rived at by consensus rather than by executive order, so decisions on publications are debated very openly. An analysis, before approval for publication, must first be presented at an OPAL weekly meeting at CERN. Then a draft will be circulated to every institute in the collaboration, although it can be hard to get all the illustrations for a meaty piece of work to all the outside laboratories in time for everyone to comment. Nobody's text is 'right' until an 'editorial board', with at least two people with no direct hand in that particular piece of work, has gone over the draft. In a final 'public reading' objectors must 'speak now or forever hold their peace'. Nevertheless there have been 34 OPAL papers and letters submitted to journals (as of 8 April 1991), with two or three new ones coming out each month.

The collaboration is still growing. Two major new groups have joined in the past year, bringing expertise and hardware to assist in the online and offline data-analysis. And the physics programme continues to advance. OPAL looks forward to lots more Zs as the luminosity of the machine is increased and to the greater sensitivity to subtleties of the theory with polarized beams. Most of all we look forward to the next great energy threshold and studying the production of W pairs. Whatever the challenge, the Omni Purpose Apparatus for LEP will be ready.

By David Miller

BERKELEY/ STANFORD B factory plans*

**A description of Cornell's B factory plans will appear in the next issue.*

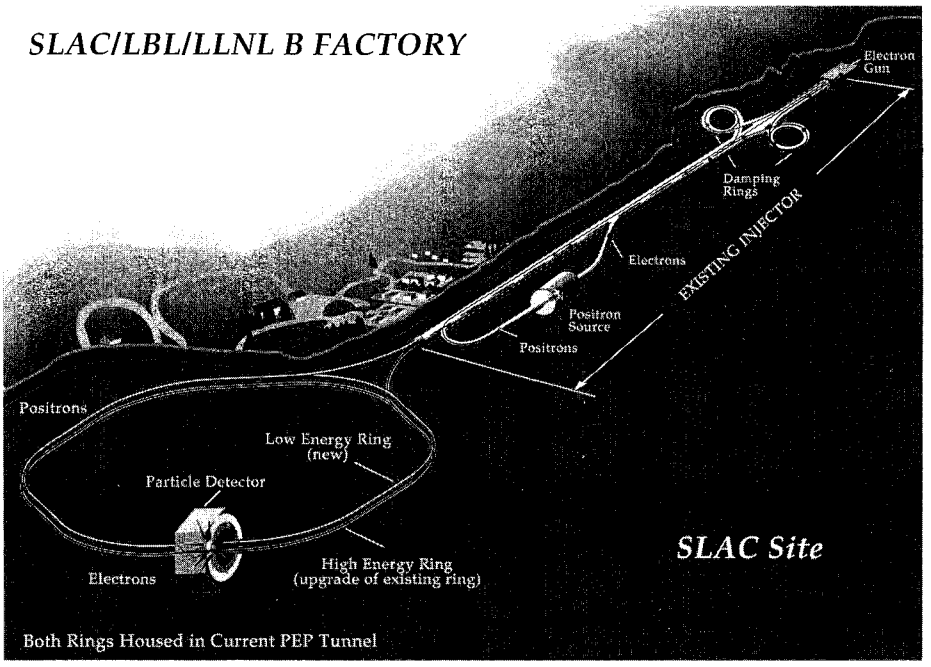
For the past several years, accelerator physicists at Lawrence Berkeley Laboratory (LBL) and the Stanford Linear Accelerator Center (SLAC) have been involved in the design of an Asymmetric B Factory to be sited in the tunnel of the PEP electron-positron collider at SLAC.

This effort comes from a suggestion by LBL's Deputy Director Pier Oddone that a high-luminosity electron-positron collider with unequal beam energies would open up exploration of CP violation with B particles (containing the heavy 'beauty' or 'b' quark – so far CP violating studies have been limited to the neutral kaon system.)

The combined violation of particle-antiparticle (C) and mirror reflection (parity – P) symmetries was discovered by V. Fitch and J. Cronin at Brookhaven in 1964. Although it is intimately related to a six-quark picture, the phenomenon has never been explained, and new information could lead to important advances in understanding.

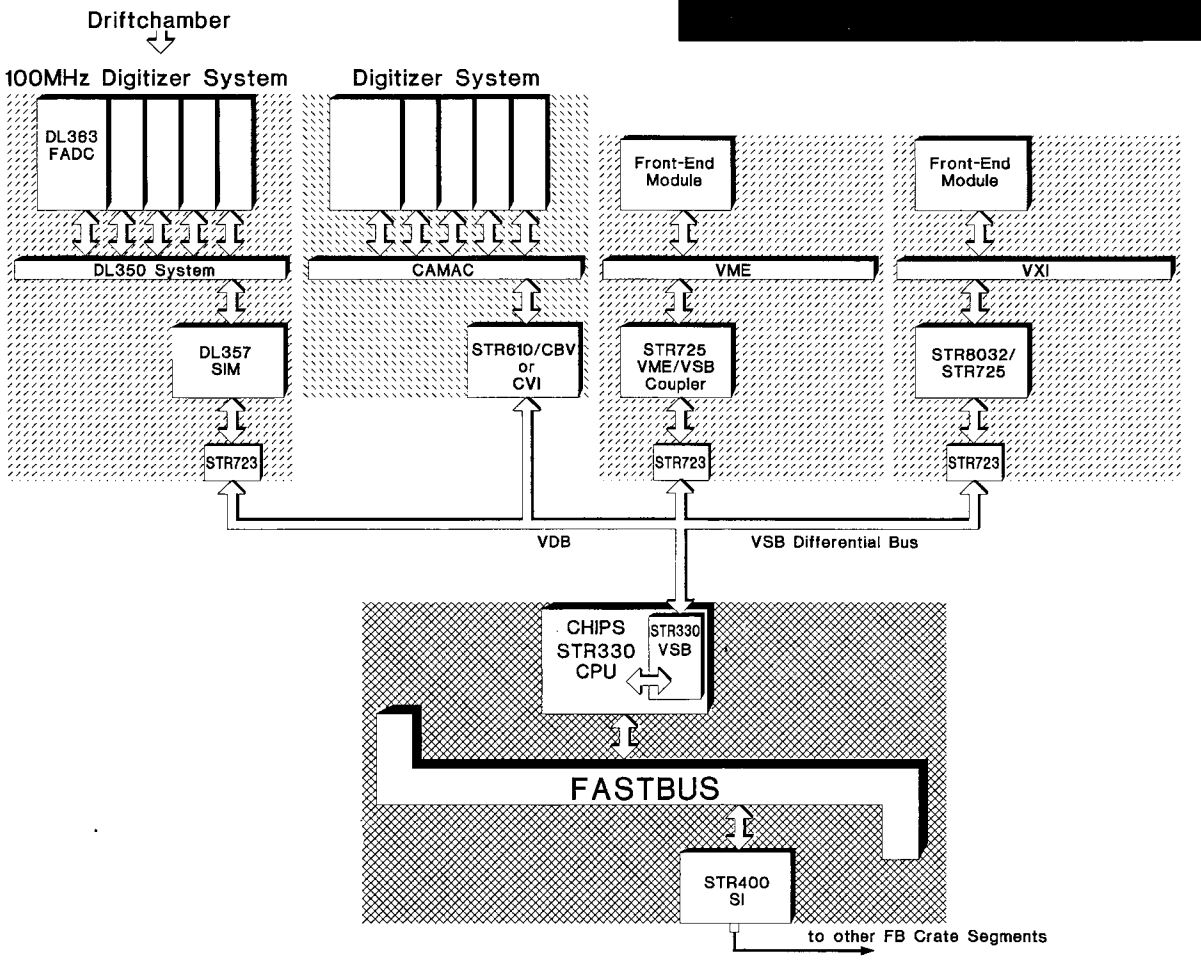
Capitalizing on recent advances in detector technology and new information on the properties of the b quark, it is now widely accepted that such an asymmetric collider offers a good platform for an in-depth study of CP violation. This was endorsed last year by the US High Energy Physics Advisory Panel (HEPAP) through the deliberations and recommendations of its 1990 subpanel, headed by Frank Sciulli, on the US high energy physics research programme for the 1990s (July/August 1990, page 4).

The design effort was initiated in early 1989, when a group of accelerator and particle physicists from Caltech, LBL, SLAC, and the University of California began looking at the idea of an asymmetric electron-positron collider based on an upgrade of the PEP ring at SLAC.



Schematic of the proposed B Factory at Stanford, fed by the two-mile linac and using the existing PEP electron-positron ring.

STRUCK'S INTERFACING OF FRONT-END-SYSTEMS TO A FASTBUS-BACKBONE



DL 363 = *Flash-ADC Module*
DL 357 = *Scanner + Interface Module*
STR 610/CBV = *CBV CAMAC to VSB Interface*
STR 725 = *VME/VSB Coupler*
STR 8032 = *Modular VXI Resource Manager*
STR 723 = *Differential VSB Extension*

STR 330/CPU = *CHIPS/FASTBUS Processor Module*
STR 330/VSB = *Interface between CHIPS and the VMEbus World*
STR 400 = *FASTBUS Segment Interconnect*
VDB = *VSB Differential Bus up to 50 m*

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A parallel study looked at the physics capabilities and the luminosity (collision rate) required for a broad-based programme aimed at understanding the origins of CP violation.

This work indicated that, with appropriate care, PEP could be upgraded to achieve the required luminosity of 3 x 10^{33} per sq cm per s. In November 1989 the SLAC Experimental Program Advisory Committee agreed that the B Factory program was indeed very compelling and encouraged the Directors of SLAC and LBL to move from a feasibility study to a conceptual design phase.

This culminated in February with the publication of a Conceptual Design Report. The effort has been headed by Jonathan Dorfan at SLAC, with the collider design activity coordinated by Andrew Hutton from SLAC and Michael Zisman from LBL. SLAC and LBL have a long and successful history of design, construction, and operation of electron-positron storage rings – the original PEP project was a joint endeavour of the two Laboratories. Recently Lawrence Livermore Laboratory has joined the collaboration, and is now a full partner in the proposal.

The Asymmetric B Factory collider described in the Conceptual Design Report is a machine that is both responsive to the physics needs and conservative in its approach to high luminosity. It consists of two independent storage rings, one atop the other in the 2.2 kilometre circumference PEP tunnel. The high energy ring, which would store a 9 GeV electron beam, is an upgrade of the existing PEP collider, reutilizing all the PEP magnets and incorporating a copper vacuum chamber (patterned after that used in the HERA electron ring at DESY) and a new room-temperature radiofrequency system capable of supporting a stored beam of very high current.

The low-energy ring, to store 3.1 GeV positrons, would be new, taking advantage of many of the machine component designs that have already proved successful at PEP.

The collider is designed initially for head-on collisions, the configuration successfully employed on existing machines. Although the initial plan has a single interaction region, it would be possible to upgrade the design to include a second interaction region – and therefore a second detector – if required.

The technique to attain the required luminosity is to use, in each ring, high circulating currents (approximately 2 A) separated into more than 1600 bunches. In this way the parameters of individual bunches (current, length, emittance, etc.) are quite conventional. Thus the challenges in the design are restricted to the high-current and multibunch goals. These are mainly engineering challenges and – although by no means easy – are amenable to standard techniques.

SLAC has the world's most powerful positron injector, and the availability of the large PEP tunnel greatly eases the problems of handling the intense synchrotron radiation emitted by the high-current beams. Moreover the parameters of the B Factory high energy ring match almost perfectly those of PEP, so that the project would benefit from the existing infrastructure with no major civil engineering required on the SLAC site.

The programme of CP violation studies envisioned for the Asymmetric B Factory has great discovery potential; should the measurements disagree with today's Standard Model, the observed effects will provide substantial and specific clues as to how the model should be extended.

In addition, the collider would host a very exciting and broad-based programme of heavy quark, tau lepton and two-photon physics. As a result, the Asymmetric B Factory would be ideal for training young physicists, and it is anticipated that more than 200 PhD theses would be completed during the programme's estimated 15 year lifetime.

At present, more than 150 PhD physicists are involved in developing the physics arguments and in designing an appropriate detector. This group includes investigators from more than 20 US institutions, as well as from Canada, Europe, Japan, and Israel. It is anticipated that a US B-physics community reaching 250 PhD physicists would ultimately be accommodated at such a national facility.

The US Department of Energy has just completed a full review of the technical feasibility, cost, schedule, and management for the project and has confirmed its readiness for a fiscal year 1993 (October 1992) starting date.

CEBAF Injector test reaches 25 MeV

On 25 April electrons were accelerated through a superconducting eight-cavity cryomodule in the tunnel of the Continuous Electron Beam Accelerator Facility (CEBAF) at Newport News, Virginia. The beam was taken from 5 to 25 MeV, the design energy for this