



## ASSESSING MAGNETIC PROPERTIES OF CELLS USING MAGNETOPHORETIC MOTION VISUALIZATION

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**Fluid:** cellular suspensions

**Visualization method(s):** video filming

**Other keywords:** image processing, trajectory tracking, magnetic properties of cells

**ABSTRACT:** Characterization and separation of submagnetic microparticles, especially biological particles, with the use of their intrinsic magnetic differences, had been attempted not once in the past, and remains the subject of noticeable interest [1]. As a rule, assessing magnetic properties of such particles relies on the indirect methods employing characteristics of the recorded particle motion in a liquid under the action of a high-gradient magnetic field. The use of analogous recording and manual data handling in early works allowed fragmentary information. Recently, modern digital means have been used to develop Cell Tracking Velocimetry [1] with the primary aim of evaluating magnetic characteristics of magnetic microspheres and magnetically labeled cells in context of immunomagnetic separation. The potential scientific and practical significance of such measurements depends on the possibility to handle large enough amount of particles. This involves simultaneous recording the scores of moving objects and excludes the possibility of recognizing the whole set of their individual characteristics influential on the magnetophoretic motion velocity (such as particle volume, particle intrinsic fluidity, and its proximity to the fluid channel walls). In this report we introduce a new technique, Magnetophoretic Trajectory Tracking Magnetometry (MTTM), that employs recording of long (as comparable with the particle diameter) 2D trajectories of particle motion caused by the action of crossed gravitational and magnetic forces, such trajectories not being dependant on the above mentioned factors [2]. Special consideration, for the first time in the field of magnetophoretic magnetometry, is given to both experimental and theoretical evaluation of methodical restrictions associated with the hydrodynamic interaction of moving particles. This allowed to evaluate the method error and to chose the appropriate experimental conditions. Possibilities of new technique are illustrated by experiments with different cell populations. The method performance is illustrated in fig. 1

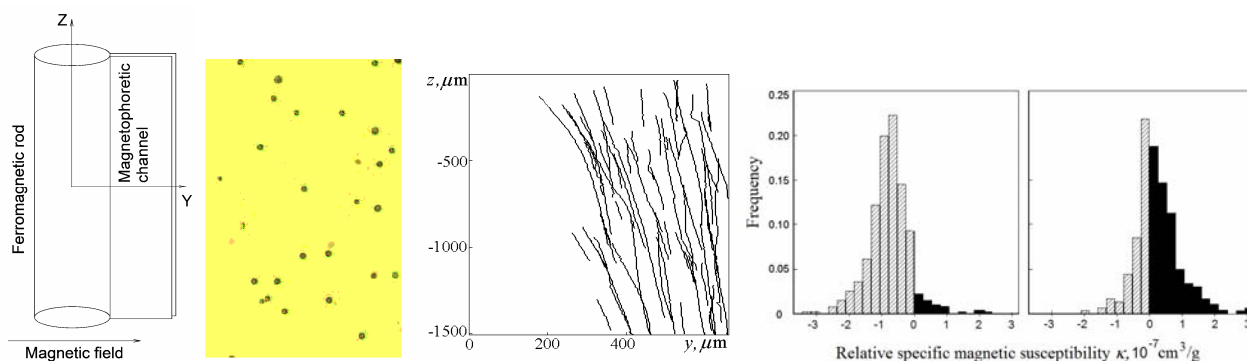


Fig.1 From left to right: a scheme of the fluid channel, a snapshot of moving cells, restored cell trajectories ( $x$  is the distance from the magnetic road), and two histograms of magnetic properties distribution of human blood cells for a healthy donor (left) and a donor after heart attack.

### References

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2. Kashevskii B.E., Kashevskii S.B., Prokhorov I.V. *Magnetophoresis and the Magnetic Susceptibility of HeLa Tumor Cells*. Biophysics. 2006, **51**(6), p. 902