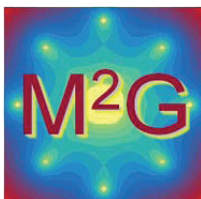




# **Eighth INTERNATIONAL CONFERENCE ON VORTEX MATTER IN NANOSTRUCTURED SUPERCONDUCTORS**

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# **ABSTRACT BOOK**



**NANOSCALE SUPERCONDUCTIVITY,  
FLUXONICS AND PHOTONICS:  
ADDRESSING GRAND CHALLENGES**  
**KU LEUVEN METHUSALEM GROUP**

**EDITED BY :**

**Johan Vanacken  
Monique Van Meerbeek  
Junyi Ge  
Matias Timmermans**



## Frequency dependence of the microwave surface resistance of MgB<sub>2</sub> by coaxial cavity resonator

*A. Agliolo Gallitto, P. Camarda, M. Li Vigni, A. Figini Albisetti and G. Giunchi*

*Dipartimento di Fisica e Chimica, University of Palermo*

The two-gap nature of MgB<sub>2</sub> affects several properties of this material, among which the em response [1]. This is mainly due to the temperature dependence of the condensed-fluid density. One of the properties determining the microwave (mw) response is the surface impedance, whose real part ( $R_s$ ) plays an important role in superconductor-based mw devices. The frequency dependence of  $R_s$  of MgB<sub>2</sub> has not been comprehensively investigated; there are only few papers concerning results obtained mainly in films [2]. In HTSC, the frequency dependence of  $R_s$  has been investigated by coaxial cavity resonator, with the superconducting sample as inner conductor [3]. The lack of detailed investigations in bulk MgB<sub>2</sub> is probably due to the difficulties to produce bulk MgB<sub>2</sub> of large dimensions. We have manufactured a coaxial cavity with outer conductor made by a hollow copper cylinder and inner conductor made by an MgB<sub>2</sub> cylindrical rod. The MgB<sub>2</sub> rod has been prepared by the reactive liquid Mg infiltration technique[4], which allows one to obtain high-density bulk MgB<sub>2</sub> objects of large dimensions. The external copper tube is 105.4 mm long and has an inner diameter of 10.2 mm; the inner MgB<sub>2</sub> rod is 94.3 mm long and has a diameter of 3.8 mm. By measuring the quality factor of the different resonance curves of the cavity, we have determined the frequency dependence of  $R_s$  at fixed temperatures ( $T = 4.2 - 77$  K). Our results show that, in the range  $f=1-8$  GHz, the  $R_s(f)$  curves follow a  $f^n$  law, where  $n$  decreases on increasing  $T$ , starting from  $n=2$  at  $T=4.2$  K down to  $n=0.7$  at  $T \approx T_c$ . We will report and discuss the obtained results and the properties of the investigated MgB<sub>2</sub> material.

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[4] G. Giunchi et al. Cryogenics 46 (2006).

*Presenting author: A. Agliolo Gallitto*