

$$\begin{aligned}
N_2 &= \frac{\epsilon V_g}{ed} = 72.4 \times 10^{12} \text{ cm}^{-2} V_g(\text{V})/d(\text{nm}) \\
D_1 &= \frac{2}{\hbar} \sqrt{\frac{2m}{E}} \quad D_2 = \frac{4\pi m}{\hbar^2} \quad D_3 = \frac{8\pi m \sqrt{2mE}}{\hbar^3} \quad E_i = \frac{\hbar^2 i^2}{8ma^2} \\
E_{F,1} &= \frac{\hbar^2 N_1^2}{32m} = 13.43 \text{ meV} (N_1(10^6 \text{ cm}^{-2}))^2 \\
E_{F,2} &= \frac{\hbar^2 N_2}{4\pi m} = 34.2 \text{ meV} N_2(10^{12} \text{ cm}^{-2}) \quad \tau = \frac{m}{e} \mu = 398 \text{ fs} \mu \\
E_{F,3} &= \frac{\hbar^2}{8m} \left(\frac{3N_3}{\pi}\right)^{2/3} = 52.1 \text{ meV} (N_3(10^{18} \text{ cm}^{-3}))^{2/3} \\
\lambda_{F,1} &= \frac{\hbar}{N_1} \quad \lambda_{F,2} = \sqrt{2\pi/N_2} \quad \lambda_{F,3} = 2 \sqrt[3]{\frac{\pi}{3N_3}} \quad \ell_n = \frac{\hbar}{e\mu N_n} \\
l_1 &= \frac{\mu \hbar}{4e} N_1 = 103.4 \text{ nm} \mu N_1(10^6 \text{ cm}^{-2}) \quad E = \frac{\hbar e}{\lambda} = \frac{1.24 \text{ eV}}{\lambda(\mu\text{m})} \\
l_2 &= \frac{\mu \hbar}{e} \sqrt{\frac{N_2}{2\pi}} = 165 \text{ nm} \mu \sqrt{N_2(10^{12} \text{ cm}^{-2})} \\
l_3 &= \frac{\mu \hbar}{2e} \sqrt[3]{\frac{3N_3}{\pi}} = 203.6 \text{ nm} \mu \sqrt[3]{N_3(10^{18} \text{ cm}^{-3})} \\
l_{depl} &= \sqrt{\frac{2\epsilon}{eN_3} (V_{bi} - \frac{2kT}{e})} \approx \frac{1.31 \mu\text{m}}{\sqrt{N_3(10^{15} \text{ cm}^{-3})}} \\
l_{depl,IPG} &\approx \frac{8\epsilon V_g}{eN_2} = \frac{580 \text{ nm} V_g}{N_2(10^{12} \text{ cm}^{-2})} \quad E_Z = g^* \mu_B B \\
r_{class} &= \frac{\sqrt{2mE}}{eB} = 28.21 \text{ nm} \sqrt{E(\text{meV})/B} \quad \mu_B = \frac{e\hbar}{4\pi m_e} \\
r_{quant} &\approx \frac{\hbar}{eB} \sqrt{\frac{N_2}{2\pi}} = 165 \text{ nm} \sqrt{N_2(10^{12} \text{ cm}^{-2})/B} \\
r_{quant} &= \sqrt{\frac{\hbar(\nu+1)}{2\pi eB}} = 25.66 \text{ nm} \sqrt{\frac{\nu+1}{B}} \quad a_0 = \frac{e\hbar^2}{\pi e^2 m} = 9.9 \text{ nm} \\
\hbar\omega_c &= \frac{\hbar eB}{m} = 1.654 \text{ meV} B \quad v = \sqrt{\frac{2eV_g}{M}} = 440 \frac{\text{km}}{\text{s}} \sqrt{\frac{V_g(\text{kV})}{A}} \\
\nu &= \frac{N_2 \hbar}{eB} = 41.36 \frac{N_2(10^{12} \text{ cm}^{-2})}{B} \quad l = \frac{\tau \text{ cm}}{I(\text{pA})} \sqrt{\frac{V_g(\text{kV})}{A}} \\
N_2 &= \frac{BI}{eV_H} \quad \mu = \frac{\ln 2 V_H}{\pi B V} = 0.2206 \frac{V_H}{B V} \quad (\text{v. d. Pauw, } \square) \\
P(\text{pW}) &= 5.67 S(\text{cm}^2) b(T_1^4 - T_2^4) \quad \lambda_{P_{max}} = \frac{2898 \mu\text{m}}{T}
\end{aligned}$$



All quantities in SI, unless specified otherwise

$D_n$ = $n$ -dim.density of states/ $m^n$        $E$ =energy  
 $m$ =effective charge carrier mass, here  $0.07 m_e$        $S$ =area  
 $\epsilon$ =dielectric constant, here  $13.1 \epsilon_0$        $E_i$ =subband energy  
 $V_{bi}$ =built-in potential, here  $1.24 V$        $a_0$ =Bohr's radius  
 $l_n$ = $n$ -dim.elast.mean free path       $\mu_B$ =Bohr's magneton  
 $N_n$ = $n$ -dim. carrier dens.       $E_Z$ =Zeeman splitting  
 $\mu$ =charge carrier mobility       $V$ =v.d.Pauw voltage drop  
 $\rho_n$ = $n$ -dim. resistivity       $V_H$ =Hall voltage  
 $T$ =temperature       $\epsilon_0$ =permittivity in vacuum  
 $l_{depl}$ =depletion length       $V_g$ =gate voltage  
 $r_{class}$ =classical magnetic length       $B$ =magnetic field  
 $r_{quant}$ =quant.mech.magn.length       $E_F$ =Fermi-energy  
 $\nu$ =2-dim.spin-split filling factor       $d$ =insulat.thickness  
 $\omega_c$ =cyclotron frequency       $e$ =electron charge  
 $P$ =black body radiation power       $h$ =Planck's quantum  
 $b$ =black body coefficient: 1 (black) ... 0.05 (pol.metal)  
 $k=1.380\,6503(24) \times 10^{-23} \text{ J/K}$        $a$ =quant.well width  
 $h=6.626\,068\,76(52) \times 10^{-34} \text{ Js}$        $\lambda$ =wavelength  
 $c=2.997\,924\,58 \times 10^8 \text{ m/s}$        $\tau$ =momen.scatt.time  
 $\mu_0=4\pi \times 10^{-7} \text{ H/m} = 1.256\,637 \dots \times 10^{-6} \text{ H/m}$   
 $\epsilon_0=1/\mu_0 c^2 = 8.854\,187\,8 \dots \times 10^{-12} \text{ F/m}$   
 $e=1.602\,176\,462(63) \times 10^{-19} \text{ C}$        $g^*$ =eff. Landé factor  
 $m_e=9.109\,381\,88(72) \times 10^{-31} \text{ kg}$        $\mu_B \approx 57.88 \mu\text{eV/T}$   
 $m_p=1.672\,621\,58(13) \times 10^{-27} \text{ kg}$        $A$ =at.mass  
 $m_n=1.674\,927\,16(13) \times 10^{-27} \text{ kg}$        $V_a$ =acc.volt.  
 $1 \text{ atm}=1.013\,25 \times 10^5 \text{ N/m}^2$        $l$ =dist.btw.ions  
 $G=6.673(10) \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$        $v$ =ion velocity  
 $N_{Av_0}=6.022\,141\,99(47) \times 10^{23} \text{ mol}^{-1}$        $M$ =ion mass  
 $1 \text{ Torr}=(1/760) \text{ atm} = 133.322 \dots \text{ N/m}^2$   
 $\sigma=5.670\,400(40) \times 10^{-8} \text{ Wm}^{-2} \text{ K}^{-4}$