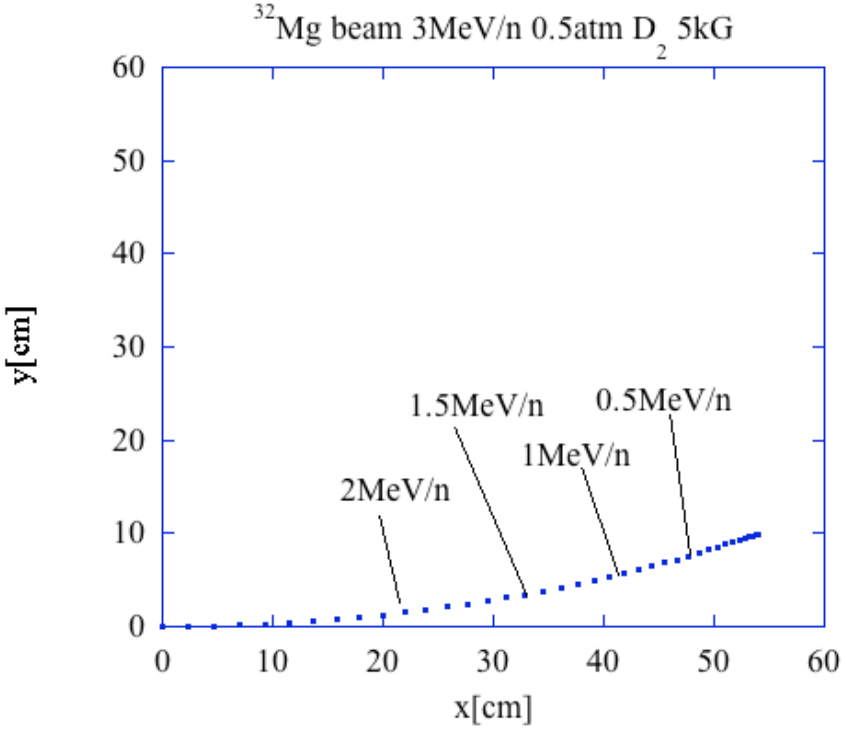
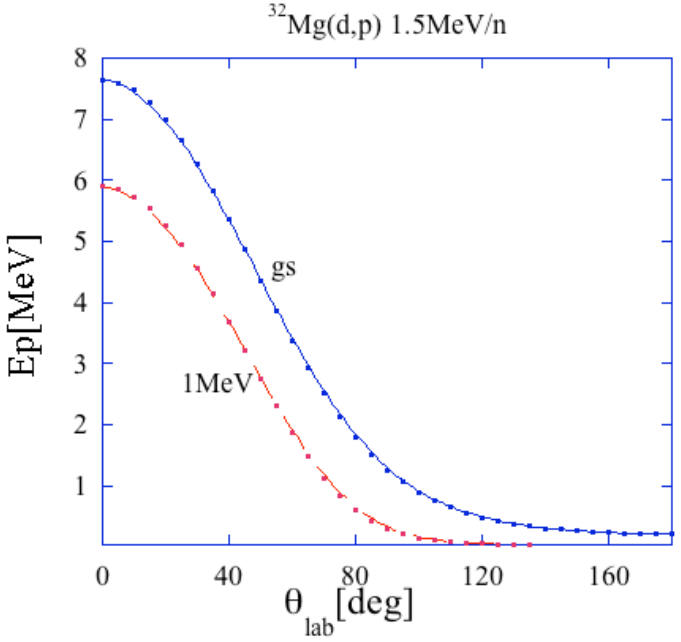
Some Considerations for the AT-TPC at NSCL-MSU

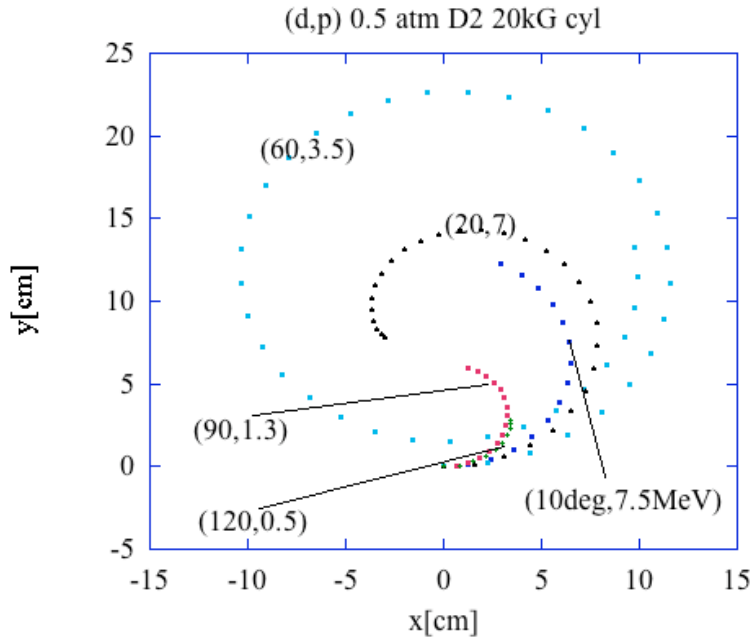
1) EOS- Studies: 150MeV/n $^{108\text{-}132}$Sn+Sn
2) Low to medium energy (1-150MeV/n) nuclear structure studies

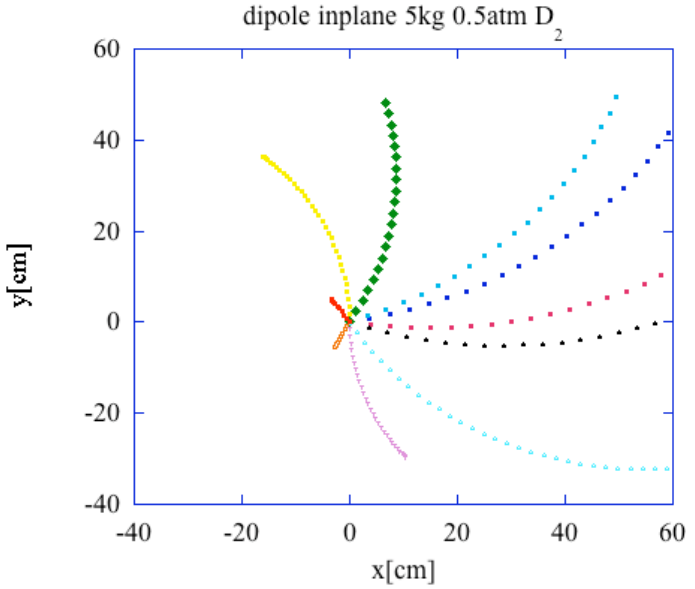
Dipole or Solenoid ?

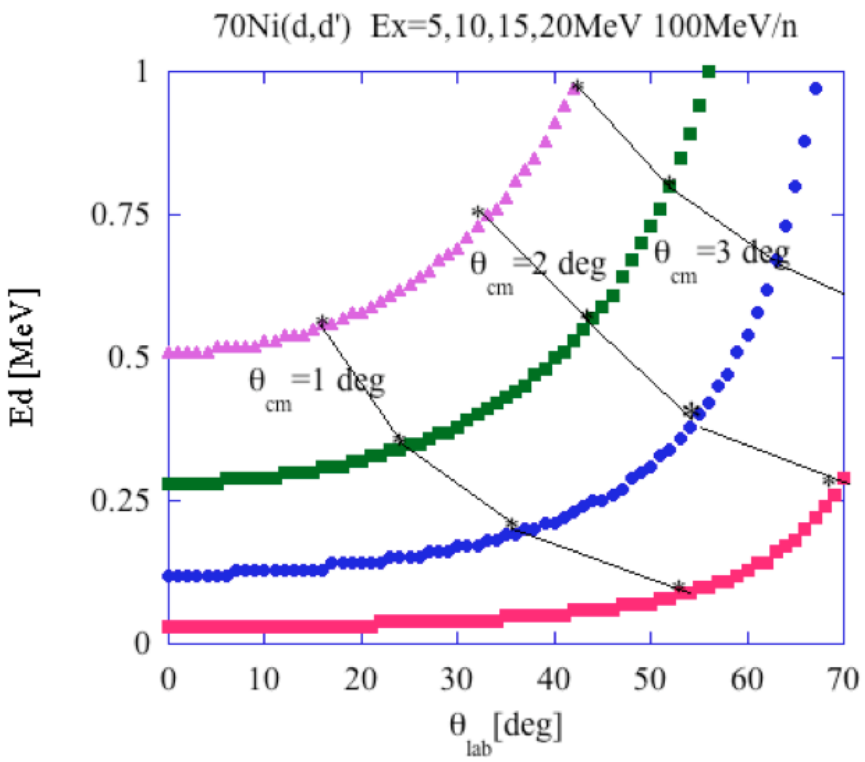
- For the EOS, both solutions should have a maximum open solid angle to forward direction
- High incident beam intensities must be possible

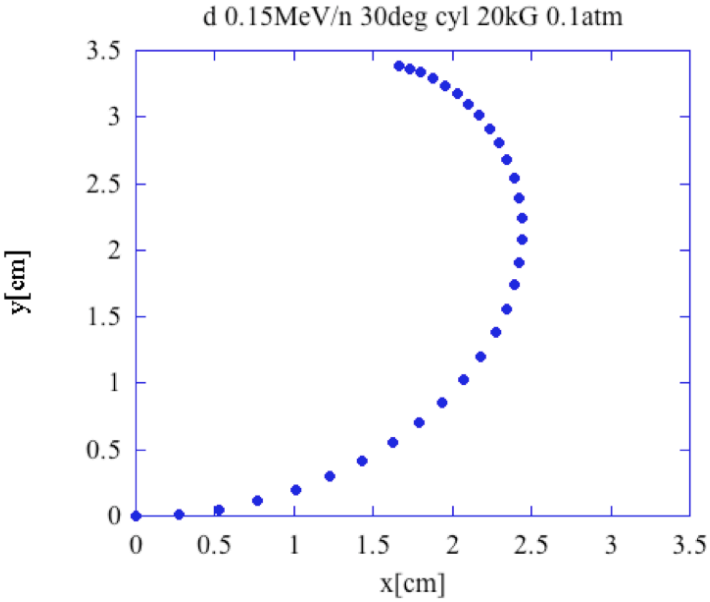

^{32}Mg beam 3MeV/n 0.5atm D_2 5kG
y[cm]
x[cm]
2MeV/n
1.5MeV/n
1MeV/n
0.5MeV/n

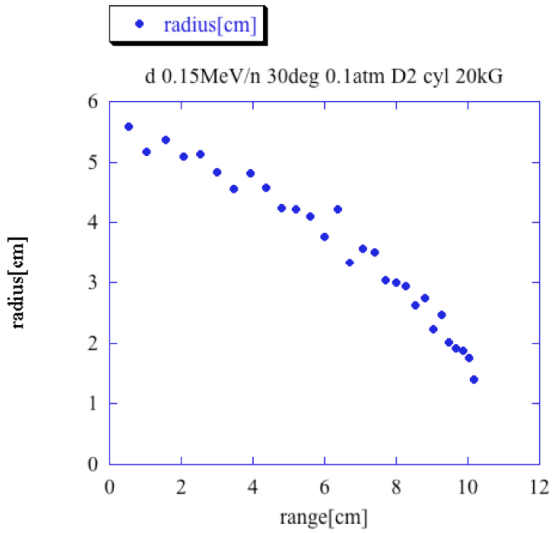

^{32}Mg(d,p) 1.5MeV/n
Ep[MeV]
θ_{lab}[deg]
gs
1MeV


(d,p) 0.5 atm D2 20kG cyl
y[cm]
x[cm]
(60,3.5)
(20,7)
(90,1.3)
(120,0.5)
(10deg,7.5MeV)


dipole inplane 5kg 0.5atm D_2
y[cm]
x[cm]


70Ni(d,d') Ex=5,10,15,20MeV 100MeV/n
Ed [MeV]
θ lab [deg]
θ cm =1 deg
θ cm =2 deg
θ cm =3 deg
0
0.25
0.5
0.75
1
0
10
20
30
40
50
60
70


d 0.15MeV/n 30deg cyl 20kG 0.1atm
y[cm]
x[cm]
0
0.5
1
1.5
2
2.5
3
3.5


radius[cm]
d 0.15MeV/n 30deg 0.1atm D2 cyl 20kG
radius[cm]
range[cm]
0
1
2
3
4
5
6
0
2
4
6
8
10
12

$\delta z = \delta t * v_{drift} = t_{rise} * (noise/signal) * v_{drift} =$

$2 * t_{drift}/nbucket * (noise/signal) * v_{drift} =$ 2 →→ 3,4 ??

$= 2 * L/nbucket * (noise/signal)$

This relation is, as it should be, independent on the drift-time.

Hence the expected resolution $\delta z = 2 * L/nbucket * (noise/signal)$.

Numerical example:

L=1000mm, nbucket = 128 signal/noise=50 ; $\delta z = 0.3mm$.

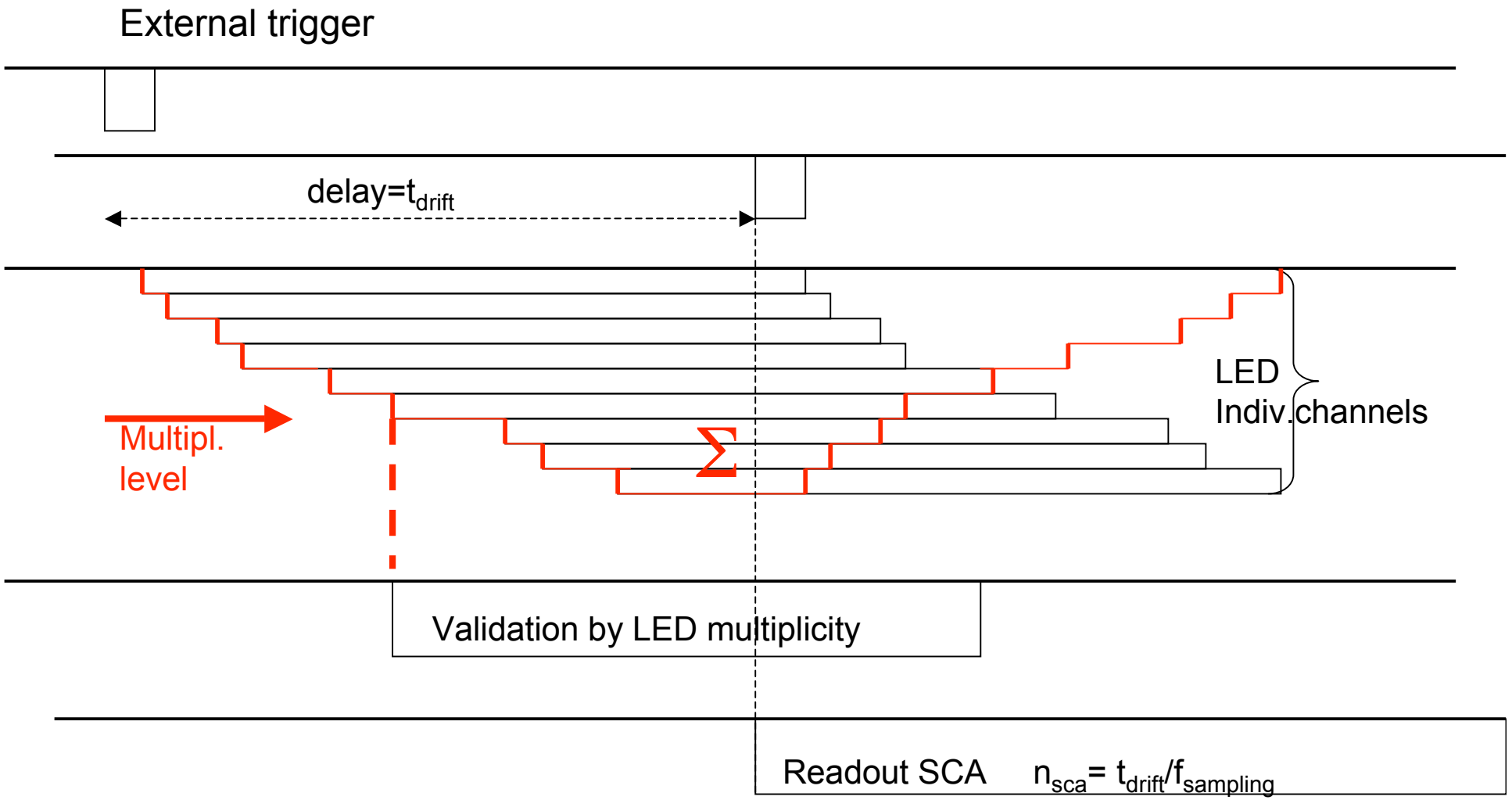
For fast external trigger one would gain a factor 2, this is $\delta z = 0.15mm$.
For a particle with low ionization, we considered that signal/noise should be at least 10.

$\delta z = 1.5mm$ or $\delta z = 0.75mm$ respectively.

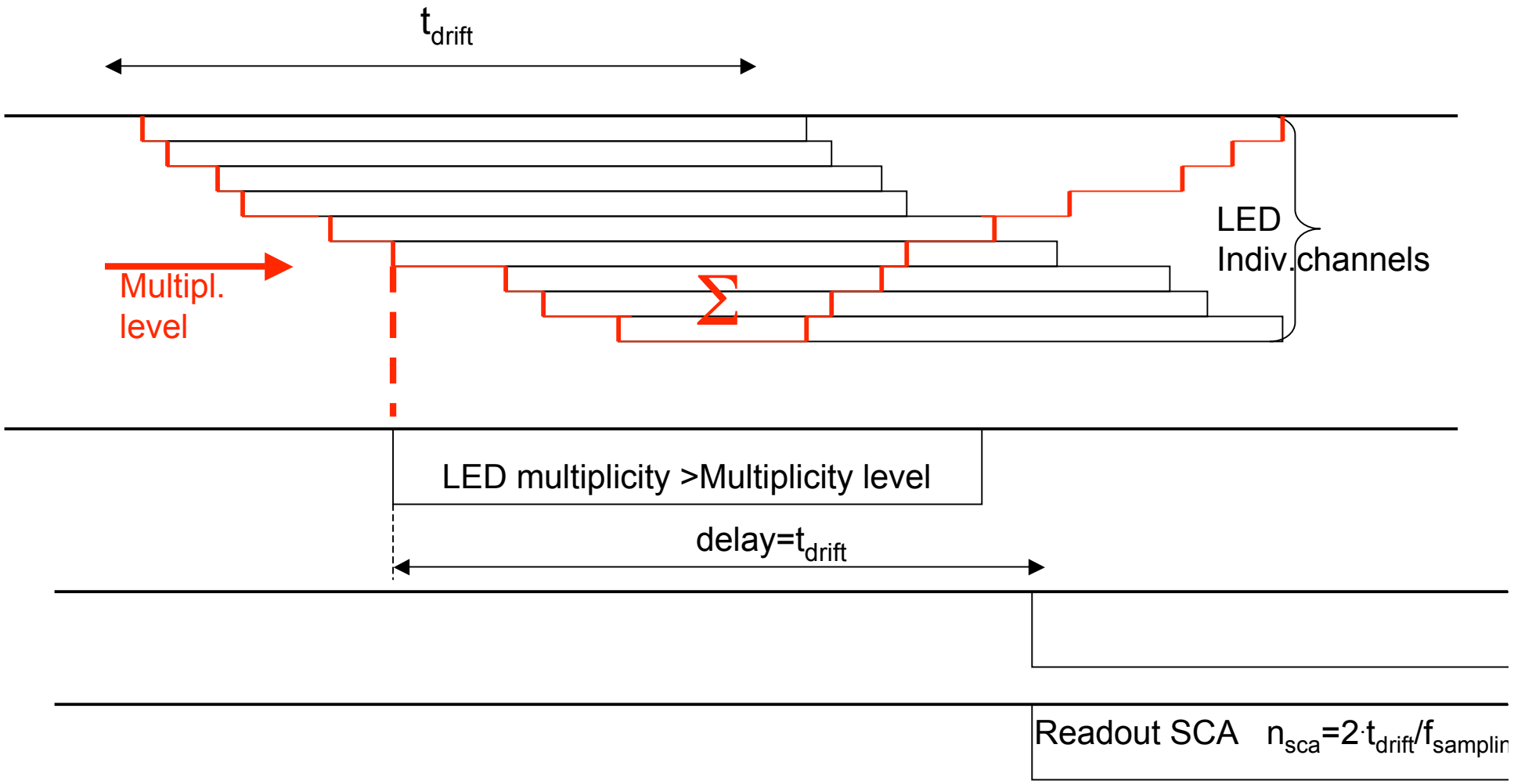
Working hypotheses

- We tried to find a solution without redoing the FEC + FEM
- Trigger logic based on availability of variable length of SCA (128,256,511 buckets, see previous mails)
- The individual channels give a current output, if not inhibited, during one drift-time(programmable); these currents are summed up and available as output of the after+; they are used in external electronics ant it is possible to make a sum of the currents externally

- This results in 2 schematic trigger


External trigger
delay=t_{drift}
Multipl.
level
Σ
LED
Indiv.channels
Validation by LED multiplicity
Readout SCA
$n_{sca}= t_{drift}/f_{sampling}$

Internal multiplicity trigger



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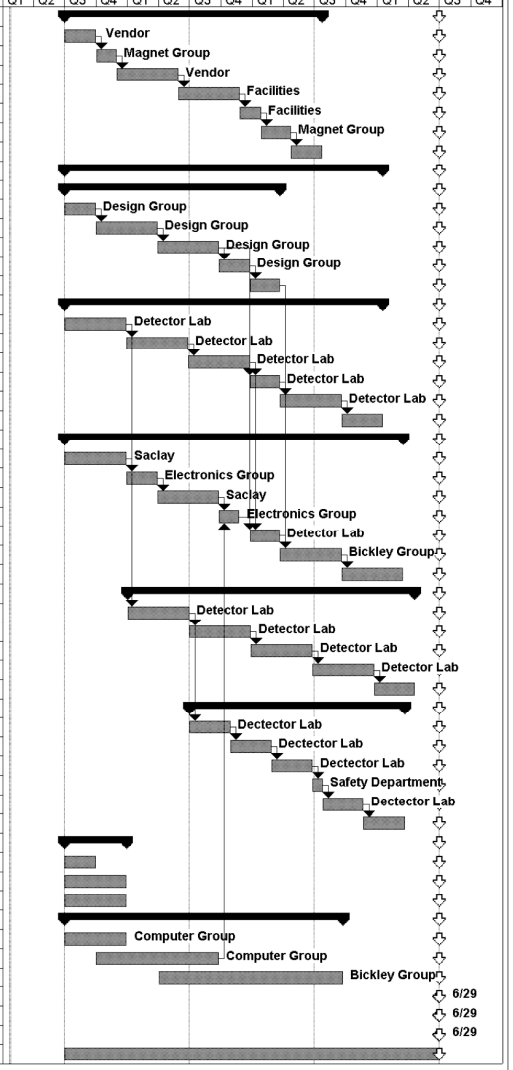
ID	Task Name	Duration	Notes
1	**Magnet**	**752 days**	**$450,000**
2	Bid Process	90 days	
3	Design Review	60 days	
4	Procurement	180 days	
5	Installation	180 days	
6	Commissioning	60 days	
7	Mapping	90 days	
8	Contingency	90 days	
9	**TPC**	**930 days**	**$85,000**
10	**Mechanical Design**	**630 days**	
11	Design	90 days	
12	Procurement	180 days	
13	Construction	180 days	
14	Installation	90 days	
15	Contingency	90 days	
16	**Pad Plane Design**	**930 days**	
17	Design	180 days	
18	Procurement	180 days	
19	Construction	180 days	
20	Installation	90 days	
21	Commissioning	180 days	
22	Contingency	120 days	
23	**Electronics**	**990 days**	**$210,500**
24	Development	180 days	
25	Prototype Testing	90 days	
26	Procurement	180 days	
27	Final Testing	60 days	
28	Installation	90 days	
29	Commissioning	180 days	
30	Contingency	180 days	
31	**Gas System**	**840 days**	**$20,000**
32	Gas System Design	180 days	
33	Procurement	180 days	
34	Construction	180 days	
35	Commisioning	180 days	
36	Contingency	120 days	
37	**Laser system**	**630 days**	**$36,000**
38	Laser System Design	120 days	
39	Procurement	120 days	
40	Construction	120 days	
41	Safety Review	30 days	
42	Commisioning	120 days	
43	Contingency	120 days	
44	**Ancillary Systems**	**180 days**	
45	HV Supply	90 days	$20,000
46	Beam Tracking	180 days	$6,000
47	External Triggering	180 days	$25,000
48	**Computing**	**814 days**	**$24,800**
49	DAQ Hardware	180 days	
50	DAQ Software	360 days	
51	Tracking Software	540 days	
52	**Manpower**	**0 days**	
53	1000hrs Engineering - fully loaded	0 days	$88,000
54	500hrs Technician - fully loaded	0 days	$31,500
55	***Project Totals:***	***1095 days***	***$996,800***



Project: TPC_v2.mpp
Date: Tue 1/22/08

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline