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A photon computer. Optical logic gates

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The paper presents the structure of a general-purpose digital photon computer and principles of its implementation, as well as the logic gates required to create such computer.

The photon computer functionality is based on the effects of interacting coherent systems of light waves generated by a laser source. The efficiency of data processing in photon computers is achieved via application of

- passive optical logic gates;
- computation discipline based on the availability of operands (data flow);
- conflict-free algorithms of data processing by processors elements.

The classes of problems that can be solved on photon and electronic computers are the same (in contrast to quantum computers). The architectural and schematic design solutions found for electronic devices are acceptable. The interference-based logic gates proposed in the paper form a complete basic functional set. The identity requirements are met for the intensity values corresponding to logic constants «0» and «1» generated by various gates within fixed time intervals.

Estimates of the peak performance of a digital photon computer with a light wave length of 1.5 μm are 10^4 to 10^5 times higher than those of modern electronic devices with the same power consumption.

1. A Photon Computer: Implementation Principles and Performance Estimation. Doklady Akademii Nauk, 2017, Vol. 476, No. 4, pp. 389-394.
2. Interference-Based Logic Gates. Doklady Rossiyskoy Akademii Nauk, 2020, Vol. 493, pp. 64-69.