Government of India
Bhabha Atomic Research Centre
Indian Nuclear Data Group

May 7, 1968.

Progress Report for the period May 1967 to April 1968

1. Participation in IAEA Activities:

a. Progress Report on Nuclear Data Activity

A report entitled "Progress Report on Nuclear Data Activities in India - IV" (N.A.R.C.-305) was compiled and published in October, 1967.

b. CINDA

Journals and reports from India were covered and 54 entries were sent to the Nuclear Data Unit.

c. DASTAR

Data on (n, p), (n,α) and (n,γ) reactions were contributed to the DASTAR. The total number of entries from Indian Laboratories is 10.

d. Reports submitted to INDC

Seven reports have been submitted.

e. Facilities List

It has been decided to revise the facilities list (INDC-102 or AEET-227) published in 1965. Requests have been sent out for revised information.

f. Visit of Mr. Alex Lorenz

When Mr. Alex Lorenz visited Bombay during February 1968, visits were arranged to the Bhabha Atomic Research Centre and the Tata Institute of Fundamental Research. At the Nuclear Physics and Solid State Physics Symposium at Madras during February 27 - March 1968, a meeting of the Indian Nuclear Data Group was arranged, where physicists from various laboratories were able to meet Mr. Lorenz. The visit, the paper presented by Mr. Lorenz at the Symposium, and informal discussions were very helpful in clarifying the important role of nuclear data activity.

2. Measurement Program:

A. Nuclear Physics Division

a. (α, n) and (p, n) reactions using the 4π neutron counter

Work is in progress to measure the $^{29}Si(\alpha, n)^{32}S$ reaction cross section.

The $^{51}V(p, n)^{51}Cr$ reaction cross section has been measured and parameters for the isobaric analogue resonance near E_p = 2.340 MeV have been determined. $^{45}Sc(p, n)^{45}Ti$ reaction has been studied.

b. Thermal Fission of ^{235}U

The total K X-ray yield has been determined; the yield per fission is (0.34 ± 0.01), with the heavy fragments contributing about 79% of the total. The energy distributions of long range alphas have been studied.

c. Fast neutron induced fission of ^{235}U

The values of angular anisotropy of fragments in binary and ternary fission induced by 3 MeV neutrons are found to be 1.17 ± 0.2 and 0.89 ± 0.10, respectively. The binary to ternary ratio, the fragment kinetic energies and the angular distribution of fission fragments have been studied.

d. Spontaneous fission of ^{252}Cf

The yield and energy distribution K X-rays emitted by ^{252}Cf fragments and prompt gamma emission have been investigated.

e. Resonance parameters

A program to measure resonance parameters of elements, using a single axis crystal spectrometer is under way; In, Rh and Pu are being studied. Resonance parameters of Ag, Au, Ta and Ho have been measured, using a slowing down time lead spectrometer.

B. Reactor Engineering Division

a. Zero Energy Reactor (ZERLINA) Experimental Program

The program is to measure intracell lattice parameters using multirod clusters of natural UO_2. In collaboration with the Australian Atomic Energy Commission, the fast fission ratio will be measured.

b. Theoretical Reactor Physics Studies

The following studies have been undertaken:

i) Study of resonance self.shielding in ^{235}U and ^{239}Pu

ii) Evaluation of self-shielding capture cross-sections for ^{240}Pu, ^{234}U and ^{236}U from resonance integral calculations.

iii) Theoretical calculation of energy point cross-sections for Al and Na, temperature dependent cross sections of ^{238}U, ^{235}U and total, reaction and elastic scattering cross sections for Zr, Mo and Cd, Nb, Pb, ^{235}U and ^{239}Pu.

iv) Compilation of multigroup cross section sets

v) Adaptation of computor-codes for calculation of cross sections.

C. Electronics Division

a. Neutron Source Standardization

A method to determine the source self absorption correction has been determined.

b. Standard Thermal Neutron Flux Density

A standard has been established by distributing six neutron sources inside a graphite stack.

3. New Facilities

a. Variable energy cyclotron Project has been approved by the AEC. The cyclotron, yielding 60 MeV protons, 130 MeV alphas and 65 MeV deuterons, will be installed at Calcutta.

b. Indian Institute of Technology, Kanpur, will install a 2 MeV HVEC Van de Graaff accelerator by the end of this year.