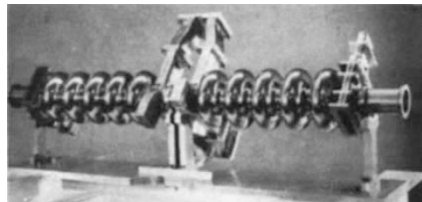


## US accelerators

## Virginia sets its sights higher

Newport News, Virginia

LESS than a year after being appointed director of the Continuous Electron Beam Accelerator Facility (CEBAF), Hermann Grunder is proposing a radical change of design for the accelerator to be built here on a green-field site starting in 1989 — if Congress approves. Grunder wants to abandon the previously-canvassed combination of room temperature linear accelerator and pulse-stretching storage ring and to use instead superconducting



Cornell-CEBAF superconducting niobium electron accelerator element. Each element includes five radio frequency cavities.

niobium radio-frequency cavities to build a continuous-wave electron accelerator, which is claimed to give superior performance for the same cost.

Part of the interest of the project is political; two years ago, the Southern Universities Research Association stole the project from under the nose of the Argonne National Laboratory. Technically, its importance is that it will be the only source of virtually continuous electron beams in the GeV range.

The proposal is being presented this week to the Department of Energy, which will decide by 1 December which design to support. The new design would consist of two antiparallel 0.5 GeV linacs connected end to end by arcs; electrons would circulate around the ring 4 times for a maximum design energy of 4 GeV. That the accelerator should produce a beam that is almost continuous in time is central to its purpose, as such a beam allows "coincidence" measurements to be made; the new design produces a continuous beam directly rather than relying on a pulse-stretching ring.

The advantages of the new design compared with the old are that the energy spread of the electrons will be reduced by a factor of 10; emittance (a measure of beam size) will be reduced by a factor of 100; and power consumption will be reduced by a factor of three, to 6 MW, because of the much lower energy losses in superconducting magnets. Furthermore, electrons will at any time be available at four different energies, corresponding to the number of revolutions completed.

Grunder was recruited to CEBAF from Lawrence Berkeley Laboratory at the beginning of this year, when enthusiasm for the project was waning. The idea of a high-duty cycle accelerator working in the 0.5–4 GeV energy range has been talked

about in the nuclear physics community since 1976, but it was not until 1983 that the CEBAF proposal submitted by the Southern Universities Research Association was recommended to the government for development funding, after a bitterly contested fight with Argonne National Laboratory. Grunder was tempted to the post of director with assurances that substantial research funds would be available in 1987 and 1988 so that he could conduct a complete technology review.

Grunder describes the superconducting continuous wave design as a "responsible risk" proposal. The concept was first demonstrated in the 1960s; advances in technology since then have made it a desirable alternative that has been investigated at several accelerator research centres and developed most recently at Cornell University. Commercial manufacturers are already able to supply the high-precision high purity niobium cavities used.

The design target adopted is 5 MeV per

metre, but in tests some cavities have already performed well above this level. The cryogenic system, which would operate with low-pressure liquid helium at 2K, is large but well within commercial manufacturers' present-day capabilities, according to Grunder. And the need for very high power klystrons, which were the target of a major development effort for the old design, is avoided altogether. Grunder estimates that the new design can be built for the same or slightly less than the \$236 million price-tag for the previous proposal.

The design energy of 4 GeV will enable quark cluster in the nucleus to be examined, but to look for semi-free quarks many physicists believe higher energies will be necessary. The new design could easily be upgraded later to increase energies two or threefold. Grunder is confident that he will be able to sell his new design to the Department of Energy and to Congress: he would, he says, rather be introducing a new design option even at this late stage than fielding questions about why the superconducting option was not considered.

Tim Beardsley

## Embryo research

## Chances of legislation fade

MR Enoch Powell MP's Unborn Children (Protection) Bill, already killed twice in the British House of Commons this year, has spluttered into life again, although its chances of prolonged survival are slim. Powell's bill will ban *in vitro* manipulations of human embryos, excepting only cases where a particular pregnancy is to be brought to term. If the bill becomes law, Britain's *in vitro* fertilization programme would halt.

Since the death of the bill, popular with many MPs, by filibuster, Mr Barney Hayhoe, a supporter of the bill, was appointed Minister for Health in the summer cabinet reshuffle, in succession to Mr Kenneth Clarke, an opponent. Hayhoe's personal views, however, are unlikely to lead him to introduce legislation that the Prime Minister, Mrs Margaret Thatcher, is known not to support.

Mrs Thatcher is understood to favour legislation to implement the recommendations of the Warnock Committee, published last year after two years of deliberations. But the government's legislative programme for the coming years, embodied in the Queen's Speech two weeks ago, says nothing about the subject, suggesting that a government bill will not make its appearance for at least a year.

So opponents of embryo research are again left to the device of the Private Member's bill, the draw for which took place last week. Powell himself drew 13th place in the ballot, so will be unable to introduce his bill himself. But several of the 20 names in the ballot are supporters, and one of these, Mr Tom Clarke, drew

first place. But Clarke prefers a less contentious subject that stands more chance of success. Although Powell's bill had a majority of support in the Commons when originally debated, MPs now seem to have moderated their views.

Part of the explanation seems to be the emergence of a group called *Progress*, including physicians and medical organizations who are seeking to educate MPs and encourage a more "rational and humane judgement".

Meanwhile, scientists using *in vitro* fertilization techniques have been registering with the voluntary licensing authority set up by the Medical Research Council and the Royal College of Obstetricians and Gynaecologists earlier this year. Eleven centres have been approved by the authority so far; eight more are likely to apply for a licence soon. And evidence that the authority is not just a public-relations exercise is provided by three centres whose initial applications were turned down, two of which have now modified their work to conform with the guidelines and have been given licences, and the third of which is expected to reapply soon. All the approved projects involve embryos less than nine days old and concern chromosome abnormalities; non-destructive identification of optimum growth media and normal stages of growth; and cryopreservation of pre-embryos. The authority will issue its first annual report in March, when it will give details of the research at the approved centres and identify those that have not applied for a licence.

Maxine Clarke