Computational Electromagnetics and Applications
Professor Krish Sankaran
Indian Institute of Technology Bombay
Lab Tour 4

So now we are going to do a different kind of experiment now in a little bit higher frequency range. We are going to do optical devices experiment. So the kind of work we are going to do in this particular lab tour is modelling the behaviour and the aspects of physical parameters of that optical fibre. So when I say optical fibre what I have in my hand is two different types of fibre the one which is in yellow colour what you see here is a single mode fibre. And the one which is in white color is a multimode fibre. And they have been designed for 1300 to 1500 nanometers. This is the range in which they are being used.

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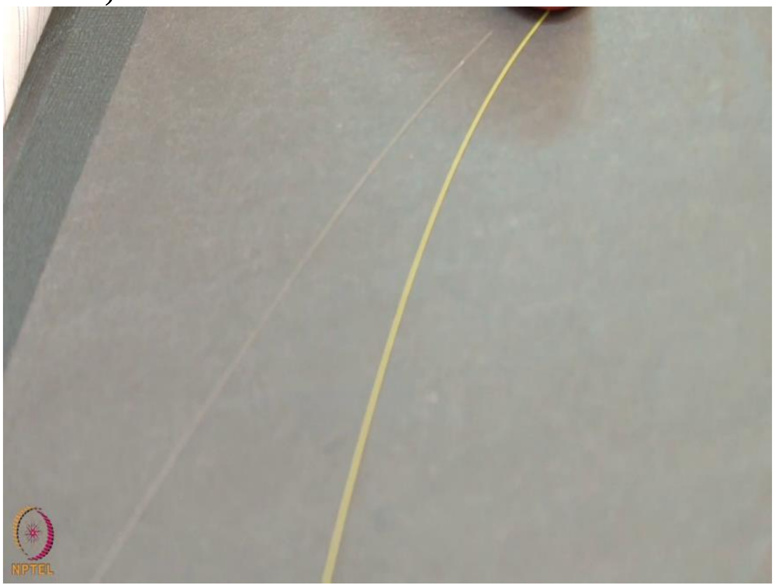

So the single mode fibre is mainly used for the long range communication. And the multimode fibre is used for the short range communication. As I said its in the range of 1300 to 1500 Nano meters and what you see in this a very thin little thing is there are three things involved one is the core and then there is a cladding and then there is also a protective jacket on each of these in order to protect it from some damages. And these are very fine devices and for modelling these devices we have to use either analytical method or we have to use Finite element method. So in this lab tour we are going to look at this two different types of material one is a single mode and the multi mode fibre.

And we are going to model it for their behaviours and characteristics and see it to using two methods. The first method what we will be doing is a kind of an analytical method. Which will explain us a characteristics the most what you are going to compute for this particular fibres using some of the analytical techniques. And then you will compare the analytical result with Finite element method and we will compare how good the finite element method is compared to the analytical method itself.

So there are going to be students who are going to work on this project. So the first part I will going to look into is the analytical method. So let us go and have a discussion with a student.

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So Thomas is a student of mine was in the computational electromagnetic course and he is going to show us what he has done using analytical method for this particular problem. Ask him to show some of the methods that we are used to analytical compute the most of this two types of fibres one is the single mode and the multi mode fibre. So let us discuss with him and see what he is doing.

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Student Teacher Conversation starts

This is a (())(03:20) using finite element method. Actually we are comparing the Finite element assess with a analytical assess because analytical assess are (())(03:29)We know that exact solutions of this fibre. So we are Finite element assess what we are getting and analytical assess

So how are you showing the how the analytical method itself is placed for something (())(03:45)

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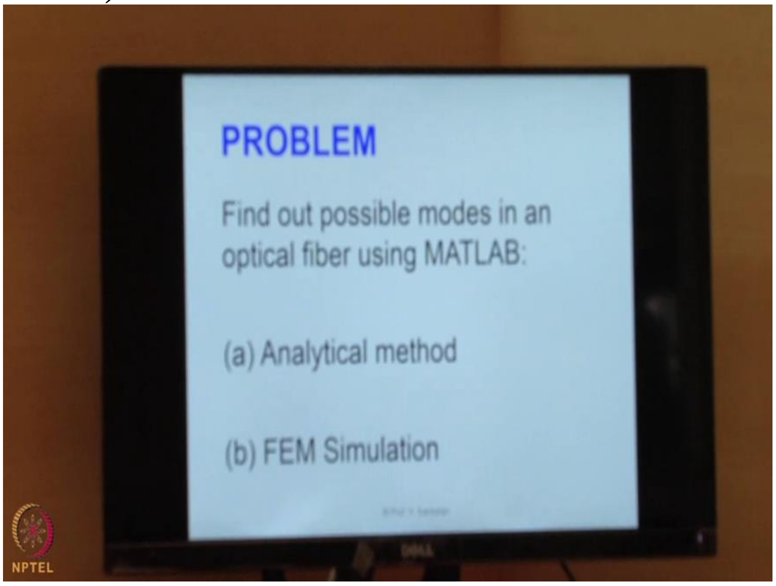

Ok So problem statement is (())(03:49)using analytical method and using FEM method.

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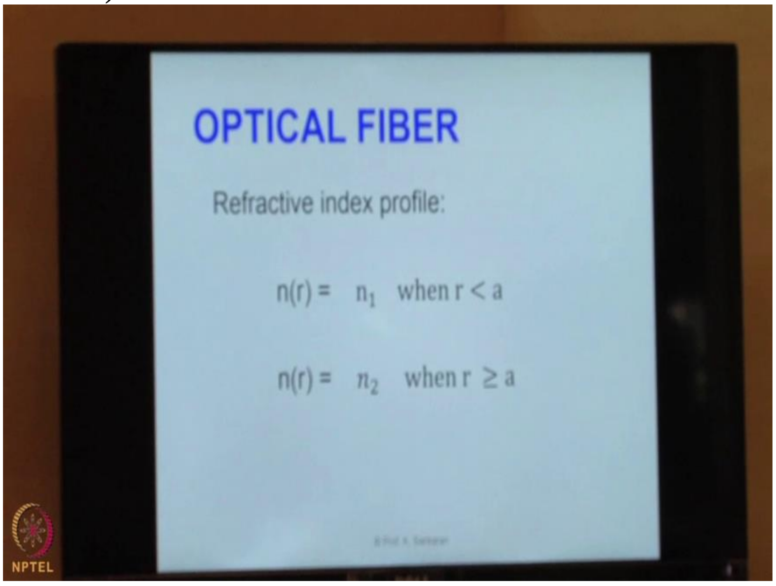

So Optical fibres can be divided into different base. One is based on the (())(03:58) based on (04:04) fibres can be divided into single mode fibre and multi mode fibre, yellow one is the single mode fibre. In single mode fibre only one mode is operating and in multi mode fibre many number of (())(04:15).And this is depends on a core diameter of the multiple In single mode fibre it is less than 10 micrometer typically around 8 micrometer for (())(04:30)And for multi mode fibre there are two standards are there one standard is 62.5 micrometers and new standard is 50 micro meter (())(04:40)

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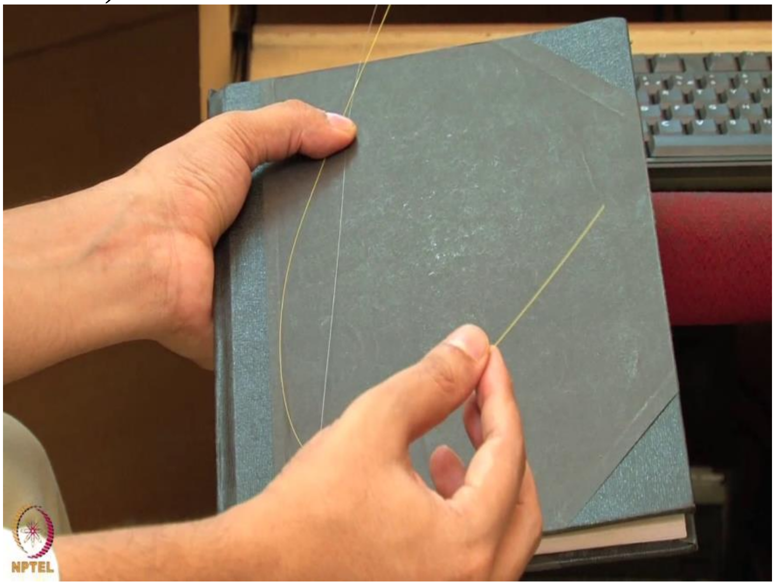

So these are as we said before they are designed for certain frequency , mainly designed for 1300 nanometre So you can go up with 300 mainly there are three optical windows are there one is 50 nano meter is there other one is 1300 nanometre is there and the third one is 350 nanometer. This 1300 nanometer is (())(05:05) So we are mainly using this for last long distance communication we are using 1300 or any window can be used.

So basically when we talk about this version what we are talking about this group velocity versus the gauge velocity. So the dispersion error that we know in the 1300 where as the wave decay itself attenuation will be lower in the (())(05:34)

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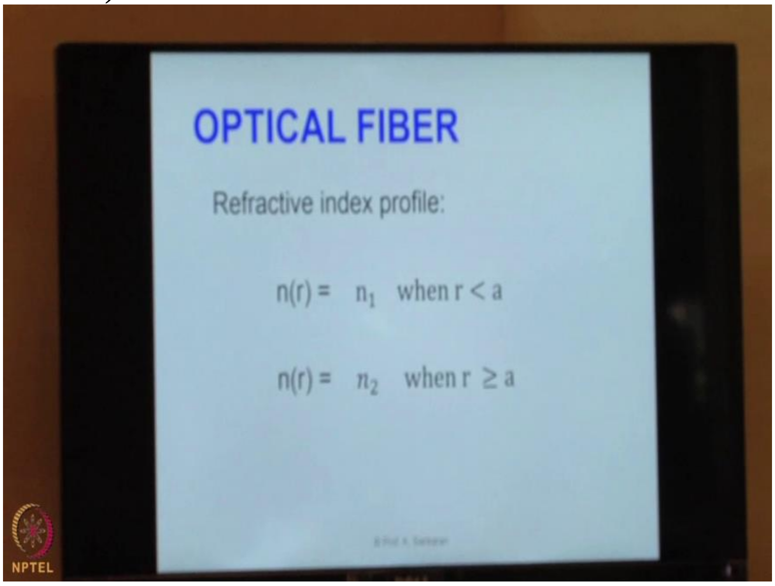

So let us , one more (())(05:40) So we can have different (())(05:58) typically you are using or parabolic (())(06:02) we are using parabolic. That parabolic (())(06:05) so when we say profile we are talking about exactly this profile (())(06:10) For simplicity we are using (())(06:15). A is the diameter.(())(06:31).