Conception, fabrication and test of AMR-based magnetic gradiometers for navigation applications

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In this talk, we will present the design and performances of a micronic magnetic gradient sensor based on AMR technology. The sensing parts of the gradiometer are made of a thin 200 um long ellipsoid-shaped Py AMR element covered by a thick Au barberpole with maximized sensitivity. The sensing magnetoresistances are placed at each part of a 5mmx5mm Si/SiO2 substrate and are included in a Wheatstone bridge balanced in a way that the transverse voltage is proportional to the field gradient. CoZrNb flux concentrators have been designed to provide optimal gain for gradiometer application i.e. maximize the amplification of a field gradient and minimized the amplification of a uniform field. Innovant solutions for low consumption anisotropy switching and offset compensations are being experimented using spin-hall-effect and spin-transfer coupling with adjacent Pt and AuW layers. We will compare sensors performances in terms of linearity, reversibility, and magnetic detectivity ($\mathrm{T}/\sqrt{Hz}$) from 0.1Hz to few KHz frequency range.