On uncertainties in the manganese sulphate bath techniques

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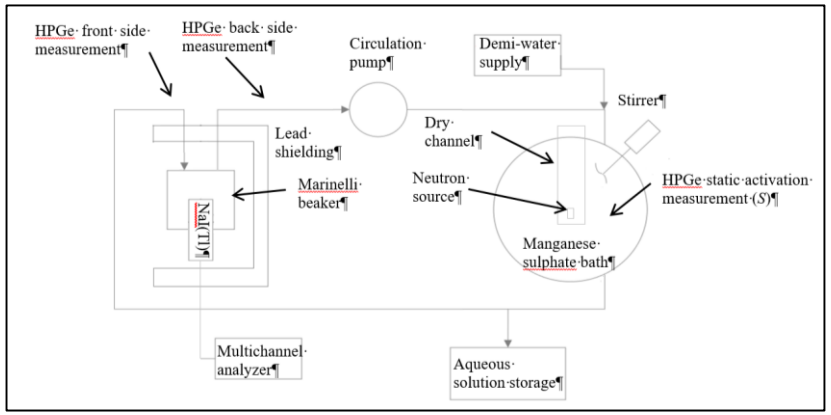
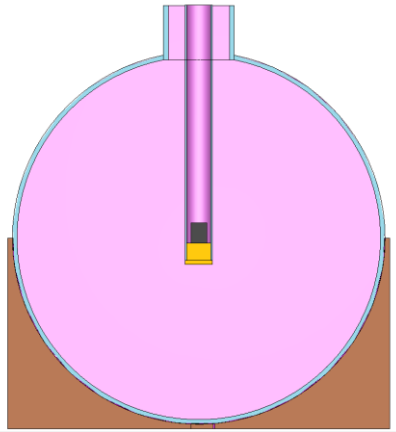
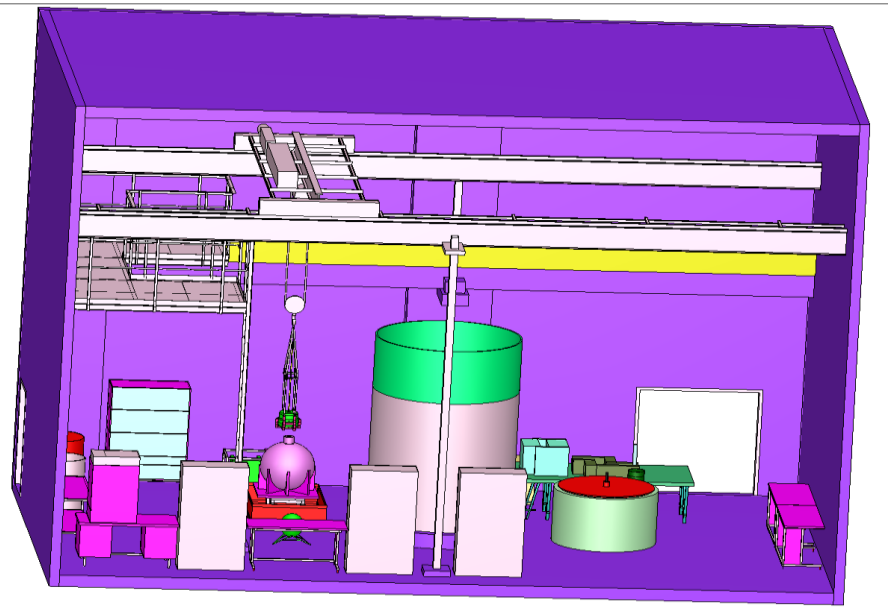
- ✓ **The manganese sulphate bath is the most widespread system for a neutron source emission rate characterization.**
- ✓ Experimental spherical plexiglas bath vessel was developed with inner diameter of 80 cm.
- ✓ Several types of measurements can be performed to estimate the neutron emission rate.
  - ✓ Continual measurement through external circuit driven by circulation pump.
    - Circuit is equipped by the 76×76 mm cylindrical NaI(Tl) gamma detector placed in the Marinelli beaker.
    - Approximate flow rate is 3.5 ℓ.min^{-1}.
    - Homogenization of the solution is provided by the stirrer with speed control; 0-200 rpm.
  - ✓ Manual extraction of the solution sample from the vessel.
    - Two extraction points; front side and back side of Marinelli beaker
    - Availability of static activation of the solution; no flow, no mixing.
    - Free of use measurement system; in our case it is a high purity germanium detector (HPGe) placed in low background chamber
  - ✓ In-vessel measurement.
    - The plexiglas bath is equipped by the dry channel.
    - Remote manipulation of a neutron source.

- ✓ **Several source of uncertainties exist, which must be determined to completely characterized neutron source emission rate by developed device.**
  - ✓ Activity of the solution. → 1.3 - 1.6 %
  - ✓ Concetration of the managanese sulphate in solution. → 4 % bias, ± 2 %
  - ✓ Volume of the spherical bath vessel, marinelly beaker, samples. → negligible
  - ✓ Correction factors – „**user effect**“.
    - Isotopic composition.
    - MC metod. → low, but higher than statistical unc.
    - Neutron source spectra. → up to 5 %
    - Details' depth of the model. → negligible
    - XS uncertainties. → Future research!!!







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