Computational Electromagnetics and Applications
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Summary of Week 3

We have completed the course work for week 3. And we have looked into the core of electromagnetics lecture which is the Maxwell equations

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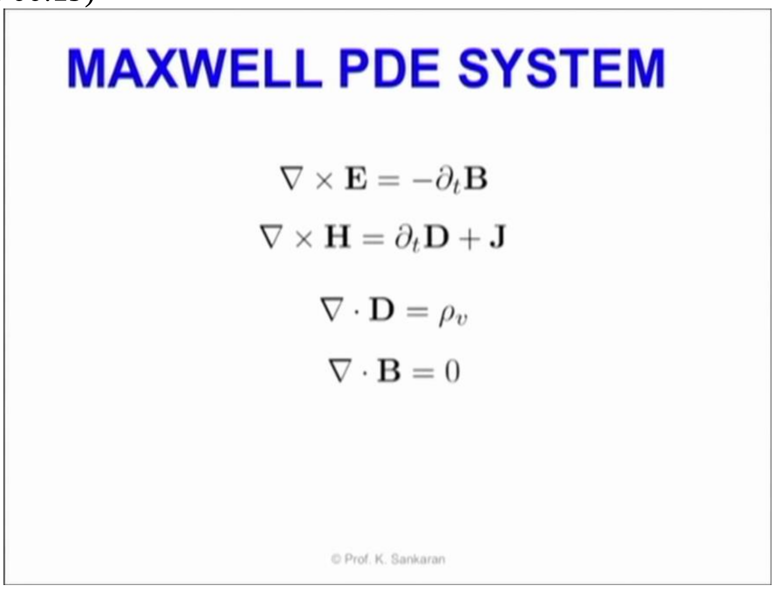

We have reintroduced some of the most commonly used terms.

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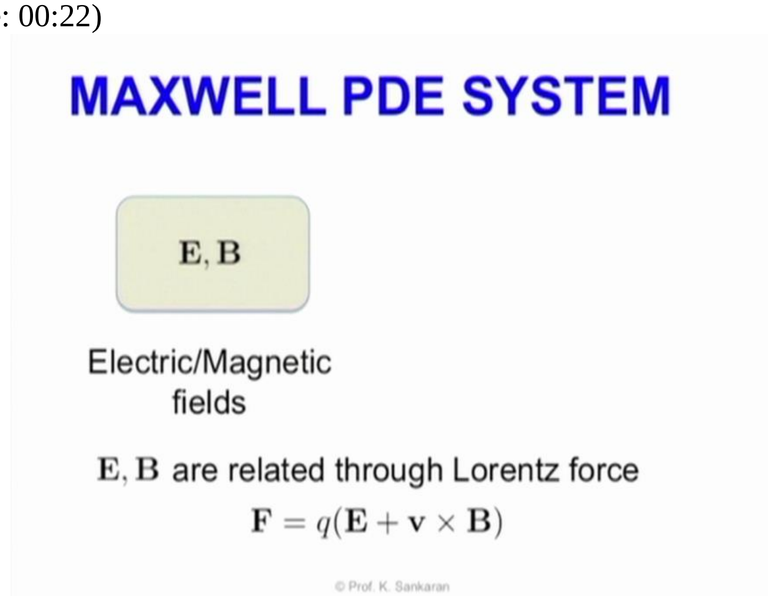

Like Electric and Magnetic fields using their proper topological and physical relationships. In fact we saw that in the definition of Lorentz Force it is actually the E and B and not E and H fields that are related. Hence we rightfully termed E and B fields as Electric and Magnetic fields in our lectures.

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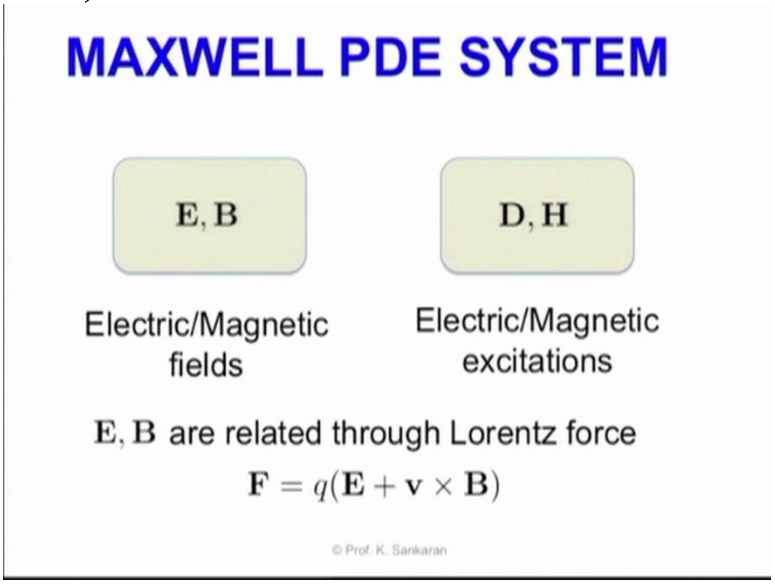

We also reintroduced Electric and Magnetic excitations which we denoted as D and H respectively.

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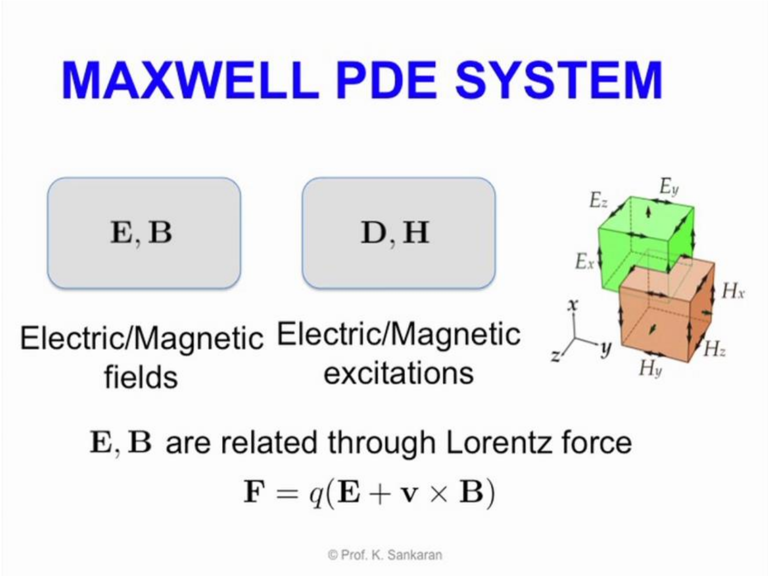

The reason for coupling E and B and D and H field became also clear while we studied the E algorithm in the finite difference time domain method.

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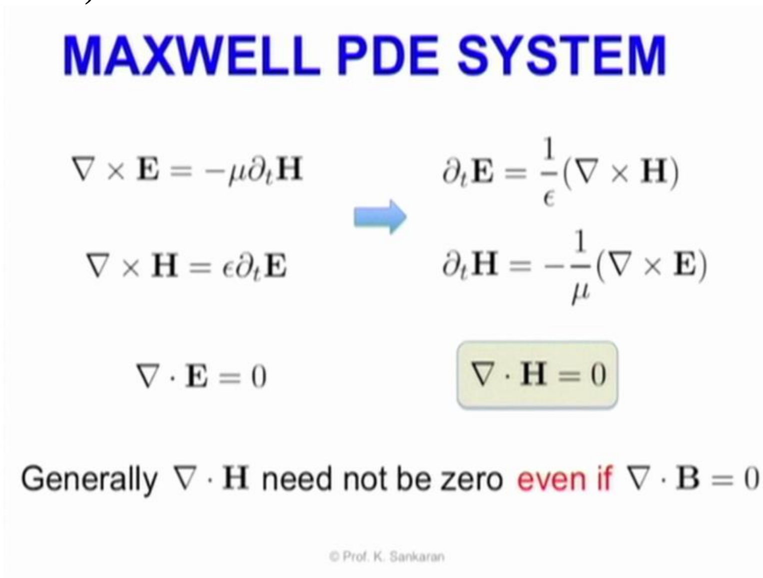

We have remarked that it is the diversions of B and not that of H which is always 0. In other words even when the diversions of B is 0 we might have some value for diversions of H.

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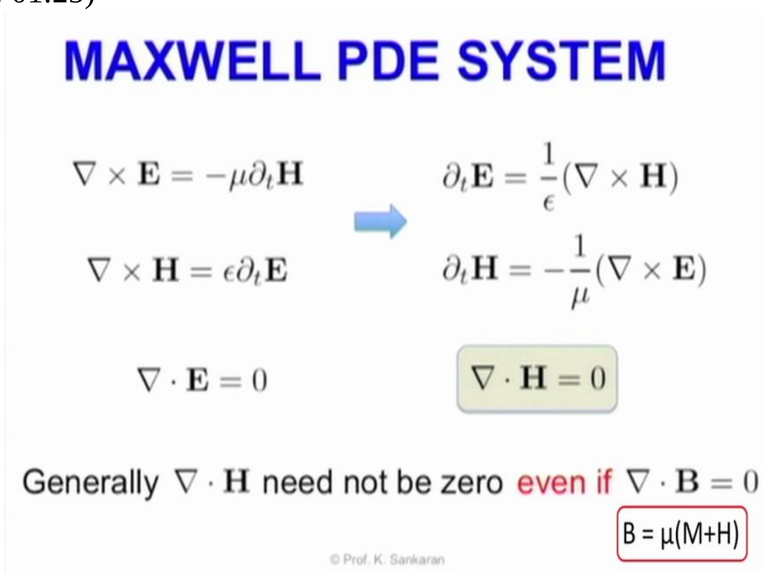

This comes directly from the relatioships between B and H fields.

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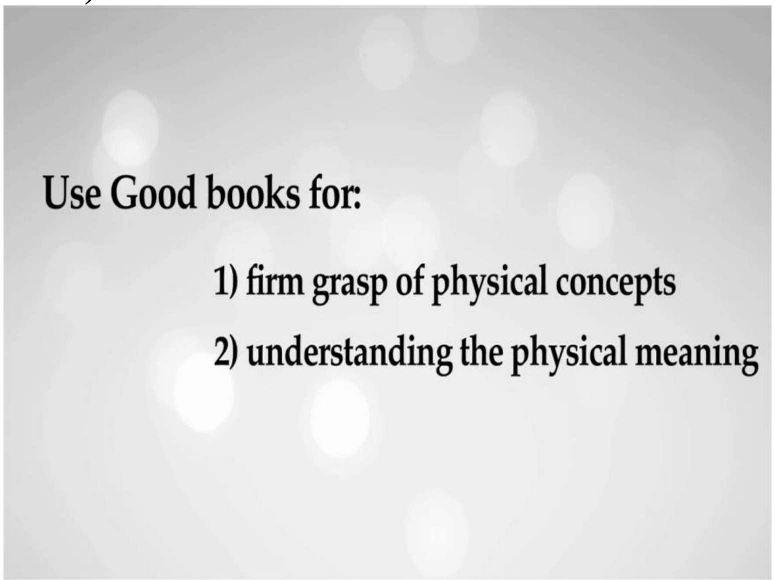

I encourage you to use good reference books to get a firm grasp of underlined physics and the physical meaning. Throughout this lecture I followed three main reference books for electromagnetic

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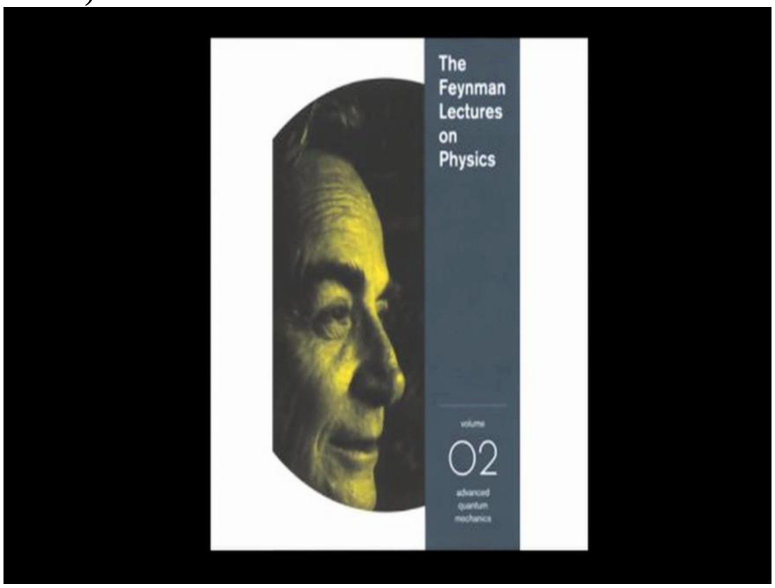

The first one is the Feynman lectures in Physics volume 2 by Richard Feynman.

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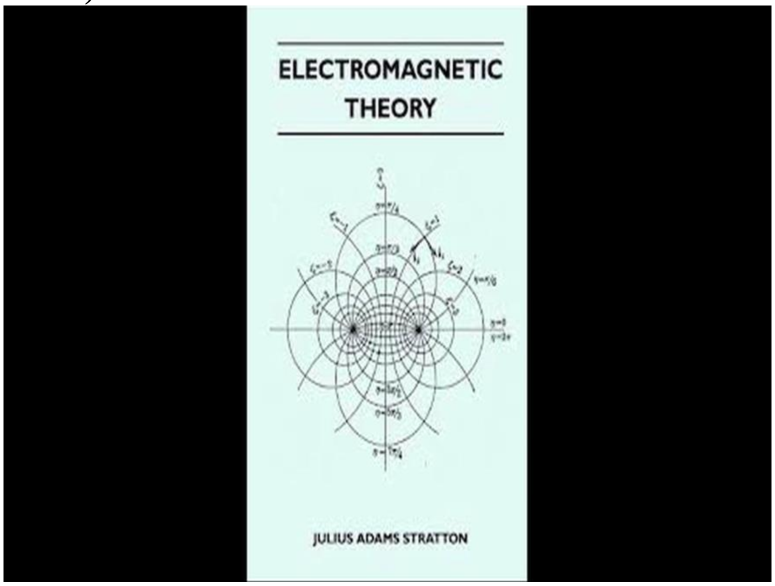

The second book is the Electromagnetic theory by Julius Adams Stratton.

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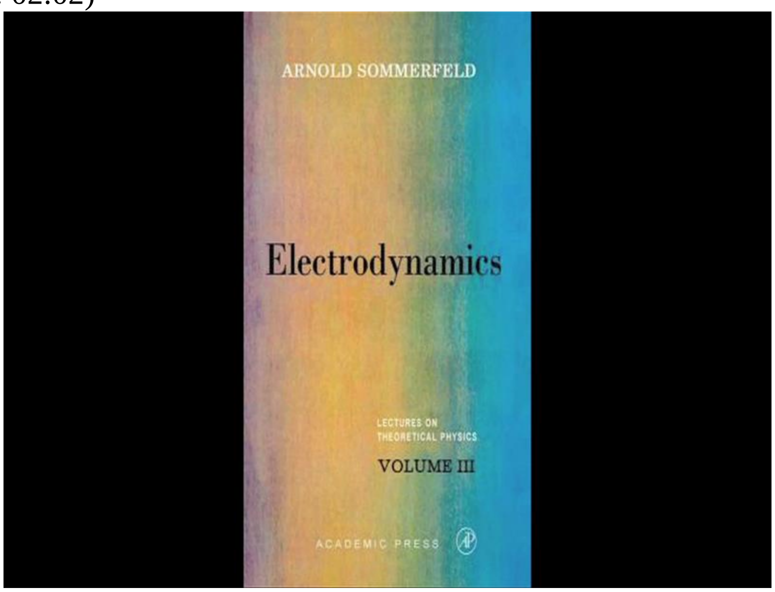

And the third book the lectures in theoretical physics by Arnold Sommerfeld.

We will be giving you the links to the information about these books on our course website.

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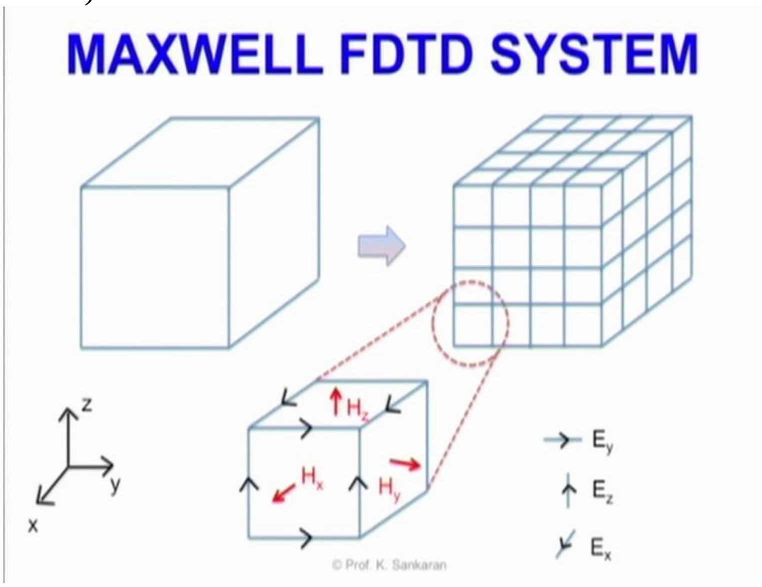

In this week we also introduce the Finite difference time domain algorithm for the Maxwell equation which is the famous E algorithm.

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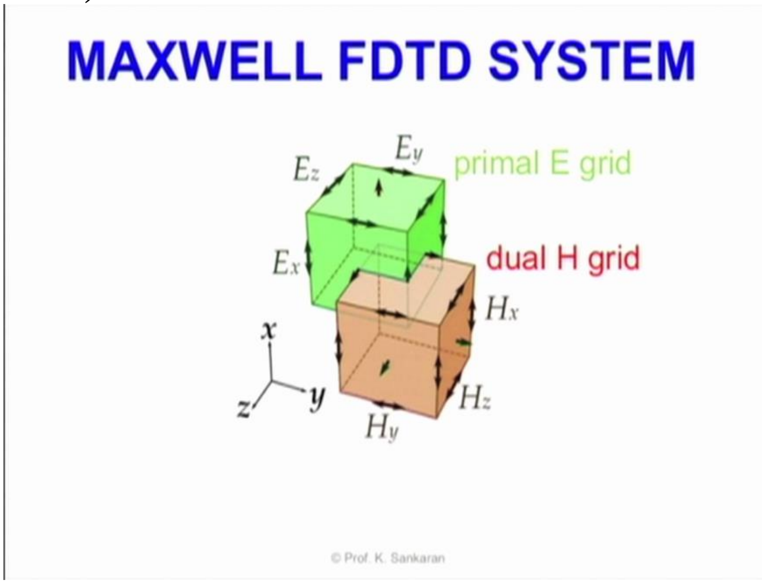

We saw how the E and H field are staggered both in space and time using this algorithm, we also notice that the PDE system is algebraic in nature and E algorithm is essentially centered in space and time scheme.

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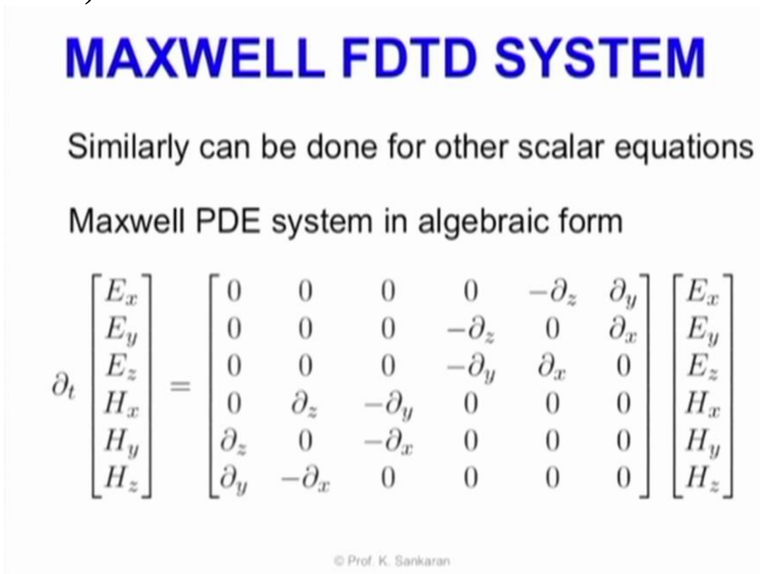

We have briefly discussed Maxwell system in frequency domain. And we also compared the Pros and cons of using Finite difference time domain method and the Finite difference frequency domain method.

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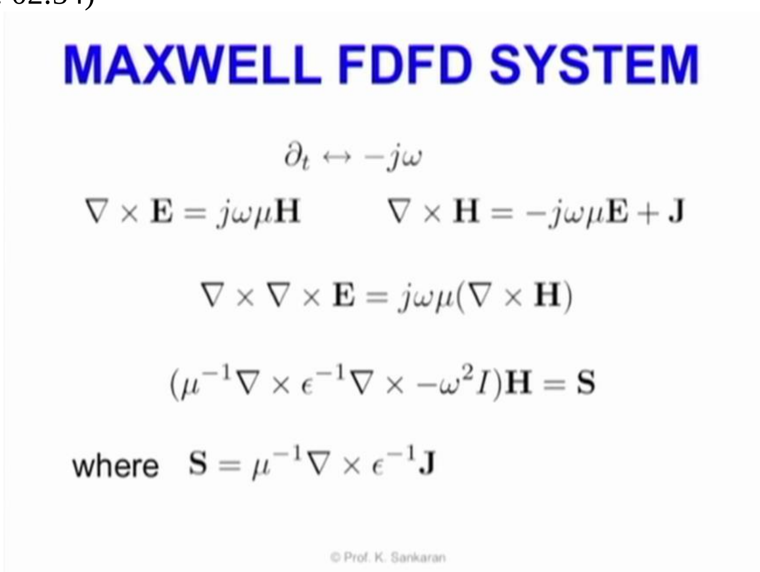

As a first exercise we looked into one dimensional electromagnetic field propagation problem.

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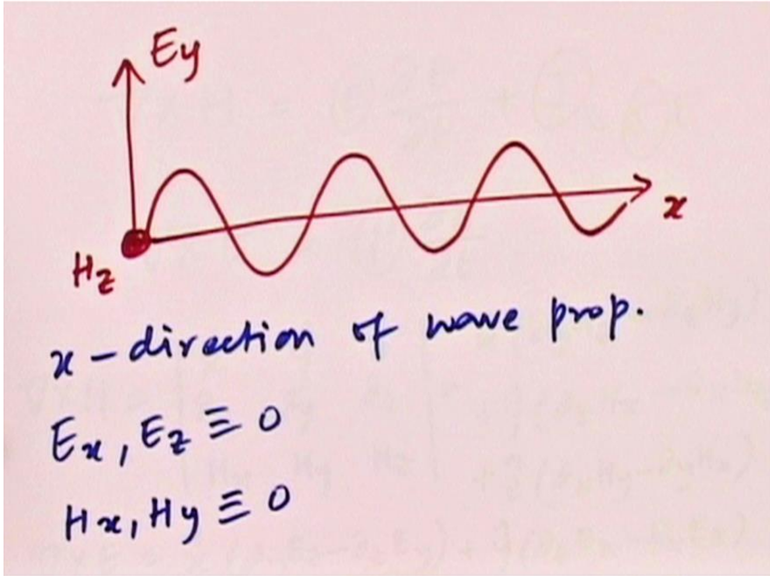

In the second exercise we looked into a single and double slit diffraction experiment using finite difference time domain method.

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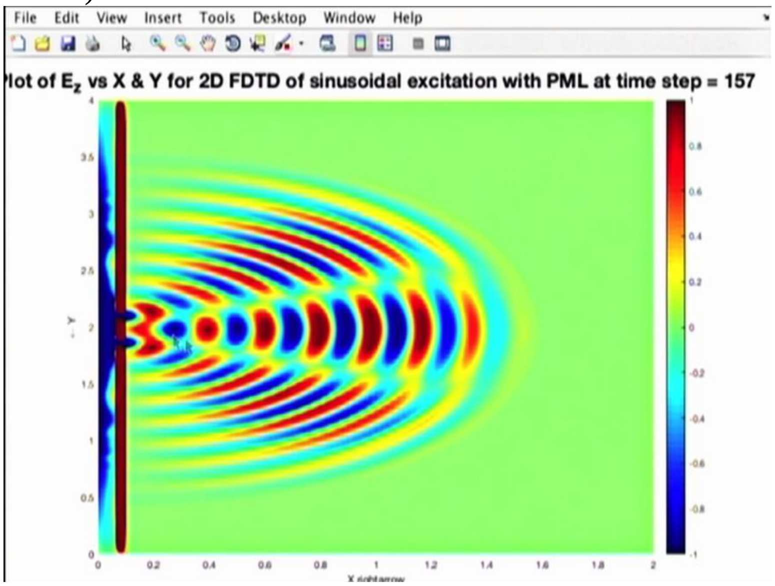

We have also investigated the role of spatial and temporal discretizations using the Matlab code. And this is the summary of this week. We will be looking into (())(03:22) boundary conditions in the upcoming lectures.

I will encourage you to practice the exercises and examples that we have studied in this week and get ready for the next week.

So until then Good Bye!