Çankaya University – ECE Department – ECE 474

2013 Spring Term **March 2013**

Experiment 4 : Ray propagation in graded index fibres

Experiment coded in MATLAB, with file name, "Ray_tracing_GI_Exp4.m" is given on webpage of ECE 474.

1. Copy the experiment file into the directory of your name.
2. Run the file, observe the OPs, Try to follow what is intended and what is happening
3. This experiment is intended to illustrate the ray propagation in graded index fibre and the minimum and maximum turning points, i.e., r_min, r_max of ray trajectory. The launching conditions, are specified by parameters x0, y0, tetx0 and tety0 on line 5 of the m code (x_0 , y_0 , θ_{x0} and θ_{y0} in (2.18) of the Notes on Propagation in GI fibres_Feb 2013_HTE). Line 4 of the code gives the fibre specifications.
4. When you run the code two outputs are obtained, one is the 3D visual propagation of the given ray in the fibre, the other is the turning points, r_min and r_max. By rotating the 3D visiual propagation plot, it is possible to obtain, the projection of ray trajectory onto fibre end face (or fibre cross section).
5. By adjusting parameters (apart from z related ones) on line 5 of the code, see how ray trajectory is affected. From the rotated ray trajectory, find r_min and r_max by pointing data cursor to them and test if these are the same as r_min and r_max written on command window.
6. By selecting at least ten different sets of x0, y0, tetx0 and tety0, find the corresponding r_min and r_max both from the ray trajectory plot and from the command window and determine if they agree. Bearing in mind that meridional rays will a line type projection, where r_min = 0, the skew rays will draw an ellipse, determine which set of x0, y0, tetx0 and tety0 give meridional, and which set of x0, y0, tetx0 and tety0 give skew rays.
7. Record the outputs to print them in your experiment report.
8. Include your comments for the experiment.