Docket #: S04-344

Germanium-Silicon Electroabsorption Modulator

Stanford researchers have patented a silicon germanium (SiGe) electroabsorption modulator that can operate well in excess of 10 Gbps and is entirely compatible with Silicon (Si) complementary metal-oxide semiconductor (CMOS) integrated circuit fabrication. The absorption modulator turns a beam of light into a stream of digital data by selectively absorbing the beam or allowing it to continue. It offers energy efficiency, compact size, lower insertion loss, much higher speeds, and higher contrast ratio compared to existing systems. This invention can provide significant cost reduction for optoelectronic or optical systems as optical devices are integrated with their driving electronic circuits using conventional Si CMOS fabrication.

Miller Lab silicon photonics technology available for licensing includes:
“Ge-Si quantum well structures” U.S. Patent No. 7,599,593.
“Integration of optoelectronics with waveguides using interposer layer” U.S. Patent 8,824,837.
“Selective area growth of germanium and silicon-germanium in silicon waveguides for on-chip optical interconnect applications." U.S. Patent No. 9,368,579.
"Self-aligned semiconductor ridges in metallic slits as a platform for planar tunable nanoscale resonant photodetectors." U.S. Patent No. 8,829,633.
"Universal Linear Components." U.S. Patent Application No. 14/092,565.
"Field-Programmable Optical Component." U.S. Patent Application No. 15/080,170.
“Phase shifting by mechanical movement “ U.S. Patent Application No. 15/380,062 (Stanford docket 15-472)

Applications

- Optoelectronic systems
- Optical systems

Advantages

- Energy efficient
- Compact size
- High speed
- Low insertion loss
- High contrast ratio
- High optical bandwidth
- Compatible with Si CMOS fabrication, reducing manufacturing costs

Publications

- Yu-Hsuan Kuo, Yong Kyu Lee, Yangsi Ge, Shen Ren, Jonathan E. Roth, Theodore I. Kamins, David A. B. Miller, and James S. Harris Strong quantum-confined Stark effect in germanium quantum-well structures on silicon *Nature 437, 1334-1336 (27 Oct 2005)*
- Orenstein, David. "Stanford innovation helps 'enlighten' silicon chips for better use in electronics." *Stanford News*, Stanford Report 27 Oct 2005.

Patents

- Published Application: 20060124919

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