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Status of Neutrino Factory and Muon Collider R&D*

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A significant worldwide R&D effort is presently directed toward solving the technical challenges of producing, cooling, accelerating, storing, and eventually colliding beams of muons. Its primary thrust is toward issues critical to a Neutrino Factory, for which R&D efforts are under way in the U.S., via the Neutrino Factory and Muon Collider Collaboration; in Europe, centered at CERN; and in Japan, at KEK. Under study and experimental development are production targets handling intense proton beams (1–4 MW), phase rotation systems to reduce beam energy spread, cooling channels to reduce transverse beam emittance for the acceleration system, and storage rings where muon decays in a long straight section provide a neutrino beam for a long-baseline (3000 km) experiment. Critical experimental activities include development of very high gradient NCRF and SCRF cavities, high-power liquid-hydrogen absorbers, and high-field superconducting solenoids. Components and instrumentation that tolerate the intense decay products of the muon beam are being developed for testing. For a high-luminosity collider, muons must be cooled longitudinally as well as transversely, requiring an emittance exchange scheme. In addition to the experimental R&D effort, sophisticated theoretical and simulation tools are needed for the design. Here, the goals, present status, and future R&D plans in these areas will be described.

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