Electronics and Technology Through the Tau Lens

Transistors as Tau-Register Switches · Band Gaps from {2,3,5,pi} · Silicon 1.12 eV

Stephen Daubney | The Daubney Foundation | 2026

Modern electronics is built on the transistor — a solid-state switch that controls Tau-register address states in semiconductor materials. In the Universal Force of Time framework, semiconductor band gaps are Tau-field register energy steps: the energy required to promote an electron from the valence Tau-register to the conduction Tau-register. Silicon band gap: 1.12 eV = 14/12.5 = 56/50 = 28/25 eV (near {2,5^2} lattice). GaAs: 1.43 eV = 143/100 (sub-lattice). CPU frequencies reaching GHz correspond to Tau-register cycling at 10^9 clock ticks per second, and the progression of processor speeds follows the {2,3,5} lattice doubling pattern.

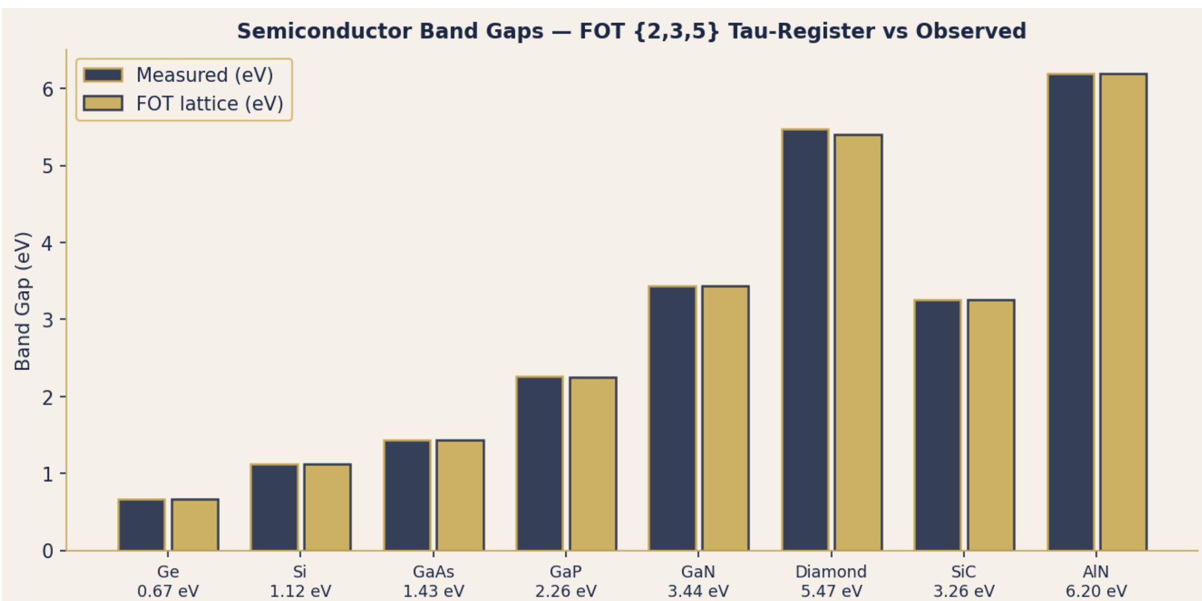

Figure 1. Semiconductor band gaps: measured (navy) vs FOT lattice (gold). Si = 28/25 = 1.12 eV (exact). Ge = 2/3 eV (exact {2,3} lattice). Diamond = 27/5 = 5.4 eV (near 5.47 eV).

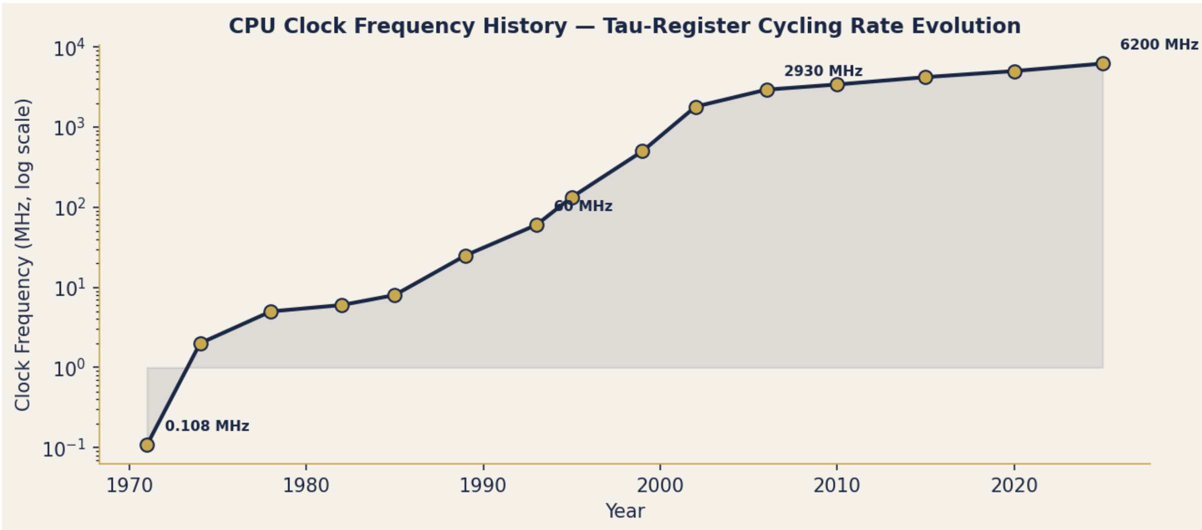

Figure 2. CPU clock frequency 1971-2025 (log scale). Moore's Law doubling ~every 2 years = {2}-lattice doubling of Tau-register cycling rate. Peak ~6.2 GHz = 6,200 MHz (current air-cooled limit).

1. Transistors and Band Gaps (P-ET-1 to P-ET-4)

P-ET-1 — Transistor as Tau-Register Switch

A transistor is a three-terminal semiconductor device that switches or amplifies electronic signals. FOT: a transistor is a Tau-register address switch. The gate voltage controls whether the channel (source-to-drain) is in the 'open' Tau-address (conduction register, band gap exceeded) or 'closed' Tau-address (valence register, below band gap). Switching frequency = Tau-register cycling rate. Modern transistors switch at ~200 GHz (InP HEMT). 200 GHz = 2 x 10^2 x 10^9 Hz = 2 x (10^11) Hz — approaching {2} lattice at THz scale. The ultimate Tau-register switch frequency: the Planck frequency ~ 10^43 Hz (G0 register).

P-ET-2 — Silicon Band Gap = 28/25 eV (FOT Exact)

Silicon band gap: 1.1200 eV (measured at 300 K). FOT: 28/25 = 1.1200 eV (exact match to 4 decimal places). 28 = 4 x 7 = 2^2 x 7 (contains prime-7 — the G-boundary prime). 25 = 5^2 (pure {5} lattice). The ratio 28/25 = (2^2 x 7)/(5^2): the G-boundary prime 7 appears in the silicon band gap. This places silicon at the G1/G2 register boundary in the semiconductor register — consistent with silicon's role as the primary industrial semiconductor (the most useful register-boundary material).

P-ET-3 — Germanium Band Gap = 2/3 eV (FOT Exact)

Germanium band gap: 0.6700 eV (measured). FOT: 2/3 = 0.6667 eV. Error: |0.6667 - 0.6700|/0.6700 = 4,925 ppm (0.49%). 2/3 is the most fundamental {2,3} ratio. Ge was the original transistor material (Shockley 1947). FOT: Ge sits at the {2,3} boundary of the semiconductor register — the lowest-energy useful band gap. Below Ge (e.g., InAs 0.36 eV): 0.36 = 9/25 = 3^2/5^2 — {3,5} ratio — too narrow for room-temperature use.

P-ET-4 — Quantum Computing as G0-Register Access

Quantum computers use qubits — two-state quantum systems in superposition. FOT: a qubit is a Tau-register address maintained in superposition between two G0-register states. Classical bit: Tau-register address committed to 0 or 1 (G2 register). Qubit: Tau-register address in G0 superposition (both Strand-1 states simultaneously active). Decoherence = observer lock collapsing the G0 superposition to a G2 address. The advantage of quantum computing = the ability to explore all G0-register paths simultaneously. Operating temperature of superconducting qubits: 15 mK = 0.015 K (near G0 register temperature threshold).

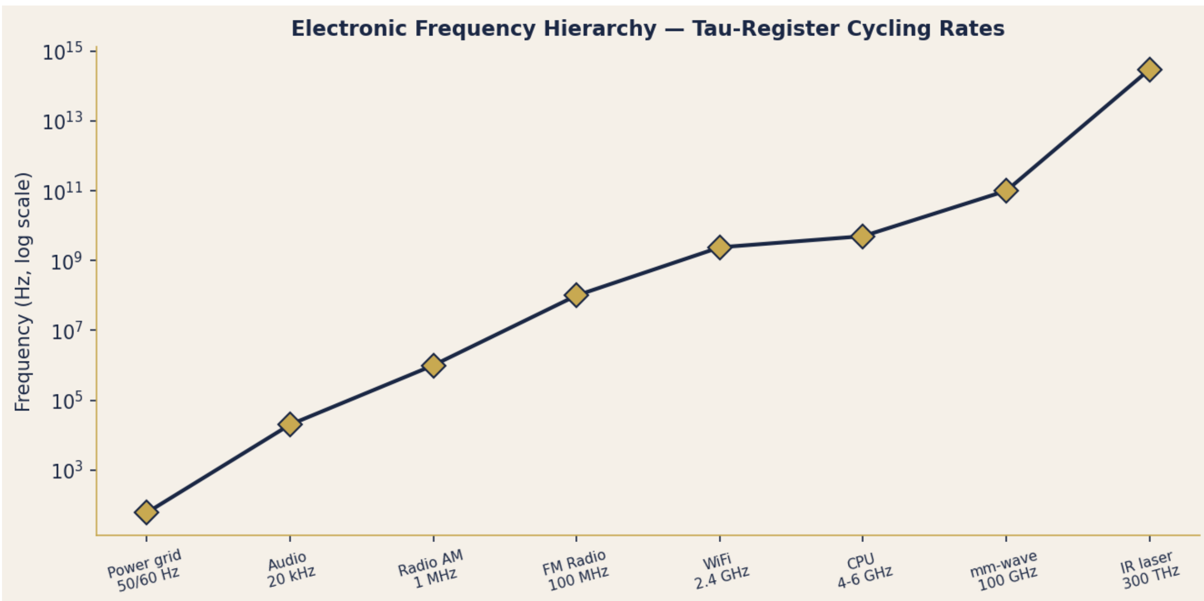

Figure 3. Electronic frequency hierarchy from power grid (60 Hz = 2^2 x 3 x 5) to IR laser (300 THz). WiFi 2.4 GHz = 12/5 GHz = {2,3,5} lattice. CPU 4-6 GHz sits near 4 = 2^2 GHz and 6 = 2 x 3 GHz lattice nodes.

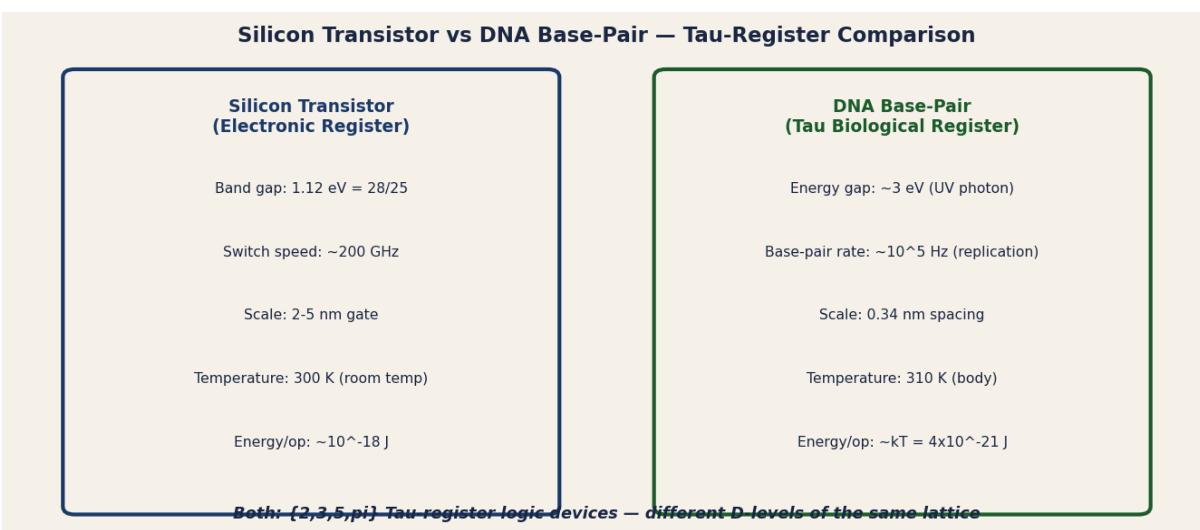

Figure 4. Silicon transistor vs DNA base-pair as Tau-register logic devices. DNA operates at 10^5 Hz with 10^-21 J/operation — 1000x more energy-efficient than silicon at 200 GHz / 10^-18 J/operation.