three-halves power law

Also known as the **Child-Langmuir Law** or the **Three-Halves Power Law**, **Child's Law** states that the space charge limited current (SCLC) in a plane-parallel diode varies directly as the **three-halves power** of the anode voltage V_a and inversely as the square of the distance d separating the cathode and the anode.

Where I_a is the anode current, J the current density, and S the anode surface inner area. This assumes the following:

1. - The electrodes are planar, parallel, equipotential surfaces of infinite dimensions.
2. - Electrons travel ballistically between electrodes (i.e., no scattering).
3. - The electrons have zero velocity at the cathode surface.
4. - In the interelectrode region, only electrons are present.
5. - The current is space charge limited.
6. - The anode voltage remains constant for a sufficiently long time so that the anode current is steady.

The assumption of no scattering (ballistic transport) is what makes the predictions of **Child-Langmuir Law** different from those of Mott-Gurney Law. The latter assumes steady-state drift transport and therefore strong scattering. Wikipedia, Space Charge

See Also

Inverse Square Law Laser Cluster Interactions Law of Atomic Dissociation Law of Atomic Pitch Law of Oscillating Atomic Substances Law of Pitch of Atomic Oscillation Law of Variation of Atomic Oscillation by Electricity Law of Variation of Atomic Oscillation by Sono-thermism Law of Variation of Atomic Oscillation by Temperature Law of Variation of Atomic Pitch by Electricity and Magnetism Law of Variation of Atomic Pitch by Rad-energy Law of Variation of Atomic Pitch by Temperature Law of Variation of Pitch of Atomic Oscillation by Pressure Models of Laser Cluster Interactions Space Charge Square Law