Title
ACCELERATOR NEUTRON SPECTRA AND SPECTRA TO DOSE CONVERSION

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SUMMARY

In late 1966 an extensive series of radiation shielding
measurements were made at the CERN Proton Synchrotron by experi-
menters from Lawrence Radiation Laboratory-Berkeley, Rutherford
High Energy Laboratory, and CERN. Preliminary results from this
experimental program have been presented elsewhere and a compre-
prehensive report is in preparation.1,2,3

Through the use of detectors with different neutron energy
thresholds and spectral responses, we were able to deduce the neutron
flux spectrum above the shielding at the CPS. A knowledge of the
neutron spectrum allows one to calculate the dose for any particular
weighting function he chooses, viz., the ICRP values that we used.
A computer program, TELLY, was used to compute the flux and dose
from the activation detector data. A major innovation was the use
of a light pen and CRT for both trial input spectra and intermediate
output spectra. In effect a continuous feedback loop existed with
the health physicist as the human interface.

*This work was done under auspices of the U. S. Atomic Energy
Commission.
The results of these procedures are shown for various locations. The shielding at the P.S. bridge is concrete, and under the ring top is earth with a high water content. The spectral difference is primarily due to this difference in hydrogen.


Table I. Percentage Distribution of Neutron Dose; TELLY Program Results

<table>
<thead>
<tr>
<th>Neutron Energy in MeV</th>
<th>Percentage of Dose from Neutrons Below Listed Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ring Top</td>
</tr>
<tr>
<td>6 x 10^{-5}</td>
<td></td>
</tr>
<tr>
<td>6 x 10^{-4}</td>
<td></td>
</tr>
<tr>
<td>6 x 10^{-3}</td>
<td>0.2</td>
</tr>
<tr>
<td>6 x 10^{-2}</td>
<td>0.4</td>
</tr>
<tr>
<td>6 x 10^{-1}</td>
<td>1.4</td>
</tr>
<tr>
<td>6 x 10^{0}</td>
<td>11</td>
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<tr>
<td>6 x 10^{1}</td>
<td>45</td>
</tr>
<tr>
<td>6 x 10^{2}</td>
<td>80</td>
</tr>
<tr>
<td>6 x 10^{3}</td>
<td>97</td>
</tr>
<tr>
<td>3.4 x 10^{3}</td>
<td>100</td>
</tr>
</tbody>
</table>

rem/neutron: 6.53 x 10^{-8}  5.17 x 10^{-8}  4.68 x 10^{-8}  4.21 x 10^{-8}  7.44 x 10^{-8}
Fig. 1. Various neutron-FLUX spectra.
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