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 characterize neutron source emission rate by developed device.

- Activity of the solution. → 1.3 - 1.6 %
- Concentration of the manganese 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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