New proposal on Beam–Dump

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My proposal is

to use the beam of LC after collision (used beam) for initiation of an accelerator–driven sub–critical reactor,

eliminating usually discussed problem of beam dump.

The idea to work with sub–critical nuclear reactor, initiated by proton or electron beam, for foolproof production of energy and (or) cleaning of nuclear pollution is well known (Rubbia). Here proton or electron beam with particle energy of about 1 GeV is suggested to produce neutrons in the cascades within body of reactor. The problem here is in obtaining necessary beam power of about 5 MWt or larger.

For definiteness, in TESLA project we expect mean used beam power about 15 MWt with electrons or (and) photons having energies of about hundreds GeV. In the suitable target this particle energy can be transmitted to low energy particles to initiate fission process in reactor.

We don't suggest here new regular energy source for industry but the method of utilization of beam and reduction of cost.

Very preliminary estimates:

1. To realize this scheme, the crab crossing scheme for detector may be preferable to move off reactor from accelerator beam. We assume for definiteness crab crossing angle of 30 mrad.

2. Two sub–critical reactors can be situated in about 300 m from detector, at about 9 m from accelerating channel providing good opportunity for protection of collider beam pipe. (Our used beams should move there in not very strong vacuum through some window protected strong vacuum of collider).

3. The reduction of particle energy in used beam can be realized in special degrader, constructed from some light element like berillium or carbon (to have better ratio of nuclear to electromagnetic component in the degraded beam), with length about $5 \div 7$ nuclear collision lengths. Initial radius of used beam in degrader will be about 1 cm. The used beam is expanded here. After that particles with mean energy in hundreds MeV penetrate in proper reactor constructed from uranium or thorium. The form of degrader and particle energy distribution within should be obtained by simulation almost independent on detailed realization of reactor.
The scheme of proper reactor should be subject of separate study (of reactor specialists).

4. The obtained accelerator–driven foolproof sub–critical reactor can be used for energy generation. In particular, the opportunity to have here complete compensation of energy necessary for LC can be considered. The possible use of this reactor for cleaning of extra nuclear pollution can be also considered.

We invite to work on!