

# Biomagnetic Imaging

## Magnetostriction, nanoparticles and tumor imaging

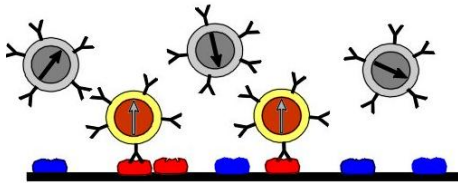
Talk by: Matteo Cialone

Seminar: Selected Topics in Physics: From basic solid state research to applications  
Prof. K. Franke, Summer semester 2013

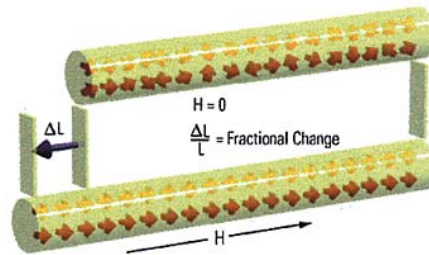
25 June 2013

Lung cancer is one of the leading causes of cancer related death all over the world. It is proved that early diagnosis of primary lesions and metastases can rescue up to 85% of patients. So it is clear the need for detect and imaging tumors. Magnetic resonance imaging (MRI) and computed axial tomography (CAT) play a fundamental and predominant role in this field, however other techniques have been developed, mainly with the purpose to be less expensive and less invasive for the patient. One of these is to use an array of fiber optic array sensors, capable of robustly detecting magnetic nanoparticles, conjugated with antibodies that target them to lung tumors.

Aim of the talk is to give an overview of the principles at the base of the magnetostrictive behavior, first observed by J. P. Joule in 1842, and of the superparamagnetic character shown by ferromagnetic nanoparticles. Then how magnetoparticles are addressed to the cancer cell and what kind of information can be gathered from them will be explained. Finally will be discussed how to put together all this information in order to develop a fast, *in vivo* detection technique for tumors, using an array of magnetometer.



(a) Immobilization of magnetic nanoparticles by antibody-antigen coupling, image from <http://www.ptb.de/> [access 06/2013]



(b) Magnetic fields cause magnetostrictive materials to change shape, image from <http://archives.sensorsmag.com/> [access 06/2013]