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Superconducting magnetic energy storage

3.1.2. Power cables 3.1.3. Fault current limiters; 3.1.4. Motors and generators; 3.2. Applications in medicine; 3.3. Applications in communications; 3.4. Energy storage; 4. Conclusions; References; Superconducting Materials and Conductors: Fabrication and Limiting Parameters Luca Bottura and Arno Godeke; 1. A Perspective on Applied Superconductivity for HEP Magnets; 2. Relevant Parameters for Application in Accelerator Magnets; 2.1. Critical current density; 2.2. Stabilizer; 2.3. Magnetization, flux jumps, AC loss; 2.4. Mechanical properties; 2.4.1. Axial strain sensitivity 2.4.2. Transverse pressure on cables 2.5. Manufacturing properties; 3. State-of-the-Art Conductors for HEP; 3.1. Nb-Ti; 3.1.1. Discovery and beginnings; 3.1.2. State of the art; 3.1.3. Challenges; 3.2. Nb₃Sn; 3.2.1. Discovery and beginnings; 3.2.2. State of the art; 3.2.3. Challenges; 4. Advances in HTS Materials; 4.1. Bi-2212; 4.2. YBCO; 4.3. Further challenges; 5. Superconducting Cables; 6. Summary; Acknowledgments; References; Superconducting Magnets for Particle Accelerators Lucio Rossi and Luca Bottura; 1. Introduction; 2. Main Characteristics of Superconducting Magnets for Accelerators 2.1. Functions of superconducting magnets 2.2. Magnet design; 2.2.1. Electromagnetic design; 2.2.2. Alternative configurations; 2.2.3. High current density; 2.2.4. Superconductor, load line and margins; 2.2.5. The iron yoke; 2.2.6. Field quality and harmonic content; 2.3. Magnet structure and forces; 2.4. Quench detection and protection; 2.5. Integration; 3. Brief History of Superconducting Magnets for Accelerators; 3.1. Early history; 3.2. Tevatron and Isabelle; 3.3. HERA and UNK; 3.4. RHIC; 3.5. LHC and SSC; 3.5.1. The rise and fall of the giant: SSC; 3.5.2. LHC: "small and smart" 3.5.3. LHC dipole magnet design

Sommario/riassunto

Over the past several decades major advances in accelerators have resulted from breakthroughs in accelerator science and accelerator technology. After the introduction of a new accelerator physics concept or the implementation of a new technology, a leap in accelerator performance followed. A well-known representation of these advances is the Livingston chart, which shows an exponential growth of accelerator performance over the last seven or eight decades. One of the breakthrough accelerator technologies that support this exponential growth is superconducting technology. Recognizing this major