

# Separation of excitation and detection coils to locate superparamagnetic iron oxide nanoparticles *in vivo*

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## **Aim**

The aim of this study is to develop a novel laparoscopic probe for sentinel node biopsy. The latter is a procedure to analyze the lymph node status of cancer patients [1], enabling personalized patient care.

## **Methods**

Superparamagnetic iron oxide nanoparticles (SPIONs) are used as a tracer to find sentinel nodes *in vivo*. The principle that we use to locate them is Differential Magnetometry (DiffMag) [2]. In DiffMag, the nonlinear magnetic properties of SPIONs are used, enabling selective detection in the diamagnetic patient.

We propose a set-up with mechanically separated excitation and detection coils. As a result, the size of the excitation coil can be increased and placed outside the body. The detection coil can be made much smaller, and placed inside laparoscopic equipment. However, the main challenge of this set-up is that the detection coils can move with respect to the excitation coils. Therefore, the detector signal is hindered by the excitation field, requiring continuous active compensation.

## **Results**

We implemented active compensation and tested it in a static set-up on three types of SPIONs. It was possible to measure small amounts of SPIONs, the minimum amount tested was 50  $\mu\text{g}$  Fe.

## **Conclusion**

These first results are promising for sentinel node biopsy. Moving the detector is a challenge that we will solve by using faster electronics, allowing real time compensation of the excitation signal.

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