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# DETERMINATION OF THE PERTURBATION FACTORS FOR A AIR PLANE-PARRAREL IONIZATION CHAMBER USED IN THE PROTON THERAPY

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The purpose of the work was determination of the perturbation factors  $p_Q$  for a representative air plane-parallel ionization chamber (PTW 23343 Markus) used in the proton dosimetry. The Monte Carlo simulations based on the MCNPX code in version 2.7.0 were applied. All details of the ionization chamber construction were taken into account. In general, the perturbation factor can be expressed as the product of two factors  $p_Q = p_{wall} \cdot p_{cav}$ , correcting for small perturbations [1]. The factor  $p_{wall}$  corrects the response of an ionization chamber for the non-medium equivalence of the chamber wall whereas the factor  $p_{cav}$  corrects the response of an ionization chamber for effects related to the presence of the air cavity instead of the equivalent water volume. This perturbation coefficient  $p_Q$  is almost equal to 1 in the range of depths up to the Bragg peak because of the proton equivalence  $p_Q$  increases significantly beyond the maximum dose depth. In specialist literature there is a lack of the perturbation factor values for plane-parallel ionization chambers for proton beams. The application of the perturbation factor in the absolute dose calculation increases the accuracy of the dose determination. There is no experimental method makes it possible to determine perturbation factors therefore the application of the Monte Carlo method is the only solutions guaranteeing to obtain the high quality results [2]. The Monte Carlo simulation were performed for beam with FWHM of 0 MeV to 2 MeV. The perturbation coefficient  $p_Q$  was determined as a function of the proton energy (30 MeV, 60 MeV, 80 MeV, 100 MeV) at chosen depths beyond the Bragg peak .

## REFERENCES

- [1] IAEA TRS-398 (2000)
- [2] CALCULATION OF PERTURBATION CORRECTION FACTORS FOR THE NACP-02 PLANE-PARALLEL IONIZATION CHAMBER IN HIGH ENERGY ELECTRON BEAMS Erika Chin, D. Shipley, J. Seuntjens, H. Palmans, M. Bailey, A. DuSautoy, F. Verhaegen McGill University Health Centre, Montreal, Canada