Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme
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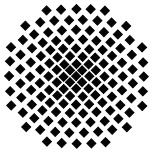

Dienstag, 9. Juli 2013	17.15 Uhr	Hörsaal 2 D5

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Opportunities of high-temperature superconducting power equipment

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Abstract

Since the discovery of high-temperature superconductivity (HTS) in 1986 by Bednorz and Müller, there has been a rapid and considerable progress in the development of technical HTS material. Today, high temperature superconducting wires and tapes are available in qualities and quantities that already allowed the successful development of a number of large scale demonstrators and prototypes for HTS power equipment like e.g. transformers, cables, generators, fault current limiters and superconducting magnetic energy storage (SMES). Nevertheless, further progress is needed not only in the development of HTS wires and tapes but also in R&D of low loss and high current conductor concepts.

There is no doubt, that our electrical power system needs extension and that new and improved power equipment needs to be installed. At present, there is a global change towards more renewable energy but especially in Germany, due to the German Energiewende, fast and huge changes already started and will further continue. Sustainable, reliable and efficient power generation, transmission and distribution are mandatory for each society and superconducting power equipment can play an important role in the future. For conventional power equipment like cables, transformers and generators superconductivity enables in general more compact and efficient devices with superior operating parameters. In addition, superconductivity offers new functionalities like fault current limitation and superconducting magnetic energy storage.

This presentation first motivates the need for new and improved power equipment in present and future power systems and then summarizes shortly the state-of-the-art for R&D of HTS power equipment. A main part of this presentation is to show application examples and opportunities for HTS power equipment. The state-of-the-art for HTS power equipment is very different. Superconducting cables and fault current limiters have been demonstrated many times in large scale prototypes and successful field applications. They are considered to be close to commercialization and market introduction, whereas transformers, rotating machines and SMES still need considerable R&D effort and further large scale prototype demonstration. Even today there are many opportunities for HTS power equipment starting in niche markets for cables and fault current limiters and further developing into bigger market shares. In the medium term, great opportunities can be expected for rotating machines (e.g. HTS wind generators and in the connection of renewable energy) and on a longer term, greater prospects are envisioned for current limiting transformers.