Lecture21: Scharfetter-Gummel scheme

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Final presentation

- Please show your plan for the final presentation.

Calendar

- Plan for remaining lectures
  - IEDM business trip
  - *Four make-up sessions* will be made.

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		16 (L18)	17	18	19	20
21 (L19)	22	23 (L20)	24	25 (L21)	26	27
28 (No lecture)	29	30 (L22)	Dec.1	2 (L23)	3	4
5 (No lecture)	6	7 (No lecture)	8	9	10	11
12 (L24)	13	14 (L25)	15	16 (Final)	17	18

Summary

- Continuity equation

$$\frac{\partial}{\partial t} n + \nabla_r \cdot \mathbf{F}_n = 0$$

- Current density equation

$$\mathbf{J}_n = q\mu_n n\mathbf{E} + qD_n \nabla_r n$$

Scharfetter-Gummel

- "The equation that started it all"
  - 1D approximation
  - The current density is discretized as

$$J_{n,i+0.5} = qD_n \frac{1}{x_{i+1} - x_i} \left[n_{i+1} B\left(\frac{\phi_{i+1} - \phi_i}{V_T} \right) - n_i B\left(\frac{\phi_i - \phi_{i+1}}{V_T} \right) \right]$$

  - Here, the Bernoulli function is

$$B(x) = \frac{x}{e^x - 1}$$

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Drift-Diffusion and computational electronics – Still going strong after 40 years!

Reflections on computational electronics and the equation that started it all

Last Homework

- Write a code for 1D drift-diffusion equation.