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OFFICE MEMORANDUM

TO : Distribution

DATE: November 5, 1976

713018

FROM : Pete Berardo

SUBJECT : Treatment Planning Progress

SYMBOL : MP-3

MAIL STOP: 809

For your information, the following are extracts from treatment planning progress report for last quarter.

The dose model computer program BUCKET has been installed in the treatment planning code PIPLAN. This dose model first creates the dose distribution for a pencil beam. Final dose distributions are then obtained for real beams by adding pencil-beam distributions for individual particle trajectories recorded by MWPC's in the beam channel. In this way the actual phase space of the channel is duplicated. The model has also been upgraded in PIPLAN by the creation of separate pencil-beam libraries for pions, muons, and electrons.

Because both PIPLAN and BUCKET are large codes, it was necessary to "overlay" sections of PIPLAN as part of this installation. Since many useful features of BUCKET, such as stopping, LET, and "star product" distributions, could still not be included, the resolution of the pencil-beam libraries was reduced with a negligible loss in accuracy. The array space saved will be used for additional distributions of interest for microdosimetry and RBE studies.

New collimator and bolus models have been installed in PIPLAN. The main feature of these models is that the code will design treatment devices that can, if fact, be easily fabricated using methods presently existing in a clinical environment. Presently collimators and bolus are designed assuming a parallel-ray beam. These models will be upgraded to reflect actual emittance of the treatment beams.

The dynamic range shifter in the beam channel is used to create dose distributions spread in depth during treatment. A range shifter model has been installed in PIPLAN which used a pre-defined function specifying the amount of range attenuation as a function on time. This function is generated independently for a particular beam tune by specifying the final depth-dose distribution desired. In the future, this capability will be included in PIPLAN with the final depth-dose distribution tailored to the treatment volume of each patient.

To accomodate patient set-up, additional geometry has been installed to definitely locate the patient and treatment volume in the beam channel and to independently move the peak dose distribution relative to the treatment volume. This is analagous to specifying the source-skin distance in x-ray therapy and using variable energy x-rays.

A collaborative effort has been established with Drs. Turner, Wright, and Hamm at ORNL to compare PIPLAN with their Monte Carlo program PION1. Both pencil beams and experiments are being compared. Initial comparisons indicate some significant differences which are being investigated at this time. As mentioned above, the additional distributions being added in PIPLAN will greatly facilitate these comparisons and understanding the effects of inhomogeneities.

PB/ah

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