Lecture 20

$\epsilon$ vs $k$

$E_f^0$

T.E. $\rightarrow k$

$\epsilon > E_g \Rightarrow$ Stim emission $\Rightarrow$ Band-to-Band Abs.

$\epsilon_{f n}$

$\epsilon_{f p}$

Unit $n' = \rho$
A. VERTICAL ACTIVE LAYER DESIGN

WAVEGUIDE LAYER
Homojunction, broad area laser diode
Poor use of carriers in tails (no stimulated emission)

$J_{th} \approx 20 \text{ kA/cm}^2 - 30 \text{ kA/cm}^2$

Poor overlap of photon population with inverted population
Double heterojunction

LPE grown

N P P

Diagram of a double heterojunction with labels and arrows indicating electron flow.


\[ J_{th} \approx 2-3 \text{ kA/cm}^2 \]

THS + STRIPF \( \Rightarrow \) Continuous RT operation

Efficient use of cermet
excellent overlap
Problem → as δ & δ optical overlap δ

$\frac{n_{\text{crit}} \cdot d}{\gamma_{\text{nn}}} = J_{\text{th}}$

Solution → separate confinement
carrier confinement "active" layer

waveguide

options
Quantum well active layer

\[ \frac{J_{\text{nnh}}}{J_{\text{Tit D1}}} = \frac{N_{\text{nnh}}}{N_{\text{Til D1}}} \cdot \frac{\Delta E_{\text{nnh}}}{\Delta E_{\text{Til D1}}} \approx \frac{1}{5} \]