# Weekly report

I/ Deuton analysis

1) Exposure time

Run Time Information are data stored for each second independantly of the event files

- Live time fraction for every second
- 8 maximum rigidity cutoffs:
  - for 4 acceptances: particles within 25,30,35,40 degrees
  - for positive and negative particles

For a given energy, exposure time is the sum of the time spent above rigidity cutoff weighted by the live time fraction:

Exposure time using Francesco's data. Up to now only 2169 files over 5838 processed (37%)

exposure time, positive particles, max angle = 40 degrees
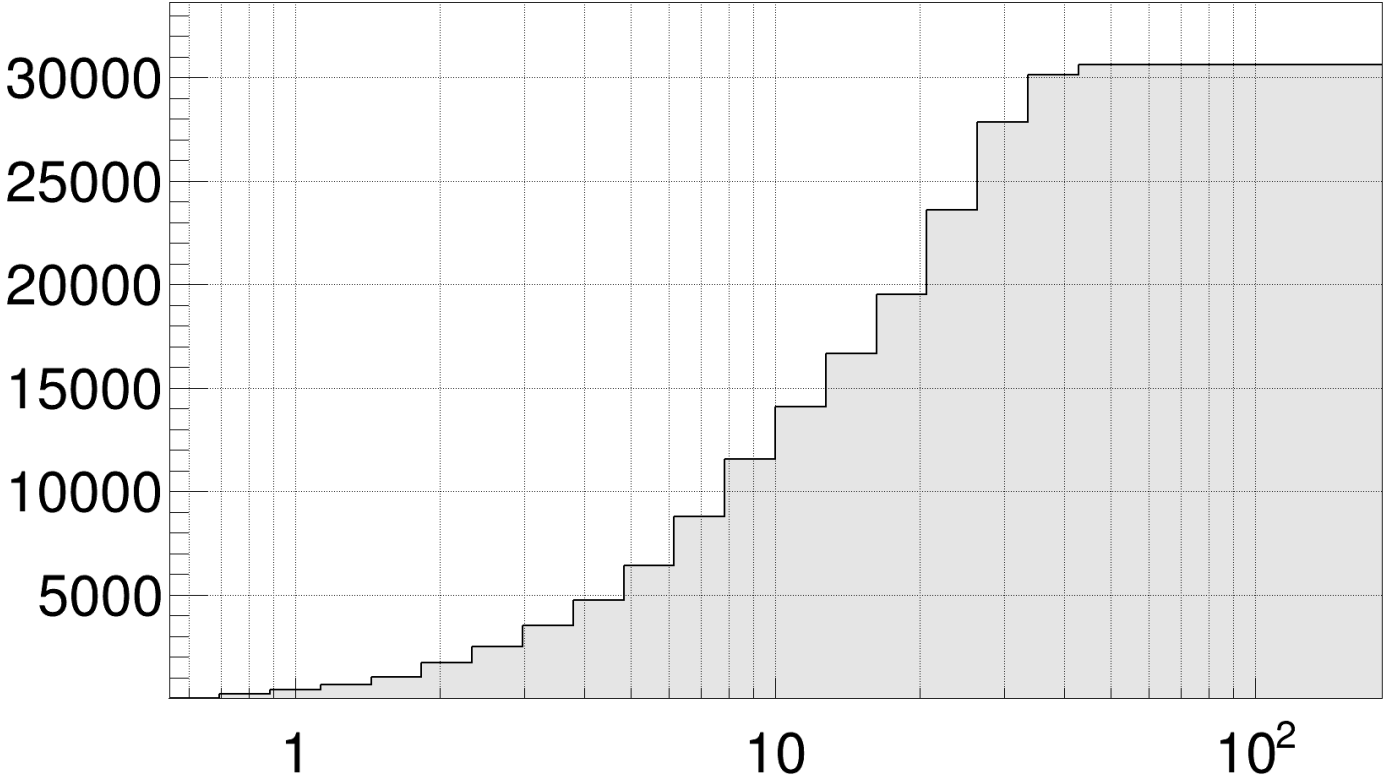
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2) Trigger efficiency

   2.1) Goal:

Estimate the percentage of deutons trigged by a physics trigger

Why not all deuteron trigger ?

⟶ Some deutons are not seen by the trigger (almost negligible, real trigger efficiency ~100%)

⟶ Some deutons are seen but vetoed by anti-counters (prensence of secondary particles)

This is the real purpose of trigger efficiency computation

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2) Trigger efficiency:

   2.2) The unbiased trigger

A trigger that sees (almost) everything that goes through the detector

     Sees too many particles ⟶ Cannot be used for event acquisition

The unbiased trigger is prescaled by a factor of 100:

     It only asks for an event aquisition every 100 events

In theory trigger effiency is simple:

1. Take a sample of events trigged by the unbiased trigger
2. Compute the fraction seen by physics triggers

BUT….

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2) Trigger efficiency:

    2.2) The unbiased trigger

Due to a hardware bug, the unbiased trigger flag is not reliable

The unbiased trigger flag is stored in the previous event

Can we recover the trigger flags of event 14 ?

Case 1:

phys trigger #13 = yes

Event #13 is kept
Unb. trig #14 is recovered

Event 13:

Phys. trigg: yes

Unb trigger: #14

Event 14:

Phys. trigg: X

Unb trigger: not yet

X means: any value

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2) Trigger efficiency:

   2.2) The unbiased trigger

Due to a hardware bug, the unbiased trigger flag is not reliable

The unbiased trigger flag is stored in the previous event

Can we recover the trigger flags of event 14 ?

Case 2:

phys trigger #13 = no

Event #13 seen only by the unb. trigg

99% chance of thowing event #13

99% chance of loosing the flag: unb. trig. #14

Event 13:
Phys. trigg: no
Unb trigger: #14

Event 14:
Phys. trigg: X
Unb trigger: not yet

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2) Trigger efficiency:

2.2) The unbiased trigger

There is a workaround:

There are in fact 2 of them !
1 with a '100' prescaled factor: TOF
1 with a '1000' prescaled factor: ECAL

All events not trigged by a physics trigger come from an unbiased trigger

$$N_{unbiased} = 1000 * N_{ECAL} + 100 * N_{TOF| No ECAL}$$

$$Efficiency = N_{phys} / (N_{phys} + N_{unbiased})$$

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2) Trigger efficiency:

2.3) The trigger flags: JMembPatt and PhysBPatt

r	E	E	E	E	E	B	A	A	F	F	F	F	F	F		Bit name (r → reserved bit)
r	X	X	C	C	C	Z	C	C	T	T	T	T	T	T	V
r	T	T	A	A	A		C	C	E	Z	C	C	C	C	
r	2	1	L	L	L		1	0			T	T	P	P	
r			A	A	A						1	0	1	0	
r				&		&										

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | ← bit number   JMembPatt |

0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	(0) "Unbiased charged" (3of4 TOF HT, presc.factor ~100)
0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	(1) "Single charged" (4of4 TOF HT, Nacc=0)
0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	(2) "Normal Ions" (4/4 TOF SHT, Nacc<5)
0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	(3) "Slow Ions" (4/4 TOF SHT, gate 640 ns)
0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	(4) "Electrons" (4/4 TOF HT, ECALF&)
0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	(5) "Photons" (ECALA&)
0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	(6) "Unbiased EM" (ECALF||, presc.factor ~1000)
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	(7) "spare"

PhysBPatt

*) Bit set to 1 means the input is disabled

N_{Unb. ECAL}
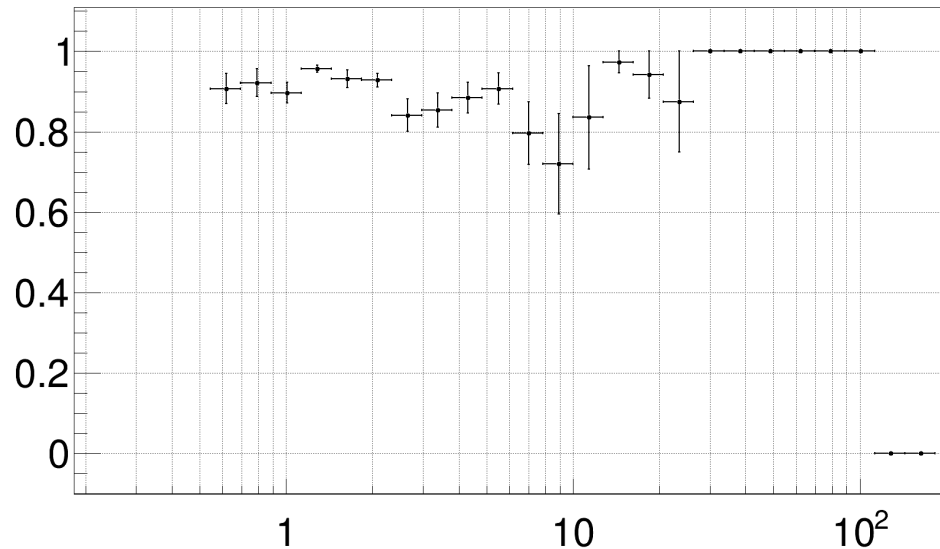- No physics trigger
- JMembPatt ECALF,OR flag

N_{Unb. TOF| No ECAL}
- No physics trigger
- JMembPatt No ECALF,OR flag

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2) Trigger efficiency:

2.4) First results on proton: more statistics required

Unbiased trigger efficiency

Selection sample:
  notFirstTwo
  notInSaaCut
  zenithCut
  runtypeCut
  oneTRDTrack
  goldenTRACKER
  oneTrack
  chargeOne
  downGoing
  betaNotCrazy
  tracker full span

Taking tracker full span instead of tracker inner span makes a big difference
Compatible with proton official trigger efficiency