

# Differential magnetometry to detect sentinel lymph nodes in laparoscopic procedures

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## Abstract

Detection of the sentinel lymph node (SLN) in cancer patients can overrule the requirement for resection of all regional lymph nodes, which leads to decreased morbidity[1]. However, SLN biopsies are currently only clinical practice in breast cancer and melanoma. In other cancer types such as colon cancer, SLNs are located deeper inside the body and therefore the resection procedure is more complicated. A trend that is observed in the medical world is the increased use of minimal invasive interventions. This will in many situations overrule open surgery, which leads to decreased risks to the patient.

The use of magnetic nanoparticles has many advantages over nuclear tracers, which are the current standard to detect SLNs. The principle that we use to achieve SLN detection is differential magnetometry (DiffMag). In DiffMag the nonlinear magnetization characteristics of superparamagnetic iron oxide nanoparticles are exploited[2]. The main drawback of the current handheld Diffmag device is limited depth sensitivity. In order to alleviate this drawback we propose a set-up in which the excitation and detection coils are mechanically separated. As a result, the size of the excitation coil can be increased and placed outside the body. The detection probe can be made much smaller. Our goal is to place the detector inside laparoscopic equipment in order to provide a minimal invasive way to detect SLNs.

[1] Giuliano and Gangi, 2015. [2] Waanders et al., 2016.