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Advanced technologies for components of future accelerators

New technologies are required to achieve the multi-TeV energies of the future e+/e- linear colliders, build compact x-ray FEL, neutrino facilities and other foreseen linear accelerators and storage rings. However, a mandatory condition to achieve these energies is the generation of high-frequency high-power RF and achieving practical accelerating gradients well above 120 MeV/m. Reaching these gradients require extensive and systematic effort in new materials, advanced diagnostics and related techniques. In addition to the highly demanding high-energy applications, accelerators play a key role and we expect they will certainly continue playing a key role also in many applications. More than 15,000 accelerators (value estimated in 2000) are in use around the world and this number is still growing. More than 97% of these accelerators are used for different industrial and commercial applications and as an example, electron linacs for radiotherapy represent one third of all the existing accelerators.

We propose here to start a coordinated R&D of key components of all next generation of accelerators: superconducting RF cavities and magnets. Among the other key developments absolutely necessary in the coming years, we need to consider new magnets with improved performance and a better stability. Regarding magnets will be particularly important improve performance of superconducting magnets, key components of the future colliders of post LHC era. The use of magnets and many other superconducting components in future high-energy accelerators has to take into account of irradiation values never reached so far.

We propose also to explore in a more systematic way damage effects induced by radiation of the new generation of high temperature superconductors (HTSC) in the presence of a high fluence of proton and gamma radiation but also of more exotic particles such as pions copiously produced today in many factories.

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