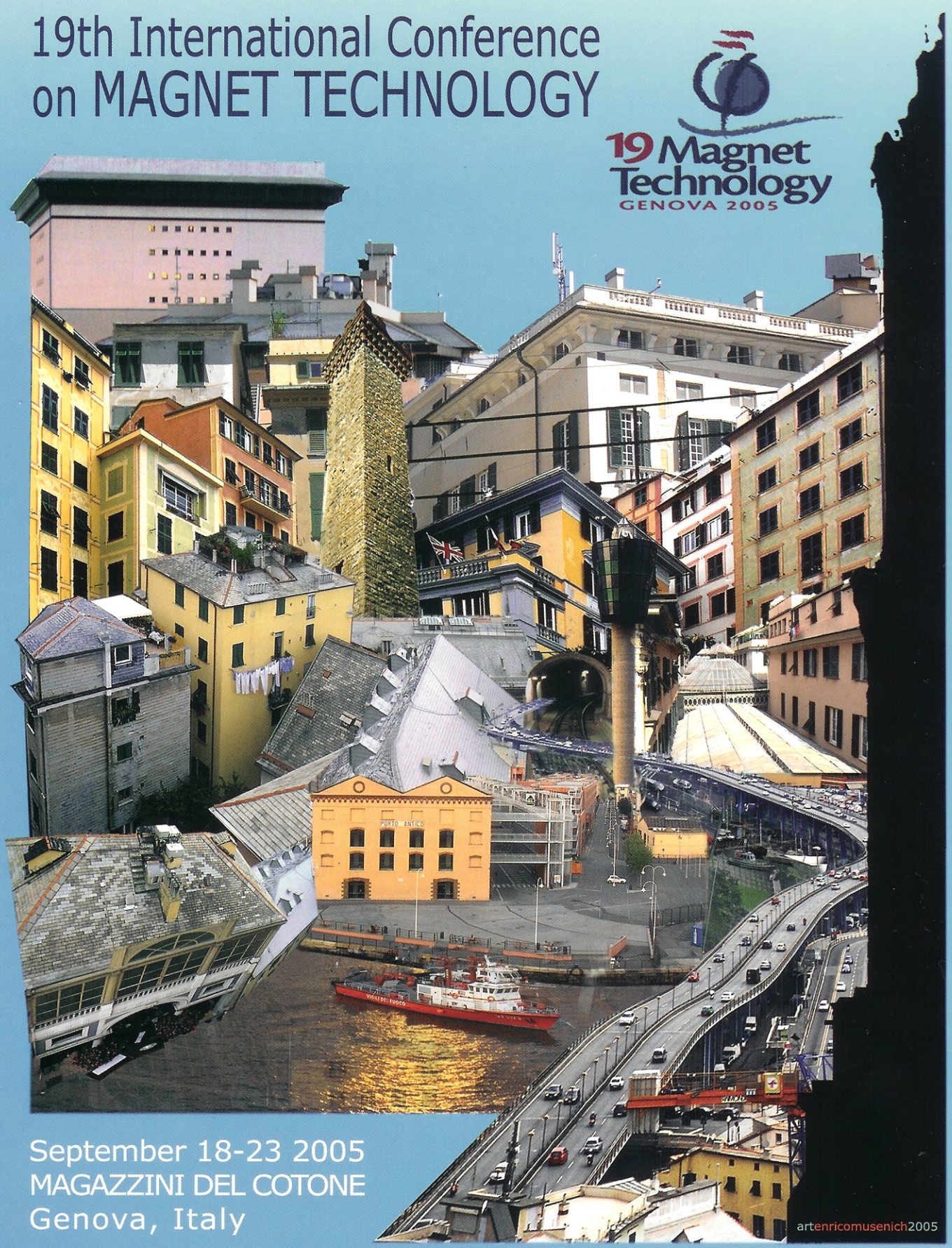
19th International Conference on MAGNET TECHNOLOGY

19 Magnet Technology
GENOVA 2005



September 18-23 2005
MAGAZZINI DEL COTONE
Genova, Italy

Hosted by INFN Istituto Nazionale di Fisica Nucleare with the contribution of Ansaldo Superconduttori

WEA04PO01
Wavelet Analysis of Quench Precursors in the LHC Superconducting Dipole Magnets

M. Calvi, L. Bottura, A. Masi, A. Siemko, CERN; L. Angrisani, University of Napoli Federico II.

Premature training quenches are caused by transient energy released within the magnet coil while it is energised. Signals recorded across the so-called quench antenna carry information about these disturbances. A new method for characterizing those events is proposed which make use of the continuous time wavelet decompositions (CWT). Such approach brings information about the time of occurrence as well as the frequency content of the events. The choice of the optimised mother wavelet is discussed and several examples of high-frequency resolution signal are proposed. The criterion to recognise the interesting events is presented as well as the possibility to classify them in term of families.

WEA04PO02
3D Calculation of the Magnetic Field and Force in a Hybrid EMS-MAGLEV System Taking Account of the Materials' Nonlinearity

Y. Yao, Y. Fang, The College of Electrical Engineering, Zhejiang University.

A hybrid EMS-Maglev system is proposed in this paper. The main magnet is energized by high temperature superconductors (HTS) in company with copper conductors. The HTS coils with constant DC provides main field. The copper conductor coils with variable current supplies adjustable field to compensate the disturbance from loads, gap and power system. Our researches in this paper focus on the computation of levitating field and force in three dimensions. As HTS Bi-2223 tape was applied to fabricate the HTS coil, a new FE model for three dimensional field calculations is deduced. The magnetic nonlinearity of the iron core and the anisotropic characteristic (Jc-Bc-Tc curve) of HTS coil are taken into consideration. The force distribution and total force is computed by local virtual work method. The force performance depending on input current is detail discussed in the paper.

WEA04PO03
Optimal Design and Structural Stress Computation of High Temperature Superconducting Magnet in 100kVA High Temperature Superconducting Generator

F. Song, G. Zhang, B. Chen, S. Yu, H. Wang, H. Guo, S. Dai, Institute of Electrical Engineering, CAS.

Optimal design and structural stress computation of high temperature superconducting (HTS) magnet is presented in this paper. The magnet is the field windings of a 100kVA innovative HTS generator with the evaporative cooling stator and the distributed Dewar rotor. Magnetic rotor and nonmagnetic rotor can be adopted in this generator. At aim of decreasing the values of vertical component of the magnetic flux density through magnets, the magnets are optimized by electrical and magnetic field computation and structural optimization is also considered. The optimal results are that step structure magnet is adopted in nonmagnetic rotor and magnetic diverter rings are applied in magnetic rotor, and the comparison between these types of rotors is implemented about the values of vertical component of the magnetic flux density. For further research, structural stress distribution of the magnets is computed at rotation situation, and based on the stress distribution; the further optimization is beneficial to get reasonable stress distribution and the minimal value of vertical component of the magnetic flux density.

WEA04PO04
Characteristic Analysis on the High Temperature Superconductivity Motor for Multi-pole and Low Speed Application.

K-C. Kim, J. Lee, Hanyang University.

This paper presents the design and analysis methods of a large scaled synchronous motor for ship which has field windings of HTS (high temperature superconductivity). The main characteristic of motor design for ship without gear system is low speed and the system needs multi-pole field HTS windings. However, the airgap of HTS motor is related to somewhat mechanical system, we can not reduce the length of airgap. Therefore, there is much more leakage magnetic flux in multi-pole HTS motor. In this paper, we analyzed the power and loss characteristics of multi-pole HTS motor according to the number of layer and distribution of HTS field windings by finite element method. The last we compared with power ratio between conventional synchronous motor with high power and low speed and HTS multi-pole motor which has same volume and stator dimension. And the power ratio of multi-pole HTS motor to four pole HTS motor also analyzed with same dimension. These are designed by considering critical magnetic flux intensity.

WEA04PO05
Solution of Laplace equation on non axially simmetrical volumes.

V. Punzo, S. Besio, S. Pittaluga, A. Trequattrini, Esaote.

The homogeneity of the magnetic field plays a fundamental role in MRI. Standard shimming techniques of the magnetic field are usually applied on volumes such as spheres or (less frequently) on surfaces of revolution (oblate and prolate spheroids) and are based on well-known solutions of the Laplace equation. We present a complete mathematical formalism for the solution of the Laplace equation with Dirichlet conditions defined on a tri-axial ellipsoid through the transformation of the equation in ellipsoidal coordinates. The importance of the ellipsoid lies in the fact that this surface can be more easily conformed to most districts of the human body (e.g. extremities) and are of interest for dedicated MRI systems.

WEA04PO06
Estimation of Characteristic Satisfaction by EMF-Inductance Map in Superconducting Motor Design

J-Y. Lee, J-P. Hong, Changwon Naitonal University; S-K. Baik, M-H. Sohn, Y-K. Kwon, KERI.

Electric motors are kind of transfers changing electrical energy to mechanical energy. If the electric energy is estimated, the output characteristics are predicted. In the motors, there are input voltage, electromotive force (EMF), current, inductance, and resistance as commonly considerable electrical parameters. Input voltage is one of specifications rather than design variables. Current is dependant variable on other variables such as EMF, inductance, and resistance. Resistance does not mainly affect performances especially in synchronous motors because reactance is relatively bigger than resistance. However, the two rest parameters, EMF and inductance, are not only directly changed by design variables, but also make motor performance considerably changed. Therefore, this paper suggests EMF-Inductance Map, which will be called E-L Map, to effectively predict the