

Low Energy e+e- Colliders

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A brief overview of the development of the idea of colliding electron-positron beams is given. It led to the appearance of many modern installations-factories with extremely high productivity-luminosity. This development progressed as complexity increased from simple single ring machines with a single bunch in the beam to two ring machines with hundreds or even thousands of circulating bunches in each of the storage rings, such as PEP-II, KEKB, DAFNE, BEPCII/BESIII, and SuperKEKB.

A revolutionary solution in the technology of colliding beams was P.Raimondi's proposal to meet flat beams not head-on, but at a significant angle in the horizontal plane. At the same time one should compensate for the geometric loss of luminosity by additional compression of their transverse dimensions and reducing the value of the vertical beta function at the point of meeting the beams to a level significantly smaller than the length of the bunches.

The parasitic modulation of the moment of meeting of the particle with the centerline of the oncoming beam by the horizontal coordinate of the particle, which occurs in this scheme, leading to the vertical blow up, is proposed to be suppressed by a pair of sextupole lenses located before and after the meeting point. They work in such a way that always shift the vertical waist of the incoming beam to the centerline of the oncoming beam, cancelling effectively y-x coupling.

This approach, dubbed Crab Waist, is now widely accepted and is at the heart of almost all future electron-positron collider projects, including Tau-Charm in Novosibirsk, FCC-ee at CERN, and CEPC in China. Other concepts of cyclic colliders, such as round colliding beams and mu-mu-tron, are also discussed.

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