OC PROTOCOL

23.10.2019

1. Lets start with materials. What is dispersion?
   Wavelength dependence of refractive index.
2. What you can say about the material when we have constant refractive index?
   Imaginary part of refractive index is zero. Material has zero loss or gain.
3. What is that material?
   Material is vacuum.
4. Why do you think that the material has zero absorption/gain?
   Because of Kramers-Kronig relations.
5. Show me in the integral? (eq 2.7)
   Just plug constant €r than show €i is zero.
6. So in real materials you always have loss or gain. You can only achieve constant refractive index over certain range of frequencies. Now in Fig.2.1b you see dielectric material. Explain.
   So we have absorption frequencies w1,w2. Around that region we have anomolous dispersion we see sudden decrease in refractive index while increasing frequency. Then normal dispersion etc.
7. Then he showed me fig 2.3. Explained what it is about then ask what are those curves?
   We have UV and IR absorptions. UV absorption is due to electronic state transtions. And IV is mainly due to molecular vibrations. Then he asked which molecule cause that. Answer is OH molecules. Then he asked where do you think that absorptions correspond to in fig.2.1b I said w1 for IR and w2 for UV. Than I started to explain Rayleigh Scattering. He asked about the frequency dependence (4th power)
8. What is scattering? What is the difference between that and absorption.
   I explained in scattering you have this random reflections and in absorption electronic state transtion. Its true but he was not fully happy with that. He was looking for elastic vs inelastic comparison. So scattering is elastic and absorption is inelastic process. Which one you have energy change? Absorption.
9. Then he returned to dispersion again. What is Chromatic dispersion? C=16ps/kmnm question. Pulse width was 20ps. What would happen after 100 km?
   You should definately memorize numbers. He wants you to come up with quick result. I wrote formula etc. He didnt like it. I spent more time then I needed. And its little harder to do even small calc in stress. In the end, you will have 800ps broadening.
10. Now thats too much broadening for 20ps pulse. What you can do to prevent this on fibre?
    I was not sure if he was asking about DSF or DCF. I said DCF.
11. How?
    C = M + W I said material dispersion is always positive and we should compansate it with very high negative W. Then he said is it always positive (for M)? No, below 1.3um you have negative M.
12. How to increase negative W?
    Higher refractive index diff. But at the same time we want to keep V same. Why? I said due to low attenuation at 1.5um. He said yes but the actual reason was different. I couldnt guess then He showed me Fig.2.20b. The reason is we want to keep V below 2.405 so it can be single moded.
13. Then he asked for the formula for compensation.
    C1L1 + C2L2 = 0