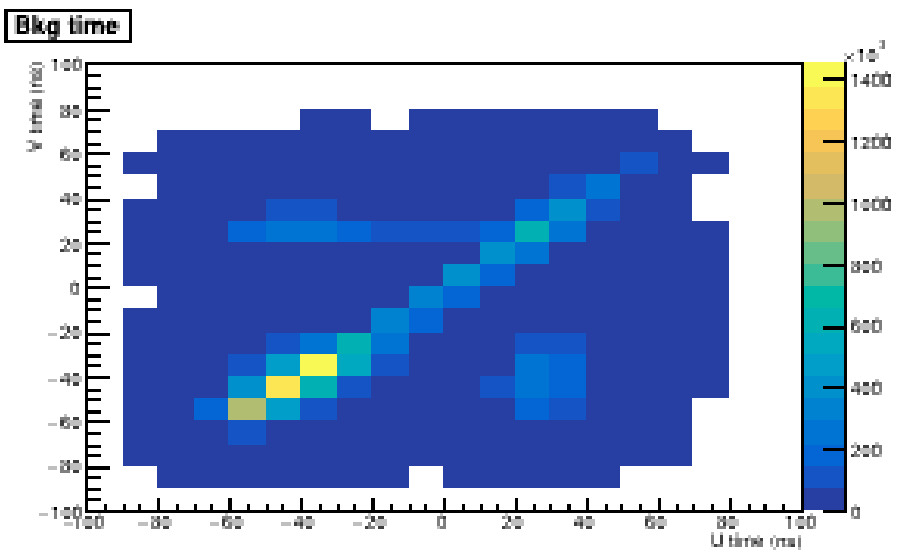


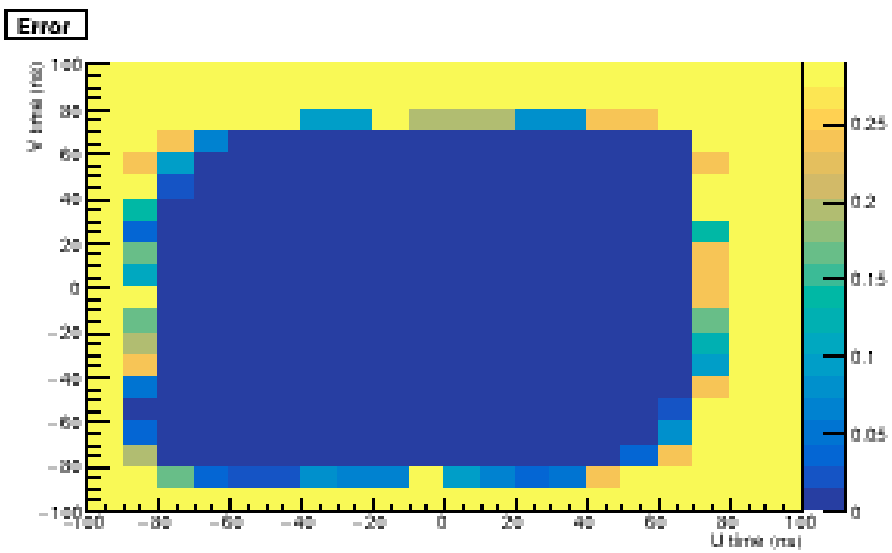
- Distribution of Q.I assigned to Spacepoints (True pairs, mismatched pairs and background pairs) from 20k events.

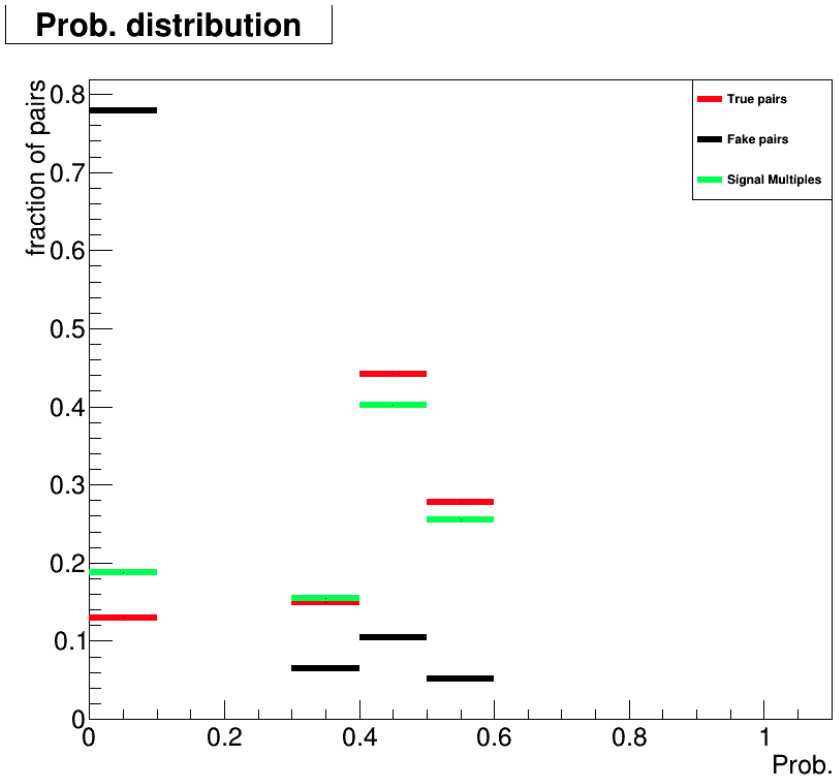
HIT TIME


Prob.(sig/tot.)
V time (ns)
U time (ns)

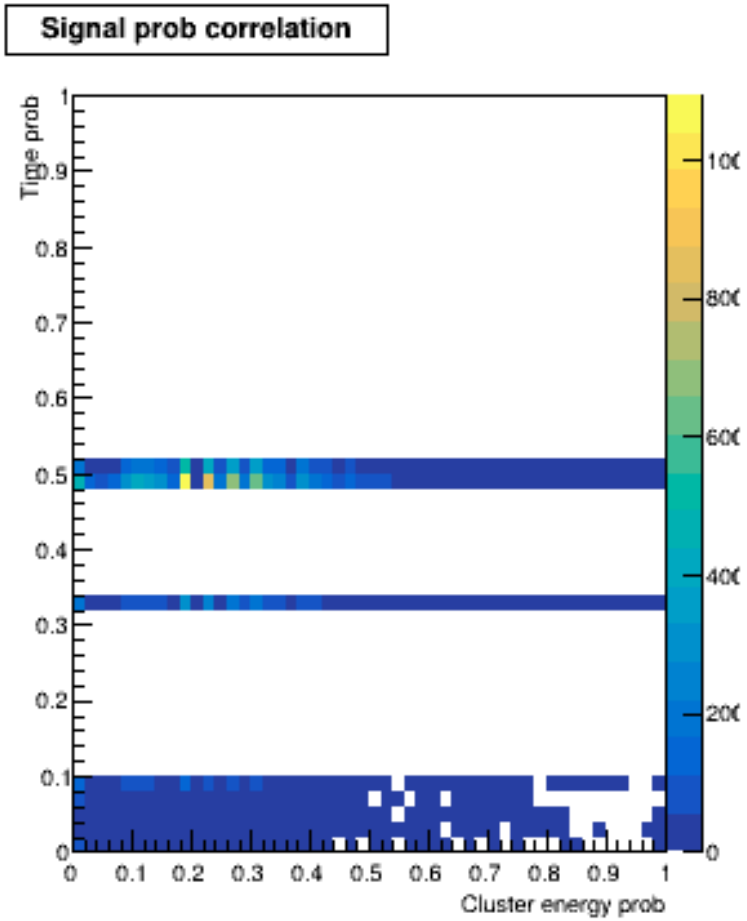

signal time
V time (ns)
U time (ns)

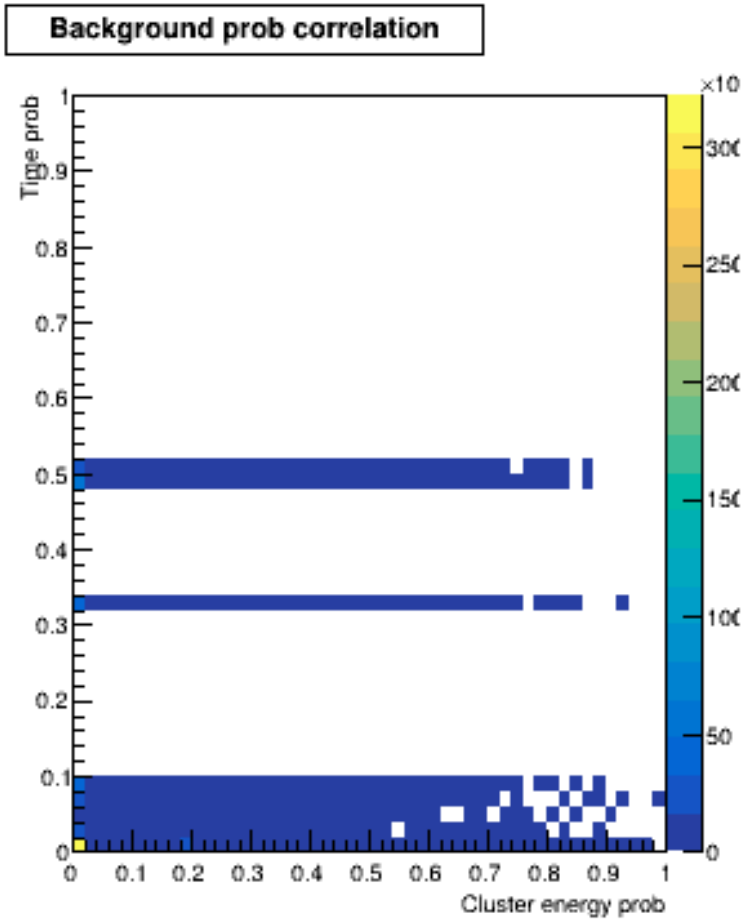

Bkg time
V time (ns)
U time (ns)


Error
V time (ns)
U time (ns)

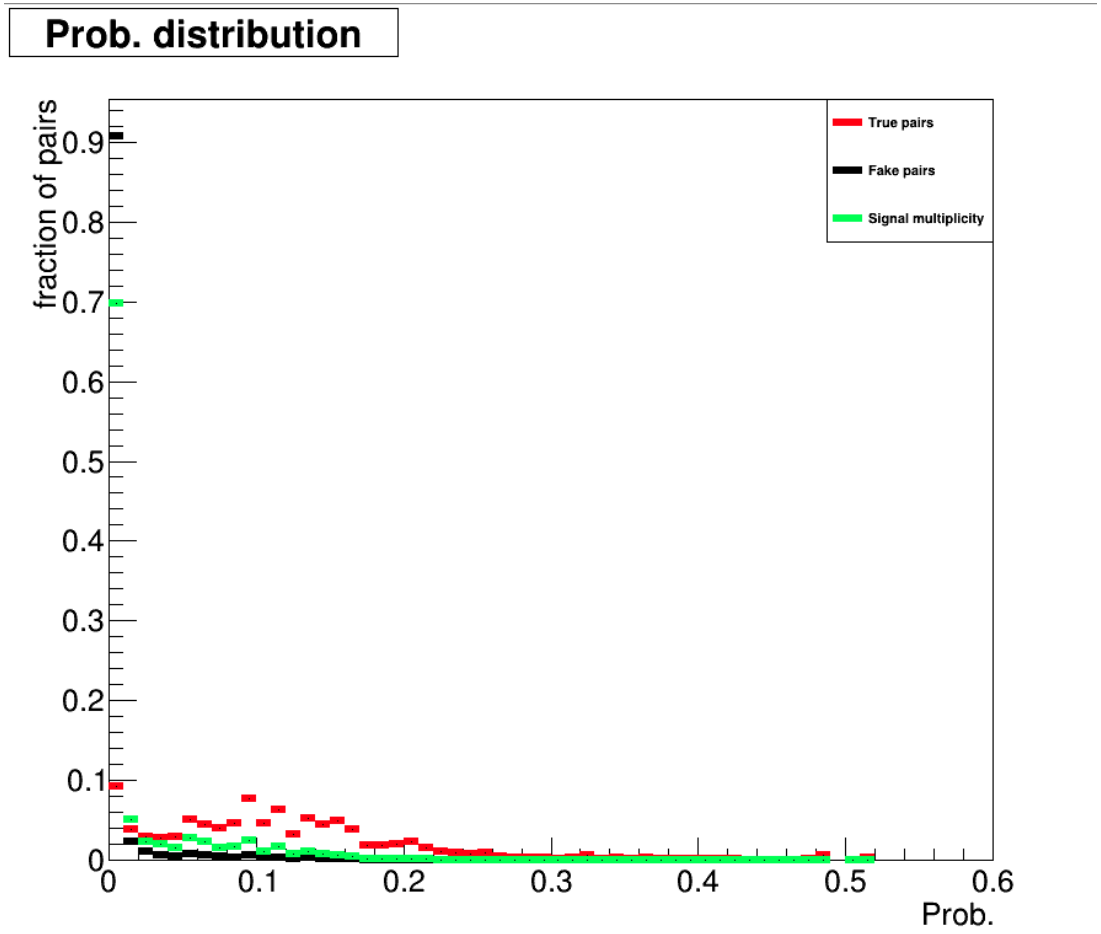


- Distribution of Q.I assigned to Spacepoints (True pairs, mismatched pairs and background pairs) from 20k events.
- Weird shape to the distribution due to bin size, currently 5ns, with the resolution on timefitter 4ns.



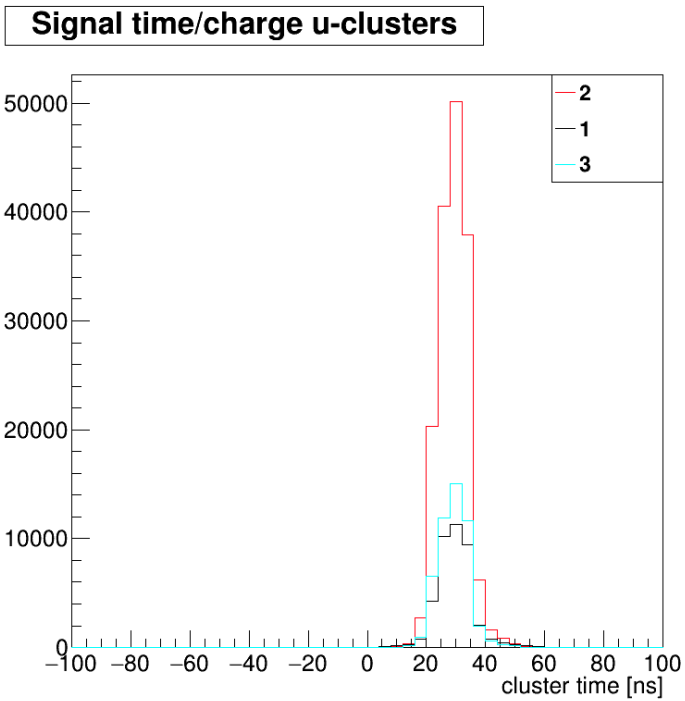


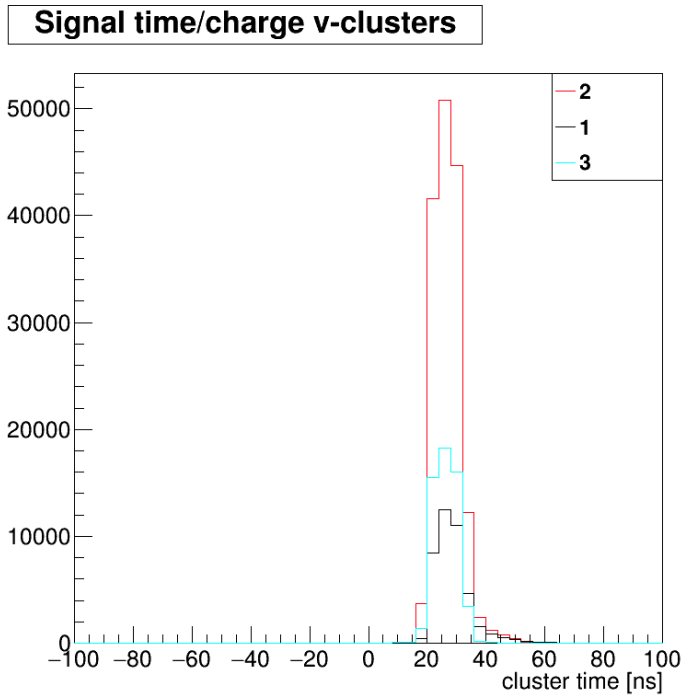
- Time and charge probabilities for true pairs and background pairs, sampled from 20k events. The probabilities are not correlated.

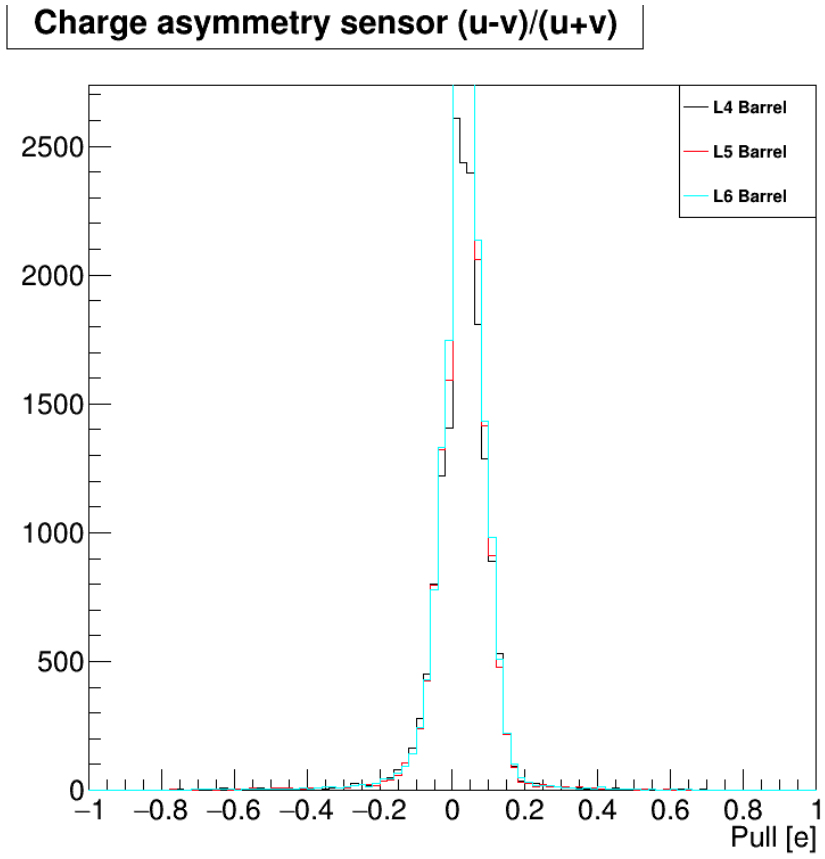


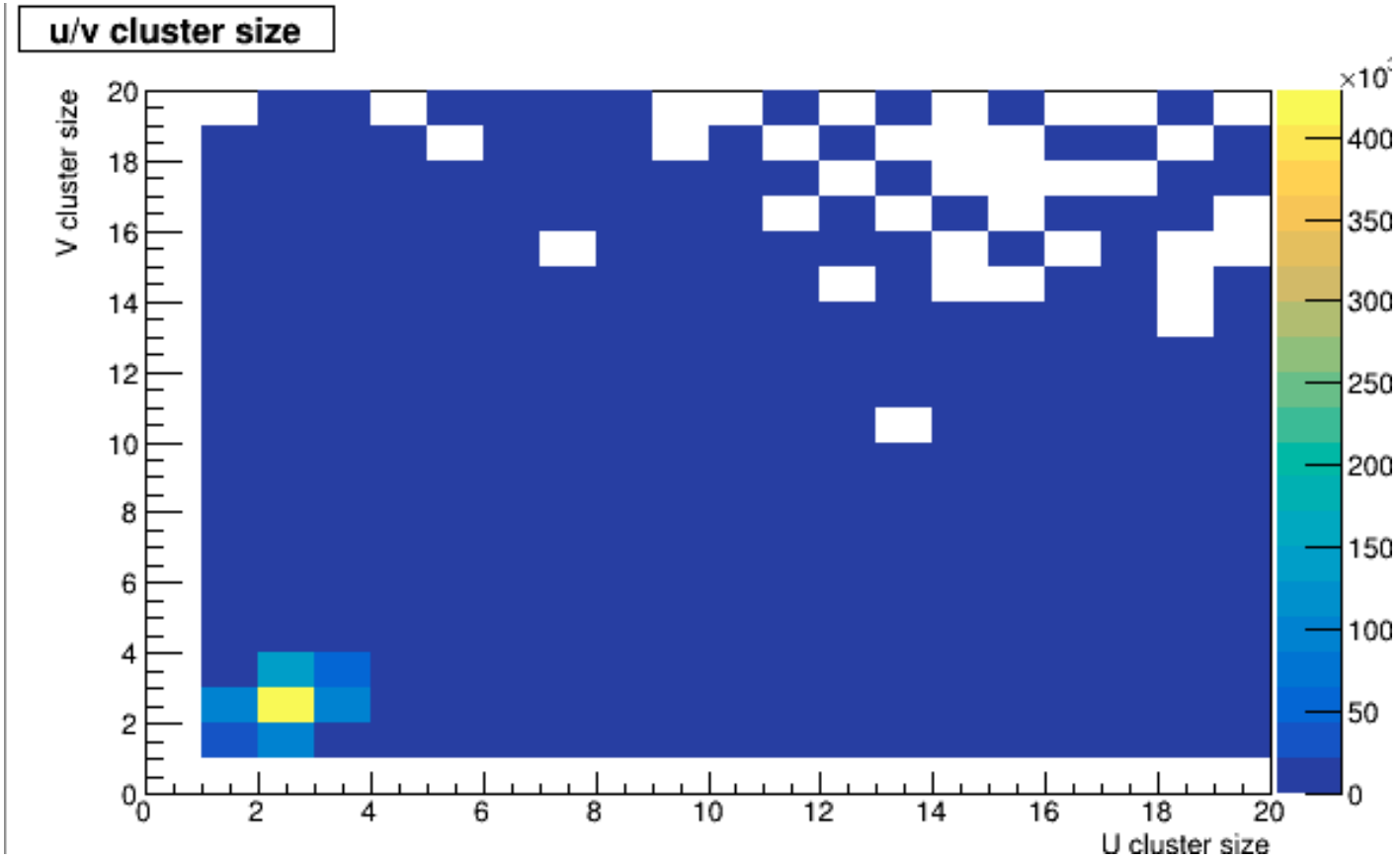
- Improved separation of real and background hits when multiplying the time and charge probabilities.

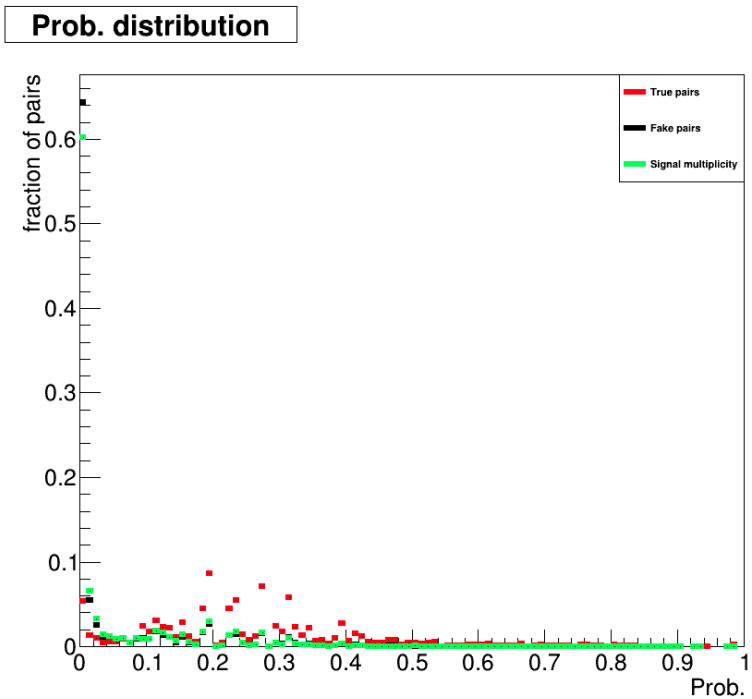
BACKUP SLIDES

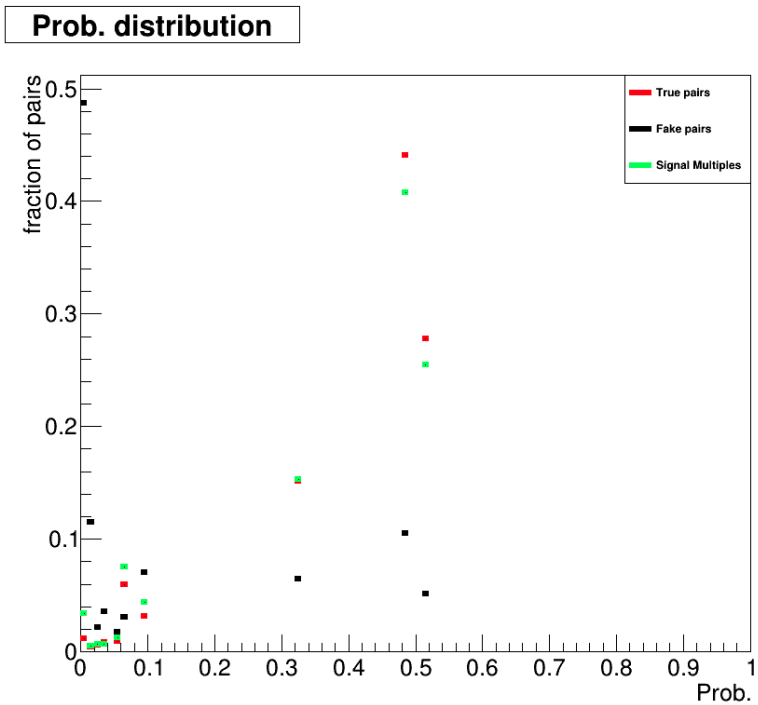





Charge asymmetry sensor (u-v)/(u+v)
L4 Barrel
L5 Barrel
L6 Barrel
2500
2000
1500
1000
500
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1
Pull [e]


u/v cluster size
V cluster size
U cluster size
0
2
4
6
8
10
12
14
16
18
20
×10
400
350
300
250
200
150
100
50
0





- Charge and time prob. distributions with finer binning.