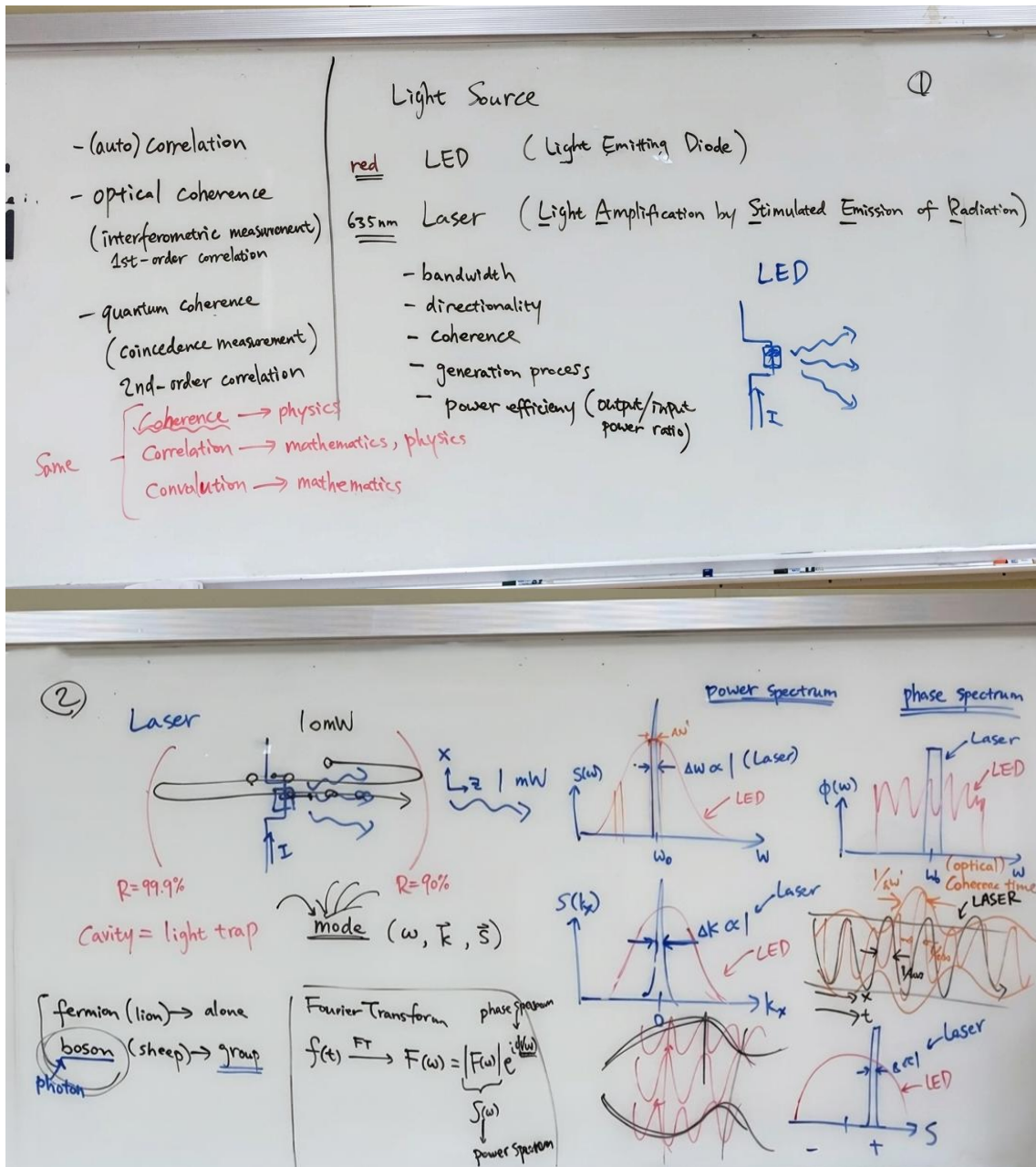
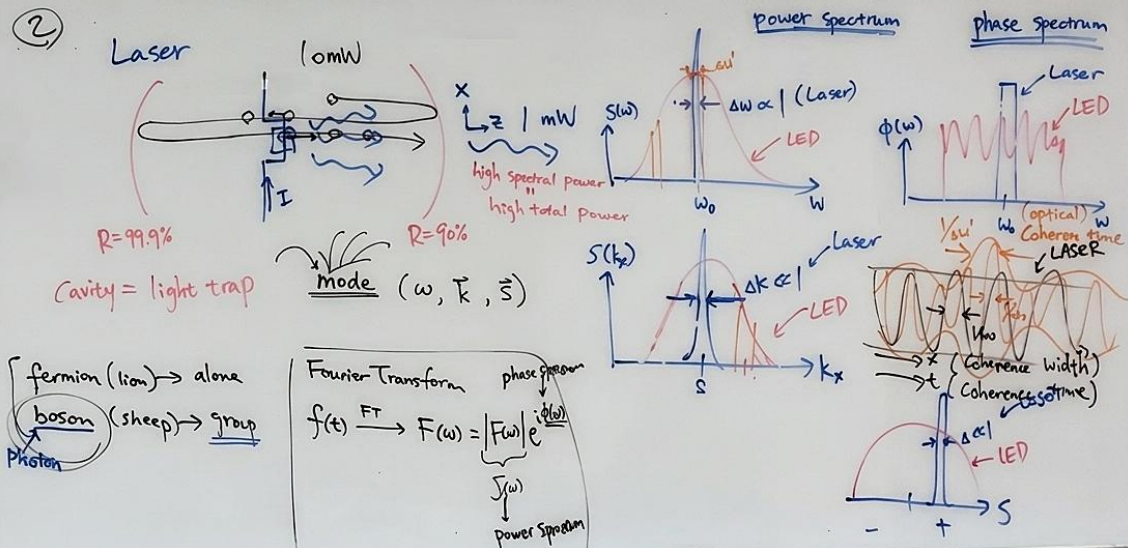




L3 (optics) optical coherence





Light Source

①

red LED (Light Emitting Diode)

635nm Laser (Light Amplification by Stimulated Emission of Radiation)

- ✓ - bandwidth
- ✓ - directionality
- ✓ - coherence
- ✓ - generation process
- ✓ - power efficiency (output/input power ratio)

LED

Low spectral power

I

- (auto) correlation

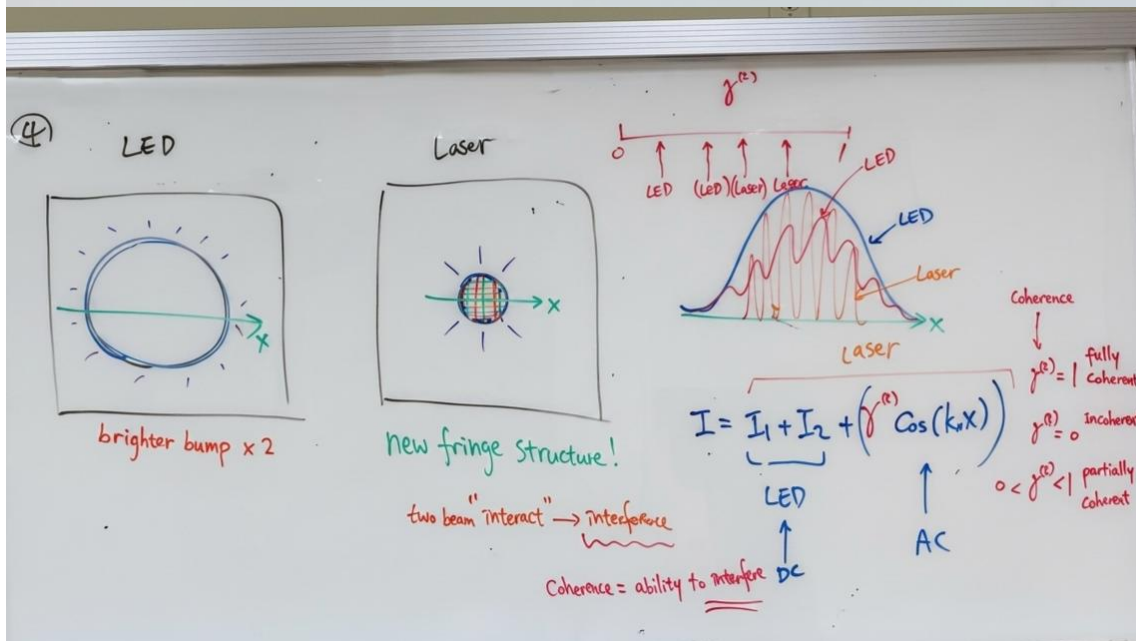
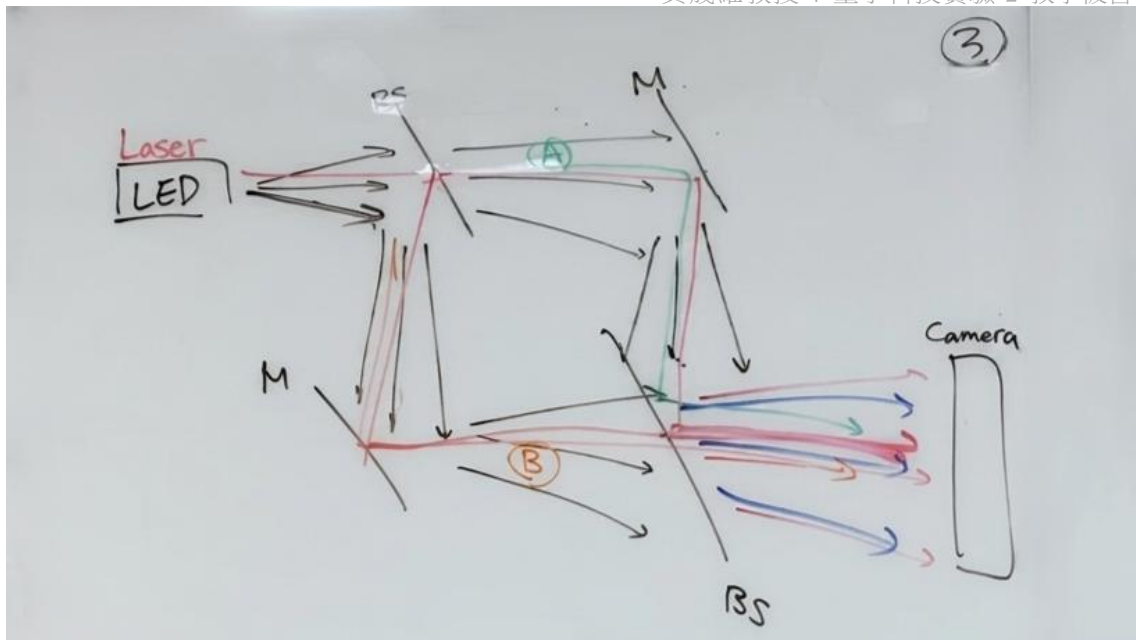
- optical coherence (interferometric measurement)
1st-order correlation

- quantum coherence (coincidence measurement)
2nd-order correlation

Same

- Coherence $\rightarrow$ physics
- Correlation $\rightarrow$ mathematics, physics
- Convolution $\rightarrow$ mathematics







⑤

LED

530 nm
580 nm
600 nm
660 nm
700 nm

80 nm

10 fs Coherence time

$\Delta L = (L_1 - L_2)/c = \frac{1 \text{ mm}}{3 \times 10^8} = 3.3 \times 10^{-11} \text{ s} = 3 \text{ ps}$

$\Delta \lambda = 50 \text{ nm}$ @ 600 nm

$c = \lambda \nu$

$\frac{c}{600 \text{ nm}}$

$\Delta \nu = \left| \frac{c}{625 \text{ nm}} - \frac{c}{575 \text{ nm}} \right|$

$= \frac{3 \times 10^8}{10^9} \left(\frac{1}{625} - \frac{1}{575} \right)$

$= 3 \times 10^7 \frac{50}{625 \times 575} = \frac{150}{625 \times 575} \times 10^{10}$

$\frac{1.3 \times 10^2}{6.25 \times 5.75 \times 10^8} \times 10^{10}$

$\frac{2}{30} \times 10^{10}$

$\frac{10^{14}}{11} \text{ Hz}$

3 fs

⑥

LED

$\Delta x > w_c$

$\Delta x < w_c$

?

No ($\Delta x > w_c$)

YES ($\Delta x < w_c$)





- (auto) correlation
- ✓ - optical coherence
 - (interferometric measurement)
 - 1st-order correlation
- quantum coherence
 - (coincidence measurement)
 - 2nd-order correlation

Same

- Coherence → physics
- Correlation → mathematics, physics
- Convolution → mathematics

