

Infrared spectroscopy of nanometer-thick interface charge in ZnO field-effect transistor(FET)

Jooyun Kim¹, SungHoon Jung¹, Kitea Kim², Kimoon Lee², Seongil Im², and E. J. Choi¹

¹Department of Physics, University of Seoul, Seoul 130-743, Korea

²Institute of Physics and Applied Physics, Yonsei University, Seoul 120-749, Korea

Phone : +82-2-2210-2842, Fax : +82-2-2245-6531, echoi@uos.ac.kr

We used far-infrared (FIR) transmission spectroscopy to probe charge carrier electrostatically induced at interface of n-type ZnO field-effect transistor. The Drude absorption exhibits highly localized FIR conductivity $\sigma_1(\omega)$ for gate voltage $V_{GS} < 40V$. As V_{GS} increases the localization effect decreases and $\sigma_1(\omega)$ evolves progressively toward the free carrier behavior. The 2-d electron density of $N_{2d} \sim 10^{13} \text{ cm}^{-2}$ is estimated from the plasma frequency which is in fair agreement with the dc-capacitance analysis.