

## Design of HQ – a High Field Large Bore Nb<sub>3</sub>Sn Quadrupole Magnet for LARP

H. Felice, G. Ambrosio, M. Anerella, R. Bossert, S. Caspi,  
D. Cheng, D. Dietderich, P. Ferracin, A. K. Ghosh,  
R. Hafalia, C. R. Hannaford, V. Kashikhin, J. Schmalze,  
S. Prestemon, G.L. Sabbi, P. Wanderer, A.V. Zlobin

**Abstract** — In support of the Large Hadron Collider luminosity upgrade, a large bore (120 mm) Nb<sub>3</sub>Sn quadrupole with 15 T peak coil field is being developed within the framework of the US LHC Accelerator Research Program (LARP). The 2-layer design with a 15 mm wide cable is aimed at pre-stress control, alignment and field quality while exploring the magnet performance limits in terms of gradient, forces and stresses. In addition, HQ will determine the magnetic, mechanical, and thermal margins of Nb<sub>3</sub>Sn technology with respect to the requirements of the luminosity upgrade at the LHC.

**Index Terms** — Superconducting accelerator magnets, Nb<sub>3</sub>Sn, IR quadrupole, LARP

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H. Felice, S. Caspi, D. Dietderich, D. Cheng, P. Ferracin, R. Hafalia, C.R. Hannaford, S. Prestemon and G.L. Sabbi are with Lawrence Berkeley National Laboratory, Berkeley, CA 94720 USA (e-mail: [HFelice@lbl.gov](mailto:HFelice@lbl.gov)).

G. Ambrosio, R. Bossert, V. Kashikhin and A. Zlobin are with Fermilab National Accelerator Laboratory, Batavia, IL 60510-0500 USA.

M. Anerella, A. K. Ghosh, J. Schmalze and P. Wanderer are with Brookhaven National Laboratory, NY, USA