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Kévin Berger, Bruno Douine, Jacques Noudem, Frédéric Trillaud, Michael  
Rudolf Koblishka, Jean Lévêque

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# Trapped Magnetic Field Experiments and Characterization of Large-Sized Bulk MgB<sub>2</sub> Samples

K. Berger<sup>1</sup>, B. Douine<sup>1</sup>, J. Noudem<sup>2,3</sup>,

F. Trillaud<sup>4</sup>, M.R. Koblishka<sup>5</sup>, and J. L  v  que<sup>1</sup>.

<sup>1</sup> University of Lorraine, GREEN, 54506 Vandoeuvre-l  s-Nancy, France

<sup>2</sup> CRISMAT, CNRS/ENSICAEN, 14050 Caen, France

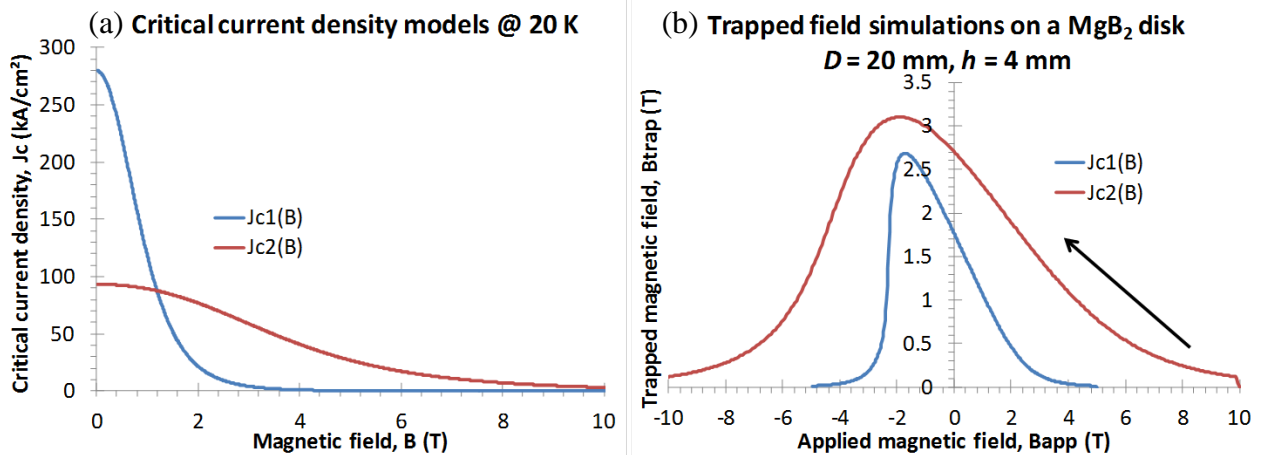
<sup>3</sup> Caen University, LUSAC, 50130 Cherbourg-Octeville, France

<sup>4</sup> National Autonomous University of Mexico, Institute of Engineering, 04510 Mexico

<sup>5</sup> Saarland University, Institute of Experimental Physics, 66123 Saarbr  cken, Germany

Contact e-mail: [kevin.berger@univ-lorraine.fr](mailto:kevin.berger@univ-lorraine.fr)

From the applications point of view, the advantage of the very low density of MgB<sub>2</sub> bulk samples must be taken into consideration and, the generation of strong magnetic flux densities using MgB<sub>2</sub> should be investigated [1]. In this contribution, we have studied the trapped magnetic field properties of samples of 20 mm, 40 mm and 50 mm in diameter. Samples with a diameter of 20 mm and 40 mm were processed by *ex-situ* Spark Plasma Sintering, since the sample of 50 mm of diameter, from Edison Spa, has been produced using a Reactive Mg-Liquid Infiltration process. Both processes are able to produce dense and high quality MgB<sub>2</sub> samples. For the sample of 40 mm diameter, some Field Cooling experiments were carried out at temperatures from 10 K to 30 K both on a single pellet of 4 mm high and on a stack of several pellets of the same diameter. With the help of modeling tools, we have simulated the behavior of such samples in order to deduce their parameters as  $J_c(B)$  and  $n$ -value, Fig. 1.



**Fig. 1:** Two models of critical current density (a), and the simulated resulting trapped magnetic field at the center of the surface of a bulk MgB<sub>2</sub> of 20 mm of diameter and 4 mm high (b).

With these simulations and experiments, we will show that the most relevant parameter for the applications of large-sized bulk MgB<sub>2</sub> samples as permanent magnet is the irreversibility field  $H_{irr}$  and not the critical current density at zero field  $J_c(0)$ .

## References

1. J. G. Noudem, M. Aburras, P. Bernstein, X. Chaud, M. Muralidhar, and M. Murakami, *Development in processing of MgB<sub>2</sub> cryo-magnet superconductors*, J. Appl. Phys. **116**, 163916 (2014).