CYGNO simulations update

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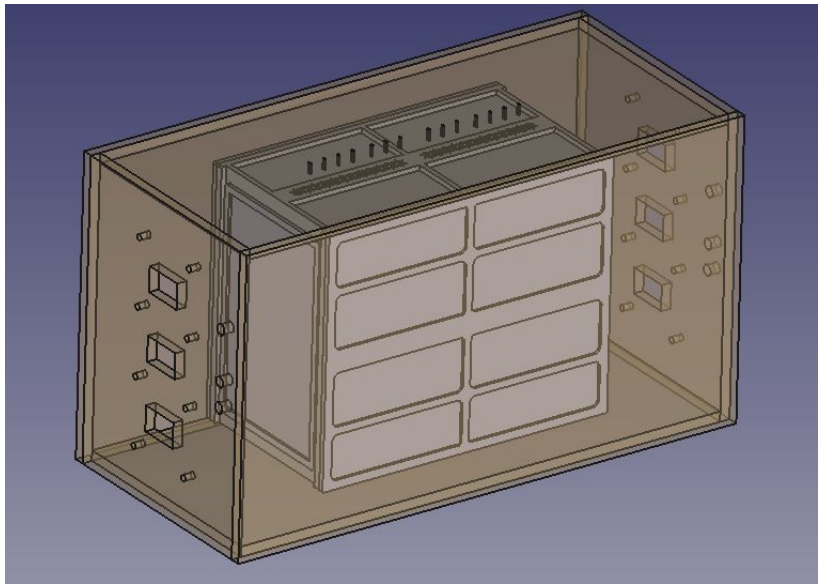
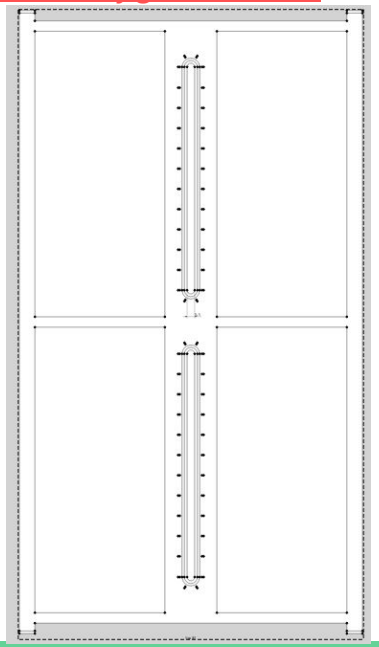
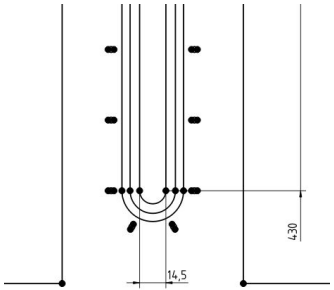
CYGNO-04 geometry

- New CAD design with calibration windows on copper and PMMA
  - new design is now implemented in github and can be checked https://github.com/CYGNUS-RD/geometry/tree/master/cygno_04_v3

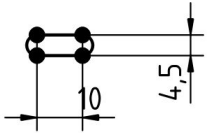




2 PMMA windows
14.5 mm x 430 mm



14 Cu windows
4.5 mm x 10 mm



Calibration simulation

- A preliminary estimate of the 55-Fe source rate was presented by Zahoor at last simulation meeting
- Simulated different sizes of holes in the copper shield

Hole size	Frequency for 1.5 million events (approx.)
4.5 mm x 40 mm x 14.5 mm	557 Hz
4.5 mm x 40 mm x **4.5 mm**	168 Hz
2.5 mm x 40 mm x 14.5 mm	238 Hz

- Target rate: ~20 Hz
- In CAD design holes are 4.5 x 10 mm, expected rate ~4-500 Hz
- A thin layer of PMMA (or ETFE) in the windows (attenuation length for 6 keV gamma is 0.5 mm [*])

[*] https://physics.nist.gov/PhysRefData/XrayMassCoef/ComTab/pmma.html

Field cage radioactivity measurements

- Review and rearrangement of HPGe measurements taking in consideration
  - Gamma emitters in U and Th radioactive chains are measured independently
  - Secular equilibrium may be broken in specific points of the chains

    ➜ some measurements are not really independent

- Updated values in the CYGNO database, details in my slides
  - Background simulations for FC should be revised
  - only HPGe at the moment ➜ mostly upper limits

- ICP-MS measurements could constrain better the activity in the upper chains of 238-U, 232-Th and 40-K.

QF simulation

- We plan to produce samples of NR for different purposes (AmBe, training of ML analysis, ...)
- QF at the moment is not included in Geant4 simulation
  - can be easily implemented (technically) but validation with SRIM is needed
  - reasonable agreement Geant4-SRIM for E>5 keV
  - investigating the possibility to import SRIM libraries in Geant4, to have the correct QF also at low energy