L6-L7-L8 overview! $\lambda = 532$ nm 2021-11-26

Green LED: 522 – 542 nm $\neq$ 20 nm $\Delta\lambda$

0. Light behaves like a wave! In particular, a sinusoid.
1. Wave characteristics are wavelength λ, amplitude A, and phase ϕ
2. "Illumination" is the sum of lots of light waves incident to an area on an object.
3. How can sinusoids be added / summed?
4. Phasor is a mathematical object that encodes sinusoid properties A, ϕ

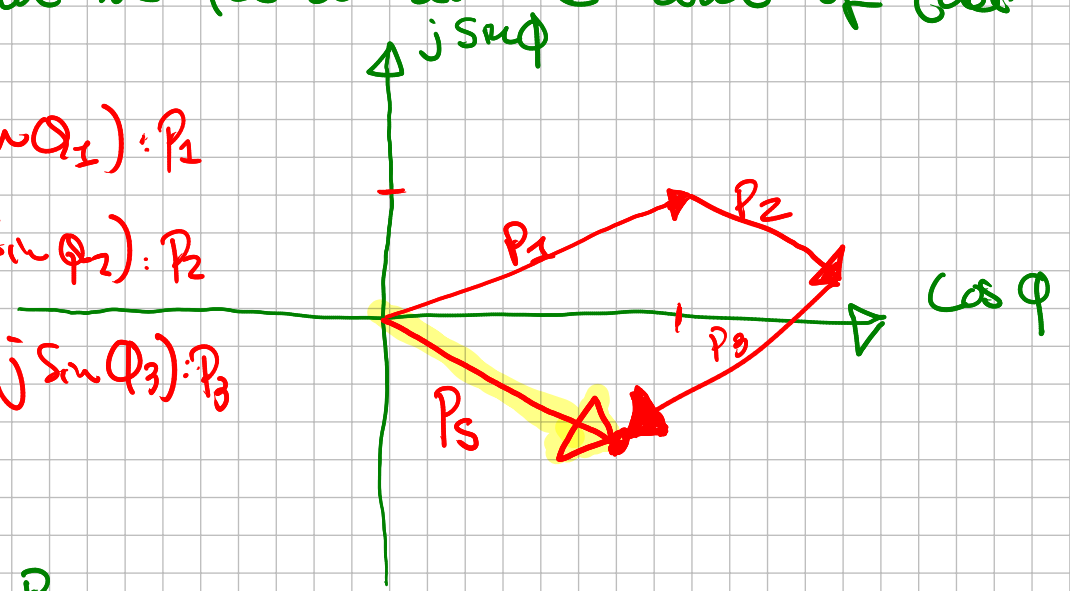
$$A e^{j\phi} = A(\cos\phi + j\sin\phi)$$

5. Sum of sinusoids can be found as the sum of their phasor terms

$S_1: [A_1, \phi_1] \rightarrow A_1(\cos\phi_1 + j\sin\phi_1) : P_1$

$S_2: [A_2, \phi_2] \rightarrow A_2(\cos\phi_2 + j\sin\phi_2) : P_2$

$S_3: [A_3, \phi_3] \rightarrow A_3(\cos\phi_3 + j\sin\phi_3) : P_3$



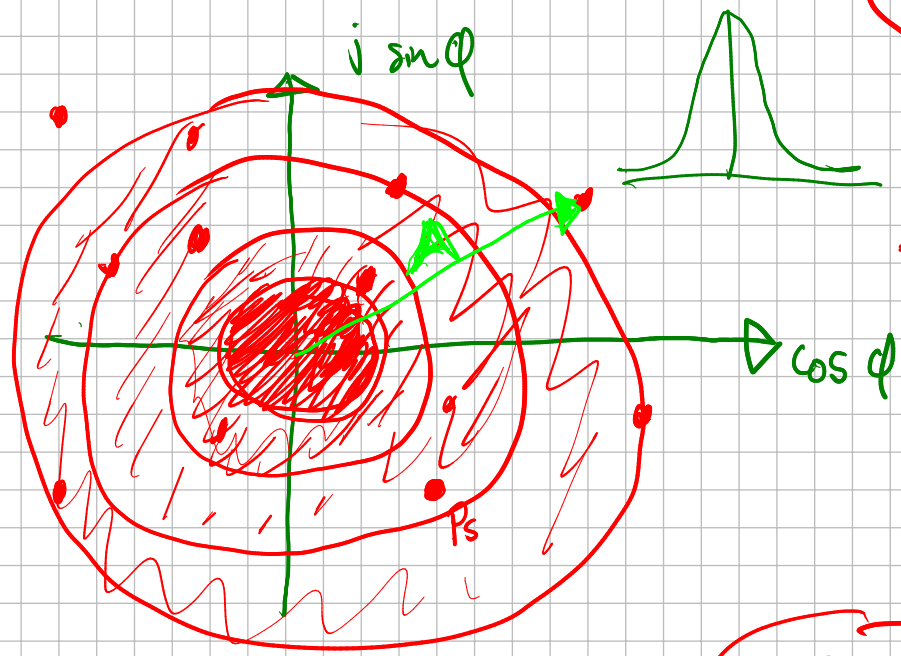
What is $S_1 + S_2 + S_3$?

$$P_S = P_1 + P_2 + P_3$$

6. Phasor summation is straightforward for specific waves / sinusoids.

7. Random Phasor sum concept is important for a general analysis of illumination.

RPS follow a "normal" Gaussian distribution



← Answer to Q4 should look something like this!

8. Amplitude of RPS can be shown to follow Rayleigh distribution

See Gaussian Point Plot on p.4 of L6 notes

9. Intensity $\propto$ (Amplitude)^2

Intensity has this probability distribution!

Negative exponential

10. Intensity sums → Simulated (L7) $\frac{1}{\sqrt{N}}$

→ Analysis (L8)