# Magnetic fluctuations in multi-layer flux concentrators

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At present as cores of flux gates magnito-soft materials with record-breaking high values of magnetic permeability $\mu = 10^5$ and above are usually used. Use of such ferromagnetic materials allows to register magnetic fields to $10^{-5}$ A/sm. To measure lower field it is not possible because of high level of noise which arise at magnetic reversal of cores by exciting fields.

In the given work high-sensitivity the substantiation of possibility of creation is resulted in a field of flux gates with film cores. As cores multilayered film systems in the form of narrow strips, which magnetic reversal by homogeneous rotation of magnetization in layers are used. As it is known, sensitivity one-domain flux gates a magnetometer considerably above, than at flux gates with massive cores. At magnetic reversal of such cores more high-frequency exciting fields ($f_{exc}$=1-50MHz) were used. It is shown that at magnetic reversal by homogeneous rotation permeability $\mu$ decreases on one order. During too time level of magnetic fluctuations near to the second harmonic $f_{exc}$ decreases on 2-3 order.

For the answer to a question on prospect of use of such films as cores of flux gates the analysis of settlement and experimental dependences M(H) (calculation for magnetic reversal of cores of flux gates along an axis of difficult magnetic reversal is spent for the first time) has been carried out.

Multilayered films of alloys Ni – Fe in which ferromagnetic layers are divided by layers SiO, have been made of condensation in vacuum. For creation of monoaxial anisotropy condensation was spent in a magnetic field. The field of the induced monoaxial anisotropy varied within $H_k$ = 1-15Oe. In rectangular samples in the size 2x20 mm and thickness of layers t = 0.1- 0.5 micron AEM has been focused perpendicularly or under some corner to the long party of the sample. The hysteresis loop in an easy direction was rectangular from Hc = 0.1 - 0.5Oe, and in a difficult direction dependence of M(H) is close to linear with a small hysteresis of $M(H) = (H/H_k)M_s$. Absence of a hysteresis in a difficult direction specifies that the sample is one-domain in each layer and reversal by homogeneous rotation $M_s$.

In work possibility of use of such film cores with linear dependence of M(H) in the range of fields $0 < H < H_k$ and $H_k < H < \infty$ (where $H_k$ – an anisotropy field) for registration of small magnetic fields is theoretically proved and experimentally proved. The conducted researches specify that use of flux gates with such film cores will allow to lower the bottom limit of registered fields on 1-2 order.