Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10333, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10333
EGU General Assembly 2008

Feasibility of a Giant Magneto-Impedance sandwich magnetometer for space applications

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Space experiments require very efficient magnetic field sensors. Fluxgates are presently the most widely used vector magnetometers to measure weak magnetic fields in space, from DC up to a few tens of Hz. But they require a meticulous calibration due to the drift of their offsets. Since a few years the Giant Magneto-Impedance (GMI) effect has been extensively studied and promising results have been obtained that will allow to built prototypes of magnetometers. We present a new GMI sandwich magnetometer for space applications based upon a GMI sandwich transducer made of nanocrystalline alloy and copper films. A very low noise amplifier is combined with an AM demodulation to extract the weak dc-low frequency dc-magnetic field signal from the carrier. The Noise Equivalent Magnetic Induction (NEMI) is improved thanks to an experimental optimization method enabling to increase the intrinsic sensitivity and to the use of a ratio transformer to reduce the electronic noise. We have obtained a flat transfer function in the frequency range [DC-1kHz]. In this broad range, the sensitivity is equal to 1000V/T and the NEMI reaches a few nT/sqrt(Hz).