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Report on research work with the cyclotron at Gustaf Werner's Institute for Nuclear Chemistry in Uppsala during the period from May 1st to June 15th, 1953.

Since my last report, a number of measurements have been made of the neutron flux from a Be target at maximum radius. These have revealed that the increase in the internal beam current has not been as great as was hoped for. However, tests are proceeding to obtain a greater efficiency in the ion source.

The triple coincidence telescope using plastic phosphor crystals and EMI photomultipliers has been set up and tested. Conditions have been found which give good plateaux of counting rate against gain of the circuits. The telescope together with the BF_3 monitor will provide a suitable detector for high energy neutrons.

A rough measurement has been made of the neutron spectrum in the forward direction from a 1 cm thick Be target bombarded by the internal proton beam at maximum energy. An integral recoil proton spectrum was measured with the telescope and from this the differential neutron spectrum was calculated. This shows the same characteristics as with other high energy machines, namely a peak at about 20 MeV lower than the maximum energy. It is proposed to make further measurements of this when a bigger flux can be obtained. It is also proposed to mea measure the energy spectrum of the internal proton beam and compare it with the neutron spectrum.

A measurement of the total cross-section of carbon for an effective neutron energy of 170 MeV gave a value of $367 \pm 37 \times 10^{-27}$ cm^2 – in agreement with published values in this energy region. The low flux and a small counting time are responsible for the large standard deviation. When the tests on the ion source have been completed this week, measurements will begin on the total cross sections. The heavy water has arrived, as have most of the other attenuators. Apart from the sample changer and the low flux, everything is now ready for the neutron measurements.

The radiation hazard in the experimental room for β and γ is below the tolerance levels, and the slow neutron flux is not highly dangerous. An upper limit of 40 neutrons cm^{-2} $sec.^{-1}$ was obtained for neutrons with energies greater than 20 MeV. It is felt that if the beam is increased from its present value, it would not be wise to stay in this room during long counting runs. Provision is therefore being made to take to a safer area than electronic and control apparatus which requires most frequent adjustment.

Uppsala, June 17th, 1953.

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