

Upload your finished worksheet as a single pdf file on moodle before the next class session in order to get participation credit.

Try to keep your books closed. Discuss with your fellow students to come to an answer. Show your work.

Name: _____

1. On page 6 we introduced the wave equation with complex refractive index. Can you relate the wave equation to the well known Lambert-Beer law?

$$\ln \frac{I}{I_0} = -\alpha z \quad (1)$$

Focus on the complex part of the wave equation $A \exp -\frac{1}{2}\alpha z$.

$$A = A_0 \exp\left(-\frac{1}{2}\alpha z\right) \quad I = A^2 \quad I_0 = A_0^2$$

$$\Leftrightarrow A^2 = A_0^2 \left[\exp\left(-\frac{1}{2}\alpha z\right) \right]^2$$

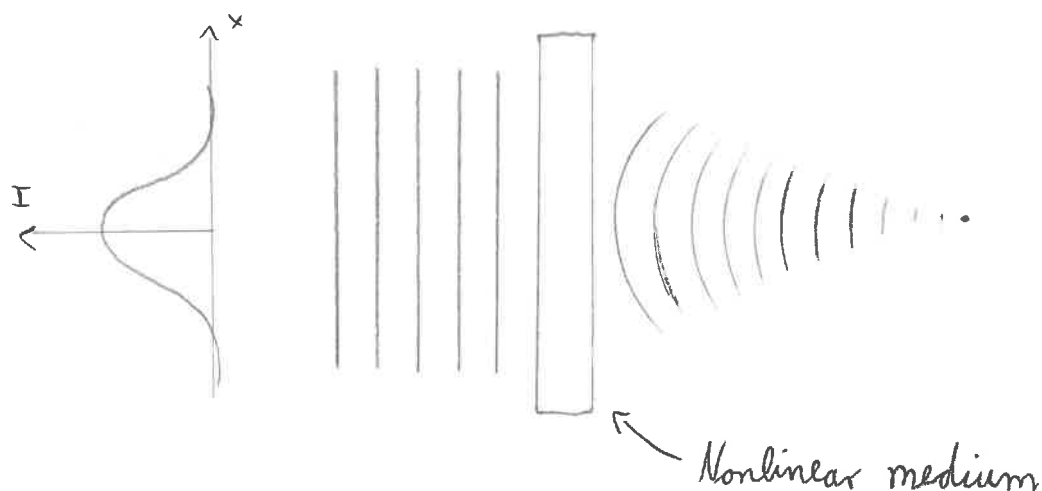
$$\Leftrightarrow A^2 = A_0^2 \exp(-\alpha z)$$

$$\Leftrightarrow I = I_0 \exp(-\alpha z)$$

$$\Leftrightarrow \frac{I}{I_0} = \exp(-\alpha z)$$

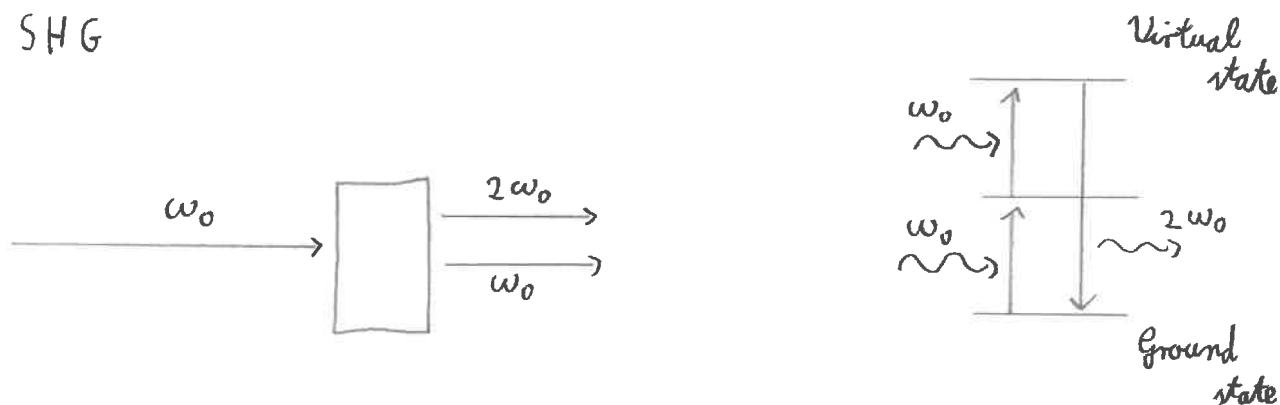
$$\Leftrightarrow \ln \frac{I}{I_0} = -\alpha z$$

2. Sketch the self-focusing effect in a Kerr lens.

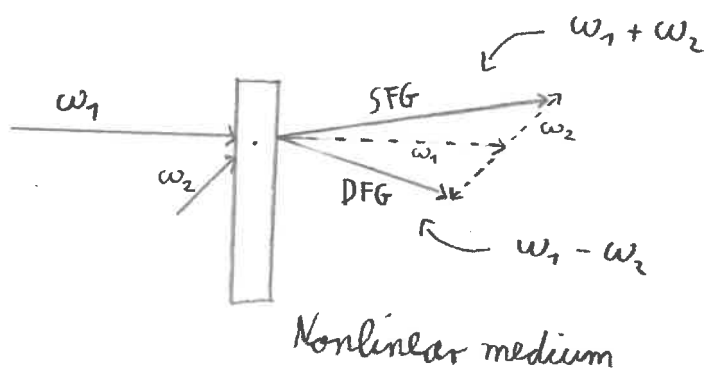


3. Lay out the difference between second harmonic generation and sum frequency generation.

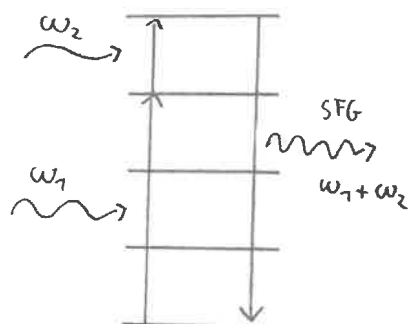
SHG



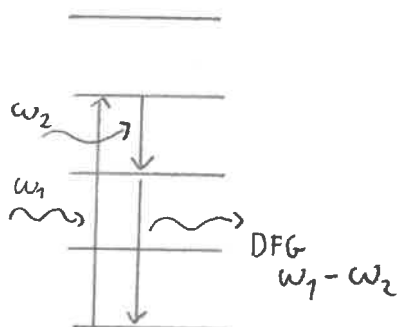
SFG / DFG (Difference frequency generation)



SFG



DFG



The End.