Novel silicon chip allowing terahertz waves

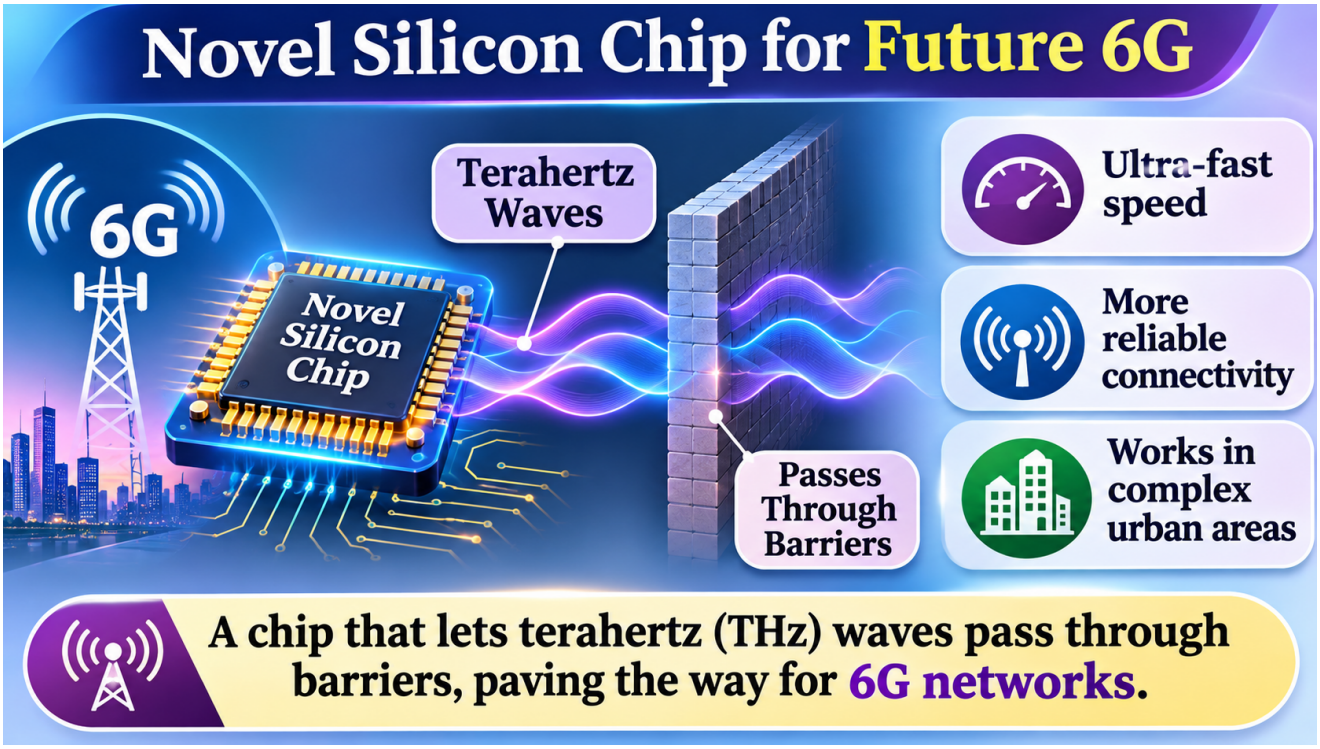
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Why in News?

Researchers have developed a novel silicon-based photonic chip that guides terahertz waves across engineered barriers with minimal signal loss.

Key Highlights

- The study enables data transmission speeds of up to **100 Gbit/s**, overcoming a major hardware bottleneck in developing compact circuits for future **6G wireless communication networks**.
- **Photonic Klein Tunnelling -** The researchers engineered a graphene-inspired honeycomb-like Silicon Valley photonic crystal by etching triangular holes into a high-resistivity silicon slab.
- By altering the size of these triangular holes, they created artificial barriers that terahertz waves can pass through via **photonic Klein tunnelling** resisting signal scattering and back-reflection.
- **Minimal Signal Loss -** Measurements across the **310–360 GHz** frequency range showed that a single engineered barrier causes only **1–2% signal loss**, while two consecutive barriers result in approximately **2–3% loss**.
- **Tested Chip Prototypes & Speeds-** Three device configurations were fabricated and tested:
  - **Double-barrier waveguide -** Achieved **48 Gbit/s** transmission.
  - **Omega-shaped waveguide** (with four sharp bends): Achieved **60 Gbit/s** transmission.
  - **Power splitter -** Achieved **100 Gbit/s** transmission using **QAM-32** (Quadrature Amplitude Modulation).
- **Future Reconfigurability-** The research team plans to introduce electrical, thermal, or mechanical tuning of the barriers, allowing future chips to dynamically switch and redirect signals on demand.



Reference

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