



International Atomic Energy Agency

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**INTERNATIONAL NUCLEAR DATA COMMITTEE**

TEHRAN UNIVERSITY NUCLEAR CENTRE

Nuclear Data Programme.

1971.

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## TEHRAN UNIVERSITY NUCLEAR CENTRE

### Nuclear Data Programme.

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#### Introduction.

At present the only nuclear facility at Tehran University Nuclear Center is a 5MW pool type reator, the regular utilisation of which for irradiation started in August 1970. A 3mev Van de Graff machine is also being installed. This is expected to be in operation before the end of 1971. Consequently the n.d.p. at this center is at an early stage. The following projects reflect the status of T.U.N.C. in this respect. No report concerning activities in this line has so far been received from other institutes in Iran.

#### 1- Decay Scheme of $^{92}\text{Sr}$

The level structure of  $^{92}\text{Y}$  has been investigated through the study of the decay of  $^{92}\text{Sr}$ . Sources were prepared by irradiating samples containing about 100 mg of uranyl nitrate  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  of natural isotopic composition in the Tehran University Nuclear Center 10-15 minutes with a flux of  $2 \times 10^{13} \text{ n cm}^{-2} \text{ Sec}^{-1}$ , following the irradiation, target was cooled for half of an hour and then the samples were radiochemically separated and Strontium activity was stripped out as  $\text{Sr Co}_3$ . The complete separation procedure took about 2 hours. Gamma rays emitted in the decay of  $^{92}\text{Sr}$  were studied through the use of a 40-cm<sup>3</sup> Ge(Li) detector. Gamma rays of energies (and relative intensities) 241.4(2.9), 352.5(0.06), 430.7(3.4), 463.4(0.04), 491.2(0.32), 651.2(0.21), 892.8(0.08), 953.3(4.0), 1142.4(3.0), and 1383.9(100) Kev have been observed. Gamma-gamma coincidences in the decay of  $^{92}\text{Sr}$  were studied with a NaI(Tl) Ge(Li) set-up. A decay scheme is proposed, based on energy sums and coincidence results of the gamma-ray transitions. All but two of the gamma rays emitted are placed in the proposed decay scheme. (the full text is being prepared for publication).

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## 2- Standard Spectrum Studies.

In view of the fast developments in the field of the nuclear reactors there has been a great need to determine the necessary nuclear data to the target accuracy of  $\pm 1\%$ . As such it has become important to determine the fission spectrum, the fission yield of  $U^{235}$  and neutron cross sections averaged over the fission spectrum. Tehran University Nuclear Center has decided to initiate some measurements in the line.

### Irradiation facility:

In order to produce the  $U^{235}$  fission spectrum a Uranium metal disc, highly enriched, 50 mm diameter and 1 mm thick affixed on an aluminium box, will be installed in a cavity, lined with Boral, in the thermal Column of the Tehran University Research Reactor. The cavity is cylindrical shaped, 150 cm high and 120 cm in diameter. A hole is provided in the base to let the neutrons impinge on the neutron converter. At the point of the uranium disc thermal flux is not more than  $10^{10}$  n/cm<sup>2</sup>-sec. The generated heat is removed from the disc by air blow. During the reactor operation for other users a cadmium shutter is used to stop thermal neutrons reaching the Uranium disc. A gadget is used to place foils at specified distances from the disc.

### Method:

In these measurements threshold detectors are used. The irradiation period depends on the cross section and the half life of the produced isotope. The foils are counted on a 3 "x3" NaI crystal or a Ge(Li) detector available at this Institute. There are two multichannel analyzers, which will be used for this purpose.

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A code (photopeak analysis) is used to calculate the net count under the photopeak. This programme fits a Gaussian equation to the photopeak from which the area under the peak is obtained. A least square program has been prepared, to fit a polynomial to the measured activity along the vertical axis to the Uranium disc.

### 3- Neutron Beam Facility Project.

The swimming pool type research Reactor of Tehran University Nuclear Center is facilitated with seven beam tubes of different sizes and shapes. Two of these, both 6 "in diameter, will be equipped by the end of 1971 mainly for the following purposes:

Solid state physics measurements.

Neutron Spectrometry.

Neutron Irradiation.

Cross Section Measurements.

Shielding Studies.

The related equipment for some of these projects have been ordered.

Two collimators for the two 6 "beamtubes are in the designing stage and their construction will follow after the completion of this stage.

It is hoped that in time more information and complete details of the research projects in this line will be available.