QUALITY ASSURANCE FOR CLINICAL DOSIMETRY OF THE EUROPEAN TRIAL ON BNCT IN PETTEN

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SUMMARY

The Council Directive on health protection 97/43/EURATOM requires for radiotherapy quality assurance programs for performance and safety characteristics including acceptance and repeated tests. For BNCT at the nuclear reactor in Petten such a programme is developed on the basis of IEC publications for medical electron accelerators. A comparison is given for requirements for accelerators and BNCT units indicating items which are not transferable, equal, additional or different.

1. INTRODUCTION

The Council Directive on health protection 97/43/EURATOM¹ of the European Union is based on the Recommendations of ICRP Report 60³ and requires explicitly appropriate quality assurance programs for performance and safety of radiotherapy units including testing of performance characteristics on a regular basis. Especially for medical electron accelerators such programmes are adopted internationally as IEC Publications.³⁴⁵ For the European BNCT trial at the nuclear reactor in Petten such a quality assurance programme was developed based as near as possible on the accelerator procedures. The fundamental differences of dosimetry for conventional photon/electron therapy and fast neutron and BNCT therapy must be taken into account. It can be shown
that several items of accelerators are not applicable for BNCT and others are additional, while a long data series is transferable.

2. FUNDAMENTAL DIFFERENCES OF CLINICAL DOSIMETRY FOR MEDICAL ACCELERATORS; FAST NEUTRON THERAPY AND BNCT FACILITIES

2.1. Medical Electron Accelerator (Figure 1)

The typical dosimmetrical aspects are:

- The primary dose component ($D_X$ or $D_e$) has the same LET as the secondary dose component ($D_e$ or $D_X$). A differentiation between both components is, therefore, irrelevant
- The sum of primary and secondary dose components are directly measurable by monitor and clinical dosimetry systems

2.2. Cyclotron Based Fast Neutron Therapy Facility (Figure 2)

- Two dose components ($D_n$ and $D_g$) of different LET are relevant
- Essentially only a combination of both dose components is measured by monitors, but in clinical dosimetry systems both relevant dose components are to be measured separately
- The TLD two-peak method indicates separately both dose components of different LET based on the different LET repines of the two main glow peaks as shown by Rassow$^6$