EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN–PH/TN/2005–49
30 February 2005

TEST-BEAM PERFORMANCE OF A TRACKING TRD PROTOTYPE

Abstract

Each paper should be preceded by a short Abstract of not more than 150 words, which should be written as a single paragraph and should not contain references.

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(Submitted to some important Journal)

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1 INTRODUCTION

The biological effect of radiation depends on the quality of the radiation as well as on the amount of energy absorbed. Evidence suggests that this quality dependence is primarily caused by the differences in rates of energy loss [1, 2]. The general criteria that have been used are:

i) to terminate the iteration when the residue between iterated and experiment values is of the order of experimental errors [1, 3–6];

ii) to terminate when the smoothest solution has been obtained.

For an overall appreciation of the work carried out in this field, see Refs. [7] and [8].

2 RADIATION PARAMETERS EFFECTIVE IN CAUSING BIOLOGICAL DAMAGE

2.1 Linear energy transfer

Smith tabulated the average values of mean linear energy transfer (LET) obtained by the different methods used in Ref. [3], and these are reproduced in Table 1.

Table 1: Calculated mean LET values in water (keV/mm)

Radiation	Smith[a)]	Jones
1 MeV α		
200 kVp X-rays total	3.25	1.79
200 kVp X-rays (primary)	2.60	1.48

[a)] J. Smith, Rad. Res. 1 (1956) 234

Figure 1 is reproduced from the publication mentioned earlier and shows the good agreement between predictions and calculations. Comparison should be made with the decay curves shown in Figs. 6 and 7 of Ref. [4], and further information is given in Section 2.1.2 and Appendix APPENDIX A:.

In order to understand the process more precisely, we must first explain the angle and curvature generation systems.

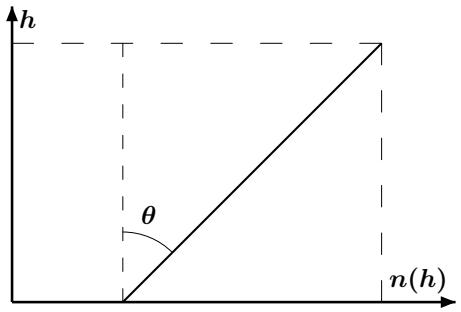

Fig. 1: Diagram of a straight line.

2.1.1 Angle generation

Equation 1 representing a straight line at an angle θ, is

$$n^k(h)u = \lambda htgq_k \tag{1}$$

and

$$n^k(h) = kh\frac{k}{32} \tag{2}$$

where:

λ is the distance between two consecutive sweep lines,

u is the least count.

2.1.2 Curvature generation

We consider a parabola, the tangent of which is parallel to the vertical axis of the main matrix. A sufficiently good approximation to a parabola [see Eq. 3] drawn inside the matrix can be given by the following formula:

$$n_q = \alpha q^2 \quad \alpha = \frac{\lambda^2}{3Ru} \tag{3}$$

where R is the radius of curvature. We have the following relationship:

$$n_q + \mu_q \text{ with } \mu_q = \alpha(2q + 1) \tag{4}$$

3 CONCLUSION

The theoretical considerations presented have been confirmed by their close agreement with the results of practical experiments. An account of the earlier work carried out in this field can be found in the bibliography.

It is expected that in the next few years many new results will be published, since a significant number of new experiments have recently been launched.

ACKNOWLEDGEMENTS

We wish to thank C. Brown for his most enlightening comments on this topic.

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APPENDIX A: CONSTRUCTION ON A FLAT SITE

A.1 General considerations

Following on ECFA recommendation, the project described in this report is based on the assumption that the machine is built close to the present CERN site, and has been taken into account in the cost estimate.

A.2 Effects on the construction

The general layout of the machine would be very similar to that shown in the main body of the report.