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Progess in Photon Colliders

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Abstract: Last two years were very important in history of a photon colliders. This option is included now in conceptual design reports of the NLC, JLC and TESLA/SBLC projects. All the designs foresee two interaction regions: one for e^+e^- and the second for $\gamma\gamma$, γ e and e^-e^- collisions. This paper is focused on three aspects: 1) arguments for photon colliders; 2) parameters of current projects; 3) ultimate luminosities and energies, new ideas. Recent studies have shown that the main collision effect - coherent pair creation - is suppressed at photon colliders with the energy ($2E < 2$ TeV) due to the beam repulsion, and one can achieve, in principle, the $\gamma\gamma$ luminosity exceeding 10^{35} $cm^{-2}s^{-1}$. The required electron beams with very small emittances can be obtained, for example, using a laser cooling of electron beams. This new method requires a laser with a power by one order of magnitude higher than that required for the ``conversion'' of electrons to photons. Such lasers are not available today, but hopefully they will appear by the time when linear colliders will be built. High energy $\gamma\gamma$, γ e colliders with the luminosity comparable to that in e^+e^- collisions are beyond the competition in study of many phenomena of particle physics.

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