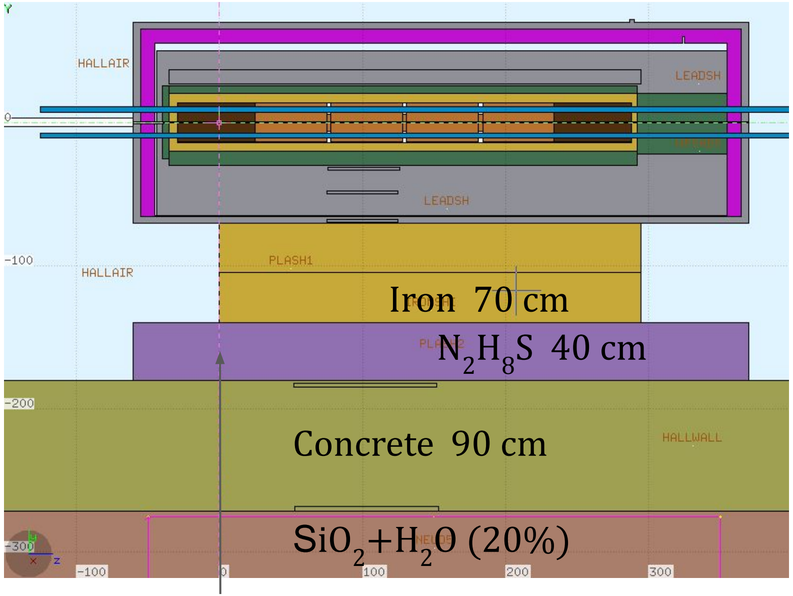
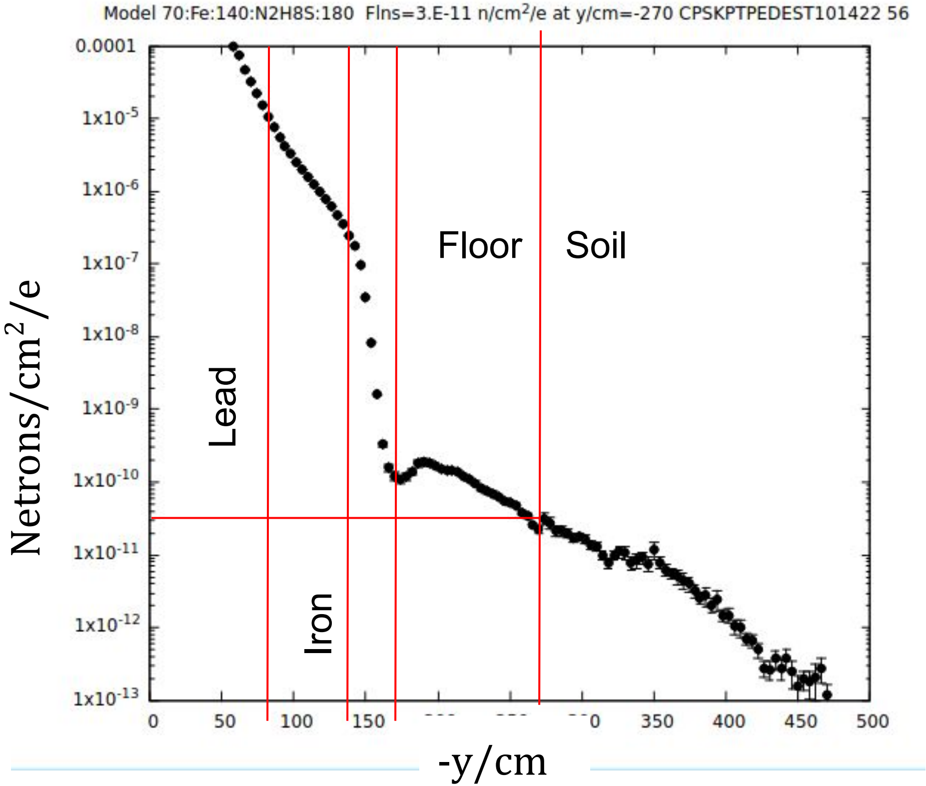
Neutrons T > 0 MeV in soil at 1 m depths after Iron/N_2H_8S pedestal

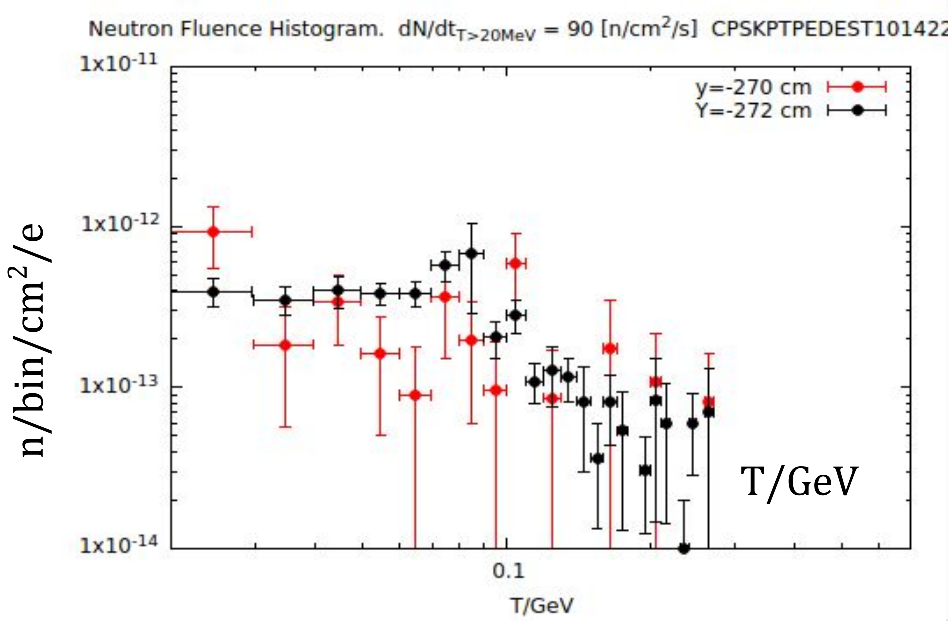


https:Ammonium sulfide



- Neutron Flux T>0 = 3.E-11 [n/e/cm^2]*3.E+13 [e/s] = ~ 900 [n/cm^2/s].
- What fraction of T>20 MeV that is responsible for Tritium production in soil?

Neutron Flux T>20 MeV in soil at 1 m depths after Iron/N_2H_8S pedestal.



- Neutron Flux (red) = 33.E-13 [n/e/cm^2]*3.1E+13 [e/s] = ~ 100 [n/cm^2/s].
- Black -150 [n/cm^2/s]. Reference 30 [n/cm^2/s] 3-5 times lower.
- How many tritium under the floor after 1 year and what is its decay rate?

Tritium concentration and activity in 1 m deep soil after 1 year.

What is $T(^3H)$ production in $2m*4m*1m=8\ m^3$?

From the plot we read:

$\sim 1.E\text{-}8\ [^3H/e]$

We calculate the production rate:

$dn_T/dt = \sim 1.E\text{-}8[^3H/e]*3.E+13[e/s]\ 0.125E\text{-}6\ [cm^{-3}]=$

$= \sim 0.04\ [T/s/cm^3]$

In one year (3.E+7 s) soil accumulates (neglect decay):

$n_T = \sim 1.2E+6\ [T/cm^3]$

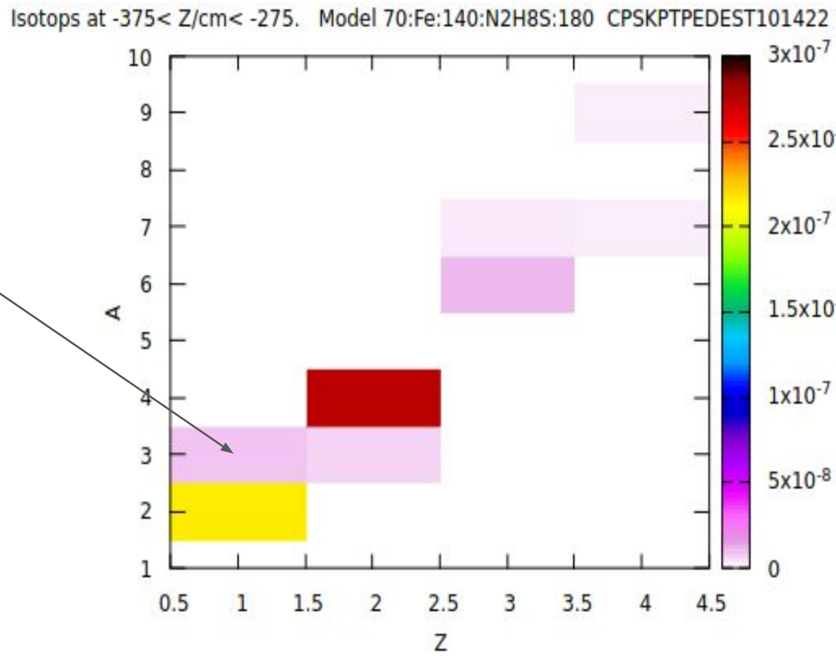
Desintegrations (~12 years):

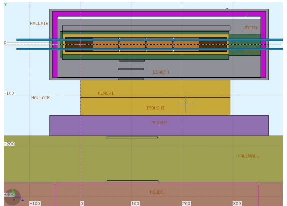
$dn_T/dt = -1.2E+6\ [T/cm^3]\ /\ (36.E+7\ s)=$

$= -3.E\text{-}3\ [\ T\ /s/cm^3]$

Reference for drink water:

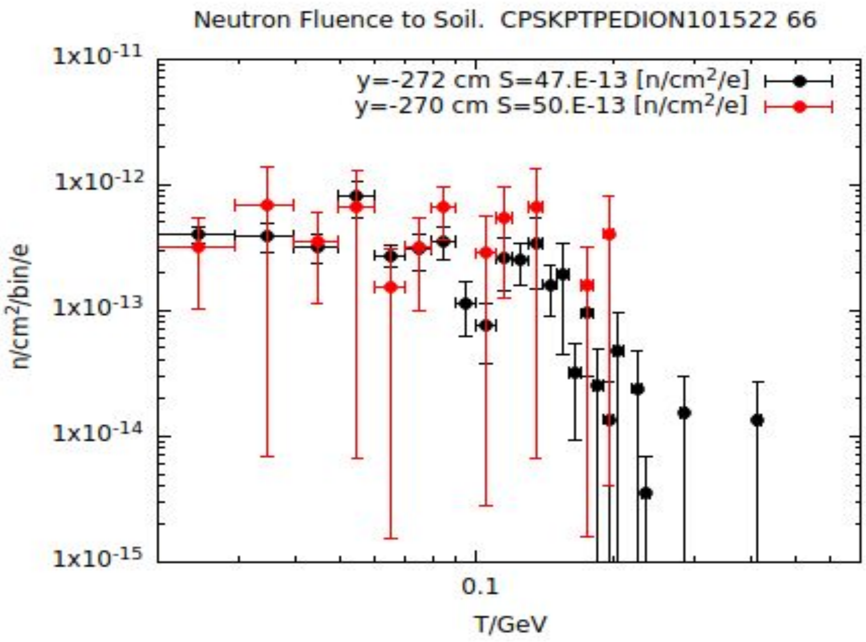
$7000\ [T/s/L]=7\ [T/s/cm^3]$ https

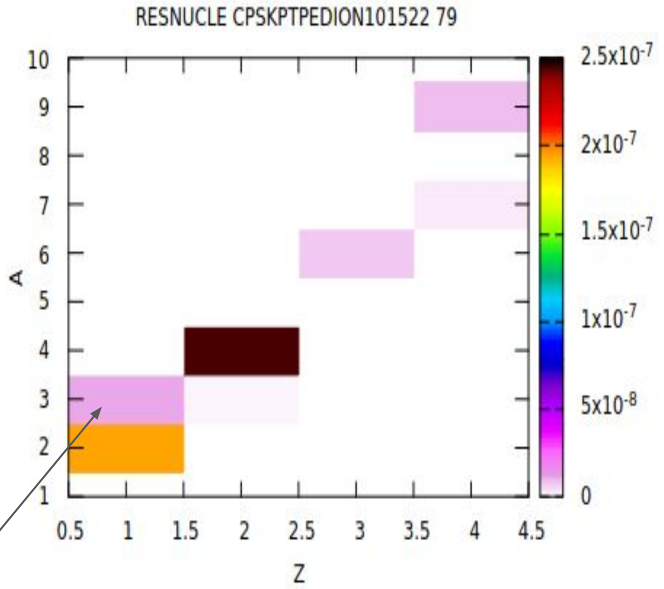




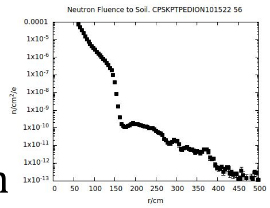
- In tagger hall soil the decay rate of T is $\sim 0.5*10^{-3}$ of reference.

Flux of neutrons T>20 MeV in soil at 1 m depths and ^{3}H concentration. Effect of ion EM-dissociation and Isomers.

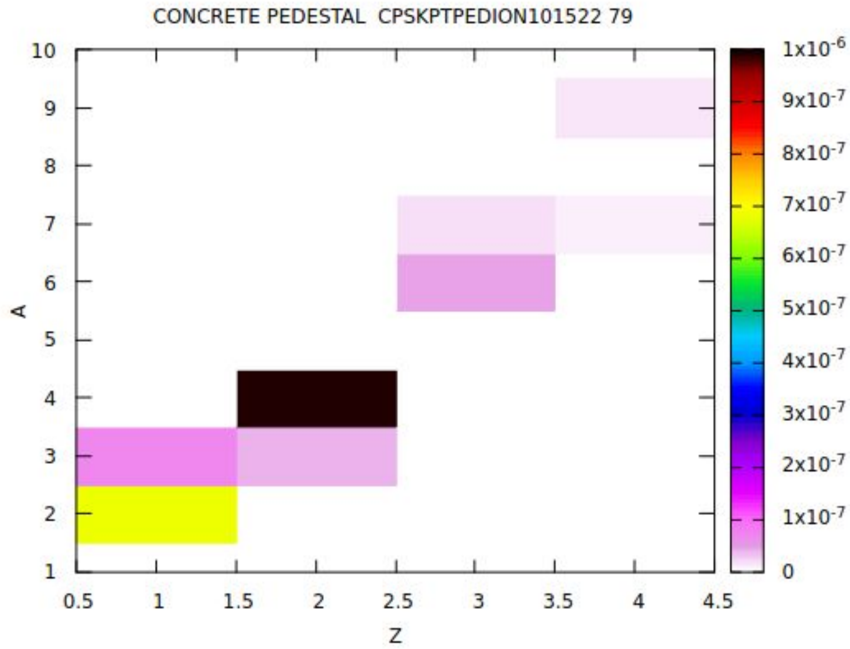


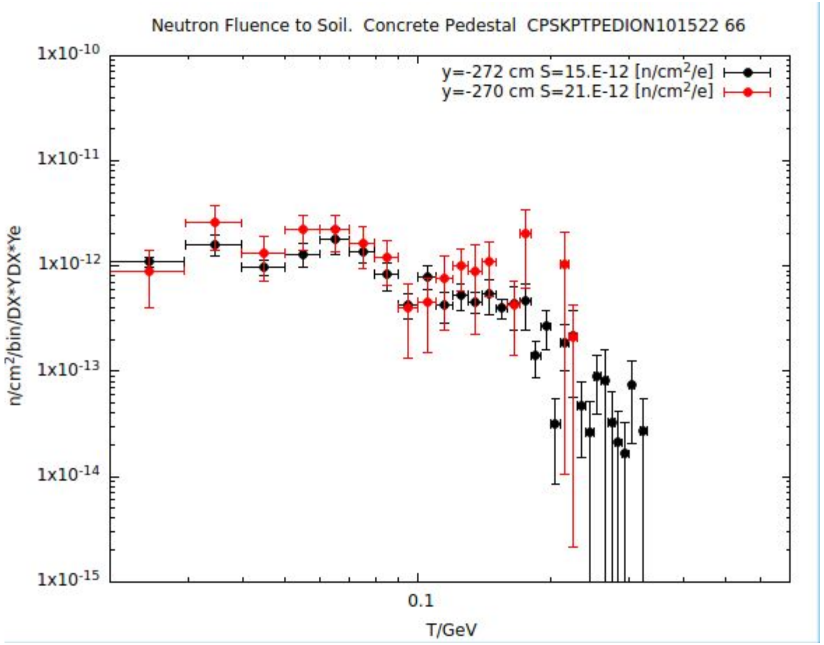


- Neutron Flux (red) = 50.E-13 [n/e/cm^2]*3.1E+13 [e/s] = ~ 150 [n/cm^2/s].
- Black - 145 [n/cm^2/s]. About 50% higher.
- Tritium fluence is about the same =1.2E-8 [T/e/V] V=2*4*8* m^3 at y=-272 cm

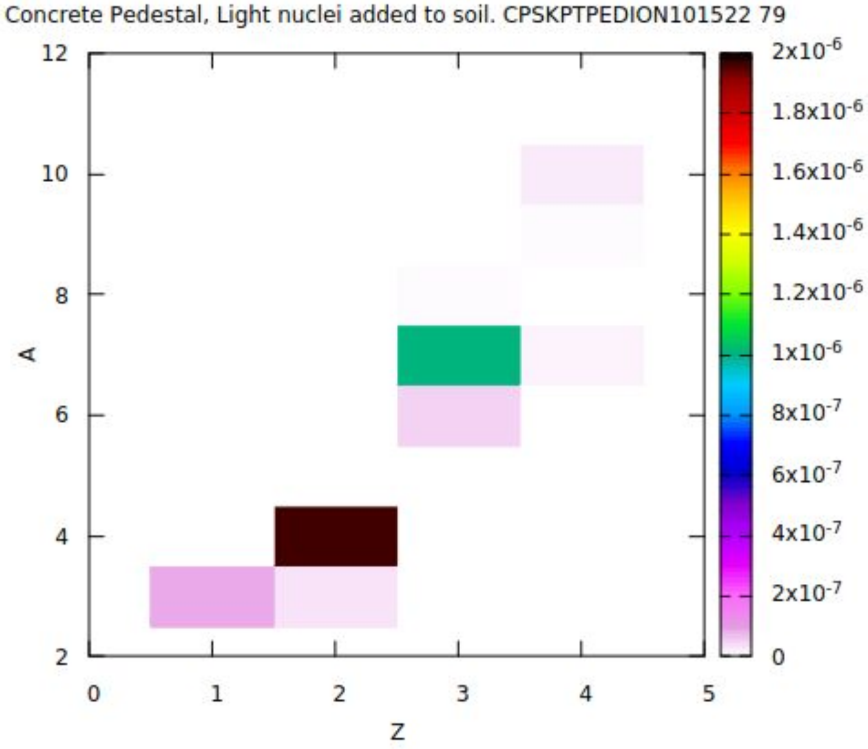


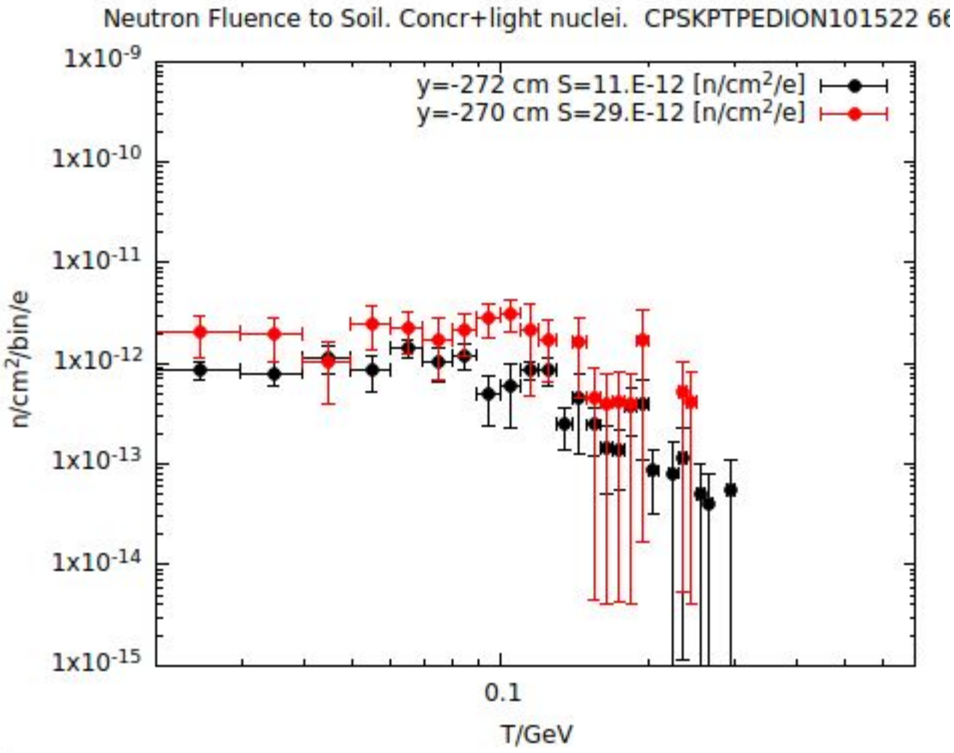
Flux of neutrons T>20 MeV in soil at 1 m depths and ^3H concentration. Effect of ion EM-dissociation and Isomers and concrete pedestal.





- Netrun fux is of ~ 5 times higher.
- Tritium yield is 1.e-7 T/e that is ~5-10 times higher then for Iron/Plastic pedestal.
- Tritium decay rate is of 0.02 [T/s/cm^3] ; reference for a drink water ~10[T/s/cm^3].


Concrete Pedestal, Light nuclei added to soil. CPSKPTPEDION101522 79
A
Z
0
1
2
3
4
5
2
4
6
8
10
12
0
2x10^-7
4x10^-7
6x10^-7
8x10^-7
1x10^-6
1.2x10^-6
1.4x10^-6
1.6x10^-6
1.8x10^-6
2x10^-6


Neutron Fluence to Soil. Concr+light nuclei. CPSKPTPEDION101522 66
y=-272 cm S=11.E-12 [n/cm2/e]
y=-270 cm S=29.E-12 [n/cm2/e]
n/cm2/bin/e
T/GeV
0.1
1x10^-9
1x10^-10
1x10^-11
1x10^-12
1x10^-13
1x10^-14
1x10^-15

Conclusion and Outlook

1. All safety parameters are met by CPS design including tritium concentration in soil.
2. Tritium concentration in 30 cm layer of soil under floor.
3. Include into the "CPS conceptual design report" (https).
4. Optimization of pedestal material based on T-activity.
5. Model test by Radcon group (Pavel).