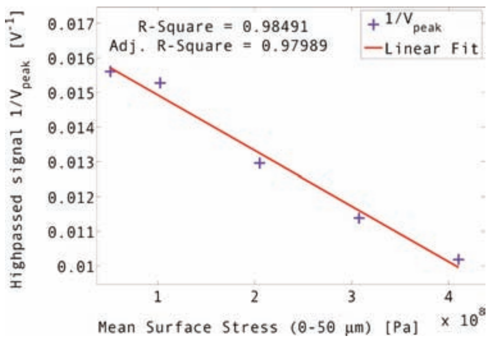

Fig. 1.: Variation of reciprocal Barkhausen voltage amplitude with stress, showing the linear relationship that was predicted theoretically and has been seen in different materials.

4:06

HE-12. Three-axis Magnetic Field Induction Sensor Realized on Buckled Cantilever Plate.

A. Alfadhel[1], A. Carreñ o[1], I. Foulds[1] and J. Kosel[1] *1. King Abdullah University of Science and Technology (KAUST), Physical Science and Engineering Division, Thuwal 23955-6900, Saudi Arabia*

This work presents the fabrication and characterization of a three-axis induction sensor to measure alternating magnetic fields in any direction applied to the sensor. The sensor consists of three planar micro coils. One is at the substrate, while the other two are fabricated on Buckled Cantilever Plates (BCP) that are oriented perpendicularly to the substrate. The BCP design provides simple and accurate out-of-plane assembly while maintaining the direct connection to the substrate for the routing of electrical lines. The proposed sensor is integrated in a single substrate allowing interaction and integration with other systems. The fabrication process is performed on a 500nm thick SiO_2 film for electrical isolation and anchor adhesion. As the sacrificial layer, 2 µm of amorphous Si is grown on top of the SiO_2. The 1um thick microcoil is fabricated using copper electrodeposition. The BCP structural layer is prepared using non-photopatternable polyimide PI2611 achieving a thickness of 4 µm. Different microcoil configurations are realized with 15-33 turns, 5um track width, and 10-15um track spacing. The electrical tests show high values of inductance up to 800 nH per coil and quality factors of about 18. The sensor showed high sensitivity to magnetic fields within a frequency range of 40Hz - 10MHz. In summary, the BCP concept provides a strikingly simple method to fabricate this three-axis field sensor that can readily be integrated with electronic circuits, and the sensor's performance can easily be adjusted in a wide range by simply changing the dimensions of the coils.

4:18

HE-13. Design and performances of a high temperature superconducting axial flux generator.

M. Trapanese[1], V. Franzitta[2] and A. Viola[2] *1. Dipartimento di Ingegneria Elettrica, Elettronica e delle Telecomunicazioni, Università di Palermo, Palermo, Italy; 2. Dipartimento di Ingegneria dell'Energia, Università di Palermo, Palermo, Italy*

An important quality index of electric machine is the power density: it is known that axial flux machine tends to have a higher power density than the radial machines. As a result they are becoming more and more used in applications where the power density is a critical issues. However, the best way to enhance the power density is to increase the value of the airgap field and this could be achieved by using a superconducting excitation. Many projects have been developed in the world in order to develop both superconducting generator and superconducting motor, but in most of these programs the geometry of the machine has been based on radial machines [1]. All of these approaches show the feasibility of a superconducting generator but some drawbacks, that are eventually linked to the fact that the low temperature area must be guaranteed in the moving part of the machine, have been evidenced In this paper, a high temperature axial flux (HTSAF) generator is presented. In this generator the excitation is obtained by using some high temperature superconducting magnets (HTSPM). The magnets are installed in the stationary part of the machine inside a thermal vessel which contains the coolant and reduces the thermal losses. This vessel is linked to the cooling system through two ducts. The winding is located on the rotating part of the generator and are linked to the power electronics section of the generator trough a slip and ring system. Due to the fact that this machine has been built in order to work at a maximum field of 2T, a ferromagnetic yoke has been installed. The structure of the stator consists of a disk containing 8 HTSPMs. The rotor has a double sided structure. The windings are made of copper. The rotor runs at room temperature. The pole shoes and the yoke are made of laminated steel. In the paper, preliminarily, an analytical magnetic analysis of the structure of the machine is performed. Then, the analytical analysis is validated through numerical technique. Finally, the electrical and mechanical output parameters of the machine are computed. The power density ratio is calculated and it is shown that is much higher than a traditional machine.

[1] Parker, J., Towne, R., "Superconducting AC generators", IEEE Transactions on Magnetics, Volume: 12, Issue: 6, 1976, pp 909-914