An intercomparison exercise on neutron detection for radiation protection purposes was organized during 2011 by ARN Neutron Laboratory in order to verify the present status of instrumentation applied in this field by different nuclear facilities in Argentina, such as research reactors, nuclear power plants, particle accelerators, and a bureau of safety.

In the exercise, the ARN laboratory acted as reference laboratory. Neutron Irradiator N40-BG-M-2 (Hopewell Designs Inc.) and the sources ISO Cf-252, Cf-252 + D2O and AmBe were used.

An assessment of measurement variables affecting the uncertainty was carried out.

Private and public laboratories were invited with the only condition of one detector per participant. Results showed that 75% of detectors are acceptable within the dose rate range of the ARN neutron laboratory.

Acceptance criteria for this exercise were adapted from IAEA RS-G-1.3 Safety Guide. Despite that RS-G-1.3 sets acceptance criteria for Personal Dose Equivalent Hp(10), however, in this exercise, it was performed considering Ambient Dose Equivalent H*(10). This criterion was based on that Hp(10) and H*(10) quantities are both good estimators of the Effective Doses received by an individual in a radiation field.

That being said, in order to consider a measurement acceptable, the average readings must fall within the interval defined by -33% to 50% around the RVL.

It is considered as result the response, defined as the average of ten readings divided by RVL.

In symbols:

\[ \frac{X}{RVL} \]

Figure 1. ARN Neutron Laboratory

Figure 2. Detectors on calibration bank in the same positions as they were irradiated.

In symbols:

0.66 < \frac{X}{RVL} < 1.50

Participants’ responses in all fields. Codes 2, 4, 7 and 10 were irradiated for two response times. No uncertainties were added for clarity.

Participation

Reading average/RVL

-2.0  -1.0  0.0  1.0  2.0

0  1  2  3  4  5  6  7  8  9  10  11  12  13

Cf-252 70 cm
Cf-252 200 cm
Cf-252 + D2O 70 cm
Cf-252 + D2O 200 cm
Am-Be 70 cm
Am-Be 200 cm

6. CONCLUSIONS

The intercomparison exercise on Neutron Detection for Radiation Protection Purposes during 2011 was successfully performed. The status of tested detectors is acceptable. In summary: 42% of detectors response is acceptable in 6 fields, 33% in 5, 8% in 3 and 17% of detectors response is not suitable in any field.