

Development and Test Results of a Low-beta Quadrupole Model for the Large Hadron Collider,

Y. AJIMA, Y. DOI, T. HARUYAMA, N. HIGASHI,
H. KAWAMATA, M. IIDA, N. KIMURA,
Y. MAKIDA, T. NAKAMOTO, T. OGITSU,
H. OHATA, N. OHUCHI, T. SHINTOMI,
K. TANAKA, A. TERASHIMA, K. TSUCHIYA,
A. YAMAMOTO, KEK, Japan; G.A. KIRBY,
R. OSTOJIC, T.M. TAYLOR, CERN, Geneva,
Switzerland - A one meter model of the high gradient
70 mm aperture superconducting low-beta quadrupole has
been developed at KEK as part of the collaboration between
CERN and KEK for the Large Hadron Collider (LHC).
The design gradient of the magnet is 240 T/m at 1.9 K,
corresponding to a load line ratio I/I_c of 92% at 7700 A,
and a peak field of 9.6 T in the coil. The magnet features a
four layer coil wound with 11 mm wide graded cables, thin
four-part spacer type collars made of non-magnetic steel,
and a two part structural iron yoke, locked together with
keys to maintain the coil prestress. This paper describes the
development of the first model magnet built and tested at
KEK. We give an account of the construction and
assembly of the magnet, and report on the test results. The
magnet has reached its short sample limit at 4.5 K on its
first training quench, and has reached its design gradient at
1.9 K.