Magnetic Field In Radiation Therapy:
Improving Dose Coverage In Tumors Of The Head And Neck By Reducing Lateral Electronic Disequilibrium.

Shada J. Wadi-Ramahi
Rush University Medical Center, Chicago, IL

Abstract:-
This research investigates the use of a low-strength ($\leq$ 1.0 T) longitudinal magnetic field with external photon beams in improving the dose coverage of the regions around air cavities. This is a problem relevant for tumors of the head and neck, where the presence of sinus cavities leads to loss of dose at the air/tissue boundaries. The loss of dose is attributed to the loss of lateral electronic equilibrium in the air gap, which depends on the size of the cavity and the size and energy of the irradiating beam. The loss of dose was found to range from minimal to more than 60%, depending on the beam-cavity combination. The magnetic field prevents the lateral spread of the electronic fluence, and hence maintains electronic equilibrium in air and thus improves the dose at the interface. Improvement in dose was found to range from minimal to about 2.3 times its original value, depending on the strength of the magnetic field and the beam-cavity combination.

The effect of air-gap perturbation on depth dose, beam profile, isodose line distributions, and two dose points, one beyond the interface and the other one at a side-wall, is investigated under different irradiating beams and different air gaps. The dose improvement with the magnetic field on all of the above parameters under the different beam-cavity combinations is studied.

Key words: Lateral electronic equilibrium, magnetic field, air cavities, tissue inhomogeneities, EGS4