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Progress Report on Nuclear Data Activities in Bolivia

1983/84

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Instituto Boliviano de Ciencia y Tecnologia Nuclear
La Paz, Bolivia

This work has been performed under IAEA research contract no. NDT-0-25 and under the Interregional Project INT/1/018

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PROGRESS REPORT-PERIOD 1983/84

The activities related to nuclear data that have been carried out in Bolivia during the present period April 1983 to April 1984 are summarized below.

All activities are performed at the Instituto Boliviano de Ciencia y Tecnologia Nuclear [redacted] for Nuclear Science and Technology [redacted], using the 165 KeV Cockroft-Walton neutron generator. The projects are supported by contract number NDT-0-25 signed with the IAEA, and the Interregional Nuclear data project INT/1/018. There are no other significant nuclear data activities in the country, for the time being.

- Renewal of the contract with the IAEA for the loan of U-235, U-238 and Th-232 targets, as part of the targets and samples program.

  The targets are being used for the measurement of relative neutron fission cross sections among the three named isotopes at 14 to 15 MeV. The technique being used is the solid state track detector method. Polycarbonate foil has been chosen, and the number of tracks in the etched detector is counted using a jumping spark counter.

  The design of the counter is a modification of that of Varnagy et al of the Institute for Experimental Physics, Kossuth University, Debrecen, Hungary, as described in the "Manual for the Interregional Training Course in the use of neutron generators-1978".

The modifications make use of commercially available electronics, that simplify greatly the assembly. Figure 1 shows the diagram of the system used with very satisfactory results. Limited supplies of foil (polycarbonate Makrofol KG) and aluminized mylar have precluded extensive measurements but the IAEA is generously remedying this situation through its INT/1/018 Project.

- In order to establish with reasonable precision the energy distribution of neutrons around the tritium target of the neutron generator, the research group at CIN-Viacha has proposed the construction of a neutron recoil telescope. The device is based on designs published in the CEA Report N° CEA-R-4884 of 1977 and in K.W. Geiger, NRC, Canada, "Neutron Dosimetry", Vol. I., IAEA proceedings of the 1962 Harwell Symposium. Athick (2000 u m) silicon suface barrier detector, capable of stopping protons of up to 17.5 MeV has been chosen, for optimum electronic resolution. Regarding the radiator and the radiator-detector geometry, a computerided model is being developed to calculate the dimensions for optimum efficiency and satisfactory resolution. The preliminary results indicate that at 14 MeV the uncer tainty due to losses in the radiator will be 4% or less and geometric uncertainties under 5%, giving a combined result of less than 6.5%.

- The measurement of the Pb (n,gamma) cross section at 14 to 15 MeV is the third project in progress. However it is still in the equipement procurement stage.

The measurements will be carried out using standard neutron-gamma anticoincidence techniques, using three Na I detectors (two 3" x 3" and one 5" x 3") for gammas and two 10" x 10" x 1/2" plastic scintillators for neutrons.

- A remeasurement of the N-15 cross section for the N-15 (n,P) C-15 reaction is also in progress, using a sample of N-15 enriched organic fertilizer. (Enrichment: 2% N-15)! Since the C-15 gamma energy is very high, (5.298 MeV), non linearities in the energy versus pulse height response of the 5" x 3" NaI detector are complicating the measurement. The repetitive activation technique is being used, with a pneumatic sample changer, due to the short (2.45 S) C-15 half life. The counting losses due to decay between end of activation-beginning of counting have been established to be less than 2.5%, since the cooling time is only 55 ms.

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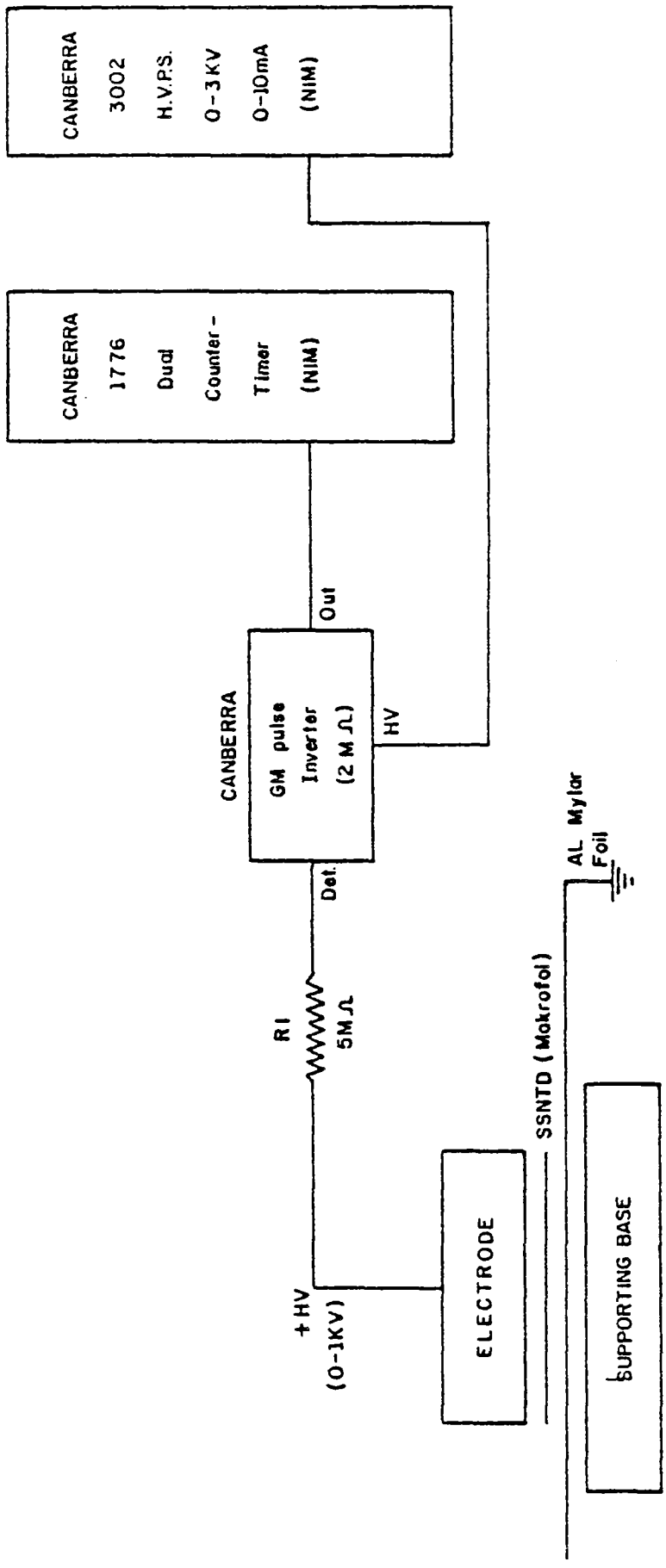

Figure 1.- SSNTD Jumping spark counter. NIM modules are those used in practice.