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The Effects of Conductor Magnetization on the Magnetic Field in an Accelerator Magnet System with Various Conductors

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It has been fifty years since the first papers on the effects of magnetization in the superconductor in an accelerator magnet field quality were measured. The effects of conductor magnetization are most pronounced at low fields. By late 1971, a reliable method for estimating the effects of superconductor magnetization on the field quality in accelerator magnets was developed. A review of this method is presented in this paper. The model included unsaturated iron. The effect of filament proximity was modeled in the late 1980's. A simple in-magnet correction system was demonstrated in the early 1990's. The problem that remained was the effect of strand-to strand circulating currents in magnet cables. These currents decay with time for magnets made with cables made with almost any conductor. Accelerator magnets made with wide ReBCO tapes in place of cables are not expected to exhibit any magnetization current decay. Calculation methods developed before 1990 can lead to solutions for reducing the effects of conductor magnetization in HTS magnets as well as LTS magnets. This will be discussed in this paper.

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