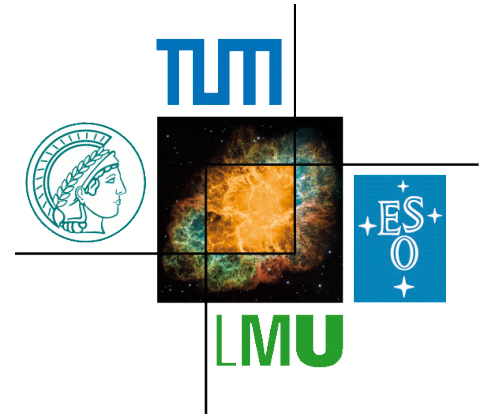
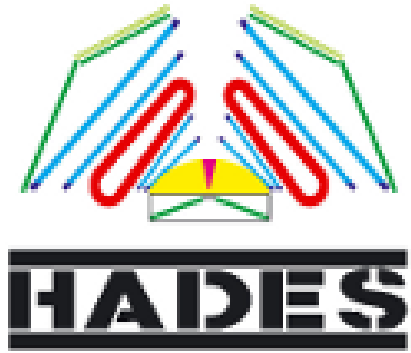




Update on simulation status

Robert Glas

2013/04/17

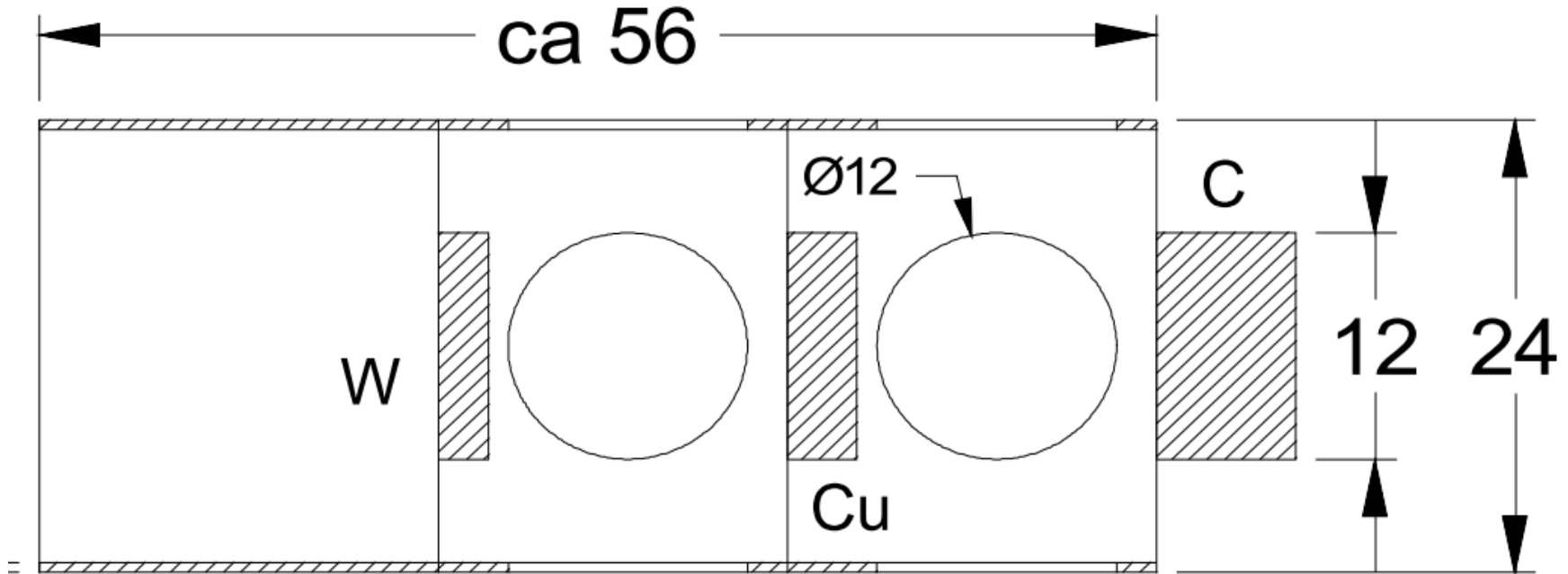
Previous simulations

- simulation with Pb, Cu and C
- interaction rate 15% (5% per target)
- targets are simulated separately
- primary vertex cuts are not necessary

New simulation method

- new interaction rate: 7.5% (2.5% per target)
- in GiBUU all three targets (W, Cu, C(graphite)) are simulated separately
- in GEANT they are also simulated separately, but for each target the other two targets are included so that particles can interact with them
- primary vertex cuts (see later)

Geometry of the targets in GEANT



	W	Gap	Cu	Gap	C
Width [mm]	2.4	16.2	3.4	16.2	6.8
Reaction rate	2.5%		2.5%		2.5%

*graphic by Wolfgang Koenig

Settings in GEANT

- distribution of pion beam on target
 - in Z direction: homogeneous
 - in X and Y direction: Gaussian with $\sigma = 25mm$
 - diameter of target is $12mm \rightarrow$ approximately homogeneous distribution in X and Y

“Problem“

- interactions (multiple scattering) of the beam with prior target segments are not taken into account (for Cu and C simulations)
- probably negligible, but has to be checked

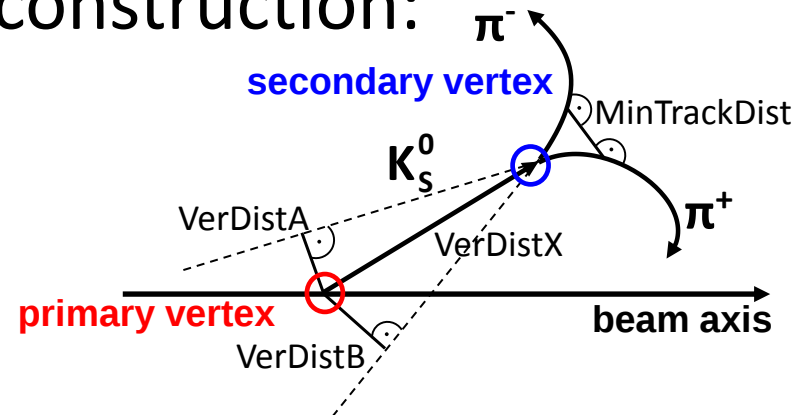
So far...

- only data for C and Cu was analysed
- data for W is still simulated in GiBUU
- sufficient statistics for W will maybe be reached in 1-2 weeks

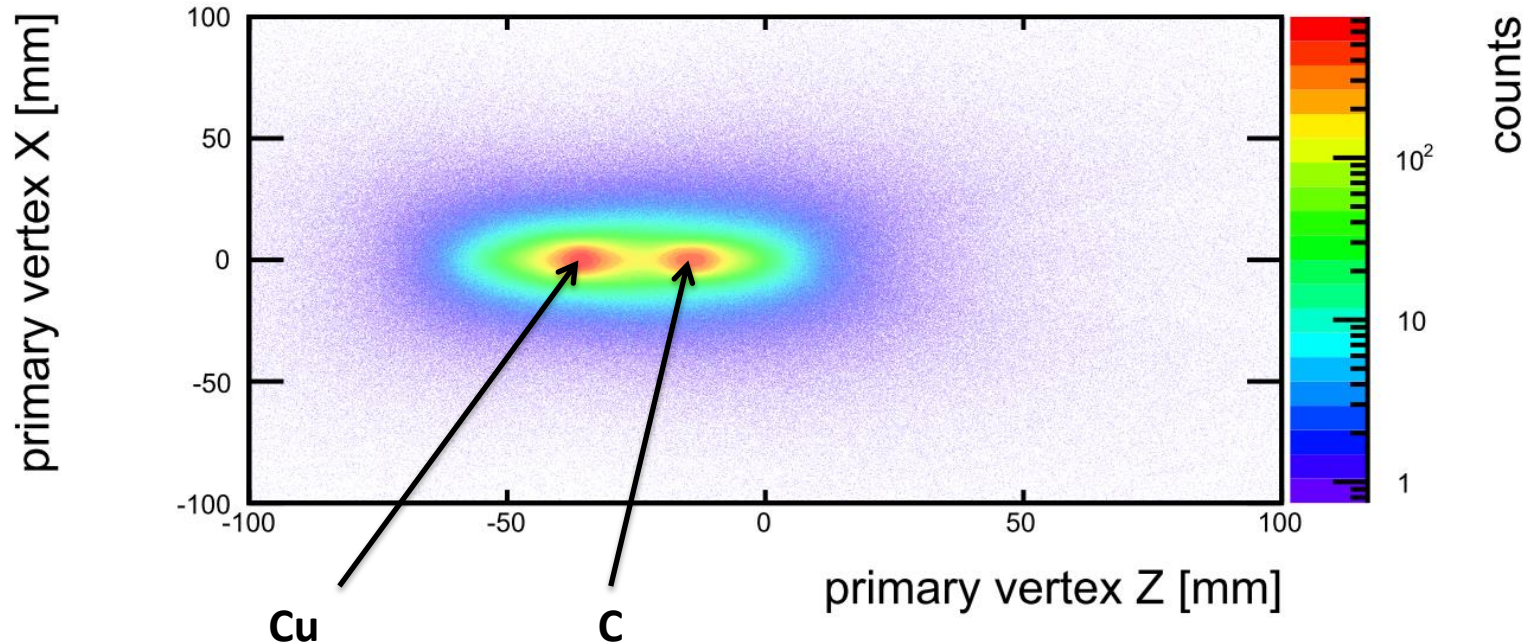
Cuts

- primary vertex cuts (from EventHeader):
 - fit primary vertex distribution of all events
 - cuts around maxima with width = 1σ
- standard cuts for particle identification:
 - dEdx cuts in MDC and TOF for K⁻ and K⁺
 - dEdx cuts in MDC for pions
- standard cuts for K⁰s reconstruction:

- VerDistX > 15
- MinTrackDist < 10
- VerDistA > 7
- VerDistB > 7
- Mass squared > 100

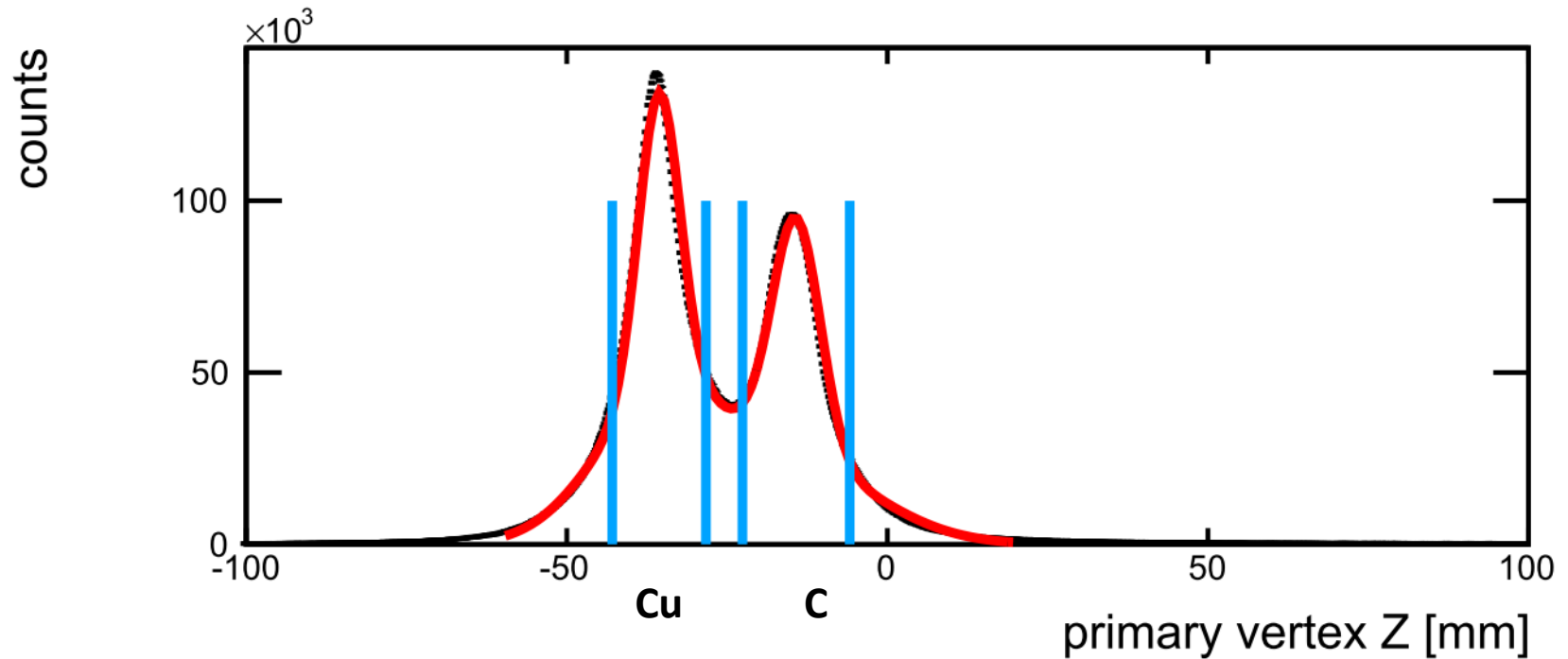


Distribution of primary vertices



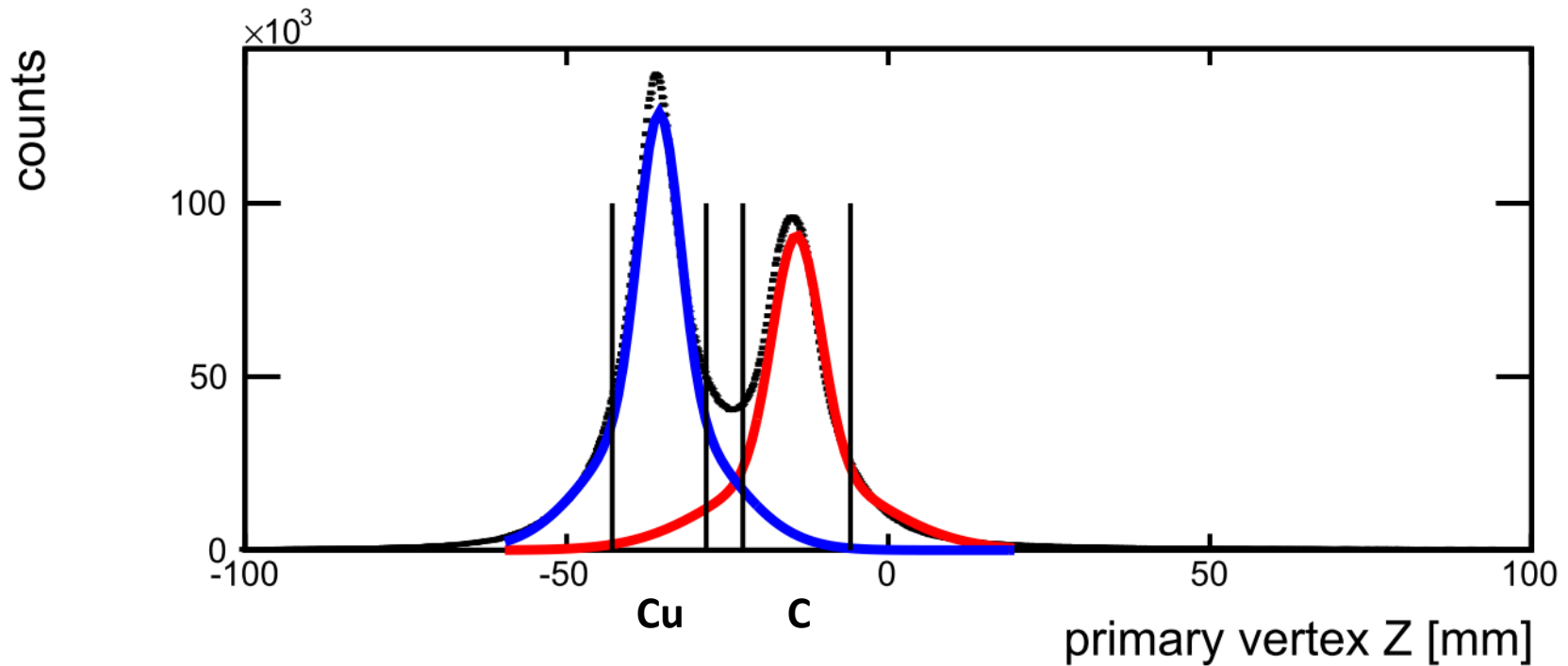
- Primary vertex distribution of all events

Distribution of primary vertices



- red lines correspond to 4 Gaussian fit curves (2 Gaussian per peak)
- blue lines correspond to 1 σ cuts

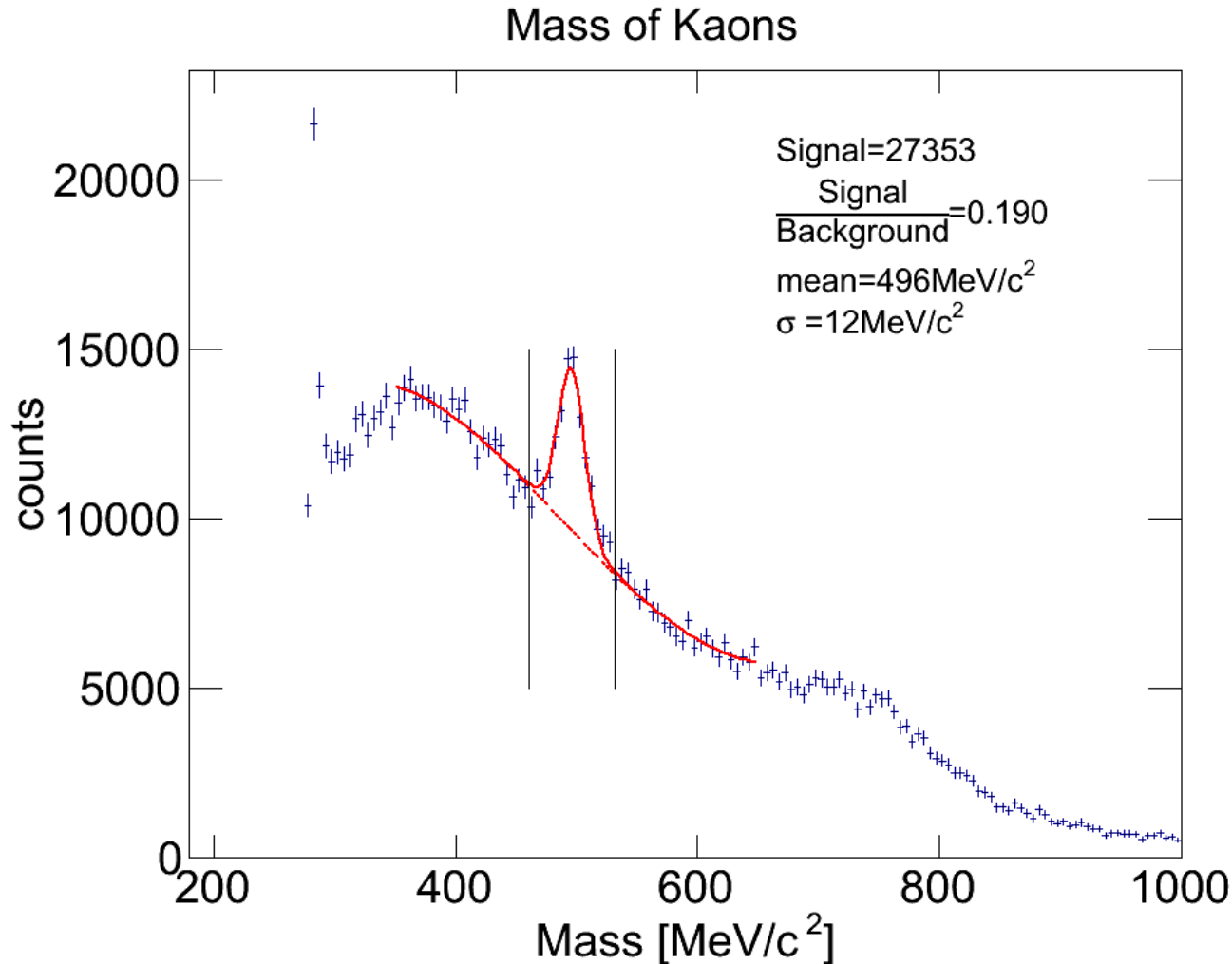
Contamination



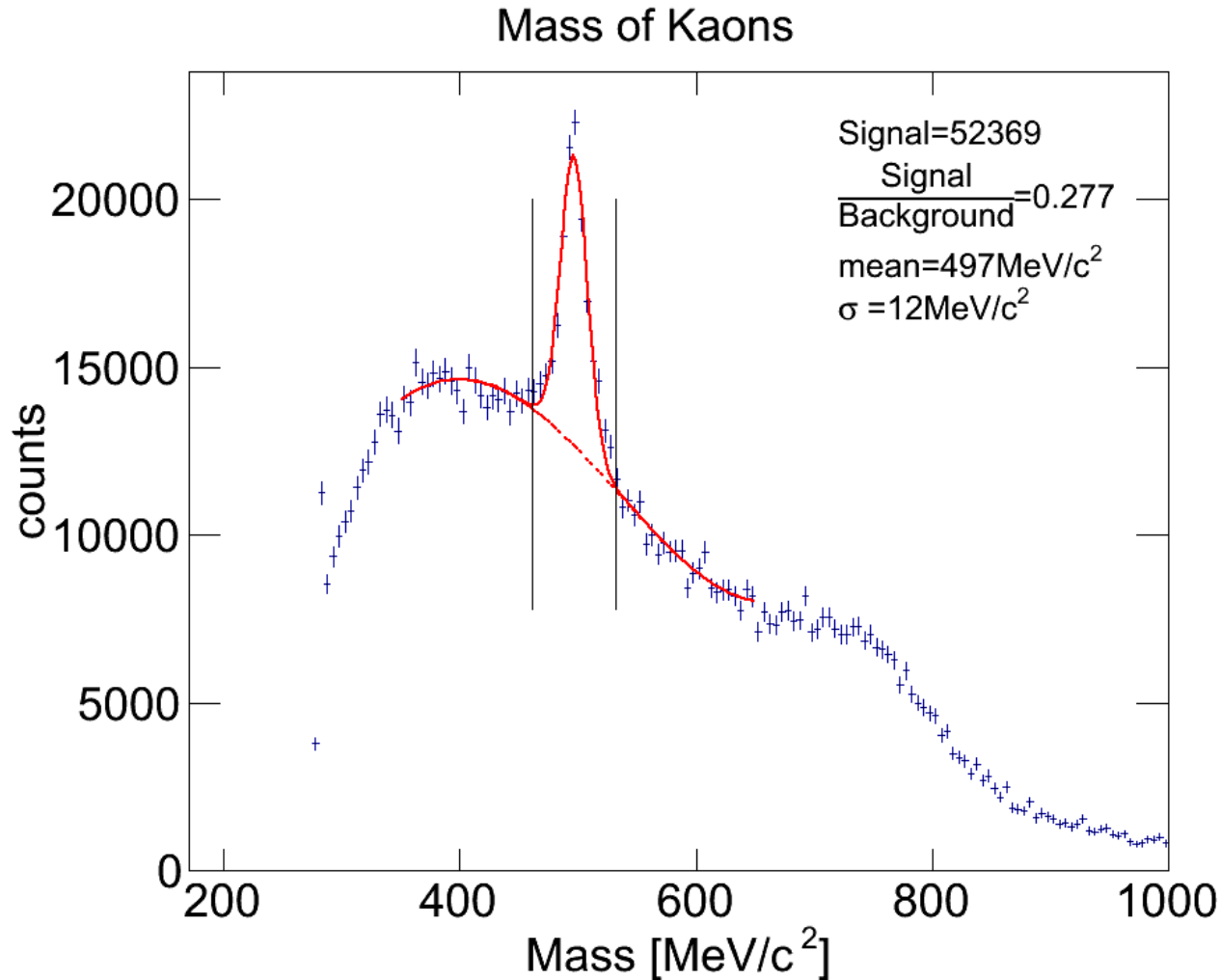
- Contamination of C in Cu: $\frac{cont(C)}{total(Cu)} = 1.3\%$
- Contamination of Cu in C: $\frac{cont(Cu)}{total(C)} = 1.8\%$

Distribution of masses:

K0s (Cu)



Distribution of masses: K0s (C)

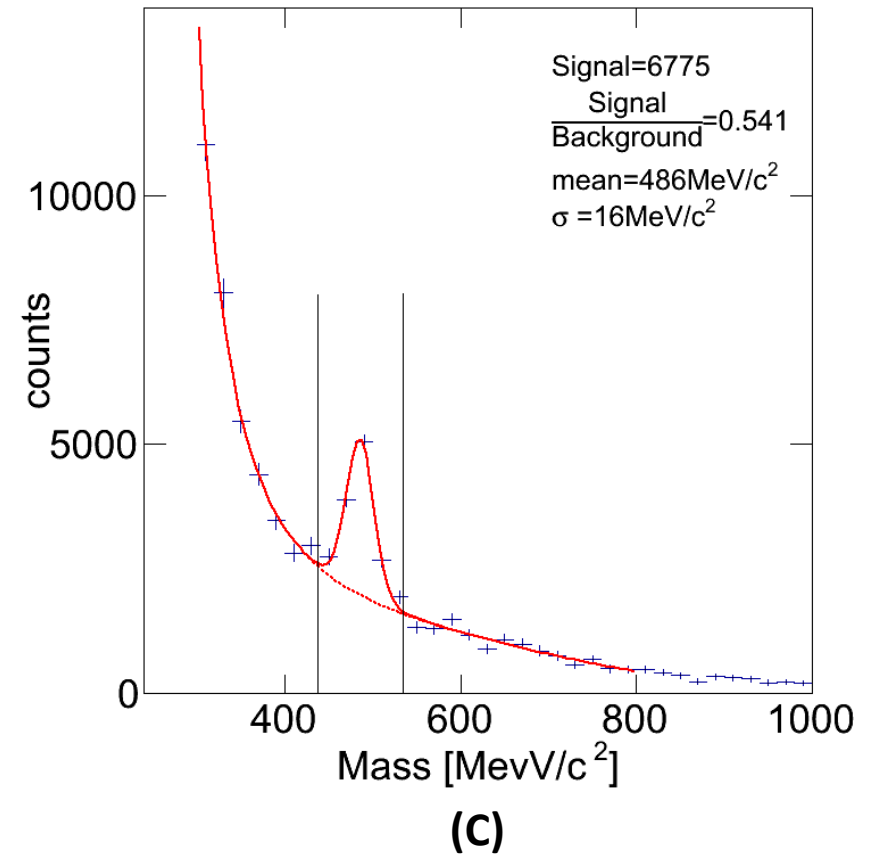
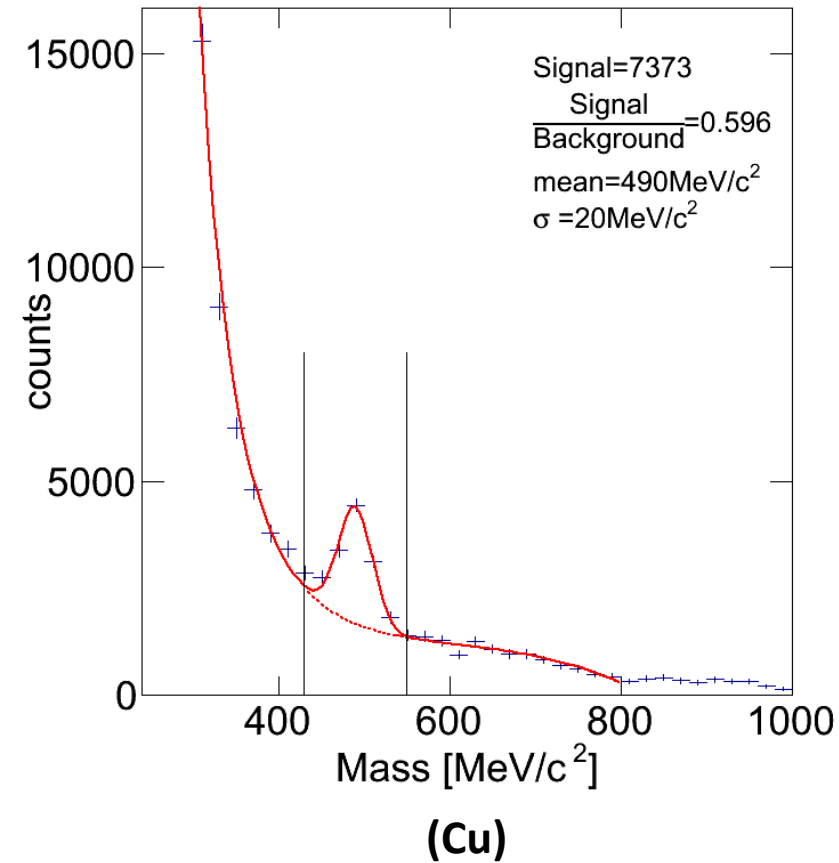


Distribution of masses:

Mass of K-

K-

Mass of K-



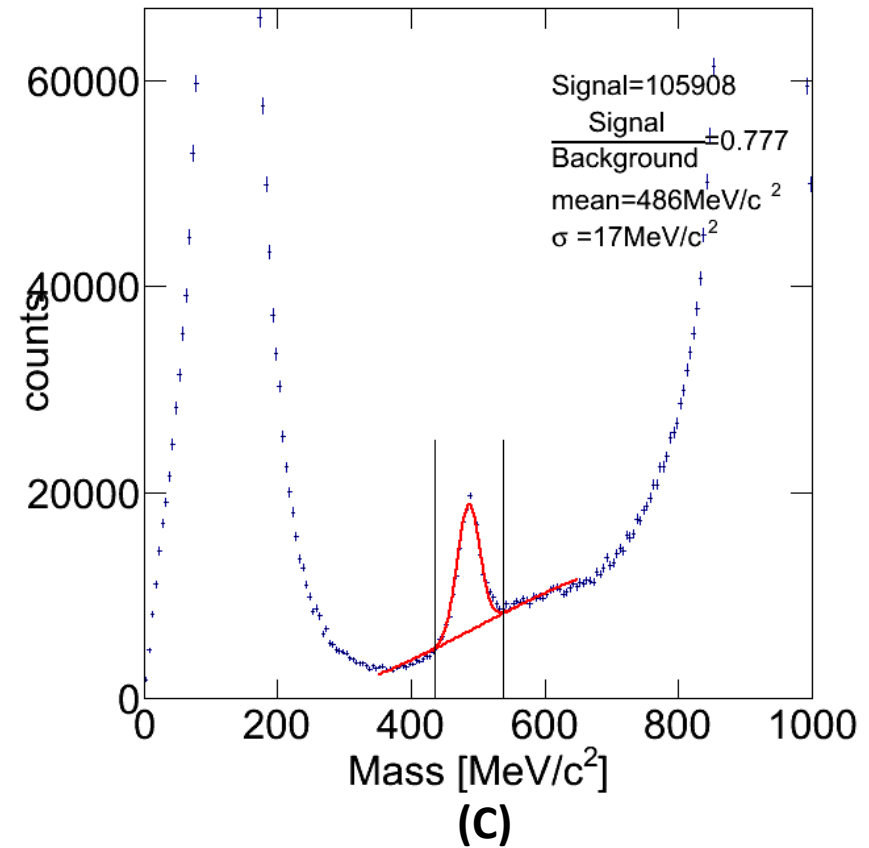
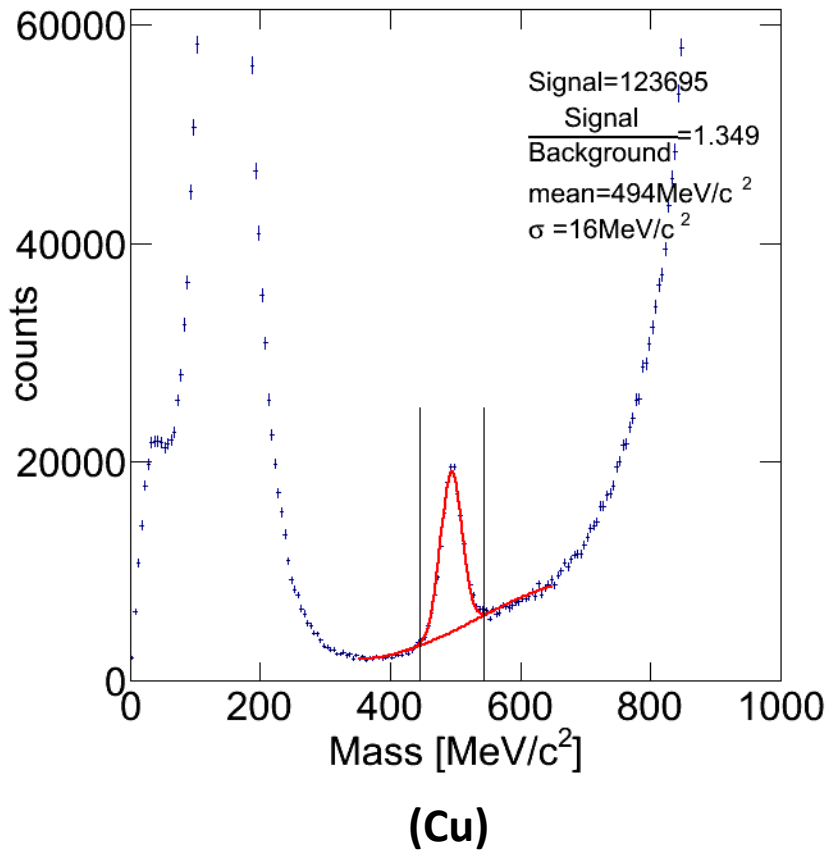
- On the left side the peak of pions (π^-) is coming up

Distribution of masses:

Mass of Kaons

K⁺

Mass of Kaons



- On the left side the peak of pions (π^+) is coming up
- On the right side the peak of protons is coming up

Results

<u>Target</u>	K0 / day	K- / day	K+ / day	t.length [cm]	r. rate
Cu	140,673	37,918	636,146	0.34	2.5 %
C	269,326	34,843	544,670	0.68	2.5 %
<u>"Old simulation"</u>					
Cu	380,000	80,000	1,500,000	0.65	5%
C	600,000	120,000	1,500,000	1.30	5%
(Pb)	440,000	70,000	1,400,000	0.80	5%

Contamination for K0s events with other targets is higher because of secondary particles in the primary vertex reconstruction → probably enhances the number of K0s per day.

Due to primary vertex cuts and bisection of reaction rate, the new results for reconstructable kaons are more than half less.