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Lawrence Livermore Laboratory

DT FUSION NEUTRON IRRADIATION OF LLL

SUPERCONDUCTOR WIRE AT 4.2°K

Susan C. MacLean

July 29, 1976

Unclassified

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June 30, 1976 was reserved at the LLL Rotating Target Neutron Source (RTNS) for Dr. Ronald M. Scanlan of LLL in order to check out his experimental apparatus before scheduling a week long irradiation.

R. M. Scanlan was going to irradiate superconductor wires at 4.2°K. His copper sample holder could hold two superconductor wire samples, two dosimetry wires and one dosimetry foil. There were four parallel shallow indentations to hold the wires. The two outside positions were for dosimetry wires and were 11 mm apart. Each was 1 mm from a sample slot. A 7 mm square dosimetry foil could be centered between the samples with an edge 1 mm from each sample.

For this short irradiation, only one sample was used. The dosimetry foil, 0.14 mm thick, was designated Nb-RS-1. The niobium dosimetry wires were 0.25 mm in diameter and about 10 mm long. The wire closest to the sample was Nb-RS-2 and the wire farthest from the sample was Nb-RS-3.

A 12 mm diameter by 0.14 mm thick niobium foil, Nb-588, was aligned with optically projected cross hairs and taped to a stainless steel piece against the watercatch cage of the target. A copper foil with a 6 mm

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diameter hole was centered over the niobium. Following a few minutes of irradiation, an autoradiograph was made of the copper and indicated that the niobium foil was well centered with the neutron beam.

The irradiation was performed on June 30, 1976 by the LLL E Division Accelerator staff. Neutron production was monitored continuously with a proton recoil counter and recorded each hour. The dose record is attached. The beam-on time was 4.0 hours. Following the irradiation, an autoradiograph of Nb-588 showed that the centering had been off by 1 mm or more.

The niobium dosimetry wires and foils were delivered to Ruth Anderson in the LLL Radiochemistry Division. She carried out the gamma ray counting.

The average fluence of each dosimeter was calculated using the method described in UCRL-51393, Rev. 1. However, the cross section used for the activation of the 10.16 day isomer of niobium by 14.8 MeV neutrons was changed to 458 millibarns. The results were as follows:

<u>Dosimeter</u>	<u>Fluence (neutrons/cm²)</u>
Nb-588	6.40×10^{15}
Nb-RS-1	2.27×10^{15}
Nb-RS-2	2.04×10^{15}
Nb-RS-3	1.75×10^{15}

The estimated overall uncertainty of these results is $\pm 7.5\%$. The relative uncertainty between any two values is about $\pm 2\%$. The fluences given here represent average fluences over the volume of each dosimetry foil or wire.

RTNS IRRADIATION OF JUNE 30, 1976

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