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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

PROGRESS REPORT

ON FINNISH ACTIVITIES IN NUCLEAR DATA

1969

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Progress report on Finnish activities in nuclear data 1969

Activities in the nuclear data field are in Finland concentrated to the Reactor Laboratory of the Technical University of Helsinki. In addition some related research is performed at the Van de Graaff Laboratory of the University of Helsinki and at the Department of Physics of Åbo Akademi (University).

The Reactor Laboratory operated a Triga Mk II Reactor, which is the only reactor in Finland. A subcritical assembly is also available. Neutron generators exist at several universities but they are generally not used for nuclear data work.

At the Reactor Laboratory the following projects are connected with the nuclear data field. (An English translation of the Annual Report of the laboratory is available).

Cross sections of ZrH_2 and of a series of polyphenyls have been measured in the subthermal region. Models and scattering kernels of possible organic coolants and moderators have thus been tested against the polyphenyl measurements. The ratio of the acoustic and optical phonon intensities in ZrH_2 have been studied by determining the slope of the cross section. The results give information determining a weighing factor of the acoustic part of the generalized phonon frequency. Thermal neutron spectra in ZrH moderated systems depend on this factor.

A study of the rethermalization of a neutron spectrum at a temperature discontinuity (150°C) in water, is being made using foil activation techniques. Conclusions concerning the scattering models to be used in water reactor calculations can be made by comparing theoretical calculations to the experimental results.

A study of shortlived fission product nuclides (I, Br, Kr) has been made using a new facility for rapid isolation of gaseous products recoiling from an UO_2 target.

The Reactor Code Group of the Reactor Laboratory has been working on computer programs for reactor physical calculations. The work has consisted of:

1) Study of reactor physics calculations, 2) development of new programs, 3) changes and modifications of existing programs, 4) testing of programs, 5) calculations for different projects.

In connection with the code development work the data libraries have been updated with KEDAK and UK evaluated data obtained through the IAEA.

13.12.69 A.Palmgren

1970 Project List for the Finnish Reactor Laboratory
Otaniemi

In progress

1.1. Group of projects using cold neutron facility (Inelastic scattering, total cross sections to 20 Å, research group strength 2,5 academics)

1.2. Development and study of neutron guide tubes (Internally polished tubes, 0,5)

1.3. Back-scattering studies (lattice constants, 1)

1.4. Texture with neutron diffraction (Al-cable, Fe-sheet, 1,5)

1.5. Short lived fission isotopes (γ -spectroscopy, 1)

1.6. Development and study of neutron filter assembly (Bi single crystal at 77°K, 0,5)

1.7. Radiation damage in semiconductors, (1)

1.8. Neutron rethermalization (170° H_2O vs 20° H_2O, 0,5)

1.9. Neutron radiography (biological and technical, 1)

1.10. Neutron stochastics (stochastic properties of multiplying assemblies, 1)

1.11. Nuclear reactor noise analysis (including diagnostic use in power reactors, 1,5)

1.12. EMP-research (electromagnetic pulse from nuclear explosions in the atmosphere, 1)

1.13. Positron annihilation (lifetime of positron, 2-γ angular correlation measurements, 2)

1.14. Development of methods and apparatus for instrumental analysis (radioisotopic applications, 2,5)

1.15. Tracer studies (applications in process industry, 1)

1.16. Production of isotopes for pharmaceutical and other applications (Iodine, 2)

1.17. Trace element determination in tissue (1)

1.18. Trace element determination in samples for prospecting (1)

1.19. Pulse neutron research (ZrH_2 at various temperatures, 1)

In preparation (mostly sub-projects to current projects)

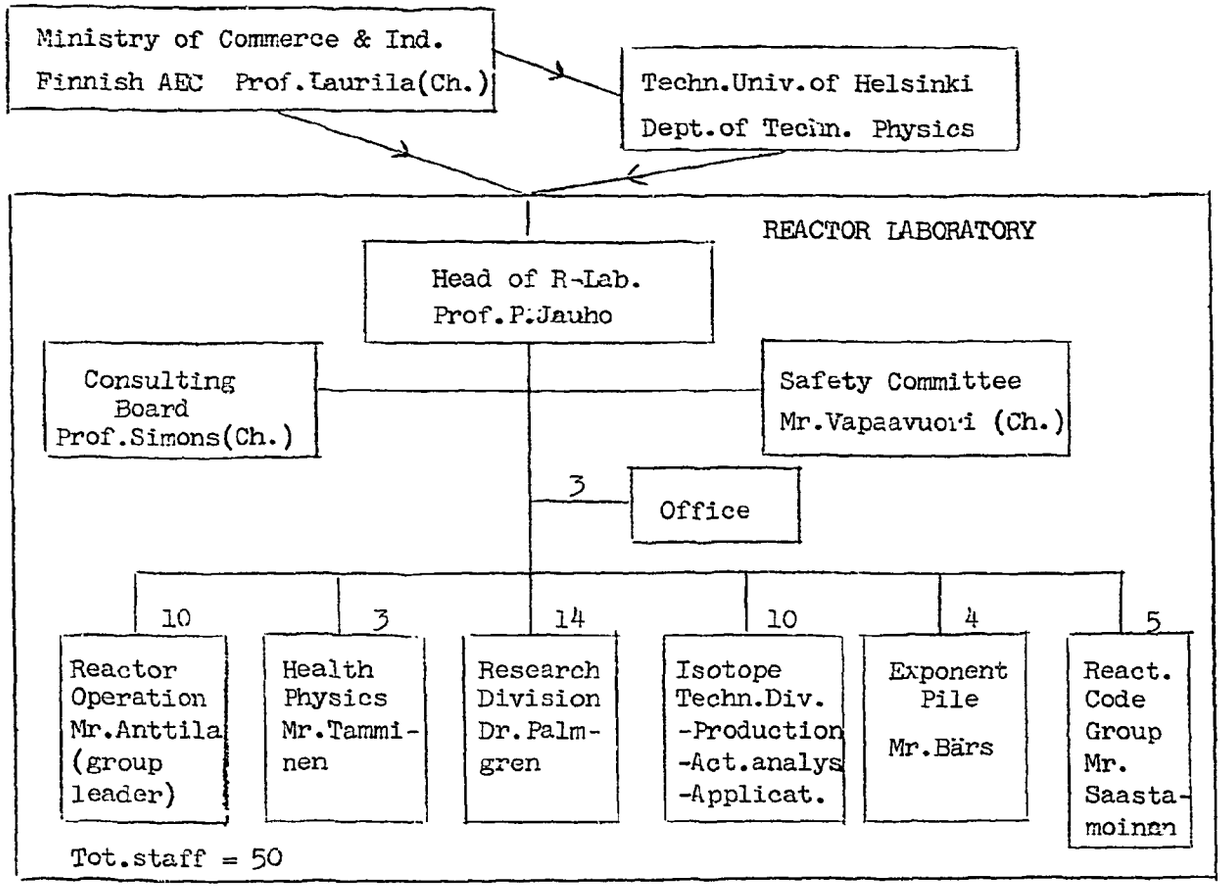
2.1. Capture gamma ray measurements (analytic purposes) (0,5)
2.2. Analysis of heavy elements (X-ray fluorescence) (0,5)
2.3. Hg in fish (continuation of earlier work) (0,5)
2.4. Development of the exponential pile (0,5)
2.5. Texture studies of thin Fe-sheet with neutron diffraction (0,5)
2.6. Calculation of resonance absorption (0,5)

Under consideration (Mostly proposals for 6-10 months diploma work for graduating students)

3.1. Testing of power reactor fuel
3.2. Radiation damage in Nb
3.3. Elastic diffraction studies with Fourier chopper
3.4. Small angle scattering with very low energy neutrons
3.5. Study of the end-anomaly of the flux distribution in Triga
3.6. Activation analysis with isotopic neutron sources
3.7. Wetting of wood chips studied with activation analysis
3.8. Back-scattering from single crystals
3.9. High energy laser
3.10. Analysis of power reactor as low temperature heat source
3.11. Dynamics of plasmasphere
3.12. Studies of semiconductors with an irradiation cryostat (He-tem.)
3.13. On-line noise analyzer for power reactor diagnostics
3.14. Systematic study of the reactivity concept
3.15. Kinetics of fast interacting systems
3.16. Development of computerized data handling for activation analysis

Organization of the Reactor Laboratory

The Reactor Laboratory is owned by the Ministry of Commerce and Industry, but operated by the Technical University of Helsinki. The reactor is a 250 kW Triga Mk II. Permanent staff and basic equipment are provided by the Technical University, and other funding is provided through the Finnish AEC from the Ministry.



Budget 1970 (approx.)

Research staff (Research Division, Isotope Div., Exp.Pile Div., Reactor Code Group)	100.000 $
Permanent staff (Reactor operation Div., Health Phys. Div.)	50.000 $
Technical auxiliary staff	30.000 $
Operational costs	70.000 $
Acquisition of capital equipment	75.000 $
	325.000 $