

Multi-Layers Surface Coil Design: Geometry Optimization

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Abstract

Nuclear Quadrupole Resonance (NQR) is a radio frequency (RF) spectroscopic technique that is used to detect quadrupole nuclei such as Nitrogen-14. NQR was found to be a good candidate for detecting narcotics, explosives and medicines [1]. However, due to its low sensitivity the use of NQR is still limited. One way to increase the sensitivity is to improve the RF coil by means of a better RF magnetic field homogeneity and a greater quality factor. In this study we will discuss the design of multi-layer surface coil used in remote NQR detection [2].

In this kind of study simulation can be very helpful. In order to optimize the geometry (distance between layers, dimensions ...), we have used Comsol Multiphysics® (ACDC module and RF module). Different configurations were compared.

Comsol Multiphysics®, we demonstrated that to improve the performances of a multi-layers surface coil, the geometry has to be chosen carefully.

Reference

[1] J. Fraissard, O. Lapina, Explosives Detection Using Magnetic and Nuclear Resonance Techniques, Springer, Berlin, 2009.

[2] Suits, B. H., and Garroway, A. N. Optimizing surface coils and the self-shielded gradiometer. J. Appl. Phys., 94:4170–4178, 2003.